basis was established. Although he was a Presbyterian clergyman, he. endeavoured at the outset to substitute the tests of scholarship for those of religion; at the same time a scientific course was introduced, courses in pedagogy followed, and in 1878 the elective system, which has since rapidly expanded, was established. President Tappan was succeeded in 1863 by Erastus Otis Haven (1820- 1881), who resigned in 1869, and was succeeded temporarily (1869-1871) by Professor Henry S. Frieze (1817-1889), and in 1871 by James Burrill Angell (b. 1829), 1 who resigned in 1909. In 1871-1872 the German seminar method was introduced in graduate work in history, by Prof. Charles Kendall Adams (1835- 1902), afterwards president of Cornell University (1885-1892) and of the University of Wisconsin (1892-1902).

See B. A. Hinsdale and I. N. Demmon, History of the University of Michigan (Ann Arbor, 1906) ; Elizabeth M. Farrand, History of the University of Michigan (Ann Arbor, 1885); and The Quarter Centennial of the Presidency of James Burrill Angell (Ann Arbor,

1896).

MICHIGAN CITY, a city of Laporte county, Indiana, U.S.A., on the S.E. shore of lake Michigan, aboift 40 m. E. by S. of Chicago. Pop. (1890) 10,776; (1900), 14,850, of whom 3662 were foreign-born; (1910 census) 19,027. Michigan City is served by the Chicago, Indianapolis & Louisville, the Lake Erie & Western, the Michigan Central and the Pere Marquette railways, by interurban electric lines, and by several lines of lake steamships. The city contains a United States Life Saving Station and the Indiana State Prison, and is the seat of a Protestant Episcopal bishop. Its transportation

1 President Angell graduated in 1849 at Brown University, where he was assistant librarian in 1 849-1 850 and was professor of modern languages in 1 853-1 860; was editor of the Providence Journal in 1860-1866; was president of the University of Vermont in 1866-1871, was United States minister to China in 1880-1881, was a member of the joint commission of 1 887-1 888 to settle' fishery disputes between the United States and Great Britain, was chairman of the international deep waterways commission in 1896, and in 1897-1898 was United States minister to Turkey.

advantages make it one of the principal commercial cities in the state. Its shipments of lumber are of special importance, and it has also a large transshipment trade in salt and iron ore. The total factory product in 1905 was valued at $6,314,226. The municipality owns and operates its water-works system. Michigan City was first settled about 1830, was incorporated as a village in 1837, and was first chartered as a city in 1867.

MICHMASH, a place in Benjamin, about 9 Roman miles north of Jerusalem (Onom, ed. Lag., p. 280), the scene of one of the most striking episodes in Old Testament history (1 Sam. xiv.). Though it did not rank as a city (not being mentioned in Joshua xviii. 21 seq.), Michmash was recolonized after the exile (Neh. xi. 31), and, favoured by the possession of excellent wheat-land (Mishna, Men. viii. 1), was still a very large village (MaxA««) m tne time of Eusebius. The modern Mukhmas is quite a small place.

The historical interest of Michmash is connected with the strategical importance of the position, commanding the north side of the Pass of Michmash, which made it the headquarters of the Philistines and the centre of their forays in their attempt to quell the first rising under Saul, as it was also at a later date the headquarters of Jonathan the Hasmonaean (1 Mace. ix. 73). From Jerusalem to Mount Ephraim there are two main routes. The present caravan road keeps the high ground to the west near the watershed, and avoids the Pass of Michmash altogether. But another route, the importance of which in antiquity may be judged of from Isa. x. 28 sqq., led southwards from Ai over an undulating plateau to Michmash. Thus far the road is easy, but at Michmash it descends into a very steep and rough valley, which has to be crossed before reascending to Geba. 1 At the bottom of the valley is the Pass of Michmash, a noble gorge with precipitous craggy sides. On the north the crag is crowned by a sort of plateau sloping backwards into a round-topped hill. This little plateau, about a mile east of the present village of Mukh- mas, seems to have been the post of the Philistines, lying clos # e to the centre of the insurrection, yet possessing unusually good communica- tion with their establishments on Mount Ephraim by way of Ai and Bethel, and at the same time commanding the routes leading down to the Jordan from Ai and from Michmash itself.

See further C. R. Conder, Tentwork ii. 1 12 seq. ; and T. K. Cheyne in Encyc. Bib., s.v. (R. A. S. M.)

MICHOACAN, or Michoacan de Ocampo, a state of Mexico touching on the Pacific, bounded N. by Jalisco and Guana- juato, E. by Mexico

and Guerrero, S. by Guerrero and the Pacific, and W. by the Pacific, Colima, and Jalisco. Pop. (1900), 935,808, chiefly Indians and me'stizos. Area, 22,874 sq. m. Its territory is divided into two nearly equal parts by the eastern branch of the Sierra Madre Occidental, the northern part belonging to the great central plateau region, and the southern to an extremely broken region formed by the diverging branches of the' Sierra Madre, with their wooded terraces and slopes and highly fertile valleys. The general slope of the southern part is southward to the river Balsas, or Mescala, which forms its boundary-line with Guerrero. The narrow coastal zone on the Pacific is only roi m. long and has no ports or towns of importance, the slopes of the Sierra Madre del Pacifico being precipitous and heavily wooded and the coast- belt sandy, hot and malarial. The Lerma, on the northern frontier, and the Balsas on the southern, are the only rivers of importance of the state, their tributaries within its boundaries being small and swift-flowing. There are several large and beautiful lakes in the state, the best known of which are Patz- cuaro and Cuitzeo. Lake Chapala lies on the northern boundary. Michoacan lies within the most active volcanic region of Mexico: Jorullo (4262 ft.) is near its southern line, and Colima (12,750 ft.) is northwest of it in the state of Jalisco. Earthquake shocks are numerous, and Colima was in violent eruption in 1908-1909. The highest summit in the state is Tancitaro (12,660 ft.). The climate is for the most part temperate and healthy, but it is hot and unhealthy on the coast. Michoacan is essentially a mining region, producing gold, silver, lead and cinnabar, and having rich deposits of copper, coal, petroleum and sulphur. The natural products include fine cabinet and construction woods, rubber, fruit, palm oil and fibres. The soil of the valleys is highly fertile, and produces cereals in the higher

1 So Isa. x. 28 describes the invader as leaving his heavy baggage at Michmash before pushing on through the pass.

regions, and sugar-cane, tobacco, coffee and tropical fruits in the lower. Though the plateau region was settled soon after the arrival of the Spaniards in Mexico, there are large districts on the southern and Pacific slopes that still belong almost exclusively to the Indians. Besides Morelia, the capital and largest city, the principal towns of the state are: La Piedad (pop. 15,123), an important commercial town on the Lerma river and on the Mexican Central railway, 112 m. N.N.W. of Morelia; Zamora (10,373), 75 m. W.N.W. of Morelia; Uruapan (9808), on the Mexican National, 55 m. S.W. of Morelia in a mountainous district celebrated for the fine quality of its coffee; Puruandiro (7782), a commercial and manufacturing town 40 m. N.W. of Morelia; Patzcuaro (7621), on Patzcuaro lake, with a station on the Mexican

National, 7550 ft. above sea level; Sahuayo (7408), 103 m. W. by N. of Morelia near Lake Chapala; Zitacuaro (6052), 60 m. S.E. of Morelia on a branch of the Mexican National, which also passes through the mining town of Angan- gueo (9115) in the same district; and Tacambaro (5070), 46 m. S.S.W. of Morelia in a fertile valley of the Rio de las Balsas basin.

MICKIEWICZ, ADAM (1798-1855), Polish poet, was born in 1798, near Nowogrodek, in the present Russian government of Minsk, where his father, who belonged to the schlachta or lesser nobility, had a small property. The poet was educated at the university of Vilna; but, becoming involved in some political troubles there, he was forced to terminate his studies abruptly, and was ordered to live for a time in Russia. He had already published two small volumes of miscellaneous poetry at Vilna, which had been favourably received by the Slavonic public, and on his arrival at St Petersburg he found himself admitted to the leading literary circles, where he was a great favourite both from his agreeable manners and his extraordinary talent of improvisation. In 1825 he visited the Crimea, which inspired a collection of sonnets in which we may admire both the elegance of the rhythm and the rich Oriental colouring. The most beautiful are The Storm, Bakchiserai, and Grave of the Countess Pdtocka.

In 1828 appeared his Konrad Wallenrod, a narrative poem describing the battles of knights of the Teutonic order with the heathen Lithuanians. Here, under a thin veil, Mickiewicz represented the sanguinary passages of arms and burning hatred which had characterized the long feuds of the Russians and Poles. The objects of the poem, although evident to many, escaped the Russian censors, and it was suffered to appear, although the very motto, taken from Machiavelli, was signifi- cant: ” Dovete adunque sapere come sono duo generazioni da combattere . . . bisogna essere volpe e leone.” This is a striking poem and contains two beautiful lyrics. After a five years’ exile in Russia the poet obtained leave to travel; he had secretly made up his mind never to return to that country or Poland so long as it remained under the government of the Muscovites. Wending his way to Weimar, he there made the acquaintance of Goethe, who received him cordially, and, pursuing his journey through Germany, he entered Italy by the Spliigen, visited Milan, Venice, and Florence, and finally took up his abode at Rome. There he wrote the third part of his poem Dziady, the subject of which is the religious com- memoration of their ancestors practised among Slavonic nations, and Pan Tadeusz, his longest poem, by many considered his masterpiece. A graphic picture is drawn of Lithuania on the eve of Napoleon’s expedition to Russia in 181 2. In this village idyll, as Bruckner calls it, Mickiewicz gives us a

picture of the homes of the Polish magnates, with their somewhat boisterous but very genuine hospitality. We see them before us, just as the knell of their nationalism, as Bruckner says, seemed to be sounding, and therefore there is something melancholy and dirge- like in the poem in spite of the pretty love story which forms the main incident. Mickiewicz turned to Lithuania with the loving eyes of an exile, and gives us some of the most delightful descriptions of Lithuanian skies and Lithuanian forests. He describes the weird sounds to be heard in the primeval woods in a country where the trees were sacred. The cloud-pictures

are equally striking. There is nothing finer in Shelley or Wordsworth.

In 1832 Mickiewicz left Rome for Paris, where his life was for some time spent in poverty and unhappiness. He had married a Polish lady, Selina Szymanowska, who became insane. In 1840 he was appointed to the newly founded chair of Slavonic languages and literature in the College de France, a post which he was especially qualified to fill, as he was now the chief repre- sentative of Slavonic literature, Pushkin having died in 1837. He was, however, only destined to hold it for a little more than three years, his last lecture having been given on the 28th of May 1844. His mind had become more and more disordered under the influence of religious mysticism. He had fallen under the influence of a strange fanatic named Towianski. His lectures became a medley of religion and politics, and thus brought him under the censure of the Government. A selection of them has been published in four volumes. They contain some good sound criticism, but the philological part is very defective, for Mickiewicz was no scholar, and he is obviously only well acquainted with two of the literatures, viz. Polish and Russian, the latter only till the year 1830. A very sad picture of his declining days is given in the memoirs of Herzen. At a comparatively early period the unfortunate poet exhibited all the signs of premature old age; poverty, despair and domestic affliction had wrought their work upon him. In 1849 he founded a French newspaper, La Tribune des peuples, but it only existed a year. The restoration of the French Empire seemed to kindle his hopes afresh; his last composition is said to have been a Latin ode in honour of Napoleon III. On the outbreak of the Crimean War he was sent to Constantinople to assist in raising a regiment of Poles to take service against .the Russians. He died suddenly there in 1855, and his body was removed to France and buried at Montmorency. In 1900 his

remains were disinterred and buried in the cathedral of Cracow, the Santa Croce of Poland, where rest, besides many of the kings, the greatest of her worthies.

Mickiewicz is held to have been the greatest Slavonic poet, with the exception of Pushkin. Unfortunately in other parts of Europe he is but little known; he writes in a very difficult language, and one which it is not the fashion to learn. There were both pathos and irony in the expression used by a Polish lady to a foreigner, ” Nous avons notre Mickiewicz a nous.” He is one of the best products of the so-called romantic school. The Poles had long groaned undef the yoke of the classicists, and the country was full of legends and picturesque stories which only awaited the coming poet to put them into shape. Hence the great popularity among his countrymen of his ballads, each of them being connected with some national tradition. Besides Konrad Wailenrod and Pan Tadeusz, attention may be called to the poem Grazyna, which describes the adventures of a Lithuanian chieftainess against the Teutonic knights. It is said by Ostrowski to have inspired the brave Emilia Plater, who was the heroine of the rebellion of 1830, and after having fought in the ranks of the insurgents, found a grave in the forests of Lithuania. A fine vigorous Oriental piece is Farys. Very good too are the odes to Youth and to the historian Lelewel; the former did much to stimulate the efforts of the Poles to shake off their Russian conquerors. It is enough to say of Mickiewicz that he has obtained the proud position of the representative poet of his country; her customs, her super- stitions, her history, her struggles are reflected in his works. It is the great voice of Poland appealing to the nations iii her agony.

His son, Ladislas Mickiewicz, wrote Vie d’Adam Mickiewicz (Posen, 1890-1895, 4 vols.), also Adam Mickiewicz, sa vie et son ceuvre (Paris, 1888) Translations into English (1881-1885) of Konrad Wailenrod and Pan Tadeusz were made by Miss Biggs. See also CEuvres poetigues de Mickiewicz, trans, by Christien Ostrowski (Paris, 1845). (W. R. M.)

MICKLE, WILLIAM JULIUS (1735-1788), Scottish poet, son of the minister of Langholm, Dumfries-shire, was born on the 28th of September 1735. He was educated at the Edinburgh L£gh school, and in his fifteenth year entered business as a

brewer. His father purchased the business, and on his death William Mickle became the owner; but he neglected his affairs, devoting his time to literature, and before long became bankrupt. In 1763 he went to London, where in 1765 he published ” a poem in the manner of

Spenser ” called the Concubine (after- wards Syr Martyn); was appointed corrector to the Clarendon Press, and translated the Lusiad of Camoens into heroic couplets (specimen published 1771, whole work, 1775). So .great was the repute of this translation that when Mickle — appointed secretary to Commodore Johnstone — visited Lisbon in 1779, the king of Portugal gave him a public reception. On his return to London he was appointed one of the agents responsible for the distribution of prize-money, and this employment, in addition to the sums brought him by his translation of the Lusiad, placed him in comfortable circumstances.

It has been suggested that the Scottish poem ” There’s nae luck aboot the hoose ” was Mickle’s. It is more likely, however, that Jean Adams was the author. Scott read and admired Mickle’s poems in his youth, and founded Kenilworih on his ballad of Cumnor Hall, which appeared in Thomas Evans’s Old Ballads . . . with some of Modem Date (1784).

MICMAC, a tribe of North American Indians of Algonquian stock. They formerly occupied all Nova Scotia, Cape Breton and Prince Edward Islands, and portions of New Brunswick, Quebec and Newfoundland. They fought on the French side in the colonial wars. They are now civilized and almost all profess Catholicism. They number some 4000 in settled com- munities throughout their former territory.

There is an excellent account of the Micmac Indians in J. G. Millais’s Newfoundland and its Untrodden Ways (1908).

MI CON, a Greek painter of the middle of the fifth century B.C. He was closely associated with Polygnotus of Thasos, in conjunction with whom he adorned the Painted Stoa, at Athens, with paintings of the battle of Marathon and other battles. He also painted in the Anaceum at Athens.

MICROCLINE, a rock-forming mineral belonging to the feldspar group (see Felspar). Like orthoclase it is a potash- feldspar with the formula KAlSi 3 8 , but differs from this in crystallizing in the anorthic system. The name (from Greek (iticpds, small, and kKLvuv, to incline) was given by A. Breithaupt in 1830, and has reference to the fact that the angle (89 30′) between the two perfect cleavages differs but little from a right angle: the species was, however, first definitely established by A. Des Cloizeaux in 1876. The crystals and cleavage masses are very like orthoclase in appearance, and the hardness (6) and specific gravity (2-56) are the same for the two minerals; there

are, however, important differences in the twinning and in the optical characters. In addition to being twinned accord- ing to the same laws as orthoclase, microcline is repeatedly twinned according to the albite-law and the pericline-law, pro- ducing a very characteristic grating or cross-hatched structure which is especially prominent when thin sections of the mineral are examined in polarized light. This lamellar structure is often on a very minute scale, sometimes so minute as to be almost indistinguishable: it has therefore been suggested that ortho- clase is really a microcline in which the twin-lamellae are ultra- microscopic. In a section parallel to the basal plane c (001) of a microcline crystal the lamellae do not extinguish optically parallel to the edge be as in orthoclase, but at an angle of 15 30'; further, the obtuse bisectrix of the optic axes in microcline is inclined to the normal of the plane b (010) at an angle of 15 26′ . Green microcline is distinctly pleochroic.

Microcline occurs, usually with orthoclase, as a constituent of pegmatites, granites and gneisses; it is rare in porphyries and is not known in volcanic rocks. A beautiful crystallized variety of a bright verdigris-green colour is known as amazon- stone (q.v.). Chesterlite is a variety occurring as crystals on dolomite in Chester county, Pennsylvania.

Closely allied to microcline is the anorthic soda-potash-feldspar known as anorthoclase or natron-microcline. Here sodium pre- dominates over potassium and a little calcium is also often present, the formula being (Na, K) AlSi s 8 . It resembles microcline in having a cleavage angle of very nearly 90 and in the cross-hatched struc- ture, the latter being usually very minute and giving rise to a mottled

extinction. It is the characteristic feldspar of volcanic rocks which are rich in soda, and is typically developed in the lavas of the island of Pantelleria near Sicily and those of Kilimanjaro and Mount Kenya in East Africa: the rhomb-shaped porphyritic feldspars of the " rhomb-porphyry " of southern Norway also belong here.

(L. J. S.)

MICROCOSM, a term often applied in philosophical and in general literature to man regarded as a " little world " (Gr. luicpos Koa-fios) in opposition to the " macrocosm," great world, in which he lives. From

the dawn of speculative thought in Greece the analogy between man and the world has been a common-place, and may be traced from Heraclitus and Empe- docles, through Plato, Aristotle, the Stoics, the Schoolmen and the thinkers of the Renaissance down to the present day. Thus Lotze's comprehensive survey of mental and moral science is termed Microcosmus The most systematic expression of the tendency indicated by the term is the monadology of Leibnitz, in which the monad is regarded as containing within its own closed sphere an expression of the universe, the typical created monad being the human soul.

MICROCOSMIC SALT, or ammonium sodium "hydrogen orthophosphate, NH 4 NaHP04 . 4H2O, so named by the alche- mists because it is contained in the decomposing urine of man (the " microcosm "). It is interesting historically as being the raw material from which Brand prepared phosphorus, whence it is also called " salt of phosphorus." It may be obtained in large transparent crystals from a mixture of solutions of sal- ammoniac and disodium phosphate, or by saturating a solution of monosodium phosphate with ammonia. When heated to redness, it leaves a transparent glass of sodium metaphosphate, NaPOs, which like borax dissolves most metallic oxides, with formation of glasses that often exhibit characteristic colours, and which may be used in the qualitative analysis of substances. (See Chemistry, § Analytical.)

MICROMETER (from Gr. fiiKpos-, small, \xtrpov, a measure), an instrument generally applied to telescopes and microscopes for measuring small angular distances with the former or the dimensions of small objects with the latter.

Before the invention of the telescope the accuracy of astro- nomical observations was necessarily limited by the angle that could be distinguished by the naked eye. The angle between two objects, such as stars or the opposite limbs of the sun, was measured by directing an arm furnished with fine " sights " (in the sense of the " sights " of a rifle) first upon one of the objects and then upon the other (?.».), or by employing an instru- ment having two arms, each furnished with a pair of sights, and directing one pair of sights upon one object and the second pair upon the other. The angle through which the arm was moved, or, in the latter case, the angle between the two arms, was read off upon a finely graduated arc. With such means no very high accuracy was possible. Archimedes concluded from his measure- ments that the sun's diameter was greater than 27′ and less than 32'; and even Tycho Brahe was so misled by his measures of the apparent diameters of the sun and moon as to conclude that a total eclipse of

the sun was impossible. 1 Michael Maestlin in 1579 determined the relative positions of eleven stars in the Pleiades {Historia coelestis Lucii Baretti, Augsburg, 1666), and A. Winnecke has shown {Monthly Notices R.A.S., xxxix. 146) that the probable error of these measures amounted to about

The invention of the telescope at once extended the possi- bilities of accuracy in astronomical measurements. The planets were shown to have visible disks, and to be attended by satellites whose distance and position angle relative to the planet it was desirable to measure. It became, in fact, essential to invent a ” micrometer ” for measuring the small angles which were thus for the first time rendered sensible. There is now no doubt that William Gascoigne, a young gentleman of Yorkshire, was the first

1 Grant, History of Physical Astronomy, p. 449.

2 This is an astonishing accuracy when the difficulty of the objects is considered. Few persons can see with the naked eye — much less measure — more than six stars of the Pleiades, although all the stars measured by Maestlin have been seen with the naked eye by a few individuals of exceptional powers of eyesight.

inventor of the micrometer. William Crabtree, a friend of his, taking a journey to Yorkshire in 1639 to see Gascoigne, writes thus to his friend Jeremiah Horrocks. ” The first thing Mr Gascoigne showed me was a large telescope amplified and adorned with inventions of his own, whereby he can take the diameters of the sun and moon, or any small angle in the heavens or upon the earth, most exactly through the glass, to a second.” The micrometer so mentioned fell into the possession of Richard Townley of Lancashire, who exhibited it at the meeting of the Royal Society held on the 25th of July 1667.

The principle of Gascoigne’s micrometer is that two pointers having parallel edges at right angles to the measuring screw, are moved in opposite directions symmetrically with and at right angles to the axis of the telescope. The micrometer is at zero when the two edges are brought exactly together. The edges are then separated till they are tangent to the opposite, limbs of the disk of the planet to be measured, or till they respectively bisect two stars, the angle between which is to be determined. The symmetrical separation of the edges is produced and measured by a single screw ; the fractions of a revolution of the screw are obtained by an index attached to one end of the screw, reading on a dial divided into 100 equal parts. The whole arrangement is elegant and ingenious. A steel cylinder (about the

thickness of a goose-quill), which forms the micrometer screw, has two threads cut upon it, one-half being cut with a thread double the pitch of the other. This screw is mounted on an oblong box which carries one of the measuring edges; the other edge is moved by the coarser part of the screw relatively to the edge attached to the box, whilst the box itself is moved relatively to the axis of the telescope by the finer screw. This produces an opening and closing of the edges symmetrically with respect to the telescope axis. Flam- steed, in the first volume of the Historia coelestis, has inserted a series of measurements made by Gascoigne extending from 1638 to 1643. These include the mutual distances of some of the stars in the Pleiades, a few observations of the apparent diameter of the sun, others of the distance of the moon from neighbouring stars, and a great number of measurements of the diameter of the moon. Dr John Bevis {Phil. Trans. (1773), p. 190) also gives results of measure- ments by Gascoigne of the diameters of the moon, Jupiter, Mars and Venus with his micrometer.

Delambre gives 3 the following comparison between the results of Gascoigne's measurements of the sun's semi-diameter and the computed results from modern determinations : —

Gascoigne. Conn. d. temps.

October 25 (o.s.) 16′ 11″ or 10″ 16′ io"-o

31 „ 16′ 11″ i6'ii"-4

December 2 ,, ... 16′ 24″ 16′ i6"-8

Gascoigne, from his observations, deduces the greatest variation of the apparent diameter of the sun to be 35"; according to the Connaissance des temps it amounts to 32"'3. 3 These results prove the enormous advance attained in accuracy by Gascoigne, and his indisputable title to the credit of inventing the micrometer.

Huygens, in his Systema saturnium (1659), describes a micrometer with which he determined the apparent diameters of the principal planets. He inserted a slip of metal, of variable breadth, at the focus of the telescope, and observed at what part it exactly covered the object under examination; knowing the focal length of the telescope and the width of the slip at the point observed, he thence deduced the apparent angular breadth of the object. The Marquis Malvasia in his Epkemerides (Bologna, 1662) describes a micrometer of his own invention. At the focus of his telescope he placed fine silver wires at

right angles to each other, which, by their intersection, formed a network of small squares. The mutual distances of the intersecting wires he determined by counting, with the aid of a pendulum clock, the number of seconds required by an equatorial star to pass from web to web, while the telescope was adjusted so that the star ran parallel to the wires at right angles to those under investigation. 4 In the Phil. Trans. (1667), No. 21, p. 373, Adrien Auzout gives the results of some measures of the diameter of the sun and moon made by himself, and this communication led to the letters of Townley and Bevis above referred to. The micrometer of Auzout and Picard was provided with silk fibres or silver wires instead of the edges of Gascoigne, but one of the silk fibres remained fixed while the other was moved by a screw. It is beyond doubt that Huygens independently discovered that an object placed in the common focus of the two lenses of a Kepler telescope appears as distinct and well-defined as the

3 Delambre, Hist. ast. moderne, ii. 590.

4 Mem. acad. des sciences (1717), pp. 78 seq.

image of a distant body; and the micrometers of Malvasia, Auzout and Picard are the natural developments of this dis- covery. Gascoigne was killed at the battle of Marston Moor on the 2nd of July 1644, in the twenty-fourth year of his age, and his untimely death was doubtless the cause that delayed the publication of a discovery which anticipated, by twenty years, the combined work of Huygens, Malvaison, Auzout and Picard in the same direction.

As the powers of the telescope were gradually developed, it was found that the finest hairs or filaments of silk, or the thinnest silver wires that could be drawn, were much too Webw thick for the refined purposes of the astronomer, as

they entirely obliterated the image of a star in the more powerful telescopes. To obviate this difficulty Felice Fontana of Florence (Saggio del real gabinetto di fisica e di storia naturale, 1755) first proposed the use of spider webs in micro- meters, 1 but it was not till the attention of Troughton had been directed to the subject by Rittenhouse that the idea was carried into practice. 2 In 1813 Wollaston proposed fine platinum wires, prepared by surrounding a platinum wire with a cylinder of silver, and drawing out the cylinder

with its platinum axis into a fine wire. 3 The surrounding silver was then dissolved by nitric acid, and a platinum wire of extreme fineness remained. But experience soon proved the superiority of the spider web; its perfection of shape, its lightness and elasticity, have led to its universal adoption.

Beyond the introduction of the spider line it is unnecessary to mention the various steps by which the Gascoigne micrometer assumed the modern forms now in use, or to describe in detail the suggestions of Hooke, 4 Wren, Smeaton, Cassini, Bradley, Maskelyne, Herschel, Arago, Pearson, Bessel, Struve, Dawes, &c, or the successive productions of the great artists Ramsden, Troughton, Fraunhofer, Ertel, Simms, Cooke, Grubb, Clarke and Repsold. It will be sufficient to describe those forms with which the most important work has been done, or which have survived the tests of time and experience.

Before astronomical telescopes were mounted parallactically, the measurement of position angles was seldom attempted. Indeed, in those days, the difficulties attached to such measures, and to the measurement of distances with the filar micrometer, were exceed- ingly great, and must have taxed to the utmost the skill and patience of the observer. For, on account of the diurnal motion, the direc- tion of the axis of the telescope when pointed to a star is always changing, so that, to follow a star with an altazimuth mounting, the observer requires to move continuously the two handles which give slow motion in altitude and azimuth.

Sir William Herschel was the first astronomer who measured position angles; the instrument he employed is described in Phil. Trans. (1781), lxxi, 500. It was used by him in his earliest observa- tions of double stars (1779-1783); but, even in his hands, the measurements were comparatively crude, because of the difficulties he had to encounter from the want of a parallactic mounting. In the case of close double stars he estimated the distance in terms of the disk of the components. For the measurement of wider stars he invented his lamp-micrometer, in which the components of a double star observed with the right eye were made to coincide with two lucid points placed 10 ft. from the left eye. The distance of the lucid points was the tangent of the magnified angles subtended by the stars to a radius of 10 ft. This angle, therefore, divided by the magnifying power of the telescope gives the real angular dis- tance of the centres of a double star. With a power of 460 the scale was a quarter of an inch for every second.

The Modern Filar Micrometer. When equatorial mountings for

telescopes became more general, no filar micrometer was considered complete which was not fitted with a position circle. 6 The use of the spider line or filar micrometer

1 In 1782 {Phil. Trans, lxxii. 163) Sir W. Herschel writes: — ” I have in vain attempted to find lines sufficiently thin to extend them across the centres of the stars, so that their thickness might be neglected.” It is a matter of regret that Fontana’s suggestion was unknown to him.

2 J- T. Quekett in his Treatise on the Microscope ascribes to Ramsden the practical introduction of the spider web in micrometers. The evidence appears to be in favour of Troughton.

3 Phil. Trans. (1813), pp. 114-118.

- Dr Hooke made the important improvement on Gascoigne’s micrometer of substituting parallel hairs for the parallel edges of its original construction (Hooke’s Posthumous Works, p. 497). , 6 Herschel and South {Phil. Trans., 1824, part iii. p. 10) claim that

became universal ; the methods of illumination were improved ; and micrometers with screws of previously unheard of fineness and accuracy were produced. These facilities, coupled with the wide and fascinating field of research opened up by Sir William Herschel’s discovery of the binary character of double stars, gave an impulse to micrometric research which has continued unabated to the present time. A still further facility was given to the use of the filar micrometer by the introduction of clockwork, which caused the telescope automatically to follow the diurnal motion of a star, and left the observer’s hands entirely at liberty. 6

The micrometer represented in figs. 1, 2, 3 is due to Troughton. Fig. 1 is a horizontal section in the direction of the axis of the tele-

Fig. 1.

Fig. 2.

Fig. 3.

scope. The eyepiece ab consists of two plano-convex lenses a, b, of nearly the same focal length, and with the two convex sides facing each other. They are placed at a distance apart less than the focal length of a, so that the wires of the micrometer, which must be distinctly seen, are beyond b. This is known as Ramsden’s eye- piece,

having been made originally by him. The eyepiece slides into the tube cd, which screws into the brass ring ef, through two openings in which the oblong frame, containing the micrometer slides, passes. These slides are shown in fig. 2, and consist of brass forks k and /, into which the ends of the screws and p are rigidly fitted. The slides are accurately fitted so as to have no sensible lateral shake, but yet so as to move easily in the direction of the greatest length of the micrometer box. Motion is communicated to the forks by female screws tapped in the heads m and n acting on the screws and p respectively. Two pins a, r, with spiral springs coiled round them, pass loosely through holes in the forks k, I, and keep the bearings of the heads m and n firmly pressed against the ends of the micrometer box. Thus the smallest rotation of either head communicates to the corresponding slide motion, which, if the screws are accurate, is proportional to the amount through which the head is turned. Each head is graduated into 100 equal parts on the drums u and v, so that, by estimation, the reading can easily be carried to TAoth of a revolution. The total number of revolutions is read off by a scale attached to the side of the box, but not seen in the figure.

Two spider webs are stretched across the forks, one (/) being cemented in a fine groove cut in the inner fork k, the other {s) in a similar groove cut in the outer fork /. These grooves are simultaneously cut in situ by the maker, with the aid of an engine capable of ruling fine straight lines, so that the webs when accurately laid in the grooves are perfectly parallel. A wire si is stretched across the centre of the field, perpendicular to the parallel wires. Each movable web must pass the other without coming in contact with it or the fixed wire, and without rubbing on any part of the brass- work. Should either fault occur (technically called ” fiddling “) it is fatal to accurate measurement. One of the most essential points in a good micrometer is that all the webs shall be so nearly in the same plane as to be well in focus together under the highest powers used, and at the same time absolutely free from ” fiddling.” For measuring position angles a brass circle gh (fig. 3), fixed to the tele- scope by the screw i, has rack teeth on its circumference that receive the teeth of an endless screw w, which, being fixed by the arms xx to the oblong box mn, gives the latter a motion of rotation round the axis of the telescope; an index upon this box points out on the graduated circle gh the angular rotation of the instrument.

the micrometer by Troughton, fitted to their 5 ft. equatorial tele- scope, is the first position micrometer constructed capable of measuring position angles to 1′ of arc.

6 So far as we can ascertain, the first telescope of large size driven by clockwork was the 9-in. equatorial made for Struve at Dorpat by Fraunhofer; it was completed in 1825. The original idea appears to be due to Claude Simeon Passemant {Mem. Acad., Paris, 1746). In 1757 he presented a telescope to the king, so accurately driven by clockwork that it would follow a star all night long.

The English micrometer still retains the essential features of Troughton s original construction above described. The later

English artists have somewhat changed the mode of communica- ting motion to the slides, by attaching the screws perman- ently to the micrometer head and tapping each micrometer screw into its slide. Instead of making the shoulder of the screw a flat bearing surface, they have given the screw a spherical bearing resting in a hollow cone (fig. 4) attached to the end of the box. The French artists still retain Troughton's form. Fraunhofer's Filar Micrometer. — The micrometer represented in fig. 5 1 is the original Merz micrometer of the Cape Observatory, made

Fig. 4.

Fig. 5. on Fraunhofer's model. S is the head of the micrometer screw proper, s that of the screw moving the slide to which the so-called " fixed web " is attached, s' that of a screw which moves the eye- piece E. C is the clamp and M the slow motion in position angle. L, L are tubes attached to a larger tube N ; the latter fits loosely on a strong hollow cylinder which terminates in the screw V. By this screw the whole apparatus is attached to the telescope. The nozzles of small lamps are inserted in the tubes L, L, for illumina- ting the webs in a dark field; the light from these lamps is admitted through apertures in the strong hollow cylinder above mentioned (for illumination, see p. 385). In this micrometer the three slides moved by S, s, and s' are simple dovetails. The lowest of these slides reposes upon a foundation-plate pp, into one end of which the screw s is tapped. In the middle of this slide a stiffly fitting brass disk is inserted, to which a small turn-table motion may be communicated by an attached arm, acted on by two fine opposing screws accessible to the astronomer; and by their means the " fixed web " may be rendered strictly parallel with the movable one. Another web is fixed parallel to the axis of the screw, as nearly as possible in the same plane with it and passing through the

axis of rotation of the micro- meter. For the internal structural details of the micrometer the reader is referred to the article ” Micrometer ” in the 9th edition of the Encyclopaedia Britannica.

To use the instrument, it is well first to adjust the web moved by the screw S, so that its point of intersection with the web (commonly called the ” position-web “), which is parallel to the axis of the screw, shall be nearly coincident with the axis of rotation of the micrometer box. For this purpose it is only necessary to direct the telescope to some distant object, bisect that object with the movable wire, and read the number of revolutions and parts of a revolution of the screw ; now reverse the micrometer box 180 and repeat the observa- tion ; the mean of the two readings will be the point required. Now direct the telescope to a star near the equator and so that the star’s image in its diurnal motion shall pass across the intersection of the two webs which mark the axis of rotation of the micrometer box. Then, as the diurnal motion causes the star-image to travel away from the axis of rotation, the micrometer box is rotated till the image of the star when at a considerable distance from the axis is bisected by the position-web. The micrometer is now clamped in position-angle by the clamp C, the star again brought back to the axis, and delicate adjustment given in position-angle by the slow-motion screw M, till the star-image remains bisected whilst it traverses the whole length of the position-web by the diurnal motion only. This determines the reading of the position-circle

corresponding to position- angle 90′ or 270 °. 2

“~i When it is remembered that the measurements of the Struves, Dembowski, Secchi, the Bonds, Maclear and of most modern European astronomers have been made with Fraunhofer or Merz micrometers it is not too much to say that fig. 5 represents the instru- ment with which a half of the astronomical measurements of the 19th century were made. • , .

2 For the corrections applicable to measures of position-angle in different hour angles, on account of errors of the equatorial instru- ment and of refraction, see Chauvenet’s Practical and Spherical Astronomy, ii. 392 and 450.

Fig. 6. spider

The position-angles of double stars are reckoned from north through east, the brighter star being taken as origin. To observe the position-angle of a double star it is only necessary to turn the position-web so

that it shall be parallel to the line joining the centres of the components of the double star. To test this parallelism the single web must be made to bisect the images of both components simultaneously, as in fig. 6, because it is evident that if the two components of the double star are not exactly equal in magnitude, there will be great tendency to systematic error if the web is placed on one side or other of the stars.

To avoid such error Dawes used double wires, not webs, placing the image of the star symmetrically between these wires, as in fig. 7, and believed that by the use of wires, much thicker than spider webs, the eye could estimate more accurately the symmetry of the star-images with respect to the wires. Other astronomers use the two distance-measuring webs, placed at a convenient distance apart, for position wires. This plan has the advantage of permitting easy adjustment of the webs to such a distance apart as may be found most suitable for the particular observation, but has the disadvantage that it does not permit the zero of the position-circle to be determined with -p.' ' the same accuracy ; because, whilst by means of the screw s' '

(fig. 5) the eyepiece can be made to follow the star for a considerable distance along a position-web parallel to the screw, the bisection of the web by a star moving by the diurnal motion at right angles to the micrometer screw can only be followed for a limited distance, viz. the field of the eyepiece. But, as the angle between the position- web and the distance-webs is a constant, the remedy is to determine that angle (always very nearly a right angle) by any independent method and employ the distance-webs as position-webs in the way described, using the position-web only to determine the instan- taneous index error of the position-circle.

To measure distances with the Fraunhofer micrometer, the posi- tion-circle is clamped at the true position-angle of the star, and the telescope is moved by its slow motions so that the component A of the star is bisected by the fixed wire; the other component B is then bisected by the web, which is moved by the graduated head S. Next the star B is bisected by the fixed web and A by the movable one. The difference between the two readings of S is then twice the distance between A and B. ■

The great improvement now introduced into all the best micro- meters is to provide a screw s, which, not as in the Fraunhofer micro- meter, moves only one of the wires, but which moves the whole micrometer box, i.e. moves both webs together with respect to the star's image in the direction of the axis of the screw. Thus the fixed wire can be set

exactly on star A by the screw s, while star B is simultaneously bisected by the movable wire, or vice versa, without disturbing the reading for coincidence of the wires. No one, unless he has previously worked without such an arrangement, can fully appre- ciate the advantage of bringing up a star to bisection by moving a micrometer with a delicate screw-motion, instead of having to change the direction of the axis of a huge telescope for the same purpose. When it is further remembered that the earlier telescopes were not provided with the modern slow motions in right ascension and that the Struves, in their extensive labours among the double

stars, used to complete S>»_ˆa V\ €ˆ3 j JQ. their bisections of the fixed

wire by a pressure of the finger on the side of the tube, one is puzzled whether more to wonder at such poor adaptation of means to ends or the patience and skill which, with such means, led to such results. 3 Dawes, who employed a micrometer of the English type (figs. I, ‘2 and 3), used to bolt the head of one of the screws, and the instrument was provided with a slipping piece, giving motion to the micrometer by screws acting on two slides, one in right ascension, the other in declination, so that ” either of the webs can be placed upon either com- ponent of a double star with ease and certainty ” (Mem. R.A.S. xxxv. 1 9).

The micrometer shown

in fig. 8 was made by

Fig. 9 represents the same

Fig. 8. Repsolds for the Cape Observatory.

3 Professor Watson used to say, ” After all the most important part of a telescope is the man at the small end.”

micrometer with the upper side of the box removed. The letters in the description refer to both figures.

S is the head of the micrometer screw, s that of the screw by which the micrometer box is moved relative to the plate/ (fig. 8), s’ that of the screw which moves the eyepiece slide. K is the clamp in position

angle, P the slow motion screw in position-angle; pp is the position circle, R, R its two readers. The latter *are* in fact little microscopes carrying a vernier etched on glass, in lieu of a filar micrometer. These verniers can be read to 1', and estimated to o'-2. D is the drum-head which gives the fraction of a revolution, d that which gives the whole number of revolu- tions, I is the index or pointer at which both drums are read. This index is shown in fig. 9, but only its mode of attach- ment (X, fig. 9) in fig. 8. The teeth of the pinion z, fig. 9, are cut on the axis of the micrometer screw. The drum d and

Fig. 9.

its attached tooth wheel are ground to turn smoothly on the axis of the screw. The pinion 2 and the toothed wheel d are connected by an intermediate wheel and pinion Y; the numbers of teeth in the wheels and pinions are so proportioned that twenty-four revolutions of the micrometer screw produce one revolution of the drum and wheel d. The divisions of both drums are conveniently read, simul- taneously, by the lens e ; at night the lamp which illuminates the webs and the position-circle also illuminates the drum-heads (see on illumination p. 385). oaoa is the web-frame (fig. 9), 187 is a single rod consisting of two cylinders accurately fitting in the ends of the micro- meter box, the larger cylinder being at /3. There is a hole in the web- frame which smoothly fits the larger cylinder at 0', and another which similarly fits the smaller cylinder at 7'. A spiral spring, coiled round the cylinder 7, resting one end on the shoulder formed by the difference of the diameters of the cylinders. and 7 and the other on the inside of the web-frame, presses the latter con- tinuously towards 7. Contact of the web-frame of the micrometer with the side of the box at 7 would therefore take place, were it not for the micrometer screw. This screw fits neatly in the end of the box at £, passes loosely through the web-frame at e', is tapped into the frame at f ', and its end rests on a flat hardened surface at f. Rotation of the web-frame about 187 is prevented by the heads of the screws at m; the head of the screw on the lower side of the frame reposes on the plane vv, that on the upper side (fig. 9) touches lightly on the inner surface of the lid of the box. Such rotation can obviously be controlled within limits that need not be further considered. But freedom of rotation in the plane of the paper (fig. 9) is only prevented by good fitting of the holes |3′ 7'; and, since the weight of the slide is on one side of the screw, misfit here will have the effect of changing the reading for coincidence of the movable with the fixed web in reverse positions of the micrometer. With the Cape micrometer a systematic difference has been found in the coincidence point for head above and head below amounting to o"l4. This corresponds, in the Cape instrument, with an

excess of the diameters of the holes over those of the cylinders of about TToinrth of an inch — a quantity so small as to imply good workman ship, though it involves a systematic error which is very much larger than the probable error of a single determination of the coincidence point. The obvious remedy is to make all measures on opposite sides of the fixed web before reversing in position-angle — a precau- tion, however, which no careful observer would neglect. In measur- ing differences of declination, where the stars are brought up by the diurnal motion, this precaution cannot be adopted, because it is

necessary always to bisect the preceding star with the fixed web. But in AS measures index error can be eliminated by bisecting both stars with the same web (or different webs of known interval fixed on the same frame), and not employing the fixed web at all. The discordance in zero, when known to exist, is really of no consequence, because the observations can be so arranged as to eliminate it.

The box is mounted on a strong hollow steel cylinder CC (fig. 9) by holes 77, 8 in the ends of the box, which fit the cylinder closely and smoothly. The cylinder is rigidly fixed in the studs C, C, and these are attached to the foundation plate /. The cylinder contains towards ?j a sliding rod, and towards a compressed spiral spring. There is thus a thrust outwards of the spring upon the hollow cap W (attached outside the box), and a thrust of the rod upon the end of the screw s. The position of the box relative to the plate /, in the direction of measurement, depends therefore on the distance between the end of the screw s and the fixed stud C. A screwing in of 5 thus causes the box to move to the left, and vice versa. Rotation of the box round CC is prevented by downward pressure of the spring Z on a projection attached to the side of the box. The amount of this pressure is regulated by the screw 2'.

The short screw whose divided milled head is a shifts the zero of the micrometer by pushing, without turning, the short sliding rod whose flat end forms the point d'appui of the micrometer screw at f . "The pitch of the screw a is the same as that of the measuring screw (50 threads to the inch), and its motion can be limited by a stop to half a revolution.

The five fixed webs are attached to the table tt, which is secured to the bottom of the box by the screws p. The three movable webs are attached to the projections XX on the frame act. The plane surfaces tt and XX are composed of a bronze of very close texture, which appears capable of receiving a finish having almost the truth and polish of an optical surface. It seems also to take a very clean V cut, as the webs

can be laid in their furrows with an astonishing ease and precision. These furrows have apparently been cut in situ with a very accurate engine; for not the slightest departure from parallelism can be detected in any of the movable webs relative to the fixed webs. Extraordinary care has evidently been bestowed in adjusting the parallelism and distance of the planes t and X, so that the movable wires shall almost, but not quite, touch the surface t. The varnish to fix the webs is applied, not on the surface t as is usual, but on a bevel for the purpose, 1 the position of the webs depending on their tension to keep them in their furrows. The result is that no trace of " fiddling " exists, and the movable and fixed webs come sharply together in focus with the highest powers. Under such powers the webs can be brought into apparent contact with such precision and delicacy that the uncertainty of measurement seems to lie as much in the estimation of the fraction of the division of the head as in the accuracy of the contact. It is

Fig. 10.

a convenient feature in Repsolds' micrometer that the webs are very near the inner surface of the top of the box, so that the eye is not brought inconveniently close to the plate when high powers are used.

Another excellent micrometer, originally based on a model by Clark of Cambridge, Massachusetts, has been largely used by Burn- ham and others in America. The form, as constructed by Warner and Swasey for the 40-in. Yerkes telescope, is shown in figs. 10 and 11. The micrometer box, and of course with it the whole system of spider webs, is moved by the screw s, whilst the measuring web is indepen- dently moved by the screw S. The other parts of the instrument will be readily understood from the figure without further explana- tion. The method of counting the total number of revolutions gives more friction and is less convenient than Repsolds', and no provision seems to be made for illuminating the micrometer head in the practical and convenient plan adopted by Repsolds.

Repsolds' more recent form of the spider-line micrometer (since

1 The marks of varnish so applied will be seen in fig. 9.

1893) for large telescopes is shown in fig. 12. Quick motion in posi- tion-angle for rough setting or for the measurement of close double

stars is given by the large ring R. The micrometer is clamped in

Fig. 11.

position-angle by the screw K and slow motion in position-angle is given by the screw p. The small drum-head T opposite the micrometer head S turns a screw which acts upon a short cylinder that cannot turn but can move only in the direction of the axis of the micrometer screw. The end-plane of this cylinder receives the pressure of the micrometer screw, so that by turning the small drum-head the coincidence-reading of the movable web with the fixed web can be changed, and thus any given angle can be measured with different

parts of the micrometer screw in order to eliminate the effects of periodic error of the screw. The electric lamp a gives illumination of the webs in a dark field, nearly in the manner described for the Cape transit circle micrometer; the intensity of illumination is regulated by a carbon-resistance controlled by the screw h. The lamp c illuminates the drum-head and also, by reflection, the por- tions of the position-circle which come under the microscopes d and e. The head / is a switch which enables the observer to illuminate lamp a or c at pleasure. These lamps, although shown in the figure, are in reality covered so as not to shine upon the observer's eye. The illumination of the field is given by a lamp near the object glass, controlled by a switch near the micrometer.

Repsolds in more recent micrometers under construction give a second motion to the eyepiece at right angles to the axis of the micrometer screw; this enables the observer to determine the zero

of position-angle for his movable webs with the same accuracy as he formerly could only do for the so-called position-angle webs. Repsolds also provide two insulated sliding contact rings instead of the single ring g, so that the electric current for illuminating the lamps does not pass through the instrument itself but may come to the micrometer from the storage battery through two insulated leads. The same firm is also constructing a micrometer in which the readings of the head are printed on a band of paper instead of being read off at the time of observation.

Instruments have been invented by Alvan Clark and Sir Howard Grubb for measuring with the spider-line micrometer angles which are larger than the field of view of the eyepiece. In both cases two eyepieces are employed, one to view each separate web. One draw- back to this form of instrument is that the two webs cannot be viewed

simultaneously, and therefore the observer must rely on the steadiness of rate of the clockwork and uniformity in the conditions of refraction whilst the eye is moved from one eyepiece to the other.

Clark's micrometer was exhibited at the June meeting of the Royal Astronomical Society in 1859 {Monthly Notices, R.A.S., vol. xix.). Grubb's duplex micrometer is described in the 9th edition of the Encyclopaedia Britannica. Some examples of use of the latter are given by Professor Pritchard {Mem. R.A.S. xlvii. 4-12), who esti- mates the accuracy attainable with the duplex micrometer as equal to that of the heliometer ; but as few measures of permanent value have been made with the instrument, and those made exhibit an accuracy far inferior to that of the heliometer, it is unnecessary to describe the instrument here in greater detail.

The Reading Micrometer-Microscope. — Micrometers used for subdividing the spaces on graduated circles and scales have, in general, only a single pair of cross-webs or parallel webs moved by a single screw. The normal form of the apparatus is shown in figs. 13 and 14. C is the objective, D the micrometer box, E the graduated head of the screw, G the milled i f head by which the screw cc is turned, A an

Fig. 13. Fig. 14.

eyepiece sliding in a tube B, aa (fig. 14) the slide, and b, b the spiral springs. The focal length of the objective and the distance between the optical centre of the lens and the webs are so arranged that images of the divisions are formed in the plane of the webs, and the pitch of the screw is such that one division of the scale corresponds with some whole number of revolutions of the screw.

There is what is technically called a " comb " inserted in the micrometer box at d (fig. 14) — its upper surface being nearly in the plane of the wires. This comb does not move with reference to the box, and serves to indicate the whole revolution of which a fraction is read on the head. In fig. 14 a division is represented bisected by cross webs, and five revolutions of the screw correspond with one division of the scale. In all modern reading micrometers the cross webs of fig. 14 are replaced by parallel webs embracing the division (fig. 15). The means for changing the length of the tube and the distance of C from the scale are omitted in the figure. These appliances are required if the " run " has to be accurately adjusted. By " run " is meant the difference between the intended whole number of screw- revolutions and the actual measures of the space between two adjacent divisions of the scale in turns of the screw Fig. 15. divided by the number of

intended revolutions. In delicate researches two divisions of the scale should always be read, not merely for increased accuracy but to obtain the corrections for ” run ” from the observations themselves.

Repsolds employ for the micrometers of their reading microscopes the form of construction shown in fig. 9, omitting, of course, the motion of the whole micrometer box given by the screw s for those cases in which the axis of the micrometer is supposed to remain constant in position, as, for example, in the case of the reading microscopes of transit circles (see Transit Circle).

But when the relative positions of two adjacent objects or scale-divisions have to be determined (as, for example, in the case of heliometer scales), much time is saved by retaining the motion of the micrometer box. One double web, fixed in the box, is pointed symmetrically, as in fig. 15, on one of the scales, by moving the whole micrometer box by means of the screw s; the pair of webs, mcved by the screw S, is then pointed upon an adjacent division on the other scale. If the reading for coincidence of the movable with the fixed webs is known, we then obtain from the single reading of S the difference from coincidence of the divisions of the two scales.

It is generally possible so to arrange the method of observation as to eliminate the effect of an error in ” the reading for coinci- dence of the webs ” from the results. This excellent time-saving contrivance has also been used in Gill’s apparatus for measuring astrographic plates (see below).

Ghost Micrometer. — C. E. Burton and Sir Howard Grubb (Monthly Notices, xli. 59), after calling attention to J. von Lamont’s paper (Jahrbuch der K. S. b. Miinchen, p. 187) and K. L. von Littrow’s paper (Proc. of Vienna Acad, of Sciences, xx. 253) on a like subject, proceed to describe a most ingenious form of ” Ghost Micrometer,” in which the image of a fine line or lines ruled in (or rather cut through) a silver film deposited on glass is formed at the common focus of an object-glass and eyepiece of a telescope. A faint light being thrown on the outside of the silvered plate, there appear bright lines in the field of view. We have not had an opportunity of testing this, nor Grubb’s more recent models; but, should it be found possible to produce such

images satisfactorily, without distortion and with an apparatus convenient and rigid in form, such micrometers may possibly supersede the filar micrometer. Their absolute freedom from diffraction, the perfect control of the illumination and thickness of the lines, and the accuracy with which it will be possible to construct scales for zone observations will be important features of the new method.

The Astrographic ‘Micrometer or Measuring Machine. — The application of photography to exact astronomy has created the necessity for new forms of apparatus to measure the relative positions of stellar and planetary images on photographic plates, and the relative positions of lines in photographic spectra.

Especially important has been the problem of measuring the ” catalogue plates ” of the international Carte du del — a work that implies the determination of the positions of some millions of stars — that is to say, of all stars to the nth or 12th magnitude. The problem has been how to accomplish this work with the minimum of labour consistent with the desired accuracy. The adoption of a reseau photographed upon the plate has greatly facilitated the procedure. A plate of parallel-surfaced glass has a film of silver deposited upon it. On this film is ruled a system of lines 5 mm. apart, and another similar system of lines at right angles to the first, thus dividing the silvered surface of the plate into squares 5 mm. on the side. The cutter employed to rule these lines removes the silver in fine lines from the surface of the glass, Thus, if a photographic plate, before it is exposed in the telescope, is placed with its sensitive surface nearly in contact with the silvered surface of this reseau, and if parallel light, normal to the surface of the plate, is allowed to fall on the silvered film through the glass on which the film has been deposited, that light will pass through the fine lines in the silver film where the silver has been removed by the cutter, but will other- wise be intercepted by the silver film. Thus a latent image of the ” reseau-lines ” will be formed on the sensitive plate, and, when the latter has been exposed to the sky in the telescope, we obtain, on develop- ment, a negative of the images both of the stars and of the reseau-lines. If the errors of the rectangular co-ordinates of these lines are known, the problem of determining the co-ordinates of any star-image on the plate becomes reduced to the comparatively simple one of interpolating the co-ordinates of the star relative to the sides of the 5 mm. square within which that image is included. This interpolation can, of course, be accomplished with the aid of a micrometer-microscope whose optical axis is normal to the plate, provided that the plate is mounted on slides which enable the observer to bring the reseau-squares

successively, under the microscope.

This system has an additional advantage beyond its convenience, viz. that if any distortion of the film takes place during development the same distortion will be communicated both to the star-images and to the reseau-lines, and consequently its effect will be eliminated from the resulting star co-ordinates, except in so far as the distortion within the 5 mm. square is of an irregular character; this exception is hardly worth consideration. An originally unanticipated difficulty has arisen from the fact that the reseau-lines have not been ruled on plates of optical glass with optical surfaces, and that, in conse- quence of irregular refraction in the glass plate, the rays do not always pass through the silver film-lines in a direction strictly normal to the silvered surface; therefore, if the sensitive surface of the photographic plate is not in contact with the silver film of the reseau, the undeveloped photographic copy of the reseau may in such a case not be an exact reproduction of the silvered reseau. It is practically impossible to work with the sensitive film in contact

with the reseau-film, not only because dust particles and contact would injure the silver film, but also because the plate-glass used for the photographic plates is seldom a perfect plane. The discre- pancies produced in this way are, however, very small, if care is taken to minimize the distance between the silver film and the photographic plate and to select a reasonably good piece of glass for the reseau. For very refined work, however, the irregularities in the reproduction of the reseau may be studied by comparing the measures of the original reseau with the mean of corresponding measures of a number of photographed copies of it.

At Greenwich, Oxford and several other observatories, instead of measuring the distances of the star's image from the opposite sides of the 5 mm. reseau-square by means of a spider-line micrometer, a glass scale, on the plan shown in fig. 16, is employed in the common focus of the objective and the eyepiece. The image of the star is set upon the intersections of the lines of the central cross, and the positions of the reseau-lines are read off by estimation to ˆ of a division on the glass scale. As each division corresponds to 3 sec.

Greenwich Fig. 16.-

Astrographic Catalogue, vol. i., by permission of the Controller of H.M. Stationery office. —Diagram of the diaphragm in eyepieces of the micrometer used for measuring the plates of the Astrographic Catalogue.

of arc, the nearest estimate corresponds with a nominal accuracy of ± 0-3”. This involves a loss of accuracy because, with a spider- line micrometer, the accidental error of pointing is of the order of ± o- 1 ” of arc.

In the measuring machines in general use the field of view, as in the case of the glass-scale micrometer, is sufficiently large to include the image of the 5 mm. square. The microscope or viewing telescope is fitted with a spider-line micrometer having two screws at right angles to each other, by means of which readings can be made first on one reseau-line, then on the star, and finally on the opposite reseau-line in both co-ordinates. This form of micrometer is of course capable of giving results of high precision, but the drawback is that the process involves a minimum of six pointings and the entering of six screw-head readings in order to measure the two co-ordinates of the star.

Gill’s ˆMeasuring _ Machine. — Sir David Gill (Monthly Notices, R.A.S. lix. 61) devised a measuring machine which combines the rapidity of the glass-scale micrometer with the accuracy of the spider- line micrometer and simplifies the reductions of the observations at the same time. The essential conditions of the instrument are: —

1. The object glass of the micrometer-microscope is placed midway between the plane of the photographic plate and the plane of the micrometer webs.

2. The micrometer is provided with a ” fixed square ” 5 mm.X 5 mm., the sides of this square being parallel spider webs 4″ of arc apart; the size of the square is reckoned from centre to centre of these double webs.

3. The two micrometer screws (X and Y, fig. 17), which actuate the movable slides, have heads divided into 100 parts, one revolution = 0-5 mm.; so that ten revolutions are =5 mm., or = the interval between two adjacent reseau-lines, or = the interval between the sides of the ” fixed square.”

4. Two other screws, 0, p, the heads of which are not graduated, give motions to the whole micrometer box through ± 1 mm. in directions parallel to the axes of the two micrometer screws.

5. Each of the two micrometer screws X and Y moves a system of six

parallel webs, placed 4″ of arc apart from each other. These

Fig. 17.

webs serve not only for pointing on stars to determine their co-ordinates (in manner afterwards described), but also for estimating the diameters of the star-images in terms of these 4″ intervals.

6. All the essential parts of the micrometer, including the slides, micrometer box, tube, &c, are of steel or cast-iron, so that changes of temperature do not affect the adjustments.

The necessary adjustments are the following: —

1. The webs of each set of movable webs shall, inter se, be strictly parallel, and the two sets shall be strictly at right angles to each other.

2. The double webs composing the sides of the fixed square shall be strictly parallel, and shall form a true square of exactly ten revolutions of the screw on the side.

3. The two micrometer screws shall be without sensible periodic or other error, and exactly alike in pitch.

4. The micrometer readings for coincidence of the movable webs with the webs of the fixed square shall.be exactly o-oooR and io-oooR.

5. The image of a normal reseau-square, as viewed in the microscope, shall exactly coincide with the square formed by the fixed webs — that is to say, the image of the sides of a normal reseau-square shall measure exactly 10 screw-revolutions.

Assuming that these conditions can be rigidly realized, .we have the following very simple modus operandi : —

1. By means of the quick rack motions A and B move the plate so as to bring the reseau-square into the centre of the field of the micrometer; then, by means of the screw heads 0, p, perfect the coincidence of the ” fixed square ” of webs, with the image of the reseau-square.

2. By means of one of the micrometer screws X place the star’s image in the middle of the six parallel webs which are moved by X.

3. Similarly, place the star's image in the middle of the webs moved by Y.

4. Estimate the diameter of the star's image in terms of the 4″ intervals of the movable webs.

By employing both hands, operation (1) can be made as quickly as a single pointing with the ordinary spider-line micrometer, and operations (2) and (3) can be similarly performed in the time required for a single pointing. The reading (2) is then the required co-ordinate in x and that of (3) is the required co-ordinate in y ; or, if the plate is reversed, 180°, these readings have to be subtracted from lo-ooo R .

A general idea of the construction of the machine can be gathered from fig. 17 above, but the reader will find a detailed account of it, and of the manner in which the requisite adjustments are made, in the paper already quoted.

The apparatus has been used with complete success at the Royal Observatory, Cape of Good Hope, and at Melbourne, Sydney and Cordoba.

Effects' of Wear on the Micrometer Screws. — The accuracy of this apparatus has been frequently criticized on the ground that errors are produced in the screws by the effect of wear. One reply to t,his is that it is not difficult to determine from time to time the errors of the screws and to apply the necessary corrections to the observations. But a little con- sideration will show that when the plate is reversed 180 the effects of errors of the screws produced by. wear are practically eliminated.

In discussing the effect of wear upon a screw, it will be convenient to imagine the thread unrolled and forming a wedge, of which we can represent the unworn bearing-side by a straight line AB (fig. 18),

X

X

Fig. 18.

on which rubs the block CD, which represents the female screw or bush, and moves between the points E and F, sometimes towards E, sometimes towards F, but having as often to measure short distances as long distances from the middle point of this range, and these as

often towards E as towards F. Now, if CD is pressed by its weight or by a spring on the surface AB, the effect of wear will be to produce a symmetrical grinding away of both surfaces, which may be represented thus, fig. 19. That is to say, the screw-errors will be

£

2

Fig. 19.

identical for revolution n and for io-», and thus will disappear in their effect in the mean of observations made in reversed positions of the plate. At the Cape of Good Hope, after more than 200,000 pointings had been made, the screw-errors were redetermined ; the results proved the truth of the above conclusions, viz. the absolute freedom of the derived co-ordinates from the effects of wear of the screws in the mean of measures made in reversed positions of the plate.

Hinks's Measuring Machine. — A very refined modification of the Cape machine is described by A. Hinks {Monthly Notices, R.A.S., vol. 61, p. 444), and the instrument contains many elegant mechanical and optical details due to Horace Darwin and Messrs Zeiss respectively.

Its fundamental principle is that, by a combination of glass scales with a micrometer screw, " the chief part of the distance to be measured is read off on the scale ; the fractional part of the scale- space is not estimated but measured by the screw." Hinks claims that thus never more than one- or two-tenths of a revolution of the screw need be used in making the measure, and little time is lost in running the screw backwards and forwards. All this is true, but three readings instead of one for each pointing, much more figure-work in computation (especially if corrections have to be applied to the scale readings to reduce them to exact normal screw readings), are factors which involve a far greater expenditure of time than making a few additional turns of a screw in the process of measurement. Hinks's further claim that, in consequence of the small motion of the screw, less error is produced in the screw by wear is not true; for, although large movements of the screw produce a large amount of wear, that wear is spread over longer parts of the screw but remains the same for any particular part of the screw; the resulting errors are exaggerated towards the ex- tremity of the range of screw employed (see Monthly Notices, R.A.S., vol. 45, p. 83), and are therefore more likely to produce errors which are not eliminated on reversal of the plate in cases where the screw range is not strictly limited, and the wear

therefore not strictly symmetrical.

The excellent manner in which the scales and micrometers are mounted, the employment of a compound microscope for viewing the scales, with its ingeniously arranged and admirably efficient reversing prism, and the perfection of its slow motions for focusing and reading, combine to render this a most accurate and convenient instrument for very refined measures, although too slow for work in which the measures must depend on single pointings in each of two reversed positions of the plate, and where speed of working is essential.

Apparatus for Measuring Star-Spectra, &“c. — These machines may be divided into three classes, viz. A, in which the motion of the slide which carries the photographic plate is measured entirely by a screw; B, in which that motion is measured by combination of a scale and screw; and C, in which the

photographic plate is fixed and the measuring microscope is moved.

The chief drawback to type A is that the errors of the screw are liable to change by wear, otherwise the apparatus, as made and used at Potsdam, is, on the whole, a convenient and accurate one. In determining the errors of the screw of the Potsdam form

Fig. 20.

of machine it is necessary to have regard to the fact that the screw is placed at one side of the 9lide, as in fig. 20.

The result is that, if the screw is bent — if, for example, the end of the frame next the screw-head is raised and that next the end p is lowered in the diagram — a twist will be given to the web-frame, and the centre of the web will be moved nearer to the micrometer- drum than it should be, whilst the reverse effect will follow when the head has been turned 180°. This would, of course, create a periodic error, which would be determinable for the motion of any particular point (say the middle) of the web, but which would be smaller for a point near the axis of the screw and greater for a point farther from that axis. In the Potsdam form of this apparatus the micrometer is, for convenience, provided with a motion at right angles to the axis of the screw, and it has been found at the Cape Observatory that the periodic errors in this apparatus do vary very sensibly according as the

microscope is directed to a point more or less distant from the measuring screw. Since the discovery of this fact all measurements have been made in that fixed position of the microscope with respect to the axis of the screw for which the errors of the screw have been determined.

In the apparatus of type B as made by Zeiss there are two microscopes attached to a base-plate, one of which views the spectrum-plate (or other object) to be measured, while the other views a scale that moves with the slide on which the spectrum- plate is mounted. In this way the scale can be viewed by a micro- scope of much higher magnifying power than can be employed for the photographed spectrum. Indeed, if the scale were sub- divided to ˆ mm. the power employed might only be limited by the sharpness of the division-lines. But for refined work this would imply the investigation of too many divisions of the scale; it is therefore more usual to divide the scale into single millimetres or half-millimetres and to provide a micrometer which subdivides the millimetre into 1000 or, by estimation, into 10,000 parts. For very accurate work it is desirable that the bate-plate, the slide and the scale should be of nickel steel, having the same thermal coefficient of expansion as glass.

The forms of measuring machines of type C, often seen in physical laboratories, should be at once rejected for refined measurements, because it is impossible to construct slides of such perfection that the axis of the microscope will remain absolutely normal to the surface of the plate (assumed to be a plane) throughout the range of measurement. Even if the slide itself is mechanically perfect, the irregularity in the thickness of the lubricating oil between the bearing surfaces of the slide is apt to produce a variable error.

Bakhuyzen (Bulletin de Com. perm, congres. astrog, i. 164) de- scribed a measuring-machine by Repsolds, in which the micrometer-microscope tilts in the bearings of the chariot on which it moves, so that it can view either a graduated scale or the photographic plate. We have, in fact, in this instrument a combination of types B and C. Even in this apparatus if the slide on which the chariot moves is not perfect (and no slide is perfect), the azimuth of the axis of the microscope is liable to change in the course of movement of the slide, and thus equal spaces on the scale will not be repre- sented by equal spaces on the plate under measurement. The remedy proposed by Repsold for this proved fault is to cause the whole slide to tilt instead of the microscope only; this should prove a complete remedy.

The Travelling Wire Micrometer. — An important modern application

of the micrometer, which is not dealt with in the article Transit Circle, is that which is now called ” the travel- ling wire micrometer.

In the Astronomische Nachrichten, No. 2940, Dr Repsold proposed a method of meridian observing which consists in causing a web to follow the image of a star in transit by motions communicated by the observer’s hands alone, whilst electrical contacts on the drum of the micrometer screw register on the chronograph the instants corresponding to known intervals from the line of collimation. The purpose of his paper was to show that if the axis, by which the

observer imparts motion to the slide on which the travelling web is mounted, is provided with two disks at its extremities, so that the observer can use the thumb and finger of both hands in rotating it, there is no difficulty, after a little practice, in keeping the web constantly bisecting the star in transit, and that with a little practice the mean of the absolute errors in following the star becomes nearly zero.

In the Astron. Nach., No. 3377, Repsold gives a detailed de- scription of two forms of eye-ends of transit circles, fitted with meansof observing in this manner, to which he gives the name of ” the impersonal micrometer.” This method of observation was very successfully employed, under Seeliger at Munich, in an ex- tensive series of meridian observations, and, under the auspices of the Geodetic Institute at Potsdam, in telegraphic longitude opera- tions. Still more recently the method has been largely employed at the Cape of Good Hope and elsewhere.

Under the date March 1901 Dr H. Struve published an account of the application of clockwork as an aid in Repsold’s method; and, later, Dr Cohn published a more elaborate paper on the same subject in the Astron. Nach., 3767. The method consisted in having motion transmitted to the micrometer screw from an axis on which is mounted a disk that presses with friction-contact upon a cone that revolves uniformly by clockwork. The velocity of rotation of the micrometer-screw could therefore be varied for stars of different declination by varying the distance from the apex at which the revolving disk presses upon the revolving cone. In the Konigsberg transit instrument used by Struve and Cohn, the clockwork was attached to the eye-end of the instrument — a condition which is obviously undesirable both from the necessarily unsymmetrical position of the clockwork with respect to the optical axis, and from the impossibility of securing the uniform going of the clock in different positions of the instrument. In more recent instruments at the

observatories of the Cape of Good Hope and Paris the motion is transmitted from a separately mounted cone and clock by a light rod passing through a perforation in the pivot of the transit instrument and thence through bevel-wheels in the cube of the axis to a second rod leading to the eyepiece. This rod turns a worm-screw which acts on a worm-wheel fitted ” spring tight ” upon the axis of the micrometer-screw.

It should be mentioned that an essential feature of the travelling wire micrometer is that the eyepiece as well as the wire shall be moved by the micrometer-screw. Thus, if the star’s image is kept in bisection by the wire, both star and wire will appear at rest in the field of view.

The distinction between the old and new method of observation may thus, in one sense, be described as the difference between shooting at a moving object and in shooting at one at rest. In the case of the original Repsold plan without clockwork the de- scription is not quite exact, because both the process of following the object and correcting the aim are simultaneously performed; whilst, if the clockwork runs uniformly and the friction-disk is set to the proper distance from the apex of the cone, the star will appear almost perfectly at rest, and the observer has only to apply delicate corrections by differential gear — a condition which is exactly analogous to that of training a modern gun-sight upon a fixed object. It is impossible in this article to give a detailed description of the apparatus, but the reader is referred to Astron. Nach-, 3377, for an illustrated account of the original Repsolds instrument and to the History and Description of the Cape Observatory for a com- plete description of the most modern form of its application to the Cape transit circle, with and without clockwork.

The Hartmann Spectrocomparator. — For accurate measurement of the displacements of lines of stellar spectra which are produced by the relative motion of star and observer in the line of sight, a very beautiful instrument has been devised by Dr J. Hartmann of Potsdam, and is described by him in the Publicationen des astrophysikalischen Observatoriums zu Potsdam, Bd. 18, Stuck 53 (1906). An English translation of this paper is given in the Astrophysical Journal, xxiv. 285-302. The method originally used by Huggins, who first conceived and proved the possibility of measuring stellar velocities in the line of sight, was to measure with a filar micrometer the displacement of some well-known line in a stellar spectrum relative to the corresponding line of a terrestrial spectrum. Vogel of Potsdam introduced the method of photographing stellar and terrestrial spectra on the same plate, and in this way obtained an immense advance in the ease and precision of observation. Vogel and his successors

employed one or other form of measuring machine, provided with a micro- scope having single or close parallel webs which could be succes- sively pointed on the photographed lines of the star spectrum and the lines of the terrestrial spectrum. To derive the stellar velocity in the line of sight relative to the observer it was then necessary to assume that the normal wave-lengths of the stellar and terrestrial spectra are accurately known. But in the

complex spectra of stars of the solar type this is by no means the case; for, as Dr Hartmann remarks, ” in the first place the lines in these spectra are so numerous that their complete . measurement and reduction would require many days, and in the second place a rigorous reduction of such material has hitherto not been at all possible because the wave-lengths of the lines are not known with sufficient accuracy. On this account, observers have until now limited themselves to a partial treatment of such spectra, measuring only a small number of lines, whereby the major part of the rich material present in the plate remains unutilized.” But the spectroscopes that can be employed for stellar spectro- graphs are not sufficiently powerful to separate fully lines which are very closely adjacent, and therefore a line, assumed to be of a known wave-length, may be apparently displaced by the near neighbourhood of an unknown line. Hartmann overcame these and many other difficulties by directly superposing the image of the spectrogram of a star, having iron comparison lines, upon the image of a spectrogram of the sun taken also with iron comparison lines.

The apparatus for this purpose is shown in fig. 21, its principle of construction is shown in figs. 22 and 23. The solar spectrograph is attached by clamps to the plate Ai, the stellar spectrograph to the plate A 2 . The plate Ai is mounted on the dove-tailed slide Bi, upon the metallic stage T, and can be moved to right or left relative to T by the micrometer-screw S; whilst the plate As is mounted on the dove-tailed slide B 2 and can

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Fig. 22.

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Fig. 21.

be moved at right angles to its greatest length by the screw G. The micrometer-screw S has a pitch of 0-5 mm., its head is divided into 100 parts. Two spiral springs underneath press the plate Bi with its agate end-bearing against the rounded end of the screw S. The whole number of revolu- tions of the screw is read by the scale X (fig. 23). The whole stage T, carrying both spectrograms, can be moved from right to left on the steei cylinder Z, by turning the head K, on the axis of which is a pinion that gears into a toothed rack attached to the lower side of the cylinder Z. A scale N on the cylinder Z serves for setting the slide to any required position. The preliminary conditions of measurement are : —

1. The centre of both spectrographs shall be parallel to the axis of the cylinder Z.

2. The distance between the centres of the two spectrographs shall be equal to the distance between the optical axes of the two viewing microscopes.

3. The scales of the images formed in the focus of the eyepiece common to both microscopes shall be identical.

To fulfil condition (1) the plates Ai and A 2 are mounted in circular slides, whose centres are Ei and E 2 respectively, so that by means of the screws Di, D 2 , with their corresponding opposing springs Fi and F 2 , the operation can be very easily accomplished. To fulfil condition (2) the two microscopes whose object glasses are Oi and 2 (fig. 22) are attached to the plate L, their optical axes being normal to the stage T. The screw Q serves to adjust the axis of Oi to coin- cidence with the centre of the lines of the solar spectrograph, and the screw G then serves to move the slide B 2 till the optical axis of 2 is coincident with the centre of the lines of the stellar spectro- graph. Suppose now the solar spectrogram to be viewed in the focus of Oi, and the converging rays to be reflected by the prisms Pi and P3, till an image is formed in the focus of the eyepiece at the point where the axis of the eyepiece intersects

the upper face of the prism P 3 . Then if the prism P4 is cemented to-

P3, a sharp image of such lines of the solar spectrograph as are visible in the field of view will be seen in the eyepiece. If the stellar spectrograph is viewed in the focus of O2 and the converging rays are reflected by the prism P 2 to P4, no image would be seen in the eyepiece, for the rays would pass out directly through the parallel glass plate which is formed by the cementing together of the prisms P3 and P4. But if the cemented face of P4 is silvered,

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Fig. 23.

then the lines of the stellar spectrogram would be seen in focus of the eyepiece and the image of the solar spectrograph would be obliterated. Therefore, if one-half of the cemented face of P4 is silvered, it becomes possible to view, side by side, one-half of the image of the solar spectrograph formed by Oi and one-half of the image of the stellar spectrograph formed by O2. A prism half silvered in this way is provided, which enables the observer to com- pare the equality of scale of both photographs. If, for example, it is found that the image of the solar spectrograph is the larger of the two it becomes necessary to adjust the object glass Oi farther

from the stellar spectrograph. This has the effect of forming the image of the latter farther from the observer's eye, and so it becomes necessary to turn the handle of the rack-pinion V in such a way as to move the prisms P 3 and P4 nearer to P 2 till the lines of the stellar spectrograph are again sharply in focus. The effect of turn- ing the pinion V is, of course, to displace the focus both of the solar and stellar spectrographs in the field of the eyepiece, but this displacement, is easily restored by the focussing screws Oi and Oy By successive adjustments of this kind condition (3) can be accurately realized.

These three adjustments having been made, the prisms P 3 and P4 are removed and replaced by another prism in which the silvering is arranged as in fig. 24, where the hatched lines denote the silvered surfaces. The narrow tongues of the silvered surface will now reflect corresponding parts of the star-spectrograph, and will obliterate corresponding parts of the solar spectrograph — as shown in figs. 25 and 26. Fig. 25 shows the stellar and solar lines of the two spectrographs in coincidence, whilst the metallic lines of comparison are non-coincident. Fig. 26 shows the metallic lines of comparison in coincidence whilst the solar and stellar lines are non-coincident. It is

obvious that these two conditions can be produced at the will of the observer by simply turning the screw S, and that the difference of the readings of the screw-head, which are required to reproduce the two conditions in question, gives a measure of the displacement of the stellar lines relative to the solar lines. If then the screw-value in kilometres per second is known for the neighbourhood of each of the comparison lines employed, the radial velocity of the star can be independently derived directly from coincidences made in above manner in the

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Fig. 24.

neighbourhood of each comparison line. For the special purpose of determining the solar parallax this instrument has been used in a most refined and perfect manner by Dr Halm at the Cape of Good Hope {Annals of the Cape Observatory, vol. x. part 3).

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Fig. 25.

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Fig. 26.

Double Image Micrometers are described in the article Helio- meter (q.v.). (D. Gl.)

MICRONESIA (from Gr. juiKpos, small, and vfjcos, island), one of the three great divisions of the oceanic islands in the central and western Pacific. Lying to the north of Melanesia, it embraces the following groups: Mariana, Pelew, Caroline, Marshall and Gilbert. See articles under these headings, and Pacific Ocean (section on Islands).

The Micronesian islanders form in the main a branch of the Polynesian race, but distinguished from it by well-marked differences in appearance, language and institutions. Many of the islanders, however, show signs of hybridism. The proximity of Japan and the Philippines 1 on the west, and of the Papuan

‘There are authenticated instances of Japanese junks, with living

people in them, having been found in various parts of the North Pacific. In 1814 the British brig ” Forester ” met with one off the coast of California (about 30° N. lat.), with three living men and fourteen dead bodies on board. In December 1832 a Japanese junk arrived at the Hawaiian Islands with four of the crew living. If these junks could cross the Pacific in the latitude of Hawaii it is not at all unlikely that others running in a south-easterly direction would reach some of the many atolls which stretch over about 35° of longitude, forming the Caroline and Marshall archipelagoes.

The traditions of the Gilbert Islanders tell us that their islands

and South Polynesian islands on the south and south-east, suggests, what in fact is found, a combination of races. In some places the oblique Mongolian eye is noticed, and (together with certain Indo-Chinese customs) there is often a scantiness of beard and general ” Malay ” look, which increases westwards, and seems to imply relations with the archipelago subsequent to the departure thence of the pure Polynesians. In the Gilberts the traces of Polynesian (Samoan) influences are evident, and are confirmed by tradition. Among the Carolines and the Marshalls darker and more savage communities are found, suggesting a Melanesian element, which is further traceable in the Ebon (Marshall) and other languages.

Each of the four main groups, viz. the Caroline, Marshall, Gilbert and Ladrone (Mariana), from long isolation, has developed ethnological peculiarities of its own. The most advanced folk were the ” Chamorros ” of the Ladrones, owing to the greater natural resources of the islands, and perhaps more frequent contact with influences from the west; but as a separate people they no longer exist, having been nearly exterminated by the Spaniards in the 17 th century. Next in advancement come the Caroline islanders. The general Micronesian type is a well-proportioned rather slightly built figure, with small and regular features; head high and well proportioned, but forehead rather retreating and narrow at the temples; cheek bones and chin slightly prominent; straight black hair, lanker than that of the Polynesians, colour somewhat darker than the Polynesians, the Marshalls being darker and more vigorous than the Carolines, while the Gilbert type, though smaller than the latter, is still darker and coarser. The upper class greatly surpasses the common people in physique and intelligence.

There is a division of society into septs or clans, the membership of which constitutes the closest tie. Persons of the same sept must not intermarry, and when two islands or communities meet in war the members of one sept, however widely separated by dis- tance of space or time, will not injure or fight with each other. Each community is usually composed (but there are local differ- ences) of — (1) an upper class of chiefs, from among whom the head (tamol or iros) is chosen; (2) a lower but still noble class; and (3) common people, mostly without rights of property. These last are only allowed one wife. Here and there are traces, as in Tonga, of a spiritual sovereign, the descendants probably of a conquered dynasty. Succession is through the female side, which assures to women a certain position, and leads besides to some curious results (see paper by J. S. Kubary in Das Ausland, 1880, No. 27). The upper class are the keepers of traditions, boat-builders, leaders of expeditions ; tattooing is generally done by them, the amount increasing with a man's rank; the custom here still has definite religious associations. Both sexes are tattooed.

The Marshall Islanders are the boldest and most skilful navi- gators in the Pacific. Their voyages of many months' duration, in great canoes sailing with outrigger to windward, well-provisioned, and depending on the skies for fresh water, help to show how the Pacific was colonized. They have a sort of chart, medo, of small sticks tied together, representing the positions of islands and the directions of the winds and currents. A two-edged weapon, of which the blade is of sharks' teeth, and a defensive armour of braided sennit, are also peculiar to the islands; a large adze, made of the shell of the Tridacna gigas (the largest bivalve known), was formerly used in the Carolines, probably by the old builder race.

The dialects of Micronesia, though grammatically alike, differ widely in their vocabularies. They have the chief characteristics of the Polynesian, with Malay affinities, and peculiarities such as the use of suffixes and inseparable pronouns and, as in Tagal, of the infix to denote changes in the verb ; in the west groups there is a tendency to closed syllables and double^ consonants, and a use of the palatals ch, j, sh, the dental th, and s' (the last perhaps only in foreign words), which is alien to the Polynesian. These letters are wanting in the Gilbert language, which differs considerably from all the others, and has much greater affinities with the Polynesian. Most words take the accent on the penult. In some of the dialects there appears to be no true article, but in the Gilbert Islands the Polynesian te is used for both definite and indefinite article. Gender is sexual only. Number in the noun is either gathered from the

were peopled from the west and also from the east. Those who came from the east are expressly said to be from Samoa. Those from the west were more numerous than those from the east. There are also traditions of the arrival of other strangers at some of these islands. On the island of Peru, in the Gilbert group, in 1869 there was still the remnants of a large proah which, from the description given, appears to have been like those used in the Indian Archipelago.

requirement of the sense or is marked by pronominal words or numerals. Case is known by the position of the noun in the sen- tence or by prepositions. In the language of Ebon, one of the islands in the Marshall archipelago, nouns have the peculiarity which is characteristic of the Papuan languages : those which indi- cate close relationship — as of a son to a father, or of the members of a person's body — take a pronominal suffix which gives them the appearance of inflexions. Many words are used indiscriminately as nouns, adjectives or verbs, without any change of form. In some languages the personal pronouns are singular, dual and plural. In others there are no special dual forms, but the numeral for two is used to indicate the dual. In the Ebon language there are inclusive and exclusive_ forms of the personal pronouns which, so far as has been ascertained, do not occur in any of the other languages. The verbs usually have no inflexions to express re- lations of voice, mood, tense, number of person — such distinctions being indicated by particles. In the Ebon language, however, the tenses are sometimes marked ; but in that the simple form of the verb is frequently given. _ All have verbal directive particles. In Ponape, one of the Caroline Islands, many words of ceremony are used in addressing chiefs, as they are used in Samoa. The custom of tabooing words is also found there as it is in the Polynesian languages.

The religious myths are generally identifiable with the Polynesian, but a belief in the gods proper is overshadowed by a general deifica- tion of ancestors, who are supposed from time to time to occupy certain blocks of stone, set up near the family dwelling, and sur- rounded by circles of smaller ones. These stones are anointed with oil, and worshipped with prayer and offerings, and are also used for purposes of divination, in which, and in various omens, thereis a general belief. In the Marshalls, in place of these stones, certain palm trees are similarly enclosed. The spirits also some- times inhabit certain birds or fishes, which are then taboo, as food, to the family; but they will help to catch them for others. Temples are very rare, though these blocks of coral are sometimes surrounded by a roofless enclosure opening to the west. The bodies of the dead, and sometimes even of the sick, are despatched to sea west- wards, with certain rites; those of the chiefs,

however, are buried, for the order has something essentially divine about it ; their bodies therefore are sacred, and their spirits naturally assume the position above described. Such a belief greatly strengthened the king's authority, for the spirits of his ancestors were necessarily more powerful thanany other spirits. Thus too it comes that the chiefs, and all belonging to them, are taboo as regards the common people. There are various other subjects and occasions of taboo, but the institution has not the oppressive and all-pervading character which it has in Polynesia. Its action is often economical or charit- able, e.g. the ripening coco-nuts are taboo as long as the bread-fruit lasts, thus securing the former for future use; or it is put on after a death, and the nuts thus saved are given to the family — a kindness to them, and a mark of respect for the dead.

The houses in the Gilberts and Marshalls (much less elaborate than in the Carolines) consist merely of a thatched roof resting on posts or on blocks of coral about 3 ft. high, with a floor at that level, which is reached from an opening in the centre. On this the principal people sleep, and it serves as a storehouse inaccessible to rats, which infest all the islands.

MICRONUCLEUS, the smaller nucleus in Infusoria (q.v.). In fission it divides by mitosis, and in conjugation furnishes the pairing or gametonuclei, by whose reciprocal fusion a zygote- nucleus is formed, which gives rise to the meganuclei and micronuclei of the individuals of the next cycle of fission.

MICROPEGMATITE, in petrology, a very fine intergrowth of quartz and alkali felspar, occurring as the last product of consoli- dation in many igneous rocks which contain high or moderately high percentages of silica. It shows the same structure on a minute scale as certain pegmatites (q.v.) or coarse granitic veins do on a large scale (see Petrology, PI. 2, figs. 6 and 8); the quartz forms angular patches scattered through a matrix of felspar. In polarized light the separate areas of each mineral extinguish at the same time, and this proves that even though apparently discontinuous they have the same crystalline orienta- tion. The felspar may be considered an irregular crystal of spongy structure, the interstices being filled up by another spongy crystal of quartz. This kind of mineral intergrowth is said to be " graphic," because the coarsely graphic veins have triangular quartz areas dotted over a felspathic background resembling certain primitive inscriptions. Micropegmatite differs from " graphic granite " only in being so much finer grained that its nature can only be detected with the microscope. The felspar of micropegmatite is usually orthoclase, but some- times albite, oligoclase or microcline. Occasionally it has

crystalline form, and then it has been proved that the quartz

may be so disposed that the two minerals have a definite relation between their crystallographic axes (parallel growth). The quartz typically occurs as angular patches; at other times it forms club-shaped, curved or vermiform threads (vermicular micropegmatite, myrmekite), and then some authors consider that the felspar has been corroded and the quartz fills up the spaces thus produced (quartz de corrosion of French petro- graphers). Micropegmatite is often so fine grained that even in the thinnest sections and with high powers it cannot be resolved into its components. This fine micropegmatite resembles threads, having a divergent arrangement In some rocks the whole ground mass consists of such spherulitic growths of fibrous micropegmatite (see Quartz — Porphyry); in their centres there is often a quartz or felspar crystal; the outer boundaries of the spherulites are not usually circular but irreg- ular owing to the interlocking of adjacent spherulites at their margins (" granophyric structure "). Micrographic structures may occur in other minerals, e.g. quartz and garnet, cordierite, epidote or hornblende, augite and felspar, but are less common, and the name micropegmatite is usually reserved for aggregates of quartz and felspar.

In rocks where micropegmatite frequently occurs (e.g. granite, porphyry and granophyre, quartz-diorite) it is usually the last product of consolidation, and represents the mother liquor left over after the other minerals had separated out in more or less perfect crystals. Hence it has no definite form of its own, but fills up the irregular interspaces between the earlier crystallizations. For that reason.it has been compared to a eutectic, and supposed to be the mixture of quartz and felspar which has the lowest fusion point. Eutectics are common in alloys and often have a very per- fect micrographic structure. The eutectic mixture of quartz and orthoclase has been estimated to contain 70-75% of the latter. This theory, however, _ is not without its difficulties; analyses of micropegmatite prove that its composition is by no means constant (this may perhaps be due to small admixtures of soda and lime felspars) ; and experimental researches on the fusion points of mixtures of quartz and felspar have not yet shown that there is a definite mixture which melts at a lower temperature than any other. Furthermore micropegmatite is not always the last con- solidation product, as a eutectic should be, but may occur as well-shaped phenocysts lying in a felsitic or glassy matrix which solidified

at a still later time. Micrographic structures in the minerals of igneous rocks prove only that these minerals crystallized simul- taneously. (J. S. F.)

MICROSCOPE (Gr. /uKpos, small, cKcnrdv, to ‘dew), an optical instrument for examining small objects or details of such objects; it acts by making the angles of vision under which the images appear greater than when the objects themselves are viewed by the naked eye.

Microscopes are distinguished as simple and compound. A simple microscope consists of a single positive lens, cr of a lens combination acting as a single lens, placed between the eye and the object so that it presents a virtual and enlarged image. The compound microscope generally consists of two positive lens systems, so arranged that the system nearer the object (termed the objective) projects a real enlarged image, which occupies the same place relatively to the second system (the eyepiece or ocular) as does the real object in the simple micro- scope. An image is therefore projected by the ocular from the real magnified image produced by the objective with increased magnification.

History of the Simple Microscope. — Any solid or liquid trans- parent medium of lenticular form, having either one convex and one flat surface or two convex surfaces whose axes are coincident, may serve as a ” magnifier,” the essential condition being that it shall refract the rays which pass through it so as to cause widely diverging rays to become either parallel or but slightly divergent. Thus if a minute object be placed on a slip of glass, and a single drop of water be placed upon it, the drop will act as a magnifier in virtue of the convexity of its upper surface; so that when the eye is brought sufficiently near it (the glass being held horizontally) the object will be seen magnified. Again if a small hole be made in a thin plate of metal, and a minute drop of water be inserted in it, this drop, having two convex surfaces, will serve as a still more powerful magnifier. There is reason to believe that the magnifying power of transparent media with

convex surfaces was very early known. A convex lens of rock- crystal was found by Layard among the ruins of the palace of Nimrud; Seneca describes hollow spheres of glass filled with water as being commonly used as magnifiers.

The perfect gem-cutting of the ancients could not have been attained without the use of magnifiers; and doubtless the artificers who

executed these wonderful works also made them. Convex glass lenses were first generally used to assist ordinary vision as ” spectacles “; and not only were spectacle-makers the first to produce glass magnifiers (or simple microscopes), but by them also the telescope and the compound microscope were first invented. During the Thirty Years' War the simple microscope was widely known. Descartes (Dioptrique, 1637) describes microscopes wherein a concave mirror, with its concavity towards the object, is used, in conjunction with a lens, for illuminating the object, which is mounted on a point fixing it at the focus of the mirror. Antony van Leeuwenhoek appears to be the first to succeed in grinding and polishing lenses of such short focus and perfect figure as to render the simple microscope a better instrument for most purposes than any compound microscope then constructed. At that time the ” compass ” microscope was in use. One leg of a compass carried the object, and the other the lens, the distance between the two being regulated by a screw. Stands were also in use, permitting the manipulation of the object by hand. Robert Hooke shaped the minutest of the lenses with which he made many of the discoveries recorded in his Micrographia from small glass globules made by fusing the ends of threads of spun glass; and the same method was employed by the Italian Father Di' Torre. Early opticians and microscopists gave their chief attention to the improvement of the simple microscope, the principle of which we now explain.

Simple Microscope

Position and Size of the Image. — A person with normal vision can see objects distinctly at a distance varying from ten. inches to a very great distance. Objects at different distances, however, are not seen distinctly simultaneously, but in succession. This is effected by the power of accommodation of the eye, which can so alter the focal length of its crystalline lens that images of objects at different distances can be produced rapidly and distinctly one after another upon the retina.

The angle under which the object appears depends upon the dis- tance and size of the object, or, in other words, the size of the image on the retina is determined by the distance and the dimensions of the object. The ratio between the real size of the object y (fig. 1)

Fig. 1.

and the distance /, which is equal to the tangent of the visual angle w, is termed the ” apparent size ” of the object. From the figure, which represents vision with a motionless eye, it is seen that the apparent

size increases as the object under observation is approached. The greater the visual angle, the more distinctly are the details of the object perceived. On the other hand, as the observer recedes from the object, the apparent size, and also the image on the retina diminishes; details become more and more confused, and gradually, after a while, disappear altogether, and ultimately the external configuration of the object as a whole is no longer recognizable. This case arises when the visual angle, under which the object appears, is approximately a minute of arc; it is due to the physio- logical construction of the retina, for the ends of nerve fibres, which receive the impression of light, have themselves a definite size. The lower limit of the resolving power of the eye is reached when the distance is approximately 3438 times the size of the object. If the object be represented by two separate points, these points would appear distinct to the normal eye only so long as the dis- tance between them is at the most only 3438 times smaller than their distance from the eye. When the latter distance is increased still further, the two appear as one. Therefore when it is desired to distinctly recognize exceedingly small obiects or details of such, they are brought as near as possible to the eye. The eye is strained in bringing its focal length to the smallest possible amount, and when this strain is long continued it may cause pain. When the shortest distance obtained by the highest strain of accommodation is insufficient to recognize small objects, distinct vision is possible at even a shorter distance by placing a very small diaphragm

between the eye and the object, the pencils of rays proceeding from the object-points, which otherwise are limited by the pupils of the eye, being thus restricted by the. diaphragm. The object is then projected with such acute pencils on the plane focused for, in this case on the plane on which the eye can just accommodate itself, that the circle of confusion arising there is still so small that it is below the limit of angular visual distinctness and on that account appears as a sharp point. However, the loss of light in this procedure is extraordinarily large, so that only most intensely illuminated objects can be investigated.

A naked short-sighted eye, which would be corrected for distant objects by a spectacle glass of — 10 diopters, may approach the object up to about 4 in. and have a sharp image upon the retina without any strain whatever. For the observation of small objects, a myopic eye is

consequently superior to a normal eye; and the normal eye in its turn is superior to the hypermetropic one. When the details are no longer recognizable by the unaided eye, the magnifying glass or the simple microscope is necessary. As a rule large magnification is not demanded from the former, but a larger field of view, whilst the simple microscope should ensure powerful magnification even when the field is small. The simple microscope enlarges the angle of vision, and does not tire the eye when it is arranged so that the image lies in the farthest limit of distinct vision (the punctum remotum). A normal eye will therefore see an image formed by the magnifying glass most conveniently when it is produced at a great distance, i.e. when the object is in its front focal plane. If y (fig. 2) be the object the image appears to a normal

Fig. 2.

eye situated behind the system L with passive accommodation at a very great distance under the angle w . Since H' P = F O, = y, from the focal length of the simple microscope, the visual angle w' is given by

tan w'ly = ijf =V, (1)

in which /', = H' F', is the image-side focal length (see Lens). Since the lens is bounded by air, the image- and object-side focal lengths/' and / are equal. The value 1//' or V in (1), is termed the power of the lens. In most cases the number of " diameters " of the simple microscope is required; i.e. the ratio between the apparent sizes of the object when observed through the microscope and when viewed by the naked eye. When a person of normal vision views a small object, he brings it to the distance of distinct vision, which would average about 10 in. The apparent size is then (fig. 1) tan w = y/l, where 1 = 10 in., whilst the apparent size of the object viewed through the magnifying glass would result from the formula (1) tan w'=y/f. Consequently the number of diameters will be

N = tan w'/tan w = yff . Ify = Iff = V.l; # (2)

it is thus equal to the magnifying power multiplied by the distance of distinct vision, or the number of times that the focal length is contained in 10 in.

Since this value for the distance of distinct vision is only con- ventional, it is understood that the capacity of the simple micro- scope given in (2) holds good only for eyes accustomed to examine small

objects 10 in. away; and observation through the magnifying glass must be undertaken by the normal eye with passive accommo- dation. A lens of I in. focal length must be spoken of, according to this notation, as a X 10 lens, and a lens of ˆ in. focal length as a X 100 lens. Obviously the position of a normal eye free from accommodation is immaterial for determining the magnification. A X 10 magnification is, however, by no means guaranteed to a myopic eye of — 10 D by a lens of I in. focus. Since this short- sighted observer can view the object with the naked eye with no inconvenience to himself at 4 in. distance, it follows (to him) the apparent size is tan w = y/4 ; and to secure convenient vision through the lens the short-sighted person would bring the object to such a distance that a virtual, magnified image would be pro- jected in his punctum remotum. In addition it will be supposed that the centre of the pupil of the observer coincides with the back focal poirft of the system. The apparent size of the object seen through the lens is then tan w' = y/f. The magnification, resulting from the simple microscope of 1 in. focus, is here N = tan it/ /tan w = ylf \ly — Alf~\ Thus, while a lens of I in. focal length assures to the normal-sighted person a X 10 magnification, it affords to the short-sighted individual only X 4- On the other hand, it is even of greater use to the hypermetropic than to the observer of normal sight. From this it appears that each observer obtains specific advantages from one and the same simple microscope, and also the individual observer can obtain different magnifications by either using different accommodations, or by viewing in passive accommodation.

Regulation of the Rays. 1 — In using optical instruments the eye in general is moved just as in free vision ; that is to say, the attention is fixed upon the individual parts of the image one after another, the eye being turned in its cavity. In this case the eye is always directed so that the part of the image which is wished to be viewed exactly falls upon the most sensitive portion of the retina, viz. the macula lutea (yellow spot). Corresponding to the size of the yellow spot only a small fraction of the image appears particularly distinctly. The other portions which are reproduced on the retina on the regions surrounding the yellow spot will also be perceived, but with reduced definition. These external and less sensitive parts of the retina, therefore, merely give information as to the general arrangement of the objects and to a certain extent act as guide-post in order to show quickly and conveniently, although not distinctly, the places in the image which should claim special attention. Vision with a motionless eye, or " indirect vision," gives a general view over the whole object with particular definition of a small central portion. Vision with a movable eye, or " direct vision," gives exact information as to the

parts of the object one after another.

The simple microscope permits such vision. If the instrument has a sensible lens diameter, and is arranged so that the centre of rotation of the eye can coincide with the intersection of the principal rays, the lens can then form with the eye a centred system. Such lenses are termed ” lenses for direct vision.” By moving the eye about its centre of rotation M the whole field can be examined. The margin of the mount of the lens serves as the diaphragm of the field of view. The selection of the rays emerging from the lens and actually employed in forming the image is undertaken by the pupil of the eye which, in this case, is consequently the exit pupil of the instrument. In fig. 3 P’P’i designates the exit pupil of the

V- :

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F’

v FlG. 3.

lens, and the image of P’P’i, i.e. PPj, which is formed by the lens, limits the aperture of the pencils of rays on the object-side; consequently it is the entrance pupil of the instrument. Since the exit pupil moves in observing the whole field, the entrance pupil also moves. The principal rays, which on the object-side connect the object-points with the centre of the entrance pupil, intersect the axis on the image-side at the centre of rotation M of the eye. M is therefore the intersection of the principal rays.

So long as the exit pupil is completely filled the brightness of the image will be approximately equal to that of free vision. If, however, we fix the points lying towards the margin of the field of view, the diaphragm gradually cuts off more and more of the rays which were necessary to fill the pupil, and in consequence the brightness gradually fall’s off to zero. This vignetting can be observed in all lenses.

In most cases, and also in corrected systems, the intersection of the principal rays is no longer available for the centre of rotation of the eye, and this kind of observation is impossible.

In some instruments observation of the whole available field is only possible when the head and eye are moved at the same time, the lens retaining its position. Dr M. von Rohr terms this kind of vision ” peep-

hole observation." It has mainly to be considered in connexion with powerful magnifying glasses. In most cases a diaphragm regulates the rays. Fig. 4 shows the position of the diaphragms . to be considered in this kind of observation. PP: is the' entrance pupil, P'Pi' the exit pupil, and GG the diaphragm. The inter- section of the principal rays in this case lies in the middle of the entrance pupil or of the exit pupil. By head and eye motion p

the various parts of the ' **'

whole field can be viewed one after another. The distance of the eye from the lens is here immaterial. In this case also the illumi- nation must fall to zero by the vignetting of the pencils coming from objects at the margin of the field of view. C and D -are the outermost rays which can pass through the instrument.

Magnifying glasses are often used for viewing three-dimensional objects. Only points lying on the plane focused for can be sharply reproduced in the retina, which acts as object-plane to the retina.

1 See also Lens.

AH points lying out of this plane are reproduced as circles of con- fusion. The central projection, of which the centre is the middle point of the entrance pupil on the plane focused for, will show in weaker systems, or those very much stopped down, a certain finite depth of definition ; that is to say, the totality of points, which lie out of the plane focused for, and which are projected with circles of confusion so small that they appear to the eye as sharp points, will include the sharp object relief, and determine the depth of definition of the lens. With increasing magnification the depth of definition diminishes, because the circles of confusion are greater in consequence of the shorter focal length. Very powerful simple microscopes have hardly any depth of definition so that in fact only points lying in one plane can be seen sharply with one focusing.

Illumination. — So long as the pupil of the observer alone under- takes the regulation of the rays there is no perceptible diminution of illumination in comparison with the naked eye vision. The losses of light which occur in this case are due to reflection, which takes place in the passage of the light through the glass surfaces. In a lens with two bounding surfaces in air there is a loss of about 9%; and in a lens

system consisting of two separated lenses, i.e. with four surfaces in air, about 17 %. Losses due to absorption are almost zero when the lenses are very thin, as with lenses of small diameter. A. very marked diminution in illumination occurs, however, when the exit -pupil of the instrument is smaller than the pupil of the eye. In such instruments an arrangement is often required to intensely illuminate the object.

Forms of the Simple Microscope. — If the ordinary convex lens be employed as magnifying glass, great aberrations occur even in medium magnifications. These are: (1) chromatic aberration, (2) spherical aberration and (3) astigmatism (see Aberration).

When the pupil regulates the aperture of the rays producing the image the aberrations of the ordinary lenses increase considerably with the magnification, or, what amounts to the same thing, with the increase in the curvature of the surfaces. For lenses of short focus the diameter of the pupil is too large, and diaphragms must be employed which strongly diminish the aperture of the pencils, and so reduce the errors, but with a falling off of illumination. To reduce the aberrations Sir David Brewster proposed to employ in the place of glass transparent minerals of high refractive index and low dispersion. In this manner lenses of short focus can be produced having lower curvatures than glass lenses necessitate. The diamond has the requisite optical properties, its index of refraction being about 1-6 times as large as that of ordinary glass. The spherical aberration of a diamond lens can be brought down to one-ninth of a glass lens of equal focus. Apart, however, from the cost of the mineral and its very difficult working, a source of error lies in its want of homogeneity, which often causes a double or even a triple image. Similar attempts made by Pritchard with sapphires were more successful. With this mineral also spherical and chromatic aberration are a fraction of that of a glass lens, but double refraction, which involves a doubling of the image, is fatal to its use. Improvements in glass lenses, however, have rendered further experiments with precious stones unnecessary. The simplest was a sphere of glass, the equator of which (i.e. the mount) formed the diaphragm. Wollaston altered this by taking two plano-convex lenses, placing the plane surfaces towards each other and employing a diaphragm between the two parts (fig 5). Wollaston. Brewster. Brewster (Stanhope).

Fig. 5. Fig. 6. Fig. 7.

Sir David Brewster found that Wollaston’s form worked best when the two lenses were hemispheres and the central space was filled up with

a transparent cement having the same refractive index as the glass; he therefore used a sphere and provided it with a groove at the equator (see fig. 6). Coddington employed the same con- struction, and for this reason this device is frequently called the Coddington lens; although he brought the Wollaston-Brewster lens into general notice, he was neither the inventor nor claimed to be. This lens reproduced all points of a concentric spherical surface simultaneously sharp. A construction also employing one piece of glass forms the so-called Stanhope lens (fig. 7), which was really due to Brewster. This is a glass cylinder, the two ends of which are spherical surfaces. The more strongly curved surface is placed next the eye, the other serves at the same time as specimen carrier. This lens is employed in articles found in tourist resorts as a magnify- ing glass for miniature photographs of the locality.

Doublets, &c. — To remove the errors which the above lenses showed, particularly when very short focal lengths were in question, lens combinations were adopted. The individual

components required weaker curvatures and permitted of being more correctly manufactured, and, more particularly, the advan- tage of reduced aberrations was the predominant factor.

Wollaston's doublet (fig. 8) is a combination of two plano-convex lenses, the focal lengths of which are in the ratio of 3 : 1 ; the plane Wollaston. Fraunhofer. Wilson. Steinheil. Chevalier

(Brucke).

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Fig. 8.

Fig. 9.

Fig. 10.

Fig. 11.

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Fig. 12.

sides are turned towards the object, and the smaller of the two lenses is nearer the object. This construction was further improved (1) by introducing a diaphragm between the two lenses; (2) by altering the

distance between the two lenses; and (3) by splitting the lower lens into two lenses. Triplets are employed when the focal length of the simple microscope was less than ˆ in. When well made such constructions are almost free from spherical aberration, and the chromatic errors are very small. Similar doublets composed of two plano-convex lenses are the Fraunhofer (fig. 9) and the Wilson (fig. 10). Axial aberration is reduced by distributing the refraction between two lenses; and by placing the two lenses farther apart the errors of the pencils of rays proceeding from points lying outside the axis are reduced. The Wilson has a greater distance between the lenses, and also a reduction of the chromatic difference of magnification, but compared with the Fraun- hofer it is at a disadvantage with regard to the size of the free working distance, i.e. the distance of the object from the lens surface nearer it.

By introducing a dispersive lens of flint the magnifying glass could be corrected for both chromatic and spherical aberrations. Browning's " platyscopic " lens and the Steinheil " aplanatic " lens (fig. 11) are of this type. Both yield a field of good definition free from colour.

The manner in which the eye uses such a lens was first effectively taken into account by M. von Rohr. These anastigmatic lenses, which are manufactured up to X 40, are chromatically and spher- ically corrected, and for a middle diaphragm the errors of lateral pencils, distortion, astigmatism and coma are eliminated. " Peep- hole " observation is employed, observation being made by moving the head and eye while the lens is held steady. Even in powerful magnifications a good image exists in all parts of a relatively large field, and the free working distance is fairly large.

For especially large free working distances the corrections pro- posed by Chevalier and carried out by E. Brucke must be noticed (fig. 12). To an achromatic collective lens, which is turned towards the object, a dispersive lens is combined (this type to a certain extent belongs to the compound microscope). By altering the distance of the collective and dispersive members the magnification can be widely varied. Through the large free working distance, which for certain work offers great advantages, the size of the field of view is diminished.

In magnifying glasses for direct vision the eye must always be considered. The lens is brought as close as possible to the eye so as to view as large a field as possible. The watchmaker's glass is one of the earliest forms of this kind. Gullstrand showed how to correct these lenses for direct vision, i.e. to eliminate distortion and astigmatism when the centre of rotation of the eye coincided with the point where

the principal rays crossed the axis. Von Rohr fulfilled this condition by constructing the Verant lens, which are low power systems intended for viewing a large flat field.

Stands. — For dissecting or examining objects it is an advantage to have both hands free. Where very short focus simple micro- scopes are employed, using high magnifications, it is imperative to employ a stand which permits exact focusing and the use of a special illuminating apparatus. Since, however, only relatively low powers are now employed, the ordinary rack and pinion movement for focusing suffices, and for illuminating the object only- a mirror below the stage is required when the object is transparent, and a condensing lens above the stage when opaque.

Dissecting stands vary as to portability, the size of the stand, and the manner in which the arm-rests are arranged. A stand is shown in fig. 57 (Plate). On the heavy horseshoe foot is a column carrying the stage. In the column is the guide for the rack-and- pinion movement. Lenses of various magnifications can be adapted to the carrier and moved about over the stage. The rests can be attached to the stage, and when done with folded together. Illu- mination of transparent objects is effected by the universal-jointed mirror. By turning the knob A, placed at the front corner of

the stage, a black or white plate, forming a dark or light back- ground, can be swung underneath the specimen.

When the recognition of the arrangement in space of small objects is desired a stereoscopic lens can be used. In most cases refracting and reflecting systems are arranged so that the natural inter- pupillary distance is reduced. Stereoscopic lenses can never be powerful systems, for the main idea is the recognition of the depth of objects, so that only systems having a sufficient depth of definition can be utilized. Very often such stereoscopic lenses, owing to faulty construction, give a false idea of space, ignoring the errors which are due to the alteration of the inter-pupillary distance and the visual angles belonging to the principal rays at the object-side (see Binocular Instruments).

Compound Microscope

The view held by early opticians, that a compound microscope could

never produce such good images as an instrument of the simple type, has proved erroneous; and the principal attention of modern opticians has been directed to the compound instru- ment. Although we now know how the errors of lenses may be corrected, and how the simple microscope may be improved, this instrument remains with relatively feeble magnification, and to obtain stronger magnifications the compound form is necessary.

By compounding two lenses or lens systems separated by a definite interval, a system is obtained having a focal length considerably less than the focal lengths of the separate systems. If / and /' be the focal lengths of the combination, /i,/i' and/ 2 ,/ 2 ' the focal lengths of the two components, and A the distance between the inner foci of the components, then /= — /1/2/A, /'=// ft I A (see Lens). A is also equal to the distance Fi'Fz. The accented /'s are always on the image side, whilst the unaccented are on the object side. From this formula it follows, for example, that one obtains a system of | in. focal length by compounding two positive systems of 1 in. each, whose focal planes, turned towards one another, are separated by 8 in.

A microscope objective being made in essentially the same way as a simple microscope, and the front focus of the compound system being situated before the front focus of the objective, the magnifica- tion due to the simple system makes the free object distance greater than that obtained with a simple microscope of equal magnification. Moreover, this distance between the object and eye is substantially increased in the compound microscope by the stand; the incon- veniences, and in certain circumstances also the dangers, to the eye which may arise, for example by warming the object, are also avoided. The convenient and rapid change in the magnification obtained by changing the eyepiece or the objective is also a special advantage of the compound form.

In the commonest compound microscopes, which consist of two positive systems a real magnified image is produced by the objective. This permits researches which are impossible with the simple micro- scope. For example, the real image may be recorded on a photo- graphic plate; it may be measured; it can be physically altered by polarization, by spectrum analysis of the light employed by absorb- ing layers, &c. The greatest advantage of the compound microscope is that it represents a larger area, and this much more completely than is possible in the simple form. According to the laws of optics it is only possible either to portray a small object near one of the foci of the system with wide pencils, or to produce an image from a relatively large object by correspondingly narrow pencils. The simple microscope is subject to either limitation. As we shall see later, one of

the principal functions of the microscope objective is the representation with wide pencils. In that case, however, in the compound microscope a small object may always be represented by means of wider pencils, one of the foci of the objective (not of the collective system) being near it. For the eyepiece the other rule holds; the object is represented by narrow pencils, and it is hence possible to subject the relatively great object, viz. the magni- fied real image, to a further representation.

History of the Compound Microscope. — The arrangement of two lenses so that small objects can be seen magnified follo.wed soon after the discovery of the telescope. The first compound miscroscope (discovered probably by the Middelburg lens-grinders, Johann and Zacharias Janssen about 1590) was a combination of a strong biconvex with a still stronger biconcave lens; it had thus, as well as the first telescope, a negative eyepiece. In 1646 Fontana described a microscope which had a positive eyepiece. The development of the compound microscope essentially depends on the improvement of the objective; but no distinct improvement was made in its construction in the two centuries following the discovery. In 1668 the Italian Divini employed several doublets, i.e. pairs of plano-convex lenses, and his example was followed by Griendl von Ach. But even with such moderate magnification as these instruments permitted many faults were apparent. A microscope, using concave mirrors, was proposed in 1672 by Sir Isaac Newton; and he was succeeded

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by Barker, R. Smith, B. Martin, D. Brewster, and, above all, Amici. More recently these catadioptric microscopes were disregarded because they yielded unfavourable results. From 1830 onwards many improvements were made in the miscroscope objective; these may be best followed from a discussion of the faults of the image.

Position and Size of Image. — In most microscopic observations the object is mounted on a plane glass plate or slide about 0-06 in. thick, embedded in a liquid such as water, glycerine or Canada balsam, and covered with a plane glass plate of about 0-008 to 0-006 in. thick, called the cover-slip. If we consider the production of the image of an object of this kind by the two positive systems of a compound microscope shown in fig. 13, the objective Li forms a real magnified image O’CV; the object OOi must therefore lie some- what in front of the front focus Fi of the objective. Let OOi = y, O’Oi’ = y’, the focal distance of the image F/0′ = A, and the image-side focal length ft, then the magnification

M = y'/3- = A//i'. (3)

The distance A is called the " optical tube length."

Weak and strong microscope objec- tives act differently. Weak systems act like photographic objectives. In this case the optical tube length may be altered within fixed limits without spoiling the image; at the same time the objective magnification M is also altered. This change is usually effected by mounting the objective and eye- piece on two telescoping tubes, so that by drawing apart or pushing in the tube length is increased or diminished at will. For strong objectives there is, however, only one optical tube length in which it is possible to obtain a good image by means of wide pencils, any alteration of the tube length in- volving a considerable spoiling of the image. This limitation is examined below.

When forming an image by a micro- scope objective it often happens that the transparent media bounding the system have different optical proper- ties. A series of objectives with short focal lengths are available, which per- mit the placing of a liquid between the cover-slip and the front lens of the objective; such lenses are known as "immersion systems"; objectives bounded on both sides by air are called " dry systems." The immer- sion liquids in common use are water, glycerine, cedar-wood oil, monobrom- naphthalene, &c. Immersion systems in which the embedding liquid, cover-

FlG. 13. — Ray transmis- slip, immersion-liquid and front lens slon m compound micro-

with

positive

have equal refractive indices are called SC0 P e " homogeneous immersion systems." ocula '- In immersion systems the object-side Li = objective, L 2 L 3 = eye- focal length is greater than the image- piece of the Ramsden type, side focal length. Nothing is altered Fi, , F/ = object- and im- as to objective magnification, however, age-side foci of objec- as the first surface is plane, and the tive. employment of the immersion means F 2 = = front focus of eye- that the value oi ft is unaltered. piece.

If we assume that a normal eye P'Pi' = exit pupil of objec- observes the image through the eye- tive.

piece, the eyepiece must project a P"Pi" = exit pupil of corn- distant

image from the real image plete microscope, produced by the objective. This is D D = diaphragm of field the case if the image O'O/ lies in the of view, front focal plane of the eyepiece. In this case the optical tube length equals the distance of the adjacent focal planes of the two systems, which equals the distance of the image-side focus of the objective Fi' from the object-side focus of the eyepiece F 2 , The image viewed through the eyepiece appears then to the observer under the angle w", and as with the single microscope tana>7y = i// j' (4)

where f\ is the image-side focal length of the eyepiece.

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To obtain the magnification of the complete microscope we must combine the objective magnification M with the action of the eye-piece. If we replace / in equation (4) by the value given by (3), we obtain

ta.nu>"ly=Mfi'.ilf i "=V, _ (5)

the magnification of the complete microscope. The magnification therefore equals the power of the joint system._

The magnification is also expressed as the ratio of the apparent size of the object observed through the microscope to the apparent size of the object seen with the naked eye. As the conventional distance for clear vision with naked eye is 10 in., it results from fig. I that the apparent size is tan w = y/l. If this value of y be inserted in equation (5), we obtain the magnification number of the compound microscope : —

N -tan w"l tan w = A///// 2 ' = VI. (6)

The magnification number increases then with the optical tube-length and with the diminution of the focal lengths of objective and eyepiece. As with the simple microscope, different observers see differently in the same compound microscope; and hence the magnification varies with the power of accommodation.

The image produced by a microscope formed of two positive systems (fig. 13) is inverted, the objective Li tracing from the object OOi a real inverted image O'O'i, and the eyepiece L 2 L 3 maintaining this arrangement. ' For many purposes it is immaterial whether the image is inverted or upright ; but in some cases an upright image lightens the

work, or may be indispensable.

The simplest microscope which produces an upright image has a negative lens as eyepiece. As shown in fig. 14, the real image formed by the objective must fall on the object-side focal plane of the eye-piece F 2 , where a normal eye without accommodation can observe it. But as the object-side focus F 2 lies behind the eyepiece, the real image is not produced, but the converging pencils from the objective are changed by the eyepiece in- to parallels ; and the point Oi in the top of the object y appears at the top to the eye, i.e. the image is upright.

The erection of inverted images by prisms, which was applied to the simple telescope by Porro, and to the binocular (g.u.) by A. A. Boulanger was employed by K. Bratuscheck in the Greenough double microscope; these inverting prisms permit a convenient adaptation of the instrument to the interpupillary distance of the observer. Double microscopes, which produce a correct impression of the solidity of the object, must project upright images. The terrestrial eyepiece (see Telescope), which likewise ensures an upright image, but which involves an inconvenient lengthening, has also been employed in the binocular microscope.

Regulation of the Rays. — Weak and medium microscope objectives work like photographic objectives in epi- scopic or diascopic projection; in the microscope, however, the projected image is not intercepted on a screen, but a real image in air is formed. This must lie in the front focal plane of the eyepiece if we retain the supposition that it is to be viewed by a normal eye with passive accommodation. The plane in the object conjugate to the focal plane of the eye-piece is the plane focused for; and all points in it are sharply portrayed (a perfect objective being assumed) . Object points lying out of the focal plane, on the other hand, are projected as circles of confusion on the plane focused for, the centre of the entrance pupil being the centre of pro- jection and the circles of confusion con- stituting, with the points of the focal plane, the object-side imago. As the pencils used in the representations are of wide aperture on the object-side, only such points as are proportionately very near the focal plane can produce such small dispersion circles on the plane focused for, that they, so far as the objective- and eyepiece-magnification permit, appear as points to the eye. It follows that the depth of definition of the microscope is in general very trifling. As it is entirely a

Fig. 14. — Ray trans- mission in compound microscope with a negative eyepiece. Li = weak achromatic ob- jective. L 2 = negative eyepiece. Fi, Fi' = object- and im- age-side foci of objec- tive. F 2 , F 2 ' = object-_ and im- age-side foci of eye- piece. P'Pi' = exit pupil of objective. P Pi' = virtual image of Pi Pi' = exit pupil of complete microscope.

function of the aperture and the magnification, it can be increased by diminishing the entrance pupil, the magnification remaining unchanged. A diminution of the aperture, however, would injure a very much more important property, viz. the resolving power (see below). With powerful systems, object-points lying quite near the plane focused for would be represented by such large dispersion circles that practically only the points lying in one plane appear simultaneously sharp; and it is only by varying the focus that the object-points lying in other planes can be observed.

The position of the diaphragm limiting the pencils proceeding from the object-points is not constant in the compound microscope. In all microscopes the rays are limited, not in the eyepiece, but in the objective, or before the objective when using a condenser. If the pencils are limited in the objective, the restriction of the pencil proceeding from the object-point is effected by either the front lens itself, by the boundary of a lens lying behind, by a real diaphragm placed between or behind the objective, or by a diaphragm-image.

The centre of the entrance pupil is the point of intersection of the principal rays ; and it is therefore determinative for the perspective representation on the plane focused for. In fig. 15 the centre of the

(After M. v. Rohi.) Fig. 15. — Entocentric transmission through a microscope objective. E = plane focused for; Oi*, 2 * = projections of Oi0 2 on E; Z =

centre of projection; P Pi = a virtual image of real diaphragm

P'Pi' with regard to the preceding part of the objective is the

entrance pupil, entrance pupil lies behind the focal plane, and consequently nearer objects appear larger, and farther objects smaller (" entocentric transmission," see below). If a diaphragm lying in the back focal plane of the objective forms the exit pupil for the objective, as in figs. 13 and 14, so that its image, the entrance pupil, lies at infinity, all the principal rays in the object-space are parallel to the axis, and we have on the object-side " telecentric " transmission. The

size of the imago on the focal plane is always equal to its actual size, and is independent of the distance of the object from the plane focused for. This representation acquires a special importance if the object be micrometrically measured, for an inaccuracy in focusing does not involve an alteration of the size of the image. To ensure the tele- centric transmission, the diaphragm in the back focus of the objective may be replaced by a diaphragm in the front focal plane of the condenser, supposing that uniformly illuminated objects are being dealt with; for in this case all the principal rays in the object-space are transmitted parallel to the axis.

With uniformly illuminated objects it may happen that the pencil in the object-space may be limited before passing the object, either through the size of the source of light employed or through a diaphragm connected with the illuminating system. In fig. 16

(After M. v. Rohr.) Fig. 16. — Hypercentric transmission in a microscope objective. E, Oi*, O* and Z as in fig. 15. PPi is the entrance pupil.

the intersection of the principal rays lies in front of the object, p.nd consequently objects in front of the plane focused for will be projected on E magnified and the objects lying behind it diminished (" hypercentric " transmission). It produces a perspec- tive representation entirely opposed to ordinary vision. As objects lying near us appear smaller in the case of hypercentric trans- mission than those lying farther from us, we receive a false impression of the spatial arrangement of the object.

Whether the entrance pupil be before or behind the object, in general its position is such that it lies not too near the object, so that the principal rays will have in the object space only trifling inclina- tions towards one another or are strictly parallel. This is specially important, for otherwise pencils from points placed somewhat later- ally to theaxis arrive with diminished aperture at the image.

We see from fig. 13 that the objective's exit pupil P'Pi' is portrayed by the positive eyepiece, the image P"Pi" limits the pencils.

proceeding from the eyepiece. This image P"Pi" is then the exit pupil of the combined system, and consequently the image of the entrance pupil of the combined system. As the exit pupil P'Pi' for the objective

lies before the front focus of the eyepiece, generally at some distance and near the objective, the eyepiece projects a real image from it behind its image-side focus, so that if this point is accessible it is the exit pupil P”Pi”. If, e.g. in the object-space the objective has telecentric transmission, the exit pupil must coincide with the back focal plane of the combined system, a»d it always lies behind the image-side focus of the eyepiece. The exit pupil, often called Ramsden’s circle, is thus accessible to the observer, who by head- and eye-movements may survey the whole field.

We can now understand the ray transmission in the compound microscope, shown in fig. 13. Points of a small object (compared with the focus of the objective) send to the objective wide pencils. The diaphragm limiting them, i.e. the entrance pupil, is placed so that the principal rays are either parallel or slightly inclined. The pencils producing the real image are very much more acute, and their inclination is the smaller the stronger the magnification. The eyepiece, which by means of narrow pencils represents the relatively large real image at infinity, transmits from all points of this real image parallel pencils, whereby the inclination of the principal rays becomes further increased. The point of intersection, i.e. the centre of the exit pupil, is Accessible to the eye of the observer. In the case of the negative eyepiece, on the other hand, the divergence of the principal rays through the eyepiece is also further augmented, but their point of intersection is not accessible to the eye. This property shows the superiority of the collective eyepiece over the dispersive.

The increase of the inclination of the principal rays, which arises with the microscope, influences the perception of the relief of the object. In entocentric transmission this phenomenon appears in general as in the case of the contemplation of perspective represen- tations at a too short distance, the objects appearing flattened. Although in the case of the spatial comprehension of a perspective representation experience plays a large part, in observing through a microscope it does not count, or only a little, for the object is presumably quite unknown. In telecentric and hypercentric transmission we obtain a false conception of the spatial arrangement of the objects or their details; in these cases one focusses by turns on the different details, and so obtains an approximate idea of their spatial arrangement.

While the limiting of the pencil is almost always effected by the objective, the limiting of the field of view is effected by the eyepiece, and indeed it is carried out by a real diaphragm DD arranged in the plane of the real image O’O/ (fig. 13) projected from the objective. The entrance window is then the real image of this diaphragm pro-

jected by the objective in the surface conjugate to the plane focused for, and the exit window is the image projected by the eyepiece; this happens with the image of the object lying at infinity. The result must be that the field of view exhibits a sharp border. In the case of the dispersive eyepiece, on the contrary, no sharply limited field can arise, but vignetting must occur.

Illumination. — The dependence of the clearness of the image on the aperture of the system, i.e. on the angular aperture of the image-producing pencil, holds for all instruments.

The brightnesses of image points in a median section of the pencil are proportional to the aperture of the lens, supposing that the rays are completely reunited. This is valid so long as the pencil is in air; but if, on the other hand, the pencil passes from air through a plane surface into an optically denser medium, e.g. water or glass, the pencil becomes more acute and the aperture smaller. But since no rays are lost in this transmission (apart from the slight loss due to reflection) the brightness of the image point in the water is as large as that in air, although the apertures have become less. Fig. 17 shows a pencil in air, A, dispersing in water, W, from the semi- aperture Mi, or a pencil in water dispersing in air from the semi- aperture %. If the value of the clearness in air be taken as sin «i, then by the law of refraction N = sin Mi/sin w 2 , the value for the clearness in water is N sin u 2 . This rule is general. The value of the

Fig. 17

clearness of an image-point in a median section is the sine of the semi-aperture of the pencil multiplied with the refractive index of the medium.

An illustration of this principle is the immersion experiment. A view taken under water from the point O (fig. 18) sees not only the whole horizon, but also a part of the bed of the sea. The whole field of view in air of 180° is compressed to one of 97-5° in water. The rays from O which have a greater inclination to the vertical

than 48-75° cannot come out into the air, but are totally reflected. If pencils proceed from media of high optical density to media of low density, and have a semi-aperture greater than the critical angle, total reflection occurs; in such cases no plane surface can be employed, hence front lenses have small radii of curvature in order to permit the wide pencils to reach the air (see fig. 19, in which P is the preparation, O the object-point in it, D the cover slip, I the immersing

fluid, and L the front lens).

The function n sin u = A, for the microscope, has been called by Abbe the numerical aperture. In dry-systems only the sine of the semi-aperture is concerned; in immersion-systems it is the product of the refractive index of the immersion-liquid and the sine of the object-side semi-aperture. In the case of the brightness of large objects obviously the whole pencil is involved, and hence the clear- ness is the squares of these values, i.e. sin 2 u or m 2 sin 2 u. As the semi- aperture of a pencil proceeding from an object point cannot exceed 90°, the numerical aperture of a dry-system cannot be greater than 1. On the other hand, in immersion-systems the numerical aperture can almost amount to the refractive index, for A = n sin u

Dry systems of 0-98 numerical aperture, water immersion (» = 1-33) from A=l-25, oil immersion (b = i-5i) from A = l-40, and even o-bromnaphthalene immersions (re = 1-65) from A=i-6o, are available. In immersion-systems of such considerable aperture no medium of smaller refractive index than the immersion liquid may be placed between the surface of the front lens and the object, as otherwise total reflection would occur. This is especially in- convenient in the case of the o-bromnaphthalene immersion.- As the embedding and immersing liquids must have equal refractive indexes, one must use o-bromnaphthalene for embedding; but this substance destroys organic preparations, so that one can employ this immersion-system only for examining inorganic materials, e.g. fine diatoms.

In immersion-systems a very much greater aggregate of rays is used in the representation than is possible in dry-systems. In addition to a considerable increase in brightness the losses due to reflection are avoided; losses which arise in passing to the back surface of the cover-slip and to the front surface of the front lens.

The Physical Theory

In order to fully understand the representation in the micro- scope, the process must be investigated according to the wave- theory, especially in considering the representation of objects or object details having nearly the size of a wave-length. The rectilinear rays, which we have considered above, but which have no real existence, are nothing but the paths in which the light waves are transmitted. According to Huygens's principle (see Diffraction) each aether particle, set vibrating by an incident wave, can itself act as a new centre of excitement, emitting a spherical wave; and similarly each particle on this wave itself produces wave systems. All systems which are emitted from a

single source can by a suitable optical device be directed that they simultaneously influence one and the same aether particle. According to the phase of the vibrations at this common point, the waves mutually strengthen or weaken their action, and there arises greater clearness or obscurity. This phenomenon is called interference (q.v.). E. Abbe applied the Fraunhofer diffraction phenomena to the explanation of the representation in the microscope of uniformly illuminated objects.

If a grating is placed as object before the microscope objective, Abbe showed that in the image there is intermittent clear and dark banding only, if at least two consecutive diffraction spectra enter into the objective and contribute towards the image. If the illumi- nating pencil is parallel to the axis of the microscope objective, the illumination is said to be direct. If in this case the aperture of the objective be so small, or the diffraction spectra lie so far from each other, that only the pencil parallel to the axis, i.e. the spectrum of zero order, can be admitted, no trace is generally found of the image of the grating. If, in addition to the principal maximum, the maximum of 1st order is admitted, the banding is distinctly seen, although the image does not yet accurately resemble the object. The resemblance is greater the more diffraction spectra enter the objective. From the Fraunhofer formula S =X/» sin « one can immediately deduce the limit to the diffraction constant 5, so that the banding by an objective of fixed numerical aperture can be perceived. The value n sin u equals the numerical aperture A, where n is the refractive index of the immersion-liquid, and u is the semi-aperture on the object-side. For microscopy the Fraunhofer formula is best written 5=X/A. This expresses 5 as the resolving power in the case of direct lighting. All details of the object so resolved are perceived, if two diffraction maxima can be passed through the objective, so that the character of the object is seen in the image, even if an exact resemblance has not yet been attained.

The Fraunhofer diffraction phenomena, which take place in the

back focal plane of the objective, can be conveniently seen with the naked eye by removing the eyepiece and looking into the tube, or better by focusing a weak auxiliary microscope on the back focal plane of the objective. If one has, e.g. in the case of a grating, telecentric transmission on the object-side, and in the front focal plane

of the illuminating system a small circular aperture is arranged, then by the help of the auxiliary microscope one sees in the middle of the back focal plane the round white image O (fig. 20) and to the right and left the diffraction spectra, the images of different colours partially overlapping. If a resolvable grating is considered, the diffraction phenomenon has the appearance shown in fig. 21.

It is possible to almost double the resolving power, as in the case

Fig. 24. Fig. 25. Fig. 26. Fig. 27.

(From Abbe, Theorie der Bilderzeugung im Mikroskop.)

of direct lighting, so that a banding of double the fineness can be perceived, by inclining the illuminating pencil to the axis; this is controlled by moving the diaphragm laterally. If the obliquity of illumination be so great that the principal maximum passes through the outermost edge of the objective, while a spectrum of 1st order passes the opposite edge, so that in the back focal plane the diffraction phenomenon shown in fig. 22 arises, banding is still to be seen. The resolution in the case of oblique illumination is given by the formula S = X/2A.

Reverting to fig. 13, we suppose that a diffracting particle of such fineness is placed at O that the diffracted pencils of the 1st order make an angle w with the axis; the principal maximum of the Fraunhofer diffraction phenomena lies in F'i ; and the two diffraction maxima of the 1st order in P' and P'i. The waves proceeding from this point are united in the point O'. Suppose that a well corrected objective is employed. The image O' of the point O is then the interference effect of all waves proceeding from the exit pupil of the objective PiP/.

Abbe showed that for the production of an image the diffraction maxima must lie within the exit pupil of the objective. In the silvering of a glass plate lines are ruled as shown in fig. 23, one set traversing the field while the intermediate set extends only half-way across. If this object be viewed by the objective, so that at least the diffraction spectra of 1st order pass the finer divisions, then the corresponding diffraction phenomenon in the back focal plane of the objective has the appearance shown in fig. 21, while the diffrac- tion figure corresponding to the coarser ruling appears as given in fig. 20. If one cuts out by a diaphragm in the back focal plane of the objective all diffraction spectra except the principal maximum, one sees in the image a field divided into two halves, which show with different clearness, but no banding. By choosing a somewhat broader

diaphragm, so that the spectra of 1st order can pass the larger division, there arises in the one half of the field of view the image of the larger division, the other half being clear without any such structure. By using a yet wider diaphragm which admits the spectra of 2nd order of the larger division and also the. spectra of 1st order of the fine division, an image is obtained which is similar to the object, i.e. it shows bands one half a division double as fine as on the other. If now the spectrum of 1st order of the larger division be cut out from the diffraction figure, as is shown in fig. 24, an image is obtained which over the whole field shows a similar division (fig. 25), although in the one half of the object the represented banding does not occur. Still more strikingly is this phenomenon shown by Abbe's diffraction plate (fig. 26). This is a so-called cross grating formed by two perpendicular gratings. Through a suitable diaphragm in the back focal plane, banding can easily be produced in the image, which contains neither the vertical nor the horizontal lines of the two gratings, but there exist streaks, whose direction halves the angle under which the two gratings intersect (fig. 27). There can thus be shown structures which are not present in the object. Colonel Dr Woodward of the United States army showed that interference effects appear to produce details in the image which do not exist in the object. For example, two to five rows of globules, were produced, and photographed, between the bristles of mosquito wings by using oblique illumination. In observing with strong systems it is therefore necessary cautiously to distinguish

between spectral and real marks. To determine the utility of an objective for resolving fine details, one experiments with definite objects, which are usually employed simultaneously for examining its other properties. Most important are the fine structures of diatoms such as Surirella gemma and Amphipleura pellucida or artificial fine divisions as in a Nobert's grating. The examination of the objectives can only be attempted when the different faults of the objective are known.

If microscopic preparations are observed by diffused daylight or by the more or less white light of the usual artificial sources, then an objective of fixed numerical aperture will only represent details of a definite fineness. All smaller details are not portrayed. The Fraunhofer formula permits the determination of the most useful magnification of such an objective in order to utilize its full resolving power.

As we saw above, the apparent size of a detail of an object must be greater than the angular range of vision, i.e. 1'. Therefore we can assume that a detail which appears under an angle of 2′ can be surely

perceived. Supposing, however, there is oblique illumina- tion, then formula (5) can always be applied to determine the magnifying power attainable with at least one objective. By substituting y, the size of the object, for d, the smallest value which a single object can have in order to be analysed, and the angle w' by 2', we obtain the magnifying power and the magnification number :

V 2 = tan w'ld = 2A tan 2'/X; N 2 = 2AZ tan 2'/X; where I equals the sight range of 10 in.

Even if the details can be recognized with an apparent magnifica- tion of 2', the observation may still be inconvenient. This may be improved when the magnification is so increased that the angle under which the object, when still just recognizable, is raised to 4'. The magnification and magnifying number which are most necessary for a microscope with an objective of a given aperture can then be calculated from, the formulae:

V 4 = 2A tan 4'/X; N 4 = 2Ai tan 4'/X. If 0-55 m is assumed for daylight observation, then according to Abbe {Joum. Roy. Soc, 1882, p. 463) we have the following table for the limits of the magnification numbers, for various microscope objectives, m = o-ooi mm.: —

A = » sin u. din p. N2. N 4 .

o-io 2-75 53 106

0-30 0-92 159 317

o-6o 0-46 317 635

0-90 0-31 476 952

1-20 0-23 635 1270

1-40 0-19 741 1481

i-6o 0-17 847 1693

From this it can be seen that, as a rule, quite slight magnifications suffice to bring all representable details into observation. If the magnification is below the given numbers, the details can either not be seen at all, or only very indistinctly ; if, on the contrary, the given magnification is increased, there will still be no more details visible. The table shows at the same time the great superiority of the immersion-system over the dry-system with reference to the resolving

power. With the best immersion-system, having a numerical aperture of 1-6, details of the size 0-17 m can be resolved, while the theoretical maximum of the resolving power is 0-167 M, so that the theoretical maximum has almost been reached in practice. Still smaller particles cannot be portrayed by using ordinary day- light.

In order to increase the resolving power, A. Kohler (Zeit. f. Mikros., 1904, 21, pp. 129, 273) suggested employing ultra-violet light, of a wave-length 275 mm; he thus increased the resolving power to about double that which is reached with day-light, of which the mean wave-length is 550 mm. Light of such short wave-length is, however, not visible, and therefore a photo- graphic plate must be employed. Since glass does not transmit the ultra-violet light, quartz is used, but such lenses can only be spherically corrected and not chromatically. For this reason the objectives have been called monochromats, as they have only been corrected for light of one wave-length. Further, the different transparencies of the cells for the ultra-violet rays render it unneces- sary to dye the preparations. Glycerin is chiefly used as immer- sion fluid. M. v. Rohr's monochromats are constructed with apertures up to 1-25. The smallest resolving detail with oblique lighting is S = X/2A, where X = 275 nix. As the microscopist usually estimates the resolving power according to the aperture with ordinary day-light, Kohler introduced the " relative resolving power " for ultra-violet light. The power of the microscope is thus repre- sented by presupposing day-light with a wave-length of 550 fin. Then the denominator of the fraction, the numerical aperture, must be correspondingly increased, in order to ascertain the real resolving power. In this way a monochromat for glycerin of a numerical aperture 1-25 gives a relative numerical aperture of 2-50.

If the magnification be greater than the resolving power demands, the observation is not only needlessly made more difficult, but the entrance pupil is diminished, and with it a very considerable decrease of clearness, for with an objective of a certain aperture the size of the exit pupil depends upon the magnification. The diameter of

the exit pupil of the microscope is about 0-04 in. with the magnifica- tion Nj, and about 0-02 in. with the magnification N4. Moreover, with such exceptionally narrow pencils shadows are formed on the retina of the observer's eye, from the irregularities in the eye itself. These disturbances are called " entoptical phenomena." From the section

Regulation of the Rays (above) it is seen that the resolving power is opposed to the depth of definition, which is measured by the reciprocal of the numerical aperture, I /A.

Dark-field Illumination. — It is sometimes desirable to make minutest objects in a preparation specially visible. This can be done by cutting off the chief maximum and using only the diffracted spectra for producing the image.

At least two successive diffraction maxima must be admitted through the objective for there to be any image of the objects. With this device these particles appear bright against a dark back- ground, and can be easily seen. The cutting off of the chief maximum can be effected by a suitable diaphragm in the back focal plane of the objective. But, owing to the various partial reflections which the illuminating cone of rays undergoes when traversing the surfaces of the lenses, a portion of the light comes again into the preparation, and into the eye of the observer, thus veiling the image. This defect can be avoided (after Abbe) if a small central portion of the back surface of the front lens be ground away and blackened; this portion should exactly catch the direct cone of rays, whilst the edges of the lens let the deflected cone of rays pass through (fig. 28),

(By permission of C. Zeiss.)

Fig. 28.

The large loss of light, which is caused in dark-field illumination by the cutting off of the direct cone of rays, must be compensated by employing exceptionally strong sources. By dark-field illumina- tion it is even possible to make such small details of objects per- ceptible as are below the limits of the resolving power. It is a similar phenomenon to that which arises when a ray of sunlight falls into a darkened room. The extremely small particles of dust (motes in a sunbeam) in the rays are made perceptible by_ the_ dif- fracted light, whilst by ordinary illumination they are invisible. The same observation can be made with the cone of rays of a reflector, and in the same way the fine rain-drops upon a dark back- ground and the fixed stars in the sky become visible. It is not possible to recognize the exact form of the minute objects because their' apparent size is much too small; only their presence is observ- able. In addition, the particles can only be recognized as separate objects if their apparent distance from one another is greater than the angular definition of sight.

Ultramicroscopy. — This method of illumination has been used by H.

Siedentopf in his ultramicroscope. The image consists of a diffraction disk from whose form and size certain conclusions may be drawn as to the size and form of the object. It is impossible to get a representation as from an object. “Very finely divided sub-microscopic particles in liquids or in transparent solids can be examined; and the method has proved exceptionally valuable in the investigation of colloidal solutions.

Siedentopf employed two illuminating arrangements. With the orthogonal arrangement for illuminating and observing the beam

of light traverses an extremely fine slit through a well-corrected system, whose optic axis is perpendicular to the axis of the micro- scope; the system reduces the dimensions of the beam to about 2 to 4 /i in the focal plane of the objective. For the microscopic observation it is the same as if a thin section of a thickness of 2 to 4 p had been shown. In this optical way it is possible to show thin sections even in liquid preparations. The inconvenience of ortho- gonal illumination, which certainly gives better results, is avoided in the coaxial apparatus. Care must here be taken, by using suitable dark-field screens, that no direct rays enter the observing system. The only sources of light are sunlight or the electric arc. The limit at which sub-microscopic particles are made visible is dependent upon the specific intensity of the source of light. With sunlight particles can be made visible to a size of about 0-004 It- Production of the Image. — As shown in Lens and Aberration, for reproduction through a single lens with spherical surfaces, a com- bination of the rays is only possible for an extremely small angular aperture. The aberrations, both spherical and chromatic, increase very rapidly with the aperture. If it were not possible to recombine in one image-point the rays leaving the objective and derived from one object-point, i.e. to eliminate the spherical and chromatic aber- rations, the large angular aperture of the objective, which is necessary for its resolving power, would be valueless. Owing to these aberrations, the fine structure, which in consequence of the large aperture could be resolved, could not be perceived. In other words, a sufficiently good and distinct image as the resolving power permits cannot be arrived at, until the elimination, or a sufficient diminution, of the spherical and chromatic aberrations has been brought about. The objective and eyepiece have such different functions that as a rule it is not possible to correct the aberrations of one system by those of the other. Such a compensation is only possible for one single defect, as we shall see later. The demands made upon the eyepiece, which has to represent a relatively large field by narrow cones of rays, are not very considerable. It is therefore not very difficult to produce a usable eyepiece. On the other

hand, the correction of the objective presents many difficulties.

We will now examine the conditions which must be fulfilled by an objective, and then how far these conditions have been realized. Consider the aberrations which may arise from the representation by a system of wide aperture with monochromatic light, i.e. the spherical aberrations. The rays emitted from an axial object-point are not combined into one image-point by an ordinary biconvex lens of fixed aperture, but the central rays come to a more distant focus than the outer rays. The so-called ” caustic ” occupies a definite position in the image-space. The spherical aberrations, however, can be overcome, or at least so diminished that they are quite harmless, by forming appropriate combinations of lenses.

The aberration of rays in which the outer rays intersect the axis at a shorter distance than the central rays is known as ” under-correction.” The reverse is known as ” over-correction.” By selecting the radii of the surfaces and the kind of glass the under- or over-correction can be regulated. Thus it is possible to correct a system by combining a convex and a concave lens, if both have aberrations of the same amount but of opposite signs. In this case the power of the crown lens must preponderate so that the result- ing lens is of the same sign, but of a little less power. Correction of the spherical aberration in strong systems with very large aperture can not be brought about by means of a single combination of two lenses, but several partial systems are necessary. Further, under- corrected systems must be combined with over-corrected ones. Another way of correcting this system is to alter the distances. If, by these methods, a point in the optic axis has been freed from aberration, it does not follow that a point situated only a very small distance from the optic axis can also be represented without spherical aberration. The representation, free from aberration, of a small surface-element, is only possible, as Abbe has shown, if the objective simultaneously fulfils the ” sine-condition,” i.e. if the ratio of the sine of the aperture u on the object-side to the sine of the corresponding aperture u’ on the image-side is constant, i.e. if n sin w/sin u’ = C, in which C is a constant. The sine-condition is in contrast to the tangent-condition, which must be regarded as the point-by-point representation of the whole object-space in the image-space (see Lens), and according therefore the equation n tan w/tan u’ = C must exist. These two conditions are only com- patible when the representation is made with quite narrow pencils, and where the apertures are so small that the sines and tangents are of about the same value.

Very large apertures occur in strong microscope objectives, and hence

the two conditions are not compatible. The sine-condition is, however, the most important as far as the microscopic representa- tion is concerned, because it must be possible to represent a surface- element through the objective by wide cones of rays. The removal of the spherical aberration and the sine-condition can be accomplished only for two conjugate points. A well-corrected microscope objective with a wide aperture therefore can only represent, free from aberra- tions, one object-element situated on a definite spot on the axis. As soon as the object is moved a short distance away from this spot the representation is quite useless. Hence the importance of observing the length of the tube in strong systems. If the sine-condition is not fulfilled but the spherical aberrations in the

axis have been removed, then the image shown in fig. 19 results. The cones of rays issuing from a point situated only a little to the

Fig. 30. — O' is the virtual image of O formed at a spherical sur- face of centre C and radius CS.

Fig. 29. — The lens is spherically corrected for 00', but the sine-condition is not fulfilled. Hence the different magnifications of a point Oi beyond the axis, side, which traverse different zones of the objective, have a different magnification. The sine-condition can therefore also be understood as follows: that all objective zones must have the same magnification for the plane-element.

According to Abbe, a system can only be regarded as aplanatic if it is spherically corrected for not only one axial point, but when it also fulfils the si.ne-condition and thus magnifies equally in atl zones a surface-element situated vertically on the axis at this point.

A second method of correcting the spherical aberration depends on the notion of aplanatic points. If there are two transparent substances separated from one another by a spherical surface, then there are two points on the axis where they can be reproduced free from error by monochromatic light, and these are called " aplanatic points." The first is the centre of the sphere. All rays issuing from this point pass unref racted through the dividing surface ; its image-point coincides with it. Besides this there is a second point on the axis, from which all issuing rays are so refracted at the surface of the sphere that, after the refraction, they appear to originate from one point — the image-point

(see fig. 30). With this, the object- point O, and consequently the image-point O' also, will be at a quite definite distance from the centre. If however the object-point does not lie in the medium with the index n, but before it, and the medium is, for example, like a front lens, still limited by a plane surface, just in front of which is the object-point, then in traversing the plane surface spherical aberrations of the under-corrected type again arise, and must be removed. By homogeneous immersion the object-point can readily be reduced to an aplanatic point. By experiment Abbe proved that old, good microscope objectives, which by mere testing had become so corrected that they produced usable images, were not only free from spherical aberrations, but also fulfilled the sine-condition, and were therefore really aplanatic systems.

The second aberration which must be removed from microscope objectives are the chromatic. To diminish these a collective lens of crown-glass is combined with a dispersing lens of flint; in such a system the red and the blue rays intersect at a point (see Aberra- tion). In systems employed for visual observation (to which class the microscope belongs) the red and blue rays, which include the physiologically most active part of the spectrum, are combined; but rays other than the two selected are not united in one point. The transverse sections of these cones of rays diverge more or less from the transverse section of the chosen blue and red cones, and produce a secondary spectrum in the image, and the images still appear to have a slightly coloured edge, mostly greenish-yellow or purple; in other words, a chromatic difference of the spherical aberrations arises (see fig. 31). This refers to systems with small apertures, but still more so to systems with large ones; chromatic aberrations are exceptionally increased by large apertures.

The new glasses produced at Schott's glass works, Jena, possessed in part optical qualities which differed considerably from those of the older kinds of glass. In the old crown and flint glass a high

Fig. 31. — Showing a system with chromatic difference of spherical aberration. 0″ = image of O for red light; O''' for blue. The system is under-corrected for red, and over-corrected for blue rays.

refractive index was always connected with a strong dispersion and the reverse. Schott succeeded, however, in producing glasses which with a comparatively low refraction have a high dispersion,

and with a high refraction a low dispersion. By using these glasses and employing minerals with special optical properties, it is possible to

correct objectives so that three colours can be combined, leaving only a quite slight tertiary spectrum, and removing the spherical aberration for two colours. Abbe called such systems ” apochro- mats.” Good apochromats often have as many as twelve lenses, whilst systems of simpler construction are only achromatic, and are therefore called ” achromats.”

Even in apochromats it is not possible to entirely remove the chromatic difference of magnification, i.e. the images produced by the red rays are somewhat smaller than the images produced by the blue. A white object is represented with blue streaks and a black one with red streaks. This aberration can, however, be successfully controlled by a suitable eyepiece (see below).

A further aberration which can only be overcome with difficulty, and even then only partially, is the “curvature of the field, ” i.e. the points situated in the middle and at the edge of the plane object can not be seen clearly at the same focusing.

Historical Development. — The first real improvement in the microscope objective dates from 1830 when V. and C. Chevalier, at first after the designs of Selligue, produced objectives, con- sisting of several achromatic systems arranged one above the other. The systems could be used separately or in any com- bination. A second method for diminishing the spherical aberration was to alter the distances of the single systems, a method still used. Selligue had no particular comprehension of the problem, for his achromatic single systems were simply telescope objectives corrected for an infinitely distant point, and were placed so that the same, surface was turned towards the object in the microscope objective as in the telescope objective; although contrary to the telescope, the distance of the object in the microscope objective is small in proportion to the distance of the image. It would have been more correct to have employed these objectives in a reverse position.

These circumstances were considered by Chevalier and Lister. Lister showed that a combination of lenses can be achromatic for only two points on the axis, and therefore that the single systems must be so arranged that the aplanatic (virtual) image-point O’ (fig- 3 2) of the first system coincides with the object-point of the next system. This system will always be aplanatic. These ob- jectives permitted a much larger aperture than a simple achromatic system. Although such systems have been made recently for special purposes, this construction was abandoned, and a more complex one adopted, which also made the production of better objectives possible; this is the

principle of the compensation of the aberrations produced in the different parts of the objective. Even Lister, who proceeded on quite different lines, hinted at the possibility of such a compensation. This method makes it specially possible to overcome the chromatic and spherical aberrations of higher orders and to fulfil the sine-condition, and the chief merit of this improvement belongs to Amici. He had recognized that the good operation of a microscope objective depended essentially upon the size of the aperture, and he therefore endeavoured to produce systems with wide aperture and good correction. He used chiefly a highly curved plano-convex front lens, which has since always been employed in strong systems. Even if the object-point on the axis cannot be reproduced quite free from aberration through such a lens, because aberrations of the type of an under-correction have been produced by the first plane outer limiting surface, yet the defects with the strong refraction are relatively small and can be well compensated by other systems. Amici chiefly employed cemented pairs of lenses consisting of a plano-convex flint lens and a biconvex crown lens(fig. 33), and constructed objectives with an aper- ture of 135°. He also showed the influence of the cover-slip on pencils of such wide aperture. The lower surface of the slip causes under- correction on being traversed by the pencil, with over-correction when it leaves it; and since the aberration of the surface lying farthest from the object, i.e. those caused by the upper surface preponderate, an over-corrected cone of rays enters the objective. The over-correction increases when the glass is thickened. In order to counteract this aberration the whole objective must be correspondingly under-corrected. Objectives with definite under-correction can however only produce really good images with glass covers of a specified thickness. With apertures of 0-90-0-95 differences of even O-0O4-0-O08 in. in the glass covers can be noticed by the deterioration of the image. In systems with smaller apertures variations of the thickness of the glass cover are not so

Fig. 32.

Fig. 33.

noticeable. For this reason Amici constructed objectives of a similar aperture and focus for different thicknesses of glass covers.

This expensive method was simplified in 1837 by Andrew Ross by

making the upper and lower portion of the objective variable by means of a so-called correction-collar, and so giving the objective a corresponding under-correction according to the thickness of the glass cover. The alteration of the focus and the aperture are little influenced. The correction-collar was improved by Wenham and Zeiss, by working the upper system upon the lower, and not the reverse; for in this way the preparation remains almost exactly focused during the operation (see fig. 34).

The injurious influence of the glass cover is substantially lessened if no air is admitted to the space between the glass cover and the

Fig. 35. — Achro- matic objective for homogeneous immer- sion.

Fig. 36 — Apochromatic system.

Fig. 34. — Objec- tive fitted with cor- rect io n collar (Zeiss).

front lens (as in the dry-system) but if the intervening space is filled with an immersion-liquid. Amici was likewise the first to produce practical and good immersion-systems. The slight difference of the refractive indexes of the glass cover and the immersion-liquid involves a diminution of the aberrations, by which the objective will become less sensitive to the differences in thickness of the glass covers and admits of a more perfect adjustment. Water-immersion was introduced by Amici in 1840, and was improved by E. Hartnack in 1855.

The advantages of the immersion over the dry-systems are greatest when the embedding-liquid, the glass cover, the immersion-liquid and the front lens have the same refractive index. Such systems with a so-called homogeneous immersion were first constructed after the plan of E. Abbe in 1878 in-the Zeiss workshops at the instigation of J. W. Stephenson. Cedarwood oil (Canada balsam), which has a refractive index of 1-515, is the immersion-liquid. The structure of a modern system of this type, with a numerical aperture of 1-30, is shown in fig. 35. . ■

The most perfect microscope objective was invented by E. Abbe in 1886 in the so-called apochromatic objective. In this, the secondary spectrum is so much lessened that for all practical purposes it is unnoticeable. In the apochromats the chromatic difference of the spherical aberrations is eliminated, for the spherical aberration is completely avoided for three colours. Since in these systems the sine-condition can be fulfilled for several colours, the quality of the images of points beyond the axis is better. There still remains a slight

chromatic difference in magnification, for although the magnification consequent upon the fulfilmentof the sine-condition is the same for all zones for one colour, it is impossible to avoid a change of the magnification with the colour. Abbe overcame this defect by using the so-called compensation ocular, made with Jena glasses. Fig. 36 shows an apochromat of a numerical aperture of

1-40.

The Eyepiece or Ocular

The eyepiece is considerably simpler in its construction than the objective.

Its purpose in a microscope is by means of narrow cones of rays to represent at infinity the real magnified image which the objective produces. As, however, the object represents a real image, the problem is to project a transparent diapositive. It is therefore impossible to observe this image through an ordinary lens. Since many of the rays coming from the exit-pupil of the objective would not reach the eye of the observer at all, it is necessary, in order to make use of all of them, to direct the diverging rays forming the real image so that the whole of the light enters the eye of the observer. This is effected by a collective lens ; it may be compared with the second part of the condenser system of a projecting lantern.

The two most customary eyepieces consist in two simple plano-convex lenses, whose distance one from the other is equal to half the sum of the two focal lengths. One of these is the Ramsden eyepiece (fig- 37)- If the real image produced by the objective coincides with the collective lens, only the inclination of the principal rays is altered, the form of the cone being affected only to a very small extent. The lens nearer the eye, which has about the same focal length as the collective lens, is distant from it by about its focal

length. The eye-lens converts diverging pencils into parallels. Both lenses together form the exit-pupil of the objective behind the eye-, lens, so that this image, the exit-pupil of the total system or the Ramsden circle, is accessible to the eye of the observer. It is possible to see the whole field through this pupil by slightly moving the head and eye. In practice the real image is formed not directly

Fig. 37. — Ramsden Eyepiece. L.2 = collective-, L 3 = eye-lens. DD = diaphragm of the field of view. P”P” = Ramsden’s circle, or exit-pupil of whole microscope.

on the collective lens but a little in front of it, because otherwise ull the particles of dust on the collective would also be seen magnified. In the other type, the Huygenian eyepiece (fig. 38), which is much more widely used, the collective lens is in front of the real image ; it alters the direction of the principal rays and somewhat diminishes the real image. In this type the eye-lens is about twice as powerful as the collective lens, and makes the rays parallel. Here also the exit-pupil is accessible to the eye and through it the whole field can be seen by moving the head and eye. In both eyepieces micro- meters or cross-wires are used for measuring in the plane of the real

U

DD

P”P” =

Fig. 38. — Huygenian Eyepiece, collective-, Ls = eye-lens. diaphragm of the field of view. Ramsden’s circle, or exit-pupil of whole microscope.

image. The Ramsden eyepiece is the most convenient for this because this plane lies in front of the collective lens, and the objec- tive image has not yet been influenced by the eyepiece. As both eyepieces are used with very small apertures (about/: 20) no attempt has been made to overcome the spherical aberrations, which are usually very slight; neither, as a rule, are the eyepieces chro- matically corrected, care has only to be taken by a suitable choice of the distance of one lens from the other, that the coloured images derived from a colourless object should have the same apparent size. Since, however, the difference of chromatic magni- fication cannot be overcome in powerful objectives, this error is still further increased by the eyepiece. The difference of chromatic magnification cannot even be over- come in apochromats, and to cancel this aberration Abbe devised the compensating ocular (fig. 39).

The weak compensation oculars resemble a Huygenian eyepiece with achromatic eye-lens, whilst the more powerful ones are of a different construction. These eye- pieces are intentionally provided with a different chromatic magnifi- cation, which however is in oppo- sition to that originating in the objective. They have also a shorter Fig. 39.— Compensating Eye- focus for red, and a longer one for pieces (Zeiss), blue, and thus magnify the red image more than the blue; and as the objective gives a large blue and a small red image, the two cancel one another and a colourless image is produced.

These eyepieces are very convenient in use, for when they are changed the lower focus always falls in about the same plane. In German and French microscopes the optical length of the tube, when apochromats and compensation-eyepieces are used, is 180 mm. By multiplying the magnification of the objective by the number

on the eyepiece the total magnification of the microscope is obtained. By the magnification of the objective is meant the ratio of the distance of distinct vision to the focal length of the objective. As powerful achromatic objectives show differences of chromatic magnification in the same way as apochromats, compensation eyepieces can be used in combination with these objectives.

Illuminating Systems

Most microscopic observations are made with transmitted light; an illuminating arrangement is therefore necessary, and as the plane of the object is nearly always horizontal or only slightly inclined, the illuminating rays must be directed along the optical axis of the microscope.

To fully utilize the aperture of the system all dispersing rays in the object-space of the objective must be retained in the image- space of the illuminating system. When this occurs the greatest brightness will be obtained if the corresponding diaphragms of the two systems coincide; i.e. the field-diaphragm on the image-side of the observing system with object-side of the illuminating system, and the exit pupil of the illuminating system with the entrance-pupil of the objective.

For slight magnifications a revolving plane mirror fixed below the object for altering the direction of the rays suffices. For this mirror to illuminate all the points of the objective so that the rays fill up the objective, it must not be too small, and should be as near as possible to the stage plate, and the source of light must be con- siderably extended (fig. 40). Diffused daylight is very suitable. If the aperture of the objective is increased, the diameter of the illuminating sur- face must also be increased so that the system is quite filled up, from which it follows that this method of illuminating soon fails. The possi- bilities of illuminating with a concave mirror seem a little more favourable. As a rule a concave mirror of similar aperture is fitted on the other side of the plane mirror. With the con- cave mirror an image

of the source of light can be thrown upon the object. The distance of the concave mirror from the stage plate is about equal to its focal length. This is also the most suitable distance when diffused daylight is used, but it is too short with artificial light; the distance between the stage plate and the mirror should then be increased, so that an image of the source of light can be thrown upon the object. It is simpler to place an illuminating lens in front of the source of light so that the source falls approximately at the front focus of this lens and at infinity through the illuminating

Fig. 40. — Mirror Illumina- tion.

Mi = plane-, Mi — curved- mirror.

= object ; £1 = front lens of microscope;

PP = diaphragm.

consequently is represented

lens. By a correct choice of the focal length of the illuminating lens in relation to the focal length of the mirror, it is possible to choose the size of the image of the source of light so that the whole object-field is uniformly lighted.

Too much light is useless for observing delicately coloured or colourless preparations, whose parts only become visible as a result of slight differences of diffraction. Then it is necessary to use powerfully concentrated cones of light. The apparatus must be such that the apertures of the illuminating rays can easily be altered, e.g. by inserting diaphragms in the course of the rays of the illuminat- ing cone below the stage plate (fig. 40, PP). This concentration is most easily produced by sliding or revolving diaphragms. A series of holes of different sizes perforate a revolving disk below the stage plate at an equal radial distance from the axis of the disk, so that the holes can be brought under the preparation in turn, the centre of the diaphragms always being a continuation of the optical axis of the microscope.

The so-called cylinder diaphragms (fig. 41) are used especially in German microscopes. A changeable diaphragm is placed at the upper end of a short tube which can be moved in a case below the stage in the direction of the optical axis. ggga By bringing the diaphragm

F IG . 4I .-C y linderDiaphra g m (Zeiss). ^**$ ***?&

creased ; if the diaphragm is removed farther from the object the cone

of rays is diminished (cf. fig. 40). These diaphragms are

sometimes fitted in a slide, so that it is possible to move the diaphragm sideways and give oblique illumination (see below).

With very powerful objectives these methods are insufficient; and a condenser is fitted below the stage plate. As a rule an iris diaphragm, which can be moved sideways, is now fitted below this condenser; below is the mirror which can be moved in all directions. The Abbe apparatus consists of a condenser, movable iris diaphragm, and mirror (fig. 42). The whole apparatus can be focused by a rack

FlG. 42. — Abbe Illuminating Apparatus with Ordinary Condenser (Zeiss).

and the button s. The iris diaphragm can be regulated by the lever p ; it can also be turned to one side round the pivot z, so that the condenser k can be removed or changed. The correct direction can be given to the illuminating cone by the mirror m. It is often desirable to pass from direct to oblique lighting. The Abbe apparatus makes this easy. The iris diaphragm i is pushed to the side by the rack and pinion / ». The chief cone of rays then enters obliquely into the objective, the angle between the direct cone of rays and the diffraction spectrum of the first order can then become as large again as with direct lighting, and still be taken up in the objective. Oblique lighting, however, can only be in an azimuth, so that the object must be turned in order that the details may be observed. Hence a condenser, for lighting with very oblique cones, must have about the same aperture as the objective, and therefore be of very wide aperture; they therefore closely resemble microscope objectives in construction. Especially powerful achromatic con- densers are really only magnified microscope objectives, with the difference that they are not corrected for the thickness of the cover slip, but for the thickness of the glass on which the object is placed. For exceptionally accurate work microscope objectives are sometimes used as condenser systems. When using immersion objectives, an immersion condenser must also be used if rays of extreme obliquity are wanted, for, in consequence of the total reflections, rays can only come from the upper plane surface of the condenser, which have not a larger inclination to the axis than about 41 °, varying according to the refractive index of the glass. In order to let highly inclined rays pass out from the condenser, some immersion liquid must be placed between the upper surface of the condenser and the object slide. Condensers are for this reason also constructed with apertures up to 1-40.

Vertical Illuminators. — Opaque objects can only be seen by reflected light. With low magnifying systems and a large free object distance, ordinary good daylight is sufficient. If the objects have a low reflecting power, or if a slightly higher magnification is needed, the lighting can be improved by optical system.

To examine small opaque objects with a high magnification the Lieberktihn mirror, so named after its inventor, was formerly much used. This was a concave mirror, pierced in the middle, fixed to the objective, and directed towards the object and with such a

Fig. 43. — Vertical Illuminator (Zeiss).

focal length that rays parallel to the axis falling upon it were united exactly upon the object. In this case the object lay upon a stage plate, whose centre had so far been made opaque, so that the rays coming from the illuminating plane mirror could not reach the objec- tive direct, but only the rays passing the stage plate to the side of this blackened portion reached the Lieberkiihn mirror, and were used in lighting. The disadvantage of this method was that only small opaque objects could be examined. Much more easily manipulated is the parabolic side-illuminator invented by R. Beck, which can be conveniently fitted in and used for objectives with different focal lengths. It consists in half of a short focused parabolic mirror, which concentrates all the light coming from the one side on to the object. To examine objects with objectives of high power and low free object distance, the apparatus for side-illumination is not sufficient, and a so-called vertical illuminator is used. In Zeiss's form (fig. 43) a small prism p, which also revolves upon a horizontal axis, is placed as near as possible to the back lens of the objective. The edge which is the separating line of the horizontal and hypothenuse surfaces of the prism, lies approximately over the middle of the system, so that the rays entering through the opening in the side after having been reflected by the hypothenuse surface are concentrated through one half of the objective on to the object. When observing only the other half of the objective is used. The sources of light used should be arranged so that the objective throws an image of the light-source upon the object. It is best if the image of the IliPHfltoiH PH I'ght i s n °t larger than the object

L – I IfeB HP examined, and to effect this, an

‘ SlitSP SKS fiK illuminating lens with an iris dia-

^^PˆPHSB^^ phragm is often placed between the

Igggjr ubjij) source of light and the illuminator. By

suitable adjustment and by changing the iris diaphragm the size of the illuminating field can be controlled. The objects observed with the vertical illuminator must not have a glass cover if the dry system is employed, because the upper surface of the glass cover would send so much light back into the objective by reflection, that the image would be indistinct. It is, on the contrary, possible to examine covered objects with the vertical illuminator, if the immersion system be employed. Owing to the slight difference of illumination between the immersion liquid and the cover, the portion of light reflected on the cover is not noticeable.

Dark Field Illumination. — As was seen when discussing the physical theory, the minute details of the object cause diffractions, and can only be examined if the objective can take up at least two consecutive diffraction spectra. These diffracting details become especially distinct if the direct lighting cone of rays, the spectrum of zerobrder or the chief maximum, is not allowed to enter the objective and instead only two or more diffraction maxima are taken up; the details then appear bright on a dark background. In dark field illumination care has to be taken that no direct rays reach the objec- tive, and hence a good dark field illumination can be produced if the condenser system has a larger aperture than the objective. If an Abbe lighting apparatus is used a dark field diaphragm (fig. 44) can be placed in the iris diaphragm case. The central diaphragm disk keeps away all the light which would otherwise fall directly into the objective, and the open zones send so many oblique rays through the object that they cannot all be taken up by the objective. Exactly the same effect is reached when, as is shown in Fig. 45, a more powerful system D is used for a condenser, which has a blackened section on the back of the front lens of such a size that no light can enter the objective A. In this way it is only possible for diffracted rays to enter the objective.

Apparatus for a good dark field illumination has received much attention, because in this way ultra-microscopical particles can be made visible. This depends on the good combination of the entering cones of rays, which should be as oblique as possible; this is most easily done by mirror condensers. A number of early inventions have been revived for this purpose.

Wenham's paraboloid illuminator (fig. 46) is made entirely of glass, arid is in the form of a paraboloid, having on the top a spherical hole, of such a curvature that all entering rays, r r' r", parallel to the axis, after their reflection on the surface of the paraboloid, traverse the spherical surface perpendicularly and unite in F, the centre of the sphere. A diaphragm s is placed in the middle of the spherical surface, and this keeps back the central rays. This diaphragm is sometimes fixed to a handle piercing the condenser, and which can be moved up and down, so that the aperture of the oblique entering cones of rays can be altered. Another form of the paraboloid condenser, also due to Wenham, has a plane surface on the upper side. Some immersion fluid must then be placed between the stage plate and the condenser in order to allow all the rays to pass out; otherwise only those rays would be able to pass out which are

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Fig. 44.

close to the axis of the condenser in the inside of the condenser, and are smaller than the limiting angle of the total reflection.

Fig. 45. — Path of Rays for dark-ground illumination with fixed

diaphragm in the objective.

(Objective D can also be used as a condenser (Zeiss).)

Th. Ross's " spot lens," invented in 1855, and J. W. Stephenson's

catoptric illuminator (1879), may also be mentioned. A recent

condenser of very high illuminating power is due to H. Siedentopf

(fig. 47). It is a double mirror system, whose reflecting surfaces are

a sphere a and a cardioid b. The combination of rays is also sufficient

in practice if the cardioid surface is replaced by a spherical one.

Fig. 46. — Wenham's Paraboloid Condenser.

Fig. 47.— Siedentopf's Cardioid Condenser.

A supplementary spherical surface c is necessary for the completion of the condenser.

Binocular Instruments

The stereoscopic microscope is the most suitable for finding out the space taken up by the separate parts of a preparation. (See also Binocular Instruments and Stereoscopy.) The observer has a stereoscopic impression of an object, when different perspective representations are presented to both eyes, which, through the action of the central nerve system, resolve into one impression.

One way of receiving a stereoscopic impression through a microscope is by fixing an apparatus as directly as possible above the last lens of the microscopic objective, which divides the rays passing out and directs half into each eyepiece. The half cones of rays have now semicircular sections, the diaphragms having the same form. The cones must be so directed through the divided system that the two exit pupils correspond to the interpupillary distance of the observer. The distance of the centres of the semicircular entrance pupils and their distance from the object regulates the difference of the two perspective representations, which are presented one to the right eye and one to the left. If the perspective centres lie too near one another in the object-space, as may happen with slightly opened and weak systems, the difference of the perspective is then too slight to make any real stereoscopic impression. On the other hand, a very much exaggerated stereoscopic effect can be derived from short focused

Fig. 48.— Riddell's Prisms.

Fig. 49.

Wenham's

Prism.

systems of wide aperture. On account of the slight depth defini- tion, short focused systems of wide aperture are not at all specially suitable for stereoscopic observation, because the possibility of observing objects taking up a good deal of space is too limited when such systems are used.

Professor J. L. Riddell {Quart. Journ. Micros, 1853, p. 236; 1854, pp. 18-24) published an arrangement of prisms, which, however, imparted a pseudomorphous impression if image-forming oculars were not used, and in 1854 a second system (fig. 48), essentially a Wheatstone pseudoscope, added just above the objective. This gave an orthoscopic image even in ordinary eye- pieces. By adopting right-angled reflection- prisms above the eyepiece he completely erected the image. Stephenson's stereoscopic microscope (fig. 58, Plate) resembles this apparatus in all essentials. A construction of prisms by Nachet is now almost forgotten, while on the contrary an extremely simple dividing prism published by Wenham (Lond. Micros. Soc, 1861, i. 109) has been exception- ally well attested in practice. It is more easily used than any other apparatus (see Binocular Instruments, fig. 8). A reflec- tion-prism (fig. 49) in a setting is placed above the last surface of the objective and divides the exit rays. The group of rays coming from the left half of the objective can continue its way without hindrance to the right eye. The group of rays coming from the right half of the objective is reflected twice in the prism and directed to the left eye. The tube con- taining the left eyepiece is a little inclined to- wards the right tube, which is perpendicular. It can be adapted to the interpupillary distance by changing the tube slide. If it is desired to use the instrument as a monocular, the setting with the prism at the lower end of the tube is taken away.

A second manner of making stereoscopic observations employs stereoscopic eyepieces. The first of such eyepieces was proposed by R. B. Tolles. 1 He realized that the division of the cones of rays by prisms could only be satisfactorily performed if the prism was placed in the position of the exit pupil of the objective or in the position of the real image of this exit pupil. He employed a Nachet combina- tion of prisms and placed the dividing prism at the spot where a special reversing system formed a real image of the exit pupil of the objective. A second stereoscopic eyepiece was devised by A. Prazmowski who substituted a Wenham diffracting division prism at the position of the real image of the exit pupil of the objective formed by a reversing system. The newest form of a stereoscopic microscope resembles the oldest in so far as two completely separate microscopes, are used. In the oldest microscope by Cherubin d'Orleans the observer receives a pseudoscopic impression in con- sequence of the reversed image. This

defect has been avoided in the instruments constructed in the Zeiss factory (fig. 59, Plate) at the instigation of the American zoologist H. S. Greenough. The system of Porro prisms employed affords a convenient method of adapting the ends of the eyepieces to the interpupillary distance. The two tubes are inclined to one another at an angle of about 14 . The _ microscope is only intended for slight magnifications. The possibility already suggested of using both eyes for observing without having a stereoscopic impression, is often regarded as a great advan- tage. Binocular microscopes have therefore been constructed on this plan. Such a combination of prisms was used by Wenham, who placed it directly behind the last objective lens. As a rule this arrangement of prisms can be exchanged for the Wenham stereo- scopic reflection-prisms.

A second kind of dividing prism which directs the entire course of rays to both eyes, and thus produces identical images, was used by Powell and Lealand (fig. 50). Every ray is divided into a re- flected and a refracted portion on the front side of a parallel plate. Whilst the refracted portion after leaving the plate continues its way in the same direction, displaced a little to one side, the reflected portion is directed into the side tube by a reflection- prism. With these microscopes, which are not stereoscopic, objectives of any power can be used. The surfaces of the dividing prisms must be very exact, so that no deterioration of the image may arise from them. A microscope for two eyes can also be obtained by employing the Abbe stereoscopic eyepiece. By the supplementary use of one of Wenham's prisms every ray is analysed into a more powerful refracted and a weaker reflected one. The same image Powell's can be presented to each eye by using this eyepiece Prisms. also. No stereoscopic impression is then felt. It is brought about by placing special semicircular dia- phragms in the plane of the exit pupil of the microscope. By

1 R. B. Tolles, Sill. Journ. (1865), xxxix. 212; Journ. Roy. Micr. Sec. (1890), pt. i. p. 383.

Fig. 50.

turning the diaphragms 180° round the optical axis, the orthoscopic impression can be changed into the pseudoscopic. The mechanical arrangement of the eyepiece is such that the distance of the two exit pupils can be adjusted to the interpupillary distance.

Mechanical Arrangements

Although the optical, system is the first consideration in a microscope,

the system is valueless if the fittings do not allow its correct use. The optical system must be kept at a certain distance and well centred, and a correct position for the object in relation to the system must be assured.

In fig. 60, Plate, the microscope is seen to consist of the heavy metal foot A, which rests on the table at three points. The whole microscope is fitted to this foot. The object can be held firmly on the stage plate B by cramps C. On the lower side of the stage plate are the condenser and the diaphragms, and the illuminating mirror J is held by a rod D fixed to the stage plate. Likewise on the stage plate is the support for the tube E. The rough adjustment of the microscope can be made by a rack and pinion F; and the fine adjust- ment by the screw G. The tube containing the eyepiece and the objective is double. The inner tube H is movable, making a change in the length of the tube possible. As a rule this inner tube has a mark which allows the length of the tube to be set.

It is most important the stand should be free of vibration. A fine adjustment is also necessary, in order to perform conveniently and with certainty the slight motion of the microscope in relation to the object. In cheap stands the rough adjustment was worked by moving the inner tube by hand, but the more convenient rack and pinion is now used almost exclusively.

For slight magnifications rough adjustment is sufficient, but with objectives of a focus below | in., a fine adjustment is wanted. Very different constructions are in use. Almost all are such that the whole microscope tube is raised or sunk by the mechanism of the fine adjustment, and not only the objective. The most used is the micrometer screw adjustment (fig, 51), The tube carrier B

s.

Fig. 51. — Micrometer Adjustment of Leitz.

Screw Fig.

52. — Lever Adjustment d J. Swift & Son.

fits closely on to a column A which is fixed firmly to the stage plate The end of the column C is traversed by the micrometer screw D which is set in action by the knob E. The column A contains i powerful spiral spring, which exercises a strong pressure on the plate F fixed to the carrier B. By screwing in the micrometer, the spring is compressed and the tube lowered. By the contrary movement the

spring pressure raises the tube as far as is allowed by the screw. The strong pressure of the spring practically excludes motion, which with fine adjustments is very important. Another very good adjustment is that of Messrs Swift & Son, shown in fig. 52. The long lever D is pressed to one side by the screw F, and is thus turned round the pin E. On the tube very near to the pin E is a cylinder C, which by the action of the screw F is very slightly raised or lowered. A double lever is used in a fine adjustment by Messrs Watson & Sons (fig- 53.)- According to whether the screw A or B is used, the adjust- ment is fine or coarse. In other fine adjustments by means of springs and balance wheels either a micrometer screw is moved (Zeiss), or a curved disk fixed to the balance wheel is turned (Leitz), or an oblique disk arranged more or less in a circle and attached to the balance wheel is revolved (Reichert). These modern adjust- ments are made so exact that motions can be easily measured

MICROSCOPE

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Fig. 57.— LARGE DISSECTING STAND (ZEISS).

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Fig. 58.— STEPHENSON'S BINOCULAR MICROSCOPE (SWIFT).

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Fig. 60.— THE DEMONSTRATION MICROSCOPE (BAKER).

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Fig. 53. — Double Lever Adjust- ment of Watson & Sons.

up to 0-002 mm. An essential in all rough and fine adjustments is that the motion must always be parallel to the optical axis of

the microscope, so that the same point in the object remains in the centre of the field.

Another condition which must be fulfilled by a good stand is the power of inclination. It is only rarely necessary to arrange the preparation really horizontal ; and for easy observation, especially when it will take a long time, it is of great assistance if the micro- scope can be inclined, so that the observations can be made in a natural position. The appar- atus for inclining the microscope is chiefly such that the micro- scope can be placed in all posi- tions between the vertical and the horizontal. The horizontal position is sometimes necessary if photographs are to be taken by the microscope.

Many devices are available for changing the objective. It is essential .that the objective is always brought before the lower end of the tube

in such a way that the optic axis of the objective coincides with the optic axis of the rest of the system. The fittings of the objective and the changer are so arranged that little or no fine adjustment is necessary after the change. The most widely used is the revolving changer (fig. 60, Plate). The revolver may hold two, three or four objectives. In the sliding changer the objective is, dovetailed to a slide, the correct position being secured by clamps.

Fully equipped microscopes have apparatus for moving and turn- ing the object. In simple microscopes the stage plate lies on the stand held by two springs, and must be moved by the hand (fig. 60, Plate). For elaborate work a so-called cross-table is indispensable. By means of screws the stage plate is movable in two directions at right angles to one another, in the plane of the stand. In many cases the stand is also movable round the optic axis.

The microscope stands described above can be used for the greater number of the naturalist's experiments. For very special objects the stand must be expressly made ; thus stands with tube carriers very much projecting are made for examining sections of the brain. The petrographical microscope is shown in fig. 61, Plate.

In order to determine the refractive index when the thickness of the crystal is known, or the thickness of the crystal when the index is known, a fine adjustment A makes it possible to measure exactly the changes in the length of the microscope. Further, a revolving stage plate provided with a graduation B is used to determine the angle in crystals. To obviate mistakes the optical axis of the micro- scope must coincide with the revolving axis of the plate, and the revolving plate has a central position C to keep this condition ful- filled. In many stands the objective can be centred instead of the plate. For measuring this angle, an eyepiece with cross-threads is used. In the lower focal plane of the eyepiece, at the spot where the real image which the objective forms of the object arises, a glass plate is introduced on which are two fine cross lines or even two very thin threads. The eye-lens can be adjusted for the thread-plate, so that different observers can see the cross clearly. The cross is always adjusted first. When observing with such an eyepiece, care must be taken that the real image of the object lies in the plane of the cross- threads, i.e. that there is no parallax. The adjustment is easily controlled. If the eye is moved to and fro over the eyepiece and the image makes apparently similar movements in relation to the cross threads, then the image does not yet lie in the plane of the threads.

To measure the angle, the images of the crystal edges are covered in

turn by one of the threads by turning the table, and the angle of rotation is read from the scale. A cross-table is very convenient for this calculation, for with the aid of the two movable slides situated in the plane of the plate and at right angles to one another, the point where the two crystal edges intersect can be quickly and correctly brought into the revolving axis of the plate. This measurement can also be made with a goniometer eyepiece, in which a row of parallel double-marks are used instead of the cross threads. The fitting of the eyepiece at the upper end of the tube is provided with a graduated circle. The eyepiece proper with the parallel strokes can be revolved, and the rotation be read from the graduated circle. In carrying out this calculation the marks of the thread-plate have only to be placed exactly parallel tc the crystal edge.

For examining preparations in polarized light a polarizer D is introduced in the illuminating apparatus below the diaphragm and an analyser E above the eyepiece. The analyser can be rotated, the angle being read by a divided circle F. Very often the analyser is placed in the tube, a little above the objective: it is then generally in a case G, which can be put into the tube. The placing of the analyser near the objective has the advantage that the field of view

is not restricted, as is the case if the analyser is used above the eyepiece. Nicols's, Glan-Thomson prisms or similar polarization apparatus are used as polarizers and analysers. Below the analyser G a plate H of selenite or mica may be put in the course of the rays. This small plate can also be laid above the polarizer in the illuminat- ing apparatus or in the eyepiece.

To examine crystals, especially in converging light, a condenser, movable in the optic axis, is needed above the polarizer. The image produced by the microscope objective M in its back focus plane is then observed through a supplementary microscope. The objective of this supplementary microscope, the Bertrand lens, can be applied through a window I at the lower end of the inner tube K. By using a rack and pinion movement L the supplementary microscope can be adjusted for the images. There is nearly always an arrangement to observe the preparation first in convergent light and then in parallel polarized light. This change can often be brought about by taking away or adding parts of the condenser.

Micrometry

It is often required in microscopical work to determine the size of objects or parts of objects.

There are three essential ways of performing this. The first method uses the objective screw micrometer. The object is placed on a slide in the plane of the stage plate and able to be very finely moved by the micrometer screw, which has as fine a worm as possible. A divided cylinder is fixed to the turning knob, which thus makes it possible to measure fractions of the revolution. The revolutions of the cylinder are registered by a calculator. The use of an eyepiece with a cross thread is essential to this measurement. After the microscope has been so adjusted that the image of the object to be measured falls exactly in the plane of the cross threads, the object is moved by the micrometer until one edge of the object is exactly covered by a thread. The micrometer is now read. Then the object is moved by the micrometer till the image of the other edge is covered by the thread in the eyepiece, and the micrometer is again read. The difference between the two positions gives the size of the object. The objective screw micrometer is, however, not sufficiently delicate, and is only used when comparatively large objects are to be measured, and especially for objects whose edges do not appear at the same time in the field of view.

The second and most widely used method employs a micrometer eyepiece. In this case not the object itself but a real image which has _ already been magnified by the objective is measured, and obviously much more accurate results are possible. The most accurate calculations are obtained by using the screw micrometer ocular (fig. 54). Directly below the collective lens of a Ramsden

Fig. 54. — Screw Micrometer Ocular. Sectional elevation and plan (Zeiss).

eyepiece a slide b can be moved by a micrometer screw a ; the slide carries a little glass plate c provided with a graduation. With the help of this scale the total revolutions of the screw, can be read; fractions of the revolution can be read from the divided cylinder d. The scale is generally divided into hundredths of millimetres or thousandths of inches. A fixed mark which serves as an index is placed on the lower side of the collective lens and is seen clearly at the same time as the graduation of the movable slide. The micrometer stands at zero if the zero mark of the cylinder coincides with the index and the fixed mark is at a known division. The calculation is most convenient if the micrometer is left in the position of zero and the object is moved till one of its edges corresponds to the zero mark of the eyepiece scale. If the micrometer is then moved till another graduation corresponds to the other edge of the image the size of the image can be read off. As this method measures

the image correctly to a few thousandths of millimetres, the object itself is measured accurately to some hundred-thousandths of millimetres, if it has been magnified a hundred times by the objective. To keep up this degree of exactitude the magnification of the objec- tive must be carefully ascertained, e.g. by using an objective micro- meter. A fine scale with known intervals is put on the stage plate, and by determining the distance between the graduations of the objective micrometer formed through the same objective, by means of the screw micrometer ocular, the magnification of the objective is determined. As the errors in the graduation of the objective micrometer are also magnified, very exact scales are necessary. When determining the magnification the microscope must be used under exactly the same conditions : neither the length of the tube nor the focal length of the objective may be altered.

A fixed eyepiece micrometer is simpler and more popular. This consists of a scale on a little glass plate, which, instead of a cross wire, is placed in the eyepiece. The adjustment must be such that the image produced by the objective falls exactly in the plane of the scale. The size of the image is determined by calculating the entire interval taken up by it. By using an objective micrometer in place of the object, the magnification of the objective can be ascertained and from this the actual size of the object. As fractions of intervals can only be estimated in this method, a measurement with such an eyepiece scale can of course not be as exact as with a screw micro- meter ocular. However, such a determination of size is often quite accurate enough.

A third method employs a drawing prism. The object and the drawing plane are seen at the same time and the outlines can be readily drawn. If, as before, an objective micrometer is placed below the microscope in the place of the object, and the size of a special micrometer-interval is drawn on the same board, then the actual size of the object an be ascertained. Instead of first drawing ihe object and the objective micrometer, they can of course be pro- jected at the same moment on a scale on the drawing board.

The errors attending the determination of the size of a micro-

The Testing of the Microscope

The excellence of a microscope objective depends on its definition and

its resolving power.

The definition is better according as the chromatic and spherical aberrations are removed; there always remains in even the best constructions some slight aberration. In consequence of these residual aberrations, every object-point is not reproduced in an ideal image-point, but as a small circle of aberration. These circles will be objection- able when the smallest details are examined. The size of these circles depends, in the case of equal tube lengths, only on the type of the objective, and not on the focal length, exact execution being assumed. Object details will only be well seen if the aberration circles are small in comparison. The size of these details in the image depends only on the magnification of the objective, M = A//i', and can by appropriate choice of the focal length of the objective be brought to the right value. In the case of a suitable ocular magnification, the details will be well seen, while the aberration circles remain invisible. It is therefore possible to judge the excel- lence of the focusing of objectives on the P strength of the ocular-magnification, or the

rlG. 55. over- magnification, which they permit.

DD = diaphragm. E. Abbe, through the so-called delicate

K1K2 = condenser. r ay transmission, suggested a way by which

L = front lens of the the quality of the images of objectives can be objective. observed. The ray transmission, shown in

The lower figure fig. 5Si j s obtained by means of a stop shows the plan of f the form shown in the lower figure the transmission. anc [placed under the condenser in the plane of the iris diaphragm. The entrance pupil is in this way reduced on two small separate fields, which nevertheless contain rays of all zones. It is necessary that the outside edge of the diaphragm

coincides with the edge of the entrance pupil. This can be attained by drawing the iris diaphragm so far as to form the entrance pupil. The double diaphragm is then in such a position that the edge of the outer diaphragm coincides with the edge of the iris diaphragm.

The object employed must have distinct boundaries. Abbe's test plate consists of an object carrier on which six cover glasses of exactly determined thickness (between 0-09 mm. and 0-24 mm.) are cemented. The cover glasses are silvered on their under surfaces, and in the silvering fine lines are drawn; these lines form the test object. This plate admits at the same time of a correct determination of the

thickness of the cover glass, for which the best correction exists. So long as the object is not sharply focused two separate dispersion figures will be seen. The defects of the objective are revealed, e.g. two adjacent sharp images are formed, which become indistinct if they coincide, or one pencil produces a distinct, the other an indistinct image, or that the images are surrounded with coloured rings. Owing to the curvature of the image, all parts of the object are not seen distinctly at one and the same time.

The resolving power of an objective depends on its numerical aperture. The numerical aperture can be determined in two ways. A diaphragm with a very narrow hole is placed on the stage, and the microscope sharply focused on the edges of the hole. The illuminating mirror is turned aside and a graduated scale is laid on the_ foot of the microscope. Strong systems produce in the proximity of their back focal plane an image of the scale, which can be inspected with a weak auxiliary microscope, and the length of the visible part of the graduation determined. The ratio of half the length of the visible piece of the scale to its distance from the dia- phragm on the stage gives the tangent of half the angular aperture. The sine of this angle is the numerical aperture for dry lenses. With weak systems no auxiliary microscope is necessary, the eye- piece being removed and the scale viewed directly in the tube.

E. Abbe constructed a simple instrument for the determination of the aperture, termed the apertometer (fig. 56). A semi-circular

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m

_ . Abbe’s

.Zeiss . Jena

Apertometer

View from above

Side view

Fig. 56. — Abbe’s Apertometer (Zeiss), glass plate bears two scales, over which two black thin metal plates bent back at right angles may be moved. A little hole in the silvered plate a marks the centre of this circle. Through this hole the points of the metal plates b can be observed by total reflection on the surface c. The apertometer is laid

on the stage, so that the hole lies in the axis of the microscope, and the hole is sharply focused. The eyepiece being removed the image of the metal plates b pro- duced by the objective is seen. In order to ensure for the eye a central position, there is fixed on the upper end of the tube in place of the eyepiece a disk of pasteboard or metal with an axial hole. The metal plates b are then moved till the points just cut off the edge of the field to be surveyed. The angular or numerical aperture can then be read off. With strong systems the vanishing of the points is observed with an auxiliary microscope, formed by means of the inner tube. In immersion systems the immersion liquid is placed between the front lens and apertometer.

If the numerical aperture be known the resolving power is easily found. The resolving power can also be determined by using differ- ent fine test objects. Norbert's test plates, which bear graduated groups of extremely fine and narrow divisions are very useful, while the tests of Amphipleura pellucida and Surirella gemma are often employed.

The magnification of a microscope is determined from the focal lengths of the two optical systems and the optical tube length, for N = 25o A/fi'fi. To determine the optical tube length A, it is neces- sary to know the position of the focal planes of the objective and of the ocular. If one focuses an auxiliary microscope, carried in the inner tube, on the image situated in the back focal plane of the objective of a distant object, and then on the dust particles lying on a slide pressed against the end of the outer tube, the displacement of the auxiliary microscope gives the distance of the back focal plane of the objective from the end of the outer tube. To determine the position of the anterior focal plane of the eyepiece, the eyepiece is placed on the stage with the eye-lens downwards. An auxiliary microscope is now focused first on the image of a distant object and then on the plane of the edge of the setting. This plane can be marked by a small piece of paper. This gives the distance of the anterior focal plane of the eyepiece from the bottom edge of the setting of the eyepiece and consequently also of the edge of the eye- piece carried by the upper end of the tube. These measurements determine the optical tube length A.

MICROTOMY

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There are many methods for determining the focal length of the objective. The objective to be examined is placed on the stage, and in

the manner just shown, the distance of the focal plane from the edge of the fittings or to the surface plane of the front lens is deter- mined. Any plane object a few yards distant can be used. If the object can be seen by using the mirror, the plane mirror must be used ; then the actual size of the object and of the image produced by the objective is measured (of the image by a micrometer ocular). The distance of the object from the nearer focus of the objective is next determined. This distance is composed of the distance of the object from the centre of the plane mirror, and of the distance of the focus of the objective on the stage plate from the centre of the plane mirror. Let the size of the object be y, the size of the image y' the distance of the object from the focus x, then y/y' = x/fi f rom which /1 can be calculated (see Lens). The same method can be used to determine the focal length of the eyepiece. These are the dimensions necessary for determining the magnification of the micro- scope, viz. the optical length of the tube A, the focal lengths of the objective//, and of the eyepiece fa.

The focal length of an objective can be more simply determined by placing an objective micrometer on the stage and reproducing on a screen some yards away by the objective which is to be examined. If the size of the image of a known interval of the objective micro- meter is determined by an ordinary scale, and the distance of the image from the focal plane of the objective belonging to it is measured, then the focal length can be calculated from the ratio y/y'=/i'/*i'i in which y is the size of the object, y' that of the image, and x\ the distance of the image from the focal plane belonging to it.

Besides this indirect method of determining the magnification there is also a direct one, in which it is not necessary to first measure fi, fa or A. If a drawing prism is used above the eyepiece, and an objective micrometer is inserted, then if a scale is laid on the drawing board which is 25 cm. distant from the exit pupil, one or more intervals of the objective micrometer can be seen projected on the scale lying on the board. The comparison of the two scales gives directly the magnification. The course of the light within the drawing prism must be taken into account when determining the distance of the scale from the exit pupil. Although this method does not give very accurate results, it is more convenient and simple than the indirect method.

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aspects, whilst the theory is treated in M. von Rohr (Die Theorie der optischen Instrumente, Berlin, 1904) and in S. Czapski (Grund- zuee der Theorie der optischen Instrumente; ed. by O. Eppenstein, Leipzig, 1904). (O. Hr.)

MICROTOMY (Gr. tow, renveiv, to cut), the term applied to the preparation of minute sections of organic tissue for the microscope. In 1875 the methods were yet in their infancy; their development has enabled observers to achieve the most exact study of minute anatomy, in the case of small objects, which without these methods could only be investigated by the unsatisfactory process of focusing with the microscope through the solid object.

It is not necessary here to detail at length the wet method of preparing sections. Briefly, the tissue is soaked in a solution of gum, or of gum and syrup, and after being frozen by ether spray, or by a mixture of ice and salt, is cut into sections either by the Rutherford, Cathcart or some similar section-cutter, or by apparatus which can be fitted to the more modern types of microtome referred to below. This method, which is to-day used mainly by pathologists, has two main disadvantages: the prolonged action of watery fluids on the tissues, and the impossibility of getting ribbons, each section having to be picked up separately.

The general processes of the dry method employed in zoological ˆnd botanical microtomy are, up to a certain point, practically identified with those used for the preservation of animals and their tissues for other branches of microscopic work. In the first place the tissues must be killed; in the second, they must be fixed, i.e. the protoplasm must be set or coagulated as far as possible in the condition in which it appears in life; and in the third, they must be hardened, i.e. in most cases dehydrated. Killing may be effected by asphyxiation or narcotization (nicotine, cocaine, chloral hydrate, &c.) in special cases, but is generally achieved by fixing reagents, of which corrosive sublimate and other chlorides, picric, acetic, osmic and chromic acids, alone or in combination, chromates and strong alcohol

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are the most usual. These serve to a great extent also as harden- ing agents, but alcohol, used after them, completes this process effectively, and when not too strong (70%) is the best storage fluid. The second set of processes relates to the staining, without which transparent sections are almost invisible. The stains are divisible into general stains, which dye the tissue practically uniformly and

indifferently; and selective stains, which have affinity for special tissues or cell elements. Of the latter group some fasten on nuclei, others only on the chromatin of the nuclei; some on connective tissues, others on muscle fibres and so on. It is probable that the action of all these selective stains is produced by definite chemical combination with compounds originally present in, generated in, or introduced into the tissue selected. The most generally useful stains for ordinary work belong either to the cochineal series (borax-carmine, carmalum, &c), or to the logwood series (haematoxylin, haemalum, iron haematoxylin, &c); in both of these great improvements have been introduced of late years by Dr Paul Mayer. The activity of these stains apparently depends upon the presence of alumina or of some similar base. For more special researches, such as cytology, neuropathology, neuro histology, and so forth, greater dependence is placed on the coal-tar colours, the name of which is legion. Some of these, such as safranine or gentian violet, are regressive stains; that is to say, the tissues are overstained uniformly, and the superfluous colouring matter washed out either by alcohol or by weak hydrochloric acid from the unselected parts. Others, such as methyl green, are progressive — that is, the colour is brought up to the pitch required and the reaction promptly stopped. The coal-tar stains can be used singly, or in combinations of two or three. Some of the best, unfortunately, are not permanent. A third group of stains is furnished by such reagents as silver nitrate, gold chloride, and the like (impregnation stains), which can be made not only to stain, but also to deposit a fine metallic precipitate on certain structures. In the case of small and delicate objects, the staining is done in the mass before any further preparation for sections, but with larger animals, or large pieces of resistant tissue, the stain is applied to the sections only. The processes so far mentioned are applicable to many branches of microscopic work.

When preparing tissues for sections the first step is complete dehydration, generally effected by bringing the object into absolute alcohol. It is then transferred to one of a group of reagents, which are miscible with absolute alcohol, but would form an emulsion with water, and are solvents of the embedding medium. The embedding mass in most general use is paraffin wax, melting at a temperature of 54° to 6o° C, according to the character of the object and the thickness of section required. The object is transferred from absolute alcohol to benzol, chloroform, cedar oil, or similar fluid to the melted paraffin; the fluid diffuses and evaporates, leaving the tissues to be completely permeated by the paraffin. This process can be greatly has- tened by the use of a partial vacuum. When impregnation is complete the

paraffin is cooled rapidly, so as to assume a homo- geneous non-crystalline condition, and the tissue thus comes to form part of a block of soft but tenacious material, which' pro- tects it from damage by air or damp, and can be readily cut by a razor. The block is then trimmed to the form of a triangle or rectangle, and fixed by a clamp or by local melting in the holder of the microtome.

The first automatic microtome suitable for cutting a block of tissue into a continuous series of sections was made in 1883 in the university workshops of Cambridge, from a design by W. H. Caldwell and R. Threlfall. Only a single machine was made, but in 1884 twelve machines were made by the Cambridge Scientific Instrument Company from a design by Caldwell. Since then numerous excellent and simpler forms of microtome have been evolved. Some of these have distinct advantages over others, but with microtomes as with other tools — the success of the results depends very largely on the manipulator, for every one works best with his accustomed instrument. In one type of microtome the razor is attached at one end only to a heavy

block, sliding backwards and forwards in a horizontal V-groove; the paraffin block is fed to this either up a vertical guide (Schanze, Reichert, &c.) or up an inclined plane (Thoma-Jung). In another type the razor is firmly clamped at both ends, to diminish vibration, and the paraffin block advances to it at the end of a long lever on trunnion bearings (Cambridge rocker) or up a vertical guide (Minot types).

In the selection of a microtome, apart from its steadiness, rigidity, accuracy of workmanship, and so forth, it must be borne in mind that, in general, simplicity of working parts means longer life, and that an elaborate " automatic " mechan- ism, by which a single movement is translated into several in different directions, not only complicates the machine, but robs the operator of those alterations of pace, rigidity, pressure, &c, which are often necessitated by the varying texture in different parts of the object cut. For general use by less skilful students in a laboratory, price, simplicity and rapidity of work recom- mend the rocking microtome of the Cambridge Scientific Instru- ment Company, but it tends to fail at large or hard objects. For the all-round work of an investigator, its simplicity and finish have made Jung's sliding microtome with the Naples improvements deservedly popular for many years; it can be fitted with special apparatus for cutting

celloidin and frozen objects, and it can be relied upon to cut any tissue, however difficult; but it cannot be worked as rapidly as some others, nor produce long ribbons of large objects. For this latter purpose the Minot-Becker, Minot-Zimmermann and Reinhold- Gilltay have been strongly recommended; these, however, are all of more complicated construction, with corresponding liability to uneven wear and damage; they are highly ” automatic,” leav- ing nothing but pace under control of the operator, and they are (particularly the last) expensive.

[In 1910 the Cambridge Scientific Instrument Company issued a new microtome designed primarily for cutting larger sections than was possible in their earlier forms, which respectively dealt with sections 12X20 mm. and 30 mm. in diameter; the new instrument cuts sections measuring 150X120 mm. (6X4! in.) embedded in paraffin or celloidin and of a thickness varying from 0-002 to 0-06 mm., each division of the scale being equal to 0-002 mm. and the total distance of automatic feed being 21 mm. The construction and action of the instrument can be understood by referring to the figure; a detailed description is given, since the same principles are utilized to a greater or less extent in all sliding microtomes.

Large Sliding Microtome.

The object to be cut, having been embedded in a suitable prepara- tion A, is fixed to a wooden block which is attached by clamps to the object-holder B. The object-holder is provided with mechan- ism by means of which the height of the block is determined; this is effected by mounting the holder in a cup-shaped socket at the extremity of a brass pillar E, which can be raised or lowered and fixed in any position by a clamp. In addition, the direction in which a section is cut can be varied by adjusting the four screws,

one of which is shown at C, which orientate the block. The object-holder and feeding mechanism are carried on a sliding carriage which rests at three points on two guides in the frame N, Ni of the instrument; and in order to secure easy running the necessary lubrication of the bearing surfaces is provided for by a groove in which oil is placed. The motion of the carriage in either direction is effected by the handle G, connected to a system of levers H, which, being constructed on geometrical principles, prevent any side-play and ensure a uniform motion. The arrangement for determining the thickness of the section cut consists of a stop-pin, which, operating through the ratchet M, causes a toothed wheel to revolve, which in turn raises the pillar K; the amount of the motion can be read off by

an index. On the return stroke of the sliding carriage the stop-pin is again actuated in such a manner that just before the knife R reaches the object-holder the mechan- ism depresses this part of the instrument so that the knife is not fouled ; and after its passage the object-holder is raised to the posi- tion appropriate for taking the next section. The knife R is rigidly set in two heavy brass clamps adjustable by the screws S, and these clamps are attached to the frame of the instrument by the screws T. The angle which the cutting edge makes with the frame is also adjustable, and by means of a small angular scale engraved on the knife-holders any setting can be easily determined or repeated. The knife is flat on one side and hollow-ground on the other. In using the microtome it is essential that the cutting edge of the knife points towards the end of the instrument where the handle is placed; the hollow-ground face should be uppermost, and the flat surface should not be exactly horizontal but slightly inclined so that the lower facet of the cutting edge is parallel to the frame. As to the relation of the position of the knife to the direction of motion, it is the usual practice, when paraffin sections are to be taken, to have the cutting edge at right angles to the motion; when, on the other hand, celloidin preparations are being cut, the knife must be set obliquely across the frame, an angle of 30 being convenient. This oblique setting is also recommended for paraffin sections. In addition it must be remembered that celloidin prepar- ations always require lubricating when being cut, and it is also necessary to keep both the knife and the preparation constantly moistened with either 80 % alcohol or with cedar-wood oil.]

The sections, when cut by the microtome with the knife straight and the two sides of the rectangular paraffin block parallel to it, in most cases can be got off in a continuous ribbon, each sticking to its predecessor. This very desirable result generally can be insured by a coating of softer paraffin; but if the object be large, or brittle, or of varying texture, it is safer to cut the sections singly from a triangular block with an oblique knife. The sections or ribbon are often not quite flat, but rolled, creased or compressed; they must be flattened before being attached to the slide. It is possible to carry out these two processes simultaneously by covering the carefully cleaned slide with plenty of a very dilute solution of Mayer's glycerine and albumen, and laying the sections on the fluid and the slide on a hot-plate; as the water becomes warm the sections flatten out, and as it evaporates they settle down on the slide, and are held there by the albumen (many other methods are in use). The slide is then warmed to melt the paraffin, and plunged into benzol, or some similar fluid, which removes the paraffin; thence into absolute alcohol, which de- H

hydrates and coagulates the albumen. If the tissue has not been stained en bloc the sections can now be stained on the slide. After staining they are fully dehydrated, rendered transparent by oil of cloves, and mounted in xylol-dammar or Canada balsam. W. Giesbrecht was the first to fix sections on the slide, using a solution of shellac in creasote in 1881; and also in the same year and in the laboratory of the Naples aquarium, W. H. Caldwell first cut and fixed ribbons of sections.

For ordinary work the paraffin method excels all others for rapidity, certainty and cleanliness; but for large and hard objects, or crumbling tissues (such as ova with a large quantity of yolk), some manipulators prefer to embed in celloidin. By this method, after dehydration, the tissue is soaked in a mixture of absolute alcohol and ether; thence transferred either to increasingly strong solutions of celloidin in the same mixture or to a thin solution which is then boiled down till, strong. The celloidin mass is then hardened: at first, if necessary, by drying; afterwards by a bath of chloroform or its vapour. It can then be cut in the microtome, either wet, or (if

previously cleaned with cedar oil) dry like a paraffin block. The method is more tedious and more messy than the paraffin process; but amongst its advantages must be reckoned that little or no heat is required, and that the embedding mass is transparent, though it does not allow of such thin sections as paraffin.

The above accounts present an outline of the complex processes employed to-day, by which, on the one hand, sections 30 ju in thickness may be made through the entire human brain; and, on the other, organisms invisible to the naked eye may be cut into a long ribbon of consecutive sections 1 n (one-thousandth of a millimetre) thick, every minutest fragment being retained in its proper place.

The standard book on the subject is Bolles Lee's Microtomist's vade-mecum. Other works are G. Mann, Methods and Theory of Physiological Histology (Oxford, 1902), and A. Flatters, Methods in Microscopical Research (London, 1905). (G. H. Fo.)

MIDAS, the name of several Phrygian kings. The first of these was said to have been the son of Gordius and Cybele, whose first priest he was, and in whose honour he founded a temple at Pessinus. Having taken

the drunken Silenus back to his youth- ful charge Dionysus, he was rewarded by the god with the power of transforming everything he touched into gold. Finding himself in danger of starvation, even his food and drink being changed by his touch, Midas entreated Dionysus to take back the gift. By the command of the god he bathed in the river Pactolus, which henceforth became auriferous (Ovid, Metam. xi. 85-145; Hyginus, Fab. 191). Another story connects him with the musical contest between Apollo and Marsyas (or Pan). Having decided against the god, his ears were changed into those of an ass. He concealed them under a Phrygian cap; but the secret was discovered by his barber, who, being unable to keep it, dug a hole in the ground and whispered into it " Midas has the ears of an ass." He then filled up the hole, thinking his secret safe; but the reeds which grew up over the spot proclaimed it to all the world. Midas with the ass's ears was a frequent subject of the Attic satyr-drama. There is no doubt that Midas was the name of one or more real persons around whom religious legends have grown up. The name " Midas the king " occurs on a very ancient tomb in the valley of the Sangarius, the legen- dary seat of the Phrygian kingdom. The Phrygian monarchy was destroyed by the Cimmerians about 670 B.C., and the name Midas became in Greek tradition the representative of this ancient dynasty.

On the connexion between Midas and the Attic story see J. G- Frazer, The Golden Bough, ii. 134.

MIDDELBURG, the ancient capital of the province of Zeeland, Holland, in the middle of the island of Walcheren, 4 m. by rail N. by E. of Flushing, with which it is also connected by steam tramway and by ship canal (1873), which continues to Veere on the N.E. coast, with a branch eastward to Arnemuiden. Pop. (1903), 19,002. Middelburg contains many splendid old houses, which recall the prosperity which distinguished it until the end of the 18th century. The beautiful town-hall, built by Anton Keldermans about 1512, with a square tower 180 ft. high, and a facade adorned with statues of the counts and coun- tesses of Zeeland and Holland, contains the valuable city archives and antiquarian and historical collections. The old abbey of St Nicholas, founded in n 50, and now occupied by the provin- cial council, has some fine old tapestry of the end of the 16th century. The building was added to in the 14th and 15th centuries, and partly rebuilt after a fire in 1492. It was the scene in 1505 of a meeting of the knights of the Golden Fleece, and was frequently the residence of royal visitors, including Maximilian, Philip the Fair and Charles V. The abbot of Middel- burg formerly possessed a vote of his own in the Provincial States. What was formerly the nave of the abbey church is now the New Church, and the ancient choir constitutes the Choir Church.

These churches are interesting for the monu- ments of William II., count of Holland, king of the Romans (d. 1256), the 16th century scholar Hadrian Junius, and Jan Pieterszoon; and the tombs of Jan and Cornelius Evertsen, who fell in the naval war against England in 1666. The high tower (280 ft.), known as de lange Jan, standing apart from the church

contains a good chime of bells. The corn exchange, the hof St Joris and the hof St Sebastian (formerly buildings belonging to the gilds of archers, and now places of amusement) also deserve mention. The museum of antiquities belonging to the Zeeland Society of Arts and Sciences (founded at Flushing in 1769, and transferred to Middelburg in 1801) contains a complete collection of the fauna and flora of the province, many maps., plans and drawings relating to Zeeland, the first telescope made by Hans Lippershey and Zacharias Jansen in Middelburg in 1608, and some provincial Roman antiquities.

The extensive trade which Middelburg formerly carried on with the East and West Indies and with England and Flanders, was ruined by the war with England and the French occupation. But the construction of the railway in 1872, followed by the opening of the ship canal and the large dock (1876), as well as the establishment, by the aid of the chamber of commerce, of certain manufacturing industries (iron, machinery, furniture, oil and cigars), lifted it out of its isolation.

MIDDELBURG, a town of the Transvaal, 98 m. E. by rail of Pretoria, and 251 m. W. of Lourenco Marques. Pop. (1904), 5085 — of whom 2343 were whites. It is prettily situated on the high veld, 5090 ft. above the sea, on one of the head streams of the Olif ants River. Middelburg is the chief town of an adminis- trative division of the same name, and is a trading centre for a large district. It is also the centre of one of the richest coal- fields in South Africa. From some of the adjacent collieries excellent steam coal is obtained. Copper and cobalt are found in the neighbourhood.

Middelburg was chosen in 1901 as the place of conference for peace negotiations between the British and the Boers. After the occupation of Pretoria in June 1900 by Lord Roberts the Boer forces had been reduced to guerilla warfare, and Lord Kitchener, learning that the Transvaal commandants were despondent, invited General Botha to enter into negotiations, on the basis of the recognition of British sovereignty. The conference between Lord Kitchener and General Botha was opened on the 28th of February and the negotiations, which ended in failure, were protracted until the 16th of March (see Transvaal: History, § The War of 1899-1902).

Middelburg is also the name of a town in the Cape Province, South Africa, 250 m. N. by W. of Port Elizabeth. Pop. (1904), 6137.

MIDDLE AGES, THE. This name is commonly given to that period of European history which lies between what are known as ancient and modern times, and which has generally been considered as extending from about the middle of the 5th to about the middle of the 15th centuries. The two dates adopted in old textbooks were 476 and 1453, from the setting aside of the last emperor in the West until the fall of Constantinople. In reality it is impossible to assign any exact dates for the opening and close of such a period. The trend of recent historical re- search leads one even to doubt the validity of the very concep- tion of any definite medieval period. The evolution of modern European society has been continuous. Progress has not been uniform. There was much retrogression with the intrusion of new barbarian races; but from their absorption by the 10th century until the 20th there is not a century in which some notable gain was not made towards the attainments of modern civilization. The correct perspective places between the sum- mits of modern and ancient times, not a long level stretch of a thousand years, with mankind stationary, spell-bound under the authority of the Church, absorbed in war or monastic dreams, but a downward and then a long upward slope, on both of which the forces which make for civilization may be seen at work.

It is clear that a survey of the history of these so-called middle ages — long use makes the term inevitable — must include not only the political phase, but also economics, religion, law, science, literature, &c, since all are involved in the concept. A hurried outline of each of these vital branches of our civilization will at once reveal the falseness of the usual periodizing. It is only after having traced these one by one that we can properly review the process as a whole.

In political history, the epochal fact which marks the close of ancient times is the decline of the Roman Empire. This was a process extending over three or four centuries, in which no one date lends itself to the historian. The deposition of Romulus Augustulus, the last Roman emperor in the West, in 476, was certainly not one of those events upon which the history of the Western world depends. Outwardly it did not mark the end of the Empire, but the restoration of imperial unity. The throne in Italy had been vacant before, and the restoration of unity was realized in fact under Justinian. There is no

reason why the date 476 should stand out in European history more strongly than half a dozen other such dates. Yet we may say that the 5th century did witness the actual dismemberment of the* Roman Empire. The new nations in Spain, Gaul, parts of Italy and Britain were forming the rude beginnings of what were to become national states in the centuries following. Western Europe was taken out of the imperial mould and broken up. This is a revolution of sufficient magnitude to be regarded as politically the opening of a new era. It had been long preparing in the economic and administrative decline of the Empire, and in the steady influx of Germanic peoples into Roman territory for over two centuries; but the power of the old civilization to absorb the new races was exhausted by the 5th century, and the political history of Europe was turned into a different path. That path, however, was not destined to end blindly in a ” middle age.” The line of political development marked out in the 5th century — that of the national states — still continues. The revolution in which Alaric, Theodoric and Clovis figured did not set the prob- lem for the middle ages only, as is frequently stated; its full meaning did not appear until the Peninsular War, the Prussia of Stein and Scharnhorst, and even Solferino and Sedan. Thus the 5th century politically introduces not so much the history of the middle ages as that of modern Europe.

The immediate introduction, however, was a long one — so long and so distinct from the later development as to constitute in itself a distinct phase. For five or six centuries — from the 5th until about the nth — comparatively little permanent progress was made. The Germanic tribes were still adjusting themselves and slowly learning to combine their primitive institutions with the remains of those of Rome; the premature union under Charlemagne gave way before new invasions, and anarchy be- came crystallized in feudalism. It was not until the 12th and 13th centuries that modern national states really took shape: England with its trial by jury, circuit courts, Magna Charta and parliament; France under the strong hand of the Capetians. A political middle age certainly lay between Theodosius and William the Conqueror, or at least between Justinian and Henry II. It is difficult to grasp its vastness. Few students of history realize that the period from the Saxon to the Norman Conquest of England would take us as far back as from George V. to Edward I.; or that from Theodosius to Philip Augustus there is an interval equal to that between the accession of Hugh Capet and the French Revolution.

This, however, is not the period most frequently termed the middle ages in political histories. It does not include those two institutions which more than any others stand in popular imagination as

genuinely medieval — the papal monarchy and the Holy Roman Empire. The papacy received its full monarchial structure under Hildebrand (Gregory VII.) in the middle of the nth century; its political decline set in suddenly after the ponti- ficate of Boniface VIII. at the opening of the 14th. The great age of the Empire began slightly earlier, and continued until the fall of the Hohenstaufen in the middle of the 13 th century. One cannot now deny the term middle ages to the period of these two institutions. It has been consecrated to this use too long. Yet when we include under a common name two eras so distinct as this and that preceding, our term becomes so vague as to be almost valueless. Moreover, it is doubtful if this second period is really as " medieval " as it has seemed. Papal mon- archy and Holy Roman Empire were not the only political phenomena of their age, and it is possible that their vast pre- tensions have somewhat blinded historians as to their real

importance. While they were struggling to enforce their claims to universal sovereignty, the royal power, less extravagant but more real, was welding together the feudal states of France and moulding the England of to-day. Compared with this obscure process — this spread of the king's peace along the highways and through the distant forest lands of the 12th and 13th centuries — papal interdicts and jubilees, however impressive their spec- tacle, are but fleeting shows. The chivalry of Germany pouring through Alpine passes for an Italian campaign, or a coronation, left little trace in history except the lesson of their futility. There is much in the imperial and papal histories that is merely spectacular and romantic; much that appeals to the imagina- tion and lends itself to myth; and since the sources are abundant — the papal archives inexhaustible and the German chronicles easily accessible — an undue emphasis has been placed upon them. It is at least evident that the political middle ages were already disintegrating during the period of papal monarchy and Holy Roman Empire.

In economic history there is a more definite line traceable. The one great economic change brought about by the decline of the Roman Empire was the lessening of urban life throughout the greater part of Europe, the closing up of avenues of com- munication and the predominance of isolated agricultural communities. This phase began to give way in the nth century to a commercial and industrial renaissance, which received a great impetus from the crusading movements — themselves largely economic — and by the 14th century had made the Netherlands the factory of Europe, the Rhine a vast artery of trade, and north Italy a hive of busy cities. The discovery of America and the expansion of commerce merely readjusted conditions already highly developed. The period of isolated

economy which we may term medieval lasted only from about the 5th to the 12th centuries. As for manufactures, the antique methods survived until the 18th and 19th centuries.

In religious history — to be distinguished from that of the political organization referred to above as the papal monarchy — • the official recognition of the Christian Church by Galerius in 311 serves as a convenient starting-point for what we know as universal Christendom, though the slow disappearance of paganism, as distinct from Christianity, stretches over at least a century more. The Reformation of the 16th century has long been regarded as the close of the period. The real close, how- ever, is the present day — as the result of the rationalism and science of the 18th and 19th centuries. The heroes of the Reformation, judged by modern standards, were reactionaries. Unconsciously and to its own ultimate damage the Reformation forged the weapons of progress; but it was itself in no sense, except the institutional and political, the end of that religious history inaugurated before the Council of Nicaea. The real change in attitude which marks the dawn of a new era came in the generation of Voltaire. And ” medievalism ” is only now on the defence against ” modernism,” both Catholic and Protestant.

In legal history there was a distinct medieval period, when Germanic customs superseded Roman law, that most splendid of Rome’s legacies. But the renaissance of law began relatively early; by the 12th century it had created a university, by the 13th it was helping to organize national states and laying the basis for that order which the economic renaissance was already demanding.

In science there was no great product in antiquity to be lost. Compared with art or law, literature or philosophy, ancient science (in our sense) was almost insignificant. The promise in Aristotle of such production remained unfulfilled. The 17 th century is not so much a renaissance here as a mere beginning. No one can deny the general unscientific, uncritical nature of ” medieval ” thought. A single Roger Bacon does not relieve his age of the charge. But the middle age in science must include much of antiquity, including Pliny.

Philosophy was the one subject which had, clearly and definitely, a medieval period. Scholasticism, which absorbed the attention of most thinkers from about the nth to about the

1 5th centuries, is so easily marked ofi and played so considerable a role in the academic history of that time, that historians often refer to it as the only intellectual interest of ” medieval ” men. Then, selecting some of the later and less virile scholastics as victims, they ask how men could be seriously interested in their trivialities. But these men were not all busy over the problem of how many angels could stand on a needle-point; nor were they all dominated by the religious spirit of faith or intellectual cowardice. They were searching for truth with scientific eager- ness. Their very failure made possible the modern era. It is perhaps unnecessary to point out how small a proportion of the ” intellectuals ” were scholastics even in the 13th century.

In the realm of art the ” middle ages ” had already set in before Constantine robbed the arch of Titus to decorate his own, and before those museums of antiquity, the temples, were plundered by Christian mobs. The victory of Christianity — iconoclastic in its primitive spirit — was but a single chapter in the story of decline. The process was completed by the misery of the decaying empire, and by the Germanic invasions. The barbarians, however, destroyed less than has been commonly supposed. Destruction was more the product of necessity than of wantonness. Thus public monuments became fortresses, and antique sculpture was built into city walls. Such art as continued was almost wholly religious; for in the wilderness of the times the churches formed oases of comparative prosperity and peace, and, even in the darkest times, wherever such oases existed there the seeds of art took root. The Church architecture of the ” middle ages,” then developed naturally and without a break, through the Byzantine and Romanesque styles, out of the secular and religious architecture of Greece and Rome. And, with the return of comparatively settled and prosperous condi- tions, not only architecture but the other arts also blossomed under the influence of what was later stigmatized as the ” Gothic ” spirit into new and original forms. Down to the Reformation the churches continued to be, as the temples of the ancient world had been, the main centres of the arts; yet the arts were not confined to them, but flourished wherever, as in castles or walled cities, the conditions essential to their development existed. With the revival of civilized conditions in secular life, secular ideals in art also revived; the ecclesiastical traditions in painting and sculpture, which always tend to become stereo- typed, began in the West to be encroached upon long before the period of the ” Renaissance.” The 12th and 13th centuries, which witnessed the great struggle between the secular and spiritual powers in the state, witnessed also the rise of a literature inspired by the lay spirit, and of an art which was already escaping from the thraldom of the stereotyped ecclesiastical forms. Gothic

sculpture was not incidentally decorative, it was an essential element in the harmony of the architectural design. The elongated kings that guard the door of Chartres Cathedral, or the portals with the Last Judgment, are a necessary element in the facade. Thus fettered, even the realism of the Gothic sculptors failed, except in rare instances, of its full expression. The plastic arts were left for Italy, where antique models were at hand, and the glory of its achievement in the 15th and 16th centuries was so great as to obscure in men's eyes what had been done before.

But this Italian renaissance was not the only one. It was but one of many; and it was concerned with the two subjects which perhaps least deeply influence the lives of the mass of men — -literary humanism and art. It is obviously absurd, in the face of the foregoing facts, to regard it as the end of a middle age in anything but in its own field.

When one studies the history of Europe subject by subject, as indicated above, and not merely in a monastic chronicle of things in general, chosen according to the author's point of view, one sees the old-time framework passing away. The traditional idea of a barren middle age and a single glorious renaissance proves false. An organic study of the past reveals a more rational picture of the process which produced the Europe of to-day. Cataclysm and special creation here as elsewhere give way to evolution. The new synthesis reveals a universal

decline from the 5th to the 10th centuries, while the Germanic races were learning the rudiments of culture, a decline that was deepened by each succeeding wave of migration, each tribal war of Franks or Saxons, and reached its climax in the disorders of the 9th and 10th centuries when the half-formed civilization of Christendom was forced to face the migration of the Northmen by sea, the raids of the Saracen upon the south and the onslaught of Hungarians and Slavs upon the east. That was the dark age. It left Europe bristling with feudal castles, and already alert for the march of progress. At once the march begins. Henry the Fowler beats back the Slavs and places the outposts of Christen- dom along the Elbe and the Oder. Otto I., his son, drives the Magyars from southern Germany and establishes the East Mark (Austria) to guard the upper Danube. The. restoration of the Empire in 962 marks the first milestone on the pathway of re- covery. Already scholarship had found a home in monasteries planted in the heart of the German forests. The succeeding century brought the Empire to the acme of its power, until Henry III. in the Synod of Sutri, sat in judgment on the impo- tent and demoralized papacy. Meanwhile France had been learning something even in its feudal anarchy. The

monks of Cluny were at work. The Capetians had begun. The great monastery of Bee was drawing the sons of northern sea-robbers to the service of that greatest “civilizing force, the Church. The progress made through even this darkest age may be measured by the difference between the army of Rollo and that which William the Conqueror gathered for the invasion of England.

There is a legend, current among historians from the days of Robertson and Hallam, that as the year 1000 approached man- kind prepared for the Last Judgment; that the earth ” clothed itself with the white mantle of churches,” and like a penitent watched in terror and in prayer for the fatal dawn. Contem- porary sources fail to bear out this beautiful conception. Apart from the fact that reckoning from the birth of Christ was by no means universal, and consequently the mass of men were ignorant that there was such a thing as the year 1000, one wonders how that most enduring type of architecture, the Romanesque, reached its maturity among men who thought that the earth itself was so soon to ” shrivel like a parched scroll.” Recent scholarship has absolutely disproved this legend, founded on a few trite phrases in monastic chronicles, and still to be heard in similar contexts. • The year 1000 marks no epoch in medieval history.

The latter half of the nth century witnessed the most remark- able political creation in Europe since the days of Caesar, the papal monarchy of Hildebrand. The great scholastic contro- versies had already begun in the schools of France ; the revival of Roman law had called forth the university of Bologna, and the canonists had begun the codification of the law of the Church. The way was already cleared for the busy 12th century — the age of Louis VI. and Henry II., of Glanvill and Suger, of Abelard and Maimonides, of Frederick Barbarossa and Alexander III., of the emancipation of French communes and cities and the inde- pendence of those of Lombardy, of the growth of gilds and the extension of commerce, of trouvere and troubadour and the beginnings of vernacular literature, of the creation of Gothic art, of trial by jury and the supremacy of royal justice. Such are but a fraction of its achievements. The 12th century stands beside the 18th as one of the greatest creative centuries in human history. The 13th like the 19th applied these creations in the transformation of society. The century of Dante was also that of the first English parliament; its vast economic expansion enabled the national state to triumph in both England and France, and furnished the grounds for the overthrow of Boniface VIII. Into the complex history of this momentous age it is impossible to go in any detail. Sufficient to say that in the opening quarter of the 14th century England and France at least stood on the brink of ” modern times.” Then these two nations

entered upon that long tragedy of the Hundred Years' War, a calamity absolutely immeasurable to both. But during its massacres, jacqueries, plagues and famines, the cities of Italy, growing rich with trade and manufactures, were in their turn

the centres of progress, this time in a new direction, toward the recovery of the antique past and the development of art.

This is the so-called Renaissance (q.v.). The humanists which it produced, interested only in its splendid revelations, forgot or ignored the achievements of the period which inter- vened between Cicero and Petrarch. Then by the genius of their work they fastened their mistaken perspective upon his- torians and the cultured world at large. They struck upon the unfortunate and opprobrious term " middle ages " for that which stood between them and their classic ideals. The term was first used in this sense by Flavio Biondo, whose " decades " was an attempt to block out the annals of history from 410 to 1410. His treatment fell in admirably with the ideas of his age and of that following. To Protestants the age of the papal monarchy was like the reign of Anti-Christ. Then, after the indifference of humanists and Protestant polemic, came the dis- gust of men of science at the scholastic philosophy — an attitude best exhibited in Bacon's Advancement of Learning. The 1 8th century was thus trebly barred from a knowledge of genuine medieval history. Romanticism, that reaction in which Sir Walter Scott, the Schlegels and Victor Hugo so largely figured, was as far from understanding what it admired as classicism had been from what it hated. Its extravagant praise of all that savoured of the middle ages was still blind to their real progress and work. They were, for it, the ages of romance and chivalry. The view of the romanticists was as one-sided as any that had gone before. It is only with the introduction of a wider outlook in the scientific study of history that it has been possible to straighten the perspective and modify the traditional scheme.

In the purely intellectual sphere it is certainly true that the recovery of the antique world was of great importance; that it made possible genuine criticism by presenting new points of contrast and opening up fields that led away from theological quibbles. But it did not mean the " double discovery of the outer and inner world." Mankind did not, as Burckhardt and J. A. Symonds lead one to imagine, suddenly throw off a cowl that has blinded the eyes for a thousand years to the beauty

of the world around, and awaken all at once to the mere joy of living. If any one was ever awake to the joys of living it was the minnesinger, troubadour or goliard, and the world had to wait until Rousseau and Burns before its external beauty was dis- covered, or at least deeply appreciated, by any but a few Dutch artists. Even Goethe crossed the Alps with his carriage shutters closed. Mont Blanc is not mentioned by travellers until after the middle of the 18th century. The discovery of the outer world is a recent thing in art as well as in science. As for the claim that the ” Renaissance ” delivered men from that blind reliance upon authority which was typical of ” medieval ” thought, that is a fallacy cherished by those who themselves rely upon the authority of historians, blind to the most ordinary processes of thought. In this regard, indeed, in spite of the advance of scientific method and the wealth of material upon which to base criticism, we are still for the most part in the middle ages. The respect for anything in books, the dogma of journalistic inerrancy which still numbers its devotees by millions, the common acceptance of even scientific conceptions upon the dicta of a small group of investigators, these are but a few of the signs of the persistence of what is surely not a medieval but a universal trait. The so-called Renaissance did much; but it did not do the things attributed to it by those who see the ” middle ages ” through humanist glasses.

Upon the whole, therefore, it would seem that not only was there no one middle age common to all branches of human evolu- tion, except the period more definitely marked as the dark age, but that those characteristics which are generally regarded as ” medieval ” were by no means limited to a single epoch of European history. In short, the dark age was a reality; but the traditional ” middle ages ” are a myth. (J. T. S.*)

MIDDLEBORO, a township of Plymouth county, Massachu- setts, U.S.A., in the S.E. part of the state, bounded on the N.W. by the Taunton river. Pop. (1890), 6065; (1900), 6885 — of whom 920 were foreign-born; (1910 census) 8214. Area,

about 70 sq. m. The principal village also is named Middleboro’, it is 35 m. S. of Boston, is served by the New York, New Haven & Hartford railroad and by electric lines connecting with Taunton, Boston, New Bedford and Cape Cod, and has a town- house, a soldiers’ monument, and a public library housed in a building erected from a fund (part of which is used as a permanent endowment) bequeathed by Thomas Sprout Peirce (1823-1901), a merchant of the township, who, in addition, bequeathed about $500,000 as a special trust-fund for the use and benefit of the town of Middleboro; the income has been spent

largely in the construction of macadam roads, the erection of an almshouse and the installation of special courses in the high school. The village, a place of considerable natural beauty, is a summer resort, and has various manufactures. Other villages in the township are North, East and South Middleboro, and Rock. The township had important herring fisheries in early times and manufactured straw hats (from 1828) and ladies' dress goods. Middleboro was settled about 1662 under the Indian name Nemasket; became a part of the township of Plymouth in 1663; and in 1669 was incorporated as a separate township, taking its name probably from Middlesbrough, North Riding, York.

See Thomas Weston, History of the Town of Middleboro, Massachusetts (Boston, 1906).

MIDDLEBURY, a village and the county-seat of Addison county, Vermont, U.S.A., in Middlebury township, on Otter Creek, about 31 m. N.N.W. of Rutland. Pop. of the village (1890), 1762; (1900), 1807 (221 foreign-born); (1910), 1866; of the township, (1900), 3045; (1910), 2848. Middlebury is served by the Rutland railroad. It is picturesquely situated near the Green Mountain range, and is the seat of Middlebury College (chartered, 1800; co-educational since i883),which offers a classical course and a Latin-scientific course, and had in 1907- 1908 12 instructors and 203 students (84 of whom were women), and a library of 35,000 volumes. The Sheldon art museum and a public library are among the public institutions of the village, and the principal buildings include the court-house and the opera-house. The principal industrial establishments are marble quarries, " Italian " marble works, iron foundries, lime-kilns, flour-mills, and door, sash and lumber mills. About 1 m. north of the village, in the township of Weybridge, there is a large United States government breeding station for Morgan horses; and merino sheep are raised in the vicinity.

The township of Middlebury was incorporated in 1761, and the first settlement on the site of the present village was made in 1773. At the outbreak of the War ˆf-Lndependence the settle- ment was deserted, and all except two or three of the houses were destroyed by British troops; but the settlers returned soon after the close of the war, and the township was formally organized and sent a- member to the state assembly in 1788. Middlebury was incorporated as a borough in 1813, and as a village in 1832.

MIDDLESBROUGH, a municipal, county and parliamentary borough and seaport in the North Riding of Yorkshire, England, 2385 m. N. by

W. from London, on the North Eastern railway. Pop. (1891), 75,532; (1901), 91,302. It lies on the south bank of the Tees, 5 m. from its mouth in the North Sea, and is the centre of one of the most important iron-working districts in the world. It is wholly of modern growth, having been incorporated in 1853. Its chief buildings are a fine town-hall with lofty clock-tower and spire (1889), containing the municipal offices, free library, &c; the exchange, county court, Dorman memorial museum and Roman Catholic cathedral. Besides iron and steel works, the first of which was that of Messrs Bolckow, Vaughan & Co., there are rolling-mills, tube works, wire-mills, engineering works, oil works, chemical works, salt works and a considerable ship- building industry. The district abounds in blast furnaces. The docks are accessible to large vessels, the entrance having a depth of 32 ft. Extensive dredging operations are carried on in the river. The accommodation for shipping includes two graving docks, two patent slips, &c. The entrance to the river is pro- tected by two breakwaters named respectively the North Gare and South Gare. The furnaces within the port produce some

2,500,000 tons of pig iron annually. Middlesbrough is the seat of a Roman Catholic bishop. The parliamentary borough falling within the Cleveland division of the county, returns one member. The county borough was created in 1888. The town is governed by a mayor, ten aldermen and thirty councillors. Area, 2823 acres. ,

The earlier history of the place is meagre. Where Middles- brough now stands there were at one time a small chapel and priory founded by Robert de Brus of Skelton Castle. These were dedicated to St Hilda, and with some lands were given by de Brus to the abbey of St Hilda at Whitby in 1 130. The priory fell into ruins at the time of the Reformation, and no trace now remains beyond some stones built into the wall of a brewery. The Oak Chair in the town-hall also is made from a fragment. In 1801 there were upon the site of Middlesbrough only four farm- houses. In 1829 a company styling itself the Middlesbrough Owners bought 500 acres of land, and began building in the town. In 1830 the Stockton & Darlington railway was extended to Middlesbrough; four years later the town was lighted with gas; and after six years more a public market was established. The census of 1831 showed the population to be 154; that of 1841 showed 5709. In 1842 the opening of the docks gave additional importance to the town. From the year 1851, when John Vaughan discovered the

presence of ironstone in the Eston hills, the town advanced rapidly.

MIDDLESEX, LIONEL CRANFIELD, ist Earl of (1575-1645), was a successful London merchant, who was introduced to King James I. by Henry Howard, earl of Northampton, and entered the royal service in 1605. In 16 13 he was knighted and was appointed surveyor-general of customs; in 1616 he became one of the masters of requests, and in 1619 master of the court of wards and liveries and chief commissioner of the navy. He was returned to parliament as member for Hythe in 1614 and for Arundel in 162 1. Cranfield, who was also master of the ward- robe, was responsible for many economies in the public service, and his business acumen was very useful to the king. Ho took part in the attack on Bacon in 1621, and although, contrary to general expectation, he did not succeed Bacon as lord chancellor, he was created Baron Cranfield in July of this year. In 1621 also he became lord high treasurer, and in September 1622 was created earl of Middlesex, losing his positions and influence shortly afterwards because he opposed the projected war with Spain, and had incurred the hostility of Prince Charles and George Villiers, duke of Buckingham. Impeached by the House of Commons for corruption, he was found guilty by the House of Lords in May 1624 and was sentenced to lose all his offices, to pay a heavy fine and to be imprisoned during the king's pleasure. However, he was released from prison in a few days, was pardoned in the following year, and was restored to his seat in the House of Lords in 1640. The earl's second wife was Anne Brett. (d. 1670). a cousin of Buckingham's mother, whom he married somewhat reluctantly in 162 1 in order to ensure Buckingham's support. Middlesex died on the 6th of August 1645, leaving with other issue a son James (1621-1651), 2nd earl of Middlesex, who was a partisan of the parliamentary party during the Civil War. James was succeeded by his brother, Lionel, and when this earl died in October 1674 his titles became extinct. The first earl's daughter Frances married Richard Sackville, 5th earl of Dorset, and their son Charles was created earl of Middlesex in 1675. Two years later he became earl of Dorset, and the title of earl of Middlesex was borne by the earls and dukes of Dorset until 1843.

MIDDLESEX, a south-eastern county of England, bounded N. by Hertfordshire, E. by Essex, S.E. by the county of London, S. by Surrey, and W. by Buckinghamshire. The area is 283-3 sq. m., and, excepting Rutland, the county is the smallest in England. The area outside the county of London, or extra- metropolitan area, with which this article is mainly concerned, is 233-8 sq. m. It lies entirely in the basin of the river Thames, which forms its southern boundary. On the east it is separated from Essex by the Lea, the largest northern tributary of the

Thames. The other rivers, in order westward, are the Brent, the Crane or Yedding Brook, and the Colne. The waters of

several streams are collected in the artificial Brent reservoir near Hendon, from which the Brent flows with a circuitous course to the Thames at Brentford. The Crane, rising in the high ground near Harrow-on-the-Hill, joins the Thames at Isleworth; and the Colne, which rises on the elevated plain between Hatfield and St Albans (Hertfordshire), traverses a flat valley on the western boundary of the county, where it divides into several channels, and joins the main river at Staines. The highest ground, exceeding 400 ft. at several points, and reaching 503 ft. above Stanmore, is found along the northern boundary, in a line from Stanmore through Elstree, Chipping Barnet and Potter's Bar. Two well-marked lines of heights, detached from the main line, project southward, the eastern from Whetstone through Finchley and Highgate to Hampstead, where, within the county of London, a height of 443 ft. is found on Hampstead Heath ; the western being the isolated elevation on which stands Harrow-on-the-Hill. The hills skirting the Lea valley, in the neighbourhood of Enfield, are abrupt, though of no great elevation. Elsewhere the country is very slightly undulating or quite flat, as along the banks of the Thames and Lea. The Thames, however, beautifies its immediate neighbourhood, and rich sylvan scenery is not wanting in the higher districts. The greater part of the county was formerly densely forested and sparsely populated, and the name of Enfield Chase, a royal preserve in the north-east, still recalls this condition. In modern times the visible influence of London has spread over practically the entire county. Villages have grown into populous suburbs; large institutions, for which sites adjacent to rather than within the metropolis have been found preferable, are numerous, and the development of suburban railway communi- cations has brought fresh ground within reach of builders.

Geology. — The county lies entirely within the structural basin of the Thames, and, as in the neighbouring counties, the general slope of the ground and dip of the strata is towards the south-east. South of an irregular line passing from Uxbridge, north of Hayes, by Hanwell and Ealing to Hyde Park and east of a similar line from the upper side of the Park to Tottenham and on from that point to Enfield, the only visible deposits are the gravels, loams, brick- earths and sands laid down in former times by the Thames, with contributions by the Lea and the Colne. These alluvial deposits rise gradually northward from the Thames and westward from the Lea, in a series of gentle terraces. The earliest portions of London were built upon these terraces, because while they were dry at the surface, water could be obtained

by sinking shallow wells. The alluvium has yielded many flint implements and the bones of the mammoth, bear and rhinoceros, great elk and other extinct forms. The loams are dug for bricks and the gravel for ballast, &c, about West Drayton, Southall, Enfield and Tottenham.

The London clay, a marine deposit, is bluish where it has not been turned brown by exposure to the weather. It underlies all the river deposits and rises to the surface north and east of the alluvial boundary indicated above. It gives rise to the undulating grassy country round Harrow, Chipping Barnet and Elstree. Below the London clay are the more sandy Reading beds, they may be seen at Harefield and at South Minims; inliers occur at Pinner and Ruislip. Chalk is only visible on the side of the Colne valley at Harefield, where it is quarried, and at South Mimms. Formerly, the sandy and pebbly Bagshot beds covered all the London clay area, but now only isolated patches remain, such as those on the top of Harrow, Hampstead and Highgate hills. Long after the Bagshot beds were laid down the country was covered by a variety of glacial deposits; such are the pebble gravels of Stanmore Heath and the district north of Barnet, the clay and sand of Finchley, Muswell Hill and Southgate, the chalky boulder clay to be seen at Finchley, Southgate and Potter's Bar. Several deep borings in the London basin prove the existence, beneath the chalk, of beds which do not crop out in Middlesex. The most interesting is that at Meux's Brewery, Tottenham Court Road (about 1146 ft.), which passes through the following formations: gravel and clay, 21 ft.; London clay, 64 ft. ; Reading beds, 51 ft. ; Thanet sand, 21 ft. ; chalk, 655 ft.; upper greensand, 28 ft.; gault, 160 ft.; lower greensand, 64 ft. ; Devonian rocks, 80 ft. 1

Industries, &c. — The climate of some of the high-lying districts is particularly healthy. Little more than one-half the total area of the county is under cultivation; and the grain crops, greatly decreasing, are insignificant. The soil in the north and north-west

1 See " Geology of Part of the London Basin," Mem. Geol. Survey, 2 vols.; "Soils and Subsoils," ditto; Proceedings of the Geolo- gists' Association. A large model of the geology of London is exhibited in the Museum of Practical Geology, Jermyn Street, London.

is heavy, poor clay; but the rich alluvial soil of the Thames Valley is specially suitable for market gardens. On the outskirts of London much land now built over was formerly devoted to market gardening.

The number of livestock decreases; in fact, agriculture as a whole has slowly to give place to extension of building. Industries are extensive and varied. The county is naturally, in view of the proximity of London, closely intersected with railways, the following companies, from east to west and south, affording communi- cations: Great Eastern, Great Northern, Midland, London & North- western, Metropolitan, Great Central, Metropolitan District, Great Western, London & South- Western. Moreover, in some parts the tramway system has been extended over a wide area from London ; thus Uxbridge, in the extreme west of the county, is so served. The principal canals are the Grand Junction, running west from Brentford to the Colne Valley, and thence northward; with a branch (the Paddington Canal) connecting it with the Regent's Canal in London ; and, in the east, the Lea navigation.

Population and Administration. — The area of the ancient county is 181,320 acres, with a population in 1871 of 2,539,765; in 1891 of 3,251,671 ; and in 1901 of 3,585,323. At the time of the Domesday Survey the population of Middlesex, exclusive of London, was 2302. The extra-metropolitan area is 149,668 acres, with a population in 1901 of 798,738. The part of the ancient county transferred to the county of London under the Local Government Act 1888 was 31,484 acres in extent, and 771 acres were then transferred to Hertfordshire; while under the London Government Act 1899 the southern part of Hornsey was transferred to London. The area of the administrative county is 148,700 acres. The county contains six hundreds. The municipal boroughs are Ealing (pop. 33,031), Hornsey (72,056). The urban districts are Acton (37,744), Brent- ford (15,171), Chiswick (29,809), Edmonton (46,899), Enfield (42,738), Feltham (5280), Finchley (22,126), Friern Barnet (11,566), Greenford (819), Hampton (6813), Hampton Wick (2606), Hanwell (10,438), Harrow-on-the-Hill (10,220), Hayes (3000), Hendon (22,450), Heston and Isleworth (30,863), Kingsbury (757), Ruislip- Northwood (3850), Southall Norwood (13,200), Southgate (14,993), Staines (6688), Sunbury-on-Thames (4544), Teddington (14,037), Tottenham (102,541), Twickenham (20,991), Uxbridge (8585), Wealdstone (5901), Wembley (4519), Willesden (114,811), Wood Green (34,233). The county is in the jurisdiction of the central criminal court, and the whole extra-metropolitan county is within the metropolitan police district, the name of " Greater London " covering it. There are one court of quarter sessions and eight petty sessional divisions. The number of civil parishes is 60. Middlesex (extra-metropolitan) is wholly in the diocese of London, excepting a small portion in that of Oxford, and includes 153 ecclesiastical parishes or districts, wholly or in part. The extra-

metropolitan parliamentary divisions, each returning one member, are Enfield, Tottenham, Hornsey, Harrow, Uxbridge, Brentford and Ealing.

History. — The district which is now Middlesex was colonized in the 6th century by an offshoot of the East Saxon tribe, and derived its name from its position between the kingdoms of the East and West Saxons. In a charter dated 704 Middlesex is mentioned by name as a dependency of Essex, but soon after it acknowledged the supremacy of Mercia, and from 748 onwards the Mercian council was held at London, and from 780 onwards at Brentford. In the 9th century Middlesex formed part of the Danelagh, and in 993 Anlaf the Dane came with 93 ships to Staines. The only reference to Middlesex in the Saxon Chronicle occurs in 101 1 , when it was again overrun by the Danes. The Conqueror's march upon London was preceded by a general devastation of the surrounding country, the effects of which are illustrated in the Domesday Survey by the diminution in land values. At this time the district north of London formed the vast forest of Middlesex, the greater part of which was dis- afforested in the reign of Henry. III. Enfield had woodlands for 2000 pigs; Ruislip for 1500 pigs; and Kingsbury, Hillingdon and Hendon for 1000 pigs each. Vineyards are mentioned at Holborn, Colham, Kempton and Kensington; fishponds at ,Harmondsworth and Harefield produced each 1000 eels.

As a shire Middlesex probably originated about the time of the frith of 886, when it is described as the land dependent upon London, and in 912 is referred to as " London and the land which owed obedience thereto." During the Saxon period the exten- sive manors held by the church of Canterbury, the bishop of London and his canons of St Paul's, and the abbey of Westminster were held as independent franchises, the courts for St Paul's being held at Stepney and Fulham, for West- minster at Westminster and Staines, and for Canterbury at Harrow. By charter of Henry I. (confirmed by Stephen and Henry II.) the citizens of London held Middlesex at

farm for £300, with power to elect a sheriff from among their number, and by charter from John the shrievalty of both London and Middlesex was granted to the mayor and citizens in fee. By charter of 1242 the common pleas for the county of Middlesex were ordered to be held at the stone cross in the Strand. Under a charter of 1447 the lord mayor was authorized to nominate one of the city aldermen as justice of the peace for Middlesex. The six modern hundreds of Edmonton, Elthorne, Gore, Isleworth, Ossulston, and Spelthorne have

been scarcely changed since the Domesday Survey, except that Isleworth was then Honeslaw (Hounslow), while in the 12th century hidage a hundred of ” Mimes ” is mentioned, corresponding with the Domesday hundred of Edmonton. Middlesex has always been included in the diocese of London. The archdeaconry of Middle- sex, which includes part of Essex, is mentioned in 1151, but the Middlesex portion was not subdivided into rural deaneries until 1857, when the deaneries of Fulham, Ealing, Uxbridge, Staines, Hampton, Enfield, Harrow and St Pancras were created. The deaneries of Chelsea, Hammersmith, Hampstead, Hornsey, Ken- sington, Paddington, St Marylebone, Westminster and Willesden were created later, but Staines was abolished.

In 1 215 Middlesex was ravaged by William, earl of Salisbury, and Falkes de Breaute, and in the same year at Runnimede near Staines John was forced to issue the. Magna Carta. In the Civil War of the 17th century Middlesex supported the Parlia- mentary cause, joining in 1642 with Hertfordshire and Essex in a petition that the votes of the bishops and popish lords might be disallowed in the House of Lords, and that the forts and castles of the kingdom might be placed in such hands as the Parliament could confide in. Sir Denzil Hollis was defeated by the Royalists at Brentford in 1642, and in 1645 a fruitless treaty between Charles I. and the Parliament was concluded at Uxbridge. Brentford had famous election contests in 1768 and 1769.

The woollen and leather industries flourished in Middlesex in Norman times. London was the great place of slaughter, and hides were tanned at Enfield. Bricks were also manu- factured from early times, and Heston was noted for its wheat. Paper was extensively manufactured in the 17th century, and much distress was caused in 1636 by a decree prohibiting the purchase of old rags for the Middlesex paper-mills for fear of the plague. In 1640 the manufacturers of mohair yarn in Middlesex appealed against a bill prohibiting the wearing of material made of the said yarn during the winter season. In 1655 a certificate of a hundred master tanners and other traders of Middlesex approved an invention for converting raw hides into leather by means of new liquor, with or without oak-bark.

Middlesex returned two members to parliament in 1295. (For the representation of London, see London.)

See John Nqrden, Speculum Britanniae: thefirste parte, an histori- call and chorographicall description of Middlesex (London, 1593; reprinted “1637 and 1723); Daniel Lysons, The Environs of London (1 792-1 796); Victoria County History, Middlesex.

MIDDLETON, EARLS OF. John Middleton, ist Earl of Middleton (c. 1619-1674), belonged to a Kincardineshire family which had held lands at Middleton since the 12th century. In early life he served as a soldier in France; later he fought against Charles I. both in England and in Scotland, being especially prominent at the battle of Philiphaugh and in other operations against the great Montrose. He held a high command in the Scottish army which marched to rescue the king in 1648, and he was taken prisoner after the battle of Preston. He joined Charles II. when that monarch reached Scotland in 1650, but he was soon at variance with the party which at that time was dominant in church and state and was only restored to favour after doing a public penance at Dundee. He was a captive for the second time after the battle of Worcester, where he commanded the Royalist cavalry, but he escaped from the Tower of London to Paris. In 1653 Middleton was chosen by Charles II. to head the projected rising in Scotland. He reached that country in February 1654, but the insurrection was a complete failure. Its leader, who cannot be held responsible for this result, remained in Scotland until 1655, when he rejoined Charles II., who made

him an earl in 1656. He returned to England with the king in 1660 and was appointed commander-in-chief of the troops in Scotland and lord high commissioner to the Scottish parliament, which he opened in January 1661. He was an ardent advocate of the restoration of episcopacy, this being one reason which led to serious dissensions between the earl of Lauderdale and himself, and in 1663 he was deprived of his offices. He was afterwards (1667) governor of Tangier, where he died in June 1674.

His eldest son Charles, 2nd Earl of Middleton (c. 1640- 1710), held several offices under Charles II. and James II., being envoy extraordinary at Vienna and afterwards joint secretary for Scotland. In 1684 he became an English secretary of state, and with Richard Graham, Viscount Preston, he had the difficult task of managing the House of Commons for James II. He was loyal to James after the king fled to France, although he re- mained in England, where, as the leader of the moderate Jacob- ites, he sought to bring about a restoration by peaceful means. In 1693 the earl joined the exiled king at St Germains, where he became his secretary of state; afterwards he held the same office at the court of James Edward, the old pretender, in Flanders and in Lorraine. He was partly responsible for the

unsuccessful expedition of the Jacobites to Scotland in 1707, and he resigned his office as secretary in 1713. Middleton, who had been created earl of Monmouth by the pretender, died in 1719. His titles had been declared forfeited in 1695, but they were claimed by his son John, who died unmarried about 1746. The earl was a Protes- tant, although a lukewarm one, until 1701, when he yielded to the dying wish of James II. and joined the Roman Catholic Church.

One of Middleton's kinsmen was Sir Charles Middleton, Bart. (1726-1813). Having served in the navy Middleton was comptroller of the navy from 1778 to 1790, "standing out through that period of inept administration as the pillar of the service." In April 1805, at a most critical time, he was, although eighty years of age, appointed first lord of the admiralty by Pitt and was created Lord Barham. It has been usual to regard Barham as a cipher at the admiralty board, but more recent research, especially an examination of the Barham Papers, has proved this to be the reverse of the truth. He enjoyed the absolute confidence of Pitt, and it was his experience, industry and energy which made possible the great campaign which ended at Trafalgar. He resigned office in January 1806 and died on the 17th of January 1813. His barony passed through his daughter Diana (1762-1823) to the Noels, earls of Gains- borough, by whom it is still held. The Barham Papers are being edited by Sir J. K. Laughton (vol. i. 1907; vol. ii. 1910). See also J. S. Corbett, The Campaign of Trafalgar (1910).

See A. C Biscoe, The Earls of Middleton (1876).

MIDDLETON, ARTHUR (1742-1787), American politician and signer of the Declaration of Independence, was born at Middleton Place on the Ashley river, South Carolina, on the 26th of June 1742. His family was one of the most prominent in the colony. The grandfather, Arthur Middleton (1681-1737), was president of the Council in 1 721-1730 and as such was acting governor in 1725-1730, and the father, Henry Middleton (1717- 1784), was speaker of the Assembly in 1 745-1 747 and again in 1754-1755, a delegate to the Continental Congress in 1774-1776, and its president from October 1774 to May 1775, a member of the South Carolina Committee of Safety, and in 1775 president of the South Carolina Provincial Congress. Like most wealthy South Carolinians of the 18th century, Arthur Middleton was educated in England — at Hackney, at Westminster School, and at St John's College, Cambridge. He then returned to South Carolina, but soon afterwards went back to England to live, and travelled on the Continent. In 1773 he again returned to South Carolina, and in the controversies between the colonists and the home government became

a leader of the Whigs. He was a member of the provincial Council of Safety in 1775-1776, and a delegate to the Continental Congress in 1776-1777. In 1778 he was elected governor of South Carolina, but owing to his dis- satisfaction with the new state constitution he declined to serve. He was captured by the British at Charleston in May 1780, was exchanged in July 1781, was again a delegate to Congress in

1 781-1783, and later served in the state legislature. He died on the 1st of January 1787 at Middleton Place, near Charleston.

His eldest son, Henry Middleton (1770-1846), was an orator of ability, was governor of South Carolina in 1810-1812, a representative in Congress in 1815-1819, and the United States minister to Russia from 1820 to 1830, negotiating in 1824 a convention ” relative to navigation, fishing and trading in the Pacific Ocean, and to establishments on the North-West Coast.” This was the first treaty between the United States and Russia.

MIDDLETON, CONYERS (1683-1750), English divine, was born at Richmond in Yorkshire on the 27th of December 1683. He graduated at Cambridge, took orders, and in 1706 obtained a fellowship, which he soon resigned upon contracting an advanta- geous marriage. In 171 7 a dispute with Richard Bentley, who made an extortionate demand on the occasion of Middleton’s being created D.D., involved him in an acrimonious controversy. He wrote several trenchant pamphlets, among them the ” Remarks ” and ” Further Remarks ” on Bentley’s Proposals for a New Edition of the Greek Testament, an endeavour to visit his grievances upon the text of the New Testament. In 1723 he was involved in a lawsuit by personalities against Bentley, which had found their way into his otherwise judicious tract on library administration, written on the occasion of his appointment as university librarian. In 1726 he offended the medical profession by a dissertation contending that the healing art among the ancients was only exercised by slaves or freedmen. Between the dates of these publications he visited Italy, and made those observations on the pagan origin of church ceremonies and beliefs which he sub- sequently embodied in his Letter from Rome (1729). This cogent tract probably contributed to prepare the storm which broke out against him on his next publication (1731). In his remonstrance with Daniel Waterland on occasion of the latter’s reply to Matthew Tindal’s Christianity as Old as the Creation, Middleton takes a line which in his day could hardly fail to expose him to the reproach of infidelity. He gives up the literal truth of the primeval Mosaic narratives; and, in pro- fessing to indicate a short and easy method of confuting Tindal,

lays principal stress on the indispensableness of Christianity as a mainstay of social order. This was to resign nearly every- thing that divines of the Waterland stamp thought worth defend- ing. Middleton was warmly assailed from many quarters, and retreated with some difficulty under cover of a sheaf of apolo- getic pamphlets and a more regular attendance at church. His next important publication was a Life of Cicero (1741), largely told in that statesman's own words. Though Middleton's reputation was much enhanced by this piece of work, there is no doubt that he drew largely from the scarce book of William Bellenden, De tribus luminibus Romanorum. The work was undertaken at the instance of Lord Hervey, in correspondence with whom also originated his disquisition on The Roman Senate, published in 1747. The same year and the following produced the most important of all his writings, the Introductory Discourse and the Free Inquiry " concerning the miraculous powers which are supposed to have subsisted in the church from the earliest ages." In combating this belief Middleton indirectly established two propositions of capital importance. He showed that ecclesi- astical miracles must be accepted or rejected in the mass; and he distinguished between the authority due to the early fathers' testimony to the beliefs and practices of their times, and their very slender credibility as witnesses to matters of fact. Some individual grudge seems to have prompted him to expose, in 1750, Bishop Sherlock's eccentric notions of antediluvian prophecy, which had been published 25 years before. On the 28th of July 1750 he died at Hildersham, near Cambridge.

Middleton's most ambitious work is obsolete from no fault of his, but his controversial writings retain a permanent place in the history of opinion. In his more restricted sphere he may not inappropriately be compared with Lessing. Like Lessing's, the character of his intellect was captious and iconoclastic, but redeemed from mere negation by a passion for abstract truth, too apt to slumber until called into activity by some merely personal stimulus. His diction is generally masculine and

harmonious. Pope thought him and Nathaniel Hooke the younger the only prose writers of the day who dtoerved to be cited as authorities on the language. Samuel Parr, while expos- ing his plagiarisms, heaps encomiums on his style. But his bes'c qualities, his impatience of superstition and disdain of mere external authority, are rather moral than literary.

The best general view of his intellectual character and influence is to be found in Sir Leslie Stephen's English Thought in the Eighteenth Century, ch. vi. A handsome edition of his works, containing several posthumous tracts, but not including the Life of Cicero, appeared in 4 vols, in 1752 and in 5 vols, in 1755.

MIDDLETON, THOMAS (c. 1570-1627), English dramatist, son of William Middleton, was born about 1570, probably in London. There is no proof that he studied at either university, but he may be safely identified with one of the Thomas Middletons entered at Gray's Inn in 1593 and 1596 respectively. He began to write for the stage with The Old Law, in the original draft of which, if it dates from 1599 as is generally supposed, he was certainly not associated with William Rowley and Philip Massinger, although their names appear on the title-page of 1656. By 1602 he had become one of Philip Henslowe's established playwrights. The pages of Henslowe's Diary contain notes of plays in which he had a hand, and in the year 1607-1608 he produced no less than six comedies of London life, which he knew as accurately as Dekker and was content to paint in more realistic colours. In 1 613 he devised the pageant for the installation of the Lord Mayor, Sir Thomas Middleton, and in the same year wrote an entertainment for the opening of the New River in honour of another Middleton. From these facts it may be reasonably inferred that he had influential connexions. He was frequently employed to celebrate civic occasions, and in 1620 he was made city chronologer, performing the duties of his position with exactness till his death.

The most notable event in his career was the production at the Globe theatre in 1624 of a political play, A Game at Chess, satirizing the policy of the court, which had just received a rebuff in the matter of the Spanish marriage, the English and Spanish personages concerned being disguised as the White Knight, the Black King, and so forth. The play was stopped, in consequence of remonstrances from the Spanish ambassador, but not until after nine days' performances, and the dramatist and the actors were summoned to answer for it. It is doubtful whether Middleton was actually imprisoned, and in any case the king's anger was soon satisfied and the matter allowed to drop, on the plea that the piece had been seen and passed by the master of the revels, Sir Henry Herbert. Middleton died at his house at Newington Butts, and was buried on the 4th of July 1627.

He worked with various authors, but his happiest collaboration was with William Rowley, this literary partnership being so close that F. G. Fleay (Biog. Chron. of the Drama) treats the dramatists together. The plays in which the two collaborated are A Fair Quarrel (printed 161

7), The World Lost at Tennis (1620), an ingenious masque, TheChangeling (acted 1624, printed 1653), and The Spanish Gipsie (acted 1623, printed 1653). The main interest of the Fair Quarrel centres in the mental conflict of Captain Ager, the problem being whether he should fight in defence of his mother's honour when he no longer believes his quarrel to be just. The underplot, dealing with Jane, her con- cealed marriage, and the physician, which is generally assigned to Rowley, was suggested by a story in Giraldi Cinthio's Hecatom- mithi. The Changeling is the most powerful of all the plays with which Middleton's name is connected. The plot is drawn from the tale of Alsemeroand Beatrice-Joanna in Reynolds's Triumphs of God's Reveng against Murther (bk. L, hist, iv.), but the story, black as it is, receives additional horror in Middleton's hands. The famous scene in the third act between Beatrice and De Flores, who has murdered Piracquo at her instigation, is admirably described by Swinburne:

" That note of incredulous amazement that the man whom she has just instigated to the commission of murder ' can be so wicked ' as to have served her end for any end of his own beyond the pay of a professional assassin, is a touch worthy of the greatest dramatist that ever lived. . . . That she, the first criminal, should be honestly

shocked as well as physically horrified by revelation of the real motive which impelled her accomplice into crime, gives a lurid streak of tragic humour to the lifelike interest of the scene; as the pure infusion of spontaneous poetry throughout redeems the whole work from the charge of vulgar subservience to a vulgar taste for the presentation or the contemplation of criminal horror."

Leigh Hunt thought that the character of De Flores, for effect at once tragical, probable and poetical, " surpassed anything with which he was acquainted in the drama of domestic life." The underplot of the piece, though it is based on the humours of a madhouse, has genuine comic flashes. The Spanish Gipsie has a double plot based on the Fuerza de la sangre and the Gitanitia of Cervantes Much has been said on the collaboration of Middleton with Rowley, who was much in demand with fellow- dramatists, especially for his experience in low comedy. These plays, even in scenes where the evidence in favour of one or other of the collaborators is clear, rise to excellence which neither dramatist was able to achieve alone. It was clearly no mechanical partnership the limits of which can be said to be definitely assigned when the actual text has been parcelled out between the collaborators.

With Thomas Dekker he wrote The Roaring Girle, or Moll Cut- Purse

(1611). The frontispiece represents Moll herself in man's attire, indulging in a pipe of tobacco. She was drawn or ideal- ized from life, her real name being Mary Frith (1584-1659 ?), who was made to do penance at St Paul's Cross in 161 2. "Worse things, I must confess," says Middleton in his preface, " the world has taxed her for than has been written of her; but 'tis the excel- lency of a writer to leave things better than he finds 'em." In the play she is the champion of her sex, and is equally ready with her sword and her wits. Middleton is also credited with a share in Thomas Dekker's Honest Whore (pt. i., 1604) . The Witch, first printed in 1778 from a unique MS., now in the Bodleian, ha,s aroused much controversy as to whether Shakespeare borrowed from Middleton or vice versa. The dates of both plays being uncertain, there are few definite data. The distinction between the two conceptions has been finely drawn by Charles Lamb, and the question of borrowing is best solved by supposing that what is common to the incantations of both plays was a matter of common property. The Mayor of Quinborough was published with Middleton's name on the title-page in 1661. Simon, the comic mayor, is not a very prominent character in the plot, which deals with Vortiger, Hengist, Horsus and Roxena among other characters. One of its editors, Mr Havelock Ellis, thinks the proofs of its authenticity as Middleton's work very slender. It is generally supposed to have been a very early work subjected to generous revision.

The plays of Middleton still to be mentioned may be divided into romantic and realistic comedies of London Life. Dekker had as wide a knowledge of city manners, but he was more sympathetic in treatment, readier to idealize his subject. Two New Playes. Viz.: More Dissemblers besides Women. Women beware Women, of which the former was licensed before 1622, appeared in 1657. The plot of Women beware. Women is a double intrigue from a con- temporary novel, Hyppolito and Isabella,, and the genuine history of Bianca Capello and Francesco de Medici. This play, which ends with a massacre appalling even in Elizabethan drama, may be taken as giving the measure — no mean one — of Middleton's unaided power in tragedy.

The remaining plays of Middleton are: Blurt. Master-Constable. Or the Spaniards Nighl-walke (1602); Michaelmas Terme (1607), described by A. C. Swinburne as an excellent Hogarthian comedy; The Phoenix (1607), a version of the Haroun-al-Raschid trick; The Famelie of Love (1608) ; A Trick to catch the Old-one (anonymously printed, 1608) ; Your Five Gallants (licensed 1608) ; A Mad World, my Masters (1608) ; A Chast Mayde in Cheapside (printed 1630), notable for the picture of Tim, the Cambridge student, on his return home; Anything for a

Quiet Life (c. 1617, printed 1662); No Wit, No Help like a Woman's (c. 1613, printed 1657); The Widdow (printed 1652), on the title-page of which appear also the names of Ben jonson and John Fletcher, though their collaboration may be doubted. Eleven of his masques are extant. A tedious poem, The Wisdom of Solomon paraphrased, by Thomas Middleton, was printed in 1597, and Microcynicon, Six Snarling Satires by T. M. Gent, in 1599. Two prose pamphlets, dealing with London life, Father Hubbard's Tale and The Black Book, appeared in 1604 under his initials. His non-dramatic work, however, even if gtenuine, has little value.

Authorities. — His works were edited by Alexander Dyce (5 vols.) in 184O, with a valuable introduction quoting many documents, and by A. H. Bullen (8 vols.) in 1885. The Best Plays of Thomas Middleton were edited for the Mermaid series (1887) by Havelock Ellis with an introduction by A. C. Swinburne. See also Miss P. G. Wiggin's Inquiry into the Authorship of the Middleton-Rowley Plays (Boston, 1897), and the notice on Middleton in Professor A. W. Ward's Hist, of Eng. Dram. Lit. (ed. 1899; ii., 493-540), which contains a full account of Middleton's Game at Chesse. A careful examination of the parallelisms between the plays of Shake- speare and Middleton is made by D. Hugo Jung in " Das Verhaltnis Thomas Middleton's zu Shakspere " (Miinchener Beitrage zur roman. u. engl. Phil. vol. xxix., 1904).

MIDDLETON, a market town and municipal borough in the Middleton parliamentary division of Lancashire, England,, on the Irk, near the Rochdale Canal, and on the Lancashire & Yorkshire railway, 6 m. N.N.E. from Manchester. Pop. (1901), 25,178. The church of St Leonards is of mixed architecture, with a low square tower. The oldest portion of the building (the tower arch) dates from the 12th century, but the main portion from 141 2, and the south aisle from 1524. Two chapels in it con- tain memorials of, and are named after, two ancient Lancashire families, the Asshetons and the Hopwoods. The Queen Elizabeth grammar-school, a building in the Tudor style, was founded in 1572 by Nowell, dean of St Paul's, London. There are a handsome town-hall and municipal technical schools. An extensive system of tramways and electric light railways connects the town with its suburbs and adjacent industrial centres. The prosperity of the town dates from the introduction of manu- factures at the close of the 18th century. The staple trade is the spinning and weaving of cotton, and the other industries include silk weaving, calico-printing, bleaching,

dyeing, iron-founding and the manufacture of soap and chemicals. There are collieries in the neighbourhood. The town was incorporated in 1886, and the corporation consists of a mayor, 6 aldermen and 18 councillors. Area, 4775 acres.

MIDDLETOWN, a city and the county-seat of Middlesex county, Connecticut, U.S.A., in the township of Middletown, in the south central part of the state, on the west bank of the Connecticut river, about 30 m. from its mouth, and about 15 m. south of Hartford. Pop. (1890), 9013; (1900), 9589, of whom 2316 were foreign-born; (1910 census) 11,851. Within a radius of 2 m. from the city hall there was found in 1910 most of the township's population of 20,749. The city is served by two branches of the New York, New Haven & Hartford railroad, by a line of coast steamers, and by electric lines connecting with neighbouring cities and villages. The city is connected by a long highway bridge with the village of Portland in the township of Portland (pop. in 1910, 3425; area 26 sq. m.), which is known for its brown-stone quarries. Four miles south of Middletown is Chest- nut Mountain (or Bull Hill), which commands a fine view; and about 3 m. east are the " Narrows " of the Connecticut river, where the water flows between high hills. Middletown has a number of handsome residences. In High Street stand the buildings of Wesleyan university (Methodist Episcopal), founded in 1831 by the Rev. Wilbur Fisk, who became the first president and the Rev. Laban Clark (1778-1868), who became the -first president of the board of trustees. Women were first admitted in 1872, but coeducation was later discontinued; and the last freshman class of women students under the old system entered in 1909. The university offers classical and scientific courses, and in 1908-1909 had 36 instructors, 322 students (30 being women), and a library of 79,000 volumes. In 1875-1877 the work of the first agricultural experiment station in the United States was carried on here under state supervision in Wesleyan University, with Professor Wilbur Olin Atwater (1844-1907) as director; it was then removed to New Haven. Middletown is also the seat of the Berkeley divinity school (Protestant Episcopal), founded in 1849 as the theological department of Trinity College, Hartford, rechartered and removed to Middletown in 1854, and having in 1907 a faculty of 8, and 16 students; and the city has a free public library (1874) with 17,700 vols, in 1907. South-east of the city is the Connecticut hospital for the insane, and south- xvin. 14

West of the city, the Connecticut industrial school for girls (reformatory). The total value of the factory products in 1905 was $5,604,676, an increase of 35 % over that for 1900. The municipality owns and operates the waterworks.

Middletown occupies the site of an Indian village, Mattabesec or Mattabesett (from Massa-sepues-et, ” at a great rivulet or brook “), the principal village of the Mattabesec Indians, an Algonquian tribe which included the Wongunk, Pyquaug and Montowese Indians and seems to have had jurisdiction over the whole of south-western Connecticut. The township of Middle- town was settled by whites in 1650, and until 1653, when the present name was adopted, was known by the Indian name, Mattabesett. It was incorporated in 1651; and the city was chartered in 1784. Shipbuilding and commerce became the principal sources of wealth. In the middle of the nineteenth century Middletown was one of the leading cities of Connecticut, and as late as 1886 it was a port of entry; but the development of rival ports, especially New Haven, Hartford and Bridgeport, into railway centres, retarded the growth of manufacturing, and commerce declined after the Civil War.

MIDDLETOWN, a city of Orange county, New York, U.S.A., on the Wallkill river, 67 m. N.N.W. of New York City. Pop. (1890) 11,977; (19°°) i4,5 22 , including 1700 foreign-born and 480 negroes; (1905, state census) 14,516; (1910) 15,313. It is served by the Erie, the New York, Susquehanna & Western, and the New York, Ontario & Western railways, and is connected by an electric line with Goshen (pop. in 1910, 3081), the county-seat. It is situated in an attractive dairy and agricultural country; and in the city and vicinity there are many summer residences. Here are the state homoeopathic hospital for the insane, a state armoury, Thrall hospital, and Thrall library. Middletown is primarily a manufacturing city, and has the car shops of the New York, Ontario & Western railway. The value of its factory-products increased from $2,154,742 in 1900 to $3,356,330 in 1905, or 55-8 %. The municipality owns and operates its waterworks. Middletown was settled about 1796 and owed its early commercial importance to its being a ” half-way house ” (whence its name) for travellers on the Minisink Road to western New York, and it was for a time a terminus of the Erie railroad. It was incorporated as a village in 1848, and first chartered as a city in 1888.

MIDDLETOWN, a city of Butler county, Ohio, U.S.A., on the Miami river, 34 m. N. of Cincinnati. Pop. (1890), 7681; (1900), 9215, of whom 769 were foreign-born and 314 were negroes; (1910) 13,152. It is served by the Cleveland, Cincinnati, Chicago & St Louis, the Cincinnati, Hamilton & Dayton, the Cincinnati Northern (New York Central system), and a branch of the Cincinnati, Lebanon & Northern (Pennsylvania system) railways. It is the trade centre of a rich and beautiful agricultural region in which tobacco, wheat and Indian corn are the principal crops. The river furnishes considerable water-power

and the total factory product in 1905 was valued at $8,357,993, an increase of 47-2 % over that in 1900. The waterworks are owned and operated by the municipality. Middletown was laid out in 1802 and was named from its location between Cincinnati and Dayton; it was incorporated in 1833.

MIDDLETOWN, a borough of Dauphin county, Pennsylvania, U.S.A., on the east bank of the Susquehanna river, 9 m. below Harrisburg. Pop. (1890), 5080; (1900), 5608 (340 foreign-born and 289 negroes) ; (1910), 5374. It is served by the Pennsylvania and the Philadelphia & Reading railways, and by an electric line to Harrisburg. The borough has a considerable trade with the surrounding agricultural country, and owing to the proximity of the Yorkhaven power-plant (across the river) and the excellent railway service, is a manufacturing centre. The municipality owns its electric lighting plant. Middletown was founded in 1755 by Friends (from Philadelphia and other places in Pennsyl- vania) and Scotch-Irish, and was so named because of its position midway between Lancaster and Carlisle. It was first incorporated as a borough in 1828.

MIDDLEWICH, an urban district in the Northwich parlia- mentary division of Cheshire, England, 166 m. N.W. of London,

on the London & North Western railway. Pop. (1901), 4669. It lies in open country near the river Dane, having water communications by the Trent and Mersey canal, and a branch giving access to the Shropshire Union canal. The church of St Michael and All Angels is of various periods and contains numerous monuments. In the streets not a few old buildings remain, making for picturesqueness, and a number of the fine timbered houses in which Cheshire abounds are seen in the immediate neighbourhood. Middlewich shares in the salt industry common to several towns, such as Northwich and Winsford, in this part of the county; there are also chemical works and a manufacture of condensed milk.

MIDHAT PASHA (1822-1884), Turkish statesman, the son of a civil judge, was born at Constantinople in 1822. His father, a declared partisan of reform, trained him for an administrative career, and at the age of twenty-two he was attached as secretary to Faik Effendi, whom he accompanied in Syria for three years. On his return to Constantinople Midhat was appointed chief director of confidential

reports, and after a new financial mission in Syria was made second secretary of the grand council. His enemies, however, succeeded in ousting him from this post, and caused him to be entrusted with the apparently impossible task of settling the revolt and brigandage rampant in Rumelia. His measures were drastic and their success was startling and the government made him an official of the first rank and restored him to his place in the grand council. In similar vigorous fashion he restored order in Bulgaria in 1857. In 1.860 he was made vizier and pasha, and entrusted with the government of Nisch, where his reforms were so beneficial that the sultan charged him, in conjunction with Fuad Pasha and Ali Pasha, to prepare the scheme for adapting them to the empire which was afterwards known as the law of the vilayets. After further administrative work in his province, he was ordered to organize the council of state in 1866, and was then made governor of Bagdad, where his success was as decisive as at Nisch, but attended with much greater difficulties. In 1871 the anti-reform influence of the grand vizier, Mahmoud Nedim, seemed to Midhat a danger to the country, and in a personal interview he boldly stated his views to the sultan, who was so struck with their force and entire disinterestedness that he appointed Midhat grand vizier in place of Mahmoud. Too independent, however, for the court, Midhat remained in power only three months, and after a short governorship of Saloniea he lived apart from affairs at Constantinople until 1875.

From this time forward, however, Midhat Pasha's career resolved itself into a series of strange and almost romantic adventures. While sympathizing with the ideas and aims of the " Young Turkey "party, he was anxious to restrain its impatience, but the sultan's obduracy led to a coalition between the grand vizier, the war minister and Midhat Pasha, which deposed him in May 1876, and he was murdered in the following month. His nephew Murad V. was in turn deposed in the following August and replaced by his brother, Abdul Hamid II. Midhat Pasha now became grand vizier, reforms were freely promised, and the Ottoman parliament was inaugurated with a great flourish. In the following February, however, Midhat was dismissed and banished for supposed complicity in the murder of Abdul Aziz. He then visited various European capitals, and remained for some time in London, where he carefully studied the procedure in the House of Commons. Again recalled in 1878, he was appointed governor of Syria, and in August exchanged offices with the governor of Smyrna. But in the following May the sultan again ordered him to be arrested, and although he effected his escape and appealed to the powers, he shortly afterwards saw fit to surrender, claiming a fair hearing. The trial accordingly took place in June, when Midhat and the others were

sentenced to death. It was, however, generally regarded as a mockery, and on the intercession of the British government the sentence was com- muted to banishment. The remaining three years of his life were consequently spent in exile at Taif in Arabia, where he died, probably by violence, on the 8th of May 1884. To great ability, wide sympathies, and undoubted patriotism he added absolute

honesty, that rare quality in a vizier, for he left office as poor as when he entered it. (G. F. B.)

MIDHURST, a market town in the north-western parlia- mentary division of Sussex, England, 1 2 m. N. by E. of Chichester by the London, Brighton & South Coast railway; served also by the London & South Western railway. Pop. (1901); 1674. It is pleasantly situated on slightly rising ground near the river Rother. The church of St Mary Magdalen and St Denis is a large Perpendicular building. The town retains several picturesque old houses, and in the vicinity, by the river, are the ruins of the 1 6th century mansion of Cowdray, burnt down in 1793. A grammar-school was founded at Midhurst in 1672 and attained some eminence. After being closed for many years it was re- opened in 1880. In 1906 a magnificent sanatorium for consump- tives was opened about 4 m. from Midhurst; it bears the name of King Edward VII., who laid its foundation stone and opened it.

The name of Midhurst (Middeherst, Mudhurst) first occurs in the reign of Henry I. when Savaric Fitz-Cana held it of the honour of Arundel, then presumably in the king's hands. The charter of Henry I., although no longer extant, is quoted in later confir- mation charters of Richard I., Henry III., Edward III. and Richard II. Franco de Bohun inherited Midhurst from his uncle Savaric Fitz-Savaric, and the De Bohuns held the lordship until 1499 when Sir David Owen obtained it through his marriage with the daughter of the last male heir. He sold it to Sir William Fitz- William, from whom it passed to Sir Anthony Browne and descended to the viscounts Montague. Midhurst is definitely called a borough in the reign of Edward I., but the borough-court and market were probably in existence much earlier. It was governed by a bailiff, elected annually, until the office lapsed, probably early in the 19th century. In an act of 1883 it is mentioned as one of the towns which had long ceased to be municipal. No charter of incorporation is known. Midhurst returned two members to parliament from 1300-1301 till 1832, and from that date one member until 1885 when it was dis- franchised. In the reign of Henry VI. a market was held by the burgesses every Thursday, and a fair on Whit-Tuesday, by grant from Sir John Bohun. In 1888 the fair-days were the 6th of April, the 9th of May and the 29th of October. The market- day was Thursday.

Pleasure-fairs are still held on the 6th of April and the 29th of October, but there is no market.

MIDIAN (properly Madyan, so Sept.), in the Bible, one of the peoples of North Arabia whom the Hebrews recognized as distant kinsmen, representing them as sons of Abraham's wife Keturah (" incense "). Thus the sons of Keturah are the " incense-men," not indeed inhabitants of the far south incense-land, but presum- ably the tribes whose caravans brought the incense to Palestine and the Mediterranean ports. So the Midianites appear in con- nexion with the gold and incense trade from Yemen (Isa. lx. 6), and with the trade between Egypt and Syria (Gen. xxxvii. 28,36). They appear also as warriors invading Canaan from the eastern desert, and ravaging the land as similar tribes have done in all ages when Palestine lacked a strong government (see Gideon). Again, they are described as peaceful shepherds, and the pastures of the Midianites, or of the branch of Midian to which Moses's father-in-law (Jethro or Reuel, or Hobab) belonged, lay near Mount Horeb (Exod. iii. 1). The Kenites who had friendly relations with Israel, and are- represented in Judg. i. 16, iv. n, as the kin of Moses's father-in-law, appear to have been but one fraction of Midian which took a separate course from their early relations to Israel. 1 Balaam, according to one version of the story, was a Midianite (Num. xxii. seq.) and his association with Moab has been connected with the statement in Gen. xxxvi. 35, that the Edomite king Hadad defeated Midian in the land of Moab; (see Balaam, Edom).

1 The admixture of Midianite elements in Judah and the other border tribes of Israel is confirmed by a comparison of the names of the Midianite clans in Gen. xxv. 4 with the Hebrew genealogies (1 Chron. ii. 46, Ephah; iv. 17, Epher; Gen. xlvi. 9, Hanoch). Epher is also associated with 'Ofr near Hanakiya (Hanoch), three days north from Medina, also with Apparu a Bedouin locality mentioned by Assur-bani-pal. Ephah is probably the Hayapa transported by Sargon to Beth-Omri (Samaria).

A place Midian is mentioned in 1 Kings xi. 18, apparently between Edom and Paran, and in later times the name lingered in the district east of the Gulf of 'Akaba, where Eusebius knows a city Madiam in the country of the Saracens and Ptolemy (vi. 7) places Modiana. Still later Madyan was a station on the pilgrim route from Egypt to Mecca, the second beyond Aila (Elath). Here in the middle ages was shown the

well from which Moses watered the flocks of Sho'aib (Jethro), and the place is still known as " the caves of Sho'aib." It has considerable ruins, which have been described by Sir R. Burton (Land of Midian, 1879).

This district which has on its east Tairna, a centre of civilization in the 5th century B.C., and on its south-east El-'Ola whose existence as a seat of culture is possibly even older, is identified by some scholars with the Musran of the Minaean (south Arabian) inscrip- tions, on which see Sabaeans, Yemen. That this part of north-west Arabia had frequent intercourse with Palestine appears certain from its commercial relations with Gaza; and the association of the Midianite Jethro with early Hebrew legislation, as also the possi- bility that Mizraim (" Egypt ") in the Old Testament should be taken in some cases to refer to this district, have an important bearing upon several Old Testament questions. See Mizraim.

MIDLETON, WILLIAM ST JOHN FREMANTLE BRODRICK,

9TH Viscount (1856-), English politician, was the son of the 8th viscount (1830-1907). He came of a Surrey family who in the 17th century, in the persons of Sir St John Brodrick and Sir Thomas Brodrick, obtained grants of land in the south of Ireland. Sir St John Brodrick settled at Midleton, between Cork and Youghal in 1641; and his son Alan Brodrick (1660-1728), speaker of the Irish House of Commons and lord chancellor of Ireland, was created Baron Brodrick in 171 5 and Viscount Midleton in 1717m the Irish peerage. In 1796 the title of Baron Brodrick in the peerage of the United Kingdom was created. The English family seat at Peper Harow, near Godalming, Surrey, was designed by Sir William Chambers. The 8th viscount was a Conservative in politics, who for a few years had a seat in the House of Commons, and who was responsible in the House of Lords for carrying the Infants Protection Act. His brother, the Hon. G. C. Brodrick, was for many years warden of Merton College, Oxford. As Mr St John Brodrick, the 9th viscount had a distinguished career in the House of Commons. After being at Eton and Balliol, Oxford, and serving as president of the Oxford Union, he entered parliament as conservative member for one of the Surrey divisions in 1880. From 1886 to 1892 he was financial secretary to the war office; under secretary for war, 1895-1898; under secretary for foreign affairs, 1898-1900; secretary of state for war, 1 900-1 903; and secretary of state for India, 1903-1905. He lost his seat for the Guildford division of Surrey at the general election of January 1906. In March 1907 he was made an alderman of the London County Council. He married, first in 1880, Lady Hilda (d. 1901), daughter of the 9th earl of

Wemyss, by whom he had a family; and secondly in 1903, Madeleine Stanley, daughter of Lady St Helier by her first husband.

MIDLETON, or Middleton, a market town of Co. Cork, Ireland, on the river Owenacurra, 13 m. E. of Cork by the Youghal branch of the Great Southern & Western railway. Pop. (1901), 3361. The river here enters a branch of Cork harbour. The surrounding hilly country is pleasant and fertile, and furnishes the town with a good agricultural trade. There are also whisky-distilleries. Ballinacurra, if m. south on the estuary, serves as a small port. The grammar school was founded in 1696, and here among its students were John Philpot Curran and Isaac Butt. Midleton is governed by an urban district council.

MIDNAPORE, a town and district of British India, in the Burdwan division of Bengal. The town is 68 m. W. of Calcutta; it has a station on the Bengal Nagpur railway. Pop. (1901), 33,140. It is an important centre of trade, being the terminus of a navigable canal to Calcutta, and also the junction for the Sini branch of the Bengal-Nagpur railway. There are manu- factures of brass and copper wire. It has an American mission, a municipal college, and a public library founded in 1852.

The District or Midnapore has an area of 5186 sq. m. The general appearance is that of a large open plain, of which the greater part is under cultivation. In the northern portion the soil is poor, and there is little wood. The country along the western boundary, known as the Jungle Mahals, is undulating and picturesque; it is almost uninhabited. The eastern and south-eastern portions are swampy and richly cultivated. The chief rivers of the district are the Hugh and its three tributaries, the Rupnarayan, the Haldi and the Rasulpur. Th Midnapore high-level canal used also for irrigation runs almost due east and west from the town of Midnapore to Ulubaria on the Hugli 16 m. below Calcutta, and affords a continuous navigable channel 53 m. in length. There is also a tidal canal for navigation, 26 m. in length, extending from the Rupnarayan river. The district is traversed as well by the Bengal-Nagpur railway towards Orissa, with a branch to Chota Nagpur. The jungles in the west of the district yield lac, tussur, silk, wax, resin, fire-wood, charcoal, &c, and give shelter to large and small game. The principal exports are rice, silk and sugar; and the chief imports consist of cotton cloth and twist. Salt, indigo, silk, mats and brass and copper utensils are manufactured. Both silk and indigo are decaying industries. The population in 1901 was 2,789,114, showing an increase of 6% in the decade.

The early history of Midnapore centres round the ancient town of

Tamluk, which in the beginning of the 5th century was an important Buddhist settlement and maritime harbour. The first connexion of the English with the district dates from 1760, when Mir Kasim ceded to the East India Company Midnapore, Chitta- gong, and Burdwan (then estimated to furnish one-third of the entire revenue of Bengal) as the price of his elevation to the throne of Bengal on the deposition of Mir Jafar.

MIDRASH, a very common term in Jewish writings for ” exposition ” and a certain class of expository literature. The word also occurs twice in the Old Testament (2 Chron. xiii. 22, xxiv. 27; R.V. rather poorly ” commentary “).

1. Introduction. — The term (Heb. midrdsh from ddrash “to search out, enquire “) denotes some explanation or exposition, which, in contrast to the more literal exegesis (technically called pSshat ” simple “), endeavours to reach the spirit lying below the text. It may be defined as a didactic or homiletic development of some thought or theme, characterized by a more subjective, imaginative and ampliative treatment. Jewish Midrash falls broadly into two classes: Halaka (q.v.) or HSlaka (walking, way, conduct) and Haggddah (narrative [with a purpose], homily; Aramaic equivalent Aggadah; the incorrect form Agadah rests upon a mistaken etymology). The former dealt with legal and ritual matters; it flourished in the schools and developed into the most subtle casuistry. The latter covered all non-halakic exposition and was essentially popular. It embraced historical and other traditions; stories, legends, parables and allegories; beliefs, customs and all that may be called folk-lore. It fed itself, not upon the laws, but upon the narrative, the prophetical and the poetical writings of the Old Testament, and it had a more spiritual and ethical tone than the Halaka. In both classes, accepted tradition’ (written or oral) was reinterpreted in order to justify or to deduce new teaching (in its widest sense) , to connect the present with a hallowed past, and to be a guide for the future; and the prevalence of this process, the innumerable different examples of its working, and the particular application of the term Midrash to an important section of Rabbinical literature complicates both the study of the subject and any attempt to treat it concisely. 1 Apart from the popular paraphrastic translations of the Old Testament (see Targum), the great mass of orthodox Rabbinical literature consists of (1) the independent Midrashlm, and (2) the Mishna which, with its supplement the Gemara, constitutes the Talmud. Both contain Halaka and Haggada, although the Mishna itself is essentially Halaka, and the Midrashim are more especially Haggadic; and consequently further information bearing upon Midrash must be sought in the art. Talmud. These two articles

1 For a careful study of the meaning of the term, see W. Bacher, Jew. Quart. Rev. IV. 406-429.

handle one of the most famous bodies of ancient literature, which, in its turn, has given rise to innumerable Jewish and non- Jewish works, and has many points of value and interest which cannot be adequately discussed here. It must suffice, therefore, to deal rather broadly with the subject, and to refer for fuller details to the special encyclopaedias, viz.: Hamburger's Real- Encyc. fur Bibel und Talmud, and the very elaborate articles in the Jewish Encyclopedia. '

2. Narrative Midrash. — Of the three different kinds of historical writing — the genetic or scientific, the purely narrative and the pragmatic — it is the last which has prevailed among religious historians. It is extremely difficult to avoid the subjec- tive element in dealing with matters of fact, and the religious treatment of history is influenced, however unconsciously, by the mental environment of the writers. In giving greater promi- nence to events of religious importance and to their bearing upon the spiritual needs of contemporaries they view and interpret the past in a particular light, and will see in the past those growths which only in their own time have become mature. A latent significance is found, a particular connexion is traced, and a continuity is established, the true nature of which must be tested by critical students. Now, it is subjective history which we find in the earliest references to Midrash. The Midrash of the prophet Id do (2 Chron. xiii. 22) like the Visions and the Histories of Iddc and Shemaiah (ix. 29, xii. 15) which are quoted for the lives of Solomon, Abijah and Jeroboam, are evidently quite distinct from the sources cited in the parallel portions of the earlier compilation, and the entire spirit of the narratives is different. Similarly, there is a conspicuous difference of treat- ment of the life of Joash in 2 Kings xi. seq., compared with 2 Chron. xxiii. seq., which refers to some Midrash of the Book of the Kings (xxiv. 27). Although it is uncertain whether this com- prehensive Midrash also included the " books of the Kings " (xvi. 11, xxvii. 7, &c), and the Midrash of Iddo and other related works, it is clear that the Book of Chronicles (q.v.) marks a very noteworthy advance upon the records in the (canonical) Book of Kings (q.v.). It is now recognized that the compiler of the former has used many novel narratives of a particular edifying and didactic stamp, and scholars are practically unanimous that these are subsequent to the age of the Israelite monarchy and present a picture of historical and

religious conditions which (to judge from earlier sources) is untrustworthy. At the same time various details (as comparison with the Book of Kings shows) are relatively old and, on a priori grounds, it is extremely unlikely that the unhistorical elements are necessarily due to deliberate imagination or perversion rather than to the develop- ment of earlier traditions. The religious significance of the past is dominant, and the past is idealized from a later standpoint; and whether the narratives in Chronicles are expressly styled Midrash or not, they are the fruit of an age which sought to inculcate explicitly those lessons which, it conceived, were implied in the events of the past. The value of the book lay not in history for its own sake, but in its direct application to present needs. But the tendency to reshape history for the edification of later generations was no novelty when Chronicles was first compiled (about 4th cent. B.C.), Pragmatic historiography is exemplified in the earliest continuous sources (viz. of the " Deuter- onomic " writers, i.e. allied to Deut., especially the secondary portions); and there are many relatively early narratives in which the details have been modified, and the heroes of the past are the mouthpiece for the thought of a later writer or of his age. Numerous instructive examples of the active tendency to develop tradition may be observed in the relation- ship between Genesis and the "Book of Jubilees," or in the embellishments of Old Testament history in the Antiquities of Josephus, or in the widening gaps in the diverse traditions of the famous figures ot the Old Testament (Adam, Noah, Enoch, Abraham, Moses, Isaiah, Ezra, &c), as they appear in non- canonical writings. In such cases as these one can readily perceive the different forms which the same material elements have assumed, and one may distinguish the unreliable accretions which are clearly later and secondary. Accordingly, when

there are narratives which cannot be tested in this manner, should they show all the internal marks of didactic expansion and date from an age much later than the times with which they deal, their immediate value will not necessarily lie in the details which appear to be of historical interest, but in their contribution to later form's of tradition and phases of thought. So far then, Midrash tends to include moralizing history, whether we call it narrative or romance, attached to names and events, and it is obviously exemplified whenever there are unmistakable signs of untrustworthy amplification and of some explicit religious or ethical aim colouring the narrative. This, however, is only one of the aspects which have to be taken into consideration when one advances to the Rabbinical Midrash.

For Old Testament " Midrash " see further K. Budde, Zeitsckr.f. alt-test. Wissenschaft, xii. 37, seq., and commentaries on Chronicles

((£.».). The elaborate study by the Jewish scholar Zunz (Die gottes- dienstlichen Vortrage, ch. viii.) is also valuable for bridging the gulf between the canonical and the non-canonical traditions and for its just attitude to the criticism of historical traditions. The rigid line between fact or fiction in religious literature, which readers often wish to draw, cannot be consistently justified, and in studying old Oriental religious narratives it is necessary to realize that the teach- ing was regarded as more essential than the method of presenting it. ” Midrash ” which may be quite useless for historical investiga- tion maybe appreciated for the light it throws upon forms of thought. Historical criticism does not touch the reality of the ideas, and since they may be as worthy of study as the apparent facts they clothe, they thus indirectly contribute to the history of their period. In any case, while the true historical kernel of the Midrashic narrative (e.g. dealing with Adam, Moses or Isaiah) will always be a matter of dispute, the teaching to which it is applied stands on an inde- pendent footing as also does the application of that teaching to other ages.

3. Continuity of Literature and Material. — Amid obscure vicissitudes in the 7th to 5th centuries, B.C., the Canonical books of the Old Testament gradually began to assume their present shape (see Palestine: History). The internal peculiarities show that the compilations are the much edited remains of a larger body of literature, and it may reasonably be supposed that the older sources did not at once perish. There is literary critical evidence for late insertions by exilic or later compilers; 1 the compiler of Chronicles apparently refers to accessible works; and there is a close material relationship between the Old Testa- ment and later literature. All this suggests that Old Hebrew writings, apart from those preserved in the Canon, persisted to a relatively late period. No a priori distinction can be made and no precise chronological line can be drawn between the books of the Canon (Canticles, Ecclesiastes, Esther, Ezekiel and Proverbs had been at one time or another subjects of debate among the Rabbis) and the Apocrypha (Ecclesiasticus, Judith, Maccabees and Tobit, were “allowed”); and the intimate relation between them appears in the character of the ” Wisdom Literature ” (e.g. Proverbs, and the Wisdom of Solomon), in the treatment of the stories of Esther and Daniel (the history of Susanna), and also in the twofold recensions Ezra and 1 Esdras. Historical or narrative Midrash is exemplified in the ” canonical ” books Daniel, Esther, Jonah and Ruth, and in the ” apocryphal ” stories of Daniel (viz. Susanna, where the point lies in the name Daniel ” God is judge “), Esther, Judith, Tobit (and the Ahiqar cycle of stories), the story of Zerubbabel (1 Esd. iii. seq., the sequel of which belongs to the canonical Ezra), and the martyrdom of

Eleazer (2 Mace. vi. seq., compare 4 Mace). This is not the place to notice the course of Jewish literary activity in Palestine or Alexandria, whether along the more rigid lines of Pharisaic legalism (the development of the canonical ” priestly ” law), or the popular and less scholastic phases, which recall the earlier apocalyptical tendencies of the Old Testament and were culti- vated alike by early Jewish and Christian writers. But after the fall of Jerusalem, partly through the need for systematizing the traditional post-biblical law, and partly through disputes with the Christians, orthodox Rabbinism received the stamp which has since characterized it. The traditional or oral law was codified in the Mishna (see Talmud, § 1 seq.), the Canon was

1 .E.g. Judg. i. (see G. F. Moore, Ency. Bib. ” Historical Lit.,” col. 2085, middle), 2 Sam. ix.-xx., &c.

fixed, and the fluctuations in the MSS. of the Old Testament (which, like the numerous variations in the Septuagint, compli- cated exact exegesis) gave way to what was virtually a single text. Moreover, the important body of apocalyptical and pseudepigraphical literature, with all its links between Christi- anity and Judaism, fell into disfavour on both sides. This literature is especially valuable because it illustrates contem- porary Halaka and Haggada, and it illuminates the circle of thought with which Jesus and his followers were familiar; it thus fills the gap between the Old Testament and the authoritative Rabbinical Midrashim which, though often in a form several centuries later, not rarely preserve older material. 1

A few miscellaneous examples of related Midrashic details may be cited : —

i. The book of Jubilees (a haggadic and halakic Midrash on Genesis, about 2nd century B.C.), contains the story of the war between Amorite Kings and Jacob (ch. xxxiv.). This is known to the probably contemporary Testament of Judah and to much later Midrashim {Mid. Wayyisa’u, Yalqut Shimeoni, also the apo- cryphal ” book of Jashar “), and is evidently connected with the cryptic allusion to the capture of Shechem in Gen. xlviii. 22 (R.V. marg.). Unless we suppose that the latter was suddenly expanded into the stories which thenceforth persisted, it may be inferred that an old extra-canonical tradition (for which a case can be made) continued to survive the compilation of Genesis {q.v.) and ultimately assumed the various exaggerated forms

now extant. Naturally the probability of such a tradition — the merest hint of which happens to be preserved in Gen. loc. cit. — does not prejudice the problem of its origin or accuracy; in Jub. the story is useless for Jacob's history, and is probably influenced by a recollection of more recent events in the Maccabaean age.

ii. A curious account of war between Egypt and Canaan after Joseph's death recurs in Jub. xli., Test, of Simeon, viii., and Benjamin vii., and is connected with details (burial of Jacob's sons at Hebron) recorded by Josephus {Ant. ii. 8). Josephus in turn has another story wherein Moses leads the Egyptians against Ethiopia {Ant. ii. 10, for parallels see Moore, Ency. Bib. col. 2089 seq.), and this is found in the late chronicles of Jerahmeel and the Book of Jashar (cf. also Mid. Dibre ha-yamlm shel-Mosheh; see Jew. Ency. viii. 573 seq.). The former may be linked with Gen. 1. 9 (where the con- course of chariots and horsemen would invite speculation), and the latter with the Cushite wife of Moses ; but although one may grant that the canonical sources do not by any means preserve all the older current traditions, the contents of the latter cannot be recovered from the later persisting Midrashim. 2

iii. The allusion in Jude v. 9 to the contention of the archangel Michael for the body of Moses belongs to a group of traditions which have been collected by R. H. Charles {Assumption of Moses, pp. 105 seq.), and it appears that the incident was familiar to Clement of Alexandria, Origen and other early writers. Moreover, Jude v. 16 agrees very closely with the Latin version of the Testament of Moses, which has other parallels in Matt. xxiv. 29; Acts vii. 36, 38 seq. (ibid. pp. lxii. seq.). Here may be added Jannes and Jambres, who withstood Moses (2 Tim. iii. 8) ; these or related names were known to the elder Pliny (xxx. i. 11), Apuleius (first half of 2nd century;, Origen (who refers to a book of Jannes and Mambres), and various earlier and later Jewish sources; see 1. Abrahams, Ency. Bib. col. 2327 seq.; H. St J. Thackeray, Relation of St Paul to con- temporary Jewish thought (London, 1900), pp. 215 sqq.

iv. Jewish traditions of Abraham in Ur cf the Chaldees recur in the Targums, Midrashic works, and earlier in the book of Jubilees (ch. xii., ed. Charles, p. 91 ; cf. also Judith v. 6 seq.). The legends of his escape from a fiery furnace may have a philological basis {ur interpreted as " fire "), but the allusion to the redemption of Abraham in Isa. xxix 22 seems to indicate that older tradition was fuller than the present records in Genesis, and supplies another example of the link connecting the Old Testament with Rabbinical thought.

v. Not to multiply examples further, it may suffice to refer to (a) the apparent belief that the serpent tempted Eve to unchastity (2 Cor. xi. 2 seq., see Thackeray pp. 50 seq.) ; {b) the descent of the angels upon earth (Gen. vi. 1 seq.; Jude 6, 14 seq., see Charles, Jub. p. 33 seq., Clermont-Ganneau, Quart. Statements of the Pal. Explor. Fund, 1903, pp. 233 seq. and the Midr. Abkir. see Jew, Ency. viii. 572) ; (c) the relationship between the Midrashic developments of the story of Esther in Josephus, the Greek and Old Latin Versions, the Targums and later Jewish sources (see L. B. Paton, Comm. on Esther, pp. 20, 100 and passim) ; and finally {d) the numerous minor miscellaneous parallels noticed in recent annotated editions of the

1 On the history of his intermediate stage see E. Schurer, Hist, of Jew. People (Edinburgh, 1886), Germ. Gesch. Jiid. Volkes; M. Fried- lander, Relig. Bewegungen innerhalb des Judentums im Zeitalter Jesu (Berlin, 1905) ; W. Fairweather, Background of the Gospels (Edinburgh 1908). See also Apocalyptic Lit. and Apocryphal Lit.

2 Note also the allusion to the wisdom of Moses in Acts vii. 22, upon which contemporary writings are pretty well informed.

pseudepigraphical literature (especially those of R. H. Charles). (See further Talmud, § 5.)

4. Midrashic Exposition. — The Talmud poetically describes Midrash as' a hammer which wakes to shining light the sparks which slumber in the rock; and the simile is a happy one when one considers the exegetical implements, the workmen and their workmanship. For the expository or interpretative Midrash was bound up with rules and methods which often appear crude and arbitrary, they are nevertheless those of the age and they helped to build up lasting monuments. 3 It was believed that the Written Word had an infinite fulness; according to the Midr. Bemidbar Rabbak every word of the Law had seventy different aspects, and Philo of Alexandria held that there are no superfluous words in Scripture. Con- sequently an exaggerated emphasis is often laid upon single words; as, for example, in the school of Rabbi 'Aqiba, where even individual letters were forced to reveal their meaning. Thus, since the Hebrew eth, which marks the accusative, is also the preposition " with," Deut. x. 20 (" thou shalt fear [eth-] Yahweh thy God ") was interpreted to include the venera- tion of the doctors of the law along with Yahweh. 4 Many examples of literal interpretation can of course be found, but arbitrary cases of the kind just noticed are due either to an obviously far-fetched interpretation or to the endeavour to find some authoritative support for teaching which it was desired to inculcate. Thus faulty

proof rather than faulty inference is illustrated when the word ” in-number ” (Ex. xii. 4) was used to confirm the Halaka that the man who killed the Passover Lamb must know how many people were about to share it {Jew. Ency. viii. 570). Often the biblical text cannot be said to supply more than a hint or a suggestion, and the particular application in Halaka or Haggada must be taken on its merits, and the teaching does not necessarily fall because the exegesis is illegitimate. To take another specimen: the Mekilta on Ex. xx. 25 infers from the unusual form of the word “it,” that the prohibition of iron applies only to it, i.e. the altar, and not to stones used in building the temple. This Halaka is followed by a haggadic explanation of the prohibition: ” iron abridges life while the altar prolongs it; iron causes destruction and misery, while the altar produces reconciliation between God and man; and therefore the use of iron cannot be allowed in making the altar.” 6 Such were the sparks that could be hammered out of the rock, and it is instructive to observe similar exegetical methods in the New Testament. Emphasis upon a single word is illustrated by Gal. iii. 16, where the argu- ment rests upon the word ” seed ” (and not the plural ” seeds “) in the proof-text, and the same word in Rabbinical writings is used to support other arguments. 6 By identical kinds of exegesis Lev. xix. 14 (not to put a stumbling block before the blind) is the ground for cautioning a father against striking an adult child, and Deut, xxv. 4 (the law of the muzzled ox) is used to show that God’s labourer is worthy of his hire. 7 Again, since through Eve sin entered into the world, woman must be subordinate to man (1 Tim. ii. 11-14), or, she who has thus extinguished ” the light of the world ” should atone by lighting the festal candles on the sabbath (Talm. Shabb. 56). By the allegorical method Isa. lxi. is interpreted as applying to Jesus (Luke iv. 16-22), and frequently passages which origin- ally had another application have a Messianic reference in

3 For the Rabbinical ” rules ” and examples of their working see F. Weber, Jiid. Theologie (Leipzig, 1897), pp. 109-125; C. A. Briggs Study of Holy Scripture (Edinburgh, 1899), ch. xviii. ; Jew. Ency. xii. 30-33 ; S. Schechter, Hastings’s Diet. Bible, v. 59, 63 ; and H. L. Strack, Einleitung in den Talmud (Leipzig, 1908), pp. 119-131,

4 So Aquila, the disciple of ‘Aqlba, translates the accusative particle by avv; see W. R. Smith, Old Test, in the Jew. Church, p. 63.

- Oesterley and Box, Religion and Worship of the Synagogue (London, 1907), p. 80; pp. 44-97 deal with Midrashic and other Jewish literature.

6 Mish. Sanhed. iv. 5, see A. Geiger, Zeit. f. morgenland. Gesell-

schaft, 1858, pp. 307 sqq., S. R. Driver, Expositor, ix. (1889), p. 18 seq.

7 The Talmud Mo'ed Qa(an, ya, and New Testament (1 Cor. ix. 9, I Tim. v. 18) respectively.

Christian and Rabbinical teaching. Similarly the application of Hos. ii. 23, not to the scattered tribes of Israel, but to the Gentiles, is common to the Mishna and to Romans ix. 25 seq. (Sanday and Headlam, Comment, ad loc.) The Apostle Paul, once a disciple of the famous Rabbi Gamaliel, uses in 1 Cor. x. 4 (" the spiritual rock that followed them ") a familiar Jewish Haggada which, however, he reinterprets, even as, when he identifies the " rock " with Christ, he diverges from the Alex- andrian Philo who had identified it with Wisdom or the Word of God. Moreover, not only are passages thus taken out of their context, but they are combined, especially when they contain the same words or phrases, or appear to have the same or similar thoughts or aims. The Talmud, with a reference to Prov. xxxi. 14 (" she bringeth her food from afar "), says " the words of the Torah are poor (or deficient) in one place but rich in another." Hence in the Mid. Siphre on Numbers xv. 39, " ye shall not seek after . . . your own eyes " is explained to refer to adultery, after the words of Samson " she is pleasing in my eyes " (Judg. xiv. 3); and on Deut. vi. 5 it charges man to love the Lord " with all thy soul . . . even if he should take away thy soul," the teaching being based upon Ps. xliv. 22. 1 Similarly, in the New Testament, after the same method, Mai. iii. 1 and Is. xl. 3 (linked by the phrase " to prepare the way ") are combined in Mark i. 2 seq. ; Abraham's faith (Gen. xv. 6) and temptation (xxii. 1) are associated in James ii. 21-23, as also in contemporary Jewish thought; and by other combined quotations Paul enunciates the universality of sin (Rom. iii. 10 sqq.) and the doctrine that Christians are God's temple (2 Cor. vi. 16 sqq). Proceeding upon such lines as these, the Jews wove together their Midrashic homilies or sermons where, though we may find much that seems commonplace, there are illuminating parables and proverbs, metaphors and similes, the whole affording admirable examples of the contemporary thought and culture, both of the writers and — what is often overlooked — the level of their hearers or readers. Like many less ancient discourses, the Midrashim are apt to suffer when read in cold print, and they are sometimes judged from a stand- point which would be prejudicial to the Old Testament itself. But they are to be judged as Oriental

literature and if they contain jarring extravagances and puerilities, one may recall that even in modern Palestine it was found that the natives understood Robinson Crusoe as a religious book more readily than the Pilgrim's Progress (J. Robertson, Early Rel. of Israel, 1892, p. 66). In making allowance for the defects (without which they would probably not have appealed to the age) it must be remembered that some of the Rabbis themselves recognized that the Midrashic Haggada was not always estimable.

An interesting example of combined quotation is illustrated in Matt. xii. 4-8, where the teaching of Jesus on the law of the Sabbath rests upon 1 Sam. xxi. 1-6, Num. xxviii. 9 seq. and Hos. vi. 6. Apropos of this law the Rabbinical arguments are worth noticing. Appar- ently the severe rules laid down in Jubilees 1. 8-12 (see R. H. Charles, ad loc.) were exceptional. It was allowed that the Sabbath need not be too rigorously kept, and this was justified by Exod. xxxi. 13, where the singular use of the restrictive particle ak (EV " verily ") supported the teaching that other Sabbaths need not be observed. Also, from the_ words " holy unto you " (v. 14) it was taught that " the Sabbath is given to you to desecrate in case of need, but thou art not given to the Sabbath." Hence the Sabbath might be broken when life was in danger. Moreover, it was argued that a battle need not be stopped from religious considerations, e.g. the Sabbath. This was justified by Deut. xx. 20 " until it fall " (Talm. Shabb. 190). Also, the Passover Lamb could be sacrificed on the Sabbath, and justification for this was found in Num. ix. 2 " in its season " (Pesah. 660) . See further on this subject, and on the evasions of the Sabbath law, S. Shechter, Studies in Judaism, pp. 297 sqq. ; ibid, in C. G. Montefiore, Hibbert Lectures (for 1892), Appendix; ibid. Hastings' Diet. Bib. v. 63, and also S. R. Driver, Hastings' Diet. iv. 320 seq. With the above interpretations, cf. A. H. McNeile on Matt. xii. 5, John vii. 23: " the a priori element in them perhaps suggests that [these verses] were due to later reflexion on the part of Christians who had realized the inadequacy of the law " (Swete's Camb. Bibl. Essays, 1909, p. 226). For other examples illustrating Rabbinical methods of exegesis in the New Testament, see McNeile, pp. 221, sqq. (" Our Lord's use of the Old Testament ") ; Briggs, op. cit. pp. 436,

1 Cited by S. Schechter, Hastings, Diet. Bible, v. 64.

sqq., and Thackeray, op. cit. (ch. vii. " use of the Old Testament," ch. viii. " St Paul the Haggadist "). The latter observes (p. 203) : " the arguments by which Paul tried to convince his opponents of the true meaning of the Old Testament as pointing forward to Christ, are those which they would themselves have employed for another purpose ;

and to some extent we need not doubt that they were selected for that very reason. They were the arguments which were best calculated to appeal to them." Quite in accordance with Rabbinical custom is the system of question and answer (Rom. x. 5, seq., 16 seq.), and the argument in the sequence: statement, objection and reply, appears already in the book of Malachi (q.v.).

5. The Jewish Midrashim. — The earlier stages in the growth of the extant Rabbinical Midrashim cannot be traced with any certainty. Although there are several allusions to early written works, other references manifest an objection to the writing down of Haggada and Halaka. Perhaps it was felt that to preserve uniformity of teaching in the schools it was undesir- able to popularize the extant collections, or perhaps the refer- ences must be reconsidered in the light of those significant changes after the fall of Jerusalem which have been mentioned above (§ 3). 2 However this may be, the independent Halakoth (where the oral decisions are interpreted or discussed on the basis of the Old Testament) were gradually collected and arranged according to their subject in the Mishnah and Tosephta. (Talmud, § 1), while in the halakic Midrashim (where the decisions are given in connection with the biblical passage from which they were derived) they follow the sequence of the text of the Old Testament. The Haggada was likewise collected according to the textual sequence of the Old Testament. But the sermons or discourses of the homilelic Midrashim are classified according to the reading of the Pentateuch in the Synagogue, either the three year cycle, or else according to the sections of the Penta- teuch and Prophetical books assigned to special and ordinary Sabbaths and festival days. Hence the latter are sometimes styled Pesiqta (" section "). The homiletic Midrashim are characterized by (a) a proem, an introduction based upon some biblical text (not from the lesson itself), which led up to (b) the exposition of the lesson, the first verse of which is more fully discussed than the rest. They conclude © with Messianic or consolatory passages on the future glory of Israel. A feature of some Midrashim (e.g. nos. 4, si, e, and 7 below) is the halakic exordium which precedes the proems. 3

Among the more important Midrashim are: i. — Mekilta (Aram. " measure," i.e. " rule ") best known as the name of a now imperfect halakic Midrash on Exod. xii.-xxiii. 19 (also xxxi. 12-17 an d xxxv. 1-3). It represents the school of R. (Rabbi) Ishmael, is a useful source for old Haggadah (especially on the narrative portions of Exodus), and is interesting for its variant readings of the Canonical Massoretic text. 4 Edited by Blasius Ugolinus, Thes. Antiq. Sacr. xiv. (Venice, 1744, with a poor Latin translation), more recently by J. H. Weiss (Vienna,

1865) and M. Friedmann (ibid. 1870), Germ, trans, by J. Winter and A. Wiinsche Leipzig, 1909). See further J. Z. Lauterbach, Jew. Ency. viii. 444 seq.

ii. Siphra (Aram. ” the book “) or Torath Kohanlm (” the law of the priests “), a commentary on Leviticus, mainly halakic, the text being a source for various maxims. (On Lev. xix. 17 seq., neighbourly love and abstinence from vengeance con- stitute, according to R. Aqiba, the great principle of the Torah.) It is useful for the interpretation of the Mishnah treatises Qodashim and Teharoth. Latin trans, in Ugolinus, vol. xiv.; recent editions by I. H. Weiss (Vienna, 1862), and with the commentary of Shim- shon (Samson) of Siens (Warsaw, 1866) ; see Jew. Ency. xi. 330 sqq.

iii. Siphre (Aram. ” the books “), an old composite collection of Halaka on Numbers, after R. Ishmaei’s school; and on Deut. after that of R. Aqiqa, although the haggadic portions belong to the former. Latin in Ugol. xv. ; recent edition, with good introduction by Friedmann (Vienna, 1864); see Jew. Ency. xi. 332 seq.

The above works, although of 5th century or later date in their present form, contain much older material, which was perhaps first redacted in the earlier part of the 2nd century, A.D. They are of

2 See, on this point, Jew. Ency. viii. 549 seq., 552, 576; Schechter, op. cit. p. 62; Strack, op. cit. pp. 10 sqq.

3 See more fully Jew. Ency. viii. 553. Cf. for the structure, the hopeful concluding notes in the prophecies {e.g. Amos) and the dis- course after the reading of the lesson from the prophets in Luke iv. 17 sqq., Acts xiii. 15 sqq.

4 See I. Abrahams in Swete’s Cambridge Bibl. Essays (1909), pp. 174 seq.

Palestinian origin, although the main redaction was made in Baby- lonia.’

iv. Tanfyuma, one of the oldest on the lessons of the Pentateuch, with many proems ascribed to R. Tanhuma ben (“son of”) Abba, one of the most famous haggadists of Palestine (4th century), who systematized and fixed the haggadic literature. This collection of 158-161 homilies

is also known as T. Yelammedenu, from the opening words, Yel. Rabbenu, ” our Rabbi teaches us ” ; on the critical questions connected with the titles and the present redaction (probably 5th century), see Jew. Ency. viii. 560 seq., xii. 44 sqq. Recent edition by Buber (Wilna, 1885).

v. Midrash Rabbah (or Rabbolh), a large collection of very diverse origin and date, probably not completed before the 13th century. It covers the Pentateuch (isl ed., Constantinople, 1512) and the “Five Rolls” (Pesaro, 1519; the whole printed first at Venice, 1545) ; Germ, trans, by A. Wiinsche, Bibliotheca rabbinica (Leipzig, 1880-1885). The several portions are named after the ordinary Jewish titles of the Old Testament books with the addition of Rabbah ” great.” These are (a) Bheshith (” in the beginning,” Gen. i. 1) Rabbah, on Genesis, the oldest and most valuable of haggadic Midrashim. Traditionally ascribed to R. Hoshaiah (3rd. century), ‘but in the main a redaction of 6th century. Ed. J. Theodor ; see Jew. Ency. iii. 62 seq. ; viii. 557 seq. (b) Shemoth (” names ” Exod. i. 1) R., a composite and incomplete work of nth and 12th century date, but valuable nevertheless for its Tan huma homilies. Exod. i.xi. is a commentary on the text in con tinuation of (a). 1 See Jew. Ency. viii. 562 (c.) Wayyiqra (” and he called “) R., on Leviticus, perhaps 7th century, based upon sources in 2 and 5a above. It is characterized by its numerous proverbs (e.g. on xix. 6: “do not care for the good pup of a bad dog, much less for the bad pup of a bad dog “). See Jew. Ency. viii. 560, xii. 478 seq. (d) Bemidbar (” in the desert of . . . “) R., 33 homilies on Numbers, mainly derived from 4 above (though in an earlier text), with a later haggadic exposition, perhaps of 12th century, on Num. i.vii. See Jew. Ency. ii. 669 sqq., viii. 562. (e) Debarim (” words “) R., independent homilies on Deuteronomy, of about A.D. 900, but with a good collection of Tanhumas and excerpts from the old sources. See Jew. Ency. iv. 487 seq. (/) Shir (” song “) R., or (after the opening words) Aggadath Hazith, a late compilation of haggadah on Canticles, illustrating the allegorical interpretation of the book in reference to the relation between God and Israel (so already in the exegesis of R. Aqiba, cf. also 2 Esd. v. 24, 26, vii. 26). For this and other Mid. on this popular book, see Jew. Ency. viii. 564 seq., xi. 291 seq. (g) Mid. Ruth or Ruth Rabbah,ˆ a com pilation including an exposition of I Chron. iv. 21-23, xi. 13-15 and interesting Messianic references. For this and similar Mid. or Ruth, see Jew. Ency. viii. 565, x. 577 seq. (h) Iikah (“how “) Rabbathi, a compilation of about the 7th century on Lamentations, from sources cited also in the Palestinian Talmud. Thirty-six proems precede the commentary. See Jew. Ency. v. 85 seq. (i) Mid. Koheleth or Koh. Rabbah, on Ecclesiastes ; see Jew. Ency. vii.

529 sqq.; viii. 565. (j) Mid. Megillath Esther, dating, to judge from its indebtedness to Josippon (the pseudo-Josephus), after 10th century. On this and other similar works dealing with this ever- popular book, see Jew. Ency. v. 241, viii. 566, and Paton's Comment, on Esther, p. 104.

vi. Pesiqta (" section ") or P. de-Rab Kahana, contains 33 or 34 homilies (on the principal festivals), the first of which opens with a sentence of R. Abba bar Kahana, who was confused with a pre-decessor, Rab Kahana. Although it goes back to early Haggada it has received later additions (as is shown by the technique of the proems). Edited by S. Buber (Lyck, 1868), Germ, trans, by A. Wiinsche (Leipzig, 1 885) ; see Jew. Ency. viii. 559 seq. Not to be confused with this is: —

vii. Pesiqta Rabbathi. — A very similar but larger collection of 51 homilies, of which 28 have ajialakic exordium prefixed to the Tanhuma-proems, perhaps of 9th century. Edited by M. Fried- mann (Vienna, 1880). Quite another and later work is the Pes. Zutarta or Leqah Tob of Tobiah b. Eliezer of Mainz (trans. Ugolinus, vol. xv. seq. ; ed. Buber, 1880) ; see Jew. Ency. viii. 561 sqq.

viii. In addition to the more prominent Midrashim mentioned above there are numerous self-contained works of greater or less interest. Some are connected with Old Testament books; e.g. Aggadath Bereshith, 83 homilies on Genesis, each in three parts connected with a section from the lectionary of the Pentateuch, and one from the Prophets, and a Psalm (ed. Buber, Cracow, 1903; see Jew. Ency. viii. 563) ; the Mid. Tehilllm on the Psalms (Germ, trans. A. Wiinsche, Trier, 1892-1893), &c. _ Others are historical, e.g. Pirqe or Baraitha de-Rabbi Eliezer, a fanciful narrative of events

'They contain (as I. Abrahams has pointed out to the present writer) a good deal of haggada, but far more halakic material than those which follow. The latter (nos. 4 sqq.) also contain halaka, but the chief contents are haggadic and homiietical.

2 1. Abrahams points out to the writer that the rest is more summary. This difference is accounted for by the fact that Exod. xii. onwards and the rest of the Pentateuch have independent Midrashim: the Law proper was held by the Rabbis to begin at Exod. xii.

selected from the Pentateuch, &c. ; the eschatology is interesting. Though associated by name with a well-known 1st century Rabbi, it is hardly earlier than the 8th (Latin trans, by Vorstius, Leiden, 1644; see

Jew. Ency. viii. 567). Further, the Megillath Ta'anlth (" roll of fasts "), an old source with a collection of miscellaneous legends, &c. ; Megillath Antiokhos, on the martyrdom under Hadrian; Seder'Olam Rabbah, on biblical history from Adam to the rebellion of Bar Kokba (Barcocheba) ; the " Book of Jashar "; the Chronicle of Jerahmeel," &c. Liturgical Midrash is illustrated by the Haggada shel Pesah, part of the ritual recited at the domestic service of the first two Passover evenings. In Mid. Ta'ame Haseroth we- Yetheroth, Hebrew words written " defectively " or " fully," and other Masso- retic details, are haggadically treated. Finally Kabbalah (q.v.) is exemplified in Othiyyoth de R. Aqiba on the alphabet, and M. Tadshe (or Baraitha de-R. Phinehas b. Ya'ir), on groups of numbers, &c. ; of some interest for its relation to the book of Jubilees.

ix. Of collections of Midrash the chief are (a) the Yalqut Shimeoni, which arranges the material according to the text of the Old Testa- ment (extending over the whole of it), preserves much from sources that have since disappeared, and is valuable for the criticism of the text of the Midrashim (recent ed. Wilna, 1898) translation of the Yalqut on Zechariah by E. G. King (Cambridge, 1882; see further Jew. Ency. xii. 585 seq.). (6) Yal. ha-Makiri, perhaps later, covers only certain books, is useful for older sources and their criticism; portions have been edited by Spira (1894, on Isaiah); Buber (1899, on Psalms); Griinhut (1902, on Proverbs), (c) Midrash ha-Gadol (" the great "), an extensive thesaurus, but later (quoting from Ibn Ezra, Maimonides, &c.) ; the arrangement is not so careful as in (a) and (b). See further Jew. Ency. viii. 568 seq.

Of modern collections special mention must be made of A. Jellinek's Bet ha-Midrasch (Leipzig, 1853) and A. Wiinsche's valuable translations; to those already mentioned must be added his Aus Israels 'Lehrhallen (excerpts of a more miscellaneous character (Leipzig, 1907 sqq.).

Besides dictionary articles on this subject (S. Schiller-Szinessy, Ency. Brit., 9th ed. ; H. L. Strack, Real-Ency. f. Protest. Theol. u. Kirche; and especially J. Theodor and others in the Jew. Ency), see D. Hoffmann, Zur Einleitung in die halachischen Midraschim (Berlin, 1888), and the great work by Zunz, Die gottesdienstlichen Vortrage der Juden, 2nd ed. by N. Brtill (Frankfort on Main, 1892). These, as also the citations in the course of this article, give fuller information. (See further Talmud.) (S. A. C.)

MIDSHIPMAN, the title in the British and American navies of the " young gentlemen " who are serving in order to qualify themselves to

hold a commission as lieutenant. The English midshipman was originally a petty officer, one of the crew under the immediate orders of the boatswain. After the restoration of King Charles II., in 1660, the king and his brother, James Duke of York, lord high admiral, decided to train officers for the sea service. They therefore decided to send a volunteer to each ship of a squadron in commission, with a ” letter of service,” which instructed the admirals and captains that the bearer was to be shown ” such kindness as you shall judge fit for a gentleman, both in accommodating him in your ship and in furthering his improvement.” He was to receive the pay of a midshipman, and one midshipman less was to be borne in the ship. Until 1729 the young gentlemen who entered the British navy were known as ” king’s letter boys.” In that year the system was altered. A school, known as the naval academy, was founded at Portsmouth in which forty lads were to be trained for the sea service. In 1773 the school, having proved unsatisfactory, was reorganized and the number of boys to be trained there increased from forty to seventy. In 1806 it was again reorganized, under the name of the naval college, and was finally suppressed in 1837, when the practice of training the boys under instructors in the ships was intro- duced. A special school was re-established in 1857, and was finally placed in the ” Britannia.” In the meantime the number of midshipmen had increased far beyond one for a ship. A line- of battle ship in the 18th century carried as many as twenty four, and the title had come to be confined entirely to those who were being trained as officers. The immense majority of officers of the British navy never passed through the academy or the college. They entered the ships directly as ” captains’ servants ” or ” volunteers,” and were rated midshipman, if there was a vacancy, at the age of fifteen. As they were expected to learn navigation, they were instructed by the master, and at the age of seventeen were supposed to be qualified to be masters’ mates. To-day the midshipman is the officer of the British and American navies who has passed through the

preliminary schools and has been appointed to a ship. The French equivalent fs aspirant, and other European navies use that name, or cadet.

MIDSOMER NORTON, an urban district in the northern parliamentary division of Somersetshire, England, 12I m. S.S.W. of Bath, on the Somerset & Dorset and the Great Western railways. Pop. (iqoi), 5809.

The town is pleasantly situated in a hilly district, between two branches of the small river Somer. The church of St John the Baptist, principally Perpendicular, has in its tower three , bells presented by Charles II. Both this town and the adjacent urban district of Radstock (pop. 33 ss) have a considerable trade in coal, which is mined in the vicinity. The coalfield extends north- westward towards Bristol, and is of great importance to the manufactures of that city.

MIDWIFE (Mid. Eng. midwif, mydwyf or medewife, from preposition mid, with, and wife, i.e. woman, in the sense of one who is with ,the mother, or from adjective mid, one who is the means of delivering the mother, a woman who assists other women in 'childbirth). As a class, midwives were recog- nized in Egypt in the time of the Jewish captivity. It was the universal practice in Europe until the middle of the 16th century, as it is to-day in the East, that women should be attended in confinement only by those of their own sex. From that period more attention was given to the practice of mid- wifery by the medical profession (see Obstetrics), while in continental Europe, towards the close of the 17th century, special schools were instituted for the proper training of mid- wives. But it was not until well on in the 19th century that any supervision or regulation was imposed on those who acted as midwives. Now in practically every European country midwives are under strict state control, they are required to undergo a course of thorough training, and their practice is carefully regulated by legislation.

In France midwives (sages femmes) are divided into a first and a second class. Those qualifying for both classes go through a two years' course of training and must qualify both in the theory and practice of midwifery, as well as in anatomy, physiology and pathology. A midwife of the first class has a superior status and can practise in any part of France, while those of the second class are restricted in their practice to the department for which the certificate was issued. Their qualifications allow them also to vaccinate and to prescribe certain antiseptic preparations. They are not allowed to use instruments and must call in a medical man in difficult cases. All cases must be reported to a central officer. In Spain midwives are allowed to practise on the result of an ex- amination after studies covering at least four half-years. The diploma is issued by the director-general of public instruction. In Germany midwives are appointed, recognized and authorized by the state. They can conduct confinements independently and without the aid of a medical man. They must be provided with a certificate from the police authorities, and must reside in special districts assigned to them by the authorities. In Austria midwives before they are allowed to practise must pass'a strict examination,

after having followed a six months' course at one of the state schools of midwifery. They are subject to elaborate ' ' instructions for midwives " issued from time to time by the ministry of the interior. In Italy a midwife must oass an examination and obtain a diploma from a recognized authority ; but in order to obviate the difficulty ' which the poorer classes in the smaller communes would find in obtaining properly-authorized midwives, a certificate of permission to practise may be given to a certain number who have practised without the sanction of the law satisfactorily during a term of five years. These certificates are distributed by the prefect. In Russia matters pertaining to the appointment, transfer, dismissal and pay of midwives are under the charge of the medical depart- ment of the ministry of the interior. In each town of a province or region there is stationed one senior midwife and a number of junior midwives in proportion to the number of districts in the province. The examination of midwives and the issue of certificates of competency is carried out by the Medico-Chirurgical Academy and certain of the universities. A duly-licensed midwife, on pre- sentation of her licence, is at once excluded from the tax-paying class to which she may have belonged. The general code of Russian laws lays down extensive rules for the carrying out of the duties of midwives. In Norway all midwives are licensed after examination and are under the control and inspection of the board of health. Provision is made for infirm and aged midwives. They are usually paid by the parish, but also receive fees according to the means of the person attended. In Sweden a certificate of competency and of having passed an examination does not give a midwife a right

to practise until a note has been made on the certificate that the oath of office has been duly taken. All midwives are under the control of the board of health. When a midwife takes up her residence in a parish, or moves from one place to another, she must announce the fact within a month to the nearest appointed doctor and exhibit her certificate. In towns a midwife must put up a notice board outside her residence ; she must not absent herself from home without leaving word as to where she may be found and at what hour she will probably return. In the country a midwife may be paid out of the poor rate. In Denmark, also, midwives are recognized by the state, and the practise of midwifery is almost entirely in the'hands of women. In Holland a certain number of candidates are given free training by the state in return for their practising midwifery in scattered country districts at a fixed salary. Many of the states of the United States have also passed laws for the registration of midwives.

In England alone there was no regulation of any kind so late as 1902. Any person, however ignorant and untrained, could describe herself as

a midwife and practise for gain. Several societies made continuous efforts towards the close of the 19th century to obtain legislation. A select committee on midwives' registration reported in 1892 that the evidence they had taken showed that there was at the time " serious and unnecessary loss of life and health and per- manent injury to both mother and child in the treatment of child- birth, and that some legislative provision for improvement and regulation was desirable." A similar committee reported to the same effect in 1893. Eventually a bill was drafted with the object of securing the examination and registration of midwives, but, although introduced several times into the House of Commons, it was not successful until 1902. The Midwives Act 1902 forbids any woman after the 1st of April 1905 to call herself " midwife " without a certificate, or to act as a midwife for gain without a certificate after the 1st of April 19 10. Existing midwives (those who held certificates in midwifery from certain recognized institu- tions, or produced satisfactory evidence at the passing of the act that they had been for at least one year in bona fide practice as midwives, and bore good characters) were allowed to claim certifi- cates within two years from the 1st of April 1903. The act created a central midwives' board, whose duties are, inter alia, to regulate the issue of certificates and the conditions of admission to the roll of midwives; to regulate the course of training and conduct of examinations; to regulate, supervise and restrict within due limits the practice of midwives ; to publish annually a roll of duly certified midwives; to remove from the roll the name of any midwife who disobeys the rules and regulations laid down from time to time; to issue and cancel certificates, &c. There is an appeal to the High Court of Justice against removal of a name, but the appeal must be made within three months. Local authorities are required to exercise supervision over the midwives within their area ; they must investigate charges of malpractice, negligence or misconduct; exercise the power of suspension and report convictions. They must supply the central board with the names and addresses of those practising within their area, and notify any death. The local authority must appoint a committee to carry out its powers or duties under the act, and may, if it think fit, delegate its powers to a lesser local authority, such as a district council. The act provides for penalties for obtaining a certificate by false representation or for wilful falsification of the roll. The act does not apply to Ireland or Scotland. (T. A. I.)

MIERES, a town of northern Spain, in the province of Oviedo, 12 m. by rail S.E. of Oviedo, on the river Caudal, a tributary of the Nalon. Pop. (1900), 18,083. Mieres is the chief town of a mountainous, fertile and well-wooded region in which coal, iron, and copper are

extensively mined and sulphur and cinnabar are obtained in smaller quantities. The town contains large iron foundries and chemical works, and has an active trade in fruit, cider, timber and live stock.

MIEREVELT (Miereveld, or Mireveldt), MICHIEL JANSZ VAN (1567-1641), Dutch painter, was born at Delft, the son of a goldsmith, who apprenticed him to the copperplate engraver J. Wierix. He subsequently became a pupil of Willem Willemz and Augusteyn of Delft, until Anthonie van Montfoort (Blocklandt), who had seen and admired two of Mierevelt's early engravings, " Christ and the Samaritan " and " Judith and Holofernes," invited him to enter his school at Utrecht. Devoting himself first to still life, he eventually took up por- traiture, in which he achieved such success that the many commissions entrusted to him necessitated the employment of numerous assistants, by whom hundreds of portraits were turned out in factory fashion. The works that can with cer- tainty be ascribed to his own brush are remarkable for their sincerity, severe drawing and harmonious colour, but compara- tively few of the two thousand or more portraits that bear

his name are wholly his own handiwork. He settled down in his native town, but went frequently to The Hague, where he entered the gild of St Luke in 1625. So great was his reputa- tion that he was patronized by royalty in many countries and acquired great wealth. The king of Sweden and the count palatine of Neuburg presented him with golden chains, Arch- duke Albrecht gave him a pension, and Charles I. vainly endea- voured to induce him to visit the English court. Though Mierevelt is chiefly known as a portrait painter, he also executed some mythological pieces of minor importance. Many of his portraits have been reproduced in line by the leading Dutch engravers of his time. He died at Delft on the 27th of June

1641.

The Ryks Museum in Amsterdam has the richest collection of Mierevelt's works, chief of them being the portraits of William, Philip William, Maurice, and Frederick Henry of Orange, and of the count palatine Frederick V. At The Hague Museum are the portraits of four princes of the house of Orange, of Frederick V., king of Bohemia, and of Louise de Coligny as a widow. Other portraits by him are at nearly all the leading continental galleries, notably at Brunswick (3), Gotha

(2), Schwerin (3), Munich (2), Paris (Louvre, 3), Dresden (4), Berlin (2), and Darmstadt (3). The town hall of Delft also has numerous examples of his work.

Many of his pupils and assistants rose to fame. The most gifted of them were Paulus Moreelse and Jan van Ravesteyn. His sons Pieter (1596-1623) and Jan (d. 1633), and his son-in-law Willem Jacobz Delff, probably painted many of the pictures which go under his name. His portrait was painted by Van Dyck and engraved by Delff.

MIERIS, the name of a family of artists who practised paint- ing at Leiden for three generations in the 17th and 18th centuries.

1. Frans van Mieris, the elder (? 1635-1681), son of Jan van Mieris, a goldsmith and diamond setter, was born, according to Houbraken, at Leiden on the 16th of April 1635, and died there on the 12th of March 1681. His father wished to train him to his own business, but Frans preferred drawing to chasing, and took service with Abraham Torenvliet, a glazier who kept a school of design. In his father's shop he became familiar with the ways and dress of people of distinction. His eye was fascinated in turn by the sheen of jewelry and stained glass; and, though he soon gave up the teaching of Torenvliet for that of Gerard Douw and Abraham van den Tempel, he acquired a manner which had more of the finish of the exquisites of the Dutch school than of the breadth of the disciples of Rembrandt. It should be borne in mind that he seldom chose panels of which the size exceeded 12 to 15 in., and whenever his name is attached to a picture above that size we may surely assign it to his son Willem or to some other imitator. Unlike Gerard Douw when he first left Rembrandt, or Jan Steen when he started on an independent career, Mieris never ventured to design figures as large as life. Characteristic of his art in its minute proportions is a shiny brightness and metallic polish. The subjects which he treated best are those in which he illustrated the habits or actions of the wealthier classes; but he sometimes succeeded in homely incidents and in portrait, and not unfrequently he ventured on allegory. He repeatedly painted the satin skirt which Ter Borch brought into fashion, and he often rivalled Ter Borch in the faithful rendering of rich and highly-coloured woven tissues. But he remained below Ter Borch and Metsu, because he had not their delicate perception of harmony or their charming mellowness of touch and tint, and he fell behind Gerard Douw, because he was hard and had not his feeling for effect by concentrated light and shade. In the form of his composition, which sometimes represents the framework of a window enlivened with greenery, and adorned with bas-reliefs within which figures are seen to the waist, his model is certainly Gerard

Douw.

It is a question whether Houbraken has truly recorded this master's birthday. One of his best-known pieces, a party of ladies and gentlemen at an oyster luncheon, in the Hermitage at St Petersburg, bears the date of 1650. Celebrated alike

for composition and finish, it would prove that Mieris had reached his prime at the age of fifteen. Another beautiful example, the " Doctor Feeling a Lady's Pulse " in the gallery of Vienna, is dated 1656; and Waagen, in one of his critical essays, justly observes that it is a remarkable production for a youth of twenty-one. In 1657 Mieris was married at Leiden in the presence of Jan Potheuck, a painter, and this is the earliest written record of his existence on which we can implicitly rely. Of the numerous panels by Mieris, twenty-nine at least are dated — the latest being an allegory, long in the Ruhl collection at Cologne, illustrating what he considered the kindred vices of drinking, smoking and dicing, in the year 1680.

Mieris had numerous and distinguished patrons. He received valuable commissions from Archduke Leopold, the elector- palatine, and Cosimo III., grand-duke of Tuscany. His practice was large and lucrative, but never engendered in him either carelessness or neglect. If there be a difference between the painter's earlier and later work, it is that the former was clearer and more delicate in flesh, whilst the latter was often darker and more livid in the shadows. When he died his clients naturally went over to his son Willem, who in turn bequeathed his painting-room to his son Frans. But neither Willem nor Frans the younger equalled Frans the elder.

2. Willem van Mieris (1662-1747), son of Frans. His works are extremely numerous, being partly imitations of the paternal subjects, or mythological episodes, which Frans habitually avoided. In no case did he come near the excellence of his sire.

3. Frans van Mieris, the younger (1680-1763), also lived on the traditions of his grandfather's studio.

The pictures of all the generations of the Mieris family were successfully imitated by A. D. Snaphaan, who lived at Leipzig and was patronized by the court of Anhalt-Dessau. To those who would study his deceptive form of art a visit to the collection of Worlitz near Dessau may afford instruction.

MIFFLIN, THOMAS (1744-1800), American soldier and politician, was

born in Philadelphia, Pennsylvania, on the 10th of January 1744, of Quaker parentage. He graduated at the college of Philadelphia (now the university of Pennsylvania) in 1760. As a member of the Pennsylvania house of representa- tives in 1772-1775, he was an ardent Whig, and in 1774 was a member of the first Continental Congress. After the outbreak of the War of Independence he devoted himself chiefly to the enlisting and drilling of troops, and was chosen major of a regiment. In June 1775 he entered the continental service as Washington's first aide-de-camp, and in August was chosen quartermaster-general. He became a brigadier-general in May 1776 and a major-general in February 1777. On the 5th of June 1776 he was succeeded as quartermaster-general by Stephen Moylan. Moylan, however, proved incompetent, and Mifflin resumed the office on the 1st of October. In the autumn of 1777 Mifflin was a leader in the obscure movement known as the Conway Cabal, the object of which was to replace Washington by General Horatio Gates. On the ground of ill health Mifflin tendered his resignation on the 8th of October, and on the 7th of November Congress accepted his resignation as quartermaster- general, but continued him in rank as major-general without pay. On the same day he was appointed a member of the new board of war, and on the following day was asked to continue as quartermaster-general until his successor should be appointed. On the 2 1 st of November he urged before the old board of war and ordnance that Gates should be made president of the new board of war " from a conviction that his military skill would suggest reformations in the different departments of the army essential to good discipline, order and economy, and that his character and popularity in the army would facilitate the execution of such reformations when adopted by Congress." The attacks on Washington failed, and in March 1778 Mifflin was finally superseded as quartermaster-general by General Nathanael Greene. In October of the same year he was removed from the board of war. The sufferings of the troops at Valley Forge having been charged to his mismanagement as quarter-

master-general, Congress, in June 1778, ordered an investigation; but before this inquiry had proceeded far, Congress granted him $1,000,000 to settle all claims against the office during his administration. In February 1779 he resigned his commission as major-general. During the war his eloquence was repeatedly of assistance to Congress in recruiting soldiers. He was a delegate in

Congress in 1 782-1 784, and from November 1783 to November 1784 was president, in which office he received Washington's resignation of the command of the army and made a congratulatory address. In 1 785-1 788 he was speaker of the Pennsylvania general assembly (then consisting of only one house); he was a member of the Federal Constitutional Con- vention of 1787, and president of the state supreme executive council (or chief executive officer of the state) in 1 788-1 790. He was president of the Pennsylvania Constitutional Convention of 1 789-1 790; was the first governor of the state, from 1790 to 1799, after the adoption of the new state constitution; and during the Whisky Insurrection assumed personal command of the Pennsylvania militia. Towards the close of his last term as governor he was elected a member of the state assembly, but died during the first session, at Lancaster, on the 20th of January 1800.

See William Rawle, " Sketch of the Life of Thomas Mifflin," in. Memoirs of the Historical Society of Pennsylvania (vol. 2, part 2, Philadelphia, 1830); and J. H. Merrill, Memoranda relating to the Mifflin Family (Philadelphia, 1890).

MIGNARD, PIERRE (1610-1695), called— to distinguish him from his brother Nicholas — Le Romain, French painter, was born at Troyes in 1610, and came of a family of artists. In 1630 he left the studio of Simon Vouet for Italy, where he spent twenty-two years, and made a reputation which brought him a summons to Paris. Successful with his portrait of the king, and in favour with the court, Mignard pitted himself against Le Brun, declined to enter the Academy of which he was the head, and made himself the centre of opposition to its authority. The history of this struggle is most important, because it was identical, as long as it lasted, with that between the old gilds of France and the new body which Colbert, for political reasons, was determined to support. Shut out, in spite of the deserved success of his decorations of the cupola of Val de Grace (1664), from any great share in those public works the control of which was the attribute of the new Academy, Mignard was chiefly active in portraiture. Turenne, Moliere, Bossuet, Maintenon (Louvre), La Valliere, Sevigne, Montespan, Descartes (Castle Howard), all the beauties and celebrities of his day, sat to him. His readiness and skill, his happy instinct for grace of arrange- ment, atoned for want of originality and real power. With the death of Le Brun (1690) the situation changed; Mignard deserted his allies, and succeeded to all the posts held by his opponent. These late honours he did not long enjoy; in 1695 he died whilst about to commence work on the cupola of the Invalides. His best compositions have been engraved by Audran, Edelinck, Masson, Poilly and others.

MIGNE, JACQUES PAUL (1800-1875), French priest and pub- lisher, was born at St Flour, Cantal, on the 25th of October 1800. He studied theology at Orleans, was ordained priest in 1824 and placed in charge of the parish of Puiseaux, in the diocese of Orleans. In 1833 he went to Paris, and started L'Univers religieux, which afterwards became Louis Veuillot's ultra- montane organ. On severing his connexion with the paper three years later, he opened at Petit Montrouge, near Paris, the great publishing house which brought out in rapid succession numerous religious works at popular prices. The best known of these are: Scripturae sacrae cursus completus, and Theologiae cursus (each in 28 vols., 1840-1845); Collection des auteurs sacres (100 vols., 1846-1848); Encyclopedic theologique (171 vols., 1 844-1 866); Patrologiae cursus completus, Latin series in 221 vols. (1844-1855; 2nd edition, 1878 seq.); Greek series, first published in Latin (85 vols., 1856-1861); with Greek text and Latin translation (165 vols., 1857-1866). Unfortunately these editions, brought out in great haste and often edited by super- ficial scholars, do not come up to the requirements of modern

criticism. By far the most noteworthy is the Patrology, which was superintended by the learned Benedictine J. B. Pitra. Its vast scope leaves it still unique and valuable, where other editions of special works do not exist. The indices in 3 vols, are arranged so that one may easily find any reference in the patristic writings. In February 1868 a great fire destroyed the whole of Migne's printing premises, but he established a new house in Paris, which was purchased in 1876 by the publishers Gamier Freres, who still own all the works brought out by Mighe. He died in Paris on the 25th of October 1875.

For a more complete account of Migne's life, see the article in the Catholic Encyclopedia (New York, 1906 seq.).

MIGNET, FRANQOIS AUGUSTE ALEXIS (1796-1884), French historian, was born at Aix in Provence on the 8th of May 1796, and died at Paris on the 24th of March 1884. His father, a Vendean by birth, was an ordinary locksmith, who enthusiastically accepted the principles of the French Revolution and roused in his son the same love for liberal ideas. Francois had brilliant successes when studying at Avignon in the lycic where he was afterwards professor (181 5); he returned to Aix to study law, and in 1818 was called to the bar, where his elo- quence would have ensured his success had he not preferred the career of an historian. His abilities were shown in an Eloge de Charles VII., which was crowned by the Academie de Nimes in 1820, and a memoir on Les Institutions de Saint Louis, which in 1821 was crowned by the Academie des Inscrip- tions et Belles Lettres. He then

went to Paris, where he was soon joined by his friend and compatriot, Adolphe Thiers, the future president of the French republic. He was introduced by J. A. Manuel, formerly a member of the Convention, to the Liberal paper, Courrier franqais, where he became a member of the staff which carried on a fierce pen-and-ink warfare against the Restoration. He acquired his knowledge of the men and intrigues of the Napoleonic epoch from Talleyrand. He wrote a Histoire de la revolution francaise (1824) in support of the Liberal cause. It was an enlarged sketch, prepared in four months, in which more stress was laid on fundamental theories than on the facts, which are more rigidly linked together than their historical sequence warrants. In 1830 he founded the National with Thiers and Armand Carrel, and signed the journal- ists' protest against the Ordonnances de juillet, but he refused to accept his share of the spoil after his party had won. He was satisfied with the modest position of director of the archives at the Foreign Office, where he stayed till the revolution of 1848, when he was dismissed, and retired permanently into private life. He had been elected a member of the Academie des Sciences Morales et Politiques, re-established in 1832, and in 1837 was made the permanent secretary; he was also elected a member of the Academie Francaise in 1836, and sought no further honours. He was well known in fashionable circles, where his witty, conversation and his pleasant manners made him a favourite. The greater part of his time was, however, given to study and to his academic duties. Eulogies on his deceased fellow-members, the Academy reports on its work and on the prizes awarded by it, which it was part of Mignet's duty as secretary to draw up, were literary fragments thoroughly appreciated by connoisseurs. They were collected in Mignet's Notices et portraits. He worked slowly when in his study, and willingly lingered over research. With the exception of his description of the French Revolution, which was chiefly a poli- tical manifesto, all his early works refer to the middle ages — De La feodalite, des institutions de Saint Louis et de l' influence de la legislation de ce prince (1822); La Germanie au viii" et au ix' siecle, sa conversion au christianisme, et son introduction dans la sociUe civilisee de I' Europe occidentale (1834); Essai sur la formation territoriale et politique de la France depuis la fin du xi e siecle jusqu'd la fin du xv" (1836); all of these are rough sketches showing only the outlines of the subject. His most noted works are devoted to modern history. For a long time he had been taken up with a history of the Reformation, but only one part of it, dealing with the Reformation at Geneva, has been published. His Histoire de Marie Stuart (2 vols., 1851)

is well worth reading; the author made liberal use of some important unpublished documents, taken for the greater part from the archives of Simancas. He devoted some volumes to a history of Spain, which had a well-deserved success — Charles Quint, son abdication, son sejour, et sa mort au monastere de Yuste (1845); Antonio Perez et Philippe II. (1845); and Histoire de la rivalite de Francois I. et de Charles Quint (1875). At the same time he had been commissioned to publish the diplomatic acts relating to the War of the Spanish Succession for the Collection des documents inidits; only four volumes of these Negociations were published (1835-1842), and they do not go further than the peace of Nijmwegen; but the intro- duction is celebrated, and Mignet reprinted it in his Melanges historiques.

See the eulogy of Mignet by Victor Duruy, delivered on entering the Academie Frangaise on the 18th of June 1885, and the notice by Jules Simon, read before the Academie des Sciences Morales et Politiques on the 7th of November 1885.

MIGNON, ABRAHAM (1640-1697), Dutch painter, was born at Frankfort. His father, a merchant, placed him under the still-life painter Jacob Merrel, by whom he was taken to Holland about 1660. He then worked under de Heem at Utrecht, where in 1675 he married the daughter of the painter Cornelis Willaerts. Sibylle Merian (1647-1717), daughter of the engraver Matthew Merian, became his pupil and achieved distinction as a flower painter. He died at Wetzlar. Mignon devoted himself almost exclusively to flowers, fruit, birds and other ” still life,” though at times he also attempted portraiture. His flower pieces are marked by careful finish and delicate handling. His favourite scheme was to introduce red or white roses in the centre of the canvas and to set the whole group of flowers against a dark background. Nowhere can his work be seen to better advantage than at the Dresden Gallery, which contains fifteen of his paintings, twelve of which are signed. Six of his pictures are at the Louvre, four at the Hermitage, and other examples are to be found at the museums of Amsterdam, The Hague, Rotterdam, Brussels, Munich, Karlsruhe, Brunswick, Cassel, Schwerin, Copenhagen and Turin.

MIGNONETTE, or Mignonnette {i.e. ” little darling “), the name given to a popular garden flower, the Reseda odorata of botanists, a ” fragrant weed,” as Cowper calls it, highly esteemed for its delicate but delicious perfume. The mignonette is generally regarded as being of annual duration, and is a plant of diffuse decumbent twiggy habit, scarcely reaching a foot in height, clothed with bluntish lanceolate

entire or three-lobed leaves, and bearing longish spikes — technically racemes — of rather insignificant flowers at the ends of the numerous branches and branchlets. The plant thus naturally assumes the form of a low dense mass of soft green foliage studded over freely with the racemes of flowers, the latter unobtrusive and likely to be overlooked until their diffused fragrance compels attention. It is probably a native of North Africa and was sent to England from Paris in 1742; and ten years later it appears to have been sent from Leiden to Philip Miller at Chelsea. Though originally a slender and rather straggling plant, there are now some improved garden varieties in which the growth is more compact and vigorous, and the inflorescence bolder, though the odour is perhaps less pene- trating. The small six-petalled flowers are somewhat curious in structure: the two upper petals are larger, concave, and furnished at the back with a tuft of club-shaped filaments, which gives them the appearance of being deeply incised, while the two lowest petals are much smaller and undivided; the most conspicuous part consists of the anthers, which are numerous and of a brownish red, giving the tone of colour to the inflorescence. In the varieties named Golden Queen and Golden Machet the anthers have a decided tint of orange- yellow, which imparts a brighter golden hue to the plants when in blossom. A handsome proliferous or double-flowered variety has also been obtained, which is a very useful decorative plant, though only to be propagated by cuttings; the double white flowers grow in large massive panicles (proliferous

racemes), and are equally fragrant with those of the ordinary forms.

What is called tree mignonette in gardens is due to the skill of the cultivator. Though practically a British annual, as already noted, since it flowers abundantly the first season, and is utterly destroyed by the autumnal frosts, and though recorded as being annual in its native habitat by Desfontaines in the Flora Atlantica, the mignonette, like many other plants treated in England as annuals, will continue to grow on if kept in a suitable temperature. More- over, the life of certain plants of this semi-annual character may be prolonged into a second season if their flowering and seeding are persistently prevented. In applying these facts to the pro- duction of tree mignonette, the gardener grows on the young plants under glass, and prevents their flowering by nipping off the blooming tips of the shoots, so that they continue their vegetative growth into the second season. The young' plants are at first supported in an erect position, the laterals being removed so as to secure clean upright stems, and then at the height of one or two feet or more, as may be desired, a head of branches is encouraged to develop itself. In this way very large plants can be produced.

For ordinary purposes, however, other plans are adopted. In the open borders of the flower garden mignonette is usually sown in spring, and in great part takes care of itself; but being a favourite either for window or balcony culture, and on account of its fragrance a welcome inmate of town conservatories, it is'also very extensively grown as a pot plant, and for market purposes with this object it is sown in pots in the autumn, and thinned out to give the plants requisite space, since it does not transplant well, and it is thereafter specially grown in pits protected from frosts, and marketed when just arriving at the blooming stage. In this way hundreds of thousands of pots of blooming mignonette are raised and disposed of year by year.

In classifying the odours given off by plants Rimmel ranks the mignonette in the class of which he makes the violet the type; and Fee adopts the same view, referring it to his class of " iosmoids " along with the violet and wallflower.

The genus Reseda contains about fifty species, natives of Europe and West Asia. R. luteola, commonly called dyer's-weed and weld, yields a valuable yellow dye. J?, alba is a fine biennial about 2 ft. high, with erect spikes of whitish flowers.

MIGNONS, LES. In a general sense the French word mignon means " favourite," but the people of Paris used it in a special sense to designate the favourites of Henry III. of France, frivolous and fashionable young men, to whom public malignity attributed dissolute morals. According to the contemporary chronicler Pierre de l'Estoile, they made themselves " exceed- ingly odious, as much by their foolish and haughty demeanour, as by their effeminate and immodest dress, but above all by the immense gifts the king made to them." The Guises appear to have stirred up the ill will of the Parisians against them. From 1576 the mignons were attacked by popular opinion, and historians accredited without proof the scandalous stories of the time. The best known of the mignons were the dukes of Joyeuse and of Epernon.

MIGNOT, CLAUDINE FRANCOISE [commonly called Marie] (c. 1617-1711), French adventuress, was born near Grenoble, at Meylan. At the age of sixteen she attracted the notice of the secretary of Pierre des Portes d'Amblerieux, treasurer of the province of Dauphiny, and Amblerieux promised to promote their marriage. He married the girl himself, however, and left her his fortune. His will was disputed by his family, and Claudine went to Paris in 1653 to secure its fulfilment. She sought the protection of Francois de PH6pital, marshal of France, then a man of seventy-five. He married her within a week of their first

meeting, and after seven years of marriage died leaving her part of his estate. By a third and morganatic marriage in 1672 with John Casimir, ex-king of Poland, a few weeks before his death, she received a third fortune. Imme- diately on her marriage with Amblerieux she had begun to educate herself, and her wealth and talents assured her a welcome in Paris. She retired in her old age to a Carmelite convent in the city, where she died on the 30th of November 1711.

Her history, very much modified, was the subject of a play by Bayard and Paul Duport, Marie Mignot (1829).

MIGRATION. Under this title will be considered movements of men with intention of changing their residence or domicile. Such migration (Lat. migrare) may be either external — that is, from one country to another, including emigration from mother country to colony; or it may be internal — that is, within

the limits of a single country. .Under external migration are comprised emigration and immigration, denoting simply direction from and to. The emigrants are at the same time the immi- grants; that is, the material of the movement is the same, but the effect upon the country giving up and the country receiving the migrant requires separate treatment. Hence it is proper to separate emigration from immigration. Tem- porary migration, or travel for purposes of business, enterprise or pleasure, will be considered only incidentally, and because in some cases it is difficult to distinguish between such movements and permanent migration.

Migration in general may be described as a natural function of social development. It has taken place at all times and in the greatest variety of circumstances. It has been tribal, national, class and individual. Its causes have been political, economic, religious, or mere love of adventure. Its causes and results are fundamental for the study of ethnology (forma- tion and mixture of races), of political and social history (forma- tion of states and survival of institutions), and of political economy (mobility of labour and utilization of productive forces). Under the form of conquest it makes the grand epochs in history (e.g. the fall of the Roman Empire); under the form of colonization it has transformed the world (e.g. the settlement of America); under free initiative it is the most powerful factor in social adjustment (e.g. the growth of urban population). It must suffice here

to indicate the character of the principal movements in the past, and then describe certain aspects of modern migration. The early movements may be grouped as follows: (a) Prehistoric migrations. Among savage and nomadic nations the whole tribe often moves into new territory, either occupy- ing it for the first time or exterminating or driving out the indigenous inhabitants. We have only vague knowledge of these early movements, laboriously gleaned from archaeology, anthropology and philology. The cause has been commonly said to be the pressure of population on the food-supply. A more probable explanation is the love of booty and the desire of the stronger to take possession of the lands of the weaker, (b) Greek and Roman coloni- zation. Both of these ancient civilizations extended their influence through migration of individual families and the planting of colonies. The motive seems to have been primarily commercial — that is, the love of gain. It may have been partly a sort of ” swarming ” process, caused by pressure of population at home. In some cases it had a political motive, as the planting of military colonies or providing new homes for the proletariat. The consequences were of course momentous, (c) The German Conquest. Beginning about the 5th century, the Roman empire was overthrown by German tribes from the north of the river Danube and east of the river Rhine. This V blkerwanderung, as it is called by German historians, again transformed the face of Europe, resulting in the establishment of independent kingdoms and a great mix- ture of races and institutions. It was coincident with the building-out of the feudal system. The conquered in many cases could be left as serfs and tillers of the soil, while the conquerors seized the higher positions of administration and power, (d) The later middle ages saw many minor migratory movements, such as those accompanying the crusades, the pushing of German colonization among the Slavs, and the introduction of Flemish weavers into England. The religious reformation caused a considerable amount of expatriation, culminating in the expulsion of the Huguenots from France, (e) The period of discovery and colonization opened up a new era for migration. The first expeditions were for adventure and booty, especially the discovery of gold and silver. Then came the establishment of commercial posts or factories for the purposes of trade. Finally came coloni- zation proper — that is, the settlement of new countries by Europeans intending to remain there permanently,

but still retaining their connexion with the mother country. This meant the opening up of the world to commerce and the extension of European civilization to vast areas formerly peopled by savages or half-civilized peoples. It meant a great outlet for the spirit of

enterprise and adventure, relief from over-population, an enormous increase in wealth and power, and a struggle for supremacy among the nations of Europe. Colonization and colonial policy excited immense attention in Europe; and this extended into the 19th century (e.g. E. G. Wakefield's plans for colonization, and the various colonization societies of modern times). The colonial policy proper was broken down by the revolt of the North American colonies from Great Britain, and later of Mexico and Central and South America from Spain. (/) The movement of popula- tion, however, has continued under the form of emigration. This movement is characterized firstly by its magnitude; secondly, by the fact that the emigrant changes his political allegiance, for by far the greater part of modern emigration is to independent countries, and even where it is to colonies the colonies are largely self-governing and self-regarding; and thirdly, it is a movement of individuals seeking their own good, without state direction or aid. This is 20th-century emigration, differing from all preceding forms and having an importance of its own.

Statistics of Emigration. — The direction of the modern movement is from Europe to America, Australia and South Africa, as shown in the following table: —

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10,298

139,979

20,653

57,484

218,116

1891

38,318

13,341

109,415

10,382

I37,88i

22,190

58,446

218,507

1892

4L275

17,049

74,681

10,442

133,815

23,325

52,902

210,042

1893

37.504

18,778

4C545

9,150

134,045

22,637

52,132

208,814

i«94

9,678

5,642

17,792

4,105

99,590

14,432

42,008

156,030

1805

15.104

6,207

36,725

3,607

"2,538

18,294

54,349

185,181

1896

12,919

6,679

32,127

2,876

102,837

16,866

42,222

161,925

1897

8,926

4,669

18,107

2,260

94,658

16,124

35,678

146,460

1898

7,32i

4,859

27,853

2,340

90,679

i5,57o

34,395

140,644

1899

12,028

6,699

63,101

2,799

87,400

16,072

42,890

146,362

1900

16,434

10,931

92,833

3,570

102,448

20,472

45,905

168,825

1901

20,464

12,745

87,431

4,657

m,585

20,920

39,210

I7L7I5

1902

33,477

20,343

no,453

6,823

137,121

26,285

42,256

205,662

1903

35,975

26,784

140,211

8,214

I77.58I

36,801

45,568

259,950

1904

—

22,264

—

9,o34

175,733

37,445

58,257

271,435

1905

—

21,059

—

8,051

170,408

41,510

50,159

262,077

1 The figures relate only to the emigrants of each nationality emigrat- ing from their own country to countries outside of Europe.

2 Exclusive of emigrants to Spanish colonies.

3 Russian emigrants from German ports.

Since 1820 over twenty million persons have emigrated from Europe to countries beyond the sea. The greater part of this emigration has been to the United States of North America. The history of emigration is well shown in the following table of emigra- tion from Great Britain and Ireland. Down to 1853 the figures include all emigrants from British ports; after 1853 emigrants of British and Irish origin only.

Emigration from Great Britain and Ireland, 1815-IQ05.

All Emigrants.

To

British

North

America.

To United States.

To Australia.

To other Places.

Total.

1815-1820 (5 years) . 1821-1830 (10 „) . 1831-1840 (10 „) . 1841-1850 (10 „) . 1851-1852- (2 „) .

70,438 139,269

322,485

429,044

75,478

50,359

99,8oi

308,247 1,094,556

511,618

9,036

67,882

127,124

109,413

2,731 1,805 4-536 34,168 8,221

123,528 249,911 703,150 1,684,892 704,730

1815-1852 (37 years) .

1,036,714

2,064,581

313,455

5i,46l

3,466,211

Emigrants of British and Irish Origin.

1 853-1 860 (8 years) . 1861-1870 (10 „) . 1871-1880 (10 „) . 1881-1890 (10 „) . 1891-1900 (10 „) . 1901-1905 (5 „) .

123,408 130,310 177,976 301,922 176,336 181,504

805,596 1,132,626 1,087,372

1,713,953

1.090,685

290,679

365,307 267,358

303,367

372,744

119,018

27,120

18,372

41,535

110,204

169,916'

258,942 2

85,6o7 3

1,312,683 1,571,829 1,678,919

2,558,535

1,644,981

584,910

1853-1905 (53 years) .

1,091,456

6,120,911

1,454,914

684,576

9,351,857

it was speedily resumed on an enlarged scale owing especially to the improved means of ocean transportation. It culminated in the decade 1880-1890, and declined after the commercial crisis of 1893. Later there was another increase.

The relative movement of nationalities is best presented by the statistics of the United States. The nationality (country of origin of immigrants coming to the United States, 1 871-1895) is shown in the following table: —

Nationality, of Immigration to the United States.

Anglo-Saxons, Celts, and . Welshmen — England and Wales Scotland . . . .

Total Irish — Ireland

,, Per cent.

25 Years of T

1 871-1895. Immigration

1,334,817 12-9

286,807 2-8

1,621,624 1,334,635

Teutons — ■

Austria 374,872

Germany 2,607,562

Netherlands …. 96,035

Total 3,078,469

The general direction of emigration from Europe is shown in the following table : —

Latins — Belgium , France Italy . Spain Portugal

Total

42,447

148,683

655,104

14,292

17.108

877,634

15-7 12-9

3-6

25-3 0-9

29-8

0-4 1-4 6-3

0-2 0-2

8-5

Emigration from various Countries of Europe.

Country of

Destination.

Country.

British

United

North

Brazil.

Argentine.

Australasia.

Africa.

All other.

Total.

States.

America.

Great Britain and Ireland, 1905

122,370

82,437

—

—

15,139

26,307

15,824

262,077

Norway, 1905

19,638

1,386

—

—

4

25

6

21,059

Sweden, 1903

35,439

329

—

—

5i

118

38

35,975

Germany, 1905

26,005

243

333

674

84

57

7

27,403

Denmark, 1905

7,158

453

—

—

55

19

366

8,051

Holland, 1905

2,282

—

—

—

15

—

2,297

Belgium, 1905

2,162

—

—

—

2

101

275

2,540

France, 1905

No

information

available.

Portugal, 1904

4,3

51

21,449

—

—

i,954

—

27,925

Spain, 1902 .

Cannot 1

:>e given.

1,120

8,767

—

20,460

—

44,401

Italy, 1905

316,797

5,930

30,079

88,840

765

13,072

3,866

479,349

Switzerland, 1905

4,349

—

53

471

—

—

—

5,049

Austria-Hungary, 1905

284,967

io,399

—

5,346

— •’

— -

— .

—

Statistics of Immigration.— The statistics of the United States are the most important and the most

complete. The statistics since 1820 are shown in the following table : —

Immigration into the United States, 1820-1905.
Decade ending 30th June.

1830

1840

1850

i860

1870

1880

1890

1900

1901-1905

Total . . .23,116,501 Prior to 1820 there was no official record of immigration, but it is estimated that the total number of immigrants from the dose of the Revolutionary War was 250,000. During the decade from 1820 to 1830 the movement was very moderate. From 1830 to 1840 it steadily increased, but never reached 100,000 per annum. In 1846 came the Irish potato famine, and an enormous emigration began, followed by a very large German emigration from similar causes. The Civil War of the United States interrupted the movement, but

1 Of these, 77,409 went to the Cape of Good Hope and Natal.

2 Of these, 152,797 went to the Cape of Good Hope and Natal. * Of these, 69,052 went to the Cape of Good Hope and Natal.

Aggregate

Annual

Arrivals.

Average.

143,439

H,343

599.125

59,912

1,713,251

171,325

2,598,214

259,821

2,314,824

231,482

2,812,191

281,219

5,246,613

524,661

3,844,422

384,442

3,833,076

766,615

Scandinavians —

Denmark 159,759

Norway 331,258

Sweden 660,193

Total ‘1,151,210

Czechs, Magyars, Slavs —

Bohemia 77,247

Hungary 256,347

Poland 141,908

Rumania 10,377

Russia 5°o,797

Total 986,676

Swiss — Switzerland T 35,736

Greeks — Greece 7,325

Turks — Turkey 3,41 1

Europe, not specified 294

Total Europe 9,197,014

North America 776,071

All other countries 366,454

Grand Total . 10,339,539

1-5 3-2 6-4

ii-i

MIGRATION

A very important transformation has taken place in the propor- tionate number coming from different countries during the last half of the 19th century. At first the Irish and Germans were most prominent. Of later years, the Italians, Czechs, Hungarians and Russians were, as will be seen from the following table, numerously represented.

Nationality of Immigrants to the United States, IQ01-IQ05.

Number.

Austria-Hungary 944,239

Belgium

Bulgaria, Servia and Montenegro .

Denmark

France

Germany

Greece

Holland

Italy 959,768

Norway

Portugal

Rumania

Russia

Spain

Sweden .

Switzerland

Turkey

United Kingdom —

England

Ireland

Scotland .

Wales

All other European countries

Total 3.645.018 95

The following table shows the relative number of different nation- alities represented in the immigration to the United States: —

Number.

%

944.239

25‘0

16,884

0-44

6,637

0-17

33.968

0-9

31.419

o-8

176,995

4-6

49.962

1-3

18,501

0-48

959,768

25-0

103,065

2–7

30,532

0–8

35.185

0–4

658,735

17–0

10,243

0–27

154.607

4–0

17,820

0–46

10,909

0–3

155.343

4–0

184,096

4–8

38,842

1–0

6,972

0–18

0-006

Country.

Great Britain Ireland . . . . Germany Austria-Hungary Norway and Sweden Russia and Poland . Italy

1861-70.

% 24-5 18-8

34-0

o-3

4-7

0-2

o-5

1871-80.

%

16-4 15-5 25-5

2-6

7-5 19

2-0

I88I-9O.

%

12-5 12-5

27-7 6-7

io-8

5-1 5-9

1891-1900.

%

7-5

io-o

14-0 16-0

8-6 14-0

18-0

Sex and Age. — Of all the immigrants (1871-1895), 61-25% were males and 38-75 % were females.

This percentage remains fairly constant, but the proportion differs somewhat among different nationalities. The following table shows the proportions for 1905: —

Males. Females.

Austria-Hungary 207,034 77.933

France . - 5,574 3,889

Germany 21,586 15.357

Holland 3,082 1,758

Italy 216,268 5’. 2 73

Russia 111,795 66,065

Sweden and Norway 29,907 18,105

United Kingdom —

England 29,993

Ireland 18,754

Scotland 9,264

18,160

18,890

5,022

The immigrants were in the most vigorous period of life, few

children and few old people, as shown in the following table :■ Ages of Immigrants to the United States, i88i-i8qo.

Country of Origin.

Under 15.

From 15 to 40.

Over 40 years.

Number.

Per cent.

Number.

Per cent.

Number.

Per cent.

Germany

Ireland

England

Sweden and Norway .

Italy . . .

Russia (includ- ing Poland) .

Austria .

Scotland

Hungary

386,934 92,308

I5L3I5

104,254 47.603

65.427 50,027

36,192

18,785

26–6 14– 1

23–5

18–3 15–3

24–7

22–1 24–2

14–7

904,002

515,089 420,303

414,609 212,475

174.754

149,909

97,819

95,635

62–2 78–6 65–2

73–0 69–2

65–9 66–3 65–2 74–9

162,034 48,085 73.062

49.499

47.771

24.907 26,109 15,858 13,261

II-2

7-3

n-3

8-7 15-5

9-4

n-6 io-6

10-4

Occupation. — The immigrants are for the most part unskilled labourers. The statistics for the United States show the following figures for the years 1 881-1890: —

Occupation of Immigrants to the United States.

Males.

Females.

Total.

Professional

Skilled

Miscellaneous .

Not stated . . . .

Without occupation .

Total ….

25,257

5H.552

1.833.325

73.327

759,45o

1,749

25,859

245,810

42,830

1,724,454

27,006 540,411

2,079,135 116,157

2,483,904

3. 2 05.9H

2,040,702

5,246,613

Those ” without occupation ” are mostly women and children. The ” miscellaneous ” are day labourers. It is probable that about 20% of the adult males are ” skilled.”

Immigration to Other Countries. — In no other country is immigra- tion conducted on so important a scale as in the United States. The statistics are very imperfect. The main figures have already been given in the table of emigration. Australia has an annual immigra- tion of about 250,000, mostly of British origin. This is offset by a very heavy emigration, which sometimes exceeds the immigration in certain of the states. The immigration to Canada for the year 1905 was put down as 146,266, but a portion of this consisted of immi- grants passing through to the United States. Brazil has had a large immigration (in 1895 equal to. 169,524, but in 1904 only 12,447). The Argentine is credited with an immigration in 1905 of 177,117, and Uruguay with an immigration in 1903 of 6247. In all the South American immigration the countries principally

represented are those of southern Europe, especially Italy. The majority of the immigrants are adult males and farm labourers.

Balance of Emigration and Immigration. — Even in the case of emigration from Europe to countries beyond the seas there is some return movement. Emigrants who have been successful in business return in order to end their days in the old country. Those who have not succeeded return in order to be cared for by friends and relatives, or simply from home-sickness. Thus, for Great Britain and Ireland, while the emigration of persons of British and Irish origin was, in 1905, 262,077, the immigration of persons of the same category was 122,712, leaving a net emigration of only 139,365. In the United States' statistics we cannot distinguish in the outgoing passenger movement emigrants from other persons. But if for a period of years we take the total inward passenger movement and subtract from it the total outward passenger movement, we ought to have the net immigration. By this method we arrive at the conclusion that while the gross immigration during the five years 1901-1905 was 3,833,076, the net immigration was only 1,779,976, showing an out- ward movement of 273,134, or about 7-12 % of the total number of immigrants.

Temporary Emigration. — In many European countries there is not only emigration beyond seas, but a very considerable movement to neighbouring countries in search of work, and generally with the intention of returning. Thus in Italy, the " permanent " emigration (i.e. to countries beyond seas) numbered, in 1905, 447,083; the " temporary " emigration to European or Mediterranean countries amounted to 279,248. This temporary emigration is strongest in the spring, and consists principally of adult males (agriculturists, farm and day labourers, bricklayers and masons) in search of work. It resembles somewhat the movement of Irish labourers into Great Britain at harvest time. It is notorious that the Italians who 'emigrate to the United States largely return.

Effects of Emigration. — There are two views with

regard to emigra- tion: one unfavourable, viz., that it is a drain on population, reduc- ing its economic strength and disturbing social and politicalrelations ; the second looking upon it as a relief from over-population and a congested labour market. As a matter of fact, emigration has not succeeded in diminishing the population of Europe, which, on the contrary, doubled during the 19th century. The one great excep- tion is Ireland, where population declined from 8,175,124 in 1841 to 4,458,745 in 1901. From 1851 to 1901 the total emigration from Ireland was 3,881,246 or 72-5 % of the average population. Emigra- tion, by carrying off the young men and women, also reduced the Irish marriage and birth-rates, which were almost the lowest in Europe. But hitherto the countries of strongest emigration (Eng- land, Germany, &c.) have shown practically undiminished birth and marriage-rates and a steady growth in population.

The intensity of emigration is measured not by the absolute number of emigrants, but by the number of emigrants to the total population. Its, effect is shown by comparing the number of emigrants with the excess of births over deaths per 1000 of the population. This is shown in the following table (1905) : —

Excess of births

over deaths per

1000 Inhabitants.

Emigrants

per 1000

Inhabitants.

Great Britain and Ireland England and Wales

Sweden (1903) ....

Denmark

Italy

Austria-Hungary ….

n-4

12-0 12-2

6-3 13-2

9-5

io-6

12-6

13-5

io-6

12-2

6-06 4-96

8-45 11-42

•45

1-45 6-89

9-n

3-12

H-33

6-29

It will be observed that, with the exception of Ireland and Italy, wherever there is a heavy emigration there is usually a considerable excess of births over deaths, i.e. natural increase more than makes up for the loss by emigration. Even taking Great • Britain and Ireland together, the loss by

emigration per annum has not been very large, as is shown by the following table : —

Annual Emigration per 1000 of the Average Population of Great Britain and Ireland.

853–1855 •

. 8–4 1881–1890 .

• 7–1

856–1860 .

. 4–3 1891–1895 .

■ 51

861–1870 .

. 5–2 1896–1900 .

• 37

871–1880 .

. 5–1 1901–1905 .

• • 5‘5

Even in particular districts where emigration is heavy the loss is made up by births. For instance, in 1891 the emigration from the provinces of West Prussia and Posen was extraordinarily heavy — 10–9 and 10–4 per mille respectively — but the excess of births over deaths was 19–6 per mille. Emigration may give temporary relief to congested districts, but it is not in itself a remedy for so-called over-population.

It is difficult to analyse closely the economic effect of emigration, because so much depends upon the character of the emigrants and the condition of the labour market. The following considerations have been urged at different times: Although emigration does not diminish population, yet, as the emigrants are in the most productive period of life (15 to

45), the country of emigration loses adults and replaces them with children. It thereby loses the cost of rearing that number of people to adult age, and is left with a disproportionate number of children and old people. The age distribution of the population of Ireland lends some support to this view. In the same vein it is urged that voluntary emigration takes away the cream of the working-classes. It is the man of energy, of some means, of ambition, who takes the chances of success in the new country, leaving the poor, the indolent, the weak and crippled at home. It is maintained that such emigration institutes a process of selection which is unfavourable to the home country.

On the other side, it is said that the men who are doing well at home are the ones least likely to emigrate, because they have least to gain. Modern means of transportation have made the voyage so cheap that almost any one is able to go. It is therefore the rest- less, the unsuccessful, or at least those not fitted for the strenuous competition of the older countries, who are tempted to go. Emigra- tion affords a natural outlet for the superfluous labour force of a country. The supply of labour is somewhat reduced, but wages are kept up for those who remain. Those who go find means of bettering their own condition beyond the seas, where they become producers of food and raw material for the home country, and at the same time customers for her manufactured products.^ Emigra- tion is .therefore an economic gain, both directly and indirectly. It is evident from these arguments that no general answer can be given to the question. In some cases it may be an evil; in most, when conducted under normal conditions, it would seem to offer little danger.

The same remark would hold true in regard to the social and political effects of emigration. In some cases, by taking away the strong, self-reliant and energetic, it may result in the deterioration of the home population. In other cases it allows restless spirits who have failed at home to try again elsewhere. Often in cases of political revolution

the members of the defeated party have sought refuge elsewhere, as after the revolutionary movements of 1848. In case of conquest the conquered nationality takes to emigration on an extensive scale, as after the absorption of Alsace-Lorraine by Germany in 1871. The movement may be aided either by the state or by private associations. Of such character have been the state-aided emigration from Ireland, and the assisted emigration of paupers, criminals and other persons in the effort to relieve a con- gested population, or simply from the desire to get rid of undesirable members of the community. Such efforts fail if the new countries are unwilling to admit these persons. Finally, we have the expulsion of the Jews from Russia as an example of the effort of a community to get rid of an element which has made itself obnoxious to the local sentiment.

Effects of Immigration.— -The effects of emigration are negative in character; those of immigration are positive, (a) On population: immigration, of course, is a direct addition to the population of new countries, and greatly accelerates the growth by natural increase, especially as the immigrants are in the most productive ages of manhood and womanhood. In the United States, for instance, out of a population of 76,303,387 (in 1900), there were 26,147,407 persons who were either foreign-born or who had one or both parents foreign- born. This does not mean that the population would have been twenty-six millions less if it had not been for immigration ; for the rate of natural increase among the native-born might have maintained itself. Nevertheless, immigration has probably stimulated the growth of population. (6) Economic effects: The economic gain of immigration to new countries is evident. It adds directly to their available labour force, that is, to the number of adults engaged in the work of producing wealth.

According to the United States census of 1900, out of 29,073,233 (1900) persons engaged in gainful occupations, 5,851,399 or 20-1 , were of foreign birth. If we add to these the native whites of foreign parentage (5,300,924) we’ have 11,152,323

persons of foreign extrac- tion or 39-4 of the total labour force. The foreign whites alone constituted 10-4% of the total number ef persons engaged in agricultural pursuits ; 1 1 -4 % of those in professional services ; 25-7 % in domestic and personal services ; 19-2 % in trade and transporta- tion; and 30-6 % of those engaged in manufacturing and mechanical industries. In addition to these, the native whites of foreign parentage constituted, in agriculture, &c, 10-6%; in professional service, 20-6%; in domestic and personal service, 16-4%; in trade and transportation, 25-7 % in manufacturing and mechanical, 25-4% of all those engaged in those occupations. The labour force of the United States is thus made up very largely of immigrants and the children of immigrants.

Attempts have sometimes been made to put a money value on the economic gain by immigration. The amount of money brought by the immigrants is not large, and is probably more than offset by the money sent back by immigrants for the support of families and friends at home or to aid them in following. The valuable element is the able-bodied immigrant himself as a factor of production. It is said, for instance, that an adult slave used to be valued at from $800 to $1000, so that every adult immigrant may be looked upon as worth that sum to the country. Or, it has been said that an adult immigrant represents what it would cost to bring up a child from infancy to the age, say, of 15. This has been estimated by Ernst Engel as amounting to $550 for a German child. The most scientific procedure, however, is to calculate the probable earnings of the immigrant during the rest of his lifetime, and deduct therefrom his expenses of living. The remainder represents his net earnings which he will contribute to the well-being of the new country. W. Farr reckoned this to be, in the case of unskilled English emigrants, about £175. Multiplying the total number of adult immigrants by any one of these figures, we get the annual value of immigration. Such attempts to put a precise money value on immigration are futile. They neglect the question of

quality and of opportunity. The immigrant is worth what it has cost to bring him up only if he is able-bodied, honest and willing to work. If he is diseased, crippled, dishonest or indolent, he may be a direct loss to the community instead of a gain. So, too, the immigrant is worth his future net earnings to the community only if there is a demand, for his labour.

Social and Political Effects of Immigration. — The influx of millions of persons of different nationality, often of a foreign language and generally of the lower classes, would seem to be a danger to the homogeneity of a community. The United States, for instance, has felt some inconvenience from the constant addition of foreigners to its electorate and its population. The foreign-born are more numerously represented among the criminal, defective and dependent classes than their numerical strength would justify. They also tend to segregate more or less, especially in large cities. Nevertheless, the process of assimilation goes on with great rapidity. Intermarriage with the native-born occurs to a considerable extent. The influence of the physical environment leads to the adoption of the same mode of life. The most powerful influences, however, seem to be social. These are common school education and the adoption of one language (English) ; participation in political life, which is granted to all adult males after five years' residence; and the general influence of social standards embodied in laws, institutions and customs already established. Doubtless immigration in the last fifty years of the 19th Century hadj a modifying effect on American life; but on the whole the power of a modern civilized community working through individual freedom to assimilate elements not differing from it too radically has been displayed to a remarkable degree.

Restriction of Immigration. — New countries have sought to escape certain evils of indiscriminate immigration. These evils were as follows: (a) The immigration of criminals, paupers, persons diseased in mind or body, and persons unable to support

themselves. By the Acts of 1882 and 1893 such persons were refused admission to the United States, and, when rejected, the steamship companies that brought them were compelled to take them back. The number debarred from 1896 to 1905 is shown in the following table:—

Causes.

1896

1897

1898

1899

1900

1901

1902

1903

1904

1905

Insane …. Paupers Diseased Assisted Convicts Prostitutes . Contract Labourers All other . . .

Total debarred .

10

2010

2

776 1

6

1277

1

3 1

328 1

12

2261

258

79

2

417 1

19 2599

348

82

8

741 1

32

2974

393

2

4

7

833

1

16

2798

309

5°

7

3

327

6

27

3944

7–9

9

3 275

7

23 5812

1773

9

51

13

1086

2

33 4798 1560

38

35

9

1501

20

92

7898

2198

19

39

24

1 164

445

2799

1617

3030

3798

4246

3516

4974

8769

7994

11,879

Year.

No law of international comity is violated by the refusal to receive these unfortu- nates. They should be taken care of at home. The English legislature in 1905 passed an act to prevent the landing of undesirable aliens, and the number refused admission in 1906 was 493. (b) Immigration sometimes increases

the competition in the labour market, and thus lowers wages. One case is particularly aggravating, viz. when employers import foreign labourers in order to take the place of their men who are on strike. In 1885 the United States passed what is called the Contract Labor Law, forbidding the landing of any person who is under contract to perform labour in the United States. It is very difficult to discover such cases, but the number rejected is fairly large (see table above), (c) The immigration of men of alien race who refuse to assimilate , with the natives is said sometimes to be a danger to the country. This at least is the excuse for the entiife exclusion of Chinese labourers from the United States since 1882 (provisions made more severe in 1888 and 1892) (see also the article Coolie).

Internal Migration. — In modern times there is constant movement of population within national lines, from section to section, and especially from rural districts to the cities. No record is kept ot this, and we can trace it only through the census-statistics of birth- place. In the United States, for instance, it was shown in 1890 that more than 21-5 per cent, of the native-born inhabitants were living in a state other than that in which they were born. Still further, it appears that about one-half of the native-born inhabitants had moved out of the county in which they were born. In 1890 there were 1,233,629 natives of the state of New York living in other states. The movement is principally westwards in direction and along parallels of latitude. For instance, New York has made large contributions to the population of Ohio, Michigan, Illinois, Wisconsin, Iowa and so on. Virginia has contributed largely to the popula- tion of West Virginia, Kentucky, Ohio, Indiana, Illinois and Missouri. In Europe there is a similar movement; but it is difficult to make comparisons, because of the differences in the administrative areas. In England in 1891, 71-6% of the population were residing in their native county; in Prussia, 69-7% in the kreis; in France, 81-7% in the department; in Austria,

80-2% in the bezirk; in Switzerland, 82-1% in the canton where they were born (Weber, Growth of Cities, p. 249). The most important phase of internal migration is the movement from the rural districts to the cities. The statistical results are shown in the following table extracted from the admirable work of Weber, just quoted: —

Year.

United

In Towns of

Rural

States.

8000 and over.

Districts.

1 790-1 800

% 35-1

% 60

% 34

1800-1810

36-4

69

35

1810-1820

33-0

33

33

1820-1830

33‘6

82

31

1 830–1 840

32–7

68

30

1840–1850

35–9

99

30

1 850–1 860

35–6

75

30

1860–1870

22–6

59

15

1870–1880

30–1

40

27

1880–1890

24–9

61

15

1 890–1 900

20–8

37

14

In England and Wales the rural population increased in the aggregate during the first half of the 19th century, but at a gradually diminishing rate; in the second half of the century the population declined with varying regularity, until the decennium 1 891–1900, when there was an increase. But notwithstanding this aggregate increase there are many rural districts which still show a steadily declining population. The urban population is increasing, as shown in the following table :—

Decennial Rale of Increase or Decrease.

1851- 1861- 1871- 1881- 1891-

1861 1871 1881 1891 1900

Jrban.

Rural.

%

%

+21-9

+ 1-88

+28-1

-5-86

+25-6

-3-84

+ 18-5

—2-76

+ 15-22

+2-94

Percentage of Population living in Towns of 10,000 and over at Three

Periods.

About 1800

About 1850

About 1890

or 1 801.

or 1851.

or 1891.

England and Wales

21–3

39–5

61–7

Scotland , .

17–0

32–2

50–0

Australia (7 colonies)

41–4

Belgium Netherlands

13–5

20–8

34–8

29–5

29–0

31–3

Prussia (18 16) . .

7–3

10–6

30–0

United States

3–8

12–0

27-6

France ….

9-5

14-4

25-9

Denmark

10-9

9-6

23-6

Italy ….

—

20-6

Ireland ….

7-8

IO-I

18-0

Norway ….

3-3

5-3

16-7

Switzerland (1822) .

4-3

7-3

16-5

Austria ….

4.4

5-8

15-8

Hungary

Sweden ….

5-4

9-1

161

3-9

47

13-7

Portugal

12-7

2-9

12-7

Russia ….

3-7

5-3

9-3

Everywhere the city population is increasing faster than the rural. In the United States the rate of increase per decade was as follows : —

Somewhat the same phenomenon is seen in France. According to the census of 1 89 1 not less than 55 out of the 87 departments had decreased in population ; and out of the 32 that had increased, 7

showed a decrease in their rural parts when the large towns were deducted. In Germany the towns of 10,000 and over show a much more rapid increase than the rural districts; and the same fact is generally true of the other countries of Europe. This more rapid increase of population in cities is due only in part to migration from the country. Until the 19th century deaths generally exceeded births in cities, so that if it had not been for constant immigration the cities would not only not have grown, but would have decreased in population. Cities grow more rapidly now than formerly, because the excess of deaths over births has been turned into an excess of births over deaths. Thereby the cities are becoming less dependent upon immigration for increase of population than formerly, but the migration still goes on. The causes of migration from country to city are mainly economic. In early stages of culture men are scattered over the country, or at most gathered together in hamlets and villages. Each of these is self-sufficing, having its own artisans and handicraftsmen, and producing what it needs. With the beginning of exchange commercial centres spring up, situated on navigable streams and especially at points where land and water journeys are broken. With the growth of manufactures, industrial centres spring up where the division of labour can be fully provided for. In modern times two factors have accelerated this process, viz.: (1) the building of railways, which have developed commerce to a very great degree and favoured the large towns at the expense of the small; and (2) the invention of machinery, which has greatly increased the possibility of division of labour and manufactures on a large scale. The old handicraftsman has been superseded by machine labour and the village artisan by the factory hand. At the same time improvements in agriculture and the opening up, of new countries have enabled the modern community to gain its food and raw material with a less expenditure of labour force, and the surplus agricultural population has gone to the city. The attractive influences upon individuals have been higher wages, greater scope for the ambitious, and

the social advantages of city life.

The general laws of internal migration may be summarized (according to Ravenstein) as follows: —

1. The great body of migrants proceed only a short distance.

2. The process of absorption goes on as follows : The inhabitants of the country immediately surrounding a town of rapid growth flock into it ; the gaps thus left in the rural population are filled up by migrants from more remote districts, until the attractive force of one of the rapidly-growing cities makes its influence felt, step by step, to the most remote corner of the land. Migrants enumerated in a certain centre of absorption will consequently grow less with the distance, proportionately to the native population which furnishes them.

3. The process of dispersion is the inverse of that of absorption, and exhibits similar features.

4. Each main current of migration produces a compensating countercurrent.

5. Migrants proceeding long distances generally go by preference to one of the great cities of commerce or industry.

6. The natives of towns are less migratory than those of the rural parts of the country.

7. Females are more migratory than males.
Authorities.— The statistics of migration are to be found in the

official returns of different countries, especially the statistical tables relating to emigration and immigration published by the British Board of Trade, and the Reports (annual) of the Commissioner-

General of Immigration of the United States. For general discus- sion see Philippovich, Auswanderung und Auswanderungspolitik (Leipzig, 1892). An exhaustive bibliography will be found in an article by same author, ” Auswanderung,” in Handworterbuch der Slaatswissenschaften; R. Mayo-Smith, Emigration and Immigration, with bibliography (New York, 1890). For internal migration see A. F. Weber, Growth of Cities (New York, 1899). See also Ravenstein, “The Laws of Migration,” in Journal of Royal Statistical Society (1885 and 1889). Professor Flinders Petrie, in his Huxley Lecture for 1906 on Migrations (reprinted by the Anthropological Institute), deals with the mutations and movements of races from an anthro- pological standpoint with profound knowledge and originality.

(R. M.-S. ; T. A. I.)

Migration, in Zoology. In zoology considerable import- ance attaches to the problems of migration, by which is meant the wandering of living creatures into another, usually distant, locality in order to breed there; this implies a return, and the double phenomenon is annual. All other changes of the abode are either sporadic, epidemic, or fluctuating within lesser limits. Further, migration should not be confounded with ” spreading,” which proceeds steadily, and in epicycles, with a totally different result. It need not be emphasized that hard and fast lines between these phenomena do not exist; they are often a question of degree. For instance, when the common toad, which is a strictly terrestrial creature, wanders every spring to a fre- quently distant pool in order to spawn there, this is a true migration. The same applies, strictly speaking, to those insects which hibernate in the ground, at the root of the tree on which they feed and breed. The grey plover breeds in the arctic circle and winters in equatorial countries. To complicate matters further, it is not necessary that the migration be undertaken periodically, more than once, by the same individual. For instance, the common eel ascends the rivers as an elver in its youth; years after it returns to the sea, there to breed and to die,

whilst other fishes come and go, year after year. Further, some of the larger birds, for instance swans and cranes, are still immature in their second year, and yet they migrate like their older relations. It seems permissible to use this fact as an indication that the breeding as such is not the prime reason of their wanderings. The fundamental impelling agent must have been the want of food, and what we usually under- stand by migration cannot suddenly have sprung into existence to its full extent, but is more likely the cumulative effect of the doings of countless generations. The faculty of shifting the abode was of course always there, the necessity of moving further on was also present, and those which went in the wrong direction came to grief, while the others flourished and returned with their progeny. They did not at first cover enormous distances, but just enough to find unoccupied ground. The annual repetiton became an established habit, at last an ineradicable instinct. There can be but little doubt that the prime impulse was want of food. The new growing grass on the prairie or on the veldt attracts every year those creatures which live upon pasture. The inter-tropical belt of the world is so crowded with creatures that there is the keenest competition, whilst in the temperate and cold regions is a long winter quiescence unfit for the support of many creatures, whereas in the summer these same regions are covered with new vegetation, with its concomitant abundance of insects and other invertebrates. The tables are decked again, and these opportunities are not wasted.

The process of migration, in its most striking cases, is now very complicated. Many a bird goes actually to the arctic regions for the shortest of summers, but spends most of the year within the tropics. On the other hand there are many

species which do not go so far north, but stop to breed in the intermediate regions. We must not take the extremes when trying to unravel the development of the problem. The periodical migrations of mammals, with their more limited extent and greater leisure, are less perplexing.

It has been argued with some show of reason that the real home of a bird is that country in which it was born, in other words where the species breeds, but this is not in every case a valid conclusion. It applies to most creatures, but it can well bear exceptions if we leave sentiment aside. When it comes to a question of domicile, the ten weeks' sojourn of the swift, Cypselus, in England are more than weighted down by the nine months or more which these birds spend in southern countries, although we do not know whether they are resident there or roam about. The breeding time is the busiest period of a bird's life; then the numbers of each species are suddenly multiplied, and so is the stress of providing food, and the par- ticular food which is best for the young may not be available in every country. The idea that the arctic circle is the original home of the numerous kinds of birds which breed in it, whence they are now periodically driven away by stress, has been coupled with the glacial epoch, that supposed solution of so many diffi- culties. We have only to assume that the old, permanent home of these migrants was in the arctic region, that the progressing glaciation drove them away, of course towards the equator, and that, when times improved again, the birds returned to their old home. This sounds very plausible, but it involves huge assumptions. The birds, not the individuals, but the species, are supposed to have inherited such a loving reminiscence of their old home, that after thousands of years — with most of the small birds meaning as many generations — they returned at the first opportunity. It implies that their long continued sojourn in foreign lands, where — under this assumption — thousands of generations must have been bred and have spent all their lives, was not sufficient to naturalize them, so to speak, in other words to supplant the instinctive love of the primary ancient home. That the last glacial epoch has driven the limit of many kinds of animals and plants farther south is as certain as that many have recovered the lost ground after the reversion of the glaciation, but it must have been a very slow and steady process of spreading. It may, and

probably does, account for the present annual visitations of arctic lands, as a phenomenon which has been evolved de novo, which would have come to pass even if no birds had existed in pre-glacial times.

How do birds manage to find their way, thousands and thousands of miles across land and water? This question has been extolled as a mystery of mysteries. It has been stated that the old birds show the way to the young, a specula- tion which does not apply to those many cases in which old and young notoriously travel at different times. It has teen assumed that they travel by sight, taking advantage of certain landmarks; another untenable idea, since — experience having to be excluded in a flock of birds which made the journey for the first time — it implies that the young must have inherited the reminiscence of those landmarks! Others have likened the bird to a kind of compass, because in eastern Siberia E. von Middendorff found some migration routes to coincide with the direction of the magnetic pole. The whole question reduces itself to a sense of direction, a faculty which is possessed by nearly all animals; in some it is present to an astonishing extent ; but the manifestations of this sense vary only in degree. The cat which escapes out of the bag finds its way back-, directly or after many adventures. The bee, after having loaded itself with pollen, returns by the proverbial line to the hive which may be a mile away, but, move the small entrance hole in the meantime an inch to the right or left, and the bee will knock its head against the hive and blunder about ; move the hive a few yards and bee after bee returning will be puzzled to find its hive again. They, maybe with the help of landmarks, have accustomed themselves to steer a course. Such instances need not be multiplied. The principle is the same whether

the journey be one of a few yards or of many miles. Given the sense of direction, it is no more difficult to steer a course due north than it is to lay one south-east by east, provided always the impetus to be on the move. There is no mystery, except that we, the most intellectual of mankind, should so well nigh have lost this sense, and even this fact is simply an instance of the loss of a faculty through long-continued disuse.

Birds. — (The following account is to a great extent based upon A. Newton's article " Birds "in Ency. Brit., 9th ed.)

In almost all countries there are some species which arrive in spring, remain to breed, and depart in autumn; others which arrive in autumn, stop for the winter and depart in spring; and others again — and these are strictly the " birds of passage "— which show themselves but twice a year, passing through the country without staying long in it, and their transient visits take place about spring and autumn. These three apparently different categories of migrants are all acted upon by the same impulse in spite of the at first sight dissimilar nature of their movements. The species which resort to Britain and to other temperate countries in winter are simply those which have their breeding quarters much nearer the poles, and in returning to them on the approach of spring are but doing exactly as do those species which, having their winter abode nearer the equator, come to us with the spring.

The birds-of-passage proper, like our winter visitants, have their breeding quarters nearer the pole, but like our summer visit- ants, they seek their winter abode nearer the equator, and thus perform a somewhat larger migration. As H. Seebohm puts it (Geograph. Distrib. of the family Charadriidae, London) : —

" They all represent birds which breed in the north and winter in the south. Every migratory bird wintering in England goes north to breed, and every migratory bird breeding in England goes south to

winter. It is a rule without exception in the northern hemisphere that each bird breeds in the extreme north point of its migrations. To make the rule apply to the southern hemi- sphere as well it must be modified as follows: each bird breeds in the coldest climate which it visits on its migrations. ... It is a remarkable fact that whilst there are many birds breeding in the northern hemisphere and wintering in the southern, it is not known that any land-bird breeds in the southern and habitually winters in the northern! This is probably owing to the difference in the distribution of the land, there being no antarctic breeding grounds. . . . Birds breeding in the tropics are always resident, except when they breed on mountains, where the climate causes them to descend into the valleys for the winter."

In many countries we find that while there are some species, such as in England the swallow or the fieldfare, of which every individual disappears at one period of the year or another, there are other species, such as the pied-wagtail or the woodcock, of which only the majority of individuals vanish — a few being always present — and these species form the so-called " partial migrants." In England the song-thrushes receive in the autumn a considerable accession in numbers from the birds which arrive from the north, though the migration is by no means so well marked as it is on the continent, where the arrival of the strangers sets all the fowlers at work. In most localities in Britain the newcomers depart after a short sojourn, and are accompanied by so many of the home- bred birds that in some parts of the island it may be safely declared that not a single song-thrush can be found from the end of November to the end of January, while in others examples can always be seen. Much the same may be said of the redbreast. Undeniably resident as a species, attentive scrutiny will reveal the fact that its numbers are subject to very considerable variation, according to the season of the year. At no time do our redbreasts collect in bands, but towards the end of summer they may be seen in the

south of England successively passing onward, the travellers being mostly — if not wholly — young birds of the year; and so the great majority dis- appear, departing it may be safely presumed for more southern countries, since a few weeks later the markets of most towns, first in France and then in Italy, are well supplied with this species. But the migratory influence affects, though in a less degree, many if not most of the redbreasts that remain with us. Every bird of the northern hemisphere is to a greater or less degree migratory in some part or other of its range.

Want of food, and perhaps of the special, proper kind during the breeding season, seems to be the most obvious cause of migration, and none can wonder that those animals which possess the power of removing themselves from a place of scarcity should avail them- selves of it, while it is unquestionable that birds possess this faculty in the greatest degree. Even among those species which we com- monly speak of as sedentary it is only the adults which maintain their ground throughout the year. It has long been known that birds-of-prey customarily drive away their offspring from their own haunts so soon as the young are able to shift for themselves. The reason generally, and no doubt truly, given for this behaviour, which at first sight appears so unnatural, is the impossibility of both parents and progeny getting a livelihood in the same vicinity. The practice, however, is not limited to the birds- of-prey alone, but is much more universal. We find it to obtain with the red-

breast, and if we watch our feathered neighbours closely we shall perceive that most of them indulge in it. The period of expulsion, it is true, is in some birds deferred from the end of summer or the autumn, in which it is usually performed, until the following spring, when indeed from the maturity of the young it must be regarded as much in the light of a voluntary secession on their part as in that of an act of parental compulsion, but the effect is ultimately the same.

The mode in which the want of sustenance produces migration may best be illustrated by confining ourselves to the unquestion- ably migrant birds of our own northern hemisphere. As food grows scarce towards the end of summer in the most northern limits of the range of a species, the individuals affected thereby seek it elsewhere. Thus doing, they press upon the haunt of other in- dividuals: these in like manner upon that of yet others, and so on, until the movement which began in the far north is communicated to the individuals occupying the extreme southern range of the species at that season; though, but for such an intrusion, these last might be content to stay some time longer in the enjoyment of their existing quarters.

This seems satisfactorily to explain the southward movement of all migrating birds in the northern hemisphere; but when we con- sider the return movement which takes place some six months later, doubt may be entertained whether scarcity of food can be assigned as its sole or sufficient cause, and perhaps it would be safest not to come to any decision on this point. On one side it may be urged that the more equatorial regions which in winter are crowded with emigrants from the north, though well fitted for the resort of so great a population at that season are deficient in certain neces- saries for the nursery. Nor does it seem too violent an assumption to suppose that even if such necessaries are not absolutely wanting, yet that the regions in question would not supply sufficient food for both parents and offspring — the latter being at the lowest computation twice as numerous as the former — unless the numbers of both were diminished by the casualties of travel. 1 But on the other hand we must remember what has above been advanced in regard to the pertinacity with which birds return to their accus- tomed breeding-places, and the force of this passionate fondness for the old home cannot but be taken into account, even if we do not allow that in it lies the whole stimulus to undertake the perilous voyage.

A. R. Wallace in some remarks on the subject

(Nature, x. 459) ingeniously suggests the manner in which the habit of migration has come to be adopted 2 : —

” It appears to me probable that here, as in so many other cases, ‘ survival of the fittest ‘ will be found to have had a powerful influence. Let us suppose that in any species of migratory bird, breeding can as a rule be only safely accomplished in a given area; and further, that during a great part of the rest of the year sufficient food cannot be obtained in that area. It will follow that those birds which do not leave the breeding area at the proper season will suffer, and ultimately become extinct; which will also be the fate of those which do not leave the feeding area at the proper time. Now, if we suppose that the two areas were (for some remote ancestor of the existing species) coincident, but by geological and climatic changes gradually diverged from each other, we can easily under- stand how the habit of incipient and partial migration at the proper seasons would at last become hereditary, and so fixed as to be what we term an instinct. It will probably be found that every grada- tion still exists in various parts of the world, from a complete coincidence to a complete separation of the breeding and the sub- sistence areas; and when the natural history of a sufficient number of species is thoroughly worked out we may find every link between species which never leave a restricted area in which they breed and live the whole year round, to those other cases in which the two areas are absolutely separated.”

A few more particulars respecting migration are all that can here be given, and it is doubtful whether much can be built upon them. It has been ascertained by repeated observation that in the spring- movement of most species of the northern hemisphere the cock-birds are always in the van of the advancing army, and that they appear some days, or perhaps weeks, before the hens. It is not difficult to imagine that, in the course of a journey prolonged throughout some 50 or 6o° of latitude, the stronger individuals

1 If the relative proportion of land to water in the southern hemisphere were at all such as it is in the northern, we should no doubt find the birds of southern continents beginning to press upon the tropical and equatorial regions of the globe at the season when they were thronged with the emigrants from the north, and in such a case it would be only reasonable that the latter should be acted upon, by the force of the former, according to the explanation given of the southward movement of northern migrants. But, though we know almost nothing of the migration of birds of the other hemisphere, yet, when we regard the comparative deficiency of land in southern latitudes all round the world, it is obvious that the feathered population of such as nowadays exists can exert but little influence, and its effects may be practically disregarded.

2 In principle F. W. Hutton had already foreshadowed the same theory (Trans. New Zeal. Inst., 1872, p. 235).

should outstrip the weaker by a very perceptible distance, and it can hardly be doubted that in most species the males are stronger, as they are bigger than the females. Some observers assert that the same thing takes place in the return journey in autumn — Seebohm, for instance, says that, from Europe, first go the young, then the males, having finished their moult of autumn, and lastly the females — but on this point others are not so sure, which is not surprising when we consider that the majority of observations have been made towards what is the northern limit of the range of the Passeres, to which the remark is especially applicable — in the British islands, France, North Germany and the Russian empire — for it is plain that at the beginning of the journey any inequality in the speed of travelling will not have become so very manifest. There is also another matter to be noticed. It has

been suspected that where there is any difference in the size of birds of the same species, particularly in the dimensions of their wings, the individuals that perform the most extensive journeys would be naturally those with the longest and broadest remiges, and in support of this view it certainly appears that in some of the smaller migrants — such as the wheatear (Saxicola oenanthe) and willow-wren (Phylloscopus trochilus) — the examples which reach the extreme north of Europe and there pass the summer possess greater mechanical powers of flight than those of the same species which stop short on the shores of the Mediterranean. It may perhaps be also inferred, though precise evidence is wanting, that these same individuals push further to the southward in winter than do those which are less favoured in this respect. It is pretty nearly certain that such is the case with some species, and it may well be so with individuals. H. B. Tris- tram has remarked (Ibis, 1865, p. 77) that, in many genera of birds, ” those species which have the most extended northerly have also the most extended southerly range; and that those which resort to the highest latitudes for nidification also pass further than others to the southward in winter,” fortifying his opinion by examples adduced from the genera Turdus, Fringilla, Cypselus and Turtur.

For many years past a large number of persons in different countries have occupied and amused themselves by carefully registering the dates on which various migratory birds first make their appearance, and there is now an abundance of records so compiled. Still it does not seem that they have been able to determine what connexion, if any, exists between the arrival of birds and the weather; in most cases no corresponding observations have been made about the weather in the places whence the travel- lers are supposed to have come. As a rule it would seem as though birds were not dependent on the weather to any great degree. Occasionally the return of the swallow or the nightingale may be somewhat delayed, but most sea-fowls may be trusted, it is said, as the almanac itself. Foul weather or fair,

heat or cold, the puffins (Fratercula arctica) repair to some of their stations punctu- ally on a given day as if their movements were regulated by clock- work. Whether they have come from far or from near we know not, but other birds certainly come from a great distance, and yet make their appearance with scarcely less exactness. Nor is the regularity with which certain species disappear much inferior; every observer knows how abundant the swift {Cypselus apus) is up to the time of its leaving its summer-home — in most parts of England, the first days of August — and how rarely it is seen after that time is past.

It must be allowed, however, that, with few exceptions, the mass of statistics above spoken of has never been worked up and digested so as to allow proper inferences to be made from it, and there- fore it would be premature to say that little would come of it, but the result of those exceptions is not very encouraging. E. von Middendorff carefully collated the records of the arrival of migratory birds throughout the Russian Empire, but the insight into the question afforded by his published labours is not very great. His chief object has been to trace what he has termed the isepipteses (I

memoir by J. A. Palmed, but it would be beyond our limits to do more than mention his results concisely. He enters very fully into this part of the inquiry and lays down with much apparent probability the chief roads taken by the most migratory birds of the palaearctic region in their return autumnal journey, further asserting that in the spaces between these lines of flight such birds do not usually occur. Broadly speaking, the birds of Europe, Russia and Western Siberia go for the winter to Africa, those of middle Siberia to Mongolia, and those of Siberia east of the Lena go towards Japan.

But lay down the paths of migratory birds, observe their comings and goings, or strive to account for the impulse which urges them forward as we will, there still remains for consideration the most marvellous thing of all — how do the birds find

their way so un- erringly from such immense distances? This seems to be by far the most inexplicable part of the matter. Year after year the migratory wagtail will build her nest in the accustomed spot, and year after year the migratory cuckoo will deposit her eggs in that nest, and yet in each interval of time the former may have passed somt; months on the shores of the Mediterranean, and the latter, absent for a still longer period, may have wandered into the heart of Africa. That particular form of bluethroat which yearly repairs to breed upon the mosses of the subalpine and northern parts of Scandinavia (Cyanecula suecica) is hardly ever seen in Europe south of the Baltic. Throughout Germany it may be said to be quite unknown, being replaced by a conspicuously different form (C. leucocyana), and as it is a bird in which the collectors of that country, a numerous and well-instructed body, have long taken great interest, we are in a position to declare that it is not known to stop in its transit from its winter haunts, which we know to be Egypt and the valley of the Upper Nile, to its breeding-quarters. Other instances, though none so crucial as this, could be cited from among European birds were there room here for them. In New Zealand there are two cuckoos which are annual visitors: one, a species ol Chrysococcyx, is supposed to come from Australia, the other, Eudynamis taitensis is widely spread throughout Polynesia, yet both these birds yearly make two voyages over the enormous waste of waters that surrounds the country to which they resort to breed. But space would utterly fail us were we to attempt to recount all the examples of these wonderful flights. Yet it seems impossible that the sense of sight should be the faculty whereby they are so guided to their destination, any more than in the case of those which travel in the dark. J. A. Palm^n asserted {pp. cit. p. 195) that migrants are led by the older and stronger individuals among them, and, observing that most of those which stray from their right course are yearlings that have never before taken the journey, he ascribed the due performance of the flight to “experience.” There are’ many birds

which cannot be said to migrate in company. While swallows, to take a sufficiently evident example, conspicuously congregate in vast flocks and so leave our shores in large companies, the majority of our summer-visitors slip away almost unobserved, each ap- parently without concert with others. Experience here can only signify the result of knowledge acquired on former occasions and obtained by sight. Now it was stated by C. J. Temminck (Manuel d' ornithologie, III. Introd., 1820) many years ago, and so far as would appear the statement has not been invalidated, that among migrants the young and the old always journey apart and most generally by different routes. The former can have no " experi- ence," and yet the greater number of them safely arrive at the haven where they would be. The sense of sight, essential to a knowledge of landmarks, is utterly insufficient to account for the success that attends birds which travel by night, or in a single flight span oceans or continents. Yet without it the idea of " ex- perience " cannot be substantiated. We may admit that inherited but unconscious experience, which is really all that can be meant by instinct, is a factor in the whole matter — certainly, as Wallace seems to have proved, in originating the migratory impulse, but yet every aspect of the question is fraught with difficulty.

Less than nothing is known about the speed at which birds fly during their long stretches of migration. Gaetke, in his otherwise very interesting book, has startled ornithologists by various state- ments, but his calculations were based upon such crude observa- tions that the results are ridiculous. For instance, he proved to his satisfaction that the grey or hooded crow, Corvus comix, which notoriously is not a fast bird, flies from Heligoland to the coast of Lincolnshire in England at the rate of one hundred and twenty miles an hour. To the little bluethroat he assigned a velocity of two hundred and forty miles an hour, a statement as silly as that made by some fanciful observer in Portugal who convinced himself that " Turtle-doves leaving Kent or Surrey at dawn might easily be the very birds that a few

hours later were skimming over the Portuguese pine forests on their way to Central Africa.” Fifty miles an hour would be a high average speed for most migratory birds, and there are no reliable data to tell how long such birds can continue their flight without interruption. All we seem to know is that not a few kinds manage, in various parts of the world, to cross enormous distances without the chance of a break. It was Gaetke’s notion that migration was for the most part carried on at such a height in the air as to be beyond our ken, and that what

comes to our perception consists chiefly of the abortive or unsuccess- ful attempts, when birds are checked in their course, and being unable to proceed present themselves to our sight and hearing. Now for obvious reasons birds could not well fly at very great heights in very thin air, as experiments with pigeons released from balloons have shown, and the condor soaring far above the tops of the Andes is a myth. The few trustworthy instances in which birds have been observed through a telescope passing across the face of v the moon have naturally yielded but vague calculations as to distance and height. W. E. D. Scott (Bull. Nuttall Orn. Club, vi. 97-100), computed heights varying from I to 2 m. F. M. Chapman’s observations {Auk, 1888, pp. 37-39) resulted in a height of from 1500 to 15,000 ft.; average, say, 1 m. If the sky is’ clouded and the birds fly above the clouds the migration proceeds beyond our ken, and if for some reason or other they are below the clouds the phenomenon becomes to us very noticeable. It is well known ” that on clear and bright nights birds are rarely heard passing overhead, while on nights that are overcast, misty and dark, especially if slight rain be falling, flocks may often be heard almost continuously.” It is in such weather, continues Newton, that birds while migrating are most vociferous, doubtless with the result that thereby the company of fellow-

travellers is kept together.

There yet remain a few words to be said on what may be termed Exceptional Migration,, that is when from some cause or other the ordinary practice is broken through. The erratic movements of the various species of crossbill (Loxia) and some allied forms afford perhaps the best-known examples. In England no one can say in what part of the country or at what season of the year he may not fall in with a company of the common crossbill (L. curvirostra), and the like may be said of many other lands. The food of these birds consists mainly of the seeds of conifers, and as its supply in any one locality is intermittent or precarious, we may not unreasonably guess that they shift from place to place in its quest, and may thus find an easy way of accounting for their uncertain appearance. The great band of nutcrackers (Nucifraga caryocatactes) which in the autumn of 1844 pervaded western and central Europe (Bull. Acad. Bruxelles, xi. 298), may also have been actuated by the same motive, but we can hardly explain the roaming of all other birds so plausibly. The inroads of the waxwing (Ampelis garrulus) have been the subject of interest for more than 300 years, and by persons prone to superstitious auguries were regarded as the forerunners of dire calamity. Sometimes years have passed without the bird being seen in central, western or southern Europe, and then perhaps for two or three seasons in succession vast flocks have suddenly appeared. Later observation has shown that this species is as inconstant in the choice of its summer as of its winter-quarters. One of the most extraordinary events known to ornithologists is the irruption into Europe in 1863 of Pallas's sandgrouse (Syrrhaptes paradoxus). Of this bird, hitherto known only as an inhabitant of the Tatar steppes, a single specimen was obtained at Sarepta on the Volga in the winter of 1848. In May 1859 a pair is said to have been killed in the government of Vilna, on the western borders of the Russian empire, and a few weeks later five examples were pro- cured, and a few others seen, in western Europe

— one in Jutland, one in Holland, two in England and one in Wales. In i860 another was obtained at Sarepta; but in May and June 1863 a horde com- puted to consist of at least 700 individuals overran Europe — reaching Sweden, Norway, the Faeroes and Ireland in the north- west, and in the south extending to Sicily and almost to the frontiers of Spain. On the sandhills of Jutland and Holland some of these birds bred, but they were all killed off. A much greater visitation took place in 1888, which met with the same fate. The number of birds was quite incalculable, the wave extending from Norway to southern Spain.

In comparison with the periodic annual migrations of so very many birds, those of other creatures are scarce and insignificant, excepting fishes.

Mammals. — Few trustworthy observations have been recorded. The most regular and least limited migrations seem to be those of the eared seals. The walrus also goes each year to the north in the summer, further south in the winter. Delphinapterus leucas, one of the Cetacea, ascends the Amoor regularly on the breaking of the ice, a distance of 400 m. up the stream, Some bats are supposed to migrate. The American bison used to roam north and south, according to the season, in search of pasture; and similar periodic wanderings have often been recorded of various kinds of game on the South African veldt. They are all obviously a mere matter of commissariat and have little to do with the breed- ing, except in the case of seals.

In one way the lemming's " migrations " are instructive. They are quite sporadic. When, owing to combination of some favour- able circumstances they suddenly increase, enormous numbers forsake the highlands for the lowlands of Norway; not in a methodical way, but quite lawlessly ; that means to say they radiate from their centres of dispersal. At any given spot, however, they seem to keep to the same direction, and no obstacles seem to divert their course. Those which arrive at the much indented coast are known even to rush into the sea,

where of course they get drowned. There is no sense in this. The overcrowded condition of their

home impels them to leave, and this impulse continues blindly. They do not attempt to settle anywhere between their home and the sea. A year or two after the irruption not a lemming is there to be found, and where during their stampede they come across suitable districts, they find these already occupied by resident lemmings.

Such and similar irruptions have no doubt taken place often during the world's history; and yet such sporadic stampedes into a foreign country hardly ever lead to its regular settlement, especi- ally when such a country possesses already a kindred fauna of its own.

Fishes. — Many fishes make periodic migrations for breeding purposes, which by their numbers and the distances travelled much resemble those of birds, but very little is known about these fishes. Take the incredible masses of herrings and their kindred; the collecting of the cod and its allies on their breeding-ground. According to D. S. Jordan (A Guide to the Study of Fishes, New York, 1905) some kinds are known mainly in the waters they make their breeding-homes, as in Cuba, southern California, Hawaii or Japan, the individuals being scattered at other times through the wide seas. The tunny, which has a world-wide distribution, arrives off the south coast of Portugal in the month of May; enormous numbers pass through the Straits of Gibraltar and sup- port great fishing industries in the Mediterranean. In the month of August they return to the ocean (Apesca do Atum no Algarve em i8q8, por D. Carlos de Braganza, Lisboa, 1899; with many maps).

Many fresh-water fishes, as trout and suckers (quoting Jordan) forsake the large streams in the spring, ascending the small brooks where their young can be reared in greater safety. Still others, known as anadromous fishes, feed and mature in the sea, but ascend the rivers as the impulse of reproduction grows strong. Among such fishes are the salmon,

shad, alewife, sturgeon and striped bass in American waters ; Clupea alosa, the Allis shad, and C. finta, the Twait shad, Alepocephalus rostratus, the ” maifisch ” of the Rhine, in Europe. ” The most remarkable case of the anadromous instinct is found in the king-salmon or quinnat (Onchorhynchus tschawytscha) , of the Pacific coast. This great fish spawns in November, at the age of four years and an average weight of twenty- two pounds. In the Columbia river it begins running with the spring freshets in March and April. It spends the whole summer, without feeding, in the ascent of the river. By autumn the individuals have reached the mountain streams of Idaho, greatly changed in appearance, discoloured, worn and distorted. On reaching the spawning-beds, which may be 1000 m. from the sea in the Columbia, over 2000 m. in the Yukon, the female deposits her eggs in the gravel of some shallow brook. The male covers them and scrapes the gravel over them. Then both male and female drift, tail foremost, helplessly down the stream; none, so far as certainly is known, ever survive the reproduction act. The same habits are found in the five other species of salmon in the Pacific. The salmon of the Atlantic has a similar habit, but the distance travelled is everywhere much less, and most of the hook-jawed males drop down to the sea and recover, to repeat the act of reproduction.”

Few fishes are katadromous, i.e. their usual habitat is in rivers and lakes, but they descend into the sea for breeding purposes. The common eel is the classical example.

Insects. — D. Sharp makes the following remarks (Cambridge Nat. Hist, vi.): ” Odonata are among the few kinds of insects that are known to form swarms and migrate. Swarms of this kind have been frequently observed in Europe and in North America; they usually consist of a species of the genus Libellula, but species of various other genera also swarm, and sometimes a swarm may consist of more than one species.

” Locust swarms do not visit the districts that are

subject to their invasions every year, but as a rule only after intervals of a considerable number of years. . . . The irregularity seems to depend upon three facts, viz. that the increase of locusts is kept in check by_ parasitic insects; that the eggs may remain more than one year in the ground and yet hatch out when a favourable season occurs, and that the migratory instinct is only effective when great numbers of superfluous individuals are produced. ... It is well established that locusts of the migratory species exist in countries without giving rise to swarms or causing any serious injuries. . . . When migration of locusts does occur it is attended by remarkable manifestations of instinct. Although several generations may elapse without a migration, it is believed that the locusts when they migrate do so in the direction taken by predecessors. They are said to take trial flights to ascertain the direction of a favourable wind, and that they alight and wait for a change. The most obscure point is their disappearance from a spot they have invaded. A swarm will alight on a locality, deposit there a number of eggs, and then move on. But after a lapse of a season or two there will be few or none of the species present in the spot invaded. In other cases they again migrate after growth to the land of their ancestors. It has been ascertained by the United States Entomo- logical Commission that such return swarms do occur.”

See J. A. Palmen, Om Foglarnes fly ttningsv agar (Helsingfors, 1874). The same in German: liber die Zugstrassen der Vogel (Leipzig, 1896). In this and the work of von Middendorff, already

cited, reference is made to almost every important publication on the subject of migration, which renders a notice of its very extensive literature needless here, and a pretty full bibliographical list is given in Giebel’s Thesaurus ornithologiae (i. 146-155). Yet mention may be made of Schlegel’s

Over het trekken der Vogels (Harlem, 1828) ; Hodgson's " On the Migration of the Natatores and Grallatores as observed at Kathmandu " in Asiatic Researches (xviii. 122-128), and Marcel de Serres's Des Causes des migrations des animaux et particulierement des oiseaux et des poissons (Harlem, 1842). This last, though one of the largest publications on the subject, is one of the least satisfactory. S. F. Baird's excellent treatise " On the Distribution and Migrations of North American Birds," Am. Journ. Sc. and Arts (2nd ser. 1866), pp-78-90, 187-192, 337-347; reprinted Ibis 1867, pp. 257-293. N. A. Severzoff, " Etudes sur le passage des oiseaux dans l'Asie centrale," Bull. Soc. Nat. (Moscow, 1880), pp. 234-287; Menzbier, " Die Zugstras- sen der Vogel im europaischen Russland," op. cit. (1886), pp. 291-369 ; Palm6n, Referat uber den Stand der Kenntniss des Vogelzuges, Intern. Ornith. Congr., Budapest, 1891; W. W. Cooke and C. H. Merriam, Report on Bird Migration in the Mississippi Valley, U.S. Dep. Agric.Economic Ornithol., publ. 2 (Washington, 1888) ; Gaetke, Die Vogelwarte Helgoland (Braunschweig, 1891). In English: Heligo land as an Ornithological Observatory (Edinburgh, 1895); A. Newton, article " Migration," Diet. Birds (1893). (H. F. G.)

MIGUEL, MARIA EVARIST (1802-1866), usually known as Dom Miguel, whose name is chiefly associated with his preten- sions to the throne of Portugal, was the third son of King John VI. of Portugal, and of Carlota Joaquina, one of the Spanish Bourbons; he was born at Lisbon on the 26th of October 1802. In 1807 he accompanied his parents in their flight to Brazil, where he grew up an uneducated and fanatical debauchee; in 1821, on his return to Europe, it is said that he had not yet learned to read. In 1822 his father swore fidelity to the new Portuguese constitution which had been proclaimed in his absence; and this led Carlota Joaquina, who was an abso- lutist of the extremest Bourbon type, and hated her husband, to seek his dethronement in favour of Miguel her favourite son. The insurrections which ensued (see Portugal) resulted

in her imprisonment and the exile of Miguel (1824), who spent a short time in Paris and afterwards lived in Vienna, where he came under the teaching of Metternich. On the sudden death of John VI. in May 1826, Pedro of Brazil, his eldest son, renounced the crown in favour of his daughter Maria da Gloria, on the understanding that she should become the wife of Miguel. The last named accordingly swore allegiance to Pedro, to Maria, and to the constitution which Pedro had introduced, and on this footing was appointed regent in July 1827. He arrived in Lisbon in February 1828, and, regardless of his promises, dissolved the new Cortes in March; having called together the old Cortes, with the support of the reactionary party of which his mother was the ruling spirit, he got himself proclaimed sole legitimate king of Portugal in July. His private life was characterized by the wildest excesses, and he used his power to oppose all forms of liberalism.

The public opinion of Europe became more and more actively hostile to his reign, and after the occupation of Oporto by Dom Pedro in 1832, the destruction of Miguel's fleet by Captain (afterwards Sir Charles) Napier off Cape St Vincent in 1833, and the victory of Saldanha at Santaremin 1834, Queen Christina of Spain recognized the legitimate sovereignty of Maria, and in this was followed by France and England. Dom Miguel capitulated at Evora on the 29th of May 1834, renouncing all pretensions to the Portuguese throne. He lived for some time at Rome, where he enjoyed papal recognition, but afterwards retired to Bronnbach, in Baden, where he died on the 14th of November 1866.

MIHRAB, a term in Mahommedan architecture given to the niche which in a mosque indicates the direction of Mecca, towards which the Moslems turn when praying.

MIKADO (Japanese for " exalted gate "), the poetical title associated by foreign countries with the sovereign of Japan; the Japanese title, corresponding to " emperor," is tenno, the term kotei being used of his function in relation to

external affairs. By the constitution of 1889, the emperor of Japan transferred a large part of his former powers as absolute monarch to the representatives of the people, but as head of the empire

he appoints the ministers, declares war, makes peace and con- cludes treaties, acting generally as a constitutional sovereign but with all the personal authority attaching to his august position. The history of the mikados goes back to very early times, but from 1600 to 1868 the real power was in the hands of the shoguns, who nevertheless were in ceremonial theory always successively invested with their authority by the mikado. The revolution of 1867 restored the real power into the mikado's hands. (See Japan: History; and Mutsu-Hito.)

MIKIRS, a hill tribe of India, occupying two or three detached tracts in Nowgong and Sibsagar districts of Eastern Bengal and Assam, known as the Mikir hills. In 1901 their total number was returned as 87,056. Mikir is the name given to them by the Assamese; they call themselves Arleeng, which means " man " in general. They have long settled down to agriculture, and are distinguished from the tribes around them by the absence of savagery. Their language, which has been studied by mission- aries, seems to connect them with the Kuki-Chin stock on the Burmese frontier.

See Sir C. Lyall, The Mikirs (1908).

MIKLOSICH, FRANZ VON (1813-1891), Austrian philologist, was born at Luttenberg, Styria, on the 29th of November 1813. He graduated at the university at Gratz as a doctor of philo- sophy, and was for a time professor of philosophy there. In 1838 he went to Vienna, where he took the degree of doctor of law. He devoted himself, however, to the study of Slavonic languages, abandoned the law, and obtained a post in the imperial library, where he remained from 1844 to 1862. In the former year he published a noteworthy review of Bopp's Comparative Grammar, and this began a long series of works of

immense erudition which completely revolutionized the study of Slavonic languages. In 1849 Miklosich was appointed to the newly created chair of Slavonic philology at the university of Vienna, and he occupied it until 1886. He became a member of the Academy of Vienna, which appointed him secretary of its historical and philosophical section, a member of the council of public instruction and of the upper house, and correspondent of the French Academy of Inscription. His numerous writings deal not only with the Slav languages, but with Rumanian, Albanian, Greek, and the language of the gypsies. Miklosich died on the 7th of March

1891.

MILAN (Ital. Milano, Ger. Mailand, anc. Mediolanum, q.v.), a city of Lombardy, Italy, capital of the province of Milan, 93 m. by rail E.N.E. of Turin. Pop. (1881), 321,839; (1906), 560,613. It is the seat of an archbishop, the headquarters of the II. army corps, the chief financial centre of Italy and the wealthiest manufacturing and commercial town in the country. It stands on the little river Olona, near the middle of the Lombard plain, 400 ft. above sea-level.

The plain around Milan is extremely fertile, owing at once to the richness of the alluvial soil deposited by the Po, Ticino, Olona and Adda, and to the excellent system of irrigation. Seen from the top of the cathedral, the plain presents the appearance of a vast garden divided into square plots by rows of mulberry or poplar trees. To the east this plain stretches in an unbroken level, as far as the eye can follow it, towards Venice and the Adriatic; on the southern side the line of the Apennines from Bologna to Genoa closes the view; to the west rise the Maritime, Cottian and Graian Alps, with Monte Viso as their central point; while northward are the Pennine, Helvetic and Rhaetian Alps, of which Monte Rosa, the Saasgrat and Monte Leone are the most conspicuous features. In the plain itself lie many small villages; and here and there a larger town like Monza or Saronno, or a

great building like the Certosa of Pavia, makes a white point upon the greenery. The climate is changeable and trying; in summer it is intensely hot, in winter very cold. Snow is often seen, and the thermometer is frequently below freezing-point.

In shape Milan is a fairly regular polygon, and its focus is the splendid Piazza del Duomo, from which a number of broad modern streets radiate in all directions. These streets are connected by an inner circle of boulevards, constructed just outside the canal, which marks the site of the town moat. The

arches of Porta Nuova are almost the last trace of the inner circuit, constructed after the destruction of the city by Frederick Barbarossa, to which also belonged the Porta dei Fabbri, de- molished in 1900. Curious reliefs from the Porta Romana are to be seen in the museum. Within this circle the majority of the streets are narrow and crooked, while those between it and the bastions, though broader on the whole, have but little regularity. An outer circle of boulevards, planted with trees and com- manding the view of the suburbs, lies just beyond the present walls of the city, erected by the Spaniards in the 16th century; the entire length of these boulevards is traversed by an electric tramway 7 m. long.

Occupying one end of the Piazza del Duomo is the famous cathedral. It is built of brick cased in marble from the quarries which Gian Galeazzo Visconti gave in perpetuity to the cathedral chapter. It was begun in 1386. The name of the original architect is unknown, but it is certain that many German master- masons were called to Milan to assist the Italian builders. It was then the largest church in existence, and now, after St Peter’s at Rome and the cathedral of Seville, the Duomo of Milan is the largest church in Europe; it covers an area of 14,000 sq. yds. and can hold

40,000 people. The interior is 486 ft. long, 189 ft. wide; the nave is 157 ft. high, and the distance from the pavement to the top of the tower is 356 ft. The style is Gothic, very elaborately decorated, but it shows many peculiar- ities, for the work was continued through several centuries and after many designs by many masters, notably by Amadeo, who carried out the octagonal cupola (the pinnacle of which dates from 1774), and by Tibaldi, who laid down the pavement and designed a baroque facade. This last feature was begun after Tibaldi's design in 1615, but was not finished till 1805, when Napoleon caused the work to be resumed. With its Renaissance windows and portals this facade, though good in itself, was utterly out of keeping with the general style of the church, and in 1900 the removal of the inharmonious features was begun, to be replaced in a style strictly in accordance with the Gothic style of the rest of the building from the designs of Giuseppe Brentano. In shape the church is cruciform, with double aisles to the nave and aisles to the transepts. The roof is supported by fifty-two pillars with canopied niches for statues instead of capitals; the great windows of the choir, reputed to be the largest in the world, are filled with stained glass of 1844. To the right of the entrance is the tomb of Arch- bishop Heribert, the champion of Milanese liberty, while beside him rests Archbishop Otto Visconti, the founder of that family as a reigning house. The large bronze candelabrum in the left transept is said to be 13th century work. In a crypt under the choir lies the body of the cardinal saint Carlo Borromeo, who consecrated the cathedral in 1577. It is contained in a rock-crystal shrine, encased in silver, and is vested in full ponti- fical robes blazing with jewels. The roof of the cathedral is built of blocks of marble, and the various levels are reached by staircases carried up the buttresses; it is ornamented with a profusion of turrets, pinnacles and statues, of which last there are said to be no fewer than 4440, of very various styles and periods. In front of the cathedral rises a colossal bronze equestrian statue of Victor Emmanuel II.

There are two noteworthy palaces in the Piazza del Duomo. The first is the Palazzo Reale dating from 1772, but occupying the site of the earliest mansion of the Viscontis and the Sforza; its great hall is a handsome chamber with a gallery supported by caryatides. Built into the palace is the ancient church of San Gottardo, a Romanesque building which was built by Azzone Visconti in 13 28-1339, and was the scene of the murder of Giovanni Maria Visconti in 141 2. Its campanile is a beautiful example of early Lombard terra-cotta work. The second palace is that of the archbishops, the fine facade of which is the work of Fabio Magnone. It has an older north colonnade, by some attributed to Bramante, but, like many other buildings, without sufficient evidence, and a fine court with double colon- nades by Tibaldi, to whom the back facade is due. The Palazzo della Ragione, erected in the Piazza dei Mercanti, just west of

the Piazza del Duomo, the central point of the medieval city, in 1223-1238 by the podesta, Oldrado da Tresseno, whose eques- trian portrait in high relief adorns it, still exists in fine preserva- tion. It is a brick edifice with a portico on the ground floor and a large hall on the upper. Close by to the south is the beautiful Loggia degli Osii, erected in 13 16, with two loggie or open porticos, one above the other, in black and white marble.

Among the most interesting buildings in Milan is the ancient church of S. Ambrogio. Here St Ambrose baptized St Augus- tine; here he closed the doors against the emperor Theodosius after his cruel massacre at Thessalonica ; here the Lombard kings and the early German emperors caused themselves to be crowned with the iron crown of Lombardy, and the pillar at which they took their coronation oaths is preserved under the lime-trees in the piazza. The church was built by St Ambrose early in the 4th- century (on the site of a temple of Bacchus it is said), but as it stands it is a Romanesque basilica of the 12th century, recently well restored (like many other churches in Milan), with a brick exterior, like so many churches of Milan and

Lombardy, curious galleries over the facade, and perhaps the most perfectly preserved atrium in exist- ence. The wooden door belongs to the original 4th century church ; it has carvings with scenes from the life of David. In a great silver reliquary (modern) in the crypt lie the bones of St Ambrose, above which rises the high altar, which retains its original decora- tions, the only intact example of its period (835). These consist of reliefs in gold and silver enriched with enamel and gems, and are the work of one Vuolfvinus, a German. The baldacchino, with sculptures of the 12th or early 13th century, is borne by four ancient columns of porphyry, with 9th-century capitals. In the tribune are fine mosaics of the 9th century, which, Burckhardt remarks, completely break with Byzantine tradition. In the side chapel of S. Satiro are even earlier mosaics (5th century) ; there are also fine frescoes by Borgognone and Bernardino Lanini. The lofty brick campanile (789-824) is among the earliest in Italy, and is decorated with coloured majolica disks. The court of the neighbouring canonica is by Bramante, and so also may be the design of the cloisters of the monastery of S. Ambrogio, now the military hospital. S. Lorenzo, in the south portion of the town, dates from before A.D. 538, thus being practically contemporary with S. Vitale at Ravenna (though Burckhardt considers it to belong to about A.D. 300, and to be a part of the thermae or palace of Maximian), but was burnt down and restored in 1071 (in the restoration Corinth- ian capitals were used as bases). Thirty-three years later part of it collapsed, and a second fire followed in 1 124. It was restored, but collapsed again in 1573, and a great part of it had to be re- constructed, including the dome (1574-1591). (The chapel of S. Aquilino, possibly a part of the original structure, contains mosaics of the 5th or 6th century.) In plan the church is an octagon, supported at the corners by four square towers in brick- work, which belong to the original structure. The interior with its two orders is a very fine one, and its influence on Renaissance architects has been very considerable. S. Eustorgio, one of the largest

Gothic churches in Milan, with some Romanesque survivals, dates, as it stands, with its campanile, from the end of the 13th century, and has a modern fagade in the old style. It has some interesting medieval works of sculpture, and a fine chapel (Cappella Portinari), with a good dome and a beautiful frieze of angels, built by Michelozzo in 1462–1468, and containing the splendid sculptured tomb (a marble sarcophagus with reliefs, supported by statues) of Peter Martyr (q.v.), the masterpiece of Giovanni di Balduccio of Pisa (1339); the walls of the chapel are decorated with important frescoes by Vincenzo Foppa of Brescia. S. Simpliciano, too, though originally Romanesque, is now in the main Gothic, and has been much altered.

S. Vincenzo in Prato (833), now restored to its basilican form, with nave and two aisles divided by columns and three apses, and with small, flat arcading on the exterior, which is in brickwork; S. Satiro, founded in 879 ; S. Babila, also restored to its original form, &c, are interesting for their Romanesque architecture. The small domed structure on the left of S. Satiro is earlier than the church, while the campanile is part of the original structure, though pre- ceded in date by that of S. Ambrogio, which is one of the earliest genuine campanili in Italy (789–824). The reconstruction of the church of S. Satiro was Bramante's earliest work in Milan (after 1476). The choir is painted in perspective (there was no room to build one), the earliest example of this device, which was so fre- quently used in baroque architecture. The octagonal sacristy (before 1488), with niches below and a gallery above, with stucco decorations by Bramante himself (the frieze with putti and medal- lions is ascribed to Caradosso), is a masterly work, and one of his best. The Cistercian abbey-church of Chiaravalle, 5J m. south of Milan, is a fine brick building in the plan of a Latin cross, with nave and two aisles with round pillars, with a lofty domed tower, in the so-called Romanesque Transition style, having comparatively slender round pillars and cross vaulting, while the exterior is still quite

Romanesque. It was founded in n 33 by St Bernard and consecrated in 122 1. It is interesting as the model for the plan of many other churches in Lombardy, e.g. S. Maria del Carmine and

S. Francesco in Pavia. S. Marco, modernized inside, still retains a beautiful facade of 1254 and a tower — in brick as elsewhere — and contains another tomb by Balduccio. S. Maria Incoronata is unique as a double Gothic church, in the horizontal sense (1451-

H87). , . .

Of the secular buildings of the beginning of the 15th century, the most notable is the Palazzo Borromeo, which still preserves its Gothic courtyard. It has a good collection of Lombard pictures. At no great distance from S. Ambrogio, in the Corso Magenta, is the church of Santa Maria delle Grazie, built by the Dominicans about 1460, to which the Gothic facade and nave belong. The choir, crossing, and beautiful sixteen-sided dome, with the elegant external decorations in terra-cotta and marble, are by Bramante (c. 1492). Adjoining the church is the convent, long used as barracks. Leading from the fine cloisters, also the work of Bramante, is the former refectory, on the walls of which Leonardo da Vinci painted his celebrated ” Last Supper,” a work which is unfortunately in a bad state of preservation.

Farther along the Corso, but nearer the Piazza del Duomo, is San Maurizio, the interior of which is covered by exceedingly effective frescoes by Luini and his contemporaries. The interior was erected by Giovanni Dolcebuono, a pupil of Bramante, to whom is also due S. Maria presso S. Celso (the interior and the baroque facade are by Alessi). Thence the Via Bollo leads to the Piazza della Rosa, in which is situated the renowned Biblioteca Ambrosiana, erected in 1603-1609 by Fabio Manzone, to whom the Palazzo

del Senato is also due, rich in MSS. In the same building there is also a picture gallery, in which is Raphael's cartoon for his fresco the " School of Athens " in the Vatican. Situated just within the Naviglio, the canal encircling the inner town (adjacent to San Nazaro, which contains Bernardino Lanini's [fl. 1546] masterpiece, the " Martyrdom of St Catherine "), is the Ospedale Maggiore. This institution, which can accommodate 2400 patients, was founded in the reign of Francesco Sforza. The principal court (there are nine in all) is surrounded by fine arcades of the 17th century by Ricchini. The entire edifice is covered externally with terra-cotta, and its facade, designed by the Florentine Antonio Averulino (Filarete) and begun in 1457, is superior to any other of the kind in Milan.

The city is rich in works of art, for Milan, with the introduction of the early Renaissance style by Filarete and Michelozzo after 1450, became the home of a Lombard school of sculpture, among the chief masters of which may be mentioned Giovanni Antonio Amadeo, or Omodeo, 1 of Pavia (1447-1522), Cristoforo Solari, and, the last of them, Agostino Busti, known as Bambaia (c. 1480-1548), whose work may be seen in the cathedrals of Como and Milan and in the Certosa di Pavia. Subsequently, towards the close of the 15th century, the refined court of Lodovico Sforza attracted such celebrated men as Bramante, the architect, Gauffino Franchino, the founder of one of the earliest musical academies, and Leonardo da Vinci, from whose school came Luini, Boltraffio, Gaudenzio Ferrari, Marco d'Oggiono, &c. Later, Pellegrino Tibaldi and Galeazzo Alessi of Genoa (the for- mer a man of very wide activity) were the chief architects, and Leone Leoni of Arezzo the chief sculptor. In still more recent times Beccaria (1738-1794) as a jurist, Monti (1734-1828) as a poet and Manzoni (1785-1873) as a novelist, have won for the Milanese a high reputation.

The picture gallery of the Brera, one of the finest in Italy, occupies an imposing palace with a good courtyard by Ricchini. It was built as a Jesuit college in 1651, but since 1776 has been the seat of

the Accademia di Belle Arti, and contains besides che picture gallery a .library of some 300,000 volumes, a collection of coins numbering about 60,000, and an excellent observatory founded in 1766. The Brera Gallery, the nucleus of which was formed in 1806, possesses Raphael's famous " Sposalizio," and many pictures and frescoes by Luini, Guadenzio Ferrari and Bramantino; the collection of the works of Carlo Crivelli (fl. 1480) affords an in- structive survey of his work, -which connects the Paduan school with the Venetian, here particularly well represented by works of Paolo Veronese, Paris Bordone, Gentile Bellini, Cima da Conegliano, Bonifazio, Moroni and Carpaccio. Additions are continually made to it.

The Castel Sforzesco, or Castle of Milan, stands in the Parco Nuovo; it was built in 1450 by Francesco Sforza on the site of one erected by Galeazzo II. Visconti (1355-1378) and demolished in 1447 by the populace after the death of Filippo- Maria Visconti. After suffering many vicissitudes and being partially destroyed more than once, it was restored — including especially the splendid entrance tower by Antonio Averulino (Filarete, 1451-1453), de- stroyed by a powder explosion in 1521 — in the 15th- century style

1 See F. Malaguzzi Valeri, G. A. Amadeo, scultore e architetto (Bergamo, 1905).

in 1893 sqq., and it is now a most imposing pile. Some of the fine windows with their terra-cotta decorations are preserved. The archaeological museum is housed here on the ground floor; besides Roman and pre-Roman objects it contains fragments of the 9th century basilica of Santa Maria in Aurona, one of the first examples of vaulted Lombard architecture; the bas-reliefs of the ancient Porta Romana of Milan, representing the return of the Milanese in 1 171 after the defeat of Barbarossa; the remains of the church of Santa Maria in Brera, the work of Balduccio da Pisa ; the grandiose sepulchral monument of Bernabo Visconti formerly in the church of San Giovanni in Conca; the tomb of

Regina della Scala, the wife of Bernabo; the funeral monument of the Rusca family; the great portal of the palace of Pigello Portinari, seat of the Banco Mediceo at Milan, a work of Michelozzo; a series of Renaissance sculptures, including works by Amadeo Mantegazza, Agostino Busti (sur- named Bambaia), including fragments of the tomb of Gaston de Foix. Several of the rooms occupied by the archaeological museum bear traces of the decorations executed under Galeazzo Maria and Lodovico il Moro, and one of them has a splendid ceiling with trees in full foliage, painted so as to cover the whole vaulting, ascribed to Leonardo da Vinci. In the upper rooms is placed a large collec- tion of Milanese and central Italian ceramics, stuffs, furniture, bronzes, ivories, enamels, glass and historical relics; together with a picture gallery containing works by Vincenzo Foppa, Gianpietrino, Boltraffio, Crivelli, Pordenohe, Morone, Cariani, Correggio, Antonello da Messina, Tiepolo, Guardi, Potter, Van Dyck and Ribeira.

The finest of the modern thoroughfares of Milan is the Via Dante, constructed in 1888; it runs from the Piazza de' Mercanti to the spacious Foro Bonaparte, and thence to the Parco Nuovo, the great public garden in which stands the Castello Sforzesco. This park was once a national drilling ground, which was taken over by the municipality with a view to erecting upon it a new residential quarter, rendered necessary by the phenomenal growth of the city during the last twenty-five years of the 19th century. This design was happily abandoned, and around the Parco Nuovo has grown up a new quarter of wide streets, spacious gardens and private villas.

To the north of the castle is the Arena, a kind of circus erected by Napoleon in 1805; while facing the castle on the opposite side of the park is the Arco della Pace, begun by Napoleon in 1806 from the designs of Cagnola to mark the beginning of the Simplon Road, but finished by the Austrians in 1833. Leading east-north-east from the Piazza del Duomo, the centre of Milanese traffic, especially of electric trams, is the Corso Vittorio Emanuele.

Connecting the piazza with the neighbouring Piazza della Scala is the famous Galleria Vittorio Emanuele, a great arcade in the form of a Latin cross, with an octagon in the centre, crowned at the height of 160 ft. with a glass cupola; it is roofed with glass throughout, and is 320 yds. long, 16 yds. wide and 94 ft. high. It has splendid facades at each end, and was constructed in 1865–1867 at the cost of £320,000; it is the finest of its kind in Europe.

In the Via Morone near the Piazza della Scala is a collection of art treasures bequeathed to the town in 1879 by a Milanese patrician, the Cavaliere Poldi-Pezzoli. It comprises valuable pictures, textile fabrics, arms, armour and a number of antiqui- ties, and is exhibited in the house once occupied by the founder. In the middle of the neighbouring Piazza della Scala stands Magni's monument of Leonardo da Vinci (1872). Opposite is the celebrated Teatro della Scala, built in 1778 on the site of a church founded by Beatrice della Scala, wife; of Bernabo Visconti. After the San Carlo at Naples it is the largest theatre in Europe, and can seat 3600 spectators. Looking on to the piazza is the fine Palazzo Marino, the seat of the municipality since 1861; it was built by Galeazzo Alessi in 1558, to whom the side facade and the court are due, but was not completed until 1890, when the main facade was erected by Luca Beltrami. S. Fedele by Tibaldi (1569) is close by. Milan has a royal scientific and literary academy with a faculty of philosophy, a royal technical institute, a school of veterinary science, a royal school of agricul- ture, a polytechnic with the Bocconi commercial school (founded 1898) and numerous other learned and educational institutions. Milan has long been famous as one of the great musical centres of Europe, and numerous students resort here for their musical education. There are many philanthropic institutions, the most interesting of which is the Albergo Popolare, an establishment conducted on lines similar to the houses established in England

by Lord Rowton in 1894. Sport and athletics are provided by a number of clubs, notably the Touring Club Italiano, founded in

1894.

The modern industrial development of Milan, with its suburbs and neighbouring towns, such as Monza, Gallarate, Saronno, Busto Arsizio and Legnano, has been noteworthy. Machine-making on a large scale is carried on by firms widely celebrated for the construction of locomotives, railway trucks and carriages, steam- boilers and motors, turbines, pumps, metal bridges and roofs. Minon industries are represented by workshops for the production of surgical, musical and geodetic instruments; of telephone and telegraph accessories; dynamos, sewing-machines, bicycles and automobiles. There is also a large carriage industry. In textile industries silk holds the first place. The amount of silk handled and woven in Milan is greater than that dealt with at Lyons. Spinning and twisting are as highly developed as the weaving industry. Milan is also the centre of the Italian cotton industry. Cotton-weaving, dyeing and printing are extensively carried on. Linen, flax, jute and wool are also spun and woven. The Milanese manufactures of articles in caoutchouc and of electric cables have acquired a world-wide reputation. In typography Milan is renowned principally for its musical editions and for its heliotype and zincotype establishments. There is, besides, a huge production of posters for advertisement. The manufacture of furniture of all kinds is still extensively carried on, Milan being the chief Lombard market and centre of exportation. The towns of Cantu, Meda, Lissone and Carugo supply Milanese firms with most of their mer- chandise, the furniture being made by the workmen at their own homes with materials supplied by the Milanese buyers, who also advance the capital necessary for working expenses. Theatrical costumes and appliances are also made in Milan, which is an im- portant theatrical centre. House industry is still widely

diffused in Milan itself .especially as regards working in gold, silver, vulcanite, bronze and leather. The motive power for much of the house industry is supplied by electricity. The electricity is partly furnished by hydraulic works at Paderno, 24 m. from Milan; the horse-power is continually being increased owing to new needs. Gas is also much used. Milan is also a centre of the export trade in cheese; chocolate, biscuits, &c, are also manufactured.

The municipal schools of Milan are as well organized as any in Italy, and the exhibit in connexion with them at the great inter- national exhibition of 1906 was of interest. There were, in 1907, 76 buildings for schools and 47,968 pupils, while in the evening and holiday classes there were 10,724 older pupils; 2,109,920 free rations and 215,135 paid rations were distributed to 16,526 pupils, and douches were supplied. Pizzoli's Tavolo Psicoscopico for examining the mental qualities of the pupils is of interest. The international exhibition of 1906 held in Milan was of considerable importance, all the leading states of the world taking part in it. The retro- spective exhibition of means of transport was interesting in view of the recent opening of the Simplon tunnel, the occasion of the exhibition. Among the most noteworthy exhibits were those of machinery, of automobiles and bicycles, of agriculture, of transports by sea, of modern art and architecture, of Italian home industries, of the city of Milan; besides which, all the countries exhibiting had their own separate pavilions.

Until 1898 the octroi circle did not extend beyond the walls; but in that year it was found necessary, owing to the growth of the city and of municipal expenditure, to include the external quarters or Corpi Santi (a name also applied to the extramural portions of Cremona and Pavia), with their large industrial population. Since that time municipal finance has been in a prosperous condition.

The water supply, from wells some 150 ft. deep in the sub-soil, is fairly good ; one of the towers of

the Castello Sforzesco is used as a distributing centre, while the sewerage system consists of 48 m. of sewers on the single channel principle, with collectors discharging into the Vettabia, a tributary of the Lambro.

In i860 a large cemetery, the Cimitero Monumentale, was opened, but found to be insufficient, it is reserved for important monuments, that of Musocco, 3 m. from the city, being used for general purposes.

History — (For earlier history see Mediolanum). — After the establishment of the Lombard capital at Pavia in 569 Milan remained the centre of Italian opposition to the foreign conquest. The Lombards were Arians, and the archbishops of Milan from the days of Ambrose had been always orthodox. Though the struggle was unequal, their attitude of resolute opposition to the Lombards gained for them great weight among the people, who felt that their archbishop was a power around whom they might gather for the defence of their liberty and religion. All the innate hatred of the foreigner went to strengthen the hands of the archbishops, who slowly acquired, in addition to their spiri- tual authority, powers military, executive and judicial. These powers they came to administer through their delegates, called viscounts. When the Lombard kingdom fell before the Franks under Charlemagne in 774, the archbishops of Milan were still

further strengthened by the close alliance between Charles and the Church, which gave a sort of confirmation to their temporal authority, and also by Charles's policy of breaking up the great Lombard fiefs and dukedoms, for which he substituted the smaller counties. Under the confused government of Charles's immediate successors the archbishop was the only real power in Milan. But there were two classes of difficulties in the situa- tion, ecclesiastical and political; and their presence had a marked effect on the development of the people and the growth of the commune, which was the next stage in the history of Milan. On the one hand the archbishop was obliged to contend against the

heretics or against fanatical reformers who found a following among the people; and on the other, since the archbishop was the real power in the city, the emperor, the nobles and the people each desired that he should be of their party; and to whichever party he did belong he was certain to find himself violently opposed by the other two. From these causes it sometimes happened that there were two archbishops, and therefore no central control, or no archbishop at all, or else an archbishop in exile. The chief result of these difficulties was that a spirit of independence and a capacity of judging and acting for themselves was developed in the people of Milan. The terror of the Hun- nish invasion, in 899, further assisted the people in their progress towards freedom, for it compelled them to take arms and to fortify their city, rendering Milan more than ever independent of the feudal lords who lived in their castles in the country. The tyranny of these nobles drove the peasantry and smaller vassals to seek the protection for life and property, the equality of taxation and of justice, which could be found only inside the walled city and under the rule of the archbishop. Thus Milan grew populous, and learned to govern itself. Its inhabitants became for the first time Milanese, attached to the standard of St Ambrose — no longer subjects of a foreign conqueror, but a distinct people, with a municipal life and prospects of their own. For the further growth of the commune, the action of the great archbishop, Heribert (1018-1045), the establishment of the carroccio, the development of Milanese supremacy in Lombardy, the destruction of Lodi, Como, Pavia and other neighbouring cities, the exhibition of free spirit and power in the Lombard league, and the battle of Legnano, see the articles Italy and Lombards. In 1157 an almost circular moat, still preserved in the inner canal or Naviglio, was constructed round the town; but in 1 162 Frederick Barbarossa took and almost entirely destroyed the city, only a few churches surviving. The city with its walls was, however, rebuilt five years later by the allied cities of Bergamo, Brescia, Mantua and Verona.

After the battle of Legnano, in 11 74, although the Lombard cities failed to reap the fruit of their united action, and fell to mutual jealousy once more, Milan internally began to grow in material prosperity. After the peace of Constance (1183) the city walls were extended; the arts flourished, each in its own quarter, under a syndic who watched the interests of the trade. The manufacture of armour was the most important industry. During the struggles with Barbarossa, when freedom seemed on the point of being destroyed, many Milanese vowed themselves, their goods and their families to the Virgin should their city come safely out of her troubles. Hence arose the powerful fraternity of the ” Umiliati,” who established their headquarters at the Brera, and began to develop the wool trade, and subse- quently gave the first impetus to the production of silk. From this period also date the irrigation works which render the Lom- bard plain a fertile garden. The government of the city con- sisted of (a) a parlamento or consiglio grande, including all who possessed bread and wine of their own — a council soon found to be unmanageable owing to its size, and reduced first to 2000, then to 1500 and finally to 800 members; (b) a credenza or committee of 12 members, elected in the grand council, for the despatch of urgent or secret business, (c) the consuls, the executive, elected for one year, and compelled to report to the great council at the term of their office.

The bitter and well-balanced rivalry between the nobles and the people, and the endless danger to which it exposed the city

owing to the fact that the nobles were always ready to claim the protection of their feudal chief, the emperor, brought to the front two noble families as protagonists of the contending factions— the Torriani of Valsassina, and the Visconti, who derived their name from the office of delegates

which they had held under the archbishops. After the battle of Cortenova, in 1237, where Frederick II. defeated the Guelph army of the Milanese and captured their carroccio, Pagano della Torre rallied and saved the remnants of the Milanese. This act recommended him to popular favour, and he was called to the government of the city — but only for the distinct purpose of establishing the ” catasta,” a property tax which should fall with equal incidence on every citizen. This was a democratic measure which marked the party to which the Torriani belonged and rendered them hateful to the nobility. Pagano died in 1241. His nephew Martino followed as podesta in 1256, and in 1259 as signore of Milan — the first time such a title was heard in Italy. The nobles, who had gathered round the Visconti, and who threatened to bring Ezzelino da Romano, the Ghibelline tyrant of Padua, into the city, were defeated by Martino, and 900 of their number were captured. Martino was followed by two other Torriani, Filippo his brother (1263-1265) and Napoleone his cousin (1265-1277), as lords of Milan. Napoleone obtained the title of imperial vicar from Rudolph of Hapsburg. But the nobles under the Visconti had been steadily gathering strength, and Napoleone was defeated at Desio in 1277. He ended his life in a wooden cage at Castel Baradello above Como.

Otto Visconti, archbishop of Milan (1262), the victor of Desio, became lord of Milan, and founded the house of Visconti, who ruled the city — except from 1302 to 13 10 — till 1447, giving twelve lords to Milan. Otho (1277-1295), Matteo (1310-1322), Galeazzo (1322-1328), Azzo (1328-1339), Lucchino (i339-i349)_ and Giovanni (1349-1354) followed in succession. Giovanni left the lordship to three nephews — Matteo, Galeazzo and Bernabd. Matteo was killed (1355) by his brothers, who divided the Milanese, Bernabo reigning in Milan (1354-1385) and Galeazzo in Pavia (1354-1378). Galeazzo left a son, Gian Galeazzo, who became sole lord of Milan by seizing and imprisoning his uncle Bernabo. It was under him’ that the cathedral of Milan and the

Certosa di Pavia were begun. He was the first duke of Milan, having obtained that title from the emperor Wenceslaus. His sons Giovanni Maria, who reigned at Milan (1402–1412), and Filippo Maria, who reigned at Pavia (1402–1447), succeeded him. In 141 2, on his brother's death, Filippo united the whole duchy under his sole rule, and attempted to carry out his father's policy of aggrandizement, but without success.

Filippo was the last male of the Visconti house. At his death a republic was proclaimed, which lasted only three years. In 1450 the general Francesco Sforza, who had married Filippo's only child Bianca Visconti, became duke of Milan by right of conquest if by any right. Under this duke the castello was rebuilt and the canal of the Martesana, which connects Milan with the Adda, and the Great Hospital were carried out. Fran- cesco was followed by five of the Sforza family. His son Galeazzo Maria (1466–1476) left a son, Gian Galeazzo, a minor, whose guardian and uncle Lodovico (il Moro) usurped the duchy (1479–1500). Lodovico was captured in 1500 by Louis XII. of France, and Milan remained for twelve years under the French crown. In the partial settlement which followed the battle of Ravenna, Massimiliano Sforza, a protege of the emperor, was restored to the throne of Milan, and held it by the help of the Swiss till 1515, when Francis I. of France reconquered the Milan- ese by the battle of Marignano, and Massimiliano resigned the sovereignty for a revenue from France. This arrangement did not continue. Charles V. succeeded the emperor Maximilian, and at once disputed the possession of the Milanese with Francis. In 1522 the imperialists entered Milan and proclaimed Francesco Sforza (son of Lodovico). Francesco died in 1535, and with him ended the house of Sforza. From this date till the War of the Spanish Succession (17 14) Milan was a dependency of the Spanish crown. At the close of that war it was handed over to Austria; and under Austria it remained till the Napoleonic campaign of

1796. For the results of that campaign, and for the history of Italian progress towards independence, in

which Milan played a prominent part by opening the revolution of 1848, with the insurrection of the Cinque Giornate (March 17–22), by which the Austrians were driven out; the reader is referred to the article Italy. The Lombard campaign of 1859, with the battles of Solferino and Magenta, finally made Milan a part of the kingdom of Italy.

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MILANESI, GAETANO (1813–1895), Italian scholar and writer on the history of art, was born at Siena, where he studied law, and in 1838 he obtained an appointment in the public library. In 1856 he was elected member of the Accademia della Crusca, in which capacity he took part in the compilation of its famous but still unfinished dictionary, and two years later was appointed assistant keeper of the Tuscan archives, in Florence; then he took charge of the famous Medici archives, whence he collected a vast body of material on the history of Italian art, not all of which is yet published. In 1889 he became director of the archives, but retired in 1892, and died three years later. His most important publication is his edition of Vasari's works in nine volumes, with copious and valuable notes (Florence, 1878– 1885). Of his other writings the following may be mentioned: // diario inedito di Alessandro Sozzini (in the Archivio storico Italiano, 1842); Documenti per la storia dell' arte senese, 3 vols. (Siena, 1854–1856) and Discorsi sulla storia civile

ed arlistica di Siena (Siena, 1862). He also edited a number of Italian classics.

See E. Ridolfi's article in the Nuova antologia (May 15, 1895); and A. Virgili's article in the Atti della regia Accademia della Crusca (Florence, 1898).

MILAN OBRENOVICH IV. (1854–1901), king of Servia, was born on the 22nd of August 1854, at Jassy. He was the grand-nephew of the famous Milosh, whose brother Jefrem (d. 1856) had a son, Milosh (1829–1861), who married Maria Katardzi, a Moldavian. Milan was their son. While still very young, he lost both his parents, and was adopted by his cousin, Michael Obrenovich, who returned to Servia on the expulsion of the Karageorgeviches in 1858 and became ruling prince on the death of his father, Milosh, in i860. During the reign of Michael young Milan was educated in Paris, at the Lycee Louis- le-Grand, where he displayed considerable precocity, but he was only fourteen years of age when in 1868 his cousin was assassi- nated and he succeeded to the throne under a regency. In 1872 he was declared of age, and taking the reins of government into his own hands, soon manifested great intellectual power, coupled with a passionate headstrong character. Eugene Schuyler, who saw him about this time, found him " a very remarkable young man . . . singularly intelligent and well-informed." By a careful balancing of the Austrian and Russian parties in Servia, with a judicious leaning towards the former, Prince Milan was enabled in 1878, at the end of the Turkish War, to induce the Porte to acknowledge his independence, and was proclaimed king in 1882. (The history of his reign is told in detail under Servia.) Acting under Austrian influence, King Milan devoted all his energies to the improvement of means of communication and the development of natural resources, but the cost, which was unduly increased by reckless extravagance, led to proportionately heavy taxation. This, coupled with increased military service, rendered King Milan and the Austrian party most unpopular; and his political troubles were further increased by the defeat of the Servians in the war against Bulgaria,

1885-86. In 1885 (Sept.) the union of Rumelia and Bulgaria caused widespread agitation in Servia, and Milan precipitately declared war upon his kinsman Prince Alexander on the 15th of November. After

a short but decisive campaign, the Servians were utterly routed at the battles of Slivinska and Pirot, and Milan's throne was only saved by the direct intervention of Austria. Domestic difficulties now arose which rapidly assumed a political signifi- cance. In October 1875 King Milan had married Natalie, the sixteen-years-old daughter of Peter Ivanovich Ketchko, a Moldavian Boyar, who was a colonel in the Russian army, and whose wife, Pulcheria, was by birth Princess Sturdza. A son, Alexander, was born in 1876, but the king and queen showed signs of friction. Milan was anything but a faithful husband. Queen Natalie was greatly influenced by Russian sympathies; and the couple, ill-assorted both personally and politically, separated in 1886, when the queen withdrew from the kingdom, taking with her the young prince, Alexander, afterwards king, then ten years of age. While she was residing at Wiesbaden in 1888, King Milan succeeded in recovering the crown prince, whom he undertook to educate; and in reply to the queen's remonstrances, he exerted considerable pressure upon the metropolitan, and procured a divorce, which was afterwards annulled as illegal. King Milan now seemed master of the situation, and on the 3rd of January 1889 promulgated a new constitution much more liberal than the existing one of 1869. Two months later (March 6) he suddenly abdicated in favour of his son, a step for which no satisfactory reason was assigned, and settled as a private individual in Paris. In February 1891 a Radical ministry was formed, Queen Natalie and the ex-metro- politan Michael returned to Belgrade, and Austrian influence began to give way to Russian. Fear of a revolution and of King Milan's return led to a compromise, by which in May 1891 the queen was

expelled, and Milan was allowed a million francs from the civil list, on condition of not returning to Servia during his son's minority. Milan in March 1892 renounced all his rights, and even his Servian nationality. The situation altered, how- ever, after the young King Alexander in April 1893 had effected his coup d'etat and taken the reins of government into his hands. Servian politics began to grow more complicated, and Russian intrigue was rife. In January 1894 Milan suddenly appeared at Belgrade, and his son gladly availed himself of his experience and advice. On the 29th of April a royal decree reinstated Milan and Natalie, who in the meantime had become ostensibly recon- ciled, in their position as members of the royal family. On the 21st of May the constitution of 1869 was restored, and Milan continued to exercise considerable influence over his son. The queen, who had been residing chiefly at Biarritz, returned to Belgrade in May 1895, after four years' absence, and was greeted by the populace with great enthusiasm. In 1897 Milan was appointed commander-in-chief of the Servian army. In this capacity he did some of the best work of his life, and his success in improving the Servian military system was very marked. His relations with the young king also remained good, and for a time it seemed as though all Russian intrigues were being checked. The good relations between father and son were interrupted, however, by the latter's marriage in July 1900. Milan violently opposed the match, and resigned his post as commander-in- chief;, and the young king banished him from Servia and threw himself into the arms of Russia. Milan retired to Vienna, and there he died unexpectedly on the nth of February 1901. Milan was an able, though headstrong man, but he lived a scandalously irregular life, and was devoid of moral principle. In considering his relations with his young son, it must be remembered that in the dynastic and political condition of Servia natural feeling was inevitably subordinated in Milan to other considerations. (H. Ch.)

MILA Y FONTANALS, MANUEL (1818-1884), Spanish

scholar, born at Villafranca del Panades, near Barcelona, on the 4th of May 1818, was educated first at Barcelona, and afterwards at the university of Cervera. In 1845 he became professor of literature at the university of Barcelona, and held this post till his death at Villafranca del Panades on the 16th of July 1884. The type of the scholarly recluse, Mila y Fontanals was almost unknown outside the walls of the university till 1859, when he was appointed president of the juegos florales at Barcelona.

On the publication of his treatise, De Los trovadores en Esparia (1866), his merits became more generally recognized, and his monograph, De La poesla herdico-poptdar castellana (1873) revealed him to foreign scholars as a master of scientific method.

MILAZZO, a seaport on the north coast of Sicily, in the province of Messina, 22 m. W. of Messina by rail. Pop. (1901), 16,422. It is mainly built on the low isthmus of a peninsula, which stretches some 3 m. farther north and forms a good har- bour: but the old town, which contains a castle, mainly the work of Charles V., lies on a hill above. Milazzo is the ancient Mylae, an outpost of Zancle, occupied before 648 B.C., perhaps as early as 716 B.C. (E. A. Freeman, History of Sicily, I., pp. 395, 587). It was taken by the Athenians in 426 B.C. The people of Rhegium planted here the exiles from Naxos and Catana in 395 B.C. as a counterpoise to Dionysius' foundation of Tyndaris; but Dionysius soon took it. In the bay Duilius won the first Roman naval victory over the Carthaginians (260 B.C.).

MILDENHALL, a market town in the Stowmarket parliamen- tary division of Suffolk, England, 76! m. N.N.E. from London by a branch of the Great Eastern railway from Cambridge. Pop. (1901), 3567. It lies on the edge of Mildenhall Fen, the great Fen district stretching northward and westward from here. The church of St Andrew has an Early English chancel with fine east window and chancel arch. The remainder is principally Perpendicular with a

magnificent carved oak roof, ornate north porch and lofty tower with fan tracery within. There is a wooden market cross of the 15th century; the manor house is a picturesque gabled building of the 17th century, and there is a modern public hall. Flour milling is an industry. The discovery of Roman remains indicates a small settlement.

MILDEW (O. Eng. meledeaw or mildeaw, explained as ” meal- dew,” cf. Ger. Mehlthau, with more probability, as ” honey- dew,” Goth, melith,. honey, cf. Lat. mel, Gr. neKi), a popular name given to various minute fungi from their appearance, and from the sudden, dew-like manner of their occurrence. Like many other popular names of plants, it is used to denote different species which possess very small botanical affinity. The term is applied, not only to species belonging to various systematic groups, but also to such as follow ‘different modes of life. The corn-mildew, the hop-mildew and the vine-mildew are, for example, parasitic upon living plants, and the mildews of damp linen and of paper are saprophytes (Gr. aa7rp6s, rotten), that is, they subsist on matter which is already dead. As regards mil- dews in general, the conditions of life and growth are mainly suitable nutrition and dampness accompanied by a high tempera- ture. The life history of the same species of mildew frequently covers two or more generations, and these are often passed on hosts of different kinds. In some cases again the same genera- tion confines its attack to the same kind of host, while in others the same generation grows on various hosts (see Fungi; Hop; and Wheat).

MILES, NELSON APPLETON (1839-), American soldier, was born in Westminster, Massachusetts, on the 8th of August 1839. He was engaged in mercantile pursuits in Boston when the Civil War began, and he entered the army in September 1861 as a lieutenant in the 22nd Massachusetts volunteer infantry. He served with distinction in the Peninsular campaign, and at Antietam, Fredericksburg and Chancellorsville, where he received a wound which incapacitated him up to the opening of Grant’s Virginia campaign of 1864. He had been commissioned

in September 1862 colonel of the 61st New York volunteers, commanded a brigade at the Wilderness and Spottsylvania, and in May 1864 was rewarded for his gallant leadership by the grade of brigadier-general of volunteers. He fought in the Cold Harbor and Petersburg operations in 1864-65, was brevetted major-general of volunteers for his conduct at Reams Station, and at the close of the war was in temporary command of an army corps. In July 1866 he was made colonel of a regular infantry regiment, and in 1867 he was brevetted brigadier- general in the regular army for his services at Chancellorsville and major-general for his services at Spottsylvania. He was promoted to be brigadier-general U.S.A. (Dec. 1880), and to be •

major-general (April 1890), and in 1895 succeeded General John McA. Schofield as commanding general of the United States army. He was conspicuously successful (1869-1886) in dealing with Indian outbreaks, fighting the Cheyenne, Kiowa and Comanche on Llano Estacado (1875) and the Sioux in Montana (1876), capturing the Nez Perces under Chief Joseph (1877), and defeating the Chiricahua Apaches under Geronimo (1886), and he commanded the United States troops sent to Chicago during the railway riots in 1894. He was in nominal direction of mili- tary operations during the war with Spain in 1898, though his personal share of the operations was confined to directing the almost unopposed Porto Rico expedition. He was raised to the rank of lieutenant-general in June 1900, and retired from active service in August 1903. In 1905-1906 he was adjutant-general and chief-of-staff under Governor William L. Douglas in Massa- chusetts. He wrote Personal Recollections (1896), Military Europe (1898) and Observations Abroad (1899).

MILETUS (mod. P alalia), an ancient city of Asia Minor, on the southern shore of the Latmic Gulf near the mouth of the Maean- der. Before the Ionic

migration it was inhabited by Carians (Iliad ii. 876; Herod, i. 146), and pottery, found by Th. Wiegand on the spot proves that the site was inhabited, and had relations with the Aegean world, in the latest Minoan age. The Greek settlers from Pylos under Neleus are said to have massacred all the men in the old city, and built for themselves a new one on the coast. Miletus occupied a very favourable situation at the Biouth of the rich valley of the Maeander, and was the natural outlet for the trade of southern Phrygia (Hipponax, Fr. 45). It had four harbours, one of considerable size, and its power extended inland for some distance up the valley of the Maeander, and along the coast to the south, where it founded the city of Iasus. Its enterprise extended to Egypt, where it had much to do with the settlement of Naucratis (q.v.). Very little ” Nau- cratiti ” pottery, however, was found on the site by Wiegand, and only in the Athena temple. The Black Sea trade, however, was the greatest source of wealth to the Ionian cities. Miletus, like the rest, turned its attention chiefly to the north, and succeeded in almost monopolizing the traffic. Along the Hellespont, the Propontis and the Black Sea coasts it founded more than sixty cities — among them Abydus, Cyzicus, Sinope, Dioscurias, Panticapaeum and Olbia. All these cities were founded before the middle of the 7th century; and before 500 B.C. Miletus was decidedly the greatest Greek city. During the time when the enterprise of the seafaring population raised Miletus to such power and wealth nothing is known of its internal history, though the analogy of all Greek cities, and some casual state- ments in later writers, suggest that the usual struggles took place between oligarchy and democracy, and that tyrants sometimes raised themselves to supreme power. Miletus was equally distinguished at this early time as a seat of literature. The Ionian epic and lyric poetry indeed had its home farther north; philosophy and history were more akin to the practical race of Miletus, and Thales, Anaximander, Anaximenes and Hecataeus all belonged to this city. The poet Timotheus and the famous Aspasia were also natives.

The three Ionian cities of Caria — Miletus, Myus and Priene — spoke a peculiar dialect of Ionic.

The Mermnad kings of Lydia found in Miletus their strongest adversary. War was carried on for many years, till Alyattes III. concluded a peace with ThraEsybulus, tyrant of Miletus; the Milesians afterwards seem to have acknowledged peaceably the rule of Croesus. On the Persian conquest Miletus passed under a new master; it headed the Ionian revolt of 500 B.C., and was taken by storm after the battle of Lade (see Ionia). Darius massacred most of the inhabitants, transported the rest to Ampe at the mouth of the Tigris, and gave up the city to the Carians. This disaster was long remembered in Greece and made the theme of a tragedy by Phrynichus. Henceforth the history of Miletus has no special interest. It revived indeed when the Persians were expelled from the coast in 479 B.C., became a member of the Delian League (q.v.), revolted to Sparta in 412, passed into Carian hands, and opposed Alexander on his southward march, succumbing only to a siege in form (334 B.C.). It was a

town of commercial importance throughout the Graeco-Roman period, and received special attention from Trajan. Its har* bours, once protected by Lade and the other Tragasaean islands, were gradually silted up by the Maeander, and Lade is now a hill some miles from the coast. Ephesus took its place as the great Ionian harbour in Hellenistic and Roman times. Miletus became the seat of a Christian bishopric and was strengthened by a Byzantine castle (Kaarpov twv TldXarioiv) built above the theatre; but its decay was inevitable, and its site is now a marsh.

Since 1899 Miletus has been the scene of extensive excavations directed by Dr Th. Wiegand for the Berlin Academy. The ruins lie about the base of a hillock projecting north-east into a bend of the Maeander. On the north is a well-preserved theatre of Roman times on the site of an older Greek building. When complete it had 54 rows of seats. It was as large as any theatre in Asia Minor, and is still imposing, the auditorium, though deprived of

its upper ranks and colonnade, rising nearly 100 ft. Cyriac of Ancona described the building as practically complete in his day (1446). The front is over 150 yds. long. East of this was the ancient north harbour, now silted up, and on the hillside above it stood a large heroon of Hellenistic time remarkable for being, like the tomb of Brasidas at Amphipolis, within the walls. South of the harbour head lies the Hellenistic agora with ruins of large magazines of Doric style. South of these again lie a nymphaeum of the age of Titus, and a senate-house of theatral form. On the east opens a great hall surrounded by porticoes and enclosing a high altar of Artemis, once richly adorned with reliefs. The Roman agora lies beyond this again. A straight street leads south-west from the north harbour to the Didyma Gate in the wall, which runs across the neck of the peninsula and was rebuilt by Trajan, when he under- took to raise the level of the outer quarters of the city; and streets cross this at right angles in the geometric Hellenistic manner. A Sacred Way lined with tombs, led to Didymi. Two temples have been discovered by Dr Wiegand, one, on the south-east, being a large sanctuary of Apollo Delphinius with triple colonnade enclosing a court with central tripod. This seems to have been the chief temple of the city and the place where public records, treaties, &c, were engraved. The other temple, an archaic sanctu- ary of Athena, lies west of the stadium.

See O. Rayet and A. Thomas, Milet et le golfe Latmique (1877) ; Th. Wiegand, ” Vorlaufige Berichte iiber die Ausgrabungen in Milet,” in Sitzungsberichte of the Berlin Academy (1900, foil.) ; A. von Salis, ” Die Ausgrabungen in. Milet und Didyma ” in Neue Jakrb. f. d. k. Alt., xxv. 2, 1910. (D. G. H.)

MILFORD, a township of New Haven county, Connecticut, U.S.A., on Long Island Sound, separated from the township of Stratford on the W. by the Housatonic river, and about 10 m. S.W. of New Haven. Pop. (1890), 3811; (1900), 3783, including 541 foreign-born and 173 negroes; (i9io),4366. Area,

about 16 sq. m. Milford is served by the New York, New Haven & Hart- ford railroad, and by an electric line connecting with Bridgeport and New Haven. Within its borders are various popular beaches, including Woodmont (incorporated as a borough in 1903), Pond Point, Bay View, Fort Trumbull Beach (where a fortification, named Fort Trumbull, was erected in 1776), Myrtle Beach, Meadow's End, Walnut Beach and Milford Point. The township is traversed by the Wepowaug river, which here empties into the Sound. Milford is a typical old New England town, and many of the permanent inhabitants are descendants from the first settlers. The burying-ground includes the tomb of Robert Treat (1622-1710), commander of the Connecticut troops in King Philip's War, leader of the company that founded Newark, New Jersey, governor of Connecticut (from 1683 to 1698) at the time its charter was demanded by Governor Andros in 1686-1687, and deputy-governor in 1676-1683 and 1698- 1708; and also that of Jonathan Law (1674-1751), governor of Connecticut from 1742 to 1751- Spanning the Wepowaug river near a gorge and not far from its mouth is a granite bridge and tower, built, as a memorial to the first settlers, in 1889, in connexion with the celebration of the 250th anniversary of the founding of the town. Milford has a beautiful green of about four acres, containing a soldiers' monument. It has also the Taylor Library (founded in 1894), and along the Sound are many summer residences. Named after Milford, England, it was founded in 1639 by Rev. Peter Prudden and his followers from New Haven and Wethersfield. The land was purchased from the Indians for 6 coats, 10 blankets, 1 kettle, 12 hatchets, 12 hoes,

24 knives and 12 small mirrors. A " church-state " was imme- diately organized after the model of that of New Haven, but two or three years later the town bestowed suffrage on six of its inhab- itants who were not church members. These citizens were an

obstacle to the town's admission to the New Haven Jurisdiction, which was formed in 1643, but in the following year a compromise was effected and Milford was admitted on condition that, in the future, suffrage should be granted only to church members and that none of the objectionable six should be elected to any office of the Jurisdiction. In 1664 Milford, with the other members of the Jurisdiction, was absorbed by Connecticut; this caused considerable dissatisfaction and some of the inhabitants under the lead of Robert Treat removed to New Jersey and assisted in the founding of Newark. The regicides Whalley and Goffe were concealed in Milford from 1661 to 1664.

See M. Louise Greene, " Early Milford," in the Connecticut Magazine, vol. v. (Hartford, 1899).

MILFORD, a township of Worcester county, Massachusetts, U.S.A., about 16 m. S.E. of Worcester. Pop. (1890), 8780; (1900) 11,376, of whom 3342 were foreign-born; (1910 census) I 3>°SS- Within its area of about 15 sq. m. are a large rural population and the village of Milford, on the Charles river, about 33 m. S.W. of Boston, served by the Boston & Albany, the New York, New Haven & Hartford and the Grafton & Upton railways (the last named having its passenger department operated by electricity and its freight by steam, and connecting Milford with North Grafton), and by inter-urban electric lines. The village has a memorial hall, housing the public library, and in the town- ship there is an excellent hospital, the gift of Eben. S. Draper. The village is a shipping point for an agricultural and manufac- turing district. In 1905 the value of the township's factory products was $3,390,504 (32-8% more than in 1900). The most important manufacture? ire boots and shoes; the industry was established in 1795, and for many years the special product was brogans for Southern negroes. In 1908 there were 12 large granite quarries in the township (north and north-east of the village). Milford granite is the typical stone of an area reaching into Rhode Island south of the southern boundary of Providence county; it is a

biotite granite of post-Cambrian age, is generally pinkish-gray in colour (owing to the large proportion of feldspar among its constituents), and is widely used for building purposes. The township was the east precinct of Mendon until 1780, when it was incorporated; in 1835 parts of Holliston and Hopkinton were annexed; in 1886 a part was separated as Hopedale.

See Adin Ballou, History of Milford (Boston, 1882); and T. Nelson Dale, The Chief Commercial Granites of Massachusetts, New Hampshire and Rhode Island (Washington, 1908), Bulletin 354 of the U.S. Geological Survey.

MILFORD HAVEN, a market town, seaport, urban district and contributory parliamentary borough of Pembrokeshire, Wales, situated on the north shore of the celebrated harb.our of the same name. Pop. (1901), 5102, including the adjacent village of Hakin. Milford Haven is the terminus of a branch-line of the South Wales section of the Great Western railway. The town possesses a pier and important dock accommodation, inclu- ding a graving-dock 600 ft. long, and is the centre of a valuable and increasing fishing industry. The promenade of Hamilton Terrace commands a fine view of the broad expanse of the Haven with its various towns and forts.

The present town of Milford Haven, originally a hamlet in the parish of Steynton, is of modern growth, and was first called into existence by the exertions of the Hon. R. F. Greville, nephew of Sir William Hamilton, who in 1790 laid out a town on this spot, the advantages of which as a convenient port for the Irish traffic he clearly recognized. In the opening years of the 19th century a royal dockyard was established here, but in 1814 dockyard and arsenal were removed to Paterchurch near Pem- broke. The growth of the town was further checked twenty years later by the development of Neyland, or New Milford, further east on the Haven, whither the Irish packet service was trans- ferred; but towards the close of the 19th century the town recovered

much of its former prosperity. The importance of the

place is wholly due to its excellent situation on the splendid land-locked harbour, which is here 2 m. broad.

‘ Milford Haven itself, designated by the Welsh Aberdaugleddau, as the estuary of the united East and West Cleddy rivers, has played an important part on several occasions in the course of history. Throughout Plantagenet times it formed the chief point of embarcation for Ireland. It was from Milford Haven that Henry II. set sail for the conquest of Ireland in 1172, and to this harbour he made his return journey. In 1399 Richard II. landed at Milford Haven from Ireland, shortly before his surrender to Henry of Lancaster, afterwards Henry IV., in whose reign a French fleet with 12,000 men on board sailed to the Haven and disembarked with the object of assisting the rebellion of Owen Glendower. In 1485 Henry, earl of Richmond, disem- barked here on his return from France, and was welcomed on landing by Sir Rhys ap Thomas and much of the chivalry of Wales. In 1588 the leading persons of Pembrokeshire, with Bishop Anthony Rudd of St David’s at their head, petitioned Queen Elizabeth to fortify the Haven against the projected Spanish invasion, upon which the block-houses of Dale and Nangle at either side of the mouth of the harbour were accord- ingly erected. During the 19th century numerous forts have been constructed for the protection of the Haven and of the royal dockyard at Pembroke Dock.

MILICZ, or Militsch (d. 1374), Bohemian divine, was the most influential among those preachers and writers in Moravia and Bohemia who, during the 14th century, in a certain sense paved the way for the reforming activity of Huss. The date of his birth is not known, but he was in holy orders in 1350, in 1360 was attached to the court of the emperor Charles IV., whom he accompanied into Germany in that year, and about the same time also held a canonry in the cathedral of Prague along with the dignity of archdeacon. About 1363 he resigned all

his appointments that he might become a preacher pure and simple; he addressed scholars in Latin, and (an innovation) the laity in their native Czech, or in German, which he learnt for the purpose. He was conspicuous for his apostolic poverty and soon roused the enmity of the mendicant friars. The success of his labours made itself apparent in the way in which he transformed the notorious ” Benatki ” street of Prague into a benevolent institu- tion, ” Jerusalem.” As he viewed the evils inside and outside the church in the light of Scripture, the conviction grew in his mind that the ” abomination of desolation ” was now seen in the temple of God, and that antichrist had come, and in 1367 he went to Rome (where Urban V. was expected from Avignon) to expound these views. He affixed to the gate of St Peter’s a placard announcing his sermon, but before he could deliver it was thrown into prison by the Inquisition. Urban, however, on his arrival, ordered his release, whereupon he returned to Prague, and from 1369 to 1372 preached daily in the Teyn Church there. In’ the latter year the clergy of the diocese com- plained of him in twelve articles to the papal court at Avignon, whither he was summoned in Lent 1374, and where he died in the same year, not long after being declared innocent and authorized to preach before the assembly of cardinals. He was the author of a Libellus de Antichristo, written in prison at Rome, a series of Poslillae and Lectiones quadragesimales in Latin, and a similar series of Postils (devotional tracts) in Czech.

See Count Liitzow, Life and Times of Master John Hus (1909), pp. 27–38.

MILITARY FRONTIER (Ger. Militargrenze, Slav. Granitza), a narrow strip of Austrian-Hungarian territory stretching along the borders of Turkey, which had for centuries a peculiar military organization, and from 1849 to 1873 constituted a crown-land. As a separate division of the monarchy it owed its existence to the necessity of maintaining during the 16th and 17th centuries a strong line of defence against the invasions of the Turks, and may be said to have had its origin with

the establishment of the captaincy of Zengg (a coast town about 35 m. south-east of Fiume) by Matthias Corvinus and the introduction of Uskoks (q.v.) into Croatia. By the close of the 17th century there were three frontier ” generalates ” — Carlstadt, Warasdin and Petrinia

or Petrinja (the last also called the Banal). After the defeat of the Turkish power by Prince Eugene it was proposed to abolish the military constitution of the frontier, but the change was successfully resisted by the inhabitants of the district; in fact a new Slavonian frontier district was established in 1702, and Maria Theresa extended the organization to the march-lands of Transylvania (the Szekler frontier in 1764, the Wallachian in

1766). 1

As a reward for the service it rendered the government in the suppression of the Hungarian insurrection in 1848, the Military Frontier was erected in 1849 into a crown-land, with a total area of 15,182 sq. m. and a population of 1,220,503. In 1851 the Transylvanian portion (1177 sq. m.) was incorporated with the rest of Transylvania; and in 1871 effect was given to the imperial decree of 1869 by which the districts of the Warasdin regiments (St George and the Cross) and the towns of Zengg, Belovar, Ivanic, &c, were ” provincialized ” or incorporated with the Croatian-Slavonian crown-land. In 1872 the Banat regiments followed suit; and in 1873 the old military organiza- tion was abolished in the rest of the frontier. Not till 1881, however, were the Croatian-Slavonian march-lands completely merged in the kingdoms to which they naturally belonged.

The social aspect of the military frontier regime is interesting. The zadruga system of land tenure was artificially kept in exist- ence (see See. via).

Watch-towers with wooden clappers and the beacons which flashed the alarm along the whole frontier in a few hours are still features in the landscape.

MILITARY LAW, "the law which governs the soldier in peace and in war, at home and abroad. At all times and in all places the conduct of officers and soldiers as such is regulated by military law." The above is the definition as given in the opening chapter of the Manual of Military Law, which is issued under the authority of the English War Office, and which is the text- book used by all English courts martial. The definition is, however, somewhat too wide, as the British system does not exclude in time of peace the action of the civil courts. In time of peace all persons who belong to the military class in most European continental countries are judged by military law and by military courts. There is also in most continental countries an intermediate stage between war and peace, known as in itat de siege, which may be declared for a fixed period for a district, or even a city, by reason of domestic insurrection or the presence of an enemy. It requires legislative enactment. Thirdly comes a state of war, when the military authorities are supreme; and whilst they can call upon the civil power to act in concert with them, the military authority is final. This is a brief summary of the system of military law that prevails in most countries of the continent. The cardinal point of difference between the British and the continental systems lies in the fact that in the United Kingdom the soldier is not only a soldier, but a citizen also; and although he may be tried for civil offences by a military tribunal, the power is not exercised in all cases. Thus treason, treason-felony, murder, manslaughter, rape, are brought before a civil court in times of peace, if the offence is committed in the United Kingdom, or if it is committed anywhere else in the king's dominions, except Gibraltar, within a hundred miles from a place where the offender can be tried by a civil court. Minor civil offences, when not committed within military lines, or when the person affected

by the offence is a civilian, or when it is a case for a jury, or where intricate questions of law may arise, may also be brought before a civil tribunal. But an offence, of whatever nature, committed on active service would be brought before a military tribunal.

The military law of England in early times existed, like the

1 By 1848 the following had come to be the division of the Mili- tary Frontier: (1) The Carlstadt (Carlowatz), Warasdin and Banal Generalate; corresponding to the original three generalates. (2) The Slavonian Generalate; (district of Mitrovica). (3) The Banat Generalate; south and east of Temesvar, and (4) The Transylvanian Generalate. Twelve towns, known as ” military communities,” had communal constitutions not unlike those of the free towns of Hungary-Carlopago, Zengg, Petrinia, Kostajnica,. Belovar, Ivanic, Brod, Peterwardein, Carlowitz, Semlin, Pancsova and Weisskirchen.

•forces to which it applied, in a period of war only. Troops were raised for a particular service, and were disbanded upon the cessation of hostilities. The crown, of its mere .

prerogative, made laws known as Articles of War, LaWt for the government and discipline of the troops while thus embodied and serving. Except for the punishment of deser- tion, which offence was made a felony by statute in the reign of Henry VI., these ordinances or Articles of War remained almost the sole authority for the enforcement of discipline until 1689, when the first Mutiny Act was passed and the military forces of the crown were brought under the direct control of parliament. Even the Parliamentary forces in the time of Charles I. and Cromwell were governed, not by an act of the legislature, but by articles of war similar to those issued by the king and authorized by an ordinance of the Lords and Commons, exercising in that respect the sovereign prerogative. This power of law-making by prerogative was, however, held to be applicable

during a state of actual war only, and attempts to exercise it in time of peace were ineffectual. Subject to this limitation it existed for considerably more than a century after the passing of the first Mutiny Act. From 1689 to 1803, although in peace time the Mutiny Act was occasionally suffered to expire, a statutory power was given to the crown to make Articles of War to operate in the colonies and elsewhere beyond the seas in the same manner as those made by prerogative operated in time of war. In 1715, in consequence of the rebellion, this power was created in respect of the forces in the kingdom. But these enactments were apart from and in no respect affected the principle acknowledged all this time— that the crown of its mere prerogative could make laws for the government of the army in foreign countries in time of war. The Mutiny Act of 1803 effected a great constitutional change in this respect: the, power of the crown to make any Articles of War became altogether statutory, and the prerogative merged in the act of parliament. So matters remained till the year 1879, when the last Mutiny Act was passed and the last Articles of War were promulgated. The Mutiny Act legislated for offences in respect of which death or penal servitude could be awarded, and the Articles of War, while repeating those provi- sions of the act, constituted the direct authority for dealing with offences for which imprisonment was the maximum punishment as well as with many matters relating to trial and procedure. The act and the articles were found not to harmonize in all respects. Their general arrangement was faulty, and their language sometimes obscure. In 1869 a royal commission recommended that both should be recast in a simple and intelli- gible shape. In 1878 a committee of the House of Commons endorsed this view and made certain recommendations as to the way in which the task should be performed. In 1879 the govern- ment submitted to parliament and passed into law a measure consolidating in one act both the Mutiny Act and the Articles of War, and amending their provisions in certain important respects. This measure was called the ” Army Discipline and

Regulation Act 1879." After one or two years' experience of its working it also was found capable of improvement, and was in its turn superseded by the Army Act 1881, which now forms the founda- tion and the main portion of the military law of England. It contains a proviso saving the right of the crown to make Articles of War, but in such a manner as to render the power in effect a nullity; for it enacts that no crime made punishable by the act shall be otherwise punishable by such articles. As the punish- ment of every conceivable offence is provided for by the act, any articles made thereunder can be no more than an empty formality having no practical effect. Thus the history of English military law up to 1879 may be divided into three periods, each having a distinct constitutional aspect: (1) that prior to 1689, when the army, being regarded as so many personal retainers of the sovereign rather than servants of the state, was mainly governed by the will of the sovereign; (2) that between 1689 and 1803, when the army, being recognized as a permanent force, was governed within the realm by statute and without it by the pre- rogative of the crown; and (3) that from 1803 to 1879, when it was governed either directly by statute or by the sovereign under

an authority derived from and denned and limited by statute. Although in 1879 the power of making Articles of War became in effect altogether inoperative, the sovereign was empowered to make rules of procedure, having the force of law, which regulate the administration of the act in many matters formerly dealt with by the Articles of War. These rules, however, must not be inconsistent with the provisions of the Army Act itself, and must be laid before parliament immediately after they are made. Thus in 1879 the government and discipline of the army became for the first time completely subject either to the direct action or the close supervision of parliament.

A further notable change took place at the same time. The Mutiny Act had been brought into force on each occasion for one year only, in compliance with the constitutional theory that the maintenance of a standing army in time of peace, unless with the consent of parliament, is against law. Each session therefore the text of the act had to be passed through both Houses clause by clause and line by line. The Army Act, on the other hand, is a fixed permanent code. But constitutional traditions are fully respected by the insertion in it of a section providing that it shall come into force only by virtue of an annual act of parliament. This annual act recites the illegality of a standing army in time of peace unless with the consent of parliament, and the necessity nevertheless of maintaining a certain number of land forces (exclusive of those serving in India) and a body of royal marine forces on shore, and of keeping them in exact discipline, and it brings into force the Army Act for one year.

Military law is thus chiefly to be found in the Army Act and the rules of procedure made thereunder, the Militia Acts, the Reserve Forces Acts and the Volunteer Acts, together with certain acts relating to the yeomanry, the Territorial and Reserve Forces Act 1907, and various royal warrants and regulations. In the Army (Annual) Act 1906 important amendments were made to the Army Act for the purpose of preventing soldiers convicted of offences against discipline under the act, and not discharged with ignominy, being subjected to the stigma attach- ing to imprisonment. This was effected by creating a new pun- ishment, termed detention, the places in which soldiers undergo detention being termed detention barracks. The change, while principally one of nomenclature, removed an undoubted griev- ance. The Army Act itself is, however, the chief authority. Although the complaint has been sometimes made, and not without a certain amount of reason, that it does not accomplish much that it might in point of brevity, simplicity and clearness of expression, it is a very comprehensive piece of legislation, and shows some distinct improvements upon the old Mutiny

Acts and Articles of War.

When a person subject to military law commits an offence he is taken into military custody, which means either arrest in his own quarters or confinement. He must without unnecessary delay be brought before his commanding officer, who upon investigating the case may dismiss the charge, if in his discretion he thinks it ought not to be proceeded with, or may take steps to bring the offender before a court martial. Where the offender is not an officer he may dispose of the case summarily, the limit of his power in this respect being seven days' imprisonment with hard labour, a fine not exceeding 10s. for drunkenness, certain deductions from pay, confinement to barracks for twenty-eight days, this involving severe extra drills, deprivations and other minor punishments. Where the offence is absence without leave for a period exceeding seven days, the commanding officer may award a day's imprisonment in respect of each day of such absence up to twenty-one. It is only in the case of the imprison- ment exceeding seven days that the evidence before the com- manding officer is taken on oath, and then only in the event of the accused so desiring it. The commanding officer is enjoined by regulation not to punish summarily the more serious kind of offences, but his legal jurisdiction in this respect is without limit as regards any soldier brought before him, and when he has dealt summarily with a case the accused is free from any other liability in respect of the offence thus disposed of. In any instance where

the commanding officer has summarily awarded imprisonment, fine or deduction from pay, the accused may claim a district court martial instead of submitting to the award.

Ordinary courts martial are of three kinds, viz. (1) a regimental court martial, usually convened and confirmed by the command- ing officer of the regiment or detachment, presided over by an officer not under the rank of captain, composed of at least three officers of the regiment or detachment with

not less than one year's service, and having a maximum power of punishment of forty-two days' detention; (2) a district court martial, usually convened by a general officer having authority to do so, consis- ting of not less than three officers, each with not less than two years' service, and having a maximum power of punishment of two years' imprisonment; (3) a general court martial, the only tribunal having authority to try a commissioned officer, and with a power of punishment extending to death or penal servitude, for offences for which these penalties are authorized by statute; it consists of not less than nine officers in the United Kingdom, India, Malta and Gibraltar and of five elsewhere, each of whom must have had over three years' service, five being not under the rank of captain. There is another kind of tribunal, viz. a field general court martial. It is convened (1) by any officer in command of a detachment or portion of troops beyond the seas when not on active service, or by any officer in immediate com- mand of a body of forces on active service where it appears to him on complaint or otherwise that a person subject to military law has committed an offence. The officer must be satisfied that it is not practicable, with due regard to the public service, to try the person by an ordinary court martial. The quorum of the court is three, if consistent with military exigencies, and each member must have held a commission for not less than a year. The quorum may be reduced when the public service requires it. The procedure of ordinary courts martial is observed as far as possible, and the proceedings always should be in writing when possible. But in the circumstances in which these courts are assembled, it is not always possible to adhere to the technical rules which obtain in the ordinary tribunals, although the broad principles are not violated. The evidence on a field general court martial is taken on oath. The prisoner may cross-examine the witnesses for the prosecution, and may call any available witnesses for his defence. The prisoner is allowed to address the court in his own defence.

The Army Act prescribes the maximum punishment which may be inflicted in respect of each offence. That of death is incurred by various acts of treachery or cowardice before the enemy, or by, when on active service, interfering with or impeding authority, leaving without orders a guard or post, or when sentry sleeping or being drunk on a post, plundering or committing an offence against the person or property of an inhabitant, intentionally causing false alarms, or deserting. Whether upon active service or not, a soldier also becomes liable to the. punishment of death who mutinies or incites to or joins in or connives at a mutiny, who uses or offers violence to or defiantly disobeys the lawful command of his superior officer when in the execution of his office. Penal servitude is the maximum punishment for various acts and irregularities upon active service not distinctly of a treacherous or wilfully injurious character, for using or offering violence or insubordinate language to a superior, or disobeying a lawful command when upon active service. The same punishment is applicable when not upon active service to a second offence of desertion or fraudulent enlistment (i.e. enlistment by one who already belongs to the service), certain embezzlements of public property, wilfully releasing without authority a prisoner or wilfully permitting a prisoner to escape, enlisting when previously discharged from the service with disgrace without disclosing the circumstances of such discharge, or any other offence which by the ordinary criminal law of England is punishable with penal servitude. Imprisonment for two years is the maximum punishment for minor forms and degrees of those offences which if committed upon active service would involve death or penal servitude, such as using or offering violence or insubordinate language to a superior or disobey- ing a lawful command, and for the following offences: resisting an escort, breaking out of barracks, neglect of orders, a first offence of desertion or attempted desertion or aiding or conniving at deser- tion, or of fraudulent enlistment, absence without leave, failure to appear at parade, going beyond prescribed

bounds, absence from school, malingering or producing disease or infirmity, maiming with intent to render a soldier unfit for service, an act of a fraudulent nature, disgraceful conduct of a cruel, indecent or unnatural kind, drunkenness, releasing a prisoner without proper authority or

allowing him to escape, ‘being concerned in the unreasonable deten- tion of a person awaiting trial, escaping or attempting to escape from lawful custody, conniving at exorbitant exactions, making away with, losing by neglect, or wilfully injuring military clothing or equipments, ill-treating a horse used in the service, making false or fraudulent representations in public documents, making a wilfully false accusation against an officer or soldier, making a false confession of desertion or fraudulent enlistment, or a false statement in respect of the prolongation of furlough, misconduct as a witness before a court martial or contempt of such court, giving false evidence on oath, any offence specified in relation to billeting or the impressment of carriages, making a false answer to a question put upon attesta- tion, being concerned in unlawful enlistment, using traitorous or disloyal words regarding the sovereign, disclosing any circumstance relating to the numbers, position, movements or other circumstances of any part of His Majesty’s forces so as to produce effects injurious to His Majesty’s service, fighting or being concerned in or conniving at a duel, attempting suicide, obstructing the civil authorities in the apprehension of any officer or soldier accused of an offence, any con- duct, disorder or neglect to the prejudice of good order and military discipline, any offence which if committed in England would be punishable by the law of England. There is another offence which can be committed by officers only, namely ” scandalous conduct unbecoming the character of an officer and a gentleman.” It necessitates cashiering, a punishment

which in the case of an officer may be awarded as an alternative to imprisonment in several other instances. There is also an offence peculiar to officers and non- commissioned officers, that of striking or ill-treating a soldier or unlawfully detaining his pay. A sentence of cashiering as distinguished from that of dismissal in the case of an officer involves an incapacity to serve the crown again. An officer may be also sentenced to forfeiture of seniority of rank and to reprimand or severe reprimand. A non-commissioned officer may be sentenced to be reduced to a lower grade or to the ranks, and where sentenced to penal servitude or imprisonment the tribunal also has power to deprive him of his seniority. The Army Council in England, or the commander-in-chief in India or in either of the presidencies, may also cause a non-commissioned officer to be reduced to a lower grade or to the ranks. An acting non-commissioned officer may be ordered by his commanding officer for an offence or for inefficiency or otherwise to revert to his permanent grade— in other words, to forfeit his acting rank.

It will have been observed that persons subject to military law are liable to be tried by court martial for offences which if committed in England would be punishable by the ordinary law, and to suffer either the punishment prescribed by. the ordinary criminal law or that authorized for soldiers who commit offences to the prejudice of 'good order and military discipline. The effect of the latter alternative is that for many minor offences for which a civilian is liable to a short term of imprisonment, or perhaps only to a fine, a soldier may be awarded two years' imprisonment or detention. A court martial, however, cannot take cognizance of the crimes of treason, murder, manslaughter, treason-felony or rape if committed in the United Kingdom. If one of these offences be committed in any place within His Majesty's dominions other than the United Kingdom or Gibraltar, a court martial can deal with it only if it be committed on active service or in a place more than ioo miles from a civil court having

jurisdiction to try the offence. With regard to all civil offences the military law, it is to be understood, is subordinate to the ordinary law, and a civilian aggrieved by a soldier in respect of a criminal offence against his property or person does not forfeit his right to prosecute the soldier as if he were a civilian.

The crimes for which soldiers are most usually tried are desertion, absence without leave, loss of necessaries, violence or insubordina- tion to superiors, drunkenness, and various forms of conduct to the prejudice of discipline. The punishments are, generally speaking, gauged as much with regard to the character and antecedents of the prisoner as to the particular offence. For a first offence of an ordinary kind a district court martial would give as a rule fifty-six days' imprisonment with hard labour, for a second or graver crime eighty-four days. There are not many instances in which the period of imprisonment exceeds six months. Corporal punishment, which had been practically limited to offences committed upon active service, and in 1879 to crimes punishable with death, was finally abolished in 1881, and a summary punishment substituted. The practice of marking a soldier with the letters " D " (deserter) or " BC " (bad character), in order to prevent his re-enlistment, was abolished in 1879 in deference to public opinion, which erroneously adopted the idea that the " marking " was effected by red-hot irons or in some other manner involving torture. Many military men regretted its abolition, and maintained that if the practice were still in force the army would not be tainted by the presence of many bad characters who find means of eluding the vigilance of the authorities and enlisting after previous discharge.

The course of procedure in military trials is as follows. When a soldier is remanded by his commanding officer for trial by a district or general court martial, a copy of the charge, together with the statements of the witnesses for the prosecution (called the sum- mary of evidence), is furnished to him, and he is given proper oppor-

tunity of preparing his defence, of communicating with his witnesses

or legal adviser, and of procuring the attendance of his witnesses. Further, if he desires it, a list of the officers appointed to form the court shall be given him. Any officer is disqualified to sit as a member who has convened the court, who is the prosecutor or a witness for the prosecution, who has made the preliminary inquiry into the facts, who is the prisoner's commanding officer, or who has a personal interest in the case. The prisoner may also object to any officer on the ground of bias or prejudice, similarly as a civilian might challenge a juror. Except as regards the delay caused by the writing out of the evidence, the procedure at a court martial is very much the same as that at an ordinary criminal trial — the examination and cross-examination of the witnesses, addresses of the prosecutor and prisoner, and the rules governing the admission or rejection of evidence being nearly identical. At a general court martial, and sometimes at a district court, a judge advocate repre- senting the judge advocate general officiates, his functions being very much those of a legal assessor to the court. He advises upon all points of law, and sums up the evidence just as a judge charges a jury. When the prisoner pleads guilty the court finds a verdict accordingly, reads the summary of evidence, hears any statement in mitigation of punishment, and takes evidence as to character before proceeding to pass sentence. The sentence is that of the majority of the court, except where death is awarded, when two-thirds of the members in the case of a general court martial and the whole in that of a field general court martial must concur. When an acquittal upon all the charges takes place the verdict is announced in open court, and the prisoner is released without any further proceeding. When the finding is " guilty," evidence as to character is taken, and the court deliberates in private upon the sentence, but the result is not made known until the proceedings are confirmed and promulgated. No conviction or sentence has any effect until it is thus confirmed

by the proper authority. The confirming authority in the case of a regimental court is the commanding officer, in that of a district court martial an officer authorized to convene general courts martial or some officers deriving authority to confirm the findings and sentences of district courts martial, and in that of a general court, if held in the United Kingdom, His Majesty, and if abroad in most cases the general officer commanding. The confirming authority may order the reassembling of the court in order that any question or irregularity may be revised and corrected, but not for the purpose of increasing a sentence. He may, however, of his own discretion and without further reference to the court, refuse confirmation to the whole or any portion of the finding or sentence, and he may mitigate, commute or entirely remit the punishment. In the case of a general court martial the proceedings are sent to the judge advocate general, who submits to the sovereign his opinion as to the legality of the trial and sentence. If they are legal in all respects he sends the proceedings to the Army Council, upon whom rests the duty of advising the sovereign regarding the exercise of clemency. In addition to confirmation, however, every general or district court martial held out of India has another ordeal to go through. It is reviewed and examined in the office of the judge advocate general, and any illegality that may be disclosed is cor- rected and the prisoner is relieved of the consequences. To a certain extent a protection against illegality also exists in the case of regi- mental courts martial. A monthly return of those held in each regiment is laid before the general commanding, by whom any ques- tion that might appear to him doubtful would be referred to the adjutant general or the judge advocate general for decision. It is to be noted, however, that the judge advocate general, although fulfilling duties which are in their nature judicial, is only an adviser. He is not actually a judge in an executive sense, and has no authority directly to interfere with or correct an illegal conviction. In many cases the law thus provides no remedy for an officer or

soldier who may have been wronged by the finding or sentence of a court martial — for instance, through a verdict not justified by the evidence or through a non-observance of the rules and practice prescribed for these tribunals. A person who has suffered injustice may appeal to the king's bench division of the high court of justice. But, speaking generally, that tribunal would not interfere with a court martial exercising its jurisdiction within the law as regards the pri- soner, the crime and the sentence. In most cases, therefore, the virtual protector of an accused person against illegality is the judge advocate general, who personally advises the sovereign and the military authorities that the law shall be complied with (see Judge Advocate General).

The Army Act applies to European officers and soldiers serving in India in the same manner as to the rest of the army, but natives of India are governed by their own Articles of War, and in the case of civil offences they are dealt with according to the provisions of the Indian penal code. There are judge advocates general for each of the presidencies, and a deputy judge advocate at each of the more important military centres.

Important changes were made in the system of courts of inquiry by an Army Order of the 10th of February 1902. A court of inquiry is and has been an assembly of officers di- rected by a commanding officer to collect evidence and report with respect to a transaction into which he cannot conveniently

himself make inquiry. But now, whenever any inquiry affects the character or military reputation of an officer or soldier, full opportunity must be given him of being ^"T° f P resent at the inquiry and of giving any evidence oqury. ^ making any statement, or cross-examining adverse witnesses, or producing witnesses, on his own behalf. Evidence may now be

ordered to be taken on oath if the assembling officer thinks the case requires it. No proceedings of a court of inquiry, no confession, statement or answer, is admissible in a court martial. But an officer or soldier tried by court martial in respect of matter which has been the subject of a court of inquiry is entitled, to a copy of the proceedings on payment of the cost of the copy. The finding and sentence are only valid after confirmation by the proper military authority. A sentence of death or penal servitude can only be confirmed by the general or field officer in command of the forces with which the prisoner is present. The rule which allows the prisoner and his wife to tender their evi- dence on oath under the Criminal Evidence Act 1898 as regards evidence is applicable to field general courts martial. It is use- ful to note that the Army Act, sec. 70, enables His Majesty to make new provisions under the hand of a secretary of state for, amongst other things, the assembly and the procedure of courts of inquiry. The power to make changes by Army Order or rule is only limited by the principle that the rules must not be contrary to or inconsistent with the act.

In an authoritative report published by the Norwegian

government, and compiled by a trained Norwegian lawyer who

visited the various countries, the systems of twenty-

Coatiaeatal ty/0 states are reviewed. The earliest military law

la^* sti11 in force is found in Norwa y and Denmark, and dates from 1683, while England and Sweden date from 1881. Sweden has a military penal code, and England is ruled by the Army Act. There are two kinds of military courts of first instance: (1) those belonging to separate military bodies, such as divisions, brigades, regiments; (2) those having jurisdiction in a certain territory, and their seat

determined. In times of war the courts must follow the military bodies. In Bavaria and Switzerland a military jury is attached to a court martial. In several states ” auditors,” i.e. judicial guides, are attached to courts martial. In some a military jurisconsult (lawyer) is attached as judge, always a fixed post. This obtains in Sweden, Finland, Austria-Hungary, Switzerland and Portugal. In Norway, Denmark, Sweden, Finland, Belgium, Great Britain, Germany, Austria, United States, Spain, Wurttemberg and Switzerland the presiding officer is chosen for the single trial. In other states the military judges are appointed for a certain term, usually six months. The quorum of judges required on military courts on the continent differs. Seven judges sit in Belgium, Holland, France, Spain, Portugal, Greece, Turkey and Wurttemberg; three only, in cases of ordinary offences com- mitted by non-commissioned officers and soldiers in Switzerland, Russia, the United Kingdom, United States and Bavaria. In grave cases in the United Kingdom five to nine sit, nine in Russia, five to thirteen in the United States. In Norway and Denmark the court is of thirteen up to twenty-five, unless replaced by a commission and a military lawyer.

In Norway, Denmark, Sweden, Finland, and Bavaria and other places in Germany, special summary courts martial are Summary held when necessary. Certain forms and legal Courts guarantees are then dispensed with. Such are held Martial j n Belgium and Holland ” in a town or place in state of siege.” La Privdte is a special court of a judge assisted by a registrar, for vagabonds, servants, sutlers, and with a very limited competence over soldiers who have committed a petty offence, held in time of war in France, Rumania and Greece.

The United Kingdom has a summary court martial when the regular court martial cannot be held without injuring the military service. In the United States there are the “field officers’ court martial ” and ” military commission,” consisting of three officers. The second is for judging spies and some other matters that escape the jurisdiction of the regular

courts martial.

A special military tribunal in Germany judges the officials attached to the army. Courts of honour exist in Russia, Germany, Bavaria, Wurttemberg, Austria-Hungary and Spain. Great Britain and the United States have the system of a ” court of inquiry.” This was only a commission of inquiry, but it is now public, the accused is present, and the witnesses are sworn.

Soldiers not on active service, says the Swedish report, should be answerable for infractions of common law under the jurisdiction of the civil courts. All infractions of military order or discipline committed by soldiers, ^^Stev* whether on active service or no, should be judged by courts. military courts. In time of war, it is equally admitted, military courts must judge all offences, even offences at common law, committed by soldiers forming part of an army on campaign. The difference lies in regard to offences committed in time of peace. Sweden, Great Britain, France, Italy and the United States, as a general rule, place offences against the common law (infractions de droit commun) in time of peace under the jurisdiction of the civil courts. In the United States offences against good order, in Great Britain personal offences (such as drunkenness), are judged by courts martial. In most other states the general rule is that soldiers, even in time of peace, if on actual service are judged by courts martial. In the case of complicity between a soldier and a civilian, sometimes one is judged by a military and the other by a civil court (in Germany, Switzerland and Spain), sometimes both by a military court (Belgium, Italy, Servia, Rumania and Greece); sometimes it depends on the nature of the crime — in the United Kingdom, United States, Sweden, Finland, Holland and Portugal. In Norway a mixed tribunal judges them.

The procedure in military courts differs according to the countries. In some systems (a) the examination and preparation of evidence are confided to a juge d’ instruction ; (6) in other systems j^^

they are confided to a special commission of inquiry; (c) again, in other places they are left to the court martial itself that will judge the case. The United Kingdom and the United States follow the last plan. There is no preparatory examination in these two countries. A commission of inquiry for the preparation of evidence is held in Norway, Denmark, Germany, Wurttemberg, Austria-Hungary, Servia, Belgium and Holland. An auditor directs these courts of inquiry. In Russia an officer acts as juge d' instruction; in grave cases he must be a military jurisconsult. In Italy, Spain, Rumania, Greece and Turkey an officer acts as juge d 'instruction.

The proceedings before a court martial are usually public, except in the case of matters that offend morality, compromise public order, or where publicity is considered injurious to the PabBcUy. interests of the service (cases of discipline, disclosing plans, &c.). This does not apply (except in Great Britain and the United States) to the proceedings before the courts charged with preliminary investigation. In several states, i.e. Norway, Denmark, Holland, Austria, Servia, Germany and Wurttemberg, the public prosecutor is also the counsel of the accused. The auditor who directs the court of inquiry fills these offices (except in cases of small importance in Germany and Wurttemberg). In other states there is a special office of public prosecutor. In Spain, Portugal, Rumania, Greece and Turkey he is an officer. In Russia, Belgium, Bavaria, Switzerland and Italy he is a military lawyer. In these countries the accused has the right to choose a counsel, or one is assigned him. In the United Kingdom and the United States, when the matter is grave, the direction of the case is put in the hands of a judge advocate. In the United States the judge advocate is the public prosecutor.

There is no superior tribunal to which to appeal in Denmark, Great Britain and the United States. In Denmark the cases are sent to the auditor-general, who can annul if there is , . error in form, and send back the case to be tried anew. C%f? na ^ In

Great Britain and the United States judgment in i owe a a ad ordinary cases must be confirmed by the commanding tow i, om , officer by whose order the court was called. He can lighten the sentence. In certain cases of great gravity it must go to the head of the state, after passing the revision of the judge advocate general, who in Great Britain is the constitutional adviser of the crown as regards courts martial from the view of legality. There is also in these two countries a special revision of judgments in the judge advocate general's office. This revisional power is the safeguard of military justice, as all decisions are reviewed, and if any illegality is pointed out the proceedings are consequently I quashed. The effect of this disapproval is not merely to annul the

proceedings, but it also prevents the accruing of any disability or forfeiture. The British judge advocate's office has been much strengthened. It now consists of: (i) The judge advocate general (one of H.M. judges) ; (2) a deputy judge advocate general, who is a trained lawyer; (3) a deputy judge advocate, also a trained lawyer; (4) a military officer of the rank of colonel who has been called to the bar; (5) in South Africa (since 1899, and on a five-years' appointment from 1902) a colonel who has been called to the bar.

In Germany there is no appeal, except for officials attached to the army. In Austria-Hungary the sentence can be lightened by the commanding officer. It can also be returned for trial by a superior court if it appears to him too light. In Spain all judgments have to be confirmed, and if confirmation is refused, it is carried before the supreme court of the navy and army. The condemned has no power of appeal himself, but all cases of death or life sentences go before the supreme court of the navy and army. Russia only requires the con- firmation of the commanding officer. In Rumania and Greece all

condemned prisoners in time of peace can demand a court of revision, composed of a general and four superior officers. In time of war the court may be composed of three.

Certain forms of punishment, in all countries but the United States, can be given by the superior officer, without judicial intervention, for small purely military offences, where a summary DiscjpUaaty procedure is required. The offender, if he prefers, may Punish- k e carr ; ec i before court-martial. The punishment is men s * immediately carried into force, but the person punished can complain to higher military authority. In that case, if the complaint is not admitted, the punishment is enhanced. The com- monest of these disciplinary punishments are deprivation of liberty, confined to barracks, arrests and prison. Certain special punish- ments obtain in certain countries — for instance, imprisonment in Turkey may be accompanied by a bread-and-water diet ; and officers in Finland and Russia may be deprived of advancement.

In 1908 France took steps to abolish courts-martial in time of peace, all common law offences to be judged by the ordinary courts, and breaches of military discipline such as rebellion, insubordination, desertion and the like by mixed courts composed of civil and military magistrates.

See Clode, Military Forces of the Crown; T. Gram, Fonctionnement de Injustice militaire dans les differents £tats de V Europe. (Jno. S.)

MILITIA (Fr. milice, Ger. Miliz, from Lat. miles, soldier, ■ militia, military service), a term used generally for organized military forces which are not professional in character and not permanently embodied. All ancient armies, with the exception of the personal guards of their leaders, were militias or national levies, remaining under arms for the war or the campaign and returning to their ordinary occupations at the close of each military episode. Militias such as those of the Greek city-states and that of Rome were of course highly trained to the

use of arms; so were the barbarian ” nations in arms “; which overcame the professionalized Roman armies of the Empire; and although in the Eastern Empire these new fighting elements were absorbed into a fully organized regular arm, in the West the tribal militia system gradually developed into feudalism. The noble and the knight indeed spent the greater part of their lives in the field and devoted themselves from their youth to the cult of arms, but the feudal tenantry, who were bound to give forty days’ war service and no more, and the burghers who, somewhat later in the history of civilization, formed the efficient garrisons of the walled towns were true militias. The English Yeomanry indeed almost ruled the battlefield.

In the 15th century the introduction of firearms began to weigh down the balance in favour of the professional soldier. Artillery was always the arm of the specialist. The develop- ment of infantry, ” fire-power,” with the early arquebus and musket, called for the highest skill and steadiness in the individual soldier, and cavalry too adopted the new weapon in the form of long and expensive wheel-lock pistols. In the new military organization there was no place for the unprofessional soldier. The r61e of the unprofessional combatant, generally speaking, was that of an insurgent — harassing small detachments of the enemy, cutting off stragglers, and plundering convoys. Towards the end of the first civil war in England (1645) the country-folk banded themselves together to impose a peace on the two warring armies, but their menace was without effect, and they were easily disarmed by Fairfax and Cromwell, who did not even trouble to hold them as prisoners. The calling out of the arriere ban of Franche-Comte in 1675 displayed its ludicrous inefficiency, and thereafter in France, which set the fashion to

*vm. 1?

Europe in all military matters, the ” provincial militia,” which Louvois and Barbezieux raised in place of the discredited arriere ban, was employed

partly to find drafts for and partly to augment the regular army.

When a first line army was large enough to absorb the fighting strength of the country there was neither room nor need for a true militia force. This was the case with France under Napoleon's regime, but things were different elsewhere. In Great Britain the county militia (whose special history is briefly sketched below) was permanently embodied during the greater part of the Napoleonic Wars. Destitute as it was of technical and administrative services, of higher staffs and organization, and even of cavalry, this militia was a regular army in all but name. Combining continuous service with territorial recruiting as it did, it consisted of men of a better stamp than the casually recruited regular forces. In those days, the militia was a county force commanded by the lords- lieutenant and officered by men of influence; it was not administered by the War Office.

In other countries, Napoleon's invading armies had only to deal with regular or professional troops. Once these were crushed, nothing remained for the beaten side but to make peace with the conqueror on such terms as could be obtained. Militias existed in name as organizations, for the production of more or less unwilling drafts for the line, but the fundamental militia obligation of defending the fatherland as distinct from defending the slate, produced only local and occasional outbursts of guerrilla warfare. In the Crimean War, the 1859 war in Italy, the 1866 war in Germany, and other wars (the Hungarian War of 1848-49 excepted) the forces, other than the regular troops, engaged in first line were guerrilleros, insurgents, Garibaldians, &c, and behind the forces in first line there were draft-supplying agencies, but no true militia. Only the British militia and the Prussian landwehr represented the self-contained army of second line, and of these the former was never put to the test, while the latter, responding feebly to a political call to arms in 1850, was in consequence so entirely reorganized that it formed a mere rear rank to the

line troops. This latter system, consecrated by the German successes of 1870, became the universal model for the continent of Europe, and organized and self-contained militias to-day are only to be found in states maintaining first line armies of ” general service ” professionals, or in states which maintain .no first line troops whatever. In the first class are the auxiliary forces of the British Empire and the United States, in the second the Swiss, Norwegian, Dutch and Swedish forces.

Militia of the United Kingdom

The title of ” militia ” disappeared from the list of the British forces in 1908, on the conversion of the existing self-contained militia into an army ” special reserve ” which is restricted to the rdle of providing drafts for the first line. 1 The ” self-contained” second line army of the present day is the Territorial Force (see United Kingdom: Army).

The county organization of England, with which throughout the militia was closely associated, began with the advent of the Saxons. The prototype of the militia was the Fyrd. In this force as reorganized by Alfred liability of service was general on the part of every able-bodied male between the ages of 16 and 60. Although the title of ” The Fyrd ” survived until long after the Norman Con- quest, the force established by King Alfred was known as the general levy, which was bound to appear armed when ordered to aid in sup- pressing domestic riots as well as in defending the realm against invasion by foreign foes. Service was restricted to the counties, except in case of invasion, when it was extended to the whole kingdom. _ For centuries these remained with little alteration as the principles governing the national forces ot the kingdom, and form in effect with certain developments the basis of the modern militia system. The Norman Conquest was immediately followed by the introduction of the feudal levy in addition to the general levy, the distinction between these forces being that while obligation to serve in the latter rested upon every male within certain limits of

1 Various dominions and colonies of the British Empire have militias, for which see United Kingdom: Army. For the Swiss Militia System, which is in many respects the archetype of modern militias, see Switzerland; and for the organized militia of the United States see United States.

age, service in the feudal levy depended upon tenure of land under the king as feudal lord. The general levy was not in any case liable for service overseas, but the king for a long time employed his feudal tenants in continental wars until they too, successfully resisted the demand. Personal service formed the basis of both levies, but service by deputy, or payment in lieu ot personal service, and the calling out of a quota only, were allowed rom very early times. The feudal levy was discontinued during the Commonwealth and abolished at the Restoration; but liability to serve in the general levy has never been extinguished, but remains in the statutory and practical form of liability to serve both in the general and local militia. Even at the abolition of these forces the statutory liability to service in them was not done away with. Inspections of arms and the assembly and training of the men raised under this national system were secured from time to time by means of ” assizes of arms,” ” views of armour,” ” commissions of array,” and ” commissions of musters,” dating from early in the 12th century down to the 1 6th century. The machinery employed to carry out the law formed the basis of the existing procedure for the enforcement of the ballot for the militia, which thus bears a strong resemblance to the means adopted from ancient times. These constitutional powers were frequently abused by ” electing ” or impressing men to serve out of the kingdom, but this was checked in the year 1327 by an Act of Parliament, which strictly regulated the scope and limits of military service within the

kingdom at the charge of the parishes or counties, but provided for service abroad at the charge of the Crown. ” Commissions of musters ” were a development of preceding measures for raising men and material for military service, under which the commissioners registered and mustered persons liable to serve, sorted them into bands and trained and exercised them at the charge of the county. These bands became known as train or trained bands, and were mustered annually. With them ‘were asso- ciated lieutenants of counties, first appointed in 1549 by Edward VI., subsequently in Queen Mary’s reign called lords lieutenant, and after the Restoration appointed as statutory officers for the militia, their commissions at the present day being issued under the Militia Act. There does not appear to have been any clearly defined regimental organization in existence until these bands or companies were called into active service, but the Acts of the Commonwealth supplied this defect, and initiated a permanent regimental system. One of the earliest attempts to reform the force since the time of King Alfred was made by Charles I. in 1629, when Orders in Council were issued instructing lords lieutenant to put the militia on a better footing and to fill up vacancies among the officers. Cromwell subsequently issued similar orders couched in strong terms, though under the Commonwealth the duties of lords lieutenant were not recognized, the militia being raised by commissioners. The great services rendered by the militia in the ” crowning mercy ” of Wor- cester are a historic exception to the general decadence of second line troops in the 17th and 18th centuries (see Great Rebellion). At the Restoration an act was passed declaring that the control of the militia was the prerogative of the king. By the same statute the militia of each county was placed under the lieutenant, who was vested with the appointment of officers, but with a reservation to the Crown in the way of commissioning and dismissal. The cost of the annual training — for fourteen days — fell upon the local authority. Offences against discipline were dealt with by the civil magistrates, but with a power to the officers of fining and of imprisoning

in de- fault. Upon this footing the militia of England remained for nearly a century with the general approval of the community. It was recognized as an instrument for defence and for the preservation of internal order, while it was especially popular from the circumstance that from its constitution and organization the Crown could not use it as a means of violating the constitution or abridging the liberty of the subject. It was controlled and regulated in the county ; it was officered by the landowners and their relatives, its ranks were filled by men not depending for their subsistence or advancement upon the favour of the Crown; its numbers and maintenance were beyond the royal control; its government was by statute. While the supreme command was distinctly vested in the Crown, every practical security was thus taken against its use by the Crown for any object not constitutional or legitimate. It was regarded as, and was, in fact, the army of the state as distinguished from the standing army, which was very much the army of the king personally. The latter consisted of hired soldiers, and was more than once recruited by a conscription, confined, however, to persons of the vagrant class not having a lawful employment, while the former was mainly composed of those having a fixed abode and status. The militia thus enjoyed for many years as compared with the regular forces a social as well as a constitutional superiority. To this, however, along with the general breakdown of militia systems under the new ” professional ” conditions of warfare, explained above, and perhaps the practice of trying military offences by civil courts, may be attributed the disrepute into which the militia fell and the inefficiency it displayed, with the exception of the trained bands of London, until it was reorganized in 1757. Under the act of 1662 all train bands were discontinued in the counties, but those of Lon- don, with their auxiliaries, remained until 1794, when they were reorganized as the City of London Militia. In 1688 an act was passed raising the militia for one year, and for some time it was an

annually sanctioned force as the regular army is to-day. In 1690, on the occasion of the threatened French invasion, the militia was embodied; and again in 17 15 and 1745 during the troubles caused by the Old and Young Pretenders. In a pamphlet of 1712 the Eng- lish militia was estimated at 7450 horse and 84,391 foot soldiers. From 17 15 until 1734, and again from that year until 1757, with the exception of 1745, no votes were taken in parliament for the militia.

The foregoing .emarks apply only to the English militia and its predecessors. Ireland and Scotland did not furnish any regular militia until 1715 and 1797 respectively, although in Scotland militia existed long before 1797, e.g. in Perthshire in 1684; and in addition corps of fencibles were raised and embodied. The Irish militia when first raised in 1715 was restricted to Protestants between the ages of 16 and 60, who were bound to appear or provide substi- tutes. The force was not made subject to military law, but various military offences were punishable by fine or imprisonment. Several amendments and other acts followed until 1793, when a new act was passed providing for raising a force of militia by ballot among men between the ages of 18 and 45, to serve for four years. Each county was liable to a fine of £5 for each man deficient, and enlist- ment in the army was prohibited. Other amendments followed from time to time, and notably one in 1797 abolishing religious restrictions for the supplementary militia, and another in 1802 removing the same restrictions in the case of the general militia. Finally, all the acts were consolidated in 1809 by an act which fixed establishments, provided for raising the men by ballot, but gave power to the lord-lieutenant to authorize voluntary enlist- ment by means of bounties, and also to suspend the raising of any regiment. The Scottish militia was at first raised by ballot among men between the ages of 19 and 30. In 1802 former acts were re- placed by an Act providing for the organization of the militia on a basis similar to that on which the militia of

England was organized by the Consolidation Act passed in that year.

To return to England, the immediate cause of the organic reform carried out in 1757 was the disclosure of the inefficiency of the militia during the Rebellion of 1745. The act of 1662 followed the old law by requiring owners of property to furnish men, horses and arms in proportion to the value of their property, and the liability of persons of small property was to be discharged out of a rate levied in the parish. This was entirely altered in 1757, a liability on the part of the county or parish being substituted for a liability on the part of individuals. Each county was required to furnish a quota apportioned among the various parishes; men were to be chosen by lot to serve for three years (this being the first provision of a fixed term of service) or to provide, or pay £10 for the provision of, a substitute, and vacancies were to be filled from time to time by a like process of ballot. The ages of liability were from 18 to 45. The system thus legalized is practically the existing though sus- pended ballot system. The force was to be annually trained and exer- cised for a limited period, and in case of invasion or danger thereof, or in case of rebellion, the Crown could order it or any portion of it to be embodied; but only on condition of informing parliament (which was if not sitting to be summoned for the purpose). During the embodiment or annual training it was subject to the Mutiny Act, except that no punishment during training was to extend to ” life or limb “; to prevent an unconstitutional use of the militia by the Crown, the estimate for its training was framed each year, not by an executive minister of the sovereign, but by the House of Commons itself. Upon the initiative of a committee of the house, an act was passed providing for the pay and clothing of the militia for the year. The king directly appointed the permanent staff and was given a veto on the appointment and promotion of the offi- cers, who were to have a property qualification.

Under this act 30,000 militiamen were raised by

ballot and em- bodied from 1759 to 1763. This force was exclusively ” Protestant,” and remained so until 1802. The service of the militia as thus arranged remained nearly in the same state until 1870. Pitt’s reform, however, was followed by numerous amendments, new enactments, and other changes, of which the following is a summary in chronological order: — 1758. Men volunteering to serve recognized as counting towards the

quota. 1 761. Raising of quota made compulsory on counties under penalty

of fines. Mutiny Act applied to militia when out for training as well as

when embodied. : 775- (American War.) Act passed empowering embodiment of

militia in case of colonial as well as domestic rebellion. 1786. Charge on parishes for storage of arms, &c, transferred to

counties.

1795. Enlistment into regulars encouraged.

1796. Supplementary militia formed, consisting of 63,878 men.

1798. (Irish Rebellion.) English militia volunteered for service in

Ireland.

1799. Irish militia volunteered to serve in Great Britain. 15,000 militiamen volunteered to regular army.

1803. 45,492 men raised for militia by ballot, but of these 40,998

were substitutes. 1805. Militia affiliated to line for purposes of recruiting for regulars.

MILK

1806. Training Act to raise by ballot 200,000 men to be trained for one whole year, and then to discharge them from train- ing for two years.

1808. Difficulties having arisen under above Act, local militia (which is in effect the old general levy) established in addi- tion to general militia then embodied. 27,000 militiamen volunteered to regular army during pre- ceding twelve months.

181 1. English militia, hitherto not liable to serve out of the king-

dom, now made liable to serve in any part of the United Kingdom under certain restrictions, which were subse- quently (in 1859) removed. Method of obtaining men from militia for regulars further systematized.

1812. In this year there were 250 regiments of local militia, with

an establishment of 240,388 men and 214,418 actually enrolled.

1813. During ten years, from 1803 to 1813, nearly 100,000 militia-

men joined the regular army. Act passed to enable militia to serve abroad as militia with their own officers. Three strong battalions joined the British army in France.

1815. Militiamen recruited in great numbers the army which fought

at Waterloo. Local militia ceased to be raised.

1816. Local militia and Ballot Act suspended. General militia disembodied.

1820-21-25. Militia called out for training. 1829. Act passed suspending ballot for the general militia. 1831. Militiamen raised by ballot in accordance with Order in Council, 27th of December 1830. This was the last occa- sion on which the ballot was put in force.

In the latter stages of the great French war the tendency of the government was to use the general militia rather as a reservoir producing drafts (in the end whole units) for service abroad, and the local militia as the real defensive force. During the height of the war (in 1812) the relative position of the various branches of the army was as follows: First line, the standing army; second line, the general or regular militia, which as the war went on were more and more used abroad; third line,

the local militia, with the survivors of the volunteers, who at that time numbered about 68,000 men. After the peace of 181 5 the militia was allowed practically to fall into abeyance, and although the permanent staff was maintained, it had no duties to perform. In 1848 the Prime Minister intimated in parliament his intention to re-establish the militia, but it was not until 1852, after an unsuccessful attempt to resuscitate the local militia, that the general militia of England was reorganized under a system of voluntary enlistment with the ballot in reserve, Scotland and Ireland being included in 1854. The property qualification of officers which had hitherto existed (with exception in favour of ex-officers of the army and navy) was reduced, and after a further reduction in 1854, abolished in 1869. Larger powers respecting the militia were conferred upon the Crown, and during the Crimean War the queen was authorized to embody the militia whenever a state of war existed with any foreign power. In that war the militia was embodied and did garrison duty not only in the United Kingdom but in the Mediterranean garrisons, thus enabling the authorities to send most of the available regular troops to the scene of hostilities. It further contributed many officers and some 30,000 men to the line. During the Indian Mutiny it filled scarcely less useful functions when again called out. The acceptance of voluntary offers of service in the Channel Islands and Isle of Man was definitely authorized in 1859, and extended to service in Malta and Gibraltar in 1875.

In 1871 an important constitutional change was made. It was part of the new army system inaugurated in that year that the con- trol of the militia should be removed from the lord-lieutenant of the county and vested wholly in the Crown. It now virtually ceased to exist as a distinct body, and in 1 88 1 it became a part of the regular forces with a limitation as to the time and area and other conditions of service. Militia battalions were united with the line battalions to form territorial regiments, the artillery and engineers being also

closely associated with the regular services. Various amendments and new enactments followed, all in the direction of increasing the usefulness of the militia, rendering it more efficient and readier for service, though at the same time making it more and more a means for supplying recruits, both officers and men, to the regular army. The officers, who were commissioned by the Crown, were in 1877 made subject at all times to military law. Non-commissioned officers and men were only so subject when embodied or out for training, with extension in the case of men convicted of offences committed during training until the expiration of the punishment. 1 Enlistment was voluntary, compulsory service by ballot remained

1 This, though here mentioned as part of a process of " regular- izing " the militia, was in fact a reform that was advisable under any conditions. The new Territorial Force when created out of the Volunteer Force (which had no such liabilities except when training or serving with regulars) was made subject to military law, officers at all times, men whenever under instruction.

legal, but suspended. The period of engagement was for six years, re-engagements for periods of four years up to the age of 45 being permitted. Bounties were paid to militiamen at various rates upon enlistment, conclusion of training, re-engagement, enlist- ment into reserve or special service section, and other special circumstances. Recruit training, maximum six months, as a rule did not exceed three months. Recruits were either drilled immedi- ately upon enlistment at any time of the year, which is now the most usual system, or else at preliminary drills (first instituted in i860), immediately preceding the annual training of the corps. The annual training varied with the different branches of the service. The usual term for infantry was 27 days, but when on manoeuvres this was generally extended to 34 days, 56 days being the legal maximum. Artillery and fortress engineers trained for 41 days and submarine mining engineers for 55 days. Trainings took place for the most part in camp or barracks, and large numbers of militia

battalions were latterly called on to take part in field manoeuvres. The militia depdts occupied as a rule the same barracks, and officers and men wore (with slight distinctions) the same uniform as the regulars. The militia occupied an- important position in the mobilization scheme for national defence. The permanent staff (adjutant, quartermaster, and an establishment of non-commissioned officers and buglers or drummers, all regulars) was engaged during the non-training period of the year in recruiting, care of arms, clothing &c, and in drilling recruits. The general lines of the system, as regards training are still followed with the Special Reserve, though the constitution of the new force is very different.

The militia ordinarily was liable only for service in the United Kingdom, but by legislation in 1899 may voluntarily serve in any part of the world, including India. During 1899-1900, 22,000 militiamen were thus accepted for service abroad, the bulk of them proceeding to the seat of war in South Africa.

The militia reserve consisted of men selected from the ranks of the militia for special enlistment for service in the regular army when called upon in emergencies, in the following proportions to the establishments of the various corps: Artillery, one-third; engineers and infantry, one-fourth ; medical staff corps, one-half. The militia reserve was first formed in 1867, and in 1900 numbered 30,000 men. During an emergency in 1878, 20,000 militia reservists joined the regular army. The term ” militia ” reserve was therefore a complete misnomer, and the force so called was purely an army reserve. The special service section of the militia was formed by royal warrant in 1898, and consisted of (1) militia units and (2) individual militia- men. A militia unit was considered as available for special service if not less than 75 % of the officers and men present at training made a voluntary offer to engage for special service in any part of the world, and if in the infantry at least 500 and in the artillery at least 250 men were accepted as qualified. Individual militiamen engage to serve

either with their militia unit if it were registered for service, or else for special service with the regular forces. Liability for service was limited to twelve months. Men of the special service section could also belong to the militia reserve, and receive a bounty in addition to that given for the reserve. The result of this special section was not up to 1900 satisfactory. Very few units could qualify for registration, and the response of individual men was comparatively insignificant.

During and after the South African War, while militia recruiting for the regulars showed a constant increase compared with preceding years, the strength of the militia itself decreased year after year. Its militia character had been diminishing ever since the creation of the ” militia reserve ” and the close affiliation of the force to the regular army. For good or evil, then, it had become in the first place a draft-producing agency, and on the reorganization of the forces of the Crown into two lines by Mr Haldane the old ” con- stitutional force ” was frankly reorganized as a reserve for the line, enlistment and training conditions remaining somewhat similar to those in vogue in the militia, but the liability for service abroad becoming the first and most important condition in the ” special reservist s ” enlistment.

MILK (O. Eng. meoluc; from a common Indo-European root, cf. Lat. mulgere, Gr. kiitkyuv), the fluid secreted by the mammary glands of the division of vertebrate animals called Mammalia (see Mammary Gland), and primarily devised for the nourishment of their own young.

The milk of various domesticated animals is more or less used by man for food. The milk of the cow, which may be taken as typical of all others, and is indeed by far the most important and valuable of all (see Dairy and Dairy Farming), is, when newly drawn, an opaque white fluid, with a yellowish tinge, soft, bland and sweetish to the taste, and possessed of a faintly animal odour. This odour, according to Schreiner, is due to the presence of sulphuretted

hydrogen, and disappears after a short exposure. The specific gravity of milk ordinarily ranges from 1-029 t° I-0 33> very seldom reaching 1-035 or falling so low as 1-027. In chemical constitution it consists of an emulsion

of fatty globules (cream) in a watery alkaline solution of casein, and a variety of sugar, peculiar to milk, called lactose. The fat (which when separated we know as butter) and the lactose constitute the carbonaceous portion of the milk regarded as food. The casein, which forms the principal constituent of cheese, and a certain proportion of albumen which is present, form the nitrogenous, while the complex saline substances and water are the mineral constituents. These various substances are present in the proportions which render milk a perfect and typical food suitable to the wants of the young of the various animals for whom it is provided by nature. The milk of animals, so far as is known, contains them, although they are present in somewhat different proportions. It is probable that the milk of ruminants possesses certain physical and physio- logical distinctions from that of non-ruminant animals, which will account for the virtues attributed to the milk of the ass and mare. The following table exhibits the chemical constitution of the kinds of milk most frequently used by man : —

Cow.

Goat.

Ewe. 1

Mare.

Ass.

Human.

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Water. . Fat . . . Casein and albumin . Sugar . Ash.
. .

86-87 3-50

|4-75

4-00 0-70

87-00 4-00

4-10

4-28 0-62

84-48

6-n

3-94 4-68 0-79

83-70

4-45 5-16

5-73 0-96

90-310 1-055 1-953 6-285 0-369

91-65

O-II

1-82

6-o8

0-34

88-02 2-90

i-6o

7-03 0-31

In addition to these constituents milk contains small propor- tions of the gases carbonic acid, sulphuretted hydrogen, nitrogen and oxygen, and minute quantities of other principles, the constant presence and essential conditions of which have not been determined. These consist of gaiactin and lactochrome, substances peculiar to milk, discovered by Winter Blyth, with certain animal principles such as leucin, pepton, kreatin, tyrosin, &c. The salts in milk consist, according to the average of numerous analyses by Fleischmann, of the following constituents: —

Phosphoric acid

Chlorine

Lime ….

Soda ….

28-31 16-34 27-00

10-00

Potash .

• • 17-34

Magnesia .

• • 4-07

Ferric oxide

0-62

Milk thus is not to be regarded as a definite chemical compound nor even as a mixture of bodies in fixed and invariable propor- tions. Not only does the milk of different races and breeds of cows vary within comparatively wide limits; the milk of the same animal is subject to extensive fluctuation. The principal causes of variation in the individual are age, period of lactation, nature and amount of food, state of health, and treatment, such as frequency of milking, &c. The following table indicates the range of normal variations: —

Water 90-00 to 83-65

Fat 2-80 „ 4-50

Casein and albumin 3-36 „ 5-55

Sugar 3-oo „ 5-50

Ash 0-70 „ o-8o

The average quantity of milk yielded by cows is also

highly variable, both in individuals and breeds.

Milk and Disease. — Although the milk of a perfectly healthy cow may be absolutely sterile, it is difficult to obtain it in that condition. In the report of the joint committee appointed for the purpose by the county boroughs of Bradford, Hull, Leeds, Rotherham and Sheffield in 1908, the following conclusions were drawn: (1) Cows' milk freshly drawn from the udder by ordinary methods contains bacteria. They are more numerous in the first flow of the milk. (2) There is a great increase in contamination in the milk at each stage before it reaches the customer. This is due to (a) the dirty condition of the cows' udders, (b) the imperfect cleansing of the cans and of the hands of the milkers. The committee recommend:

1 Ewe's milk is exceedingly variable, especially in its percentage of fat. The above analysis is one of nine by Dr Arthur Voelcker, in which the fat was found to range from about 2 to iaf %.

" (1) The washing of the udder and flanks with soap and water, and similar attention to the hands of the milker. (2) Efficient steriliza- tion of all vessels by steam if possible, or by abundance of boiling water. (3) Rejection of the first draw of the milk from each teat. (4) Avoidance of any work raising dust immediately before or during milking. (5) Removal of the milk of each cow immediately from the shed. (6) Ventilation and cleanliness of the cowsheds. This provides for the reduction as far as possible of contamination during the milking process itself. As any bacteria present in the milk tend to multiply rapidly on the way to the consumer, it is mainly a question of the time which elapses before consumption. It is, there- fore, further recommended (a) that the milk be rapidly cooled or chilled, as the lower the temperature the less do the bacteria multiply, (6) that contamination during railway transit be avoided by dust- proof locked milk cans.

By treating milk at a temperature of 6o° C. for one hour, 70 C. for ten minutes, and 95 C. for one

minute, tubercle bacilli, if present, will certainly be killed. Cholera and typhoid organisms are less resistant, and are killed more quickly than tubercle bacilli at the above temperatures. Only a single pathogenic species can with- stand the short boiling to which milk is ordinarily treated in domestic management, and this is the anthrax bacillus containing spores. The danger from this source is remote, as the microbe does not form spores within the animal body. Even in the worst cases, therefore, only vegetable forms, easily destroyed by boiling, can find their way into the milk from the body of the cow.

The lactic acid bacillus, always present in unboiled milk (to which the souring of milk is due), is easily destroyed by heat; but the bacillus mesentericus, often found in it, forms spores, which are not destroyed by ordinary boiling, and germinate when the milk is kept at a moderately warm temperature, producing a brisk fermentation whereby a large volume of gas is liberated. The fundamental idea of Soxhlet's method for sterilizing milk is to boil it for forty minutes in small bottles holding just enough for one meal, and closing the same with an impervious stopper, which is only re- moved just before use. Milk so treated will keep at the ordinary room temperature, as the spores of the B. mesentericus do not develop below 15° C. ; but if it be introduced into the alimentary canal of a child the spores will rapidly multiply, and in such cases large quanti- ties of gas, giving rise to flatulency, will be formed, and possibly also poisonous decomposition products of albuminoid matter. To render milk sterile in the strict sense of the word it is necessary to raise it to a temperature of about 120° C. for twenty minutes. Under these conditions the lactose decomposes into dark-brown fission products, the fat loses its emulsified condition and separates out as cream which cannot be made to diffuse again even by shaking, and the albuminoids are converted into a form very difficult of digestion.

In short, there is the greatest difficulty in

freeing milk on a large scale from germs without at the same time seriously prejudicing its flavour and nutritive value. Since, then, the destruction of the hardy germs is so difficult, the greater care should be taken, by wash- ing the udder, hands and milk vessels, to secure extreme cleanliness in the preparation of milk intended for infant consumption. Steriliza- tion then becomes an easier task, the milk drawn under these con- ditions being very poor in spore-forming bacteria. It is imperative that cream destined for butter-making should be free from patho- genic organisms. The organisms of cholera, typhoid fever and tuberculosis present in butter retain their vitality for a long time. As butter is consumed in the raw state, a trustworthy preliminary treatment of the cream is in the highest degree desirable. Schuppan has shown that it is possible to produce good butter from Pasteurized or even sterilized cream, and Weigmann introduced the plan of arti- ficially souring cream by means of pure cultures of B. acidi laciici.

Since Metchnikoff's introduction (see Longevity) of the use of soured milk for dietetic purposes — the lactic acid bacillus destroying pathogenic bacteria in the intestine — a great impetus has been given to the multiplication of laboratory preparations containing cultures of the bacillus; and in recent years much benefit to health has, in certain cases, been derived from the discovery.

See also the articles Adulteration ; Dairy and Dairy Farming ; Infancy; Dietetics; Food and Food Preservation; in the last of which the preparation of condensed milk is described.

MILKWORT, in botany, the common name for plants of the genus Poly gala (natural order Polygalaceae), a large genus widely dispersed in temperate and tropical regions and represented by a few species in Britain. The common species, P. vulgaris, is a small wiry perennial found on heaths and in meadows through- out the British Isles. The stems are 2 to 10 in. long and bear narrow rather tough leaves and small, \ to \ in. long, white, pink, blue, lilac or

purple flowers. The flowers (see fig.) are peculiar in form and arrangement of parts; they have five free sepals the two inner of which (b) are large petaloid and winglike, forming the most conspicuous part of the flower; the petals are united below with the sheath of the eight stamens forming a tube split at the base behind; their form recalls that of the pea family. The name Polygala is from the Greek woXw, much,

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and y&\a, milk, the plant being supposed to increase the yield of milk in cows. Some species with showy flowers are known in cultivation as greenhouse, or hardy r.nnual or perennial, herbs or shrubs. The root of P. Senega, snake-root, a North American species is officinal. Sea milkwort is the common name for Glaux maritima, a small succulent herb found on seashores and in estuaries in the British Isles; it belongs to the primrose order (Primulaceae).

After Berg & Schmidt, from Strasburger's Lekrbuch der Botanik, by permission of Gustav Fischer.

Poly gala Senega.

A, Flower; o, small sepals; b, large sepals; c, keel, representing the anterior petal; d, its fimbriated edge; e, lateral petals.

B, The 8 stamens united into a sheath below; h, anthers (magnified).

MILL, JAMES (1773-1836), historian and philosopher, was born on the 6th of April 1773, at Northwater Bridge, in the parish of Logie-Pert, Forfarshire, the son of James Mill, a shoe- maker. His mother, Isabel Fenton, of a good family which had suffered from connexion with the Stuart rising of, 1745, resolved that he should receive a first-rate education, and sent him first to the parish school and then to the Montrose Academy, where he remained till the unusual age of seventeen and a half. He

then entered the university of Edinburgh, where he distinguished himself as a Greek scholar. In October 1798 he was licensed as a preacher, but met with little success. From 1790 to 1802, in addition to holding various tutorships, he occupied himself with historical and philosophical studies. Finding little prospect of a career in Scotland, in 1802 he went to London in company with Sir John Stuart, then member of parliament for Kin- cardineshire, and devoted himself to literary work. From 1803 to 1806 he was editor of an ambitious periodical called the Literary Journal, which professed to give a summary view of all the leading departments of human knowledge. During this time he also edited the St James's Chronicle, belonging to the same proprietor. In 1804 he wrote a pamphlet on the corn trade, arguing against a bounty on the exportation of grain. In 1805 he published a translation (with notes and quotations) of C, F. Villers's work on the Reformation, an unsparing exposure of the alleged vices of the papal system. In 1805 he married Harriet Burrow, whose mother, a widow, kept an establishment for lunatics in Hoxton. He then took a house in Pentonville, where his eldest son, John Stuart Mill (q.v.), was born in 1806. About the end of this year he began his History of India, which he took twelve years to complete, instead of three or four, as he had expected.

In 1808 he became acquainted with Jeremy Bentham, and was for many years his chief companion and ally. He adopted Bentham's principles in their entirety, and determined to devote all his energies to bringing them before the world. Between 1806 and 1818 he wrote for the Anti-Jacobin Review, the British Review and the Electric Review, but there is no means of tracing his contributions. In 1808 he began to write for the Edinburgh Review, to which he contributed steadily till 1813, his first known article being " Money and Exchange." He also wrote on Spanish America, China, General Miranda, the East India Company, and the Liberty of the Press. In the Annual Review for 1808 two articles of his are traced — a " Review of Fox's History," and an

article on ” Bentham’s Law Reforms,” probably his first published notice of Bentham. In 181 1 he co-operated with William Allen (1 770-1843), quaker and chemist, in a periodical called the Philanthropist. He contributed largely to every number — his principal topics being Education,

Freedom of the Press, and Prison Discipline (under which he expounded Bentham’s ” Panopticon “). He made powerful onslaughts on the Church in connexion with the Bell and Lan- caster controversy, and took a prominent part in the discussions which led to the foundation of London University in 1825. In 1814 he wrote a number of articles, containing an exposition of utilitarianism, for the supplement to the fifth edition of the Encyclopaedia Britannica, the most important being those on ” Jurisprudence,” ” Prisons ” and ” Government.”

In 1818 the History of India was published, and obtained a great and immediate success. It brought about a change in the author’s position. The year following he was appointed an official in the India House, in the important department of the examiner of Indian correspondence. He gradually rose in rank till he was appointed, in 1830, head of the office, with a salary of £1900, raised in 1836 to £2000. His great work, the Elements of Political Economy, appeared in 1821 ‘ (3rd and revised ed. 1826).

From 1824 to 1826 Mill contributed to the Westminster Review, started as the organ of his party, a number of articles in which he attacked the Edinburgh and Quarterly Reviews and ecclesi- astical establishments. In 1829 appeared the Analysis of the Human Mind. From 1831 to 1833 Mill was largely occupied in the defence of the East India Company, during the controversy attending the renewal of its charter, he being in virtue of his office the spokesman of the court of directors. For the London Review, founded by Sir William Molesworth in 1834, he wrote a notable article entitled ” The Church and its Reform,” which was much too sceptical for the

time, and injured the Review. His last published book was the Fragment on Mackintosh (1835). He died on the 23rd of June 1836.

Mill had a thorough acquaintance with Greek and Latin literature, general history, political, mental and moral philosophy. His intellect was logical in the highest degree; he was clear and precise, an enemy of loose reasoning, and quick to refute prevailing fallacies. All his work is marked by original constructive thought, except in a few sutjects, in which he confessedly expounded Bentham's views. At a time when social subjects were as a rule treated empirically, he brought first principles to bear at every point. His greatest literary monument is the History of India. The materials for narrating the acquisition by England of its Indian Empire were put into shape for the first time; a vast body of political theory was brought to bear on the delineation of the Hindu civilization; and the conduct of the actors in the successive stages of the conquest and administration of India was subjected to a severe criticism. The work itself, and the author's official connexion with India for the last seventeen years of his life, effected a complete change in the whole system of governing that country. ■

Mill played a great part also in English politics, and was, more than any other man, the founder of what was called " philosophic radicalism." His writings on government and his personal influence among the Liberal politicians of his time determined the change of view from the French Revolution theories of the rights of man and the absolute equality of men to the claiming of securities for good government through a wide extension of the franchise. Under this banner it was that the Reform Bill was fought and won. His Elements of Political Economy, which was intended only as a textbook of the subject, shows all the author's precision and lucidity. As Dr J. K. Ingram said, it has the " character of a work of art. " It followed up the views of Ricardo, with whom Mill was always on terms of intimacy. Its interest is mainly historical, as

an accurate summary of views which are now largely discarded. Among the more important of its theses are: (1) that the chief problem of practical reformers is to limit the increase of popu- lation, on the assumption that capital does not naturally increase at the same rate as population (ii. § 2, art. 3); (2) that the value of a thing depends entirely on the quantity of labour put into it; and (3) that what is now known as the ” unearned increment ” of land is a proper object for taxation. The work as a whole is a striking example of the weakness of treating

economic problems from a purely a priori standpoint by the deductive method.

By his Analysis of the Mind and his Fragment on Mackintosh Mill acquired a position in the history of psychology and ethics. He took up the problems of mind very much after the fashion of the Scottish school, as then represented by Reid, Stewart and Brown, but made a new start, due in part to Hartley, and still more to his own independent thinking. He carried out the principle of association into the analysis of the complex emotional states, as the affections, the aesthetic emotions and the moral sentiment, all which he endeavoured to resolve into pleasurable and painful sensations. But the salient merit of the Analysis is the constant endeavour after precise definition of terms and clear statement of doctrines. The Fragment on Mackintosh is a severe exposure of the flimsiness and misrepresentations of Sir James Mackintosh’s famous Dissertation on the Progress of Ethical Philosophy (1830), and discusses the foundations of ethics from the author’s utilitarian point of view.

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Scottish Philosophy (1885); J. S. Mill, Autobiography (1873) ; Th. Ribot, La Psychologie anglaise (1870; Eng. trans., 1873) ; J. Morley in Fortnightly Review, xxxvii. (1882); Graham Wallas, The Life of Francis Place (1898).

MILL, JOHN (c. 1645–1707), English theologian, was born about 1645 at Shap in Westmorland, entered Queen's College, Oxford, as a servitor in 1661, and took his master's degree in 1669 in which year he spoke the " Oratio Panegyrica " at the opening of the Sheldonian Theatre. Soon afterwards he was chosen fellow and tutor of his college; in 1676 he became chaplain to the bishop of Oxford, and in 1681 he obtained the rectory of Bletchington, Oxfordshire, and was made chaplain to Charles II. From 1685 till his death he was principal of St Edmund's Hall ; and in 1704 he was nominated by Queen Anne to a prebendal stall in Canterbury. He died on the 23rd of June 1707, just a fortnight after the publication of his Greek Testament.

Mill's Novum testamentum grcecum, cum lectionibus varianlibus MSS. exemplarium, versionum, editionum SS. patrum et scrip- torum ecclesiasticorum, et in easdem notis (Oxford, fol. 1707), was undertaken by the advice and encouragement of John Fell {a. v.), his predecessor in the field of New Testament criticism ; it represents the labour of thirty years, and is admitted to mark a great advance on all that had previously been achieved. The text indeed is that of R. Stephanus (1550), but the notes, besides embodying all pre- viously existing collections of various readings, add a vast number derived from his own examination of many new MSS, and Oriental versions (the latter unfortunately he used only in the Latin transla- tions). Though the amount of information given by Mill is small compared with that in modern editions, it is probable that no one person, except perhaps Tischendorf, has added so much material for the work of textual criticism. He was the first to notice, though only incidentally, the value of the concurrence of the Latin evidence with the Codex Alexandrinus, the only representative of an ancient

non- Western Greek text then sufficiently known; this hint was not lost on Bentley (see Westcott and Hort, Introduction to New Testa- ment). Mill's various readings, numbering about thirty thousand, were attacked by Daniel Whitby (1638-1726) in his Examen as destroying the validity of the text; Antony Collins also argued in the same sense though with a different object. The latter called forth a reply from Bentley (Phileleutherus lipsiensis). In .1.710 Kuster reprinted Mill's Testament at Amsterdam with the readings of twelve additional MSS.

MILL, JOHN STUART (1806-1873), English philosopher and economist, son of James Mill, was born on the 20th of May 1806 in his father's house in Pentonville, London. He was educated exclusively by his father, who was a strict disciplinarian, and at the age of three was taught the Greek alphabet and long lists of Greek words with their English equivalents. By his eighth year he had read Aesop's Fables, Xenophon's Anabasis, and the whole of Herodotus, and was acquainted with Lucian, Diogenes Laertius, Isocrates and six dialogues of Plato (see his Auto- biography). He had also read a great deal of history in English — Robertson's histories, Hume, Gibbon, Robert Watson's Philip II. and Philip III., Hooke's Roman History, part of a translation of Rollin's Ancient History, Langhorne's Plutarch, Burnet's History of My Own Times, thirty volumes of the Annual Register, Millar's Historical View of the English Government, Mosheim's

Ecclesiastical History, M'Crie's Knox, and two histories of the Quakers. A contemporary record of Mill's studies from eight to thirteen is published in Bain's sketch of his life. It shows that the Autobiography rather understates the amount of work done. At the age of eight he began Latin, Euclid, and algebra, and was appointed schoolmaster to the younger children of the family. His main reading was still history, but he went through all the Latin and Greek authors commonly read in the schools and universities, besides several that are not commonly read by undergraduates. He was not taught to compose

either in Latin or in Greek, and he was never an exact scholar; it was for the subject matter that he was required to read, and by the age of ten he could read Plato and Demosthenes with ease. His father's History of India was published in 18 18; immediately thereafter, about the age of twelve, John began a thorough study of the scholastic logic, at the same time reading Aristotle's logical treatises in the original. In the following year he was introduced to political economy and studied Adam Smith and Ricardo with his father.

Not unnaturally the training which the younger Mill received has aroused amazement and criticism; and it is reasonable to doubt whether the material knowledge which he retained in the result was as valuable to him as his father imagined. It is important, however, to note that the really important part of the training was the close association which it involved with the strenuous character and vigorous intellect of his father. From his earliest days he spent much time in his father's study and habitually accompanied him on his walks in North London. Much therefore of what he acquired was assimilated without difficulty, and the accuracy of his impressions was tested by his subsequently drafting a resume of their conversations. He thus learned early to grapple with difficulties and to accustom himself to the necessity of precision in argument and expression. It was an inevitable result of such an education that Mill acquired many of his father's speculative opinions, and his father's way of defending them. But he did not receive the impress passively and mechanically. " One of the grand objects of education," according to the elder Mill, " should be to generate a constant and anxious concern about evidence." The duty of collecting and weighing evidence for himself was at every turn impressed upon the boy; he was taught to accept no opinion on authority. He was deliberately educated as an apostle, but it was as an apostle of reasoned truth in human affairs, not as an apostle of any system of dogmatic tenets. It was to prevent any falling off from this high moral standard till it

should become part of his being that his father kept the boy so closely with himself. Mill expressly says that his childhood was not unhappy. It seems unhappy only when we compare it with the normal life of a boy and decline to imagine its peculiar enjoyments and aspirations. Mill complains that his father often required more than could be expected of him, but his tasks were not so severe as to prevent him from growing up a healthy and high-spirited boy, though he was not constitutionally robust, and his pursuits were so different from those of other boys of the same age.

From May 1820 till July 1821 Mill was in France in the family of Sir Samuel Bentham, brother of Jeremy Bentham. Away from his father he maintained his laborious habits. Copious extracts from a diary kept by him at this time are given by Bain; they show how methodically he read and wrote, studied chemistry and botany, tackled advanced mathematical problems, made notes on the scenery and the people and customs of the country. He also gained a thorough acquaintance with the French language. On his return in 182 1 he added to his work the study of psychology, and that of Roman law, which he read with John Austin, his father having half decided on the bar as the best profession open to him. In 1822, however, when he had just completed his seventeenth year, this intention was aban- doned, and he entered as a clerk in the examiner's office of the India House, " with the understanding that he should be employed from the beginning in preparing drafts of despatches, and be thus trained up as a successor to those who then filled the highest departments of the office."

Mill's work at the India House, which was henceforth his livelihood, did' not come before the public; hence some have scouted his political writings as the work of an abstract philo- sopher, entirely unacquainted with affairs. From the first he was

more than a clerk, and after a short apprenticeship he was promoted, in 1828, to the responsible position of assistant- examiner with a salary of £600 a year. The duty of the so-called examiners was to examine the letters of the agents of the Company in India, and to draft instructions in reply. The character of the Company's government was almost entirely dependent upon their abilities as statesmen. For twenty years, from 1836 (when his father died) to 1856, Mill had charge .of the Company's relations with the native states, and in 1856 he became chief of the office with a salary of £2000. In the hundreds of despatches that he wrote in this capacity, much, no doubt, was done in accordance with established routine, but few statesmen of his generation had a wider experience of the responsible application of the principles of government. About this work he said little in the Autobiography, probably because his main concern there was to expound the influences that effected his moral and mental development.

About the time of his entering the India House Mill read Dumont's exposition of Bentham's doctrines in the Traits de Legislation, which made a lasting impression upon him. When he laid down the last volume, he says, he had become a different being. It gave unity to the detached and fragmentary parts of his knowledge and beliefs. The impression was confirmed by the study of the English psychologists, as well as Condillac and Helvetius, and in 1822-1823 he established among a few friends the " Utilitarian " Society, taking the word, as he tells us, from Gait's Annals of the Parish. Two newspapers were open to him — the Traveller, edited by a friend of Bentham's, and the Morning Chronicle, edited by his father's friend Black. One of his first efforts was a solid argument for freedom of discussion, in a series of letters to the Chronicle apropos of the prosecution of Richard Carlile. But he watched all public incidents with a vigilant eye, and seized every passing oppor- tunity of exposing departures from sound principle in parliament and courts of justice. Another outlet was opened up for him (April

1824) by the starting of the Westminster Review, and still another in the following year in the Parliamentary History and Review. This year also he found a congenial occupation in editing Bentham's Rationale of Judicial Evidence. All the time, his mind full of public questions, he discussed eagerly with the many men of distinction who came to his father's house. He engaged in set discussions at a reading society formed at Grote's house in 1825, and in set debates at a Speculative Society formed in the same year.

From the Autobiography we learn that in 1826 Mill's enthu- siasm was checked by a misgiving as to the value of the ends which he had set before him. This expression was the result, no doubt, of his strenuous training and the comparative lack of congenial friendships. His father Was reserved, undemonstra- tive even to the pitch of chilling sternness, and among young Mill's comrades contempt of feeling was almost a watchword. Himself absorbed in abstract questions and projects of general philanthropy, he had been careless of personal attachment. On the other hand without experience he could not have been prepared for the actual slowness of the reformer's work. In 1826 he looked back to four years of eager toil. What were the results? He had become convinced that his comrades in the Utilitarian Society, never more than ten, had not the stuff in them for a world-shaking propaganda; the society itself was dissolved; the Parliamentary Review was a failure; the West- minster did not pay its expenses; Bentham's Judicial Evidence produced little effect on the reviewers. His own reception at the Speculative Debating Society, where he first measured his strength in public conflict, was calculated to produce self- distrust. He found himself looked upon with curiosity as a precocious phenomenon, a " made man," an intellectual machine set to grind certain tunes. The outcome of this period of depression was a broadening of his outlook on the problems

which he had set himself to solve. He now saw that regard for the public good was too vague an object

for the satisfaction of a man's affections. It is a proof of the dominating force of his father's character that it cost the younger Mill such an effort to shake off his stern creed about poetry and personal emotion. Like Plato, the elder Mill would have put poets under ban as enemies of truth, and he subordinated private to public affections. Landor's maxims of " few acquaintances, fewer friends, no familiarities " had his cordial approval. These doctrines the younger Mill now felt himself forced in reason to abandon. Too much in awe of his father to make him a confidant, he wrestled in the gloomy solitude of his own mind. He gained from the struggle a more catholic view of human happiness, at delight in the poetry of nature and the affections as well as the poetry of heroic unselfishness, a disposition to study more sympathetically the point of view of opponents, a more courteous style of polemic, a hatred of sectarianism, an ambition, no less noble and disinterested, but moderated to practical possibilities.

In the course of the next few years he wrote comparatively little, but he continued his reading, and also derived much benefit from discussions held twice a week at Grote's house in Threadneedle Street. Gradually also he had the satisfaction of seeing the debates in the Speculative Society becoming famous enough to attract men with whom it was profitable for him to interchange opinions, among others Maurice and John Sterling. He ceased to attend the society in 1829, but he carried away from it the strengthening memory of failure overcome by per- severing effort, and the important doctrinal conviction that a true system of political philosophy was " something much more complex and many-sided than he had previously had any idea of, and that its office was to supply, not a set of model institutions but principles from which the institutions suitable to any given circumstances might be deduced."

The first sketch of Mill's political philosophy appeared in a series of contributions to the Examiner in the autumn of 1830 entitled " Prospects

in France.” He was in Paris soon after the July Revolution, and made the acquaintance of the leading spirits among the younger men; in his discussion of their pro- posals we find the germs of many thoughts afterwards more fully developed in his Representative Government. It is from this time that Mill’s letters supply a connected account of his life (see Hugh Elliott, Letters of John Stuart Mill, 1010).

The letters in the Examiner may be taken as marking the close of his period of meditative search, and his return to hopeful aspiring activity. It was characteristic of his nature that he should be stirred to such delight by the Revolution in France, and should labour so earnestly to make his countrymen under- stand with what gravity and sobriety it had been effected. Their own Reform Bill came soon after and it is again character- istic of Mill — at once of his enthusiasm and of his steady deter- mination to do work that nobody else seemed able or willing to do — that we find him in the heat of the struggle in 1831 writing to the Examiner a series of letters on ” The Spirit of the Age ” which drew from Carlyle the singular exclamation ” Here is a new mystic 1″ How little this criticism was justified may be seen from the fact that Mill’s inductive logic was the direct result of his aspirations after political stability as determined by the dominion of the wisest {Examiner letters). ” Why is it,” he asked, ” that the multitude accept implicitly the decisions of the wisest, of the specially skilled, in physical science? ” Because in physical science there is all but complete agreement in opinion. ” And why this agreement?” Because all accept the same methods of investigation, the same tests of truth. Is it possible then to obtain unanimity as to the methods of arriving at con- clusions in social and political matters, so as to secure similar agreement of opinion among the specially skilled, and similar general respect for their authority ? The same thought appears in a review of Herschel’s Natural Philosophy, written about the same time. Mill remarks that the

uncertainty hanging over the very elements of moral and social philosophy proves that the means of arriving at the truth in those sciences are not yet

properly understood. ” And whither,” he adds, ” can mankind so advantageously turn, in order to learn the proper means, and to form their minds to the proper habits, as to that branch of knowledge in which by universal acknowledgment the greatest number of truths have been ascertained, and the greatest possible degree of certainty arrived at ? ”

By 1831 the period of depression had passed; Mill’s enthusiasm for humanity had been thoroughly reawakened, and had taken the definite shape of an aspiration to supply an unimpeachable method of search for conclusions in moral and social science. No mystic ever worked with warmer zeal than Mill. But his zeal encountered a check which baffled him for several years, and which left its mark in various inconsistencies and inco- herences in his completed system. He had been bred by his father in a great veneration for the syllogistic logic as an antidote against confused thinking. He attributed to his early discipline in this logic an impatience of vague language which in all likeli- hood was really fostered in him by his study of the Platonic dialogues and of Bentham, for he always had in himself more of Plato’s fertile ingenuity in canvassing the meaning of vague terms than the schoolman’s rigid consistency in the use of them. Be this as it may, enthusiastic as he was for a new logic that might give certainty to moral and social conclusions, Mill was no less resolute that the new logic should stand in no antagonism to the old. In his Westminster review of Whately’s Logic in 1828 (invaluable to all students of the genesis of Mill’s logic) he appears, curiously enough, as an ardent and brilliant champion of the syllogistic logic against highfliers such as the Scottish philosophers who talk of ” superseding ” it by ” a supposed

system of inductive logic." His inductive logic must " supple- ment and not supersede." But for several years he searched in vain for the means of concatenation.

Meantime, while recurring again and again, as was his custom, to this cardinal difficulty, Mill worked indefatigably in other directions where he saw his way clear. The working of the new order in France, and the personalities of the leading men, had a profound interest for him; he wrote on the subject in the Examiner. He had ceased to write for the Westminster in 1828; but during the years 1832 and 1833 he contributed many essays to Tait's Magazine, the Jurist, and the Monthly Repository. In 1835 Sir William Moles worth founded the London Review with Mill as editor; it was amalgamated with the Wesminster (as the London and Westminster Review) in 1836, and Mill continued editor (latterly proprietor also) till 1840. Much of what he wrote then was subsequently incorporated in his systematic works: some of his essays were reprinted in his first two volumes of Dissertations and Discussions (1859). The essays on Bentham and Coleridge constituted the first manifesto of the new spirit which Mill sought to breathe into English Radicalism. But the reprinted papers give no just idea of the immense range of Mill's energy at this time. His position in the India Office, where alone he did work enough for most men, cut him off from entering parliament; but he laboured hard though ineffectually to influence the legislature from without by com- bating the disposition to rest and be thankful. In his Auto-biography he admits that the attempt to form a Radical party in parliament at that time was chimerical.

It was in 1837, on reading Whewell's Inductive Sciences and re-reading Herschel, that Mill at last saw his way clear both to formulating the methods of scientific investigation and joining on the new logic as a supplement to the old. The Logic was published in 1843. In 1844 appeared his Essays on Some Unsettled Questions in Political Economy. These essays were worked out and written many years

before, and show Mill in his first stage as a political economist. Four out of the five essays are elaborate and powerful solutions of perplexing technical problems — the distribution of the gains of international commerce, the influence of consumption on production, the definition of productive and unproductive labour, the precise relations between profits and wages. Though Mill appears here purely as the disciple of Ricardo, striving after more precise statement, and reaching forward to further consequences, we

can well understand in reading these essays how about the time when he first sketched them he began to be conscious of power as an original and independent thinker.

That originality and independence became more conspicuous when he reached his second stage as a political economist, struggling forward towards the standpoint from which his systematic work was written. It would seem that in his fits of despondency one of the thoughts that marred his dreams of human improvement was the apparently inexorable character of economic laws, condemning thousands of labourers to a cramped and miserable existence, and thousands more to semi- starvation. From this oppressive feeling he found relief in the thought set forth in the opening of the second book of his Political Economy — that, while the conditions of production have the necessity of physical laws, the distribution of what is produced among the various classes of producers is a matter of human arrangement, dependent upon alterable customs and institutions. There can be little doubt that this thought, whether or not in the clear shape that it afterwards assumed, was the germ of all that is most distinctive in his system of political economy. This system, which for many years subsequently was regarded as authoritative, has been subjected to vigorous criticism by later economists, and it is perhaps not too much to say that it now possesses mainly an historical interest. Its chief importance is perhaps the stress which it laid on the vital connexion which must subsist between true

economic theory and the wider facts of social and national development.

While his great systematic works were in progress, Mill wrote very little on events or books of the day. He turned aside for a few months from his Political Economy during the winter of the Irish famine (1846-1847) to advocate the creation of peasant- proprietorships as a remedy for distress and disorder in Ireland. He found time also to write elaborate articles on French history and Greek history in the Edinburgh Review apropos of Michelet, Guizot and Grote, besides some less elaborate essays.

The Political Economy was published in 1848. Mill could now feel that his main work was accomplished; he remained, however, on the alert for opportunities of useful influence, and pressed on with hardly diminished enthusiasm in his search for useful truth. Among other things, he made a more thorough study of socialist writers, with the result that, though he was not converted to any of their schemes as being- immediately practic- able, he began to look upon some more equal distribution of the produce of labour as a practicability of the remote future, and to dwell upon the prospect of such changes in human character as might render a stable society possible without the institution of private property. This he has called his third stage as a political economist, and he says that he was helped towards it by the lady, Mrs Taylor, 1 who became his wife in 185 1. It is generally supposed that he writes with a lover’s extravagance about this lady’s powers when he compares her with Shelley and Carlyle. But a little reflection will show that he wrote with his usual accuracy and sobriety when he described her influence on him. He expressly says that he owed none of his technical doctrine to her, that she influenced only his ideals of life for the individual and for society; the only work perhaps which was directly inspired by her is the essay on the enfranchisement of women {Dissertations, vol. ii.). It is obvious from what he says that his inner life became very different after he threw off his

father’s authority. This new inner life was strengthened and enlarged by Mrs Taylor.

During the seven years of his married life Mill published less than in any other period of his career, but four of his most 1 Mrs Taylor (Harriet Hardy) was the wife of John Taylor, a wholesale druggist in the city of London. She was a confirmed invalid, and lived in the country, where Mill visited her regularly for twenty years, with the full consent of her husband, a man of limited mental powers, but of high character and unselfish- ness. Mill’s friendship with Mrs Taylor and their marriage in 1 85 1 involved a break with his family (apparently due te his resentment at a fancied slight, not to any bitterness on their part), and his practical disappearance from society. (On these points see Mary Taylor, Mrs Mill’s grand-daughter, in Elliott’s edition of the Letters.)

closely reasoned and characteristic works, the Liberty, the Utilitarianism, the Thoughts on Parliamentary Reform, and the Subjection of Women, besides his posthumously published essays on Nature and on the Utility of Religion, were thought out and partly written in collaboration with his wife. In 1856 he became head of the examiner’s office in the India House, and for two years, till the dissolution of the Company in 1858, his official work, never a light task, kept him fully occupied. It fell to him as head of the office to write the defence of the Company’s government of India when the transfer of its powers was pro- posed. Mill was earnestly opposed to the transfer, and the documents in which he substantiated the proud boast for the Company that ” few governments, even under far more favour- able circumstances, have attempted so much for the good of their subjects or carried so many of their attempts to a beneficial issue,” and exposed the defects of the proposed new government, are models of trenchant and dignified pleading.

On the dissolution of the Company Mill was offered a seat in the new council, but declined, and retired with a pension of £1500. His retirement from official work was followed almost immediately by his wife's death at Avignon, whither they had come in the course of a tour. So great was the shock that for the rest of his life he spent most of his time at a villa at St Veran, near Avignon, returning to his Blackheath residence only for a short period in each year. He sought relief in active literary occupation, in politics, sociology and psychology. He pub- lished, with a touching dedication to his wife, the treatise on Liberty, which they had wrought out together. He then turned to poHtics, and published, in view of the impending Reform Bill, a pamphlet on parliamentary reform. The chief feature in this was an idea concerning which he and Mrs Mill often deliberated — the necessity of providing checks against uneducated demo- cracy. His suggestion of a plurality of votes, proportioned to the elector's degree of education, was avowedly put forward only as an ideal; he admitted that no authentic test of education could for the present be found. An anonymous Conservative caught at the scheme in another pamphlet, proposing income as a test. Soon after Mill supported in Fraser's, still with the same object, Hare's scheme for the representation of minorities. In the autumn of the same year he turned to psychology, reviewing Bain's works in the Edinburgh Review. In his Repre- sentative Government (i860) he systematized opinions already put forward in many casual articles and essays. His Utili- tarianism (published in Fraser's in 1861) was a closely-reasoned systematic attempt to answer objections to his ethical theory and remove misconceptions of it. He was especially anxious to make it clear that he included in " utility " the pleasures of the imagination and the gratification of the higher emotions, and to show how powerfully the good of mankind as a motive appealed to the imagination. His next treatise, The Subjection of Women, was not published till i860. 1 His Examination of Hamilton's Philosophy, published in 1865, had engaged a large share of his time for

three years before.

While mainly occupied in those years with philosophical studies, Mill did not remit his interest in current politics. He supported the North in the American crisis of 1862, using all his strength to explain what has since been universally recognized as the issue really at stake in the struggle, the abolition of slavery. It was characteristic of the closeness with which he watched current events, and of his zeal in the cause of " lucidity," that when the Reader, an organ of science and unpartisan opinion, fell into difficulties in 1865 Mill joined with some distinguished men of science and letters in an effort to keep it afloat. He supplied part of the money for carrying it on, contributed several articles, and assisted the editor, Fraser Rae, with his advice. The effort was vain, though such men as Herbert Spencer,

1 He was one of the founders, with Mrs P. A. Taylor, Miss Emily Davies and others, of the first women's suffrage society, which developed into the National Union of Women's Suffrage Societies, and his writings are still the most important theoretical statement of the case for women's suffrage. He presented to Parliament the first petition on the subject (see further Blackburn, Women's Suffrage Record).

Huxley, Tyndall, Cairnes, Mark Pattison, F. Harrison, Sir Frederick Pollock and Lockyer were among the contributors.

In 1865 he agreed to stand as parliamentary candidate for Westminster, on conditions strictly in accordance with his principles. He would not canvass, nor pay agents to canvass for him, nor would he engage to attend to the local business of the constituency. He was with difficulty persuaded even to address a meeting of the electors. The story of this remarkable election has been told by James Beal, one of the most active supporters of Mill's candidature. In parliament he adhered to his life-

long principle of doing only work that needed to be done, and that nobody else seemed equally able or willing to do. It may have been a consciousness of this fact which prompted a remark, made by the Speaker, that Mill’s presence in parliament elevated the tone of debate. The impression made by him in parliament is in some danger of being forgotten, because he was not instrumental in carrying any great measure that might serve as an abiding memorial. But, although his first speech on the bill for the prevention of cattle diseases excited the opposition of country members, and a subsequent speech against the suspension of the Habeas Corpus Act in Ireland was very unfavourably received, Mill thoroughly succeeded in gaining the ear of the House. The only speech made by him during his three years in parliament that was listened to with impatience was, curiously enough, his speech in favour of counteracting democracy by providing for the representation of minorities. His attack on the conduct of Governor Eyre in Jamaica (q.v.) was listened to, but with repugnance by the majority, although his action in this matter in and out of parliament was far from being ineffectual. He took an active part in the debates on Disraeli’s Reform Bill (moving an amendment to omit the word ” man ” and insert ” person “), and helped to extort from the government several useful modifications of the Bill for the Prevention of Corrupt Practices. The reform of land tenure in Ireland, the representation of women, the reduction of the national debt, the reform of London government, the abrogation of the Declaration of Paris, were among the topics on which he spoke with marked effect. He took occasion more than once to enforce what he had often advocated in writing, England’s duty to intervene in foreign politics in support of the cause of freedom. As a speaker Mill was somewhat hesitating, pausing occasionally as if to recover the thread of his argument, but he showed great readiness in extemporaneous debate. Viewed as a candidate for ministerial office, he might be regarded as a failure in parliament, but there can be no doubt that his career there greatly extended his

influence.

Mill’s subscription to the election expenses of Bradlaugh, and his attitude towards Governor Eyre, are generally regarded as the main causes of his defeat in the general election of 1868. But, as he suggests himself, his studied advocacy of unfamiliar projects of reform had made him unpopular with ” moderate Liberals.” He retired with a sense of relief to his cottage and his literary life at Avignon. His parliamentary duties and the quantity of correspondence brought upon him by increased publicity had absorbed nearly the whole of his time. The scanty leisure of his first recess had been devoted to writing his St Andrews rectorial address on higher education and to answering attacks on his criticism of Hamilton; of the second, to annotating in conjunction with Bain and Findlater, his father’s Analysis of the Mind. Now he looked forward to a literary life, and his letters show how much he enjoyed the change. His little cottage was filled with books and newspapers; the beautiful country round it furnished him with a variety of walks; he read, wrote, discussed, walked, botanized. He was extremely fond of music, and was himself a fair pianist. His step-daughter, Miss Taylor (d. January 1907), was his constant companion after his wife’s death. ” Helen,” he wrote to W. T. Thornton, an old colleague in the India House, ” has carried out her long-cherished scheme (about which she tells me she consulted you) of a ‘ vibratory ‘ for me, and has made a pleasant covered walk, some 30 ft. long, where I can vibrate in cold or rainy weather. The terrace, you must know, as it goes round two sides of the house, has got itself

dubbed the ‘ semi-circumgyratory.’ In addition to this, Helen has built me a herbarium, a little room fitted up with closets for my plants, shelves for my botanical books, and a great table whereon to manipulate them all. Thus, you see, with my

herbarium, my vibratory, and my semi-circumgyratory, I am in clover; and you may imagine with what scorn I think of the House of Commons, which, comfortable club as it is said to be, could offer me none of these comforts, or, more perfectly speak- ing, these necessaries of life." Mill was an enthusiastic botanist all his life long, and a frequent contributor of notes and short papers to the Phytologist. One of the things that he looked forward to during his last journey to Avignon was seeing the spring flowers and completing a flora of the locality. His delight in scenery frequently appears in letters written to his friends during his summer and autumn tours.

Yet he did not relax his laborious habits nor his ardent out- look on human affairs. The essays in the fourth volume of his Dissertations — on endowments, on land, on labour, on meta- physical and psychological questions — were written for the Fortnightly Review at intervals after his short parliamentary career. One of his first tasks was to send his treatise on the Subjection of Women (written 1861, published 1869, many edi- tions) through the press. The essay on Theism was written soon after. The last public work in which he engaged was the starting of the Land Tenure Reform Association. The inter- ception by the state of the unearned increment, and the promo- tion of co-operative agriculture, were the most striking features in his programme. He wrote in the Examiner and made a public speech in favour of the association a few months before his death. The secret of the ardour with which he took up this question probably was his conviction that a great struggle was impending in Europe between labour and capital. He regarded his project as a timely tompromise.

Mill died at Avignon on the 8th of May 1873. He was a man of extreme simplicity in his method of life. Though occasionally irritable in speech, in his written polemics he was remarkable for courtesy to opponents and a capacity to understand their point of view. His references to his friends were always

generous, and he was always ready to assist those whose work needed help. For example, he desired to guarantee the cost of the first books of Bain and Herbert Spencer. A statue in bronze was placed on the Thames Embankment, and there is a good portrait by Watts (a copy of which, by Watts himself, was hung in the National Gallery).

The influence which Mill's works exercised upon contemporary English thought can scarcely be overestimated. His own writings and those of his successors {e.g. J. E. Cairnes and Alexander Bain) practically held the field during the third quarter of the 19th century and even later. In philosophy his chief work was to systematize and expound the utilitarianism of his father and Bentham (see Utilitarianism) . He may, in fact, be regarded as the final exponent of that empirical school of philosophy which owed its impulse to John Locke, and is generally spoken of as being typically English. Its fundamental characteristic is the emphasis laid upon human reason, i.e. upon the duty incumbent upon all thinkers to investigate for themselves rather than to accept the authority of others. Know- ledge must be based upon experience. In reasserting and amplifying the empirical conclusions of his predecessors, especially in the sphere of ethics, Mill's chief function was the introduction of the humanist element. This was due, no doubt, to his revulsion from the sternness of his upbringing and the period of stress through which he passed in early manhood, but also to the sympathetic and emotional quali- ties which manifested themselves in his early manhood. We have seen, for example, that he was led to investigate the subject of logic because he found in attempting to advance his humanitarian schemes in politics an absence of that fundamental agreement which he recog- nized as the basis of scientific advance. Both his logical and his metaphysical studies were thus undertaken as the pre-requisites of a practical theory of human development. Though he believed that the lower classes were not yet ripe for socialism, with the principles of which he (unlike James Mill and

Bentham) was in general agree- ment, his whole life was devoted to the amelioration of the conditions of the working classes. This fact, no doubt, should be taken into account in any detailed criticism of the philosophic work ; it was taken up not as an end but as ancillary to a social and ethical system. Reference to the articles on Logic, Metaphysics, &c, will show that subsequent criticism, however much it has owed by way of stimulus to Mill's strenuous rationalism, has been able to point to much that is inconsistent, inadequate and even superficial in his

writings. Two main intellectual movements from widely different standpoints have combined to diminish his influence. On the one hand there has arisen a school of thinkers of the type of Thomas Hill Green, who have brought to bear on his metaphysical views the idealism of modern German thinkers. On the other hand are the evolutionists, who have substituted for the utilitarian ideal of the " greatest happiness " those of " race-preservation " and the " sur- vival of the fittest " (see Ethics, ad. fin. ; Spencer). In the sphere of psychology, likewise— e.g. in connexion with Mill's doctrine of Association of Ideas {q.v.) and the phrase " Mental Chemistry," by which he sought to meet the problems which Associationism left unsolved — modern criticism and the experimental methods of the psycho-physiological school have set up wholly new criteria, with a new terminology and different fields of investigation (see Psychology).

A similar fate has befallen Mill's economic theories. The title of his work, Principles of Political Economy, with some of their Applications to Social Philosophy, though open to criticism, indicated a less narrow and formal conception of the field of the science than had been common amongst his predecessors. He aimed in fact at producing a work which might replace in ordinary use the Wealth of Nations, which in his opinion was " in many parts obsolete and in all imperfect." Adam Smith had invariably associated the general principles of the subject with their applications, and in treating those applications had perpetually appealed to other

and often far larger considerations than pure political economy affords. And in the same spirit Mill desired, whilst incorporating all the results arrived at in the special science by Smith's successors, to exhibit purely economic phenomena in relation to the most advanced conceptions of his own time in the general philosophy of society, as Smith had done in reference to the philosophy of his century. This design he certainly failed to realize. His book is very far indeed from being a " modern Adam Smith." It is an admirably lucid, and even elegant, exposition of the Ricardian economics, the Malthusian theory being of course incorporated with these; but, notwithstanding the introduction of many minor novelties, it is in its scientific substance little or nothing more.

With respect to economic method he shifted his position, yet to the end occupied uncertain ground. In the fifth of his early essays he asserted that the method a priori is the only mode of investigation in the social sciences, and that the method a posteriori " is altogether inefficacious in those sciences as a means of arriving at any considerable body of valuable truth." When he wrote his Logic he had learned from Comte that the a posteriori method — in the form which he chose to call " inverse deduction " — was the only mode of arriving at truth in general sociology; and his ad- mission of this at once renders the essay obsolete. But, unwilling to relinquish the a priori method of his youth, he tries to establish a distinction of two sorts of economic inquiry, one of which, though not the other, can be handled by that method. Sometimes he speaks of political economy as a department " carved out of the general body of the science of society;" whilst on the other hand the title of his systematic work implies a doubt whether political economy is a part of " social philosophy " at all, and not rather a study preparatory and auxiliary to it. Thus, on the logical as well as the dogmatic side, he halts between two opinions. Not- withstanding his misgivings and even disclaimers, he yet remained as to method a member of the old school, and never

passed into the new ” historical ” school.

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Biographical and Critical. — Many of Mill’s letters are published in Mrs Grote’s ‘life of her husband, in Duncan’s Life of Herbert Spencer, in the Memories of Caroline Fox, and in Kingsley s letters. There are also editions of the correspondence with Gustave d’Eichtal and Comte (specially that of Levy-Bruhl, 1899). By far the most illuminating collection is that of Hugh Elliott, Letters of John Stuart Mill (2 vols., 1910), which contains letters to John Sterling, Carlyle, E. Lytton Bulwer (Lord Lytton), John Austin, Alex. Bain, and many leading French and German writers and politicians. These letters are essential to an understanding of Mill’slife and thought, Besides the Autobiography and many references in the writings of Mill’s friends (e.g. Alex. Bain’s Autobiography, 1904), see furthei

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See further Logic (Historical Sketch) ; Psychology ; Association of Ideas. (W. M.; J. M. M.)

MILL (O. Eng. mylen, later myln, or miln, adapted from the late Lat. molina, cf . Fr. moulin, from Lat. mala, a mill, molere, to grind; from the same root, mol, is derived ” meal;” the word appears in other Teutonic languages, cf . Du. molen, Ger. mtihle) , the term given to the apparatus or machinery used in the grind- ing of corn into flour,

and hence applied to similar mechan- ical devices for grinding, crushing to powder, or pulping other substances, e.g. coffee-mill, powder-mill. ” Mill ” was first used of the building containing the apparatus, frequently with a word attached descriptive of the motive power, e.g. wind-mill, water- mill, &c. It was not the early word used of the actual grinding mechanism. The old hand-mill was known as a ” quern,” a word which appears in this sense in many Indo-European languages; the ultimate root is gar-, to grind. ” Quern ” (see Flour) is only remotely connected with ” churn ” (q.v.). The word is also applied to many mechanical devices by which raw material is transformed into a condition ready for use or into a stage preparatory to other processes, e.g. saw-mill, rolling-mill, &c, or still more widely to buildings containing machinery used in manufactures, e.g. cotton-mill. In mining it is applied to various machines used in breaking and crushing the ore (see Ore-Dressing) .

In the engineering industries milling machines constitute a very important class of machine tools, the characteristic of which is that rotary cutters are employed for shaping the metal (see Tools). In coins the ” milling is the serrated edge, called ” crenneling ” by John Evelyn (Discourse on Medals, 1697, p. 225), which is formed on them to prevent clipping and filing. Coins made by the old process of hammering were apt to have irregular edges which invited mutilation; but the introduction of the screw press, which came to be known as a mill (cf. W. Lowndes, Amendm. Silver Coinage, 1695, p. 93), permitted the production of a regular edge with serrations, which in consequence were termed milling. This machine also enabled legends to be impressed round the edges of coins, such as the Decus et tutamen suggested by Evelyn (see W. J. Hocking, Catalogue of the Coins, &c, in the Museum of the Royal Mint, 1906). It was invented about the middle of the 16th century, and has generally been attributed to Guyot Brucher (d. 1556), who was succeeded at the Paris mint by his brother Antoine. Introduced into England by one Eloye Mestrel in

1561, it was used for twelve years, and was then abandoned owing to the opposition of the mint officials to Mestrel, who was executed for counterfeiting and striking money outside the precincts of the Tower of London; but it was again introduced by one Peter Blondeau in 1662, when it permanently superseded hammering. In the United States of America the term ” milling ” or ” milled ” is applied to the raised edge on the face of the coin; this is known in the British mint as ” marking ” (see Mint).

MILLAIS, SIR JOHN EVERETT (1829–1896), English painter, was born at Southampton on the 8th of June 1829, the son of

John William Millais, who belonged to an old Norman family settled in Jersey for many generations, and Emily Mary, nie Evamy, the widow of a Mr Hodgkinson. After his birth the family returned to Jersey, where the boy soon began to sketch. At the age of eight he drew his maternal grandfather. He went to school for a short time, but showed no inclination for study, and was afterwards educated entirely by his mother. In 1835 the family removed to Dinan in Brittany, where he sketched the French officers, to their great amusement, and in 1837, on the family’s return to Jersey, he was taught drawing by a Mr Bissel. In 1838 he came to London, and on the strong recommendation of Sir Martin Archer Shee, P.R.A., his future was decided. He was sent at once to Sass’s school, and entered the Academy schools in 1840. He won a silver medal from the Society of Arts in 1839, and carried off all the prizes at the Royal Academy. He was popular amongst the students, and was called ” the child,” because he wore his boyish costume till long after the usual age. In 1840 and the immediately succeeding years he made the acquaintance of Wordsworth and other interesting and useful people. He was at this time painting small pictures, &c, for a dealer named Thomas, and defraying a great part of the household expenses in Gower Street, where his family lived. In 1846 he exhibited ” Pizarro seizing the Inca of Peru ” at the Royal Academy, and in 1847 “Elgiva seized by the

Soldiers of Odo." In the latter year he competed unsuccessfully at the exhibition of designs for the decoration of the Houses of Parlia- ment, sending a very large picture of " The Widow's Mite," which was afterwards cut up. In the beginning of 1848 he and W. Holman Hunt, dissatisfied with the theory and practice of British art, which had sunk to its lowest and most conventional level, initiated what is known as the Pre-Raphaelite movement, and were joined by Dante Gabriel Rossetti, and afterwards by five others, altogether forming the Pre-Raphaelite Brotherhood. Rossetti was then engaged, under the technical guidance of Hunt, upon his picture of " The Girlhood of Mary Virgin," which, with Hunt's " Light of the World " and Millais's " Christ in the House of His Parents," forms what has been called the trilogy of Pre- Raphaelite art. According to Millais, the Pre-Raphaelites had but one idea — " to present on canvas what they saw in Nature." Millais's first picture on his new principles was a banquet scene from Keats's " Isabella " (1849), and contains all the character- istics of Pre-Raphaelite work, including minute imitation of nature down to the smallest detail, and the study of all persons and objects directly from the originals. The tale was told with dramatic force, and the expression of the heads was excellent. His next important picture, " Christ in the House of His Parents," or "The Carpenter's Shop" (1850), represented a supposed incident in the childhood of our Lord treated in a simply realistic manner, and drew down upon him a storm of abuse from nearly all quarters, religious and artistic. The rest of his more strictly Pre-Raphaelite pictures — " The Return of the Dove to the Ark," " The Woodman's Daughter " and the " Mariana " of 1851, " The Huguenot " and " Ophelia " of 1852, " The Proscribed Royalist " and " The Order of Release " of 1853 — met with less opposition, and established his reputation with the public. Indeed, this may be said to have been accomplished by the " Huguenot " and " Ophelia," the refined sentiment and exquisite execution of which appealed to nearly all who were unprejudiced. The public were also greatly influenced by the splendid champion- ship of Ruskin,

who, in letters to The Times, and in a pamphlet called ” Pre-Raphaelitism,” enthusiastically espoused the cause of the Brotherhood. In 1851 Millais, who had refused to read Modern Painters, where the supposed principles of the Brother- hood were first recommended, became acquainted with Ruskin, and in 1853 went to Scotland with him and Mrs Ruskin, the latter of whom sat for the woman in ” The Order of Release.” He made several designs for Ruskin, and painted his portrait. In 1855 Millais exhibited ” The Rescue,” a scene from a fire, which drew great attention, from the frantic expression of the mother and the brilliant painting of the glare. In the Paris Exhibition of this year he was represented by ” The Order of Release,” ” Ophelia ” and ” The Return of the Dove.” This was also the

year of his marriage with Mrs Ruskin (Euphemia Chalmers, daughter of Mr George Gray of BowersweU., Perth), who had obtained a decree of the nullity of her previous marriage. The newly-wedded couple went to live at Annat Lodge, near Bowers- well, where ” Autumn Leaves,” described by Ruskin as ” the first instance of a perfect twilight,” was painted. This and ” Peace Concluded ” were singled out for special praise by Ruskin in his notes on the Academy Exhibition of 1856, which contained, with other works by Millais, the picture of ” A Blind Girl,” with a beautiful background of Icklesham and its common. The principal pictures of 1857 were ” Sir Isumbras at the Ford,” and ” The Escape of a Heretic,” both of which were violently attacked by Ruskin, who was kinder to the ” Apple-blossoms ” and ,: Vale of Rest ” of 1859, extolling the power of their painting, but still insisting on the degeneracy of the artist. The ” Black Brunswicker ” of i860 was in motive very like the ” Huguenot,” but it was less refined in expression, and a great deal broader in execution, and may be said to mark the end of the period of transition from his minute Pre-Raphaelite manner to the masterly freedom of his

mature style. From i860 to 1869 the invention of Millais was much employed in illustration, especially of Trol- lope's novels, beginning with Framley Parsonage in the Cornhill Magazine. He made altogether eighty-seven drawings for Trollope, and was the cleverest and one of the most prolific of the book illustrators of the 'sixties. He contributed to Moxon's illustrated edition of Tennyson's Poems, and made occasional drawings for Once a Week, the Illustrated London News, Good Words, and other periodicals and books. In 1863 he was elected a Royal Academician. The most important pictures of this and the next few years were " The Eve of St Agnes," remarkable for the painting of moonlight, " Romans leaving Britain " (1865), " Jephthah " (1867), " Rosalind and Celia " (1868), " A Flood," and " The Boyhood of Raleigh " (1870). All these were executed in a very broad and masterly manner. In many of his pictures of this period, such as " The Boyhood of Raleigh," his children were his models, and formed the subject of many more, like "My First Sermon," "My Second Sermon," "Sleeping," " Awake," " Sisters," " The First Minuet," and " The Wolf's Den." He now painted many single figures with more or less sentiment, like " Stella," " Vanessa," and " The Gambler's Wife," with occasionally a' more important composition, like " Pilgrims to St Paul's," and " Victory, O Lord " (exhibited 1871), representing Aaron and Hur holding up Moses' hands (Exod. xvii. 12). With it was exhibited the first and most popular of his pure landscapes, called " Chill October," which was followed at intervals by several others remarkable for literal truth to nature and fine execution. They were all from Perth- shire, where he generally spent the autumn, and included " Scotch Firs " and " Winter Fuel " (painted in 1874), " Over the Hills and Far away," and " The Fringe of the Moor " (1875) and "The Sound of Many Waters" (1876). A later series was painted in the neighbourhood of Murthly, a village in the parish of Little Dunkeld, Perthshire, where he rented a house and shooting from 1881 to 1891. It was to painting nature and the world around him that he principally devoted himself for the last twenty-

five years of his life, abandoning imaginative or didactic themes. To this period belong a number of pictures of children, with fancy titles, like "Cherry Ripe," " Little Miss Muffet," " Bubbles," and others well known by reproductions in black and white and in colour for the illustrated papers; and also some charming studies of girlhood, like " Sweetest eyes were ever seen," and " Cinderella." Amongst his more serious pictures were " The Princes in the Tower " (1878), " The Princess Elizabeth " (1879), two pictures from Scott—" Effie Deans " and " The Master of Ravenswood "— painted for Messrs Agnew in 1877 and 1878, and " The North- West Passage," sometimes regarded as his masterpiece, repre- senting an old mariner (painted from Edward John Trelawney, the friend of Byron) listening to some tale of Arctic exploration in a room overlooking the sea and strewn with charts. " A Yeoman of the Guard " (1877) was perhaps his most splendid piece of colour, and was greatly admired at the Paris Exhibition

of 1878, where it was sent with " Chill October " and three others of his pictures. But perhaps the works of his later years by which he will be most remembered are his portraits — especially his three portraits of Gladstone (1879, 1885 and 1890), and those of John Bright, of Lord Tennyson, and of Lord Beaconsfield, which was left unfinished at his death. He also painted the marquess of Salisbury, Lord Rosebery, the dukes of Devonshire and Argyll, Cardinal Newman, Thomas Carlyle, Sir James Paget, Sir Henry Irving, George Grote, Lord Chief Justice Russell, J. C. Hook, R.A., and himself (Uffizi Gallery, Florence). He drew Charles Dickens after his death. Amongst his finer portraits of women were those of Mrs Bischoffsheim, the duchess of Westminster, Lady Campbell and Mrs Jopling.

No very serious interruption of his usual life as a prosperous English gentleman occurred in these years, except the death of his second son, George, in 1878. In 1875 he went to Holland, one of his few visits to the Continent. In 1879 he left Cromwell Place for a house at Palace Gate, Kensington, which

he built, and where he died. In 1885 he was created a baronet, on the suggestion of Mr Gladstone. In 1892 his health began to break down. After a bad attack of influenza he was troubled with a swelling in his throat, which proved to be due to cancer. He suffered much from depression, but worked when he could, and derived much pleasure in painting several pictures, including ” St Stephen,” ” A Disciple,” ” Speak ! Speak ! ” (which was bought out of the Chantrey Bequest), and ” The Forerunner ” — his last exhibited subject-picture. His finely-characterized portraits of Mr John Hare, the actor, and Sir Richard Quain belong also to his last years. In 1895, in consequence of the illness of Lord (then Sir Frederick) Leighton, he was called upon to preside at the annual banquet of the Royal Academy, and on the death of Lord Leighton he was elected to the presidential chair. He died on the 13th of August 1896, and was buried in St Paul’s Cathedral. The Winter Exhibition of the Royal Academy in 1898 was devoted to his works. The list of his honours at home and abroad is a long one. Millais was one of the greatest painters of his time, and did more than any other to infuse a new and healthy life into British art. He had not the imagination of an idealist, but he could paint what he saw with a force which has seldom been excelled. As a man he was manly, frank and genial, devoted to his art and his family, and very fond of sport, especially hunting, fishing and shooting. He was greatly loved by a very large circle of friends. He was singularly handsome, and had a fine presence. The National Gallery of British Art possesses many of his finest works. He is also represented in the National Gallery, in the National Portrait Gallery, the Victoria and Albert Museum, and in the public galleries at Manchester, Liverpool and Birmingham.

Authorities. — J. G. Millais, Life and Letters, &c; Ruskin’s Modern Painters, Notes on Royal Academy Exhibitions, Pre-Raphaelit- ism, &c; Catalogues of Grosvenor Gallery (summer of 1886); and of Royal Academy (winter of 1898) ; M. H. Spielmann, Millais and his Works (London, 1896); A. L. Baldry, Sir J.

E. Millais, his Art and Influence (London, 1899). (C. Mo.)

MILLAR, ANDREW (1707–1768), British publisher, was born in 1707. About 1729 he started business as a bookseller and publisher in the Strand, London. His own judgment in literary matters was small, but he collected an excellent staff of literary advisers, and did not hesitate to pay what at the time were considered large prices for good material. ” I respect Millar, sir,” said Dr Johnson in 1755, ” he has raised the price of literature.” He paid Thomson £105 for The Seasons, and Fielding a total sum of £700 for Tom Jones and £1000 for Amelia. He was one of the syndicate of booksellers who financed Johnson’s Dictionary, and on him the work of seeing that book through the press mainly fell. He also published the histories of Robertson and Hume. He died at his villa at Kew Green, near London, on the 8th of June 1768.

MILLAU, a town of southern France, capital of an arron- dissement in the department of Aveyron, on the right bank of the Tarn at its confluence with the Dourbie, 74 m. N. of Beziers on the Southern railway. Pop. (1906), 16,853. Millau lies in a,

rich valley 1200 ft. above the sea surrounded by the spurs of the Levezou, Causse Noir and Larzac ranges. The streets are narrow and some of the houses of great antiquity, but the town is surrounded by spacious boulevards. One of its squares is bordered on two sides by wooden galleries supported on stone columns. The only buildings of special interest are the Roman- esque church of Notre Dame, restored in the 16th century, and the fine Gothic belfry of the old hotel de ville. Millau is seat of a sub-prefect, and possesses tribunals of first instance and of commerce, a board of trade-arbitrators, a chamber of commerce and a communal college. The principal industry is the manu- facture of gloves, and various

branches of the leather industry are carried on. The chief articles of trade are skins, wool, wine and Roquefort cheese.

In the middle ages Millau was the seat of a viscounty held by the counts of Barcelona and afterwards by the counts of Armagnac. In the 16th century it became one of the leading strongholds of Calvinism in southern France. In 1620 it revolted against Louis XIII., and after its submission Richelieu caused its fortifications to be dismantled. The edict of Nantes hastened the decline of the town, which did not recover its prosperity till after the Revolution.

MILLBURY, a township of Worcester county, Massachusetts, on the Blackstone river, 5 m. S.S.E. of Worcester. Pop. (1890), 4428; (1900) 4460 (1176 foreign-born); (1905, state census) 4631; (1910) 4740. Area, 15-79 sq. m. Millbury is served by the New York, New Haven & Hartford, and the Boston & Albany railways, and by electric interurban railways. It lies for the most part in the valley of the Blackstone river, from which water-power is derived for its mills; among its manufactures are cotton, linen, felt and woollen goods, hemp thread, and foundry and machine-shop products. The municipality owns and operates the waterworks and electric-lighting plant. Millbury was formed in 1813 from the North Parish of Sutton; in 1851 a part of Auburn was annexed to the township.

MILLEDGEVILLE, a city and the county-seat of Baldwin county, in the central part of Georgia, U.S.A., on the Oconee river, at the head of navigation, 32 m. E.N.E. of Macon. Pop. (1890), 3322; (1900), 4219 (2663 negroes); (i9ro), 4385. It is served by the Georgia and the Central of Georgia railways. Milledgeville is situated in the Cotton Belt, and its principal industry is the preparation of cotton for the markets. The importance of the place, however, is mainly educational and historical. It is the seat of the Middle Georgia Military and Agricultural College, which occupies the old capitol building, and of the Georgia Normal and Industrial

College for girls (1889; enrolment 1908-1909, 653), which is a part of the University of Georgia, and occupies the site of the old state penitentiary. About 2 m. north-west of Milledgeville is the state juvenile reformatory; 2 m. south of the city are the state asylums for white and negro insane; and 3 m. north-west is the state prison farm. Milledgeville was founded in 1803, and was named in honour of John Milledge (1757-1818), a representative in Congress in 1792-1793 and 1795-1802, governor of Georgia in 1802-1806, a United States senator in 1806-1809, and a benefactor of the state university. In 1804 it was made the seat of the state government in place of Louisville (capital in 1 795-1 804; pop. in 1900, roog), a dignity it held until 1868. The city was first chartered in 1836. Although admirably situated for trade and manufacturing, Milledgeville was surpassed in both by Macon, which became the commercial emporium of middle Georgia; but it was a favourite place of residence for the wealthy and cultivated class of Georgians before the Civil War. It was seized by General William T. Sherman on the 23rd of November 1864. In order to remove the state documents beyond reach of the enemy, Governor Joseph E. Brown called upon the convicts in the penitentiary for aid, granting them pardons in return for their services.

MILLENNIUM (a pseudo-Latin word formed on the analogy of biennium, triennium, from Lat. milk, a thousand, and annus, year), literally a period of a thousand years. The term is specially used of the period of 1000 years during which Christ,

as has been believed, would return to govern the earth in person. Hence it is used to describe a vague time in the future when all flaws in human existence will have vanished, and perfect good- ness and happiness will prevail. The attribution of a mystic significance to the millennium-period, though perhaps not prominent in that theory of Christian eschatology to which the names Millenarianism and Chiliasm (from Gr. x l ^”*s, a thousand) are given, is quite common in non-Christian religions and cosmological systems.

Faith in the nearness of Christ's second advent and the establishing of his reign of glory on the earth was undoubtedly a strong point in the primitive Christian Church. In the antici- pations of the future prevalent amongst the early Christians (c. 50-150) it is necessary to distinguish a fixed and a fluctuating element. The former includes (1) the notion that a last terrible battle with the enemies of God- was impending; (2) the faith in the speedy return of Christ; (3) the conviction that Christ will judge all men, and (4) will set up a kingdom of glory on earth. To the latter belong views of the Antichrist, of the heathen world- power, of the place, extent, and duration of the earthly kingdom of Christ, &c. These remained in a state of solution; they were modified from day to day, partly because of the changing circum- stances of the present by which forecasts of the future were regulated, partly because the indications — real or supposed— of the ancient prophets always admitted of new combinations and constructions. But even here certain positions were agreed on in large sections of Christendom. Amongst these was the expectation that the future kingdom of Christ on earth should have a fixed duration — according to the most prevalent opinion, a duration of one thousand years. From this fact the whole ancient Christian eschatology was known in later times as " chiliasm " — a name which is not strictly accurate, since the doctrine of the millennium was only one feature in its scheme of the future.

1. This idea that the Messianic kingdom of the future on earth should have a definite duration has — like the whole eschatology of the primitive Church — its roots in the Jewish apocalyptic literature, where it appears at a comparatively late period. At first it was assumed that the Messianic kingdom in Palestine would last for ever (so the prophets; cf. Jer. xxiv. 6; Ezek. xxxvii. 25; Joel iv. 20; Dan. vi. 27; Sibyll. iii. 49 seq., 766; Psalt. Salom. xvii. 4; Enocn lxii. 14), and this seems always to have been the most widely accepted view (John xii. 34). But from a comparison of prophetic passages of

the Old Testament learned apocalyptic writers came to the conclusion that a dis- tinction must be drawn between the earthly appearance of the Messiah and the appearance of God Himself amongst His people and in the Gentile world for the final judgment. As a necessary consequence, a limited period had to be assigned to the Messianic kingdom. According to the Apocalypse of Baruch (xl. 3) this kingdom will last.” donee finiatur mundus corruptionis.” In the Book of Enoch (xci. 12) “a week ” is specified, in the Apoca- lypse of Ezra (vii. 28 seq.) four hundred years. This figure, corresponding to the four hundred years of Egyptian bondage, occurs also in the Talmud (Sanhedrin 99a). But this is the only passage; the Talmud has no fixed doctrine on the point. The view most frequently expressed there (see Von Otto in Hilgenf eld’s Zeitschrijt, 1877, p. 527 seq.) is that the Messianic kingdom will last for one thousand (some said two thousand) years. ” In six days God created the world, on the seventh He rested. But a day of God is equal to a thousand years (Ps. xc. 4). Hence the world will last for six thousand years of toil and labour; then will come one thousand years of Sabbath rest for the people of God in the kingdom of the Messiah.” This idea must have already been very common in the first century before Christ. The combination of Gen. i., Dan. ix. and Ps. xc. 4 was peculiarly fascinating.

Nowhere in the discourses of Jesus is there a hint of a limited duration of the Messianic kingdom. The apostolic epistles are equally free from any trace of chiliasm (neither 1 Cor. xv. 23 seq. nor r Thess. iv. 16 seq. points in this direction). In Revelation however, it occurs in the following shape (ch. xx.). After

Christ has appeared from heaven in the guise of a warrior, and vanquished the antichristian world- power, the wisdom of the world and the devil, those who have remained steadfast in the time of the last

catastrophe, and have given up their lives for their faith, shall be raised up, and shall reign with Christ on this earth as a royal priesthood for one thousand years. At the end of this time Satan is to be let loose again for a short season; he will prepare a new onslaught, but God will miraculously destroy him and his hosts. Then will follow the general resurrection of the dead, the last judgment, and the creation of new heavens and a new earth. That all believers will have a share in the first resurrection and in the Messianic kingdom is an idea of which the author of Revelation knows nothing. The earthly kingdom of Christ is reserved for those who have endured the most terrible tribulation, who have withstood the supreme effort of the world- power — that is, for those who are actually members of the church of the last days. The Jewish expectation is thus considerably curtailed, as it is also shorn of its sensual attractions. ” Blessed and holy is he that hath part in the first resurrection; on such the second death hath no power; but they shall be priests of God and of Christ, and shall reign with Him a thousand years.” Other ancient Christian authors were not so cautious. Accepting the Jewish apocalypses as sacred books of venerable antiquity, they read them eagerly, and transferred their contents bodily to Christianity. Nay more, the Gentile Christians took possession of them, and just in proportion as they were neglected by the Jews — who, after the war of Bar-Cochba, became indifferent to the Messianic hope and hardened themselves once more in devotion to the law — they were naturalized in the Christian com- munities. The result was that these books became ” Christian ” documents; it is entirely to Christian, not to Jewish, tradition that we owe their preservation. The Jewish expectations are adopted for example, by Papias, by the writer of the epistle of Barnabas, and by Justin. Papias actually confounds expressions of Jesus with verses from the Apocalypse of Baruch, referring to the amazing fertility of the days of the Messianic kingdom (Papias in Iren. v. 33). Barnabas (Ep. 15) gives us the Jewish theory (from Gen. i. and Ps. xc. 4) that the present condition of the world is to

last six thousand years from the creation, that at the beginning of the Sabbath (the seventh millennium) the Son of God appears, to put an end to the time of ” the unjust one,” to judge the ungodly and renew the earth. But he does not indulge, like Papias, in sensuous descriptions of this seventh millennium; to Barnabas it is a time of rest, of sinlessness, and of a holy peace. It is not the end, however; it is followed by an eighth day of eternal duration — ” the beginning of another world.” So that in the view of Barnabas the Messianic reign still belongs to ovtos 6 atcoe. Justin (Dial. 80) speaks of chiliasm as a necessary part of complete orthodoxy, although he knows Christians who do not accept it. He believes, with the Jews, in a restoration and extension of the city of Jerusalem; he assumes that this city will be the seat of the Messianic kingdom, and he takes it as a matter of course that there all believers (here he is at one with Barnabas) along with patriarchs and prophets will enjoy perfect felicity for one thousand years. That a philosopher like Justin, with a bias towards an Hellenic con- struction of the Christian religion, should nevertheless have accepted its chiliastic elements is the strongest proof that these enthusiastic expectations were inseparably bound up with the Christian faith down to the middle of the 2nd century. And another proof is found in the fact that even a speculative Jewish Christian like Cerinthus not only did not renounce the chiliastic hope, but pictured the future kingdom of Christ as a kingdom of sensual pleasures, of eating and drinking and marriage festivities (Euseb. H. E. iii. 28, vii. 25).

After the middle of the 2nd century these expectations were gradually thrust into the background. They would never have died out, however, had not circumstances altered, and a new mental attitude been taken up. The spirit of philosophical and theological speculation and of ethical reflection, which began to spread through the churches, did not know what to make of the dd hopes of the future. To a new generation they seemed pa

ltry,

earthly and fantastic, and far-seeing men had good reason to regard them as a source of political danger. But more than this, these wild dreams about the glorious kingdom of Christ began to disturb the organization which the churches had seen fit to intro- duce. In the interests of self-preservation against the world, the state and the heretics, the Christian communities had formed themselves into compact societies with a definite creed and con- stitution, and they felt that their existence was threatened by the white heat of religious subjectivity. So early as the year 170, a church party in Asia Minor — the so-called Alogi — rejected the whole body of apocalyptic writings and denounced the book of Revelation as a book of fables. All the more powerful was the reaction. In the so-called Montanistic controversy (c. 160-220) one of the principal issues involved was the continuance of the chiliastic expectations in the churches. The Montanists of Asia Minor defended them in their integrity, with one slight modifica- tion: they announced that Pepuza, the city of Montanus, would be the site of the New Jerusalem and the millennial kingdom. After the Montanistic controversy chiliastic views were more and more discredited in the Greek Church; they were, in fact, stigma- tized as ” Jewish ” and consequently ” heretical.” It was the Alexandrian theology that superseded them; that is to say, Neo- Platonic mysticism triumphed over the early Christian hope of the future, first among the ” cultured,” and then, when the theology of the ” cultured ” had taken the faith of the ” un- cultured ” under its protection, amongst the latter also. About the year 260 an Egyptian bishop, Nepos, in a treatise called e\e7xos aWriyopiaruv, endeavoured to overthrow the Origenistic theology and vindicate, chiliasm by exegetical methods. Several congregations took his part; but ultimately Dionysius, bishop of Alexandria, succeeded in healing the schism and asserting the allegorical interpretation of the prophets as the only legitimate exegesis. During this controversy

Dionysius became convinced that the victory of mystical theology over ” Jewish ” chiliasm would never be secure so long as the book of Revelation passed for an apostolic writing and kept its place among the homolo- goumena of the canon. He accordingly raised the question of its apostolic origin; and by reviving old difficulties, with ingenious arguments of his own, he carried his point. At the time of Eusebius the Greek Church was saturated with prejudice against the book and with doubts as to its canonicity. In the course of the 4th century it was removed from the Greek canon, and thus the troublesome foundation on which chiliasm might have continued to build was got rid of. The attempts of Metho- dius of Tyre at the beginning of the 4th century and Apollinarius of Laodicea about 360 to defend chiliasm and assail the theology of Origen had no result. For many centuries the Greek Church kept Revelation out of its canon, and consequently chiliasm remained in its grave. It was considered a sufficient safeguard against the spiritualizing eschatology of Origen and his school to have rescued the main doctrines of the creed and the regula fidei (the visible advent of Christ; eternal misery and hell-fire for the wicked). Anything beyond this was held to be Jewish. It was only the chronologists and historians of the church who, following Julius Africanus, made use of apocalyptic numbers in their calculations, while court theologians like Eusebius entertained the imperial table with discussions as to whether the dining-hall of the emperor — the second David and Solomon, the beloved of God — might not be the New Jerusalem of John’s Apocalypse. Eusebius was not the first who dabbled in such speculations. Dionysius of Alexandria had already referred a Messianic pre- diction of the Old Testament to the emperor Gallienus. But mysticism and political servility between them gave the death- blow to chiliasm in the Greek Church. It never again obtained a footing there; for, although, late in the middle ages, the book of Revelation— by what means we cannot tell — did recover its authority, the Church was by that time so hopelessly trammelled by a magical cultus as

to be incapable of fresh developments. In the Semitic churches of the East (the Syrian, Arabian and Ethiopian), and in that of Armenia, the apocalyptic literature was preserved much longer than in the Greek Church. They were very conservative of ancient traditions in general, and hence

chiliasm survived amongst them to a later date than in Alexandria or Constantinople.

But the Western Church was also more conservative than the Greek. Her theologians had, to begin with, little turn for mystical speculation; their tendency was rather to reduce the gospel to a system of morals. Now for the moralists chiliasm had a special significance as the one distinguishing feature of the gospel, and the only thing that gave a specifically Christian character to their system. This, however, holds good of the Western theologians only after the middle of the 3rd century. The earlier fathers, Irenaeus, Hippolytus, Tertullian, believed in chiliasm simply because it was a part of the tradition of the church and because Marcion and the Gnostics would have nothing to do with it. Irenaeus (v. 28, 29) has the same conception of the millennial kingdom as Barnabas and Papias, and appeals in support of it to the testimony of disciples of the apostles. Hip- polytus, although an opponent of Montanism, was nevertheless a thorough- going millennarian (see his book De Antichristo) . Tertullian (cf. especially Adv. Marcion., 3) aimed at a more spiritual conception of the millennial blessings than Papias had, but he still adhered, especially in his Montanistic period, to all the ancient anticipations. It is the same all through the 3rd and 4th centuries with those Latin theologians who escaped the influence of Greek speculation. Commodian, Victorinus Petta- vensis, Lactantius and Sulpicius Severus were all pronounced millennarians, holding by the very details of the

primitive Christian expectations. They still believe, as John did, in the return of Nero as the Antichrist; they still expect that after the first resurrection Christ will reign with his saints ” in the flesh ” for a thousand years. Once, but only once (in the Gospel of Nicodemus), the time is reduced to five hundred years. Victori- nus wrote a commentary on the Apocalypse of John; and all these theologians, especially Lactantius, were diligent students of the ancient Sibylline oracles of Jewish and Christian origin, and treated them as divine revelations. As to the canonicity and apostolic authorship of the Johannine Apocalypse no doubts were ever entertained in the West; indeed an Apocalypse of Peter was still retained in the canon in the 3rd century. That of Ezra, in its Latin translation, must have been all but a canoni- cal book — the numbers of extant manuscripts of the so-called 4 Ezra being incredibly great, while several of them are found in copies of the Latin Bible at the beginning of the 16th century. The Apocalypse of Hermas was much read till far through the middle ages, and has also kept its place in some Bibles. The apocalyptic ” Testamenta duodecim patriarcharum ” was a favourite reading-book ; and Latin versions of ancient apocalypses are being continually brought to light from Western libraries {e.g. the Assumptio Mosis, the Ascensio Jesajae, &c). All these facts show how vigorously the early hopes of the future main- tained themselves in the West. In the hands of moralistic theologians, like Lactantius, they certainly assume a somewhat grotesque form, but the fact that these men clung to them is the clearest evidence that in the West millennarianism was still a point of ” orthodoxy ” in the 4th century.

This state of matters, however, gradually disappeared after the end of the 4th century. The change was brought about by two causes — first, Greek theology, which reached the West chiefly through Jerome Rufinus and Ambrose, and, second, the new idea of the church wrought out by Augustine on the basis of the altered political situation of the church. Augustine was the first who ventured to

teach that the catholic church, in its empirical form, was the kingdom of Christ, that the millennial kingdom had commenced with the appearing of Christ, and was therefore an accomplished fact. By this doctrine of Augustine's, the old millennarianism, though not completely extirpated, was at least banished from the official theology. It still lived on, however, in the lower strata of Christian society; and in certain undercurrents of tradition it was transmitted from century to century. At various periods in the history of the middle ages we encounter sudden outbreaks of millennarianism, sometimes as the tenet of a small sect, sometimes as a far-reaching movement. And, since it had been suppressed, not, as in the East, by

mystical speculation, its mightiest antagonist, but by the political church of the hierarchy, we find that wherever chiliasm appears in the middle ages it makes common cause with all enemies of the secularized church. It strengthened the hands of church democracy; it formed an alliance with the pure souls who held up to the church the ideal of apostolic poverty; it united itself for a time even with mysticism in a common opposition to the supremacy of the church; nay, it lent the strength of its convic- tions to the support of states and princes in their efforts to break the political power of the church. It is sufficient to recall the well-known names of Joachim of Floris, of all the numerous Franciscan spiritualists, of the leading sectaries from the 13th to the 15th century who assailed the papacy and the secularism of the church — above all, the name of Occam. In these men the millennarianism of the ancient church came to life again; and in the revolutionary movements of the 15th and 16th centuries — especially in the Anabaptist movements — it appears with all its old uncompromising energy. If the church, and not the state, was regarded as Babylon, and the pope declared to be the Anti- christ, these were legitimate inferences from the ancient traditions and the actual position of the church. But, of course, the new chiliasm was not in every respect

identical with the old. It could not hold its ground without admitting certain innovations. The ” everlasting gospel ” of Joachim of Floris was a different thing from the announcement of Christ’s glorious return in the clouds of heaven; the ” age of the spirit ” which mystics and spiritualists expected contained traits which must be characterized as ” modern “; and the ” kingdom ” of the Anabaptists in Munster was a Satanic caricature of that kingdom in which the Christians of the 2nd century looked for a peaceful Sabbath rest. Only we must not form our ideas of the great apocalyptic and chiliastic movement of the first decades of the 16th century from the rabble in Munster. There were pure evangelical forces at work in it; and many Anabaptists need not shun com- parison with the Christians of the apostolic and post-apostolic ages.

The German and Swiss Reformers also believed that the end of the world was near, but they had different aims in view from those of the Anabaptists. It was not from poverty and apocalypticism that they hoped for a reformation of the Church. In contrast to the fanatics, after a brief hesitation they threw millen- narianism overboard, and along with it all other ” opiniones Judaicae.” They took up the same ground in this respect which the Roman Catholic Church had occupied since the time of Augustine. How millennarianism nevertheless found its way, with the help of apocalyptic mysticism and Anabaptist influences into the churches of the Reformation, chiefly among the Reformed sects, but afterwards also in the Lutheran Church, how it became incorporated with Pietism, how in more recent times an exceedingly mild type of ” academic ” chiliasm has been developed from a belief in the verbal inspiration of the Bible, how finally new sects are still springing up here and there with apocalyptic and chiliastic expectations — these are matters which cannot be fully entered upon here.

See Schtirer, Lehrbuch der neutestamentlichen Zeitgeschichte (1874), §§ 28, 29; Corrodi, Kritische Geschichte des Chiliasmus (1781); R. H. Charles, The Doctrine of a Future Life (1899); Book of the

Secrets of Enoch (1896), pp. xxvii-xxx, ch. xxxii. 2-xxxiii. 2; Apocalypse of Baruch (1896), xxix. 3-8 (notes); Book of Enoch (index, s.v. ” Messianic Kingdom”); Bousset, Religion des Juden- thums (1903), 273-276; C. A. Briggs, The Messiah of the Apostles, p. 284 seq. ; Sabatier, Les Origines litteraires et la composition de l’ Apocalypse de St Jean (1887); Spitta, Die Offenbarung des Johannes untersucht (1889). See also Eschatology and works there quoted.

(A. Ha.)

MILLER, HUGH (1802-1856), Scottish geologist and man of letters, was born in humble circumstances at Cromarty, on the 10th of October 1802; his father, Hugh Miller, a seaman, was drowned when he was but five years old. His primary education was acquired at a dame’s school and afterwards at the parish school, and at the age of six he had learned that ” the art of reading is the art of finding stories in books.” At the age of twelve he began to write verses. Two of his mother’s brothers, James and ” Sandy ” Wright, hard-working men at Cromarty,

offered to assist him to enter the ministry, but he felt no call to the sacred office, and from 1820 to 1822 he was apprenticed to a stone-mason. During the next few years he obtained employ- ment as a journeyman mason in Edinburgh, Inverness and various other parts of Scotland. The writing of verses occupied his leisure hours, and in 1826 he sent to the Scotsman an ” Ode on Greece ” which was refused. It was not until 1829 that he met with his first success in the publication of Poems written in the Leisure Hours of a Journeyman Mason. These were printed and issued from the office of the Inverness Courier. Miller now turned his attention to prose and contributed many essays to the Inverness Courier. As remarked by Sir A. Geikie, ” These made so favourable an impression that they were soon

afterwards reprinted separately. They marked the advent of a writer gifted with no ordinary powers of narration and with the command of a pure, nervous and masculine style."

At the age of thirty-two he was still a stone-mason, but in the latter part of 1834 he was offered a post as accountant in the Commercial Bank of Scotland, and was almost immediately transferred to the Cromarty branch. His prose writings had now attracted much notice, and he next issued in 1835 Scenes and Legends of the North of Scotland, or the traditional history of Cro- marty, in which he introduced some memoranda on the geology. This work met with a cordial reception. Miller, while still a stone-mason, had observed the abundant fossils in the Jurassic shales on the shores of Ethie, but it was not until 1830 that he first obtained remains of fossil fishes in the Old Red Sandstone. These for many years he collected and studied as far as he could, and in 1837 some of his specimens were brought to the notice of R. I. Murchison and Professor Agassiz. In the following year he was in communication with Murchison and his career as a geologist was definitely opened.

In 1837 Miller married Lydia Falconer Frazer (i8ii?-i876), a lady of good position and great natural ability, whom he had met six years previously. He set up his household in Cromarty, on a salary of sixty pounds a year, aided by the small sums he then earned by literary work; and his wife took a few pupils. Mrs Miller eventually became well known under the pseudonym of Mrs Harriet Myrtle as author of the Ocean Child (1857) and other story-books for children.

Soon after his marriage, Miller became greatly stirred by the internal dissensions in the Church of Scotland, of which he was a staunch member and he published two pamphlets which brought him to the notice of some of the prominent members of the liberal church party. In 1839 he went by invitation to Edinburgh to edit a new Whig newspaper, the Witness, which was intended to support the views of

those who after the disruption in 1843 formed the Free Church. The paper rapidly attained a large circulation; and this was no doubt largely due to his own literary and scientific essays. In 1840 he contributed a series of articles on The Old Red Sandstone, and these were reprinted in book form in the following year. The charm of this work was widely appreciated, as was also the natural sagacity shown in the descriptions and restora- tions of some of the fossil fishes. His Footprints of the Creator was published in 1849, and My Schools and Schoolmasters in 1854. He was engaged on the final proofs of his Testimony of the Rocks on the day of his death. During the last year of his life he suffered from inflammation of the lungs; and the strain of ill-health proving too severe, he died by his own hand in Edinburgh on the 23rd of December 1856. By request of his wife, The Cruise of the Betsey, with Rambles of a Geologist (1858) previously printed only in the Witness newspaper was published under the editorship of the Rev. W. S. Symonds.

In memory of Hugh Miller a monument was erected by public subscription in i860 at Cromarty; and the cottage in which he was born was acquired at a later period by his son Hugh. In it have been placed part of his library, a set of the Witness newspaper, some letters addressed to him, and a number of geo- logical specimens, including many referred to in his Old Red Sandstone. On the 22nd of August 1902 the centenary of his birth was celebrated at Cromarty, and was attended by scientific representatives from all parts of the world.

His elder son, Hugh Miller (1850-1896), passed through the Royal School of Mines and joined the Geological Survey in England in 1873; afterwards he was transferred to Scotland and surveyed the country around Cromarty and other parts of Ross-shire and Sutherlandshire. He was author of Landscape Geology, 1891.

See The Life and Letters of Hugh Miller, by Peter Bayne (2 vols., 1871) ; Hugh Miller; his work and

influence, address by Sir A. Geikie, at the centenary celebration. (H. B. Wo.)

MILLER, JOAQUIN (Cincinnatus Heine) (1841-), American poet, was born in Indiana, on the 10th of November 1 84 1, and was educated for the law. After some experiences of mining and journalism in Idaho and Oregon, he settled down in 1866 as judge in Grant county, Oregon, and during his four years' tenure of this post he began to write verse. In 1870 he travelled in Europe, and in 1871 he published his first volume of poetry, full of tropical passion, Songs of the Sierras, on which his reputation mainly rests. His Songs of the Sunlands (1873) followed in the same vein, and after other volumes had appeared, his Collected Poems were published in 1882. He also wrote plays, The Danites in the Sierras having some success as a sensational melodrama. On his return from Europe he became a journalist in Washington, but in 1887 returned to California. His pen- name, " Joaquin Miller," by which he is known, was assumed by him when he published his first book, in consequence of his having written an article in defence of Joaquin Murietta, the Mexican brigand.

Revised editions oi his Complete Poetical Works appeared at San Francisco in 1902.

MILLER, JOE (Joseph or Josias((1684-1738), English actor, first appears in the cast of Sir Robert Howard's Committee at Drury Lane in 1709 as Teague. Trinculo in The Tempest, the First Grave-digger in Hamlet and Marplot in The Busybody, were among his many favourite parts. He is said to have been a friend of Hogarth. He died on the 16th of August 1738. After his death, John Mottley (169 2-1 7 50) brought out a book called Joe Miller's Jests, or Wit's Vade Mecum (1739), a collection of contemporary and ancient coarse witticisms, only three of which are told of Miller. Owing to the quality of the jokes in Mottley's book, their number increasing with each of the many subsequent editions, any time-worn jest has, somewhat unjustly, come to be called " a Joe Miller."

MILLER, SAMUEL FREEMAN (1816-1890), American jurist, was born in Richmond, Kentucky, on the 5th of April 1816, of Pennsylvania- German stock. He was brought up on a farm, was a clerk in a drug-store, graduated from the medical department of Transylvania University in 1838, and practised medicine in Barboursville, Kentucky, until 1847. In that year he was admitted to the bar, and entered politics as a Whig. His anti- slavery sympathies induced him to settle in Iowa, where in 1850 he freed his slaves and began to practise law in Keokuk, and he soon became a leader of the Republican party in the state. In 1862 he succeeded Justice Peter V. Daniel (1784-1860), as a justice of the U.S. Supreme Court, and served until his death in Washington, D.C., on the 13th of October 1890, when he was senior justice. Miller was a man of great mental force and individuality, and his judgments carried great weight. In 1877 he was a member of the electoral commission, which adopted his' motion that Congress could not " go behind the returns " as properly accredited by state officials. He was a prominent member of the Unitarian Church and for three years was president of its national conference. He published a volume of Lectures on the Constitution of the United States (New York, 1891).

See Wm. A. Maury, in The Juridical Review of Edinburgh (for January 1 891), and Chas. M. Gregory, in Yale Law Journal (for April 1908).

MILLER, WILLIAM (1782-1849), leader of the Second Adventists in America, was born on the 5th of February 1782 at Pittsfield, Massachusetts. He was a recruiting officer at the beginning of the War of 181 2, and after Plattsburg he was promoted captain, retiring from the army in 1815. About 1816 he settled in Low Hampton, Washington county, New York.

He now joined the Baptist Church at Low Hampton, and, after two years of minute study of the Bible,

about 1818 became a Second Adventist. In 1831 he began to lecture, arguing that the ” two thousand three hundred days ” of Daniel viii. 14 meant 2300 years, and that these years began with Ezra’s going up to Jerusalem in 457 B.C., and therefore came to an end in 1843, and urging his hearers to make ready for the final coming of Christ in that year. To his many followers, after the year 1 843 had passed, he proclaimed that 1844 was the year, that his error was due to following Hebrew instead of Roman chronology, and that the 22nd of October was to be the day. There was renewed excite- ment among Miller’s followers; many of them left their business, and in white muslin robes, on house tops and hills, awaited the epiphany. In spite of disappointment, many still believed with him that the time was near. He returned to Low Hampton and died there on the 20th of December 1849. The Adventists or Millerites, who were formed into a single body in a convention called by him in April 1845, have since separated into several sects: the Evangelical Adventists (1147 in the United States in 1908), who believe in everlasting punishment; the Seventh Day Adventists (64,332), who observe the seventh day, and practise the sacrament of foot-washing; the Advent Christians (26,500), the Churches of God in Jesus Christ (2872), and the Life and Advent Union (3800). Their total number in the United States in 1908 was about 99,300. Miller published in 1833 a pamphlet which was the basis of his lectures; these were published in 1842 as Evidence from Scripture and History of the Second Coming of Christ about the Year 1843.

See Sylvester Bliss, Memoirs of William Miller (Boston, 1853); James White, Sketches of the Christian Life and Public Labors of William Miller (Battle Creek, 1875); and Edward Eggleston’s novel, End of the World (1872).

MILLER, WILLIAM (1795-1861), British soldier, who took a prominent part in the South American Wars of Liberation, entered the British artillery service in 181 1, and till 1814 he was continuously on active service with Wellington’s army in the Peninsula. In

the latter year he accompanied the ill-fated New Orleans expedition. After the general peace he travelled for two years about Europe, and then went to South America. The war which culminated in the expulsion of the Spaniards was just breaking out, and he took command in the Chilean artillery, with which he served during the Chilean part of the war. As a major he commanded the marines on Cochrane's vessel, the " O'Higgins." In 1821 he landed in Peru, to assist General San Martin against the Spanish General Canterac. He was made general of brigade, and became very intimate with Simon Bolivar. He rendered the most conspicuous services at Junin (Aug. 6, 1824), and his regiment, the " Hussars of Junin," covered itself with glory in the decisive victory of Ayacucho (Dec. 9, 1824). From 1830 to 1839 he filled various high military and political offices in Peru. In the latter year he was involved in the fall of Santa Cruz, and went into exile. For some years he filled the post of British Consul-General of the Pacific Coast. He died on board H.M.S. " Naiad " at Callao, on the 31st of October 1861.

See the Memoirs published by his brotherJohnMiller(London,1827).

MILLER, WILLIAM (1796-1882), Scottish line-engraver, was born in Edinburgh on the 28th of May 1796. After studying in London under George Cook, a pupil of Basire's, he returned to Edinburgh. He executed plates after Thomson of Duddingston, Macculloch, D. O. Hill, Sir George Harvey, and other Scottish landscapists, but his chief works were his transcripts from Turner. The first of these was the Clovelly (1824), of The Southern Coast, a publication undertaken by George Cook and his brother William B. Cook, to which Miller also contributed the Combe Martin and the Portsmouth. He was engaged on the illustrations of England and Wales, 1827-1838; of The Rivers of France, 1833-1835; of Roger's Poems, 1834; and very largely on those of The Prose and Poetical Works of Sir Walter Scott, 1834. In The Pro- vincial Antiquities and Picturesque Scenery of Scotland, 1826, he executed a

few excellent plates after Thomson and Turner. Among his larger engravings of Turner's works may be mentioned "The Grand Canal, Venice"; "The Rhine, Osterprey and

Feltzen "; " The Bell Rock "; " The Tower of London "; and " The Shepherd." The art of William Miller was warmly appre- ciated by Turner himself, and Ruskin pronounced him to be on the whole the most successful translator into line of the paintings of the greatest English landscapist. His renderings of complex Turnerian sky-effects are especially delicate and masterly. To- wards the end of his life Miller abandoned engraving and occupied his leisure in the production of water-colours, many of which were exhibited in the Royal Scottish Academy, of which he was an honorary member. He resumed his burin, however, to produce two final series of vignettes from drawings by Birket Foster illustrative of Hood's Poems, published by Moxon in 1871. Miller, who was a Quaker, died on the 20th of January 1882.

MILLER, WILLIAM HALLOWES (1801-1880), British mineralogist and crystallographer, was born at Velindre near Llandovery, Carmarthenshire, on the 6th of April 1801. He was educated at St John's College, Cambridge, where he gradu- ated in 1826 as fifth wrangler, and became a fellow in 1829. For a few years he was occupied as a college tutor and during this time he published treatises on hydrostatics and hydro- dynamics. He also gave special attention to crystallography, and on the resignation of W. Whewell he succeeded in 1832 to the professorship of mineralogy, a post which he occupied until 1870. His chief work, on Crystallography, was published in 1838. He was elected F.R.S. in 1838. In 1852 he edited a new edition of H. J. Brooke's Elementary Introduction to Miner- alogy. He assisted in 1843 the committee appointed to super- intend the construction of the new Parliamentary standards of length and weight (see Phil. Trans., 1856). He died in Cambridge on the 20th of May 1880.

MILLERAND, ALEXANDRE (1859-), French socialist and politician, was born in Paris on the 10th of February 1859. He was educated for the bar, and made his reputation by his defence, in company with Georges Laguerre, of Ernest Rcche and Duc-Quercy, the instigators of the strike at Decazeville in 1883; he then took Laguerre's place on M. Clemenceau's paper, La Justice. He was elected to the Chamber of Deputies for the department of the Seine in 1885 as a radical socialist. He was associated with MM. Clemenceau and Camille Pelletan as an arbitrator in the Carmaux scrike (1892). He had long had the ear of the Chamber in matters of social legislation, and after the Panama scandals had discredited so many politicians his influence grew. He was chief of the Socialist left, which then mustered sixty members, and edited until 1896 their organ in the press, La Petite Republique. His programme included the collective ownership of the means of production and the international association of labour, but when in June 1899 he entered Waldeck-Rousseau's cabinet of " republican defence " as minister of commerce he limited himself to practical reforms, devoting his attention to the improvement of the mercantile marine, to the development of trade, of technical education, of the postal system, and to the amelioration of the conditions of labour. Labour questions were entrusted to a separate department, the Direction du Travail, and the pension and insurance office was also raised to the status of a " direction. " The introduction of trades-union representatives on the Supreme Labour Council, the organization of local labour councils, and the instructions to factory inspectors to put themselves in communication with the councils of the trades-unions, were valuable concessions to labour, and he further secured the rigorous application of earlier laws devised for the protection of the working-classes. His name was especially associated with a project for the establishment of old age pensions, which became law in 1905. He became in 1898 editor of La Lanterne. His influence with the extreme Socialists had already declined, for it was said that his departure

from the true Marxist tradition had disintegrated the party.

For his administration in the Waldeck-Rousseau cabinet see A. Lavy, VCEuvre de Millerand (1902); his speeches between 1899 and 1907 were published in 1907 as Travail et travailleurs,

MILLERITE, a mineral consisting of nickel sulphide, NiS. Crystals belong to the rhombohedral system and have the form

of slender needles arranged in divergent groups or of delicate fibres loosely matted together. The colour is brass-yellow and the lustre metallic. Before the chemical composition of the mineral had been determined it had been known as " capillary pyrites " or " hair pyrites " (Ger., Haarkies), and was not distinguished from the capillary forms of pyrites and marcasite: the name millerite was given by W. Hai dinger in 1845, in honour of W. H. Miller. The hardness is 3-3^ and the specific gravity 5-65. There are perfect cleavages parallel to the faces of the rhombohedron (100); and gliding planes parallel to the faces of the rhombohedron (no), on which secon- dary twinning may be readily produced artificially by pressure.

Typical specimens of millerite are found in the coal measures in the neighbourhood of Merthyr Tydvil in South Wales, where the delicate needles and fibres occur with crystals of quartz and pearl-spar in the fissures of septarian nodules of clay- ironstone. Radiating groups of needles are found with ankerite in cavities in haematite in the Sterling mine at Antwerp in Jefferson county, New York. At the Gap mine in Lancaster county, Pennsylvania, the mineral occurs as fibrous encrusting masses with a velvety lustre. The most perfect crystals are those formerly found with calcite, diopside and a bright green chrome-garnet in a nickel mine at Orford in

Sherbrooke county, Quebec. (L. J. S.)

MILLER'S THUMB (Cottus gobio), a small fish, abundant in all rivers and lakes of northern and central Europe with clear water and gravelly bottom. The genus Cottus, to which the miller's thumb belongs, is easily recognized by its broad, flat head, rounded and scaleless body, large pectoral and narrow ventral fins, with two dorsal fins, the anterior shorter than the posterior; the praeoperculum is armed with a simple or branched spine. The species of the genus Cottus are rather numerous, and are Gonfined to the north temperate zone of the globe, the majority being marine, and known by the name of " bullheads." The miller's thumb is confined to fresh water; and only one other freshwater species is found in Europe, C. poecilopus, from rivers of Hungary, Galicia, and the Pyrenees; some others occur in the fresh waters of northern Asia and North America. The miller's thumb is common in all suitable localities in Great Britain, but is extremely rare in Ireland; in the Alps it reaches to an altitude exceeding 7000 ft. Its usual length is from 3 to 5 in. Generally hidden under a stone or in a hollow of the bank, it watches for its prey, which consists of small aquatic animals, and darts when disturbed with extra-ordinary rapidity to some other place of refuge. The female deposits her ova in a cavity under a stone, whilst the male watches and defends them until the young are hatched and able to shift for themselves.

MILLET, FRANCIS DAVIS (1846-), American artist, was born at Mattapoisett, Massachusetts, on the 3rd of November 1846. He was a drummer boy with the Union forces in the Civil War; graduated from Harvard College in 1869; and in 1871 entered the Royal Academy of Fine Arts, Antwerp, where he studied under Van Lerius and De Keyser. In 1873 he was made secretary of the Massachusetts commission to the Vienna Exposition. During the Russo-Turkish War of 1877-78 he was correspondent of the London Daily News and Graphic, and of the New York Herald. On his return he was made a member from the United States of the International Art Jury at the Paris

Exposition of 1878. He was director of decorations at the Columbian Exposition, Chicago, 1893, and in 1898 he went to Manila as war correspondent for The Times and for Harper's Weekly. In 1880 he became a member of the Society of American Artists, and in 1885 was elected to full membership in the National Academy of Design, New York, and was for one term its vice-president; he became a member also of the American Water Color Society and of the Institute of Painters in Oil Colours, London. As a decorative artist his work may be seen at Trinity Church, Boston; the Bank of Pittsburg; and the Capitol at St Paul, Minnesota. His pictures are in many public collections: among them are " A Cosy Corner," in the Metropolitan Museum of Art, New York; " At the Inn," in the

Union League Club, New York; and " Between two Fires," in the Tate Gallery, London. He also wrote essays and short stories, and an English version of Tolstoi's Sebastopol (1887); and among his publications are The Danube (1891), Capillary Crime and other Stories (1892), and Expedition to the Philip- pines (1899).

MILLET (or Mile), JEAN FRANCOIS (c. 1642-1679), com- monly called Francisque, was born at Antwerp about 1642, and is generally classed amongst the painters of Flanders on account of the accident of his birth. But his father was a Frenchman, a turner in ivory of Dijon, who took service with the prince of Conde and probably returned after a time to his native country. He remained long enough in Antwerp to apprentice his son to an obscure member of a painter family called Laurent, pupil of Gabriel Franck. With Laurent, Francis- que left Antwerp for Paris, and there settled in 1660 after marry- ing his master's daughter. He was received a member of the Academy of Painting at Paris in 1673, and after gaining consider- ation as an imitator of the Poussins he died in 1679, bequeathing his art and some of his talents to one of his sons. Francisque probably knew, as well as imitated, Nicolas Poussin, Gaspar Dughet and Sebastian Bourdon; and it is doubtless because of his acquaintance with these travelled

artists that, being himself without familiarity with the classic lands of Italy and Greece, he was able to imagine and reproduce Italian and Arcadian scenery with considerable grace and effectiveness. It is indeed surprising to observe, even at this day how skilfully he executed these imaginary subjects, enlivened them with appropriate figures, and shed over them the glow of a warm yet fresh and sparkling tone. Twelve of his most important landscapes, which remained in the palace of the Tuileries, were destroyed by fire; and though many of his pieces may still be found catalogued in Continental and English collections, others in great number remain unknown and unacknowledged.

His son Jean Francois Millet, the younger (1666-1723), also called Francisque, was born in Paris, and was made a member of the Academy of Painting in 1709. He is not quite so independent in his art as his father; but he had clever friends, and when he wanted figures to his landscapes, he consulted Watteau, and other followers of the " court shepherdess " school. In the museum of Grenoble is a " Paysage " by him which is prettily adorned with Watteau's figures.

MILLET, JEAN FRANCOIS (1814-1875), French painter, who came cf a peasant family, was born on the 4th of October 1814 in the hamlet of Gruchy, near Greville (La Manche), in the wild and picturesque district called La Hague. His boyhood was passed working in his father's fields, but the sight of the engravings in an old illustrated Bible set him drawing, and thenceforth, whilst the others slept, the daily hour of rest was spent by Millet in trying to render the familiar scenes around him. From the village priest the lad learnt to read the Bible and Virgil in Latin, and acquired an interest in one or two other works of a high class which accompanied him through life; he did not, however, attract attention so much by his acquirements as by the stamp of his mind. The whole family seems, indeed, to have worn a character of austerity and dignity, and when Millet's father finally decided to test the vocation of his son as an artist, it was with a gravity and authority which

recalls the patriarchal households of Calvini’st France. Two drawings were prepared and placed before a painter at Cher- bourg named Mouchel, who at once recognized the boy’s gifts, and accepted him as a pupil; but shortly after (1835) Millet’s father died, and the eldest son, with heroic devotion, took his place at home, nor did he return to his work until the pressing calls from without were solemnly enforced by the wishes of his own family. He accordingly went back to Cherbourg, but after a short time spent there with another master (Langlois) started with many misgivings for Paris. The council-general of the department had granted him a sum of 600 francs, and the town council promised an annual pension of 400, but in spite of friendly help and introductions Millet went through great difficulties. The system of the Ecole des Beaux Arts

was hateful to him, and it was not until after much hesitation that he decided to enter an official studio — that of Delaroche. The master was certainly puzzled by his pupil; he saw his ability, and, when Millet in his poverty could not longer pay the monthly fees, arranged for his free admission to the studio, but he tried in vain to make him take the approved direction, and lessons ended with ” Eh, bien, allez a votre guise, vous etes si nouveau pour moi que je ne veux rien vous dire.” At last, when the competition for the Grand Prix came on, Delaroche gave Millet to understand that he intended to secure the nomination of another, and thereupon Millet withdrew himself, and with his friend Marolle started in a little studio in the Rue de l’Est. He had renounced the beaten track, but he continued to study hard whilst he sought to procure bread by painting portraits at 10 or 15 francs apiece and producing small ” pastiches” of Watteau and Boucher. In 1840 Millet went back to Greville, where he painted ” Sailors Mending a Sail ” and a few other pictures — reminiscences of Cherbourg life.

His first success was obtained in 1844, when his ” Milkwoman ” and ” Lesson in Riding ” (pastel) attracted notice at the Salon, and friendly artists presented themselves at his lodgings only to learn that his wife had just died, and that he himself had disappeared. Millet was at Cherbourg; there he remarried, but having amassed a few hundred francs he went back to Paris and presented his ” St Jerome ” at the Salon of 1845. This picture was rejected and exists no longer, for Millet, short of canvas, painted over it ” Oedipus Unbound,” a work which during the following year was the object of violent criticism. He was, however, no longer alone; Diaz, Eugene Tourneux, Rousseau, and other men of note supported him by their confidence and friendship, and he had by his side the brave Catherine Lemaire, his second wife, a woman who bore poverty with dignity and gave courage to her husband through the cruel trials in which he penetrated by a terrible personal experience the bitter secrets of the very poor. To this date belong Millet’s ” Golden Age,” ” Bird Nesters,” ” Young Girl and Lamb,” and “Bathers”; but to the ” Bathers ” (Louvre) succeeded ” The Mother Asking Alms,” ” The Workman’s Monday,” and ” The Winnower.” This last work, exhibited in 1848, obtained conspicuous success, but did not sell till Ledru Rollin, informed of the painter’s dire distress, gave him 500 francs for it, and accompanied the purchase with a commission, the money for which enabled Millet to leave Paris for Barbizon, a village on the skirts of the forest of Fontainebleau. There he settled in a three-roomed cottage for the rest of his life — twenty-seven years, in which he wrought out the perfect story of that peasant life of which he alone has given a ” complete impression.” Jules Breton has coloured the days of toil with sentiment; others, like Courbet, whose eccentric ” Funeral at Ornans ” attracted more notice at the Salon of 1850 than Millet’s ” Sowers and Binders,” have treated similar subjects as a vehicle for protest against social misery; Millet alone, a peasant and a miserable one himself, saw true, neither softening nor exaggerating what he saw. In a curious letter written to M. Sensier at

this date (1850) Millet expressed his resolve to break once and for all with mythological and undraped subjects, and the names of the principal works painted subsequently will •show how steadfastly this resolution was kept. In 1852 he pro- duced ” Girls Sewing,” ” Man Spreading Manure “; 1853, ” The Reapers “; 1854, ” Church at Greville “; 1855— the year of the International Exhibition, at which he received a medal of second class—” Peasant Grafting a Tree “; 1857, ” The Gleaners “; 1859, ” The Angelus,” ” The Woodcutter and Death “; i860, ” Sheep Shearing “; 1861, ” Woman Shearing Sheep,” ” Woman Feed- ing Child”; 1862, “Potato Planters,” “Winter and the Crows “; 1863, ” Man with Hoe,” ” Woman Carding “; 1864, ” Shepherds and Flock, Peasants Bringing Home a Calf Born in the Fields”; 1869, “Knitting Lesson”; 1870, “Butter- making; 1871, ” November — recollection of Gruchy.” Any one of these works will show how great an influence Millet’s previous practice in the nude had upon his style. The dresses worn by his figures are not clothes, but drapery through which the forms and movements of the body are strongly felt, and

their contour shows a grand breadth of line which strikes the eye at once. Something of the imposing unity of his work| was also, no doubt, due to an extraordinary power of memory, which enabled Millet to paint (like Horace Vernet) without a model; he could recall with precision the smallest details of attitudes or gestures which he proposed to represent. Thus he could count on presenting free from afterthoughts the vivid impressions which he had first received, and Millet’s nature was such that the impressions which he received were always of a serious and often of a noble order, to which the character of his execution responded so perfectly that even a ” Washerwoman at her Tub ” will show the grand action of a Medea. The drawing of this subject is reproduced in Souvenirs de Barbizon, a pamphlet in which M. Piedagnel has recorded a visit paid to Millet in 1864. His circumstances were then less evil, after struggles as severe as those endured in Paris. A contract by

which he bound himself in i860 to give up all his work for three years had placed him in possession of 1000 francs a month. His fame extended, and at the exhibition of 1867 he received a medal of the first class, and the ribbon of the Legion of Honour, but he was at the same moment deeply shaken by the death of his faithful friend Rousseau. Though he rallied for a time he never com- pletely recovered his health, and on the 20th of January 1875 he died. He was buried by his friend's side in the churchyard of Chailly. His pictures, like those of the rest of the Barbizon school, have since greatly increased in value.

See the article Barbizon; also A. Sensier, Vie et ceuvre de J. F. Millet (1874); Piedagnel, Souvenirs de Barbizon, &c. (1876); D. C. Thomson, The Barbizon School (1891); Richard Muther, J. F. Millet (1905); Gensel, Millet und Rousseau (1902). (E. F. S. D.)

MILLET (Fr. millet; Ital. miglietto, diminutive of miglio = Lat. mille, a thousand, in allusion to its fertility) , a name applied with little definiteness to a considerable number of often very variable species of cereals, belonging to distinct genera and even subfamilies of Gramineae. Common millet is Panicum milia- ceum (German Hirse). It is probably a native of Egypt and Arabia but has been cultivated in Egypt, Asia and southern Europe from prehistoric times. It is annual, requires rich but friable soil, grows to about 3 or 4 ft. high, and is character- ized by its bristly, much branched nodding panicles. One variety has black grains. It is cultivated in India, southern Europe, and northern Africa, and ripens as far north as southern Germany, in fact, wherever the climate admits of the production of wine. The grain, which is very nutritious, is used in the form of groats, and makes excellent bread when mixed with wheaten flour. It is also largely used for feeding poultry, for which purpose mainly it is imported. Hungarian grass, Setaria italica (also called Panicum italicum), a native of eastern Asia is one of the most whole- some and palatable Indian cereals. It is annual, grows 4 to 5 ft. high, and requires dry light soil. German Millet (Ger.

Kolbenhirse, Mohar) is probably merely a less valuable and dwarf variety of S. italica, having an erect, compact, and shorter spike. The grains of both are very small, only one half as long as those of common millet, but are exceedingly prolific. Many stalks arise from a single root, and a single spike often yields 2 oz. of grain, the total yield being five times that of wheat. They are imported for poultry feeding like the former species and for cage-birds, but are extensively used in soups, &c, on the Continent. Numerous other species belonging to the vast genus Panicum — the largest among grasses, of which the following are among the most important — are also cultivated in tropical or subtropical countries for their grain or as fodder

Setaria italica.

grasses, or both, each variety of soil, from swamp to desert, having its characteristic forms.

Polish millet is P. sanguinale; P. frumentaceum, shamalo, a Deccan grass, is probably a native of tropical Africa; P. decom- positum is the Australian millet, its grains being made into cakes by the aborigines. P. maximum is the Guinea grass, native of tropical Africa; it is perennial, grows 8 ft. high, and yields abun- dance of highly nutritious grain. P. spectabile is the coapim of Angola, but has been acclimatized in Brazil and other tropical countries. Other gigantic species 6 or 7 ft. high form the field- crops on the banks of the Amazon. Of species belonging to allied genera, Pennisetum lyphoideum, bajree, sometimes also called Egyptian millet or pearl millet, is largely cultivated in tropical Asia, Nubia and Egypt. Species of Paspalum, Eleusine and Milium, are also cultivated as millets. For Indian millet, see

DURRA.

MILLIGAN, WILLIAM (1821-1892), Scottish theologian, was born on the 15th of March 1821, the eldest son of the Rev. George Milligan and his wife Janet Fraser. He was educated at the High School, Edinburgh, and, from the age of fourteen, at the university of St Andrews, where he graduated in 1839. In 1843 at the disruption he took the side of those who remained in the Establishment, and in 1844 became minister of Cameron in Fifeshire. In 1845, his health having given way, he went to Germany, and studied at the university of Halle. After his return to Scotland and his resumption of his clerical duties he began to write articles on Biblical and critical subjects for various reviews. This led to his appointment in i860 to the professorship of Biblical criticism in the university of Aberdeen. In 1870 he was appointed one of the committee for the revision of the translation ofthe New Testament. His fervent piety, and his wide interest in educational and social questions, extended his influence far beyond the circle of theologians. His contribu- tions to periodical literature for many years were numerous and valuable; but his reputation chiefly rests on his works on the Resurrection (1890) and Ascension of our Lord (1892), his Baird lectures (1886) on the Revelation of St John, and his Discussions (1893) on that book. All these volumes are dis- tinguished by great learning and acuteness, as well as by breadth and originality of view. He died on the nth of December

1892.

MILLINER, originally a dealer in goods from the city of Milan in Italy, whence the name. Such goods were chiefly steel work, including cutlery, .teedles, also arms and armour and textile fabrics, ribbons, gloves and ” Milan bonnets.” The ” milliners ” of London, though never formed into a Livery Company seem to have been associated with the ” Cappers and Hurers,” which later were amalgamated with the “Haber- dashers ” (q.v.). Minsheu’s derivation of the word from tniile, thousand (” as having a thousand small wares to sell “), though a typical instance of guessing etymologies, shows the

miscella- neous character of their trade in the 16th and 17th centuries. The modern use of the word is confined chiefly to one who makes and sells bonnets and hats for women ; but articles of ” millinery ” include ribbons, laces, &c, usually retailed by haberdashers.

MILLIPEDE, the popular name of the best known members of a group of the Arthropoda, scientifically known as Diplopoda, and formerly united with the Chilopoda (see Centipede), the Pauropoda and the Symphyla as an order of the class Myriapoda. This classification, however, has of late years been abandoned on account of the recognition of closer affinity between the Chilopoda (centipedes) and the Hexapoda (insects) than between the Chilopoda and Diplopoda. By modern writers the above- mentioned groups of ” tracheate ” Arthropoda are either regarded as independent classes of this phylum Arthropoda, or associated in two superclasses, the Opisthogonea or Opistho- goneata for the Chilopoda and Hexapoda; and the Prosogonea or Prosogoneata for the Diplopoda, Pauropoda and Symphyla. The structural character upon which these superclasses are based is the position of the generative apertures which open anteriorly in the Prosogonea and posteriorly in the Opisthogonea. Although the Pauropoda and Symphyla are not, strictly speak- ing, Diplopoda, these three groups of prosogoneate arthropods are here for convenience considered together. \

CLASS DIPLOPODA.

Structure. — The anterior extremity is provided with a distinct head which by its general form and the nature of its appendages is as sharply marked off from the body as is the case in the Hexa- poda. It always bears at least three pairs of appendages, the eyes when present and, in the Oniscomorpha a peculiar sense organ. The inferior edge of the head plate overhangs the mouth and is termed the labrum. The exoskeleton of a typical somite consists of the following elements: a dorsal plate, a ventral plate, and a pleural plate on each side. To the external

margin of the ventral plate or sternum is articulated a pair of legs and between the leg and the pleural plate is situated the spiracle of the tracheal system. But the segmentation of the Diplopoda presents two marked peculiarities. The first is the fact that, with the ex- ception of a few of the anterior i leg-bearing seg- ments and perhaps one or two of those at the posterior end of the body, a single dorsal plate or tergum with its pleural plates overlies two sternal plates, two pairs of legs and two pairs of spiracles. Hence the segments appear to be double and to be furnished with twice as many legs as is normal in the Arthropoda — a peculiarity which has suggested the term ” Diplopod ” or ” double-footed,” for this group. It is generally believed that each tergal plate results from the coalescence of the terga of two originally distinct adjoining segments; but the same effect would be produced by the enlargement of one of a pair of terga and the complete excalation of the other. It is in favour of the latter view that there is only a single pair, and not two pairs, of stink-glands on each so-called double tergal plate. Unfortun- ately the history of the development of the segments does not clear up the difficulty since the terga of the double segments are single from the first, and no evidence either of fusion or excalation is supplied. The second of the two peculiarities above-mentioned is the great development of the tergal sclerite as compared with the sternal. Only very rarely {i.e. in Platydesmus) is there a broad sternal area. In the majority of cases the lateral edges of the tergum are bent downwards and inwards towards the mid ventral fine; the sternum at the same time is so much reduced that the basal segments of the legs of opposite sides are almost in contact. The

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After Pocock in Max Weber’s Zool. Ergebnisse, &c, IV., PI. XXI., fig. 8, i8q 4 .

Fig. 1. — Spirostreptus vittalus, an Oriental species of the Spirostrep- toidea, lateral view, showing the repugnatorial pores on the sides of the segments.

a.tg, a.st,

head with eyes and antennae, tergal plate of first segment, tergal plate of last or anal

segment, sternal plate of ditto, anal valve.

A ‘ h ”’ B

After Silvestri, Ann. Mas. Genova, (2), xvi, figs. 17, 19, 25.

Fig. 2. — The Gnathochilarium or jaws of second pair of various Chilongatha. A, of Spirostreptus. B, of Julus. C, of Glomeris. c, cardo. m, menturri.

st, stipes. pm, promentum.

Ig, linguae. h, hypostoma.

pleural plate on each side usually disappears either by suppression or by fusion with the tergum. The sterna with their attached legs often remain free. But quite commonly the coalescence of the skeletal elements is carried to such an extreme that each seg- ment is a solid ring with two pairs of movable appendages. The last segment is differently constructed from the others. It is always limbless, and usually consists of a complete tergal ring, a single sternal plate, and a pair of movable anal valves which are normally closed, but are capable of being opened for the passage of faeces. These anal valves are possibly the homologues of the plural scutes of a normal segment. The appendages are modified

as a single pair of antennae, two or three pairs of

jaws and a variable number of walking-legs, of which one or more pairs may be trans- formed into gonopods. The antennae are short and very similar to the legs. They are preoral in position, and usually consist of seven segments, the seventh or distal segment being small, as a rule, and furnished with a sense organ which is probably olfactory or tactile in function. The mandibles or jaws of the first pair are the most anterior of the postoral appendages. They are large, powerful, and usually consist of three or two segments, a basal or

Fig.

After Voges.

3. — Inner view of ventral area of a single segment of Julus,

much enlarged to show the structure and arrangement of the tracheal organs. The two pairs of tracheae are seen in situ, the posterior pair overlapping the anterior.

h, Posterior margin of the body- t, Fine tracheae given off from it. ring (tergum). ms, Respiratory muscle attached

r, Anterior border. to tracheal sac.

st, Tubular chamber of tracheae, m, Ventral body muscle.

cardo, which is sometimes absent, a second or stipes, and a third or mala, the latter being supplied with a strong tooth and pectinate lamellae. In all Diplopods, with the exception of the Pselapho- gnatha, there are only two pairs of jaws, those of the second pair forming a large plate, the gnathochilarium, which acts as a lower lip. It consists of several distinct sclerites, two external on each side, the proximal known as the cardo, the distal as the stipes, the latter being tipped with one or two lobes (malae) and far exceeding the cardo in size. Between the external plates there is a median proximal plate (mentum) generally of large

size and often itself subdivided, and a pair of distal plates (linguae). Behind the base of the gnathochilarium there is a single large transverse plate, the hypostoma. In the Pselaphognatha, the jaws representing the gnathochilarium are differently constructed and an additional pair, the maxillulae, has been recently detected between the gnathochi- larium and the mandibles. Behind the gnathochilarium, which from embryological data appears to result from the modification of a single pair of appendages, a legless somite has been detected in some embryos. Possibly the plate referred to above as the hypostoma is its sternal element.

The heart is a median dorsal vessel composed of a series of chambers each giving off a pair of arteries and furnished with a pair of orifices or ostia. According to Newport, the anterior chamber lying in the second segment is prolonged into an aortic trunk from which arise three pairs of lateral arteries dipping down on each side of the alimentary canal and uniting beneath it in a common ventral vessel. The heart is enveloped in a delicate pericardial membrane and is supported by lateral alary muscles. The alimentary canal is a simple tube extending usually straight through the body from mouth to anus. Only in the Oniscomorpha is it looped, thus suggesting the origin of this short-bodied group of millipedes from longer, more vermiform ancestors. A pair of so-calleci salivary glands opens into the fore-gut near its anterior extremity and one or two pairs of malpighian tubes communicate with the hind-gut at its junction with the broad mesenteric portion of the canal. Respiration is effected by means of tracheal tubes which communicate with the exterior by means of spiracles situated just above the bases of the walking limbs. Each spiracle leads into a longer or a shorter pouch whence the tracheae, which are of two kinds, arise. In the majority of the orders the tracheae are tufted, that is to say, they form two bundles of short simple tubules springing from the innermost corners of each pouch. In the

Oniscomorpha, however, each pouch gives rise to a number of long tubes which extend through the body and somewhat resemble those of the Chilopoda except that they neither branch nor are extensive. As in the Chilopoda and Hexapoda the tracheae are strengthened and kept expanded by a slender spiral filament.

The ventral nerve cord consists of two strands so closely approxi- mated as to be practically fused, with a small ganglionic enlarge- ment for each pair of legs. Hence in the double segments there are two such ganglia, which in addition to the crural nerve give off

on each side a large branching nerve to other organs in the segment. In the Opisthospermophora (Julus, Spirostreptus) and the Onisco- morpha {Glomeris, Sphaerotherium) the ganglia are spaced at equal distances on the cord, but in the Merochaeta (Polydesmus) they are grouped in pairs to correspond to the spacing of the legs. The apodous penultimate and anal segments are innervated from the last ganglion of the cord, as are also the gonopods of the males of

C cb . oc

Tvgon

After G. C. Bourne, J. Linn. Soc. xix., PI. 29, 1886. Fig. 4. — Diagram of the nervous and circulatory system of Sphae- rotherium obtusum, a South African species of Oniscomorpha.

c, oc, ant, mi,

gP and g/ 22 , Second and twenty- second ganglia of chain, the posterior nerve of each gan- glion, Ig.n, supplies the leg, the anterior, tr.n, the tra- cheal sac and other organs.

n.gon, Nerve to gonopods.

tr. Tracheal tubes with spiral filament.

tr.s, Tracheal sac.

Head.

Eye-cluster. Antenna.

Basal segment of mandible.

tg* and tg 13 , Part of the terga of

the second and thirteenth

segments.

cb, Cerebral ganglia supplying

the eyes and antennae. oes, Oesophagus, cut through. sb.gl, Suboesophageal or first

ganglion of ventral chain.

the Oniscomorpha. The first (suboesophageal) ganglion of the cord supplies the mandibles and gnathochilarium and is connected by the oesophageal commissures with the bilobed cerebral nerve whence arises the nerves for the eyes, when present, and the antennae.

Eyes are sometimes absent, as in all the genera of Merochaeta and in many genera of other groups, as in Siphonophora, one of the Colobognatha, and several of the Juloidea (Typhloblaniulus) . In other cases they are represented by one or two ocelli on each side (Stemmiuloidea) ; or by a vertical series of ocelli as in the Glomeroidea and Polyzonium amongst the Colobognatha. But in the majority of the orders they are represented by triangular or subspherical aggregations of ocelli recalling in a certain degree those of the Litho- biomorpha amongst the Chilopoda. They are simple in structure and consist externally of a cuticular corneal thickening or lens and internally of a retinular layer of enlarged epidermic cells, the

internal or proximal ends of which are continuous with the fibres of the optic nerve. The ovary is unpaired and extends almost the entire length of the body beneath the alimentary canal. The oviducts are sometimes separate tubes (Lysiopetalum) , some- times confluent and divided just before terminating in the two orifices behind the base of the legs of the second pair (Julus). The testes and seminal ducts occupy the same position and extent as the ovary and oviducts. The ducts are sometimes coiled, some- times divided, sometimes united. The two testes are sometimes united by transverse branches across the middle line, and are some- times branched posteriorly. They bear short caecal diverticula in which the semen is developed. There are no accessory glands associated with the generative organs; but in some forms, e.g. Polyxenus, there is a pair of receptacula seminis extending back- wards alongside the ovary and opening into the oviduct.

post

After Pocock, /. Linn. Soc. xxi., PI. 25. Fig. 5. — Gonopods of Trigoniulus andersoni, one of the Opistho- spermophora (Spiroboloidea). Jj A, Anterior view, and B, lateral views of the apparatus, ant, anterior, and post, posterior portions of the coleopod ensheathing the phallopod, of which the proximal portion, ph, is shown. C, Phallopod removed from the coleopod.

The secondary sexual characters of the males are of great taxonomic importance. The seminal ducts, like the oviducts, open behind the legs of the second pair. Associated with them in the Limacomorpha (Glomeridesmus), there is a pair of very long retractile penes. In the Spirostreptoidea and Juloidea the penes are much shorter and have coalesced. Sometimes they are un- developed (Spiroboloidea). In other cases, the Merochaeta, Oniscomorpha, &c, the ducts traverse the coxae of the legs of the second pair. But in all these groups, with the exception of the Oniscomorpha,

semen is transferred from the genital orifices, with or without the aid of the penes, either into the first or second pairs of appendages of the seventh segment which are modified in various ways, and are termed phallopods. When the posterior legs are so modified the anterior are as a rule even more profoundly altered to form a protective sheath, or coleopod, for the phallopod; and as a further precaution the entire apparatus is usually withdrawn within the seventh segment. In the Oniscomorpha the semen is transferred into a pair of receptacles developed upon the coxae of the legs of the last pair, which are chelate. The male appendages that are modified in the above described ways are comprehensively spoken of as gonopods. Other secondary sexual characters, like the stridulating organs of the males of some Oniscomorpha, the suctorial pads on the legs of Spirostreptoidea, the development of angular processes upon the mandible or first tergal plate, or of fine ridges in the gnathochilarium — all of which are concerned in enabling the male to maintain a secure hold upon the female — are of great taxonomic use in distinguishing the genera and species.

The most important glands in the Diplopoda are the repugnatorial or stink-glands, which, except in the Oniscomorpha, Limacomorpha and Ascospermophora, open by pores upon the sides of more or fewer of the segments. They secrete a fluid with an unpleasant odour, breaking up in one case into cyanide of potassium, and are practically the only means of protection, apart from the hard exoskeleton, which Diplopods possess. In some millipedes silk glands also exist and open upon papillae upon the posterior border of the last tergal plate. They are found in the Ascospermophora, Stemmiuloidea and Proterospermophora, and are used for spin- ning nests for the eggs and protective cases for the young during exuviation.

Classification. — The existing members of the class Diplopoda may be classified as follows : —

Subclass I. PSELAPHOGNATHA.

Order: Penicillata {Polyxenus). „ 2. Chilognatha.

Order: Oniscomorpha (Glomeris, Zephronia). Limacomorpha (Glomeridesmus). Colobognatha (Polyzonium, Siphonophora) . Ascospermophora (Ghordeuma) . Proterospermophora (Lysiopetalum) . Merochaeta (Polydesmus). Opisthospermophora. Suborder: Stemmiuloidea (Stemmiulus) . „ Spiroboloidea (Spirobolus) .

,, Spirostreptoidea (Spirostreptus).

„ Juloidea (Julus, Nemasoma).

Subclass PSELAPHOGNATHA.

Diplopods with the soft integument strengthened by weakly chitinized sclerites and furnished above and on the head with trans- verse rows of short, stout, somewhat squamiform bristles; laterally, on each side of the principal segments, with a thick tuft of long bristles and with a large, silky, white tuft projecting backwards from the posterior extremity. Mandibles one-jointed. Behind them a pair of small, one-jointed maxillulae, attached to a median membranous ” lingua.” Behind the ” lingua ” and maxillulae, a large, double, transverse plate with a long, external sclerite bearing distally in Polyxenus an inner short-lobate process and an outer long spiny palpiform branch. The latter, however, is absent in Lophoproctus. These sclerites probably represent the gnatho- chilarium of the Chilognatha, but the homology between the skeletal elements of the jaws in question is not clearly understood. It has been suggested that they represent two pairs of jaws, but embryological proof of this does not exist.

A, after Ca^pente^,Q./.lf.5 , . 49, PI. 28, fig. 1.

B, after Latzel, DieMyr. Ost. Ung. Urn. II., PI. ii., 1884.

Fig. 6. — Jaws of Polyxenus lagurus. A, Jaws of second and third pairs, mxl, maxillula; mx.p, palpi- form branch of maxilla; mx.lb, lobate process of

maxilla; mx.ext, external plate of maxilla perhaps corresponding to the stipes of the gnathochilarium of the Chilognatha; mx.int, internal plate of maxilla, perhaps corresponding to the mentum and promentum of the gnathochilarium (by Carpenter mx.int is regarded as an appendage posterior to the maxilla) ; mb, membrane. _B, Mandibles of Polyxenus lagurus.

Order Penicillata (= Ancyrotricha).

Head large, usually with lateral eyes. Antennae eight-jointed, attached near the middle of the front of the head. On the dorsal side of the body there are eleven segments, simple and compound. The first four of these bear one pair of legs each, the suc- ceeding four two pairs of legs, the ninth segment one pair, making a total of thirteen pairs of legs. The tenth and eleventh or anal segment are legless. There is a narrow sternal area separating the bases of the legs of the two sides. There are no repugnatorial glands. In the male none of the legs are modified as gonopods, but the coxa of each of the legs of the second pair is furnished with a conical penis, which during copulation, it may be supposed, is inserted into the genital orifice of the female, which occupies a corresponding position in that sex. The young when first hatched has only three pairs of legs and five segments. The millipedes of this order are all of small size, measuring at most only a few millimetres in length. The best-known genera are Polyxenus and Lophoproctus, both of which occur in Europe. Other forms have been discovered in the West Indies, North and South America, and Ceylon; and it is probable that the group has an almost cos- mopolitan range. They live under stones or the loosened bark of trees. The carbon- iferous fossil, Palaeocampa, is usually re- ferred to this subclass.

Subclass Chilognatha.

Diplopods with firmly chitinized exo- skeleton, sometimes thickly, sometimes sparsely covered with short, simple hairs,, but never decorated with tufts

or rows of peculiarly modified bristles,

After Bode.

Fig. 7. — Ventral view of Polyxenus lagurus much en- larged, actual length a little over j^th of an inch.

a, Position of gener- ative openings.

MILLIPEDE

47i

Mandibles, two- or three-jointed ; maxillulae absent, the jaws of the second pair being represented by the gnathochilarium described above.

Order Oniscomorpha.

Body short and broad, hemispherical in transverse section; convex above, flat below, and capable of being spherically coiled. The exoskeleton of a typical compound segment consists of a vaulted tergum, a pair of free pleural sclerites, two pairs of small tracheal sclerites and two pairs of legs, the latter attached to the ventral membrane, which has no sternal plates. The tergal plates are twelve or thirteen in number, whereof the first is very small, the second enormously expanded laterally, and the last, also en- larged and probably representing at least three segments, extends laterally and posteriorly like a hood over the posterior end of the

9P*~yl-

paw

After Pocock, in Max Weber's Zool. Ergebnisse, &c. , IV., PI. xx.

Fig. 8. — Sphaeropoeus hercules, a Sumatran species of the Oniscomorpha.

A, Lateral view of the entire animal, c, head; ant, antenna; 'g 1 . t£ anf l tg u < tergal plates of

first, second and thirteenth segments ; Ig, extremities of some of the anterior legs.

B, Gonopods of the male, g^ 1 and gp 2 , anterior and posterior pairs of gonopods, both being chelate claspers ; pen, processes arising from the basal segments of the gonopods of the second pair, which act as penes.

C, Vulvae or genital plates attached to the basal segments of the legs of the second pair in the female, g.o, genital orifice.

body without forming a chitinous ring round the anal valves and sternum. In the male the legs of the penultimate pair are some- times modified as claspers ; those of the last pair are always enlarged and prehensile, and bear on their coalesced basal segments a pair of sperm-carrying processes analogous to the phallopods of other groups. Apart from these organs the male has no penis, the seminal ducts perforating the coxae of the legs of the second pair. This order contains two well-marked suborders, the Glomeroidea and the Zephronioidea. The Glomeroidea, comprising the families Glomeridae, Gervaisiidae, Onomeridae, have the antennae approxi- mated on the head, the eyes uniserial and twelve (rarely eleven) tergal plates. To this group belong the common pill-millipedes of Europe and North Africa. In North America the Onomeridae alone are found. The Zephronioidea, with the single family Zeph- roniidae, have the antennae at the sides of the head, the eyes com- posed of a spherical cluster of ocelli, and always thirteen tergal plates. This group is common in the tropical and southern con- tinents of the Old World, having representative genera in South Africa, Madagascar, India, Malaysia, Australia and New Zealand. They are much larger forms than the Glomeroidea, large specimens reaching two or three inches in length. In addition to the characters mentioned above the Oniscomorpha differ from all other Diplopods in having long tubular tracheae and the alimentary canal bent upon itself.

Order Limacomorpha.

Resembling the Oniscomorpha in the shape and structure of a typical segment, except that the tracheal plates are unrepresented ; in the facts that the last tergal plate does not form a complete ring round the anal area, and that the last pair of legs in the male are modified; but differing from them in that the body consists of nineteen or twenty segments, is elongate, and tapers anteriorly and posteriorly, the second and last tergal plates being small ; in the presence in the male of a pair of long hairy protrusible penes between the legs of the second and third pairs, and in the structure of the gonopods, which, instead of being chelate, terminate in a slender, tapering tarsal segment. This order contains two families : Zeph- roniodesmidae (Zepkroniodesmus) and Glomeridesmidae- (Glomerisdes- mus), the former from tropical Asia, the latter from tropical America. The largest of these millipedes reach a length of only about 7 mm. Nothing special is known of their habits.

Order Colobognatha. Body elongate, capable of being spirally coiled, consisting of a large and indefinite number of segments, each being furnished with a distinct often large sternal area, and with the pleural sclerite or membrane distinct from the tergum. The last tergal plate forms a complete ring round the anal valves. Legs with coxal pouches; those of the seventh segment transformed into gonopods of a very simple type in the male, which is also furnished with a double penis completely or partially confluent with the coxae of the legs of the second pair. Head always small, frequently triangular or piriform, in the latter case the gnathites reduced in size and complexity. Repugnatorial pores present and lateral. The genera of this order

B

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After Pocock, /. Linn. Soc. xxiv., PI. 37. Fig. 9. — Glomeridesmus marmoreus, one of the Limacomorpha.

A, Lateral view, c, head with antennae; tg l , tergal plate of first segment ; an.tg, tergal plate of last or anal segment.

B, Lower view of one of the segments, tg, inferior edge of the tergal plate; pi, pleural sclerite; Ig 1 , basal segment of leg.

C, Posterior extremity of body, an.tg, tergal plate of anal seg- ment ; cop.lg. gonopod or copulatory leg.

D, Legs of the third pair with extruded penes, pen, in front of them.

are divisible into three families: the Platydesmidae (Platydesmus, Pseudodesmus), Polyzonidae (Polyzonium, Siphonotus), Siphono- phoridae (Siphonophora). Of these the Platydesmidae have de- parted least and the Siphonophoridae most from the typical Diplopod in the structure of the mouth parts. The group is for the most part tropical, one genus only, Polyzonium, extending as far north as Central Europe.

Order Ascospermophora. Body elongate, consisting of from twenty-six to thirty-two segments, but not varying within specific limits; the pleurae coalesced with the terga, the sterna free. More or fewer of the anterior ten pairs of legs may be modified in the males, but no true phallopods are differentiated, the function of seminal receptacles

being performed (according to C. Verhoeff) by the exsertile coxal pouches of the two pairs of legs of the eighth segment. The seminal ducts in the male perforate the coxae of the legs of the second pair. There are no repugnatorial pores, and the terga are furnished with three pairs of symmetrically placed hairs or bristles. On the posterior border of the last tergal plate there is a pair of spinning papillae. The millipedes of this order, also called Coelochoeta, are referable to several families: Chordeumidae (Chordeuma), Craspedosomidae (Craspedosoma) , Heterochordeumidae (Heterochor- deunta), &c. The Heterochordeumidae belong to the Oriental region, extending from India to New Zealand. The others are particularly abundant in genera and species in North and Central America and Europe; but are unknown in Africa, south of the Sahara.

Order Proterospermophora.

Differing from the Ascospermophora in that the number of seg- ments is large and variable; they are furnished with repugnatorial pores, and not with the three pairs of setae. In the males the anterior appendages of the seventh segment are modified as phallo- pods, and the seminal ducts perforate the coxae of the legs of the second pair.

This order, containing the family Lysiopetalidae (Lysiopetalum), is widely distributed in Europe and North America. Large ex- amples of some of the species, e.g. L. xanthinum, reach a length of 4 or 5 ins.

Order Merochaeta.

Resembling the Proterospermophora in having only the anterior appendages of the seventh segment converted into phallopods and the seminal ducts perforating the coxae of the second legs in the males; but differing essentially in that the sterna are

solidly welded to the rest of the exoskeleton of the segments, which are either nineteen or twenty in number, in the absence of eyes and of spinning papillae, and in having six- jointed legs. This order is cosmopolitan jn distribution and consists of a very large number of genera which by some authors are referred to the single family Poly-desmidae ; by others to numerous families. Many species are brightly coloured, and some individuals of the Oriental genus

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After Pocock, in Max Weber's Zool. Ergetnisse, &c, IV., PI. xx.

Fig. io.

Platyrhachus mirandus, a Sumatran species of Polydesmidae, to show the form characteristic of the order Merochaeta.

c, Head.

ant, Antenna.

tg l , Tergal plate of first body segment.

tg 7 , Ditto of seventh,

a.tg, Tergal plate of anal segment.

The figure also shows the repugnatorial pores which are present upon the majority of the segments, the laterally exparfded tergal plates, and the presence of two pairs of legs for each of the segments except the two last, the four first and the seventh; the latter, since the figured specimen was a male, has the anterior leg converted into a phallopod which is concealed beneath the body.

Platyrhachus may reach a length of 5 ins. The segments are usually provided with lateral laminate or tubercular expansions bearing the repugnatorial pores, which are only very rarely absent. Order Opisthospermophora.

Resembling the Proterospermophora in possessing a large and variable number of segments, each of which, with the exception of the last and the anterior four or five, is furnished with a pair of repugnatorial pores, but differing essentially from them in that the posterior pair of appendages of the seventh segment are converted into phallopods, and the anterior into protective coleopods in the male, and that the seminal ducts in this sex do not perforate the coxae of the legs of the second pair but are usually associated with a distinct penis situated immediately behind them. The genera of this order present greater diversity of structure than is found in the other orders and are referred to four suborders, which by some zoologists are erected to ordinal rank, namely, the Stemmiuloidea (Monochaeta) ; the Spiroboloidea (Anochaeta) ; the Spirostreptoidea (Diplochaeta) ; and the Juloidea (Zygochaeta).

In the Stemmiuloidea the sterna are free and the pleurae partially so; the terminal segment of the legs is bisegmented ; there are two pairs of spinning papillae on the last tergite; the penis is a single long tube, and the eyes are represented by one or two large lenses on each side of the head. The genus Stemmiulus, constituting the Stemmiulidae, is represented by a few species recorded from the Oriental, Ethiopian and Neotropical regions. In the possession of silk-glands this suborder resembles the Ascospermophora and Proterospermophora, and should perhaps rank as an order apart from the Opisthospermophora.

The Spiroboloidea, containing one family, the Spirobohdae (Spirobolus, Rhinocricus, &c), have the sterna and pleurae coalesced, the tarsi undivided ; no spinning papillae, no penis, the eyes repre-sented by an aggregation of ocelli ; and the first

five segments each with a single pair of legs, the sixth carrying two pairs. This group attains its maximum of development in the tropics, where species and genera are numerous and specimens of large size, i.e. 6 ins. or over, are met with. „.,,.,

The Spirostreptoidea resemble the Spiroboloidea in many par- ticulars, but the fourth segment is footless, and the fifth has two pairs of linibs; the male has a distinct and double penis, and in both sexes the stipites of the gnathochilarium extend to the proximal end of the mentum, which is relatively small. The distribution of this order, which contains several families : Spirostreptidae (Spiro- streptus, Rhynchoproctus), Cambalidae (Cambala, Julomorpha), &c, is practically the same as that of the Spiroboloidea. Specimens over 6 ins. in length are met with in the tropics of Africa and Asia.

The Juloidea differ from the Spirostreptoidea in having the third segment limbless, the first, second and fourth with a single pair of appendages, and the stipites of the gnathochilarium much expanded and meeting for a considerable distance in the middle line behind the very small promentum.

The best marked family of this group is the Julidae, which is widely distributed in the northern hemisphere. Its species and genera (Julus, Pachyiulus) are abundant in Europe. Another European family, the Nemasomidae, is founded for the genus Nemasoma, which is remarkable for having the sterna free.

Habits, &c. — Millipedes are principally cryptozoic, living under

stones or logs of wood in damp, secluded localities. They feed almost wholly upon decaying vegetable matter, and drink a con- siderable quantity of water. Some of the tropical species emerge in numbers from their hiding-places after heavy rains, and crawl over the ground and bushes in search of moisture in broad day- light. Their method of progression over level ground is quite peculiar. The

body is held in a straight line and is propelled by a succession of wave-like movements of the legs, which are moved in groups, the groups on the right and left side exactly correspond- ing. Some forms, e.g. Stemmiulus, have been described as attempt- ing to evade capture by a hopping action caused by vigorous jerking and wriggling of the body. Many of the species are very conspicuously coloured and the association of brilliant colouring with the existence of the nauseous secretion of the repugnatorial glands suggests that the coloration is aposematic or of warning significance.

Copulation between the sexes takes place before oviposition. In the Opisthospermophora the males and females coil together with the ventral surface of the anterior ends of their bodies opposed, the male holding the female securely by the head while the extended phallopods carrying the semen are brought into contact with her genital orifice. In the Polydesmidue pairing is effected in the same way except that the male and female instead of intercoiling remain extended, the male clasping the female with his legs. In the Onisco- morpha the sexes also pair front to front, not head to head, however, but head to tail, so that the gonopods in the anal segment of the male can be applied to the second pair of postoral appendages in the female. Some males of this group, e.g. Sphaerolherium, have a stridulating organ on their posterior gonopods and stridulate when finding the females.

The method of disposing of the young, which usually have only three pairs of legs at hatching, differs in various groups. In Julus and Polydesmus the female burrows below the surface and makes a subspherical nest of small blocks of earth which are moistened with the’salivary secretion and moulded to the proper shape between her jaws and anterior legs. When the re- ceptacle is nearly finished she deposits her eggs in it, and, closing the aperture, leaves the whole to its fate. On the other hand, a female specimen of the South African species, Archispirostreptus erythrocephalus, that lived in the London Zoological Gardens, buried herself,

coiled round the eggs, and remained with her young for some time after they were hatched. Again, millipedes, like the Stemmiuloidea and Ascospermophora, which possess silk-glands, spin silken cases for the protection of their eggs. Immature specimens of these groups spin similar silken cases at the time of exuviation; and cases, resembling the nests, are likewise made for purposes of moulting by immature forms of some

From

Balfour, after Metsch- nikov.

Fig. 1 1 . — Larva of Strongylosoma Guerinii, one of the Polydesmidae, just hatched, exotic species of Polydesmidae, e.g. by the tropical African Oxydes- mus. There is good reason to think, however, that the animal makes use of its own voided excrement in the formation of these receptacles.

A considerable number of Chilognatha of doubtful systematic position have been recorded from beds of the carboniferous forma- tion. The best known are Acantherpestes and Euphoberia. Speci- mens referred to existing genera have been discovered in amber beds of Oligocene age.

CLASS PATJROPODA.

As in the Diplopoda there is a distinct head bearing a pair of antennae and two pairs of jaws. On each side of the head there is an eye-like spot which may conceivably represent a degenerate eye, although the external cuticle shows no corneal thickening nor the epidermis retinular specialization, and optic nerves are absent from the brain. The antennae are structurally unique in the Arthropoda. There are four short basal segments from the distal of which arise two one-jointed branches, an external thinner and an internal thicker. The external or postaxial branch is tipped with a single long annulate flagelliform bristle with a rounded apical knob ; and the internal or preaxial branch with two similar but shorter bristles and a globular, usually

pedunculated, sense organ between them. The mandibles or jaws of the first pair are large and one-jointed. Those of the second pair are very short, piriform, and attached to the ventral side of the head by a long, rod-like sclerite. Between these two pairs of jaws there is a horny framework forming a kind of lower lip to the mouth. The correspondence between these mouth parts and those of the Diplopoda is not understood. No doubt the mandibles are homologous in the two groups ; but whether the jaws of the second pair in the Pauropoda correspond to the maxillulae of the Pselaphognatha, or to part of the gnathochilarium in the Chilognatha, or whether the chitinous framework alone or in conjunction with the pair of jaws answers to the gnathochilarium

are questions to which no answer can as yet be given. Judging from the segmentation and the appendages the body is composed of twelve somites, including the last or anal, which, like the pen-ultimate somite, is limbless. Each somite in front of the penultimate ani one

asff.

A and B, after Kenyon, Tufts Colt. Studies, iv., 1895; C, after Hansen, Vid. II did., 1901, PI. VI., fig. sa; D. and E, after Kenyon.

Fig. 12. — Pauropus.

A. Pauropus huxleyi (?). c, head; ant. antenna; tg l and fg 5 , first and fifth double tergal plates; Ig 1 , first walking-leg (= 2nd post- cephalic appendage); /g 9 , ninth walking-leg; a.sg, anal segment; st, setae.

B. Eurypauropus spinosus. Lettering as in A.

C. Brachypauropus superbus. Lettering as in A and B ; (tg 1) = first and second terga ; tg b , = ninth and tenth terga.

D. Jaws of Pauropus huxleyi; md, mandible; mx, maxilla; lb, labial framework.

E. Antenna of Eurypauropus spinosus; fl, flagella; gl, sensory organ.

bears a single pair of legs, nine pairs of which are fully developed ambulatory limbs, while those of the first segment are reduced to

After Lubbock. Fig. 13. — Enlarged view of Pauropus huxleyi, from ventral side, a pair of bud-like processes. The first and last pairs of ambulatory limbs consist of five segments; in the remaining pairs the terminal segment may be subdivided into two, so that there may be six segments in all. The ambulatory limbs are usually terminated by three claws, a principal and two subsidiary, each claw being accom- panied by a membranous pad. Between these limbs, which are relatively longer and stronger than in the Diplopoda and evenly spaced on each side of the body, extends a soft-skinned sternal area. The distensible pleural region of the body is also membra- nous, but the dorsal area is covered by chitinous plates or terga,

usually six in number, excluding that of the anal segment ; each of the anterior five of these overlies two limb-bearing somites, the first covering the somite of the rudimentary limbs and of the first pair of locomotor legs, the second those of the second and third pairs of locomotor legs, and so on. This condition is an adumbra- tion of the far completer fusion of somites seen in the Diplopoda. The sixth tergal plate belongs to the limbless penultimate somite. The duplex character of the first five terga is suggested in Pauropus by the presence of two rows of sensory bristles; there being only one such row upon the sixth tergum. In the aberrant genus Brachy- pauropus the evidence is practically completed by the correspon- dence in number between the terga and pairs of legs, there being a divisional line between the two rows of setae. On each side of the body there are five long pubescent tactile setae situated on the second to

the sixth terga in Pauropus, and on the pleural area corresponding to these terga in Brachypauropus.

The cerebral mass of the nervous system is large and when viewed from above is seen to consist of two lobes defined by a median groove. In the absence of eyes no optic nerves are given off. Beneath these are two antennal lcbes whence arise, close together, the antennal nerves.' Two short commissural cords connect the cerebral mass with the suboesophageal ganglion, a composite mass formed of the nervous centres which supply the two pairs of jaws and the rudimentary legs of the first pair. Behind this large ganglion the cord, which shows superficially no trace of its double origin, presents a ganglionic swelling for each pair of legs. No circulatory or respiratory organs have been detected.

The alimentary canal consists of a short, narrow fore-gut, a large, straight mid-gut, and a moderately long hind-gut which is itself composed of two parts, an anterior narrow tube which opens into

vup.1.

¥ r %' > Ig'

After Kenyon, Tufts Coll. Studies, iv., 1805.

FlG._I4. — Pauropoda.

A. Alimentary canal of Pauropus ; /g, fore-gut ; sg, salivary gland ; mg, mid-gut; hg, anterior portion of hind-gut; a, anus; m.p.t., mal- pighian tubule.

B. Female genital organs of Eurypauropus; ov, ovary; ovid, oviduct ; rs, receptaculum seminis ; go, genital orifice.

C. Male genital organs of Pauropus; t 1 and fi, anterior and pos- terior portions of testes; vd l , vd 2 , vd 3 , vasa deferentia; vs.s, vesi- cula seminalis; cd, common duct; go, genital orifices.

D. Lateral view of Pauropus; c, head; ant. antenna; tg 1 ,tg t , first and fifth tergal plates; a.sg,

anal segment; st, lateral bristles; Ig.r, rudimentary leg; Ig 1 and Ig, 9 first and ninth fully formed walking legs ; p, penis.

a dilated, piriform, posterior portion, narrowing gradually to terminate in the anus. Opening into the anterior extremity of the fore-gut there is a pair of ” salivary ” glands. Malpighian tubes have been found in some forms, i.e. females of Eurypauropus spinosus, but not in any examples, male or female, of Pauropus huxleyi. Where present they open at the point of union of the mid-

and hind-guts. The generative organs in the female are very simple, and much like those of the Diplopoda. In the male they are highly complex, and unlike those of any known Arthropod in certain particulars. The wide, unpaired ovary extends nearly to the posterior end of the body. Anteriorly it passes into an oviduct which is unpaired throughout its length. The posterior portion of the duct is wide. The anterior, an abruptly narrowed tube, curves round the nerve-cord and opens by a single sub-median orifice in the third segment. Just within the orifice there opens into the oviduct the short duct of a spherical receptaculum seminis. In the male the testis is never paired. Sometimes it is single, sometimes divided into an anterior and a posterior mass, and sometimes merely constricted. It lies above the intestine in the posterior half of the body in the adult, but at least in the young in some cases, where as many as four divisions have been detected, its position is more lateral. Leading from the sperm masses there may be as many as three slender short ducts which soon expand into wider tubes. These tubes, regarded as seminal vesicles, after forming a complex of loops, coils and caecal prolongations, ulti- mately unite beneath the intestine in a single tube which passing forwards divides on each side of the alimentary canal to terminate in the two penes situated just behind the

bases of the second pair of complete legs, that is to say, the legs of the third segment. Just at the root of the penis there is an accessory gland on the duct, and a little farther back a’much larger glandular swelling.

The Pauropoda are divided into three rather sharply defined groups or families which may be briefly characterized as follows : — Pauropodidae. — Head not covered by the first tergal plate. Anal segment not covered by the sixth tergal plate. Terga of the first ten body segments fused in couples. Tactile setae situated on the lateral portions of the terga which are neither sculptured nor spinous. {Pauropus, Stylopauropus.)

Brachypauropodidae. — Head and anal segment free and the terga smooth as in the last ; but each of the double terga of the Pauropodidae divided into an anterior and posterior plate by a transverse band of membrane and each of these into a pair of plates by a longitudinal integumental strip. The tactile setae arising from the pleural area of the segments. {Brachy pauropus.)

Eurypauropodidae. — Body wide and onisciform, the head and the anal segment concealed dorsally by the first and penultimate terga respectively. Terga fused as in the Pauropodidae, but thickly spinous or sculptured. The tactile setae situated beyond the edge of the terga, as in the Brachypauropodidae. (Eury pauropus.)

The genus Pauropus is probably world-wide in distribution, since it has been discovered in Europe, North and South America, and in Siam. The two known species of Brachypauropus were found respectively in Italy and Austria. Eurypauropus has representatives in North America and Europe. Examples of Pauropus are extremely agile, recalling the centipede Lithobius in their movements; those of Eurypauropus, on the contrary, are extremely slow and quite comparable in lack of agility to the common pill-millipede. They are usually found in woods, under stones, fallen branches, dead leaves or

other damp situations. They are believed to be vegetable feeders and are oviparous. The young upon hatching has four segments and three pairs of legs representing the first three pairs of ambulatory legs of the adult. The two last segments are apodous, the first bears the first pair of legs, and the second the second and third pairs. The young passes through four successive moults, and gradually acquires its full complement of segments and limbs.

CLASS SYMPHYLA. Prosogoneate Arthropods, differing in many important particulars from the Diplopoda and Pauropoda. The axis of the head lies in the same straight line as that of the body, as in the Chilopoda, and not at right angles to it as in the Diplopoda and Pauropoda. There are no eyes. The antennae are very long and many-jointed. Four pairs of gnathites attached to the under-side of the head have been detected. The first pair (mandibles) are two-jointed, as in many Diplopods. The second pair (maxillulae) are minute, one jointed and articulated to a median lobe or hypopharynx which is supported by two chitinous skeletal rods. The third pair (maxill'e) consist of a long, basal segment terminating distally in two lobes; near the distal end of the basal segments there is externally a minute one- or two-jointed process, regarded as a palpus. Between the maxillae lies a large, double plate (labium or maxillae of second pair) which is attached proximally to two rod-like basal segments and terminates distally in two pairs of short lobes. The body is long and narrow and bears on its dorsal side fifteen tergal plates. The first of these, immediately succeeding the head, is very short; the remainder are large and sub-equal in size. The adult animal is furnished with twelve pairs of walking legs, which, with the exception of the first pair, are alike in size and segmentation. Each consists of five segments, the distal of which is long and termi- nates with two powerful claws. The proximal "segment bears internally a slender, cylindrical process which may be termed the parapod. It has been asserted that the segment bearing this para- pod is in reality the second and that the true basal segment or coxa is embedded in the ventral

integument. The legs of the first and second pairs never have the parapod, but they are invariably present in the remaining ten pairs. The legs of the first pair

are never more than four-jointed; they are always smaller than the others, and are sometimes reduced to mere bud-like pro- cesses. They belong to the first segment behind the head. The segment represented by the last tergal plate has no ambulatory limbs; but. articulated to its posterior border is a pair of large, backwardly directed sclerites, which are perforated by the ducts of two spinning glands. These segments are regarded by some authors as the appendages of the last

After Latzel, Die Myr. Osi. Ung. Mon. II. PI. L.

1884.

A. Mandibles or jaws of first pair of Scolopendrella; md 1 , md % , first and second segments; t, tendon; c, part of ventral skeleton of head.

B. Jaws of second pair; mxl, maxillula; hyp, hypopharynx.

C. Jaws of third and fourth pairs; mx, maxilla; p.mx, maxillary palp; Ib.mx, maxillary lobes; Ib.st, sternal plate of jaw of fourth pair or labium; lb 1 , lb 2 , first and second segments of labium. (Figs. A, B, C modified from Hansen, Q.J. M.S.,

47, Pi. I-)

D. Posterior end of body from below; lg u , leg of nth pair: /g 12 , rudimentary leg of 1 2th pair of immature specimen; sc, exsertile sac; ent., parapod; pap, sensory papilla; cere, cercus or spin- ning sclerite: dl, duct of silkgland; a,

anus. „

Fig. 15.

segment, and have been compared to the cercopods of insects. At- tached also to the sides of the last segment in front of the spinning mamilla there is a sub-conical papilla bearing an apical seta arising from a cuplike depression. It has been suggested that these papillae also represent a pair of appendages. In that case the last segment must be double and bear two pairs of appendages. Thus there may be as many as fourteen pairs of trunk append- ages. There are, however, only twelve pairs known to exist with certainty. These are represented by as many segments on the ventral side; but are numerically less by two than the terga. It is not known whether this very unusual phenomenon is to be accounted for by the addition of two supernumerary terga or by the excalation of two pairs of appendages. The legs of the first pair are basally in contact; the rest are separated by a triangular sternal area. At the base of the legs, with

the exception of those of the first

and last pair, there is a slit-like

orifice recalling the coxal sacs of

certain Diplopoda {e.g. Lysiopetalum,

Platydesmus). In internal anatomy

the Symphyla closely resemble the

Diplopoda. The alimentary canal

is straight and simple, with a pair

of ” salivary ” glands opening into

the fore-gut, and a pair of malpighian

tubes joining the hind-gut close to its

communication with the mid-gut.

There is a dorsal heart with seg- mental ostia and valves, and also

a supraneural vessel. The silk

glands, which occur in both sexes,

are situated as in Lysiopetalum.

The generative glands and ducts,

which are paired, lie between the

alimentary canal above and the nor- mally constructed nerve-cord below,

and are accompanied in the male

by a pair of seminal vesicles; and

the orifice lies ventrally in the third

segment behind the head. A peculi- arity in which the Symphyla differ

from all ” tracheate ” arthropoda is

the presence of a single pair of

tracheal tubes opening by a pair of

spiracles

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a

Fig. 16. — 1, Scutigerella sp? highly magnified (slightly modified from Packard); a, tuoes opening uy a pair _oi irm ; sc l e rites; b, b, legs on the lower surface of the K r t ° • . . an(. pnn

head behind the antennae.

The newly hatched young has a

of first pair; c, antennae. 2, One of the functional

ine newly natcnea young nas a , further enlarged

(from smaller number of appendages than w s ood Mason) showing the the adult, the full complement of fiye joints and terminal pair legs, being reached only after sue- o{ c ,J h parap od. cessive moults.

The known species of Symphyla are referred to two genera, Scolopendrella and Scutigerella, which together constitute the family Scolopendrellidae. The chief difference between the two lies in the form of the tergal plates, which in Scolopendrella have the posterior

angles produced and angular, whereas in Scutigerella they are rounded. Both genera are widely distributed and are represented, in Europe, South America, Siara, &c. Large specimens reach a limit of between six and seven millimetres. They live in earth, beneath stones, dead leaves or fallen branches, and resemble diminutive centipedes {Scolo- pendra or Lithobius) both in appearance and movements. The Symphyla have frequently been compared with the Thysanurous Hexapods, the parapods with their adjacent exsertile vesicles in Scolopendretta being very similar to the abdominal appendages and vesicles of such an insect as Machilis; while the posterior spinning sclerites or cerci of the former bear much resemblance to the cerco- pods of Japyx. It must be remembered, however, that the spinning glands of certain Diplopods occupy the same position as those of the Symphyla and open upon papilliform processes of the last tergal plate, which are certainly not appendages. Hence, if the papillae are the homologues of the cerci in Scolopendretta, these cerci cannot be morphologically comparable to the cercopods of Japyx or other insects. But even if the full force of the arguments in favour of relationship between the Symphyla and the Hexapoda be admitted, the Symphyla, nevertheless, differ essentially from the Hexapoda in the anterior position of the generative orifice, and in the presence of twelve pairs of similar ambulatory

limbs. (R. I. P.)

MILLOM, a market town in the Egremont parliamentary division of Cumberland, England, in the extreme south-west of the county, on the Furness railway. Pop. of urban district (1901), 10,426. The church of Holy Trinity, Early Norman and Decorated in date, is chiefly of interest for its curious pillars, alternately round and octagonal, and for a window in the north aisle, which has five lights, and is known, on account of its unique shape, as the ” fish-window.” A massive roodstone stands in the churchyard. Millom Castle, dating from shortly after the Conquest, was fortified in the 14th century by Sir John Huddlestone, whose descendants held it until 1774. For centu- ries, they exercised the power of life and death; a stone stands where the gallows were formerly erected, and indicates that here they exercised jura regalia. Though strongly built, the castle was never of great size, and it has been largely dismantled. A fine carved staircase, however, still exists in the main chapel. In 164S the Parliamentary forces besieged Millom Castle, and early in the 19th century its park was converted into farmland. In the neighbourhood qf Millom there are blast furnaces and highly productive mines of red haematite ore. The deposit lies partly under the foreshore of the river Duddon, and a company has expended upwards of £120,000 upon a sea-wall and embankment to protect the mine from the sea.

MILLS, JOHN (d. 1736), English actor, was a member of the company at Drury Lane from 1695 almost uninterruptedly to the time of his death, playing and creating hundreds of parts. He was at his best in tragedy. His wife was an actress, and their son William — ” the younger Mills ” — was also an actor of some meiit.

MILLS, ROGER QUARLES (1832-), American legislator, was born in Todd county, Kentucky, on the 30th of March 1832. He went to Texas in 1839, studied law, and was admitted to the bar by a special act of the legislature before he was twenty-one. He entered the

Confederate army in 1861, took part as a private in the battle of Wilson's Creek, and as colonel commanded the Tenth Texas Infantry at Arkansas Post, Chickamauga (where he commanded a brigade during part of the battle), Missionary Ridge and Atlanta. He served in the national House of Representatives as a Democrat from 1873 to 1892 and in the Senate from 1892 to 1899. He made the tariff his special study, and was long recognized as the leading authority in Congress. As chairman of the Ways and Means Committee of the House of Representatives in 1887–1889 during President Cleveland's first administration, he led the fight for reform. From his committee he reported in April 1888 the " Mills Bill," which provided for a reduction of the duties on sugar, earthen- ware, glassware, plate glass, woollen goods and other articles, the substitution of ad valorem for specific duties in many cases, and the placing of lumber (of certain kinds), hemp, wool, flax, borax, tin plates, salt and other articles on the free list. This bill was passed by the Democratic House on the 21st of July, and was then so amended by a Republican Senate as to be unacceptable to the house. The tariff thus became the chief issue in the presi- dential campaign of 1888. In 1891 Mills was a candidate in the

Democratic caucus for Speaker of the house, but was defeated by Charles F. Crisp (1845–1896) of Georgia. During the free silver controversy he adhered to the Cleveland section of the Democratic party, and failed to be re-elected when his term in the Senate expired in 1899. He then retired to Corsicana, Texas, where he engaged in business and the practice of law.

MILLSTONE GRIT, in geology, a series of massive sandstones, grits and conglomerates with alternate shales, the whole resting directly upon the Carboniferous Limestone or upon intervening shales (Yoredale, Limestone Shales), usually in stratigraphical continuity. Its occasional coal-seams show that conditions of coal-formation had already begun. In Great Britain its outcrop extends from the Bristol Coalfield through South and North

Wales to its fullest development in the north-midland counties, Lancashire and Yorkshire, and thence to Scotland, where the Roslin Sandstone of the Lothians and the Moor Rock of Lanark and Stirling are considered its equivalents. Characterized by grits and sandstones of the same general type, though individually variable, as sandbanks formed on the shoaling of the Carboniferous sea, yet often persistent over wide areas, the formation, estimated as 5000 ft. thick in Lancashire, contains typically the following grits in descending order: First, or Rough Rock; second, or Haslingden Flags (Lancashire); third, or Chatsworth Grit (the last two being the Middle Grits of Yorkshire); fourth and fifth, or Kinderscout Grits and the Shale Grits. The first and third, the most persistent, are often coarse and pebbly, like the Kinderscout Grits. In the north of England these grits lose their identity. In South Wales the Millstone Grit, immediately succeeding the Carboniferous Limestone, consists of 450 ft. of grit and shale, its upper member being the massive pebbly Farewell Rock. It extends into the Bristol Coalfield, though not recognized in the Devonshire Culm. In Ireland certain grey grits and flags are assigned to it.

In northern France and Belgium it loses its individuality and is merged in the Coal-measures. It reappears east of the Rhine, but is unrecognizable in the somewhat different Carboniferous succession of eastern Europe. In America the Pottsville Conglomerate, 1500 ft. thick in the south Appalachians, with workable coals, and widely unconformable upon the Mississippian, introduces the Pennsylvanian (Upper Carbon- iferous) system, and approximately represents the Millstone Grit of western Europe, as does the red conglomerate of Nova Scotia.

The shales of the Millstone Grit include thin beds of marine goniatites {Glyphioceras bilingue, Gastrioceras carbonarium), Pterinopecten papyraceus, and Lingula mytiloides, while the grits contain Lepidodendron, Stigmaria and calamites. In Scotland plants and estuarine fishes differ markedly above

and below the Roslin Sandstone.

The English Millstone Grit produces a characteristic scenery of wild moorland plateaux, or alternations of shale-valleys and rugged grit-ridges. The grits furnish valuable building- stones .and grindstones. They also afford an excellent water supply. (C. B. W.*)

MILLVILLE, a city of Cumberland county, New Jersey, U.S.A., on the Maurice river, 40 m. S. by E. of Philadelphia. Pop. (1890) 10,002; (1900) 10,583 (598 foreign-born); (1905, state census) 11,884; (1910) 12,451. It is served by the West Jersey & Seashore railway, by electric lines to Philadelphia, Bridgeton, Vineland and Fairton, and by schooners and small freight boats. Peaches and small fruit are cultivated extensively in the surrounding country. In the north part of the city is a large public park, in which a beautiful lake 3 m. long and about 1 m. wide has been formed by damming the river. Glass and moulding sand is found in the vicinity, and the city is engaged principally in the manufacture of glass (especially druggists' ware). The value of the city's factory products increased from $2,513,433 in 1900 to $3,719,417 in 1905, or 48%; and of the total value in 1905, $2,332,614, or 62-7%, was the value of the glass products. Millville was incorporated as a town in 1801, was chartered as a city in 1866, and its charter was revised in 1877.

MILMAN, HENRY HART (1791-1868), English historian and ecclesiastic, third son of Sir Francis Milman, Bart., physician to George III., was born in London on the 10th of November 1791. Educated at Eton and at Brasenose College, Oxford, his university career was brilliant. He gained the Newdigate prize with a poem on the Apollo Belvidere in 181 2, was elected a fellow of Brasenose in 1814, and in 1816 won the English essay prize with his Comparative Estimate of

Sculpture and Painting. In 1816 he was ordained, and two years later was presented to the living of St Mary's, Reading. Milman had already made his appearance as a dramatic writer with his tragedy Fazio (produced on the stage under the title of The Italian Wife). He also wrote Samor, the Lord of The Bright City, the subject of which was taken from British legend, the " bright city " being Gloucester; but he failed to invest it with serious interest. In subsequent poetical works he was more successful, notably the Fall of Jerusalem (1820) and the Martyr of Antioch (1822). The influence of Byron is seen in his Belshazzar (1822). A tragedy, Anne Boleyn, followed in 1826; and Milman also wrote " When our heads are bowed with woe," and other hymns; an admirable version of the Sanskrit episode of Nala and Damayanti; and translations of the Agamemnon of Aeschylus and the Bacchae of Euripides. In 1821 he was elected professor of poetry at Oxford, and in 1827 he delivered the Bampton lectures on the character and conduct of the apostles as an evidence of Christianity. His poetical works were published in three volumes in 1839.

Turning to another field, Milman published in 1829 his History of the Jews, which is memorable as the first by an English clergyman which treated the Jews as an Oriental tribe, recognized sheikhs and amirs in the Old Testament, sifted and classified documentary evidence, and evaded or minimized the miraculous. In consequence, the author was violently attacked and his inevit- able preferment was delayed. In 1835, however, Sir Robert Peel made him rector of St Margaret's, Westminster, and canon of Westminster, and in 1849 he became dean of St Paul's. By this time his unpopularity had nearly died away, and generally revered and beloved, he occupied a dignified and enviable position, which he constantly employed for the promotion of culture and in particular for the relaxation of subscription to ecclesiastical formularies. His History of Christianity to the Abolition of Paganism in the Roman Empire (1840) had been com- pletely ignored; but widely different was the reception accorded to

the continuation of his work, his great History of Latin Christianity (1855), which has passed through many editions. In 1838 he had edited Gibbon's Decline and Fall of the Roman Empire, and in the following year published his Life of Gibbon. Milman was also responsible for an edition of Horace, and when he died he had almost finished a history of St Paul's Cathedral, which was completed and published by his son, A. Milman (London, 1868), who also collected and published in 1879 a volume of his essays and articles. Milman died on the 24th of September 1868, and was buried in St Paul's Cathedral. .By his wife, Mary Ann, a daughter of Lieut. -General William Cockell, he had four sons and two daughters. His nephew, Robert Milman (1816-1876), was bishop of Calcutta from 1867 until his death, and was the author of a Life of Torquato Tasso (1850).

See A. C. Tait, Sermon in Memory of H. H. Milman (London, 1868), and Arthur Milman, H. H. Milman (London, 1900). See also the Memoirs of R. Milman, bishop of Calcutta, by his sister, Frances Maria Milman (1879).

MILNE-EDWARDS, HENRY (1800-1885), French zoologist, the son of an Englishman, was born in Bruges on the 23rd of October 1800, but spent most of his life in France. At first he turned his attention to medicine, in which he graduated at Paris in 1823; but his passion for natural history soon prevailed, and he gave himself up to the study of the lower forms of animal life. One of his earliest papers (Recherches anatomiques sur les crus- tacis), which was presented to the Academy of Sciences in 1829, formed the theme of an elaborate and eulogistic report by G. Cuvier in the following year. It embodied the results of two dredging expeditions undertaken by him and his friend J. V.

Audouin during 1826 and 1828 in the neighbourhood of Granville, and was remarkable for clearly distinguishing the marine fauna of that portion of the French coast into four zones. Much of his original work was published in the Annates des

sciences naturelles, with the editorship of which he was associated from 1834. Of his books may be mentioned the Hisloire naturelle de crustac&s (3 vols., 1837–1841), which long remained a standard work; Histoire naturelle des coralliaires, published in 1858–1860, but begun many years before; Lecons sur la physiologie et I'anatomie comparee de I'homme et des animaux (1857–1881), in 14 volumes; and a little work on the elements of zoology, origin- ally published in 1834, but subsequently remodelled, which enjoyed an enormous circulation. He was appointed in 1841 professor of entomology at the museum d'histoire naturelle, where twenty-one years later he succeeded Geoffroy Saint- Hilaire in the chair of zoology. The Royal Society in 1856 awarded him the Copley medal in recognition of his zoological investigations. He died in Paris on the 29th of July 1885. His son, Alphonse Milne-Edwards (1835–1900), who became professor of ornithology at the museum in 1876, devoted himself especially to fossil birds and deep-sea exploration.

MILNER, ALFRED MILNER, Viscount (1854-), British statesman and colonial administrator, was born at Bonn on the 23rd of March 1854, the only son of Charles Milner, M.D., whose wife was a daughter of Major-General Ready, sometime governor of the Isle of Man. His paternal grandfather, an Englishman, settled in Germany and married a German lady; and their son, Charles Milner, practised as a physician in London and became later Reader in English at Tubingen University. Alfred Milner was educated first at Tubingen, then at King's College, London, and under Jowett as a scholar of Balliol College, Oxford, from 1872 to 1876. He graduated in 1877, with a first class in classics, having won the Hertford, Craven, Eldon and Derby scholarships, and was elected to a fellowship of New College. At Oxford he formed a close friendship with Arnold Toynbee, and was associated with his schemes of social work; and subsequently he wrote a tribute to his friend, Arnold Toynbee: a Reminiscence (1895). In 188 1 he was called \o the bar at the Inner Temple and joined the staff of the Pall Mall Gazette

under John Morley, becoming assistant editor under W. T. Stead. In 1885 he abandoned journalism, and became Liberal candidate for the Harrow division of Middlesex at the general election, but was defeated. He acted as private secretary to Mr (afterwards Lord) Goschen, and in 1887, when Goschen became chancellor of the exchequer, was appointed his principal private secretary. It was by Goschen's influence that in 1889 he was made under-secretary of finance in Egypt. He remained in Egypt four years, his period of office coinciding with the first great reforms, after the danger of bankruptcy had been avoided. Milner returned to England in 1892, and was appointed chairman of the Board of Inland Revenue, being made C.B. in 1894 and K.C.B. in 1895. Shortly after his return to England he published his England in Egypt, which at once became the authoritative account of the work done since the British occupation.

Sir Alfred Milner remained at the Board of Inland Revenue until 1897. He was regarded as one of the clearest-headed and most judicious officials in the British service, and his position as a man of moderate Liberal views, who had been so closely associated with Goschen at the Treasury, Cromer in Egypt and Hicks-Beach (Lord St Aldwyn) and Sir W. Harcourt while at the Inland Revenue, marked him out as one in whom all parties might have confidence. The moment for testing his capacity in the highest degree had now come. In April Lord Rosmead resigned his posts of high commissioner for South Africa and governor of Cape Colony. The situation resulting from the Jameson raid (see Transvaal and South Africa) was one of the greatest delicacy and difficulty, and Mr Chamberlain, now colonial secretary, selected Milner as Lord Rosmead's successor. The choice was cordially approved by the leaders of the Liberal party, and warmly recognized at a farewell dinner presided over by Mr Asquith (March 28th, 1897). The

appointment was avowedly made in order that an acceptable British statesman, in whom public confidence was reposed, might go to South Africa to consider all the circumstances, and to formulate a policy which should combine the upholding of British interests with the attempt to deal justly with the Transvaal and Orange Free State governments.

Sir Alfred Milner reached the Cape in May 1897, and after the difficulties with President Kruger over the Aliens' Law had been patched up he was free by August to make himself personally acquainted with the country and peoples before deciding on the lines of policy to be adopted. Between August 1897 and May 1898 he travelled through Cape Colony, the Bechuanaland Protectorate, Rhodesia and Basutoland. The better to understand the point of view of the Cape Dutch and the burghers of the Transvaal and Orange Free State, Milner also during this period learned both Dutch and the South African " Taal." He came to the conclusion that there could be no hope of peace and progress in South Africa while there remained the " permanent subjection of British to Dutch in one of the Republics." He also realized — as was shown by the triumphant re-election of Mr Kruger to the presidency of the Transvaal in February 1898 — that the Pretoria govern- ment would never on its own initiative redress the grievances of the " Uitlanders." In a speech delivered at Graaf Reinet, a Bond stronghold, on the 3rd of March 1898, he made it clear ihat he was determined to secure freedom and equality for the British subjects in the Transvaal, and he urged the Dutch colonists to induce the Pretoria government to assimilate its institutions, and the temper and spirit of its administration, to those of the free communities of South Africa. The effect of this pronouncement was great, and it alarmed the Afrikanders, who at this time viewed with apprehension the virtual resump- tion by Cecil Rhodes of his leadership of the Progressive (British) party at the Cape. That Milner had good grounds for his view of the situation is shown in a letter written (March n) by Mr J. X. Merriman to President Steyn of the Free State: "The

greatest danger (wrote Mr Merriman^ lies in the attitude of President Kruger and his vain hope of building up a State on a foundation of a narrow unenlightened minority, and his obstinate rejection of all prospect of using the materials which lie ready to his hand to establish a true republic on a broad liberal basis. Such a state of affairs cannot last. It must break down from inherent rottenness.” Though this was recognized by the more far-seeing of the Bond leaders, they were ready to support Kruger, whether or not he granted reforms, and they sought to make Milner’s position impossible. His difficulties were increased when at the general election in Cape Colony the Bond obtained a majority. Acting strictly in a con- stitutional manner, Milner thereupon (Oct. 1898) called upon Mr W. P. Schreiner to form a ministry, though aware that such a ministry would be opposed to any direct intervention of Great Britain in the Transvaal. Convinced that the existing state of affairs, if continued, would end in the loss of South Africa by Britain, Milner came to England in November 1898. He returned to the Cape in February 1899 fully assured of the support of Mr Chamberlain, though the government still clung to the hope that the moderate section of the Cape and Free State Dutch would induce Kruger to deal justly with the Uitlanders. He found the situation more critical than when he had left, ten weeks previously. Johannesburg was in a ferment, while General Sir William Butler, who acted as high commissioner in Milner’s absence, had allowed it to be seen that he did not take a favourable view of the Uitlander griev- ances. On the 4th of May Milner penned a memorable despatch to the Colonial Office, in which he insisted that the remedy for the unrest in the Transvaal was to strike at the root of the evil — the political impotence of the injured. ” It may seem a paradox,” he wrote, ” but it is true that the only way for protecting our subjects is to help them to cease to be our subjects.” The policy of leaving things alone only led from bad to worse, and ” the case for intervention is overwhelming.” Milner felt that only the enfranchisement of the Uitlanders in the

would give stability to the South African situation. He had not based his case against the Transvaal on the letter of the Conventions, and regarded the employment of the word ” suze- rainty ” merely as an ” etymological question,” but he realized keenly that the spectacle of thousands of British subjects in the Transvaal in the condition of ” helots ” (as he expressed it) was undermining the prestige of Great Britain throughout South Africa, and he called for ” some striking proof ” of the intention of the British government not to be ousted from its predominant position. This despatch was telegraphed to London, and was intended for immediate publication; but it was kept private for a time by the home government. Its tenor was known, however, to the leading politicians at the Cape, and at the instance of J. H. Hofmeyr a conference was held (May 31–June 5) at Bloemfontein between the high com- missioner and the president of the Transvaal. Milner then made the enactment by the Transvaal of a franchise law which would at once give the Johannesburgers a share in the government of the country his main, and practically his only, demand. The conference ended without any agreement being reached, and the diplomatic discussion which followed (see Transvaal) gradually became more and more contentious. When war broke out, October 1899, Milner rendered the military authorities ” unfailing support and wise counsels,” being, in Lord Roberts’s phrase ” one whose courage never faltered.”

In February 1901 he was called upon to undertake the adminis- tration of the two Boer states, both now annexed to the British Empire, though the war was still in progress. He thereupon resigned the governorship of Cape Colony, while retaining the post of high commissioner. The work of reconstructing the civil administration in the Transvaal and Orange River Colony could only be carried on to a limited extent while operations continued in the field. Milner therefore returned to England to spend a ” hard-begged holiday,” which was, however, mainly occupied in work at the

Colonial Office. He reached London on the 24th of May 1901, had an audience with the king on the same day, was made a G.C.B. and privy councillor, and was raised to the peerage with the title of Baron Milner of St James's and Cape Town. Speaking next day at a luncheon given in his honour, answering critics who alleged that with more time and patience on the part of Great Britain war might have been avoided, he asserted that what they were asked to " conciliate " was " panoplied hatred, insensate am- bition, invincible ignorance." Meanwhile the diplomacy of 1899 and the conduct of the war had caused a great change in the attitude of the Liberal party in England towards Lord Milner, whom Mr Leonard Courtney even characterized as " a lost mind." A violent agitation for his recall, in which Sir Henry Campbell-Bannerman joined, was organized, but without success, and in August he returned to South Africa, where he plunged into the herculean task of remodelling the administration. In the negotiations for peace he was associated with Lord Kitchener, and the terms of surrender, signed at Pretoria oh the 31st of May 1902, were drafted by him. In recognition of his services he was, on the 15th of July, made a viscount.

Immediately following the conclusion of peace Milner published (June 21) the Letters Patent establishing the system of crown colony government in the Transvaal and Orange River colonies, and exchanging his title of administrator to that of governor. The reconstructive work necessary after the ravages of the war was enormous. He provided a steady revenue by the levying of a tax of 10% on the annual net produce of the gold mines, and devoted special attention to the repatriation of the Boers, land settlement by British colonists, education, justice, the constabulary, and the development of railways. While this work of reconstruction was in progress domestic politics in England were convulsed by the tariff reform movement and Mr Chamberlain's resignation. Milner, who was then spending a brief holiday in Europe, was urged by Mr Balfour to take the vacant post of secretary of state for the

colonies. This offer he declined (Oct. 1, 1903), considering it more important to complete his work in South Africa, where economic depression

was becoming pronounced. He was back in Johannesburg in December 1903, and had to consider the crisis in the gold-mining industry caused by the shortage of native labour. Reluctantly he agreed, with the assent of the home govern- ment, to the proposal of the mineowners to import Chinese coolies on a three years' contract, the first batch of Chinese reaching the Rand in June 1904.

In the latter part of 1904 and the early months of 1905 Lord Milner was engaged on the elaboration of a scheme to provide the Transvaal with a system of " representative " government, a half-way house between crown colony administration and that of self-government. Letters patent providing for repre- sentative government were issued on the 31st of March 190s. 1 For some time he had suffered in health from the incessant strain of work, and he determined to retire. He left Pretoria on the 2nd of April and sailed for Europe on the following day. Speaking at Johannesburg on the eve of his departure, he re- commended to all concerned the promotion of the material pros- perity of the country and the treatment of Dutch and British on an absolute equality. Having referred to his share in the war, he added: " What I should prefer to be remembered by is a tremendous effort subsequent to the war not only to repair the ravages of that calamity but to re-start the colonies on a higher plane of civilization than they have ever previously attained." He left South Africa while the economic crisis was still acute and at a time when the voice of the critic was audible everywhere; but, in the words of the colonial secretary (Mr Alfred Lyttelton) he had in the eight eventful years of his administration " laid deep and strong the foundation upon which a united South Africa would arise to

become one of the great states of the empire." On his return home his university honoured him with the honorary degree of D.C.L.

Experience in South Africa had shown him that underlying the difficulties of the situation there was the wider problem of imperial unity. In his farewell speech at Johannesburg he concluded with a reference to the subject. " When we who call ourselves Imperialists talk of the British Empire we think of a group of states bound, not in an alliance — for alliances can be made and unmade — but in a permanent organic union. Of such a union the dominions of the sovereign as they exist to-day are only the raw material." This thesis he further developed in a magazine article written in view of the colonial conference held in London in 1907. He advocated the creation of a permanent deliberative imperial council, and favoured preferential trade relations between the United Kingdom and the other members of the empire; and in later years he took an active part in advocating the cause of tariff reform and colonial preference.

In March 1906 a motion censuring Lord Milner for an infraction of the Chinese labour ordinance, in not forbidding light corporal punishment of coolies for minor offences in lieu of imprisonment, was moved by a Radical member of the House of Commons. On behalf of the Liberal government an amendment was moved, stating that " This House, while recording its condemnation of the flogging of Chinese coolies in breach of the law, desires, in the interests of peace and conciliation in South Africa, to re- frain from passing censure upon individuals." The amendment was carried by 355 votes to 135. As a result of this left-handed censure, a counter-demonstration was organized, led by Sir Bartle Frere, and a public address, signed by over 370,000 persons, was presented to Lord Milner expressing high apprecia tion of the services rendered by him in Africa to the crown and empire.

See also E. B. Iwan-Miiller, Lord Milner and South Africa (London, 1902) ; W. B. Worsfold, Lord Milner'

s Work in South Africa (London, 1906); W. T. Stead, ” Sir Alfred Milner,” in The Review of Reviews, vol. xx. (1899); and the bibliography to South Africa.

MILNER, JOSEPH (1 744-1 797), English evangelical divine, was born at Leeds and educated at Leeds grammar-school and Cambridge. After taking his degree he went to Thorparch,

1 Owing to the advent of a Liberal ministry in England, December 1905, this scheme remained inoperative (see Transvaal: History).

Yorkshire, as curate and assistant schoolmaster. Subsequently he became head master of Hull grammar-school, and in 1768 he was chosen afternoon lecturer at Holy Trinity church, Hull. He became a strong supporter of the evangelical move- ment of the period, and greatly contributed to its success in Hull. In addition to his work as head master, he took charge of North Ferriby parish, about 9 m. from Hull. His published works include essays and numerous sermons, but his best known work is the History of the Church of Christ (Lon- don, 1794-1809). He lived to complete the first three volumes, and two more were added by his brother, Isaac Milner (1750- 1820), dean of Carlisle, who re-edited the whole work in 1810.

MILNGAVIE (locally pronounced Millguy), a police burgh of Dumbartonshire, Scotland. Pop. (1901), 3481. It lies 6 m. N.N.W. of Glasgow by the North British railway. The chief industries include bleach-fields, dye-works, a distillery and a paper mill; but the town is largely a residential quarter for Glasgow business men. Close to the town are two reservoirs, Mugdock (62 acres) and Craigmaddie (88 acres), in which is stored the water from Loch Katrine. Mugdock Castle, if m. N. of Milngavie, is an old stronghold of the Grahams; in Balder- nock parish, about 2 m. E., stands a cromlech, called “the Auld Wives’ Lift ” (400 ft. high), commanding a fine view of the lands between the Forth and Clyde. Dougalston Loch, 1 m. S.E., contains several rare aquatic plants.

MILO, or Milon, of Crotona, Greek athlete, lived about the end of the 6th century B.C. He was six times crowned at the Olympic games and six times at the Pythian for wrestling, and was famous throughout the civilized world for his feats of strength — such as carrying an ox on his shoulders through the stadium at Olympia. In his native city he was much honoured, and he commanded the army which defeated the people of Sybaris in 511. The traditional account of his death is often used to point a moral: he found a tree which some woodcutters had partially split with a wedge, and attempted to rend it asunder; but the wedge fell out, and the tree closed on his hand, imprisoning him till wolves came and devoured him. His name became proverbial for personal strength (Diod. Sic. xii. 9; Pausanias vi. 14; Strabo vi. 263; Herodotus iii. 137).

MILO, TITUS ANNIUS, Roman political agitator, was the son of C. Papius Celsus, but was adopted by his mother's father, T. Annius Luscus. He joined the Pompeian party, and organized bands of mercenaries and gladiators to support the cause by public violence in opposition to P. Clodius, who gave similar support to the democratic cause. Milo was tribune of the plebs in 57 B.C. He took a prominent part in bringing about the recall of Cicero from exile, in spite of the opposition of Clodius. In 53, when Milo was candidate for the consulship and Clodius for the praetorship, the two leaders met by acci- dent on the Appian Way at Bovillae and Clodius was murdered (January 52). Milo was impeached; his guilt was clear, and his enemies took every means of intimidating his supporters and his judges. Cicero was afraid to speak, and the extant Pro Milone is an expanded form of the unspoken defence. Milo went into exile at Massilia, and his property was sold by auction. He joined M. Caelius Rufus in 48 in his rising against Caesar, but was slain near Thurii in Lucania. His wife was Fausta, daughter of the dictator Sulla.

MILO OF GLOUCESTER, lord of Brecknock and earl of Hereford (d. 1143), was the son of Walter of Gloucester, who appears as sheriff of that county

between n 04 and n 21. Milo succeeded his father about the latter year. He was high in the service of Henry I. between 1130 and 1135, and combined the office of sheriff with that of local justiciar for Gloucester- shire. After the death of Henry I. he declared for Stephen, at whose court he appears as constable in 1136. But in 1139, when the empress Matilda appeared in England, he declared for her, and placed the city of Gloucester at her disposal; he was further distinguished by sacking the royalist city of Wor- cester and reducing the county of Hereford. In n 41, at Matilda's coronation, he was rewarded with the earldom of

Hereford. He remained loyal to the empress after her defeat at Winchester. John of Salisbury classes him with Geoffrey de Mandeville and others who were non tarn comites regni quam hosies pubhci. The charge is justified by his public policy; but the materials for appraising his personal character do not exist.

See the Continuation of Florence of Worcester (ed. B. Thorpe, 1848- 1849); the Cartulary of Gloucester Abbey (Rolls series); and J. H. Round's Geoffrey de Mandeville (1892).

MILORADOVICH, MICHAEL ANDRIJEVICH, Count (1770-1825), Russian general, saw service under Suvarov in the wars against Turkey and Poland, and in the campaign of Italy and Switzerland (1799) earned much distinction as a commander of advanced troops. In 1805, having attained the rank of lieutenant-general, he served under Kutusov in the campaign of Austerlitz, taking part in the actions of Enns and Krems and in the decisive battle of the 2nd of December, in which his column held the Pratzen heights. In the Turkish War he distinguished himself at Giurgevo (1807). Promoted general of infantry in 1810, he commanded a corps at Borodino, and subsequently inflicted the defeat of Tarutino (or Winkovo) on Murat, king of Naples (October 18,

1812). His corps was one of those most active in the pursuit of Napoleon's Grande Armee, and in 1813 he led the rear-guard of the Allies after their earlier defeats. At the victory of Kulm he was present in command of a Russian-Prussian corps, which he led at Leipzig and in the campaign of 1814. From 1818 to the time of his death he was military governor of St Petersburg. He perished in the popular outbreak in the capital, on the 26th (14th o.s.) of December 1825.

MILOSH OBRENOVICH I. (1780-1860), prince of Servia, founder of the Obrenovich dynasty, was born in 1780 of poor Servian peasants. When he later became prince of Servia he used to tell how for a penny a day he drove cattle from Servia to Dalmatia. His half-brother, Milan Obrenovich, who had developed into a successful exporter of cattle and pigs into Austria, associated him in his own export trade and otherwise supported him. Partly from gratitude and partly because the family name of his half-brother was already honourably known in the country, Milosh adopted that name as his own, and called himself Obrenovich, instead of Theodorovich. Kara- george, the leader of the first Servian revolution against the Turks, appointed Milosh Obrenovich in 1807 a voyvode, i.e. district commander of the national army and civil administrator. As such he distinguished himself in many battles, and was reputed a wise and energetic administrator and a just judge. When in 1813 the Turks under the Grand Vizier Khurshid occupied Servia, and Karageorge and almost all his voyvodes left the country for Austria, Milosh, although strongly advised to follow their example, refused to do so. He remained in the country, surrendered to the Turks, and was recognized by them as the voyvode of Rudnik (Central Servia). As he was then practically the only chief of the nation, the Turks called him to Belgrade, where he was kept through the year 1814 as a hostage. But he found means to prepare a new rising of the Servians against the Turks, and on Palm Sunday 181 5 he appeared with his voyvode's standard before the people round the small church of Takovo,

and started the second and successful in- surrection. Not so much by his victories on the battlefields as by his clever exploitation of the international difficulties of Turkey, and of the known weakness of the Turkish pashas for ” baksheesh ” — no doubt also by his statesmanlike modera- tion — he succeeded in less than two years in obtaining from the Porte the practical recognition of the Servian people’s right to self-government. The National Assembly in 1817 elected him prince of Servia.

From that year began the organization of Servia by the Servians as an autonomous province of the Ottoman Empire. But its existence as such rested on no safe and legal basis, except on the readiness of the Servians to defend it with all their might and on the goodwill of the sultan and his” Sublime Porte.” Milosh therefore worked hard to obtain some sort

of international recognition of the semi-independent status of Servia. Russia came to his assistance, and by the Treaty of Adrianople of 1829 the Porte engaged formally to grant Servia full autonomy. This engagement was somewhat devel- oped in the Hatti- sherif of 1830, which added to Servia three districts (Krushevats, Alexinats, Zaechar), acknowledged her full autonomy, recognized Milosh as hereditary prince of Servia, and declared that the Turks in Servia could have properties and live only in fortified places where there were Turkish garrisons, and not in other towns and villages. Milosh won for his family the hereditary right to the throne of Servia with- out the co-operation of Russia. The creation of a hereditary dynasty in Servia was outside the Russian Balkan policy of that time, and this great and independent success of Milosh was the first cause of Russia’s dissatisfaction with him. The second cause was that, yielding to the pressure exercised on him by his own people, he gave the country a constitution without asking ” the protector of Servia,” the tsar, for his approval of the step. The third cause was that Milosh consistently resented the interference of

Russia in the internal affairs of the principality. The climax of his misdeeds, from the Russian point of view, was that on the occasion of his visit to the Sultan Mahmud II. in 1836 he persuaded the British ambassador, Lord Ponsonby, that it would be useful to establish a British consulate in Belgrade. The first British consul in Servia, Colonel Hodges, became speedily an intimate friend of Prince Milosh, who — probably under his new friend's influence — began to agitate to replace the exclusive protectorate of Russia by the joint protectorate of all the great Powers of Europe. The cabinet of St Petersburg now decided to remove Milosh from the throne of Servia, and, supported by the Russian consul- general, the leaders of the Servian opposition, who posed as champions of a constitutional system, succeeded in forcing him to abdicate in 1839. After his abdication Milosh lived mostly on his estates in Rumania, or in Vienna. In December 1858 the National Assembly of Servia, having dethroned Prince Alexander Karageorgevich, recalled Milosh to the throne of Servia. Milosh came, accompanied by his son Michael, and began to reign in his own old fashion; but death closed his activity on the 14th (27th n.s.) of September i860. He was buried in the cathedral of Belgrade. (C. Mi.)

MILTIADES, the name of two Athenian statesmen and generals of a family (the Philaidae) of Aeginetan origin, which claimed descent from Aeacus.

1. Miltiades (6th century B.C.), the son of Cypselus, a promi- nent opponent of Peisistratus. According to Herodotus (vi. 36, 37) he led a colony to the Tbracian Chersonese at the request of the Doloncians, who, hard pressed by the Absinthians (or Apsinthians), were advised by the Delphian oracle to invite to their country the man who should first show them hospi- tality after leaving the temple. Since, however, the Athenians had from c. 600-590 B.C. held Sigeum in the Troad, whence they had fought against Mitylene, it is probable that the Doloncians appealed for help to Athens, and that Peisistratus took the opportunity of getting rid of one of his chief opponents by sending Miltiades. He

became ” tyrant ” of the Chersonesus, which he fortified by a wall across the isthmus from Cardia to Pactya. He was captured by the people of Lampsacus, but released on the intercession of Croesus of Lydia. He was succeeded by Stesagoras, son of his half-brother, Cimon.

2. Miltiades (died c. 488 B.C.), the victor of Marathon, was another son of Cimon. On the death of Stesagoras, he was sent to the Chersonese (? about 518-516) by Hippias — no doubt to support Hegesistratus at Sigeum (see Peisistratus). He entrapped and imprisoned the chief men of Chersonesus, which was then in a turbulent condition, and strengthened himself by an alliance with Hegesipyle, daughter of the Thracian prince Olorus (Herod, vi. 39). He led a contingent in the Scythian expedition of Darius Hystaspis and, according to Herodotus, advised the leaders who were left at the Danube bridge to destroy it and leave Darius to his fate. This story is improbable, as Darius left Miltiades in possession of the Chersonese for some

twenty years longer, though Persian forces Vere frequently in the neighbourhood. Miltiades was, according to Herodotus, expelled by Scythian invaders, but was brought back by the Doloncians, and subsequently captured Lemnos and Imbros for Athens from the so-called Pelasgian inhabitants, who were Persian dependents. Having thus (probably) incurred the enmity of Darius, Miltiades fled to Athens on the approach of the Persians under Datis and Artaphernes, leaving his son Metiochus a prisoner in Persian hands, and was at once impeached unsuccessfully on the charge of tyranny in the Chersonese. 1 Possibly the story of his having tried to destroy the Danube bridge was invented or exaggerated at this time as an argument in his favour (see Grote, History of Greece, i vol., ed. 1907, p. 119 note). Since, however, Herodotus almost

certainly relied on Alcmaeonid tradition, which was hostile to Miltiades, the whole story is uncertain; the statement that he fled before a Scythian invasion is especially improbable. If Miltiades really recommended the destruction of the bridge, we may infer that the Herodotean story of his flight before the Scythians is a misunderstanding of the fact that his residence in Chersonese after the Scythian invasion was insecure and not continuous.

On the approach of the Persians Miltiades was made one of the ten Athenian generals, and it was on his advice that the polemarch Callimachus decided to give battle at Marathon (?.».). Subsequently he used his influence with the Athenians to induce them to give him a fleet of seventy ships without any indication of his object (Herod, vi. 132–136). Cornelius Nepos (Miltiades, c. vii.), probably on good authority (? Eph- orus), states that he had a commission to regain control over the Aegean. No doubt his object was to establish an outer line of defence against future Persian aggression. Herodotus says that, having besieged Paros vainly for nearly a month, he made a secret visit to Timo, a priestess of Demeter in Paros, with a view to the betrayal of the island, and being compelled to flee wounded himself severely in attempting to leap a fence (but see Ephorus in Fragm. hist. gr. 107). ,

On his return to Athens he was impeached by Xanthippus, who was allied by marriage to the Alcmaeonids, on the ground that he had ” deceived the people,” and only escaped on the strength of his past services with a fine of 50 talents. The facts of the trial and the charge are difficult to recover, nor do we know why the siege was raised. Some authorities hold that he was bribed to this course, and hence that the charge was one of treason; others suggest that be retired in the belief that a Persian fleet was approaching. All that is known is that he died of his wound (480–488), without paying the fine, which was paid subsequently by his son Cimon (q.v.). He appears to have been a man of strong determination and great personal courage, of a type characteristic of the

pre-Cleisthenic constitution. His absence in the Chersonese during the first years of the new democracy (508-493?) and his patrician line- age account naturally for the difference which existed between him and the popular leaders — Themistocles and Aristides.

See the passages of Herodotus and Cornelius Nepos, quoted above, and histories of Greece. On the Parian expedition and the trial, R. W. Macan, Herodotus iv.-vi., vol. 2, appendix xi. ;on the foreign policy of Miltiades see Themistocles. (J. M. M.)

HILTON, JOHN (1608-1674), English poet, was born in Bread Street, Cheapside, London, on the 9th of December 1608. His father, known as Mr John Milton of Bread Street, scrivener, was himself an interesting man. He was a native of Oxford- shire, the son of a Richard Milton, yeoman of Stanton-St-John's, one of the sturdiest adherents to the old Roman Catholic religion in his district, and was educated at Christ Church, Oxford, where he turned Protestant. According to the poet's earliest biographer, John Milton senior was disinherited in the beginning of Queen Elizabeth's reign for reading the Bible. With a good education and good abilities, especially in music, he may have lived for some time in London by musical teaching and practice.

1 So Herodotus ; but the story is difficult to believe in view of the fact that the family of Miltiades was distinctively fiKrorvpavvos. Possibly the trial is merely a hostile version of the ordinary test of a man's qualification for office (Soni/toola).

Not till 1595, at all events, when he must have been long past the usual age of apprenticeship, do we hear of his preparation for the profession of a scrivener; and not till February 1599-1600, when he was about thirty-seven years of age, did he become a qualified member of the Scriveners' Company. It was then that he set up his " house and shop " at the sign of the Spread Eagle in Bread Street, and began his business of drawing up wills, marriage-

settlements, and the like, with such related business as that of receiving money from clients for investment and lending it out to the best advantage. It was at the same time that he married, not, as stated by Aubrey, a lady named Bradshaw, but Sarah Jeffrey, one of the two orphan daughters of a Paul Jeffrey, of St Swithin's, London, " citizen and merchant- taylor," originally from Essex, who had died before 1583. At the date of her marriage she was about twenty-eight years of age. Six children were born to the scrivener and his wife, of whom three survived infancy — Anne, who married Edward Phillips; John, the poet; and Christopher (1615-1693), who was knighted and made a judge under James II.

The first sixteen years of Milton's life, coinciding exactly with the last sixteen of the reign of James I., associate themselves with the house in Bread Street. His father, while prospering in business, continued to be known as a works. man of " ingeniose " tastes, and acquired distinction in the London musical world of that time. He contributed a madrigal to Thomas Morley's Triumph of Oriana (1601), four motets to Sir William Leighton's Tears and Lamentations of a Sorrowful Soul (1614), and some hymn tunes — one of which, " Yor," is still in common use — in Thomas Ravenscroft's Whole Book of Psalms (1621). Music was thus a part of the poet's domestic education from his infancy. Again and again Milton speaks with gratitude and affection of the ungrudging pains bestowed by his father on his early education. " Both at the grammar school and also under other masters at home," is the statement in one passage, " he caused me to be instructed daily. " When Milton was ten years of age his tutor was Thomas Young (1587-1655), a Scottish divine, who afterwards became master of Jesus College, Cambridge. Young's tutorship lasted till 1622, when he accepted the pastorship of the congre- gation of English merchants in Hamburg. Already, however, for a year or two his teaching had been only supplementary to the education which the boy was receiving by daily attendance at St Paul's public

school, close to Bread Street. The head- master of the school was Alexander Gill, an elderly Oxford divine, of high reputation for scholarship and teaching ability. Under him, as usher or second master, was his son, Alexander Gill the younger, also an Oxford graduate of scholarly reputa- tion, but of blustering character. Milton's acquaintanceship with this younger Gill, begun at St Paul's school, led to subse- quent friendship and correspondence. Far more affectionate and intimate was the friendship formed by Milton at St Paul's with his schoolfellow Charles Diodati, the son of an Italian physician, Dr Theodore Diodati, a naturalized Englishman settled in London, and much respected, both on his own account and as being the brother of the famous Protestant divine, Jean Diodati of Geneva. Young Diodati, who was destined for his father's profession, left the school for Trinity College, Oxford, early in 1623; but Milton remained till the end of 1624. In that year his elder sister, Anne, married Edward Phillips, a clerk in the Government office called the Crown Office in Chancery.

Milton had then all but completed his sixteenth year, and was as scholarly, as accomplished and as handsome a youth as St Paul's school had sent forth. We learn from himself that his exercises " in English or other tongue, prosing or versing, but chiefly this latter," had begun to attract attention even in his boyhood. Of these poems the only specimens that now remain are two copies of Latin verses, preserved in a common- place book of his (printed by the Camden Society in 1877), and his " Paraphrase on Psalm CXIV " and his " Paraphrase on Psalm CXXXVI." At the age of sixteen years and two months, Milton was entered as a student of Christ's College, Cambridge,

in the grade of a " Lesser Pensioner," and he matriculated two months later, on the 9th of April

1625. The master of Christ's was Dr Thomas Bainbrigge; and among the thirteen fellows were Joseph Meade, still remembered as a commentator on the Apocalypse, and William Chappell, afterwards an Irish bishop. It was under Chappell's tutorship that Milton was placed when he first entered the college. At least three students who entered Christ's after Milton, • but during his residence, deserve mention. One was Edward King, a youth of Irish birth and high Irish connexions, who entered in 1626, at the age of fourteen, another was John Cleveland, afterwards known as royalist and satirist, who entered in 1627; and the third was Henry More, subsequently famous as the Cambridge Platonist, who entered in 1631, just before Milton left. Milton's own brother, Christopher, joined him in the college in February 1630-1631, at the age of fifteen.

Milton's academic course lasted seven years and five months, bringing him from his seventeenth year to his twenty-fourth. The first four years were his time of undergraduateship. It was in the second of these — the year 1626 — that there occurred the quarrel between him and his tutor, Chappell, which Dr Johnson, making the most of a lax tradition from Aubrey, magnified into the supposition that Milton may have been one of the last students in either of the English universities that suffered the indignity of corporal punishment. The legend deserves no credit; but it is certain that Milton, on account of some disagreement with Chappell, left college for a time, though he did not lose his term; and that when he did return, he was transferred from the tutorship of Chappell to that of Nathaniel Tovey. From the first of the Latin elegies one infers that the cause of the quarrel was some outbreak of self-assertion on Milton's part. We learn indeed, from words of his own elsewhere, that it was not only Chappell and Bainbrigge that he had offended by his independent demeanour, but that, for the first two or three years of his undergraduateship, he was generally unpopular, for the same reason, among the younger men of his college. They had nicknamed him " the Lady " — a nickname which the students of the other

colleges took up, converting it into “the Lady of Christ’s”; and, thbugh the allusion was chiefly to the peculiar grace of his personal appear- ance, it conveyed also a sneer at what the rougher men thought his unusual prudishness, the haughty fastidiousness of his tastes and morals. A change in this state of things had certainly occurred before January 1628-1629, when, at the age of twenty, he took his B.A. degree. By that time his intellectual pre- eminence had come to be acknowledged. His reputation for scholarship and literary genius, extraordinary even then, was more than confirmed during the remaining three years and a half of his residence in Cambridge. A fellowship in Christ’s which fell vacant in 1630 would undoubtedly have been his had the election to such posts depended then absolutely on merit. As it was, the fellowship was conferred, by royal favour on Edward King, his junior in college standing by sixteen months. In July 1632 Milton completed his career at the university by taking his M.A. degree. Tradition still points out Milton’s rooms at Christ’s College. They are on the first floor on the first stair on the north side of the great court.

Of Milton’s skill at Cambridge, in what Wood calls ” the collegiate and academical exercises,” specimens remain in his Prolusiones quaedam oratoriae. They consist of seven rhetorical Latin essays, generally in a whimsical vein, delivered by him, either ; n the hall of Christ’s College or in the public university schools. To Milton’s Cambridge period belong four of his Latin ” Familiar Epistles,” and the greater number of his preserved Latin poems, including: (1) the seven pieces, written in 1626, which compose his Elegiarum liber, two of the most interesting of them addressed to his friend, Charles Diodati, and one to his former tutor, Young, in his exile at Ham- burg; (2) the five short Gunpowder Plot epigrams, now appended to the Elegies-, and (3) the first five pieces of the Sylvamm liber, the most important of which are the hexameter poem ” In quintum novembris ” (1626), and the piece entitled Naturam

non pati senium (1628). Of the English poems of the Cambridge period the following is a dated list: ” On the Death of a fair Infant ” (1625-1626), the subject being the death of the first-born child of his sister Anne Phillips; “At a Vacation Exercise in the College” (1628), the magnificent Christmas ode; “On the Morning of Christ’s Nativity ” (1629); the fragment called ” The Passion ” and the ” Song on May Morning,” both probably belonging to 1630; the sonnet ” On Shakespeare,” certainly belonging to that year, printed in the Shakespeare folio of 1632; the two facetious pieces ” On the University Carrier ” (1630- 1631); the “Epitaph on the Marchioness of Winchester” (163 1); the sonnet “To the Nightingale,” probably of the same year; the sonnet ” On arriving at the Age of twenty- three,” dating itself certainly in December 1631.

Just before Milton quitted Cambridge, his father, then verging on his seventieth year, had practically retired from his Bread Street business, leaving the active management of it to a partner, named Thomas Bower, a former apprentice of his, and had gone to spend his declining years at Horton in Buckinghamshire, a small village near Colnbrook, and not far from Windsor. Here, in a house close to Horton church, Milton mainly resided for the next six years — from July 1632 to April 1638.

Although, when he had gone to Cambridge, it had been with the intention of becoming a clergyman, that intention had been abandoned. His reasons were that ” tyranny had invaded the church,” and that, finding he could not honestly subscribe the oaths and obligations required he ” thought it better to preserve a blameless silence before the sacred office of speaking, begun with servitude and forswearing.” x In other words, he was disgusted with the system which Laud was establishing and maintaining in the Church of England. ” Church-outed by the prelates,” as he emphatically expresses it, he seems to have thought for a time of the law, but he decided that the only life possible for himself

was one dedicated wholly to scholar- ship and literature. His compunctions on this subject, expressed already in his sonnet on arriving at his twenty-third year, are expressed more at length in an English letter of which two drafts are preserved in Trinity College, Cambridge, sent by him, shortly after the date of that sonnet, and with a copy of the sonnet included, to some friend who had been remon- strating with him on his ” belatedness ” and his persistence in a life of mere dream and study. There were gentle remon- strances also from his excellent father. Between such a father and such a son, however, the conclusion was easy. What it was may be learnt from Milton’s fine Latin poem Ad patrem. There, in the midst of an enthusiastic recitation of all that his father had done for him hitherto, it is intimated that the agree- ment between them on their one little matter of difference was already complete, and that, as the son was bent on a private life of literature and poetry, it had been decided that he should have his own way, and should in fact, so long as he chose, be the master of his father’s means and the chief person in the Horton household. For the six years from 1632 this, accordingly, was Milton’s position. In perfect leisure, and in a pleasant rural retirement, with Windsor at the distance of an easy walk, and London only about 17 m. off, he went through, he tells us, a systematic course of reading in the Greek and Latin classics, varied by mathematics, music, and the kind of physical science we should now call cosmography.

It is an interesting fact that Milton’s very first public appear- ance in the world of English authorship was in so honourable a place as the second folio edition of Shakespeare in 1632. His enthusiastic eulogy on Shakespeare, written in 1630, was one of three anonymous pieces prefixed to that second folio. Among the poems actually written by Milton at Horton the first, in all probability, after the Latin hexameters Ad patrem, were the exquisite companion pieces L Allegro and 27 Penseroso. There followed, in or about 1633, the

fragment called Arcades. It was part of a pastoral masque performed by the young people of the noble family of Egerton before the countess-dowager

1 See the preface to Book II. of his Reason of Church Government (1641-1642), which is of great biographical interest.

of Derby, at her mansion of Harefield, about 10 m. from Horton. That Milton contributed the words for the enter- tainment was, almost certainly, owing to his friendship with Henry Lawes, who supplied the music. Next in order among the compositions at Horton may be mentioned the three short pieces, ” At a Solemn Music,” ” On Time,” and ” Upon the Circumcision “; after which comes Comus, the largest and most important of all Milton’s minor poems. The name by which that beautiful drama is now universally known was not given to it by Milton himself. He entitled it, more simply and vaguely, ” A Masque presented at Ludlow Castle, 1634, on Michaelmas night, before John Earl of Bridgewater, Lord President of Wales ” (1637). The earl of Bridgewater, the head of the Egerton family, had been appointed president of the council of Wales ; among the festivities on his assumption of the office, a great masque was arranged in the hall of Ludlow Castle, his official residence. Lawes supplied the music and was stage manager; he applied to Milton for the poetry; and on Michaelmas night, the 29th of September 1634, the drama furnished by Milton was performed in Ludlow Castle before a great assemblage of the nobility and gentry of the Welsh princi- pality, Lawes taking the part of “the attendant spirit,” while the parts of ” first brother,” ” second brother ” and ” the lady,” were taken by the earl’s three youngest children, Viscount Brackley,Mr Thomas Egerton and Lady Alice Egerton.

From September 1634 to the beginning of 1637 is a

compara- tive blank in our records. Straggling incidents in this blank are a Latin letter of date December 4, 1634, to Alexander Gill the younger, a Greek translation of ” Psalm CXIV.,” a visit to Oxford in 1635 for the purpose of incorporation in the degree of M.A. in that university, and the beginning in May 1636 of a troublesome lawsuit against his now aged and infirm father. The lawsuit, which was instituted by a certain Sir Thomas Cotton, bart., nephew and executor of a deceased John Cotton, Esq., accused the elder Milton and his partner Bower, or both, of having, in their capacity as scriveners, misappro- priated divers large sums of money that had been entrusted to them by the deceased Cotton to be let out at interest.

The lawsuit was still in progress when, on the 3rd of April 1637, Milton’s mother died, at the age of about sixty-five. A flat blue stone, with a brief inscription, visible on the chancel- pavement of Horton church, still marks the place of her burial. Milton’s testimony to her character is that she was ” a most excellent mother and particularly known for her charities through the neighbourhood.” The year 1637 was otherwise eventful. It was in that year that his Comus, after lying in manuscript for more than two years, was published by itself, in the form of a small quarto of thirty-five pages. The author’s name was withheld, and the entire responsibility of the publica- tion was assumed by Henry Lawes. Milton seems to have been in London when the little volume appeared. He was a good deal in London, at all events, during the summer and autumn months immediately following his mother’s death. The plague, which had been on one of its periodical visits of ravage through England since early in the preceding year, was then especially severe in the Horton neighbourhood, while London was comparatively free. It was probably in London that Milton heard of the death of Edward King, who had sailed from Chester for a vacation visit to his relatives in Ireland, when, on the 10th of August, the ship in perfectly calm water struck on a rock and went down, he and nearly all the other passengers going down

with her. There is no mention of this event in Milton's two Latin " Familiar Epistles " of September 1637, addressed to his friend Charles Diodati, and dated from London; but in November 1637, and probably at Horton, he wrote his matchless pastoral monody of Lycidas. It was his contribution to a collection of obituary verses, Greek, Latin and English, inscribed to the memory of Edward King by his numerous friends, at Cambridge and elsewhere. The collection appeared early in 1638. The second part contained thirteen English poems, the last of which was Milton's monody, signed only with his initials " J. M."

Milton was then on the wing for a foreign tour. He had long set his heart on a visit to Italy, and circumstances now favoured his wish. The vexatious Cotton lawsuit, after hanging on for nearly two years, was at an end, as far as the elder Milton was concerned, with the most absolute and honourable vindica- tion of his character for probity, though with some continuation of the case against his partner, Bower. Moreover, Milton's younger brother Christopher, though but twenty-two years of age, and just about to be called to the bar of the Inner Temple, had married ; and the young couple had gone to reside at Horton to keep the old man company.

Before the end of April 1638 Milton was on his way across the channel, taking one English man-servant with him. At the time of his departure the last great news in England was that of the National Scottish Covenant. To Charles the news of this " damnable Covenant," as he called it, was enraging beyond measure; but to the mass of the English Puritans it was far from unwelcome, promising, as it seemed to do, for England herself, the subversion at last of that system of " Thorough," or despotic government by the king and his ministers without parliaments, under which the country had been groaning since the contemptuous dissolution of Charles's third parliament ten years before. Through Paris, where Milton received polite attention from the English ambassador, Lord Scudamore, and had the honour of an introduction to the famous Hugo

Grotius, then ambassador for Sweden at the French court, he moved on rapidly to Italy, by way of Nice. After visiting Genoa, Leghorn and Pisa, he arrived at Florence, in August 1638. Enchanted by the city and its society, he remained there two months, frequenting the chief academies or literary clubs, and even taking part in their proceedings. Among the Florentines with whom he became intimate were Jacopo Gaddi, founder of an academy called the Svogliati, young Carlo Dati, author of Vile de' pittori anlichi, Pietro Frescobaldi, Agostino Coltellini, the founder of the Academy of the Apatisti, the grammarian Benedetto Buommattei, Valerio Chimentelli, afterwards professor of Greek at Pisa, Antonio Francini and Antonio Malatesti. It was in the neigh- bourhood of Florence also that he " found and visited " the great Galileo, then old and blind, and still nominally a prisoner to the Inquisition for his astronomical heresy. 1

By way of Florence and Siena, he reached Rome some time in October, and spent about another two months there, not only going about among the ruins and antiquities and visiting the galleries, but mixing also, as he had done in Florence, with the learned society of the academies. Among those with whom he formed acquaintance in Rome were the German scholar, Lucas Holstenius, librarian of the Vatican, and three native Italian scholars, named Alessandro Cherubini, Giovanni Salzilli and a certain Selvaggi. There is record of his having dined once, in company with several other Englishmen, at the hospitable table of the English Jesuit College. The most picturesque incident, however, of his stay in Rome was his presence at a great musical entertainment in the palace of Cardinal Francesco Barberini. Here he had not only the honour of a specially kind reception by the cardinal himself, but also, it would appear, the supreme pleasure of listening to the marvellous Leonora Baroni, the most renowned singer of her age..

Late in November he left Rome for Naples. Here he met the aged Giovanni Battista Manso, marquis of Villa (1560-1645), the friend and biographer of

Tasso, and subsequently the friend and patron of Marini. He had hardly been in Naples a month, however, when there came news from England which not only stopped an intention he had formed of extending his tour to Sicily and thence into Greece, but urged his immediate return home. "The sad news of civil war in England," he says, " called me back; for I considered it base that, while my fellow- countrymen were fighting at home for liberty, I should be travelling at my ease for intellectual culture" (Defensio secunda). In December 1638, therefore, he set his face northwards

1 This interview forms the subject of one of W. S. Landor'* Imaginary Conversations.

again. His return journey, however, probably because he learnt that the news he had first received was exaggerated or premature, was broken into stages. He spent a second January and February (1638-1639) in Rome, in some danger, he says, from the papal police, because the English Jesuits in Rome had taken offence at his habit of free speech, wherever he went, on the subject of religion. From Rome he went to Florence, his second visit to the city, including an excursion to Lucca, extending over two months; and not till April 1639 did he take his leave, and proceed, by Bologna and Ferrara, to Venice. About a month was given to Venice; and thence, having shipped for England the books he had collected in Italy, he went on, by Verona and Milan, over the Alps, to Geneva. In this Protestant city he spent a week or two in June, forming interesting acquaintanceships there too, and having daily conversations with the great Protestant theologian Dr Jean Diodati, the uncle of his friend Charles Diodati. From Geneva he returned to Paris, and so to England. He was home again in August 1639, having been absent in all fifteen or sixteen months.

Milton's Continental tour, and especially the

Italian portion of it, which he describes at some length in his Defensio secunda, remained one of the chief pleasures of his memory through all his subsequent life. Nor was it without fruits of a literary kind. Besides two of his Latin Epistolae familiares, one to the Florentine grammarian Buommattei, and the other to Lucas Holstenius, there have to be assigned to Milton's sixteen months on the Continent his three Latin epigrams A d Leonoram Romae canentem, his Latin scazons Ad Salsillum poetam romanum aegrotantem, his fine Latin hexameters entitled Mansus, ad- dressed to Giovanni Battista Manso, and his five Italian sonnets, with a canzone, in praise of a Bolognese lady.

His bosom friend and companion from boyhood, Charles Diodati, died in Blackfriars, London, in August 1638, not four months after Milton had gone away on his tour. The intelligence did not reach Milton till some months afterwards, probably not till his second stay in Florence; and, though he must have learnt some of the particulars from his friend's uncle in Geneva, he did not know them fully till his return to England. How profoundly they affected him appears from his Epitaphium Damonis, then written in memory of his dead friend. The importance of this poem in Milton's biography cannot be overrated. It is perhaps the noblest of all his Latin poems; and, though written in the artificial manner of a pastoral, it is un- mistakably an outburst of the most passionate personal grief. In this respect Lycidas, artistically perfect though that poem is, cannot be compared with it; and it is only the fact that Lycidas is in English, while the Epitaphium Damonis is in Latin, that has led to the notion that Edward King of Christ's College was peculiarly and pre-eminently the friend of Milton in his youth and early manhood.

We should not have known, but for an incidental passage in the Epitaphium Damonis, that, at the time of his return from Italy, he had chosen a subject for a great poem from the Arthurian legend. The passage (lines 160-178) is one in which, after referring to the hopes of Diodati's medical career

so suddenly cut short by his death, Milton speaks of himself and of his own projects in Ms profession of literature. Milton wrote that he was meditating an epic of which King Arthur was to be the central figure, but which should include somehow the whole cycle of British and Arthurian legend. This epic was to be in English, and he had resolved that all his poetry for the future should be in the same tongue.

Not long after Milton's return the house at Horton ceased to be the family home. Christopher Milton and his wife went to reside at Reading, taking the old gentleman with them, while Milton himself preferred London. He had first taken lodgings in St Bride's Churchyard, at the foot of Fleet Street; but, after a while, probably early in 1640, he removed to a " pretty garden house " of his own, at the end of an entry, in the part of Aldersgate Street which lies immediately on the city side of what is now Maidenhead Court. His sister, whose first

husband had died in 163 1, had married a Mr. Thomas Agar, his successor in the Crown Office; and it was arranged that her two sons by her first husband should be educated by their uncle. John Phillips, the younger of them, only nine years old, had boarded with him in the St Bride's Churchyard lodgings; and, after the removal to Aldersgate Street, the other brother, Edward Phillips, only a year older, became his boarder also. Gradually a few other boys, the sons of well-to-do personal friends, joined the two Phillipses, whether as boarders or for daily lessons, so that the house in Aldersgate Street became a small private school.

The Arthurian epic had been given up, and his mind was roving among many other subjects, and balancing their capa- bilities. How he wavered between Biblical subjects and heroic subjects from British history, and how many of each kind suggested themselves to him, one learns from a list in his own handwriting among the Milton MSS. at Cambridge. It contains jottings of no fewer than fifty-three subjects from the Old Testament, eight from the Gospels, thirty-three from British and English

history before the Conquest, and five from Scottish history. It is curious that all or most of them are headed or described as subjects for ” tragedies,” as if the epic form had now been abandoned for the dramatic. There are four separate drafts of a possible tragedy on the Greek model under the title of Paradise Lost, two of them merely enumerating the dramatis personae, but the last two indicating the plot and the division into acts. In 1641 he wrote in the Reason of Church Government that he was meditating a poem on high moral or religious subjects. But the fulfilment of ” these plans was indefinitely postponed. Milton became absorbed in the ecclesiastical controversies following on the king’s attempt to force the episcopal system on the Scots.

Of the first proceedings of the Long Parliament, including the trial and execution of Strafford, the impeachment and imprisonment of Laud and others, and the breakdown of the system of Thorough by miscellaneous reforms and by guarantees for parliamentary liberty, Milton was only a spectator. It was when the church question emerged distinctly as the question paramount, and there had arisen divisions on that question among those who had been practically unanimous in matters of civil reform, that he plunged in as an active adviser. There were three parties on the church question. There was a high- church party, contending for episcopacy by divine right, and for the maintenance of English episcopacy very much as it was; there was a middle party, defending episcopacy on grounds of usage and expediency, but desiring to see the powers of bishops greatly curtailed, and a limited episcopacy, with councils of presbyters round each bishop, substituted for the existing high episcopacy; and there was the root-and- branch party, as it called itself, desiring the entire abolition of episcopacy and the reconstruction of the English Church on something like the Scottish Presbyterian model. Since the opening of the parliament there had been a storm of pamphlets from these three parties. The manifesto of the high-church party was a pamphlet by

Joseph Hall, bishop of Exeter, entitled ” Humble Remonstrance to the High Court of Parliament.” In answer to Hall, and in representation of the views of the root- and-branch party, there had stepped forth, in March 1640-1641, five leading Puritan parish ministers, the initials of whose names, clubbed together on the title-page of their joint pro- duction, made the uncouth word ” Smectymnuus.” These were Stephen Marshall, Edmund Calamy, Thomas Young, Matthew Newcomen and William Spurstow. Thomas Young was the Scottish divine who had been Milton’s tutor in Bread Street; he had returned from Hamburg in 1628, and had been appointed to the vicarage of Stowmarket in Suffolk. The famous Smectymnuan pamphlet in reply to Hall was mainly Young’s. What is more interesting is that his old pupil Milton was secretly in partnership with him and his brother- Smec- tymnuans. Milton’s hand is discernible in a portion of the original Smectymnuan pamphlet; and he continued to aid the Smectymnuans in their subsequent rejoinders to Hall’s defences

of himself. In May 1641 he put forth a defence of the Smec- tymnuan side in Of Reformation touching Church Discipline in England and the Causes that hitherto have hindered it. He reviewed English ecclesiastical history, with an appeal to his countrymen to resume that course of reformation which he considered to have been prematurely stopped in the preceding century, and to sweep away the last relics of papacy and prelacy. Among all the root-and-branch pamphlets of the time it stood out, and stands out still, as the most thorough-going and tremendous. It was followed by four others in rapid succession, — Of Prelatical Episcopacy and whether it may be deduced from the Apostolical Times (June 1641), Animadversions upon the Remonstrant’s Defence against Smectymnuus (July 1641), The Reason of Church Government urged against Prelaty (Feb. 1641-1642), Apology against a Pamphlet called a Modest Confuta- tion of the Animadversions, &c.

(March and April 1641-1642). The first of these was directed chiefly against that middle party which advocated a limited episcopacy, with especial reply to the arguments of Archbishop Ussher, as the chief exponent of the views of that party. Two of the others, as the titles imply, belong to the Smectymnuan series, and were castigations of Bishop Hall. The greatest of the four, and the most important of all Milton's anti-episcopal pamphlets after the first, is that entitled The Reason of Church Government. It is there that Milton takes his readers into his confidence, speaking at length of himself and his motives in becoming a controversialist. Poetry, he declares, was his real vocation; it was with reluctance that he had resolved to " leave a calm and pleasing solitariness, fed with cheerful and confident thoughts, to embark in a troubled sea of noises and hoarse disputes"; but duty had left him no option. The great poem or poems he had been meditating could wait; and meanwhile, though in prose- polemics he had the use only of his " left hand/' that hand should be used with all its might in the cause of his country and of liberty. The Apology was in answer to a Modest Confutation of a Slanderous and Scurrilous Libel, the joint work of Hall and his son, attacking Milton's personal character. The parliament had advanced in the root-and-branch direction so far as to have passed a bill for the exclusion of bishops from the House of Lords, and compelled the king's assent to that bill, when, in August 1642, the further struggle between Charles and his subjects took the form of civil war. The Long Parlia- ment moved on more and more rapidly in the root-and-branch direction, till, by midsummer 1643, the abolition of episcopacy had been decreed, and the question of the future non-prelatic constitution of the Church of England referred to a synod of divines, to meet at Westminster under parliamentary authority. Of Milton's life through those first months of the Civil War little is known. He remained in his house in Aldersgate Street, teaching his nephews and other pupils; and the only scrap that came from his pen was the semi-jocose

sonnet bearing the title ” When the Assault was intended to the City.” In the summer of 1643, however, there was a great change in the Aldersgate Street household. About the end of May, as his nephew Edward Phillips remembered, Milton went away on a country journey, without saying whither or for what purpose; and, when he returned, about a month afterwards, it was with a young wife, and with some of her sisters and other relatives in her company. He had, in fact, been in the very headquarters of the king and the Royalist army in and round Oxford; and the bride he brought back with him was a Mary Powell, the eldest daughter of Richard Powell, of Forest Hill, near Oxford. She was the third of a family of eleven sons and daughters, of good standing, but in rather embarrassed circumstances, and was seventeen years and four months old, while Milton was in his thirty-fifth year. However the marriage came about, it was a most unfortunate event. The Powell family were strongly Royalist, and the girl herself seems to have been frivolous, and entirely unsuited for the studious life in Aiders-gate Street. Hardly were the honeymoon festivities over, when, her sisters and other relatives having returned to Forest Hill and left her alone with her husband, she pined for home

again and begged to be allowed to go back on a visit. Milton consented, on the understanding that the visit was to be a brief one. This seems to have been in July 1643. Soon, however, the intimation from Forest Hill was that he need not look ever to have his wife in his house again. The resolution seems to have been mainly the girl’s own; but, as the king’s cause was then prospering in the field, Edward Phillips was probably right in his conjecture that the whole of the Powell family had repented of their sudden connexion with so prominent a Parliamentarian and assailant of the Church of England as Milton. While his, wife was away, his old father, who had been residing for three years with his younger and lawyer son at Reading, came to take up his quarters in Aldersgate Street.

Milton’s conduct under the insult of his wife’s

desertion was most characteristic. Always fearless and speculative, he converted his own case into a public protest against the existing law and theory of marriage. The Doctrine and Disci- pline of Divorce, Restored to the good of both Sexes from the Bondage of Canon Law and other Mistakes was the title of a pamphlet put forth by him in August 1643, without his name, but with no effort at concealment, declaring the notion of a sacramental sanctity in the marriage relation to be a clerically invented superstition, and arguing that inherent incompatibility of char- acter, or contrariety of mind, between two married persons is a perfectly just reason for divorce. If the date, the 1st of August, is correct, the pamphlet must have been written almost immedi- ately on his wife's departure and before her definite refusal to return. There was no reference to his own case, except by implication; but the boldness of the speculation roused attention and sent a shock through London. It was a time when the authors of heresies of this sort, or of any sort, ran considerable risks. The famous Westminster Assembly of Divines, called by the Long Parliament, met on the 1st of July 1643. Whether Milton's divorce tract was formally discussed in the Assembly during the first months of its sitting is unknown; but it is certain that the London clergy, including not a few members of the Assembly, were then angrily discussing it in private. That there might be no obstacle to a more public prosecution, Milton put his name to a second and much enlarged edition of the tract, in February 1644, dedicated openly to the parliament and the assembly. Then, for a month or two, during which the gossip about him and his monstrous doctrine was spreading more and more, he turned his attention to other subjects.

Among the questions in agitation in the general ferment of opinion brought about by the Civil War was that of a reform of the national system of education and especially of the univer- sities. To this question Milton made a contribution in June 1644, in a small treatise, Of Education, in the form of a letter to Samuel Hartlib, a German then

resident in London and interesting himself busily in all philanthropic projects and schemes of social reform. In the very next month, however, July 1644, he returned to the divorce subject in a pamphlet addressed specially to the clergy and entitled The Judgment of Martin Bucer concerning Divorce. The outcry against him then reached its height. He was attacked in pamphlets; he was denounced in pulpits all through London, and especially by Herbert Palmer in a sermon preached on the 13th of August, before the two Houses of Parliament; strenuous efforts were made to bring him within definite parliamentary censure. In the cabal formed against him for this purpose a leading part was played, at the instigation of the clergy, by the Stationers' Company of London, which had a plea of its own against him on the ground that his doctrine was not only immoral, but had been put forth in an illegal manner. His first divorce treatise, though published immediately after the " Printing Ordinance " of the parliament of the 14th of June 1643, requiring all publica- tions to be licensed for press by one of the official censors, and to be registered in the books of the Stationers' Company, had been issued without license and without registration. Com- plaint to this effect was made against Milton, with some others

liable to the same charge of contempt of the printing ordinance, in a petition of the Stationers of the House of Commons in August 1644; and the matter came before committee both in that House and in the Lords.

It is to this circumstance that the world owes the most popular and eloquent, if not the greatest, of all Milton's prose writings, his famous Areopagitica, a Speech of Mr John Milton for the Liberty of Unlicensed Printing, to the Parliament of England. It appeared on the 25th of November 1644, deliber- ately unlicensed and unregistered, and was

–a remonstrance addressed to the parliament, as if in an oration to them face to face, against their ordinance of June 1643 and the whole system of licensing and censorship of the press. Nobly eulogistic of the parliament in other respects, it denounced their printing ordinance as utterly unworthy of them, and of the new era of English liberties which they were initiating, and called for its repeal. Though that effect did not follow, the pamphlet virtually accomplished its purpose. The licensing system had received its death-blow; and, though the Stationers returned to the charge in another complaint to the House of Lords, Milton's offence against the press ordinance was condoned. He was still assailed in pamphlets, and found himself " in a world of disesteem "; but he lived on through the winter of 1644/5 undisturbed in his house in Aldersgate Street. To this period there belong, in the shape of verse, only his sonnets ix. and x., the first to some anonymous lady, and the second " to the Lady Margaret Ley," with perhaps the Greek lines entitled Philosophus ad regent quendam. His divorce specula- tion, however, still occupied him; and in March 1644/5 he published simultaneously his Tetrachordon: Expositions upon the four chief places of Scripture which treat of Marriage, and his Colasterion, a Reply to a nameless Answer against the Doctrine and Discipline of Divorce. In these he replied to his chief recent assailants, lay and clerical, with merciless severity.

Through the latter part of 1644, Milton had been saved from the penalties which his Presbyterian opponents would have inflicted on him by the general championship of liberty of opinion by Cromwell and the army Independents. Before the middle of 1645 he, with others who were on the black books of the Presbyterians as heretics, was safer still. Milton's position after the battle of Naseby may be easily understood. Though his first tendency on the Church question had been to some form of a Presbyterian constitution for the Church, he had parted utterly now from the Scots and Presbyterians, and become a partisan of Independency, having no dread of " sects

and schisms," but regarding them rather as healthy signs in the English body-politic. He was, indeed, himself one of the most noted sectaries of the time, for in the lists of sects drawn out by contemporary Presbyterian writers special mention is made of one small sect who were known as Miltonists or Divorcers.

So far as Milton was concerned personally, his interest in the divorce speculation came to an end in July or August 1645, when, by friendly interference, a reconciliation was effected between him and his wife. The ruin of the king's cause at Naseby had suggested to the Powells that it might be as well for their daughter to go back to her husband after their two years of separation. It was not, however, in the house in Aldersgate Street that she rejoined him, but in a larger house, which he had taken in the adjacent street called Barbican, for the accommodation of an increasing number of pupils.

The house in Barbican was tenanted by Milton from about August 1645 t° September or October 1647. Among his first occupations there must have been the revision of the proof sheets of the first edition of his collected poems. It appeared as a tiny volume, copies of which are now very rare, with the title, Poems of Mr John Milton, both English and Latin, compos' d at several times. Printed by his true Copies. The songs were set in Musick by Mr Henry Lawes. . . . The title-page gives the date 1645, but the 2nd of January 1645/6 seems to have been the exact day of its publication. Whether because his pedagogic duties now engrossed him or for other reasons, very

few new pieces were added in the Barbican to those that the little volume had thus made public. In English, there were only the four sonnets now numbered xi.-xiv., the first two entitled " On the Detraction which followed upon my writing certain Treatises," the third "To Mr Henry Lawes on his Airs," and the fourth" To the Religious Memory of Mrs Catherine Thomson," together . with the powerful anti-Presbyterian invective or " tailed sonnet "

entitled ” On the New Forcers of Conscience under the Long Parliament “; and in Latin there were only the ode Ad Joannem Rousium, the Apologus de Rustico et Hero, and one interesting ” Familiar Epistle ” (April 1647) addressed to his Florentine friend Carlo Dati.

Some family incidents of importance belong to this time of residence in Barbican. The fall of Oxford in 1646 compelled the whole of the Powell family to seek refuge in London, and most of them found shelter in Milton’s house. His first child, a daughter named Anne, was born there on the 29th of July that year; on the 1st of January 1646/7 his father-in-law Richard Powell died there, leaving his affairs in confusion; and in the following March his own father died there, at the age of eighty-four, and was buried in the adjacent church of St Giles, Cripplegate.

From Barbican Milton removed, in September or October 1647, to a smaller house in that part of High Holborn which adjoins Lincoln’s Inn Fields. His Powell relatives had now left him, and he had reduced the number of his pupils, or perhaps kept only his two nephews. But, though thus more at leisure, he did not yet resume his projected poem, but occupied himself rather with three works of scholarly labour which he had already for some time had on hand. One was the compilation in English of a complete history of England, or rather of Great Britain, from the earliest times; another was the preparation in Latin of a complete system of divinity, drawn directly from the Bible; and the third was the collection of materials for a new Latin dictionary. Milton had always a fondness for such labours of scholarship and compilation. Of a poetical kind there is nothing to record, during his residence in High Holborn, but an experi- ment in psalm-translation, in the shape of Ps. lxxx.-lxxxviii. done into service-metre in April 1648, and the sonnet to Fairfax, written in September of the same year.

The crushing defeat of the Scottish army by Cromwell

in the three days' battle of Preston (1648) and the simultaneous suppression of the English Royalist insurrection in the south- east counties by Fairfax's siege and capture of Colchester, left King Charles at the mercy of the victors. Milton's sonnet " On the Lord General Fairfax, at the siege of Colchester," attested the exultation of the writer at the triumph of the parliamentary cause. His exultation continued through what followed. When the king was beheaded (1649) the first English- man of mark out of parliament to attach himself openly to the new republic was John Milton. This he did by the publication of his pamphlet entitled " Tenure of Kings and Magistrates, proving that' it is lawful, and hath been held so in all ages, for any who have the power, to call to account a Tyrant or wicked King, and, after due conviction, to depose and put him to death, if the ordinary Magistrate have neglected or denied to do it." It was out within a fortnight after the king's death, and was Milton's last performance in the house in High Holborn. The chiefs of the new republic could not but perceive the importance of securing the services of a distinguished man who had so opportunely and so powerfully spoken out in favour of their tremendous act. In March 1649, accordingly, Milton was offered, and accepted, the secretaryship for foreign tongues to the council of state of the new Commonwealth. The salary was to be £288 a year (worth about £1000 a year now). To be near his new duties in attendance on the council, which held its daily sittings for the first few weeks in Derby House, close to Whitehall, but afterwards regularly in Whitehall itself, he removed at once to temporary lodgings at Charing Cross. In the very first meetings of council which Milton attended he must have made personal acquaintance with President Brad- shaw, Fairfax, Cromwell himself, Sir Henry Vane, Whitelocke,

Henry Marten, "Haselrig, Sir Gilbert Pickering and the other chiefs of the council and the

Commonwealth, if indeed he had not known some of them before. After a little while, for his greater convenience, official apartments were assigned him in Whitehall itself.

At the date of Milton's appointment to the secretaryship he was forty years of age. His special duty was the drafting in Latin of letters sent by the council of state, or sometimes by the Rump Parliament, to foreign states and princes, with the examination and translation of letters in reply, and with personal conferences, when necessary, with the agents of foreign powers in London, and with envoys and ambassadors. As Latin was the language employed in the written diplomatic documents, his post came to be known indifferently as the secretaryship for foreign tongues or the Latin secretaryship. In that post, however, his duties, more particularly at first, were very light in comparison with those of his official colleague, Walter Frost, the general secretary. Foreign powers held aloof from the English republic as much as they could; and, while Frost had to be present in every meeting of the council, keeping the minutes, and conducting all the general correspondence, Milton's presence was required only when some piece of foreign business turned up. Hence, from the first, his employment in very miscellaneous work. Especially, the council looked to him for everything in the nature of literary vigilance and literary help in the interests of the struggling Commonwealth. He was employed in the examination of suspected papers, and in inter- views with their authors and printers; and he executed several great literary commissions expressly entrusted to him by the council. The first of these was his pamphlet entitled Observa- tions on the Articles of Peace (between Ormonde and the Irish). It was published in May 1649, and way in defence of the republic against a complication of Royalist intrigues and dangers in Ireland. A passage of remarkable interest in it is one of eloquent eulogy on Cromwell. More important still was the Eikonoklastes (which may be translated " Image- Smasher "), published by Milton in October 1649, by

way of counterblast to the famous Eikon Basilike (" Royal Image "), which had been in circulation in thousands of copies since the king's death, and had become a kind of Bible in all Royalist households, on the supposition that it had been written by the royal martyr himself (see Gaxjden, John). In the end ot 1649 there appeared abroad, under the title of Defensio regia pro Carolo I., a Latin vindication of the memory of Charles, with an attack on the English Common- wealth. As it had been written, at the instance of the exiled royal family, by Salmasius, or Claude de Saumaise, of Leiden, then of enormous celebrity over Europe as the greatest scholar of his age, it was regarded as a serious blow to the infant Common- wealth. Milton threw his whole strength into a reply through the year 1650, interrupting himself only by a new and enlarged edition of his Eikonoklastes. His Latin Pro populo anglicano defensio (1651), ran at once over the British Islands and the Continent, and was received by scholars as an annihilation of Salmasius. Through the rest of 165 1 the observation was that the two agencies which had co-operated most visibly in raising the reputation of the Commonwealth abroad were Milton's books and Cromwell's battles.

Through the eventful year 1651, in addition to the other duties of his secretaryship, Milton acted as licenser and superintending editor of the Mercurius politicus, a newspaper issued twice a week, of which Marchamont Nedham was the working editor and proprietor. Milton's hand is discernable in some of the leading articles.

About the end of 1651 Milton left his official rooms in White- hall for a " garden house " he had taken on the edge of St James's Park in what was then called Petty France, Westminster, but is now York Street. The house, afterwards 19 York Street, was occupied by James Mill and William Hazlitt in succession, and was not pulled down till 1877. Milton had now more to do in the special work of his office, in consequence of the increase of correspondence with foreign powers. But he had for some time been in ailing health; and a dimness of

eyesight which had

been growing upon him gradually for ten years had been settling rapidly, since his labour over the answer to Salmasius, into total blindness. Before or about May 1652, when he was but in his forty-fourth year, his blindness became total, and he could go about only with some one to lead him. Hence a rearrangement of his secretarial duties. Such of these duties as he could per- form at home, or by occasional visits to the Council Office near, he continued to perform; but much of the routine work was done for him by an assistant, a well-known German, George Rudolph Weckherlin, succeeded later by Philip Meadows and, eventually, by Andrew Marvell. Precisely to this time of a lull in Milton's secretaryship on account of his ill-health and blindness we have to refer his two great companion sonnets "To the Lord General Cromwell " and " To Sir Henry Vane the Younger."

In 1652 died his only son, who had been born at Whitehall in the March of the preceding year. His wife died in 1653/4, just after she had given birth to his third daughter, Deborah. With the three children thus left him — Anne, but six years old, Mary, not four, and the infant Deborah — the blind widower lived on in his house in Petty France in such desolation as can be imagined. He had recovered sufficiently to resume his secretarial duties; and the total number of his dictated state letters for the single year 1652 is equal to that of all the state letters of his preceding term of secretaryship put together. To the same year there belong also three of his Latin " Familiar Epistles." In Decem- ber 1652 there was published Joannis Philippi Angli responsio ad apologiam anonytni cujusdam tenebrionis, being a reply by Milton's younger nephew, John Phillips, but touched up by Milton himself, to one of several pamphlets that had appeared against Milton for his slaughter of Salmasius.

In December 1653 Cromwell's formal sovereignty began under the name of the Protectorate, passing

gradually into more than kingship. This change from Government by the Rump and its council to government by a single military lord protector and his council was regarded by many as treason to the republican cause, and divided those who had hitherto been the united Commonwealth's men into the "Pure Republicans," represented by such men as Bradshaw and Vane, and the " Oliverians, " adhering to the Protector. Milton, whose boundless admiration of Cromwell had shown itself already in his Irish tract of 1649 and in his recent sonnet, was recognized as one of the Oliverians. He remained in Oliver's service and was his Latin secretary through the whole of the Protectorate. For a while, indeed, his Latin letters to foreign states in Cromwell's name were but few— Thurloe, as general secretary, officiating as Oliver's right- hand man in everything, with a Philip Meadows under him, at a salary of £200 a year, as deputy for the blind Milton in foreign correspondence and translations. The reason for this temporary exemption of Milton from routine duty may have been that he was then engaged on an answer to the pamphlet from the Hague entitled Regit sanguinis clamor ad coelum adversus parricidas anglicanos (March 1652). Salmasius was now dead, and the Commonwealth was too stable to suffer from such attacks; but no Royalist pamphlet had appeared so able or so venomous as this in continuation of the Salmasian controversy. All the rather because it was in the main a libel on Milton himself did a reply from his pen seem necessary. It came out in May 1654, with the title Joannis Miltoni Angli pro populo anglicano defensio secunda (Second Defence of John Milton, Englishman, for the People of England) . The author of Regii sanguinis clamor was Dr Peter du Moulin the younger, a naturalized French Presbyterian minister, then moving about in English society, close to Milton; but, as that was a profound secret, and the work was universally attributed on the Continent to an Alexander More or Moras, a French minister of Scottish descent then a professor at Middel- burg, who had certainly managed the printing in consultation with the now deceased Salmasius, and had contributed some portion of the

matter — Milton made More the responsible person and the one object of his invective. The savage attack on More's personal character, however, is but part of the Defensio secunda. It contains passages of singular autobiographical and histori- cal value, and includes laudatory sketches of such eminent

Commonwealth's 'men asBradshaw, Fairfax, Fleetwood, Lambert and Overton, together with a long panegyric on Cromwell himself and his career, which remains to this day unapproached for elaboration and grandeur by any estimate of Cromwell from any later pen.

From about the date of the publication of the Defensio secunda to the beginning of 1655 the only specially literary relics of Milton's life are his translations of Ps. i.viii. in different metres, done in August 1654, his translation of Horace's Ode, i. 5, done probably about the same time, and two of his Latin "Familiar Epistles." The most active time of his secretaryship for Oliver was from April 1655 onwards. In that' month, in the course of a general revision of official salaries under the Protec torate, Milton's salary of £288 a year hitherto was reduced to £200 a year, with a kind of redefinition of his office, recognizing it, we may say, as a Latin secretaryship extraordinary. Philip Meadows was to continue to do all the ordinary Foreign Office work, under Thurloe's inspection; but Milton was to be called in on special occasions. Hardly was the arrangement made when a signal occasion did occur. In May 1655 all England was horrified by the news of the massacre of the Vaudois Protestants (Waldenses) by the troops of Emanuele II., duke of Savoy and prince of Piedmont, in consequence of their disobedience to an edict requiring them either to leave their native valleys or to conform to the Catholic religion. Cromwell and his council took the matter up with all their energy; and the burst of indig- nant letters on the subject despatched in that month and the next to the

duke of Savoy himself, Louis XIV. of France, Cardinal Mazarin, the Swiss cantons, the states-general of the United Provinces, and the kings of Sweden and Denmark, were all by Milton. His famous sonnet ” On the Late Massacre in Pied- mont ” was his more private expression of feeling on the same occasion. This sonnet was in circulation, and the case of the Vaudois Protestants was still occupying Cromwell, when, in August 1655, there appeared the last of Milton’s Latin pamphlets. It was his Pro se defensio … in answer to an elaborate self- defence which More had put forth on the Continent since Milton’s attack on his character. In that year also appeared Milton’s Scriptum domini protectoris . . . contra hispanos.

Through the rest of Cromwell’s Protectorate, Milton’s life was of comparatively calm tenor. He was in much better health than usual, bearing his blindness with courage and cheerfulness; he was steadily busy with important despatches to foreign powers on behalf of the Protector, then in the height of his great foreign policy; and his house in Petty France seems to have been, more than at any previous time since the beginning of his blind- ness, a meeting-place for friends and visitors, and a scene of pleasant hospitalities. The four sonnets now numbered xix.- xxii., one of them to young Lawrence, the son of the president of Cromwell’s council, and two of the others to Cyriack Skinner, once his pupil, belong to this time of domestic quiet, as do also no fewer than ten of his Latin ” Familiar Epistles.” His marriage with Katherine Woodcock on the 12th of November 1656 brought him a brief period of domestic happiness; but, after only fifteen months, he was again a widower, by her death in childbirth in February 1657/8. The child dying with her, only the three daughters by the first marriage remained. The touching sonnet which closes the series of Milton’s Sonnets is his sacred tribute to the memory of his second marriage and to the virtues of the wife he had so soon lost. Even after that loss we find him still busy for Cromwell. Andrew Marvell, in September 1657 succeeded Meadows,

much to Milton's satisfac- tion, as his assistant secretary; but this had by no means relieved him from duty. Some of his greatest despatches for Cromwell, including letters, of the highest importance, to Louis XIV., Mazarin and Charles Gustavus of Sweden, belong to the year

1658.

There is, unfortunately, no direct record to show what Cromwell thought of Milton; but there is ample record of what Milton thought of Cromwell. " Our chief of men," he had called Cromwell in his sonnet of May 1652; and the opinion remained unchanged. He thought Cromwell the greatest and best man

of his generation, or of many generations; and he regarded Crom- well's assumption of the supreme power, and his retention of that power with a sovereign title, as no real suppression of the republic, but as absolutely necessary for the preservation of the republic, and for the safeguard of the British Islands against a return of the Stuarts. Nevertheless, under this prodigious admiration of Cromwell, there were political doubts and reserves. Milton was so much of a modern radical of the extreme school in his own political views and sympathies that he cannot but have been vexed by the growing conservatism of Cromwell's policy through his Protectorate. To his grand panegyric on Oliver in the Defensio secunda of 1654 he had ventured to append cautions against self-will, over-legislation and over-policing; and he cannot have thought that Oliver had been immaculate in these respects through the four subsequent years. The attempt to revive an aristocracy and a House of Lords, on which Cromwell was latterly bent, cannot have been to Milton's taste. Above all, Milton dissented in toto from Cromwell's church policy. It was Milton's fixed idea, almost his deepest idea, that there should be no such thing as an Established Church, or state-paid clergy, of any sort or denomination or mixture of denominations, in any nation, and that, as it had been the connexion between church and state, begun by Constantine, that had vitiated Christianity in

the world, and kept it vitiated, so Christianity would never flourish as it ought till there had been universal disestablishment and disendowment of the clergy, and the propagation of the gospel were left to the zeal of voluntary pastors, self -supported, or supported modestly by their flocks. He had at one time looked to Cromwell as the likeliest man to carry this great revolution in England. But Cromwell, after much meditation on the subject in 1652 and 1653, had come to the opposite conclusion. The conservation of the Established Church of England, in the form of a broad union of all evangelical denominations of Christians, whether Presbyterians, or Independents, or Baptists, or moderate Old Anglicans, that would accept state-pay with state-control, had been the fundamental notion of his Protectorate, persevered in to the end. This must have been Milton's 1 deepest disap- pointment with Cromwell's rule.

Cromwell's death on the 3rd of September 1658 left the Protec- torship to his son Richard. Milton and Marvell continued in their posts, and a number of the Foreign Office letters of the new Protectorate were of Milton's composition. In October 1658 appeared a new edition of his Defensio prima, and, early in 1659, a new English pamphlet, entitled Treatise of Civil Power in Ecclesiastical Causes showing that it is not lawful to compel in Matters of Religion, in which he advocated the separation of Church and State. To Richard's Protectorate also belongs one of Milton's Latin " Familiar Epistles."

The last of his known official performances in his Latin secre- taryship are two letters in the name of William Lenthall, as the speaker of the restored Rump, one to the king of Sweden and one to the king of Denmark, both dated the 15th of May 1659. Under the restored Rump, if ever, he seemed to have a chance for his notion of church-disestablishment; and accordingly, in August 1659, he put forth, with a prefatory address to that body, a pamphlet entitled Considerations touching the likeliest means to remove Hirelings out of the Church. The restored Rump had no time to attend to such matters. They

were in struggle for their own existence with the army chiefs; and to prevent the restora- tion of the monarchy, to argue against it and fight against it to the last, was the work to which Milton set himself; the preserva- tion of the republic in any form, and by any compromise of differences within itself, had become his one thought, and the study of practical means to this end his most anxious occupation. In a Letter to a Friend concerning the Ruptures of the Common- wealth, written in October 1659, he had propounded a scheme of a kind of dual government for reconciling the army chiefs with the Rump; through the following winter, marked only by two of his Latin "Familiar Epistles," his anxiety over the signs of the growing enthusiasm throughout the country for the recall of Charles II. had risen to a passionate vehemence which found vent in a pamphlet entitled The Ready and Easy Way to Establish

a Free Commonwealth, and the Excellence thereof compared with the Inconveniences and Dangers of readmitting Kingship to this Nation. An abridgment of this pamphlet was addressed by him to General Monk- in a letter entitled " The Present Means and Brief Delineation of a Free Commonwealth " (March 1660). Milton's proposal was that the central governing apparatus of the British Islands for the future should consist of one indis- soluble grand council or parliament, which should include all the political chiefs, while there should be a large number of provincial councils or assemblies sitting in the great towns for the management of local and county affairs.

Not even when the king's cause was practically assured would Milton be silent. In Brief Notes upon a late Sermon, published in April 1660, in reply to a Royalist discourse by a Dr Matthew Griffith, he made another protest against the recall of the Stuarts, even hinting that it would be better that

Monk should become king himself; and in the same month he sent forth a second edition of his Ready and Easy Way, more frantically earnest than even the first, and containing additional passages of the most violent denunciation of the royal family, and of prophecy of the degradation and disaster they would bring back with them. This was the dying effort. On the 25th of April the Convention Parliament met; on the 1st of May they resolved unanimously that the government by King, Lords and 'Commons should be restored; and on the 29th of May, Charles II. made his triumphal entry into London. The chief republicans had by that time scattered themselves, and Milton was hiding in an obscure part of the city.

How Milton escaped the scaffold at the Restoration is a mystery now, and was a mystery at the time. The Commons voted that he should be taken into custody by the serjeant-at- arms, for prosecution by the attorney-general on account of his Eikonoklastes and Defensio prima, and that all copies of those books should be called in and burnt by the hangman. There was a story that Milton had once protected Davenant and now owed his immunity to him; but it is more likely that he was protected by the influence of Marvell, by Arthur Annesley, after- wards earl of Anglesey, and by other friends who had influence at court. At all events, on the 29th of August 1660, when the Indemnity Bill did come out complete, with the king's assent, Milton did not appear as one of the exceptions on any ground or in any of the grades. From that moment, therefore, he could emerge from his hiding, and go about as a free man. Not that he was yet absolutely safe. There were several public burnings by the hangman at the same time of Milton's con- demned pamphlets; and the appearance of the blind man him- self in the streets, though he was legally free, would have caused him to be mobbed and assaulted. Though the special prosecution ordered against him by the Commons had been quashed by the subsequent Indemnity Bill, the serjeant-at- arms had taken him into custody. Entries in. the Commons journals of the 17th and 19th of December

show that Milton complained of the exorbitant fees charged by the serjeant-at-arms for his release, and that the matter was referred to a committee at the instance of Andrew Marvell.

Milton did not return to Petty France. For the first months after he was free he lived as closely as possible in a house near what is now Red Lion Square, Holborn. Thence he removed, apparently early in 1661, to a house in Jewin Street, in his old Aldersgate Street and Barbican neighbourhood. In Jewin Street Milton remained for two or three years, or from 1661 to 1664. This is the time of which he says: —

"... though fallen on evil days, On evil days though fallen, and evil tongues, In darkness, and with dangers compassed round, And solitude."

The "evil days" were those of the Restoration in its first or Clarendonian stage, with its revenges and reactions, its return to high Episcopacy and suppression of every form of dissent and sectarianism, its new and shameless royal court, its open procla- mation and practice of anti-Puritanism in morals and in litera- ture no less than in politics. For the main part of this world of

the Restoration Milton was now nothing more than an infamous outcast, the detestable blind republican and regicide who had, by too great clemency, been left unhanged. The friends that adhered to him still, and came to see him in Jewin Street, were few in number, and chiefly from the ranks of those noncon- forming denominations, Independents, Baptists or Quakers, who were themselves under similar obloquy. Besides his two nephews, the faithful Andrew Marvell, Cyriack Skinner and some others of his former admirers, English or foreign, we hear chiefly of a Dr Nathan Paget, who was a physician in the Jewin Street neighbourhood, and of several young men who would drop in upon him by turns, partly to act as his amanuenses, and partly for the benefit of lessons from him — one of them a Quaker youth, named Thomas Ellwood. With all this

genuine attachment to him of a select few, Milton could truly enough describe his condition after the Restoration as one of ” solitude.” Nor was this the worst. His three daughters, on whom he ought now to have been able principally to depend, were his most serious domestic trouble. The poor motherless girls, the eldest in her seventeenth year in 1662, the second in her fifteenth and the youngest in her eleventh, had grown up, in their father’s blindness and too great self-absorption, ill-looked-after and but poorly educated; and the result now appeared. They ” made nothing of neglecting him”; they rebelled against the drudgery of reading to him or otherwise attending on him; they ” did combine together and counsel his maid-servant to cheat him in her marketings”; they actually “had made away some of his books, and would have sold the rest.”

It was to remedy this state of things that Milton consented to a third marriage. The wife found for him was Elizabeth Minshull, of a good Cheshire family, and a relative of Dr Paget. They were married on the 24th of February 1662/3, the wife being then only in her twenty-fifth year, while Milton was in his fifty-fifth. She proved an excellent wife; and the Jewin Street household, though the daughters remained in it, must have been under better management from the time of her entry into it. Meanwhile, he had found some solace in renewed industry of various kinds among his books and tasks of scholarship, and more particularly he had been building up his Paradise Lost. He had begun the poem in earnest, we are told, in 1658 at his house in Petty France, not in the dramatic form contemplated eighteen years before, but deliberately in the epic form. He had made but little way when there came the interruption of the anarchy preceding the Restoration and of the Restoration itself; but the work had been resumed in Jewin Street and prosecuted there steadily, by dictations of twenty or thirty lines at a time to whatever friendly or hired amanuensis chanced to be at hand. Considerable progress had been made in this way before his third marriage; and after that the work proceeded apace,

his nephew, Edward Phillips, who was then out in the world on his own account, looking in when he could to revise the growing manuscript.

It was not in the house in Jewin Street, however, that Paradise Lost was finished. Not very long after the third marriage, probably in 1664, he removed to another house, with a garden, in ” Artillery Walk, leading to Bunhill Fields.” Here Paradise Lost was certainly finished before July 1665 — Aubrey says in 1663— for when Milton and his family, to avoid the Great Plague of London, went into temporary country-quarters in a cottage in Chalfont St Giles, Buckinghamshire, 1 the finished manuscript was taken with him, in probably more than one copy. This we learn from Thomas Ellwood, who had taken the cottage for him, and was allowed to take a copy of the manu-script way with him for perusal, during Milton’s stay at Chal- font {Life of Thomas Ellwood, 17 14). The delay in the publica- tion of the poem may be explained partly by the fact that the official licenser hesitated before granting the necessary imprima- tur to a book by a man of such notorious republican antecedents, and partly by the paralysis of all business in London by the Great Fire of September 1666. It was not till the 27th of April 1667 that Milton concluded an agreement, still preserved in the British

1 Milton’s cottage here is still standing, and is open to visitors.

Museum, with Samuel Simmons, printer, of Aldersgate Street, London, to dispose of the copyright for £5 down, the promise of another £5 after the sale of the first edition of 1300 copies, and the further promise of two additional sums of £5 each after the sale of two more editions of the same size respec-tively. It was as if an author now were to part With all his rights in a volume for £17, 10s. down, and a contingency of £52, 1 os. more in three equal

instalments. The poem was duly entered by Simmons as ready for publication in the Stationers' Registers on the 20th of the following August ; and shortly after that date it was out in London as a neatly printed small quarto, with the title Paradise Lost: A Poem written in Ten Books: By John Milton. The reception accorded to Paradise Lost has been quoted as an example of the neglect of a great work, but the sale of an edition of 1300 copies in eighteen months proves that the poem found a wide circle of readers. " This man cuts us all out, and the ancients too " is the saying attributed to Dryden on the occasion ; and it is the more remarkable because the one objection to the poem which at first, we are told, " stumbled many " must have " stumbled " Dryden most of all. Except in the drama, rhyme was then thought essential in anything professing to be a poem; blank verse was hardly regarded as verse at all; Dryden especially had been and was the champion of rhyme, contending for it even in the drama. That, notwithstanding this obvious blow struck by the poet at Dryden's pet literary theory, he should have welcomed the poem so enthusiastically and proclaimed its merits so emphatically, says much at orce for his critical percep- tion and for the generosity of his temper. According to Aubrey, Dryden requested Milton's leave to turn the poem into a rhymed drama, and was told he might " tag his verses if he pleased." The result is seen in Dryden's opera, The State of Innocence and the Fall of Man (1675). One consequence of Milton's renewed celebrity was that visitors of all ranks again sought him out for the honour of his society and conversation. His obscure house in Artillery Walk, Bunhill, we are told, became an attraction now, " much more than he did desire," for the learned notabilities of his time.

Accounts have come down to us of Milton's personal appearance and habits in his later life. They describe him as to be seen every other day led about in the streets in the vicinity of his Bunhill residence, a slender figure, of middle stature or a little less, generally dressed in a grey cloak or overcoat, and wearing sometimes a small silver-

hilted sword, evidently in feeble health, but still looking younger than he was, with his lightish hair, and his fair, rather than aged or pale, complexion. He would sit in his garden at the door of his house, in warm weather, in the same kind of grey overcoat, ” and so, as well as in his room, received the visits of people of dis- tinguished parts, as well as quality.” Within doors he was usually dressed in neat black. He was a very early riser, and very regular in the distribution of his day, spending the first part, to his midday dinner, always in his own room, amid his books, with an amanuensis to read for him and write to his dictation. Music was always a chief part of his afternoon and evening relaxation, whether when he was by himself or when friends were with him. His manner with friends and visitors was extremely courteous and affable, with just a shade of stateliness. In free conversation, either at the midday dinner, when a friend or two happened, by rare accident, to be present, or more habitually in the evening and at the light supper which concluded it, he was the life and soul of the company, from his ” flow of subject ” and his ” unaffected cheerfulness and civility,” though with a marked tendency to the satirical and sarcastic in his criticisms of men and things. This tendency to the sarcastic was connected by some of those who observed it with a peculiarity of his voice or pronunciation. ” He pronounced the letter r very hard,*’ Aubrey tells us, adding Dryden’s note on the subject : ” litera canina, the dog-letter, a certain sign of a satirical wit.” He was extremely temperate in the use of wine or any strong liquors, at meals and at all other times; and when supper was over, about nine o’clock, ” he smoked his pipe and drank a glass of water, and went to bed.” He suffered much from gout, the effects of which had become apparent in a stiffening of his hands and finger-joints, and the recurring attacks of which in its acute form were very painful. His favourite poets among the Greeks were Homer and the Tragedians, especially Euripides; among the Latins, Virgil and Ovid; among the English, Spenser and Shakespeare. Among his English contemporaries, he thought most highly of

Cowley. He had ceased to attend any church, belonged to no religious communion, and had no religious observances in his fami'y. His reasons for this were a matter for curious surmise among his friends, because of the profoundly religious character of his own mind; but he does not seem ever to have

furnished the explanation. The matter became of less interest perhaps after 1669, when his three daughters ceased to reside with him, having been sent out " to learn some curious and ingenious sorts of manufacture that are proper for women to learn, particularly embroideries in gold or silver." After that the household in Bunhill consisted only of Milton, his wife, a single maid-servant, and the " man " or amanuensis who came in for the day.

The remaining years of Milton's life, extending through that part of the reign of Charles II. which figures in English history under the name of the " Cabal Administration," were by no means unproductive. In 1669 he published, under the title of Accedence commenced Grammar, a small English compendium of Latin grammar that had been lying among his papers. In 1670 there appeared, with a prefixed portrait of him by Faithorne, done from the life, his History of Britain . . . to the Norman Conquest, being all that he had been able to accomplish of his intended complete history of England; and in the same year a Latin digest of Ramist logic, entitled Artis logicae plenior institutio, of no great value, and doubtless from an old manu- script of his earlier days. In 1671 there followed his Paradise Regained and Samson Agonistes, bound together in one small volume, and giving ample proof that his poetic genius had not exhausted itself in the preceding great epic. In 1673, at a moment when the growing political discontent with the govern- ment of Charles II. and the conduct of his court had burst forth in the special form of a " No-Popery " agitation and outcry, Milton ventured on the dangerous experiment of one more political pamphlet, in which, under the title " Of True Religion, Heresy, Schism, Toleration, and what best means may be used against the growth of Popery," he

put forth, with a view to popular acceptance, as mild a version as possible of his former principles on the topics discussed. In the same year appeared the second edition of his Poems . . . both English and Latin, which included, with the exception of the Sonnets to Cromwell, Fairfax, Vane and the second address to Cyriack Skinner, all the minor poems.

Thus we reach the year 1674, the last of Milton's life. One incident of that year was the publication of the second edition of Paradise Lost, with the poem rearranged as now — into twelve books, instead of the original ten. Another was the publication of a small volume 1 containing his Latin Epistolae familiar es, together with the Prolusiones oratoriae of his student-days at Cambridge — these last thrown in as a substitute for his Latin state-letters in his secretaryship for the Commonwealth and the Protectorate, the printing of which was stopped by order from the Foreign Office. A third publication of the same year, and probably the very last thing dictated by Milton, was a transla- tion of a. Latin document from Poland, relating to the recent election of the heroic John Sobieski to the throne of that kingdom, with the title A Declaration or Letters Patents of the Election of this present King of Poland, John the Third. It seems to have been out in London in August or September 1674. On Sunday the 8th of the following November Milton died, in his house in Bunhill, of " gout struck in," at the age of sixty-five years and eleven months. He was buried, the next Thursday, in the church of St Giles, Cripplegate, beside his father; a considerable concourse attending the funeral.

Before the Restoration, Milton — what with his inheritance from his father, what with the official income of his Latin secretaryship — must have been a man of very good means indeed. Since then, however, various heavy losses, and the cessation of all official income, had greatly reduced his estate, so that he left but £900 (worth about or over £2700 now) besides furniture and household goods. By a word-of-mouth will, made in presence of his brother Christopher, he had bequeathed the whole to his

widow, on the ground that he had done enough already for his ” undutiful ” daughters, and that there remained for them his interest in their mother’s marriage portion of £1000, which had never been paid, but which their relatives, the Powells of Forest Hill, were legally bound for, and were now in

1 Joannis Miltonii Angli epistolarum familiarum liber unus; quibus accesserunt, ejusdem (jam olim in collegio adolescentis) prolusiones quaedatn oratoriae (1674; translation by J. Hall, 1829).

Family.

circumstances to make good. The daughters, with the Powells probably abetting them, went to law with the widow to upset the will; and the decision of the court was that they should receive £100 each. With the £600 thus left, the widow, after some further stay in London, retired to Nantwich in her native Cheshire. There, respected as a pious member of a local Baptist congregation, she lived till 1727, having survived her husband fifty-three years. By that time all the three daughters were also dead. The eldest, Ann Milton, who was somewhat deformed, had died not long after her father, having married ” a master- builder,” but left no issue; the second, Mary Milton, had died, unmarried, before 1694; and only the third, Deborah, survived as long as her step-mother. Having gone to Ireland, as com- panion to a lady, shortly before her father’s death, she had married an Abraham Clarke, a silk- weaver in Dublin, with whom she returned to London about 1684, when they settled in the silk-weaving business in Spitalfields, rather sinking than rising in the world, though latterly some public attention was paid to Deborah, by Addison and others, on her father’s account. One of her sons, Caleb Clarke, had gone out to Madras in 1703, and had died there as ” parish-clerk of Fort George ” in 1719, leaving children, of whom there are some faint traces to as

late as 1727, the year of Deborah's death. Except for the possibility of further and untraced descent from this Indian grandson of Milton, the direct descent from him came to an end in his grand-daughter, Elizabeth Clarke, another of Deborah's children. Having married a Thomas Foster, a Spitalfields weaver, but afterwards set up a small chandler's shop, first in Holloway and then in Shoreditch, she died at Islington in 1754, not long after she and her husband had received the proceeds of a performance of Comus got up by Dr Johnson for her benefit. All her children had predeceased her, leaving no issue. Milton's brother Chris- topher, who had always been on the opposite side in politics, rose to the questionable honour of a judgeship and knighthood in the latter part of the reign of James II. He had then become a Roman Catholic — which religion he professed till his death in retirement at Ipswich in 1692. Descendants from him are traceable a good way into the 18th century. Milton's two nephews and pupils, Edward and John Phillips, both of them known as busy and clever hack-authors before their uncle's death, continued the career of hack-authorship, most industri- ously and variously, though not very prosperously, through the rest of their lives: Edward in a more reputable manner than John, and with more of enduring allegiance to the memory of his uncle. Edward died about 1695; John was alive till 1706. Their half-sister, Ann Agar, the only daughter of Milton's sister by her second husband, had married, in 1673, a David Moore, of Sayes House, Chertsey; and the most flourishing of all the lines of descent from the poet's father was in this Agar-Moore branch of the Miltons.

Of masses of manuscript that had been left by Milton, some portions saw the light posthumously. Prevented, in the last year of his life from publishing his Latin State Letters in the Posthumous same vomme W1 th his Latin Familiar Epistles, he had Publications. comm ;tted the charge of the State Letters, prepared for the press, together with the completed manuscript of his Latin Treatise of

Christian Doctrines, to a young Cambridge scholar, Daniel Skinner, who had been among the last of his amanuenses, and had, in fact, been employed by him especially in copying out and arranging those two important MSS. Negotiations were on foot, after Milton's death, between this Daniel Skinner and the Amsterdam printer, Daniel Elzevir, for the publication of both MSS., when the English government interfered, and the MSS. were sent back by Elzevir, and thrown aside, as dangerous rubbish, in a cupboard in the State Paper Office. Meanwhile, in 1676, a London bookseller, named Pitt, who had somehow got into his possession a less perfect, but still tolerably complete, copy of the State Letters, had brought out a surreptitious edition of them, under the title Literae pseudo-senatus anglicani, Cromwellii . . . nomine etjussu conscriptae a Joanne Miltono. No other posthumous publications of Milton's appeared till 1 681, when another bookseller put forth a slight tract entitled Mr John Milton's Character of the Long Parliament and Assembly of Divines, in 1641, consisting of a page or two, of rather dubious authenticity, said to have been withheld from his History of Britain in the edition of 1670. In 1682 appeared A Brief History of Moscovia, and of other less-known Countries lying Eastward of Russia as far as Cathay . . . undoubtedly Milton s, and a specimen of

those prose compilations with which he sometimes occupied his leisure. Of the fate of his collections for a new Latin Dictionary, which had swelled to three folio volumes of MS., all that is known is that, after having been used by Edward Phillips for his Enchiridion and Speculum, they came into the hands of a committee of Cambridge scholars, and were used for that Latin dictionary of 1693, called The Cambridge Dictionary, on which Ainsworth's Dictionary was based. In 1698 there was published in three folio volumes, under the editorship of John Toland, the first collective edition of Milton's prose works, professing to have been printed at Amsterdam, though really printed in London. A very interesting folio volume, published in 1743 by ”

John Nickolls, junior," under the title of Original Letters and Papers of State addressed to Oliver Cromwell, consists of a number of intimate Cromwellian documents that had somehow come into Milton's possession immediately after Cromwell's death, and were left by him confidentially to the Quaker Ellwood. Finally, a chance search in the London State Paper Office in 1823 having discovered the long-lost parcel containing the MSS. of Milton's Latin Stale Letters and his Latin Treatise of Christian Doctrine, as these had been sent back from Amsterdam a hundred and fifty years before, the Treatise on Christian Doctrine was, by the command of George IV., edited and published in 1825 by the Rev. C. R. Sumner, keeper of the Royal Library, and afterwards bishop of Winchester, under the title of Joannis Miltoni Angli de doctrina Christiana libri duo posthumi. An English translation, by the editor, was published in the same year. Those state papers of Milton which had not been already printed were edited by W. D. Hamilton for the Camden Society, in 1859.

Milton's literary life divides into three almost mechanically distinct periods: (1) the time of his youth and minor poems, (2) his middle twenty years of prose polemics, and (3) the time of his later Muse and greater poems.

Had Milton died in 1640, when he was in his thirty-second year, and had his literary remains been then collected, he would have been remembered as one of the best Latinists of his generation and one of the most exquisite of lst ff s " er " minor English poets. In the latter character, more particularly, he would have taken his place as one of that interesting group or series of English poets, coming in the next forty years after Spenser, who, because they all acknowledged a filial relationship to Spenser, may be called collectively the Spenserians. In this group or series, counting in it such other true poets of the reigns of James I. and Charles I. as Phineas and Giles Fletcher, William Browne and Drummond of Haw- thornden, Milton would have been entitled, by the small collec- tion of pieces he had

left, and which would have included his Ode on the Nativity, his L' Allegro and II Penseroso, his Comus and his Lycidas, to recognition as indubitably the very highest and finest. There was in him that peculiar Spenserian something which might be regarded as the poetic faculty in its essence, with a closeness and perfection of verbal finish not to be found in the other Spenserians, or even in the master himself. Few as the pieces were, and owning discipleship to Spenser as the author did, he was a Spenserian with a difference belonging to his own consti- tution — which prophesied, and indeed already exhibited, the passage of English poetry out of the Spenserian into a kind that might be called the Miltonic. This Miltonic something, dis- tinguishing the new poet from other Spenserians, was more than mere perfection of literary finish. It consisted in an avowed consciousness already of the os magna soniturum, " the mouth formed for great utterances," that consciousness resting on a peculiar substratum of personal character that had occasioned a new theory of literature. " He who would not be frustrate of his hope to write well hereafter on laudable things ought himself to be a true poem " was Milton's own memorable expression afterwards of the principle that had taken possession of him from his earliest days; and this principle of moral manliness as the true foundation of high literary effort, of the inextricable identity of all literary productions in kind, and their coequality in worth, with the personality in which they have their origin, might have been detected, in more or less definite shape, in all or most of the minor poems. It is a specific form of that general Platonic doctrine of the invincibility of virtue which runs through his Comus.

That a youth and early manhood of such poetical promise should have been succeeded by twenty years of all but incessant prose polemics has been a matter of regret with many. But this

is to ignore his political and social side. If Burke, whose whole public career consisted in a succession of speeches and pamphlets, is looked back upon as one of the greatest men of his century on their account, why should there be regret over the fact that Milton, after having been the author of Comus and Lycidas, became for a time the prose orator of his earlier and more tumul- tuous generation? Milton was not only the greatest pamph- leteer of his generation — head and shoulders above the rest — but there is no life of that time, not even Cromwell's, in which the history of the great Revolution in its successive phases, so far as the deep underlying ideas and speculations were concerned, may be more intimately and instructively studied than in Milton's. Then, on merely literary grounds, what an interest in those prose remains! Not only of his Areopagitica, admired now so unreservedly because its main doctrine has become axiomatic, but of most of his other pamphlets, even those the doctrine of which is least popular, it may be said confidently that they answer to his own definition of " a good book," by containing somehow " the precious life-blood of a master- spirit." From the entire series there might be a collection of specimens, unequalled anywhere else, of the capabilities of that older, grander and more elaborate English prose of which the Elizabethans and their immediate successors were not ashamed. Nor will readers of Milton's pamphlets continue to accept the hackneyed observation that his genius was destitute of humour. Though his prevailing mood was the severely earnest, there are pages in his prose writings, both English and Latin, of the most laughable irony, reaching sometimes to outrageous farce, and some of them as worthy of the name of humour as anything in Swift. Here, however, we touch on what is the worst feature in some of the prose pamphlets — their measureless ferocity, their boundless licence in personal scurrility.

While it is wrong to regard Milton's middle twenty years of prose polemics as a degradation of his genius, and while the fairer contention might be

that the youthful poet of Comus and Lycidas actually promoted himself, and became a more powerful agency in the world and a more interesting object in it for ever, by consenting to lay aside his ” singing robes ” and spend a portion of his life in great prose oratory, who does not exult in the fact that such a life was rounded off so miraculously at the close by a final stage of compulsory calm, when the ” singing robes ” could be resumed, and Paradise Lost, Paradise Regained and Samson Agonistes could issue in succession from the blind man’s chamber? Of these three poems, and what they reveal of Milton, no need here to speak at length. Paradise Lost is one of the few monu- mental works of the world, with nothing in modern epic literature comparable to it except the great poem of Dante. This is best perceived by those who penetrate beneath the beauties of the merely terrestrial portion of the story, and who recognize the coherence and the splendour of that vast symbolic phantasma- gory by which, through the wars in heaven and the subsequent revenge of the expelled archangel, it paints forth the connexion of the whole visible universe of human cognisance and history with the grander, pre-existing and still environing world of the eternal and inconceivable. To this great epic Paradise Regained is a sequel, and it ought to be read as such. The legend that Milton preferred the shorter epic to the larger is quite incorrect. All that is authentic on the subject is the statement by Edward Phillips that, when it was reported to his uncle that the shorter epic was ” generally censured to be much inferior to the other,” he ” could not hear with patience any such thing.” The best critical judgment now confirms Milton’s own, and pronounces Paradise Regained to be not only, within the possibilities of its briefer theme, a worthy sequel to Paradise Lost, but also one of the most artistically perfect poems in any language. Finally, the poem in which Milton bade farewell to the Muse, and in which he reverted to the dramatic form, proves that to the very end his right hand had lost none of its power or cunning. Samson Agonistes is the most powerful drama in the English language after the severe Greek model, and

it has the additional interest of being so contrived that, without any deviation from the strictly objective incidents of the Biblical story which it

enshrines, it is yet the poet's own epitaph and his condensed autobiography.

Much light is thrown upon Milton's mind in his later life, and even upon the poems of that period, by his posthumous Latin Treatise of Christian Doctrine. It differs from all his other prose writings of any importance in being cool, abstract and didactic. Professing to be a system of divinity derived directly from the Bible, it is really an exposition of Milton's metaphysics and of his reasoned opinions on all questions of philosophy, ethics and politics. The general effect is to show that, though he is rightly regarded as the very genius of English Puritanism, its represen- tative poet and idealist, yet he was not a Puritan of what may be called the first wave, or that wave of Calvinistic orthodoxy which broke in upon the absolutism of Charles and Laud, and set the English Revolution agoing. He belonged distinctly to that larger and more persistent wave of Puritanism which, passing on through Independency, and an endless variety of sects, many of them rationalistic and freethinking in the extreme, developed into what has ever since been known as English Liberalism. The treatise makes clear that, while Milton was a most fervid theist and a genuine Christian, believing in the Bible, and valuing the Bible over all the other books in the world, he was at the same time one of the most intrepid of English thinkers and theologians. (D. Ma.;X.)

Considerable interest attaches among collectors to the variety of prints representing portraits of Milton. So far as the original contemporary portraits are concerned, which have portraits inspired the large number of engravings, the following may be mentioned: (1) The existing. Janssen painting, 1618 (" aetatis suae 10 "), which belonged to Mrs Milton. (2) An unknown painting of 1623 (?i62o), from which was taken an engraving in

the Gentleman's Magazine for September 1787 (" aet. suae 12 "). (3) The " Onslow " painting of Milton when a Cambridge scholar (lost), which belonged to Mrs Milton and in 1794 was in Lord Onslow's possession; a copy by Van der Gucht was made for Lord Harcourt and is still at Nuneham. (4) William Marshal's engraved frontispiece to Moseley's edition of the poems (1645). (5) William Faithorne's engraving of Milton from life, at the age of sixty-two, in Milton's History of Britain (1670). (6) Faithorne's original drawing for the above, belonging in 1909 to Sir R. H. Hobart. (7) The Bayfordbury (or Tonson) drawing (probably by Faithorne, or (?) by White or Richardson) at Bayfordbury Park near Hertford. (8) A drawing by George Vertue in Dr Williamson's collection. (9) A clay bust (? by Pierce or Simon) at Christ's College. (10) A miniature by Cooper (1653), which is, however, considered by Dr G. C. Williamson not to be of Milton at all. (n) A painting by Pieter Van der Plas (d. 1704) in the National Portrait Gallery. (12) An oil painting at Christ's College. (13) The " Woodcock " miniature of Milton when about forty-eight. In Poets' Corner, Westminster Abbey, a bust by Rysbrack was put up in 1737. A monument in St Giles, Cripplegate, by John Bacon, R.A., was erected by Samuel Whitbread in 1793; and a modern statue by Horace Montford also stands there. A memorial window in St Margaret's, West- minster, with an inscription by J. G. Whittier, was presented by G. W. Childs, of Philadelphia.

_ Bibliography. — MSS. of the poems of Milton's earlier period in his own handwriting are preserved in the library of Trinity College, Cambridge. These are not enumerated among the gifts made by Sir Henry Newton Puckering in 1691, but presumably belonged to him, and came to the library at his death in 1700, as they were found by Charles Mason, a fellow of the college, among papers and books which had been his. They were bound in a folio volume by the care of Thomas Clarke, afterwards Master of the Rolls, in 1736. Besides the poems, with many interlineations and corrections, the MS. contains suggestions, and

in some cases fully developed plans, for works generally dramatic in form. This manuscript volume, invaluable as an index to Milton's methods of work, was reproduced in facsimile (Cambridge, 1899) by W. Aldis Wright.

The first complete edition of The Poetical Works of Mr John Milton . . . was printed by Jacob Tonson in 1695. In 1732 Richard Bentley put forward a curious edition of Paradise Lost in which long passages were rejected and placed in the margin on the ground that they were interpolations made possible by Milton's blindness. The Latin and Italian poems, with a translation by William Cowper,

were printed by W. Hayley in 1808. The most important of the numerous later editions of Milton's poetical works are by H. J. Todd (6 vols., 1801); J. Mitford (" Aldine edition," 3 vols., 1832); T. Keightley (2 vols., 1859), whose notes are most original and interest- ing; D. Masson (" Library "or "Cambridge "edition, 3 vols., 1874; of which a new edition appeared in 1890, with memoir, introduction, notes and an essay on Milton's English and versification) ; John Bradshaw (new " Aldine edition," 2 vols., 1892) ; also a careful reprint retaining the peculiarities of the earlier printed copies, by H. C. Beeching (" Oxford edition," 1904) ; and another, with variant readings, by W. Aldis Wright (Cambridge University Press, 1903). The prose works were first partially collected in 1697. They were edited by J. Toland (3 vols., 1698), by C. Symmons (7 vols., 1806), by Pickering (8 vols., 1851) with the poetical works, and by J. A. St John for Bohn's "Libraries" (5 vols., 1848-1853). There are numerous annotated editions of separate works.

The earliest life of Milton is contained in Wood MS. D. 4 in the Bodleian Library, Oxford, and was printed in the Eng. Hist. Review for January 1902, also by E. S. Parsons in Colorado College Studies,

No. X (1903). The author, who sympathized with the poet's political views, is unknown, but the name of Milton's friend, Dr Nathan Paget, is suggested. His account formed the basis of the life given by Anthony a Wood in Fasti oxonienses (1691). Wood was also indebted to John Aubrey, whose Brief Lives were not printed until later. The life by his nephew Edward Phillips was prefixed to the Letters of State printed in 1694, and reprinted by William Godwin in his Lives of E. and J. Phillips (1815). Samuel Johnson's famous Life of Milton (1779), which contains some valuable criticism, is written from a somewhat unfriendly standpoint. The records of Milton's official life, available in the State Papers, were first made use of by H. J. Todd in a third edition (1829) of his Milton. All the available information was gathered in Professor Masson's ' Life of John Milton; narrated in Connexion with the Political, Ecclesi- astical and Literary History of his Time (6 vols., 1859-1880, with index, 1894; new ed. of vol. i., 1881) which contains ample reference to original authorities. Shorter works are Milton und seine Zeit (2pts., 1877,1879), by Alfred Stern; Milton (1879), by Mark Pattison in the " English Men of Letters " series, and Life of John Milton (1890) by Dr Richard Garnett in the " Great Writers" series, with a bibliography by J. P. Anderson.

The sources of Paradise Lost have given rise to much discussion. It has been supposed to owe something to Adamo, a comedy by Giovanni Battista Andreini (1 578-1652), to the Paraphrase associated with the name of Caedmon which was printed at Amsterdam in 1D 55 by Francis Junius, and to the Lucifer and other plays of Joost van den Vondel. Parallelisms between Vondel and Milton were pointed out by Mr Edmund Gosse in Literatures of Northern Europe (1879), an d the comparison was carried further in Mr G. Edmund- son's Milton and Vondel; A Curiosity of Literature (1885), a book which aroused much discussion. A valuable contribution to Miltonic criticism was made in 1893 by Mr Robert Bridges in an essay on Milton's Prosody. This was reprinted in 1901, with some

additional matter and an essay on ” Classical Metres in English Verse ” by W. J. Stone. Amongst other critical essays should be mentioned essays by Macaulay (Edinburgh Review, 1825) ; Walter Bagchot (Literary Studies, vol. i., 1879); S. T. Coleridge {Seven Lectures on Shakespeare and Milton 1856); Edward Dowden (Transcripts and Studies, 1888); Edmond Scherer (Etudes stir la lillerature contemporaine, vol. vi., 1882) ; Augustine Birrell (Obiter dicta, second series 1887); Walter Raleigh (Mtlion, 1900); E. Allodoli, Giovanni Milton e Vltalia (Prato, 1907).

Concordances of Milton’s Poetical Works were compiled by G. L. Prendergast (Madras, 1856-1857); by C. J. Cleveland (1867), based on a verbal index used in an American edition 1853, of the Poetical Works; by John Bradshaw (1894), by L. E. Lockwood, Lexicon to the English Poetical Works of John Milton (New York, 1907).

The tercentenary of Milton’s birth was celebrated in 1908 in Cambridge, London and elsewhere. An exhibition of the portraits of Milton, authentic and supposed, with a great collection of valuable editions of the poet’s works, was held in June and July at Christ’s College, Cambridge. The catalogue of this exhibition, drawn up by Dr G. C. Williamson, forms a valuable bibliography and icono- graphy of the poet. A collection of Milton autographs, early editions and portraits was also held in December at the British Museum, and the anniversary itself was celebrated by a special meeting of the” British Academy, at which papers by Professors W. J. Courthope, Edward Dowden and others were read. There was a religious service at St Mary-le-Bow, Cheapside, and a banquet at the Mansion House.

MILTON, a township of N.E. Norfolk county, Massachusetts, U.S.A., about 7 m. S. of Boston, the Neponset river forming a large part of its N. and N.W. boundary. Pop. (1890), 4278; (1900), 6578 (1840 being foreign-born) ; (1905, state census), 7054: (1910) 7924. It is served by the New York, New Haven & Hartford railway, and is primarily a residential

suburb of Boston, with which it is connected by electric lines. The township covers an area of about 13 sq. m., and includes the villages of

Milton, East Milton and Mattapan. The country is rolling and hilly, the Blue Hills (with the exception of a part included in Brain tree in 171 2 and now in Quincy) lying in Milton. On Great Blue Hill, the highest (635 ft. above tide-level), great fires were kindled at the news of the repeal of the Stamp Act, of the adoption of the Declaration of Independence, and of the sur- renders of Burgoyne and Cornwallis; beacon fires were burned during the American War of Independence; an ” observatory ” for tourists was built at an early date; and in 1885 the Blue Hill Observatory for meteorological investigation was established by Abbott Lawrence Rotch (b. 1861), who made important investi- gations concerning clouds, and attracted attention by his use of kites for obtaining meteorological data. Milton Academy (a non-sectarian school) was founded in 1798, opened in 1805, and suspended in 1867; a new academy was opened in 1885. There is a public library, which was opened in 187 1, and in 1909 had more than 20,000 volumes. Cunningham Park is under the control of the trustees of a fund left for the benefit of the town- ship, and contains a gymnasium, skating-pond, tennis courts, &c, open to townspeople only. Hutchinson Field, another public park, is a part of the estate of the last royal governor, Thomas Hutchinson; Governor Jonathan Belcher also lived in Milton for a time. There are two granite quarries in the town- ship, immediately north-west of the Blue Hills; the granite is of the ” dark Quincy ” variety — dark bluish grey in colour — and is used chiefly for monuments. Milton, originally a part of Dorchester, was first settled in 1640, and was called Uncata- quissett. The township was separated from Dorchester and incorporated in 1662. It owes its name either to its early paper and grist mills (Milton being abbreviated from Milltown) or to Milton Abbey, Dorset, whence members of the Tucker family came, it is supposed, to Milton about 1662. In 1712 the Blue Hill lands were divided between

Milton and Braintree, and in 1868 part of Milton was included in the new township of Hyde Park. In Milton, on the 9th of September 1774, at the house of Daniel Vose, a meeting, adjourned from Dedham, passed the bold ” Suffolk Resolves ” (Milton then being included in Suffolk county), which declared that a sovereign who breaks his compact with his subjects forfeits their allegiance, that parliament’s repressive measures were unconstitutional, that tax-collectors should not pay over money to the royal treasury, that the towns should choose militia officers from the patriot party, that they would obey the Continental Congress and that they favoured a Provincial Congress, and that they would seize crown officers as hostages for any political prisoners arrested by the governor; and recommended that all persons in the colony should abstain from lawlessness.

See A. K. Teele, History of Milton, Mass., 1640 to 1887 (Milton,

1887).

MILTON, a borough of Northumberland county, Pennsylvania, U.S.A., on the Susquehanna river at the mouth of Lime- stone Run, about 66 m. N. of Harrisburg. Pop. (1890), 5317; (1900), 6175 (166 foreign-born); (1910), 7460. It is served by the Pennsylvania, and the Philadelphia & Reading railways, and is connected with Lewisburg and Watsontown by an electric line. Milton has an attractive public park, is in an agricultural region, and has various manufactures. It was founded in 1792, and incorporated as a borough in 18 17. In 1880 it was in great part destroyed by fire.

MILWAUKEE, a city and the county-seat of Milwaukee county, Wisconsin, U.S.A., the largest city of the state, at the mouth of the Milwaukee river on the W. shore of Lake Michigan, about 85 m. N. of Chicago. Pop. (1900), 285,315; (1910), 373)857. The Milwaukee river entering the city from the north is joined about 5 m. from its mouth by the Menominee flowing from the west and a short distance from the lake by

the Kinnikinnic flowing from the south. These rivers are navigable for lake traffic into the heart of the city. Milwaukee Bay, into which their combined waters empty, is an inlet of Lake Michigan, about 6 m. across. By the construction of extensive piers and breakwaters a fine harbour of refuge has been created; and its inner harbour is deep enough for the largest lake-steamers.

From the shore of the lake the land rises, rather abruptly in most places, to a height of from 75 to 100 ft. From a broad plateau overlooking the lake the land slopes gradually westward to the river, again rising on the north, west and south to a height of 125 ft. or more. The rivers separate the city into three distinctly marked divisions of varying character known as the east, west and south sides. The manufactories are largely on the ” flats ” along the rivers and on the south side. The extensive use as building material of cream-coloured brick made in the vicinity gives the city its nickname, ” the Cream City.”

The city has many beautiful parks and squares, the most picturesque of which is Juneau Park, along the lake bluff. It contains statues of Leif Ericsson and Solomon Juneau. Other parks are Lake Park, also on the lake shore, at North Point, where stands the waterworks pumping station with its tall tower; Riverside and Kilbourn Parks, east and west respectively of the upper Milwaukee river, in the northern part of the city, Washing- ton Park on the west side, containing a menagerie and a herd of deer; Sherman Park on the west side, and Kosciusko, Humboldt and Mitchell Parks on the south side. McKinley Park on the lake shore south of the city, and Whitefish Bay 6 m. north of the city, are popular bathing resorts. In addition to the statues in Juneau Park there is a statue of Kosciusko in the park of that name; one of Washington and a soldiers’ monument on Grand Avenue; a statue of Henry Bergh in

front of the city hall; one of Robert Burns in the First Ward Park, and, in Washington Park, a replica of Ernst Rietschel's Schiller-Goethe monument in Jena, given to the city in 1908 by the Germans of Milwaukee. Of the several cemeteries, that of Forest Home, south-west of the city, is the largest and most beautiful. The city is well sewered, and has an excellent water-supply system owned by the municipality and representing an investment of more than $5,000,000. The water is obtained from Lake Michigan through an intake far out in the lake. Through a tunnel J m. long, constructed in 1888, water is pumped by means of one of the largest single pumps in the world from the lake into the upper Milwaukee river, which is thus completely flushed by fresh water every twenty-four hours.

Milwaukee is one of the most healthful of the larger cities of the United States. Its average annual death-rate for 1000-1004 was 13-6. The proximity of Lake Michigan cools the atmosphere in summer and tempers the cold in winter. As a result, the extremes of heat and cold are not as great as those in most inland cities. The mean monthly temperatures vary between 20 in January and 70 in July, with extremes of ioo° and -25°. The mean annual precipitation is 31-4 in.

Suburbs— Milwaukee proper occupies 22J sq. m., a small area as compared with other cities near it in population — Detroit (36 sq. m.) and Washington, D.C. (69} sq. m.). As a result, the population has overflowed into several populous suburbs industrially a part of a " greater " Milwaukee. Of these by far the most important are the township of Wauwatosa (pop., 1905, 11,132; 1910, 11,536), and the city of the same name, separated from the township in 1897 and having in 1910 a population of 3346; the city and township are on the Menominee river, immediately adjoining the city on the west. The first settlement was made here in 1835. Wauwatosa has important manufactures, including machinery, brick, lime, beer, chemicals and woodenware, and extensive market gardens and nurseries and valuable stone quarries. It has a Carnegie library,

and is the seat of an Evangelical Lutheran theological seminary (1865), of Lutheran homes for the aged and orphan, of the Milwaukee county hospital for the insane, of the Milwaukee sanatorium for nervous diseases, and of the north-western branch of the national soldiers' home, which has grounds covering 385 acres and with main building and barracks affording quarters for over 2000 disabled veterans, and has a hospital, a theatre, and a library of 15,000 volumes. Within the limits of Wauwatosa also are the State Fair grounds. Other suburbs are West Allis pop., 1905, 2306; U. S. cen- sus 1910, 6645), an incorporated rapidly growing manufacturing city on the west; Cudahy (pop., 1910, 3691), a manufacturing village south of Milwaukee, largely devoted to meat packing ; South Milwaukee (pop. 1910, 6092), an incorporated city with several large manufactories, and North Milwaukee (pop., 1910, i860), a village immediately adjoining the city on the north.

Public Buildings, Institutions, &c. — The principal public building in the city is the Federal building (1895-1898), the post office, custom- house and local headquarters for the United States courts. The public library and museum, on the north side of Grand Avenue, in

addition to an excellent collection of natural history, palaeontology, &c, contained in 1909 a library of about 190,000 volumes. The city hall on the east side is surmounted by a tal! clock-tower containing one of the largest bells in the world. The Layton Art Gallery contains one of the best collections of paintings west of the Alleghanies. The chamber of commerce, and the Pabst, Mitchell, North-Western Life Insurance, Germania Sentinel and Wells build- ings, are among the principal business structures. In Milwaukee are St John's Roman Catholic Cathedral and All Saints Protestant Episcopal Cathedral — the city is the see of a Roman Catholic arch- bishopric (established in 1892) and of a Protestant Episcopal bishopric. Among other church structures are Plymouth Congrega- tional, Westminster Presbyterian, Church of Gesu (Roman

Catholic) and Trinity Lutheran. The hotels include the Pfister on the east side and the Plankinton, the Republican and the Schlitz on the west side. Among the theatres are the Davidson, Majestic, Schubert, Bijou, Alhambra and the Pabst German. During the summer there are open-air theatres in several private parks or ” gardens.” The social clubs include the Milwaukee, Deutscher-Concordia, University and Marquette clubs. The predominance of Germanic influence in the city is evidenced by at least 75′ musical clubs and numerous Turnverein societies. There are 12 hospitals (3 of them city in- stitutions), 6 orphan asylums, 4 homes for the aged, a foundlings’ home and a state industrial school for girls.

The educational institutions are numerous. Marquette University was established in 1906 by a union of Marquette College (1881), a Roman Catholic school of high rank, and existing schools of medicine, pharmacy, dentistry and law; in 1908 it added a department of engineering, and in that year it had 81 instructors and 630 students. Milwaukee-Downer College (for girls), in the north-east part of the city was established in 1895 by a consolidation of Milwaukee College for girls, and Downer College, formerly at Fox Lake. Other in- stitutions are Concordia College (1881, Lutheran), a state normal school (1880), the Wisconsin College of physicians and surgeons (1893), the national German-American teachers’ seminary (normal), Milwaukee academy (1864), Milwaukee University school, Milwaukee school of engineering (1904), Milwaukee Turnverein school of physical culture, one of the largest schools of the sort in the United States, St John’s Catholic institute, Our Lady of Mercy acadeYny (Roman Catholic), Wisconsin academy of music, the Wisconsin school of art (art students’ league), a Catholic normal school, St Rose’s manual training school, the industrial chemical institute (the only technical school for brewers in the United States) and several business and commercial schools. At St Francis, adjoining the city on the south, is the seminary of St Francis of Sales (Roman Catholic),

and St Joseph's institute for deaf mutes (Roman Catholic). The Milwaukee public school system comprises four high schools, a high school of trades, and in addition to the ordinary grades, a kindergarten department and day schools for the blind and deaf.

Transportation. — Milwaukee is favourably situated commercially, with excellent facilities for shipping both by lake and rail afforded by four trunk lines and a dozen lines of lake steamboats. It is served by the Chicago & North-Western, the Chicago, Milwaukee & St Paul, the Minneapolis, St Paul & Sault Ste Mane, the Grand Trunk, and the P6re Marquette railways. The last-named connects with the main line at Ludington, Michigan, by means of a railway ferry across Lake Michigan; the Grand Trunk has a railway ferry from Milwaukee to Grand Haven. The city's extensive street railway system connects with interurban electric lines leading to Waukesha, Oconomowoc and Watertown on the west, Sheboygan and Fond du Lac on the north, and Chicago and intermediate points along the lake shore on the south.

Trade and Commerce. — Commercially Milwaukee is one of the most important of the inland cities of the United States, although its trade it largely domestic. It is a distributing point for a considerable part of Wisconsin, and several states farther west, its wholesale business aggregating about $350,000,000 annually. The country produce sold in Milwaukee averages about $75,000,000 a year in value. The chief commodities of trade are coal, grain, lumber, flour and various products of the city's own manufactories. Milwaukee is an important grain shipping port— in 1908 it shipped 28,618,519 bushels of grain and 3,752,033 barrels of flour, and its 25 elevators have a capacity of over 12,500,000 bushels. It is one of the largest distributing centres in the country for coal, which is received by lake, and stored in enormous coal docks for trans- shipment by rail throughout the west and north-west. The city is a port of entry, and in 1908 its imports were valued at $3,080,437, and its

exports at only $75,525.

Manufactures.— In 1905 the total value of Milwaukee's factory products was $138,881,545, 25-3% more than in 1900. In the manufacture of malt liquors and malt Milwaukee stands first among the cities of the United States and of the world. The total value of these products for 1905 was $29,909,248, of which $22,134,580 was the value of malt liquors and $3,774,668 was the value of malt. In 1905 Milwaukee manufactured 77-1 % of the malt liquors manu- factured in the state and 7-4 % of the entire product of the United States. Other products exceeding $1,000,000 in value were: leather ($14,074,397), Milwaukee being second in the manufacture of leather among the cities of the United States ; foundry and machine

grist-mill products ($6,320,428) ; slaughtering and meat-packing products ($5,958,515); men's clothing ($4,759,548); boots and shoes ($2,929,405); electrical machinery, apparatus and supplies ($2,257,229); chewing and smoking tobacco ($1,966,930) and cigars and cigarettes ($1,540,019); furniture ($1,767,290); trunks and valises ($1,623,310); hosiery and knit goods ($1,535,176); confectionery ($1,379,668); stoves and furnaces ($1,288,931); leather gloves and mittens ($1,207,633); structural iron work ($1,037,217); wooden packing boxes ($1,024,750); and paints ($1,015,774). Among Milwaukee's largest industrial establish- ments are: the Pabst and the Schlitz breweries, on the west side of the city, the machine shops (35 acres) of the Allis-Chalmers Company at West Allis, employing about 5000 men and making engines of all kinds; and the plant of the Illinois Steel Company, at Bay View on the south side, which covers 154 acres. The flour mills of Milwaukee have a capacity of about 12,000 barrels a day. Two of the

city's tanneries are among the largest in America. In the Menominee river valley the peculiar cream-coloured Milwaukee bricks are made. North of the city on the Milwaukee river are extensive cement works.

Newspapers. — The first newspaper in Milwaukee, the Advertiser, began publication in 1836. The first German newspaper was established in 1844. In 1909 there were eleven daily newspapers, as follows: Evening Wisconsin (1847; Republican), Free Press (1901; Independent Republican),- Journal (1882; Independent Democrat), News (1886; Independent), and Sentinel (1837; Republican), the oldest paper in continuous publication, Daily Commercial Letter (Commercial), Reporter (legal and commercial), Dziennik Milwaucki (Polish), Kuryer Polski (1888; Republican; Polish), Germania Abendpost (1872; Independent; German); and Der Herold (1854; Independent; German). Of more than a hundred other publications thirty-two, 10 monthly or quarterly and 22 weekly, were published in German. There are 5 Polish weekly publications, 3 Bohemian, 1 Italian and one periodical for the blind.

Population. — The population of Milwaukee in 1840 was only 1712. During the following decade there was a steady flow of immigrants from the eastern states and from Europe, with the result that in 1850, two years after the admission of Wisconsin to the Union, the population was 20,061. The population at the succeeding decennial censuses was as follows: (i860), 45,246;

(1870), 71,440; (1880), 115,587; (1890), 204,468; (1900), 285,315.

In 1905, according to the state census, the population was 312,948; The fact that out of a population of 285,315 in 1900, 88,991 were foreign-born, and 235,889 were of foreign parentage, that 53,854 were born in Germany, that 124,211 had both parents born in Germany, and that 26,834 additional had one or the other parent born in Germany, stamps the character of Milwaukee's population. The negro

population in 1900 was only 862. The proportion of illiterates is small. Of the male population, aged 10 years or more, only 3206 (2968 foreign-born whites; 194 native-born whites) were illiterate in 1900.

Government. — Milwaukee is governed under a city charter of 1874, providing the form of city government most common in America, a mayor (elected biennially) and a single board of aldermen. There are the usual administrative boards whose members are appointed by the mayor, some of them with the approval of the board of aldermen, though the board of school directors is elected by direct popular vote. Two boards of civil service commissioners, one for fire and police departments and one for all other departments, have supervision over the city's civil service.

The assessed valuation of taxable property, in the city, in August 1906 was $201,585,127, of which $157,611,560 represented realty and $43,973,567 personality. The valuation is about 60 % of the actual value. The tax rate for all purposes in that year was $2-26 per ,$100. According to a special report of the census the cost of the city government of Milwaukee in 1906 was smaller per capita than that of any other city in the country with a population of over 300,000. At the close of the year 1906 the total debt was $8,835,049, and the funded debt was $8,106,500.

History. — The first Europeans known to have visited the site of Milwaukee were Father Jacques Marquette, the Jesuit missionary, and his companion, Louis Joliet, who on their return in the autumn of 1673 to the mission of St Francis Xavier at De Pere from their trip down the Mississippi, skirted the west shore of Lake Michigan in their canoes from Chicago northward. Milwaukee Bay is distinctly marked in the map attributed to Marquette, the original of which is now in the Jesuit College at

Montreal, Canada; it was discovered in a convent in Montreal by Felix Martin (1804-1886), of the Society

of Jesus, and was copied by Parkman. In 1679 La Salle and his party probably stopped here on their way south, and in the Jesuit Relations of that year the name Milwaukee first appears, as ” Millioke. ” This, and the various other spellings of the name, attempted to reproduce the Indian name of the village here, which Kelton thinks was pronounced Minewagi and meant ” there is a good point ” or ” there is a point where huckleberries grow,” in allusion to the fertile soil. Doubtless the coureurs du hois who at this time began to frequent the Wisconsin forests, touched at the bay many times within the succeeding years as the place was known to be a favourite rendezvous of the Fox (or Outagamie) Indians. In 1699- 1700 Father St Cosme, a Recollet friar, was here, finding bands of Mascoutens, Fox, Winnebago and Potawatomi. He called the river ” Melwarik,” ” Melwarck ” and ” Meliwarik.”

For more than half a century no definite reference to the place can be found. In 1760 its advantageous situation attracted the adventurous trader, Alexander Henry, the first Englishman known to have visited the spot. Three years late* (1763) there was a French fur-trading post here, but it is uncertain just when it was established or how long it was maintained. In 1795 Jacques Vieau, a Frenchman in the employ of the North- Western Fur Company, established a permanent post here, which seems to have continued, under his direction, with practically no inter- ruption until 1820, when it was superseded by that of Astor’s American Fur Company. Vieau built a dwelling and a ware- house and conducted extensive trading operations. In 1818 there joined the settlement a young Frenchman named Laurent Solomon Juneau (1793-1856), who married one of Vieau’s daughters and eventually bought out his business. Juneau and several others who arrived at about the same time built homes on the east side of the river near the foot of the present Wisconsin Street. Vieau’s house and store was at this time on the south side. Milwaukee was on the direct route of travel between Fort Dearborn (Chicago) and the

flourishing settlement at Green Bay, and at once after the treaties between the United States and the Menominee in 1831 and 1833 for the extinguishing of the Indian titles, settlers began to come to [the neighbourhood. A map of 1830 shows a small settlement on ” Milwalky Bay “; and the treaty of the 8th of February 1831 speaks of the ” Mil- wauky or Manawauky River.” Morgan L. Martin (1805-1887) of Green Bay, a lawyer and judge, and a delegate to Congress in 1845-1847 from Wisconsin territory, explored the harbour facilities in 1833 and made a map of the place which he called ” Milwaukie.” He entered into an agreement later in the same year with Juneau and Michael Dousman for its development. A saw-mill was built in 1834, and settlers began to arrive. The east side was platted in the summer of 1835, and very soon after- ward the plat of a settlement on the west side was also recorded, Byron Kilbourn being the chief projector and proprietor of the latter. The rival settlements, officially known as Milwaukee East Side and Milwaukee West Side, bore the popular designa- tions of ” Juneautown ” and ” Kilbourntown.” A third settle- ment, begun on the south side by George H. Walker and known as ” Walker’s Point,” was subsequently platted independently. The rivalry between the east and west side towns was intense, the plats were so surveyed that the streets did not meet at the river, and there were bitter quarrels over the building of bridges. Milwaukee county was set off from Brown county in 1834, and in 1836 the establishment of townships was authorized. Under this act the east and west sides were independently incorporated in February 1837. A realization that the continuation of inde- pendent and rival corporations retarded growth eventually led to a compromise by which the two were united as two wards of the same village in 1839, the autonomy of each being still recognized by an odd arrangement whereby each maintained practically independent management of its finances and affairs. Walker’s Point, the south side, was annexed as a third ward in 1845, and in 1846 the three wards were incorporated as the city of Milwaukee, of which Solomon Juneau was elected first

mayor. The influence of this early rivalry may be seen in several provisions of the existing city charter.

About 1840 a strong tide of immigration from Germany set in, continuing steadily for a half-century. It was greatly accelerated by the German revolutionary movements of the late ‘forties, which added to the city’s population a considerable element of educated Germans of the upper class. From this time the Teutonic character of the population was marked. The first newspaper, the Advertiser, began publication in 1836; the first bank was established in 1837. In 1839 George Smith and Alexander Mitchell established the Fire and Marine Insur- ance Company Bank. As ” Mitchell’s Bank ” this institution was known for forty years as one of the strongest banking houses west of the Alleghanies, its notes passing at par during panics in which even the government issues were depreciated. Through it the Chicago Milwaukee & St Paul and other western railways were financed. Beer was first brewed in Milwaukee in 1840. Milwaukee was connected with Chicago by telegraph in 1849, and by railway in 1856. Previous to this, however, in 185 1, the first train ran over- the Chicago Milwaukee & St Paul railway to Waukesha, and in 1857 through trains were run over the same road to the Mississippi at Prairie du Chien.

See J. S. Buck, Pioneer History of Milwaukee (4 vols., Milwaukee, 1876-1886); A. C. Wheeler, Chronicles of Milwaukee (Milwaukee, 1861); E. S. Mack, ” The Founding of Milwaukee ” in Proceedings of the State Historical Society for iqo6 (Madison, 1907) ; and L. M. Larson, Administrative History of Milwaukee (Madison, Wisconsin,

1908).

MIMETITE, a mineral consisting of lead chloro- arsenate, •(PbCl)Pb4(As0 4)3, crystallizing in the

hexagonal system and closely resembling pyromorphite (q.v.) in appearance and general characters. The arsenic is usually partly replaced by equivalent amounts of phosphorus, and there may thus be a gradual passage from mimetite to pyromorphite. The two species can, as a rule, only be distinguished by chemical analysis, and because of their close resemblance the less frequently occurring chloro-arsenate was named mimetite or mimetesite, from Gr. lunrirfy, imita- tor. Crystals of pyromorphite though usually optically uniaxial are sometimes biaxial, but in mimetite this anomalous character is almost always present; a cross-section of a hexa-gonal prism of mimetite shows a division into six optically biaxial sectors or a complex lamellated structure. In colour mimetite is usually yellow or brown, rarely white or colourless; the lustre is resinous to adamantine. The hardness is 35, and the specific gravity •j-o-'2$. Like pyromorphite, mimetite is found in the upper parts of veins of lead ore, where it has been formed by the oxidation of galena and mispickel. When found in large amount it is of importance as an ore of lead. The best crystallized specimens are those from Johanngeorgen stadt in Saxony and Wheal Unity in Cornwall. It was formerly found in considerable amount at Dry Gill in Cumberland, as six-sided barrel-shaped crystals of a brownish-red or orange- yellow colour and containing a considerable proportion of phos- phoric acid; this variety has been called campylite, from Gr. KafiirvKos, curved, on account of the remarkable curvature of the faces of the crystals. (L. J. S.)

MIMICRY, in zoology, the deceptive and advantageous resemblance presented by defenceless and edible species of animals to other species of animals living in the same locality, which are harmful or distasteful and are consequently avoided by all or by a majority of the enemies of the class to which the mimetic and usually the mimicked species belong. Mimicry is a special form of protective resemblance, differing from ordinary protective resemblance as exemplified by the similarity of the resting goat-sucker to a piece of bark or of leaf- and stick-

insects to the objects after which they are named, in that the imitated object belongs to the animal kingdom and not to the vegetable kingdom or to inorganic nature. Although, like protective resem- blance, quite independent of affinity between the organisms con- cerned in the likeness, mimicry occurs most commonly between animals structurally similar, and therefore related, to one another, the relationship may be close or remote. For instance, the commonest and best-known cases are found in insects where

both mimic and model may belong to the same genus, sub-family, family or order, or to different orders. More rarely it occurs between members of distinct classes of the same sub-kingdom, i.e. between spiders and ants or spiders and beetles; yet even in this case both mimic and model have in common certain funda- mental structural points to which the finishing touches complet- ing the mimetic likeness are superadded. Still more rarely mimicry exists between totally unrelated species like cater- pillars and snakes or spiders and snails. But in no case does it appear that the modifications in shape and colour, which con- tribute to bring about a mimetic resemblance, are greater and more elaborate than those which result in the simpler examples of ordinary protective resemblance.

The principle of protective resemblance, for which the term mimicry, as above defined, was originally employed, was first explained by H. W. Bates. Subsequently the meaning of the word was extended by F. Muller to include cases of mutual resemblance between two or more noxious species inhabiting the same area. Hence the resemblances belonging to the first category are commonly termed ” Batesian mimicry,” and those belonging to the second category ” Mullerian mimicry,” or more properly ” Mullerian resemblance.” The difference between the two phenomena is essential and evident; but without experi- mental information as to palatability it is impossible to know with certainty to which of the two a particular case of mimicry is to be assigned. Over and over again extended knowledge on this point

and inferences drawn from other facts have shown the certainty or probability of examples of mimicry being in reality ” Mullerian,” which were previously accepted without question as ” Batesian.” A simple illustration will serve to explain these two aspects of mimicry and to show the advantage in the struggle for existence that mimicry confers upon the species concerned.

There is a common English Syrphid fly (Eristalis tenax) known as the drone-fly from its resemblance to a large hive or honey bee. Honey bees are protected from a large number of insect enemies because they sting and are distasteful. Insect-eating birds soon learn to associate distastefulness with the size, form and colour of the bees, and consequently leave them alone after one or more trials. But flies of the drone-fly kind cannot sting, and, so far as is known, are perfectly innocuous and edible. The advantage to the fly of its deceptive resemblance to the bee is theoretically perfectly evident and practically can be demonstrated by experiment. It is in the first place a matter of common know- ledge that human beings who have been taught to avoid handling bees invariably fear to touch drone-flies, unless specially trained to distinguish the one from the others. Moreover, Professor Lloyd Morgan found that young birds that had tasted and re- jected workers of the hive bee as unpalatable subsequently refused to taste not only drones, which have no sting, but also drone-flies. So far as our information at present extends the resemblance between these two insects is a simple case of mimicry in the Batesian sense of the word. That is to say, an edible species is protected by resembling one that is inedible. But if it be discovered, as is possible, that the drone-fly is also inedible, the mimicry must be ascribed to the Mullerian category, and the reason for it becomes less evident. In what way, it may be asked, are two or more distasteful species of insects, occurring in the same locality, benefited by resembling each other? The ingenious explanation suggested by Fritz Muller for similar cases met with

in butterflies is probably the true answer. This explanation depends upon what is now an experimentally demon- strated fact that insectivorous birds, and probably other animals, have no instinctive knowledge of what insects are edible and what inedible. This knowledge is acquired by experience; and since it is not, at all events as a rule, taught by the first taste to any individual bird, it is reasonable to infer that a considerable amount of injury, sufficient to disable if not to kill, is annually inflicted upon insects belonging to species protected by distaste- fulness or kindred qualities. Now insects that possess noxious attributes, and the same is true of other animals, usually have a conspicuous warning coloration which appeals to the eyes of enemies and helps them to remember more easily the cause of an

unpleasant experience, helps in fact to establish a psychical association between a particular style of coloration and a nasty taste or a painful wound. This being so, it is evident that if all the distasteful species in a given area are differently coloured, some individuals of all the species will be annually sacrificed to the experimental tasting of inexperienced foes before the numer- ous lessons have been learnt. But if all the species in question resemble each other the resemblance will be mutually beneficial to them because the association between the two attributes they have in common, namely distastefulness and a particular scheme of colour, will be rapidly established. One lesson only, instead of many, has to be learnt ; and once learnt at the expense of a few individuals of one or two species it will thereafter be applied indiscriminately to all. This type of mimicry has been well defined by Professor E. B. Poulton as the unification of warning colours.

Since belief in the adequacy of the two theories, above outlined, to account for the facts they profess to explain, depends ultimately upon the testimony that can be brought forward of the usefulness of warning characters, of the deception of mimicry and of the capacity for learning by experience possessed by enemies, it is necessary to give some of the evidence that has been accumulated on these points, (i) In South America there are butterflies formerly grouped as Heliconidae which are conspicuously coloured, slow of flight and abundant in individuals so as to be susceptible of easy capture. They possess scent glands. By observation and experiment it was discovered independently by Messrs Bates, Wallace and Bell that they are not attacked by birds nor by many other enemies that prey upon unprotected Lepidoptera. (2) As the result of a series of trials made in Calcutta F. Finn came to the conclusion that young birds have no instinctive knowledge of the unpalatability of dis- tasteful insects, but that experimental tasting

soon teaches them to recognize and avoid species they have previously rejected with dislike, and that having once learnt the lesson they long remember it. (3) That birds may also be deceived by insects that mimic those they have found to be uneatable has been shown by the above- quoted experiment with the drone-fly and the honey-bees made by Professor Lloyd Morgan. He also found that chickens that had been given meal moistened with quinine and placed upon glass slips banded black and yellow, afterwards refused to touch meal moistened with water and spread upon the same slips, although they had previously eaten it with readiness off plain coloured slips. With two exceptions, these chickens that had learnt to associate black and yellow banding with a bitter taste also refused to touch the caterpillar of the cinnabar moth (Euchelia jacobaeae) , which is banded with these colours. Moreover, young birds that had been taught by experience that these caterpillars are uneatable also left wasps untouched. (4) Guy Marshall once offered to a baboon a dis- tasteful butterfly (Acraea anemosa), holding the insect in such a way as to display its bright red and black markings to the monkey. It was taken but rejected after being tasted. A specimen of another butterfly (Precis sesamus) which mimics the Acraea was then offered in the same manner. The baboon took it, held it in her hands for a few moments, and then let it escape uninjured without trying to taste it. But when another butterfly of the same species, but with the wings cut off, was offered to her she promptly ate it without showing any sign of dislike. The results of this experiment with the baboon and of those with the birds are precisely what would be expected if the theory of mimicry is true. Experiments to test distastefulness have also been made with various kinds of insecti- vorous Arthropoda, like spiders and mantises. These experiments have shown that Arthropods also have their likes and dislikes in the matter of insect-food and frequently refuse to eat insects which are warningly coloured and are distasteful to vertebrated enemies. They appear, however, to have no appreciation of mimetic and

warn- ing colours, and have therefore not influenced in any way the evolu- tion of mimetic resemblances dependent upon hues and patterns. Nevertheless, as explained below, it seems to be highly probable that ant-imitating insects and spiders, when the resemblance is dependent to a greater extent upon size, shape and movement than upon tint, have acquired their mimetic likeness especially to protect them from the attacks of such insect-enemies as predaceous wasps of the family Pompilidae, flies of the family Asilidae, and from so- called parasitic hymenoptera of the family Ichneumonidae, as well as from other insect-eating Arthropods.

The term mimicry has also been applied to resemblances of a different kind from the two enumerated above — resemblances, that is to say, by which predaceous species are supposed to be enabled to approach or mix without detection with animals they prey upon or victimize in other ways. To this end the resem- blance may be actually to the species victimized or preyed upon or else to a species which the species preyed upon does not fear. This phenomenon is termed ” aggressive mimicry ” as opposed to

the Batesian and Mullerian phenomena, which are termed ” protective mimicry.” A few possible cases of aggressive mimicry are enumerated in the following summary of some of the recorded cases of mimicry in different classes of the animal kingdom; but the phenomenon is of comparatively rare occur- rence, and the supposed instances may be susceptible of other interpretations, excluding them altogether from mimicry, or bringing them under the Batesian or Mullerian interpretation of the phenomenon.

Among mammalia there are no certain cases of mimicry knowni It has been claimed that the resemblance between some of the Oriental tree-shrews of the genus Tupaia and squirrels comes under the category of aggressive mimicry, the tupaias being enabled by their likeness to approach and pounce upon small birds or other animals which, mistaking them for the vegetable-feeding squirrels, make no effort to get

out of the way. But this hypothesis cannot be accepted as furnishing a satisfactory explanation of the likeness. For in the first place there seems to be no good reason for thinking that the Tupaias feed to any considerable extent upon prey of that kind, and in the second place the resemblance is due to characters which may be merely adaptations to a similar mode of life. A long and bushy tail, for instance, is a useful balancer and is a not un- common feature in mammals which lead an active arboreal life. Similarly the dull coloration of the two sets of animals is very pos- sibly procryptic and serves to hide both shrews and squirrels from enemies. Hence there seem to be good reasons for regarding the likeness in question as due to similarity in habitat and not as mimetic.

In East and South Africa there is a genus of Mustelidae known as Ictonyx (Zorilla) which possesses a foetid odour and is warningly coloured with black and white bands after the manner of skunks. There also occurs in South Africa another member of this family {Poecilogale albinucha) , which is very similarly coloured. It is possible that this resemblance is mimetic in the Batesian sense of the word,, and that the Poecilogale, if inoffensive, profits by its likeness to the highly offensive and warningly coloured Ictonyx. But, on the other hand, Poecilogale may itself be a protected form since sub- caudal stink-glands are commonly found in species of the weasel tribe. If this be the case the two species probably furnish an instance of true Mullerian mimicry. In South America there is considerable superficial resemblance between the little bush dog (Speothos vehaticus) of Guiana and Brazil and the large weasel-like animal of the same countries — the tayra (Galera barbara). The tayra is, when adult, black beneath and on the legs, and not un- commonly has a considerable quantity of greyish hair on the head! In these particulars, as well as in size and shortness of leg, the dog resembles the weasel ; and since there are good reasons for believing that the latter is protected alike by ferocity and stink-glands, it is

quite possible that the dog, of unusual coloration and form for the Canidae, is protected from the attacks of pumas, jaguars and ocelots by his likeness to the tayra.

A few cases of mimicry have been recorded in birds. The common cuckoo and some other species inhabiting Africa and Asia closely resemble sparrow-hawks. Some cuckoos are singular for their habit of using the nests of smaller' birds to lay their eggs in, so that the young may be reared by foster-parents; and it has been suggested that the object of the likeness exhibited to the hawk is to enable the cock cuckoo either to frighten the small birds away from their nests or to lure them in pursuit of him, while the hen bird quietly and without molestation disposes of her egg. The fact that both sexes of the cuckoo resemble the hawk does not necessarily prove this suggested explanation to be false; but if it be true that the smaller passerine birds are duped by the similarity to the bird of prey, it may be that the cuckoos themselves escape molestation from larger hawks on account of their resemblance to the sparrow- hawk. Another species of this group, the black cuckoo of India, apparently mimics the black drongo-shrike (Dicrurus ater), the resemblance between the two species being very close. The drongo is a fierce and powerful bird which will not tolerate a strange bird of the size of a cuckoo near its nest, yet on account of its resemblance to the drongo, the hen cuckoo is enabled, it has been claimed, to lay her egg in the nest of the drongo, which mistakes the cuckoo for one of its own kind. In this case also both sexes of the cuckoo mimic the drongo, whereas according to the theory it would be necessary for the hen bird alone to do so. This suggests that the resemblance to the pugnacious drongo may be beneficial in protect- ing the defenceless cuckoo from enemies.

Some observations, however, of Guy Marshall on the inedibility of certain birds suggest that the resemblance between cuckoos and hawks on the one hand and cuckoos and drongos on the other may be susceptible of another explanation in full agreement

with the theory of mimicry as propounded by Bates. He found that a South African drongo {Dicrurus (Buchanga) assimilis) was rejected after one or two attempts to eat it by a hungry mongoose (Herpestes galera) which had been starved for purposes of the experiment. The drongo is blue and black and is, he believes, warningly coloured. The same mongoose also refused to eat a kestrel (Cerchneis rupico- loides) and a hobby {Falco subbuteo), although it devoured certain

other birds that -were given to it. It is clearly possible, therefore, that cuckoos which mimic drongos and hawks may be protected from those enemies which find these birds distasteful.

One of the most perfect cases of mimicry in birds is presented by a Madagascar thrush or babbler (Tylas eduardi), which resembles feather for feather a. shrike {Xenopirostris polleni), from the same island. The Tylas has departed from the normal coloration of its group to take on that of the shrike, a comparatively powerful and pugnacious bird. Analogous cases are supplied by the mimicry that exists between some of the orioles {Mimeta) and the friar-birds (Philemon or Tropidorhynchus) of the Austro-Malayan Islands. The friar-birds are noisy and pugnacious species of the group of honey-eaters, and mob hawks and other birds of prey, which leave them unmolested. The general style of coloration of orioles is gaudy yellow and black, rendering them invisible in sunlit foliage, and quite different from the more sombre hues of the friar-birds; but in the islands of Bourou, Timor and Ceram the orioles have not only assumed the tints of friar-birds in general, but in each of the islands named a species of oriole has acquired the little peculiarities in colour of plumage possessed by the friar-bird of the same locality. There seem to be no reasons for doubting that these are cases of genuine protective mimicry.

Apparently the only instances of mimicry known amongst reptiles occur amongst snakes; and in all the cases quoted by Wallace harmless snakes mimic venomous species. In tropical America the genus Elaps, which is both poisonous and warningly coloured, is a model for several innocuous snakes. In Guatemala Elaps fulvus is mimicked by Pliocerus equalis; in Mexico Elaps corallinus by Homalocranium semicinctum, and in Brazil, Elaps lemniscatus by Oxyrhopus trigeminus. In South Africa the harmless egg-eating snake {Dasypeltis scaber) is very like the Cape adder (Bitis atropos) ; and in Ceylon the harmless Colubrine Lycodon aulicus_ is alleged to mimic Bungarus ceylonicus , an ally of the deadly krait of India. Considering, however, the numbers of venomous and innocuous snakes that occur in most tropical countries, it might be supposed that mimicry in this order of reptiles would be of commoner occur- rence than appears to be the case. It must be remembered, however, that apart from size and colour all snakes resemble each other in a general way in their form and actions. They present a strong family likeness which is not found in any other terrestrial vertebrated animals with exception of some lizards and possibly Caecilians amongst the Amphibia. So close indeed is the similarity that many monkeys, apes and human beings have an apparently instinctive fear of all snakes and do not discriminate between poisonous and non-poisonous forms. Hence it may be that innocuous snakes are in many instances sufficiently protected by their likeness in shape to poisonous species that close and exact resemblance in colour to particular species is superfluous.

As a possible instance of mimicry in fishes, A. T. Masterman recalls the fact that two species of weever (Trachinus draco and T. vipera), have the same habitat in British waters as certain species of soles (e.g. Solea vulgaris). The weevers are poisonous and the venom is concentrated principally in the six spines of the first dorsal fin. These spines are sharp and connected by a black membrane which projects, when the fish is disturbed, as a

danger singal, it is believed, above the surface of the sand in which the fishes lie hid awaiting prey. For protective purposes soles, which are edible, also lie buried in or on the sand which they match in colour, with the exception of the right or upper pectoral fin which has a large black patch. When disturbed the soles raise this black fin and, as a rule, hold it rigid so that it becomes a very conspicuous object. If the view that the sole is protected by the blackness of the pectoral fin resembling the blackness of the dorsal fin of the weever, be correct, these fishes furnish an instance of Batesian mimicry. Furthermore, there is a common littoral fish in the Mediterranean (Uranoscopus scaber), belonging to the same family as Trachinus, exhibiting the same habits and living on the same ground, which also has a jet black erectile dorsal fin, and is believed to be poisonous. It is probable that the resemblance between Uranoscopus and Trachinus with respect to the colour of the dorsal fin is mutually beneficial to the two fishes. If so, the likeness must be regarded as an instance of Miillerian mimicry.

It is amongst Arthropods, however — and especially amongst insects — that mimicry, both Batesian and Miillerian, occurs in greatest profusion and perfection.

In insects of the order Orthoptera, departure from the normal in fortn and colour, carrying with it similarity to other living things, usually takes the line of protective resemblance to parts of plants. This is well exemplified by the leaf-insects (Phyllium) and stick- insects (Baclra), where the likeness to the models after which they are named is procryptic; and also by various species of tropical Mantidae which resemble flowers for the purpose of alluring insects within striking distance and perhaps also for concealing their identity from enemies. Some cases of genuine mimicry, however, are known in the order. Perhaps the best is that of the Sudanese Locustid (Myrmecophana fallax), which is strikingly ant-like. The head is large, the neck slender, the antennae short and the legs Iongish,

and the appearance of the long stalk-like waist of the ant is produced by a patch of whitish hair on each side of the forepart of the abdomen which has the effect of cutting away the parts of

the segments so covered, leaving a narrow dark-coloured median area to represent the waist. This at least is the method of disguise suggested by examination of the dried insect; but representatives of the same or an allied species found in Mashonaland were observed in the living state to be green with the antlike parts represented in black pigment. These parts were quite conspicuous against the green of the plants frequented by the insects, wherever the green portions were rendered invisible by the same background. Ant- mimicry has also been recorded in the case of the larva of one of the Indian species of Mantidae. Again, several species of this order have become profoundly modified in form in imitation of inedible beetles. In the Philippines, a cricket (Scepastus pachyrhynchoides), has taken on the shape and coloration of a species of Apocyrtus, a hard and inedible weevil (Curculionidae) ; and Phoraspis, a kind of grasshopper similarly resembles ladybirds (Coccinellidae) . A species of beetle (Caria dilalata) of this family in Borneo is mimicked by a species of a genus allied to Gammaroteltix not only in shape and colora- tion but also in the habit of remaining still when disturbed. In the same island a species of Gryllacris mimics Pheropsophus aquatus, a ” Bombardier ” beetle which ejects a puff of volatile formic acid when attacked; and Condylodera tricondyloides mimics different species of tiger-beetles (Cicindelidae) at different stages of its growth. Finally the larva of one of the Bornean Mantidae, which is a floral simulator in its pupal and adult stages, closely resembles in its black and red coloration the larva of the stinking and warningly coloured bug Eulyes amoena.

Comparatively few cases of mimicry in the Neuroptera have been observed. There are records, however, of species of Mantispa mimicking the wasp Polisles in North America and Borneo and Belonogaster in South

Africa; and other species of the genus imitate parasitic hymenoptera of the genera Bracon and Mesostenus.

Coleoptera (beetles) supply instances of mimicry of ants, wasps and Ichneumonids, and some defenceless forms of this order mimic others that are protected. A good illustration of wasp-mimicry is furnished by a large heteromerous beetle (Coloborhombus fasciati- pennis) from Borneo which is remarkably like a large wasp (Myg- nimia aviculus) from the same island. The front wings of the wasp have a conspicuous white patch near the tip and a patch similar in size and colour is present on the wings of the beetle, which, unlike the majority of beetles, habitually keeps its wings extended, and since the elytra are exceptionally short the wings are not covered by them when folded. The resemblance also extends to the general form of the body and to the length and thickness of the wings and antennae. The elytra are equally reduced, and apparently for the same purpose, in an Australian Longicorn beetle (Esthesis ferrugineus) , which, like so many wasp-like Hymenoptera, has the body banded red and black. This beetle probably mimics the Australian hornet (Abispa australis). In the European Longicorn (Clylus arietis), on the other hand, the elytra are of normal length and are banded with yellow stripes. The beetle, moreover, is of slender build and all its actions are suggestively wasp-like. This may, however, be an in- stance of Miillerian rather than of Batesian mimicry, the beetle being itself inedible; for Shelford has stated his conviction that the Bornean representatives of the sub-family (Clytinae), to which Clytus arietis belongs, are all highly distasteful and are warningly coloured, as are members of this sub-family from other parts of the world.

In the Philippine Islands several species of Longicorns of the genus Doliops mimic hard inedible weevils (Curculionidae) of the genus Pachyrhynchus. The antennae of these weevils are short and end in a knob; those of the Longicorns are very much larger, but the weevil-like look is produced by the presence

of a knob-like swelling upon the third joint, the terminal portion of the antenna being so extremely fine as to be almost invisible. Similar modification of the antennae in the Longicorn Estigmenida variabilis brings about the resemblance between this beetle and a beetle, Estigmena chinen- sis, one of the Phytophaga of the family Hispidae. Numerous instances of mimicry in this order of insects have recently been recorded from Borneo by R. W. C. Shelford, a large number of them being in all probability Miillerian.

Instances of ant-mimicry, unique in the method employed to bring about the resemblance, are supplied by some insects of the Homopterous group of the Rhynchota, belonging to the family Membracidae. In one of these (Heteronolus trinodosus), the dorsal area of the forepart of the thorax is developed into a plate which projects backwards over the body of the insect, which retains its normal form, and conceals all but the head, wings and legs. This shield if shaped in such a manner as to resemble closely the body of an ant, the median portion of the shield being deeply constricted in imitation of the waist and the terminal portion sub-globular like the abdomen of the ant. This insect comes from Central America. Still more curious is the mimicry of another of these insects from Venezuela which is found in company with a leaf-cutting ant (Oecodoma cephalotes) of that country. When pursuing their operations of leaf-storage, these ants present the appearance of a crawling crowd of leaf-particles, fragments of leaves being carried by the insects in such a way as to conceal to a great extent the insect underneath, of which little more than the dark coloured legs project beyond the burden. The immature form of the above-mentioned species of Membracidae mimics both ant

and leaf-particle. The legs and lower part of the body are dark coloured, but the dorsal surface of

the thorax and abdomen is coloured green and is raised so as to form a crest with jagged edges exactly reproducing the irregular margin of a fragment of leaf cut out by the mandibles of the ant. In Borneo the Homopteron Issus bruchoides mimics a species of Curculionid beetle of the genus Alcides.

In the Hemipterous group of the Rhynchota ant-mimicry is illustrated by the larva of a British species of Reduviidae (Nabis lativentris) in which the forepart of the abdomen is furnished on each side with a patch of white hairs leaving a central narrow dark portion in imitation of the waist of the ant ; and also by an East African species (Myrmoplasta mira) which in its general form exhibits a close resemblance to an ant (Polyrrhacis gagates) which occurs in the same neighbourhood. Another instance in this group is supplied by a Bornean species of Reduviidae which mimics a species of the genus Bracon, one of the parasitic Hymenoptera.

Typical dipterous insects (flies) closely resemble in general form aculeate Hymenoptera belonging to the families of bees and wasps. The changes in colour and structure required to complete the resemblance to particular species are comparatively slight and much less complicated than those needed to produce a likeness to other pro- tected insects. Hence we find that the majority of flies that mimic insects of other orders haye bees or wasps for their models. Many of the Syrphidae are banded black and yellow and present a general resemblance to wasps, especially when they alight, the resemblance being enhanced by a twitching action of the abdomen imitating the similar action so familiar in species of stinging hymenoptera. These flies are characterized by a peculiar method of flight. They commonly hang poised in the air, then dart with lightning swiftness to another spot and poise themselves again. This habit, the origin of the name ” hover-flies,” is probably connected with their mimetic coloration. If they flew like ordinary flies their resemblance to Hymenoptera would be obscured

by the rapidity of their flight and they might be caught on the wing by insectivorous birds or other insects; but when poised they display their coloration. When the latter is lost during flight, the rapidity of their movement defies pursuit. The particular likeness to a honey-bee presented by one member of this family, the drone-fly {Eristalis tenax), has been already referred to. But the likeness probably goes deeper than superficial resemblance that appeals to the eye; for spiders which distinguish flies from bees by touch and not by sight, treat drone-flies after touching them, not in the fearless way they evince towards blue-bottles (Calliphora), but in the cautious manner they display to- wards bees and wasps, warily refraining from coming to close quarters until their prey is securely enswathed in silk. This forcibly suggests that the drone-fly mimics a honey-bee not only in appear- ance but also in the feel of its hairs or the nature of its buzz. Other flies of the genus Volucella, larger and heavier in build than Eristalis, resemble humble-bees in colour and form, and it was formerly supposed that the purpose of this similarity was to enable the flies to enter with impunity the nests of the humble-bees and to lay their eggs amongst those of the latter insects. But it has been ascer- tained that the species of Volucella which behave in this manner also visit for a like purpose the nests of wasps, which they do not resemble. Hence it is probable that this case of mimicry is purely of a protective and not of an aggressive nature and serves to save the flies from destruction by insectivorous enemies. The same explanation no doubt applies to the mimicry, both in Borneo and South Africa, of hairy bees of the family Xylocopidae by Asilid flies of the genus Hyperechia, and also to other cases of mimicry of Hymenoptera as well as of inedible beetles of the family Lycidae by Diptera. Numerous other cases of mimicry between Diptera and Hymenoptera might be cited.

The Lepidoptera furnish more instances of mimicry, both Batesian and Mtillerian, than any other order of insects. In the majority of cases both model and

mimic belong alike to the Lepidoptera, and it is often uncertain whether both are inedible (Miillerian mimicry) or whether inedibility is the attribute only of the model (Batesian mimicry). A large number of cases that were formerly regarded as belonging to the latter category are now suspected of belonging rather to the former. Sometimes Lepidoptera mimic protected members of other orders of insects — such as Coleoptera, Hymenoptera and Hemiptera ; but perhaps the most singular illustrations of the phenomenon known in the order are exemplified by the larvae of the hawk-moth Chaerocampa, which imitate the heads of snakes. Professor Poulton long ago suggested, and supported the suggestion by experimental evidence on a lizard, that the larvae of two British species, C. elpenor and C. porcellus, are protected by the resemblance to the heads of snakes presented by the anterior extremities of their bodies which are ornamented with large eye-like spots. When the larvae are disturbed the similarity is produced with startling suddenness by the telescopic contraction of the anterior segments in such a manner as to suggest a triangular, pointed head with two large dorsal eyes. Subsequent observers (A. Weismann, La.dy Verney) have shown by experiment- ing upon birds that this suggestion is correct ; and Guy Marshall found that baboons which are afraid of snakes are also afraid of the snake-like larva of the South African Chaerocampa osiris. Finally Shelford states that the anterior end of a Bornean species

(C. myodori) offers a striking and detailed resemblance to the head of a snake (Dendrophis picta).

Instances of ant-mimicry in this order are sometimes confined to the larval stage. The early larval stage of the ” Lobster Moth ” {Stauropus fagi) . for example, presents a general resemblance, due to a combination of shape, colour, attitude and movements, to black ants, the swollen head and the caudal disk with its two tentacles representing respectively the abdomen and antenna-bearing head of the model. A parallel case of mimicry exists at

Singapore be- tween the larva of a Noctuid moth and the common red tree-ant (Oecophylla smaragdina). In this case also the posterior end of the larva represents the anterior end of the ant. Another instance of mimicry affecting the larval form is supplied by the moth Endromis versicolor, the caterpillars of which resemble the inedible larvae of saw-flies. The resemblance that certain moths — e.g. Trochilium apiforme, crabroniforme — present to bees and wasps is effected in the main by the loss of the scales from the wings, leaving these organs transparent. It is important to note that the scales are present when the moths first emerge from the pupa-case, but are loosely attached and fall off with the first flight.

Of the multitudes of cases of mimicry between different species of Lepidoptera, a few only can be selected for description. These cases, however, have a peculiar interest and importance for they have been studied in fuller detail than any others and the discovery of a particular instance in South America first suggested to Bates the theoretical explanation of this bionomical phenomenon. On the Amazons and in other parts of South America there are butterflies of the group Ithomiinae which are distasteful and have all the charac- ters of specially protected species, being conspicuously coloured, slow of flight, careless of exposure and abundant in individuals. The wings are transparent and are black-bordered and black-barred, the anterior wing having two black bars and the posterior one. This type of colouring is also found in genera of quite distinct sub-families of butterflies, namely in Danainae and Pierinae, as well as in some diurnal moths, all of which occur in the same district as the Itho- miinae. The following species may be cited as instances of this type of pattern : Methona confusa, Thyridia psidii, . Eutresis imita- trix and Dirgenna dero (Ithomiinae) ; Itura ilione and /. phenarete (Danainae) ; Dismorphia arise (Pierinae) ; Anthomyza buckleyi (moth of the family Pericopidae) and Castnia linus (moth of the family Castniidae). So alike in form,

colour and mode of flight are those Lepidoptera that when on the wing it is almost or quite impossible to distinguish one from the other, and the resemblance between members belonging to different sub-families cannot be assigned to affinity. Microscopical examination of the wings, moreover, has shown that the transparency of the wings, common to all, has been acquired by a different modification of the scales in each of the genera exhibiting the Ithomiine type of coloration. That the Danaine and Ithomiine species are distasteful is known. Itura, for example, belonging to the former, has protrusible scent-emitting processes at the end of the abdomen; and Thyridia has scent-pro- ducing tufts of hair on the edge of the posterior-wing. Bates offered no satisfactory explanation of the resemblance between these two genera and others of the same protected sub-families; but he did not hesitate to ascribe the resemblance to them presented by the Pierine, Dismorphia (Leptalis) orise, to mimicry, believing Dis- morphia to be unprotected and noting that it departed widely in the matter of coloration from typical members of the sub-family to which it belongs. Although mimicry in the Lepidoptera has been carried to a greater extreme in South America than in any other country of the world, remarkable instances of it have taken place in the Ethiopian and Oriental regions. A classical and highly com- plex case first investigated and explained by R. Trimen is that of Papilio dardanus which is widely distributed in Africa and is repre- sented_ by several sub-species or geographical races. The most primitive of these is antinorii from Abyssinia, which is non-mimetic and has the two sexes nearly alike. The males ,of the other sub- species are much like the males of antinorii; but the females are widely different and mimic various species of inedible butterflies belonging to the protected groups of the Danainae and Acraeinae. One of these sub-species, merope, which ranges from the west coast to Victoria Nyanza, is polymorphic and occurs under three forms, namely (a) hippocoon, which mimics the Danaine Amauris niavius;

(b) trophonius, which mimics the Danaine Limnas chrysippus;

(c) planemoides, which mimics the Acraeine Planema poggei. Oddly enough one or more of these forms may occur in other sub-species. For example, the sub-species cenea which occurs in south and south- east Africa not only has the form cenea mimicking two Danaines, Amauris echeria and^l. albimaculata, but also the hippocoon form which resembles a local race of Amauris niavius, known as domini- canus. The sub-species polytrophus from the Kikuyu Escarpments also has the planemoides and cenea forms and another form trimeni, which is intermediate between the unmodified female of antinorii and hippocoon, and like the latter is mimetic of Amauris niavius dominicanus. Finally the sub-species tibullus from the east coast has the cenea-iorm, the trimeni-form and probably the planemoides- form. The study of this intricate case is not yet completed and it is at present unknown whether it is an instance of Batesian or Miillerian mimicry. Special attention may be drawn to two pheno- mena connected with it, both of not uncommon occurrence in

mimetic Lepidoptera. The first is the occurrence of mimicry only in the female sex. The reason for this is to be found in the greater need of protection of the female which is slower in flight than the male and is exposed to special danger of attack when resting to lay her eggs. The second noteworthy phenomenon is the mimi- cry of more than one protected species by members of a single species. This is a not uncommon occurrence, and in the case of Batesian mimicry the explanation is probably this. When an edible species gains protection by mimicking a distasteful one, there is a likelihood of its increasing in numbers until it equals or surpasses its model in this respect. Were this to take place the purpose of the mimicry would be abortive, because enemies would probably not refrain

from slaughter if even every alternate capture proved palatable. It is advantageous therefore that the numbers of the mimetic species should be fewer than those of the model; and this appears to be achieved in some cases by the individuals of the mime- tic species dividing themselves between two or more models

Spiders furnish numerous instances of mimicry. Though simple in kind, many of these are as perfect illustrations of the phenomenon as any found in the animal kingdom.

Amongst the orbweavers of the family Argyopidae there are species belonging to the genera Cyclosa and Cyrtophora which closely resemble small snail-like gastropods as they cling to the underside of leaves with their legs drawn up. Other members of the same family — like Araneus- coccinella, and Parapleciana ihorntoni — ■ imitate beetles of the family Coccinellidae which are known to be distasteful; and certain genera of the family Salticidae (Homalattus and Rhanis) closely resemble small hard-shelled beetles.

The most perfect cases, however, are exhibited by those species which imitate ants. The structural modifications required to con- vert a spider into the image of an ant are of a more complicated character than those that serve the same purpose in an insect. All insects have the same regional division of the body into head, thorax and abdomen, the same number of legs, a pair of antennae and a segmented abdomen. Spiders on the contrary have no antennae, no separate ” head,” an unsegmented abdomen and an additional pair of legs. In the majority of ant-imitating spiders the forepart of the cephalothorax is constricted on each side to resemble the neck of the insect, and in many cases the similarity is increased by the presence of a stripe of white hairs which has the optical effect of cutting out an extra piece of integument, exactly as occurs in analogous cases in insects. Narrowing of the posterior portions of the spider’s cephalothorax and sometimes of the anterior end of

the abdomen reproduces the slender waist of the ant, and frequently transverse bands of hairs represent the segmentation of this region in the insect. The legs become slender and those of the first or of the second pairs are held up and carried in front of the head to simu- late the antennae of the ant. Added to this the spiders commonly copy to the life the mode of progression and the restless activities of their models.

The likeness presented varies considerably in degree from a general resemblance to several species, such as is seen in the Salticid spider (Peckhamia picata) of North America, to a close similarity to particular species. To this category belong Myrmarachne plataleoides, one of the Salticidae, and Amyciaea forticeps, one of the Thomisidae which in India imitate and live with the vicious little red ant (Oecophylla smaragdina) ; also Myrmarachne providens, which mimics the red and black Indian ant (Sima rufonigra) ; and the South American species of Clubionidae, e.g. Myrmecium nigrum, which is an accurate copy of the large black ant (Pachycondyla villosa).

Sometimes it is only the males of a species of spider that mimic ants, as in the case of Ildebaha mutilloides and /. myrmicaeformis, two South American species of the family Argyopidae, in which the females are protected by strong spine-armature. The males are without these protective spines and are exposed to special dangers as they wander in search of the webs of the females. In South Africa too the males of a species of Eresidae (Seothyra) resemble and are found in company with a large ant (Camponotus fuhopilosus) , which is common on the veld. Like the males of Ildebaha, those of Seothyra wander about by day in search of the females which live concealed in burrows. Many other spiders belonging to the Theri- diidae and Linyphiidae also mimic ants; but it is needless to enumer- ate them, the most perfect examples of this phenomenon being found in the families Clubionidae and Salticidae.

Ant-mimicking spiders have been seen now and again

to devour their models. It has therefore been suggested by some and taken for granted by others that the resemblance comes under the category of aggressive mimicry and that the ants are deluded by this resem- blance into regarding the spiders as members of their own species. That the ants do not destroy them is certain; but that they are deceived by the superficial similarity of the spiders to themselves is highly improbable, for these insects are capable of distinguishing a strange ant belonging to the same species if it comes from another colony. Moreover, the above-suggested explanation does not coincide with the explanation of the likeness to ants shown by certain insects such as Myrecophana fallax, the ant and leaf-like Membracid Homopteron and the larvae of the lobster-moth (Stauro- posfagi), which are plant-eaters. It is probable that one explanation — namely, that of protection — covers all cases of ant-mimicry; and this explanation lies in all probability in the immunity from the attacks

of most insectivorous enemies that ants enjoy, and especially from predaceous wasps of the family Pompilidae which annually destroy thousands upon thousands ot spiders to feed their larvae; and since more than one observer has testified to the fear and abhorrence these wasps have of ants, it is needless to look farther for the benefit ant-mimicry is to spiders. These wasps, moreover, also provision their nurseries with' caterpillars, grasshoppers and other insects. Hence it may be inferred that the insects which imitate ants profit in the same way that spiders do from this form of mimicry.

In the above-cited historical instance of mimicry amongst some South American Lepidoptera which formed the foundation of Bates' theory, species of butterflies, belonging to the Ithomiine genus Itura and the Danaine genus Thyridia, both unpalatable forms, resemble each other. This is a very simple case of the possession of the same type of coloration by two or more protected insects inhabiting the same district. The significance of this phenomenon, as already stated, was first

explained by Fritz Miiller; but although the term ” Milllerian mimicry ” has been assigned to this and similar instances, they are not strictly speaking cases of mimicry at all but of warning coloration. Poisonous or noxious animals usually have some special advertising attribute, sometimes the display of con- spicuous coloration, as in the skunk; sometimes the emission of sound as in the rattlesnake; sometimes a combination of the two, as in the common porcupine and the large black scorpions of Africa and India. Such characters have been termed by Professor Poulton ” aposematic.” Neither of the above-mentioned animals is mimicked; but where two or more noxious animals, inhabiting the same district, resemble each other, both being aposematically or warningly coloured, the likeness is said to be ” synaposematic.” Synaposemasy is Milllerian mimicry. Finally, the likeness of an edible species to a warningly coloured inedible one in the same locality is termed ” pseudaposematic,” in allusion to the pretentious- ness or falsity of the warning signal. Pseudaposemasy is Batesian mimicry.

An important phenomenon connected with insect mimicry is the convergence of several species in the same area towards a common type of coloration and shape, exhibited by one or more than one protected form. The resemblance shows various grades of complete- ness; and the convergent mimics may be themselves noxious, or edible and innocuous. In other words the insects entering into the combination may furnish instances of Batesian and of Milllerian mimicry. Very commonly different species of aculeate Hymenop- tera, inhabiting the same district, form the centres of mimetic attrac- tion for insects of various orders, so that a considerable percentage of the insect-fauna can be arranged in groups according to the pattern of the particular model the species have copied. Good illustrations of this law have been discovered by Guy Marshall in Mashonaland. He found on the same day on a bud of vetch, specimens of black ants (Camponotus sericeus and C. cosmicus), black ant-

like Hemipterous insects (Megapetus atratus). and the ant- like Orthopteron (Myrmecophana fallax) (cf. supra). In this little coterie the ants are beyond question the models towards which the bug and the grasshopper have converged in appearance. Since many of the insects of the order Hemiptera are distasteful, the mimi- cry of the bug (Megapetus) is in this case probably Mtillerian or synaposematic; the grasshopper (Myrmecophana), on the other hand, is probably edible and the mimicry is Batesian or pseudaposematic. This is a simple case consisting of a small number of component species. Others are more complex, numerous species being in- volved. In Mashonaland, for instance, a large number of genera and species of Hymenoptera belonging to the Apidae, Eumenidae, Sphegidae, Pompilidae, Scoliidae, Tiphiidae and Mutillidae, resemble each other in having black bodies and dark blue wings. The same style of coloration is found in Coleoptera of the families Cetoniidae and Cantharidae; in Diptera of the families Asilidae, Bombylidae, Tabanidae and Tachinidae ; in Hemiptera of the family Reduviidae and in Lepidoptera of the family Zygaenidae. In this instance the Hymenoptera, of which the coloration is synaposematic, form together a composite model which the other insects have mimicked. Of the latter, the Lepidopteron (Tascia homochroa) is distasteful, as also are the beetles of the family Cantharidae (e.g Lytta moesta). Probably the bugs too (e.g. Harpactor tristis) are protected. The mimicry of these insects therefore is synaposematic ; but some, at all events, of the flies like the Bombylid Exoprosopa umbrosa, probably form pseudaposematic elements in the group. Into another category Hymenoptera enter not as models but as mimics, the models being inedible Malacodermatous beetles mostly belonging to the genus Lycus and characterized by orange coloration set off by a large black patch upon the posterior end of the elytra and a smaller black spot upon the thorax. Towards this Lycoid centre have converged Coleoptera (beetles) of the sub-order Lamellicornia (Copridae), Phytophaga ; Heteromera (Cantharidae) and Longicornia ; Hemiptera of the families Pyrrhocoridae, Lygaeidae and Reduviidae ;

Lepidop- tera of the families Arctiidae and Zygaenidae ; Diptera of the family Asilidae; and lastly Hymenoptera of the families Braconidae, Pom- pilidae, Crabronidae and Eumenidae. With the exception of the Asilid fly and perhaps some of the Longicorn and Phytophagous beetles, which are probably protected Batesian mimics, all the other species constituting the above-mentioned assemblage are, it is believed, Miillerian or synaposematic mimics. In the three cases

tited above, with the exception of the first, the synaposematic mimics are vastly in excess of the pseudaposematic ; this appears to be the general rule elsewhere. Frequently the groups are composed solely of protected species, so far as is at present known ; and some- times solely, in all probability, of unprotected species with exception of course of the model. An example of the latter occurs in Singapore where the vicious red spinning-ant (Oecophylla smaragdina) is mimicked by the larva of a Noctuid moth and by spiders belonging to two distinct families, namely, Saltiicus plataleoides (Salticidae) and Amyciaea forticeps (Thomisidae) , there Deing no reason to suppose that either the moth larva or the spiders are protected forms. Mimetic aggregations of species similar to those mentioned above have been found in other countries; but the instances cited are sufficient to show how widespread are the influences of mimicry and how pro- foundly it has modified the insect fauna of various parts of the world. Bibliography. — H. W. Bates, Trans. Linn. Soc. (Lond., 1862); id. The Naturalist on the Amazons (1879) ; T. Belt, The Naturalist in Nicaragua (2nd ed. 1888) ; F. A. Dixey, Rep. Brit. Assoc. (1894) p. 692 ; id. Tr. Ent. Soc. {London, 1894), p. 249; id., op. cit. (1896); p. 65; id., op. cit. (1897), p. 317-; also Proc. Ent. Soc. (Lond. 1897), pp. xx.- xxxii. and xxxiv.-xlvii. ; F. Finn, Journ. Asiatic Soc. Bengal, lxiv., (1895); lxv. (1896) and lxvi. (1897); E.

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MIMNERMUS of Colophon, Greek elegiac poet, flourished about 630–600 B.C. His life fell in the troubled time when the Ionic cities of Asia Minor were struggling to maintain themselves against the rising power of the Lydian kings. One of the extant

fragments of his poems refers to this struggle, and contrasts the present effeminacy of his countrymen with the bravery of those who had once defeated the Lydian king Gyges. But his most important poems were a set of elegies addressed to a flute- player named Nanno, collected in two books called after her name. Mimnermus was the first to make the elegiac verse the vehicle for love-poetry. He set his own poems to the music of the flute, and the poet Hipponax says that he used the melancholy wpos KpaSwjs, "the fig-branch strain," said to be a peculiar melody, to the accompaniment of which two human purificatory victims were led out of Athens to be sacrificed during the festival of Thargelia (Hesychius, s.v.).

Edition of fragments in T. Bergk, Poetae lyrici Graeci; see also G. Vanzolini, Mimnermo (1883), a study of the poet, with notes and a metrical version of the fragments.

MIMOSA (so named from the movements of the leaves in many species which " mimic " animal sensibility), a genus of the natural order Leguminosae, which gives its name to the large sub-order Mimoseae (characterized by usually small regular flowers with valvate corolla), to which belongs also the nearly allied genus Acacia. They are distributed throughout almost all tropical and subtropical regions, the acacias preponderating in Australia and the true mimosas in America. The former are of considerable importance as sources of timber, gum and tannin, but the latter are of much less economic value, though a few, like the talh (M. ferruginea) of Arabia and Central Africa, are important trees. Most are herbs or undershrubs, but some South American species are tall woody climbers. They are often prickly

Branch and leaves of the sensitive plant (Mimosa pudica), showing the petiole in its erect state, a, and in its depressed state, 6; also the leaflets closed ©, and the leaflets expanded (d); p, pulvinus.

The roots of some Brazilian species are poisonous, and that of M. pudica, has irritating properties.

The mimosas, how- ever, owe their interest and their extensive cultivation, partly to the beauty of their usually bipin- nate foliage, but still more to the remarkable development in some species of the sleep movements manifested to some extent by most of the pinnate Leguminosae, as well as many other (especially seedling) plants. In the so-called ” sensitive plants ” these move- ments not only take place under the influence of light and dark- ness, but can be easily excited by mechanical and other stimuli. When stimulated — say, at the axis of one of the secondary petioles — the leaflets move up- wards on each side until they meet, the movement being propagated centripetally. It may then be communicated to the leaflets of the other secondary petioles, which close (the petioles, too, con- verging), and thence to the main petiole, which sinks rapidly downwards towards the stem, the bending taking place at the pul- vinus (p in figure) or swollen base of the leafstalk. When shaken in any way, the leaves close and droop simultaneously, but if the agitation be continued, they reopen as if they had become accustomed to the shocks. The common sensitive plant of hot- houses is M. pudica, a native of tropical America, but now naturalized in corresponding latitudes of Asia and Africa, but the hardly distinguishable M. sensitiva and others are also cultivated. Species of the closely allied genus Schrankia are known as sensitive-briar in the southern United States.

MIMULUS, in botany, a genus (nat. order Scrophulariaceae), of showy, hardy or half-hardy, herbaceous, rarely shrubby plants, natives of the extra-tropical or mountainous parts of both old and new worlds excepting Europe, but chiefly American. The plants have opposite, undivided leaves, and axillary, generally solitary flowers with a two-lipped, gaping corolla. The herbaceous species thrive best in damp situations; the shrubby species, of which M. glutinosus (formerly called Diplacus) is best known, are adapted for pot culture in the greenhouse. M. luteus, the monkey-flower of gardens, has yellow flowers with two dark marks in the mouth

of the corolla; M. Langsdorfii, an American species, has become naturalized by river-sides in many parts of Britain.

M. moschatus, musk, a native of north-western America, with small, nearly regular, yellow flowers, diffuse hairy stem and hairy scented leaves, is a well known and favourite perennial for pot culture and outside borders.

MINA, FRANCISCO ESPOZ Y (1781-1836) Spanish guerrillero leader and general, was born at Ydozin in Navarre on the 17th of June 1 78 1. His father, Juan Esteban Espoz y Mina, and his mother Maria Teresa Hundain y Ardaiz, belonged to the class of yeomen. Mina remained working on the small family inheri- tance till 1808. When Napoleon endeavoured to seize Spain in that year he enlisted in the regiment of Doyle, and then passed to the guerrilla band commanded by his nephew Xavier Mina. When Xavier was captured by the French on the 21st of March 1810, seven men of the band elected to follow Francisco; and on the 1st of April of the same year the Junta of Aragon gave him the command of the guerrilleros of Navarre. His first act was to arrest and shoot at Estella, one Echevarria, who, under pretence of being a patriotic guerrillero, was in fact a brigand. The national government at Cadiz gave him rank, and by the 7th of September 181 2, he had been promoted to be commander-in- chief in Upper Aragon, and on the left bank of the Ebro. In the interval he claimed that he had fought 143 actions big and little, had been repeatedly wounded with bullet, sword and lance, had taken 13 fortified posts, and 14,000 prisoners, and had never been

surprised by the French. Though some maintain that he was not at his best as a leader in battle, as a strategist he was very successful, and he displayed great organizing capacity. The French authorities were compelled to allow him to levy customs dues on

all goods imported into Spain, except contraband of war, which he would not allow to pass without fighting. The money thus obtained was used to pay his bands a regular salary. He was able to avoid levying excessive contributions on the country and to maintain discipline among his men, whom he had brought to a respectable state of efficiency in 181 2. Mina claimed that he immobilized 26,000 French troops which would but for him have served with Marmont in the Salamanca campaign. In the cam- paign of 1813 and 1814 he served with distinction under the duke of Wellington. After the restoration of Ferdinand he fell into disfavour. On the 25th and 26th of September he attempted to bring about a rising at Pamplona in favour of the Liberal party, but failed, and went into exile. His political opinions were democratic and radical, and as a yeoman he disliked the hidalgos (nobles). The revolution of 1820 brought him back, and he served the Liberal party in Galicia, Leon and Catalonia. In the last district he made the only vigorous resistance to the French intervention in favour of Ferdinand VII. On the ist'of Novem- ber 1825 he was compelled to capitulate, and the French allowed him to escape to England by sea. In 1830 he took part in an un- successful rising against Ferdinand. On the death of the king he was recalled to Spain, and the government of the regent Christina gave him the command against the Carlists in 1835, though they feared his Radicalism. By this time, years, exposure and wounds had undermined his health. He was also opposed to Thomas Zumalacarregui {q.v.), an old officer of his in the War of Independence, and an even greater master of irregular mountain warfare. His health compelled him to resign in April 1835, and his later command in Catalonia was only memorable for the part he took in forcing the regent to grant a constitution in August 1836. He died at Barcelona on the 24th of December 1836. Mina was a brave and honest man, who would have conducted the war against the French in 1810-12 with humanity if they had allowed him, but as they made a practice of shooting those of his men whom they took, he was compelled to retaliate. He finally forced the French

to agree to an exchange of prisoners.

Authorities. — In 1825 Mina published A Short Extract from the Life of General Mina, in Spanish and English, in London. Mention is made of him in all histories of the affairs of Spain during the first third of the 19th century. His full Memoirs were published by his widow at Madrid in 1851-1852. (D. H.)

MINARET (from the Arabic manarat ; manar or minar is Arabic for a lighthouse, a tower on which nor, fire, is lit), a lofty, turret peculiar to Mahommedan architecture. The form is derived from that of the Pharos, the great lighthouse of Alexan- dria, in the top storey of which the Mahommedan conquerors in the 7th century placed a small praying chamber. The light- house form is perpetuated in the minarets which are found attached to all Mahommedan mosques, and probably had considerable influence on the evolution of the Christian church tower (see an exhaustive study in Hermann Thiersch, Pharos Antike, Islam und Occident, 1909). The minaret is always square from the base to the height of the wall of the mosque to which it is attached, and very often octangular above. The upper portion is divided into two or three stages, the wall of the upper storey being slightly set back behind the one below, so as to admit of a narrow balcony, from which the azan, or call to prayer, is chanted by the muaszin {muezzin, moeddin). In order to give greater width to the balcony it is corbelled out with stalactitic vaulting. The balconies are surrounded with stone balustrades, and the upper storeys are richly decorated; the top storey being surmounted with a small bulbous dome. The earliest minaret known is that which was built by the caliph Walid (a.d. 705) in the mosque of Damascus, the next in date being the minaret of the mosque of Tulun, at Cairo (a.d. 879), with an external spiral flight of steps like the observatory towers in Assyrian architecture. This mina- ret as also the example of El Hakim (996), is raised on great square towers. The more remarkable of the other Cairene minarets are those of Imam esh-Shafi (1218), Muristan al Kalaun (1280),

Hassan (1354), Barkuk (a.d. 1382) and Kait Bey (a.d. 1468). Of the same type are the two minarets added to the mosque of Damascus in the 1 5th century. In Persia the minarets are gener- ally circular, with a single balcony at the top, corbelled out and covered over. In India, at Ghazni, there are no balconies, and the upper part of the tower tapers upwards; the same is notice- able at Delhi, where the minaret of Kutab is divided into six storeys with balconies at each level. In the well-known tomb of the Taj Mahal the four minarets are all built in white marble, in three storeys with balconies to each storey, and surmounted by open lanterns. The minarets of Constantinople are very lofty and wire-drawn, but contrast well with the domes of the mosques, which are of slight elevation as compared with those at Cairo.

MINAS [MINOi'DES] (c. 1 790-1 860), Greek scholar, was a native of Macedonia. During the Greek War of Independence he migrated to Paris, where he tried to enlist the sympathies of Europe on behalf of his countrymen and to promote the study of ancient and modern Greek. But his chief claim to recognition consists in his discovery of two important MSS. (amongst others) in the monastery of Mt Athos during his exploration of the libraries of Turkey and Asia, at the instance of M. Villemain, minister of public instruction in France. One of these contained the last part of a treatise on the Refutation of all Heresies, now generally admitted to be the work of Hippolytus (q.v.), the other the greater portion of the Fables of Babrius.

MINAS GERAES (i.e. " general mines "), popularly Minas, an inland state of Brazil, bounded N. by Goyaz and Bahia, E. by Bahia, Espirito Santo and Rio de Janeiro, S. by Rio de Janeiro and Sao Paulo, and W. by Sao Paulo, Matto Grosso and Goyaz. It is very irregular in outline and covers an area of 221,861 sq. m. upon the great Brazilian plateau. Among the Brazilian states it is fifth in size and first in population — 3,184,099 in 1890, and 3,594,471 m 1900.

The surface of Minas Geraes is broken by mountain ranges and deeply eroded rivercourses, the latter forming fertile valleys shut in by partly barren uplands, or campos. The reckless destruc- tion of forests along the watercourses also adds to the barren aspect of the country. The principal mountain ranges are the Serra da Mantiqueira on its southern frontier and its N. exten- sion, the S. do Espinhaco, which runs parallel to the Serra do Mar, or coast-range, and separates the inland or campo region from a lower forested zone between the two ranges. Most of the wooded district south of the Mantiqueira belongs to the states of Sao Paulo and Rio de Janeiro, but east of the Espinhaco it belongs to Minas Geraes and extends eastward to the Serra das Aymores, on the frontier of Espirito Santo. This zone has an abundant rainfall, dense forests and a fertile soil. It is drained by the Doce, Mucury, Jequitinhonha and Pardo, which have their sources on the eastern slopes of the Espinhaco and cut their way through the Aymores to the sea. The tributaries of the Rio Doce cover the slopes of the Serra do Espinhaco for a distance north and south of about 200 m. The southern part of this region is well populated, and is covered with coffee and sugar plantations. On the western frontier a northern extension of the great central chain of Goyaz forms the water-parting between the drainage basins of the Sao Francisco and Tocantins, and is known at different points as the Serra do Paranan, Serra de Sao Domingos and Serra das Divisoes. South-east of this chain, between the headwaters of the Parana and Sao Francisco, are the Serra da Canastraand Serra da Matta da Corde, an irregular chain of moderate elevation running north and south. The highest elevations in the state, so far as known, are Itatiaya (8898 ft.) in the Serra da Mantiqueira, and Caraca (6414 ft.), near Ouro Preto, in the Serra do Espinhaco. The hydrography of the campo region of Minas Geraes is extremely complicated. The Mantiqueira-Espinhaco chain shuts out the streams flowing directly east to the Atlantic, and the boundary ranges on the west shut out the streams that flow into the Tocantins, though their sources

are on the actual threshold of the state. Between these two mountain chains the head streams of the Parana and Sao Francisco are intermingled — the one flowing inland and

southward to the great La Plata estuary, the other northward and eastward across the arid highlands of Brazil to the Atlantic coast in io° 30′ S. lat. Less than 100 m. from the city of Rio de Janeiro and about 60 m. from the coast is the source of the Rio Grande, the larger of the two rivers that form the Parana. It rises near the peak of Itatiaya, on the northern slopes of the Mantiqueira, and flows north-west and west across the Minas plateau, receiving several large tributaries from the south. North and parallel with its course is a low watershed, which separates its drainage basin both from that of the Sao Francisco and from that of the Parnahyba, the northern confluent of the Parana. The latter rises on the western slopes of the Serra da Matta da Corde, and one of its northern tributaries has its source in a ” knot ” of the Serra dos Pyreneos, from which streams flow eastward to the Sao Francisco and northward to the Tocantins. The central and greater part of the state, however, is included in the drainage basin of the upper Sao Francisco. Its source is in the Serra da Canastra, and its general course across the state is north by east, during which it receives the Paracatu, Urucuia, Pardo and Carinhanha from the west and the Verde Grande and das Velhas from the east. Part of these rivers are navigable for small steamers, and the Sao Francisco must some day be of great importance in the development of Central Brazil. All these rivers of. the Brazilian plateau are interrupted by falls and rapids. The climate of Minas Geraes is characterized by high sun tempera- tures and cool nights, the latter often dropping below the freezing point on the higher campos. The mean annual temperature is about 85° in the Sao Francisco valley, 77° on the campos of the S.E., and 70 on the campos of the W.

The year is divided into two seasons — wet and dry — the former lasting from November to May. This division is not so clearly marked in the south, especially in the ” matta ” (forest) regions, where the rainfall ranges from 59 to 65 in. There is much malaria in the wooded districts of the east and on the higher campos, where the daily extremes of temperature are great, lung and bronchial diseases are common. Some of the high plains, however, as at Barbacena, serve as health resorts for the coast districts.

Minas Geraes is a mining state, though the mining industry has lost much of its importance through the decline in the output of gold and diamonds. Gold is widely diffused, and abandoned ” washings ” all over the state show how general the industry was at one time. There were in 1908 five deep mines worked by English companies and one by a French company. One of these, the Morro Velho mine, belonging to an English company, is not only the deepest gold-mine in existence” (over 2000 ft.), but it has been worked since 1725, and since 1835 by its present owners. Silver is not mined by itself, but is found in combination with gold. In 1008 a rich goldfield was discovered in the northern part of the state, 5 m. from Montes Claros, in the valley of the Verde Grande River, and attracted large numbers of miners. There are many rich deposits of iron ores in the state, but they only produce a small quantity of charcoal iron for local con- sumption. Manganese ore is mined for export, and bismuth is reported to have been discovered. Minas Geraes is most widely known for its diamonds, which are found in widely separated parts of the state. The largest and most productive field is that of Diamantina (q.v.) on the head-waters of the Jequitinhonha River, where diamonds were discovered about 1725, and where the celebrated ” diamond reservation ” — an oval-shaped territory 8 leagues wide by 16 leagues long (Mawe), with Tejuco, now Diamantina, very nearly in the centre — was established in 1 730. The mines became crown property, gold-mining was forbidden, and no one was permitted to enter the reservation without a

licence. The state monopoly was abolished in 1832, and mining has since been carried on by private enterprise. John Mawe estimates that the annual product was 1000 oz. during the first twenty years, and Castelnau estimates the value of the total output down to 1849 at 300,000,000 fr. No estimate can be made of the contraband, which must have been large. A great decline in the output occurred during the last half of the 19th century; but a new field was discovered in 1908 at Abbadia dos Dourados, in the western part of the state.

Other valuable stones, the topaz, chrysolite, aquamarine amethyst and tourmaline are found.

Agriculture and grazing have become the main dependence of the population — the former in the lower, forested region of the south-east, where coffee and sugar-cane are the principal pro- ducts, and the latter on the higher campos and river valleys, and on the mountain slopes, where large herds of cattle are to be found, and milk, butter and cheese are produced. The shipping of fresh milk to Rio de Janeiro and butter-making are compara- tively new industries. The river valleys of the campo region are also cultivated to some extent. Among the general products are Indian corn, tobacco, mandioca, beans, pork and cotton. Wheat has been produced in some localities, but not on a paying basis, and experiments have also been made with tea. There is a large variety of fruits, and the cultivation of grapes for wine- making is developing into a profitable industry. Railway com- munication with Minas Geraes includes the following lines: the Central do Brazil (formerly known as the Dom Pedro II.), which starts from Rio de Janeiro and penetrates nearly to Pirapora (its objective point), at the head of navigation of the Sao Francisco River, with branches into neighbouring districts; the Leopoldina, from Rio de Janeiro into the forested region of eastern Minas; the Minas and Rio, from Cruzeiro, on the Sao Paulo branch of the Central do Brazil, into southern Minas; the Mogyana, from Campinas, Sao Paulo, and runs to Uberaba in western Minas, and is intended to cross into Goyas;

and the Bahia & Minas, from the port of Caravellas, in southern Bahia, which runs a short distance into Minas Geraes, and is planned to extend to Philadelphia and beyond. Another line from the port of Victoria, Espirito Santo, northward to Diamantina, Minas Geraes, was under construction in 1908. River transport has some local value on the upper Sao Francisco and its larger tributaries, and this will be greatly increased when the Central do Brazil railway reaches the head of navigation on that river.

The population of Minas Geraes is chiefly of Portuguese origin, which has been constantly strengthened by immigrants from the mother country. A considerable admixture from other nationalities has resulted from the influx of mining adventurers, and some German colonies have been established in the state. The negro population is large, and there is a still larger contingent of mixed races. The capital is Bello Horizonte (q.v.) , or Cidade de Minas; other important cities and towns are: the former capital, Ouro Preto, Barbacena, Diamantina, Baependy (pop. 22,817 m 1890), on the head-waters of the Rio Verde, the centre of a rich tobacco-producing district; Curvello (8071), north of Sahara in the Rio das Velhas Valley, the centre of a cotton- growing district and cotton manufactures; Entre Rios (7681), in the coffee district of south-east Minas; Januaria (5888), a river port of the Sao Francisco in northern Minas; Juiz de Fora; Marianna (4751), an episcopal town east of Ouro Preto, Mar de Hespanha (18,712), the centre of a productive and populous agricultural municipality of south-east Minas; Paracatu (21,418), an important commercial centre of western Minas near the Goyaz frontier; Queluz (12,600), on the Central do Brazil railway; Congonhas do Campo (10,902), in the municipality of Queluz, celebrated for its miracle-working image, its great church and chapels, and the pilgrimages to its shrine; Sahara (4959), a rail- way junction on the Central do Brazil, and port on the Rio das Velhas; Congonhas de Sahara (14,066), in the municipality of Sahara, where the celebrated Morro

Velho gold-mine is situated; Sao Joao d' El-Rei (15,820) an important commercial mining and pastoral centre, near the Rio das Mortes, connected with the Central do Brazil railway by a branch called the Oeste de Minas; and Uberaba (12,231), a commercial town of the western campos of Minas, connected with Sao Paulo by the Mogyana and Sao Paulo railways.

Minas Geraes was first explored by Fernando Dias Paes Leme between 1664 and 1677, though he was not the first European to penetrate it. The discovery of gold in 1692-1695 by bands of adventurers from the Sao Paulo settlements, led to every occupation and profession being abandoned in the mad rush for the new mines. Minas Geraes at first formed part of the

capitania of Sao Paulo, but in 1720 it became a separate govern- ment and was brought more directly under the Portuguese crown. The arbitrary restrictions imposed upon the colonists aroused dissatisfaction among them and eventually led to conspiracy in 1789, inspired by a fear that the Portuguese government was about to enforce the collection of its "fifths" of the mining output, which had largely fallen into arrears. Among the conspirators was one Jose Alves Maciel, who had just returned from France where he had met Thomas Jefferson and had become infected with French revolutionary ideas. A number of residents became involved, among them the poet Thomaz Antonio Gonzaga. Reckless talk in public places led to the arrest of the conspirators. Only one was executed, a poor, uneducated subaltern militia officer Joaquim Jose da Silva Xavier, nicknamed O Tiradentes (the Tooth-puller), the others being imprisoned or banished. Tiradentes has since been glorified as the pro-martyr of Brazilian independence. In 1822 Minas became a province of the empire created by Dom Pedro I., though a revolutionary outbreak had occurred in Ouro Preto the year before. In 1842 a long series of quarrels in Rio de Janeiro culminated in a

revolution in Minas Geraes and Sao Paulo, which was suppressed at Santa Luzia, Minas Geraes, on the 20th of August of that year. The abolition of slavery in 1888 caused much discontent among the planters and in the following year Minas Geraes promptly adhered to the declaration of the republic in Rio de Janeiro.

MINBAR, or Mimbar, a term in Mahommedan architecture for the pulpit in a mosque from which the Friday or Mahommedan Sabbath sermon is given (see Pulpit).

MINBU, a district and division of Upper Burma. The district has an area of 3299 sq. m., and a population (1901) of 233,377, showing an increase of 8% in the decade and a density of 71 inhabitants to the sq. m. The district may be said to consist of low plain-land towards the Irrawaddy, and of undulating country inland rising higher and higher westwards towards the Arakan hills. Between the plain and the Arakan Yoma range is a distinct line of hills running north and south, and usually called the Nwa-Madaung hills. The submontane valleys are largely cultivated, but are deadly except to those born in them. The chief streams besides the Irrawaddy are the Mon, the Maw, and the Salin, which are largely used for irrigation. At Minbu town the Irrawaddy is 3 miles wide, with many islands and sand- banks. There are considerable fisheries along the Irrawaddy and on the Paunglin lake, which is a lagoon fed from the Irra- waddy. The rights are sold yearly by public auction, and realize an average of £1000. Oil has been discovered near the mud volcanoes of Minbu, but it seems to lie at too great a depth to be profitably worked.

There is a large area of reserved forest in the district. The chief crops raised are rice, gram, millet, beans, peas, sesamum and tobacco. The betel-vine is largely cultivated along the Mon River. The district, which was in a chronically disturbed state before the annexation, was not reduced till two years afterwards, many officers losing their lives, among them Phayre, the first deputy-commissioner. The annual rainfall varies greatly over the

district. It is very considerable on and under the Arakan Yomas, and very slight towards the Irrawaddy. The thermo- meter rises to over ioo° in the hot months, and the mean of minimum in December is about 49 . Minbu, the district head- quarters, stands on the Irrawaddy. It had a population of 5780 in 1901. The river steamers in the dry season can come no nearer than two miles to the south of the town.

The division includes the districts of Thayetmyo, Pakokku, Minbu and Magwe. It has a total area of 17,172 sq. m. and a population (1901), of 1,076,280, showing an increase of 8% in the decade and giving a density of 63 inhabitants to the square mile. It bestrides the Irrawaddy. (J. G. Sc.)

MINCHINHAMPTON, a town in the Stroud parliamentary division of Gloucestershire, England, 4 m. S.E. of Stroud. Pop. (1901), 3737. It lies high on a slope of the Cotswold Hills; Minchinhampton Common being a fine openupland. The church of Holy Trinity, largely reconstructed, contains many brasses

and memorials. The manufacture of woollen cloth is the long- established staple of Minchinhampton. Prehistoric remains have been discovered on the common, and earthworks are also seen; while the name of Woeful Dane Bottom, a neighbouring valley, perhaps indicates the scene of a defeat of the Danes (c. 918).

MINDEN, a town of Germany, in the Prussian province of Westphalia, 44 m. by rail to the W.S.W. of Hanover, on the left bank of the Weser, which is spanned by two bridges. Pop. (1905), 25,428. The older parts of the town retain their narrow and crooked streets. The cathedral tower dating from the nth century, illustrates the first step in the growth of the Gothic spire in Germany. The nave was erected at the end of the 13th century, and the choir in 1377–1379. Among the chief edifices are the old church of St Martin; the town hall, with a Gothic facade; the law courts and the government offices, constructed, like many of the other buildings, of a peculiar veined brown sandstone

found in the district. The town has a statue of Frederick William I., the great elector of Brandenburg. Minden contains a gymnasium and several hospitals, besides other charitable institutions. Its industries include linen and cotton weaving, dyeing, calico printing, brewing, ship-building and the manufacture of tobacco, glass, soap, chocolate, leather, lamps, chicory and chemicals. There is also some activity in the building of small craft.

Minden (Mindun, Mindo), apparently a trading place of some importance in the time of Charlemagne, was made the seat of a bishop by that monarch, and subsequently became a flourishing member of the Hanseatic League. In the 13th century it was surrounded with walls. Punished by military occupation and a fine for its reception of the Reformation, Minden underwent similar trials in the Thirty Years' War. In 1648 the bishopric was converted into a secular principality under the elector of Brandenburg. From 1807 to 1814 Minden was included in the kingdom of Westphalia, and in the latter year it passed to Prussia. In 1816 the fortifications, which had been razed by Frederick the Great after the Seven Years' War, were restored and strengthened, and as a fortress of the second rank it remained the chief military place of Westphalia down to 1873, when the works were finally demolished. About 3 m. to the south of Minden is the so-called " Porta Westfalica," a narrow defile by which the Weser quits the mountains. The bishopric of Minden embraced an area of about 400 sq. m. and had about 70,000 inhabitants.

The battle of Minden was fought on the 1st of August 1759 between the Anglo-Allied army commanded by duke Ferdinand of Brunswick and the French under Marshal Coutades, the latter being defeated. The most brilliant episode of the battle was the entire defeat of the French cavalry by the British infantry (with whom there were some Hanoverian troops) , but Minden, though it is one of the brightest days in the history of the British army, has its dark side also, for the British cavalry commander Lord George Sackville (see Sackville, Viscount) refused to obey

the order to advance, several times sent by Duke Feidinand, and thereby robbed the victory of the decisive results which were to be expected from the success of the infantry. For an account of the battle and of the campaign of which it is the centre, see Seven Years' War.

See Stoy, Kurzer Abriss der Geschichte Mindens (Minden, 1879); Bolische, Skizzen cms Mindens Vergangenheit (Minden, 1897); Holscher, Beschreibung des vormaligen Bistumes Minden (Munster,

1877).

MINEHEAD, a market town and seaside resort in the Welling- ton parliamentary division of Somersetshire, England, 188 m. W. by S. of London by the Great Western railway. Pop. of urban district (1901), 2511. The town has three parts: the Upper, built on the sides of a lofty foreland known as North Hill; the Lower; and the Quay Town, with many ancient houses, stretching for about a mile beside the haroour. It is much visited for the sake of its mild climate, the grand cliffs, moors and hills of the neighbourhood, and the beach, admirably suited for bathing. St Michael's, the parish church, has a striking Perpen- dicular tower, an arch of carved oak dividing its nave and

chancel, a magnificent rood-loft, and a 13th-century monument doubtfully described as the tomb of Bracton, the famous lawyer, whose birthplace, according to local tradition, was Bratton Court in the vicinity. Coaches for Porlock and Lynton start from the town.

There is no evidence of the existence of Minehead (Mannheve, Manehafd, Mynneheved) in Roman or Saxon times. The town owed its origin and growth to its position on the shores of the Bristol Channel, and its good harbour developed an oversea trade with

Bristol, South Wales and the Irish ports. The De Mohun family were overlords of the town from 1086 to the 14th century, when they were followed by the Luttrells, who are the present owners. It is possible that Minehead had a corporate existence during the 1 5th century, as certain documents executed by the portreeve and burgesses at that date are preserved, but no record of the grant of a charter has been found. A charter of incorporation given by Elizabeth in 1558 vested the government in a portreeve, a steward and twelve burgesses, the continuance of the corporation being subject to the port and harbour being kept in repair. This condition being unfulfilled, the charter lapsed in the reign of James I., and an attempt to obtain its renewal in the 18th century failed. The corporation was replaced by two constables chosen annually in the court leet of the manor until 1894, when an urban district council was appointed. The borough returned two members to parliament from 1558 until disfranchised by the Reform Act of 1832. A weekly market on Tuesdays and a fair (Sept. 29 to Oct. 2) were held by the lord of the manor from the 15th century, but the date of the grant has not been found. In 1465 a second annual fair on the 1st of May was granted by Edward IV., which is still held on the Wednesday in Whitsun week. The other fair has been dis- continued, and the market day has been changed to Wednesday. During the 16th, 17th and 18th centuries Minehead had a con- siderable coastwise trade in wool, grain and wine, but began to decline owing to the migration of the woollen industry to the north of England, and to the decay of the herring fishery. A renewal of prosperity began when it acquired a reputation as a watering-place.

See Victoria County History: Somerset; F. Handcock, Parish and Borough of Minehead (1903).

MINEO, a town of the province of Catania, Sicily, 34 m. S.W. of Catania by rail. Pop. (1901), 9828. It occupies the site of the ancient Menaenum, founded by Ducetius in 459 B.C. There is some doubt as to whether this town was also the birthplace of Ducetius, owing to confusions in nomenclature (see

E. A. Free- man, History of Sicily, ii. 361). Remains of ‘ ancient fortifica- tions still exist, though it seems uncertain whether they are of Greek or of Byzantine origin (Notizie degli Scam, 1899, p. 70). Four miles to the north is the Lacus Palicorum, a small lake in a crater, which still sends up carbonic acid gas. By ijt was the temple of the Palici, twin Sicel gods, the most holy place in Sicily, where an oath taken was especially binding, and an inviolable asylum for fugitive slaves. There is now nothing to suggest twin deities; in ancient times there were probably two craters, whereas now there is only one. It was here that Ducetius, a few years later, founded a new seat for his power, the city of Palica.

MINERAL DEPOSITS. The subject of mining (q.v.) can only be properly understood after the general features of mineral deposits have been elucidated. In this article deposits of all kinds of useful minerals are included, whether they are metalli- ferous or earthy. In general practice it is customary to treat the former under the name ” ore- deposits ” and the latter as the ” non-metallics.” This is warranted because in a large degree different geological problems are presented and different methods of mining are pursued. Nevertheless there are other important similar or common features and they may be classed together without great disadvantage.

The word ” ore ” is used in several meanings, each of which depends for its special significance upon the connexion. In purely scientific applications ” ore ” implies simply a metalliferous mineral, and in this sense it appears in works on mineralogy and petrology. In former years and in

Ore.

connexion with practical mining an ore was defined as a com- pound of metal or of metals with one or more non-metallic elements, called mineralizers, of which oxygen and sulphur were the chief. The ore must, in addition, be sufficiently rich to be mined

at a profit. Native metals not being compounds were not considered ores. The product of the copper mines on Keweenaw Point, Lake Superior, was, and to a great extent is still, called copper rock rather than copper ore, and native gold in quartz is often described as gold quartz rather than gold ore, but these restrictions are gradually disappearing. An ore may therefore be defined as a metalliferous mineral or aggregate of metalliferous minerals mingled with a greater or less amount of barren materials called the ” gangue,” and yet rich enough to be mined at a profit. When not proved to be sufficiently rich to be remunerative, the aggre- gate is called ” mineral.” The ” mineral ” of to-day may be changed by the advent of a railway or the rise in the price of metal into the ” ore ” of to- morrow. The question has re- peatedly appeared in litigation involving contracts or property rights.

Since the greater number of the ores are believed to have been precipitated from aqueous solution, or to have been otherwise formed through the agency of water, the term ” ore-deposit ” has resulted; and inasmuch as nearly all the other useful minerals owe their origin to the. same agent, the term ” mineral deposit ” is equally well justified. A few, however, have been produced in a different way, such as certain iron ores of igneous origin; certain igneous rocks used for building stone, as in the case of granite; and the accumulations of vegetable material in coal beds. These latter, the igneous masses and the vegetable accumula- tions, being placed in two divisions by’ themselves, we may group the larger number into two main classes, depending on their precipitation from solution or from suspension. In the case of solution we will further subdivide on the place, and there- fore in large part on the cause, of precipitation, since these are the questions chiefly involved in actual development.

Especially in connexion with ore-deposits widening experience has modified the older conceptions of relative values in the several types. In the early days of geology, Cornwall and Saxony were the two regions where the most active and influential

students of ore-deposits were trained and where the principal books relat- ing to mining originated. The pronounced and characteristic fissure veins of England and Germany became the standards to which the phenomena met elsewhere were referred, and by means of which they were described. This particular form, the fissure vein along a fault, assumed a predominating importance, both in the thought and in the literature of the day. Widening experience, however, especially in the Cordilleran region of North America, in the Andes of South America, in Australia and in South Africa, has brought other types into equally great and deserved prominence. Comprehensive treatment to-day there- fore departs somewhat from earlier standards.

As far as analyses and estimates permit, the common useful metals occur in the earth's crust in approximately the following percentages : — occurrence.

1. Aluminium 8-13

2. Iron . 4-71

3. Manganese 0-07

4. Nickel . o-oi

5. Cobalt . 0-0005

6. Tin . . o-ooox— 00c

By the letter * is meant some undetermined digit in the corre- sponding place of decimals. Apart from aluminium, iron, manganese and nickel, the figures show how small is the con- tribution made by even the commoner metals to that portion of the mass of the globe which is open to observation and investigation.

As compared with the earth's crust at large certain of the metals are known to be locally present in favourable, usually igneous, rocks in richer amounts, according to the following determinations which have been made upon large samples of carefully

selected materials. Copper, 0-009%; lead.

7-

Copper

o-ooooa;

8.

Lead

O-OOOOiC

9-

Zinc .

o-ooooa;

10.

Silver

o- 000000*

11.

Gold .

o-oooooooc c

12.

Platinum

o-oooooooox

MINERAL DEPOSITS

505

0-0011-0-008; zinc, 0-0048-0-009; silver,, o- 000c 7-0-0001 6; gold, 0-00002-0-00004. I ron and aluminium .seldom fail, and vary from 1 to 2% as a minimum, up to 25% as a maximum.

In order that the several metals may constitute

ores, their percentages must be the following — the percentages of each vary with favourable or unfavourable conditions at the mine, and can therefore be expressed only in a general way; ores favourable to milling and concentration may go below these limits, and the mingling of two metals of which one facilitates the extraction of the other may also reduce the percentages: —

Aluminium . 30 Nickel . . 2-5

Copper . . 2-10 Platinum . 0-00005

Gold . . . 0-003—00016 Silver . . 0-03-0-16

Iron . . . 35-65 Tin . . . 1-5-3

Lead. . . 2-25 Zinc. . . 5-25

Manganese . 40-50

Cobalt is a by-product in the metallurgy of nickel and is usually in much inferior amount to the latter.

When we compare the first and second tabulations with the third it is at once apparent that with the possible although only occasional exception of iron the production of an ore-body from the normal rocks which constitute the outer mass of the earth requires the local concentration of each of the metals by one or several geological processes, and to a degree that is only occasion- ally developed in the ordinary course of nature. It is, therefore, an instance of somewhat exceptionally good fortune when one is discovered, and it is only the part of ordinary prudence to develop and utilize it as one would treat a resource which is limited and subject to exhaustion.

The minerals which constitute ore-bodies are divided into two Classes of great classes: the ores proper, which contain the Mineral. metals; and the barren minerals or gangue, which reduce the yield.

The ores are generally and naturally subdivided into

two groups: first, the sulphides and related compounds containing arsenic, antimony, tellurium and selenium; and, second, the oxidized compounds embracing oxides, carbonates, sulphates, silicates, phosphates, arsenates, chromates, &c. With the oxides are placed, because of related geological occurrence, a few rare compounds with chlorine, bromine and iodine into which silver more than any other metal enters, and to the same group we may add a few metals which occur in the native state. Iron, manga- nese, aluminium and tin differ from the rest of the metals in their original occurrence in the oxidized form, whereas the others with the exception of gold, platinum, and possibly copper, in their first precipitation in ore-bodies are in the form of sulphides or related compounds. Only by subsequent changes, characteristic of the upper parts of the deposits, do they pass by oxidation into the minerals of the second group.

With regard to the nature and source of the water which serves to gather up the widely disseminated metals and concentrate them in ore-bodies two contrasted views are now current, not necessarily antagonistic but applied in different degrees by different observers. The older view attributes the water primarily to the lainfall, and therefore it is called meteoric water. After falling upon the surface the meteoric water divides into three parts. The first, and smallest, evaporates; the second, the largest portion, joins the surface drainage and is called the run-off: while the third, intermediate in amount, sinks into the ground and mingles with the ground-waters. The ground-waters rise in springs, usually fed from no great depth, and themselves pass into the surface drainage after a small subterranean journey. While as a rule the ground-water level is fairly definite, yet it sometimes displays even in the same mining district great irregularity.

The section of active circulation and work of the descending meteoric waters between the surface and the ground-water level was called by Franz Posepny (1836-1895) the vadose or shallow region (" Genesis of Ore-deposits," Trans. Amer. Inst. Min. Eng.,

xxiii., xxiv., 1893; reprinted as a book, 2nd ed., 1902). It has been long recognized by miners as the home of the oxidized ores, and the, place of the work of the descending waters. The

deep-waters are relatively motionless and their movements as far as visible are comparatively slow. But the really important feature of the ground-water as regards the filling of veins is the depth to which it extends. This remained a somewhat indefinite matter until L. M. Hoskins showed mathematically that cavities in the firmest rocks became impossibilities at about 10,000 metres. Down to some such limiting depth as an extreme the ground- water was believed by many to descend; to migrate laterally; to experience the normal increase of temperature with depth; the effect of pressure; the increased efficiency as a solvent peculiar to the conditions; and finally with a burden of dissolved gangue and ore to rise again, urged on by the ” head ” of the descending column. In its ascent it was supposed to fill the veins. Mining experience has, however, indicated that the known ground-waters are comparatively shallow and seldom extend lower than 500-600 metres. It is conceivable that during faulting and the formation of great dislocations this upper reservoir might be tapped into greater depths and set in limited circulations through deeper-seated rocks. But so far as these objections have weight they have greatly restricted the vertical range of the meteoric ground-waters as they were formerly believed to exist.

In contrast with the meteoric waters outlined above, other waters are believed by many geologists to be given off by the deep-seated intrusive rocks, and are generally called magmatic. We are led to this conclusion by observing the vast quantities of steam and minor associated vapours which are emitted by vol- canoes; by the difficulty of accounting in any other way for the amount and composition of certain hot springs; and by the marked and characteristic association of almost all ore-deposits in the form of veins, with eruptive rocks. That igneous masses have been connected with the formation of veins is

further brought out by the following general consideration, which has hitherto received too little attention. Aside from pegmatites, veins rich enough to be mined and even large veins of the barren gangue-minerals are exceptional phenomena when we compare the regions containing them with the vast areas of the earth which have been carefully searched for them and which have failed to reveal them. As components of the earth's crust the useful metals except iron and aluminium are extremely rare. Some sharply localized, exceptional, and briefly operative cause must have brought the veins into being. The universal circulation of the ground-water of meteoric origin fails to meet this test, since if it is effective we ought at least to find veins of quartz and calcite fairly universal in older rocks. In North America, moreover, by far the greater number of veins which have been studied date from the Mesozoic and Tertiary times. The ore deposits of older date are chiefly of iron and man- ganese and can be satisfactorily explained in many cases by the reactions of the vadose region, or by crystallization from molten masses.

In summary it may be stated that the meteoric waters are of great importance and of unquestioned efficiency in the shallow vadose region, or, as named by C. R. van Hise, " the zone of weathering." In it the disintegration of rocks exposes them to the searching action of solutions, and the portions of ore-bodies already deposited undergo great modifications. The deeper and far more immovable ground- water probably extends to but moderate depth and is chiefly affected as regards movement by the head of waters entering heights of land and by local intrusions of igneous rocks. It is very doubtful if the normal increase of temperature with depth produces much effect. The meteoric waters are of altogether predominant importance in all surface concentrations of a mechanical character. The magmatic waters, on the other hand, seem to be of paramount importance and of great efficiency in producing the deposits of ores in the contact zones next eruptives, and in the formation of veins which

are reasonably to be attributed to uprising heated waters in regions of expiring vulcanism. Tbey start with their burden of dissolved metals and minerals under great heat and pressure, amid conditions favouring solution, and migrate to the upper world into cooling and greatly contrasted conditions which favour precipitation. Undoubtedly they are responsible for many low-grade deposits

which have later been enriched by the action of descending meteoric waters. They are more copiously yielded, so far as we may judge, by acidic magmas than by basic ones.

The natural waterways are furnished by the cavities in rocks. They vary in size from very minute pores, where movement is slow because of friction, but where solution takes place, through others of all dimensions up to great fault-zones. The smallest cavities are the natural pores of minerals; cleavage cracks; the voids along the contacts of different minerals; cracks from crush- ing during dislocation; cellular lavas; volcanic necks; voids among the grains, pebbles, or boulders of fragmental rocks; joints; caves, and faults. So far as waters have deposited ores and yielded ore-bodies by subterranean circulations the latter are guided by some such controlling influence as these in all cases, and they will be selected as the governing principle in a large part of the scheme of classification. The types will be reviewed in the following order: —

I. — Of Igneous Origin.

A. Eruptive masses of non-metalliferous rock.

B. Basic segregations from fused and cooling magmas.

C. Deposits produced in contact metamorphism, most commonly

by the action of intrusive masses on limestones.

D. Pegmatites.

II. — Precipitated from Solution.

A. Surface deposits.

B. Impregnations in naturally open-textured rocks.

C. Impregnations and replacements of naturally soluble rocks.

D. Deposits along broken anticlinal summits and in synclinal

troughs.

E. Deposits in shear zones.

F. Deposits in faults.

G. Deposits in volcanic necks.

III. — Deposited from Suspension.

A. Placers.

B. Residual deposits.

IV. — Carbonaceous Deposits from Vegetation.

I. Of Igneous Origin. — A. Eruptive Masses of Non-metalliferous Rock. — Among the non-metallic objects of mining and quarrying which are of igneous nature, building stone is the chief. Granites, syenites, and other light-coloured rocks are the most important. These rocks occur as intrusive masses called bosses when of limited extent and diameter, and bathyliths when of vast, irregular area. The main point of importaace is the jointing and cleavage, which should in each case yield blocks as nearly rectangular as possible so as to save tool treatment. Dark, basic igneous rocks in dikes, sills and surface flows are employed for macadam, and are often of excellent quality for this purpose.

B. Basic Segregations from Fused and Cooling Magmas. — A few ore-bodies, of which the best-known involve iron, are believed to result directly in the igneous processes by which molten rock cools and crystallizes. Thus magnetite, one of the common iron ores, is a widely distributed component in the eruptive rocks, rarely if ever failing in any variety. It is one of the first minerals to crystallize, and it possesses a much higher specific gravity than the other con- stituents. There is reason, therefore, to believe that, forming in some molten magmas in relatively large quantity, it sinks to or toward the bottom of the mass until the latter is at least greatly enriched with it, if not actually changed to iron ore. If the molten rock, after passing through a stage of partial crystallization, moves toward the surface of the earth, the body of ore may occupy almost any position in it other than the bottom. The flowing of the magma in original movements or from pressure sustained in subsequent metamorphic processes, or both, may give the ore the lenticular shape which is quite characteristic of magnetite bodies the world over. Almost all iron ores of recognized eruptive origin contain titanium oxide in amounts from a few units to over 40%. They are most frequently found in dark basic rocks. These ores are not at present of much commercial value because of the difficulties of treating titaniferous varieties in the modern blast furnace practice, but there is little doubt that in the near future they will be extensively mined.

Non-titaniferous magnetites, which often form lenses in gneissoid rocks of more acidic character than those with which the titaniferous are associated, are likewise believed by some observers to be of igneous origin, but there are equally positive believers in sedimentary deposition followed by metamorphism.

Besides magnetite, chromite is a characteristically igneous mineral and is always found in the richly magnesian rocks. Whether the relatively large masses which appear in serpentine are direct crystal- lizations from fusion, or whether they have

segregated from a finely disseminated condition during the change of the original eruptive to serpentine, is a matter of dispute, but the general trend of later opinion is toward an original igneous origin. Although not strictly

an ore, corundum is another mineral which is the direct product of igneous action.

A form of ore-body which marks a connecting and transitional member between those just treated and those of the next group is furnished by the sulphides of iron, nickel and copper which are found in the outer borders of basic igneous intrusions. Observers differ somewhat as to the relative importance to be attributed to reactions purely of the nature of crystallization from fusion or those brought about by the agency of gases or other highly heated solvents in the cooling stages. The most important example is afforded by the mingled ores of nickel and copper which are developed in their largest form in the region of Sudbury, Ontario, Canada, and are now the principal source of nickel for the world. 1 The ores are chalcopyrite and pyrrhotite, the latter containing throughout its mass at Sudbury the mineral pentlandite, a rich nickel-iron sulphide and the real source of the nickel. With the base metal there are also found minute traces of the metals of the platinum group. Wherever these ore-bodies have been observed they invariably occur in the borders of intrusive masses. The sulphides constitute an integral part of the rocky_ mass, which shows almost no signs of alteration or vein production in the ordinary sense. Only some slight rearrange- ments have subsequently taken place through the agency of water, but all this is a small factor in the total.

C. Ore-Bodies produced by Contact Metamorphism. — Great bodies of igneous rock have often been forced in a molten and highly heated condition through other rocks when at a distance below the surface of the earth. After coming to rest they have remained during the cooling stages for long periods in contact with the surrounding walls. All molten

igneous magmas are more or less richly charged with aqueous vapour, doubtless in a dissociated state; with carbonic acid and probably with other gases, especially those involving sul- phur. During the cooling stages the gases are emitted and carry with them silica, iron, alumina and metallic elements in less amount, of which copper is the commonest, but among which are also num- bered lead, zinc, gold and silver, if the rock standing next the intru- sive mass is limestone, the silica and iron, and to a less degree the alumina, combine with the lime to the elimination of the carbonic acid and produce extensive zones of lime silicates, of which garnet is the most abundant. Disseminated throughout these garnet-zones are large and small masses of pyrite and chalcopyrite, oftentimes in amounts sufficient to yield large ore-bodies. Again in the lime- stone outside the garnet-zones, but none the less closely associated with them, are bodies of sulphides containing copper. The copper ores of Bisbee and Morenci, Arizona, of Aranzazu near Concepcion del Oro, Mexico, and of many other parts of the world not yet studied in detail are of this type. The eruptive which most frequently produces contact zones is of a marked acidic or siliceous character, since among eruptives these are the ones most richly charged with gases. When the copper ores are of low-grade in their original deposition it often happens that processes of secondary enrichment, which are later described, are required to bring them up to a richness which warrants mining. Less often than copper appear lead, zinc or gold ores in the same relations.

D. Pegmatites. — One other phase of eruptive activity needs also to be briefly mentioned before passing to the discussion of the ore- bodies, which have hitherto chiefly occupied students of the subject. In the regions surrounding intrusive masses of granite we almost always see dikes or veins of coarsely crystalline quartz, felspar and mica radiating outward, it may be, for very long distances. They are believed to be produced by emissions from the eruptive similar _ to those which

yield the garnet-zones just mentioned. The veins are technically called pegmatites. They are characteristic carriers of tin and of minerals containing the rare earths, and less commonly are known to yield gold or copper.

II. Precipitated from Solution. — A. Surface Deposits. — The chief ore-body under this type is furnished by iron. The peculiar chemical property possessed by this metal of having two oxides, a ferrous, which is relatively soluble, and a ferric, which is insoluble, leads to its frequent precipitation from bodies of standing or comparatively quietwaters. Ferruginous minerals of all sorts, but more particularly pyrite and siderite, pass into solution in the descending oxidizing or carbonated surface waters, either as ferrous sulphate, or as salts of organic acids, or ferrous carbonate, the last-named dissolved in an excess of carbonic acid. On being exposed to the atmosphere when the solutions come to rest, or to the breaking up of organic acids, or to alkaline reagents, or sometimes to fresh-water algae, the hydrated sesquioxide 2Fe 2 3 , 3H2O is precipitated as the familiar beds of bog ore. The ore usually forms earthy aggregates or crusts and cakes, but may also, as in the interesting case of the Swedish lake deposits, yield small concretions. Bog ores are not very rich in iron and are apt to have much sand and clay intermingled. If subsequently buried under later sediments they may become dehydrated and changed to red hematite, as in the case of some of the Clinton iron ores of the eastern United States. These widely extended beds in the lower strata of the Upper Silurian are often oolitic red hematites, consisting of concentric shells of iron oxide and

'A. H. Barlow, "On the Sudbury Deposits," Geol. Survey of Canada Ann. Rept., vol. xiv., part H; A. P. Coleman, Ann. Report of the Ontario Bureau of Mines, vol. xiv., part iii. (1905).

chalcedonic silica, deposited around grains of sand. The most extensive of all ore-beds of this type and the mainstay of the German and Belgian smelting industry, are the Jurassic ores, locally called minette, of Luxemburg and the neighbouring territories. Three principal and several subordinate beds are distinguished, which furnish a product ranging from 30 to 40 % of iron and between I and 2 % of phosphoric oxide (P2O5). They are generally believed to have been deposited on the bottoms of embayments of the Jurassic sea. The iron was furnished by the drainage of the land and was precipitated, according to Van Werweke, as silicate, carbonate, sulphide and as several forms of oxide. More than two billions of tons are believed to be available. Very similar deposits occur in the Cleveland district, England, in the Middle Lias.

In the presence of much organic matter which creates reducing conditions, concretions and even beds of spathic ore or black-band may result and afford the ores of this type extensively utilized in the Scottish iron industry and formerly of some importance in the eastern United States.

The brown hematites often have more or less manganese, and manganese ores themselves may result by closely related reactions, since manganese is very similar to iron in its chemical properties. Aluminium is yielded by deposits of bauxite, the hydrated oxide, which in the states of Georgia and Alabama, of the United States, are the result of surface precipitations. In the depths it is believed that pyritous shales exist. The oxidation of the pyrite supplies sulphuric acid which takes into solution the alumina of the shales. Rising to the surface along a marked series of faults, the aluminium sulphate meets calcium carbonate in an overlying limestone, and the aluminium hydrate is precipitated as concretions at the vents of the springs.

Of scientific importance but as yet not of commercial value are the siliceous sinters deposited around the vents of hot springs which yield

appreciable amounts of both the precious and the base metals. While surface precipitations in every particular, they are yet chiefly important in casting light on the processes of vein formation in the depths.

Non-metallic minerals which are deposited from solution on the surface of the earth are the salines, rock-salt, related potassium salts, gypsum and the rarer nitrates. The alkaline chlorides and gypsum are derived, in nearly all cases, from impounded bodies of sea-water, which, exposed to evaporation with or without constant renewal, finally yield beds of rock-salt and related minerals. Shallow estuaries cut off from the sea, it may be by the sudden rising of a bar during a heavy storm or brines impounded in deep bays with a shallow connexion as in the ” bar theory ” of Ochsenius, have given rise to the great stores of these minerals which are so ex- tensively mined. The potassium compounds have only been found as yet in large quantities in the Stassfurt region of Germany, and seem to be due to the fact that in this locality the mother-liquors of the rock-salt deposits failed to escape, and were evaporated to dryness. The nitrates are chiefly obtained in northern Chile and are the result of the reaction of nitrogenous organic matter, upon alkaline minerals and under conditions where there is enough but not too much water.

Another very important mineral found in surface deposits formed from solution is asphalt. It has happened in various parts of the world, but especially in the island of Trinidad, in the Carribean Sea, that petroleum with an asphalt base has reached the surface, has evaporated, and has become oxidized so as to leave a residuum of asphalt suitable for street-paving or other purposes. _ So-called pitch-lakes are afforded which may be of great commercial value.

Again, if large sheets, crusts, stalactites and stalagmites are deposited from calcareous water by the escape of the solvent carbonic acid, beautiful

ornamental stones are afforded, generally known as Mexican onyx.

B. Impregnations in Open-textured Rocks. — In a number of instances in various parts of the world naturally open-textured rocks have been discovered so richly impregnated with the metalliferous minerals as to be ores. The enriching minerals have been intro- duced in solution, and the solvent has found its way through the rock because of its natural character, and not because geological movements have opened it. Porous sandstones are one of the most common cases. Deposits of silver ores have been extensively mined at St George in southern Utah, consisting of films of argentite and cerargyrite, which have been precipitated upon fossil leaves, sticks, and in the sandstone itself. Over wide areas in the northern United States, copper in various minerals has been discovered in sandstones of Permian or Triassic age. At Silver Cliff, Colorado, silver ores have impregnated a volcanic tuff, while at the Boleo mines in Lower California tuffs yield copper ores. In at least two of the great copper mines on Lake Superior the native metal im- pregnates a conglomerate, and in a number of others it has enriched a cellular basalt, filling the blow-holes with shots and pellets. In the Commern district between Bonn and Aachen, sandstones of the Triassic Buntersandstein contain knots of galena, distributed over wide areas as impregnations. Organic matter is believed to have precipitated the galena by a reducing action upon percolating solutions of lead.

All these porous rocks have been fed by solutions which have entered along waterways, clearly due to faults or some extensive

breaks which have provided introductory conduits. The solutions have then been tapped off from the main passages by the porous rock. They are, therefore, closely connected with faults.

Non-metallic minerals in the form of petroleum and asphalt may also impregnate sedimentary beds or

other rocks of open texture. Many oil wells derive their supplies from lenticular beds of' sand- stone in the midst of impervious shales, and others, as those in the Mexican fields near Tampico, from volcanic tuffs. Asphalt may saturate both sandstones and limestones in such richness as to furnish a natural paving material when crushed, heated and laid. Brines are also yielded by porous strata and supply much of the salt of the world.

C. Impregnations and Replacements of Naturally Soluble Rocks. — Ore-deposits of great importance appear in different regions which can only be interpreted as having been formed by the replacement of some or all of a rock with the metallic minerals. The most common rock to yield in this way is limestone, because of its soluble nature, but important cases occur of others composed of silicates. Replacement implies the precipitation of the ore and gangue, molecule by molecule, in the position of the original minerals but without, as in pseudomorphs, the necessary reproduction of crystal- line forms. Some waterway must of course introduce the ore- bearing solutions, but it may be slight compared with the great size of the resulting ore- bodies. Lead and zinc ores, often carrying some silver, are those most widely distributed, as they were also the earliest recognized in deposits of this character. More than any other metals their association with limestone is pronounced. The replacements may be found near the supply fissure as in the great zinc deposits near Aachen, or the supply fissures may be obscure as at Leadville, Colorado. While ores occur in the lime- stone, they are often close along its contact with some relatively impervious stratum, which seems partly to have directed the cir- culations, partly to have checked or stagnated them, while pre- cipitation took place. With the lead and zinc sulphides, pyrites and chalcopyrite are commonly associated in greater or less degree, the copper increasing locally. All the sulphides are exposed to oxidation above the ground-waters and mining in the upper levels' has been often directed against the

carbonate and sulphate of lead, or the mingled carbonate and hydrated silicate of zinc.

A non-metallic deposit formed by replacement and of much scientific interest is furnished by sulphur when derived from gypsum, as in the Sicilian and other localities of Europe.

D. Deposits along Anticlinal Summits and in Synclinal Troughs. — When strata experience folding they are violently strained at the bends, and, if stiff or brittle like limestone, often crack in limited fissures, which in anticlines open upward and in synclines downward. They thus yield joints in relatively great numbers. Softer rocks, such as shales, are moulded by the strains without fracturing. Very gentle folds seem to have yielded such abundance of cracks in the lead and zinc district of the Upper Mississippi Valley as to cause the so-called " gash veins " which have been worked for many years. The crevices are not all vertical, but often run horizontally and are due to the parting and buckling of individual beds. The resulting ore-bodies are chiefly limited to a single great stratum, and are believed to have been formed by the infiltration of galena, blende and pyrite from overlying formations.

When strata are stiff enough to buckle under violent folding and part so as to produce openings of a crescentic cross-section which afterwards become filled, there result the " saddle-reefs " so remarkably illustrated in the gold veins of Victoria, Australia, and in pitching anticlines of a much larger character in Nova Scotia.

Of far the greatest importance of all the ore-bodies in troughs are the iron ores of the Lake Superior region, now the most pro- ductive of all the iron-mining districts. In a series of sedimentary formations, generally of Huronian age, and with associated eruptives, there occur strata consisting of a cherty iron carbonate, which were probably originally marine deposits akin to glauconite. They rest upon relatively impervious rocks, and are often

penetrated by basaltic dikes. The entire series has been folded, so that the cherty carbonates, shattered by the strains, have come to rest in troughs of relatively tight, impervious rocks. The descending surface waters have next altered them, have taken the iron into solution, and have redeposited it in the troughs as a slightly hydrated red hematite. The silica has usually been precipitated elsewhere.

The most important of the non-metallics which occur along anticlinal summits are petroleum and natural gas, but it is true only in a very limited sense that they are introduced in solution. The general cause of the accumulation is, however, the same as that of the metallic minerals, i.e. that storage cavities are afforded. In the most productive oil-fields it is the general experience to find the oil and gas impounded in porous rocks, either sandstones or limestones, at the crests of anticlines and beneath impervious shales which do not shatter or crack with gentle folding.

E. Deposits in Shear-Zones. — It sometimes happens both in massive rocks and in sediments that strains of compression have been eased by local crushing along comparatively narrow belts without appreciable or measurable displacement of the sides such as would be required by a pronounced fault. The word shear-zone has become quite widely used in recent years as a descriptive term applicable to these cases.

The gold-bearing reefs of the Transvaal present a good illustration. Beds of conglomerate consisting chiefly of quartz and quartzite pebbles have experienced crushing and shattering, and have had their natural porosity much enhanced by these after-effects. Solutions of gold, coming through, have encountered pyrites and have had the gold precipitated upon the pyrites, which is itself often

broken and granulated. In other regions shearing has led to sheeting and opening of the rocks by many parallel cracks but almost always with such marked displacement that the next type most correctly describes them. From any point of view the shear-zone is a natural transition to the fault and closely related to it.

F. Deposits^ in Faults. — This type of ore-body was one of the earliest established, and has always figured very prominently in the minds of students of the subject since the first systematic formula- tions of our knowledge. The dislocation of the earth's crust by faults has furnished either clean-cut fissure or else lines of closely set parallel fractures, whose combined displacement has been comparatively great. The faults go to relatively profound depths and they furnish therefore waterways of extended character, which may reach from regions of heat and pressure in depth to regions of cold and diminishing pressure above ; thus from conditions favour- able to solution below to conditions favouring precipitation toward the surface. Faults often occur, moreover, in connexion with eruptive outbreaks, and .therefore in circumstances especially favourable to ore deposition. From all these reasons it is not surprising that the " true fissure vein " based on a profound fault has been the ideal of the prospector's search in many parts of the world, and has often been his reward. The historic veins of Corn- wall and of Saxony are of this type, also the great silver veins of Mexico, the gold veins of California, the great silver-gold deposits of the Comstock lode, and many in South America.

Faulting often leads to great shattering of the country rock, and instead of being a clean-cut open cavity, there results a brecci- ated belt which may then be cemented by infiltrating ore and gangue. In the midst of this the richer ore occurs as bonanzes or chutes, which are succeeded by leaner stretches. The movement of the walls produces the polished surfaces specifically called " slicken- sides," parallel to which the ore-chutes often run. The

change in

the character of the entering solu- tions from time to time gives a banded character to the deposit, so that from both walls toward the centre corresponding layers succeed one another. At the centre the last layers may meet as interlocking crystals in the familiar comb-in- comb structure or they may leave cavities called ” vugs ” into which beautiful and perfectly formed crys- tals project (see fig.). Fault fissures swell and pinch affording wide and narrow places in the resulting ore-body. They often intersect each other and one may throw or heave another, according to the me- chanics of faulting as set forth under the article on Geology.

While fault-fissures have in no way failed in later years to be appreciated by mining geologists, yet they do not hold that pre- dominant place which in the days of more limited experience was theirs. On the contrary, other types such as contact zones, re- placements and impregnations are found to be of scarcely inferior importance. Nevertheless the last two, at least, must usually owe to the fault-fissure the waterway which has brought in the solutions. A very peculiar non-metallic deposit found in fault- fissures and imitating the ordinary veins in all essentials is furnished by the asphaltic minerals, often described as asphaltic coals and known in mineralogy as ” grahamite,” ” albertite,” ” uintaite,” ” gil- sonite,” &c. Petroleums with asphaltic bases have percolated into fault-fissures and have there deposited on evaporation and oxidation their dissolved burdens. The black coaly mineral presents all the geological relations of a fissure vein and is mined like so much ore.

G. Volcanic Necks. — A very unusual ore-body is furnished by this type, which is only known in a few instances. In two mines, however, in Colorado, the Bassick and the Bull-Domingo, there occur chimneys of elliptical cross-section filled with rounded boulders, and believed with much reason to be the tubes of small explosive volcanoes. After brief periods of activity they became waterways for

uprising heated solutions which filled the interstices with ore.

III. Deposited from Suspension. — The ores which result from this process are all formed upon the surface of the earth and through the action of water. They are primarily the result of the weathering of rocks and of the removal of the loose products thus afforded in the ordinary processes of erosion.

A. Placers. — Many useful minerals, including some of a metallic character, are very resistant to the agents of decomposition which cause the disintegration of the common rocks. Thus magnetite is a mineral present in a minor capacity in all eruptives and in fairly large percentage in many of the basic types. It is proof against protracted exposure to natural reagents, and it is heavy. Becoming freed by the disintegration of the containing rock it is mingled with

the transported materials of running streams, and settles with other heavy minerals wherever the current slackens to a sufficient degree. Concentration may thus ensue and beds of black sand result. If again deposits of loose sand containing more or less magnetite are exposed to the surf of the ocean, or even to the waves of lakes, a similar sorting action takes place on the beach. The magnetite remains behind while the undertow removes the lighter materials. Iron sands of either of these varieties are usually too rich in titanium to be of commercial value, but with the magnet- ite may be gold or platinum in sufficient amount to be of value.

While magnetite is the commonest of the ores to be found in placers, gold is the metal which usually gives them value. Wherever systems of drainage have eroded gold-bearing rocks, the gold has passed into the streams with the other detrital materials, and, even though in very fine flakes, being yet very heavy has sunk to the bottom in the slackened water and has there enriched the gravel. The gold tends to

work its way through the gravels even to the bed-rock, or to some bed of interstratified and impervious clay, and thwe to be relatively rich. It favours also the insides of bends and the heads of quiet reaches. When a small tributary stream joins a larger one and is both checked itself and checks the current of the large one, the gold, as in the Klondike, tends to settle in relatively great abundance.

Pot-holes, strangely enough, or related rock-cavities, often fail to yield the nuggets, apparently because the swirl of the water and grit has ground them to impalpable powder. The particles have then been washed elsewhere.

When the gold-bearing gravels are panned down a small residue is obtained of all the heavy minerals in the gravel. Magnetite is the commonest and gives the technical name of ” black sand ” to the concentrate. With it, however, there are almost always found garnet and other less familiar minerals. If the stream valley has been hunted over by sportsmen with shot-guns or rifles, the lost shot and bullets are commonly caught in the pan. Even diamonds have been rarely noted and they may, indeed, be specially sought in gravels.

Along sea-beaches where great beds of auriferous gravel have been attacked by the surf, concentrated bars carrying nuggets and flakes of gold in workable quantity have not infrequently resulted. Cape Nome, Alaska, is perhaps the most productive of all. The gold in the beach-placers is usually worn by the constant attrition into extremely fine particles, and the flakes or colours are more difficult to save than in the case of stream-placers.

In some regions of gold-bearing rocks, as in the south-eastern United States, the products of superficial decay of rocks may remain in situ and be sufficiently charged with gold to be washed for the yellow metal. They are different from the usual placer deposit although hydraulicked in the same way. They might be properly considered residual

deposits under the next head.

Auriferous stream-gravels of ancient and long-abandoned systems of drainage may remain beneath lava flows or later sedimentary accumulations and be the objects of underground mining. Both in Australia, where they are called ” deep leads,” and in California, where they are called ” buried channels ” or ” deep gravels,” they have been for many years the objects of mining. In California the bed-rock is usually slate or schist and a series of technical terms have resulted descriptive of the rich streaks. The bed-rock is called the rim-rock; the pay-streaks which appear on its sides, bench-gravels, and the lowest one the channel-gravel. Tunnels are often very skilfully driven through the rim-rock to strike the channel-gravel and at the same time preserve the proper slope for drainage and extraction. The buried channels in California have proved of much scientific interest from the remains of prehistoric man, skulls, mortars and pestles which they have yielded.

Among the non-metallic minerals sought from placers, phos- phates for fertilizers hold a position of great importance.

B. Residual Deposits. — As contrasted with the placers whose materials are derived by transport from a distance, we sometimes find heavy and resistant minerals, once contained in the rock but freed by the process of decay and disintegration. The lighter loose materials are washed away and deposited elsewhere. The heavy remain behind in a concentrated condition. Iron ores of this character are known, and chromite is set free in the same way by the decomposition of serpentine.

In the decay of ferruginous rocks like limestones the iron may be changed to the insoluble ferric hydrate, brown hematite, and remain as veinlets and crusts throughout a mantle of clay. The brown hematite may be freed by artificial washing and used as an iron ore.

IV. Carbonaceous Deposits from Vegetation. — Farthe most important of the non-metallic minerals are those composing the coal series. They yield entire strata analogous to other sedimentary rocks, but in most cases from vegetation which has grown in situ. They are found in all stages from nearly carbonized leaves and woody tissue in peat, through much more altered materials in lignite and bituminous coal to extremes in anthracite and graphite. The prime necessity for their preservation from decay is furnished by water, in or near which they must grow, and beneath which they must be deposited, so that oxidation may be retarded. In instances they have been heaped together by rivers, especially when at flood. The method of origin is fully discussed under Coal and under

Mining, but it may be remarked here that once formed they undergo all the foldings, faultings and disturbances which have affected the sedimentary rocks of other kinds.

Bibliography. — The following are general works on the deposits of the useful minerals, in addition to Posepny's volume already mentioned: In English — J. A. Phillips, revised by Henry Louis, Treatise on Ore-Deposits (London, 1896); J. F. Kemp, Ore-Deposits of the United States and Canada (New York, 1900) ; Prime's translation of Von Cotta's Ore-Deposits (New York, 1870); H. Ries, Economic Geology of the United States (New York, 1906) ; W. H. Weed's trans- lation of Beck's The Nature of Ore-Deposits (New York, 1905) ; Genesis of Ore-Deposits (American Institute of Mining Engineers, 1901); G. P. Merrill, The Non-Metallic Minerals (New York, 1904). In German — B, von Cotta, Die Lehre von den Erzlagerstdlten (Frei- berg, 1859); A. von Groddeck, Die Lehre von den Lagerstatten der Erze (Leipzig, 1879); R. Beck, Lehre von den Erzlagerstdlten (Berlin, 1904) ; A. W. Stelzner and A. Bergeat, Die Erzlagersldtten (Leipzig, 1905-1906). In French — E.

Fuchs and L. de Launay, Traite des gites mineraux et metalliferes (Paris, 1893); G. Moreau, Etude industriette des giles metalliferes (Paris, 1S94). (J. F. K.)

MINERALOGY, the science which describes and classifies the different kinds of mineral matter constituting the material of the earth's crust and of those extra-terrestrial bodies called meteorites. The study of minerals is thus a branch of natural history, but one in which certain of the exact sciences find an applica- tion. The determination of the composition and constitution of minerals is a chemical problem; their optical and other physical properties are determined according to the principles of physics; the study of their crystalline form and structure belongs to crystallography; their modes of occurrence, origins, associations and changes come within the province of geology and petrology; while a consideration of the localities at which they are found requires some acquaintance with geography. Finally, there is the economic side, dealing with the mining and application of useful minerals, the extraction of metals from their ores, and the uses of minerals for building, decoration and jewelry.

In this article we shall treat only of the general characters of minerals; their special characters will be found in the articles on the individual minerals.

After a brief historical sketch the subject will be treated under the following headings : —

I. Characters of Minerals.

1. Morphological Characters.

a. Crystalline Form.

b. State of Aggregation : Structure.

2. Physical Characters.

a. Optical Characters (Colour, &c).

6. Magnetic, Electrical and Thermal Characters.

c. Characters depending on Cohesion (Hardness, &c).

d. Specific Gravity.

«. Touch, Taste and Smell.

3. Chemical Characters.

Synthesis of Minerals.

II. Occurrence and Origin of Minerals.

Alteration of Minerals : Pseudomorphs.

III. Nomenclature and Classification of Minerals.

History. — Owing to their numerous applications for useful and decorative purposes, minerals have attracted the attention of mankind from the earliest times. The stone and bronze imple- ments of prehistoric man and many of his personal ornaments and charms were directly or indirectly of mineral origin. The oldest existing treatise on minerals is that written about 315 B.C. by Theophrastus (irepi ruiv Xiduv — On Stones, English version by John Hill, 1746), of which only a portion is now in existence. Minerals were then classed as metals, stones and earths. The last five books of Pliny's Historic, naturalis, written about a.d. 77, treat of metals, ores, stones and gems. Some of the Arabian philosophers devoted themselves to the study of minerals, and about 1262 Albertus Magnus wrote his De miner alihus. In the 1 6th century Georgius Agricola published several large volumes, dealing more especially with the mining and metallurgy of metalliferous minerals, in which more exact descriptions were given of the external characters: he mentioned several minerals by names (e.g. blende, fluor, quartz) which are now in common use. About the same period there appeared

the systematic treatise on minerals of K. Gesner (1565), and that on precious stones by Anselm Boethius de Boodt (1609). The remarkable researches

of Erasmus Bartholinus on Iceland-spar were published in 1669, and J. F. Henckel's Pyritologia in 1725. Later came the Sy sterna naturae of C. Linnaeus (1735). Although the, importance of chemical properties was recognized by the Swedish chemists — J. G. Wallerius (1747) and A. F. Cronstedt (1758)— the external characters of minerals formed the basis of the mixed systems of classification of A. G. Werner (1774) and of other authors, and even as late as the Natural History System of Mineralogy of F. Mohs (1820).

It was not until the end of the 18th and beginning of the 19th century, when the foundations of crystallography were laid by Rome de ITsle and R, J. Haiiy, and chemistry had assumed its modern phase, that any real advance was made in scientific mineralogy. It was then recognized that chemical composition and crystalline form were characters of the first importance, and that external (natural history) characters were often more or less accidental. During this period numerous mineral sub- stances were analysed by Scheele, Klaproth, Charles Hatchett- Vauquelin, Kirwan, Berzelius, Rose and other chemists, and many new mineral-species and chemical elements discovered. After W. H. Wollaston's invention of the reflecting goniometer in 1809, exact measurements of the crystalline forms of many minerals were made. The principles of isomorphism and dimor- phism enunciated by E. Mitscherlich in 1819 and 1821 respec- tively cleared up many difficulties encountered in the definition of mineral-species. About the same time also the discovery by E. L. Malus of the polarization of light gave an impetus to the optical examination, by Sir David Brewster and others, of natural crystals. Later, the investigation of rocks in thin section under the microscope led to the exact determination r particularly by A. Des Cloizeaux (1867), of the optical constants of rock-forming minerals.

For a detailed account of the history of mineralogy (including crystallography), see F. von Kobell, Geschichte der Mineralogie von 1650-1860 (Miinchen, 1864). The recent history of mineral-specie! may be

well traced in the six editions of J. D. Dana's System <% Mineralogy (1837-1892).

I. — Characters of Minerals.

A distinction is to be made between essential and non-essentiai characters. Essential characters are those relating to chemical composition, crystalline form, crystallo-physical properties and specific gravity; these are identical, or vary only within certain defined limits, in all specimens of the same mineral-species. Non-essential characters — such as colour, lustre, hardness, form and structure of aggregates — depend largely on the presence of impurities, or on the state of aggregation of imperfectly formed crystalline individuals. In an absolutely pure* and perfectly developed crystal all the characters may be said to be essential, but such crystals are of exceptional occurrence in nature, and certain of the characters are subject to modification under different conditions of growth. For example: a well- formed crystal of haematite (" specular iron ore "), with its smooth black faces and brilliant metallic lustre, is strikingly different in appearance from a piece of massive haematite (" red iron ore "), which is dull and earthy and bright red in colour; the former is so hard that it can only with difficulty be scratched with a knife, while the latter is quite soft and soils the fingers. Both specimens will, however, be found on analysis to have the same chemical composition (Fe 2 3), the same crystalline structure (as determined by the optical characters under the microscope in the case of the massive variety), and very nearly the same specific gravity (especially if this be determined upon finely powdered material, the effect of cavities being thus eliminated). The essential characters being identical, the difference between the two specimens lies in the state of aggre- gation of the material: with "specular iron ore" we have a single crystal, while with the " red iron ore " we are dealing with a confused aggregate of minute crystalline individuals,, which have interfered with each other's growth to such an extent that no crystal-

faces have been developed. Such differences do

not therefore depend on the nature of the material, but only on the conditions which prevailed during its growth. (See e.g. Quartz and Calcite.)

In the following enumeration of the more salient characters of minerals it is to be noted that many of the terms used for non-essential characters are purely descriptive and have no exact definition; on the other hand, essential characters can be expressed numerically and are therefore perfectly definite.

i. Morphological Characters. .

a. Crystalline Form. — This most important character of minerals can, of course, be determined only when the material available is in the form of crystals (i.e. crystallized), which is not always the case. Massive aggregates of crystalline material are of much more frequent occurrence; when small fragments or thin sections of such material are transparent, the crystalline symmetry may be determined, within certain limits, by the help of the optical characters (see below). External crystalline form must not, however, be considered alone apart from all other characters, for crystals of substances quite different chemically, e.g. silver iodide, zinc oxide and zinc sulphide, are sometimes almost identical in crystalline form; further, in groups of iso- morphously related minerals the degree of symmetry will usually be the same and the angles vary only slightly, and unless the crystals are perfectly developed and suitable for exact gonio- metric measurement no crystallographic distinction can be made between two such species.

All the six systems of crystals and most of the thirty-two symmetry-classes are represented amongst minerals (see Crystal- lography). Crystals of the

same mineral-species may differ very widely in general form or habit; e.g. crystals of calcite (q.v.) may be rhombohedral, prismatic, scalenohedral or tabular in habit. Other descriptive terms of the habit of crystals are pyramidal, acicular or needle-shaped (from the Lat. acicula, a needle), capillary or hair-like (from the Lat. capillus, hair), &c; and these peculiarities of habit may sometimes be character- istic of certain minerals. Sometimes also there are characteristic kinds of groupings of crystals: thus parallel, divergent or radiating (e.g. scolecite), rosette-shaped (e.g. haematite — Eisenrosen), reticulated (e.g. rutile), or matted. The faces of natural crystals may be smooth, rough, striated, curved or drusy, 1 i.e. studded with small crystal faces and angles.

6. State of Aggregation: Structure. — According to the par- ticular state of aggregation of a number of imperfectly developed crystals, which have grown together, various kinds of structure may be presented even by the same mineral species. The descriptive terms applied to these structures are almost self- explanatory: thus the structure may be granular (e.g. marble), fibrous (asbestos), radio-fibrous or stellated (wavellite), columnar (beryl), laminar or lamellar (talc), bladed (cyanite), &c, ac- cording to the relative shape and sizes of the individual crystals composing the aggregate. When the constituent crystals are invisible to the unaided eye the material is described as compact; incoherent aggregates are powdery or earthy. Minerals which are really amorphous, i.e. without any crystalline structure, are comparatively few in number (e.g. opal) ; many which are apparently amorphous are really microcrystalline (e.g. turquoise). The term massive is often used loosely for a crystalline mineral not showing crystal-faces. Crystal-aggregates often assume more or less accidental and imitative external forms to which the following descriptive terms are applied : dendritic cr arborescent (e.g. copper, pyrolusite), mossy (copper), leafy (gold), wiry or filiform (silver), capillary (millerite), coralloidal (aragonite),

globular (aragonite, with concentric structure; wavellite, with radiated structure), mamillary or with breast-like protuberances (arsenic), nodular (malachite), warty (menilite), botryoidal or resembling a bunch of grapes (from /36rpus, a bunch of grapes) (dolomite), reniform or kidney-shaped (menilite), amygdaloidal or almond-shaped (agate), stalactitic (calcite, chalcedony), &c.

1 This is from a German word, druse, originally meaning ” brush,’’ and applied by miners to hollow stones, lined with minute pro- jecting crystals.

2. Physical Characters.

a. Optical Characters. — The action of crystallized matter on transmitted light is a character of the highest importance in mineralogy. Even when the substance is opaque in large masses, it may be sufficiently transparent when in small splinters or in thin sections for the determination of the optical characters. The refractive indices, strength of the double refraction, optic axial angle, extinction angles on certain faces, &c, are characters capable of exact measurement and numerical expression, and are constant for each mineral-species. (See Crystallography.)

In their “diaphaneity,” or degree of transparency, minerals differ very widely even in the same species. Some, such as metals and most metallic sulphides are always opaque; while others may vary in different specimens from perfect transparency to perfect opacity (in the latter case, however, minute fragments will, as a rule, still be transparent). A good example of this is afforded by the varieties of quartz: rock-crystal is water-clear, chalcedony is translucent, and jasper opaque.

The ” colour ” of minerals is the character which first arrests attention; but being a character which may vary almost in- definitely in one and the same kind of mineral, it affords a typical example of a non-essential character. Thus, fluor-spar and quartz, when in well-formed and chemically pure

crystals, are quite colourless and transparent; but it would be easy to collect a series of each of these minerals in which almost every shade of colour is represented. Crystals of fluor-spar of an emerald-green, purple, golden-yellow, bright pink or other colour are at first sight very different in appearance, and yet the difference is due solely to the presence of traces of colouring matters so small in amount that their exact nature is difficult or impossible to determine. The value of diamond, corundum and other gem- stones depends largely on these accidental differences in colour. Such substances, which are essentially colourless and owe their colour to the presence of colouring matter as an impurity, are said to be ” allochromatic “: any colour they may possess is non- essential. In some other substances, known as ” idiochromatic,” the colour is a definite and essential character; for example, the yellow colour of gold, the red of cinnabar, &c; but even here, owing to differences in the state of aggregation and the presence of various impurities, they may be wide variations in colour. Colour is thus a character of little determinative value, especially in minerals which are allochromatic; but it is sometimes a useful guide when taken in conjunction with other characters. An elaborate list of colour-names for descriptive use was drawn up by A. G. Werner in 1774.

An important character of transparent crystals is that of unequal absorption in different directions; so that light will, as a rule, be differently coloured according to the direction in which it has travelled through the crystal: this is known as dichroism or pleochroism (see Crystallography). Certain minerals (e.g. zircon, almandine and those containing cerium) when examined with a spectroscope by transmitted light exhibit characteristic absorption spectra.

The colours of minerals may also be due to the interference of rays of white light at the surfaces of thin crevices or minute inclusions, either tabular or fibrous in form, in the mineral; for example, the play of colours of opal; the change of

colours of labradorite; the bands of rainbow colours (Newton's rings) seen along cleavage cracks and irregular in- ternal fractures (e.g. in quartz); the iridescent tarnish due to a superficial film of a decomposition product (e.g. " peacock copper ore ") ; or the bluish opalescence of moon-stone and cat's-eye.

The true colour of a mineral is best revealed by its " streak," i.e. the colour of its powder. This is obtained by scratching the mineral, or by crushing a fragment of it on a sheet of white paper, or rubbing it upon unglazed porcelain. The streak of allochromatic minerals is white, while that of idiochromatic minerals is coloured and is often of determinative value. Ores of iron may, for example, generally be distinguished by their streaks: that of magnetite being black; haematite, blood-red;

Iimonfte, yellow; and chalybite, white. The streak of a mineral may be either shining (e.g. argentite) or dull.

Another character depending on light is that of lustre, which is often very characteristic in certain minerals, though it may be considerably modified by the state of aggregation. For example, the usual adamantine lustre of diamond is not exhibited by the compact aggregate known as carbonado; while earthy masses of any mineral will be devoid of lustre. Descriptive terms applied to the kinds of lustre are: metallic (e.g. pyrites), adamantine (diamond), vitreous (quartz), resinous (pyromor- phite), greasy (elaeolite), waxy (chalcedony), pearly (talc, heulandite and other minerals with a perfect cleavage), silky (satin-spar) , &c. The degrees of intensity of lustre are described as splendent, shining, glistening, glimmering and dull, and depend usually on the smoothness of the crystal-faces.

The phenomena of phosphorescence (q.v.), fluorescence (q.v.) and radio-activity (q.v.) are strikingly exhibited by some minerals. (See Fluor-spar, Diamond, &c.)

b. Magnetic, Electrical and Thermal Characters. — These, as far as related to crystalline form, are discussed under crystallography (q.v.). Magnetite (" lode-stone ") is the only mineral which is strongly magnetic with polarity; a few others, such as pyrrhotite and native platinum, possess this character to a much less degree. Many minerals are, however, attracted by the pole of a strong electro-magnet, while a few (diamagnetic) are repelled.

Most minerals with a metallic lustre are good conductors of heat and electricity; others are bad conductors. For example, graphite is a good conductor, while diamond is a bad conductor. Non-conductors of electricity become electrified by friction, some positively (e.g. quartz and topaz), others negatively (e.g. sulphur and amber). The length of time during which different gem-stones retain their charge of frictional electricity was made use of by R. J. Haiiy as a determinative character. For the pyro-electrical and thermo-electrical characters of crystals see Crystallography. Some minerals — for example, salt, sylvite and blende — are highly diathermanous, i.e. transparent for heat-rays.

The specific heat and melting point of minerals are essential characters capable of exact measurement and numerical expres- sion, but they are not often made use of. Different minerals differ widely in their "fusibility": the following scale of fusi-bility was proposed by F. von Kobell: —

1. Stibnite . (525 C.) 5. Orthoclase . (1175 C.)

2. Natrolite . (965 C.) 6. Bronzite . (1300 C.)

3. Almandine (1265 C.) 7. Quartz . (1430 C.)

4. Actinolite . (1296° C.)

The melting points given above in parentheses were determined by J. Joly. Stibnite readily fuses to a globule in a candle-flame, while quartz is infusible even on the thinnest edges before the ordinary blowpipe.

c. Characters depending on Cohesion. — Some minerals (e.g. a sheet of mica) are highly elastic, springing back to their original shape after being bent. Others (e.g. talc) may be readily bent, but do not return to their original form when released; these are said to be pliable or flexible. Sectile minerals (e.g. chlorar- gyrite) may be cut with a knife without being fractured : related characters are malleability (e.g. argentite) and ductility (e.g. silver). The tenacity, or degree of frangibility of different minerals varies widely: they may be brittle, tough, soft or friable. The fractured surface produced when a mineral is broken is called the ” fracture,” and the kind of fracture is often of determinative value; descriptive terms are: conchoidal (e.g. quartz, which may often be recognized by its glassy conchoidal fracture), sub-conchoidal, uneven, even, splintery (e.g. jade), hackly or with short sharp points (e.g. copper), &c.

In many cases when a crystallized mineral is broken it separates in certain definite directions along plane surfaces. This property of ” cleavage ” (see Crystallography) is an important essential character of minerals, and one which is often of considerable assistance in their recognition. For example, calcite, with its three directions of perfect cleavage parallel to the faces of a rhombohedron, may always be readily

distinguished from aragonite or quartz; or again, the perfect cubical cleavage of galena renders this mineral always easy of recognition.

“Hardness,” or the resistance which a substance offers to being scratched by a harder body, is an important character of minerals, and being a test readily applied it is frequently made use of. It must, however, be remembered that the hardness of an

incoherent or earthy aggregate of small crystals will be very different from that of a single crystal. A comparative ” scale of hardness ” was devised by F. Mohs in 1820 for the purpose of giving a numerical statement of the hardness of minerals. Mohs’s Scale of Hardness.

1. Talc. 6. Orthoclase.

2. Gypsum. 7. Quartz.

3. Calcite. 8. Topaz.

4. Fluor-spar. 9. Corundum.

5. Apatite. 10. Diamond.

These minerals, arbitrarily selected for standards, are suc- cessively harder from talc the softest, to diamond the hardest of all minerals: a piece of talc is readily scratched by gypsum, and so on throughout the scale. A mineral which is capable of scratching calcite and itself be as easily scratched by fluor-spar is said to have a hardness of 35. Some care is required to avoid error in the determination of hardness: it is best to select a smooth crystal-face, cleavage-surface or fracture on which to rub a sharp corner of the scratching mineral; the powder should be wiped off and the surface examined with a lens to see if a scratch has really been produced or only powder rubbed off the corner of the mineral with which the scratching Was attempted. With a little practice a fair idea of the hardness of a mineral may be obtained with the use of a knife or file, which will scratch all minerals with a hardness of 6 or less. Thus iron-pyrites (H. = 6%) and copper-pyrites (H. = 3D, apatite (H. = 5) and beryl (H. = 7J), or gem-stones and their paste imitations may be readily distinguished by this test. Talc and gypsum can be readily scratched with the finger-nail.

Planes of parting, etching figures, pressure- and percussion- figures are sometimes characters of importance in describing and distinguishing

minerals. (See Crystallography.)

d. Specific Gravity. — The density or specific gravity of minerals is an essential character of considerable determinative yalue. In minerals of constant composition it has a definite value, but in isomorphous groups it varies with the composition: it also, of course, varies with the purity of the material. It is a character which has the advantage of numerical expression: minerals range in specific gravity from i-oi for copalite to 22-84 for iridium. The exact determination of the specific gravity of minerals is therefore a matter of some importance. Three methods are in common use, viz. hydrostatic weighing, the pyenometer, and the use of heavy liquids. The first two methods are only applicable when a weighable amount of pure material can be selected or picked out; this is, however, generally a laborious operation, since impurities are often present and usually several species of minerals are closely associated, and in selecting material it is often necessary to determine some other character to make certain that only one kind is being selected. For exact determinations the pyenometer method is usually to be recommended, using for material the pure fragments which have been selected for quantitative chemical analysis. With a single pure crystal or a faceted gem-stone the method of hydrostatic weighing is usually applicable, providing the stone is not too small. The most ready method, however, is that afforded by the use of a heavy liquid, and the most convenient liquid for this purpose is methylene iodide. This is a clear, mobile liquid with a specific gravity of 3-33, and by the addition of benzene, drop by drop, the specific gravity may be reduced to any desired amount. With such a liquid the specific gravity of the minutest fragment, the purity of which has previously been scrutinized under the microscope, may be rapidly determined. The liquid is diluted with benzene until the fragment just remains suspended, neither floating nor sinking; the specific gravity of the fragment will then be the same as that of the liquid, and the latter may be

determined by hydrostatic weighing or, more conveniently, by

means of indicators. Small recognizable crystals of the following minerals may be kept at hand as a set of indicators: gypsum (sp. gr. 2-32), colemanite (2-42), orthoclase (2-56), quartz (2-65), calcite (2-72), aragonite (2-93), rubellite (3-02), apatite (3-20), dioptase (3-32), &c. With a series of tubes containing mix- tures of methylene iodide and benzene of different densities and suitable indicators, specific gravities may be rapidly and ac- curately determined. Values intermediate between those of the indicators may be estimated by a diffusion column of the liquid, or by noting the rate at which the benzene evaporates and the specific gravity of the liquid increases. For use with minerals of specific gravity greater than 3-33 various other heavy liquids have been suggested; the best being thallium silver nitrate ($TlAg(NO_3)_2$), which melts at 75° C. to a clear liquid with a density of 4-8, and is miscible with water.

e. Touch, Taste and Smell. — In their action on the senses of touch, taste and smell a few minerals possess distinctive char- acters. Talc is unctuous or soapy to the touch; tripolite and trachyte are respectively meagre and harsh. Some porous minerals (e.g. clays and hydrophane) adhere to the tongue. Gem-stones may often be distinguished from their glass imitation by the fact that they feel colder, since they are better conductors of heat. Bitumen and clays, when moistened, have a character- istic smell; pyrites and some other sulphides when rubbed emit a sulphurous odour. Minerals which are soluble in water have taste: e.g. saline (salt), alkaline (natron), bitter (epsomite), astringent (chalcanthite) , &c.

3. Chemical Characters.

Chemical composition is the most important character of minerals, and on it all modern systems of classification are based. A mineral-species cannot, however, be defined by chemical composition alone, since many instances are known in which the same chemical element or compound is dimorphous or polymorphous (see Crystallography). Thus both the minerals diamond and graphite consist of the element carbon; both calcite and aragonite consist of calcium carbonate; and rutile, anatase and brookite consist of titanium dioxide. In such cases a knowledge of some other essential character, preferably the crystalline form, is necessary, before the mineral can be determined.

All the known chemical elements have been found in minerals; and of many of them minerals are the only source. On the other hand, nitrogen, which is frequently present in organic substances, is rare in minerals; carbon has a wide distribution in mineral carbonates. It is estimated that the minerals of the earth's crust consist of about 47% by weight of oxygen, 27 of silicon and 8 of aluminium; silicates, and especially alumino- silicates, therefore predominate, these being the more important rock-forming minerals.

The chemical composition of minerals is determined by the ordinary methods of analytical chemistry. Since, however, minerals of different kinds usually occur intimately associated, it is often a matter of some difficulty to select a sufficiency of pure material for analysis. For this reason the exact composi- tion and the empirical formulae of several minerals, particularly amongst the silicates, still remain doubtful. There are even cases on record in which the chemical composition and the crystalline form have been determined on different materials in the ,belief that they were the same. Whenever possible, therefore, the chemical analysis should be made on small pure crystals which have been previously determined crystallographi- cally. For the qualitative chemical examination of minerals, when only a small amount of material is available, the methods of blowpipe analysis and microchemical

analysis are often con- venient. (See G. J. Brush, Manual of Determinative Mineralogy, 16th ed., by S. L. Penfield, New York, 1903 ; H. Behrens, Manual of Microchemical Analysis, London, 1894.)

The principle of isomorphism (see Crystallography) is of the highest importance in mineralogy, and on it the classification of minerals largely depends. In some minerals (e.g. quartz) isomorphous or vicarious replacement is not known to occur;

but in the majority of minerals one or other of the predominating elements (generally the base, rarely that of the acid radicle) may be isomorphously replaced by equivalent amounts of other chemically-related elements. In some isomorphous groups of minerals replacement takes place to only a limited extent, and the element which is partly replaced always predominates; while in other groups the replacement rray be indefinite in extent, and between the ends of the series the different members may vary indefinitely in composition, with no sharp demarcation between species. Thus in the group of rhombohedral carbonates the different species are usually sharply defined. In well-formed crystals of calcite the calcium is replaced by only small amounts of magnesium, iron, lead, &c; in chalybite, however, iron is often more largely replaced by calcium, magnesium, manganese, &c, and the ” hrown spars ” are not always readily distin- guishable. In the dimorphous group of orthorhombic carbonates isomorphous replacement is less frequent, and the different species (aragonite, cerussite, &c.) are quite sharply defined. In other groups of minerals, particularly amongst the silicates, isomorphous replacement of the basic elements is so general that the several members of the series vary almost indefinitely in chemical composition, and will scarcely be the same for any two specimens, though it may be reduced to the same type of formula. For example, the formula of all varieties of garnet may be expressed generally as R”3R"‘2(Si0 4)3, where R” = Ca, Mg, Fe, Mn, and R”’ = Al, Fe, Mn, Cr, Ti. Tourmaline affords another good example. In the plagioclase felspars (see Plagioclase) we have an

example of the isomorphous mixing of two end-members, albite ($NaAlSi_3O_8$) and anorthite ($CaAl_2(SiO_4)_2$) in all proportions and with no sharp line between the several sub- species. In some other similar cases the end-members of the series are purely hypothetical: e.g. in the scapolite group (mixtures of $Ca_4Al_6Si_6O_{25}$ and $Na_4Al_3Si_9O_{24}Cl$) and in the micas and chlorites. In such instances, where the formulae of the two end-members differ in type, " mass effect " may have some influence on the isomorphism.

In addition to isomorphous series, there are amongst minerals several instances of double salts, which contain the same con- stituents as the members of isomorphous series: e.g. dolomite (q.v.) and barytocalcite (q.v.).

The manner in which water enters into the composition of minerals is often difficult to determine. In some cases, e.g. in the zeolites {q.v.), it is readily expelled at a low temperature, even at the ordinary temperature over sulphuric acid, and may be reabsorbed from a moist atmosphere or replaced by some other substances: it is then regarded as " water of crystalliza- tion." In other cases, when expelled only at a higher tempera- ture, it is to be regarded as " water of constitution," forming either a basic salt (e.g. malachite, $Cu(OH)_2CO_3$) or. an acid salt (e.g. dioptase, H_2CuSiO_4, and mica, q.v.). When present as hydroxyl it is often isomorphously replaced by fluorine (e.g. topaz, $[Al(F,OH)]_2SiO_4$). Sometimes the water is partly water of crystallization and partly water of constitution.

As to the actual chemical constitution of minerals the little that is at present known is mainly speculative. Dimorphous minerals, which have the same empirical formula may be expected to differ in constitution; and experiments have been made, for example on pyrites and marcasite, with the object of discovering a difference, but the conclusions of various investigators are not in agreement. More promising results have been obtained (by F. W.

Clarke and others) by the action of various reagents on silicates, particularly on the more readily decomposed zeolites, and several substitution-derivatives have been prepared.

Synthesis of Minerals. — The production of minerals by artificial means is a branch of chemical mineralogy which has been pursued with considerable success, especially by French chemists. Most minerals have been obtained artificially in a crystallized condition, and many related compounds, not as yet found in nature, have also been prepared. Crystals of artificially pre- pared minerals, though usually quite small in size, possess all the essential characters of natural crystals, differing from these only in origin. The following are the principles of some of the

methods which have been used: simple sublimation (e.g. arseno- lite); interaction of gases (e.g. haematite, from steam and ferric chloride; cassiterite, from steam and stannic chloride or fluoride) ; action of gases on liquids and solids; slow cooling of fused masses, either with or without the presence of agents miner alisaUurs (e.g. minerals in furnace slags) ; from aqueous solution sometimes at a high temperature and under pressure (e.g., quartz); electro- lysis; or even by subjecting dry amorphous material to enormous pressure. The chemical reactions by which various minerals have been obtained are often of considerable help in speculating as to their mode of origin in nature, though it must be born in mind that the same mineral may have been formed, both naturally and artificially, by more methods than one. In this direction important results have been obtained experimentally by J. H. van’t Hoff and his pupils on the formation of oceanic salt deposits, and by J. H. L. Vogt with slags. Many minerals used as gem-stones have been prepared artificially, e.g. diamond and ruby (see Gems: Artificial).

II. — Occurrence and Origin of Minerals.

While some minerals are of rare and sporadic occurrence in rock-cavities and mineral-veins, others are widely distributed as important constituents of rocks. The same mineral species may have several distinct modes of occurrence and origin, and be associated with different minerals in each case; facts which are well illustrated by quartz (q.v.).

Minerals of Igneous Rocks. — The rock-forming minerals of primary origin in igneous rocks have crystallized out from the magma, or fused silicate-mass, which on consolidation gave rise to the rock-mass. Magmas sometimes contain a considerable amount of water and are then in a state of aqueo-igneous fusion, rather than of dry fusion: in such cases very coarsely crystalline rocks (pegmatites) often result, and under these conditions minerals of many kinds are formed as well-developed crystals. Those minerals which are present in large amount in igneous rocks are distinguished as essential constituents, since it is on these that the classification of igneous rocks is largely based: the most important are quartz, felspars, pyroxenes, amphiboles, micas and olivines. Felspars of different composition are present in almost all kinds of igneous rocks, while quartz and olivine are characteristic of acid (e.g. granite, rhyolite) and basic (e.g. basalt, peridotite) rocks respectively. When the magma contains alkalies in relatively large amount the ” felspathoid ” minerals, nepheline and leucite, are formed (e.g. in nepheline- syenite, leucite-basalt, &c). Other minerals occurring as pri- mary constituents, but only in small amounts, are distinguished as accessory; thus small crystals of magnetite, apatite, zircon, &c, are of frequent occurrence disseminated in igneous rocks (see. Petrology). Sometimes these accessory constituents are concentrated by magmatic differentiation, important ore- deposits sometimes resulting in this manner (e.g. of chromite, or nickel-bearing pyrrhotite). The alteration of igneous rocks by weathering and other processes results in the

alteration of some or all of the primary minerals with the production of others, which are spoken of as secondary minerals: thus felspars are often partly or wholly altered to kaolin, olivine to serpentine, pyroxene and mica to epidote, chlorite, &c.

Minerals are also formed by the vapours given off by igneous magmas. The gases emitted by volcanoes and solfataras may deposit directly by sublimation, or by their chemical interaction, such minerals as sulphur, sal-ammoniac, haematite, which occur, for instance, as incrustations on Vesuvian lava: the boric acid of the Tuscan lagoons has also originated in this way. The effects produced by the exhalations of deep-seated magmas are more complex in character, since the vapours, being more confined, have more opportunity of acting chemically not only on the surrounding rocks but also on the igneous rock-mass itself before its final consolidation. A good example of the " pneumatolytic " action produced by the vapours from a mass of granitic magma is afforded by veins of tin-ore, in which the ore (cassiterite) is associated with minerals containing boron and fluorine, such as topaz, tourmaline, lepidolite, fluor-apatite

and fluor-spar. The production of such minerals may be accounted for by assuming the presence of stannic fluoride in the vapours, which by reacting on water vapour would deposit cassiterite with the liberation of hydrofluoric acid, and this would again react on other minerals. The topaz and tourmaline crystals often found in the cavities of granites and pegmatites have doubtless been formed in this manner. In a similar way the exhalations of basic magmas have- given rise to chlor-apatite with associated sphene and ilmenite, as, for example, in the extensive apatite veins in connexion with gabbro in southern Norway.

Minerals of Metamorphic Rocks. — By the baking action of a deep-seated igneous mass on the

surrounding rocks or on included rock-fragments, various new minerals are developed. By this process of thermal or contact-metamorphism well-crystallized examples of many minerals have often been formed; e.g. in calcareous rocks (limestones) , especially those containing some magnesia and silica, vesuvianite, garnet, diopside, tremolit€, wollastonite, &c, are developed; in argillaceous rocks (slates), chiastolite and staurolite are characteristic products; and in arenaceous rocks (sandstones), cordierite and sillimanite often result. The effects of pressure (dynamo-metamorphism) on rocks of various kinds, especially those of igneous origin, also result in the production of new minerals: e.g. pyroxene is trans-formed to amphibole, orthoclase to muscovite, plagioclase to zoisite, olivine to tremolite, &c. In gneisses and crystalline schists, quartz, felspar, mica, talc, amphibole, &c. are important constituents.

Minerals of Sedimentary Rocks. — By the weathering and disintegration of igneous and metamorphic rocks the various minerals set free and the products of decomposition of others supply the material of sedimentary rocks; thus sandstones consist largely of quartz, shales of kaolin and other clay minerals. Those minerals (e.g. gem-stones and gold) which resist the action of weathering processes are found as water-worn pebbles and grains in detrital deposits. Other sedimentary rocks consist of minerals deposited from solution either by chemical or organic agencies, from sea-water, lakes or springs: e.g. the calcite of limestones, deposits of bog-iron ore (limonite), gypsum, rock salt, &c.

Minerals Segregated in Veins and Rock-cavities. — Water per- colating through rock-masses takes up mineral matter in solution, and the solutions so formed may further react on the minerals composing the rocks. Such solutions will deposit some of their dissolved material in rock-cavities with the production of various minerals. For instance, the amygdaloidal cavities of basic volcanic rocks (e.g. basalt, melaphyre), especially when the rocks are

somewhat weathered, are frequently partly or completely filled with agate or beautifully crystallized zeolites, calcite, &c. The crevices and joint-planes of limestone become in this way coated with crystals of calcite, and those of siliceous rocks with quartz, giving rise to the abundantly occurring quartz- veins. In sedimentary rocks, pyrites, flint and other minerals become segregated round a nucleus of organic matter. The beautiful crystal-lined crevices in the crystalline rocks of the Alps have much the same origin, and so have the various types of ore-deposits, including metalliferous veins or lodes. In the latter cases, however, the solutions are no doubt sometimes of deep-seated origin and often connected with igneous and meta- morphic processes. Metalliferous veins are storehouses of crystallized minerals of almost every kind, some being the ores themselves and others, such as quartz, calcite, barytes, fluor- spar, being gangue minerals. By the weathering of the metallic minerals- of mineral- veins numerous other finely crystallized minerals result: for example, in the upper oxidized portion of veins of lead-ore (galena), crystals of anglesite, cerussite and pyromorphite are often met with; in veins of copper-ore the alteration of chalcopyrite gives rise to malachite, chessylite and cuprite.

Alteration of Minerals: Pseudomorphs. — Crystals which have been formed under one set of conditions of temperature and pressure and in the presence of certain solutions, will in many

cases be unstable under another set of conditions. The crystals may then be corroded or even completely redissolved, or the substance may undergo a chemical or physical change and give rise to the formation of other minerals which are stable under the new conditions. The results of such changes and alterations of minerals are very frequently to be observed in nature, and several instances have

already been cited in the preceding section. A good example of the secondary products which may result by the decomposition of a mineral is afforded by pyrites (FeS_2), of which two types of alteration may be distinguished. By oxidation in the presence of pure water it gives rise to ferrous sulphate (melanterite), free sulphur and sulphuric acid; the melanterite by further alteration gives various basic ferric sulphates (copiapite, &c); and the sulphuric acid by acting on surrounding rocks (limestone, clay, &c.) gives rise to the formation of gypsum, aluminite and other sulphates. By the action of water containing oxygen and calcium carbon- ate in solution, pyrites suffers another kind of alteration: the sulphur is carried away in solution as gypsum and the iron is left behind as a ferric hydroxide (limonite) which preserves the original form of the crystals. We have then a pseu- domorph (from xj/evSris, false and juop^q, form) of limonite after pyrites; i.e. limonite with the external form of a crystal of pyrites.

Pseudomorphs are frequently met with in nature, and they are of considerable importance in studying the changes which minerals undergo. Several kinds of pseudomorphs are to be distinguished. When the alteration has involved no change in chemical composition of the material, but only in the internal crystalline structure and physical properties, the altered crystal is called a ” paramorph.” For example, crystals of aragonite are often altered to a confused granular aggregate of crystalline individuals of calcite, the change being accompanied by an increase in specific gravity but without change in external form: such a change may be effected artificially by simply heating a crystal of aragonite. Other examples of paramorphs are rutile with the form of anatase, and hornblende with the form of augite. An ” epimorph ” results from the encrustation of one mineral by another; the first may be afterwards partly or wholly dissolved out, leaving the second as a hollow shell (e.g. chalybite after fluor-spar). As instances of pseudomorphs in which there has been some chemical change the

following may be cited: by the gain of chemical constituents, e.g. malachite after cuprite; by the loss of material, e.g. native copper after cuprite; or by an interchange of constituents, e.g. galena after pyromorphite and limonite after pyrites. In other cases there may be no evident chemical relationship between the two minerals, as, for exarnple, in pseudomorphs of native copper after aragonite or quartz after calcite. Different minerals may also take the form of various organic remains.

III.— Nomenclature and Classification of Minerals.

A mineral species, or simple mineral, is completely defined by the statement of its chemical composition and crystalline form. When we are dealing with a definite chemical compound the limitation of species is easy enough; thus corundum, cassiterite, galena, blende, &c. are quite sharply defined mineral species. But with isomorphous mixtures the division into species, or into sub-species and varieties, must be to a certain extent arbi- trary, there being no sharp lines of demarcation in many iso- morphous groups of minerals. Thus in the mineral tourmaline the chemical composition varies indefinitely between wide limits, but no corresponding difference can be traced in the crystalline form or in the external characters save colour and specific gravity. Some authors have therefore questioned the advisability of separating minerals into species each with distinctive names, and they have attempted to devise chemical names for the different kinds of minerals. Owing, however, to the frequency of polymorphism and isomorphism amongst mineral substances such a system presents many practical difficulties. Thus the three modifications of titanium dioxide are more simply and conveniently referred to as rutile, anatase and brookite, while

to give a purely chemical designation to such a mineral as tourmaline would be quite impracticable. Further, later investi- gations often show that such chemical names require revision, and hence confusion may arise.

The practice of giving distinct names to different kinds' of minerals dates from very early times (e.g. diamond). The common termination ite (originally itis or ites) was adopted by the Greeks and Romans for the names of stones, the names themselves indicating some character, constituent, or use of the stone, or the locality at which it was found. For example, haematite, because of the blood-red colour; siderite, containing iron; alabaster (originally alabastritis), a stone from which a vessel called an alabastron was cut; magnesite, from-the locality Magnesia. The custom of naming minerals after persons is of modern origin; e.g. prehnite, biotite, haiiyne, zoisite. Un- fortunately there is a lack in uniformity in the termination of mineral names, many long-established names being "without the termination tie, e.g. beryl, blende, felspar, garnet, gypsum, quartz, zircon, &c. The termination ine is also often used, e.g. nepheline, olivine, serpentine, tourmaline, &c; and many others were introduced by R. J. Haiiy without much reason, e.g. anatase, dioptase, epidote, analcime, sphene, &c. (see A. H. Chester, A Dictionary of the Names of Minerals, New York, 1896).

The number of known mineral species differs, of course, according to different authors; roughly there may be said to be about a thousand. The total number of mineral names (apart from chemical names), many of them being applied to trivial varieties or given in error, amount to about 5000.

Minerals may be classified in different ways to suit different purposes; thus they may be classified according to their uses, modes of occurrence, system of crystallization, &c. The earlier systematic classifications, being based solely on the external characters of minerals, were on natural history principles and too artificial to be of any value. J. J. Berzelius, in 181 5, was the first to propose a purely chemical system of classification: his primary divisions depended on the basic (electro-positive) element and the sub-divisions on the acid (electro-negative) element. Such a method of classification, though still in use for metallic

ores, must be quite arbitrary or give rise to much duplication; since, apart from isomorphous replacement, many minerals contain more than one metal. The systematic classi- fications in use at the present day are modifications in detail of the crystallo-chemical system published by G. Rose in 1852. Here there are four main divisions, viz. elements; sulphides, arsenides, &c; halogen compounds; and oxygen compounds: the last, and largest, division is subdivided into oxides and according to the acid (carbonates, silicates, sulphates and chromates, phosphates and arsenates, &c); in each section isomorphous minerals are grouped together. The classifications adopted by different authors differ much in detail, especially in the large section of the silicates, which presents many difficulties and for which no satisfactory classification has yet been devised.

As an example of a systematic classification of minerals the following may be given. Except in a few details it is the classification of Dana's System of Mineralogy (6th ed., 1892). Only those minerals which are described under their respective headings in these volumes are included : the list therefore serves, at the same time, as an enumeration of the more common and important species and varieties of minerals, and as a system of classification it is necessarily incomplete. Species belonging to the same isomorphous group are bracketed together: varieties are given in parentheses after the species to which they belong. The chemical composition of each species is given by the formula; and the crystal-system by the initial letters C (cubic), T (tetra- gonal), O (orthorhombic), M (monoclinic), A (anorthic), H (hexa- gonal) and R (rhombohedral) : when the crystal class is definitely known to be some other than the holosymmetric this is indi- cated by a number corresponding to those used in the article Crystallography, e.g. C2 for the tetrahedral class of the cubic system.

I— NATIVE ELEMENTS.

1. Non-Metals.

Diamond . . . C

(Bort, Carbonado)

Graphite . C

Sulphur . . . . S

2. Semi-Metals.

("Arsenic . . . .As

■\ Antimony . Sb

[Bismuth . . . . Bi

3. Metals.

fGold . . . . Au

J Silver . . . . Ag

"] Copper …. Cu

[Platinum . . . Pt

II.— SULPHIDES, ARSENIDES, TELLURIDES, ETC.

1. Of the Semi-Metals.

R O

R R R

C C C C

Realgar j Stibnite J Bismuthite

Tetradymite

Molybdenite 2. Of the Metals.

A. Monosulphides, &c. J Argentite .

(Galena

Copper-glance

Blende

Cinnabar .

Covellite .

Greenockite ("Millerite . . . i Niccolite . [_
Pyrrhotite

B. Intermediate Division.

Erubescite Chalcopyrite .

C. Disulphides, &c. f Pyrites

-J Smaltite [Cobaltite .

Marcasite .

Mispickel

Sylvanite .

AsS M

Sb 2 S 3 O

Bi 2 S 3 . ■ .- . . . ■■ . .0 Bi 2 Te 2 S R

MoSj

Ag 2 S .

PbS .

Cu 2 S .

ZnS .

HgS .

CuS .

CdS .

NiS .

NiAs .

FenS, 2 .

R

C C O C2

R3

H

R2

R

R

R

m.-

Freieslebenite

Bournonite

Pyrargyrite

Proustite .

Tetrahedrite

Stephanite

Stannite

Argyrodite

1. Anhydrous.

Salt _ . .

Sylvite

Cerargyrite

Fluor-spar

Cryolite

2. OXYCHLORIDES.

Atacamite

Cu 5 FeS4 C

CuFeS 2 T2

FeS 2 C 3

CoAs 2 C3

CoAsS C3

. . FeS 2 O

. . FeAsS O

. . AuAgTe 4 M

SULPHO SALTS.

(Pb,Ag 2) 6 Sb4Sn . . . . M

PbCuSbS 3 O

Ag 3 SbS 3 R2

Ag 3 AsS 3 R2

Cu 3 SbS 3 C2

Ag 5 SbS 4 O2

Cu 2 FeSnS4 T2

Ag 8 GeS 6 C

IV.— HALOIDS.

NaCl C

KC1 C4

Ag(Cl,Br,I) C

CaF 2 C

Na 3 AlF 6 M

Cu 2 Cl(OH) 3 O

V.— OXIDES.

1. Oxides of Silicon.

Quartz …. Si0 2 R3

(Agate, Amethyst, Avanturine, Bloodstone, Cairngorm, Carnelian, Cat's-eye, Chalcedony, Chrysoprase, Heliotrope, Jasper, Mocha-stone, Onyx, Rock-crystal, Sard, Sardonyx.) Tridymite . . . Si0 2 . 0(?)

Opal Si0 2 +wH 2

Oxides of the Semi-Metals. Oxides of the Metals. A. Anhydrous Oxides.

a. Monoxides.

Cuprite …. Cu 2 . Zincite …. ZnO Melaconite . . . CuO .

b. Sesquioxides. C Corundum . . . A1 2 3 .

J (Asteria, Emery, Ruby, Sapphire.)

I Haematite . . . Fe 2 3 .

Amorphous

Lllmenite 1

. . R2

. . M

. . R

. . R FeTi0 3 R4

1 Often classed with the titanates.

c. Intermediate Oxides. 2

(Spinel . J Magnetite 1 Franklinite

[Chromite . Chrysoberyl

d.

(Alexandrite, Cymophane) Dioxides.

MgAl 2 4 C

FeFe 2 4 C

(Fe,Zn,Mn)(Fe,Mn)ii04 . . C

(Fe,Mg)(Cr,Fe) 2 4 . . . C

BeAl 2 04 O

S Cassiterite } Rutile . .

Anatase

Brookite

Pyrolusite .

Pitchblende 3 B. Hydr us Oxides. fDiaspore . J. Goethite [Manganite

Limonite .

Bauxite

Brucite

Psilomelane (Wad)

Sn0 2 Ti0 2 Ti0 2 Ti0 2 MnQ 2

T

T T O

?

(U,Th)0 2 C

AIO O

FeO(OH) O

MnO(OH) O

Fe 2 3 .3H 2 . . Amorphous A1 2 3 .2H 2 0? . .

Mg(OH) 2 R

aMn0 2 (>'BaO-r-H 2 Amorphous

VI.— OXYGEN SALTS.

Carbonates.

A. Anhydrous. Calcite …. CaC0 3 .

(Satin-spar) Dolomite . Ankerite Magnesite Chalybite . Rhodochrosite . .. Calamine .

(Aragonite . Alstonite . Witherite . . Strontianite Cerussite . Barytocalcite Parisite Phosgenite

B. B a sic Carbon

Malachite Azurite 2. Silicates.

A. Anhydrous Silicates, a. Disilicates, R"Si 2 0,

R

d

c

u

c3

Bt

cU

a

O <

fa

a)

Oh

b.

Petalite Orthoclase

(Moon-stone) Microcline

(Amazon-stone) Albite NaAlSi 3 0:

.. CaMg(C0 3) 2 R 4

. Ca(Mg,Fe)(C0 3) 2 . . . R

. MgC0 3 R

. FeC0 3 …. : R

. MnC0 3 … .’ . R

. ZnCO, R

. CaC0 3 O

. (Ca,Ba)C0 3 O

. BaC0 3 O

. SrC0 3 O

. PbC0 3 O

. CaBa(C0 3) 2 M

. (CeF) 2 Ca(C0 3) 3 . . . . H

. (PbCl) 2 C0 3 T

ates.

. Cu 2 (OH) 2 C0 3 . . . . M . Cu 3 (0H) 2 (C0 3) 2 . . . M

Poly silicates, R’SisOs.

LiAl(Si 2 6) 2 M

KAlSi 3 8 M

KAlSi 3 8 A

Oligoclase

(Sun-stone) Andesine . . Labradorite Bytownite

Anorthite . . . . Metasilicates, R”Si0 3 . Leucite ….

Ab 6 Ani to Ab 3 Ani

Ab 3 Ani to AbiAni AbiAni to AbiAn 3 AbiAn 3 to AbiAn 6 CaAl 2 Si 2 8 . .

A A

A A

A A

KAl(Si0 3) 2

Pollux . . . . . H 2 Cs 4 Al4(Si0 3) 9

Pseudo-C C

O

a

fEnstatite . . . MgSi0 3 O

Bronzite …. (Mg,Fe)Si0 3 O

Hypersthene . . . (Fe,Mg)Si0 3 O

Diopside …. CaMg(Si0 3) 2 M

Augite …. J Ca(Mg,Fe)(SiO s) 2 . .)■.,

(Diallage) } with(Mg,Fe)(Al,Fe) 2 SiO, J M Acmite …. NaFe"'(Si0 3) 2 . . . . M Spodumene . . . LiAl(Si0 3) 2 M

(Hiddenite, Kunzite)

J3 O

a >;

so

<

Jadeite . _ . . . . NaAl(Si0 3) 2 . . Wollastonite . . . CaSi0 3 Rhoddnite . . . MnSiOs . . . Tremolite …. CaMg 3 (Si0 3)4 [Actinolite] . . . Ca(Mg,Fe) 3 (Si0 3) 4 (Asbestos, Nephrite)

Hornblende

rCa(Mg,Fe) 3 (Si0 3) 4 . . J. with NaAl(Si0 3) 2 .

[and (Mg,Fe)(Al,Fe) 4 (SiO,)i . NaFe(Si0 3) 2 .FeSi0 3

M M A

M M

M

M

Crocidolite

Beryl ….. Be 3 Al 2 (Si0 3) 6 H

(Aquamarine, Emerald) Intermediate. Iolite H 2 (Mg,Fe)4Al 8 Si 10 O 3 7 . . O

2 Often classed as aluminates.

3 Usually classed as a uranate.

d. Orlhosilicates, R’&iOi. Nepheline . Sodalite [Lazurite] .

(Lapis-lazuli) - [Grossularite]

(Cinnamon-stone) Pyrope Almandine [Andradite]

(Demantoid) Olivine

(Mg,Fe) 2 Si0 4 . . . . O (Chrysolite, Peridot)

. Be 2 SiO„ R4

. Zn 2 Si0 4 R4

. H 2 CuSi0 4 R4

J 7wCa 4 Al 6 Si 6 2 5 1 Tn t reNa 4 Al 3 Si 9 24 Cl f * – *

. H 2 Ca 5 (Al,Fe) s Si 5 0i 8 . . . T

. ZrSi0 4 T

Jacinth, Jargoon)

ThSi0 4 T

CaB 2 (Si0 4) 2 O

[Al(F,OH)] 2 S:0 4 . . . . O

Al 2 Si0 6 O

Al 2 Si0 5 O

AUSiOs A

{Phenacite Willemite . Dioptase .

Scapolite .

Vesuvianite C Zircon . -J (Hyacinth

[Thorite

{Danburite . Topaz Andalusite , Sillimanite . Cyanite J Datolite . ™^ Euclase Zoisite Epidote Axinite Prehnite e. Subsilicates. Humite Hemimorphite Tourmaline

(Rubellite Staurolite . B. Hydrous Si Apophyllite Heulandite Phillipsite . Harmotome Stilbite . Chabazite . Analcite

(Bole, Clay) Pyrophyllite Allophane Chrysocolla C. Titan o-s i Heat Sphene Perofskite

NlOBATES, TANTALATES,

Columbite Phosphates, Arsenates,

a

3

£ O

K 2 Na 6 Al 8 Si 9 O si H5

Na«(AlCl)Al,(Si0 4)» . . C

Na«(NaS,.Al)Al,(SiO0i . C

Ca 3 Al 2 (Si0 4) 3 C

Mg 3 Al 2 (Si0 4) 3 C

Fe 3 Al 2 (Si0 4) 3 C

Ca 3 Fe 2 (Si0 4) 3 . C

HCaBSiOs …. HBeAlSiOe …. Ca 2 (A10H)Al 2 (Si0 4) 3 . Ca 2 (A10H) (Al,Fe) 2 (Si0 4) 3 HCa 3 BAl 2 (Si0

4) 4 . . H 2 Ca 2 Al 2 (Si0 4) 3 . .

M M O M A O2

. Mg 5 [Mg(F,OH)] 2 (Si0 4) 3 . . O

. H 2 Zn 2 SiO s 02

. (H 2 ,Na 2 ,Mg) 3 (Al,Fe) 6 (BOH) 4

Si 8 38 R2

. HFeAl 6 Si 2 0, 3 O

icates.

. H 7 KCa 4 (Si0 3) 8 +4|H 2 . . T

. H 4 CaAl 2 (Si0 3) 6 +3H 2 . . M

. (K 2 .Ca)Al 2 (Si0 3) 4 +4H 2 . M

. H 2 (K 2 ,Ba)Al 2 (Si0 3) 6 +5H 2 M

. (CaAl 2 (Si0 3) c +6H 2 . . M

. (Ca,Na 2)Al 2 (Si0 4) 2 +4H 2 0,&c.R

. NaAl(Si0 3) 2 +H 2 . . . C

. Na 2 Al 2 Si 3 Oio+2H 2 . . . O

. CaAl 2 Si 3 O, +3H 2 O . . . M3

. H 2 KAl 3 (Si0 4) 3 . . . . M

. KLi[Al(OH,F) s]Al(SiOj) 3 . M

. (H,K) 2 (Mg,Fe) 2 Al 2 (Si0 4) 3 ,&c.M

. [H,K,(MgF)] 3 Mg 3 Al(Si0 4) 3 M

. H 2 (Fe,Mg)Al 2 Si0 7 ,&c. . . M

. H 8 (Mg,Fe) 6 Al 2 Si 3 0i 8 ,&c. . M

. H 4 Mg 3 Si 2 9 M

. H 2 Mg 3 (Si0 3) 4 . . . . M

. H 4 Mg 2 Si 3 Oio . . Amorphous

. H 4 Al 2 Si 2 9 M

. HAl(Si0 3) 2 M?

. Al 2 Si0 6 +5H 2 . Amorphous

. CuSi0 3 +2H 2 . Titanates.

CaTiSiOs M

CaTi0 3 . . Pseudo-C

e s,

(Fe,Mn)(Nb,Ta) 2 6

&c.

A. Anhydrous Phosphates, &c.

Monazite Beryllonite

{Apatite (Phosphorite) Pyromorphite Mimetite . Vanadinite Amblygonite Basic P h s p h J Olivenite . I Descloizite. Clinoclasite

C. Hydrous Phosphates, &c.

f Vivianite -I Erythrite . L Annabergite .

Wavellite .

Turquoise .

Pharmacosiderite

(Ce,La,Di)P0 4 . . . NaBeP0 4 . . . . . [Ca(F,Cl)]Ca 4 (P0 4) 3

. (PbCi)Pb 4 (P0 4 > 3 . (PbCl)Pb 4 (As0 4) 3 . (PbCl)Pb 4 (V0 4) 3 . Li(AlF)P0 4 . . ates, &c.

. Cu 2 (OH)As0 4 . . (Pb,Zn) 2 (OH)V0 4 Cu 3 (OH) 3 As0 4 .

. O

M O H2

H2 H2 H2 A

O O

M

Fe 8 (P0 4) 2 +8H 2 . . . M Co 3 (As0 4) 2 +8H 2 . . . M . Ni 3 (As0 4) 2 +8H 2 . . . M . Al,(OH) s (P0 4) 2 +4lH 2 0. . O [A!(OH) 2 ,Cu(OH),H] 3 P0 4 Amorph. . Fe 3 (OH)3As0 4 +5H 2 . . £2

(Fe,Mn)Al(OH) 2 P0 4 +H 2 O

Cu 3 Al 4 (OH)i 5 (As0 4) 5 +2oH 2 M

Cu(U0 2) 2 (P0 4) 2 +i2H 2 0. . T

Ca(U0 2) 2 (P0 4) 2 +i2H 2 0. . O

Pseudo-C2 . . M . . M

O

Childrenite

Liroconite . (Torbernite (Autunite .

5. Borates.

Boracite …. Mg 7 Cl 2 Bi 6 O 30 Colemanite . . . Ca 2 B 6 0n +5H5O . Borax Na 2 B 4 7 + ioH 2 0.

6. Nitrates.

Nitre KN0 3 ….

7. Sulphates and Chromates.

A. Anhydrous Sulphates, &c.

f Barytes …. BaS0 4 O

-{ Celestite …. SrS0 4 O

[Anglesite …. PbS0 4 O

Anhydrite CaS0 4 O

Crocoite …. PbCr0 4 M

B. Basic Sulphates.

Brochantite . . . Cu 4 (OH) 6 S0 4 …. O

C. Hydrous Sulphates.

Gypsum …. CaS0 4 +2H 2 . . . . M Alunite …. KA1 3 (S0 4) 2 (0H) 6 . . . . R Jarosite …. KFe 3 (S0 4) 2 (OH) 6 . . . R

D. Sulphates with Chlorides, Carbonates, &c.
Connellite …. Cui 6 (Cl,OH) 4 S0 16 + i5H 2 . H
Leadhillite . . . Pb 4 S0 4 (C0 3) 2 (OH) 2 . . . O

8. Tungstates, Molybdates.

Wolframite . . . (Fe,Mn)W0 4 M

< Scheelite …. CaW0 4 T3

I Wulfenite …. PbMo0 4 T4

VH.— HYDROCARBON COMPOUNDS.

1. Simple Hydrocarbons.

Hatchettine, Ozocerite.

2. Oxygenated Hydrocarbons.

Amber, Retinite, Copaline, Bathvillite, Dopplerite.

3. Appendix to Hydrocarbons.

Petroleum, Asphaltum, Bitumen, Elaterite, Albertite, Coal, Anthracite, Jet, Lignite.

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MINERAL WATERS. No absolute line of demarcation can be drawn between ordinary and mineral waters. There is usually in the latter an excess of mineral constituents or of temperature, but some drinking waters contain more mineral constituents than others that are called mineral waters, and many very pure waters, both cold and warm, have been regarded for ages as mineral springs.

As to the origin of mineral waters, there is much in what the elder Pliny said, that waters are such as

the soil through which they flow. Thus in limestone and chalk districts an excess of lime is usually present; and the waters of a particular district have much resemblance to each other — as in the Eifel, in Auvergne, and in the Pyrenees. But this is only a partial explanation, for waters are by no means necessarily uniform throughout a particular geological formation. We do not know with any certainty the depth from which various mineral waters proceed, nor the various distances from the surface at which they take up their different mineral constituents.

The source of the temperature of thermal waters remains a subject of much uncertainty. Among the assigned causes are the internal heat of the globe, or the development of heat by chemical or electrical agencies in the strata through which they arise.

Their occasional intermittence is doubtless often dependent on the periodical generation of steam, as in the case of the Geysers. A few geological facts are certain, which bear on the origin of mineral waters. Such springs are most abundant in volcanic districts, where many salts of soda and much carbonic acid are present. They occur most frequently at meetings of stratified with unstratified rocks, in saddles, and at points where there has been dislocation of strata.

The diffusion of mineral waters is very extended. Pliny was quite correct in observing that they are to be found on alpine heights and arising from the bottom of the ocean. They are found at the snow in the Himalayas and they rise from the sea at Baiae and Ischia. They are to be found in all quarters of the globe, but more particularly in volcanic regions, as in the Eifel and Auvergne, in the Bay of Naples, and parts of Greece, in Iceland, New Zealand and Japan. But there are few countries in which they are not to be found, except in very flat ones, and in deltas of rivers — for instance, in the north of France, where they are very few, and in Holland, from which they are absent. France, Germany, Italy and Spain, as well as Greece, Asia Minor, and the

Caucasus, are all rich in mineral waters. The British Isles have a fair though not very large proportion of them. There are a few in Sweden and Norway. They are abundant in the United States, less so in Canada. They are found in the Azores and in the West India Islands. Of their occurrence in the interior of Africa or of Australia we know little; and the same is true of South America. But they are met with in Algiers, in Egypt, and in the Holy Land. The vast Indian peninsula has for its size a comparatively small supply.

Mineral waters, when analysed, are found to contain a great many substances, although some of them occur only in very minute quantities: soda, magnesia, calcium, potash, alumina, iron, boron, iodine, bromine, arsenic, lithium, caesium, rubidium, fluorine, barium, copper, zinc, manganese, strontium, silica, phosphorus, besides extractive matters, and various organic deposits known under the name of glairin or baregin. Of gases, there have been found carbonic acid, hydrosulphuric acid, nitrogen, hydrogen, oxygen and ammonia. Of all these by far the most important in a therapeutic point of view are sodium, magnesia and iron, carbonic acid, sulphur, and perhaps hydro- sulphuric acid. These substances, detected separately by chemists, are in, their analyses combined by them into various salts, if not with absolute certainty, undoubtedly with a close approximation to it. Those combinations are very numerous, and some waters contain ten to twenty of them; but there are

always some predominating ones which mark their character, while many of them, such as caesium, rubidium, or fluorine, occur in mere traces, and cannot be assumed to be of any real importance. Mineral waters therefore resolve themselves into weaker or stronger solutions of salts and gases in water of higher or lower temperature. For medical purposes they are used either externally or internally. As the quantity of salts present commonly bears but a very small proportion to that of the fluid containing them, water becomes a very influential agent in mineral-water treatment, about

which it is therefore necessary to say something.

For the action of mineral- water baths see Balneothera- peutics. According to the most generally received opinion, the cutaneous surface does not absorb any portion of the salts in a mineral- water bath, although it may absorb a little gas (and alkaline water, for instance, at most acting as a slight detergent on the skin), and that neither salts nor gases have any action on the system, except as stimulants of the skin, with partial action on the respiratory organs.

It seems to be ascertained that drinking considerable amounts of cold water reduces the temperature of the body, diminishes the frequency of the pulse, and increases the blood pressure temporarily. Water when introduced into the stomach, especi- ally if it be empty, is quickly absorbed; but, although much of the water passes into the veins, there is no proof that it ever produces in them, as is sometimes supposed, a state of fluidity or wateriness. Therapeutically, the imbibition of large quantities of water leads to a sort of general washing out of the organs. This produces a temporary increase of certain excretions, aug- mented diuresis, and a quantitative increase of urea, of chloride of sodium, and of phosphoric and sulphuric acids in the urine. Both the sensible and the insensible perspirations are augmented. A draught of cold water undoubtedly stimulates the peristaltic action of the intestines. On the whole water slightly warm is best borne by the stomach, and is more easily absorbed by it than cold water; and warm waters are more useful than cold ones when there^ is much gastric irritability. In addition to the therapeutic action of mineral waters, there are certain very important subsidiary considerations which must not be overlooked. An individual who goes from home to drink them finds himself in a different climate, with possibly a considerable change in altitude. His diet is necessarily altered, and his usual home drinks are given up. There is change in the hours of going to bed and of rising. He is relieved from the routine of usual duties, and

thrown into new and probably cheerful society. He takes more exercise than when at home, and is more in the open air, and this probably at the best season of the year. So im- portant has this matter of season and climate been found that it is an established axiom that waters can be used to the greatest advantage during the summer months and in fine weather, and during the periods most convenient for relaxation from business. Summer is therefore the bath season, but of late years provision has been made in many places, with the aid of specially con- structed rooms and passages, for carrying out cures satisfactorily during the winter season, e.g. at Aix-la-Chapelle, Wiesbaden, Baden Baden, Baden in Switzerland, Dax, Vichy and Bath. The ordinary bath season extends from the 15th of May to the 20th or 30th of September. The season for baths situated at con- siderable elevations commences a month later and terminates some ten days earlier. Mineral waters may be employed at home, but patients seldom so use them; and this necessarily limits the time of their use. It is common to declare that the treatment should last for such or such a period. But the length of time for which any remedy is to be used must depend on its effect, and on the nature of the particular case. It is found, however, that the continued use of mineral waters leads to certain disturbances of the system, which have been called crises, such as sleeplessness, colics and diarrhoea, and to skin eruptions known as la poussee. This cause, and also certain peculiarities of the female constitution, have led to the period of three weeks to a month being considered the usual period for treatment. A certain after-treatment is often prescribed — such as persistence

in a particular diet, visiting springs or climates of a different and usually of a tonic character, or continuing for a certain time to drink the waters at home. It may be added that the advantage of having recourse to mineral waters is often felt more after

than during treatment.

Since improved methods of bottling have been discovered, and the advantage of an additional supply of carbonic acid has been appreciated, the export of waters from their sources has increased enormously, and most of the principal waters can now be advantageously used at home. It may be added that many of the artificial imitations of them are excellent.

The history of the use of mineral waters can only just be

a good deal of nitrogen in some of them; the quantity of hydro- sulphuric acid, even in strong sulphuric waters, is wonderfully small; but the volume of carbonic acid present is often very large — for instance, in the case of Kissingen, Schwalbach and Selters. The immediate effect of the carbonic acid which they contain is that of pleasant stimulation to the stomach and system. Extremely little appears to be known of its actual operation on the system: a part of what is swallowed is returned by eructation, and a part passes on to the intestines; whether any appreciable quantity reaches the blood is doubtful. There is no question that carbonic acid increases diuresis. Practically it is found to aid digestion, helping the functions of the stomach, and in

Table I

— Typical Mineral Waters.

Indifferent.

Earthy.

Salt.

Salt.

Sulphur.

Iron.

Alkaline.

Alkaline-

Table

Purging

Gastein. 95°-li8°.

Leuk. 123-8°.

Kissingen.

Sea-Water.

Aix-Ia- Chapelle. U3°-i40°.

Schwalbach.

Vichy. 105 -8°.

Saline. Carlsbad. ii9°-i38°.

Water. Seltzers.

Water.

Hunyadi

Janos.

Solids.

Bicarbonate of soda .

—

— ■

—

0-6449

0-0206

4-883

I-92

1-2

.

„ potash .

— ■

—

—

—

—

—

0-352

—

—

„ magnesia

0-0017

0-013

0-017

o-45

0-0506

0-2122

0-303

0-18

—

„ calcium .

0-0195

O-0I2

1-06

2-38

0-157

0-2213

0-434

0-428

— .

Sulphate of soda .

O-02O8

0050

—

— ■

0-2831

O-O079

0-292

2-37

15-9

„ potash .

0-0135

0-038

— ■

—

0-1527

0-0037

—

0-16

— .

„ magnesia

—

0-308

0-588

2-96

—

—

—

—

0-46

16-0

„ calcium .

— .

1-520

0-389

0-25

—

—

—

— .

Sulphide of sodium .

—

0–0136

—

—

—

—

Chloride of sodium .

0–0428

5–52

25–21

2–616

—

0–534

1–03

2–2

I– 3

„ potash

—

0–286

—

—

—

—

„ magnesia

— ■

0-303

3-39

—

—

—

— .

—

Carbonate of iron

0-0005

0-023

0-277

—

—

0-0837

—

0-003

0-01

. — .

Silicic acid ….

0-0496

0-036

—

—

—

0–0320

—

—

—

Gases.

Carbonic acid

— ■

3–19

— ■

—

5–35

2–6

0–76

2–24

°–45

Hydrosulphuric acid

■

trace

—

—

alluded to. They have been employed from the earliest periods, and traces of Roman work have been

found at most of the European baths which are now in favour — at almost all the thermal ones. Occasionally new springs are discovered in old countries, but the great majority of them havet>een long known. Warm waters, and those containing small quantities of mineral constituents, appear to have remained more steadily in favour than any other class within the appropriate sphere of mineral waters, which is limited to the treatment of chronic disease.

The attempt has been made to range mineral waters according to their therapeutic action, according to their internal or external use, but most generally according to their chemical constituents so far as they have been from time to time understood; and a judicious classification undoubtedly is a help towards their rational employment. But their constituents are so varied, and the gradations between different waters are so finely shaded off, that it has been found impossible to propose any one definite scientific classification that is not open to numberless objections. Thus a great many of the sulphur waters are practically earthy or saline ones. Yet because they contain very minute amounts of such a gas as hydrosulphuric acid, an ingredient so palpable as always to attract attention, it is considered necessary to class them under the head of sulphur. The general rule is to attempt to class a water under the head of its predominant element; but if the amount of that be extremely small, this leads to such waters as those of Mont Dore being classified as alkaline or arseniated, because they contain a very little soda and arsenic. The classification in the following table, which is that usually adopted in Germany, has the merit of comparative simplicity, and of freedom from theoretical considerations which in this matter influence the French much more than the German writers. The more important constituents only are given. The amount of solid constituents is the number of parts to one thousand parts of the water; the temperature of thermal springs is added. The waters are classified as indifferent, earthy, salt,

sulphuretted, iron, alkaline, alkaline-saline — with subvarieties of table waters and purging waters.

In addition to their solid constituents, gas is present in many waters in considerable quantity. There is a little oxygen and

a slight degree the peristaltic action of the intestines. The increased flow of urine may be caused by its favouring the absorption of water by the stomach. In some baths carbonic acid is so abundant that precautions have to be taken to prevent Table II.’ — Indifferent Waters.

Locality.

Evian, Lake of Geneva

Badenweiler, Baden .

Buxton, England . Schlangenbad, Nassau

Sacedon, Spain .

Wildbad, Wiirttem-) berg . . . J Pfeffers,
Switzerland Ragatz, do.

Panticosa, S. Pyrenees

Teplitz, Bohemia. Gastein, Austria .

Height in Ft.

1425 980 800

1500

1320 2115 1570

51 10

648

3315

Temp. °Fahr.

82 80-87

85

90-101

99 95

85-95

101-120

95-118

For what prescribed.

Nervous cases, dyspep- sia, urinary affections.

For mild rheumatic treatment ; a health resort.

Gout and rheumatism (nitrogen present).

Nervous cases, female disorders, skin.

Rheumatism, gout, cu- taneous affections.

Gout and rheumatism, neuralgia, thickenings. Do. do. do.

Do. do. do.

Do. (nitrogen present) ; special action in phthisis.

Gout, rheumatism, old injuries, joints or bones.

Do. do. ; soothes nervous system.

its tendency to accumulate on account of its heavy specific gravity. Carbonic acid gas, used as a bath, proves stimulating to the skin and to the general system; but its employment has not answered the expectations formed of it.

Indifferent Waters scarcely vary in chemical qualities from ordinary drinking water ; but they are usually of higher temperature. Their therapeutic action, which is mainly exercised through baths,

1 In this and the following tables a selection is given of some of the best-known mineral waters in various European countries that possess establishments. Their chief peculiarities of elevation, of temperature and constituents are briefly noted. The curative effects, necessarily alluded to very generally, are those usually attributed to them.

has been explained on the theory of peculiarities of their electric or thermal condition, about which we know nothing definite, and on the presence in some of them of a large quantity of nitrogen. It has also been ascribed to the various organic substances in some of them, such as glairin, which when collected is sometimes useful as a cataplasm. These waters are not often much drunk, but any efficiency they may have in dyspepsia and perhaps in neuralgic diarrhoeas must be attributed to the favourable action of hot water on the digestion. The waters of this class, especially the hotter ones in the form of baths, are extremely useful in resolving the effects of inflammation, in thickenings of the joints and in chronic rheumatism and gout. They also are often effective, especially the cooler ones, in neuralgia and in some hysterical affections. They are sometimes prescribed in urinary affections, in which case they probably assist by dilution. The effects of many of these waters are aided by the baths often being situated at considerable elevations and in out-of-the-way spots, whence the Germans called them Wildbader. They are very widely diffused, being found in all quarters of the globe, especially in volcanic districts. There are many in New Zealand; in America the hottest are in the west and in California.

Earthy Waters. — These differ chiefly from the indifferent waters in containing an appreciable quantity of salts, among which sul- phate or carbonate of lime or of magnesia predominates. The

great majority of them are of high temperature. They produce the same effects as the indifferent waters, but are perhaps less efficacious in neuralgic affections, while they are more employed in some of the chronic scaly eruptions. There was formerly a tendency to consider these waters useful in urinary affections; but at the present day it is only the colder ones that have come into repute for the expulsion of gravel and biliary calculi and in the treat ment of affections of the bladder generally. Some of them have also of late years been considered to exercise a favourable influence on scrofula, and to be useful in the early stages of pulmonary phthisis. This has been attributed to the salts of lime present in them, although it is known that most of its salts pass through the system unaltered. Many of these baths, such as Leuk and Bormio, enjoy the advantages of great elevation, but Bath, otherwise one of the best of them, lies low.

Table III. — Earthy Waters.

Locality.

Contrexdville, Vosges

Lippspringe, N. 1 Germany . . . $

Wildungen, do.

Weissenberg, Swit-) zerland . . .)

Pougues, France .

Baden, Switzerland .

Leuk, do.

Bormio, North Italy Lucca, Italy . Bath, England . Dax, south of France B. de Bigorres, Pyr- { enees •
i

Height in Ft.

1050

2600 600

1 180

4400 4400

1400 1800

Temp. Fahr.

1 17-122

93-123 86-104 108-122 108-122

139 64-123

Therapeutic Action.

j Special action in cal- / culous affections. (Supposed to be use- / f ul in phthisis. (“Special use in urin- ■j ary complaints ; (contains iron. j Resorted to for pul- (monary affections. (Dyspepsia.diabetes, •j hepatic and urin- (ary concretions. (Rheumatism, gout, •j paralysis, scaly (eruptions. (Do., some female J complaints. Do. do. ; old sprains. Do. do. do.

Do. do. do.

Do. do.

(Do. ; chlorosis, neu- (ralgia.

Salt Waters are so called from containing a predominant amount of chloride of sodium. They also generally contain chlorides of magnesia and of lime, and occasionally small amounts of lithium, bromine and iodine. They further often contain a little iron, which is an important addition. The great majority of the drinking wells have a large supply of carbonic acid. There are cold and hot salt springs. Sometimes they are used for drinking, sometimes for bathing ; and the double use of them is often resorted to.

The normal quantity of common salt consumed daily by man is usually set down at about 300 grains. The

maximum quantity likely to be taken at any well may be 225 grains, but commonly not more than naif of that amount is taken. The increase to the usual daily amount is therefore probably not much more than one-third. Still it may be presumed that the action of a solution of salt on an empty stomach is different from that of the same amount of salt taken with food. Salt introduced into the stomach excites the secretion of gastric juice and favours the peristaltic actions, and when taken in considerable quantity is distinctly aperient. We thus see how it is useful in dyspepsia, in atony of the stomach and intestines, and sometimes in chronic intestinal catarrh. Salt when absorbed by the stomach appears again in the urine, of which it

increases the amount both of fluid and of solid constituents, especi- ally of the urea. It seems, therefore, to be pretty certain that considerable quantities of salt taken into the circulation increase the excretion of nitrogenous products through the urine, and on the whole accelerate the transformation of tissue. Salt is thus useful in scrofula by stimulating the system, and also in anaemia, especially when iron is also present. In some German stations, as at Soden, carbonated salt waters are considered to be useful in chronic laryngitis or granular pharyngitis.

Baths of salt water, as usually given, rarely contain more than 3 % of chloride of sodium, some of the strongest perhaps from 8 to 10%. Their primary action is as a stimulant to the skin, in which action it is probable that the other chlorides, especially that of calcium, and still more the carbonic acid often present, co-operate. In this way, and when aided by various processes of what may be termed water poultices and packing, they are often useful in remov- ing exudations, in chronic metritis and in some tumours of the uterus, and generally in scrofula and rachitis, and occasionally in some chronic skin affections.

The French accord high praise to some of their thermal salt waters in paralysis, and some German

ones are used in a similar way in spinal affections. The salt waters are sometimes so strong that they must be diluted for bathing. In other cases concentrated solutions of salt are added to make them sufficiently strong. These waters are widely diffused, but on the whole Germany is richest in them, especially in such as are highly charged with salt. The Kissingen springs may be considered as typical of the drinking wells, and sea-water of bathing waters. The air of salt-works and pulverization of the water are employed in German baths as remedial agents.

Salt springs are found in many quarters of the world, but the chief carbonated groups for drinking purposes occur in Germany, and at Saratoga in America, where very remarkable wells indeed are to be found. France and England have no springs of this class. The stronger wells, used chiefly for bathing, occur where

Table IV. — Salt Springs.

Locality.

S

u

11

“Soden, near J Frankfort . .)

Homburg, do.

Kissingen, Bavaria Pyrmont, North Germany .

Kreuznach, near Bingen .

Wiesbaden, Nassau Baden-Baden . .

Botrrbonne,

Haute-Marne . Balaruc, South

France . Salins, Moutiers,

Savoy (1480 ft.) Brides, Savoy)

(1700 ft.) . . 5

Acqui, North Italy

Abano, do

Caldas de Mom- buy, near Bar- celona .

Cestona, Guipuz- coa, Spain .

Temp. Fahr.

155

156

1 14-149

116-6

96

95 169

185

153-158

88-94

Therapeutic Action.

Dyspepsia, anaemia, scrofula,

special for throat and

phthisis.

S Dyspepsia, slighter hepatic

(affections, chlorosis, gout.

In all essentials the same.

5 Better known for its iron ; has

(a good salt drinking spring.

iA salt well without carbonic acid; used in scrofula and anaemia; bathing more important. (Used in dyspepsia and gout, j the bathing is most import- (ant.

S Still milder water; uses simi 1 lar; gout.

J Rheumatism, neuralgia, effects (of malaria. S Do. ; special for treatment of I paralysis. S Scrofula, anaemia, loss of (power, sexual disorders. S Act on liver and digestive (canal ; used for obesity. (Rheumatism ; special treat- } ment with the bath deposit. Chiefly as baths; mud of bath used for poultice.

(Rheumatism, sciatica, old in- (juries.

J Rheumatism, indigestion, bron-) chitis.

Almost all the above stations have several springs of various strengths: the cold may be said to vary from 14 to 5-8 % of chloride of sodium; the warm are generally weaker, perhaps varying from 6-8 to i-6.

there are salt-bearing strata, as in Germany, Galicia, Italy, Switzer- land, France and England. Very powerful waters of this class are those of St Catherines in Canada.

The presence of minute portions of iodine or bromine in salt waters is by no means infrequent, and they appear in considerable quantity in some few. It is, however, extremely doubtful whether any known spring contains a sufficient quantity of iodine, still more of bromine, to act specially on the system, even if that action were not necessarily superseded by the presence of the large quantity of

other salts with which they are associated. Some of the best- known springs of the kind are: Challes,

Wildegg, Castrocaro, Hall, Adelheid’s Quelle, Krankenheil, Kreuznach, Woodhall Spa.

Iron or Chalybeate Waters. — Iron usually exists in waters in the state of protoxide or its carbonate, less frequently as sulphate or crenate, and very rarely, if at all, as chloride. The quantity present is usually extremely small. It may be said to vary from o- 12 to 0-03 in the iooq parts of water. Some wells considered distinct chaly- beates contain less than 0-03. Many wells, especially in Germany, have a rich supply of carbonic acid, which is unfortunately wanting in French and English ones.

It has long been the prevalent idea that want of iron in the blood is the main cause of chlorosis and of other anaemic conditions, and that these conditions are best relieved by a supply of that metal. Since the detection of it in haemoglobuline this view has been still more popular. It is pretty certain that the blood contains 37 to 47 grains and the whole system 70 to 74 grains of iron ; and it has been calculated that in normal conditions of the system somewhat more than one grain of iron is taken daily in articles of food, and that the same amount is passed in the faeces; for although the stomach takes the iron up it is excreted by the alimentary canal mainly, it being doubtful whether any is excreted in the urine. It

Table V ‘.—Stronger Salt Waters.

Locality.

Rheinfeld, Aargau, Switzer- land

Salzungen, North Germany Ischl, Austria (1440 ft.) . Hall, Tyrol (1700 ft.) . . Reichenhall, near Salzburg

(1800 ft.) ... . Bex, Rhone Valley (1400 ft.) Castrocaro, Tuscany. Droitwich, near Worcester . Sea Water

Rehme, Westphalia (92 F.).

Nauheim, Wetterau (80 °- 103 F.)

3ii

256 256 255 224

156 36 233-6

30-4 24-85

29

Therapeutic Application.

Scrofula, effects of inflam- mation, chronic exuda- tions, some chronic ex- | anthemas, rheumatism, uterine infiltrations. Do. do.

Do. do.

Do. do.

Do.

do.

Do. Do. Do.

do.

do. do.

Do. ; special use motor ataxia.

in loco

Do.

do.

Table VI. — Iron Waters.

Locality.

Rippoldsau, Black Forest

Homburg, near Frankfort Elster, Saxony . Liebenstein, North Ger- many

Schwalbach, Nassau

Bocklet, near Kissingen

Griesbach, Black Forest

Franzensbad, Bohemia Pyrmont, Germany Spa, Belgium Petersthal, Black Forest St Moritz, Engadine,)

Switzerland . . .) Forges-les-Eaux, France La Malou.Herault, France

(temp. 88°) . . . Recoafo, North Italy .

Tunbridge Wells, England

Muspratt Spring, Harro- gate (chloride)

Height in Ft.

1886

1465 911

900

600

1614

1293

1000 1333 5464

1943

600

Carb. of Iron.

0-12

o-io

0-08

0-08

0-08

0-08

0-07

0-07 0-07 0-06 0-04

0-03

0-06

0–08

0–04

0–06

0–15

Therapeutic Use.

For anaemic condi- tions; laxative. Do. do.

Do. do.

Do. ; much of ladies’ bath.

Do.

Do. ; laxative ; ladies’ bath.

do.

laxative, sought for its

Do. Do. Do. Do.; Do.; air. Do.

Do.

Do.

Do. ; deficient carbonic acid.

is possible by drinking several glasses to take in more than a grain of carbonate of iron in the day, equivalent to half that amount of metallic iron. It has further been ingeniously reckoned from practice that 10 to 15 grains of metallic iron suffice to supply the deficiency in the system in a case of chlorosis. It is thought probable that a portion of the iron taken up in water is in certain patho- logical states not excreted, but retained in the system, and goes towards making up the want of that metal. But whether this or

any other explanation be satisfactory, there is no question as to the excellent effects often produced by drinking chalybeate waters (especially when they

are carbonated), and by bathing in those which are rich in carbonic acid after they have been artificially heated. As regards the drinking cure we must not, however, forget that carbonate and chloride of sodium, and also the sulphate, are often present and must be ascribed a share in the cure. Thus chloride of sodium is a powerful adjuvant in the strong Stahl Quelle of Homburg and in the Putnam Well at Saratoga. A whole category of female complaints is treated successfully with these waters. Indeed, anaemia from any source, as after fever or through loss of blood, and enlargements of the spleen, are benefited by them. The stimulating action of the copious supply of carbonic acid in steel baths is a very important adjuvant; »o one now believes in direct absorption of iron from the bath. Irrin waters are scarcely ever thermal. They are extremely common in all countries — frequently along with sulphuretted hydrogen in bogs and near coal-measures. But such springs and non-carbonated wells gener- ally are weak, and not now held in much esteem.

It may be added that some of the strongest known iron wells are sidphated or aluminated. They are styptic and astringent, and can only be used diluted. They are sometimes useful as an application to ulcers and sores. Such springs have often been brought into notice, but never retain their popularity. They are known in the Isle of Wight, in Wales, in Scotland, as well as in Elba, &c. ; and of late years the Bedford Alum and Oak Orchard Springs, U.S., have been brought into notice, the latter containing 10 grains of free sulphuric acid in the pint. All such springs have been con- sidered useful in scrofula, anaemia and chronic diarrhoeas.

Sulphur Springs. — Waters having the odour of hydrosulphuric acid, however slightly, are usually called sulphur ones. They owe their smell sometimes to the presence of the free acid, sometimes to sulphides of sodium, calcium or magnesia, and sometimes to both. Sulphuretted hydrogen is absorbed more freely by cold than by hot water, and is therefore most abundant in cold springs. The

sulphides decompose and give off the gas. Most of these springs occur near coal or shale measures, or strata containing fossils, or in moors and in places generally where organic matter is present in the soil or strata. Many of them contain so little mineral impreg- nation that they might as well be classed among the indifferent or earthy waters. One group contains a considerable amount of chloride of sodium, another of sulphate of lime, while a third has little mineral impregnation, but contains sulphides.

Sulphuretted hydrogen is a strong poison, and its action on the system has been pretty well ascertained. It has been assumed that the gas in mineral waters acts similarly, though in a modified degree ; but there is next to nothing absolutely known of the action of the small quantities of the gas that are present in mineral waters, and which certainly have no toxic effect. It has been assumed that this gas has some special action on the portal system and so on the liver. On the connexion of metallic poisoning with the liver has been founded the idea that sulphur waters are useful in metallic intoxication. Drinking large quantities of these waters, especially of such as contain sulphates or chlorides of sodium or magnesia, combined with hot baths and exercise, may help to break up albuminates, but there is no proof of the action of the sulphur.

For similar reasons, and primarily to counteract mercurial poison, sulphur waters have been considered useful in syphilis. But it may be well to remember that at most baths mercury is used along with them. No doubt they are frequently, like other warm waters, useful in bringing out old eruptions, acting in this way as a test for syphilitic poison, and in indicating the treatment that may be

Table VII. — Cold Sulphur Springs.

Locality.

Sulphuretted

Hydrogen

dissolved in

Water.

Sulphide

of Sodium.

Eilscn, Schaumburg-Lippe . Meinberg, Lippe-Detmold . Gurnigel, Switzerland (3600 ft.) Leuk, do. (3593 ft.)

Enghien, near Paris …. Uriage, Isere, France (1500 ft.) . Harrogate, England …. Strathpeffer, Scotland Lisdoonvarna, Clare, Ireland

42-3 231

44-5 7-34

0-008

0-478 0-106

0-207 0-026

required. Sulphur waters, both hot and cold, are used in gout and rheumatism, in dyspepsia, in hepatic and cutaneous affections; and of late years inhalation of them has been popular in phthisis and in laryngeal affections. They have long been popular remedies in cutaneous affections. While so much doubt has been cast on the action of the sulphur of these waters, it may be admitted that the sulphides are probably decomposed in the stomach and sulphur-etted hydrogen generated. That gas is probably a slight stimulant

to the intestine. What sulphuretted hydrogen reaches the blood is eliminated by the lungs. There seems to be no doubt that the gas is absorbed in small

quantities by the skin.

It is in sulphur waters chiefly that glairin and baregin occur. This peculiar organic substance has been found both in American and in European springs. Cold sulphur springs are very widely diffused throughout the world. Thermal ones are not so common. Perhaps the largest though not the strongest group of the latter is to be found in the Pyrenees. We may remark again how very little

Table VIII-

-Warm Sulphur

Springs.

Locality.

Height in Ft.

Temp. Fahr.

Hydrosul-

phuric Acid

absorbed in

Water.

Sulphide

of Sodium.

Aix-la-Chapelle, Germany

534

131-140

o-3

o-oi

Baden, near Vienna .

—

95-H5

2-5

0-052

Schinznach, Switzerland .

1060

80-92

37-8

—

Lavey, Rhone Valley .

1350

92-113

3-5

—

Hercules Bad, Banat .

500

‘no

42-6

—

Aix-les-Bains, Savoy .

765

108-5

27-2

—

Luchon, Pyrenees …

2000

135-5

—

0-07

Bareges, do.

4100

113

—

0-04

Amelie-les-Bains,Pyrenees

810

87-147

— -

O-OI

Cauterets, do.

3254

7I-I34

—

0-02

Eaux Bonnes, do.

2400

9°-5

—

0-02

■ Archena, Murcia, Spain .

_

126

_

_ "_

hydrosulphuric acid there is in many of the most favourite sulphur springs, including the very popular White Sulphur ones of Virginia. There seems to be something peculiarly unsatisfactory in the analysis of sulphur waters, and there has been difficulty in constructing the following imperfect tables.

Some of the most powerful cold wells are those of Challes (with its very peculiar water), Leuk and Harrogate. Uriage has a very large amount of chloride of sodium in its springs. Cold_ sulphur waters are on the whole more used in liver and indigestion than warm ones. The general effects of warm sulphur waters differ so little at the various baths as to make it difficult to mention anything special to particular localities. Schinznach has a reputation in skin complaints, Cauterets, Eaux Bonnes and Challes in laryngeal affections, the two Aix, Luchon and Archena in syphilis.

Alkaline Waters are such as contain carbonate (chiefly bicarbon- ate) of soda, along with an excess of carbonic acid. Of the action of those carbonates it is known that when taken into the stomach they are neutralized by the gastric juice, and converted into chloride of sodium. On their introduction into the stomach they produce an increased flow of gastric juice. If given during or immediately after meals in any quantity, they impede digestion. They slightly increase peristaltic action, but only feebly, unless assisted by other salts. They act slightly as diuretics. Of the connexion between the biliary system and alkalies, which undoubtedly exists, not much i,s known with

certainty. The alkalization of the blood by them is assumed by many, but not proved. It is very doubtful whether they reduce the quantity of fibrine in the blood, and thus induce a lowered state of the system, or whether they have any direct ten- dency to combine with fat and carry off a portion of superfluous adipose tissue. Their excess of carbonic acid, through its action on the stomach, favours the operation of alkaline waters. They have been classed as follows: (1) simple alkalines, where carbonate of soda is the main agent; (2) waters containing in addition some chloride of sodium; (3) waters containing sulphates of soda or of magnesia. All these classes may be said to be used in gout, lithiasis, affections of the liver, catarrh and obstructions of the gall ducts, in dyspepsia, chronic catarrh of the stomach and diarrhoea, in obesity and in diabetes. Some of the waters of the_ second class are supposed to influence bronchial catarrhs and incipient phthisis, while the more powerful sulphated waters of the third class are especially useful in catarrh of the stomach, and in affections of the biliary organs; of these only one of importance (Carlsbad) is thermal. The rival cold waters of Tarasp contain twice as much carbonate of soda. The cold ones are chiefly used internally, the thermal ones both internally and externally. The latter, besides acting as warm water, slightly stimulate the skin when the carbonic acid is abundant, and the carbonate of soda has some slight detergent effect on the cutaneous surface like soap. These waters are un- known in England. They are most abundant in countries of extinct volcanoes.

Classes I. and II. of alkaline waters may be said to have a sub- variety in acidulated springs or carbonated waters, in which the quantity of salts is very small, that of carbonic acid large. These table waters are readily drunk at meals. They have of late years been so widely exported as to be within the reach almost of every one. Their practical importance in aiding digestion is in reality much greater than one could expect from their scanty mineraliza- tion. They are drunk by the country

people, and also largely exported and imitated. They are very abundant on the Continent,

and, although some of the best-known ones enumerated below are German and French, they are common in Italy and elsewhere: Heppingen, Roisdorf, Landskro, Apollinaris, Selters, Bruckenau, Gieshtibel, all German; St Galmier, Pougues, Chateldon, French. Associated with Class III. is that of the strongly sulphated waters known in Germany as bitter or purging waters, which have of late deservedly come into use as purgative agents. They are almost wanting in France and in America, and there are no very good ones in England. The chief supply is from Bohemia and Hungary^ The numerous waters of Ofen are the best known, and some of

Table IX. — Alkaline Waters.

Class I. — Simple Alkaline.

Locality.

Vals, South France .

Bilin, Bohemia

Vichy, France (105° F.) . Neuenahr, Rhineland(92°-97° F.) .....

La Malou, France (97 F.) Vidago, Portugal .

Carb. Soda.

7-1

4-2

5-i

Therapeutic Uses.

(Catarrh of stomach, gout, j renal and biliary calculi, (liver complaints, diabetes. Do. do. do.

Do. do. do.

(Mucous catarrh; diabetes (specially.

(Do.; sedative effect on (nervous system. Do., gout, urinary affec- tions — “The Portuguese Vichy.”

Class II. — With Chloride of Sodium varying from 4’j to 1 in amount.

Locality.

Luhatschowitz, \

Moravia . J

Tonnistein,)

Rhine Valley \

Ems, Nassau

Ischia, Italy

Royat, Auvergne Mont Dore, do.]

Bourboule, do.

Height in Ft.

1600

1400 3300

2800

Temp. Fahr.

85-115

up to 170

80-95 100-114

107-125

Carb. Soda.

8-4 2-5

Therapeutic Uses.

(Springs rich both j in carb. soda (and chl. sodium. I Light antacid j tonic to stom- (ach.

{Special in female complaints and mucous mem- brane. (Specially matism female com- plaints. (Do. and some (skin affections. (Asthma, chronic / laryngitis.

i Scrofula, rachitis, cutaneous affec-

rheu- and

Class III.- — With Sulphate of Soda varying from 5-2 to 2 in amount and Carbonate of Soda varying from 3-55 to o-$l in amount.

Locality.

Elster, Saxony

Marienbad, Bohemia. Franzensbad, do.

Tarasp, Lower Engadine

Carlsbad, Bohemia (121°) -164 F.) . . . . \

Height in Ft.

1460

1012 1293

4000 1200

Therapeutic Uses.

Action on abdominal organs,

female complaints. Do. ; special use in obesity. Do. ; specially a ladies' bath. Powerful action on abdomi- nal viscera. Gout, liver affections, biliary and renal calculi, diabetes.

them are stronger than the Hunyadi, of which an

analysis has been given in Table I. They are easily imitated. Some of the best- known are Ofen, Pullna, Saidschiitz, Friedrichshall, Birmerstorff, Kissingen.

Two other classes of waters demand a few words of notice. The French have much faith in the presence of minute quantities of arsenic in some of their springs, and trace arsenical effects .in those who drink them, and some French authors have established a class of arsenical waters. Bourboule in Auvergne is the strongest of them, and is said to contain t \th of a grain of arseniate of soda in 7 oz. of water. Baden-Baden, according to Bunsen's latest analysis, has a right to be considered an arsenical water. It is, however, extremely doubtful whether the small amounts of. arseni- ate of soda which have been detected, accompanied as they are by preponderating amounts of other salts, have any actual operation on the system. The following are among the most noted spring.?:

Bourboule, Mont Dore, Royat, Salies (Bigorres), Plombieres, Baden-Baden.

Of late years lithium has been discovered in the waters of Baden- Baden; and various other places boast of the amount of that sub- stance in their springs. Indeed a new bath has been established at Assmannshausen on the Rhine in consequence of the discovery of a weak alkaline spring containing some lithium. Not very much is known of the action of lithium in ordinary medicine, and it un- doubtedly does not exist in medicinal doses even in the strongest

Designation and Locality.

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O V.-

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p^ §^ U

13

Lebanon, Columbia co., N.Y. (73° F.)

Healing, Bath co., Va. (88″ F.)

Warm, Bath co., Va. (98* F.)

Hot, Bath co., Va. (no F.)

Paso Robles, San Luis Obispo) co., Cal. (122° F.) .
. . \

Hot, Garland co.,Ark. (93-150′ F.)

Gettysburg, Adams co., Penn.

Sweet, Monroe co., W. Va.(74°F.)

Berkeley, Morgan co., W. Va.

(74° F.)

Alleghany, Montgomery co., Va

Bethesda, Waukesha co., Wis.

Lower Blue Lick, Nicholas co.,

Ky

Sharon, Schoharie co., N.Y.

White Sulphur, Greenbrier co., Va

Salt Sulphur, Monroe co., W. Va. Bedford, Bedford co., Penn.

St Catharines, Ontario, Canada Caledonia, Ontario, Canada . Hathorne, Saratoga, N. Y. . l_ Ballston, Saratoga co., N. Y.

Oak-Orchard Acid, Genesee co., N.Y

Rawley, Rockingham co., Va. . Sweet Chalybeate, Alleghany)

co., Va 5

Rockbridge Alum, Rockbridge ?

co., Va 5

Cooper’s Well, Hinds co., Miss.

Crab Orchard, Lincoln co., Ky. Midland, Midland Co., Mich.

Bladen, Choctaw co., Ala. (car- bonated alkaline) .■

Congress, Santa Clara co., Cal. (saline-alkaline)

St Louis, Gratiot co., Mich, (simple alkaline)

Therapeutic Application.

Scrofulous ulcers and oph- thalmia, ozoena, chronic diarrhoea and dysen- tery, secondary and tertiary syphilis. rChronic and subacute I rheumatism, gout, neur- algia, nephritic and calculous diseases.

(Chronic rheumatism, gout, diseases of liver, neur- algia, contractions of joints.

iDartrous diseases of skin, functional diseases of uterus, chronic mer- curial and lead poison-

ing.

f Calculus, gravel, catarrh -{ of stomach or

bladder, I. dyspepsia.

5 Gravel, dyspepsia (diu- (retic, diaphoretic).

J Neuralgia (restorative).

Purgative, diuretic.

1 Diabetes mellitus, gravel, inflammation of blad- der, dropsy, albumin- uria (diuretic).

Aperient and alterative.

Do. do.

[Dartrous skin diseases, -j diseases of the bladder, I jaundice, dyspepsia. Do.; scrofula and syphilis.

J Anaemia, gravel, calculus 1 (strongly diuretic).

J Rheumatism, gout, scro- (fula, neuralgia. Rheumatism, gout. (Dyspepsia, jaundice, } dominal plethora. Do. do. do.

Ulcers, diseases of skin, passive haemor- rhages, atonic diarrhoea (has 10 grains of free sulphuric acid in the pint). Chlorosis and anaemia generally; tonic.

Do. do. do.

Scrofula, chronic diar- rhoea.

Anaemia, chlorosis, chronic diarrhoea, dropsy.

.b-

the

[Dyspepsia, neuralgia, ■I chronic and subacute L rheumatism.

springs. Among these springs are those of Baden- Baden, Assmanns- hausen, Elster, Royat, Ballston Spa, and Saratoga (U.S.).

American Mineral Waters. — The number of springs in

the United States and Canada to which public attention has been called on account of their supposed therapeutic virtues is very large, amounting in all to more than three hundred. Of this number comparatively few are in Canada, and of these not more than six (St Catharines, Caledonia, Piantagenet, Caxton, Charlottesville and Sandwich) have attained general celebrity. The first three belong to the saline class, the Caxton is alkaline-saline, and the last two are sulphur waters. The St Catharines is remarkable for the very large amounts of sodium, calcium and magnesium chlorides which it contains, its total salts (450 grains in the pint) being more than three times the quantity contained in the brine-baths of Kreuznach in Prussia. The Charlottesville and Sandwich springs likewise surpass the noted sulphur-waters of Europe in their excessive per- centages of sulphuretted hydrogen, the former containing more than 3 and the latter 4-72 cub. in. of this gas in the pint.

The mineral springs in the United States are very unequally dis- tributed, by far the larger number of those which are in high medical repute occurring along the Appalachian chain of mountains, and more especially on or near this chain where it passes through the States of Virginia, West Virginia and New York. The Devonian and Silurian formations which overlie the Eozoic rocks along the course of the Appalachian chain have been greatly fissured— the faulting of the strata being in some places of enormous magnitude — by the series of upheavals which gave rise to the many parallel mountain ridges of the Appalachians. In many places the springs occur directly along the lines of fault. The various classes of mineral waters are likewise very unequally represented, the alkaline springs, and those containing Glauber and Epsom salts, being much inferior to their European representatives. On the other hand, the very numerous and abundant springs of Saratoga compare very favourably with the Selters and similar saline waters, and among the many American chalybeate springs the subclass represented by the Rockbridge Alum is unequalled in regard to

the very large percentages of alumina and sulphuric acid which it contains. Besides its greater amount of mineral constituents (135 grains per pint), the Ballston spring surpasses the similar saline waters of Homburg, Kissingen, Wiesbaden and Selters, in its percentage of carbonic acid (53 cub. in.). It is also remarkable for the very large proportion of carbonate of lithia, amounting to 0-701 grains. Thermal springs are specially numerous in the territories west of the Mississippi and in California. Those in the east mostly occur in Virginia along the southern portion of the Appalachian chain; in the middle and New England States Lebanon is the only important thermal spring. Subjoined is a list of thirty American springs, the design being to represent as many of the more noted spas as possible, while at the same time enumerating the best representa- tives of the classes and subclasses into which mineral waters are divided according to the German method of classification.

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MINERVA, an Italian goddess, subsequently identified with Athena. She presided over all handicrafts, inventions, arts and sciences. Her oldest sanctuary at Rome was in the temple built by Tarquin on the Capitol, where she was worshipped with Jupiter and Juno. She had also a temple on the Aventine,

which was the meeting-place for dramatic poets and actors, whose organization into gilds under her patronage dated from the time of Livius Andronicus (q.v.). The dedication day of the temple was the 19th of March, the great festival of Minerva, called quinquatrus, because it fell on the fifth day after the ides. All the schools had holidays at this time, and the pupils on reassembling brought a fee (minerval) to the teachers. In every house also the quinquatrus was a holiday, for Minerva (like Athena Ergane) was patron of the women's weaving and

spinning and the workmen's craft. At a later time the festival extended over five days, the last four being chiefly occupied with gladiatorial shows — because Minerva was the goddess of war (Ovid, Fasti, iii. 809–834; Juvenal x. 115, with Mayor's note). The erection of a temple to her by Pompey out of the spoils of his eastern conquests shows that she was the bestower of victory, like Athena Nike, and the dedication of a vestibule in the senate house by Augustus recalls Athena the goddess of counsel (fiovKaia). Under Domitian, who claimed her special protection, the worship of Minerva attained its greatest vogue in Rome. The emperor Hadrian founded an educational institution, named after her the Athenaeum. The 23rd of March had always been the day of the tubilusirium, or purification of the trumpets used in the sacred rites, so that the ceremony came to be on the last day of Minerva's festival, but it is very doubtful whether it was really connected with her. There was another temple of Minerva on the Caelian Hill, where she was worshipped under the name of Capta, the " captive," the origin of which is unknown. Here a festival called the lesser quinqua- trus was celebrated on the i3th–i4th of June, chiefly by the flute-players (Livy ix. 30; Ovid, Fasti, vi. 651). As the Romans learnt the use of the flute from the Etruscans, the fact of Minerva being the patron goddess of flute-players is in favour of her Etruscan origin, although it may merely be a reminiscence of the Greek story which attributed the invention of the flute to Athena. A carved image of the goddess called the Palladium, said to have been brought from Troy to Lavinium, and thence to Rome by the family of the Nautii, was kept in the temple of Vesta and carefully guarded as necessary to the prosperity of the city. The older form of the name Minerva is Menerva (= Menes-va, Gr. fievos); it probably means " thinker."

MINGHETTI, MARCO (1818–1886), Italian economist and statesman, was born at Bologna on the 18th of November 1818. In 1846 he signed the petition to the Conclave for the election of a Liberal pope, and was appointed member of the state council summoned to

prepare the constitution for the papal states. With Antonio Montanari and Rodolfo Audinot he founded at Bologna a paper, II Felsineo. In the first constitutional cabinet, presided over by Cardinal Antonelli, Minghetti held the portfolio of public works, but after the allocution by Pius IX. against the Italian war of independence he resigned, and joined the Piedmontese army as captain on the general staff. Returning to Rome in September 1848, he refused to form a cabinet after the assassination of Pellegrino Rossi, and spent the next eight years in study and travel. Summoned to Paris by Cavour in 1856 to prepare the memorandum on the Romagna provinces for the Paris congress, he was in 1859 appointed by Cavour secretary-general of the Piedmontese Foreign Office. In the same year he was elected president of the assembly of the Romagna after the rejection of pontifical rule by those pro- vinces, and prepared their annexation to Piedmont. Appointed Piedmontese minister of the interior, he resigned office shortly after Cavour's death, but was subsequently chosen to be minister of finance by Farini, whom he ■succeeded as premier in 1863. With the help of Visconti-Venosta he concluded (Sept. 15, 1864) the " September Convention " with France, whereby Napoleon agreed to evacuate Rome, and Italy to transfer her capital from Turin to Florence. The convention excited violent opposition at Turin, in consequence of which Minghetti was obliged to resign office. He took little part in public life until 1869, when he accepted the portfolio of agriculture in the Menabrea Cabinet. Both in and out of office he exercised his influence against an Italo-French alliance and for an immediate

advance upon Rome, and in 1870 was sent to London and Vienna by the Lanza-Sella Cabinet to organize a league of neutral powers on the outbreak of the Franco-Prussian War. In 1873 he overthrew the Lanza-Sella Cabinet and regained the premier- ship, which, with the portfolio of finance, he held until the fall of the Right from power on the 18th of March 1876. During his premiership he inaugurated the rapprochement between Italy, Austria and Germany,

and reformed the naval and military administration; and before his fall he was able, as finance minister, to announce the restoration of equilibrium between expenditure and revenue for the first time since i860. After the advent of the Left, Minghetti remained for some years in Opposition, but towards 1884 joined Depretis in creating the ” Trasformismo,” which consisted in bringing Conservative support to Liberal cabinets. Minghetti, however, drew from it no personal advan- tage, and died at Rome on the 10th of December 1886 without having returned to power.

His writings include : Delia economia pubblica e delle sue attinenze con la morale e col diritto (Bologna, 1859), and La Chiesa e lo Stato (Milan, 1878).

MINGRELIA, a former principality of Transcaucasia, which became subject to Russia in 1804, and since 1867 has belonged to the government of Kutais. The country corresponds to the ancient Colchis; and Sukhum Kaleh on the Black Sea coast, which was the capital under the Dadian dynasty (1323-1694), is to be identified with the ancient Dioscurias, a colony of Miletus. The Mingrelians, who are closely akin to the Georgians, numbered 241,000 in 1902, and belong to the Orthodox Greek Church (see further Kutais and Caucasia).

MINIATURE. The word “miniature,” derived from the Latin minium, red lead, has been technically employed, in the first instance, to describe a picture in an ancient or medi- eval manuscript; the simple decoration of the early codices having been ” miniated ” or delineated with that pigment. The generally small scale of the medieval pictures has led secondly to a pseudo-etymological confusion of the term with ” minute- ness ” and to its application to ” paintings in little “; it is now used mainly in this sense, and is ordinarily applied to a painting on a very small scale, usually a portrait, and by analogy to anything on a very small scale.

1. Miniatures in Ancient and Medieval MSS. — The part played by the miniature in the scheme of the ornamentation of MSS., in the early centuries of the Christian era and in the middle ages, is dealt with in the article on Illuminated MSS. In the present article will be discussed the development and changes which it underwent, in different ages and in different countries, both in its technical treatment and in its leading characteristics. The subject divides itself into two distinct portions, the classical and the medieval, between which there lies the great separating space of the early middle ages, which affords but scanty material to connect them. When, however, we have advanced into the middle ages, we are no longer at a loss; and we can follow the later development of the miniature through all its changes in the various schools of western Europe down to its transition into the modern picture.

The importance of the study of the miniature has perhaps hardly received in the past the recognition which it merits. The history of painting cannot be perfectly understood without a knowledge of the rise and progress of the art of miniature- painting in MSS; and examples of the art still survive in an abundance which frescoes and paintings in the large cannot rival. Modern methods of photography have brought within the reach of the student material which in earlier generations was not accessible; and consequently a juster conception can be formed of the position which the miniature holds in the history of art than was possible before.

The earliest examples that have descended to us are closely connected in style and treatment with the pictorial art of the later Roman classical period. In fact they are separated from that period by only two or three centuries, and they still follow its traditions. The oldest specimens of all are the series of coloured drawings or miniatures cut from an illustrated MS.

of the Iliad and now in the Ambrosian Library at Milan, which there is good reason for placing as early as the 3rd century. In these pictures there is a considerable variety in the quality of the drawing, but there are many notable instances of fine figure-drawing, quite classical in sentiment, showing that the earlier art still exercised its influence. Such indications, too, of landscape as are to be found are of the classical type, not conventional in the sense of medieval conventionalism, but still attempting to follow nature, even if in an imperfect fashion; just as in the Pompeian and other frescoes of the Roman age.

Of even greater value from an artistic point of view are the miniatures of the Vatican MS. of Virgil, known as the " Schedae Vaticanae," of the 4th century. They are in a more perfect condition and on a larger scale than the Ambrosian fragments, and they therefore offer better opportunity for examining method and technique. The drawing is quite classical in style, and the idea is conveyed that the miniatures are direct copies from an older series. The colours are opaque: indeed, in all the miniatures of early MSS. the employment of body colour was universal. The method followed in placing the different scenes on the page is highly instructive of the practice followed, as we may presume, by the artists of the early centuries. It seems that the background of the scene was first painted in full, covering the whole surface of the page; then, over this background were painted the larger figures and objects; and over these again the smaller details in front of them were superimposed. Again, for the purpose of securing something like perspective, an arrangement of horizontal zones was adopted, the upper ones containing figures on a smaller scale than those below.

It was reserved for the Byzantine school to break away more decidedly from the natural presentment of things and to develop convention. Yet in the best early examples of this school the classical sentiment still lingers, as the relics of the miniatures of the Cottonian Genesis, in the British

Museum, and the best of the miniatures of the Vienna Dioscorides testify; and in the miniatures of the later Byzantine MSS., which were copied from earlier examples, the reproduction of the models is faithful. But on comparing the miniatures of the Byzantine school generally with their classical predecessors, one has a sense of having passed from the open air into the cloister. Under the restraint of ecclesiastical domination Byzantine art became more and more stereotyped and conventional. The tendency grows to paint the flesh-tints in swarthy hues, to elongate and emaciate the limbs, and to stiffen the gait. Browns, blue-greys and neutral tints are in favour. Here we first find the technical treatment of flesh-painting which afterwards became the special practice of Italian miniaturists, namely the laying on of the actual flesh-tints over a ground of olive, green or other dark hue. Landscape, such as it was, soon became quite conventional, setting the example for that remarkable absence of the true representation of nature which is such a striking attribute of the miniatures of the middle ages.

And yet, while the ascetic treatment of the miniatures obtained so strongly in Byzantine art, at the same time the Oriental sense of splendour shows itself in the brilliancy of much of the colouring and in the lavish employment of gold. In the miniatures of Byzantine- MSS. are first seen those backgrounds of bright gold which afterwards appear in such profusion in the productions of every western school of painting.

The influence of Byzantine art on that of medieval Italy is obvious. The early mosaics in the churches of Italy, such as those at Ravenna and Venice, also afford examples of the dominating Byzantine influence. But the early middle ages provide but few landmarks to guide the student; and it is only when he emerges into the 12th century, with its frescoes and miniatures still bearing the impress of the Byzantine tradition, that he can be satisfied that the connexion has always existed during the intervening centuries.

When we turn to the farther-west of Europe, there also we find under the Carolingian monarchs a school of painting obviously derived from classical models, chiefly of the Byzantine type, but whether derived directly from the East, or, what is

more probable, transmitted through Italian channels, must remain doubtful. The interest of that school for our present purpose is that it was the parent of the later miniature-painting in the countries of the West. For in the native schools of those countries decoration only was the leading motive. In the MSS. of the Merovingian period, in the school which connected Frankland and northern Italy, and which is known as Lombardic or Franco-Lombardic, in the MSS. of Spain, in the productions of the Celtic school of our own islands, figure-drawing was scarcely known, and where it was practised it was of a barbarous character, serving rather as a feature of decoration than as a representation of the human form. Hence in those native schools the miniature, in its true sense of a picture, may be regarded as non-existent.

From these native schools we exclude the Anglo-Saxon school, developed especially at Canterbury and Winchester, which probably derived its characteristic free-hand drawing from classical Roman models, scarcely influenced by the Byzantine element. The highest qualities of the miniatures of the 10th and nth centuries of this school lie in fine outline drawing, which had a lasting influence on the English miniature of the later centuries. But the southern Anglo-Saxon school rather stands apart from the general line of development of the western medieval miniature. How far it was affected by Continental influence will be presently noticed.

Turning to the productions of the Carolingian school, which owed its origin to the encouragement of Charlemagne, it is seen that the miniature appears in two forms. First, there is the truly conventional miniature following the Byzantine model, the subjects being generally the portraits of the Evangelists, or portraits of the emperors themselves: the figures stiff and formal; the pages

brilliantly and often coarsely coloured and gilded, generally set in architectural surroundings of a fixed type, and devoid of landscape in the real sense of the word. On the other hand, there is also the miniature in which there is an attempt at illustration, as, for example, the depicting of scenes from Bible history. Here there is more freedom; and we trace the debased classical style which copies Roman, as distinguished from Byzantine, models. The figure-drawing is sufficiently clumsy, but the type is Roman, or debased Roman, and the costumes are clearly derived from the same source. Here, too, there is a better attempt at landscape, which is not of the absolutely conventional deadness of the Carolingian- Byzantine type. But this second style of illustrative miniature appears only occasionally. The other was the characteristic miniature of the Carolingian school, and, accompanied as it was with profuse decoration in border and initial, it set the pattern for the later Continental schools of the West.

The influence which the Carolingian school exercised on the miniatures of the southern Anglo-Saxon artists shows itself in the extended use of body-colour and in the more elaborate employment of gold in the decoration. Such a MS. as the Benedictional of Aethelwold, bishop of Winchester, 963 to 984, with its series of miniatures drawn in the native style but painted in opaque pigments, exhibits the influence of the foreign art. But the actual drawing remained essentially national, marked by its own treatment of the human figure and by the peculiar disposition of the drapery with fluttering folds. Its fault was over-refinement, tending to an affected exaggeration and disproportion of the limbs. With the Norman Conquest this remarkable native school passed away.

The period immediately succeeding the Carolingian school in western Europe was one of extreme decadence in the minia- tures of MSS. In the 10th and nth centuries they were mere lifeless copies of earlier types. But with the awakening of art in the 12th century the decoration of MSS. received a

powerful impulse. Although the artist of the time excels in the border and the initial, still in the miniature also there is vigorous drawing, with bold sweeping lines and careful study of the draperies. The artist now grows more practised in figure-drawing, and while there is still the tendency to repeat the same subjects in the same conventional manner, individual effort

produced in this century many miniatures of a very noble character. The Norman Conquest had brought England directly within the fold of Continental art; and now began that grouping of the French and the English and the Flemish schools, which, fostered by growing intercourse and moved by common impulses, resulted in the magnificent productions of the illuminators of north-western Europe from the latter part of the 12th century onwards. But of natural landscape there is nothing, unless rocks and trees of a stereotyped character can be so regarded. Hence the background of the miniature of the 1 2th and immediately succeeding centuries became the field for decoration to throw into stronger relief the figures in the scene. And thus arose the practice of filling in the entire space with a sheet of gold, often burnished: a brilliant method of ornament which we have already seen practised in the Byzantine school. We have also to notice the conventional treatment of the sacred figures, which continue henceforward, from a sense of veneration, to be clad in the traditional robes of the early centuries, while the other figures of the scene wear the ordinary dress of the period.

It will be convenient, at this point, to follow the development of the miniature in the northern schools of England and France and the Low Countries, occasionally glancing at Germany, during the next three centuries, and to leave aside for the moment consideration of the Italian school and the schools allied therewith.

Entering the 13th century, we reach the period when the miniature may be said to justify the modern false etymology which has connected the title with minuteness. The broad, bold style of the 12 th century gives place to the precise and minute. Books in general exchanged their form from the large folio to the octavo and smaller sizes. There was a greater demand for books; and vellum was limited in quantity and had to go further. The handwriting grew smaller and lost the roundness of the 12th century. Contractions and abbreviations in the texts largely increased in number. Everywhere there is an effort to save space. And so with the miniature. Figures were small, with delicate strokes in the features and with neat slim bodies and limbs. The backgrounds blaze with colour and burnished gold; and delicate diaper patterns of alternate gold and colour abound. Frequently, and especially in English MSS., the drawings are merely tinted or washed with transparent colours. In this century, too, the miniature invades the initial. Whereas in the earlier periods bold flowering scrolls are the fashion, now a little scene is introduced into the blank spaces of the letter. To compare the work of the three schools, the drawing of the English miniature, at its best, is perhaps the most graceful; the French is the neatest and the most accurate; the Flemish, including that of western Germany, is less refined and in harder and stronger lines. As to colours, the English artist affects rather lighter tints than those of the other, schools: a partiality is to be observed for light green, for grey-blue, and for lake. The French artist loved deeper shades, especially ultra-marine. The Fleming and the German painted, as a rule, in less pure colours and inclined to heaviness. A noticeable feature in French MSS. is the red or copper-hued gold used in their illuminations, in strong contrast to the paler metal of England and the Low Countries.

It is remarkable how the art of the miniature throughout the 13th century maintains its high quality both in drawing and colour without any very

striking change. Throughout the century the Bible and the Psalter were in favour; and natur- ally the same subjects and the same scenes ran through the period and were repeated by artist after artist ; and the very character of those sacred books would tend to restrain innovation. But towards the close of the period such secular works as the romances were growing in popularity, and afforded a wider field for the invention of the illustrating artist. Therefore with the opening of the 14th century a palpable change of style supervenes. We pass to more flowing lines; not to the bold sweeping strokes and curves of the 12th century, but to a graceful, delicate, yielding style which produced the beautiful swaying figures

of the period. In fact the miniature now begins to free itself from the r61e of an integral member of the decorative scheme of illumination and to develop into the picture, depending on its own artistic merit for the position it is [to hold in the future. This is shown by the more prominent place that the miniature now assumes, and by its growing independence of the decorative border and initial. But, at the same time, while the miniature of the 14th century thus strives to dissociate itself from the rest of the illuminated details of the MS., within itself it flourishes in decoration. Besides the greater elasticity of the figure- drawing, there is a parallel development in the designs of the backgrounds. The diapers become more elaborate and more brilliant; the beauty of the burnished gold is enhanced by the stippled patterns which are frequently worked upon it; the gothic canopies and other architectural features which it became the practice to introduce naturally followed the development of the architecture of the period. In a word, the great expansion of artistic sentiment in decoration of the best type, which is so prominent in the higher work of the 14th century, is equally conspicuous in the illuminated miniature.

In the early part of the century, English drawing is very graceful, the figures bending with a waving movement which, if they were not so simple, would be

an affectation. Both in the outline specimens, washed with transparent colour, and in the fully . painted examples, the best English work of this time is unsurpassed. French art still maintains its neat precision, the colours more vivid than those of England and the faces delicately indicated without much modelling. The productions of the Low Countries, still keeping to the heavier style of drawing, appear coarse beside the works of the other schools. Nor does German miniature art of this period hold a high position, being generally mechanical and of a rustic character. As time advances the French miniature almost monopolizes the field, excelling in brilliancy of colouring, but losing much of its purity of drawing although the general standard still remains high. The English school gradually retrogrades and, owing no doubt to political causes and to the wars with France, appears to have produced no work of much value. It is only towards the end of the century that there is a revival.

This revival, which is referred to in the article on Illuminated MSS., has been attributed, with some reason, to a connexion with the flourishing school of Prague — a school which in the scheme of colouring suggests a southern influence — following on the marriage of Richard II. with Anne of Bohemia in 1382. The new style of English miniature painting is distinguished by richness^f colour, and by the careful modelling of the faces, which compares favourably with the slighter treatment by the contemporary French artists. Similar attention to the features also marks the northern Flemish or Dutch school at this period and in the early 15th century; and it may therefore be regarded as an attribute of Germanic art as distinguished from the French style. The promise of the new development in English miniature painting, however, was not to be fulfilled. In the first quarter of the 1 5th century, examples of great merit were produced, but at a standstill in drawing and fettered by medieval convention. The native art practically came to a close about the middle of the century, just when the

better appreciation of nature was breaking down the old conventional representation of landscape in European art, and was transforming the miniature into the modern picture. Whatever miniature painting was to be produced in England after that time was to be the work of foreign artists or of artists imitating a foreign style. The condition of the country during the Wars of the Roses suffi- ciently accounts for the abandonment of art. Thus the history of the miniature in the 15th century must be sought in the manuscripts of the Continental schools.

First we have to consider northern France and the Low Countries. As it passes out of the 14th and enters the 15th century, the miniature of both schools begins to exhibit greater freedom in composition; and there is a further tendency to aim rather at general effect by the colouring than neatness in drawing. This was encouraged by the wider field opened to

the miniaturist. Books of all kinds were illustrated, and sacred books, Bibles and Psalters and liturgical books, were no longer the chief, if not the only, MSS. which were illuminated. And yet there was one class of MSS. which came into the greatest promi- nence and which was at the same time liturgical. This was the Horae, or Hours of the Virgin, &c, devotional books for individual use, which were multiplied in vast numbers and contained some of the finest work of the miniaturists. The decoration of these little volumes escaped in great measure from the con- ventional restraints which their religious character might have imposed. Futhermore, the demand for illuminated MSS. had by this time established a regular trade; and their production was not confined, as formerly, to the cloister with its narrow and limited views.

Early in the century the old conventional treatment

of land- scape still held its own; nor did the diapered and gilded back- ground pass out of use. Indeed, in some of the finest French specimens of the time the diapered patterns are more brilliant than ever. But natural scenery in the second quarter of the century asserts itself more decidedly, although with faults in perspective. It was not until another generation had arisen that there was a true appreciation of the horizon and of atmospheric effect.

The miniatures of the French and Flemish schools run fairly parallel for a time, but after the middle of the century national characteristics become more marked and divergent. The French miniature began to deteriorate, though some very fine ex- amples were produced by the more gifted artists of the school. The figure-drawing was more careless, and the painting tended to hardness without depth, which the artist endeavoured to relieve by an excess of gilt shading. The close of the century brought with it the end of the French miniature; for the ex- travagant productions of the 16th century cannot be counted as worthy of consideration.

The French miniature went down before the Flemish school, which in the latter part of the 15th century attained to its highest excellence. The Flemish miniature affected extreme softness and depth of colour; also an ever-increasing carefulness in the treatment of details, of the draperies, of the expression of the features: the Flemish type of the Virgin’s face, for ex- ample, with its full, high forehead, can never be mistaken. In the best Flemish miniatures of the period the artist succeeds in presenting a wonderful softness and glow of colour; nor did the high standard cease with the 15th century, for many excellent specimens still remain to attest the favour in which it was held for a few decades longer.

In the foregoing remarks what has been said in regard to the careful treatment of details applies still more to the miniatures executed in grisaille, in which the absence of colour invited an even

stronger accentuation of that treatment. This is perhaps most observable in the grisaille miniatures of northern Flanders, which often suggest, particularly in the strong angular lines of the ■ draperies, a connexion with the art of the wood-engraver.

The Flemish miniature did not, however, hold the favour of western Europe without a rival. That rival had arisen in the south, and had come to perfection concurrently with the miniature of the Low Countries in the 15th century. This was the Italian miniature; and the history of its development now claims a brief notice. We return to the 13th century, where we suspended examination of the work of the school of the miniature painters of Italy; but we are not in a position, from lack of material, to follow so closely the development of the Italian miniature. Yet there is enough to show that it passed through the same stages as the miniatures of England and France and the Low Countries. Intercommunication between the countries of Europe was too well established for the case to be otherwise. In Italian MSS. of the normal type the influence of Byzantine art is very manifest during the 13th and 14th centuries. The old system of painting the flesh tints upon olive green or some similar pigment, which is left exposed on the lines of the features, thus obtaining a swarthy complexion,

continued to be practised in a more or less modified form into the 15th century. As a rule, the pigments used are more opaque than those employed in the northern schools; and the artist trusted more to colour alone to obtain the desired effect than to the mixture of colour and gold which gave such brilliant results in the diapered patterns of France. The vivid scarlet of the Italian miniaturists is peculiarly their own. The figure-drawing does not bear comparison with the contemporary art of English and French MSS., the human form being often stunted and thick-set. In general, the Italian miniature, before its great expansion in the 14th century, is far behind the miniatures of the north. But with the 15th century,

under the influence of the Renaissance, it advanced into the front rank and rivalled the best work of the Flemish school. The use of thicker pig- ments enabled the miniaturist to obtain the hard and polished surface so characteristic of his work, and to maintain sharpness of outline, without losing the depth and richness of colour which compare with the same qualities in the Flemish school.

The Italian style was followed in the MSS. of Provence in the 14th and 15th centuries. It had its effect, too, on the school of northern France, by which it was also influenced inUurn. In the MSS. of southern Germany it is also in evidence. But the principles which have been reviewed as guiding the develop- ment of the miniature in the more important schools apply equally to all. Like the miniature of the Flemish school, the Italian miniature was still worked to some extent with success, under special patronage, even in the 16th century; but with the rapid displacement of the manuscript by the printed book the miniaturist's occupation was brought to a close.

For Authorities see under Illuminated MSS. (E. M. T.)

2. Miniatures as separate Small Pictures. — In Europe the later development of the miniature, applied almost exclusively to portraits, is to a large extent English, and the greater number of the chief masters in the art have been Englishmen or have lived in England. Several great portrait painters are said to have worked occasionally in miniature, and there are paintings, small in size attributed with good reason to Holbein, Antonio Moro, John Shute, Cleef, Stretes, Teerlinck, Zucchero, John and T. Betts, and with less probability even to Van Dyck. There is a fine signed work by Shute (see Lomazzo's Trattato dell' arte della pittura, trans. Heydock, 1 598) in the Pierpont Morgan collec- tion; examples by Betts at Montagu House and Madresfield Court, and portraits, by Lavina Teerlinck in the collections of Mr George Salting and Mr J. Pierpont Morgan.

The first portrait miniaturist about whom anything definite is known was Nicholas Hilliard (c. 1547–1610), whose work partakes of the characteristics of illuminated manuscripts. The colours are opaque; gold is used to heighten the effect; while the paintings are on card. They are often signed, and have frequently also a Latin motto upon them. It has recently been proved that Hilliard worked for a while in France, and he is probably identical with the painter alluded to in 1577 as ” Nicholas Belliart.” Nicholas Hilliard was succeeded by his son Lawrence (d. 1640), some works by whom are in the Pierpont Morgan and Madresfield Court collections. His technique was similar to that of his father, but bolder, and his miniatures richer in colour. Isaac and Peter Oliver succeeded Hilliard. Isaac (c. 1 567–161 7) is said to have been the pupil of Hilliard and Zucchero. Peter (1594–1647) was the pupil of Isaac. The two men were the earliest to give roundness and form to the faces they painted. They signed their best works in monogram, and painted not only very small miniatures, but larger ones measuring as much as 10 in. by 9 in. They copied for Charles I. on a small scale many of his famous pictures by the old masters. Several of these copies are at Windsor and at Montagu House. At about the same date Gerbier, Poelemberg, Jamesone, Penelope Cleyn and her brothers, were workers in the art. John Hoskins (d. 1664) was the master of Samuel Cooper, the greatest English miniaturist. The work of Cooper can best be studied in the collection at Ham House. He was followed by a son of the same name, who was known to have been living in 1700, since a miniature signed by him and bearing that date is in the Pierpont

MINIATURES

Plate 1.

CoUeclim of Mr J. Pierponl Morgan.

Fig. i. —MRS PEMBERTON.

By Holbein.

Collection of the Duke of Portland, KG-

Fig. 2.— A YOUNG MAN IN DEEP MOURN- ING (i 6 i 6). By Nicolas Hilliard.

Collection of Win^ld Digby, Esq.

Fig. 3.— LADY LUCY STANLEY. By Isaac Oliver.

Collection of .he. Duke oj Buoleuch and Queensbeery. KG.

Fig. 4.— OLIVER CROMWELL (unfinished). By Samull Cooper.

Collection of the Duke of Pottland, K.G.

Fig. 6.— COL. HENRY SIDNEY (1665). By Samuel Cooper.

Collection 0/ B.M. the King.

Fig. 5.— SIR PHILIP SIDNEY. By Isaac Oliver.

Collection of the Duke of Portland, K.G.

Fig. 7— INIGO JONES. By David Des Granges.

Collection of the Marquis of Exeter.

Fig. 8.— CHARLES II. AS A BOY, By John Hoskins.

Collection of the Duke of Portland, K.G.

Fig. 9-- "MR SYMPSON, MASTER OF MUSIC K." By Thomas Flatman.

Plate H

MINIATURES

Collection aj the Dttke of Portland, K.G.

Fig. i.— BERNARD LENS. By himself, 1718.

Fig. 4.— MRS PARSONS. By Richard Cosway, R.A.

Fig. 3.— UNKNOWN LADY (1781). By John Smart.

Fig. 2.— SIR CHARLES OAKELEY. By John Smart.

Fig. 5.— MISS FREE. By Andrew Plimer.

Collation o\ Mr E. M. Bodgkins.

Fig. 7- KITTY FISHER. By Ozias Humphry.

Marshall Ball Collection.

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Fig. 8. —A BOY. Fig. 9.— LADY. By Horace Fig . I0 ._THE COUNTESS D'EGMON*.

By J. H. Feagonard. Hone. By p. a. Hall

Nos. 2, 3, 4, s, 6 and 8 arc al! from the Collection of Mr J. Pierpont Morgan. 18

Morgan collection. It represents the duke of Berwick. Samuel Cooper (1600-1672) was a nephew of Hoskins. He spent much of his time in Paris and Holland, and very little is known of his career. His work has a superb breadth and dignity, and has been well called " life-size work in little." His portraits of the men of the Puritan epoch are remarkable for their truth to life and strength of handling. He painted upon card, chicken skin and vellum, and on two occasions upon thin pieces of mutton bone. The use of ivory was not introduced until long after his time. His work is frequently signed with his initials, generally in gold, and very often with the addition of the date. Flatman (d. 1688); Alexander Cooper (d. 1660), who painted a series of portraits of the children of the king and queen of Bohemia, now belonging to the German emperor, and several of whose best miniatures are in the collections of the queen of Holland and the king of Sweden; David des Granges (1611-1675) whose work can be seen at Ham House and Windsor Castle; R.

Gibson (1615-1690); Mrs Rosse, his daughter, who so cleverly imitated the work of Samuel Cooper, and Charles and Mary Beale, deserve notice at this period. They are followed by such artists as Lawrence Crosse (d. 1724), Gervase Spencer (d. 1763), Lens, Nathaniel Hone and Jeremiah Meyer, the latter two notable in connexion with the foundation of the Royal Academy. The workers in black lead (plumbago, as it was called at that time) must not be overlooked, especially David Loggan, Faithorne, White, Forster and Faber. They drew with exquisite detail and great effect on paper or vellum. The 1 8th century produced a great number of miniature painters, of whom Richard Cosway (1742-1821) is the most famous. His works are of great beauty, and executed with a dash and brilliance which no other artist equalled. His best work was done about 1799. His portraits are generally on ivory, although occasionally he worked on paper or vellum, and he produced a great many full-length pencil drawings on paper, in which he slightly tinted the faces and hands, and these he called ” stayned ” drawings. Cosway’s finest miniatures are signed on the back; there is but one genuine signed on the face; very few bear even his initials on the front. George Engleheart (1750-1829) painted 4900 miniatures, and his work is stronger and more impressive than that of Cosway; it is often signed ” E ” or ” G.E.” Andrew Plimer (1763-1837) was a pupil of Cosway, and both he and his brother Nathaniel produced some lovely portraits. The brightness of the eyes, wiriness of the hair, exuberance of colour, combined with forced chiaroscuro and often very inaccurate drawing, are characteristics of Andrew Plimer’s work. John Smart (1741-1811) was in some respects the greatest of the 18th-century miniaturists. His work excelled in refinement, power and delicacy; its silky texture and elaborate finish, and the artist’s love for a brown background, distinguish it. Other notable painters were Ozias Humphry (1 742-1810), Nixon (1741-1812), Shelley (c. 1750-1808), whose best pictures are groups of two or more persons, William Wood, a Suffolk artist (1768-1808), Edridge (1760-1821), Sullivan, Sheriff, Crosse, Bogle, Daye.

In the 19th century J. C. D. Engleheart (1784–1862), nephew of George: Andrew Robertson (1777–1845), Beaumont, Behnes, Harlow, Heaphy and Mrs Mee must be mentioned. Sir Thomas Lawrence painted a few miniatures, and Raeburn some in his early days; but the art may be said to have died out with Sir William Ross, the Chalons and Newtori, although some works by Landseer in this form are in existence, some small paintings of flowers by George Lance, and one portrait by Rossetti. Towards the end of the 19th century came a revival of miniature painting, but without producing any masters of the same calibre. Alyn Williams and Lloyd amongst Englishmen, J. W. von Rehling-Quistgaard, the talented Danish miniature painter, and Bess Norris, an Australian artist, deserve mention. From about 1650 onwards many fine miniatures were executed in enamel. Petitot (1 607–1 691) was the greatest worker in this material, and painted his finest portraits in Paris for Louis XIV. His son succeeded him in the same profession. Other artists in enamel were Boit (d. 1727), Zincke (d. 1767), Hurter (1734– 1790), Thouron (1 737–1 789), Liot, Prieur, Spicer, Dinglinger,

Vouquer, Bain and Thienpondt. Many of these artists were either Frenchmen or Swiss, but most of them visited England and worked there for a while. The greatest English enamel portrait painter was Henry Bone (1755–1839), the finest of whose productions are now at Kingston Lacy. A great collection of his small enamel reproductions of celebrated paintings is in Buckingham Palace.

The earliest French miniature painters were Jean Clouet (d. c. 1540), his son Francois, Jean Fouquet, Jean Perreal and others; but of their work in portraiture we have little trace at the present day, although there are many portraits and a vast number of drawings attributed to them with more or less reason. The seven portraits in the manuscript of the Gallic War (Bibliotheque Nationale) are assigned to the elder Clouet; and to them may be added a fine work, in the Pierpont Morgan collection, representing the Mareschal de Brissac. Following

these men we find the two Stresors, St Andre, Cotelle and Masse; the fine draughtsmen Picart, Vauthier and Cheron; and then, later on, we know of miniatures by Largilliere, Boucher, Nattier, Montpetit, Desfosses, Drouais, Charlier, Thouron, Perrin and Dubourg; but the greatest names are those of Hall the Swede, Dumont the Frenchman, and Fiiger the Austrian. The tiny pictures painted by the von Blarenberghe family are by many persons grouped as miniatures, and some of the later French artists, as Prud'hon, Constance Meyer and Dubois, executed miniature portraits, while others whose names might be mentioned were Werner (1637-1710), Rosalba (1675-1757), Chatillon, Pasquier, Marsigli, Garriot, Sicardi and Festa. The most popular artists in France, however, were Augustin (d. 1832) and Isabey (d. 1855). Their portraits of Napoleon and his court are exceedingly fine, and perhaps no other Frenchman painted miniatures so well as did Augustin. The Spanish painter Goya is known to have executed a few miniatures.

Miniatures are painted in oil, water-colour and enamel, but chiefly in water-colour. Many Dutch and German minia- tures were painted in oil, and as a rule these are on copper; and there are portraits in the same medium, and often on the same material, attributed to many of the great Italian artists, notably those of the Bologna school. Samuel Cooper is said to have executed a few paintings in oil on copper, but we know little about the artists who prepared the numerous oil portraits in foreign collections.

The work of the 18th century on ivory is, of course, in water- colour. The use of ivory came into general adoption in the early part of the reign of William III., miniatures previous to that time having been painted on vellum, chicken-skin or card- board, a few on the backs of playing cards, and many more on very thin vellum closely mounted on to playing cards.

The most important collections of miniatures in England in 1907 were those in the possession of the

king, the duke of Buccleuch, Mr j. Pierpont Morgan, the duke of Rutland, the earls of Exeter, Ilchester, Dysart, Dartrey (notable for enamel work, some examples of which are of the greatest rarity) and Ancaster (especially notable for works by Cosway), of Earl Beauchamp, the late Baroness Burdett-Coutts, Sir Gardner Engleheart (remarkable for containing almost exclusively works by the Engleheart family), Lord Weardale, and Messrs Drake, Digby, Williams, Whitehead, and Usher of Lincoln. There is a remarkable collection, principally of works in enamel, in the University Gallery, Oxford, a few fine miniatures at South Kensington, and in the same museum in the Jones collec- tion some splendid works by Petitot, and there are also some famous foreign portrait and picture miniatures in the Wallace Collection, Hertford House, London. The collection at the Louvre is of importance, especially as regards the works of Petitot; that belonging to the queen of Holland of very high merit, and includes some choice works by Holbein and Alexander Cooper; and there is also a very fine collection at Amsterdam, including some of the largest works by Samuel Cooper and the largest known by Hoskins; some very fine ones belong to the Crown of Sweden, and there is a superb but very mixed collection in Peter the Great's Gallery in St Petersburg, unfortunately in great confusion and needing re- arrangement. Many fine miniatures, including some very scarce enamel work by Prieur, are at the Rosenborg Palace in Copen- hagen; the German emperor and the Crown of Prussia both own some remarkable examples, and there are important collections at Vienna, Florence and Stockholm, and in private hands in Berlin, Moscow and Helsingfors.

For fuller information see also J. L. Propert, History of Miniature Art (London, 1887) ; G. C. Williamson, History of Portrait Miniatures (2 vols., folio, 1904), Portrait Miniatures (London, 1897); Richard Cosway (London, 1897); George Engleheart

(London, 1902); Andrew Plimer, &c. (London, 1902) ; How to Identify Miniatures (London, 1904); Richard Cosway (London, 1905), and the privately printed catalogue of the Pierpont Morgan Collection (1906, 1907, 1908) ; Les £maux de Petitot du Louvre (Paris, 1 862–1 864); catalogues of the Buccleuch Gallery, Welbeck Gallery, Ward Usher Collection, Bemrose Collection, Woburn Abbey Collection, all privately printed, the catalogue of the collection exhibited at South Ken- sington, and the privately issued catalogue at the Burlington Fine Arts Club, with illustrations. (G. C. W.)

MINIM (adapted from Lat. minimus, the smallest; a super- lative formed from the Indo-Germanic root min-, small), the smallest possible part of a thing, a particle. In music the name ” minim ” (nota minima) was given by medieval musicians to a note whose value was half a semibreve. It was, as its name implies, the note of the shortest duration then in use. In modern music several notes of lesser value, as the ” crotchet ” and ” quaver,” have been added, and the minim is now about half- way in the scale of ” values.” According to Thomas Morley {A Plaine and Easie Introduction to Practical Music, 1597), its introduction into manuscript music is ascribed to Phillipus de Vitriaco, a musician of the 14th century.

In medicine a minim is the smallest fluid measure, being equal to one drop. Sixty minims make a fluid drachm.

For the religious Order known as ” Minims ” see Francis of Paola, St.

MINING, the general term for the working of deposits of valuable mineral. The term 1 is not limited to underground operations, but includes also surface excavations, as in placer mining and open-air workings of coal and ore deposits by methods similar to quarrying, and boring operations for oil, natural gas or brine. Mining may be subdivided into the operations of prospecting or search for minerals, exploration and develop- ment, work preparatory to

active operations, and working. The latter includes not only the actual excavation of the mineral, but also haulage and hoisting by which it is brought to the surface, timbering and other means of supporting the excava- tions, and the drainage and ventilation of mines. Finally, under the heads of administration, mine valuation, mining education, accidents, hygiene and mining law, will be discussed matters having important bearing on mining operations. Special methods of mining are dealt with in the separate articles on Coal, Gold, and other minerals and metals. Quarrying and Ore-dressing, which may be considered as branches of mining, are also discussed in separate articles.

Prospecting.— In the article on Mineral Deposits (q.v.) the distribution and mode of occurrence of the useful minerals and ores are fully discussed. The work of prospecting is usually left to adventurous men who are willing to undergo privation and hardship in the hope of large reward though the chances of success are small. The prospector is guided in his search by a knowledge of the geological conditions under which useful minerals occur. When the rocks are concealed by detrital material he looks for outcroppings on steep hillsides, on the crests of hills or ridges, in the beds of streams, in landslides, in the roots of overturned trees, and in wells, quarries, road cuttings and other excavations. When the solid rock is not exposed the soil sometimes furnishes an indication of the character of the underlying rock. Sometimes the vegetation, shrubs, trees, &c, as characteristic of certain soils, may furnish evidence as to rock or minerals below. Search should be made in the beds of streams and on the hillsides for ” float mineral ” or ” shoad stones,” fragments of rocks and minerals known to be associated with and characteristic of the deposits. Frag- ments of coal, or soil stained black with coal, will be found near the outcrop of coal beds. Grains of gold or particles of ore may be detected by washing samples of gravel in a prospector’s

1 Of doubtful origin. ” Mine,” both verb and

substantive, come from the Fr., and is usually connected with Lat. minare, to drive or lead; but this would normally result in Fr. mener, not miner. Skeat, following Thurneysen, accepts a Celtic origin (cf. Irish mein, ore), but the New Eng. Diet, doubts this.

pan. By tracing such indications up the stream or up the hill- side the outcrop may sometimes be found, or at least approxi- mately located. The outcrop of a metalliferous vein frequently manifests itself as a line of rocks stained with oxide of iron, often honeycombed and porous, the ” gossan ” or ” eisen-hut,” the iron oxide of which results from the decomposition of the pyrites, usually present as a constituent of such veins. Other metals, such as manganese, copper, nickel, may show their presence by characteristic colours. Finally, the surface topo- graphy will often throw much light on the underground structure. The shape of the hills and ridges is necessarily influenced by the inclination of the strata, by the relative hardness of different rock-beds, and by the presence of folds and fissures and other lines of weakness. A quartz vein or bed of hard rock may show itself as a sharp ridge or as a well-defined bench; a stratum of soft rock or the line of a great fissure, or the weakening of the strata by an anticlinal fold, may produce a ravine or a deep valley. The bed of fire-clay under a coal seam, being impervious to water, frequently determines the horizon of numerous springs issuing from the hillsides. As the coal and the associated rocks usually contain pyrites, these springs are often chalybeate. When the location of the deposit has been determined approxi- mately, further search is made by trenches or pits or borings through the surface soil.

Exploratory Work. — Before opening and working a mine it is necessary to have as full and accurate information as possible as to the following:—

1. The probable extent and area of the deposit, its average thickness, and the probable amount and value of the mineral;

2. The distribution of the workable areas of mineral in the deposit;

3. Conditions affecting the cost of opening, developing and working the mine or determining the methods to be adopted.

Work undertaken to secure this information must be dis- tinguished from prospecting, which is the search for mineral deposits and from development, work undertaken to prepare for actual mining operations. Exploratory work is associated intimately both with prospecting and with development, but the purpose is quite distinct from either prospecting, develop- ment or working, and it is of importance that this should be clearly recognized. It must be remembered that the line between a workable deposit and one that cannot be profitably worked is often very narrow and that the majority of mineral deposits are not workable. The money that is spent in prospecting and in development is therefore liable to prove a loss. This is a recognized and legitimate business risk, differing only in degree from the risks attending all business operations. The risk of failure in mining enterprises is offset by the chances of more than ordinary profits. If the property proves valuable the returns may be very great. While the risk of loss of capital is not to be avoided, it is of the utmost importance to limit the amount of money expended while the extent and value of the deposit are still uncertain and to do the necessary work by the cheapest methods consistent with thoroughness. As the information as to the character and extent of the deposit becomes more definite, and as the prospects of success become more favourable, money may be spent more freely. The risk will vary with the character of the deposit. In the case of the cheaper and more abundant minerals, such as coal and iron ore, and of large deposits of low-grade ores, the extent and character of the deposit can generally be determined by surface examina- tions at comparatively small expense. On the other hand, in the case of less regular deposits, including most metalliferous veins, and especially those of the

precious metals, the uncertainty is often very great, and it is sometimes necessary to work on a small scale for months before any considerable expenditure of money is justified.

The quickest and cheapest method is by surface explorations. The work of the prospector frequently furnishes much of the information required. By sinking additional pits or by ex- tending the costeaning trenches and uncovering the outcrop of the deposit more fully it is sometimes possible to obtain all the

information required for the most extensive and important mining operations. Even when the outcrop is oxidized, and Surface the mineral character and richness of the deposit is Explore- altered thereby, it is possible to determine variations tioB ' in thickness and the extent and distribution of the

rich and barren areas by outcrop measurements. Information of this sort obtained by surface exploration is often as conclusive as similar information obtained from underground workings. If the deposit shows great variations in thickness in its outcrop along the surface it is probable that a drift or a slope would show the same thing in depth. If the workable areas are poor, and appear only at long intervals along the outcrop, the chances of discovering richer areas by a shaft are very small.

In many cases underground exploration is necessary. For example, the deposit does not outcrop as in the case of blind Borlaz ve,ns an< i A at deposits below the general level of the country; or the outcrop lies beyond the limits of the property or under water or water-bearing formations, or is covered by quicksand, or is deeply buried. For such buried deposits boring is cheaper than sinking. In the case of coal, salt, iron ore, pyrite and other homogeneous minerals, boring may give all the

information required. With a number of holes the average thickness and probable extent of the deposit may be determined, at least approximately. When the deposit is vertical or steeply inclined, horizontal or inclined bore-holes will be necessary. This will increase the cost of boring and will render the holes more likely to swerve from the true direction. In the case of metalliferous deposits of varying thickness or irregular distribution the information from bore-holes is less satisfactory. A large number of holes must be bored to obtain, even approximately, the average thickness and value of the ore and the shape and size of the ore bodies. In extreme cases the results from boring are likely to be untrustworthy and misleading unless the work is done on such a scale that the cost becomes prohibitory.

While the information obtained by surface explorations is always valuable, and sometimes conclusive, as to the value Under- °f the deposit, it is usually necessary to supplement ground Ex- and confirm it by underground work. The outcrop Proration. f a metalliferous vein is generally more or less altered by oxidation, and often a part of the valuable mineral has been converted into a soluble form and leached out. These conditions sometimes extend to a considerable depth. Below the oxidized outcrop the vein is often increased in value by secondary enrichment, sometimes to a depth of several hundred feet. In the case of such altered deposits surface exploration alone is likely to be misleading, and it is important to push the underground exploration far enough to reach the unaltered part of the deposit, or at least deep enough to make it certain that there is a sufficient quantity of altered or enriched ore to form the basis of profitable mining operations. As the sinking of shafts or the driving of narrow entries or drifts is expensive, and as the mineral extracted rarely pays more than a small fraction of the cost, it is usual to plan this exploratory work so that the openings made shall serve some useful purpose later. The mistake is often made of sinking large

and expensive shafts, or driving costly tunnels, before it is fully proved that the deposit can be worked on a scale to warrant such developments, and, indeed, too often before it is known that the deposit can be worked at all; and in too many cases large amounts of money are thus unnecessarily lost by over-sanguine mine managers. It is, however, often advisable that the money spent in surface or underground exploration should at the beginning be spent for information alone. The information so gained not only determines the value of the deposit, but also serves to indicate the best methods of development and of working. The money so spent, if judiciously used, insures the undertaking against loss by diminishing the mining risk, and is thus analogous to premiums paid to insure against fire or other sources of loss.

Development. — As soon as it appears reasonably certain that the property is workable the mine will be opened by one or more shafts, drifts or tunnels, and the underground passages

for active mining operations will be started. A drift or entry is a horizontal passageway starting from the outcrop and following the deposit. The former term is used in metal-mines and the latter in coal-mining. A tunnel differs from a drift in that it is driven across the strata to intersect the deposit Either may be used for drainage of the mine workings, in which case it becomes an adit. A mine should always be opened by drift or entry if practicable, as thereby the expense of hoisting and pumping is avoided. Drifts, entries and tunnels find their chief application in mining regions cut by deep valleys. When, however, the deposit lies below the surface the mine must be opened by a shaft. If the outcrop of the vein or bed is accessible the shaft may be inclined and sunk to follow the deposit. This is in general a cheaper and quicker method of development for inclined deposits than by a vertical shaft, and it has the added advantage that much information as to the character of the deposit is obtained as the shaft is sunk. When the deposit lying below the surface is horizontal, or

nearly so, or when the outcrop of an inclined deposit is not accessible, a vertical shaft will be necessary. Vertical shafts are better adapted to rapid hoisting, and have therefore somewhat greater capacity, than inclined shafts. They are to be preferred also for very deep shafts, or for sinking in difficult ground. Drifts and inclined shafts following the deposit may prove difficult of maintenance when the workings become large and settle- ment of the overlying strata begins. Large pillars of mineral should be left for the protection of the main openings, whether these be shafts or adits. In the case of very thick beds and mass deposits the main shaft or tunnel will preferably be located in the foot-wall.

Figs. 1 and 2 illustrate the development of a metal-vein by two adits, two inclined shafts in the lode, and by a deep vertical shaft connected with Solml . 'li-

the lode by horizontal cross • - '"-

cuts. The stippled areas represent the ore shoots and the white areas the barren portions of the lode. The levels are supposed to be 10 fathoms (60 ft.) apart. As the mine is opened the deposit is subdivided into blocks of convenient size by parallel passages, which form later the main haulage roads, and by transverse openings

for ventilation. In metal- / s* \ , .

mines the mam passages are ^ * ' '

known as levels, and these Fig. 1.

are connected at intervals by winzes or small shafts. In coal mines, entries and headings, bords and walls serve similar purposes. The size of the blocks or the distance between the

Fig. 2.

main passages is determined mainly by considerations of convenience and economy in excavating and

handling the

mineral, and by the possibility of supporting the roof long enough to permit the excavation of the mineral without unnecessary risk or expense. In metal mining, when the workable portions of the deposit are small and separated by unworkable areas, the levels serve also the purpose of explora- tion, and in such cases must not be so far apart as to risk missing valuable mineral. In coal-mines main entries are often ioo yds. apart, while in metal-mines the distance between levels rarely exceeds 50 yds. and sometimes is but 50 or 60 ft. In irregular and uncertain deposits this work of development should be kept at all times so far in advance of mining opera- tions as to ensure a regular and uniform output. In some cases, where the barren areas are large, it may be necessary to have two or three years' supply of ore thus blocked out in advance. A mine, however, may be over-developed, which results in loss of interest on the capital unnecessarily locked up for years by excessive development, and involves additional cost for the maintenance of such openings until they are needed for active mining operations.

Working. — When the . development of a mine has advanced sufficiently the operation of working or extracting the mineral begins. The method to be adopted will vary with the thickness and character of the deposit, with its inclination, and to some extent with the character of the enclosing rocks, the depth below the surface, and other conditions. The safety of the men must be one of the first considerations of the mine operator. In most civilized countries the safety of mine workers is guarded by stringent laws and enforced by the careful supervision of mine inspectors on behalf of the government. The method of mining adopted must secure the extraction of the mineral at a minimum cost. The principal item in mining cost is that of

labour, which is expended chiefly in breaking down the mineral, either by the use of hand tools or with the aid of powder. Labour is also expended in handling the mineral in the working- places and in bringing it to the mine-cars in which it is brought to the surface. Narrow and contracted working-places are to be avoided, as in such places the cost of breaking ground is always large. Economy in handling makes it desirable to bring the mine-cars as near as may be to the point where the mineral is broken. This can be done in inclined deposits, it can often be done by the aid of mechanical appliances, though sometimes at an expense not warranted in the saving in the labour of loading. In steeply inclined beds the working-place can be so arranged that the mineral will fall or slide from the place where it is broken down to the main haulage road. The greatest difficulty is found where the inclination of the deposit is too great to permit the mine-cars to be brought into the working-place and yet not great enough to allow the mineral to fall or slide to a point where it can be loaded.

While it is always desirable to provide large working-places, the size of .the working-place is limited by the thickness and size of strength of the overlying beds forming the roof Working- or hanging wall of the mine. With thick and strong Places. rocks the working-places may sometimes exceed 100 or even 200 ft. in width. Indeed in metal-mines 100 ft. is the usual distance from one level to the next. With weak and thin beds forming the roof the working-places are often not wider than 20 or 30 ft. as in most coal-mines. While the width of the working-place is thus limited by the strength of the roof, its length is determined by other considera- tions — namely, the rapidity with which the mining work can be conducted and the length of time it is practicable to keep the working-place open, and also by the increased difficulty of handling the minerals sometimes experienced when the workings reach undue length. In long-wall and in the work of mining pillars the roof will be supported on one side only, the over- hanging beds acting as cantilevers. The

working-place in such case is considerably narrower than in rooms or stopes, and there is also greater difficulty in supporting the roof because the projecting beds tend to break close to the point of support where the strain is greatest. This tendency is overcome by the use of timber supports so disposed as to ensure the breaking

of the overhanging roof at a safe distance from the working- face and prevent the interruption of the work that might otherwise result.

While it is always desirable to work the deposit so as to extract the mineral completely, it frequently happens that this can only be done at greatly increased cost. In complete the case of cheap and abundant minerals and low- Extraction grade ore deposits it is sometimes necessary to of Mineral. sacrifice a considerable proportion of the mineral, which is left for the support of the overlying strata. A similar sacrifice in the shape of pillars is often necessary to support the surface, either to avoid injury to valuable structures or to prevent a flooding of the mine. As already noted large pillars must always be left to protect shafts, adits and the more important mine-passages necessary for drainage, ventilation and the haulage of mineral. In the early history of mining there was but little attempt at systematic development and working, and the mines were often irregular and tortuous. Fig. 3 is

Fig. 3.

an old Mexican silver-mine of this type. In such mines the mineral was carried out on the backs of men, and the water was laboriously raised by a long line of suction-pumps, operated by hand, each lifting the water a few feet only. With but slight modifications permitting the use of pumps and hoisting- machinery equally simple methods of mining may be seen to-day when the deposit is of small extent. Fig. 4 is a portion of a mine which consists of a series of irregular chambers with the roof supported on small pillars left at intervals for the purpose. In the systematic mining of larger

deposits, the simplest plan consists in mining large areas by means of numerous working-places under the protection of pillars of mineral left for the purpose, and later mining these pillars systematically, allowing the ‘ **”

overlying rock beds to fall and fill the abandoned workings. In shallow mines the pillars are small and the saving of the mineral of minor importance. In deep mines the pillars may furnish the bulk of the product, and the control of the fall of the roof, so as to permit the successful extraction of the mineral, demands a well-schemed plan of operation. In the robbing of pillars, timber is necessary for the support oi

the roof in the working-places, and later to control the fall of the roof while the pillars are mined. More effective support and control of the roof may be secured by the use of rock-filling alone or with timber. By the use of rock-filling it is even possible to dispense with pillars of mineral; or, if pillars are left, the use of rock-filling greatly facilitates sub- sequent robbing operations. Rock-filling will be used whenever a large proportion of barren material must be mined with the ore. If rock-filling must be brought from the surface its use will generally be confined to mines in which it is difficult to support the roof in any other way. Rcck-filling yields and becomes consolidated under heavy pressure, and therefore does not furnish a rigid support of the overlying strata, but rather a cushion to control and equalize the subsidence.

With soft material, pillars must be large, even at moderate depths below the surface, and it involves less labour to leave Room- and long rectangular pillars than to form numerous Pillar- square ones. This leads to the adoption of the Mining. r00m anc [pillar system so common in coal-mining. Fig. 5 is a mine in a bed of soft iron ore worked by a series

Fig. 5.

of inclined shafts, from which long horizontal rooms branch off right and left.

The usual method of working metal-mines is by overhand and underhand stoping, using rock-filling! or pillars of mineral _., . to support the roof. Fig. 6 represents a portion

Stoping. r *i. t 1 e • • i J

of one of the Lake Superior copper-mines worked by overhand stoping. A stope is that portion of the working assigned to a party of miners, and the block of ground is usually

W//W/////AW//////////////A V///A !m%%m%

Fig. 6.

divided into three or four stopes at varying heights above the main level, the lowest being known as the cutting-out stope, the others as the first and second back stopes in ascending order. In steep pitching beds sufficient excavated material is allowed to remain in the stope for the support of the machines and men, the excess being drawn out from time to time and loaded into cars. The rest of the mineral is allowed to remain until the stope has so far advanced that its support is no longer needed. This method of mining requires but little timbering,

only a single line of timber and lagging over the level, called the stull. When the roof is weak, or when it is undesirable to leave so much ore in the stopes, false stulls are sometimes erected in the upper part of the stope. The ore below the false stulls can then be drawn out without waiting for the completion of the top stope. When the mineral does not stand well in the pillar it will be necessary to erect a line of timbers with lagging so as to sheathe the under-side of the pillar and prevent

Fig. 7

its falling. It is not desirable to leave large areas standing upon pillars in the mine, and as soon as the work on any level i.5 completed the pillar below should be mined out as far as is safe, and the abandoned portion of the mine allowed to cave in and lessen the weight on the pillars elsewhere. The block or ground between levels is sometimes mined by underhand stoping (fig. 7.). In this case the advanced drift is run under- neath the pillar, and the ground below is mined in descending steps. This plan has the advantage of requiring little or no timbering when the mineral is strong enough to stand well in the pillars and when the hanging wall is good. The main haulage tracks are laid at the bottom of the stope, which thus forms the level. In this method of mining the different stopes must be kept close together; otherwise there is much added labour in shovelling the broken ore down to the main level. This method has the advantage of permitting the ore to be sent to the surface as fast as it is mined instead of being left for some months in the stopes for the men to stand upon. It has the disadvantage that the distance from one level to the next cannot usually be more than fifty feet without increasing greatly the chances of injury to the men from falling rock. The method is then practicable and safe only with exceptionally strong mineral and roof. In metal-mines producing abundant rock-filling the overhand method of stoping, illustrated in fig. 8, is used. In this the stoping contracts run vertically,

and each party of contractors has one or more mills or timbered chutes through which the rich ore is conveyed to the level below and loaded in cars. The ore as mined is hand-picked and the barren material allowed to remain in the stope where it

falls. In this method of mining no pillars need be left under the levels, as the rock-filling gives sufficient support to the roof. This method of

mining affords the maximum of safety to the miners.

In the working of thick deposits the block of ground between two levels is divided into horizontal sections or floors which Working are worked either from above downward or from at Thick the bottom upward; in the first case the separate Deposits, floors are worked by one of the caving systems; in the second, generally with the aid of filling. Fig. 9 illustrates the working of a block of ground by the top-slice caving system. Above, the ground has been completely worked out from the surface, and the space formerly occupied by ore is now filled with the debris of the overlying strata which has caved in above the block of ore now being worked. There is considerable thickness of old timber left from the working of the upper levels. This mat of timber forms a roof under the protection of which the mining of the ore proceeds downward floor by floor. The working-floors are connected by winzes with the main haulage roads below. These winzes serve for ventilation, for the passage of the workmen, and for chutes through which the ore is dumped to the level below. The working out of each floor is conducted much as if it were a bed of corresponding thickness. Haulage roads are driven in the ore so as to divide the floor into areas of convenient size. These separate areas are then mined in small rooms, each room being timbered as in mining under a weak roof rock. The room is driven in this way from one haulage road to another or to the boundary of the ore body. On completion of any room the timbers are withdrawn and the overlying mass of timber and rock is allowed to fall and a new room is started immediately alongside of the one just completed. In this way the whole floor is worked out and the mat of timber and overlying rock is gradually lowered and rests upon the top of the ore forming the floor below. Before abandoning a room it is usual to cover the bottom of the working-place with lagging- poles, which facilitate the mining of the floor below. In this manner one floor after another is worked until the floor contain- ing the main haulage roads of the level below is reached. In the meantime a new level

and a system of haulage roads have been driven a hundred feet belowj and winzes have been driven upward to connect with the old level which is to be abandoned. The floor containing these old haulage roads now becomes the top slice of the one hundred-foot block of ground below and is mined out as described. Several floors may be mined simultaneously,

Fig. 9.

the workings in the upper floor being kept in advance of those below, so as to allow the broken mass above to become con- solidated before it is again disturbed by the working places of the next floor. This system permits the complete extraction of the ore at moderate cost and without danger to the men. The subdrift caving system, fig. 10, differs from the top-slice system mainly in the greater thickness given to the working floors, which may be from 12 to 40 ft. in thickness, whereas in the top-slice system the height of the floor is limited by the length of the timbers used in the working-rooms, rarely over 8 or 10 ft. The subdrift system requires a smaller amount

of narrow work in excavating the necessary haulage roads, and is therefore better adapted to hard ores in which such narrow work is expensive. The mining of each floor is carried on in sections with small working-places which are first driven of moderate height to their full length and width, leaving a back of ore above and pillars of ore between to support the upper portion of the upper layer or floor. These pillars and the

"1

Fig. 10.

back of ore above are then mined in retreating back towards the haulage road. The subdrift system is somewhat cheaper than the top-slice system, the output per man being greater.

The bottom-slice caving system of mining begins at the bottom of a hundred-foot block of ground, a floor being excavated under the whole area, leaving pillars of sufficient size to support the ground above. These pillars are then filled with blast holes which are fired simultaneously, permitting the whole block of ground to the level above to drop. A floor is then reopened in this fallen ore, leaving pillars for temporary support which are blasted out as before. This is the cheapest of the three caving systems, but is applicable only when the deposit lies between walls of very solid rock, as otherwise wall rock is liable to cave with and become mixed with ore, which adds greatly to the expense of handling.

When rock filling is available, as when the ore contains much barren material to be left behind in mining, the ore body is divided into blocks of convenient height as above, and these blocks are divided into floors, the bottom floor of each block however being attacked. Each floor is opened up by subsidiary haulage roads and worked out in small rooms which are timbered and filled with broken rock when completed. An adjoining room is next excavated and filled, and thus the whole floor is worked out and replaced with rock-filling. Work is then, started on the floor above, the upper floors being connected with the main haulage roads by winzes which are maintained through the filled ground. Several floors can be mined simultan- eously, the work in the lower floors being kept well in advance. Instead of mining in horizontal floors the filling method permits the ore to be mined in vertical chambers or slices which extend from one level to the next above and from one wall of the deposit to the other. When a chamber has been excavated and completely filled the slice adjoining is mined out, or at times a block of ground may be left untouched between two filled chambers and then mined out. In the latter case the top-slice caving method will usually be employed for the working of such intervening pillars. In order to lessen the cost of handling the rock-filling, the excavation sometimes

takes the form of inclined working-places, parallel to the slope naturally taken by the rock when dumped from above into the working

place. This method of mining and filling can be used when the work is done in horizontal floors or in transverse chambers. In the United States the Nevada square set system of timbering is used in connexion with rock filling (fig. n). The use of the heavy timbers and continuous framing which ‘ characterize this system facilitates greatly the work of mining and maintain- ing the haulage roads on the different floors, and gives more rigid support to the unmined portions of the block of ground above. These advantages compensate for the greater first cost. Where each floor is timbered by itself with light timbers, as is the practice on the continent of Europe, the consolidation of the rock-filling under pressure gives rise to considerable subsidence of the unmined ore, which has frequently settled 20 ft. or more before the upper part of the block is reached. This occasions much added expense in the maintenance and retimbering of the haulage roads on the upper floors. The shrinkage of the rock-filling and the settlement of the workings

Fig. 11,

can be greatly lessened by the use of hard rock with a minimum of fine stuff; but even so the advantage lies with the American System of timbering.

The cost of filling has been greatly reduced by the system of flushing culm, sand, gravel and similar material, through

pipes leading from the surface into mine work- Flushlag. m S s - Material as coarse as 1 in. in diameter may be

carried long distances underground with the use of little more than an equal volume of water. This

method originated in the Pennsylvania anthracice mines in 1887, but has been employed in recent years on a large scale in Silesia, Westphalia and other European coalfields. In some cases it has been found advantageous to quarry and crush rock for the purpose of using it in this way. Examples of other mining methods will be found under Coal.

Where mineral deposits lie near the surface underground mining may be replaced by open excavations, and the reduced

cost of mining makes it possible to remove the Workings, overlying soil and rock to considerable depths.

The depth to which open working can be pushed depends upon the size and value of the mineral-deposit and upon the expense of removing the over-burden. Open excava- tions several hundred feet in depth are not uncommon. Where practicable steam shovels are employed, even when it is neces- sary to break up the material beforehand by blasting. Steam shovels are not well adapted to deep excavation unless provision is, made for the rapid handling of the cars when filled. For deep workings the milling method is usually employed, in

which the ore is excavated in funnel-shaped pits, each of which connects with underground haulage roads by a shaft. The ore is mined in the ordinary way, by pick and shovel if soft, or by the aid of powder if necessary, and the funnel-shaped bottom of the pit is maintained at such an angle that little or no shovelling is required to bring the excavated material to the shaft. Before the bottom of these pits reaches the level of the haulage roads below, a new set of roads will have been driven at a lower level and connected with the excavations above by the shafts. The cost of mining by the milling method does not greatly exceed the cost of steam-shovel work. For the special methods by which placer deposits are mined see Gold.

Underground Haulage. — The excavated material is

brought to the hoisting shaft, or sometimes directly to the surface, in small mine cars, moved by men or by animals, or by locomotives or wire-rope haulage. The size, shape and design of the cars depend on the size of the mine passage and of the hoisting compartments of the shafts; on whether the cars are to be trammed by hand or hauled in trains; whether they are loaded by shovel or by gravity from a chute; and whether they are to be hoisted to the surface or used only for underground trans- port. The cost of underground haulage is lessened, by the use of cars of large capacity. In the United States cars in the coal and iron mines hold from 2 to 4 tons. In Europe the capacity ranges from 1000 to 15001b, though the tendency is to increase the size of the cars used. In mines of copper, lead and the precious metals, in which the cars are moved by hand, the usual load is from 1200 to 3000 lb. These small cars are constructed so that the load may be dumped by pivoting the car bodies on the trucks. Larger cars are usually dumped by means of rotating or swinging cradles, the car bodies being rigidly attached to the axles or trucks. When loaded by shovel the car is made low to economize labour. Wooden rails, protected by iron straps, are sometimes used on underground roads for temporary traffic; but steel rails, similar to, though lighter than, those employed for. railways are the rule. For hand tramming, animal and rope haulage, the rails weigh from 8 to 24 lb per yard, for locomotive haulage 30 to 40 lb. Grades are made, whenever possible, in favour of the load, and of such degree that the power required to haul out the loaded cars shall be approximately equal to that for hauling back the empties, viz. about 5 of 1 %. Sharp curves should be avoided, especially for mechanical haulage. Switches for turnouts and branches, &c, are similar to but simpler than those for railways.

In metal mines, where, as a rule, mechanical haulage is inapplicable, the cars are moved by men (trammers). This is expensive, but is made necessary by the small Man and amount of material to be handled at any given Animal point. The average speed

is about 200 ft. per Haulage. minute, and the distances preferably but a few hundred feet. Animal haulage is employed chiefly in collieries and large metal mines; sometimes for main haulage lines, but oftener for dis- tributing empty cars and making up trains for mechanical haulage. In mines .operated through shafts the animals are stabled underground, and when well fed and cared for, thrive notwithstanding their rather abnormal conditions of life. Mine cars are sometimes run long distances, singly or in trains, over roads which are given sufficient grade to impart consider- able speed by gravity, say from 1 to 2§%. The grades must not be too great for brake control nor for the hauling back of the empty cars. Cars may thus be run through long adits or through branch gangways to some central point for making up into trains. Near the top and bottom of hoisting shafts the tracks are usually graded to permit the cars to be run to and from the shaft by gravity.

Locomotive haulage is applicable to large mines, where trains of cars are hauled long distances on flat or undulating roads of moderate gradients. Steam locomotives have been largely superseded by compressed air or electric locomotives. Compressed air locomotives are provided with cylindrical

steel tanks charged from a special compressor with air at a pressure of 500 to 700 lb per sq. in. The capacity of. the

tank depends on the power required and the dis- Hauiage.™ tance to be traversed by a single charge of air.

The air passes through a reducing valve from the main to an auxiliary tank, in which the pressure is, say, 125 lb, and thence to the driving cylinders. By using compressed air vitiation of the mine air is avoided, as well as all danger of fire or explosion

of gas. Electric locomotives usually work on the trolley system, though a few storage battery locomotives have been successfully employed. Trolley haulage lacks the flexibility of steam or compressed air haulage, and is limited to main lines because the wires must be strung throughout the length of the line. By adopting modern non-sparking motors there is but little danger of igniting explosive gas. Electric and compressed air locomotives are durable, easily operated, and can be built to run under the low roofs of thin veins. Their power is proportioned to requirements of load and maximum gradient; the speed is rarely more than 6 or 8 m. per hour. Electric locomotives are in general more economical then either steam or compressed air.

For heavy gradients rope haulage has no rival, though for moderate grades it is often advantageously replaced by electric

and compressed air haulage. Gravity or self-acting Haulage. pl anes are f° r lowering loaded cars, one or more

at a time, from a higher to a lower level. The minimum grade is that which will enable the loaded cars in travelling down the plane to pull up the empty cars. At the head of the plane is mounted a drum or sheave, and around it passes a rope, one end of which is attached to the loaded cars at the top, the other to the empty cars at the foot. The speed due to the excess of weight on the loaded side is controlled by a brake on the drum. The rope is carried on rollers between the rails. There may be two complete lines of track or three lines of rails, one being common to both tracks, and the cars passing on a middle turnout or ” parting “; or a single track with a parting. An engine plane is an inclined road, up which loaded cars are hauled by a stationary engine and rope, the empty cars running down by gravity, dragging the rope after them. This is similar to shaft hoisting, except that the grades are often quite flat. In the tail-rope system of haulage, best adapted for single track roads, there are two ropes — a main and a ” tail ” rope — winding

on a pair of drums operated by an engine. The loaded train is coupled to the main rope, and to the rear end is attached the tail-rope, which reaches to the end of the line, passing there around a large grooved sheave and thence back to the engine. By winding in the main rope the loaded cars are hauled towards the engine, dragging behind them the tail-rope, which unwinds from its drum. The trip being completed, the empty train is hauled back by reversing the engine. The ropes are supported between the rails and guided on curves by rollers and sheaves. High speeds are often attained. Branches, operated from the main line, are readily installed. In the endless rope system the rope runs from a grip wheel on the driving engine to the end of the line, round a return sheave, and thence back to. the engine. Chains are occasionally used. The line is double track and the rope constantly in motion, the cars being attached at intervals through its length by clips or clutches; the loaded cars move in one direction, the empties in the other. There are two modes of installing the system: either the rope passes above the cars and is carried by them, resting in the clips, or it is carried under the cars on rollers, the cars being attached by clips or a grip- carriage. (For details see Hughes, Text-book of Coal Mining, pp. 236-272; Hildenbrand, Underground Haulage by Wire Rope.) Rope haulage is widely used in collieries, and sometimes in other mines having large lateral extent and heavy traffic. With the tail-rope system, cars are run in long trains at high speed, curves and branches are easily worked, and gradients may be steep, though undulating gradients are somewhat disadvantageous. In the endless-rope systems cars run singly or in short trains, curves are disadvantageous, unless of long

radius, speed is relatively slow, and branch roads not so easily operated as with tail-rope. The tail-rope plant is the more expensive, but for similar conditions the cost of working the two systems is nearly the same. An advantage of the endless system is that the cars may be delivered at regular

intervals. Hoisting. — When the mine is worked through shafts, hoisting plant must be installed for raising the ore and handling- men and supplies. On a smaller scale hoisting is also necessary for sinking shafts and winzes and for various underground services. As ordinarily constructed, a pair of horizontal cylin- ders is coupled to a shaft on which are mounted either one or two drums (fig. 12). The diameter of the cylinders is such that each alone is capable of starting the Engine* load. As the cranks are set 90° apart, there is no dead centre, and the engine is able to start under full load from any point of the stroke. This is important in mine hoisting,

Fig. 12. — Plan of direct-acting hoisting engines, compound Corliss engines and conical drums. Wellman-Seaver-Morgan Co., Cleveland, Ohio, makers.

which is intermittent in character and variable as to power and speed required. The cylinders are generally single-expan- sion, though compound engines are occasionally used for heavy work. The engine is direct-acting, the drums making one revolution for each double stroke. In geared hoists the drums are.on a separate shaft, driven from the crank-shaft by tooth or friction gearing, and make one revolution for, say, 4 or 5 double strokes. The hoisting speed is therefore slower, and as less engine power is required for a given load the cylinders are smaller, though making more strokes per minute. Large and powerful- geared hoists are not uncommon. The dimensions of the drum depend on the hoisting speed desired and the depth of shaft or length of rope to be wound. Drums are either cylindrical or conical. Conical drums (fig. 12) tend to equalize the varying load on the engine due to the winding and unwinding of the rope. On starting to hoist, the rope winds from the small towards the large end of the drum, the lever arm, or radius of the coils, increasing as the weight of

rope decreases. A similar equalizing effect is obtained by the use of flat rope and reel, the rope winding on itself like a ribbon. Tapering ropes, tail-ropes suspended from the cages, and other means of equalization, are also employed. If, for a two-compartment shaft, a pair of drums (or a single wide drum) be keyed to the engine shaft, with the ropes wound in opposite directions, the hoisting is ” in balance,” that is, the cages and cars counterbalance each other, so that the engine has to raise only the useful load of mineral, plus the rope. This arrangement allows no independence of movement: when the loaded cage is being, hoisted the y’’

empty must be lowered. Independent drums, on the contrary, are loose upon their shaft, and are thrown on or off by tooth or friction clutches. The maximum load on the engine is thus greater and more .. power is required than for fixed drums. ‘ Steam consumption is economized, when- ever possible, by throwing in the clutches of both drums and hoisting in balance. Fixed drums are best for mines in which the hoisting is done chiefly from one level; independent drums when there are a number of different levels. Hoisting engines are provided with powerful brakes and fre- quently with reversing gear. In deep shafts hoisting speeds of 3000 or 3500 ft. per minute are often attained, occasionally as much as 5000 ft.

Formerly hemp and also fibre ropes were commonly used. Except in a few instances these were long ago superseded by Kopes° g iron-wire ropes, which in turn have been replaced by steel because of its greater strength. For hoisting in deep shafts, and to reduce the weight of rope, tempered-steel wire of very high tensile strength (up to 250,000 or 275,000 lb ultimate strength per sq. in.) is advantageously em- ployed. A i-in. ordinary steel rope has a breaking strength of about 32 tons, which, with a factor of safety of six gives a safe working load of si tons. A i-in. plow-steel rope has breaking and working strengths respectively of at least 48 and 8 tons. Standard round rope (fig. 13) has six strands

of 19 wires each and a hemp "core. Flat rope is in favour in some districts. It is composed of several four- stranded ropes, without hemp centres, laid side by side, and sewed together by wire (fig. 14). It is not as durable as round rope and is heavier for the same working strength. As the sewing wires soon begin to break, a flat rope must usually be ripped apart and resewed every six or eight months. Numerous patent ropes, some having wires and strands of special shapes, have been introduced with the idea of improving the wearing properties. Such, for example, are the Lang-lay, locked-coil and flattened strand rope. Hoisting ropes are weakened by deterioration and breakage of the wires, due to corrosion and repeated bend- ing, and should be kept under careful inspection. To prevent excessive bending stresses the diameter of drum and sheave must bear a proper ratio to that of the rope. A ratio of 48 to 1 is the minimum allowable; better 60 to 75 to 1, and for highly-

tempered steel ropes ratios of 150 to 1 or more are desirable- To prevent corrosion the rope should be treated at intervals with hot lubricant. With proper care a steel rope should last from two to three years.

A frame of wood or steel, erected at the shaft mouth, and

Head-gear.

Fjg. 13. — Standard round Rope.

Fig. 14. — Flat Rope.

(From The Colliery Engineer, May 1897.)

Fig. 15. — Head-gear.

carrying the grooved sheaves over which the hoisting ropes pass, is known as the head-gear (fig. 15). In Great Britain and her colonies it is also called the poppet-head or pit- head frame; in the United States head-frame or gallows-frame. Though it is small and simple in construction for light work, for heavy

hoisting at high speeds massively framed towers, often 80 to 100 ft. in height, are built. Steel frames are more durable than those of wood, and have become common in nearly all mining countries, especially where timber is scarce. A German design is shown in fig. 16. The head-gear is often combined with ore-bins and machinery for breaking and sizing the lump ore previous to shipment to the reduction works.

Cages, running in guides in the shaft, are used for raising the cars of mineral to the surface (fig. 17),. They may have one, two or more decks, usually carrying one or two cars on each deck. Multiple-deck cages are rarely employed except for deep shafts of small cross-section or when the mine cars (tubs) are small, as in many parts of Europe. In many mines the mineral is raised in skips (fig. 18), filled from cars underground and dumping automatically on reaching the surface. Skips are sometimes of very large capacity, holding 5, 7, and even 10 tons of ore; such are used, for example, in several shafts at Butte, Montana, in the Lake Superior copper district, and in South Africa. Fig. 18 is a small skip; the upper illustration showing position for dumping. The lower cut is of a skip for either ore or water; note valve in bottom. Hoisting buckets or kibbles are employed for small

Cages and Skips.

scale work or temporary service, such as raising the material blasted in sinking shafts. They hold from a few hundred pounds up to i ton. In hoisting from great depths the weight of the rope, which may exceed that of the cage and

Fig. i 6. — Steel head-gear, modern German type, constructed by Aug. Klonne, Dortmund.

contents, produces excessive variations in the load

on the engine difficult to deal with. Moreover, the limit of vertical depth at which rope of even the best quality will support its own weight only, with a proper margin of safety, is, say, 10,000 to 12,000 ft.; and with the load the safe working limit of depth would be reached at 7000 to 8000 ft. A number of

Fig. 17. — Light steel safety FIG. 18. — Ore and water skips

mining cage and car for gold for inclined shaft. Allis-

and silver mines. Wellman- Chalmers Co., Milwaukee,

Seaver-Morgan Co., Cleveland, Wisconsin, makers. Ohio, makers.

shafts in South Africa, the United States and elsewhere, are already approximating depths of 5000 ft., a few being even deeper. Ropes of tapering section may be used for great depths, but are not satisfactory in practice. 1 Stage hoisting is applicable to any depth. Instead of raising the load in one lift from the bottom of the shaft, one or more intermediate 1 A full discussion of this subject is given in Trans. Ins. Min. and Met., vol. xi.

dumping and loading stations are provided. Each stage has its own engine, rope and cage. The variations in engine load are thus reduced, and incidentally hoisting time is saved.

In shallow mines the men use the ladder-way in going to and from their work. This is sometimes the case also for considerable depths. It is more economical leering to save the men’s strength, however, by raising Men. and lowering them with the hoisting engines.

At mines with vertical shafts this is a simple operation. Cages of the size generally used in metal mines will hold from ten to fifteen and occasionally twenty men. The time consumed in lowering the men is

shortened by the use of cages having two or more decks. These are common in Europe, and are sometimes employed in the United States and elsewhere in mines where the output is large and the shafts deep and. of small cross section. While a shift of men is being lowered the miners of the preceding shift are usually raised to the surface in the ascending cages, the entire shift being thus changed in the time required for lowering. Nevertheless, in very deep and large mines the time consumed in handling the men may make serious inroads on the time available for hoisting ore. At a few mines special man-cages are operated in separate compartments by their own engines for handling part of the men, and for tools, supplies, &c. For inclined shafts, where the mineral is hoisted in skips, the operation of raising and lowering men may not be so simple. Even a large skip will hold but a few men, the speed is slower, and more time is required for the men to get into and out of the skip than to step on and off a cage. Moreover, skips are rarely provided with safety attachments, so that the danger is greater. When the shafts are deep and the number of miners large man-cars are sometimes employed. These are long frames on four wheels, with a series of seats like a section of a theatre gallery. Ordin- arily 4 or 5 men occupy each seat, the car accommodating from 20 to 36 men. Such cars are in use at a number of deep inclined shafts in the Lake Superior copper district, where the depths range from 3000 to 5000 ft. or more. At a few mines (since safety catches cannot be successfully applied to man-cars) these conveyances are raised and lowered by separate engines and ropes. To replace the ore-skip expeditiously by the man-car when the shifts are to be changed a crane is often erected over the shaft mouth. At the end of a shift the ore-skip is lifted from the shaft track — the hoisting rope being uncoupled — and the man-car put in its place and attached to the rope. This change may be made in a few minutes.

Formerly, at many deep European mines, and at a few in the United States, men were raised by means of

“man-engines.” A man-engine consists of two heavy wooden rods (like the rods of a Cornish pumping plant), placed Bagines. parallel and close to each other in a special shaft compartment, and suspended at the surface from a pair of massive walking beams (or ” bobs “). The rods are caused to oscillate slowly by an engine, one rising while the other is falling. Thus they move simultaneously in opposite directions through a fixed length of stroke, say from 10 to 12 ft. At intervals on the rods are attached small horizontal platforms, only large enough to accommodate two men at a time. As the rods make their measured strokes one of the miners, starting from the surface, steps on the first platform as it rises to the surface landing ind is then lowered on the down stroke. At the end of the stroke, when his platform comes opposite to a correspond- ing platform on the other rod, he steps over on to the latter during the instant of rest prior to the reversal of the stroke, descends with the second rod on this down stroke, steps again’ at the proper time to a platform of the first rod and so on to the bottom. The men follow each other, one by one, so that in a few minutes all the rod platforms in a deep shaft may be simultaneously occupied by men stepping in unison but in opposite directions from platforms of one rod to the other. Meantime, the men quitting work are ascending in a similar way, as there is room on each platform for two men at a time when passing each other. Man-engines were long used,

but are now practically abandoned in both Great Britain and the United States, and few remain in any of the mining regions of the world. Their first cost is great and they are dangerous for new men, as they require constant alertness, presence of mind, and a certain knack in using them. See Trans. Inst. Min. and Met. xi. 334, 345, 380, &c; also Eng. and Min. Jour. (April 4, 1903), pp. 517 and 518.

Surface Handling, Storage and Shipment of Minerals. — To mine ore or coal at minimum cost it is necessary to work the mine plant at nearly or quite its full capacity and to avoid interrup- tion and delays. When the mineral is transported by rail or water to concentration or metallurgical works for treatment, or to near or distant markets for sale, provision must be made for the economical loading of railway wagons or vessels, and for the temporary storage of the mineral product. For short periods the mineral may remain in the mine cars, or may be loaded into railway wagon's held at the mine for this purpose. Cars, however, are too valuable to be used in this way for more than a few hours, and it is usual to erect large storage bins at the mine, at concentration works and metallurgical establish- ments, in which the mineral may be stored, permitting cars, wagons and vessels to be quickly emptied or loaded. In mining regions where 'water transportation is interrupted during certain months of the year the mineral must be stored underground, or in great stock -piles on the surface. In coal mining the market demand varies in different seasons, and surface storage is sometimes necessary to permit regular work at the mines. For coal, iron ore and other cheap minerals, mechanical handling by many different methods is used in loading and unloading railway wagons and vessels, and in forming the stock-piles and reloading the mineral therefrom. (See Conveyor and Docks; also G. F. Zimmer, Mechanical Handling of Materials, and Engineering Magazine, xiv. 275, xx. 157 and xxi. 657.)

Mine Drainage. — A mine which has been opened by an adit tunnel or drift drains itself, so far as the workings above the adit level are concerned. In many mining regions long tunnels have been driven at great expense to secure natural drainage. Under modern mining conditions drainage tunnels have lost much of their former importance. Taking into account the risk attending all mining operations, which make necessary large interest and amortization charges on the cost of a tunnel, it will in most cases be advisable to raise the water to the sur- face by

mechanical means. Drainage channels are provided, usually along the main haulage roads, by which the water flows to a sump excavated at the pump shaft. In driving mine passages that are to be used for drainage, care is taken to maintain sufficient gradient. Siphons are sometimes used to carry the water over an undulating grade and thereby save the expense of a deep rock cutting. As the larger part of the water in a mine comes from the surface, the cost of drainage may be reduced by intercepting this surface water, and collecting it at convenient points in the pump shaft from which it may be raised at less cost than if permitted to go to the bottom. Water may be raised from mines by buckets, tanks or pumps. Wooden or steel buckets, holding from 35 to 200 gallons, are employed only for temporary or auxiliary service or for small quantities of water in shallow shafts. Tanks operated by the main hoisting engines, and of capacities up to 1500 gallons or more, are applicable under several conditions: (j) When the shaft is deep, the quantity of water insufficient to keep a pump in regular operation, and the hoisting engine not constantly employed in raising mineral, the tank is worked at intervals, being attached temporarily to the hoisting rope in place of the cage. (2) For raising large volumes of water from deep shafts pairs of tanks are operated in balance in special shaft compartments by their own hoisting engine. With an efficient engine the cost per gallon of water is often less than for pumping. (3) For clearing flooded mines. As the water level falls the tanks readily follow it while at work, whereas pumps must be lowered to new positions to keep within suction distance. Self-acting tanks are occasionally built underneath

the platforms of hoisting cages. Mine pumps are of two classes: (1) those in which the driving engine is on the surface and operates the pumps by a long line of rods passing down the shaft, commonly known as the Cornish system; (2) direct-acting pumps, in which the engine and pumping cylinders form a single unit, placed close to the point underground from

which the water is to be raised. Cornish pumps are the oldest of the machines for draining mines; in fact, one of the earliest applica- tions of the old Woolf and Newcomen engines in the 18th century was to pumps for deep mines. The engine works a massive counter-balanced walking-beam from which is suspended in the shaft a long wooden (or steel) rod, made in sections and spliced together. Attached to the rod by offsets are one or more plunger or bucket pumps, set at intervals in the shaft. All work simultaneously, each raising the water to a tank or sump above, whence it is taken by the next pump of the system, and finally discharged at the surface. The individual pumps are placed several hundred feet apart, so that a series is required for a deep shaft. The speed is slow — from 4 to 10 strokes per minute — but the larger sizes, up to 24 in. or more in diameter by 10 or 12 ft. stroke, are capable of raising millions of gallons per day. Cornish pumps are economical in running expenses, provided the driving engine is of proper design and the dis- advantages incurred in conveying steam underground are avoided. Their first cost, however, is high and the cumbeisome parts occupy much space in the shaft. Direct-acting pumps, first introduced (1841) by an American, Henry R. Worthington, are made of many different designs. Typically they are steam pumps, the steam and water cylinders being set tandem on the same bed frame, generally without fly-wheel or other rotary parts; they may be single cylinder or duplex, simple, compound or triple expansion, and having a higher speed of stroke are smaller in all their parts than Cornish pumps. For high heads the water cylinders, valves and valve chambers are specially constructed to withstand heavy pressures, water being sometimes raised in a single lift to heights of more than 2000 ft. Con- densers are always required for underground pumps. Sinking pumps, designed for use in shafts in process of sinking, are suspended by wire ropes so as to be raised before blasting and promptly lowered again to resume pumping. Electrically driven pumps, now widely used, are convenient and economical. Mine pumps of ordinary forms may be operated by

compressed air, and air-lift pumps have been successfully employed. Hy- draulic pumping engines, while not differing essentially from steam pumps, must have specially designed valves in the power cylinder on account of the incompressibility of water. They can be used only when a supply of water under sufficient pressure is available for power. Centrifugal pumps, constructed with Several stages or sets of vanes, and suitable for high lifts, have been introduced for mine service. When mine water is acid the working parts of the pump must be lined with or made of bronze or other non-corrosive material; Or the acid may be neutralized by adding lime in the sump.

Ventilation.— The air of a mine is vitiated by the presence of large numbers of men and animals and of numerous lights, each of which may consume as much air as a number of men. In mining operations explosives are used on a large scale and the powder gases contain large quantities of the very poisonous gas, carbon monoxide, a small percentage of which may cause death, and even a minute percentage of which in the air will seriously affect the health. In addition to these sources of contamination the air of the mine is frequently charged with gas issuing from the rocks or from the mineral deposit. For example, carbon dioxide occurs in some mines, and hydrogen sulphide, which is a poisonous gas, in others. In coal-mines we have to deal with ” fire-damp ” or marsh gas, and with inflammable coal dust, which form explosive mixtures with air and frequently lead to disastrous explosions resulting in great loss of life. The gases produced by such fire-damp or dust explosions contain carbon dioxide and carbon monoxide in large proportion, and the majority of the deaths from such explosions are due to this ” after-damp ” rather than to the

Natural Ventilation.

explosion itself. The terrible effects of fire-damp have led to the adoption of elaborate systems of ventilation, as the most effective safeguard against these explosions is the dilution and removal of the fire-damp as promptly and completely as possible. Very large volumes of air are necessary for this purpose, so that in such mines other sources of vitiation are adequately provided against and need not be considered. In metal mines, however, artificial ventilation is rarely attempted, and natural ventilation often fails to furnish a sufficient quantity of air. The examination of the air of metal mines has shown that in most cases it is much worse than the air of crowded theatres or other badly ventilated buildings. This has a serious effect on the health and efficiency of the workmen employed, and in extreme cases may even result in increased cost of mining operations. The ventilation of a mine must in general be produced artificially. In any case whether natural or artificial means be employed, a mine can only be ventilated properly when it has at least two distinct openings to the surface, one an intake or ” downcast,” the other a chimney serving as an ” upcast.” Two compartments of a shaft may be utilized for this purpose, but greater safety is ensured by two separate openings, as required by law in most mining countries.

The air underground remains throughout the year at nearly the same temperature, and is warmer in winter and cooler in summer than the outside air. If the two openings to the mine are at different levels the difference in weight of the inside and outside air due to differ- ence in temperature causes a current, and in the winter months large volumes of air will be circulated through the mine from this cause alone. In summer there will be less movement of air and the current will frequently be reversed. In a mine with shafts opening at . the same level, natural ventilation once established will be effective during cold weather, as the down- cast will have the temperature of the outside air, while the upcast will be filled with the warm air of the mine. In summer this will occur only on cool days

and at night. When the temperature of outside and inside air becomes equal or nearly so natural ventilation ceases or becomes insignificant. In a mine with two shafts a ventilating current may result from other conditions creating a difference in the temperature of the air in either shaft — for example, the cooling effect of dropping water or the heating effect of steam pipes. Natural ventilation is impracticable in flat deposits worked by drifts and without shafts.

Ventilation may be produced by heating the air of the mine, as for example, by constructing a ventilating furnace at the bottom of an air shaft. The efficiency of such p e ° n '^'° g ventilating furnaces is low, and they cannot safely be used in mines producing fire-damp. They are sometimes the cause of underground fires, and they are always a source of danger when by any chance the ventilating current becomes reversed, in which case the products of combustion, containing large quantities of carbon dioxide, will be drawn into the mine to the serious danger of the men. On account of their dangerous character furnaces are prohibited by law in many countries.

Positive blowers and exhausting apparatus of a great variety of forms have been used in mines for producing artificial ventilation. About 1850, efficient ventilators of the Ventilators centr i lu f? a l typ e were first introduced, and are now 'almost universally employed where the circulation of large volumes of air is necessary, as in collieries. The typical mine fan consists of a shaft upon which are mounted a number of vanes enclosed in a casing; the air entering a central side inlet is caught up by the revolving vanes and thrown out at the periphery by the centrifugal force thus generated. " Open- running " fans have no peripheral casing, and discharge freely throughout their entire circumference; in " closed " fans the revolving part is completely enveloped by a spiral casing opening at one point into a discharge chimney. Fans either force air into or exhaust it from the mine. The inlet opening of the pressure fan is in free

communication with the outside air,

the discharge connecting with the mine air- way; in the more generally used exhaust fan the inlet is connected with the air- way, the fan discharging into the atmosphere. Among the exhaust fans most widely employed is the Guibal. Many others have been introduced, such as the Capell (fig. 19), Rateau,

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(From Mines and Minerals, March, 1005.)

Fig. 19. — Capell Fan.

Schiele, Pelzer, Hanarte, Ser, Winter, Kley, and Sirocco fans.

The Waddle may be instanced as an example of the open fans.

Slow-speed fans are sometimes of large dimensions, up to 3c

and even 45 ft. diameter, discharging hundreds of thousands

of cubic feet of air per minute. Occasionally, at very gassy

and dangerous collieries, two fans and driving engines are

erected at the same air shaft, and in case of accident to the

fan in operation the other can be started within a few minutes.

Opposed to the motive force producing the air current is the

frictional resistance developed in passing through the mine

workings. This resistance is equal to the square of

the velocity of the current m feet per minute, otAlr

multiplied ‘ by the total rubbing or friction surface of the air-ways in square feet and by the coefficient of friction. The latter, determined experimentally, varies with different kinds of surfaces of mine workings, whether rough or smooth, timbered or unlined; it ranges from 0-000000001872 to 0-0000000217 lb per sq. ft., the latter being the value usually adopted. A certain pressure of air is required to main- tain circulation against the resistance, and for a given volume per minute the smaller and more irregular the mine openings the greater must be the pressure. The pressure is measured by a ” water-gauge ” and the velocity of flow by an ” anemometer.” The power required to circulate the air through a mine increases as the cube of the velocity of the air current. To decrease the velocity, when large volumes of air are required, the air passages are made larger, and the mine is divided into sections and the air current subdivided into a corresponding number of indepen- dent circuits. This splitting of the air not only lessens the cost of ventilating, but greatly increases its efficiency by permitting the circulation of much larger volumes, and has the added advantage that the effect of an explosion or other accident vitiating the air current is often confined to a single division of the mine, and affects but a small part of the working force. The adjust- ment of the air currents in the different splits is affected by regulators which are placed in the return air-ways, and act as throttle valves to determine the volume of air in each case. The circulation of air in any given division of the mine is further controlled and its course determined by temporary or permanent partitions (” brattices “), by the erection of stoppings, or by the insertion of doors in the mine passages and by the use of special air-ways (see Coal). In devising a system of ventilation it is customary to subdivide the workings so that the resistance to the ventilating current in each split shall be nearly equal, or so

that the desired amount of air shall be circulated in each without undue use of regulating appliances which add to the friction and increase the cost of removing the air. In addition to this it is desirable to take advantage of the natural ventilation, that is, to circulate the air in the direction that it goes naturally, as otherwise the resistance to the movement of the air may be

greatly increased. So far as possible, vitiated air is led directly to the shaft instead of passing through other workings; for example, mine stables when used are placed near the upcast shaft and ventilated by an independent split of the ventilating current.

Deep Mining. — There has been much speculation as to the depth to which it will be practicable to push the work of mining. The special difficulties which attend deep mining, in addition to the problems of hoisting ore and raising water from great depths, are the increase of temperature of the rocks and the pressure of the overlying strata. The deepest mine in the world is No. 3 shaft of the Tamarack mine in Houghton county, Michigan, which has reached a vertical depth of about 5200 ft. Three other shafts of the Tamarack Company, and three of the neighbouring Calumet and Hecla mine, have depths of between 4000 and 5000 ft. vertical. The Quincy mine, also in Houghton county, has reached a vertical depth of nearly 4000 ft. In England are several collieries over 3000 ft., and in Belgium two are nearly 4000 ft. deep. In Austria three shafts in the silver mines at Prizbram have reached the depth of over 1000 metres. At Bendigo in Australia are several shafts between 3000 and 4000, and one, the Victoria Quartz mine, 4300 ft. deep. In the Transvaal gold region (South Africa), a number of shafts have been sunk to strike the reef at about 4000 ft. In most cases the deposits worked are known to extend to much greater depths than have been

reached. The possibility of hoisting and pumping from great depths has been discussed, and it remains now to consider the other conditions which will tend to limit mining operations in depth — namely, increase of temperature and increase of rock pressure. Observations in different parts of the world have shown that the increase of temperature in depth varies: in most localities the rise being at the rate of one degree for 50 to 100 feet of depth; while in the deep mines of Michigan and the Rand, an increase as low as one degree for each 200 ft. or more has been observed. In the Comstock mines at Virginia City, Nevada, it is possible to continue mining operations at rock temperatures of 130 F. In these mines a constant supply of pure air, about 1000 cub. ft. per minute, was blown into the hot working places through light iron pipes. The air issuing from these pipes was dry and warm, and served to keep the temperature of the air below 120°, at which temperature it was possible for men to work continuously for half an hour at a time, and for four hours in the day. In some places work was conducted with rock temperatures as high as 158 F., with air 135 F. In these very hot drifts the fatality was large. In the Alpine tunnels, where the air was moist and probably not as pure as in the Comstock mines, great difficulty was experienced in prosecuting the work at temperatures of 90° F. and less. The mortality was large, and it was believed by the engineers that temperatures over 104 would have proved fatal to most of the workmen. Deep mines, however, are generally dry, so that in most cases it will be possible to realize the more favourable conditions of the Comstock mines. Assuming an initial mean temperature of 50° F., and increments of one degree for 100 and for 200 ft., a rock tem- perature of 130 will be reached at 8000 to 16,000 ft. In many deep mines to-day ” explosive rock ” has been encoun- tered. This condition manifests itself, for example, in mine pillars which are subjected to a weight beyond the limit of elas- ticity of the mineral of which they are composed. Under such conditions the pillar begins to yield, and fragments of mineral fly off with explosive

violence, exactly as a specimen of rock will splinter under pressure in a testing machine. The flying frag- ments of rock have frequently injured and sometimes killed miners. A similar condition of strain has been observed in deep mines in different parts of the world — perhaps due to geological movements. Assuming a weight of 13 cub. ft. to the ton, then at 6500 ft. the pressure per sq. ft. will be 500 tons, and at 13,000 ft. 1000 tons; and as the mineral is mined the weight on the pillars left will be proportionately greater. At such pressures all but the strongest rocks will be strained beyond their limit of elasticity. At depths of 1000 ft.

and less some of the softer rocks show a tendency to flow, a& exhibited by the under-clay in deep coal-mines, which not infrequently swells up and closes the mine passages. In the Mont Cenis tunnel a bed of soft granite was encountered that continued to swell with almost irresistible force for some months. The pressure developed was sufficient to crush an arched lining of two-foot granite blocks. Similar swelling ground is not infrequently met with in metal mines, as, for example, in the Phoenix copper mine in Houghton county, Michigan, where the force developed was sufficient to crush the strongest timber that could be used. In very deep mines this flowing of soft rock will doubtless add greatly to the difficulty of maintaining openings. What may happen in some cases is illustrated by the curious form of accident locally known as a ” bump,” which occurs in some of the deep coal-mines of England. In one instance (described by F. G. Meacham, Trans. Fed. Inst. M.E. v. 381), the force developed by the swelling under-clay broke through and lifted with the force and suddenness of an explosion a lower bench of coal 8 ft. thick in the bottom of a gangway 12 ft. wide for a length of 200 ft., throwing men and mine cars violently against the roof and producing an air-wave which smashed the mine doors in the vicinity. It is apparent that the combined effect of internal heat and rock pressure will greatly increase the cost of mining at depths of 8000 or 10,000 ft., and will probably render mining

impracticable in many instances at depths not much greater.

Mine Administration. — In organizing a mining company it must be recognized that mining is of necessity a temporary business. When the deposit is exhausted the company must be wound up or its operations transferred to some other locality. Mining is also subject to the risks of ordinary business enterprises, and to addi- tional risks and uncertainties peculiar to itself. The vast majority of mineral deposits are unworkable, and of those that are developed a large proportion prove unprofitable. In addition mining opera- tions are subject to interruption and added expense from explosions, mine fires, flooding, and the caving-in of the workings. To provide for the repayment from earnings of the capital invested in a mining property and expended in development, and to provide for the depreciation in value of the plant and equipment, an amortization fund must be accumulated during the life of the mine; or, if it be desired to continue the business of mining elsewhere, a similar fund must be created for the purchase, development and equipment of a new property to take the place of the original deposit when that shall be exhausted. If, for example, we assume the life of a given mine at ten years and the rate of interest at 5 % it will be neces- sary that the property shall earn nearly 13% annually — viz., 5% interest and 8 % for the annual payment to the amortization or the reserve fund. To cover the special risks of mining, capital should earn a higher interest than in ordinary business, and if we assume that the sinking-fund be safely invested, we must compute the amortization on a lower basis than 5 . Assuming, for example, the life of the mine at ten years as before, and taking the interest to be earned by the amortization fund at 3, and that on the investment at 10%, we shall find that the annual income should amount to 18-7% per year. These simple business principles do not seem to be generally recognized by the investing public, and mines, whose earning capacity is accurately known, are frequently quoted on the stock

markets at prices which cannot possibly yield enough to the purchaser to repay his investment during the probable life of the mine.

Mine Valuation. — The value of any property is measured by its annual profits. In the case of mining properties these profits are more or less uncertain, and cannot be accurately determined until the deposit has been thoroughly explored and fully developed. In many instances, indeed, profits are more or less uncertain during the whole life of the mine, and it is evident that the value of the mining property must be more or less speculative. In the case of a developed mine its life may be predicted in many cases with abso- lute certainty— as when the extent of the mineral deposit and the volume of mineral can be measured. In other cases the life of the mine, like the value of the mineral, is more or less uncertain. Further, both time and money are required for the development of the mining property before any profit can be realized. Mathemati- cally we have thus in all cases to compute present value on the basis of a deferred as well as a limited annuity. The valuation of mines then involves the following steps: (1) The sampling of the deposit so far as developed, and assaying of the samples taken; (2) The measurement of the developed ore ; (3) estimates of the probable amount of ore in the undeveloped part of the property ; (4) estimates of probable profits, life of the mine, and determination of the value of the property. Where the deposit is a regular one and the mineral is of fairly uniform richness, the taking of. a few samples from widely separated parts of the mine will often furnish sufficient data to

determine the value of the deposit. On the other hand in the case of uncertain and irregular deposits, the value of which varies between very wide limits, as, for example — in most metal mines and especially mines of gold and silver — a very

large number of samples must be taken — sometimes not more than two or three feet apart — in order that the average value of the ore may be known within reasonable limits of error. The sampling of a large mine of this character may cost many hundreds of pounds. This applies with even greater force to estimates of undeveloped portions of the property. If the deposit is regular and uniform, the value of undeveloped areas may sometimes be predicted with confidence. In the majority of instances, however, the estimates of undeveloped ore contain a large element of uncertainty. In order to determine the probable profit and life of the mine a definite scale of operations must be assumed, the money required for development and plant and for working capital must be estimated, the methods of mining and treating the ore determined, and their probable cost estimated. Where the deposit is uncertain and the element of risk is large, we must adopt a high rate of interest on investments of capital in our computations of value — in some cases as high as 10, 15 or even 20%. Where the deposit is regular and the future can be predicted with some degree of certainty, we may be justified in adopting in some cases possibly as low as 5 %. The interest on the annual contribu- tion to the sinking-fund or its equivalent should be reckoned at a low rate of interest, for such funds are assumed to be invested in perfectly safe securities. Allowance must be made for the period of development during which there are no contributions to the sinking- fund and within which no interest is earned on invested capital.

Mining Education. — It is necessary to have the work directed by men thoroughly familiar with the characteristics of mineral deposits, and with wide experience in mining. For the purpose of training such men special schools of mining engineering (ecoles des mines, Bergakademie) have been established in most mining countries. A student of mining must receive thorough instruction in geology; he must study mining as practised in different countries, and the metallurgical and mechanical treatment of minerals; and he should have an

engineering education, especially on mechanical and electrical lines. As he is called upon to construct lines of transport, both underground and on the surface, works for water-supply and drainage, and buildings for the handling, storage and treatment of ore, he must be trained to some extent as a civil engineer. As a foundation his education must be thorough in the natural and physical sciences and mathematics. In addition there have beeri established in many countries schools for the education of workmen, in order to fit them for minor positions and to enable them to work intelligently with the engineers. These miners' schools {Bergschule, ecoles des mineurs) give elementary instruction in chemistry, physics, mechanics, mineralogy, geology and mathematics and drawing, as well as in such details of the art of mining as will best supplement the practical information already acquired in underground work. The training of a mining engineer merely begins in the schools, and mining graduates should serve an apprenticeship before they accept responsibility for important mining operations. It is especially necessary that they should gain experience in management of men, and in the conduct of the business details, which cannot well be taught in schools.

Accidents. — Mining is an extra-hazardous occupation, and the catastrophes, which from time to time have occurred, have caused

agencies to enforce their authority. While in some cases these lawl are unnecessarily stringent and tend to restrict the business of mining yet on the whole they have had the effect of reducing greatly the loss of life and injuries of miners where they have been well enforced. This is evident from fig. 20, which shows the number of men killed in the coal and metal mines of Great Britain for a series of years. As will be seen from this diagram the most serious source of death and injury is not found in mine explosions, but in the fall of rocks and mineral in the working places. This danger can be reached only in small degree by laws and inspection; but the safety of the men must depend upon the skill

and care of the miners themselves and the officers in charge of the underground work. Great loss of life and injury occur through the ignorance, carelessness and reck- lessness of the men themselves, who fail to take the necessary precautions for their own safety, even when warned to do so. Mining laws have proved chiefly serviceable in securing the introduc- tion of efficient ventilation, the use of safety-lamps, and of proper explosives, to lessen the danger from fire-damp and coal-dust in the coal-mines, the inspection of machinery for hoisting and haulage, and prevention of accidents due to imperfection in design or in working the machinery.

Fire-damp and dust explosions are caused by the presence of marsh-gas in sufficient quantity to form an explosive mixture, or by a mixture of small percentages of marsh-gas Q xp i os j ons , and coal-dust, and in some cases by the presence of coal-dust alone in the air of the mine. Explosive mixtures of marsh-gas and air may be fired by an unprotected light. But when coal-dust is present, and little or no marsh-gas, an initial explosion —such as is produced by a blown-out shot — is required. To guard against explosions from this cause it is necessary to use explosives in moderate quantities and to see that the blast- holes are properly placed, so that the danger of blown-out shots may be lessened. In dry and dusty mines the danger may be greatly lessened by sprinkling the working places and passages, and the removal of the accumulated dust and fine coal. Where large quantities of fire-damp are present, safety-lamps of approved pattern must be used and carefully inspected daily. The use of matches and naked lights of any kind must be prohibited. To lessen the danger from blasting operations the use of special safety explosives is required in Great Britain and some European countries. The use of such explosives decreases to some extent the danger from dust explosions; but experiment shows that no efficient explosive is absolutely safe, if used in excessive quantity, or in an improper manner. Absolute security is

impossible, as is proved by the many and serious disasters under the most stringent laws and careful regulations that can be devised.

Mine fires may originate from ordinary causes, but in addition they may result from the explosion of fire-damp or from the acci- dental lighting of jets of fire-damp issuing from the coal. jtfj ne /3/ res . In some mining districts the coal is liable to spontaneous combustion. A fire underground speedily becomes formidable, not only in coal but also in metal mines, on account of the large quantity of timber used to support the excavations. Underground fires may sometimes be .extinguished by direct attack with water. The difficulty of extinguishing an underground fire in this way is, however, very great, as on account of the poisonous products 0/ combustion it is impossible to attack it except in the rear, and even there the men are always in great danger from the reversal of the

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‘ALL ACCIDENTS. IN AND ABOUT MINES.

Fig. 20. — Death-rate from various classes of accidents in and about all mines in the United Kingdom from 1873 to 1900.

the enactment of laws to protect the lives of the men engaged in underground work. These laws are enforced by mine inspectors who are empowered to call upon the courts and other government

air current, or back-draught from the fire. Further,

the burning of the timber produces falls of ground, making necessary the excava- tion and removal at times of hundreds of tons of heated rock and

burning coal, in order to reach the fire. When direct attack is no longer practicable, it is possible to extinguish the fire by sealing the mine workings, and exhausting the supply of oxygen. It is necessary, however, to keep the mine sealed until the burning timbers, or coal, and the red-hot rocks have become cool, or the fire will again break out. This sometimes requires two or three months. Where an effective sealing of the mine is impracticable it is sometimes possible to extinguish the fire from the outside of the mine by constructing a large reservoir or tank in the upper part of the mine-shaft and suddenly releasing a large volume of water by opening discharge- doors. The mass of water falling down the shaft is converted into spray, which is carried by the force of the fall long distances into the workings. Where the fire is in or near the shaft this method has proved very effective. Mine fires may sometimes be reached by bore-holes sunk for the purpose from the surface, and the burning workings below filled by flushing with culm and water. As a last resort the mine may be flooded with water. This is an expensive operation as it entails the cost of pumping the water out again and repairing the resulting damage. If the fire is in working places to the rise the water may not reach the burning portions of the mine, but will effectually seal them. But sufficient time must be allowed to elapse before pumping out the water, as otherwise the fire may break out again.

Mines may become flooded by the inrush of surface waters in times of great rainfall or sudden floods, or by the undermining of surface waters. The mine workings may also be flooded Flooding of ^ [ar g e bodies of underground water. The surface Mines.

floods must be provided with channels of sufficient size to carry them safely past the mine openings, and intercepting ditches should be excavated for this purpose, and dams and embank- ments constructed to divert the flood waters. That it is possible to work with safety beneath rivers, lakes and even the ocean has been proved in numerous instances; mines in different parts of the world having been extended long distances under the sea. In such cases preliminary surveys should be made to determine the thickness of rock over the proposed workings. Under favourable conditions mining may be conducted under the protection of a few yards of solid rock only, as in the submarine work for the removal of reefs in the harbours of San Francisco and New York. At Silver Islet, Lake Superior, mining was successfully carried on for years under the protection of a coffer dam and an arch of rich silver ore less than 20 ft. thick. At Wheal Cock near St Just in Cornwall the protecting roof was so thin that holes bored for blasting more than once penetrated to the bed of the ocean, and wooden plugs were kept on hand to drive into such holes when this occurred. In storms the boulders could be heard striking each other overhead. When large areas are undermined, as in submarine coal mining, it is best to have several hundred feet of protecting rock. In Great Britain the iaw requires that the workings shall be protected by 120 ft. of solid strata. When the presence of underground bodies of water is known or suspected, advance bore-holes should radiate from the end of the advancing working place so as to give warning of the position of the body of water, these holes being of such length as to ensure a safe thickness of solid rock.

The caving in of mine workings results from the excavation of large areas supported upon pillars of insufficient size. While the mine workings are small the overlying rocks support themselves Caviar of an< ^ ^e ^ u ^ P ressure d° es n °t come upon the mine „._ pillars. As the workings increase in size the pillars

w rkl support an increasing weight until finally

they are strained o ngs. beyond the limit of elasticity. When this occurs, the pillars begin to crack and splinter with a noise like musketry firing, and the roof of the mine shows signs of subsidence. This may con- tinue for weeks before the final crash takes place. At first a fall of the roof occurs locally, here and there throughout the mine, and these falls may succeed one another until the settlement of portions of the roof has so far relieved the strain that the remaining areas are sup- ported by the stronger pillars, and by the fallen rock masses. While abundant warning of the caving-in of the workings is thus given in advance it may happen that men are unexpectedly imprisoned by the closing of the main passage ways. The caving-in of the mine, however, is rarely so complete that avenues of escape are not open. In many cases, however, it has been found necessary to reopen the mine through the fallen ground, and even to excavate openings through the solid mineral. The history of mining is full of dramatic episodes of this character.

Accidents from the misuse and careless handling of explosives are unfortunately too frequent in mines. The conditions under Accidents wn ' c h explosives may be stored, handled and used are ton, carefully formulated in the mining laws of most states,

Explosives. DUt '* ' s a ' m ost impossible to secure obedience to these regulations on the part of the miners, who are, as a rule, both careless and reckless in their use of powder. In some states it has become necessary to provide for fines and even imprisonment of men disobeying the regulations regarding explosives.

Mine Hygiene. — While mining is not necessarily an unhealthy occupation, miners are subject to certain diseases resulting from vitiated air, and from unusual or special conditions under which at times they are forced to work. Recent investigations have shown ah alarming increase in mortality from miners" phthisis in Cornwall,

South Africa and elsewhere. This seems to be due to the dust abundantly produced in mining operations, and especially by machine drills when boring ” dry ” (rising) blast holes. Drill runners, Who are compelled to breathe this dusty air daily, furnish most of the sufferers from phthisis. The increased mortality seems to be due to the general tendency toward forced speed in development work, which is secured by rapid drilling, and by an increase in the number of machine drills used in a single working-place. The miners, to save time, often return to their work after blasting before the powder- smoke and dust have been sufficiently removed. It is probable that the carbon monoxide seriously affects the general health and vitality of the men, and renders them more likely to succumb to phthisis. More effective ventilation will materially lessen the death- rate. In the metal mines of Cornwall and Devon special rules are now in force requiring the use of water in drilling, and other pre- cautions, to lessen this danger from dust. In sonfe mines dust seems to have but little effect on the health of the miners; indeed it is even claimed by some that coal dust decreases the mortality from phthisis. On the other hand, as in mining ores containing jead, arsenic and mercury, the dust may be poisonous. The climb- ing of ladders from deep mines not only lessens the efficiency of the men by reason of fatigue, but often tends to increase the mortality from diseases of the heart. In cold climates men coming from the warm atmosphere of a mine, often in wet clothing, are liable to suffer in health unless proper provision is made for the necessary change of clothing. In such cases the establishment of dressing- rooms, properly heated, and connected with the mine by covered passages will be necessary. These ” change-houses ” are provided with washing and bathing facilities, and arrangements for drying wet clothing. Ankylostomiasis (q.v.) is a disease which finds a congenial habitat in the warm damp atmosphere of mines, and has become a veritable scourge in some mining regions. The disease yields readily to treatment, but is difficult to eradicate from a mine without stringent sanitary regulations

to prevent its spread. The care of the health of the working force should be entrusted to com- petent mine physicians, thoroughly familiar with the conditions under which the miners work, and with the special diseases to which they are subject. The men should be instructed in the laws of sanitation, and in the proper care of injured men.

Mine Law. — Mine law is that branch of the law of real property relating to mineral and mining rights as distinct from rights pertain- ing to the surface of the ground. Under the common law the owner of the surface possesses all mining rights as well, unless these have been reserved by some previous owner of the property. From very ancient times deposits of gold and silver have in most countries been held as the property of the crown. In public or government land the minerals as well as surface belong to the state, and not infrequently these rights have been separated by law and granted or otherwise disposed of to different owners. It is to the public interest that deposits of mineral should not be permitted to remain idle and undeveloped. This has been recognized from the earliest times, and laws have been framed in all countries for the encourage- ment of mining enterprise. In many cases the state or the ruler has sought to obtain a share in the profits of mining, or even to work mines for the individual profit of the ruler or of the state. But in most cases it has been found better policy for the state to divest itself of all interest in mining property, and to extend all possible encouragement to those who undertake the development of the mineral wealth of the nation. The mining laws of most civilized states grant the right of free prospecting over the public lands, protect the rights of the discoverer of the mineral deposit during the period of exploration, and provide for the acquisition of mineral property on favourable terms. Striking examples of the far-reaching effect of such laws is shown in the history of the Rocky Mountain region and western coast of the United States, the colonization and development of Australia, and the development of Alaska.

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1902) ; Periodical Publications — Annates des mines de Belgique (Brus- sels, quarterly); Australian Mining Standard (Melbourne, Sydney and Brisbane, weekly) ; Engineering and Mining Journal (New York, weekly); Gliickauf (Essen, weekly); Mines and Quarries; General Report and Statistics (London, annually); with details from official reports of colonial and foreign mining departments ; Mines and

Minerals (monthly, Scranton, Pennsylvania) ; The Mineral Industry (New York, annually) ; Transactions of the American Institute of Min- ing Engineers (New York) ; The Mining and Scientific Press (weekly, San Francisco) ; Transactions of the Institute of Mining and Metallurgy (London) ; Transactions of the Institution of Mining Engineers (New- castle-on-Tyne). (H. S. M.)

MINION, a favourite, pet or spoiled person. The word is adapted from the Fr. mignon (Ital. mignone), of which the origin is doubtful. Connexions with the O.H. Ger. minna, love, and with a Celtic root min-, meaning small, have been suggested. ” Minion ” is chiefly applied in a derogatory sense to the ” creatures ” of a royal court, and thus has been used of the favourites of Edward II. and James I. of England, and of Henry III. of France. In the sense pretty, delicate, dainty, the French form mignon or mignonne is often used in English. During the. 17th century “minion” was the name of a type of cannon with a small bore. In typography, it is still used for the type which comes between ” nonpareil ” and ” brevier.”

MINISTER (Lat. minister, servant), an official title both civil and ecclesiastical. The word minister as originally used in the Latin Church was a translation of the Greek Slclkovos, deacon; thus Lactantius speaks of presbyteri et ministri, priests and deacons (De mort. persecutorum, No. 15), and in this sense it is still technically used; thus canon vi., Sess. xxiii. of the council of Trent speaks of the hierarchy as consisting ” ex episcopis, presbyteris et ministris.” But the equivocal character of the word soon led to the blurring of any strictly technical sense it once possessed. Bishops signed themselves minister in the spirit of humility, priests were “servants of the altar” (ministri altaris), while sometimes the phrase ministri ecclesiae was used to denote the clergy in minor orders (see Lex Bajwar. tit. 8, quoted in Du Cange). A similar equivocal character attaches to the word minister as used in the Anglican formularies: ” Oftentimes it is made to express the

person officiating in general, whether priest or deacon; at other times it denoteth the priest alone, as contradistinguished from the deacon ” (Burn’s Eccl. Law, ed. Phillimore, iii. 44). Thus the 33rd canon of 1603 orders that ” no bishop shall make any person a deacon and minister both together upon one day.” Generally, however, it may be said that in the use of the Church of England ” minister ” means no more than executor officii, a sense in which it was used long before the Reformation. As the most colourless of all official ecclesiastical titles, it is easy to see how the word minister has come to be applied to the clergy of Protestant denominations. The phrase ” minister of religion ” is wide enough to embrace any evangelical office, and has about it more of the savour of humility than ” pastor.”

The civil title of minister originates in the same exact sense of servant, i.e. servants of the royal household (ministri aulae regis). This origin is still clearly traceable in the titles of some ministers in Great Britain, e.g. chancellor of the exchequer, first lord of the treasury, and in the official style of ” his majesty’s servants ” applied to all. Practically, however, the word minister has in modern states come to be applied to the heads of the great administrative departments who as such are members of the government. On the continent there are, besides, ” ministers without portfolio,” i.e. ministers who, without being in charge of any special department, are members of the government. In general it is distinctive of constitutional states that any public act of the sovereign must bear the countersignature of the minister responsible for the department concerned. (See the articles Ministry and Cabinet. For the history and meanings of the word ” minister ” in diplomacy, see Diplomacy.)

(W. A. P.)

MINISTRY, the office of a minister (q.v.), in all its meanings, political and religious, or the body of persons holding such an office and performing its duties; more particularly the body of

persons who, in theory the servants at the head of the state, act as the responsible executive over the whole sphere of government, as in the United Kingdom. On the continent of Europe, on the other hand, the word ” ministry ” is most usually applied to the responsible head of a particular department together with his subordinates, including the permanent officials or staff. In England, ever since the introduction of monarchical institutions the sovereign has always been surrounded by a select body of confidential advisers to assist the crown in the government of the country. At no period could a king of England act, accord- ing to law, without advice in the public concerns of the king- dom; the institutions of the crown of England and the institution of the privy council are coeval. At the Norman Conquest the king’s council, or as it is now called, the privy council, was composed of certain members of the aristocracy and great officers of state, specially summoned by the crown, with whom the sovereign usually advised in matters of state and government. In the earlier stages of English constitutional history the king’s councillors, as confidential servants of the monarch, were present at every meeting of parliament in order to advise upon matters judicial in the House of Lords; but in the reign of Richard II. the privy council dissolved its judicial connexion with the peers and assumed an independent jurisdiction of its own. It was in the reign of Henry VI. that the king’s council first assumed the name of privy council, and it was also during the minority of this sovereign that a select council gradually emerged from the larger body of the privy council, which ultimately became the modern cabinet. Since the Revolution of 1688, and the develop- ment of parliamentary government, the privy council has dwindled into comparative insignificance. The, power once swayed by the privy council is now exercised by that unrecog- nized select committee of the council known as the cabinet (q.v.). The practice of consulting a few confidential advisers instead of the whole privy council had been resorted to by English monarchs from a very early period; but the first mention of

the term cabinet council in contradistinction to privy council occurs in the reign of Charles I., when the burden of state affairs was entrusted to the committee of state which Clarendon says was enviously called the ” cabinet counciL” At first government by cabinet was as unpopular as it was irregular. Until the for- mation of the first parliamentary ministry by William III. the ministers of the king occupied no recognized position in the House of Commons; it was indeed a moot point whether they were entitled to sit at all in the lower chamber, and they were seldom of one mind in the administration of matters of importance. Before the Revolution of 1688 there were ministers, but no ministry in the modern sense of the word; colleague schemed against colleague in the council chamber, and it was no uncom- mon thing to see ministers opposing one another in parliament upon measures that in modern times would be supported by a united cabinet. As the change from government by prerogative to government by parliament, consequent upon the Revolution of 1688, developed, and the House of Commons became more and more the centre and force of the state, the advantage of having ministers in the legislature to explain and defend the measures and policy of the executive government began to be appreciated. The public authority of the crown being only exercised through the medium of ministers, it became absolutely necessary that the advisers of the sovereign, who were respon- sible for every public act of the Crown as well as for the general policy they had been called upon to administer, should have seats in both Houses of Parliament. Still nearly a century had to elapse before political unanimity in the cabinet was recognized as a political maxim. From the first parliamentary ministry of William III. until the rise of the second Pitt, divisions in the cabi- net were constantly occurring, and a prime minister had more to fear from the intrigues of his own colleagues than from the tactics of the opposition. In 181 2 an attempt was made to form a ministry consisting of men of opposite political principles, who were invited to accept office, not avowedly as a

coalition govern- ment, but with an offer to the Whig leaders that their friends should be allowed a majority of one in the cabinet. This offer

was declined on the plea that to construct a cabinet on ” a system of counteraction was inconsistent with the prosecution of any uniform and beneficial course of policy.” From that date it has been an established principle that all cabinets are to be formed on some basis of political union agreed upon by the members when they accept office together. It is now also dis- tinctly understood that the members of a cabinet are jointly and severally responsible for each other’s acts, and that any attempt to distinguish between a particular minister and his colleagues in such matters is unconstitutional.

During the ioth century the power of ministers was greatly extended, and their duties became more distinctly marked out. As now interpreted, the leading principles of the British constitu- tion are the personal irresponsibility of the sovereign, the respon- sibility of ministers, and the inquisitorial and controlling power of parliament. At the head of affairs is the prime minister (q.v.), whose duties are more general than departmental; and the other members of the administration, whose work is exemplified by the titles of their offices (the more important of which are treated separately), are the lord high chancellor, the lord president of the council, the lord privy seal, the first lord of the treasury, the five secretaries of state (home, foreign affairs, colonies, war, India), the chancellor of the exchequer, the secretary for Scot- land, the chief secretary to the lord-lieutenant of Ireland, the postmaster-general, the presidents of the board of trade, the local government board, the board of agriculture and the board of education (all of which were originally committees of the privy council), the chancellor of the duchy of Lancaster and the first lord of the admiralty. These are the

more impor- tant members of the administration, and they are generally in the cabinet. The subordinate members of the administration, some of whom are occasionally invited to join the cabinet, while others are never in it, are the parliamentary and financial secretary to the admiralty, the parliamentary under-secretaries of the home, foreign, war, colonial and India offices, the board of trade, local government and board of education, the junior lords of the treasury (assistant ” whips “), the financial secretary and patronage secretary to the treasury (the senior ” whip “), the first commissioner of works, the paymaster-general, and the attorney-general and solicitor-general. There are in addition the lord advocate and the solicitor-general for Scotland, the lord- lieutenant and lord chancellor of Ireland (who are sometimes members of the cabinet), and the attorney-general and solicitor- general for Ireland.

Table of Lord Treasurers or First Lords of the Treasury [The title was at first lord treasurer, except when the treasury was put in commission. Ultimately special rank was given to one of the commissioners as first lord of the treasury. From the time of the earl of Essex (1679) the name given is that of the first lords, with the exception of the three printed in italics. In modern times the first lord of the treasury has usually, but not invariably, been the head of the government or prime minister. A list of the Prime Ministers is given in the article Prime Minister. 1603. Lord Buckhurst, cr. Earl 1649. Interregnum.

of Dorset 1604.

Earl of Salisbury.

Earl of Northampton and others. (Commissioners.)

Earl of Suffolk. 1618. Archbishop Abbot and others. (Commissioners.) 1620. Sir H. Montagu, cr. Vis- count Mandeville 1620.

Lord Cranfield, cr. Earl of Middlesex 1622.

Sir J. Ley, cr. Lord Ley 1625, and Earl of Marl-
borough 1626. 1628. Lord Weston, cr. Earl of
Portland 1633.

1635. Archbishop Laud and

others. (Commissioners.)

1636. W. Juxon, Bishop of Lon-

don. 1641. Sir E. Littleton and others.

(Commissioners.) 1643. Lord Cottington.

1608 1612

1614.

1621. 1624.

1660. Sir E. Hyde and others.

(Commissioners.) 1660. Earl of Southampton. 1667.
Duke of Albemarle and

others. (Commissioners.)

1672. Lord Clifford.

1673. Viscount Dunblane, cr.

Earl of Danby 1674. 1679. Earl of Essex. 1679. Lord
Hyde, cr. Earl of

Rochester 1682. 1684. Lord Godolphin. 1687. Lord
Bellasyse.

1689. Earl of Monmouth.

1690. Viscount Lonsdale. 1690. Lord Godolphin.

1697. C. Montagu, cr. Earl of Halifax 1700.

1699. Earl of Tankerville.

1700. Lord Godolphin.

1 70 1. Earl of Carlisle.

1702. Lord Godolphin. 1710. Earl Poulett.

711. Earl of Oxford. 714. Duke of Shrewsbury.

714. Earl of Halifax.

715. Earl of Carlisle. 715. Sir R. Walpole.

717. Lord Stanhope.

718. Earl of Sunderland. 721. Sir R. Walpole.

742. Earl of Wilmington.

743. H. Pelham.

754. Duke of Newcastle.

756. Duke of Devonshire.

757. Duke of Newcastle.

762. Earl of Bute.

763. G. Grenville.

765. Marquess of Rockingham.

766. Duke of Grafton. 770. Lord North.

782. Marquess of Rockingham.

782. Earl of Shelburne.

783. Duke of Portland. 783. W. Pitt.

801. H. Addington. 804. W. Pitt.

806. Lord Grenville.

807. Duke of Portland. 807. S. Perceval.

812. Earl of Liverpool. 827. G. Canning.

827. Viscount Goderich.

828. Duke of Wellington. 830. Earl Grey.

834. Viscount Melbourne. 834. Sir R. Peel.

Table of Lord Chancellors

603. Sir T. Egerton, L.K., cr.

Lord Ellesmere 1603, and

Viscount Brackley 1616.

617. Sir F. Bacon, L.K., cr.

Lord Verulam 16 18,

and Viscount St Albans

162 1.

1621. J. Williams, Bishop of

Lincoln, L.K. 1625. Sir T. Coventry, L.K., cr. Lord Coventry 1628.

1640. Sir J. Finch, L.K., cr.

Lord Finch 1640.

1641. Sir E. Littleton, L.K.,

cr. Lord Lyttelton 1641. 1645. Sir R. Lane, L.K. 1649. Interregnum. 1660. Sir E. Hyde, C, cr. Lord

Hyde 1660, and Earl of

Clarendon 1661. 1667. Sir O. Bridgeman, L.K.

1672. Earl of Shaftesbury, C.

1673. Sir H. Finch, L.K.,cr. Lord

Finch .1674, C. 1675,

cr. Earl of Nottingham

1681.

1682. Sir F. North, L.K., cr.

Lord Guilford 1683. 1685. Lord Jeffreys, C. 1690. Sir J. May nard and others.

(Commissioners.) 1690. Sir J. Trevor and others.

(Commissioners.) 1693. Sir J. Somers, L.K., C,

cr. Lord Somers 1697. 1700. Sir N. Wright, L.K. 1705. W. Cowper, L.K., cr. Lord

Cowper 1706, C. 1707, 1 710. Sir T. Trevor and others.

(Commissioners). 1710. Sir S. Harcourt, L.K., cr.

Lord Harcourt 1711, C.

I7I3- 1 7 14. Lord Cowper, C. 1718. Sir R. Tracy and others.

(Commissioners.) 1718. Lord Parker, C, cr. Earl of

Macclesfield 1721. 1725. Sir J. Jekyll and others.

(Commissioners.) 1725. Lord King, C. r 733- Lord Talbot of Hensol, C. !737- Lord Hardwicke, C, cr.

Earl of Hardwicke 1754.

1835. 1841. 1846.

1852. 1852.

1855- 1858.

1859- 1865. 1866. 1868. 1868. 1874.

1880. 1885.

1886. 1886. 1887.

1891.

1892. 1894.

i895-

Viscount Melbourne.

Sir R. Peel.

Lord J. Russell, cr. Earl Russell 1 861.

Earl of Derby.

Earl of Aberdeen.

Viscount Pa’merston.

Earl of Derby.

Viscount Palmerston.

Earl Russell.

Earl of Derby.

B. Disraeli.

W. E. Gladstone.

B. Disraeli, cr. Earl of Beaconsfield 1876.

W. E. Gladstone.

Sir Stafford Northcote, cr. Earl of Iddesleigh 1885 (prime minister, Marquess of Salisbury).

W. E. Gladstone.

Marquess of Salisbury.

W. H. Smith (prime minis- ter, Lord Salisbury).

A. J. Balfour (prime minis- ter, Lord Salisbury).

W. E. Gladstone.

Earl of Rosebery.

A J. Balfour (prime minis- ter, Lord Salisbury till

1902).

Sir H. Campbell-Banner-

man. 1908. H. H. Asquith.

(C.) or Lord Keepers (L.K.)

1756. Sir J. Willes and others.

(Commissioners.)

1757. Sir R. Henley, L.K., cr.

Lord Henley and C. 1760, Earl of Northington 1764.

1766. Lord Camden, C.

1770. Charles Yorke, C.

1770. Sir S. S. Smythe and

others. (Commissioners.)

1 77 1 . Lord Apsley , C. , succeeded

as Earl Bathurst 1775. 1778. LordThurlow, C. 1783. Lord Loughborough and

others. (Commissioners.) 1783. Lord Thurlow, C.

1792. Sir J. Eyre and others.

(Commissioners.)

1793. Lord Loughborough, C,

cr. Earl of Rosslyn 1801. 1801. Lord Eldon, C.

1806. Lord Erskine, C.

1807. Lord Eldon, C. 1827. Lord Lyndhurst, C. 1830. Lord Brougham, C.

1834. Lord Lyndhurst, C.

1835. Sir C. C. Pepys and others.

(Commissioners.)

1836. Lord Cottenham, C. 1 841. Lord Lyndhurst, C. 1846. Lord Cottenham, C. 1850. Lord Langdale and others.

(Commissioners.)

1850. Lord Truro, C.

1852. Lord St Leonards, C.

1852. Lord Cranworth, C.

1858. Lord Chelmsford, C.

1859. Lord Campbell, C. 1861. Lord Westbury, C.

1865. Lord Cranworth, C.

1866. Lord Chelmsford, C. 1868. Lord Cairns, C. 1868. Lord Hatherley, C. 1872. Lord Selborne, C.

1874. Lord Cairns, C, cr. Earl

Cairns 1878. 1880. Lord Selborne, C, cr. Earl

of Selborne 1882.

1885. Lord Halsbury, C.

1886. Lord Herschell, C. 1886. Lord Halsbury, C. 1892. Lord Herschell, C.

1895. Lord Halsbury, C.,cr. Earl

of Halsbury 1898. 1905. Lord Loreburn, C.

Table ok Secretaries of State [The substitution of two secretaries for one was the consequence of the increase of business. There was no distinction of departments, each secretary taking whatever work the king saw fit to entrust him with During the reigns of the first two Stuarts, however, there was a tendency to entrust one secretary with the

correspondence with Protestant states and their allies, and the other with the correspondence with Catholic states. Probably in the reign of Charles II., and certainly as early as 1691, two departments, the Northern and the Southern, were instituted. In 1782 the departments were changed to Home and Foreign. A third secretary of state was appointed in 1794, and he was called the Secretary for War and the Colonies from 1801 to 1854, when the work was divided, and the War and Colonial Secretaryships were instituted. The Secretary of State for India was appointed in 1858.]

1603. Sir R. Cecil, cr. Lord Cecil

1603, Viscount Cranborne

1604, Earl of Salisbury

1605

1612. Vacant.

1614. Sir R. Win wood.

1615

1618. Sir R. Naunton.

1619. Sir G. Calvert.

1623. Sir E. Conway, cr. Lcrd

Conway 1625.

1625. .....

1625.

1628. Viscount Dorchester. 1632. Sir F. Windebank.

1640. .....

1 64 1. Sir E. Nicholas.

1642. Viscount Falkland.

1643 Lord Digby.

1643. Interregnum. 1660. Sir E. Nicholas. . 1662. Sir H. Bennet, cr. Earl

of Arlington 1665.

1668

1672.

1674. Sir J. Williamson.

1678. Earl of Sunderland.

1680

1 68 1. Lord Conway. 1683. Earl of Sunderland.

1684

1684 Earl of Middleton.

1688. Viscount Preston.

1689. Earl of Shrewsbury. . Earl of Nottingham.

1690. Viscount Sidney. 1692. Sir J. Trenchard.

1694. Earl of Shrewsbury.

1695. Sir W.Trumbull.

1697. J. Vernon.

1700. Sir C. Hedges. . . Earl of Jersey.

1701 Earl of Manchester.

1702 Earl of Nottingham.

1704 R. Harley.cr. Earlof Oxford 171 1

1 706. Earl of Sunderland.

1708. H. Boyle, cr. Baron Carleton

1714-

1710. Lord Dartmouth, cr. Earl H. St. John, cr. Viscount Boling- of Dartmouth 1711. broke 1712.

1713. W. Bromley.

1714. J. Stanhope, cr. Earl Stan- Viscount Towrishend.

hope 1718

Sir T. Lake.

Sir A. Morton. Sir J. Coke.

Sir H. Vane.

Sir W. Morrice.

Sir J.Trevor. Henry Coventry

Sir L. Jenkins.

S. Godolphin.

1717. Earl of Sunderland. . J.Addison.

1718. Earl Stanhope. . . . J. Craggs. 1721. Viscount Townshend. . Lord Carteret.

1724 Duke of Newcastle.

1730. Lord Harrington.

1742. Lord Carteret, became Earl Granville 1744. 1744. Earl of Harrington. 1746. Earl Granville. 1746. Earl of Harrington. 1746. Earl of Chesterfield. 1748. Duke of Bedford. 1 75 1 . Earl of Holderness.

1754-

Sir T. Robinson, cr. Baron

Grantham 1761 H. Fox. W. Pitt.

1755

1756

1 76 1. Earl of Bute. 1 76 1 ` . . Earl of Egremont.

1762. G. Grenville.

1763. Earl of Halifax. . . Earl of Sandwich.

1765. Duke of Grafton. . . H. S. Conway.

1766. Duke of Richmond. 1766. Earl of Shelburne.

1768. . . . . Viscount Weymouth.

1768. Earl of Hillsborough, Colo- nies. 1768. Earl of Rochford.

1770 Earl of Sandwich.

1 77 1 Earl of Halifax.

1771- ..... Earl of Suffolk.

1772. Earl of Dartmouth, Colonies.

1775. Viscount Weymouth, cr.

Marquess of Bath 1789.

1776. Lord G. S. Germaine, Colo-

nies.

1779 Viscount Stormont.

1779. Earl of Hillsborough, cr.

Marquess of Downshire 1789 1782. W. Ellis, cr. Baron Mendip,

1794, Colonies.

Home Department. 1782. Earl of Shelburne.

1782. Lord Grantham.

1783. Lord North. 1 783. Marquess of Carmarthen.

1783 Lord Sydney.

1789. W. W. Grenville, cr. Baron

Grenville 1790. 1 79 1. H. Dundas. . . . Lord Grenville.

Foreign Department. C. J. Fox. [1783

T. Townshend, cr. Baron Sydney C. J. Fox. Earl Temple.

1794 1801 1803 1804 1805 1806, 1807 1809 1809 1812 1822 1827 1827 1828, 1830, 1833

1834 1834 1835 1839 1839 1841

1845 1846, 1852 1852

Home Department. Duke of Portland …. Lord Pelham, aft. Earl of Chichester C. P. Yorke Lord Hawkesbury

Earl Spencer

Lord frawkesbury, aft. Earl of

R. Ryder ….

Viscount Sidmouth (H. Addington) R. Peel . ^ .

W. S. Bourne . * . Marquess of Lansdowne . R. Peel ….

Viscount Melbourne .

Liverpool

Viscount Duncannon,aft.Earl of Bessborough

H. Goulburn

Lord J. Russell . . . .

Marquess of Normanby …. Sir J. Graham, Bart. ....

Sir G. Grey Spencer H. Walpole Viscount Palmerston

Foreign Department. Lord Grenville Lord Hawkesbury

Lord Harrowby Lord Mulgrave C. J. Fox G. Canning .

Earl Bathurst Marquess Wellesley Viscount Castlereagh, G. Canning Earl of Dudley

aft. Marquess of

[Londonderry

Earl of Aberdeen . Viscount Palmerston

Duke of Wellington Viscount Palmerston

Earl of Aberdeen

Viscount Palmerston Earl of Malmesbury Lord J. Russell

War and Colonial Department. H. Dundas, cr. Visct.Melvillei862. Lord Hobart, aft. Earl of

Buckinghamshire. Earl Camden. Viscount Castlereagh. W. Windham. Viscount Castlereagh.

Earl Bathurst.

Viscount Goderich.

W. Huskisson.

Sir G. Murray. [Ripon.

Viscount Goderich, aft. Earl of

E. G. S. Stanley ,aft. Lord Stanley

and Earl of Derby. T. Spring-Rice, aft. Lord Mont-Earl of Aberdeen. [eagle. Lord Glenelg. Marquess of Normanby. Lord J. Russell. Lord Stanley. W. E. Gladstone. Earl Grey. [Hampton. Sir J. S. Pakington, aft. Lord Duke of Newcastle.

MINK

545

1855- 1855- 1855- 1858.

Home Department. Sir G. Grey

S. H. Walpole

Foreign Department. Earl of Clarendon

Earl of Malmesbury

Colonial Department. Sidney Herbert . Lord J. Russell. [Taunton H. Labouchere, aft. Lord Lord Stanley

War Department. Lord Panmure.

Jonathan Peel.

1858.

1859- 1859-

1861. 1863.

1864. 1865. 1866.

1867.

1868.

1870.

1874. 1878.

1880. 1882. 1885.

1886. 1886. 1886.

1887.

1892. 1804.

1895-

1900.

1902. 1903. 1905.

1908. 1910.

Home Department. S. H. Walpole

T. H. S. Sotheron-

Estcourt. Sir G. Cornewall

Lewis Sir G. Grey

S. H. Walpole

H. A. Bruce, cr. Baron Aberdare

1873

Sir R. A. Cross

Sir W. Vernon Har- court

Sir R. A. Cross, cr. Viscount Cross

1886

H. C. E. Childers . H. Matthews, cr.

Viscount Llandaff

1895

H. H. Asquith

Sir M.White Ridley, cr. Viscount Rid- ley 1900

C. T. Ritchie, cr. Baron Ritchie of Dundee 1905

A. Akers-Douglas.

H. J. Gladstone, cr. Viscount Glad- stone 1910

Winston S. Churchill.

Foreign Department. Earl of Malmesbury

Lord J. Russell, cr. Earl Russell 1 86 1

Earl of Clarendon. Lord Stanley, aft. Earl of Derby

Earl of Clarendon

Earl Granville Earl of Derby Marquess of Salisbury

Earl Granville

Marquess of Salisbury .

Earl of Rosebery. Earl of Iddesleigh

Marquess of Salisbury .

Earl of Rosebery. Earl of Kimberley

Marquess of Salisbury. Marquess of Lansdowne

Sir E. Grey .

Colonial Department. Sir E. G. E. L. Bulwer Lytton, cr. Baron Lytton 1866

Duke of Newcastle

E. Cardwell Earl of Carnarvon Duke of Buckingham Earl Granville

Earl of Kimberley. Earl of Carnarvon Sir M. Hicks Beach, cr.

Viscount St Aldwyn

1906

Earl of Kimberley

Earl of Derby

Sir F. A. Stanley, cr. Baron Stanley of Preston 1886, aft. Earl of Derby

Earl Granville E. Stanhope

SirH.T.Holland.cr. Vis- count Knutsford 1895. Marquess of Ripon

J. Chamberlain

Hon. A. Lyttelton Earl of Elgin

Earl of Crewe.

War Department. Jonathan Peel

S. Herbert, cr. Lord Herbert of Lea 1861

Sir G. C. Lewis.

Earl de Grey and Ripon, aft. Marquess of Ripon

Jonathan Peel

Sir J. S. Pakington, aft. Baron Hampton

E. Cardwell, cr. Vis- count Cardwell 1874

G. Hardy F. A. Stanley

H. C. E. Childers

Marquess of Hartington,

aft. D. of Devonshire W. H. Smith . .

Viscount Cranbrook. H. Campbell-Bannerman W. H. Smith. .

E. Stanhope.

H. Campbell-Bannerman

Marquess of Lansdowne

Hon. W. St J. Brodrick, aft. Viscount Midleton

H. O. Arnold-Forster . R. B. Haldane .

India Department. Lord Stanley.

Sir C.Wood.cr. Viscount Halifax 1866.

Viscount Cranborne.

Sir S. H. Northcote, cr.

Earl of Iddesleigh 1885 Duke of Argyll.

Marquess of Salisbury. G. Hardy, cr. Viscount Cranbrook 1878.

Marquess of Hartington.

Earl of Kimberley.

Lord R. Churchill.

Earl of Kimberley. Viscount Cross.

Earl of Kimberley.

H. H. Fowler, cr. Vis- count Wolverhamp- ton 1908.

Lord G. Hamilton.

Hon. W. St J. Brodrick.

J. Morley, aft. Viscount

Morley of Blackburn.

MINK, a name for certain large species of the zoological genus Putorius (Polecat), distinguished by slight structural modifica- tions and semi-aquatic habits. The two best-known species, so much alike in size, form, colour and habits that, although they are widely separated geographically, some zoologists question their specific distinction, are P. luireola, the Nbrz or Sumpfotter (marsh-otter) of eastern Europe, and P. vison, the mink of North America. The former inhabits Finland, Poland and the greater part of Russia, though not found east of the Ural Mountains. Formerly it extended westward into central Germany, but it is now very rare, if not extinct, in that country. The latter is found in places which suit its habits throughout the whole of North America. Another form, P. sibiricus, from eastern Asia, of which much less is known, appears to connect the true minks with the polecats.

The name may have originated in the Swedish maenk applied to the European animal. Captain John Smith, in his History of Virginia (1626), at p. 27 speaks of ” Martins, Powlecats, Weesels and Minkes,” showing that the animal must at that time have been distinguished by a vernacular appellation from its

congeners. By later authors, as Lawson (1709) and Pennant (1784), it is often written ” Minx.” For the following descrip- tion, chiefly taken from the American form (though almost equally applicable to that of Europe) we are mainly indebted to Dr Elliott Couts’sFur-bearing Animals of N orth America, 1877.

In size it much resembles the English polecat — the length of the head and body being usually from 15 to 18 in., that of the tail to the end of the hair about 9 in. The female is considerably smaller than the male. The tail is bushy, but tapering at the end. The ears are small, low, rounded, and scarcely project beyond the adjacent fur. The pelage consists of a dense, soft, matted under fur, mixed with long, stiff, lustrous hairs on all parts of the body and tail. The gloss is greatest on the upper parts; on the tail the bristly hairs predominate. Northern specimens have the finest and most glistening pelage; in those from southern regions there is less difference between the under and over fur, and the whole pelage is coarser and harsher. In colour different specimens present a considerable range of varia- tion, but the animal is ordinarily of a rich dark brown, scarcely or not paler below than on the general upper parts ; but the back

is usually the darkest, and the tail is nearly black. The under jaw, from the chin about as far back as the angle of the mouth, is generally white. In the European mink the upper lip is also white, but, as this occasionally occurs in American specimens, it fails as an absolutely distinguishing character. Besides the white on the chin, there are often other irregular white patches on the under parts of the body. In very rare instances the tail is tipped with white. The fur is important in commerce.

The principal characteristic of the mink in comparison with its congeners is its amphibious mode of life. It is to the water what the other weasels are to the land, or martens to the trees, being as essentially aquatic in its habits as the otter, beaver, or musk-rat, and spending perhaps more of its time in the water than it does on land. It swims with most of the body Submerged, and dives with perfect ease, remaining long without coming to the surface to breathe. It makes its nest in burrows in the banks of streams, breeding once a year about the month of April, and producing five or six young at a birth. Its food consists of frogs, fish, fresh-water molluscs and crustaceans, as well as mice, rats, musk- rats, rabbits and small birds. In common with the other animals of the genus, it has a very peculiar and disagreeable effluvium, which, according to Dr Coues, is more powerful, penetrating and lasting than that of any animal of the country except the skunk. (W.H.F.)

MINNEAPOLIS, the largest city of Minnesota, U.S.A., and the county-seat of Hennepin county, situated on both banks of the Mississippi river at the Falls of St Anthony and imme- diately above St Paul. Pop. (1870), 13,066; (1880), 46,887; (1890), 164,738; (1900), 202,718; (1910 census) 301,408. Of the total population in 1900, those of foreign parentage (both parents foreign-born) numbered 118,946, and there were 61,021 of foreign birth, including 20,035 Swedes, 11,532 Norwegians, 7335 Germans, 5637 English-Canadians, 3213 Irish, 2289 English, 1929 Russians, 1706 French-Canadians and 1133 Austrians. Minneapolis is served by the Chicago, Burlington & Quincy, the Chicago, Great Western, the Chicago, Milwaukee & St Paul, the Chicago & Northwestern, the Chicago, Rock Island & Pacific, the Great Northern, the Minneapolis & St Louis, the Minneapolis, St Paul & Sault Sainte Marie, and the Northern Pacific railways. It has also three terminal switching lines and the belt line of the Minnesota Transfer Company, serving both Minneapolis and St Paul. With St Paul, which is served by the same system of railways, Minneapolis is the chief railway centre of the

Northwest and one of the greatest in the United States, being the principal gateway to the commerce of the Canadian and Pacific north- west. There are a Union passenger station, and separate stations for the Chicago, Milwaukee & St Paul, the Chicago, Great W es tem and the Minneapolis & St Louis railways.

The city is situated on a high plateau (800-850 ft. above sea- level) above the river, and covers an area of about 53 sq. m. It has an extensive system of boulevards, parkways and parks (aggregating 2465 acres in 1908). Among the parks are Loring, near the centre of the city, in which is a statue of Ole Bull; Lyndale, in the south-west part of the city; Interlachen, just north-west of Lyndale; Glen wood, in the west of the city; Van Cleve, Logan, Windom and Columbia in the part of the city east of the Mississippi river; Riverside, on the south-west bank of the Mississippi; and Minnehaha Park, in which are the Minne- haha Falls, a beautiful cascade of the Minnehaha Creek (the out- let of Lake Minnetonka), near the Mississippi, with a fall of 50 ft., well known from Longfellow's poem " Hiawatha." The numerous small lakes in the city (there are about '200 lakes in Hennepin county) have been incorporated in the park system; among them are Lake Harriet (353 acres; in Lake Harriet Park), Lake Calhoun (on which are extensive public baths), Lake Amelia (295 acres), Lake of the Isles (100 acres), Cedar Lake, Powder Horn Lake (in the park of that name) and Sandy Lake (in Columbia Park). Adjoining Minnehaha Park are the grounds (51 acres, given to the state by the city) and buildings of the Minnesota state soldiers' home (1887); and 2 m. beyond the Falls, at the junction of the Minnesota and Mississippi rivers, is

the Fort Snelling Military Reservation (1819). Seven miles south-west of the limits of the city is Lake Minnetonka, one of the most famous summer resorts in the Northwest, a beautiful body of water 15 m. long, with a shore line of 150 m. encircled by undulating wooded hills. Among the most fashionable streets are Mount Curve, Clifton and Park avenues, all in the " West Division " or south-western quarter of the

city. The streets in all parts of the city are of exceptional width and heavily shaded in the residential districts. There are handsome residential suburbs. The court-house and city-hall, constructed of red Minnesota granite and completed in 1902 at a cost of about $3,500,000, is one of the finest municipal buildings in America. Other prominent buildings are the Masonic Temple, the Chamber of Commerce, the Lumber Exchange, the Bank of Commerce, the Auditorium; the buildings of the Metropolitan Life (formerly the Guaranty), the Security Bank, the North- western National Bank, the First National Bank, the Andrus, the New York Life, and the Young Men's Christian Association; Hotel Radisson and West Hotel. Minneapolis is the see of a Protestant Episcopal bishopric. On the east side of the river are the buildings of the university of Minnesota (q.v.). In Minneapolis are the Minneapolis College of Physicians and Sur- geons (1883), the medical school of Hamline University; Augs- burg Seminary (Norwegian Lutheran, 1869), the United Church Seminary (1890), the Minnesota College (Swedish, 1905), the Minneapolis Normal School for Kindergartners, the Froebellian Kindergarten Normal School, Graham Hall and Stanley Hall, the Minneapolis School of Music, Oratory and Dramatic Art, and the Northwestern Conservatory of Music. Between Minneapolis and St Paul are the main buildings of Hamline; University (Methodist Episcopal, co-educational, 1854). The public library (more than 180,000 volumes in 1908) grew out of a private library, the Athenaeum (i860), was reorganized by Herbert Putnam (librarian from 1887 to 1 891), and has several branches, the most notable of which is the Pillsbury Library (1904) on the east side; in its main building (Hennepin Avenue and 10th Street) are the offices of the Minnesota Academy of Natural Sciences (1873), which, with the Society of Fine Arts, assisted in erecting the building in 1884. Among the hospitals and charitable institutions are the Minneapolis city hospital, the state hospital for crippled and deformed children, and Asbury Methodist, the Northwestern, the Deaconess', the Swedish, the St Mary's, the

Maternity and the St Barnabas hospitals, Bethany Home, the Catholic orphan asylum, the Washburn orphans' home, the Pillsbury House (1906) where settlement work is carried on by the Plymouth Congregational Church, and several free dispensaries. The first newspaper in the city was the St Anthony Express, which began publication in 1851; it is no longer in existence. In 1906 the city had, in addition to numerous weekly and monthly periodicals (English, Norwegian- Danish, Swedish, German, French), four dailies, the Tribune (1867), the Journal (1878), and the News (1903), all in English, and the Tidende (Norwegian-Danish), established as a weekly in 1851.

The Mississippi river, which here has an average width of about 1200 ft., is crossed by 17 bridges (9 highway and 8 railway bridges). The Federal government undertook to deepen the channel by dredging and by making two dams and two locks between the Chicago, St Paul, Minneapolis & Omaha railway bridge in St Paul and the Washington Avenue bridge in Minne- apolis — a distance of 11-4 m.— from 2 or 3 ft. to 6 ft., and to make the river regularly navigable as far as the Washington Avenue bridge, Minneapolis; the project, first adopted in 1894 and modi- fied in 1907, was 70% completed in July 1908, and up to that time $1,061,397 had been spent on the work. The enormous water-power of the Falls of St Anthony, yielding about 40,000 h.p., has been the principal factor in making Minnea- polis a great manufacturing centre. The rapid erosion of the soft limestone bed at one time threatened the destruction of the power, but this has been prevented by an enormous apron and an artificial concrete floor (completed in 1879). Additional water- power (25,000 h.p.) is derived from Taylor's Falls on the St Croix

river. The proximity of the rich wheatfields of the north- west, and the extensive timber forests, have

made Minneapolis the greatest lumber and flour centre in the world. The impor- tance of the flour manufacturing industry was originally due to the excellent water-power available, and dates from the intro- duction of improved roller-mill methods in the early 'seventies, although there were successful mills in operation twenty years earlier. The enormous flour-mills of Minneapolis (22 in 1907) are perhaps the most interesting sights of the city. Their aggre- gate daily capacity is over 80,000 barrels, the largest of them having a capacity of 15,000 to 16,500 daily. In 1905 the value of the city's flour and grist mill products was $62,754,446, 51-6 % of the total value of the city's factory product, and 8-8 % of the value of the flour and grist mill products of the entire United States. Food preparations were valued in 1905 at $1,361,492. Minneapolis is also the greatest primary wheat market in the world, its 40 or more elevators (of which those of the Washburn-Crosby Company, erected in 1907, are the largest) having a net capacity of about 35,000,000 bushels, and handling more than 90,000,000 bushels in 1908. Its commerce in other grains is also extensive; in the amount of barley received and shipped Minneapolis surpasses any other city in the United States, and in receipts and shipments of rye is second only to Chicago. The Mississippi river above Minneapolis is made to serve, by means of a series of extensive log-booms, as the princi- pal source of supply to the great saw-mills, of which there are here some of the largest in the world, with a combined capacity of 3,500,000 ft. a day, and with an average annual cut of 575,000,000 ft. The total value of the lumber products in 1905 was $9,960,842 (lumber and timber, $5,816,726; planing- mill products, including sash, doors and blinds, $4,144,116). Other important manufactures with the product-value of each in 1905 were malt liquors ($1,185,525), foundry and machine shop products ($2,820,697), structural iron-work ($1,991,771), steam railway car construction and repairing ($2,027,248), patent medicines ($1,715,889), furniture ($1,238,324), cooperage ($1,415,360), and hosiery and knit goods ($957,455).

The total value of the factory product was $94,407,774 in 1900, and $121,593,120 in 1905, an increase of 28-8 %; in 1905 the value of the factory product was 39-5 % of that of the entire state.

Minneapolis is governed under a charter adopted in 1872 (when St Anthony and Minneapolis were consolidated) and frequently amended. It provides for the election of a mayor, treasurer and comptroller for two-years terms; for elected boards of control for library, parks and education, and for a unicameral city council, half of which is chosen every two years for a term of four years. The mayor, whose veto may be nullified by an adverse vote of two-thirds of the council, has very limited appointing powers, the head of the police department being the most important of his appointees. The city council elects the city clerk, city attorney, city engineer, chief of the fire depart- ment and most of the minor officers. Under a provision of the charter adopted in 1887 saloons are not permitted outside the "patrol limits of the business district"; so that there are no saloons in the residential districts of the city. The municipality owns the waterworks system, the water supply being obtained from the Mississippi river.

History. — The first recorded visit of a European to the site of Minneapolis was that of Father Louis Hennepin, the French Jesuit missionary, who discovered and named the Falls of St Anthony in 1680; but it is almost certain that he was preceded by some of the adventurous coureurs des bois, few of whom left records of their extensive wanderings, and Radisson and Grose- illiers seem to have visited this region two decades before Henne- pin. The land on which the city lies, being divided by the Mississippi river, was for many years under different sovereignties, the east side becoming United States territory at the close of the War of Independence, while the west side, after being under Spanish and French rule, did not become a part of the United States until the purchase of Louisiana in 1803. In 1766 the site was visited by the American traveller, Jonathan Carver, 1

and in 1805 by Lieut. Zebulon M. Pike; the military reserve which Pike bought from the Indians included a greater portion of the west side of the present city. After the erection of Fort St Anthony (1819; later called Fort Snelling), a water-power saw-mill was erected (1822) to saw lumber for the fort on the east bank of the river at the Falls of St Anthony. Later flour was also ground in this mill, which thus became the forerunner of the greatest of the city's industries. Gradually as the Indian land titles became extinguished the east bank was settled. The first settlement on the west bank was made by Colonel John H. Stevens in 1850, but the land was not opened to settlers until 1855. The village of St Anthony, on the east side of the river, was incorporated in 1855; Minneapolis, on the west bank, was incorporated in 1856. St Anthony became a city in i860, and Minneapolis, which then had only 2564 inhabitants, soon outstripped its neighbour after the Civil War, and received a city charter in 1867. In 1870 Minneapolis alone had 13,066 inhabitants (18,079 vvith St Anthony), and in 1872 the two cities were united under the name of Minneapolis. The Republican National Convention met in Minneapolis in 1 89 2 and renominated President Benjamin Harrison.

Authorities. — Isaac Atwater, History of the City of Minneapolis (2 vols., New York, 1893) ; G. E. Warner and C. M. Foote, History of Hennepin County and the City of Minneapolis (Minneapolis, 1881); Hudson's Dictionary of Minneapolis and Vicinity (Minneapolis, annually) ; A. Morrison, The Industries of Minneapolis (Minneapolis, 1885); S. P. Snyder and H. K. Macfarlane, Historical Sketch of St Anthony and Minneapolis (Philadelphia, 1856); and C. B. Elliott's " Minneapolis-St Paul " in L. P. Powell's Historic Towns of the Western States (New York, 1901). , A

MINNESINGERS (Ger. Minnesanger from Minne, love), the name given to the German lyric poets of the 12th and 13th centuries. The term Minnesang, strictly applicable to the poems expressing the homage {Mivnedienst) rendered by the knight to his

mistress, is applied to the whole body of lyric poetry of the period, whether dealing with love, religion or politics. The idea of amour courtois, with its excessive worship of woman, its minute etiquette and its artificial sentiment, was introduced into German poetry from Provencal literature; but the German Minnesang was no slavish imitation of the poetry of the trouba- dours. Its tone was, on the whole, far healthier and more sin- cere, reflecting the difference between the simple conditions of German life and the older and corrupt civilization of Provence. The minnesinger usually belonged to the lower ranks of the nobility, and his verses were addressed to a married woman, often above him in rank; consequently the commonest lyric themes are the lover's hopeless devotion and complaints of the lady's cruelty, expressed with a somewhat wearisome iteration. That real passion was sometimes present may be safely assumed, but it was not within the rules of the game, which corresponded fairly closely to the later sonneteering conventions. The poet was not permitted to give the lady's name, or to betray her identity; and a direct expression of passion would also have contravened the rules. The poems were from the first sung in open court to a melody (Weise) of the poet's own composing, with the accompaniment of a fiddle or small harp. That the minnesinger was no improvisatore is evident from the complicated forms of his verse, which were partly borrowed from the Provencal, but possibly owed something to the Latin rhymed verse 1 of the wandering scholars. The older songs consisted of a single strophe cast in three divisions, two (known as Stollen or doorposts) identical in form, stating and developing the argument, the third (Abgesang) of different form, giving the con- clusion. Later oil, two or more strophes were used in a single poem, but the principle of their structure was retained. In this form were cast the Tagelied, a dialogue describing the parting of lovers at dawn; and the crusading song. Side by side with these existed the Spruch, written in a single undivided stanza, destined for recitation and often cast in the form of a fable.

The lay (Leich) was written in unequal strophes, each formed of two equal divisions. It was applied in the first instance to sacred lyrics,

1 See the Carmina Burana, ed. J. A. Schmeller, 4th ed., Breslau,

1904.

and was first used in love poems by the .Alsatian minnesinger Ulrich von Gutenberg.

The origin of the native lyric, which flourished especially in Austria and Bavaria, is perhaps to be sought in the songs which accompanied dancing. These were not necessarily love songs, but celebrated the coming of spring, the gloom of winter &c, the commonplaces of Minnesang throughout the two centuries of its existence. The older lyrics, which date from the middle of the 1 2th century, are simple in form and written in the ordi- nary epic metres. The earliest minnesinger whose name has come down to us is Der von Kiirenberg (fl. c. 1160), a scion of an Austrian knightly family whose castle lay on the Danube, west of Linz. These songs, however, contradict the root idea of Minnedienst, since the lady is the wooer, and the poet, at the most, an acquiescent lover. They take the form of laments for an absent lover, complaints of his faithlessness and the like. Among the other Austrian and south German lyrists who show small trace of foreign influence was Dietmar von Aist (d. c. n 71), though some of the songs attributed to him seem to be of later date. While the love-song remained in the hands of noble singers, the Spruch was cultivated by humbler poets. The elder of the two or three poets concealed under the name of Spervogel was a wandering singer who found patronage at the court of the burgraves of Regensburg, one of whom himself figures among the earlier minnesingers.

The characteristic period of German Minnesang begins at the close of the 12th century with the establishment of the Provencal tradition in western Germany through the poems of Heinrich von Veldeke and Friedrich von Hausen. National elements abound in Veldeke's songs, although the amour courtois dominates the whole; Friedrich von Hausen (d. n 90) followed Provencal models closely. The long crusading song Sie darf mich des Zlhen niel, is a good example of his powers. A close disciple of the troubadours Peire Vidal and Folquet de Marseille was the Swiss Co'unt Rudolf von Fenis. 1 The greatest name among the earlier minnesingers is that of Heinrich von Morungen, a Thuringian poet who lived on in popular story in the ballad of " The Noble Moringer." He brought great imaginative power to bear on the common subjects of Minnesang, and his poetry has a very modern note. The formal art and science of Minnesang reached full development in the subtle love-songs of Reinmar, the Alsatian " nightingale of Hagenau." Uhland aptly called him the " scholastic philosopher of unhappy love." As a metrist he developed a greater correctness of rhyme, and a better handling of German metres. He became a member of the court of Duke Leopold V. (d. 1194) of Austria, and there Walther von der Vogelweide (q.v.) was first his disciple, and then perhaps his rival. Walther, the greatest of medieval German lyric poets, had Reinmar's technical art, but in feeling was more nearly allied to Morungen. He raised the Spruch to the dignity of a serious political poem, which proved a potent weapon against the policy of Innocent III. In 1202 at the court of Hermann, landgrave of Thuringia, he met Wolfram von Eschen- bach, who is said to have taken part in the tourney of poets known as the Wartburgskrieg, made world- famous through Wag- ner's Tannhauser. The Tagelieder of Wolfram give him a high place in Minnesang, although his fame, like that of Heinrich von Veldeke and Hartmann von Aue, chiefly rests on his epics. A new style — called by Lachmann hofische Dorfpoesie — was marked out by Neidhart von Reuental (d. c. 1240), who be- longed to the lesser Bavarian nobility. He wrote songs to accompany the dances of

the village beauties, and comic and realistic descriptions of village life to please the court. He was acknowledged by the Meistersinger as one of the twelve masters of song. Nevertheless, with him the decadence may be said to have begun.

The Styrian poet Ulrich von Lichtenstein (d. c. 1275) uncon- sciously caricatured chivalry itself by his Frauendienst, in which he relates the absurd feats which he had undertaken at his lady's command, while Steinmar (fl. 1276) deliberately parodied

1 Rudolf II., count of Neuenburg (d. 1196), or, according to some, a nephew of his who died in 1257.

court poetry in his praises of rustic beauty and good living. In the lays, songs and proverbs of Tannhauser something of both elements, of the court and the village, is to be found. He seems to have lived as a wandering singer until 1268, and there very soon grew up round his name the Tannhauser myth which has so little foundation in his life or poetry. The Austrian poet Reinmar von Zweter (d. c. 1260) left some hundreds of Sprilche political or social in their import. Among the princes who practised Minnesang were the emperor Henry VI., though the two songs preserved under his name are of doubtful authenticity, Duke Henry IV. of Breslau (fl. 1270-1290), King Wenceslaus II. of Bohemia, the margrave Otto IV. of Brandenburg, Wizlaw IV., prince of Riigen and the unhappy Conradin, the last of the house of Hohenstaufen, beheaded by the order of Charles of An jou before he reached his seventeenth year.

The didactic motive came more and more to the front in the 13th century. The wandering Swabian poet Marner (d. c. 1270) cultivated especially the Spruch, laughed at the Provencal arid courtly tradition, and there is no very great step from his learning and his feuds to the conditions of Meistersang. Heinrich von Meissen (1250-1319), known as " Frauenlob"(" ladies' praise"), was one of the last minnesingers, and his pedantry and virtuosity entitle him to be called the first meistersinger.

Bibliography. — The chief MSS. containing the work of the 300 or more minnesingers whose work has been partially preserved, are the old Heidelberg MS. (13th century), the Weingarten — Stuttgart MS. (14th century) and the Great Heidelberg MS. (14th century), formerly known as the Manasse MS. This last is the most compre- hensive of all. The collection on which it is based was made by Riidiger Manasse (d. 1304.) and his son "Johannes at Zurich. It is quaintly illustrated with imaginary portraits of the poets (that of Hartmann von Aue in full armour with closed vizor!), and pictures of their coats of arms. It was printed by F. Pfaff (Heidelberg, 1899). The completest collection of the minnesingers' verses is F. H. von der Hagen, Deutsche Liederdichter des zwolften, dreizchnten und vierzehnten Jahrhunderts (4 vols., Leipzig, 1838), vol. iv. of which contains biographical matter and a discussion of the music ; K. Lachmann and M. Haupt, Des Minnesangs Friihling (3rd ed., edited F. Vogt, Leipzig, 1882) is a collection of the minnesingers earlier than Walther von der Vogelweide; there is a comprehensive selection of 97 minnesingers by Karl Bartsch, Deutsche Liederdichter des zwolften bis vierzehnten Jahrhunderts (ed. W. Golther, Berlin 1901) with bio-bibliographical account of individual minnesingers ; see also F. Pfaff, Der Minnesang der 12 bis 14 Jahrhunderts, pt. i. (Stuttgart, 1892). English trans- lations of early German lyrics are F. C. Nicholson, Old German Love Songs, translated from the minnesingers of the 12th to 14th centuries (London, 1907). See also Walther v. d. Vogelweide.

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MINNESOTA, a North Central State of the United States of America. It is bounded on the S. by Iowa, on the W. by South and North Dakota — the Red River (commonly called the Red River of the North) separating it from the latter state — on the N. by the Canadian provinces of Manitoba and Ontario, being separated from the latter by the Lake of the Woods, Rainy River and Rainy Lake, and certain of their tributaries and outlets, and on the E. by Lake Superior and by Wisconsin, from which it is separated for the greater part of the distance by the Missis- sippi and St Croix rivers. It is the tenth state in size in the Union, with a total area of 84,682 sq. m., of which 3824 sq. m. are water surface. 2 From north to south it is about 400 m. in length, extending from 43 30′ to 49 23′ 55″ N. lat., and from east to west its width is about 354 m., lying between long. 89° 29′ and 97° 15′ W.

The north-east part of the state is included in the Great Lakes Province, and the southern and western parts are in the Prairie Plains Province. The whole area of the state was formerly a complexly folded mountainous region of strong relief, which was

s In addition the state contains approximately 2514 sq. m. of Lake Superior.

afterwards worn down to a more nearly level surface, except in the extreme north-east corner, where ridges of harder rock resisted erosion. Marine deposits were laid down over the south of the state after a submergence of the region; an uplift afterwards made of these deposits a coastal plain. The rather level surface of the ” worn down mountains ” of the north of the state and the coastal plain beds of the southern and western parts are now dissected by rivers, which make most of the

state a rolling or hilly country, without strong relief. The average elevation is about 1275 ft. above sea-level or 600 ft. above the surface of Lake Superior. An extensive water-parting in the north central part of the state, an elevation whose inclination is almost imperceptible, determines the course of three great continental river systems. From this central elevation the land slopes off in all directions, rising again in the extreme north-east corner, where the rugged granite uplift in Cook county, known as the Misquah Hills, reaches an altitude of 2230 ft., the highest point in the state; and in the south-west corner, where an altitude of 1800 ft. is reached in the Coteau des Prairies. Only in the valleys of the Red, Minnesota and Mississippi rivers does the elevation fall below 800 ft. In the southern and central portions of the state open rolling prairies interspersed with groves and belts of oak and other deciduous hard- wood timber predominate. A little north of the centre the state is traversed from north- west to south-east by the extensive forest known as the ” Big Woods,” in which also oak occurs most frequently. In the northern part of the state the great pine belt stretches from the head of Lak’e Superior westward to the confines of the Red River Valley, while along the north border and in the north-east the forest growth is almost exclusively tamarack and dwarf pine. More than three-fourths of the area of the state is arable, the small percentage of non-arable land lying principally in the north-eastern regions, which afford compensation in the form of rich mineral deposits. Of the three great continental river systems above mentioned, the Red River and its tributaries drain the western and west central slope northward through Lake Winnipeg into Hudson Bay; the other two being the St Lawrence system, to which the St Louis River and its branches and several smaller streams flowing into Lake Superior con- tribute their waters by way of the Great Lakes and the Missis- sippi, which with its tributaries drains about two-thirds of the state into the Gulf of Mexico. A few rivers in the south drain into the Mississippi through Iowa, while a smaller area in

the extreme north is drained through the Lake of the Woods and Rainy Lake into Hudson Bay. These river systems serve the threefold purpose of drainage, providing water communications (there being about 3000 m. of navigable waters in the state), and, by falls and rapids caused by glacial displacement of rivers, furnishing a magnificent volume of water-power. The Missis- sippi river, which flows for about 800 m. within or along the borders of the state, has its principal sources in and near Lake Itasca. It affords facilities for the transport of logs by means of booms above Minneapolis, and is navigable below St Paul; being half a mile broad where it reaches the border of the state at Hastings. At the Falls of St Anthony, St Cloud, Little Falls and other places, it provides ample water-power for manufac- turing purposes. Its two principal tributaries are the St Croix and the Minnesota. The first, after having for about 135 m. (about 50 being navigable) formed the boundary between Wis- consin and Minnesota, enters the Mississippi at Hastings; the second, rising in Big Stone Lake on the western border, but 1 m. from Lake Traverse, the source of the Red River, enters the Mississippi from the south-west between St Paul and Minne- apolis after a course of about 430 m., about 240 of which are navigable at high water. Both furnish valuable water-power, which is true also of the Cannon and Zumbro rivers flowing into the Mississippi below Hastings. The Red River, which forms the western boundary of the state for more than half its distance, has its source in Lake Traverse. Its most important branch is the Red Lake River, and both are navigable for vessels of light draught at high water. In the south the western fork of the Des Moines River, flowing for 125 m. through the state,

is navigable for 20 m. Glacial action determined the direction and character of the rivers, made numerous swamps, and, by scouring out rock basins, damming rivers and leaving morainal hollows, determined the character and formation of the lakes, of which Minnesota has upwards of 10,000, a number probably

exceeding that of any other state in the Union. The general characteristics of the lakes in the north differ from those of the south, the former being generally deep, with ragged rocky shores formed by glacial scouring which caused rock basins, the latter being mostly shallow. The most interesting feature of the glacial epoch is the extinct Lake Agassiz, which the receding ice of the later glacial period left in the Red River Valley of Minnesota, North Dakota and Manitoba. This lake drained southward into the Gulf of Mexico via the Minnesota and Mississippi rivers, until the ice sheet which had prevented its natural drainage to the north had melted sufficiently to allow it to be drained off into Hudson Bay by way of the Nelson River. The remarkably level character of the Red River district is due to horizontal deposits in the bottom of this lake, which have been little dis- sected by river erosion. The largest of the present lakes, Red Lake, in Beltrami county, has an area of 342 sq. m. Other large lakes are Mille Lacs (198 sq. m.) in Mille Lacs and Aitkin counties; Leech Lake (184 sq. m.) in Cass county; Lake Winnibigashish (82 sq. m.) in Itasca county; and Vermilion Lake (66 sq. m.) in St Louis county. On the northern boundary are the Lake of the Woods (612 sq. m.) and Rainy Lake (148 sq. m.), draining northwards into Hudson Bay. The beautiful ” Park Region,” centring in Ottertail county, contains several thousand lakes. Several large lakes such as Pepin, Traverse and Big Stone are river expansions. The state supports three parks — Itasca state park (22,000 acres, established in 1891), about the sources of the Mississippi, in Clearwater, Becker and Hubbard counties; the St Croix (established in 1895), in Chicago county, across the St Croix from the Wisconsin state park of the same name, and including the beautiful Dalles of the St Croix; and the Minneopa state park (established in 1905), containing Minneopa Falls, near Mankato.

Flora and Fauna. — The flora and fauna are similar to those of the other states of the same latitude. The rapid settling of the state drove its native

fauna, which comprised buffalo, deer, moose, bear, lynx and wolves, in great numbers into the northern sections, v/estward into Dakota, or across the Canadian border. Deer and moose are still found in the state. The preservation of game is now enforced by stringent game laws, administered by an efficient state Game and Fish Commission. The fisheries, which are of great value, are care- fully supervised and systematically replenished from, the State Fish Hatchery at St Paul, and the Federal Fish Hatchery maintained at Duluth, in which particular attention is devoted to the fish of Lake Superior. Minnesota ranked third among the states of the Union in 1900 in the production of lumber, but in 1905 was fifth, the supply having diminished and the industry having been developed in the states of Washington and Louisiana. The danger of loss from forest fires, such as that of 1894, emphasized the necessity of forest preser- vation, and resulted (1895) in the creation of a special state depart- ment with a forest' commissioner and five wardens with power to enforce upon corporations and individuals a strict observance of the forestry laws, the good effects of the law being evidenced by the fact that the fire losses in forest lands for the first twelve years of its operation averaged only $31,000 a year. Furthermore, in order to encourage the growth and preservation of the forests, and to create systematically forest reserves, the legislature established in 1899 a State Forestry Board. There are two national forest reserves, with an aggregate area of 1882 sq. m.

Climate. — Minnesota has the characteristic climate of the North Central group of states, with a low mean annual temperature, a notably rarefied atmosphere that results in an almost complete absence of damp foggy weather, and an unusual dryness which during the rather long winters considerably neutralizes the excessive cold. The cold increases not only from south to north, but to some extent from east to west. The mean annual temperature, according to the reports of the U.S. Weather Bureau, varies from 45 ° F. at St Paul and

points in the south of the state to 37 ° F., at points in the north-east and as far south-west as Moorhead, Clay county. In the south the season is usually without killing frost from early in May to late in September, but in the north it is not uncommon late in May or early in September. The amount of rain decreases from east to west, the mean annual rainfall being 32-7 in. at Grand Meadow in the south-east and 33-3 in. at Mount Iron in the north-east, but less than 25 in. at several points of obser- vation in the western half of the state. In all sections about as

much, or even more, rain falls in summer as in both autumn and winter, and the summer rains, together with the long summer days, are very favourable to a rapid growth and early maturity of crops. Nearly the whole state is usually covered with snow during the greater part of winter, and the mean annual fall of snow varies from about 52 in. at points in the north-east to less than 25 in. in the south-west. In most localities the prevailing winds are north- west in winter and southerly in summer, but at Duluth, on the shore of Lake Superior, they are south-west during November, December and January and north-east during all other months.

Soil and Minerals. — The surface drifts of the greater part of the state, which are almost wholly of glacial origin, have provided Minnesota with a remarkably fertile soil. It consists largely of a dark brown or black sandy loam, finely comminuted, the richness of which in organic matter and mineral salts induces rapidity of growth, and the strength and durability of which render it capable of a long succession of crops. This soil prevails throughout the southern counties and the Minnesota and Red River valleys, in which sections cereal crops predominate. Toward the east central part of the state there is a somewhat less fertile sandy soil, which is devoted more largely to potatoes and

similar crops. The non-arable north-east portion of the state is covered with a coarse granite drift. Underneath the surface are beds of sand, gravel and clays, the last affording material for the manufacture of brick, tiles and pottery. The rock formations of the state furnish building stones of great value.

Minnesota ranked first among the states in 1902 in the production of iron ore. Although the iron ranges in the north-east had been explored about i860 and were known to contain a great wealth of ore, it was not until 1884 that mining was actually begun on the Vermilion Range. Since that date the development of iron mining in Minnesota has been remarkable, and the increase both in volume and value of the output has been practically uninterrupted. Eight years later (1892) the much richer Mesabi Range, the most produc- tive iron range in the world, was opened up; it soon surpassed the Vermilion in its output, and by 1902 the product was nearly ten times greater. The ore, which in many places is found in an almost pure state, is at or near the surface and the process of mining is one of great simplicity and ease. The quality of ore in the two ranges differs somewhat, that mined from the Vermilion Range being a hard specular or red haematite, while that taken from the Mesabi Range, largely red haematite, is much softer and in many localities quite finely comminuted.

Agriculture. — The principal industry of Minnesota is agriculture. Large areas of swamp lands in the central and north central parts of the state once counted non-arable have been drained and re-claimed. There were in 1900 154,659 farms aggregating 26,248,498 acres, of which 70-3 % was improved land ; the total value of farm property was $788,684,642, an increase in value of $373,983,016, or more than 90%, for the decade 1 890-1900. The value of domestic animals on farms and ranges was $86,620,643. The total value of farm products for the year 1899 (census of 1900) was $161,217,304. Geographically the wheat-raising area extends across the entire south of the state — the Minnesota Valley

and the Red River Valley — the rich glacial loam of which renders it one of the most productive wheat regions in the world. Other important crops in the order of their value are oats, hay and forage, Indian corn, barley, flax-seed, potatoes, rye, grass seeds, wild grass, clover, beans, peas, and miscellaneous vegetables and orchard products. Both fruit-raising and dairying interests are centred principally in the southern half of the state.

Manufactures and Commerce. — The extraordinary numbers of utilizable water-powers, the unusual transport facilities affording ample means of reaching the great markets, and finally the proximity to the raw materials of manufacture, have made Minnesota of great importance as a manufacturing state. The federal census showed for the decades 1880-1890 and 1890-1900 an increase in the number of manufacturing establishments from 3493 in 1880 to 7505 in 1890, and 11,114 ' n 1900. During the same period the capital invested increased from $31,004,811 in 1880 to $127,686,618 in 1890 and $165,832,246 in 1900, and the value of the manufactured products increased from $76,065,198 in 1880 to $192,033,478 in 1890 and $262,655,881 in 1900. The wonderful development of Minnesota as a flour-producing state began with the introduction of improved roller processes after 1870. Minneapolis is the chief flour-making centre of the world, and the cities at the " Head of the Lakes " (Duluth, Minnesota, and Superior, Wisconsin, considered industrially as one place) constitute the second largest centre. The towns of the Red River Valley, which are nearer to the great wheat belt, give promise of developing into great flouring cities. Next to flour, lumber and timber products rank in importance. Other manufac- tures of importance are butter, cheese and condensed milk, packed meats and other slaughter-house products, steam railway cars, foundry and machine-shop products, linseed oil, malt liquors, planing-mill products, sash, doors and blinds, boots and shoes, and agricultural implements. As compared with other states of the Union Minnesota ranked third in 1900 and fifth in

1905 in lumber; sixth in 1900 and fifth in 1905 in cheese, butter and condensed milk; eighth in 1900 and in 1905 in agricultural implements; and fourteenth in 1900 and eighth in 1905 in planing-mill products.

For an inland state Minnesota is exceptionally well situated to play a chief part in the commercial life of the country, and various causes combine to make it important in respect to its interstate and foreign trade. It is the natural terminal of three great northern transcontinental railway lines — the Northern Pacific, the Great North- ern, and the Chicago, Milwaukee & Puget Sound (the extension of the Chicago, Milwaukee & St Paul system) ; and the Chicago, Burlington & Quincy and the connecting lines of the Canadian Pacific form lines of communication with the middle Northwest and the Pacific provinces of Canada. Seven navigable rivers within or on the borders of the state — the Red River of the north, the Red Lake River, Rainy River, the Minnesota, the Mississippi, the St Croix and the St Louis 1 — give facilities for transport by water that exert an important competing influence on freight charges; and at the ” Head of the Lakes ” (Duluth-Superior) many lines of steamships on the Great Lakes, providing direct or indirect connexion with the Eastern and Southern states, make that port in respect to tonnage the first in the United States. This combination of natural and artificial highways of commerce derives an additional importance from the character of the regions thus provided With transport facilities, which renders its cities the principal distributing centres both for the entire Northwest for coal shipped via the Great Lakes, and also for the eastern and middle Western states for the great staples, wheat and lumber, derived either from Minnesota itself or by means of its great transcontinental railways from the neighbouring North- western states and Canadian provinces. Iron shipments from the Mesabi and Vermilion ranges, cereals from the Northwest, fruits and vegetables from the Pacific coast, and Oriental products obtained via the great northern railways,

are also elements of great importance in the state's commerce., There were on the 31st of December 1908 8 438'73 m. of railway within the state. St Paul and Duluth are ports of entry.

Population. — The population of Minnesota at the first Federal census (i860) after its admission into the Union was 172,023, and by the succeeding Federal enumerations it was: (1870), 439,706; (1880), 780,773; (1890), 1,301,826, excluding Indians (10,096); (1900), 1,751,394; (1910) 2,075,708.2 Of the total population in 1900, 932,490, or 53-2 %, were males, and 818,904, or 46-8 %, females; 1,246,076 were native-born; 505,318, or 28-9 %, were foreign-born, and 1,312,019 were of foreign parentage {i.e. having either one or both parents foreign-born). Of the 14,358 coloured inhabitants, 4959 were negroes and 9182 Indians, 8457 of whom lived on reserva- tions. The urban population {i.e. inhabitants of cities of 8000 or over) was 26-8 % of the total population, as compared with 28-2 % in 1890. By the state census of 1905 the population of the principal cities was as follows: Minneapolis, 261,954; St Paul, 197,023; Duluth, 64,942; Winona, 20,334; Stillwater, 12,435; and Mankato, 10,996; by the same census four other cities, all in the mining region in the north-east, had passed the 5000 limit, viz. Hibbing, 6566; Cloquet, 6117; Virginia, 5056; and Eveleth, 5332. The density of population increased from i6'5 per sq. m. in 1890 to 22-1 in 1900. The largest religious denomination in the state in 1906 was the Roman Catholic, with 378,288 communicants out of a total of 834,442 members of all religious denominations; there were 267,322 Lutherans, 47,637 Methodists, 27,569 Presbyterians, 24,309 Baptists, 22,264 Congregationalists, and 18,763 Protestant Episcopalians.

Government.— The state is governed under the constitution adopted on the 13th of October 1857 and frequently amended. By an amendment of 1898 an amendment may be suggested by a majority of both houses of the legislature and comes into effect if approved by a majority of all electors voting at the general election at which the amendment is voted

upon; if two or more amendments are submitted at the same election voters shall vote for or against each amendment separately. For the re- vision of the constitution it is necessary that two-thirds of the members elected to each house of the legislature vote for the call of a constitutional convention, that a majority of all electors voting at the next general election approve the call for the con- vention, and that the convention consist of as many members as the house of representatives, who shall be chosen in the same manner, and shall meet within three months after the general

1 At International Falls on Rainy River and at Duluth on the St Louis immense water-power is utilized for manufacturing.

2 By the state census of 1905 the total population was 1,979,912 (1,060,412 males and 909,275 females — excluding Indians from the sex classification), of whom 537,041 were foreign-born, 10,929 were Indians, 51 13 were negroes, 171 were Chinese, and 50 were Japanese.

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election at which it is voted. The executive department consists of a governor, lieutenant-governor, secretary of state, treasurer and attorney-general, elected biennially in November of the even-numbered years, and an auditor elected at the same time every four years. The veto power of the governor (since 1876) extends to separate sections of appropriation bills. The judicial department comprises a supreme court consisting of a chief justice and (since 1881) four associate justices elected for terms of six years, and lower courts consisting of district courts with original jurisdiction in civil cases in law and equity, and in criminal cases upon indictments by grand juries; justices' courts, in which the. amount in litigation cannot exceed $100, or the punishment cannot exceed three months' imprisonment or a fine of $100; and of municipal and probate courts with the usual jurisdictions. The legislative department consists of a senate of sixty-three members elected for four years, and a house of representatives of one hundred and nineteen members, elected for two years, the remuneration being mileage and $500 a year. The reapportionment of congressional, senatorial and representa- tive districts is made in the first legislative session after the state census, which has been taken in every tenth year since 1865. The legislature meets biennially in odd-numbered years, the session being limited to ninety days by a constitutional amend- ment of 1888. A majority of all the members elected to each house is required for the passage of a bill, and a two-thirds majority is necessary to pass a bill over the governor's veto. All bills for raising revenue must originate in the House of Representatives, but the senate may propose and concur with amendments as on other bills. Expenditures from the fund known as " The Internal Improvement Land Fund," derived from the sale of state lands, can be made only after the enactment for that purpose has been approved by the voters of the state; in 1 88 1 the legislature, and

in 1884 the popular vote, pledged the proceeds of this fund to the payment of Minnesota state railway adjustment bonds. Taxation must be uniform only within classes of property prescribed by the legislature. An Australian ballot law was enacted in 1891; the qualifications for electors (adopted in 1896) require that the voter be at least twenty-one years old, that he shall have been a full citizen of the United States for three months prior to the election, and shall have lived in the state six months and in the election district thirty days. Women (since 1898) may vote for school officers and members of library boards, and are eligible for election to any office pertaining to the management of schools or libraries. A constitutional amendment in regard to local government adopted in 1898 provides that any city or village, by a four-sevenths vote of its electors, may adopt a charter drawn by a commission (appointed by the local district judges) and proposed by such commission within six months of its appointment.

An amendment to the constitution adopted in November 1888 declares that any combination or pool to affect the markets for food products is a ” criminal conspiracy, and shall be punished in such manner as the legislature may provide.”

A homestead which is owned and occupied by a debtor as his dwelling place is exempt from seizure or sale for debts other than taxes, those secured by a mortgage on it, or those incurred for its improvement or repair, or for services performed by labourers or servants. But a homestead so exempted may not be larger than one-fourth of an acre if it is in an incorporated place haying a popu- lation of 5000 or more, than half an acre if it is in an incorporated place having a population of less than 5000, or than eighty acres if it is outside an incorporated place. In case the owner is married the homestead cannot be sold or mortgaged, except for an unpaid portion of the purchase money, without the joinder of husband and wife, and if the owner dies leaving a spouse or minor children, the homestead with its exemptions descends to the surviving member

or members of the family. If the owner is a husband and he deserts his family, the wife and minor children may retain the homestead. Under the laws of the state the legal existence and legal personality of a woman are not affected by marriage, and the property rights of a husband and wife are nearly equal. A husband may, however, convey his real estate, other than a homestead, by his separate deed, whereas a wife's deed for her real estate is void without the joinder of her husband. If either husband or wife dies intestate and there are no descendants the whole of the estate passes to the survivor; if there are descendants the surviving spouse has the use

of the homestead for the remainder of his or her life, an absolute title to one-third of the other real estate of the deceased, and to personal property limited to $1000 besides wearing apparel. The grounds for an absolute divorce in Minnesota are adultery, impotence, cruel and inhuman treatment, sentence to state prison or state reformatory subsequent to the marriage, desertion or habitual drunkenness for one year next preceding the application for a divorce. Before applying for an absolute divorce the plaintiff must have resided in the state for the year next preceding, unless the cause of action is adultery committed while the plaintiff was a resident of the state. A wife may at any time sue for a limited divorce from her husband on the ground of cruel and inhuman treatment, of such conduct as to render life with him unsafe and improper, or of aban- donment and refusal or neglect to provide for her, if both parties are inhabitants of the state or their marriage took place in the state. A law of 1909 provides for a women's and children's department in the state bureau of labour.

The sale of intoxicating liquors is for the most part regulated by licences, but the granting of licences may be prohibited within any town or incorporated village by its legal voters, and the question must be submitted to popular vote upon the request of ten legal voters.

Penal and Charitable Institutions. — The charitable and correctional institutions of Minnesota have been since 1901 under the supervision of a State Board of Control consisting of three paid members ap- pointed by the governor and serving for terms of six years ; this board supplanted an unpaid Board of Corrections and Charities established in 1883, and the boards of managers of separate institutions (except the schools for the deaf and the blind at Faribault, and the state public school at Owatonna) and of groups of institutions were abolished. The state institutions consist of state hospitals for the insane at St Peter (1866), at Rochester (1877), established originally as a state inebriate asylum under a law taxing liquor dealers for that purpose, which was subsequently held to be uncon- stitutional, at Fergus Falls (1887), at Anoka (1900) and at Hastings (1900); the state institute for defectives at Faribault, consisting of the schools for the deaf (1863), blind (1874) and feeble-minded (1879) ; the state public school for dependent and neglected children at Owatonna (1886); a sanatorium for consumptives at Walker; a hospital for indigent, crippled or deformed children (1907) at St Paul; the state training school for boys near Red Wing; a similar industrial school for girls (established separately in 1907) at Sauk Center; the state reformatory at St Cloud (1887), inter- mediate between the training school and the state prison, for first offenders between the ages of sixteen and thirty years, in which indeterminate sentences and a parole system are in operation; the state prison at Stillwater (1851), in which there is a parole system and a graded system of diminution of sentence for good conduct, and in which, up to 1895, prisoners were leased under contract (especially to the Minnesota Thresher Company), and since 1895 have been employed in the manufacture of shoes and of binding twine, and in providing for the needs of the prison population ; and the state soldiers' home occupying fifty-one acres adjoining Minnehaha Park in Minneapolis. By an act of 1907 the Board of Control was empowered to establish a hospital for inebriates.

Education. — The state supports a highly efficient public school system, organized through all the grades from the primary district and rural schools to the state university. At the head of the system stands the state superintendent of public instruction, appointed by the governor; there are also county superintendents; and a state high school board, consisting of the governor, state superintendent and the president of the state university, has general supervision of the schools and apportions the state aid. The schools are sup- ported by a state tax, and by the proceeds of a permanent school fund amounting (in 1908) to $19,709,383; in the same year the total value of all public school property was $28,297,420, with an aggregate debt of $6,329,794, and $13,463,211 was spent for public educa- tional purposes. There are state normal schools at Winona (i860), Mankato(i868), St Cloud (1869), Moorhead (1888) and Duluth (1902). The university of Minnesota at Minneapolis was projected by the Territorial Legislature of 1 85 1. Some ground was purchased for its campus in 1854, but it was actually founded by an act of 1864, amended in 1866, 1868 and 1872. It is governed by a board of twelve regents, of whom the president of the university, the governor of the state and the state superintendent of public instruction are members ex officio, and the other nine, holding office for six years, are appointed by the governor with the advice and consent of the senate. The university is supported by a state tax of 0-23 mills per dollar on the taxed property of the stale, by special appropria- tions from the state (for ” deficiency,” for School of Mines, and for salaries of teachers in the department of mines and engineering), by the interest on state bonds and land contracts purchased with the proceeds of Federal land grants under the Morrill Act of 1862, by Federal appropriations under the Morrill Act of 1890 and the Hatch Act, and by students’ fees, &c. ; the total of this income was estimated in 1906-1907 at $628,500. The Act of 1872 provided for five or more colleges or departments: a college of science, literature and the arts, which offers (for the

degree of Bachelor of Arts) a four-years course, is entirely elective (except that a certain number of ” long courses ” must be selected) after the first year, and in which the

only restriction is upon the range of subjects from which the student’s choice may be made; a college of agriculture (including military tactics), which is now a ” department,” including a college and a school of agriculture, a short course for farmers, a dairy school, the Crookston school of agriculture, a main experiment station at St Anthony Park, between Minneapolis and St Paul, and sub-stations i m. north of Crookston and 2 m. east of Grand Rapids; a college of mechanic arts, now called the college of engineering and the mechanic arts, which offers four-year courses in civil, mechanical, electrical and municipal engineering, a four-year course in science and technology, leading to the degree of Bachelor of Science, and graduate work leading to the degree of Master of Science; the college of law, a three-years course, with evening classes and graduate courses; a college of medicine, which is now the college of medicine and surgery (1888), and the college of homoeopathic medicine and surgery (1889), each with four-year courses, and each (since 1903) with a course of six years partly in the college of science, literature and the arts, and partly in the medical college and leading to the degrees of Bachelor of Science and Doctor of’Medicine. In addition to these departments provided for in the organic act, the university included in 1909 colleges of dentistry (three-year course), pharmacy (two-year and three-year courses), a school of mines (1891 ; four-year course, leading to the degree of Engineer of Mines or Metallurgical Engineer), a school of analytical and applied chemistry (four-year courses, leading to the degree of Bachelor in Science in Chemistry or in Chemical Engineering), a college of education (1906; three-year course, after two years of college work,

leading to a Master's degree), a graduate school (with courses leading to the degrees of Master of Arts, of Science and of Laws, and of Doctor of Philosophy, of Science and of Civil Law), and a university summer school. The growth and development of the university have been almost entirely under the administration of Cyrus Northrop (b. 1834), who graduated at Yale College in 1857 and at Yale Law School in 1859, and was professor of rhetoric and English literature at Yale from 1863 until 1884, when he became president of the university of Minnesota. The university is one of the largest in the country. In 1907 there were twenty-three buildings valued at more than $1,475,000. The university library of 110,000 volumes is supplemented by the libra- ries of Minneapolis and St Paul. In 1 908-1909 the faculty numbered about 325 and the total enrolment of students was 4421. Other higher educational institutions in Minnesota are Hamline University (Methodist Episcopal), with a college of liberal arts at St Paul, and a college of medicine at Minneapolis; Macalester College (Presby- terian) at St Paul; Augsburg Seminary (Lutheran) at Minneapolis; Carleton College (non-sectarian, founded in 1866) and St Olaf College (Lutheran, founded in 1874) at Northfield; Gustavus Adolphus College (Lutheran) at St Peter; Parker College (Free Baptist, 1888) at Winnebago City; St John's University (Roman Catholic) at Collegeville, Stearns county; and Albert Lea College for women (Presbyterian, founded 1884) at Albert Lea.

History. — The first European visitors to the territory now embraced in the state of Minnesota found it divided between two powerful Indian tribes, the Ojibways or Chippewas, who occupied the heavily wooded northern portion and the region along the Mississippi river, and the Sioux or Dakotas, who made their homes on the more open rolling country in the south and west and in the valley of the Minnesota. The first known white explorers were Radisson and Groseilliers, who spent the winter of 1658-1659 among the Sioux in the Mille Lacs region. At Sault Sainte Marie in 1671, before

representatives of fourteen Indian nations, the Sieur de St Lusson read a proclamation asserting the French claim to all the territory in the region of the Great Lakes. Two years afterwards the upper course of the Mississippi was explored by Joliet and Marquette. In 1679 Daniel Greysolon, Sieur du Lhut (Duluth) , as agent for a company of Canadian merchants which sought to establish trading posts on the Lakes, explored the country from the head of Lake Superior to Mille Lacs and planted the arms of Louis XIV. in a large Sioux village. In the following year the Franciscan friar Father Louis Hennepin, acting as an agent of the Sieur de la Salle, discovered and named the Falls of St Anthony; and in 1686 Nicholas Perrot, the commandant of the west, built Fort St Antoine on the east bank of Lake Pepin, in what is now Pepin county, Wisconsin, and in 1688 formally took possession of the region in the name of the French king. A few years later (1694) Le Sueur, who had as early as 1684 engaged in trade along the upper Mississippi, established a trading post on Isle Pelee (Prairie Island) in the Mississippi between Hastings and Red Wing, and in 1700 he built Fort L'Huillier at the confluence of the Blue Earth and the Le Sueur rivers. In 1762 the Sieur de la Perriere, acting as an agent of the French government, estab- lished on the west bank of Lake Pepin a fortified post (Fort

Beauharnois), which was to be a headquarters for missionaries, a trading post and a starting-point for expeditions in search of the " western sea." But none of the French posts was perma- nent, and in 1763 French rule came to an end, the Treaty of November (1762) and the Treaty of Versailles (1763) trans- ferring respectively the western portion of the state to Spain and that part east of the Mississippi river to Great Britain. In 1766 the region was visited by the Connecticut traveller Jonathan Carver (1732-1780). Great Britain surrendered its title to the eastern portion by the Treaty of Paris (1783), and after the surrender of Virginia's colourable title had been accepted by Congress in 1784, this eastern part was made a part

of the Northwest Territory by the ordinance of 1787, although the British held possession and did some trading there until 1796. The western part remained under Spanish control until 1803, when it, too, after being retransferred to France, became a part , of the United States with the rest of the Louisiana Purchase. In 1805-1806, at the instance of President Thomas Jefferson, Lieut. Zebulon M. Pike led an exploring expedition as far north as Leech Lake and took formal possession of the Minnesota region for the United States. He obtained from the Sioux for military reservations one tract 9 m. square at the mouth of the St Croix River and another containing about 100,000 acres at the confluence of the Minnesota and Mississippi rivers. On the latter tract a military post was established by Lieut.-Colonel Henry Leavenworth (1783-1834) in 1819, and in the following year the construction was begun of a fort at first named Fort St Anthony but renamed Fort Snelling in 1824 (two years after its completion) in honour of its builder and commander Colonel Josiah Snelling (1782-1829). In 1819 Michigan Territory was extended west- ward to the Mississippi river, and in 1820 General Lewis Cass, its governor, conducted an exploring expedition in search of the source of the Mississippi, which he was satisfied was in the body of water named Lake Cass in his honour. Further search for the true source of the Mississippi was made in 1823 by Giacomo Constantio Beltrami (1 779-1855), an Italian traveller and political refugee, and in 1832 by Henry Rowe Schoolcraft, who had accompanied Cass's expedition and traced the Mississippi from Lake Cass to Lake Itasca. In 1823 extensive explorations of the Minnesota and Red River valleys were conducted by Major Stephen Harriman Long (1784-1864), and subsequently (1834- 1836) knowledge of the region was extended by the investigations of the artist George Catlin (1796-1872), the topographer George William Featherstonhaugh (1780-1866), and the geologist Jean Nicholas Nicollett (1786-1843). Meanwhile, the country was slowly being settled. In 1823 the first river steamboat reached St Paul; the Mississippi was soon afterwards opened to continu-

ous if irregular navigation; and in 1826 a party of refugees from Lord Selkirk's colony on the Red River settled near Fort Snelling. On the erection of Wisconsin Territory in 1836 the whole of Minnesota, which then extended westward to the Missouri river, was incorporated with it, but on the erection of Iowa Territory in 1838 Minnesota was divided and the part west of the Missis- sippi became a part of Iowa Territory. In 1 83 7 , by two important treaties, the one (July 29) between the Chippewas and Governor Henry Dodge of Wisconsin at St Peters, and the other (Sept. 29) between some Sioux chiefs and Joel R. Poinsett at Washington, the Indian titles to all lands east of the Mississippi were practi- cally extinguished. The first county, St Croix, was established in 1839, and in the succeeding years thriving settlements were established at St Paul and Stillwater. The admission of Wis- consin as a state in 1848 left that part of the former territory west of the St Croix and north of the Mississippi rivers, which was not included in the new state, practically without a government. On the 26th of August a convention met at Stillwater, where measures were taken for the formation of a separate territorial government, and Henry Hastings Sibley (1811–1891) was sent to Congress as a delegate of " Wisconsin Territory." Upon his admission to a seat the curious situation was presented of representatives of the state and of the territory of Wisconsin sitting in the same body. This situation did not last long, however, for on the 3rd of March 1849 the bill organizing the territory of Minnesota was passed,

and on the 19th President Zachary Taylor appointed Alexander Ramsey of Pennsylvania the first territorial governor. The territorial boundaries extended to the Missouri river, including a greater part of the present North and South Dakota. The first territorial legislature met at St Paul on the 3rd of September following. By the Federal census of 1850 the territory had a population of 6077, most of

whom lived east of the Mississippi, or along the Red river in the extreme north-west. Two treaties negotiated with the Sioux by Luke Lea, commissioner, and Governor Alexander Ramsey in 1851 opened to settlement the greater part of the land within the territory west of the Missis- sippi, and such an unparalleled rush to the new lands took place that a census taken in 1857 showed a population of i5°>°37- I n July 1857 a convention chosen to form a state constitution was found on assembling to be so evenly divided between the Republican and Democratic parties that organization was impossible, and the members proceeded to their work in two separate bodies. By means of conference committees, however, identical constitutions were formed, which in the following October were adopted by an almost unanimous popular vote. The state was admitted to the Union with its present boundaries on the 12th of May 1858, and the federal census of i860 showed that the population had increased to 172,023, despite the fact that the financial panic of 1857 had severely checked the state's growth. Minnesota furnished more than 25,000 troops for the Federal armies during the Civil War. But even more pressing than the call of the nation was the need of defending her own homes against the uprisings of the Indians within her borders. The settlements bordering on the Indian reservations had ex- perienced more or less trouble with the Sioux for several years, the most serious outbreak having occurred in March 1857, when Ink-pa-du-ta led his band to massacre the settlers at Spirit Lake. The absence of a large proportion of the able-bodied young settlers in the northern armies was taken advantage of by the Indians, and in the summer of 1862 there was delay in paying them their yearly allowance. Suddenly towards the end of August, as if by previous understanding (although nothing of the sort was ever proved), small bands of Sioux scattered along the frontier for 200 m. and began a systematic massacre of the white settlers. Beginning with the first outbreak at Acton, Meeker county (Aug. 17), the attacks continued with increasing fury (nearly 1000 whites losing their lives) until the 23rd of September, when hastily-

raised volunteer forces under Colonel H. H. Sibley decisively defeated Little Crow, the principal leader of the Kapo- sia band, at Wood Lake. Three days later more than 2000 of the Indians were surrounded and captured, Little Crow with a few of his companions alone escaping beyond the Missouri. A military commission tried 425 of the captives for murder and rape, of whom 321 were found guilty and 303 were condemned to death. Of these 38 were hanged at Mankato on the 26th of December 1862. Little Crow and his followers kept up desultory raids from the Dakota country, during one of which in July 1863 he lost his life. Expeditions of Sibley in 1863, and General Alfred Sully (1821-1879) in 1864, eventually drove the hostile Indians beyond the Missouri and terminated the war, which in two years had cost upwards of a thousand lives of settlers and volunteers. The opening of the Chippewa lands in the north- west and the coming of peace marked the beginning of a new period of rapid growth, the Federal census of 1870 showing a population of 439,706, or a gain of 75-8 % in five years. During the same half-decade railway construction, which had begun with the opening of the railway between St Paul and Minneapolis in 1862, reached a total of more than 1000 m. For a period of five years after the financial panic of 1873 the growth was com- paratively slow, but in the succeeding two years the recuper- ation was rapid. During the decade, 1880-1890, more than 2300 m. of railway were completed and put in operation. In September 1894 disastrous forest fires, starting in the neighbour- hood of Hinckley in Pine county, destroyed that village and several neighbouring towns, causing the death of 418 people, rendering 2200 others homeless, and devastating about 350 sq. m. of forest land, entailing a loss of more than $1,000,000. The

state furnished four regiments (a total of 5313 officers and men) to the volunteer army during the Spanish-American War (1898), the service of the 13th Regiment for more than a year in the Philippines being particularly notable. In October 1898 there ■ was an uprising of the Pillager band of Chippewa

Indians at Leech Lake, which was quelled by the prompt action of Federal troops. Since the first state election, which was carried by the Democratic party, the state has been generally strongly Republi- can in politics; but the Republican candidate for governor was defeated in 1898 by a ” fusion ” of Democrats and Populists, and in 1904, 1906 and 1908 a Democratic governor, John Albert Johnson, was elected, very largely because of his personal popularity.

Governors of Minnesota. Territorial.

Alexander F.amsey Whig . 1849-1853

Willis Arnold Gorman …. Democrat . 1853-1857

Samuel Medary „ . 1857-1858

State.

Henry Hastings Sibley …. Democrat . 1858-1860

Alexander Ramsey Republican . 1860-1863

Henry A. Swift „ . 1863-1864

Stephen Miller „ . 1864-1866

William Rogerson Marshall … „ . 1866-1870

Horace Austin „ . 1870-1874

Cushman Kellogg Davis … „ . 1874-1876

John Sargent Pillsbury …. „ . 1876-1882

Lucius Fairchild Hubbard … „ . 1882-1887

Andrew Ryan McGill …. „ . 1887-1889

William Rush Merriam …. „ . 1889-1893

Knute Nelson …... „ . 1893-1895

David Marston Clough …. „ . 1895-1899

John Lind . Democrat-Populist 1899-1901

Samuel R. Van Sant …. Republican 1901-1905 John Albert Johnson . . .Democrat (died in office) 1905-1909

Adolph Olson Eberhart . . . Republican 1909-

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(New York, 1901) ; Sanford Niles, History and Civil Government of Minnesota (Chicago, 1897); and the Legislative Manual, published biennially by the state at St Paul.

MINNOW (Leuciscus phoxinus), the smallest British fish of the Cyprinoid family, readily distinguished by its very minute scales. The ordinary name is derived from the common Indo-European word for " little " (cf. Lat., minor), and " minnow " is

popularly identified with any tiny fish; in America it is given to small forms of the Gambusia and Notropis genera, &c. The British minnow abounds in lakes, rivers and brooks, swimming in schools, and shifting its ground in search of food, in the shape of every kind of animal and vegetable substance. It ranges from Scandinavia to south Europe, and from Ireland to north-east Asia, attaining an elevation of nearly 8000 ft. in the Alps. Its size varies from between 2 and 3 in. to as much as 4 or 5 in. The minnow is commonly used by anglers for bait, and is useful in ponds as food for trout, perch or pike.

MINO DI GIOVANNI (1431-1484), called Da Fiesole, Italian sculptor, was born at Poppi in the Casentino. He had property at Fiesole. Vasari's account of him is very inaccurate. Mino was a friend and fellow-worker with Desiderio da Settignano and Matteo Civitale, all three being about the same age. Mino's sculpture is remarkable for its finish and delicacy of details, as well as for its spirituality and strong devotional feeling. Of Mino's earlier works, the finest are in the duomo of Fiesole, the altarpiece and tomb of Bishop Salutati, executed before 1466. In the Badia of Florence are an altarpiece and the tombs of Bernardo Giugni (1466) and the Margrave Hugo (1481), all sculptured in white marble, with life-sized recumbent effigies and attendant angels. The pulpit in Prato Cathedral, in which he collaborated with Antonio Rossellino, finished in 1473, is very delicately sculptured with bas-reliefs of great minuteness, but somewhat weakly designed. Soon after the completion of this work Mino went to Rome, where he executed the tomb of Pope Paul II. (now in the crypt of St Peter's), the tomb of Francesco Tornabuoni in S. Maria sopra Minerva, and a beautiful little marble tabernacle for the holy oils in S. Maria in Trastevere. There can be little doubt that he was also the sculptor of several monuments in S. Maria del Popolo, especially those of Bishop Gomiel and Archbishop Rocca (1482), and the marble reredos given by Pope Alexander VI. Some of Mino's portrait busts and profile bas-reliefs are preserved in the Bargello at Florence;

they are full of life and expression, though without the extreme realism of Verrocchio and other sculptors of his time.

See Vasari, Milanesi's ed. (1 878-1 882) ; Perkins's Italian Sculptors, Winckelmann and D'Agincourt, Storia delta scultura (1813); Hans Semper, Architekten der Renaissance (Dresden, 1880) ; Wilhelm Bode, Die italienische, Plastik (Berlin, 1893).

MINOR, ROBERT CRANNELL (1839-1904), American artist, was born in New York city on the 30th of April 1839, and re- ceived his art training in Paris under Diaz, and in Antwerp under Joseph Van Luppen. His paintings are characteristic of the Barbizon school, and he was particularly happy in his sunset and twilight effects; but it was only within a few years of his death that he began to have a vogue among collectors. In 1897 he was elected a member of the National Academy of Design, New York. After 1900 he lived at Waterford, Connecticut, where he died on the 4th of August 1904.

MINOR (Lat. for smaller, lesser), a word used both as an adjective and as a substantive for that which is less than or inferior to another, and often correlatively opposed to that to which " major " is applied in the same connotation. Among the numerous special uses of the word the following may be mentioned: " Minor Friars," sometimes known as " Minorites," i.e. the name (fratres minores, lesser brothers) given by St Francis to the order he founded (see Franciscans) ; " minor canons " are clergymen attached to a cathedral or collegiate church who read and sing the daily service. In some cathedrals they are known as " vicars choral "; they are not members of the chapter. (For the distinction between holy and minor orders in Christian hierarchy see Orders.) The name " Minor Prophets " is used collectively of the twelve

prophetical books of the Old Testament from Hosea to Malachi inclusive. (For the distinction in music between major and minor intervals, and for other

applications of the correlative term, see Music and Harmony.) In the categorical syllogism (q.v.) in logic, the minor term is that term which forms the subject of the conclusion, the minor premiss is that which contains the minor term. In law, a ” minor ” is a person under legal age (see Infant).

In mathematics, the ” minor of a determinant ” is the deter- minant formed by erasing an equal number of the rows and columns of the original determinant. If one column and row be erased there is formed the first minor; if two rows and columns the second minor, and so on. The minor axis of a central conic section is the shorter of the two principal axes; it may also be regarded as the line joining the two imaginary foci. In astro- nomy, the term minor planets is given to the members of the solar system which have their orbits between those of Mars and Jupiter (see Planets, Minor).

MINORCA, the second in size of the group of Spanish islands in the Mediterranean Sea, known as the Balearic Islands (q.v.), 27 m. E.N.E. of Majorca. Pop. (1900), 371,512; area, 260 sq. m. The coast is deeply indented, especially on the north, with numerous creeks and bays — that of Port Mahon (17,144) being one of the finest in the Mediterranean, if not the best of them all, according to the popular rhyme — ” Junio, Julio, Agosto y puerto Mahon Los mejores puertos del Mediterraneo son ” —

” June, July, August and Port Mahon are the best harbours of the Mediterranean ” (see Port Mahon). The ports Addaya, Fornelle, Ciudadela and Nitja may also be mentioned. The surface of the island is uneven, flat in the south and rising irregu- larly towards the centre, where the mountain El Toro — probably so called from the Arabic tor, a height, though the natives have a legend of a tor or bull — has an altitude of 1 207 ft. The climate is not so equable as that of Majorca, and the island is exposed in autumn and winter to the violence of the north winds. Its soil is of very unequal quality; that of the higher districts being light, fine,- and

fertile, and producing regular harvests without much labour, while that of the plains is chalky, scanty, and unfit for pasture or the plough. Some of the valleys have a good alluvial soil; and where the hills have been terraced they are cultivated to the summit. The wheat and barley raised in the island are sometimes sufficient for home consumption; there is rarely a surplus. The Hedysarum coronarium, or zulla, as it is called by the Spaniards, is largely cultivated for fodder. Wine, oil, potatoes, hemp and flax are produced in moderate quantities; fruit of all kinds, including melons, pomegranates, figs and almonds, is abundant. The caper plant is common throughout the island, growing on ruined walls. Horned cattle, sheep and goats are reared, and small game abound. Stone of various kinds is plentiful. In the district of Mercadal and in Mount Santa Agueda are found fine marbles and porphyries; lime and slate are also abundant. Lead, copper and iron might be worked were it not for the scarcity of fuel. There are manufactures of the wool, hemp and flax of the island; and formerly there was a good deal of boat-building; but agriculture is the chief industry. An excellent road, constructed in 1713-1715 by Brigadier- General Richard Kane, to whose memory a monument was erected at the first milestone, runs through the island from south-east to north-west, and connects Port Mahon with Ciudadela. Ciudadela (861 1), which was the capital of the island till Port Mahon was raised to that position by the English, still possesses considerable remains of its former importance.

MINOS, a semi-legendary king of Crete, son of Zeus and Europa. By his wife, Pasiphae, he was the father of Ariadne, Deucalion, Phaedra and others. He reigned over Crete and the islands of the Aegean three generations before the Trojan War. He lived at Cnossus for periods of nine years, at the end of which he retired into a sacred cave, where he received instruction from Zeus in the legislation which he gave to the island. He was the author of the Cretan constitution and the founder of its naval

supremacy (Herodotus iii. 122; Thucydides i. 4). In Attic tradition and on the Athenian stage Minos is a cruel tyrant, the heartless exactor of the tribute of Athenian youths to feed the Minotaur (q.v.). It seems possible that tribute children were actually exacted to take part in the gruesome shows of the Minoan bull-rings, of which we now have more than one illustration (see Crete: Archaeology). To reconcile the contra- dictory aspects of his character, two kings of the name of Minos were assumed by later poets and mythologists. Since Phoenician intercourse was in later times supposed to have played an important part in the development of Crete, Minos is sometimes called a Phoenician. There is no doubt that there is a considerable historical element in the legend; recent dis- coveries in Crete (q.v.) prove the existence of a civilization such as the legends imply, and render it probable that not only Athens, but Mycenae itself, was once subject to the kings of Cnossus, of whom Minos was greatest. In view of the splendour and wide influence of Minoan Crete, the age generally known as ” Mycenaean ” has been given the name of ” Minoan ” by Dr Arthur Evans as more properly descriptive (see Crete). Minos himself is said to have died at Camicus in Sicily, whither he had gone in pursuit of Daedalus, who had given Ariadne the clue by which she guided Theseus through the labyrinth. He was killed by the daughter of Cocalus, king of Agrigentum, who poured boiling water over him in the bath (Diod. Sic. iv. 79). Subsequently his remains were sent back to the Cretans, who placed them in a sarcophagus, on which was inscribed: ” The tomb of Minos, the son of Zeus.” The earlier legend knows Minos as a beneficent ruler, legislator, and suppressor of piracy (Thucydides i. 4). His constitution was said to have formed the basis of that of Lycurgus (Pausanias iii. 2, 4). In accordance with this, after his death he became judge of the shades in the under-world {Odyssey, ix. 568); later he was associated with Aeacus and Rhadamanthus.

The solar explanation of Minos as the sun-god has been thrown into the background by the recent discoveries. In any case a divine origin would naturally be claimed for him as a priest-king, and a divine atmosphere hangs about him. The name of his wife, Pasiphae (" the all-shining "), is an epithet of the moon-goddess. The name Minos seems to be philo- logically the equivalent of Minyas, the royal ancestor of the Minyans of Orchomenus, and his daughter Ariadne (" the ex- ceeding holy ") is a double of the native nature-goddess. (See Crete: Archaeology.)

On Cretan coins Minos is represented as bearded, wearing a diadem, curly-haired, haughty and dignified, like the traditional portraits of his reputed father, Zeus. On painted vases and sarco- phagus bas-reliefs he frequently occurs with Aeacus and Rhadaman- thus as judges of the under-world and in connexion with the Minotaur and Theseus.

MINOT, LAURENCE (fl. 1333-1352), English poet, the author of eleven battle-songs, first published by Joseph Ritson in 1 795 as Poems on Interesting Events in the reign of King Edward III. They had been discovered by Thomas Tyrwhitt in a MS. (Cotton Galba, E. IX., British Museum) which bore on the fly- leaf the misleading inscription: " Chaucer, Exemplar emendate scriptum." It dates from the beginning of the 15th century. The authorship of Laurence Minot's eleven songs is fixed by the opening of the fifth: " Minot with mowth had menid to make," and in VII. 20, " Now Laurence Minot will begin." The poems were evidently written contemporaneously with the events they describe. The first celebrates the English triumph at Halidon Hill (1333), and the last the capture of Guines (1352). The writer is animated by an ardent personal admiration for Edward III. and a savage joy in the triumphs of the English over their enemies. The technical difficulty of his metres and the comparatively even quality of the work led to the inference that Minot had written other songs, but none have come to light. Nothing whatever is known of his life, but the minuteness of his information

suggests that he accompanied Edward on some of his campaigns. Though his name proves him to have been of Norman birth, he writes vigorous and idiomatic English of the northern dialect with some admixture of midland forms. His poems are

instinct with a fierce national feeling, which has been accepted as an index of the union of interests between the Norman and English elements arising out of common dangers and common successes.

There are excellent editions of Minot's poems by Wilhelm Scholle (Quellen und Forschungen, vol. Iii., Strasburg, 1884), with notes on etymology and metre, and by Mr J. Hall (Clarendon Press, 2nd ed., 1897). Mr Hall is inclined to include as his work the " Hymn to Jesus Christ and the Virgin " (Religious Pieces, Early English Text Society, No. 26, p. 76), on the grounds of similarity of style and language. See also T. Wright, Political Poems and Songs (Rolls series, 1859).

MINOTAUR (Gr. Mivwravpos, from MLvws, and ravpos, bull), in Greek mythology, a fabulous Cretan monster with the body of a man and the head of a bull. It was supposed to be the offspring of Pasiphae, the wife of Minos, and a snow-white bull, sent to Minos by Poseidon for sacrifice. Minos, instead of sacrificing it, spared its life, and Poseidon, as a punishment, inspired Pasiphae with an unnatural passion for it. The monster which was born was shut up in the Labyrinth (q.v.). Now it happened that Androgeus, son of Minos, had been killed by the Athenians, who were jealous of the victories he had won at the Panathenaic festival. To avenge the death of his son, Minos demanded that seven Athenian youths and seven maidens should be sent every ninth year to be devoured by the Minotaur. When the third sacrifice came round Theseus volunteered to go, and with the help of Ariadne (q.v.) slew the Minotaur (Plutarch, Theseus, 15-19; Diod. Sic. i. 16, iv. 61; Apollodorus iii. 1, 15). Some modern mythologists regard the Minotaur as a solar personification and a Greek adaptation of the Baal-Moloch of the Phoenicians. The slaying of the Minotaur by Theseus

in that case indicates the abolition of such sacrifice by the advance of Greek civilization.

According to A. B. Cook, Minos and Minotaur are only different forms of the same personage, representing the sun-god Zeus of the Cretans, who represented the sun as a bull. He and J. G. Frazer both explain Pasiphae's monstrous union as a sacred ceremony (iepos Yd/ios), at which the queen of Cnossus was wedded to a bull-formed god, just as the wife of the apxav fiaaikivs in Athens was wedded to Dionysus. E. Pottier, who does not dispute the historical personality of Minos, in view of the story of Phalaris (q.v.) considers it probable that in Crete (where a bull-cult may have existed by the side of that of the double axe) victims were tortured by being shut up in the belly of a red-hot brazen "bull. The story of Talos, the Cretan man of brass, who heated himself red-hot and clasped strangers in his embrace as soon as they landed on the island, is probably of similar origin. The contest between Theseus and the Minotaur was frequently represented in Greek art. A Cnossian didrachm exhibits on one side the labyrinth, on the other the Minotaur surrounded by a semicircle of small balls, probably intended for stars ; it is to be noted that one of the monster's name, was Asterius.

See A. Conze, Theseus und Minotaur os (1878); L. Stephani, De> Kampf zwischen Theseus und Minotauros (1842), with plates and history of the legend; L. Preller, Griechische Mythologie; Helbig in Roscher's Lexicon der Mythologie; F. Durrbach in Daremberg and Saglio's Dictionnaire des antiquites; A. B. Cook in Classical Review, xvii. 410; J. G. Frazer, Early History of the Kingship (i9°5) ; E. Pottier in La Revue de Paris (Feb. 1902) ; the story is told in Kingsley's Heroes.

MINSK, a government of western Russia, bounded by the governments of Vilna, Vitebsk, Mogilev and Chernigov on the N. and E. and by Kiev, Volhynia and Grodno on the S. and W. It has an area of 35,283 sq. m. The surface is undulating and hilly in the north-west, where a narrow plateau and a range of hills

(800-1000 ft.) of tertiary formation separate the basin of the Niemen, which flows into the Baltic, from that of the Dnieper, which sends its waters into the Black Sea. The remainder of the government is flat, 450 to 650 ft. above Sea-level, and covered with sands and clays of the glacial and post-glacial periods. Two broad shallow depressions, drained by the Berezina and the Pripet, cross the government from north to south and from west to east; and these, as well as the triangular space between them, are occupied by immense marshes (often as much as 200 to 600 sq. m. each), ponds and small lakes, peat-bogs and moving sands, intermingled with dense forests. This country, and especially its south-western part, is usually known under the name of Polyesie (" The Woods "). Altogether, marshes and moors

take up 22% and marshy forests no less than 405% of the entire area of the province. It is only in the north-west that the forests consist of full-grown trees; those which grow on the marshy ground are small, stunted pine, birch and aspen. The climate of the Polyesie is extremely unhealthy; malarias and an endemic disease of the hair (plica Polonica) are the plagues of these tracts. Communication is very difficult. The railway from Poland to Moscow has taken advantage of the plateau above mentioned; but still it has to cross the broad marshy depression of the Berezina. A successful attempt was made to drain the marshes of the Polyesie by a system of canals, and more than 4,500,000 acres have thus been rendered suitable for pasture and agriculture. Two tributaries of the Dnieper — the Berezina and the Pripet — both navigable, with numberless subtributaries, many also navigable, are the natural outlets for the marshes. The Dnieper flows along its south-eastern border for 160 m. and the Niemen on the north-western for 130 m. The affluents of the Baltic, the Dvina and the Vistula, are connected by canals with tributaries of the Dnieper. The

estimated population in 1906 was 2,581,400. The peasants constitute 65% of the population, who are mostly White Russians (71%); there are also Poles (12%), Jews (16%), Little Russians and Great Russians. About 70,000 are considered to be Lithuanians; there are also 4500 Tatars and 2000 Germans.

The principal occupation of the inhabitants is agriculture, which is very unproductive in the lowlands; in the Polyesie the peasants rarely have pure bread to eat. Only 23-5 % of the area is under crops. Cattle-breeding is very imperfectly developed. Hunting and bee-keeping are sources of income in the Polyesie, and fishing gives occupation to about 20,000 persons. Gardening is carried on in some parts. The chief source of income for the inhabitants of the lowlands is the timber trade. Timber is floated down the rivers, and tar, pitch, various products of bark, potash, charcoal and timber-ware (wooden dishes, &c.) are manufactured in the villages to a great extent; and ship-building is carried on along the Dnieper, Pripet and Niemen. Shipping is also an important source of income. The industrial arts are almost entirely unde- veloped, but there are several distilleries, flour-mills, saw-mills and tanneries, and woollen-stuffs, candles, tobacco, matches and sugar are manufactured. The great highway from Warsaw to Moscow crosses the government in the south, and its passage through the Berezina is protected by the first-class fortress of Bobruisk. The government is divided into nine districts, of which the chief towns and populations in 1897 are: Minsk, capital of the government (q-v.), Bobruisk (35,177), Igumen (4579), Mozyr (10,762), Novogrudok (7700), Pinsk (27,938), Ryechitsa (10,681) and Slutsk (14,180).

This region was originally inhabited by Slavs. That portion of it which was occupied by the Krivichi became part of the Polotsk principality, and so of White Russia; the other portion, occupied by the Dregovichi and Drevlyans, became part of Black Russia; whilst the south-western portion was occupied by Yatvyags or Lithuanians. During the

12th, 13th and 14th centuries it was divided among several principalities, which were successively incorporated with Lithuania, and. later annexed to Poland. Russia took possession of this country in 1793. In 1812 it was invaded by the army of Napoleon I. Archaeological finds of great value, dating from the Neolithic and subsequent ages, have lately been made. (P.A.K.; J.T.Be.)

MINSK, a town of Russia, capital of the government of the same name, on the Svisloch, a tributary of the Berezina, at the intersection of the Moscow-Warsaw and Libau-Kharkov rail- ways, 430 m. by rail W. from Moscow. It had, in 1897, 91,494 inhabitants, of whom one-third were Jews of the poorest class; the others were White Russians, Poles and Tatars. Amongst its public buildings is a cathedral, built in 161 1. Minsk is the headquarters of the IVth Army Corps and the see of a bishop of the Orthodox Greek Church, and from 1798 to 1853 it was a see of the Roman Catholic Church. The manufactures are few and insignificant. Since the introduction of railways the com- mercial importance of the place, which formerly was slight, has begun to increase.

Minsk is mentioned in Russian annals in the nth century under the name of Myen'sk, or Menesk. In 1066 and 1096 it was devastated, first by Izyazlav and afterwards by Vladimir, prince of Kiev. It changed rulers many times until the 13th century, when it became a Lithuanian fief. In the 15th century it was

part of Poland, but as late as 1505 it was ravaged by Tatars, and in 1508 by Russians. In the 18th century it was taken several times by Swedes and Russians. Russia annexed it in 1793. Napoleon I. took it in 18 12. MINSTER, two towns of Kent, England.

1. Minster-in-Thanet, in the Isle of Thanet parliamentary division, lies on the southern slope of the isle, above the Minster marshes, in the low, flat valley of the river Stour, 4 m. west of Ramsgate, on the South-Eastern & Chatham railway.

Pop. (1901), 2338. Its church, dedicated to St Mary, is cruciform, with a western tower, the nave a fine example of Norman work, the transepts and chancel a beautiful Early English addition. The carved choir-stalls are a notable feature. The church belonged to a nunnery, founded at the close of the 7th century. The abbey, a residence close to the church, incorporates portions of the ancient buildings. Fruit- growing is largely carried on in the neighbourhood.

2. Minster-in-Sheppey, in the north-eastern, parliamentary division, lies in the Isle of Sheppey, near the north coast. Pop. (1901), 1306. It is served by the Sheppey light railway from Sheerness, 2 m. west. The village has in modern times become a seaside resort. It has a fine church, dedicated to St Mary and St Sexburga, originally attached to a convent of the 7th century, founded by Sexburga, widow of Erconberht, king of Kent. The building as it stands is only a portion of the conventual church founded in the early part of the 12th century by William de Corbeuil, archbishop of Canterbury; it retains also traces of pre-Norman work. It contains some interesting early monu- ments. The abbey gatehouse remains, and other fragments may be traced. There are oyster beds in the neighbouring shallow sea.

MINSTER (from Lat. monasterium; cf. German Miinster), the church of a monastery, or one to which a monastery has been attached. In the 10th century the name was applied to the churches of outlying parishes, and is now given to some of the English cathedrals, such as York, Lincoln, Ripon and Southwell, and to large churches or abbeys, like those of Sherborne, Wim- borne or Westminster.

MINSTREL. The word ” minstrel,” which is a derivative from the Latin minister, a servant, through the diminutives ministellus, ministr -alius (Fr. menestrel), only acquired its special sense of household entertainer late in the 13th century. It was the equivalent of the Low Latin joculator x (Prov. joglar, Fr. jougleur, Mid. Eng. jogclour),

and had an equally wide significance.

The minstrel of medieval England had his forerunners in the Teutonic scdp (O.H.G. scopf or scof, a shaper or maker), and to a limited extent in the mimus of the later Roman empire. The earliest record of the Teutonic scdp is found in the Anglo-Saxon poem of Widsith, which in an earlier form probably dates back before the English conquest. Widsith, the far-traveller, belonged to a tribe which was neighbour to the Angles, and was sent on a mission to the Ostrogoth Eormanric (Hermanric or Ermanaric, d. 375), from whom he received a collar of beaten gold. He wandered from place to place singing or telling stories in the mead- hall, and saw many nations, from the Picts and Scots in the west to the Medes and Persians in the east. Finally he received a gift of land in his native country. The Complaint of Deor and Beowulf give further proof that the Teutonic scdp held an honour- able position, which was shaken by the advent of Christianity. The scdp and the gleeman (the terms appear to have been practi- cally synonymous) shared in the general condemnation passed by the Church on the dancers, jugglers, bear-leaders and tumblers. Saxo Grammaticus (Historia danica, bk. v.) condemns the Irish king Hugleik because he spent all his bounty on mimes and jugglers. That the loftier tradition of the scdpas was preserved in spite of these influences is shown by the tales of Alfred and Anlaf disguised as minstrels. With the Normans came the joculator or jogleur, who wore gaudy-coloured coats and the flat

1 Used by John of Salisbury (Polycraticus, i. 8) as a generic term to cover mimi, salii or saliares, balatrones, aemiliani, gladiatores, palaestritae, gignadii, praestigiatores.

shoes of the Latin mimes, and had a shaven face and close-cut hair. Jogleurs were admitted everywhere, and enjoyed the freedom of speech accorded to the

professional jester. Their impunity, however, was not always maintained, for Henry I. is said to have put out the eyes of Luc de la Barre for lampoon- ing him. A fairly denned class distinction soon arose. Those minstrels who were attached to royal or noble households had a status very different from that of the motley entertainers, who soon came under the restrictions imposed on vagabonds generally. A joculator regis, Berdic by name, is mentioned in Domesday Book. The king's minstrels formed part of the royal household, and were placed under a rex, a fairly common term of honour in the craft (cf. Adenes li rois). Edward III. had nineteen minstrels in his pay, including three who bore the title of waits. The large towns had in their pay bodies of waits, generally designated in the civic accounts as histriones. A wait under Edward III. had to " pipe the watch " four times nightly between Michaelmas and Shere Tuesday, and three times nightly during the remainder of the year. In spite of the repeated prohibitions of the ' Church, the matter was compromised in practice. Even religious houses had their minstrels, and so pious a prelate as Robert Grosseteste had his private harper, whose chamber adjoined the bishop's. St Thomas Aquinas (Summa iheologia) said that there was no sin in the minstrel's art if it were kept within the bounds of decency. Thomas de Cabham, bishop of Salisbury (d. 1313), in a Penitential distin- guished three kinds of minstrels {histriones) — buffoons or tum- blers; the wandering scurrae, by whom he probably meant the goliardi (see Goliard) ; and the singers and players of instruments. In the third class he discriminated between the singers of lewd songs and those joculatores who took their songs from the deeds of princes and the lives of saints. The performances of these joculatores were permissible, and they themselves were not to be excluded from the consolations of the Church. The Parisian minstrels were formed into a gild in 13-21, and in England a charter of Edward IV. (1469) formed the royal minstrels into a gild, which minstrels throughout the country were compelled to join if they wished to exercise their trade. A new charter was conferred in

1604, when its jurisdiction was limited to the city of London and 3 m. round it. This corporation still exists, under the style of the Corporation of the Master, Wardens and Commonalty of the Art or Science of the Musicians of London.

During the best time of minstrelsy — the 10th, nth and 12th centuries — the minstrel, especially when he composed his own songs, was held in high honour. He was probably of noble or good bourgeois birth, and was treated by his hosts more or less as an equal. The distinction between the troubadour and the jogleur which was established in Provence probably soon spread to France and England. In any case it is probable that the poverty which forms the staple topic of the poems of Rutebeuf (q.v.) was the commonest lot of the minstrel.

Entries of payments to minstrels occur in the accounts of corporations and religious houses throughout the 16th century; but the art of minstrelsy, already in its decline, was destroyed in England by the introduction of printing, and the minstrel of the entertainments given to Elizabeth at Kenilworth was little more than a survival.

The best account of the subject is to be found in E. K. Chambers's Medieval Stage (1903), i. 23-86 and ii. 230-266. See also L. Gautier in Epopees francaises (vol. ii., 2nd ed., 1892); A. Schultz, Das hofische Leben zur Zeit der Minnesinger (2nd ed., 1889) ; T. Percy, Reliques of English Poetry (ed. H. B. Wheatley, 1876); J. Ritsori, Ancient English Metrical Romances (1802); J. J. Jusserand, English Wayfaring Life in the Middle Ages (4th ed., 1892).

MINT, botanically Mentha, a genus of labiate plants, com- prising about twenty species of perennial herbs, widely distributed throughout the temperate and sub-tropical portions of the globe, but chiefly in the temperate regions of the Old World. The species have square stems, opposite, aromatic leaves, and a stoloniferous creeping rootstock. The flowers are arranged in axillary clusters (cymes),

which either form separate whorls or are crowded together into a terminal spike. The corolla is usually small and of a pale purple or pinkish colour; it has four

nearly equal lobes, and encloses two long and two short stamens. Nearly three hundred intermediate forms have been named and described. Many of these varieties are permanent, in con- sequence of being propagated by stolons.

In Britain ten species are indigenous or naturalized. Mentha viridis, or spearmint, grows in marshy meadows, and is the species commonly used for culinary purposes; it is distinguished by its smooth, sessile leaves and lax tapering flower-spikes. It is probably a cultivated race of the next species, Mentha sylvestris, or horsemint, which chiefly differs from the above in its coarser habit and hairy leaves, which are silky beneath, and in its denser flower-spikes. This plant is supposed to be the mint of Scripture, as it is extensively cultivated in the East; it was one of the bitter herbs with which the paschal lamb was eaten. M. rotundifolia resembles the last in size and habit, but is distinguished by its rounded wrinkled leaves, which are shaggy beneath, and by its lanceolate bracts. The last two species usually grow on damp waste ground. M. aquatica grows in ditches, and is easily recognized by its rounded flower-spikes and stalked hairy leaves. M. piperita, or peppermint (q.v.), has stalked smooth leaves and an oblong obtuse terminal spike of flowers; it is cultivated for its volatile oil. M. pratensis belongs to a group which have the flowers arranged in axillary whorls and never in terminal spikes; it otherwise bears some resemblance to M. viridis. M. saliva grows by damp roadsides, and M . arvensis in cornfields; they are distinguished from M . pratensis by their hairy stalked leaves, which in M. arvensis are all equally large, but in M. saliva are much smaller towards the apex of the stem. M. Pulegium, commonly known as pennyroyal, more rarely as fleamint, has small oval obtuse leaves and flowers in axillary whorls, and is remarkable for

its creeping habit and peculiar odour. It differs from all the mints above described in the throat of the calyx being closed with hairs. It is met with in damp places on grassy commons, and was formerly popular for medicinal purposes.

All the genus Mentha abound in a volatile oil, contained in resinous dots in the leaves and stems. The odour of the oil is similar in several species, but is not distinctive, the same odour occurring in varieties of distinct species. Thus the peppermint flavour is found in M . piperita, in M. incana, and in Chinese and Japanese varieties of M. arvensis. Other forms of the last- named species growing in Ceylon and Java have the flavour of the common garden mint, M. viridis, and the odour is found in M. sylvestris, M. rotundifolia and M. canadensis. A bergamot scent is met with in a variety of M. aquatica and in forms of other species. Most mints blossom in August.

The name mint is also applied to plants of other genera, Monarda punctata being called horsemint, Pycnanthemum linifolium mountain mint, and Nepeta cataria catmint.

MINT (Lat. moneta; Mid. Eng. mynt), a place where coins are manufactured with the authority of the state. Coins are pieces of metal, of weight and composition fixed by law, with a design upon them, also fixed by law, by which they are identified, their value made known and their genuineness certified. The origin of the word ” mint ” is ascribed to the manufacture of silver coin at Rome in 269 B.C. at the temple of Juno Moneta. 1 This goddess became the personification of money, and her name was applied both to money and to its place of manufacture. Metals were used for money at an early stage of civilization, and are well suited to the purpose, owing to their great intrinsic value and their durability, indestructibility, divisibility and rarity. The best metals for coinage are gold, silver, platinum, copper, tin, nickel, aluminium, zinc, iron, and their alloys; certain alloys of gold, silver, copper and nickel have the best

combination of the required qualities.

History of Minting. — The earliest metallic money did not consist of coins, but of unminted metal in the form of rings and other ornaments or of weapons, which were used for thousands of years by the Egyptian, Chaldean and Assyrian Empires (see Numismatics). According to Herodotus, the first mint was probably that established by Gyges in Lydia towards the end of the 8th century B.C. for the coining of gold, silver and electrum, an 1 Lenormant, La Monnp,ie dans I'antiquite, i. 82.

alloy of gold and silver found in a natural state. 1 Silver was coined in the island of Aegina soon afterwards. The art of coining was introduced by the Greeks into Italy and other countries bordering on the Mediterranean and into Persia and India. Subsequently the Romans laid the foundations of modern minting. Coining originated independently in China at a later date than in the western world, and spread from China to Japan and Korea. Coins may be made by casting in moulds or by striking between engraved dies. The Romans cast their larger copper coins, in clay moulds carrying distinctive markings, not because they knew nothing of striking, but because it was not suitable for such large masses of metal. Casting is now used only by counterfeiters. The most ancient coins were cast in bullet- shaped or conical moulds and marked on one side by means of a die which was struck with a hammer. The " blank " or un- marked piece of metal was placed on a small anvil (ambos), and the die was held in position with tongs. The reverse or lower side of the coin received a rectangular mark made by the sharp edges of the little anvil. Subsequently the> anvil was marked in various ways, and decorated with letters and figures of beasts, and later still the ambos was replaced by a reverse die. The spherical blanks soon gave place to lenticular-shaped ones. The blank was made red-hot and struck between cold dies. One blow

was usually insufficient, and the method was similar to that still used in striking medals in high relief, except that the blank is now allowed to cool before being struck. With the substitution of iron for bronze as the material for dies, about a.d. 300, the practice of striking the blanks while they were hot was gradually discarded. 2 In the middle ages bars of metal were cast and hammered out on an anvil. Portions of the flattened sheets were then cut out with shears, struck between dies and again trimmed with shears. A similar method had been used in Egypt under the Ptolemies (c. 300 B.C.) but had been forgotten. Square pieces of metal were also cut from cast bars, converted into round disks by hammering and then struck between dies. In striking, the lower die was fixed into a block of wood, and the blank piece of metal laid upon it by hand. The upper die was then placed on the blank, and kept in position by means of a holder round which was placed a roll of lead to protect the hand of the operator while heavy blows were struck with a hammer. An early improvement was the introduction of a tool resembling a pair of tongs, the two dies being placed one at the extremity of each leg. This avoided the necessity of readjusting the dies between blows, and ensured greater accuracy in the impression. Minting by means of a falling weight (monkey press) intervened between the hand hammers and the screw press in many places. In Birmingham in particular this system became highly developed and was long in use. A. Olivier introduced screw - presses for striking coins, together with rolls for reducing the cast bars and machines for punching-out round disks from flattened sheets of metal, in Paris in 1553. After being discarded in 1585, except for making medals, they were reintroduced by J. Varin in 1640 and the practice of hammering was forbidden in 1645. 3 In England the new machinery was tried in London in 1561, but abandoned soon afterwards; it was finally adopted in 1662, although the old pieces continued in circulation until 1696. At first the rolls were driven by workmen by means of cranks, but later they were worked by horses, mules or water-power. Steam-power was applied to them by Matthew

Boulton and Watt in Birmingham in 1788, and was adopted by the Royal Mint, London, in 1810. Recently the practice of driving rolls by electricity has been growing, the advantage being that each pair of rolls can be driven independently without the intervention of cumbrous shafting. Boulton and Watt's screw press, invented in 1788 and used at the Royal Mint until 1881, was worked by atmospheric pressure applied to a piston. The piston was in communication with a vacuum vessel from which the air had been pumped by steam power.

History of British Mints. — In Britain there are evidences of

1 Op. cit. i. 136. Herodotus i. 94.

2 E. Dumas, L'lLmission des monnaies decimates de bronze, p. 14.

3 Ibid. p. 19.

the existence of mints before the arrival of the Romans. The Romans at first imported their coins, and no Roman mints were established until about the end of the 3rd century, when coins were being struck at London and Colchester. 4 In Anglo-Saxon times Athelstan appears to have been the first monarch who enacted regulations for the mints. 6 He promulgated laws about, the year 928, appointing a large number of " moneyers " 01 " mynteres," London being assigned eight, Canterbury seven, other important towns various numbers and all smaller boroughs one moneyer each. The necessity for so many mints lay in the imperfect means of communication. At an early period, probably about a.d. iooo, the dies were made in London and issued to the other mints. The moneyers, who were elected by the burgesses, were responsible for the manufacture of the coin, and according to Madox were, liable at the time of Henry II. to be summoned to Westminster to take part in the trials of the pyx. 6 If there was any deficiency in the weight of the fineness of the coin the moneyers were punished as traitors. These moneyers appear to have been abolished about n 80/ when

officers were appointed to supervise the coinage on behalf of the king, and the name ” moneyer ” was applied to contractors who manufactured the coin under superintendence and were not responsible to the king for its weight and fineness. The moneyers continued to manufacture the coin of the realm until the year 1850, when the work was entrusted to civil servants. In the reign of Henry III. the principal officers of the Mint were the master, who manufactured the coin under a contract, the warden or paymaster who acted on behalf of the Crown, the assay master (also a king’s officer) who was responsible for the fineness of the coin, the cuneator or superintendent of the engravers of the dies, and the moneyer. One of the most important duties of the warden was the collection from the contractor of the seigniorage which was claimed by the sovereign by virtue of his prerogative as a source of revenue to the Crown. In 17 18 Sir Isaac Newton was made master of the Mint, and in that capacity as contractor for the coinage he amassed a considerable fortune. 8 As the work of the Mint became more extensive and more complicated other officers were added and their duties were varied from time to time. The present administration of the English Mint is based on arrangements made in 1870, when the establishment was re- organized. The office of master of the Mint is held by the chan- cellor of the exchequer for the time being, without salary, but the actual administrative work of the department is entrusted to the deputy master and comptroller. The receipt of bullion and the delivery of coin from the Mint is under the charge of the chief clerk, the manufacture of coin is in the hands of the superinten- dent of the operative department, and the valuation of the bullion by assay, and matters relating to the fineness of the coin are entrusted to the chemist and assayer. The date of the establishment of the Mint in the Tower of London is unknown. There is a reference to it dated 1229 and a clear reference dated 1329. 9 According to Ruding, there were over fifty mints in the reign of Edward the Confessor. After the Norman Conquest the mints increased to about seventy, a greater number than

now exists in the world, but they were gradually reduced and in the reign of Edward I. there were only twelve. Ruding enumerates 128 mints operated at various times in the United Kingdom, including some established by usurpation, as in the reign of Stephen by certain barons, and also mints established by grants to ecclesiastics to be worked for their own profit. The provincial mints were all closed just before the reign of Mary, who coined in London only. Charles I. set up small mints in various towns, and for the great re-coinage in the reign of William III. mints were established at York, Chester, Exeter, Bristol and Norwich, but were soon abandoned. Wood's copper money for Ireland and America was coined at Wolverhampton (1700-1722), and the tradesmen's tokens were struck at various towns. Copper coins were struck by Boulton at Soho, Birmingham,

4 H. A. Grueber, Coins of Great Britain and Ireland, p. viii.

6 Rogers Ruding, Annals of the Coinage, 3rd ed. ii. 135. ■ 6 Grueber, op. cit. p. xxv. 8 Ruding, op. cit. i. 35.

7 Ibid. p. xxvi. 9 Ibid. ii. 192, 194.

in 1788, and a colonial bronze coinage was executed at this establishment as recently as the year 1875. There is another mint in Birmingham worked by a private company (" The Mint, Birmingham, Limited "), where coinages for foreign governments are executed and in addition silver and bronze colonial coins are occasionally manufactured under the supervision of the London Mint. The existing London Mint was erected on Tower Hill in 1810. Minting in Scotland began in the reign of David I. (1124-1153) and ceased in 1709, two years after the Act of Union, in which it had been expressly stipulated that a mint should be continued in Scotland. l Coinage in Dublin

began in Anglo- Saxon times and came to an end in the reign of William III. 2 The other Irish mints were of little importance.

British Dominions. — Turning to mints in British Dominions beyond the Seas, Ruding enumerates twenty-six mints in France and Flanders used by British monarchs between 1186 and 1513, and Anglo-Hanoverian coins were struck at Clausthal, Zellerfeld and Hanover in the period 17 14-183 7. In India 3 the earliest English mint was that at Madras which was bought by the East India Company in 1620, reorganized more than once and finally closed in 1869. The Calcutta mint was established by the East India Company in 1757, but other mints in Bengal continued to be used till about 1835, when the Calcutta mint was rebuilt. The Bombay mint was set up about the year 1671, but the coins were made by hammer and anvil until 1800. The Calcutta and Bombay mints are still in operation. A mint was opened in Hong-Kong in 1866 but was closed in 1868 and the machinery sold to Japan. In Australia there are three mints, Sydney, opened in 1855, Melbourne, opened in 1872, and Perth, opened in 1899. Up to 1909 only sovereigns and half-sovereigns were struck at these establishments, but in 1910 arrangements were made for a Commonwealth silver coinage. A mint at Ottawa was opened in 1908 for the manufacture of all Canadian coins as well as English sovereigns.

Other Countries. — In the United States the Philadelphia mint was opened in 1792, but only manual or horse power was used until 1836, when steam was introduced. Other mints are now in operation at New Orleans, San Francisco and Denver. In most European countries a single mint situated at the capital is found to be sufficient, but there a^e six mints in the German Empire and two in Austria-Hungary. In China 26 mints were at work in 1906. There are also mints at Osaka, Bangkok and Teheran, and the Seoul mint was at work in 1904. In Mexico n mints formerly existed, but one only, in the city of Mexico, remained open in 1907. In South America there are mints at Lima, Santiago, Buenos Ayres and Tegucigalpa. No mints are in operation in Africa. In

all there are nearly 70 mints in the world.

The Supply of Bullion to Mints. — In England, in the middle ages, the king was accustomed to send in to the mint the produce of his own silver mines, and claimed the exclusive privilege of purchasing the precious metals. The right of levying seigniorage, however, was sometimes waived by the king to encourage his subjects to bring gold and silver to the mint, and several instances are recorded in which the aid of alchemists was called in to effect the transmutation of baser metals into gold. Seigniorage was abolished for both gold and silver in 1666, when it was provided that no charge should be made at the Mint for coining and assay- ing. Finally in 1816 the free coinage of silver was brought to an end. At present all gold bullion brought to the Mint is weighed and portions are cut off for assay. The amount of gold in standard ounces (916-6 fine) corresponding to the ” imported ” bullion is thus ascertained, and on the application of the im- porter the gold is coined and delivered to him in the form of sovereigns and half-sovereigns at the rate of £3, 17s. iojd. per standard ounce troy, no deduction being made for wastage, seigniorage, the purchase of alloy metal, or the expense of manu- facture. As a considerable time elapses between the receipt of bullion by the Mint and the delivery of the coin, it is generally

1 Grueber, op. cit. p. liv. 2 Ruding, op. cit. ii. 245.

3 W. J. Hocking, Catalogue of Coins in the Royal Mint, i. 272, 275 and 279.

more profitable for the holder of gold bullion to sell it to the Bank of England or dispose of it in some other way. The result is that the gold presented for coinage is almost always sent from the Bank of England, which suffers no loss of interest during the coinage of the bullion, because bank-notes have already been issued against it. Silver bullion, and the copper, tin and zinc required to make up bronze, are bought by the Mint and manu-

factured into coin, which is kept in stock and issued as it may be required. One ounce of standard silver, which contains 925 parts of silver and 75 of copper per 1000, is converted into 5s. 6d. in silver coin, whatever may be the market price of silver bullion. This seldom exceeded 3od. per ounce in the years 1 893-1 907. Coinage bronze consists of copper 95 parts, tin 4 parts and zinc 1 part, and a ton yields £448 in pence or £373, 6s. 8d. in halfpence or farthings. The difference between the nominal value of silver and bronze coin and its intrinsic value is retained by the state to cover the expenses of manufacture and as a source of profit. It corresponds to the seigniorage levied by the king on all coinages down to the reign of Charles II. In return, the Mint receives at its nominal value for recoinage the worn gold and silver coin which is withdrawn from circulation by the Bank of England and some other banks. In spite of the cost of this recoinage, however, the profit on the issue of new silver and bronze usually exceeds in each year the total expenditure of the Mint. Gold and silver are delivered in a refined state suitable for immediate conversion into coin. In general, only old coin, ingots resulting from the melting of coin, and ” fine ” ingots are received. Fine gold ingots (the ” bar gold ” of commerce) are usually about 400 oz. troy in weight, and contain from 990 to 999-5 parts of gold per 1000, the remainder being chiefly silver. Fine silver ingots usually weigh from 1000 to 1200 oz. troy and contain from 995 to 999 parts of silver per 1000. The ingots are valued by weighing and assaying, and a calculation is made as to the amount of copper required for melting with them to produce the standard alloy. The two standard alloys consist respectively of gold 916-6, copper 83-3 and of silver 925, copper 75. All gold coins received at the Bank are weighed on automatic balances (see below) and those below the lowest legal current weight are separated. The lowest current weight is 122-5 grains for sovereigns and 61-125 grains for half-sovereigns corresponding to losses by wear of about o-6% and o-8% respectively. The average age on withdrawal is about 24 years for

sovereigns and 15 years for half-sovereigns. Silver coins are not weighed but are selected for withdrawal when they present a worn appearance. The average deficiency in weight of worn silver coin received at the Mint is from 8 to 10%, and the mean age somewhat less than 50 years. In European mints generally little difficulty is experienced in procuring refined gold and silver for coinage. In Australia, the United States, Japan and some other countries, the Mints receive unrefined gold from the mines and refine it before it is coined. A charge for refining is made in all cases. A refinery was attached to the London Mint from 1816 to 1 85 1, but was then let on lease and left to private enterprise. The operations employed in the manufacture of gold and silver coin are as follow: —

(1) Melting the metal and casting it into bars. (2) Rolling the bars into strips or ” fillets.” (3) Cutting out disks or blanks from the fillets. (4) Adjusting the weight of the blanks (this is omitted in some mints). (5) ” Marking ” or edge-rolling the blanks to produce a raised rim or to impress a design on the edge. (6) Annealing the blanks and (in some mints) cleaning them in acid.

(7) Striking the blanks between dies surrounded by a collar.

(8) Weighing each coin. Among the incidental operations are

(a) the valuation of the bullion by weighing and assaying it;

(b) ” rating ” the bullion, or calculating the amount of copper to be added to make up the standard alloy; (c) recovering the values from ground-up crucibles, ashes and floor sweepings (the Mint “sweep”); (d) assaying the melted bars; (e) “pyxing” the finished coin or selecting specimens to be weighed and assayed; (J) ” telling ” or counting the coin.

Melting. — Formerly bullion was melted in crucibles

made of refrac- tory clay, but they are liable to crack and require careful handling

These were succeeded by iron crucibles, especially for melting silver, and these have now been generally replaced by graphite (plumbago) crucibles made of a mixture of clay and graphite. Good graphite crucibles can be used many times in succession if they are heated gradually each time, but they are usually discarded after about fifteen or twenty meltings. At the Royal Mint gold is melted in crucibles about 10 in. in height and 8j in. in diameter at the widest part. The charge is from 1200 to 1300 02. (37-3 to 40-5 kilograms) of metal. The furnace is 12 in. square and 2 ft. deep from the fire-bars to the cover. An old crucible is cut off about 2 in. from the bottom and the bottom piece is inverted and placed on the fire-bars as a support for the crucible. The ” muffle,” a graphite cylinder 6 in. in height, is placed on the crucible to allow room for long bars to be melted in the crucible and to prevent the surrounding

and C is the flue, common to two furnaces and leading to the stack; The handle D, acting through the gear wheels E, F, G and H, turns the cogwheel K, which moves the curved rack of the cradle and tips the crucible M. The molten metal is poured into the moulds N, which are carried on wheels running on rails Q. The parts of the range of moulds are brought tightly together and held in position by the bars O and the screw P, and when one mould is filled the carrier is moved forward on its rails by wheels worked by a handle also shown in the figure. In some other mints still larger crucibles are used, containing various amounts up to about 1000 kilograms or over 30,000 oz. In foreign mints the molten metal is generally transferred from the crucible to the moulds by dipping crucibles or iron ladles covered with clay. Gas is used as fuel for the melting furnaces at Philadelphia. It is cleaner

than coke and is said to

Fig. 1. — Furnace Apparatus.

coke from falling into it. The flue, of about 5 in. square, communi- cates with a stack 60 ft. high. In many mints the flues pass into condensing chambers where volatilized gold and silver are recovered. The crucible is at a red heat when the gold is charged in, the copper being added last, and a graphite lid put on the crucible to check loss by volatilization. The charge is completely melted in about half an hour, and it is then thoroughly mixed by stirring with a graphite rod. The crucible is then lifted out by circular tongs suspended in such a way that two men can take part in the' operation. The contents are poured by hand into moulds which are contained side by side in an iron carriage running on wheels, fig. I, OP. The niolten gold, which is of a pale green colour, solidifies at once in the iron moulds, and the bars can be taken out immediately. Bars from which sovereigns are to be coined are 22 in. long, if in. wide and 5 in. thick, and about seven such bars are cast from one pot. The rough edges of the bars are removed by a circular revolving file, and the hollow ends are cut off. Pieces are cut out for assay, and the bars are then ready for rolling. The amount of gold melted in an ordinary day's work is two tons to two and a half tons, of the value of £250,000 to £300,000. For silver larger crucibles are used, containing 'about 5000 oz. troy (155 kilograms). They are heated in circular furnaces 21 in. in diameter and lifted out with circular tongs suspended from a travelling crane which is worked by elec- tricity. The crucible is placed in the pouring cradle, which has been in use since 1816, and is shown in fig. I. Here A is the iron cover surrounding the furnaces, B is the revolving lid of a furnace,

save time and to reduce the loss of the precious metals. At Denver and Ottawa the fuel used is " first distillate " oil, which is found to be cheaper than either naphtha or gas. The oil is pumped from buried tanks and warmed to about 90 F. before it

reaches the burners at the furnaces. At the Denver mint the crucibles are used for from twelve to fifteen meltings with oil fuel, whereas they were soon destroyed when gas was employed. A charge of 6000 oz. of gold is melted in about an hour. The melting losses amount to about 0-2 per 1000 of gold and o-6 per 1000 of silver in the Royal Mint. The losses are caused by volatilization, by the absorption of metal by the crucible, stirring rod, &c, and by occasional projection of particles from the pot into the furnace. The ash-pit is lined with iron plates to facilitate the recovery of metal accidentally spilt. All crucibles and other materials which might contain precious metal are ground up and washed in a pan, and the pannings together with a selection from the floor sweepings are remelted. The residues (the Mint ” sweep “) are sold to refiners or ore-smelters.

Rolling. — The cast bars are reduced to the thickness of the coin by repeated passages between rolls. These are cylinders of cast iron or steel from 6 in. to 15 in. in diameter set parallel to one another with a small interval between, and revolved by electric or steam power. They are divided into breaking-down and finishing rolls, the latter being of smaller diameter than the former. The power is usually transmitted through toothed wheels, each roll being driven independently in some cases, while sometimes power is ap- plied to the lower roll only, the upper roll being coupled to it. The

power required f jr breaking down mint bars amounts to from 25 to 35 h. p. The bars are fed to the rolls by hand. Heavy pinches are applied at first, the space between the rolls being diminished by a hand-screw after each passage of the bars through them. When the bars are nearly to gauge, light pinches are given, the power required by finishing rolls being about 5 h.p. only. The reduction in thickness of the bars is accompanied by a slight increase in their

width and a very great increase in their length, so that it is generally necessary to cut partly rolled bars into two parts to keep them of convenient dimensions. By repeated passages through the rolls the bars are hardened, and to facilitate further reduction they are usually softened by annealing before being passed to the finishing rolls. In some mints the fillets are annealed frequently, the fillets for one-mark pieces at the Berlin mint, for example, being annealed four times in the course of rolling. In this case the bars are reduced from 5J mm. in thickness to I \ mm. by being passed thirteen times through the rolls. At the Vienna mint the practice has been to anneal silver bars after each passage through the rolls. On the other hand, in the United States mints, the use of very carefully refined metal has made it possible to discontinue the annealing of partly rolled bars. In the Royal Mint silver bars are annealed once during rolling by passing through a Bates & Peard gas furnace. The fillets are placed on an endless chain which moves slowly through the furnace, returning, underneath. At each end of the furnace is a trough of water which covers the furnace mouth, so that air is prevented from entering the furnace. The chain dips below the water, then rises into the furnace and passes down into the other trough on its way out. The result is that so long as the fillets are hot they are kept from contact with the air and blackening of the metal is prevented. In some mints the drag-bench or draw-bench is used after the rolls to equalize the thickness of the fillets. The fillet is drawn between two little steel cylinders which do not revolve and are held rigidly in position. The principle resembles that used in wire drawing. It was introduced by Sir John Barton at the Royal Mint in 1816 and was abandoned there in 1905. The thickness of the

Fig. 2. — Gauge Plate.

fillets is measured by the gauge-plate shown in fig. 2. When they have been reduced to the correct thickness they are examined by the ” tryer,” who cuts out one or two blanks from each fillet with a

hand machine and weighs them on a delicate balance. If the weight of the blank is slightly below the standard weight, a somewhat larger cutter is used, so that the blanks may be of correct weight. If the blank is too heavy the fillet may of course be passed through the rolls again.

Remedy.— The degree of accuracy required is indicated by the ” remedy ” allowance for weight, which is different for each coin, and is the maximum difference from the standard weight which is allowed by law. In the sovereign it is o-2 grain or about 1-62 per 1000. As the mean thickness of a sovereign is 0-0466 in., the remedy for weight corresponds to a difference of less than miro in- in the thickness of the fillet. The remedy for English silver coins varies from 2 grains or 4-58 per 1000 in the case of the crown’, to 0-087 grain or 11-97 P er 1000 in the case of the silver penny. The reme- dies for weight on foreign coins are in general greater than those allowed in the British Empire, averaging 2 per 1000 for gold coins. Reference may here be made to the similar working margin allowed in respect of the fineness of gold and silver. In England the remedy for fineness is 2 per 1000 on gold coins and 4 per 1000 on silver coins above and below the legal standard. Thus gold coins would be within the limits if they contained between 914-6 and 918-6 parts of gold per 1000. Remedies are intended to cover accidental variations from the exact standard and are now generally used only in this way. In former times, however, advantage was sometimes taken of the remedy as a means of profit. In the reign of Queen Elizabeth, the master of the Mint, finding the allowance under his contract to be insufficient, availed himself of the remedy on the silver coinage, which amounted to 6jd. on the pound troy, or about 8-7 per 1000.

Cutting Blanks. — The cutting machine used in the Mint is shown in fig. 3. The revolution of an eccentric A causes two short steel cylinders or cutters mounted on a block of iron B, suitably guided, to enter two holes in a plate fixed to the bed of the machine. When the fillet FF is brought

above the holes, the cutters descend and force disks of metal through the holes. After each descent of the cutters, the fillet is advanced by small gripping rolls C C C″ worked by a ratchet wheel E driven from the shaft which bears the eccentric A. The disks fall down the tube G to a receptacle on the floor. The cutters are so placed as to remove blanks in the manner shown in fig. 4, this arrangement leaving less ″ scissel ″ or residual metal than any other. In the case of very large silver coins only one blank is cut in the width of the fillet, but bronze fillets are made wider so that three penny blanks are

cut out at each stroke of the machine. The cutting machines at the Mint work at 160 revolutions per minute, so that each of the eleven machines would . be capable of cutting 19,200 blanks in an hour if it could be fed continuously. The scissel, which amounts to about 30% of the metal operated on, is returned in bundles to the melting house. Marking. — The blanks are then passed to an edge rolling machine, by which they are thickened at the edge so as to form a rim to protect the finished coin from wear. This operation is called marking, because originally the edges

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Fig. 3. — Cutting Machine.

Fig. 5.

Fig. 4.

were not only thickened but were also marked with an inscription. This is still done in the case of many foreign coins. The letters are some- times sunk and sometimes raised. Like the graining or ″ milling ″ on the edge of many coins, the inscriptions were intended to put a stop to the practice of clipping and filing coins, which was preva- lent in the 16th and 17th centuries. They also render the manufacture

of counterfeit coin more difficult. At the Royal Mint the blanks are passed between the parallel faces of a revolving steel plate and fixed block. The plate has a circular groove in its face and the block has a corresponding curved groove. The blank passes between these grooves. The distance between the block and the plate is adjusted so as to be slightly less than the diameter of the blank, and the result is that the edge of the blank is thickened and its diameter reduced before it escapes from the machine. About 720 blanks are passed through this machine per minute. In marking machines in some foreign mints the groove is in the periphery of the revolving wheel, and the grooved block is curved (fig. 5). Annealing and Blanching the Blanks. — The blanks are next softened by annealing, and are then thoroughly cleaned before being passed to the coining presses. In England gold and copper blanks are protected from oxidation, and after their passage through the furnace are merely washed in colanders with water and dried with sawdust in a rotating drum. Silver blanks, however, are passed through rotary gas furnaces in which no attempt is made to exclude the air. The blanks are charged into a hopper at one end of the furnace and conveyed towards the other end by a revolving Archimedean screw. The blanks fall through an aperture after having been heated for a few minutes. They are at a dull red heat and are allowed to cool gradually in the air and become blackened by the formation on the surface of a film of oxide of copper. This is removed by solution in hot dilute sulphuric acid and a layer of pure frosted silver is left on the surface, which appears dead white in colour, and has lost its metallic lustre. The operation is called ” blanching.” A similar method was formerly used for gold coins in England and is still employed in some mints. The removal of part of the copper from the blank raises the percentage of silver contained in them and this is allowed for by adding an equivalent amount of copper to the metal when it is melted. The amount of copper removed from silver blanks containing 900 to 925 parts of silver pei 1000 is from o-6 to I-o per 1000. The process will probably

be abandoned as soon as the tarnishing of the metal during rolling and annealing can be avoided.

Coining Press. — The blanks are converted into coin by receiving an impression from engraved dies. Each blank is placed on the lower of two dies and the upper die is brought down forcibly upon it. The pressure causes the soft metal to flow like a viscous solid, but its lateral escape is prevented by a collar which surrounds the blank while it is being struck. The collar may be plain, or crenated ("■ milled "), or engraved with some device. In the last case the collar must be made in two or more pieces, as otherwise the coin could not be removed without injury. The collar for striking English crown pieces is made in three sections now that raised lettering is put on the edge of the coin. Sunk letters, such as occur on the edges

of many foreign coins, are put on by the marking machine, and a plain collar is used in striking.

The coining presses now used are all modifications of the lever press invented by Uhlhorn of Grevenbroich near Cologne in 1839. The

at the Mint strike from 90 to 125 coins per minute, most of them working at the rate of no coins per minute. There are 19 presses and it is possible with these to strike between 700,000 and 800,000 pieces in an ordinary working day.

Fig. 6.

press in use at the Royal Mint since 1882 is shown in figs. 6 and 7. The lever M worked from the front of the machine causes the fly- wheel to be connected with the driving-wheel and the machine starts. The blanks are placed in the slide J and the lowest one is carried forward to the die in two successive movements of the " layer-on " K, a rod working backwards and forwards on a horizontal plate and

actuating the finger L, fig. 8. The lower die is firmly fixed

Fig. 8.

to the bed of the machine, and the blank is placed exactly upon it. The collar A' is then raised by the lever G so as to encircle the blank, and the upper die which is held at A is brought down. This is done by the little crank B on the axle of the fly-wheel, acting through the rod C, and the bent lever D, which forms a toggle-joint at E with the vertical piece of metal below it. The straightening of the_ toggle- joint when C is pushed forward forces A down to strike the coin. The reverse movement of D lifts up the upper die and the collar drops simultaneously so that its upper surface is level with the face of the lower die on which the finished coin lies. Another blank moved on by the finger L pushes off the finished coin which falls down the tube N. The diagram, fig. 9, shows the relative position of the dies and levers more clearly. The dies and collar are shaded. The presses

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Fig. 7.

Weighing the Coins. — Gold and silver coins are examined and tested by ringing, and each coin is then weighed separately by being passed over delicate automatic balances. The first automatic balance for weighing single coins was introduced at the Bank of England in 1843, and was designed by William Cotton, the deputy governor of the Bank. In 1851 these balances, improved by Richard Pilcher, were introduced at the Royal Mint, and modifications of them are now used at most foreign mints. For mint use it is necessary that they shall distinguish between " light," " heavy " and " good " coins which do not differ from standard by more than the small

weight known as the ” remedy ” (see above). The balances used in the Royal Mint were further improved by J. T. Butler in the year 1889. The balance consists essentially of a beam with two scale pans, one for the coin and the other for the counterpoise. The beam is released and in the course of a second or so takes up a certain position dependent on the relative weights of the coin and counterpoise. Its position is then fixed by an automatic grip, and the coin falling down a shoot enters one of three compartments of a box, according to the position of the beam when it is arrested. The chief working parts are shown in fig. 10. The beam A is of steel made in one piece,

Fig. 9.

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Fig. 10

about 11 in. long. Its centre and end knife edges are shown in fig. II. The scale pan for the coin is shown in fig. 12. B is the pan on which the coin rests, at a point above the beam. The coins are placed in a rouleau in the hopper C and the lowest one is pushed on to the pan B by a slide not shown in the figure. While the coin is being moved the hanger D is held firmly by the forceps E to prevent the pan from being pushed sideways. The forceps are then opened and the beam released, but at this moment the levelling bar F is allowed to drop momentarily by a bent lever G acting on the pin G’, until the ends of F press down on a stirrup in each hanger at H, H. This brings the beam to a horizontal position. The lever G at once

lifts the bar F again by acting on the pin G’ so that the bar F does not touch the stirrups at H and the beam and hangers are free to move. The coin is balanced by the brass counterpoise J on the left-

hand hanger and by little weights made of wire attached to the right-hand hanger at K. If the coin is heavier than the lowest legal weight (that is, the standard weight less the remedy) the right- hand side of the beam begins to fall and the left-hand one is raised. This movement proceeds until the stirrup L below the left-hand hanger is raised far enough to touch the rod M, which is equal in weight to twice the remedy. The movement is then stopped provided that the weight of the coin is not greater than the standard weight plus the remedy. If it is heavier than this, it raises the

Fig. ii. weight M, and the movement of the beam and its hangers proceeds farther in the same direction. After about a second from the time of the final release of the beam, the forceps E again close and the hanger D is held firmly in its new position. The rod N is then lowered and allows the indicating finger O, which is pivoted at P, to fall until it rests on the stirrup R, which is part of the hanger D. The extension of O holds down the right-hand end of the rod S which is also pivoted at P, and enables its end to fit into one of the three inverted steps on the bottom of the shoot Q. The position of the shoot is thus determined. It stops over one of three orifices in the bottom plate of the balance. If the coin is light the rod S fits into the uppermost step and the shoot stops over the right-hand slot. If the coin is heavy, S fits into the lowest step and the shoot stops over the left-hand slot. The middle step and slot are for coins within the remedy. The movement of the slide now pushes another coin forward, and the weighed coin is displaced by it and falls down the shoot, through one of the slots. Each slot leads into a separate compartment and the coins are consequently sorted into three classes, light, correct weight and heavy. The balance turns to o-oi grain. The driving power is applied by shafting through a number of cams. In the Royal Mint both light and heavy coins are returned to the melting pot. The proportion of rejected gold coin varies with the quality of the bullion, and frequently exceeds 10%. The percentage of rejected silver is

often no more than I %. In most foreign mints the blanks are weighed by the automatic balances before being struck, and those which are too heavy are reduced by filing or planing. A workman sitting at a balance files the edges of the piece and weighs it until it is within the remedy. The blank is then again passed through the automatic balance and is sent forward to the coining press if the correctness of the weight is confirmed. Since 1870 no adjusting of the weight of coins has been attempted at the Royal Mint. Heavy blanks have also been reduced chemically by making them part of the anode in a cyanide bath through which a current of electricity is passed. Some metal from the surface of each blank then passes into solution, and the blanks are reduced in weight with remarkable uniformity. This system was introduced into the Indian mints in 1873. .,

Telling. — The coin is counted and packed into bags for despatch from the Mint. The counting or telling is now carried out in the case of bronze and silver coins by ingenious machines introduced in 1891. The coins are spread on an inclined table by hand. They slide down the table and enter a narrow passage where only one can pass at a time, jamming being prevented by the joggling action of an eccentric rotating disk at the entrance to the passage. The coins are then gripped by a pair of india-rubber driving wheels, which force them past the rim of a thin disk with notches in its edge to fit the coins. As the disk is thus made to revolve, the coins are pushed forward, and falling down a shoot are received in a bag. The machine can be set to deliver a certain number of coins, after which the counting wheel stops automatically.

Trial of the Pyx. — Periodical examinations of the coins issued by the Mint have been made from very early times in England by per- sons appointed by the Crown. Specimens are selected from the finished coin and are put into a box or ” pyx.” At intervals these coins are weighed and assayed by a jury of skilled persons and the results reported to the Crown. A trial of the pyx is mentioned in the Lansdowne MSS.

as having taken place in the reign of Henry II., but the practice had probably originated much earlier. The trial is now held annually by a jury consisting of freemen of the Company of Goldsmiths. Coins from the London and Australian mints are examined. The Company has been entrusted with the duty since the time of James I. Coins of foreign mints are generally submitted to examination by a committee of eminent chemists and metal- lurgists whose report is published in the official journals.

A full account of the work of the Mint, with valuable tables giving the amount of the coinage of gold and silver and bronze in the United Kingdom and the colonies in detail, and a resume of the coinages of foreign countries, will be found in the Annual Reports of the Deputy Master and Comptroller of the Mint, which have been published since 1870. (T. K. R.)

MINTO, EARLS OF. The Scottish border family of Elliot which has held the earldom of Minto since 1813 has had many distinguished members. Sir Gilbert Elliot, bart. (1651-1718), and his son and successor, another Sir Gilbert Elliot (1693-17 66), were both celebrated Scottish judges and both took the official title of Lord Minto. The elder Sir Gilbert was sentenced to death for his share in the rising of the earl of Argyll in 1685, but was afterwards pardoned; the younger Sir Gilbert was a scholar and an agriculturist. Among the children of the latter were John Elliot (d. 1808), a naval officer, who served as governor of New- foundland and was made an admiral; Andrew Elliot, the last English governor of New York; and the poetess Jean, or Jane, Elliot (c. 1727-1805), who wrote the popular ballad ” Flowers of the Forest.” The eldest son, Sir Gilbert Elliot (1722-1777), who became the third baronet in April 1766, was a member of parlia- ment from 1753 to 1777, and a friend and follower of the earl of Bute. He filled several public offices, and Horace Walpole said he was ” one of the ablest members of the House of Commons.” His second son was the diplomatist, Hugh Elliot (1752-1830), who represented his country at Munich, at Berlin, at

Copenhagen and at Naples. He was governor of Madras from 1814 to 1820, and he died on the 10th of December 1830.

See the Memoirs of the Right Hon. Hugh Elliot, by the countess of Minto (Edinburgh, 1868).'

The third baronet's eldest son was Gilbert Elliot, 1st earl of Minto (1751-1814). About 1 763 Gilbert and his brother Hugh were sent to Paris, where their studies were supervised by David Hume and where they became intimate with Mirabeau. Having passed the winters of 1766 and 1767 at Edinburgh University, Gilbert entered Christ Church, Oxford, and on quitting the university he was called to the bar. In 1776 he entered parliament as an independent Whig. He became very friendly with Burke, whom he helped in the attack on Warren Hastings and Sir Elijah Impey, and on two occasions was an unsuccessful candidate for the office of speaker. In 1794 Elliot was appointed to govern Corsica, and in 1797 he assumed the additional names of Murray-Kynyn- mond and was created Baron Minto. From 1799 to 1801 he was envoy-extraordinary to Vienna, and having been for a few months president of the board of control he was appointed governor- general of India at the end of 1806. He governed with great success until 1813. He was then created Viscount Melgund and earl of Minto. He died at Stevenage on the 21st of June 1814 and was buried in Westminster Abbey.

The earl's second son was Admiral Sir George Elliot (1784- 1863), who as a youth was present at the battles of Cape St Vincent and the Nile, and who was secretary to the admiralty from 1830 to 1834. A nephew of the earl was Sir Charles Elliot (1801-1875) also an admiral, who took a prominent part in the war with China in 1840. Afterwards he was governor of Bermuda, of Trinidad and of St Helena.

Gilbert Elliot-Murray-Kynynmond, 2nd earl of Minto (1782-1859), eldest son of the 1st earl, was ambassador to Berlin from 1832 to 1834, first lord of the admiralty from 1835 to 1841 and lord privy

seal from 1846 to 1852. His influence in the Whig party was partly due to the fact that his daughter, Frances, was the wife of Lord John Russell.

His son William Hugh, the 3rd earl (1814–1891), was the father of the 4th earl, Gilbert John Elliot-Murray-Kynyn- mond (1845-), who joined the Scots Guards in 1867. In 1874, in the capacity of a newspaper correspondent, he witnessed the operations of the Carlists in Spain; he took service with the , Turkish army in the war with Russia in 1877 and served under Lord Roberts in the second Afghan War (1878–70), having narrowly escaped accompanying Sir Louis Cavagnari Kabul. He acted as private secretary to Lord Roberts during his mission to the Cape in 188 1; as military secretary to Lord Lansdowne during his governor-generalship of Canada from 1883 to 1885; and as chief of the staff to General Middleton in the Riel Rebellion in Canada (1885). Having succeeded to the earldom in 1891 he was appointed governor-general of Canada in 1898. His term of office (1898–1904) was distinguished by a visit of the prince and princess of Wales to the colonies. In 1905, on the resig- nation of Lord Curzon, Lord Minto was appointed viceroy and governor-general of India, retiring in 1910.

The 4th earl's brother, the Hon. Arthur Ralph Douglas Elliot (b. 1846) , editor of the Edinburgh Review, was a member of parlia- ment from 1880 to 1892 and again from 1898 to 1906, and from 1903 to 1906 he was financial secretary to the treasury. Sir Francis Edmund Hugh Elliot (b. 1851), a grandson of the 2nd earl, became British minister at Athens in 1903.

See Hon. G. F. S. Elliot, The Border Elliots and the Family of Minto (Edinburgh, 1897); the article India; History; also the Life and Letters of the first Earl of Minto, 1751–1806 (1.874) and Lord Minto in India, 1807–18 14 (1880), both edited by

the countess of Minto; and Sir J. F. Stephen, The Story of Nuncomar and the Impeachment of Sir E. Impey (1885).

MINTO, WILLIAM (1845-1893), Scottish man of letters, was born at Auchintoul, Aberdeenshire, on the 10th of October 1845. He was educated at Aberdeen University, and spent a year at Merton College, Oxford. He was assistant professor under Alexander Bain at Aberdeen for some years; from 1874 to 1878 he edited the Examiner, and in 1880 he was made full professor of logic and English at Aberdeen. In 187 2 he published a Manual of English Prose Literature, which was distinguished by sound judgment and sympathetic appreciation; and his Characteristics of English Poets from Chaucer to Shirley (1874) showed the same high qualities. His other works include: The Literature of the Georgian Era (1894) edited with a bio- graphical introduction by W. Knight a monograph on Defoe in the English Men of Letters series (1879) ; three novels of small importance, and numerous articles on literary subjects in the 9th edition of the Encyclopaedia Britannica. He died on the 1 st of March 1893.

MINTURNAE, an ancient city of the Aurunci, in Italy, situated on the N.W. bank of the Liris with a suburb on the opposite bank 1% m. from its mouth, at the point where the Via Appia crossed it by the Pons Tiretius. It was one of the three towns of the Aurunci which made war against Rome in 314 B.C., the other two being Ausona (see Sessa Atjrunca) and Vescia; and the Via Appia was made two years later. It became a colony in 295 B.C. In 88 B.C. Marius in his flight from Sulla hid himself in the marshes of Minturnae. The ruins consist of an amphitheatre (now almost entirely demolished, but better preserved in the 1 8th century), a theatre, and a very fine aqueduct in opus reticulatum, the quoins of which are of various colours arranged in patterns to produce a decorative e”ffect. Close to the mouth of the river was the sacred grove of the Italic goddess Marica. It is still mentioned in the 6th century, but was probably destroyed by the Saracens, and its low site, which had become unhealthy, was abandoned

in favour of that of the modern town of Minturno (known as Traetto until the 19th century), 459 ft. above sea-level. A tower at the mouth of the river, erected between 961 and 981, commemo- rates a victory gained by Pope John X. and his allies over the Saracens in 915. It is built of Roman materials from Minturnae, including several inscriptions and sculptures.

See T. Ashby in Melanges de V Acole francaise deRome (1903), 413;

R. Laurent- Vibert and A. Piganol, ibid. (1907), p. 495; G. Q. Giglioli, Notizie degli Scavi (1908) p. 396. (T. As.)

MINUCIUS, FELIX MARCUS, one of the earliest if not the earliest, of the Latin apologists for Christianity. Of his personal history nothing is known, and even the date at which he wrote can be only approximately ascertained. Jerome (De vir. ill 58) speaks of him as ” Romae insignis causidicus,” but in this he is probably only improving on the expression of Lactantius (Inst. div. v. 1) who speaks of him as ” non ignobilis inter causidicos loci.” He is now exclusively known by his Octavius, a dialogue on Christianity between the pagan Caecilius Natalis 1 and the Christian Octavius Januarius, a provincial lawyer, the, friend and fellow-student of the author. The scene is pleasantly and graphically laid on the beach al Ostia on a holiday afternoon, and the discussion is represented as arising out of the homage paid by Caecilius, in passing, to the image of Serapis. His arguments for paganism (possibly modelled on those of Celsus) are taken up seriatim by Octavius, with the result that the assailant is convinced. Minucius. himself plays the part of umpire. The form of the dialogue is modelled on the De natura deorum and De divinatione of Cicero and its style is both vigorous and elegant if at times not exempt from something of the affectation of the age. Its latinity is not of the specifically Christian type. If the doctrines of the Divine unity, the resur rection, and future rewards and punishments be left

out of account, the work has less the character of an exposition of Christianity than of a philosophical and ethical polemic against the absurdities of polytheism. While it thus has much in common with the Greek Apologies it is full of the strong common sense that marks the Latin mind. Its ultimate appeal is to the fruits of faith.

The Octavius is admittedly earlier than Cyprian's Quod idola dii non sint, which borrows from it ; how much earlier can be determined only by settling the relation in which it stands to Tertullian's Apologeticum. Since A. Ebert's exhaustive argument in 1868, repeated in 1889, the priority of Minucius has been generally ad- mitted; the objections are stated in the Diet. Chr. Biog. article by G. Salmon. Editions: F. Sabaeus-Brixianus, as Bk. viii. of Arnbbius (Rome, 1543); F. Balduinus, first separate edition (Heidel- berg, 1560); Migne, Patrol. Lat. iii. 239; Halm in Corp. Scr. Eccl. Lat. (Vienna, 1867); H. A. Holder). Translations: R. E. Wallis, in Ante-Nic. Fathers, vol. iv. ; A. A. Brodribb's Pagan and Puritan. Literature: In addition to that already cited see H. Boenig's art. in Hauck-Herzog's Realencyk. vol. 13, and the various histories of early Christian Literature by A. Harnack, G. Kriiger, A. Ehrhard and O. Bardenhewer.

MINUET (adapted, under the influence of the Italian minuetto, from Fr. menuet, small, pretty, delicate, a diminutive of menu, from Lat. minutus; the word refers probably to the short steps, pas menus, taken in the dance), a dance for two persons, in } time. At the period when it was most fashionable it was slow, ceremonious, and graceful (see Dance). The name is also given to a musical composition written in the same time and rhythm, but when not accompanying an actual dance the pace was quicker. An example of the true form of the minuet is to be found in Don Giovanni. The minuet is frequently found as one of the movements in the Suites of Handel and Bach. Haydn introduced it into the symphony, with little trace of the slow grace and ceremony of the dance. In the hands of Beethoven it becomes the scherzo.

MINUSINSK, a town of Russia, in East Siberia, and the government of Yeniseisk, 180 m. S.S.W. of Krasnoyarsk railway station, and 5 m. from the right bank of the Yenisei, in a fertile prairie region. Pop. (1897), 10,255. It is a centre for. trade with the native populations of the Sayan Mountains and north- western Mongolia. It has an excellent natural history, ethnor graphical and archaeological museum (1877), with a library and a meteorological station. Coal and iron abound in the vicinity.

1 This name occurs in six inscriptions of the years 21 1-2 17 foundat Constantine (Cirta), North Africa (C.I.L. vol. viii.). Like the other North African fathers Tertullian, Cyprian, Arnobius and Lactantius, he was a lawyer. Some use may have been made. of rhetorical expressions of M. Cornelius Fronto of Cirta (d. c. a.d. 170).

MINUTE (Lat. minutus, small; minuere, to make less), an adjective meaning of very small size, petty or trifling; also extremely precise. In this sense the word is pronounced mi-nute. As a substantive and pronounced minnit the word (usually in the plural) is applied to a written summary of the transactions of a meeting of a public or other body, or to a memorandum of instructions, &c. A Treasury minute in the United Kingdom is an official memorandum authorizing certain procedure. ” To minute ” is to draw up such a summary or memorandum. More particularly, ” minute ” is used of the sixtieth part of any unit); in time, of an hour; and in astronomy, geometry, geography, &c, of a degree in the measurement of a circle. The sexagesimal system of division was originally used by the ancient Babylonian astronomers, was adopted by Ptolemy; and the sixtieth part of a degree, and its further subdivision into sixty parts, was called in Latin pars minutae primae, and pars minutae secundae respectively, hence the English ” minute ” and ” second.”

MINUTE MEN: in the American War of Independence, militia- men who had undertaken to turn out for service at a minute’s notice. In Massachusetts the minute men were enrolled by an act of the provincial congress of the 23rd of November 1774, and in Boston alone they numbered 16,000 prior to the outbreak of the war. The Americans who fought in the opening action of Lexington were ” minute men.”

MIOCENE, in geology, the system of strata which occurs between the Oligocene and the Pliocene. The term, derived from the Greek fieiov, less, and k

A. de Lapparent’s classification is here adopted : —
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V. Pontian or Pannonian. — Brackish- and fresh-water marls, limestones and gravels: occurring at Vienna, in the Caspian and eastern Mediterranean basins, and in southern France; mammalian deposits of Pikermi and the Siwalik Hills, with Hipparion gracile, Mastodon longirostris, Rhinoceros schleiermachi, numerous ruminants, Congeria subglobosa. Marine beds of Belgium (Black Crag) and north Germany.

IV. Sarmatian. — More or less salt-water sands and marls of the same basins with Mastodon angustidens, Anchitherium aurelianense, Cerithium pictum, C. rubiginosum, Ostrea gingensis, Mactra podolica, Tapes gregarius. Stages IV. and V. represented in north-western France by marine sands (Cardita striatissima) , and in Algeria and Morocco by marine marls and limestones.

III. Vindobonian. — Sub-stages :—

(b) Tortonian: Marine marls with Ancillana glandiformis, Conus antiquus, Ranella marginata, Trochus patulus, Voluta rarispina. Laminated fresh-water limestones of Oeningen with fish, countless insects, and plants showing seasonal changes of the year in their successive layers (Acer trilobatum, Populus mutabilis, Juglans acuminata, Camphora, Podogonium) ; and the lacustrine deposits of central Spain.

(a) Helvetian: Marine shelly sandstones and conglomerates (” molasse ” of Switzerland) with Ostrea gingensis, Cardita jouanneti, Panopaea menardi, Conus ventricosus ; the “faluns” of Touraineand Aquitaine; and the marine beds of Black Sea basin. At the base of the marine Helvetian in the Vienna basin clays (” Schlier “) with rock-salt and gypsum, and the lacustrine beds of Gascony (Calcaire de Simorre with Mastodon tapir oides, M. simorrensis, Dinotherium giganteum) occur.

II. Burdigalian or Langhian. — Marine ” faluns ” of Bordeaux {Oliva basteroti, Turritella terebralis) ; marls of Langhe in Liguria (Pecten burdigalensis) ; marine deposits of Vienna basin, Caspian region, Tunis and Algeria; fresh-water sands and marls of Orleans with Mastodon angustidens, M. tapiroides, Dinotherium cuvieri, Anthracotherium onoideum; Littorinella clays of Mainz basin with Acerotherium incisivum Littorinella acuta, Dreyssenia brardi; fresh- water grey ” molasse ” of Switzerland, with acacias, laurels, palms and sequoias.

I. Aquitanian. — Limestones, sands and marls of lakes and lagoons, with Anthracotherium, Anchitherium, Acerotherium incisivum, Palaeochoerus typus, Helix ramondi, Limnaea pachygaster, Planorbis cornu, Potamides lamarcki; Quercus, Acacia, Ficus, Camphora, Cinnamomum, Taxodium, Glyptostrobus, Sequoia, Sabal, Phoenix, occur in central France (Calcaire de la Beauce) ; the plant-beds of Manosque; Mainz basin; lower ” molasse ” of Switzerland with

lignite, gypsum, red marls and conglomerates; ” brown-coal series ” of north Germany with lignite. Intercalated marine sandstones occur in Aquitaine and near Marseilles; other marine developments occur in the ” faluns ” of Gascony (Lepidocyclina mantelh, Mio- gypsina burdigalensis), the upper Aquitanian of Bavaria and Austria- Hungary (Ostrea crassiassima, Pectunculus pilosus), and in southern Spain, Italy and Malta (Lepidocyclina and Lithothamnium). Basic tuffs and lavas occur in Auvergne.

Some authors assign Stage I. to the Oligocene, Stage V. to the Pliocene; Stages I. and II. correspond to the first, and III. to the second Mediterranean Stage of E. Suess.

In Europe a general emergence of land in late Oligocene time resulted at the beginning of the Miocene (Aquitanian) in wide- spread lacustrine conditions throughout the western part of that continent, upon which the sea encroached at few points, though it had gained access to the Vienna basin and extended westward into Bavaria. Otherwise, marine Aquitanian deposits are confined to the Mediterranean basin and the south-west corner of France. Most of northern Europe, including the British Isles, remained dry land throughout Miocene time. During the Burdigalian period, with increasing elevation of the mountain regions and depression of the Mediterranean and Caspian basins, a marine invasion began, which passed its maximum in the Vindobonian. The Mediterranean reached eastward to Persia, and, still open to the Atlantic, sub- merged north Africa, most of Italy and the neighbouring islands. It ascended the Rhone valley, penetrated to the Mainz basin, and skirting the north flank of the Alpine region passed into the Vienna basin and thence around the Carpathian tract into the Pontic and Caspian depression. The waters of the Atlantic further invaded the regions of the Garonne and the Loire, isolated Brittany and encroached upon north Europe between Belgium and Denmark.

The elevation of the Alps, and probably of the whole Alpine system of mountain folds from Morocco to Indo-China, though initiated by earlier Miocene and late Oligocene movements, took place mainly during the latter part of the Vindobonian period, and was completed in the Sarmatian. The waters of the ocean were then excluded from the Caspian and eastern Mediterranean basins, and replaced by vast fresh-water lakes; while brackish- water lagoons occupied much of the western Mediterranean. This great retreat of the sea culminated in the Pontian stage, and land-connexion was established between North and South America. Outside the Eurasian region,

Aquitanian deposits occur in Formosa, Java, Borneo and Madagascar; while Burdigalian deposits are found in Mongolia. The Vindobonian ranges from Greenland, Iceland and Spitzbergen, where it contains lignite and plants denoting a temperate climate, by Japan, Java and India, to Victoria. It recurs in the Azores and the Antilles, and at intervals along the American continent from Patagonia to Alaska, where all three lower stages are represented, as also in the West Indies. Along the Atlantic slope of the United States and around the Gulf of Mexico the complete Miocene series is present, the Sarmatian and Pontian also occur in California.

The Miocene was a period of change, of mountain-building, climatic differentiation hitherto unprecedented, and of moderation in organic life, especially on land. The rich European flora indicates an equable and moist sub-tropical climate, slowly cooling, as wit- nessed by the gradual increase of trees with deciduous foliage amongst those characteristic of more tropical conditions. Oaks, maples, poplars, planes, willows, Cinnamomum, Camphora, Myrica, Sequoia, Taxodium, Glyptostrobus and palms, flourished together. The marine calcareous alga Lithothamnium became an important reef-building organism. Nummulites gave place to Lepidocyclina; lamellibranchs and particularly gasteropods abounded in the shallow seas, of which the shark Carcharodon and the marine mammals Squalodon and Halitherium were amongst the largest denizens. The mammalian land-fauna of Europe made striking advances, and assumed a decidedly African aspect. Marsupials had disap- peared from it before the Burdigalian period, during which primitive genera like Palaeochoerus, Hyopotamus, and the hornless ruminants Anthracotherium and Brachyopus, became extinct, while probos- cideans (Mastodon, Dinotherium), rhinoceros and apes (Oreopithecus, Pliopithecus) came in, followed by antelopes, beavers and probably Machaerodus in the Vindobonian. The spread of turf-forming grasses was succeeded in the Pontian by an enormous increase of herbivorous mammals, including Hipparion and horned ruminants

(Helladotherium, Antilope, Cervus, Camelopardalis , Palaeotragus) , whose migrations were facilitated by the desiccation of the Medi- terranean basin. (C. B. W.*)

MIOT DE MELITO, ANDRt FRANCOIS, Comte (1762-1841), French statesman and scholar, was born at Versailles (Seirie- et-Oise) on the 9th of February 1762. He was a high official in the war office before the Revolution, and under the Republic he eventually became secretary-general for foreign affairs. That he was not denounced under the Terror was due to the fact that he was indispensable in his department. In 1795 he was sent as French envoy to, Florence; then to Rome, and on

his return to Florence received orders to proceed to Corsica, which, after its evacuation by the British, was in a state of anarchy. In Corsica he allied himself with Joseph Bonaparte, and after pacifying the island returned to Italy. Recalled by their Dectory in 1798 because of his refusal to foment insurrection in Italy, he spent some time in retirement, but he was in the diplomatic service in Holland at the revolution of 18. Brumaire (Nov. 9, 1799). Under the consulate he was secretary-general at the ministry of war, and a member of the council of state, and was sent on a second mission (1801-1802) for the pacification of Corsica. In 1806 he joined Joseph Bonaparte in Naples as minister of the interior, afterwards following him to Spain as comptroller of the household, but he returned to France in the retreat of 1813. Next year he was created comte de Melito, and during the Hundred Days he served as commissary extra- ordinary with the XII. Army division. He took no part in politics after Waterloo, where his son-in-law, General J. B. Jamin, was killed, and his own son mortally wounded. He visited Joseph Bonaparte in America in 1825, and then spent some years in Germany with his daughter, whose second husband,. General von Fleischmann,

represented the king of Wurttem- burg in Paris in 1831. He was admitted in 1835 to the French Academy on the merits of his translations of Herodotus (Paris, 1822) and Diodorus (Paris, 1835–1838). He died in Paris on the 5th of January 1841.

Miot de Melito had kept a diary which, arranged for publication by his son-in-law, General von Fleischmann, covers the years from 1788 to 1815, and is of interest for the history of the Bonaparte family and of Joseph's dominion in Spain. Published in France in 1858, it was translated into English by Mrs C. Hoey and J. Lillie (2 vols., 1 881); and also into German (Stuttgart, 1866–1867). See Albert Gaudin, Les Arrites Miot (Ajaccio, 1896).

MIQUEL, JOHANN VON (1829–1901), German statesman, was born at Neuenhaus, Hanover, on the 19th of February 1829, being descended from a French family which had emigrated during the Revolution. He learnt law at the universities of Heidelberg and Gottingen. Studying the writings of Karl Marx he became a convert to an extreme revolutionary, socialistic and atheistic creed; but though he entered into corre- spondence with Marx, with the object of starting a revolutionary movement, he does not appear to have taken any overt part in the events of 1848–1849. Further study of political economy soon enabled him to pass out of this phase, and in 1850 he settled down to practise as an advocate at Gottingen. He acquired repute as an able lawyer and a rising politician, and especially for his knowledge of financial questions. He was one of the founders of the German Nationalverein, and in 1864 he was elected a member of the Hanoverian parliament as a Liberal and an opponent of the government. He accepted the annexa- tion of Hanover by Prussia without regret, and was one of the Hanoverians whose parliamentary abilities at once won a com- manding position in the Prussian parliament, which he entered in 1867. For some reason — perhaps because Bismarck did not entirely trust him — he did not at this time attain quite so influen- tial a position as might have been anticipated; nevertheless he was chairman of the parliamentary committee which in

1876 drafted the new rules of legal procedure, and he found scope for his great administrative abilities in the post of burgomaster of Osnabriick. He held this position from 1865 to 1870, and again from 1876 to 1879, being in the meantime (1870-1873) a director of the Discontogesellschaft. In 1879 he was elected burgomaster of Frankfort-on-Main, where he gained a great reputation for the energy with which he dealt with social questions, especially that of the housing of the poor. Probably owing to his early study of socialism, he was very ready to support the new state socialism of Bismarck. He was the chief agent in the reorganization of the National Liberal party in 1887, in which year he entered the imperial Reichstag. After Bismarck's fall in 1890 he was chosen Prussian'minister of finance, and held this post for ten years. He distinguished himself by his reform of the Prussian system of taxation, the one really successful measure of the new reign in internal affairs. An attempt, however, to reform the system of imperial finance in 1893-1894 failed, and much injured

his reputation. Miquel had entirely given up his Liberalism, and aimed at practical measures for improving the condition of the people irrespective of the party programmes; yet some of his measures — such as that for taxing " Waarenhauser " (stores) — were of a very injudicious nature. He professed to aim at a union of parties on the basis of the satisfaction of material interests, a policy to which the name of Sammlung was given; but his enemies accused him of constantly intriguing against the three chancellors under whom he served, and of himself attempting to secure the first place in the state. The sympathy which he expressed for the Agrarians increased his unpopularity among Liberals and industrials; but he pointed out that the state, which for half a century had done everything to help manufac- tures, might now attempt to support the failing industry of agriculture. In June 1901 the rejection of the canal bill led to a crisis, and he was obliged to send in his resignation. His health was already failing, and he died on the 8th of

September of the same year at his house in Frankfort.

MIQUELETS (Miqtjeletes or Migueletes) were irregular local troops in Catalonia who derived their name, it is said, from Miguel or Miquelot de Prats, a Catalan mercenary captain in the service of Cesare Borgia. They enjoyed a certain prominence in the minor wars of Spain during the 17th and 18th centuries, and in peace seem to have plundered travellers. In the War of the Spanish Succession (q.v.) the Miquelets continued the struggle against the French claimant until long after the peace. During the Peninsular War they were exceedingly successful in harassing the French invaders in the mountains of Catalonia. Sometimes they even attempted operations in large bodies, as in the operations round Gerona in 1808 and 1809. They were maintained by the several parishes, not by the central or the provincial governments, and as they had to turn out for duty on sound of the village alarm-bell (somaten) they are frequently called somatenes.

MIRABEAU, ANDRE BONIFACE LOUIS RIQUETI, Vicomte de (1754-1792), brother of the orator Mirabeau, was one of the reactionary leaders at the opening of the French Revolution. Sent to the army in Malta in 1776 he spent part of his two years there in prison for insulting a religious procession. During the War of American Independence he was in several sea-fights with the English, and was at the taking of Yorktown in 1781. In the following year he had two narrow escapes from drowning. In 1789, with his debts paid up by his father, he was elected by the noblesse of Limoges a deputy to the States General. He was a violent Conservative and opposed everything that threatened the old regime. His drunkenness produced a corpulency which brought him the nickname Mirabeau Tonneau (" Barrel Mirabeau "); but he was not lacking in some of that insight which marked his brother. He shared fully in the eccentric family pride; and boasted of his brother's genius even when bitterly opposing him. He emigrated about 1790, and raised a legion which was to bear his name ; but his insolence alienated the German princes, and his

command was taken from him. He died in August 1792 — of apoplexy or from a duel — in Freiburg im Breisgau. He wrote some verse as well as various pamphlets.

See Joseph Sarrazin, Mirabeau Tonneau, ein Condottiere aus der Revolutionszeit (Leipzig, 1893) ; and La Revolution francaise, vols, xxi. and xxiv. ; Eugene Berger, Le Vicomte de Mirabeau(Mirabeau Tonneau), 17$ 4-17 Q2 (1904); and for a list of contemporary pamphlets, &c, M. Tourneux, Bibliographie de la ville de Paris. . ., vol. iv. (1906).

MIRABEAU, HONORf GABRIEL RIQUETI, Comte de (1749-1791), French statesman, was born at Bignon, near Nemours, on the 9th of March 1749. The family of Riquet, or Riqueti, originally of the little town of Digne, won wealth as merchants at Marseilles, and in 1570 Jean Riqueti bought the chateau and seigniory of Mirabeau, which had belonged to the great Provencal family of Barras. In 1685 Honore Riqueti obtained the title of marquis de Mirabeau. His son Jean Antoine served with distinction through all the later campaigns of the reign of Louis XIV., and especially distinguished himself in 1705 at the battle of Cassano, where he was so severely wounded in

the neck that he had ever after to wear a silver stock; yet he never rose above the rank of colonel, owing to an eccentric habit of speaking unpleasant truths to his superiors. On retiring from the service he married Francoise de Castellane, and left at his death, in 1737, three sons — Victor marquis de Mirabeau, Jean Antoine, bailli de Mirabeau, and Comte Louis Alexandre de Mirabeau. The great Mirabeau was the eldest surviving son of the marquess. When but three years old he had a virulent attack of small-pox which left his face disfigured, and contributed to his father’s dislike of him.

Being destined for the army, he was entered at a pension militaire at Paris. Of this school, which had Lagrange for its professor of mathematics, we have an amusing account in the life of Gilbert Elliot, 1st earl of Minto, who with his brother Hugh, afterwards British minister at Berlin, there made the acquaintance of Mirabeau. On leaving this school in 1767 he received a commission in a cavalry regiment which his grandfather had commanded years before. He at once began love-making, and in spite of his ugliness succeeded in winning the heart of the lady to whom his colonel was attached; this led to such scandal that- his father obtained a lettre de cachet, and the young scapegrace was imprisoned in the isle of Re. The love affairs of Mirabeau form a well-known history, owing to the celebrity of the letters to Sophie. Yet it may be asserted that until the more durable and more reputable connexion with Mme de Nehra these love episodes were the most disgraceful blemishes in a life otherwise of a far higher moral character than has been commonly supposed. As to the marquess, his use of lettres de cachet is perfectly defensible on the theory of lettres de cachet, and Mirabeau, if any son, surely deserved such correction. Further, they had the effect of sobering the culprit, and the more creditable part of his life did not begin till he left Vincennes. Mirabeau did not develop his great qualities of mind and character until his youthful excesses were over, and it was not till 1781 that these began to appear. On being released, the young count obtained leave to accompany as a volunteer the French expedi- tion to Corsica. After his return, he tried to keep .on good terms with his father, and in 1772 he married a rich heiress, Marie Emilie, daughter of the marquess de Marignane, an alliance procured for him by his father. His wild extravagance, however, forced his father to forestall his creditors by securing his deten- tion in semi-exile in the country, where he wrote his earliest extant work, the Essai sur le despotisme. His violent disposition now led him to quarrel with a country gentleman who had insulted his sister, and his semi-exile was changed by lettre de cachet into

imprisonment in the Chateau d'If. In 1775 he was removed to the castle of Joux, to which, however, he was not very closely confined, having full leave to visit in the town of Pontarlier. Here he met Marie Therese de Monnier, his Sophie as he called her. Of his behaviour nothing too strong can be said: he was introduced into the house as a friend, and betrayed his trust by inducing Mme de Monnier to fall in love with him. The affair ended by his escaping to Switzerland, where Sophie joined him; they then went to Holland, where he lived by hack- work for the booksellers; meanwhile Mirabeau had been con- demned to death at Pontarlier for rapt et vol, and in May 1777 he was seized by the French police, and imprisoned by a lettre de cachet in the castle of Vincennes.

During his imprisonment he seems to have learnt to control his passions from their very exhaustion, for the early part of his confinement is marked by the indecent letters to Sophie (first published in 1793), and the obscene Erotica biblion and Ma conversion, while to the later months belongs his political work of any value, the Lettres de cachet, published after his liberation (1782). It exhibits an accurate knowledge of French constitutional history skilfully applied in an attempt to show that an existing actual grievance was not only philosophically unjust but constitutionally illegal. It shows, though in rather a diffuse and declamatory form, that application of wide historical knowledge, keen philosophical perception, and genuine eloquence to a practical purpose which was the great characteristic of Mirabeau, both as a political thinker and as a statesman.

With his release from Vincennes (August 1782) begins the

second period of Mirabeau's life. He found that his Sophie was an idealized version of a rather common and ill-educated woman, and she consoled herself with the affection of a young officer, after whose death she committed suicide. Mirabeau first set to work to get the sentence of death still hanging over

him reversed, and by his eloquence not only succeeded in this but got M. de Monnier condemned in the costs of the whole law proceedings. From Pontarlier he went to Aix, where he claimed the court's order that his wife should return to him. She naturally objected, but his eloquence would have won his case, even against Jean Etienne Marie Portalis, the leader of the Aix Bar, had he not in his excitement accused his wife of infidelity, on which the court pronounced a decree of separation. He then intervened in the suit pending between his father and mother before the parlement of Paris, and attacked the ruling powers so violently that he had to leave France and again go to Holland, and try to live by literary work. About this time began his connexion with Mme de Nehra, the daughter of Zwier van Haren, a Dutch statesman and political writer, and a woman of a far higher type than Sophie, more educated, more refined, and more capable of appreciating Mirabeau's good points. His life was strengthened by the love of his petite horde, Mme de Nehra, his adopted son, Lucas de Montigny, and his little dog Chico. After a period of work in Holland he betook himself to England, where his treatise on lettres de cachet had been much admired, being translated into English in 1787, and where he was soon admitted into the best Whig literary and political society of London, through his old schoolfellow Gilbert Elliot, who had now inherited his father's baronetcy and estates, and become a leading Whig member of parliament. Of all his English friends none seem to have been so intimate with him as the 1st marquess of Lansdowne, better known as Lord Shelburne, and Mr, afterwards Sir Samuel, Romilly. The latter became particu- larly attached to him, and really understood his character; and it is strange that his remarks upon Mirabeau in the fragment of autobiography which he left, and Mirabeau's letters to him, should have been neglected by French writers. Romilly was introduced to Mirabeau by Sir Francis D'lvernois (1757–1842), and readily undertook to translate into English the Considera- tions sur I'ordre de Cincinnatus, which Mirabeau had written in 1785.

Romilly writes thus of him in his autobiography: — ■

"The count was difficult enough to please; he was sufficiently impressed with the beauties of the original. He went over every part of the translation with me, observed on every passage in which justice was not done to the thought or the force of the expression lost, and made many useful criticisms. During this occupation we had occasion to see one another often, and became very inti- mate; and, as he had read much, had seen a great deal of the world, was acquainted with all the most distinguished persons who at that time adorned either the royal court or the republic of letters in France; had a great knowledge of French and Italian literature, and possessed very good taste, his conversation was extremely interest- ing and not a little instructive. I had such frequent opportunities of seeing him at this time, and afterwards at a much more important period of his life, that I think his character was well known to me. I doubt whether it has been so well known to the world, and I am convinced that great injustice has been done him. This, indeed, is not surprising, when one considers that, from the first moment of his entering upon the career of an author, he had been altogether indifferent how numerous or how powerful might be the enemies he should provoke. His vanity was certainly excessive; but I have no doubt that, in his public conduct as well as in his writings, he was desirous of doing good, that his ambition was of the noblest kind, and that he proposed to himself the noblest ends. He was, however, like many of his countrymen, who were active in the calamitous Revolution which afterwards took place, not sufficiently scrupulous about the means by which those ends were to be accom- plished. He indeed to some degree professed this; and more than once I have heard him say that there were occasions upon which ' la petite morale etait ennemie de la grande.' It is not surprising that with such maxims as these in his mouth, unguarded in his expressions and careless of his reputation, he should have afforded room for the circulation of many stories to

his disadvantage.”

This luminous judgment, it must be noted, was written by a man of acknowledged purity of life, who admired Mirabeau in early life not when he was a statesman, but when he was only a struggling literary man, The Considerations sw I’ordrt

de Cincinnatus which Romilly translated was the only important work Mirabeau wrote in the year 1785, and it is a good specimen of his method. He had read a pamphlet published in America attacking the proposed order, which was to form a bond of asso- ciation between the officers who had fought in the American War of Independence against England; the arguments struck him as true and valuable, so he re-arranged them in his own fashion, and rewrote them in his own oratorical style. He soon found such work not sufficiently remunerative to keep his petite horde in comfort, and then turned his thoughts to employment from the French foreign office, either in writing or in diplomacy. He first sent Mme de Nehra to Paris to make peace with the authorities, and then returned himself, hoping to get employment through an old literary collaborateur of his, Durival, who was at this time director of the finances of the department of foreign affairs. One of the functions of this official was to subsidize political pamphleteers, and Mirabeau had hoped to be so employed, but he ruined his chances by a series of writings on financial questions. On his return to Paris he had become acquainted with Etienne Claviere, the Genevese exile, and a banker named Panchaud. From them he heard plenty of abuse of stock-jobbing, and seizing their ideas he began to regard stock-jobbing, or agiotage, as the source of all evil, and to attack in his usual vehement style the Banque de St Charles and the Compagnie des Eaux. This last pamphlet brought him into a controversy with Caron de Beaumarchais, who certainly did not get the best of it, but it lost him any chance of

literary employment from the government. However, his ability was too great to be neglected by a great minister such as Charles Gravier, Comte de Vergennes undoubtedly was, and after a preliminary tour to Berlin at the beginning of 1786 he was des- patched in July 1786 on a secret mission to the court of Prussia, from which he returned in January 1787, and of which he gave a full account in his Histoire secrete de la cour de Berlin (1780). The months he spent at Berlin were important in the history of Prussia, for while he was there Frederick the Great died. The letters just mentioned show clearly what Mirabeau did and what he saw, and equally clearly how unfit he was to be a diplo- matist. He certainly failed to conciliate the new king Frederick William; and thus ended Mirabeau's one attempt at diplo- macy. During his journey he had made the acquaintance of Jakob Mauvillon (1743-1794), whom he found possessed of a great number of facts and statistics with regard to Prussia; these he made use of in a great work on Prussia published in 1788. But, though his De la monarchic prussienne sous Fridiric le Grand (London, 1788) gave him a general reputation for historical learning, he had in the same year lost a chance of political employment. He had offered himself as a candidate for the office of secretary to the Assembly of Notables which the king had just convened, and to bring his name before the public published another financial work, the Denonciation de Vagiotage, which abounded in such violent diatribes that he not only lost his election, but was obliged to retire to Tongres; and he further injured his prospects by publishing the reports he had sent in during his secret mission at Berlin. But 1789 was at hand; the states-general was summoned; Mirabeau's period of probation was over.

On hearing of the king's determination to summon the states- general, Mirabeau started for Provence, and offered to assist at the preliminary conference of the noblesse of his district. They rejected him; he appealed to the tiers Mat, and was returned both for Aix and for Marseilles. He elected to sit for the former city, and was present at the opening of the

states-general on the 4th of May 1789. From this time the record of Mirabeau's life forms the best history of the first two years of the Constituent Assembly, for at every important crisis his voice is to be heard, though his advice was not always followed. He possessed at the same time great logical acuteness and the most passionate enthusiasm. From the beginning he recognized that government exists in order that the bulk of the population may pursue their daily work in peace and quiet, and that for a government to be successful it must be strong. At the same time he thoroughly

comprehended that for a government to be strong it must be in harmony with the wishes of the majority of the people. He had carefully studied the English constitution in England, and he hoped to establish in France a system similar in principle but without any slavish imitation of the details of the English constitution. In the first stage of the history of the states- general Mirabeau's part was very great He was soon recognized as a leader, to the chagrin of Jean Joseph Mounier, because he always knew his own mind, and was prompt in emergencies. To him is to be attributed the successful consolidation of the National Assembly. When the taking of the Bastille had assured the success of the Revolution, he warned the Assembly of the futility of passing fine-sounding decrees and urged the necessity for acting. He declared that the famous night of the 4th of August was but an orgy, giving the people an immense theoretical liberty while not assisting them to practical freedom, and overthrowing the old regime before a new one could be constituted. His failure to control the theorizers showed Mirabeau, after the removal of the king and the Assembly to Paris, that his eloquence would not enable him to guide the Assembly by himself, and that he must therefore try to get some support. He wished to establish a strong ministry, which should be responsible like an English ministry, but to an assembly chosen to represent the people of France better than the English House of Commons at that time represented England. He first thought of

becoming a minister at a very early date, if we may believe a story contained in the Mimoires of the duchesse d'Abrantes, to the effect that in May 1789 the queen tried to bribe him, but that he refused this and expressed his wish to be a minister. The indignation with which the queen repelled the idea may have made him think of the duke of Orleans as a possible constitutional king, because his title would of necessity be parliamentary. But the weakness of Orleans was too palpable, and in a famous remark Mirabeau expressed his utter contempt for him. He also attempted to form an alliance with Lafayette, but the general was as vain and as obstinate as Mirabeau himself, and had his own theories about a new French constitution. Mirabeau tried for a time, too, to act with Necker, and obtained the sanction of the Assem bly to Necker's financial scheme, not because it was good, but because, as he said, " no other plan was before them, and some- thing must be done."

Hitherto weight has been laid on the practical side of Mirabeau's political genius; his ideas with regard to the Revolution after the sth' and 6th of October must now be examined, and this can be done at length, thanks to the publication of Mirabeau's correspondence with the Comte de la Marck, a study of which is indispensable for any correct knowledge of the history of the Revolution between 1789 and 1791. Auguste Marie Raymond, prince d'Arenberg, known as the Comte de la Marck, was a Flemish nobleman who had been proprietary colonel of a German regiment in the service of France; he was a close friend of the queen, and had been elected a member of the states-general. His acquaintance with Mirabeau, begun in 1788, ripened during the following year into a friendship, which La Marck hoped to turn to the advantage of the court. After the events of the 5th and 6th of October he consulted Mirabeau as to what measures the king ought to take, and Mirabeau, delighted at the opportu- nity, drew up an admirable state paper, which was presented to the king by Monsieur, afterwards Louis XVIII. The whole of this Mtmoire

should be read to get an adequate idea of Mirabeau's genius for politics; here it must be summarized.

The main position is that the king is not free in Paris; he must therefore leave Paris and appeal to France. " Paris n'en veut que l'argent; les provinces demandent des lois." But where must the king go? " Se retirer a Metz ou sur toute autre frontiere serait declarer la guerre a la nation et abdiquer le tr6ne. Un roi qui est la seule sauvegarde de son peuple ne fuit point devant son peuple; il le prend pour juge de sa conduite et de ses principes." He must then go towards the interior of France to a provincial capital, best 01 all to Rouen, and there he must appeal to the people and summon a great convention. It would be ruin to appeal to the noblesse, as the queen advised: " un corps de noblesse n'est point une armee, qui puisse combattre." When this great convention met the

king must show himself ready to recognize that great changes have taken place, that feudalism and absolutism have for ever disappeared, and that a new relation between king and people has arisen, which must be loyally observed on both sides for the future. " II est certain, d'ailleurs, qu'il faut une grande revolution pour sauver le royaume, que la nation a des droits, qu'elle est en chemin de les recouvrer tous, et qu'il faut non seulement les retablir, mais les consolider." To establish this new constitutional position between king and people would not be difficult, because " l'indivisibilite du monarque et du peuple est dans le cceur de tous les Francais; il faut qu'elle existe dans Taction et le pouvoir."

Such was Mirabeau's programme, from which he never diverged, but which was far too statesmanlike to be understood by the poor king, and far too positive regarding the altered condition of the monarchy to be palatable to the queen. Mira- beau followed up

his Memoire by a scheme of a great ministry to contain all men of mark — Necker as prime minister, ” to render him as powerless as he is incapable, and yet preserve his popularity for the king,” the due de Liancourt, the due de la Rochefoucauld, La Marck, Talleyrand, bishop of Autun, at the finances, Mirabeau without portfolio, G.J. B. Target, mayor of Paris, Lafayette generalissimo to reform the army, Louis Philippe, comte de Segur (foreign affairs), Mounier and I. R. G. le Chapelier. This scheme got noised abroad, and was ruined by a decree of the Assembly of the 7th of November 1789, that no member of the Assembly could become a minister; this decree destroyed any chance of that necessary harmony between the ministry and the majority of the representatives of the nation which existed in England, and so at once overthrew Mirabeau’s hopes. The queen utterly refused to take Mirabeau’s counsel, and La Marck left Paris. However, in April 1790 he was suddenly recalled by the comte de Mercy-Argenteau, the Austrian ambassador at Paris, and the queen’s most trusted political adviser, and from this time to Mirabeau’s death he became the medium of almost daily communications between the latter and the queen. Mirabeau at first attempted again to make an alliance with Lafayette, but it was useless, for Lafayette was not a strong man himself and did not appreciate “la force ” in others. From the month of May 1790 to his death in April 1 79 1 Mirabeau remained in close and suspected, but not actually proved, connexion with the court, and drew up many admirable state papers for it. In return the court paid his debts; but it ought never to be said that he was bribed, for the gold of the court never made him swerve from his political principles — never, for instance, made him a royalist. He regarded himself as a minister, though an unavowed one, and believed himself worthy of his hire.

Before Mirabeau’s influence on foreign policy is discussed, his behaviour on several important points must be noticed. On the great question of the veto he took a practical view, and seeing that the royal power was already sufficiently weakened, declared

for the king’s absolute veto and against the compromise of the suspensive veto. He knew from his English experiences that such a veto would be hardly ever used unless the king felt the people were on his side, and that if it were used unjustifiably the power > of the purse possessed by the representatives of the people” would, as in England in 1688, bring about a bloodless revolution. He saw also that much of the inefficiency of the Assembly arose from the in- experience of the members and their incurable verbosity; so, to establish some system of rules, he got his friend Romilly to draw up a detailed account of the rules and customs of the English House of Commons, which he trans- lated into French, but which the Assembly, puffed up by a belief in its own merits, refused to use. On the great subject of peace and war he supported the king’s authority, and with some success. Again Mirabeau almost alone of the Assembly held that the soldier ceased to be a citizen when he became a soldier; he must submit to be deprived of his liberty to think and act, and must recognize that a soldier’s first duty is obedi- ence. With such sentiments, it is no wonder that he approved of the vigorous conduct of Francois Claude Amour, marquis de Bouille, at Nancy, which was the more to his credit as Bouille was the one hope of the court influences opposed to him. Lastly,

in matters of finance he showed his wisdom: he attacked Necker’s ” caisse d’escompte,” which was to have the whole control of the taxes, as absorbing the Assembly’s power of the purse; and he heartily approved of the system of assignats, but -with the reservation that they should not be issued to the extent of more than one-half the value of the lands to be sold.

Of Mirabeau’s attitude with regard to foreign affairs it is necessary to speak in more detail. He held it to be just that the French people should conduct their Revolution as they would, and that no foreign nation had any right to interfere with them while they kept themselves strictly to their own affairs. But he knew also that neighbouring nations

looked with unquiet eyes on the progress of affairs in France, that they feared the influence of the Revolution on their own peoples, and that foreign monarchs were being prayed by the French emigres to interfere on behalf of the French monarchy. To prevent this interference, or rather to give no pretext for it, was his guiding thought as to foreign policy. He had been elected a member of the comite diplomatique of the Assembly in July 1790, and became its reporter at once, and in this capacity he was able to prevent the Assembly from doing much harm in regard to foreign affairs. He had long known Armand Marc, comte de Mont- morin, the foreign secretary, and, as matters became more strained from the complications with the princes and counts of the empire, he entered into daily communication with the minister, advised him on every point, and, while dictating his policy, defended it in the Assembly. Mirabeau's exertions in this respect are not his smallest title to the name of statesman; and how great a work he did is best proved by the confusion which ensued in this department after his death. For indeed in the beginning of 1791 his death was very near; and he knew it to be so. The wild excesses of his youth and their terrible punishment had weakened his strong constitution, and his parliamentary labours completed the work. So surely did he feel its approach that some time before the end he sent all his papers over to Sir Gilbert Elliot, who kept them under seal until claimed by Mirabeau's executors. In March his illness was evidently gaining on him, to his great grief, because he knew that he alone could yet save France from the distrust of her monarch and the present reforms, and from the foreign interference, which would assuredly bring about catastrophes unparalleled in the history of the world. Every care that science could afford was given by his friend and physician, Cabanis, to whose brochure on his last illness and death the reader may refer. The people kept the street in which he lay quiet; but medical care, the loving solicitude of friends, and the respect of all the people could not save his life. When he could speak no more he

wrote with a feeble hand the one word ” dormir,” and on the 2nd of April 1791 he died.

No man ever so thoroughly used other men’s work, and yet made it all seem his own. ” Je prends mon bien ou je le trouve ” is as true of him as of Moliere. His first literary work, except the bombastic but eloquent Essai sur le despotisme (Neufchatel, 1775). was a translation of Robert Watson’s Philip II., done in Holland with the help of Durival ; his Considerations sur I’ordre de Cincinnatus (London, 1788) was based on a pamphlet by Aedanus Burke (1743–1802), of South Carolina, who opposed the aristocratic tendencies of the Society of the Cincinnati, and the notes to it were by Target; his financial writings were suggested by the Genevese exile, Claviere. During the Revolution he received yet more help; men were proud to labour for him, and did not murmur because he absorbed all the credit and fame. Etienne Dumont, Claviere, Antoine Adrien Lamourette and Etienne Salomon Reybaz were but a few of the most distin- guished of his collaborators. Dumont was a Genevese exile, and an old friend of Romilly’s, who willingly prepared for him those famous addresses which Mirabeau used to make the Assembly pass by sudden bursts of eloquent declamation; Claviere helped him in finance, and not only worked out his figures, but even wrote his financial discourses; Lamourette wrote the speeches on the civil constitution of the clergy ; Reybaz not only wrote for him his famous speeches on the assignats, the organization of the national guard, and others, which Mirabeau read word for word at the tribune, but even the posthumous speech on succession to the estates of intestates, which Talleyrand read in the Assembly as the last work of his dead_ friend. Yet neither the gold of the court nor another man’s conviction would make Mirabeau say what he did not himself believe, or do what he did not himself think right. He took

other men’s labour as his due, and impressed their words, of which he had suggested the underlying ideas, with the stamp of his own individuality; his collaborators themselves did not com- plain — they were but too glad to be of help in the great work of controlling and forwarding the French Revolution through its greatest thinker and orator. As an orator his eloquence has been likened to that of both Bossuet and Vergniaud, but it had neither the polish of the old 17th century bishop nor the flashes of genius of the young Girondin. It was rather parliamentary oratory in which he excelled, and his true compeers are rather Burke and Fox than any French speakers. Personally he had that which is the truest mark of nobility of mind, a power of attracting love and winning faithful friends. (H. M. S.)

Authorities. — The best edition of Mirabeau’s works is that published by Blanchard in 1819-1822, in ten volumes, of which the first two contain his CEuvres oratoires; from this collection, however, many of his less important works and the De la monarchie prussienne are omitted. For details of his life consult Peuchet, Mirabeau: Memoires sur sa vie litter aire et privee (1824); and the Memoires biographigues, litteraires et politiques de Mirabeau, Merits par lui-mtme, par son pere, son oncle et son fils adoptif, which was issued by his adopted son, Lucas de Montigny (8 vols., Paris, 1834-1835). See also Etienne Dumont, Souvenirs sur Mirabeau (1832), a work which has been translated into English by Lady E. R. Seymour as The Great Frenchman and the Little Genevese (1904); Louise Colet, La Jeunesse de Mirabeau (1841); and Alfred Begis, Mirabeau, son interdiction judiciaire (1895). The publica- tion of the Correspondence entre Mirabeau et le comte de la Marck, by A. de Bacourt (2 vols., 1851) marks an epoch in our exact knowledge of Mirabeau and his career; some additional letters appeared in the German edition (3 vols., Leipzig, 1851-1852). Other published correspondence is Lettres de Mirabeau a Chamfort (1796); Lettres du comte de Mirabeau a Jacques

Mauvillon (Bruns- wick, 1792); Lettres originates de Mirabeau, icrites du donjon de Vincennes, 1777-1780, published by L. P. Manuel (4 vols., 1792); and, on the same subject, Paul Cottin, Sophie de Monnier et Mirabeau d'apres leur correspondence inedite (1903) ; Lettres d, Julie, edited by D. Meunier and G. Selois (Paris, 1903) ; Lettres inedites (1806), edited by J. F. Vitry. The Hisloire secrete forms the basis of H. Welschin- ger's La Mission secrete de Mirabeau d, Berlin (Paris, 1900). The most useful modern books are Louis and Charles de Lomenie, Les Mirabeau (5 vols., 1878 and 1889); Alfred Stern, Das Leben Mirabeaus (1889). See also E. Rousse, Mirabeau (1891) in the Grands Ecrivains Francais series ; P. Plan, Un Collaborateur de Mira- beau (Paris, 1874), treating of Reybaz and throwing infinite light on Mirabeau's mode of work; and H. Reynald, Mirabeau et la constitu- ante (1873). On his eloquence and the share his collaborators had in his speeches see F. A. Aulard, Orateurs de Vassemblee constituante (1882). For his death see the curious brochure of his physician, Cabanis, Journal de la maladie et de la mart de Mirabeau (Paris, 1791, ed. H. Duchenne, Paris, 1890). There is a good sketch sum- marizing modern opinion by E. Charavay in La Grande Bncyclopedie. English works include P. F. Willert, Mirabeau (1898) in the " Foreign Statesman" series; C. F. ; Warwick, Mirabeau and the French Revolution (1905) ; W. R. H. Trowbridge, Mirabeau, the demi-god (1907) ; H. E. von Hoist, The French Revolution Tested by Mirabeau's Career (Chicago, 1894); and F. Fling, Mirabeau and the French Revolution (London and New York, 1908). Other works are Victor Hugo, TLtude sur Mirabeau (1834); Jules Barni, Mirabeau (1882); Albert Sorel, " Mirabeau " in Essais d'histoire et de critique (1883) ; G. Leloir, Mirabeau a Pontarlier (1886); Ferdinand Schwartz, Mirabeau und Marie Antoinette (Basel, 1891) ; and Alfred Mezieres, Vie de Mirabeau (1892).

MIRABEAU, VICTOR RIQUETI, Marquis de (1715-1789), French author and political economist, father of the great Mirabeau, was born at Pertuis, near the old chateau de Mirabeau, on the 4th of October 1715. He

was brought up very sternly by his father, and in 1728 joined the army. He took keenly to campaigning, but never rose above the rank of captain, owing to his being unable to get leave at court to buy a regiment. In 1737 he came into the family property on his father's death, and spent some pleasant years till 1743 in literary companionship with due Clapiers, marquis de Vauvenargues and the poet Lefranc de Pompignan, which might have continued had he not deter- mined to marry — not for money, but for landed estates. The lady whose property he fancied was Marie Genevieve, daughter of a M. de Vassan, a brigadier in the army, and widow of the marquis de Saulveboef, whom he married without previously seeing her on the 21st of April 1743. While in garrison at Bordeaux Mirabeau had made the acquaintance of Montesquieu, and after retiring from the army he wrote his first work, his Testament Politique (17 47), which demanded for the prosperity of France a return of the French noblesse to their old position in the middle ages. This work was followed in 1750 by a book on the Utiliti

des Stats provenciaux, which was attributed to Montesquieu himself. In 1756 Mirabeau made his first appearance as a political economist by the publication of his Ami des hommes cu traite de la population. This work has been often attributed to the influence, and in part even to the pen, of Quesnay, the founder of the economical school of the physiocrats, but was really written before the marquis had made the acquaintance of the physician of Madame de Pompadour. In 1 760 he published his Thiorie de I'impdt, in which he attacked with all the vehemence of his son the farmers-general of the taxes, who got him imprisoned for eight days at Vincennes, and then exiled to his country estate at Bignon. At Bignon the school of the physiocrats was really established, and the marquis in 1765 bought the Journal de F agriculture, du commerce, et des finances, which became the organ of the school. He was recognized as a leader of political thinkers by Prince Leopold of Tuscany, afterwards emperor, and by Gustavus III. of Sweden, who in 1772 sent him the

grand cross of the order of Vasa. But his marriage had not been happy; he had separated from his wife in 1762, and had, he believed, secured her safely in the provinces by a lettre de cachet, when in 1772 she suddenly appeared in Paris, and commenced proceedings for a separation. One of his own daughters had encouraged his wife to take this step. He was determined to keep the case quiet, if possible, for the sake of Mme de Pailly, a Swiss lady whom he had loved since 1756. But his wife would not let him rest; her plea was rejected in 1777, but she renewed her suit, and, though the great Mirabeau had pleaded his father's case, was successful in 1781. This trial quite broke the health of the marquis, as well as his fortune; he sold his estate at Bignon, and hired a house at Argenteuil, where he lived quietly till his death on the nth of July 1789.

The marquis's younger brother, Jean Antoine Riqueti, " the bailli " (d. 1794), served with distinction in the navy, but his brusque manners made success at court impossible. In 1763 he became general of the galleys of Malta. In 1767 he returned to France and took charge of the chateau de Mirabeau, helping the marquis in his disastrous lawsuits.

See Louis de Lomenie's Les Mirabeau (2 vols., 1879). Also Henri Ripert, Le Marquis de Mirabeau, ses theories politiques et economiques, [these pour le doctorat] Paris (1901); Oncken, Der altere Mirabeau und die pekonomische Gesellschaft in Bern (Berne, 1886) ; De Lavergne, Les Economistes francais du 18"" siecle.

MIRACLE (Lat. miraculum, from mirari, to wonder), anything wonderful, beyond human power, and deviating from the common action of the laws of nature, a supernatural event. The term is particularly associated with the supernatural factors in Christianity. To the Lat. miraculum correspond Gr. r&pas in the New Testament, and Heb. n^b (Exod. xv. 11; Dan. xii. 6) in the Old Testament. Other terms used in the New Testament are 8vva/ju.s " with reference to the power residing in

the miracle worker ” (cf . nrps Deut. iii. 24 and rona Num. xvi. 30), and crjixtiov ” with reference to the character or claims of which it was the witness and guar- antee ” (cf. ni’K Exod. iv. 8) ; t]jat the power is assumed to be from God is shown by the phrases irvevnari deov (Matt. xii. 28; cf. Luke iv. 18) and 8o.ktv\c^ deov (Luke xi. 20).

While Augustine describes miracles as ” contra naturam quae nobis est nota,” Aquinas without qualification defines them as ” praeter naturam,” ” supra et contra naturam.” Loscher affirms in regard to miracles that ” solus Deus potest turn supra naturae vires turn contra naturae leges agere ” ; and Buddaeus argues that in them a ” suspensio legum naturae ” is followed by a restitutio. Against the common view that miracles can attest the truth of a divine revelation Gerhard maintained that ” per miracula non possunt probari oracula ” ; and Hopfner returns to the qualified position of Augustine when he describes them as ” praeter et supra naturae ordinem.” The two conceptions, once common in the Chris- tian church, that on the one hand miracles involved an interference with the forces and a suspension of the laws of nature, and that, on the other hand, as this could be effected only by divine power, they served as credentials of a divine revelation, are now generally abandoned. As regards the first point, it is now generally held that miracles are exceptions to the order of nature as known in our common experience; and as regards the second, that miracles are constituent elements in the divine revelation, deeds which display

the divine character and purpose ; but they are signs and not merely seals of truth. Some of the theories regarding miracles which have been formulated may be mentioned. Bonnet, Euler, Haller, ochmid and others ” suppose miracles to be already implanted in aature. The miraculous germs always exist alongside other germs in a sort of sheath,

like hidden springs in a machine, and emerge into the light when their time comes." Similar is the view of Paracelsus and Jerome Cardan, who " suppose a twofold world, existing one in the other; beside or behind the visible is an inner, ideal world, which breaks through in particular spots " (Dorner's System of Christian Doctrine, [ii. 155, 156). The 8th duke of Argyll (Reign of Law) maintains that " miracles may be wrought by the selection and use of laws of which man knows and can know nothing, and which, if he did know, he could not employ." These theories endeavour to discover the means by which the exceptional occurrence is brought about; but the explanation is merely hypothetical, and we are not helped in conceiving the mode of the divine activity in the working of miracles. The important consideration from the religious standpoint is that God's activity should be fully recognized.

An attempt has been made to discover a natural law which will explain some at least of the miracles of Jesus. " In one respect alone," says Matthew Arnold, " have the miracles recorded by the evangelists a more real ground than the mass of miracles of which we have the relation. Medical science has never gauged, perhaps never enough set itself to gauge the intimate connexion between moral fault and disease. To what extent or in how many cases what is called illness is due to moral springs having been used amiss, whether by being over-used, dr by not being used sufficiently, we hardly at all know, and we too little inquire. Certainly it is due to this very much more than we commonly think, and the more it is due to this the more do moral therapeutics rise in possibility and importance " (Literature and Dogma, pp. 143-144). The moral therapeutics consists in the influence of a powerful will over others. Harnack accepts this view. " We see that a firm will and a con- vinced faith act even on the bodily life and cause appearances which appeal to us as miracles. Who has hitherto here with cer- tainty measured the realm of the possible and the real? Nobody. Who can say how far the influences of one soul on another soul and of the soul on the body reach? Nobody. Who

can still affirm that all which in this realm appears as striking rests only on deception and error? Certainly no miracles occur, but there is enough of the wonderful and the inexplicable ” (Das Wesen des Christentums, p. 18). As regards the theory, it may be pointed out: (1) that the nature or cosmical miracles — feeding of the five thousand, stilling of the storm, withering of the fig-tree — are as well- attested as the miracles of healing; (2) that many of the diseases, the cure of which is reported, are of a kind with which moral thera- peutics could not effect anything; l (3) that Christ’s own insight regarding the power by which He wrought His works is directly challenged by this explanation, for He never failed to ascribe His power to the Father dwelling in Him.

The divine agency is recognized as combining and controlling, but not as producing, in the teleological notion of miracles. ” In miracle no new powers, instituted or stimulated by God’s creative action, are at work, but merely the general order of nature “; but ” the manifold physical and spiritual powers in actual existence so blend together as to produce a startling result ” (Dorner’s System of Christian Doctrine, ii. 157). While we cannot deny, we have no ground for affirming the truth of this theory. Whether God’s action is creative, or only [selective and directive in miracles, is beyond our knowledge; we at least do not know the powers exercised, whether new or old.

An attempt is made to get rid of the distinctive nature of miracle when the exceptionalness of the events so regarded is reduced to a new subjective mode of regarding natural phenomena. H. E. G. Paulus dismisses the miracles as ” exaggerations or misappre- hensions of quite ordinary events.” A. Ritschl has been unjustly charged with this treatment of miracles. But what he emphasizes is on the one hand the close connexion between the conception of miracles and the belief in divine providence, and on the other the compatibility between miracles and the order of nature. He de- clines to regard miracles as divine action contrary

to the laws of nature. So for Schleiermacher "miracle is neither explicable from nature alone, nor entirely alien to it." What both Ritschl and Schleiermacher insist on is that the belief in miracles is inseparable from the belief in God, and in God as immanent in nature, not only directing and controlling its existent forces, but also as initiating new stages consistent with the old in its progressive development.

We may accept Dorner's definition as adequate and satisfactory. " Miracles are sensuously cognizable events, not comprehensible on the ground of the causality of nature as such, but essentially on the ground of God's free action alone. Such facts find their possi- bility in the constitution of nature and God's living relation to it, their necessity in the aim of revelation, which they subserve " (p. 161). By the first clause, inward moral and religious changes due to the operation of the Spirit of God in man are excluded, and

1 See also R. J. Ryle, " The Neurotic Theory of the Miracles of Healing," Hibbert Journal, v. 586.

rightly so (see Inspiration). The negative aspect is presented in the second clause. This is prominent in J. S. Mill's definition of miracles: " to constitute a miracle, a phenomenon must take place without having been preceded by any antecedent phenomenal conditions sufficient again to reproduce it. . . . The test of a miracle is, were there present in the case such external conditions, such second causes we may call them, that wherever these conditions or causes reappear the event will be reproduced. If there were, it is not a miracle; if there were not, it is" (Essays, p. 224). The positive aspect is presented in the third clause. When the existence of God is denied (atheism), or His nature is declared unknowable (agnosticism), or He is identified with nature itself (pantheism), or He is so distinguished from the world that His free action is excluded from the course of nature (deism), miracle is necessarily denied. Thus Spinoza, identifying God and nature, declares " nothing happens in nature which is in

contradiction with its universal laws.” The deists, compelled by their view of the relation of God to nature to regard miracles as interventions, disposed of the miracles of the Bible either as ” mistaken allegory ” or even as conscious fraud on^the part of the narrators. It is only the theistic view of God as personal power — that is as free-wil! ever present and ever active in the world, which leaves room for miracles. The possibility of miracles is often confidently denied. ” We are of the unalterable conviction,” says Harnack, ” that what happens in time and space is subject to the universal laws of move- ment; that accordingly there cannot be any miracles in this sense, i.e. as interruptions of the continuity of nature ” (Das Wesen des Christentums, p. 17). Huxley expresses himself much more cau- tiously, as he recognizes that we do not know the continuity of nature so thoroughly as to be able to declare that this or that event is necessarily an interruption of it. ” If a dead man did come to life, the’fact would be evidence, not that any law of nature had been violated, but that these laws, even when they express the results of a very long and uniform experience, are necessarily based on incomplete knowledge, and are to be held only on grounds of more or less justifiable expectation ” (Hume, p. 135).

Lotze has shown how the possibility of miracle can be conceived. ” The whole course of nature becomes intelligible only by sup- posing the co-working of God, who alone carries forward the reci- procal action of the different parts of the world. But that view which admits a life of God that is not benumbed in an unchangeable sameness will be able to understand his eternal co-working as a variable quantity, the transforming influence of which comes forth at particular moments and attests that the course of nature is not shut up within itself. And this being the case, the complete con- ditioning causes of the miracle will be found in God and nature together, and in that eternal action and reaction between them which perhaps, although not

ordered simply according to general laws, is not void of regulative principles. This vital, as opposed to a mechanical, constitution of nature, together with the con- ceptions of nature as not complete in itself — as if it were dissevered from the divine energy — shows how a miracle may take place without any disturbance elsewhere of the constancy of nature, all whose forces are affected sympathetically, with the consequence that its orderly movement goes on unhindered ” (Mikrokosmos, iii. 364).

The mode of the divine working in nature is in another passage more clearly defined.

” The closed and -hard circle of mechanical necessity is not immediately accessible to the miracle-working fiat, nor does it need to be; but the inner nature of that which obeys its laws is not determined by it but by the meaning of the world. This is the open place on which a power that commands in the name of this meaning can exert its influence; and if under this command the inner condition of the elements, the magnitudes of their relation and their opposition to each other, become altered, the necessity of the mechanical cause of the world must unfold this new state into a miraculous appearance, not through suspension but through strict maintenance of its general laws ” (op. cit. ii. 54).

If we conceive God as personal, and His will as related to the course of nature analogously to the relation of the human will to the human body_, then the laws of nature may be regarded as habits of the divine activity, and miracles as unusual acts which, while consistent with the divine character, mark a new stage in the fulfilment of the purpose of God.

The doctrine of Evolution, instead of increasing the difficulty of conceiving the possibility of miracle, decreases it; for it presents to us the universe as an uncompleted process, and one in which there is no absolute continuity on the phenomenal side; for life and mind are inexplicable by their physical

antecedents, and there is not only room for, but need of, the divine initiative, a creative as well as conservative co-operation of God with nature. Such an absolute continuity is sometimes assumed without warrant; but Descartes already recognized that the world was no continuous process, ” Tria mirabilia fecit Dpminus; res ex nihilo, liberum arbitrium et hominem Deum.” That life cannot be explained by force is recognized by Sir Oliver Lodge. ” Life may be something not only ultra-terrestrial, but even immaterial, something outside our present categories of matter and energy; as real as they are, but

different, and utilizing them for its own purpose ” {Life and Matter, p. 198). The theory of psychophysical parallelism recognizes that while there is a correspondence between mental and material phenomena, changes in the mind and changes in the brain, the former cannot be explained by the latter, as the transition from the one to the other is unthinkable. William James distinguishes the transmissive function of the brain from the productive in relation to thought, and admits only the former, and not the latter (Human Immortality, p. 32). Thus as life is transcendent and yet immanent in body, and mind in brain, and both utilize their organs, so God, transcendent and immanent, uses the course of nature for His own ends; and the emergence both of life and mind in that course of nature evidences such a divine initiative as is assumed in the recognition of the possibility of miracles. For such an initiative there must be adequate reason ; it must be prepared for in the previous process, and it must be necessary to further progress.

The proof of the possibility of miracle leads us inevitably to the inquiry regarding the necessity of miracle. The necessity of miracles is displayed in their connexion with the divine revelation; but this

connexion may be conceived in two ways. The miracles may be regarded as the credentials of "the agents of divine revelation. "It is an acknowledged historical fact," says Butler, " that Christianity offered itself to the world, and demanded to be received, upon the allegation — i.e. as unbelievers would speak — upon the pretence of miracles, publicly wrought to attest the truth of it, in such' an age ; and that it was actually received by great numbers in that very age, and upon the professed belief of the reality of miracles ' (Analogy, part ii. ch. vii.). This view is now generally abandoned, for it is recognized that acts of superhuman power, even if established by adequate historical evidence, do not necessarily certify their divine origin. Their moral quality must correspond with the character of God; and they must be connected with teaching which to reason and conscience approves itself divine. " Miracula sine doctrina nihil valent " is the principle now generally recog- nized. The miracle and the doctrine mutually illuminate one another. " Les miracles discernent la doctrine, et la doctrine discerne les miracles " (Pascal's Pensees des miracles). Accordingly, the credentials must also be constituents of the revelation. Of the miracles of Jesus, Bushnell says, " The character of Jesus is ever shining with and through them, in clear self - evidence leaving them never to stand as raw wonders only of might, but covering them with glory as tokens of a heavenly love, and acts that only suit the proportions of His personal greatness and majesty " (Nature and the Supernatural, p. 364). If it be asked why the character may not be displayed in ordinary acts instead of miracles, the answer may be given, "Miracle is the certificate of identity between the Lord of Nature and the Lord of Conscience— the proof that He is really a moral being who subordinates physical to moral interests" (Lidden's Elements of Religion, p. 73). As God is the Saviour, and the chief end of the revelation is redemption, it is fitting that the miracles should be acts of divine deliverance from physical evil. This congruity of the miracle with divine truth and grace is the answer to Matthew Arnold's taunt about

turning a pen into a pen-wiper or Huxley's about a centaur trotting down Regent Street. The miracles of Jesus — the relief of need, the removal of suffering, the recovery of health and strength — reveal in outward events the essential features of His divine mission. The divine wisdom and goodness are revealed in the course of nature, but also obscured by it. The existence of physical evil, and still more of moral evil, forbids the assumption without qualification that the real is the rational. God in nature as well as history is fulfilling a redemptive as well as perfective purpose, of which these miracles are appropriate signs. It is an unwarranted idealism and optimism which finds the course of nature so wise and so good that any change in it must be regarded as incredible. On the problem of evil and sin it is impossible here to enter; but this must be insisted on, that the miracles of Jesus at least express divine benevolence just under those conditions in which the course of nature obscures it, and are therefore, proper elements in a revelation of grace, of which nature cannot give any evidence.

Having discussed the possibility and necessity of miracles for the divine revelation, we must now consider whether there _ is sufficient historical evidence for their occurrence. Hume maintains that no evidence, such as is available, can make a miracle credible. Mill states the position with due care. ″ The question can be stated fairly as depending on a balance of evidence, a certain amount of positive evidence in favour of miracles, and a negative presumption from the general course of human experience against them ″ (Essays on Religion, p. 221). The existence of ″ a certain amount of positive evidence in favour of miracles ″ forbids the sweeping statement that miracles are ″ contrary to experience.″ The phrase itself is, as Paley has pointed out, ambiguous. If it means all experience it assumes the point to be proved ; if it means only common experience then it simply asserts that the miracle is unusual — a truism. The probability of miracles depends on the conception we have of the

free relation of God to nature, and of nature as the adequate organ for the fulfilment of God's purposes. If we believe in a divine revelation and redemption, transcending the course of nature, the miracles as signs of that divine purpose will not seem improbable.

For the Christian Church the miracles of Jesus are of primary importance; and the evidence — external and internal— in their favour may be said to be sufficient to justify belief. The Gospels assumed their present form between a.d. 60 and 90. Their repre- sentation of the moral character, the religious consciousness, the teaching of Jesus, inspires confidence. The narratives of miracles are woven into the very texture of this representation. In these acts Jesus reveals Himself as Saviour. " The Jesus Christ pre- sented to us in the New Testament would become a very different person if the miracles were removed " (Temple's Relations between Religion and Science). In His sinless perfection and filial relation to God He is unique, and His works are congruous with His Person. Of the supreme miracle of His resurrection there is earlier evidence than of any of the others (1 Cor. xv. 3-7, before A.D. 58). His con- quest of death is most frequently appealed to in the apostolic teaching. The Christian Church would never have come into existence without faith in the Risen Lord. The proof of the supernaturalness of His Person sets the seal to the credibility of His supernatural works. In Christ, however, was the fulfilment of law and prophecy. This close connexion invests the antecedent revelation in some degree with the supernaturalness of His Person: at least, we are prepared to entertain without prejudice any evidence that may be presented in the Old Testament. That this evidence is not as good as that for the miracles of Jesus must be conceded, as much of it is of much later date than the events recorded. The miracles connected with the beginnings of the national history — the period of the Exodus — appear on closer inspection to have been ordinarily natural phenomena, to which a supernatural character was

given by their connexion with the prophetic word of Moses. The miracles recorded of Elijah and Elisha lie somewhat apart from the main currents of the history, the narratives themselves are distinct from the historical works in which they have been incorporated, and the character of some of the actions raises serious doubts and difficulties. In some cases suspense of judgment seems necessary even from the standpoint of Christian faith. The supernatural element that is prominent in the Old Testament is God's providential guidance and guardianship of His people, and His teaching and training of them by His prophets. The Apostolic miracles, to which the New Testament bears evidence, were wrought in the power of Christ, and were evidences to His church and to the world of His continued presence. When the Church had estab- lished itself in the world, and possessed in its moral and religious fruits evidence of its claims, these outward signs appear gradually to have ceased, although attempts were made to perpetuate them. It is true that in Roman Catholicism, in medieval as in modern times, the working of miracles has been ascribed to its saints; but the character of most of these miracles is such as to lack the o priori probability which has been claimed for the Scripture miracles on account of their connexion and congruity with the divine revela- tion. The a posteriori evidence as regards both its moral and religious quality and its date is altogether inferior to the evidence of the Gospels. Further, these records are imitative. As Christ and the apostles worked miracles, it is assumed that those who in the Church were distinguished for their sanctity would also work miracles; and there can be little doubt that the wish was often father to the thought. There may be cases which cannot be explained in this way; but " whatever may be thought about them, it is plain that even if these and their like are really to be traced to the intervention of the divine mercy which loves to reward a simple faith (and it does not seem to us that the evidence is sufficient to establish such a conclusion), yet they do not serve as vehicles of revelation as the miracles of the Gospel did " (H. J. Bernard in

Hastings's Bible, Dictionary, hi. 395). (A. E. G.*)

MIRA, DE AMESCUA, ANTONIO (1578 7-1636 ?), Spanish dramatist, was born at Guadix (Granada) about 1578. He is said, but doubtfully, to have been the illegitimate son of one Juana Perez; he took orders, obtained a canonry at Guadix, and settled at Madrid early in the 17th century. He is mentioned as a prominent dramatist in Rojas Villandrando's Loa (1603), which v/as written several years before it was published. In 1 6 10, being then arch-dean of Guadix, he accompanied the count de Lemos to Naples, and on his return to Spain was appointed (1619) chaplain to the cardinal Infante Ferdinand of Austria; he is referred to as still alive in Montalban's Para todos (1632), and he collaborated with Montalban and Calderon in Polifemo y Circe, printed in 1634. The date of his death is not known. Mira de Amescua's plays are dispersed in various printed collections, and the absence of a satisfactory edition has pre- vented his due recognition. He has an evenness of execution which indicates an artistic conscience uncommon in Spanish playwrights; he resisted the temptation to write too much, and he unites a virile dignity of expression to impressive conception of character.

Two of his plays — La Adversa fortuna de Don Bernado de Cabrera

and El ejemplo mayor de la desdicha—axe respectively the sources of Rotrou's Don Bernardo de la Cabrere and Belisaire ; Moreto's Caer para levantar is simply a recast of Mira's El Esclavo del demonio, a celebrated drama which clearly influenced Calder6n when com- posing La Devocion de la cruz; and there is manifestly a close relation between Mira's La Rueda de la fortuna on the one hand and Corneille's Heraclius and Calderon's En esta vida todo es verdad y todo es mentira. A few of Mira de Amescua's plays are reprinted in the Biblioteca de autores

espanoles, vol. xlv.

MIRAGE (a French word, from mirer, to look at, se mirer, to be reflected), an optical illusion due to variations in the refractive index of the atmosphere. It embraces the phenomena of the visionary appearance of lakes in arid deserts, the images of ships and icebergs, frequently seen as if inverted and suspended in the atmosphere in the Polar Regions, the Fata Morgana, and ” looming ” as witnessed in mists or fogs.

In the article Refraction it is shown that a ray of light traversing a homogeneous medium is deviated from its rectilinear path when it enters a medium of different refractive index; it is therefore readily seen that the path of a ray through con- tinuously varying media is necessarily curvilinear, being com- pounded of an infinite number of infinitesimally small rectilinear deviations. Our atmosphere is a medium of continuously vary- ing refractive index. Meteorological optical phenomena, due to variations in the refractive index of the atmosphere, may be divided into groups: (i) those due to the permanent or normal variation experienced as one ascends in the atmosphere, and (2) those due to sporadic variations occasioned by irregular heating. The first variation must be taken into account in correcting geodetic observations of heights and astronomical observations of the heavenly bodies; it also has a considerable bearing on the phenomena of the twilight and the afterglow (see Refraction: § Astronomical; and Twilight). The second (or temperature) variation gives rise to phenomena which we proceed to discuss.

A common type of mirage is the appearance of an isolated lake frequently seen in hot sandy deserts, as in the Sahara, Turkestan, &c. The explanation is as follows: The sand, being abnormally heated by the solar rays, causes the neighbour- ing air to expand, consequently its density, and therefore its refractive index, is diminished, and attains a minimum value in the lowest layers. It increases as we ascend and reaches a maximum at a certain height,

and then decreases according to the normal variation. Any object viewed across such an area is seen by two sets of rays: one set passing near the earth and assuming a curved path convex to the horizon, the second set more remote from the earth and concave to the horizon. The object thus appears double, an image being seen mirrored in the sand. The sky appears as a shining lake; mountains or palms may be similarly reflected, but it is to be noted that the

images are inverted (see fig.). Similar atmospheric conditions sometimes prevail in the air over large, bodies of water on cold autumn mornings. These phenomena have been experimentally realized by R. W. Wood (Phil. Mag., 1899, vol. xlvii.), who viewed objects over a series of heated slate slabs.

Another type of mirage, frequently observed at sea in the northern latitudes, is presented in the appearance of ships and icebergs as if inverted and suspended in the clouds. This is due to a stratum of hot air at some distance above the sea level, the rays of light near the horizon being practically hori- zontal, while those at greater elevations are fairly concave. It may happen that the change in density is so great that only the upper rays reach the eye; we are then met with the curious illusion of seeing inverted ships in the clouds, although nothing is visible on the ocean.

The Fata Morgana, frequently seen in the Straits of Messina, consists of an apparent vertical elongation of an object situated on the opposite shore. The distribution of density is similar to that attending a desert mirage, but the transition is not so abrupt. The object is really viewed through a horizontally

stratified medium consisting of a central sheet of maximum refractive index, over- and under-laid by sheets of decreasing refractive power. The system consequently acts as a continuous lens, magnifying the object in a vertical direction.

If, in addition to this horizontal stratification, the atmosphere varies similarly in vertical planes, then the object would be magnified both horizontally and vertically. These conditions sometimes prevail in misty or foggy weather, more particularly at sea, and thus give rise to the phenomena known as " looming." A famous example is the Brockengespenst or " spectre of the Brocken." The chromatic halos which frequently encircle these images are due to diffraction. (See Corona.)

It is interesting to note that lenses formed on non-homogeneous material, having the maximum refractive index along the central axis, have been prepared, and reproduce the effects caused by abnormal distribution of the density of the atmosphere.

The mathematical investigation of this subject was worked out by Gaspard Monge. For this aspect and further details, both descriptive and experimental, see J. Pernter, Meteorologische Optik (1906); E. Mascart, Traite d'optique (1899-1903); R. W. Wood, Physical Optics (1905) ; R. S. Heath, Geometrical Optics.

MIRAJ, a native state of India, in the Deccan division of Bombay, forming part of the southern Mahratta Jagirs. Since 1820 it has been subdivided between a senior and a junior branch. The territory of both is widely scattered among other native states and British districts. Area of the senior branch, 339 sq. m.; pop. (1901), 81,467; revenue £23,000; tribute £800. Area of the junior branch, 211 sq. m.; pop. (1901), 35,806; revenue £27,000, tribute £400. The chiefs are Brahmans of the Patwardhan family. The town of Miraj, at which the chief of the senior branch resides, is situated near the river Kistna; it is a junction of the Southern Mahratta rail- way for the branch to Kolhapur. Pop. (1901), 18,425. The chief of the junior branch has his residence at Bhudgaon (pop.

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MIRAMON, MIGUEL (1832-1867), Mexican soldier of

French extraction, was born in the city of Mexico, on the 29th of Septem- ber 1832, and shot with the Emperor Maximilian at Queretaro on the 19th of June 1867. While still a student he helped to defend the military academy at Chapultepec against the forces of the United States; and, entering the army in 1852, he rapidly came to the front during the civil wars. It was largely due to Miramon's support of the ecclesiastical party against Alvarez and Comonfort that Zuloaga was raised to the presidency; and in 1859 he was called to succeed him in that office. Decisively beaten by the Liberals in i860, he spent some time in Europe advocating foreign intervention in Mexican affairs; and returned as a partisan of Maximilian. His ability as a soldier was shown by his double defence of Puebla in 1856.

MIRANDA, FRANCESCO (c. 1754-1816), Spanish-American soldier and adventurer, was born at Caracas, Venezuela, about 1754. He entered the army, and served with the French in the American War of Independence. The success of that war inspired him with a belief that the independence of Spanish America would increase its prosperity. He began to scheme a revolution, but was discovered and had only just time to escape to the United States. Thence he went to England, where he was introduced to Pitt, but chiefly lived with the leading members of the opposition — Fox, Sheridan and Romilly. Finding no help, he travelled through Austria and Turkey to Russia, where he was warmly received, but was dismissed with rich presents, at the demand of the Spanish ambassador, backed up by France. The news of the dispute between England and Spain about Nootka Sound in 1790 recalled him to England, where he saw a good deal of Pitt, but the peaceful arrangement of the dispute again destroyed his hopes. In April 1792 he went to Paris,- with introductions to Petion and the leading Girondists, hoping for aid in South America. France had too much to do to help others; but Miranda's friends sent him to the front as general of brigade. He distinguished himself under Dumouriez, was entrusted in February 1793 with the siege of Maestricht, and commanded the left wing of

the French army at the disastrous

battle of Neerwinden. Although he had given notice of Dumou- riez's treachery, he was put on his trial on the 12th of May, unanimously acquitted, but again imprisoned, and not released till after the 9th Thermidor. He was sentenced to be deported after the struggle of Vendemiaire, yet he continued in Paris till the coup d'etat of Fructidor caused him to take refuge in England. He now found Pitt and Dundas ready to listen, but, as neither of them would or could give him substantial help, he went to the United States, where President Adams only gave him fair words. Addington might have done something for him but for the peace of Amiens in 1802. Though in no way amnestied, he returned to Paris, but was expelled by the First Consul, who was eager to be on good terms with Spain. Disappointed in England and the United States, he decided to make an attempt at his own expense. Aided by two American citizens, Colonel W. S. Smith and Mr S. G. Ogden, he equipped the " Leander," in 1806, and with the help of the English admiral Sir A. Cochrane made a landing near Caracas, and proclaimed the Colombian republic. He had some success, but a false report of peace between France and England caused the English admiral to withdraw his support. At last, in 18 10, the events in Spain which brought about the Peninsular War had divided the authorities in Spanish America, some of whom declared for Joseph Bonaparte, others for Ferdinand VII., others for Charles IV., and Miranda again landed, and got a large party together who declared a republic both in Venezuela and New Granada or Colombia. But Miranda's desire — that all the South American colonies should form a federal republic — awoke the selfishness of provincial administrations, and the cause was believed to be hateful to heaven owing to a great earthquake on the 26th of March 181 2. The count of Monte Verde, the Bourbon governor, had little difficulty in defeating Miranda, and on the 26th of

July the general capitulated on condition that he should be deported to the United States. The condition was not observed; Miranda was moved from dungeon to dungeon, and died on the 14th of July 1816 at Cadiz. There are allusions to Miranda's early life in nearly all memoirs of the time, but they are not generally very accurate. For his trial see Buchez et Roux, Histoire parlementaire, xxvii. 26–70. For his later life see J. Biggs, History of Miranda's Attempt in South America (London, 1809); and Veggasi, Revolution de la Colombia. Prof. William S. Robertson has recently devoted considerable research in the Spanish archives and elsewhere to Miranda, his monograph on F. de M. and the revolutionizing of Spanish America being awarded a prize of the American Historical Association in 1908. See also Marques de Rojas, El General Miranda (Paris, 1884), and his Miranda dans la revolution francaise (Caracas, 1889); and R. Becerra, Ensayo hislorico documentado de la vida de Don F. de M. (Caracas. 1896).

MIRANDE, a town of south-western France, capital of an arrondissement in the department of Gers, on the left bank of the Grande Baise, 17 m. S.S.W. of Auch by the Southern railway. Pop. (1906), 2368. Mirande is laid out on the uniform plan typical of the bastide. Its church, built at the beginning of the 15th century, is chiefly remarkable for its porch which bestrides the Rue de l'Eveche and is surmounted by two flying buttresses supporting a belfry of Flemish appearance. The remains of ramparts are still to be seen and the principal street is bordered by ancient arcades. The town has a sub-prefecture and a tribunal of first instance. The trade is in live-stock and agricultural products. Tanning and wood-turning are carried on.

Mirande was founded in 1286 by the monks of Berdones and the seneschal of Toulouse acting on behalf of Philip IV. During the 14th century it was the capital of the counts of Astarac.

MIRANDOLA, a town of Emilia, Italy, in the province of Modena, 195 m. N. by E. of it by rail, 59 ft.

above sea-level. Pop. (1901), 15,162 The Palazzo del Commune is a 15th- century edifice of Gothic style. The castle of the Pico family, who held the town from the 14th century to 1710, when the last member was deprived of his dominions by Joseph I. of Austria, is almost entirely destroyed. The height of the fortunes of this family was from about 1450 to 1550, Giovanni (b. 1463, d. 1494) being its ablest and most learned member (see Pico). The cathedral, dating from the end of the 16th century, has been restored S. Francesco is a fine Gothic church.

MIRANZAI VALLEY, or Hangu, a mountain valley on the Kohat border of the North- West Frontier Province of India. Miranzai comprises two valleys draining S.W. into the Kunam and N.E. into the Kohat Toi. It is thus divided into upper and lower Miranzai, and extends from Thai to Raisan, and from the Zaimukht and Orakzai hills to those of the Khattaks. Its length is about 40 m., and its breadth varies from 3 to 7 m. Area, 546 sq. m.; pop. (1901), 43,901. The portion of Miranzai east of Hangu village consists of numerous small and well-cultivated valleys, in which orchard trees flourish abundantly. To the west of Hangu, including the whole of Upper Miranzai, the coun- try is a broad, open, breezy valley. The plain is bare of trees, but the hills are generally covered with scrub. The country is full of ravines towards Thai. The wealth of the inhabitants consists principally in cattle, goats and sheep ; of these the cows are of a lean and dwarf breed, and give but little milk. Miranzai forms the meeting place of many different tribes; but its chief inhabitants are the Bangash and Orakzais. Disturbances have necessitated British expeditions in 1851, 1855, and twice in 1891.

MIRBEAU, OCTAVE HENRI MARIE (1850-), French dramatist and journalist, was born at Trevieres (Calvados) on the 16th of February 1850. He was educated in a Jesuit school dt Vannes, and studied law in Paris. He began his journalistic career as dramatic critic of the Bonapartist paper, L'Ordre. For a short time before 1877 he was sous-prefet and then prejet of Saint-Girons, but from that time he

devoted himself to literature. He was one of the earliest defenders of the Impressionist painters. His witty articles in the anti- republican papers, and his attacks on established reputations, involved him in more than one duel. He gradually developed extreme individualist views. In 1890 he began to write for the Revolte, but his anarchist sympathies were definitely checked by the murder of President Carnot in 1894. He was one of the early and consistent defenders of Captain Alfred Dreyfus. He married in 1887 the actress Alice Regnault. His first novel, Jean Marcellin (1885), attracted little attention, but he made his mark as a conteur with a series of tales of the Norman peasantry, Lettres de ma chaumiere (1886). Le Calvaire (1887), a chapter of which on the defeat of 1870 aroused much discussion, was followed by L'Abbi Jules (1888), the story of a mad priest; by Sebastien Roch (1890), a bitter picture of the Jesuit school in which his own early years were spent; Le Jardin des supplices (1899), a Chinese story; Les Memoires d'une femme de chambre (1901); and Les Vingt-et-un jours d'un neurasthinique (1902). In 1897 his five-act piece, Les Mauvais Bergers, was played at the Renaissance by Sarah Bernhardt, and he followed this up with Les Affaires sont les affaires (Theatre Francais, 1903), which was adapted by Sydney Grundy for Sir H. Beerbohm Tree in 1905. Some of his short pieces are collected as Farces et moralites (1904).

MIRFIELD, an urban district in the Morley parliamentary division of the West Riding of Yorkshire, England, 3 m. S.W. of Dewsbury, on the Lancashire & Yorkshire and London & North- Western railways. Pop. (1901), 11,341. The church of St Mary was completed in 1874, from designs of Sir Gilbert Scott. The tower of the ancient church remains. The large industrial population is employed in woollen, cotton, carpet and blanket manufactures, and in the numerous collieries in the vicinity.

MIRKHOND (1433-1498). Mohammed bin Khawandshah bin Mahmud, commonly called Mlrkhwand or Mirkhawand, more familiar to Europeans under the name of Mirkhond, was born in 1433, the son of a very pious

and learned man who, although belonging to an old Bokhara family of Sayyids, or direct descendants of the Prophet, lived and died in Balkh. From his early youth he applied himself to historical studies and literature in general. In Herat, where he spent the greater part of his life, he gained the favour of that famous patron of letters, Mir ‘Alishir (1440–1501), who served his old schoolfellow, the reigning sultan Husain (who as the last of the Timurides in Persia ascended the throne of Herat in 1468), first as keeper of the seal, afterwards as governor of Jurjan. At the request of

Mir ‘Allshlr, himself a distinguished statesman and writer, Mirkhond began about 1474, in the quiet convent of Khilasiyah, which his patron had founded in Herat as a house of retreat for literary men of merit, his great work on universal history, Rauzat-ussafa fi slrat-ulanbia walmuluk walkhulafd or Garden of Purity on the Biography of Prophets, Kings and Caliphs. He made no attempt at a critical examination of historical traditions, and wrote in a flowery and often bombastic style, but in spite of this drawback, Mirkhond’s Rauzat remains one of the most marvellous achievements in literature. It comprises seven large volumes and a geographical appendix; but the seventh volume, the history of the sultan Husain (1438–1505), together with a short account of some later events down to 1523, cannot have been written by Mirkhond himself, who died in 1498. He may have compiled the preface, but the main portion of this volume is probably the work of his grandson, the historian Khwandamlr (1475–1534), to whom also a part of the appendix

must be ascribed.

For accounts of Mirkhond's life see De Sacy's " Notice sur Mirkhond " in his Memoires sur diverses antiquites de la Perse (Paris, 1793); JOurdain's "Notice de l'histoire universelle _ de Mirkhond " in the Notices et extraits, vol. ix. (Paris, 1812); Elliot, History of India, iv. 127 seq. ; Morley, Descriptive Catalogue (London, 1854), p. 30 seq.; Rieu, Cat. of Persian MSS. of the Brit. Mus. (vol. i. London, 1879), p. 87 seq. Besides the lithographed editions of the whole work in folio (Bombay, 1853, and Teheran, 1852- 1856) and a Turkish version (Constantinople, 1842), the following portions of Mirkhond's history have been published by European Orientalists: Early Kings of Persia, by D. Shea (London, 1832) (Oriental Translation Fund) ; L'Histoire de la dynastie des Sassanides, by S. de Sacy (in the above-mentioned MSmoires); Histoire des Sassanides (texte Persari), by Jaubert (Paris, 1843); Historia priorum regum Persarum, Persian and Latin, by Jenish (Vienna, 1782); Mirchondi historia Taheridarum, Persian and Latin, by Mitscherlik (Gottingen, 1814, 2nd ed., Berlin, 1819); Historia Samanidarum, Persian and Latin, by Wilken (Gottingen, 1808); Histoire des Samanides, translated by Defremery (Paris, 1845); Historia Ghaznevidarum, Persian and Latin, by Wilken (Berlin, 1832) ; Geschichte der Sultane aus dem Geschlechte Bujeh, Persian and German, by Wilken (Berlin, 1835); followed by Erdmann's Erlauterung und Ergdnzung (Kazan, 1836); Historia Seldschuckidarum, ed. Vullers (Giessen, 1837); and a German trans, by the same; Histoire des Sultans du Kharezm, in Persian, by Defremery (Paris, 1842) ; History of the A tabeks of Syria and Persia, in Persian, by W. Morley (London, 1848) ; Historia Ghuridarum, Persian and Latin, by Mitscherlik (Frankfort, 1818) ; Histoire des Sultans Ghurides, trans, into French by Defremery (Paris, 1844); Vie de Djenghiz-Khan, in Persian, by Jaubert (Paris, 1841) (see also extracts from the same 5th vol. in French trans, by Langles in vol. vi. of Notices et extraits, Paris, 1799. P- l 9 2 seq.), and by Hammer in Sur les origines russes, St Petersburg, 1825, p.

52 seq.); ” Timflr’s Expedition against Tukta- mish Khan,” Persian and French, by Charmoy, in Memoires de Vacad. imper. de St Petersbourg (1836), pp. 270-321 and 441-471.

(H. E.)

MIRROR (through O. Fr. mirour, mod. miroir, from a sup- posed Late Lat. miratorium, from mirari, to admire), an optical instrument which produces images of objects by reflection. In its usual forms it is simply a highly polished sheet of metal or of glass (which may or may not be covered, either behind or before, with a metallic film); a metallic mirror is usually termed a speculum. The laws relating to the optical properties of mirrors are treated in the article Reflection of Light.

Ancient Mirrors. — The mirror (kotottpov, ‘io- awrpov, evowrpov, speculum) of the Etruscans, Greeks and Romans consisted of a thin disk of metal (usually bronze) slightly convex and polished on one side, the other being left plain or having a design incised upon it. A manufactory of mirrors of glass at Sidon is mentioned by Pliny (Nat. Hist, xxxvi. 66, 193), but they appear to have been little used (one has been found at San Remo). Glass mirrors were coated, but with tin; some silver mirrors have also been found. They are said to have been in use as early as the time of Pompey, and were common under the empire. Homer knows nothing of mirrors, but they are frequently mentioned in the tragedians and onwards. The usual size was that of an ordinary hand-mirror, but in imperial times some appear to have been large enough to take in the whole figure (Seneca, Nat. quaest., i. 17, 8), being either fixed to the wall or working up and down like a window sash. The first specimen of a Greek mirror was not discovered till 1867, at Corinth, and the number

extant is comparatively small. They are usually provided with a handle, which sometimes took the form of a statuette (especially of Aphrodite) supported on a pedestal, or consist of two metallic circular disks (the ” box ” mirrors) fitting in to

each other, and sometimes fastened together by a hinge. The upper disk or cover was ornamented on the outside with a design in low relief; inside it was polished to reflect the face. The lower disk was decorated inside with engraved figures. The best specimens of both kinds of mirrors date from a little before 400 B.C. and last for some time after that. Of the reliefs, one of the best examples is ” Ganymede carried away by the eagle “; amongst the incised mirrors may be mentioned one representing Leucas and Corinthus, inscribed with their names (both the above in Collignon, L’Archeologie grecque, 1907, figs. 212, 213); the Genius of the Cock-fights (Revue arcMologique, new ser. xvii., 1868, PI. 13). A bronze mirror-case, found at Corinth, has attached on the outside a relief representing an Eros with two girls; on the inside is incised a design of a nymph seated on a bench and play- ing with Pan at a game resembling the Italian mora (Classical Review, Feb. 1889, p. 86). On the back of another mirror in the British Museum (Gazette archeologique, ii. PI. 27) is a figure of Eros which has been silvered over. With this was found the bronze case used to contain it, on the back of which is a group of Aphrodite and Eros in repousse. It was found in Crete; but most of the Greek mirrors and mirror-cases having designs are from Corinth.

The principal feature of the Etruscan mirrors, the extant examples of which far outnumber the Greek, is the design incised on the back. Belonging chiefly to the 4th and 3rd centuries, they mostly resemble the Greek disk-mirrors in form, box-mirrors being rare. As a rule the subjects incised are taken from Greek mythology and legend (Trojan War, birth of Athena, Aphrodite and Adonis), the names of the persons represented being frequently added in Etruscan letters and orthography (Apul = Apollo, Achle = Achilles, Achmemrum = Agamemnon). Scenes from daily life, the toilet, the bath, the palaestra, also occur. In most cases the style of drawing, the types of the figures, and the manner of composing the groups are true to the characteristics of Greek art. Some may have been imported from Greece, but the

greater number appears to have been more or less faithfully imitated from such designs as occurred on the Greek vases which the Etruscans obtained from Greece. Even where distinctly Etruscan figures are introduced, such as the heroes Aelius and Caelius Vibenna on a mirror in the British Museum, Greek models are followed. Although the work is frequently rough and careless, certain very fine and beautiful specimens have been found: the famous Semele-mirror, and the healing of Telephus, in which Achilles is shown scraping the healing rust from the lance with a crescent-shaped knife (Baumeister, Denkmaler, figs. 557, 1774)- Roman mirrors are usually disk-mirrors, the back of the disk, if engraved, being generally ornamented with decorative patterns, not with any subject design.

Plain mirrors are found wherever Greek and Roman civiliza- tion spread, and a specimen found in Cornwall (now in the British Museum) shows that the Celtic population of England had adopted the form and substance of the mirror from their con- querors. This specimen is enriched with a Celtic pattern incised. The shape of the handle exhibits native originality. Mirrors were sometimes used in Greece for purposes of divination (Pausanias vii. 21, 5). The mirror was let down into a well by means of a string until it grazed the surface of the water with the rim; after a little while it was pulled up, and when looked into showed the face of the sick person, alive or dead, on whose behalf the ceremony had been performed. This took place at Patrae.

See J. J. de Witte, ” Les miroirs chez les anciens,” in Extrait des annates de I’academie, xxviii. (Antwerp, 1872) ; Mylonas, ‘EXXtji’ikA K&ToTrpa. (Athens, 1876); M. Collignon, L’Archeologie grecque (new ed., 1907; Eng. tr. by J. H. Wright, 1886); E. Gerhard, Etruskische Spiegel (1 840-1 867), continued by K. Klugmann and G. Korte (1 884-1 897); article in Smith’s Dictionary of Greek and Roman Antiquities (3rd ed., 1891). (J. H. F.)

Medieval and Modem Mirrors. — Small metallic mirrors with a highly polished surface were largely used during the middle ages: pocket mirrors or small hand mirrors carried at the girdle being indispensable adjuncts to ladies' toilets. The pocket mirrors consisted of small circular plaques of polished metal, usually steel or silver, fixed in a shallow circular box covered with a lid. Mirror-cases were chiefly made of ivory, carved with relief representations of love or domestic scenes, hunting and games, and sometimes illustrations of popular poetry or ro- mance. Gold and silver, enamels, ebony and other costly materials were likewise used for mirror cases, on which were lavished the highest decorative efforts of art workmanship and costly jewelling. The mirrors worn at the girdle had no cover, but were furnished with a short handle. In 625 Pope Boniface IV. sent Queen Ethelberga of Northumbria a present of a silver mirror; and in early Anglo-Saxon times mirrors were well known in England. It is a remarkable fact that on many of the sculp- tured stones of Scotland, belonging probably to the 7th, 8th or 9th century, representations of mirrors, mirror-cases and combs occur.

The method of backing glass with thin sheets of metal for mirrors was well known in the middle ages, at a time when steel and silver mirrors were almost exclusively employed. Vincent of Beauvais, writing about 1 250, says that the mirror of glass and lead is the best of all, " quia vitrum propter transparentiam melius recipit radios " ; and a verre d mirer is mentioned in the inventories of the dukes of Burgundy, dating from the 15th century. A gild of glass-mirror makers existed at Nuremberg in 1373, and small convex mirrors were commonly made in southern Germany before the beginning of the 16th century; and these continued to be in demand, under the name of bull's- eyes (Ochsen-Augen), till comparatively modern times. They were made by blowing small globes' of glass into which while still hot was passed through the pipe a mixture of tin, antimony and resin or tar. When the globe was

entirely coated with the metallic compound and cooled it was cut into convex lenses, which formed small but well-defined images. As early as 13 17 a ” Magister de Alemania,” who knew how to work glass for mirrors, broke an agreement he had made to instruct three Venetians, leaving in their hands a large quantity of mixed alum and soot for which they could find no use. It was, however, in Venice that the making of glass mirrors on a commercial scale was first developed; and the republic enjoyed a much- prized monopoly of the manufacture for about a century and a half. In 1507 two inhabitants of Murano, representing that they possessed the secret of making perfect mirrors of glass, a knowledge hitherto confined to one German glass-house, obtained an exclusive privilege of manufacturing mirrors for a period of twenty years. In 1564 the mirror-makers of Venice, who enjoyed peculiar privileges, formed themselves into a corporation. The products of the Murano glass-houses quickly supplanted the mirrors of polished metal, and a large and lucrative trade in Venetian glass mirrors sprang up. They were made from blown cylinders of glass, which were slit, flattened on a stone, carefully polished, the edges frequently bevelled, and the backs ” silvered ” by an amalgam. The glass was remarkably pure and uniform, the ” silvering ” bright, and the sheets sometimes of considerable dimensions. In the inventory of his effects, made on the death of the French minister Colbert, a Venetian mirror, 46 by 26 in., in a silver frame, is valued at 8016 livres, while a picture by Raphael is put down at 3000 livres.

The manufacture of glass mirrors, with the aid of Italian workmen, was practised in England by Sir Robert Mansel early in the 17th century, and about 1670 the duke of Buckingham was concerned in glass-works at Lambeth where flint glass was made for looking-glasses. These old English mirrors, with bevelled edges in the Venetian fashion, are still well known. The Venetians guarded with the utmost jealousy the secrets of their manufactures, and gave exceptional privileges to those engaged in such

industries. By their statutes any glass-maker carrying his art into a foreign state was ordered to return on the pain of imprisonment of his nearest relatives, and should he disobey

the command emissaries were delegated to slay him. In face of such a statute Colbert attempted in 1664 to get Venetian artists transported to France to develop the two great industries of mirror-making and point-lace working. The ambassador, the bishop of Beziers, pointed out that this was to court the risk of being thrown into the Adriatic, and, further, that Venice was selling to France mirrors to the value of 100,000 crowns and lace to three or four times that value. Nevertheless, twenty Venetian glass-mirror makers were sent to France in 1665, and the manu- facture was begun in the Faubourg St Antoine, Paris. But previous to this the art of blowing glass for mirrors had been practised at Tour-la- Ville, near Cherbourg, by Richard Lucas, Sieur de Nehou, in 1653; and by the subsequent combination of skill of both establishments French mirrors soon excelled in quality those of Venice. The art received a new impulse in France on the introduction of the making of plate glass in 1601. The St Gobain Glass Company attribute the discovery to Louis Lucas of Nehou, and over the door of the chapel of St Gobain they have placed an inscription in memory of ” Louis Lucas qui inventa en 1601 le methode de couler les glaces et installa la manufacture en 1695 dans le chateau de Saint Gobain.”

Manufacture. — The term ” silvering,” as applied to the formation of a metallic coating on glass for giving it the properties of a mirror, was till quite recently a misnomer, seeing that till about 1840 no silver, but a tin amalgam, was used in the process. Now, however, a large propor- tion of mirrors are made by depositing on the glass a coating of pure silver, and the old amalgamation process is comparatively little used.

The process of amalgamation consists in applying a thin amalgam of tin and mercury to the surface of

glass. A sheet of thin tin-foil, somewhat larger than the glass to be operated on, is spread out on a flat table, and after all folds and creases have been completely removed a small quantity of mercury is rubbed lightly and quickly over the whole surface, and the scum of dust, impure tin and mercury is taken off. Mercury is then poured upon the ” quickened ” foil until there is a body of it sufficient to float the glass to be silvered (about I in. deep), and the glass (scrupulously cleaned simultaneously with the above operations) is slid over the surface of the mercury. Weights are placed over the surface until the greater part of the amalgamated mercury is pressed out, and the table is then tilted so that all superfluous mercury finds its way to the gutter. The glass is left twenty-four hours under weights; it is then turned over, silvered side up and removed to a drainer, where it dries and hardens. This process, when, elaborated, yields excellent results, producing a brilliant silver-white metallic lustre, which is only subject to altera- tion by exposure to high temperatures or by contact with damp surfaces; but the mercurial vapours to which the workmen are exposed give rise to the most distressing and fatal affections.

The ” silver on glass ” mirror may be regarded as a discovery of J. von Liebig, who in 1835 observed that by heating aldehyde with an ammoniacal solution of silver nitrate in a glass vessel a brilliant deposit of metallic silver was formed on the surface of the glass. In practice the process was introduced about 1840; and it is now carried on, with several modifications, in two distinct ways, called the hot and the cold process respectively. In the former method there is employed a horizontal double-bottomed metallic table, which is heated with steam to from 35° to 40° C, and the reduction of the ammoniacal silver solution is effected with tartaric acid.

In silvering by the cold process advantage is taken of the power of sugar to reduce the silver nitrate. This method has been gener- ally adopted for the silvering of mirrors for astronomical telescopes. G.

W. Ritchey (" The Modern Reflecting Telescope," Smithsonian Contributions to Knowledge, xxxiv. 40) used the process devised by Brashear in 1884. The glass disk is mounted on a rocking-table, and most carefully cleaned with nitric acid, potash, and finally with distilled water. The reducing solution (which improves on keeping) is made up from 200 parts of water, 20 of loaf sugar, 20 of alcohol and I of nitric acid (commercial pure). The silver solution is prepared as follows: 2 parts of silver nitrate are dissolved in 20 parts of water, and strong ammonia added until the brown solution becomes clear. A solution of 1 1 parts of potash (pure by alcohol) in 20 of water is now added, and then ammonia until the solution is again clear. A solution of J part of silver nitrate in 16 of water is added until the liquid is straw-coloured ; it is then filtered. Quantities of the solu- tions, such that the sugar equals one half the nitrate, are taken, then diluted, mixed, and poured on to the plate, which is gently rocked. The liquid goes muddy-brown, and in 3 to 4 minutes it begins to clear, a thick deposit being formed in about 5 minutes. The solution is poured off, and water run on, the streaks of precipitate being removed by lightly held cotton wool. The washing is repeated, and then water is allowed to remain on the film for one hour. The water is then run off, and the plate is washed several times with alcohol, and then dried by an air fan. The film is now burnished with a chamois leather pad, and finally with the finest jewellers' rouge, the silver surface being the reflecting surface of the mirror.

The deposit of silver on glass is not so adherent and unalterable under the influence of sunlight and sulphurous fumes as the tin- mercury amalgam, and, moreover, real silvered glass has in many cases a slightly yellowish tinge. These defects have been overcome by a process introduced by Lenoir, which consists of brushing over the silvered surface with

a dilute solution of cyanide of mercury, which, instantaneously forming a kind of amalgam, renders the deposit at once much whiter and more firmly adherent than before. To protect the thin metallic film from mechanical injury and the chemical action of gases and vapours it is coated with shellac or copal varnish, over which, when dry, are applied two coatings of red-lead paint or an electrolytically-deposited film of copper. This precaution only applies when the silver forms the back of the mirror.

Platinum Mirrors. — A cheap process of preparing mirror glass was to some extent prosecuted in France, whereby a thin but very adherent deposit of platinum is formed on the glass. A solution of chloride of platinum with a proportion of litharge and borate of lead dissolved in essential oil of spike is applied with a brush to well- cleaned glass, which is then placed on edge in a muffle furnace, and the platinum is thus burned in, forming an exceedingly thin but brilliant metallic backing having a somewhat grey lustre. It was used only for the lids of cheap boxes, toys, ornamental letters, &c.

Magic Mirrors. — Hand mirrors of metal are still in common use in Oriental countries, and in Japan bronze mirrors possess a religious significance. They have been known and used from the most remote period, mention of them being found in Chinese literature of the 9th century. The (reputed) first made Japanese mirror, preserved at Is6, is an object of the highest veneration in Japan, and an ancient mirror, connected with which is a tradition to the effect that it was given by the sun-goddess at the foundation of the empire, is a princi- pal article of the Japanese regalia. The mirrors of Japan in general consist of thin disks, from 3 to 12 in. in diameter, of speculum metal with handles, cast in one piece. The polished face of the mirror is slightly convex in form, so that a reflected image is seen proportionately reduced in size; the back of the disk is occupied with ornamentation and inscriptions in bold relief, and its rim is also

raised to the back. Much attention has been attracted to these mirrors by a singular physical peculiarity which in a few cases they are found to possess. These are known as magic mirrors from the fact that when a strong beam of light is reflected from their smooth and polished surface, and thrown on a white screen, an image of the raised ornaments and characters on the back of the mirror is formed with more or less distinctness in the disk of light on the screen. This peculiarity has at no time been specially observed by the Japan- ese, but in China it attracted attention as early as the nth century, and mirrors possessed of this property sell among the Chinese at ten or even twenty times the price sought for the ordinary non- sensitive examples. The true explanation of the magic mirror was first suggested by the French physicist Charles Cleophas Person in 1847, who observed that the reflecting surface of the mirrors was not uniformly convex, the portions opposite relief surfaces being plane. Therefore, as he says, ” the rays reflected from the convex portion diverge and give but a feebly illuminated image, while, on the con- trary, the rays reflected from the plane portions of the mirror preserve their parallelism, and appear on the screen as an image by reason of their contrast with the feebler illumination of the rest of the disk.” Such differences of plane in the mirror surface are accidental, being due to the manner in which it is prepared, a process explained by W. E. Ayrton and J. Perry (Proc. Roy. Soc, 1878, vol. xxviii.), by whom ample details of the history, process of manufacture and composition of Oriental mirrors have been published. A preliminary operation in polishing the surface consists of scoring the cast disk in every direction with a sharp tool. The thicker portions with relief ornament offer more resistance to the pressure of the tool than the thin flat portions, which tend to yield and form at first a concave surface, but this by the reaction of its elasticity rises after- wards and forms a slightly convex surface, while the more rigid thick, portions are comparatively little affected. This irregularity of surface is inconspicuous in ordinary light, and does

not visibly distort images ; but when the mirror reflects a bright light on a screen the unequal radiation renders the minute differences of surface obvious. .

MIRZAPUR, a city and district of British India, in the Benares division of the United Provinces. The city is on the right bank of the Ganges; a station on the East Indian railway, about half- way between Allahabad and Benares, 509 m. N. W. from Calcutta. Pop. (1901), 79,862. The river front, lined with stone ghats or flights of stairs, mosques, Hindu temples and dwelling-houses of the wealthier merchants, is handsome; but the interior of the town is mainly composed of mud huts. Formerly it was the emporium of trade between central India and Bengal, which has now been diverted to the railways. It has European and native lace factories, and manufactures brass vessels and woollen carpets. The London Mission manages a high school and an orphanage. The municipal limits include the town of Bind-

hachal, an important centre of pilgrimage, with the shrine of Vindhyeshwari.

The District of Mirzapur extends into the Sone valley. Area, 5238 sq. m. It is crossed from east to west by the Vindhya and Kaimur ranges. A central jungly plateau connects these and separates the valley of the Ganges from that of the Sone. The part north of the Vindhyas is highly cultivated and thickly peopled, but the rest of the district consists largely of ravines and forests with a sparse population. The population in 1901 was 1,082,430, showing a decrease of 6-8% in the decade. The district comprises a large part of the hereditary domains of the raja of. Benares, which are revenue-free. It is traversed, near the Ganges, by the main line of the East Indian railway. The Great Southern road used to start from the city.

MISCARRIAGE, in its widest sense a going astray, a failure. In law, the word is used in several phrases; thus, a miscarriage of justice is a failure of the law to attain its ends. In the Statute of

Frauds (29 Car. II., c. 3) in the expression ” debt, default or miscarriage of another,” the word has sometimes been inter- preted as equivalent in meaning to default, but it is more usually considered to mean a species of wrongful act for the consequence of which the law makes a party civilly responsible. The term is also used (see Abortion) for the premature expulsion of the contents of the womb before the period of gestation is complete.

MISCEGENATION (from Lat. miscere, to mix, and genus, race), a mixture or blending of two races, particularly of a white with a black or negro race.

MISCELLANY, a term applied to a single book containing arti- cles, treatises or other writings dealing with a variety of different subjects. It is a common title in the literature of the 17th and 18th centuries. The word is an adaptation of Lat. miscellanea (from tniscellaneus, mixed, miscere, to mix), used in this sense by Tertullian, Miscellanea Ptolemaei (Tert. adv. Val. 12); the ordi-. nary use of the word in Latin was for a dish of broken meats, applied by Juvenal (xi. 20) to the coarse food of gladiators.

The Lat. miscellaneus has affected the form of a word which is now usually spelled ” maslin,” applied to a mixture of various kinds of grain, especially rye and wheat. This, however, is really from the 0. Fr. mesteillon; Late Lat. mistilio, formed from mistus, past participle of miscere, to mix, mingle.

MISCHIEF, a term meaning originally calamity, trouble; now used particularly of annoying injuries or damage done in play or through petty spite. The word is derived through O. Fr. meschef, mod. mechef, from meschever, to do wrong, mes-, amiss, and chever, bring to a head (chef, Lat. caput).

MISDEMEANOUR (from O. Fr. mes- and demener, to conduct oneself ill), the generic term used in English law to include all those offences against the criminal law which are not by common law or statute made treason or felony. In Russell on Crimes

it is defined as a crime for which the law has not provided a particular name (6th ed., i. 193). The term misprision, at one time applied to the more heinous offences of this class, is now almost obsolete. The term misdemeanour includes not only all indict- able offences below the degree of felony, some of them grave crimes, such as sedition, riot and perjury, but also the petty misdemeanours, which may be dealt with summarily by justices of the peace, and the most trifling breaches of local by-laws.

As a matter of legal history, many misdemeanours now repre- sent what were originally described as trespasses against the peace, a phrase which is equivalent to a ” tort ” or delict, accom- panied by circumstances calling for prosecution in the interest of the Crown and the public as well as for civil proceedings by the injured parties. Such acts as riot, public nuisance, sedition and the different forms of libel naturally came to be regarded as wrongs against the king’s peace. Many of the early statutes anent justices are particularly concerned with the punishment of rioters; and some offences now treated as misdemeanours belonged to the spiritual and not to the temporal courts, e.g. perjury.

While it is true that almost all crimes which in the middle ages were considered heinous fall into the categories of treason or felony, many statutory misdemeanours differ so little, if at all,

from felony in character or in the mode of punishment that, in the absence of a code, no logical line of division can now be drawn, inasmuch as few felonies are now capital and none involve the forfeitures of land or goods, which at one time afforded an appreciable distinction between the two categories of crime. The result is that it is impossible to distinguish without enumera- ting the

specific crimes falling under each head.

Among the chief misdemeanours are: (i) Assault on the sovereign; (2) unlawful assembly; (3) riot and sedition; (4) for- cible entries; (5) perjury, which until 1563 was mainly, if not solely, cognizable by the spiritual courts; (6) blasphemy; (7) ex- tortion; (8) bribery; (9) obtaining property by false pretences (which is nearly cognate to the felony of larceny); (10) assault; (11) public nuisance; (12) libel; (13) conspiracy to defraud, &c; (14) attempts to commit other crimes.

Numerous acts or omissions are punishable as " misdemean- ours by interpretation." In other words, disobedience to the command or prohibition of a statute as to a matter of public concern is indictable as a misdemeanour, even if the statute does not so describe it, unless the terms of the statute indicate that some other remedy alone is to be pursued. For some misde- meanours penal servitude may be imposed by statute. But as a rule the appropriate punishment is by fine or imprisonment without hard labour or both, at the discretion of the court unless limited by a particular statute. The offender may also be put under recognizance to keep the peace and be of good behaviour. Theoretically, whipping may be imposed; but this is not now done except under specific statutory authority: and the like authority is necessary to authorize the addition of hard labour to a sentence of imprisonment.

At the present time the practical difference in English law between misdemeanour and felony lies in matters of procedure, in which a trial for misdemeanour closely resembles an ordinary civil trial.

1. An arrest for misdemeanour may not be made without judicial authority except under specific statutory authority.

2. A person charged with misdemeanour is entitled to bail (see Arrest), i.e. to release on the obtaining

of sureties, or even on his own recognizance without sureties to appear and take his trial. Bail is obligatory in all misdemeanours, with the exception of mis- demeanours where the costs of the prosecution are payable out of the county or borough rate or fund.

3. A misdemeanour may be tried on an information filed by the attorney-general or by leave of the high court without the indictment essential in cases of treason and felony.

4. The same indictment or information may include a number of charges of misdemeanour committed at different times and even against different persons. See Indictment.

5. A trial for misdemeanour may proceed in the absence of the defendant, who is not ” given in charge ” to the jury, as in the case of felony.

6. On a charge of misdemeanour a trial by special jury may be ordered.

7. There is no right to challenge peremptorily any of the jurors summoned to try the case; any challenge made must be for cause. The jury is sworn collectively (four men to a book), and not poll by poll as in felony, and their oath is to try the issues joined between the king and the defendant. They may separate during adjournments of the trial, like a jury in a civil case.

8. The costs of prosecuting certain misdemeanours are recoverable out of public funds under specific statutory provisions; but in very few cases can the court make the misdemeanant himself pay them.

9. There are no accessories after the fact to misdemeanour. (See Accessory.)

Under French law and systems based thereon or having a common origin a distinction is drawn between crime (verbrechen) , delit (vergehen) and contravention. The English term misde- meanour roughly corresponds to the two classes of delit and contravention but

includes some offences which would be quali- fied as ” crime.” In the criminal code of Queensland the term ” misdemeanour ” is retained, whilethat of ” felony ” is abol- ished; and offences are classified as crimes, misdemeanours and simple offences, the two former punishable on indictment, the latter on summary conviction only; the more serious offences described in English law as misdemeanours are in that code described as crimes (e.g. perjury). In the United States the English common law as to misdemeanour is generally followed,

but in New York and other states a statutory distinction has been made between misdemeanour and felony by defining the latter as a crime punishable by death or by imprisonment in a state prison. (W. F. C.)

MISE, an Anglo-French term (from Fr. meltre, to place) signi- fying a settlement of accounts, disputes, &c, by agreement or arbitration. As an English legal term it was applied to the issue in a writ of right; and in history to the payment, in return for certain privileges, made by the county palatine of Chester to each hew earl, and by the Welsh to each new lord of the Marches, or to a prince or king on his entry into the country. In its more general sense of agreement the term is familiar in English history in the ” Mise of Amiens,” in January, and that of Lewes, in May of 1264, made between Henry III. and the barons.

MISENUM, an ancient harbour town of Campania, Italy, about 3 m. S. of Baiae (q.v.) at the western extremity of the Gulf of Puteoli (Pozzuoli). Until the end of the Republic it was dependent on Cumae, and was a favourite villa resort. Agrippa made the fine natural harbour into the main naval station of the Mediterranean fleet, and founded a colony there probably in 31 B.C. The emperor Tiberius died in his villa here. Its importance lasted until the decline of the fleet in the 4th century a.d. It was at first an independent episcopal see: Gregory the Great united it with that of Cumae. In 890 it was destroyed by the Saracens. The name was derived from

one of the companions of Ulysses, or from Aeneas' trumpeter, an account of whose burial is given in Virgil, Aeneid, vi. 232.

The harbour consisted of the outer basin, or Porto di Miseno f protected by moles, of which remains still exist, and the present Mare Morto, separated from it by a comparatively modern embankment. The town lay on the south side of the outer harbour, near the village of Miseno, where remains of a theatre and baths and the inscriptions relating to the town have been found. Remains of villas can also be traced, and to the largest of these, which occupied the summit of the promontory, and belonged first to Marius, then to Lucullus, and then to the imperial house, probably belongs the subterranean Grotta Dragonara. Roads ran north to Baiae and north-west past the modern Torre Gaveta to Cumae: along the line of both are numerous columbaria.

See J. Beloch, Campanien, ed. ii. (Breslau, 1890), 190 sqq. (T. As.)

MISER, a term originally meaning (as in Latin) miserable or wretched, but now used for an avaricious person who hoards up money and who spends the smallest possible sum on necessities.

MISERERE (the imperative of Lat. misereri, to have mercy or pity), the name of one of the penitential psalms (li.), from its opening words, Miserere mei, Deus. The word is frequently used in English as equivalent to "Misericord" (Lat. misericordia, pity, compassion) for various forms in which the rules of a monastic order or general discipline of the clergy might be relaxed; thus it is applied to a special chamber in a monastery for those members who were allowed special food, drink, &c, and to a small bracket on the under side of the seat in a stall of a church made to turn up and afford support to a person in a position between sitting and standing. " Misericord " and " miserere " are also used of a small dagger, the " dagger of mercy," capable of passing between the joints of armour, with which the coup de grace might be given to a wounded man.

MISHAWAKA, a city of St Joseph county, Indiana, U.S.A., on the St Joseph river of Michigan, about 80 m. E. by S. of Chicago. Pop. (1900), 5560 (821 foreign-born); (1910) 11,886. It is served by the Grand Trunk and the Lake Shore & Michigan Southern railways, and by inter-urban electric lines. It has an extensive trade in grain and other agricultural products. Two miles up the river is the Hen Island dam, which, with the Mishawaka hydraulic dam nearer the city, is the source of much of the power used by the city's manufactories. St Joseph Iron Works was laid out on the south side of the river, in 1833, and in 1835 was organized as a village and two additions were platted. In 1836 Indiana City was laid out on the north side of the river;

and in 1839 St Joseph Iron Works, with its two additions, and Indiana City were incorporated as one town named Mishawaka — the name of an Indian village formerly occupying a part of the present site. Mishawaka was chartered as a city in

1899.

MISHMI, a hill-tribe on the frontier of Eastern Bengal and Assam. The Mishmis occupy the hills from the Dihong to the Brahmakund, in the north-eastern corner of the Brahmaputra valley. In 1854 M. Krick and M. Bourry, two French mission- aries, were murdered in the Mishmi country, but their death was avenged by a small expedition which took the murderer prisoner. In 1899 another British expedition was sent against the Mishmis, owing to the murder of some British subjects.

MISIONES, a territory of northern Argentina, bounded N. by Paraguay and Brazil, E. and S. by Brazil and W. by Paraguay and the Argentine province of Corrientes. Its boundary lines are formed by the upper Parana and Iguassti rivers on the N., the San Antonio and Pequiry-guassu streams on the E. and the

Uruguay River on the S. Area, 11,282 sq. m.; pop. (1904, esti- mate), 38,755, chiefly Indians and mestizos. The territory is a region of roughly-broken surfaces, divided longitudinally by low mountains, called the Sierra Iman and Sierra Grande de Misiones, which form the water-parting for many small streams flowing northward to the Parana and southward to the Uruguay. The greater part of the country is covered with forest and tropical jungle. The climate is sub-tropical, the temperature ranging from 40 to 95° F. The soil, is described as highly fertile, but its products are chiefly confined to yerba mate or Paraguay tea {Ilex paraguayensis) , tobacco and oranges and other fruits. Communication with the capital is maintained by two lines of steamboats running to Corrientes and Buenos Aires, but a rail- way across Paraguay from Asuncion is planned to Encarnacion, opposite Posadas. Some of the Jesuit missions of the 17th and 1 8th centuries were established in this territory, and are to-day represented by the lifeless villages of Candelaria, Santa Ana, San Ignacio and Corpus along the Parana River, and Apostoles, Conception, and San Javier along the Uruguay. Posadas (estimated pop. in 1905, 8000), the capital, on the Parana, officially dates from 1865. It was also a Jesuit settlement called Itapua, though the large mission of that name was on the Paraguayan side of the river. It is at the extreme west of the territory, and is the terminal port for the steamers from Corrientes.

MISKOLCZ, capital of the county of Borsod, Hungary, 113 m. N.E. of Budapest by rail. Pop. (1900), 40,833. It is situated in a valley watered by the Szinva in the east of the Biikk moun- tains, and opens towards the south to the plain of the Sajo, an affluent of the Hernad. Miskolcz is a thriving town, and among its buildings are a Roman Catholic church of the 13th century in Late Gothic style, a Minorite convent, and Greek Catholic, Lutheran and Calvinist churches. It manufactures snuff, por- celain, boots and shoes, and prepared leather, and has both steam and water mills. It trades in grain, flour, wine, fruit, cattle, hides, honey, wax and agricultural

products, while four well- attended fairs are held annually. About 5 m. west of the town in the Szinva valley is Diosgyor (pop. 11,520), which possesses important iron-works, and the ruined castle of Diosgyor, for- merly a shooting residence of the kings of Hungary. About 4 m. to the south-west of Miskolcz are the baths of Tapolcza, contain- ing warm springs. To the south-west of the town lies Onod (pop. 2087), to the south of which, on the banks of the Sajo, is the heath of Mohi or Muhi, famous as the scene of the great defeat of the Hungarians by the Mongols in 1241. About 85,000 Hungarians fell, and the whole country was devastated for the next two years by the Mongolian hordes. During the 1 6th and 17 th centuries Miskolcz suffered much from the Ottomans, and from the troops of George Rakoczy and Emeric Tokolyi. In 1781, 1843 and 1847 it was devastated by fire, and on the 30th of August 1878 a great portion of the town was ruined by a terrific storm.

MISPICKEL, a mineral consisting of iron sulpharsenide, FeAsS; it contains 46% of arsenic, and is of importance as an

ore of this element. It is known also as arsenopyrite or arsenical pyrites (Ger. Arsenikkies) : mispickel is an old name of German origin, and in the form Mistpuckel was used by G. Agricola in 1546. The crystals are orthorhombic, with angles similar to those of marcasite; they are often prismatic in habit, and the prism M is usually terminated by the deeply striated faces of an obtuse dome r. Twinning is not uncommon, the twin- planes- M (no) and g (101) being the same as in marcasite. The colour of the mineral is silver-white or steel-grey, with a metallic lustre, but it is often tarnished yellow; the streak is greyish-black. The hardness is 5§-6, and the specific gravity

5-9-6-2.

Mispickel occurs in metalliferous veins with ores of tin, copper, silver, &c. It is occasionally found as embedded crys- tals, for example, in serpentine at

Reichenstein, Silesia. In Cornwall and Devon it is associated with cassiterite in the tin- lodes, but is also found in the copper-lodes: well crystallized specimens have been obtained from the neighbourhood of Tavis- tock, Redruth and St Agnes. Mispickel is the principal source of arsenious oxide or the ” white arsenic ” of commerce (see Arsenic) . The chief supplies are from Cornwall and Devon, and Freiberg in Saxony, and from Canada and the United States.

Danaite is a cobaltiferous variety of mispickel, containing up to 9% of cobalt replacing iron; it was first noticed by J. F. Dana in 1824 at Franconia in New Hampshire. This variety forms a passage to the species glaucodote, (Co,Fe)AsS, which is found as well-developed orthorhombic crystals in copper ore at Hakansboda in Ramberg parish, Vestmanland, Sweden. Other species belonging to this isomorphous group of orthorhombic minerals are marcasite (FeS_2), lollingite ($FeAs_2$), safflorite ($CoAs_2$) and rammelsbergite ($NiAs_2$). (L. J. S.)

MISPRISION (from O. Fr. mesprendre, mod. meprendre, to misunderstand), a term in English law, almost obsolete, used to describe certain kinds of offence. Writers on criminal law usually divide misprision into two kinds (a) negative, (b) positive.

(a) Negative misprision is the concealment of treason or felony. By the common law of England it was the duty of every liege subject to inform the king’s justices and other officers of the law of all treasons and felonies of which the in- formant had knowledge, and to bring the offender to justice by arrest (see Sheriffs Act 1887, s. 8). The duty fell and still falls primarily on the grand jurors of each county borough or fran- chise, and is performed by indictment or presentment, but it also falls in theory on all other inhabitants (see Pollock and Maitland, Hist. Eng. Law, ii. 505). Failure by the latter to dis- charge this public duty constitutes what is known as misprision of treason or felony (see 3 Co. Inst., 139).

Misprision of Treason, in the words of Blackstone, ” consists in the bare knowledge and concealment of treason, without any degree of assent thereto, for any assent makes the party a principal traitor.” According to Bracton, de Corona, seq. 118, failure to reveal the trea- son of another was in itself high treason, but statutes of 1551-1552 and 1 554-1 555 made concealment of treason misprision only. Most of the statutes regulating procedure on trials for treason also apply to misprision of treason. The punishment is loss of the profit of the lands of the offender during life, forfeiture of all his goods and imprisonment for life. These punishments are not affected by the Forfeiture Act 1870.

Misprision of Felony is the concealment of a felony committed by another person, but without such previous concert with, or subse- quent assistance of the offender, as would make the concealer an accessory before or after the fact. The offence is a misdemeanour punishable on indictment by fine and imprisonment.

(b) Positive misprision is the doing of something which ought not to be done; or the commission of a serious offence falling short of treason or felony, in other words of a misdemeanour of a public character (e.g. maladministration of high officials, con- tempt of the sovereign or magistrates, &c). To endeavour to dissuade a witness from giving evidence, to disclose an examina- tion before the privy council, or to advise a prisoner to stand mute, used to be described as misprisions (Hawk. P. C. bk. I. c. 20).

The old writers say that a misprision is contained in every felony and that the Crown may elect to prosecute for the misprision instead of the felony. This proposition merely affirms the right of the Crown to choose a more merciful remedy in certain cases, and has no present value in the law. Positive

misprisions are now only of antiquarian interest, being treated as misdemeanours.

In the United States, misprision of treason is defined to be the crime committed by a person owing allegiance to the United States, and having knowledge of the commission of any crime against them, who conceals and does not, as soon as may be, disclose and make known the same to the president or to some judge of the United States, or to the governor, or to some judge or justice of a particular state. The punishment is imprisonment for not more than seven years and a fine of not more than one thousand dollars.

MISRULE, LORD OF, in medieval times the master of the Christmas revels. Probably J. G. Frazer {Golden Bough III.) is right in suggesting that the lord or abbot of misrule is the successor of the king of the ancient Roman Saturnalia, who personated Saturn and suffered martyrdom at the end of the revels. Compare, too, the burlesque figure at the carnival, which is finally destroyed. Stow {Survey) writes: ” In the feast of Christmas there was in the King’s House, wheresoever he lodged, a Lord of Misrule or Master of merry disports, and the like had ye in the house of every nobleman of honour or good worship, were he spiritual or temporal.” The mayor and sheriffs of London also had Lords of Misrule. These mock-monarchs began their reign on Allhallows Eve, and misruled till Candlemas. In Scot- land they were known as “Abbots of Unreason,” and in 1555 a special act suppressing them was passed. In Tudor times their reign was marked by much display and expense. In Henry VIII.‘s reign an order for a fool’s coat is signed by six of the Privy Council. By an Act of Common Council (1555) the city expenses of the Lords of Misrule were severely curtailed. Machyn speaks of a Lord of Misrule who in 1561 rode through London followed by a hundred gentlemen on horseback hung with gold chains (see also Revels, Master or).

MISSAL, the book containing the liturgy, or office of the mass {missa), of the Roman Catholic Church. This name {e.g. Missale gothicum, francorum,

gallicanum vetus) began to supersede the older word Sacramentary (sacramentarium, liber sacramentorum) from about the middle of the 8th century. 1 At that period the book so designated contained merely the fixed canon of the mass or consecration prayer (actionem, precem canonicam, canonem actionis), and the variable collects, secretae or orationes super oblata, prefaces, and post-communions for each fast, vigil, festival or feria of the ecclesiastical year; for a due celebration of the Eucharist they required accordingly to be supplemented by other books, such as the Antiphonarium, afterwards called the Graduate, containing the proper antiphons (introits), responsories (graduals), tracts, sequences, offertories, communions and other portions of the communion service designed to be sung by the schola or choir, and the Lectionarium (or epistolarium and evangelistarium) with the proper lessons. 2

1 It first occurs in Ecgbert of York's De remediis peccatorum, where it refers to the sacramentary of Gregory the Great.

2 One of the most celebrated of early missals is the Stowe missal of the 6th century in the British Museum. It contains the litany of the saints, the gloria with the collects, the part of the Epistle to the Corinthians relating to the Eucharist, the credo and the conse- cratio and memento corresponding exactly to the Roman canon. After the daily mass follow the missa apostolorum, missa sanctorum, missa pro poenitentibus vivis and the missa pro mortuis. To the 7th century belong the Missale francorum and the Missale gothicum, originally in the abbey of Fleury. In the 8th century we find in Ecgbert of York's De remediis peccatorum, i., that those who devote their lives to sacred orders are supposed to furnish themselves with a psalter, lectionary, antiphonary, missal, baptismal office and mar- tyrology. The adoption of the Roman liturgy by Charlemagne explains the great quantity of missals within this period; e.g. the missal of Worms in the library of the Arsenal at Paris. From the 10th century we have the missal of St Vougay, although

badly mutilated, and several others. From the 12th century missals became common, and more so with the invention of printing.

Afterwards missals contained more or less fully the antiphons and lessons as well as the prayers proper to the various days, and these were called missalia plenaria. All modern missals are of this last description. The Missale romanum ex decreto ss. concilii tridentini restitutum, now in almost exclusive use throughout the Latin obedience, owes its present form to the council of Trent, which undertook the preparation of a correct and uniform liturgy, and entrusted the work to a committee of its members. This committee had not completed its labours . when the council rose, but the pope was instructed to receive its report when ready and to act upon it. The ” reformed missal ” was promulgated by Pius V. on the 14th of July 1570, and its universal use enjoined, the only exceptions being churches having local liturgies which had been in unbroken use for at least two centuries. 3 It has subsequently undergone slight revisions under Clement VIII. (1604), Urban VIII. (1634) and Leo XIII. (1884), and various new masses, both obligatory and permissive, universal and local, have been added. Although the Roman is very much larger than any other liturgy, the communion office is not in itself inordinately long. The greater part of it is contained in the ” ordinary ” and ” canon “of the mass, usually placed about the middle of the missal, and occupies, though in large type, only a few pages. The work owes its bulk and complexity to two circumstances. On the one hand, in the celebration of the sacrifice of the mass practically nothing is left to the discretion of the officiating priest; everything — what he is to say, the tone and gestures with which he is to say it, the cut and colour of the robe he is to wear — is carefully prescribed in the rubrics. 4 On the other hand, the Roman, like all the Western liturgies, is distinguished from those of the Eastern Church by its flexibility. A distinctive character has been given to the office for each ecclesiastical season,

for each fast or festival of the year, almost for each day of the week; and provision has also been made of a suitable communion service for many of the special occasions both of public and of private life.

The different parts of the Roman communion office are not all of the same antiquity. Its essential features are most easily caught, and best understood, by reference to the earliest Sacramentaries (particularly the Gregorian, which was avowedly the basis of the labours of the Tridentine committee), to the Gregorian Antiphonary, and to the oldest redaction of the Ordo romanus? The account of the mass (qualiter Missa Romana celebratur) as given by the sacramentarium gregorianum is to the effect that there is in the first place ” the Introit according to the time, whether for a festival or for a common day; there- after Kyrie eleison. (In addition to this Gloria in excelsis Deo is said if a bishop be [the celebrant], though only on Sundays and festivals; but a priest is by no means to say it, except only at Eastertide. When there is a litany (quando letania agitur) neither Gloria in excelsis nor Alleluia is sung.) Afterwards the Oratio is said, whereupon follows the Apostolus, also the Gradual and Alleluia. Afterwards the Gospel is read. Then comes the OJferlorium, 6 and the Oratio super oblata is said.” Then follow the Sursum corda, the Preface, Canon, Lord’s Prayer and ” embolism “(eju/SoXio^a or insertion, Libera nos, Domine), given at full length precisely as they still occur in the Roman missal.

3 The English missal consequently continued to be used by English Roman Catholics until towards the end of the 17th century, when it was superseded by the Roman through Jesuit influence. The Gallican liturgy held its ground until much more recently, but has succumbed under the Ultramontanism of the bishops.

4 In all the older liturgies the comparative absence of rubrics is conspicuous and sometimes perplexing. It is very noticeable in the Roman Sacramentaries,

but the want is to some extent supplied by the very detailed directions for a high pontifical mass in the various texts of the Ordo Romanus mentioned below. That there was no absolutely fixed set of rubrics in use in France during the 8th century is shown by the fact that each priest was required to write out an account of his own practice (" libellum ordinis ") and present it for approbation to the bishop in Lent (see Baluze, Cap. Reg. Franc, i. 824, quoted in Smith's Diet, of Chr. Antiq. ii. 1521).

6 For the genealogical relationships of the Roman with other liturgies, see Liturgy. For the doctrines involved in the " sacrifice of the mass," see Eucharist.

6 Some editions do not mention the Offertory here.

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In every liturgy of all the five groups a passage similar to this occurs, beginning with Sursum corda, followed by a Preface and the recitation of the Sanctus or Angelic Hymn. The " canon " or consecration prayer, which in all of them comes immediately after, invariably contains our Lord's words of institution, and (except in the Nestorian liturgy) concludes with the Lord's Prayer and " embolism." But there are certain differences of arrangement, by which the groups of liturgies can be classified. Thus it is distinctive of the liturgy of Jerusalem that the " great intercession " for the quick and the dead follows the words of institution and an Epiklesis (eirLn\r)o-Ls rov ■wvtbjj.aTOs ayiov) or petition for the descent of the Holy Spirit upon the gifts; in the Alexandrian the "great intercession" has its place in the Preface; in the East Syrian it comes between the words of restitution and the Epiklesis; in the Ephesine it comes before the Preface; while in the Roman it is divided into two, the commemoration of the living being before, and that of the dead after, the words of institution. Other distinctive features of the

Roman liturgy are (1) the position of the ” Pax ” after the consecration, and not as in all the other liturgies at a very early stage of the service, before the Preface even; and (2) the absence of the Epiklesis common to all the others. 1 The words of its ” canonical prayer ” are of unknown antiquity; they are found in the extant manuscripts of the Sacramentarium gelasianum, and were already old and of forgotten authorship in the time of Gregory the Great, who, in a letter to John, bishop of Syracuse {Registr. Epist. vii. 64), speaks of it as ” the prayer composed by a ‘ scholastic ‘ ” (precem quam scholasticus composuerat). The same letter is interesting as containing Gregory’s defence, on the ground of ancient use, of certain parts of the Roman ritual to which the bishop of Syracuse had taken exception as merely borrowed from Constantinople. Thus we learn that, while at Constantinople the Kyrie eleison was said by all simultaneously, it was the Roman custom for the clergy to repeat the words first and for the people to respond, Christe eleison being also repeated an equal number of times. Again, the Lord’s Prayer was said immediately after the consecration aloud by all the people among the Greeks, but at Rome by the priest alone.

The meagre liturgical details furnished by the Sacramentarium gregorianum are supplemented by the texts of the Ordo romanus, the first of which dates from about the year 730. The ritual they enjoin is that for a pontifical high mass in Rome itself; but the differences to be observed by a priest ” quando in statione facit missas ” are comparatively slight. Subjoined is a precis of Ordo Romanus I.

It is first of all explained that Rome has seven ecclesiastical regions, each with its proper deacons, subdeacons and acolytes. Each region has its own day of the week for high ecclesiastical functions, which are celebrated by each in rotation. [This accounts for the Statio ad S. Mariam Majorem, ad S. Crucem in Jerusalem, ad S. Petrum, &c, prefixed to most of the masses in the Gregorian Sacramentary, and still retained in the ” Proprium de Tempore ” of the Roman missal.] The regulations

for the assembling and marshalling of the procession by which the pontiff is met and then escorted to the appointed station are minutely given, as well as for the adjustment of his vestments ” ut bene sedeant,” when the sacristy has been reached. He does not leave the sacristy until the Introit has been begun by the choir in the church. Before the Gloria he takes his stand at the altar, and after the Kyrie Eleison has been sung (the number of times is left to his discretion) he begins the Gloria in excelsis, which is taken up by the choir. During the singing he faces eastward; at its close he turns round for a moment to say ” Pax vobis,” and forthwith proceeds to the Oratio. 1 This finished, all seat themselves in order while the subdeacon ascends the ambo and reads [the epistle}. After he has done, the cantor with his book (cantatorio) ascends and gives out the response (Responsum) with the Alleluia and Tr actus in addition if the season calls for either. The deacon then silently kisses the feet of the pontiff and receives his blessing in the words ” Dominus sit in corde tuo et in labiis tuis.” Preceded by acolytes with lighted candles and subdeacons burning incense, he ascends the ambo, where he reads the Gospel. At the close, with the words ” Pax tibi ” and

1 This was one of the points discussed at the council of Florence, and Cardinal Bessarion for a time succeeded in persuading the Greeks to give up the Epiklesis.

2 Quam collectam dicunt, Ord. Rom. II.

” Dominus vobiscum,” the pontiff, 3 after another Oratio, descends to the ” senatorium ” accompanied by certain of the inferior clergy, and receives in order the oblations of the rulers (oblationes princi- pum), the archdeacon who follows taking their ” amulas ” of wine and pouring them into a larger vessel ; similar offerings are received from the other ranks and classes present, including the women. This concluded, the pontiff and archdeacon wash their hands, the offerings being meanwhile arranged by the subdeacons on the altar, and water,

supplied by the leader of the choir (archiparaphonista), being mingled with the wine. During this ceremony the schola have been engaged in singing the Offertorium ; when all is ready the pontiff signs to them to stop, and enters upon the Preface, the subdeacons giving the responses. At the Angelic Hymn (Sanctus) all kneel and continue kneeling, except the pontiff, who rises alone and begins the Canon. At the words ” per quern haec omnia ” the archdeacon lifts the cup with the oblates, and at ” Pax Domini sit semper vobiscum ” he gives the peace to the clergy in their order, and to the laity. The pontiff then breaks off a particle from the consecrated bread and lays it upon the altar; the rest he places on the paten held by the deacon. It is then distributed while Agnus Dei is sung. The pontiff in communicating puts the particle into the cup, saying, ” Fiat commixtio et consecratio corporis et sanguinis Domini nostri Jesu Christi accipientibus nobis in vitam aeternam.” Those present communicate in their order under this species also. As the pontiff descends into the senatorium to give the communion, the schola begins the communion Antiphon, and continues singing the Psalm until, all the people having communicated, they receive the sign to begin the Gloria, after which, the verse having been again repeated, they stop. The celebrant, then, facing eastward, offers the Oratio ad complendum, which being finished the archdeacon says to the people, ” Ite, missa est,” they responding with ” Deo gratias.”

To complete our idea of the Roman communion office as it was prior to the end of the 8th century we must now turn to the Gregorian Antiphonarius sive gradualis liber ordinatus per circulum anni, which as its name implies contains those variable portions of the mass which were intended to be sung by the schola or choir. It gives for each day for which a proper mass is provided: (1) the Antiphona (Antiphona ad Litroitum) and Psalmus; (2) the Responsorium and Versus, with its Alleluia and Versus; (3) the Ojferlorium and Versus; (4) the Communio and Psalmus. Some explanation of each- of

these terms is necessary. (1) The word Antiphon (o.vtL4>covov , O.Eng. Antefn, Eng. Anthem) in its ecclesiastical use has reference to the very ancient practice of relieving the voices of the singers by dividing the work between alternate choirs. In one of its most usual meanings it has the special signification of a sentence (usually scriptural) constantly sung by one choir between the verses of a psalm or hymn sung by another. According to the Roman liturgiologists it was Pope Celestine who enjoined that the Psalms of David should be sung (in rotation, one presumes) antiphonally before mass; in process of time the antiphon came to be sung at the beginning and end only, and the psalm itself was reduced to a single verse. In the days of Gregory the Great the introit appears to have been sung precisely as at present — that is to say, after the antiphon proper, the Psalmus with its Gloria, then the antiphon again. (2) The Responsorium, introduced between the epistle and gospel, was probably at first an entire psalm or canticle, originally given out by the cantor from the steps from which the epistle had been read (hence the later name Graduate), the response being taken up by the whole choir. (3) The Offertorium and Communio correspond to the ” hymn from the book of Psalms ” mentioned by early authorities (see, for example, Augustine, Retr. ii. 11; Ap. Const, viii. 13) as sung before the oblation and also while that which had been offered was being distributed to the people. A very intimate connexion between these four parts of the choral service can generally be observed; thus, taking the first Sunday in the ecclesi- astical year, we find both in the Antiphonary and in the modern Missal that the antiphon is Ps. xxv. 1-3, the psalmus Ps. xxv. 4, the responsorium (graduale) and versus Ps. xxv. 3 and xxv. 4, the offertorium and versus Ps. xxv. 1-3 and xxv. 5. The communio is Ps. lxxxv. 12, one of the verses of the responsorium being Ps. lxxxv. 7. In the selection of the introits there are also traces of a certain rotation of the psalms in the Psalter having been observed.

The first pages of the modern Roman missal are

occupied with the Calendar and a variety of explanations relating to the 3 After singing ” Credo in unum Deum,” Ord. Rom. II.

year and its parts, and the manner of determining the movable feasts. The general rubrics (Rubricae generates missalis) follow, explaining what are the various kinds of mass which may be celebrated, prescribing the hours of celebration, the kind and colour of vestments to be used, and the ritual to be followed (ritus celebrandi missam), and giving directions as to what is to be done in case of various defects or imperfections which may arise. The Praeparatio ad missam, which comes next, is a short manual of devotion containing psalms, hymns and prayers to be used as opportunity may occur before and after celebration. Next comes the proper of the season {Proprium missarum de tempore), occupying more than half of the entire volume. It contains the proper introit, collect (one or more), epistle, gradual (tract or sequence), gospel, offertory, secreta (one or more), communion and post-communion for every Sunday of the year, and also for the festivals and ferias connected with the ecclesias- tical seasons, as well as the offices peculiar to the ember days, Holy Week, Easter and Whitsuntide. Between the office for Holy Saturday and that for Easter Sunday the ordinary of the mass {Ordo missae), with the solemn and proper prefaces for the year, and the canon of the mass are inserted. The proper of the season is followed by the proper of the saints {Proprium sanctorum), containing what is special to each saint’s day in the order of the calendar, and by the Commune sanctorum, containing such offices as the common of one martyr and bishop, the common of one martyr not a bishop, the common of many martyrs in paschal time, the common of many martyrs out of paschal time, and the like. A variety of masses to be used at the feast of the dedication of a church, of masses for the dead, and of votive masses (as for

the sick, for persons journeying, for bridegroom and bride) follow, and also certain benedictions. Most missals have an appendix also containing certain local masses of saints to be celebrated ” ex indulto apostolico.”

Masses fall into two great subdivisions: (i) ordinary or regular (secundum ordinem officii), celebrated according to the regular rotation of fast and feast, vigil and feria, in the calendar; (2) extraordinary or occasional (extra ordinem officii), being either ” votive ” of ” for the dead,” and from the nature of the case having no definite time prescribed for them . Festival masses are either double, half-double or simple, an ordinary Sunday mass being a half -double. The difference depends on the number of collects and secretae; on a double only one of each is offered, on a half-double there are two or three, and on a simple there may be as many as five, or even seven, of each. Any mass may be either high (missa solennis) or low (missa privata) . The dis- tinction depends upon the number of officiating clergy, certain differences of practice as to what is pronounced aloud and what inaudibly, the use or absence of incense, certain gestures and the like. Solitary masses are forbidden; there must be at least an acolyte to give the responses. The vestments prescribed for the priest are the amice, alb, cingulum or girdle, maniple, stole and chasuble (planeta). There are certain distinctions of course for a bishop or abbot. The colour of the vestments and of the drapery of the altar varies according to the day, being either white, red, green, violet or black. This last custom does not go much further back than Innocent III., who explains the symbolism intended (see Vestments).

Subjoined is an account of the manner of celebrating high mass according to the rite at present in force.

I. The priest who is to celebrate, having previously confessed (if necessary) and having finished matins and lauds, is to seek leisure for private prayer (fasting) and to use as he has opportunity the ”

prayers before mass ” already referred to. How the robing in the sacristy is next to be gone about is minutely prescribed, and prayers are given to be used as each article is put on. The sacramental elements having previously been placed on the altar or on a credence table, the celebrant enters the church and takes his stand before the lowest step of the altar, having the deacon on his right and the subdeacon on his left. After invoking the Trinity (In nomine Patris, &c.) he repeats alternately with those who are with him the psalm ” Judica me, Deus,” which is preceded in the usual way by an antiphon (Introibo ad altare Dei), and followed also by the Gloria and Antiphon. 1 The versicle ” Adjutorium nostrum,” with its

1 This antiphon is not to be confounded with the Antiphona ad

response ” Qui fecit,” is followed by the ” Confiteor,” 2 said alter- nately by the priest and by the attendants, who in turn respond with the prayer for divine forgiveness, ” Misereatur.” The priest then gives the absolution (” Indulgentiam “), and after the versicles and responses beginning ” Deus, tu conversus ” he audibly says, ” Ore- mus,” and ascending to the altar silently offers two short prayers, one asking for forgiveness and liberty of access through Christ, and another indulgence for himself, ” through the merits of the saints whose relics are here.” Receiving the thurible from the deacon he censes the altar, and is thereafter himself censed by the deacon. He then reads the Introit, which is also sung by the choir; the Kyrie eleison is then said, after which the words Gloria in excelsis 3 are sung by the celebrant and the rest of the hymn completed by the choir.

2. Kissing the altar, and turning to the people with the formula ” Dominus vobiscum,” the celebrant proceeds with the collect or collects proper to the season or day, which are read secretly. The epistle for the day is then read by the subdeacon, and is followed by the gradual, tract, alleluia or sequence, according to the time. 4 This finished,

the deacon places the book of the gospels on the altar, and the celebrant blesses the incense. The deacon kneels before the altar and offers the prayer ” Munda cor meum,” afterwards takes the book from the altar, and kneeling before the celebrant asks his blessing, which he receives with the words ” Dominus sit in corde tub.” Having kissed the hand ot the priest, he goes accompa- nied by acolytes with incense and lighted candles to the pulpit, and with a ‘_’ Dominus vobiscum ” and minutely prescribed crossings and censings gives out and reads the gospel for the day, at the close of which ” Laus tibi, Christe ” is said, and the book is brought to the celebrant and kissed with the words ” Per evangelica dicta deleantur nostra delicta.” The celebrant then standing at the middle of the altar sings the words ” Credo in unum Deum,” and the rest of the Nicene creed is sung by the choir. 5

3. With ” Dominus vobiscum ” and ” Oremus ” the celebrant proceeds to read the offertory, which is also sung by the choir. This finished he receives the paten with the host from the deacon, and after offering the host with the prayer beginning ” Suscipe, Sancte Pater ” places it upon the corporal. The deacon then ministers wine and the subdeacon water, and before the celebrant mixes the water with the wine he blesses it in the prayer ” Deus qui humanae.” He then takes the chalice, and having offered it _(” Offerimus tibi, Domine “) places it upon the corporal and covers it with the pall. Slightly bowing over the altar, he then offers the prayer ” In spiritu humilitatis,” and, lifting up his eyes and stretch- ing out his hands, proceeds with ” Veni sanctincator.” After blessing the incense (” Per intercessionem beati Michaelis archan- geli “) he takes the thurible from the deacon and censes the bread and wine and altar, and is afterwards himself censed as well as the others in their order. Next going to the epistle side of the altar he washes his fingers as he recites the verses of the 26th Psalm beginning ” Lavabo.” Returning and bowing before the middle of the altar, with joined hands he says, ” Suscipe, sancta

Trinitas," then turning himself towards the people he raises his voice a little and says, " Orate, fratres " (" that my sacrifice and yours may be acceptable to God the Father Almighty "), the response to which is " Suscipiat Dominus sacrificium de manibus tuis," &c. He then recites the secret prayer or prayers, and at the end says, with an audible voice, " Per omnia saecula saeculorum " (R. " Amen ").

4. Again saluting with a " Dominus vobiscum," he lifts up his hands and goes on to the Sursum corda and the rest of the Preface. A different intonation is given for each of the prefaces. 6 At the Sanctus the handbell is rung. If there is a choir the Sanctus is sung while the celebrant goes on with the canon. 7 After the words of consecration of the wafer, which are said " secretly, dis- tinctly and attentively," the celebrant kneels and adores the host, rising elevates it, and replacing it on the corporal again adores

Introitum further on. This use of the 43rd Psalm goes as far back at least as the end of the 1 ith century, being mentioned by Micrologus (1080). It is omitted in masses for the dead and during Holy Week.

2 A form very similar to the present is given by Micrologus, and it is foreshadowed even in liturgical literature of the 8th century.

3 During Lent and Advent, and in masses for the dead, this is omitted. In low masses it is of course said, not sung (if it is to be said). It may be added that this early position of the Gloria in excelsis is one of the features distinguishing Roman from Ephesine use.

4 The tract is peculiar to certain occasions, especially of a mournful nature, and is sung by a single voice. By a sequence is understood a more or less metrical composition, not in the words of Scripture, having a special bearing on the festival of the day. See, for example, the sequence, " Lauda Sion Salvatorem," on Corpus Christi day.

5 On certain days the Credo is omitted.

6 Now eleven ; they were at one time much more numerous.

7 The approved usage appears to be in that case that it is sung as far as ” Hosanna in excelsis ” before the elevation, and ” Benedictus qui venit ” is reserved till afterwards. In France it was a very com- mon custom, made general for a time at the request of Louis XII., to sing ” salutaris hostia ” at the elevation.

it (the bell meanwhile being rung). 1 The same rite is observed when the chalice is consecrated. Immediately before the Lord’s Prayer, at the words ” per ipsum et cum ipso et in ipso,” the sign of the cross is made three times over the chalice with the host, and towards the close of the ” embolism ” the fraction of the host takes place. After the words ” Pax Domini sit semper vobiscum ” the emission of the particle into the cup takes place with the words ” Haec commixtio et consecratio,” &c. The celebrant then says the Agnus Dei three times. .

5. While the choir sings the Agnus Dei and the Communion, the celebrant proceeds, still ” secrete,” with the remainder of the office, which though printed as part of the canon is more conveniently called the communion and post-communion. After the prayer for the peace and unity of the Church (” Domine Jesu Christe, qui dixisti “) he salutes the deacon with the kiss of peace, saying, ” Pax tecum “; the subdeacan is saluted in like manner, and then conveys the ” pax ” to the rest of the clergy who may be assisting. The celebrant then communicates under both species with suitable prayers and actions, and afterwards administers the sacrament to the other communicants if there be any. Then while the wine is poured into the cup for the first ablution he says, ” Quod ore sumpsimus “; having

taken it he says, ” Corpus tuum, Domine.” After the second ablution he goes to the book and reads the Communion. Then turn- ing to the people with ” Dominus Vobiscum ” he reads the post- communion (one or more) ; turning once more to the congregation Jie uses the old dismissal formula ” Dominus vobiscum ” {R. ” Et cum spiritu tuo “), and ” Ite, missa est ” or ” Benedicamus Domino,” in those masses from which Gloria in excelsis has been omitted (R. ” DeoGratias”). Bowing down before the altar he offers the prayer ” Placeat tibi, sancta Trinitas,” then turning round he makes the sign of the cross over the congregation with the words of the bene- diction (” Benedicat “). 2 He then reads the passage from the gospel of John beginning with ” In principio erat Verbum,” or else the proper gospel of the day. 3 (J. S. Bl.)

MISSI DOMINICI, the name given to the officials commissioned by the Frankish kings and emperors to supervise the administra- tion of their dominions. Their institution dates from Charles Martel and Pippin the Short, who sent out officials to see their orders executed. When Pippin became king in 754 he sent out rnissi in a desultory fashion; but Charlemagne made them a regular part of his administration, and a capitulary issued about 802 gives a detailed account of their duties. They were to execute justice, to enforce respect for the royal rights, to control the administration of the counts, to receive the oath of allegiance, and to supervise the conduct and work of the clergy. They were to call together the officials of the district and explain to them their ^duties, and to remind the people of their civil and religious’ obligations. In short they were the direct representatives of the king or emperor. The inhabi- tants of the district they administered had to provide for their subsistence, and at times they led the host to battle. In addition special instructions were given to various missi, and many of these have been preserved. The districts placed under the missi, which it was their duty to visit four times a year, were called missatici or legationes. They were not

perma- nent officials, but were generally selected from among persons at the court, and during the reign of Charlemagne personages of high standing undertook this work. They were sent out in twos, an ecclesiastic and a layman, and were generally complete strangers to the district which they administered. In addition there were extraordinary missi who represented the emperor on special occasions, and at times beyond the limits of his dominions. Even under the strong rule of Charlemagne it was difficult to find men to discharge these duties impartially, and after his death in 814 it became almost impossible. Under the emperor Louis I. the nobles interfered in the appointment of the missi, who, selected from the district in which their duties lay, were soon found watching their own interests rather than those of the central power. Their duties became merged in the ordinary work of the bishops and counts, and under the emperor Charles the Bald they took control of associations

1 The history of the practice of elevating the host seems to have arisen out of the custom of holding up the oblations, as mentioned in the Ordo Romanus (see above). The elevation of the host, as at present practised, was first enjoined by Pope Honorius III. The use of the handbell at the elevation is still later, and was first made general by Gregory XI.

2 The benediction is omitted in masses for the dead.

3 The reading of the passage from John on days which had not a proper gospel was first enjoined by Pius V.

for the preservation of the peace. About the end of the 9th century they disappeared from France and Germany, and during the 10th century from Italy. It is possible that the itinerant justices of the English kings Henry I. and Henry II., the itinerant baillis of Philip Augustus king of France, or the royal enqulteurs of St Louis originated from this source.

See G. Waitz, Deutsche Verfassungsgeschichte (Kiel,

1844) ; E. Bourgeois, Le Capitulaire de Kiersy-sur-Oise (Paris, 1885) ; V. Krause, Geschichte des Institutes der missi dominici in the Mittheilungen des Institutsfur osterreichische Geschichtsforschung, Band XI. (Innsbruck, 1880). E. Dobbert, Uber das Wesen und den Gesckaftskreis der missi dominici (Heidelberg, 1861); N. D. Fustel de Coulanges, Histoire des institutions politiques de Vancienne France (Paris, 1889-1890); L. Beauchet, Histoire de V organization judiciaire en France, epoque franque (Paris, 1865).

MISSIONS (Lat. missio, a sending) the term used specially for the propagandist operations of the Christian Church among the heathen, the executants of this work being missionaries. Both ” mission ” and ” missionary ” have hence come to be used of similar works in other spheres. The history of Christian missions may, for practical purposes, be divided into three chief periods: (1) the primitive, (2) the medieval and (3) the modern.

The Primitive Period There can be little doubt that the Christian Church derived its missionary impulse from the teaching of its founder. Even though we may .feel some hesitancy, in the light of modern criticism, about accepting as authentic the specific injunctions ascribed to Jesus by Matthew (ch. xxviii. 19) and Luke (ch. xxiv. 47; Acts i. 8), it must be admitted that the teaching of Jesus, in the emphasis which it laid on the Fatherhood of God and the brotherhood of man, was bound sooner or later to break away from the trammels of Judaism, and assert itself in the form of Christian missions. The triumph of this ” universalistic ” element in the teaching of Christ is vividly portrayed in the Acts of the apostles. At the beginning of the Acts the Christian Church is a little Jewish sect; long before the end is reached it has become a world-conquering spiritual force. The transfor- mation was due in its initial stages to broad-minded men like Stephen, Philip and Barnabas who were the first pioneers of missionary work. Their efforts, however, were soon completely eclipsed by the magnificent achievements of the apostle Paul, who evangelized a

large part of Asia Minor and the most impor- tant cities of Greece. The success which attended the work of the great apostle to the Gentiles stamped Christianity as a missionary religion for ever. From this point onwards Chris- tianity pushed its way into all the great centres of population. We know very little about the missionaries of the first three centuries. We suddenly find province after province chris- tianized though there is nothing to show how and by whom the work was done. The case of Bithynia is an excellent illustration of this. When Pliny wrote his famous letter to Trajan (a.d. 112), Christianity had taken such a firm hold of the province that its influence had penetrated into remote country districts, pagan festivals were almost entirely neglected, and animals for sacrifice could scarcely find purchasers. Yet the history of the conver- sion of Bithynia is absolutely buried in oblivion. By the time of Constantine, Christianity had practically covered the whole empire. Harnack has tabulated the results which our scanty data allow us to reach in his Expansion of Christianity. He divides the countries which had been evangelized by the close of the 3rd century into four groups: (1) Those countries in which Christianity numbered nearly one-half of the population and represented the standard religion of the people, viz. most of what we now call Asia Minor, that portion of Thrace which lay over against Bithynia, Armenia, the city of Edessa. (2) Those districts in which Christianity formed a very material portion of the population, influencing the leading classes and being able to hold its own with other religions, viz. Antioch and Coele-Syria, Cyprus, Alexandria together with Egypt and the Thebais, Rome and the lower parts of Italy, together with certain parts of middle Italy, Proconsular Africa and Numidia, Spain, the maritime parts of Greece, the southern coasts of Gaul.

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(3) Those districts in which Christianity was sparsely scattered, viz. Palestine, Phoenicia, Arabia, certain parts of Mesopotamia, the interior districts of Greece, the provinces on the north of Greece, the northern districts of middle Italy, the provinces of Mauretania and Tripolis. (4) Those districts in which Christi- anity was extremely weak or where it was hardly found at all : the districts to the north and north-west of the Black Sea, the western section of upper Italy, middle and upper Gaul, Belgica, Germany, Rhaetia, the towns of ancient Philistia. It is not possible to obtain even an approximate estimate of the numbers of the Christians at the time of Constantine. Friedlander, for instance, does not think that they exceeded by much Gibbon's estimate for the reign of Decius, viz. one-twentieth of the population. La Bastie and Burckhardt put the ratio at one-twelfth, Matter at a fifth and Staudlin even at a half (see Harnack ii. 453).

After the end of the 3rd centur}' missionary enterprise was mainly concentrated on the outlying borders of the empire. . In the 4th and 5th centuries may be mentioned Gregory the Illuminator, the " apostle of Armenia " (about 300), Ulfilas, the "apostle of the Goths," about 325; Frumentius, 1 a bishop of Abyssinia, about 327; Nino, the Armenian girl who was the means of converting the kingdom of Iberia (now Georgia) , about 330; 2 Chrysostom, who founded at Constantinople in a.d. 404 an institution in which Goths might be trained to preach the Gospel to their own people; 3 Martin of Tours, who evangelized the central districts of Gaul; Valentinus, the " apostle of Noricum," about 440; Honoratus, who from his monastic home in the islet of Lerins, about 410, sent missionaries among the masses of heathendom in the neighbourhood of Aries, Lyons, Troyes, Metz and Nice; and St Patrick, who converted Ireland into " the isle of saints " (died either in 463 or 495).

The Medieval Period

With the 5th century the Church was confronted with

number- less hordes, which were now precipitated over the entire face of Europe. Having for some time learnt to be aggressive, she girded herself for the difficult work of teaching the nations a higher faith than a savage form of nature-worship, and of fitting them to become members of an enlightened Christendom.

(a) The Celtic Missionaries. — The first pioneers who went forth to engage in this difficult enterprise came from the secluded Celtic Churches of Ireland and the Scottish Highlands. Of many who deserve mention in connexion with this period, the most prominent were: Columba, the founder of the famous monastery of Iona in 563 and the evangelizer of the Albanian Scots and northern Picts; Aidan, the apostle of Northumbria; Columbanus, the apostle of the Burgundians of the Vosges (590); Callich or Gallus (d. 646), the evangelizer of north-eastern Switzerland and Alemannia; Kilian, the apostle of Thuringia; and Trudpert, the martyr of the Black Forest. The zeal of these men seemed to take the world by storm. Travelling generally in companies, and carrying a simple outfit, these Celtic pioneers flung themselves on the continent of Europe, and, not content with reproducing at Annegray or Luxeuil the willow or brushwood huts, the chapel and the round tower, which they had left behind in Derry or in the island of Hy (Iona) , they braved the dangers of the northern seas, and penetrated as far as the Faroes and even far distant Iceland. 4 ” Their zeal and success,” to quote the words of Kurtz, ” are witnessed to by the fact that at the beginning of the 8th century, throughout all the district of the Rhine, as well as Hesse, Thuringia, Bavaria and Alemannia, we find a network of flourishing churches bearing the impress of Celtic institutions.”

(b) The English Missionaries. — Thus they laid the foundations, aweing the heathen tribes by their indomitable spirit of self- sacrifice and the sternness of their rule of life. But, marvellous as it was, their work lacked the element of permanence; and it

1 Socrates, H.E. i. 15; Sozomen ii. 24; Theodoret i. 22.

2 Socrates, H.E. i. 20 ; Sozomen ii. 7 ; Theodoret i. 24. 8 Theodoret, H.E., v. 30.

4 See A. W. Haddan, ” Scots on the Continent,” Remains, p. 256.

became clear that a more practical system must be devised and carried out. The men for this work were now ready, and the sons of the newly evangelized English Churches were ready to go forth. The energy which warriors were accustomed to put forth in their efforts to conquer was now ” exhibited in the enterprise of conversion and teaching ” 5 by Wilfrid on the coast of Fries- land, 6 by Willibrord (658-715) in the neighbourhood of Utrecht, 7 by the martyr-brothers Ewald* or Hewald amongst the ” old ” or continental Saxons, 8 by Swidbert the apostle of the tribes between the Ems and the Yssel, by Adelbert, a prince of the royal house of Northumbria, in the regions north of Holland, by Wursing, a native of Friesland, and one of the disciples of Willibrord, in the same region, and last, not least, by the famous Winfrid or Boniface, the ” apostle of Germany ” (680-755), wno went forth first to assist Willibrord at Utrecht, then to labour in Thuringia and Upper Hessia, then with the aid of his kinsmen Wunibald and Willibald, their sister Walpurga, and her thirty companions, to consolidate the work of earlier missionaries, and finally to die a martyr on the shore of the Zuider Zee.

(c) Scandinavian Missions. — Devoted, however, as were the labours of Boniface and his disciples, all that he and they and the emperor Charlemagne after them achieved for the fierce untutored world of the 8th century seemed to have been done in vain when, in the 9th ” on the north and north-west the pagan Scandinavians were hanging about every coast, and pouring in at every inlet ; when on the east the pagan Hungarians were swarming like locusts and devastating Europe from the Baltic to the Alps; when

on the south and south-east the Saracens were pressing on and on with their victorious hosts. It seemed then as if every pore of life were choked, and Christendom must be stifled and smothered in the fatal embrace.” 9 But the devoted Anskar (801-865) went forth and sought out the Scandinavian viking, and handed on the torch of self-denying zeal to others, who saw, after the lapse of many years, the close of the mono- tonous tale of burning churches and pillaged monasteries, and taught the fierce Northman to learn respect for civilized institutions. 10 The gospel was first introduced into Norway in the 10th century by an Englishman named Hacon, though the real conversion of the country was due to Olaf Tryggvason. About the same time, and largely owing to the exertions of Olaf , Iceland, Greenland and the Orkney and Shetland islands we’re also’evangelized.

(d) Slavonic Missions. — Thus the ” gospel of the kingdom” was successively proclaimed to the Roman, the Celtic, the Teutonic and the Scandinavian world. A contest still more stubborn remained with the Slavonic tribes, with their triple arid many-headed divinities, their powers of good and powers of evil, who could be propitiated only with human sacrifices. Mission work commenced in Bulgaria during the latter part of the 9th century; thence it extended to Moravia, where in 863 two Greek missionaries — Cyril and Methodius — provided for the people a Slavonic Bible and a Slavonic Liturgy; thence to Bohemia and Poland, and so onwards to the Russian kingdom of Ruric the Northman, where about the close of the 10th century the Eastern Church ” silently and almost unconsciously bore into the world her mightiest offspring.” u But, though the baptism of Vladimir (c. 956-1015) was a heavy blow to Slavonic idolatry, mission work was carried on with but partial success; and it taxed all the energies of Adalbert, bishop of Bremen, of Vicilin, bishop of Oldenburg, of Bishop Otto of Bamberg the apostle of the Pomeranians, of Adalbert the martyr-apostle of Prussia, to spread the word in that country, in Lithuania, and in the territory of the Wends. It was

not till n 68 that the gigantic four-headed image of Swantevit was destroyed at Arcona, the capital of the island of Riigen, and this Mona of Slavonic superstition was included in the advancing circle of Christian

6 Church, Gifts of Civilization, p. 330. 6 Bede, H.E. v. 19.

7 ” Annal. Xantenses,” Pertz, Mon. Germ. ii. 220.

8 Bede, H.E. v. 10.

9 See Lightfoot, Ancient and Modern Missions.

10 See Hard wick, Middle Ages, pp. 1 09- 1 1 4.

11 Stanley, Eastern Church, p. 294. - . ,

civilization. As late as 1230 human sacrifices were still being offered up in Prussia and Lithuania, and, in spite of all the efforts of the Teutonic Knights, idolatrous practices still lingered amongst the people, while amongst the Lapps, though successful missions had been inaugurated as early as 1335, Christianity cannot be said to have become the dominant religion till at least two centuries later.

(e) Moslem Missions. — The mejvtion of the order of the Teu- tonic Knights reminds us how the crusading spirit had affected Christendom. Still even then Raimon Lull protested against propagandism by the sword, urged the necessity of missions amongst the Moslems, and sealed his testimony with his blood outside the gates of Bugiah in northern Africa (June 30, 1315). Out of the crusades, however, arose other efforts to develop the work which Nestorian missionaries from Bagdad, Edessa and Nisibis had already inaugurated along the Malabar coast, in the island of Ceylon, and in the neighbourhood of the

Caspian Sea. In 1245 the Roman pontiff sent two embassies — one, a party of four Dominicans, sought the commander-in-chief of the Mongol forces in Persia; the second, consisting of Franciscans, made their way into Tartary, and sought to convert the successor of Oktai-Khan. Their exertions were seconded in 1253 by the labours of another Franciscan whom Louis IX. of France sent forth from Cyprus, 1 while in 1274 the celebrated traveller Marco Polo, accompanied by two learned Dominicans, visited the court of .Kublai-Khan,, and at the commencement of the 14th century two Franciscans penetrated as far as Peking, even translating the New Testament and the Psalter into the Tatar language, and training youths for a native ministry. 2

(J) Missions to India and the New World. — These tentative missions were now to be supplemented by others on a larger scale. In 1488 the Cape of Good Hope was rounded by Diaz, and in 1 508 the foundations of the Portuguese Indian empire were laid by Albuquerque. Columbus also in 1492 had landed on San Salvador, and the voyages of the Venetian Cabot along the coast of North America opened up a new world to missionary enterpriser Thus a grand opportunity was given to the churches of Portugal and Spain. But the zeal of the Portuguese took too often a one-sided direction, repressing the Syrian Christians on the Malabar coast, and interfering with the Abyssinian Church, 3 while the fanatic temper of the Spaniard consigned, in Mexico and Peru, multitudes who would not renounce their heathen errors to indiscriminate massacre or abject slavery. 4 Las Casas has drawn a terrible picture of the oppression he strove in vain to prevent. 6 Some steps indeed were taken for disseminating Christian principles, and the pope had induced a band of mission- aries, chiefly of the mendicant orders, to go forth to this new mis- sion field. 6 But only five bishoprics had been established by 1520, and the number of genuine converts was small. However, every vestige of the Aztec worship was banished from the Spanish settlements. 7

(g) The Jesuit Missions. — It was during this period that the Jesuits came into existence. One of the first of Loyola's asso- ciates, Francis Xavier, encouraged by the joint co-operation of the pope and of John III. of Portugal, disembarked at Goa on the 6th of May 1542, and before his death on the Isle of St John (Hiang-Shang) , on the 2nd of December 1552, roused the European Christians of Goa to a new life, laboured with singular success amongst the Paravars, a fisher caste near Cape Comorin, gathered many converts in the kingdom of Travancore, visited Malacca, and fqunded a mission in Japan.

The successor of Xavier, Antonio Criminalis, was regarded by the Jesuits as the first martyr of their society (1562). Matteo Ricci, an Italian by birth, was also an indefatigable missionary in China for twenty-seven years, while the unholy compromise

1 Neander vii. 69; Hakluyt 171 ; Hue i. 207.

2 Neander vii. 79; Gieseler iv. 259, 260; Hardwick, Middle Ages, p. 337.

3 Geddes, History of the Church of Malabar, p. 4; Neale, Eastern Church, ii. 343.

- Prescott, Conquest of Mexico, i. 318, iii. 218.
- Relation de la destruction de las Indias.

6 Prescott, Mexico, iii. 218 n. ' Prescott iii. 219.

with Brahminfsm in India followed by Robert de' Nobili was fatal to the vitality of his own and other missions. Others of the same order evangelized Paraguay in 1582, while the Hugue- nots sent forth under a French knight of Malta a body of devoted men to attempt the formation of a Christian colony at Rio Janeiro. By the close of the 16th century a committee of cardinals was appointed under the name of the " Congregatio de propaganda fide," to give unity and solidity to the work of missions. The scheme originated with Gregory XIII., but was not fully organized till forty years afterwards, when Gregory XV. gave it plenary authority by a bull

dated the 2nd of June 1622; Gregory's successor, Urban VIII., supplemented the establish- ment of the congregation by founding a great missionary college, where Europeans might be trained for foreign labours, and natives might be educated to undertake mission work. At this college is the missionary printing-press of the Roman Church, and its library contains an unrivalled collection of literary treasures bearing on the work.

Modern Missions

Missionary Societies. — Modern missionary activity is. dis- tinguished in a special degree by the exertions of societies for the development of mission work.

As contrasted with the colossal display of power on the part of the Church of Rome, it must be allowed that the churches which in the 16th century broke off from their allegiance tothfe Latin centre at first showed no great anxiety for the extension of the gospel and the salvation of the heathen. The causes of this are not far to seek. The isolation of the Teutonic churches from the vast system with which they had been bound up, the conflicts and troubles among themselves, the necessity of fixing their own principles and defining their own rights, concentrated, their attention upon themselves and their own home work, to the neglect of work abroad. 8

Still the development of the maritime power of England, which the Portuguese and Spanish monarchies noted with fear and jealousy, was distinguished by a singular anxiety for the spread of the Christian faith. Edward VI. in his instructions to the navigators in Sir Hugh Willoughby's fleet, Sebastian Cabot in those for the direction of the intended voyage to Cathay, and Richard Hakluyt, who promoted many voyages of discovery in addition to writing their history, agree with Sir Humphrey Gilbert^ chronicler that " the sowing of Christianity must be the chief intent of such as shall make any attempt at foreign discovery, or else whatever is builded

upon other foundation shall never obtain happy success or continuance." When on the last day of the year 1600 Queen Elizabeth granted a charter to George, earl of Cumberland, and other "adventurers," to be a body-corporate by the name of " The Governor and Company of Merchants of London trading with the East Indies," the expressed recognition of higher duties than those of commerce may by some be deemed a mere matter of form, and, to use the words of Bacon, " what was first in God's providence was but second in man's appetite and intention." Yet a keen sense of missionary duty marks many of the chronicles of English mariners. Notably was this the case with the establishment of the first English colony in America, that of Virginia, by Sir Walter Raleigh. The philosopher Thomas Harriot (1560-1621), one of his colleagues, laboured for the conversion of the natives, amongst whom the first baptism is recorded to have taken place on the 13th of August 1 s87. 9 Raleigh himself presented as a part- ing gift to the Virginian Company the sum of £100 "for the pro- pagation of the Christian religion " in that settlement. 10 When James I. granted letters patent for the occupation of Virginia it was directed that the " word and service of God be preached,

8 We must not, however, overlook the remarkable appeal made by Erasmus in the first book of his treatise on the art of preaching (Ecclesiastes sive concionator evangelicus) . The salient passages are quoted in G. Smith, Short History of Christian Missions, pp. 1 16-1 18 ; Gustavus Vasa in 1559 made an effort to educate and evangelize the Lapps.

9 Hakluyt, Voyages, iii. 345.

10 Oldy, Life of Raleigh, p. 1 18.

planted and used as well in the said colonies as

also as much as might be among the savages bordering among them "; and the honoured names of Nicolas Ferrar, John Ferrar, John Donne and Sir John Sandys, a pupil of Hooker, are all found on the council by which the home management of the colony was conducted.

In the year 1618 was published The True Honour of Navigation and Navigators, by John Wood, D.D., dedicated to Sir Thomas Smith, governor to the East India Company, and about the same time appeared the well-known treatise of Hugo Grotius, De veritate religionis christianae, written for the ex- press use of settlers in distant lands. Grotius also persuaded seven law students of Liibeck to go to the East as missionaries; the best known of them was Peter Heiling, who worked for 20 years in Abyssinia. A good deal of work was done by Dutch evangelists in Java, the Moluccas, Formosa and Ceylon, but it was not permanent.

The wants, moreover, of the North American colonies did not escape the attention of Archbishop Laud during his official connexion with them as bishop of London, and he was developing a plan for promoting a local episcopate there when his troubles began and his scheme was interrupted. During the Protectorate, in 1649, an ordinance was passed for " the promoting and propa- gating of the gospel of Jesus Christ in New England " by the erection of a corporation, to be called by the name of the Presi- dent and Society for the Propagation of the Gospel in New England, to receive and dispose of moneys for the purpose, and a general collection was ordered to be made in all the parishes of England and Wales; and Cromwell himself devised a scheme for setting up a council for the Protestant religion, which should rival the Roman Propaganda, and consist of seven councillors and four secretaries for different provinces. 1 On the restoration of the monarchy, through the influence of Richard Baxter with Lord Chancellor Hyde, the charter already granted by Cromwell was renewed, and its powers were enlarged. For now the cor- poration was styled " The Propagation of the Gospel in New England and the parts adjacent in America," and its

object was defined to be ” not only to seek the outward welfare and pros- perity of those colonies, but more especially to endeavour the good and salvation of their immortal souls, and the publishing the most glorious gospel of Christ among them.” On the list of the corporation the first name is the earl of Clarendon, while the Hon. Robert Boyle was appointed president. Amongst the most eminent of its missionaries was the celebrated John Eliot, the Puritan minister of Roxbury, Massachusetts, who, encouraged and financially assisted by Boyle, brought out the Bible in the Indian language in 1661-1664. Boyle displayed in other ways his zeal for the cause of missions. He contributed to the expense of printing and publishing at Oxford the four Gospels and the Acts of the Apostles in the Malay language, and at his death left £5400 for the propagation of the gospel in heathen lands.

The needs of the colonial church soon excited the attention of others. George Fox, the Quaker, wrote to ” All Friends every- where that have Indians or blacks, to preach the Gospel to them and their servants.” Great efforts were made by William Beveridge (1637-1708), bishop of St Asaph, William Wake (1657-1737), archbishop of Canterbury, John Sharp (1645-1714), archbishop of York, Edmund Gibson (1669-1748), bishop of London, and afterwards by the philosophic Bishop Berkeley, and Bishop Butler, the famous author of the Analogy, to develop the colonial church and provide for the wants of the Indian tribes. In 1696 Dr Thomas Bray, at the request of the governor and assembly of Maryland, was selected by the bishop of London as ecclesiastical commissary; and, having sold his effects, and raised money on credit, he sailed for Maryland in 1699, where he promoted, in various ways, the interests of the Church. Return- ing to England in 1 700-1 701, and supported by all the weight of Archbishop Tenison and Henry Compton, bishop of London, he was graciously received by William III., and received letters

1 Neale, History of New England, i. 260; Burnet,

History of his own Times, i. 132 (" Everyman's Library " ed., p. 27).

patent under the great seal of England for creating a corporation by the name of the " Society for the Propagation of the Gospel in Foreign Parts " on the 16th of June 1701.

Meanwhile, in 1664, Von Welz, an Austrian baron, issued a stirring appeal to the Church at large for a special association devoted to extending the evangelical religion and converting the heathen. He was told that each Christian country should be responsible for its non-Christian neighbours, e.g. the Greeks for the Turks, and that as for the heathen it was no good casting pearls before swine. Finding no better response, he went him- self as a missionary to Dutch Guiana. The opening of the 18th century saw other movements set on foot. Thus in 1705 Frederick IV. of Denmark founded a mission on the Coromandel coast, and inaugurated the labours of Bartholomew Ziegenbalg, Henry Plutschau and C. F. Schwartz, whose devotion and success told with such remarkable reflex influence on the Church at home. Again in 1731 the Moravians (q. v.) illustrated in a signal degree the growing consciousness of obligation towards the heathen. Driven by persecution from Moravia, hunted into mountain-caves and forests, they had scarcely secured a place of refuge in Saxony before, " though a mere handful in numbers, yet with the spirit of men banded for daring and righteous deeds, they formed the heroic design, and vowed the execution of it before God, of bearing the gospel to the savage and perishing tribes of Greenland and the West Indies, of whose condition report had brought a mournful rumour to their ears. " And so, literally with " neither bread nor scrip," they went forth on their pilgrimage, and, incredible as it sounds, within ten years they had established missions in the islands of the West Indies, in South America, Surinam, Greenland, among the North Ameri- can tribes, in Lapland, Tartary, Algiers, Guinea, the Cape of Good Hope and Ceylon. 2 Up till this time all missionary enter- prises had been more or less connected with the state. The era

of modern missions, based on associate organizations, begins with William Carey (q.v.), and is closely connected with the great evangelical revival of the latter part of the 18th century. That revival had intensified the idea of the worth of the individual soul, whether Christian or heathen, and ” to snatch even one brand from the burning ” became a dominant impulse. In 1792, Carey, a Baptist, who was not only a cobbler, but a linguist of the highest order, a botanist and zoologist, published his Enquiry into the Obligations of Christians to use Means for the Conversion of the Heathens, and the book marks a distinct point of departure in the history of Christianity. Under its influence twelve minis- ters at Kettering in October 1792 organized the Baptist Society for Propagating the Gospel among the Heathen, and subscribed £13, 2s. 6d. In June 1793 Carey was on his way to India. Letters from him quickened interest outside his own communion, and in the autumn of 1794 a meeting of Evangelical ministers of all denominations resolved to appeal to their churches, especi- ally with a view to work being started in the South Sea Islands. The chief movers in the enterprise were the Congregationalist, David Bogue of Gosport, and the Episcopalian, Thomas Haweis, rector of Aldwinkle, Northamptonshire. With them were associated Wesleyan and Presbyterian divines, and in September 1795 the London Missionary Society, emphasizing no one form of church government, was formed. £10,000 was subscribed by June 1796, and in August 29 missionaries sailed for Tahiti. Societies formed in Glasgow and Edinburgh in the spring of the same year gave their attention to the continent of Africa.

The need of this continent was also the means of creating the distinctively Anglican organization known as the Church Missionary Society. The evangelical movement had produced philanthropists like Wilberforce and Granville Sharp, and the Eclectic Society, a group of clergy and laymen who fell to dis- cussing the new missionary movements. In April 1 799, under the guidance of John Venn and Thomas Scott, was established the Church Missionary

Society, originally known as the ” Society for Missions to Africa and the East.” Its promoters declared their intention of maintaining cordial relations with Nonconformist

2 J. B. Holmes, Hist. Sketches of the Missions of the United Brethren, p. 3; A. Grant, Bampton Lectures (1843), p. 190.

missionary societies, and this has largely been done, the older Society for the Propagation of the Gospel, manned by ” High ” Churchmen, standing more aloof. In 1814 the Wes- leyan Missionary Society was formed, Methodist effort of this kind having previously been left to the individual enterprise of Dr Thomas Coke. Thus shorn of two chief bodies of sup- porters, and Presbyterians in England being then comparatively few, the London Missionary Society became in effect a Congre- gationalist organization, though it has never departed from the broad spirit of its founders. In Scotland Robert Haldane sold his estate and devoted £25,000 to the cause; with others he would have gone to India himself but for the prohibition of the East India Company, one of whose directors said he would rather see a band of devils in India than a band of missionaries. What Carey did for England was largely done for Scotland by Alex- ander Duff, who settled in Calcutta in 1830, and was a pioneer of higher education in India. On the Continent the Basel Mission (1815) grew out of a society founded in 1780 to discuss the general condition of Christianity; ” Father ” Janicke, a Bohemian preacher in Berlin, founded a training school which supplied many men to the Church Missionary Society and the London Missionary Society; and Van der Kemp, who pioneered the London Missionary Society work in South Africa, organized in 1797 the Netherland Missionary Society, which turned its attention chiefly to Dutch Colonial

possessions.

In America as in England the sense of individual responsibility had been developed. In 1796 and 1797 respectively the New York and the Northern societies were formed for work among Indians by Presbyterians, Baptists and Reformed Dutch, acting in concert. News of the London Society stimulated interest in New England, and in 1806 Andover Seminary was founded as a missionary training college. In the same year Samuel J. Mills, Gordon Hall and James Richards, three students at Williams College, Massachusetts, formed themselves into a mission band which ultimately became the American Board of Commissioners for Foreign Missions (June 1810), an organization which, like the London Mission, originally undenominational and still catholic, has become practically Congregational. The first offshoot from it was the American Baptist Missionary Union in 1814.

The following chronological lists illustrate the growth of missionary societies in Britain and the United States : —

Great Britain and Ireland. 1691. Christian Faith Society for the West Indies. 1698 Society for Promoting Christian Knowledge. 1 701 Society for the Propagation of the Gospel in Foreign Parts. 1732. Moravian Missions. 1792. Baptist Missionary Society.

1795. London Missionary Society.

1796. Scottish Missionary Society. 1799. Church Missionary Society. 1799. Religious Tract Society.

1804. British and Foreign Bible Society.

1808. London Society for Promoting Christianity among the Jews.

1813. Wesleyan Missionary Society.

1817. General Baptist Missionary Society.

1823. Colonial and Continental Church Society.

1825. Church of Scciiand Mission Boards. National Bible Society of Scotland.

1 83 1. Trinitarian Bible Society.

1832. Wesleyan Ladies' Auxiliary for Female Education in Foreign

Countries.

1835. United Secession (afterwards United Presbyterian) Foreign

Missions.

1836. Colonial Missionary Society.

1840. Irish Presbyterian Missionary Society.

1840. Welsh Calvinistic Methodist Missionary Society.

1841. Colonial Bishoprics Fund.

1 841. Edinburgh Medical Missionary Society.

1843. British Society for the Propagation of the Gospel among the

Jews. (843. Free Church of Scotland Missions. /843. Primitive Methodist African and Colonial Missions.

Methodist New Connexion in England Foreign Missions.

1844. South American Missionary Society.

1847. Presbyterian Church in England Foreign Missions.

1858. Christian Vernacular Education Society for India.

i860. Central African Mission of the English Universities.

*862. China Inland Mission.

1865. Friends’ Foreign Mission Association.

1866. Delhi Female Medical Mission.

1867. Friends’ Mission in Syria and Palestine. 1876. Cambridge Mission to Delhi.

1880. Church of England Zenana Missionary Society. 1884. Presbyterian Mission to Korea. 1892. Student Volunteer Missionary Union.

United States of America. 1 733- Corporation for the Propagation of the Gospel in New England. 1787. Society for Propagating the Gospel among the Indians at

Boston. 1795. Friends’ Missionary Society. 1800. New York Missionary Society.

Connecticut Missionary Society for Indians. 1803. United States Mission to the Cherokees. 1806. Western Missionary Society for Indians. 1810. Board of Commissioners for Foreign Missions. 1 8 14. Baptist Missionary Union.

1819. Methodist Episcopal Church Missionary Society. 1833. Free-will Baptist Foreign Missionary Society in India. 1835. Foreign Missions of the Protestant Episcopal Church. 1837. Board of Foreign Missions of the Presbyterian Church (North). 1837. Evangelical Lutheran Foreign Missionary Society.

1842. Seventh Day Baptist Missionary Society. Strict Baptist Missionary Society.

1843. Baptist Free Missionary Society. 1845. Methodist Episcopal Church (South).

1845. Southern Baptist Convention.

1846. American Missionary Association.

1857. Board of Foreign Missions of (Dutch) Reformed Church; 1859. Board of Foreign Missions of United Presbyterian Church. 1862. Board of Foreign Missions of the Presbyterian Churc ,p > (South). 1878.

Evangelical Association Missionary Society. 1886. Student Volunteer Missionary Union.

It is not possible to follow in detail the history of the hundred or more organized societies of some size that have thus come into being since the end of the 1 8th century, still less that of the three or four hundred smaller agencies. 1 It may be noted, however, that the enter- prise has followed certain more or less clearly defined lines. These are described as follows by Dr E. M. Bliss, editor of the Encyclopaed-H of Missions.

1. The Denominational. — The course of denominational work may be seen in the way in which the London Society and the American Board were gradually left to the Congregationalists, it being recog- nized that while fraternity was maintained, the widest tesults could only be obtained as appeal was made directly to the members of each separate denomination. To some extent a similar development is traceable m other lands. In Germany the Rhenish Society (1825) became independent of the Basel Mission, but like it and the Berlin Society founded by Neander and Tholuck has preserved a broad basis and inclades both Lutheran and Reformed constituents. The North German or Bremen Society split into a strict Lutheran or Leipzig agency and the Hermannsburg Mission, which aimed at a more primitive and apostolic method. In Denmark, the Danish Missionary Society, founded by Pastor Bone Falck Ronne in 182I, worked through the Moravian and Basel societies until 1862, when it began independent work and concentrated on the Tamil population of South India. In Norway and Sweden missionary activity kept pace with the development of the national life ; in the former country the Free Church, in the latter the State Church has been the most successful agency.

In Holland a religious revival in 1846 led to the foundation of several organizations which supplemented the work of the original Netherland Missionary Society. In France protestant missionary effort began after the overthrow of the empire, and

in 1822 several isolated committees united to form the Soci£te des Missions Evange- liques, better known as the Paris Evangelical Society. In Tahiti, Madagascar and other fields this society has largely taken over work begun by the London Society, whose operations were viewed with suspicion by the French government.

2. Collateral Aid. — Side by side with the founding of the great missionary societies, Bible and Tract societies sprang up. The dates are significant: Society for Promoting Christian Knowledge. (1698), Religious Tract and Book Society of Scotland (1793), Religious Tract Society in London (1799), British' and Foreign Bible Society (1804), American Bible Society (1816), American Tract Society (1823). (See further Bible Societies.) Medical Missions have not been so much collateral organizations as departments of the work of the general societies, and the same is generally true of women's missions. Both of these will be discussed in more detail.

3. Independent and Special Agencies. — The individual element that was so marked a feature in Carey's generation has never vanished, in spite of the tendency to central control. J. Hudson Taylor in 1853 went to China as the agent of a number of folk in England who feared that missionary work was becoming too mechanical. His aim was to push inland and to work through native evangelists. Out of his endeavours sprang a new organization, the China Inland

1 For complete directory see Statistical Atlas of Foreign Missions

(1910).

/. British.

Mission; and similar undenominational societies, e.g. the Regions Beyond Missionary Union in England, and the Christian and Missionary Alliance in America, have since been founded. Other individual enterprises have been launched by persons or single churches, but such have not usually flourished for any length of time, their workers gradually attaching themselves to the larger associations.

Protestant Missions. — It is generally agreed that the period since 1885 has witnessed a very marked increase of missionary zeal and interest in Great Britain, both in the Church of England and among the Nonconformists. The improvement, indeed, dates back somewhat earlier. So far as the Church of England is concerned it may fairly be said to have started afresh in the year following the first observance of the Day of Intercession for Missions, on the 20th of December 1872. Both the Society for the Propagation of the Gospel and the Church Missionary Society were at that time suffering from a general coldness which, in the case of the latter society, had led in that very year to the committee reporting ” a failing treasury and a scanty supply of men.” The observance of that first Day of Intercession was followed by an immediate change, and unquestionably there has been progress ever since. Then, less than five months afterwards, David Livingstone died at Ilala; and no event of the whole century did so much to wake up Protestant Christendom. Most of the missions in Central Africa owe their origin to the spirit it aroused. But the year 1884 was also an epoch to be marked. In that year Bishop Hannington went to Africa; and his murder in 1885 (first reported in England on New Year’s Day, 1886) deeply touched the Christian conscience. The speedy publication of E. C. Dawson’s biography of him worked a revolution in the circulation of missionary literature. Another event of 1884-1885 was the going forth to China of ” The Cambridge Seven,” in connexion with the China Inland Mission. All were men of good family; some of them went at their own charges; and among them were the stroke-oar of the University Eight (Mr Stanley Smith) and the captain

ofithe University Eleven (Mr C. T. Studd). Probably no event of recent years has exercised a wider influence in the cause of missions. In particular, university graduates have since then gone out as missionaries in much larger numbers than before. There are now five missions definitely linked with the universities. The Central African Mission (1858), indeed, is not for the most part manned by graduates, though it is led by them ; but the Cambridge Mission at Delhi (1878), the Oxford Mission at Calcutta (1880), and the Dublin Missions in Chota Nagpur (Society for the Propagation of the Gospel, 1891) and the Fuh-Kien Province of China (Church Missionary Society, 1887) consist of university men. Moreover, the older and larger societies have much increased the proportion of graduates on their staffs.

The cause of missions in the universities has been fostered greatly by the Student Volunteer Missionary Movement, initiated in America in 1886, and organized in England in 1892. The Union has over 3000 members (of whom 1400 have gone to the field), and has adopted as its watchword, ” The Evangelization of the World in this Generation”; and this motto has been approved by several bishops and other Christian leaders. An- other influence upon university men and others who have taken holy orders is that of the Younger Clergy Union of the Church Missionary Society (1885) and the Junior Clergy Association of the Society for the Propagation of the Gospel (1891). At the same time there has been a great accession of men to the mission- ary ranks from among other classes of society. The Anglican societies and the regular and older Nonconformist societies (Methodist, Baptist, Presbyterian and the London Missionary Society, which is virtually Congregationalist) have shared in these humbler recruits; but a large proportion of them have joined several younger ” non-denominational ” or ” inter-denominational ” missions. Of these the China Inland Mission is the largest and most influential; and while it has sent forth many of this class, it has also enrolled not a few men and women of

considerable wealth, education and social status. The South Africa General Mission, the North Africa Mission, and the Congo Balolo Mission come next in importance; but there are several

smaller bodies working in different countries. The Salvation Army also has missions in India, Ceylon and Japan; but these cannot be called ” non-denominational,” because the Army has gradually become a very strict denomination itself. There is one Anglican society working, like some of those just men- tioned, in one particular field, viz. the South American Missionary Society, founded in 1844. Many foreign dioceses also have associations in England for their lielp and support. Medical men have come forward in increasing numbers for mis-sionary service, and medical missions are now regarded as a very important branch of the work of evangelization. They are especially valuable in Mahommedan countries, where open preaching is difficult and sometimes impossible, and also in works of mercy among barbarous tribes; while in China, which comes under neither of these two categories, they have been largely developed. There are 980 doctors (most of them fully qualified) labouring in British and American missions; and in 1910 it was calculated that the in-patients in mission hospitals exceeded 160,000, while the visits of out-patients in a year were about 5,000,000. In several of the great London hospitals there are missionary associations, the members of which are medical students; but a chief source of supply in the past has been the Edinburgh Medical Mission, founded in 1841, which, while* working among the poor in that city, has trained many young doctors for missionary service.

The most remarkable development of missionary enterprise has been the employment of women. From an early date many of the wives of missionaries have done good service; but the going forth of single women in any appreciable number has only been encouraged by the societies in the last quarter of the 19th century. The Society for Promoting Female Education in the East (now absorbed by others,

chiefly by the Church Missionary Society) was founded in 1834; the Scottish Ladies' Association for the Advancement of Female Education in India (which subsequently became two associations, for more general work, in connexion with the Established and Free Churches of Scotland respectively) in 1837; the Indian Female Normal School Society (now the Zenana Bible and Medical Mission) in 1861 (taking over an association dating from 1852) ; the Wesleyan Ladies' Auxiliary in 1859; the Women's Association of the Society for the Propagation of the Gospel, and the Baptist Zenana Mission, in 1867; The London Society's Female Branch, in 1875; the Church of England Zenana Society (an offshoot from the Indian Female Society) in 1880. But the earlier of these organi- zations only contemplated employing women for educational work on a very small scale. Out of it grew the visitation oi Indian zenanas. The employment of women in general evan- gelistic work, such as village itineration, house-to-house visiting in towns, classes for female inquirers, training of native female workers, &c, although recent, has rapidly extended. The Church Missionary Society, besides relying on the above-named Zenana Bible and Medical Mission and Church of England Zenana Missionary Society for women's work at several of its stations in India and China, sent out 500 single women in the fifteen years ending 1900; and the non-denominational missions above referred to have (including wives) more women than men engaged in their work — especially the China Inland Mission, which has sent out several hundreds to China. Women's work and medical work are combined in the persons of nearly 300 fully-qualified lady doctors in various missions. Although nearly half the male missionaries (Protestant) are unmarried, these are exceeded in number by the unmarried women; and consequently, the husbands and wives being equal, the aggregate of women in the Missions is greater than the aggregate of men.

The home organization of missions is a subject that has been much considered. The bulk of the work has been done by volun- tary societies, membership in

which depends upon a pecuniary subscription, and the administration of which is entrusted to elected committees. These committees comprise not only real experts, such as retired veteran missionaries, and retired civil and military officers who have been active friends of missions while on foreign service, but also leading clergyman and laymen

who, though not personally acquainted with the mission fields, become almost equal experts by continuous attendance and care- ful study. In the case of the two leading Church of England societies, the bishops (being members) axe ex officio on all execu- tive committees; but their labours in other directions prevent their ordinarily attending. The numerous non-denominational missions previously referred to are differently worked. There is no membership by subscription, nor any elected committee. The ” mission ” consists of the missionaries themselves, and they are governed by a ” director,” with possibly small advisory councils in the field and at home, the latter undertaking the duty of engaging missionaries and raising funds.

On the other hand, there is a growing sense that missions should be the work of the Church in its corporate capacity, and not of voluntary associations. This is the system of the Presby- terian Churches, the missions of which are entirely controlled by the General Assemblies in Edinburgh, Belfast and London respectively. The Wesleyan Society also is under the authority of the Conference. In the Church of England the question was broached in Convocation, shortly after the revival of that body, in 1859; and during the next few years many suggestions were p

The closing years of the 19th century were remarkable for the centenary commemorations of the

older missionary societies. The Baptist Society celebrated its centenary in 1892; the London Missionary Society (Congregational) did the same in 1895; the Society for Promoting Christian Knowledge kept its bi- centenary in 1898; the Church Missionary Society its centenary in 1899; the Society for the Propagation of the Gospel its bicentenary in 1900-1901; and the British and Foreign Bible Society its centenary in 1904. Considerable special funds have been raised in connexion with these commemorations. A good deal of interest has also been awakened and maintained by missionary exhibitions, and by a more intelligent type of missionary literature.

Colonial missions next claim attention. By ” colonial ” is meant, not missions to the British colonial population, but 2 Colonial m i ss i° ns from the colonial population to the heathen. The former have been very largely the work of the Society for the Propagation of the Gospel, and, in a smaller degree, of the Colonial Church Society (Church of England) and the Colonial Missionary Society (Congregational) . Those missions, however, are more properly an outlying branch of home missions, being to the professing Christian settlers or their descendants. But these Christian settlers have their own missions to the heathen — both to the heathen at their doors and to the great heathen lands beyond.

In Canada and Australia, the Anglican, Presbyterian, Metho- dist, Baptist and other communities have regular organizations for foreign missions. The non-episcopal; missions thus formed and supported are worked quite independently of the home societies of the denominations respectively. The Australian Presbyterians have important agencies in the South Seas and in Korea, the Australian Baptists in Bengal, the Canadians of

various denominations in the Far North- West of the Dominion, and in India and China. The Anglican Church in Canada has its Domestic and Foreign Missionary Society, working in the North- West and

in Japan; and in Australia it has a Board of Missions, working amongst the Australian aborigines and in New Guinea. The Melane&an Mission, associated with the names of Selwyn and Patteson, is officially connected with the Church of New Zealand, but is also largely supported in Australia. In New South Wales, Victoria, New Zealand and Canada there are also Church missionary associations which supply missionaries, and support them, for the mission fields of the Church Missionary Society.

The German societies are numerous and important, and have increased in number and in vigorous work. The Moravian Church, whose missions are the oldest (1732), is itself a missionary organization in a sense in which no \fntaL other Christian community rivals it. Its total membership is under 100,000, and it has some 350 mission- aries, labouring in the most unpromising fields— Greenland, Labrador, Alaska, Central America, Tibet, and among the Hot- tentots. The Basel Society, with its famous seminary at Basel, which formerly supplied many able German missionaries to the Church Missionary Society, has extensive work in India, West Africa and South China. The Berlin Society and the Rhenish Society labour in South Africa and China, the Hermannsburg Mission (Hanover) in South Africa and India; Gossner's Mission (Berlin) and the Leipzig Lutherans in India. At least two of these societies, and other new associations formed for the pur- pose, and the Moravians, have taken up work in German East Africa. The principal organizations in Holland are the Nether- lands Missionary Society and the Utrecht Missionary Society, working mainly in the Dutch colonies. A Danish society has a mission in South India. The old Swedish and Norwegian missionary societies work in South Africa, Madagascar and India; but large numbers of Scandinavians have been stirred up in missionary zeal, and have gone out to China in connexion with the China Inland Mission; several were massacred in the Boxer outbreaks. . The French Protestants support the Soci&S des Missions Svangeliques, founded in 1822. Its chief mission has been in Basutoland, since extended to the Zambesi;

but it has also followed French colonial extension, establishing missions in Senegambia, the French Congo, Madagascar and Tahiti.

The newer American organizations are, as in England, non- denominational and ” free-lance,” especially the Christian and Missionary Alliance (1897), developed from the^^ marfcaa International Missionary Alliance (1887), which has sent many missionaries to India and China. The older societies attribute to these new agencies more zeal than discretion, while the newer credit the older with a discretion that cripples zeal. The Student Volunteer Movement, already referred to, has had large influence in the United States, where it arose; and its leaders have proved themselves men of rare intellectual and practical capacity. In a journey round the world in 1895-1897, J. R. Mott succeeded in forming students’ associations in universities and colleges in several European countries, as well as in Turkey in Asia, Syria, India, Ceylon, China, Japan and Australia; and all these associations, over 150 in number, are now linked together in a great International Student Federation. The older American societies, especially the American Board (Congregational), the Presbyterian Boards, the Methodist Episcopal Church Society, the Baptist Missionary Union, and the Missionary Society of the Protestant Episcopal Church, have much extended their work. The ” Ecumenical Missionary Conference,” held at New York in April 1900, was an astonishing revelation to the American public of the greatness of missions generally and of the missions of their own churches in particular. The Laymen’s Missionary movement is a significant outcome of the interest then awakened.

Missions to the Jews are worked by distinct organizations. There are several societies in England, Scotland, Germany and America. No special development has to be reported, except the great extension of John Wilkinson’s MUdmay Mission to

the Jews, and its energy in the free distribution of Hebrew New Testaments. Converted Jews are commonly supposed to be

very few, and in numbers they do not compare with to the Jews, converted heathen; but they are more numerous than

is usually imagined, especially if the second and third generations of Christians of Hebrew race are included. A number of them find in Unitarianism a form of Christianity that appeals to them. It is estimated that 250 Anglican clergy- men are converted Jews or the sons of converted Jews. The London Society for Promoting Christianity among the Jews includes among its missionaries about 80 who are converts. Professor Delitzsch estimated that 100,000 Jews had embraced Christianity in the first three quarters of the 19th century; and Dr Dalman of Leipaig says that ” if all those who have entered the Church and their descendants had remained together, instead of losing themselves among the other peoples, there would now be a believing Israel to be counted by millions, and no one would have ventured to speak of the uselessness of preaching the Gospel to the Jews.”

Interesting as is the story of Protestant mission work in Austria, Spain, Italy and Russia, it does not fall within the scope of this article. Nor do the proselytizing enterprises of Seventh Day Ad- ventists, Christian Scientists, Mormons and other American bodies rightly find a place here.

Roman Catholic Missions. — At the beginning of the 19th century the Roman Communion seems to have shared to some extent in the torpor and stagnation as regards missions that characterized the Protestant churches. There was little of the zeal which had carried the Franciscans all over Asia in the 13th century, and the Jesuits to South America,

India and Japan in the 1 6th. But the 19th century witnessed a great change, and Roman Catholic missions have been extended pari passu with Protestant. The revival was not a little due to the foundation in 1)522, by a few earnest but (as they called themselves) ” humble and obscure ” Catholics at Lyons, of a new voluntary society, called the Institution for the Propagation of the Faith. It collected in its first year about £2000 from the shopkeepers and artisans of Lyons. Thirty years later its income was £200,000 a year; and now it is £300,000. It has sent out no missionaries of its own. It merely makes grants to the various missionary parties sent forth, and it has done much in this direction. Roman missions are carried on both by missionary societies and by religious orders, all under the supreme direction of the pope, and also more or less under the general supervision of the Sacra Congregatio de Propaganda Fide at Rome since its foundation by Gregory XV. in 1622. This important congregation has been described as corresponding pretty much in the Catholic Church to the colonial office in the British empire, and its head, the ” Prefect of Propaganda,” to the secretary of state for the colonies. It holds supreme control over all the foreign missions in heathen countries, and also over large and important parts of the church in Christian countries whose governments are not Catholic — including the British empire, the United States, Holland, the Norse kingdoms, Greece, and some parts of Germany and Switzerland. A special section (erected by Pius IX.) has charge of the affairs of all the Oriental rites in union with the Romun see. Confining our attention at present to the missions strictly understood under ” foreign,” i.e. to heathen or non- Christian countries, we shall find the whole of these parts of the globe carefully mapped and parcelled out by propaganda to a variety of missionary agencies or religious orders. The govern- ment of the various mission fields is generally carried on by ” Vicars-Apostolic ” (i.e. titular bishops acting as vicars or dele- gates of the Apostolic see) or ” Prefects-Apostolic ” (i.e. priests with similar powers, but without episcopal

rank). In some few cases (notably India and Japan) a regular territorial hierarchy has been established, just as in the United Kingdom and the Nether- lands. Of the religious societies engaged in the evangelization of these many fields of labour, some have been established exclu- sively for foreign missionary work among the heathen — notably the famous Societe des Missions Etrangeres of Paris, the oldest ■andgreatest of all (dating from 1658, and consisting of 34 bishops,

1200 European missionaries and 700 native priests) ; the German ” Society of the Divine Word,” whose headquarters are at Steyl in Holland; the Belgian Society of Scheat; the celebrated French Society of the ” White Fathers,” founded by the late Cardinal Lavigerie for African missions; the English Society of St Joseph, founded at Mill Hill by Cardinal Vaughan; and some others. The other missions are entrusted to the care of various religious orders and congregations, which take up foreign missionary work in addition to their labours in Christian countries. Such are the Franciscans, Dominicans, Jesuits, Lazarists, Augustin- ians, Marists, &c. Besides the above orders of priests, an immense number of religious societies of women are engaged iir works of education and charity throughout the whole of the foreign mission field. These have been reckoned at about 42,000 European and 10,000 native sisters. Again, there are some 20 congregations of ” Brothers ” (not priests) engaged in teaching, and numbering some 4500 members.

By far the greater part of the Roman missionary work is done by France. The majority of the missionaries are French (over 7000); the bulk of the money — so far as it is voluntary contribution (but the propaganda at Rome has large endow- ments) — is raised in France. The French government, anti-clerical as it is at home, is the watchful and strenuous protector of the missions abroad; and it is evident that not a little political influence in foreign countries is gained thereby. L’Annee de I’Eglise, in reporting on the missions in all parts of the world, dwells continually on this with

satisfaction. Protestant mission- aries are opposed, not merely because they are heretical, but because they are English or (if American) English-speaking; and the Greek Church missionaries in Persia and Japan, not only because they are schismatic, but because they are Russian — the Franco-Russian alliance notwithstanding. This is a feature in French Catholic missions which cannot be overlooked in the briefest account of them.

The following list shows the principal foreign Roman Catholic missionary societies and their fields of work : — ■

I. SodHS des Missions Etrangeres (Paris, 1658). — Missions: Manchuria, Korea, Tibet, Japan, China (Sze-Chuen, Kui-Chow, Kwang-tong, Yunnan), Indo-China (W., S. and Upper Tongking, E., W. and N. Cochin-China ; Cambodia, Siam), Malay Peninsula, Burma (S. and N), S. India (dioceses of Pondicherry, Kombakonam, Mysore, Coimbatore). II. Society of ” White Fathers ” (founded by Cardinal Lavigerie, 1868). — Missions: Algeria, Sahara, Nyasa, Victoria Nyanza, Tanganyika, Unyanyembe, Upper Congo.

III. Lyons Seminary for Foreign Missions (1856). — Missions:

Nile Delta, Benin, Ivory Coast, Gold Coast, Dahomey, Upper Niger.

IV. Congregation of the Holy Ghost (1703 and 1848). — Missions:

Senegambia, Gambia, Sierra Leone, Lower Niger, Gaboon, French Congo, Lower Congo, Mayotte, Nossibe 1 and Comoro Islands. V. Milan Seminary for Foreign Missions (1850). — Missions: China (Hong Kong, N. and S. Ho-nan), East Burma, India (dioceses of Kishnagar and Haidarabad). VI. Steyl Society of Foreign Missions (German, 1875). — Missions: S. Shan-tung, China; Togo, W. Africa. VII. Scheat Society of Foreign Missions (Belgian, 1863). — Missions: Mongolia, Kang-Su (China), Belgian Congo. VIII. Picputian Society 1 (Paris, 1817). — Missions:

Hawaii, Tahiti, Marquesas Islands. IX. Mill Hill Society (English, 1866). ^Missions: N. Borneo and Labuan; N. Punjab, Kashmir and Ladak; Telugu missions of Madras; Maori missions of N. New Zealand; N. Uganda. X. Congregation of the Sacred Heart (Issoudun, France, 1855). — Missions: New Guinea, New Pomerania, Gilbert Islands XL Society of 'the Divine Saviour (Rome, 1881). — Mission : Assam. XII. Verona Society for African Missions. — Mission: The Sudan,

Upper Egypt. The following societies are engaged in home as well as foreign missions : — XIII. Marists (French, 1816). — Missions: Fiji, Navigator's Island, New Caledonia, Central Oceania, Solomon Islands, parts of New Zealand (dioceses of Wellington and Christ- church).

1 Father Damien belonged to this society, which takes its popular name from the Rue de Picpus, Paris.

XIV. Lazarists (founded by St Vincent de Paul, 17th century).— Missions: Abyssinia, Persia, China (Peking or N. Chih-li, S.-W. Chih-li, Kiang-si, Che-Kiang), S. Madagascar. XV. Oblates of Mary Immaculate (1840). — Missions: Ceylon (nearly all), S. Africa (Basutoland, Natal, Transvaal, Orange River Colony), the " Great North- West " of Canada (Athabasca-Mackenzie, Saskatchewan, St Boni- face, New Westminster). XVI. Saiesians (founded by Don Bosco).— Missions: Patagonia and Tierra del Fuego, Falkland Islands, Indians of S. America (Ecuador, Brazil, Argentine); some missions in Palestine. XVII. Pallottines. — Missions: Cameroon, W. Africa; Australia (Beagle Bay, native settlement).

XVIII. Jesuits. — Missions: India (dioceses of Bombay, Poona, Calcutta, Madura, Mangalore,

Trichinopoly) , Ceylon (dioceses of Galle and Trincomalee), China (Kiang-nan, S.-E. Chih-li), Madagascar, Koango (W. Africa), Zam- bezia, Jamaica, British Guiana, British Honduras, Alaska. XIX. Dominicans. — Missions: Asiatic Turkey (Mosul), Tongking (N., E. and Central), China (Amoy, Fokien), Curacao, Trinidad. XX. Franciscans. — Missions: Egypt, Tripoli, Morocco, China (N. and S. Shan-si, N. and E. Shan-tung, N. Shen-si, E., N.-W. and S.-W. Hu-pe). Capuchins: Aden and Arabia, India (dioceses of Agra, Allahabad, Lahore), Seychelles, Eritrea (Red Sea), Gallas, Cephalonia, Trebi- zond, Mardin, Crete, Caroline Islands, Araucania, Brazil, Bulgaria. Conventuals: Jassy (Rumania). XXI. Benedictines. — Missions: Ceylon (diocese of Kandy), New Zealand (diocese of Auckland), N. American Indians (Indian Territory and Oklahoma), Australian natives (New Nursia).

XXII. Trappists. — Missions: Settlements in Natal (Marianhill) , West Africa (Congo), China, Japan.

XXIII. Augustinians. — Missions: Philippines, China (N. Hu-nan),

Balkan Peninsula, Asia Minor (” Assumptionists “).

XXIV. Carmelites. — Missions: Bagdad, India (djoceses of Verapoly

and Quilon). XXV. Redemptorists. — Missions : Dutch Guiana. XXVI. Passionists. — Missions: Bulgaria (diocese of Nicopolis).

These missions are largely supported by the Society of the Propaga- tion of the Faith (est. in Lyons, 1822), Society of the Holy Childhood (est. 1843 as auxiliary to the former; ” children for children “) and Society of the Schools of the East (est. 1855).

On figures given in H. A. Krose’s Katholische Missions- statistik (1908), the following totals of Roman Catholic Missions amongst non-Christians have been compiled: European priests, 7933; native priests, 5837; lay brothers, 5270; sisters, 21,320;

catechists, 24,524; native membership, 7,441,215; catechumens, 1,517,909. The annual baptisms of adult heathen are 190,000; those of heathen children at the point of death, 450,000. Over 840,000 children are in lower schools, 66,000 in middle schools, and 90,000 in orphanages. The total number of schools is 24,000, of churches and chapels 28,000, and of mission stations

43,000.

Note. — Where figures for 1910 are quoted in this article they are really those of two cr three years earlier, collected for the World Conference of 1910.

Orthodox Eastern Church. 1 — When the tsar Ivan the Terrible (1 533-1 584) began the great advance of Russia into Northern Asia, a large number of missionaries accompanied the troops, and during the 17th century many thousands of Tatars were baptized, though from lack of fostering influences they lapsed into heathenism. Very little was done until 1824, when John Veniaminov (d. 1879), a priest of Irkutsk, afterwards Archbishop Innocent, began a career of evangelistic activity which has few parallels. He founded missions in Alaska and the Aleutian Islands, Kamtchatka and throughout Eastern Siberia, and established the Orthodox Missionary Society at Moscow. In Altai (Central Siberia) the Archimandrite Macarius, and among the Tatars in south-east Russia with headquarters at Kazan the great linguist Ilminski, did similar work. In addition to the nine distinct missions (300 workers) in Siberia and the six (with 50 workers) in European Russia, the Orthodox Church (Russian) has three foreign missions: (1) in China, founded at Pekin 17 14, in the face of Jesuit opposition; (2) in Japan, established about 1863 by Bishop Nicolai, a chaplain at Naga- saki; (3) in Alaska and the Aleutian Islands, the bishop residing

1 See E. Smirnoff, Russian Orthodox Missions ; an article in The East and the West (April, 1904) ; and the Statistical Atlas (1910); p. 99.

at San Francisco and having jurisdiction also over members ol the church settled in the United States of America Altogether the Russian Church spends over £30,000 annually on these missions, and works with the British and Foreign Bible Society in translating and distributing the Scriptures. In japan the mis- sion has become a practically independent branch of the Church.

History of Mission Fields

The continuity of missionary enthusiasm maintained through the primitive, the medieval, and the modern periods of the Church's history, operating at every critical epoch, and surviving after periods of stagnation and depression, is a very significant fact. It is true that other religions have been called missionary religions, and that one of them long held first place in the religious census of mankind. The missionary, activity of Budd- hism is a thing of the past, and no characteristic rite distinguish- ing it has found its way into a second continent. Mahomme- danism indeed is active, and is the chief opponent of Christianity to-day, but the character of its teaching is too exact a reflection of the race, time, place and climate in which it arose to admit of its becoming universal. It is difficult to trace the slightest probability of its harmonizing with* the intellectual, social and moral progress of the modern world. With all its deficiencies, the Christian church has gained the " nations of the future," and whereas in the 3rd century the proportion of Christians to the whole human race was only that of one in a hundred and fifty, this has now been exchanged for one in three, and it is indisputable that the progress of the human race at this moment is identified with the spread of the influence of the nations of Christendom.

Side by side with this continuity of missionary zeal, a notice- able feature is the immense influence of individual energy and the subduing force of personal character. Around individuals penetrated with Christian zeal and self-denial has

centred not merely the life, but the very existence of primitive, medieval and modern missions. What Ulfilas was to the Gothic tribes, what Columba and his disciples were to the early Celtic missions, what Augustine or Aidan was to the British Isles, what Boniface was to the churches of Germany and Anskar to those of Denmark and Sweden, that, on the discovery of a new world of missionary enterprise, was Xavier to India, Hans Egede to Greenland, Eliot to the Red Indians, Martyn to the church of Cawnpore, Marsden to the Maoris, Carey, Heber, Wilson, Duff and Edwin Lewis to India, Morrison, Gilmour, Legge, Hill, Griffith John to China, Gray, Livingstone, Mackenzie, Moffat, Hannington, Mackay to Africa, Broughton to Australia, Patteson to Melan- esia, Crowther to the Niger Territory, Chalmers to New Guinea, Brown to Fiji. 2 At the most critical epochs such men have ever been raised up, and the reflex influence of their lives and self-denial has told upon the Church at home, while apart from their influence the entire history of important portions of the world's surface would have been altered.

If from the agents themselves we turn to the work that has been accomplished, it will not be disputed that the success of missions has been marked amongst rude and aboriginal tribes. What was true in the early missions has been found true in these latter times. The rude and barbarous northern peoples seemed to fall like " full ripe fruit before the first breath of the gospel." The Goths and the Vandals who poured down upon the Roman Empire were evangelized so silently and rapidly that only a fact here and there relating to their conversion has been preserved. This is exactly analogous to modern experience in the South Seas, Asia and Africa, to a survey of which we now turn.

The South Seas. — Missionary work in the Pacific began with Magellan (15 21), when in a fortnight he converted all the in- habitants of Cebii and the adjacent Philippine Islands! The Jesuits, Recollets and Augustinians also worked in Mariana, Pelews and Caroline Islands, though the two latter were soon

abandoned. The beginning of modern effort was made by the London Missionary Society in 1797.

2 E. Stock's Short Handbook of Missions has a chapter on " Some Notable Missionaries" and another on "Some Prominent Native Christians."

[MISSION FIELDS

Australia and New Zealand. — The earliest attempt to evange- lize the aborigines of Australia by a separate mission was that of the Church Missionary Society in 1825. This work centred at Wellington Valley and Moreton Bay, but was given up in 1842. A new beginning was made in 1850 by the Anglican Board of Missions for Australia and Tasmania, and now each diocese is responsible for its own area. At Bellenden Ker, near Cairns, in North Queensland (diocese of Carpentaria), many natives have settled upon a reserve granted by government to the Anglican Church, and at another reserve, Fraser Island, the diocese of Brisbane has also undertaken successful work. Nomadic aborigines have hardly been touched. Apart from Queensland most of the black population is in West Australia; here the Roman Catholic Church is the main evangelizing agency. In the north and central districts the German missions have been active. Both in Australia (especially in Sydney and Melbourne) and at Thursday Island there is work among the Chinese.

In Tasmania the aborigines are extinct, the last pure-blooded native dying in 1876. The half-castes settled in the Bass Straits are ministered to by the bishop of Tasmania. The Maoris of New Zealand first came under Christian influence through the efforts of Samuel Marsden," a colonial chaplain in New South Wales about 1808. In 1822 Wesleyan missionaries reached the island. The first baptism was in 1825 but during the next five years there was a great mass movement. In 1840 the country became a British

colony, and soon afterwards George Selwyn was consecrated bishop. He was so impressed with the work of native evangelists that he founded a college in Auckland where such teachers could be trained. In this he was helped by J. C. Patteson, and out of it grew the Melanesian Mission. The Maori rebellion, fomented by French Catholics, was an outbreak against everything foreign, and the strange religion Hau-hauism, a blend of Old Testament history, Roman Catholic dogmas, pagan rites and ventriloquism, found many adherents. Yet the normal missionary organization suffered very little. Later came Mormon missionaries, and these have to some extent further depleted the Christian ranks.

New Guinea. — In this large island some Gossner missionaries (1854) were the pioneers. They could not do much, but their successors, the Utrecht Missionary Union, who began work when the Dutch took possession of the north-west of the island, are making themselves felt through their six stations. In German New Guinea the Neuendethelsau (1886) and Rhenish (1887) Societies have fourteen stations. In British New Guinea, the south-east portion of the island, the London Mission (1871), the Australian Wesleyans (1892) and the Anglican Church of Australia (1892), have arranged a friendly division of the field and met with gratifying success. Work was begun in 1871-1872 when under the oversight of S. Macfarlane and A. W. Murray a number of native teachers from the Loyalty Islands Rarotonga and Mare settled on the island. The first converts were baptized in 1882 and the establishment of a British Protectorate (1884-1888) gave the work a new impetus. The name of W. G. Lawes and James Chalmers (who with O. Tompkins was killed by cannibals, 1901) of the London Missionary Society, and that of Maclaren, the pioneer of the Church Missionary Society's work, are immor- tally associated with Papua. The history of mission work here is one of exploration and peril amongst savage peoples, multitudinous languages and an adverse climate, but it has been marked by wise methods as well as enthusiastic devotion, industrial work being one of

the basal principles. Besides the Protestant agencies already named, the Roman Catholic Order of the Sacred Heart has been working in the island since 1886; its centre is at Yule Island, and it works up the St Joseph's river.

Other Islands. — The London Mission ship "Duff" in 1797 landed eighteen missionaries (mainly artisans) at Tahiti, ten more in the Tonga or Friendly Islands, and one on the Marquesas. Those in Tahiti had a varying experience, and their numbers were much reduced, but in July 181 2 King Pomare II. gave up his idols and sought baptism. By 1815 idolatry was abolished in the larger islands of the group and there ensued the task of building up a Christian community. Foremost in this work

were William Ellis (q.v.) and John Williams (g.v.), who formed a native agency to carry the gospel to their fellow islanders, and so inaugurated what has since been a characteristic feature of South Sea Missions. In 181 8 two Tahiti teachers settled in the Tonga islands, which the " Duff " pioneers had abandoned after half of them had been killed for a cannibal feast. When the Wesleyans came in 182 1 the way had been prepared, and soon after, led by their king, George, the people turned to the new faith. About the same time Rurutu in the Austral Islands and Aitutaki in the Cook Islands were evangelized, also by natives, and Christianity spread from island to island. John Williams himself removed in 1827 to Rarotonga and from there influenced Samoa, the Society Islands and Fiji. To Fiji in 1834 came James Calvert and other Wesleyan missionaries beginning a work which under them and their successors had extraordinary success. Williams met his death at Erromanga in 1839, but he had established a training school on Rarotonga, and bought a ship, the " Camden," which was of the greatest service for the work. In 1841 work was begun in New Caledonia, in 1842 in the Loyalty Isles and in the New Hebrides, associated from 1857 with the memorable name of John G. Paton. In 1846 a teacher was placed on Niue, Savage Island, and in ten years it was evangelized. Meanwhile the original work in Tahiti had been taken

over by missionaries of the Paris Society, though the last London Missionary Society agent did not leave that group till 1890. In 1861 Patteson was consecrated bishop of Melanesia, and the Auckland training school was removed to Norfolk Island. By arrangement with the Presbyterians the area of the mission includes the Northern New Hebrides, Banks, Torres, Santa Cruz and Solomon Islands. Patteson was murdered in 1871, a victim of the mistrust engendered in the natives by kidnapping traders. In 1877 John Selwyn was consecrated bishop. Wesleyan native evangelists from Fiji and Tonga carried Christianity in 1875 to the Bismarck Archipelago.

The solitary worker (W. P. Crook) on the Marquesas did not remain long, and after he went nothing was done till 1833-1834, when first some American and then some English missionaries arrived, but met with scant success and gave it up in 184 r. Since 1854 teachers from the Hawaiian Islands have worked in the Marquesas, but results here have been less fruitful than anywhere else in the South Seas. In Hawaii itself much was accomplished by American missionaries, the first of whom were H. Bingham and A. Thurston (1820), and the most successful, Titus Coan, under whose leadership over 20,000 people were received into the churches between 1836 and 1839. Under the reign of Kalakaua (1874-1891) there was a strong reaction towards heathenism, but since the annexation of the islands by the United States of America the various churches of that land have taken up the task of evangelization and consolidation.

In the Micronesian Islands, while animism and tabu were strong, there was not the cannibalism of the southern islands. Work was begun in the Caroline Isles in 1852 and in time spread to the Gilbert and Marshall groups. In the Carolines and Mar- shalls it has now largely passed to German missionaries, the Americans having enough to do in the Philippines, where there are already over 27,000 Protestants.

The outstanding features of missionary work in the South Seas are (1) its remarkable success: cannibalism, human sacrifice and infanticide have

been suppressed, civilization and trade have marvellously advanced; (2) the evangelical devotion of the natives themselves; (3) the need of continued European super- vision, the natives being still in many ways little better than grown-up children.

Africa. 1 — In Africa, as in the South Seas, mission work has gone hand in hand with geographical discovery. It is in every sense a modern field, or rather a collection of fields, varying in physical, racial, social and linguistic character. The unaccus- tomed conditions of life and the fatal influence of the climate have claimed as many victims here as did savagery in the Pacific

1 SeeF. P. Noble, The Redemption of Africa; J. Stewart, Dawn in the Dark Continent; Sir Harry Johnston, ” The Negro and Religion ” in Nineteenth Century, June 1910.

Islands. The partition of the continent among the various European nations has been on the whole favourable to mission work. The nature of the task and of the results may be best approached by considering the different divisions — North, South, East, West and Central Africa.

North Africa, along the Mediterranean from Morocco to Egypt, is distinctly Mahommedan. To these regions came St Louis and Raimon Lull, and one may in passing remember the strength of Christianity in Proconsular Africa in the days of Tertullian and Cyprian, and in Egypt under Clement of Alex- andria, Origen and Athanasius. To-day Islam is supreme, though the North Africa Mission, working largely on medical lines, has penetrated into many cities. In Egypt the United Presbyterians of America have met with considerable success among the Copts, and their fine educational work has proved a valuable asset

both to themselves and the country. The Church Missionary Society is doing steady work in Cairo and in Upper Egypt. In the Eastern Sudan a promising beginning has been made, but the regions south of Kordofan have hardly been touched. In Nigeria the Hausa tribes are coming to be better known, and to respond to the Christian teaching. In the Sahara and at Suakin there are Roman Catholic missions. There is a Roman mission to the Gallas in Abyssinia. That country has its own crude form of Christianity, and is much the same today as when Peter Heiling in the 17th century endeavoured to pro- pagate a purer faith. A mission undertaken by the Church Missionary Society in 1830 was closed by French Jesuit intrigue in 1838.

South Africa.— The Moravians, represented by George Schmidt, who arrived at Cape Town in July 1737, were the first to undertake mission work in South Africa. Schmidt won the confidence of the Hottentots, but the Dutch authorities stopped his work. In 1798 John T. Vanderkemp, an agent of the London Missionary Society, founded a mission to the Kaffirs east of Cape Town, and Robert Moffat (1818) went to the Bechuanas. David Livingstone was as determined to open the interior as the Boers were to keep it shut, and he succeeded, pushing north, discovering Lake Ngami, and consecrating a remarkable life to the evangelization of Central Africa. The London Mission has also largely evangelized the Matabele. In 1814 the Wesleyans began work among the Namaquas and Hottentots, and after- wards went into Kaffraria, Bechuanaland and Natal. They were followed by the Glasgow Missionary Society (1821), the Paris Evangelical Society (1829), the Moravian, Rhenish arid Berlin Societies, and the American Board. The Society for the Propagation of the Gospel came in 1819, mainly for colonists, the Church Missionary Society in 1837. The province of South Africa has ten dioceses, the bishop of Cape Town being metro- politan. The Glasgow Society’s work was ultimately taken over by the Free Church of Scotland, whose great achievement is the Lovedale Institute, combining industrial and mission work. The Germans

and Scandinavians have also been ardent workers in South Africa, and the Dutch Reformed Church has not entirely neglected the natives. One Dutch society gives its attention to the northern part of the Transvaal. The chief difficulties in the way of evangelization have been (1) the hostility of natives races aroused by European annexations, (2) the intro- duction of European vices, (3) the movement known as Ethio- pianism. The British Wesleyans refused to confer full rights on negro pastors, who then appealed to the African Methodist Episcopal Church, a product of American evangelization. One of them, J. M. Dwane, was made Vicar-Bishop, and a large and powerful independent negro church organized. Dwane afterwards approached the Anglicans, and in 1900 that church formed the " Ethiopian Order," ordaining Dwane a deacon and making him Provincial of the Order. Each bishop now deals with the Ethiopians in his own diocese. The South African governments foresaw dangerous developments in the Ethiopian movement, and steps were taken to restrain its growth. Ethiopianism, if ecclesiastical in its origin, gained strength from racial base. The task of averting the racial bitterness so dominant in the United States of America is a most formidable one. There

are in South Africa several vicariates and prefectures of the Roman Church, the principal missions being French, those of the Congregation of the Holy Ghost and the Oblates of Mary.

West Africa was first visited by the Society for the Propa- gation of the Gospel in 1752. Its agent, T. Thompson, trained Philip Quaque, said to be " the first convert who ever received ordination since the Reformation in the Reformed Church." The Church Missionary Society came in 1804 and has worked heroically and successfully, though the largest mission now is that of the Wesleyans, who came in 181 1, settling first at Sierra Leone. The American Baptists in Liberia (1821) and the Basel Mission in the Gold Coast (1827), the Congregationalists of the United States of America and Canada in Angola, and the English and American Baptists on the Congo

(since 1875) have also extensive and prospering agencies. West Africa has taken heavy toll not only in money but in life, but the lesson has now been learned, and a system of frequent furloughs combined with a better understanding of the climatic requirements have appreciably lessened the peril. This region is linked with the name of the Anglican negro Bishop, Samuel Crowther, and with one phase of the ceaseless strength of Islam, which has so far failed to reach the west coast, finding itself confronted by the Christian influences which are at work among the great Hausa tribes and other peoples within the area of the Niger mission. The Portuguese in Angola and the agents of King Leopold in the Congo State have not been conspicuous friends of missionary enterprise, and the light-hearted childishness of the native character, so well portrayed in Miss Kingsley's writings, shows how difficult it is to build up a strong and stable Christian church. Bishop Taylor's effort at creating a self-supporting mission proved fruitless. The American Lutherans are attempt- ing the same task on rather different lines, and with more promise. The Roman Catholic missions are chiefly French, and organized by the Congregation of the Holy Ghost and the Lyons African Mission.

Central Africa. — The upper Congo region opened up by Living- stone and Stanley has been a favourite sphere for what are known as " faith societies," e.g. the Plymouth Brethren, the Christian and Missionary Alliance, the Regions Beyond Mission- ary Union. The American Baptists continue the work started by the Livingstone Inland Mission in 1878, and the Southern Presbyterian Board (American) have done notable work. The Paris Society, represented especially by Francois Coillard, has been successful along the Zambezi, and Scottish, German, Moravian and Jesuit agencies are also well represented. North- ward, Central and East African organizations, following the Cape to Cairo route, are in touch with North African agencies working up the Nile.

East Africa. — When the Abyssinia mission was closed in 1838 one of the missionaries, Krapf, went among

the Gallas and then on to Mombasa, working in company with Rebmann. Since H. M. Stanley's appeal (1875) most satisfactory work, extensive and intensive, has been accomplished in Uganda, by the Church Missionary Society. The names of Mackay, Hannington and Pilkington, who lived and died here, are amongst the greatest in the roll of missionary heroes. The Roman Mission too has been very successful; for some years a French agency, the White Fathers of Algeria, carried it on, but they were afterwards joined by English helpers from St Joseph's Society at Mill Hill. The White Fathers also work in the Great Lakes region, and on the Zanzibar coast are the French Congre- gation of the Holy Ghost and German Benedictines. Zanzibar is also one of the centres of the Universities Mission, another being Likoma on Lake Nyasa. Near this lake the Scottish churches are also doing noble work. Besides Uganda the Church Missionary Society is responsible for Mombasa. The London Mission is meeting with success at the south end of Lake Tanganyika in North-east Rhodesia. The English United Methodists and some Swedish societies have begun work among the Gallas. German Missionary agencies have also come in with German colonization. In East Africa, as in the West, Christian missionaries fear most the aggressive Moslem propaganda.

[MISSION FIELDS

Madagascar 1 is one of the most interesting mission fields. Work was begun by the London Mission in 1819, and the work of civilization and evangelization went steadily forward till 1835, when a period of repression and severe persecution set in, which lasted till 1861. When the work was recommenced it was found that the native Christians had multiplied and developed during the harsh treatment of the 25 years. In 1869 the idols were publicly destroyed and the island declared Christian

by royal proclamation. The Society for the Propagation of the Gospel (1864), the Norwegian Missionary Society (1866), and the Friends' Foreign Missionary Association joined in the work, the prosperity of which received a severe check by the French annexation in 1896. The French authorities were hostile to the English missionaries, and even the handing over of part of the field to the Paris Evangelical Society did not do much to ease the situa- tion. Laws were first enacted against private schools, then against elementary schools, and in 1906–1907 measures were passed which practically closed all mission schools. Family prayers were forbidden if any outside the immediate family were present, and religious services at the graveside were pro- hibited. Missionary work in the island has thus passed through a peculiarly trying experience, but happier conditions are now likely to prevail. In Mauritius and the Seychelles the Church Missionary Society and the Society for the Propagation of the Gospel are at work, especially among the coolies on the sugar plantations.

The outstanding problem of African missions at least north of the Equator (south there is the Ethiopian question) is not the degradation of the black races, nor the demoralizing influences of heathen Christians, nor even the slave dealer, though all these obstacles are present and powerful. The all-decisive conflict is that between Christianity and Islam, and the Christian agencies must show much more co-operation if they are to be successful. The lines of mission- ary work have been, generally speaking, simple gospel preaching followed by education and industrial work. So rare were the ordi- nary comforts, and even necessities of life, that the latter had to take a prominent place from the beginning: the missionary had to be farmer, carpenter, brickmaker, tailor, printer, house and church builder, not only for himself but for his converts. The work of Bible translation has been particularly long and difficult; for the innumerable peoples who did not speak some form of Arabic the languages had first to be reduced to writing, and

many Christian terms had to be coined.

India. 2 — The earliest missionaries to India, with the possible exception of Pantaenus of Alexandria (c. a.d. 180), were the Nestorians from Persia. The record of their work is told else- where (see Nestorius and Nestorians). The Jesuits came in the 1 6th century, but were more successful quantitatively than qualitatively; in the 18th century the Danish coast mission on the coast of Tranquebar made the first Protestant advance, Bartholomaus, Ziegenbalg (1683-1719), Plutschau and Christian Friedrich Schwartz (1726-1798) being its great names. Up to this time the chief results were that (1) Christianity had gained a footing, (2) it had continued the monotheistic modification of Indian thought begun by Mahommedanism, and (3) the futility of sporadic and fanatical proselytism had been shown. A new era began with the arrival of William Carey and the founding of the Serampur Mission (15 m. north of Calcutta), though the hostility of the East India Company made the early years of the 19th century very unproductive. When Carey died in 1834 he and his colleagues Marshman and Ward had translated the Bible into seven languages, and the New Testament into 23 more, besides rendering services of the highest kind to literature, science and general . progress. They founded agricultural societies and savings' banks, and helped to abolish suttee, infan- ticide and other cruelties. At Travancore in the south, Ringel- taube, an agent of the London Missionary Society, had begun a work, especially among the Shanars or toddy drawers, which by 1840 had 15,000 Christians; and the Church Missionary Society, led by Rhenius, had equal success in Tinnevelly. The Baptists, drawn by the fame of the temple of Jagannath at Puri on the

1 See T. T. Matthews, Thirty Years in Madagascar.

2 See E. P. Rice in A Primer of Modern Missions, ed. R. LoVett (London, 1896); J. Richter, A History of Missions in India (1908); The Church Missionary Review (July 1908); Contemporary Review (May 1908 and June 1910).

east coast, established a mission in Orissa in 1821 which soon bore fruit ; the Wesleyans were in Ceylon, Mysore and the Kaveri valley, the London Missionary Society at the great military centres Madras, Bangalore and Bellary, agents of the American Board at Ahmednagar and other parts of the Mahratta country around Bombay. The headquarters of Hinduism, the Ganges valley, was occupied by the Baptists, the Church Missionary Society and the London Missionary Society, these entering Benares in 1816, 1818 and 1820 respectively. Alexander Duff, a Scottish Presby- terian, had begun his great educational work in Calcutta, and Bible tract and book societies were springing up everywhere. Chaplains and bishops of the Anglican Church like James Hough in Tinnevelly, Henry Martyn in the north, Daniel Corrie in Agra, T. F. Middleton in Calcutta, and Reginald Heber all over India, were eagerly using their opportunities. In 1830 ten societies with 106 stations and 147 agents were at work; 1834 saw the founding of the Basel Mission on the west coast, the American Mission in Madura, the American Presbyterian Mission in Ludhiana. It would be impossible to trace in detail the work done by the different societies since Carey's time. The task as it presented itself may be analysed as follows: (1) to replace the caste system and especially the oppressive supremacy of the Brahmins by a spirit of universal brotherhood and the estab- lishment of social and religious' liberty; (2) to correct and raise the standard of conduct; (3) to attack polytheistic idolatry with ics attendant immoralities; (4) to replace the pantheistic by a theistic standpoint; (5) to elevate woman and the pariah. Besides these matters which concerned Hinduism there was the problem of converting sixty million Mahommedans. The chief methods adopted have been the following: (1) vernacular preaching in the large towns and on itineraries through the rural districts, a work in which native evangelists guided by Europeans and Americans played a large part. (2) Medical missions, which have done much to break down barriers of prejudice, especially in Kashmir under Dr Elmslie of the Church Missionary Society, and in

Rajputana at Jaipur under Dr Valentine of the United Presbyterians. (3) Orphanages, in which the Roman Catholics led the way and have maintained their lead. (4) Vernacular schools, a good example of which is seen in the American Board's Madura Mission. (5) English education, in which the missionary societies have amply supple- mented the efforts of the government, outstanding examples being the Madras Christian College (Free Church of Scotland), so long connected with the name of Dr William Miller, the General Assembly of Scotland's Institution at Calcutta, founded by Duff, Wilson College, Bombay (Free Church of Scotland), and St Joseph's College (Roman Catholic) at Trichinopoly. Work of this kind is followed up in some centres by lectures and con- versations with educated Hindus. The Haskell Lectureship, which grew out of the Parliament of Religions in Chicago, belongs here. (6) Female education and zenana work. (7) Uplifting work among the Panchamas or low-castes, which has been strikingly successful among the Malas (American Baptists) and the Madigas (London Missionary Society) of the Telugu-speaking country, who come in mass movements to the Christian faith.

(8) Missions among aboriginal tribes, e.g. the Kols and Santals of Chota Nagpur (Berlin Gossner Mission and the Society for the Propagation of the Gospel), and the tribes of the Khassia Mountains east of Bengal (Welsh Calvinistic Methodists)

(9) Christian literature, in which connexion the name of Dr John Murdoch will always be honourably remembered. (10) Pastoral work and the care of the churches.

The great changes that have been wrought in India, politically, commercially, intellectually and religiously, by the combined action of the British government and the Christian missions, are evidenced among other tokens by the growth of such societies as the Arya Samaj and the Brahmo Samaj. • Ortho- dox Hindus, especially those whose social status and very liveli- hood are imperilled by the revolution, have shown their alarm either by open opposition,

subjecting converts to every sort of caste coercion, or by methods of defence, e.g. Hindu tract societies and young men's associations, which are modelled on

Christian organizations. A counter reformation can also be traced which attempts to revive Hinduism by purging it of its grossness and allegorizing its fables and legends. A new Islam is also a factor of the situation. Comparatively few converts have been made from Mahommedanism to Christianity, and these have been chiefly among the learned. But there is a wide prevalence of free-thinking, especially among the younger and educated classes of the community.

The special difficulties of mission work in India may be thus summarized, (i) Racial antipathy. (2) The speculative rather than experimental and practical nature of the Hindu consciousness — historical proofs make no appeal to him. (3) The lack of initiative : in a land where the joint family system is everywhere and all power- ful, individualism and will-power are at a discount. (4) The ignor- ance and conservatism of the women. (5) An inadequate sense of sin. (6) The introduction of European forms of materialism and anti-Christian philosophy. Perhaps, too, the methods adopted by missionaries have not always been the wisest, and they have some- times failed to remember the method of their Master, who came " not to destroy, but to fulfil." In spite, however, of all the difficulties, permanent and increasing results have been achieved along all the lines indicated above. The establishment of a strong native church is far from being the only fruit of the enterprise, but it is a fruit that can be gauged by statistics, and these are sufficiently striking. In a necessarily inadequate sketch it is impossible to give more than the barest mention to one or two other features of modern missionary achievement in India, e.g. the

development of industrial schools, the establishment of a South India United Church, in which the Congregationalist agencies (London Missionary Society and American Board) and the Presbyterians have joined forces, and the endeavour to train an efficient and educated native ministry, which is being promoted especially at Serampur, where an old Danish degree- granting charter has been revived in what should become a Christian university, and at Bangalore, where Presbyterians, Congregational- ists and Wesleyans collaborate to staff and maintain a united theo- logical college. The government census for India and Burma (1901) gives a Christian population of 2,923,241 (native Christians 2,664,313) out of a total population of 294,361 ,056, or about 3 . The inclu- sion of Portuguese and French possessions would add about 350,000 to the Christian total. Though the number does not seem relatively high, it is significant when compared with that of former censuses — in 1872, 1,517,997; in 1881, 1,862,525 (increase 22-7); in 1891, 2,284,380 (increase 22-6%); in 1901, 2,923,241 (increase of 28%). The increase of 28 % between 1891 and 190 1 has often been compared with the fact that the total population of India only registered an increase of 25% in that decade. In the words of The Pioneer, ” this is a hard fact which cannot be explained away ” and ” the most remarkable feature of the returns.” The increase was shared by every province and state in India. In 1910 there were 4614 missionaries (including wives) , representing 122 societies, 1272 Indian ministers, and 34,095 other native workers, including teachers and Bible-women.

The growth of the Protestant Native Christian community between 1851 and 1910 is shown in the following table: —

Native Christian Community.

Communicants.

Native Agents.

Number.

Rate of Increase.

Number.

Rate of Increase.

Proportion

of the Community.

Ordained.

Unordained Preachers.

1851 1861 1871 1881 1890 1900 1910

91,092

138,731 224,258

417,372

559,661

854,867

1,472,448

%

52-3

6i-6

86-1

34-0

52-8 72-2

14,661 24,976 52,816

113,325 182,722 301,699 522,743

/o

70-3 111-4

"4-5

6l-2

65-1 73-3

%

16-0 18-0

23-5 27-1 32-6 35-3

21

97 225 461

797

1,272

493 1266

1985 2488

3491

The Protestant community in India in 1910 was over a million strong, well distributed among the chief provinces, a fine spiritual force, easily first in female education, and rapidly growing in wealth, position and influence. A recent report of the Director of Public Instruction for the Madras Presidency says: ” I have frequently called attention to the educational progress of the native Christian community. There can be no question, if the community pursues with steadiness the present policy of its teachers, that in the course of a generation it will have secured a preponderating position in all the great professions.”

What India wants (as Nobili 300 years ago saw, and attempted, though by fatal methods of deceit, to supply) is a Christianity not foreign but native, not dissociated from the religious life of the land but its fulfilment. Though there are many Christians in India to-day, the Hindu still looks askance at Christianity, not because it is a religion but because it is foreign. ” India is waiting for her own divinely appointed apostle, who, whether Brahmin or non-Brahmin,

shall connect Christianity with India’s religious past, and present it as the true Vedanta or completion of the Veda and thus make it capable of appealing to the Hindu religious nature.”

It only remains to be said that the work of the missionaries individually and collectively has over and over again received the warmest recognition and praise from the highest officials of the Indian government.

China. 1 — The earliest Christian missionaries to China, as to India, were the Nestorians (q.v.). Their work and that of the Roman Church, begun as the result of Marco Polo's travels about 1290, faded away under the persecution of the Ming dynasty which came to power about 1350. The next attempt was that of the French Jesuits, following on the visit and death of Xavier. They established themselves at Canton in 1582, and on the accession of the Manchu dynasty (1644) advanced rapidly. In 1685 there were three dioceses, Peking, Nanking and Macao, with a hundred churches. The Orthodox Eastern Church gained 1 footing in Peking in the same year, and established a college o; Greek priests. Friction between Jesuits and Dominicans lee* to the proscription of Christianity by the emperor in 1724, missionaries and converts being banished. The story of modern missions in China begins with Robert Morrison (q.v.) of the London Missionary Society, who reached Canton in 1807, and not being allowed to reside in China entered the service of the East India Company. In 18 13 he was joined by a colleague, William Milne, and in 1814 baptized his first convert. In 1829 came representatives of the American Board, in 1836 Peter Parker began his medical mission, and on the opening of the Treaty Ports the old edicts were withdrawn, and other societies crowded in to a field more than ample. After the war of 1856 a measure of official toleration was obtained, and the task of evangelizing the country was fairly begun. Though the missionaries were chiefly concentrated in the treaty ports they gradually pushed inland, and here the names of W. C. Burns, a Scottish evangelist, J. Hudson Taylor, the founder of the China Inland Mission, and James Gilmour, the apostle of Mongolia, are pre-eminent. But for more than half a century China seemed the most hopeless of mission fields.

The upper classes were especially anti-foreign, and the whole nation vaunted its superiority to the rest of man- kind. In 1857 there were only about 400 baptized Protestant Christians in the whole of China. Even after the removal of the edicts the old prejudices remained, and the missionaries were regarded as political emissaries, the forerunners of military aggression. Native Christians were stigmatized as traitors, ” followers of the foreign devils.” In 1870 there was a great out- break concentrating in the massacres at Hankow and Tientsin; in 1 89 1 at Hunan and in 1 89 5 at Ku Cheng there were other attacks which were only pre- liminary to the Boxer uprising of 1899-1900, when 135 missionaries, besides 52 children and perhaps 16,000 native Christians, whose heroism will always be memorable, perished, often after horrible tortures. There is little doubt that this savage outburst was directed not against religious teaching as such, but against the introduction of customs and ideas which tended to weaken the old power of the mandarins over thfe people. These leaders skilfully seized upon every breach of tradition to inflame popular passion, attacking especially the medical work as a pretext for mutilation, the schools as hotbeds of vice, and the orphanages as furnishing material for witchcraft. Out of the agony, however, a new China was born. The growing power of Japan, seen in her wars with China and Russia, and the impotence of the Boxers against the European allies, made all classes in China realize their com- parative impotence, and the central government began a series of reforms, reorganizing the military, educational, fiscal and poli- tical systems on Western lines. Educational reforms became especially insistent, and modern methods and studies supplanted

1 See A. H. Smith, Chinese Characteristics; Village Life in China; and J. C. Gibson, Mission Problems and Mission Methods in South China.

the immemorial Confucian type. Students went in great numbers to Japan, Europe and America, and the old contempt and hostility toward things Western gave place to respect and friendliness. Early in the 19th century the missionaries had not been able to do much by way of education, but the new openings were seized with such power as was possible, and while in 1876 there were 289 mission schools with 4909 pupils, in 1910 there were 3129 schools with 79,823 scholars. More significant still is the way in which the foremost Chinese officials have turned to missionaries like Timothy Richard and Griffith John for assistance in guiding the new impulse. The universities of Oxford and Cambridge, under the inspiration of Lord William Cecil, were interesting themselves in 1910 in a scheme for establishing a Christian university in China.

One of Morrison's contemporaries hoped that after a century of mission work there might possibly be 2000 Christians in China. That number was reached in 1865, and in 1910 there was a Protestant community of 214,546 church members and baptized Christians. These numbers are more than double what they were in 1900. In addition there are more than as many adherents. 1 The excellence of the converts, upon the whole, is testified to by travellers who really know the case ; particularly by Mrs Bishop, who speaks of the " raw material " out of which they are made as "the best stuff in Asia." The total number of Protestant missionaries (including wives) in China in 1910 was 4175, one to about 1 100 sq. m., or to more than 100,000 Chinese. There are over 12,000 Chinese evangelists, Bible-women, teachers, &c. The Roman Catholic returns give 902,478 members and 390,617 cate- chumens. The work is carried on by eleven societies or religious orders with over 40 bishops and 1000 European priests, mostly French. A large feature of the work is the baptism of children. An important concession was obtained in 1899 by the French minister at Peking, with a view to the more effective protection of the Roman missions. The bishops were declared " equal in rank to the viceroys and governors," and the priests " to

the prefects of the first and second class "; and their influence and authority were to correspond. The Anglican bishops agreed to decline these secular powers, as also did the heads of other Protestant missions. It is alleged by some that the exercise of the powers gained by the Roman hierarchy was one cause of the Boxer outbreaks. Certainly their native adherents had their full share of persecution and massacre.

The Anglican Church is not so strong in China as in some other fields; the American Episcopalians were first in the field in 1835, followed by the Church Missionary Society (in 1844), which has had stirring success in Fu-Kien, and the Society for the Propagation of the Gospel in 1874. There are five dioceses, and in 1897 an episcopal conference was held in Shanghai. Since the Japanese War the Scottish and Irish Presbyterians have made wonderful progress in Manchuria ; native evangelists do an increasing share of the work, and there is hardly any town or village without Christians. The London Mission has always been conspicuous for the contribution made by its agents to linguistic and literary knowledge, the name of James Legge being an outstanding example; it is now, in co-operation with other societies, earnestly taking up the new educational and medical openings. One of the most interesting features of missionary work in China is the comity that prevails among the workers of different societies and agencies. Thus in 1907 at the Centenary Conference in Shanghai, when many topics were discussed centring in the question of the native Chinese Church, a general declaration of faith and purpose was adopted, which, after setting out the things held in common, proceeded, " We frankly recognize that we differ as to methods of administration and of church government; that some among us differ from others as to the administration of baptism; and that there are some differences as to the statement of the doc- trine of predestination, or the election of grace. But we unite in holding that these exceptions do not invalidate the assertion of our rear unity in our

common witness to the Gospel of the Grace of God." The conference reported, " We have quite as much reason to be encouraged by the net result of the progress of Christianity in China during the 19th century as the early Christians had with the progress of the Gospel in the Roman Empire during the first century."

Japan and Korea. — The Christian faith was brought to Japan by Portuguese traders in 1542, followed by Xavier in 1549-

x See Contemporary Review (Feb. 1908), "Report on Christian Missions in China," by Mr F. W. Fox, Professor Macalister and Sir Alex. Simpson.

This great missionary was well received by the daimios (feudal lords), and though he remained only 2§ years, with the help of a Japanese whom he had converted at Malacca he organized many congregations. In 1581 there were 200 churches and 150,000 Christians; ten years later the converts numbered 600,000, in 1594 a million and a half. Then came a time of repression and persecution under Iyeyasu, whose second edict in 1614 condemned every foreigner to death, forbade the entry of foreigners and the return of Japanese who had left the islands, and extinguished Christianity by fire and sword. The reopening of the country came in 1859, largely through American pressure, and in May of that year two agents of the Protestant Episcopal Church began work at Nagasaki. They were followed by others from the Presbyterian and Reformed Churches, and by their great intellectual ability, patience and tact these pioneers • (S. R. Brown, J. C. Hepburn and G. F. Verbeck), as the Marquis Ito said, contributed very largely to the progress and develop- ment of Japan in the days when she was first studying the outer world. They did an immense amount of preparatory work along evangelistic, medical and educational lines, and skilfully gathered the youths of the country around them. The accession of a new mikado in 1868 finally ended the old seclusion; financiers, engineers, artisans poured in from Western Europe, and from America came bands of teachers, largely

under mission- ary influence. In 1869 the American Board (Congregational) sent its first band; in 1870 Verbeck was called on to organize a scheme for national education. In 1872 the first Japanese church was formed; in 1875 Joseph Neesima, who had been converted by a Russian missionary and then educated in America, founded a Christian Japanese College, the Doshisha, in the sacred city of Kyoto. Meanwhile the Christian calendar had been adopted and the old anti-Christian edicts removed. By 1889 there were 30,000 Protestant communicants. It was at this time that the nation, conscious of its new life, began to be restive under the supercilious attitude of foreign nations, and the feeling of irritation was shared by the native Christian communi- ties. It showed itself in a desire to throw off the governance of the missionaries, in a criticism of Protestant creeds as not adapted to Japanese needs, and in a slackened growth numeri- cally and intensively. After a period of stress and uncertainty, due very largely to the variety of denominational creed and polity, matters assumed an easier condition, the missionaries recognizing the national characteristics and aiming at guidance rather than control. The war with China in 1894 marked a new chapter and initiated a time of intense national activity; educa- tion and work for women went forward rapidly. Missionaries went through the island as. never before, and their evangelistic work was built upon by Japanese ministers. In the war with Russia Japanese Christianity found a new opportunity; on the battlefield, in the camp, at home, Christian men were pre-eminent. In 1902 there were 50,000 church members; in 1910, 67,043; the total Protestant community in 1910 was about 100,000, and had an influence out of all proportion to its numbers; the Roman Church was estimated at 79,000, and the Orthodox Eastern Church (Russian) at 30,000.

No sketch, however brief, can omit a reference to the Anglican bishop of South Tokyo, Edward Bickersteth (1850-1897), who from his appointment in 1886 guided the joint movement of English and

American Episcopalians which issued in the Nippon Sei Kokwai or Holy Catholic Church of Japan, a national church with its own laws and its own missions in Formosa. In April 1907 the Conference of the World's Student Christian Federation (700 students from 25 different countries) met in Tokyo, and received a notable welcome from the national leaders in adminis- tration, education and religion.

In Korea, the " Hermit Nation," or as the Koreans prefer to say, " The Land of the Morning Calm," Christianity was intro- duced at the end of the 18th century by some members of the Korean legation at Pekin who had met Roman Catholic mission- aries. It took root and spread in spite of opposition until 1864, when an anti-foreign outbreak exterminated it. The door was re-opened by the treaties of 1882-1886, and even before that

copies of the gospels had been circulated from the Manchuria side. The Methodist Episcopal Church and the Presbyterian Board, both of America, entered the country in 1885, and were soon joined by similar agencies from Canada and Australia. The Anglican Church began work in 1800, the work was thoroughly planned, the characteristics of the people were care- fully considered, and the successes and failures of other mission- fields were studied as a guide to method. The medical work won the favour of the government, and so wisely did the missionaries act, that during all the turbulent changes since 1884 they escaped entanglement in the political disturbances and yet held the confidence of the people. The persistence and growth of Christi- anity among the Koreans is largely due to the fact that Chris- tianity had not been superimposed on them as a foreign organiza- tion. They had built their own churches and schools, adopted their, own forms of worship and phrased their own beliefs. Korea vies

with Uganda as a triumph of modern missionary enterprise. In 1866 there were not more than 100 Christians; official returns in 1910 show 178,686 Protestants, including 72,000 church members and probationers; and 72,290 Roman Catholics. Theological colleges, normal training colleges and higher and lower grade schools bear witness to an activity and a success which are truly remarkable. ,

South'East Asia and the East Indies. — The work of Christian missions in this area has had the double advantage of freedom from political and social unrest, and of comparatively little overlapping, each country as a rule being taken over by a single society. In Burma the American Baptists, whose work began with Adoniram Judson in 1813, are conspicuous, and have had marked success among the Karens or peasant class, where the pioneer was George Dana Boardman (1827). The Karen Christian communities are strong numerically and have a good name for self-support. The Baptists have also stations in Arakan and Assam where they link up with the Welsh Calvinistic Methodists (1845). The Society for the Propagation of the Gospel and the Methodist Episcopal Church work in and around Rangoon. In Siam again the Americans, especially the Pres- byterians, have been most prominent. Medical work made an impression on the people and won the favour of the government, which has always been cordial and has employed missionaries as court-tutors. Buddhism is at its best at Siam, and this and the enervating climate are responsible for the comparatively small direct success of Christian propaganda in Siam proper. In the Laos country to the north, however, much more has been done, and a healthy type of Christian community established. Native workers have done something to carry the Gospel into the French colonies of Tongking and Annam. Here the Roman missions are very extensive, and have over a million adherents, despite violent persecution before the French occupation.

The peninsula and archipelago known as Malaysia presents a remarkable mingling of races, languages and beliefs. Tatar, Mahommedan and Hindu invasions

all preceded the Portuguese who brought Roman Catholicism, and the Dutch who brought Protestantism. This last resulted in a great number of nominal conversions, as baptism was the passport to government favour, and church membership was based on the learning of the Decalogue and the Lord's Prayer, and on the saying of grace at mealtimes. In the Straits Settlement the foundations of modern missionary effort were laid by the London Missionary Society pioneers who were waiting to get into China; they were succeeded by the Society for the Propagation of the Gospel (1856), English Presbyterians (1875), Methodist Episcopalians (1884), who have a fine Anglo-Chinese College at Singapore, and the Church of England Zenana Society (1900).

In the Archipelago most of the work has naturally been in the hands of the Netherlands Missionary Society (181 2) and other Dutch agencies, who at first were not encouraged by the colonial government, but have since done well, especially in the Minahassa district of Celebes (150,000 members) and among the Bataks of Sumatra (Rhenish Mission). In Celebes and the Moluccas the work is now under the Colonial State Church. In Java the government has favoured Mahommedans (there is

active intercourse between the island and Mecca), but there are some 25,000 Christians and a training school and seminary at Depok near Batavia. In Dutch Borneo the Rhenish Society is slowly making headway among the Dyaks; in British Borneo the Society for the Propagation of the Gospel (1848) and the Methodist Episcopalians occupy the field. The total number of Christians in British Malaysia and the Dutch East Indies is about 600,000 (including 57,000 Roman Catholics).

Western Asia and the Turkish Empire. 1 — The American Presbyterians and Congregationalists have the largest Protestant missions in these lands, working, however, mainly for the enlight- enment and education of the Oriental Christians. With the same object, though on different lines, the archbishop of

Canter^ bury's Assyrian Mission seeks to influence the Nestorians. The Roman Catholics have extensive missions in these countries, directed at winning adherents to the unity of the Holy See from the Oriental Churches, which are regarded as schismatic and heretical. In this enterprise there has been great advance in Egypt among the Copts, and in 1899 the Pope signalized " the resurrection of the Church ' of Alexandria " by appointing a Patriarch for Egypt, Libya and Nubia. Farther east, on the borders of Turkey and Persia, the Roman and Russo-Greek Churches compete for the adhesion of the Nestorians, Chaldeans and Armenians. The Franciscans, Dominicans, La^arists and Jesuits are engaged in all these works. Direct work among Mahommedans is done, though with small result, by the North Africa Mission (non-denominational) and the Church Missionary Society. The Egypt, Palestine and Persia missions of the latter society have been largely reinforced and extended since 1884, medical work and women's work being especially prominent. Four cities in southern Persia are now occupied. Three missions just touch the border of Arabia, viz. the United Free Church of Scotland at Aden, founded by Ion Keith-Falconer (1856-1887) son of the 9th earl of Kintore and Arabic professor at Cambridge; an American Presbyterian Mission on the Persian Gulf; and the Church Missionary Society's Mission at Bagdad. The American Robert College at Constantinople and the work of the Friends' Missionary Association in Syria are honourable and successful enterprises. The chief difficulties have been (1) the antagonism of the officials of the Oriental churches, (2) the suspicion and hostility of Islam, (3) the jealousies, religious and political, connected with the Eastern Question.

Missions in Christian Lands. — Australia has been referred to already (see South Seas, above). In the Western Hemisphere we may distinguish the following: (1) Early Roman Missions began with the discovery of the continent and practically ceased in the middle of the 1 8th century. Conspicuous among their achievements was the conversion of Mexico, 200,000

converts being enrolled within six years after the capture of the capital (152 1), and a million baptized by the Franciscans alone within thirty years. In South America the passive character of the population made them submis- sive alike to the Spanish government and the Roman faith. Their natural devotion and their susceptibility to pomp and ritual was a factor skilfully used by the priests, but hardly anything was done to strengthen their moral power. The influx of base European strata helped to reduce the whole continent south of Mexico in about a century to a level as low as that preceding the first mission. About 1600 the Franciscans and French Jesuits began their work in North America and among the Indians did a successful work marked by much heroism. They also enabled the Roman Church to keep its hold on the French colonists of Quebec and Montreal, and were pioneers in California. (2) Modern Missions in North America. — • Missions among the Red Indian tribes in the North-West Territories of both the United States and Canada have long been carried on by several societies. The first workers were Thomas Mayhew, junior and John Eliot at Martha's Vineyard (1643) and Roxbury (1646). Bishop Whipple of Minnesota was justly called the Apostle of the Indians, so far as the work of the American Episcopal Church was concerned. In the Canadian North-West the Church Missionary Society's Missions have reached many tribes up to the shores of the Polar sea, and made some thousands of converts. Even the wan- dering Eskimos, thanks to the Moravians, are mainly Christians. The Anglican Church has nine dioceses in the province of Rupert's Land. The Roman Catholic missionaries also are scattered over these immense territories, and have a large number of Indian adherents. Besides the Oblates many are Jesuits from French Canada. The Russo-Greek Church has a mission in Alaska, dating

1 See J. Richter, A History of Protestant Missions in the Near East

(1910).

from the time when it was Russian territory, and various American societies are also represented. The total number of Indians in British North America is 99,000, of whom about 27,000 are still pagan, and the rest are about equally divided between the Protestant and Roman Catholic Missions. (3) Central and South America. — Protestant missions to Indians here have been very limited. Von Weltz did something in Dutch Guiana (c. 1670), and the Moravians among the Arrawak Indians of Surinam (1738-1808). Since i847they have worked on the Mosquito coast of Central America. American Missions are at work in Mexico and adjacent countries. In the West India Islands the negro population has been reached by most of the larger British societies. The South American Missionary Society, founded by the ill-fated Captain Allen Gardiner, has much extended its work among the Indians of the interior of what has been well called ” the Neglected Continent “; it has been specially successful among the Araucanians of Chile and the Paraguayan Chaco. Their work among the Fuegians drew a warm tribute from Charles Darwin. Several American missions are also at work. The Society for the Propagation of the Gospel has an important mission in British Guiana. But there are numerous heathen tribes never yet reached. The Roman Church, which is dominant throughout the continent, has been engaged in serious struggles with the anti-religious tenden- cies of the Republican governments, and L’Annee de VEglise makes no mention of missions among the Indians. In fact the Pope in 1897 was obliged to send a severe rebuke to the clergy for their lack of con- sistency and zeal. Protestant societies have done much to bring the Bible to the knowledge of the nominally Roman Catholic population. Results of Missions The Christian Church bases its missionary enterprise upon the spirit, the example, and the commandment of its Founder, and regards the duty as just the same

whether the results be

I

results. If, however, we are to take statistical returns for what they are worth, it is estimated that the Christians in heathen lands gathered by Protestant missions probably amount to five millions, and a similar total may be ascribed to Roman Catholic missions, making ten millions in all. This, however, includes adherents still under instruction for baptism, and their children. The inner circle of communicant members is hardly more than one-third of the total.

Missions are however a far greater thing after all than simple proselytism. It would require many a volume to tell of what they have done for civilization, freedom, the exploration of unknown regions, the bringing to light of ancient literatures, the founding of the science of comparative religion, the broad- ening of the horizon of Christian thought in the homelands, and the bringing of distant peoples into the brotherhood of nations. These are results that cannot be put into figures. While it is true that very diverse opinions are held concerning missions, it is indisputable that the most favourable testimonies come from those who have really taken the most pains to examine and understand their work. The one discouraging feature, from the Christian point of view, is the backward- ness of Christendom in its great enterprise. If the Churches did their foreign work with the same energy which they throw into their home work, the results would be very different.

The figures given below are taken from a table compiled by Dr D. L. Leonard, and refer only to Protestant missions to non-

STATISTICS OF THE GREAT RELIGIONS OF THE WORLD.

(From The Blue Book of Missions, 1907).

Christians.

Jews.

Moham- medans.

Buddhists.

Hindus.

Confucian- is ts and Taoists.

Shintoists.

Animists,

Fetishists,

&c.

Unclassed.

Totals.

Protestants.

Roman Catholics.

Eastern Churches.

Africa . America, N. . America, S. . Asia ….
Australasia . Europe . Malaysia Oceania .

Aggregate

2,665,000

64,488,000

362,000

1,542,000

3,424,000

92,922,000

416,500

247,000

2,493,000

36,693,000

36,125,000

5,385,000

964,000

183,754,000

7,095,500

129,000

3,799,000 1,000,000

17,144,000

1,000

98,213,000

381,000

1,069,000

22,000

482,000

17,000

9,247,000

3,000

1,000

50,810,000

15,000

10,000

141,456,000

3,000

3,576,000

20,760,000

11,000 5,000

I 37, 900,000

4,000

15,000

277,000

94,000

108,000

209,152,000

1,000

27,000

31,000

85,00

4,000

291,030,000

31,000

570,000 65,000

24,900,000

97,179,500

20,000

1,262,000

41,436,000 40,000

16,445,000 507,000

125,500 8,002,000

63,000 5,693,000

70,000 1,319,000

62,000

18,000

157,722,000

111,651,000

37,956,000

876,120,000

4,555,ooo

389,031,000

45,379,ooo

982,000

166,066,500

272,638,500

120,157,000

11,222,000

216,630,000

i37,935,ooo

209,659,000

291,816,000

24,900,000

157,069,500

15,352,500

1,623,446,000

558,862,000

large or small. It appeals to common sense, saying in effect, ” If it be a fact that a Divine Person came into the world to bless mankind, all men ought to know it, and have a right to know it. However much or (if you will) little a Buddhist or a

II.— SUMMARY OF PROTESTANT MISSIONARY WORK.

Christian and non-Protestant peoples. The figures are for 1907, and should be compared with those in the Statistical Atlas. This list gives a total of 69 Foreign Missionary Societies, of which 34 are American, 19 British, 10 German, and 6 other societies. The statistics for these 69 societies may be grouped as follows:-^

American.

British.

German.

Other Societies, viz.

Paris Society,

Swiss Romande,

Netherlands Societies,

Scandinavian Societies,

&c.

Totals for Christendom.

Totals for 1895

(showing growth

between 1895 and

1907).

Ordained Missionaries

Laymen

Unmarried women Ordained natives …. Communicants (full members) Numbers added in 1906 .

Adherents

Schools

Scholars

1,911

535

1,527

2,312

545,i8o

63,916

1,286,259

8,855

344.213

1,980

i,738

2,332 2,141

565.179

38,614

1,398,306

11,789

6i9,399

932

168

150

197

240,883

25-983

540,073

2,878

139,891

912

361

378

623

466,208

12,336

1,136,500

5,346

199,402

5-735

2,802

4,387

5,273

1,817,450

140,849

4,361,138

28,868

1,302,905

4,028

1,477

2,578

4,295

995,793

63,081

2,770,801

19,384 786,002

Moslem may need to know of Christ, he certainly has a claim to be told of Him. The responsibility, if there be any, of believing, rests with the individual told; the responsibility of telling him rests with the Christian Church." On this view of the matter, results, however desirable, are no certain test of a mission doing its work. A mission in Persia, with its handful of converts, has, on this view, as much right to support and appreciation as a mission in southern India with its tens of thousands. Again, on the hypothesis that Christianity is true, the statistics at a particular period are no test of success at all. For in them the dead are not counted; and the converts who are already dead are — at least in respect of individual salvation — the surest of

III— PROTESTANT MISSIONARY INCOME.

1895 1900

1905

£2,724,194 £3,o95,9i5 £3,932,377

1906 1907

£4,256,029 £4,473,933 1

A world missionary conference was held at Edinburgh in June 1910, which aimed at making, on a scale far more comprehensive than had been previously attempted, a thorough and scientific study of the problems involved in the relation of Christianity to the non- Christian world. For two years preceding the conference eight representative commissions investigated the following questions:

1 The Statistical Atlas (1910) puts it at £5,071,225, of which British and American societies each find about £2,000,000, and German societies £427,455.

(l) Carrying the Gospel to all the non-Christian world; (2) the Church in the mission field; (3) education in relation to the Chris- tianization of national life; (4) the missionary message in relation to non-Christian religions; (5) the preparation of missionaries; (6) the home base of missions; (7) missions and governments; (8) co-operation and the promotion of unity. The reports on these subjects in eight volumes, together with a ninth volume giving the proceedings of the conference itself, and a statistical atlas, will for some time be the vade mecum of information on Christian missions, and precludes the need of any attempt at a bibliography here, an attempt which would indeed be doomed to failure. It may not, however, be out of place to call attention, in addition to literature already cited, to a few recent books, chiefly manuals, in several of which full lists of missionary books are given.

E. M. Bliss, The Missionary Enterprise (1908) ; E. Stock, A Short Handbook of Missions (1904); H. H.

Montgomery, Foreign Missions (1904); T. Moscrop, The Kingdom Without Frontiers (1910); W. T. Whitley, Missionary Achievement (1908) ; S. L. Gulick, The Growth of the Kingdom of God (1897) ; B. Lucas, The Empire of Christ, a study of the missionary enterprise in the light of modern religious thought (1907) ; R. H. Maiden, Foreign Missions, a study of some principles and methods (1910); G. Smith, Short History of Christian Missions (1897); G. Warneck, Outline of a History of Protestant Missions (1901 ; new German ed., 1910). See also J. S. Dennis, Centennial Sur- vey of Foreign Missions (1902), Christian Missions and Social Progress (3 vols., 1897); G. Warneck, Modern Missions and Culture (1882); E. Stock, History of the Church Missionary Society (3 vols., 1899) ; J. B. Myers, Centenary Volume of the Baptist Missionary Society (1892) ; R. Lovett, History of the London Missionary Society (2 vols.,. 1899) ; J. Lowe, Medical Missions, Their Place and Power. A somewhat overlooked side of missions, viz. the ” attempt to estimate the contribution of great races to the fulness of the Church of God,” is presented in Mankind and the Church, edited by Bishop H. H. Montgomery (1907). The Encyclopaedia of Missions (2nd ed., 1904) edited by Bliss, Dwight and Tupper ; The Blue Book of Missions by H. O. Dwight (1907); and the already mentioned Statistical Atlas of Missions (1910) by H. P. Beach, are all of the highest value. For Roman Catholic Missions see Missiones Catholicae cura S. Congre- gations de Propaganda Fide descriptae (Romae, ex Typographia polyglotta S. C.de Prop. Fid. [official biennial publication]); Louvet, Les Missions Catholiques[au]xix*. Siecle (Lyon, Bureau des Missions Catholiques, 14 Rue de la Charite, 1900) ; Piolet, Les Missions Catholiques Francaiseslaulxtx”. Siecle (6 vols., Paris, A. Colin, 5 Rue des Mezieres) ; H. A. Krose, Kalholische Missionsstatistik (1908) ; K. Streit, Katholischen Missionsatlas (1908).

(E. St; H. T. A.; A. J. G.)

MISSISSIPPI, a South Central state of the United States, situated between 35 N. lat. and 31° N. lat.,

with its S.E. part extending to the Gulf of Mexico, the extreme southern point being in 30 13′ N. lat. near the mouth of the Pearl River. On the E. the line is mostly regular, its extreme E. point being at 88° 7′ W. long, in the N.E. corner of the state; the W. boundary has its extreme W. point at qi° 41′ W. long, in the S.W. corner of the state. Mississippi is bounded N. by Tennessee, E. by Alabama, S. by the Gulf of Mexico and Louisiana, W. by Louisiana, from which it is separated by the Pearl River and by the Mississippi, and by Arkansas, from which also it is separated by the Mississippi. The total area is 46,865 sq. m., of which 503 sq. m. are water surface.

Physical Features. — Mississippi lies for the most part in the Missis- sippi embayment of the Gulf Coastal Plain. A feature of its surface is a strip of bottom land between the Mississippi and Yazoo rivers, known as the Yazoo Delta; it extends from north to south about 175 m., and has an average width of more than 60 m., and covers an area of about 7000 sq. m. With the exception of a few flat ridges running from north to south, it is so low that it requires, to protect it from overflows, an unbroken line of levees averaging 15 ft. in height; these were built and are maintained by the state in part from a special tax on the land and in part from the sale of swamp lands of the United States (under an act of 1850). Along the eastern border of this delta, and southward of it, along the Mississippi itself, extends a belt of hills or bluffs (sometimes called "cane-hills"), which is cut by deep ravines and, though very narrow in the north, has in the south an average width of about 10 m. East of the belt are level or gently rolling prairies, and along the Gulf Coast is a low, marshy tract. The highest elevations, from 800 to 1000 ft. above the sea, are on the Pontotoc ridge in Tippah and Union counties; and from this ridge there is an almost imperceptible slope south and west from the Appalachian Mountain system. Along the margins of valleys there are hills rising from 30 to 120 ft., but farther back from the water courses the differences of elevation are much

less. The coast-line, about 85 m. long, is bordered by a beach of white sand, and broken by several small and shallow indentations, among which are St Louis, Biloxi. Pascagoula and Point aux Chenes bays; separated from it by the shallow and practically unnavigable Mississippi Sound is a chain of low, long and narrow sand islands,

the largest of which are Petit Bois, Horn, Ship and Cat. The prin- cipal rivers are: the Mississippi on the western border, and its tributaries, the Yazoo and the Big Black; the Pearl and Pascagoula, which drain much of the southern portion of the state and flow into the Gulf ; and the Tombigbee, which drains most of the north-eastern portion. The Pontotoc ridge separates the drainage system of the Mississippi from that of the Tombigbee; extending from the north- eastern part of the state southward, this ridge divides in Choctaw county, the eastern branch separating the drainage basin in the Pascagoula from that of the Pearl, and the western branch separa- ting the drainage basin of the Pearl from that of the Big Black and the Mississippi. The Delta is drained chiefly by the Yazoo. A small area in the north-eastern corner of the state is drained north- ward by the Tennessee and the Hatchie. Each of the larger rivers is fed by smaller streams; their fall is usually gentle and quite uniform. The valleys vary in width from a few hundred yards to several miles. In the east of the state much of the valley of each of the larger streams is several feet above the stream's present high- water mark and forms the " hommock " or " second bottom " lands. Most of the rivers flowing into the Gulf are obstructed by sand-bars and navigable only during high-water from January to April. Oxbow lakes and bayous are common only in the Delta.

Geology. — The older formations are nearly all overlaid by deposits of the Quaternary period, which will be described last. In the extreme north-east are found the oldest rocks in the state — lower Devonian (the New Scotland beds of New York) and, not so old, an extension of the Lower Carboniferous which underlies the Warrior coalfields of Alabama,

and which consists of cherts, limestones, sandstones and shales, with a depth of 800 to 900 ft. The strata here show some traces of the upheaval which formed the Appalachian Mountain chain. When this chain formed the Atlantic mountain- border of the continent excepting this north-eastern corner, Missis- sippi had not emerged from the waters of the ancient Gulf of Mexico. As the shore line of the Gulf slowly receded southward and west- ward, the sediment at its bottom gradually came to the surface, and constituted the Cretaceous and Tertiary formations. Wherever stratification is observed in these formations in Mississippi, it shows a dip west and south of 20 or 30 ft. to the mile.

The Cretaceous region includes, with the exception of the Lower Carboniferous, all that part of the state eastward of a line cutting the Tennessee boundary in 88° 50′ W. long., and drawn southward and eastward near Ripley, Pontotoc, and Starkville, crossing into Alabama in latitude 32 ° 45′. There are four formations of Creta- ceous strata in Mississippi, defined by lines having the same general direction as the one just described. The oldest, bordering the Lower Carboniferous, is the Tuscaloosa formation of clays and sands arranged as follows: dark clays, thin lignite seams, lignitic clays, sands and chert, and light clays; this formation is 5-15 m. wide and reaches from about 33° 30′ on the Alabama boundary north to the Tennessee boundary. It is about 270 ft. thick. Tuscaloosa clays are used in the manufacture of pottery. Overlying the Tuscaloosa are the Eutaw sands, characterized by sandy laminated clays, and yellow, orange, red and blue sands, containing lignite and fossil resin. The Eutaw formation is a strip about 5 to 12 m. wide with a maximum depth of 300 ft. ‘ Westward to Houston and southward to about 32 ° 48′ on the Alabama boundary and occupying a much larger area than the other Cretaceous formations, is the Selma chalk, called ” Rotten Limestone ” by Hilgard; it is made up of a material of great uniformity, — a soft chalky rock, white or pale blue, composed chiefly of tenacious clay, and white carbonate of

lime in minute crystals. Borings show that the thickness of this group varies from 350 ft. in the north to about 1000 ft. at Starkville. Fossils are abundant, and forty species are recorded. The latest Cretaceous is the Ripley formation, which lies west of the northern part of the last-named, and, about Scooba, in a small strip, the most southerly of the Cretaceous — it is composed of coarse sandstones, hard crystal- line white limestones, clays, sands, phosphatic greensands, and dark- coloured, micaceous, glauconitic marls; its greatest thickness is about 280 ft. Its marine fossils are admirably preserved, and one hundred and eight species have been described.

Deposits of the Tertiary period form the basis of more than half the state, extending from the border of the Cretaceous westward nearly to the Yazoo Delta and the Mississippi Bottom, and south- ward to within a few miles of the Gulf coast. Seven formations (or groups) of the Tertiary strata have been distinguished in Missis- sippi. The oldest is the Midway limestone and clays in a narrow strip whose western limit is nearly parallel to the western boundary of the Selma chalk; it includes: the Clayton formation, characterized by the hard blue Turritella limestone (so named from the frequent fossil (Turritella mortoni) ; and Porters Creek (previously called Flat- woods) clay, which is grey, weathering white, and is occasionally over- lain by grey fossiliferous sandstone. The Wilcox formation (called Lignitic by Hilgard, and named by Safford the Lagrange group) lies to the west of the last, and its western limit is from about 32 12′ on the Alabama boundary about due north-west; in its north- western- most part it is on the western edge of the Tertiary in this state. Its minimum depth is 850 ft. It is marked by grey clays and sands, lignitic fossiliferous clays, beds of lignite or brown coal, sometimes 8 ft. in thickness, and brownish clays. The siliceous Claiborne

(or Tallahatta Buhrstone) formation lies south? westward from the last-named in a strip 10-30 m. wide, whose south-eastern extrem- ity is the intersection of the 32nd meridian with the Alabama boundary, is characterized by beds of aluminous grey and white sandstone, aluminous and siliceous clay-stone, quartzitic sandstone, and green sand and marls. The calcareous Claiborne or Claiborne- Lisbon formation-group lies south of the last, in a wedge-like strip with the apex on the Alabama boundary; it is a series of clays and sands, richly fossiliferous. The Jackson formation eouth-west of the Lisbon beds, is made up chiefly of grey calcareous clay marls, bluish lignitic clays, green-sand and grey siliceous sands. Basilo- saurus (or Zeuglodon) bones are found only in the Jackson marls, and other marine fossils are abundant. The minimum thickness of the formation is 240 ft. The Vicksburg formation lies next in order south-west, in a narrow strip of fairly regular width which alone of the Tertiary formations runs as far west as the Mississippi River; it is probably nowhere more than no ft. deep. It is characterized by semi-crystalline limestones and blue and white sandy marls. Marine fossils are very abundant in the marl. The Grand Gulf group, of formations of different ages, consisting of sands, sandstones and clays, and showing a few fossil plants, but no marine fossils, extends southward from the last to within a few miles of the coast, and is 750-800 ft. deep.

The older formation of the Quaternary period is the Lafayette (also called ” Orange-sand ” or ” stratified drift “), which imme- diately overlies all the Cretaceous groups except the prairies of the Selma chalk, and all the Tertiary except the Porters Creek and Vicksburg formations and parts of the Jackson. Its depth varies from a few feet to over 200 ft. (in the southern part of the state), and it forms the body of most of the hills in the state. Its materials are pebbles, clays and sands of various colours from white to deep red, tinged with peroxide of iron, which sometimes cements the pebbles and sands into compact rocks. The shapes of

these ferrugin- ous sandstones are very fantastic — tubes, hollow spheres, plates, &c, being common. The name stratified drift has been used to indicate its connexion with the northern drift. The fossils are few, and in some cases probably derived from the underlying formations. Well-worn pebbles of amorphous quartz (agate, chalcedony, jasper, &c.) are found in the stratified drift along the western side of the Tertiary region of the state, and from Columbus northward. The second Quaternary formation is the Port Hudson, occurring within 20 m. of the Gulf coast, and, with alluvium, in the Yazoo Delta. Heavy clays, gravel and sands, containing cypress stumps, drift- wood and mastodon bones, are characteristic. The loess or bluff formation lies along the bluffs bordering the Bottom, nearly con- tinuously through the state. Its fine-grained, unstratified silt contains the remains of many terrestrial animals, including fifteen mammals.

Fauna. — Among the more common species of game are squirrels, opossums, musk-rats, rabbits, racoons, wild turkeys, ” partridges ” (quail, or Bob White), geese, and ducks; deer, black bears, grey (or timber) wolves, black wolves and ” wild cats ” (lynx), once common, have become rare. Alligators inhabit the southern river-bottoms, and there are some rattlesnakes on the uplands. Among a great variety of song-birds the mocking-bird is prominent; the parakeet is found in the southern part of the state. Buffalo-fish, paddle-fish, cat-fish, drum, crappie, black bass, rock bass, German carp, sturgeon, pike, perch, eels, suckers and shrimp inhabit the waters of t’he Mississippi and its tributaries, and oysters, shrimp, trout, Spanish mackerel, channel bass, black bass, sheepshead, mullet, croakers, pompano, pin-fish, blue-fish, flounders, crabs and terrapin are ob- tained from the Mississippi Sound and the rivers flowing into it.

Flora. — Originally Mississippi was almost entirely covered with a growth of forest trees of large size, mostly deciduous ; and in 1900 about seven-tenths of its area was still classed as timber-land. The north

central part of the state, known as the ” flat woods,” is level and heavily forested. There are more than 120 species of trees in the state, 15 of oak alone. The most valuable species for lumber are the long-leaf pine which is predominant in the low southern third of the state, sometimes called the ” cow-country ” ; the short-leaf pine, found farther north ; the white oak, quite widely distributed ; cotton-wood and red gum, found chiefly on the rich alluvial lands; and the cypress, found chiefly in the marshes of the Delta. The beautiful live oaks and magnolias grow only in the south of the state; the holly in the lowlands; and the finest species of pecan, in the Delta. The sassafras, persimmon, wild cherry and Chickasaw plum are found in all parts cf the state. The grape, Ogeechee lime (Nyssa capitata) and pawpaw are also native fruits. Among indigenous shrubs and vines are the black- berry, dewberry, strawberry, yellow jasmine, mistletoe and poison-oak; and among medicinal herbs are horehound, ginger and pepper- mint. Here, too, grows Spanish moss, used by upholsterers.

Climate. — The southern latitude, the low elevation and the prox- imity to the Gulf of Mexico produce in southern Mississippi a rather mild and equable climate, but to the northward the extremes increase. The normal annual temperature for the state is 64 ° F. ; on the coast it is 67 ° F., and on the northern border it is 61 ° F. During a period of twenty years, from January 1887 to December 1906, extremes of temperature at Biloxi, on the coast, ranged from 1° F. to 100° F. ; during nearly the same period at Pontotoc, in the north-eastern part

of the state, they ranged from- n 8 F. to 105° F. The greatest extremes recorded were 15° F. at Aberdeen, Monroe county, on the 13th of February 1899, and 107 F. at several places in July and August of different years. January is the coldest month, and July is the warmest. During the winter the normal temperature decreases quite steadily from south to north ; thus the mean tempera, ture in January at Biloxi is 51 ° F., at Meridian, in the east central part, it is 46° F., and at Pontotoc it

is 43° F. But during the summer, temperatures are affected as much by altitude as by lati- tude, and the coast is cooled at night by breezes from the Gulf. The July mean is 82 ° F. at several places in the southern part of the state, and at Yazoo city, in the west central part, it is 83° F. The normal annual precipitation for Mississippi is about 51 in. ; for the southern half, 54 in., and for the northern half, 49 in. An average of 4 in. of snow falls in the northern half, but south of Natchez snow is seldom seen. Nearly one-third of the rain falls in January, February and March; July, also, is one of the wet months. The driest season is in September and October. The prevailing winds are from the south-east; but the rain-bearing winds are chiefly from the south- west, and the high winds from the west and north-west.

Soils. — The most fertile soil is the alluvium of the Delta, deposited during the overflows of the Mississippi. Others that are exceedingly productive are the black calcareous loam of the prairies, the calcareous silt of the bluff belt along the eastern border of the Delta, and the brown loam of the tableland in the central part of the state. Of inferior quality are the yellow loam of the hills in the north-east and the sandy loam in the pine belt of the south. Throughout the southern portion sand is a large ingredient, and to the northward there is more or less lime.

Agriculture. — Mississippi is devoted largely to the cultivation of cotton. Of the total land area of the state, 18,240,736 acres (61 3 %) were, in 1900, included in farms, and the improved farm land in creased from 4,209,146 acres in 1870 to 7,594,428 acres (41-6 % of all farm land) in 1900. After the abolition of slavery, farms greatly decreased in size and increased in number; the number grew from 68,023 in 1870 to 220,803 in 1900; the average size fell from 369-7 acres in i860 to 82-6 acres in 1900. Of the total number of farms in 1900, 81,412 were worked by owners or part owners (60,585 by- whites and 20,827 by negroes) ; 70,699 were worked by cash tenants (13.505 by whites and 57,194 by negroes);

and 67,153 were worked by share tenants (16,748 by whites and 50,405 by negroes).

The acreage of cotton increased from 2,106,215 acres in 1879 to 3,220,000 in 1907; the yield increased from 936,111 bales in 1879 to 1,468,177 bales in 1907. Cotton is grown in every county of the state, but the large yields are in the Delta (Bolivar, Coaohma, Wash- ington, Yazoo and Leflore counties), the greatest cotton-producing region of the world, and in Monroe. Lowndes and Noxubee counties on the Alabama border. The acreage of Indian corn in 1907 was 2,500,000 acres and the crop 42,500,000 bushels. The production of other cereals decreased during the latter half of the 19th century: oats, from 1,959,620 bushels in 1879 to 1,611,000 bushels in 1907; wheat, from 587,925 bushels in 1859 to 22,000 in 1907; rye, from 39,474 bushels in 1859 to 963 bushels in 1899, after which year the crop has been negligible; and rice, from 2,719,856 lb in 1849 to about 1,080,000 lb in 1907. The largest Indian-corn producing districts are nearly the same as those which produce the most cotton ; oats and wheat are grown chiefly in the north-eastern quarter of the state, and rice in the south-western quarter.

Between 1850 and 1907 dairy cows increased from 214,231 to 330,000; other neat cattle from 519,739 to 5‘89,ooo; sheep decreased from 304,929 to 181,000; swine decreased from 1,582,734 to 1,316,000; horses increased from 115,460 to 260,000, and mules from 54,547 to

279,000.

Sugar-cane is grown principally in the southern part of the state, but sorghum-cane is grown to some extent in nearly every county. Sweet potatoes, white potatoes and onions also are important crops. The greatest relative advance between 1889 and 1899 in any branch of agriculture was made in the growth of market-garden produce and small fruits; for old pine lands, formerly considered useless, had been found valuable for the purpose. The number of orchard trees increased nearly 100 % within the same decade.

At Crystal Springs tomatoes were first successfully grown for the market (1 874-1 876). Orchard trees and grape-vines are widely distributed throughout the state, but with the exception of peaches their yield is greater in the northern portion,

Lumber .—Mississippi ranks high among the southern states in the production of lumber. Its timber-land in 1900 was estimated at 32,300 sq. m. From the extreme south most of the merchantable timber had been cut, but immediately north of this there were still vast quantities of valuable long-leaf pine ; in the marshes of tt(e Delta was much cypress, the cotton-wood was nearly exhausted; and the gum was being used as a substitute for it ; and on the rich upland soil were oak and red gum, also cotton-wood, hickory and maple. The lumber and timber product increased in value from $1,920,335 in 1880 to $24,035,539 in 1905. Pine stumps and waste limbs are utilized, notably at Hattiesburg, for the manufacture of charcoal, tar, creosote, turpentine; &c.

Fisheries, — Fishing is a minor industry, confined for the most part to the Mississippi Sound and neighbouring waters and to the Missis- sippi and Yazoo rivers. The most valuable branch is the oyster

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fishery on the reefs in the Sound, much developed since 1880. The shrimp fishery, too, grew during the same period. About 40 % of the total catch of the state is made by the inhabitants of Harrison county on the Gulf of Mexico.

Minerals. — The mineral wealth of the state is limited. Clays and mineral waters are, however, widely distributed. Large quantities of mineral water, sulphur, chalybeate and lithia, bottled at Meridian, Raymond and elsewhere, are sold annually. The state contains deposits of iron, gypsum, marl, phosphate, lignite, ochre, glass-sand, tripoli, fuller’s earth, limestones and sandstones; and there are small gas flows in the Yazoo Delta.

Manufactures. — The lack of mineral resources, especially of coal and iron, of a good harbour (until the improvement of Gulfport), and of an adequate supply of labour has discouraged most kinds of manufacturing. The value of the total factory product was 157,451,445 in 1905, when a little more than three-fourths was represented by lumber and timber products, cotton-seed oil and cake, and cotton goods. The leading manufacturing centres are Meridian, Vicksburg, Jackson, Natchez and Biloxi.

Transport. — Along the entire western border of the state the Mississippi River is navigable for river steamboats. On the south- ern border, the

Mississippi Sound affords safe navigation for small coasting vessels, and from Gulfport (13 m. W.S.W. of Biloxi) to Ship Island, which has one of the best harbours on the entire Gulf Coast, the Gulf & Ship Island Railroad Company, with the co-operation of the United States Government, in 1901 began to dredge a channel 300 ft. wide and 19 ft. at mean low water, and to construct an anchor- age basin (completed in 1906) at Gulfport, § m. long and J m. wide, and 19 ft. deep. In June 1908 the maximum low-water draft of the channel and the basin was 19 ft. The Gulfport project reduced freight rates between Gulfport and the Atlantic seaboard cities and promoted the trade of Gulfport, which is the port of entry for the Pearl River customs district. Its imports for 1909 were valued at $82,028 and its exports at $8,581,471. The Yazoo, Tallahatchie, Yalobusha, Sunflower, Big Black, Pascagoula and Pearl rivers are also navigable to a limited extent. The first railway in Mississippi was completed from Vicksburg to Clinton in 1840, but the state had suffered severely from the panic of 1837, and in 1850 it had only 75 m. of railway. This was increased to 862 m. by i860. The Civil War then interfered, and in 1880 the mileage was only 1127 m. During the next decade it was a little more than doubled, and at the close of 1908 it was 3916-85 m. The principal lines are the Illinois Central, the Yazoo & Mississippi Valley, the Southern, the Mobile & Ohio, the New Orleans & North-eastern, the Kansas City, Memphis & Birmingham, the Mobile, Jackson & Kansas City, the Alabama & Vicksburg, and the Gulf & Ship Island.

Population. — The population increased from 1,131,597 in 1880 1 to 1,289,600 in 1890, of 14% within the decade, and by 1900 it had grown to 1,551,270 (99-48% native-born), and by 1910 to 1,797,114. The density of population in 1900 was 33.5 per sq. m.; 641,200, or 4 1 ‘3%, were whites; 907,630, or 58-5%, were negroes; 2203 were Indians, and 237 were Chinese; in eight counties of the Delta the ratio of negroes to whites was almost 7 to 1. The Indians are descendants of the Choctaw tribe;

they are all subject to taxation, and most of them live in the east central part of the state. The principal religious denominations are the Baptist (371,518 in 1906) and the Methodist (212,105 m 1906). The cities and towns having a population in 1900 of 4000 or more were: Vicksburg, Meridian, Natchez, Jackson, Greenville, Columbus, Biloxi, Yazoo City, McComb and Hattiesburg.

Government — The chief special object of the present constitu- tion, adopted on the 1st of November 1890, was to preserve in a legal manner the supremacy of the whites over the ignorant negro majority. In addition to the ordinary suffrage qualifi- cations of age, sex, and residence, the voter must have paid all taxes due from him for the two years immediately preceding the election, and he must be able to read any section of the constitution or-" be able to understand the same when read to him, or give a reasonable interpretation thereof." The former provision, strengthened by a poll-tax for school purposes assessed on adult males, affects both white and blacks; the latter, owing to the discretion vested in the election officers, affects (in practice) mainly the blacks. The chief executive officials are the governor, lieutenant-governor, secretary of state, treasurer, auditor, attorney-general, and superintendent of education. All are chosen for terms of four years, and the governor, treasurer, and auditor are ineligible for immediate re-election.

1 The population at each of the preceding censuses was : 8850 in 1800; 40,352 in 1810; 75,448 in 1820; 136,621 in 1830; 375,651 in 1840; 606,526 in 1850; 791,305 in i860; and 827,922 in 1870.

The method of election is peculiar, being based in part upon the national presidential model. Each county or legislative district casts as many electoral votes as it has members in the state house £>f representatives, and a majority of both the electoral and the popular vote is required. If no one has such a majority, the house of representatives chooses one of the two who have

received the highest number of popular votes; but this is really a provision never executed, as the Democratic nominees are always elected without any serious opposition. The governor is empowered to call extraordinary sessions of the legislature, to grant pardons and reprieves, and to exercise a power of veto which extends to items in appropriation bills; a two-thirds majority of the legislature is necessary to pass a bill over his veto. His appointing power is not very extensive, as nearly all officials, except judges, are elected by popular vote.

The legislature consists of a senate and a house of represen- tatives, chosen every four years. It meets in regular session quadrennially, in special sessions in the middle of the interval to pass the appropriation and revenue bills, and in extraordinary session whenever the governor sees fit to call it. Revenue mea- sures may originate in either house, but a three-fifths vote in each is necessary to their enactment. The constitution goes into minute detail in prohibiting local, private and special legislation.

The judiciary consists of a supreme court of three judges, thirteen (1908) circuit courts, seven (1908) chancery courts, county courts and justice of the peace courts. Under the con- stitution of 1890 the governor, with the consent of the senate, appoints supreme court judges for a term of nine years, and circuit and chancery judges for four years. The local judicial authorities are the County board of supervisors of five members and the justices of the peace.

The other county officials are the sheriff, coroner, treasurer, assessor, surveyor and superintendent of education. The superintendent is chosen by the state board of education except in those counties (now all or nearly all) in which the legislature has made the office elective. The courts have interpreted this to mean that the manner of selection need not be uniform (Wynn v. State, 67 Miss. 312), a rule which would possibly apply to other local offices. The

intention seemed to be to permit the appointment of officials in counties and districts where there was any likelihood of negro supremacy.

Mississippi has taken a leading part in the movement to bring about the removal of the common law disabilities of married women, the first statute for that purpose having been passed in 1839. Under the present constitution they are ” fully emancipated from all dis- ability on account of coverture,” and are placed on an equality with their husbands in acquiring and disposing of property and in making contracts relative thereto. A divorce may be granted only to one who has lived for at least one year in the state ; among the recognized causes for divorce are desertion for two years, cruelty, insanity or physical incapacity at time of marriage, habitual drunkenness or excessive use of opium or other drugs, and the conviction of either party of felony. The homestead of a householder (with a family) who occupies it may be held exempt from sale for the collection of debts other than those for purchase-money, taxes, or improvements, or for the satisfaction of a judgment upon a forfeited recognizance or bail-bond, but a homestead so exempted is limited to $3000 in value and to 160 acres of land. A considerable amount of personal property, including furniture, a small library, provisions, tools, agri- cultural implements, livestock and the proceeds of a life insurance policy, is also exempt from seizure for the satisfaction of debts. Since 1909 the sale of intoxicating liquors has been prohibited by statute.

Penal and Charitable Institutions. — The penitentiary at Jackson was established under an Act of 1836, was erected in 1838-1839, was Opened in 1840, was burned by the Federals in 1863, and was rebuilt in 1866-1867. The board of control is composed of the governor, attorney-general and the three railroad commissioners. The convict lease system was abolished by the constitution of 1890 (the provision to take effect on the 31st of December 1894), and state farms were purchased in Rankin, Hinds and Holmes counties. As these were

insufficient to give employment to all the prisoners, some were put to work on Yazoo Delta plantations on partnership con- tracts. Under an act of 1900, however, 13,889 acres of land were purchased in Sunflower county; and there and at Tchula, Holmes county, and at Oakley, Hinds county, the negro convicts — the white convicts are on the Rankin county farm— are kept on several large plantations, with saw-mills, cotton gins, &c. Under a law of 1906 these farm penitentiaries are controlled by a board of three trustees, elected by the people; they are managed by a superintendent.

appointed once every four years by the governor. The charitable institutions of the state are supervised by separate boards of trustees appointed by the governor. The state insane hospital, opened at Jackson in 1856 (act of 1848), in time became overcrowded and the East Mississippi insane hospital was opened, 2 m. west of Meridian in 1885 (act of 1882). The state institution for the education of the deaf and dumb (1854) and the state institution for the blind (1848) are at Jackson. State aid is given to the hospitals at Vicksburg and Natchez.

Education. — Educational interests were almost entirely neglected during the colonial and territorial periods. The first school estab- lished in the state was Jefferson College, now Jefferson Military College, near Natchez, Adams county, incorporated in 1802. Charters were granted to schools in Claiborne, Wilkinson and Amite counties in 1809-1815, and to Port Gibson Academy and Mississippi College, at Clinton, in 1826. The public school system, established in 1846, never was universal, because of special legislation for various counties; public education was retarded during the Civil War and the Reconstruction period (when immense sums appropriated for schools were grossly mismanaged), but conditions gradually improved after 1875, especially through the

concentration of schools. The sessions are still too short, teachers are poorly paid and attendance is voluntary. The long lack of normal training for white teachers (from 1870 to 1904 there was a normal school for negroes at Holly Springs) lasted until 1890, when a teacher's training course was introduced into the curriculum of the state university. There are separate schools for whites and blacks, and the equipment and service are approximately equal, although the whites pay about nine-tenths of the school taxes. The schools are subject to the supervision of a state superintendent of public education and of a board of education, composed of the superintendent, the secretary of state, and the attorney-general, and within each county to a county superintendent. The schools are supported by a poll-tax, by general appropriations, by local levies, and by the Chickasaw school fund. An act of Congress of the 3rd of March 1803 reserved from sale section sixteen of the public lands in each township for educational purposes. When the Chickasaws ceded their lands to the national government, in 1830 and in i832,thestatemadeaclaim to the sixteenth sections, and finally in 1856 received 174,550 acres — one thirty-sixth of the total cession of 6,283,804 acres. The revenue derived from the sales and leases of this land constitutes an endowment fund upon which the state as trustee pays 6 % interest. It is used for the support of the schools in the old Chickasaw territory in the northern part of the state.

Among the institutions for higher education are the university of Mississippi (chartered 1844; opened 1848), at Oxford, which was opened to women in 1882; the Agricultural and Mechanical College (opened 1880), at Agricultural College, near Starkville, Oktibbeha county; the Industrial Institute and College for Girls (opened 1885), at Columbus; and the Alcorn Agricultural and Mechanical College for negroes (1871; reorganized in 1878), at Westside. In 1819 Congress granted thirty-six sections of public land for the establish- ment of a university. This land was sold in 1833 for $277,332.52, but the

entire sum was lost in the failure of the Planters' Bank in 1840. In 1880 the stace assumed liability for the full amount plus interest, and this balance, $544,061.23, now constitutes an endow- ment fund, upon which the state pays 6% interest. Congress granted another township (thirty-six sections) for the university in 1892, and its income is supplemented by legislative appropria- tions for current expenses and special needs. The two agricultural and mechanical colleges were founded by the sale of public lands given by Congress under the Morrill Act of 1862. An agricultural experiment station established in 1887 under the Hatch Act, is at Agricultural College; and there are branch experiment stations at McNeill, Pearl River county (1906), near Holly Springs, and at Stonevilie, near Greenville.

Finance.— The chief sources of revenue are taxes on realty, personalty and corporations, a poll-tax, and licences. The more important expenditures are for public schools, state departments, educational and charitable institutions and pensions for Con- federate veterans. The early financial history of the state is not very creditable. The Bank of Mississippi, at Natchez, incorporated by the Territorial legislature in 1809, was rechartered by the state in 1818, and was guaranteed a monopoly of the banking business until 1840. In violation of this pledge, and in the hope that a new bank would be more tractable than the Bank of Mississippi, the Planters' Bank was established at Natchez, in 1830, with a capital of $3,000,000, two-thirds of which was subscribed by the state. During the wild era of speculation which followed (especially in 1832 — upon the open- ing of the Chickasaw Cession to settlement) a large number of banks and railroad corporations with banking privileges were chartered. The climax was reached in 1838 with the incorporation of the Union Bank. This, the most pretentious of all the state banks of the period, was capitalized at $15,500,000. The state subscribed $5,000,000, which was raised on bonds sold to Nicholas Biddle, president of the United States Bank

of Pennsylvania. As the Union Bank was founded in the midst of a financial panic and was mismanaged, its failure was a foregone conclusion. Agitation for repudiation was begun by Governor A. G. McNutt (1801–1848), and that question became the chief issue in the gubernatorial campaign of 1841,

Tilghman M. Tucker (1802–1859), the Democratic candidate, repre- senting the repudiators and David O. Shattuck, Whig, representing the anti-repudiators. The Democrats were successful, and the bonds were formally repudiated in 1842. In 1853 the High Court of Appeals and Errors of the state in the case of Mississippi v. Hezion Johnson (35 Miss. Reports, 625) decided unanimously that nothing could absolve the state from its obligation. The decision was disre- garded, however, and in the same year the Planters' Bank bonds were also repudiated by popular vote. These acts of repudiation were sanctioned by the constitution of 1890. The $7,000,000 saved in this manner has doubtless been more than offset by the additional interest charges on subsequent loans, due to the loss of public con- fidence. Mississippi suffered less than most of the other Southern states during the Reconstruction period; but expenditures rose from $463,219.71 in 1869 to $1,729,046.34 in 1871. At the close of the Republican regime in 1876 its total indebtedness was $2,631,704.24, of which $814,743 belonged to the Chickasaw fund (see above) and $718,946.22 to the general school fund. As ' the principal of these funds is never to be paid, the real debt was slightly over $1,000,000. On the 1st of October 1907 the payable debt was $1,253,029.07, the non-payable $2,336, 197. 58, 1 a total 01 $31589,226.65. Since the Civil War the banking laws have become more stringent and the national banks have exercised a wholesome influence. There were, in 1906, 24 national banks and 269 state banks, but no trust companies, private banks or savings banks.

History. — At the beginning of the 16th century the territory- included in the present state of Mississippi was inhabited by three powerful native tribes: the Natchez in the south-west, the Choctaws in the south-east and centre, and the Chickasaws in

the north. In addition, there were the Yazoos in the Yazoo valley, the Pascagoulas, the Biloxis, and a few weaker tribes on the borders of the Mississippi Sound. The history of Mississippi may be divided into the period of exploration (1540- 1699), the period of French rule (1699-1763), the period of English rule (1763-1781), the period of Spanish rule (1781- 1798), the territorial period (1798-1817), and the period of statehood (1817 seq.).

Hernando de Soto (q.v.) and a body of Spanish adventurers crossed the Tombigbee river, in December 1540, near the present city of Columbus, marched through the north part of the state, and reached the Mississippi river near Memphis in 1541. In 1673 a French expedition organized in Canada under Jacques Mar- quette and Louis Joliet sailed down the Mississippi to the mouth of the Arkansas, and nine years later (1682) Rene Robert Cave- lier, sieur de la Salle, reached the mouth of the river, took formal possession of the country which it drains, and named it Louisiana in honour of Louis XIV. The first European settle- ment in Mississippi was founded in 1699 by Pierre Lemoyne, better known as Iberville, at Fort Maurepas (Old Biloxi) on the north side of Biloxi Bay, in what is now Harrison county. The site proving unfavourable, the colony was transferred to Twenty- seven Mile Bluff, on the Mobile River, in 1 702, and later to Mobile (1710). The oldest permanent settlements in the state are. (New) Biloxi (c. 171 2), situated across the bay from Old Biloxi and nearer to the Gulf, and Natchez or Fort Rosalie (1716). During the next few years Fort St Peter and a small adjoining colony were established on the Yazoo River in Warren county, and some attempts at settlement were made on Bay St Louis and Pascagoula Bay. The efforts (1712-1721) to foster coloni- zation and commerce through trading corporations established by Antoine Crozat and John Law failed, and the colony soon came again under the direct control of the king. It grew very slowly, partly because of the hostility of the Indians and partly because of the incapacity of the French as .colonizers. In 1729-1730 the Natchez tribe

destroyed Fort St Peter, and some of the small outposts, and almost destroyed the Fort Rosalie (Natchez) settlement.

At the close of the Seven Years' W T ar (1763) France ceded to Great Britain all her territory east of the Mississippi except New Orleans, and Spain ceded Florida to Great Britain. By a royal proclamation (Oct. 7, 1763) these new possessions were divided into East Florida and West Florida, the latter lying S. of the 31st parallel and W. of the Chattahoochee and Apalachicola rivers. Crown orders of 1764 and 1767 extended the limits N. to

1 The increase is due mainly to the assumption of the university obligations in 1880.

a line due E. from the mouth of the Yazoo at about 32 28′ N. lat. Under English rule there was an extensive immigration into this region from England, Ireland, Georgia and South Carolina. A settlement was made on the Big Black, 17 m. froin its mouth, in 1774 by Phineas Lyman (1716–1774) of Connecticut and other " military adventurers," veterans of the Havana cam- paign of 1762; this settlement was loyal during the War of Independence. Spain took military possession in 1781, and in the Treaty of Paris (1783) both of the Floridas were ceded back to her. But Great Britain recognized the claims of the United States to the territory as far south as the 31st parallel, the line of 1763. Spain adhered to the line of 1 764–1 767, and retained possession of the territory in dispute. Finally, in the treaty of San Lorenzo el Real (ratified 1796) she accepted the 1763 (31°) boundary, and withdrew her troops in 1798. Missis- sippi Territory was then organized, with Winthrop Sargent as governor. The territorial limits were extended on the north to the state of Tennessee in 1804 by the acquisition of the west cessions of South Carolina and Georgia, and on the south to the Gulf of Mexico by the seizure of West

Florida in 1810-1813, 1 but were restricted on the east by the formation of the Territory of Alabama in 1817. Just after the uprising of 1729-1730 the French, with the help of the Choctaws, had destroyed the Natchez nation, and the shattered remnants were absorbed by the neighbouring tribes. The Chickasaws ceded their lands to the United States in 1816 and the Choctaws theirs in 1830-1832; and they removed to the Indian Territory. The smaller tribes have been exterminated, absorbed or driven farther west.

An Enabling Act was passed on the 1st of March 181 7, and the state was formally admitted into the Union on the 10th of December. The first state constitution (1817) provided a high property qualification for governor, senator and representative, and empowered the legislature to elect the judges and the more important state officials. In 1822 the capital was removed to Jackson from Columbia, Marion county. 2 The constitution of 1832 abolished the property qualification for holding office and provided for the popular election of judges and state officials. Mississippi thus became one of the first states in the Union to establish an elective judiciary. 3 The same constitution pro- hibited the importation of negro slaves from other states; but this prohibition was never observed, and the United States Supreme Court held that it was ineffective without an act of the legislature. On the death of John C. Calhoun in 1850 the state, under the leadership of Jefferson Davis, began to rival South Carolina as leader of the extreme pro-slavery States' Rights faction. There was a brief reaction: Henry Stuart Foote (1800-1880), Unionist, was elected governor in 1851 over Davis, the States' Rights candidate, and in the same year a Constitu- tional Convention had declared almost unanimously that " the asserted right of secession" . . . "is utterly unsanctioned by the Federal Constitution." But the particularistic sentiment continued to grow. An ordinance of secession was passed on the 9th of January 1861, and the constitution was soon amended to conform to the new constitution of the Confederate States. During

the Civil War battles were fought at Corinth (1862), Port Gibson (1863), Ja.kson (1863) and Vicksburg (1863). In 1865 President Johnson appointed as provisional governor William Lewis Sharkey (1797–1873), who had been chief justice of the state in 1832–1850, and a convention which assembled on the 14th of August recognized the ” destruction ” of slavery and declared the ordinance of secession null and void. The first reconstruction legislature met on the 16th of October 1863, and at once proceeded to enact stringent vagrancy laws and other measures against the freedmen; these laws the North

1 South Carolina ceded its western lands to the United States in 1787 and Georgia in 1802. The government added them to Missis- sippi in 1804. The seizure of West Florida was supplemented by the treaty of 1819–1821, in which Spain surrendered all of her claims.

2 The seats of government have been Natchez (1 798–1 802), Wash- ington (1802–1817), Natchez (1817–1821), Columbia (1821–1822), Jackson (1822 seq.).

3 This system proved unsatisfactory, and in 1869 was aban- ‘ doned.

interpreted as an-effort to restore slavery. Under the Recon- struction Act of the 2nd of March 1867 Mississippi with Arkansas formed the fourth military district, commanded successively by Generals E. O. C. Ord (1867), Alvan C. Gillem (1868) and Irvin McDowell (June–July 1868), and by Gillem (1868–1869) and Adelbert Ames (1869–1870). The notorious ” Black and Tan Convention ” of 1868 adopted a constitution which con- ferred suffrage upon the negroes and by the imposition of test oaths disfranchised the leading whites. It. was at first rejected at the polls, but was finally ratified in November 1869 without the disfranchising clauses. The fourteenth and fifteenth amend- ments to the Federal Constitution were ratified in 1870, and the state was formally readmitted into the Union on the 23rd “of February of that year.

From 1870 to 1875 the government was under the control of ” carpet-baggers,” negroes and the most disreputable element among the native whites. Taxes were increased — expenditure increased nearly threefold between 1869 and 1871 — and there was some official corruption; but the state escaped the heavy burden of debt imposed upon its neighbours, partly because of the higher character of its reconstruction governors, and partly because its credit was already impaired by the repudiation of obligations contracted before the war. The Democrats carried the legis- lature in 1875, and preferred impeachment charges against Governor Adelbert Ames (b. 1835), a native of Maine, a graduate of the United States Military Academy (1861), a soldier in the Union army, and military governor of Mississippi in 1868-1870. The lieutenant-governor, A. K. Davis, a negro, was impeached and was removed from office; T. W. Cardoza, another negro, superintendent of education under Ames, was impeached on twelve charges of malfeasance, but was permitted to resign. Governor Ames, when the impeachment charges against him were dismissed on the 29th of March 1876, immediately resigned. The whites maintained their supremacy by very dubious methods until the adoption of the constitution of 1890 made it no longer necessary. The state has always been Democratic in national politics, except in the presidential elections of 1840 (Whig) and 1872 (Republican). The electoral vote was not counted in 1864 and 1868.

Governors Territorial Period (1798-1817).

Winthrop Sargent 1798-1801

William C. C. Claiborne 1801-1805

Robert Williams 1805-1809

David Holmes 1809-1817

Statehood Period (18 17 seq.).

David Holmes Democrat 1817-1820

George Poindexter „ 1820-1822

Walter Leake …. Democrat (died in office) 1822-1825

Gerard C. Brandon (ad int.) . . Democrat 1825-1826

David Holmes …. Democrat (resigned) 1826

Gerard C. Brandon (ad int. 1826-1828) 1826-1832

Abram M. Scott . . . Democrat^ (died in office) . 1832-1833

Charles Lynch 4 (ad int.) Hiram G. Runnels John Anthony Quitman (ad int. Charles Lynch …. Alexander Gallatin McNutt. Tilghman M. Tucker Albert Gallatin Brown . Joseph W. Matthews John Anthony Quitman 5 John Isaac Guion 6 (ad int.). James Whitfield (ad int.) . Henry Stuart Foote John Jones Pettus 7 (ad int.) John J. McRae …. William McWillie … John Jones Pettus

•)

Democrat

Whig Democrat

Unionist Democrat

1833

1833-1835

1835-1836

1836-1838

1838-1842

1842-1844

1 844-1 848

1848-1850

1850-1851

1851

1851-1852

1 852-1 854

1854 1854-1857

1857-1859 1859-1863

4 Under the constitution of 1832 the president of the senate suc- ceeded the governor in case of a vacancy.

5 Governor Quitman resigned because of charges against him of aiding Lopez's expedition against Cuba.

6 On the 4th of November the term for which Guion had been elected as a senator expired and he was succeeded in the governor- ship by Whitfield, elected by the senate to be its president.

7 Served from the 5th of January (when Foote resigned) to the 10th, when McRae was inaugurated.

MISSISSIPPI RIVER

Charles Clark 1 Democrat 1 863-1 865

William Lewis Sharkey Provisional 1865

Benjamin Grubb Humphreys 2 . . . Republican 1865-1868 Adelbert Ames . . Republican (Military Governor) 1868-1870

James Lusk Alcorn 3 Republican 1 870-1 871

Ridgley Ceylon Powers (ad int.) . . ,, 1 871-1874

Adelbert Ames 4 ,, 1874-1876

John Marshall Stone (ad int. 1876-78) Democrat 1 876-1 882

Robert Lowry , 1882-1890

J. M. Stone „ 1890-1896

Anselm Joseph McLaurin 1896-1900

Andrew Houston Longino …. „ 1900-1904

Tames Kimble Vardaman 1 904-1 908

Edmund Favor Noel „ 1908

See T. A. Owen, ” A Biography of Mississippi,” in the Annual Report of the American Historical Association, 189Q, i. 633-828 (Washington, 1900) ; ” Report of the Mississippi Historical Commis- sion ” in the Publications of the Mississippi Historical Society, v. 52- 310 (Oxford, Miss., 1902). J. F. H. Claiborne’s Mississippi as a Pro- vince, Territory and State (Jackson, 1880), gives the best account of the period before the Civil War. R. Lowry and W. H. McCardle, History of Mississippi (New York, 1893), is useful for local history. Of most value for the history are the writings of P. J. Hamilton, J. W. Garner and F. L. Riley. Hamilton’s Colonial Mobile (Boston and New York, 1898), and the Colonization of the South (Philadelphia, 1904) are standard authorities for the French and English periods (1699-1781). Garner’s Reconstruction in Mississippi (New York, 1902) is judicial, scholarly and readable. Most of Riley’s work is in the Publications of the Mississippi Historical Society (Oxford, 1898 seq.), which he edited ; see his Spanish Policy in Mississippi after the Treaty of San Lorenzo, i. 50-66; Location of the Boundaries of Mississippi, iii. 167-184; and Transition from Spanish to American Rule in Mississippi, iii. 261-31 1. There is much material in the Encyclopaedia of Mississippi History (2 vols., Madison, Wisconsin, 1907), edited by Dunbar Rowland. There is a state Department of Archives and History.

MISSISSIPPI 5 RIVER, the central artery of the river system which drains the greater part of the United States of America lying between the Appalachian Mountains on the east and the Rocky Mountains on the west. It rises in the basin of Itasca Lake, in

northern Minnesota, and flows mostly in a southerly direction to the Gulf of Mexico. In the region of its headwaters are numerous lakes which were formed by glacial action, but the river itself was old before the glacial period, as is shown by the crumbling rocks on the edges of the broad and driftless valley through which it flows along the S.E. border of Minnesota and the S.W. border of Wisconsin, in contrast with the precipi- tous bluffs of hard rock on the edges of a valley that is narrow and steep-sided farther down where the river was turned from its ancient course by the glacier. So long as the outlet of the Great Lakes through the St Lawrence Valley was blocked by the icy mass, they were much larger than now and discharged through the Wabash, Illinois and other rivers into the Mississippi. Below the glaciated region, that is from southern Illinois to the Gulf, the river had carved before the close of the glacial period a flood-plain varying in width from 5 to 80 m., but this has been filled to a depth of 100 ft. or more with alluvium, and in the post- glacial period an inner valley has been formed within the outer one. The total length of the river proper from the source near Lake Itasca to its mouth in the Gulf of Mexico is 2553 m.; but the true source of the river is at the fountain-head of the Missouri, in the Rocky Mountains, on the S.W. border of Mon- tana, 8000 ft. above the sea, and from this source there is a con- tinuous stream to the Gulf which is 4221 m. long — the longest in the world. The Mississippi and its tributaries have more than 15,000 m. of navigable waterways and drain an area of approximately 1,250,000 sq. m. The system extends through the heart of the continent and affords a direct line of communica- tion between temperate and tropical regions. Certain physical and hydrographic features, however, make the regulation and

1 Removed from office by Federal troops, 22nd of May 1865; W. L. Sharkey was appointed provisional governor by President Johnson.

2 Removed from office by U.S. troops 15th of June 1868.

3 Resigned 30th of November 1 871.

4 Resigned 29th of March 1876; succeeded by the president of the senate.

5 The name is from the Algonkin missi-sepe, literally ” father of waters.”

control of the Mississippi below the influx of the Missouri an exceedingly difficult problem.

The Upper Mississippi, that is the Mississippi from its source to the mouth of the Missouri, drains 173,000 sq. m., over which the annual rainfall averages 34-7 in., and its discharge per second into the Lower Mississippi varies from 25,000 cub. ft. to 550,000 cub. ft. The Missouri drains 528,000 sq. m., over which the annual rainfall averages 19-6 in., and its discharge per second into the Mississippi varies from 25,000 cub. ft. to 600,000 cub. ft. The Ohio drains 214,000 sq. m., over which the annual rainfall averages 43 in., and its discharge per second varies from 35,000 cub. ft. to 1,200,000 cub. ft. The Arkansas drains 161,000 sq. m., over which the annual rainfall averages 28-3 in., and its discharge per second varies from 4000 cub. ft. to 250,000 cub. ft. The Red drains 97,000 sq. m., over which the annual rainfall averages 38-3 in., and its discharge per second varies from 3500 cub. ft. to 180,000 cub. ft. These and a few smaller tributaries produce a river which winds its way from Cape Girardeau, Missouri, to the passes through a flood plain averag- ing about 40 m. in width and having a general southern slope of 8 in. to the mile. The general lateral slope towards the foothills is about 6 in. in 5000 ft., but the normal fall in the first mile is about 7 ft. Thus the river sweeps onward with great velocity, eroding its banks in the bends and rebuilding them on the points, now forming islands by its deposits, and now removing them. Chief among the changes is the formation of cut-offs. Two eroding bends gradually approach each other until the water forces a passage across the narrow neck. As the channel distance between these bends may be many miles, a cascade perhaps 5 or 6

ft. in height is formed, and the torrent rushes through with a roar audible for miles. The checking of the current at the upper and lower mouths of the abandoned channel soon obstructs them by deposit, and forms in a few years one of the cres- cent lakes which are so marked a feature on the maps. At the mouth of the Red river, 316 m. above the passes, the water surface at the lowest stage is only 5J ft. above the level of' the Gulf, where the mean tidal oscillation is about ij ft. The river channel in this section is therefore a fresh-water lake. At the flood stage the surface rises 50 ft. at the mouth of Red river, but of course retains its level at the Gulf, thus giving the head necessary to force forward the increased volume of discharge. Above the mouth of the Red river the case is essentially different. The width increases and the depth decreases. Hence the general slope in long distances is here nearly the same at all stages. The effect of these different physical condi- tions appears in the comparative volumes which pass through the channel. At New Orleans the maximum discharge hardly reaches 1 ,200,000 cub. ft. per second, and a rising river at high stages carries only about 100,000 cub. ft. per second more than when falling at the same absolute level; but just below the mouth of the Ohio the maximum flood volume reaches 1,400,000 cub. ft. per second, and at some stages a rising river may carry one-third more water than when falling at the same absolute level. The river is usually lowest in October. It rises rapidly until checked by the freezing of the northern tributaries. It begins to rise again in February, as a consequence of the storms from the Gulf which traverse the basin of the Ohio, and attains its highest point about the 1st of April. It then falls a few feet, but the rains in the Upper Mississippi basin cause it to rise again and high water is maintained until some time in June by the late spring and early summer rains in the Missouri basin. As a rule the river is above mid-stage from January to August inclusive, and below that level for the remainder of the year.

Engineering Works. — Below Cape Girardeau there are

at least 29,790 sq. m. of rich bottom lands which require protection from floods, and this has been accomplished to a great extent by the erection of levees. The first levee was begun in 17 17, when the engineer, Le Blond de La Tour (d. about 1725) erected one a mile long to protect the infant city of New Orleans from over- flow. Progress at first was slow. In 1770 the settlements extended only 30 m. above and 20. m. below New Orleans; but in 1828 the levees, although quite insufficient in dimensions, had become continuous nearly to the mouth of the Red river. In 1850 a great impulse was given to systematic embankment by the United States government, which turned over to the several states all unsold swamps and overflowed lands within their limits, to provide a fund for reclaiming the districts liable to inundation. The action resulting from this caused alarm in Louisiana. The aid of the government was invoked, and Congress immediately ordered the necessary investigations and surveys. This work was placed in charge of Captain (later General) Andrew A. Humphreys (1810-1883), and an elaborate report covering the results of ten years of investigation was published, just after the outbreak of the Civil War in 1861. In this report it was demonstrated that the great bottom lands above the Red river before the construction of their levees did

not, as had been supposed, in Louisiana, serve as reservoirs to diminish the maximum wave in great flood seasons. Further- more, the report argued that no diversion of tributaries was possible; that no reservoirs artificially constructed could keep back the spring freshets which caused the floods; that the making of cut-offs, which had sometimes been advocated as a measure of relief, was in the highest degree injurious; that outlets were impracticable from the lack of suitable sites; and, finally, that levees properly constructed and judiciously placed would afford protection to the entire alluvial

region.

During the Civil War (1861-65) the artificial embankments were neglected; but after its close large sums were expended by the states directly interested in repairing them. The work was done without concert upon defective plans, and a great flood early in 1874 inundated the country, causing terrible suffering and loss. Congress, then in session, passed an act creating a commission of five engineers to determine and report on the best system for the permanent reclamation of the entire alluvial region. Their report, rendered in 1875, endorsed the conclusions of that of 1861, and advocated a general levee system on each bank. This system comprised: (1) a main embankment raised to specified heights sufficient to restrain the floods; and (2) where reasonable security against caving required considerable areas near the river to be thrown out, exterior levees of such a height as to exclude ordinary high waters, but to allow free passage to great floods, which as a rule occur only at intervals of five or six years. An engineering organization was proposed for constructing and maintaining these levees, and a detailed topographical survey was recommended to deter- mine their precise location. Congress promptly approved and ordered the survey; but strong opposition on constitutional grounds was raised to the construction of the levees by the government.

In the meantime complaints began to be heard respecting the low-water navigation of the river below the mouth of the Ohio. A board of five army engineers, appointed in 1878 to consider a plan of relief, reported that a depth of 10 ft. could probably be secured by narrowing the wide places to about 3500 ft. with hurdle work, brush ropes or brush dykes designed to cause a deposit of sediment, and by protecting caving banks by light and cheap mattresses. Experiments in these methods were soon begun and they proved to be effective.

The bars at the efflux of the passes at the mouth of the Mississippi were also serious impediments to

commerce. The river naturally discharges through three principal branches, the south-west pass, the south pass and the north-east pass, the latter through two channels, the more northern of which is called Pass a. l'Outre. In the natural condition the greatest depth did not exceed 12 or 13 ft. After appropriations by Congress in 1837, 1852 and 1856, a depth of 18 ft. was finally secured by dredging and scraping. The report of 1861 discussed the subject of bar formation at length, and the stirring up of the bottom by scrapers during the flood stages of the river (six months annually) was recommended by it. After the war this recommendation was carried into effect for several years, but experience showed that not much more than 18 ft. could be steadily maintained. This depth soon became insufficient, and in 1873 the subject was discussed by a board of army engineers, the majority approving a ship canal. In 1874 Congress consti- tuted a special board which, after visiting Europe and examining similar works of improvement there, reported in favour of con- structing jetties at the south pass, substantially upon the plan used by Pieter Caland (b. 1826) at the mouth of the Meuse; and in 1875 Captain James B. Eads (1820-1887) and his associates were authorized by Congress to open by contract a deep channel through the south pass upon the general plan proposed by this board. As modified in 1878 and 1879 the contract called for the maintenance for twenty years of a channel through the pass and over the bar not less than 26 ft. in depth throughout, a width of not less than 200 ft. and with a middle depth of 30 ft. The work was begun on the 2nd of June 1875. The required iepth was obtained in 1879, and with few interruptions has been

maintained. In 1902 Congress authorized preparations for the

construction of a deeper (35 ft.) and a wider channel through the south-west pass; the work was begun in 1903 and virtually completed in 1909.

In the year in which Captain Eads opened the south pass of deep- water navigation Congress created a

commission of seven members to mature plans for correcting and deepening the channel of the river, for protecting its banks and for preventing floods, and since then large expenditures for improvement between the head of the passes and the mouth of the Ohio have been under the control of this commis- sion. In protecting the banks, mattresses of brush or small trees, woven like basket-work, were sunk on the portion of the bank at the time under water, by throwing rubble stone upon them, an excess of stone being used. A common size of mattress was 800 ft. long, counted along the bank, by 250 ft. wide. Sometimes a width of 300 ft. was used, and lengths have reached 2000 ft. The depth of water was often from 60 to 100 ft. At first these mats were light structures, but the loss of large quantities of bank protection by the caving of the bank behind them, or by scour at their channel edges, forced the commission steadily to increase the thickness and strength of the mattress, so that the cost of the linear foot of bank protection, measured along the bank, rose from $8 or $10 to $30 in the later work. The contraction works adopted were systems of spurs or pile dykes, running out from the shore nearly to the line of the pro- posed channel. Each dyke consisted of from one to four parallel rows of piles, the interval between rows being about 20 ft. and be- tween piles in a row 8 or 10 ft. The piles and rows were strongly braced and tied together, and in many cases brush was woven into the upper row, forming a hurdle, in order further to diminish the velocity of the water below the spur. By 1893 it was evident that the cost,, which had been estimated at $33,000,000 in 1881, would really be several times that amount, and that the works would re- quire heavy expense for their maintenance and many years for their execution. Navigation interests demanded more speedy relief. The commission then began experimenting with hydraulic dredges, and in 1896 it adopted a project for maintaining a channel from the mouth of the Ohio to the passes that should be at least 9 ft. deep and 250 ft. wide throughout the year. Centrifugal pumps are used, the suction pipes being at the bow and the discharge at the stern

through a line of pipes about 1000 ft. long, supported on pontoons. Water jets or cutters stir up the material to be dredged before it enters the suction pipes. The later dredges have a capacity of about 1000 cub. yds. of sand per hour, the velocity in the 32- to 34-in. dis- charge pipes being from 10 to 15 ft. per second. They cost from $86,000 to $120,000, and their working during a low-water season costs about $20,000. These dredges begin work on a bar where trouble is feared before the river reaches its lowest stage, and make a cut through it. A common cut is 2000 ft. long by 250 ft. wide, and 3 or 4 ft. deep. Since 1903 a channel of the proposed depth or more has been maintained.

In 1882 occurred one of the greatest floods known on the Missis- sippi, and extensive measurements of it were made. A maximum flood of 1,900,000 cub. ft. per second crossed the latitude of Cairo. Much of it escaped into the bottom lands, which are below the level of the great floods, and flowed through them to rejoin the river below. The flow in the river proper at Lake Providence, 542 m. below Cairo, was thus reduced to about 1,000,000 cub. ft. per second, while if the river had been confined by levees the flow between them would have been double, or about 2,000,000 cub. ft. per second. The volume of the levees in 1882 was about 33,000,000 cub. yds., and by the 30th of June 1908 had been increased to 219,621,594 cub. yds., of which the United States had built about one-half, and has expended on them $22,562,544. The length of the levees is about i486 m., and they are continuous save where interrupted by tributaries or by high lands, from New Madrid, or 80 m. below Cairo, to Fort Jackson, 1039 m. below Cairo. The width of the interval between levees on the opposite banks of the river varies greatly ; in many places the levees are built much nearer the normal margin of the river than is consistent with keeping the flood heights as low as possible. This has arisen from two causes: firstly, to give protection to lands already cultivated, which lie usually near the bank of the river; secondly, to avoid the lower ground, which, owing to the peculiar

formation, is found as one goes back from the river. Another bad result of this nearness of the levees to the bank of the river is the loss of levees by caving, which was nearly 5,000,000 cub. yds. in 1904-1905, and can only be prevented by bank protection, costing $ 1 50,000 per mile, to protect a levee perhaps 16 ft. high cost- ing about $30,000 per mile. The levees have top widths of 8 ft., side slopes of one-third, and banquettes when their heights exceed about 10 ft. The grades of the levees are usually 3 ft. above the highest water, and have to be raised from year to year as greater confinement of water gives greater flood heights. When this system is completed there will probably be hundreds of miles of levee with heights exceeding 14 ft. In 1899, after about $28,000,000 had been spent on levees by the United States and by the local authorities, the commission submitted an estimate for additional work on levees, amounting to 124,000,000 cub. yds. and costing $22,000,000. The effect of the levees has been to increase flood heights. Though the

Mississippi River Commission was forbidden by Congress to build levees to protect lands from overflow, a majority of its members believed them useful for the purpose of navigation improvement. They have, however, effected no sensible improvement in the naviga- tion of the river at low stages, and at other stages no improvement was needed for the purposes of navigation. Neither did they prevent a destructive flood in 1897 and again in 1903. By the 30th of June 1908, $57,510,216.81 had been appropriated for the commission’s work below the mouth of the Ohio.

From the mouth of the Ohio to the mouth of the Missouri, a distance of about 210 m., the river is affected by back water from the Ohio which increases the deposit of sediment, and although the banks increase in height above Cape Girardeau the channel

was in its natural state frequently a mile or more in width, divided by islands, and oostructed by bars on which the low-water depth was only 3J to 4 ft. The improvement was begun in 1872, and in 1881 a project was adopted for narrowing the channel to approximately 2500 ft. In 1896 dredging was begun and in 1905 the further execution of the original project of 1881 was discontinued, because of a new plan for a channel 14 ft. deep from the Great Lakes to the Gulf.

The Upper Mississippi carries only a small amount of sediment and was navigable in its natural state to St Paul, although at low water the larger river boats could ascend no farther than La Crosse, Wisconsin. In 1879 Congress adopted a project for obtaining a channel with a minimum depth at low water of 4! ft., chiefly by means of contraction works. In 1907 Congress authorized further contraction, dredging, the construction of a lateral canal at Rock Island Rapids, and the enlargement of that at Des Moines Rapids with a view to obtaining a channel nowhere less than 6 ft. in depth at low water. By means of two locks and dams, which were begun in 1894 and were about three-fourths complete in 1908, a navigable channel of the same depth will be extended from St Paul to Minneapolis. The United States government has constructed dams at the outlets of lakes Winnibigashish, Cass, Leech, Pine, Sandy and Pokegama, and thereby created reservoirs having a total storage capacity of about 95,000,000,000 cub. ft. This reservoir system, which may be much enlarged, is also beneficial in that it mitigates floods and regulates the flow for manufacturing purposes and for logging.

Although the United States government has expended more than $70,000,000 on the Mississippi river between the mouth of the Missouri and the head of the passes, the improvement of navigation thereon has not been great enough to make it possible for river freighters to force down railway rates by competition. But it is no longer merely a question of competition. The productivity of this region has become so enormous that railways alone cannot meet

the requirements of its commerce, and a persistent demand has arisen for a channel 14 ft. deep from the Great Lakes to the Gulf. The first great impetus to this demand was given in 1900, when a canal 24 ft. in depth, and known as the Chicago Drainage Canal, was opened from the Chicago river to Lockport, Illinois, on the Des Plaines river, 34 m. from Lake Michigan. Two years later Congress appropriated $200,000 for the Mississippi River Commission to make a survey and prepare plans, with estimates of cost, for a navigable waterway 14 ft. in depth from Lockport to St Louis. The commis- sion reported favourably in 1905, and in 1907 Congress provided for another commission, which in June 1909 reported against the 14 ft. channel, estimating that it would cost $128,000,000 for construction and $6,000,000 annually for maintenance, and considered a 9-ft. channel (8 ft. between Ohio and St Louis) sufficient for commercial purposes.

The Ohio is commercially the most important tributary, and in flood time most of the commerce on the Lower Mississippi consists of coal and other heavy freight received from the mouth of this river. Its navigation at low water has also been improved by dredging, rock excavation and contraction works. In its upper reaches a channel 9 ft. in depth had been obtained before 1909 by the con- struction of a number of locks with collapsible dams which are thrown down by a flood. It is the plan of the government to extend this system to the mouth of the river, and it has been estimated that a channel 12 to 14 ft. in depth may ultimately be obtained by a system of mountain reservoirs. Furthermore, the government has given to a corporation a franchise for the connexion of the Ohio at Pittsburg with Lake Erie near Ashtabula, Ohio, by means of a canal 12 ft. in depth. The Missouri is navigable from its mouth to Fort Benton, a distance of 2285 m., and it had become a very important highway of commerce when the first railway, the Hannibal & St Joseph, reached it in 1859. Its commerce then rapidly disappeared, but regular navigation between Kansas City and St Louis was re-estab- lished in 1907 and a demand has

arisen for a 12-ft. channel from the mouth of the river to Sioux City, Iowa. The Red, Arkansas, White, Tennessee, and Cumberland rivers, which are parts of the Mississippi system, have each a navigable mileage exceeding 600 m.

History. — Although the Mississippi river was discovered in its lower course by Hernando de Soto in 1541, and possibly by Alonso Alvarez de Pineda in 1519, Europeans were not yet prepared to use the discovery, and two Frenchmen, Louis Joliet and Father Jacques Marquette, first made it generally known to the civilized world by a voyage down the river from

the mouth of the Wisconsin to the mouth of the Arkansas in 1673. 1 In 1680 Louis Hennepin, sent by La Salle, who planned to acquire for France the entire basin drained by the great river and its tributaries, explored the river from the mouth of the Illinois to the Falls of St Anthony, where the city of Minneapolis now stands, and two years later La Salle himself descended from the mouth of the Illinois to the Gulf, named the basin ” Louisiana,” and took formal possession of it in the name of his king, Louis XIV. By the war which terminated (1763) in the Treaty of Paris, Great Britain wrested from France all that part of the basin lying east of the middle of the river (except the island of New Orleans at its mouth), together with equal rights of navigation; and the remainder of the basin France had secretly ceded to Spain in 1762. During the War of Indepen- dence the right to navigate the river became a troublesome question. In 1779 the Continental Congress sent John Jay to Spain to negotiate a treaty of commerce, and to insist on the free navigation of the Mississippi, but the Spanish government refused to entertain such a proposition, and new instructions that he might forego that right south of 31° N. latitude reached him too late. While the commissioners from Great Britain and the United States were negotiating a treaty of peace at Paris, Spain, apparently supported by France, sought to prevent the extension of the western boundary of the United States to the Mississippi, but was

unsuccessful, and the United States acquired title in 1783 to all that portion of the basin east of the middle of the river and north of 31° N. lat. In 1785 Congress appointed John Jay to negotiate a commercial treaty with Don Diego de Gardoqui, the Spanish minister to the United States, but the negotiations resulted in nothing. For the next ten years the Spaniards imposed heavy burdens on the American commerce down the Mississippi, but in 1794 James Monroe, the United States minister to Prance, procured the aid of the French govern- ment in further negotiations, for which Thomas Pinckney had been appointed envoy extraordinary, and in 1795 Pinckney negotiated a treaty which granted to the United States the free navigation of the river from its source to the Gulf and the privi- lege of depositing American merchandise at the port of New Orleans or at some other convenient place on the banks. Spain retroceded Louisiana to France in 1800, but the Louisiana Purchase in 1803 left very little of the Mississippi basin outside of the United States.

As the headwaters of the river were not definitely known, the United States government sent Zebulon M. Pike in 1805 to explore the region, and on reaching Leech Lake, in February 1806, he pronounced that the main source. In 1820 Lewis Cass, governor of Michigan territory, which then had the Mississippi for its western boundary, conducted an expedition into the same region as far as Cass Lake, where the Indians told him that the true source was about 50 m. to the W.N.W., but as the water was too low to proceed by canoe he returned, and it remained for Henry Schoolcraft, twelve years later, to discover Lake Itasca, which occupies a low depression near the centre of the basin in which the river takes its rise. Jean N. Nicollet, while in the service of the United States government, visited Lake Itasca in 1836, and traced its principal affluent, since known as Nicollet’s Infant Mississippi river, a few miles S.S.W. from the lake’s western arm. Jacob Vradenberg Brower (1844–1905), who was commissioned by the Minnesota Historical Society in 1889 to make a more

detailed survey, traced the source from Nicollet's Infant Mississippi to the greater ultimate reservoir, which contains several lakelets, and lies beyond Lake Itasca, 2553 m. by water from the Gulf of Mexico, and 1558 ft. above the sea. Soon after this survey the state of Minnesota created Itasca State Park, which contains both Itasca Lake and its affluents from the south.

1 It seems probable that Joliet and Marquette were preceded by two other Frenchmen, Pierre Esprit Radisson and Menard Chouart des Groseilliers, who apparently reached the Upper Mississippi in or about 1665; but their claim to priority has been the subject of considerable controversy, and, at all events, there was no general knowledge of the river until after the voyage of Joliet and Marquette.

From the close of the 17th century until the building of the first railways in the Mississippi basin, in the middle of the 19th century, the waterways of the Mississippi system afforded practically the only means of communication in this region. During the early years of the French occupancy trade with the Indians was the only important industry, and this was carried on almost wholly with birch canoes and a few pirogues; but by 1720 immigrants were coming in considerable numbers both by way of the Great Lakes and the mouth of the Mississippi, and to meet the demands of a rapidly expanding commerce barges and keelboats were introduced. The development of the Mississippi Valley must have been slow until the railways came had it not been for the timely application of the power of steam to overcome the strong current of the Lower Mississippi. Even without the steamboat, however, the Mississippi was indispensable to the early settlers, and the delay of the United States in securing for them its free navigation resulted in threats of separation from the Union. The most formidable movement of this kind was that of 1 787-1

788, in which James Wilkinson, who had been an officer in the War of Independence, plotted for a union with Spain. Steamboat navigation on this river system was begun in 181 1, when the ” New Orleans,” which had been built by Nicholas Roosevelt (1767–1854), made the trip from Pittsburg to New Orleans, but it was six years later before the steamboat was sufficiently improved to ascend to St Louis. In 181 7 the com- merce from New Orleans to the Falls of the Ohio, at Louisville, was carried in barges and keel-boats having a capacity of 60 to 80 tons each, and 3 to 4 months were required to make a trip. In 1820 steamboats were making the same trip in 15 to 20 days, by 1838 in 6 days or less; and in 1834 there were 230 steamboats, having an aggregate tonnage of 39,000 tons, engaged in trade on the Mississippi. Large numbers of flat boats, especially from the Ohio and its tributaries, continued to carry produce down stream; an extensive canal system in the state of Ohio, completed in 1842, connected the Mississippi with the Great Lakes; these were connected with the Hudson river and the Atlantic Ocean by the Erie Canal, which had been open since 1825. Before the steamboat was successfully employed on the Mississippi the population of the valley did not reach 2,000,000, but the population increased from approximately 2,500,000 in 1820 to more than 6,000,000 in 1840, and to 14,000,000 or more in i860. The well-equipped passenger boats of the period immediately preceding the Civil War were also a notable feature on the Ohio and the Lower Mississippi.

In the Civil War the Lower Mississippi, the Ohio, and its two largest tributaries — the Cumberland and the Tennessee — being still the most important lines of communication west of the Appalachian Mountains, determined largely the movements of armies. The adherence of Kentucky to the Union excluded the Confederacy from the Ohio, but especially disastrous was the fall of Vicksburg and Port Hudson, whereby the Confederacy was cut in two and the entire Mississippi became a Federal high- way. Under Federal control it was closed to commerce, and when

the war was over the prosperity of the South was tem- porarily gone and hundreds of steamboats had been destroyed. Moreover, much of the commerce of the West had been turned from New Orleans, via the Mississippi, to the Atlantic seaboard, via the Great Lakes and by new lines of railways, the number of which rapidly increased. There was, of course, some revival of the Mississippi commerce immediately after the war, but this was checked by the bar at the mouth of the south-west pass. Relief was obtained through the Eads jetties at the mouth of the south pass in 1879, but the facilities for the transfer of freight were far inferior to those employed by the railways, and the steamboat companies did not prosper. But at the beginning of the 20th century the prospects of communication with the western coast of North America and South America, and with the Orient by way of an isthmian canal, the inadequate means of transportation afforded by the railways, the efficiency of competing waterways in regulating freight rates, and the consideration of the magnificent system of inland waterways which the Mississippi and its tributaries would afford when

fully developed, have created the strong demand for river improvement.

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MISSOLONGHI, or Mesolonghi (Meo-6Myyiov),the chief town of the monarchy of Acarnania and Aetolia, Greece. It is on the N. side of the Gulf of Patras, about 7 m. from the coast; pop., about 8300. The place is notable for the siege which Mavrocordato and Botzaris sustained in 1822 and 1823 against a Turkish army 11,000 strong, and for the more famous defence of 1825-26. Byron died here in 1824, and is commemorated by a cenotaph and a statue.

MISSOULA, a city and the county-seat of Missoula county, Montana, U.S.A., on the Clark Fork of the Columbia (here called the Missoula river), about 125 m. W.N.W. of Helena. Pop. (1900), 4366 (1020 foreign-born) ; (1910), 12,869. It is served by the Chicago, Milwaukee & Puget Sound railway, and by the Northern Pacific railway, which has shops here and of which Missoula is a division headquarters. There is an electric railway from Missoula to Hamilton,

about 48 m. south. The Northern Pacific railway maintains a large hospital here, and St Patrick's hospital is maintained by sisters of charity. Missoula is about 3200 ft. above sea-level, with Mount Jumbo immediately north, and University Mountain immediately south of the Clark Fork, and the Bitter Root range to the west. The city is situated on the bed of a prehistoric lake. Missoula is the seat of the Sacred Heart academy (for girls), of a Christian Brothers' school (for boys), of the Garden City commercial college, and of the state university (founded in 1893, and opened in 1895), which occupies a campus of 40 acres. On the Bitter Root river, 4 m. distant, is the United States army post, Fort Missoula. Missoula has con- siderable trade with the surrounding country in farming, fruit- growing, lumbering and mining. The Clark Fork furnishes water power, and at Bonner, 6 m. east, is the Clark dam (28 ft.), which furnishes electric power. Missoula was founded in 1864, and chartered as a city in 1887.

MISSOURI, a north-central state of the United States of America, and one of the greatest and richest, and economically one of the most nearly independent, in the Union, lying almost midway between the two oceans, the Gulf of Mexico and Canada. It is bounded N. by Iowa; E. by Illinois, Kentucky and Tennessee; S. by Arkansas; and W. by Oklahoma, Kansas and Nebraska. Its N. and S. limits are mainly coincident with the parallels of 40 35′ and 36 30′ N. lat.— the southernmost boundary, in the S.E. corner, is the meridian of 36 N. lat. — and much of the western- border is the meridian of 94 43′ W. long, respectively; but natural boundaries are afforded on the extreme N.E. by the Des Moines river, on the E. by the Missis- sippi, on the S.E. by the St Francis and on the N.W. by the

Missouri. Altogether, about 850 m., or considerably more than half of the entire boundary, is water-

front: about 560 m. along the Mississippi, about 208 m. along the Missouri, and about 100 m. along the St Francis and Des Moines. The length of the state from north to south, disregarding the St Francis projection southward, is 282 m., 1 the width from west to east varies from 208 to 308 m., and the total area is 69,420 sq. m., of which 693 sq. m. are water surface.

Physical Features. — Missouri has three distinct physiographic divisions: a north-western upland plain, or prairie region; a lowland, in the extreme south-east; and, between these, the Missouri portion of the Ozark uplift. The boundary between the prairie and Ozark regions follows the Missouri river from its mouth to Glasgow, running thence south-westward, with irregular limits, but with a direct trend, to Jasper county at the south-east corner of Kansas; and the boundary between the Ozark and embayment regions runs due south-west from Cape Girardeau.

1. The prairie region embraces, accordingly, somewhat more than ” northern ” Missouri — i.e. the portion of the state north of the Missouri river — and somewhat more than a third of the state. It is a beautiful, rolling country, with a great abundance of streams; more hilly and broken in its western than in its eastern half. The elevation in the extreme north-west is about 1200. ft. and in the extreme north-east about 500 ft., while the rim of the region to the south-east, along the border of the Ozark region, has an elevation of about 900 ft. The larger streams have valleys 250 to 300 ft. deep and sometimes 8 to 10 m. broad, the country bordering them being the most broken of the region. The smaller streams have so eroded the whole face of the country that little of the original surface plain is to” be seen. The Mississippi river is skirted through- out the length of the state by contours of 400 to 600 ft. elevation.

2. The Ozark region is substantially a low dome, with local faulting and minor undulations, dominated by a ridge — or, more exactly, a relatively even

belt of highland— that runs from near the Mississippi about Ste Genevieve county to Barry county on the Arkansas border; the contour levels falling with decided regularity in all directions below this crest. High rocky bluffs that rise precipitously on the Mississippi, sometimes to a height of 150 ft. or so above the water, from the mouth of the Meramec to Ste Genevieve, mark where that river cuts the Ozark ridge, which, across the river, is continued by the Shawnee Hills in Illinois. The elevations of the crest in Missouri (the highest portion of the uplift is in Arkansas) vary from 1100 to 1600 ft. This second physiographic region comprehends somewhat less than two-thirds of the area of the state. The Burlington escarpment, which in places is as much as 250 to 300 ft. in height, runs along the western edge of the Cambro-Ordovician formations and divides the region into an eastern and a western area, known respectively to physio- graphers as the Salem Upland and the Springfield Upland. 2 Super- ficially, each is a simple rolling plateau, much broken by erosion (though considerable undissected areas drained by underground channels remain), especially in the east, and dotted with hills; some of these are residual outliers of the eroded Mississippian lime-stones to the west, and others are the summits of an archaean topo- graphy above which sedimentary formations that now constitute the valley-floor about them were deposited and then eroded. There is no arrangement in chains, but only scattered rounded peaks and short ridges, with winding valleys about them. The highest points in the state are Tom Sauk Mountain (more than 1800 ft.), in Iron county and Cedar Gap Plateau (1683 ft.), in Wright county. Few localities have an elevation exceeding 1400 ft. Rather broad, smooth valleys, well degraded hills with rounded summits, and — despite the escarpments — generally smooth contours and sky-lines, characterize the whole of this Ozark region.

3. The third region, the lowlands of the south-east, has an area of some 3000 sq. m. It is an undulating country, for the most part well drained, but swampy

in its lowest portions. The Mississippi is skirted with lagoons, lakes and morasses from Ste Genevieve to the Arkansas border, and in places is confined by levees.

The drainage of the state is wholly into the Mississippi, directly or indirectly, and almost wholly into either that river or the Mis- souri within the borders of the state. The latter stream, crossing the state and cutting the eastern and western borders at or near St Louis and Kansas City respectively, has a length between these of 430 m. The areas drained into the Mississippi outside the state through the St Francis, White and other minor streams are relatively small. The larger streams of the Ozark dome are of decided interest to the physiographer. Those of the White system have open-trough valleys bordered by hills in their upper courses and canyons in their lower courses; others, notably the Gasconade, exhibit re-

1 Counting the St Francis projection the length is 328 m.

2 Both the Ozark region and the prairie region are divided by minor escarpments into ten or twelve sub-regions.

markable differences in the drainage areas of their two sides, with interesting illustrations of shifting water-partings ; and the White, Gasconade, Osage and other rivers are remarkable for upland meanders, lying, not on flood-plains, but around the spurs of a highland country. 3

Caves, chiefly of limestone formation, occur in great numbers in and near the Ozark Mountain region in the south-western part of Missouri. More than a hundred have been discovered in Stone county alone, and there are many in Christian, Greene and McDonald counties. The most remarkable is Marble Cave, a short distance south-east of the centre of Stone county. The entrance is through a large sink-hole at the top of Roark Mountain, from which there is a passage-way to an open chamber. This extraordinary

hall-like room is about 350 ft. long and about 125 ft. wide, has bluish-grey limestone walls, and an almost perfectly vaulted roof, rising from 100 to 195 ft. Its acoustic properties are said to be almost perfect, and it has been named ” the Auditorium.” At one end is a remarkable stalagmitic formation of white and gold onyx, about 65 ft. in height and about 200 ft. in girth, called .” the White Throne.” Jacob’s Cavern (q.v.), near Pineville, McDonald county, disclosed on exploration skeletons of men and animals, rude implements, &c. Crystal Cave, near Joplin, Jasper county, has its entire surface lined with calcite crystals and scalenohedron formations, from I ft. to 2 ft. in length. Knox Cave, in Greene county, and several caverns near Ozark, in Christian county, are also of interest. Other caves include Fried’s Cave, about 6 m. north-east of Rolla, Phelps county, Hannibal Cave (in Ralls county, about 1 m. south of Hannibal), which has a deep pool containing many eyeless fish; and various caverns in Miller, Ozark, Greene and Parry counties.

Geology. — The geological history of the state covers the period from Algonkian to late Carboniferous time, after which there is a gap in the record until Tertiary time, except that there was ap- parently a temporary depression of the north-western and south- western corners in the Cretaceous age. Northern Missouri is covered with a mantle of glacial deposits, generally thick, although in the stream valleys of the north-east the bed-rocks are widely exposed. The southern limit of these glacial deposits is practically the bluffs bordering the Missouri river, except for a narrow strip along the Mississippi below St Louis. These Pleistocene deposits include bouldery drift, loess, terrace deposits and alluvium. The till is generally less than 5 ft. and rarely more than 40 ft. deep, but in some localities it reaches a thickness of 200 ft., or even more. Modified drift and erratics were also widely deposited. The loess, however — reddish-brown, buff or grey in colour, according to the varying proportions of iron oxide — is almost

everywhere spread above the drift. It is exposed in very deep cuts along the bluffs of the Missouri. Southern Missouri is covered, generally speaking, with residuary rocks. The embayment region is of Tertiary origin, containing deposits of both neocene and eocene periods. Regarding now the outcrops of bed-rock, there are exposures of Algonkian (doubtful, and at most a mere patch on Pilot Knob), Archean, Cambrian, Ordovician, Silurian, Devonian, sub-Carboniferous and Carboniferous. The St Francois Mountains and the neighbouring portion of the Ozark region are capped with Archean rocks. All the rest of the Ozark region except the extreme south-western corner of the state is Cambro-Ordovician. Along the margin of this great deposit, on the Mississippi river below St Louis and along the northern shore of the Missouri near its mouth, is an outcrop of Silurian. Parallel to this in the latter locality, and lying also along the Mississippi near by to the north, as well as in the intervening country between the two rivers, are strips of Devonian. Both this and the Silurian are mere fringes on the great area of Cambro- Ordovician. Next, covering the north-eastern and south-western corners of the state, and connecting them with a narrow belt, are the lower Carboniferous measures (which also appear in a . very narrow band along the Mississippi for some distance below St Louis). The western edge of these follows an irregular line from Schuyler county, on the northern border, to Barton county, on the western border, of the state, but with a great eastward projection north of the Missouri river, to Montgomery county. This line defines the eastern limit of the Coal Measures proper, which cover a belt 20 to 80 m. in width. Finally, to the west of these, and covering the north-western corner of the state, are the upper coal measures. Thus the state is to be conceived, in geological history, as gradually built up around an Archean island in successive seas, the whole of the state becoming dry land after the post-Carboniferous uplift. Until the post-Mesozoic uplift of the Rocky Mountain region the north-western portion of the state drained westward.

Fauna. — Excepting the embayment region, Missouri lies wholly within the Carolinian area of the Upper Austral life-zone; the

3 There has been some controversy as to whether this condition is due to the elevation and corrosion of original flood-plain meanders after their development in a past base-level condition — which theory is probably correct — or to the natural, simultaneous lateral and vertical cut of an originally slightly sinuous stream, under such special conditions of stream declivity and horizontal bed- strata (conditions supposed by some to be peculiarly fulfilled in this region) as would be favourable to the requisite balance of bank cutting and channel incision.

embayment lies in the Austro-riparian area of the same zone. Among wild animals, deer and bear are not uncommon. Opossums, raccoons, woodchucks, foxes, grey squirrels and fox-squirrels are common. The game birds include quail ("Bob White ") and partridges. Prairie chickens (pinnated grouse), pheasants and wild turkeys, all very common as late as 1880, are no longer to be found save in remote and thinly-settled districts. A state fish commission has laboured to increase the common varieties of river fish. So far as these are an article of general commerce, they come, like frogs, terrapin and turtles, mainly from the counties of the embayment region. Mussel fisheries, an industry confined to the Mississippi river counties from Lincoln to Lewis, are economically important, as the shells are used in the manufacture of pearl buttons. There are state fish-hatcheries at St Louis and St Joseph.

Flora. — The most valuable forests are in the southern half of the state, which, except where cleared for farms, is almost continuously wooded. An almost entire absence of underbrush is

characteristic of Missouri forests. The finest woods are on the eastern upland and on the Mississippi lowlands. The entire woodland area of the state was estimated at 41,000 sq. m. by the national census of 1900. Ash, oaks, black and sweet gums, chestnuts, hickories, hard maple, beech, walnut and short-leaf pine are noteworthy among the trees of the Carolinian area; the tupelo and bald cypress of the embay- ment region, and long-leaf and loblolly pines, pecans and live oaks of the uplands, among those characteristic of the Austro-riparian. But the habitats overlap, and persimmons and magnolias of different species are common and notable in both areas. The heavy timber in the south-eastern counties (cypress, &c), and even scattered stands of such valuable woods as walnut, white oak and red-gum, have already been considerably exploited.

Climate. — Missouri has a continental climate, with wide range of moisture and temperature. The Ozark uplift tempers very agreeably the summers in the south, but does not affect the climate of the state as a whole. The normal mean annual temperature for the entire state is about 54 F. ; the normal monthly means through the year are approximately 29-6, 30-3, 42, 55-4, 64-6, 73-2, 77-1, 75 - 7> 68-2, 57, 42-8 and 33-1° F. The south-eastern corner is crossed by an annual isotherm of 60°, the north-western by one of 50 ; and although in the former region sometimes not a day in the year may show an average temperature below freezing-point, at Jefferson' City there are occasionally two months of freezing weather, and at Rockport three. Nevertheless, the yearly means of the five districts into which the state is divided by the national weather service exhibit very slight differences: approximately 52-1, 52-7, 54-4, 56-1 and 55-7° F. respectively for the north-west, north-east, central, south-east and south-west. On the other hand, the range in any month of local absolute temperatures over the state is habitu- ally great (normally about 50 in the hottest and 100° or more in the coldest months), and likewise the annual range for individual localities (90 to 140). Temperatures as high as loo" to 105

and as low as -20 or -30 are recorded locally almost every year, and the maximum range of extremes shown by the records is from 116 at Marble Hill, Bollinger county, in July 1901, to -40° at Warsaw, Benton county, in February 1905. The average fall of snow, which is mostly within the months from November to March inclusive, ranges from about 8 in. in the south-east counties to 30 in. in the north-west counties. The Missouri river is often closed by ice, and the Mississippi at St Louis, partly because it is obstructed by bridges, sometimes freezes over so that for weeks together horses and wagons can cross on the ice.

The average yearly rainfall for the state as a whole is about 39 in., ranging from 53-7 in. in 1898 to 25-3 in. in 1901. The prevail- ing winds are southerly, although west winds are common in winter. Winds from the north and west are generally dry, cool, clear and invigorating; winds from the south and east warm, moist and depressing. Rainfall comes from the Gulf of Mexico. The south-east winds blow from the arid lands and carry rising temperatures across the state; and the winter anti-cyclones from the north-west carry low temperatures even to the southern border. Missouri lies very frequently in the dangerous quadrant of the great cyclonic storms passing over the Mississippi valley — indeed, north- ern Missouri lies in the area of maximum frequency of tornadoes.

Agriculture. — Few states have so great a variety of soils. This variety is due to the presence of different forms of glacial drift, and to the variety of surface rocks. The northern half of the state is well watered and extremely fertile. The south- eastern embay- ment is rich to an exceptional degree. Speaking generally, the Ozark region is characterized by reddish clays, mixed with gravels and stones, and cultivable in inverse proportion to the amount of these elements; northern Missouri by a generally black clay loam over a clay subsoil, with practically no admixture of stones; the southern prairies, above referred to, share the characteristics of those north of the Missouri. The

Mississippi embayment is in parts predominantly sandy, in others clayey; it is mainly under timber. The state as a whole is devoted predominantly to agri- culture. Within its borders or close about them are the centres of total and of improved farm acreage, of total farm values, of gross farm income, of the growth of Indian corn, of wheat, and of oats. In 1900 agriculture absorbed the labour of 41-3% of the total working population of the state. Of the area of the state 77-3 % was

included in that year in farm land (33,997,873 acres); and of this, 67-4% was improved. The average size of a farm was 119-3 acres; 39‘9% of all farm tamilies owned a home clear of all incumbrance; -and the percentages of farms operated by owners, cash tenants and share tenants were respectively 69-5, Il-o and 19-5. Negroes worked 1-7% of the total acreage. The total value of farm- property was $1,033,121,897. The aggregate values of farm products in 1899 was $219,296,970, and this total consisted of $117,012,895 in crops (area in crops, 14,827,620 acres), $97,841,944 in animal products, and $4,442,131 of forest by-products of farm operations. Indian corn is the most prominent single crop; in 1899 it was valued at $61,246,305. Of other cereals none except wheat is produced in any quantity as compared with other states. Tobacco is grown over half the area of the state, but especially in the central and north-central counties, and cotton along the Arkansas border counties, but especially in the embayment lowlands. Orchard fruits, small fruits and grapes are produced in large quantities, and a fruit experiment station, the only institution of its kind in the country in 1900, is maintained by the state at Mountain Grove, in Wright county. To a slight extent it is possible to grow fruit of distinctively southern habitat, but even pears (a prominent and valuable crop) are uncertain in returns. Apples are grown to best advantage in the north-west quarter; peaches on the Arkansas border; pears along the Mississippi; melons in the sandy regions of the embayment ; small fruits

in the south-west. Grapes are mainly grown in the Ozark region, and wine is produced in Gasconade and other central and north-central counties in amounts sufficient to place Missouri, California aside, in the front rank of wine states in the Union. Indian corn and abundant grasses give to Missouri, as to the other central prairie states, a sound basis for her live- stock interests. In 1900 the value of her live stock was $160,540,004. Two of the four remount purchasing stations of the United States Army are at St Louis and Kansas City. As a mule market Missouri has no rival. Sheep are herded in the southern Ozarks.

Minerals. — Coal, lead, zinc, clays, building stones and iron are the most important minerals. Cobalt and nickel are associated with lead in the St Francois field ; but though the American ouput is almost exclusively derived from Missouri the production is small in comparison with the amount derived from abroad. Practically the whole comes from Mine La Motte, in Madison county. Mis- souri is also the largest producer in the Union of tripoli and of barytes. Copper occurs in various localities, but is of economic importance only in the Ozark uplift; it was first mined in small quantities in 1837. The value of the copper mined in 1906 (based on smelter returns) was $54,347. Mineral waters — muriatic, alkaline chalybeate and sulphuric — occur widely. Various mineral paint bases (apart from lead, zinc, baryta and kaolin) are produced in small quantities. Iron, once an extremely important product, has ceased since about 1880 to be significant in the general produc- tion of the country. But it is of great importance to the state, nevertheless, and its production has possibilities much beyond present realization. The ore occurs in two forms, haematites and limonites; the specular hematites often being grouped, for practical purposes, into two classes— those occurring in porphyry and those occurring in sandstone. The haematites are found not only in the archean porphyries but in Cambrian limestone and sandstone, and in the sub-Carboniferous formations; while the limonites are confined almost exclusively

to the Cambrian. The bedded haema- tites and limonites have been little exploited. Mining was begun in Iron and Crawford counties in the second decade of the 19th century; at Iron Mountain in 1846, and at Pilot Knob in the next year. Since 1880 the output of the state has been falling, and the total production up to 1902 did not exceed 9,000,000 tons of ore; in 1906 the output was 80,910 tons. Iron pyrites, which occurs widely and abundantly, has become of value as material for the preparation of sulphuric acid.

The limits of the coal belt have already been defined. The area of the Coal Measures is about 23,000 sq. m., and that of those classed by the National Geological Survey as probably productive is about 14,000 sq. m., or nearly the entire area of the lower measures. The coal is almost wholly bituminous, with very little cannelite. The seams are generally from one to five feet in thickness. Macon, Lafayette and Adair are the leading counties in output; Lexington and Bevier are the leading mining centres. The total output from 1840 to 1902 was about 78,500,000 short tons; the annual output first passed 1,000,000 tons in 1876, and 2,000,000 tons in 1882; and from 1901 to 1905 the yearly output, steadily increasing, aver- aged 4,196,688 tons, of a value at the mines of $6,266,154; the output in 1908 was 3,317,315 tons, with a spot value of $5,444,907. Superficial evidences of natural gas and petroleum are abundant in western and north-western Missouri, but these have not been found in commercially profitable quantities. The total value of natural gas from wells in Missouri in 1908 was $22,592. A few small oil wells are open near the Kansas line. Both crude oil and natural gas are drawn from Kansas for the supply of Kansas City and other parts of western Missouri.

Lead occurs in three areas in southern Missouri. In the first, of which St Francois county is the centre, it occurs generally alone disseminated in Cambrian limestone; in the second, of which the counties immediately south-west of Jefferson City are the centre,

it occurs with zinc in reticulated deposits and fissure veins in clays and clastic limestones; and in the third, of which Jasper county is much the most important county, the two metals occur in pockets and joints in the Burlington-Keokuk beds of the sub-Carboniferous.- The first is the great lead area, the third the great zinc area; the second is no longer of relative importance. The lead ores are galena and carbonate; the zinc ores, calamine, smithsonite and blende. The mines in the St Francois field were worked by the French from early in the 18th century. The oldest, Mine La Motte (Madison county), discovered in 1715 by De la Motte Cadillac, is still a heavy producer. St Francois county alone produces about nine-tenths the yield of the field; Madison, Washington, Jefferson and Franklin counties furnish most of the remainder. Large quantities of lead are also obtained from the zinc field of the south-west. Both the St Francois and Jasper ores yield from 70 to 75 % of metal in final product, and assay even higher. It has been estimated that down to 1893 1,100,000 tons of ore, yielding metal worth $74,000,000, had been taken from the state, fully half of this having been mined in the preceding twenty years. The total output for the state in 1908 was 114,459 tons, valued at $12,134,556; of this 116,531 tons came from the central and south- east field, and of the remainder 15,240 tons from the Webb City — Prosperity camp. Zinc was originally a hindering by-product of lead mining in the south-west, and was thrown away; but it long ago became the chief product in value in this field. The so-called ” Joplin district ” of south-western Missouri and south-eastern Kansas — three-fourths of it being in Missouri — produces nine- tenths of all the zinc mined in the United States. Mining in south- western Missouri began about 1851, but zinc was of no importance in the output until 1872. In the next thirty-one years the aggre- gate product was about

3,000,000 tons of ore, worth some $100,000,000. The output from 1894 to 1905 averaged 219,874 tons of ore yearly; in 1908 it was 107,404 tons. The history of the St Francois, Granby and Joplin districts has been sensational. The fortunes of the last have largely revolutionized the conditions and prospects of the south-western counties. Silver is found in connexion with lead and zinc mining; in 1908 the total output was 49,131 oz., valued at $26,039. Clays occur in amounts and varieties surpassed by the deposits in very few if any states of the Union. They are in every form from the rare to the common— glass pot clay, ball clays, kaolins, flint fireclays, plastic fireclays, stone-ware clays, paving-brick shales, building-brick and gumbo clays. Plastic fireclays, paving and brick clays are available in seemingly limitless quantities. The loess, the re-sorted residual clays, and the glacial clays are all used for the production of brick. Clays occur, in short, all over the state; and their use is almost as general. In 1905 and 1907 the rank of Missouri was sixth in the Union in the value of clay products — namely, $6,203,411 in 1905 and $6,898,871 in 1907. There has been no more than the slightest beginning made in the utilization of these resources. Stone resources are also large. Limestones are by far the most important; red and gray granites, sandstones and marble (Ste Genevieve county) being of little more than local importance. In 1908 the total value of stone quarried was $2,306,058. Tripoli is quarried particularly in Newton county, where it has been produced since 1872, and though not produced in great quantities has value from its general scarcity. This Missouri tripoli is a finely decomposed light rock, about 98 % silica, and is used for filter stones and as an abrasive. ” Chat ” — finely crushed flint and limestone yielded as tailings in the lead and zinc mines — finds many uses. Limestone is quarried all over the state (except in the embayment region). There are unlimited supplies of clay, shale and limestone, the three essential constituents of Portland cement, and the manufacture of this, begun in 1902, at once assumed im- portant proportions.

Quicklime manufacture is also an important industry. In 1908 the product of quicklime was 167,060 tons.

Manufactures. — Manufacturing and mechanical pursuits absorbed in 1900 the labours' of 19-5% of all persons engaged in gainful occupations, less than half as many as were engaged in agriculture. Though an agricultural state, Missouri had in 1900 three cities with populations of above 100,000, whose wealth is based on manu- factures and trade. Missouri is the leading manufacturing state west of the Mississippi. Between 1880 and 1900 the value of the product increased from $165,386,205 to $385,492,784, of which $316,304,095 was the value of products of the " factory system "; in 1905 the factory product was valued at $439,548,957. Of the total output in 1900, three-fourths were made up by the output of St Louis ($233,629,733; of which $193,732,788 was from estab- lishments under the " factory system "), Kansas City ($36,527,392; $23,588,653 being " factory product "), St Joseph ($31,690,736, including the product of some establishments outside the city limits; $11,361,939 being "factory product" within the city limits), and Springfield ($4,126,871; $3,433,800 being "factory product "); for the same four cities in 1905 the proportion of the state's total product ($439,548,957) manufactured under the " factory system " is smaller, and less than three-fourths was made up by the following seven cities: St Louis ($267,307,038), Kansas City ($35,573,049), St Joseph ($11,573,720), Springfield ($5,293,315), Hannibal ($4,442,099), Jefferson City ($3,926,632), and Joplin ($3,006,203). In 1905 the eleven municipalities with a population of at least 8000 each (including the seven above, and Carthage,

Moberly, Sedalia and Webb City) produced, under the " factory system," goods valued at $335,431,978. Eighteen industries in 1905 employed nearly three-fifths of the wage-earners in factories and were represented by nearly two-thirds ($293,882,705) of the total product. The most prominent items in this were slaughtering and meat-packing products (value $60,031,133 in 1905); tobacco (in 1905,

$30,884,182), flour and grist-mill products (in 1905, $38, 026,142)/ malt liquors (in 1905, $24,154,264), boots and shoes (in 1905, $23,493,552), lumber and timber products (in 1905, $10,903,783), men's factory-made clothing (in 1905, $8,872,831), and cars and general shop construction and repairs by steam rail- ways (1905, $8,720,433). The increase in the slaughtering industry between 1890 and 1900 (134-9%) was chiefly due to remarkable growth in St Joseph — or, to be more precise, just outside the city limits of St Joseph; between 1900 and 1905 the increase was 39-5%. Although Missouri is not a great tobacco state, St Louis is one of the greatest centres of the country in the output of tobacco products. It is also, for the state, the great centre of all the leading interests with the exception of slaughtering. The boot and shoe industry isnew west of the Mississippi, but Missouri holds in it a high and rising rank. In the Joplin mining region a considerable amount of ores is smelted, but the bulk of the ores is sent into Kansas for smelting. The finer clays, also, are mainly shipped from the state in natural form, but in the manufacture of sewer-pipe and fire-brick, Missouri is a very prominent state. St Louis and Kansas City are the centres of the clay industries.

Communications. — In 1900 rather under a fifth of the working population were engaged in trade and transportation. In commerce as well as in manufactures St Louis is first among the cities of the state, but Kansas City also is one of the greatest railway centres of the country, and the trade with the south-west, which St Louis once held almost undisputed, has been greatly cut into by Kansas City, as well as by Galveston and other ports on the Gulf. There is still considerable commerce on the Mississippi from St Louis to New Orleans, and a few passenger steamers are still in service. In 1906-1907 there was a notable agitation for improve- ment, following trial voyages that proved the navigability of the Missouri up to Kansas City. For this part of the river the maxi- mum draft at mean low water was 4 ft. in 1908. In 1907 the amount of

freight carried from the mouth of the Missouri to Sioux City, Iowa, was 843,863 tons, and river rates were about 60% of railway rates. In 1907 estimates were made for 6 ft. and 12 ft. channels from Sioux City to Kansas City, and from Kansas City to the mouth of the river. The improvement of the Missouri — which is far more difficult to navigate than the Mississippi — was begun by Congress in 1832, and (in addition to large joint appro- priations for the Missouri, Mississippi, Arkansas and Ohio rivers from 1832 to 1882) cost $11,130,560 between 1876 and 1900. Also $65,000 was expended from 1852 to 1876. In nothing except the freighting of bulky and imperishable products, like cotton, coal and cereals, was the river ever able to contest the monopoly of the railways. The mileage of these within the state rose from 3960 in 1880 to 6142 in 1890, and to 8023-94 in 1908; the Missouri Pacific being far the greatest system of the state. St Louis, Kansas City and St Joseph are ports of entry for foreign commerce.

Population.— The total population of Missouri in 1900 was 3,106,665 and in 1910, 3> 2 93»33S- The population in 1810 was 20,845; in 1820, 66,586; in 1830, 140,455; in 1840, 383,702; in 1850, 682,044; in i860, 1,182,012; in 1870, 1,721,295; in 1880, 2,168,380; and in 1890, 2,679,184. Thus, even in the years of the Civil War, there was no apparent set-back. Of the aggregate of 1900, 63-7 % lived in "rural districts" {i.e. those outside all places of a population of 2500 or upwards), and 27-1 % in the three great cities of the state, St Louis (pop. 575,238), Kansas City (163,752) and St Joseph (102,979); S -2 % were negroes — their increase from 1890 to 1900 being less than half as rapid as that of the whites; and 7-0 % only were foreign-born. Slightly more than half of all foreigners are Germans; Irish, English and Scotch, French and English Canadians, Swiss and Scandinavians follow- ing. The German element is, and has been since about 1850, of great importance — an importance not indicated at all by its apparently small strength in the population to-day. The Ger- man immigration

began about 1845, and long ago passed its maximum, so that in 1900 more than half of all the foreign-born (not only the Germans, but also the later-coming nationalities) had lived within Missouri for more than twenty years, and more than three-fourths of all had been residents of the state for ten

1 Omitting here printing and publishing, and foundry and machine- shop products, which (like carpentering, bakery products, &c, in cities) have little distinctive in them to set Missouri off from other states. But it is to be noted that St Louis is one of the leading producers of street-railway cars.

years or more. Thus the foreign element is an old one., and other statistics show that it is being effectively absorbed into the native mass by intermarriage. 1 The German influence has been felt in education and in the anti-slavery cause. The early settlers of the state were practically all from Kentucky, Tennes- see, Virginia and the old slave-states of the south-east, and their influence was easily dominant in the state until well after the Civil War (about 1875), when northerners first began to enter the state in large numbers. The south-western Ozarks were settled originally by mountaineers from Kentucky and Tennes- see, and retained a character of social primitiveness and indus- trial backwardness until after the Civil War. This region has been industrially regenerated by the mine development. In addition to St Louis, 2 Kansas City and St Joseph, the leading cities in 1900 were Joplin, Springfield, Sedalia, Hannibal, Jefferson City, Carthage, Webb City and Moberly.

As Missouri was originally a French colony the Roman Catholic is its oldest church; and it is still the strongest with 382,642 communicants in 1906 out of a total of 1,199,239 for all denomi- nations. In the same year there were 218,353 Baptists, 214,004 Methodists, 166,137 Disciples of Christ, 71,599

Presbyterians, 45,018 Lutherans, and 32,715 members of the German Evangelical Synod of North America.

Administration. — Three constitutions, framed by conventions in 1820, 1865 and 1875, have been adopted by the people of the state, and a fourth (1845) was rejected, principally because it provided for popular election of the state judiciary, which was then appointed. In addition to these four constitutional con- ventions, mention should be made of the special body chosen in 1 86 1 to decide the question of secession, which retained supreme though irregular control of the state during the Civil War, and some of whose acts had all the force of promulgated constitu- tional amendments. Universal manhood suffrage was estab- lished by the first constitution. The constitution of 1865 was a partisan and intolerant document, a part of the evil aftermath of war; it was adopted by an insignificant majority and never had any strength in public sentiment. 3 The present constitution (that of 1875) was a notable piece of work when framed. The term of the governor and other chief executive officers, which had been four years until the adoption of the constitution of 1865, under which it was two years, was restored to the long term (unusual in American practice). The legislature (or, as it is called in Missouri, General Assembly) had been permitted to hold adjourned sessions under the constitution of 1865. This expensive practice was abolished; various checks were placed upon legislative extravagance, and upon financial, special and local legislation generally; and among reform provisions, common enough to-day, but uncommon in 1875, were those forbidding the General Assembly to make irrevocable grants of special privileges and immunities; requiring finance officials of the state to clear their accounts precedent to further eligibility to public office; preventing private gain to state officials through the deposit of public moneys in banks, or otherwise; and permitting the governor to veto specific items in general appropriation bills. The grand jury was reduced to twelve members, and nine con- curring may indict. The township system

may be adopted by county option, but has not been widely established, though purely administrative (not corporate) ” townships ” are an essential part of state administration. St Louis and Kansas City have adopted their own charters under constitutional provision. Up to 1909 37 constitutional amendments were submitted to the people for adoption or rejection, and 22 were adopted. Three of these (1900) restrict the calling of the grand jury, permit two-thirds of a petit jury to render verdicts in courts not of record, and three-fourths to give verdict in civil

1 In 1900 only one person in six had both parents of foreign birth.

2 St Louis was the capital in 1812-1820, St Charles in 1820-1826, and Jefferson City since 1826.

3 After the proscriptive features of this constitution were abolished by amendments in 1870, however, there was no great discontent, and the vote for holding a constitutional convention in 1875 was very close: 111,299 to 111,016.

cases in courts of record. Cities have been allowed (1892), upon authorization by the General Assembly, to organize pension systems for disabled firemen, but not allowed (1904) to organize the same for police forces. An amendment which was adopted (177,615 for; i47> 2 9° against) in November 1908, and came in effect on the 4th of December 1908^ provides for initiative and referendum applying to statutory law and to constitutional amendments, but emergency measures, and appropriations for the state government, for state institutions, and for public schools are exempt from referendum. Initiative petitions, signed by at least 8 % of the legal voters in each of two-thirds (at least) of the congressional districts of the state, must be filed not later than four months before the election at which the measure is to be voted upon. The referendum may be ordered by the legislature or by a petition signed by at least 5% of the legal voters in each of two-thirds (at least) of the

congressional districts of the state; such petition must be filed not more than 90 days after the final adjournment of the legislature; referred measures become law upon receiving a favourable majority of the popular vote. Among defeated amendments that are indi- cative of socio-political tendencies was one (1896) to authorize cities of a population of 30,000 or more to purchase, erect or maintain waterworks or lighting plants.

There is nothing extraordinary in the general judicial system. The civil law seems to have had only a tacit, and as soon as American immigration began a limited, application. The common law was introduced with the American settler, and after 1804 was the explicitly declared basis of judicature. Practically no trace of French and Spanish administration was left except in the land registers. The metropolitan primacy of St Louis and Kansas City is reflected in the general organization of the courts. The Bureau of Labor Statistics maintains free employment-bureaus in St Louis, Kansas City and St Joseph. There is also a State Board of Media- tion and Arbitration to settle labour disputes. A Board of Rail- road and Warehouse Commissioners, elected by the people, was established in 1875, under a provision of the constitution requiring the General Assembly to establish maximum rates and provide against discriminations. 4

The homestead of a housekeeper or head of a family, together with the rents and products of the same, is exempt from levy and attachment except to satisfy its liabilities at the time he acquired it. A homestead so exempted is, however, limited to 18 sq. rods of ground and to $3000 in value if it is in a city having a population of 40,000 or more, to 30 sq. rods and $1500 in value if it is in a city having a population of 10,000 and less than 40,000, to 5 acres and $1500 in value if it is in an incorporated place having a popula- tion of less than 10,000, and to 160 acres apd $1500 in value if it is in the country. A husband owning a homestead is debarred from selling or mortgaging it without

the joinder of his wife, and if the husband dies leaving a widow or minor children the homestead passes to either or to both jointly, and may be so held until the youngest child is twenty-one years of age or until the marriage or death of the widow. The principal grounds for divorce are im- potence, bigamy, adultery, conviction of felony or other infamous crime subsequent to the marriage or before the marriage if un- known to the other party, desertion or habitual drunkenness for one year, such cruel or barbarous treatment as to endanger the life of the other, such conduct as to render the condition of the other intolerable, and vagrancy of the husband; but before apply- ing for a divorce the plaintiff must reside in the state for one year immediately preceding, unless the cause of action was given within the state or while the plaintiff was a resident of the state. A married woman may hold and manage property as if she were single. She is entitled to the wages for her separate labour and that of her children, and is not liable for her husband's debts. A widow has a dower right to one-third of her husband's real estate and to the share of a child in his personal estate. If a hus- band dies without leaving children or other descendants, the widow is entitled to all the real and personal estate which came to him by marriage, to what remains of the personal property which came into his possession by the written consent of his wife, and to one- half his other real and personal property at the time of his death. If a husband dies leaving descendants only by a former marriage, the widow may take in lieu of dower the personal property that came to him by means of marriage, or if there be children by both marriages she may take in lieu of her dower right to his real estate an absolute right therein equivalent to the share of a child. Her dower is not lost by a divorce resulting from the fault or mis- conduct of the husband. A widower is entitled to a share in his wife's personal estate equal to the share of a child, and if there are

4 In 1907, in Missouri, as in various other states, passenger rates were reduced by law to 2 cents per

mile ; but this law was declared unconstitutional in 1909.

no descendants he has an absolute right to one-half of her property, both real and personal.

Finance. — Revenue is drawn mainly from a general property tax. In 1904 the gross valuation of all taxable wealth was put at $1,155,402,647, and taxation for state purposes aggregated $0.17 per $iooo. 1 In the years 1851-1857 a debt of $23,701,000 was incurred in aiding railways, and all the roads made default during the Civil War. The state could not meet its guarantee obligations (hence the strict bonding provisions of the constitution of 1875), and in 1865 had a bonded debt of above $36,000,000. This was reduced to $21,675,000 by 1869, and in 1903 was wholly extinguished, every obligation having been fully discharged. A small debt 2 (at the close "of 1906, $4,398,839) is carried in the form of non-negotiable state certificates of indebtedness issued in exchange for money taken from the educational funds of the state, and is intended as a permanent obligation to those funds. An amendment to the constitution adopted in 1908 permitted counties to make an extra levy of 25 cents on each 100 dollars valuation for the construction and repair of roads and bridges.

Charitable and Penal Institutions. — The charitable and penal institutions of the state include the penitentiary at Jefferson City, opened in 1836, which is self-supporting; a training school for boys at Boonville (opened 1889), an industrial home for girls at Chilli- cothe (established 1887), hospitals for the insane at Fulton (1847), St Joseph (opened 1874), Nevada (1887), and Farmington (1899); a school for the blind at St Louis (opened 1851); a school for the deaf at Fulton (opened 1851); a colony for the feeble-minded and epileptic at

Marshall (established 1899) ; a state sanitorium, for consumptives, at Mount Vernon (established 1905, opened 1907.) ; a Federal soldiers' home at St James, and a Confederate soldiers' home at Higginsville (both established 1897).

Education. — The expenditure upon public schools is much greater in Missouri than in any other of the old slave states. Most of the total expenditure (in 1908, $12,769,690) is made possible by local taxation. The percentage of the enumerated school-population (children 6 to 20 years of age) attending school in 1908 was 48, and the percentage of the total enumeration enrolled was about 71 ; the general showing being excellent, and that for negroes remark- ably so. Blacks and whites are segregated in all schools. Various high-schools scattered over the state are given over to the negroes ; and in 1904 the number of pupils attending these was exceeded only by the corresponding numbers in Texas and Mississippi — states with five- and sixfold the negro population of Missouri. Illiterate persons above 10 years of age constituted in 1900 6-4% of the total population — 28-1 % of the negroes, 7-1 % of the natives, 6-9% of the foreign-born. The idea of providing a university and free local schools as parts of a public school system occurs in the constitution of 1820 (and in the Acts of Congress that prepared the way for statehood), and the occurrence is noteworthy; but the real beginnings of the system scarcely go back further than 1850. Nor was very much progress made until a law was passed in 1853 requiring a quarter of the general yearly revenue of the state to be distributed among the counties for schools. This appropriation was made regularly after 1855 (save in 1861-1867), and since 1875 has rested on a constitutional provision. The maintenance of a free public school system was placed on a firm and broad foundation by the constitution adopted in that year. In the years after 1887 one-third of the total revenue was appropriated to the public common schools; and in 1908 the total appropriation for public schools, normal schools and the state

university was about three- fifths of the entire state revenue. Local taxation is another source of the school funds. In 1908 the total school fund, including state, county, township and special district funds, was about $14,000,000, of which the state fund was nearly one-third. The schools of St Louis have a very high reputation.

Among institutions of higher learning the university of Missouri at Columbia is the chief one maintained by the state. It was opened to students in 1 841, received aid for the first time from the state in 1867; women were first admitted to the mormal department in 1869, to the academic department in 1870, and soon afterwards to all departments. In addition to the academic department or college proper, the university embraces special schools of pedagogics (1868), agriculture and mechanic arts (1870), mines and metallurgy (1870, at Rolla), law (1872), medicine (1873), fine arts (1878), engin- eering (1877), military science, commerce, a graduate school of arts and sciences (1896), and a department of journalism (1908). An experiment station supported by the national government was established in 1888, and is part of the school of agriculture. The state Board of Agriculture organizes educational farmers' institutes ; and agriculture is taught, moreover, in the normal schools of the

'The constitutional provision requiring assessments at cash valuations is not at all observed; according to the State Revenue Commission of 1902 the average tax valuation was 40 to 50% of the real value. The national censuses of 1880 and 1890 (no estimate being made in 1900) put the total value of all property at $1,562,000,000 and $2,397,902,945 respectively.

2 In 1902 the bonded debts of counties and townships aggregated $8,066,878; that of towns and cities (mostly that of St Louis), fei. 193.87a

state. Of these five are maintained as follows: at Kirksville (1870), at Warrensburg (established

1870), at Cape Girardeau (established 1873), at Springfield (established 1905), at Maryville (established 1905), and there is a normal department in connexion with the Lincoln Institute, for negroes, at Jefferson City. Lincoln Institute (opened in 1866) is for negro men and women. The basis of its endowment was a fund of $6379 contributed in 1866 by the 62nd and 65th regiments U.S. Colored Infantry upon their discharge from the service; it has agricultural, industrial, sub-normal, normal and collegiate departments. Among privately endowed schools the greatest is Washington University in St Louis; it is non-sectarian and was opened in 1857. Noteworthy, too, is the St Louis Uni- versity, opened in 1829, the oldest institution for higher learning west of the Mississippi; it is a Jesuit college and the parent school of six other Jesuit institutions in the states of the middle west. There are many minor colleges and schools, most of them co- educational, and special colleges or academies for women are main- tained by different religious sects. Finally, there are various professional schools, most of them in St Louis and Kansas City.

History. — The early French explorers of the Mississippi valley left the first trace of European connexion in the history of Missouri. Ste Genevieve was settled in 1735; Fort Orleans, two-thirds of the way across the state up the Missouri river, had been temporarily established in 1720; the famous Mine La Motte, in Madison county, was opened about the same time; and before the settlement of St Louis, the Missouri river was known to trappers and hunters for hundreds of miles above its mouth. It was in 1764 that St Louis (q.v.) was founded. Two years before, the portion of Louisiana west of the Mississippi had secretly passed to Spain, and in 1763 the portion east passed to England. When the English took possession a large part of the people in the old French settlements removed west of the river. Not until 1770, after O'Reilly had established Spanish rule by force at New Orleans, did a Spanish officer at St Louis take actual possession of the upper

country; another on the ground, in 1 768-1 769, had forborne to assert his powers in the face of the unfriendly attitude of the inhabitants. Spanish administration began in 17 71. French remained the official language, and administration was so little altered that the people quickly grew reconciled to their changed allegiance. Settlement was confined to a fringe of villages along the Mississippi. French-Canadian hunters and trappers, and soon the river boatmen, added an element of adventure and colour in the primitive life of the colony. Lead and salt and peltries were sent to Montreal, New Orleans, and up the Ohio river to the Atlantic cities.

The Americans were hospitably received; the immigrants, even Protestant clergymen, enjoyed by official goodwill complete religious toleration; and after about 1796 lavish land grants to Americans were made by the authorities, who wished to strengthen the colony against anticipated attacks by the British, from Canada. Kentucky, Tennessee and Virginia furnished most of the new-comers. The French had lived in villages and main- tained considerable communal life; the Americans scattered on homesteads. With them came land speculation, litigiousness, the development of mines and mining-camp law, and. the passion of politics, of which duels were one feature of early days. In 1804 there were some 10,000 inhabitants in Upper Louisiana (mainly in Missouri), and of these three-fifths were Americans and their negroes. Racial antipathies were unimportant, and all parties were at least passively acquiescent when Louisiana became a part of the United States. On the 9th of March 1804, at St Louis, Upper Louisiana was formally transferred. In 1818, after passing meanwhile through four stages of limited self- government, 3 that portion of the Purchase now included in the state of Missouri made application for admission to the Union as a state. 4 In 1812-1813 a remarkable earthquake devastated the region about New Madrid. A large region was sunken, enormous fissures were opened in the earth, the surface soil was displaced

3 In 1804, the District of Louisiana, in the

administrative system of the Territory of Indiana; in 1805, an independent government, renamed the Territory of Louisiana; in 1812, the Territory of Mis- souri; in 1816, another grade of territorial government.

4 Until 1836 the state boundary in the north-west was the meridian of the mouth of the Kansas river drawn due north to the Iowa line. The addition of the triangle west of that line — the so-called Platte Purchase — violated the Missouri Compromise.

and altered, and great lakes were formed along the Mississippi. One of these, Reelfoot Lake, east of the river, is 20 m. long and 7 wide, and so deep that boats sail over the submerged tops of tall trees. Indian troubles again disturbed the peace during the second war with Great Britain. By 1808 the Indian title was extinguished to two-thirds of the state, though actual settle- ment did not extend more than a few miles westward from the Mississippi; in 1825, by a treaty with the Shawnee made at St Louis on the 7th of November, the title to the rest of the state was cleared, and a general removal of the Indians followed. Meanwhile, after the peace of 181 5 a great immigration had set in, many settlers coming from the free states north of the Ohio. The application for statehood precipitated one of the most famous and significant episodes of national history — the Missouri Compromise (q.v.). In August 1821, after three years of bitter controversy, Missouri was formally admitted to statehood.

In the four decades before the Civil War, two matters stand out as most distinctive in the history of the state: the trouble with the Mormons, and the growth of river and prairie trade. In 1 831-183 2 Joseph Smith, the Mormon leader, selected a tract at the mouth of the Kansas river as the site of the New Jerusa- lem, to which his followers came from Ohio in 1832. They were not welcome. Their ” revelations

” in their papers predicted dire things for the Gentiles; they were thrifty and well-to-do, and were rapidly widening their lands: they were accused of disregard for Gentile property titles, and they obstructed the processes of Gentile law within their lands. In 1833 the Missou- rians, in mass meeting, resolved to drive them from the country. The five years thereafter were marked by plunder and abuse of the sect. The militia and the courts gave them no protection. They were driven out, and went to Illinois, but continued to hold part of their abandoned lands. First St Louis, and then other towns on the Missouri river in succession westward, as they were settled and became available as depots, served as the outfit points for the Indian trade up the Missouri and the trade with Mexico through Santa Fe. The trail followed by the latter had its beginning about 1812, and (beginning in 1825) was surveyed by the national government. In early days Mexican and Ameri- can military detachments escorted the caravans on either side of the international line. Independence, Missouri (after about 183 1) and Kansas City (after 1844) were the great centres of this trade, which by i860 was of national importance. 1 After the Civil War the railways gradually destroyed it, the Atchison Topeka & Santa Fe railroad running along the old wagon trail. No steamer traversed the Mississippi above the Ohio until 181 7, nor was a voyage made between New Orleans and St Louis, nor the lower Missouri entered, until 1819. In 1832 a steamer ran to the mouth of the Yellowstone, and in 1890 the last commercial trip was made to old Fort Benton (Great Falls), Montana. The interval of years witnessed the growth of a river trade and its ■gradual decline as point after point on the river — Kansas City, St Joseph, Council Bluffs (Iowa), Sioux Falls (South Dakota) and Helena (Montana) — was reached and commanded by the railways. In 1906-1907 an active campaign was begun at Kansas City for improving the channel of the Missouri and stimulating river freighting below that point.

Among events leading up to the Civil War, first the

annexation of Texas and then the war with Mexico left special impress on Missouri history. Since 1828, when national political parties were first thoroughly organized in the state, the Democrats had been supreme, and carried Missouri on the pro-slavery side of every issue of free and slave territory. But there was always a strong body of anti-slavery sentiment, 2 nevertheless; and this

1 In 1855 its value was estimated at $5 000,000. In i860 it was much greater. In the latter year the trade employed 3000 wagons, 62,000 oxen and mules, and 7000 men.

2 Under the constitution of 1820 the General Assembly had

fiower to emancipate the slaves with the consent of their masters. n 1828 Senator T. H. Benton and others prepared a plan tor educating the slaves and gradually emancipating them under state law; and undoubtedly a considerable party would have supported such a project, for the Whigs and Democrats were not then divided along party lines on the slavery issue; but nothing

took organized form in 1849, when Senator Benton repudiated certain ultra pro-slavery instructions, breathing a secession spirit, passed by the General Assembly for the guidance of the representatives of the state in Congress. From that time until his death he organized and led the anti-disunion party of the state, Francis Preston Blair, jun., succeeding him as leader. The struggle over Kansas (q.v.) aroused tremendous passion in Missouri. Her border counties furnished the bogus citizens who invaded Kansas to carry the first territorial elections, and soon guerrilla forays back and forth gave over the border to a carnival of crime and plunder. Political conditions were chaotic. In the presidential election of i860, Douglas received the electoral vote of the state, the only one he carried in the Union. The Republicans had little strength outside St Louis, where the German element was strong. A party led’ by Claiborne F. Jackson, the

governor-elect, was resolved to carry the state out of the Union. Such secession, it was supposed, would-carry the other border states out also. With equal blindness the Secessionists favoured, and the Republicans opposed, the calling of a special state convention to decide the issue of secession. The election showed that popular sentiment was overwhelm- ingly hostile to secession; and the convention, by a vote of 80 to 1, resolved (March 4, 1861) that Missouri had ” no adequate cause ” therefor. Governor Jackson thereupon sought to attain his ends by intrigue, and the national arsenal at St Louis became the objective of both parties. It was won by the unconditional- union men, but a smaller arsenal at Liberty was seized by the Secessionists. Governor Jackson refused point-blank to con- tribute the quota of troops from Missouri called for by President Lincoln. Aggressive conflict really opened at St Louis on the 10th of May, and armed hostilities began in June. On the 10th of August 1 86 1 at Wilson’s Creek, near Springfield, General Nathaniel Lyon was defeated by a superior Confederate force in one of the bloodiest battles of the war. After this the Confederates held much of southern Missouri until the next spring, when they were driven into Arkansas, never afterward regaining foothold in the state. In the autumn of 1864 Sterling Price led a brilliant but rather bootless Confederate raid across the state, along the Missouri River, and was only forced to retreat southward by defeat at Westport (Kansas City). The western border was rendered desolate and deserted by guerrilla forays throughout the war. Probably 25,000 or 30,000 soldiers served in the Confederate armies, and 109,111 were furnished to the Union arms. 3 This was a remarkable showing. There was more or less internecine conflict throughout the war, and local dis- affection under Union rule; and Confederate recruiting was carried on even north of the Missouri.

Altogether, the state offered a difficult civil and military problem throughout the Civil War. An emancipation pro- clamation issued by General J. C.

Fr6mont at St Louis in August 1 86 1, though promptly disavowed by President Lincoln, precipitated the issue. The state convention, after voting against secession, had adjourned, and after various sessions was dissolved in October 1863. Assuming revolutionary powers, it deposed Governor Jackson and other state officers, appointed their successors, declared vacant the seats of members of the Assembly, and abrogated the disloyal acts of that body. In October 1861 a rump of the deposed Assembly passed an act of secession, which the Confederate States saw fit to regard as legitimate, and under which they admitted Missouri to their union by declaration of the 28th of November. In 1862 the convention rejected the President's suggestion of gradual eman- cipation, disfranchised Secessionists, and prepared a strong oath of allegiance. In the summer of 1863 the convention decreed emancipation with compensation to owners. This did not satisfy the Radical Republicans, and on the issue of

came of the plan, and the manner of its defeat proves that it could not possibly have been pushed to success The trouble over Lovejoy's printing office at St Louis (1833-1836) put an effectual end to the movement for emancipation.

3 Compare the vote of 1861. The Union death-roll of Massachu- setts (troops furnished, 159,165) was 13,942, that of Missouri 13,887.

immediate and unconditional emancipation they swept the state in November 1864. By the constitution of 1865 slavery was abolished outright. 1 The convention of 1861, by maintaining continuous government, had saved the state from anarchy and from reconstruction by the national power; but an ironclad test oath (it required denial of forty-five distinct offences) was provided, to be taken by all voters, state, county and municipal officers,

lawyers, jurors, teachers and clergymen. Its attempted enforcement was a grave error of judgment, and was attended by great abuses, and it was finally held unconstitu- tional by the United States Supreme Court. The legislature, however, maintained its ends by registration laws that reduced to impotence the Democratic electorate. The Radical Republi- cans held control until 1870, when they were defeated by a com- bination of Liberal Republicans and Democrats, 2 and the test- oath and the rest of the intolerant legislation of the war period were swept away. In 1872 the Democrats gained substantial control, and after 1876 their power was established beyond challenge. The constitution of 1875 closed the war period with blanket amnesties. Though in politics habitually Democratic, Missouri has generally had a strong opposition party — Whig in antebellum days, and since the war, Republican — which in recent years has made political conditions increasingly unstable. This instability is shown in congressional and local rather than in general state elections. In 1908 a Republican governor was elected, the first for more than thirty years.

The Governors of Missouri since 1804 have been as follow: — Territorial Period.

Party Affiliation. Service.

James Wilkinson Appointed 1805-1806

Joseph Brown (acting governor) 1 806-1 807

Frederick Bates

Meriwether Lewis Appointed

Frederick Bates (acting governor) ....

Benjamin Howard Appointed

Frederick Bates (acting governor) ....

William Clark Appointed

Stale Period.

Alexander McNair Democrat

Frederick Bates (died in office) . . „

Abraham J. Williams (acting governor) 1825

John Miller (special election to fill out

term) Democrat

John Miller

Daniel Dunklin (resigned office) . „

Lilburn W. Boggs (acting governor)

Lilburn W. Boggs Democrat

Thomas Reynolds (died in office) . ,,

M. M.Marmaduke (acting governor)

John C. Edwards Democrat

Austin A. King ,,

Sterling Price „

Trusten Polk (elected to United

States Senate) ,,

Hancock Jackson (acting governor) Robert M. Stewart (elected to serve

out term) Democrat

Claiborne F. Jackson (deposed

by state convention) .... „

1807

I 807- I 809

1809-1810

1810-1812

1812-1813

1 8 13-1820

1 820-1 824 s

1 824-1 825

1 825-1 828

1828-1832

1832-1836

1836

1 836-1 840

1 840-1 844

1844

1 844-1 848

1848-1853

1853-1857

1857 1857

1857-1861

1861

1 Thus liberating about 1 14,000 blacks, of a tax valuation of

$40,000,000.

2 The Liberals were those who thought unjust the proscriptionary legislation passed against the Secessionists and Democrats; and to this issue of local politics were added the issues of national reform which- the course of President Grant's administration had forced upon his party. A convention of Liberals that met at Jefferson City in January 1872 issued to all Republicans favourable to

reform within the party an invitation to meet at Cincinnati in May; and this was the convention of revolters against General Grant that nominated Horace Greeley of New York and B. Gratz Brown of Missouri as Liberal Republican candidates for the presidency and vice-presidency respectively. The first definite organization of the Liberal Republican party may therefore be said to have been made in Missouri in 1870.

3 From 1820-1844 the elections were in August and inaugurations in November; Governor King served from the 27th of December 1848 till January 1853; thereafter the inauguration was in January, and beginning with 1864 the election was in November. The term was four years except under the constitution of 1865.

Hamilton R. Gamble (appointed by state convention; died in office), provisional governor

Willard P. Hall (Lieut.- governor by same power, acting provisional governor)

Thomas C. Fletcher ….

Joseph W. McClurg ….

B. Gratz Brown

Silas Woodson

Charles H. Hardin ….

John S. Phelps

Thomas T. Crittenden .

John S. Marmaduke (died in

office)

Albert P. Morehouse (acting

governor)

David R. Francis …. William J. Stone ….. Lon V.

Stephens …. Alexander M. Dockerey .

Joseph W. Folk

Herbert S. Hadley ….

Party Affiliation.

Republican

Liberal Republican (and Democrat)

Democrat

Democrat

Republican

Service,

1861-1864

1 864-1 865 1 865- 1 869 1869-1871

1871-1873 1873-1875

1875-1877 1877-1881 1881-1885

1885-1887

1887-1889 1889-1893 1 893-1 897 1897-1901 1901-1905 1905-1909 1909

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MISSOURI COMPROMISE, an agreement (1820) between the pro-slavery and anti-slavery factions in the United States, involving primarily the regulation of slavery in the public territories. A bill to enable the people of Missouri to form a state government preliminary to admission into the Union came before the House of Representatives in Committee of the Whole, on the 13th of February 1819. An amendment offered by James Tallmadge (1778-1853) of New York, which provided that the further introduction of slaves into Missouri should be forbidden, and that all children of slave parents born in the state after its admission should be free at the age of twenty-five, was adopted by the committee and incorporated in the Bill as finally passed (Feb. 17) by the house. The Senate refused to concur in the amendment and the whole measure was lost. During the following session (1819-1820), the house passed a similar bill with an amendment introduced on the 26th of January 1820 by John W. Taylor (1784-1854) of New York making the admission of the state conditional upon its adop- tion of a constitution prohibiting slavery. In the meantime the question had been complicated by the admission in December of Alabama, a slave state (the number of slave and free states now becoming equal), and by the passage through the house (Jan. 3, 1820) of a bill to admit Maine, a free state. The Senate decided to connect the two measures, and passed a bill for the

admission of Maine with an amendment enabling the people of Missouri to form a state constitution. Before the bill was returned to the house a second amendment was adopted on the motion of J. B. Thomas (1777–1850) of Illinois, excluding slavery from the " Louisiana Purchase " north of 36° 30′ (the southern boundary of Missouri), except within the limits of the proposed state of Missouri. The House of Representatives refused to accept this and a conference committee was appointed. There was now a controversy between the two houses not only

on the slavery issue, but also on the parliamentary question of the inclusion of Maine and Missouri within the same bill. The committee recommended the enactment of two laws, one for the admission of Maine, the other an enabling act for Missouri without any restrictions on slavery but including the Thomas amendment. This was agreed to by both houses, and the measures were passed, and were signed by President Monroe respectively on the 3rd and on the 6th of March 1820. When the question of the final admission of Missouri came up during the session of 1820–1821 the struggle was revived over a clause in the new constitution (1820) requiring the exclusion of free negroes and mulattoes from the state. Through the influence of Henry Clay an act of admission was finally passed, to come into operation as soon as the state legislature would pledge itself not to pass any legislation to enforce this clause. This is sometimes known as the second Missouri Compromise.

These disputes, involving as they did the question of the relative powers of Congress and the states, tended to turn the Democratic-Republicans, who were becoming nationalized, back again toward their old state sovereignty principles— to prepare the way for the Jacksonian-Democratic Party. On the other hand, the old Federalist nationalistic element was soon to emerge first as National Republicans, then as Whigs,

and finally as Republicans. On the constitutional side the Compromise of 1820 was important as the first precedent for the congressional exclusion of slavery from public territory acquired since the adoption of the Constitution, and also as a clear recognition that Congress has no right to impose upon a state asking for admission into the Union conditions which do not apply to those states already in the Union. The compromise was specifically repealed by the Kansas-Nebraska Bill of 1854.

See J. A. Woodburn, ” The Historical Significance of the Missouri Compromise ” in the Annual Report of the American Historical Association for 1893 (Washington, D.C.); Dixon, History of the Missouri Compromise (Cincinnati, 1899) ; Schouler’s and McMaster’s Histories of the “United States. (W. R. S*.)

MISSOURI RIVER, the principal western tributary of the Mississippi river, U.S.A. It is formed at Gallatin City, in the Rocky Mountain region of south-western Montana, by the confluence of the Jefferson, Madison and Gallatin forks; thence it flows N. into the plains, which it traverses in a course at first N.E., then E. Entering North Dakota, the river turns gradually to the S.E., then S., and again S.E., traversing both North and South Dakota. It forms the eastern boundary of Nebraska and in part of Kansas, and crosses Missouri in an easterly course td its junction with the Mississippi 20 m. above St Louis, and 2547 m. below the confluence of the three forks. The stream which is known as the Jefferson Fork in its lower course, Beaver Head River in its middle course, and Red Rock Creek in its upper course, is really the upper section of the Missouri; it rises on the border between Montana and Idaho, 20 m. west of the western boundary of the Yellowstone National Park, near the crest of the Rocky Mountains, 8000 ft. above the sea, and 398 m. beyond Gallatin City; and with this and the Lower Mississippi the Missouri forms a river channel 4221 m. in length, the longest in the world. The Madison and Gallatin forks rise within the Yellowstone Park,

where the former is fed by geysers and hot springs and the latter by both hot springs and melting snow. The Yellowstone river, which is the principal tributary, of the Missouri, traverses the park. The Missouri drains a basin having an area of about 580,000 sq.m.; this includes the eastern slope of the Rocky Mountains from the northern border of the United States to the middle of Colorado, and its larger tributaries take their rise in those mountains. Besides the Yellowstone and the three forks there are the Platte, which rises in two large branches in Colorado, and the Milk, which rises in north-western Montana. The Kansas in Kansas, the James and Big Sioux in the Dakotas, and the Niobrara in Nebraska, are the principal tributaries wholly of the plains. In the mountain region the Missouri flows through deep canyons and over several cascades. Below Great Falls the slower current is unable to carry all the silt brought down from the mountains

and plains, and consequently a winding and unstable channel has been formed on deposits of silt 5° to 100 ft. or more in depth. Bends in the river continue to develop by erosion until the neck between two of them is cut off, and in the process numerous islands, sand-bars, and crescent-shaped lakes are formed. Cottonwood, willow, cedar and walnut trees grow upon the banks that are for a time left undisturbed, but years later the eroding current returns to undermine these banks, the trees fall in and are carried down stream as snags (or ” sawyers “), which are especially dangerous to navigation. The variation of level is great and it varies greatly in different parts of the river’s course: it is about 19 ft. at Kansas City, about 25 ft. at St Charles, Missouri, and about 8 ft. at Fort Benton, Montana. It is estimated that the Missouri’s average discharge per second amounts to about 94,000 cub. ft., and that each year it carries into the Mississippi 550,000 tons of silt. The waters of the Missouri begin to rise in March, and a high- water stage is reached in April as a result of the spring rains and the melting snow on the plains; a second

high stage is produced in June by the melting of snow on the mountains, and the river is navigable from early spring to midsummer as far as Fort Benton, within 40 m. of the Great Falls and 2285 m. above the mouth. Above Great Falls the river is navigable to Three Forks.

The mouth of the Missouri was discovered in 1673 by Mar- quette and Joliet, while they were coming down the Mississippi. Early in the 18th century French fur-traders began to ascend the river, and in 1764 St Louis was established as a depot; but the first exploration of the river from its mouth to its head-waters was made in 1 804-1805 by Meriwether Lewis and William Clark. Until many years later the commerce on the river was restricted to the fur trade #nd was carried on with such primitive craft as the canoe (made from the log of a cottonwood tree); the pirogue (usually two canoes side by side and with a floor over them on which to place the cargo) ; the bullboat (made by covering a framework of willow poles with the hides of bison bulls) ; the mackinaw boat (made of boards and having a flat bottom); and the keelboat (a vessel of some pretensions, with a keel from bow to stern, 60 to 70 ft. in length, with a breadth of beam from 15 to 18 ft., and drawing 20 to 30 in. of water). A canoe, pirogue, bullboat, or mackinaw boat was propelled by two or more men with paddles, poles, or oars; but to propel a keelboat up the river required 20 to 40 men who walked along the shore and pulled a corvette, a line about 1000 ft. long and fastened to the mast. An average of about 15 m. a day was made with a keelboat going up the river. The first attempt to navigate the Mis- souri with steamboats was made in the spring of 1819, when the ” Independence ” made a trip from St Louis to the mouth of the Chariton river and back. The American Fur Company began to use steamers in 1830, and from then until the advent of railways the steamboat on the Missouri was one of the most important factors in the development of the Northwest. The traffic was at its height in 1858, when no fewer than 60 regular packets were engaged in it, but its decline began in the following year

with the completion of the Hannibal & St Joseph railway to St Joseph, Missouri, and 20 years later it had nearly disappeared. In an attempt to regulate railway rates, however, four boats were run between Kansas City and St Louis between 1890 and 1894 by the Kansas City & Missouri Transportation Company, and in 1906 the Missouri River Valley Improvement Association was formed at Kansas City. Congress began to make appropriation for the removal of snags about 1838, and forty years later appropriations were begun for a general improvement which in 1884 was placed under the charge of the Missouri River Commission. In 1890 its work was restricted to that part of the river below Sioux City and in 1902 the Commission was abolished. Up to the 30th of June 1908 the Federal government had expended $11,398,881 for the improve- ment of the river.

See H. M. Chittenden, History of Early Navigation on the Missouri River (New York, 1903) ; P. E. Chappel, A History of the Missouri River (Kansas City, 1905); J. V. Brower, The Missouri River and

its Utmost Source (St Paul, 1896); J. M. Hanson, The Conquest of the Missouri (New York, 1909) ; L. M. Jones, ” The Improvement of the Missouri River and its Usefulness as a Traffic Route,” in Annals of the American Academy of Political and Social Science (Jan. 1908), and the Annual Reports of the Chief of Engineers, U.S. Army.

MISTAKE {i.e. take amiss), a misconception or error in thought or action. In law, the word is often used in the sense of ignorance or error, as when it is said that mistake of law affords no excuse for crime. In the law of contract, mistake is of special importance, and may occur either in a matter of law or in a matter of fact. In general, a mistake of law cannot be alleged in avoidance of the consequences of contracts or acts, although there are exceptions in which relief may be given. Mistake of fact,

however, may be ground for avoidance, pro- vided the mistake was not due to negligence. (See further Contract.)

MISTLETOE 1 (Viscum album), a species of Viscum, of the botanical family Loranthaceae. The whole genus is parasitical, and contains about twenty species, widely distributed in the warmer parts of the old world; but only the mistletoe proper is a native of Europe. It forms an evergreen bush, about 4 ft. in length, thickly crowded with forking branches and opposite leaves, which are about 2 in. long, obovate-lanceolate in shape and yellowish-green; the dioecious flowers, which are small and nearly of the same colour but yellower, appear in February and March; the white berry when ripe is filled with a viscous semi- transparent pulp (whence bird-lime is derived). The mistletoe is parasitic both on deciduous and evergreen trees and shrubs. In England it is most abundant on the apple-tree, but rarely found on the oak. - Poplars, willows, lime, mountain-ash, maples, are favourite habitats, and it is also ffjund on many other trees, including cedar of Lebanon and larch. The fruit is eaten by most frugivorous birds, and through their agency, particularly that of the species which is accordingly known as missel-thrush or mistle-thrush, the plant is propagated. The Latin proverb has it that ” Turdus malum sibi cacat”; but the sowing is really effected by the bird wiping its beak, to which the seeds adhere, against the bark of the tree on which it has alighted. The viscid pulp soon hardens, affording a protection to the seed; in germination the sucker-root penetrates the bark, and a connexion is established with the vascular tissue of the first plant. The growth of the plant is slow, and its durability proportionately great, its death being determined generally by that of the tree on which it has established itself. The mistletoe so extensively used in England at Christmas is largely derived from the apple orchards of Normandy; a quantity is also sent from the apple orchards of Herefordshire.

Pliny {H. N., xvi. 92-95; xxiv. 6) has a good deal

to tell about the viscum, a deadly parasite, though slower in its action than ivy. He distinguishes three ” genera.” ” On the fir and larch grows what is called stelis in Euboea and hyphear in Arcadia.” Viscum, called dryos hyphear, is most plentiful on the esculent oak, but occurs also on the robur, Prunus sylvestris and terebinth. Hyphear is useful for fattening cattle if they are hardy enough to withstand the purgative effect it produces at first; viscum is medicinally of value as an emollient, and in cases of tumour, ulcers and the like. Pliny is also our authority for the reverence in which the mistletoe when found growing on the robur was held by the Druids. Prepared as a draught, it was used as a cure for sterility and a remedy for poisons. The mistletoe figures also in Scandinavian legend as having furnished the material of the arrow with which Balder (the sun-god) was slain by the blind god Hoder. Most probably this story had its origin in a particular theory as to the meaning of the wore! mistletoe.

MISTRAL, FREDERIC (1830-), Provencal poet, was born at Maillane (Bouches-du-Rh6ne) on the 8th of September 1830. In the autobiographical sketch prefixed to the Isclo d’or (1876) he tells us, with great simplicity and charm, all that is worth knowing of his early life. His father was a prosperous farmer,

1 Gr. i&a or l£6s, hence Lat. viscum, Ital. vischio or visco, and Fr. gui. The English word is the O.E. misteltan, Icelandic mistel- teinn, in which tan or teinn means a twig, and mistel may be associ- ated either with mist in the sense of fog, gloom, because of the prominence of mistletoe in the dark season of the year, or with the same root in the sense of dung (from the character of the berries or the supposed mode of propagation).

and his mother a simple and religious woman of the people, who first taught him to love all the songs and legends of the country. In these early days on the farm he received those first impressions which were destined to constitute one of the chief

beauties of Mirbio. In his ninth year Mistral was sent to a small school at Avignon, where he was very wretched at first, regretting the free outdoor life of the country. Gradually, however, his studies attracted him, above all the poetry of Homer and Virgil; and he translated the latter's first eclogue, showing his efforts to a young schoolfellow, A. Mathieu, who was destined to play a part in the foundation of the Felibrige. When Roumanille (see Provencal Literature) became an usher at Mistral's school, the two, fired by the same love of poetry and of their native Provence, soon became close friends. " Voila. l'aube que mon ame attendait pour s'eveiller a. la lumiere," he exclaimed, on reading Rouman- ille's first dialect poems; and he goes on to say: " Embrases tous les deux du desk de relever le parler de nos meres, nous etudiames ensemble les vieux livres Provencaux, et nous nous proposames de restaurer la langue selon ses traditions et caracteres nationaux." On leaving school (1847) he returned to Maillane, where he sketched a pastoral poem in four cantos {Li Meissoun). With all his love for the country, he soon realized that life on a farm did not satisfy his ambition. So he went to study law at Aix, where he contributed his first published poems to Roumanille's Li Prouvencalo (1852). He had become licenciS en droit the year before, but now decided on a literary career. The Felibrige was founded in 1854, and five years later appeared Mirbio, the masterpiece not only of Mistral, but so far of the entire school. The tale itself was nothing — the old story of a rich girl and her poor lover, kept apart by the girl's parents. Mireille, in despair, wanders along a wide tract of country to the church of the Trois- Maries, in the hope that these may aid her. But the effort was too great: she sinks exhausted, and dies in the presence of her stricken parents and her frenzied lover. Into this simple web Mistral has woven descriptions of Provencal life, scenery, character, customs and legends that raise the poem to the dignity of a rustic epic, unique in literature. Nothing is forced : every detail is filled into the framework of the whole with a

cunning which the poet was never again to attain. There is no deep psychology in the characters, but then the people depicted are simple rustic folk, who wear their hearts on their sleeve. Calendau (1867), the story of a princess held in bondage by a ruthless brigand, and eventually rescued by a youthful hero, is a comparative failure. The description of scenery is again masterly; but the old lore, which had charmed all readers in Mirbio, here becomes forced, not inevitable. The characters are mere symbols — indeed the whole poem is obviously an allegory, the princess standing for Provence, the brigand for France, and the young lover for the Felibrige. Mistral lavished enormous labour on this work, which probably accounts for its lack of spontaneity, as also for the love he bears it. In 1876 (the same year in which he married Mile Marie Riviere, of Dijon) was published the volume Lis Isclo d'Or — a collection of the shorter poems Mistral had composed from the year 1848 onwards. Here he is again at his very best. Old legends, sirventes (mostly, as in medieval times, poems with a tendency), and lyrics — all are admirable. Even the pibces oV occasion may be reckoned with the best of their kind. Two pieces, the Coupe and the Princesse, aroused violent controversy on their first appearance. They reproduce, in effect, the theme of Calendau, and Mistral was accused of trying to sow discord between the north and south of France. Needless to say he was altogether innocent of such a design. Nerlo (1884) is a charming tale of Avignon in the olden days, in which a girl's purity triumphs over her lover's base designs and leads him to nobler thoughts. There is little individuality in the characters, which should rather be regarded as types; and we feel no terror or pity at the tragic close. But we are carried along by Mistral's art and by the brilliancy of his espisodes; and he achieved the object he had in view: a pretty tale imbued with the proper touch of local colour and with the true spirit of romance. The play La Rbino Jano (1890) is a complete failure, if judged from the dramatic

standpoint: it is rather a brilliant panorama, a series of stage pictures, and the characters neither live nor arouse our sympathy. In the great epic on the Rhone (Lou Poulmo ddu Rouse, 1897) the poet depicts the former barge-life of that river, and inter- twines his narrative with the legends clustering round its banks, and with a graceful love episode. For the first time he employs blank verse, and uses it with great mastery, but again the ancient lore is overdone. A splendid piece of work is Lou Tresor ddu Filibrige (1886). In these two volumes Mistral has deposited with loving care every word and phrase, every proverb, every scrap of legend, that he had gathered during his many years' journeyings in the south of France. In 1904 he was awarded one of the Nobel prizes for literature.

An excellent literary appreciation of the poet is that by Gaston Paris, " Frederic Mistral " (originally in the Revue de Paris (Oct. and Nov. 1894) ; then in Penseurs et Poites (Paris, 1896). More elaborate accounts are Welter, Frederic Mistral (Marburg, 1899) ; and Downer, Frediric Mistral (New York, 1901), with a full bibliography.

(H. O.)

MISTRAL, a local wind similar to the bora (q.v.), met with on the French Mediterranean coast. The warm Gulf of the Lion (Golfe du Lion) has to the north the cold central plateau of France, which during winter is commonly a centre of high barometric pressure, and the resulting pressure gradient causes persistent currents of cold dry air from the north-west in the intermediate zone. The mistral occurs along the coast from the mouth of the Ebro to the Gulf of Genoa, but attains greatest strength and frequency in Provence and Languedoc, i.e. the district of the Rhone delta, where it blows on an average one day out of two; the record at Marseilles is 175 days in the year. It is usually associated with cloudless skies and brilliant sun- shine, intense dryness and piercing cold. With the passage

of a cyclone over the gulf, or a rapid rise of pressure following a fall of snow on the central plateau, the mistral develops into a stormy wind of great violence.

MISTRESS (adapted from O. Fr. maistresse, mod. maitresse, the feminine of maistre, maltre, master), a woman who has authority, particularly over a household. As a form of address or term of courtesy the word is used in the same sense as ” madam.” It was formerly used indifferently of married or unmarried women, but now, written in the abbreviated form ” Mrs ” (pronounced ” missis “), it is practically confined to married women and prefixed to the surname; it is frequently retained, however, in the case of spinster cooks or housekeepers, as a title of dignity; as the female equivalent of ” master ” the word is used in other senses by analogy, e.g. of Rome as ” the mistress of the world,” Venice ” the mistress of the Adriatic,” &c. From the common use of ” master ” as a teacher, ” mis- tress ” is similarly used. The old usage of the word for a lady- love or sweetheart has degenerated into that of paramour. ” Miss ” a shortened form of ” mistress,” is the term of address for a girl or unmarried woman; it is prefixed to the surname in the case of the eldest or only daughter of a family, and to the Christian names in the case of the younger daughters.

MITAU (Russian, Mitava; Lettish, Yelgava), a town of Russia, capital of the government of Courland, 29 m. by rail S.W. of Riga, on the right bank of the river Aa, in a fertile plain which rises only 12 ft. above sea level, and has probably given its name to the town (Mitte in der Aue). Pop. (1897), .35,011 inhabitants, mainly Germans, but including also Jews (6500), Letts (5000) and Russians. At high water the plain and sometimes also the town are inundated. Mitau is surrounded by a canal occupying the place of former fortifications. It has regular, broad streets, bordered with the mansions of the German nobility, who reside at the capital of Courland. Mitau is well provided with educa- tional institutions, and is also the seat of the Lettish

Literary Society. The old castle (1266) of the dukes of Courland, situated on an island in the river, was destroyed by Duke Biren, who erected in its place (1738-1772) a spacious palace, now occupied by the governor and the courts. Manufactures are few, those of wax-cloth, linen, soap, ink and beer being the most important.

Mitau is supposed to have been founded in 1266 by Conrad

Mandern, grand-master of the order of the Brethren of the Sword. In 1345, when it was plundered by the Lithuanians, it was already an important town. In 1561 it became the residence of the dukes of Courland. During the 17th century it was thrice taken by the Swedes. Russia annexed it with Courland in 1795. It was the residence (1 798-1801 and 1804-1807) of the count of Provence (afterwards Louis XVIIL). In 1812 it was taken by Napoleon I.

MITCHAM, a suburb of London, in the Wimbledon parlia- mentary division of Surrey, England, 10 m. S. of London Bridge by the London, Brighton & South Coast railway. Pop. (1901), 14,903. Mitcham Common covers* an area of 480 acres, and affords one of the best golf courses near London. The neighbourhood abounds in market gardens and plantations of aromatic herbs for the manufacture of scents and essences.

MITCHEL, ORMSBY MACKNIGHT (1809-1862), American astronomer, was born at Morganfield, Kentucky, on the 28th of July, 1809. He began life as a clerk, but, obtaining an appoint- ment to a cadetship at West Point in 1825, he graduated there in 1829, and acted as assistant professor of mathematics 1829-1832. He was then called to the bar, but in 1836 became professor of mathematics and natural philosophy at Cincinnati College. In 1845 he was made director of an observatory established there through his initiative, and also in 1859 superintendent of the Dudley observatory at Albany. In 1861 he took part in the war as brigadier-general of volunteers, and for his skill in seizing certain

important strategic points was on the nth of April 1862 made major-general. He died of yellow fever at Beaufort, South Carolina, on the 30th of October 1862. He founded the Sidereal Messenger in 1846, was one of the first to adopt (in 1848) the electrical method of recording observations, and published besides other works, TheOrbs of Heaven (1848, &c), and Popular Astronomy (i860), both reissued at London in 1892.

See Ormsby MacKnight Mitchel; a Biographical Narrative, by his son, F. A. Mitchel (1887); P. C. Headley, The Patriot Boy (1865); Amer. Journal of Science, xxiv. 451 (1862) ; Month. Notices Roy. Astr. Society, xxiii. 133, xxxvii. 121 (C. Abbe); Astr. Nach., No. 1401 (G. W. Hough).

MITCHELL, DONALD GRANT (1822–1908) American author, was born in Norwich, Connecticut, on the 12th of April 1822. He graduated at Yale College in 1841; studied law, but soon took up literature. Throughout his life he showed a particular interest in agriculture and landscape-gardening, which he followed at first in pursuit of health. He produced books of travel, volumes of essays on rural themes, of which My Farm of Edgewood (1863) is the best; sketchy studies of English monarchs and of English and American literature; and a character-novel entitled Doctor Johns (1866), &c; but is best known as the author (under the pseudonym of ” Ik Marvel “), of the sentimental essays contained in the volumes Reveries of a Bachelor, or a Book of the Heart (1850), and Dream Life, a Fable of the Seasons (1851).

MITCHELL, MARIA (1818–1889), American astronomer, was born of Quaker ancestry on the island of Nantucket on the 1st of August 1818. Her father, William Mitchell (1791–1869), was a school teacher and self-taught astronomer, who rated chrono- meters for Nantucket whalers, was an overseer of Harvard University (1857–1865), and for a time was employed by the United States Coast Survey. As early as 1831 (during the annular eclipse of the sun) she had been her father’s assistant in his observations. On the 1st of October 1847 she discovered a telescopic comet (seen by De Vico Oct. 3, by W. R. Dawes Oct. 7, by Madame Riimker Oct. n), and for this discovery she received a gold medal from the King of Denmark, and was elected (1848) to the American Academy of Arts and Sciences, and (1850) to the American Association for the Advancement of Science. In 1861 she removed from Nantucket to Lynn, where she used a large equatorial telescope presented to her by the

women of America; and there she lived until 1865, when she became professor of astronomy and director of the observa- tory at Vassar College; in 1888 she became professor emeritus. In 1874 she began making photographs of the sun, and for years she made a special study of Jupiter and Saturn. She died at

Lynn on the 28th of June 1889. In 1908 an observatory was established in her honour at Nantucket.

See Phebe Mitchell Kendall, Maria Mitchell: Life, Letters and Journals (Boston, 1896); In Memoriam (Poughkeepsie, 1889), by her pupil and successor at Vassar, Mary W. Whitney ; and a sketch by her brother, Henry Mitchell (1830-1902), himself a well-known hydrographer, in the Proceedings of the American Academy of Arts and Sciences, vol. xxv. (1 889-1890), pp. 331-343.

MITCHELL, SILAS WEIR (1830—), American physician and author, son of a Philadelphia doctor, John Kearsley Mitchell (1 798-1858), was born in Philadelphia on the 15th of February 1830. Ha studied at the university of Pennsylvania in that city, and received the degree of M.D. at Jefferson Medical College in 1850. During the Civil War he had charge of nervous injuries and maladies at Turner’s Lane Hospital, Philadelphia, and at the close of the war became a specialist in nervous diseases. In this field Weir Mitchell’s name became prominently associated with his introduction of the ” rest cure,” subsequently taken up by the medical world, for nervous diseases, particularly hysteria; the treatment consisting primarily in isolation, con- finement to bed, dieting and massage. In 1863 he wrote a clever short story, combining physiological and psychological problems, entitled ” The Case of George Dedlow,” in the Atlantic Monthly. Thenceforward Dr Weir Mitchell, as a writer, divided his attention between professional and literary

pursuits. In the former field he produced monographs on rattlesnake poison, on intellectual hygiene, on injuries to the nerves, on neurasthenia, on nervous diseases of women, on the effects of gunshot wounds upon the nervous system, and on the relations between nurse, physician, and patient; while in the latter he wrote juvenile stories, several volumes of respectable verse, and prose fiction of varying merit, which, however, gave him a leading place among the American authors of the close of the 19th century. His historical novels, Hugh Wynne, Free Quaker (1897), The Adventures of Francois (1898) and The Red City (1909), take high rank in this branch of fiction.

MITCHELL, SIR THOMAS LIVINGSTONE (1792–1855), Australian explorer, was born at Craigend, Stirlingshire, Scotland, on the 1 6th of June 1792. From 1808 to the end of the Peninsular War he served in Wellington's army, and was raised to the rank of major. He was appointed to survey the battlefields of the Peninsula, and his map of the Lower Pyrenees is still admired. In 1827 he was appointed deputy surveyor-general, and after- wards surveyor-general of New South Wales. He made four exploring expeditions between 1831 and 1846, and discovered the Peel, the Namoi, the Gwyder and other rivers, traced the course of the Darling and Glenelg, and was the first to penetrate into that portion of the country which he named Australia Felix. His last expedition was mainly devoted to the discovery of a route between Sydney and the Gulf of Carpentaria, and during the journey he explored the Fitzroy Downs, and discovered the Balonne, Victoria, Warrego and other streams. In 1838, while in England, Mitchell published his Three Expeditions into the Interior of East Australia. In 1839 he was knighted and made' a D.C.L. of Oxford. During this visit he took with him some of the first specimens of gold and the first diamond found in Australia. In 1848 the narrative of his second expedition was published in London, Journal of an Expedition into the Interior of Tropical Australia. In 1851 he was sent to report on the Bathurst goldfields, and in 1853 he

again visited England and patented his boomerang propeller for steamers. He died at Darling Point, Sydney, on the 5th of October 1855.

Besides the above works, Mitchell wrote a book on Geographical and Military Surveying (1827), an Australian Geography, and a trans- lation of the Lusiad of Camoens. During his tenure of office as surveyor-general he published an admirable map (still in use) of the settled districts of New South Wales.

MITCHELL, a city and the county-seat of Davison county, South Dakota, U.S.A., about 70 m. W.N.W. of Sioux Falls. Pop. (1905), 5719; (1910), 6515. Mitchell is served by the Chicago, Milwaukee & St Paul and the Chicago, St Paul, Minne- apolis & Omaha railways. Among its buildings and institutions are the city hall, the Federal building, a Carnegie library, a

hospital, and a sanitorium. Mitchell is the seat of the Dakota Wesleyan University (1885; Methodist Episcopal). At Mitchell is a ” corn palace,” which is decorated each autumn with split ears of Indian corn, and is the centre of an annual festival, held in September and October. The city is an important shipping point for grain and livestock, and has a large wholesale trade. There are railway repair shops of the Chicago, Milwaukee & St Paul railway, machine shops, and manufactories of bricks and dressed lumber. Mitchell was settled in 1879 and chartered as a city in 1883.

MITCHELSTOWN, a market town of Co. Cork, Ireland, situated between the Kilworth and Galty Mountains, on a branch of the Great Southern & Western railway. Pop. (1901), 2146. Here is the Protestant Kingston College, a home for poor gentlefolk, founded by James, Lord Kingston, in 1760. The seat of the earls of Kingston was built in 1823. It is a massive castellated structure, among the finest of its kind in Ireland. The Mitchelstown limestone caves, exhibiting beautiful stalactite formations, are 6 m. distant in Co. Tipperary (q.v.). On the 9th of

September 1887 Mitchelstown was the scene of a riot in connexion with the Irish Nationalist ” plan of campaign.” The police were compelled to fire on the rioters, and two men were killed, after which the coroner’s jury brought in a verdict of wilful murder against the police. This verdict was ignored by the government, and subsequently quashed by the Queen’s Bench in Dublin, but additional feeling was roused in respect of the incident owing to a message later sent by Mr Gladstone ending with the words ” Remember Mitchelstown.”

MITE, a name applied to an order of small Arachnida, with which this article deals, and to a coin of very slight value. The origin of both would appear to be ultimately the same, viz. a root mei-, implying something exceedingly small. It has been suggested that the name for the animal comes from a secondary root of the root mei-, to cut, whence come such words as Goth. maitan, to cut, and Ger. messer, knife. In this case mite would mean ” the biter ” or ” cutter.” The coin was originally a Flemish copper coin (Dutch mijt) worth one-third or, according to some authorities, a smaller fraction of the Flemish penning, penny. It has become a common expression in English for a coin of the smallest value, from its use to translate Gr. \ewrbv, two of which make a KoSpavrris, translated ” farthing ” (Mark xii. 43).

In zoology, ” mite ” is the common name for minute members of the class Arachnida (q.v.), which, with the ticks, constitute the order Acari. The word ” mite,” however, is merely a popular and convenient term for certain groups of Acari, and does not connote a natural assemblage as contrasted with the ticks (q.v.). Mites are either free-living or parasitic throughout their lives or parasitic at certain periods and free-living at others. They are almost universally distributed, and are found wherever terrestrial vegetation, even of the lowliest kind, occurs. They are spread from the arctic to the antarctic hemisphere, and inhabit alike the land, fresh-water streams and ponds, brackish marshes and the sea. The largest species, which occur in the tropics, reach barely half an

inch in length; while the smallest, the most diminutive of the Arthropoda, are invisible to the naked eye.

Mites are divided into a considerable number of families. The Bdellidae (Bdella) are free-living forms with long antenniform palpi. The large tropical forms above mentioned belong to the genus Trombidium of the family Trombidiidae. The members of this genus are covered with velvety plush-like hairs, often of an exquisite crimson colour. The legs are adapted for crawling or running, and the palpi are raptorial. They are non-parasitic in the adult stage; but immature individuals of a British species (T. holosericeum) are parasitic upon various animals (see Harvest Bug). The Tetranychidae are nearly related to the last. A well-known example, Tetranychus telarius, spins webs on the backs of leaves, and is sometimes called the money spider. The fresh-water mites or Hydrach- nidae are generally beautifully coloured red or green, and are commonly globular in shape. Their legs are furnished with

long hairs for swimming. The marine mites of the family Halacaridae, on the contrary, are not active swimmers but merely creep on the stems of seaweeds and zoophytes. The Gamasidae are mostly free-living forms with a thick exoskeleton, and are allied to the Ixodidae or ticks (?.».). A common species is Gamasus coleoptratorum, the females and young of which may be found upon the common dung-beetle. The Oribatidae or beetle-mites, so called from their resemblance to minute beetles, are non-parasitic, and often go through remark- able metamorphoses during development. The Sarcoptidae, as stated below, are mostly parasitic forms. Some members of this family, however, live in decaying animal substances, the best known perhaps being the cheese-mite (Tyroglyphus siro) which infests cheese, especially Stilton, in thousands. An allied species

(T. entomophagus) often causes great damage to collec- tions of insects by destroying the dried specimens. They may be easily exterminated by application of benzine, which does not harm the contents of the cabinet.

From the economic standpoint the most important mites are those which are parasitic upon mammals and birds. They belong to the four families, Gamasidae, Trombidiidae, Sarcoptidae and Demodicidae. Most of the Gamasidae are free-living mites. The family, however, contains an aberrant genus, Dertnanyssus, of which several species have been described, although they are all perhaps merely varieties of one and the same species commonly known as D. gallinae or D. avium. This species is found in fowl-houses, dovecotes and bird-cages. During the day they lurk in cracks in the floor, walls or perches, and emerge at night to attack the roosting birds. They are a great pest, and frequently do much damage to birds both by sucking their blood and by depriving them of rest at night. They are sometimes transferred from birds to mammals. The Trombidiidae also are mostly free-living predaceous mites. A few, however, are parasitic upon mammals and birds, the best-known being Trombidium holosericeum, the larva of which attacks human beings, as well as chickens and other birds, sometimes producing considerable mortality amongst them (see Harvest Bug). Another genus, Cheyletiella, affects rabbits as well as birds. Birds are also attacked by many species of Sarcoptidae, which according to the organs infected are termed plumicolae (Analgesinae), epi- dermicolae (Epidermoptinae) , and cysticolae (Cytoditinae) . The Analgesinae (Pterolichus, Analges) live almost wholly upon and between the barbules of the feathers. They are found in nearly every species of bird without apparently affecting the health in any way. The Epidermoptinae (Epidermoptes) occur on diseased fowls and live, as their name indicates, upon the skin at the base of the feathers, where their presence gives rise to an accu- mulation of yellowish scales. The Cytoditinae (Cytodiles), on the other hand, live in the subcutaneous or

intermuscular con- nective tissue round the respiratory organs, or in the air sacs, especially of gallinaceous species. They also penetrate to certain internal organs, and may become encysted and give rise to tubercle-like nodules. Sometimes they exist in such quantities in the air passages as to cause coughing and asphyxia.

The cutaneous mites, mentioned above, and others akin to them, produce no very marked disturbance in the skin of the species they infest. They merely suck the blood or feed upon the feathers, scurf and desquamating epidermis. Hence they are termed ” non-psoric ” mites. A certain number of species, however, called in contradistinction ” psoric ” mites, give rise by their bites, by the rapidity of their multiplication, and by the excavation of galleries in the skin, to a highly contagious disease known as scabies or mange, which if not treated in time produces the gravest results. These mites belong exclu- sively to the Sarcoptidae and Demodicidae. A variety of species are responsible for Sarcoptic mange, Sarcoptes mutatis producing it in the feet of gallinaceous and passerine birds by burrowing beneath the scales and giving rise to a crusted exuda- tion which pushes up beneath and between the scales. Feather scabies or depluming scabies of poultry is caused by another species, 5. laevis. Three genera of Sarcoptidae, namely Sarcoptes Chorioptes and Psoroptes cause mange or scabies in mammals,

the mange produced by Sarcoptes being the most serious form of the disease, because the females of the species which produces it, Sarcoptes scabiei, burrow beneath the skin and are more difficult to reach with acaricides. A considerable number of varieties of this species have been named after the hosts upon which they most commonly and typically occur, such as S. scabiei hominis, equi, bovis, caprae, ovis, cameli, lupi, vulpis, &c. ; but they are not restricted to the mammals from which their names have been derived and structural differences between them are often difficult to define and sometimes non-existant. Under favourable conditions

the multiplication of this species is very rapid. It has been computed indeed that a single pair may give rise to one million and a half individuals in about three months. Psoroptes lives in the epidermic incrustations to which it gives rise, without, however, excavating subcutaneous burrows. One species, P. communis, is known to affect various domestic animals. Of the genus Chorioptes two species have been described on domestic animals, viz. Ch. symbiotes, which has the same mode of life as Psoroptes communis and Ch. cynotis, which has been detected only in the ears of certain carnivora such as dogs, cats and ferrets. Mange, if taken in time, can be cured by applications of sulphur ointment or of sulphur mixed with an animal or vegetable oil. Mites of the family Demodicidae give rise to a skin disease called ” Demodecic or follicular mange,” which is often serious and always difficult to cure on account of the deep situation taken up by the parasites. These infest the hair follicles and sebaceous glands, and are therefore termed Demodex folliculorum. These mites differ greatly from those previously noticed — in the reduction of their legs to short three- jointed tubercles, and in the great elongation of the abdomen to form an annulated flexible postanal area to the body. They live not uncommonly in small numbers in the skin of the human face and their presence may never be detected. They also occur on dogs, pigs and other domesticated animals, as well as on mice and bats, and numerous varieties named after their hosts, hominis, bavis, canis, cati, &c, have been described, but they apparently differ from each other, principally in size.

The mites of the family Eriophyidae or Phytoptidae produce in various plants pathological results analogous to those produced in animals by parasitical Sarcoptidae and by Demodicidae. As in the Demodicidae the abdomen is elongate and annulate, but the Eriophyidae differ from all other mites in halving per- manently lost the last two pairs of legs. The excrescences and patches they produce on leaves are called ” galls,” the best

known of which are perhaps the nail-galls of the lime caused by Eriophyes tiliae. A very large number of species have been described and named after the plants upon which they live. They often inflict very considerable loss upon fruit-growers by destroying the growing buds of the trees. (R. I. P.)

MITFORD, MARY RUSSELL (1787-1855), English novelist and dramatist, only daughter of Dr George Mitford, or Midford, was born at Alresford, Hampshire, on the 1 6th of December 1787. She retains an honourable place in English literature as the authoress of Our Village, a series of sketches of village scenes and characters unsurpassed in their kind, and as fresh as if they had been written yesterday. Her father was a curious character. He first spent his wife's fortune in a few years; then he spent the greater part of £20,000, which in 1797 his daughter, then at the age of ten, drew as a prize in a lottery; then he lived on a small remnant of his fortune and the proceeds of his daughter's literary industry. The father kept fresh in his daughter the keen delight in incon- gruities, the lively sympathy with self-willed vigorous indi- viduality, and the womanly tolerance of its excess, which inspire so many of her sketches of character. Miss Mitford lived in close attendance on him, refused all holiday invitations because he could not live without her, and worked incessantly for him except when she broke off her work to read him the sporting newspapers. Her writing has all the charm of perfectly unaffected spontaneous humour, combined with quick wit and exquisite literary skill. Miss Mitford met Elizabeth Barrett (Mrs Browning) in 1836, and the acquaintance ripened into a warm friendship. The strain of poverty began to tell on her

work, for although her books sold at high prices, her income did not keep pace with her father's extravagances. In 1837, however, she received a civil list pension, and five years later her father

died. A subscription was raised to pay his debts, and the surplus increased the daughter's income. Miss Mitford eventually removed to a cottage at Swallowfield, near Reading, where she died on the 10th of January 1855.

Miss Mitford's youthful ambition had been to be " the greatest English poetess," and her first publications were poems in the manner of Coleridge and Scott (Miscellaneous Verses, 1810, reviewed by Scott in the Quarterly; Christine, a metrical tale, 181 1 ; Blanche, 18 13). Her play Julian was produced at Covent Garden, with Macready in the title-role, in 1823; The Foscari was performed at Covent Garden, with Charles Kemble as the hero, in 1826; Rienzi, 1828, the best of her plays, had a run of thirty-four nights, and Miss Mitford's friend, Talfourd, imagined that its vogue militated against the success of his own play Ion. Charles the First was refused a licence by the Lord Chamberlain, but was played at the Surrey Theatre in 1834. But the prose, to which she was driven by domestic necessities, has rarer qualities than her verse. The first series of Our Village. sketches appeared in 1824, a second in 1826, a third in 1828, a fourth in 1830, a fifth in 1832. Our Village was several times reprinted; Belford Regis, a novel in which the neighbourhood and society of Reading were idealized, was published in 1835.

Her Recollections of a Literary Life (1852) is a series of causeries about her favourite books. Her talk was said by her friends, Mrs Browning and Hengist Home, to have been even more amusing than her books, and five volumes of her Life arid Letters, published in 1870 and 1872, show her to have been a delightful letter-writer.

MITFORD, WILLIAM (1744-1827), English historian, was the elder of the two sons of John Mitford, a barrister, who lived near Beaulieu, at the edge of the New Forest. Here, at Exbury House, his father's property, Mitford was born on the 10th of February 1744. He was educated at Cheam School, under the picturesque writer William Gilpin, but at the age of

fifteen a severe illness led to his being removed, and after two years of idleness Mitford was sent, in July 1761, as a gentleman commoner to Queen's College, Oxford. In this year his father died, and left him the Exbury property and a considerable fortune. Mitford, therefore, being " very much his own master, was easily led to prefer amusement to study." He left Oxford (where the only sign of assiduity he had shown was to attend the lectures of Blackstone) without a degree, in 1763, and proceeded to the Middle Temple. But when he married Miss Fanny Molloy in 1766, and retired to Exbury for the rest of his life, he made the study of the Greek language and literature his hobby and occupa- tion. After ten years his wife died, and in October 1776 Mitford went abroad. He was encouraged by French scholars whom he met in Paris, Avignon and Nice to give himself systematically to the study of Greek history. But it was Gibbon, with whom he was closely associated when they both were officers in the South Hampshire Militia, who suggested to Mitford the form which his work should take. In 1784 the first of the volumes of his History of Greece appeared, and the fifth and last of these quartos was published in 1810, after which the state of Mitford's eyesight and other physical infirmities, including a loss of memory, forbade his continuation of the enterprise, although he painfully revised successive new editions. While his book was progressing, Mitford was a member of the House of Commons, with intervals, from 1785 to 1818, and he was for many years verderer of the New Forest and a county magistrate; but it does not appear that he ever visited Greece. After a long illness, he died at Exbury on the 10th of February 1827. In addition to his History of Greece, he published a few smaller works, the most important of which was an Essay on the Harmony of Language, 1774. The style of Mitford is natural and lucid, but without the rich colour of Gibbon. He affected some oddities both of language and of orthography, for which he was censured and which he endeavoured to revise. But his political opinions were still more severely treated, since Mitford was an impassioned anti- Jacobin, and his

partiality for a monarchy led him to be

unjust to the Athenians. Hence his History of Greece, after having had no peer in European literature for half a century , faded in interest on the appearance of the work of Grote. Clinton, too, in his Fasti hellenici, charged Mitford with ” a general negligence of dates,” though admitting that in his philosophical range ” he is far superior to any former writer ” on Greek history. Byron, who dilated on Mitford’s shortcomings, nevertheless declared that he was ” perhaps the best of all modern historians altogether.” This Mitford certainly is not, but his pre-eminence in the little school of English historians who succeeded Hume and Gibbon it would be easier to maintain.

William Mitford’s cousin, the Rev. John Mitford (1781-1859), was editor of the Gentleman’s Magazine and of various editions of the English poets. For the Freeman-Mitfords, who were also relatives, see Redesdale, Earl of.

MITHILA, an ancient kingdom of India, corresponding to that portion of Behar lying N. of the Ganges, with an extension into Nepal, where was the capital of Janakpur. Its early history is obscure, but it has always been noted for its peculiar conservatism and the learning of its Brahmans. They form to this day one of the five classes of northern Brahmans, and their head is the Maharaja of Darbhanga. The language, known as Maithili, is a dialect of Bihari, with an archaic system of grammar and a literature of its own.

MITHRADATES, less correctly Mithridates, a Persian name derived from Mithras (q.v.), the sun-god, and the Indo- European root da, ” to give,” i.e. ” given by Mithras.” The name occurs also in the forms Mitradates (Herod, i. no) and Meherdates (Tac. Ann. xii. 10). It was borne by a large number of Oriental kings, soldiers and statesmen. The earliest are Mithradates, the eunuch who helped Artabanus to assassinate Xerxes I. (Diod. xi. 69), and the Mithradates who fought first with Cyrus the Younger

and after his death with Artaxerxes against the Greeks (Xen. Anab. ii. 5, 35; iii. 3, i-io;iii. 4, 1-5), and is the ancestor of the kings of Pontus. The most important are three kings of Parthia of the Arsacid dynasty, and six (or four) kings of Pontus. There were also two kings of Commagene, two of the Bosporus and one of Armenia (a.d. 35-51).

Mithradates I. (Arsaces VI.), successor of his brother, Phraates I., came to the Parthian throne about 175 B.C. The first event of his reign was a war with Eucratides of Bactria, who tried to create a great Greek empire pfrthia in the East. At last, when Eucratides had been murdered by his son about 150, Mithradates was able to occupy some districts on the border of Bactria and to conquer Arachosia (Kandahar) ; he is even said to have crossed the Indus (Justin 41, 6; Strabo xi. 515, 517; cf. Orosius v. 4, 16; Diod. S3> 18). Meanwhile the Seleucid kingdom was torn by internal dissen- sions, fostered by Roman intrigues. Phraates I. had already conquered eastern Media, about Rhagae (Rai), and subjected the Mardi on the border of the Caspian (Justin 41, 5; Isidor. Charac. 7). Mithradates I. conquered the rest of Media and advanced towards the Zagros chains and the Babylonian plain. In a war against the Elymaeans (in Susiana) he took the Greek town Seleucia on the Hedyphon, and forced their king to become a vassal of the Parthians (Justin 41, 6; Strabo xv. 744). About 141 he must have become master of Babylonia. By Diodorus 33, 18 he is praised as a mild ruler; and the fact that from 140 he takes on his coins the epithet Philhellen (W. Wroth, Catalogue of the Coins of Parthia, p. 14 seq. ; till then he only calls himself ” the great king Arsakes “) shows that he tried to conciliate his Greek subjects. The Greeks, however, induced Demetrius II. Nicator to come to their deliverance, although he was much pressed in Syria by the pretender Diodotus Tryphon. At first he was victorious, but in 138 he was defeated. Mithradates settled him with a royal household in Hyrcania and gave him his daughter Rhodogune in marriage (Justin 36, 1, 38, 9; Jos. Ant. 13, 5, n; Euseb. Chron. I.

257; Appian Syr. 67). Shortly afterwards Mithradates I. died, and was succeeded by his son Phraates II. He was the real founder of the Arsacid Empire.

Mithradates II. the Great, king of Parthia (c. 120–88 B.C.), saved the kingdom from the Mongolian Sacae (Tochari),

who had occupied Bactria and eastern Iran, and is said to have extended the limits of the empire (Justin 42, 2, where he is afterwards confused with Mithradates III.). He defeated King Artavasdes of Armenia and conquered seventy valleys; and the prince Tigranes came as hostage to the Parthians (Justin 42, 2; Strabo, xi. 532). In an inscription from Delos (Ditten- berger, Or. gr. inscr. 430) he is called ” the great King of Kings Arsakes.” He also interfered in the wars of the dynasts of Syria (Jos. Ant. xiii. 14, 3). He was the first Parthian king who entered into negotiations with Rome, then represented by Sulla, praetor of Cilicia (92 B.C.). `

Mithradates III. murdered his father Phraates III. about 57 B.C., with the assistance of his brother Orodes. He was made king of Media, and waged war against his brother, but was soon deposed on account of his cruelty. He took refuge with Gabinius, the Roman proconsul of Syria. He advanced into Mesopotamia, but was beaten at Seleucia by Surenas, fled into Babylon, and after a long siege was taken prisoner and killed in 54 by Orodes I. (Dio Cass. 39, 56; Justin 42, 4; Jos. Bell. i. 8, 7, Ant. 14, 6, 4).

A Parthian king Mithradates, who must have occupied the throne for a short time during the reign of Phraates IV., is mentioned by Jos. Ant. xvi. 8, 4, in 10 B.C.; another pretender Meherdates was brought from Rome in a.d. 49 by the opponents of Gotarzes, but defeated (Tac. Ann. xi. 10, xii. 10 sqq.). The

name of another pretender Mithradates (often called Mithradates IV.) occurs on a coin of the first half of the 2nd century, written in Aramaic, accompanied by the Arsacid titles in Greek (Wroth, Catal. of the Coins of Parthia, p. 219) ; he appears to be identical with Meherdotes, one of the rival kings of Parthia who fought against Trajan in 116; he died in an attack on Commagene and appointed his son Sanatruces successor, who fell in a battle against the Romans (Arrian ap. Malalas, Chron. pp. 270. 274). (Ed. M.)

The kings of Pontus were descended from one of the seven Persian conspirators who put the false Smerdis to death (see

Darius I.). According to Diodorus Siculus, three pontus! members of his family — Mithradates, Ariobarzanes,

Mithradates — were successively rulers of Cius on the Propontis and Carine in Mysia. The last of these was put to death in 302 B.C. by Antigonus, who suspected him of having joined the coalition against him. He was succeeded by his son Mithradates I. or III. (if the two dynasts of Cius be included 1) the founder (ktiotijs) of the Pontic kingdom, although this distinction is by some attributed to the father. Warned by his friend Demetrius, the son of Antigonus, that he was threatened with the same fate as his father, he fled to Paphlagonia, where he seized Cimiata, a fort at the foot of the Olgassys range. Being joined by the Macedonian garrison and the neighbouring populations, he conquered the Cappadocian and Paphlagonian territories on both sides of the Halys and assumed the title of king. Before his death he further enlarged Pontic Cappadocia. He was succeeded by Ariobarzanes, who left the throne to Mithradates II. (c. 256-190, according to Meyer, Mithradates II. and III.), a mere child. Early in his reign the Gauls of Galatia invaded his territory. Mithradates was at the battle of Ancyra (c. 241), in which he assisted Antiochus Hierax against his brother Seleucus Callinicus, in spite of the fact that he had married the daughter

of the latter with Greater Phrygia as her dowry. His two daughters, both named Laodice, were married, one to Antiochus the Great, the other .0 his cousin Achaeus, a dynast of Asia Minor. He unsuccessfully attacked Sinope, which was taken by his successor Pharnaces, the brother (not the son) of Mithradates III. (169-121), surnamed Philopator, Philadelphus, and Euergetes. According to Meyer, however, there were two kings (Mithradates IV. Philopator and V. Euergetes). He was the first king of Pontus to recognize the suzerainty of the Romans, of whom he was a loyal ally. He assisted Attalus II. of Pergamum to resist Prusias II. of Bithynia; furnished a contingent during the Third Punic War; and aided the Romans in obtaining possession of Pergamum, bequeathed to them by Attalus III., but claimed by Aristonicus, a natural son of

•There is much difference of opinion in regard to the kings of Pontus called Mithradates to the accession of Mithradates Eupator. Ed. Meyer reckons five, T. Reinach three.

Eumenes II. Both Mithradates and Nicomedes of Bithynia demanded Greater Phrygia in return for their services. It was awarded to Mithradates, but the senate refused to ratify the bargain on the ground of bribery. For several years the kings of Pontus and Bithynia bid against each other, till in 116 Phrygia was declared independent, although in reality it was treated as part of the province of Asia. Mithradates appears to have taken it without waiting for the decision of the senate. He invaded Cappadocia, and married his daughter to the young king, Ariarathes Epiphanes; bought the succession from the last king of Paphlagonia, and obtained a kind of pro- tectorate over Galatia. He was a great admirer of the Greeks, who called him Euergetes; he removed his capital from Amasia to Sinope, and bestowed liberal gifts upon the temples of Delos and Athens. At the height of his power he was assassinated by his courtiers during a banquet in his palace at Sinope.

Mithradates VI. Eupator, called the Great, a boy of

eleven, now succeeded his father. Alarmed at the attempts made upon his life by his mother, he fled to the mountains and was for many years a hunter. In in he returned to Sinope, threw his mother into prison, and put his younger brother to death. Having thus established himself on the throne, he turned his attention to conquest. In return for his assistance against the Scythians, the Greeks of the Cimmerian Bosporus and the Tauric Chersonese recognized his suzerainty. He occupied Colchis, Paphlagonia and part of Galatia; set his son Ariarathes on the throne of Cappadocia and drove out Nicomedes III., the young king of Bithynia. The Romans restored the legiti- mate kings, and, while apparently acquiescing, Mithradates made preparations for war. He had long hated the Romans, who had taken Phrygia during his minority, and he aimed at driving them from Asia Minor. The cause of rupture was the attack on Pontic territory by Nicomedes at the instigation of the Romans. Mithradates, unable to obtain satisfaction, declared war (88 B.C.). He rapidly overran Galatia, Phrygia and Asia, defeated the Roman armies, and ordered a general massacre of the Romans in Asia. He sent large armies into European Greece, and his generals occupied Athens. But Sulla in Greece and Fimbria in Asia defeated his armies in several battles; the Greek cities were disgusted by his severity, and in 84 he concluded peace, abandoning all his conquests, surren- dering his fleet and paying a fine of 2000 talents. During what is called the Second Mithradatic War, Murena invaded Pontus without any good reason in 83, but was defeated in 82. Hostilities were suspended, but disputes constantly occurred, and in 74 a general war broke out. Mithradates defeated Cotta, the Roman consul, at Chalcedon; but Lucullus worsted him, and drove him in 72 to take refuge in Armenia with his son-in-law Tigranes. After two great victories at Tigranocerta (69) and Artaxata (68), Lucullus was disconcerted by mutiny and the defeat of his lieutenant Fabius (see Lucullus). In 66 he was superseded by Pompey, who completely defeated both Mithra- dates and Tigranes. The former established himself in 64 at

Panticapaeum, and was planning new campaigns against the Romans when his own troops revolted, and, after vainly trying to poison himself, he ordered a Gallic mercenary to kill him. So perished the greatest enemy that the Romans had to en- counter in Asia Minor. His body was sent to Pompey, who buried it in the royal sepulchre at Sinope.

Ancient authorities have invested Mithradates with a halo of romance. His courage, his bodily strength and size, his skill in the use of weapons, in riding, and in the chase, his speed of foot, his capacity for eating and drinking, his penetrating intellect and his mastery of 22 languages are celebrated to a degree which is almost incredible. With «. surface gloss of Greek education, he united the subtlety, the superstition, and the obstinate endurance of an Oriental. He collected curiosities and works of art; he assembled Greek men of letters round him; he gave prizes to the greatest poets and the best eaters. He spent much of his time in practising magic, and it was believed that he had so saturated his body with poisons that none could injure him. He trusted no one; he murdered

his mother, his sons, the sister whom he had married; to prevent his harem from falling to his enemies he murdered all his con- cubines, and his most faithful followers were never safe. For eighteen years he showed himself no unworthy adversary of Sulla, Lucullus and Pompey.

See T. Reinach, Milhridate Eupator (1890; Ger. trans, by A. Goetz, 1895, with the author’s corrections and additions) ; also E. Meyer, Geschichte des Kbnigreichs Pontos (1879).

MITHRAS, a Persian god of light, whose worship, the latest one of importance to be brought from the Orient to Rome, spread throughout the empire and became the greatest anta- gonist of Christianity.

I. History and Distribution. — The cult goes back to a period before the separation of the Persians from the Hindus, as is shown by references in the literatures of both stocks, the Avesta and the Vedas. Though but faintly pictured in the Vedic hymns, he is there invoked with Ormazd, or Ahuramazda, the god of the sky, and is clearly a divinity of light, the protector of truth and the enemy of error and falsehood. In the Avesta, after the separation of the Iranian stock from the Hindu and the rise of Zoroastrianism, which elevated Ormazd to the summit of the Persian theological system, his role was more distinct, though less important; between Ormazd, who reigned in eternal brightness, and Ahriman, whose realm was eternal darkness, he occupied an intermediate position as the greatest of the yazatas, beings created by Ormazd to aid in the destruction of evil and the administration of the world. He was thus a deity of the realms of air and light, and, by transfer to the moral realm, the god of truth and loyalty. Because light is accompanied by heat, he was the god of vegetation and increase; he sent prosperity to the good, and annihilated the bad; he was the god of armies and the champion of heroes; as the enemy of darkness and of all evil spirits, he protected souls, accompanying them on the way to paradise, and was thus a redeemer. Animals and birds were sacrificed and liba- tions poured to him, and prayers were addressed to him by devotees who had purified themselves by ablution and repeated flagellation. As a god who gave victory, he was pro- minent in the official cult of Persia, the seventh month and the sixteenth day of other months being sacred to him. His worship spread with the empire of the Persians throughout Asia Minor, and Babylon was an important centre. Its popu- larity remained unimpaired after the fall of Persia, and it was during the ferment following the conquests of Alexander that the characteristics which mark it during the Roman period were firmly fixed. Mithraism was at full maturity on its arrival at Rome, the only modifications it ever suffered having been experienced during its younger days in Asia.

Modified though never essentially changed, (1) by contact with the star-worship of the Chaldaeans, who identified Mithras with Shamash, god of the sun, (2) by the indigenous Armenian religion and other local Asiatic faiths and (3) by the Greeks of Asia Minor, who identified Mithras with Helios, and contri- buted to the success of his cult by equipping it for the first time with artistic representations (the famous Mithras relief originated in the Pergamene school towards the 2nd century b.c.) , Mithraism was first transmitted to the Roman world during the 1st century b.c. by the Cilician pirates captured by Pompey. It attained no importance, fiowever, for nearly two centuries. The lateness of its arrival in the West was due to the fact that its centres of influence were not in immediate contact with Greek and Roman civiliza- tion. It never became popular in Greek lands, and was regarded by Hellenized nations as a barbarous worship. It was at rivalry with the Egyptian religion. As late as the time of Augustus it was but little known in Roman territory, and gained a firm foothold in Italy only gradually, as a result of the intercourse between Rome and Asia consequent upon the erection of the Eastern provinces and the submission and colonization of Mesopotamia. It seems at first to have had relations with the cult of the Great Mother of the Gods at Rome, whose influ- ence served to protect it and facilitate its growth. The cult of Mithras began to attract attention at Rome about the end

of the 1st century a.d. Statius (c. a.d. 80) mentions the typical Mithraic relief in his T heboid (i. 719,720); from Plutarch's (a.d. 46-125) Vita Pompei (24) it is apparent that the worship was well known; and the first Roman reliefs show the characteristics of about the same time.

Towards the close of the 2nd century the cult had begun to spread rapidly through the army, the mercantile class, slaves and actual propagandists, all of which classes were largely composed of Asiatics. It throve especially among military posts, and in the track of trade, where its monuments have been discovered in greatest abundance. >The German

frontiers afford most evidence of its prosperity. Rome itself was a favourite seat of the religion. From the end of the 2nd century the emperors encouraged Mithraism, because of the support which it afforded to the divine right of monarchs. The Persian belief that the legitimate sovereign reigned by the grace of Ormazd, whose favour was made manifest by the sending of the Hvareno, a kind of celestial aureole of fire, resulted in the doctrine that the sun was the giver of the Hvareno. Mithras, identified with Sol Invictus at Rome, thus became the giver of authority and victory to the imperial house. From the time of Commodus, who participated in its mysteries, its supporters were to be found in all classes. Its importance at Rome may be judged from the abundance of monumental remains — more than 75 pieces of sculpture, 100 inscriptions, and ruins of temples and chapels in all parts of the city and suburbs.

Finally, philosophy as well as politics contributed to the success of Mithraism, for the outcome of the attempt to recognize in the Graeco-Roman gods only forces of nature was to make the Sun the most important of deities; and it was the Sun with whom Mithras was identified.

The beginning of the downfall of Mithraism dates from a.d. 275, when Dacia was lost to the empire, and the invasions of the northern peoples resulted in the destruction of temples along a great stretch of frontier, the natural stronghold of the cult. The aggression of Christianity also was now more effective. The emperors, however, favoured the cult, which was the army's favourite until Constantine destroyed its hopes, The reign of Julian and the usurpation of Eugenius renewed the hopes of its devotees, but the victory of Theodosius (394) may be considered the end of its existence. It still survived in certain cantons of the Alps in the 5th century, and clung to life with more tenacity in its Eastern home. Its legitimate successor was Manichaeism, which afforded a refuge to those mystics who had been shaken in faith, but not converted, by the polemics of the Church against

their religion.

II. Sources, Remains, Ritual. — The sources of present know- ledge regarding Mithraism consist of the Vedas, the Avesta, the Pahlevi writings, Greek and Latin literature and inscriptions, and the cult monuments. The monuments comprise the remains of nearly a score of temples and about 400 statues and bas reliefs. The Mithraic temples of Roman times were artificial grottoes (spelaea) wholly or partially underground, in imitation of the original selcuded mountain caverns of Asia. The Mithraeum hewn in the tufa quarries of the Capitoline Hill at Rome, still in existence during the Renaissance, is an example. The main room of the ordinary temple was rectangular, with an elevated apsidal arrangement, like a choir, containing the sacred relief on its wall, at the end opposite the entrance, and with continuous benches (podia) of masonry, about 5 ft. wide and inclining slightly towards the floor, built against the wall on its long sides. The ceiling was made to symbolize the firmament. There were arrangements for the brilliant illumination of the choir and its relief, which was sometimes sculptured on both sides and reversible, while the podia were intentionally more obscure. The choir and the long space between the podia were for minis- trants, the podia themselves for kneeling worshippers. Two altars, to the Sun and the Moon, stood before the former, and cult statues along the latter. The approach to the grotto lay through a portico on the level with and fronting the street, and a pronaos, in communication with which was a kind of sacristy. Steps led to the lower level of the sanctuary. The

simplicity and smallness of the Mithraic temples are to be accounted for by structural and financial reasons; an under- ground temple was difficult to construct on a large scale, and the worshippers of Mithras were usually from the humbler classes. The average grotto held from fifty to a hundred persons.

The size of the sanctuaries, however, was compensated for by their number; in Ostia alone there were five.

The typical bas relief, which is found in great abundance in the museums of Europe, invariably represents Mithras, under the form of a youth with conical cap and flying drapery, slaying the sacred bull, the scorpion attacking the genitals of the animal, the serpent drinking its blood, the dog springing towards the wound in its side, and frequently, in addition, the Sun-god, his messenger the raven, a fig-tree, a lion, a ewer, and torch-bearers. The relief is in some instances enclosed in a frame of figures and scenes in relief. The best example is the monument of Osterburken (Cumont, Textes et monuments figures, No. 246). With this monument as a basis, Franz Cumont has arranged the small Mithraic reliefs into two groups, one illustrating the legend of the origin of the gods, and the other the legend of Mithras. In the first group are found Infinite Time, or Cronus; Tellus and Atlas supporting the globe, representing the union of Earth and Heaven; Oceanus; the Fates; Infinite Time giving into the hand of his successor Ormazd the thunder- bolt, the symbol of authority; Ormazd struggling with a giant of evil — the Mithraic gigantomachy. The second group repre- sents, first, the birth of Mithras; then the god nude, cutting fruit and leaves from a fig-tree in which is the bust of a deity, and before which one of the winds is blowing upon Mithras; the god discharging an arrow against a rock from which springs a fountain whose water a figure is kneeling to receive in his palms; the bull in a small boat, near which again occurs the figure of the animal under a roof about to be set on fire by two figures; the bull in flight, with Mithras in pursuit; Mithras bearing the bull on his shoulders; Helios kneeling before Mithras; Helios and Mithras clasping hands over an altar; Mithras with drawn bow on a running horse; Mithras and Helios banqueting; Mithras and Helios mounting the chariot of the latter and rising in full course over the ocean. Few of the Mithraic

reliefs are of even mediocre art. Among the best is the relief from the Capitoline grotto, now in the Louvre.

Cumont's interpretation of the main relief and its smaller companions involves the reconstruction of a Mithraic theology, a Mithraic legend, and a Mithraic symbolism. Paucity of evidence makes the first difficult. The head of the divine hierarchy of Mithras was Infinite Time — Cronus, Saturn; Heaven and Earth were his offspring, and begat Ocean, who formed with them a trinity corresponding to Jupiter, Juno, and Neptune. From Heaven and Earth sprang the remaining members of a circle analogous to the Olympic gods. Ahriman, also the son of Time, was the Persian Pluto. Owing to Semitic influence every Persian god had in Roman times come to possess a twofold significance — astrological and natural, Semitic and Iranian — the earlier and deeper Iranian significance being imparted by the clergy to the few intelligent elect, the more attractive and superficial Chaldaean symbolism being presented to the multi- tude. Mithras was the most important member of the circle. He was regarded as the mediator between suffering humanity and the unknowable and inaccessible god of all being, who reigned in the ether.

The Mithras legend has been lost, and can be reconstructed only from the scenes on the above described relief. Mithras was born of a rock, the marvel being seen only by certain shep- herds, who brought gifts and adored him. Chilled by the wind, the new-born god went to a fig-tree, partook of its fruit, and clothed himself in its leaves. He then undertook to vanquish the beings already in the world, and rendered subject to him first the Sun, with whom he concluded a treaty of friendship. The most wonderful of his adventures, however, was that with the sacred bull which had been created by Ormazd. The hero seized it by the horns and was borne headlong in the flight of the animal, which he finally subdued and dragged into a cavern.

The bull escaped, but was overtaken, and by order of

the Sun, who sent his messenger the raven, was reluctantly sacrificed by Mithras. From the dying animal sprang the life of the earth, although Ahriman sent his emissaries to prevent it. The soul of the bull rose to the celestial spheres and became the guardian of herds and flocks under the name of Silvanus. Mithras was through his deed the creator of life. Meanwhile Ahriman sent a terrible drought upon the land. Mithras defeated his purpose by discharging an arrow against a rock and miraculously drawing the water from it. Next Ahriman sent a deluge, from which one man escaped in a boat with his cattle. Finally a fire desolated the earth, and only the creatures of Ormazd escaped. Mithras, his work accomplished, banqueted with the Sun for the last time, and was taken by him in his chariot to the habitation of the immortals, whence he continued to protect the faithful.

The symbolism employed by Mithraism finds its best illustra- tion in the large central relief, which represents Mithras in the act of slaying the bull as a sacrifice' to bring about terrestrial life, and thus portrays the concluding scenes in the legend of the sacred animal. The scorpion, attacking the genitals of the bull, is sent by Ahriman from the lower world to defeat the purpose of the sacrifice; the dog, springing towards the wound in the bull's side, was venerated by the Persians as the companion of Mithras; the serpent is the symbol of the earth being made fertile by drinking the blood of the sacrificial bull; the raven, towards which Mithras turns his face as if for direction, is the herald of the Sun-god, whose bust is near by, and who has ordered the sacrifice; various plants near the bull, and heads of wheat springing from his tail, symbolize the result of the sacrifice; the cypress is perhaps the tree of immortality. There was also an astrological symbolism, but it was superficial, and of secon- dary importance. The torch-bearers sometimes seen on the relief represent one being in three aspects — the morning, noon and evening sun, or the vernal, summer and autumn sun.

Owing to the almost absolute disappearance of

documentary evidence, it is impossible to know otherwise than very imperfectly the inner life of Mithraism. Jerome (Epist. cvii.) and inscrip- tions preserve the knowledge that the mystic, sacratus, passed through seven degrees, which probably corresponded to the seven planetary spheres traversed by the soul in its progress to wisdom, perfect purity, and the abode of the blest: Corax, Raven, so named because the raven in Mithraic mythology was the servant of the Sun; Cryphius, Occult, a degree in the taking of which the mystic was perhaps hidden from others in the sanctuary by a veil, the removal of which was a solemn cere- monial; Miles, Soldier, signifying the holy warfare against evil in the service of the god; Leo, Lion, symbolic of the element of fire; Perses, Persian, clad in Asiatic costume, a reminiscence of the ancient origin of the religion; Heliodromus, Courier of the Sun, with whom Mithras was identified; Pater, Father, a degree bringing the mystic among those who had the general direction of the cult for the rest of their lives. One relief (Cumont, vol. i. p. 17s, fig- 10) shows figures masked and costumed to represent Corax, Perses, Miles and Leo, indicating the practice on occasion of rites involving the use of sacred disguise, a custom probably reminiscent of the primitive time when men represented their deities under the form of animals, and believed themselves in closer communion with them when disguised to impersonate them. Of the seven degrees, those mystics not yet beyond the third, Miles, were not in full communion, and were called virqperovvTes (servants); while the fourth degree, Leo, admitted them into the class of the fully initiate, the fierexovres (participants). No women were in any way connected with the cult, though the male sex could be admitted even in childhood. The time requisite for the several degrees is unknown, and may have been determined by the Patres, who conferred them in a solemn ceremony called Sacramentum, in which the initial step was an oath never to divulge what should be revealed, and for which the mystic had been specially prepared by lustral purification, prolonged absti- nence, and severe deprivations.

Special ceremonies accompanied

the diverse degrees: Tertullian speaks of ” marking the forehead of a Miles,” which may have been the branding of a Mithraic sign; honey was applied to the tongue and hands of the Leo and the Perses. A sacred communion of bread, water and possibly wine, compared by the Christian apologists to the Eucharist, was administered to the mystic who was entering upon one of the advanced degrees, perhaps Leo. The ceremony was probably commemorative of the banquet of Mithras and Helios before the former’s ascension, and its effect strength of body, wisdom, prosperity, power to resist evil, and participation in the immortality enjoyed by the god himself. Other features reminiscent of the original barbarous rites in the primitive caverns of the East, no doubt also occupied a place in the cult; bandaging of eyes, binding of hands with the intestines of a fowl, leaping over a ditch filled with water, witness- ing a simulated murder, are mentioned by the Pseudo-Augustine ; and the manipulation of lights in the crypt, the administration of oaths, and the repetition of the sacred formulae, all contributed toward inducing . a state of ecstatic exaltation. What in the opinion of Albrecht Dieterich (Eine Mithrasliturgie, Leipzig, 1903) is a Mithras liturgy is preserved in a Greek MS. of Egyptian origin of about a.d. 300. It is the ritual of a magician, imbedded in which, and alternating with magic formulae and other occult matter, are a number of invocations and prayers which Dieterich reconstructs as a liturgy in use by the clergy of Mithras between a.d. 100 and 300, and adapted to this new use about the latter date.

The Mithraic priest, sacerdos or antistes, was sometimes also of the degree of pater. Tertullian (De praescr. haeret. 40) calls the chief priest summus pontifex, probably the pater patrum who had general supervision of all the initiates in one

city, and states that he could marry but once. According to the same author, there were Mithraic, as well as Christian, virgines et continentes. Besides the administration of sacraments and the celebration of offices on special occasions, the priest kept alight the eternal fire on the altar, addressed prayers to the Sun at dawn, midday and twilight, turning towards east, south and west respectively. Clad in Eastern paraphernalia, he officiated at the numerous sacrifices indicated by the remains of iron and bronze knives, hatchets, chains, ashes and bones of oxen, sheep, goats, swine, fowl, &c. There was pouring of libations, chanting and music, and bells and candles were employed in the service. Each day of the week was marked by the adoration of a special planet, the sun being the most sacred of all, and certain dates, perhaps the sixteenth of each month and the equinoxes, in conformity with the character of Mithras as mediator, were set aside for special festivals.

The Mithraic community of worshippers, besides being a spiritual fraternity, was a legal corporation enjoying the right of holding property, with temporal officials at its head, like any other sodalitas: there were the decuriones and decern primi, governing councils resembling assembly and senate in cities; magistri, annually elected presidents; curatores, financial agents; defensores, advocates; and patroni, protectors among the influ- ential. It may be that a single temple was the resort of several small associations of worshippers which were subdivisions of the whole community. The cult was supported mainly by voluntary contribution. An abundance of epigraphic evidence testifies to the devotion of rich and poor alike.

III. Moral Influence. — The rapid advance of Mithraism was due to its human qualities. Its communities were bound together by a sense of close fraternal relation. Its democracy obliterated the distinctions between rich and poor; slave and senator became subject to the same rule, eligible for the same honours, par- took of the same

communion, and were interred in the same type of sepulchre, to await the same resurrection. The reward of title and degree and the consequent rise in the esteem of his fellows and himself was also a strong incentive; but the Mithraic faith itself was the greatest factor. The impressive- ness and the stimulating power of the mystic ceremonies, the consciousness of being the privileged possessor of the secret wisdom of the ancients, the sense of purification from sin,

and the expectation of a better life where there was to be com- pensation for the sufferings of this world — were all strong appeals to human nature. The necessity of moral rectitude was itself an incentive. Courage, watchfulness, striving for purity, were all necessary in the incessant combat with the forces of evil. Resistance to sensuality was one aspect of the struggle, and asceticism was not unknown. Mithras was ever on the side of the faithful, who were certain to triumph both in this world and the next. The worthy soul ascended to its former home in the skies by seven gates or degrees, while the unworthy soul descended to the realms of Ahriman. The doctrine of the immortality of the soul was accompanied by that of the resur- rection of the flesh; the struggle between good and evil was one day to cease, and the divine bull was to appear on earth, Mithras was to descend to call all men from their tombs and to separate the good from the bad. The bull was to be sacrificed to Mithras, who was to mingle its fat with consecrated wine and give to drink of it to the just, rendering them immortal, while the unjust, together with Ahriman and his spirits, were to be destroyed by a fire sent from Heaven by Ormazd. The universe, renewed, was to enjoy eternal happiness.

IV. Relation to Christianity. — The most interesting aspect of Mithraism is its antagonism to Christianity. Both religions were of Oriental origin; they were propagated about the same time, and spread with equal rapidity on account of the same causes, viz. the unity of the political world and the debasement of its moral life. At the end of

the 2nd century each had advanced to the farthest limits of the empire, though the one possessed greatest strength on the frontiers of the Teutonic countries, along the Danube and the Rhine, while the other throve especially in Asia and Africa. The points of collision were especially at Rome, in Africa, and in the Rh6ne Valley, and the struggle was the more obstinate because of the resem- blances between the two religions, which were so numerous and so close as to be the subject of remark as early as the 2nd century, and the cause of mutual recrimination. The fraternal and democratic spirit of the first communities, and their humble origin; the identification of the object of adoration with light and the Sun; the legends of the shepherds with their gifts and adoration, the flood, and the ark; the representation in art of the fiery chariot, the drawing of water from the rock; the use of bell and candle, holy water and the communion; the sancti- fication of Sunday and of the 25th of December; the insistence on moral conduct, the emphasis placed upon abstinence and self-control; the doctrine of heaven and hell, of primitive revelation, of the mediation of the Logos emanating from the divine, the atoning sacrifice, the constant warfare between good and evil and the final triumph of the former, the immor- tality of the soul, the last judgment, the resurrection of the flesh and the fiery destruction of the universe — are some of the resemblances which, whetheureal or only apparent, enabled Mithraism to prolong its resistance to Christianity. At their root lay a common Eastern origin rather than any borrowing.

On the other hand, there were important contrasts between the two. Mithraism courted the favour of Roman paganism and combined monotheism with polytheism, while Christianity was uncompromising. The former as a consequence won large numbers of supporters who were drawn by the possibility it afforded of adopting an attractive faith which did not involve a rupture with the religion of Roman society, and con- sequently with the state. In the middle of the 3rd century Mithraism seemed on the

verge of becoming the universal ‘ religion. Its eminence, however, was so largely based upon dalliance with Roman society, its weakness so great in having only a mythical character, instead of a personality, as an object of adoration, and in excluding women from its privileges, that it fell rapidly before the assaults of Christianity. Manichaeism, which combined the adoration of Zoroaster and Christ, became the refuge of those supporters of Mithraism who were inclined to compromise, while many found the transition to orthodox Christianity easy because of its very resemblance to their old faith.

See Franz Cumont, Textes el monuments figure’s relatifs aux my stores de Mithra (Brussels, 1896, 1899), which has superseded all publications on the subject; Albrecht Dieterich, Eine Mithras- liturgie (Leipzig, 1903). See also the translation of Cumont’s Conclusions (the second part of vol. i. of the above work, published separately 1902, under the title Les Mystkres de Mithra), by T. J. McCormack (Chicago and London, 1903). Extended bibliography in Roscher’s Lexicon der Mythologie. (G. Sn.)

MITRA, RAJENDRA LALA (1824-1891), Indian Orientalist, was born in a suburb of Calcutta on the 15th of February 1824, of a respectable family of the Kayasth or writer caste of Bengal. To a large extent he was self-educated, studying Sanskrit and Persian in the library of his father. In 1846 he was appointed librarian of the Asiatic Society, and to that society the remainder of his life was devoted — as philological secretary, as vice- president, and as the first native president in 1885. Apart from very numerous contributions to the society’s journal, and to the series of Sanskrit texts entitled ” Bibliotheca indica,” he published three separate works: (1) The Antiquities of Orissa (2 vols., 1875 and 1880), illustrated with photographic plates, in which he traced back the image of

Jagannath (Juggernaut) and also the car-festival to a Buddhistic origin; (2) a similarly illustrated work on Bodh Gay a (1878), the hermitage of Sakya Muni, and (3) Indo-Aryans (2 vols., 1881), a collection of essays dealing with the manners and customs of the people of India from Vedic times. He received the honorary degree of LL.D. from the university of Calcutta in 1875, the com- panionship of the Indian Empire when that order was founded in 1878, and the title of raja in 1888. He died at Calcutta on the 26th of July 1891.

MITRE (Lat. mitra, from Gr. nirpa, a band, head-band, head-dress), a liturgical head-dress of the Catholic Church, generally proper to bishops.

1. Latin Rite. — In the Western Church its actual form is that of a sort of folding cap consisting of two halves which, when not worn, lie flat upon each other. These sides are stiffened, and when the mitre is worn, they rise in front and behind like two horns pointed at the tips {cornua mitrae). From the lower rim of the mitre at the back hang two bands (infulae), termi- nating in fringes. In the Roman Catholic Church mitres are divided into three classes: (1) Mitra pretiosa, decorated with jewels, gold plates, &c; (2) Mitra auriphrygiata, of white silk, sometimes embroidered with gold and silver thread or small pearls, or of cloth of gold plain; (3) Mitra simplex, of white silk damask, silk or linen, with the two falling bands behind terminating in red fringes. Mitres are the distinctive head-dress of bishops; but the right to wear them, as in the case of the other episcopal insignia, is granted by the popes to other dignitaries — such as abbots or the heads and sometimes all the members of the chapters of cathedral or collegiate churches. In the case of these latter, however, the mitre is worn only in the church to which the privilege is attached and on certain high festivals. Bishops alone, including of course the pope and his cardinals, are entitled to wear the pretiosa and auriphrygiata; the others wear the mitra simplex.

The proper symbol of episcopacy is not so much the

mitre as the ring and pastoral staff. It is only after the service of consecration and the mass are finished that the consecrating prelate asperses and blesses the mitre and places on the head of the newly consecrated bishop, according to the prayer which accompanies the act, ” the helmet of protection and salvation,” the two horns of which represent ” the horns of the Old and New Testaments,” a terror to ” the enemies of truth,” and also the horns of ” divine brightness and truth ” which God set on the brow of Moses on Mount Sinai. There is no suggestion of the popular idea that the mitre symbolizes the ” tongues of fire ” that descended on the heads of the apostles at Pentecost.

According to the Roman Caeremoniale the bishop wears the mitra pretiosa on high festivals, and always during the singing of the Te Deum and the Gloria at mass. He is allowed, however, ” on account of its weight,” to substitute for the pretiosa the auri- phrygiata during part of the services, i.e. at Vespers from the first psalm to the Magnificat, at mass from the end of the Kyrie to the

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canon. The auriphrygiata is worn during Advent, and from Septua- gesima to Maundy Thursday, except on the third Sunday in Advent (Gaudete), the fourth in Lent (Laetare) and on such greater festivals as fall within this time. It is worn, too, on the vigils of fasts, Ember Days and days of intercession, on the Feast of Holy Innocents (if on a week-day), at litanies, penitential processions, and at other than solemn benedictions and consecrations. At mass and vespers the mitra simplex may be substituted for it in the same way as the auri- phrygiata for the pretiosa. The simplex is worn on Good Friday, and at masses for the dead; also at the blessing of the candles at Candlemas, the singing of the absolution at the coffin, and the solemn investiture with the pallium. At provincial synods archbishops wear the pretiosa, bishops the auriphrygiata, and mitred

abbots the simplex.^ At general councils bishops wear white linen mitres, cardinals mitres of white silk damask ; this is also the case when bishops and cardinals in pontificalibus assist at a solemn pontifical function presided over by the pope.

Lastly, the mitre, though a liturgical vestment, differs from the others in that it is never worn when the bishop addresses the Almighty in prayer — e.g. during mass he takes it off when he turns to the altar, placing it on his head again when he turns to address the people (see 1 Cor. xi. 4).

The origin and antiquity of the episcopal mitre have been the subject of much debate. Some have claimed for it apos- tolical sanction and found its origin in the liturgical head-gear of the Jewish priesthood. Such as have been adduced for this view are, however, based on the fallacy of reading into words (mitra, infula, &c.) used by early writers a special meaning which they only acquired later. Mitra, even as late as the 15th century, retained its simple meaning of cap (see Du Cange, Glossarium, s.v.) ; to Isidore of Seville it is specifically a woman's cap. Infula, which in late ecclesiastical usage was to be confined to mitre (and its dependent bands) and chasuble, meant originally a piece of cloth, or the sacred fillets used in pagan worship, and later on came to be used of any ecclesiastical vestment, and there is no evidence for its specific application to the liturgical head-dress earlier than the 12th century. With the episcopal mitre the Jewish miznephet, translated " mitre " in the Autho- rized Version (Exod. xxviii. 4, 36), has nothing to do, and there is no evidence for the use of the former before the middle of the 10th century even in Rome, and elsewhere than in Rome it does not make its appearance until the nth. 1

The first trustworthy notice of the use of the mitre is under Pope Leo IX. (1049-1054). This pope invested Archbishop Eberhard of Trier, who had accompanied him to Rome, with the Roman mitra, telling him that he and his successors should wear it in ecclesiastico officio (i.e. as a liturgical

ornament) according to Roman custom, in order to remind him that he is a disciple of the Roman see (Jaffe, Regesta pont. rom., ed. Leipzig, 1888, No. 4158). This proves that the use of the mitre had been for some time established at Rome; that it was specifically a Roman ornament; and that the right to wear it was only granted to ecclesiastics elsewhere as an exceptional honour. 2 On the other hand, the Roman ordines of the 8th and 9th centuries make no mention of the mitre; the evidence goes to prove that this liturgical head-dress was first adopted by the popes some time in the 10th century; and Father Braun shows convincingly that it was in its origin nothing else than the papal regnum or phrygium which, originally worn only at outdoor processions and the like, was introduced into the church, and thus developed into the liturgical mitre, while outside it preserved its original significance as the papal

1 Father Braun, S. J., has dealt exhaustively with the supposed evidence for its earlier use — e.g. he proves conclusively that the mitra mentioned by Theodulph of Orleans (Paraenes. ad episc.) is the Jewish miznephet, and the well-known miniature of Gregory the Great (not St Dunstan, as commonly assumed) wearing a mitre (Cotton MSS. Claudius A. iii.) in the British Museum, often ascribed to the 10th or early nth century, he judges from the form of the pallium and dalmatic to have been produced at the end of the 1 ith century ” at earliest.” The papal bulls granting the use of mitres before the nth century are all forgeries (Liturgische Gewandung,

431-448). (

2 That it had been already so granted is proved by a miniature containing the earliest extant representations of a mitre, in the Exultete rotula and baptismal rotula at Bari (reproduced in Berteaux, L’Art dans I’ltalie miridionale, I., Paris, 1904).

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tiara (q.v.). From Leo IX. ‘s time papal grants of the mitre to eminent prelates became increasingly frequent, and by the 1 2th century it had been assumed by all bishops in the West, with or without papal sanction, as their proper liturgical head-dress. From the 12th century, too, dates the custom of investing the bishop with the mitre at his consecration.

It was not till the 12th century that the mitre came to be regarded as specifically episcopal, and meanwhile the custom had grown up of granting it honoris causa to other dignitaries besides bishops. The first known instance of a mitred abbot is Egelsinus of St Augustine’s, Canter- bury, who received the honour from Pope Alexander II. in 1063. From this time onward papal bulls bestow- ing mitres, together with other episcopal insignia, on abbots become increasingly frequent. The original motive of the recipients of these favours was doubtless the taste of the time for outward display; St Bernard, zealous for the monastic ideal, de- nounced abbots for wearing mitres and the like more pontificum, and Peter the Cantor roundly called the abbatial mitre ” inane, superfluous and puerile ” (Verb, abbrev. c. xliv.in Migne, Patrolog. lat. 205, 159). It came, however, to symbolize the exemption of the abbots from episcopal jurisdiction, their quasi-episcopal character, and their immediate dependence on the Holy See. No such significance could attach to the grant of the usus mitrae (under somewhat narrow restrictions as to where and when)

to cathedral dignitaries. The first instance is again a bull of Leo IX. (1051) granting to Hugh, archbishop of Besancon, and his seven cardinals the right to wear the mitre at the altar as celebrant, deacon and subdeacon, a similar privilege being granted to Bishop Hartwig of Bamberg in the following year. The intention was to show honour to a great church by allowing it to follow the custom doubtless already established at Rome. Subsequently the privilege was often granted, sometimes to one or more of the chief dignitaries, sometimes to all the canons of a cathedral {e.g. Campostella, Prague).

Mitres were also sometimes bestowed by the popes on secular sovereigns, e.g. by Nicholas II. (1058-1061) on Spiteneus (Spytihnew) II., duke of Bohemia; by Alexander II. on Wratis- laus of Bohemia; by Lucius II. (1144-1145) on Roger of Sicily; and by Innocent III., in 1204, on Peter of Aragon. In the coronation of the emperor, more particularly, the mitre played a part. According to the 14th Roman ordo, of 1241, the pope places on the emperor's head first the mitra clericalis, then the imperial diadem. Father Braun (Liturgische Gewandung, p. 457) gives a picture of a seal of Charles IV. representing him as wearing both.

The original form of the mitre was that of the early papal tiara (regnum), i.e. a somewhat high conical cap. The stages of its general development from this shape to the high double-horned modern mitre are clearly trace- able (see fig. 1), though it is impossible exactly to distinguish them in point of date. The most charac- teristic modifications may be said to have taken place from the nth to the middle of the 13th century. About 1100 the conical mitre begins to give place to a round one; a band of embroidery is next set over the top from back to front, which tends to bulge up the soft material on either side; and these bulges develop into points or horns. Mitres with horns on either side seem to have been worn till about the end of the 12th century, and Father Braun gives examples of their appearances on episcopal seals in France until far into the 13th. Such a mitre appears on a seal of Archbishop

Thomas Becket (Father Thurston, The Pallium, London, 1892, p. 17). The custom was, however,

of the head instead of the sides (the mitre said to have belonged to St Thomas Becket, now at Westminster Cathedral, is of this type), 1 and with this the essential character of the mitre, as it persisted through the middle ages, was established. The exaggeration of the height of the mitre, which began at the time of the Renaissance, reached its climax in the 17th century.

Develop’ ment of Form.

already growing up of setting the horns over the front and back

Drawn, by Father J. Braun and reproduced from his Liturgische Gewandung by permission of B. Herder.

Fig. I. — Evolution of the Mitre from the nth century to the present day.

This ugly and undignified type is still usually worn in the Roman Catholic Church, but in some cases the earlier type has survived, and many bishops are also now reverting to it.

The decoration of mitres was characterized by increasing elabora- tion as time went on. From the first the white conical cap seems to have, been decorated round the lower edge by a band or orphrey (cir cuius). To this was added later a vertical orphrey (titulus), usually from the centre of the front of the circulus to that of the back, partly in order to hide the seam, partly to emphasize the horns when those were to left and right. When the horns came to be set before and behind, the vertical orphrey retained its position. Of the surviving early mitres the greater number have only the orphrey embroidered, the body of the mitre being left plain. Very early, however, the custom arose of ornamenting the triangular spaces between the orphreys with embroidery, usually a round medallion, or a star, set in the middle, but sometimes figures

of saints, &c. (e.g. the early example from the cathedral of Anagni, reproduced by Braun, p. 469). The richness and variety of decora- tion increased from the 14th century onwards. Architectural motives even were introduced, as frames to the embroidered figures of saints, while sometimes the upper edges of the mitre were orna- mented with crockets, and the horns with architectural finials. Finally, the traditional circulus and titulus seem all but forgotten, the whole front and back surfaces of the mitre being ornamented with embroidered pictures or with arabesque patterns. The latter is characteristic of the mitre in the modern Roman Catholic Church, the tradition of the local Roman Church having always excluded the representation of "figures on ecclesiastical vestments.

2. Reformed Churches. — In most of the reformed Churches the use of mitres was abandoned with that of the other vest- ments. They have continued to be worn, however, by the bishops of the Scandinavian Lutheran Churches. In the Church of England the use of the mitre was discontinued at the Reformation. There is some evidence to show that it was used in consecrating bishops up to 1552, and also that its use was revived by the Laudian bishops in the 17th century (Hierurgia anglicana ii. 242, 243, 240). In general, however, there is no evidence to prove that this use was liturgical, though the silver-gilt mitre of Bishop Wren of Ely (d. 1667), which is preserved, is judged from the state of the lining to have been worn. The instances of the use of the mitre quoted in Hier. anglic. ii. 310, as carried by the bishop of Rochester at an investiture of the Knights of the Bath (1725), and by the archbishops and bishops at the coronation of George II. (1727), have no liturgical significance. The tradition of the mitre as an episcopal ornament has, nevertheless, been continuous in the Church of England, " and that on three lines: (1) heraldic usage; (2) its presence on the head of effigies of bishops, of which a number are extant, of the 16th, 17th, 18th and 19th centuries; (3) its presence in funeral processions, where

1 In Father Braun's opinion, expressed to the writer, this mitre, which was formerly at Sens, belongs probably to the 13th century.

Church of England.

MITRE

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Fig. 6. — Mitre (restored) of William of Wykeham, Bishop of Winchester (d. 1404), preserved at New 'College, Oxford.

From a photograph by Father Joseph Braun, S. /■■ by kind permission.

Fig. 5. — German. Mitre, of red velvet embroidered with pearls and silver gilt plaques. 15th century. In the cathedral at Halberstadt.

"Semish Mitre, embroidered in gold thread, and the panels in colours, with figures of the Virgin and .St. Augustine. The other side is similar, with figures of St. Leonard and St. Mary Magdalene. It is dated 1592, repaired in 1766. Iq the Victoria and Albert Museum.

MITROVICA— MITSCHERLICH

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Drawn from a photograph taken by; Father J. firaun (reproduced in Die titurgische Gewandung). By permission of B. Herder.

Fig. 2. — Greek Mitre.

an actual mitre or the figure of one was sometimes

carried, and sometimes suspended over the tomb ” {Report on the Orna- ments of the Church, p. 106). The liturgical use of the mitre was revived in the Church of England in the latter part of the 19th century, and is now fairly widespread. ‘: 3. Oriental Rites. — Some form of liturgical head-dress is com- mon to all the Oriental rites. In the Orthodox Eastern Church the mitre (Gr. fdrpa; Slav, mitra) is, as in the Western Church, proper only to bishops. Its form differs entirely from that

of the Latin Church. In general it rather resembles a closed crown, consisting of a circlet from which rise two arches intersecting each other at right angles. Circlet and arches are richly chased and jewelled; they are filled out by a cap of stiff material, often red velvet, ornamented with pictures in embroidery or applique” metal. Surmount- ing all, at the intersection of the arches is a cross. In Russia this usually lies flat, only certain metro- politans, and by prescrip- tion the bishops of the eparchy of Kiev, having the right to have the cross upright (see fig. 2). In the Armenian Church priests and archdeacons, as well as the bishops, wear a mitre. That of the bishops is of the Latin form, a custom dating from a grant of Pope Innocent III.; that of the priests, the sagvahart, is not unlike the Greek mitre (see fig. 3). In the Syrian Church only the patriarch wears a mitre, which resembles that of the Greeks. The biruna of the Chaldaean Nestorians, on the other hand, worn by all bishops, is a sort of hood ornamented with a cross. Coptic priests and bishops wear the ballin, a long strip of stuff ornamented with crosses &c, and wound turban- wise round the head; the patriarch of Alexandria has a helmet-like mitre, the origin of which is unknown, though it perhaps antedates the appearance of the phrygium at Rome. The Maronites, and the uniate Jacobites, Chaldaeans and Copts have adopted the Roman mitre.

The mitre was only introduced into the Greek rite in com- paratively modern times. It was unknown in the earlier part

of the 15th century, but had certainly been introduced by the beginning of the 16th. Father Braun suggests that its assumption by the Greek patriarch was connected with the changes due to the capture of Constantinople by the Turks. Possibly, as its form” suggests, it is based on the imperial crown and symbolized at the outset the quasi - sovereignty over the rayah population which Mahommed II. was content to leave to the patriarch. In

Reproduced by kind permission of the T –o : f _,„„ ;n+,,w1ii™>r! fntr. Archbishop of Westminster. z 5°9 ll was introduced mtO

Fig. 4.— Mitra pretiosa of the Russia, when the tsar Theodore late Cardinal Vaughan, Roman erected the Russian patriarch- Catholic Archbishop of West- a te and bestowed on the new mmster - patriarch the right to wear the

mitre, sakkos and mandyas, all borrowed from the Greek rite.

From Braun’s Lilur- gisdie Gewandung. By permission of B. Herder.

Fig. 3.— Mitre of Armenian Priest.

A hundred years later the mitre, originally confined to the patriarch, was worn by all bishops.

See J. Braun, S.J., Die liturgische Gewandung (Freiburg-im- Breisgau, 1907), pp. 424-498. The question of the use of the mitre in the Anglican Church is dealt with in the Report of the Sub-Committee of the Convocation of Canterbury on the Ornaments of the Church and its Ministers (1908). See also the bibliography to the article Vestments. (W. A. P.)

MITROVICA (Hungarian, Mitrovicz; German, Mitroivitz), a town of Croatia-Slavonia, Hungary, situated on the river Save, in the county of Syrmia. Pop. (1900), 11,518. Mitrovica is on the railway from Agram, 170 m. W.N.W. to Belgrade, 38 m. E. by S. Roman remains have been discovered in its

neighbourhood, and it occupies the site of Sirmium or Syrmium, the chief city of Lower Pannonia under Roman rule. The emperor Probus (232-282) was born and buried at Sirmium, where, according to some authorities, the emperor Marcus Aurelius (121-180) also died; but this is uncertain. In 351, 357 and 358, ecclesiastical councils of some importance met at Sirmium, which became an episcopal see about 305, and was united with the diocese of Bosnia in 1773. The city was sacked by the Huns in 441, and by the Turks, who destroyed all its ancient buildings, in 1396 and 1521.

MITSCHERLICH, EILHARDT (1794-1863), German chemist, was born on the 7th of January 1794 at Neuende near Jever, in the grand duchy of Oldenburg, where his father was pastor. His uncle, Christoph Wilhelm Mitscherlich (1760-1854), professor at Gottingen, was in his day a celebrated scholar. He was educated at Jever under the historian F. C. Schlosser, when he went to Heidelberg in 1 8 1 1 , devoted himself to philology, giving special attention to the Persian language. In 1813 he went to Paris to obtain permission to join the embassy which Napoleon I. was to send to Persia. The events of 1 814 put an end to this, and Mitscherlich resolved to study medicine in order that he might enjoy that freedom of travel usually allowed in the East to physicians. He began at Gottingen with the study of chemistry, and this so arrested his attention that he gave up the journey to Persia. From his Gottingen days dates the treatise on certain parts of Persian history, compiled from MSS. in the university library and published in Persian and Latin in 1814, under the title Mirchondi historia Thaheridarum historicis nostris hucusque incognitorum Persiae principum. In 1818 he went to Berlin and worked in the laboratory of H. F. Link (1767-1851). There he made analyses of phosphates and phosphites, arsenates and arsenites, con- firming the conclusions of J. J. BerzeKus as to their composi- tion; and his observation that corresponding phosphates and arsenates crystallize in the same town was the germ from which grew the theory of isomorphism which he communicated to the

Berlin Academy in December 1819. In that year Berzelius suggested Mitscherlich to the minister Altenstein as successor to M. H. Klaproth at Berlin. Altenstein did not immediately carry out this proposal, but he obtained for Mitscherlich a government grant to enable him to continue his studies in Berzelius's laboratory at Stockholm. He returned to Berlin in 1821, and in the summer of 1822 he delivered his first lecture as extraordinary professor of chemistry in the university, where in 1825 he was appointed ordinary professor. In the course of an investigation into the slight differences discovered by W. H. Wollaston in the angles of the rhombohedra of the carbonates isomorphous with calc-spar, he observed that the angle in the case of calc-spar varied with the temperature. On extending his inquiry to other aelotropic crystals he observed a similar variation, and was thus led, in 1825, to the discover}' that aelotropic crystals, when heated, expand unequally in the direction of dissimilar axes. In the following year he discovered the change, pro- duced by change of temperature, in the direction of the optic axes of selenite. His investigation (also in 1826) of the two crystalline modifications of sulphur threw much light on the fact that the two minerals calc-spar and aragonite have the same composition but different crystalline forms, a property which Mitscherlich called dimorphism. In 1833 he made a series of careful determinations of the vapour densities of a large

number of volatile substances, confirming Gay-Lussac's law. He obtained selenic acid in 1827 and showed that its salts are isomorphous with the sulphates, while a few years later he proved that the same thing is true of the manganates and the sulphates, and of the permanganates and the perchlorates. He investi- gated the relation of benzene to benzoic acid and to other derivatives. In 1829-1830 he published his Lehrbuch der Chemie,

which embodied many original observations. His interest in mineralogy led him to study the geology of volcanic regions, and he made frequent visits to the Eifel with a view to the discovery of a theory of volcanic action. He did not, however, publish any papers on the subject, though after his death his notes were arranged and published by Dr. J. L. A. Roth in the Memoirs of the Berlin Academy (1866). In December 1861 symptoms of heart-disease made their appearance, but he was able to carry on his academical work till December 1862. He died at Schonberg near Berlin, on the 28th of August 1863.

Mitscherlich's published papers are chiefly to be found in the Abhandlungen of the Berlin Academy, in Poggendorff's Annalen, and in the Annales de chimie et de physique. The 4th edition of the Lehrbuch der Chemie was published in 1844-1847, a 5th was begun in 1855, but was not completed.

MITTEN, a covering for the hand, with a division for the thumb only, and reaching to the lower joint of the fingers; it is made of silk, lace, wool or other material. The word is of obscure origin; it has been connected with Ger. mitte, middle, half, in the sense of that which half covers the hand. There are several Celtic words which may be cognate, e.g. Irish miotag, mutan, a thick glove, mitten, such as is worn by hedgers and ditchers. The 16th-century French word miton meant a gauntlet. A fine mitten made of lace or open network and extending well up the forearm was much worn by ladies in the early part of the 19th century, and has been fashionable at various times since that date.

MITTWEIDA, a town of Germany in the kingdom of Saxony, on the Zschopau, 12 m. by rail N. of Chemnitz on the railway to Dobeln and Riesa. Pop. (1905), 17,465. It has a handsome Evangelical church, a classical, a modern and a technical school, and cotton and spinning mills. Other industries are the making of furniture, machinery, cigars and cement.

MIVART, ST GEORGE JACKSON (1827-1900), English

biologist, was born in London on the 30th of November 1827, and educated at Clapham grammar-school, Harrow, and King's College, London, and afterwards at St Mary's, Oscott, since his conversion to Roman Catholicism prevented him from going to Oxford. In 1851 he was called to the bar, but he devoted him- self to medical and biological studies. In 1862 he was appointed lecturer at St Mary's Hospital medical school, in 1869 he became a fellow of the Zoological Society, and from 1874 to 1877 he was professor of biology at the short-lived Roman Catholic University College, London. In 1873 he published Lessons in Elementary Anatomy, and an essay on Man and Apes. In 1 881 appeared The Cat: an Introduction to the Study of Back-boned Animals. The careful and detailed work he bestowed on Insectivora and Carnivora largely increased our knowledge of the anatomy of these groups. In 1871 his Genesis of Species brought him into the controversy then raging. Though admitting evolution generally, Mivart denied its applicability to the human intellect.

His views as to the relationship existing between human nature and intellect and animal nature in general were given in Nature and Thought (1882); and in the Origin of Human Reason (1889) he stated what he considered the fundamental difference between men and animals. In 1884, at the invitation of the Belgian episcopate, he became professor of the philosophy of natural history at the university of Louvain, which had conferred on him the degree of M.D. in 1884. Some articles published in the Nineteenth Century in 1892 and 1893, in which Mivart advocated the claims of science even where they seemed to conflict with religion, were placed on the Index expurgatorius, and other articles in January 1900 led to his excommunication by Cardinal Vaughan, with whom he had a curious corre- spondence vindicating his claim to hold liberal opinions while

remaining in the Roman Catholic Church. Shortly afterwards he died, in London, on the 1st of April 1900. Mivart was also the author of many scientific papers and occasional articles, and of Castle and Manor: a Tale of our Time (1900), which originally

appeared in 1894 as Henry Standon, by ” D’Arcy Drew.”

MIZPAH, or Mizpeh, the name of several places referred to in the Old Testament, in each case probably derived from a ” commanding prospect,” the Hebrew name having that sig- nificance. (1) Mizpah or Gilead, where Jacob was reconciled to Laban (Gen. xxxi. 49); apparently the site of the camp oi the Israelites when about to attack the Ammonites under Jephthah’s leadership (Judges x. 1 7) . This ancient sanctuary was probably the scene of Jephthah’s vow (Judges xi. 29; cf. v. n). The identification of this Mizpeh is a difficult problem: it is supposed to be the same as Ramoth Gilead, but the evidence is scarcely conclusive. It is referred to in Hos. v. 1. (2) Mizpah or Benjamin. It has been suggested, on hardly sufficient grounds, that the Mizpeh where the Hebrews assembled before the extermination of the Benjamites (Judges xx. 1) was not the shrine where Samuel made his headquarters (1 Sam. vii. 5). It was fortified by Asa (1 Kings xv. 22), and after the destruction of Jerusalem was the seat of government under the viceroy Geda- liah (2 Kings xxv. 23): here Gedaliah was murdered (ibid. 25). After the exile it retained the tradition of being a seat of govern- ment (Neh. iii. 7) and a holy place (1 Mace. iii. 46). It is probably to be identified with the mountain, Neby Samwil, north of Jerusalem, still considered sacred by the Moslems: a Crusaders’ church (now a mosque), covers the traditional tomb of Samuel. (3) A territory near Mount Hermon, a seat of the Hivites, which joined the coalition of Jabin against Joshua (Joshua xi. 3). In the territory was the “valley of Mizpeh” (v. 8) where the Canaanites were routed. (4) A town in the tribe of Judah (Joshua xv. 38). (5) Mizpeh of Moab, where David interviewed the king of Moab and found an asylum for his parents (1 Sam. xxii. 3). (R. A. S. M.)

MIZRAIM, the biblical name for Egypt (Gen. x. 6, 13, Hebrew Misrayim; the apparently dual termination aim may be due to a misunderstanding); there is an alternative poetical form Masor (2 Kings xix. 24, &c). In Isa. xi. n the name is kept distinct from

Pathros or Upper Egypt, and represents some por tion at least of Lower Egypt. It perhaps means ” boundary ” or ” frontier,” a somewhat ambiguous term, which illustrates the topographical problems. First (a), E. Schrader. pointed out in 1874 that the Assyrians knew of some Musri (i.e. Mizraim) in North Syria, and it is extremely probable that this land is referred to in 2 Kings vii. 6 (mentioned with the Hittites), and in 1 Kings x. 28 seq., 2 Chron. i. 16 seq., where the word for ” droves ” (Heb. m-q-v-h) conceals the contiguous land Kue (Cilicia). 1 Next (b), C. T. Beke, as long ago as 1834, concluded in his Origines biblicae (p. 167 et passim) that •” Egypt ” in the Old Testament sometimes designates a district near Midian and the Gulf of ‘Akaba, and the view restated recently and quite independently by H. Winckler on later evidence (1893) has been the subject of continued debate. Egypt is known to have laid claim to the southern half of Palestine from early times, and consequently the extension of the name of Egypt beyond the limits of Egypt and of the Sinaitic penin- sula, is inherently probable. When, for example, Hagar, the ” Egyptian,” is the ancestress of Ishmaelite tribes, the evidence makes it vepy unlikely that the term is to be understood in the strict ethnical sense; and there are other passages more suitably interpreted on the hypothesis that the wider extension of the term was once familiar. In the second half of the 8th century B.C., Assyrian inscriptions allude to a powerful Musri at a time when the Nile empire was disintegrated and scarcely in a position to play the part ascribed to it (i.e. if by Musri we are to under- stand Egypt). 2 Not until the supremacy of Tirhakah does the ambiguity begin to disappear, and much depends upon the

1 See further, H. Winckler, Alt. test. Untersuch. (1892), pp. 168-174.

s So, too, according to one passage, Tiglath-pileser IV. appoints a governor over Musri before Egypt itself had actually been con- quered.

unbiased discussion of the related biblical history (especially the writings of Isaiah and Hosea) and the Egyptian data. But even in the period of disintegration the minor princes of the Delta were no doubt associated with their eastern neighbours, and although the Assyrian Musri stands in the same relation to the people of Philistia as do the Edomites and allied tribes of the Old Testament, Philistia itself was always intimately associated with Egypt. (See Philistines.)

The problem is complicated by the obscurity which over- hangs the history of south Palestine and the Delta (see Edom; Midian). The political importance of Egypt was not constant, and the known fluctuations of geographical terms combine with the doubtful accuracy of early writers to increase the difficulties. The Assyrian evidence alone points very strongly to a Musri in north-west Arabia; the biblical evidence alone suggests an extra- Egyptian Misrayim. On the whole the result of discussion has been to admit the probability that Misrayim could refer to a district outside the limits of Egypt proper. But it has not justified the application of this conclusion to all the instances in which some critics have relied upon it, or the sweeping inferences and reconstructions which have sometimes been based upon it. Each case must be taken on its merits.

See further, H. Winckler, Altorient. Forschungen, i. 24 seq; Mitteil. d. vorderasiat. Gesell. (1898), pp. I sqq., 169 sqq.; Hibbert Journal (April 1904); Keilinschr. u.das alte Test., 3rd ed., 136 sqq.; and Im Kampfe um den alten Orient, ii. (1907) ; T. K. Cheyne, especially Kingdom of Judah (1908), pp. xiv. sqq. ; F. Hommel, Vier neue arab. Landschaftsnamen in A.T. For criticisms (many of them somewhat captious) see Konig’s reply to Hommel (Berlin, 1902), A. Noordtzij, Theolog. Tijdsch. (1906, July, September), and E. Meyer, Israeliten u. ihre Nachbarstamme, pp. 455 sqq. A valuable survey of the geographical and other conditions is given by N.

Schmidt, Hibbert Journal (January 1908). (S. A. C.)

MNEMONICS (from Gr. ixvaadai, remember; whence nvfifMiiv, mindful; rb nvrmovuibv, sc. Ttyyr\ii.o>, that which mechanically aids the memory) , the general name applied to devices for aiding the memory. Such devices are also described as memoria technica. The principle is to enable the mind to reproduce a relatively unfamiliar idea, and specially a series of dissociated ideas, by connecting it, or them, in some artificial whole, the parts of which are mutually suggestive. A pupil is far more likely to remember the cities which claimed to be the birthplace of Homer when he remembers that their names can be made to form the hexameter line, ” Smyrna, Chios, Colophon, Salamis, Rhodos, Argos, Athenae.” Among the most famous examples of metrical mnemonics are the ” gender rhymes ” of the Latin grammars, the hexameter lines (especially that beginning ” Barbara Celarent “) invented by logicians (for a list see Baldwin’s Diet, of Philos., vol. ii., s.v, ” Mnemonic Verses “), the verse for remembering the number of days in the months (” Thirty days hath September, April, June and November “). Other devices are numerous. Thus the name and lights of the sides of a ship may be remembered because the three shorter words ” port,” ” left,” ” red,” go together, as compared with the longer, ” starboard,” ” right,” ” green.”

Memory is commonly classified by psychologists according as it is exercised (a) mechanically, by attention and repetition;

(b) judiciously, by careful selection and co-ordination; and

(c) ingeniously, by means of artifices, i.e. mnemotechny, mnemonics. It must, however, be observed that no mnemonic is of any value which does not possess the qualities of (a) and (b) . A mnemonic is essentially a device which uses attention and repetition, and careful selection is equally necessary. A more accurate description of mnemonics is ” mediate” or ” indirect ” memory. In

the technical sense the word ” mnemonic ” is confined to the systems of general application which have been elaborated by various writers.

Systems. — Mnemonic devices were much cultivated by Greek sophists and philosophers, and are repeatedly referred to by Plato and Aristotle. In later times the invention was ascribed to the poet Simonides, 1 perhaps for no other reason than that the strength of his memory was famous. Cicero, who attaches

1 Pliny, H.N. vii. 24. Cicero, De or. ii. 86, mentions this belief without committing himself to it.

considerable importance to the art, but more to the principle of order as the best help to memory, speaks of Carneades (or perhaps Charmades) of Athens and Metrodorus of Scepsis as distinguished examples of the use of well-ordered images to aid the memory. The latter is said by Pliny to have carried the art so far ” ut nihil non iisdem verbis redderet auditum.” The Romans valued such helps as giving facility in public speak- ing. The method used is described by the author of Rhet. ad Heren., iii. 16-24; see also Quintilian {Inst. Or. xi. 2), whose account is, however, somewhat incomplete and obscure. In his time the art had almost ceased to be practised. The Greek and Roman system of mnemonics was founded on the use of mental places and signs or pictures, known as ” topical ” mnemonics. The most usual method was to choose a large house, of which the apartments, walls, windows, statues, furniture, &c, were severally associated with certain names, phrases, events or ide^s, by means of symbolic pictures; and to recall these it was only necessary to search over the apartments of the house till the particular place was discovered where they had been deposited by the imagination. In accordance with this system, if it were desired to fix an historic date in the memory, it was localized in an imaginary town divided into a certain number of districts, each with ten houses, each house with ten rooms, and each room with a hundred quadrates or memory-places, partly on the floor, partly on the four walls,

partly on the roof. Thus, if it were desired to fix in the memory the date of the invention of printing (1436), an imaginary book, or some other symbol of printing, would be placed in the thirty-sixth quadrate or memory-place of the fourth room of the first house of the historic district of the town. Except that the rules of mnemonics are referred to by Martianus Capella, nothing further is known regarding the practice of the art until the 13th century. Among the voluminous writings of Roger Bacon is a tractate De arte memorativa. Raimon Lull devoted special attention to mnemonics in . connexion with his ars generalis. The first important modification of the method of the Romans was that invented by the German poet Konrad Celtes, who, in his Epitoma in utramque Ciceronis rhetoricam cum arte memorativa nova (1492), instead of places made use of the letters of the alphabet. About the end of the 15th century Petrus de Ravenna (b. 1448) awakened such astonishment in Italy by his mnemonic feats that he was believed by many to be a necromancer. His Phoenix artis memoriae (Venice, 1491, 4 vols.) went through as many as nine editions, the seventh appearing at Cologne in 1608. An impression equally great was produced about the end of the 1 6th century by Lambert Schenkel {Gazophylacium, 1610), who taught mnemonics in France, Italy, and Germany, and, although he was denounced as a sorcerer by the university of Louvain, published in 1593 his tractate De memoria at Douai with the sanction of that celebrated theological faculty. The most complete account of his system is given in two works by his pupil Martin Sommer, published at Venice in 1619. In 1618 John Willis (d. 1628?) published Mnemonica; sive ars reminiscendi (Eng. version by Leonard Sowersby, 1661; extracts in Feinaigle's New Art of Memory, 3rd ed., 1813), containing a clear statement of the principles of topical or local mnemonics. Giordano Bruno, in connexion with his exposition of the ars generalis of Lull, included a memoria technica in his treatise De umbris idearum. Other writers of this period are the Florentine Publicius (1482); Johann Romberch (1533); Hieronimo Morafiot, Ars

memoriae (1602); B. Porta, Ars reminiscendi (1602).

In 1648 Stanislaus Mink von Wenussheim or Winckelmann made known what he called the ” most fertile secret ” in mnemo- nics — namely, the use of consonants for figures, so as to express numbers by words (vowels being added as required); and the philosopher Leibnitz adopted an alphabet very similar to that of Winckelmann in connexion with his scheme for a form of writing common to all languages. Winckelmann’s method, which in fact is adopted with slight changes by the majority of subsequent ” original ” systems, was modified and supplemented in regard to many details by Richard Grey (1694-1771), who published a Memoria technica in 1730. The

principal part of Grey’s method (which may be compared with the Jewish system by which letters also stand for numerals, and therefore words for dates) is briefly this: “To remember anything in history, chronology, geography, &c, a word is formed, the beginning whereof, being the first syllable or syllables of the thing sought, does, by frequent repetition, of course draw after it the latter part, which is so contrived as to give the answer. Thus, in history, the Deluge happened in the year before Christ two thousand three hundred forty-eight; this is signified by the word Del-elok, Del standing for Deluge and etok for 2348.” To assist in retaining the mnemonical words in the memory they were formed into memorial lines, which, however, being composed of strange words in difficult hexameter scansion, are by no means easy to memorize. The vowel or consonant, which Grey connected with a particular figure, was chosen arbitrarily; but in 1806 Gregor von Feinaigle, a German monk from Salem near Constance, began, in Paris to expound a system of mnemonics, one feature (based on Winckelmann’s system) of which was to represent the numerical figures by letters chosen on

account of some similarity to the figure to be represented or some accidental connexion with it. This alphabet was supplemented by a complicated system of localities and signs. Feinaigle, who apparently published nothing himself, came to England in 181 1, and in the following year one of his pupils published The New Art of Memory, which, beside giving Feinaigle's system, contains valuable historical material about previous systems. A simplified form of Feinaigle's method was published by Aime Paris (Principes et applications diverses de la mnemonique, 7 th ed., Paris, 1834), and the use of symbolic pictures was revived in connexion with the latter by a Pole, Antoni Jazwifisky, of whose system an account was published by the Polish general J. Bern, under the title Expose genSral de la mSthode mnimonique polonaise, perfectionnee a Paris (Paris, 1839). Various other modifications of the systems of Feinaigle and Aime Paris were advocated by subsequent mnemonists, among them being the Phrenotypics of Major Beniowsky, a Polish refugee, the Phreno-Mnemotechny (1845) of Francois Fauvel Gouraud the Mnemotechnik of Karl Otto Reventlow (generally known as Karl Otto), a Dane, and the Mnemotechny of the American Pliny Miles.

The more complicated mnemonic systems have fallen almost into complete disuse; but methods founded chiefly on the so-called laws of association (see Association or Ideas) have been taught with some success in Germany by, among others, Hermann Kothe, author of Lehrbuch der Mnemonik (2nd ed., Hamburg, 1852), and Katechismus der Geddchtnisskunst (6th ed. by Montag, Leipzig, 1887); and Hugo Weber-Rumpe, author of Mnemonische Zahlworterbuch (Breslau, 1885) and Mnemonische Unterrichts- briefe (1887-1888); in England by Dr Edward Pick, whose Memory and the Rational Means of Improving it (5th ed., 1873) and Lectures on Memory Culture (1899) obtained a wide circula- tion. Passing over the work of William Day (New Mnemonical Chart and Guide to the Art of Memory, 1845), Rev. T. Brayshaw (Metrical Mnemonics, a very rare work), Fairchild and W. Stokes, the next name of any importance is the Rev. J. H. Bacon, a

pupil of Edward Pick. His book (A Complete Guide to the Improvement of the Memory, 3rd ed., rev. 1890) contains a good summary of the history of mnemonics and a very reasonable account of the principles; it gains in value by its comparative simplicity. More or less successful systems were issued by Lyon Williams (1866), T. Maclaren (1866), Thomas A. Sayer (1867), Rev. Alexander Mackay (1869), George Crowther (1870), F. Appleby (1880), John Sambrook, who made use of similarities in sounds (gun, 1 ; Jew, 2), the French scientist Abbe Moigno, J. H. Noble, and Allan Dalzell. Considerable interest was roused both in London and in America by the controversy which raged round the system of "Alphonse Loisette," who taught his "art of never forgetting" successively in London and Washington. It claimed to be original in system, but was attacked in England by F. Appleby and in America by George S. Fellows, and is generally regarded as both unoriginal and inferior on the whole to preceding systems (for the litigation in America see e.g. Part II. of Middleton's

Memory Systems, pp. 96 sqq.). An interesting work (Memoranda mnemonica) was published by James Copner in 1893, containing a system based partly on the use of letters for figures and words for dates, as well as a large number of rhymes for remembering facts in biblical, Roman, Greek and English history. He made use of Grey's system, but endeavoured as far as possible to invent, where necessary, words and terminations which in them- selves had some special fitness in place of Grey's monstrosities. More complicated systems are the Keesing Memory System (Auckland, 1896), the Smith- Watson System of Memory and Mental Training (Washington), and the Pelman memory system. Bibliography. — A large number of the works referred to in the text contain historical material. Among histories of the subject, see C. F. von Aretin, Systematische Anleitung zur Theorie und Praxis der Mnemonik (Sulzberg, 1810); A. E. Middleton, Memory Systems, Old and New (espec. 3rd rev. ed., New York, 1888), with bibliography of works from 1325 to 1888 by G. S. Fellows and account

of the Loisette litigation; F. W. Colegrove, Memory (1901), with biblio- graphy, pp. 353-361. (J. M. M.)

MNESICLES, the architect of the great Propylaea of the Athenian Acropolis, set up by Pericles about 437 B.C.

MOA, apparently the Maori name of the extinct Ratite birds in New Zealand, comprising the group Dinornithes (cf. Bird: Classification; and Ratitae). The earliest account of these birds is that of Polack (New Zealand, London, 1838), who speaks of the former existence of some struthious birds in the north island as proved by fossil bones which were shown to him. ” The natives added that, in times long past, they received the tradition that very large birds had existed, but the scarcity of food, as well as the easy method of entrapping them, had caused their extermination.” In the North Island the moas seem to have died out soon after the arrival of the Maoris, according to F. W. Hutton, some 700-500 years ago. In the South Island they seem to have lingered much longer, possibly, according to H. O. Forbes (Nat Sci. II. 1893, pp. 374-380), ” down even to the time that Captain Cook visited New Zealand.” But these are only surmises, based upon the fact that in various dry caves limbs still surrounded by the mummified flesh and skin, feathers, and even eggs with the inner membrane, have been found. Great quantities of bones have been found in caves and in swamps, so that now nearly every part of the skeleton, of some kind or other, is known.

The most striking feature of the moas, besides the truly gigantic size of some species, is the almost complete absence of the wings. In fact, the whole skeletons of the wings and of the shoulder girdle seem to have been lost, excepting Anomalo- pteryx dromaeoides, which, according to Hutton, 1 had still some vestiges. Such a complete reduction of the whole anterior limb and girdle is unique among birds, but the cassowaries indicate the process. In conformity with these reductions the breastbone of the moas is devoid of any coracoidal facets; there is no trace of a keel, and the number of sternal

ribs is reduced to three or even two pairs. The hind limbs are very strong; the massive femur has a large pneumatic foramen; the tibia has a bony bridge on the anterior surface of the lower portion, a character in which the moas agree only with Apteryx amongst the other Ratitae. The number of toes is four, unless the hallux is more or less reduced. The pelvis much resembles that of the kiwis.

The skull has been monographed by T. J. Parker (" On the Cranial Osteology, - Classification and Phylogeny of the Dinor- nithidae," Tr. Z. Soc. (1893), xiii. 373-431, pis. 56-62); it resembles in its general configuration that of the emeus and cassowaries, while it differs from that of Apteryx most obviously by the short and stout bill.

The feathers have a large after-shaft which is of the size of the other half, likewise in agreement with the Australian Ratitae, while in the others, including the kiwis, the after-shaft is absent. Another important point, in which the moas agree with the other Ratitae and differ from the kiwis, are the branched, instead of simple, porous canals in the eggshell.

1 " The Moas of New Zealand," Tr. N. Zea. Inst. (1892), xxiv. 93-172, pis. xv.-xvii.

The affinities of the moas are undoubtedly with the Australian Ratitae, and, in spite of the differences mentioned above, with the kiwis. In this respect Max Furbringer and T. J. Parker are in perfect agreement. The relationship with Aepyornis of Madagascar is still problematic. Whilst the moas seem to have been entirely herbivorous, feeding not unlikely upon the shoots of ferns, the kiwis have become highly specialized worm- eaters. In this respect cassowaries and emeus hold an inter- mediate position, their occasional zoophagous (especially piscivo- rous) inclination being well known.

Unmolested by enemies (Harpagornis, a tremendous bird of prey, died out with the Pleistocene) , living in an equable insular climate, with abundant vegetation, the moas nourished and seem to have reached their greatest development in specialization, numbers, and a bewilder- ing variety of large and small kinds, within quite recent times. Unfortunately no fossil moas, older than the Pleiocene, are known. Parker recognizes five genera, with about twenty species, which he combines into three sub-families: Dinornithinae with Dinornis, Anomalopteryginae with Pachyomis, Mesopteryx and Anomalopteryx, comprising the comparatively least special- ized forms; and Emeinae with the genus Emeus, not to be con- founded with the vernacular emeu. The moas ranged in size from that of a turkey to truly colossal dimensions, the giant being Dinornis maximus, which, with a tibial length of 39 in., stood with its small head about 12 ft. above the ground.

(H. F. G.)

MOAB, the name of an ancient people of Palestine who inhabited a district E. of the Jordan and the Dead Sea, lying N. of Edom and S. of Ammon (q.v.) and the Israelite Transjordanic districts. There is little material for its earlier history outside the Old Testament, and the various references in the latter are often of disputed reference and date. The national traditions of Israel recognize a close relationship between Moab and Ammon, ” sons ” of Lot, and the ” brothers ” Esau (Edom) and Jacob (Israel), and Moab is represented as already a powerful people when Israel fled from Egypt (Exod. xv. 15). The detailed narratives, however, give conflicting views of the exodus and the conquest of Palestine. It was supposed that Moab, having expelled the aboriginal giants, was in turn displaced by the Amorite king Sihon, who forced Moab south of the Arnon (Wadi MSjib, a natural boundary) and drove Ammon beyond the Jabbok. The Israelites at Kadesh, almost at the gate of the promised land, incurred the wrath of Yahweh, and, deterred by a defeat at Hormah from pursuing their journey

northwards, were obliged to choose another route (Num. xiv. 40–45; contrast xxi. 1–3). (See Exodus, The.) Messengers to Edom were repulsed (Num. xx. 14–18), or Israel was met by Edom with force (v. 19 seq.); consequently a great detour was made from Kadesh round by the south of Edom (Num. xiv. 25, xxi. 4; Judges xi. 18). At length the people safely reached Pisgah in Moab (Num. xxi. 16–20; cf. Deut. iii. 27, xxxiv. 1), or, according to another view, passed outside Moab until they reached the border of Sihon's kingdom (Num. xxi. 13, 26; Judges xi. 17 seq.). There are other details in Deut. ii., and the late list in Num. xxxiii. even seems to assume that the journey was made from Kadesh across the northern end of Edom. Apparently no fixed or distinct tradition existed regarding the journeys, and it extremely probable that some of the most characteristic features belong to much later periods than the latter half of the second millen- nium B.C., the age to which they are ascribed (e.g. the poem on the fall of Heshbon, Num. xxi. 27–30).

The account of Balaam (q.v.), the son of Beor, the soothsayer, of the children of Ammon (xxii. 5, some MSS.), or of Aram or of Edom (see Cheyne, Ency. Bib., col. 3685 and below), is noteworthy for the prophecies of Israel's future supremacy; but he is passed over in the historical sketch, Deut. ii.; and even the allusion, ibid, xxiii. 4 seq., belongs to a context which on independent grounds appears to be a later insertion. Israel's idolatry in Moab is supplemented by a later story of the vengeance upon Midian (xxv. 6–18, xxxi.). In Joshua xiii. 21 the latter is associated with both Sihon and Balaam, and in some obscure manner Midian and Moab are connected in Num. xxii. 4–7 (cf. xxv. 18, xxxi. 8). An Edomite list of kings includes Bela (cf. Bil'am, i.e. Balaam), son of Beor, and states that a Hadad, son of Bedad, smote Midian in the field of Moab (Gen.

xxxvi. 32, 35) ; these events, assigned to an early age, have been connected with the appearance of Moabite power west of the Jordan in the days of the " judge " Ehud {q.v.). However, all that is recorded in Num. xxii. sqq., together with various legal and

other matter, now severs the accounts of the Israelite occupation of east Jordan (Num. xxi. 33-35, xxxii. 39-42)- For full details see G. B. Gray, ” Numbers ” (Internal. Critical Comment.).

Although Moab and Ammon were ” brothers,” their history was usually associated with that of Judah and Israel respectively, and naturally depended to a considerable extent upon these two and their mutual relations. Jephthah (q.v.), one of the Israelite ” judges,” delivered Gilead from Ammon, who resumed the attack under its king Nahash, only to be repulsed by Saul (q.v.). Ehud (q.v.) of Benjamin or Ephraim freed Israel from the Moabite oppression. To the first great kings, Saul and David, are ascribed conquests over Moab, Ammon and Edom. The Judaean David, for his part, sought to cultivate friendly relations with Ammon, and tradition connects him closely with Moab. His son Solomon contracted marriages with women of both states (1 Kings xi. 5, 7), thus introducing into Jerusalem cults which were not put down until almost at the close of the monarchy (2 Kings xxiii. 13). In the 9th century B.C. the two states appear in more historical surroundings, and the discovery of a lengthy Moabite inscription has thrown valuable light upon contemporary conditions.

This inscription, now in the Louvre, was found at Dhlban, the biblical Dibon, in 1868 by the Rev. F. Klein, a representa- tive of the Church Missionary Society stationed at Jerusalem. It contains a record of the successes gained by the Moabite king Mesha against Israel. 1 Omri (q.v.) had previously seized a number of Moabite cities north of the Arnon, and for forty years the Moabite national god Chemosh was angry with his land. At length he roused Mesha; and Moab, which had evi- dently retreated southwards towards Edom, now began to take reprisals. ” The men of Gad had dwelt in the land of ‘Ataroth from of old; and the king of Israel built ‘Ataroth for himself.” Mesha took the city, slew its people in honour of Chemosh, and dragged before the god the altar-hearth (or the priests?) of D-v-d-h (apparently a divine name, but curiously similar to

David). Next Chemosh roused Mesha against the city of Nebo. It fell with its thousands, for the king had "devoted" it to the deity "Ashtar-Chemosh. Yahweh had been worshipped there, and his . . . (? vessels, or perhaps the same doubtful word as above) were dragged before the victorious Chemosh. With the help of these and other victories (at Jahaz, Aroer, &c), Moab recovered its territory, fortified its cities, supplied them with cisterns, and Mesha built a great sanctuary to his god. The inscription enumerates many places known elsewhere (Isa. xv.; Jer. xlviii.), but although it mentions the "men of Gad," makes no allusion to the Israelite tribe Reuben, whose seat lay in the district (Num. xxxii.; Josh. xiii. 15-23; see Reuben). The revolt will have followed Ahab's death (see 2 Kings i. 1) and apparently led to the unsuccessful attempt by Jehoram to recover the lost ground (ibid. iii.).

The story of Jehoram in 2 Kings iii. now gives prominence to Elisha, his wonders, his hostility to the ruling dynasty and his regard for the agedjehoshaphat of Judah. Following other synchronisms, the Septuagint (Lucian's recension) names Ahaziah of Judah ; from 2 Kings i. 17, the reigning king could only have been Jehoram's namesake. The king of Edom appears as an ally of Israel and Judah (contrast I Kings xxii. 47; 2 Kings viii. 20), and hostile to Moab (comp. above, and the obscure allusion in Amos ii. 1-2). But the king of Moab's attempt to break through unto him suggests that in the original story (there are several signs of revision) Moab and Edom were in alliance. In this case the object of Jehoram's march round the south of the Dead Sea was to drive a wedge between them, and the result hints at an Israelite disaster. Singularly enough, Jehoram of Judah suffered some defeat from Edom at Zair, an unknown name for which Ewald suggested (the Moabite) Zoar (2 Kings viii. 21 ; see Jehoram).

Moab thus retained its independence, even harrying Israel with marauding bands (2 Kings xiii. 20), while Ammon was

1 See edition by M. Lidzbarski, Altsemitische Texte, Bd. I. (Giessen, 1907) ; also G. A. Cooke, North Semitic Inscr., ‘pp. i-i4,andthe articles on ” Moab ” in Hasting’s Diet. Bible (by W. H. Bennett), and ” Mesha ” in Ency. Bib. (by S. R. Driver).

perpetrating cruelties upon Gilead (Am. i. 13 sqq.)- But under Jeroboam II. (q.v.) Israelite territory was extended to the Wadi of the ‘Arabah or wilderness (probably south end of the Dead Sea), and again Moab suffered. If Isa. xv. seq. is to be referred to this age, its people fled southwards and appealed for protec- tion to the overlord of Edom (see Uzziah). During the Assyrian supremacy, its king Salamannu (probably not the Shalman of Hos. x. 14) paid tribute to Tiglath-Pileser IV., but joined the short-lived revolt with Judah and Philistia in 711. When Sennacherib besieged Jerusalem in 701, Kamus(Chemosh)-nadab also submitted, and subsequently both Esarhaddon and Assur- bani-pal mention the Moabite king Musuri (” the Egyptian,” but cf. Mizraim) among their tributaries. In fact, during the reign of Assur-bani-pal Moab played the vassal’s part in helping to repulse the invasion of the Nabayati and nomads of Kedar, a movement which made itself felt from Edom nearly as far as Damascus. It had its root in the revolt of Samas- sum- yukin (Shamash-shun-ukin) of Babylonia, and coming at a time immediately preceding the disintegration of the Assyrian Empire, may have had most important consequences for Judah and the east of the Jordan. 1 (See Palestine: History.)

Moab shares with Ammon and Edom in the general obscurity which overhangs later events. If it made inroads upon Judah (2 Kings xxiv. 2), it joined the coalition against Babylonia (Jer. xxvii. 3) ; if it is condemned for its untimely joy at the fall of Jerusalem (Isa. xxv. 9 seq.; Jer. xlviii.; Ezek. xxv. 8-ri; Zeph. ii. 8-10), it had offered a harbour to fugitive Jews (Jer. xl. n). The dates of the most

significant passages are unfortu- nately uncertain. If Sanballat the Horonite was really a native of the Moabite Horonaim, he finds an appropriate place by the side of Tobiah the Ammonite and Gashmu the Arabian among the strenuous opponents of Nehemiah. Still later we find Moab part of the province of Arabia in the hands of fresh tribes from the Arabian desert (Jos. Ant. xiii. 13, 5); and, with the loss of its former independent power, the name survives merely as a type (Dan. xi. 41). (See Jews; Nabataeans.)

A populous land commanding the trade routes from Arabia to Damascus, rich in agricultural and pastoral wealth, Moab, as Mesha's inscription proves, had already reached a high state of civilization by the 9th century B.C. Its language differed only dialectically from Hebrew; its ideas and religion were very closely akin to the Israelite, and it may be assumed that they shared in common many features of culture. 2 The relation of Chemosh, the national god, to his " children " (Num. xxi. 29) was that of Yahweh to Israel (see especially Judges xi. 24). He had his priests (Jer. xlviii. 7), and Mesha, perhaps himself a priest-king, receives the oracles direct or through the medium of his prophets. The practice of devoting, banning or annihilat- ing city or community was both Moabite and Israelite (cf . above, also Deut. ii. 34, iii. 6, xx. 10-20; 2 Chron. xxv. 12, &c), and human sacrifice, offered as an exceptional gift to Chemosh in 2 Kings iii. 27, in Israel to Molech (q.v.), was a rite once less rare. Apart from the religious cult suggested in the name Mount Nebo, there were local cults of the Baal of Peor and the Baal of Meon, and Mesha's allusion to 'Ashtar-Chemosh, a compound deity, has been taken to point to a corresponding consort whose existence might naturally be expected upon other grounds (see Astarte) . The fertility of Moab, the wealth of wine and corn, the temperate climate and the enervating heat supply conditions which directed the form of cult. Nature- worship, as in Israel, lay at the foundation, and the impure rites of Shittim and

Baal-Peor (Num. xxxi. 16; Ps. cvi. 28) would not materially differ from practices which Israelite prophets were called upon to condemn. Much valuable evidence is to be obtained also from the survival of ancient forms of cult in Moab

1 See G. Smith, Ashurbanipal (p. 288, cyl. A. viii. 51, B. viii. 37); L. B. Paton, Syria and Palestine, p. 269 seq.; R. F. Harper, Ass. and Bab. Lit., pp. 118 sqq.; H. Winckler, Keilinschr. u. das alte Test., 3rded., p. 151.

2 Excavation alone can supplement the scanty information which the present evidence furnishes. For a representation of a Moabite warrior (-god ?), see G. Perrot and C. Chipiez, Art in Phoenicia, ii. 4.5 seq.

and east of the Jordan (e.g. sacrifices on the house roofs) and from a survey of epigraphical and other data from the Greek, Roman, and later periods, allowance being made for contamina- tion. The whole question deserves careful investigation in the light of comparative religion. 3

The relationship felt between Israel and the external states (Moab, Edom, and Ammon) is entirely justified. It extends intermittently throughout the history, and certain complicated features in the traditions of the southern tribes point to affinities with Moab which find a parallel in the traditions of David (see Ruth) and in the allusions to intercourse between Moab and Benjamin (1 Chron. viii. 8) or Judah (ibid. iv. 21 seq.). But the obscure historical background of the references makes it uncertain whether the exclusiveness of orthodox Judaism (Neh. xiii. 1-3; cf. Deut. xxiii. 3-6; Ezra ix. 1, 12) was imposed upon an earlier catholicity, or represented only one aspect of religious spirit, or was succeeded by a more tolerant attitude. Evidence for the last-mentioned has been found in the difficult narrative in Josh. xxii. But Israel remained a great power in religious history while Moab disappeared. It is true that Moab was continuously hard pressed by desert hordes; the

exposed condition of the land is emphasized by the chains of ruined forts and castles which even the Romans were compelled to construct. The explanation of the comparative insignificance of Moab, however, is not to be found in purely topographical considerations. Nor can it be sought in political history, since Israel and Judah suffered as much from external movements as Moab itself. The explanation is to be found within Israel itself, in factors which succeeded in re-shaping existing material and in imprinting upon it a durable stamp, and these factors, as biblical tradition recognizes, are to be found in the work of the prophets.

See the articles on Moab in Hastings's Diet. Bible (W. H. Bennett), Ency. Bib. (G. A. Smith and Wellhausen) , and Hauck's Realencyklo- pddie (F. Buhl) with their references; also the popular description by W. Libbey and F. E. Hoskins, Jordan Valley and Petra (1905), and the very elaborate and scientific works by R. E. Brunnow and A. von Domaszewski, Die Provincia Arabia (1904-1905), and A. Musil, Arabia Petraea (1907-1908). Mention should be made of the mosaic map of Palestine found at Medaba, dating perhaps from the 5th century a.d. ; for this, see A. Jacoby, Das geograph. Mosaik von M. (1905), and P. Palmer and Guthe (1906). For language and epigraphy see Nabataeans, Semitic Languages ; for topography, &c, Palestine; and for the later history, Jews. (S. A. C.)

MO'ALLAKAT (Mo'allaqat or Mu'allaqat). Al-Mo'allaqdt is the title of a group of seven longish Arabic poems, which have come down to us from the time before Islam. The name signifies " the suspended " (pi.), the traditional explanation being that these poems were hung up by the Arabs on or in the Ka'ba at Mecca. The oldest passage known to the present writer where this is stated occurs in the 'Iqd of the Spanish Arab, Ibn 'Abd-Rabbihi (a.d. 860-940), Bulaq ed. of 1293 a.h. vol. iii. p. 116 seq. We read there: " The Arabs had such an interest in poetry, and valued it so highly, that they took seven long pieces selected from the ancient poetry, wrote them in gold on pieces of Coptic linen folded up, and

hung them up (‘allaqat) on the curtains which covered the Ka’ba. Hence we speak of ‘the golden poem of Amra’al Qais,’ the golden poem of Zuhair.’ The number of the golden poems is seven; they are also called ‘the suspended’ (al-Mo’allaqdl).” Similar statements are found in later Arabic works. But against this we have the testimony of a contemporary of Ibn “Abd- Rabbihi, the grammarian Nahhas (d. a.d. 949), who says in his commentary on the Mo’allaqat: “As for the assertion that they were hung up in [sic] the Ka’ba, it is not known to any of those who have handed down ancient poems. ” 4 This cautious scholar is unquestionably right in rejecting a story so utterly unauthenticated. The customs of the Arabs before Mahomet

3 See W. R. Smith, Religion of the Semites (2nd ed.), which may be supplemented by the scattered gleanings in Clermont-Ganneau’s Recueil d ‘ arcMologie orientate ; and more especially by P. Antonin Jaussin’s valuable monograph, Coutumes des Arabes au pays de Moab (Paris, 1908). (See also Hebrew Religion.)

4 Ernst Frenkel, An-Nahljas’ Commentar zur Mu’allaqa des Imruul-Qais (Halle, 1876), p. viii.

are pretty accurately known to us; we have also a mass of information about the affairs of Mecca at the time when the Prophet arose; but no trace of this or anything like it is found in really good and ancient authorities. We hear, indeed, of a Meccan hanging up a spoil of battle on the Ka’ba (Ibn Hisham, ed. Wiistenfeld, p. 431). Less credible is the story of an impor- tant document being deposited in that sanctuary (ibid. p. 230), for this looks like an instance of later usages being transferred to pre-Islamic times. But at all events this is quite a different thing from the hanging up of poetical manuscripts. To account for the disappearance of the Mo’allaqat from the Ka’ba we

are told, in a passage of late origin (De Sacy, Chrestom. ii. 480), that they were taken down at the capture of Mecca by the Prophet. But in that case we should expect some hint of the occurrence in the circumstantial biographies of the Prophet, and in the works on the history of Mecca; and we find no such thing. That a series of long poems was ■written at all at that remote period is improbable in the extreme. Up to a time when the art of writing had become far more general than it was before the spread of Islam, poems were never — or very rarely — written, with the exception, perhaps, of epistles in poetic form. The diffusion of poetry was exclusively committed to oral tradition. Moreover, it is quite inconceivable that there should have been either a gild or a private individual of such acknowledged taste, or of such influence, as to bring about a consensus of opinion in favour of certain poems. Think of the mortal offence which the canonization of one poet must have given to his rivals and their tribes. It was quite another thing for an individual to give his own private estimate of the respec- tive merits of two poets who had appealed to him as umpire, or for a number of poets to appear at large gatherings, such as the fair of ʻOqaz (Okad) as candidates for the place of honour in the estimation of the throng which listened to their recitations. No better is the modifications of the legend, which we find, at a much later period, in the Moqaddima of Ibn Khaldfin (a.d. 1332-1406), who tells us that the poets themselves hung up their poems on the Ka'ba (ed. Paris iii. 357)- In short, this legend, so often retailed by Arabs, and still more frequently by Europeans, must be entirely rejected. 1 The story is a pure fabrication based on the name " suspended." The word was taken in its literal sense; and as these poems were prized by many above all others in after times, the same opinion was attributed to " the [ancient] Arabs," who were supposed to have given effect to their verdict in the way already described. A somewhat simpler version, also given by Nahhas in the passage already cited, is as follows: " Most of the Arabs were accustomed to meet at ʻOqaz and recite verses; then,

if the king was pleased with any poem, he said, ‘ Hang it up, and preserve it among my treasures.’ ” But, not to mention other difficulties, there was no king of all the Arabs; and it is hardly probable that any Arabian king attended the fair at ‘Oqaz. The story that the poems were written in gold has evidently originated in the name ” the golden poems ” (literally ” the gilded “), a figurative expression for excellence. We may interpret the designation ” suspended ” on the same principle. It seems to mean those (poems) which have been raised, on account of their value, to a specially honourable position. Another derivative of the same root is ‘ilq, “precious thing.” A clearer significance attaches to another name some- times used for these poems — assumilt, ” the strings of pearls.” The comparison of artificially elaborated poems to these strings is extremely apt. Hence it became so popular that, even in ordinary prose, to speak in rhythmical form is called simply na%m — ” to string pearls.”

The selection of these seven poems can scarcely have been

1 Doubts had already been expressed by various scholars, when Hengstenberg — rigid conservative as he was in theology — openly challenged it, and Sprenger {Das Leben des Mohammad, i. 14, Berlin, 1861) declared it a fable. Since then it has been controverted at length in Noldeke’s Beitrage zur Kenntniss der Poesie der alten Araber (Hanover, 1864), p. xvii. sqq. Ahlwardt concurs in this con- clusion; see his Bemerkungen iiber die Aechtheit der alten arabischen Gedichte (1872), pp. 25 seq.

the work of the ancient Arabs at all. It is much more likely that we owe it to some connoisseur of a later date. Now Nahhas says expressly in the same passage: ” The true view of the matter is this: when Hammad ar-Rawiya (Hammad the Rhapsodist) saw how little men cared for poetry, he collected these seven pieces, urged people to study them, and said to them: ‘ These are the [poems] of renown.’ ” And this agrees with all our other information. Hammad (who lived in the first three quarters of the 8th

century a.d.) was perhaps of all men the one who knew most Arabic poetry by heart. The recitation of poems was his profession. To such a rhapsodist the task of selection is in every way appropriate; and it may be assumed that he is responsible also for the somewhat fantastic title of ” the suspended.”

There is another fact which seems to speak in favour of Hammad as the compiler of this work. He was a Persian by descent, but a client of the Arab tribe, Bakr ibn Wall. For this reason, we may suppose, he not only received into the collection a poem of the famous poet Tarafa, of the tribe of Bakr, but also that of another Bakrite, Harith, who, though not accounted a bard of the highest rank, had been a prominent chieftain; while his poem could serve as a counterpoise to another also received — the celebrated verses of Harith’s con- temporary ‘Amr, chief of the Taghlib, the rival brethren of the Bakr. ‘Amr praises the Taghlib in glowing terms: Harith, in a similar vein, extolls the Bakr — ancestors of Hammad’s patrons. The collection of Hammad appears to have consisted of the same seven poems which are found in our modern editions, composed respectively by Amra’al-Qais, Tarafa, Zuhair, Labid, ‘Antara ibn Shaddad, ‘Amr ibn Kulthum, and Harith ibn HMiza. These are enumerated both by Ibn ‘Abd-Rabbihi, and, on the authority of the older philologists, by Nahhas; and all subsequent commentators seem to follow them. We have, however, evidence of the existence, at a very early period, of a slightly different arrangement. Certainly we cannot now say, on the testimony of the Jamharat ask’dr al ‘Arab, that twoof the most competent ancient authorities on Arabic poetry, Mofaddal (d. c. 790) and Abu ‘Ubaida (d. a.d. 824, at a great age), had already assigned to the ” Seven ” (viz. ” the seven Mo’allaqat “) a poem each of Nabigha and A’sha in place of those of ‘Antara and Harith. For meanwhile it has been discovered that the compiler of the above-mentioned work — who, in order to deceive the reader, issued it under a false name — is absolutely untrust- worthy. But the learned Ibn Qotaiba (9th century a.d.), in his book

Of Poetry and Poets, mentions as belonging to the ” Seven ” not only the poem of ‘Amr, which has invariably been reckoned among the Mo’allaqat (ed. de Goeje, p. 120), but also a poem of ‘Abld ibn Abras (ibid. 144). In place of which poem he read this we do not know; and we are equally ignorant as to whether he counted other pieces than those indicated above among the seven.

Now Nabigha and A’sha enjoyed greater celebrity than any of the poets represented in the Mo’allaqat, with the exception of Amra’al-Qais, and it is therefore not surprising that scholars, of a somewhat later date, appended a poem by each of these to the Mo’aliaqat, without intending by this to make them an integral part of that work. This is clear, for instance, from the introductory words of TibrizI (d. a.d. 1109) to his com- mentary on the Mo’allaqat. Appended to this he gives a com- mentary to a poem of Nabigha, to one of A’sha, and moreover one to that poem of ‘Abld which, as we have just seen, Ibn Qotaiba had counted among the seven. It is a pure misunder- standing when Ibn Khaldun {loc. cit.) speaks of nine Mo’allaqat; and we ought hardly to lay any stress on the fact that he mentions not only Nabigha and A’sha, but also ‘Alqama, as Mo’allaqa — poets. He was probably led to this by a delusive recollection of the Collection of the ” Six Poets,” in which were included these three, together with the three Mo’allaqa-poets, Amra’al- Qais, Zuhair and Tarafa.

The lives of these poets were spread over a period of more than a hundred years. The earliest of the seven was Amra’al- Qais (q.v.), regarded by many as the most illustrious of Arabian

poets. His exact date cannot be determined; but probably the best part of his career fell within the midst of the 6th century. He was a scion of the royal house of the tribe Kinda, which lost its power

at the death of King Harith ibn ‘Amr in the year 529. 1 The poet’s royal father, Hojr, by some accounts a son of this Harith, was killed by a Bedouin tribe, the Banu Asad. The son led an adventurous life as a refugee, now with one tribe, now with another, and appears to have died young. The anecdotes related of him — which, however, are very untrust- worthy in detail — as well as his poems, imply that the glorious memory of his house and the hatred it inspired were still com- paratively fresh, and therefore recent. A contemporary of Amra’al-Qais was ‘Abid ibn Abras, one poem of whose, as we have seen, is by some authorities reckoned among the collection. He belonged to the Banu Asad, and is fond of vaunting the heroic dead of his tribe — the murder of Hojr — in opposition to the victim’s son, the great poet.

The Mo’allaqa of ‘Amr hurls defiance against the king of Hira, ‘Amr son of Mundhir, who reigned from the summer of 554 till 568 or 569, and was afterwards slain by our poet. 2 This prince is also addressed by Harith m his Mo’allaqa. Of Tarafa, who is said to have attained no great age, a few satirical verses have been preserved, directed against this same king. This agrees with the fact that a grandson of the Qais ibn Khalid, mentioned as a rich and influential man in Tarafa’s Mo’allaqa (v. 80 or 81), figured at the time of the battle of Dhu-Qar, in which the tribe Bakr routed a Persian army. This battle falls between a.d. 604 and 610. 3

The Mo’allaqa of ‘Antara and that of Zuhair contain allusions to the feuds of the kindred tribes ‘Abs and Dhobyan. Famous as these contests were, their time cannot accurately be ascer- tained. But the date of the two poets can be approximately determined from other data. Ka’b, son of Zuhair, composed first a satire, and then, in the year 630, a eulogy on the Prophet; another son, Bujair, had begun, somewhat sooner, to celebrate Mahomet. ‘Antara killed the grandfather of Ahnaf ibn Qais, who died at an advanced age in a.d. 686 or 687; he outlived ‘Abdallah ibn Simma, whose brother Duraid was a very old man when he fell in battle against

the Prophet (early in a.d. 630); and he had communications with Ward, whose son, the poet'Orwa, may perhaps have survived the flight of Mahomet to Medina. From- all these indications we may place the pro- ductive period of both poets in the end of the 6th century. The historical background of 'Antara's Mo'allaqa lies somewhat earlier than that of Zuhair's.

To the same period appears to belong the poem of 'Alqama, which, as we have seen, Ibn Khaldun reckons amongst the Mo'allaqat. This too is certainly the date of Nabigha, who was one of the most distinguished of Arabic poets. For in the poem often reckoned as a Mo'allaqa, as in many others, he addresses himself to No'man, king of Hira, who reigned in the two last decades of the 6th century. The same king is mentioned as a contemporary in one of 'Alqama's poems.

The poem of A'sha, sometimes added to the Mo'allaqat, contains an allusion to the battle of Dhu Qar (under the name " Battle of Hinw," v. 62). This poet, not less famous than Nabigha, lived to compose a poem in honour of Mahomet, and died not long before a.d. 630.

Labid is the only one of these poets who embraced Islam. His Mo'allaqa, however, like almost all his other poetical works, belongs to the Pagan period. He is said to have lived till 661, or even later; certainly it is true of him, what is asserted with less likelihood of several others of these poets, that he lived to a ripe old age.

The seven Mo'allaqat, and also the poems appended to them, represent almost every type of ancient Arabian poetry in its excellences and its weaknesses. In order rightly to appreciate these, we must translate ourselves into the world of the Bedouin,

1 See Tabari's Geschichte der Perser und Araber . . . ubersetzt von Th. Noldeke (Leiden, 1879), p. 171.

2 See Noldeke's Tabari, pp. 170,172. * Ibid. p. 311.

and seek to realize the peculiar conditions of his life, together with the views and thoughts resulting from those conditions. In the Mo'allaqa of Tarafa we are repelled by the long, anatomi- cally exact description of his camel; but such a description had an extraordinary charm of its own for the Bedouins, every man of whom was a perfect connoisseur on this subject down to the minutest points; and the remaining parts of the poem, together with the other extant fragments of his songs, show that Tarafa had a real poetic gift. In the Mo'allaqat of 'Amr and Harith, for the preservation of which we are especially grateful to the compiler, we can read the haughty spirit of the powerful chieftains, boastfully celebrating the splendours of their tribe. These two poems have also a certain historical importance. The song of Zuhair contains the practical wisdom of a sober man of the world. The other poems are fairly typical examples of the customary qaslda, the long poem of ancient Arabia, and bring before us the various phases of Bedouin life. But even here we have differences. In the Mo'allaqa of 'Antara, whose heroic temperament had overcome the scorn with which the son of a black slave-mother was regarded by the Bedouins, there predominates a warlike spirit, which plays practically no part in the song of Labid.

It is a phenomenon which deserves the fullest recognition, that the needy inhabitants of a barren country should thus have produced an artistic poetry distinguished by so high a degree of uniformity. Even the extraordinary strict metrical system, observed by poets who had no inkling of theory and no knowledge of an alphabet, excites surprise. In the most ancient poems the metrical form is as scrupulously regarded as in later compositions. The only poem which shows unusual metrical freedom is the above-mentioned song of 'Abid. It is, however, remarkable that 'Abid's contemporary Amra'al- Qais, in a poem which in other respects also exhibits certain coincidences with that of 'Abid (No. 55, ed. Ahlwardt), presents himself considerable licence in the use of the very same metre — one which,

moreover, is extremely rare in the ancient period. Presumably, the violent deviations from the schema in ʻAbid are due simply to incorrect transmission by compilers who failed to grasp the metre. The other poems ascribed to ʻAbid, together with all the rest attributed to Amra'al-Qais, are con- structed in precise accord with the metrical canons. It is necessary always to bear in mind that these ancient poems, which for a century or more were preserved by oral tradition alone, have reached us in a much mutilated condition. Fortunately, there was a class of men who made it their special business to learn by rote the works either of a single poet or of several. The poets themselves used the services of these rhapsodists (rawi). The last representative of this class is Hammad, to whom is attributed the collection of the Mo'allaqat; but he, at the same time, marks the transition of the rhapsodist to the critic and scholar. The most favourable opinion of these rhapso- dists would require us to make allowance for occasional mistakes: expressions would be transposed, the order of verses disarranged, passages omitted, and probably portions of different poems pieced together. It is clear, however, that Hammad dealt in the most arbitrary fashion with the enormous quantity of poetry which he professed to know thoroughly. The seven Mo'allaqat are indeed free from the suspicion of forgery, but even in them the text is frequently altered and many verses are transposed. The loose structure of Arabic poems was extremely favourable to such alterations. Some of the Mo- ʻallaqat have several preambles: so, especially, that of ʻAmr, the first eight verses of which belong not to the poem, but to another poet. Elsewhere, also, we find spurious verses in the Mo'allaqat. Some of these poems, which have been handed down to us in other exemplars besides the collection itself, exhibit great divergences both in the order and number of the verses and in textual details. This is particularly the case with the oldest Mo'allaqa — that of Amra'al-Qais — the critical treatment of which is a problem of such extreme difficulty that only an approximate solution can ever be reached. The variations of the text,

outside the Mo’allaqat collection, have

here and there exercised an influence on the text of that collection. It would be well if our manuscripts at least gave the Mo’allaqat in the exact form of Hammad’s days. The best text — in fact, we may say,, a really good text — is that of the latest Mo’allaqa, the song of Labid.

The Mo’allaqat exist in many manuscripts, some with old commen- taries, of which a few are valuable. They have also been several times printed. Especial mention is due to the edition of Charles (afterwards Sir Charles) Lyall with the commentary of Tibrlzl (Calcutta, 1894). Attempts to translate these poems, verse for verse, in poetical form, could scarcely have a happy result. The strangeness, both of the expression and of the subjects, only admits of a paraphrastic version for large portions, unless the sense is to be entirely obliterated. An attempt at such a translation, in conjunc- tion with a commentary based on the principles of modern science, has been made by the present author: ” Filnf Mo’allaqat tibersetzt und erklart,” in the Sitzungsberichte der kais. Akad. d. Wiss. in Wien. Philos.-hist. Classe. Bde. cxl.-cxiv. A supplement to this is formed by an article, by Dr Bernh. Geiger, on the Mo’allaqa of Tarafa, in the Wiener Zeitschrift fur die Kunde des Morgenlands, xix. 323 sqq. See further the separate articles on the seven poets.

(Th. N.)

MOAT, a ditch filled with water surrounding a castle, town or other fortified place for purposes of defence. The word is taken from the O. Fr. mote, or motte, a mound or embankment of earth used as a means of defence; the transition in meaning from the heap of earth to the trench left by excavating the earth is parallel with the similar interchange of

meaning in dike and ditch (see Dike). In mod. Fr. motte means a lump or clod of earth. The word is probably of Teutonic origin, and may be connected with Eng. ” mud.” (See Fortification

AND SlEGECRAFT.)

MOB. (1) A disorderly crowd, a rabble, also a contemptuous name for the common people, the lower orders, the Greek by\os, (whence ” ochlocracy,” mob-rule). The word is a shortened form of Lat. mobile (sc. vulgus), the movable or mutable emotional, easily stirred crowd. ” Mobile ” in the sense of rabble was used in the 17th century, and was still used after the shortened form, for some time considered a vulgarism, had become common. Thus Addison (Spectator, No. 135) writes, “It is perhaps this humour of speaking no more than we needs must which has so miserably curtailed some of our words. ... I dare not answer that ‘ mob ‘ . . . ‘ incog.’ and the like will not in time be looked at as part of our tongue.” Roger North’s Examen, vii., 574 (1740), dates the beginning of the use of the shortened form ” mob.” ” I may note that the rabble first changed their title and were called the ‘mob ‘ in the assemblies of this club. It was their beast of burden, and called first mobile vulgus, but fell naturally into the con- traction of one syllable, and ever since is become proper English.” The club alluded to is the Green Ribbon Club (q.v.), and the date would be about 1680. (2) A kind of head-dress for women, usually called a ” mob cap,” worn during the 18th and early part of the 19th centuries. It was a large cap covering all the hair, with a bag-shaped crown, a broad band and frilled edge. It seems to have been originally an article of wear for the morn- ings. It is probably connected with words such as ” mop,” ” mab,” meaning untidy, niglige.

MOBERLY, GEORGE (1803-1885), English divine, was born on the 10th of October 1803, and educated at Winchester and Balliol. After a distinguished academic career he became head master of Winchester in 1835. This post he resigned in 1866, and retired to Brightstone Rectory, Isle of Wight. Mr.

Gladstone, however, in 1869 called him to be bishop of Salisbury, in which see he kept up the traditions of his predecessors, Bishops Hamilton and Denison, his chief addition being the summoning of a diocesan synod. Though Moberly left Oxford at the begin- ning of the Oxford movement, he fell under its influence: the more so that at Winchester he formed a most intimate friendship with Keble, spending several weeks every year at Otterbourne, the next parish to Hursley. Moberly, however, retained his independence of thought, and in 1872 he astonished his High Church friends by joining in the movement for the disuse of the damnatory clauses in the Athanasian Creed. His chief contribution to theology is his B amp ton Lectures of 1868, on

The Administration of the Holy Spirit in the Body of Christ. He died en the 6th of July 1885.

MOBERLY, ROBERT CAMPBELL (1845–1903), English theologian, was born on the 26th of July 1845. He was the son of George Moberly, bishop of Salisbury, and faithfully maintained the traditions of his father's teaching. Educated at Winchester and New College, Oxford, he was appointed senior student of Christ Church in 1867 and tutor in 1869. In 1876 he went out with Bishop Copleston to Ceylon for six months. After his return he became the first head of St Stephen's House, Oxford (1876–1878), and then, after presiding for two years over the Theological College at Salisbury, where he acted as his father's chaplain, he accepted the college living of Great Budworth in Cheshire in 1880, and the same year married Alice, the daughter of his father's predecessor, Walter Kerr Hamilton. In 1892 Lord Salisbury made him Regius Professor of Pastoral Theology of Oxford; and after a long period of delicate health he died at Christ Church on the 8th of June 1903. His chief writings were: An essay in Lux Mundi on " The Incarnation as the Basis of Dogma " (1889); a paper, Belief in a Personal God (1891) ; Reason and Religion (1896), a pro- test against the limitation of the reason to the understanding; Ministerial Priesthood (1897) ; and Atonement and Personality (1901). In this last work, by which he

is chiefly known, he aimed at presenting an explanation and a vindication of the doctrine of the Atonement by the help of the conception of personality. Rejecting the retributive view of punishment, he describes the sufferings of Christ as those of the perfect ” Penitent,” and finds their expiatory value to lie in the Person of the Sufferer, the God-Man.

MOBERLY, a city of Randolph county, Missouri, U.S.A., in the north central part of the state, about 130 m. E. by N. of Kansas City. Pop. (1890), 8215; (1900), 8012, (923 negroes); (1910), 10,923. It is served by the Missouri, Kansas & Texas and the Wabash railways, and is a division headquarters of the latter. The city is regularly laid out on a level prairie site. There are two public parks, a Carnegie library, a commercial college, a Y.M.C.A. building, and a hospital maintained by the Wabash Employees Hospital Association. The most important industrial establishments are the large machine shops (established here in 1872) of the Wabash railway. Moberly was platted in 1866, was incorporated as a town and became the county- seat in 1868, and in 1873 secured a special city charter, which it surrendered in 1889 for city status under the general statute.

MOBILE, a city and the county-seat of Mobile county, Ala- bama, U.S.A., in the S.W. part of the state, at the mouth of Mobile River, and the head of Mobile Bay. Pop. (1890), 31,076; (1900), 38,469, of whom 17,045 were negroes and 2111 foreign-born (562 German, 492 Irish, 202 English); (1910 census), 51,521. It is served by the Southern, the Louisville & Nashville, the Mobile & Ohio, the Mobile, Jackson & Kansas City, and the Tombigbee Valley railways; by steamboat lines to ports in Europe, Cuba, Mexico, Central America (especially Panama) and South America; by a coastwise steamboat line to New York; and by river boats on a river system embracing nearly 2000 m. of navigable waters in Alabama, Mississippi, and Georgia. The city occupies about 17 sq. m. of a sandy plain, which rises gradually from a low water front along the river to a range of

hills a few miles to the westward. Among the principal buildings are the customs-house and post-office, the court-house, the Battle House (a hotel), the United States marine hospital, the city hospital, the Providence infirmary, Barton Academy (a part of the public school system), a Young Men's Christian Association building, St Joseph's church (Roman Catholic), the cathedral of the Immaculate Conception, the Van Antwerp office building, and the southern market and armoury. Mobile is the see of a Roman Catholic bishopric and the headquarters of the United States district court for the southern district of Alabama. In the city are a public library; the departments of medicine and pharmacy of the university of Alabama; the academy of the Visitation, and the

Immaculate Conception school, both for girls and both Roman Catholic; the Convent of Mercy; the Emerson normal and industrial school (for negroes), McGill Institute, the University military school, and the Mobile military institute; and 5 m. from Mobile, at Spring Hill, is Spring Hill college (Roman Catholic, founded in 1830, chartered 1836), controlled by the Jesuits. There is an annual celebration in Mobile on Mardi Gras (Shrove Tuesday), conducted by the Order of Myths and the Mystics, two social organizations, successors of the Cowbel- lion de Rakin Society, which was organized in 1830 and long conducted a somewhat similar celebration annually on New Year's Eve.

Mobile is the only seaport of Alabama. In 1826 the channel from it to the Gulf, about 30 m. distant, had a minimum depth of only sJ ft. through Choctaw Pass and 8 ft. through Dog River bar; but subsequently the channel has been greatly improved by the United States government, and in June 1908 ' vessels drawing 23 and 24 ft. could pass at low-water to the mouth of Chickasaw Creek above the city. While the channel was still shallow, and

rapidly growing railway systems were serving other ports, much foreign commerce was lost to Mobile, the value of the exports falling off from $12,784,171 in 1877 to $3,258,605 in 1882, and the value of the imports, during the same period, from $648,404 to $396,573; but after the improve- ment of the channel the value of the exports increased from $8,140,502 in 1897 to $26,815,279 in 1908, and the value of the imports rose from $956,712 in 1897 to $4,242,169 in 1908. The foreign commerce consists largely in the export of cotton, lumber, timber, cotton-seed oil, coal, provisions and clothing, and in the import of tropical fruits (especially bananas), sisal grass, coffee, mahogany, asphalt, and manganese and sulphur ores. Vegetables, particularly beans and cabbage, and small fruits are grown extensively in the vicinity, and the city has an important domestic trade in market-garden produce, fish and oysters, hardware, dry goods, grain and groceries. In manu- facturing Mobile was second (Birmingham being first) among the cities of the state in 1905, when the value of the factory product was $4,942,331, 41-8% more than in 1900. In 1905 it ranked first in the state in the value of fertilizer, lumber and timber, and in the construction of railway cars; and the manufacture of flour and grist mill products and machinery for lumber mills were important industries.

Founded by Pierre Lemoyne, Sieur d'Iberville (1661-1706), and his brother Jean Baptiste Lemoyne, Sieur de Bienville (1680-1768), in 1702, Mobile 2 was the capital of the French province of Louisiana until 1720, when the seat of government was transferred to Biloxi, in the present Mississippi. The original settlement was at Twenty-seven Mile Bluff, about 20 m. above the present site, to which it was removed in 1710 as a consequence of floods in 1709. By the Treaty of Paris (1763) Mobile, as a part of Louisiana east of the Mississippi, was ceded to Great Britain; but on the 14th of March 1780 it was captured by a Spanish force under Don Bernardo de Galvez (1755-1786), the governor at New Orleans, and Spain was confirmed in its possession by the

treaty of 1783. Spanish civil institutions were introduced, and new names, such as Con- ception, St Emanuel and St Joseph, which still survive, were given to the streets. Yet neither the English nor the Spanish occupation made any substantial change in the tone of the place or the habits of its people, even the negroes holding to their French jargon. The alliance between Great Britain and Spain, at the outbreak of the war of 181 2, gave Mobile strategic import- ance for the military operations in the south-west. Hence, on the 15th of April 1813 General James Wilkinson, acting on President James Madison's instructions, which were based on the claim that Mobile was a part of Louisiana sold by France to the United States in 1803, seized Mobile for the United States.

1 Between 1826 and 1908 the Federal government expended $5,148,179 on the improvement of the harbour. The bar channel also has been improved.

2 The city was named from the Mobile or Maubila Indians, a Muskhogean tribe, now extinct, who occupied the neighbouring region and were Christianized by the French,

In August 1814 General Andrew Jackson made Mobile his headquarters. He repaired Fort Bowyer, on Mobile Point at the mouth of the bay, and garrisoned it just in time for it to resist attack by the British on the 15th of September. On the nth of February 1815, forty-two days after peace had been declared and thirty-four days after the battle of New Orleans, a British force captured Fort Bowyer; but it made no move against Mobile, and withdrew on the 1st of April. Now began the Americanization of Mobile, a tide of immigration from the up-country setting in and rapidly changing the character of the place, which had previously been distinctly French. A town charter had been granted by the territorial legislature of Mississippi on the 20th of January 1814, and an interesting feature under the town government was the " tariff for bakers," which fixed the weight of loaves of bread in accordance with the price of flour. A city charter, dated the 17th of

December 1819, was granted by the first state legislature of Alabama, and Mobile became the commercial emporium for Alabama and Mississippi, its cotton exports increasing from 7000 bales in 1818 to 100,000 in 1830 and 450,000 in 1840. In 1826 Barton Academy, still one of the landmarks of the city, was built; but it was not until 1852 that common schools were opened in Mobile county. Branches of the United States Bank and of the State bank were established at Mobile, and in the panic of 1837 the Bank of Mobile was one of the few banks in the United States that did not suspend payment. The Mobile & Ohio railroad, begun in 1848, provided ampler com- munication with the Mississippi valley, and Mobile's export of cotton rose to 1,000,000 bales in 1861.

During the Civil War Mobile was an important seaport of the Confederacy. A Federal blockade was begun as early as the 26th of May 1 86 1, but trade with West Indian and European ports was continued by a line of swift vessels, which regularly escaped the blockading squadron. On the 5th of August 1864 Admiral David G. Farragut (q.v.), with a Federal fleet of four iron moni- tors, seven wooden sloops of war, and several gunboats, entered the channel by passing the Confederate defences, Fort Gaines on Dauphin Island and Fort Morgan occupying the site of old Fort Bowyer on Mobile Point, captured the formidable Confederate ironclad ram " Tennessee," destroyed one gunboat and drove another aground. One of the Federal monitors, the " Tecum- seh," was destroyed by torpedoes. The Confederate fleet was commanded by Admiral Franklin Buchanan (1800-18 74). Fort Gaines surrendered on the 7th, and Fort Morgan on the 23rd of the same month. In the spring of 1865 General E. R. S. Canby (1819-1873), with a Federal force of about 45,000, laid siege to Fort Blakely and Spanish Fort, on the east side of 'the bay (opposite the city), defended by General Randall L. Gibson (183 2-1 892) with 5000 men. After twenty- five days of resistance the Confederates evacuated the fortifications and then the city, the Federals entering on the 12th of April 1865. Losses from rail- way enterprises and the panic of 1873 resulted

in the bankruptcy of the municipality in 1879, whereupon its charter was vacated, its property vested in certain trustees acting under the Chancery Court to adjust its debt, and a municipal government under the name of Port of Mobile succeeded the city of Mobile until 1887, when the latter was again chartered. On the 27th of September 1906 Mobile was swept by a hurricane, which destroyed property valued at $5,000,000 or more.

See Peter J. Hamilton, Colonial Mobile (Boston, 1897); and a chapter by the same writer in L. P. Powell's Historic Towns of the Southern States (New York, 1900).

MOBIUS, AUGUST FERDINAND (1790-1868), German astronomer and mathematician, was born at Schulpforta on the 17th of November 1790. At Leipzig, Gottingen and Halle he studied for four years, ultimately devoting himself to mathe- matics and astronomy. In 181 5 he settled at Leipzig as privat- docent, and the next year became extraordinary professor of astronomy in connexion with the university. Later he was chosen director of the university observatory, which was erected (1818-1821) under his superintendence. In 1844 he was elected ordinary professor of higher mechanics and astronomy, a position

which he held till his death on the 26th of September 1868. His doctor's dissertation, De computandis occultationibus fixarum per planetas (Leipzig, 181 5), established his reputation as a theoretical astronomer. Die Hauptsatze der Astronomie (1836), Die Elemente der Mechanik des Himmels (1843), may be noted amongst his other purely astronomical publications. Of more general in- terest, however, are his labours in pure mathematics, which appear for the most part in Crelle's Journal from 1828 to 1858. These papers are chiefly geometrical, many of them being develop-

ments and applications of the methods laid down in his great work, Der barycentrische Calcul (Leipzig, 1827), which, as the name implies, is based upon the properties of the mean point or centre of mass (see Algebra: Universal). This work abounds in suggestions and foreshadowings of some of the most striking discoveries in more recent times — such, for example, as are contained in H. Grassmann's Ausdehnungslehre and Sir W. R. Hamilton's Quaternions. Mobius must be regarded as one of the leaders in the introduction of the powerful methods of modern projective geometry.

His Gesammelten Werke have been published in four volumes at Leipzig (1885-1887).

k MOCATTA, FREDERICK DAVID (1828-1905), English Jewish philanthropist, was a member of the London financial firm, Mocatta and Goldsmid, but retired from business in 1874 and devoted himself to works of public and private benevolence. Besides this he was a patron of learning and himself an author of historical works, the chief of which was The Jews and the Inquisi- tion. On occasion of his 70th birthday, he was presented with a testimonial from more than 200 philanthropic and literary institutions. The Anglo-Jewish Historical Exhibition (1887) owed its inception to him. He bequeathed his fine library to the Jewish Historical Society of England, of which he was at one time president. This library formed the basis of the collections which are now included in the Mocatta Library and Museum, founded in his memory, and located at the University of London (University College, Gower Street).

See Trans. Jewish Hist. Soc. Eng. vol. v. (I. A.)

MOCCASIN (a North-American Indian word, of which the spelling and pronunciation vary in different dialects), a shoe made of deerskin or other soft leather. It is made in one piece; the sole is soft and flexible and the upper part is often adorned with embroidery, beading or other ornament. It is the footwear of the North American Indian tribes and is also worn by hunters, traders and settlers. In

botany, the lady's slipper is known in the United States of America, as the " moccasin flower," from its resemblance to a shoe or moccasin. The name moccasin is also given to a venomous snake, found as far north as North Carolina and westward to the Rocky Mountains, and popularly called " cottonmouth," from the white rim around the mouth. It belongs to the family Crotalidae, species Ancistrodon (or Cenchris) piscivorus, is about two feet long, and is often found in marshy land. It is sometimes called the water moccasin to distinguish it from the upland moccasin (Ancistrodon contorlrix or atrofuscus), which is commonly called " copperhead " and is found further north in dry and mountainous regions. The name is possibly a distinct word of which the origin has not been traced.

MOCENIGO, the name of a noble and ancient Venetian family which gave many doges, statesmen and soldiers to the republic. Tommaso Mocenigo (1343–1423) commanded the crusading fleet in the expedition to Nicopolis in 1396, and also won battles against the Genoese. While he was Venetian ambassador at Cremona he was elected doge (1414), and he escaped in secret, fearing that he might be held a prisoner by Gabrino Fondolo, tyrant of that city. He made peace with the Turkish sultan, but when hostilities broke out afresh his fleet defeated that of the Turks at Gallipoli. During his reign the patriarch of Aquileia was forced to cede his territories to the republic (1420), which also acquired Friuli and Dalmatia. Tommaso greatly encouraged commerce, reconstructed the ducal palace and commenced the library. Pietro Mocenigo, doge from 1474 to 1476, was one of the greatest Venetian admirals,

and revived the fortunes of his country's navy, which had fallen very low after the defeat at Negropont in 1470. In 1472 he captured and destroyed Smyrna; the following year he placed Catherine Cornaro, queen of Cyprus, under Venetian protection, and by that means the republic obtained possession of the island in 1475. He then defeated the Turks who were besieging Scutari, but he there contracted an illness of which he died. Giovanni Mocenigo,

Pietro ‘s brother, who was doge from 1478 to 1485, fought against Mohammed II. and Ercole I., duke of Ferrara, from whom he recaptured Rovigo and the Polesine. Luigi Mocenigo was doge from 1570 to 1577. During his reign Venice lost the fortresses Nicosia and Famagosta in Cyprus. He took part in the battle of Lepanto, but after the loss of Cyprus he was forced to make peace with the Turks and to hand them back his conquests. Andrea Mocenigo, who flourished in the 15th and 1 6th centuries, was a senator of the republic and a historian; he composed a work on the league of Cambrai entitled Belli memorabilis Cameracensis adversus Venetos historiae libri vi. (Venice, 1525). Another Luigi Mocenigo was doge from 1700 to 1709, and his brother Sebastiano from 1722 to 1732. Alvise Mocenigo (1701–1778), who was doge from 1763 until his death, restricted’ the privileges of the clergy, and in consequence came into bitter conflict with Pope Clement XIII.

MOCHA STONE, a name applied to chalcedony with dendritic markings, said to have been obtained originally from Mocha in Arabia. The markings which sometimes simulate with curious fidelity the form of miniature trees and shrubs, are caused by the infiltration of solutions carrying iron and manga- nese, which are deposited as thin films of oxide along the cracks of the stone, producing black, brown or red dendrites, effectively disposed on a ground of grey or white chalcedony. Most of the Mocha stones of commerce are obtained from India, where they are found among the agate-pebbles resulting from the disinte- gration of the trap rocks of the Deccan. In recent years the formation of dendrites has been artificially effected at the agate- works of Oberstein, so as to imitate the true Mocha stones.

MOCK, an adjective meaning sham, feigned, spurious, falsely imitative. As a verb it means to deride or imitate contemp- tuously. The derivation of O. Fr. mocquer, mod. moquer; Ital. moccare, from which the English word is adopted, is disputed. Some authorities refer it to Ger. mucken, mucksen, to growl, grumble, which is probably echoic in origin;

others to a supposed Late Lat. muccare, formed from mucus— mucus, in the sense of ” to wipe the nose at.”

MOCKING-BIRD, or Mock-bird (as W. Charleton, J. Ray and M. Catesby called it), the popular name of birds belonging to the American sub-family Miminae of the thrushes, Turdidae, differing by having the tarsus scutellate in front, while the typical thrushes have it covered by a single horny plate. Mimus poly-glottus, the northern mocking-bird, inhabits the southern part of the United States, being in the north only a summer visitant; it breeds rarely in New England, is seldom found north of the 38th parallel, and migrates to the south in winter, passing that season in the Gulf States and Mexico. It appears to be less numerous on the western side of the Alleghanies, though found in suitable localities across the continent to the Pacific coast, but seldom farther north than Virginia and southern Illinois, and it is said to be common in Kansas. J. J. Audubon states that the mocking-birds which are resident all the year round in Louisiana attack their travelled brethren on the return of the latter from the north in autumn. The names of the species, both English and scientific, have been bestowed from its capacity of success- fully imitating the cry of many other birds, to say nothing of other sounds, in addition to uttering notes of its own which possess a varied range and liquid fullness of tone that are unequalled, according to its admirers, even by those of the nightingale (q.v.).

Plain in plumage, being greyish brown above and dull white below, while its quills are dingy black, variegated with white, there is little about the mocking-bird’s appearance beyond its graceful form to recommend it; but the lively gesticulations it exhibits are very attractive, and therein its European rival in melody is far surpassed, for the cock-bird mounts aloft in rapid

circling flight, and, alighting on a conspicuous perch, pours forth his ever-changing song to the delight of all listeners; while his actions in attendance on his mate are playfully demonstrative and equally interest the observer. The mocking-bird is more- over of familiar habits, haunting the neighbourhood of houses, and is therefore a general favourite. The nest is placed with little regard to concealment, and is not distinguished by much care in its construction^ The eggs, from three to six in number, are of a pale bluish-green, blotched and spotted with light yellowish-brown. They, as well as the young, are much sought after by snakes, but the parents are often successful in repelling these deadly enemies, and are always ready to wage war against any intruder on their precincts, be it man, cat or hawk. Their food is various, consisting of berries, seeds and insects.

Some twelve or fourteen other species of Mimus have been recog- nized, mostly from South America; but M. orpheus seems to be common to some of the Greater Antilles, and M. hilli is peculiar to Jamaica, while the Bahamas have a local race in M. bahamensis. The so-called mountain mocking-bird (Oreoscoptes montanus) is a form not very distant from Mimus; but it inhabits exclusively the plains overgrown with sage-brush {Artemisia) of the interior table- land of North America, and is not at all imitative in its notes, so that it is an instance of a misnomer. Of the various other genera allied to Mimus, the best known are the thrashers (genus Harpo- rhynchus) of which six or eight species are found in North America, which are thrush-like and shy in their habits and do not mimic; and the cat-bird (Galeoscoptes carolinensis), which in addition to having an attractive song, utters clucks, whistles and mewing sounds. The sooty-grey colour that, deepening into blackish-brown on the crown and quills, pervades the whole of its plumage — the lower tail- coverts, which are of a deep chestnut, excepted — renders it a con- spicuous object ; and though, for some reason or other, far from being a

favourite, it is always willing when undisturbed to become intimate with men's abodes. It has a much wider range on the American continent than the mocking-bird, and is one of the few species that are resident in Bermuda, while on more than one occasion it is said to have appeared in Europe.

The name mocking-bird, or more frequently mock-nightingale, is in England occasionally given to some of the warblers {q.v.), especially the blackcap (Sylvia atricapilla) , and the sedge-bird (Acrocephalus schoenobaenus). In India and Australia the same name is sometimes applied to other species. (A. N.)

MODEL (O. Fr. modelle, mod. modele; It. modello, pattern, mould; from Lat. modus, measure, standard), a tangible represen- tation, whether the size be equal, or greater, or smaller, of an object which is either in actual existence, or has to be constructed in fact or in thought. More generally it denotes a thing, whether actually existing or only mentally conceived of, whose properties are to be copied. In foundries, the object of which a cast is to be taken, whether it be for engineering or artistic purposes, is usually first formed of some easily workable material, generally wood. The form of this model is then reproduced in clay or plaster, and into the mould thus obtained the molten metal is poured. The sculptor first makes a model of the object he wishes to chisel in some plastic material such as wax, ingenious and complicated contrivances being employed to transfer this wax model, true to nature, to the stone in which the finai work is to be executed. In anatomy and physiology, models are specially employed as aids in teaching and study, and the method of moulage or chromoplastic yields excellent impressions of living organisms, and enables anatomical and medical prepara- tions to be copied both in form and colour. A special method is also in use for making plastic models of microscopic and minute microscopic objects. That their internal nature and structure may be more readily studied, these are divided by numerous parallel transverse cuts, by means of a microtome, into exceedingly thin

sections-. Each of these shavings is then modelled on an enlarged scale in wax or pulp plates, which are fixed together to form a reproduction of the object.

Models in the mathematical, physical and mechanical sciences are of the greatest importance. Long ago philosophy perceived Represeiite-the essence of our process of thought to lie in the tionia fact that we attach to the various real objects Thought. aroun d us particular physical attributes — our con- cepts — and by means of these try to represent the objects to our minds. Such views were formerly regarded by mathematicians and physicists as nothing more than unfertile speculations, but

in more recent times they have been brought by J. C. Maxwell, H. v. Helmholtz, E. Mach, H. Hertz and many others into intimate relation with the whole body of mathematical and physical theory. On this view our thoughts stand to things in the same relation as models to the objects they represent. The essence of the process is the attachment of one concept having a definite content to each thing, but without implying complete similarity between thing and thought; for naturally we can know but little of the resemblance of our thoughts to the things to which we attach them. What resemblance there is lies principally in the nature of the connexion, the correlation being analogous to that which obtains between thought and language, language and writing, the notes on the stave and musical sounds, &c. Here, of course, the symbolization of the thing is the important point, though, where feasible, the utmost possible correspondence is sought between the two — the musical scale, for example, being imitated by placing the notes higher or lower. When, therefore, we endeavour to assist our conceptions of space by figures, by the methods of descriptive geometry, and by various thread and object models; our topography by plans, charts and globes; and our mechanical and physical ideas by kinematic models — we are simply extending and continuing the principle by means of which we comprehend objects in thought and represent them in language or writing. In precisely the same

way the micro- scope or telescope forms a continuation and multiplication of the lenses of the eye; and the notebook represents an external expansion of the same process which the memory brings about by purely internal means. There is also an obvious parallelism with representation by means of models when we express longi- tude, mileage, temperature, &c, by numbers, which should be looked upon as arithmetical analogies. Of a kindred character is the representation of distances by straight lines, of the course of events in time by curves, &c. Still, neither in this case nor in that of maps, charts, musical notes, figures, &c, can we legitimately speak of models, for these always involve a concrete spatial analogy in three dimensions.

So long as the volume of matter to be dealt with in science was insignificant, the need for the employment of models was naturally less imperative; indeed, there are self-evident advan- tages in comprehending things without resort to complicated models, which are difficult to make, and cannot be altered and adapted to extremely varied conditions so readily as can the easily adjusted symbols of thought, conception and calculation. Yet as the facts of science increased in number, the greatest economy of effort had to be observed in comprehending them and in conveying them to others; and the firm establishment of ocular demonstration was inevitable in view of its enormous superiority over purely abstract symbolism for the rapid and complete exhibition of complicated relations. At the present time it is desirable, on the one hand, that the power of deducing results from purely abstract premisses, without recourse to the aid of tangible models, should be more and more perfected, and on the other that purely abstract conceptions should be helped by objective and comprehensive models in cases where the mass of matter cannot be adequately dealt with directly.

In pure mathematics, especially geometry, models constructed of papier-mache and plaster are chiefly employed to present to the senses the precise form

of geometrical figures, surfaces and curves. Surfaces of the second order, repre- Models la sented by equations of the second degree between Mathematics the rectangular co-ordinates of a point, are very and Physics. simple to classify, and accordingly all their possible forms can easily be shown by a few models, which, however, become somewhat more intricate when lines of curvature, loxodromics and geodesic lines have to appear on their surfaces. On the other hand, the multiplicity of surfaces of the third order is enormous, and to convey their fundamental types it is necessary to employ numerous models of complicated, not to say hazardous, construction. In the case of more intricate surfaces it is sufficient to present those singularities which exhibit variation from the usual type of surface with synclastic or anticlastic curvatures, such as, for example, a sharp edge or point, or

an intersection of the surface with itself; the elucidation of such singularities is of fundamental importance in modern mathematics.

In physical science, again, models that are of unchangeable form are largely employed. For example, the operation of the refraction of light in crystals can be pictured if we imagine a point in the centre of the crystal whence light is dispersed in all directions. The aggregate of the places at which the light arrives at any instant after it has started is called the wave- front. This surface consists of two cups or sheets fitting closely and exactly one inside the other. The two rays into which a single ray is broken are always determined by the points of contact of certain tangent-planes drawn to those sheets. With crystals possessing two axes these wave-surfaces display peculiar singularities in the above sense of the term, in that the inner sheet has four protuberances, while the outer has four funnel-like depressions, the lowest point of each

depression meeting the highest point of each protuberance. At each of these funnels there is a tangent-plane that touches not in a single point, but in a circle bounding the depression, so that the corresponding ray of light is refracted, not into two rays, but into a whole cone of light — the so-called conical refraction theoretically predicted by Sir W. R. Hamilton and experimentally detected by Humphrey Lloyd. These conditions, which it is difficult to adequately express in language, are self-evident so soon as the wave-surface formed in plaster lies before our eyes. In thermodynamics, again, similar models serve, among other purposes, for the representation of the surfaces which exhibits the relation between the three thermodynamic variables of a body, e.g. between its temperature, pressure and volume. A glance at the model of such a thermodynamic surface enables the behaviour of a particular substance under the most varied conditions to be immediately realized. When the ordinate intersects the surface but once a single phase only of the body is conceivable, but where there is a multiple intersection various phases are possible, which may be liquid or gaseous. On the boundaries between these regions lie the critical phases, where transition occurs from one type of phase into the other. If for one of the elements a quantity which occurs in calorimetry be chosen — for example, entropy — information is also gained about the behaviour of the body when heat is taken in or abstracted.

After the stationary models hitherto considered, come the manifold forms of moving models, such as are used in geometry, to show the origin of geometrical figures from the motion of others — e.g. the origin of surfaces from the motion of lines. These include the thread models, in which threads are drawn tightly between movable bars, cords, wheels, rollers, &c. In mechanics and engineering an endless variety of working models are employed to convey to the eye the working either of machines as a whole, or of their component and subordinate parts. In theoretical mechanics models are often

used to exhibit the physical laws of motion in interesting or special cases — e.g. the motion of a falling body or of a spinning-top, the movement of a pendulum on the rotating earth, the vortical motions of fluids, &c. Akin to these are the models which exe- cute more or less exactly the hypothetical motions by which it is sought to explain various physical phenomena — as, for instance, the complicated wave-machines which present the motion of the particles in waves of sound (now ascertained with fair accuracy), or the more hypothetical motion of the atoms of the aether in waves of light.

The varying importance which in recent times has been attached to models of this kind is intimately connected with Theories of the changes which have taken place in our con- Nature. ceptions of nature. The first method by which an attempt was made to solve the problem of the universe was entirely under the influence of Newton's laws. In ana- logy to his laws of universal gravitation, all bodies were conceived of as consisting of points of matter — atoms or mole- cules — to which was attributed a direct action at a distance. The circumstances of this action at a distance, however, were conceived as differing from those of the Newtonian law of attrac-

tion, in that they could explain the properties not only of solid elastic bodies, but also those of fluids, both liquids and gases. The phenomena of heat were explained by the motion of minute particles absolutely invisible to the eye, while to explain those of light it was assumed that an impalpable medium, called luminiferous aether, permeated the whole universe; to this were attributed the same properties as were possessed by solid bodies, and it was also supposed to consist of atoms, although of a much finer composition. To explain electric and magnetic phenomena the assumption was made of a third species of matter — electric fluids which were conceived of as being more of the nature of fluids, but still consisting of infinitesimal particles, also acting directly upon one another at a distance. This first phase of

theoretical physics may be called the direct one, in that it took as its principal object the investigation of the internal structure of matter as it actually exists. It is also known as the mechanical theory of nature, in that it seeks to trace back all natural phenomena to motions of infinitesimal particles, i.e. to purely mechanical phenomena. In explaining magnetic and electrical phenomena it inevitably fell into somewhat artificial and improbable hypotheses, and this induced J. Clerk Maxwell, adopting the ideas of Michael Faraday, to propound a theory of electric and magnetic phenomena which was not only new in substance, but also essentially different in form. If the mole- cules and atoms of the old theory were not to be conceived of as exact mathematical points in the abstract sense, then their true nature and form must be regarded as absolutely unknown, and their groupings and motions, required by theory, looked upon as simply a process having more or less resemblance to the workings of nature, and representing more or less exactly certain aspects incidental to them. With this in mind, Maxwell propounded certain physical theories which were purely mechanical so far as they proceeded from a conception of purely mechanical pro- cesses. But he explicitly stated that he did not believe in the existence in nature of mechanical agents so constituted, and that he regarded them merely as means by which phenomena could be reproduced, bearing a certain similarity to those actually existing, and which also served to include larger groups of phenomena in a uniform manner and to determine the relations that held in their case. The question no longer being one of ascertaining the actual internal structure of matter, many mechanical analogies or dynamical illustrations became avail- able, possessing different advantages; and as a matter of fact Maxwell at first employed special and intricate mechanical arrangements, though later these became more general and indefinite. This theory, which is called that of mechanical analogies, leads to the construction of numerous mechanical models. Maxwell himself and his followers devised many kine- matic

models, designed to afford a representation of the mechani- cal construction of the ether as a whole as well as of the separate mechanisms at work in it : these resemble the old wave-machines, so far as they represent the movements of a purely hypothetical mechanism. But while it was formerly believed that it was allowable to assume with a great show of probability the actual existence of such mechanisms in nature, yet nowadays philo- sophers postulate no more than a partial resemblance between the phenomena visible in such mechanisms and those which appear in nature. Here again it is perfectly clear that these models of wood, metal and cardboard are really a continuation and integration of our process of thought; for, according to the view in question, physical theory is merely a mental construction of mechanical models, the working of which we make plain to ourselves by the analogy of mechanisms we hold in our hands, and which have so much in common with natural phenomena as to help our comprehension of the latter.

Although Maxwell gave up the idea of making a precise investigation into the final structure of matter as it actually is, yet in Germany his work, under G. R. Kirchhoff's lead, was carried still further. Kirchhoff defined his own aim as being to describe, not to explain, the world of phenomena; but as he leaves the means of description open his theory differs little from Maxwell's, so soon as recourse is had to description bv

means of mechanical models and analogies. Now the resources of pure mathematics being particularly suited for the exact description of relations of quantity, Kirchhoff 's school laid great stress on description by mathematical expressions and formulae, and the aim of physical theory came to be regarded as mainly the construction of formulae by which phenomena in the various branches of physics should be determined with the greatest approximation

to the reality. This view of the nature of physical theory is known as mathematical phenomenology; it is a presentation of phenomena by analogies, though only by such as may be called mathematical.

Another phenomenology in the widest sense of the term, maintained especially by E. Mach, gives less prominence to mathematics, but considers the view that the phenomena of motion are essentially more fundamental than all the others to have been too hastily taken. It rather emphasizes the prime importance of description in the most general terms of the various spheres of phenomena, and holds that in each sphere its own fundamental law and the notions derived from this must be employed. Analogies and elucidations of one sphere by another — e.g. heat, electricity, &c. — by mechanical conceptions, this theory regards as mere ephemeral aids to perception, which are necessitated by historical development, but which in course of time either give place to others or entirely vanish from the domain of science.

All these theories are opposed by one called energetics (in the narrower sense), which looks upon the conception of energy, not that of matter, as the fundamental notion of all scientific investigation. It is in the main based on the similarities energy displays in its various spheres of action, but at the same time it takes its stand upon an interpretation or explanation of natural phenomena by analogies which, however, are not mechanical, but deal with the behaviour of energy in its various modes of manifestation.

A distinction must be observed between the models which have been described and those experimental models which pre- Experi- sen t on a small scale a machine that is subsequently mental to be completed on a larger, so as to afford a trial of Models. jt s capabilities. Here it must be noted that a mere alteration in dimensions is often sufficient to cause a material alteration in the action, since the various capabilities depend in various ways on the linear dimensions. Thus the weight varies as the

cube of the linear dimensions, the surface of any single part and the phenomena that depend on such surfaces are pro- portionate to the square, while other effects — such as friction, expansion and conduction of heat, &c, vary according to other laws. Hence a flying-machine, which when made on a small scale is able to support its own weight, loses its power when its dimensions are increased. The theory, initiated by Sir Isaac Newton, of the dependence of various effects on the linear dimen- sions, is treated in the article Units, Dimensions of. Under simple conditions it may often be affirmed that in comparison with a large machine a small one has the same capacity, with reference to a standard of time which must be diminished in a certain ratio.

Of course experimental models are not only those in which purely mechanical forces are employed, but also include models of thermal, electro-magnetic and other engines — e.g. dynamos and telegraphic machines. The largest collection of such models is to be found in the museum of the Washington Patent Office. Sometimes, again, other than purely mechanical forces are at work in models for purposes of investigation and instruction. It often happens that a series of natural processes — such as motion in liquids, internal friction of gases, and the conduction of heat and electricity in metals — may be expressed by the same differential equations; and it is frequently possible to follow by means of measurements one of the processes in question — e.g. the conduction of electricity just mentioned. If then there be shown in a model a particular case of electrical conduction in which the same conditions at the boundary hold as in a problem of the internal friction of gases, we are able by measuring the electrical conduction in the model to determine at once the

numerical data which obtain for the analogous case of internal friction, and which could only be ascertained otherwise by intri- cate calculations. Intricate calculations, moreover, can very often be dispensed with by the aid of mechanical devices, such as the ingenious calculating machines which

perform additions and subtractions and very elaborate multiplications and divi- sions with surprising speed and accuracy, or apparatus for solving the higher equations, for determining the volume or area of geometrical figures, for carrying out integrations, and for developing a function in a Fourier's series by mechanical means. (L. Bo.)

MODELS, ARTISTS', the name given to persons who pose to artists as models for their work. The Greeks, who had the naked body constantly before them in the exercises of the gymnasium, had far less need of professional models than the moderns; but it is scarcely likely that they could have attained to the high level reached by their works without constant study from nature; and the story told of Zeuxis by Valerius Maximus, who had five of the most beautiful virgins of the city of Crotona offered him as models for his picture of Helen, proves their occasional use. The remark of Eupompus, quoted by Pliny, who advised Lysippus, " Let nature be your model, not an artist," directing his attention to the crowd instead of to his own work, also suggests a use of models which the many portrait statues of Greek and Roman times show to have been not unknown. In Egypt, too, although the priesthood had control of both sculpture and painting as used for the decoration of temples and palaces, and imposed a strict conventionalism, there are several statues of the early periods which are so lifelike in their treatment as to make it certain that they must have been worked from life. At the period of the Renaissance, painters generally made use of their relations and friends as models, of which many examples might be quoted from Venice, Florence, Rome and other places, and the stories of Titian and the duchess of Ferrara, and Botti- celli and Simonetta Vespucci, go to show that ladies of exalted rank were sometimes not averse from having their charms immortalized by the painter's brush. But paid models were not unknown, as the story of the unfortunate contadino used by Sansovino as model for his statue of the little Bacchus will show. Artists' models as a special class appear when the establishment of

schools for the study of the human figure created a regular demand, and since that time the remuneration offered has ensured a continual supply. The prices and the hours of work vary in different art centres. In England seven shillings is generally paid for a day of six hours, but models of exceptional beauty or talent frequently obtain more from successful artists or wealthy amateurs.

MODEL-YACHTING, the pastime of building and racing model-yachts. It has always been customary for ship-builders to make a miniature model of the vessel under construction, which is in every respect a copy of the original on a small scale, whether steam-ship or sailing-vessel (there is a fine collection in the Victoria and Albert Museum, London). Many of these models are of exquisite workmanship, every rope, pulley or portion of the engine being faithfully reproduced. In the case of sailing yachts these models were often pitted against each other on small bodies of water, and hence arose the modern pastime. It was soon seen that elaborate fittings and complicated rigging were a detriment to rapid handling, and that, on account of the comparatively stronger winds in which models were sailed, they needed a greater draught. For these reasons modern model yachts, which usually have fin-keels, are of about 15% or 20% deeper draught than full-sized vessels, while rigging and fittings have been reduced to absolute simplicity. This applies to models built for racing and not to elaborate copies of steamers and ships, made only for show or for " toy cruising."

Model-yacht clubs have existed for many years in Great Britain, Ireland and the United States, most of them holding a number of regattas during each season. The rules do not generally require the owner or skipper of a model to build his own craft, but among model-yachtsmen the designing and the construction of the boats constitute as important and interesting

MODENA

a part of the sport as the actual sailing. Models are constructed of some light, seasoned wood — such as pine (preferably white), white cedar or mahogany — free from knots. The hull may either be hollowed out of a solid block of wood, or cut from layers of planks in the so-called ” bread-and-butter ” style, or planked over a frame of keel and cross-sections. The first two methods are used in constructing ” dug-out ” models. Hollowing out from the solid block entails a great deal of labour and has there- fore fallen into disfavour. In the ” bread-and-butter ” style a number of planks, which have been shaped to the horizontal sections of the model and from which the middle has been sawn out, are glued together and then cut down to the exact lines of the design, templates being used to test the precision of the curves. In the planked, or ” built-up ” model, which is generally chosen by more expert builders, the planks are tacked to the frame, as in the construction of large vessels. Models now are generally exaggerated cutters, so far as their under- bodies are concerned, or, more often, are fitted with fin-keels weighted with lead, after the manner of full-sized yachts. They may have any rig, but schooner and sloop rigs are most common, the latter being the favourite for racing on account of its simplicity. Two kinds of steering-gear are used, the weighted swinging rudder and the ” main-sheet balance gear,” the object of both being to keep the model on a true course, either before or against the wind. Models are often sailed without rudders, but though a perfectly built boat will sail readily against the wind without steering-gear, it is almost impossible to keep it on its course before the wind without some contrivance to check divergence. This is accomplished by the weighted rudder, which falls over when the vessel heels and tends to counteract the force of the breeze. There are two varieties of the weighted rudder, in the first of which the weight, usually lead, is fixed to the edge of the rudder, while in the second the weight, usually a ball of lead, is made to run on the tiller above the

deck, so that it can be placed further forward or aft, according to the force needed to overcome the influence of the wind. While the weighted rudder is almost universal in the British Isles, the chief model-yachtsmen in America use the ” main-sheet balance gear,” in which the boom is connected with the tiller in such a manner that, when it swings out with a pressure of wind, the rudder is automatically pulled round sufficiently to keep the yacht in its course. This apparatus is particularly efficient in sailing before the wind.

Model-yacht regattas are very different from the toy-boat matches indulged in by children from one side of a pond to the other. They take place upon sufficiently large bodies of water to allow a course at least a quarter of a mile, in length, which is generally sailed twice* or three times over to windward and back- ward. Triangular courses are also sailed. Racing rules corre- spond generally to those controlling regattas of large boats, and there is full scope to exhibit all the proofs of good seamanship. The yachts are followed in light skiffs, and may not be touched more than a certain number of times during a race, on penalty of a handicap. Racing measurements differ in the various clubs, but all are based upon length and sail-area. In Great Britain the regular Yacht Racing Association rule has been generally adopted, and handicaps deducted from it. In America models are divided into a single schooner with a maxi- mum load water-line of 63 in., and three classes of sloops, the first class including yachts with water-lines between 48 and 53 in., the second class those between 42 and 48 in. and the third and smallest class those between 35 and 42 in. A yacht with a shorter water-line than 35 in. must race in the third class. It has been found that yachts of smaller dimensions possess too little resistance to the wind.

See Model Sailing Yachts, in Marshall’s Practical Manuals series, 1905; and How to Build a Model Yacht, by Herbert Fisher (New York, 1902).

MODENA (ancient Mutina), one of the principal cities

of

Emilia, Italy, the chief town of the province of Modena and the

seat of an archbishop, 31 m. E.S.E. of Parma by rail. Pop.

£1906), 26,847 (town); 66,762 (commune). It is situated in a

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damp, low plain in the open country in the south side of the valley of the Po, between the Secchia to the west and the Panaro to the east. Some of its main streets (as their names indicate) follow the lines of canals, which still (though now covered) traverse the city in various directions. The observatory stands 135 ft. above the level of the sea. Dismantled since 18 16, and now largely converted into promenades, the fortifications give the city an irregular pentagonal contour, modified at the north-west corner by the addition of a citadel also pentagonal Within this circuit there are various open areas — the spacious Ippodromo in front of the citadel, the public gardens in the north-east of the city, the Piazza Grande in front of the cathedral, and the Piazza Reale to the south of the palace. The Via Aemilia passes obliquely right through the heart of the city, from the Bologna Gate in the east to that of Sant' Agostino in the west.

Begun by the Countess Matilda of Tuscany in 1099, after the designs of Lanfranc, and consecrated in 1184, the Romanesque cathedral (S Geminiano) is a low but handsome building, with a lofty crypt, under the choir (characteristic of the Tuscan Romanesque architecture), three eastern apses, and a facade still preserving some curious sculptures of the 12th century. The interior was restored in 1897. The graceful bell-tower, erected in 1224-1319, named La Ghirlandina from the bronze garland surrounding the weathercock, is 335 ft. high; in the base- ment may

be seen the wooden bucket captured by the Modenese from the Bolognese in the affray at Zappolino (1325), and rendered famous by Tassoni's Secchia Rapita. Of the other churches in Modena, the church of S Giovanni Decollato contains a Pieta in painted terra-cotta by Guido Mazzoni (1450-1518). The so-called Pantheon Estense (the church of S. Agostino, containing works of sculpture in honour of the house of Este) is a baroque building by Bibbiena; it also contains the tombs of Sigonio and Muratori. San Pietro and San Francesco have terra-cottas by Begarelli (1498-1565). The old ducal palace, begun by Duke Francis I. in 1635 from the designs of Avanzini, and finished by Francis Ferdinand V., is an extensive building with a fine courtyard, and now contains the military school and the observatory. The Albergo d' Arti, built by Duke Francis III., accommodates the civic collections, comprising the Museo Lapidario (Roman inscriptions, &c.) ; the valuable archives, the Biblioteca Estense, with 90,000 volumes and 3000 MSS.; the Museo Civico, with large and good palaeo-ethnological and archaeological collections; a fine collection of textile fabrics, and the picture gallery, a good representative collection presented to the city by Francis V. and since augmented by the addition of the collection of the Marchese Campori. Many of the best pictures in the ducal collection were sold in the 18th century and found their way to Dresden. The town hall is a noteworthy building, with arcades dating from 1194, but in part rebuilt in 1826. The university of Modena, originally founded in 1683 by Francis II., is mainly a medical and legal school, but has also a faculty of physical and mathematical science. The old academy of the Dissonanti, dating from 1684, was restored in 1814, and now forms the flourishing Royal Academy of Science and Art. In industrial enterprise silk and linen goods and iron wares are almost the only products of any note. Commerce is chiefly agricultural and is stimulated by a good position in the railway system, and by a canal which opens a water-way by the Panaro and the Po to the Adriatic. Modena is the point at which the railway to Mantua and Verona diverges from that

between Milan and Bologna, and has several steam tramways to neighbouring places. It is also the starting-point of a once important road over the Apennines to Pistoia by the Abetone Pass.

Modena is the ancient Mutina in the territory of the Boh, which came into the possession of the Romans probably in the war of 215-212 B.C. In 183 B.C. Mutina became the seat of a Roman colony. The Roman town lay immediately to the south- east of the modern; its north-western wall is marked by the modern Corso Umberto I. (formerly Canal Grande) It appears to have been a place of importance under the empire, but none of its buildings is now to be seen. The Roman !evel, indeed,,

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is some 15 to 20 ft. below the modern town. Its vineyards and potteries are mentioned by Pliny, the latter doing a considerable export trade. Its territory was coterminous with that of Bononia and Regium, as its diocese is now, and to the south it seems to have extended to the summit of the Apennines. During the civil wars Marcus Brutus, the lieutenant of Lepidus, held out within its walls against Pompeius in 78 B.C., and in 44 B.C. the place was successfully defended by D. Brutus against Mark Antony for four months. The 4th century found Mutina in a state of decay; the ravages of Attila and the troubles of the Lombard period left it a ruined city in a wasted land. In the 7th century, perhaps owing to a terrible inundation, 1 its exiles founded, at a distance of 4 m. to the north-west, a new city, Citta. Geminiana (still represented by the village of Cittanova) ; but about the close of the 9th century Modena was restored and refortified by its bishop, Ludovicus. When it began to build its cathedral (a.d. 1099) the city was part of the possessions of the Countess Matilda of Tuscany; but when, in 1184, the edifice was consecrated by Lucius

III., it was a free community. In the wars between Frederick II. and Gregory IX. it sided with the emperor, though ultimately the papal party was strong enough to introduce confusion into its policy. In 1288 Obizzo d'Este was recognized as lord of the city; after the death of his successor, Azzo VIII. (1308), it resumed its communal independence; but by 1336 the Este family was again in power. Constituted a duchy in 1452 in favour of Borso d'Este, and enlarged and strengthened by Hercules II., it became the ducal residence on the incorporation of Ferrara with the States of the Church (1598). Francis I. (1629–1658) erected the citadel and commenced the palace, which was largely embellished by Francis II. Rinaldo (ob. 1737) was twice driven from his city by French invasion. To Francis III. (1698–1780) the city was indebted for many of its public buildings. Hercules III. (1727–1803) saw his states transformed by the French into the Cispadine Republic, and, having refused the principality of Breisgau and Ortenau, offered him in compensation by the treaty of Campo Formio, died an exile at Treviso. His only daughter, Maria Beatrice, married Ferdinand of Austria (son of Maria Theresa), and in 1814 their eldest son, Francis, received back the Stati Estensi. His rule was subservient to Austria, reactionary and despotic. On the outbreak of the French Revolution of 1830, Francis IV. seemed for a time disposed to encourage the corresponding movement in Modena; but no sooner had the Austrian army put an end to the insurrection in Central Italy than he returned to his previous policy. Francis Ferdinand V., who succeeded in 1846, followed in the main his father's example. Obliged to leave the city in 1848, he was restored by the Austrians in 1849; ten years later, on the 20th of August 1859, the representatives of Modena declared their territory part of the kingdom of Italy, and their decision was confirmed by the plebiscite of i860.

See Vedriani, Storia di Modena (1666) ; Tiraboschi, Mem. storiche modenesi (1793); Scharfenberg, Gesch. des Herzogth. Modena (1859) ; Oreste Raggi, Modena descritta (i860); Baraldi, Storia di Modena;

Valdrighi, Diz. Storico, &c, delle contrade di Modena (1798-1880); Crespellani, Guida di Modena (1879); Cavedoni, Dichiarazione degli antici marmi Modenesi (1828).

MODERATOR (from Lat. moderare, to impose a modus, limit), a judge or umpire, one who acts the part of mediator, and so a term \ised of the person chosen to be president of a meeting (as in America, of a town meeting). In academic use, the word was formerly applied to the public officer who presided over the exercises, &c, prescribed forcandidates for degrees in the univer- sity schools; it is now used at Cambridge of one or two officers who are appointed each year to preside over the examination for the mathematical tripos, at Oxford of an examiner in the first public examination, known as ” moderations,” and at Dublin of a candidate for honours in the examination for degree of Bachelor of Arts. In the Presbyterian churches the name is applied to the minister elected to preside over ecclesiastical meetings or assemblies, as the synod, presbytery or general

1 Some authorities (of whom Tiraboschi was the first) attribute its desertion entirely to a succession of inundations, denying that it was even among the cities destroyed by Attila.

assembly (see Presbyterianism). The name was historically given to a party of people who joined together to oppose the “Regulators,” another party who professed to administer jus- tice in the Carolinas (1767-1771). Technically, the word is also used of a particular form of lamp, in which the flow of oil from the reservoir to the burner is regulated by a mechanical arrangement to which the name is applied.

MODERATUS OF GADES, a Greek philosopher of the Neo-Pythagorean school, contemporary with Apollonius of Tyana. He wrote a great work on the doctrines of the Pythagoreans, and tried to show that the successors of Pythagoras had made no additions to the views of their founder, but ha-d merely borrowed and altered

the phraseology. He has been given a fictitious importance by recent commentators, who have regarded him as the forerunner of the Alexandrian School of philosophy. Zeller has shown that the authority on which this view is based is entirely unsound. Moderatus is thus left as an unimportant ‘ though interesting representative of a type of thought which had almost disappeared since the 5th century B.C.

Stobaeus, Eclogae, p. 3, preserves a fragment of his writings.

MODESTINUS, HERENNIUS, a celebrated Roman jurist, who flourished about 250 B.C. He appears to have been a native of one of the Greek-speaking provinces, probably Dalmatia, and was a pupil of Ulpian. In Valentinian’s Law of Citations he is classed with Papinian, Paulus, Gaius and Ulpian. He is mentioned in a rescript of Gordian in the year 240 B.C. in connexion with a responsum which he gave to the party to whom the rescript was addressed. No fewer than 345 passages in the Digest are taken from his writings.

MODICA, a town of Sicily, in the province of Syracuse, 57 m. W.S.W. of Syracuse by rail and $s m. direct. Pop. (1901), 48,962. It lies on a hill between two valleys; the hill, crowned by the church of S. Giorgio, reconstructed in the 17th century, was the site of the Sicel town of Motyca, while the modern part of the town extends along the river Mauro, an inundation of which did much damage in September 1902. Remains of mega- lithic buildings, apparently, however, houses of the Byzantine period, are described in Notizie degli Scavi, 1896, 242 seq. Six miles to the south-east is the valley known as the Cava d’Ispica. with hundreds of grottoes cut in its rocky sides; of these only ? few are Sicel tombs, the majority being catacombs or open tombs of the early Christian and Byzantine periods, or even cave-dwellings of the latter age.

See P. Orsi in Notizie degli Scavi (1905), 431.

MODILLION (a French word, probably from Lat. modulus, a measure of proportion), a term in architecture for the enriched block or horizontal bracket generally found under the cornice and above the bedmould of the Corinthian entablature. It is probably so called because of its arrangement in regulated distances.

MODJESKA, HELENA (1844–1909), Polish actress, was born at Cracow on the 12th of October 1844. Her father, Michael Opido, was a musician, and her tastes soon declared themselves strongly in favour of a dramatic career; but it was not until after her marriage in 1861 that she first attempted to act, and then it was with a company of strolling players. Her husband (whose name, Modrzejewski, she simplified for stage purposes) died in 1865. In 1868 she married Count Bozenta Chlapowski, a Polish politician and critic, and almost immediately afterwards received an invitation to act at Warsaw. There she remained for seven or eight years, and won a high position in her art. Her chief tragic roles were Ophelia, Juliet, Desdemona, Queen Anne in Richard III., Louisa Miller, Maria Stuart, Schiller's Princess Eboli, Marion Delorme, Victor Hugo's Tisbe and Slowacki's Mazeppa. In comedy her favourite roles were Beatrice in Much Ado About Nothing, and Donna Diana in the Polish trans- lation of an old Spanish play of that name. Madame Modjeska was also the Polish interpretress of the most prominent plays of Legouve, Dumas, father and son, Augier, Alfred de Musset, Octave Feuillet and Sardou. In 1876 she went with her husband to California, where they settled on a ranch. This new career, however, proved a failure, and Madame Modjeska returned to

the stage. She appeared in San Francisco in 1877, in an English version of Adrienne Lecouvreur, and, in spite of her imperfect command of the language, achieved a remarkable success. She continued to act

principally in America, but was also seen from time to time in London and elsewhere in the United Kingdom, her repertory including several Shakespearian roles and a variety of emotional parts in modern drama. She died on the 9th of April 1909 at her home near Los Angeles, California.

See Mabel Collins, The Story of Helena Modjesha (London, 1883), and the (autobiographical) Memories and Impressions (New York, 1910).

MODLING, an old town of Austria, in Lower Austria, 10 m. S. of Vienna by rail. Pop. (1900), 15,304. It is situated at the entrance of the Briihl valley and is a popular summer resort, possessing iron and sulphur baths. It possesses a Gothic church, with a crypt dating from the 15th century, and a still older Romanesque burial chapel. It has a considerable iron and metal industry, and manufactures of shoes, varnish, &c.

MODOC {i.e. “southerners”), a tribe of North American Indians of the Lutuamian stock, who formerly lived around Lower Klamath Lake, south-western Oregon. They were always an aggressive people, and constantly at war with their neighbours. They are known mainly from their stubborn resistance to the United States government in 1872 and 1873. This is called the Modoc War, and was caused by an attempt to place them on a reservation. After some preliminary fighting the Modocs retreated to the ” Lava Beds,” a basaltic region, seamed and crevassed, and rich in caves. Here they made a stand for several months. During the war two members of a peace commission were treacherously massacred by them while under a flag of truce. On their final submission the leaders were hanged and part of the tribe was removed to Indian Territory (now Oklahoma), and the others were sent back to a reservation on the Klamath.

MODULE (Lat. modulus, a measure), in architecture, the semi- diameter of the column at its base; the term was first set forth by Vitruvius (iv. 3), and was generally employed by the archi- tects of the

Italian revival to determine the relative proportions of the various parts of a columnar ordinance. The module was divided by the revivalists into thirty parts, called minutes, allowing of much greater accuracy than was thought necessary by Vitruvius, whose subdivision was usually six parts. The tendency now is to adopt the whole diameter instead of the semi-diameter when determining the height of the column or entablature or any of their subdivisions. The term module is also applied in hydraulics (q.v.) to a contrivance for regulating the supply of water from an irrigation channel.

MOERIS, AELIUS, Greek grammarian, surnamed Atticista (" the Atticist "), probably flourished in the 2nd century a.d. He was the author of an extant (more or less alphabetical) list of Attic forms and expressions ('Attwch Xe£«is), accompanied by the Hellenistic parallels of his own time, the differences of gender, accent and meaning being clearly and succinctly pointed out.

Editions by J. Hudson (1711); J. Pierson (1759); A. Koch (1830); I. Bekker (1833) ; with Harpocration.

MOERIS, LAKE OF, the lake which formerly filled the deep depression of the Fayum to the Nile level, now shrunken and sunk more than 200 ft. to the shallow Birket el Kerun. In remote prehistoric times the Fayum depression was probably dry, but with the gradual rise of the river bed the high Nile reached a level at which it could enter through the natural or artificial channel now known as the Bahr Yusuf. The borders of the lake were occupied by a neolithic people, and the town of Crocodilo- polis grew up very early on the eastern slope south of the channel, where the higher ground formed a ridge in the lake. The rise continuing (at the rate of about 4 in. to the century) the waters threatened to flood the town; consequently under the XHth Dynasty great embankments were made to save the settled land from encroachment. The line of the embankment is still trace- able in places and marked by monuments of the XHth Dynasty kings, an obelisk of Senwosri I. at Ebgig, and colossi of Amenemhe III. at Biahmu. The

latter ornamented the quay

of the port of Crocodilopolis, and projected into the lake on high bases. As the Nile fell the broad expanse of the lake lowered, and the water pouring back through the channel was of value for summer irrigation; the inflow and outflow were regulated by sluices, and the capture of fish here and in the lake was enormous. The channel which was of such importance was called the ” Great Channel,” Mewer, in Greek Moeris. The native name of the lake was Shei, ” the lake,” later Piom, ” the sea ” (whence Fayum) ; Teshei, ” the land of the lake,” was the early name of the region. At its capital Crocodilopolis and elsewhere the crocodile god Sobk (Suchus) was worshipped. Senwosri II. of the XHth Dynasty built his pyramid at Illahun at the outer end of the channel, Amenemhe III. built his near the inner end at Hawara, and the vast labyrinth attached to it was probably his funerary temple. This king was afterwards worshipped in more than one locality about the lake under the name Marres (his praenomen Nemare) or Peremarres, i.e. Pharaoh Marres. The mud poured in at high Nile made rich deposits on the eastern slope; in the reign of Philadelphus large reclamations of land were made, veterans from the Syrian War were settled in the ” Lake ” (Ai/xv-q), and the latter quickly became a populous and very fertile province. Strabo’s account of the Lake of Moeris must be copied from earlier writers, for in his day the outflow had been stopped probably for two centuries, and the old bed of the lake was dotted with flourishing villages to a great depth below the level of the Nile. Large numbers of papyri of the Ptolemaic and Roman periods have been found in and about the Fayum, which continued to flourish through the first two centuries of the Roman rule.

See W. M. F. Petrie, Hawara Biahmu and Arsinoe (London, 1889) ; R. H. Brown, The Fayum and Lake Moeris (London, 1892); B. P. Grenfell, A. S. Hunt and D. G. Hogarth, Fayum Towns and their Papyri (London, 1900); H. J. C. Beadnell, The Topography and Geology of the Fayum Province of Egypt (Cairo, 1905). (F. Ll. G.)

MOESIA (Gr. Mvala and Mvala 17 h> Etiponrj?, to distinguish it from Mysia in Asia), in ancient geography, a district inhabited by a Thracian people, bounded on the S. by the mountain ranges of Haemus and Scardus (Scordus, Scodrus), on the W. by the Drinus, on the N. by the Danube and on the E. by the Euxine. It thus corresponded in the main to the modern Servia and Bul- garia. In 75 b.c, C. Scribonius Curio, proconsul of Macedonia, penetrated as far as the Danube, and gained a victory over the inhabitants, who were finally subdued by M. Licinius Crassus, grandson of the triumvir and also proconsul of Macedonia, during the reign of Augustus c. 29 B.C. (see Mommsen, Provinces of the Roman Empire, Eng. trans., i. 12-14). The country, however, was not organized as a province until the last years of the reign; in a.d. 6 mention is made of its governor, Caecina Severus (Dio Cassius lv. 29). The statement of Appian (Illyrica, 30) that it did not become a Roman province until the time of Tiberius, is therefore incorrect. Originally one province, under an imperial consular legate (who probably also had control of Achaea and Macedonia), it was divided by Domitian into Upper (superior) and Lower (inferior, also called Ripa Thracia) Moesia, the western and eastern portions respectively, divided from each other by the river Cebrus (Ciabrus; mod. Cibritza or Zibru). Some, however, place the boundary further west. Each was governed by an imperial consular legate and a procurator. As a frontier province, Moesia was strengthened by stations and fortresses erected along the southern bank of the Danube, and a wall was built from Axiopolis to Tomi as a protection against Scythian and Sarmatian inroads. After the abandon- ment of Dacia (q.v.) to the barbarians by'Aurelian (270-275) and the transference of its inhabitants to the south of the Danube, the central portion of Moesia took the name of Dacia Aureliani (again divided into Dacia ripensis and interior). The district called Dardania (in Upper Moesia), inhabited by the Ulyrian Dardani, was formed into a special province by Diocletian with capital Naissus (Nissa or Nish), the birthplace of Constantine the Great. The Goths, who

had already invaded Moesia in 250, hard pressed by the Huns, again crossed the Danube during the reign of Valens (376), and with his permission settled in

Moesia. But quarrels soon took place, and the Goths under Fritigern defeated Valens in a great battle near Adrianople (378). These Goths are known as Moeso-Goths, for whom Ulfilas made the Gothic translation of the Bible. In the 7th century Slavs and Bulgarians entered the country and founded the modern kingdoms of Servia and Bulgaria. The chief towns of Upper Moesia were: Singidunum (Belgrade), Viminacium (sometimes called municipium Aelium; Kostolatz), Bononia (Widdin), Ratiaria (Artcher): of Lower Moesia; Oescus (colonia Ulpia, Gigen), Novae (near Sistova, the chief seat of Theodoric), Nicopolis ad Istrum (Nikup), really on the Iatrus or Yantra, Odessus (Varna), Tomi (Kustendje), to which the poet Ovid was banished. The last two were Greek towns, which, with Istros, Mesambria and Apollonia, formed a pentapolis.

See Orosius v. 23, 20; Livy, Epit.92, 134, 135; Dio Cassius li. 25-27 ; E. R. Rosier, Romanische Studien (Leipzig, 1871) ; T. Momm- sen, Corpus inscriptionum latinarum, iii. 141, 263; J. Marquardt, Romische Staatsverwaltung (1881), i. 301; H. Kiepert, Lehrbuch der alien Geographic (1878), §§ 298, 299; article in Smith's Dictionary of Greek and Roman Geography (1873). G- H. F.)

MOFADDALlYAT, strictly MufaddalIyat, an anthology of ancient Arabic poems, which derives its name from al-Mufaddal, son of Muhammad, son of Ya'la, a member of the tribe of Pabba, who compiled it some time between a.d. 762 and 784 in the latter of which years he died. Al-Mufaddal was a contempo- rary of Hammad ar-Rawiya and Khalaf al-Ahmar, the famous collectors of ancient Arab poetry and tradition, and was some- what the junior of Abu 'Amr ibn al-'Ala, the first scholar who systematically set himself to

preserve the poetic literature of the Arabs. He died about fifty years before Abu ‘Ubaida and al-Asma’I, to whose labours posterity is largely indebted for the arrangement, elucidation and criticism of ancient Arabian verse; and his anthology was put together between fifty and sixty years before the compilation by Abu. Tammam of the lj.amasa (q.v.).

Al-Mufaddal was a careful and trustworthy collector both of texts and traditions, and is praised by ail authorities on Arabian history and literature as in this respect greatly the superior of Hammad and Khalaf, who are accused (especially the latter) of unscrupulous fabrication of poems in the style of the ancients. He was a native of Kufa, the northernmost of the two great military colonies founded in 638 by the caliph ‘Omar for the control of the wide Mesopotamian plain. In Kufa and Basra were gathered representatives of all the Arabian tribes who formed the fighting force of the Islamic Empire, and from these al-Mufaddal was able to collect and record the compositions of the poets who had celebrated the fortunes and exploits of their forefathers. He, no doubt, like al-Asma’I and Abu ‘Ubaida, also himself visited the areas occupied by the tribes for their camping grounds in the neighbouring desert; and adjacent to Kufa was al-Hira, the ancient capital of the Lakhmid kings, whose court was the most celebrated centre in pre-Islamic Arabia, where, in the century before the preaching of the Prophet, poets from the whole of the northern half of the peninsula were wont to assemble. There is indeed a tradition that a written collection (diwan) existed in the family of an-Nu’man, the last Lakhmid king, containing a number of poems by the Fuhvl, or most eminent poets of the pagan time, and especially by those who had praised the princes of the house, and that this collection passed into the possession of the Omayyad caliphs of the house of Marwan; to this, if the tradition is to be believed, al-Mufaddal probably had access.

The date of al-Mufaddal’s birth is unknown; but he lived for many years under the caliphs of the Omayyad line until their overthrow by the ‘Abbasids

in 749. In 762 he took part in the rising led by Ibrahim ibn ‘Abdallah ibn al-Hasan, the ‘Alid, called ” Tie Pure Soul,” against the caliph al-Mansur, and after the defeat and death of Ibrahim was cast into prison. Al- Mansiir, however, pardoned him on the intercession of his fellow- tribesman Musayyab ibn Zuhair of Dabba, and appointed him the instructor in literature of his son, afterwards the caliph al-Mahdl. It was for this prince that, at al-Mansur’s instigation, aJ-Mufaddal compiled the Mufaddaliyat.

The collection, in its present form, contains 126 pieces of

verse, xong and short; that is the number included in the recen- sion of al-Anbarl, who had the text from Abu Tkrima of Pabba, who read it with Ibn al-A’rabl, the stepson and inheritor of the tradition of al-Mufaddal. We know from the Fihrist of Muhammad an-Nadim (a.d. 988) that in his time 128 pieces were counted in the book; and this number agrees with that contained in the Vienna MS., which gives an additional poem, besides those annotated by al-Anbarl, to al-Muraqqish the Elder,and adds at the end a poem by al-Harith ibn Hilliza. The Fihrist states (p. 68) that some scholars included more and others fewer poems, while the order of the poems in the several recensions differed; but the correct text, the author says, is that handed down through Ibn al-A’rabl. It is noticeable that this traditional text, and the accompanying scholia, as represented by al-Anbari’s recension, are wholly due to the scholars of Krifa, to which place al-Mufaddal himself belonged. The rival school of Basra, on the other hand, has given currency to a story that the original collection made by al-Mufaddal included a much smaller number of poems. The Berlin MS. of al-Marzuql’s commentary states that the number was thirty, but a better reading of the passage, found elsewhere, 1 mentions eighty; and that al-Asma’I and his school added to this nucleus poems which increased the number to a hundred and twenty. It is curious that this tradition is ascribed by al-Marzuqi and his teacher Abu ‘All al-FarisI to Abu

Tkrima of Dabba, who is represented by al-Anbarl as the trans- mitter of the correct text from Ibn al-A'rabl. There is no men- tion of it in al-Anbari's work, and it is in itself somewhat im- probable, as in al-Asma'I's time the schools of Kufa and Basra were in sharp opposition one to the other, and Ibn al-A'rabl in particular was in the habit of censuring al-Asma'I's interpretations of the ancient poems. It is scarcely likely that he would have accepted his rival's additions to the work of his step-father, and have handed them on to Abu Tkrima with his annotations.

The collection is one of the highest importance as a record of the thought and poetic art of Arabia during the time imme- diately preceding the appearance of the Prophet. Not more than five or six of the 126 poems appear to have been composed by poets who had been born in Islam. The great majority of the authors belonged to the days of " the Ignorance," and though a certain number (e.g. Mutammim ibn Nuwaira, Rabl'a ibn Maqrum, 'Abda ibn at-Tablb and Abu Dhu'aib), born in paganism, accepted Islam, their work bears few marks of the new faith. The ancient virtues — hospitality to the guest and the poor, profuse expenditure of wealth, valour in battle, faithfulness to the cause of the tribe — are the themes of praise; wine and the game of maisir, forbidden by Islam, are celebrated by poets who professed themselves converts; and if there is no mention of the old idolatry, there is also little spirituality in the outlook on life. The 126 pieces are distributed between 68 poets, and the work represents a gathering from the compositions of those who were called al-Muqittun, " authors of whom little has survived," in contrast to the famous poets whose Works had been collected into diwans. At the same time" many of them are extremely celebrated, and among the pieces selected by al-Mufaddal several reach a very high level of excellence. Such are the two long poems of 'Alqama ibn 'Abada (Nos. 119 and 120), the three odes by Mutammim ibn Nuwaira (Nos. 9, 67, 68), the splendid poem of Salama ibn Jandal (No. 22), the beautiful

naslb of ash-Shanfara (No. 20), and the death-song of ‘Abd-Yaghtith (No. 30). One of the most admirable and famous is the last of the series (No. 126), the long elegy by Abu Dhu’aib of Hudhail on the death of his sons; almost every verse of this poem is cited in illustration of some phrase or meaning of a word in the national lexicons. Only one of the poets of the Muallaqdt (see Mo’ allakat) , al-Harith, son of HiHiza, is represented in the collection. Of others (such as Bishr ibn Abl Khazim, al-Hadira, ‘Amir ibn at-Tufail, ‘Alqamah ibn ‘Abadah, al-Muthaqqib, Ta’abbata Sharra and Abu Dhu’aib) diwans or bodies of collected poems exist, but it is doubtful how far these had been brought together when al-Mufaddal made

1 In the dhail or supplement to the Amad of al-Qall. (Edn. Cairo 1324 H., p. 131).

his compilation. An interesting feature of the work is the treat- ment in it of the two poets of Bakr ibn Wa'il, uncle and nephew, called al-Muraqqish, who are perhaps the most ancient in the collection. The elder Muraqqish was the great-uncle of Tarafa of Bakr, the author of the Mu'allaqa, and took part in the long warfare between the sister tribes of Bakr and Taghlib, called the war of Basus, which began about the end of the 5th century a.d. Al-Mufaddal has included ten pieces (Nos. 45-54) by him in the collection, which are chiefly interesting from an antiquarian point of view. One, in particular (No. 54), presents a very archaic appearance. It is probable that the compiler set down all he could gather of this ancient author, and that his interest in him was chiefly due to his antiquity. Of the younger Muraq- qish, uncle of Tarafa, there are five pieces (Nos. 55-59). The only other authors of whom more than three poems are cited are Bishr ibn Abl Khazim of Asad (Nos. 96-99) and Rabi'a ibn Maqrum of Dabba (Nos. 38, 39, 43 and 113).

The Mufaddallydt differs from the ITamasa in being a collection of complete odes (qasidas), while the latter is an anthology of brilliant passages specially selected for their interest or effective- ness, all that is prosaic or less striking being pruned away. It is of course not the case that all the poems of al-Mufaddal's collection are complete. Many are mere fragments, and even in the longest there are often lacunae; but the compiler evidently set down all that he could collect of a poem from the memory of the rawls, and did not, like Abu Tammam, choose only the best portions. We are thus presented with a view of the litera- ture of the age which is much more characteristic and comprehen- sive than that given by the brilliant poet to whom we owe the Ifamdsa, and enables us to form a better judgment on the general level of poetic achievement.

The Mufaddallydt is not well represented by MSS. in the libraries of the West. There is an imperfect

copy of the recension of al- Marzuqi (died 1030) , with his commentary, in the Berlin collection. A very ancient fragment (dated 1080) of al-Anbari's recension, contain- ing five poems in whole or part, is in the Royal Library at Leipzig. In the British Museum there is a copy made about a century ago for C. J. Rich at Bagdad of a MS. with brief glosses; and at Vienna there is a modern copy of a MS. of which the original is at Constan- tinople, the glosses in which are taken from al-Anbari, though the author had access also to al-Marzuqi. In the mosque libraries at Constantinople there are at least five MSS. ; and at Cairo there is a modern copy of one of these, containing the whole of al-Anbari's commentary. In America there are at Yale University a modern copy of the same recension, taken from the same original as the Cairo copy, and a MS. of Persian origin, dated 1657, presenting a text identical with the Vienna codex. Quite recently a very in- teresting MS., probably cf the 6th century of the Hegira, but not dated, has come to light. It purports to be the second part of a combination of two anthologies, the MufaddaUydt of al-Mufa

In 1885 Professor Heinrich Thorbecke began an edition of the text based on the Berlin codex, but only the first fasciculus, containing forty-two poems, had appeared when his work was cut short by death. In 1891 the first volume of an edition of the text, with a short com- mentary taken from al-Anbari, was printed at Constantinople. In 1906 an edition of the whole text, with short glosses taken from al-Anbari's commentary, was published at Cairo by Abu Bakr b. 'Omar Daghistani al-Madam; this follows generally the Cairo codex above mentioned, but has profited by the scholarship of Professor Thorbecke's edition of the first half of the work. A complete edition of al-Anbari's text and commentary, with a translation of the poems, undertaken by Sir C. J. Lyall (see J. R. A. S., April 1904) was in the press in 1910. (C. J. L.)

MOFETTA (Ital. from Lat. mephitis, a pestilential exhalation), a name applied to a volcanic discharge

consisting chiefly of carbon dioxide, often associated with other vapours, representing the final phase of volcanic activity. The word is used frequently in the plural as mofette, or, following the French, mofettes. The volcanic vents yielding the emanations are themselves called

mofette. They are not uncommon in Auvergne and in the Eifel, notably on the shore of the Laacher See; whilst other examples are furnished by the Grotta del Cane, near Puzzuoli, the Valley of Death in Java, and the Death Gulch in the Yellowstone Park.

MOFFAT, ROBERT (1795–1883), Scottish Congregationalist missionary to Africa, was born at Ormiston, Haddingtonshire, on the 21st of December 1795, of humble parentage. He began as a gardener, but in 1814, when employed at High Leigh in Cheshire, offered himself to the London Missionary Society, and in 18 16 was sent out to South Africa. After spending a year in Namaqua Land, with the chief Afrikaner, whom he converted, Moffat returned to Cape Town in 18 19 and married Mary Smith (1 795–1870), the daughter of a former employer, a remarkable woman and most helpful wife. In 1820 Moffat and his wife left the Cape and proceeded to Griqua Town, and ultimately settled at Kuruman, among the Bechuana tribes living to the west of the Vaal river. Here he worked as a missionary till 1870, when he reluctantly returned finally to his native land. He made frequent journeys into the neighbouring regions as far north as the Matabele country. The results of these journeys he communicated to the Royal Geographical Society (Journal xxv.–xxxviii. and Proceedings ii.), and when in England on furlough (1839–1843) he published his well-known Missionary Labours and Scenes in South Africa (1842). He translated the whole of the Bible and The Pilgrim’s Progress into Sechwana. Moffat was builder, carpenter, smith, gardener, farmer, all in one, and by precept and example he succeeded in. turning a horde of bloodthirsty savages into a “people apprecia- ting and cultivating the arts and habits of civilized life, with a written language of their own.” He met with

incredible dis- couragement and dangers at first, which he overcame by his strong faith, determination and genial humour. It was largely due to him that David Livingstone, his son-in-law, took up his subsequent work. On his return to England he received a testimonial of £5000. He died at Leigh, near Tunbridge Wells, on the 9th of August 1883.

See Lives of Robert and Mary Moffat, by J. S. Moffat (1885) ; and C. S. Home, The Story of the L. M. S. (1894).

MOFFAT, a burgh of barony, and police burgh, of Upper Annandale, Dumfriesshire, Scotland. Pop. (1901), 2153. It is situated -2 1 m. N.N.E. of Dumfries by road and 63 m. distant by the Caledonian railway, from both Edinburgh and Glasgow. It is the terminus of a branch line from Beattock, 2 m. distant. It has been famous for its sulphur and saline waters since the middle of the 18th century, and also enjoys great vogue as a holiday resort. The hills in the locality range from the adjacent Gallow Hill (832 ft.) to Hartfell (2651 ft.); about 5 m. north there is abundance of beautiful and varied scenery on the Annan, the Evan, the Birnock and the Moffat. The spa, a mile to the north of the town, was acquired by the burgh commissioners in 1898, and there are also spas at Hartfell (3^ m. north) and Garpel (2 m. south-west). Dumcrieff House, 2 m. south-west, is the seat of Lord Rollo.

MOGADOR (Es-Sueira), the most southern seaport on the Atlantic coast of Morocco, in 31 50′ N., 9 20′ W., the capital of the province of Haha. Pop. (1908), about 20,000, of whom nearly a half are said to be Jews, and about 100 Europeans. The town stands from 10 to 20 ft. above high water on a projecting ridge of calcareous sandstone. In certain states of wind and sea it is turned almost into an island, and a sea-wall protects the road to Saffi. On the land side stretch miles of sand-dunes studded with broom, and beyond, the argan forests, distinctive of southern Morocco. Approached from this side the city bursts on the view like a mirage between sky and sea, and this perhaps entitles it to its name — Es-

Sueira — ” the picture.” It is the best planned and cleanest town in the empire, and this combined with the climate, which is very equable, makes it a health resort, especially for consumptive patients. The mean temperature of the hottest month is 7i°-o6, and of the coldest month 58°-69. The rainfall varies between 13 and 20 in. annually. The water supply is carried by an overground conduit from a spring near

Diabat. The prosperity of Mogador is due to its commerce. The harbour is well sheltered from all winds except the south- west, but escape is difficult with the wind from that quarter, as the channel between the town and Mogador Island is narrow and hazardous. It is the best-built port of the sultanate and is generally second in point of trade, which is carried on mainly with Marseilles, London, Gibraltar and the Canaries, the princi- pal exports being almonds, goat-skins, gums and olive-oil, and the principal imports cotton goods, sugar and tea. The exports were valued at £407,000 in 1900 and at £364,000 in 1906. The imports were worth £246,000 in 1900 and £368,000 in 1906. Shipping, 1900, 132,000 tons; 1906, 140,000 tons.

A place called Mogador is marked in the 1351 Portulan of the Laurentian library, and the map in Hondius’s Atlas minor shows the island of Mogador, i”. Domegador; but the origin of the present town is much more recent. Mogador was founded by Mohammed XVII. (bin Abd Allah) in 1760, and completed in 1770. The Portuguese called it after the shrine of Sidi Megdul, which lies towards the south half-way to the village of Diabat, and forms a striking landmark for seamen. In 1844 the citadel was bombarded by the French.

See A. H. Dye, ” Les Ports du Maroc,” in Bull. Soc. Geog. Comm. Paris (1908), xxx. 313 sqq., and British Consular reports.

MOGILA, PETER (c. 1596-1647), metropolitan of Kiev from 1632, belonged to a noble Wallachian family. He studied for some time at the university of Paris, and first became a monk in 1625. He was the author of a Catechism (Kiev, 1645) and other minor works, but is principally celebrated for the Orthodox Confession, drawn up at his instance by the Abbot Kosslowski of Kiev, approved at a provincial synod in 1640, and accepted by the patriarchs of Constantinople, Jerusalem, Alexandria and Antioch in 1642-1643, and by the synod of Jerusalem in 1672. (See Orthodox Eastern Church.)

There are numerous editions of the Confession in Russian; it has been edited in Greek and Latin by Panagiotes (Amsterdam, 1662), by Hofmann (Leipzig, 1695), and by Kimmel (Jena, 1843), and there is a German translation by Prisch (Frankfort, 1727).

MOGILEV, a government of western Russia, situated on the upper Dnieper, between the governments of Vitebsk and Smolensk on the north and east, and Chernigov and Minsk on the south and west. In the north it is occupied by the water- shed which separates the basins of the Dvina and the Dnieper, an undulating tract 650 to 900 ft. above sea-level, and covered nearly everywhere with forests. This watershed slopes gently to the south, to the valley of the Dnieper, which enters the government from the north-east and flows due south. The southern part of the government is flat and has much in common with the Polyesie of the government of Minsk; it is, however, more habitable, the marshes being less extensive. Mogilev is built up of Devonian deposits in the north, of Cretaceous in the east, and of Tertiary elsewhere, but generally is covered with a thick layer of Glacial and later alluvial deposits. Interesting finds from the Stone Age, as well as remains of the mammoth, have been made.

The soil is mostly sand, clay (brick-clay and potter's-clay are not uncommon), and peat-bogs,with a few patches of " black earth." The climate is harsh and wet, the average yearly tem- perature at the Gorki meteorological observatory being 4o°-4 F.

(i4°-2 in January and 63°-8 in July); cold nights in summer are often the cause of bad crops. The government had 947,625 inhabitants in 1870, and in 1897, 1,706,511, of whom 861,533 were women, and 146,752 lived in towns. The estimated popu- lation in 1906 was 2,024,300. The population is mostly White Russian. Agriculture is their chief occupation. Out of the total area of 18,546 sq. m. 40 % is held in communal ownership by the peasants, 48 % is owned by landlords possessing more than 270 acres each, and 35 % by small owners. Most of the private owners belong to the nobility. The principal crops are rye, oats, barley, buckwheat, potatoes, though wheat, beetroot, flax, hemp and tobacco are also grown. Paper, spirits, wire and nails, leather and tiles are the chief products of the manufactures. The government is divided into eleven districts, of which the

chief towns with their populations in 1897 were: Mogilev-on- Dnieper, or Mogilev Gubernskiy (47,591 in 1900), Chausy (555°), Cherikov (5250), Homel or Gomel (45,081 in 1900), Gorki (6730), Klimovichi (4706), Mstislavl (10,382 in 1900), Orsha (13,161), Rogachev (9103), Staryi Bykhov (6354), and Syenno (4061).

This government was inhabited in the 10th century by the Slav tribes of the Krivichi and Radimichi. In the 14th century it became part of Lithuania, and afterwards of Poland. Russia annexed it in 1772.

MOGILEV ON THE DNIEPER, a town of Russia, capital of the government of Mogilev. Pop. (1900), 47,591, two-thirds Jews. It is situated on a hilly site on both banks of the Dnieper, 120 m. by rail S.W. of Smolensk. It is the see of an archbishop of the Orthodox Greek Church. The public buildings include the cathedral of the Orthodox Greek Church (founded by Catherine II. of Russia and Joseph II. of Austria in 1780), a Roman Catholic cathedral (built in 1692), an old castle, a museum, a church dating from 1620, and an old Tatar tower. The principal industries are tanneries. The commerce is mostly in the hands of Jews. Corn, salt, sugar and fish are

brought from the south, whilst skins and manufactured wares, imported from Germany, are sent to the southern governments.

Mogilev is mentioned for the first time in the 14th century as a dependency of the Vitebsk, or of the Mstislavl principality. At the beginning.of the 1 5th century it became the personal property of the Polish kings. But it was continually plundered — either by Russians, who attacked it six times during the 16th century, or by Cossacks, who plundered it three times. In the 17th century its inhabitants, who belonged to the Orthodox Greek Church, suffered much from the persecutions of the United Greek Church. In 1654 it surrendered to Russia, but in 1661 the Russian garrison was massacred by the inhabitants. In the 1 8th century the town was taken several times by Russians and by Swedes, and in 1708 Peter the Great ordered it to be destroyed by fire. It was annexed to Russia in 1772. Near here the French under Davout defeated the Russians under Bagration on the 23rd of July 181 2.

MOGILEV ON THE DNIESTER, a town of Russia, in the government of Podolia, on the left bank of the Dniester, 57 m. E.S.E. of Kamenets-Podolsk. Pop. (1900), 25,141, nearly one-half Jews; the remainder are Little Russians, Poles and a few Armenians. The Little-Russian inhabitants carry on agri- culture, gardening, wine-growing and mulberry culture. The Jews and Armenians are engaged in a brisk trade with Odessa, to which they send corn, wine, spirits and timber, floated down from Galicia, as well as with the interior, to which they send manufactured wares imported from Austria.

Mogilev, named in honour of the Moldavian hospodar Mo-hila, was founded by Count Potocki about the end of the 16th century. Owing to its situation on the highway from Moldavia to the Ukraine, at the passage across the Dnieper, it developed rapidly. For more than 150 years its possession was disputed between the Cossacks, the Poles and the Turks. It remained in the hands of the Poles, and was .annexed to Russia in 1795.

MOGUL, Moghal, or Mughal, the Arabic and Persian form of the word Mongol, usually applied to the Mahommedan Empire in India, which was founded by Baber. In consequence the name is applied to all foreign Mahommedans from the coun- tries on the west and north-west of India, except the Pathans. The Great Mogul is the name given to the Mogul emperors of Delhi by the Portuguese and subsequently by Europeans generally.

MOHACS, a market town of Hungary, in the county of Baranya, 115 m. S. of Budapest. Pop. (1900), 15,812. It is situated on the right bank of the Danube, and carries on a brisk trade in wine and the agricultural produce of the neighbourhood. Amongst its principal buildings are an old castle and the summer palace of the bishop of Pecs. Moha.cs is famous in the history of Hungary by the two fateful battles which took place in the plain situated about 3 m. south-west of the town, and marked the beginning and the close of the Turkish dominion in Hungary. In the first (Aug. 29, 1526) the Hungarian army under Louis II.

was annihilated by the Ottoman forces led by Soliman the Mag- nificent. In the second (Aug. 12, 1687) the Austrians under Charles of Lorraine gained a decisive victory over the Turks, whose power was afterwards still further broken by Prince Eugene of Savoy.

MOHAIR, the hair of a variety of goat originally inhabiting the regions of Asiatic Turkey of which Angora is the centre, whence the animal is known as the Angora goat. The Arabic muhayyar, from which the word came into English probably through the Ital. moccacaro or Fr. mocayart, meant literally, ” choice ” or ” select,” and was applied to cloth made of goats’ hair. In the 17th century the word, which before appears in such forms as mocayare or mokaire, became corrupted by con- nexion with ” hair,” cf. ”

cray-fish ” from ecrevisse. From the English ” mohair ” the French adapted moire, a watered silk fabric.

The typical mohair fibre is 7 to 8 in. long, very lustrous owing to its physical structure (which although akin to wool is different in that the wool scales are indicated only instead of being fully developed, while the fibre is always solid), j^-j- to ^tj of an inch in diameter, of a soft elastic handle, and usually of a clear white transparent colour. The staples of which the fleece is formed should be uniform in length and clearly defined, naturally lending themselves to a good ” spin ” — a difficult attainment in the case of mohair (see Woollen and Worsted Manufactures). There are many varieties of mohair, from the first qualities as here defined to lower qualities of a kempy, unsatisfactory character. Thus in Constantinople, the chief centre of the Turkey mohair trade, a large variety of fleeces is recognized. For example, from the Lake Van district a distinctly inferior kind known as ” Van ” mohair is obtained, while other districts pro- duce varieties ranging from Van up to the typical quality described above.

The animal from which mohair was originally obtained was a finely-bred Angora goat. Owing to the demand for raw material exceeding the supply, from 1820 onwards there has been a great deal of crossing of the well-bred Angora with the common kind of goat: in fact it has been said that by 1863 the original Angora had practically disappeared. The growing demand for mohair further resulted in attempts on a commercial scale to introduce the goat into South Africa — where it was crossed with the native goat — the United States, Australia, and later still New Zealand. Perhaps the introduction of the Angora into Australia and New Zealand may in part be due to its value as a scrub and blackberry browser; these growths being the ” pests ” of the two respective countries.

The manufacture of fabrics from mohair — as in the case of alpaca and cashmere — was in the first

instance due to the genius of the rearers of the goat. It would, indeed, be interesting to know if the present day mohair goods — often styled ” alpacas ” really had their origin in the earlier products of Asia Minor. That fabrics of mohair were in use in England early in the 18th century is obvious from Pope’s allusion: —

” And, when she sees her friend in deep despair,
Observes how much a chintz exceeds mohair.”

Raw mohair was first exported from Turkey to England about 1820, and from that date onwards marked strides were made in its manufacture into useful yarns and fabrics. England has always had, and still maintains, supremacy in this manufacture. Practically the whole of both the Turkish and Cape clips is at least converted into yarn in Yorkshire mills. Quantities of these yarns are also woven into dress goods, dust cloakings, pile fabrics, imitation furs, &c, in Yorkshire, but even greater quantities of mohair yarn are exported to Russia, Germany, Austria, &c, to be converted into astrakans, ordinary braids, brush braids, &c. In the first decade of the 20th century the mohair braid trade received a blow from the introduction of artificial silk.

The history of the introduction of the Angora goat from Asia Minor into the other countries mentioned is as follows. In 1838 pure bred Angoras were introduced into Cape Colony — cashmeres having been previously tried and found unsatisfac-

tory. These pure-bred goats crossed with the common goat laid the basis of the Cape flocks. In 1856-1857 other importations of pure-bred goats were made. From 1868 to 1897 further impor- tations were made, but these were not of the pure-bred goat and consequently were not so valuable. It should here be noted that the Cape flock-owner clips twice — the summer clip yielding a staple which should be of not less than 7 in., and the winter clip a staple which should be of not less than 3 in. to 4 in. Bradford from time to time has objected to the winter clip as

being too short, but this clip seems to have established itself and at least once during recent years has been as saleable as the summer clip. The introduction of Angoras into the United States took place in 1849. Other importations of goats from Asia Minor were made between 1857 and 1880, and interchanges of blood also took place between the United States and Cape Colony. Be- tween 1856 and 1875 some three hundred goats were introduced into Australia. Other importations from Cape Colony and the United States have also been made from time to time, and it seems at least possible, if not probable, that Australia may yet find the Angora goat an important asset.

From the following statistics relating to mohair it will be realized that the mohair supply practically comes from two sources, viz. Turkey in Asia and South Africa : —

Country. No. of Goats. Yield of Hair.

Asia Minor ….. 3 1 to 4 millions. 11 to 12,000,000 lb.

South Africa 4 millions. 12 to 14,000,000 lb.

United States …. 800,000 1,600,000 lb.

Australia 30,000

The price per lb of mohair has varied from 4s. id. in 1870 to 13d. or I4d. in 1903, and it is interesting to note that the shipments from Turkey to England follow these price fluctuations in a most curious manner.

Of the consumers of English mohair yarns Russia takes from 15 to 25 %, and the continent of Europe as a whole a very large per- centage of the total mohair yarn production of Bradford.

MOHAVE (corrupted from hamok-habi; ” three mountains,” their native name, with reference to three peaks, which form a prominent feature of their country), a tribe of North American Indians of Yuman

stock. They have always lived along both banks of the lower Colorado river, in Arizona and California.

MOHAWK, a tribe of North American Indians, the chief people of the Iroquois confederacy. The name probably means "man-eaters"; they call themselves Kaniengehaga, "flint people." Their villages were in the valley of the Mohawk river, New York. Their territory extended northward to the St Lawrence and southward to the Delaware river and Catskill Mountains. They were thus early in touch with Dutch and English, and were the first Indians to obtain firearms. In the War of Independence they fought with the English, and finally took refuge in Canada, where most of them have remained.

See Indians, North American. For Mohawk cosmology see 21st Annual Report Bureau Amer. Ethnol. (1899-1900).

MOHICAN, MAHICAN and MOHEGAN, the first two the alternative names of an important tribe and confederacy of North American Indians of Algonquian stock, and the last a dialectic form of the name applied to a branch tribe. The Mohicans inhabited the Hudson valley, and their domain extended into Massachusetts. The Mohicans were called by the French Loups (wolf Indians), a translation of " Mohican." At first their council-fire was at Schodac, on an island near Albany, and they were grouped in forty villages. In consequence of attacks by the Mohawks, they moved their council-fire to what is now Stockbridge, Massachusetts, in 1664; in 1730 many migrated to the Susquehanna valley, Pennsylvania, and became absorbed into the Delawares. In 1736 those left in Massachu- setts were placed on a reservation at Stockbridge, and called by that name. A few of these Stockbridge Indians, who may be truly called " the last of the Mohicans," are now settled, with some of the Munsees, on a reservation at Green Bay, Wisconsin. The Mohegans, originally an offshoot of the Mohican, lived on Thames river, Connecticut, their county extending into Massa- chusetts and including Rhode Island. In 1637, on the destruc- tion of the

Pequots, an offshoot of the Mohegans, the Mohegans claimed their country too, and thus the territorial power of the

two tribes was consolidated under one Mohegan chief. For some time the Mohegans remained the supreme Indian people of southern New England. Eventually they sold most of their lands and centred in a small reservation on Thames river. They have now practically become extinct.

MOHL, HUGO VON (1805-1872), German botanist, was born at Stuttgart on the 8th of April 1805. He was a son of the Wurttemberg statesman Benjamin Ferdinand von Mohl (1766- 1845), the family being connected on both sides with the higher class of state officials of Wurttemberg. While a pupil at the gymnasium he pursued botany and mineralogy in his leisure time, till in 1823 he entered the university of Tubingen. After graduating with distinction in medicine he went to Munich, where he met a distinguished circle of botanists, and found ample material for research. This seems to have determined his career as a botanist, and he started in 1828 those anatomical investiga- tions which continued till his death. In 1832 he was appointed professor of botany in Tubingen, a post which he never left. Unmarried, his pleasures were in his laboratory and library, and in perfecting optical apparatus and microscopic preparations, for which he showed extraordinary manual skill. He was largely a seli-taught botanist from boyhood, and, little influenced in his opinions even by his teachers, preserved always his indepen- dence of view on scientific questions. He received many honours during his lifetime, and was elected foreign fellow of the Royal Society in 1868. Von Mohl's writings cover a period of forty- four years; the most notable of them were republished in 1845 in a volume entitled Vermischte Schriften- (For lists of his works see Botanische Zeitung, 1872, p. 576, and Royal Soc. Catalogue, 1870, vol. iv.) They dealt

with a variety of subjects, but chiefly with the structure of the higher forms, including both rough anatomy and minute histology. The word ” protoplasm ” was his suggestion; the nucleus had already been recognized by R. Brown and others,” but von Mohl showed in 1844 that the protoplasm is the source of those movements which at that time excited so much attention. He recognized under the name of ” primordial utricle ” the protoplasmic lining of the vacuolated cell, and first described the behaviour of the protoplasm in cell- division. These and other observations led to the overthrow of J. M. Schleiden’s theory of origin of cells by free-cell-formation. His contributions to knowledge of the cell-wall were no less remarkable; he held the view now generally adopted of growth of cell-wall by apposition. He first explained the true nature of pits, and showed the cellular origin of vessels and of fibrous cells; he was, in fact, the true founder of the cell theory. Clearly the author of such researches was the man to collect into one volume the theory of cell-formation, and this he did in his treatise Die vegetabilische Zelle (1851), a short work translated into Eng- lish (Ray Society, 1852). Von Mohl’s early investigations on the structure of palms, of cycads, and of tree-ferns permanently laid the foundation of all later knowledge of this subject: so also his work on Isoetes (1840). His later anatomical work was chiefly on the stems of dicotyledons and gymnosperms; in his observations on cork and bark he first explained the formation and origin of different types of bark, and corrected errors relating to lenticels. Following on his early demonstration of the origin of stomata (1838), he wrote a classical paper on their opening and closing (1850). In 1843 he started in conjunction with F. Schlechtendal the weekly Botanische Zeitung, which he jointly edited till his death. He was never a great writer of comprehen- sive works; no text-book exists in his name, and it would indeed appear from his withdrawal from co-operation in W. F. B. Hofmeister’s Handbuch that he had a distaste for such efforts. In his latter years his productive activity fell off, doubtless through failing health,

and he died suddenly at Tubingen on the 1st of April 1872.

See Sachs, History of Botany, p. 292, &c. ; De Bary, Botanische Zeitung (1872), p. 561 ; Proc. Roy. Soc, xxiii. 1 ; Allgemeine Deutsche Biographie, xxii. 55. (F. O. B.)

MOHL, JULIUS VON (1800-1876), German Orientalist, brother of Hugo von Mohl (q.v.), was born at Stuttgart on the 25th of October 1800. Having studied theology at Tubingen (1818-

1823), he abandoned the idea of entering the Lutheran ministry, and in 1823 went to Paris, at that time, under Silvestre De Sacy, the great European school of Eastern letters. From 1826 to 1833 he was nominally professor at Tubingen, but had permission to continue his studies abroad, and he passed some years in London and in Oxford. In 1826 he was charged by the French government with the preparation of an edition of the Shah Nama (Livre des rois), the first volume of which appeared in 1838, while the seventh and last was left unfinished at his death, being com- pleted by Barbier de Meynard. Discerning this to be his life's work, he resigned his chair at Tubingen in 1834, and settled per- manently in Paris. In 1844 he was nominated to the academy of inscriptions, and in 1847 he became professor of Persian at the College de France. But his knowledge and interest extended to all departments of Oriental learning. He served for many years as secretary, and then as president of the Societe Asiatique. His annual reports on Oriental science, presented to the society from 1840 to 1867, and collected after his death in Paris on the 3rd of January 1876, under the title Vingl-sept ans d'histoire des etudes orientates (Paris, 1879), are an admirable history of the progress of Eastern learning during these years. Concerning the discoveries at Nineveh he wrote Lettres de M. Botta sur les dScouvertes a Khorsabad (1845). He also published anonymously, in conjunction with Justus Olshausen (1800-1882), Fragments relatifs a la religion de Zoroastre (Paris, 1829); Confucii Chi-

king sive liber carminum, ex latina P. Lacharmi inter pretatione (Stuttgart, • 1830); and an edition of Y-King, Anliquissimus Sinarum liber, ex inter pretatione P. Regis (Stuttgart, 1834-1839).

His wife Mary (1793-1883), daughter of Charles Clarke, had passed a great part of her early life in Paris, where she was very intimate with Madame Recamier, before their marriage in 1847, and for nearly forty years her house was one of the most popular intellectual centres in Paris. Madame Mohl's friends included a large number of Englishmen and Englishwomen. She died in Paris on the 14th of May 1883. Madame Mohl wrote Madame Recamier, with a Sketch of the History of Society in France (London, 1862).

See Kathleen O'Meara, Madame Mohl, her Salon and Friends (1885); and M. C. M. Simpson, Letters and Recollections of Julius and Mary Mohl (1887).

Mohl's elder brother, Robert von Mohl (1799-1875), was a well-known jurist and statesman. From 1824 to 1845 ne wa s professor of political sciences at the university of Tubingen, losing his position because of some frank criticisms which brought him under the displeasure of the authorities of Wurttemberg. In 1847 he was a member of the parliament of Wurttemberg, and in the same year he was appointed professor of law at Heidelberg; in 1848 he was a member of the German parliament which met at Frankfort, and for a few months he was minister of justice. His later public life was passed in the service of the grand-duke of Baden, whom he represented as ambassador in Munich from 1867 to 1871. He died in Berlin on the 5th of November 1875. Among his numerous writings may be men- tioned, Die deutsche Polizeiwissenschaft nach den Grundsatzen des Rechtsstaats (Tubingen, 1832-1834, and again 1866); Geschichte und Liter atur der Staatswissenschaften (Erlangen, 1855-1858); Encyklopadie der Staatswissenschaften (Tubingen, 1859, again 1881); and Staatsrecht, Volkerrecht und Politik (Tubingen, 1860—

1869).

See Mohl's own Lebenserinnerungen (Leipzig, 1901); and H. Schulze, Robert von Mohl, Ein Erinnerungsblatt (Heidelberg, 1886).

Another brother, Moritz von Mohl (1802-1888), entered official life at an early age and was a member of the Frankfort parliament, and later of the parliament of Wurttemberg and of the imperial Reichstag. He was a voluminous writer on economic and political questions.

MOHLER, JOHANN ADAM (1796-1838), German theologian^ was born at Igersheim in Wurttemberg on the 6th of May 1796, and after studying philosophy and theology in the lyceum at Ellwangen, entered the university of Tubingen in 181 7. Ordained to the priesthood in 181 9, he was appointed to a curacy at Riedlingen, but speedily returned as " repetent " to Tubingen,

where he became privatdozent in 1822, extraordinary professor of theology in 1826 and ordinary professor in 1828. His lectures drew large audiences, including many Protestants. The con- troversies excited by his Symbolik (1832) proved so unpleasant that in 1835 he accepted a call to the university of Munich. In 1838 he was appointed to the deanery of Wiirzburg, but died shortly afterwards (April 12, 1838).

Mohler wrote Die Einheit in der Kirche oder das Prinzip des Katholicismus (Tubingen, 1825) ; Athanasius der Grosse u. d. Kirche seiner Zeit (2 vols., Mainz, 1827) ; Symbolik, oder Darstellung der dogmatischen Gegensatze der Katholiken u. Protestanten nach ihren offentlichen Bekenntnissschriften (Mainz, 1832; 8th ed., 1871-1872; Eng. trans, by J. B. Robertson, 1843); and Neue V titer suchungen der Leht -gegensatze zwischen den Katholiken u. Protestanten (1834). His

Gesammelte Schriften u. Aufsdtze were edited by Dollinger in 1839; his Patrologie by Reithmayr, also in 1839; and a Biographie by B. Worner was published at Regensburg in 1866. It is with the Symbolik that his name is chiefly associated; the interest excited by it in Protestant circles is shown by the fact that within two years of its appearance it had elicited three replies of considerable importance, those namely of F. C. Baur, P. K. Marheineke and C. J. Nitzsch. But, although characterized by learning and acuteness, as well as by considerable breadth of spiritual sympathy, it cannot be said to have been accepted by Catholics themselves as embodying an accurate objective view of the actual doctrine of their church. The liberal school of thought of which Mohler was a prominent exponent was discouraged in official circles, while Protestants, on the other hand, complain that the author failed to grasp thoroughly the significance of the Reformation as a great movement in the spiritual history of mankind, while needlessly dwelling on the doctrinal shortcomings, inconsistencies and contradictions of its leaders.

MOHMAND, a Pathan tribe who inhabit the hilly country to the north-west of Peshawar, in the North-West Frontier Province of India. They are one of the strongest tribes on the border after the Afridis and Waziris, and have given much trouble to the government of India. The country of the Mohmands may be defined roughly as bounded on the E. by British districts from near Jamrud to Fort Abazai, and thence by the Utman Khel country; on the N. by Bajour; on the W. by Kunar; and on the S. by the territories of the Shinwari and Afridi; area, about 1200 sq. m. The Indo- Afghan boundary line now runs through the Mohmand country; but the amir of Afghanistan formerly claimed allegiance from all the Mohmands, and only handed over the greater part of this tract to the British by the Durand Agreement of 1893. The government has given assurances to the Burhan Khel, Dawezai, Halimzai, Isa Khel, Tarakzai and Utmanzai sections of the Mohmands that they will not suffer by the severance of their ancient

connexion with Afghanistan; and these are known as the Assured Clans. The tribe are Afghans by descent, and are more akin to the Yusafzais than any of their neighbours. The aspect of the Mohmand hills is exceedingly dreary, and the eye is everywhere met by dry ravines between long rows of rocky hills and crags, scantily clothed with coarse grass, scrubwood and the dwarf palm. In summer great want of water is felt, and the desert tracts radiate an intolerable heat. This, coupled with the unhealthiness of the lowlands, probably accounts for the inferior physique of the Mohmands as compared with their Afridi and Shinwari neighbours, who in summer retire to the cool highlands of Tirah and the Safed Koh. The crops in the Mohmand hills are almost entirely dependent on the winter and autumn rains, and should these fail there is considerable distress; but the Mohmands supplement this source of livelihood by a through trade on raits along the Kabul river between the British districts and the hill- country beyond them. The exports are wax, hides, ghi and rice from Kunar, and iron from Bajour; the imports are salt, cloth, paper, soap, tea, indigo, sugar, grain, tobacco, needles, scissors and other manufactures of civilization. The Mohmands are characterized by great pride and haughtiness, they bear a bad reputation for treachery and ruthless cruelty, and are not as brave as their Afridi neighbours. They number some 18,000 fighting men, giving roughly a population of 65,000; but all the clans would never act together under any circumstances. British punitive expeditions have been sent against the Mohmands in 1851-52, 1854, 1864, 1879, 1880, but the principal operations were those of 1897. (T. H. H.*)

Campaign of 1897. — The year 1897 witnessed an almost general outbreak among the tribes on the north-west frontier of India. The tribes involved were practically independent, but the new frontier arranged with the amir of Afghanistan, and demarcated by Sir Mortimer Durand's commission of 1893-1894, brought them within the British sphere of influence. The great dread of these high-spirited mountaineers was annexation, and the hostility shown

during the demarcation led to the Waziri expedition of 1894. Other causes, however, contributed to bring about the outbreak of 1897. The easy victory of the Turks over the Greeks gave rise to excitement throughout the Mahommedan world, and the publication by the amir of Afghan- istan, in his assumed capacity of king of Islam, of a religious work, in portions of which fanatical antipathy to Christians was thinly veiled, aroused a warlike spirit among the border Mahom- medans. The growing unrest was not recognized, and all appeared quiet, when, on the 10th of June 1897, a detachment of Indian troops escorting a British frontier officer was suddenly attacked during the mid-day halt in the Tochi valley, where, since the Waziri expedition of 1894-95, certain armed posts had been retained by the government of India. On the 29th of July, with equal suddenness, the fortified posts at Chakdara and Mala- kand, in the Swat valley, which had been held since the Chitral expedition of 1895, were for several days fiercely assailed by the usually peaceful Swatis under the leadership of the Mad Mullah. On the 8th of August the village of Shabkadar (Shankarghar), within a few miles of Peshawar, and in British territory, was raided by the Mohmands, while the Afridis besieged the fortified posts on the Samana ridge, which had been maintained since the expeditions of 1888 and 1891. Finally, the Afridis, within a few days, captured all the British posts in the Khyber Pass. A division commanded by Major-General Sir Bindon Blood was assembled at Nowshera. The post at Malakand was reached on the 1 st of August, and on the following day Chakdara was re- lieved. The punishment of the Afridis was deferred till the preparations for the Tirah campaign (see Tirah) could be com- pleted. The Mohmands, however, could be immediately dealt with, and against them the two brigades of Sir Bindon Blood’s division advanced from Malakand simultaneously with the move- ment of another division under Major-General (afterwards Sir Edmund) R. Elles from Peshawar; it was intended that the two columns should effect a junction in Bajour. About the 6th of September the two forces advanced, and

Major-General Blood reached Nawagai on the 14th of September, having detached a brigade to cross the Rambat Pass. This brigade being sharply attacked in camp at Markhanai at the foot of the pass on the night of the 14th, was ordered to turn northwards and punish the tribesmen of the Mamund valley. On the 15th Brigadier- (afterwards Major-) General Jeffreys camped at Inayat Killa, and on the following day he moved up the Mamund valley in three columns, which met with strong resistance. A retirement was ordered, the tribesmen following, and when darkness fell the general, with a battery and a small escort, was cut off, and with difficulty defended some buildings until relieved." The casualties in this action numbered 149. This partial reverse placed General Blood in a position of some difficulty. He deter- mined, however, to remain at Nawagai, awaiting the arrival of General 2lles, and sent orders to General Jeffreys to prosecute the operations in the Mamund valley. From the 18th to the 23rd these operations were carried on successfully, several villages being burned, and the Mamunds were disheartened. Mean while, the camp at Nawagai was heavily attacked on the night of the 20th by about 4000 men belonging to the Hadda Mullah's following. The attack was repulsed with loss, and on the 21st Generals Blood and Elles met at Lakarai. The junction having been effected, the latter, in accordance with the scheme, advanced to deal with the Upper Mohmands in the Jarobi and Koda Khel valleys, and they were soon brought to reason by his well-con- ducted operations. The work of the Peshawar division was now accomplished, and it returned to take part in the Tirah campaign. Its total casualties were about 30 killed and wounded. On the 22nd General Blood joined General Jeffreys, and on the 24th he

started with his staff for Panjkora. On the 27th General Jeffreys resumed punitive operations in the Mamund valley, destroying numerous villages. On the

30th he encountered strong opposition at Agrah, and had 61 casualties. On the 2nd of October General Blood arrived at Inayat Killa with reinforce- ments, and on the nth the Mamunds tendered their submission. The total British loss in the Mamund valley was 282 out of a force which never exceeded 1200 men. After marching into Buner, and revisiting the scenes of the Umbeyla expedition of 1863, the Malakand field-force was broken up on the 21st of January. The objects of the expedition were completely f ttained, in spite of the great natural difficulties of the country. The employment of imperial service troops with the Peshawar column marked a new departure in frontier campaigns.

(C. J. B.)

MOHONK LAKE, a summer settlement at the northern end of Lake Mohonk, Ulster county, New York, U.S.A., about 14 m. N.W. of Poughkeepsie. It is served from New Paltz, about 1 m. S.E. (about 5! m. by stage), by the Wallkill Valley railway, a branch of the West Shore. The lake is a small body of water, picturesquely situated 1245 ft. above the sea-level, on Sky Top Mountain (1 542 ft.), one of the highest peaks of the Shawangunk range. The highest point of Sky Top lies just east of the south end of the lake; close by, to the west, Eagle Cliff rises to a height of 141 2 ft. The development of this beautiful region into a summer resort and the holding of Indian and arbitration con- ferences here have been due to Albert Keith Smiley (b. 1828), a graduate of Haverford College (1849), who conducted an English and classical academy in Philadelphia in 1853-1857, was principal of the Oak Grove academy at Vassalboro, Maine, in 1858-1860, was principal and superintendent of the Friends' school at Providence, Rhode Island, in 1860-1879, and became a member of the United States Board of Indian Commissioners in 1879. In 1869 he bought, at the northern end of Lake Mohonk, a tract of land on which he built a large hotel. Here, in October 1883, the first Conference of the Friends of the American Indian met; these conferences have since been held annually, their scope being enlarged in 1904 to include

consideration of the condition of ” other dependent peoples ” — i.e. the natives of the Philippines, Porto Rico and Hawaii. The first conference on international arbitration was held here in June 1895.

MOHR, KARL FRIEDRICH (1806-1879), German pharmacist, son of a well-to-do druggist in Coblentz, was born on the 4th of November 1806. Being a delicate child he received much of his early education at home, in great part in his father’s labora- tory. To this may be traced much of the skill he showed in devising instruments and methods of analysis. At the age of twenty-one he began to study chemistry under Leopold Gmelin, and, after five years spent in Heidelberg, Berlin and Bonn, returned with the degree of Ph.D. to join his father’s establish- ment. On the death of his father in 1840 he succeeded to the business, retiring from it for scientific leisure in 1857. Serious pecuniary losses led him at the age of fifty-seven to become a privaldozent in Bonn, where in 1867 he was appointed, by the direct influence of the emperor, extraordinary professor of pharmacy. He died at Bonn on the 28th of September 1879. Mohr was the leading scientific pharmacist of his time in Ger- many, and he was the author of many improvements in ana- lytical processes. His methods of volumetric analysis were expounded in his Lehrbuch der chemisch-analytischen Titrir- methode (1855), which won the special commendation of Liebig and has run through many editions. His Geschichie der Erde, eine Geologie auf neuer Grundlage (1866), also obtained a wide circulation. In a paper ” Uber die Natur der Warme,” published in the Zeitschrift fiir Physik in 1837, he gave one of the earliest general statements of the doctrine of the conservation of energy in the words: ” besides the 54 known chemical elements there is in the physical world one agent only, and this is called Kraft (energy). It may appear, according to circumstances, as motion, chemical affinity, cohesion, electricity, light and magnetism; and from any one of these forms it can be transformed into any of the others.”

MOHS, FRIEDRICH (1773-1839), German mineralogist,

was born at Gernrode in the Harz Mountains, on the 29th of January 1773. He was educated at Halle, and at the mining academy at Freiburg. He spent much time in Austria in studying miner- alogy and mining, and became professor of mineralogy at Gratz in 1812. On the death of Werner in 1817, he was appointed to the chair of mineralogy in the mining academy of Freiburg, and in 1826 he became professor of mineralogy and superinten- dent of the Imperial Cabinet at Vienna. His great work was the Grundriss der Mineralogie (Eng. trans. Treatise on Mineralogy, by Wilhelm Haidinger, 1825). He died at Agardo, near Belluno, Italy, on the 29th of September, 1839.

MOHUN, CHARLES MOHUN, 4th Baron (c. 1675–1712), was the son of the 3rd Baron Mohun, who died in October 1677 as the result of a wound received while acting as second in a duel. The boy had no regular guardian, and before he was seventeen he had earned an unpleasant notoriety in London for rowdyism and brawling, had fought a duel and had been tried on a charge of murder. His friend, Captain Richard Hill, a roystering young officer, was in love with the actress Mrs Bracegirdle, and thought William Mountfort, the actor, to be his successful rival. On the night of the 9th of December 1692 Mohun assisted Hill to attempt the actress’s abduction. The attempt failed, and Mohun and Hill then escorted Mrs Bracegirdle to her house, and subsequently remained together outside drinking till the appearance of Mountfort, who lived close at hand. Greetings were exchanged between Mohun and Mountfort, and the latter made a disparaging remark about Hill, who either without warning (according to Mountfort’s deathbed statement) or in fair fight (according to other evidence) ran Mountfort through the body, and then absconded. Mohun was arrested and put on trial in Westminster Hall before his peers for murder as an accessory before the fact (1693), but by an overwhelming majority the peers found him not guilty. This verdict has been severely criticized, notably by Macaulay, who saw in it merely a gross instance of class favouritism. But a careful examination of the evidence (in the State Trials)

justifies the decision, and establishes the presumption that the fight was a fair one. In 1 699 Mohun was put on his trial for another alleged murder, but was unanimously and quite justly acquitted. His boon com- panion, Edward Rich, earl of Warwick (1673-1701), who was tried on a separate indictment for the same crime, was found guilty of manslaughter. On this occasion Mohun expressed regret for his past life, and he seems subsequently to have made a genuine attempt to alter his ways and to have taken a practical interest in public affairs. But in 171 2 his violent temper again got the better of him, and he forced the 4th duke of Hamilton, with whom he had been at law for some years, into a desperate duel in Hyde Park in the early hours of the 15th of November, in which both combatants were killed. Thackeray has utilized this incident in Esmond. Lord Mohun had no issue, and on his death the barony, which was created in 1628 in favour of his great-grandfather John Mohun (c. 1592-1640), became extinct.

See The Whole Life and History of My Lord Mohun and the Earl of Warwick (London, 1711); J. Evelyn, Diary and Correspondence; Historical Manuscripts Commission, nth report, appendix v. (Dartmouth MSS.) ; G. C. Boase and W. P. Courtney, Bibliotheca cornubiensis (1874-1882); Howell, State Trials; and Colley Cibber, Apology, edited by R. W. Lowe (i£~

MOHUN, MICHAEL (c. 1625-1684), English actor, played at the Cockpit in Drury Lane before the Civil War. He served on the king's side with credit and was promoted captain, and subsequently, in Flanders, major. At the Restoration he returned with Charles II. and took up his former profession, playing a great variety of parts, usually as second to Charles Hart.

MOHUR, the name of a Persian gold coin, used in India from the 1 6th century. The word is taken from the Persian muhr, a seal or ring. Between 1835 and 1891 a gold coin, also called a " mohur," was struck by the government of British India and was of the nominal value of 1 5 rupees. On the establishment of

a gold standard in India in 1899, on the basis of i6d. a rupee,

the British sovereign was declared legal tender and the mohur was thus superseded.

MOIDORE, (a corruption of the Portuguese moeda d'ouro, literally, money of gold), the name of a gold Portuguese coin, coined from 1640 to 1732. This was of the sterling value of 13s. 53d. It is the double moida d'ouro, of the value of 4800 reis in 1688, that was current in western Europe and the West Indies for a long period after it ceased to be struck. It was the principal coin current in Ireland at the beginning of the 18th century, and spread to the west of England. At the same period it was current in the West Indies, particularly in Barbados. It was rated in English money at 27s.

MOIR, DAVID MACBETH (1798-1851), Scottish physician and writer, was born at Musselburgh on the 5th of January 1798. He studied medicine at Edinburgh University, taking his degree in 1816. Entering into partnership with a Musselburgh doctor he practised there until his death on the 6th of July 185 1. He was a contributor of both prose and verse to the magazines, and particularly, with the signature of " Delta," to Blackwood's. A collection of his poetry was edited in 1852 by Thomas Aird. Among his publications were the famous Life of Mansie Wauch, Tailor (1828), which shows his gifts as a humorist, Outlines of the Ancient History of Medicine (1831), and Sketch of the Poetical Literature of the Past Half Century (1851).

MOISSAC, a town of south-western France, capital of an arrondissement in the department of Tarn-et-Garonne, 17 m. W.N.W. of Montauban on the Southern railway between Bordeaux and Toulouse. Pop. (1906) town, 4523; commune, 8218. Moissac stands at the foot of vine-clad hills on the right bank of the

Tarn; it is divided into two parts by the lateral canal of the Garonne, which crosses the Tarn by way of an aqueduct a short distance above the town. It contains little of note except the abbey-church of St Pierre, a building of the 15th century with a porch of the 12th century which is decorated with elaborate Romanesque carving unsurpassed in France. The cloister of the early 12th century adjoining the north side of the church is also one of the finest of its kind. Romanesque in character, it has pointed arches resting alternately on single and clustered columns with sculptured capitals. Among other remains of the abbey is the abbot's palace, which contains two halls of the Romanesque period. St Martin, the oldest of the other churches of Moissac, dates from before the year 1000. The town has a sub-prefecture, a tribunal of first instance, a communal college for boys, a library and a museum. Trade is in oil, wine, eggs, wool, poultry and fruit (peaches, apricots, &c).

The town owes its origin to an abbey probably founded in the 7th century by St Amand, the friend of Dagobert. After being devastated by the Saracens, the abbey was restored by Louis of Aquitaine, son of Charlemagne. Subsequently it was made dependent on Cluny, but in 1618 it was secularized by Pope Paul V., and replaced by a house of Augustinian monks, which was suppressed at the Revolution. The town, which was erected into a commune in the 13th century, was taken by Richard Cceur de Lion and by Simon de Montfort.

MOISSAN, HENRI (1852-1907), French chemist, was born at Paris on the 28th of September 1852. Educated at the Museum of Natural History, he was successively professor of toxicology (1886) and of inorganic chemistry (1889) at the School of Phar- macy, and of general chemistry at the Sorbonne (1900). In 1886 he succeeded in obtaining the element fluorine in the free state by the electrolysis of potassium fluoride and anhydrous hydrofluoric acid at a low temperature. Thence he was led to study the production of carbon in its three varieties and to attempt the artificial preparation of diamond, of

which he was able to make some minute specimens (see Gems, § Artificial). In connexion with these experiments he developed the electric furnace as a convenient means of obtaining very high temperatures in the laboratory; and by its aid he prepared many new compounds, especially carbides, silicides and borides, and melted and volatilized substances which had previously been regarded as infusible. For his preparation of fluorine he was

awarded the Lacase prize in 1887, and in 1906 he obtained the Nobel prize for chemistry. He died in Paris on the 20th of February 1907.

His published works include Le four electrique (1897), and Lefluor et ses composes (1900), besides 'numerous papers in the Comptes rendus and other scientific periodicals. A Traite de chimie minerale in five volumes was published under his direction in 1904-1906.

MOJI, a town of Japan, on the Kiushiu side of the Shimono- seki Strait. The strait being only 1 m. in width, Moji and Shimonoseki would be practically the same port did not the swiftness of the current along the latter shore make it con- venient for vessels to anchor off Moji. Moji is one of the places voluntarily opened by the Japanese for purposes of direct export. It is the starting-point of the Kiushiu railway, and as there is abundance of coal in its neighbourhood, it has become a town of considerable importance. In 1890 it was little more than a hamlet, but it had in 1901 a population of 25,274, and a considerable foreign trade.

MOJSISOVICS VON MOJSVAR, JOHANN AUGUST GEORG EDMUND (1839-1907), Austro-Hungarian geologist and palaeontologist, son of the surgeon Georg Mojsisovics von Mojsvar (1799-1860), was born at Vienna on the 18th of October 1839. He studied law in Vienna University, taking his doctor's degree in 1864, and in 1867 he entered the Geological Institute, becoming chief geologist in 1870 and vice-director in 1892. He retired in 1900, and died at Mallnitz on the 2nd of October 1907. He paid special attention

to the cephalopoda of the Austrian Trias, and his publications include Das Gebirge wm Hallstatt (1873-1876); Die Dolomitrisse von Siidtirol und Venetien (1878-1880); Grundlinien der Geologie von Bosnien-H erzegowina (1880) with E. Tietze and A. Bittner; Die Cephalopoden der mediterranen Triasprovinz (1882); Die cephalopoden der Hallstdtter Kalke (1873-1903); and Beitriige zur Kenntniss der obertriadischen Cephalopodenfaunen des Himalaya (1896). With Melchior Neumayr (1845-1890) he conducted the Beitrdge zur Paldon- tologie und Geologie Oesterreich-Ungarns. In 1862, with Paul Grohmann and Dr Guido von Sommaruga, he founded the Austrian Alpine Club, and he also took part in establishing the German Alpine Club, which combined with the former in 1873.

MOKANNA (al-M oqanna' , the Veiled), the name given to Hakim, or "Ata, a man of unknown parentage, originally a fuller in Merv, who posed as an incarnation of Deity, and headed a revolt in Khorasan against the caliph MahdI. For about three years he sustained himself in the field against' the troops of the caliph and for two years longer in his fortress of Sanam; then, reduced to straits in 779, he and his followers took poison and set fire to the fortress. Much is related to his magical arts, espe- cially of a moonlike light visible for an enormous distance which he made to rise from a pit near Nakhshab. He is the hero of the first part of Moore's Lalla Rookh. ;- -

MOKHA (Mocha, properly Makha), a town in Arabia on the Red Sea coast in i3°i9'N.and 43° 12' E. Formerly the chief port for the Yemen coffee export, it has much diminished in im- portance. The coffee grown in the mountain districts of Haraz, Uden, and Ta'iz is now shipped at Hodeda or Aden, though the article retains the trade name of " Mocha." The town lies in a small bay 40 m. N. of Perim at the southern entrance to the Red Sea. The anchorage is not good, and the port is only used by native vessels. Seen from the sea the town has rather an imposing appearance, but a near review shows that the houses though large and built of stone are mostly in ruins.

The neighbouring country is an arid plain without fresh water, the town being supplied by an aqueduct from the village of Muza, situated 16 m. to the east. This is probably identical with the Muza of the Periplus, a great seat of the Red Sea trade in antiquity, which like Betel Fakih, Zubed and other old Tehama towns, formerly seaports, has long since been left by the receding sea. There is a Turkish kaimakam and a small garrison at Mokha, which is part of the civil district of Taiz in the vilayet of Yemen.

MOKSHANY, a town of Russia, in the government of Penza, 24 m. N.W. of the city of Penza. Pop. (1000), 10,710. The

inhabitants are engaged in agriculture, or work in flour-mills, oilworks, tanneries and potash-works. Mokshany, which was built in 1535 as a fort to protect the country from the raids of the Tatars and the Kalmucks, is supposed to occupy the site of the Meshcheryak town of MurunzaJ mentioned as early as the 9th century.

MOLASSES, the syrup obtained from the drainings of raw sugar or from sugar during the process of refining. In American usage the word usually applies to both forms of the syrup, but in English usage the second form is more usually known as ” treacle ” (see Sugar). The word, which in early forms appears as melasses, molassos, &c, is from the Port. melaco, or Fr. milasse, cf. the Late Lat. mellaceum, syrup made from honey {met). The geological term ” molasse ” must be distinguished; this word, applied to the soft greenish sandstone of the district between the Jura and the Alps, is French, meaning ” soft,” Lat. mollis.

MOLAY, JACQUES DE (d. 13 14), last grand master of the Knights Templars, was born of a noble but impoverished family, at a village of the same name

in the old province of Franche- Comte (mod. department of Haute-Saone), about the middle of the 13th century. The family property being the inheritance of an elder brother, Jacques was thrown upon his own resources. Having been brought up in the neighbourhood of a commandery of the Temple, he entered the order in 1265 at Beaune in the diocese of Autun. It is probable that he at once set out for the East to take part in the defence of the Holy Land against the Saracens. About 1295 he was elected grand master of the order. After the Templars had been driven out of Palestine by the Saracens, De Molay took refuge with the remnant of his followers in the island of Cyprus. Here, while attempting to get together a force to retrieve the disasters to the Christian arms, he received a summons (in 1306) from Pope Clement V. to repair to Paris. The pope's pretext for the summons was his desire to put an end to the quarrels between the Templars and the Knights of St John, and to concert plans for a new crusade ; in reality he had entered into a secret agreement with the king of France for the sup- pression of the Templars. Molay left Cyprus with a retinue of 60 followers, and made a triumphal entry into Paris. On the 13th of October 1307 every Templar in France was arrested, and a prolonged examination of the members of the order was held. De Molay, probably under torture, confessed that some of the charges brought against the order were true. He was kept in prison for several years, and in 1314 he was brought up with three other dignitaries of the Temple before a commission of cardinals and others to hear the sentence (imprisonment for life) pronounced. Then, to the surprise of the commission, De Molay withdrew his confession. Immediately the king heard of it he gave orders that De Molay and another of the four, who had also recanted, should be burnt as lapsed heretics. The sentence was carried out on the nth (or 19th) of March 1314. De Molay's ashes were gathered up by the people, and it is said that with his last breath he summoned the king and the pope to appear with him before the throne of God.

For the charges brought against the Templars and the

famous process in connexion with them, see Templars; J. Michelet, Prods des Templiers (1841-1851) and Lavocat, Prods des frlres et de Vordre du Temple d'apris des pieces inedites publiees par M. Michelet (1888) ; E. Besson, " fitude sur Jacques de Molay in Memoires de la soc. ^emulation du Doubs (Besangon, 1876) ; H. H. Milman; Hist, of Latin Christianity, bk. xii., chs. I and 2; H. Prutz, Entwickelung und Vntergang des Tempelherrenordens (Berlin, 1888).

MOLD (formerly Mould, Welsh Y Wyddgrug, a conspicuous barrow, Lat. Mons alius, the translation of the Welsh name), a market town, contributory parliamentary borough of Flint- shire, N. Wales; on the London & North- Western railway (Chester and Denbigh branch), 182 m. from London and n m. from Chester. Pop. of urban district (1901), 4263. The locality is populous owing to the collieries and lead-smelting works in the vicinity. At the north end of the town there is a height, Bailey Hill (perhaps from ballia, the architectural term applied to fortified castle courts). This hill, partly natural and partly artificial, was once the site of a Roman fortification, and in old

records is known as Moaldes, Monhault, or Monthault (de monte alto). Mold Castle was probably built by Robert Monthault (temp. William Rufus), was taken and destroyed by Owen Gwynedd in 1144-1145, its site lost to the English and retaken by Llewelyn ap Iowerth in 1 201 , and by Gruffydd Llwyd in 1322. On this site, too, where there are now no remains of any fortress, were found, in 1849, some 15 skeletons, supposed to be of the 13th or 14th centuries. Maes Garmon (the battlefield of Germanus) is about a mile west of Mold. Here, as is supposed, the " Alleluia Victory " was gained over the Picts and Scots by Lupus and Germanus, bishop of Auxerre, according to some about a.d. 430, but others give a.d. 448, the date of the saint's death. A commemorative obelisk was erected on the Maes by N. Griffith of Rhual (1736). Over a mile south of Mold, on the right of the road to Nerquis, is the "Tower" (15th' century, but perhaps restored in the 18th), where, in 1465 or 1475, the royal chieftain,

Rheinallt ab Gruffyd ad Bleddyn, hanged Robert Byrne, mayor of Chester, and subsequently burned alive some 200 Chester folk who tried to arrest him. Many tumuli are visible round Mold.

Mold county gaol, bought in 1880 by Jesuits expelled from France, was by them named St Germanus's House. St Mary's church, a Gothic building, is mentioned as early as the time of Henry VII. Its important collieries and lead mines; fire-brick, tile, earthenware, mineral oil, tinplate and nail manufactures, tanneries, breweries and malt-houses, have made Mold the business centre of the county. About 4 m. distant is Cilcain village, of which the church has a carved oak roof, stolen from Basingwerk Abbey at the dissolution of the monasteries. Among the neighbouring Clwyd hills Moel Fammau and Moel Arthur are specially noticeable. On the summit of the former is George III.'s jubilee pyramid. The Ordovices and the Romans fortified Moel Arthur. The sites of seven posts established against Rome may be traced along the hills bound- ing Flintshire and Denbighshire.

MOLDAVIA, a former principality of south-eastern Europe, constituting, after its union with Wallachia on the 9th of November 1859, a part of Rumania (q.v.).

MOLDAVITE, an olive-green or dull greenish vitreous sub- stance, named by A. Dufrenoy from Moldauthein in Bohemia, where it occurs. It is sometimes cut and polished as an orna- mental stone under the name of pseudo-chrysolite. Its bottle- glass colour led to its being commonly called Bouteillenstein, and at one time it was regarded as an artificial product, but this view is opposed to the fact that no remains of glass-works are found in the neighbourhood of its occurrence: moreover pieces of the substance are widely distributed in Tertiary and early Pleistocene deposits in Bohemia and Moravia. For a long time it was generally believed to be a variety of obsidian, but its difficult fusibility and its chemical composition are rather against its volcanic origin. Dr F. E. Suess pointed out that the nodules or small

masses of moldavite presented curious pittings and wrinkles on the surface, which could not be due to the action of water, but resembled the characteristic markings on many meteorites. Boldly attributing the material to a cosmic origin, he regarded moldavite as a special type of meteor- ite for which he proposed the name of tectite (Gr. tt^ktSs, melted). To this type are also referred the so-called obsidian bombs and buttons from Australia and Tasmania, known some- times as australite, and called by R. H. Walcott obsidianites. Similar bodies have been found in Malaysia and have been termed billitonite, from the isle of Billiton where they occur in tin-bearing gravels. Usually they are flat, rounded or ellipsoidal bodies, sometimes surrounded by an equatorial girdle or rim, and often with a brilliant black superficial lustre, as though varnished. Moldavite has been reported also from Scania in Sweden.

See Franz E. Suess, Jahrbuch der k.-k. geolog. Reichsanstalt (Vienna), 1901, p. 193; E. Weinschenk, Centralblatt f. Mineralogie (Stuttgart), 1908, p. 737. (F. W. R.*)

MOLDE, a small seaside town of Norway, in Romsdal ami (county), 204 m. by sea N.N.E. of Bergen, in 62 45′ N. (that

of the Faroe Islands). It has little trade, but is the principal tourist centre on this part of the coast, and the steamers from Hull and Newcastle, the Norwegian ports, Hamburg, Antwerp, &c, call here. The town fronts the broad Molde Fjord, with its long low islands, and to the east and south a splendid panorama of jagged mountains is seen, reaching 6010 ft. in Store Troldtinder of the Romsdal group. Molde is the port for the tourist route through the Romsdal.

M0L6, LOUIS MATHIEU, Comte (1781-1855), French

states- man, was born in Paris on the 24th of January 1781. His father, a president of the parlement of Paris, who came of the family of the famous president noticed below, was guillotined during the Terror, and Count Mole's early days were spent in Switzerland and in England with his mother, a relative of Lamoignon-Malesherbes. On his return to France he studied at the ecole centrale des travaux publics, and his social educa- tion was accomplished in the salon of Pauline de Beaumont, the friend of Chateaubriand and Joubert. A volume of Essais de morale et de politique introduced him to the notice of Napoleon, who attached him to the staff of the council of state. He became master of requests in 1806, and next year prefect of the Cote d'Or, councillor of state and director-general of bridges and roads in 1809, and count of the empire in the autumn of the same year. In November 1813 he became minister of justice. Although he resumed his functions as director-general during the Hundred Days, he excused himself from taking his seat in the council of state and was apparently not seriously com- promised, for Louis XVIII. confirmed his appointment as director-general and made him a peer of France. Mole supported the policy of the due de Richelieu, who in 181 7 entrusted to him the direction of the ministry of marine, which he held until December 1818. From that time he belonged to the moderate opposition, and he accepted the result of the revolution of 1830 without enthusiasm. He was minister for foreign affairs in the first cabinet of Louis Philippe's reign, and was confronted with the task of reconciling the European powers to the change of government. The real direction of foreign affairs, however, lay less in his hands than in those of Talleyrand, who had gone to London as the ambassador of the new king. After a few months of office Mole retired, and it was not until 1836 that the fall of Thiers led to his becoming prime minister of a new govern- ment, in which he held the portfolio of foreign affairs. One of his first actions was the release of the ex-ministers of Charles X., and he had to deal with the disputes with Switzerland and with the Strassburg coup of

Louis Napoleon. He withdrew the French garrison from Ancona, but pursued an active policy in Mexico and in Algeria. Personal and political differences rapidly arose between Mole and his chief colleague Guizot, and led to an open rupture in March 1837 in face of the general opposition to a grant to the due de Nemours. After some attempts to secure a new combination M0I6 resonstructed his ministry in April, Guizot being excluded. The general election in the autumn gave him no fresh support in the Chamber of Deputies, while he had now to face a formidable coalition between Guizot, the Left Centre under Thiers, and politicians of the Dynastic Left and the Republican Left. Mole, supported by Louis Philippe, held his ground against the general hostility until the beginning of 1839, when, after acrid discussions on the address, the chamber was dissolved. The new house showed little change in the strength of parties, but Mole resigned on the 31st of March 1839. A year later he entered the Academy, and though he continued to speak frequently he took no im- portant share in party politics. Louis Philippe sought his help in his vain efforts to form a ministry in February 1848. After the revolution he was deputy for the Gironde to the Con- stituent Assembly, and in 1849 to the Legislative Assembly, where he was one of the leaders of the Right until the coup d'etat on the 2nd of December 1851 drove him from public life. He died at Champlatreux (Seine-et-Oise) on the 23rd of November 1855.

See P. Thureau-Dangin, Histoire de la monarchie de juillet (1884- 1892); and Robert Cougny, Diet, des parlementaires francais (1891).

MOLE, MATHIEU (1584-1656), French statesman, son of Edouard Mole (d. 1614), who was for a time procureur-giniral, was educated at the university of Orleans. Admitted conseiller in 1606, he was president aux requites in 1610, procureur-geniral in succession to Nicolas de Bellievre in 1614, and he took part in the assembly of the Notables summoned at Rouen in 161 7. He fought in vain against the setting up of special tribunals, or commissions, to try prisoners charged with political offences, and

for his persistence in the case of the brothers Louis and Michel de Marillac he was suspended in 1631, and ordered to appear at Fontainebleau in his own defence. Hitherto Mole's relations with Richelieu had been fairly good, but his inclination to the doctrines of Port Royal increased the differences between them, and it was not until after Richelieu's death that he was able to secure the release of his friend, the abbe de St Cyran. In 1641 he was appointed first president of the parlement, with the preliminary condition that he should not permit the general assembly of the chambers except by express order of the king. After Richelieu's death the pretensions of the parlement in- creased; the hereditary magistrature arrogated to itself the functions of the states-general, and in 1648 the parlement with the other sovereign courts (the cour des aides, the grand conseil, and the cour des comptes) met in one assembly and proposed for the royal sanction twenty-seven articles, which amounted in substance to a new constitution. In the long conflict between Anne of Austria and the parlement, Mole, without yielding the rights of the parlement, played a conciliatory part. In the popu- lar tumult known as the day of the barricades (Aug. 26, 1648) he sought out Mazarin and the queen to demand the release of Pierre Broussel and his colleagues, whose seizure had been the original cause of the outbreak. Next day the parlement marched in procession to repeat Mole's demand. On their way back they were stopped by the crowd. " Turn, traitor," said one of the rebels to M0I6, seizing him by the beard, " and unless you wish to be massacred, either bring back Broussel, or bring Mazarin as a hostage." Many magistrates fled; the remnant, headed by the intrepid Mole, returned to the Palais Royal, where Anne of Austria was induced to release the prisoners.

Mol6's moderating counsels failed to prevent the outbreak of the first Fronde, but he negotiated the peace of Rueil in 1651, and averted a conflict between the partisans of Conde and of the Cardinal de Retz within the precincts of the Palais de

Justice. He refused honours and rewards for himself or his family, but became keeper of the seals, in which capacity he was compelled to follow the court, and he therefore retired from the presidency of the parlement. He died on the 3rd of January 1656.

The Memoires of Mole were edited for the Societe de l'histoire de France (4 vols., 1855) by Aime Champollion-Figeac, and his life was written by Baron A. G. P. de Barante in Le Parlement et la Fronde (1859). See also the memoirs of Omer Talon and of De Retz.

MOLE. (1) A small animal of the family Talpidae (see below). (2) A mark, or stain, and particularly a dark-coloured raised spot on the human skin. This word, O. Eng. mdl, appears in such forms as meil or mail, in old forms of Teutonic languages, and in mal, a sign; cf. Ger. Dcnkmal, a monument. It is probably cognate with Lat. maculus, spot. Its meaning of stain is seen in the corrupted form " iron-mould," properly " iron-mole," a stain produced on linen or cloth by rust or ink. (3) A large structure of rubble, stone or other material, used as a breakwater or pier (see Breakwater), or the space of water so enclosed, forming a harbour or anchorage. This word comes through the French from Lat. moles, a mass, large structure. The name of the " Mole of Hadrian " (moles Hadriani) is sometimes given to the mausoleum of that emperor, now the castle of St Angelo at Rome.

In zoology the name of mole (a contracted form of mould- warp, i.e. mould-caster), is properly applicable to the common mole (Talpa europaea), a small, soft-furred, burrowing mammal, with minute eyes, and broad fossorial fore-feet, belonging to the order Insectivora and the family Talpidae. In a wider sense may be included under the same term the other Old World moles, the North American star-nosed and other moles, and the

African golden moles of the family Chrysochloridae. In a still wider sense the name is applied to the Asiatic zokors and the African strand-moles, belonging to the order Rodentia, as well as to the Australian marsupial mole.

The common mole is an animal about six inches in length, with a tail of one inch. The body is long and cylindrical, and, owing to the forward position of the front limbs, the head appears to rest between the shoulders; the muzzle is long and obtusely pointed, terminated by the nostrils, which are close together in front; the minute eye is almost hidden by the fur; the ear is without a conch, opening on a level with the sur- rounding skin; the fore-limbs are rather short and very muscular, terminating in broad, naked, shovel-shaped feet, the palms normally directed outwards, each with five sub-equal digits armed with strong flattened claws; the hind-feet, on the contrary, are long and narrow; and the toes are provided with slender claws. The body is densely covered with soft, erect, velvety fur — • the hairs uniform in length and thickness, except on the muzzle and short tail, the former having some straight bristles on its sides, whilst the latter is clothed with longer and coarser hairs. The fur is generally black, with a more or less greyish tinge, or brownish-black, but various paler shades up to pure white have been observed.

The food of the mole consists chiefly of earthworms, in pursuit of which it forms its well-known underground excavations. The mole is one of the most voracious of mammals, and, if deprived of food, is said to succumb in from ten to twelve hours. Almost any kind of flesh is eagerly devoured by captive moles, which have been seen, as if maddened by hunger, to attack animals nearly as large as themselves, such as birds, lizards, frogs, and even snakes; toads, however, they will not touch, and no form of vegetable food attracts their notice. If two moles be confined together without food, the weaker is invariably devoured by the stronger. Moles take readily to the water — in this respect, as well as in external form, resembling their North American

representatives. Bruce, writing in 1793, remarks that he saw a mole paddling towards a small island in the Loch of Clunie, 180 yds. from land, on which he noticed molehills.

The sexes come together about the second week in March, and the young — generally from four to six in number — which are brought forth in about six weeks, quickly attain their full size.

Much misconception has prevailed with regard to the structure of the mole's " fortress," i.e. the large breeding hillock, which is generally placed in bushes, or amid the roots of a tree ; but a trustworthy account, by Mr L. E. Adams, will be found in the Memoirs of the Manchester Literary and Philosophical Society for 1903, vol. xlvii., pt. 2.

The geographical distribution of the mole exceeds that of all the other species of the genus taken together. It extends from England to Japan, and from the Dovre-Fjeld Mountains in Scandinavia and the Middle Dwina region in Russia to southern Europe and the southern slopes of the Himalaya, where it occurs at an elevation of 10,000 ft. In Great Britain it is found as far north as Caithness, but in Ireland and in the Western Isles of Scotland (except Mull) it is unknown. (See Insectivora.) (G. E. D. ; R. L.*)

MOLECULE (from mod. Lat. moleada, the diminutive of moles, a. mass), in chemistry and physics, the minutest particle of matter capable of separate existence. The word appears to have been invented during the 17 th century, and remained synonymous with " atom " (Gr. arofMS, from a-, privative, and reiiveiv, to cut) until the middle of the 19th century, when a differentiation was established. " Atom " has mainly a chemical import, being defined as the smallest particle of matter which can take part in a chemical reaction; a "molecule" is composed of atoms, generally two or more. For the detailed chemical significance of these terms, see Chemistry; and for the atomic theory of the chemist (as distinguished from the atomic or molecular theory of the physicist) see Atom; reference may

also be made to the article Matter.

The doctrine that matter can be divided into, or regarded as composed of, discrete particles (termed ” atoms ” by early writers, and ” molecules ” by modern ones) has at all times played an important part in metaphysics and natural science.

The leading historical stages in the evolution of the modern conception of the molecular structure of matter are treated in the following passage from James Clerk Maxwell’s article Atom in the 9th edition of the Ency. Brit.

” Atom l (cb-ojuos) is a body which cannot be cut in two. The atomic theory is a theory of the constitution of bodies which asserts that they are made up of atoms. The opposite theory is that of the homogeneity and continuity of bodies, and asserts, at least in the case of bodies having no apparent organization, such, for instance, as water, that as we can divide a drop of water into two parts which are each of them drops of water, so we have reason to believe that these smaller drops can be divided again, and the theory goes on to assert that there is nothing in the nature of things to hinder this process of division from being repeated over and over again, times without end. This is the doctrine of the infinite divisibility of bodies, and it is in direct contradiction with the theory of atoms.

“The atomists assert that after a certain number of such divisions the parts would be no longer divisible, because each of them would be an atom. The advocates of the continuity of matter assert that the smallest conceivable body has parts, and that whatever has parts may be divided.

” In ancient times Democritus was the founder of the atomic theory, while Anaxagoras propounded that of continuity, under the name of the doctrine of homoeomeria (‘0/j.oi.oij.ipia),oro{ the similarity of the parts of a body to the whole. The arguments of the atomists, and their replies to the objections of Anaxagoras, are to be found in Lucretius.

” In modern times the study of nature has brought to light many properties of bodies which appear to depend on the magnitude and motions of their ultimate constituents, and the question of the exist- ence of atoms has once more become conspicuous among scientific inquiries.

” We shall begin by stating the opposing doctrines of atoms and of continuity. The most ancient philosophers whose speculations are known to us seem to have discussed the ideas of number and of continuous magnitude, of space and time, of matter and motion, with a native power of thought which has probably never been sur- passed. Their actual knowledge, however, and their scientific experience were necessarily limited, because in their days the records of human thought were only beginning to accumulate. It is probable that the first exact, notions of quantity were founded on the consideration of number. It is by the help of numbers that concrete quantities are practically measured and calculated. Now, number is discontinuous. We pass from one number to the next per saltum. The magnitudes, on the other hand, which we meet with in geometry, are essentially continuous. The attempt to apply numerical methods to the comparison of geometrical quantities led to the doctrine of incommensurables, and to that of the infinite divisibility of space. Meanwhile, the same considerations had not been applied to time, so that in the days of Zeno of Elea time was still regarded as made up of a finite number of ‘ moments,’ while space was confessed to be divisible without limit. This was the state of opinion when the celebrated arguments against the possibility of motion, of which that of Achilles and the tortoise is a specimen, were propounded by Zeno, and such, apparently, continued to be the state of opinion till Aristotle pointed out that time is divisible without limit, in precisely the same sense that space is. And the slowness of the’ development of scientific ideas may be estimated from the fact that Bayle does not see any force in this statement of Aristotle, but continues to admire the paradox of

Zeno (Bayle's Dictionary, art. ' Zeno '). Thus the direction of true scientific progress was for many ages towards the recognition of the infinite divisibility of space and time.

"It was easy to attempt to apply similar arguments to matter. If matter is extended and fills space, the same mental operation by which we recognize the divisibility of space may be applied, in imagi- nation at least, to the matter which occupies space. From this point of view the atomic doctrine might be regarded as a relic of the old numerical way of conceiving magnitude, and the opposite doc- trine of the infinite divisibility of matter might appear for a time the most scientific. The atomists, on the other hand, asserted very strongly the distinction between matter and space. The atoms, they said, do not fill up the universe; there are void spaces between them. If it were not so, Lucretius tells us, there could be no motion, for the atom which gives way first must have some empty place to move into.

' Quapropter locus est intactus, inane, vacansque Quod si non esset, nulla ratione moveri Res possent; namque, officium quod corporis exstat, Officere atque obstare, id in omni tempore adesset Omnibus : haud igitur quicquam procedere posset, Principium quoniam cedendi nulla daret res.'

De rerum natura, i. 335.

" The opposite school maintained then, as they have always done,

1 It will be noted that Clerk Maxwell's " atom " and " atomic theory" have the significance which we now attach to " molecule " and " molecular theory."

that there is no vacuum — that every part of space is full of matter, that there is a universal plenum, and that all motion is like that of a fish in the water, which yields in front of the fish because the

fish leaves room for it behind.

‘ Cedere squamigeris latices nitentibus aiunt Et liquidas aperire vias, quia post loca pisces Linquant, quo possint cedentes confluere undae.’

Ibid. i. 373. ” In modern times Descartes held that, as it is of the essence of matter to be extended in length, breadth and thickness, so it is of the essence of extension to be occupied by matter, for extension cannot be an extension of nothing.

” ‘ Ac proinde si quaeratur quid fiet, si Deus auferat omne corpus quod in aliquo vase continetur, et nullum aliud in ablati locum venire permittat? respondendum est, vasis latera sibi invicem hoc ipso fore contigua. Cum enim inter duo corpora nihil interjacet, necesse est ut se mutuo tangant, ac manifeste repugnat ut distent, sive ut inter ipsa sit distantia, et tamen ut ista distantia sit nihil; quia omnis distantia est modus extensionis, et ideo sine substantia extensa esse non potest.’ — Principia, ii. 18.

” This identification of extension with substance runs through the whole of Descartes’s works, and it forms one of the ultimate founda- tions of the system of Spinoza. Descartes, consistently with this doctrine, denies the existence of atoms as parts of matter, which by their own nature are indivisible. He seems to admit, however, that the Deity might make certain particles of matter indivisible in this sense, that no creature should be able to divide them. These par- ticles, however, would be still divisible by their own nature, because the Deity cannot diminish his own power, and therefore must retain his power of dividing them. Leibniz, on the other hand, regarded his monad as the ultimate element of everything.

” There are thus two modes of thinking about the constitution of bodies, which have had their adherents both in ancient and in modern times. They correspond to the two methods of regarding quantity — the arithmetical and the geometrical. To the

atomist the true method of estimating the quantity of matter in a body is to count the atoms of it. The void spaces between the atoms count for nothing. To those who identify matter with extension, the volume of space occupied by a body is the only measure of the quantity of matter in it.

" Of the different forms of the atomic theory that of R. J. Boscovich may be taken as an example of the purest monadism. According to Boscovich matter is made up of atoms. Each atom is an indivisible point, having position in space, capable of motion in a continuous path, and possessing a certain mass, whereby a certain amount of force is required to produce a given change of motion. Besides this the atom is endowed with potential force, that is to say, that any two atoms attract or repel each other with a force depending on their distance apart. The law of this force, for all distances greater than say the thousandth of an inch, is an attraction varying as the inverse square of the distance. For smaller distances the force is an attraction for one distance and a repulsion for another, according to some law not yet discovered. Boscovich himself, in order to obviate the* possibility of two atoms ever being in the same place, asserts that the ultimate force is a repulsion which increases without limit as the distance diminishes without limit, so that two atoms can never coincide. But this seems an unwarrantable concession to the vulgar opinion that two bodies cannot co-exist in the same place. This opinion is deduced from our experience of the behaviour of bodies of sensible size, but we have no experimental evidence that two atoms may not sometimes coincide. For instance, if oxygen and hydrogen combine to form water, we have no experimental evidence that the molecule of oxygen is not in the very same place with the two molecules of hydrogen. Many persons cannot get rid of the opinion that all matter is extended in length, breadth and depth. This is a pre- judice of the same kind with the last, arising from our experience of bodies consisting of immense multitudes of atoms. The system of atoms, according to Boscovich, occupies a

certain region of space in virtue of the forces acting between the component atoms of the system and any other atoms when brought near them. No other system of afoms can occupy the same region of space at the same time, because before it could do so the mutual action of the atoms would have caused a repulsion between the two systems insuperable by any force which we can command. Thus, a number of soldiers with firearms may occupy an extensive region to the exclusion of the enemy's armies, though the space filled by their bodies is but small. In this way Boscovich explained the apparent extension of bodies consisting of atoms, each of which is devoid of extension. According to Boscovich's theory, all action between bodies is action at a dis- tance. There is no such thing in nature as actual contact between two bodies. When two bodies are said in ordinary language to be in contact, all that is meant is that they are so near together that the repulsion between the nearest pairs of atoms belonging to the two bodies is very great.

" Thus, in Boscovich's theory, the atom has continuity of existence in time and space. At any instant of time it is at some point of space, and it is never in more than one place at a time. It passes from one place to another along a continuous path. It has a definite

mass which cannot be increased or diminished. Atoms are endowed with the power of acting on one another by attraction or repulsion, the amount of' the force depending on the distance between them. On the other hand, the atom itself has no parts or dimensions. In its geometrical aspect it is a mere geometrical point. It has no extension in space. It has not the so-called property, of Impene- trability, for two atoms may exist in the same place. This we may regard as one extreme of the various opinions about the constitution of bodies.

" The opposite extreme, that of Anaxagoras — the theory that bodies apparently homogeneous and continuous are so in reality — is, in its extreme

form, a theory incapable of development. To explain the properties of any substance by this theory is impossible. We can only admit the observed properties of such substance as ultimate facts. There is a certain stage, however, of scientific progress in which a method corresponding to this theory is of service. In hydrostatics, for instance, we define a fluid by means of one of its known properties, and from this definition we make the system of deductions which constitutes the science of hydrostatics. In this way the science of hydrostatics may be built upon an experi- mental basis, without any consideration of the constitution of a fluid as to whether it is molecular or continuous. In like manner, after the French mathematicians had attempted, with more or less ingenuity, to construct a theory of elastic solids from the hypothesis that they consist of atoms in equilibrium under the action of their mutual forces, Stokes and others showed that all the results of this hypothesis, so far at least as they agreed with facts, might be deduced from the postulate that elastic bodies exist, and from the hypothesis that the smallest portions into which we can divide them are sensibly homogeneous. In this way the principle of continuity, which is the basis of the method of Fluxions and the whole of modern mathematics, may be applied to the analysis of problems connected with material bodies by assuming them, for the purpose of this analysis, to be homogeneous. All that is required to make the results applicable to the real case is that the smallest portions of the substance of which we take any notice shall be sensibly of the same kind. Thus, if a railway contractor has to make a tunnel through a hill of gravel, and if one cubic yard of the gravel is so like another cubic yard that for the purposes of the contract they may be taken as equivalent, then, in estimating the work required to remove the gravel from the tunnel, he may, without fear of error, make his calculations as if the gravel were a continuous substance. But if a worm has to make his way through the gravel, it makes the greatest possible difference to him whether he tries to push right

against a piece of gravel, or directs his course through one of the intervals between the pieces; to him, therefore, the gravel is by no means a homogeneous and continuous substance.

” In the same way, a theory that some particular substance, say water, is homogeneous and continuous may be a good working theory up to a certain point, but may fail when we come to deal with quantities so minute or so attenuated that their heterogeneity of structure comes into prominence. Whether this heterogeneity of structure is or is not consistent with homogeneity and continuity of substance is another question.

“The extreme form of the doctrine of continuity is that stated by Descartes, who maintains that the whole universe is equally full of matter, and that this matter is all of one kind, having no essential property besides that of extension. All the properties which we perceive in matter he reduces to its parts being movable among one another, and so capable of all the varieties which we can perceive to follow from the motion of its parts {Principia, ii. 23). Descartes’s own attempts to deduce the different qualities and actions of bodies in this way are not of much value. More than a century was required to invent methods of investigating the conditions of the motion of systems of bodies such as Descartes imagined. But the hydrodynamical discovery of Helmholtz that a vortex in a perfect liquid possesses certain permanent characteristics has been applied by Sir W. Thomson (Lord Kelvin) to form a theory of vortex atoms in a homogeneous, incompressible and frictionless liquid.”

The Molecular Structure oe Matter An enormous mass of experimental evidence now shows quite conclusively that matter cannot be regarded as having a con- tinuous structure, but that it is ultimately composed of discrete parts. The smallest unit of matter with which physical pheno- mena are concerned is the molecule. When chemical phenomena occur the molecule may be divided into atoms, and these atoms, in the presence of electrical

phenomena, may themselves be further divided into electrons or corpuscles. It ought accordingly to be possible to explain all the non-electrical and non-chemical properties of matter by treating matter as an aggregation of molecules. In point of fact it is found that the properties which are most easily explained are those connected with the gaseous state; the explanation of these properties in terms of the mole- cular structure of matter is the aim of the " Kinetic Theory of Gases." The results of this theory have placed the molecular

conception of matter in an indisputable position, but even without this theory there is such an accumulation of electrical and optical evidence in favour of the molecular conception of matter that the tenability of this conception could not be regarded as open to question.

The Scale of Molecular Structure. — Apart from speculation, the first definite evidence for the molecular structure of matter occurs when it is found that certain physical phenomena change their whole nature as soon as we deal with matter of which the linear dimensions are less than a certain amount. As a single instance of this may be mentioned some experiments of Lord Rayleigh (Proc. Roy. Soc, 1890, 47, p. 364), who found that a film of olive oil spread over the surface of water produced a perceptible effect on small floating pieces of camphor, at places at which the thickness of the film was io-6Xio~ 8 cms., but produced no perceptible effect at all at places where the thickness of the film was 8-iXio -8 cms. Thus a certain phenomenon, of the nature of capillary action, is seen to depend for its existence on the linear dimensions of the film of oil; the physical properties of a film of thickness io-6Xio -8 cms. are found to be in some way qualitatively different from those of a film of thickness 8-iXio 8 cms. Here is proof that the film of oil is not a con tinuous

homogeneous structure, and we are led to suspect that the scale on which the structure is formed has a unit of length comparable with 8X10 8 cms. The probability of this con jecture is strengthened when it is discovered that in all pheno- mena of this type the critical length connected with the stage at which the phenomenon changes its nature is of the order of magnitude of io -8 cms.

Lord Rayleigh (Phil. Mag. 1890 [5], 30, p. 474) has pointed out that the earliest known attempt to estimate the size of molecules, made by Thomas Young in 1805, was based upon the consideration of phenomena of the kind just mentioned. Dis- cussing the theory of capillary attractions, Young 1 found that at a rough estimate ” the extent of the cohesive force must be limited to about the 250- millionth of an inch ” (=io~ 8 cms.), and then argues that ” within similar limits of uncertainty we may obtain something like a conjectural estimate of the mutual distance of the particles of vapours, and even of the actual magnitude of the elementary atoms of liquids. ... It appears tolerably safe to conclude that, whatever errors may have affected the determination, the diameter or distance of the particles of water is between the two thousand and the ten thousand millionth of an inch” (= between - i^Xio -8 and •025 X io -8 cms.).

The best estimates which we now possess of the sizes of mole- cules are provided by calculations based upon the kinetic theory of gases. In the following table are given the values of the diameters qf the molecules of six substances with which it is easy to experiment in the gaseous state, these values being calculated in different ways from formulae supplied by the kinetic theory.

Gas.

Diameter calculated by the kinetic theory of gases.

From devia- tions from Boyle’s law.

From co- efficient of viscosity.

From co- efficient of conduction of heat.

From co- efficient of diffusion.

Mean value.

Hydrogen Carbon

monoxide Nitrogen Air . . Oxygen Carbon

dioxide

2-05XIO-8

3-I2XIO-8 2-90X10-8

3-OOXlO" 8

2-05X10-8

2-90X10-8 2-90X10-8 2-86X10-8 2-81X10-8

3-47X10-8

I-99XIO" 8

2-74X10-8 2-74XIO- 8 2-72XlO-« 2-58X10-8

3-58XIO-8

2 02X10* 2-92XIO-8

2-70XIO-8

3-28X10-8

2-03XIO-8

2-85XIO-8 2-92X10-8 2-83X10-8 2-70X10-8

3-33XIO-8

The agreement of the values obtained for the same quantity by different methods provides valuable confirmation of the truth of the molecular theory and of the validity of the methods of the kinetic theory of gases. That the results do not agree even

1 ” On the Cohesions of Fluids,” Phil. Trans. (1805); Young’s Coll. Works, i. 461.

better need not cause surprise when it is stated that the quantities are calculated on the hypothesis that the molecules are spherical in shape. This hypothesis is introduced for the sake of simplicity, but is known to be unjustifiable in fact. What is given by the formulae is accordingly the mean radius of an irregularly shaped solid (or, more probably, of the region in which the field of force surrounding such a solid is above a certain intensity), and the mean has to be taken in different ways in the different phenomena. This and the difficulty of obtaining accurate experimental results fully account for the differences inter se in the values of the quantities calculated.

Heat a Manifestation of Molecular Motion. — An essential feature of the modern view of the structure of matter is that the molecules are supposed to be in rapid motion relatively to one another. We are led to this conception by a number of experimental results, some of which will be mentioned later. We are compelled also to suppose that the motion assumes different forms in different substances. Roughly speaking, it is found that there are three main types of molecular motion corresponding to the three states of matter — solid, liquid and gaseous. That the distances traversed by the molecules of a solid are very small in extent is shown by innumerable facts of everyday observation, as for instance, the fact that the surface of a finely-carved metal (such as a plate used for steel engraving) will retain its exact shape for centuries, or again, the fact that when a metal body is coated with gold-leaf the molecules of the gold remain on its surface indefinitely: if they moved through any but the smallest distances they would soon become mixed with the molecules of the baser metal and diffused through its interior. Thus the molecules of a solid must make only small excursions about their mean positions. In a gas the state of things is very different; an odour is known to spread rapidly through great distances, even in the

stillest air, and a gaseous poison or corrosive will attack not only those objects which are in contact with its source but also all those which can be reached by the motion of its molecules.

As a preliminary to . examining further into the nature of molecular motion and the differences of character of this motion, let us try to picture the state of things which would exist in a mass of solid matter in which all the molecules are imagined to be at rest relatively to one another. The fact that a solid body in its natural state is capable both of compression and of dilatation indicates that the molecules of the body must not be supposed to be fixed rigidly in position relative to one another; the further fact that a motion of either compression or of dilata- tion is opposed by forces which are brought into play in the interior of the solid suggests that the position of rest is one in which the molecules are in stable equilibrium under their mutual forces. Such a mass of imaginary matter as we are now considering may be compared to a collection of heavy particles held in position relatively to one another by a system of light spiral springs, one spring being supposed to connect each pair of adjacent particles. Let two such masses of matter be suspended by strings from the same point, and then let one mass be drawn aside, pendulum-wise, and allowed to impinge on the other. After impact the two masses will rebound, and the process may be repeated any number of times, but- ultimately the two masses will be found again hanging in con- tact side by side. At the first impact each layer of surface molecules which takes the shock of the impact will be thrust back upon the layer behind it: this layer will in this way be set into motion and so influence the layer still further behind; and so on indefinitely. The impact will accordingly result in all the molecules being set into motion, the time that the masses have ceased impinging another the molecules of which they are composed performing oscillations about their positions of equilibrium. The kinetic energy with which the moving mass originally impinged on that at rest is now

represented by the energy, kinetic and potential, of the small motions of the

and by on one

will be

individual molecules. It is known, however, that when two bodies impinge, the kinetic energy which appears to be lost from the mass-motion of the bodies is in reality transformed into heat-energy. Thus the molecular theory of matter, as we have now pictured it, leads us to identify heat-energy in a body with the energy of motion of the molecules of the body relatively to one another. A body in which all the molecules were at rest relatively to one another would be a body devoid of heat. This conception of the nature of heat leads at once to an absolute zero of temperature — a temperature of no heat-motion — which is identical, as will be seen later, with that reached in other ways, namely, about - 273 C.

The point of view which has now been gained enables us to interpret most of the thermal properties of solids in terms of molecular theory. Suppose for instance that two bodies, both devoid of heat, are placed in contact with one another, and that the surface of the one is then rubbed over that of the other. The molecules of the two surface-layers will exert forces upon one another, so that, when the rubbing takes place, each layer will set the molecules of the other into motion, and the energy of rubbing will be used in establishing this heat-motion. In this we see the explanation of the phenomenon of the generation of heat by friction. At first the heat-motion will be confined to molecules near the rubbing surfaces of the two bodies, but, as already explained, these will in time set the interior molecules into motion, so that ultimately the heat-motion will become spread throughout the

whole mass. Here we have an instance of the conduction of heat. 1 When the molecules are oscillating about their equilibrium positions, there is no reason why their mean distance apart should be the same as when they are at rest. This leads to an interpretation of the fact that a change of ‘dimensions usually attends a change in the temperature of a substance. Suppose for instance that two molecules, when at rest in equilibrium, are at a distance a apart. It is very possible that the repulsive force they exert when at a distance a − e may be greater than the attractive force they exert when at a distance a + e. If so, it is clear that their mean distance apart, averaged through a sufficiently long interval of their motion, will be greater than a. A body made up of molecules of this kind will expand on heating.

As the temperature of a body increases the average energy of the molecules will increase, and therefore the range of their excursions from their positions of equilibrium will increase also. At a certain temperature a stage will be reached in which it is a frequent occurrence for a molecule to wander so far from its position of equilibrium, that it does not return but falls into a new position of equilibrium and oscillates about this. When the body is in this state the relative positions of the molecules are not permanently fixed, so that the body is no longer of unalterable shape: it has assumed a plastic or molten condition. The substance attains to a perfectly liquid state as soon as the energy of motion of the molecules is such that there is a constant rearrangement of position among them.

A molecule escaping from its original position in a body will usually fall into a new position in which it will be held in equilibrium by the forces from a new set of neighbouring mole- cules. But if the wandering molecule was originally close to the surface of the body, and if it also happens to start off in the right direction, it may escape from the body altogether and describe a free path in space until it is checked by meeting a second wandering molecule or other obstacle. The body is continually

losing mass by the loss of individual molecules in this way, and this explains the process of evaporation. More- over, the molecules which escape are, on the whole, those with the greatest energy. The average energy of the molecules of the liquid is accordingly lowered by evaporation. In this we see the explanation of the fall of temperature which accompanies evaporation.

When a liquid undergoing evaporation is contained in a closed vessel, a molecule which has left the liquid will, after a certain

1 Other processes also help in the conduction of heat, especially in substances which are conductors of electricity.

number of collisions with other free molecules and with the sides of the vessel, fall back again into the liquid. Thus the process of evaporation is necessarily accompanied by a process of recon- densation. When a stage is reached such that the number of molecules lost to the liquid by evaporation is exactly equal to that regained by condensation, we have a liquid in equilibrium with its own vapour. If the whole liquid becomes vaporized before this stage is attained, a state will exist in which the vessel is occupied solely by free molecules, describing paths which are disturbed only by encounters with other free molecules or the sides of the vessel. This is the conception which the molecular theory compels us to form of the gaseous state.

At normal temperature and pressure the density of a substance in the gaseous state is of the order of one-thousandth of the density of the same substance in the solid or liquid state. It follows that the average distance apart of the molecules in the gaseous state is roughly ten times as great as in the solid or liquid state, and hence that in the gaseous state the molecules are at distances apart which are large compared with their linear dimensions, (If the molecules of air at normal tem- perature and pressure were arranged in cubical

order, the edge of each cube would be about 2-qXio-7 cms.; the average diameter of a molecule in air is 2-8Xio- 8 cms.) Further and very important evidence as to the nature of the gaseous state of matter is provided by the experiments of Joule and Kelvin. These experiments showed that the change in the temperature of a gas, consequent on its being allowed to stream out into a vacuum, is in general very slight. In terms of the molecular theory this indicates that the total energy of the gas is the sum of the separate energies of its different molecules : the potential energy arising from intermolecular forces between pairs of molecules may be treated as negligible when the matter is in the gaseous state.

These two simplifying facts bring the properties of the gaseous state of matter within the range of mathematical treatment. The kinetic theory of gases attempts to give a mathematical account, in terms of the molecular structure of matter, of all the non-chemical and non-electrical properties of gases. The remainder of this article is devoted to a brief statement of the methods and results of the kinetic theory. No attempt will be made to follow the historic order of development, but the present theory will be set out in its most logical form and order.

The Kinetic Theory of Gases.

A number of molecules moving in obedience to dynamical laws will pass through a series of configurations which can be y theoretically determined as soon as the structure of each molecule and the initial position and velocity of every part cf it are known. The determination of the series of configurations developing out of given initial conditions is not, however, the problem of the kinetic theory: the object of this theory is to explain the general properties of all gases in terms only of their molecular structure. We are therefore called upon, not to trace the series of configurations of any single gas, starting from definite initial conditions, but to search for

features and properties common to all series of configurations, independently of the particular initial conditions from which the gas may have started.

We begin with a general dynamical theorem, whose special appli- cation, when the dynamical system is identified with a gas, will appear later. Let q\, < £,... q n be the generalized co- n v „ am > ca i ordinates of any dynamical system, and let pi, p%, . . . p n B ^ s , s be the corresponding momenta. If the system is supposed to obey the conservation of energy and to move solely under its own internal forces, the changes in the co-ordinates and momenta can be found from the Hamiltonian equations

. 3E . BE , .

& = dp; pT= ~dq? w

where q r denotes dq r /dt, &c, and E is the total energy expressed as a function of pi, q u . . . pn, g». When the initial values of pi, qi . . . p n , q n , are given, the motion can be traced completely from these equations.

Let us suppose that an infinite number of exactly similar systems start simultaneously from all possible values of pi, qi, . . . pn, qn, each moving solely under its own internal forces, and therefore in accordance with equations (1). Let us confine our attention to those

pn, 2» He within

systems for which the initial values of pi, gi, a range such that

pi is between pi and pi--dpi 2i >> ,, ffi ,, qi--dqi, and so on. Let the product dpi dqi . . . dp n dq„ be spoken of as the ” extension ” of this range of values.

After a time dt the value of pi will have increased to pi--pidt, where pi is given by equations (i), and there will be similar changes in qi, p2, 22, . . . 2»- Thus after a time dt the values of the co-ordinates and momenta of the small group of systems under con- sideration will lie within a range such that

pi is between pi+pidt and pi+dpi+ (Pi + af^A) dt

Si

qi+qidt „ qi+dqi+ [qi +~^dqij dt,

and so on. Thus the extension of the range after the interval dt is

d P i(l+ ^dt)d q i(l+ gdt)

or, expanding as far as first powers of dt,

dpidqi . . . d Pn dq n j I +2,» (f|+fj) dt j .

From equations (i), .we find that

4- = dpi^dqi '

so that the extension of the new range is seen to be dpidqi . . . dp n dq n , and therefore equal to the initial extension. Since the values of the co-ordinates and momenta at any instant during the motion may be treated as ” initial ” values, it is clear that the ” extension ” of the range must remain constant throughout the whole motion.

This result at once disposes of the possibility of all the systems acquiring any common characteristic in the course of their motion through a tendency for their co-ordinates or momenta to concentrate about any particular set, or series of sets, of values. But the result goes further than this. Let us imagine that the systems had the initial values of their cq-ordinates and momenta so arranged that the number of systems for which the co-ordinates and momenta were within a given range was proportional simply to the extension of the range. Then the

result proves that the values of the co- ordinates and momenta remain distributed in this way throughout the whole motion of the systems. Thus, if there is any character- istic which is common to all the systems after the motion has been in progress for any interval of time, this same characteristic must equally have been common to all the systems initially. It must, in fact, be a characteristic of all possible states of the systems.

It is accordingly clear that there can be no property common to all systems, but it can be shown that when the system contains a gas (or any other aggregation of similar molecules) as part of it there are properties wnLh are common to all possible states, except for a number which form an insignificant fraction of the whole. These properties are found to account for the physical properties of gases.

Let the whole energy E of the system be supposed equal to E1+E2, where Ej is of the form E i = ii: (mu?+mv i +mw i + ai6i 2 +a 2 62 ,t + . . . +a„0„ 2)

+ hX(m'u'**+mV**m'w'>(3ii* +fc

+/3„/»' 2) (2)

where 81,82, . . . 8„ and similarly cjn, fa, . . . #,„ are any momenta or functions of the co-ordinates and momenta or co-ordinates alone which are subject only to the condition that they do not enter into the coefficients 01, 02, &c.

In this expression the first line may be supposed to represent the energy (or part of the energy) of 5 similar molecules of a kind which we shall call the first kind, the terms i(mu 2 +mv i +mw' 2) being the kinetic energy of translation, and the remaining terms arising from energy of rotation or of internal motion, or from the energy, kinetic and potential, of small vibrations. The second line in £ 2 will represent the energy (or part of the energy) of s' similar mole- cules of the second kind, and so on.

It is not at present necessary to suppose that the molecules are those of substances in the gaseous state. Considering only those states of the system which have a given value of E2, it can be proved, as a theorem in pure mathematics, 1 that when s, s′, . . . are very large, then, for all states except an infinitesimal fraction of the whole number, the values of u, v, w lie within ranges such that

(i) the values of u (and similarly of v, w) are distributed among the s molecules of the first kind according to the law of trial and error ; and similarly of course for the molecules of other kinds :

(ii) 2Jwm 2 2fmt> 2 2-|«to 2 2IM1 2

2|otV 2

2|/30i !

(3)

1 See Jeans, Dynamical Theory of Gases (1904), ch. v.

A state of the system in which these two properties are true will be called a ” normal state “; other states will be spoken of as “abnormal.” Let all possible states of the system be _, „ divided into small ranges of equal extension, and of„. e . orma ‘ these let a number P correspond to normal, and a number p to abnormal, states. What is proved is that, as s, s′, . . . become very great, the ratio P/p becomes infinite. Considering only systems starting in the p abnormal ranges, it is clear, from the fact that the extensions of the ranges do not change with the motion, that after a sufficient time most of these systems must have passed into the P normal ranges. Speaking loosely, we may say that there is a probability PftP+p), amounting to certainty in the limit, that one of these systems, selected at random, will be in the normal state after a sufficient time has elapsed. Again, considering the systems which start from the P

normal fmgrjs, we see that there is a prob- ability pl(P+p) which vanishes in the limit, that a system selected at random from these will be in an abnormal state after a sufficient time. Thus, subject to a probability of error which is infinitesimal in the limit, we may state as general laws that —

.4 system starting from an abnormal state tends to assume the normal state; while

A system starting from the normal state will remain in the normal state.

It will now be found that the various properties of gases follow from the supposition that the gas is in the normal state.

If each of the fractions (3) is put equal to 1/4/1, it is readily found, from the first property of the normal state, that, of the LawofDis- s molecules of the first kind, a number trlbutioa of

W (h 3 m :i lir 3)e- hm <- u2+ i> 2+w2)dudvdw (4)
Velocities.

have velocities of which the components lie between u and u--du, v and v+dv, w and w--dw, while the corresponding number of mole- cules of the second kind is, similarly,

s'J (h>m'**/ir**)e hm '<-'*+<' 2 +» l *>dudvdw. (5)

If c is the resultant velocity of a molecule, so that c 2 = u i --v l --w i ,

it is readily found from formula (4) that the number of molecules

of the first kind of which the resultant velocity lies between c and

c--dc is

4«V {h z m 3 l-w i)e- hm ' i cHc. (6)

These formulae express the " law of distribution of

velocities ” in the normal state : the law is often called Maxwell’s Law of Dis- tribution.

If \mu 2 denote the mean value of \mu 2 averaged over the 5 molecules of the first kind, equations (3) may be written in the form

\mu 2 = \mv l = \mw’ l = \aWi = . . . =1/4/2, (7)
Equlpartl-

showing that the mean energy represented by each t io ” of term in E2 (formula 2) is the same. These equations Energy. express the ” law of equipartition of energy,” commonly spoken of as the Maxwell-Boltzmann Law.

The law of equipartition shows that the various mean energies of different kinds are all equal, each being measured by the quantity 1/4/?. We have already seen that the mean energy in- creases with the temperature: it will now be supposed J ew P tr * m that the mean energy is exactly proportional to the e ‘ temperature. The complete justification for this supposition will appear later: a partial justification is obtained as soon as it is seen how many physical laws can be explained by it. We accordingly put l/2/t = RT, where T denotes the temperature on the absolute scale, and then have equations (7) in the form

trm 2 — mv i = ... =RT. (8)

When a system is composed of a mixture of different kinds of molecules, the fact that h is the same for each constituent [cf. formulae. (5) and (6)] shows that in the normal state the different substances are all at the same temperature. For instance, if the system is composed of a gas and a solid boundary, some of the terms in expression (2) may be supposed to represent the kinetic energy of the molecules of the boundary, so that equations (7) show that in the normal state the gas has the same temperature as the boundary. The process of equalization of temperature is now seen to be a special form of the process of motion towards the

normal state : the general laws which have been stated above in connexion with the normal state are seen to include as special cases the following laws : —

Matter originally at non-uniform temperature tends to assume a uniform temperature; while

Matter at uniform temperature will remain at uniform temperature.

It will at once be apparent that the kinetic theory of matter enables us to place the second law of thermodynamics upon a purely dynami- cal basis. So far it has not been necessary to suppose the matter to be in the gaseous state. We now pass to the consideration of laws and properties which are peculiar to the gaseous state.

A simple approximate calculation of the pressure exerted by a gas on its containing vessel can be made by supposing that the mole- cules are so small in comparison with their distances apart that they may be treated as of infinitesimal size. ™* ssure ol Let a mixture of gases contain per unit volume v mole- a s ‘ cules of the first kind, v’ of the second kind, and so on. Let us fix our attention on a small area dS of the boundary of the

vessel, and let co-ordinate axes be taken such that the origin is in dS, and the axis of x is the normal at the origin into the gas. The number of molecules of the first kind of gas, whose components of velocity lie within the ranges between u and u+du, v and v+dv, w and w+dw, will, by formula (5), be

W (h 3 m 3 lw i)e- hm(- u2+ ” 1+w ‘ 1, >dudvdw (9)

per unit volume. Construct a small cylinder inside the gas, having dS as base and edges such that the projections of each on the co- ordinate axes are udt, vdt, wdt. Each of the molecules enumerated in

expression (9) will move parallel to the edge of this cylinder, and each will describe a length equal to its edge in time dt. Thus each of these molecules which is initially inside the cylinder, will impinge on the area dS within an interval dt. The cylinder is of volume u dt dS, so that the product of this and expression (9) must give the number of impacts between the area dS and molecules of the kind under consideration within the interval dt. Each impinging molecule exerts an impulsive pressure equal to mu on the boundary before the component of velocity of its centre of gravity normal to the boundary is reduced to zero. Thus the contribution to the total impulsive pressure exerted on the area dS in time dt from this cause

muXudldSX^ {h 3 m 3 lw 3)e- hm <- u2+ '' i+w ^dudvdw (10)

The total pressure exerted in bringing the centres of gravity of all the colliding molecules to rest normally to the boundary is ob- tained by first integrating this expression with respect to u, v, w, the limits being all values for which collisions are possible (namely from — 00 to o for u, and from —00 to +00 for v and w), and then summing for all kinds of molecules in the gas. Further impulsive pressures are required to restart into motion all the molecules which have undergone collision. The aggregate amount of these pressures is clearly the sum of the momenta, normal to the boundary, of all molecules which have left dS within a time dt, and this will be given by expression (10), integrated with respect to « from o to », and with respect to v and w from -co to +00 , and then summed for all kinds of molecules in the gas. On combining the two parts of the pressure which have been calculated, the aggregate impulsive pressure on dS in time dt is found to be

~Zdt dS JJJ wliwHr^^'^M'M*,

where 2 denotes summation over all kinds of molecules. This is equivalent to a steady pressure pi per unit area where

pi-ZJJf W (h 3 m 3 /Tr 3)e- hm <- u ' i+ " 2+w ^mu' 1 dudvdw.

Clearly the integral is the sum of the values of mu 1 for all the molecules of the first kind in unit volume, thus

(> = »»»'-(• v'm'u 2

(11)

On substituting from equations (7) and (8), this expression assumes the forms

P = (v + v'+...)l2h (12)

= (" + "'+...)RT (13)

The number of molecules per unit volume in a gas at normal tem- perature and pressure is known to be about 2-75 X io 19 . If in formula „, (13) we P"t £ = l-oi3Xio 6 , (»+*'+ . . .)=2-75Xio 19

Molecular x = 273, we obtain R = i-35Xio 16 and this enables us velocities, tQ determine the mean velocities produced by heat motion in molecules of any given mass. For molecules of known gases the calculation is still easier. If p is the density correspond ing to pressure p, we find that formula (11) assumes the form

p = hc\

where C is a velocity such that the gas would have its actual transla- tional energy if each molecule moved with the same velocity C. By substituting experimentally determined pairs of values of p and p we can calculate C for different gases, and so obtain a knowledge of the magnitudes of the molecular velocities. For instance, it is found that

for hydrogen at ., air

mercury vapour at 0°

0° Cent. = 183,900 cms. per sec. 15° » C= 49,800 ,,

” ”

C= 18,500

and other velocities can readily be calculated.

From the value R = i-35Xio 16 it is readily calculated that a mole cule, or aggregation of molecules, of mass 10 ~’- 2 grammes, ought to have a mean velocity of about 2 millimetres a second at “Brownian ^ Q o q Such a velocity ought accordingly to be set up in a Movements. p art j c i e f 10 ~ 12 grammes mass immersed in air or liquid at o° C, by the continual jostling of the surrounding molecules or particles. A particle of this mass is easily visible microscopically, and a velocity of 2 mm. per second would of course be visible if continued for a sufficient length of time. Each bombardment will, however, change the motion of the particle, so that changes are too frequent for the separate motions to be individually visible. But it can be shown that from the aggregation of these separate short motions the particle ought to have a resultant motion, described

with an average velocity which, although much smaller than 2 mm. a second, ought still to be microscopically visible. It has been shown by R. von. S. Smoluchowski {Ann. d. Phys., 1906, 21, p. 756) that this theoretically predicted motion is simply that seen in the ” Brownian movements ” first observed by the botanist Robert Brown in 1827. Thus the ” Brownian movements ” provide visual demonstration of the reality of the heat-motion postulated by the kinetic theory.

Dalton’s Law. — The pressure as given by formula (12) can be written as the sum of a number of separate terms, one for each gas in the mixture. Hence we have Dalton’s law: Pressure, The pressure of a mixture of gases is the sum of the pres- Volume and sures which would be exerted separately by the several Temperature constituents if each alone were present. Relations.

Avogadro's Law. — From formula "(13) it appears that v--v'{ . . ., the total number of molecules per unit volume, is determined when p, T and the constant R are given. Hence we have Avogadro's law: Different gases, at the same temperature and pressure, contain equal numbers of molecules per unit volume.

Boyle's and Charles' Laws. — If v is the volume of a homogeneous mass of gas, and N the total number of its molecules, N = »(*+»' + . . .), so that

pv=RNT. (14)

In this equation we have the combined laws of Boyle and Charles: When the temperature of a gas is kept constant the pressure varies inversely as the volume, and when the volume is kept constant the pressure varies as the temperature.

Since the volume at constant pressure is exactly proportional to the absolute temperature, it follows that the coefficients of expansion of all gases ought, to within the limits of error introduced by the assumptions on which we are working, to have the same value 1/273.

Van der Waals's Equation. — The laws which have just been stated are obeyed very approximately, but not with perfect accuracy, by all gases of which the density is not too great or the temperature too low. Van der Waals, in a famous monograph, On the Continuity of the Liquid and Gaseous States (Leiden, 1873), has shown that the imperfections of equation-(14) may be traced to two causes : —

(i.) The calculation has not allowed for the finite size of the molecules, and their consequent interference with one another's motion, and

(ii.) The calculation has not allowed for the field of inter-molecular force between the molecules, which, although small, is known to have a real existence. The presence of this field of force results in the molecules, when they reach the boundary, being acted on by forces in addition to

those originating in their impact with the boundary.

To allow for the first of these two factors, Van der Waals finds that v in equation (14) must be replaced by v — b, where 6 is four times the aggregate space occupied by all the molecules, while to allow for the second factor, p must be replaced by p+a/v 1 . Thus the pressure is given by the equation

{p+a/v*) (»-&)=RNT, which is known as Van der Waals's equation. This equation is found experimentally to be capable of representing the relation between p, v, and T over large ranges of values. (See Condensation of Gases.)

Let us consider a single gas, consisting of N similar molecules in a volume v, and let the energy of each molecule, as in Calorlmetry. formula (2) be given by

^ E = i-Z(.mu 2 +mv ,1 +mw i a 1 ej . . . a„0„ 2)] (15)

N = N(re+3)/4/i by equation (7) ‘

= i(»+3)RNT. ,-,,, ; , _*v _ (16)

Let a quantity dQ of energy, measured in work units, be absorbed by the gas from some external source, so that its pressure, volume and temperature change. The equation of energy is

dQ = dE+pdv, (17)

expressing that the total energy dQ is used partly in increasing the internal energy of the gas, and partly in expanding the gas against the pressure p. If we take p = KNT/v from equation (14) and substitute for E from equation (16), this iast equation becomes iQ = |(»+3)RNiT+RNTip/», (18)

which may be taken as the general equation of calorimetry, for a gas which accurately obeys equation (14).

Second Law of Thermodynamics. — If we divide

throughout by T, we obtain

4S = i(»+3)RN^+RNf,

showing that dQ/T is a perfect differential. This not only verifies that the second law of thermodynamics is obeyed, but enables us to identify T with the absolute thermodynamical temperature.

If the volume of the gas is kept constant, we put dv = o in equation (18) and dQ = JC„NmdT, where C„ is thespecific Specific heat of the gas at constant volume and J is the mechani- Heats. cal equivalent of heat. We obtain

C, = K»+3)R/Jw. (19)

On the other hand, if the pressure of the gas is kept constant

throughout the motion, T/» is constant and dQ = JC p NmdT, whence C p = i(n+s)RIJm. (20)

• By division of the values of C p and C„ we find for 7, the ratio of the specific heats.

7 = i+2/(»+3)- _ (2I)

The comparison of this formula with experiment provides a

striking confirmation of the truth of the kinetic theory but at the

same time discloses the most formidable difficulty which the theory

has so far had to encounter.

On giving different values to n in formula (21), we obtain the values for 7 :

n = o,

7 = 1-66,

1, 1-5.

2,

i-4.

3. 1-33.

4. 5.

1-28, 1-25, &c.

Thus, to within the degree of approximation to which our theory is accurate, the value of 7 for every gas ought to be one of this series. The following are the values of 7 for gases for which 7 can be observed with some accuracy : —

Mercury …. 1-66 Nitrogen …. 1-40 Krypton …. 1-66 Carbon monoxide . . 1-41 Helium . . . .1-65 Hydrogen 1-40

Argon . . . .1-62 Oxygen 1-40

Air 1-40 Hydrochloric acid . .1-39

It is clear that for the first four gases n = o, while for the remainder n = 2. To examine what is meant by a zero value of » we refer to formula (15). The value of n is the number of terms in the energy of the molecule beyond that due to translation. Thus when » = o, the whole energy must be translational : there can be no energy of rotation or of internal motion. The molecules of gases for which n = must accordingly be spherical in shape and in internal structure, or at least must behave at collisions as though they were spherical, for they would otherwise be set into rotation by the forces expe- rienced at collisions. In the light of these results it is of extreme significance that the four gases for which » = o are all believed to be monatomic : the molecules of these gases consist of single atoms. Moreover, these four are the only monatomic gases for which the value of 7 is known, so that the only atoms of

which the shape can be determined are found to be spherical. It is at least a plausible conjecture, until the contrary is proved, that the atoms of all elements are spherical. 1

The next value which occurs is n = 2. The kinetic energy of the molecules of these gases must contain two terms in addition to those representing translational energy. For a rigid body the kinetic energy will, in general, consist of three terms (Aa>i 2 + Bw2 2 +Ca>3 2) in addition to the translational energy. The value n = 2 is appropriate to bodies of which the shape is that of a solid of revolution, so that there is no rotation about the axis of symmetry. We must accord- ingly suppose that the molecules of gases for which n = 2 are of this shape. Now this is exactly the shape which we should expect to find in molecules composed of two spherical atoms distorting one another by their mutual forces, and all gases for which n = 2 are diatomic.

No molecule could possibly be imagined for which « had a negative Value or the value » = i. The theory therefore passes a crucial test when it is discovered that no gases exist for which n is either negative or unity. On the other hand, the theory encounters a very serious difficulty in the fact that all molecules possess a great number of possibilities of internal motion, as is shown by the number of distinct lines in their spectra both of emission and of absorption. So far as is known, each line in the spectrum of, say, mercury, represents a possibility of a distinct vibration of the mercury atom, and accordingly provides two terms (say cu#> 2 +^ 2 , where is the normal co-ordinate of the vibration) in the expression for the energy of the molecule. There are many thousands of lines in the mercury spectrum, so that from this evidence it would appear that for mercury vapour n ought to be very great, and 7 almost equal to unity. Instead of this we have re = o, and 7 = i|. As a step towards removing this difficulty we notice that the energy of a vibration such as is represented by a spectral line has the peculiarity of being unable to exist

(so far as we know) without suffering dissipation into the ether. This energy, therefore, comes under a different category from the energy for which the law of equipartition was proved, for in proving this law conservation of

1 Very significant confirmation of this conjecture is obtained from a study of the specific heats of the elements in the solid state. If a solid body is regarded as an aggregation of similar atoms each of mass m, its specific heat C is given, as in formula (19) by C = i(w+3)R/J»». From Dulong and Petit's law that Cm is the same for all elements, it follows that n+3 must be the same for all atoms. Moreover, the value of Cm shows that »+3 must be equal to six. Now if the atoms are regarded as points or spherical bodies oscillating about positions of equilibrium, the value of re+3 is precisely six, for we can express the energy of the atom in the form

My jiv d*V E = l(mtf +«n»+mui»-|-*K i , + f^p+ rf^p-).

where V is the potential and x, y, z are the displacements of the atom referred to a certain set of orthogonal axes.

energy was assumed. The difficulty is further diminished when it is proved, as it can be proved, 2 that the modes of energy repre- sented in the atomic spectrum acquire energy so slowly that the atom might undergo collisions with other atoms for centuries before being set into oscillations which would possess an appreciable amount of energy. In fact the proved tendency for the gas to pass into the " normal state " in which there is equipartition of energy, represents in this case nothing but the tendency for the transla- tional energy to become dissipated into the energy of innumerable small vibrations. We find that this dissipation, although un- doubtedly going on, proceeds with extreme slowness, so that the vibrations pass their energy on to the ether as rapidly as they acquire it, and the " normal state " is never established. These considerations suggest that the difficulty which has

been pointed out may be apparent rather than real. At the same time this difficulty is only one aspect of a wider difficulty which cannot be lightly passed over; Maxwell himself regarded it as the principal obstacle in the way of the full acceptance of the theory of which he was so largely the author. (J. H. Je.)

MOLE-RAT, the name of a group of blind burrowing rodents, typified by the large grey Spalax typhlus of eastern Europe and Egypt, which represents the Old World family Spalacidae. All the mole-rats of the genus Spalax are characterized by the want of distinct necks, small or rudimentary ears and eyes, and short limbs provided with powerful digging claws. There are three pairs of cheek-teeth which are rooted, and show folds of enamel on the crown. Mole-rats are easily recognized by the peculiarly flattened head, in which the minute eyes are covered with skin, the wart-like ears, and rudimentary tail; they make burrows in sandy soil, and feed on bulbs and roots. Bamboo- rats, of which one genus (Rhizomys) is Indian and Burmese, and the other {Tachyoryctes) East African, differ by the absence of skin over the eyes, the presence of short ears, and a short, sparsely-haired tail. They burrow either among tall grass, or at the roots of trees (see Rodentia).

MOLE-SHREW, any individual of the genera Urotrichus and Uropsilus (see Insectivora). These animals, which are some- times called shrew-moles, are not moles with shrew-like habits, but shrews with the burrowing habits of moles and resembling them in appearance.

MOLESKIN, a term employed not only for the skin of a mole but also, from a real or fancied resemblance, for a stout heavy cotton fabric of leathery consistence woven as a satin twill on a strong warp. It is shorn before being dyed or bleached. Being of an exceedingly durable and economical texture, it has been much worn by working-men, especially outdoor labourers. It is also used for gun-cases, carriage-covers, and several purposes in which a fabric capable of resisting rough usage is desirable.

MOLESWORTH, MARY LOUISA (1839-), Scottish writer, daughter of Major-General Stewart, of Strath, N.B., was born in Rotterdam on the 29th of May 1839, and was educated in Great Britain and abroad. In 1861 Miss Stewart married Major R. Molesworth. Her first novels, Lover and Husband (1869) to Cicely (1874), appeared under the pseudonym of " Ennis Graham." Mrs Molesworth is best known as a writer of books for the young, such as Tell Me a Story (1875), Carrots (1876), and The Cuckoo Clock (1877).

MOLESWORTH, ROBERT MOLESWORTH, ist Viscount (1656-1725), came of an old Northamptonshire family. His father Robert (d. 1656) was a Cromwellian who made a fortune in Dublin, and he himself supported William of Orange and in 1695 became a prominent member of the Irish privy council. In 1 7 16 he was created a viscount. He was succeeded by his two sons, John, 2nd viscount (1679-1726), and Richard 3rd viscount (1680-17 58), the latter of whom saved Marlborough's life at the battle of Ramillies and rose to be a field-marshal. The 3rd viscount's son Richard Nassau (1 748-1 793) succeeded to the title, which has descended accordingly.

A great-grandson of the ist viscount, John Edward Nassau Molesworth(i790-i877), vicar of Rochdale, was a well-known High Churchman and controversialist; and two of his sons became prominent men — William Nassau Molesworth (1816- 1890), author of History of England 1830-1871 (1871-1873), History of the Reform Bill (1865), and History of the Church of 4 J. H.

Jeans, Dynamical Theory of Gases, ch. ix.

England (1882); and Sir Guilford Molesworth (b. 1828), an eminent engineer and economist.

MOLESWORTH, SIR WILLIAM, Bart. (1810–1855), English politician, son of the 7 th baronet, was born in London on the 23rd of May 1810, and in 1823 succeeded to the baronetcy. At Cambridge he fought a duel with his tutor, and for some time studied abroad. On the passing of the Reform Act of 1832 he was returned to parliament for the eastern division of 'Cornwall, to support the ministry of Lord Grey. Through Charles Buller he made the acquaintance of Grote and James Mill, and in April 1835 he founded, in conjunction with Roebuck, the London Review, as an organ of the " Philosophic Radicals." After the publication of two volumes he purchased the Westminster Review, and for some time the united magazines were edited by him and J. S. Mill. From 1837 to 1841 Sir William Moles- worth sat for Leeds, and acquired considerable influence in the House of Commons by his speeches and by his tact in presiding over the select committee on transportation. But his Radical- ism made little impression either on the house or on his con- stituency. From 1841 to 1845 he had n0 seat in parliament, occupying his leisure time in editing the works in Latin and English cf Thomas Hobbes of Malmesbury, a recreation which cost him no less than £6000. In 1845 he was returned for Southwark, and retained that seat until his death. On his return to parliament he devoted special attention to the condition of the colonies, and was the ardent champion of their self- government. In January 1853 Lord Aberdeen included him in the cabinet as first commissioner of works, the chief work by which his name was brought into prominence at this time being the construction of the new Westminster Bridge; he also was the first to open Kew Gardens on Sundays. In July 1855 he was made colonial secretary, but he died on the 22nd of

October. Molesworth was for many years a great friend of Mr and Mrs Grote, and Mrs Grote's privately printed work on The Philosophical Radicals (1866) contains an account of his life. He married in 1844, but had no children, and the baronetcy passed to a cousin. His sister (d. 1910) married Richard Ford, famous for his Handbook of Spain.

A Life by Mrs Fawcett was published in 1903. A full pedigree of the Molesworth family is printed in Sir John Maclean's Trigg Minor, vol. i. ; the titles of his speeches and works may be found in the Bibl. Cornubiensis, vol. i. and iii.

MOLFETTA, a seaport and episcopal see of Apulia, Italy, in the province of Bari, from which it is 16 m. N.N.W. by rail. Pop. (1901), 42,363. The old cathedral of S. Conrad is a Romanesque structure. The old town is surrounded by walls, and has medieval houses; the new town is more spacious, and is an active seaport. The origin of Molfetta is uncertain, though there was a neolithic settlement here. The town was given by Charles V. to the duke of Termoli in 1522, and during his lordship it was sacked by the French under Lautrec. In 1 63 1 Cesare Gonzaga took the title of duke of Guastalia and prince of Molfetta; but in 1640 the fief was sold to the Spinola family, and in 1798 incorporated with the royal domain. The bishopric is directly subject to the papal see.

MOLIERE (1622-1673), the nom de thedtre chosen, for some undiscovered reason, by the great French dramatist Jean Baptiste Poquelin, and ever since substituted for his family name. He was born in Paris, probably in January 1622. The baptismal certificate which is usually, and almost with absolute certainty, accepted as his is dated 15th January 1622, but it is not possible to infer that he was born on the day of his christen- ing. The exact place of his birth is also disputed, but it seems tolerably certain that he saw the light in a house of the Rue St Honore. His father was Jean Poquelin, an upholsterer, who, in 1 63 1, succeeded his own uncle as "valet tapissier de chambre du

roi.” The family of Poquelin came from Beauvais, where for some centuries they had been prosperous tradesmen. The legend of their Scotch descent seems to have been finally dis- proved by the researches of M. E. Reverend du Mesnil. The mother of Moliere was Marie Cresse; and on his father ‘s side he was connected with the family of Mazuel, musicians attached to

the court of France. In 1632 Moliere lost his mother; his father married again in 1633. The father possessed certain shops in the covered Halle de la Foire, Saint Germain des Pres, and the biographers have imagined that Moliere might have received his first bent towards the stage from the spectacles offered to the holiday people at the fair. Of his early education little is known; but it is certain that his mother possessed a Bible and Plutarch’s Lives, books which an intelligent child would not fail to study. In spite of a persistent tradition, there is no reason to believe that the later education of Moliere was neglected. ” II fit ses humanitez au college de Clermont,” says the brief life of the Comedian published by his friend and fellow-actor, La Grange, in the edition of his works printed in 1682. La Grange adds that Moliere ” eut 1’advantage de suivre M. le Prince de Conti dans toutes ses classes.” As Conti was seven years younger than Moliere, it is not easy to understand how Moliere came to be the school contemporary of the prince. Among more serious studies the Jesuit fathers encouraged their pupils to take part in ballets, and in later life Moliere was a distinguished master of this sort of entertainment. According to Grimarest, the first writer who published a life of Moliere in any detail (1705), he not only acquired ” his humanities,” but finished his ” philosophy ” in five years. He left the College de Clermont in 1641, the year when Gassendi, a great contemner of Aristotle, arrived in Paris. The Logic and Ethics of Aristotle, with his Physics and Meta- physics, were the chief philosophical textbooks at the College de Clermont. But when he became the pupil of Gassendi (in company with Cyrano

de Bergerac, Chapelle, and Hesnaut), Moliere was taught to appreciate the atomic philosophy of Lucretius. There seems no doubt that Moliere began, and almost or quite finished, a translation of the De natura rerum. According to a manuscript note of Trallage, published by M. Paul Lacroix, the manuscript was sold by Moliere's widow to a book-seller. His philosophic studies left a deep mark on the genius of Moliere. In the Jugement de Pluton sur les deux parties des nouveaux dialogues des morts (1684), the verdict is " que Moliere ne parleroit point de philosophic." To " talk philo- sophy " was a favourite exercise of his during his life, and his ideas are indicated with sufficient clearness in several of his plays. There seems no connexion between them and the opinions of " Moliere le Critique " in a dialogue of that name, published in Holland in 1 709. From his study of philosophy, too, he gained his knowledge of the ways of contemporary pedants: of Pancrace the Aristotelian, of Marphorius the Cartesian, of Trissotin, " qui s'attache pour l'ordre au Peripatetisme," of Philaminte, who loves Platonism, of Belise, who relishes " les petits corps," and Armande, who loves " les tourbillons." Grimarest has an amusing anecdote of a controversy in which Moliere, defending Descartes, chose a lay-brother of a begging order for umpire, while Chapelle appealed to the same expert in favour of Gassendi. His college education over, Moliere studied law, and there is even evidence — that of tradition in Grimarest, and of Le Bou- langer de Chalussay, the libellous author of a play called Elomire hypochondre — to prove that he was actually called to the bar. More trustworthy is the passing remark in La Grange's short biography (1682), " au sortir des icoles de droit, il choisit la profession de comedien." Before joining a troop of half-amateur comedians, however, Moliere had some experience in his father's business. In 1637 his father had obtained for him the right to succeed to his own office as " valet tapissier de chambre du roi." The document is mentioned in the inventory of Moliere's effects, taken after his death. When the king travelled the valet tapissier accompanied him

to arrange the furniture of the royal quarters. There is very good reason to believe (Loiseleur, Points obscurs, p. 94) that Moliere accompanied Louis XIII. as his valet tapissier to Provence in 1642. It is even not impossible that Moliere was the young valet de chambre who concealed Cinq Mars just before his arrest at Narbonne, on the 13th of June 1642. But this is part of the romance rather than of the history of Moliere. Our next glimpse of the comedian we get in a document of 6th January 1643. Moliere acknowledges the receipt of money

due to him from his deceased mother's estate, and gives up his claim to succeed his father as "valet de chambre du roi." On the 28th of December of the same year we learn, again from documentary evidence, that Jean Baptiste Poquelin, with Joseph Bejard, Madeleine Bejard, Genevieve Bejard, and others, have hired a tennis-court and fitted it up as a stage for dramatic performances. The company called themselves L'llustre Theatre, illustre being then almost a slang word, freely employed by the writers of the period.

We now reach a very important point in the private history of Moliere, which it is necessary to discuss at some length in defence of the much maligned character of a great writer and a good man. Moliere's connexion with the family of Bejard brought him much unhappiness. The father of this family, Joseph Bejard the elder, was a needy man, with eleven children at least. His wife's name was Marie Herve. The most noted of his children, companions of Moliere, were Joseph, Madeleine, Genevieve, and Armande. Of these, Madeleine was a woman of great talent as an actress, and Moliere's friend, or perhaps mistress, through all the years of his wanderings. Now, on the 14th of February 1662 (for we must here leave the chronological order of events), Moliere married Armande Claire Elisabeth Gresinde Bejard. His enemies at that time, and a

number of his biographers in our own day, have attempted to prove that Armande Bejard was not the sister, but the daughter of Madeleine, and even that Moliere's wife may have been his own daughter by Madeleine Bejard. The arguments of M. Arsene Houssaye in support of this abominable theory are based on reckless and ignorant confusions, and do not deserve criticism. But the system of M. Loiseleur is more serious, and he goes no further than the idea that Madeleine was the mother of Armande. This, cer- tainly, was the opinion of tradition, an opinion based on the slanders of Montfleury, a rival of Moliere's, on the authority of the spiteful and anonymous author of La Fameuse comedienne (1688), and on the no less libellous play, Elomire hypochondre. In 1821 tradition received a shock, for Beffara then discovered Moliere's "acte de mariage," in which Armande, the bride, is spoken of as the sister of Madeleine Bejard, by the same father and mother. The old scandal, or part of it, was revived by M. Fournier and M. Bazin, but received another blow in 1863. M. Soulie then discovered a legal document of the 10th of March 1643, in which the widow of Joseph Bejard renounced, in the name of herself and her children, his inheritance, chiefly a collec- tion of unpaid bills. Now in this document all the children are described as minors, and among them is "une petite non encore baptisee." This little girl, still not christened in March 1643, is universally recognized as the Armande Bejard afterwards married by Moliere. We reach this point, then, that when Armande was an infant she was acknowledged as the sister, not as the daughter, of Madeleine Bejard. M. Loiseleur refuses, however, to accept this evidence. Madeleine, says he, had already become the mother, in 1638, of a daughter by Esprit Raymond de Moirmoron, comte de Modene, and chamberlain of Gaston due d'Orleans, brother of Louis XIII. In 1642 Modene, who had been exiled for political reasons, "was certain to return, for Richelieu had just died, .and Louis XIII. was likely to follow him." Now Madeleine was again — this is M. Loiseleur's hypothesis — about to become a mother, and if Modene

returned, and learned this fact, he would not continue the liaison, still less would he marry her — which, by the way, he could not do, as his wife was still alive. Madeleine, therefore, induced her mother to acknowledge the little girl as her own child. In the first place, all this is pure unsupported hypothesis. In the second place, it has always been denied that Bejard's wife could have been a mother in 1643, owing to her advanced age, probably fifty-three. But M. Loiseleur himself says that Marie Herve was young enough to make the story "sufficiently probable." If it was probable, much more was it possible. M. Loiseleur supports his contention by pointing out that two of the other children, described as legally minors, were over twenty-five, and that their age was understated to make the account of Armande's birth more probable. Nothing is less likely than

that Modene would have consulted this document to ascertain the truth about the parentage of Armande, yet M. Loiseleur's whole theory rests on that extreme improbability. It must also be observed that the date of the birth of Joseph Bejard is un- known, and he may have been, and according to M. Jal (Diction- naire critique, p. 178) must have been, a minor when he was so described in the document of the 10th of March 1643, while Madeleine had only passed her twenty-fifth birthday, her legal majority, by two months. This view of Joseph's age is supported by Bouquet (Moliere d Rouen, p. 77). M. Loiseleur's only other proof is that Marie Herve gave Armande a respectable dowry, and that, as we do not know whence the money came, it must have come from Madeleine. The tradition in Grimarest, which makes Madeleine behave en femme furieuse, when she heard of the marriage, is based on a juster appreciation of the character of women. It will be admitted, probably, that the reasons for supposing that Moliere espoused the daughter of a woman who had been his mistress (if she had been his mistress) are flimsy and inadequate. The affair of the dowry is insisted on by M. Livet (La Fameuse comedienne, reprint of 1877, p. 143). But M. Livet explains the

dowry by the hypothesis that Armande was the daughter of Madeleine and the comte de Modene, which exactly contradicts the theory of M. Loiseleur, and is itself contradicted by dates, at least as understood by M. Loiseleur. Such are the conjectures by which the foul calumnies of Moliere's enemies are supported in the essays of modern French critics.

Michelet accepted the scandal apparently as a buttress to his charges against Louis XIV. and Madame (Histoire de France, 1879, xv. 63, 64, 332).

To return to the order of events, Moliere passed the year 1643 in playing with and helping to manage the Theatre Illustre. The company acted in various tennis-courts, with very little success. Moliere was actually arrested by the tradesman who supplied candles, and the company had to borrow money from one Aubrey to release their leader from the Grand Chatelet (Aug. 13, 1645). The process of turning a tennis-court into a theatre was somewhat expensive, even though no seats were provided in the pit. The troupe was for a short time under the protection of the due d'Orleans, but his favours were not lucrative. The due de Guise, according to some verses printed in 1646, made Moliere a present of his cast-off wardrobe. But costume was not enough to draw the public to the tennis-court theatre of the Croix Noire, and empty houses at last obliged the Theatre Illustre to leave Paris at the end of

1646.

"Nul animal vivant n'entra dans notre salle," says the author of the scurrilous play on Moliere, Momire hypochondre. But at that time some dozen travelling companies found means to exist in the provinces, and Moliere determined to play among the rural towns. The career of a strolling player is much the same at all times and in all countries. The Roman comique of Scarron gives a vivid picture of the adventures and mis- adventures, the difficulty of transport, the queer cavalcade of horses, mules, and lumbering carts that drag the wardrobe and properties, the sudden metamorphosis of the tennis- court, where the

balls have just been rattling, into a stage, the quarrels with local squires, the disturbed nights in crowded country inns, all the loves and wars of a troupe on the march. Perrault tells us what the arrangements to the theatre were in Moliere's early time. Tapestries were hung round the stage, and entrances and exits were made by struggling through the heavy curtains, which often knocked off the hat of the comedian, or gave a strange cock to the helmet of a warrior or a god. The lights were candles stuck in tin sconces at the back and sides, but luxury sometimes went so far that a chandelier of four candles was suspended from the roof. At intervals the candles were let down by a rope and pulley, and any one within easy reach snuffed them with his fingers. A flute and tambour, or two fiddlers, supplied the music. The highest prices were paid for seats in the dedans (cost of admission fivepence); for the privilege of standing up

in the pit twopence-halfpenny was the charge. The doors Were opened at one o'clock, the curtain rose at two.

The nominal director of the Theatre Illustre in the provinces was Du Fresne; the most noted actors were Moliere, the Bejards, and Du Pare, called Gros Rene. It is extremely difficult to follow exactly the line of march of the company. They played at Bordeaux, for example, but the date of this performance, when Moliere (according to Montesquieu) failed in tragedy and was pelted, is variously given as 1644-1645 (Trallage), 1647 (Loiseleur), 1648-1658 (Lacroix). Perhaps the theatre prospered better elsewhere than in Paris, where the streets were barricaded in these early days of the war of the Fronde. We find Moliere at Nantes in 1648, at Fontenay-la-Compte, and in the spring of 1649 a t Agen, Toulouse, and probably at Angouleme and Limoges. In January 1650 they played at Narbonne, and be- tween 1650 and 1653 Lyons was the headquarters of the troupe. In January 1653, or

perhaps 1655, Moliere gave L'Etourdi at Lyons, the first of his finished pieces, as contrasted with the slight farces with which he generally diverted a country audience. It would be interesting to have the precise date of this piece, but La Grange (1682) says that " in 1653 Moliere went to Lyons, where he gave his first comedy, L'Etourdi," while in his Registre La Grange enters the year as 1655. At Lyons de Brie and his wife, the famous Mile de Brie, entered the troupe, and du Pare married the " marquise " de Gorla, better known as Mile du Pare. The libellous author of La Fameuse comidienne reports that Moliere's heart was the shuttlecock of the beautiful du Pare and de Brie, and the tradition has a persistent life. Moliere's own opinion of the ladies and men of his company may be read between the lines of his Impromptu de Versailles. In 1653 Prince de Conti, after many political adventures, was residing at La Grange, near Pezenas, in Languedoc, and chance brought him into relations with his old schoolfellow Moliere. Conti had for first gentleman of his bed-chamber the abbe Daniel de Cosnac, whose memoirs now throw light for a moment on the fortunes of the wandering troupe. Cosnac engaged the company "of Moliere and of La Bejart"; but another company, that of Cormier, nearly intercepted the favour of the prince. Thanks to the resolution of Cosnac, Moliere was given one chance of appearing on the private theatre of La Grange. The excellence of his acting, the splendour of the costumes, and the insistence of Cosnac, and of Sarrasin, Conti's secretary, gained the day for Moliere, and a pension was assigned to his company (Cosnac, Mimoires, i. 128; Paris, 1852). As Cosnac proposed to pay Moliere a thousand crowns of his own money to recompense him in case he was supplanted by Cormier, it is obvious that his profession had become sufficiently lucrative. In 1654, during the session of the estates of Languedoc, Moliere and his company played at Montpellier. Here Moliere danced in a ballet (Le Ballet des incompatibles) in which a number of men of rank took part, according to the fashion of the time. Moliere's own rdles were those of the Poet and the Fishwife. The sport of the

little piece is to introduce opposite characters, dancing and singing together. Silence dances with six women, Truth with four courtiers, Money with a poet, and so forth. Whether the ballet, or any parts of it, are by Moliere, is still disputed {La Jeunesse de Moliere, suivie du ballet des incompat- ibles, P. L. Jacob, Paris, 1858). In April 1655 it is certain that the troupe was at Lyons, where they met and hospitably enter- tained a profligate buffoon, Charles d'Assoucy, who informs the ages that Moliere kept open house, and " une table bien garnie." November 1655 found Moliere at Pezenas, where the estates of Languedoc were convened, and where local tradition points out the barber's chair in which the poet used to sit and study character. The longest of Moliere's extant autographs is a receipt, dated at Pezenas, on the 4th of February 1656, for 6000 livres, granted by the estates of Languedoc. This year was notable for the earliest representation, at Beziers, of Moliere's second finished comedy, the Dipit amoureux. Conti now (1656) began to " make his soul." Almost his first act of peni- tence was to discard Moliere's troupe (1657), which consequently found that the liberality of the estates of Languedoc was dried

up for ever. Conti's relations with Moliere must have definitively closed long before 1666, when the now pious prince wrote a treatise against the stage, and especially charged his old school- fellow with keeping a new school, a school of atheism (Traits de. la comedie, p. 24; Paris, 1666). Moliere was now (1657) independent of princes and their favour. He went on a new circuit to Nismes, Orange and Avignon, where he met another old class-mate, Chapelle, and also encountered the friend of his later life, the painter Mignard. After a later stay at Lyons, ending with a piece given for the benefit of the poor on the 27th of February 1658, Moliere passed to Grenoble, returned to Lyons, and is next found in Rouen, where, we should have said, the Theatre Illustre had played in 1643 (F. Bouquet, La Troupe de Moliere a Rouen, p. 90; Paris, 1880). At Rouen Moliere must have made or renewed the acquaintance

of Pierre and Thomas Corneille. His company had played pieces by Corneille at Lyons and elsewhere. The real business of the comedian in Rouen was to prepare his return to Paris. ” After several secret journeys thither he was fortunate enough to secure the patronage of Monsieur, the king’s only brother, who granted him his protection, and permitted the company to take his name, presenting them as his servants to the king and the queen mother ” (Preface to La Grange’s edition of 1682). The troupe appeared for the first time before Louis XIV. in a theatre arranged in the old Louvre (Oct. 24, 1658).

Moliere was now thirty-six years of age. He had gained all the experience that fifteen years of practice could give. He had seen men and cities, and noted all the humours of rural and civic France. He was at the head of a company which, as La Grange, his friend and comrade, says, ” sincerely loved him.” He had the unlucrative patronage of a great prince to back him, and the jealousy of all playwrights, and of the old theatres of the Hotel de Bourgogne and the Marais, to contend against. In this struggle we can follow him by aid of the Registre of La Grange (a brief diary of receipts and payments), and by the help of notices in the rhymed chronicles of Loret. ?

The first appearance of Moliere before the king was all but a failure. Nicomede, by the elder Corneille, was the piece, and we may believe that the actors of the H6tel de Bourgogne, who were present, found much to criticize. When the play was over, Moliere came forward and asked the king’s permission to act ” one of the little pieces with which he had been used to regale the provinces.” The Docteur amoureux, one of several slight comedies admitting of much ” gag,” was then performed, and ” diverted as much as it surprised the audience.” The king commanded that the troupe should establish itself in Paris (Preface, ed. 1682). The theatre assigned to the company was a salle in the Petit Bourbon, in a line with the present Rue du Louvre. Some Italian players already occupied the house on Tuesdays, Fridays, and Sundays; the company of Moliere played on the other

days. The first piece played in the new house (Nov. 3, 1658) was L'Etourdi. La Grange says the comedy had a great success, producing seventy pistoles for each actor. The success is admitted even by the spiteful author of Elomire hypochondre (Paris, 1670): —

" Je jouai I'Etourdi, qui fut une merveille." The success, however, is attributed to the farcical element in the play and the acting — the cuckoo-cry of Moliere's detractors. The original of L'Etourdi is the Italian comedy (1629) L'lnav- verlito, by Nicolo Barbieri detto Beltrame; Moliere pushed rather far his right to " take his own wherever he found it." Had he written nothing more original, the contemporary critic of the Festin de Pierre might have said, not untruly, that he only excelled in stealing pieces from the Italians. The piece is conventional: the stock characters of the prodigal son, the impudent valet, the old father occupy the stage. But the dialogue has amazing rapidity, and the vivacity of M. Coquelin to Mascarille made L'Etourdi a favourite on the modern stage, though it cannot be read with very much pleasure. The next piece, new in Paris, though not in the provinces, was the Dipit amoureux (first acted at Beziers, 1656). The play was not

less successful than L'£tourdi. It has two parts, one an Italian imbroglio; the other, which alone keeps the stage, is the original work of Moliere, though, of course, the idea of amantium irae is as old as literature. " Nothing so good," says Mr Saintsbury, " had yet been seen on the French stage, as the quarrels and reconciliations of the quartette of master, mistress, valet and soubrette." Even the hostile Le Boulanger de Chalussay (Elomire hypochondre) admits that the audience was much of this opinion: —

" Et de tous les c6tes chacun cria tout haut:

‘ C’est la faire et jouer les pieces comme il faut.’ ”

The same praise was given, perhaps even more deservedly, to Les Precieuses ridicules (Nov. 18, 1659)- Doubts have been raised as to whether this famous piece, the first true comic satire of contemporary foibles on the French stage, was a new play. La Grange calls it piece nouvelle in his Registre; but, as he enters it as the third pihce nouvelle, he may only mean that, like L’Etourdi, it was new to Paris. The short life of 1682, produced under La Grange’s care, and probably written by Marcel the actor, says the Precieuses was ” made ” in 1659. There is another controversy as to whether the ladies of the Hotel Rambouillet, or merely their bourgeoises and rustic imitators, were laughed at. Menage, in later years at least, professed to recognize an attack on the over-refinement and affectation of the original and, in most ways, honourable precieuses of the H6tel Rambouillet. But Chapelle and Bachaumont had discovered provincial pricieuses, hyper-aesthetic literary ladies, at Montpellier before Moliere’s return to Paris; and Furetiere, in the Roman bourgeois (1666), found Paris full of middle-class precieuses, who had survived, or, like their modern counterparts, had thriven on ridicule. Another question is: Did Moliere copy from the earlier Precieuses of the abbe de Pure ? This charge of plagiarism is brought by Somaize, in the preface to his Veritables precieuses. De Pure’s work was a novel (1656), from which the Italian actors had put together an acting-piece in their manner — that is, a thing of ” gag,” and improvised speeches. The reproach is interesting only because it proves how early Moliere found enemies who, like Thomas Corneille in 1659, accused him of being skilled only in farce, or, like Somaize, charged him with literary larceny. These were the stock criticisms of Moliere’s opponents as long as he lived. The success of the Pricieuses ridicules was immense; on one famous occasion the king was a spectator, leaning against the great chair of the dying Cardinal Mazarin. The play can

never cease to please while literary affec- tation exists, and it has a comic force of deathless energy. Yet a modern reader may spare some sympathy for the poor heroines, who do not wish, in courtship, to ” begin with marriage,” but prefer first to have some less formidable acquaintance with their wooers. Moliere’s next piece was less important, and more purely farcical, Sganarelle; ou le cocu imaginaire (May 28, 1660). The public taste preferred a work of this light nature, and Sgana- relle was played every year as long as Moliere lived. The play was pirated by a man who pretended to have retained all the words in his memory. The counterfeit copy was published by Ribou, a double injury to Moliere, as, once printed, any company might act the play. With his habitual good-nature, Moliere not only allowed Ribou to publish later works of his, but actually lent money to that knave (Soulie, Recherches, p. 287)..

On the nth of October 1660 the Theatre du Petit Bourbon was demolished by the superintendent of works, without notice given to the company. The king gave Moliere the Salle du Palais Royal, but the machinery of the old theatre was maliciously destroyed. Meanwhile the older companies of the Marais and the Hotel de Bourgogne attempted to lure away Moliere’s troupe, but, as La Grange declares {Registre, p. 26), ” all the actors loved their chief, who united to extraordinary genius an honour- able character and charming manner, which compelled them all to protest that they would never leave him, but always share his fortunes.” While the new theatre was being put in order, the company played in the houses of the great, and before the king at the Louvre. In their new house (originally built by

Richelieu) Moliere began to play on the 20th of January 1661. Moliere now gratified his rivals by a failure. Don Garde de Navarre, a heavy tragi-comedy, which had long lain among his papers, was first represented on the 4th of February 1661. Either Moliere was a poor actor outside comedy, or his manner was not sufficiently ” stagy,” and, as he says, ” demoniac,” for the taste of the day. His

opponents were determined that he could not act in tragi-comedy, and he, in turn, burlesqued their pretentious and exaggerated manner in a later piece. In the Precieuses (sc. ix.) Moliere had already rallied ” les grands comediens ” of the Hotel Bourgogne. ” Les autres,” he makes Mascarille say about his own troupe, ” sont des ignorants qui recitent comme 1’on parle, ils ne savent pas faire ronfler les vers.” All this was likely to irritate the grands comediens, and their friends, who avenged themselves on that unfortunate jealous prince, Don Garcie de Navarre. The subject of this unsuccessful drama is one of many examples which show how Moliere’s mind was engaged with the serious or comic aspects of jealousy, a passion which he had soon cause to know most intimately. Meantime the everyday life of the stage went on, and the doorkeeper of the Theatre St Germain was wounded by some revellers who tried to force their way into the house (La Grange, Registre). A year later, an Italian actor was stabbed in front of Moliere’s house, where he had sought to take shelter (Campardon, Nouvelles pieces, p. 20) . To these dangers actors were peculiarly subject: Moliere himself was frequently threatened by the marquises and others whose class he ridiculed on the stage, and there seems even reason to believe that there is some truth in the story of the angry marquis who rubbed the poet’s head against his buttons, thereby cutting his face severely. The story comes late (1725) into his biography, but is supported by a passage in the contemporary play, Zelinde (Paris, 1663, scene viii.). Before Easter, Moliere asked for two shares in the profits of his company, one for himself, and one for his wife, if he married. That fatal step was already contemplated (La Grange). On the 24th of June he brought out for the first time L’Ecole des maris. The general idea of the piece is as old as Menander, and Moliere was promptly accused of pilfering from the Adelphi of Terence. One of the ficelles of the comedy is borrowed from a story as old, at least, as Boccaccio, and still amusing in a novel by Charles de Bernard. It is significant of Moliere’s talent that the grotesque and baffled paternal wooer,

Sganarelle, like several other butts in Moliere's comedy, does to a certain extent win our sympathy and pity as well as our laughter. The next new piece was Les Fascheux, a comedie- ballet, the Comedy of Bores, played before the king at Fouquet's house at Vaux le Vicomte (Aug. 15-20, 1661). The comedians, without knowing it, were perhaps the real " fascheux " on this occasion, for Fouquet was absorbed in the schemes of his insatiable ambition (Quo non ascendam? says his motto), and the king was organizing the arrest and fall of Fouquet, his rival in the affections of La Valliere. The author of the prologue to Les Fascheux, Pellisson, a friend of Fouquet's, was arrested with the superintendent of finance. Pellisson's prologue and name were retained in the later editions. In the dedication to the king Moliere says that Louis suggested one scene (that of the Sportsman), and in another place he mentions that the piece was written, rehearsed, and played in a fortnight. The funda- mental idea of the play, the interruptions by bores, is suggested by a satire of Regnier's, and that by a satire of Horace. Perhaps it may have been the acknowledged suggestions of the king which made gossips declare that Moliere habitually worked up hints and memoires given him by persons of quality {Nouvelles nouvelles, 1663).

In February 1662 Moliere married Armande Bejard. The date is given thus in the Registre of La Grange: " Mardy 14, Les Visionnaires, L'Ecol des M.

" Part. Visite chez M e d'Equeuilly." And on the margin he has painted a blue circle — his way of recording a happy event — with the words, " mariage de M. de Moliere au sortir de la Visite." M. Loiseleur gives the date in one passage as the 29th of February; in another as the 20th of

February. But La Grange elsewhere mentions the date as " Shrove Tuesday," which was, it seems, the 14th of February. Elsewhere M. Loiseleui* makes the date

of the marriage a vague day ” in January.” The truth is that the marriage contract is dated the 23rd of January 1662 (Soulie, Documents, p. 203). Where it is so difficult to establish the date of the marriage, a simple fact, it must be infinitely harder to discover the truth as to the conduct of Mme Moliere. The abominable assertions of the anonymous libel, Les Intrigues de Moliere et celles de sa jemme; ou la fameuse comedienne (1688), have found their way into tradition, and are accepted by many biographers. But M. Livet and M. Bazin have proved that the alleged lovers of Mme Moliere were actually absent from France, or from the court, at the time when they are reported, in the libel, to have conquered her heart. A conversation between Chapelle and Moliere, in which the comedian is made to tell the story of his wrongs, is plainly a mere fiction, and is answered in Grimarest by another dialogue between Moliere and Rohault, in which Moliere only complains of a jealousy which he knows to be unfounded. It is noticed, too, that the contemporary assailants of Moliere counted him among jealous, but not among deceived, husbands. The hideous accusation brought by the actor Montfleury, that Moliere had married his own daughter, Louis XIV. answered by becoming the godfather of Moliere’s child. The king, indeed, was a firm friend of the actor, and, when Moliere was accused of impiety on the production of Don Juan (1665) Louis gave him a pension. We need not try to make Mme Moliere a vertu, as French ladies of the theatre say, but it is certain that the charges against her are unsubstantiated. It is generally thought that Moliere drew her portrait in Le Bourgeois gentilhomme (acte m. sc. ix.), ” elle est capricieuse, mais on souffre tout des belles.”

From 1662 onwards Moliere suffered the increasing hatred of his rival actors. La Grange mentions the visit of Floridor and Montfleury to the queen mother, and their attempt to obtain equal favour, ” la troupe de Moliere leur donnant beau- coup de jalouzie ” (Aug. 12, 1662). On the 26th of December was played for the first time the admirable Ecole

des femmes, which provoked a literary war, and caused a shower of ” paper bullets of the brain.” The innocence of Agnes was called indecency; the sermon of Arnolphe was a deliberate attack on Christian mysteries. We have not the space to discuss the religious ideas of Moliere; but both in L’ Ecole des femmes and in Don Juan he does display a bold contempt for the creed of ” boiling chaldrons ” and of physical hell. A brief list of the plays and pamphlets provoked by L’ Ecole des femmes is all we can offer in this place.

December 26, 1662. — Ecole des femmes.

February 9, 1663. — Nouvelles nouvelles, by De Vise\ Moliere is accused of pilfering from Straparola.

June i, 1663. — Moliere’s own piece, Critique de V ecole des femmes. In this play Moliere retorts on the critics, and especially on his favourite butt, the critical marquess.

August 1663. — Zelinde, a play by De Vis6, is printed. The scene is in the shop of a seller of lace, where persons of quality meet, and attack the reputation of ” filomire ” — that is, Moliere. He steals from the Italian, the Spanish, from Furetiere’s Francion, ” il lit tous les vieux bouquins,” he insults the noblesse, he insults Christianity, and so forth.

November 17, 1663. — Portrait du peintre is printed — an attack on Moliere by Boursault. This piece is a detailed criticism, by several persons, of L’Ecole des femmes. It is pronounced dull, vulgar, farcical, obscene and (what chiefly vexed Moliere, who knew the danger of the accusation) impious. Perhaps the only bio- graphical matter we gain from Boursault’s play is the interesting fact that Moliere was a tennis-player. On the 4th November 1663, Moliere replied with V Impromptu de Versailles, a witty and merciless attack on his critics, in which Boursault was mentioned by name. The actors of the Hotel de Bourgogne were parodied on the stage, and their art was ridiculed.

The next scenes in this comedy of comedians were : —

November 30. — The Panegyrique de I'ecole des femmes, by Robinet.

December 7. — Riponse a V impromptu; ou la vengeance des marquis, by De Vis6.

January 19, 1664. — L'Impromptu de I'hotel de Conde. It is a reply by a son of Montfleury.

March 17, 1664. — La Guerre comique; ou defense de Vicole des femmes.

1664. — Lettre sur les affaires du thidtre, published in Diversit&s galantes, by the author of Zelinde.

In all those quarrels the influence of Corneille was opposed to Moliere, while his cause was espoused by Boileau, a useful ally, when " les comediens et les auteurs, depuis le cedre [Cor- neille?] jusqu'a l'hysope, sont diablement animes contre lui " (Impromptu de Versailles, sc. v.).

Moliere's next piece was Le Mariage force (Feb. 15, 1664), a farce with a ballet. The comic character of the reluctant bridegroom excites contemptuous pity, as well as laughter. From the end of April till the 22nd of May the troupe was at Ver- sailles, acting among the picturesque pleasures of that great festival of the king's. The Princesse d' 'Elide was acted for the first time, and the three first acts of Tarluffe were given. Moliere's natural hatred of hypocrisy had not been diminished by the charges of blasphemy which were showered on him after the Ecole des femmes. Tartuffe made enemies everywhere. Jan- senists and Jesuits, like the two marquesses in L'Impromptu de Versailles, each thought the others were aimed at. Five years passed before Moliere got permission to play the whole piece in public. In the interval it was acted before Madame, Conde, the legate, and was frequently read by Moliere in private houses. The Gazette of the 17th of May 1664 (a paper hostile to Moliere) says that the king

thought the piece inimical to religion. Louis was not at that time on good terms with the divots, whom his amours scandalized; but, not impossibly, the queen mother (then suffering from her fatal malady) disliked the play. A most violent attack on Moliere, ” that demon clad in human flesh,” was written by one Pierre Roulle (Le Roy glorieux au monde, Paris, 1664). This fierce pamphlet was suppressed, but the king’s own copy, in red morocco with the royal arms, remains to testify to the bigotry of the author, who was cur6 of Saint Barthelemy. According to Roulle, Moliere deserved to be sent through earthly to eternal fires. The play was pro- hibited, as we have seen, but in August 1665 the king adopted Moliere’s troupe as his servants, and gave them the title of ” troupe du roy.” This, however, did not cause Moliere to relax his efforts to obtain permission for Tartuffe (or Tartufe, or Tartufle, as it was variously spelled), and his perseverance was at length successful. That his thoughts were busy with contem- porary hypocrisy is proved by certain scenes in one of his greatest pieces, the Festin de Pierre, or Don Juan (Feb. 15, 1665). The legend of Don Juan was familiar already on the Spanish, Italian and French stages. Moliere made it a new thing: terrible and romantic in its portrait of un grand seigneur mauvais homme, modern in its suggested substitution of la humaniti for religion, comic, even among his comedies, by the mirthful character of Sganarelle. The piece filled the theatre, but was stopped, probably by authority, after Easter. It was not printed by Moliere, and even in 1682 the publication of the full text was not permitted. Happily the copy of De la Regnie, the chief of the police, escaped obliterations, and gave us the full scene of Don Juan and the Beggar. The piece provoked a virulent criticism (Observations sur le festin de Pierre, 1665). It is allowed that Moliere has some farcical talent, and is not unskilled as a plagiarist, but he ” attacks the interests of Heaven,” ” keeps a school of infidelity,” ” insults the king,” ” corrupts virtue,” ” offends the queen-mother ” and so , forth. Two replies were published, one of which is by some critics believed to show traces of the hand

of Moliere. The king’s reply, as has been shown, was to adopt Moliere’s company as his servants, and to pension them. L’ Amour medecin, a light comedy, appeared on the 22nd of September 1665. In this piece Moliere, for the second time, attacked physicians. In December there was a quarrel with Racine about his play of Alexandre, which he treacherously transferred to the Hotel de Bourgogne. The 4th of June 1666 saw the first representation of that famous play, Le Misanthrope (ou L’ Atrabiliaire amour eux, as the ori- ginal second title ran). This piece, perhaps the masterpiece of Moliere, was more successful with the critics, with the court, and with posterity than with the public. The rival comedians called it ” a new style of comedy,” and so it was. The eternal

passions and sentiments of human nature, modified by the influence of the utmost refinement of civilization, were the matter of the piece. The school for scandal kept by Celimene, with its hasty judgments on all characters, gave the artist a wide canvas. The perpetual strife between the sensible optimism of a kindly man of the world (Philinte) and the saeva indigna- tio of a noble nature soured (Alceste) supplies the intellectual action. The humours of the joyously severe Celimene and of her court, especially of that deathless minor poet Oronte, supply the lighter comedy. Boileau, Lessing, Goethe have combined to give this piece the highest rank even among the comedies of Moliere. As to the ” keys ” to the characters, and the guesses about the original from whom Alceste was drawn, they are as valueless as other contemporary tattle.

A briefer summary must be given of the remaining years of the life of Moliere. The attractions of Le Misanthrope were reinforced (Aug. 6) by those of the Midecin malgre lui, an amusing farce founded on an old fabliau. In December the court and the comedians went to St Germain, where, among other diversions,

the pieces called MUicerte, La Pastorale comique (of which Moliere is said to have destroyed the MS.) and the charming little piece Le Sicilien were performed. A cold and fatigue seem to have injured the health of Moliere, and we now hear of the consumptive tendency which was cruelly ridiculed in £lomire hypochondre. Moliere was doubtless obliged to see too much of the distracted or pedantic physicians of an age when medicine was the battlefield of tradition, super- stition, and nascent chemical science. On the 17th of April 1667 Robinet, the rhyming gazetteer, says that the life of Moliere was thought to be in danger. On the 10th of June, however, he played in Le Sicilien before the town. In the earlier months of 1667 Louis XIV. was with the army in Flanders. There were embassies sent from the comedy to the camp, and on the 5th of August it was apparent that Moliere had overcome the royal scruples. Tartuffe was played, but Lamoignon stopped it after the first night. La Grange and La Torilliere hastened to the camp, and got the king's promise that he would reconsider the matter on his return. Moliere's next piece (Jan. 13, 1668) was Amphitryon, a free — a very free — adaptation from Plautus, who then seems to have engaged his attention; for not long afterwards he again borrowed from the ancient writer in L'Avare. There is a controversy as to whether Amphitryon was meant to ridicule M. de Montespan, the husband of the new mistress of Louis XIV. Michelet has a kind of romance based on this probably groundless hypothesis. The king still saw the piece occasionally, after he had purged himself and forsworn sack under Mme de Maintenon, and probably neither he nor that devout lady detected any personal references in the coarse and witty comedy. As usual, Moliere was accused of plagia- rizing, this time from Rotrou, who had also imitated Plautus. The next play was the immortal George Dandin (July 10), first played at a festival at Versailles. Probably the piece was a rapid palimpsest on the ground of one of his old farces, but the addition of these typical members of a county family, the De Sotenville, raises the work

from farce to satiric comedy. The story is borrowed from Boccaccio, but is of unknown age, and always new — Adolphus Crosbie in The Small House at Allington being a kind of modern George Dandin. Though the sad fortunes of this peasant with social ambition do not fail to make us pity him somewhat, it is being too refined to regard George Dandin as a comedy with a concealed tragic intention. Moliere must have been at work on L'Avare before George Dandin appeared, for the new comedy after Plautus was first acted on the 9th of September. There is a tradition that the piece almost failed; but, if unpopular in the first year of its produc- tion, it certainly gained favour before the death of its author. M. de Pourceaugnac (Sept. 17, 1669) was first acted at Chambord, for the amusement of the king. It is a rattling farce. The physicians, as usual, bore the brunt of Moliere's raillery, some of which is still applicable. Earlier in 1669 (Feb. 5) Tartuffe was played at last, with extraordinary success. Les Amants magnifiques, a comedy-ballet, was acted first at St Germain

(Feb. 10, 1670). The king might have been expected to dance in the ballet, but from Racine's Britannicus (Dec. 13, 1669) the majestical monarch learned that Nero was blamed for exhibitions of this kind, and he did not wish to out-Nero Nero. Astrology this time took the place of medicine as a butt, but the satire has become obsolete, except, perhaps, in Turkey, where astro- logy is still a power. The Bourgeois gentilhomme, too familiar to require analysis, was first played on the 23rd of October 1770. The lively Fourberies de Scapin " saw the footlights" (if footlights there were) on the 24th of May 167 1, and on the 7th of May we read in La Grange, " les Repetitions de Spsyche ont commance." La Grange says the theatre was newly decorated and fitted with machines. A " concert of twelve violins " was also provided, the company being resolute to have every- thing handsome about them. New singers were introduced, who did not refuse to sing unmasked on the stage. Quinault composed the words for the music, which was by

Lulli; Moliere and Pierre Corneille collaborated in the dialogue of this magni- ficent opera, the name of which {Psyche) La Grange eventually learned how to spell.- The Comtesse d' Escarbagnas (Feb. 2, 1672) was another piece for the amusement of the court, and made part of an entertainment called Le Ballet des ballets. In this play, a study of provincial manners, Moliere attacked the financiers of the time in the person of M. Harpin. The comedy has little importance compared with Les Femmes savantes (Feb. n), a severer Precieuses, in which are satirized the vanity and affectation of sciolists, pedants and the women who admire them. The satire is never out of date, and finds its modern form in Le Monde oil Von s'ennuie, by M. Pailleron. On the 1 7th of February Madeleine Bejard died, and was buried at St Paul. She did not go long before her old friend or lover Moliere. His Mariage forcS, founded, perhaps, on a famous anecdote of Gramont, was played on the 18th of July. On the 7 th of August La Grange notes that Moliere was indisposed, and there was no comedy. Moliere's son died on the nth of October. On the 22nd of November the preparations for the Malade imaginaire were begun. On the 10th of February 1673 the piece was acted for the first time. What occurred on the 17th of February we translate from the Registre of La Grange: —

" This same day, about ten o'clock at night, after the comedy, Monsieur de Moliere died in his house, Rue de Richelieu. He had played the part of the said Malade, suffering much from cold and inflammation, which caused a violent ccugh. In the violence of the cough he burst a vessel in his body, and did not live more than half an hour or three-quarters after the bursting of the vessel. His body is buried at St Joseph's, parish of St Eustache. There is a gravestone raised about a foot above the ground."

Moliere's funeral is thus described in a letter, said to be by an eyewitness, discovered by M. Benjamin Fillon: —

" Tuesday, 21st February, about nine in the evening,

was buried Jean Baptiste Poquelin Moliere, tapissier valet de chambre, and a famcms actor. There was no procession, except three ecclesiastics; four priests bore the body in a wooden bier covered with a pall, six children in blue carried candles in silver holders, and there were lackeys with burning torches of wax. The body . . . was taken to St Joseph's churchyard, and buried at the foot of the cross. There was a great crowd, and some twelve hundred livres were distributed among the poor. The archbishop had given orders that Moliere should be interred without any ceremony, and had even forbidden the clergy of the diocese to do any service for him. Nevertheless a number of masses were commanded to be said for the deceased."

When an attempt was made to exhume the body of Moliere in 1792, the wrong tomb appears to have been opened. Unknown is the grave of Moliere.

Moliere, according to Mile Poisson, who had seen him in her extreme youth, was " neither too stout nor too thin, tall rather than short; he had a noble carriage, a good leg, walked slowly, and had a very serious expression. His nose was thick, his mouth large with thick lips, his complexion brown, his eyebrows black and strongly marked, and it was his way of moving these that gave him his comic expression on the stage." " His eyes seemed to search the deeps of men's hearts," says the author of Zilinde. The inventories printed by M. Souli6 prove that Moliere was fond of rich dress, splendid furniture,

and old books. The charm of his conversation is attested by the names of his friends, who were all the wits of the age, and the greater their genius the greater their love of Moliere. As an actor, friends and enemies agreed in recognizing him as most successful in comedy. His ideas of tragic declamation were in advance of his time, for he set

his face against the prevalent habit of ranting. His private character was remarkable for gentleness, probity, generosity and delicacy, qualities attested not only by anecdotes but by the evidence of documents. He is probably the greatest of all comic writers within the limits of social and refined, as distinguished from romantic, comedy like that of Shakespeare, and political comedy like that of Aristophanes. He has the humour which is but a sense of the true value of life, and now takes the form of the most vivacious wit and the keenest observation, now of melancholy and pity and wonder at the fortunes of mortal men. In the literature of France his is the greatest name, and in the literature of the modern drama the greatest after that of Shakespeare. Besides his contemplative genius he possessed an unerring knowledge of the theatre, the knowledge of a great actor and a great manager, and hence his plays can never cease to hold the stage, and to charm, if possible, even more in the performance than in the reading.

The best biography of Moli&re on a level with the latest researches into his life is that in vol. x. of his works in Grands ecrivains de la France (Eugene Despois and Paul Mesnard). The next best is probably that of M. Taschereau, prefixed to an edition of his works (CEuvres completes, Paris, 1863). To this may be added Jules Loiseleur's Les Points obscurs de la vie de Moliere (Paris, 1877). We have seen that M. Loiseleur is not always accurate, but he is laborious. For other books it is enough to recommend the ex- cellent Bibliographie molieresque of M. Paul Lacroix (1875), which is an all but faultless guide. The best edition of Moliere's works for the purposes of the student is that published in Les Grands ecrivains de la France (Hachette, Paris, 1 874-1 882). It contains reprints of many contemporary tracts, and, with the Registre of La Grange, and the Collection molieresque of M. Lacroix, is the chief source of the facts stated in this notice, in cases where the rarity of documents has prevented the writer from studying them in the original texts. Another valuable authority is the

Recherckes sur Moliere et sur sa famille of Ed. Souiie (1863). Lotheisen's Moliere, sein Leben und seine Werke (Frankfurt, 1880), is a respect- able German compilation. Le Molieriste (Tresse, Paris, ed. by M. Georges Monval) was a monthly serial, containing notes on Moliere and his plays, by a number of contributors. The essays, biographies, plays and poems on Molieire are extremely numerous. The best guide to these is the indispensable Bibliographie of M. Lacroix. (A. L.)

MOLINA, LUIS (1535-1600), Spanish Jesuit, was born at Cuenca in 1535. Having at the age of eighteen become a member of the Society of Jesus, he studied theology at Coimbra, and after- wards became professor in the university of Evora, Portugal. From this post he was called, at the end of twenty years, to the chair of moral theology in Madrid, where he died on the 12th of October 1600. Besides other works he wrote Liberi arbitrii cum gratiae donis, divina praescientia, providentia, praedestinatione et reprobalione, concordia (4to, Lisbon, 1588); a commentary on the first part of the Summa of Thomas Aquinas (2 vols., fol., Cuenca, 1593); and a treatise De justitia et jure (6 vols., 1593-1609). It is to the first of these that his fame is principally due. It was an attempt to reconcile, in words at least, the Augustinian doctrines of predestination and grace with the Semipelagianism which, as shown by the recent condemnation of Baius (q.v.), had become prevalent in the Roman Catholic Church. Assuming that man is free to perform or not to perform any act whatever, Molina maintains that this circumstance renders the grace of God neither unnecessary nor impossible: not impossible, for God never fails to bestow grace upon those who ask it with sincerity; and not unnecessary, for grace, although not an efficient, is still a sufficient cause of salvation. Nor, in Molina's view, does his doctrine of free-will exclude predestination. The omniscient God, by means of His " scientia media " (the phrase is Molina's invention, though the idea is also to be found in his older contemporary Fonseca), or power of knowing future contingent

events, foresees how we shall employ our own free-will and treat His proffered grace, and

upon this foreknowledge He can found His predestinating decrees. These doctrines, although in harmony with the pre- vailing feeling of the Roman Catholic Church of the period, and further recommended by their marked opposition to the teachings of Luther and Calvin,excited violent controversy in some quarters, especially on the part of the Dominicans, and at last rendered it necessary for the pope (Clement VIII.) to interfere. At first (1594) he simply enjoined silence on both parties so far as Spain was concerned; but ultimately, in 1598, he appointed the ” Congregatio de auxiliis Gratiae ” for the settlement of the dispute, which became more and more a party one. After holding very numerous sessions, the ” congregation ” was able to decide nothing, and in 1607 its meetings were suspended by Paul V., who in 1611 prohibited all further discussion of the question ” de auxiliis,” and studious efforts were made to control the publication even of commentaries on Aquinas. The Molinist subsequently passed into the Jansenist controversy (see Jansenism).

A full account of Molina’s theology will be found in Schneeman’s ” Entstehung der thomistisch-molinistischen Controverse,” pub- lished in the Appendices (Nos. 9, 13, 14) to the Jesuit periodical, Stimmen aus Maria-Laach. To the lay reader may be recommended Ernest Renan’s article, ” Les congregations de auxiliis ” in his Nouvelles etudes d’histoire religieuse.

MOLINE, a city of Rock Island county, Illinois, U.S.A., in the north-west part of the state, on the Mississippi river, adjoining the city of Rock Island and opposite the upper end of Rock Island. Pop. (1900), 17,248, of whom 5699 were foreign- born, principally Swedes and Belgians; (1910 census), 24,199. It is served by the Chicago, Burlington & Quincy, the Chicago, Milwaukee & St Paul, the Chicago, Rock Island & Pacific, and the Davenport, Rock Island & North-Western railways. A channel in

the Mississippi river here, 250 ft. wide and 4 ft. deep at low water, projected in 1905, was completed in 1908; and in 1907 a lock was finished which affords a draught of 6 ft. and is a part of the 6 ft. channel improvement of Rock Island Rapids. The city has large and varied manufacturing industries ; water-power is derived from a dam maintained by the Moline Water-Power Company; and there is a large electric-power plant. The most important industry is the manufacture of agricultural implements (particularly steel ploughs, which seem to have been made here first in the United States, and corn-planters). Among the other manufactures are boilers and gasolene engines, wagons and carriages, automobiles, and pianos and organs. The Chicago, Rock Island & Pacific railway has a 900-acre yard and machine shop east of the city limits, and there is a large U.S. arsenal on Rock Island. Moline was settled in 1832, laid out as a town in 1842, and was chartered as a city in 1855 and rechartered in 1872.

MOLINET, JEAN (1433-1507), French poet and chronicler, was born at Desvres (Pas de Calais). In 1475 he succeeded Georges Chastellain as historiographer of the house of Burgundy, and Margaret of Austria, governor of the Low Countries, made him her librarian. His continuation of Chastellain's chronicle, which covers the years from 1474 to 1504, remained unpublished until 1828 when it was edited (Paris, 5 vols.) by J. A. Buchon. It is far from possessing the historical value of his predecessor's work. A selection from his voluminous poetical works was published at Paris in 1531, Les Faictz et Dictz de feu . . . J than Molinet. . . . He also translated the Roman de la rose into prose (pr. Lyons, 1503). He became, in 1501, canon of the church of Notre-Dame at Valenciennes, where he died on the 23rd of August 1507. He is noteworthy as the head of the vicious Burgundian school of poetry known as the rhetoriqueurs, charac- terized by the excessive use of puns and of puerile metrical devices. His chief disciple was his nephew, Guillaume Cretin (d. 1525), ridiculed by Rabelais as Raminagrobis, and Jean Lemaire des Beiges was his

friend.

See A. Wauters in the Biographie nationale de Belgique (vol. xv.,

1899).

MOLINIER, AUGUSTE (1851-1904), French historian, was born at Toulouse on the 30th of September 1851. He was a pupil at the Ecole des Chartes, which he left in 1873, and also

at the Ecole des Hautes Etudes; and he obtained appointments in the public libraries at the Mazarine (1878), at Fontainebleau (1884), and at St Genevieve, of which he was nominated libra- rian in 1885. He was a good palaeographer and had a thorough knowledge of archives and manuscripts; and he soon won a first place among scholars of the history of medieval France. His thesis on leaving the Ecole des Chartes was his Catalogue des actes de Simon et d'Amauri de Montfort (inserted in vol. xxxiv. of the Bibliotkeque de I'ecole, an important contribution to the history of the Albigenses. This marked him out as a capable editor for the new edition of L'histoire gentrale de Languedoc by Dom Vaissete: he superintended the reprinting of the text, adding notes on the feudal administration of this province from 900 to 1250, on the government of Alphonso of Poitiers, brother of St Louis from 1226 to 1271, and on the historical geography of t,be province of Languedoc in the middle ages. He also wrote a Bibliographie du Languedoc, which was awarded a prize by the Academie des inscriptions et belles- lettres, but remained in manuscript. He also published several documents for the Societe 1 de l'Orient Latin {Itinera hierosoly- mitana, in collaboration with Ch. Kohler, 1885) ; for the Societe de l'Histoire de France (Chronique normande du xiif Steele, assisted by his brother Emile, 1883); for the Collection de textes relatifs a

I’enseignemenl de l’histoire (Vie de Louis le Gros, by Suger, 1887); for the Collection des documents inedits (Correspondence administrative d’Alfonse de Poitiers, 1894-1900); for the Recueil des historiens de la France (Obituaires de la province de Sens 1904, 1906), &c, and several volumes in the Recueil des catalogues des bibliotheques publiques de France. Applying to the French classics the rigorous method used with regard to the texts of the middle ages, he published the Pensees of Pascal, revised with the original manuscript (1887-1889), and the Provinciates (1891), edited with notes. In 1893 he was nominated professor at the Ecole des Chartes, and gave a successful series of lectures which he published (Manuel des sources de l’histoire de France au moyen dge, 1902-1906). He also taught at the Ecole des Hautes fitudes. He died on the 19th of May 1904, after a short illness, leaving in manuscript a criticism on the sources of the Speculum historiale of Vincent de Beauvais.

His elder brother, Charles (b. 1843), is also of some importance as an historian, particularly on the history of art and on the heresies of the middle ages. He was appointed professor of history at the university of Toulouse in 1886.

A younger brother, Emile (1857-1906), became an assistant in the print-room at the Bibliotheque Nationale, and afterwards joined the staff at the Musee du Louvre, of which he eventually became keeper, retiring in 1902. He was a well-known con-noisseur of art. He organized the famous Exposition Retro- spective held at the Petit Palais in 1900, and published a number of expert volumes on enamels, ceramics and furniture.

MOLINOS, MIGUEL DE (c. 1640-1697), Spanish divine, the chief apostle of the religious revival known as Quietism, was born about 1640 near Saragossa. He entered the priesthood and settled in Rome about 1670. There he became well known as a director of consciences, being on specially friendly terms with Cardinal Odescalchi, who in 1676 became Pope Innocent XL In the previous year Molinos had

published a volume, Guida spirituale, che disinvolge Vanima e la conduce per I' interior camino all' acquisito delta perfetla contemplazione e del ricco tesoro della pace interiore. This was shortly followed by a brief Trattato della cotidiana communione. No breath of suspicion arose against Molinos until* 1681, when the Jesuit preacher, Segneri, attacked his views, though without mentioning his name, in his Concordia tra la fatica e la quiete nell' orazione. The matter was referred to the Inquisition. It pronounced that the Guida spirituale was perfectly orthodox, and censured the intemperate zeal of Segneri. But the Jesuits set Father La Chaise to work on his royal penitent, Louis XIV., who prided himself on being a pillar of orthodoxy; but he was on very bad terms with Innocent XL, and soon yielded to the pleasure of discovering heresy in an intimate friend of the pope. Following oil official representations by the French ambassador in Rome,

who happened to be a cardinal, Molinos was arrested in May 1685. At first his friends were confident of an acquittal, but in the beginning of 1687 a number of his penitents of both sexes were examined by the Inquisition, and several were arrested. A report got abroad that Molinos had been convicted of moral enormities, as well as of heretical doctrines ; and it was seen that he was doomed. On the 3rd of September 1687 he made public profession of his errors, and was sentenced to imprisonment for life. In the following November, Innocent signed a bull con- demning sixty-eight propositions from the Guida spirituale and other Unpublished writings of its author. At some date unknown in 1696 or 1697 Molinos died in prison.

Contemporary Protestants saw in the fate of Molinos nothing more than a persecution by the Jesuits of a wise and enlightened man, who had dared to withstand the petty ceremonialism of the Italian piety of the day. But Molinos was much more than the enlightened semi-Protestant that his English admirers took him to be; and his Quietism, had it been suffered to run its course would have swept aside beliefs and

practices more important than the rosaries of nuns, though it is most unlikely that he realized the consequence of his own theories. Segneri and La Chaise were not so easily deceived. They were Jesuits; and Jesuitism is built- up on the double assumption that God reveals Himself wholly and only through Jesus, and that Jesus reveals Himself wholly and only through the Church of Rome. Luther had already broken through one link in this chain, when he taught the Protestant world to come directly to Jesus, without troubling about the Church; but Luther still assumed that God could only be reached, through the intermediacy of Jesus. Molinos wished to find a royal road to God without any intermediaries at all. The Reformation maintained that the Church, so far from being a help, was a hindrance, to union with Jesus; whereas Molinos welcomed both Church and Jesus as helps to union with God, always provided that the believer treated both as means to an end beyond themselves. In other words, he held that there was a triple stage in piety. Beginners gave themselves wholly to the Church. At the second step came devotion to Jesus. At the third and highest stage both Church and Jesus were left behind as deiformes, sed non Deus, and God remained alone.

But how could a finite being bring himself into direct relation with Infinity? Following very ancient precedents, Molinos fell back on those phenomena of our consciousness which seem least within our own power. The less sense of proprietorship we had in a thought or action — the less it was the fruit of our deliberate will — the more certain might we be that it was divinely inspired. But what state of mind is most likely to be visited by these spontaneous illuminations? Plainly the state that Molinos calls the ” soft and savoury sleep of nothingness,’” where the soul is content to fold its hands, and wait in dreamy musing till the message comes; meanwhile it will think, do, will as little as it can. For this reason disinterested love became the great hall-mark of Quietist sanctity. Why it is unfitted to be a test of sanctity in general has been explained at length

by Bossuet in a remarkable Instruction sur les Slats d'oraison, published while the Quietist controversy was at its height. But, although Molinos's system did not long survive him, he had at least the double merit of courage and tenacity. Few writers have struggled so long and so hard to disengage the essence of religion from its transitionary embodiment in an historical creed.

The Guida spirituale was published in Italian in 1675, and has been reprinted. An English translation appeared in 1688; it has been re-edited by Mrs Arthur Lyttelton. French, Spanish and Latin translations have also appeared. For the history of its author see C. E. Scharling, Michael de Molinos (Ger. trans, from Danish; Gotha, 1855). H. Heppe, Geschichte der quietistischen Mystik (Berlin, 1875). On the whole subject of Quietism see H, Delacroix, Etudes d'histoire et de psychologie du mysticisme (Paris, 1908). There is a brilliant, but very fanciful, account of Molinos and his doctrines in J. H. Shorthouse's romance, John Inglesant. (St C.)

MOLIQUE, WILHELM BERNHARDT (1802— 1869), German violinist and composer, was born at Nuremberg on the 7 th of October, 1802, and learnt the violin at Munich under Pietro

Rovelli. In 1826 he became music-director at Stuttgart. As a composer for the violin Molique was commonly compared with Spohr. He also wrote some charming songs. He died at Cannstadt in 1869.

MOLKO (1500-1532), a Marano kabbalist, who proclaimed the advent of the Messiah. He was associated with David Reubeni, who also made Messianic claims. Molko, after a chequered career, was condemned to death by the ecclesiastical court at Mantua. He was offered his life by the emperor Charles V. if he would return to Christianity, in which he had been educated. He refused, and died at

the stake. (I. A.)

MOLLENDORF, RICHARD JOACHIM HEINRICH VON (1724-1816), Prussian soldier, began his career as a page of Frederick the Great in 1740. The outbreak of the Silesian wars gave him his first opportunity of seeing active service, and the end of the second war saw him a captain. In the Seven Years' War his brilliant conduct at the churchyard of Leuthen (1757) and at Hochkirch won him his majority. In 1760 his exertions retrieved the almost lost battle of Torgau, and the last success of the great king was won by the brigades of Prince Wied and Mollendorf (now major-general) at the Burkersdorf heights. Seventeen years later, as lieutenant-general, he won at Brix one of the few successes of the Bavarian Succession (or " Potato ") War. In the years of peace he occupied considerable posts, being made governor of Berlin in 1783. Promoted general of in- fantry in 1787, and general field marshal in 1793, he commanded the Prussian army on the Rhine in 1794. In the disastrous campaign of Jena (1806) Mollendorf played a considerable part, though he did not actually command a corps. He was present with the king at Auerstadt, falling into the hands of the French in the debdcle which followed. After his release he passed the remainder of his life in retirement. He died in 1816.

MOLLIEN, NICOLAS FRANCOIS, Count (1758-1850), French financier, was born at Paris on the 28th of February 1758. The son of a merchant, he early showed ability, and entered the ministry of finance, where he rose rapidly; in 1784, at the time of the renewal of the arrangements with the farmers-general of the taxes, he was practically chief in that department and made terms advantageous to the national exchequer. Under Calonne he improved the returns from the farmers-general; and he was largely instrumental in bringing about the erection of the octroi walls of Paris in place of the insufficient wooden barriers. He, however, advocated an abolition of some of the restrictions on imports, as came about in the famous Anglo- French commercial treaty of 1786, to the conclusion of which he contributed

in no small measure. The events of the French Revolution threatened at times to overwhelm Mollien. In 1794 he was brought before the revolutionary tribunal of Evreux as a suspect, and narrowly escaped the fate that befell many of the former farmers-general. He retired to England, where he observed the financial measures adopted at the crisis of 1 796-1 797. After the coup d'eiat of Brumaire (November 1799) he re-entered the ministry of finance, then under Gaudin, who entrusted to him important duties as director of the new caisse d'amortissement. Napoleon, hearing of his abilities, frequently consulted him on financial matters, and after the Proclamation of the Empire (May 1804) made him a councillor of state. The severe financial crisis of December 1805 to January 1806 served to reveal once more his sound sense. Napoleon, returning in haste not long after Austerlitz, dismissed Barge-Marbois from the ministry of the treasury and confided to Mollien those important duties. He soon succeeded in freeing the treasury from the interference of great banking houses. In other respects, however, he did something towards curbing Napoleon's desire for a precise regulation of the money market. The conversations between them on this subject, as reported in Mollien's Memoirs, are of high interest, and show that the ministry had a far truer judgment on financial matters than the emperor, who often twitted him with being an ideologue. In 1808 Mollien was awarded the title of count. He soon came to see the impossi- bility of the measures termed collectively " the continental

system "; but his warnings on that subject were of no avail. After the first abdication of the emperor (April n, 1814), Mollien retired into private life, but took up his ministerial duties at the appeal of Napoleon during the Hundred Days (1815), after which he again retired. Louis XVIII. wished to bring him back to office, but he resisted these appeals. Nominated a peer in 1819, he took some part in connexion with the annual budgets. He lived to see the election of Louis Napoleon as president of the Second Republic, and died in April 1850, with the

exception of Pasquier, the last surviving minister of Napoleon I.

See Mollien's Memoires d'un ministre du tresor public 1780-1815, 4. vols. (Paris 1845; new ed., Paris, 3 vols., 1898); A. G. P. Barante, Etudes historiques et biographiques ; Salvandy, Notice sur Mollien; also M. M. C. Gaudin (due ae Gaete), Notice Hislorique sur les finances de la France 1800-1814 (Paris, 1818). (J. Hl. R.)

MOLLUSCA, one of the great "phyla," or sub-kingdoms, of the animal pedigree or kingdom. The shell-bearing forms belonging to this group which were known to Linnaeus were placed by him (in 1748) in the third order of his class Vermes under the name " Testacea," whilst the Echinoderms, Hydroids and Annelids, with the naked Mollusca, formed his second order termed " Zoophyta." Ten years later he replaced the name " Zoophyta " by " Mollusca," which was thus in the first instance applied, not to the Mollusca at present so termed, but to a group consisting chiefly of other organisms. Gradually, however, the term Mollusca became used to include those Mollusca formerly placed among the " Testacea," as well as the naked Mollusca.

It is important to observe that the term yuaXa/cia, of which Mollusca is merely a latinized form, was used by Aristotle to indicate a group consisting of the cuttle-fishes only.

As now classified, the Mollusca consist of the following sub- divisions: —

Grade A. — Isopleura.

Class I. — Amphineura (see Chiton). Grade B. — Prorhipidoglossomorpha. Class II. — Gastropoda (q.v.). Class III. — Scaphopoda (q.v.). Class IV. — Lamellibranchia (q.v.). Grade C. — Siphonopoda.

Class V. — Cephalopoda (q.v.).

History of_ Classification. — -The definite erection of the Mollusca into the position of one of the

great primary groups of the animal kingdom is due to George Cuvier (1788-1800), who largely occupied himself with the dissection of representatives of this type. 1 * An independent anatomical investigation of the Mollusca had been earned on by the remarkable Neapolitan naturalist Poli (1791), whose researches 2 were not published until after his death (1817), and were followed by the beautiful works of another Neapolitan zoologist, the illustrious Delle Chiaje. 3

The embranchement or sub-kingdom Mollusca, as defined by Cuvier, included the following classes of shellfish: (1) the cuttles or poulps, under the name Cephalopoda; (2) the snails, whelks and slugs, both terrestrial and marine, under the name Gastropoda ;

(3) the sea-butterflies or winged-snails, under the name Pteropoda ;

(4) the clams, mussels and oysters, under the name Acephala;

(5) the lamp-shells, under the name Brachicpoda; (6) the sea- squirts or ascidians, under the name Nuda; and (7) the barnacles and sea-acorns, under the name Cirrhopoda.

The main limitations of the sub-kingdom or phylum Mollusca. as laid down by Cuvier, and the chief divisions thus recognized within its limits by him, hold good to the present day. At the same time, three of the classes considered by him as Mollusca have been one by one removed from that association in consequence of improved knowledge, and one additional class, incorporated since his day with the Mollusca with general approval, has, after more than forty years, been again detached and assigned an independent position owing to newly acquired knowledge.

The first of Cuvier’s classes to be removed from the Mollusca was that of the Cirrhopoda. Their affinities with the lower Crustacea were recognized by Cuvier and his contemporaries, but it was one of

the brilliant discoveries of that remarkable and too-little-honoured naturalist, J. Vaughan Thompson, of Cork, which decided their posi- tion as Crustacea. The metamorphoses of the Cirrhopoda were described and figured by him in 1830 in a very complete manner, and the legitimate conclusion as to their affinities was formulated by him. 4 Thus it is to Thompson (1830), and not to Burmeister (1834), as erroneously stated by Keferstein, that the merit of this discovery belongs. The next class to be removed from Cuvier's

- These figures refer to the Bibliography at the end of the article.

Mollusca was that of the Nuda, better known as Tunicata. In 1866 the Russian embryologist Kowalewsky startled the zoological world with a minute account of the developmental changes of Ascidia, one of the Tunicata, 5 and it became evident that the affinities of that class were with the Vertebrata, whilst their structural agreements with Mollusca were only superficial. The last class which has been removed from the Cuvierian Mollusca is that of the Lamp-shells or Brachiopoda. The history of its dissociation is connected with that of the class, viz. the Polyzoa or Bryozoa, which has been both added to and again removed from the Mollusca between Cuvier's date and the present day. The name of J. Vaughan Thompson is again that which is primarily connected with the history of a Molluscan class. In 1830 he pointed out that among the numerous kinds of " polyps" at that time associated by naturalists with the Hydroids, there were many which had a peculiar and more elaborate type of organization, and for these he proposed the name Polyzoa. Subsequently 6 they were termed Bryozoa by Ehrenberg (1831).

Henri Milne-Edwards in 1844 demonstrated the affinities of the Polyzoa with the Molluscan class

Brachiopoda, and proposed to associate the three classes Brachiopoda, Polyzoa and Tunicata in a large group ” Molluscoidea,” co-ordinate with the remaining classes of Cuvier’s Mollusca, which formed a group retaining the name Mollusca. By subsequent writers the Polyzoa have in some cases been kept apart from the Mollusca and classed with the ” Vermes ” ; whilst by others they have, together with the Brachiopoda, been regarded as true Mollusca. Increase of knowledge has now, however, established the conclusion that the agreement of structure supposed to obtain between Polyzoa and true Mollusca is delusive; and accord- ingly they, together with the Brachiopoda, were removed from the Molluscan phylum by Lankester in his article in the 9th edition of this work (on the which present article is based). Further details in regard to this, the last revolution in Molluscan classification, will be found in the article Polyzoa.

As thus purified by successive advances of embryological research, the Mollusca were reduced to the Cuvierian classes of Cephalopoda, Pteropoda, Gastropoda and Acephala. Certain modifications in the disposition of these classes are naturally enough rendered necessary by the vast accumulation of knowledge as to the anatomy and em- bryology of the forms comprised in them. Foremost among those who between 1840 and 1880 laboured in this field are the French zoologists Henri Milne-Edwards 9 and Lacaze Duthiers, 10 to the latter of whom we owe the most accurate dissections and beautiful illustrations of a number of different types. To Kolliker, 11 Gegenbaur, 12 and more recently Spenger, 13 amongst German anato- mists, we are indebted for epoch-making researches of the same kind. In England, Owen’s anatomy of the pearly nautilus, 14 Huxley’s discussion of the general morphology of the Mollusca, 17 and Lankester’s embryological investigations, 19 have aided in advancing our knowledge of the group. Two remarkable works_ of a systematic character dealing with the Mollusca deserve mention here — the Manual of the Mollusca, by Dr S. P. Woodward, a model of clear

systematic exposition, and the exhaustive treatise on the Malacozoa or Weichthiere by Professor Keferstein of Gottingen, published as part of Bronn's Klassen und Ordnungen des Thier-Reichs.

The arrangement adopted by Ray Lankester in the 9th edition of the Ency. Brit. (art. " Mollusca "; 1883) was as follows: Of the four Cuvierian classes mentioned above, the Pteropoda were united with the Cephalopoda, on account of the apparent similarity of the cephalic tentacles in some of the former to the arms of the latter. An additional class was instituted for the reception of Dentalium and its few allies, and for this class Bronn's name Scaphopoda was used. The Chitons and their allies were placed under the Gastropoda, as a distinct branch called Isopleura, and for the Acephala de Blainville's name Lamellibranchia was substituted. The latter were regarded as forming a distinct branch, equivalent in rank to the other three classes together, the latter alt possessing the radula which is wanting in Lamellibranchs.

Since the 9th edition of the Ency. Brit, was published important advances have been made in our knowledge of the Mollusca, as the result of researches largely due to the interest excited in the subject by Lankester's article. Attention has been especially directed to the investigation of the most primitive forms in each group, and accordingly we can now form much more definite conceptions of the phylogeny and evolution of the various classes. The most important and extensive contributions to this progress have been made by the Belgian zoologist, Dr Paul Pelseneer, who has made the Mollusca his special study.

The Chitonidae and the Aplacophora are now separated from the Gastropoda and raised to the rank of a distinct class, under the name of Amphineura. On the other hand, Boas and Pelseneer have shown that the Pteropoda have nothing to do with the Cephalopoda, but are Gastropoda modified for a pelagic life; they are therefore now united with the Gastropoda. The Lamellibranchia are no longer regarded as a distinct

branch in contrast to the remaining Mollusca ; according to Pelseneer they are allied to the Gastropoda and Sca- phopoda, all three classes being derived from a common hypotheti- cal ancestor, called Prorhipidoglossum. These three classes have therefore been united by Grobben into one branch or grade, the Prorhipidoglossomorpha.

General Characters of the Mollusca. — The forms comprised in the various groups, whilst exhibiting an extreme range of variety in shape, as may be seen on comparing an oyster, a cuttle-fish, and a sea-slug such as Doris; whilst adapted, some to life on dry land, others to the depths of the sea, others to rushing streams; whilst capable, some of swimming, others of burrowing, crawling or jumping, some, on the other hand, fixed and immobile; some amongst the most formidable of carnivores, others feeding on vegetable mud, or on the minutest of microscopic organisms — yet all agree in possessing in common a very considerable number of structural details which are not possessed in common by any other animals.

The structural features which the Mollusca do possess in common with other animals belonging to other great phyla of the animal kingdom are those characteristic of the Coelomata, one of the two great grades (the other and lower being that of the Coelentera) into which the higher animals, or Metazoa as distinguished from the Protozoa, are divided. The Metazoa all commence their individual existence as a single cell or plastid, which multiplies itself by transverse division. Unlike the cells of Protozoa, these embryonic cells of the Metazoa do not remain each like its neighbour and capable of independent life, but proceed to arrange themselves into two layers, taking the form of a sac. The cavity of the two-cell-layered sac or diblastula thus formed is the primitive gut or arch-enteron. In the Coelentera, whatever subsequent changes of shape the little sac may undergo as it grows up to be polyp or jelly-fish, the original arch-enteron remains as the one cavity pervading all regions of the body. In the Coelomata, on the other hand, there is another cavity, dividing the body-

wall into two layers : an internal layer surrounding the gut, and an external layer. This cavity is excavated in a third mass of cells distinct from the cells lining the gut, forming the endoderm, and the cells covering the surface of the body, the ectoderm. This third mass of cells is the mesoderm. The Mollusca agree in being coelomate with the phyla Vertebrata, Platyhelmia (flat- worms) , Echinoderma, Appendiculata (insects, ringed-worms, &c), and others — in fact, with all the Metazoa except the sponges, corals, polyps, and medusae.

In common with all other Coelomata, the Mollusca are at one period of life possessed of a prostomium or region in front of the mouth, which is the essential portion of the ” head,” and is connected with the property of forward locomotion in a definite direction and the steady carriage of the body (as opposed to rotation of the body on its long axis). As a result, the Coelomata, and with them the Mollusca, present (in the first instance) the general condition of body known as bilateral symmetry; the dorsal is differentiated from the ventral surface, whilst a right and a left side similar, to, or rather the complements of, one another are permanently established. In common with all other Coelomata, the Mollusca have the mouth and first part of the alimentary canal which leads into the met-enteron formed by a special invagination of the outer layer of the primitive body- wall, not to be confounded with that which often, but not always, accompanies the antecedent formation of the arch-enteron; this invagination is termed the stomodaeum. Similarly an anal aperture is formed in connexion with a special invagi- nation which meets the hinder part of the met-enteron, and is termed the proctodaeum.

The coelom is primarily and essentially the generative cavity: the reproductive cells arise from its walls, i.e. from the coelomic epithelium. True nephridia do not primarily open into the coelom, as was formerly taught, but are intra-cellular ducts in the mesoderm. Such organs are absent in Mollusca in the adult state, but a pair of nephridia usually

occurs in the larva. The coelom opens to the exterior by ducts which are primarily genital ducts by which the ova or sperms are discharged. These ducts, however, as well as the coelomic epithelium, may assume excretory functions. In Mollusca the coelom is reduced and consists of two ‘parts, the pericardial cavity which surrounds the heart, and the cavity of the gonads or generative organs. There is usually one pair of coelomic ducts leading from the

pericardium to the exterior, and these are the excretory organs or kidneys, formerly known as the organs of Bojanus. The walls of the pericardium are also excretory in parts, these parts forming the pericardial glands. In the majority of Mollusca the gonads are provided with a pair of ducts of their own. There are thus two pairs of coelomic ducts. This fact gives rise to the question whether the Mollusca are to be regarded as primi- tively segmented animals or not. In animals which exhibit typical segmentation or metamerism, such as segmented worms (Chaetopoda), each segment or metamere possesses its own coelomic cavity, a pair of coelomic ducts, and a pair of nephridia. The structure of the Mollusca in the greater number of cases agrees with the hypothesis that the primitive form was unseg- mented, and therefore had but one pair of coelomic ducts and one pair of nephridia. In existing forms the latter disappear in the adult. In the most primitive forms of several classes there are no distinct genital ducts, the gonads when mature discharging into or through the kidneys. Among the Gastropoda, in the Aspidobranchia, there is no genital duct, and the gonad opens into the right kidney; in the more modified forms the left kidney alone is functional, the right has been converted into the genital duct. Among the Lamellibranchia again the kidneys serve as genital ducts in the Protobranchia and some Filibranchia. In the higher forms the opening of the gonad is shifted

more and more towards the external aperture of each kidney until finally it is situated on the external surface, and thus the gonad secondarily acquires an independent aperture. In the Scaphopoda there is no distinct genital duct, the relations are as in Aspidobranchia. Among the Amphineura we find one pair of coelomic ducts in the Aplacophora, two pairs in the Chitons. In the former the genital coelom and the pericardial coelom are continuous and the reproductive cells escape by the renal ducts. In the Chitons or Polyplacophora, on the other hand, the two cavities are separate, and there are independent genital ducts. It is possible therefore to regard the latter condition as secondary, and to conclude that the separate genital ducts have been derived from the original single pair of coelomic ducts, as in Lamellibranchs.

The Cephalopoda, however, do not harmonize so well with this view. The earliest forms of this class geologically are the Nautiloidea. Assuming that these ancestral forms resembled the existing Nautilus in their internal anatomy, they had two pairs of renal ducts and one pair of genital ducts, which would apparently indicate, not a single metamere or unsegmented body, but three metameres. There are however only two pairs of branchiae. The Dibran'chia, with only one pair of branchiae, one pair of renal organs, and one pair of genital ducts, are much more recent, not appearing till the end of the Secondary epoch, and therefore must be regarded as descended from the Tetra- branchia. The latter are represented in the Upper Cambrian formations, together with Lamellibranchia and Gastropoda, and there are no earlier Molluscan fossils than these. Palaeontology therefore throws no light on the question whether the metameric or the unsegmented Mollusca were the earlier. The development of the Cephalopoda affords at present no better evidence that the metamerism is secondary. That of Nautilus, which would be most important in this inquiry, is unfortunately still unknown. In the Dibranchia true nephridia have not been detected in the embryo, nor has it been shown that the genital ducts are derived

from the renal tubes. On the other hand, there is no evidence that the forms which show no metamerism, such as the Gastro- poda, are descended from metameric ancestors. On the whole, then, the most probable conclusion is that the original ancestral form of the Mollusca was unsegmented, possessed one pair of true nephridia, and one pair of coelomic ducts whose function was to conduct the generative products to the exterior. The chief types of Mollusca were already differentiated at the beginning of the geological record, and the metamerism which occurs in the Cephalopoda has been evolved within the limits of that class. *

External Characters. — The characteristic organs of Mollusca are the mantle and shell, the foot, the ctenidia and the radula,

of which all but the last are external. The original form was bilaterally symmetrical, and this symmetry is retained in all the classes except the Gastropoda. At the anterior end the head is differentiated; it bears the sense-organs, and contains the muscular pharynx within which is the radular apparatus. The rest of the body consists of the foot ventrally and the visceral mass dorsally. The foot is a muscular mass without cuticle or skeleton, excepting certain cuticular structures such as the byssus of Lamellibranchs and the operculum of Gastropods, which do not aid in locomotion. The foot is usually the only organ of locomotion. It corresponds to the ventral part of the body-wall in other animals. The muscular tissue of the dorsal body-wall is much reduced and the integument here is thin and

Fig. 1. — Ctenidia of various Mollusca (original).

A, Of Chiton: f.t., fibrous tissue; a.b.v., afferent blood-vessel;

e.b.v., efferent blood-vessel; g.l., laterally paired lamellae. B , Of Sepia : letters as in A. C , Of Fissurella : letters as in A.

D, Of Nucula: d, position of axis with blood-vessels; a, inner:

b and c, outer row of lamellae.

E, Of Paludina: i, intestine running parallel with the axis of the

ctenidium and ending in the anus a; br., rows of elongate processes corresponding to the two series of lamellae of the upper figures.

soft. The external epithelium of the dorsal region secretes the shell. Between the edge of the shell and the foot there is a groove or cavity, chiefly developed laterally and posteriorly. The dorsal border of this groove is extended outwards and downwards as a fold of the integument. There is some confusion of terms here: some writers call the free fold the mantle or pallium, and this is the proper use of the term; but others apply the term to the whole of the dorsal integument, including both the projecting fold and the part covering the viscera. The shell extends to the edge of the mantle-fold, and the cavity between the mantle and the side of the body is the pallial chamber. This chamber serves two purposes: it is primarily

the respiratory cavity containing the gills, but it also serves to enclose the body so that the latter is surrounded by the shell, from which the head and foot can be protruded at the will of the animal.

The shell consists of an organic basis the substance of which is called conchiolin, impregnated with carbonate of lime, with a small proportion, 1-2 %, of phosphate of lime. On the outside of the shell is a non-calcified layer of conchiolin called the periostracum, secreted by the thickened edge of the mantle. The zone of the external surface of the mantle within the edge secretes a layer formed of prisms of calcite; the rest of the epithelium from

this zone to the apex secretes the inner layer of the shell, Composed of successive laminae; this is the nacreous layer, and in certain species has a commercial value as nacre or mother-of-pearl. Thus the growth of the shell in extent is due to additions to the prismatic layer at the edge, its growth in thickness to new layers of nacre deposited on its inner surface. In many cases in various classes the mantle is reflected over the edges of the shell, so as to cover more or less completely its outer surface. When this covering is complete the shell is contained in a closed sac and is said to be ” internal,” but the sac is lined by ectoderm and the shell is always morpho- logically external. In one or two cases the epithelium of the foot secretes a calcified shell, which is either free as in Argonauta or adherent as in Hipponyx.

The ctenidia (fig. 1) are the branchial organs of the Mollusca. In the primitive condition there is one on each side in the mantle cavity, towards the posterior end of the body. Each is an outgrowth of the body-wall at the side of the body, and consists of an axis containing two main vessels, an afferent and efferent, and bearing on either side a series of transverse plates whose blood-sinuses communicate with the vessels of the axis. The afferent vessel of the ctenidium receives blood from the vena cava or principal blood-sinus of the body, the efferent vessel opens into the auricle of its own side. Near the base of the ctenidium is a patch of sensory epithelium innervated from the branchial nerve, forming a sense-organ called the osphra- dium, whose function is to test the water entering the branchial cavity. The branchial current is maintained by the cilia which cover the surface of the ctenidia, except in Cephalopoda, in which cilia are absent and the current is due to muscular action. Thus in the primitive mollusc the mantle-cavity contains a symmetrical group of structures at the posterior end of the body, and this group of structures is called the pallial complex. It consists of the anus in the middle, a renal organ and renal aperture on each side of this, and a ctenidium outside or anterior to

the renal organ, an osphradium being situated at the base of the ctenidium.

Internal Anatomy: Digestive Tube. — In primitive Mollusca the mouth and anus are the two extremities of the body, but the anus may be brought to an anterior position by a ventral flexure, complicated in Gastropoda by a lateral torsion. The alimentary tube consists of three regions: firstly, the anterior buccal mass with the oesophagus, of ectodermic origin, and therefore bearing cuticular structures, namely the jaws and radula ; secondly, the mid-gut, of endodermic origin and including the stomach and liver; and, thirdly, the hind-gut or intestine. The radula consists of a chitinous band bearing teeth, secreted by a ventral caecum of the pharnyx and moved by an apparatus of cartilage and muscles. It was present in the ancestral mollusc, occurs in nearly all archaic types, and is only absent in the most specialized forms, in which it has evidently been lost; these forms are certain Neomeniomorpha, all the Lamelli- branchia, various degenerate Gastropoda, and the Cirrhoteuthidae among Cephalopods. The teeth are secreted by a small number of cells at the closed end of the caecum, the basal membrane by a trans- verse row of cells in front of these. The teeth are disposed in transverse rows, and in each row they are arranged symmetrically on either side of a central tooth. In Polyplacophora there are eight on each side (8.1.8); in Scaphopoda two on each side (2.I.2); in almost all Cephalopoda three on each side (3.I.3) ; in Gastropoda the number varies very much in different subdivisions. Beneath the anterior parts of the radula where it emerges from the caecum are a pair of cartilages, and attached to these a number of special muscles by which the radula is moved backwards and forwards to act as a rasp. The secretion of the radula at the closed end of the caecum is continuous, so that it is constantly growing forward as fast as its exposed anterior portion is worn away by use, just as a finger- nail is pushed forward by constant growth at its posterior end,

and is worn away or has to be cut short from time to time at its outer end.

Circulation.— The system of blood-vessels is entirely separate from the coelomic cavities. It consists of arteries, veins and sinuses, but ramified capillaries are usually absent except in the integuments of Cephalopods. The arteries and veins have proper endothelial walls; they pass abruptly into the sinuses and in some cases communication is effected by orifices in the walls of the vessels, as for example in the vena cava of Nautilus. The heart is situated in the pericardium on the dorsal side of the intestine and at the posterior end of the animal. The pericardium never contains blood, as is well shown in those forms which have red corpuscles in their blood ; these corpuscles are never found in the pericardium.

The heart receives blood from the gills and mantle, and pumps it through arteries to the body. It consists of a median ventricle with muscular walls and a cavity traversed by muscular strands. On either side of the ventricle, in the primitive condition, is a thin- walled auricle, opening into the ventricle by a valved opening. Each auricle forms the terminal enlargement of the efferent vein of the ctenidium of its own side. In Nautilus two pairs of auricles are present, corresponding with the two pairs of ctenidia. In the primi- tive form a single anterior aorta is given off from the ventricle, the two together representing the dorsal blood-vessel of Chaetopods. In more specialized forms a posterior aorta passes backwards from the ventricle, as in Gastropods and the majority of Lamellibranchs. The ramifications of the arteries convey the blood to all parts of the body, and it finally reaches the venous sinuses, the chief of which are the pedal, the pallial and the median-ventral. The last is between the pericardium and the foot ; from it the blood passes through the renal organs to the ctenidia. Some blood, however, enters the auricles directly from the mantle, without passing through the ctenidia. In the majority of Gastropoda one gill and one auricle are lost.

The blood is usually a colourless liquid containing amoeboid cells and sometimes other corpuscles called haematids. It may be coloured blue by haemocyanin, a respiratory compound containing copper. In a few forms the blood contains haemoglobin, either in solution or in haematids (red blood-corpuscles). In the Gastropoda the muscular tissue of the buccal mass is coloured red by haemo- globin.

Nervous System. — The central nervous system may be described as consisting of a collar surrounding the oesophagus, and two pairs of cords arising from the collar and passing backwards. The two pairs of cords arise from the same point of the collar. The ventral cords are the pedal, the dorso-lateral, the pleural, the former innervating the foot, the latter the mantle. The dorsal half of the collar is the cerebral commissure, the ventral the labial commissure. The pedal cords are connected by commissures, and the pedal and pleural of each side are similarly connected. The pallial cords are united to one another posteriorly, dorsal to the rectum. This is the condition of the nervous system found in Chiton and the other Amphineura, but may not be in all respects the ancestral condition. Generally the system is differentiated into ganglia connected by nerve-cords consisting of nerve-fibres only. At the point of the collar whence the nerve-cords arise are the cerebral ganglia; from these one pair of connectives passes to a pair of pedal ganglia, and another pair of connectives to a pair of pleural ganglia. Pedal and pleural on each side are connected by a pleuro-pedaf connective Each pleural ganglion gives off a long nerve which supplies the viscera, and the two unite posteriorly below the intestine. There are usually three small ganglia on the course of this visceral Commissure, namely, the right and left visceral ganglia and the abdominal. The perio- esophageal nerve-ring of Chaetopoda and Arthropoda is represented, not by the collar first mentioned in the above description, but by the commissures connecting the cerebral and pedal ganglia. The labial commissure supplies only the buccal mass and the oesophagus and stomach.

The special sense-organs are a pair of eyes on the head, a pair of otocysts or statocysts, and a pair of osphradia which have already been mentioned. In certain cases accessory eyes are also present, e.g. the pallial eyes of Pecten and other Lamellibranchs, and of Chitons. The otocysts are invaginations of the epithelium of the foot, but are innervated from the cerebral ganglia, and the same innervation has been proved in some cases for the osphradia.

Reproduction and Development. — Molluscs are usually of separate sexes, but sexual dimorphism is seldom highly developed. Herma- phroditism is secondary, and occurs in one sub-class of Gastropoda, in some Lamellibranchs, and in one sub-order of Amphineura. In Cephalopods and the majority of Gastropods copulation occurs. As a rule no parental care is exhibited, but incubation of the developing ova within some part of the parental body, or receptacles attached to the parent, occurs in some Lamellibranchs, some Gastropods, and in Argonauta among the Cephalopods. True viviparity, that is the development of the ova within the oviduct, is very rare, occurring only in one case among the Amphineura and in some aquatic and pulmonate Gastropoda.

The egg-cell of Mollusca is either free from food-material — a simple protoplasmic corpuscle — or charged with food-material to a greater or less extent. Those cases which appear to be most typical —^i.e. which adhere to a procedure which was probably common at one time to all then existing Mollusca and has been departed from only

in later and special lines of descent — show approximately the following history. By division of the egg-cell a mulberry-mass of embryonic-cells is formed (morula), which dilates, forming a one-cell-layered sac (blastula). By invagination one portion of this sphere becomes tucked into the other — as in

the preparation of a woven night-cap for the head. The orifice of invagination (blastopore) narrows, and we now have a two-cell-layered sac — the gastrula. The invaginated layer is the enteric cell-layer or endoderm ; the outer cell-layer is the dermic cell-layer or ectoderm. The cavity communicating with the blastopore and lined by the endoderm is the arch- enteron. The blastopore, together with the whole embryo, now elongates. The blastopore then closes along the middle portion of its extent, which corresponds with the later developed foot. At the same time the stomodaeum, or oral invagination, forms around the anterior remnant of the blastopore, and the proctodaeum, or anal invagination, forms around the posterior remnant of the blastopore. There are, however, variations in regard to the relation of the blasto- pore to the mouth and to the anus which are probably modifications of the original process described above.

In eggs which contain a larger quantity of food-yolk, the process by which the endoderm is enveloped by the ectoderm is somewhat different. Segmentation in these is very unequal, and results in the formation of small cells called micromeres and large cells called megameres, as in fig. 4. As the micromeres become more numerous they gradually envelop the megameres until the latter are completely enclosed. The gastrula is in these cases said to be formed by epibole. Between ectoderm and endoderm a third intermediate cell-layer

(After Lankester, 15.)

Fig. 2. — Development of the Pond-Snail, Limnaeus stagnalis.

r, Directive corpuscle.

bl, Blastopore.

en, Endoderm or enteric cell layer.

ec, Ectoderm or deric cell-layer.

v, Velum.

m, Mouth.

/, Foot.

t, Tentacles.

fp, Pore in the foot (belonging

to the pedal gland?). mf. The mantle-flap or limbus

pallialis. sh, The shell. I, The sub-pallial space, here

destined to become the lung.

A, First four cells resulting from

the cleavage of the original egg-ceil.

B, Side-view of the same.

C, Diblastula stage showing the

two cell-layers and the blastopore.

D, E, F, Trochosphere stage, D

older than E or F.

G, Three-quarter view of a Dib- lastula, to show the orifice of invagination of the endo- derm or blastopore, (bl).

H, I, Veliger stage later than D.

is formed, which is called the mesoderm, and gives rise to the muscular and connective tissues to the vascular system, and to the excretory and generative organs. The mesoderm arises for the most part from the ehdoderm. When the segmentation is unequal one of the megameres gives rise by successive divisions to two primary mesoderm cells called mesomeres; these divide to form two masses of cells called mesoblastic bands. The coelom is formed as a cavity or cavities in the interior of these cell-masses. In some cases the

coelom is formed as a single cavity, and renal and generative organs are formed from its walls. This is the primitive method, but in other cases the organs mentioned may be formed separately in the mesoderm. The renal organs are tubular outgrowths of the pericardial parts of the coelom ; the reproductive cells are derived from cells lining the generative portion.

The external form of the embryo meanwhile passes through highly characteristic changes, which are on the whole fairly constant

(After Lankester, 17.)

Fig. 3. — Development of the River-Snail, Paludina vivipara.

dc, Directive corpuscle (outcast

ceil). ae, Arch-enteron or cavity lined

by the enteric cell-layer or

endoderm. bl, Blastopore. vr, Velum or circlet of ciliated

cells. dv, Velar area or cephalic dome. sm, Site of the as yet unformed

mouth. /, Foot. mes, Rudiments of the skeleto-

trophic tissues. pi, The pedicle of invagination,

the future rectum. shgl, The primitive shell-sac or

shell-gland.

A,

Gastrula phase (optical sec- tion).

The Gastrula has become a Trochosphere by the development of the ciliated ring vr (optical section).

Side view of the Trochosphere. with commencing formation of the foot. D, Further advanced Trocho- sphere (optical section). -

The Trochosphere passing to the Veliger stage,dorsal view showing the formation of the primitive shell- sac.

Side view of the same, showing foot, shell-sac (shgl), velum (vr), mouth and anus.

B

C,

E,

F,

m, Mouth, an, anus.

N.B. — In this development the blastopore is not elongated; it persists as the anus. The mouth and stomodaeum form indepen- dently of the blastopore.

throughout the Mollusca. A circlet of cilia forms when the embryo is still nearly spherical in an equatorjal position. As growth pro- ceeds, one hemisphere remains relatively small, the other elongates and enlarges. Both mouth and anus are placed in the larger area; the smaller area is the prostomium simply; the ciliated band is therefore in front of the mouth. The larval form thus produced is known as the trochosphere. It exactly agrees with the larval form of many Chaetopod worms and other Coelomata. Most remark- able is its resemblance to the adult form of the Wheel animalcules, or Rotifera, which retain the prae-oral ciliated band as their chief organ of locomotion and prehension throughout life. So far the young mollusc has not reached a definitely molluscan stage of

development, being only in a condition common to it and other Coelomata. It now passes to the veliger phase, a definitely molluscan form, in which the disproportion between the area in front of the ciliated circlet and that behind it is very greatly increased, so that the former is now simply an emarginated region of the head fringed with cilia. It is termed the ” velum,” and is frequently drawn out

(From Balfour, after Bobretzky.) Fig. 4. — Early Stages of division of the Fertilized Egg-cell in Nassa

mutabilis.

A, The egg-cell has divided into two spheres, of which the lower

contains more food-material, whilst the upper is again incom- pletely divided into two smaller spheres. Resting on the dividing upper sphere are the eight-shaped ” directive corpuscles,” better called ” praeseminal outcast cells or apoblasts,” since they are the result of a cell-division which affects the egg-cell before it is impregnated, and are mere refuse, destined to disappear.

B, One of the two smaller spheres is reunited to the larger sphere.

C, The single small sphere has divided into two, and the reunited

mass has divided into two, of which one is oblong and practically double, as in B.

D, Each of the four segment-cells gives rise by division to a small

pellucid cell.

E, The cap of small cells has increased in number by repeated for-

mation of pellucid cells in the same way, and by division of those first formed. The cap will spread over and enclose the four segment-cells, into lobes and processes. As in the Rotifera, it serves the veliger larva as an organ of locomotion. The body of the veliger is charac- terized by the development of the visceral hump on one surface, and by that of the foot on the other. Growth is greater in the vertical dorso-ventral axis than in the longitudinal oro-anal axis ; consequently the foot is relatively small and projects as a blunt process between mouth and anus, which are not widely distant from one another, whilst the antipedal area projects in the form of a great hump or dome. In the centre of this antipedal area there has appeared (often at a very early period) a gland-like depression or follicle of the integument. This is the primitive shell-sac discovered by Lankester in 1 87 1, and shown by him to precede the development of the permanent shell in a variety of molluscan types. The shell-gland is bounded by a ridge of ectodermic cells. This ridge forms the edge of the shell-secreting epithelium, and therefore of the mantle, since the shell extends to the edge of the mantle. The shell-gland, as development proceeds, extends from its point of origin as an ectodermic thickening, which may be only slightly concave or may be deeply invaginated and then evaginated.

In the larvae of several Gastropoda and Lamellibranchia occur excretory organs which have the characters of true nephridia. There is a single pair of these organs situated immediately behind the velum. They agree with primitive nephridia in being of ectodermic origin, inconsisting of perforated cells in linear series, and in having no communication with the coelom. The inner end of each of these organs consists of a flame-cell, i.e. a cell with an internal cavity containing a vibrating filament or flagellum. They are best de- veloped in the Pulmonata ; in some cases they are very rudimentary and may be destitute of an external opening. They invariably disappear before the adult stage is reached, but their presence in the larva is

evidence that the ancestral mollusc possessed a pair of true nephridia quite distinct from the coelomic excretory organs, which are so characteristic of existing forms in the adult condition. The ctenidia, it will be observed, have not yet been mentioned, and they are indeed the last of the characteristic Molluscan organs to make their appearance. They arise as outgrowths of the sides of the body within the cavity formed by the development of the mantle. The veliger, as soon as its shell has attained some extent and begins to assume definite shape, is no longer of a form common

to Mollusca generally, but acquires characters peculiar to the parti- cular class to which its parents belong. For the later development therefore the articles on the several classes must be consulted.

Relations between the Classes. — From the preceding discussion an idea may be formed of the primitive characters of the Phylum

embryonic form of Mollusca.

(From Gegenbaur.)

Fig. 5.-

Velum. A, Earlier, and (B), later, Veliger

Visceral dome with dependent of a Gastropod.

mantle-skirt. C, Veliger of a Pteropod showing

Foot. lobe-like processes of the

Cephalic tentacles. velum and the great paired

Operculum. 1 outgrowths of the foot.

Mollusca, and it is possible to construct a diagrammatic mollusc, as was first done by Lankester, which will possess these primitive features. The figure here given represents such a hypothetical form according to present views. We

cannot assert that this was in all respects the condition of the common ancestor, as will be seen when we attempt to derive the various sub-types from it. In the Amphineura the nervous system, having no

(From Lankester's Treatise on Zoology. A. and C. Black.)

Fig. 6. — Diagram of a primitive Mollusc, viewed from the left side.

eg,

h,

k,

lax

m,

pa,

Anus. pa.n,

Cerebral ganglion. pe,

Foot. p.g, Gill, in the pallial cavity, pl.g,

Gonad. ra,

Heart. r.p.o,

Kidney. st,

Labial commissure. st.g,

Mouth. v.g, Mantle.

Pallial nerve. Pericardium. Pedal ganglion. Pleural ganglion. Radula.

Reno-peiicardial orifice. Stomach.

Stomato-gastric ganglion. Visceral ganglion.

separate ganglia and no ventral visceral commissure, may be still more primitive. The metameric

repetition of the shell- plates and of the ctenidia are probably special modifications, but it is difficult to explain the spicules of the dorsal integument except as a condition more primitive than the shell itself. The Prorhipidoglossomorpha are distinguished by the separation of the genital coelom from the pericardium, and by the long visceral commissure passing ventral to the intestine. The Lame'libranchia have markedly diverged from the original type by the adoption of filtration as a method of feeding. This has

led to the loss of the radula, and is accompanied by the division of the shell into two valves. The peculiarities of the Gastropoda are all due to the torsion of the shell and body. The Cephalopoda can be derived without much difficulty from the schematic Mollusc, if we assume that some metameric repetition of organs has occurred, as explained above in reference to the coelom. The foot has been developed into long processes which have extended in a circle round the mouth; all the ganglia, including the visceral, have been concentrated around the oesophagus.

Habits and Distribution. — More than 28,000 species of living Molluscs have been distinguished, of which more than half are Gastropods. They are essentially aquatic animals, and the

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(From Lankester's Treatise on

Zoology.

A.

and C. Black.)

Fig. 7. — Diagrams of the five cla

=ses of Mollusca, from the left side

A, Amphineura.

h, Heart, in the pericardium.

B, Scaphopoda.

h.a, Posterior adductor.

C, Gastropoda.

m, Mouth.

D, Lamellibranchia.

pa, Pallium or mantle.

E, Cephalopoda.

p.g, Pedal ganglion.

a, Anus.

pl.g, Pleural ganglion.

a.a, Anterior adductor.

ra, Radula.

eg, Cerebral ganglion.

st. Stomach.

/, Foot.

st.g, Stomato-gastric ganglion.

fu, Funnel.

v.g, Visceral ganglion.

g, Ctenidium.

majority live in the sea. Some, like many Cephalopods and the Pteropods, are pelagic or free-swimming; other's creep or lie on the sea bottom. Some are littoral, living between tide-marks; others are found at very various depths, up to 2800 fathoms. A few species have invaded the fresh waters, while the pulmonate and terrestrial Gastropods are distributed over the whole surface of the land in all latitudes and to a height of 1 5,000 ft. As a rule Molluscs are free and more or less active, but many Lamellibranchs are sedentary, and a few of these and of Gastro- pods are permanently fixed to their habitat. Commensalism occurs in a few instances, but parasitism either external or internal is rare. The latter is confined to certain Gastropods which live in Echinoderms and are extremely degenerate in structure. Protective resemblance is exhibited by some Nudibranch Gastropods which have assumed the colour and appearance of their habitat.

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MOLLUSCOIDA, a name long employed to denote a division of the animal kingdom which contained Brachiopods (q.v.), Polyzoa (q.v.), and Tunicata

(q.v.), the members of the three groups having been supposed to resemble the Mollusca. As it is now known that these groups have no relation to molluscs, and very little to one another, the name Molluscoida has been abandoned.

MOLLY MAGUIRES, an Irish American secret society which maintained numerous branches in the anthracite coal regions of Pennsylvania, U.S.A., from 1854 to 1877, and perhaps later. The name was imported from Ireland, where it had been used to designate one of the Ribbon societies that devoted its energies to intimidating and maltreating process servers and the agents of landlords, and whose greatest activity was between 1835 and 1855. The Irish society of Molly Maguires seems to have been organized in 1843 in the barony of Farney, Co. Monaghan, to co-operate with the ribbonmen, and its membership seems to have been confined to the very lowest classes. The Molly Maguires of Pennsylvania consisted of similar classes of Irishmen, but there seems to have been no connexion between the two societies. Every member of the American organization was also a member of the Ancient Order of Hibernians, an association organized for benevolent purposes, and having branches throughout the United States and Great Britain. To the Ancient Order of Hibernians none might be admitted but persons of Irish birth or descent, who were Roman Catholics, and whose parents were Roman Catholics; but notwithstanding this requirement, the organization — being a secret society — was under the ban of the Catholic Church. At the head of each division or lodge there was a ” body master,” who communicated directly with a county delegate; the county delegates reported to the state delegate, and the state delegates to a national delegate. The supervision of the whole order was vested in a ” Board of Erin,” meeting quarterly in England, Ireland or Scotland, and at each meeting arranging a new code of signals and passwords, which were communicated to the national delegate in the United States by the steward of a transatlantic steamship, and thence were transmitted to the various subdivisions. In the mining districts

of Pennsylvania the organization fell under the control of a lawless element,

which created the inner order of ” Molly Maguires,” with the ■abject, it appears, of intimidating the Welsh, English, and German miners, and of ridding the region of mine superin- tendents, bosses and police who should make themselves in any way objectionable to members of the order. Any member having a grievance might lay a formal complaint before his ” body master,” who thereupon conferred with the officers of the neighbouring divisions and secured members from a distance to make away with the offending person. Under this system the crimes in a given district were always committed by strangers rendering identification of the criminal difficult and escape easy. The society grew in strength during the Civil War, when the increased demand for coal caused an influx of miners, many of them lawless characters, into the coal-fields, and in 1862-1863 it opposed enlistments in the Federal Army and roughly treated some of the enlisting officers. After the war its activity was shown by an increasing number of assassinations, burnings and other outrages, until by 1875 it completely dominated the mining classes and forced a general strike in the coal regions. After repeated efforts to bring the criminals to justice had failed, Franklin B. Gowen (1836-1889), president of the Philadelphia and Reading Coal and Iron Company, sent James McParlan, an Irish Catholic and a Pinkerton detective (who some thirty years later attracted attention in the investigation of the assas- sination of Governor Steunenberg of Idaho), to the mining region in 1873; he joined the order, lived among the ” Molly Maguires ” for more than two years, and even became secretary of the Shenandoah division, one of the most notoriously criminal lodges of the order. The evidence he secured led to the arrest, conviction, and execution or imprisonment of a large number of members during the

years 1876-1877, and subse- quently the outrages ceased and the society was disbanded.

See F. P. Dewees, The Molly Maguires [(Philadelphia, 1877) ; Allan Pinkerton, The Molly Maguires and the Detectives (New York, 1877); E. W. Lucy, The Molly Maguires of Pennsylvania; (London, n.d.); The Commonwealth versus John Kehoe et al. (Pottsville, Pa., 1878); and an article by J. F. Rhodes in Amer. Hist. Review, April, 1910.

MOLOCH, or Molech (in Hebrew, with the doubtful exception of 1 Kings xi. 7, always ” the Molech “), the name or title of the divinity which the men of Judah in the last ages of the kingdom were wont to propitiate by the sacrifice of their own children. According to the Hebrew consonants it might simply be read ” the king ” (melek), an appellation for the supreme deity of a Semitic state or tribe. The traditional pronunciation (MoXox), which goes back as far as the Septuagint version of Kings, probably means that the old form was perverted by giving it the vowels of bosheth ” shame,” the contemptuous name for Baal (q.v.). In 1 Kings xi. 7 (see above) it is the name of the god of the Ammonites, elsewhere called Milcom or Malcam; but it appears from 2 Kings xxiii. 10, 13 that the worship of Milcom at the shrine set up by Solomon was distinct from Molech worship, and the text should probably therefore be emended to the longer form (so the Septuagint).

The phrase employed in speaking of these sacrifices is that of dedication — ” to make one’s son or daughter pass through (or by means of) fire to (the) Molech ” (2 Kings xxiii. 10; but elsewhere without the words ” through fire ” Lev. xviii. 21); and it appears from Jer. vii. 31, xix. 5; Ezek. xvi. 20 seq., that this phrase denotes a human holocaust, 1 and not, as some- times has been thought, a mere consecration to Molech by passing through or between fires, as in the Roman Palilia and similar rites elsewhere (on which see Frazer, Golden Bough, 2nd ed., ii. 40 sqq., iii. 237 sqq.). Human sacrifice was common in Semitic heathenism, and at least the

idea of such sacrifices was

1 In 2 Chron. xxviii. 3 (parallel to 2 Kings xvi. 3) a single letter is transposed in the phrase, changing the sense from ” caused to pass through the fire ” to ” caused to burn with fire.” Geiger (Urschrift und Uebersetzung, p. 305) very unnecessarily supposed that this was everywhere the original reading, and that it had been changed to soften the enormity ascribed to the ancient Hebrews. The phrase ” to give one’s seed to Molech ” (Lev. xx. 2 seq.), and the fact that these victims were (like other sacrifices) regarded as food for the deity (Ezek. xvi. 20) explain and justify the common reading.

not unknown to Israel from early times (see Isaac; Jefhthah).* We learn from 2 Kings iii. 27 that the piacular sacrifice of his son and heir was the last offering which the king of Moab made to deliver his country. Even the Hebrew historian ascribes to this act the effect of rousing divine indignation against the invading host of Israel; it would not, therefore, be surprising if under the miseries brought on Palestine by the westward march of the Assyrian power, the idea of the sacrifice of one’s own son, as the most powerful of atoning rites, should have taken hold of those kings of Judah (Ahaz and Manasseh, 2 Kings xvi. 3, xxi. 6) who were otherwise prone, in their hopelessness of help from the old religion (Isa. vii. 12), to seek to strange peoples and their rites. Ahaz’s sacrifice of his son (which indeed rests on a somewhat late authority) was apparently an isolated act of despair, since human sacrifices are not among the corruptions of the popular religion spoken of by Isaiah and Micah. In the 7 th century, however, when the old worship had sustained rude shocks, and all religion was transformed into servile fear (Mic. vi. 1 seq.), the example of Manasseh did not stand alone, and Jeremiah and Ezekiel made frequent and indignant reference to the ” high places ” for the sacrifice of children by their parents which rose beneath the very walls of the temple from the gloomy ravine of Hinnom or Tophet. 3 (Jer. vii. 31, xix., xxxii. 35;

Ezek. xvi. 18 sqq., xxiii. 37). The children apparently were not burned alive; they were slain and burned like any other holocaust (Ezek. loc. cit.; Isa. lvii. 5), their blood was shed at the sanctuary (Jer. xix. 4; Ps. cvi. 38). Thus the late Rabbinical picture of the calf-headed brazen image of Molech within which children were burned alive is pure fable, and with it falls the favourite comparison between Molech and the Carthaginian idol from whose brazen arms children were rolled into an abyss of fire, and whom Diodorus (xix. 14) naturally identifies with the child-eater Kronos, thus leading many moderns to make Molech the planet Saturn.

It is with these sacrifices that the name of ” the Molech ” is always connected; sometimes ” the Baal ” (lord) appears as a synonym. At the same time, the horrid ritual was so closely associated with Yahweh worship (Ezek. xxiii. 39) that Jeremiah more than once finds it necessary to protest that it is not of Yahweh’s institution (vii. 31, xix. 5). So too it is the idea of sacrificing the firstborn to Yahweh that is discussed and rejected in Micah vi. It is indeed plain that such a sacrifice — for we have here to do, not with human victims in general, but with the sacrifice of the dearest earthly thing — could only be paid to the supreme deity; and Manasseh and his people never ceased to acknowledge Yahweh as the God of Israel. Thus the way in which Jeremiah (Jer. xix. 5) and the legislation of Leviticus (xviii. 21, xx. 2-5) and the author of Kings, seem to mark out the Molech or Baal as a false god, distinct from Yahweh, is precisely parallel to the way in which Hosea speaks of the golden calves or Baalim. In each case the people thought themselves to be worshipping Yahweh under the title of Molech or Baal; but the prophet refuses to admit that this is so, because the worship itself is an apostasy to heathenism. Note, also, the attitude of Ezekiel in xx. 25 seq., 31, references which cannot be explained away.

Although the motive came from within, the form taken by the cult has appeared to many to be of non-Israelite origin. Babylonia and Assyria, however, seem to be out of the question: malik, ” arbiter,

decider," is there an epithet of various gods, and as an appellative means " prince " and not king; further, little

2 In Hos. xiii. 2, the interpretation " they that sacrifice men " is improbable, and 2 Kings xvii. 17 and Lev. xviii., xx. are of too late date by themselves to prove the immolation of children to Moloch in old Israel. The " ban " (Din), which was a religious execution of criminals or enemies, was common to Israel with its heathen neighbours (cf. the inscription of Mesha), but lacked the distinctive character of a sacrifice in which the victim is the food of the deity, conveyed to him through fire.

3 The etymology of the word Tophet is obscure ; it is possibly of Aramaic origin and means'" fire-place," cf . tophteh, " pyre, (Isa. xxx. 33). The vocalization is artificial, the Masoretes having given it the vowel-points of bosheth. See W. R. Smith, Religion of the Semites, 2nd ed., 377.

evidence for the prevalence of human sacrifice has as yet been found in those lands (A. Jeremias, Das Alte Test, itn Lichte d. alten Orients, 2nd ed., p. 454). Among the Canaanite branch, the king-god is more prominent, and apart from the Ammonite variant Milcom, numerous names compounded with Milk- are found on Phoenician inscriptions and among western Semites mentioned in cuneiform literature (H. Zimmern, Keilinschr. u. das Alte Test., 3rd ed. pp. 470 sqq.). It is true that child- sacrifice in connexion with fire prevailed among the Phoenicians, and, accqrding to the Greeks, the deity honoured with these grisly rites was Kronos (identified with the Phoenician El, " God ")• On the other hand, the seat of the cult appears to have been at Jerusalem, and the period during which it flourished does not favour any strong Phoenician influence. Again, the form of the word Tophet and Ahaz's association with

Damascus might point to an Aramaean origin for the cult; but it would not be safe to support this view by the statements and names in 2 Kings xvii. 31. On the whole, the biblical tradition that the Molech-cult was Canaanite and indigenous (Deut. xii. 29 sqq., xviii. 9 seq.) holds the ground. There was a tendency in time of misfortune to revert to earlier rites (illustrated in some ancient mourning customs), and it may have been some old disused practice revived under the pressure of national distress. See, generally, G. F. Moore, Ency. Bib., s.v. ; Lagrange, Htudes sur les religions semitiques 2nd ed. pp. 99-109; B. Stade, Bib. Theol. d. Alt. Test. i. 232 seq., 244 seq.; J. G. Frazer, Adonis, &c, 2nd ed. pp. 144 seq. 401 sqq; and J. A. Montgomery, Journ. Bib. Lit., 1908, 1. 40 sqq. On archaeological evidence for human sacrifice from Palestinian soil, see H. Vincent, Canaan d'apres I' exploration recente, pp. 50, 116, 189 sqq. (W. R. S. ; S. A. C.)

MOLSHEIM, a town of Germany, in the imperial province of Alsace-Lorraine at the foot of the Vosges, on the Breusch and at the junction of railways to Zabern and Strassburg. Pop. (1905), 3164. It contains a beautiful Roman Catholic and a Protestant church, a handsome new town-hall and an agricultural school. Its industries embrace the manufacture of iron and steel goods, tanning and organ-building. There is also some trade in wine. Molsheim was known in the 9th century as Molleshem, and formerly was the seat of a famous Jesuit college, which in 1702 was removed to Strassburg and united with the university of that city.

MOLTKE, ADAM GOTTLOB, Count (1710-1792), Danish courtier, was born on the 10th of November 17 10, at Riesenhof in Mecklenburg. Though of German origin, many of the Moltkes were at this time in the Danish service, which was considered a more important and promising opening for the young north German noblemen than the service of any of the native principalities; and through one of his uncles, young Moltke became a page at the Danish court, in which capacity he formed a life-long friendship with the

crown prince Frederick, afterwards Frederick V. He never had any opportunity of enriching his mind by travel or study, but he was remarkable for a strongly religious temperament and seems for some time to have been connected with the Moravians. Immediately after his accession, Frederick V. made him hofmarskal (court marshal), and overwhelmed him with marks of favour, making him a privy councillor and a count and bestowing upon him Bregentved and other estates. As the inseparable companion of the king, Moltke's influence soon became so boundless that the foreign diplomatists declared he could make and unmake ministers at will. Fortunately he was no ordinary favourite. Naturally tactful and considerate, he never put difficulties in the way of the responsible ministers. Especially interesting is Moltke's attitude towards the two distinguished statesmen who played the leading parts during the reign of Frederick V., Johan Sigismund Schulin and the elder Bernstorff. For Schulin he had a sort of veneration. Bernstorff irritated him by his grand airs of conscious superiority. But though a Prussian intrigue was set up for the supersession of Bernstorff by Moltke, the latter, convinced that Bernstorff was the right man in the right place, supported him with unswerving loyalty. Moltke was far less liberal in his views than many of his contemporaries. He looked askance at all projects for the emancipation of the

serfs, but, as one of the largest landowners of Denmark, he did much service to agriculture by lightening the burdens of the countrymen and introducing technical and scientific improve- ments which greatly increased production. His greatest merit, however, was the guardianship he exercised over the king, whose sensual temperament and weak character exposed him to many temptations which might have been very injurious to the state. Frederick had the good sense to appreciate the honesty of his friend and there was never any serious breach between them. On the death of Queen Louisa the king would even have married one of Moltke's daughters had he not peremptorily declined

the dangerous honour. On the decease of Frederick V., who died in his arms (Jan. 14, 1766), Moltke's dominion was at an end. The new king, Christian VII., could not endure him, and exclaimed, with reference to his lanky figure: " He's stork below and fox above." He was also extremely unpopular, because he was wrongly suspected of enriching himself at the public expense. 1 In July 1766 he was dismissed from all his offices and retired to his estate at Bre- gentved. Subsequently, through the interest of Russia, to whom he had always been favourable, he regained his seat in the council (Feb. 8, 1768), but his influence was slight and of brief endurance. He was again dismissed without a pension, on the 10th of December 1770, for refusing to have anything to do with Struensee. He lived in retirement till his death on the 25th of September 1792.

His memoirs, written in German and published in 1870, have considerable historical importance. See H. H. Langhorn, Historische Nachricht iiber die ddnischen Moltkes (Kiel, 1871). (R. N. B.)

MOLTKE, ADAM WILHELM, Count (1785-1864), Danish statesman, son of the minister Joachim Godske Moltke (1746- 18 1.8), and grandson of Adam Gottlob Moltke, was born at Einsiedelsborg in Funen, on the 25th of August 1785. Under the influence of the agricultural reformer Christian Colbjornsen he abandoned the legal career he had adopted and entered the administrative service of the state, to which he devoted the remainder of his life. In 1831 he succeeded Johan Sigismund Mosting (1789-1843), as minister of finance. On the death of Christian VIII. he was one of the most prominent members of the Council of State, and when the constitutional crisis came in 1848 he seemed marked out as the man who could bridge over the gap between the old era and the new. The services which Count Moltke rendered to Denmark cannot be too highly appre- ciated. The mere fact that a distinguished statesman who had served the last two absolute kings of Denmark now voluntarily placed himself at the head of a ministry which included the most advanced of the popular

agitators, gave the new govern- ment the hall-mark of stability and trustworthiness, whilst the fact that he still retained the ministry of finance was of itself a guarantee of security during the earlier years of a trouble- some and costly war. It was this, his first administration, which introduced the constitution of the sth of June 1849, and he also presided over the third constitutional ministry which was formed in July 1851; but he resigned on the 27th of January 1852, because he could not approve of the decree which aimed at transforming Denmark into a composite, indivisible, monarchy. Moltke continued to take part in public life as a member of the Landsting, or Upper House, but henceforth kept in the background. On the 2nd of October 1855 he was elected a member of the consultative Rigsraad, a position he continued to hold till 1863. He died on the 15th of February 1864.

See Swalin, Det danske Staatsraad (Stockholm, 1881); Madvig, Livserindringer (Copenhagen, 1887). (R. N. B.)

MOLTKE, HELMUTH CARL BERNHARD, Count von (1800–1891), Prussian field marshal, for thirty years chief of the staff of the Prussian army, the greatest strategist of the latter half of the 19th century, and the creator of the modern method of directing armies in the field, was born on the 26th of October 1800, at Parchim in Mecklenburg, of a German family of ancient nobility. His father in 1805 settled in Holstein and

1 He was said to be worth 10 million rix-dollars, but proved that he had less than one million.

became a Danish subject, but about the same time was impover- ished by the burning of his country house and the plunder by the French of his town house in Liibeck, where his wife and children were. Young

Moltke therefore grew up in straitened circumstances. At the age of nine he was sent as a boarder to Hohenfelde in Holstein, and at the age of eleven to the cadet school at Copenhagen, being destined for the Danish army and court. In 1818 he became a page to the king of Denmark and second lieutenant in a Danish infantry regiment. But at twenty-one he resolved to enter the Prussian service, in spite of the loss of seniority. He passed the necessary examination with credit, and became second lieutenant in the 8th Infantry Regiment stationed at Frankfort-on-Oder. At twenty-three, after much less than the regulation term of service, he was allowed to enter the general war school, now the war academy, where he studied the full three years and passed in 1826 a brilliant final examination. He then for a year had charge of a cadet school at Frankfort-on-Oder, after which he was for three years employed on the military survey in Silesia and Posen. In 1832 he was seconded for service on the general staff at Berlin, to which in 1833 on promotion to first lieutenant he was transferred. He was at this time regarded as a brilliant officer by his superiors, and among them by Prince William, then a lieutenant-general, afterwards king and emperor. He was well received at court and in the best society of Berlin. His tastes inclined him to literature, to historical study and to travel. In 1827 he had published a short romance, The Two Friends. In 1831 it was followed by an essay entitled Holland and Belgium in their Mutual Relations, from their Separation under Philip II. to their Reunion under William I., in which were displayed the author’s interest in the political issues of the day, and his extensive historical reading. In 1832 appeared An Account of the Internal Circumstances and Social Conditions of Poland, a second study of a burning question based both on reading and on personal observation of Polish life and character. In 1832 he contracted to translate Gibbon’s Decline and Fall into German, for which he was to receive £75, his object being to earn the money to buy a horse. In eighteen months he had finished nine volumes out of twelve, but the

publisher failed to produce the book and Moltke never received more than £25, so that the chief reward of his labour was the historical know- ledge which he acquired. He had already found opportunities to travel in south Germany and northern Italy, and in 1835 on his promotion as captain he obtained six months' leave to travel in south-eastern Europe. After a short stay in Con- stantinople he was requested by the sultan to enter the Turkish service, and being duly authorized from Berlin he accepted the offer. He remained two years at Constantinople, learned Turkish and surveyed for the sultan the city of Constantinople, the Bosporus and the Dardanelles. He travelled in the sultan's retinue through Bulgaria and Rumelia, and made many other journeys on both sides of the Strait. In 1838 he was sent as adviser to the Turkish general commanding the troops in Armenia, who was to carry on a campaign against Mehemet Ali of Egypt. During the summer he made extensive recon- naissances and surveys, riding several thousand miles in the course of his journeys, navigating the dangerous rapids of the Euphrates, and visiting and mapping many districts where no European traveller had preceded him since Xenophon. In 1839 the army moved south to meet the Egyptians, but upon the approach of the enemy the general became more attentive to the prophecies of the mollahs than to the advice of the Prussian captain. Moltke resigned his post of staff officer and took charge of the artillery, which therefore, in the ensuing battle of Nezib or Nisib, was the last portion of the Turkish army to run away. The Turks were well beaten and their army dispersed to the four winds. Moltke with infinite hardship made his way back to the Black Sea, and thence to Constanti- nople. His patron Sultan Mahmoud was dead, so he returned to Berlin where he arrived, broken in health, in December 1839. When he left Berlin in 1834 he had already " the courtier's, soldier's, scholar's eye, tongue, sword." When he returned it was

with a mind expanded by a rare experience, and with a character doubly tempered and annealed. While

away, he had been a constant letter-writer to his mother and sisters, and he now revised and published his letters as Letters on Conditions and Events in Turkey in the Years 1835 to 183Q. No other book gives so deep an insight into the character of the Turkish Empire, and no other book of travels better deserves to be regarded as a German classic. One of his sisters had married an English widower named Burt, who had settled in Holstein. Her step-daughter, Mary Burt, had read the traveller's letters, and when he came home as a wooer was quickly won. The marriage took place in 1 84 1, when Mary was just turned sixteen. It was a very happy union, though there were no children, and Moltke's love-letters and letters to his wife are among the most valuable materials for his biography. On his return in 1840 Moltke had been appointed to the staff of the 4th army corps, stationed at Berlin; he was promoted major on his wedding day. The fruits of his Eastern travels were by no means exhausted. He published his maps of Constantinople, of the Bosporus and of the Darda- nelles, and, jointly with other German travellers, a new map of Asia Minor and a memoir on the geography of that country, as well as a number of periodical essays on various factors in the Eastern Question. In 1845 appeared The Russo-Turkish Cam- paign in Europe, 1828-2Q, described in 1845 by Baron von Moltke, Major in the Prussian Staff, a volume which was recognized by competent judges as a masterpiece of military history and criticism. Moltke at this period was much occupied with the development of railways. He was one of the first directors of the Hamburg-Berlin railway, and in 1843 published a review article entitled What Considerations should determine the Choice of the Course of Railways? which reveals a mastery of the technical questions involved in the construction and working of railway lines.

In 1845 Moltke was appointed personal adjutant to Prince Henry of Prussia, a Roman Catholic who lived at Rome. He thus had the opportunity of a long stay in the Eternal City, with no more than nominal duties to perform. It was a life which he and his

wife much enjoyed, and he spent much of his leisure in a survey, of which the result was a splendid map of Rome, published at Berlin in 1852. In 1846 Prince Henry died, and Moltke was then appointed to the staff of the 8th army corps at Coblenz. In 1848, after a brief return to the great general staff at Berlin, he became chief of the staff of the 4th army corps, of which the headquarters were then at Magdeburg, where he remained seven years, during which he rose to lieutenant- colonel (1850), and colonel (1851). In 1855 he was appointed first adjutant to Prince Frederick William (afterwards crown prince and emperor) , whom he accompanied to England on his betrothal and marriage, as well as to Paris and to St Petersburg to the coronation of Alexander II. of Russia. Prince Frederick William was in command of a regiment stationed at Breslau, and there as his adjutant Moltke remained for a year, becoming major-general in 1856. On the 23rd of October 1857, owing to the serious illness of King Frederick William IV., Prince William became prince regent. Six days later the regent selected Moltke for the then vacant post of chief of the general staff of the army. The appointment was made definitive in January 1858. Moltke's posthumously published military works disclose a remarkable activity, beginning in 1857, devoted to the adaptation of strategical and tactical methods to changes in armament and in means of communication, to the training of staff officers in accordance with the methods thus worked out, to the perfection of the arrangements for the mobilization of the army, and to the study of European politics in connexion with the plans for campaigns which might become necessary. In 1859 came the war in Italy, which occasioned the mobilization of the Prussian army, and as a consequence the reorganization of that army, by which its numerical strength was nearly doubled. The reorgani- zation was the work not of Moltke but of the king, and of Roon, minister of war; but Moltke watched the Italian campaign closely, and wrote a history of it, published in 1862, and attri- buted on the title-page to the historical division of the Prussian

staff, which is the clearest account of the campaign and contains the best criticism upon it. In December 1862 Moltke was asked for an opinion upon the military aspect of the quarrel with Denmark then becoming acute. He thought the difficulty would be to bring the war to an end, as the Danish army would if possible retire to the islands, where, as the Danes had the command of the sea, it could not be attacked. He sketched a plan for turning the flank of the Danish army before the attack upon its position in front of Schleswig, and hoped that by this means its retreat might be intercepted. When the war began in February 1864, Moltke was not sent with the Prussian forces, but kept at Berlin. The plan was mismanaged in the execution, and the Danish army escaped to the fortresses of Diippel and Fredericia, each of which commanded a retreat across a strait on to an island. The allies were now checked; Diippel and Fredericia were besieged by them, Diippel taken by storm, and Fredericia abandoned by the Danes without assault; but the war showed no signs of ending, as the Danish army was safe in the islands of Alsen and Fiinen. On the 30th of April Moltke was sent to be chief of the staff to the commander- in-chief of the allied forces, and, so soon as the armistice of May and June was over, persuaded Prince Frederick Charles to attempt to force the passage of the Sundewitt and attack the Danes in the island of Alsen. The landing was effected on the 29th of June, and the Danes then evacuated Alsen. Moltke next proposed a landing in Fiinen, but it was unnecessary. The Danes no longer felt safe in their islands, and agreed to the German terms. Moltke’s appearance on the scene had quickly transformed the aspect of the war, and his influence with the king had thus acquired a firm basis. Accordingly, when in 1866 the quarrel with Austria came to a head, Moltke’s plans were adopted and he was almost invariably supported in their execution. A disciple rather of Clausewitz, whose theory of war was an effort to grasp its conditions, than of

Jomini, who ex- pounded a system of rules, Moltke regarded strategy as a practical art of adapting means to ends, and had developed the methods of Napoleon in accordance with the altered conditions. He had been the first to realize the great defensive power of modern firearms, and had inferred from it that an enveloping attack had become more formidable than the attempt to pierce an enemy's front. He had pondered the tactics of Napoleon at Bautzen, when the emperor preferred to bring up Ney's corps, coming from a distance, against the flank of the allies, rather than to unite it with his own force before the battle; he had also drawn a moral from the combined action of the allies at Waterloo. At the same time he had worked out the conditions of the march and supply of an army. Only one army corps could be moved along one road in the same day; to put two or three corps on the same road meant that the rear corps could not be made use of in a battle at the front. Several corps stationed close together in a small area could not be fed for more than a day or two. Accordingly he inferred that the essence of strategy lay in arrangements for the separation of the corps for marching and their concentration in time for battle. In order to make a large army manageable, it must be broken up into separate armies or groups of corps, each group under a commander authorized to regulate its movements and action subject to the instructions of the commander-in-chief as regards the direction and purpose of its operations. In the strategy of 1866 the conspicuous points are: (1) The concentration of effort. There were two groups of enemies, the Austro-Saxon armies, 270,000; and the north and south German armies, 120,000. The Prussian forces were 64,000 short of the adverse total, but Moltke determined to be superior at the decisive point against the Austro-Saxons; he therefore told off 278,000 men for that portion of the struggle, and employed only 48,000 men in Germany proper. His brilliant direction enabled the 48,000 to capture the Hanoverian army in less than a fortnight, and then to attack and drive asunder the south German forces. (2) In dealing with Austro- Saxony the difficulty was to have the

Prussian army first ready — no easy matter, as the king would not mobilize until after the Austrians. Moltke's railway knowledge helped him to save

time. Five lines of railway led from the various Prussian provinces to a series of points on the southern frontier on the curved line Zeitz-Halle-Gorlitz-Schweidnitz. By employing all these railways at once, Moltke had the several army corps moved simultaneously from their peace quarters to points on this curved line. When this first move was finished the corps then marched along the curve to collect into three groups, one near Torgau (Elbe army), another at the west end of Silesia (first army, Prince Frederick Charles), the third between Lands- hut and Waldenburg (second army, crown prince). The first army when formed marched eastwards towards Gorlitz. The small Saxon army at Dresden now had the Elbe army in its front and the first army on its right flank, and as it was out-numbered by either of them, its position was untenable, and so soon as hostilities began fell back into Bohemia, where it was joined by an Austrian corps, with which it formed an advance guard far in front of the Austrian main army concentrated near Olmtitz. The Elbe army advanced to Dresden, left a garrison there, and moved to the right of Prince Frederick Charles, under whose command it now came. (3) Moltke now had two armies about 100 miles apart. The problem was how to bring them together so as to catch the Austrian army between them like the French at Waterloo between Wellington and Bliicher. If, as was thought likely, the Austrians moved upon Breslau, the first and Elbe armies could continue their eastward march to co-operate with the second. But on the 15th of June Moltke learned that on the nth of June the Austrian army had been spread out over the country between Wildenschwerdt, Olmtitz and Brtinn. He inferred that it could not be concentrated at Josefstadt in less than thirteen days. Accordingly he deter- mined to bring his own two armies together by directing each of them to advance towards Gitschin. He foresaw that the march of the crown prince would probably bring

him into collision with a portion of the Austrian army; but the crown prince had 100,000 men, and it was not likely that the Austrians could have a stronger force than that within reach of him. The order to advance upon Gitschin was issued on the 22nd of June, and led to one of the greatest victories on record. The Austrians marched faster than Moltke expected, and might have opposed the crown prince with four or five corps; but Benedek's attention was centred on Prince Frederick Charles, and he interposed against the crown prince's advance four corps not under a common command, so that they were beaten in detail, as were also the Saxons and the Austrian corps with them, by Prince Frederick Charles. On the 1st of July Benedek collected his already shaken forces in a defensive position in front of Koniggratz. Moltke's two armies were now within a march of one another and of the enemy. On the 3rd of July they were brought into action, the first against the Austrian front and the second against the Austrian right flank. The Austrian army was completely defeated and the campaign decided, though an advance towards Vienna was needed to bring about the peace upon Prussia's terms. Moltke was not quite satisfied with the battle of Koniggratz. He had tried to have the Elbe army brought up to the Elbe above Koniggratz so as to prevent the Austrian retreat, but its general failed to accomplish this. He also tried to prevent the first army from pushing its attack, hoping in that way to keep the Austrians in their position until retreat should be cut off by the crown prince, but he could not restrain the impetuosity of Prince Frederick Charles and of the king. During the negotiations Bismarck, who dared not risk the active intervention of France, opposed the king's wish to annex Saxony and perhaps other territory beyond what was actually taken. Moltke would not have hesitated; he was confident of beating both French and Austrians if the French should intervene, and he submitted to Bismarck his plans in case of need for the opening moves against both French and Austrians.

After the peace, the Prussian Diet voted Moltke the

sum of £30,000, with which he bought the estate of Creisau, near Schweidnitz, in Silesia. In 1867 was published The Campaign of 1866 in Germany, a history produced under Moltke's personal

supervision, and remarkable for its combination of accuracy with reticence. On the 24th of December 1868 Moltke's wife died at Berlin. Her remains were buried in a small chapel erected by Moltke as a mausoleum in the park at Creisau.

In 1870 suddenly came the war with France. The probability of such a war had occupied Moltke's attention almost con- tinuously since 1857, and a series of memoirs is preserved in which from time to time he worked out and recorded his ideas as to the best arrangement of the Prussian or German forces for the opening of the campaign. The arrangements for the transport of the army by railway were annually revised in order to suit the changes in his plans brought about by political conditions and by the growth of the army, as well as by the improvement of the Prussian system of railways. The great successes of 1866 had strengthened Moltke's position, so that when on the 15th of July 1870 the order for the mobilization of the Prussian and south German forces was issued, his plans were adopted without dispute and five days later he was ap- pointed " Chief of the general staS of the army at the head- quarters of his Majesty the King " for the duration of the war. This gave Moltke the right to issue in the king's name, though of course not without his approval, orders which were equivalent to royal commands. Moltke's plan was to assemble the whole army to the south of Mainz, this being the one district in which an army could best secure the defence of the whole frontier. If the French should disregard the neutrality of Belgium and Luxemburg, and advance on the line from Paris to Cologne or any other point on the Lower Rhine, the German army would be able to strike at their flank, while the

Rhine itself, with the fortresses of Coblenz, Cologne and Wesel, would be a serious obstacle in their front. If the French should attempt to invade south Germany, an advance of the Germans up either bank of the Rhine would threaten their communications. Moltke expected that the French would be compelled by the direction of their railways to collect the greater part of their army near Metz, and a smaller portion near Strassburg. The German forces were grouped into three armies: the first of 60,000 men, under Steinmetz, on the Moselle below Treves; the second of 131,000 men, under Prince Frederick Charles, round Homburg, with a reserve of 60,000 men behind it; the third under the crown prince of 130,000 men, at Landau. Three army corps amounting to 100,000 men were not reckoned upon in the first instance, as it was desirable to keep a considerable force in north-eastern Germany, in case Austria should make common cause with France. If, as seemed probable, the French should take the initiative before the German armies were ready, and for that purpose should advance from Metz in the direction of Mainz, Moltke would merely put back a few miles nearer to Mainz the points of debarcation from the railway of the troops of the second army. This measure was actually adopted, though the anticipated French invasion did not take place. Moltke's plan of operations was that the three armies while advancing should make a right wheel, so that the first army on the right would reach the bank of the Moselle opposite Metz, while the second and third armies should push forward, the third army to defeat the French force near Strassburg, and the second to strike the Moselle near Pont-a-Mousson. If the French army should be found during this advance in front of the second army, it would be attacked in front by the second army and in flank by the first or the third or both. If it should be found on or north of the line from Saarburg to Lun6ville, it could still be attacked from two sides by the second and third armies in co-operation. The intention of the great right wheel was to attack the principal French army in such a direction as to drive it north and cut its communications with Paris. The fortress

of Metz was to be observed, and the main German forces, after defeating the chief French army, to march upon Paris. This plan was carried out in its broad outlines. The battle of Worth was brought on prematurely, and therefore led, not to the capture of MacMahon's army, which was intended, but only to its total defeat and hasty retreat as far as Chalons. The battle of Spicheren was not intended by Moltke, who wished

to keep Bazaine's army on the Saar till he could attack it with the second army in front and the first army on its left flank, while the third army was closing towards its rear. But. these unintended or unexpected victories did not disconcert Moltke, who carried out his intended advance to Pont-a-Mousson, there crossed the Moselle with the first and second armies, then faced north and wheeled round, so that the effect of the battle of Gravelotte was to drive Bazaine into the fortress of Metz and cut him off from Paris. Nothing shows Moltke's insight and strength of purpose in a clearer light than his determination to attack on the 18th of August, when many strategists would have thought that, the strategical victory having been gained, a tactical victory was unnecessary. He has been blamed for the last local attack at Gravelotte, in which there was a fruitless heavy loss; but it is now known that this attack was ordered by the king, and Moltke blamed himself for not having used his influence to prevent it. During the night following the battle Moltke made his next decision. He left one army to invest Bazaine and Metz, and set out with the two others to march towards Paris, the more southerly one leading, so that when MacMahon's army should be found the main blow might be delivered from the south and MacMahon driven to the north. On the 25th of August it was found that MacMahon was moving north-east for the relief of Bazaine. The moment Moltke was satisfied of the accuracy of his information, he ordered the German columns to turn their faces north instead of west. MacMahon's right wing was attacked at Beaumont while attempting to cross the Meuse, his advance necessarily aban-

doned, and his army with difficulty collected at Sedan. Here the two German armies were so brought up as completely to surround the French army, which on the 1st of September was attacked and compelled to raise the white flag. After the capitulation of Sedan, Moltke resumed the advance on Paris, which was surrounded and invested. From this time his strategy is remarkable for its judicious economy of force, for he was wise enough never to attempt more than was practicable with the means at his disposal. The surrender of Metz and of Paris was a question of time, and the problem was, while main- taining the investment, to be able to ward off the attacks of the new French armies levied for the purpose of raising the siege of Paris. Metz surrendered on the 27th of October, and on the 28th of January 1871 an armistice was concluded at Paris by which the garrison became virtually prisoners and the war was ended.

On the 29th of October 1870 Moltke was created graf (count or earl), and on the 16th of June 187 1, field marshal. After the war he superintended the preparation of its history, which was published between 1874 and 1881 by the great general staff. In 1888 he resigned his post as chief of the staff. In 1867 Moltke was elected to the North German Diet, and in 1871 to the Reichstag. His speeches, dealing mostly with military questions, were regarded as models of conciseness and relevancy. He died suddenly on the 24th of April 1891, and after a magni- ficent funeral ceremony at Berlin his remains were laid beside those of his wife in the chapel which he had erected as her tomb at Creisau.

As a strategist Moltke cannot be estimated by comparison with Frederick or Napoleon, because he had not the authority either of a king or of a commander-in-chief. While it is doubtful whether he can be convicted of any strategical errors, it seems beyond doubt that he never had to face a situation which placed any strain on his powers, for in the campaigns of 1866 and 1870 his decisions seemed to be made without the slightest effort, and he was never at a loss.

He had a tall spare figure,' and in his latter years his tanned features had received a set expression which was at once hard and grand. He was habitually taciturn and reserved, though a most accomplished linguist, so that it was said of him that he was " silent in seven languages." The stern school of his early life had given him a rare self-control, so that no indiscreet or unkind expression is known to have ever fallen from him. Long before his name was on the lips of the public he was known

in the army and in the staff as the " man of gold," the ideal character whom every one admired and who had no enemies.

Authorities. — Gesammelle Schriften und Denkwiirdigkeiten des General Feldmarschalls Grafen Helmuth von Mcllke (8 vols., Berlin, 1892-1893) ; Moltke's militarische Werke (Berlin, 9 vols., 1892-1900) ; Feldmarschall Moltke, by Max Jahns (3 vols., Berlin, 1 894-1900); Feldmarschall Graf Moltke: Ein militarisches Lebensbild, by W. Bigge, Oberst, &c. (2 vols., Munich, 1901). (H. S. W.)

MOLUCCAS, or Spice Islands, a name which in its wider sense includes all the islands of the Malay Archipelago between Celebes on the W., New Guinea on the E., Timor on the S., and the open Pacific Ocean on the N. They are thus distributed over an area between 2° 43′ N. and 8° 23′ S. and 124 22′ and 135° E., and include: (1) the Moluccas proper or Ternate group, of which Halmahera is the largest and Ternate the capital; (2) the Bachjan, Obi, and Xulla groups; (3) the Amboyna group, of which Ceram (Serang) and Buru are the largest; (4) the Banda Islands (the spice or nutmeg islands par excellence) ; (5) the south- eastern islands, comprising Timor-Laut or Tenimber, Larat, &c. ; (6) the Kei Islands and the Aru Islands, of which the former are sometimes attached to the south-eastern group; and (7) the south-western islands or the Babar, Sermata, Leti,

Damar, Roma and Wetar groups. At the close of the 16th century this part of the archipelago was divided among four rulers settled at Ternate, Tidore, Halmahera and Bachian. The northern portion belongs to the Dutch residency of Ternate, the southern portion to that of Amboyna.

The name Moluccas is said to be derived from the Arabic for ” king.” Argensola (1609) uses the forms islas. Malucas, Maluco, and el Maluco; Coronel (1623), islas del Moluco; and Camoens, Maluco. Since 1867, when the political unity, under a governor, was dissolved, the Moluccas are often named by the Dutch the ” Great East ” (Groote Oost). Most of the islands are mountainous, with still active volcanoes. As they lie near or under the equator, the monsoons blowing over them are less regular, and the rainfall, of large volume throughout the -year, is dependent on the height and direction of the chains. The vegetation of the small and narrow islands, all encompassed by the sea, is very luxuriant, and the products, principally nutmegs, mace, and other spices, include also rice and sago. The inhabitants are of mixed descent. In some islands are people of obvious Papuan blood, while in others are Polynesian or Malayan tribes. With these three main races have crossed traders and colonists, Macassars, Buginese, Javanese and Europeans.

The geology of the Moluccas is very imperfectly known. The great chain of volcanoes which runs through Sumatra and Java is continued eastwards into the Moluccas, and terminates in a hook- like curve which passes through the Damar Islands to the Banda group. Outside this hook lies a concentric arc of. non- volcanic islands, including Tenimber, the Lesser Kei Islands, Ceram and Buru; and beyond is still a third concentric arc extending from Taliabu to the Greater Kei Islands. The islands of these outer arcs consist chiefly of crystalline schists and limestones, overlaid by Jurassic, Cretaceous and Tertiary deposits. On the whole it appears that the older rocks are found more particularly towards the interior of the curve, and the newer rocks towards the exterior. Eruptive rocks of supposed Cretaceous

age are met with in these outer islands, but Tertiary and recent volcanic lavas are confined to the innermost arc. Halmahera lies outside these arcs. It appears to consist chiefly of gabbro, peridotite, serpentine and other very basic eruptive rocks, which are believed to be of Cretaceous age. Nummulitic limestone occurs in the south-east. Upon the floor of older rock rise a number of volcanoes, some of which are now extinct while others are still active. Most of them lie near the west coast or on the islands off this coast; and they are arranged in lines which run approximately from north to south, with, generally, a slight . convexity towards the west.

See further Malay Archipelago, and separate articles on the principal islands and groups.

MOLY (Gr. fiSiXv), a mysterious plant with magical powers described in Homer, Odyssey, x. 302-306. Hermes pulls it up and gives it to Odysseus as a protection against the arts of Circe. It is further described as ” having a black root and a flower like milk, and hard for mortals to pull up.” There has been much controversy as to the identification. Philippe Champault — PMniciens et Grecs en Itaiie d’apres VOdysste (1906),

pp. 504 seq. — decides in favour of the Peganum harmala (of the order Rutaeeae), the Syrian or African rue (Gr. iriiyavov), from the husks of which the vegetable alkaloid harmaline (C13H14N2O) is extracted. The flowers are white with green stripes. Victor Berard — Les PMniciens et I’Odyssee, ii. 288 seq. — relying partly on a Semitic root, prefers the Atriplex halimus {atriplex, a Lat. form of Gr. drpd^a^us, and iDufios, marine), order Chenopodiaceae, a herb or low shrub common on the south European coasts. These identifications are noticed by R. M. Henry in Class. Rev. (Dec. 1906), p. 434, who illustrates the Homeric account by passages in the Paris and Leiden magical papyri, and argues that moly is probably a magical name, derived perhaps from Phoenician or Egyptian sources, for a plant which cannot be certainly identified. He shows

that the ” difficulty of pulling up ” the plant is not a merely physical one, but rather connected with the peculiar powers claimed by magicians. In Tennyson’s Lotus Eaters the moly is coupled with the amaranth (” propt on beds of amaranth and moly “).

MOLYBDENITE, a mineral consisting of molybdenum disulphide, M0S2. It closely resembles graphite in appearance, but may readily be distinguished from this by its greater density (4-7) and by its behaviour before the blowpipe. Crystals have the form of six-sided plates or scales, but they are never sharply defined, and their reference to the hexagonal system is doubtful. They have a perfect cleavage parallel to the large surface of the plates, and the flakes are readily bent, but are not elastic. The mineral is very soft (H=i to ij) and unctuous, and makes a bluish-grey mark on paper: it is opaque and has a bright metallic lustre. The colour is lead-grey differing slightly from that of graphite in having a bluish tinge. The name molybdenite is from the Greek itoXvfiSos, meaning lead or lead ore, with which graphite (black-lead) and molybdenite were confused; the latter was distinguished by P. J. Hjelm, who in 1782 discovered the element molybdenum in this mineral.

Molybdenite occurs as disseminated scales in crystalline rocks — such as granite, gneiss, schist and marble — and also in quartz-veins. It has been found in small amounts at many localities, but only those which have yielded large crystals need be specially mentioned here, viz. in a pyroxene-rock at Aldfield in Pontiac county, Quebec; with native bismuth at Kingsgate in Gough county, New, South Wales; with wolframite and scheelite in quartz-veins at Caldbeck Fells in Cumberland; and recently, as crystals 6 in. across, at Slangsvold near Raade in Norway.

Molybdenite has been used mainly for the preparation of molybdates for use as chemical reagents. Recently, however, it has been used in the manufacture of molybdenum steel (ferro-molybdenum), which by reason of its hardness and toughness is specially suitable for tools. (L. J. S.)

MOLYBDENUM [symbol, Mo; atomic weight, 96 (0=i6)] a metallic chemical element. The name is derived from Gr. noKvPSos, lead, and was originally employed to denote many substances containing or resembling lead; ultimately the term was applied to graphite and to molybdenum sulphide. The difference between these two latter substances was first pointed out by Cronstedt, and in 1778 C. Scheele prepared molybdic acid from the sulphide. Molybdenum occurs in nature chiefly as the minerals molybdenite (M0S2) and wulfenite (PbMo0 4), and more rarely as molybdic ochre (M0O3) and ilse- mannite; it also occurs in many iron ores. The metal may be obtained by heating the trioxide with carbon in the electric furnace (H. Moissan, Comples rendus, 1893, 116, p. 1225), or by the Goldschmidt method (Rosenheim and Braun, Zeit. anorg. Che-m., 1905, p. 311) or by dissociating the tetra- and penta- chloride in a graphite crucible with an electric current below l 33°° (J- N. Pring and W. Fielding, Jour. Ctiem. Soc, 1909, 95, p. 1497). It forms a grey coloured powder of specific gravity 9-01; it is malleable, and not as hard as glass. It is rapidly oxidized on heating to a temperature of 5oo°-6oo° C, and also when fused with nitre or potassium chlorate. It is soluble in dilute nitric acid, and in concentrated sulphuric acid; in the

latter case with the formation of a blue solution which on heating becomes colourless, molybdenum trioxide being formed with the liberation of sulphur dioxide.

Molybdenum combines with oxygen to form many oxides, the most important of which are : the monoxide, MoO.m (H 2 0), the sesquioxide, M02O3, the dioxide, Mo0 2> and the trioxide, M0O3. Molybdenum monoxide, MoO.»(H 2 0), is a black powder obtained when the dichloride is boiled with concentrated potash solution. According to W. Muthmann and W. Nagel (Ber., 1898, 31, p. 2009), this oxide does not exist, the reaction leading to the formation of an hydroxide according to the equation: Mo 3 Cl 4 (OH) 2 4- 4KHO + 3H 2 = 3Mo(OH) 3 +4KBr+3H. Molybdenum sesquioxide, M02O3, a black mass insoluble in acids, is formed by heating the corresponding hydroxide in vacuo, or by digesting the trioxide with zinc and hydrochloric acid. Molybdenum dioxide, M0O2, is formed by heating sodium trimolybdate, Na 2 Mo 3 Oio, to redness in a current of hydrogen (L. Svanberg and H. Struve, Jour. prak. Chem., 1848, 44, p. 301), or by long fusion of a mixture of ammonium molybdate, potassium car- bonate, and boron trioxide (W. Muthmann, Ann., 1887, 238, p. 114). It forms quadratic prisms, having a violet reflex and insoluble in boiling hydrochloric acid. Molybdenum trioxide, M0O3, is prepared by oxidizing the metal or the sulphide by heating them in air, or with nitric acid. It. is a white powder, which turns pale yellow on heating, and melts at a red heat. It sublimes in small rhombic tables or needles, and is slightly soluble in cold water, the solution possess- ing an acid reaction. Several hydrated forms of the oxide are known, and a colloidal variety may be obtained by the dialysis of a strong hydrochloric acid solution of sodium molybdate. Molybdenum trioxide, like chromium trioxide, is an acidic oxide, and forms salts known as molybdates. The normal molybdates show a tendency to pass into polymolybdates. The molybdates are also capable of combining with other oxides (such as phosphorus and arsenic pentoxides) yielding very complex salts. The ordinary ammo- nium molybdate, used as a test reagent for phosphates, is a salt of composition (NH<)i MOi2O« ; it has been examined physicochemi- cally by J. Sand and F. Eisenlohr (Abst. J.C.S., 1907, ii. pp. 178, 179). The molybdates may be

recognized by the fact that they give a white precipitate on the addition of hydrochloric or nitric acids to their solutions, and that with reducing agents (zinc and sulphuric acid) they give generally a blue coloration which turns to a green and finally to a brown colour.

. Molybdenum combines with the halogen elements in varying pro- portions, forming with chlorine a di-, tn-, tetra- and penta-chloride, and similar compounds with bromine and iodine. Molybdenum dichloride (MoCl 2) 3 or CUMojCU (chlormolybdenum chloride), is prepared (together with some tetrachloride) by heating the tri- chloride in a stream of carbon dioxide (C. W. Blomstrand, Jour. f. prak.Chem., 1857, 71, p. 449; 1861, 82, p. 433). It is a yellow amorphous powder which is soluble in dilute alkalis, the solution on acidifi- cation giving an hydroxide, CUMo3(OH) 2 , which is soluble in nitric acid, and does not give a reaction with silver nitrate. The molecular weight determinations of W. Muthmann and W. Nagel (Ber., 1898, 31, p. 2009) show the salt to possess the composition M03CI6. Molybdenum trichloride, M0CI3, is obtained when the pentachloride is heated to a temperature of about 250 C. in a current of hydrogen. It forms red crusts, is insoluble in cold water, but is decomposed by boiling water. It is easily soluble in hot nitric acid. Molybdenum pentachloride, MoCU, is obtained when molybdenum is gently heated in dry chlorine (L. P. Liechti and B. Kempe, Ann., 1873, 169, p. 345). It is a dark-coloured crystalline solid which melts at 194 C. and boils at 268° C. It fumes in moist air and deliquesces gradually. It is occasionally used as a chlorine carrier. It is soluble in absolute alcohol and in ether. Molybdenum disulphide, MoS2, is found as the mineral molybdenite, and may be prepared by heating the trioxide with sulphur or sulphuretted hydrogen. It is a black crystalline powder, resembling graphite in appearance. It is readily oxidized by nitric acid, and when strongly heated in a current of hydrogen is reduced to the metallic condition. Molybdenum trisulphide, MoSs, is obtained by

saturating a solution of an alkaline molybdate with sulphuretted hydrogen and adding a mineral acid. It is a brown powder which on heating in air loses sulphur and leaves a residue of the disulphide. A tetrasulphide, M0S4, has also been described.

Many varying values have been given for the atomic weight of molybdenum. J. J. Berzelius (Pogg. Ann., 1826, 8, p. 23), by convert- ing lead molybdate into lead nitrate, obtained the value 95-2 ; while J. B. A. Dumas (Ann., i860, 113, p. 32), by converting the trioxide into the metal, obtained the value 95-65. K. Seubert and W. Pollard (Zeit. anorg. Chem., 1895, 8, p. 434) using this second method obtained the value 96-28; whilst E. F. Smith and P. Maas (Zeit. anorg. Chem., 1894, 5, p. 280), by heating pure sodium molybdate in hydrochloric acid and estimating the amount of sodium chloride formed, obtained the value 96-087.

MOLYNEUX. This historic English name came into the country from France at the time of the Norman Conquest through William de Molines (Moleyns, Molyneux), who obtained a grant of Sefton, in Lancashire, whence come the earls of Sefton to-day. His descendant Adam de Molyneux (Moleyns or

Molins), who died in 1450, was bishop of Chichester and keeper of the privy seal; he was a son of Sir Richard Molyneux of Sefton. and uncle of the Sir Richard Molyneux (d. 1459), the Lancastrian and favourite of Henry VI., whose descendant Richard Molyneux (1593-1636) was created in 1628 1st Viscount Molyneux of Maryborough, a title now merged in that of Sefton (created 1771). Another Molyneux family of some importance is the Irish one, descended from Sir Thomas Molyneux (1531-1597), Irish chancellor of the exchequer, who, born at Calais, settled in Ireland in 1576. He was the great-grandfather of Sir Thomas Molyneux, Bart. (1661-1733), a well-known physician and zoologist, and of William Molyneux (1656-1698), the philosopher, astronomer and politician, the friend of Locke, and author of Dioptrica nova (1692), whose famous work on the legislative independence of

Ireland (The Case of Ireland, &c. 1698) created much stir at the time. The latte.r's son Samuel Molyneux (1689–1728), was also a well-known astronomer.

MOMBASA, the principal seaport of British East Africa, in 4 4′ S., 39 43′ E., 150 m. N. of Zanzibar. Pop. about 30,000. Mombasa is built on a coralline island which nearly fills the mouth of a deep arm of the sea. The channel on either side of the island — Mombasa to the N.E., Kilindini to the S.W. — affords safe harbourage, and each leads to a deeper ramification of the sea, Mombasa Harbour to Port Tudor, Kilindini Harbour to Port Reitz. Mombasa town is on the N.E. side of the island, 2 m. from Kilindini, with which it is connected by rail and tramways. Viewed from the sea Mombasa has a picturesque appearance, the most conspicuous object being the fort, built on a coral hill 40 ft. high. Except for the main street and Government Square (close to the harbour and containing the customs-house and other official buildings), Mombasa proper presents the usual aspect of an Oriental city — a maze of narrow, irregular streets and lanes. To the south, overlooking the sea, is the European suburb. There are Anglican and Roman Catholic churches (the Roman Catholic church and mission house is one of the finest buildings in Mombasa), mission schools, Hindu, Parsee, and Mahommedan temples, and hospitals and law courts, the last named completed in 1902. Built into the facade of the courts is a stone with an inscription recording the building of a fort, dedicated to St Joseph, by the Portuguese at Kilindini in 1666. This stone was found in the ruins of Fort St Joseph. Mombasa Fort, or citadel, quadrangular in form, was built by the Portuguese in 1593–1595 (as an inscription in the interior testifies), was dedicated to the Saviour, and known as < the Jesus Fort. It bears the symbol I.H.S. The fort was repaired by Seixas de Cabreira in 1635, the restoration being recorded in an inscription over the gateway. By the British authorities the fort is used as a military store and central gaol. In the public garden on the point of the town facing the sea a bronze statue of Sir William Mackinnon — to

whom Mombasa owes its renaissance — has been placed. The population of the city is cosmopolitan, with three well-marked racial distinc- tions: the Arab (Swahili), the Indian and the European. The climate is fairly healthy, and Europeans live there with comfort.

The harbour at Mombasa is more than a mile in length, but only 1200 ft. in width. It is consequently not so suitable for large ships as Kilindini (" the place of deep water "), which possesses the finest land-locked harbour on the East Coast of Africa. The entrance is about the same width as that of Mombasa, but Kilindini Harbour widens to J m. and is 3 m. long, the depth of water varying from 25 to 30 fathoms. Kilindini is a depot of the British navy. Port Reitz, which opens out of Kilindini Harbour westward, is 4 m. long and 1 m. broad, with excellent anchorage. At Kilindini is a pier alongside which ships 450 ft. in length and drawing 27 ft. can load and unload cargo. Here is the virtual terminus of the Uganda railway, and the offices, workshops and hospital connected therewith, also a branch customs-house. The Uganda railway crosses to the mainland on a bridge, i m. long, built over the shallow channel which on the north-west separates the island from the continent. Mombasa is the outlet for the produce of a large tract of territory, including the European

settlements in the highlands of the protectorate, and by means of the railway to Victoria Nyanza taps the rich regions of the Nile sources. German, British, French and Austrian mail- boats call regularly at the port, which is connected by submarine cable with Zanzibar. Trade statistics are included in those of British East Africa (

Mombasa Island (named after the town) is 3 m. long by 2 J m. broad, with an area of 9 sq. m. Except at the western end, the coast of the island consists of

cliffs from 40 ft. to 60 ft. high. The island contains many fertile plantations, chiefly of coco- nut palms, except on the side facing the ocean, where there is little vegetation, the coral reefs being but thinly covered with earth. There are no springs and the island is dependent for water on rain collected in tanks or drawn from wells — the latter brackish. Ruins of Arab, Portuguese and Turkish buildings are found in various parts of the island. At Ras Serani are the ruins of a chapel ” Nossa Senhora das Merces,” built by the Portuguese in the 17th century on the site of a Turkish fort, and afterwards turned into a fort again by the Arabs.

Mombasa takes its name from Mombasa in Oman. A Perso- Arabic settlement was made here about the nth century. It is mentioned by Ibn Batuta in 1331 as a large place, and at the time of Vasco da Gama’s visit (1498) it was the seat of consider- able commerce, its inhabitants including a number of Calicut Banyans and Oriental Christians. The ruler of the city tried to entrap da Gama (or so the Portuguese navigator imagined), • and with this began a series of campaigns which gave full force to its Swahili name Mvita (war). The principal incidents are the capture and burning of the place by Almeida (iS°S)> Nuno da Cunha (1529), and Duarte de Menezes (1587) — this last as a revenge for its submission to the sultan of Constantinople — the revolt and flight (1631) of Yusuf ibn Ahmed (who murdered all the Portuguese in the town — over 100), and the three-years’ siege by the imam of Omam i696- g8(the garrison being reduced to eleven men and two women), ending in the expulsion of the Portuguese. From the 12th of March 1728 to the 29th of November 1729a Portuguese force from Goa again held Mombasa, when they were finally driven out by the Muscat Arabs. In December 1823 the Mazrui family, who had ruled in Mombasa from the early part of the 18th century, first as representatives of Oman, afterwards as practically independent princes, placed the city under British protection; and in February 1824 Lieut. J. J. Reitz was appointed

commandant or resident at the city by Captain (afterwards Vice-Admiral) W. F. W. Owen. Reitz, after whom Port Reitz is named, died at Mombasa either in 1824 or 1825. The protectorate was repudiated by the British government, which left the place to be bombarded and captured by Seyyid Said of Oman, who made repeated attacks between 1829 and 1833, and only got possession in 1837 by treachery. Said thereafter made Zanzibar his capital, Mombasa becoming of secondary importance. A revolt against Zanzibar in 1875 was put down with British assistance. The British government in the following year vetoed a proposal by the khedive Ismail to annex Mombasa and its hinterland up to the equatorial lakes to Egypt — a project which originated with General C. G. Gordon, when that officer administered the Upper Nile provinces. In 1887 the city was handed over by the sultan of Zanzibar to the British for administration. It became the capital of the province of Seyyidie and of the East Africa protectorate. In 1907, how- ever , the seat of the central government was removed to Nairobi (q.v.). Mombasa still forms, nominally, part of the sultanate of Zanzibar. The city, together with Malindi, is mentioned in Paradise Lost.

MOMEIN, the Burmese name of the Chinese city Teng-yueh- chow, in the S.W. of the province of Yunnan, China. It was opened to foreign trade by the Burmese Convention of 1897, but so far no advantage has been taken of the permission. It lies close to the Burmese frontier and on the old trade route from Bhamo to Yunnan, but its importance as an outpost of the British Empire is political rather than commercial. The distance from Teng-yueh to Bhamo by the usual trade route is 160 m., and is generally traversed by pack-animals in seven

or eight days. In a straight line the two towns are only 80 m. apart. Near Momein and within its jurisdiction is the frontier town of Manwyne, where A. R. Margary was assassinated in January 1875.

MOMMSEN, THEODOR (1817-1903), German historian and archaeologist, was born on the 30th of November 1817

at Garding, in Schleswig. After being educated at the university of Kiel he devoted himself to the study of Roman law and antiquities. In 1843 a grant from the Danish government enabled him to undertake a journey to Italy, which was to be decisive for his future career. There he began the study of Roman inscriptions, in association with other Italian and German scholars, especially Borghesi, de Rossi and Henzen. His first work was directed to the restoration of the old Italian dialects, and the French government, which at one time proposed to undertake the task of compiling a complete collection of all extant Roman inscriptions, asked for his co-operation. When they gave up the project it was taken up by the Berlin Academy, which had recently completed the collection of Greek inscriptions edited by Boeckh. They had already made a grant to Mommsen, and in 1844 Savigny proposed that he should be appointed to carry out the great work. Many years, however, passed before the plan was finally approved. Meanwhile Mommsen continued his work in Italy: he drew up a full memorandum explaining the principles on which a Corpus inscriptionum should be compiled, and on which alone he could undertake the editorship. As a specimen he collected the inscriptions of Samnium, and in 1852 published those of the kingdom of Naples. These works caused him to be recognized as the first authority in this field of learning. In 1847, however, he was obliged to return to Germany: he first went to Schleswig, where during the Revolution he edited a paper in which he supported the claims of the Elbe Duchies; at the end of 1848 he was appointed professor of civil law at Leipzig. His work there was interrupted by his political opinions. During 1848, when the extreme party was in the ascendant, Mommsen supported the monarchy against the Republicans. With characteristic courage and independence, next year, when the Revolution had spent its force and Beust executed his coup d’itat, he protested, with many of his colleagues, against this act. In consequence he was summoned before a disciplinary court, and, together with Haupt and Jahn, dismissed from his professorship.

Mommsen found an asylum in Switzerland, and became professor at Zurich: he repaid the hospitality of the Republic by writing exhaustive monographs on Roman Switzerland, His spare time was occupied with the Roman History, the three volumes of which appeared between 1854 and 1856. His name at once became known throughout Europe. In this work, with a true insight into the relative importance of things, he passed over with a few strong broad touches the antiquarian discussions on the origins of the city, on which previous historians had laboured so long; but in place of this he painted with astonishing vigour the great political struggle that accompanied the fall of the republic. It was, above all, his new reading of old characters which demanded attention, if not always approval: Cicero, the favourite of men of letters, was for him "a journalist in the worst sense of the word"; Pompey, the hero of Plutarch and the Moralists, was brushed aside as a mere drill-sergeant; and the book culminated in the picture of .Caesar, who established absolute rule in the name of demo- cracy, " the complete and perfect man."

The three volumes ended with the dictatorship of Caesar. The book has never been continued, for the volume on the Roman Provinces under the Empire, which appeared in 1884, is in reality a separate work. Mommsen was henceforward fully occupied with work of a more technical nature. In 1854 the definite offer was made to him by the Academy that he should be chief editor of a Corpus inscriptionum, with full control, and in order that he might carry on the work he was appointed in 1858 to a professorship at Berlin. The first volume appeared in 1 861; five of the succeeding volumes he edited himself, and the

whole was executed under his immediate supervision and with the co-operation of scholars whom he had himself trained.

Enormous as was the labour, this task occupied only a small part of his extraordinary intellectual energy. He found time to write two larger works, the History of the Roman Coinage and the Romisches Staatsrecht, a profound analysis of Roman constitutional law, and Romisches Strafrecht, on Roman criminal jurisdiction. His Roman Provinces already mentioned gives a singularly interesting picture of certain aspects of social life under the empire. His smaller papers amount to many hundreds in number, and there is no department of Roman life and learn- ing, from the earliest records of the Roman law to the time of Jornandes, which he has not illuminated. As secretary to the Berlin Academy for over twenty years he took a leading part in their deliberations, and was their spokesman on great occasions. His interest in political problems of the present was as keen as in those of the past. He was one of the founders of the Preussische Jahrbucher, the most influential of German political periodicals. For many years he was a member of the Prussian Parliament. His political opinions were strong but ill-regulated. Intensely nationalist, he acquiesced in the annexation of his native land to Prussia, and in a public letter to the Italian nation in 1870 defended the German cause before the nation which had become to him a second fatherland; but he was of too independent a character ever to be quite at ease under Prussian government. Loving liberty, he hated its consequences; a democrat, he had and always expressed a profound contempt for the mob. Like many idealists, he was a severe critic of the faults of his own and other countries, and he added something to the increasing Chauvinism in Germany.

It was, however, above all, German scholarship which remained his first interest. There is probably no other instance in the history of scholarship in which one man has established so complete an ascendancy in a great department of learning. Equally great as antiquary, jurist, political and social historian, he lived to see the time when among students of Roman history he had pupils,

followers, critics, but no rivals. He combined the power of patient and minute investigation with a singular faculty for bold generalization and the capacity for tracing out the effects of thoughts and ideas on political and social life. Partly, perhaps, owing to a philosophical and legal train- ing, he had not the gift of clear and simple narrative, and he is more successful in discussing the connexion between events than in describing the events themselves. Though his History ends with the fall of the republic, his most enduring work has been that on the empire; and if he has not written the history of the empire, he has made it possible for others to do so.

Mommsen died at Charlottenburg on the 1st of November 1903. His brothers, Carl Johann Tycho (1819-1900), a great authority on Pindar and Shakespeare, and August (b. 1821), who wrote chiefly on ancient chronology and Greek festivals, were also prominent among German scholars in their day.

The History of Rome (including the volumes of the provinces) has been translated into English by W. P. Dickson (the Provinces, revised by F. Haverfield, 1909) ; there is a French edition of his work on Roman Coinage. Many of his pamphlets and articles have been collected under the title Rbmische Forschungen. Of his other works, the more important are the Roman Chronology to the Time of Caesar (1858), a work written in conjunction with his brother August; his editions of the Monumentum Ancyranum and of the Digest in the Corpus juris civilis, and of the Chronica of Cassiodorus in Monu- menta Germaniae hislorica, the Auctores antiquissimi section of which was under his supervision. A great part of his work is to be found in the German learned publications such as Hermes, Rheinisches Museum, &c. His Reden und Aufsatze and Gesammelte Schriften, i. ii., were published after his death. A full list of his works is given by Zangemeister, Mommsen als Schriftsteller (1887; continued by Jacobs, 1905). See also monographs by C. Bardt (1903) and Gradenwitz (1904, in the Zeitschrift der Savigny-Stiftung fur Rechtsgesckichte), and O.

Hirschfeld, Geddchtnisrede auf Theodor Mommsen (1904).

MOMORDICA, in botany, a genus of annual or perennial climbing herbs belonging to the natural order Cucurbitaceae, natives of the tropics, especially Africa, and known in cultivation chiefly as hothouse plants. They are grown for their ornamental

fleshy fruits, which are oblong to cylindrical in shape, orange to red in colour, prickly or warted externally, and burst when ripe, generally with elastic force, into irregular valves. M. Balsamina, known as balsam apple, is a very pretty annual, well adapted for trellises, &c, in warm outside situations.

MOMUS, in Greek mythology, the son of N0£ (Night), the personification of censoriousness. He is frequently mentioned in Lucian as the lampooner of the gods. It is said that Pallas, Hephaestus, and Poseidon entered into a competition as to which of them could create the most useful thing. Hephaestus made a man, Poseidon an ox, Pallas a house. Momus, being called upon to pronounce an opinion as to the merits of these productions, expressed dissatisfaction with all: with the man, because a window ought to have been made in his breast, through whkh his heart could be seen; with the ox, because its horns were in the wrong place; with the house, because it ought to have been portable, so as to be easily moved to avoid unpleasant neighbours. Momus is reported to have burst with chagrin at being unable to find any but the most trifling defects in Aphrodite. He is represented sometimes as a young, sometimes as an old man, wearing a mask, and carrying a fool’s bauble.

Hesiod, Theogony, 214; Lucian, Hermotimus, 20, and especially Deorum Concilium ; Philostratus, Epistolae, 37.

MONA, the name used by classical writers, and in particular by Tacitus, to denote Anglesey (q.v.). This island was raided by the Roman general

Suetonius about a.d. 60 and conquered by. Agricola about a.d. 79. The Romans probably mined copper there, but no trace has yet been found of any Roman military post, and the villages of the inhabitants which have been recently excavated show only mediocre traces of Roman civilization. The name Mona seems also to have been occasionally used, perhaps from ignorance, for the other large island lying between England and Ireland, Man. The ancient name of this latter was probably not unlike that of Mona, but is not accurately known to us (? Monapia, Manavia). (F. J. H.)

MONACO, a territory of south-eastern France, the smallest of the sovereign principalities of Europe. Area about 8 sq. m., the length being 2J m. and the width varying from 165^0 1100 yds. Pop. (1900), 15,180. Monaco is situated on the coast of the Mediterranean, 9 m. east of Nice, and is bounded on all sides by the French department of Alpes-Maritimes. It includes the towns of Monaco (3292), Condamine (6218) and Monte Carlo (3794). The principality at one time included Mentone and Roccabruna, now known as Roquebrune, which towns, however, were ceded to France in 1861 for a sum of four million francs. The town of Monaco occupies the level summit of a rocky head- land, rising about 200 ft. from the shore, and still defended by ramparts. Though largely modernized, the palace is an inter-esting specimen of Renaissance architecture; the " cathedral " (Romanesque-Byzantine style), and the oceanographical museum may also be mentioned. For this museum a fine building, appropriately decorated, was opened in March 1910 by the prince of Monaco. It stands on the edge of the cliff rising from the sea at the gardens of St Martin, and was designed to house the collections made by the prince during twenty-five years of oceanographical research, and others. Behind the rock, between Mont Tete de Chien and Mont de la Justice, the high grounds rise towards La Turbie, the village on the hill which takes its name from the tropaea with which Augustus marked the boundary between Gaul and Italy. On the north lies the bay of Monaco; along

the lower ground on the west of the bay stretches the health and bathing resort of Condamine; with orange-gardens, manufac- tures of perfumes and liqueurs, and the chapel of Ste Devote, the patron saint of Monaco; to the north of the bay on the rocky slopes of the Spelugues (speluncae) are grouped the various buildings of the Casino of Monte Carlo with the elaborate gardens and the numerous villas and hotels which it has called into existence. Adjoining the Casino terrace and overlooking the sea is the pigeon-shooting ground, the competitions on which are celebrated.

There appear to have been gambling-tables at Monte Carlo

in the year 1856, but it was in 1861 that Francois Blanc, seeing his tenancy at Homburg coming to an end, with no hope of renewal, obtained a concession for fifty years from Charles III. This concession passed into the hands of a joint-stock company, which in 1898 obtained an extension to 1947, in return for a payment to the prince of £400,000 in 1899 and of £600,000 in 1913, together with an increase of the annual tribute of £50,000 to £70,000 in 1907, £80,000 in 1917, £90,000 in 1927, and £100,000 in 1937. None of the inhabitants of Monaco have access to the tables; and their interest in the maintenance of the status quo is secured by their complete exemption from taxation and the large prices paid for their lands. The ruler of the principality, Prince Albert, born 1848, succeeded his father, Prince Charles III., in 1889. He married in 1869 Lady Mary Douglas Hamilton, by whom in 1870 he had a son, Prince Louis: that marriage was, however, annulled in 1880, and subsequently Prince Albert married Alice, dowager-duchess of Richelieu, from whom he was divorced in 1902. The prince is absolute ruler, as there is no parliament in the principality. He is advised by a small council of state, the members of which are appointed by

himself. The maire and other municipal authorities are also appointed by the prince. A governor-general presides over the administration. The judicial system is the same as that of France, there being a court of first instance and a juge de paix. By arrangement, two Paris judges form a court of appeal. Monaco is the seat of a Roman Catholic bishop.

A temple of Heracles seems to have been built on the Monaco headland by the Phoenicians at a very early date, and the same god was afterwards worshipped there by the Greeks under the surname of Movoikos, whence the name Monaco. Monoeci Port us or Port us Herculis is frequently mentioned by the later Latin writers. From the 10th century the place was associated with the Grimaldi, a powerful Genoese family who held high offices under the republic and the emperors; but not till a much later date did it become their permanent possession and residence. In the beginning of the 14th century it was notorious for its piracies. Charles I. (a man of considerable mark, who, after doing great service by sea and land to Philip of Valois in his English wars, was severely wounded at Crecy) purchased Mentone and Roccabruna, and bought up the claims of the Spinola to Monaco. The princes of Monaco continued true to France till 1524, when Augustin Grimaldi threw in his lot with Charles V. Honore I., Augustin's successor, was made marquis of Campagna and count of Canosa, and people as well as rulers were accorded various important privileges. The right to exact toll from vessels passing the port continued to be exercised till the close of the 18th century. Honore II. in 1641 threw off the supremacy of Spain and placed himself under the protec- torate of France; he was compensated for the loss of Canosa, &c, with the duchy and peerage of Valentinois and various lesser lordships; and " duke of Valentinois " long continued to be the title of the heir-apparent of the principality. In 1731 Antoine, his great-grandson, was succeeded by his daughter Louise Hippolyte; she had married Jacques Goyon, count of Matignon and Thorigny, who took the name of Grimaldi

and succeeded his wife. The National Convention annexed the principality to France in 1793; restored to the Goyon Grimaldis by the Treaty of Paris in 18 14, it was placed by that of Vienna under the protection of Sardinia. The Sardinian government took the opportunity of disturbances that occurred in 1848 to annex Mentone and Roccabruna, which were occupied by a Sardinian garrison till 1859. With the transference of Nice to France in i860 the principality passed again Under French protection.

See H. Metivier, Monaco et ses princes, La Fleche (1862).

MONAD (Gr. /xovas, unit, from ixovos, alone), a philosophic term which now has currency solely in its connexion with the philosophy of Leibnitz. In the earlier Greek philosophy the term meant unity as opposed to duality or plurality; at a later time it meant an individual, or, with the Atomists, an atom. It was first used in a sense approximate to that of Leibnitz by Bruno, who meant by it a primary spiritual element as opposed to the material atom. Leibnitz, however, seems to have

borrowed the term not directly from Bruno, but from a con- temporary, Van Helmont the younger. Leibnitz's view of things is that the world consists of monads which are immaterial centres of force, each possessing a certain grade of mentality, self-contained and representing the whole universe in miniature, and all combined together by a pre-established harmony. Material things, according to Leibnitz, are in their ultimate nature composed of monads, each soul is a monad, and God is the monas monadum. Thus monadism, or monadology, is a kind of spiritual atomism. The theory has been revived in recent years by C. B. Renouvier.

MONADNOCK, a term derived from Mount Monadnock in New Hampshire, U.S.A., to denote the " isolated remnants of hard rock which remain distinctly above their surroundings in the late stages of an erosion cycle" (T. C. Chamberlin, R. D. Salisbury). Examples are frequently found where a hard pipe of igneous

rock surrounded by softer rock is gradually exposed by the washing away of the softer rock and becomes a con- spicuous feature of the landscape, forming a volcanic ” neck,” and finally, in the later stages of erosion, a stump. The Peak Downs, Queensland, furnish many examples, and Mato Tepee, Wyoming, is a remarkably conspicuous instance of this type of formation.

MONAGHAN, a county of Ireland in the province of Ulster, bounded E. by Armagh, S.E. by Louth, S. by Meath, S.W. by Cavan, W. by Fermanagh, and N. by Tyrone. The area is 319,741 acres, or about 496 sq. m. The north-western part of the country is included in the great central plain of Ireland; but to the south and east the surface is irregular, although none of the hills is of great elevation. The principal range is that of Slievebeagh, a rugged and barren tract extending into the county Fermanagh, its highest summit being 1254 ft. above sea-level. The principal rivers are the Finn, which rises near the centre of the county and passes into Fermanagh, and the Blackwater, which forms the boundary with Tyrone. The Ulster Canal passes the towns of Monaghan and Clones, affording communi- cation between Lough Neagh and Lough Erne. In geological structure the county drops from the Upper Carboniferous outlier of Slievebeagh in the north-west to a Carboniferous Limestone area towards Monaghan town; but south of this a tumbled Silurian area stretches across the Cavan and Armagh borders. At Carrickmacross, an outlier of Carboniferous Limestone, Coal Measures (with poor seams of coal) and Trias is encountered. Gypsum has been quarried in the Trias, and lead ore was formerly mined in many places in the Silurian area. The Triassic clay furnishes excellent bricks. Eskers or glacial ridges occur at several places. The limestone is not only abun- dant and good, but from the position of the rocks it can be obtained at small expense in working. Freestone and slates are quarried in considerable quantities. The soil in the more level portions of the county is fertile where it rests on limestone, and there is also a mixed soil of deep

clay, which is capable of high cultivation; but in the hilly regions a strong retentive clay prevails, which could be made productive only by careful draining and culture. Spade husbandry generally prevails. The proportion of tillage to pasturage is roughly as 1 to i. Oats, potatoes and turnips are the principal crops, but the quantity grown decreases. The number of cattle, sheep, pigs, goats and poultry, on the other hand, increases or is well main- tained. Linen is the only manufacture of consequence, but the cultivation of flax has almost died out. The Belfast and Clones line of the Great Northern railway crosses the county from north-east to west, passing the town of Monaghan, and the Dundalk and Clones line of the same company runs from south- east to west, with branches to Carrickmacross and to Cootehill (county Cavan).

The population (86,206 in 1801; 74,611 in 1901) decreases as rapidly as any county population in Ireland, and emigration is very heavy. The total includes about 73% of Roman Catholics, and about 12% each of Protestant Episcopalians and of Presbyterians. The principal towns are Monaghan (the county town, pop. 2932), Clones (2068), Carrickmacross (1874),

Castleblayney (1576) and Ballybay (1208). The county includes five baronies. Assizes are held at Monaghan, and quarter ses- sions at Carrickmacross, Castleblayney, Clones and Monaghan, The two county members sit for the north and south divisions respectively. The county is in the Protestant and Roman Catholic dioceses of Clogher.

The district now called the county Monaghan was included in the district of Uriel or Orgial, and long known as Macmahon’s country. It was made shire ground under its present name by Sir John Perrot in the reign of Elizabeth. At Clones there is a round tower in good preservation, but very rude in its

masonry, another at Inishkeen is in ruins. Near Clones there are two large raths. Although there are several Danish forts there are no medieval castles of importance The only monastic structure of which any vestiges remain is the abbey of Clones, which was also the seat of a bishopric. The abbey dates from the 6th century, but was rebuilt in the 14th century after destruction by fire.

MONAGHAN, a market town and the county town of county Monaghan, Ireland, on the Ulster Canal and the Belfast and Clones line of the Great Northern railway, by which it is 52 m. S.W. by W. of Dublin, Pop (1901), 2932. There is a modern Roman Catholic cathedral (1862-1892) for the diocese of Clogher, a convent of the Sisters of St Louis, and a Protestant church (1836;, and the public and county buildings include court-house, gaol, workhouse, asylum, hospital and barracks. Educational establishments include a national model school and the college of St Macartan, preparatory for the Roman Catholic priesthood. The town takes its name (Muinechan, the town of monks) from an early monastery. It was incorporated by James I., but was little more than a hamlet until the close of the 18th century. Rossmore Park, the fine demesne of Lord Rossmore, is the most noteworthy of several neighbouring residences. The town is governed by an urban district council.

MONA MONKEY, a West African representative of the group of monkeys generally known as guenons, and scientifically as Cercopithecus. The mona (C. mono) typifies a sub-genus of the same name (Mona) characterized, among other features, by the presence of a black band running from the angle of each eye to the ear. In the mona itself the general colour of the upper parts is black, with a pair of oval white spots near the root of the tail, while a band across the forehead and the whole under surface are likewise white. (See Primates)

MONARCHIANISM, a theological term designating the view taken by those Christians who, within the Church, towards the end of the 2nd century and during the 3rd, opposed the doctrine of an

independent personal subsistence of the Logos. During the middle of the 2nd century a number of varying christological views began to germinate, growing for a time side by side. They fall into two great classes: (a) Christ was a man in whom the Spirit of God had dwelt; (b) Christ was the Divine Spirit who had assumed flesh. Each class based its position on Scripture, but the latter (which prevailed) had the advantage of being able easily to combine with cosmological and theological propositions current in the religious philosophy of the time. The opposition to it arose out of a fear that it threatened monotheism. The representatives of the extreme monotheistic view, which while regarding Christ as Redeemer, clung tenaciously tc the numerical unity of the Deity, were called Monarchians, a term brought into general use by Tertullian It has to be remembered (1) that the movement originated within the pale of the Church, and had a great deal in common with that which it opposed; (2) that it was ante-Catholic rather than. anti-Catholic, e.g. the Canon of the New Testament had not yet been established. It is usual to speak of two kinds of monarchianism — the dynamistic and the modalistic, though the distinction cannot be carried through without some straining of the texts. By monarchians of the former class Christ was held to be a mere man, miraculously conceived indeed, but constituted the Son of God simply by the infinitely high degree in which he had been filled with Divine wisdom and power. This view was represented in Asia Minor about the year 170 by the anti-Montanistic Alogi, so called by

Epiphanius on account of their rejection of the Fourth Gospel; it was also taught at Rome about the end of the 2nd century by Theodotus of Byzantium, a currier, who was excommunicated by Bishop Victor, and at a later date by Artemon, excommuni- cated by Zephyrinus About the year 260 it was again pro- pounded within the Church by Paul of Samosata (q.v.), who held that, by his unique excellency, the man Jesus gradually rose to the Divine dignity, so as to be worthy of the name of God. Modalistic

monarchianism, conceiving that the whole fullness of the Godhead dwelt in Christ, took exception to the ” subordi- natianism ” of some Church writers, and maintained that the names Father and Son were only two different designations of the same subject, the one God, who ’’ with reference to the rela- tions in which He had previously stood to the world is called the Father, but in reference to His appearance in humanity is called the Son.” It was first taught, in the interests of the ” mon- archia ” of God, by Praxeas, a confessor from Asia Minor, in Rome about 190, and was opposed by Tertullian in his well-known controversial tract. The same view — the ” patripassian ” as it was also called, because it implied that God the Father had suffered on the cross — obtained fresh support in Rome about 215 from certain disciples of Noetus of Smyrna, who received a modified support from Bishop Callistus. It was on this account that Hippolytus, the champion of hypostasian subordinatianism, along with his adherents, withdrew from the obedience of Callistus, and formed a separate community. In Carthage t Praxeas for a time had some success, but was forced by Ter- tullian not only to desist but to retract. A new and conciliatory phase of patripassianism was expounded at a somewhat later date by Beryllus of Bostra, who, while holding the divinity of Christ not to be t5ia, or proper to Himself, but irarpLK-n (belonging to the Father), yet recognized in His personality a new ■Kpbo-ixmov or form of manifestation on the part of God. Beryllus, however, was convinced of the wrongness of this view by Origen (q.v), and recanted at the synod which had been called together in 244 to discuss it. (For the subsequent history of modalistic monarchianism see Sabeixius.)

See the Histories of Dogma by A. Harnack, F. Loofs. R. Seeberg ; also R. L. Ottley, The Doctrine of the Incarnation.

MONARCHY (Fr. monarchic, from Lat. monorchia, Gr. fiovapxia, rule of one, nSvos, alone, apxh, rule), strictly, the undivided sovereignty or rule of a single person, Hence the term is applied to states

in which the supreme authority is vested in a single person, the monarch, who in his own right is the permanent head of the state. The character of true monarchy is well defined in the well-known lines of Cowper (Verses supposed to be written by Alexander Selkirk): ” I am monarch of all I survey,

My right there is none to dispute.”

The word ” monarchy ” has, however, outlived this original meaning, and is now used, when used at all, somewhat loosely of states ruled over by hereditary sovereigns, as distinct from republics with elected presidents; or for the “monarchical principle,” as opposed to the republican, involved in this distinction.

The old idea of monarchy, viz. that of the prince as represent- ing within the limits of his dominions the monarchy of God over all things, culminated in the 17th century in the doctrine of the divine right of kings, and was defined in the famous dictum of Louis XIV.: L’etat c’est moil The conception of monarchy was derived through Christianity from the theocracies of the East; it was the underlying principle of the medieval empire and also of the medieval papacy, the rule of the popes during the period of its greatest development being sometimes called ” the papal monarchy.” The monarchical principle was shaken to its foundations by the English revolution of 1688; it was shattered by the French revolution of 1789; and though it survives as a political force, more or less strongly, in most European countries, ” monarchists,” in the strict sense of the word, are everywhere a small and dwindling minority. To express the change phrases were invented which have come into general use, though involving a certain contradiction in terms, viz. ” limited ” or

” constitutional monarchy,” as opposed to ” absolute

” or ” autocratic monarchy.”

Finally, a distinction is drawn between ” elective ” and ” hereditary ” monarchies. Of the former class the most conspicuous was the Holy Roman Empire; but in Europe all monarchies were, within certain limits, originally elective; and, after the introduction of Christianity, the essential condition of the assumption of sovereign power was not so much kinship with the reigning family as the ” sacring ” by the divine authority of the Church. The purely hereditary principle was of comparatively late growth, the outcome of obvious convenience, exalted under the influence of various forces into a religious or quasi-religious dogma. (See also Government and Sovereignty.)

MONASSIR (Monasir), an African tribe of Semitic stock, living in the Nile valley (Berber mudiria) between Birti (their headquarters) and Dar Robatab. They are a prosperous, sedentary tribe, claim kinship with the Ababda, and speak Arabic, but are of very mixed blood. Next to Birti their chief settlement is at Salamat. Both places are on the left bank of the Nile. It was by Monassir tribesmen that Colonel J. D. H. Stewart, Gordon’s comrade at Khartum, was mur- dered in 1884.

MONASTICISM (Gr. ixovafxriKos, living alone, fibvos), a system of living which owes its origin to those tendencies of the human soul which are summed up in the terms ” asceticism ” and ” mysticism.” Mysticism may broadly be described as the effort to give effect to the craving for a union of the soul with the Deity already in this life; and asceticism as the effort to give effect to the hankering after an ever-progressive purification of the soul and an atoning for sin by renunciation and self-denial in things lawful. These two tendencies may well be said to be general instincts of humanity; because, though not always called into activity, they are always liable to be evoked, and in all ages and among all races they frequently have asserted them- selves. (See Asceticism and Mysticism.) Indeed the history of religion shows that they are among the most deep-

rooted and widespread instincts of the human soul; and monasticism is the attempt to develop and regulate their exercise. Thus monasticism is not a creation of Christianity; it is much older, and before the Christian era a highly organized monasticism existed in India. (See the articles on Brahmanism; Buddhism; and Lhasa.)

1. Pre-Christian Monasticism. — Greek asceticism and mysti- cism seem never to have produced a monastic system; but among the Jews, both in Judaea and in Alexandria, this development took place. In Judaea the Essenes before the time of Christ lived a fully organized monastic life (see Schurer, Jewish People, ii. § 30) ; and the same is true in regard to the Therapeutae in the neighbourhood of Alexandria (the authenticity of Philo's De Vita contemplativa, which describes their manner of life, is again recognized by scholars).

A general sketch of pre-Christian asceticism and monasticism, with indication of the chief authorities, is given in O. Zockler's Askese und Monchtum (1897), pp. 32-135. This account is epito- mized by J. O. Hannay, Spirit and Origin of Christian Monasticism (1903), app. i: the view now common among scholars is there maintained, that these pre-Christian realizations of the monastic idea had little, and indeed no, influence on the rise and development of Christian monasticism.

2. Beginnings of Christian Monasticism. — The practice of asceticism asserted itself at an early date in Christian life: men and women abstained from marriage, from flesh meat, from the use of intoxicating drink, and devoted themselves to prayer, religious exercises and works of charity (S. Schiwietz, Das morgenlandische Monchtum, 1904, pt. i.; J. 0. Hannay, op. cit. chs. 2, 3). This they did in their homes, without withdrawing from their families or avocations. In time, however, the ten- dency to withdraw from society and give oneself up wholly to the practice of religious and ascetical exercises set in; and at any rate in Egypt, at the middle of the 3rd century, it was the custom for

such ascetics to live in solitary retirement in the neighbour- hood of the towns and villages. This was the manner of life

which St Anthony (q.v.) began to lead, c. 270; but after fifteen years he withdrew to a deserted fort on the east bank of the Nile, opposite the Fayum. Here he enclosed himself and led a life cut off from all intercourse with man. There are reasons for doubting that Anthony was the first Christian hermit: probably there is some historical foundation for the tradition that one of those who fled to the desert in the Decian persecution continued to dwell in a cave by the shore of the Red Sea, un- known to men, till visited by St Anthony long years afterwards (see E. C. Butler, Lausiac History of Palladius, 1898, pt. i. p. 230). But this was a single case which does not affect the fixed tradition of monastic Egypt in the 4th century that Anthony was the father of Christian monachism.

During twenty years Anthony lived a life of, seclusion, never coming forth from his fort, never seeing the face of man. But his fame went abroad and a number of would-be disciples came and took up their abode in the caves and among the rocks that sur- rounded his retreat, and called on him to guide them in the path of life they had chosen. In response to these appeals Anthony came forth and set himself to organize the life of the multitude of ascetics that had grown up around him. This act, which took place in the first years of the 4th century, must be regarded as the inauguration of Christian monachism.

3. St Anthony's Monachism. — The form of monastic life directly derived from St Anthony was the type that prevailed in middle and northern Egypt up to the middle of the 5th century. The chief authorities for the study of this type of monastic life are the Vita Antonii (probably by Athanasius), the Historia monachorum (ed. E. Preuschen), the Historia lausiaca of Palladius (ed. E. C. Butler) — these works are to be found in Latin in Rosweyd's Vitae Patrum {Migne, Patrol Lat. LXXIIL, LXXIV.) — and the writings of

Cassian (English translation by Gibson in ” Nicene and Post-Nicene Library “). A generation ago all this literature was in disrepute; but it has been revindi- cated, and its substantially historical character is now recognized on all hands (see E. C. Butler, op. cit. pt. ii. § 1).

Antonian monachism grew out of the purely eremitical life, and it retained many of the characteristic features inherited from its origin. The party of travellers whose journey in 394 is narrated in the Historia monachorum found at the chief towns along the Nile from Lycopolis (Assiut or Siut) to Alexandria, and in the deserts that fringed the river, monastic habitations, sometimes of hermits, sometimes of several monks living to- gether but rather the life of hermits than of cenobites. It is at the great monastic settlements of Nitria and Scete that we are best able to study this kind of Egyptian monasticism. Here in one portion of the desert, named Cellia, the monks lived a purely eremitical life; but in Nitria (the Wadi Natron) they lived either alone, or two or three together, or in communities, as they preferred. The system was largely voluntary; there was no organized community life, no living according to rule, as it is now understood. In short the life continued to be semi-eremitical. (See Butler, op. cit. pt. i. p. 233; Hannay, op. cit. chs. 4, 5; Schiwietz, op. cit. pt. ii. §§ 1-11.)

4. St Pachomius’s Monachism. — Very different was the type of monastic life that prevailed in the more southerly parts of Egypt, Here, at Tabennisi near Dendera, about 315-320, St Pachomius (q.v.) established the first Christian cenobium, or monastery properly so called. (On St Pachomius and his monastic institute see P. Ladeuze, Cenobitisme Pakhomien (1898); Schiwietz, op. cit. pt. ii. §§ 12-16; E. C. Butler, op. cit. pt. i. p. 234, pt. ii. notes 48, 49, 54, 59). Before his death in 346 Pachomius had established nine monasteries of men and one of women, and after his death other foundations continued to be made in all parts of Egypt, but especially in the south, and in

Abyssinia. Palladius tells us that c. 410 the Pachomian or Tabennesiot monks numbered some seven thousand. The life was fully cenobitical, regulated in all details by minute rules, and with prayer and meals in common. As contrasted with the Antonian ideal, the special feature was the highly organized system of work, whereby the monastery was a sort of agricul- tural and industrial colony. The work was an integral part

of the life, and was undertaken for its own sake and not merely for an occupation, as among the Antonian monks. This marks a distinctly new departure in the monastic ideal.

In another respect too St Pachomius broke new ground: not only did he inaugurate Christian cenobitical life, but he also created the first " Religious Order." The abbot of the head monastery was the superior-general of the whole institute; he nominated the superiors of the other monasteries; he was visitor and held periodical visitations at all of them; he exercised universal supervision, control and authority; and every year a general chapter was held at the head house. This is a curious anticipation of the highly organized and centralized forms of government in religious orders, not met with again till Cluny, Citeaux, and the Mendicant orders in the later middle ages.

A passing reference should be made to the Coptic ■ abbot Shenout, who governed on similar lines the great " White Monastery," whereof the ruins still survive near Akhmim; the main interest of Shenout's institute lies in the fact that it continued purely Coptic, without any infiltration of Greek ideas or influence. (See J. Leipoldt, Schenute ■von Alripe, 1003.)

Egyptian monachism began to wane towards the end of the 5th century, and since the Mahommedan occupation

it has ever been declining. Accounts of its present condition may be found in R. Curzon's Monasteries of the Levant (1837), or in A. J. Butler's Ancient Coptic Churches (1884). Hardly half a dozen monasteries survive, inhabited by small and ever dwindling communities.

5. Oriental Monachism. — The monastic institute was imported early in the 4th century from Egypt into Syria and the Oriental lands. Here it had a great vogue, and under the influence of the innate Asiatic love of asceticism it tended to assume the form of strange austerities, of a kind not found in Egyptian monachism in its best period. The most celebrated was the life of the Stylites or pillar hermits (see Simeon Stylites). Monastic life, here tended to revert to the eremitical form, and to this day Syrian and Armenian monks are to be found dwelling in caverns and desert places, and given up wholly to the practice of austerity and contemplation (see E. C. Butler, Lausiac History of Palladius, pt. i. p. 239, where the chief authorities are indi- cated). Before the close of the 4th century monachism spread into Persia, Babylonia and Arabia.

6. Basilian and Greek Monachism. — Though Eustathius of Sebaste was the first to introduce the monastic life within the confines of what may be called Greek Christianity in Asia Minor (c. 340), it was St Basil who adapted it to Greek and

■ European ideas and needs. His monastic legislation is explained and the history of his institute sketched in the article Basilian Monks. Here it will suffice to say that he followed the Pacho- mian rather than the Antonian model, setting himself definitely against the practice of the eremitical life and of excessive asceticism, and inculcating the necessity and superiority of labour. The lines laid down by St Basil have continued ever since to be the lines in which Greek and Slavonic monasticism has rested, the new multitudinous modifications of the monastic ideal, developed in such abundance in the Latin Church, having no counterpart in the Greek. But the element of work has decreased, and

Greek and Slavonic monks give themselves up for the most part to devotional contemplation.

7. Early Western Monachism. — The knowledge of the monas- tic life was carried to western Europe by St Athanasius, who in 340 went to Rome accompanied by two monks. The Vita Anlonii was at an early date translated into Latin and propagated in the West, and the practice of monastic asceticism after the Egyptian model became common in Rome and throughout Italy, and before long spread to Gaul and to northern Africa. A rSsumS of the chief facts will be found in E. C. Butler, op. cit. pt. i. p. 245; see also Hannay, op. cit. ch. 7. The monastic ideals prevalent were those of the Antonian monachism, with its hankering after the eremitical life and the practice of extreme bodily austerities. But climatic conditions and racial tempera- ment rendered the Oriental manner of monasticism unattainable, as a rule, in the West. Hence it came to pass that by the end of

the 5th century the monastic institute in western Europe, and especially in Italy, was in a disorganized condition, sinking under the weight of traditions inherited from the East. It was St Benedict who effected a permanently working adaptation of the monastic ideal and life to the requirements and conditions of the western races.

8. St Benedict’s Monachism. — St Benedict (c. 500) effected his purpose by a twofold break with the past : he eliminated from the idea of the monastic life the element of Oriental asceticism and extreme bodily austerity; and he put down the tendency, so marked in Egypt and the East, for the monks to vie with one another in ascetical practices, commanding all to live according to the rule. The life was to be self-denying and hard, but not one of any great austerity (for details see Benedict of Ntjrsia; and E. C. Butler, op. cit. pt. i. pp. 237 and 251). The individual monk was sunk in the community, whose corporate life he had to live. St Benedict’s rule was a new creation in monastic history; and as it rapidly supplanted all other monastic rules in

western Europe, and was for several centuries the only form of monasticism in Latin Christianity (outside of Ireland), it is necessary to speak in some little detail of its spirit and inner character. 1 It has to be emphasized at the outset that the monasteries in which the Benedictine rule was the basis of the fife did not form a body or group apart within the great ” monastic order,” which embraced all monasteries of whatever rule; nor had Benedictine monks any special work or object beyond that common to all monks — viz. the sanctifying of their souls by living a community life in accordance with the Gospel counsels. St Benedict defines his monastery as ” a school of the service of the lord ” (Reg., Prol.). The great act of service is the public common celebration of the canonical office, the ” work of God ” he calls it, to which ” nothing is to be preferred ” (Reg. c. 43). The rest of the day is filled up with a round of work and reading. Work, and in St Benedict’s time it was predominantly field work, took an even more recognized and integral place in the life than was the case under St Pacho- mius or St Basil, occupying notably more time than the church services. St Benedict introduced too into the monastic life the idea of law and order, of rule binding on the abbot no less than on the monks; thus he reduced almost to a vanishing point the element of arbitrariness, or mere dependence on the abbot’s will and whim, found in the earlier rules. Lastly, he introduced the idea of stability, whereby monk and community were bound to each other for life, the normal thing for the Benedictine being to live and die in the monastery of his profession: thus the power hitherto enjoyed by monks, of wandering from monastery to monastery, was cut away, and the Benedictine community was made into a family whose members were bound to one another by bonds that could not be severed at will.

9. Western Monachism in the Early Middle Ages. — It is easy to understand that a form of monastic life thus emptied of dis- tinctively Oriental features and adapted to the needs of the West by a great religious genius like St Benedict, should soon have

distanced all competitors and have become the only monastic rule in western Europe. The steps in the propagation of the Benedictine rule are traced in the article Benedictines. The only serious rival was the Irish rule of Columban; and here it will be in place to say a word on Irish monasticism, which, in its birthplace, stood aloof to the end from the general movement. The beginnings of Celtic monachism are obscure, but it seems to have been closely connected with the tribal system. 2 When, however, Irish monachism emerges into the full light of history, it was in its manifestations closely akin to the Egyptian, or even to the Syrian type: there was the same love of the eremitical life, the same craving after bodily austerities of an extraordinary kind, the same individualistic piety. The Irish monks were great missioners in the north of England and the northern and

1 This topic is dealt with by F. A. Gasquet, Sketch of Monastic Con- stitutional History (pp. viii.-xxii.), the Introduction to 2nd edition of the translation of Montalembert's Monks of the West (1895).

2 See Willis Bund, Celtic Church in Wales (1897) ; H. Zimmer, art. " Keltische Kirche " in Herzog-Hauck, Realencyklopadie (3rd ed.), translated into English by Kuno Meyer (1902).

central parts of Europe, and in the course of the 7th century the Irish rule of St Columban and the Roman rule of St Benedict met in the monasteries in central Europe that had been founded by Columban and his Irish monks. The Benedictine rule supplanted the Irish so inevitably that the personnel ceased to be Irish, that even in St Columban's own monastery of Luxeuil his rule was no longer observed, and by Charlemagne's time all remembrance of any other monastic rule than the Benedictine had died out.

During the 7th and 8th centuries the Benedictine houses were the chief instrument in the christianizing, civilizing and educat- ing of the Teutonic races. In spite of the frequent pillage and destruction of monasteries by Northmen, Saracens, Arabs and other invaders; in spite of the existence of even widespread local abuses, St Benedict's institute went on progressing and consolidating; and on the whole it may be said that throughout the early middle ages the general run of Benedictine houses continued to perform with substantial fidelity the religious and social functions for which they were created.

10. Offshoots and Modifications of Benedictine Monachism: the Rise oj " Orders." — Up to the beginning of the 10th century we do not meet in the West such a thing as an " order " — an organized corporate body composed of several houses, diffused through various lands, with centralized government and objects and methods of its own. As stated above, St Pachomius's monasteries formed an order — a curious anticipation of what six centuries later was to become the vogue in Western monasti- cism. The Benedictine houses never coalesced in this manner; even when, later on, a system of national congregations was introduced, they were but loose federations of autonomous abbeys; so that to this day, though the convenient expression " Benedictine order " is frequently used, the Benedictines do not form an order in the proper sense of the word. But with the 10th century we reach the period of orders, and it is on this line that all subsequent developments in Western monasticism have run.

The first order was that of Cluny, founded in 910; in rule and manner of life it continued purely Benedictine, and it wielded extraordinary power and religious influence up to the middle of the 12th century. (See Cluny.)

The chief offshoot from the Benedictine institute were the Cistercians (c. 100) ; their ground idea was a return to the letter of St Benedict's rule, and a reproduction, as close as could be, of the

exterior conditions of life as they existed in St Benedict's own monastery; consequently field work held a prominent place in the Cistercian ideal. This ideal it has not been possible permanently to maintain in the great body of the order, but only in limited circles, as Trappists (q.v.). But for a century (1125- 1225) Citeaux supplanted Cluny as the spiritual centre of western Europe. The Cistercians were an organized, centralized order in the full sense of the word. (See Cistercians.)

Towards the end of the 10th century and during the nth a strong tendency set in to revert to the eremitical life, probably owing to the example of the Greek monks, who at this time entered Sicily and south Italy in great numbers. This tendency produced the orders of the Camaldulians or Camaldolese (c. 975) in Italy, and in France the Grandmontines (1076) and Carthusians (1084), all leading practically eremitical lives, and assembling ordinarily only for the church services. The Vallombrosians (1038) near Florence maintained a cenobitical life, but eliminated every element of Benedictine life that was not devoted to pure contemplation. At Fontevrault (founded in 1095) the special feature was the system of " double monasteries " i.e. neighbouring, but rigorously separated, monasteries of men and of women — the government being in the hands of the abbesses.

In all these lesser orders may be discerned the tendency of a return to the elements of Eastern monasticism discarded by St Benedict — to the eremitical life; to the purely contemplative life with little or no factor of work; to the undertaking of rigorous bodily austerities and penances — it was at this time that the practice of self-inflicted scourgings as a penitential exercise was

introduced. All this was a reaction from St Benedict's recon" struction of the monastic life — a reaction which in the matter of austerities and individualistic piety has made itself increasingly felt in the later manifestations of the monastic ideal in the West.

n. New Kinds oj Religious Orders. — Up to this point we have met only with monasticism proper; and if the term were taken strictly, the remainder of this article would be concerned only with the later history of the institutes already spoken of; for neither canons regular, friars, nor regular clerks, are in the strict sense monks. But it is usual, and it will be convenient here, to use the term monasticism in a broader sense, as equivalent to the technical ” religious life,” and as embracing the various forms that have come into being so prolifically in the Latin Church at all periods since the middle of the nth century.

The first of these new forms was that of the canons regular or Augustinian canons (q.v.) who about the year 1060 arose out of the older semi-monastic Canonical institute, and lived ac- cording to the so-called ” Rule of St Augustine.” The essential difference between monks and regular canons may be explained as follows: monks, whether hermits or cenobites, are men who live a certain kind of life for its own sake, for the purpose of leading a Christian life according to the Gospel’s counsel and thus serving God and saving their own souls; external works, either temporal or spiritual, are accidental; clericature or ordination is an addition, an accession, and no part of their object, and, as a matter of fact, till well on in the middle ages it was not usual for monks to be priests; in a word, the life they lead is their object, and they do not adopt it in order the better to compass some other end. But canons regular were in vhtue of their origin essentially clerics, and their common life, monastery, rule, and the rest, were something additional grafted on to their proper clerical state. The difference manifested itself in one external point: Augustinian canons frequently and freely themselves served the parish churches in the patronage of their houses; Benedictine monks did so, speaking broadly, hardly at all, and their doing so was forbidden by law, both ecclesiastical and civil. In other respects the life of canons regular in their monasteries, and the external policy and

organization among their houses, differed little from what prevailed among the Black Benedictines; their superiors were usually provosts or priors, but sometimes abbots. As contrasted with the friars they are counted among the monastic orders. Alongside of the local federations or congregations of houses of Augustinian canons were formed the Premonstratensian order (1120) (q.v.), and the English ” double order” of St Gilbert of Sempringham (1148) (q.v.), both orders, in the full sense of the word, composed of Augustinian canons.

Two special kinds of orders arose out of the religious wars waged by Christendom against the Mahommedans in the Holy Land and in Spain: (1) the Military orders: the Knights Hospitallers of St John and the Knights Templars, both at the beginning of the 12 th century, and the Teutonic Knights at its close; (2) the orders of Ransom, whose object was to free Christian prisoners and slaves from captivity under the Mahommedans, the members being bound by vow even to offer themselves in exchange; such orders were the Trinitarians (q.v.) founded in n 98, and the order of Our Lady of Ransom (de Mercede), founded by St Peter Nolasco in 1223; both were under the Augustinian rule.

At the beginning of the 13th century arose the series of great Mendicant orders. Their nature and work and the needs that called them into being are explained in the article Mendicant Movement, and in the separate articles on St Francis or Assisi and Franciscans (1210), St Dominic and Dominicans (1215), Carmelites (1245), Augustinian Hermits (1256) — these were the four great orders of Mendicant friars — to them were added, in 1487, the Servites (q.v.) founded in 1233.

It will be in place here to explain the difference between friars, monks, and canons regular. The distinction between the two last has already been brought out; but they agree in this that the individual monk and canon alike belongs to his house of profession and not to any greater or wider corporation. They

are bound by place and the unit is the individual community. Thus among monks and canons regular each monastery has its own fixed community, which is in a real sense a family; and the monk or canon, no matter where he may be, looks on his monas- tery as his " home," like the ancestral home of a great family. With the friars this is all changed: the friar does not belong to any particular house, but to the province or order, so that there is no reason, beyond the command of his superiors, why he should be living in one house rather than another. In the monk attachment to his own one monastery is a virtue; in the friar detachment is the ideal. The monk, or the canon, normally exer- cises his influence on the world in and through his community, not as an individual but as a member of a corporate body. The friar's sphere of work is normally outside his convent, and he works and influences directly and as an individual. Lastly, in regard to the object aimed at there was an important differ- ence, for the professed object of the friars was to be clerical helpers of the parochial clergy in meeting the specifically religious needs of the time. Already, in St Francis's lifetime, his friars had grown into an order dedicated to spiritual ministrations among the poor, the sick, the ignorant, the outcasts of the great cities; while by the very conception of their institute the Domini- cans were dedicated to the special work of preaching, especially to heretics and heathens. Here, too, should be mentioned St Francis's other great creation, the Tertiaries (q.v.), or devout men and women living in the world, who while continuing their family life and their ordinary avocations, followed a certain rule of life, giving themselves up to more than ordinary prayer and the pursuit of good works, and abstaining from amusements of a worldly kind.

12. The Religious Orders in the Later Middle Ages. — The 13th century was the heyday of monasticism in

the West; the Mendicant orders were in their first fervour and enthusiasm; the great abbeys of Benedictines, Cistercians and Augustinian canons reflected the results of the religious reform and revival associated with Hildebrand's name, and maintained themselves at a high and dignified level in things religious and secular; and under the Benedictine rule were formed the new congregations or orders of Silvestrines (1231), Celestines (c. 1260) and Olivetans (1319), which are described under their several headings. But towards the end of the century a period of decline set in, which ran its course in increasing volume throughout the 14th century. A great wave of secularity rolled over the Church, engulfing the religious orders with the rest; love waxed cold, fervour lan- guished! learning declined, discipline was relaxed, bitter rivalries broke out, especially between Franciscans and Dominicans. The great schism was reflected in the Mendicant orders which were divided into two obediences, to the destruction of discipline. The great wealth of the old monastic orders exposed them, especially in France and Italy, to the vicious system of commen- dation, whereby a bishop, an ecclesiastic, or even a layman was appointed " commendatory abbot " of a monastery, merely for the purpose of drawing the revenues (see Abbot); the monas- teries were often deprived even of necessary maintenance, the communities dwindled, and regular observance became impos- sible. There is reason to believe that in England a relatively good level was maintained throughout, thanks in great measure to the fact that the kings resolutely refused to allow the introduction of commendation — Wolsey was the first and last commendatory abbot in England. In the German lands, the lowest level was touched, and the writings of the Augustinian canon Johann Busch, and of the Benedictine abbot Trithemius reveal a state of things in the first half of the 15th century that urgently called for reform. The first move in this direction was made in the Netherlands and north Germany under the influence of Gerhard Groot (q.v.), and issued in the formation of the Windesheim congregation of Augustinian canons and the secular

congregation of Brothers of Common Life (q.v.) founded c. 1384, both of which became centres of religious revival. During the first half of the 15th century numerous and effective efforts at reform were initiated in all the orders without exception, and in every part of Europe. These

movements, promoted by the councils of Constance and Basel, partook of the spirit of the time and were characterized by an extreme austerity of life and a certain hardness of spirit, and a sort of police regulation easily understandable at a time of reaction from grave abuses. At this time arose the Hieronymites (q.v.) founded in 1375, under the Augustinian rule, the Observants (1415) among the Franciscans (q.v.), and the Minims (founded c. 1460 by St Francis of Paola, q.v.), whose programme was to outdo the Minors cr Franciscans. These various reform movements among the orders were widely but not universally successful; and so the Reformation found reli- gious houses in an unsatisfactory state in sufficient numbers to afford the reformers one of their chief handles against the old religion. The Reformation and the religious wars that followed in its wake destroyed the monasteries and religious orders of all kinds in northern Europe and crippled them in central Europe.

13. The Modern Orders. — During the Reformation period there sprang up, to meet the needs of the time, a new kind of religious order, called Regular Clerks. These are religious orders in the full sense of the word, as the members take the solemn religious vows. Regular clerks are by their institute clerics and priests, and they are devoted to some particular work or works as their own special object — as education, the preaching of missions and retreats, or the going on missions to the heathen. They carry still further the tendencies that differentiate the friars from the monks; and in particular, in order to be more free in devoting themselves to their special works, the orders of regular clerks have commonly given up the choral celebration of the canonical office, which had been maintained by the friars.

Of regular clerks by far the most important are the Jesuits (q.v.), founded in 1340; there are also the Theatines (founded 1524 by St Cajetan and Caraffa, afterwards Paul IV.); the Bamabites (founded 1530, by St Antonio Zaccaria) and others (see Max Heimbucher, Orden u. -Kongregationen (1897), II., §§ 108-114). Strictly speaking the ” religious congregations ” should be distinguished from the orders of regular clerks, the difference being that in the former the vows, though taken for life, are only ” simple vows ” and more easily dispensable by authority; but the character and work of the two institutes is very similar. The chief of these congregations are the Passion- ists (founded by St John of the Cross, 1725) and the Redemptorists (founded by St Alfonsus Liguori, 1749), both dedicated to giving missions and retreats. The Christian Brothers, devoted to primary education, founded by St Jean Baptiste de la Salle in 1679, are not in orders (Heimbucher, op. cit. §§ 115-118).

Besides the religious congregations there are a number of ” secular congregations,” composed of secular priests living together under temporary vows and free to leave at will; the following deserve mention: Oblates of St Charles (founded by St Charles Borromeo, 1578); Oratorians (founded by St Philip Neri, c. 1570); the French Oratory (founded by Cardinal Berulle, 1 613), a similar but distinct institution, which produced a number of scholars of the highest distinction — Thomassin, Morin, Marlebranche, Richard Simon, Juenin, Lebrun, Masillon, and others; Lazarists (founded by St Vincent de Paul, 1624); Sulpicians (founded by M. Olier, 1642) , and a vast number of others, including several for the mission to the heathen (see Heimbucher op. cit. §§ 124-^40).

During the period under review, from the Reformation to the French Revolution, the old orders went on alongside of the new, and many notable revivals and congregations arose among them: the most noteworthy were the Capuchins (q.v.) among the; Franciscans (1528); the Discalced Carmelites (q.v.) of St Teresa and St John of the Cross (1562); the Trappists

(q.v.) among the Cistercians (1663); and, most famous of all, the Maurists (q.v.) among the Benedictines of France (1621).

14. The Religious Orders in Recent Times. — At the end of the 18th century and the opening of the 19th the religious orders received a succession of blows in those countries in which they had survived the Reformation from which they have only

in the present generation recovered. The Jesuits were suppressed by Pope Clement XIV, in 1773, and restored by Pius VII. in 1814. As the result of the ecclesiastical policy of the emperor Joseph II. nearly all religious houses of all kinds were suppressed through- out the Austrian dominions (1780). The French Revolution swept them out of France and caused the secularization of the great majority in central Europe and Italy. In Portugal and Spain they were dissolved in 1834-1835; in Italy in 1866; in the Prussian dominions in 1871. The last half of the 19th century, and more especially the last quarter, witnessed a remarkable revival of vitality and growth in most of the older orders in nearly every country of western Europe, and besides, an extra- ordinary number of new congregations, devoted to works of every sort, were founded in the 10th century: Heimbucher (op. cit., §§ 118, 134-140) numbers no fewer than seventy of these new congregations of men. In the new countries, especi- ally in the United States and Australia, but also in South Africa, orders and congregations of all kinds are most thriving. The chief set-back has come again in France, where, by the Associa- tion Laws of 1903, the religious orders have nearly all been suppressed and expelled and their property confiscated.

15. The Nuns. — In the foregoing sketch nothing has been said concerning the nuns; and yet in all ages women, hardly less than men, have played their part in monasticism. In the earliest Christian times the

veiled virgins formed a grade or order apart, more formally separated from the community than were the male ascetics. There is reason for believing that there were organized convents for women before there were any for men; for when St Anthony left the world in 270 to embrace the ascetic life, the Vita says he placed his sister in a nunnery (irapdevuv). We learn from Palladius that by the end of the 4th century nunneries were numerous all over Egypt, and they existed also in Palestine, in Italy and in Africa — in fact throughout the Christian world. It is a curious coincidence that the sister of each of the three great cenobitical founders, Pachomius, Basil and Benedict, was a nun and ruled a community of nuns ac- cording to an adaptation of her brother's rule for monks. In the West the Benedictine nuns played a great part in the Christian settlement of north-western Europe. As the various monastic and mendicant orders arose, a female branch was in most cases formed alongside of the order; and so we find canonesses, and hermitesses, and Dominicanesses, and Franciscan nuns [or Clares (g.v.)] — requisite information will be found in the respective articles. Then there were the " double orders " of Sempringham (see St Gilbert) and Fontevrault, in which the nuns were the predominant, or even the dominant, element. Of the modern orders of men only a few include nuns. But on the other there are a vast number of purely female orders and congregations. The great majority of these modern congregations of women follow the Augustinian rule, supplemented by special constitu- tions or by-laws; such are the Brigittines, the Ursulines and the Visitation nuns: others follow the rule of the third order of the Franciscans or other Mendicants (see Tertiaries). In early times nuns could go out of their enclosure on occasion; but in the later middle ages, up to the council of Trent, the tendency was to keep them more and more strictly confined within their convent precincts. In 1609 an English lady, Mary Ward, founded at Munich the " Institute of Mary," the nuns of which were not bound to enclosure. This new departure, or rather, return to old ideas, encountered vehement opposition and

difficulties that nearly wrecked it; but it has survived, and has been the pioneer in the extraordinary development of institutes of women devoted to external good works of every kind. St Vincent of Paul soon followed; in 1633 he established the Sisters of Charity, bound only by yearly vows, and wholly given up to works of charity — chiefly nursing in hospitals and in the homes of the poor, and primary education in poor schools.

As women are debarred from exercising the spiritual functions of the ministry, it follows that nuns have to devote themselves either to a more purely contemplative life, or else to a more wholly active one, than is usual among the orders of men, who commonly, in virtue of their priesthood, have been able to find a mixed form

of life between the two extremes. The nuns belonging to the older orders tend to the contemplative idea, and they still find recruits in sufficient numbers, in spite of the modern rush to the active congregations. These latter exist in wondrous number and variety, exercising every imaginable form of good work — education, both primary and secondary; the care of hospitals, orphanages, penitentiaries, prisons; of asylums for the blind, the deaf and dumb, the insane; of refuges for the aged poor and the destitute.

See the works of Helyot and Heimbucher, referred to below under "Literature"; also Lina Eckenstein, Woman under Monasticism (1896) ; and for information on the various orders of women, J. N. Murphy, Terra incognita (1873); and F. M. Steele, Convents of Great Britain and Ireland (1902).

16. Conclusion. — Few phenomena are more striking than the change that has come over educated Protestant opinion in its estimate of monasticism. The older Protestantism uncompro- misingly judged the monastic ideal and life to be both unchristian and unnatural, an absolute perversion deserving nothing but condemnation. But now the view of the critico-historical school of Protestant thought, of

which Dr Adolf Harnack is so represen- tative a spokesman, is that the preservation of spiritual religion in Catholic Christianity, both Eastern and Western, has been mainly, if not wholly, due to monasticism (see Harnack's early tractate Das Monchtum, translated under the title Monasticism, by E. E. Kellett, 1901; also the lectures on Greek and Roman Catholicism in Das Wesen des Christentums, translated by Bailey Saunders, 1902; the first-named work is the most suggestive general apergu of the whole subject — though written from a frankly hostile standpoint, it is in large measure a panegyric).

The views of the new Protestantism concerning monasticism are probably no less excessive than those of the old. The truth probably lies somewhere between them. It may perhaps be agreed that not the least of the services rendered to the Christian people at large by monasticism is this : Into every life the spirit of renunciation must enter; in most lives there are crises in which the path of mere duty can be followed only in virtue of a great renunciation; if we are able to make these ordinary and necessary renunciations, it is in some measure owing to the fact that the path has been made easier for us by those who (like the author of the Imitation of Christ) have shown the example, and thereby been able to formulate the theory, of renunciation in a supreme degree.

Literature. — The literature on monasticism is immense. The chief repertory for information on the historical side is Helyot's Histoire des ordres religieux (8 vols., 1714; 2nd ed. 1792 ; digested in dictionary form by Migne, i860). This information has been condensed and brought up to date by Max Heimbucher, Orden und Kongregationen (2 vols., 1896-1897; a 2nd ed. in 3 vols., 1907) — this most useful handbook is equipped throughout with an excellent and well chosen bibliography. Otto Zockler's Askese und Monchtum (1897), also covers the whole ground, and is written more from the point of view of theory. The inner spirit and working of the older monasticism is well portrayed in F.A.

Gasquet's English Monastic Life (1904); more popular accounts are given in H. J. Feasy's Monasticism (1898), and F. M. Steele's Monasteries and Religious Houses of Great Britain and Ireland (1903). The rules of the various orders are collected in Brockie's edition of Holsten's Codex regularum (6 vols., 1759). The article Monchtum in Herzog-Hauck Realencyklopddie (3rd ed.), and in Wetzer und Welte Kirchenlexicon (2nd ed.) go over the same general ground as the present article, in the earlier portion entering into greater detail as to facts, but in the later dealing much more sum- marily. The relevant separate articles in these two great diction- aries, Protestant and Catholic respectively, will supply adequate information and ample references on most points. The Catholic Dictionary contains useful articles on most of the subjects here touched on; and an extensive Catholic Encyclopaedia is in course of preparation at the Catholic University of Washington. The habits and dress of the various orders may be seen in Helyot's Histoire, which abounds in plates, coloured, in the ed. of 1792. There are plates representing members of the chief orders in Dugdale's Monas- ticon, and in the books of Gasquet and Steele mentioned above; also (coloured) in Tuker and Malleson, Handbook to Christian Rome s pt. iii. (1900). (E. C. B.)

MONASTIR, or Bitolia, the second city of Macedonia, and the capital of the vilayet of Monastir in European Turkey, on the Salonica- Monastir railway, 400 m. W. of Constantinople. Pop. (1905), about 60,000. Monastir is situated at an altitude

of 2019 ft. on the eastern versant of the richly wooded mountains which culminate in the Peristeri (8300 ft.) and sever Lake Prespa from the valley of the Kara-Su or Tzerna. A tributary of this river, the Dragor or Drahor, traverses Monastir through a rocky channel which is rarely filled except after a thaw or heavy rain. The city possesses many mosques,

churches and schools, baths and a military hospital. It is the seat of numerous con- sulates, an American Protestant mission, and a Lazarist mission. The annual value of its trade is about £400,000. Grain, flour, cloth, hides and bones are exported, and a large amount of gold and silver ornaments is manufactured, though this industry tends to decline.

The military advantages of its position at the meeting-place of roads from Salonica, Durazzo, Uskub, and Adrianople led the Turks, about 1820, to make Monastir the headquarters of an army corps. Since then the general and commercial impor- tance of the city has greatly increased, and in 1898 it was made the see of a Bulgarian bishop. The ancient diocese of its Greek archbishop is known as Pelagonia, from the old name of the Kara-Su Plain. Monastir itself has been identified wifh the ancient Heraclea Lyncestis on the Via Egnatia; its modern name is derived from the monastery of Bukova (" the beeches ") near the southern outskirts of the city.

MONAZITE, a mineral consisting of anhydrous phosphate of the cerium metals (Ce, La,Di)P04, together with small and vari- able amounts of thorium (ThC>2, 1-10%) and yttrium. It is of considerable commercial importance as a source of thoria for the manufacture of the Welsbach and other mantles for incandescent gas-lighting: the cerium is used to a limited extent in pharmacy.

The following analyses are of monazite from: (I.) Burke county, North Carolina; (II.) Arendal, Norway; (III.) Emmaville, Gough county, New South Wales.

I. II. III.

Phosphorus pentoxide (P2O5) . 29-28 27-55 2 5'°9

Cerium oxide (Ce 2 O s) . . 31 -38 29-20 36-64

Lanthanum oxide (La 2 3)) „„ 00 „< .c

Didymium oxide (Di 2 8) \ ' 3°'88 26-26 30-21

Yttrium oxide (Yt 2 O s) ... —

Thorium oxide (Th0 2) . . . 6-49

Silica (Si0 2) 1-40

Alumina (A! 2 3) .... —

Iron oxide (Fe 2 3) ... —

Lime (CaO) —

Water (H 2 0) 0-20

3-82

—

9-57 1-86

1-23 321

—

3-n

I-I3

0-69

—

0-52

—

99-63 100-60 99‘49

Specific gravity 5-10 5-15 5-001

Thoria and silica being often present in the molecular ratio I : I , it has been suggested that they exist as thorite (ThSi0 4) as a mechanical impurity in the monazite.

Crystals of monazite belong to the monoclinic system, and are usually flattened parallel to the ortho-pinacoid (a in the figure). The large (up to 5 in. in length) reddish- brown, dull and opaque crystals from Norway and the Urals are simple in

form, whilst the small, translucent, honey-yellow crystals from the Alps are bounded by numerous bright faces. Crystals of the latter habit were described in 1823 from Dauphine under the name turnerite, and owing to their rarity were not until many years afterwards analysed chemically and proved to be iden- tical with monazite. Monazite from the Urals was described by A. Breithaupt in 1829, and named by him fromGr. novofav, to be solitary, because of the rarity of the singly occurring crystals. The hardness is 55, and the specific gravity 5-1-5-2. Light which has traversed a crystal or grain of monazite exhibits a characteristic absorption spectrum, and this affords a ready means of detecting the mineral.

As minute idiomorphic crystals monazite is of wide distribu- tion in granites and gneisses, being present in very small amounts as an accessory constituent of these rocks. By powdering the rock and washing away the lighter minerals in a stream of water the heavy minerals (zircon, anatase, rutile, magnetite, garnet,

monazite, xenotime, &c.) may be collected. This separation has been effected naturally by the weathering and disintegration of the rocks and the accumulation of the heavier minerals in the beds of streams. Under these conditions monazite has been found as rounded water-worn grains in the alluvial gold-washings of the Urals, Finland, Siberia, the United States, Brazil, Colom- bia, New South Wales, &c, and in tin-gravels in Swaziland, South Africa. Larger crystals of monazite are found embedded in pegmatite veins in the Ilmen Mountains (southern Urals) ; at Arendal and other places in southern Norway, where it is col- lected in the feldspar quarries to the extent of about one ton per annum; and in the mica mines at Villeneuve in Quebec, where masses of monazite weighing 20 lb have been found. The small crystals of the ” turnerite ” habit occur implanted, often with anatase and rutile, on the crystallized quartz and albite, which line crevices in the crystalline schists of the French, Swiss and Tirolese Alps; similar crystals with the same

associations occur very exceptionally in the clay-slate at Tintagel in Cornwall. Microscopic crystals of monazite (cryptolite, from Kpvxros, concealed) have been observed embedded in the crystallized apatite of Arendal in Norway.

The deposits worked commercially are the monazite-bearing sands of North Carolina and Brazil, and to a smaller extent those of South Carolina. In North Carolina it occurs over a wide area in the streams rising in the South Mountains, an eastern outlier of the Blue Ridge. The rocks of the district are granitic biotite- gneiss and hornblende-gneiss, and are intersected by veins of auri- ferous quartz. The percentage of monazite in the river-gravels varies from very small amounts up to 1 or 2 . The heavy minerals contained in the gravels are collected in the same manner as in washing for gold (which is often also present) ; magnetite is separated with a magnet; but other minerals, such as zircon, rutile, garnet, corundum, &c, cannot be separated by mechanical means. The product is a fine-grained yellowish sand containing 65-85 of monazite and 3-9% of thoria. In Brazil it occurs in river-gravels and also in the sand on the sea-beaches ; an extensive accumulation of very rich monazite sand occurs on the seashore near Alcobaca in Bahia, and this has been shipped as ballast in the natural state.

See H. B. C. Nitze, ” Monazite ” (1 6th Annual Report of the United States Geological Survey, pt. iv. (1895), pp. 667-693). (L. J. S.)

MONBODDO, JAMES BURNETT, Lord (1714-1799), Scottish judge and anthropologist, was born in 17 14 at Monboddo in Kincardineshire. He studied at Aberdeen, and, after passing his law examinations in Edinburgh, he quickly took a leading position at the Scottish bar, being made a Lord of Session in 1767 with the title of Lord Monboddo. Many of his eccen- tricities, both of conduct and opinion, appear less remarkable to us than they did to his contemporaries; moreover, he seems to have heightened the impression of them by his humorous sallies in their defence. He may have had other

reasons than the practice of the ancients for dining late and performing his journeys on horseback instead of in a carriage. He is remembered more particularly for his writings on human origins. In his Antient Metaphysics (1779-1799), Monboddo conceived man as gradually elevating himself from an animal condition, in which his mind is immersed in matter, to a state in which mind acts independently of body. In his equally voluminous work, The Origin and Progress of Language (1773), he brought man under the same species as the orang-outang. He traced the gradual elevation of man to the social state, which he conceived as a natural process determined by " the necessities of human life." He looked on language (which is not " natural " to man in the sense of being necessary to his self-preservation) as a consequence of his social state. His views about the origin of society and language and the faculties by which man is distinguished from the brutes have many curious points of contact with Darwinism and neo-Kantianism. His idea of studying man as one of the animals, and of collecting facts about savage tribes to throw light on the problems of civilization, bring him into contact with the one, and his intimate knowledge of Greek philosophy with the other. In both respects Monboddo was far in advance of his neighbours. His studied abstinence from fine writing — from " the rhetorical and poetical style fashionable among writers of the present day " — on such subjects as he handled confirmed the idea of his contemporaries that he was only an eccentric

concocter of supremely absurd paradoxes. He died on the 26th

of May 1799.

Boswell's Life of Johnson gives an account of the lexicographer's visit to Burnett at Monboddo, and is full of references to the natural contemporary view

of a man who thought that the human race could be descended from monkeys.

MONCEY, BON ADRIEN JEANNOT DE, Duke of Conegliano (1754–1842), marshal of France, was the son of a lawyer of Besancon, where he was born on the 31st of July 1754. In his boyhood he twice enlisted in the French army, but his father procured his discharge on both occasions. His desire was at last gratified in 1778, when he received a commission. He was a captain when, in 1791, he embraced the principles of the French Revolution. Moncey won great distinction in the campaigns of 1793 and 1794 on the Spanish frontier (see French Revolu- tionary Wars), rising from the command of a battalion to the command in chief of the Army of the Western Pyrenees in a few months, and his successful operations were largely instru- mental in compelling the Spanish government to make peace. After this he was employed in the highest commands until 1799, when the government, suspecting him of Royalist views, dis- missed him. But the coup d'etat of 18. Brumaire brought him back to the active list, and in Napoleon's Italian campaign of 1800 he led a corps from Switzerland into Italy, surmounting all the difficulties of bringing horses and guns over the then formidable pass of St Gothard. In 1801 Napoleon made him inspector-general of gendarmerie, and on the assumption of the imperial title created him a marshal of France. In 1805 Moncey received the grand cordon of the legion of honour, and in 1808 the title of duke of Conegliano. In the latter year, the first of the Peninsular War, Moncey was sent to Spain in command of an army corps. He signalized himself by his victorious advance on Valencia, the effect of which was, however, destroyed by the disaster to Dupont at Baylen, and took a leading part in the emperor's campaign on the Ebro and in the second siege of Saragossa in 1809. He refused, to serve in the invasion of Russia, and therefore had no share in the campaign of the grande armee in 1812 and 1813. When, however, France was invaded (1814) Marshal Moncey reappeared in the field and fought the last battle for Paris on the heights of

Montmartre and at the barrier of Clichy. He remained neutral during the Hundred Days, feeling himself bound to Louis XVIII. by his engagements as a peer of France, but after Waterloo he was punished for refusing to take part in the court-martial on Ney by imprisonment and the loss of his marshalate. He was reinstated in 1816, and re-entered the chamber of peers three years later. His last active service was as commander of an army corps in the short war with Spain, 1823. In 1833 he became governor of the Invalides. He died on the 20th of April 1842.

MONCHIQUE, a town of southern Portugal, in the district of Faro (formerly the province of Algarve); 13 m. S. of Saboia station on the Lisbon-Faro railway, and 1 2 m. N. of Villa Nova on the Atlantic. Pop. (1900), 7345. Monchique is one of the principal Portuguese health-resorts, finely situated among the wooded heights of the Serra de Monchique, which rise on the west to 2963 ft. There are hot sulphur springs, with baths and a sanatorium 4 m. south. Wheat, millet, rye, beans, oranges, wine, olive oil and chestnuts are the chief products, and there is a woollen factory.

MONCTON, a city and port of entry in Westmoreland county, New Brunswick, Canada, 89 m. by rail N.E. of St John, at the head of navigation on the Petitcodiac river, the seat of the workshops and general offices of the Inter-Colonial railway and the eastern terminus of the new Grand Trunk Pacific railway. Pop. (1901), 9026. It has large stove factories, engine and boiler works, and is a flourishing manufacturing town. The workshops of the railway and great part of the town were swept away by fire in February 1906, but have been rebuilt on a larger and more modern scale.

MOND, LUDWIG (1839-1909), British chemist, was born at Cassel in Germany on the 7th of March 1839. After studying

at Marburg under Hermann Kblbe and at Heidelberg under Robert Bunsen, he came to England in 1862 and obtained a position in a chemical works at Widnes,

where he elaborated the practical application of a method he had devised for recovering the sulphur lost as calcium sulphide in the black ash waste of the Leblanc alkali process. He became a naturalized British subject in 1867. In 1873 he entered into partnership with Sir John Tomlinson Brunner (b. 1842-),whom he had

met when he was at Widnes, and thus founded the great chemical manufacturing firm of Brunner, Mond & Co. They began to make alkali by the ammonia-soda process, under licence from the Belgian chemist, Ernest Solvay, but at first the venture threatened to prove a failure. Gradually, however, the tech- nical difficulties were overcome and success assured, largely as a result of improved methods worked out by Mond for the recovery of the ammonia. About 1879 he began experiments in the economical utilization of fuel, and his efforts led him to the system of making producer-gas, known by his name (see Gas: II. For Fuel and Power). Later, while attempting to utilize the gas for the production of electricity by means of a Grove gas battery, he noticed that the carbon monoxide contained in it combined with nickel. The resulting compound, nickel car- bonyl, which was described to the Chemical Society in 1890, is both formed and decomposed within a very moderate range of temperature, and on this fact he based a successful process for the extraction of nickel from its ores. A liberal contributor to the purposes of scientific research, Mond founded in 1896 the Davy-Faraday Research Laboratory in connexion with the Royal Institution. On his death, which occurred in London on the nth of December 1909, he bequeathed «a large part of his collection of pictures to the nation.

MONDAY (in O.E. Monandaig, the moon’s day, a transla- tion of the Late Lat. Lunae dies, from which the French lundi is taken), the second day of the week (see Calendar). The day has been humorously canonized as St Monday, the festival of cobblers, who seldom work on Mondays, and were supposed not to know exactly on which day St Crispin’s (their patron saint) festival fell, save that it should be a

Monday, and thus celebrated each Monday in the year as a holiday so as to be certain to honour the day. In some parts of Yorkshire any holiday is called Cobblers' Monday. Collop Monday, in the north of England, is the Monday before Shrove Tuesday, so called in allusion to the dish of fried eggs and bacon, and slices of salted, dried meat, called collops, taken on that day prepara- tory to the Lenten fast. Plough Monday in England is the Monday after Twelfth Day, the first Monday after Epiphany, in allusion to the fact that in medieval times the ploughmen had their fete-day and went around the villages begging plough- money. The lord mayor of London holds a Grand Court of Wardmote at the Guildhall on Plough Monday of each year, to receive returns from the wards of the election of common councilmen and to hear petitions against such returns.

MONDONEDO, a city of northern Spain, in the province of Lugo, 27 m. N.N.E. of the city of Lugo, on the 1 river Masma. Pop. (1900), 10,590. Mondofiedo occupies a sheltered valley among the northern outliers of the Cantabrian Mountains. The principal buildings are the cathedral, a Corinthian structure of the 17th century, an ex-convent of Franciscan friars of Alcantara, which is used for a theatre and a public school, and the civil hospital. The industries include lace-making, linen-weaving, and leather manufacture.

According to local tradition, the bishopric of Dumium, near Braga, was transferred to San Martin de Mondofiedo (10 m. from Mondofiedo) in the 8th century; it was brought to Mondofiedo itself in the beginning of the 12th century. After having been for nearly a century and a half in the hands of the Moors, Mondofiedo was recaptured by Ordofio I. in 858; and the Christian possession was made permanent by Alphonso III. in 870. It was taken by surprise by the French in 1809.

MONDOVJ, a town and episcopal see of the province of Cuneo, Piedmont, Italy, 17 m. by rail E. of Cuneo. Pop. (1901), S379 (town); 18,982 (commune). The

lower town is 1283 ft.

above sea-level, the upper 1834 ft. There is a school of the industrial arts and handicrafts, and majolica, paper, and silk cocoons are produced. The upper town contains the hex- agonal piazza, a citadel, erected in 1573 by Emanuel Philibert, the cathedral of S. Donatus, a spacious episcopal palace, and higher up is a tower, the Belvedere, with a fine view. At the foot of the hill along the banks of the Ellero (a tributary of the Po) lie the industrial and commercial suburbs of Breo, Borgatto, Pian della Valle and Carassone, with their potteries, tanneries, paper-mills, marble-works, &c. The mansion of Count San Quintino in Pian della Valle was the seat of the printing-press which from 1472 issued books with the imprint Mons Regalis.

Mondovi — Mons Vici,Mons Regalis,Monteregale — did not take its rise till about a.d. iooo. The bishopric dates from 1388. About 2 m. to the east is the sanctuary of Vico, a church designed by Ascanio Vittozzi in 1596 and crowned by a famous dome (1730-1748), which has been declared a national monu- ment. In the square before it is a monument (1891) to Charles Emmanuel I. of Savoy.

See L. Melano Rossi, The Sanctuario of the Madonna di Vico (London, 1907).

MONET, CLAUDE (1840-), French painter, was born in Paris on the 14th of November 1840. His youth was passed at Havre, where his father had settled in 1845. Until he was fifteen years old he led a somewhat irregular life, learning little at school, and spending all his time in decorating his books with drawings and caricatures which gave him notoriety in Havre. At the same time he became acquainted with Boudin, a clever sea-painter, under whose guidance he learned to love and to understand nature., At the age of twenty he became a. soldier,

and spent two years of his military time with the regiment of the Chasseurs d'Afrique in the desert. Falling ill with fever, he was sent home, and entered the studio of Gleyre. This classical painter tried in vain to keep him to conventional art and away from truth and nature, and Monet left his studio, where he had become acquainted with two other " impression- istic " painters — Sisley and Renoir. At that time he also knew Manet (q.v.), and in 1869 he joined the group of Cezanne, Degas, Duranty, Sisley, and became a plein air painter.. During the war of 1870 he withdrew to England, and on his return was introduced by Daubigny to a dealer, M. Durand-Ruel, in whose galleries almost all his works have been exhibited. In 1872 he exhibited views of Argenteuil, near Paris; in 1874 a series entitled " Cathedrals," showing the cathedral of Rouen under different lights. He afterwards painted views of Vetheuil (1875, see Plate), Pourville and cliffs of Etretat (1881), of Bordighera (1886), of the Creuse (1889), Le Meules (1891), and some further views of cathedrals (1894). In December 1900 he exhibited some pictures called " Le Bassin des Nympheas," and was engaged at the beginning of 1901 in painting views of London. Several of Monet's paintings, bequeathed by M. Caillebotte, are in the Luxembourg Museum, Paris. (See Impressionism.)

MONETARY CONFERENCES (International). These assemblies were one of the features of the latter half of the 19th century, due to the decided tendency towards securing reforms by concerted international action. The disorganized state of the European currencies, which became more serious in conse- quence of the great expansion in trade and industry, came into notice through the great gold discoveries and their effect on the relations between the two precious metals. Both by its situation and its currency system, France was the country that was first led to aim at the establishment of a currency union, in which French ideas and influences would be predominant. A pre liminary step was the formation of the Latin union,

whereby the currencies of France, Italy, Belgium and Switzerland were — in respect to their gold and silver coins — assimilated. In 1867 the Paris Exhibition furnished the occasion for summoning a monetary conference, to which the principal countries of the world sent representatives. The guiding spirit of this assembly was the eminent economist, De Parieu, who had originated the Latin Union. By his advice a scheme was approved recommending the adoption of the single gold standard, the use of the decimal

system, and the co-ordination of the various currencies with the French system. Difficulties as to the mode of bringing these principles into practical operation were discussed, and full liberty had to be given to the several nations to carry out the proposals in the way that seemed best. The result proved that the obstacles were insurmountable, e.g. the British government could not obtain the assent of a Royal Commission to the assimi- lation of the sovereign to the 25-franc piece; and the course of political events soon completely altered the relative position of the leading countries, even in their monetary relations. Germany and the United States reformed their currencies, without reference to any international considerations.

The meeting of the next international conference took place under very different conditions. A great fall in the value of silver as measured in gold, in progress from 1873, had affected the relations of silver-using countries, and disturbed the level of prices. Indian interests as well as those of American producers of silver suffered, while the management of all double-standard currencies became a task of increasing difficulty. The govern- ment of the United States invited the representatives of the leading powers to meet in Paris for the purpose of considering (1) the desirability of retaining the unrestricted use of silver for coinage, (2) the adoption of international bimetallism (q.v.), by the acceptance of a ratio to be fixed by agreement. Eleven nations sent delegates, Germany being the

only great power unrepre- sented. After somewhat protracted discussion and the presen- tation of a large number of documents the European states accepted the American proposition ” that it is necessary to maintain in the world the monetary functions of silver “; but declined to bind the discretion of particular states as to the methods to be employed. They further declared it impossible to enter into an agreement for a common ratio. The conference, therefore, separated without any result being obtained.

In consequence of the continuing fall in the value of silver, which stimulated the bimetallic agitation, a third conference was convened by the joint action of France and the United States; it also met in Paris, and was more influential than its predecessor, since Germany sent representatives, as did Spain, Portugal, Denmark and India. The characteristic of this conference was the greater strength of the support given to the bimetallic proposal by France and the United States, together with the opposition of the delegates of the smaller European countries, and the refusal of Germany to promise any co-operation. The inevitable consequence of this situation was the adjournment of the conference to obtain fresh instructions, which, however, were never furnished.

After several abortive attempts the fourth (and last) of the conferences of this class was brought together at Brussels in November 1892 on the initiative of the United States. A full representation of the powers attended, but delay arose from the absence of definite proposals by the American government. These, when they were presented, proved to be only a reaffirma- tion of the bimetallic policy, and showed no advance. The conference, therefore, proceeded to consider the plans of Levy, Baron de Rothschild and Sotbeer for the more extended use of silver. Such devices, being merely alleviations, failed to gain any effective support. Appeals to England and Germany to grant some concessions likewise failed. Thus, like its Paris forerunners, the Brussels conference

adjourned, but never resumed its sittings.

After 1892 the currency problem passed into a new stage, in which action was national rather than international. The method of procedure by conference was for the time abandoned.

The proceedings of the several conferences have been issued by the governments taking part in them. Those of the United States are the most convenient for English and American readers. See also H. B. Russell, International Monetary Conferences (New York, 1898). (C. F. B.)

MONEY, r. Definition and Functions. — The difficult question as to the best definition of money has been complicated by the efforts of writers so to define the term as to give support to their particular theories. It is hard to frame a precise account which

will hold good of the many objects that have served for monetary use.. From denoting coined metal, money has come to include anything that performs the money work: though there has been considerable hesitation in extending the term to those forms of credit that are in modern societies the chief instrument of exchange. It is therefore best to avoid a formal definition; and, instead, to bring out the character of money by describing the functions that it performs in the social system. The most important is, clearly, that of facilitating exchange. It is not necessary to dwell on the great importance of this office. The slightest consideration of industrial organization shows that it is based on the division of employments; but the earliest economic writers saw plainly that division of employments was only possible through the agency of a medium of exchange. They recognized that the result of increasing specialization of labour was to establish a state of things in which each individual

pro- duced little or nothing for the direct satisfaction of his own wants, and had therefore to live by exchanging his product for the products of others. They saw, further, that this only became feasible by the existence of an article that all would be willing to accept for their special products; as otherwise the difficulty of bringing together persons with reciprocal wants would prove an insurmountable obstacle to that development of exchange, which alone made division of labour possible. A second function hardly inferior in importance to the one just mentioned is that of affording a ready means for estimating the comparative values of different commodities. Without some common object as a standard of comparison this would be practically impossible. ” If a tailor had only coats and wanted to buy bread or a horse, it would be very troublesome to ascertain how much bread he ought to obtain for a coat or how many coats he should give for a horse “; and as the number of commodities concerned increased the problem would become harder, ” for each commodity would have to be quoted in terms of every other commodity.” There is, indeed, a good deal to be said for the view that the conception of general exchange value could never have been formed without the previous existence of money; it has certainly support from the evidence of competent observers respecting the methods of exchange followed by savage communities. The selection of some particular article as the criterion makes the comparison of values easy. ” The chosen commodity becomes a common denominator, or common measure of value in terms of which we estimate the value of all other goods,” and in this way money, which in its primary function renders exchange possible by acting as an intermediate term in each transfer, also makes exchanges easier by making them definite. Still another function of money comes into being with the progress of society. One of the most distinctive features of advancing civilization is the increas- ing tendency of people to trust each other. There is thus a con- tinuous increase in relations arising from contract, as can be seen by examining the

development of any legal system. Now, a contract implies something to be done in the future, and for estimating the value of that future act a standard is required; and here money which has already acted as a medium of exchange and as a measure of value at a given time, performs a third function, by affording an approximate means of estimating the present value of the future act; in this respect it may be regarded as a standard of value, or as some prefer to say, of deferred payments. Nor does this exhaust the list of services that money renders. In the earlier stages of economic life it acts as a store of value; for in no other way could a large body of wealth be concentrated. Though this is no longer needed by individuals, even at the present day the great banks find that their reserves must take the form of a monetary store. Again, money in its various forms has been the great agency for transmitting values from place to place. Its international function in this respect still continues. The balance of debt between countries is ultimately settled by the passage of bullion from the debtor to the creditor nation. But, though money has these powers, it is nevertheless correct to say that its essential functions are three in number, i.e. it supplies: (1) the common medium by which exchanges are made possible; (2) the common measure by which the comparative

values of those exchanges are estimated; (3) the standard by which future obligations are determined.

2. The Value of Money, its Determining Causes. The Quantity of Money required by a Country. — The value of money is in principle only a special case of the general problem of value; but owing to its peculiar position the medium of exchange has in this respect become surrounded by difficulties that need to be removed. The very phrase ” value of money ” is employed in two senses, which on the surface seem to have no connexion with each other, and are the cause of much confusion to those who have not looked into the matter. In mercantile phraseology the value of money means the interest charged for the use of loanable capital. When the market rate of interest

is high, money is said to be dear; when it is low, money is regarded as cheap. Without entering into the reasons for this use of the term, it is sufficient to state the other and for our present purpose more correct meaning of the phrase. As the value of a thing is what it will exchange for; so ” the value of money is what money will exchange for, or its purchasing power. If prices are low, money will buy much of other things, and is of high value; if prices are high, it will buy little of other things, and is of low value. The value of money is inversely as general prices, falling as they rise and rising as they fall.” Now the proximate condition under which value is determined is admittedly the establish- ment of an equation between demand and supply. In the case of money, however, some explanation as to the nature of both these elements in the problem becomes necessary. In what forms is the supply of, and the demand for, money exhibited ? The supply of a commodity is the quantity of it which is offered for sale. But in what shape does the sale of money take place ? Plainly, by being offered for goods. . The supply of money is the quantity of it which people are wanting to lay out, i.e. all the money in circulation at the time. Demand, in like manner, means the quantity of a commodity desired, or, according to another mode of expression, the amount of purchasing power offered for it. Taking the latter as the more convenient for the case of money, we can say that the demand for it consists in all goods offered for sale. The position of money as the medium of exchange introduces a further novel feature; for the market in its case is world-wide and the demand is unceasing; money is consequently in a constant state of supply and demand. It thus appears that the factors determining the value of money at a given time are: (1) the amount of money in circulation, and (2) the amount of goods on sale. Closer examination reveals other influencing conditions. The mere quantity of money is not the only element on the supply side. The varying circula- tion of the monetary units must be taken into account. Some coins do not make a single purchase in a year, while

others change hands in transactions hundreds of times. By averaging, we may estimate the effect of the rapidity with which money does its work, or, to employ a technical term, the ” efficiency of money.” Similarly, the amount of sales rather than the quantity of commodities is the determining element on the demand side. Thus, if the influence of credit be omitted, it is true to say that the value of money varies inversely as its quantity multiplied by its efficiency, the amount of transactions being assumed to be constant. Some additional explanation is required before this formula can be accepted as an expression of the whole truth on the subject. It must be noticed that it is not commodities only that are exchanged for money. Services of all kinds consti- tute a large portion of the demand for the circulating medium, while the payment of interest on the many kinds of obligations makes a further call on it. The potent influence of credit must also be recognized. The latter force is indeed the chief agency to be considered in dealing with the variations of prices; though so far as it is based on deposits of metallic money it may be regarded as a form of increased monetary efficiency, and therefore as coming within the formula given above. In its wider aspect, credit acts as a substitute for ordinary money, and may be interpreted as equivalent to a system of perfected barter, or, better, as a new currency development. An interesting but paradoxical conclusion should be noticed: it is that increased

trade and expanding business are causes which operate not to raise, but to lower prices; for by enlarging the work that money has to do they raise its value, i.e provided that other things remain the same. Another more obvious deduction is that a large addition to the stock of money does not necessarily raise prices, since money is only effective when brought into circulation.

The chief topic of dispute in respect to the theory of money- value has been concerned with the question as to the ultimate regulating influence. The value of freely produced commodities is — according to economic theory — determined by ” cost of production,” or, where the article is produced at different costs, by the cost of production under the most unfavourable circum- stances. As demand varies with price, it follows that an adjustment of value takes place through the interaction of cost and demand, the latter indicating the influence of the utility of the commodity on the quantity required. In applying the theory to the special case of money, the first consideration is the fact that gold and silver, the principal money materials, are the products of mines, and are produced at different costs, so that their values depend on the portions raised at greatest cost. We thus obtain the proposition that has figured in so many text- books; viz. that ” the value of money depends on its cost of production.” The theory of normal value, however, involves certain assumptions, which are significant in this connexion. Competition is conceived as absolutely free; it is assumed that there are accurate data for computing costs, and that the deter- mination of value by cost is effective only ” in the long run.” It is recognized, also, that cost operates on value through its power in regulating supply. ” The latent influence,” says Mill, “by which the value of things are made to conform in the long run to the cost of production is the variation that would other- wise take place in the supply of the commodity.” From such considerations it follows that the influence of cost on the value of money is not so predominant as a rigid interpretation of the theory of value seems to suggest.

In earlier times it has been a common proceeding on the part of governments to restrict or stimulate both mining for the precious metals and the business of coining. At all times the working of gold and silver mines has been rather a hazardous speculation than a legitimate business. ” When any person undertakes to work a new mine in Peru,” says Adam

Smith, ” he is universally looked upon as a man destined to bankruptcy and ruin, and is upon that account shunned and avoided by everybody. Mining, it seems, is considered there in the same light as here, as a lottery in which the prizes do not compensate the blanks.” The modern capitalistic organization of gold mining has not done much to alter this con- dition. As regards the adjustment of supply to meet an altered cost of production the difficulties are, if possible, greater. The actual supply of money is so large, when compared with the annual production of the precious metals, that a change in output can operate but slowly on its value. The total stoppage of fresh supplies from the mines would not be sensibly felt for some years ; and though increased production is more rapid in its operation, it takes some time to produce a decided effect. Hence the conclusion is reached that ” the effects of all changes in the conditions of production of the precious metals are at first, and continue to be for many years, questions of quantity only, with little reference to cost of production.” This is the position which is usually known as that of the ” quantity ” theory; though very different degrees of doctrine are comprised under the general title. With due qualification and comment it may be taken as the prevalent theory. At all events it is beyond dispute that the cost of production is not for short periods the controlling force which governs the value of money; while even for long periods its influence is very hard to ascertain, in consequence of the speculative nature of the industries of gold and silver mining. Another peculiar feature of the problem of money value arises from the fact that it is only through an actual change in the supply of money that its value can be altered. With other commodities the knowledge that they can be produced at lower cost will bring about a reduction in their value. In the case of money, this does not hold. There must be an adjustment of the amount, or of the efficiency, of the money stock, since, as ex- plained above, it is in a constant state of supply and demand. Its value is established in the very process of carrying on

exchanges, and that process is influenced by the available supply. In regard to another form of money the effect of the amount in existence is still more decisive. This is paper money, not immediately redeemable in coin. In this case the idea of cost is manifestly inapplicable; the quantity in circulation is evidently, as proved by abundant tacpenence, the ruling influence on value. In fact, the ” quantity ”

theory receives its simplest illustration in the case of inconvertible paper. The truth that the theory is but an instance of the action of supply and demand is equally shown by this prominent class of instances. Where metallic coinage is artincally limited the same principle holds good. The value of such currencies plainly depends on the conditions of supply and demand.

The immense growth of credit and its embodiment in instru- ments that can be used as substitutes for money has led to the promulgation of a view respecting the value of money which may be called the ” credit ” theory. According to the upholders of this doctrine, the actual amount of metallic money has but a trifling effect on the range of prices, and therefore on the value of money. What is really important is the volume of credit instruments in circulation. It is on their amount that price movements depend. Gold has become only the small change of the wholesale markets, and its quantity is comparatively un- important as a determinant of prices. The theory has some connexion with the view of ” money ” as consisting in the loanable capital of the market, taking shape in the cheques that transfer liabilities. Thus the rate of interest comes to form a factor in the creation of ” money,” and the mercantile use of the phrase ” value of money ” receives a justification. Like the pure ” cost ” theory of money value, the ” credit ” theory gives too one-sided a view of the facts. In particular, it fails to recognize the ultimate dependence of all kinds of credit on the stock of money in the full sense, i.e. on metallic legal- tender money. The truths adumbrated in the theory are better ex- pressed in the statement of the

quantity theory in its developed form, as set forth above. It is necessary to take into account the varying quantities of the precious metals, the modes of use in respect to them; the influence of cost of production, and the way in which credit expedients replace standard money. A complete theory must include all these elements, while not unduly emphasizing any one of them.

At the beginning of statistical inquiry much attention was given to the question: What quantity of money does a country require for the proper working of its industrial system? Petty and Locke were ready to give definite answers; but modern inquirers decline making any quantitative statement, and content themselves with indicating the conditions to be considered. Amongst these are: Population, amount of transactions, the efficiency of money, the development of credit, and the height to which banking organization has attained. Other elements in the problem are the disposition towards hoarding, and the employment of some form of barter in transactions. The contrast between India and the United States in monetary and industrial habits supplies an effective series of illustrations on this matter. The conclusion is obvious that economic , progress is accompanied by a more sparing use of money. The most important aspect of the question in modern times is in relation to the division of money between countries. Regarded from this point of view, the quantity of money that a country needs is that which will keep its prices in due level with those of the countries with which it has commercial relations. For, this is the condition of equilibrium ; there would otherwise be an excess of either exports or imports, involving a transfer of money to adjust the balance. It may be added that the organization works automatically, since fluctuations in the stock of money are corrected by the action of trade. The best estimates place the gold circulation of the United Kingdom at somewhat under £100,000,000, the token currency at about £15,000,000, and the note circulation as nearly £43,000,000. The French use of metallic money is

much larger; probably over £200,000,000, and the note circulation is also over £200,000,000.

3. Early Forms of Currency. — Up to the present we have considered money as being fully established and properly adapted to fulfil its various functions. We have now to trace the steps by which a suitable system of currency was evolved from a state of barter. It is important for a right understanding of the question to grasp the fact that exchanges took place originally between groups, and not between individuals. The slow growth of exchanges is thus explained, as each group produced most of the articles necessary for itself, and such acts of barter as took

place were rather reciprocal presents than mercantile exchanges. Such is actually the case among modern savages. ” It is in- structive to see trade in its lowest form among such tribes as the Australians. The tough greenstone valuable for making hatchets is carried hundreds of miles by natives, who receive from other tribes in return the prized products of their districts, such as red ochre to paint their bodies with; they have even got so far as to let peaceful traders pass unharmed through tribes *at war, so that trains of youths might be met, each lad with a islab of sandstone on his head to be carried to his distant home ‘and shaped into a seed-crusher. When strangers visit a tribe they are received at a friendly gathering or corrobboree, and presents are given on both sides. No doubt there is a general sense that the gifts are to be fair exchanges, and if either side is not satisfied there will be grumbling and quarrelling; but in this roughest kind of barter we do not yet find that clear notion of a unit of value which is the great step in trading.” This vivid description of E. B. Tylor’s enables us to realize the way in which money came into existence. When any commodity becomes an object of desire, not merely from its use

to the persons desiring it, but from their wanting it as being readily exchangeable for other things, then that article may be regarded as rudimentary money. Thus the greenstone and ochre are on their way to being promoted to the position of currency, and the idea of a ” unit of value ” is all that is needed to complete the invention. ” This higher stage is found among the Indians of British Columbia, whose strings of haiqua-shells worn as orna- mental borders to their dresses serve them also as currency to trade with — a string of ordinary quality being reckoned as worth one beaver’s skin.” Such shells are in reality money, inasmuch as they discharge its functions.

On a review of existing savage tribes and ancient races of more or less civilization we are surprised at the great variety of objects which have been used to supply the need of a circulating medium. Skins, for instance, seem to be one of the earliest forms of money. They have been found among the Indians of Alaska performing this service, while accounts of leather money seem to show that their use was formerly more general. As the hunting stage gives place to the pastoral, and animals become domesticated, the animal itself, instead of its skin, becomes the principal form of currency. There is a great mass of evidence to show that, in the most distant regions and at very different times, cattle formed a currency for pastoral and early agricultural nations. Alike among existing barbarous tribes, and in the survivals discovered among classical nations, sheep and oxen both appear as units of value. Thus we find that at Rome, and through the Italian tribes generally, ” oxen and sheep formed the oldest medium of exchange, ten sheep being reckoned equivalent to one ox. The recognition of these objects as universal legal representatives of value, or, in other words, as money, may be traced back to the epoch of a purely pastoral economy.” The Icelandic law bears witness to a similar state of things; while the various fines in the different Teutonic codes are estimated in cattle. The Latin word pecunia {pecus) is an

evidence of the earliest Roman money being composed of cattle. The English fee and the famous term feudal, according to its most probable etymology, are derived from the same root. In a well-known passage of the Iliad (vi. 235-6) the value of two different sets of armour is estimated in terms of oxen. The Irish law tracts bear evidence as to the use of cattle as one of the measures of value in early Irish civilization. Similarly, oxen from the principal wealth and the circulating medium among the Zulus and Kaffirs. On the testimony of an eye-witness we are assured that, " as cattle constitute the sole wealth of the people, so they are their only medium of such transactions as involve exchange, payment or reward." So also we find that cattle-rents are paid by the pastoral Indian tribes to the United States govern- ment. From the prominence of slavery in early societies it is reasonable to suppose that slaves would be adopted as a medium of exchange, and one of the measures of value in the Irish law tracts, cumhal, is said to have originally meant a female slave. They are at present applied to this purpose in Central Africa, and also in New Guinea. On passing to the agricultural stage a greater number of objects are found capable of being applied to currency purposes. Among these are corn — used even at present in Norway — maize, olive oil, coco-nuts and tea. The most remarkable instance of an agricultural product being used as currency is to be found in the case of tobacco, which was adopted as legal tender by the English colonists in North America. Another class of articles used for money consists of ornaments, which among all uncivilized tribes serve this purpose. The haiqua-shells mentioned before are an instance, cowries in India, whales' teeth among the Fijians, red feathers among some South Sea Island tribes, and finally, any attractive kinds of stone which can be easily worked. Mineral products, so far as

they do not come under the preceding head, furnish another class. Thus salt was used in Abyssinia and Mexico; while the metals — a phenomenon which will require a more careful examination — -have succeeded

in finally driving all their inferior competitors out of the field, and have become the sole substances for money.

4. The Metals as Money. Reasons for their Adoption. Superi- ority of Silver and Gold. — The employment of metals as money material can be traced far back in the history of civilization; but as it is impossible to determine the exact order of their appearance in this capacity, it will be convenient to take them in the order of their value, beginning with the lowest. Iron — ■ to judge from the statement of Aristotle — was widely used as currency. One remarkable instance is the Spartan money, which was clearly a survival of a form that had died out among the other Greek states; though it has often been attributed to ascetic policy. In conjunction with copper, iron formed one of the constituents of early Chinese currency, and at a later time was used as a subsidiary coinage in Japan. Iron spikes are used as money in Central Africa, while Adam Smith notes the employ- ment of nails for the same purpose in Scotland. Lead has served as money, e.g. in Burma. The use of copper as money has been more extensive than is the case in respect to the metals just mentioned. It, as stated, was used in China along with iron — an early instance of bimetallism — and it figured in the first Hebrew coins. It was the sole Roman coinage down to 269 B.C. and it has lingered on to a comparatively recent date in the backward European currencies. It even survives as a part of the token coinage of the present. Tin has not been a favourite material for money: the richness of the Cornish mines accounts for its use by some British kings. Silver holds a more prominent place than any of the preceding metals. Down to the close of the 18th century it was the chief form of money, and often looked on as forming the necessary standard substance. It was the principal Greek money material, and was introduced at Rome in 269 B.C. The currencies of medieval Europe had silver as their leading constituent; while down almost to the present day Eastern countries seemed to prefer

silver to gold.

The pre-eminence of gold as money is now beyond dispute; there, is, however, some difficulty in discovering its earliest employment. It is, perhaps, to be found in ” the pictures of the ancient Egyptians weighing in scales heaps of rings of gold and silver. ” According to W. Ridgeway’s ingenious theory gold comes into use as a currency in due equation to the older cattle- unit, the ox. It was certainly employed by the great Eastern monarchs; its further development will be considered later on. Metals of modern discovery — such as nickel and platinum — are only used by the fancy of a few governments, though the former makes a good token coinage.

The preceding examination of the varied materials of currency, metallic and non-metallic, suggests some conclusions respecting the course of monetary evolution, viz.: (1) that the metals tend to supersede all other forms of money among progressive com- munities; and (2) that the more valuable metals displace the less valuable ones. The explanation of these movements is found • in the qualities that are specially desirable in the articles used for money. There has been a long process of selection and elimination in the course of monetary history.

First, it is plain that nothing can serve as money which has not the attributes of wealth; i.e. unless it is useful, transfer? \)le and limited in supply. As these conditions are essential to the existence of value, the instrument for measuring and transferring values must possess them. A second requisite of great effect is the amount of value in proportion to weight or mass. High value in small bulk gives the quality of portability, want of which has been a fatal obstacle to the continued use of many early forms of money. Skins, corn and tobacco were defective in this quality, and so were iron and copper. Sheep and oxen, though technically described as ” self-moving,” are expensive to transport from place to place. That the material of money shall be the same throughout, so that one unit shall be equal

in value to another, is a further desideratum, which is as decidedly lacking in cattle-currency as it is prominent in the metals. It is, further, desirable that the substance used as money shall be

capable of being divided without loss of value, and, if needed, of being reunited. Most of the articles used in primitive societies — such as eggs, skins and cattle — fail in this quality. •Money should also be durable, a requirement which leads to the exclusion of all animal and most vegetable substances from the class of suitable currency materials; To be easily recognized is another very desirable quality in money, and moreover to be recognized as of a given value. Articles otherwise well fitted for money-use, e.g. precious stones, suffer through the difficulty of estimating their value. Finally, it results from the function of money as a standard of value that it should alter in its own value as little as possible. Complete fixity of value is from the nature of things unattainable; but the nearest approximation that can be secured is desirable. In early societies this quality is not of great importance; for future obligations are few and inconsiderable. With the growth of industry and commerce and the expansion of the system of contracts, covering a distant future, the evil effects of a shifting standard of value attract attention, and lead to the suggestion of ingenious devices to correct fluctuations: These belong to the later history of money and currency movements. It is enough for the ordinary pur- poses of money that it shall not alter within short periods, which is a characteristic of the more valuable metals, and particularly of silver and gold, while in contrast such an article as corn changes considerably in value from year to year.

From the foregoing examination of the requisites desirable in the material of money it is easy to deduce the empirical laws which the history of money

discloses, since metals, as compared with non-metallic substances, evidently possess those requisites in a great degree. They are all durable, homogeneous, divisible and recognizable, and in virtue of these superior advantages they are the only substances now used for money by advanced nations. Nor is the case different when the decision has to be made between the different metals. Iron has been rejected because of its low value and its liability to rust, lead from its extreme softness, and tin from its tendency to break. All these metals, as well as copper, are unsuitable from their low value, which hinders their speedy transmission so as to adjust inequalities of local prices.

The elimination of the cheaper metals leaves silver and gold as the only suitable materials for forming the principal currency. Of late* years there has been a very decided movement towards the adoption of the latter as the sole monetary standard, silver being regarded as suitable only for a subsidiary coinage. The special features of gold and silver which render them the most suitable materials for currency may here be noted. ” The value of these metals changes only by slow degrees; they are readily divisible into any number of parts which may be reunited by means of fusion without loss; they do not deteriorate by being kept; their firm and compact texture makes them difficult to wear; their cost of production, especially of gold, is so consider- able that they possess great value in small bulk, and can of course be transported with comparative facility; and their identity is perfect.” The possession by both these metals of all the qualities needed in money is more briefly but forcibly put by Cantillon when he says that ” gold and silver alone are of small volume, of equal goodness, easy of transport, divisible without loss, easily guarded, beautiful and brilliant and durable almost to eternity.” This view has even been pushed to an extreme form in the proposition of Turgot, that they became universal money by the nature and force of things, independently of all convention and law, from which the deduction has been drawn that to

proscribe silver by law from being used as money is a violation of the nature of things.

5. The Introduction and Development of Coinage. The State and Money. — The earliest metallic currencies passed by weight; they were, in fact, commodities, though used in a special way. The Hebrew records, as well as the Greek writers, bear witness to the prevalence of this primitive system. Thus, Aristotle, after ex- plaining the circumstances that led to the invention of money, points out how it was at first defined simply by size and weight, although finally men went further and set a stamp on every coin to relieve them from the trouble of weighing it." {Pol. i. 9, 8.)

Coinage systems have had a long period of growth, in which two distinct stages can be noted. In the first only the quality or fine- ness of the metal is denoted by the stamp, no attempt being made to fix the weight. The stamp, so to speak, acts as a kind of hall- mark. The cubes of gold employed by the Chinese may have been the earliest coins. Modern authorities accept the view of Herodotus that gold and silver coins were first used by the Lydians ; the same author mentions that the first Greek coinage was at Aegina by Pheidon of Argos. In order to complete the invention it became necessary to certify the weight of metal in the coin as well as its fineness. A further result was the establishment of a regular shape for the purpose of preventing any tampering with the coin after its manufacture. Though Various experiments in form were made, by the production of hexagonal and octagonal coins, the universally accepted shape came to be that of a flat circle, each side of which is stamped, as also in many cases the edge. The great number of the Greek city states afforded ample opportunities for experiment and competition, and rapid progress in the direction of securing good currencies was made. The improvement in the Greek coinages may be regarded as the consequence, and in some degree a cause, of their growing commerce. From Greece the art of coining was introduced into Italy by the Hellenic settlers and traders, and became one of the

essential features of a civilized society. Progress, however, did not stop with the establishment of the institution of coined money. A number of practical questions had to be decided respecting the best way of overcoming the difficulties that certain technical problems presented. In spite of early experience, it has at times been suggested that the circular form might be replaced by some other, e.g. the square or oblong. Practice has confirmed the wisdom of the old-established shape. Another question was in respect to the limits of size that were most suitable for coins. Here the lower limit is prescribed by the con- venience of the users. Coins that are easily lost, or picked up with trouble, such as the British threepenny piece and the American gold dollar, ought not to be issued. The determination of the upper limit presents greater difficulties. Very large pieces are hard to coin, and they give facilities for improper treatment by drilling holes and filling them up with cheaper metal, or even for the entire removal of the interior, the faces being preserved. The attractive appearance of large gold coins is no compensation for this danger. The English sovereign and, in silver, the half-crown seem to come near the upper limit of safe issue. The comparative wear of coins of different sizes must be considered. A long series of experiments, supported by ordinary experience, goes to show that the smaller coins wear more rapidly. The English mint in 1833 estimated the loss per cent, per annum at 2s. 6d. on half-crowns, 4s. on shillings, and 7s. 6d. on sixpences. There are accordingly reasons for adopting a medium size in preference to large or small coins. The actual coins issued have, of course, to be adapted to the requirements of the particular community. Even prejudices must be taken into due account. The designs employed in con- nexion with coinage have proved a fruitful field for the student of Numismatics (q.v.). From the monetary standpoint the aim of the design is to prevent either counterfeiting or the abstraction of any portion of the metal. For the former purpose careful execution in designing and the use of powerful machinery are

the really effective safeguards. The latter is best obviated by pro- tecting the edges by the process of milling, to which a raised inscription has sometimes been added. Great advances have been made in the organization of the modern Mint (q.v.) by the use of new appliances and scientific methods. The question of the proper alloy in coins lias received a great deal of attention. As gold and silver are both by nature soft, some other metal, such as copper or tin, has to be added, in order to secure the necessary hardness. The English gold coins have an alloy of one-twelfth ; the silver coins one of three-fortieths. Far more general is the alloy of one-tenth, which is probably due to the sentiment in favour of a decimal system ; but at any rate is simple for calculations. There does not appear to be any strong technical reason for pre- ferring either of these alloys to the other. The French mint authorities are in favour of their one-tenth; while the English ones adhere to the alloy of one-twelfth. There is agreement only on the point that a very small amount of alloy, e.g. that of one in seventy-two, as used in the Austrian ducat, does not give the requisite hardness.

A question of far more importance, both politically and economic- ally, is that of the issue of money, and the power of the state in regard to it. In the ruder societies, where money was not sharply distinguished from commodities, no difficulty presented itself. Skins, shells or cattle were money — so to speak — by the force of things; and the same condition persisted as long as crude metals were employed. But with the introduction of coinage the idea of a regulating authority came into being. The necessity of enforcing contracts and the parallel system of penalties made it incumbent on the ruler and judges to provide due standards of payment. The combined effect of these influences was reinforced by the establishment of the rudimentary forms of state revenue, which made it a matter of interest to the ruler to provide a good medium of payment. Accordingly, with the origin of the organized state, we find the coinage as a special prerogative of the

king, though

private persons often exercised the privilege of coining. The very large number of the autonomous cities of Greece, which possessed the right of issuing money, was the cause of the competition between different currencies, each having legal tender power only within its own city. In its practical outcome this ” free coinage ” system proved beneficial, for it compelled the maintenance of the true standard in order to gain wider circulation. With the establish- ment of larger states the control over the issue of money grew more stringent. In the later Roman Empire the right of coining was reserved to the emperor exclusively. After the fall of the empire the traditions of prerogative passed on to the medieval kings, a right carefully guarded by the English sovereigns. In France and Germany the principal nobles claimed this seignorial right, but in the modern state the regulation money has been definitely vested in the supreme authority, i.e. the sovereign.

One reason for the close connexion of money with the state is the fact that there is one attribute of currency which comes within the area of work specially allotted to the public authority. Money ought to have the power finally to close a transaction, i.e. to say it should be ” legal tender.” This ” liberating power,” as the French call it, might be regarded as one of the money functions. Those who look on money as a purely legal institution naturally take this view; it seems, however, better to take the economic conditions as the really fundamental ones. It is only on account of their economic effects that legal regulations require consideration. These effects are, indeed, very far-reaching. By prescribing the standard and amount of penalties, by their power of selecting the substances to be used as money, and by their frequent interferences with existing currencies, the

governments of the world have guided — as well as very often disturbed — the normal course of development. What Aristotle regarded as the ” unnatural ” character of money is mainly attributable to state intervention. But it is important to remember that the sphere of governmental action in respect to money is limited. A currency system is never an arbitrary creation ; it must grow slowly out of the habits and customs of the community, and must subserve its economic needs. No sudden change at the caprice of the state is likely to continue. Further, it is clear that no government can determine the results of its interference; these will depend on the existing conditions and will conform to economic law. Monetary history is rich in examples of the failure of legal enactment to direct the course of events, and of the disasters that have followed on the ill-advised measures of public authority.

One result of the close connexion of the state with the business of coining has been the establishment of regulations in reference to the expense of the process. As coins are manufactured articles it seems evident that a charge sufficient to cover the cost may rightly be imposed. Such a charge is described by the term Seignior- age (q.v.). It has in many cases been so fixed as to bring in a large profit to the government; but then it amounts to a depreciation of the currency; for the levy of a charge on coining is the same as the substraction of so much metal from the coins issued. English policy is peculiar in its adoption of gratuitous coinage of gold, an anomaly due in its origin to the prejudices of the mercantile doc- trines, but defended on the ground of the convenience to trade from the equivalence of gold bullion and coin. The heavy seignior- age on the silver coins — at present over 60% — is a source of con- siderable profit; in some years exceeding £800,000. All other countries levy moderate charges on their gold coinages, and make profit on their silver issues, though in different ways. As it has become the duty of the state to maintain the currency in a sound condition, it has

to deal with the question of its expense. This is composed of several elements, viz. (1) the cost of manufacture, just mentioned; (2) the loss through the wear which money under- goes in the work of circulating; and (3) the interest on the capital sunk in the monetary stock. A country with a metallic circulation of £100,000,000 incurs a loss of the interest which that amount of capital would produce by investment, i.e. at 4% £4,000,000. The expense is amply justified by the services that a good currency renders; but, at the same time, it proves the desirability of any economies that do not detract from efficiency. The great economiz- ing agency is the use of representative money and the various forms of credit, in which so much of the latest advances consist.

6. Representative Money; its Introduction and Development. The Mode in which Credit is used as Money. — Economy in the employment of the precious metals is naturally suggested by ordinary experience; but the way in which states have profited by the expedient of depreciation affords a special inducement to follow what is practically the same course, and issue paper documents in place of the more costly metallic medium. In theory, as Ricardo explained, a paper currency is one in which the whole value has been appropriated as seigniorage. The cost of keeping a stock of valuable money is obviated, and the new instrument of exchange is supported by state authority. Here the action of economic conditions is instructively illustrated; for though a government can set up a paper currency, it is not within its power to prescribe its value. The quantity theory

(§ 2) is confirmed by the inevitable decline in value when issue passes a definite point. The only effective mode of pre- venting depreciation is by limiting the amount of paper money to that of the metallic money previously in circulation. The easiest way to accomplish this is to leave the use of the paper currency optional by making it convertible into coin at the will of the holder. The amount of the circulation is thus automatic- ally

fixed by the action of the community. An evident dis- advantage is the necessity of keeping an adequate reserve of coin to meet actual and prospective demands. For ideal security the whole amount of paper issue should be covered by an equal value of metal. In practice the reserve may be much smaller; but so far as it is required, it means a deduction from the gain of issue. The temptation to reduce the reserve to an inadequate amount and then to escape the difficulty by resorting to the expedient of refusing to pay coin for notes, i.e. making the notes inconvertible, has proved too strong for nearly al] governments at times of pressure. The history of state dealings with paper money may broadly be described as a history of inconvertibility. Hard-bought experience has only now forced on the notice of governments the loss that follows from a disturbance of the standard used in ordinary payments. They are evident to all careful observers, and may be concisely summarized as consisting in: (1) the injustice to creditors through being paid in a much lower standard than that in which they lent; (2) the disturbance to trade, both domestic and foreign, by the fluctuations in the value of money; (3) the pressure on the working classes from the slower rise of money wages, in contrast with the quicker movement of the prices of commodities, resulting in a fall of real wages; and (4) the check to dealings in relation with the international money market, due to the risk of exchange fluctuations. The only gains are the temporary stimulus to certain branches of trade, and the advantage to the state by contracting a forced loan without paying interest.

The origination of paper money by state direction is the easiest to consider and explain. It does not follow that it is the most important or the earliest kind of representative currency. As W. Bagehot has pointed out, the real origin of economic institu- tions is often very different from the apparent one. In truth, representative money seems to have grown up out of the elemen- tary contrivances of early credit. A claim could be expressed and transferred

by a document, which might be used for facilitating exchanges. The rigid formalism of early law hindered the extensive use of this convenient machinery. It was not till the institution of banking that the coining of credit was made easy. Thus the bank-note comes into use, resting, not on the fiat of the state, but on the repute of the issuer. At this stage the history of the two distinct forms of representative money becomes mixed, owing to the control exercised over banks by government and to the fact that banking companies were in many cases the agents by which what was virtually state money was issued. There is, however, the fundamental difference that bank money finds its way into use through the ordinary system of granting credit; while government money is used in the purchase of commodities and the hire of services. The former, therefore, returns in a short time; the latter remains in circulation and displaces metallic currency. In the long controversy over the Bank Charter Act 1844 this distinction was brought into promi- nence. Since that date the extraordinary development of deposit banking in both Great Britain and the United States has furnished these countries with by far the most flexible form of currency yet known in the cheques that transfer claims on the capital held by the banking institutions. The confusion so often shown regarding the relation of credit- to money is con- nected with this latest progress. When it is remembered that in its origin money is only an instrument to facilitate exchange — we might even say to render it possible — it follows that from its earliest to its latest form the ruling influence is the need of society for the best mechanism of exchange.

7. Production and Consumption of the Precious Metals in their Economic Aspects. — In considering various monetary questions it is essential to have some acquaintance with the economic

aspects of the production of gold and silver. The first point to which attention may be directed is the field over which production extends. At one time or other these two metals have been found in every continent. Asia Minor in early times possessed its goldfields, or rather auriferous sands. Ceylon also undoubtedly contained gold-mines. China and India both produced silver to a considerable extent. Egyptian remains show that gold was commonly known in that country, prob- ably procured from Nubia and Abyssinia. On the opposite side of Africa, too, the name of Gold Coast shows that that metal was thence exported. The mines of Laurium in Attica were a source of supply to the Athenians, and were worked as a state monopoly. At an earlier date the Babylonian and Assyrian empires had each accumulated large stores of gold. The Phoenician importations of gold from the Red Sea coasts (Ophir) are known from Scripture. The Persian kings from the time of Darius levied tribute on all their provinces — in gold from India, in silver from the remaining districts, the larger part of which was stored up in the royal treasuries. This tendency of despotic rulers to accumulate treasure had all through ancient history important effects on the economic structure of society. At present it is quite natural to assume that the materials of money are distributed by means of international trade, and tend to keep at an equal level all the world over — an assumption which is in general well grounded, though an important exception exists. Ancient history presents a widely different set of forces in operation. Gold and silver were produced by slaves under the pressure of fear, and were drawn towards the ruling parts of the great empires; in a word, war, not commerce, was the distributing agency. From this condition of affairs it is easy to see that, whatever may be the reasons for assigning to cost of production a potent influence over the value of money in modern times (and grounds have been already advanced for the belief that its influence has been exaggerated), no such reasons then existed. The production of the precious metals was carried on in similar manner to the great buildings and other works of those

periods, on non-economic grounds, and therefore produced quite different effects. The whole history of the Persian monarchy to its overthrow by Alexander (330 B.C.) shows that the hoarded mass of the precious metals continued constantly to increase. On the capture of Persepolis by the Grecian army an enormous treasure was found there, some estimates placing it as high as 1 20,000 talents of gold and silver (£27,600,000). All the temples, too, were receptacles for the precious metals, so that the stock accumulated at about 300 B.C. must have been very great. The only causes which tended to diminish the store were the losses arising from wars, when the various treasuries were liable to be plundered and their contents dispersed. There was therefore a more unequal distribution of the material of money than at present. The growth of the Roman dominion led to important results, since under their rule the Spanish mines were developed and became a leading source of supply. The great masses of treasure set towards Rome, so that it became the monetary centre of the world. The overthrow of the republican government and the peace which followed also affected the conditions of production. The in- efficiency of the Roman administration made it advantageous to let out the mines to farmers, who worked them in a wasteful and improvident manner, while the supply of slaves was reduced, thus depriving the lessees of their principal agency for carrying on production. The result was a continuous decline in the store of money. W. Jacob has made an attempt to estimate the amount at the death of Augustus (a.d. 14), and arrives at the conclusion that it was £358,000,000. (Precious Metals, i. 225.) Without placing much value on this necessarily conjectural estimate, it is safe to assume that this period marked the highest point of accumulation.

The succeeding centuries exhibit a steady decline, though it is of course impossible to attach any value to even the most carefully guarded numerical estimates. The phenomenon which has since so often attracted notice — the drain of the precious metals

to the East — began at this time, and was a subject of

complaint by the Roman writers, while the stock of gold and silver being thrown into general circulation suffered from abrasion, and was more likely to be lost than when stored up in the royal treasure-houses and temples. These causes tended to depress the scale of prices, while the barbarian invasions produced a strong effect on the supply by drawing off the mining population and damaging the various erections used for working the mines. The conjectural estimate is that about a.d. 800 the total supply had been reduced to £33,000,000 (or about one- eleventh of what it had been at the death of Augustus). A new period in the history of gold and silver production may be fixed at this date. The Moors, now firmly established in Spain, began to reopen the mines in that country which had been allowed to fall into disuse. Other European mines also were opened, notably those of Saxony and the Harz Mountains, as well as the Austrian mines — the chief medieval sources of supply. The international system of currency, based on the pound of silver as a unit, which was introduced by Charlemagne, must have tended to economize the wear of the metals. We may therefore conclude that from this date (a.d. 800) the supply was sufficient to counteract the loss by wear and exportation, and accordingly regard the metallic supply as fixed in amount until the next change in the conditions of production, which was the result of the discovery of America. Though 1492 is the date of the first landing, yet for some time no important additions were made to the supply of money. The conquest of Mexico (1 5 1 9) gave oppor- tunities of working the silver-mines of that country, while the first mines of Chile and Peru were almost simultaneously discovered, and in 1545 those of Potosi were laid open. From this latter date we may regard the American supply as an influential factor in causing a continuous increase in the stock of money. The annual addition to the store of money has been estimated as £2,100,000 for the period from 1545 to 1600. At this date the

Brazilian supply began. The course of distribution of these fresh masses of the precious metals deserves some notice. The flow of the new supplies was first towards Spain and Portugal, whence they passed to the larger commercial centres of the other European countries, the effect being that prices were raised in and about the chief towns, while the value of money in the coun- try districts remained unaltered. The additions to the supply of both gold and silver during the two centuries 1600-1800 continued to be very considerable; but, if Adam Smith's view be correct, the full effect on prices was produced by 1640, and the increased amount of money was from that time counter- balanced by the wider extension of trade. At the commence- ment of the 19th century the annual production of gold had been estimated as being from £2,500,000 to £3,000,000. The year 1809 seems to mark an epoch in the production of these metals, since the outbreak of the revolts of the various Spanish dependencies in South America tended to check the usual supply from those countries, and a marked increase in the value of money was the consequence. During the period 1809- 1849 the value of gold and silver rose to about two and a half times its former level, notwithstanding fresh discoveries in Asiatic Russia, which became considerable from 1823. The annual yield in 1849 was estimated at £8,000,000. The next important date for our present purpose is the year 1848, when the Californian mines were opened, while in 1851 the Australian discoveries took place. By these events an enormous mass of gold was added to the world's supply. The most careful esti- mates fix the addition during the years 1851-1871 at £5oo,ooo,ooo, or an amount nearly equal to the former stock in existence. The problems raised by this phenomenon have received careful study. The main features of interest may be briefly summed up. (1) The additional supply was almost entirely of gold, thus tending to produce a distinction between the two principal monetary metals and an alteration in the currency of bimetallic countries. Under this influence France, from being a silver- using, became a gold-using country. (2) The contemporaneous

development of the continental railway systems, and the partial adoption of free trade, with the consequent facilities for freer circulation of commodities, led to the course of distribution

being different from that of the 16th century. The more back- ward districts were the principal gainers, and a more general equalization of prices combined with a slight elevation in value was the outcome. (3) The increased supply of gold rendered a general currency reform possible, and made the use of a gold monometallic standard appear feasible. The movements for currency reform, as will be seen, all arose after these discoveries. (4) The change in the value of money, which may for the period 1849-1869 be fixed at 20 , enabled a general increase of wages to be carried out, thus improving the condition of the classes living on manual labour. It may be added that the difficulty of tracing the effects of this great addition to the money stock is a most striking proof of the complexity of modern economic development. (5) The last point to be noticed is the very small influence exercised on the value of silver by the new gold. The gold price of silver in London rose only from S9fd. per oz. to 62 jd. per oz. — i.e. between 4 and 5. Hardly had the gold discoveries of 1848-1851 ceased to produce a decided effect when new silver mines of unusual fertility came into working. During the period immediately succeeding the gold discoveries the production of silver remained at an annual amount of from £8,000,000 to £9,000,000. This amount suddenly, about 1870, increased to £15,000,000, and remained at that amount for the next five years. More than half of the supply came from new mines opened in Nevada. This increased supply was accompanied by a marked depreciation in the gold price of silver, though the prices of commodities in countries having a silver standard did not rise. The disturbances resulting from the combined effect of the new silver and the diminution in the annual output of gold

which began about 1870 and continued for nearly twenty years were the cause of much contro- versy and led to the propounding of novel monetary theories. Bimetallism came into prominence; and the modes of relieving trade depression caused by the fall in prices were keenly discussed. Before any monetary adjustment took place the situation again changed in consequence of a renewal of the Australian gold production, soon followed by the great gold discoveries in South Africa. The annual output of gold, which had fallen below £20,000,000, in 1884 rose rapidly to £60,000,000, and in 1908 reached the prodigious figure of over £80,000,000, with the prospect of still larger yields in the near future. By this change the difficulties that had led to the agitations for ” free silver ” in the United States, and for ” international bimetal- lism ” in Europe and in India were removed, showing the close connexion between the production of the precious metals and the economic, especially the monetary, policy of all periods.

The modes of consumption of the precious metals — under which their use is included — are of equal importance with those of their production. Classed roughly, they come under three heads, viz. (1) their use as merchandise, (2) their use as money, (3) the ” drain” to the East. With regard to the first, though precise data are not available, it may be said with some confidence that the demand for personal use tends, after society has made some progress, to decline in strength. The desire for adornment is not a keen one with most civilized persons; and, so far. as it exists, is gratified in other ways than by using silver or gold. For purposes of manu- facture their use is large and increasing. The second head is that with which we are principally concerned. It is evidently connected with the need for metallic currency; and this again depends on the level of prices and the monetary organization, including in the latter the banking system. Currency requirements still form the largest part of the demand for the precious metals. Under the third head a remarkable exception to the

tendency towards the equal diffusion of the precious metals is presented. For nearly two thousand years the movement of silver from west to east has been noticed. Humboldt has made the ingenious remark that the course of these metals is in the opposite direction to that of civiliza- tion, and history supports his view. During the middle ages the chief Eastern products used in Europe were luxuries, such as silk and spices, and silver was sent from Europe to pay for them. Eastern trade increased, owing to the discovery of the passage round the Cape of Good Hope, and the flow of silver became greater. Special circumstances have from time to time influenced the move- ment. Thus, the new supplies of gold in the middle of the last century caused by their action on the bi-metallic currencies of Europe an acceleration in the flow, the amount exported between 1851-1862 reaching £110,000,000. To this drain of silver a more recent one of gold has been added. India takes year by year a

considerable amount of gold bars, which may in the future have a monetary use, but up to the present appear to be hoarded or used for ornament. With the complete reconstruction of Eastern currencies that now seems probable there may come a decided change in the character of the demand. Another influencing condition is also undergoing change ; the tendency to fix prices on a customary basis is bound to yield to the pressure of competition. The in- evitable result will be to make the price level alter with each influx of money, and thus to limit the demand for bullion through the action of the exchanges.

One of the technical features of the production of the precious metals should be noted, in consequence of its economic effect. Gold has more frequently been found near the surface; silver is usually obtained by deep mining. It follows that the amount of the former metal produced depends more on accidental circum- stances, in contrast to that of silver, which is affected by the standard of mining skill. The mines of Nevada were exceptional in their possessing both metals and in nearly equal value. The gold-mines of South Africa have come to be

worked at deep levels and therefore are technically in the same class as silver ones. In fact, there is a pronounced tendency all the world over towards the system of capitalistic working.

8. Review of the History of Some Important Currencies. — Monetary theory requires to be elucidated by the constant reference to history; just as in turn the history of currency has to be interpreted by the aid of general principles. Each country has its peculiar problems, which call for special treatment; though at the same time there is no way of avoid- ing the operation of those economic conditions and forces that are to be found in all countries. The first decisive fact that emerges from the vast material presented by the history of money is the tendency at most periods towards deterioration. In the time of purely metallic currency debasement is the most serious danger; when representative money has come into being extravagant issues of paper are chosen as the readiest way of evading the limits of a sound currency. It is perhaps too extreme to say that monetary history is altogether made up of accounts of debasements and over-issues. The truth is better expressed in the proposition that there has been a constant struggle between the influences that make -for deterioration and those that give support to the maintenance of a good currency condition. There is also the cheering circumstance that in spite of much popular ignorance there has on the whole been a steady improvement in the treatment of monetary systems. Expert knowledge has more effect in the later than in the earlier periods. The crude expedients of the Tudors would not be tolerated in modern England. There is much fuller recognition of the danger of over-issue in paper money; and this is accompanied by greater care in the treatment of credit institu- tions in their relation to the modern media of circulation. It is also noteworthy that mere popular agitation has lost a great deal of its power, as shown in the failure of both the ” soft money ” and the ” free silver ” movements in the United States. On the other hand the tendency to accept scientific methods is

illustrated in the treatment of the Indian currency question.

Greek Currencies. — As already noticed the political conditions of Greek life supplied a varied field for monetary experiments. Unfortunately the details are very incompletely known, and the subject of Hellenic money has not been sufficiently studied from the economic side. Certain broad facts are prominent. The Athenian use of silver as the standard substance, coupled with the later employment of gold to serve for an extra or commercial currency, is a characteristic feature. The alteration of the standard by Solon appears in the light of an exceptional revolutionary expedient. It amounted to the creation of a new standard unit — the Attic — which was imitated by other states, e.g. Corinth. Only one doubtful instance of debasement can be found in the subsequent history of Athens. This honesty in respect to the monetary standard seems on the whole to have prevailed in the Greek states. Some despots, as Dionysius, issued adulterated coins, but these were isolated cases. The use of gold and silver in an amalgam, known as electrum, was an admissible device ; it, however, had the evil effect of suggest- ing the use of poorer alloys.

Roman Money. — -The history of money in Rome is rather different. Beginning with copper, the currency was changed into a double standard one by the introduction of silver (269 B.C.). Gold came in for commercial use with the extension of the Roman dominions, and copper was reduced to a token coinage. In the stress of the Punic Wars debasement was one of the financial devices of the magistrates. The conquest of the Greek territories brought about the regulation

of their currencies. Silver was prescribed as the money substance. The establishment of the empire led to the definite concentration of the right of coining in the sovereign; though concessions were made in various localities, where the smaller

coinages were allowed to continue. But the principal interest of the money of the Roman Empire is due to the remarkable way in which it illustrates the tendency of despotic and bureaucratic rule to lower the condition of good administration. A long course of debasement is _ the characteristic aspect of the currency system. ” Under the empire,” we are told, ” the history of the silver coinage is one of melancholy debasement. The most extensive frauds in connexion with money were perpetrated by the Romans.” The gold aureus, which in the time of Augustus was one forty-fifth of a pound, was under Constantine only one seventy-second of a pound. The alloy in the silver coins gradually rose to three-fourths of the weight. Plated coins came into extensive use. The practice of debasement was in accordance .with the theories of the jurists, who seem to have regarded money as simply the creature of the state, i.e. the personal ruler.

Medieval Money. — After the overthrow of the Western Empire, though the invaders were in the condition of what has been called ” natural economy,” the state in which money has not come into being, they soon were disposed to carry on the Roman tradition, and their rulers adopted some form of silver currency. With the temporary revival of the empire under Charlemagne there comes the effort to found a general standard money on the basis of the silver pound. From this new starting-point it is possible to .trace the course of some of the leading currency systems of Europe. For purposes of illustration it will be sufficient to sketch the move- ments in England and France, which are typical of the general course of monetary development. The systems of these countries are moreover remarkable (i) in the contrasts that they present to each other, and (2) in the widespread influence that they have exercised on the monetary arrangements of other nations.

English Monetary History. — The English currency begins with the pound of silver (troy weight) as the standard unit, subdivided into 20 shillings, each containing 12 pennies. The only coin at first in use was the silver penny. This system, in force before

the Conquest, is the direct descendant of the Carlovingian system, and it continued without change until about 1276, when a slight depre- ciation was introduced by coining the pound into 243 pennies, instead of the original 240. This was the first of a series of changes, generally in the direction of lowering the weight of the coin. Two periods are remarkable for the operation of this tendency, viz. (1) the reign of Edward I., when the silver was debased by 20% in the period 1344-1351 ; and (2) the close of the reign of Henry VIII. and that of Edward VI., 1543-1552. In this short space of ten years the expedient of degrading the quality of the coinage by bringing the alloy up to three-fourths of the mass was practised for the only time in English history. The substitution of the pound troy for the Tower pound in 1527 was accompanied by a lowering in weight which far exceeded the gain from the higher Weight of the new pound (5760 instead of 5400 grains). The reformation of the silver coinage under Elizabeth (1560), and its definite settlement in 1601 on the basis of coining 62 shillings from the pound troy also deserve mention. Turning to the gold currency, we find some gold pennies issued in 1257, probably in imitation of the issue of the Italian cities, which were due to the opening of eastern trade and the example of the Greek Empire, which had always retained its gold currency. The regular series of English gold coins begins in 1343, when Edward III. ordered the coinage of florins — the title is significant — at 50 to the Tower pound. The ” noble ” soon followed. The ” sovereign ” was first issued in 1489. But gold was treated as a commercial money, to be used as subsidiary to the standard silver. Its value was therefore varied from time to time to meet the difficulty that local bimetallism is certain to cause, in consequence of the undervaluing of one or other metal. During the 17th century the most noticeable mone- tary events- are: the proposals for depreciation, of which the most remarkable was that of W. Lowndes (1652-1724), for lowering the standard by some 25 % ; the introduction of the guinea as the leading gold coin, and the frequent readjustment of the values of the

two metals by proclamation. The great recoinage of 1696, carried out on the principles advocated by Locke, reformed the silver currency. In the 18th century the establishment of the guinea at 21s. by Newton's advice made the adoption of gold as the standard inevitable, since it was overvalued in an appreciable degree. The position of gold as the practical standard is clearly recognized by Adam Smith (1776) and is regarded as settled by Ricardo (1809), The full legal establishment of the present metallic currency took place in 1816, when the guinea made way for the present pound or " sovereign," and silver was formally reduced to the level of a token coinage, being slightly lowered by the coinage of the pound of silver into 66 shillings. Thus, by a course of develop- ment extending over 700 years, the English currency has been transformed from a crude silver standard system into one resting on gold, but employing both silver and representative money for the greater part of the actual work.

French Money: its Development. — Though the monetary system of Charlemagne soon disappeared in Germany and Italy, it con-

tinued in the part of his empire that became France. The extreme confusion of the time of his successors enabled the feudal lords to claim the right of coinage. No less than 150 seigneurs are said to have exercised this power at the accession of the first Capet. With the growth of the royal authority the freedom of private coining was restricted, in order to reserve to the Crown the profitable right of seigniorage. Unfortunately the legitimate profit from this source was not sufficient to satisfy the wants of the royal treasury. Therefore French monetary history is marked by a long series of debasements, extending from the time of Philip I. to that of Louis XV. (1060-1774). In sharp contrast to English policy the tampering with the currency was persistent, so that Louis IX. was looked on as quite exceptional. "In later days his management of the

royal mint was always appealed to as the equitable standard for the observance of his successors." Yet in his time the livre had been debased to less than one-fourth of its primitive level. The Hundred Years' War presented the occasion for still further degrada- tion. At the accession of Louis XI. (1461) the livre had been brought down to one-fifteenth of its original value. The 1 6th century is equally an age of depreciation, no less than nineteen occurring between 1497 and 1602. Again, in contrast to the English system, the absolute monarchy continued the process of debasing the standard under Louis XIV., and the livre was only one-half what it had been under Henri IV. At the Revolution the decline had proceeded so far that the livre had been reduced to one seventy-eighth of its primitive value. The new spirit of reform produced an entire change. The franc was substituted for the livre at the equation: 80 francs, 81 livres. In fact, until the establishment of constitutional govern- ment the French people had to depend on popular violence to pro- cure any temporary reform in their currency. Since the Revolution the course of development has been essentially orderly and regular. All through the time of the ancien regime silver was the principal money and the standard, as the use of the word " argent " as a synonym for money shows. Just as England got a gold currency by overvaluing gold, so did France get a silver one by Overvaluing silver. Indeed, it may be said that the different ratios chosen by the two countries necessarily caused a reciprocal drain, affording a good example of the action of local bimetallic systems with different ratios between the two metals. A further result from the comparison of the systems of England and France is the greater maturity of the former. England gained an honest currency before France ; she led the way in the adoption of the gold standard, while in her treatment of representative money she has held as decided a priority. The difference in economic conditions in the nations in part explains the contrast. There is no doubt that in both cases a high degree of development has been reached. Finally, it should be remarked, that as

England has worked out in practice the system of ” composite legal tender,” so has France, with its monetary allies, been the first to show effectively the operation of the ” limping standard ” (Stalon boiteux). Each nation has thus supplied a type, which recent monetary changes give evidence of having been used as the pattern for other less advanced countries.

9. Some General Questions respecting the Constitution of Money. — The consideration of the history of currency systems naturally suggests the general problems that the more advanced countries have had to encounter. Of these, some may be described as formal, i.e. they relate to the arrangement and the definition of coinage and standards. Others are in essence issues of principle involving the most complicated theoretical doctrines, on which there is even yet sharp differences of opinion between competent students of economics. In some instances an intermediate class may be found, e.g. the question of subdivision of the coins does raise some difficult matters of application; though it clearly belongs of right to the group of formal questions. But the distinction is a valid one. Whether a country should adopt the ” gold standard ” or prefer a ” bimetallic ” standard is obviously very different from the elementary points about units and the different classes of coins. We will therefore begin by noticing some of the characteristics that are found in all modern currencies and some of which are implied in the idea of money. Thus it is true that every currency system must be based on a standard unit of value which consists of a ” fixed quantity of some concrete substance defined by reference to the units of weight or space.” The English unit, for example, is the pound, which consists of a definite quantity of gold (123-27447 grs. standard fineness) while the French unit is the franc (composed of 5 grammes of silver nine-tenths fine). It is not necessary, though it is usually the case, that there shall be a coin correspond- ing to the standard unit, all that is needed is that the current coins shall be

multiples or submultiples of the unit, or at the least easily reducible to it. The Portuguese ret is too small to be coined, and the pound of silver that formed the unit of the

early English and French currencies was too large. Quite distinct from both the actual coins and the unit of value is the money of account, though in practice it is usually identical with one of them. In Russia in early times the rouble was an imaginary money of account not coined, while the copper copeck was the unit of value. Connected with the distinction between the coins and the unit is the highly important one between standard and token money, the former being of full power for discharging debts, and in the case of most systems only of equal value to the metal out of which it is made, while the latter is rated at a nominal value higher than that of its material. The silver and copper coinage in England and the smaller coins in the Latin union are only tokens; in the case of English silver coins, the cost value is less than 40% of the nominal one. The French tokens are made of inferior fineness (835 per 1000) to the full tender silver. Two restrictions are applied to token issues: (1) they are only legally available to discharge small debts— in England silver is limited to the payment of 40s.; (2) they can be coined only by the permission of the state. Thus in England the Bank of England is the state agent for the silver coinage. The limitations are evidently required to prevent the expulsion of standard money, and to avoid the flooding of the circulation with coinage that is not needed for the purpose of the limited exchanges to which it is confined. Intermediate between standard and token currency are those forms of coinage that are free from the first limitation, but restricted by the second. They have this further point of resemblance to tokens in that their nominal value is higher than that of their material— the French 5-franc pieces and the Indian rupees are

prominent examples. Similarly, the analogy between representative money and token money is deserving of attention, and suggests the desirability of the latter being regarded as in some respects a fiduciary issue, for which the issuing authority incurs responsibility.

A class of considerations already referred to (§ 5) requires explicit notice here, viz. the influence of popular sentiment on the character and forms of a country's currency. The fact that money has to circulate amongst all classes of society makes it indispensable that it should be suited to the wants and even the prejudices of the users. Many curious instances of preferences for particular coins or special forms of paper money can be given. The Austrian Maria Theresa dollar of 1780 is a favourite on the African coasts and has been frequently reissued for use there. Reasons of convenience and of security combine with sentiment; as in the determined rejection of the U.S. " greenbacks " by the inhabitants of California during the inconvertibility of that currency. Recognition of the desires and tastes of the community is almost essential in carrying out any monetary reform. It is only by building on the habits and customs that have become established that improvements in the monetary system can be effectively completed. Not only is this careful observance of the disposition of the mass of society expedient ; there is still greater need for taking account of the methods and interests of those sections of the business world that deal specially with money. A currency change that was bitterly opposed by the banking interest would certainly be difficult to introduce in either England or the United States; traders have great influence as to the forms of money that they will accept and facilitate the use of. In another aspect the study of the interest of dealers in the arrangement of the monetary system presents itself. One of the features that caused much surprise in the infancy of economic study was the disappearance of good coins from the circulation, while inferior ones remained in use indefinitely. To the first observers

there seemed to be something perverse in the preference apparently shown towards debased or worn coins. In business transactions inferior articles are taken only at a lower price. The explanation is easily understood, when furnished; it consists in stating the difference between a commodity which is sought for its use, and money which is taken as merely a medium of exchange. Provided that coin is not too bad for further circulation it will be accepted without difficulty. Still less will there be any trouble if the differ- ence is only in the relative value of two metals, such as silver and gold. The great majority of any population will give and take money without particularly observing it. It is enough if the coin conforms to the usual type. There exists, however, in all mercantile communities a class of dealers in money, who make a profit by selecting the best coins for exportation, or if two metals are in concurrent use, the coins of that metal which is undervalued in the proportion fixed. In the case of inconvertible paper issues the withdrawal is also for the purpose of hoarding to secure the profit expected when there is a high premium on bullion. The action of self-interest under these conditions produces an effect

which has been briefly formulated in the statement ” that bad money tends to drive out good money.” The proposition has been styled ” Gresham’s Law ” (g.».). Abundant illustrations of its working are available. The establishment of the English gold currency and the French silver one in the 18th century, already mentioned (§ 8), is an effective one. Quite as good is the transition of France from the silver to the gold currency form after the great gold discoveries of the middle of the 19th century. In truth it may be said that most of the monetary transitions have been due to the operation of the force indicated in Gresham’s Law. The importance of the law lies in the warning that it gives against the attempt to reform a degraded currency by the issue of better money. Such ” operations of the mint are,” in Adam Smith’s judgment, ” somewhat like the web of Penelope.” The caution holds equally in

respect to the reform of a depreciated paper currency or to an effort to force an undervaluedmetal into circulation. The success of so many monetary reforms in the last forty years has been in great measure due to the better appreciation of the working of the principle. Its aid can also be obtained by setting up the suitable conditions; while it can be counteracted through the use of the principle of limitation, so clearly expounded^ by Ricardo. Some of the constituent parts of the French and American currencies rest altogether on the maintenance of an overvalued coinage, along with one of higher value by the limitation of the quantity of the former to the amount thatcan be employed without expelling the remaining part of the circulating medium from monetary use.

Another part of the structure of any currency is the _ scale on which its accounts, and by consequence the degrees of its coins, are arranged. The pound, the shilling, and the penny in the older English system represented so many grades in the subdivision of value. All other currencies have the same need for divisions. The simplest scale would be what is called the ” binary ” ; in which each coin is the half of the next higher, and double the one immediately below it. Most actual systems have series of coins on the binary scale. The penny, the halfpenny, the farthing; the 4s. piece, the florin, the shilling, the sixpence, the threepenny; at a higher level the sovereign, the half-sovereign, the crown, the half- crown, are English examples. The Latin and Scandinavian unions, as also Germany and the United States, have several binary coinage series. But no country adopts a purely binary scale. England in part retains the old ” duodecimal ” division in the relation of the shilling and the penny. Nearly all civilized nations have come to accept the system of Decimal Coinage (q.v.), though in their actual currencies they admit certain divergences from the strict decimal system. The convenience of having the monetary scale of accounts in accordance with the arithmetical scale will probably secure the ultimate victory of the decimal system everywhere, in spite

of the objections to it on the ground of its having only two factors — 2 and 5 — as against the larger number of the duodecimal scale (2, 3, 4 and 6). The immense trouble involved in altering accounts and the difficulty of overcoming the hostility to change felt by the ordinary members of the community are the obstacles that prevent the adoption of the decimal system in England.

Connected with the composition of a currency and the scale on which it is based is the question of its relation to other currencies. From a very early time the conception of a money that should not be confined by a political limit appears to have existed. In fact until the state took over the control of money its more important forms had a wide diffusion. The talent, equated to the ox, is a prominent instance. Even when the city-state provided its par- ticular coinage we can still perceive the circulation of the better coinages outside their legal area. The effect on the Greek currencies has been noted above (§ 8). Under the Roman hegemony and the empire that arose out of it there was the equivalent of an inter- national currency in the wide circulation of the coinages adopted from the conquered states. Such coins as the drachma and the denarius were of general use in the then civilized world. In later times the Carolingian silver currency for a short period supplied an international medium, which vanished in the confusion of the middle ages. Owing to the rise of national governments money became a national distinction peculiar to each state. It is only in the last sixty years that the idea of international money has been revived in a practical form. Unfortunately the revival was speedily checked by the reaction in favour of nationalism that followed the Franco-German War (1870-71) and by the controversies as to the proper standard. (See Bimetallism and Monetary Con- ferences for further discussion of this topic.)

10. Typical Currency Systems: their Evolution and Governing Principles.— At first sight it appears that the systems of currency are almost infinite in

their variety. They have grown up in different nations under the influence of local conditions and reflect the customs of the particular society. But, underlying these superficial differences, there are certain general principles that permit of a grouping into a small number of clearly marked types. The classification, though resting on logical grounds, is very largely in conformity with the course of historical development.

Better forms have come into being as social progress has become more pronounced; and further improvement may be expected in the future. The condition of things when money is coming into being is characterized by the weighing or measur- ing of the substances used for aiding the course of exchanges. It has therefore been called the system of " currency by weight." In strictness, it is better regarded as the stage before the intro- duction of real money; and thus outside the field cf currency systems proper. The simplest system of currency seems to be that in which the state coins ingots of different metals and allows them to circulate without assigning any ratio for their respective values. Such an inconvenient form is not likely to be of long continuance; but it has sometimes arisen at a later time through the introduction of foreign coinages. Holland at the end of the 16th century, Turkey down to the present day may be given as countries approaching this state. The title of " currency by tale " is Jevons's apt denomination for such a currency system. The next form in logical order is that in which a single metal is definitely appointed as the sole standard money. In early ages this is the most natural arrangement, and it has, therefore, been widely adopted. Silver has been the metal generally used in this way; as the instances previously given (§8) prove. The title of " single legal tender " system is the obvious one for this form. With the growth of transactions a difficulty soon presents itself. If the chosen metal is not of

high value it is cumbrous for making large payments; if on the other hand its value is high, it is unsuitable for use in small transactions. Hence there almost inevitably follows the use of other metals, which are better suited for certain particular uses. Thus silver is at once too heavy and too light. To pay £1000 in silver at its present value would take 800 lb troy, while a silver penny would be under the convenient limit of size. Partly for these reasons, but also to a large extent through the persistence of currency by tale, we find that along with the standard money other kinds are brought into or retained in use. Copper long survives beside silver; and gold is employed for the more impor- tant commercial transactions. Public convenience leads to the valuation of these subsidiary forms of money, and in this easy manner another currency system — that of ” multiple legal tender "—comes into being. Though, theoretically, several substances might be valued for use as money, in practice some kind of bimetallism is used, and generally gold and silver are the constituents of the system. Thus for over three centuries England had a currency in which the values of gold and silver were fixed from time to time by royal proclamation. France and the United States, as well as many other countries, have had long experience of national bimetallism. The great problem in such a form of currency has always been that of keeping the two metals in effective circulation. As the values of the precious metals fluctuate, the principle of Gresham’s Law is exemplified by the expulsion of the undervalued one. Each change in the conditions of production or in the ratios fixed by other countries tends to disturb the balance and is harassing to trade. Local or national bimetallism comes to be unsustainable, and is replaced by other currency types. The most remarkable is that known as the ” composite legal tender ” system. Its object is to combine any advantages of multiple legal tender with the main- tenance of the single standard principle. One metal is selected as the standard and is legal tender to any amount; other metals are utilized for the purpose of token currency. Thus in the system of

the United Kingdom gold is the only standard coinage; but silver and copper are employed for the lower coins and for smaller payments. The establishment of this ingenious arrange- ment is rather the outcome of the circumstances that governed the English monetary situation in the 18th century than any refined considerations of theory; but its justification on grounds of principle is furnished in Lord Liverpool's Coins of the Realm (1805). The extent to which the system has been copied by other nations and the stability of the English currency are strong confirmations of its merits as a solution of currency difficulties. Though the composite legal tender system has been a decided success, it does not follow that it supplies the only

mode of dealing with the troubles that attend on the use of the local double standard. Other methods have been evolved from the monetary experiences of France and India, which take distinct forms according to the special features of the case. There is the currency system known as the " limping standard," the essence of which is the concurrent use of two metals, one being overvalued and coined only by state authority. The quantity of this favoured metal is necessarily limited in amount, to avoid depreciation or the ejection of the other metal from the circulation. It, however, has the position of money in the fullest sense, in that it is legal tender for any amount. The S-franc pieces issued by the Latin union are the best known specimen of such coinage. In this case also the origin of the system was not theoretical, it was the result of the fall in the value of silver and the fear entertained by the French government that gold would be displaced by the cheaper metal. The temporary expedient of limiting the coinage of standard silver has developed into the maintenance during more than thirty- five years of the limping standard, which derives its name from the shortness of one limb of the currency' body. Equally suggestive for monetary theory is another phase or system, usually described as the " gold-exchange standard " system, in which

the ordinary currency is of a metal coined only by the state, and so limited as to keep it in a prescribed value ratio to another metal (gold) which does not circulate, but acts as the standard of value. This variation on the limping standard has been produced by the effort of the Indian government to meet the embarrassment caused by the continuous fall in the gold value of silver. Under the pressure of failing revenue and of persons suffering from the rupee depreciation in gold, the limitation on silver coinage was first enacted (1893); to be followed some years later (1899) by the establishment of gold as the standard, with a definite parity assigned for the state silver issues. The success of the Indian experiment — for such it avowedly was — has led to its imitation by the American adminis- tration in the Philippine Islands and by Mexico. It may be looked on as the natural product of the condition in which the single legal tender system is proving unfit, while the material for the composite legal tender system is wanting. The employ- ment and theoretic explanation of these methods of currency adjustment mark the greatest advance made in monetary science and practice in recent years. Whether the limping, or the gold-exchange standards will be permanent forms is difficult to determine; but they are beyond doubt of much importance in meeting the risks of a period of transition. In any case they are entitled to recognition as distinct forms of currency organi- zation, resting on a scientific basis.

The types presented by purely metallic currencies can be considered by themselves for the purpose of theoretical exposi- tion. In actual working they are now affected by the existence of representative money. The state issues paper money which may be either convertible or inconvertible, or if it refrains from so doing, the banks take up the task and supply a medium of exchange in the form of notes, or by a later development through providing for the use of cheques by their customers. An inconvertible paper currency has some pronounced affinities with overvalued metal; a duly regulated

issue of this kind is quite on the lines of the gold-exchange system, and the diffi- culties of the two forms are very similar. But, just as the cruder systems of metallic money have gradually given way to the higher ones, so it may be said that the grosser forms of misman- agement in representative money are being removed, notwith- standing the recurrence of such monetary crises as that of 1907 in the United States. The great instance of government paper money is the United States notes, known, as ” greenbacks,” which’ are fixed at the amount of $346,681,016. The most prominent case of bank issue of notes is that of the Bank of France, with somewhat over £200,000,000 in circulation. Examples of the cheque currency are more difficult to state in quantitative shape; as the constituent parts are continually being created and cancelled, but the clearing-house returns give some idea of its extent in England. The figure for 1909 was

£13,525,446,00×5. It seems highly probable that the next stage in improvement will be the extension of currency based on credit, after the Anglo-American pattern, to the other commer- cial countries of the world. But this movement can only be slow, it will not affect Eastern countries. For a long time they will remain in the metallic currency stage, with the moderate use of a guaranteed note circulation.

There are several plans which have been advocated as superior to any of the systems actually in use. Most of these schemes are undeserving of notice; a few, however, claim attention on the ground of theoretical or practical importance. The most conspicuous is that known as ” international bimetallism,” ■which was designed to obviate the evils said to result from the demonetization of silver and the overflow of the established ratio between the precious metals. Its central idea was the creation of a monetary league, composed, if not of all, at least of the leading states (the larger

the number the better), the members being bound to coin any amount of gold and silver at an agreed ratio. By such an agreement an adequate field for the use of both metals would be provided, and fluctuations in the relative value of silver and gold would be completely prevented. The expulsion of the cheaper metal would be impossible, owing to the absence of any place to which it could be driven. Variations in the production of the precious metals would act on both metals, not on one. Another plan for meeting the same set of difficulties is the composition of the monetary standard by taking assigned amounts of both metals in combina- tion as the unit — say 1 oz. of gold with 10 oz. of silver. The title ” symmetallism ” has been given to this ingenious mode of trying to obtain a more stable standard than that afforded by the employment of a single metal. Amongst the many devices that the use of paper money has suggested the most noticeable are those that aim at the replacement of metallic money by some other basis. The socialist conception of a ” labour note ” may be paralleled by the idea of ” commodity notes,” resting on a development of the clearing system. Viewed from the practical standpoint it may be said that the double standard in any form is condemned by the course of events; it has been defeated by the gold standard. In respect to the other proposed methods there is the almost insurmountable difficulty of making them in any way sufficiently popular to overcome the resistance that they must necessarily encounter. This criticism holds good, quite apart from the objections of principle to which they are all open, in very different degree it is true. The influence of custom in relation to money can never be set aside. For this reason it is certain that very gradual change is the only possible kind of monetary reform that can hope for success. It is essential to preserve as far as possible the old surroundings and avoid the intrusion of novel devices. The adoption of what Sir R. Giffen has styled ” fancy monetary standards ” is reserved for a distant future.

In the course of the development of monetary systems

important theoretical problems have presented themselves. For the middle ages the great question was the best mode of securing an honest metallic currency. At the beginning of the modern national states the problem of keeping a parity between silver and gold was the most serious issue which each state attempted to solve independently. With the rise of credit there followed debate on the proper manage- ment of paper money in its various forms, which has not yet been completely closed. But the tendency in the last fifty years has been to concentrate attention on the meaning and due constitution of the monetary standard. In particular, the difficulties that result from an alteration in general prices, and the incon- venience to foreign trade from different currency standards have been exhaustively considered. It is therefore desirable to present in a concise form what

appears to be the outcome of these discussions. The first established conclusion is the impossibility of obtaining an absolute and invariable standard. The best that can be hoped is a near approximation by balancing the elements of fluctuation. The construction of the most suitable monetary system is a work of practical adjustment. The influence of the actual conditions, which has been already emphasized, helps to indicate the limits of profitable inquiry. In respect to the metallic basis the choice is between the single standard — gold or silver, and some combina- tion of these. The single standard of silver can be set aside, though it has had influential supporters. On the other hand the only combinations that need be considered are those indicated above by the titles ” bimetallism ” and ” symmetallism.”

The theory of the gold standard rests on the principle that one metal is a better criterion for measuring values than two, since the fluctuations that occur by the substitution of one metal for the other are certain to be disturbing. There is the further difficulty that no ratio can be permanently fixed between two metals, as their values must vary

with the alterations in production. The inherent simplicity, and, so to speak, ” naturalness,” of the single standard is best realized by embodying it in gold, which is universally desired, of high cost and yet found in sufficient amount to discharge the money work of the standard. The verdict of history is appealed to as confirming the theoretic presumption, for gold has been gaining ground from century to century. The struggles to reverse this process have only made it more pronounced (see Monetary Con- ferences). Most of the objections to the gold standard rest on ideas which are the support of other economic fallacies. The at- tempts to supersede it involve the rejection of the rule of economic law. The foundation of the doctrine of ” bimetallism ” is the theory that the value of money is determined, not simply by cost of pro- duction, nor by unregulated supply and demand, but by the action of regulated demand, in conjunction with the actual conditions of production. States are the demanders of metal for monetary use, and by adjusting that demand they can powerfully influence the course of production, especially as the cost at which either

Table I. — Estimated Production of Gold and Silver,

1493-1900.

Period.

No.of

Amount

in Kilos.

Value in Millions of Francs.

Ratio of Value of

Years.

Gold to Silver.

Gold.

Silver.

Gold.

Silver.

1493–1520

28

162,400

1,316,000

560

292

1 1 –3

1 521–1544

24

171,800

2,165,000

592

481

11

2

1 545–1 580

36

273,000

10,976,000

940

2,439

11

5

1581–1600

20

147,600

8,378,000

508

1,862

11

9

1601–1620

20

170,400

8,458,000

587

1,880

13

1621–1640

20

166,000

7,872,000

572

1,749

13

4

1641–1660

20

175,400

7,326,000

604

1,628

13

8

1661–1680

20

185,200

6,740,000

638

1,498

14

7

1681–1700

20

215,300

6,838,000

742

1,520

15

1701–1720

20

256,400

7,112,000

883

1,580

15

2

1 721–1740

20

381,600

8,624,000

1,314

1,916

15

1

1741–1760

20

492,200

10,663,000

1,695

2,370

H

8

1761–1780

20

414,100

13,055,000

1,426

2,900

14

8

1781–1800

20

355–8oo

17,581,000

1,226

3,906

15

1

1801–1810

10

177,800

8,942,000

612

1,987

15

6

1811–1820

10

114,400

5,408,000

394

1,202

15

5

1 821–1830

10

142,200

4,606,000

490

1,023

15

8

1 831–1840

10

202,900

5,964,000

699

1,325

15

7

1841–1850

10

547,600

7,804,000

1,886

1,734

15

8

1851–1855

5

987,600

4,431,000

3,402

• 985

15

4

1 856–1 860

5

1,030,000

4,525,000

3,549

1,006

15

3

1861–1865

5

925,600

5,506,000

3,188

1,223

15

4

1 866–1 870

5

959.5oo

6,695,000

3–305

1,488

15

6

1871–1875

5

869,500

9,847,000

2,985

2,188

16

1876–1880

5

862,100

12,251,000

2,960

2,522

17

8

1881–1885

5

745–700

14,308,000

2,579

2,640

18

6

1 886–1 890

5

796,800

17,362,000

2,743

2,832

21

1

1891

196,600

4,266,000

677

669

20

9

1892

220,900

4,893,000

761

659

23

7

1893

236,700

5,165,000

815

640

26

5

1894

273,200

5,121,000

941

512

32

6

1895

301,500

5,234,000

1,045

544

31

6

1896

305,700

4,908,000

1,049

549

30

7

1897

356,900

5,013,000

1,215

499

34

1898

433,200

5,413,000

1,486

530

35

2

1899

463,500

5,225,000

i,59o

520

33

9

1900

384,600

5,377,000

i,325

556

33

4

1493–1850

358

4,752,100

149,828,000

16,368

33,292

14

05

1851–1885

35

6,380,000

57,563,000

21,968

12,052

16

3 1

1 886–1900

15

3,969,600

53,070,000

13,647

8,510

27

2

t 1493–1900

408

15,101,700

260,461,000

51,983

53,854

14-72

II

706

MONEY

gold or silver is obtained varies with the productiveness of the poorest mine in working. Thus by directing consumption, states are controlling production, and therefore — within limits — fixing the relative value of the two metals. This power has been shown in the stability of the ratio during the continuance of the French double- standard (1803-1873). The possibility of maintaining a given ratio being thus established, the argument proceeds to show the advantages of the system, (i.) It secures the concurrent use of the precious metals and avoids throwing all the money work on gold, (ii.) Greater stability in value may be expected, since the fluctua- tions of either metal will be compensated by those of the other. At the worst the variation can only be as great, (iii.) The larger stock of money tends to keep up prices to the benefit of trade; for falling prices hamper production, (iv.) The fixed ratio provides a stable par of exchange between silver-using and gold-using countries; though universal bimetallism would remove this dis-

tinction, (v.) The establishment of a world-currency would be facilitated by allowing both metals a well-defined relation. iThis enumeration of the heads of the ” bimetallic ” case shows that its working depends on the area of its operation. It must be ” inter- national “_ and the states composing the union must be ” great powers ” in the monetary sense. Otherwise, their action would be comparatively ineffective. The crucial difficulty has been the determination of the common ratio. The

risk of failure in carrying out the policy has proved a deterrent to such great powers as England and Germany, who are in possession of the gold standard. On the theoretic side the chief weakness of bimetallism has been its failure to supply any clear account of the limits within which states can regulate the ratio of gold to silver. If the ratio 15-5:1 can be set up why should not the ratio 100:1, or that of equality? Its practical failure has resulted partly from political conditions, partly from the removal of most of the difficulties which it was

Table II-

-The Coinage Systems of Continental Europe, exhibiting (he gold and silver coins, their weight, fineness, remedy and approximate value in English and United States money.

1

Rem.

Approximate

Rem.

Approximate

■

[rt

li

1000

Money Value.

*"3

en

5 «

J s

1000.

Money Value.

m

^j

%

a

.a

d

^

Coins.

a.

‘S S3

.3

“■“3 a

as

41

n

G

d

d

4jj

a W

51

Coins.

•s g

<3 § •sjS

"C

d

A

11

. a

Sin

Austria Hungary *—

£ s. d.

$ c.

Netherlands fi —

£ s. d.

$ c.

100 Kreutzer 20 Kronen piece

Gold

6 '775067

goo'o

20

2'5

016 8

405

100 Cents = 10 Guilder piece

Gold

6-720

goo’o

i‘5

2*0

16 6

4 2

= 1 Gulden. 10 „ ,,

„

3‘387S34

900

20

2‘5

084

2 02

1 Guilder. 5 „ „

„

3 360

goo’o

i‘5

2”0

083

2 I

8 Gulden

’’

6-45161

goo’o

2*0

2-5

015 10

3 86

4

,,

3‘22S8q

goo’o

2‘0

2-5

7 11

1 93

2\ „

Silver

25-000

945 ‘0

2*5

2*5

042

I O

4 Ducat ,,

„

13-9636

986’ 1

_

1 17 7

9 15

1 j. .–

”

10 ‘ 000

945 ‘0

2*5

2”5

018

40

I ” ”

”

3 ‘40OQ

986’ 1

095

2 29

1

3 ! ” M

25 Cents .

”

5000

3‘575

945 ‘0 640*0

2*5

2‘5

2*5 2‘5

10 005

20

O IO

1 Krone ,,

Silver

S’o

835’o

—

■ — ‘

10

20

10 „ . . .

,,

1 ‘400

640^0

2*5

2*5

002

O 4

1 Dollar

”

28-0668

833‘3

— •

—

—

5 „ . . .

,,

0-685

640*0

2‘5

2‘5

001

O 2

(Maria Theresa)

96

Norway. See Denmark.

2 Gulden „

it

24‘6gl4

goo’o

20

2‘5

3 iii

Portugal * 6 —

1 » > t 20 Kreutzer ,, 10 „ ,,

”

I2‘34S7

2666

l‘666

goo’o

500

400 ‘o

2‘0 20

2 ‘O

2*5

2‘5 2‘5

1 11$ 005

O O 2\

48 10 5

1000 Rets = 1 Crown or $10 ‘ 000 Mitrei. Half-Crown or $5 ‘ 000

Gold

17 ‘735 8-867

91 6 ‘660 916 ‘666

2‘0

2‘0

2‘0 2‘0

2 4 5

I2 2-J

IO 80

5 40

‘*

One-fifth Crown or $2 *ooo

’’

3 ‘547

916″ 66$

2‘0

20

8 10

2 16

Belgium. See France.

One-tenth Crown or $1 ‘ 000

»

I ‘773

916 ‘666

2‘0

2‘0

4 5

1 8

Denmark 2 — iooOre = i 20 Kroner piece

Gold

8-960572

goo’o

i‘5

15

12 1

5 36

500 Reis .

Silver

12 ‘500

qi6‘666 916 ‘66§

916 ‘666

gi6 ‘66&

2‘0

3’o

2 2j

54

Krone. 10 ,, „

»

4-480286

goo’o

i‘5

2‘0

O II O^

2 68

200 „ 100 „

„

5 000 2-500

2‘0 2*0

3*o 3’o

io£

si

21

II

2 ,, ,,

Silver

1 5 – 000

800 ‘0

3’o

30

2 2^

053

50 „ . . .

»

1 ‘250

20

30

2I

5

1 Krone „

7 ‘500

800 ‘0

3’o

30

O I ij

27

Rumania. See France.

50 Ore piece

’’

5-000

600 ‘0

3’o

3-0

6f

13

Russia 7 —

40 „ . .

”

4 ‘000

600 “0

3’o

30

005$

10

100 Copecks 15 Rouble piece

Gold

12 ‘902

goo’o

nil

2*0

1 11 8

7 72

25

,,

2 ‘420

600

3”o

3’o

003$

6\

-= Rouble. (Imperial)

10 ,, .

,,

1 ‘450

400

3”o

30

1 $

O 2\

10 „ ,,

’’

8- 601

goo’o

„

2‘0

113

5 14

France 3 —

7i „

„

6-451

goo’o

’’

2 ‘O

015 10

3 86

100 Centimes 100 Franc piece = 1 Franc. 50 „

Gold

32-25806

i6” 12903

goo’o

goo’o

2‘0 2‘0

I “o

I “0

319 z\

1 19 7*

1930 965

U –Imperial)

5

„

4 ‘301

goo’o

,,

2‘0

10 8

2 57

20 „ „ 10 „ ,,

„

6–45161 3–22580

900

goo’o

2‘0

2‘0

2”0 2 ‘0

015 10

7 n

386 1 93

1 „ ,,

Silver

19-995

900*0

,,

2*0

O 2 li

1 of 1 6£

51

S

..

1*61290

goo’o

2‘0

3’o

3 112

96

„

9 ‘997 4 ‘998

goo’o goo’o

„

2*0 2‘0

25 13

5

2 ,, „

Silver

23-0

io”o

goo’o 835’o

2‘0 3‘0

3-0 50

3 “2 017

96 038

20 Copecks . 15 „ • ■

”

3 ‘599 2 ‘699

Soo’o 500 ‘o

—

—

005

00 3l

10 7

1 >> .- 50 Centimes . 20 ,, . ■

»

5”o

2*5

835 -0

835-0

3‘0

5-0

q\

4!

19 10

10 „ . Servia. See France.

”

I ‘799

500 “o

O O 2\

5

I’O

835*0

__

002

4

Spain. * 8 See France.

Sweden. See Denmark.

Germany*—

Switzerland. See France.

100 Pfenntge 20 Mark piece .

Gold

7.964954

goo’o

- —

—

019 7

476

Turkey * 9 —

=*i Mark. 10 „

3.982477

goo’o

■ — •

—

g 9-1

238

5

„

I 091239

goo’o

—

—

4 iof

1 19

100 Piastres Medjidie or Lira *=! Medjidie. £ „ „

Gold

7‘2l6

3’ 608

gi6‘666 gi6‘666

2”0 2‘0

2*0 2*0

Ol8o

g

4 4°

2 20

S

Silver

27‘777?

goo’o

—

—

4 10J

1 19

1

’’

1 ‘804

gi6‘666

2‘0

2‘0

046

I 10

2 „

1′ mi

goo’o

—

—

1 115

048

1 i)

I(

5‘5555

goo’o

”

— ■

uf

24

20 Piastres .

Silver

24‘055

830*0

$‘0

3’o

o37

88

So Pfennige

”

2‘7777

goo’o

— ■

— ■

006

12

10 „ „

„

I2‘027

830 “0

3‘0

3’o

O I Qj

44

20 „

tt

1 ‘ mi

goo’o

—

O 2\

s

5

’’

6’oi3

830*0

3*o

3*o

IO^

22

Greece.* See Franck.

2 „ . .

„

2-405

830*0

30

3*o

004

9

Italy. See France.

1 „

„

1 ‘202

830*0

30

3’o

2

4

- Inconvertible paper currency.

1 Present system introduced in 1894, in place of the system adopted in 1870. The Maria Theresa dollar is only used as a com- mercial money in Levantine trade.

2 The system of the Scandinavian union came into force on the 1st of January 1875. It is based on gold monometallism.

3 The coinage system of France came into force on the 6th of May 1799. It was extended to the countries forming the Latin union in 1865; it has been adopted by Greece, Rumania, Servia and Spain. It is the most widely extended system in Europe. The Austrian 8 and 4 gulden pieces were equivalent to the 20 and 10 franc pieces. In 1879 it was estimated that the system was used by populations amounting to 148,000,000. In its origin a double standard (with ratio of 1 5′ 5:1) it has become a limping standard by the limitation of the silver coinage. The unit is the same value all through the union, but receives different names in different countries. The titles are: in France, Belgium and Switzerland, franc and centime; in Italy, lira and centesimo; in Greece, drachme and lepta ; in Rumania, leu and ban ; in Servia, dinar and para; in Spain, peseta and centesimo.

- The German coinage law came into force on the 1st of January

1875. It was modelled on the English system, but it is only in the last few years that the old silver has been completely withdrawn.

6 The Dutch standard has been changed more than once. In 1847 a silver standard was introduced, and retained till 1872, the unit being the silver guilder. In 1875 the free coinage of gold was decreed; silver coinage having been restricted since 1872. Thus the limping standard is in force.

6 The nominal standard of Portugal is gold. The English sovereign is legal tender at 4500 reis.

7 The Russian currency until 1897 was nominally a silver standard one; but really was inconvertible. The currency was improved in 1885; and in 1897 the gold standard was adopted, provision being made for the withdrawal of the paper money. Finland, which had a currency on the French model, is now being compelled to accept the Russian currency.

8 The Spanish coinage was assimilated to that of the Latin union in 1871. Spain, differing from the other countries of the group, coins a 25 peseta piece.

9 The Medjidie coinage was introduced in 1844. English sove- reigns circulate at 125 piastres; 20 franc pieces at 100 piastres.

intended to meet by the subsequent economic development. The proposal for a joint standard formed by using a unit in which the two metals are combined has the advantage of escaping the risk of failure to maintain the ratio, for it makes the employment of both silver and gold essential. Its influence in causing stability is also likely to be greater; but it is open to the danger that a shortage of one metal would not be compensated by the abundance of the other. The further advantage that it does not need international agreement (for each country could settle its own combination) is counterbalanced by the strangeness of the plan and by its necessi- tating the use of representative money. The suggestion of

" goloid " coins on the model of the Greek electrum would hardly be acceptable.

11. The Present Money Systems of the World: Changes of the last Half Century. — The facts as to the money of the leading countries of the world are given in Tables II. and III. It is, however, necessary to explain the way in which this position has been reached by the reforms of the last fifty

years. Since i860 the alterations in standards and in coin denominations have been of a very extensive nature. England is one of the

Table III.-

—Currencies of

the more

important non-European States.

Rem.

Approximate

Rem.

Approximate

-I

■s S

_ ·

1000.

Money Value.

_ .

1000.

Money Value.

Coins.

8 8

HI

C

d

a

a W

•3 3

Coins.

bo a *S ^

S ffi

— 2

a

OJ

c

d

J3

.53

"bO

c

W

■****• .A

A.— NORTH AMERICA.

Chile * 6 —

100 Centavos 20 Peso piece

£

s. d.

$ c.

British Dominions 1 — -

= 1 Peso. (Condor) .

Gold

1 1*982

9i6‘6

—

—

1

10

7 20

100 Cents=” 1 Dollar.

10 „

5

„

s‘991

2-995

9166

916‘6

—

—

15 7 6

3 60 1 80

Mexico 2 —

£

s. d.

$ c.

100 Centavos 10 Dollar piece.

Gold

8‘333

900*0

i’S

3’o

1

5

4 98

50 Cent piece .

Silver

20‘0

835-0

—

—

1 6

36

= 1 Dollar 5 „

’’

4’i66

900 ‘0

i‘5

S’o

10 3

2 49

M

lO’O

835-0

—

—

9

18

{Piastre).

20 ,,

,,

5’°

835-0

—

—

3i

7

1 j) 50 Cent piece .

20 ,,

10 „ United States 3 —

Silver

27‘073

I2‘5

5’°

2‘5

902*7

800 ‘0 800 ‘0

8oo’o

3’o

4*0 4*0

4”o

3‘6 60

8’o 8*o

2 05

1 ol

5

i\

49

25 10 5

10 „ Colombia* r — 100 Centavos 20 Peso piece . = 1 Peso. 10 „

(Condor) .

Gold

2‘5

32-258

i6’i29

835-0

9oo’o 9oo’o

–

–

3

1

2

19 3s

19 8

4 19 30 9 65

100 Cents 20 Dollar piece

5 Peso piece

’’

8-063

9000

—

—

19 10

4 82

= 1 Dollar. (Double Eagle)

Gold

33‘43°

9000

2*0

i”o

4

2 6

—

- M

.)

3‘225

900”o

—

—

7 Hi

1 93

10 Dollar piece

(Eagle) . . 5 Dollar piece.

”

16718 8‘359

900 ‘0

900 – o

2*0 2*0

2*0

2*0

2 1

1 3

l\

–

20 Centavos .

10 ,,

Silver

25-0

S’o

2‘5

9oo’o

835‘0 835‘0

—

—

3 Ha

9! 5

96 19 10

3 »

M

S’oi5

900*0

2*0

2*0

12 4i

5 » • •

n

i‘25

835‘0

—

—

2 A

5

A

,,

4179

900*0

2‘0

,3’o

10 4

Peru s —

1 ..

Silver

i‘67i

900 ‘0

2‘0

3’o

4 ij

10 Soles 1 Libra piece = 1 Libra. 5 Soles^ Libra)

Gold

7-988

3 ‘994

916*6 916*6

2‘0 2*0

2‘0 2‘0

1

10

4 86 2 43

•)•

26-729

900*0

3”o

5’o

4 1*

50 Cent piece .

’’

I2‘5°0

900 ‘0

3’o

S’o

2 05

1 Sol piece .

Silver

25’o

900*0

2”0

3”0

2

48

25

.1

6‘250

900

3”o

S’o

1 o|

50 Centavos .

’’

I2‘5

900*0

2”0

3’o

1

O 24

10 „

M

2‘500

goo’o

3’o

_

5

__

20 „

}t

5’°

835’o

3”o

5’o

O 2\

5

5

’’

i‘25o

900*0

3’o

—

2^

Ecuador. See Peru.

3

”

o‘8o2

750*0

3”o

”

i|

C— ASIA.

B— SOUTH AMERICA.

India (British) 9 —

Argentine Republic * 4 —

3 Pie= 1 Pice. 1 Rupee piece .

Silver

1 1 “66 5

916*6

—

—

1 4

32

100 Centesimos 20 Peso piece .

Gold

33‘333

900*0

—

—

4

1 8

19 94

4 Pice= 1 Anna.\ „

t ,

5-832

916*6

—

—

8

16

= 1 Dollar 10 ,,

,,

16666

900*0

—

— ■

2

10

9 97

i6Annas= iRupee.i „

,,

2‘9i6

916*6

—

—

4

8

{Peso). 5

”

8’S33

900*0

”

-

1

S

4 98

(15 Rupees | ,, = i Pound).

”

1-458

916*6

—

—

2

4

I »

Silver

25*000

900*0

—

—

3 ni

96

Japan 10 —

Brazil.* s —

100 Sen= 1 Yen. 20 Yen piece.

Gold

16-666

900*0

I’O

“2

2

1

9 97

1000 Rets 20 Milreis piece.

Gold

17-929

9i6‘6

—

—

2

4 i°i

TO 91

10 „

„

8-333

900*0

i’o

‘3

1

6

4 98

= 1 Milrei. 10 „

„

8964

916*6

~~ „

—

1

2 5

5 45

5 • ■

„

4’i66

900*0

I’O

‘4

10 3

2 49

2 „

Silver

25‘5°o

916*6

_

__

4 5

1 9

50 Sen ,,

Silver

I3‘478

800*0

3’o

“35

1 ol

25

1 »

”

I2‘2SO

916*6

_

_ -

2 *i

55

20 ,,

’’

6391

8oo’o

3’o

“5

5

10

3 ‘i

6-375

916*6

~~

__

I I

27

10 ,, . .

–

2‘695

800′

3’o

6

i\

5

- Inconvertible paper currency.

1 Until 1906 there was no mint in Canada. English and American coins circulate. The standard is gold (£i =4-866 dollars). There were formerly different methods of counting, viz. English sterling, Halifax currency and Canadian sterling; the respective ratios being 100: 120: 108.

2 The Mexican currency has been entirely altered in its standard by the legislation of 1905. The gold-exchange system has been brought into force. The old-established dollar, which is called piastre, is reduced so as to represent a ratio of about 33-1.

3 The dollar was introduced in 1787 as the unit. In 1792 the ratio of gold to silver was fixed at 1 to 15. This valuation under- rated gold, consequently silver became the standard. In 1834 the ratio was altered to I to 16, and it was again changed in 1837. In these changes gold was overrated, and silver was driven out of circulation. This led, in 1853, to the reduction of the metal in the silver coins, which therefore became a token-currency. The suspension of cash payments took place in 1861. In 1873 silver was demonetized, and gold became the standard. In 1878 the ” Bland Bill ” was passed, making the silver dollar a legal tender, but confining its coinage to the executive, and fixing the amount at from two to four million dollars per

month. The difficulties that resulted from this measure led to the Sherman Act of 1890, pro- viding for the coinage of silver to the annual amount of 54,000,000 oz. Owing to the critical situation created by these efforts to aid silver, the repeal of the Sherman Act was carried in 1893. Since then the chief problem has been to maintain an effective gold reserve.

4 The Argentine currency is, in practice, one of inconvertible paper. The gold coins were altered in 1 881. The old South American onza weighed 27 grammes, was 875 fine and worth £3, 4s. 6d.

6 The Brazilian currency is greatly depreciated. It is derived from the Portuguese.

6 The Chilean coinage was reformed in 1895, when the gold standard was adopted, and the system brought into relation to the English one. Two Chilean Condors (20 peso pieces) being equal to£3-

7 In 1904 Colombia adopted the gold standard by taking the equivalent of the U.S. dollar as the unit; but the inconvertible paper is the main currency; and the old coins pass as commercial money.

8 After attempting a parity with the Latin union, and passing through a period of inconvertible paper, Peru has adopted the English gold standard and coinage, but keeps her own silver denominations.

9 The silver standard was prescribed in India in 1835, with the use of the gold mohurs. The latter was demonetized in 1853. In consequence of the fall in the gold value of silver, the Indian mints were closed to the coinage of silver, otherwise than by the government, in 1893. The amount of currency was so limited as to bring the rupee to the value of is. 4d. On the realization of this position, English sovereigns were made legal tender at the ratio of 15 rupees = 1 sovereign. India has, by these measures joined the class, now becoming numerous, of gold-exchange standard countries.

10 The old Japanese currency consisted of gold cobangs and silver itzibus, with a ratio of 4 to 1. This antique system was replaced in 1871 by a double-standard one on the French plan, the ratio being 16-17: 11. The system passed first into one of silver monometallism; and then became one of inconvertible paper. The great reform of 1897, aided by the Chinese War indemnity, placed the currency on the gold basis.

few countries that has not found change desirable. France has reorganized her token coins (1864), entered into the Latin union (1865) and adopted the limping standard in 1874. Ger- many has completely transformed the monetary system hitherto existing in the German States (1873). The Scandinavian union has been- set up (1875). Holland has changed her system more than once. Still later, Austria-Hungary (1892) and Russia (1897) have come over from the silver standard with the practical use of inconvertible paper to new currencies on the gold basis. In America the United States, after a series of monetary expe- riences, has made the gold dollar its standard unit, though the silver complication still exists. Mexico has succeeded in establishing a gold-exchange standard at such a ratio as to induce the import of gold. British India has had its rupee currency put into relation to the English gold unit, and has been followed by the Straits Settlements. Japan first abandoned its ancient currency (1871). It then adopted a double standard sj'Stem which became in practice a silver one and later passed into inconvertible paper. Finally, it has (1897) established a composite legal tender system on the gold basis. The Dutch Indies have the gold-exchange standard on the same plan as British India.

Remarks. — In addition to the tabular statements, the following points respecting the currencies of less advanced countries may be indicated. Though there is a tendency to establish the money of the

mother-country in colonies, some of the British possessions, acquired by conquest, have kept their former currency. There has been a widespread movement in the backward countries of the world towards reforming their money; chiefly by setting up some line of connexion with the gold standard. In South and Central America the dollar has been retained as the unit ; but the movement for co-ordination with the French system has ceased. The English standard has been preferred as a model by Chile and Peru. In Asia the currency of the Philippines has been reorganized under American control. China is considering monetary reform, and Siam has made progress in the direction of the gold-exchange standard. Probably the most defective currencies are now those of Turkey and her tributary states.

Bibliography. — The literature on the subject of money has been well described as ” almost measureless.” The list of writers who have contributed to it begins with Aristotle, and includes such famous names as Copernicus, Locke and Newton. A full enumera- tion would fill a volume of no slight size. All that can be done here is to give a short classified list of the most serviceable books.

I. Economic text-books: English and American — J. S. Mill, Principles of Political Economy (London, 1848; new ed. by Ashley, 1909); Sidgwick, Principles of Political Economy (London, 1883; 3rd ed., 1901); J. S. Nicholson, Principles of Political Economy (3 vols., London, 1893-1901); P. A. Walker, Political Economy (New York, 1883; 2nd ed., 1887, often reprinted); A. T. Hadley, Economics (New York, 1896) ; E. R. A. Seligman, Principles of Econo- mics (New York, 1905) ; H. R. Seager, Introduction to Economics (New York, 1904; 3rd ed., 1908). French: M. Chevalier, Cours d’economie politique {vo. iii. ” La Monnaie,” Paris, 1850); P. Leroy- Beaulieu, Traite d’economie politique (4 vols., Paris, 1896); C. Gide, Cours d’economie politique (Paris, 1909). German: H. Mangoldt, Grundriss der Volkswirtschaftslekre (2nd ed., Stuttgart, 1871); G.

Schonberg, Handbuch der politischen Oeconomie (Ttibingen, 1882; 4th ed., 1904); G. Schmoller, Grundriss der allgemeinen Volkswirtschaftslekre (Leipzig, 1900-1904). The Dutch work by N. G. Pierson has been translated into English with the title Principles of Economics (London, 1902).

II. Special treatises on "Money": W. S. Jevons, Money and the Mechanism of Exchange (London, 1875) '< F. A. Walker, Money (New York, 1878); J. S. Nicholson, Money and Monetary Problems (London, i888;6thed., 1902) ; C. A. Conant, The Principles of Money andBanking (2 vols., New York, 1905); A. Arnaune, La Monnaie, le c'ridit et le change (Paris, 1894; 2nd ed., 1902); A. de Foville, La Monnaie (Paris, 1907) ; C. Knies, Geld und Kredit (Berlin, 1873- 1879) ; G. F. Knapp, Staatliche Theorie des Geldes (Leipzig, 1905).

III. Works on special questions: See Bimetallism; Banking; and Monetary CoNFERENCEsfor writings on the problems of the stand- ard and depreciation. For the history of money— F. Lenormant, La Monnaie dans I'antiquM (Paris, 1876); W. A. Shaw, History of Currency, 1252-1894 (London, 1895). For the history of the English currency, besides the works on the numismatic side — Lord Liverpool, Coins of the Realm (1805; reprinted 1880). For America — W. G. Sumner, History of American Currency (New York, 1874). On the production and consumption of money materials, W. Jacob, Production and Consumption of the Precious Metals (2 vols., London, 1831); and A. Del Mar, History of the Precious Metals (London, 1880). Technical details in Tate's Cambist (many editions). (C. F. B.)

MONEY-LENDING, the lending of money on usury (?.».). The business of the professional money-lender is one which, as

tyranny and abuse are likely to appear, all countries have at different times endeavoured to regulate. In England the lessons of experience have shown that the abuses of this business are best regulated by a system of registration coupled with

relief to debtors against harsh and unconscionable bargains. Other countries however still appear to cling to the belief that it is wisest to fix a maximum rate of legal interest. Thus in Germany the commercial code fixes the legal rate of interest on commercial transactions at 5%. Moreover in that country traders can demand interest on commercial debts from the day on which the debts fall due. In France, again, the Code fixes the rate of interest on ordinary loans at 5 , and on commercial transactions at 6. In the United States of America the law relating to the lending of money on usury varies in the different states. All the states have what is called a ” legal rate ” of interest; and when no rate of interest is specified in the contract between the parties, there is a presumption that the borrower has agreed to pay the legal rate. This legal rate varies from 5% in Louisiana to 8% in Wyoming; in the Eastern states it is generally 6 %. Some of the states have usury laws giving relief to borrowers in cases where circumstances have compelled them to agree to extortionate rates; but other states have no such laws, except that a contract in writing is invariably required in all cases where the ” legal rate ” is exceeded.

Practically every form of investment in which a man is capable of indulging involves the lending and borrowing of money, the interest exacted being the profit which the lender receives for the use of his capital. The existence of the pro- fessional lender, as apart from the ordinary facilities for borrowing money on good security, is obviously due to the fact that it is not every borrower who is in a position to give good security for a loan. Where the security is bad the market is narrowed; the individuals who are prepared to lend the money on merely personal security require a high rate of interest.

The first people to practise the profession of money-lending in England regularly were the Jews, and the business has remained largely in their hands, though they are in the habit of trading under assumed names. The Norman and Angevin kings were

fully alive to the advantages which accrued to the people through borrowing at usury from the Jews, but they were also alive to the advantages which they themselves were able to reap by extorting from the Jews the wealth which the latter had acquired from the people. The Jews were regarded as the king's serfs, and squeezing them was but a popular form of taxing the people. Indeed in the reign of Henry II. the Scac- carium Judaeorum was established as a separate branch of the exchequer and used for the purpose of filling the royal coffers. The English people on the other hand were not so prone to foster the money-lending business. Sections 10 and 11 of Magna Carta provided that when a person died owing money to a Jew no interest should accrue during the minority of the heir, and further that the widow should be entitled to her dower, and any children who were minors should be provided with necessaries before the repayment of the loan. Then followed a large number of statutes known generally as the Usury Laws (see also Usury) . The first of these was passed in 1235 (20 Hen. III. c. 5). The acts were directed to restrain the lending of money at usurious rates. The earlier ones in some cases prohibited the lending of money on usury at all, as in a statute of Jewry of the reign of Edward I. ; but the later statutes were chiefly confined to limiting the rate of interest. Thus 21 Jac. I. c. 17 declared void all contracts where the interest was more than 8%. In 1818 a select committee of the House of Commons was appointed to consider the Usury Laws and in 1841 a similar committee of the House of Lords was appointed. As a result an act was passed in 1854 (17 & 18 Vict. c. 90) whereby all the existing laws against usury were repealed.

The question whether any interest is payable or not, and also the amount of such interest, depends on whether the parties to the transaction have expressly or impliedly agreed to the payment of interest by the borrower; for apart from such agreement no interest can lawfully be demanded on a loan.

Although in general there is no limit on the amount of interest which a borrower may agree to pay, equity has always been ready to grant relief from unconscionable bargains. This equitable relief is still available, though it is not so wide as the relief now given to borrowers under the Money-lenders Act 1900. This act provides that where proceedings are taken in any court by a money-lender for the recovery of money lent, and there is evidence which satisfies the court that the interest charged on the loan, or the amounts charged for expenses, inquiries, fines, bonus, premium, renewals, &c, are excessive, and that in either case the transaction is harsh and uncon- scionable, or is otherwise such that a court of equity would grant relief, the court may reopen the transaction and take an account between the money-lender and the person sued, and may, notwithstanding any statement or settlement of account or any agreement purporting to close previous dealings and create a new obligation, reopen any account already taken between them and relieve the person sued from payment of any sum in excess of the sum adjudged by the court to be fairly due in respect of such principal, interest and charges as the court, having regard to the risk and all the circumstances, may adjudge to be reasonable.

The Money-lenders Act of 1900 was passed in consequence of grave abuses which had arisen. It had been the practice of a certain class of lender to trade under a variety of names; so that under one name the same individual would lend money to a person who borrowed from him under another name; the second loan would be spent in liquidating the first, and the borrower finding it always easy to obtain more money would continue borrowing until he became hopelessly involved. The act struck at the root of this pernicious system by providing that every money-lender, as defined by the act, must register himself as such, under his own or usual trade name, and in no other name, and with the address, or all the addresses if .more than one, at which he carries

on his business of a money-lender. If a money-lender fails to register himself, or if he carries on a money-lending business otherwise than in his registered name, or in more names than one, or elsewhere than at his registered address, he is liable on summary conviction to a fine, not exceeding one hundred pounds. For the purposes of the act ” money-lender ” is defined as including every person whose business is that of money-lending, but it does not include pawnbrokers, in respect of business carried on by them under the Pawnbrokers Act, Registered Friendly, Loan or Building Societies, coporate bodies incorporated or empowered by special act of parliament to lend money, persons bona fide carrying on the business of banking or insurance, or bona fide carrying on any business not having for its primary object the lending of money, or bodies corporate for the time being exempted from registration by order of the Board of Trade.

The act is not confined to providing for the registration of money- lenders and for the reopening of harsh and unconscionable bargains. A check is placed on false representations and promises made with the intention of inducing a borrower to enter into a loan transaction. If any money-lender, or any manager, agent or clerk of a money- lender, or any person being a director, manager or other officer of a corporation carrying on the business of a money-lender, by any false, misleading or deceptive statement, representation or promise, or by any dishonest concealment of material facts, fraudulently induces, or attempts to induce, any person to borrow money or to agree to the terms on which money is to be borrowed, he is declared by the act to be guilty of a misdemeanour and is liable on indictment to imprisonment with or without hard labour for a term not exceeding two years, or to a fine not exceeding five hundred pounds, or to both.

The act further provides that if any one for the purpose of earn- ing interest, commission, reward or other profit sends or causes to be sent to a person whom he knows to be an infant any circular or other

document which invites the person receiving it to borrow money or to apply to any person or at any place with a view to obtaining information or advice as to borrowing money, he shall be liable, if convicted on indictment, to imprisonment with or without hard labour, or to a fine, or to both imprisonment and fine. If any such circular or document sent to an infant purports to issue from any address named therein or indicates any address as the place at which application is to be made with reference to the subject matter of the document, and at that place there is carried on any business connected with loans, every person who attends such place for the purpose of taking part in or assisting in the

carrying on of such business will be deemed to have sent or caused to be sent such circular or document, unless he proves that he was not in any way a party to and was wholly ignorant of the sending of such document. Moreover, by section 5 of the Money-lenders Act 1900, where any proceedings are taken against the senders of these circulars to infants, if it is proved that the person to whom the document was sent is an infant, the person charged will be deemed to have been cognisant of the fact unless he proves that he had reasonable grounds for believing the infant to be of full age. Under the act of 1892 this shifting of the burden of proof only oc- curred if the circular had been sent to any person at any university, college, school or other place of education.

As for the recovery of money lent ; if the loan is not tainted with illegality or immorality, or made for a purpose contrary to public policy, the amount may be recovered by a common law action. Where an intending borrower breaks his agreement to borrow, specific performance will not be granted, and the damages recover- able must be measured by the loss sustained through the breach and not by the sum agreed to be lent (The South African Territories, Limited v. Wallington (1897), 1 Q.B. 692).

Authorities. — On equitable relief to borrowers

reference should be made to Bellot and Willis's Bargains with Money-lenders. On the law under the act of 1900 see Hastings's Law relating to Money* lenders and Unconscionable Bargains ; and Edmondson's Money- lenders Act 1900. For the taxation of the Jews in the middle ages, see Bridges, The Jews of Europe in the Middle Ages, and Gneist's History of the English Constitution. For American law relating to Usury, see Stimson's American Statute Law, and the statutes of the various states. For France and Germany, see the codes of those countries. (C. G. Ala.)

MONFORTE, or Moneorte deLemos, a town of north-western Spain, in the province of Lugo, on the Cabe, a small right-hand tributary of the Sil, and at the junction of the railways from Tuy and Astorga to Corunna. Pop. (1900), 12,912. Monforte is built on a hill surmounted by a ruined medieval citadel; it contains an ancient Benedictine monastery converted into a hospital, a Jesuit college, and a fine Renaissance parish church, besides several convents and palaces of the Leonese nobility. Monforte has manufactures of soap and linen, and some trade in timber and livestock.

MONGE, 6ASPARD (1746-1818), French mathematician, the inventor of descriptive geometry, was born at Beaune on the 10th of May 1746. He was educated first at the college of the Oratorians at Beaune, and then in their college at Lyons— where, at sixteen, the year after he had been learning physics, he was made a teacher of it. Returning to Beaune for a vacation, he made, on a large scale, a plan of the town, inventing the methods of observation and constructing the necessary instruments; the plan was presented to the town, and preserved in their library. An officer of engineers seeing it wrote to recommend Monge to the commandant of the military school at Mezieres, and he was received as a draftsman and pupil in the practical school attached to that institution; the school itself was of too aristocratic a character to allow of his admission to it. His manual skill was duly appreciated: "I was a thousand times tempted," he

said long afterwards, ” to tear up my drawings in disgust at the esteem in which they were held, as if I had been good for nothing better.” An opportunity, however, presented itself: being required to work out from data supplied to him the ” defile- ment ” of a proposed fortress (an operation then only performed by a long arithmetical process), Monge, substituting for this a geometrical method, obtained the result so quickly that the commandant at first refused to receive it — the time necessary for the work had not been taken; but upon examination the value of the discovery was recognized, and the method was adopted. And Monge, continuing his researches, arrived at that general method of the application of geometry to the arts of construction which is now called descriptive geometry (see Geometry, Descriptive). But such was the system in France before the Revolution that the officers instructed in the method were strictly forbidden to communicate it even to those engaged in other branches of the public service; and it was not until many years afterwards that an account of it was published.

In 1768 Monge became professor of mathematics, and in 1771 professor of physics, at Mezieres; in 1778 he married Mme Horbon, a young widow whom he had previously defended in a very spirited manner from an unfounded charge; in 1780 he was appointed to a chair of hydraulics at the Lyceum in Paris

(held by him together with his appointments at Mezieres), and was received as a member of the AcadSmie; his intimate friend- ship with C. L. Berthollet began at this time. In 1783, quitting Mezieres, he was, on the death of E. Bezout, appointed examiner of naval candidates. Although pressed by the minister to prepare for them a complete course of mathematics, he declined to do so, on the ground that it would deprive Mme Bezout of her only income, from the sale of the works of

her late’ husband; he wrote, however (1786), his TraiU elementaire de la statique. , Monge contributed (1 770-1 790) to the Memoirs of the Academy of Turin, the MSmoires des savantes etrangers of the Academy of Paris, the MSmoires of the same Academy, and the Annales de chimie, various mathematical and physical papers. Among these may be noticed the memoir ” Sur la theorie des deblais et des remblais ” {Mem. de I’acad. de Paris, 1781), which, while giving a remarkably elegant investigation in regard to the problem of earth-work referred to in the title, establishes in connexion with it his capital discovery of the curves of curvature of a surface. Leonhard Euler, in his paper on curvature in the Berlin Memoirs for 1760, had considered, not the normals of the surface, but the normals of the plane sections through a par- ticular normal, so that the question of the intersection of successive normals of the surface had never presented itself to him. Monge’s memoir just referred to gives the ordinary differential equation of the curves of curvature, and establishes the general theory in a very satisfactory manner; but the application to the interesting particular case of the ellipsoid was first made by him in a later paper in 1795. A memoir in the volume for 1783 relates to the production of water by the combustion of hydrogen; but Monge’s results had been anticipated by Henry Cavendish.

In 1792, on the creation by the Legislative Assembly of an executive council, Monge accepted the office of minister of the marine, but retained it only until April 1793. When the Committee of Public Safety made an appeal to the savants to assist in producing the malSriel required for the defence of the republic, he applied himself wholly to these operations, and distinguished himself by his indefatigable activity therein; he wrote at this time his Description de I’ art de fabriquer les canons, and his Avis aux ouvriers en fer sur la fabrication de I’acier. He took a very active part in the measures for the establishment of the normal school (which existed only during the first four

months of the year 1795), and of the school for public works, afterwards the polytechnic school, and was at each of them professor for descriptive geometry; his methods in that science were first published in the form in which the shorthand writers took down his lessons given at the normal school in 1795, and again in 1798–1799. In 1796 Monge was sent into Italy with C. L. Berthollet and some artists to receive the pictures and statues levied from several Italian towns, and made there the acquaintance of General Bonaparte. Two years afterwards he was sent to Rome on a political mission, which terminated in the establishment, under A. Massena, of the short-lived Roman republic; and he thence joined the expedition to Egypt, taking part with his friend Berthollet as well in various operations of the war as in the scientific labours of the Egyptian Institute of Sciences and Arts; they accompanied Bonaparte to Syria, and returned with him in 1798 to France. Monge was appointed president of the Egyptian commission, and he resumed his connexion with the polytechnic school. His later mathematical papers are published (1794–1816) in the Journal and the Corre- spondance of the polytechnic school. On the formation of the Senate he was appointed a member of that body, with an ample provision and the title of count of Pelusium; but on the fall of Napoleon he was deprived of all his honours, and even excluded from the list of members of the reconstituted Institute. He died at Paris on the 28th of July 1818.

For further information see B. Brisson, Notice historique sur Caspard Monge ; Dupin, Essai historique sur les services et les travaux scientifiques de Gaspard Monge (Paris, 1819), which contains (pp. 162- 166) a list of Monge’s memoirs and works; and the biography by F. Arago {CEuvres, t. ii., 1854).

Monge’s various mathematical papers are to a considerable extent reproduced in the Application de V analyse d, la gSometrie (4th

ed., last revised by the author, Paris, 1819); the

pure text of this is reproduced in the 5th ed. (revue, corrig6e et annotee par M. Liouville) (Paris, 1850), which contains also Gauss's Memoir, " Dis- quisitiones generates circa superficies curvas," and some valuable notes by the editor. The other principal separate works are Traite elementaire de la statique, 8 e Edition, conformee a la precedente, par M. Hachette, et suivie d'une note fife, par M. Cauchy (Paris, 1846); and the Ceometrie descriptive (originating, as mentioned above, in the lessons given at the normal school). The 4th edition, published shortly after the author's death, seems to have been substantially the same as the 7th (Geometrie descriptive par G. Monge, suivie d'une theorie des ombres et- de la perspective, extraite des papier s de Vauteur, par M. Brisson (Paris, 1847). (A. Ca.)

MONGHYR, a town and district of British India, in the Bhagalpur division of Bengal. The town is on the right bank of the Ganges, and has a railway station, with steam ferry to the railway on the opposite bank of the river. Pop. (1901), 35,880. In 1 195 Monghyr, a fortress of great natural strength, appears to have been taken by Mahommed Bakhiyar Khilji, the first Moslem conqueror of Bengal. Henceforth it is often mentioned by the Mahommedan chroniclers as a place of military importance, and was frequently chosen as the seat of the local government. After 150°) whan Akbar established his supremacy over the Afghan chiefs of Bengal, Monghyr was long the headquarters of his general, Todar Mai; and it also figures prominently during the rebellion of Sultan Shuja against his brother, Aurangzeb. In more recent times Nawab Mir Kasim, in his war with the English, selected it as his residence and the centre of his military prepara- tions. Monghyr is famous for its manufactures of iron: firearms, swords, and iron articles of every kind are produced in abundance but are noted for cheapness rather than quality. The art of inlaying sword-hilts and other articles with gold and silver affords employment to a few families.

The District op Monghyr has an area of 3922 sq. m. The Ganges divides it into two portions. The

northern, intersected by the Burhi Gandak and Tiljuga, two important tributaries of the Ganges, is always liable to inundation during the rainy season, and is a rich, flat, wheat and rice country, supporting a large population. A considerable area, immediately bordering the banks of the great rivers, is devoted to permanent pasture. Immense herds of buffaloes are sent every hot season to graze on these marshy prairies; and the ghi, or clarified butter, made from their milk forms an important article of export to Calcutta. To the south of the Ganges the country is dry, much less fertile, and broken up by fragmentary ridges. Irrigation is necessary throughout the section lying on the south of the Ganges. The population in 1901 was 2,068,804, showing an increase of i-6% in the decade. The principal exports sent to Calcutta, both by rail and by river, are oil-seeds, wheat, rice, indigo, grain and pulse, hides and tobacco; and the chief imports consist of European piece-goods, salt and sugar. The southern portion of the district is well provided with railways. At Lakhisarai junction the arc and chord lines of the East Indian railway divide, and here also starts the branch to Gaya. At Jamalpur, which is the junction for Monghyr, are the engineering workshops of the company. In the early years of British rule Monghyr formed a part of Bhagalpur, and was not created a separate district till 1832.

See Monghyr District Gazetteer (Calcutta, 1909).

MONG NAI (called by the Burmese and on most old maps Mone), one of the largest and most important of the states in the eastern subdivision of the southern Shan States of Burma. The state of Keng Tawng (Burmese Kyaing Taung) is a depen- dency of Mong Nai. It lies approximately between 20° 10′ and 21 N. and between 97 30′ and 98° 45′ E., and occupies an area of 2717 sq.m.; pop. (1901), 44,252, of whom more than five-sixths are Shans. The Salween river bounds it on the east. The main state and the sub-state of Keng Tawng consist of two plains with a ridge between them. There is much flat rice bottom, but a considerable portion consists of gently

undulating plain- land. In the central plain rice is the only crop. Outside this considerable quantities of sugar are produced. Tobacco of a quality highly esteemed by the Shans is grown in the Nawng Wawp circle at an altitude of 3100 ft. above sea-level; gram,

thanatpet (a leaf used for cigar-wrappers), and garden crops are the chief produce otherwise. In the outlying tracts quantities of coarse native paper are manufactured from the bark of a species of mulberry, and much is exported to other parts of the Shan States.

MONGOLIA, a vast territory belonging to the Chinese empire, the administrative limits of which cannot be determined with precision. On the N. it is bounded by the frontier of Russia, beginning at Mount Kalas or Kanas (49° s′ N., 87° 40′ E.) in the Altai, and running to the S.E. corner of Transbaikalia in the vicinity of Dalai-nor, thus having on the N. the Siberian provinces of Tomsk, Yeniseisk, Irkutsk and Transbaikalia. In the E. the boundary line which separates Mongolia from Manchuria runs past Dalai-nor and Lake Buir, crossing the Great Khingan in 47 30′ N., towards Tsitsihar in Manchuria; then, crossing the Nonni river, it strikes the Sungari at Khulan- chen, where it turns westwards up this river, reaching the Shara-muren river in 123 30′ E. From China proper on the S. Mongolia is separated by a line running in a south-westward direction up the Shara-muren and across the Mongolian plateau to the bending of the Hwang-ho or Yellow river in about 40° N. and uo° 30′ E. Thence the boundary describes a sinuous line, following the Great Wall, and thus includes the Ordos (Ho-tau) and Alashan (Si-tao), and reaches its most southern point in 3 6° 40′ N., 104 20′ E. Thence it turns north-west, following the Great Wall for over 300 m.; it then crosses the plateau so as to separate Mongolia from the Chinese province of Sin-Kiang (Han-su-sin-lsiang, which

includes the Nan-shan highlands and eastern Turkestan) , and from Dzungaria, reaching the Chinese or Ektagh Altai in 46 30′ N., 92° 50′ E. From that point the boundary coincides with the main water- parting of the Altai Mountains till it reaches Mount Kalas.

Geographically, Mongolia may thus be said to occupy both terraces of the great plateau of east Asia, which stretches in the south of Siberia, between the Sailughem range of the Great Altai and the Great Khingan — with the exception of the Dzun- garian depression. From Manchuria and China it is separated by the border ridge of the plateau — the Great Khingan, while in the south-west it runs up to the foot of the high northern border ridges of the Tibetan plateau — an artificial frontier separating it from east Turkestan and Dzungaria. Broadly speaking, Mongolia may be divided naturally into three parts: (1) north-western Mongolia, which occupies the high terrace of the plateau; (2) the Gobi, in its wide sense, covering the lower terrace of the plateau, together with a slightly more elevated and better-watered zone along the western slope of the Great Khingan and its south-western continuation; and (3) south- eastern Mongolia, on the eastern slope of the Khingan. Of these parts, the second is considered in detail under the heading Gobi.

North-western Mongolia was formerly represented as a region intersected by lofty mountain chains. It appears, however, from Russian explorations during the last third of the 19th North- century, that it has all the characteristics of an elevated western p l a teau, of a rhomboid shape (like Bohemia), bounded Mongolia. £ y f our mounta in ranges; namely, the Russian Altai on the N.W., the Sayans on the N.E., the Kentei range on the S.E., and the Ektagh Altai on the S.W. The border-ridge character of the Sayans (Ergik-targak-taiga) is well established, and the same orographic character is confirmed by recent explorers with regard to the Sailughem range of the Altai. The only point still remaining undecided is whether the valleys of the

Bom-kemchik (a tributary of the Yenisei) and its left-hand tributaries do not be- long geographically to the Altai region. At any rate, throughout the whole of north-west Mongolia, which covers an area of nearly 370,000 sq. m., the altitude nowhere falls below 2370 ft. (Ubsa-nor) ; and the area round this lake which has less than 3000 .ft. of altitude covers only 6600 sq. m. The remainder of this extensive territory ranges at altitudes of 3000 to 4500 ft., even in the bottoms of the river valleys and in the lower plains; while the ridges which constitute the water-partings rise about 2000 ft. above the general level of the plateau. Along the south-western border of this division of Mongolia a gigantic border-ridge, the Ektagh (or Mongolian) Altai, runs in an E.S.E. direction from the Russian Altai to 99° E. and is probably continued even farther by the Artsa-bogdo, the Saikhat and other ranges as far as the northern loop of the Yellow river. The passes across the Ektagh Altai lie at altitudes of 10,000 ft. in the north-west and

9250 ft. in 93 20′ E. ; farther east they become much lower. But while its southern foot stands in the Dzungarian trench, i.e. at altitudes of 1550 ft. only near Lake Ulungur, and at 3000 ft. in 94° E., its north-eastern foot rests on the high plateau, i.e. at 4260 ft. at Kobdo, 5410 at Oshku, 4070 at Orok-nor on the route from Kiakhta to Su-chow, and so on. Thus the Ektagh Altai is a true border-range — that is, a lofty and steep escarpment facing the Dzungarian depres- sion, with a gentle and relatively short slope towards the plateau.

In the same way the Kentei (or Gentei) Mountains, as they are called, to the north of Ujga, and the Yablonoi Mountains of Trans- baikalia, separate the higner terrace of north-west Mongolia (drained by the tributaries of the Selenga) -from the lower terrace of the Gobi, which is drained by the upper tributaries of the Onon and the Kerulen, both belonging to the basin of the Amur. It is also very probable that the Tannu-ola Mountains north-east of Ubsa-nor, and the Khangai Mountains between Ulyasutai and the upper Orkhon, both running W.N.W.

to E.S.E. , border another slightly higher terrace of the same great plateau of north-west Mongolia, upon which Lake Kossogol lies, at an altitude of 5320 ft. On this vast upper terrace even the bottoms of the river valleys are at altitudes of 4200 to 5500 ft., with one single exception — the narrow gorge of the Khua (Khi)-khem, or upper Yenisei; while the highest pass across the Tannu-ola Mountains is 7090 ft., though the others are much lower. The conception of north-west Mongolia as a region filled with mountain ranges radiating from the Altai must thus be abandoned. It is a massive swelling of the earth's crust, representing the northern counterpart of the plateau of Tibet. This massive swelling is cut into, between the Ektagh Altai and the eastern T'ien-shan, by the relative depression of Tarbagatai and Dzungaria, 1500 to 3000 ft. in altitude; while to the south of the eastern T'ien-shan comes the Tarim depression, from 2200 to 3000 ft. high, and occupying an area of about 88,000 sq. m. Neither of these " depressions," however, penetrates beyond 94 E., and on the route from Kiakhta to Su-chow, in 100° E., there is only one single place (42° N.) in which the altitude drops as low as 3300 ft.; everywhere else it varies between 4000 and 5000 ft.

Lakes and. Rivers. — North-western Mongolia is well watered, and has in its western part a group of lakes which possess no outlet to the ocean, being in reality the rapidly desiccating remains of what were formerly much larger basins. The chief of them is Ubsa-nor (2370 ft.), which receives the large river Tes. It lies in the middle of a large plain, and has to the west of it a smaller but much higher lake, Urga-nor, besides several smaller ones. Farther south on the same wide plain lie the sister lakes Kirghiz-nor and Airyk-nor, which receive another large river, the Dzap'hyn, and the Kungui. Many small lakes are scattered over the plain to the east of them. A third group of lakes occur in the neighbourhood of Kobdo. The Kobdo river, which rises in the Dain-gol (7060 ft.) in the Ektagh Altai, winds in great curves across the plateau, and enters

Lake Kara-usu (3840 ft.), which also receives the Buyantu, an outflow from Lake Kobdo, and is connected by a small river with another large lake, Durga-nor, situated a score of miles to the east. There are also many smaller lakes fed by the glaciers of the Sailughem (Achit-nor, 4650 ft., and Uryu-nor), and others scattered through the Ektagh Altai. The largest lake of this region is, however, Kosogol (Khubsu-gul), which lies at an altitude of 5320 ft., close to the Russian frontier, at the foot of the snow-clad Munku-sardyk. Besides the rivers just mentioned, there are others belonging to the basin of the Yenisei (Khua-or Khi-khem, Bei-khem and Bom- kemchik) ; while yet others belong to the Selenga, a river formed by the junction of the Eder with the Telghir. The Selenga receives the Orkhon, at the head of which remarkable inscriptions were discovered in the end of the 19th century, and cleverly deciphered by Professor V. Thomsen of Copenhagen. 1 The rivers which flow down the outer slopes of the border-ridges become lost in the Gobi shortly after entering it.

A very large portion of north-west Mongolia constitutes a high plain, 3000 to 4200 ft. in altitude, which penetrates from the south- east in a north-western direction between the Ektagh Altai and the Khangai Mountains. It has a true Mongolian character, i.e. it is covered with gravel, and presents the appearance of a dry prairie devoid of forests. This same character is also exhibited by the bottoms of the broad valleys, while the more elevated and hilly portions of the territory, especially on their northern slopes, are covered with larch, cedar, pine and deciduous trees belonging to the Siberian flora ; where the forests fail they are marshy or assume the character of Alpine meadows — e.g. in the Khangai, the Tannu-ola, and on the slopes of the border-ridges. The whole of this region is covered with excellent pasture. The forests decrease as one travels southwards. For instance, while both slopes of the Sayans are covered with forests, the Tannu-ola and the Khangai Mountains have woods on their northern faces only,

and the Ektagh Altai is quite devoid of woods, even on its northern slope.

Climate. — Owing to its high altitude, north-western Mongolia is very cold, and the severity of the winter is intensified by the prevalence of cold but dry north-western winds. The north-east wind brings more moisture. In summer the warm winds come from the south and south-east, but having first to cross the Gobi,

1 See V. Thomsen, Inscriptions de I'Orkhon (Helsingfors, 1900)

they are dried before they reach north-western Mongolia. The yearly amount of rain at Urga (altitude 4350 ft., at the northern foot of the Kentei Mountains) is only

The geology is still very imperfectly known. The plateau is built up of granites, gneisses and crystalline schists of Archean and probably Primary age. Coal is known to exist to the south- east of Kobdo, in the Tannu-ola, and in the basin of the Yenisei, but its age is unknown (fresh-water Jurassic ?). Graphite and some silver ores have also been found.

The fauna is a mixture of the Siberian and the Daurian — the latter penetrating up the valleys of the Selenga basin. The chief towns of north-west Mongolia are Urga, Ulyasutai, Kobdo and Ulankom.

South-eastern Mongolia is the part of Mongolia which lies on the

eastern slope of the Great Khingan Mountains, entering like a wedge

between the lower course of the Nonni river and the

" middle Sungari. Chiefly owing to the dryness of

climate,

eastern j ts phy S ; ca i characteristics are similar to those of Mongolia. Mongolia proper, except that the altitude of the plains is much lower. This portion of Mongolia is also much better watered, namely, by the Khatsyr, the Lao-ho and the Shara-muren, all flowing from the Khingan Mountains eastwards, and the last making the frontier between Mongolia and the Chinese province of Chihli.

Population. — The population of the whole of Mongolia is estimated at about 5,000,000. It consists of Mongols — Eastern Mongols and Kalmucks in the west — various Turkish tribes, Chinese and Tunguses. The Mongols proper, with the exception of those who inhabit north-west Mongolia, may be divided into northern and southern (more properly north-western and south- eastern) Mongols. The former, belonging to the Khalkas, occupy the Gobi and the regions of the Kentei Mountains and Khingan Mountains, while the second, divided into numerous minor branches, roam over south-eastern and southern Mongolia. The principal occupation of the Mongols is cattle-breeding, and Russian writers estimate that on an average each yurta, or family, has about 50 sheep, 25 horses, 15 horned cattle and 10 camels. The transport of goods is their next most important occupation. It is calculated that 100,000 camels are used for the transport of tea only from Kalgan to Siberia, and that no less than 1,200,000 camels and 300,000 ox-carts are employed in the internal caravan trade. Agriculture is only carried on sporadically, chiefly in the south, where the Mongols have been taught by the Chinese. Various domestic industries are also carried on. The trade is chiefly concentrated at Urga, Ulyasutai and Kobdo in north-west Mongolia; Kalgan, Kuku-khoto, Kuku-erghi, Dolon-nur and Biru-khoto in southern and south-eastern Mongolia; and at Kerulen in the north-east.

Administration. — Before the Manchurian conquest the Mongols were governed by their own feudal princes, who regarded themselves as being descended from

seven different ancestors, all, however of the same kin. Each group of principalities constituted a separate aitnak, and each principality a separate hoshun. Under Manchu rule the aimaks became converted into the same number of military corps, each composed of so many hoshuns as military units. Each of these again was divided into sumuns or squadrons, each containing 150 families. In case a hoshun contained more than 6 sumuns, every 6 of the latter were organized into a regiment — tsalan. Four Manchu tsian-tsuns, or governor-generals, acted as chiefs of the troops, and the prince of each aimak, nominated from Peking, was considered as the lieutenant or assistant of his respective Manchu chief. The hoshuns were subject to their own princes, each of whom had a military adviser, generally a Manchu. Their internal or tribal affairs were in the hands of the princes, those which concerned a whole aimak being settled at gatherings of the princes under the eldest of them, named khan. This organization was maintained by the Manchu rulers, the khan being elected from among the princes, and the latter having each an adviser, tusalakchi, nominated from Peking.

Mongolia is now administered by a Lifan Yuen or superin- tendency with headquarters at Peking. Excluding the territory to which the name of Mongolia is geographically applied, but which is included in the provinces of Shansi and Chihli, Mongolia is divided into inner and outer divisions. Inner Mongolia,

lying between the desert of Gobi, China proper and Manchuria, is divided into 24 aimaks. There are two military governors- general and two commissaries of the viceroy of Chihli, having control of civil matters. One of each pair of officials is stationed at Kalgan, and the other at Jehol. Outer Mongolia, the remainder of the territory, has 4 aimaks, three of which are under hereditary khans. There is a Chinese imperial agent at Urga.

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MONGOLS, the name of one of the chief ethnographical divisions of the Asiatic peoples (see also Turks). The early history of the Mongols, like that of all central-Asian tribes, is extremely obscure. Even the meaning of the name " Mongol " is a disputed point, though a general consent is now given to Schott's etymology of the word from mong, meaning brave. From the earliest and very scanty notice we have of the Mongols in the history of the T'ang dynasty of China (a.d. 619-690) and in works of later times, it appears that their original camping- grounds were along the courses of the Kerulen, Upper Nonni and Argun rivers. But in the absence of all historical particulars of their origin, legend, as is usual, has been busy with their early years. The Mongol historian Sanang Setzen gives currency to the myth that they sprang from a blue wolf; and the soberest story on record is that their ancestor Budantsar was

miraculously conceived of a Mongol widow. By craft and violence Budantsar gained the chieftainship over a tribe living in the neighbour- hood of his mother’s tent, and thus left a heritage to his son. Varying fortunes attended the descendants of Budantsar, but on the whole their power gradually increased, until Yesukai, the father of Jenghiz Khan, who was eighth in descent from Budantsar, made his authority felt over a considerable area. How this dominion was extended under the rule of Jenghiz Khan is shown in the article Jenghiz Khan, and when that great conqueror was laid to rest in the valley of Kilien in 1227 he left to his sens an empire which stretched from the China Sea to the banks of the Dnieper.

Over the whole of this vast region Jenghiz Khan set his second surviving son Ogotai or Ogdai as khakan, or chief khan, while to the family of his deceased eldest son Juji he assigned the country from Kayalik and Khwarizm to the borders of Bulgar and Saksin ” where’er the hoofs of Mongol horse had tramped”; to Jagatai, his eldest surviving son, the territory from the borders of the Ufghur country to Bokhara; while Tul6, the youngest, received charge of the home country of the Mongols, the care of the imperial encampment and family, and of the archives of the state. The appointment of Ogdai as his successor being contrary to the usual Mongol custom Ogdai

of primogeniture, gave rise to some bitterness of Khan. feeling among the followers of Jagatai. But the commands of Jenghiz Khan subdued these murmurs, and Ogdai was finally led to the throne by his dispossessed brother amid the plaudits of the assembled Mongols. In accordance with Mongol customs, Ogdai signalized his accession to the throne by distributing among his grandees presents from his father’s treasures, and to his father’s spirit he sacrificed forty maidens and numerous horses. Once fairly on the throne, he set himself vigorously to

follow up the conquests won by his father. At the head of a large army he marched southwards into China to complete the ruin of the Kin dynasty, which had already been so rudely shaken, while at the same time Tule advanced into the province of Honan from the side of Shensi. Against this combined attack the Kin troops made a vigorous stand, but the skill and courage of the Mongols bore down every opposition, and over a hecatomb of slaughtered foes they captured Kai-feng Fu, the capital of their enemies. From Kai-feng Fu the emperor fled to Ju-ning Fu, whither the Mongols quickly followed. After sustaining a siege for some weeks, and enduring all the horrors of starvation, the garrison submitted to the Mongols, and at the same time the emperor committed suicide by hanging. Thus fell in 1234 the Kin or ” Golden ” dynasty, which had ruled over the northern portion of China for more than a century.

But though Ogdai’s first care was to extend his empire in the rich and fertile provinces of China, he was not forgetful of the obligation under which Jenghiz Khan’s conquests in western Asia had laid him to maintain his supremacy over the kingdom of Khwarizm. This was the more incumbent on him since Jelal ed-din, who had been driven by Jenghiz into India, had returned, reinforced by the support of the sultan of Delhi, whose daughter he had married, and, having reconquered his hereditary domains, had advanced westward as far as Tiflis and Kelat. Once more to dispossess the young sultan, Ogdai sent a force of 300,000 men into Khwarizm. With such amazing rapidity did this army march in pursuit of its foe that the advanced Mongol guards reached Amid (Diarbekr), whither Jelal ed-din had retreated, before that unfortunate sovereign had any idea of their approach. Accompanied by a few followers, Jelal ed-din fled to the Kurdish Mountains, where he was basely murdered by a peasant. The primary object of the Mongol invasion was thus accomplished; but, with the instinct of their race, they made this conquest but a stepping-stone to another, and

without a moment’s delay pushed on still farther westward. Unchecked and almost un- opposed, they overran the districts of Diarbekr, Mesopotamia, Erbll and Kelat, and then advanced upon Azerbaijan. In the following year (1236) they invaded Georgia and Great Armenia, committing frightful atrocities. Tiflis was among the cities captured by assault, and Kars was surrendered at their approach in the vain hope that submission would gain clemency from the victors. Meanwhile, in 1235, Ogdai despatched three armies in as many directions. One was directed against Korea, one against the Sung dynasty, which ruled over the provinces of China south of the Yangtsze Kiang, and the third was sent westward into eastern Europe. This last force was commanded by Batu, the son of Juji, Ogdai’s deceased eldest brother, who took with him the celebrated Sabutai Bahadur as his chief adviser. Bolgari, the capital city of the Bulgars, fell before the force under Sabutai, while Batu pushed on over the Volga. With irresistible vigour and astonishing speed the Mongols made their way through the forests of Penza and Tambov, and appeared before the ” beautiful city ” of Ryazan. For five days they discharged a ceaseless storm of shot from their balistas, and, having made a breach in the defences, carried the city by assault on the 21st of December 1237. ” The prince, with his mother, wife, sons, the boyars and the inhabitants, without regard to age or sex, were slaughtered with the savage cruelty of Mongol revenge; some were impaled, some shot at with arrows for sport, others were flayed or had nails or splinters of wood driven under their nails. Priests were roasted alive, and nuns and maidens ravished in the churches before their relatives. ‘ No eye remained open to weep for the dead.’ ” Moscow, at this time a place of little importance, next fell into the hands of the invaders, who then advanced against Vladimir. After having held out for several days against the Mongol attacks, the city at length succumbed, and the horrors of Ryazan were repeated. If possible, a more dire fate overtook the inhabitants of Kozelsk, near Kaluga, where, in revenge for a partial defeat inflicted on a Mongol

force, the followers of Batu held so terrible a "carnival of death " that the city was renamed by its captors Mobalig, " the city of woe." With the tide of victory thus strong in |

their favour the Mongols advanced against Kiev, " the mother of cities," and carried it by assault. The inevitable massacre followed, and the city was razed to the ground.

Victorious and always advancing, the Mongols, having deso- lated this portion of Russia, moved on in two divisions, one under Batu into Hungary, and the other under Baidar and Kaidu into Poland. Without a check, Batu marched to the neighbourhood of Pest, where the whole force of the kingdom was arrayed to resist him. The Hungarian army was posted on the wide heath of Mohi, which is bounded by " the vine-clad hills of Tokay," the mountains of Lomnitz, and the woods of Diosgyor. To an army thus hemmed in on all sides defeat meant ruin, and Batu instantly recognized the dangerous position in which his enemies had placed themselves. To add to his chances of success he determined to deliver his attack by night, and while the Careless Hungarians were sleeping he launched his battalions into their midst. Panic-stricken and helpless, they fled in all directions, followed by their merciless foes. Two archbishops, three bishops, and many of the nobility were among the slain, and the roads for two days' journey from the field of battle were strewn with corpses. The king, Bela IV., was saved by the fleetness of his horse, though closely pursued by a body of Mongols, who followed at his heels as far as the coast of the Adriatic, burning and destroying everything in their way. Meanwhile Batu captured Pest, and on Christmas Day 1 241, having crossed the Danube on the ice, took Esztergom by assault. While Batu had been thus triumphing, the force under Baidar and Kaidu had carried fire and sword into Poland. While laying waste the country they received the announcement of the death of Ogdai, and at the same time a summons for Batu to return eastwards into Mongolia.

While his lieutenants had been thus carrying his arms in all directions, Ogdai had been giving himself up to ignoble ease and licentiousness. Like many Mongols, he was much given to drink, and it was to a disease produced by this cause that he finally succumbed on the nth of December 1241. He was succeeded by his son Kuyuk, who reigned only seven years. Little of his character is known, but it is noticeable that his two ministers to whom he left the entire conduct of affairs were Christians, as also were his doctors, and that a Christian chapel stood before his tent. This leaning towards Christianity, how- ever, brought no peaceful tendencies with it. On the death of Kuyuk dissensions which had been for a long time smouldering between the houses of Ogdai and Jagatai broke out into open war, and after the short and disputed reigns of Kaidu and Chapai, grandsons of Ogdai, the lordship passed away for ever from the house of Ogdai. It did not go, however, to the house of Jagatai, but to that of Tule.

On the 1st of July 1251 Mangu, the eldest son of Tule, and nephew to Ogdai, was elected khakan. With perfect impar- tiality, Mangu allowed the light of his countenance to fall upon the Christians, Mahommedans and Khaa! Buddhists among his subjects although Shamanism was recognized as the state religion. Two years after his accession his court was visited by Rubruquis (q.v.) and other Christian monks, who were hospitably received. The descrip- tion given by Rubruquis of the khakan's palace at Karakorum shows how wide was the interval which separated him from the nomad, tent-living life of his forefathers. It was " surrounded by brick walls. ... Its southern side had three doors. Its central hall was like a church, and consisted of a nave and two aisles, separated by columns. Here the court sat on great occasions. In front of the throne was placed a silver tree, having at its base four lions, from whose mouths there spouted into four silver basins wine, kumiss, hydromel and terasine. At the top of the tree a silver angel sounded a trumpet when the reservoirs that supplied the four fountains

wanted replenishing." On his accession complaints reached Mangu that dissensions had broken out in the province of Persia, and he therefore sent a force under the command of his

brother Hulagu to punish the Ismailites or Assassins

Hulagu.

(q.v.), who were held to be the cause of the disorder. Marching

by Samarkand and Karshi, Hulagu crossed the Oxus and advanced by way of Balkh into the province of Kuhistan or Kohistan. The terror of the Mongol name induced Rukneddin Gurshah II. (Rokn al-din), the chief of the Assassins, to deprecate the wrath of Hulagu by offers of submission, and he was so far successful that he was able to purchase a temporary immunity from mas- sacre by dismantling fifty of the principal fortresses in Kohistan. But when once the country had thus been left at the mercy of the invaders, their belief in the old saying " Stone dead hath no fellow " sharpened their battle-axes, and, sparing neither man, woman, nor child, they exterminated the unhappy people. Rukneddin having been killed, 1256 (see Assassins), Hulagu marched across the snowy mountains in the direction of Bagdad to attack the last Abbasid caliph and his Seljuk protectors. On arriving before the town he demanded its surrender. This being refused, he laid siege to the walls in the usual destructive Mongol fashion, and at length, finding resistance hopeless, the caliph was induced to give himself up and to open the gates to his enemies. On the 15th of February 1258 the Mongols entered the walls and sacked the city (see Caliphate ad fin). While at Bagdad Hulagu gave his astronomer, Nasir al-din permission to build an observatory. The town of Maragha was the site chosen, and, under the superintendence of Nasir al-din and four western

Asiatic astronomers who were associated with him, a handsome observatory was built, and furnished with ” armillary spheres and astrolabes, and with a beautifully-executed terrestrial globe showing the five climates.” The fall of Bagdad was almost contemporaneous with the end of the Seljuks of Konia as an independent power, though their actual destruction did not take place until 1308 (see Seljuks). One terrible result of the Mongol invasion was a fearful famine, which desolated the provinces of Irak-Arabi, Mesopotamia, Syria and Rum. But, though the inhabitants starved, the Mongols had strength and energy left to continue their onward march into Syria. Aleppo was stormed and sacked, Damascus surrendered (1260) and Hulagu was meditating the capture of Jerusalem with the object of restoring it to the Christians when he received the news of Mangu’s death, and, as in duty bound, at once set out on his return to Mongolia, leaving Kitboga (Kitubuka) in command of the Mongol forces in Syria.

Hitherto a vassal of Mangu, as is shown by his striking coins bearing the name of Mangu as well as his own, Hulagu was now recognized as ruler of the conquered provinces. He assumed the title of ilkhan, and, although acknowledging the khakan as supreme lord, was practically independent. The title of ilkhan was that borne by his successors, who ruled over Persia for about a century (see infra, “The Ilkhans of Persia”).

While Hulagu was prosecuting these conquests in western Asia, Mangu and his next brother Kublai were pursuing a like course in southern China. Southward they even advanced into Tong-king, and westward they carried their arms over the frontier into Tibet. But in one respect there was a vast differ- ence between the two campaigns. Under the wise command of Kublai all indiscriminate massacres were forbidden, and probably for the first time in Mongol history the inhabitants and garrisons of captured cities were treated with humanity. While carrying on the war in the province of Szech’uen Mangu was seized with an attack of dysentery, which proved fatal after a few

days’ illness. His body was carried into Mongolia on the backs of two asses, and, in pursuance of the custom of slaughter- ing every one encountered on the way, 20,000 persons were, according to Marco Polo, put to the sword.

At the Kuriltai, or assembly of notables, which was held at Shang-tu after the death of Mangu, his brother Kublai (see Kublai Khan) was elected khakan. For thirty-five years he sat on the Mongol throne, and at his death in 1204, in his seventy- ninth year, he was succeeded by his son Timur Khan, or, as he was otherwise called, Oldjeitu or Uldsheitu Khan (Chinese Yuen-cheng). The reign of this sovereign was chiefly remarkable for the healing of the division which had for thirty years separated the families of Ogdai and Jagatai from that of the ruling khakan. Uldsheitu was succeeded by his nephew Khaissan, who was

gathered to his fathers in February 1311, after a short reign, and at the early age of thirty-one. His nephew and successor, Buyantu (Chinese Yen-tsung), was a man of considerable culture, and substantially patronized Chinese literature. Among other benefits which he conferred on letters, he rescued the celebrated inscription-bearing ” stone drums,” which are commonly said to be of the Chow period (1122-255 B.C.), from the decay and ruin to which they were left by the last emperor of the Kin dynasty, and placed them in the gateway of the temple of Confucius at Peking, where they now stand. After a reign of nine years, Buyantu was succeeded by his son Gegen (Chinese Ying-tsung), who perished in 132 by the knife of an assassin. Yissun Timur (Chinese Tai-ting-tij, who was the next sovereign, devoted himself mainly to the administration of his empire. He divided China, which until that time had been apportioned into twelve provinces, into eighteen provinces, and rearranged the system of state granaries, which had fallen into disorder. His court was visited by Friar Odoric, who gives a minute description of the palace and its inhabitants. Speaking of the palace this writer says: —

” Its basement was raised about two paces from the ground, and within there were twenty-four columns of gold, and all the walls were hung with skins of red leather, said to be the finest in the world. In the midst of the palace was a great jar more than two paces in height, made of a certain precious stone called merdacas (jade) ; its price exceeded the value of four large towns. . . . Into this vessel drink was conducted by certain conduits from the court of the palace, and beside it were many golden goblets, from which those drank who listed. . . . When the khakan sat on his throne the queen was on his left hand, and a step lower two others of his women, while at the bottom of the steps stood the other ladies of his family. All those who were married wore upon their heads the foot of a man as it were a cubit and a half in length, and at the top of the foot there were certain cranes’ feathers, the whole foot being set with great pearls, so that if there were in the whole world any fine and large pearls they were to be found in the decoration of those ladies.”

The following years were years of great natural and political convulsions. Devastating floods swept over China, carrying death and ruin to thousands of homes; earthquakes made desolate whole districts; and in more than one part of the empire the banners of revolt’ were unfurled. Under various leaders the rebels captured a number of cities in the provinces of Kiang-nan and Honan, and took possession of Hang-chow, the capital of the Sung emperors. At the same time pirates ravaged the coasts and swept the imperial vessels off the sea.

In 1355 a Buddhist priest named Chu Yuen-chang became so impressed with the misery of his countrymen that he threw off his vestments and enrolled himself in the rebel army. His military genius soon raised him to the position of a leader, and with extraordinary success he overcame with his rude levies the trained legions of the Mongol emperor. While unable to defeat or check the rebels in the central provinces, Toghon Timur Khan was also called upon to face a rebellion in Korea. Nor were

his arms more fortunate in the north than in the south. An army which was sent to suppress the revolt was cut to pieces almost to a man. These events made a dream which the emperor dreamt about this time of easy interpretation. He saw in his sleep ” a wild boar with iron tusks rush into the city and wound the people, who were driven hither and thither without finding shelter. Meanwhile the sun and the moon rushed together and perished.” ” This dream,” said the diviner, ” is a prophecy that the khakan will lose his empire.” The fulfilment followed closely on the prophecy. By a subterfuge the rebels, after having gained possession of most of the central provinces of the empire, captured Peking. But Toghon Timur by a hasty flight escaped from his enemies, and sought safety on the shores of the Dolon-nor in Mongolia. For a time the western provinces of China continued to hold out against the rebels, but with the flight of Toghon Timur the Mongol troops lost heart, and in 1368 the ex-Buddhist priest ascended the throne as the first sovereign of the Ming or ” Bright ” dynasty, under the title of Hung-wu.

Thus ended the sovereignty of the house of Jenghiz Khan in China, nor need we look far to find the cause of its fall. Brave

and hardy the Mongols have always shown themselves to be; but The Mongols the capacity for consolidating the fruits of victory, expelled for establishing a settled form of government, and from China. f or gaining the allegiance of the conquered peoples, have invariably been wanting in them.

Not content with having recovered China, the emperor Hungwu sent an army of 400,000 men into Mongolia in pursuit of the forces which yet remained to the khakan. Even on their own ground the disheartened Mongols failed in their resistance to the Chinese, and at all points suffered disaster. Meanwhile

Toghon Timur, who did not long survive his defeat, was suc- ceeded in the khakanate by Biliktu Khan, who again in 1379 was followed by Ussakhal Khan. During the reign of this last prince the Chinese again invaded Mongolia, and inflicted a crushing defeat on the khan's forces in the neighbourhood of Lake Buyur. Besides the slain, 2994 officers and 77,000 soldiers are said to have been taken prisoners, and an immense booty to have been secured. This defeat was the final ruin of the eastern branch of the Mongols, who from this time surrendered the supremacy to the western division of the tribe. At first the Keraits or Torgod, as in the early days before Jenghiz Khan rose to power, exercised lordship over the eastern Mongols, but from these before long the supremacy passed to the Oirad, who for fifty years treated them as vassals. Notwithstanding their subjection, however, the Keraits still preserved the imperial line, and khakan after khakan assumed the nominal sovereignty of the tribe, while the real power rested with the descendants of Toghon, the Oirad chief, who had originally attached them to his sceptre. Gradually, however, the Mongol tribes broke away from all governing centres, and established scattered communities with as many chiefs over the whole of eastern Mongolia. The discredit of having finally disintegrated the tribe is generally attached to Lingdan Khan (1604-1634), of whom, in reference to his arrogant and brutal character, has been quoted the Mongolian proverb: " A raging khakan disturbs the state, and a raging saghan (elephant) overthrows his keepers."

At this time the Mongols, though scattered and in isolated bodies, had recovered somewhat from the shock of the disaster which they had suffered at the hand of the first Ming Chakhars. sovereign of China. When first driven northwards, they betook themselves to the banks of the Kerulen, from whence they had originally started on their victorious career; but gradually, as the Chinese power became weaker among the frontier tribes, they again pushed southwards, and at this time had established colonies in the

Ordus country, within the northern bend of the Yellow River. The Mongol royal family and their immediate surroundings occupied the Chakhar country to the north-west of the Ordus territory, where they became eventually subjugated by the Manchus on the overthrow of the Ming dynasty in 1644 by the present rulers of China. At times the old vigour and strength which had nerved the arm of Jenghiz Khan seemed to return to the tribe, and we read of successful expeditions being made by the Ordu Mongols into Tibet, and even of invasions into China. The relations with Tibet thus inaugurated brought about a rapid spread of Buddhism among the Mongolians, and in the beginning of the 17 th century the honour of having a Dalai Lama born among them was vouchsafed to them. In 1625 Toba, one of the sons of Bushuktu Jinung Khan, went on a pilgrimage to the Dalai Lama, and brought back with him a copy of the Tanjur to be translated into Mongolian, as the Kanjur had already been. But though the prowess of the Ordu Mongols was still unsubdued, their mode of living was as barren and rugged as the steppes and rocky hills which make up their territory. Their flocks and herds, on which they are entirely dependent for food and clothing, are not numerous, and, like their masters, are neither well fed nor well favoured. But though living in this miserable condition their princes yet keep up a certain amount of barbaric state, and the people have at least the reputation of being honest.

Several of the tribes who had originally migrated with those who finally settled in the Ordu territory, finding the country to

be so inhospitable, moved farther eastward into richer pastures. Among these were the Tumeds, one of whose chiefs, Altan Khaa (Chinese Yen-ta), is famous in later Mongol history for the power he acquired. For many years during the 16th century he carried on a not altogether unsuccessful war with China, and finally, when peace was made (1571), the Chinese were fain to create him a prince of the empire and to confer a golden seal of authority upon him. In Tibet his arms were as successful as in China; but,

as has often happened in history, the physical conquerors became the mental subjects of the conquered. Lamaism has always had a great attraction in the eyes of the Mongols, and, through the instrumentality of some Lamaist prisoners whom Altan brought back in his train, the religion spread at this time rapidly among the Tumeds. Altan himself embraced the faith, and received at his court the Bogda Sodnam Gyamtso Khutuktu, on whom he lavished every token of honour. One immediate effect of the introduction of Buddhism among the Tumeds was to put an end to the sacrifices which were commonly made at the grave of their chieftains. In 1584 Altan died, and was succeeded by his son Senge Dugureng Timur. The rich territory occupied by the Tumeds, together with the increased intercourse with China which sprang up after the wars of Altan, began to effect a change in the manner of life of the people. By degrees the pastoral habits of the inhabitants became more agricultural, and at the present day, as in Manchuria, Chinese immigrants have so stamped their mark on the fields and markets, on the towns and villages, that the country has become to all intents and purposes part of China proper.

Passing now from the inner division of the Mongols who live in the southern and eastern portions of the desert we come to the outer division, which occupies the territory to the north of the desert. Of these the chief are the Kalkas, who are divided into the Western and Eastern Kalkas. These people form the link of communication between Europe and eastern Asia. Early in the 17 th century the Russians sent an embassy to the court of the Golden Khan with the object of persuading the Mongol khan to acknowledge allegiance to the tsar. This he did without much hesitation or inquiry, and he further despatched envoys to Moscow on the return of the Russian embassy. But the allegiance thus lightly acknowledged was lightly thrown off, and in a quarrel which broke out between the Khirghiz and the Russians the Kalkas took the side of the former. The breach, however, was soon healed over, and we find the Golden Khan sending an envoy again to Moscow,

asking on behalf of his master for presents of jewels, arms, a telescope, a clock, and ” a monk who had been to Jerusalem that he might teach the Kalkas how the Christians prayed.” Their sub- mission to Russia on the north did not save them, however, from the Chinese attacks on the south. At that time the present Manchu dynasty ruled in China, and to the then reigning sovereign the Kalkas gave in their submission. For some time the Chinese yoke sat lightly on their consciences, but diffi- culties having arisen with the Kalmucks, they were ready enough to claim the protection of China. To cement the alliance the emperor K’ang-hi invited all the Kalka chiefs to meet him at the plain of Dolon-nor. This ceremony brought the separate history of the Kalkas to a close, since from that time they have been engulfed in the Chinese Empire.

During the Kin dynasty of China the Keraits, as has been pointed out, were for a time supreme in Mongolia, and it was during that period that one of the earliest recognized sovereigns, Merghus Buyuruk Khan, sat on the throne. In an engagement with a neighbouring Tatar tribe their khan was captured and sent as a propitiatory present to the Kin emperor, who put him to death by nailing him on a wooden ass. On the treacherous Tatar chief the widow determined to avenge herself, and chose the occasion of a feast as a fitting ‘opportunity. With well- disguised friendship she sent him a present of ten oxen, a hundred sheep and a hundred sacks of koumiss. These, last, however, instead of being filled with skins of the liquor which Mongolians love so well, contained armed men, who, when the Tatar was feasted, rushed from their concealment and killed him.

A grandson of Merghus was the celebrated Wang Khan, who was sometimes the ally and sometimes the enemy of Jenghiz Khan, and has also been identified as the Frester John of early western writers. In war he was almost invariably unfortunate, and it was with no

great difficulty, therefore, that his brother Ki Wang detached the greater part of the Kerait tribes from his banner, and founded the Torgod chieftainship, orgo . name(j p ro b a bly from the country where they settled themselves. The unrest peculiar to the dwellers in the Mongolian desert disturbed the Torgod as much as their neighbours. Their history for several centuries consists of nothing but a succession of wars with the tribes on either side of them, and it was not until 1672, when Ayuka Khan opened relations with the Russians, that the country obtained an even temporarily settled existence. Its position, indeed, at this time made it necessary that Ayuka should ally himself either with the Russians or with his southern neighbours the Turks, though at the same time it was obvious that his alliance with the one would bring him into collision with the other. His northern neighbours, the Cossacks of the Yaik and the Bashkirs, both subject to Russia, had the not un- common propensity for invading his borders and harassing his subjects. This gave rise to complaints of the tsar's govern- ment and a disposition to open friendly relations with the Krim khan. A rupture with Russia followed, and Ayuka carried his arms as far as Kazan, burning and laying waste the villages and towns on his route and carrying off prisoners and spoils. Satisfied with this vengeance, he advanced no farther, but made a peace with the Russians, which was confirmed in 1722 at an audience which Peter the Great' gave him at Astrakhan. On Ayuka's death shortly after this event, he was succeeded by his son Cheren Donduk, who received from the Dalai Lama a patent to the throne. But this spiritual support availed him little against the plots of his nephew Donduk Ombo, who so completely gained the suffrages of the people that Cheren Donduk fled before him to St Petersburg, where he died, leaving his nephew in possession. With consummate impartiality the Russians, when they found that Donduk Ombo had not only seized the throne but was governing the country with vigour and wisdom, formally invested him with the khanate. At his death he was succeeded by Donduk Taishi, who, we are told, went to Moscow to attend the coronation of

the empress Eliza- beth, and to swear fealty to the Russians. After a short reign he died, and his throne was occupied by his son Ubasha. The position of the Torgod at this time, hemmed in as they were between the Russians and Turks, was rapidly becoming unbear- able, and the question of migrating ” bag and baggage ” was very generally mooted. In the war between his two powerful neighbours in 1769 and 1770, Ubasha gave valuable assistance to the Russians. His troops took part in the siege of Ochakov, and gained a decided victory on the river Kalaus. Flushed with these successes, he was in no mood to listen patiently to the taunts of the governor of Astrakhan, who likened him to a ” bear fastened to a chain,” and he made up his mind to break away once and for all from a tutelage which was as galling as it was oppressive. He determined, therefore, to migrate eastward with his people, and on the 5th of January 1771 he began his march with 70,000 families. In vain the Russians attempted to recall the fugitives, who, in spite of infinite hard- ships, after a journey of eight months reached the province of Ili, where they were welcomed by the Chinese authorities. Food for a year’s consumption was supplied to each family; and land, money and cattle were freely distributed. It is believed that 300,000 persons survived to receive the hospitality of the Chinese. By this desperate venture the Torgod escaped, it is true, the oppression of the Russians, but they fell into the hands of other masters, who, if not so exacting, were equally determined to be supreme. The Chinese, flattered by the compliment implied by the transference of allegiance, settled them on lands in the province of Ili, in the neighbourhood of the Altai mountains, and to the west of the desert of Gobi. But the price they were made to pay for this liberality was absorption in the Chinese empire.

Among the Mongol chiefs who rose to fame during the rule of the Ming dynasty of China was Toghon, the Kalmuck khan, who, taking advantage of the state of confusion which reigned among the tribes of Mongolia, established Kalmuck. for himself an empire

in north-western Asia. Death carried him off in 1444, and his throne devolved upon his son Ye-seen, who was no degenerate offspring. Being without individual foes in Mongolia he turned his arms against China, which through all history has been the happy hunting- ground of the northern tribes, and had the unexampled good fortune to take prisoner the Chinese emperor ChSng-t'ung. But victory did not always decide in his favour, and after having suffered reverses at the hands of the Chinese, he deemed it wise to open negotiations for the restoration of his imperial prisoner. Thus, after a captivity of seven years Cheng-t'ung re-entered his capital in 1457, not altogether to the general satisfaction of his subjects. On the death of Yi-sien, shortly after this event, the Kalmucks lost much of their power in eastern Asia, but retained enough in other portions of their territory to annoy the Russians by raids within the Russian frontier, and by constant acts of pillage. In the 17th century their authority was partly restored by Galdan, a Lama, who succeeded by the usual combination of wile and violence to the throne of his brother Senghe. Having been partly educated at Lhasa, he was well versed in Asiatic politics, Khan. and, taking advantage of a quarrel between the Black and White Mountaineers of Kashgar he overran Little Bokhara, and left a viceroy to rule over the province with his capital at Yarkand. At the same time he opened relations with China, and exchanged presents with the emperor. Having thus secured his powerful southern neighbour, as he thought, he turned his arms against the Kalkas, whose chief ground of offence was their attachment to the cause of his brothers. But his restless ambition created alarm at Peking, and the emperor K'ang-hi determined to protect the Kalkas against their enemy. The emperor, in person commanding one of the two forces, marched into Mongolia. After enduring incredible hardships during the march through the desert of Gobi the imperial army encountered the Kalmucks at Chao-modo. The engagement was fiercely contested, but ended in the complete victory of the Chinese, who pursued the Kalmucks for ten miles, and completely dispersed

their forces. Galdan, with his son,, daughter and a few followers, fled westward and escaped; and thus collapsed a power which had threatened- at one time to overshadow the whole of Central Asia. For a time Galdan still maintained resistance to his powerful enemy, but death overtook him while yet in the field against the Chinese.

But though Galdan was dead the Chinese did not enjoy that complete immunity from war at the hand of his successor that they had looked for. Tsi-wang Arabtan was, however, but the shadow of his brother and predecessor, and a dispute which arose with the Russians during his reign weakened his power in other directions. Little Bokhara was said to be rich in gold mines, and therefore became a coveted region in the eyes of the Russians. Under the vigorous administration of Peter the Great an expedition was despatched to force a passage into the desired province. To oppose this invasion the Kalmucks assembled in force, and after a protracted and undecided engage- ment the Russians were glad to agree to retire down the Irtish and to give up all further advance.

To Tsi-wang Arabtan succeeded Amursama. owing to the support he received from the Chinese emperor K'ien-lung, who nominated him khan of the Kalmucks and chief of Dzungaria. But, though to the ear these titles were as high-sounding as those of his predecessors, in reality the power they represented was curtailed by the presence of Chinese commissioners, in whose hands rested the real authority. The galling weight of this state of dependence drove Amursama before long into revolt. He dispersed the Chinese garrisons stationed in Ili (Kulja) , killed the generals, and advanced his own forces as far as Palikun on the river Ili. To punish this revolt, K'ien-lung sent a large force into the rebellious province. As on the previous occasion, the

Chinese were everywhere victorious, and Amursama fled into Siberia, where he died of small-pox after a short illness.

While China was thus absorbing the Mongols within her reach, Russia was gathering within her borders those with whom she came into contact. Among these were the Buriats, who occupied a large territory on both sides of Lake Baikal. As usual in such cases, disputes arose out of disturbances on the frontier, and were ended by the Buriats and the neighbouring Mongol tribes becoming one and all tributary to Russia.

The dominions given by Jenghiz Khan to his son Jagatai were involved in the quarrels between Kaidu and Kublai for the khakanate, but at the beginning of the 14th century of Jagatai. Dua, a great-great-grandson of Jagatai, made him- self undisputed lord of the whole region. Shortly after Dua's death the Mongols of Eastern Turkestan, descen- dants of those who had favoured the pretensions of Kaidu to be khakan, separated from their western brethren and chose a son of Dua as their khan. Henceforth the Jagataids were divided into two dynasties, the western reigning at Samarkand, the eastern first at Kashgar and later at Yarkand and Aksu. Kazan (1343-1346) was the last independent khan of the western Jagataids; thereafter power fell into the hands of amirs, who, however, continued to place a titular khan on the throne. In 1360 Toghluk-Timur, a grandson of Dua and khan of the eastern Jagataids (the kingdom called by the Persian historians Mogo-listan), invaded the territories of the western Jagataids. About this time Timur (q.v.), otherwise Timur-i-leng (Tamerlane), a young amir at the court of the western Jagataids, allied himself with the leaders who had dethroned Kazan, and after the death of Toghluk-Timur became by right of conquest khan of both sections of the Jagataids. After Timur's death the two sections again divided, while a third kingdom, Ferghana, was held by the Timurids (descendants of Timur). At the beginning of the 16th century all three dynasties were swept away by Mahommed Shalbani, head of the Uzbeg Mongols (see

infra, Uzbegs).

The empire of the Ilkhans established by Hulagu lasted nominally until 1353, but after the death of the Ilkhan Abu Said ‘ n !335 the real power was divided between five of Persia!” 1 Petty dynasties which had been formed out of the provinces conquered by Hulagu. Meantime Islam had made great progress among the Mongols, the third Ilkhan, Nikudar Ahmed (reigned 1 281–1284) having embraced that faith. The western frontiers of their empire bordering on the Syrian possessions of Egypt there was frequent intercourse, sometimes friendly, sometimes warlike, between the Ilkhans and the sultans of Egypt (q.v.). Of the petty dynasties which supplanted that of Hulagu, one known as the Jelairids held Bagdad until about 1400. Another dynasty which reigned in Azerbaijan was overthrown in 1355 by the western Kipchaks (see infra, Golden Horde). Between 1369 and 1400 Timur had made himself master of the greater part of Persia and established there a second Mongol dynasty, which in turn gave place to that of the Ak Kuyunli (see Persia).

Of the Mongol tribes who became entirely subject to Russia the principal are those of the Crimea, of Kazan, and Astra- khan; of these the Tatars of Kazan are the truest]?• representatives of the Golden Horde or western

Horae. Kipchaks, who originally formed the subjects of Batu and Orda. Batu, whose victorious campaign in Russia has already been sketched, was finally awarded as his fief the vast steppes which stretch from the Carpathian Moun- tains to Lake Balkash. He fixed his headquarters on the Volga, and there set up his Golden Tent from which the horde acquired the name of the Golden Horde. In 1255 Batu died and was succeeded by his brother Bereke Khan. During the reign of this sovereign the exactions which were demanded from the Russian Christians by the Mongols aroused the Christian world against the barbarian conquerors, and at the command of Pope Alex- ander IV. a general crusade was preached against them. But. though the rage of the Christians was great,

they lacked that united energy which might have availed them against their enemies; and, while they were yet breathing out denunciations,

a Tatar host, led by Nogai and Tulabagha, appeared in Poland. After a rapid and triumphant march the invaders took and des- troyed Cracow, and from thence advanced as far as Bythom (Beuthen) in Oppeln, from which point they eventually retired, carrying with them a crowd of Christian slaves. From this time the Mongols became for a season an important factor in European politics. They corresponded and treated with the European sovereigns, and intermarried with royal families. Hulagu married a daughter of Michael Palaeologus; Toktu Khan took as his wife Maria, the daughter of Andronicus II. ; and to Nogai Michael betrothed his daughter Irene. Toktu, the second khan in succession to Bereke, is the first Mongol ruler whom we hear of as having struck coins. Those issued during his reign bear the mint marks of Sarai, New Sarai, Bulgar, Ukek, Khwarizm; Krim, Jullad and Madjarui, and vary in date from 1291 to

1312.

The adoption of Islam by the rulers of the Golden Horde had as one result the drawing closer of the relations of the Mongols with Constantinople and Egypt. Embassies passed between the three courts, and so important was the alliance with the Mongols deemed by the sultan Nasir, ruler of Egypt, that he sent to demand in marriage a princess of the house of Jenghiz Khan. At first his request was refused by the proud Mongols, but the present of a million gold dinars, besides a number of horses and suits of armour, changed the refusal into an acquiescence, and in October 13 19 the princess landed at Alexandria in regal state. Her reception at Cairo was accompanied with feasting and rejoic- ing, and the members of her escort were sent back laden with presents. With that religious toleration common to his race, Uzbeg Khan, having married one princess to Nasir, gave another in marriage to George the prince of Moscow, whose cause he espoused in a quarrel

existing between that prince and his uncle, the grand-prince Michael. Assuming the attitude of a judge in the dispute, Uzbeg Khan summoned Michael to appear before him, and, having given his decision against him, ordered his execution. The sentence was carried out with aggravated cruelty in sight of his nephew and accuser. From this time Uzbeg's sympathies turned towards Christianity. He protected the Russian churches within his frontiers, and put his seal to his new religious views by marrying a daughter of the Greek emperor, Andronicus III. He died in 1340, after a reign of twenty-eight years. His coins were struck at Sarai, Khwarizm, Mokshi, Bulgar, Azak and Krim, and are dated from 1313 to 1340. His son and successor, Tinibeg Khan, after a reign of only a few months, was murdered by his brother Janibeg Khan, who usurped his throne, and, according to the historian Ibn Haidar, proved himself to be " just, God-fearing, and the patron of the meritorious." These excellent qualities did not, however, prevent his making a raid into Poland, which was conducted in the usual Mongol manner, nor did they save his countrymen from being decimated by the black plague. The throne Janibeg had seized by violence was, in 1357, snatched from him by violence. As he lay ill on his return from a successful expedition against Persia he was murdered by his son Berdibeg, who in his turn was, after a short reign, murdered by his son Kulpa. With the death of Berdibeg the fortunes of the Golden Horde began rapidly to decline. As the Uzbeg proverb says, " The hump of the camel was cut off in the person of Berdibeg."

But while the power of the Golden Horde was dwindling away, the White Horde or Eastern Kipchak, which was the inheritance of the elder branch of the family of Juji, remained prosperous and full of vitality. The descendants rfte W* ft e of Orda, Batu's elder brother, being far removed B g Ste e ^ r from the dangerous influences of European courts, Kipchak. maintained much of the simplicity and vigour of their nomad ancestors, and the throne descended from father to son with undiminished

authority until the reign of Urus Khan (1360), when complications arose which changed the fortunes of the tribe. Like many other opponents of the Mongol rulers, Khan Tuli Khoja paid with his life for his temerity in opposing the political schemes of his connexion Urus Khan. Toktamish, the son of the murdered man, fled at the news of his

father's death and sought refuge at the court of Timur, who received him with honour and at once agreed to espouse his cause. With this intention he despatched a force against Urus Khan, and gained some advantage over him, but, while fitting out another army to make a fresh attack, news reached him of the death of Urus. Only at Sighnak are coins known to have been struck during the reign of Urus, and these bear date from 1372

to 1375-

He was followed on the throne by his two sons, Tuktakia and Timur Malik, each in turn; the first reigned but for a few weeks,

and the second was killed in a battle against Tok- Toktamish. tamish, the son of his father's enemy. Toktamish

now (1378) seized the throne, not only of Eastern Kipchak but also of the Golden Horde, over which his arms had at the same time proved victorious. He reigned as Nasir ed-din Jetal ed Mahmud Ghujas Toktamish. His demands for tribute from the Russian princes met with evasions from men who had grown accustomed to the diminished power of the later rulers of the Golden Horde, and Toktamish therefore at once marched an army into Russia. Having captured Serpukhov, he advanced on Moscow. On the 23rd of August 1382 his troops appeared before the doomed city. For some days the inhabitants bravely withstood the constant attacks on the walls, but

failed in their resistance to the stratagems which were so common a phase in Mongolian warfare. With astonishing credulity they opened

the gates to the Mongols, who declared themselves Sacked. the enemies of the grand-prince alone, and not of the

people. The usual result followed. The Russian general, who was invited to Toktamish's tent, was there slain and at the same time the signal was given for a general slaughter. Without discriminating age or sex, the Mongol troops butchered the wretched inhabitants without mercy, and, having made the streets desolate and the houses tenant- less, they first plundered the city and then gave it over to the flames. The same pitiless fate overtook Vladimir, Zvenigorod, Yuriev, Mozhaisk and Dimitrov. With better fortune, the inhabitants of Pereslavl and Kolomna escaped with their lives from the troops of Toktamish, but at the expense of their cities, which were burned to the ground. Satisfied with his conquests, the khan returned homewards, traversing and plundering the principality of Ryazan on his way. Flushed with success, Toktamish demanded from his patron Timur the restoration of Khwarizm, which had fallen into the hands of the latter at a period when disorder reigned in the Golden Horde. Such a request was not likely to be well received by Timur, and, in answer to his positive refusal to yield the city, Toktamish marched an army of 90,000 men against Tabriz. After a siege of eight days the city was taken by assault and ruthlessly ravaged. In the meantime Timur was collecting forces to punish his rebellious protege. When his plans were fully matured, he advanced upon Old Urgenj and captured it. More merciful than Toktamish, he transported the inhabitants to Samarkand,

but in order to mark his anger against the rebellious Timu^'"' c ' tv ne levelled it with the ground and sowed barley

on the site where it had stood. On the banks of the Oxus he encountered his enemy, and after a bloody

battle completely routed the Kipchaks, who fled in confusion. A lull followed this victory, but in 1390 Timur again took the field. To each man was given ” a bow, with thirty arrows, a quiver, and a buckler. The army was mounted, and a spare horse was supplied to every two men, while a tent was furnished for every ten, and with this were two spades,*a pickaxe, a sickle, a saw, an axe, an awl, a hundred needles, 85 lb of cord, an ox’s hide, and a strong pan.” Thus equipped the army set forth on its march. After a considerable delay owing to an illness which overtook Timur his troops arrived at Kara Saman. Here envoys arrived from Toktamish bearing presents and a message asking pardon for his past conduct; but Timur was inexorable, and, though he treated the messengers with consideration, he paid no attention to their prayer. In face of innumerable difficulties, as well as of cold, hunger, and weariness, Timur marched forward month after month through the Kipchak country in pursuit

of Toktamish. At last, on the 18th of June, he overtook him at Kandurcha, in the country of the Bulgars, and at once forced him to an engagement. For three days the battle lasted, and, after inclining now to this side and now to that, victory finally decided in favour of Timur. The Kipchaks were completely routed and fled in all directions, while it is said as many as 100,000 corpses testified to the severity of the fighting.

Toktamish, though defeated, was not subdued, and in 1395 Timur found it necessary again to undertake a campaign against him. This time the. armies met upon the Terek, and after a fiercely-contested battle the Kipchaks again fled in confusion. Timur, threatened by the advancing autumn, gave up further pursuit, and retired with a vast booty of gold ingots, silver bars, pieces of Antioch linen and of the embroidered cloth of Russia, &c. On his homeward march southwards he arrived before Azak, which was then the entrepot where the merchants of the east and west exchanged their wares. In vain the natives, with the Egyptian, Venetian, Genoese, Catalan and Basque inhabitants, besought him to spare the city.

His answer was a command to the Moslems to separate themselves from the rest of the people, whom he put to the sword, and then gave the city over to the flames. Circassia and Georgia next felt his iron heel, and the fastnesses of the central Caucasus were one and all destroyed. After these successes Timur gave himself up for a time to feasting and rejoicing, accompanied by every manifestation of Oriental luxury. ” His tent of audience was hung with silk, its poles were golden, or probably covered with golden plates, the nails being silver; his throne was of gold, enriched with precious stones; the floor was sprinkled with rose water.” But his vengeance was not satisfied, and, having refreshed his troops by this halt, he marched northwards against Astrakhan, which he utterly destroyed. The inhabitants were driven out into the country to perish with the cold, while the commander of the city was killed by being forced beneath the ice of the Volga. Sarai next shared the same fate, and, Timur, having thus crushed for the second time the empire of Toktamish, set out on his return home by way of Derbent and Azerbaijan.

The power in the hands of the successors of Toktamish never revived after the last campaign of Timur. They were constantly engaged in wars with the Russians and the Krim Tatars, with whom the Russians had allied themselves, and by degrees their empire decayed, until, Jon the seizure and death of Ahmed Khan at the beginning of the 16th century, the domination of the Golden Horde came to an end.

The fate which thus overtook the Golden Horde was destined to be shared by all the western branches of the great Mongol family. The .khans of Kazan and Kasimov had already in 1552 succumbed to the growing power of Tatars. 1 ” Russia, and the Krim Tatars were next to fall under the same yoke. In the 15th century, when the Krim Tatars first appear as an independent power, they attempted to strengthen their position by allying themselves with the Russians, to whom they looked for help against the attacks of the Golden Horde. But while they were in this state of dependence another power arose in

eastern Asia which modified the political events of that region. In 1453 Constantinople was taken by the Osmanli Turks, who, having quarrelled with the Genoese merchants who monopolized the trade on the Black Sea, sent an expedition into the Crimea to punish the presumptuous traders. The power which had captured Con- stantinople was not likely to be held in check by any forces at the disposal of the Genoese, and without any serious opposi- tion Kaffa, Sudak, Balaklava and Inkerman fell before the troops of the sultan Mahommed. It was plain that, situated as the Crimea was between the two great powers of Russia and Turkey, it must of necessity fall under the direction of one of them. Which it should be was decided by the invasion of the Turks, who restored Mengli Girai, the deposed khan, to the throne, and virtually converted the khanate into a depen- dency of Constantinople. But though under the tutelage of Turkey, Mengli Girai, whose leading policy seems to have been

the desire to strengthen himself against the khans of the Golden Horde, formed a close alliance with the grand-prince Ivan of Russia. One result of this friendship was that the Mongols were enabled, and encouraged, to indulge their predatory habits at the expense of the enemies of Russia, and in this way both Lithuania and Poland suffered terribly from their incursions. It was destined, however, that in their turn the Russians should not escape from the marauding tendencies of their allies, for, on pretext of a quarrel with reference to the succession to the Kazan throne, Mahommed Girai Khan in 1521 marched an army northwards until, after having devastated the country, massacred the people, and desecrated the churches on his route, he arrived at the heights of Vorobiev overlooking Moscow. The terror of the unfortunate inhabitants at the sight once again of the dreaded Mongols was extreme; but the horrors which had accompanied similar past visitations were happily averted by a treaty, by

which the grand-prince Basil undertook to pay a perpetual tribute to the Krim khans. This, however, proved but a truce. It was impossible that an aggressive state like Russia should live in friendship with a marauding power like that of the Krim Tatars. The primary cause of contention was the khanate of Kazan, which was recovered by the Mongols, and lost again to Russia with that of Astrakhan in 1555. The sultan, however, declined to accept this condition of things as final, and instigated Devlet Girai, the Krim khan, to attempt their recovery. With this object the latter marched an army northwards, where, finding the road to Moscow unpro- tected, he pushed on in the direction of that ill-starred city. On arriving before its walls he found a large Russian force occupying the suburbs. With these, however, he was saved from an encounter, for just as his foremost men approached the town a fire broke out, which, in consequence of the high wind blowing at the time, spread with frightful rapidity, and in the space of six hours destroyed all the churches, palaces and houses, with the exception of the Kremlin, within a com- pass of 30 miles. Thousands of the inhabitants perished in the flames. ” The river and ditches about Moscow,” says Horsey, ” were stopped and filled with the multitudes of people, laden with gold, silver, jewels, chains, ear-rings and treasures. So many thousands were there burned and drowned that the river could not be cleaned for twelve months afterwards.” Satisfied with the destruction he had indirectly caused, and unwilling to attack the Kremlin, the khan withdrew to the Crimea, ravaging the country as he went. Another invasion of Russia, a few years later (1572), was not so fortunate for the Mongols, who suffered a severe defeat near Molodi, 50 versts from Moscow. A campaign against Persia made a diversion in the wars which were constantly waged between the Krim khan and the Russians, Cossacks and Poles. So hardly were these last pressed by their pertinacious enemies in 1649 that they bound themselves by treaty to pay an annual subsidy to the khan. But the fortunes of war were not always on the side of the Tatars, and with

the advent of Peter the Great to the Russian throne the power of the Krim Mongols began to decline. In 1696 the tsar, sup- ported by a large Cossack force under Mazeppa, took the field against Selim Girai Khan, and gained such successes that the latter was compelled to cede Azov to him. By a turn of the wheel of fortune the khan had the satisfaction in 171 1 of having it restored to him by treaty; but this was the last real success that attended the Tatar arms. In 1735 the Russians in their turn invaded the Crimea, captured the celebrated lines of Perekop, and ravaged Bakhchi-sarai, the capital. The inevitable fate which was hanging over the Krim Tatars was now being rapidly accomplished. In 1783 the Krim, together with the eastern portion of the land of the Nogais, became absorbed into the Russian province of Taurida.

It will now only be necessary to refer briefly to the Uzbegs, who, on the destruction of the Golden Horde, assumed an important position on the east of the Caspian Sea. The founder of their greatness was the khan Abulk- hair, who reigned in the 15th century, and who, like another Jenghiz Khan, consolidated a power out of a number

The Uzbegs.

of small clans, and added lustre to it by his successful wars. Shaibani Khan, his grandson, proved himself a worthy successor, and by him Baber (?.».), the Timurid khan of Ferghana, who afterwards founded the Mogul Empire in India, was driven from his ancestral dominions. In 1500 he inflicted a severe defeat on Baber’s forces, and captured Samarkand, Herat and Kandahar. By these and other conquests he became possessed of all the country between the Oxus and the Jaxartes, of Ferghana, Khwarizm and Hissar, as well as of the territory of Tashkent from Kashgar to the frontiers of China. In the following year, by a dashing exploit, Baber recovered Samarkand, but only to lose it again a few months later. During several succeeding years Shaibani’s arms proved victorious in many fields of battle, and but for an indiscreet outrage on the territories of the shah of

Persia he might have left behind him a powerful empire. The anger, however, of Shah Ismail roused against him a force before which he was destined to fall. The two armies met in the neighbourhood of Merv, where, after a desperate encounter, the Uzbegs were completely defeated. Shaibani, with a few followers, sought refuge in a cattle-pound. But finding no exit on the farther side, the refugees tried to leap their horses over the wall. In this attempt Shaibani was killed (1510). When his body was recognized by his exultant enemies they cut off the head and presented it to the shah, who caused the skull to be mounted in gold and to be converted into a drinking-cup. After this defeat the Uzbegs withdrew across the Oxus and abandoned Khorasan. Farther east the news aroused Baber to renewed activity, and before long he reoccupied Samarkand and the province ” Beyond the River,” which had been dominated by the Uzbegs for nine years. But though the Uzbegs were defeated they were by no means crushed, and ere long we find their khans reigning, now at Samarkand, and now at Bokhara. As time advanced and European powers began to encroach more and more into Asia, the history of the khanates ceases to be confined to the internecine struggles of rival khahs. Even Bokhara was not beyond the reach of Russian ambition and English diplomacy. Several European envoys found their way thither during the first half of the 19th century, and the murder of Stoddart and Conolly in 1842 forms a melancholy episode in British relations with that fanatical capital. With the absorption of the khanate of Bokhara and the capture of Khiva by the Russians the individual history of the Mongol tribes in Central Asia comes to an end, and their name has left its imprint only on the dreary stretch of Chinese- owned country from Manchuria to the Altai Mountains, and to the equally unattractive country in the neighbourhood of the Koko-nor.

Bibliography. — Sir H. Howorth, History of the Mongols (1876, 1878); D’Ohsson, Histoire des Mongols (1834); Cahun, Introduction d, I ‘histoire d’Asie; Kohler, Die Entwicklung des Kriegswesens ;

Strakosch-Grossmann, Der Einfall der Mongolen in Mittel-Europa; (for the general reader) Jeremiah Curtin, The Mongols, a history (1908). (R. K. D.)

Language. — The Mongol tongue is one of the members of the great stock which recent scholars designate as Ural-Altaic, which also includes the Finno-Ugric, Turkish, Manchu and Samo- yede. The members of this group are not so closely related to one another as those of the Indo-European stock; but they are all bound together by the common principle of agglutinative formation, especially the so-called harmony of vowels, by their grammatical structure, and also by certain common elements in the stock of roots which run through them all, or through particular more closely-connected families within the group. 1 The fatherland proper of the Mongols is Mongolia (q.v.). The sum total of the Mongol population under Chinese government is calculated at between two and three millions.

Generally the whole Mongol tribe may be divided into three branches : East Mongols, West Mongols and Buriats.

I. The East Mongols are divided into the Kalkas in the borders just mentioned, the Shara Mongols south of the Gobi along the Great Wall north-eastward to Manchuria, and lastly the Shiraigol or Sharaigol in Tangut and in northern Tibet.

1 Compare W. Schott, Versuch iiber die tatarischen Sprachen (Berlin, 1836); Ueber das allai'sche oder finnisch-latarische Sprachen- geschlecht (Berlin, 1849); Altajische Studien, parts i.-v. • (Berlin, 1 860-1 870); and A. Gastrin, Ethnologische Vorlesungen iiber die Altai'schen Vblker, ed. by A. Schiefner (St Petersburg, 1857).

2. On the signification and employment of the different names of the West Mongols (Kalmucks,

Oelod, Oirad or Dorbon Oirad = the four Oirad, Mongol Oirad), and also as regards the subdivision of the tribes, there is much uncertainty. The name Kalmuck, so generally employed among us, is in fact only used by the Volga Kalmucks (Khalimak), but even with them the name is not common, and almost a byname. It is of foreign origin, and most likely a Tataric word which has yet to be explained. Oirad means the ” near ones,” the ” related. The usual explanation given is that the single tribes consider themselves as being related to each other — hence Mongol Oirad, ” the Mongol related tribe.” This is the favourite name among Kalmucks. Dorbon Oirad, or the four related tribes, comprise (i) Dzungars, (2) Torgod, (3) Koshod, (4) Derbet. The signification of the name Oelod, in the East Mongolian Oegeled, now the most widely-spread among the tribes living in China, is likewise very doubtful. Some assert that ” Oelod ” is nothing but the Chinese transcription of Oirad, as the ordinary Chinese language does not possess the sound r. We have, however, to bear in mind that we have a Mongolian root ogeleku, with the sense ” to be inimical,” ” to bear hatred, ill-will,” &c. The main population of the Kalmucks live, or rather drag out, their existence after the usual fashion of nomad tribes in Dzungaria, in the eastern part of the Tian-shan, on the south border of the Gobi, on Kok6-n6r, and in the province of Kan-suh. All these are under the Chinese government. In consequence, however, of the extension of the Russian empire in Tian-shan and Alatau, many hordes have come under the Russian sway. According to an approximate account we may reckon in the territory Semiryetshensk (Kulja) and Semipalatinsk 34,000 Kalmucks, while in the southern part of the government Tomsk, on the Altai, the Kalmuck population amounted formerly to 19,000. Besides these we find a section of Kalmuck population far in the west, on the banks of the Volga (near Astrakhan). From their Original seats in Dzungaria they turned in their migrations to the north, crossed the steppe of the Kirghiz, and thus gradually reached the Emba and the Or. Between these two rivers and the Ural the Torgod settled in 1616;

thence they crossed the Volga in 1650, and took possession of the now so-called steppe of the Kalmucks, being followed in 1673 by the Derbet and in 1675 by the Koshod. In 1 77 1 a considerable number returned to the Chinese empire. There is still a not unimportant population in the so-called steppe of the Kalmucks, which extends between the Caspian and the Volga in the east and the Don in the west, and from the town of Sarepta in the north to the Kuma and the Manych in the south. According to modern statistical accounts, this population amounts to 76,000. To these we have to add 25,000 more on the borders of the Cossacks of the Don, and lastly 8000 in the bordering provinces of Orenburg and Saratov.

3. In the southern part of the Russian province of Irkutsk, in a wide circle round Lake Baikal, lies the heirdom proper of the Buriats, which they also call the ” Holy Sea “; the country east of the lake is commonly called Transbiakalia. Their country practically extends from the Chinese frontier on the south within almost parallel lines to the north, to the town Kirensk on the Lena, and from the Onon in the east to the Oka, a tributary of the Angara, in the west, and still farther west towards Nizhni-Udinsk. They are most numerous beyond the Baikal Lake, in the valleys along the Uda, the Onon and the Selenga, and in Nertchinsk. These Transbaikalian Buriats came to these parts only towards the end of the 17th century from the Kalkas. While Mongols and Kal- mucks generally continue to live after the usual fashion of nomads, we find here agricultural pursuits, most likely, however, due mainly to Russian influence. Christianity is also making its way. The sum total of the Buriats amounts to about 250,000.

Another tribe separated from the rest of the Mongols is the so- called Hazara (the thousand), and the four Aimak {i.e. tribes), who wander about as herdsmen in Afghanistan, between Herat and Kabul. In external characteristics they are Mongols, and in all probability they are the remains of a tribe from the time of the Mongol dynasty. Their language,

which shows, of course, Persian influence, is strictly Mongolian, more particularly West Mongolian or Kalmuck, as has been proved by H. C. von der Gabelentz. 1 : Agreeably with this threefold division of the Mongols we have also a threefold division of their respective languages: (l) East Mongolian or Mongolian proper, (2) West Mongolian or Kalmuck, (3) Buriatic.

The dialects just mentioned are found to be in close relation to each other when we examine their roots, inflections and grammatical structure. The difference between them is indeed so slight that whoever understands one of them understands all. Phonetically a characteristic of them all is the ” harmony of vowels,” which are divided into two chief classes : the hard a, 0, u and the soft e, 0, u, between which i is in the middle. All vowels of the same word must necessarily belong to the same class, so that the nature of the first or root-vowel determines the nature of the other or inflection-vowels; now and then a sort of retrogressive harmony takes place, so that a later vowel determines the nature of the former.

1 See his essay, ” Ueber die Sprache der Hazaras und Aimaks,” in the Zeitsckrift der deutschen morgenldndischen Gesettschaft, xx. 326-

335-

The consonants preceding the vowels are equally under their in- fluence.

The Mongolian characters, which in a slightly altered form are also in use among the Manchus, are written perpendicularly from above downward, and the lines follow from left to right, the alpha- bet having signs for seven vowels — a, e, i, 0, u, 0, u, and diphthongs derived from them — ao, ai, ei, ii, oi, ui, oi Hi, and for seventeen con sonants — n, b, kh, gh, k, g, m, I, r (never initial), I, d, y, s, (ds). Is, ss, sh, w. All these are modified in shape according to their position, in the beginning, middle, or end of a word, and also by certain

orthographic rules. In Mongolian and Manchu writing the syllable (i.e. the consonant together with the vowel) is considered as a unit, in other words a syllabarium rather than an alphabet. The existing characters are lineal descendants of the original Uighurian forms, which were themselves derived from the Syriac, having been brought to the Uighurs by Nestorian missionaries. An Indian and Tibetan influence may also be noticed, while the arrangement of the char- acters in perpendicular lines is common to the Chinese. The writing was brought into its present shape by the learned Lamas Saskya Pandita, Phags-pa Lama, and Tshoitshi Odser in the 13th century, 2 but is exceedingly imperfect. To express the frequently-occurring letters borrowed from Sanskrit and Tibetan, which are wanting in the Mongol alphabet, a special alphabet, called Galik, is employed. Every one who has tried to read Mongolian knows how many difficulties have to be overcome, arising from the ambiguity of certain letters, or from the fact that the same sign is to be pronounced differently, according to its position in the word. Thus, there are no means for distinguishing the and u, and u, the consonants g and k, t and d, y and s (ds). A and e, («•) and (it)', a (e) and n, g and kh, t (d) and on, are liable to be mistaken for each other. Other changes will be noticed and avoided by advanced students. It is a great defect that such common words as ada {a fury) and ende (here), ende (here) and nada (me), aldan (fathom) and altan (gold), ordu (court-residence) and urtu (long), onokhu (to seize) and unukhu (to ride), tere (this) and dere (pillow), gebe (said) and kebe (made), gem (evil) and kem (measure), ger (house) and ker (how), naran (sun) and nere (name), yagon (what) and dsagon (hundred), should be written exactly alike. This list might be largely increased. These defects apply equally to the Mongolian and Buriatic alphabets.

In 1648 the Saya Pandita composed a new alphabet (the Kalmuck), in which these ambiguities are avoided, though the graphic differences between the two alphabets are only slight. The Kalmuck alphabet

avoids the angular and clumsy shapes of the Mongolian, and has, on the contrary, a rounded and pleasing shape. The Kalmuck alphabet has also this great advantage — that every sound has its distinct graphic character; a mistake between two characters can scarcely occur. The Kalmuck words once mastered, they can be easily recognized in their Mongolian shape. The dialectical differ- ences are also very slight.

The Kalmuck, therefore, is the key of the Mongolian, and should form the groundwork of Mongolian studies. The Kalmuck and East Mongolian dialects do not differ much, at least in the spoken lan- guage; but the Kalmucks write, according to their pronunciation, while the Mongols do not. For example, son (dson), ” hundred,” is pronounced alike by the Kalmucks and the East Mongolians; but according to Mongolian orthography the word appears in the form dsagon. The dialectic difference between the two dialects very frequently lies only in a different pronunciation of some letters. Thus East Mongolian ds is in Kalmuck soft s, &c. The chief differ- ence between the two dialects lies in the fact that in Kalmuck the soft guttural g between two vowels is omitted, while, through the joining of the two vowels, a long vowel is produced. In the pro- nunciation of common East Mongolian the g is likewise omitted, but it is written, while in Kalmuck, as just now mentioned, the guttural can only be traced through the lengthening of the syllable. Thus we find: Mongol khagan, ” prince, ” Kalmuck khan: M. dagon, “voice, sound,” K. don, dun, M. dologan, “seven,” K. dolon; M. agola, “mountain,” K. ola, ilia; M. nagor, “lake,” K. nor, nur; M. ulagan, “red,” K. ulan; M. yagon, ” what,” K. yon (yun); M. dabagan, “mountain ridge,” K. daban; M. ssanagan, “thought,” K. ssanan; M. baragon, “on the right,” K. baron, bariln; M. shibagon, “bird,” K. showon; M. chilagon, “stone,” K. chilon (chulun); M. jirgogan, ” six,” K. surgan; M. degere, ” high, above,” K. dere; M. ugukhu, ” to drink,” K. ukhu; M. togodshi, ” history,” K. todshi, tudshi; M. eguden, ” door,” K. oden; M. dsegiln, ” left,” K. son; M.

ogede, “in the height,” K. odo; M. ogeled, “the Kalmucks,” K. olod;- M. Hileged, ” if one has done,” K. uiled; M. kbbegiln, “son,” K. kowon; M. gegun, ” mare,” K. gun; M. kegur, ” corpse.” K. kur; M. kharigad^ ” returned,” K. khared, &c.

The Buriatic, in these peculiarities, is almost always found with East Mongolian, with which it is in every respect closely allied. In the pronunciation of some letters the transition of East Mongolian tsa, tse into Buriatic ss is noticeable; for instance: Mong. tsetsek, “flower,” Buriatic ssessek; M. tsak, “time,” B. ssak; M. tsagan, “white,” B. ssagan; M. tsetsen, “prudent,” B.ssessen. Ssissome- times pronounced like (the German) ch: East M. ssain, ” good,” B.

2 Cf. H. C. von der Gabelentz, in the Zeitschrift f. d. Kunde d. Morgenlandes’ (Gottingen, 1838), ii. 1-21, ” Versuch iiber eine alte mongolische Inschrift.’

chain; M. ssedkil, “heart,” B. chedkil. K in the beginning or middle of a word is always aspirated.

The noun is declined by the help of appended particles, some of which are independent post-positions, viz. Gen. yin, u, un; Dat. dur, a; Ace. yi, i; Ablat. etse; Instrum. ber, yer; Associative, luga, luge. The dative and accusative have also special forms which have at the same time a possessive sense, viz. Dat. dagan, degen; Accus. ben, yen. The plural is expressed by affixes (nar, tier, od, ss, d), or frequently by words of plurality, ” all,” ” many,” e.g. kumun nogod (man, many = men). The oblique cases have the same endings in singular and plural. Gender is not indicated. The adjective is uninflected both as attribute and as predicate; there is no comparative form, this idea being expressed by the con- struction or by the use of certain particles. The personal pronouns are hi,

I ; tchi, thou ; bida, we ; to, ye ; their genitives serve as pos- sessives. The demonstratives are ene, tere (this, that), plural ede, tede; interrogative ken, who? The relative is lacking, and its place is supplied by circumlocutions. The numerals are: I, nigen; 2, khoyar; 3, gurban; 4, dorben; 5, tabun; 6, jirgugan; 7, dologan; 8, naiman; 9, yisun; 10, arban; 100, dsagon; 1000, minggan. . The ordinals are formed by appending tugar, tilger. The theme of the verb is seen in the imperative, as bari, grasp. The conjugation is rich in forms for tense and mood, but the person and number are with few exceptions unexpressed. The present is formed from the theme by adding mui {barimui), the preterite by bai or luga (baribai, bariluga), the future by ssugai or ssu (barissugai, barissu). The preterite has also in the third person the terminations dsugui and run ; the future has in the third person yu, and in the first ya. The conditional ends in bassu (baribassu), the precative in tugai, tiigei, the potential in sa (barimuisa) , the imperative plural in ktun, the gerund in the present in n, dsu (barin, baridsu) or tala, ” while, till ” {baritala, ” inter capiendum “), in the preterite it is formed in gad {barigad); the present part, has ktchi (bariktchi), the past part. kssan (barikssan) ; the supine ends in ra, the infinitive in khu (barikhu, or when used substantively barikhui). There is but one perfectly regular conjugation, and derivative forms, derived from the theme by infixes, are conjugated on the same scheme. Thus the passive has infixed to or kda (barikdakhu, to be grasped), the causative gul (barigulkhu, to cause to grasp), the co-operative or sociative Itsa or Ida {bariltsakhu, to grasp together).

There are no prepositions, only post-positions. Adverbs are either simple particles (affirmative, negative, interrogative, modal, &c.) or are formed by suffixes from other parts of speech. There are very few conjunctions; the relations of clauses and sentences are mainly indicated by the verbal forms (part., sup., conditional, but mainly by the gerund).

The order of words and sentences in construction is pretty much the opposite of that which we follow. In a simple sentence the indication of time and place, whether given by an adverb or a sub- stantive with a post-position, always comes first ; then comes the subject, always preceded by its adjective or genitive, then the object and other cases depending on the verb, last of all the verb itself preceded by any adverbs that belong to it. So in the structure of a period all causal, hypothetical, concessive clauses, which can be conceived as preceding the main predication in point of time, or even as contemporary with it, or as in any way modifying it, must come first ; the finite verb appears only at the end of the main predication or apodosis. The periods are longer than in other languages; a single one may fill several pages.

Authorities. — Grammars and dictionaries may be divided according to the three dialects. For East Mongolian, I. J. Schmidt gave the first grammar (St Petersburg, 1831), and a Mongolian- German-Russian dictionary (St Petersburg, 1835). Next Jos. Koval- evski published in Russian a Mongolian grammar (Kasan, 1835), a chrestomathy (2 vols., Kasan, 1836, 1837), and his great Dictionnaire mongol-russe- francais (3 vols., Kasan, 1844, 1846, 1849). We may mention R. Yuille, Short Mongolian Grammar (in Mongolian), xylo- graphed at the mission press near Selenginsk beyond Lake Baikal (1838). A. Bobrovnikov's Russian Grammar of the Mongolian- Kalmuck Language (Kasan, 1849) is also very good. An abridg- ment of Schmidt's work is C. Puini, Elementi della grammatica mongolica (Florence, 1878). A. Popov's Mongolian Chrestomathy appeared in 2 vols, at Kasan (1836). For the Kalmuck we have grammars by Popov (Kasan, 1847), Bobrovnikov, as above, and H. A. Zwick {s. I. et a.), autographed at Donaueschingen (1851). Zwick's autographed Kalmuck and German dictionary with a printed German index appeared {s. 1. et a.) in 1852; B. Jtilg's edition of the tales of Siddhi-kur (Leipzig, 1866) gives a complete glossary to these stories. There are small Russian and Kalmuck vocabularies by P. Smirnov

(Kasan, 1857) and C. Golstunskyi (St Petersburg, i860). For the Buriatic we have Castren, Versuch einer burjdtischen Sprachlehre, ed. by Schiefner (1857), and A. Orlov's Russian grammar of the Mongol-Buriatic colloquial language (Kasan, 1878).

Literature. — A clear distinction must be drawn between the higher and nobler written or book-language and the common or con- versational language of every-day life. The difference between the two is very considerable, and may be fairly compared to that between the modern High German book-language and the different dialects. All grammars and dictionaries as yet published treat only of the book-language ; and so also, with a few exceptions, the published

literary documents are written in this higher style. The exceptions are the Gesser-Khan, and the Siddhi-kur and Djangariad (the last two published by Golstunskyi). The popular or conversational language has been fixed in writing by A. Pozdneev in his Russian work, Specimens of the Popular Literature of the Mongolian Tribes, pt. i., " Popular Songs " (St Petersburg, 1880), which contains rich material for the study of the popular literature.

The literature consists mostly of translations from the Tibetan, the holy language of Buddhism, which is still the language of the learned. The Tibetan Buddhist literature is itself translated from the Sanskrit ; hence, now and then, through Mongols and Kalmucks we get acquainted with Indian works the originals of which are not known in Sanskrit. Such is the case, for instance, with the tales of Siddhi-kur. Many books have also been translated from the Chinese. Most of the writings are of a religious, historical, philo- sophical, medical, astronomical or astrological character. Favourite subjects are folk-lore and fairy tales. Among the religious books, perhaps the most important is that containing the legends entitled uliger un dalai, " ocean of comparisons " (ed. by I. Jacob Schmidt under the title, Der Weise und der Thor, in Tibetan and German (St Petersburg, 1843). To this may be added the

boddhi mor, or ” the holy path,” the altan gerel, ” gleaming of gold,” the mani gambo and yertuntchii yin toli, ” mirror of the world.” What was known of poetical literature before Pozdneev is scarcely worth mentioning. In some parts of the historical and narrative literature we find, wherever the narrative takes a higher flight, an admixture of poetical diction. The poetry appears in a certain parallelism of the phrases, with a return either of the same endings (rhyme) or of the same words (refrain). Frequently we find, besides the rhyme or refrain, alliteration. The essay of H. C. von der Gabelentz in Z. /. d. Kunde des Morgenlandes, i. 20-37, ” Einiges tiber mongolische Poesie,” has been superseded by the work of Pozdneev.

Among historical works a high place is due to that composed by the tribal prince, Sanang Setzen, in the middle of the 17th century {Geschichte der Ost-Mongolen und ihres Fiirstenhauses , Mongolian and German, by I. J. Schmidt, St Petersburg, 1829), and to the Altan tobtchi, i.e. ” golden knob ” or ” precious contents ” (text and Russian trans, by the Lama Galsang Gomboyev, St Petersburg, 1858). Of folk-lore and fairy tales, we have the legend of the hero Gesser- Khan (text ed. by I. J. Schmidt, St Petersburg, 1836, and German version, 1839; cf. Schott, Ueber die Sage v. Geser-Khan, Berlin, 1 85 1, and B. Jtilg in the Transactions of the Wurzburger Philol. Versam. of 1868, pp. 58 sqq., Leipzig, 1869); and the tales about Ardshi Bordshi (Russian version by Galsang Gomboyev.St Petersburg, 1858; text and German trans, by B. Jtilg, Innsbruck, 1867, 1868). A favourite book is the tales of Siddhi-kur, based on the Sanskrit Vetdla panchavincati (Russian trans, by Galsang Gomboyev, St Peters- burg, 1865, nine of the tales in Mongolian and German, by B. Jtilg; Innsbruck, 1868). The fuller collection of these tales in Kalmuck first became known by the German trans, of B. Bergmann in vol. i. of his Nomadische Streifereien unter d. Kalmuken (4 vols., Riga, 1804, 1805) ; an autographed edition in the vulgar dialect was published by C. Golstunskyi (St Petersburg, 1864) ;

text and German trans, with glossary by B. Jtilg (Leipzig, 1866). A poetic heroic story is the Djangariad, extracts from which were given by Bergmann (op> cit., iv. 181 sqq.); a complete Russian version by A. Bobrovnikov (St Petersburg, 1854) ; a German version by F. v. Erdmann in Z.D.M.G., 1857 (Kalmuck text by Golstunskyi, St Petersburg, 1864). A similar poem is the history of Ubasha Khuntaidshi and his war with the Oirad, Kalmuck text and Russian trans, by G. Gomboyev in his Altan tobtchi as above, and text alone autographed by Golstunskyi (St Petersburg, 1864). Some books of religion for the Christian Buriats (transcribed in Russian characters) represent the Buriatic dialect. The Russian and English Bible Societies have given us a translation of the whole Bible. I. J. Schmidt translated the Gospels and. the Acts into Mongolian and Kalmuck for the Russian Bible Society (8_vols., St Petersburg, 1819-1821) — a masterly work. The English missionaries, E. Stallybrass and W. Swan, and afterwards R. Yuille, translated the whole Old Testament into Mongolian (1836-1840). This work was printed at a mission press erected at great cost for the purpose near Selenginsk, beyond Lake Baikal in Siberia. In 1846 the New Testament by the same hands appeared at London.

Authorities. — The richest collections of Mongolian and Kalmuck printed books and MSS. are in the Asiatic museum of the St Peters- burg Academy, and in the libraries of Kazan and Irkutsk; there is also a good_ collection in the royal library at Dresden. Consult in general, besides the already-cited works of Bergmann and Pozdneev, P. S. Pallas, Sammlungen historischer Nachrichten u. d. mongolischen V biker schaf ten (2 vols., St Petersburg, 1776-1801); I. J. Schmidt, Forschungen im Gebiete der dlteren . . . Bildungs geschichte der Volker Mittelasiens, vorz. d. Mongolen und Tibeter (St Petersburg and Leipzig, 1824); B. Jtilg, ” On the Present State of Mongolian Researches,” Journ. R. As. Soc, xiv. (1882), pp. 42-65. (B. J.)

MONG PAI (called Mobye by the Burmese), the most

south- westerly of the British Shan States of Burma. It has an approx- imate area of 1000 sq. m., and a population (1901) of 19,351. The general character of the country is hilly, rising westwards in a gentle slope from the chief stream, the Nam Hpilu or Balu.

This is navigable for native boats throughout the year to the point where it sinks underground in Karen-ni. The chief culti- vation is rice, with about two acres of dry or hill rice to one of wet bottom. The hill fields are left fallow for ten years after two years' cultivation. The chief, the Sawbwa Hkun Yon, held charge through the reigns of four Burmese kings, and submitted early in 1887 on the first arrival of British troops. He abdicated in favour of his son in 1890, and died a few years later.

MONG PAN (the Burmese Maingpan), a state in the eastern division of the southern Shan States, lying approximately between io° 45′ and 20° 25′ N. and between 08° and 99° E., with an area of 2299 sq. m., and a population (1901) of 16,629. The main state lies, except for a few insignificant circles, entirely west of the Salween, but beyond that river are the four sub- feudatory states of Mong Tun, Mong Hang, Mong Kyawt and Mong Hta. The only considerable area of flat land is round the capital, which lies in a large and fertile plain, marking roughly the centre of the state. From this plain rise on all sides low hills covered with scrub jungle, sloping up to ranges of about 5000 ft. on nearly every side. Rice is the only crop, irrigated where possible; elsewhere dry cultivation prevails. The state has valuable teak forests on both sides of the Salween, which cover a considerable but undetermined area. The general altitude of the valleys is about 2000 ft. The capital is small, and has only about 200 houses. The chief is of Sawbwa rank.

MONGREL (earliest form mengrel, probably from the root meng-, or mong-, to mix, cf. mingle, among), a dog that is the progeny of two different* breeds, or one whose breed it is impossible to tell on account of the various crossings. In the case of other animals or plants it is the result of a fertile cross between two varieties of the same species, and so to be distin- guished from a ” hybrid,” the result of a fertile cross between two distinct species (see Hybridism).

MONIER-WILLIAMS, SIR MONIER (1819-1899), British orientalist, son of Colonel Monier- Williams, surveyor-general in the Bombay presidency, was born at Bombay on the 12th of November 1819. He matriculated at Oxford from Balliol College in 1837, but left the university on receiving in 1839 a nomination for the East India Company’s civil service, and was completing his course of training at Haileybury when the entreaties of his mother, who had lost a son in India, prevailed upon him to relinquish his nomination and return to Oxford. As Balliol was full, he entered University College and, devoting himself to the study of Sanskrit, he gained the Boden scholarship in 1843. After taking his degree he was appointed professor of Sanskrit, Persian and Hindustani at Haileybury, where he remained until the abolition of the college upon the transfer of the government of India from the Company to the Crown. He taught oriental languages at Cheltenham for ten years, and in i860 was elected Boden professor of Sanskrit at Oxford after a contest with Professor Max Muller (q.v.), which attracted great public interest and severe criticism, the motive of the non- resident voters, whose suffrages turned the scale, being notoriously not so much to put Monier- Williams in as to keep Max Muller out. Although, however, far inferior to his rival in versatility and literary talent, Monier- Williams was in no way inferior in the special field of Sanskrit, and did himself and his professorship much honour by a succession of excellent works, among which may especially be named his Sanskrit-English and English- Sanskrit

dictionaries; his Indian Wisdom (1875), an anthology from Sanskrit literature; and his translation of Sakuntala (1853). In his later years he was especially attracted by the subject of the native religions of India, and wrote popular works on Brahmanism, Buddhism and Hinduism. His principal undertaking, however, was the foundation of the Indian Institute at Oxford, which owes its existence entirely to him. He brought the pro- ject before the university in May 1875, and in that year and the following, and again in 1883, visited India to solicit the moral and financial support of the native princes and 6ther leading men. Lord Brassey came to his aid with a donation of £9000, and in November 1880 the institute was adopted by the university, but the purchase of a site and the erection of a building were left

to the professor. Upwards of £30,000 was eventually collected; the prince of Wales, in memory of his visit to India, laid the foundation stone in May 1883; and the edifice, erected in three instalments, was finally completed in 1896. Ere this, failing health had compelled Monier-Williams to withdraw from the active duties of his professorship, which were discharged by the deputy-professor, Dr A. Macdonell, who afterwards succeeded him. He continued, nevertheless, to work upon Sanskrit philology until his death at Cannes on the nth of April 1899. He had been knighted in 1886, and was made K.C.I.E. in 1889, when he adopted his Christian name of Monier as an additional surname.

MONISM (from Gr. fxovos, alone), the philosophic view of the world which holds that there is but one form of reality, whether that be material or spiritual. The aim of knowledge is explana- tion, and the dualism or pluralism which acquiesces in recog- nizing two or more wholly disparate forms of reality has in so far renounced explanation (see Dualism). To this extent monism is justified; but it becomes mischievous if it prompts us to ignore important differences in facts as they present them- selves to our intelligence. All forms of monism from Plotinus downwards tend to ignore personal

individuality and volition, and merge all finite existence in the featureless unity of the Absolute; this, indeed, is what inspires the passion of the protest against monism. Turning to the historical forms of the theory we may class Plotinus as a mystical monist: he attains to the One which is the All by an act of mystic union raising him above the phenomenal sphere. Spinoza is a materialistic monist with an inconsistent touch of mysticism and a certain concession, more apparent than real, to the spiritual side of experience. Hegel's is an intellectualist monism, explaining matter, sensation, personal individuality and will as forms of thought. The doctrine of Schopenhauer and von Hartmann is a monism of cosmic will which submerges the individual no less completely than Hegelianism, though in a different manner. HaeckePs monism is mere materialism dignified by a higher title. Those who maintain that all these forms of synthesis are hasty and superficial stand by the convic- tion that the right philosophic attitude is to accept provisionally the main distinctions of common sense, above all the distinction of personal and impersonal; but to press forward to the under- lying unity so far as experience and reflection justify.

SeeABsoLUTE; Dualism; Metaphysics; Materialism; Idealism.

MONITION, or Admonition (Lat. monere, to admonish), in English ecclesiastical law, an order requiring or admonishing the person complained of to do something specified in the monition, or appear and show cause to the contrary, " under pain of the law and penalty thereof." It is the lightest form of ecclesiastical censure, whether to clergymen or laymen, but disobedience to it, after it has been duly and regularly served, entails the penalties of contempt of court. Monitions of a disciplinary character are either for the purpose of enforcing residence on a benefice, or in connexion with suits to restrain ritual alleged to be unlawful.

MONITOR (from Lat. monere, to warn, advise), an advisor or counsellor, one who warns another person

as to his course of action, also used of things that are more or less personified, as conscience. The word is chiefly applied to senior pupils (also known as ” prefects “) in some of the great secondary schools in England; in America to senior students in certain colleges to whom special duties are assigned, particularly that of keeping order; and also to pupil teachers in English elementary schools. It is used in a general way of anything that gives warning, and in this sense is applied to a lizard of the family Monitoridae, or Varanidae, found in Africa and Australia, which is supposed to give warning of the approach of crocodiles. The name of moni- tor was also given to a particular kind of ironclad invented for the American navy by Captain John Ericsson (q.v.) in 1862, which had a very low freeboard and revolving gun-turrets. The letter of Ericsson to the assistant secretary of the navy, of the 20th of January 1862 (quoted in the Century Dictionary) , gives the inventor’s reason for the name. ” The impregnable and aggressive character of this structure will admonish the leaders of the Southern Rebellion that the batteries on the banks

of their rivers will no longer present barriers to the entrance of the Union forces. The ironclad intruder will thus prove a severe monitor to those leaders . . . ‘ Downing Street ‘ will hardly view with indifference this last ‘ Yankee notion,’ this monitor.” It is also the name of an ironclad railway truck used for carrying a big gun. In America the raised part of the roof of a railway carriage or omnibus in which the lights or ventilators are placed is known as a monitor roof or top. In mining the word is applied to a jointed nozzle which may be turned in all directions, and is used in hydraulic mining.

MONK (or Monck), GEORGE, 1st Duke of Albemarle (1 608-1 669), second son of Sir Thomas Monk, a gentleman of good family but in embarrassed

circumstances, was born at Potheridge, near Torrington, in Devonshire, on the 6th of Decem- ber 1608. Having thrashed the under-sheriff of the county in revenge for a wrong done to his father, he had to leave home, and naturally took to the career of arms. He served as a volunteer in the expedition to Cadiz, and the next year did good service at the Isle of Rhe. In 1629 Monk went to the Low Countries, then the school of war, and there he gained a high reputation as a leader and disciplinarian. In 1638 he threw up his commission in consequence of a quarrel with the civil autho- rities of Dordrecht, and came to England. He obtained the lieutenant-colonelcy of Newport's regiment. During the opera- tions on the Scottish border he showed his skill and coolness in the dispositions by which he saved the English artillery at Newburn, though himself destitute of ammunition. At the outbreak of the Irish rebellion he was appointed colonel of Lord Leicester's regiment. All the qualities for which he was noted through life — his talent of making himself indispensable, his imperturbable temper and his impenetrable secrecy — were fully displayed in this employment. The governorship of Dublin was vacant, and Monk was appointed by Leicester. But Charles I. overruled the appointment in favour of Lord Lambart, and Monk with great shrewdness gave up his claims. Ormonde, however, who viewqd him with suspicion as one of the two officers who refused the oath to support the Royal cause in England, sent him under guard to Bristol. But he justified himself to Charles in person, and his soldierly criticisms on the conduct of the Irish War impressed the king, who gave him a command in the corps sent over from Ireland during the English Civil War. Monk was, however, soon taken prisoner, at Nantwich (1644), and spent the next two years in the Tower, where he found it difficult to live owing to his want of means. The king himself sent him £100, a gift for which Monk himself was sincerely grateful. He beguiled his imprisonment by writing his Observa- tions on Military and Political Affairs.

Monk's Irish experience, however, led to his release

and an invitation to take service in the parliament's army against the Irish rebels. Making a distinction like other soldiers of the time between fighting the Irish and taking arms against the king, he accepted the offer and took the covenant. At first as adju- tant-general to the Parliamentary lord-lieutenant, his old friend Lord Lisle, and afterwards as governor of Ulster, he rendered great services to his new masters. In conjunction with Colonel Michael Jones, governor of Leinster, he made head against the rebels for two years, but in the third (1649) the Parliamentarians, weakened by defections brought about by the execution of the king, were no longer able to keep the field. Losing one strong place after another, Monk concluded an armistice with the rebel Owen Roe O'Neill upon terms which he knew the parliament would not ratify. The convention was indeed a military expedient to deal with a military necessity, and although most of his army went over to the Royalist cause, he him- self remained faithful to his employers and returned to England. As he expected, parliament " utterly disapproved " of the armistice but exonerated their general. His next service was in Cromwell's army in Scotland. He commanded a brigade at the great victory of Dunbar, and afterwards captured a number of small places. When in 1651 Cromwell with the field army hurried southward into England to bring the invading Scots to battle, Monk was left behind to complete the

subjugation of the country. In February 1652 he left Scotland to recruit his broken health at Bath, and in Novemberof the same year he became an admiral, or rather a " general at sea," instead of a soldier. Ten days after hoisting his flag for the first time he was engaged with his colleagues, Blake and Deane, in the battle of Portland (Feb. 18, 1653). In the action of June 2-3 Monk exercised the general command after Deane's death. A third battle followed on the 29th and 30th of July, which was a decisive victory for the Commonwealth's fleet (see Dutch Wars). On his return he married Anne Clarges, a woman of low extraction, often supposed to have been

his mistress, ” ever a plain homely dowdy,” says Pepys, who, like other writers who mention her, is usually still less complimentary. Next year he was back in Scotland, methodically beating down a Royalist insurrection in the Highlands, and when this service was over settled down to a steady government of the country for the next five years. The timely discovery of a plot fomented by Overton, his second in command, in 1654, gave him an excuse for thoroughly purging his army of all Anabaptists, Fifth Monarchy men, and other dangerous enthusiasts. It is improbable that at this time Monk had proposed to himself the restoration of the king, though so astute a diplomatist must have weighed the chances of such an event. His very reticence, however, caused alarm on one side and hope on the other. In 1655 he received a letter from Charles II., a copy of which he at once sent to Cromwell, who is said to have written to him in 1657 in the following terms: ” There be that tell me that there is a certain cunning fellow in Scotland called George Monk, who is said to lye in wait there to introduce Charles Stuart; I pray you, use your diligence to apprehend him, and send him up to me.” Monk’s personal relations with Cromwell were those of sincere friendship on both sides.

During the confusion which followed Cromwell’s death Monk remained silent and watchful at Edinburgh, careful only to secure his hold on his troops. At first he contemplated armed support of Richard Cromwell, but gave up this idea on realizing the young man’s incapacity for government, and renewed his waiting policy. In July 1659 direct and tempting proposals were again made to him by the king. His brother Nicholas, a clergyman, was employed by Sir J. Grenvil to bring to him the substance of Charles’s letter. No bribe, however, could induce him to act one moment before the right time. He bade his brother go back to his books, and refused to entertain any proposal. But when Booth rose in Cheshire for the king, so tempting did the opportunity seem that he was on the point of joining forces with him, and a manifesto was prepared. His

habitual caution, however, induced him to wait until the next post from England, and the next post brought news of Booth's defeat.

For a moment he thought of retiring into private life, but soon Fleetwood and Lambart declared against the parliament, and to their surprise Monk not only refused to join them, but (Oct. 20, 1659) at once took measures of active opposition. Securing his hold on Scotland by a small but trusty corps of occupation, he crossed the border with the rest of his army. Holding Lambart in play without fighting until his army began to melt away for want of pay, Monk received the commission of commander-in-chief of the parliament's forces (Nov. 24). The navy, some of the English garrisons and the army in Ireland declared for the parliament, and the army from Scotland crossed the Tweed on the 2nd of January 1660. It was inferior in number, but in all other respects superior to Lambart's, and Monk slowly marched on to London, disbanding or taking over on his way the detachments of Lambart's army which he met, and entered the capital on the 3rd of February. In all this his ultimate purpose remained mysterious. At one moment he secretly encouraged the demands of the Royalist City of London, at another he urged submission to the existing parliament, then again he refused to swear an oath abjuring the house of Stuart, and further he hinted to the attenuated Long Parliament the urgent necessity of a dissolution. Lastly, acting as the stern military agent of the infuriated parliament, he took away the gates and portcullises of the city. This angered not only the

citizens but his own army, and gave him the lever that he desired to enforce the dissolution of parliament, while at the same time enabling him to break up as a matter affecting discipline, the political camarillas that had formed in his own regiments. He was now master of the situation, and

though he protested his adherence to republican principles, it was a matter of common knowledge that the new parliament, which Monk was imposing on the remnant of the old, would have a strong Royalist colour. Monk himself was now in communication with Charles II., whose Declaration of Breda was based on Monk's recommenda- tions. The new parliament met on the 25th of April, and on the 1st of May voted the restoration of the monarchy.

With the Restoration the historic interest of Monk's career ceases. Soldier as he was, he had played the difficult game of diplomacy with incomparable skill, and had won it without firing a shot. That he was victor sine sanguine, as the preamble of his patent of nobility stated, was felt by every one to be the greatest service of all. He was made gentleman of the bedcham- ber, knight of the Garter, master of the horse and commander- in-chief, raised to the peerage with the titles of Baron Monk, earl of Torrington and duke of Albemarle, and had a pension of £7000 a year allotted to him. As long as the army existed of which he was the idol, and of which the last service was to suppress Venner's revolt, he was a person not to be displeased. But he entirely concurred in its disbandment, and only the regiment of which he was colonel, the Coldstream (Guards), survives to represent the army of the Civii Wars. In 1664 he had charge of the admiralty when James, duke of York, was in command of the fleet, and when in 1665 London was deserted on account of the plague, Monk, with all the readiness of a man accustomed to obey without thinking of risk, remained in charge of the government of the city. Once more, at the end of this year, he was called upon to fight, having a joint commission with Prince Rupert against the Dutch. The whole burden of the preparations fell upon him. On the 23rd of April 1666 the admirals joined the fleet, and on the 1st of June began the great four days' battle, in which Monk showed not only all his old coolness and skill, but also a reckless daring which had seemed hitherto foreign to his character. Later in the same year he maintained order in the city of London during the Great Fire.

His last service was in 1667, when the Dutch fleet sailed up the Thames, and Monk, though ill, hastened to Chatham to oppose their farther progress. From that time he lived much in privacy, and died of dropsy on the 3rd of January 1670, ” like a Roman general with all his officers about him.” The dukedom became extinct on the death of his son Christopher, 2nd duke of Albemarle (1653–1688).

See the Life of Monk, by Dr Gumble, his chaplain (London, 1671), and the memoir and bibliography by C. H. Firth in the Diet. Nat. Biogr.

MONK, JAMES HENRY (1784–1856), English divine and classical scholar, was born at Buntingford, Herts. He was edu- cated at Charterhouse School and Trinity College, Cambridge, and in 1809 was elected professor of Greek in succession to Porson. The establishment of the classical tripos was in great measure due to his efforts. In 1822 he was appointed dean of Peter- borough; in 1830, bishop of Gloucester (with which the see of Bristol was amalgamated in 1836). He is best known as the author of a Life of Bentley (1830) and as the editor (with C. J. < Blomfield) of Porson's Adversaria (1812).

MONK, MARIA (c. 1817–1850), an adventuress and impostor, who, coming to New York in 1835, claimed to have escaped from the Montreal nunnery of the H6tel Dieu, concerning which, and the practices prevalent there, she circulated sensational charges in Awful Disclosures by Maria Monk (1836). Over 200,000 copies of this book and a sequel were sold, and a violent anti- Catholic agitation resulted. She was finally exposed as a woman of bad character, and her story proved to be absolutely false, but not until she had deceived many people of good standing.

MONK (O.Eng. munuc; this with the Teutonic forms, e.g. Du. monnik, Ger. Monch, and the Romanic, e.g. Fr. moine, Ital. monacho and Span, monje, are from the Lat. monachus, adapted

from Gr. fiovaxbs, one living alone, a solitary; ijAvos, alone), a member of a community of men

living a life under vows, of religiou observance; the term is properly confined to a member of a Christian community, but is sometimes applied to mem- bers of Buddhist and Mahommedan religious brotherhoods. The Greek and Latin name was first used of the hermits, but was early widened to embrace the coenobites. The term ” monk ” should not be used either of ” friars ” or of ” canons regular.” (See Monasticism.)

MONKEY, a term apparently applicable to all members of the order Primates {q.v.) except man and perhaps the larger apes. In zoology it may be used in this wider sense, as inclusive of all the Primates except man and lemurs; but it may also be employed in a more restricted application, so as to denote all ordinary ” monkeys ” as distinct from baboons on the one hand and the tail-less man-like apes on the other. The word appears in English first in the 16th century. The Low-German version of Reynard the Fox (Reinke de Vos, 1479) calls the son of Martin, the ape, Moneke; and the French version has Monnekin, Monne- quin; these are apparently Teutonic diminutives of a word for ape which occurs in several Romanic languages, e.g. Fr. monne, It. monna, &c.

MONKHOUSE, WILLIAM COSMO (1840-1901), English poet and critic, was born in’ London on the 18th of March 1840. His father, Cyril John Monkhouse, was a solicitor; his mother’s maiden name was Delafosse. He was educated at St Paul’s School, quitting it at seventeen to enter the board of trade as a junior supplementary clerk, from which grade he rose eventually to be the assistant-secretary to the. finance department of the office. In 1870-1871 he visited South America in connexion with the hospital accommodation for seamen at Valparaiso and . other ports; and he served on different departmental committees, notably that of 1894-1896 on the Mercantile Marine Fund. He was twice married: first, to Laura, daughter of James Keymer of Dartford; and, secondly, to- Leonora Eliza, daughter of Commander Blount, R.N. He died in London on the 20th of July 1901. Cosmo Monkhouse was one of those who have not

only a vocation, but an avocation. His first bias was to poetry, and in 1865 he issued A Dream of Idleness and Other Poems, a collection strongly coloured by his admiration for Wordsworth and Tennyson. It was marked by exceptional maturity, and scarcely received the recognition it deserved. Owing perhaps to this circumstance, it was not till 1890 that he put forth Corn and Poppies, a collection which contains at least one memorable effort in the well-known ” Dead March.” Five years later appeared a limited edition of the striking ballad of The Christ upon the Hill, illustrated with etchings by Mr William Strang. After his death his poetical output was completed by Pasiteles the Elder and other Poems (including The Christ upon the Hill). In 1868 Monkhouse essayed a novel, A Question of Honour. Then, after preluding with a Life of Turner in the ” Great Artists Series ” (1879), he devoted himself almost exclusively to art criticism. Besides many contributions to the Academy, the Saturday Review, the Magazine of Art and other periodicals, he published volumes on The Italian Pre-Raphaelites (1887), The Earlier English Water-Colour Painters (1890 and 1897), In the National Gallery (1895) and British Contemporary Artists (1899). He was a contributor to the Diet. Nat. Biog. from the beginning. Monkhouse also wrote an excellent Memoir of Leigh Hunt in the ” Great Writers Series ” (1887). As an art critic Monkhouse’s judgments were highly valued; and he had the rare gift of differing without offending, while he invariably secured respect for his honesty and ability. As a poet, his ambition was so wide and his devotion to the art so thorough, that it is difficult not to regret the slender bulk of his legacy to posterity.

MONKSWELL, ROBERT PORRETT COLLIER, 1st Baron (1817-1886), English judge, was born at Plymouth, on the 21st of June 1 81 7, and was the son of a prominent merchant of Quaker extraction. He was educated at Oxford, was called to the bar in 1843, and went the western circuit. He obtained a high reputation by his successful defence of Brazilian pirates in 1845;

they were, indeed, convicted at the assizes, but Collier ultimately procured their escape upon a point of law which the judge had refused to reserve. He was elected member of parliament for Plymouth in the Liberal interest in 1852, and in 1859 was appointed counsel to the admiralty and judge-advocate to the fleet. In this capacity he gave in 1862 an opinion in favour of detaining the Confederate rams building in the Mersey, which would have saved his country much money and much credit if it had been acted upon. In 1863 he became solicitor-general, and in 1868 attorney-genefal, and in 1869 successfully passed a bankruptcy bill. In 1871 he was appointed by Mr Gladstone one of four new judges upon the judicial committee of the privy council, although it was expressly provided by the act creating these offices that none of them should be filled by a law-officer of the Crown. This prohibition was evaded by making Collier a judge of common pleas, and transferring him after a few days to the privy council. This arrangement was unanimously condemned by public opinion, and gave the Gladstone cabinet a serious blow. He officiated, nevertheless, with distinction until his death on the 3rd of November 1886, and was raised to the peerage as Baron Monkswell in 1885. He was a man of many accomplishments, and especially distinguished as an amateur painter, frequently exhibiting landscapes at the Royal Academy and elsewhere. In his younger days he had been noted as a clever caricaturist. He was succeeded in the peerage by his elder son, Robert (b. 1845), who, after taking a first class in law at Cambridge, went to the bar, and became (1871) conveyancing counsel to the treasury, and (1885-1886) an official examiner of the High Court, and, taking to politics as a Liberal, under-secretary for war (1895). The younger son, John Collier (b. 1850), inherited his father's artistic tastes, and became a well-known painter.

MONLUC, or Montluc, the name of a French family. The

house of Lasseran-Mansencomme, which possessed the estate of Monluc in Agenais, and took its name in the 16th century, is held to be a branch of the family of Montesquiou. Marshal Blaise de Monluc (d. 1577), author of the Commentaires, had a son, Pierre Bertrand, called the Capitaine Peyrot, who perished in an expedition to Madeira in 1566, and another son, Fabien de Monluc, whose granddaughter, Jeanne de Monluc (d. 1657), countess of Carmaing, princess of Chabanais, brought the estates of her house to the family of Escoubleau by her marriage with Charles d'Escoubleau, marquess of Sourdis and Alluyes. Jean de Monluc, brother of the marshal, was bishop of Valence and Die, and distinguished himself in several embassies. He died in 1579, leaving a natural son, Jean de Monluc (d. 1603), seigneur de Balagny, who was at first a zealous member of the League, but made his submission to Henry IV., and received from him the principality of Cambrai and the baton of a marshal of France. MONMOUTH, JAMES SCOTT, Duke of, (1649-1685), leader of his abortive insurrection against James II. in 1685, was the son of Lucy Walters, " a brown, beautiful, bold but insipid creature," who became the mistress of Charles II. during his exile at the Hague. He was born at Rotterdam on the 9th of April 1649. That Charles was his father is more than doubtful, for Lucy Walters had previously lived with Robert Sidney (son of the earl of Leicester), brother of Algernon, and the boy resembled him very closely. Charles, however, always recog- nized him as his son, and lavished on him an almost doting affection. Until the Restoration he was placed under the care, first of Lord Crofts, by whose name he was known, and then of the queen-dowager, receiving his education to the age of nine from Roman Catholics, but thenceforward from Protestant tutors. In July 1662 he was sent for by Charles, and at thirteen was placed under the protection of Lady Castlemaine and in the full tide of the worst influences of the court. No formal acknowledgment of his relation to the king was made until his betrothal to Anne Scott, countess of Buccleuch, the wealthiest heiress of Scotland, whom he married in 1665. During 1663 he was made duke of

Orkney, duke of Monmouth and knight of the Garter, and received honorary degrees at both universities; and on his marriage he and his wife were created duke and duchess

of Buccleuch, and he took the surname of Scott. At court he was treated as a prince of the blood. In 1665 he served with credit under the duke of York in the sanguinary naval battle off Lowestoft. A captaincy in the Life Guards was given him, and in 1670, on the death of Monk, he was made captain-general of the king's forces. In 1670 Monmouth was with the court at Dover, and it is affirmed by Reresby that the mysterious death of Charles's sister, Henrietta, duchess of Orleans, was due to her husband's revenge on the discovery of her intrigue with the duke. It is certain, from an entry by Pepys, that as early as 1666 he had established a character for vice and profligacy. He was the direct author of the attack in December 1670 on Sir John Coventry, and only a few months later received the royal pardon for his share in the wanton murder of a street watchman.

Hitherto Monmouth had been but the spoiled child of a wicked court. Now, however, by no act or will of his own, he began to be a person politically important. As early as 1662 the king's excessive fondness for him had caused anxiety. Even then the fear of a " difference " between Monmouth and James, duke of York, exercised men's minds, and every caress or promotion kept the fear alive. Who could tell but that, in default of legiti- mate issue from his queen, Charles might declare Monmouth himself his lawful son? A civil war would be the certain conse- quence. Soon after 1670 the matter took a more serious aspect. The anti-popery spirit was rapidly becoming a frenzy, and the succession of James a probability and a terror. Charles was urged to legitimize Monmouth by a declaration of his marriage with Lucy Walters. He returned answer that, much as he loved the duke, he would rather see him hanged at Tyburn than own him for his legitimate son. Every attempt, however, was hence- forth made, especially by Shaftesbury, to accustom people to

this idea, and his position was emphasized by James's second marriage, with the Roman Catholic princess Mary of Modena. From this time his popular title was " the Protestant duke." In 1674 he was made " commander-in-chief"; and in connexion with this another unsuccessful attempt, graphically described in Clarke's Life of James, was made to gain from Charles a tacit admission of his legitimacy. At Shaftesbury's instance he was placed in command of the army employed in 1675 against the Scottish Covenanters, and was present at Bothwell Bridge (June 22, 1679). In 1678, when Charles was driven into war with Louis, Monmouth took the command of the English contin- gent, and again gained credit for personal courage at the battle of St Denis. On his return to London England was in the throes of the popish terror. The idea of securing the Protestant succes- sion by legitimizing Monmouth again took shape and was eagerly pressed on by Shaftesbury; at the time it seemed possible that success would wait on the audacity.

The pensionary parliament was dissolved in January 1678- 1679, and was succeeded by one still more determined in its anti- popery spirit. To avoid the storm, and to save, if possible, his brother's interests, Charles instructed him to leave the country. James retired to Brussels, the king having previously signed a declaration that he " never was married, nor gave contract to any woman whatsoever but to my wife Queen Catherine." In the summer of 1679 the king suddenly fell ill, and the dangers of a disputed succession became terribly apparent. The party opposed to Monmouth, or rather to Shaftesbury, easily prevailed upon Charles to consent to his brother's temporary return. When, after the king's recovery, James went back to Brussels, he received a promise that Monmouth too should be removed from favour and ordered to leave the country. Accordingly, in September 1679, the latter repaired to Utrecht, while shortly afterwards James's friends so far gained ground as to obtain for him permission to reside at Edinburgh instead of at Brussels. Within two months of his arrival at Utrecht Monmouth

secretly returned to England, arriving in London on the 27th of Novem- ber. Shaftesbury had assiduously kept alive the anti-popery agitation, and Monmouth, as the champion of Protestantism, was received with every sign of popular delight. The king appeared to be greatly incensed, deprived him of all his offices, and ordered him to leave the kingdom at once. This he refused

to do, and the only notice taken of the disobedience was that Charles forbade him to appear at court.

It was at this time that the Appeal from the Country to the City, written by Ferguson, was published, in which the legitimacy was tacitly given up, and in which it was urged that ” he that hath the worst title will make the best king.” Now it was, too, that the exclusionists, who in the absence of parliament were deprived of their best basis for agitation, developed the system of petitioning. So promptly and successfully was this answered by the ” abhorrers ” that Charles, feeling the ground safer under him, recalled James to London — a step immediately followed by the resignation of the chief Whigs in the council.

Once more, however, a desperate attempt was made, by the fable of the ” black box,” to establish Monmouth’s claims; and once more these claims were met by Charles’s public declarations in the Gazette that he had never been married but to the queen. Still acting under Shaftesbury’s advice, Monmouth now went upon the first of his progresses in the west of England, visiting the chief members of the country party, and gaining by his open and engaging manner much popularity among the people. In August 1680 James returned to Edinburgh, his right to the succession being again formally acknowledged by Charles. Monmouth at once threw himself more vehemently than ever into the plans of the exclusionists. He spoke and voted for exclusion in

the House of Lords, and used language not likely to be for- gotten by James when an opportunity should come for resenting it. He was ostentatiously feasted by the city, the stronghold of Shaftesbury's influence; and it was observed as he drove to dinner that the mark of illegitimacy had been removed from the arms on his coach.

The year 1681 seemed likely to witness another civil war. The parliament finished a session of hysterical passion by passing a series of resolutions of extreme violence, of which one was that Monmouth should be restored to all his offices and commands; and when Charles summoned a fresh parliament to meet at Oxford the leaders of the exclusionists went thither with troops of armed men. Not until the dissolution of this last parliament, on the 27th of March 1681, did the weakness of Monmouth's cause appear. The deep-seated respect for legitimate descent asserted itself, and a great reaction took place. In November Dryden published Absalom and Achitophel. Shaftesbury was attacked, but was saved for the time by a favouring jury. Monmouth himself did not escape insult in the street and from the pulpit. He was forbidden to hold communication with the court; and when he went, in September 1682, on a second progress through the western and north-western counties his proceedings were narrowly watched, and he was at length arrested at Stafford. Severity and extreme lenity were strangely mingled in the treat- ment he received. He was released on bail, and in February 1683, after the flight and death of Shaftesbury, he openly broke the implied conditions of his bail by paying a third visit to Chichester with Lord Grey and others on pretence of a hunting expedition.

It is probable that Monmouth never went so far as to think of armed rebellion; but there is little doubt that he had talked over schemes likely to lead to this, and that Shaftesbury had gone farther still. The Rye House plot gave an excuse for arresting the Whig leaders; Russell and Sidney were judicially murdered; Monmouth retired to Toddington, in Bedfordshire, and was left untouched. Court intrigue

favouring him, he succeeded, by the betrayal of his comrades and by two submissive letters, in reconciling himself with the help of Halifax both to the king and to James, though he had the humiliation of seeing his confessions and declarations of penitence published at length in the Gazette. His character for pettishness and folly was thus amply illustrated. Charles heartily despised him, and yet appears to have retained affection for him. His partial return to favour raised the hopes of his partisans; to check these, Algernon Sidney was executed. Monmouth was now subpoenaed to give evidence at the trial of young Hampden. To escape from the difficulties thus opened before him he fled to Holland, probably with Charles's connivance, and though he once more,

in November 1684, visited England, it is doubtful whether he ever again saw the king.

The quiet accession of James II. soon brought Monmouth to the crisis of his fate. Within two months of Charles's death he had yielded to the impetuosity of Argyll and others of the exiles and to vague invitations from England. It is curious, as showing the light in which his claims were viewed by his fellow-conspirators, that one of the terms of the compact between them was that, though Monmouth should lead the expedition, he should not assume the title of king without their consent, and should, if the rebellion were successful, resign it and accept whatever rank the nation might offer. Now, as always, he was but a puppet in other men's hands.

On the 2nd of May Argyll sailed with three ships to raise the west of Scotland; and three weeks later, with a following of only eighty-two persons — of whom Lord Grey, Fletcher of Saltoun, Wade, and Ferguson, the author of the Appeal from the Country to the City, were the chief — Monmouth himself set out for the west of England, where, as the stronghold of Protestant dissent and as the scene of his former progresses, he could alone hope for immediate support. Even here, however, there was no movement; and when on the nth of June Monmouth's

three ships, having eluded the royal fleet, arrived off Lyme Regis, he landed amid the curiosity rather than the sympathy of the inhabitants. In the market-place his " declaration," drawn up by Ferguson, was read aloud. In this document James was painted in the blackest colours. Not only was he declared to be the murderer of Essex, but he was directly charged with having poisoned Charles to obtain his crown. Monmouth soon collected an undisciplined body of some 1500 men, with whom he seized Axminster, and entered Taunton. Meanwhile the parliament had declared it treason to assert Monmouth's legitimacy, or his title to the crown; a reward of £5000 was offered for him dead or alive, and an act of attainder was passed in unusual haste. Troops had been hurriedly sent to meet him, and when he reached Bridgwater Albemarle was already in his rear. From Bridgwater the army marched through Glastonbury to attack Bristol, into which Lord Feversham had hastily thrown a regiment of foot-guards. The attempt, however, miscarried; and, after summoning Bathin vain, Monmouth, with a disordered force, began his retrograde march through Philips Norton and Frome, continually harassed by Feversham's soldiers. At the latter place he heard of Argyll's total rout in the western Highlands. He was now anxious to give up the enterprise, but was overruled by Grey, Wade and others. On the 3rd of July he reached Bridgwater again, with an army little better than a rabble, living at free quarters and behaving with reckless violence. On Sunday, the 5th, Feversham entered Sedgemoor in pursuit; Monmouth the same night attempted a surprise, but his troops were hopelessly routed. He himself, with Grey and a few others, fled over the Mendip Hills to the New Forest, hoping to reach the coast and escape by sea. The whole country, however, was on the alert, and at midnight on the 8th, within a month of their landing, James heard that the revolt, desperate from the first, was over and that his rival had been captured close to Ringwood in Hampshire.

On the day of his capture Monmouth wrote to James in terms of the most unmanly contrition, ascribing his

wrong-doings to the action of others, and imploring an interview. On the 13th the prisoners reached the Tower, and on the next day Monmouth was allowed to see James. No mercy was shown him, nor did he in the least deserve mercy; he had wantonly attacked the peace of the country, and had cruelly libelled James. The king had not, even in his own mind, any family tie to restrain him from exercising just severity, for he had never believed Monmouth to be the son of any one but Robert Sidney. Two painful interviews followed with the wife for whom he bore no love, and who for him could feel no respect; another imploring letter was sent to the king, and abject protestations and beseechings were made to all whom he saw. He offered, as the last hope, to become a Roman Catholic, and this might possibly have proved successful, but the priests sent by James to ascertain

the sincerity of his ” conversion ” declared that he cared only for his life and not for his soul.

He met his death on the scaffold with calmness and dignity. In the paper which he left signed, and to which he referred in answer to the questions wherewith the busy bishops plied him, he expressed his sorrow for having assumed the royal style, and at the last moment confessed that Charles had denied to him privately, as he had publicly, that he was ever married to Lucy Walters. He died at the age of thirty-six, on the 15th of July 1685.

Monmouth had four sons and two daughters by his wife, who in 1688 married the 3rd Lord Cornwallis and died in 1732. The elder of the two surviving sons, James, earl of Dalkeith (1674-1705) had a son Francis (1695-1751), who through his grandmother inherited the title of duke of Buccleuch in 1732, and was the ancestor of the later dukes. The younger son, Henry (1676-1730), was created earl of Deloraine in 1706, and rose to be a major-general in the army.

The best accounts of Monmouth's career, apart from the modern histories, are G. Roberts's detailed Life (1844), the articles in the Diet. Nat. Biog. (by A. W. Ward) and in Collins's Peerage, and the Correspondence of Lord Clarendon with James, earl of Abingdon, 1683-1685 (Clarendon Press, 1896). For the rebellion, Lord Grey's Secret History (1754) should be consulted. See also Evelyn's and Pepys's Diaries, &c.

MONMOUTH, ROBERT CAREY, ist earl or (e. 1560-1639), youngest son of Henry Carey, ist Baron Hunsdon, chamberlain and first cousin of Queen Elizabeth, by Anne, daughter of Sir Thomas Morgan, of Arkestone in Herefordshire, was born about the year 1 560. As a young man he accompanied several diplo- matic missions abroad and took part in military expeditions. In 1 587 he joined in the attempt to relieve Sluys, in 1 588 served as a volunteer against the Spanish expedition, and commanded a regiment in Essex's expedition to Normandy in 1591, taking part in the siege of Rouen. He was knighted by Essex the same year for having by his intercession with the queen procured his recall. In the parliaments of 1586 and 1588 he represented Morpeth; in that of 1593, Callington; and in those of 1596 and 1601, Northumberland. From 1593 till the end of Elizabeth's reign he occupied various posts in the government of the Scottish borders, succeeding to his father's appointment of lord warden of the marches in 1596, which he held till February 1598. In March 1603 he visited the court, and witnessed the queen's last illness, which he described in his Memoirs. Anxious to recommend himself to her successor, and disobeying the orders of the council, he started on horseback immediately after the queen's death on the morning of the 24th of March, in order to be the first to communicate the tidings to James, arrived at Holy- rood late on the 26th, and was appointed by the king a gentleman of the bedchamber. But his conduct met with general and merited censure as " contrary to all decency, good manners and respect," and on'james's arrival in England he was dismissed from his new post. On the

23rd of February 1605, however, he was made governor of Prince Charles, in 161 1 his master of the robes, in 1617 his chamberlain, and on the 6th of February 1622, he was created Baron Carey of Leppington. In 1623 he followed Charles to Spain, and after the latter's succession to the throne he was created earl of Monmouth in 1626. He died on the 1 2th of April 1639. His eldest son Henry (1596-1661), succeeded him as 2nd earl of Monmouth, and on his death without surviving male issue the peerage became extinct.

His Memoirs were published first by the earl of Cork and Orrery ' n 1759. a new edition, annotated by Sir Walter Scott, being printed in 1808.

MONMOUTH (Welsh Mynwy), a municipal and contributory parliamentary borough, and the county town of Monmouthshire, England, 18 m. S. of Hereford, on the Great Western railway. Pop. (1901), 5095. It is picturesquely situated at the confluence of the Wye and the Monnow, between the two rivers, and is almost surrounded by hills. Portions of the town walls remain, and there is a picturesque old gateway on the Monnow bridge; but there are only insignificant ruins of the castle, which was originally a Saxon fortress, and was twice taken by the Parlia-

mentary forces during the Civil War. Besides the churches — that of St Mary, completed in 1882 on an ancient site, and the chapel of St Thomas, a late Norman structure — the principal buildings are the town-hall, the Rolls Hall and the free grammar-school, which was founded in 1614, and educates about 150 boys on the usual lines of a public school. A statue of Henry V., who was born in its castle, stands in the market-place. With Newport and Usk, Monmouth forms the Monmouth parlia- mentary district of boroughs, returning one member.

Monmouth (Monemuta) from the coincidence of position is supposed to be the Blaestium of Antoninus. Situated between the Severn and the Wye its strategic importance was early recognized by the

Saxons, who fortified it against the Britons, while in later years it played a leading part in Welsh border warfare. At the time of the Domesday Survey the castle was in the custody of William Fitz Baderon. Henry III. granted it, together with the lordship of the borough, to his son Edmund Crouchback, through whose descendants both borough and castle passed into the duchy of Lancaster. Since the 18th century the dukes of Beaufort have been lords of the borough. Monmouth was a borough by prescription as early as 1256, and was governed by a mayor in 1461, but was not incorporated until 1550 under the title of "Mayor, Bailiffs and Commonalty." This charter was confirmed in 1558, 1606 and 1666, a recorder and town clerk being added to the constitution. In accordance with the act of 1 535-1 536 Monmouth as county town obtained the right of representation in parliament; the earliest returns existing are for 1553, since which date one member has been returned regularly. Wednesday and Saturday markets were confirmed to Monmouth in 1550, with the further proviso that no others were to be held within five miles of the borough. Friday is now the weekly market-day. At the same time an annual three-days' fair, which still exists, was granted on Whit-Tuesday and successive days. During the 16th and 17th centuries the manufacture of Monmouth caps was an important industry, fostered by legislation and mentioned by Fuller in his Worthies of England.

See Charles Heath, The Town of Monmouth (Monmouth, 1804).

MONMOUTH, a city and the county-seat of Warren countyj Illinois, in the W. part of the state, about 40 m. S. of Rock Island. Pop. (1890), 5936; (1900), 7460, (594 foreign-born); (1910), 9128. It is served by the Chicago, Burlington &Quincy and the Iowa Central railways, and by electric railways to Gales-burg and to Rock Island. The city is the seat of Monmouth College (1856* United Presbyterian), which in 1908 had 28 instructors and 454 students. Among the public buildings and institutions are the county court-house, the federal building, a hospital and the Warren county library (1836). Monmouth is

situated in a good farming region, and cattle, swine and ponies are raised in the vicinity. The city has various manufactures. Monmouth was settled about 1824, first incorporated as a village in 1836, chartered as a city in 1852 and in 1882 reorganized under a general state law.

MONMOUTH, BATTLE OF (1778), a battle in the American War of Independence. The prospect of an alliance between France and America in 1778 induced the British to concentrate their forces. Sir Henry Clinton, who had succeeded Sir W. Howe in command, determined to abandon Philadelphia, captured in the previous year, and move his troops direct to New York through New Jersey. Washington, who had spent the winter at Valley Forge, Pennsylvania, and had materially recruited his army, immediately marched to intercept the British, and overtook them near Monmouth Court House (now Freehold), New Jersey, on the 28th of June 1778. A strong detachment of Americans under General Charles Lee was sent forward to harass the enemy's rear and if possible cut off a portion of their long baggage train. Clinton strengthened his rearguard, which turned upon the Americans and compelled them to retreat. When Washington, who was well up with his main body, heard of Lee's retreat, he spurred forward and exerted himself in forming a strong line of battle in case the British continued their determined attack. Warm words passed between Washington

arid Lee, which subsequently led to the latter's court-martial and suspension for a year. The readjusted American line was composed of the divisions of Lafayette, Greene, Alexander and Patterson, while Wayne's brigade, which had been in Lee's advance from the first, was posted in a favourable position. The British attacked this line and a warm, though brief, engage- ment ensued. Both sides encamped at night on the ground occupied. The British, having accomplished their object in

delaying Washington's pursuit, continued their march the next day towards New York. Washington turned to the left, crossed the Hudson above, and encamped for the remainder of the season at White Plains, New York, within striking distance of the city. Each side suffered about the same loss in the battle, that of the British being 400 (60 due to sunstroke), the American somewhat less. In this engagement Lieut.Colonel Henry Monckton (1740 1778) of the British Grenadiers was killed in leading a charge.

MONMOUTHSHIRE, a western border county of England, bounded E. by Gloucestershire, N. E. by Herefordshire, N.W. by Brecknock, W. and S.W. by Glamorganshire (Wales), and S. by the estuary of the river Severn. The area is 534 sq. m. The surface is varied, and in many districts picturesque, especi- ally along the valley of the Wye, and between that river and the Usk. In the west and north the hills rise to a considerable height, and this mountain region encircles a finely undulating country. The highest summits are Sugar Loaf (1955 ft.), Blorenge (1838), and Skirrid Fawr (1601), summits of the hills which almost encircle the town of Abergavenny. On the other hand, along the shore of the Severn estuary on either side of the Usk, are two extensive tracts of marshland, called the Caldicot and Wentlloog levels, stretching from Cardiff to Portskewet, and protected from inundations by strong embank- ments. The principal rivers are the Wye, which forms the greater part of the eastern boundary of the county with Glouces- tershire, and falls into the Severn; the Monnow, which forms a portion of its boundary with Herefordshire, and falls into the Wye at the town of Monmouth; the Usk, which rises in Breck- nock, and flows southward through the centre of the county; the Ebbw, which rises in the north- west, and enters the estuary <»f the Usk below Newport; and the Rhymney, which rises in Brecknock, and, after forming the boundary between Monmouth and Glamorgan, enters the Bristol Channel a little east of Cardiff. Salmon abound especially in the Wye and the Usk, and trout are plentiful in many of the streams.

Geology. — The oldest rocks in the county are the Silurian strata (Wenlock Shale and Limestone, and Ludlow Beds) which form an extensive anticline at Usk; a smaller inlier appears at Rumney on the south-west borders of the county near Cardiff. These beds dip under the Old Red Sandstone, a great series of red marls, sandstones and concretionary limestones (cornstones) which occupies the north-eastern part of the county; the highest beds contain grits and conglomerates which give rise to bold escarpments and lofty plateaux (e.g. the Sugar Loaf and Skirrid Fawr) alongside the outcrop of the Carboniferous Limestone. The western part of the county, between Pontypool and the river Rhymney, is occupied by the eastern end of the great South Wales coal-field, where the Carboniferous Limestone, Millstone Grit and Coal Measures (Lower Coal Series, Pennant Sandstone and Upper Coal Series) dip westward and succeed each other from east to west. The Coal Measures abound in coal-seams and ironstone, and their densely populated valleys offer a marked contrast to the agricultural and pastoral districts of the rest of the county. The Carboniferous Limestone comes in again in the south-east near Chepstow, and has imparted its characteristic scenery to the lower reaches of the Wye. After a prolonged interval, during which these older formations were folded, faulted, upheaved and finally carved by erosion into hills and valleys, the southern portion of the region was submerged beneath the waters of the Triassic lake in which the Keuper Marls were deposited. These consist of red conglomerates and marls which wrap round the heights and fill up the hollows among the older rocks to the south-west of Chepstow, and the subsidence continuing, admitted the waters of the Jurassic sea which deposited the fossiliferous Rhaetic and Lias limestones and shales of Llanwern and Goldcliff near Newport. Glacial gravel and _ boulder-clay are found in the valleys and a broad tract of alluvium borders the shores of the Bristol Channel.

Agriculture. — Along the Severn shore the soil is deep and loamy, and admirably suited for the growth

of trees. The most fertile land is that resting on the Red Sandstone, especially along the banks of the Usk, where wheat of fine quality is raised. In the

mountainous regions more attention is paid to grazing than to the raising of crops. There are a considerable number of dairy farms, but sheep-farming is much more largely followed. Only about seven-tenths of the total area of the county is under cultiva- tion. There is a large extent of hill pasture, and a considerable acreage under orchards.

Mining. — The coal-mines and iron-works which Monmouthshire shares with South Wales are very important. They occur in the wild and mountainous western part of the county, where a series of upland valleys, running parallel from N.N.W. to S., has each its populous mining townships and railways, which have in many cases necessitated remarkable engineering works — such as the great Crumlin viaduct. These valleys, in order from east to west, with the principal townships in each, are as follows: Afon Lwyd (Panteg, Pontypool, Abersychan and Blaenavon); Ebbw Fach (Abertillery, Nantyglo and Blaina), joining the Ebbw (Risca, Ebbw Vale) ; Sirhowy (Bedwellty and Tredegar) ; Rhymney (New Tredegar and Rhymney). Besides coal, a considerable quantity of fire-clay and some iron are raised.

Communications. — The principal railway serving the county is the Great Western, but in the mining districts there are also various branches of the London and North-Western, Rhymney and Brecon and Merthyr systems. The Crumlin Canal from the Ebbw Valley, and the Monmouthshire Canal from Pontypool converge upon Newport, which is the principal port in the county. The Brecon Canal runs north from Pontypool into the valley of the Usk.

Population and Administration. — The area of the ancient county is 341,688 acres, with a population in 1891 of 252,416, and in 1901 of 292,317. The area of the administrative county is 349,7i 2 acres. The county comprises 6 hundreds. The municipal boroughs are Abergavenny (pop. 7795), Monmouth (5095), and

Newport, a county borough (67,270). The following are urban districts: Abercarn (12,607), Abersychan (17,768), Abertillery (21,945), Bedwellty (9988), Blaenavon (10,869), Caerleon (1367), Chepstow (3067), Ebbw Vale (20,994), Llan- frechfa, Upper (2979), Llantarnam (5287), Mynyddislwyn (3337), Nantyglo and Blaina (13,489), Panteg (7484), Pontypool (6126), Rhymney (7915), Risca (9661), Tredegar (18,497), and Usk (1476). Monmouthshire is in the Oxford circuit, and assizes are held at Monmouth. It has one court of quarter sessions, and is divided into 11 petty sessional divisions. The boroughs of Monmouth and Newport have commissions of the peace, but no separate court of quarter sessions. The parlia- mentary divisions are the northern, western and southern, each returning' one member; and the Monmouth district of parlia- mentary boroughs, consisting of the towns of Monmouth, Newport and Usk, returns one member.

History. — The district which is now Monmouthshire formed the Welsh kingdom of Gwent at the time of the Heptarchy, and, owing to the extraordinary courage of the Gwentians in resisting the repeated inroads of the Saxons, no permanent English settle- ment was effected in the district until close upon the middle of the nth century. The incursions of the West Saxons began in the 7th century, and, during the reign of Alfred, Brochmael and Fermael, kings of Gwent, acknowledged Alfred as their lord, and sought his protection against their enemies. In the 9th and 10th centuries the district was frequently harried by the Danes, who in 915, under Ohter and Hwald, sailed round Wessex and Cornwall to the mouth of the Severn and plundered all along the banks of the Wye, finally taking prisoner the bishop of Llandaff, whom they only released on a ransom of £40. In 926 ^Ethelstan obliged the kings of the north Britons to meet him at Hereford and fixed the Wye as the limit of their territory. In 976 the Danes destroyed Caerleon, at this time the chief town of the district. The early nth century was taken up with a series of interminable contests between the Welsh princes for the succession in South Wales, as a

result of which the Welsh Chronicle relates that in 1047 the whole of South Wales lay waste, and in 1049, when a fleet of Irish pirates entered the Severn estuary, Griffith, the king of South Wales, assisted them in plundering the neighbourhood. In 1065 Harold conquered the whole district between the lower reaches of the Wye and the Usk, and gave orders for the construction of a hunting-box at Portskewet for Edward the Confessor, but very shortly after Caradoc ap Griffith, with a large body of followers, killed all the workmen engaged in

the building and carried away the provisions prepared for the king’s reception.

After the Conquest the district conquered by Harold was bestowed on William Fitz Osborne, earl of Hereford, who built Monmouth Castle, and continued the line of defence against the Welsh frontier along the Wye, while a second line of fortifi- cations along the Usk Valley marked the continued advance of the Normans, who by 1085 had subjugated almost the whole of G wen t. The lordship of Overwent fell to Hamelin de B aladun, who founded the castle and priory of Abergavenny, and from him passed to Brian Fitz Count and later to Walter Fitz Miles, earl of Hereford. The lordship of Netherwent remained for many centuries with the Clare family. Penhow Castle was a strong- hold of the family of St Maur or Seymour, from whom are descended the present dukes of Somerset, and Grosmont and Skenfrith Castles of the family of Braose. Gwent still ranked as Welsh territory at the time of the Domesday Survey, but the town of Monmouth, the castle of Caerleon, and the district of Archenfeld, are assessed under Herefordshire, and the three hardwicks of Llanwern, Portskewet and Dinam under Gloucestershire. The Norman lords of the present county held their lands ” per baroniam,” so that the king’s writ did not run in them, and the lives and property of the poorer inhabitants were entirely at the mercy of these lords marchers as they were termed. The county still exhibits remains of no less than twenty-five Norman castles. The province of Gwent was formerly divided into four cantrefs, each comprising several commotes. Cantref Uwchcoed, or Upper Gwent, comprised the commotes of Erging and Ewyas, now principally in Hereford- shire, and the greater part of the present hundreds of Skenfrith, Abergavenny and Usk; Cantref Iscoed, or Lower or Nether Gwent, comprised the present hundred of Raglan and parts of Caldecote and Usk; Cantref Gwentlwg comprised the

present hundred of Wentlwg; while the fourth cantref, Cantref Coch, now forms the Forest of Dean in Gloucestershire. Leland, writing in the 16th century, describes Gwent as comprising the three divisions of low, middle and high ” Venteland,” and at this period it included no less than 24 lordship marches, each governed by its own ancient laws and customs and ruled by its own lord. Under the act of 1536 for the abolition of the marches, these 24 lordships were united to form a shire; Monmouth was constituted the shire town, and the sheriff’s court was ordered to be held alternately at Monmouth and Newport. A commission was also appointed to divide the shire into hundreds, which were made 6 in number: Abergavenny, Caldecote, Raglan, Skenfrith, Usk and Wentlwg, the bounds being subsequently ratified by act of parliament of 1 542–1 543. No sheriffs were actually appointed for Monmouthshire until 1541, and the legal authority of the lords marchers was not finally abolished until 1689. The act of 1536 did not expressly separate the county from Wales, and it was only gradually that Monmouthshire came to be regarded as an English county, being included in the Oxford circuit for the first time in the reign of Charles II.

Ecclesiastically Monmouthshire has been almost entirely included in the diocese of Llandaff since the foundation of that diocese in the 6th century. Monmouth, however, was in the diocese of Here- ford, and a few parishes formed part of the diocese of St Davids, until under the statute of 1836 the whole county was placed under the jurisdiction of the bishop of Llandaff. It contains, wholly or in part, 134 ecclesiastical parishes.

The river fisheries of Monmouthshire have been famed from very early times, Caerleon with seven fisheries in the Wye and the Usk yielding a return of £7, 10s. at the time of the Domesday Survey. Coal is said to have been worked in the reign of Edward I., but the industry lapsed altogether until it received new life from the construction of the canal between Blaenavon and Newport, begun in 1792 and completed in 1795. The first iron-workers at Pontypool were a

family of the name of Grant, who were succeeded in 1565 by Mr Richard Hanbury. In 1740, however, Monmouthshire contained only two furnaces, making 900 tons annually. Fifty years later three new furnaces were constructed at Blaenavon, and from that date the industry steadily improved.

By the act of 1536 two knights were to be returned for the shire and one burgess for the borough of Monmouth, but the first returns for the county were made in 1547 and for the borough in 1553.

From 1698 the boroughs of Newport and Usk returned one member each. Under the Redistribution of Seats Act of 1885 the county now returns three members in three divisions.

Antiquities. — Of Norman fortresses in Monmouthshire, either built or taken possession of by the lords of the marches, there are remains of no less than twenty-five. The more interesting and important are: Caldicot, the seat of the De Bohuns, with a round keep of the 13th century, gatehouse and other portions, still partly inhabited; Chepstow, one of the finest examples of the Norman fortress extant, in an imposing situation on a cliff above the Wye; Newport, Abergavenny, the gateway and hall of Grosmont, once the residence of the dukes of Lancaster; and Usk Castle, rebuilt by the Clares in the time of Edward IV. Raglan Castle, begun in the reign of Henry V., is a very extensive ruin, still in good pre- servation, and of special interest as a very late example of the feudal stronghold. Charles I. resided in it after the battle of Naseby, and in 1646 it was delivered up to the parliamentary forces after a stubborn resistance of ten weeks against Colonel Morgan and General Fairfax.

At the Reformation there were in Monmouth two hospitals and fifteen other religious houses; but of these there are now im- portant remains of only two — Llanthony Abbey and Tintern Abbey, both Cistercian. Llanthony Abbey in the Black Mountains was founded by William de Lacy in 1 103, and the church, dating from about 1200, is one of the

earliest examples in England of the Pointed style. The ruins consist of portions of the nave, transept, central tower and choir. Tintern Abbey (q.v.), founded by Walter de Clare in 1 13 1, occupies a position of great beauty on the Wye, and is among the finest monastic ruins in England. Of the churches, those chiefly worthy of mention are at Abergavenny, belonging to a Benedictine priory, and containing a number of old tombs; Chep- stow, partly Norman, and possessing a richly moulded doorway; St Woolos' Church, Newport, also Norman; the Norman chapel of St Thomas, Monmouth; Christchurch, principally Norman; Mathern, Early English, with a tablet to Tewdrig, king of Gwent in the 6th century; and Usk, formerly attached to a Benedictine priory.

See Victoria County History, Monmouthshire; William Coxe, An Historical Tour in Monmouthshire, 2 pts. (London, 1801); N. Rogers, Memoirs on Monmouthshire (London, 1708); David Williams, History of Monmouthshire (1796); George Ormerod, Slrigulensia. Archaeological Memoirs relating to the District adjacent to the Confluence of the Severn and the Wye; M. E. Bagnall-Oakeley, Account of the Rude Monuments in Monmouthshire (Newport, 1889); J. A. Bradney, A History of Monmouthshire (1904, &c.) ; also the publications of the Caerleon Antiquarian Association.

MONNIER, MARC (1827-1885), French writer, was born at Florence on the 7th of December 1827. His father was French, and his mother a Genevese; he received his early education in Naples, he then studied in Paris and Geneva, and he completed his education at Heidelberg and Berlin. He became professor of comparative literature at Geneva, and eventually vice-rector of the university. He died at Geneva on the 18th of April 1885. He wrote a series of short, satirical, dramatic sketches collected as Theatre de marionettes (1871), and stories, notably Nouvelles napoliiaines (1879), numerous works on Italian history, a translation of Goethe's Faust, Geneve et ses poetes (1873), &c. The first volume of his Histoire de la lilterature moderne, La Renaissance, de Dante A Luther (1884), was crowned by the French

Academy.

See E. Rambert, Hcrivains nationaux suisses, vol. i. (Geneva,

1874).

MONNIKENDAM, a fishing village of Holland, in the province of North Holland, on an inlet of the Zuider Zee known as the Gouw Zee, 12 m. N.N.E. of Amsterdam, with which it is connected by steam tramway. It was once a flourishing town, but its quietness now is only disturbed by the advent of the numerous tourists who visit it in the summer, crossing hence to the island of Marken. Among the notable buildings are the weigh-house (17th century), the bell-tower (1591), formerly attached to the town-hall before this was destroyed in the 18th century, and the church of St. Nicholas, with its beautiful massive tower. Mention is made of this church in a document of 1356, but it was not completed until the beginning of the 15th century. It contains some fine carvings, many interesting old tombs, and a monument of Jan Nieuwenhuizen, the founder of the Society for Public Welfare (Tot Nut van het Algemeen) in 1785.

MONOCHORD (Gr. ixovbxophov , kclv&v hovctikos): med. Lat. monochordum) , an instrument having a single string, used

by the ancient Greeks for tuning purposes and for measuring the scale arithmetically. The monochord, as it travelled westwards during the middle ages, consisted of a long board, or narrow rectangular box, over which was stretched the single string; along the edge of the sound-board was drawn a line divided according to simple mathematical ratios to show all the intervals of the scale. A movable bridge was so contrived as to slide along over the string and stop it at will at any of the points

marked. The vibrating length of string, being thus determined as on the guitar, lute, violin, &c, yielded a note of absolutely correct pitch on being twanged by fingers or plectrum. In order the better to seize the relation of various intervals, a second string tuned to the same note, but out of reach of the bridge, was sometimes added to give the fundamental. (K. S.)

MONOD, ADOLPHE (1802–1856), French Protestant divine, was born on the 21st of January 1802, in Copenhagen, where his father was pastor of the French church. He was educated at Paris and Geneva, and began his life-work in 1825 as founder and pastor of a Protestant church in Naples, whence he removed in 1827 to Lyons. Here his evangelical preaching, and especially a sermon on the duties of communicants (" Qui doit com- munier "?), led to his deposition by the Catholic Minister of education and religion. Instead of leaving Lyons he began to preach in a hall and then in a chapel. In 1836 he took a professorship in the theological college of Montauban, removing in 1847 to Paris as preacher at the Oratoire. He died on the 6th of April, 1856. Monod was undoubtedly the foremost Protestant preacher of 19th-century France. He published three volumes of sermons in 1830, another, La Creduliti de I'incridule in 1844, and two more in 1855. Two further volumes appeared after his death. His elder brother Frederic (1794–1863), who was influenced by Robert Haldane, was also a distinguished French pastor, who with Count Gasparin founded the Union of the Evangelical Churches of France; and Frederic's son Theodore (b. 1836) followed in his footsteps.

MONOD, GABRIEL (1844-), French historian, was born at Havre on the 7th of March, 1844. Adolphe Monod (q.v.) was his uncle. Having studied at Havre, he went to Paris to complete his education, and whilst there lived with the family of De Pressense. The influence of Edmond de Pressense, a pastor and large-minded theologian, and of Madame de Pressense, a woman of superior intellect and refined feeling, who devoted her life to educational works and charity, made a great impres- sion on him. In 1865

he left the icole normale superieure, and went to Germany, where he studied at Gottingen and Berlin. The teaching of George Waitz definitely directed his studies towards the history of the middle ages. Returning to France in 1868 he was nominated by V. Duruy to give lectures on history, following the method used in German seminaries, at the icole des haules etudes. When the Franco-Prussian War broke out, Gabriel Monod, with his cousins, Alfred and Sarah Monod, organized an ambulance with which he followed the whole campaign, from Sedan to Mans. He wrote a small book of memoirs of this campaign, Allemands et francais (187 1), in which he spoke of the conquerors without bitterness; this attitude was all the more praiseworthy as his mother was an Alsatian, and he was unable to resign himself to the loss of Alsace and Lorraine. The war being over he returned to teaching. At this period of his life he wrote Grtgoire de Tours et Marius d'Avenche (1872); Fredegaire, whose history, taken from original MSS., he published in 1885; a translation of a book of W. Junghans, Histoire critique des regnes de Childerich et de Chlodovech, with introduction and notes (1879); Etudes critiques sur les sources de I'histoire carolingienne (1898, 1st part only published); and Bibliographic de I'histoire de France (1888). He himself said that his pupils were his best books; he intended to teach them not so much new facts as the way to study, endeavouring to develop in them an idea of criticism and truth. They showed their gratitude by dedicating a book to him in 1896, Etudes d'histoire du moyen dge, and after his retirement in 1905 by having his features engraved on a slab (see A Gabriel

Monod, en souvenir de son enseignemenl: icole pratique des hautes etudes, i868~igoj, icole normale supirieure, 1880-IQ04. May 26, igof). In 1875 he founded the Revue Historique, which rapidly became a great authority on scientific education. Some of his articles in this and other periodicals have been put together in book form, Les Maltres de I'histoire: Renan, Taine, Michelet (1894); Portraits et souvenirs (1897: on Hugo, Fustel de Coulanges, V.

Duruy, &c).

MONODELPHIA (i.e. ” single uterus,”— in allusion to the fusion of at least the basal portions of this organ, and in con- tradistinction to their duality in the Didelphia, or Marsupialia), Cuvier’s name for the group which includes all the orders of mammals (See Mammalia) except the Marsupialia and Mono- tremata; other titles for this group being Placentalia and Eutheria. With the Monotremata (q.v.) this group has no near affinity; and while more nearly related to the Marsupialia (q.v.), in which an imperfect allantoic placenta is sometimes developed, it is broadly distinguished therefrom by the invariable presence of a functional placenta by the aid of which the foetus is nourished throughout the greater portion of intra-uterine life. Other distinctive features by which marsupials are separated from monodelphians or placentals will be found in the article last mentioned. (R. L.*)

MONOGENISTS, the term applied to those anthropologists who claim that all mankind is descended from one original stock (jaovos single, and ykvos, race), and generally from a single pair; while polygenists (7roXw, many) contend that man has had many original ancestors. Of the older school of scientific monogenists J. F. Blumenbach and J. C. Prichard are eminent representatives, as is A. de Quatrefages of the more modern. The great problem of the monogenist theory is to explain by what course of variation races of man so different have sprung from a single stock. In ancient times little diffi- culty was felt in this, authorities such as Aristotle and Vitruvius seeing in climate and circumstance the natural cause of racial differences, the Ethiopian having been blackened by the tropical sun, &c. Later and closer observations, however, have shown such influences to be, at any rate, far slighter in amount and slower in operation than was supposed. M. de Quatrefages brings forward (Unite de I’esp’ece humaine, Paris, 1861, ch. 13) his strongest arguments for the variability of races under change of climate, &c. (action du milieu), instancing the asserted alteration in complexion,

constitution, and character of negroes in America, and Englishmen in America and Australia. But although the reality of some such modification is not disputed, especially as to stature and constitution, its amount is not enough to countervail the remarkable permanence of type displayed by races ages after they have been transported to climates extremely different from that of their former homes. Moreover, physically different races, such as the Bushmen and the pure negroid types in Africa, show no signs of approximation under the influence of the same climate; on the other hand, the coast tribes of Tierra del Fuego and forest tribes of tropical Brazil continue to resemble each other, in spite of extreme differences of climate and food. Darwin, than whom no naturalist could be more competent to appraise the variation of a species, is moderate in his estimation of the changes produced on races of man by climate and mode of life within the range of history (Descent of Man, pt. i. chs. 4 and 7). The slightness and slowness of variation in human races having been acknowledged, a great difficulty of the monogenist theory was seen to lie in the shortness of the chronology with which it was formerly associated. Inas- much as several well-marked races of mankind, such as the Egyptian, Phoenician and Ethiopian, were much the same three' or four thousand years ago as now, their variation from a single stock in the course of any like period could hardly be accounted for except by a miracle. This difficulty was escaped by the polygenist theory (see Georges Pouchet, Plurality of the Human Race, 1858, 2nd ed., 1864, Introd.). Two modern views have, however, intervened which have tended to restore, though under a new aspect, the doctrine of a single human stock. One has been the recognition of the fact that man has

existed during a vast period of time, which has made it easier to assume the continuance of very slow

natural variation of races. The other view is that of the evolution or development of species. It does not follow necessarily from a theory of evolution of species that mankind must have descended from a single stock, for the hypothesis of development admits of the argument that several simian species may have culminated in several races of man (Vogt, Lectures on Man, London, 1864, p. 463). The general tendency of the development theory, however, is against constituting separate species where the differences are moderate enough to be accounted for as due to variation from a single type. Darwin's summing up of the evidence as to unity of type throughout the races of mankind is as distinctly a monogenist argument as those of Blumenbach, Prichard or Quatrefages: —

" Although the existing races of man differ in many respects, as in colour, hair, shape of skull, proportions of the body, &c, yet if their whole organization be taken into consideration they are found to resemble each other closely in a multitude of points. Many of these are so unimportant, or of so singular a nature, that it is ex- tremely improbable that they should have been independently acquired by aboriginally distinct species or races. The same remark holds good with equal or greater force with respect to the numerous points of mental similarity between the most distinct races of man. . . . Now when naturalists observe a close agreement in numerous small details of habits, tastes and dispositions, between two or more domestic races, or between nearly allied natural forms, they use this fact as an argument that all are descended from a common progenitor who "was thus endowed, and, consequently, that all should be classed under the same species. The same argument may be applied with much force to the races of man." (Descent of Man, pt. 1. ch. 7.)

A suggestion by A. R. Wallace has great importance in the application of the development theory to the origin of the various races of man; it is aimed to meet the main difficulty of the monogenist school, how races which have remained comparatively fixed in

type during the long period of history, such as the white man and the negro, should have, in even a far longer .period, passed by variation from a common original. Wallace's view is substantially that the remotely ancient representatives of the human race, being as yet animals too low in mind to have developed those arts of maintenance and social ordinances by which man holds his own against influences from climate and circumstance, were in their then wild state much more plastic than now to external nature; so that " natural selection " and other causes met with but feeble resistance in forming the permanent varieties or races of man, whose complexion and structure still remain fixed in their descendants {Contributions to the Theory of Natural Selection, p. 319).

MONOGRAM (from Late Lat. monogramma, in Late Gr. novoypan^ov, from ixovos, single, 7pa/i/m, letter), originally a cipher consisting of a single letter, now a design or mark consisting of two or more letters intertwined together. The letters thus interlaced may be either all the letters of a name, or the initial letters of the Christian and surnames of a person for use upon note-paper, seals, &c. Many of the early Greek and Roman coins bear the monograms of rulers for whom or the towns in which they were struck. The Late Latin and Greek words were first applied to the signatures, which took this form, of the emperors of the Eastern Empire. The signatures of the Frankish kings also took the form of a monogram. The accompanying monogram, from a coin of Charles the Bald, is a good example I of a " perfect " monogram, in which all the letters of the name Karolus can be traced (see Diplomatic and Autograph). The most famous of monograms is that known as the " Sacred Monogram," formed by the conjunction of the two initial letters of Xpioros, Christ. The most usual form of this is the symbol f , and sometimes the a (alpha) and u (omega) of the Apocalypse were placed on either side of it. The symbol was incorporated in the Labarum (q.v.) when the imperial standard was Christianized. The interlaced I.H.S. (also called " The Sacred Monogram

“) apparently possesses no great antiquity; it is said to have been the

creation of St Bernard of Siena in the middle of the 15th century. Monograms or ciphers were often used by the early printers as devices, and are of importance in fixing the identity of early printed books. Similar devices have been used by painters and engravers. The middle ages were, indeed, extremely prolific in the invention of ciphers alike for ecclesiastical, artistic and commercial use. Every great personage, every possessor of fine taste, every artist, had his monogram. The mason’s mark also wa£, in effect, a cipher. As the merchant had as a rule neither right nor authority to employ heraldic emblems, he therefore fell back upon plain simple letters arranged very much in monogram form. These ” merchants’ marks ” generally took the form of a monogram of the owner’s initials together with a private device. They nearly always contain a cross, either as a protection against storms or other catastrophes, or as a Christian mark to distinguish their goods from Mahommedan traders in the East. There is a fine example of a 16th century gold ring with a merchant’s mark in the British Museum. One of the most famous of secular monograms is the interlaced ” H.D.” of Henri II. and Diane de Poitiers. Upon every building which that king erected it was sown profusely; it was stamped upon the buildings in the royal library, together with the bow, the quiver and the interlocked crescents of Diana. It has been argued that ” H.D.” is a misreading of ” H.C.,” which would naturally point to v usband and wife; but the question is set at rest by the fact that Henri II. sometimes signed his letters to Diane with this very monogram. Henri IV. invented a punning cipher for his mistress Gabrielle d’Estrees, the surname being represented by a capital S. with a trait, or stroke through it.

See F. Builliot, Dictionnaire des monogrammes (1832–1834, 3 parts) ; G. K. Nagler, Die Monogrammisten (1857–1876, 5 parts) ; Ris-Paquot, Dictionnaire encyclopedique des marques et monogrammes, chiffres, &c. (1893); also Du Cange,

Glossarium (s.v. Monogramma), with plates giving examples of the monograms of early popes, the emperors of the Western Empire, and of other kings.

MONOLOGUE (from Gr. novos, alone, and X670J, speech), a passage in a dramatic piece in which a personage holds the scene to himself and speaks unconsciously aloud. The theory of the monologue is that the audience overhears the thoughts of one who believes himself to be alone, and who thus informs them of what would otherwise be unknown to them. The word is also used in cases when a character on the stage speaks at great length, even though not alone, but is listened to in silence by the other characters. The old-fashioned tragedies of the 17th and 1 8th centuries greatly affected this convention of the monologue, which has always, however, been liable to ridicule. There is something of a lyrical character about the monologue in verse; and this has been felt by some of the classic poets of France so strongly, that many of the examples in the tragedies of Corneille are nothing more or less than odes or cantatas. The monologues of Shakespeare, and those of Hamlet in particular, have a far more dramatic character, and are, indeed, essential to the development of the play. Equally important are those of Racine in Phedre and in Athalie. The French critics record, as the most ambitious examples of the monologue in two cen- turies, that of Figaro in Beaumarchais's Le Mariage de Figaro and that of Charles V. in Victor Hugo's Hernani, the latter ex- tends to 160 lines. In the Elizabethan drama, the popularity of Kyd's Spanish Tragedy, in which Hieronymo spouts intermin- ably, set a fashion for ranting monologues, which are very frequent in Shakespeare's immediate predecessors and contem- poraries. After 1600 the practice was much reduced, and the tendency of solitary heroes to pour forth columns of blank verse was held in check by more complex stage arrangements. After the Restoration the classic tragedies of the English play- wrights again abused the privilege of monologue to such a degree that it became absurd, and fell into desuetude.

MONOMOTAPA. In old maps of south-east Africa, derived originally from Portuguese and from Dutch sources, an extensive region on the Cuama or Zambezi and to the south of it is styled regnum monomotapae. The precise character of the kingdom or empire to which allusion is made has been the subject of much discussion, and some modern historians have gone so far

as to relegate the monomotapa to the realm of myth. But such scepticism is unjustifiable in view of the perfect una- nimity with which, in spite of variations of detail, all Portuguese writers from the beginning of the 16th century onwards reiterated the assertion that there was a powerful rule known far and wide by that title.

The word ” monomotapa ” is of Bantu origin and has been variously interpreted. Father J. Torrend, Comparative Grammar of the South African Bantu Languages (p. 101) renders it “Lord of the water-elephants,” and remarks that the hippopotamus is even to the present day a sacred animal among the Karanga. The earliest recorded bearer of the name is Mokomba Metiamo- tapam, mentioned by Diogo de Alcacova in 1506 as father of the Kwesarimgo Menamotapam who ruled at that date over Vealanga, a large kingdom that included Sofala. His capital was called Zumubany, an obvious corruption of the term ” Zimbabwe,” regularly used to describe the residence of any important chief. The title is still found during the 18th century, but had probably become extinct by the beginning of the 19th if not earlier. Possibly its use was not confined to a single tribal section, occurring as it does in conjunction with the distinct dynastic names of Mokomba and Mambo, but the Karanga is the only tribe to which the Portuguese chroniclers attribute it. The latter, indeed, not only refer to the territory and the people of the monomotapa as ” Mocaranga ” {i.e. of the Karanga tribe), but explicitly assert that the ”

emperor ” himself was a ” Mocaranga.” Consequently, he must have been a negro, and the Dominican who records the baptism of Dom Filippe by a friar of the order in the middle of the 17th century actually states that this ” powerful king ” was a black man (” com as carnes pretas “). This alone would be sufficient to controvert the baseless assumption that there existed in southern Rhodesia a ruling caste of different racial origin from the general Bantu population. The events following on the murder of the Jesuit father Dom Goncalo da Silveira (cf. Lusiads X. 93) sufficiently demonstrate that the monomotapa, though susceptible to the persuasion of foreigners, was an independent potentate in the 16th century. The state and ceremony of his court, the number of his wives, and the order and organization of his officials, are described by several of the chroniclers.

It is difficult to arrive at an estimate of the extent of territory over which this great negro chief exercised direct or indirect control. The most extravagant theory is naturally that which, was expressed by the Portuguese advocates in connexion with the dispute as to the ownership of Delagoa Bay. The crown of Portugal based its case against England on the cession of territory contained in a well-known treaty with the monomotapa (1629), and stated that this monarch’s dominions then extended nearly to the Cape of Good Hope. A more moderate and usual view is given by Diogo de Couto, who in 1616 speaks of “a dominion over all Kaffraria from the Cabo das Correntes to the great river Zambezi.” Several 17th-century writers extend the ” empire ” to the north of the Zambezi, Bocarro giving it in all ” a circumference of more than three hundred leagues.” It was ” divided among petty kings and other lords with fewer vassals who are called inkosis or fumos.” According to these authors, however, including Dos Santos, the paramountcy of the monomotapa was impaired in the 17th century by a series of rebellions. His Zimbabwe, wherever it may have been in earlier days, was now fixed near the Portuguese fort of Masapa, only a short distance south of the

Zambezi. A Portuguese garrison was maintained in it, and the monarch himself from the year 1607 onwards was little more than a puppet who was generally baptized by the Dominicans with a Portuguese

name.

The only authorities of value are the original Portuguese docu- ments collected, translated and edited by G. McC. Theal under the title Records of South Eastern Africa (9 vols., London, 1898-1903). Reference may be made to A. Wilmot's Monomotapa (London, 1896), which is, however, to a large exteijt superseded by Theal' s far richer collection of material. (D. R.-M.)

MONONGAHELA, a city of Washington county, Pennsyl- vania, U.S.A., on the Monongahela river, 31 m. by rail S. of

Pittsburg. Pop. (1890), 4096; (1900), 5173 (711 foreign-bora and 345 negroes); (1910) 7598. It is served by the Pennsylvania and the Pittsburg & Lake Erie railways, and by electric railways to Pittsburg and Washington, Pa. Monongahela is in a coal region, and the mining of coal is its principal industry. It was laid out as a town in 1792 by Joseph Parkinson, and named by him Williamsport; but it was com- monly known as Parkinson's Ferry until 1833, when it was incorporated as a borough. Four years later the present name was adopted, and in 1873 Monongahela was chartered as a city. It was here that the Whisky Insurrection convention met on the 14th of August 1794.

MONOPHYSITES (Gr. iwvo^vo-trai) , the name given to those who hold the doctrine that Christ had but one (nbvos) composite nature (4>u

The first stage of the controversy covers the seventy-five years between the council of Chalcedon and the accession of Justinian in 527. In Palestine the fanatical monks led by Theodosius captured Jerusalem and expelled the bishop, Juvenal. When he was restored, after an exile of twenty months,

Theodo- sius fled to Sinai and continued his agitation among the monks there. In Alexandria an insurrection broke out over the super- session of the patriarch Dioscurus by the orthodox Proterius, who was killed during the struggle. Timothy Aelurus was chosen bishop, and a synod which he called was so powerful as to impress even the emperor Leo I. at Constantinople, who, however, deposed him as well as Peter Fullo, who at Antioch had usurped the see of the orthodox bishop Martyrius. The short reign of Basiliscus (474–476) favoured the Monophysites, but the restoration of the rightful emperor Zeno marked an attempt at conciliation. On the advice of Acacius, the energetic patriarch of Constantinople, Zeno issued the Henolikon edict (482), in which Nestorius and Eutyches were condemned, the twelve chapters of Cyril accepted, and the Chalcedon Definition ignored. This effort to shelve the dispute was quite in vain. Pope Felix III. saw the prestige of his see involved in this slighting of Chalcedon and his predecessor Leo's epistle. He condemned and deposed Acacius, a proceeding which the latter regarded with contempt, but which involved a breach between the two sees that lasted after Acacius's death (489), through the long and troubled reign of Anastasius, and was only healed by Justin I. in 519. The monophysite cause reached its crowning point in the East when Severus was made bishop of Antioch in 513. This man was the stormy petrel of the period. A law student who had been converted from paganism, he became a mono- physite monk at Alexandria. Expelled from that city in 513, he went with his followers to stir up strife in Constantinople, and succeeded in bringing about the deposition of the orthodox bishop, Macedonius, and of Flavian, bishop; of Antioch. But Severus himself was deprived in 518: he went back to Alex- andria, and became leader of the Phthartolatrai (see below), a subsection of the Monophysites.

Justin I. was only a tool in the hands of his nephew Justinian, who sided with the orthodox and brought about the recon- ciliation between Rome and Constantinople. In Jerusalem, Tyre, and other

centres also, orthodoxy was re-established.. In Egypt, however, monophysitism was as strong as ever, and soon at Constantinople the arrogance of Rome caused a reaction, led by Theodora, the wife of the new emperor Justinian (527- 565). Justinian himself, with the aid of Leontius of Byzantium (c. 485-543), a monk with a decided turn for Aristotelian logic and metaphysics, had tried to reconcile the Cyrillian and

Chalcedonian positions, but he inclined more and'more towards the monophysite view, and even went so far as to condemn by edict three teachers (Theodore of Mopsuestia, Theodoret, the opponent of Cyril, and Ibas of Edessa) who were offensive to the monophy- sites. The Eastern bishops subscribed these edicts, and even Pope Vigilius yielded, in spite of the protests of the Western bishops, and at the sth General Council (Constantinople, 553) agreed to the condemnation of the " three chapters " l and the anathematizing of any who should defend them by an appeal to the Definitions of Chalcedon. In the last years of his life (565) the emperor adopted the extreme Aphthartodocetae position, and only his sudden death pre- vented this being forced on the Church. His successor, Justin II. took no action either way for six or seven years, and then in- stituted a quiet but thorough system of suppression, closing monophysite churches and imprisoning their bishops and priests.

Meanwhile monophysitism had split into several factions. Of these that represented by Severus stood nearest to the Christology of Cyril. Their objection to Chalcedon was that it was an innovation, and they fully acknowledged the distinctness of the two natures in Christ, insisting only that they became indissolubly united so that there was only one energy (n'la naxvfi dtavSpud) kvepyaa) of Christ's will. Thus, as Harnack points out, " there is no trace of a theological differ- ence between Severus

and Leontius," only a difference of termin- ology and of degree of willingness to assent to the formula of Chalcedon. Severus laid such stress on the human infirmities of Christ as proving that His body was like ours, created and corruptible (4>6aprbv) that his opponents dubbed him and his followers Phthartolatrae — worshippers of the corruptible. 2 The school of Themistius of Alexandria extended the argu- ment to Christ's human soul, which they said was, like ours, limited in knowledge. Hence their name Agnoetae and their excommunication.

An opposite tendency was that of the Aphthartodocetae or Phantasiastae, represented by Julian, bishop of Halicarnassus, and, in his closing days, by Justinian. They held that Christ's body was so inseparably united with the Logos as not to be consubstantial with humanity; its natural attributes were so heightened as to make it sinless and incorruptible. An extreme school, the Aktistetae or Gaianists (Gaianus was bishop of Alexandria c. 550) even held that from the moment the Logos assumed the body the latter was uncreated, the human being transmuted into the divine nature; and the Adiaphorites went still further, denying, like Stephen Barsudaili, an Edessan abbot, all distinction of essence not even between the manhood and the Godhead in Christ, but between the divine and the human, and asserting that " all creatures are of the same essence with the Creator."

A third variety of monophysitism was that known as Theopas- chitism, a name given to those who accepted the formula that in the death of Christ " God had suffered and been crucified." Peter Fullo introduced these words into' the Trishagion, and after much controversy the council of Constantinople (553), while disallowing this, gave its sanction to the similar statement — unum crucifixum esse ex sancta et consubstantiali Triniiale. The development of this line of thought led in some thinkers like John Philoponus to a kind of tritheism.

There is no doubt that the disintegration caused by

mono- physitism largely facilitated the rapid and easy victory of Islam in Syria and Egypt. The ” ethical complement ” of monophysitism is monothelitism (see Monothelites).

See the Histories of Dogma by A. Harnack, F. Loofs and R. Seeberg ; also R. L. Ottley, The Doctrine of the Incarnation.

MONOPOLI, a seaport town and episcopal see of Apulia, Italy, in the province of Bari, from which it is 25 m. S.E. by rail, 30 ft. above sea-level. Pop. (1901), 22,616. The medieval

1 I.e. (1) The person and writings of Theodore of Mopsuestia, (2) the writings of Theodoret in defence of Nestorius, (3) the letter written by Ibas to the Persian Maris.

2

walls are preserved and the castle dates from 1552. The harbour is small, the principal trade being in agricultural products. Close to it are rock-hewn tombs, possibly belonging to the ancient Gnathia (q.v.).

MONOPOLY (Gr. novoiruikla or hovottwKiov, exclusive sale, from novos, alone, and wwkelv, to sell), a term which, though used generally in the sense of exclusive possession, is more accurately applied only to grants from the Crown or from parliament, the private act of an individual whereby he obtains control over the supply of any particular article, being properly defined as “engrossing.” It was from the practice of the sovereign granting to a favourite, or as a reward for good service, a monopoly in the sale or manufacture of some particular class of goods that the system of protecting inventions arose, and this fact lends additional interest to the history of monopolies (see Patents). When the practice of making such grants first arose it does not appear easy to say. Sir Edward Coke laid it down that by the ancient common law the king could grant to an inventor, or

to the importer of an invention from abroad, a temporary monopoly in his invention, but that grants in restraint of trade were illegal. Such, too, was the law laid down in the first recorded case, Darcy v. Allen (the case of monopolies, 1602), and this decision was never overruled, though the law was frequently evaded. The patent rolls of the Plantagenets show few instances of grants of monopolies (the earliest known is temp. Edw. III.), and we come down to the reign of Henry VIII. before we find much evidence of this exercise of the prerogative in the case of either new inventions or known articles of trade. Elizabeth, as is well known, granted patents of monopoly so freely that the practice became a grave abuse, and on several occasions gave rise to serious complaints in the House of Commons. Lists prepared at the time show that many of the commonest necessaries of life were the subjects of monopolies, by which their price was grievously enhanced. That the queen did not assume the right of making these grants entirely at her pleasure is shown, not only by her own statements in answer to addresses from the house, but by the fact that the preambles to the instruments conveying the grants always set forth some public benefit to be derived from their action. Thus a grant of a monopoly to sell playing-cards is made, because " divers subjects of able bodies, which might go to plough, did employ themselves in the art of making of cards "; and one for the sale of starch is justified on the ground that it would prevent wheat being wasted for the purpose. Accounts of the angry debates in 1565 and 1601 are given in Hume and elsewhere. The former debate produced a promise from the queen that she would be careful in exercising her privileges; the latter a proclamation which, received with great joy by the house, really had but little effect in stopping the abuses complained of.

In the first parliament of James I. a " committee of griev- ances " was appointed, of which Sir Edward Coke was chairman. Numerous monopoly patents were brought up before them, and were cancelled. Many more, however, were granted by the king, and there

grew up a race of ” purveyors,” who made use of the privileges granted them under the great seal for various purposes of extortion. One of the most notorious of these was Sir Giles Mompesson, who fled the country to avoid trial in 1621. After the introduction of several bills, and several attempts by James to compromise the matter by orders in council and promises, the Statute of Monopolies was passed in 1623. This made all monopolies illegal, except such as might be granted by parliament or were in respect of new manufactures or inventions. Upon this excepting clause is built up the entire English system of letters patent for inventions. The act was strictly enforced, and by its aid the evil system of monopolies was eventually abolished. Parliament has, of course, never exercised its power of granting to any individual exclusive privileges of dealing in any articles of trade, such as the privileges of the Elizabethan monopolists; but the licences required to be taken out by dealers in wine, spirits, tobacco, &c, are lineal descendants of the old monopoly grants, while the quasi-monopolies enjoyed by

railways, canals, gas and water companies, &c, under acts of parliament, are also representative of the ancient practice.

See W. H. Price, The English Patents of Monopoly (1906).

MONOTHELITES (novodeXfJTai, monothelitae, from Gr. ftivos, only, dtKeiv, to will), 1 in Church history, the name given to those who, in the 7th century, while otherwise orthodox, maintained that Christ had only one will. Their effort, as defined by Dormer, was ” an attempt to effect some kind of solution of the vital unity of Christ’s person, which had been so seriously proposed by monophysitism, on the basis of the now firmly-established doctrine of the two natures.” The controversy had its origin in the

efforts of the emperor Heraclius to win back for the church and the empire the excommunicated and persecuted Monophysites or Eutychians of Egypt and Syria. In Egypt especially the monophysite movement had assumed a nationalistic, patriotic character. It was in Armenia, while on his expedition against Persia, in 622 that, in an inter- view with Paul, the head of the Severians (Monophysites) there, Heraclius first broached the doctrine of the yuia kvkpyua of Christ, i.e. the doctrine that the divine and human natures, while quite distinct in His one person, had but one activity and operation. 2 At a somewhat later date he wrote to Arcadius of Cyprus, commanding that ” two energies” should not be spoken of; and in 626, while in Lazistan (Colchis), he had a meeting with the metropolitan, Cyrus of Phasis, during which this com- mand was discussed, and Cyrus was at last bidden to seek further instruction on the subject from Sergius, patriarch of Constanti- nople, a strong upholder of the n’ia kvkpyua., and the emperor’s counsellor with regard to it. So well did he profit by the teach- ing he received in this quarter that, in 630 or 631, Cyrus was appointed to the vacant patriarchate of Alexandria, and in 633 succeeded in reconciling the Severians of his province on the basis of fda deavSpucri ivkpyuo. (one divine human energy). He was, however, opposed by Sophronius, a monk from Palestine, who, after vainly appealing to Cyrus, actually went to Constantinople to remonstrate with Sergius himself. Shortly afterwards Sergius wrote to Pope Honorius, and received a friendly reply. 3 Sophronius, however, who mean while had been made patriarch of Jerusalem (634), refused to be silenced, and in his Epistola synodica strongly insisted on the ” two energies.” So intense did the controversy now become, that at last, towards the end of 638, Heraclius published an Ecthesis, or Exposition of the Faith (composed by Sergius), which prohibited the use of the phrase ” one energy,” because of its disquieting effects on some minds, as seeming to militate against the doctrine of the two natures; while, on the other hand, the expression ” two energies ” was interdicted because it seemed to

imply that Christ had two wills. That Christ had but one will was declared to be the only orthodox doctrine, and all the faithful were enjoined to hold and teach it without addition or deduction. The document was not acceptable, however, to Popes Severinus and John IV., the immediate successors of Honorius; and Maximus, the confessor, succeeded in stirring up such violent opposition in North Africa and Italy that, in 648, Constans II. judged it expedient to withdraw his grandfather's edict, and to substitute for it his own Typus or Precept (titctos irepl xtorews), forbidding all discussion of the questions of the duality or singleness of either the energy or the will of Christ. The scheme of doctrine of the first four general councils, in all its vagueness as to these points, was to be maintained; so far as the controversy had gone, the disputants on either side were to be held free from censure, but to resume it

1 The name seems to occur first in John of Damascus.

' Paul, speaking for the monophysite bishops, had said that what was particularly repugnant in the definition of Chalcedon (g.tf.) was the implication of two wills in Christ. See Hefele, Conctliengesch. iii. 124 seq. (1877), who also traces the previous history of the expres- sions iila ivipyeia, 6t avSpuci) ivkpyaa, especially as found in the writings of the Pseudo-Dionysius Areopagita, which first appeared in Egypt in the 5th century.

8 In two letters Honorius expressed himself in accord with the monothelite view, for which he was denounced as heretical by the Sixth General Council and anathematized by Pope Leo II.

would involve penal consequences. The reply of the Western Church was promptly given in the unambiguously dyothelite decrees of the Lateran synod held by Pope Martin I. in 649; but the cruel persecutions to which both Martin and Maximus were exposed, and finally succumbed, secured for the imperial Typus the assent at least of silence. With the accession of Constantine Pogonatus in 668 the'

controversy once more revived, and the new emperor resolved to summon a general council. It met at Constantinople in 680, having been preceded in 679 by a brilliant synod under Pope Agatho at Rome, where it had been agreed to depart in nothing from the decrees of the Lateran synod. The will, Agatho said, is a property of the nature, so that as there are two natures there are two wills; but the human will determines itself ever conformably to the divine and almighty will.

See R. L. Ottley, The Doctrine of the Incarnation (pt. vii. §§ 5, 6, 7) ; A. Harnack, History of Dogma, iv. 252-267; art ” Monotholeten ” in Hauck-Herzog’s Realencyklop. fur prof. Theologie (vol. 13) by W. Moller and G. Kriiger.

MONOTREMATA (a name referring to the single outlet for all the excretory channels of the body), the lowest subclass of the Mammalia, represented at the present day solely by the platypus and the echidnas. It has been proposed to replace this name, when used as a subclass, by Prototheria; but it is perhaps on the whole preferable to retain it both for the subclass and for the single order by which it is now represented, distinguish- ing the latter as Monotremata Vera.

Existing monotremes are characterized by the following features. In the first place they differ broadly from all other mammals in being oviparous, or possibly in the case of one family ovoviviparous; and also in the absence of mammae, or teats, the milk-glands opening on the surface of the skin of the breast by means of a number of fine pores. Moreover, the milk-glands themselves are commonly believed to represent sweat-glands and not those of other mammals, although it has been suggested that this distinction may not prove to be valid. In the strict sense of the term monotremes are not, therefore, mammals at all. Another feature in which these creatures differ from all other living mammals is the presence of a pair of coracoid bones, which articulate with the sternum, or breast- bone, as well as of paired precoracoids, or epicoracoids, and

an unpaired T-shaped interclavicle, the arms of which overlie the clavicles or collar-bones. In all these respects monotremes closely resemble many reptiles. The brain lacks a corpus callosum, or band of nerve-tissue connecting the two hemispheres. Again, the bodies of the vertebrae are for the most part without terminal caps, or epiphyses; and each rib articulates to the vertebral column solely by its head or capitulum, instead of by a capitulum and a tuberculum. More important is the circumstance that the testes, which remain throughout life within the abdominal cavity, do not discharge by means of their ureters into a urinary bladder, but into a urino-genital sinus, which is in close communication with the lower end of the alimentary canal, so that the genital and waste products of the body are discharged by means of a common tube, or cloaca — another reptilian feature, although met with in certain other mammals. As regards other soft parts, the heart has the valve dividing the right auricle and ventricle incomplete and to a great extent fleshy — a feature which may, in some degree, account for the lower temperature of monotremes as compared with higher mammals. The presence of an anterior abdominal vein, or at least its supporting membrane, running right through the abdominal cavity, is another distinctive feature of the group. Of less importance is the presence of a pair of epipubic, or marsupial, bones attached to the front edge of the pelvis. The females have a complete or rudimentary pouch on the abdomen.

In the presence of hair, the relatively high temperature of the blood, the absence of nuclei to the red blood-corpuscles, and the existence of only the left aortic arch, as well as in the absence of a separate quadrate-bone, and the simple structure of the lower jaw, monotremes conform to the ordinary mammalian type. On the other hand the skull of the platypus possesses a peculiar ” dumb- bell bone,” believed to represent the reptilian prevomer.

The females produce their young from eggs, which are relatively large, and develop in the same manner as those of birds and reptiles, a portion only of the yolk segmenting to form the embryo, while the remainder serves for the nutriment of the latter. In the case of Ornithorhynchus it has been said that two eggs are laid in the chamber at the end of the burrow, 1 but those of the Echidnidae are carried about in the pouch on the abdomen of the female, which becomes enlarged during the time of incubation. In the adult state neither of the living groups of Monotremata have teeth ; but this is evidently only a specialized feature, the young platypus having functional teeth. In the latter, three pairs of these teeth are developed in the upper, and three in the lower jaw; but after being for some time in use, they gradually become worn away, and are finally shed. Under and around the teeth are developed the horny plates, or ” cornules,” which gradually grow round them and assume their function, the hollows on the surface of the cornules indicating the positions of the teeth. In form these teeth make a distant approximation to the molars of some of the extinct Multituberculata (q.v.).

A peculiarity of the males is the presence in the hind-limb of an additional, flat, curved ossicle on the hinder and tibial side of the plantar aspect of the tarsus, articulating chiefly to the tibia, support- ing in the adult a sharp-pointed perforated horny spur, with which is connected the duct of a gland situated beneath the skin of the back of the thigh. (A rudimentary spur is found in the young female Ornithorhynchus, but this disappears when the animal becomes adult.) The stomach is sub-globular and simple; the alimentary canal has no ileo-caecal valve, or marked distinction between large and small intestine, but is furnished with a small, slender vermiform caecum with glandular walls. The liver is divided into the usual number of lobes, and is provided with a gall-bladder.

The trunk-vertebrae are nineteen in number. The transverse processes of the cervical vertebrae are

independently developed, and remain suturally connected with the bodies of the vertebrae until the animal is full-grown. Though in this respect monotremes pre- sent an approximation to reptiles, they differ in that there is not a gradual transition from these transverse processes of the neck-verte- brae (or cervical ribs, as they may be considered) into the thoracic ribs, for in the seventh vertebra the costal element is much smaller than in the other, indicative of a very marked separation of neck from thorax, not seen in reptiles. The sternal ribs are well ossified, and there are distinct, partly ossified, intermediate ribs. The brain- cavity, unlike that of the lower marsupials or reptiles, is large and hemispherical, flattened below, arched above, and about as broad as long. The cribriform plate of the ethmoid is nearly horizontal. The cranial walls are very thin, and smoothly rounded externally, and the sutures become completely obliterated in adults. The broad occipital region slopes upwards and forwards, and the face is produced into a long depressed beak. The bony palate is pro- longed backwards, so that the posterior nares are nearly on a level with the glenoid fossa. The lower jaw, or mandible, is without distinct ascending ramus; the coronoid process and angle being rudimentary, and the two halves loosely connected at the symphysis. The fibula has a broad, flattened process, projecting from its upper extremity above the articulation, like an olecranon.

The first family, Ornithorhynchidae, is represented solely by the duck-billed platypus, or platypus {Ornithorhynchus anatinus), in which the hemispheres of the brain are relatively small and smooth, while the muzzle is expanded to form a spatula-like beak, covered during life with a delicate sensitive skin, which dries in museum-specimens to a horny consistency. Although, as mentioned above, functional teeth are developed in the young, in the adult their function is discharged by ” cornules,” or horny stuctures — elongated, narrow and sharp-edged, along the anterior part of the sides of the

mouth, and broad, flat- topped or molariform behind. The legs are short and adapted for swimming; the feet webbed, each with five well-developed toes armed with large claws, and beyond which in the fore-feet the interdigital membrane is extended. Vertebrae: C. 7, D. 17, L. 2, S. 2, Ca. 21. Acetabulum of pelvis not perforated. Tongue not extensile. Mucous membrane of small intestine covered with delicate, close-set transverse folds or ridges. Tail rather short, broad, and depressed. Eyes very small. Fur close and soft.

The platypus, or water-mole, is common to Australia and Tasmania, and entirely aquatic in habits, diving freely, and making its burrow in the river-banks. It feeds on insects, snails, small bivalve molluscs, and worms. In the adult state bivalves form its chief food; and it is believed that the substitution of horny plates for brittle teeth is an adaptation for cracking the shells of these creatures. (See Platypus.)

1 There does not appear to be authentic evidence that the eggs in this genus are actually laid. (See Platypus.)

The second family, Echidnidae, has a wider geographical distribution, including Australia, Tasmania and New Guinea, and is represented by two genera. The hemispheres of the brain are large and convoluted; and the muzzle is produced into a long, tapering, tubular beak, at the end of which the nostrils are situated. The two branches of the lower jaw are slender and rod-like. Opening of mouth small, and placed below the extremity of the beak. No teeth, though the palate and tongue are furnished with spines. Tongue very long, vermiform, slender and protractile. Lining membrane of small intestine villous, but without transverse folds. Feet with long strong claws for scratching and burrowing. The hind-feet with the ends of the toes turned outwards and backwards in the ordinary position of the animal when on the ground. Tail very short. Acetabulum with a large perforation. Calcaneal spur and gland of the male much mailer than in Ornithorhynchus. Fur

intermixed with strong, sharp-pointed spines. Terrestrial and fossorial in habits, feeding exclusively on ants.

The typical genus Echidna is represented by the echidna, or porcupine-anteater (E. aculeata), which has a distribution

Bruijn's Echidna (Proechidna bruijni).

equivalent to that of the family, and includes several local races. It is characterized by the presence of five claws to each foot, the moderately long and straight beak, the tapering tongue, with its spines restricted to the basal portion, and the vertebrae numbering C. 7, D. 16, L. 3, S. 3, Ca. 12. In Proechidna, represented by the larger P. bruijni and P. nigroaculeata, both from New Guinea, on the other hand, terminal phalanges and claws are present only on the three middle toes of each foot, the tongue is somewhat spoon-shaped and carries three rows of spines along its upper surface, and there are 17 dorsal and four lumbar vertebrae. (See Echidna.)

At present no light is shed by palaeontology on the past history of the Monotremata Vera. Species of Echidna and Ornithorhynchus have indeed been described from the superficial formations of Australia, but they apparently differ in no structural details from their existing representatives.

Possibly some of the extinct Jurassic mammals with a mar- supial or insectivorous type of dentition referred to in the article Marsupialia may be monotremes, but there is no definite evidence that this is the case. On the other hand, there is a possibility that another extinct group of mammals, dating from the Trias and continuing till the Lower Eocene, may belong to the present subclass, of which they form a second order. (See jMultituberculata.)

The most important recent information with regard to the Mono- tremata will be found in Dr R. Semon's Reise in Australien, in the Denkschrift of the Jena

Natural History Society. (R. L.*)

MONOTRIGLYPH, in architecture, the interval of the inter- columniation of the Doric column, which is observed by the intervention of one triglyph only between the triglyphs which come over the axes of the columns. This is the usual arrange- ment, but in the Propylaea at Athens there are two triglyphs over the central intercolumniation, in order to give increased width to the roadway, up which chariots and beasts of sacrifice ascended.

MONOTYPIC (Gr. nbvos, alone, single, and t£>xos, a type), a term used in biology, &c, for subjects having only one exponent, for example a genus containing only one species.

MONREALE (contraction of monte-reale, so called from a palace built here by Roger I.), a town of Sicily, in the province of Palermo, 5 m. inland (W.S.W.) from it, on the slope of Monte Caputo, overlooking the beautiful and very fertile valley called "La Conca d'oro " (the Golden Shell), famed for its orange, olive and almond trees, the produce of which is exported in large quantities. Pop. (1901), 17,379 (town); 23,556 (commune). The town, which for long was a mere" village, owed its origin to the founding of a large Benedictine monastery, with its church, the seat of the metropolitan archbishop of Sicily. 1 This, the greatest of all the monuments of the wealth and artistic taste of the Norman kings in northern Sicily, was begun about 1170 by William II., and in 1182 the church, dedicated to the Assumption of the Virgin Mary, was, by a bull of Pope Lucius III., elevated to the rank of a metropolitan cathedral.

The archiepiscopal palace and monastic buildings on the south side were of great size and magnificence, and were sur- rounded by a massive precinct wall, crowned at intervals by twelve towers. This has been

mostly rebuilt, and but little now remains except ruins of seme of the towers, a great part of the monks' dormitory and frater, and the splendid cloister, completed about 1200. This last is well preserved, and is one of the finest cloisters both for size and beauty of detail now extant. It is about 170 ft. square, with pointed arches decorated with diaper work, supported on pairs of columns in white marble, 216 in all, which were alternately plain and decorated by bands of patterns in gold and colours, made of glass tesserae, arranged either spirally or vertically from end to end of each shaft. The marble caps are each richly carved with figures and foliage executed with great skill and wonderful fertility of invention — no two being alike. At one angle, a square pillared projection contains the marble fountain or monks' lavatory, evidently the work of Moslem sculptors.

The church is fortunately well preserved. In plan it is a curious mixture of Eastern and Western arrangement. The nave is like an Italian basilica, while the large triple-apsed choir is like one of the early three-apsed churches, of which so many examples still exist in Syria and other eastern countries. It is, in fact, like two quite different churches put together endwise. The basilican nave is wide, with narrow aisles. Monolithic columns of grey oriental granite (except one, which is of cipollino), evidently the spoils of older buildings, on each side support eight pointed arches much stilted. The capitals of these (mainly Corinthian) are also of the classical period. There is no triforium, but a high clerestory with wide two-light windows, with simple tracery like those in the nave-aisles and throughout the church, which give sufficient (if anything too much) light. The other half, Eastern in two senses, is both wider and higher than the nave. It also is divided into a central space with two aisles, each of the divisions ending at the east with an apse. The roofs throughout are of open woodwork very low in pitch, constructionally plain, but richly decorated with colour, now mostly restored. At the west end of the

nave are two project- ing towers, with a narthex-entrance between them. A large open atrium, which once existed at the west, is now completely destroyed, having been replaced by a Renaissance portico. The outside of the church is plain, except the aisle walls and three eastern apses, which are decorated with intersecting pointed arches and other ornaments inlaid in marble. The outsides of the principal doorways and their pointed arches are magnificently enriched with carving and coloured inlay, a curious combination of three styles — Norman-French, Byzantine and Arab.

It is, however, the enormous extent (70,400 sq. ft.) and glittering splendour of the glass mosaics covering the interior which make this church so splendid. With the exception of a high dado, itself very beautiful, made of marble slabs with bands of mosaic between them, the whole interior surface of the walls, including soffits and jambs of all the arches, is covered with minute mosaic-pictures in brilliant colours on a gold ground. The mosaic pictures are arranged in tiers, divided by horizontal and vertical bands. In parts of the choir there are five of these tiers of subjects or single figures one above another. The half dome of the central apse has a colossal half- length figure of Christ, with a seated Virgin and Child below; the other apses have full-length colossal figures of St Peter and St Paul. Inscriptions on each picture explain the subject or saint represented ; these are in Latin, except some few which are in Greek. The sub- jects in the nave begin with scenes from the Book of Genesis, illus- trating the Old Testament types of Christ and His scheme of redemp- tion, with figures of those who prophesied and prepared for His coming . Towards the east are subjects from the New' Testament,

1 An earlier church appears to have existed at Monreale since the 6th century, but no traces of it now remain.

chiefly representing Christ's miracles and suffering, with apostles, evangelists and other

saints. The design, execution and choice of subjects all appear to be of Byzantine origin, the subjects being selected from the Menologium drawn up by the emperor Basilius Porphyrogenitus in the 10th century.

In the central apse at Monreale, behind the high altar, is a fine marble throne for the archbishop. This position of the throne is a survival of the early basilican arrangement, when the apse and altar were at the west end. In that case the celebrant stood behind the altar at mass, and looked over it eastwards towards the people. On the north side, in front of the high altar, is another somewhat similar throne for the use of the king. –The tomb of William I., the founder's father— a magnificent porphyry sarcophagus contemporary with the church, under a marble pillared canopy—and the founder William II. 's tomb, erected in 1575, were both shattered by a fire, which in 181 1 broke out in the choir, injuring some of the mosaics, and destroying all the fine walnut choir-fittings, the organs, and most of the choir roof. The tombs were rebuilt, and the whole of the injured part of the church restored, mostly very clumsily, a few years after the fire. On the north of the choir are the tombs of Margaret, wife of William I., and her two sons Roger and Henry, together with an urn containing the viscera of St Louis of France, who died in 1270. The pavement of the triple choir, though much restored, is a very magnificent specimen of marble and porphyry mosaic in opus alexandrinum, with signs of Arab influence in its main lines. The pavement of the nave, on the other hand, is of the 1 6th century. Two baroque chapels were added in the 17th and 1 8th centuries, which are fortunately shut off from the rest of the church.

Two bronze doors, those on the north and west of the church, are of great interest in the history of art. They are both divided into a number of square panels with subjects and single figures, chiefly from Bible history, cast in relief. That on the north is by Barisanus of Trani in southern Italy, an artist probably of Greek origin. It is inscribed barisanus

tran. me fecit. The cathedrals at Trani and Ravello also have bronze doors by the same sculptor. The western door at Monreale, inferior to the northern one both in richness of design and in workmanship, is by Bonannus of Pisa, for the cathedral of which place he cast the still existing bronze door on the south, opposite the leaning tower. The one at Monreale is inscribed a.d.mclxxxvi ind. hi. bonannus civis pisanvs me fecit. It is superior in execution to the Pisan one. The door by Barisanus is probably of about the same time, as other examples of his work with inscribed dates show that he was a contemporary of Bonannus. The effect of the facade is not improved by the Renaissance portico that has been added to it. The monastic library contains some valuable MSS., especially a number of bilingual documents in Greek and Arabic, the earliest being dated 1144. The archbishop now occupies the eastern part of the monastic buildings, the original palace being destroyed.

See D. B. Gravina, II Duomo di Monreale (Palermo, 1859–1865).

(J.H. M.; T.As.)

MONRO, DAVID BINNING (1836–1905), English Homeric scholar, was born in Edinburgh on the 16th of November 1836. He was a grandson of Alexander Monro, tertius (1773–1859), professor of anatomy in Edinburgh University, whose father, Alexander Monro, secundus (1 733–181 7), and grandfather, Alex- ander Monro, primus (1697–1767), both filled the same position. He was educated at Glasgow University, and Brasenose and Balliol Colleges, Oxford. In 1859 he was elected fellow, and in 1882 provost of Oriel, which office he held till his death at Heiden, Switzerland, on the 22nd of August 1905. He was a man of varied attainments, an excellent linguist, and possessed considerable knowledge of music, painting and architecture. His favourite study was Homer, and his Grammar of the Homeric Dialect (2nd ed., 1891) established his reputation as an authority on that author. He also edited the last twelve books of the Odyssey, with valuable

appendices on the composition of the poem, its relation to the Iliad and the cyclic poets, the history of the text, the dialects, and the Homeric house; a critical text of the poems and fragments (Homeri opera et reliquiae, 1896); Homeri opera (1902, with T. W. Allen, in Scriptorum classicorum bibliotheca oxoniensis); and an edition of the Iliad with notes for schools. His article on Homer, written for the 9th edition of the Encyclopaedia Britannica, was revised by him for this work before he died. Mention may also be made of his Modes of Ancient Greek Music (1894), on which see Classical Review for December 1894, with author's reply in the same for February 1895.

See Memoir by J. Cook Wilson (Oxford, 1907).

MONROE, JAMES (1758–1831), fifth president of the United States, was born on Monroe's creek, a tributary of the Potomac

river, in Westmoreland county, Virginia, on the 28th of April 1758. His father, Spence Monroe, was of Scotch, and his mother, Elizabeth Jones, was of Welsh descent. At the age of sixteen he entered the College of William and Mary, Williams- burg, Virginia, but in 1776 he left college to take part in the War for Independence. He enlisted in the Third Virginia regiment, in which he became a lieutenant, and subsequently took part in the battles of Harlem Heights, White Plains, Trenton (where he was wounded), Brandywine, Germantown, and Monmouth. In November 1777 he was appointed volunteer aide-de-camp to William Alexander (" Lord Stirling "), with the rank of major, and thereby lost his rank in the Continental line; but in the following year, at Washington's solicitation, he received a commission as lieutenant-colonel in a new regiment to be raised in Virginia. In 1780 he began the study of law under Thomas Jefferson, then governor of Virginia, and between the two there

developed an intimacy and a sympathy that had a powerful influence upon Monroe's later career.

In 1782 he was elected to the Virginia House of Delegates, and though only twenty-four years of age he was chosen a member of the governor's council. He served in the Congress of the Con- federation from 1783 to 1786 and was there conspicuous for his vigorous insistence upon the right of the United States to the navigation of the Mississippi River, and for his attempt, in 1785, to secure for the weak Congress the power to regulate commerce, in order to remove one of the great defects in the existing central government. On retiring from Congress he began the practice of law at Fredericksburg, Virginia, was chosen a member of the Virginia House of Delegates in 1787, and in 1788 was a member of the state convention which ratified for Virginia the Federal constitution. In 1790 he was elected to the United States senate to fill the vacancy caused by the death of William Grayson, and although in this body he vigorously opposed Washington's administration, Washington on the 27th of May 1794 nominated him as minister to France. It was the hope of the administration that Monroe's well-known French sym- pathies would secure for him a favourable reception, and that his appointment would also conciliate the friends of France in the United States. His warm reception in France and his enthusiastic Republicanism, however, displeased the Federalists at home; he did nothing, moreover, to reconcile the French to the Jay treaty (see Jay, John), which they regarded as a violation of the French treaty of alliance of 1778 and as a possible casus belli. The administration therefore decided that he was unable to represent his government properly and late in 1796 recalled him.

Monroe returned to America in the spring of 1797, and in the following December published a defence of his course in a pamphlet of 500 pages entitled A View of the Conduct of the Executive in the Foreign Affairs of the United Slates, and printed in Philadelphia by Benjamin Franklin Bache (1769-1798). Washington seems never to have forgiven Monroe for

this, though Monroe's opinion of Washington and Jay underwent a change in his later years. In 1799 Monroe was chosen governor of Virginia and was twice re-elected, serving until 1802. At this time there was much uneasiness in the United States as a result of Spain's restoration of Louisiana to France by the secret treaty of San Udefonso, in October 1800; and the sub- sequent withdrawal of the " right cf deposit " at New Orleans by the Spanish intendant greatly increased this feeling and led to much talk of war. Resolved upon peaceful measures, President Jefferson in January 1803 appointed Monroe envoy extraordinary and minister plenipotentiary to France to aid Robert R. Livingston, the resident minister, in obtaining by purchase the territory at the mouth of the Mississippi, including the island of New Orleans, and at the same time authorized him to co-operate with Charles Pinckney, the minister at Madrid, in securing from Spain the cession of East and West Florida. On the 18th of April Monroe was further commissioned as the regular minister to Great Britain. He joined Livingston in Paris on the 12th of April, after the negotiations were well under way; and the two ministers, on finding Napoleon willing

to dispose of the entire province of Louisiana, decided to exceed their instructions and effect its purchase. Accordingly, on the 30th of April, they signed a treaty and two conventions, whereby France sold Louisiana to the United States (see Louisiana Purchase). In July 1803 Monroe left Paris and entered upon his duties in London; and in the autumn of 1804 he proceeded to Madrid to assist Pinckney in his efforts to secure the definition of the Louisiana boundaries and the acquisition of the Floridas. After negotiating with Don Pedro de Cevallos, the Spanish minister of foreign affairs, from January to May 1805, without success, Monroe returned to London and resumed his negotia- tions, which had been interrupted by his journey to Spain, concerning the impressment of American seamen and the seizure of American vessels. As the British

ministry was reluctant to discuss these vexed questions, little progress was made, and in May 1806 Jefferson ordered William Pinkney of Maryland to assist Monroe. The British government appointed Lords Auckland and Holland as negotiators, and the result of the deliberations was the treaty of the 31st of December 1806,. which contained no provision against impressments and pro- vided no indemnity for the seizure of goods and vessels. In passing over these matters Monroe and Pinkney had disregarded their instructions, and Jefferson was so displeased with the treaty that he refused to present it to the senate for ratification, and returned it ‘ to England for revision. Just as the negotiations were re-opened, however, the questions were further complicated and their settlement delayed by the attack of the British ship ” Leopard ” upon the American frigate ” Chesapeake.” Monroe returned to the United States in December 1807, and was elected to the Virginia House of Delegates in the spring of 1810. In the following winter he was again chosen governor, serving from January to November 181 1, and resigning to become secretary of state under Madison, a position which he held until the 3rd of March 181 7. The direction of foreign affairs in the troubled period immediately preceding and during the second war with Great Britain thus devolved upon him. On the 27th of September 1814, after the disaster of Bladensburg and the capture of Washington by the British, he was appointed secretary of war to succeed General John Armstrong, and discharged the duties of this office, in addition to those of the state department, until March 1815.

In 1816 Monroe was chosen president of the United States; he received 183 electoral votes, and Rufus King, his Federalist opponent, 34. In 1820 he was re-elected, receiving all the electoral votes but one, which William Plumer (1759-1850) of New Hampshire cast for John Quincy Adams, in order, it is said, that no one might share with Washington the honour of a unanimous election. The chief events of his administra- tion, which has been called the ”

era of good feeling," were the Seminole War (1817–18); the acquisition of the Floridas from Spain (1819–21); the "Missouri Compromise" (1820), by which the first conflict over slavery under the con- stitution was peacefully adjusted; the veto of the Cumberland Road Bill (1822) 1 on constitutional grounds; and — most

1 The Cumberland (or National) Road from Cumberland, Mary- land, to Wheeling, West Virginia, was projected in 1806, by an appropriation of 1819 was extended to the Ohio River, by an act of 1825 (signed by Monroe on the last day of his term of office) was continued to Zanesville, and by an act of 1829 was extended west- ward from Zanesville. The appropriation of 1806 for the construc- tion of the road had brought into national politics the question of the authority of the Federal government to make " internal improve- ments." The bill vetoed by Monroe would in effect have given to the Federal government jurisdiction over the road; and in his elaborate memorandum (May 4, 1822) accompanying his veto message, Monroe discussed at length the constitutional questions involved, argued that the Federal government was empowered by the Constitution to appropriate money for " internal improve- ments," and in concert with the states through which a road was to pass might supervise the construction of such a road, but might not exercise jurisdiction over it, and advocated the , adoption of an amendment to the constitution giving larger power to the Federal government " confined to great national works only, since, if it were unlimited it would be liable to abuse, and might be productive of evil." For the history of the Cumberland Road, see Archer B. Hulbert, The Cumberland Road (Cleveland, Ohio, 1904).

intimately connected with Monroe's name — the

enunciation in the presidential message of the 2nd of December 1823 of what has since been known as the Monroe Doctrine (q.v.), which has profoundly influenced the foreign policy of the United States. On the expiration of his second term he retired to his home at Oak Hill, Loudoun county, Virginia. In 1826 he became a regent of the university of Virginia, and in 1829 was a member of the convention called to amend the state constitution. Having neglected his private affairs and incurred large expendi- tures during his missions to Europe, he experienced considerable pecuniary embarrassment in his later years, and was compelled to ask Congress to reimburse him for his expenses in the public service. Congress finally (in 1826) authorized the payment of $30,000 to him, and after his death appropriated a small amount for the purchase of his papers from his heirs. He died in New York City on the 4th of July 1831, while visiting his daughter, Mrs Samuel L. Gouverneur. In 1858, the centennial year of his birth, his remains were reinterred with impressive ceremonies at Richmond, Virginia. Jefferson, Madison, John Quincy Adams, Calhoun, and Benton all speak loudly in Monroe's praise; but he suffers by comparison with the greater statesmen of his time. Possessing none of their brilliance, he had, nevertheless, to use the words of John Quincy Adams, " a mind . . . sound in its ultimate judgments, and firm in its final conclusions." Schouler points out that like Washington and Lincoln he was " conspicuous … for patient considerateness to all sides." Monroe was about six feet tall, but, being stoop-shouldered and rather ungainly seemed less; his eyes, a greyish blue, were deep-set and kindly; his face was delicate, naturally refined, and prematurely lined. The best-known portrait, that by Vanderlyn, is in the New York City Hall. Monroe was married in 1786 to Elizabeth Kortwright (1 768-1830) of New York, and at his death was survived by two daughters.

See The Writings of James Monroe (7 vols., New York, 1898-1903), edited by S. M. Hamilton; Daniel C. Oilman, James Monroe (Boston, 1883), in the "

American Statesman Series "; J. R. Irelan, History of the Life, Administration and Times of James Monroe, being vol. v. of his Republic (Chicago, 1887) ; John Quincy Adams, The Lives of James Madison and James Monroe (Buffalo, 1850) ; B. W. Bond, jun., Monroe's Mission to France, 1794-1796 (Baltimore, 1907) ; Henry Adams, History of the United States (9 vols., New York, 1889-1891), containing a full but unsympathetic account of Monroe's career as a diplomatist; and James Schouler, History of the United States, vols. ii. and iii. (New York, 1894), which estimates his public services highly.

MONROE, a city of Louisiana, U.S.A., the capital of Ouachita parish, in the northern part of the state, on the east bank of the Ouachita river, 72 m. W. of Vicksburg, Mississippi, and 96 m. E. of Shreveport, Louisiana. Pop. (1890), 3256; (1900), 5428 (2834 negroes); (1910), 10,209. It is served by the Arkansas, Louisiana & Gulf, the Little Rock & Monroe, the Vicksburg, Shreveport & Pacific (Queen & Crescent), and the St Louis, Iron Mountain & Southern railways, and by river steamers plying between New Orleans and Camden, Arkansas. Across the Ouachita is the town of West Monroe (pop. in 1910, 1127). The improvement of the river, by the removal of snags and the construction of dams and locks in order to give it a navigable depth of 10 ft. at Monroe and 6| ft. beyond Camden, was nearly completed by the United States government in 1909. Monroe lies in a level valley, and has broad streets shaded by live oaks. Among the public buildings are a handsome city-hall, a city market-house, a charity hospital and a high school. There are also a parish high school and St Hyacinth's Academy (Roman Catholic). The leading industries are the manufacture of lumber and cotton products.

In 1785, during the Spanish occupation of Louisiana, Juan Filhiol, commandant of the district of Ouachita, founded a settlement on the site of the present Monroe, which was called Ouachita Post until 1790 and then Fort Mir6, in honour of the governor-general. In 18 19 the place was renamed Monroe, in

honour of President James Monroe, and in the following year the town was incorporated. Monroe was chartered as a city in 1871, and received a new charter in 1902.

MONROE, a city and the county-seat of Monroe county, Michigan, U.S.A., on the Raisin river, 2 m. from Lake Erie,

near the south-eastern corner of the state. Pop. (1890), 5258; (1900), 5043; (1904), 6128; (1910), 6893. It is served by the Michigan Central, the Lake Shore & Michigan Southern, the Pere Marquette, and the Detroit & Toledo Shore Line railways, and • by electric lines to Detroit and Toledo. There is a statue here (dedicated in 1910) of Gen. G. W. Custer. Monroe has a German Altenheim and St Mary's academy and college for girls. The city has a large trade in farming-produce and fish, and various manufactures. The place was settled in 1783 by French Canadians and called Frenchtown. In January 1813 the inhabitants, fearing destruction from the British and their Indian allies, pleaded to the Americans for protection, and about 660 men from the army of General James Winchester (1752-1826), sent from the rapids of the Maumee river, on the 18th of January drove a small British force from the viUage. Three days later General Winchester arrived with 300 more men; but at dawn on the 22nd Colonel Henry A. Proctor (1787-1859) with a force of British and Indians surprised the Americans, defeated their right wing, captured General Winchester and obtained from him an order for the surrender of his entire force. In 1815 Monroe received its present name in honour of James Monroe. In 181 7 it was made the county-seat, and in 1827 it was incor- porated as a village. It was chartered as a city in 1837 (being rechartered in' 1874), and as a city of the fourth class in 1895.

MONROE DOCTRINE. That the United States should avoid entangling itself in the politics of Europe was a policy recom- mended by Washington. The counterpart of this, that European powers should be prevented from taking a controlling share in the politics of

the American continent, grew gradually as the importance and influence of the United States increased. This American attitude towards the European powers became crystallized in what is known as the Monroe Doctrine, since it was first announced officially in a concrete form, though not originated, by President Monroe. His declaration was the result of American apprehension that the combination of European powers known as the Holy Alliance would interfere in South America to restore the Spanish colonies, which had asserted their independence, to the crown of Spain. To meet and check this movement, in his message to Congress on the 2nd of December 1823, Monroe made the following pronouncement: —

In the wars of the European powers in matters relating to them- selves we have never taken any part, nor does it comport with our policy so to do. It is only when our rights are invaded or seriously menaced that we resent injuries or make preparations for our defence. With the movements in this hemisphere we are of neces- sity more immediately connected, and by causes which must be obvious to all enlightened and impartial observers. The political system of the allied powers is essentially different in this respect from that of America. . . . We owe it, therefore, to candour, and to the amicable relations existing between the United States and those powers, to declare that we should consider any attempt on their part to extend their system to any portion of this hemisphere as dangerous to our peace and safety. With the existing colonies or dependencies of any European power we have not interfered and shall not interfere. But with the governments who have declared their independence and maintained it, and whose independence we have on great consideration and on just principles acknowledged, we could not view any interposition for the purpose of oppressing them or controlling in any other manner their destiny by any European power in any other light than as the manifestation of an unfriendly disposition towards the United States. ... It is impos- sible that the

allied powers should extend their political system to any portion of either continent without endangering our peace and happiness; nor can any one believe that our Southern brethren, if left to themselves, would adopt it of their own accord. It is equally impossible, therefore, that we should behold such interposition in any form with indifference.

Earlier in the same message, while discussing negotiations for the settlement of the respective claims of Russia, Great Britain, and the United States in the north-west, Monroe also said: —

In the discussion to which this interest has given rise and the arrangements by which they may terminate, the occasion has been judged proper for asserting as a principle in which the rights and interests of the United States are involved, that the American continents, by the free and independent condition which they have

assumed and maintain, are henceforth not to be considered as subjects for future colonization by any European powers.

With this message Great Britain was in hearty agreement. Indeed it was Canning's policy, summed up three years later by his famous reference to the necessity of calling the New World into existence to restore the balance of the Old.

This announcement of policy, it will be noticed, involved, firstly, a declaration aimed at foreign intervention in the political affairs of independent American states; secondly, a warning against future European colonization on the American continents. The first was avowedly based on the right of self-defence; it was a policy, not a law; it was not to constrain the minor republics, but to protect them. The second, as explained by John Quincy Adams, was

intended to state the fact that the American continent was occupied by contiguous states, leaving no room for further colonization and introduction of foreign sovereignty. No legislative sanction was given to Monroe's statement of policy at the time, and in fact none was needed, for the mere announcement served to prevent foreign action in South America. It has never formed part of the body of International Law, being unilateral. Nor has the United States bound itself by compact with the other republics of the American continent to protect them from European aggression. Thus it hesitated to send delegates to the Panama Congress in 1826, and took no part in any congress with the Latin American states until 1889.

Nevertheless, on several occasions since its conception the Monroe Doctrine has been enforced. Its spirit permeated the Clayton-Bulwer Treaty, in which Great Britain and the United States, in 1850, mutually renounced the right of colonizing, fortifying or occupying any porton of Central America. It was enforced against Maximilian, who, by French intervention in Mexico, had been made emperor, and until the close of the American Civil War had perforce been left undisturbed. Its applicability was urged when de Lesseps's Panama Canal was thought possible of completion. Both Cuba and the Hawaiian Islands at various periods have felt its influence, the general, though not consistent policy of the United States being, while disclaiming the desire of annexation itself, to deny the right of any European power (except Spain in Cuba's case, until 1898) to control them. And it was applied to the claims of British Guiana to Venezuelan territory by President Cleveland's message in 1895, which proposed a commission to settle the boundary and threatened war if its line were not accepted. This com- mission never reported, but the disputants finally agreed to arbitrate, and the British claim was in the main upheld.

Between 1823 and 1895 the development and enlargement of this policy on the part of the United States was very striking. To prevent the overthrow

of an independent republic is one thing; to interfere in the settlement of a boundary dispute between two states, also on the ground of self-defence, is quite another. Yet Cleveland's doctrine met with general acceptance, and in fact it had been in a sense anticipated by President Grant, who, in urging the annexation of San Domingo upon the United States Senate in 1870, used this language: —

The Doctrine promulgated by President Monroe has been adhered to by all political parties, and I now deem it proper to assert the equally important principle that hereafter no territory on this continent shall be regarded as subject of transfer to a European power.

Never having been formulated as law or in exact language, the Monroe Doctrine has meant different things to different persons at different times. It has become deeply rooted in the American heart, and a permanent part of the foreign policy of the United States. It tends to change into the principle that every portion of the American continent must be free from European control. It is still coupled, however, with the converse principle that America takes no part in European politics, as the disclaimer of the American delegates to the first Peace Conference at the Hague proved.

See Tucker's Monroe Doctrine ; Gilman's Life of Monroe ; Wharton's International Law Digest (title, "Monroe Doctrine"); Snow's

American Diplomacy; also an article by Sir Frederick Pollock in the Nineteenth Century and After (1902). (T. S. W.)

MONROSE (1 783-1843), French actor, whose real name was Claude Louis Seraphin Barizain, was born in Besancon on the 6th of December 1783, and was already playing children's parts at the time of the Revolution. He was called to the Comedie Francaise in 1815, and was received societaire in 1817. A small, active man, with mobile and expressive features and quick, nervous gestures, he was noted

as the rascally servant in such plays as Le Barbier de Seville and Les Fourberies de Scapin. His son, Louis Martial Barizain (1809–1883), also called Monrose, was also an actor. He succeeded Samson as professor at the Conservatoire in 1866.

MONS (Flemish Bergen), a town of Belgium situated on a small river called the Trouille in the province of Hainaut of which it is the capital. Pop. (1904), 27,072. Mons was the capital of the ancient countdom of Hainaut, well known in English history from the marriage of Edward III. with its Countess Philippa. The town was founded by the Countess Waudru in the 8th century, whereupon Charlemagne recognized it as the capital of Hainaut, and it has retained the position ever since. It was only in the nth century, however, that it became the fixed residence of the counts, who had previously occupied the castle of Hornu, leaving Mons to the abbey and the church of St Waudru. Regnier V. moved to Mons at the beginning of that century, and his only child — a daughter — Richilde, married Baldwin VI. of Flanders. The junction of the two countdoms was only temporary, and they again separated in the person of Richilde's sons. In this age Hainaut was known as " the poor land of a proud people," and it was not until the beginning of the 14th century that Mons was converted into a trading town by the establishment of a cloth market. At the same time the count transferred his principal fortress from Valenciennes to Mons. When the Hainaut title became merged in the duchy of Burgundy, Mons was a place of considerable importance on account of its being a stronghold near the French frontier. Its capture, defence and surrender by Louis of Nassau in 1572 was one of the striking incidents of the religious troubles. In the long wars of the 17th and 18th centuries Mons underwent several sieges, but none of the same striking character as those of Namur. Several times dismantled and refortified, Mons was finally converted into an open town in 1862.

The most remarkable building in the city is the cathedral of St Waudru, named after the first countess, which was begun in the middle of the 15th

century, but not finished for more than a century and a half later. It is a fine specimen of later Gothic, and contains some good glass as well as a few pictures by Van Thudden. The Hotel de Ville is about the same age as the cathedral, having been commenced in 1458 and finished in 1606. The tower was added a century later. There is also a fine belfry with a peal of bells. Mons is now a flourishing town with a good trade in cloth, lace, sugar refinery, &c. ; but its chief importance is derived from its proximity to the Borinage (place of boring), district containing mines of the finest coal in Belgium. The military engineering college for the Belgian army is here, and not far from Mons are the battle-fields of Malplaquet (1709) and Jemappes (1792).

MONSIEUR (Fr., formed from mon, my, and sieur, lord), the general title of address in France used vocatively in speaking formally to any male person, like the English ” sir ” or prefixed to the name like the English ” Mr.” It is, however, in France also prefixed to nobiliary, official, and other titles, e.g. Monsieur le president, Monsieur le due d’E., &c. It is abbreviated M., not Mons. As a specific title ” Monsieur ” {tout court) was used from the time of Louis XIV. of the eldest brother of the king, as ” Monseigneur ” was of the dauphin; as a general title of address it was given to the princely members of a royal house.

MONSIGNOR (It. monsignore, my lord), a title of honour granted by the pope to bishops and to high dignitaries and officials of the papal household. It is abbreviated Mgr.

MONSON, SIR WILLIAM (c. 1569-1643), British admiral, was the third son of Sir John Monson of South Carlton in Lincoln- shire, where the family was of old standing. He matriculated at Balliol College, Oxford, in 1581, but ran away to sea in 1585, being

then according to his own account sixteen. His first services were in a privateer in an action with a Spanish ship in the Bay of Biscay, of which he gives a somewhat Munchausen- like account in his Naval Tracts. In the Armada year he served as lieutenant of the ” Charles,” a small ship of the queen’s. There being at that time no regular naval service, Monson is next found serving with the adventurous George Clifford, 3rd earl of Cumberland (1558-1605), whom he followed in his voyages of 1589, 1591 and 1593. During the second of these ventures Monson had the ill-luck to be taken prisoner by the Spaniards in a recaptured prize, and was for a time detained at Lisbon in captivity. His cruises must have brought him some profit, for in 1595 he was able to marry, and he thought it worth while to take his M.A. degree. The earl offended him by showing favour to another follower, and Monson turned elsewhere. In the expedition to Cadiz in 1596, he commanded the ” Repulse ” (50). From this time till the conclusion of the war with Spain he was in constant employment. In 1602 he commanded the last squadron fitted out in the reign of Queen Elizabeth. In 1604 he was appointed admiral of the Narrow Seas, the equivalent of the Channel squadron of modern times. In 1614 he was sent to the coasts of Scotland and Ireland to repress the pirates who then swarmed on the coast. Monson claimed to have extirpated these pests, but it is certain that they were numerous a generation later. After 1614 he saw no further active service till 1635, when he went to sea as vice- admiral of the fleet fitted out by king Charles I. with the first ship-money. He spent the last years of his life in writing his Tracts, and died in February 1643.

His claim to be remembered is not based on his services as a naval officer, though they were undoubtedly honourable, but on his Tracts. These treatises consist in part of historical narratives, and in part of argumentative proposals for the reform of abuses, or the development of the naval resources of the country. They form by far the best account by a contemporary of the naval life and

transactions of the reign of Queen Elizabeth and the beginning of the reign of King James. Monson takes care to do himself full justice, but he is not unfair to his con- temporaries. His style is thoroughly modern, and has hardly a trace of the poetry of the Elizabethans. He was the first naval officer in the modern sense of the word, a gentleman by birth and education who was trained to the sea, and not simply a soldier put in to fight, with a sailing-master to handle the ship for him, or a tarpaulin who was a sailor only.

Monson's elder brother, Sir Thomas Monson (1564-1641), was one of James I.'s favourites, and was made a baronet in 161 1. He held a position of trust at the Tower of London, a circumstance which led to his arrest as one of the participators in the murder of Sir Thomas Overbury. He was, however, soon released and he died in May 1641. His eldest son was Sir John Monson, Bart. (1600-1683), a member of parliament under Charles I., and another son was Sir William Monson (c. 1607- 1678), who was created an Irish peer as Viscount Monson of Castlemaine in 1628. Having been a member of the court which tried Charles I. the viscount was deprived of his honours and was sentenced to imprisonment for life in 1661. Sir John Monson's descendant, another Sir John Monson, Bart. (1693- 1748), was created Baron Monson in 1728. His youngest son was George Monson (1730-1776), who served with the English troops in India from 1758 to 1763. The baron's eldest son was John, the 2nd baron (1727-1774), whose son William Monson (1 760-1 807) served in the Mahratta War under. General Lake. William's only son William John (1796-1862) became 6th Baron Monson in succession to his cousin Frederick John, the 5th baron, in October 1841. His son William John, the 7th baron (1829-1898), was created Viscount Oxenbridge in 1886. When he died without sons in 1898 the viscounty became extinct, but the barony descended to his brother Debonnaire John

(1830-1900), whose son Augustus Debonnaire John (b. 1868) became 9th Baron Monson in 1900. Another of Viscount Oxenbridge's brothers was Sir Edmund John

Monson, Bart, (b. 1834), who, after filling many other diplomatic appointments, was British ambassador in Paris from 1896 to 1904.

The one authority for the life of Sir William Monson is his own Tracts, but a very good account of him is included by Southey in his Lives of the Admirals, vol. v. The Tracts were first printed in the third volume of Churchill's Voyages, but they have been edited for the Navy Record Society by Mr Oppenheim.

MONSOON (Arabic Mausim, season), the name given to seasonal winds due to differences of pressure between areas of land and sea, which are primarily caused by seasonal differences of temperature. Monsoons may be regarded as the seasonal analogue of the diurnal land and sea breezes. The term is, however, also applied to seasonal winds which change in direction on account of the migrations of wind-belts in the planetary circulation. During the season of rising temperature the surface of the land warms more quickly, and becomes hotter than that of the sea, and during the season of falling temperature the reverse is the case. Barometric pressure tends to be higher over the colder region than over the warmer, and there is accordingly a tendency for air to flow, in the lower levels of the atmosphere, from the former towards the latter. Thus there is in general a movement from land to sea during the cold season, and from sea to land during the warm season.

Within a belt extending from 10 to 15 degrees on each side of the equator, seasonal changes of temperature are insufficient in range to permit of the occurrence of temperature differences adequate to the development of true monsoons. In the higher latitudes of the west wind-belt, and in the polar zones, the generally low temperature does not favour the occurrence of wide differences between land and sea. Thus the conditions required for the occurrence of monsoonal winds are best satisfied in intermediate latitudes in the neighbourhood of the tropics. But, as in the case of land and sea breezes, the strength and extension of the monsoon

produced by the action described depends to a large extent on the configuration of the land surface. When the land area consists of a low plain, or of a plateau having a steep coastal strip of small width, the circula- tion upon it tends to be local, and to approximate to the typical "continental" climate of the temperate zones. Where, on the other hand, the land slopes upwards gradually to a central massif or ridge the effect of the differences of temperature is, as it were, cumulative, and the monsoons may extend over large areas, affecting regions distant from those in which the causes producing them are directly operative, and the monsoon winds may develop great strength. Ferrel {Popular Treatise on the Winds) has compared the conditions in the two cases to those of a stove with a long horizontal flue and with a vertical or inclined flue of the same length.

It is of course to be noted that the hot season monsoon is in general of greater strength than that of the cold season, because being usually a sea wind the air is fully charged with moisture, condensation takes place as ascensional movement sets in on reaching the land, and the latent heat set free strengthens the upward current.

The position, outline and relief of the continent of Asia favour the development of monsoons to a much greater extent than any other part of the world; so much so that the climate of the whole of the southern and eastern parts is entirely controlled by these winds, forming what is typically known as " the monsoon region," a region having distinctly characteristic products. Monsoons form an important element in the climate of Australia, western and southern Africa, and the southern part of the United States of America, but with a few exceptions the monsoons of those regions are local in character, modifying the prevailing winds of the planetary circulation (usually the trade winds) for a longer or shorter period every year.

MONSTER (Lat. monstrum, from root of monere, to warn; i.e. something terrible or portentous). In

zoology, monsters or monstrous births are the subject of Animal Teratology, a

department of morphological science treating of deviations from the normal development of the embryo. The term ” embryo ” is conventionally limited, in human anatomy, to the ovum in the first three months of its intra-uterine existence, while it is still developing or acquiring the rudiments of its form, the term ” foetus ” being applied to it in the subsequent months during which the organism grows on the lines of development already laid down. It is mostly in the first or embryonic period that those deviations from the normal occur which present themselves as monstrosities at the time of birth; these early traces of deviation within the embryo may be slight, but they ” grow with its growth and strengthen with its strength,” until they amount to irreparable defects or accretions, often incompatible with extra-uterine life. The name of ” teratology,” introduced by fitienne Geoffroy St Hilaire (1822), is derived from Ttpas, the equivalent of monstrum; teratology is a term new enough to have none but scientific associations, while the Latin word has a long record of superstitions identified with it. The myths of siren, satyr, Janus, cyclops and the like, with the corresponding figures in Northern mythology, find a remote anatomical basis in monstrosities which have, for the most part, no life except in the foetal state. The mythology of giants and dwarfs is, of course-, better founded. The term monster was originally used in the same sense as portent. Luther 1 speaks of the birth of a monstrous calf, evidently the subject of contemporary talk, as pointing to some great impending change, and he expresses the hope that the catastrophe might be the Last Day itself. The rise of more scientific views will be sketched in the course of the article.

Although monstrosities, both in the human species

and in other animals, tend to repeat certain definite types of erroneous development, they do not fall readily into classes. The most usual grouping (originally suggested by G. L. L. Buffon, 1800) is into monslra per excessum, monstra per defectum, and monslra per fabricam alienam. It seems useful, however, to place the more simple cases of excess and of defect side by side; and it is necessary, above all, to separate the double monsters from the single, the theory of the former being a distinct chapter in teratology.

1. Monstrosities in a Single Body. — The abnormality may extend to the body throughout, as in well-proportioned giants and dwarfs; or it may affect a certain region or member, as — to take the simplest case — when there is a finger or toe too many or too few. It is very common for one malformation to be correlated with several others, as in the extreme case of acardiac monsters, in which the non-development of the heart is associated with the non-development of the head, and with other radical defects.

Giants are conventionally limited to persons over 7 ft. in height. The normal proportions of the frame are adhered to more or less closely, except in the skull, which is relatively small; but accurate measurements, even in the best-proportioned cases, prove, when reduced to a scale, that other parts besides the skull — notably the thigh-bone and the foot — may be undersized though overgrown. In persons who are merely very tall the great stature depends often on the inordinate length of the lower limbs; but in persons over 7 ft. the lower limbs are not markedly disproportionate. In many cases the muscles and viscera are not sufficient for the overgrown frame, and the individuals are usually, but not always, of feeble intelligence and languid disposition, and short-lived. The brain-case especially is undersized — the Irish giant in the museum of Trinity College, Dublin, is the single exception to this rule — but the bones of the face, and especially the lower jaw, are on a large scale. Giants are never born of gigantic parents; in fact,

sterility usually goes with this monstrosity. Their size is some- times excessive at birth, but more often the indications of great stature do not appear till later, it may be as late as the ninth year; they attain their full height before the twenty-first year. They have been more frequently male than female.

1 In a passage quoted by T. L. W. Bischoff from the 19th volume of Luther's works, Halle ed., p. 2416.

Dwarfs axe. conventionally limited to persons under 4 ft. They are more likely than giants to have the modulus of the body perfect. Where disproportion occurs in the true dwarf it takes the form of a large-sized head, broad shoulders and capacious chest, and undersized lower limbs. Dwarfs with rickets are perhaps to be distinguished from true dwarfs; these are cases in which the spine is curved, and sometimes the bones of the limbs bent and the pelvis deformed. As in the case of giants, dwarfs are seldom the progeny of dwarfs, who are, in fact, usually sterile; the unnatural smallness may be obvious at birth, but is more likely to make itself manifest in the years of growth. Dwarfs are much more easily brought up than giants, and are stronger and longer-lived; they have usually also strong passions and acute intelligence. The legends of the dwarfs and giants are on the whole well based on fact. (See Dwarf and Giant.)

Redundancy and Defect in Single Parts. — The simplest case of this redundancy is a sixth digit, well formed, and provided with muscles (or tendons), nerves, and bloodvessels like the others; it is usually a repetition of the little finger or toe, and it may be present on one or both hands, or on one or both feet, or in all four extremities', as in the giant of Gath. The want of one, two, or more digits on hand or foot, or on both, is another simple anomaly ; and, like the redundancy, it is apt to repeat itself in the same family. J. F. Meckel saw a girl who had an extra digit on each extremity, while a sister wanted four of the fingers of one hand. Where the supernumerary digits are more than

one on each extremity, the whole set are apt to be rudimentary or stunted; they look as if two or more of the embryonic buds had been subject to cleavage down the middle and to arrest of longitudinal growth. There are several authentic instances of a whole lower limb appearing at birth as two withered halves, as if from embryonic cleavage. Other redundancies of the skeleton are extra vertebrae (sometimes the coccygeal, giving the appearance of a rudimentary tail), or an extra rib. A double row of teeth is occasionally met with ; the most interesting case of this anomaly is that in which the rudiments of a double row exist from the first, but the phenomenon is sometimes produced by the milk teeth persisting along with the second set. Among redundancies of the soft parts, by far the most frequent relate to the mammary glands and especially to the nipples. These organs are normally paired amongst mammals, and the glands of each pair are placed symmetrically on a curved line running from the axilla towards the pubes. When many pairs occur, the glands of each pair diverge less from the median line than those of the immediately anterior pair, the abdominal glands lying close together, those towards the axilla being farther apart. When only a single pair is normally present* the pair is abdominal, pectoral or axillary; and whether the normal be one pair or many pairs, additional glands are not infrequent, but occupy the expected position on the mammary lines. Accessory glands or f nipples in human beings, if anterior to the normal pair, lie farther from the median ventral line, and vice versa. Among the sense-organs there is a remarkable instance recorded of doubling of the appendages of the left eye, but not of the eyeball itself; the left half of the frontal bone is double, making two eyersockets on that side, and the extra orbit has an eyebrow and eyelid. The external ear {pinna) has also been found double on one side and its orifice has frequently been found doubled in man and lower animals, and the additional ears lie in a definite relation to the branchial clefts of the embryo. Doubling of any of the internal organs or parts of organs may occur and innumerable cases have been

recorded. Montt ■osities from Defective Closure in the Middle Line. — Under this head come some of the commonest congenital malformations, including slight deficiencies such as harelip, and serious defects such as a gap in the crown of the head with absence of the brain. The embryo is originally a circular flattened disk spread out on one pole of the yolk, and it is formed into a cylindrical body (with four appendages) by the free margins of the disk, or rather its ventral laminae, folding inwards to meet in the middle line and so close in the pelvic, abdominal, thoracic.

pharyngeal and oral cavities. Meanwhile, and indeed rather earlier, two longitudinal parallel ridges on the top or along the back of the disk have grown up and united in the middle line to form the second barrel of the body — the neural canal— of small and uniform width in the lower three-fourths or spinal region, but expanding into a wide chamber for the brain. This division into neural (dorsal) and haemal (ventral) canals underlies all vertebrate development. Imperfect closure along either of those embryonic lines of junction may produce various degrees of monstrosity. The simplest and commonest form, hardly to be reckoned in the present category, is harelip with or without cleft palate, which results from defective closure of the ventral laminae at their extreme upper end. Another simple form, but of much more serious import, is a gap left in the neural canal at its lower end; usually the arches of the lumbar vertebrae are deficient, and the fluid that surrounds the spinal cord bulges out in its membranes, producing a soft tumour under the skin at the lower part of the back. This is the condition known as hydrorhachis, depending on the osseous defect known as spina bifida. More rarely the gap in the arches of the vertebrae is in the region of the neck. If it extend all along the back, it will probably involve the skull also. Deficiency of the crown of the head, and in the spine as well,

may be not always traceable to want of formative power to close the canal in the middle line; an over-distended condition of the central canal of the cord and brain may prevent the closure of the bones, and ultimately lead to the disruption of the nervous organs themselves; and injuries to the mother, with inflammation set up in the foetus and its appendages, may be the more remote cause. But it is by defect in the middle line that the mischief manifests itself, and it is in that anatomical category that the malformations are included. The osseous deficiency at the crown of the head is usually accompanied by want of the scalp, as well as of the brain and membranes. The bones of the face may be well developed and the features regular, except that the eyeballs bulge forward under the closed lids; but there is an abrupt horizontal line above the orbits where the bones cease, the skin of the brow joining on to a spongy kind of tissue that occupies the sides and floor of the cranium. This is the commonest form of an aiiencephalous or brainless monster. There are generally mere traces of the brain, although, in some rare and curious instances, the hemi- spheres are developed in an exposed position on the back of the neck. The cranial nerves are usually perfect, with the exception sometimes of the optic (and retina). Vegetative existence is not impossible, and a brainless monster has been known to survive sixty-five days. The child is usually a very large one.

Closely allied, as we have seen, to the anencephalous condition is the condition of congenital hydrocephalus. The nervous system at its beginning is a neural canal, not only as regards its bony covering, but in its interior; a wide space lined by ciliated epithelium and filled with fluid extends along the axis of the spinal cord, and expands into a series of chambers in the brain. As development proceeds the walls thicken at the expense of the internal spaces, the original tubular or chambered plan of the central nervous system is departed from, and those organs assume the practically solid form in which we familiarly know

them. If, however, the spaces persist in their embryonic proportions notwithstanding the thickening of the nervous substance forming their walls, there results an enormous brain which is more than half occupied inside with fluid, contained in spaces that corre- spond on the whole to the ventricles of the brain as normally bounded. A hydrocephalic foetus may survive its birth, and will be more apt to be affected in its nutrition than in its intelli- gence. In many cases the hydrocephalic condition does not come on till after the child is born.

Returning to the ventral middle line, there may be defects of closure below the lips and palate, as in the breast-bone (fissure of the sternum), at the navel (the last point to close in any case), and along the middle line of the abdomen generally. The commonest point for a gap in the middle line of the belly is at its lower part, an inch or two above the pubes. At that point in

the embryo there issues the allantois, a balloon- like expansion from the ventral cavity, which carries on its outer surface blood- vessels from the embryo to interdigitate with those of the mother on the uterine surface. Having served its temporary purpose of carrying the bloodvessels across a space, the balloon-like allantois collapses, and rolls up into the rounded stem-like umbilical cord through most of its extent; but a portion of the sac within the body of the foetus is retained as the permanent urinary bladder. That economical adaptation of a portion of a vesicular organ, originally formed for purposes of com- munication between the embryo and the mother, appears to entail sometimes a defect in the wall of the abdomen just above the pubes, and a defect in the anterior wall of the bladder itself. This is the distressing congenital condition of fissure of the urinary bladder, in which its interior is exposed through an opening in the skin; the pubic bones are separated by an interval, and the reproductive organs are ill-formed; the urachus is wanting, and the umbilicus is always placed exactly at the upper end of the gap in the skin. A monstrosity recalling the cloacal arrangement of the

bird is met with as a more extreme defect in the same parts.

Hermaphroditism. — Although this anomalous condition does not fall under defective closure in the middle line, it may be said to be due to a similar failure of purpose, or to an uncertainty in the nisus formativus at a corresponding stage of development. Strictly speaking, a hermaphrodite is a creature containing ovaries and testes — the essential organs of each sex. Evidence accumulates, however, that at least in all the higher vertebrates, including man, the sex is predetermined in the fertilized ovum, and it is more than doubtful if true hermaphroditism occurs. On the other hand, if there be no such double sex in the essential organs (as in the majority of so-called hermaphrodites) there is a great deal of doubling and ambiguity entailed in the secondary or external organs and parts of generation. Those parts which are rudimentary or obsolete in the male but highly developed in the female, and those parts which are rudimentary in the female but highly developed in the male tend in the hermaphrodite to be developed equally, and all of them badly. Amongst human beings the greater number of so-called hermaphrodites are really females, in which there is an abnormal development of the clitoris, but it also happens that true males may be born with a small clitoris-like penis, with hypospadia — that is to say, with imperfect urethra, open on the ventral side, and with undescended testes. Failure of the development of the testes or ovary, or their removal in the adult condition induces an ambiguous condition of the body in which the secondary sexual characters approach those of the other sex. Experimental removal of the ovaries or testes, followed by implantation of organs of the other sex, has produced an inversion of the secondary sexual characters.

Cyclops, Siren, &c. — The same feebleness of the formative energy which gives rise to some at least of the cases of defective closure in the middle line, and to the cases of ambiguous sex, leads also to imperfect separation of symmetrical parts. The

most remarkable case of the kind is the cyclops monster. At a point corresponding to the root of the nose there is found a single orbital cavity, sometimes of small size and with no eyeball in it, at other times of the usual size of the orbit and containing an eyeball more or less complete. In still other cases, which indicate the nature of the anomaly, the orbital cavity extends for some distance on each side of the middle line, and contains two eyeballs lying close together. The usual nose is wanting but above the single orbital cavity there is often a nasal process on the forehead, with which nasal bones may be articulated, and cartilages joined to the latter; these form the framework of a short fleshy protuberance like a small proboscis. The lower jaw is sometimes wanting in cyclopeans; the cheek-bones are apt to be small, and the mouth a small round hole, or altogether absent ; the rest of the body may be well developed. The key to the cyclopean condition is found in the state of the brain. The olfactory nerves or lobes are frequently absent; the brain is very imperfectly divided into hemispheres, and appears as a

somewhat pear-shaped sac with thick walls, the longitudinal partition of dura mater (falx cerebri) being wanting, the surface almost unconvoluted, the corpus callosum deficient, the basal ganglia rudimentary or fused. The optic chiasma and nerves are usually replaced by a single mesial nerve, but sometimes the chiasma and pair of nerves are present. The origin of this monstrosity dates back to an early period of development, to the time when the future hemispheres were being formed as protrusions from the anterior cerebral vesicle or fore-brain; it may be conceived that, instead of two distinct buds from that vesicle, there was only a single outgrowth with imperfect traces of cleavage. That initial defect would carry with it naturally the undivided state of the cerebrum, and with the latter there would be the absence of olfactory lobes and of a nose, and a single eyeball placed where the nose should have been. A cyclops has been known to live for several days. The monstrosity is not uncommon among the domestic animals, and is especially frequent in the pig.

Another curious result of defective separation of symmetrical parts is the siren form of foetus, in which the lower limbs occur as a single tapering prolongation of the trunk like the hinder part of a dolphin, at the end of which a foot (or both feet) may or may not be visible. The defects in the bones underlying this siren form are very various: in some cases there is only one limb (thigh and leg-bones) in the middle line; in others all the bones of each limb are present in more or less rudimentary condition, but adhering at prominent points of the adjacent surfaces. The pelvis and pelvic viscera share in the abnormality. A much more common and harmless case of unseparated sym- metrical parts is where the hand or foot has two, three, or more digits fused together. This syndactylous anomaly runs in families.

Limbs Absent or Stunted. — Allied to these fused or unseparated states of the extremities, or of parts of them, are the class of deformities in which whole

limbs are absent, or represented only by stumps. The trunk (and head) may be well formed, and the individual healthy; all four extremities may be reduced to short stumps either wanting hands and feet entirely, or with the latter fairly well developed; or the legs only may be rudi- mentary or wanting, or the arms only, or one extremity only. Although some of these cases doubtless depend upon aberrant or deficient formative power in the particular directions, there are others of them referable to the effects of mechanical pressure, and even to direct amputation of parts within the uterus.

Acardiac and Acranial Monsters. — It sometimes happens in a twin pregnancy that one of the embryos fails to develop a heart and a complete vascular system of its own, depending for its nourishment upon blood derived from the placenta of its well-formed twin by means of its umbilical vessels. It grows into a more or less shapeless mass, in which all traces of the human form may be lost. Other viscera besides the heart will be wanting, and no head distinguishable; the most likely parts to keep the line of development are the lumbar region (with the kidneys), the pelvis, and the lower limbs. The twin of this monster may be a healthy infant.

Reversed Position of the Viscera. — This is a developmental error associated with the retention of the right aortic arch as in birds, instead of the left as is usual in mammals. The position of all the unsymmetrical viscera is transposed, the spleen and cardiac end of the stomach going to the right side, the liver to the left, the caecum resting on the left iliac fossa, and the sigmoid flexure of the colon being attached to the right. This condition of situs inversus viscerum need cause no inconvenience; and it will probably remain undetected until the occasion should arise for a physical diagnosis or post-mortem inspection.

The causes of congenital anomalies are difficult to specify. There is no doubt that, in some cases, they are present in the sperm or germ of the parent; the

same anomalies recur in several children of a family, and it has been found pos- sible, through a variation of the circumstances, to trace the influence in some cases to the father alone, and in other cases to the mother ‘alone. The remarkable thing in this

parental influence is that the malformation in the child may not have been manifested in the body of either parent, or in the grandparents. More often the malformation is acquired by the embryo and foetus in the course of development and growth, either through the mother or in itself independently. Maternal impressions during pregnancy have often been alleged as a cause, and this causation has been discussed at great length by the best authorities. The general opinion seems to be that it is impossible to set aside the influence of subjective states of the mother altogether, but that there is no direct connexion between the cause of the subjective state and the resulting anomaly. The doctrine of maternal impressions has often been resorted to when any other explanation was either difficult or incon- venient; thus, Hippocrates is said to have saved the virtue of a woman who gave birth to a black child by pointing out that there was a picture of a negro on the wall of her chamber. Injuries to the mother during pregnancy have been unquestion- ably the cause of certain malformations, especially of congenital hydrocephalus. The embryo itself and its membranes may become the subject of inflammations, atrophies, hypertrophies, and the like; this causation is doubtless accountable for a good many of them. But a very large residue of malformations must still be referred to variation in the embryonic cells and cell-groups. The nisus formations of the fertilized ovum is always subject to morphological laws, but, just as in extra-uterine life, there may be deviations from the beaten track; and even a slight deviation at an early stage will carry with it far-reaching consequences. This is particularly noticeable in double monsters.

2. Double Monsters. — Twins are the physiological analogy of double monsters, and some of the latter

have come very near to being two separate individuals. The Siamese twins, who died in 1874 at the age of sixty, were joined only by a thick fleshy ligament from the lower end of the breast-bone (xiphoid cartilage), having the common navel on its lower border; the anatomical examination showed, however, that a process of peritoneum extended through the ligament from one abdominal cavity to the other, and that the blood-vessels of the two livers were in free communication across the same bridge. There are one or two cases on record in which such a ligament has been cut at birth, one, at least, of the twins surviving. From the most intelligible form of double monstrosity, like the Siamese twins, there are all grades of fantastic fusion of two individuals into one down to the truly marvellous condition of a small body or fragment parasitic upon a well-grown infant— the condition known as foetus in foetu. These monstrosities are deviations, not from the usual kind of twin gestation, but from a certain rarer physiological type of dual development. In by far the majority of cases twins have separate uterine appen- dages, and have probably been developed from distinct ova; but in a small proportion of (recorded) cases there is evidence, in the placental and enclosing structures, that the twins had been developed from two rudiments arising side by side on a single blastoderm. It is to the latter physiological category that double monsters almost certainly belong; and there is some direct embryological evidence for this opinion. Allen Thomson observed in the blastoderm of a hen's egg at the sixteenth or eighteenth hour of incubation two "primitive traces" or rudi- ments of the backbone forming side by side; and in a goose's egg incubated five days he found on one blastoderm two embryos, each with the rudiments of upper and lower extremities, crossing or cohering in the region of the future neck, and with only one heart between them. A very large number of similar observa- tions have been published and appear to be found in all cases where a large material is available. The developing ova of fish, available in large numbers in hatcheries, and the laboratory

investigation of the chick and the frog have provided cases of almost every degree of blending. The perfect physiological type appears to be two rudiments on one blastoderm, whose entirely separate development produces twins (under their rarer circumstances), whose nearly separate development produces such double monsters as the Siamese twins, and whose less separate development produces the various grotesque iorms

of two individuals in one body. There can be no question of a literal fusion of two embryos; either the individuality of each was at no time complete, or, if there were two distinct primitive traces,' the uni-axial type was approximately reverted to in the process of development, as in the formation of the abdominal and thoracic viscera, limbs, pelvis or head. Double monsters are divided in the first instance into those in which the doubling is symmetrical and equal on the two sides, and those in which a small or fragmentary foetus is attached to or enclosed in a foetus of average development — the latter class being the so-called cases of " parasitism."

Symmetrical Double Monsters are subdivided according to the part or region of the body where the union or fusion exists — head, thorax, umbilicus or pelvis. One of the simplest cases is a Janus head upon a single body, or there may be two pairs of arms with the two faces. Again, there may be one head with two necks and two complete trunks and pairs of extremities. Two distinct heads (with more or less of neck) may surmount a single trunk, broad at the shoulders but with only one pair of arms. The fusion, again, may be from the middle of the thorax downwards, giving two heads and two pairs of shoulders and arms, but only one trunk and one pair of legs. In another variety, the body may be double down to the waist, but the pelvis and lower limbs single. The degree of union in the region of the

head, abdomen or pelvis may be so slight as to permit of two distinct organs or sets of organs in the respective cavities, or so great as to have the viscera in common; and there is hardly ever an intermediate condition between those extremes. Thus, in the Janus head there may be two brains, or only one brain. The Siamese twins are an instance of union at the umbilical region, with the viscera distinct in every respect except a slight vascular anastomosis and a common process of peritoneum; but it is more usual for union in that region to be more extensive, and to entail a single set of abdominal and thoracic viscera. The pelvis is one of the commonest regions for double monsters to be joined at, and, as in the head and abdomen, the junction may be slight or total. The Hungarian sisters Helena and Judith (1701–1723) were joined at the sacrum, but had the pelvic cavity and pelvic organs separate; the same condition obtained in the South Carolina negresses Millie and Christina, known as the ” two-headed nightingale,” and in the Bohemian sisters Rosalie and Josepha. More usually the union in the pelvic region is complete, and produces the most fantastic shapes of two trunks (each with head and arms) joining below at various angles, and with three or four lower limbs extending from the region of fusion, sometimes in a lateral direction, sometimes downwards. A very curious kind of double monster is produced by two otherwise distinct foetuses joining at the crown of the head and keeping the axis of their bodies in a line. It is only in rare instances that double monsters survive their birth, and the preserved specimens of them are mostly of foetal size.

Unequal Double Monsters, Foetus in Foetu. — There are some well-authenticated instances of this most curious of all anomalies. The most celebrated of these parasite-bearing monsters was a Genoese, Lazarus Johannes Baptista Colloredo, born in 17 16, who was figured as a child by Licetus, and again by Bartholinus at the age of twenty-eight as a young man of average stature. The parasite adhered to the lower end of his breast-bone, and was a tolerably

well-formed child, wanting only one leg; it breathed, slept at intervals, and moved its body, but it had no separate nutritive functions. The parasite is more apt to be a miniature acardiac and acephalous fragment, as in the case of the one borne in front of the abdomen of a Chinaman figured by I. Geoffroy St Hilaire. Sometimes the parasite is contained in a pouch under the skin of the abdominal wall, and in another class (of which there is a specimen in the Hunterian Museum) it has actually been included, by the closure Of the ventral laminae, within the abdominal Cavity of the foetus — a true foetus in foetu. Shapeless parasitic fragments containing masses of bone, cartilage and other tissue are found also in the space -behind the breast-bone (mediastinal teratoma), or growing from

the base of the skull and protruding through the mouth ("epi- gnathous teratoma," appearing to be seated on the jaw), and, most frequently of all, attached to the sacrum. These last pass by a most interesting transition into common forms of congenita] sacral tumours (which may be of enormous size), consisting mainly of one kind of tissue having its physiological type in the curious gland-like body (coccygeal gland) in which the middle sacral artery comes to an end. The congenital sacral tumours have a tendency to become cystic, and they are probably related to the more perfect congenital cysts of the neck region, where there is another minute gland-like body of the same nature as the coccygeal at the point of bifurcation of the common carotid artery. Other tumours of the body, especially certain of the sarcomatous class, may be regarded from the point of view of monstra per excessum; but such cases suggest not so much a question of aberrant development within the blastoderm as of the indwelling spontaneity of a single post-embryonic tissue. (See Tumour and Pathology.)

Monstrosities in man and animals have attracted attention since the earliest times, and amongst primitive and uncivilized peoples have been regarded as of supernatural origin. Aristotle himself appears

to have been the first to examine them as a naturalist, and to explain that although they were outside the usual course of nature they were in the strictest sense of natural origin. Pliny described many well-known forms, but did not distinguish between legendary and actual monstrosities. In the middle ages they were treated in the fullest spirit of superstition, and many relics from such a point of view still survive. The human monstrosities were regarded as having been engendered in women by the devil who had commerce with them either in his own form or in the guise of some animal. The belief still to be found amongst uneducated persons that unnatural union between women and male animals, or between men and female animals, may be fertile and produce monsters, is an attenuated form of the satanic legend. The scientific appreciation of monsters has grown with the study of embryology. William Harvey in Exercitationes de generatione animalium (1651) first referred monstrosities to their proper place as abnormalities in embryonic reproduction. The doctrine of pre-formation (see Heredity) obsessed biological science until 1759 when C. F. Wolff overthrew it, and Harvey's advance was not pursued, except that a number of anatomists published careful studies and descriptions of monsters or monstrous organs. Those who believed that the normal process of development was an unrolling and expansion of a pre-formed miniature of the adult had to apply a similar theory to monsters, and Sylvain Regis, a con- temporary of Malbranche, obtained acceptance of his view that monstrous germs as well as normal germs had been created at the beginning of the world. A discussion almost as memorable as that between E. G. St Hilaire and Cuvier on specific types was pursued in the French Academy from 1724 to 1743, J. B. Winslow, who supported the current pre-formationist view, having the better of the argument with Louis Lemery, who was almost alone in a rational interpretation of monstrosities. From the time of Wolff it was accepted that normal and abnormal em- bryos alike developed by processes of epigenetic change. Wolff himself, however, and even J. F. Meckel at the

beginning of the 19th century, did not recognize the influence of physiological causes in the production of abnormalities; they believed the latter to proceed certainly in an orderly and natural way, but from abnormal ova. E. G. St Hilaire was the first to attempt experimental teratology and to lay down that many mon- strosities were the result of influences causing deviations from the normal course of embryonic development. I. G. St Hilaire, the son of E. G. St Hilaire, carried the experimental method little further, but published an elaborate descriptive treatise on anomalies (Paris, 1832-1837) which remains one of the most valuable records of the subject. A similar treatise with an incomparable atlas of illustrations was issued by W. Vrolik, the great Dutch anatomist, between 1840 and 1849, whilst A. Forster issued in 1861 a valuable textbook with a very large number of illustrations chiefly from preparations in the museum at

Wurzburg. The great museums devoted much attention to the collection and display of malformations, and no account of the subject can be adequate which does not include reference to the magnificent series in the Museum of the Royal College of Surgeons of England, with the descriptive catalogues of the animal malformations written by B. T. Lowne (1893) and of the vegetable malformations by M. T. Masters (1893).

The work hitherto referred to, as well as a vast bulk of scattered contributions to teratology throughout the 19th century, was chiefly descriptive, anatomical and embryological teratology, and carried the experimental side little beyond where it had been left by the St Hilaires. In 1891 Camille Dareste published his Recherches sur la production artificielle des mon- struositis, ou essais de teratogSnie experimentale; his experiments, chiefly on the developing egg of the fowl, not only showed the probable cause of many of

the most common abnormalities, but practically created a new branch of science, experimental embryology. Teratology has since become a side issue of the general study of the inter-relations between the inherited tendencies of the developing organism and the play of the circumambient media, and must be studied in relation to the work of O. Hertwig, W. Roux, H. Driesch, O. Biitschli, J. Loeb and their school. J. Bland Sutton's popular Evolution and Disease (1890) puts in a cogent way the relation between com- parative anatomy and common abnormalities, whilst W. Bateson in his Materials for the Study of Variation (1894) describes the acquisition of new symmetries by abnormal organs, and discusses the possible relation between abnormalities and the origin of species.

E. Schwalbe's Morphologie der Missbildungen (1906-1909) is a very complete study of the most modern developments of teratology, and contains a careful and elaborate list of authorities from the earliest times. (C. C.;P.C. M.)

MONSTRANCE (through the French from Lat. monstrare, to show), a vessel used in the Roman Church for the exhibition of the Host at Benediction (q.v.) and also when carried in processions. Another name for the vessel is ostensorium, from ostendere, to exhibit, show; whence the usual French name ostensoir. The monstrance was formerly used of a reliquary, exposing the sacred object to view. The earlier monstrances followed the usual shape of these reliquaries, viz. a cylindrical crystal case mounted in metal frames, elaborately ornamented and jewelled. Such often took the form of a turret. There is a 15th-century Italian example in South Kensington Museum of a pilastered turret containing an oblong crystal case, the whole resting on a stemmed base, and surmounted with a cupola. In the 1 6th century the present shape was adopted, viz. a crystal or glass circular disk, more suited to the shape of the sacred wafer; this is mounted in a frame of golden rays, and the whole is supported by a stem and bases. The exhibition of the Host dates from the institution of the Festival of Corpus

Christi (q.v.) by Urban IV. in 1264.

MONSTRELET, ENGUERRAND DE (c. 1400–1453), French chronicler, belonged to a noble family of Picardy. In 1436 and later he held the office of lieutenant of the gavenier (i.e. receiver of the gave, a kind of church rate) at Cambrai, and he seems to have made this city his usual place of residence. He was for some time bailiff of the cathedral chapter and then provost of Cambrai. He was married and left some children when he died on the 20th of July 1453. Little else is known about Monstrelet except that he was present, not at the capture of Joan of Arc, but at her subsequent interview with Philip the Good, duke of Burgundy. Continuing the work of Froissart, Monstrelet wrote a Chronique, which extends to two books and covers the period between 1400 and 1444, when, according to another chronicler, Matthieu d'Escouchy, he ceased to write. But following a custom which was by no means uncommon in the middle ages, a clumsy sequel, extending to 1516, was formed out of various chronicles and tacked on to his work. Monstrelet's own writings, dealing with the latter part of the Hundred Years' War, are valuable because they contain a large number of documents which are certainly, and reported speeches which

are probably, authentic. The author, however, shows little power of narration; his work, although clear, is dull, and is strongly tinged with the pedantry of its century, the most pedantic in French history. His somewhat ostentatious asser- tions of impartiality do not cloak a marked preference for the Burgundians in their struggle with France.

Among many editions of the Chronique may be mentioned the one edited for the SociUe de Vhistoire de France by M. Douet d'Arcq (Paris, 1857–1862), which, however, is not very good. See A. Molinier, Les Sources de Vhistoire de France, tomes iv. and v. (Paris, 1904).

MONTAGNAIS (Fr. " mountaineers "), the collective French name (1) for a group of North American Indian tribes of Quebec province, (2) for four tribes of

the northern division of the Athabascan stock of North American Indians in the interior of British North America.

MONTAGU (Family). Dru of Montaigu or Montagud, the ancestor of the Montagus, earls of Salisbury, came to England with Robert, count of Mortain, half-brother of William the Conqueror. He is found in Domesday among the chief tenants of the count in Somerset, where Dru held the manor of Shepton, afterwards called Shepton Montagu. Upon the hill of Lutgares- burg, in Bishopston, Robert built the castle which he called Montaigu— but there is no reason for believing that Dru's surname was derived from the castle, he being probably a Norman born — from Montaigu or Montaigu-les-bois, both in the neighbourhood of Mortain. The Domesday holding of Dru is represented in the return of 1166 by the ten knights' fee upon which his descendant, another Dru, is assessed. William Montagu of Shepton is among the knights summoned by Henry III. to the Gascon War and to the Welsh border in 1257. His son Simon, the first of the family to make a figure in history, followed Edward I. in 1277 against Llywelyn ap Gruffydd, being then, as it would appear, a minor, and he served again in 1282, when Llywelyn's power was broken for the last time. By a charter dated in 1290 his Somersetshire manors and the manor of Aston Clinton were confirmed to him by a grant from the Crown. In 1296 a ship under his command broke the blockade of Bordeaux. In 1298 he was summoned as a baron; and in 1301, as Simon lord of Montagu, he sealed the famous letter of the barons to the pope with his seal of the arms of Montagu, the counterseal showing a griffon. One of the earliest examples of quartered arms seen in England was afforded when Simon's banner displayed at Falkirk in 1298 quartered this griffon, gold on a blue field, with the Montagu's indented fesse of three fusils. He died in 13 17 and was succeeded by his son William (d. 1319), a favourite of Edward II., whose household steward he became, and seneschal of Aquitaine and Gascony. His eldest son, another William, came of age in 1322, and in 1330 led the

young king's partisans by the secret way into Nottingham Castle, and carried off the earl of March. The day before Mortimer had denounced Montagu as a traitor, but Montagu struck at once and his success was rewarded by grants from the forfeited lands of March. In 1337 he was created earl of Salis- bury, and on the death of Thomas of Brotherton in 1338 he was made marshal of England. His king employed him in missions to France, Scotland, Germany and Castile, but war was, as with most of the men of his house, the chief business of his short life. At some time between 1340 and 1342 he led an expedition of his own against the Isle of Man, winning from the Scots the little kingdom to which he had inherited a claim. His grandfather Simon is said to have married a certain Auffray or " Aufrica," sometimes described as " daughter of Fergus and sister of Orray, king of Man," and sometimes as the grand-daughter and heir of John de Courcy, the conqueror of Ulster, whose wife " Affreca " was sister of King Olaf II. John de Courcy, however, died childless, and in 1287 Simon names his wife as Ha wise. The second Aufrica or Affreca claimed the island as heir of Magnus II. (d. 1265), a letter of Edward I. in 1293 citing John of Scotland to answer her appeal to king John's suzerain. By her charter of 1306 the same Aufreca, styling herself " Aufreca of Counnoght, heir of the land of Man," granted the island to Simon, and this grant, rather than the marriage universally asserted by Simon's biographers, was probably the origin of the Montagu

claim. The first earl died in 1344 and was buried in the White- friars Church in London. His wife, Katherine, daughter of William de Graunson, and co-heir, in her issue, of her brothers, is connected by a legend of no value with the foundation of the Order of the Garter. Between William, his son and heir, the second earl (1328-1397) and Joan of Kent, daughter of Edmund of Woodstock, there was a

contract of marriage which was made null by the pope's bull in 1349. William was one of the knights-founders of the Order of the Garter, fought at Crecy, and com- manded the rearward battle at Poitiers. According to Froissart he attended the young Richard in Smithfield when the king faced the mob after the death of Wat Tyler. His only son was killed in 1383 at a tournament, and in 1393 the earl sold the lordship and crown of Man to William Scrope of Bolton. He was suc- ceeded by his nephew John, the third earl (c. 1350-1400), son of Sir John Montagu by Margaret, the heir of the barons of Monthermer. The new earl was notorious as a Lollard, and was accused, after Henry IV.'s accession, of a share in Gloucester's death, from which he was to have cleared himself in combat with the Lord Morley. But he joined Kent, Huntingdon and Rutland in their plot against Henry, and was beheaded with the earl^of Kent by the Cirencester mob. By his wife Maude, daughter of Sir Adam Francis, he had Thomas (1388-1428), who was sum- moned as an earl in 1409, his father's dignities being restored to him in 142 j, by which time his services at Harfleur and Agin-court had earned him French lordships, the lieutenant-general- ship of Normandy and the earldom of Perche. The last of a race of warriors, he ended his service at the famous siege of Orleans, a cannon-ball dashing into his face the stone and iron- work of the window from which he was gazing at the city. By his second wife, the daughter of Thomas Chaucer the Speaker, he had no issue. By his first wife, Eleanor, daughter of Thomas Holand, earl of Kent, he had an only daughter Alice, wife of Richard Neville, a younger son of the first earl of Westmorland, who claimed and was allowed the earldom of Salisbury in right of his marriage. The famous " Richard Make-a-King," earl of Warwick and Salisbury, was the grandson of the last of the Montagu earls.

Sir Edward Montagu of Boughton, a chief justice of the king's bench who died in 1557, was ancestor of three lines of peers, the dukes of Montagu, the dukes of Manchester, and the earls of Sandwich. These Montagus of Boughton claimed, by a false

pedigree, descent from the third earl of Salisbury. It is possible that there may have been some kinship between the two families, but none, apparently, that could justify the persistent quartering by these later Montagus of the arms of Monthermer.

Authorities. — Collinson's Somerset; G. E. C.'s Complete Peerage; Victoria County History of Somerset (J. H. Round's introduction to Domesday); Rymer's Foedera; Palgrave's Parliamentary Writs; Rolls of Parliament; Ramsay's Lancaster and York; Gesta Henrici V. (English Hist. Soc.) ; Chronicles of Walsingham, Knighton, Cap- grave Wavrin, Frousart, Monstrelet, &c. Inquests, Post mortem, Close, Patent, Charter and Fine Rolls; Dugdale's Monasticon Publi- cations of Somerset Record Society; Charters in British Museum and Public Record Office. (O. Ba.)

MONTAGU, ELIZABETH ROBINSON (1720-1800), English leader of society, was born at York on the 2nd of October 1720. In 1742 she married Charles Montagu, cousin of Edward Wortley Montagu and son of the earl of Sandwich — a wealthy man, considerably her senior. Thanks to her, his Mayfair house became the social centre of intellectual society in London, and her breakfast parties and evening conversaziones gained for her from her admirers the title of " The Madame du Deffand of the English capital." In other quarters the term " blue-stocking " was applied to her guests. From her husband, who died in 1775, she inherited a considerable fortune and large estates, in the management of which she showed much ability. In 1781 she built Sandleford Priory, near Newbury, and Montagu House, now 22 Portman Square, London, the latter from designs by James Stuart. With the colliers in the north she was extremely popular, and every May-day she entertained the London chimney-sweeps. She died on the 25th of August 1800. There is an admirable portrait of her by Reynolds.

See Elizabeth Montagu, the Queen of the Blue Stockings: Her Corre- spondence from 1720 to 1761, edited by E. J. Climenson (2 vols., 1906) ; and R. Huchon, Mrs Montagu and her Friends, 1720-1800 (Eng.

trans., 1907).

MONTAGU, LADY MARY WORTLEY (1689–1762), English letter-writer, eldest daughter of Evelyn Pierrepont, afterwards duke of Kingston, was baptized at Covent Garden on the 26th of May 1689. Her mother, who died while her daughter was still a child, was a daughter of William Feilding, earl of Denbigh. Her father was proud of her beauty and wit, and when she was eight years old she is said to have been the toast of the Kit-Kat Club. He took small pains with the education of his children, but Lady Mary was encouraged in her self-imposed studies by her uncle, William Feilding, and by Bishop Burnet. She formed a close friendship with Mary Astell, who was a champion of woman's rights, and with Anne Wortley Montagu, grand-daughter of the first earl of Sandwich. With this lady she carried on an animated correspondence. The letters on Anne's side, however, were often copied from drafts written by her brother, Edward Wortley Montagu, and after Anne's death in 1709 the correspondence between him and Lady Mary was prosecuted without an intermediary. Lady Mary's father, now marquess of Dorchester, declined, however, to accept Montagu as a son- in-law because he refused to entail his estate on a possible heir. Negotiations were broken off, and when the marquess insisted on another marriage for his daughter the pair eloped (1 7 1 2) . The early years of Lady Mary Wortley Montagu's married life were spent in rigid economy and retirement in the country. Her husband was M.P. for Westminster in 1715, and shortly afterwards was made a commissioner of the treasury. When Lady Mary joined him in London her wit and beauty soon made her a prominent figure at court. Early in 1716 Montagu was appointed ambassador at Constantinople. Lady Mary accompanied him to Vienna, and thence to Adrianople and Constantinople. He was recalled in 1717, but they remained at Constantinople until 1718. The story of this voyage and of her observations of Eastern life is told in a series of lively letters full of graphic description. From Turkey she brought back the practice of inoculation for small-pox. She had

her own children inoculated, and encoun- tered a vast amount of prejudice in bringing the matter forward. Before starting for the East she had made the acquaintance of Alexander Pope, and during her absence he addressed to her a series of extravagant letters, which appear to have been chiefly exercises in the art of writing gallant epistles. Very few letters passed after Lady Mary's return, and various reasons have been suggested for the subsequent estrangement and violent quarrel. Mr Moy Thomas suggests that the cause is to be found in the last of the " Letters during the embassy to Constantinople." It is addressed to Pope and purports to be dated from Dover, the 1st of November 17 18. It contains a parody on Pope's " Epitaph on the Lovers struck by Lightning." The MS. collection of these letters was passed round a considerable circle, and Pope may well have been offended at the circulation of this piece of satire. Jealousy of her friendship with Lord Hervey has also been alleged, but Lady Louisa Stuart says Pope had made Lady Mary a declaration of love, which she had received with an outburst of laughter. In any case Lady Mary always professed complete innocence of all cause of offence in public. She is alluded to in the Dunciad in a passage to which Pope affixed one of his insult- ing notes. A Pop upon Pope was generally supposed to be from her pen, and Pope thought she was part author of One Epistle to Mr A. Pope (1730). Pope attacked her again and again, but with especial virulence in a gross couplet in the " Imi- tation of the First Satire of the Second Book of Horace," as Sappho. She asked a third person to remonstrate, and received the obvious answer that Pope could not have foreseen that she or any one else would apply so base an insult to herself. Verses addressed to an Imitator of Horace by a Lady (1733), a scurrilous reply to these attacks, is generally attributed to the joint efforts of Lady Mary and her sworn ally, Lord Hervey. She had a romantic correspondence with a Frenchman named R6mond, who addressed to her a series of excessively gallant letters before

ever seeing her. She invested money for him in South Sea stock at his desire, and as was expressly stated, at his own risk. The value fell to half the price, and he tried to extort the original sum as a debt by a threat of exposing the correspondence to her husband. She seems to have been really alarmed, not at the imputation of gallantry, but lest her husband should discover the extent of her own speculations. This disposes of the second half of Pope's line " Who starves a sister, or forswears a debt " {Epilogue to the Satires, i. 113), and the first charge is quite devoid of foundation. She did in fact try to rescue her favourite sister, the countess of Mar, who was mentally deranged, from the custody of her brother-in-law, Lord Grange, who had treated his own wife with notorious cruelty, and the slander originated with him.

In 1739 she went abroad, and although she continued to write to her husband in terms of affection and respect they never met again. At Florence in 1740 she visited Horace Walpole, who cherished a great spite against her, and exaggerated her eccentricities into a revolting slovenliness (see Letters, ed. Cunningham, i. 59). She lived at Avignon, at Brescia, and at Lovere, on the Lago dTseo. She was disfigured by a painful skin disease, and her sufferings were so acute that she hints at the possibility of madness. She was struck with a terrible " fit of sickness " while visiting the countess Palazzo and her son, and perhaps her mental condition made restraint necessary. As Lady Mary was then in her sixty-third year, the scandalous interpretation put on the matter by Horace Walpole may safely be discarded. Her husband spent his last years in hoarding money, and at his death in 1761 is said to have been a million- aire. His extreme parsimony is satirized in Pope's Imitations of Horace (2nd satire of the 2nd book) in the portrait of Avidieu and his wife. Her daughter Mary, countess of Bute, whose husband was now prime minister, begged her to return to England. She came to London, and died in the year of her return, on the 21st of

August 1762.

Her son, Edward Wortley Montagu (1713-1776), author and traveller, inherited something of his mother's gift and more than her eccentricity. He twice ran away from Winchester School, and the second time made his way as far as Oporto. He was then sent to travel with a tutor in the West Indies, and afterwards with a keeper to Holland. He made, however, a serious study of Arabic at Leiden (1741), and returned twenty years later to prosecute his studies. His father made him a meagre allowance, and he was heavily encumbered with debt. He was M.P. for Huntingdon in 1747, and was one of the secre- taries at the conference of Aix-la-Chapelle. In 1751 he was involved in a disreputable gaming quarrel in Paris, and was imprisoned for eleven days in the Chatelet. He continued to sit in parliament, and wrote Reflections on the Rise and Fall of the Antient Republics . . . (1759)- His father left him an annuity of £1000, the bulk of the property going to Lady Bute. He set out for extended travel in the East, and George Romney describes him as living in the Turkish manner at Venice. He had great gifts as a linguist, and was an excellent talker. His family thought him mad, and his mother left him a guinea, but her annuity devolved on him at her death. He died at Padua on the 29th of April 1776.

Lady Mary's " Town Eclogues " were published in a pirated edition as Court Poems in 1 716. Of her famous Letters from the East she made a copy shortly after her return to England. She gave the MS. to Benjamin Sowden, a clergyman of Rotterdam, in 1761. After Lady Mary's death this was recovered by the earl of Bute, but meanwhile an unauthenticated edition, supposed to have been prepared by John Cleland, appeared (1763), and an additional volume, probably spurious, was printed in 1767. The rest of the correspondence printed by Lord Wharncliffe in the edition of her letters is edited from originals in the Wortley collection. This edition (1837) contained " Introductory Anecdotes " by Lady Bute's daughter, Lady Louisa Stuart. A more critical edition of the text, with the " Anecdotes," and a "

Memoir ” by W. Moy Thomas, appeared in 1 86 1. A selection of the letters arranged to give a continuous account of her life, by Mr A. R. Ropes, was published in 1892; and another by R. Brimley Johnson in ” Everyman’s Library ” in 1906. See also George Paston, Lady Mary Wortley Montagu and her Times (1907), which contains some hitherto unpublished letters.

Lady Mary’s journal was preserved by her daughter, Lady Bute, till shortly before her death, when she burnt it on the ground that it contained much scandal and satire, founded probably on insufficient evidence, about many distinguished persons. There is a full and amusing account of Edward Wortley Montagu in Nichols’s Anecdotes of Literature, iv. 625–656.

MONTAGU, RALPH, ist Duke of (c. 1638–1709), English diplomatist, was the second son of Edward, 2nd Baron Montagu of Boughton (1616–1684), whose peerage was one of several granted in the 17th century to different members of the Montagu family (q.v.). Sir Edward Montagu, chief justice of the king’s bench in the time of Henry VIII. , was grandfather of the first earl of Manchester (see Manchester, Earls and Dukes ‘or), and of Edward, ist Baron Montagu of Boughton (1562–1644), who was imprisoned in the Tower by the parliament on account of his loyalty to Charles I. The eldest son of the latter, Edward, who succeeded him as 2nd baron, took the side of the parlia- ment in the Civil War, and was one of the lords who conducted the king from Newark to Holmby House after his surrender by the Scots in January 1647. He had two sons, of whom Ralph was the younger. The eldest son, Edward, was master of the horse to Queen Catherine, wife of Charles II., a post from which he is said to have been dismissed by the king for showing attention to the queen of too ardent a nature. Catherine imme- diately appointed the younger brother, Ralph, to the vacant situation, and the latter soon acquired a reputation for gallantry at the court of Charles II. He took an active part in the nego- tiations in which Louis XIV. purchased the neutrality of England in the war between France and Holland. Having quarrelled with

Danby and the duchess of Cleveland, who denounced him to the king, Montagu was elected member of parliament for Northampton in 1678, with the intention of bringing about the fall of Danby; but, having produced letters seriously com- promising the minister, the dissolution of parliament placed him in such danger of arrest that he attempted to fly to France. Foiled in this design, he continued to intrigue against the govern- ment, supporting the movement for excluding the duke of York from the succession and for recognizing Monmouth as heir to the crown. His elder brother having predeceased his father, Ralph became Baron Montagu of Boughton on the death of the latter in 1684. Notwithstanding his former intrigues he gained the favour of James II. on his accession to the throne; but this did not deter him from welcoming William of Orange, who created him Viscount Monthermer and earl of Montagu in 1689. Montagu was no less avaricious than unscrupulous. In 1673 he had married the wealthy widow of the earl of Northumberland, Elizabeth Wriothesley, daughter of the earl of Southampton, who brought him a large fortune; and after her death in 1690 he married the still more wealthy Elizabeth Cavendish, daughter of the duke of Newcastle, and widow of Christopher Monk, 2nd duke of Albemarle. Montagu's position was further strength- ened in 1705 by the marriage of his son and heir to Mary, daughter of the great duke of Marlborough. In the same year he was raised to the dukedom as duke of Montagu and marquess of Monthermer. He died on the 9th of March 1709. His London residence, Montagu House, Bloomsbury, was bought by the government in 1753 to hold the national collection of antiqui- ties, and on its site was built the British Museum.

The duke was succeeded by his son John, 2nd duke of Montagu (1689–1749), who in 1745 raised a cavalry regiment known as Montagu's Carabineers, which, however, was disbanded after Culloden. He was made a K.G. in 17 19, and was a fellow of the Royal Society. As neither of his two sons survived him the title became extinct at his death in 1749, but in 1730 his daughter Mary married George Brudenell, 4th

earl of Cardigan (1 7 1 2-1 700), who on his father-in-law's death assumed the name and arms of Montagu, and in 1766 was created duke of Montagu. On his death, in 1790, this second dukedom of Montagu also became extinct; his only son, who was created Baron Montagu of Boughton, having predeceased him. His daughter Elizabeth married Henry, 2nd duke of Buccleuch, who thus acquired all the unentailed property of the dukes of Montagu, the entailed portion passing to the earls of Cardigan.

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MONTAGU, R.— MONTAIGNE

See Abel Boyer, History of the Reign of Queen Anne, vol. viii. (n vols., London, 1703-1713); Sir J. B. Burke, Genealogical History of Dormant (&"c.) Peerages (London, 1883).

MONTAGU (or Mountagtje), RICHARD (1577-1641), English divine, was born at Dorney, Buckinghamshire, and educated at Eton and Cambridge. In 1613 he was elected fellow of Eton and became rector of Stanford Rivers, Essex. He was appointed to the deanery of Hereford in 1616, but exchanged it next year for a canonry of Windsor, which he held with the rectory of Petworth, Sussex. He was also chaplain to James I. Like Laud, he disliked the extremes of Calvinism and Romanism, and this attitude constantly involved him in difficulties. About 1610 he came into collision with some Roman Catholics in his parish, and Matthew Kellison (is6o?i642) attacked him in a pamphlet entitled The Gagg of the Reformed Gospell (Douai, 1623). Montagu replied with A Gagg for the New Gospell? No. A New Gagg for an Old Goose (London, 1624). The publication of the Immediate Addresse unto God alone (London, 1624) incensed the Puritans, who appealed to the House of Commons, but Montagu was protected by the king. After the appearance of his famous Appello Caesarem (London, 1625), his case fre quently came before parliament and conferences of bishops, but his influence at court and with Laud enabled him to hold his ground. He was consecrated bishop of Chichester in 1628, and

became bishop of Norwich in 1638. He died on the 13th of April 1 64 1.

MONTAIGNE, MICHEL DE (1533-1592), French essayist, was born, as he himself tells us, between eleven - o'clock and noon on the 28th of February 1533. The patronymic of the Montaigne family, who derived their title from the chateau at which the essayist was born and which had been bought by his grandfather, was Eyquem. It was believed to be of English origin, and the long tenure of Gascony and Guienne by the English certainly provided abundant opportunity for the introduction of English colonists. But the elaborate researches of M. Malvezin (Michel de Montaigne, son origine et safamille, 1875) proved the existence of a family of Eyquems or Ayquems before the marriage of Eleanor of Aquitaine to Henry II. of England, though no connexion between this family, who were sieurs de Lesparre, and the essayist's ancestors can be made out. Montaigne is not far from Bordeaux, with which the Eyquem family had for some time been connected. Pierre Eyquem, Montaigne's father, had been engaged in commerce (a herring-merchant Scaliger calls him, and his grandfather Ramon had certainly followed that trade), had filled many municipal offices in Bordeaux, and had served under Francis I. in Italy as a soldier. He married Antoinette de Louppes (Lopez), descended from a family of Spanish Jews. The essayist was the third son. By the death of his elder brothers, however, he became head of the family. He had also six younger brothers and sisters. His father appears, like many other men of the time, to have made a hobby of educa- tion. Montaigne was not only put out to nurse with a peasant woman, but had his sponsors from the same class, and was accustomed to associate with it. He was taught Latin orally by servants (a German tutor, Horstanus, is especially mentioned), who could speak no French, and many curious fancies were tried on him, as, for instance, that of waking him every morning by soft music. But he was by no means allowed to be idle. A plan of teaching him Greek by some kind of mechanical arrangement is not very

intelligible, and was quite unsuccessful. These details of his education (which, like most else that is known about him, come from his own mouth) are not only interesting in them- selves, but remind the reader how, not far from the same time, Rabelais, the other leading writer of French during the Renais- sance, was exercising himself, though not being exercised, in plans of education almost as fantastic. At six years old Montaigne was sent to the college de Guienne at Bordeaux, then at the height of its reputation. Among its masters were Buchanan, afterwards the teacher of James I., and Muretus, one of the first scholars of the age. At thirteen Montaigne left the college de Guienne and began to study law, it is not known where, but probably at Toulouse. In 1548 he was at Bordeaux during one

of the frequent riots caused by the gabelle, or salt-tax. Six years afterwards, having attained his majority, he was made a counsellor in the Bordeaux parlement. In 1558 he was present at the siege of Thionville, in 1559 and 1561 at Paris, and in 1562 at the siege of Rouen. He was also much about the court, and he admits very frankly that in his youth he led a life of pleasure, if not exactly of excess. In 1565 he married Francoise de la Chassaigne, whose father was, like himself, a member of the Bordeaux parlement. Three years later his father died, and he succeeded to the family possessions. Finally, in 1571, as he tells us in an inscription still extant, he retired to Montaigne to take up his abode there, having given up his magistracy the year before. His health, never strong, had been further weakened by the hard living which was usual at the time. He resolved, accordingly, to retire to a life of study and contempla tion, though he indulged in no asceticism except careful diet. He neither had nor professed any enthusiastic affection for his wife, but he lived on excellent terms with her, and bestowed some pains on the education of the only child (a daughter, Leonore) who survived infancy. In his study — a tower of refuge, separate from the house, which he has minutely described — he read,

wrote, dictated, meditated, inscribed moral sentences which still remain on the walls and rafters, annotated his books, some of which are still in existence, and in other ways gave himself up to a learned ease.

He was not new to literature. In his father's lifetime, and at his request, he had translated the Theologia naturalis of Raymund de Sabunde, a Spanish schoolman (published 1569). On first coming to live at Montaigne he edited the works of his deceased friend Etienne de la Boetie, who had been the comrade of his youth, who died early, and who, with poems of real pro- mise, had composed a declamatory and school-boyish theme on republicanism, entitled the Contr' un, which is one of the most over-estimated books in literature. But the years of his studious retirement were spent on a work of infinitely greater importance. Garrulous after a fashion as Montaigne is, he gives us no clear idea of any original or definite impulse leading him to write the famous Essays. It is very probable that if they were at first intended to have any special form at all it was that of a table- book or journal, such as was never more commonly kept than in the 16th century. It is certainly very noticeable that the earlier essays, those of the first two books, differ from the later in one most striking point, in that of length. Speaking gener- ally, the essays of the-third book average fully four times the length of those of the other two. This of itself would suggest a difference in the system of composition. These first two books appeared in 1580, when their author was forty-seven years old.

They contain, as at present published, no fewer than ninety-three essays, besides an exceedingly long apology for the already men- tioned Raymund Sabunde, in which some have seen the kernel of Montaigne's philosophy. The book begins with a short avis (address to the reader), opening with the well-known words, " C'est icy un livre de bonfoy, lecteur," and sketching in a few lively sentences the character of meditative egotism which is kept up throughout. His sole object, the author says, is to leave for his

friends and relations a mental portrait of himself, defects and all; he cares neither for utility nor for fame. The essays then begin, without any attempt to explain or classify their subjects. Their titles are of the most diverse character. Sometimes they are proverbial sayings or moral adages, such as ” Par divers moyens on arrive a pareille fin,” ” Qu’il ne faut juger de notre heur qu’apres la mort,” Le profit de Ton est le dommage de l’aultre.” Sometimes they are headed like the chapters of a treatise on ethics: ” De la tristesse,” ” De 1’oisiveteY’ ” De la peur,” ” De 1’amitieV’ Sometimes a fact of some sort which has awaked a train of associations in the mind of the writer serves as a title, such as ” On est puni de s’opiniastrer a une place sans raison.” ” De la bataille de Dreux,” &c. Occasionally the titles seem to be deliberately fantastic, as ” Des puces,” ” De l’usage de se vestir.” Sometimes, though not very often, the sec- tions are in no proper sense essays, but merely commonplace book entries of singular facts or quotations, with hardly any comment. These point to the haphazard or indirect origin of them, which has been already suggested. But generally the essay-character — that is to say, the discussion of a special point, it may be with wide digres- sions and divergences — displays itself. The digressions are indeed constant, and sometimes have the appearance of being absolutely wilful. The nominal title, even when most strictly observed, is

rarely more than a starting-point ; and, though the brevity of these first essays for the most part prevents the author from journeying very far, he contrives to get to the utmost range of his tether. Quotations are very frequent.

In 1571 he had received the order of Saint- Michel; in 1574 was with the army of the duke de Montpensier; two years later was made gentleman-in-ordinary to Henry III., and next year again to Henry

of Navarre. He visited Paris occasionally, and travelled for health or pleasure to Cauterets, Eaux Chaudes and elsewhere. But his health grew worse and worse, and he was tormented by stone and gravel. He accordingly resolved to journey to the baths of Lucca. Late in the 18th century a journal was found in the chateau of Montaigne giving an account of this journey, and it was published in 1774; part of it is written in Italian and part dictated in French, the latter being for the most part the work of a secretary or servant. Whatever may be the biographical value of this work, which has rarely been reprinted with the Essays themselves, and the MS. of which disappeared early, it is almost entirely destitute of literary interest. The course of the journey was first northwards to Plombieres, then by Basel to Augsburg and Munich, then through Tirol to Verona and Padua in Italy. Montaigne visited most of the famous cities of the north and centre, staying five months at Rome, where he had an audience of the pope and was made a Roman citizen, and finally establishing himself at the baths of Lucca for nearly as long a time. There he received news of his election as mayor of Bordeaux with a peremptory royal endorsement enjoining residence, and after some time journeyed homewards. The tour contains much minute information about roads, food, travelling, &c, but the singular condition in which it exists and the disappearance of the MS. make it rather difficult to use it as a document. The best argument in its favour is the improbability of anybody having taken the trouble to forge so bald and awkward a heap of details. Of the fact of the journey there is no doubt whatever.

Montaigne was not altogether delighted at his election to the mayoralty, which promised him two years of responsible if not very hard work. The memory of his lather, however, and the commands of the king induced him to accept it; and he seems to have discharged it neither better nor worse than an average magistrate. Indeed, he gave sufficient satisfaction to the citizens to be re-elected at the close of his term, and it may be suspected that the

honour of the position, which was really one of considerable dignity and importance, was not altogether indifferent to him. Unfortunately, it cannot be said that ” nothing in his office became him like the leaving of it.” It was his business, if not exactly his duty, to preside at the formal election of his successor, the marechal de Matignon; but there was a severe pestilence in Bordeaux, and Montaigne writes to the jurats of that town, in one of the few undoubtedly authentic letters which we possess, to the effect that he will leave them to judge whether his presence at the election is so necessary as to make it worth his while to expose himself to the danger of going into the town in its then condition, ” which is specially dangerous for men coming from a good air, as he does.” It may be urged in his favour that the general circumstances of the time, where they did not produce reckless and foolhardy daring, almost necessarily produced a somewhat excessive caution. However this may be, Montaigne had difficulty enough during this turbulent period, all the more so from his neighbourhood to the chief haunts and possessions of Henry of Navarre, who actually visited him at Montaigne in 1584. He was able, despite the occupations of his journey, his mayoralty, and the pressure of civil war and pestilence, which was not confined to the town, to continue his essay-writing. His second term of office termi- nated in 1585; and in 1588 after a visit of some length to Paris, the third book of the Essays was published, together with the former ones considerably revised. The new essays, as has been remarked, differ strikingly from the older ones in respect of length; and the whimsical unexpectedness of the titles reappears in but two of them: ” Des Coches ” and ” Des Boiteux.” They arc however, identical with the earlier ones in spirit, and make

with them a harmonious whole — a book which has hardly been second in influence to any of the modern world.

This influence is almost equally remarkable in point of matter and in point of form. The latter aspect

may be taken first. Mon- taigne is one of the few great writers who have not only perfected but have also invented a literary kind. The essay as he gave it had no forerunner in modern literature and no direct ancestor in the litera- ture of classical times. It has been suggested that the form which the essays assumed was in a way accidental, and this of itself pre- cludes the idea of a definite model, even if such a model could be found. Beginning with the throwing together of a few stray thoughts and quotations linked by a community of subject, the author by degrees acquires more and more certainty of hand, until he produces such masterpieces of apparent desultoriness and real unity as the essay " Sur des vers de Virgile." In matter of style and language Montaigne's position is equally important, but the ways which led him to it are more clearly traceable. His favourite author was be- yond all doubt Plutarch, and his own explicit confession makes it undeniable that Plutarch's translator, Jacques Amyot, was his master in point of vocabulary and (so far as he took any lessons in it) of style. Montaigne, however, followed with the perfect independence that characterized him. He was a contemporary of Ronsard, and his first essays were published when the innovations of the Pleiade had fully established themselves. He adopted them to a great extent, but with much discrimination, and he used his own judgment in latinizing when he pleased. In the same way he retained archaic and provin- cial words with a good deal of freedom, but by no means to excess. In the arrangement, as in the selection, of his language he is equally original. He has not the excessive classicism of style which mars even the fine prose of Jean Calvin, and which makes that of some of Calvin's followers intolerably stiff. As a rule he is careless of definitely rhythmical cadence, though his sentences are always pleasant to the ear. But the principal characteristic of Montaigne's prose style is its remarkable ease and flexibility. A few years after Montaigne's death a great revolution, as is generally known, passed over France. The criticism of Malherbe, followed by the establish- ment of the Academy, the minute

grammatical censures of Claude Favre Vaugelas, and the severe literary censorship of Boileau, turned French in less than three-quarters of a century from one of the freest languages in Europe to one of the most restricted. During this revolution only two writers of older date held their ground, and those two were Rabelais and Montaigne — Montaigne being of his nature more generally readable than Rabelais. All the great prose writers of France could not fail to be influenced by the racy phrase, the quaint and picturesque vocabulary, and the unconstrained constructions of Montaigne.

It would be impossible, however, for the stoutest defender of the importance of form in literature to assign the chief part in Mon- taigne's influence to style. It is the method, or rather the manner of thinking, of which that style is the garment, which has in reality exercised influence on the world. Like all the greatest writers except Shakespeare, Montaigne thoroughly and completely exhibits the intellectual and moral complexion of his own time. When he reached manhood the French Renaissance was at high water, and the turn of the tide was beginning. Rabelais, who died when Montaigne was still in early manhood, exhibits the earlier and rising spirit, though he needs to be completed on the poetical side. With Montaigne begins the age of disenchantment. By the time at least when he began to meditate his essays in the retirement of his country house it was tolerably certain that no golden age was about to return. As the earlier Renaissance had specially occupied itself with the practical business and pleasures of life, so the later Renaissance specially mused on the vanity of this business and these pleasures. The predisposing circumstances which affected Montaigne were thus likely to incline him to scepticism, to ethical musings on the vanity ot life and the like. But to all this there had to be added the peculiarity of his own temperament. This was a decidedly complicated one, and neglect of it has led some readers to adopt a more positive idea of Montaigne's scepticism than is fully justified by all the facts.

The attitude which he assumed was no doubt ephectic and critical chiefly. In the ” Apologie de Raymund Sabunde, ‘ he has apparently amused himself with gathering together, in the shape of quota- tions as well as of reflections, all that can be said against certainty in aesthetics as well as in dogmatics. It is even said by some who have examined the original (vide infra) that the text and altera- tions show a progressively freethinking attitude, side by side with a growing tendency to conceal it by ambiguity and innuendo. But until all the documents are accessible this must remain doubtful. The general tenor of the essays is in complete contrast with this sceptical attitude, at least in its more decided form, and it is worth notice that the motto ” Que scai-je? ” does not appear on the title- page till after the writer’s death. Montaigne is far too much occu- pied about all sorts of the minutest details of human life to make it for a moment admissible that he regarded that life as a whole but as smoke and vapour. And it is almost certainly wrong, though M. Brunetiere may have given countenance and currency to the idea, to regard his philosophy as in the main intended as a succour against the fear of death. The reason of the misapprehension of him which is current is due very mainly to the fact that he was eminently a

humorist. Perhaps the only actual parallel to Montaigne in literature is Lamb. There are differences between them, arising naturally enough from differences of temperament and experience ; but both agree in their attitude — an attitude which is sceptical without being negative and humorous without being satiric. There is hardly any writer in whom the human comedy is treated with such completeness as it is in Montaigne. There is discernible in his essays no attempt to map out a complete plan, and then to fill up its outlines. But in the desultory and haphazard fashion which distinguishes him there are few parts of life on

which he does not touch, if only to show the eternal contrast and antithesis which dominate it. The exceptions are chiefly to be found in the higher and more poetical strains of feeling to which the humorist temperament lends itself with reluctance and distrust, though it by no means excludes them. The positiveness of the French disposition is already noticeable in Rabelais; it becomes more noticeable still in Montaigne. He is always charming, but he is rarely inspiring, except in a very few passages where the sense of vanity and nothingness possesses him with unusual strength. As a general rule, an agreeable grotesque of the affairs of life (a grotesque which never loses hold of good taste sufficiently to be called burlesque) occupies him. There is a kind of anticipation of the scientific spirit in the careful zeal with which he picks up odd aspects of mankind and comments upon them as he places them in his museum. Such a temperament is most pleasantly shown when it is least personal. A dozen genera- tions of men have rejoiced in the gentle irony with which Montaigne handles the ludicrum humani saeculi, in the quaint felicity of his selection of examples, and in the real though sometimes fantastic wisdom of his comment on his selections.

Montaigne did not very long survive the completion of his book. On his way to Paris for the purpose of getting it printed he stayed for some time at Blois, where he met De Thou. In Paris itself he was for a short time committed to the Bastille by the Leaguers, as a kind of hostage, it is said, for a member of their party who had been arrested at Rouen by Henry of Navarre. But he was .in no real danger. He was well known to and favoured by both Catherine de' Medici and the Guises, and was very soon released. In Paris, too, at this time he made a whimsical but pleasant friendship. Marie de Jars de Gournay (1565-1645), one of the most learned ladies of the 16th and 17 th centuries, had conceived such a veneration for the author of the Essays that, though a very young girl and connected with many noble families, she travelled to the capital on

purpose to make his acquaintance. He gave her the title of his ” fille d’alliance ” (adopted daughter), which she bore proudly for the rest of her long life. She lived far into the 17th century, and became a character and something of a laughing-stock to the new generation; but her services to Montaigne’s literary memory were, as will be seen, great. Of his other friends in these last years of his life the most important were Etienne Pasquier and Pierre Charron. The latter, indeed, was more than a friend, he was a disciple; and Montaigne, just as he had constituted Mile de Gournay his ” fille d’alliance,” bestowed on Charron the rather curious compliment of desiring that he should take the arms of the family of Montaigne. It has been thought from these two facts, and from an expression in one of the later essays, that the marriage of his daughter Leonore to Gaston de La Tour had not turned out to his satisfaction. But family affection, except towards his father, was by no means Montaigne’s strongest point. When Henry of Navarre came to the throne of France, he wished Montaigne, whom he had again visited in 1587, to come to court, but the essayist refused. It would seem that he returned from Paris to his old life of study and medita- tion and working up his Essays. No new ones were found after his death, but many alterations and insertions. His various maladies grew worse; yet they were not the direct cause of his death. He was attacked with quinsy, which rapidly brought about paralysis of the tongue, and he died on the 13th of September 1592, in circumstances which, as Pasquier reports them, completely disprove any intention of displaying anti- Christian or anti-Catholic leanings. He was buried, though not till some months after his death, in a church in Bordeaux, which after some vicissitudes became the chapel of the college. During the Revolution the tomb, and as it was supposed the coffin, were transferred with much pomp to the town museum; but it was discovered that the wrong coffin had been taken, and it was afterwards restored to its old position. Montaigne’s widow

survived him, and his daughter left posterity which became merged in the noble houses of Segur and Lur-Saluces. But it does not appear that any male representative of the family survived.

When Mile de Gournay heard of the death of Montaigne she undertook with her mother a visit of ceremony and condolence to the widow, which had important results for literature. Mme de Montaigne gave her a copy of the edition of 1588 annotated copiously; at the same time, apparently, she bestowed another copy, also annotated by the author, on the convent of the Feuillants in Bordeaux, to which the church in which his remains lay was attached. Mile de Gournay thereupon set to work to produce a new and final edition with a zeal and energy which would have done credit to any editor of any date. She herself worked with her own copy, inserting the additions, marking the alterations and translating all the quotations. But when she had got this to press she sent the proofs to Bordeaux, where a poet of some note, Pierre de Brach, revised them with the other annotated copy. The edition thus produced in 1595 has with justice passed as the standard, even in preference to those which appeared in the author's lifetime. Unluckily, Mile de Gournay's original does not appear to exist and her text was said, until the appearance of MM. Courbet and Royer's edition, to have been somewhat wantonly corrupted, especially in the important point of spelling. The Feuillants copy is in existence, being the only manuscript, or partly manuscript, authority for the text; but access to it and reproduction of it are subjected to rather unfortunate restrictions by the authorities, and until it is completely edited students are rather at the mercy of those who have actually consulted it. It was edited in 1803 by Naigeon, the disciple of Diderot; but, according to later inquiries, considerable liberties were taken with it. The first edition of 1580, with the various readings of two others which appeared during the author's lifetime, was reprinted by MM. Dezeimeris and Burckhausen in 1870. That of Le Clerc (3 vols., Paris, 1826-1828) and in a more compact form that of

Louandre (4 vols., Paris, 1854) have been most useful ; but that of MM. Courbet and Royer (1872-1900) is at present the standard. The Journal, long neglected and still (vide supra) doubtful, was re-edited by Professor A. d'Ancona (Citta di Castello, 1895) and translated into English by W. G. Waters (1903). The editions of Montaigne in France and elsewhere, and the works upon him during the past three centuries, are innumerable. The most recent books of importance are P. Bonnefon's Montaigne, I'homme et I'ceuire (1893) and P. Stapfer's Montaigne (1895) in the Grands ecrivains, the latter a book of remarkable excellence. Edm<3 Champion's Introduction aux essais may also be noticed, and Pro- fessor Dowden's Montaigne (1905), which has an excellent biblio- graphy. The somewhat earlier Montaigne of M. E. Lowndes (Cam- bridge, 1898) is noteworthy in especial for its attention to his life and character. In England Montaigne was early popular. It was long supposed that the autograph of Shakespeare in a copy of Florio's translation showed his study of the Essays. The autograph has been disputed, but divers passages, and especially one in The Tempest, show that at first or second hand the poet was acquainted with the essayist. The book best worth consulting on this head is J. Feis's Shakespeare and Montaigne (1884). Towards the latter end of the 17th century, Cotton, the friend of Isaac Walton, executed a com- plete translation, which, though not extraordinarily faithful, pos- sesses a good deal of rough vigour. It has been frequently reprinted with additions and alterations. Reprints of Florio are also numer- ous. One in the " Tudor Translations " (1893) has an introduction by G. Saintsbury. An English biography of Montaigne by Bayle St John appeared in 1858, and Walter Pater's unfinished Gaston de Latour borrows from Montaigne and his story. The most note- worthy critical handling of the subject in English is unquestionably Emerson's in Representative Men. (G. Sa.)

MONTALBAN, JUAN PEREZ DE (1602-1638), Spanish drama- tist, poet and novelist, was born at Madrid in 1602.

At the age of eighteen he became a licentiate in theology, was ordained priest in 1625 and appointed notary to the Inquisition. In 16 19 he began writing for the stage under the guidance of Lope de Vega, who is said to have assisted him in composing El Orfeo en lengua castellana (1624), a poem obviously intended to compete with Jauregui's Orjeo, published earlier in the same year. The prose tales in Sucesos y prodigios de amor (1624) and Para todos (1632) were very popular. Montalban's father, a publisher at Madrid, issued a pirated edition of Quevedo's Buscdn, which roused an angry controversy. The violence of these polemics, the strain of overwork, and the death of Lope de Vega so affected Montalban that he became insane; he died at Madrid on the 25th of June 1638. His last work was a eulogistic biography of Lope de Vega in the Fa-ma postuma (1636). His plays, published in 1635-1638, are all in the manner of that great dramatist, and were represented with much success, but, with the exception of Los Amantes de Teruel, are little

more than clever improvizations. A libellous attack on Quevedo, entitled El Tribunal de la justa venganza (1635), is often ascribed to him.

MONTALEMBERT, CHARLES FORBES RENE! DE (1810- 1870), French publicist and historian, was born on the 15th of March 18 10. The family was a very ancient one, belonging to Poitou, or rather to Angoumois. Direct descent is said to be traced back to the 13 th century, and charters carry the history of the house two centuries further. For some genera- tions before the historian the family had been distinguished, not merely in the army, but for scientific attainments. Mont- alembert's father, Marc Rene, emigrated, fought under Conde, and subsequently served in the English army; ha married Elise Rosee Forbes, and his eldest son, Charles, was born in London. At the Restoration of 1814 Marc Rene returned to France, was raised to the peerage in 1810, and became

ambassador to Sweden (where Charles completed his education) in 1826. He died in 1 83 1, a year after the overthrow of the legitimate monarchy. Charles de Montalembert was too young to take his seat as a peer (twenty-five being the necessary age), but he retained other rights, and this, combined with his literary and intellectual activity, made him a person of some importance. He was a Liberal, in the English sense, and had he not resolutely separated himself from the new regime on the religious question he would have approved of the policy of the golden mean represented by Louis Philippe. He wished to see the Church free from the control of the state, and passionately attacked the monopoly of public instruction by which the monarchy fortified its position. This latter scheme first brought Montalembert into notice, as he was formally charged with unlicensed teaching. He claimed the right of trial by his peers, and made a notable defence, of course with a deliberate intention of protest (1832). On the other hand, he thought that the Church should not obstinately oppose new ideas. He had eagerly entered into the plans of his friends, Lamennais and Lacordaire, and collaborated with them in the newspaper I'Avenir. The Ultramontane party was roused by their boldness, and Montalembert and his two friends then left for Rome. This famous pilgrimage proved useless to mitigate the measures which the Roman curia took against the I'Avenir. Its doctrines were condemned in two encyclicals (Mirari vos, 1832, and Singulari vobis, 1834), and Montalembert submitted. He still clung to his early Liberalism, and in 1848 saw without regret trie end of a government towards which he had always been hostile. He had a seat in the Chamber of Deputies till 1857, but to his great regret was then obliged to retire into private life. He was still, however, recognized as one of the most formidable opponents of the empire. Meanwhile his Liberal ideas had made him some irreconcilable enemies among the Ultramontanes. Louis Veuillot, in his paper, L'Univers, fought desperately against him. Montalembert answered by reviving a review which had for some time ceased publication, the Correspondant

(1855), in which he set himself to fight both against the fanatical party of Pius IX. and the Syllabus, and the more or less free-thinking Liberals of the Revue des deux mondes. He took great interest in the debuts of the Liberal empire, whilst trying to parry the blow which the Ultramontanes were preparing to deal to Liberal ideas by proclaiming in the Vatican council the dogma of papal infallibility. But once again he would not allow himself to be seduced from obedience to the pope; he now severed his connexion with Pere Hyacinthe (Loison) as he had with Lamennais, and made the submission expected of him to the council. It was his last fall. Broken down by the trial of these continued fights against people of his own religion, he died prematurely on the 13 th of March 1870.

In addition to being an eloquent orator, Montalembert wrote a style at once picturesque, fiery and polished. He was an ardent student of the middle ages, but his medieval enthusiasm was strongly tinctured with religious sentiments. His first historical work, La Vie de Ste Elisabeth de Hongrie (1836), is not so much a history as a religious manifesto, which did much to restore the position of hagiography. It met with great success; but Montalembert was not elected a member of the Academie

Francaise till later, after the fall of the July monarchy (Jan. 9, 1851). From this time he gave much of his attention to a great work on monachism in the West. He was at first attracted by the figure of St Bernard, and devoted one volume to him; this was, however, afterwards withdrawn on the advice of his friend Dupanloup, and the whole edition was destroyed. He then enlarged his original plan and published the first volumes of his Moines d'occident (i860), an eloquent work which was received with much admiration in those circles where language was more appreciated than learning. The work, which was un- finished at the time of the author's death, was completed later from some long fragments found among his papers (vols. vi. and vii., 1877).

Montalembert married Mile de Merode, sister of one of Pius IX.‘s ministers. His daughter married the vicomte de Meaux, a Roman Catholic statesman and distinguished writer.

Bibliography. — Mrs Oliphant, Memoir of Count de Montalembert, peer of France, deputy for the department of Doubs (Edinburgh, 1872). Mrs Oliphant, who has also translated into English Moines d’occident, has given a most charming account of the youth of Montalembert, and especially the first years passed at Stanmore. See also the vicomte de Meaux, Montalembert (1897) ; see also L. R. P. Lecanuet, Montalembert, d’apres son journal et sa correspondance (3 vols., 1895- 1902) a work filled with important documents; and L2on Lef6bure, Portraits de croyants au XIX m siecle: Montalembert, Auguste Cochin, Francois Rio (who was Montalembert’s professor of philosophy); A. Guthlin (1905); and Lettres d’Alphonse d’Herbelot a Charles de Montalembert et a Leon Cornudet (1828-1830).

MONTALEMBERT, MARC RENE, Marquis de (1714-1800), French military engineer and writer, was born at Angouleme on the 16th of July 1714, and entered the French Army in 1732. He fought in the War of the Polish Succession on the Rhine (1733-34), and in the War of the Austrian Succession made the campaigns of 1742 in Bohemia and Italy. In the years preceding the Seven Years’ War, Montalembert (who had become an asso- ciate member of the Academie des Sciences in 1747) devoted his energies to the art of fortification, to which Vauban’s Traiti de I’attaque attracted him, and founded the arsenal at Ruelle, near his birthplace. On the outbreak of war he became French commissioner with the allied army of Sweden, with the rank of brigadier-general. He constructed the field fortifications of Anklam and Stralsund. In 1761 he was promoted marechal de camp, and began the works on which his fame rests. Monta- lembert’s fortress has been aptly described by an English author as an ” immense battery.” The intricacies of trace by which Vauban and Cormontaigne sought to minimize the power of the attack, are abandoned in favour of a simple tenaille

plan so arranged that the defenders can bring an overwhelming fire to bear on the works of the besieger. Montalembert, who him- self drew his idea from the practice of Swedish and Prussian engineers, furnished the German constructors of the early 19th century with the means of designing entrenched camps suitable to modern conditions of warfare. The "polygonal" method of fortification is the direct outcome of Montalembert's systems. In his own country the caste-spirit of the engineer corps was roused to defend Vauban, and though Montalembert was allowed to construct some successful works at Aix and Oleron, he was forbidden to publish his method, and given but little opportunity for actual building. After fifteen years of secrecy he published in Paris (1776-1778) the first edition of La Fortification perpen- diculaire. At the time of the Revolution he surrendered a pension, which had been granted him for the loss of an eye, although he was deeply in debt, particularly on account of his Ruelle foundry, on which 6000 livres were due to him from the state, which he never received. Persuaded by his wife, he joined in the emigration of the noblesse, and for a time lived in England. All his possessions were thereupon sequestrated by the republi- can government. He very soon returned, divorced his wife, and married again. He obtained the annulment of the sequestration. Carnot often called him into consultation on military affairs, and, in 1792, promoted him general of division. Proposed as a member of the Institut in 1797, he withdrew his candidature in favour of General Bonaparte. He died at Paris on the 29th oi March 1800. His wife, Marie Josephine de Comarieu, was tbe

hostess of one of the best-known salons of Louis XVI.'s time, She wrote two novels of merit, Elise Dumesnti (1798) and Horace (1822). She died in 1832.

Besides his masterpiece, he wrote V Art defensive sup&rieure i I'offensif (1793; in reply to attacks

made upon his earliest work, La Fortification perpendiculaire, of which in later editions it forms part); Memoire historique sur le fonte des canons (Paris, 1758), and other works on the same subject; Correspondance pendant la guerre de 1757-1760 (London, 1777); Rotation des boulets (Acad., 1755); and Relations du siege de S. Jean d' 'Acre (Paris, 1 789). He also wrote short stories and verse, as well as comedies. He also modelled a complete course of Fortification (92 models), which he offered to the Committee of Public Safety. His bust was sculptured by Bonvallet. Montalembert's position in the history of fortification may be summed up as a realization of his own wish to do for the defence what Vauban had done for the attack. It was the inability of his contemporaries to see that Vauban's strength lay in his parallels and batteries and not in his bastions that vitiated their methods, and it was Montalembert's appreciation of this fact which made him the father of modern fortification. See Tripier, La Fortification deduite de son histoire (Paris, 1866).

MONTALIVET, MARTHE-CAMILLE BACHASSON, Comte de (1801-1880), French statesman, was born at Valence on the 25th of April 1801, the second son of Jean Pierre Bachasson, comte de Montalivet (1766-1823), who had been made a peer of France in 1819. Both his father and his elder brother Simon Pierre Joseph (1799-1823) had been engineer officers, and he was edu- cated at the Ecole Polytechnique and the Ecole des Ponts et Chaussees. Under Louis Philippe he occupied the ministry of the interior from, with short intervals, 1830 to 1840. After 1840 he was intendant of the civil list, occupying himself with the museums of Versailles and the Louvre, and the restoration of the palaces of Fontainebleau and Saint-Cloud. In 1847 he tried to induce Louis Philippe to adopt electoral reform, and after the catastrophe of the next year undertook the defence of the July monarchy in two works, Le Roi Louis Philippe et la liste civile (1851) and Rienl Dix annSes de gouvernemenl parlemen- taire (1862). He had become a member of the Academy of Fine Arts in

1840 and in 1843 grand cross of the Legion of Honour. The attitude of the comte de Chambord after 1870 led him to accept the republic, and he entered the Senate a year before his death, on the 4th of January 1880.

MONTANA, a north-western state of the United States, situated between latitudes 44 26′ and 49 N., and between longitudes 27 and 39 W. from Washington. It is bounded N. by the Canadian provinces of British Columbia, Alberta and Assiniboia; E. by North Dakota and South Dakota; S. by Wyoming and Idaho; W. by Idaho. Montana has an area of 146,572 sq. m., 796 sq. m. of which are water surface. (For map, see Idaho.)

Physical Features. — The Rocky Mountains cross the state' from north-west to south-east, and with their spurs and outlying ranges occupy nearly one-third of its area in the west and south- west; the remaining portion is occupied chiefly by the Great Plains. The main range of the Rockies follows the boundary line between Montana and Idaho west and north-west from Yellowstone Park in Wyoming to Ravalli county, then turns east- north-east to Lewis and Clark county, and from there extends north-north-west into Canada. From where the main range turns east from the Idaho boundary line the crest of the Bitter Root Mountains continues on that line with a downward slope to within one degree of latitude from the Canadian border. This range of mountains, which was formed by a great fault, has a maximum elevation at its southern end of about 9000 ft. above the sea. On its slope, which rises abruptly from the Bitter Root Basin, glaciers have cut canons between high and often precipitous walls, and between these canons are steep and rocky ridges having peaked or saw-toothed crest lines. To the east and north-east of the Bitter Root Mountains is a consider- able basin or peneplain dissected by short ranges having a north- west and south-west trend. To the south-east of this basin are the greatest mountain masses of the state; lofty and rugged ranges radiate in all directions, and in many instances rise to heights of 10,000-11,000 ft., the highest peak in the state

being Granite Peak (12,834 ft.) in Carbon county. Deep and narrow

canons are common, and, at higher levels, glaciers, carved out amphitheatres, or ” cirques ” and ” U “shaped troughs. In the north the Rocky Mountains consist principally of two parallel ranges, the Lewis and Clark Range to the east, and the Living ston Range to the west, which were formed by a great over- thrust; between them is the Waterton-McDonald valley, 8-15 m. wide. The east slope of the Lewis and Clark range is marked by long high spurs, and the valleys between them end in radiating canons that are crowned with bold cliffs. On the higher sum- mits the range rises to 8500-10,400 ft. above the sea, but in the wind-gaps only to 5500-6500 ft. The Livingston range is less rugged and more massive. Like the Lewis and Clark range, its crest is broken by numerous U-shaped wind-gaps and its west slope is cut by glacial troughs containing long narrow lake basins. Extending far to the eastward, especially in the south of the state, are isolated mountain groups. Among these are the Bear Paw Mountains, in the north central part, which occupy a tract 40 m. long and 20 m. wide that on the western side rises abruptly from the plains and reaches an elevation in Bear Paw Peak of 7040 ft. above the sea. The Great Plains in Montana slope from about 4000 ft. (above the sea), at the foot- hills of the mountains, to 2000 ft. in the north-east of the state. The valleys of the principal streams are deeply eroded; bluffs are common along their borders, and buttes elsewhere on the plains. The main range of the Rocky Mountains separates that part which is drained west into the Columbia river and the Pacific Ocean from that which is drained east into the Missouri and Mississippi rivers and the Gulf of Mexico, and from a very small part which is drained north-east into Hudson Bay; the water-parting which in Montana separates the drainage into Hudson Bay from the drainage into the Gulf of Mexico crosses only the north-west of Teton county. The principal rivers east of the Rockies are the Missouri and three of its tributaries; the

Yellowstone in the south-east, the Musselshell in the middle, and the Milk in the north. The Missouri is formed by a union of the Jefferson, the Madison and the Gallatin. It flows first east-north-east and then nearly east until it passes into North Dakota. Its channel is generally erratic and constantly shifting; its bed is sandy and its water muddy. In contrast, the Yellow- stone is a stream of bright clear water running over a gravelly bed and among numerous forest-clad islands. The Missouri is navigable for small boats to Fort Benton in Chouteau county, but farther upstream near Great Falls, Cascade county, to which it is navigable at high water, it falls 512 ft. in 10 m. The Yellowstone is navigable for about 300 m. The principal rivers west of the Main Divide of the Rockies are the Clark Fork of the Columbia and its principal tributary, the Flathead, which rises in British Columbia. Montana has a few mineral springs, the best known being the Lissner Springs at Helena. Small lakes and waterfalls, the result of glacial action, are numerous in the mountains. There is, however, only one large lake in the state — Flathead (or Selish) Lake, which may be regarded as an enlarge- ment of Flathead river; it is 27 m. long, has an average width of 12m., and a depth of more than 1000 ft.

Geology. — In the Great Plains region the geological structure is very simple, consisting of nearly horizontal strata of Cretaceous rock in the middle and western portions, and of Tertiary rock on the eastern border, but in the mountain region the rocks have been folded and faulted until the structure is intricate and obscure. Some of the deeper cafions show rocks of nearly all ages. The higher elevations are mostly either Archean or Paleozoic formations projecting above Tertiary deposits. In the Bitter Root Valley is a large deposit of Quaternary. Fossil remains of mammals, fish and reptiles found in the Tertiary deposits of south-western Montana are preserved in the Carnegie Museum at Pittsburg, Pennsylvania, and in the museum of the university of Montana. They include the mandible of a mastodon and a portion of a vertebra of a large fish, both found

in the Lower Madison Valley; the skull and other parts of a dog (Mesocyon drummondanus), found near Drummond, Granite county ; the skull of a Poatrephes paludicola, found near New Chicago, Granite county; a portion of the skull of a Mesohippus latidens, found near the confluence of the three forks which form the Missouri river; and a portion of the skull of a Hyrachyus priscus, found near Lima, Beaverhead county. In the region east of the Crazy Moun- tains, in Sweetgrass county, are marine beds of upper Cretaceous or lower Tertiary formation containing fossils of Dinosaurs and

Mosasaurs, and in the museum of the university of Montana is the greater part of the skeleton of a Dinosaur which was found here. Interesting fossil remains have also been found in Carboniferous formations in the south-west of the state.

Fauna. — The native fauna is not sharply distinguished from that of the surrounding states. The bison, which once ranged the plains in large herds, have been exterminated; the moose and the elk are found only occasionally in the wilder regions; mountain sheep, antelopes, black and grizzly bears, wolves, coyotes and lynx (” wild cats “) are also becoming rare. Black-tailed and mule deer are still favourite game for sportsmen. Geese, ducks and grouse are numer- ous about the lakes and rivers. Several kinds of fish, among which are trout, salmon, grayling and white fish, inhabit many of the lakes, rivers and mountain streams, and a government fish hatchery at Bozeman, Gallatin county, restocks waters in which the supply has been diminished.

Flora. — The Great Plains are covered for the most part only with bunch grass which grows in tufts, leaving the ground visible between, and except in May and June presents a yellow and withered appear- ance. Mixed with the bunch grass are occasional patches of sage brush. Most of the bluffs along the

principal river valleys, espe- cially those in the south-east, are entirely bare of vegetation, but on the bottom lands along the rivers and streams considerable patches of cottonwood and willows are common. The mountain valleys are covered with little except grasses; on the higher parts of the moun- tains there are barren rocks or only a scant growth of timber; but many of the lower mountain slopes, especially those along the western border, are clothed with heavy timber, yellow pine, red fir and tamarack being the principal species.

Climate. — The climate is generally dry, although less so on the mountains and in the Flathead river basin than on the Great Plains, and is subject to sudden changes and to great extremes of temperature; but the temperature varies more than the amount of precipitation. In the west the climate is generally delightful, it being there greatly affected by the warm, dry ” Chinook ” wind which blows from the Pacific Ocean; to some extent the wind modifies the temperature nearly to the eastern border. It is the prevailing wind of winter in the mountains and in consequence the periods of cold, though often severe, are short. In the east the winters are often long and very cold, and the summers dry and hot. The mean annual temperature ranges from 37 F. in the north-east to 47° in the sheltered valleys among the mountains. On the Great- Plains a range of extremes within a year from — 40 F. to 100 is not unusual, but in the mountain valleys the range is rarely greater than from. —20° to 90°. The records from 1880 to 1907 show a maximum range from 117 at Glendive, near the eastern border, in July 1893, to — 63 at Poplar, about 80 m. north by west of Glendive, in January 1885. The amount of precipitation is greater in the north-west and on the mountains, because in the one case the mountains of lower elevation are a less obstruction to the moisture- bearing winds from the west, and in the other the mountains con- dense the moisture; the mountains which stand in isolated groups upon the plains are frequently in summer the focus of local thunder showers. The average annual precipitation

ranges from 10 to 15 in. on the Great Plains to 20 in. or more in the north-west, and over limited areas in the higher mountain region. Nearly one-half of the rain falls during the four months from May to August inclusive. Storms endangering life and property occur only in the east, caused by a high north wind with snow or rain and a low temperature.

Soil. — In the river bottoms the soil is for the most part a black clayey loam lacking in natural drainage, but on the ” bench lands ” higher up there is a deep layer of sandy loam beneath which is a bed of gravel. Some of the best soil is in the mountain valleys, for these valleys were once lakes and rich deposits of alluvium were made in them. The mountain slopes are often bare or covered only with a thin layer of mould.

Agriculture. — The rainfall is sufficient for good grazing, but except in the Flathead valley cultivation was long considered to be dependent on irrigation; and consequently farming was only incidental to stock raising and mining until after 1870, and as late as 1900 the ratio of improved farm land to the total land area was less than in any other state or territory except New Mexico, Wyoming, Arizona and Hawaii. In 1906 the farm area was almost equally divided between ” dry ” farming and farming under irrigation, three-fourths of the wheat produced was grown without irrigation, and the dry farming was very successful with the comparatively new and valuable crops of durum, or macaroni wheat, and Russian barley, which is used in straw for winter feed to sheep and neat cattle. The counties where dry farming had been carried on on the largest scale were Missoula, Ravalli, Flathead, Cascade, Fergus and Gallatin, where cereal yields, though not nearly so large as from irrigated lands, were high compared with the average for the country. But even where dry farming was successful, the increase of crops made possible by cheap irrigation seemed to be inducing farmers to abandon it. Among the larger privately irrigated tracts are: 16,000 to 18,000 acres in Yellowstone county, fed by a canal built by the Billings Land & Irrigation Company; about 35,000

acres of orchard land in the Bitter Root Valley, in Ravalli county, irrigated by canals from Lake Como, a natural reservoir; and 100,000 acres in Missoula county, to be watered from a 28 ft. dam across the Clark

Fork (or Missoula River) at Bonner. Private irrigation by pumping was first successfully introduced about 1901, and in 1906 a state report estimated that 125 pumping irrigation plants were in use in the state. Boring for underground water supply to be used in irrigation was tried on a small scale. An area of 16,000 acres in Missoula county is watered by a ditch 10 m. long built in 1902–1905 by the co-operative Grass Valley-Frenchtown Irrigation Company, and the Teton Co-operative Canal Company in 1906 began work on a diversion canal from the Teton River, whose waters are to be stored by a dam 62 ft. high and 2100 ft. long. But more important than private and co-operative undertakings are the Federal irrigation projects. In 1894 Congress passed the Carey Act, under which Montana received title to 1,000,000 acres of arid land on condition that the state would reclaim it by providing an adequate supply of water; the state accepted the offer, created an irrigation commis- sion, and provided means for securing the necessary funds. Further- more, Congress in 1902 appropriated the receipts from the sales of public lands in the state to the construction of irrigation work. In 1899 there were 6812 m. of irrigation canals and large ditches in the state; the irrigated acreage had increased from 350,582 acres in 1889 to 951,154 acres in 1899, when about 84% of the irrigated area was in the south- west. The great Federal projects were not begun until after 1900. Among them are: the Huntley project in Yellowstone county, begun in 1904 and practically completed in 1908, covering land formerly in the Crow Indian reservation, the irrigable area being 28,921 acres; the Lower Milk river project (and the sub- sidiary St Mary project), in Chouteau, Valley and Teton counties, by which the water of St Mary river 1 is stored and diverted to the headquarters of the Milk river to

irrigate an area of 300,000 acres; the Sun river project (Teton, Lewis and Clark, Chouteau and Cascade counties), by which, as the ordinary flow of that river is already utilized for irrigation, the flood waters are stored and carried to the higher bench lands of the district ; in Montana (Dawson county) and North Dakota (McKenzie county), the Lower Yellowstone project; and the Blackfeet project, to irrigate the Blackfeet reser- vation in Teton county.

In 1900, 11,844,454 acres, or 12-7% of the area, was included in farms; of this, 1,736,701 acres, or 147%, was improved; 54-7 % of the improved farm land was irrigated; 79-4% of the irrigated land was used for growing crops and 20-6% for pasturage; the total acreage of all crops was 1,151,674, and of this 755,865, or 65-6%, was irrigated. In the same year there were 13,370 farms exclusive of those on Indian reservations; of these, 6665 contained less than 175 acres each; 1289 contained more than 1000 acres each; 8043 contained some irrigated land, the average amount being 118 acres; 11,592 were worked by owners or part owners, 624 by cash tenants, and 606 by share tenants.

Of the total acreage of all crops in 1899, 875,712 acres, or 76%, were hay and forage, and 254,231 acres, or 22-1 , were cereals; of the cereal acreage 52-7 was oats, 36-2% was wheat, 9% was barley, and 1-3% was Indian corn. In 1909 the oat crop was 1 5>39°i 000 bushels from 300,000 acres; the acreage of wheat in 1909 was 350,000 and the production 10,764,000 bushels; the acreage of barley in 1909 was 50,000 acres, and 1,900,000 bushels were raised; the acreage of Indian corn in 1909 was 50*0 acres, and 175,000 bushels were grown.

Sugar beets were first grown in Montana at Evans, Cascade county, in 1893 without irrigation. In 1906 a refinery (with a daily slicing capacity of 1200 tons) was built at Billings, Yellowstone county. Russians, with experience in beet-growing, and Japanese are furnished by the sugar company to the growers for the bunching, thinning, hoeing and topp

: ng of the’ beets. In 1906 sugar refineries were projected at Hamilton, Kalispell, Chinook, Laurel, Missoula, Dillon and Great Falls; and in 1907 the crop was so large that 12,000 freight cars were needed to carry it and the railways had a car and coal ” famine.”

The east is devoted chiefly to stock raising; for cattle, horses and sheep thrive well on the bunch grass except when it is covered with snow. The principal sheep-raising counties are Custer, Yellowstone, whither many sheep are brought to be fattened, Rosebud, Beaver- head, Valley, and Meagher. In 1909 the number of sheep in Montana was 5,747,000, being exceeded only by the number in Wyoming; the number of cattle was 922,000, only 80,000 being milch cows, and the number of horses 319,000.

Lumber. — The woodland area was estimated in 1900 at 42,000 sq. m., much of which had been burned over. It is confined mainly to the mountain slopes, and in March 1909 31,858-9 sq. m., more than three-fourths of this total, had been set apart in the following “national forests”: Absaroka (980,440 acres), Beartooth (685,293 acres), Beaverhead (1,506,680 acres in Montana; and a smaller area in Idaho), Bitterroot (1,180,900 acres), Blackfeet (1,956,340 acres),

1 The St Mary and both forks of the Milk river flow northward into the Dominion of Canada, and as there has been much private irrigation both north and south of the international boundary, the present Federal project and other undertakings in the same region necessitate an international agreement as to the division of the waters, especially of the St Mary, and commissioners representing the Canadian government and the United States conferred in regard to it in May 1908.

Cabinet (1,020,960 acres), Custer (590,720 acres), Deerlodge (1,080,220 acres), Flathead (2,092,785 acres), Gallatin (907, 160 acres), Helena (930,180 acres), Jefferson (1,255,320 acres), Kootenai (1,661,260 acres), Lewis and Clark (844,136 acres), Lolo (1,211,680 acres), Madison (1,102,860 acres), Missoula (1,237,509 acres) and Sioux (145,253 acres in Montana; 104,400 acres in SouthDakota). A large part of the woodland contains no trees fit for lumber ; never- theless the value of the lumber was $3,024,674 in 1905. More than one-half of the product is yellow pine and the remainder is princi- pally red fir and tamarack. There is scarcely any hardwood timber in the state.

Minerals and Mining. — Mining has been the leading industry of Montana ever since the discovery of gold in 1862. It contains the largest copper producing district in the world, and in 1907 mined more copper than any other state or territory except Arizona; this metal constituted nearly three-fourths in value of the state's mining products in 1907, the total value being $60,663,51 1 and that of copper $44,852,758. The most important copper mines are in Silverbow, Broadwater, Jefferson and Beaverhead counties. Gold was dis- covered in Deerlodge county as early as 1852 but very little mining was done until ten years later. In 1863 the famous Alder Gulch in Madison county was discovered and in the next year, Last Chance Gulch in the south of Lewis and Clark county. In 1865 the product reached its maximum, as the value of gold and silver combined (the value of the silver being relatively small) was $18,000,000; the pro- duction then decreased and in 1903 the value of the gold was only $1,800,000. Then copper mining rapidly developed and consider- able gold was obtained from copper ores. Until the development of copper mining, silver was produced only in small quantities along with gold, but as much more silver than gold was obtained from the copper ores the value of the silver product increased from $2,630,000 in 1881 to $24,615,822 in 1892. The product then fell off, but in 1907, when it amounted to 9,317,605 fine ounces, valued at $6,

149,619, more than nine-tenths of it was derived from the copper ores in Silverbow county. It was in 1882 while Marcus Daly was sinking a shaft at Anaconda in preparation for milling gold and silver ores that he discovered the first rich copper ledge. Other discoveries about Butte followed, and the output of copper increased from 11,011 long tons in 1883 to 129,805 long tons in 1906, more than 99-6% from Silverbow county. The industrial and political life of Montana have been strongly influenced by the copper industry and by the tremendous wealth controlled by the copper interests; in the industry three men were long dominant — Marcus Daly, William A. Clark and F. Augustus Heinze; later the Amalgamated Copper Company gained control of a large part of the mines.

Coal was discovered in Montana before 1880, when 224 tons were mined. In 1907 the output was 2,016,857 tons, and in 1908 1,920,190 tons. The coal underlying the east half of the state, the " Great Plains," is lignitic and of inferior quality, but that in the mountain districts is bituminous and generally suitable for coking. The principal fields are: the isolated Bull Mountain deposit, 45 m. north-east of Billings, in Yellowstone county; the large Clark Fork field in Meagher, Sweet Grass, Yellowstone and Carbon counties; the small but valuable Rocky Fork field in the south central part of Carbon county; the Red Lodge field in Carbon county; the Yellow- stone field, chiefly in Gallatin and Park counties; the Trail Creek deposits, 10 m. south of Bozeman; the Cinnabar field in south Park county; the Great Falls field in Cascade county; and the West Gallatin, the Toston and the Ruby valley fields. The output steadily increased until 1895 when it was 1,504,193 short tons; but from then to 1905, when it was 1,643,832 short tons, the quantity varied little from year to year. From 1905 to 1907, when the output was valued at $3,907,082, the increase in production was steady.

Granite, sandstone and limestone are abundant in the state, but have been little developed. Granite was quarried in 1907 to the value of $102,050. Limestone

quarried in the same year was worth $124,690; and sandstone was valued at $39,216. Some light grey sandstone found in Rocky Canon, Gallatin county, looks much like the Berea (Ohio) sandstone ; and a sandstone quarried at Columbus, Yellowstone county, was manufactured into grindstones equal to those made from the Berea stone. Gypsum in Carbon county and in Cascade county is worked for plaster. Sapphires are found in several gulches, especially on Yogo Creek, 16 m. from Utica, Fergus county, where blue stones are found, and on Rock and Cottonwood creeks, where green, yellow, red and blue sapphires have been found. Many of the sapphires are shipped to Switzerland for watch jewels and for bearings. In 1907 the total value of precious stones was $229,800.

Manufactures.— With the exception of the smelting and refining of copper, manufacturing is in Montana a decidedly minor industry. In 1905 the total value of the ” factory ” product was $66,415,452, and the value of the copper (by state reports) was $48,165,277. Lumber and timber products, which ranked second, increased in value from $2,846,268 in 1900, to $3,024,674 in 1905. Flour and grist mill products rose during that period from $937,462 to $2,003,136; and malt liquors increased in value from $1,267,331 to $1,731,691. In 1905 the value of the products of the factories of Anaconda and Great Falls was 63-5% of that for the entire state.

Transport. — Montana is served by three transcontinental railways :

the Great Northern traversing the north, the Northern Pacific traversing the south-east, south and south-west portions, and, north of the Northern Pacific, the Chicago, Milwaukee & Puget Sound, an extension of the Chicago, Milwaukee & St Paul to Seattle and Tacoma, practically completed in 1909; branch lines of the Great Northern, from the north, connect with the Northern Pacific and the Chicago, Milwaukee & Puget Sound at Butte, and with the Northern Pacific at Laurel. The Oregon Short Line from the south connects with the Northern Pacific,

the Great Northern, and the Chicago, Milwaukee & Puget Sound at Butte, and the Burlington system, also from the south, connects with the Northern Pacific at Billings, Yellowstone county. The Butte, Anaconda & Pacific railway carries ore from the mines at Butte to the smelters at Anaconda. The first railway was the Oregon Short Line, which was completed by the Union Pacific Company from Ogden, Utah, to Butte in 1881. The Northern Pacific reached Helena two years later and the railway mileage in the state increased from 106 m. in 1880 to 4012-62 m. in 1909. River transport has been of relatively little importance since the advent of railways.

Population. — The population of the state increased from 39,159 in 1880 to 243,329 in 1900, and to 376,053 in 1910. In 1900, 67,067 were foreign-born, 11,343 were Indians, 2441 Japanese, 1739 Chinese and 1523 negroes; most numerous among the foreign-born were 13,826 Canadians, 9436 Irish, 8077 English, 7162 Germans and 5346 Swedes. The Indians are mostly members of the following tribes: the Piegan, the Crow, the Salish (or Flathead), the Sioux, the Assiniboin, the Arapaho Atsina (miscalled Grosventres) and the Northern Cheyenne. The Piegans, with small remnants of a few other tribes, number- ing (1900) about 2060, occupy the Blackfeet reservation in the north-west of Teton county, the Crows, numbering 1857, occupy the Crow reservation in the south central part of the state; the Salish, with small remnants of the Pend Oreille, the Spokan, the Lower Kalispell and the Kutenai, numbering 1837, occupy the Flathead reservation in the north of Missoula and the south of Flathead county; Assiniboins and others of Sioux stock, numbering about 1793, occupy Fort Peck reserva- tion in the south-east of Valley county: Atsina arid Assiniboins, numbering about 1429, occupy Fort Belknap reservation in the east of Chouteau county; and the Northern Cheyennes, number- ing about 1357, occupy Northern Cheyenne reservation in the south-east of Rosebud county. Many of the Indians are engaged in stock-raising; the Crows have an irrigation system and are extensively engaged in

farming. Roman Catholics are more numerous in Montana than Protestants, having 72,359 communi- cants out of a total of 98,984 of all denominations in 1906, when there were 7022 Methodists, 4096 Presbyterians, 3290 Protestant Episcopalians and 2029 Baptists. In 1900 the urban population {i.e. population of places having 4000 inhabitants or more) was 69,989; the semi-urban {i.e. population of incorporated places having less than 4000 inhabitants) was 30,270; and the rural {i.e. population outside of incorporated places) was 143,070. The rural population was therefore in that year 58-8% of the total, and the urban was only 28-7% of the total, but from 1890 to 1900 the urban increased 185% while the rural increased only 55-6%. The principal cities are: Butte, whose population increased from 10,723 in 1890 to 30,470 in 1900 and to 39,165 in 1910; Great Falls (1910) 13,948; Helena, the capital, (1910) 12,515; and Anaconda (1910) 10,134.

Administration. — The state is governed under a constitution adopted in 1889, a month before Montana's admission into the Union. The requirements for amending this constitution are: an affirmative vote in each house of the legislature of two-thirds of its members, followed, not less than three months later, by an affirmative vote of a majority of the electors voting thereon at a general election; or, by a like vote of each house of the legis- lature and of the electorate, a convention may be called to revise or amend it, a revision or amendment in this manner requiring the ratification of the electorate not less than two months nor more than six months after the adjournment of the convention. General suffrage is conferred on every male citizen of the United States who is twenty-one years of age and who has lived in the state one year, and in the county thirty days immediately preceding an election, the only exceptions being idiots or insane persons; a woman who has the qualifications for suffrage that are required of a man, may vote at any school district election

and if a tax-payer she may vote on all questions submitted to the tax-payers of the ‘ state or of any political division thereof.

The officers of the executive department are the governor, lieutenant-governor, secretary of state, attorney-general, treasurer, auditor and superintendent of public instruction, each of whom is elected for a term of four years. No person is eligible to any of these offices who shall not have lived within the state for two years next preceding the election; no person is eligible to the office of governor, lieutenant-governor, attorney- general or superintendent of public instruction who is not thirty years of age; no person is eligible to the office of secretary of state, treasurer or auditor who is not twenty-five years of age; no person is eligible to the office of attorney-general who has not been admitted to practice in the supreme court of the state; and the treasurer is ineligible to his office for the immediately suc- ceeding term. The governor’s powers are limited. As in other states he is commander-in-chief of the militia. With the advice and consent of the senate he appoints various administrative officers. With the approval of the majority of a board of pardons (composed of the secretary of state, attorney-general and auditor), he may pardon offences or commute punishment, and remit fines and forfeitures. He may veto any bill passed by the assembly, or in the case of a bill making appropriations of money he may veto any item of it, and no bill or item of an appropriation bill which he vetoes within five days (Sunday excepted) after it has been presented to him, can become a law or part of a law unless passed over his veto in each house by a two-thirds vote of the members present. Under an amendment to the Constitution adopted in 1906 his veto power does not extend to measures referred to the people by the legislative assembly or by initiative and referendum petitions. Without his ap- proval, also, no order or resolution of either House, other than to adjourn or relating solely to the business of the assembly, can take

effect until passed again by a two-thirds vote as in case of a bill.

The legislature consists of a senate and a house of represen- tatives. Except when called in special session by the governor it meets (at Helena) on the first Monday of January in odd num- bered years only, and the length of its session is limited by the constitution to sixty days. Senators are elected, one from each county, for a term of four years; representatives are elected, one or more from each county according to population, for a term of two years. The qualifications for a senator are that he be at least twenty-four years of age and have resided in his county or district at least one year next preceding his election; for a repre- sentative there are no qualifications other than those required for suffrage. The action of the legislature is much restricted by the constitution: a long list of cases is named in which that body is prohibited from passing any local or special laws; it is prohibited from delegating to any special commission power to perform any municipal functions whatever; from making any appropriations for charitable, industrial, educational or benevo- lent purposes to any person, corporation or community not under the absolute control of the state; and from authorizing the state to contract any debt or obligation in the construction of any railway, or to lend its credit in aid of such railway con- struction. In 1906 an amendment to art. 5, sec. 1 of the state constitution, authorized the initiative and referendum, but two- fifths of the entire number of counties must each furnish for initiative petitions signatures amounting in number to 8% of the whole number of votes cast for governor at the election last preceding the filing of the petition; for referendum petitions two-fifths of the counties must each furnish as signers 5 % of the legal voters; and any measure referred to the people shall be in full force unless the petition for the referendum be signed by 1 5 % of the legal voters (whose number is that of the total votes cast for governor, &c, as above) of a majority of the whole number of

counties, but that in such case the law to be referred shall be inoperative until it is passed at the popular election.

The administration of justice is intrusted to a supreme court, an increasing number of district courts, and at least two justices'

courts in each organized township, besides police and municipal courts. The supreme court is composed of a chief justice and two associate justices elected for a term of six years. It holds four sessions a year at Helena and has both original and appellate jurisdiction. For most district courts there is only one judge, but for the more populous there are two; they are all elected for four years. These courts have original jurisdiction in cases at law and in equity in which the value in controversy exceeds $50, in criminal cases amounting to felony, in all matters of probate, in actions for divorce, &c, and appellate jurisdiction in cases arising in the inferior courts. Justices of the peace are elected for two years and have civil jurisdiction in several classes of actions in which the amount demanded does not exceed $300, and in such cases as petit larceny, assault in the third degree and breach of the peace.

For purposes of local government the state is divided into counties; each county into townships, school districts and road districts; and there are incorporated cities and towns. The county officers are a board of three commissioners, a treasurer, a sheriff, a county clerk, a clerk of the district court, an attorney, a surveyor, a coroner, a public administrator, an assessor, a superintendent of schools, and in some instances, an auditor. The commissioners are elected for six years, the other officers, for two years. Among the commissioners' powers and duties are: the management of county property; the levying of taxes; the equalizing of assessments; the division of the county into townships, school districts and road districts; the laying out and management of public highways and ferries, and the care of the poor. The township is

of minor importance, its principal officers being two justices of peace and two constables. Municipal corporations are classified according to population; those having 10,000 inhabitants or more are cities of the first class; those having less than 10,000 but more than 5000 inhabitants, cities of the second class; those having less than 5000 but more than 1000 inhabitants, cities of the third class, and those having less than 1000 but more than 300 inhabitants towns. In a city of the first class, a mayor, two aldermen from each ward, a police judge, and a treasurer who may be ex officio tax-collector are elected, and an attorney, a clerk, a chief of police, an assessor, a street commissioner, a jailer, a surveyor, and, where there is a paid fire department, a chief engineer with one or more assis- tants, may be appointed by the mayor with the consent of the council. The officers of cities of the second and third class are the same, except that the clerk is ex officio assessor. In towns only a mayor and aldermen are elected, and the mayor with the consent of the council appoints a clerk who is ex officio assessor, a treasurer who is ex officio collector, and a marshal who may be ex officio street commissioner. The principal municipal officers hold office for two years.

A wife may hold property and make contracts as if she were single, and neither husband nor wife is accountable for the acts of the other. The husband is required to support himself and his wife if he is able to do so; if he is unable, his wife is required to assist him. On the death of either husband or wife at least one-third of his or her property passes to the other. Recognized causes for divorce are adultery, extreme cruelty, wilful desertion, wilful neglect, habitual intemperance or conviction for felony. The homestead of a head of a family consisting either of a farm not exceeding 160 acres or $2500 in value, or of a house and lot — the lot not exceeding | acre, and the house and lot not exceeding $2500 in value — is secured against debtors except in case of judgments obtained before the homestead was recorded as such, in case of

labourers', mechanics' or vendors' liens, and in case of a debt secured by mortgage; if the owner is a married person the homestead cannot be mortgaged without the consent of both husband and wife. For the settlement of disputed between labourers and employers there is a state board, appointed by the governor and consisting of an employer of labour, a labourer and a disinterested citizen. Upon application of either or both of the parties, provided the employees be not less than twenty, this board is required to inquire into the cause of the dispute, with the aid of two expert assistants, who shall be nominated by the parties, and to render a decision, which is binding for at least six months upon the parties to the application.

Charitable and Penal Institutions. — These are a state prison at Deer Lodge, managed by contract ; a reform school at Miles City, an industrial school at Butte, an orphans' home at Twin Bridges, the soldiers' home at Columbia Falls, a school for deaf and blind

at Boulder, and an insane asylum at Warm Springs, managed by contract. They are all under the supervision of a state board of charities and reform. The state also has a bureau of child and animal protection.

Education. — The public school system is administered by state, county and district officers. The common school of each district is under the immediate supervision of a board of trustees; but a state text-book commission determines what text-books shall be used in these schools; the state superintendent of public instruction prepares the questions that are used in examining applicants to teach, passes judgment on publications for use in school libraries, and advises with the county superintendent of schools. A county board of education examines applicants for teachers'

positions and pupils applying to enter high schools. The county superintendent advises the teachers, and holds teachers' institutes. Each school district is required by law to keep its school open at least three months a year and all children between the ages of eight and fourteen are required to attend for the full term ; if unemployed they are required to continue in school until they have attained the age of sixteen. In 1908 fifteen of the counties had a county high school, and there were also 10 accredited city high schools in 1908. The state educa- tional institutions are the university of Montana (1895), at Missoula, the normal college at Dillon, the college of agriculture and mechanic arts (1893) at Bozeman; and the school of mines (1900) at Butte. They are all under the supervision and control of the state board of education, which consists of the governor, the state super 1 intendent, the attorney-general and eight other members appointed by the governor for a term of four years, two retiring annually. The entire educational system is maintained very largely out of funds derived from lands appropriated by Congress for that purpose.

Finance. — About one-half of the revenue for state and county purposes is derived from a general property tax. All taxable property in each county except that of railways in more than one county is assessed at its full value by the county assessor. The franchise, roadway, roadbed, rails and rolling stock of railways in more than one county are assessed at their full value by the state board of equalization. The assessment rolls of the county assessor are subject to alteration by the board of county commissioners sitting as a county board of equalization and the assessments as between counties are subject to alteration by the state board of equalization. The state legislature biennially fixes the rate of taxes for state purposes; the amount of this levy is now limited by the Constitution to 2§ mills on the dollar. The board of county commissioners fixes the rate of county taxes and levies those taxes; and the county treasurer

collects the taxes of the state and those of the county. Among the other sources of revenue are a poll-tax of two dollars on each man between the ages of twenty-one and sixty, licences, an inheritance tax, rent of state lands and the income from invested funds received from the sale of state lands.

The state had a bonded debt in 1909 of $384,000, authorized by popular vote in November 1908 ; by the constitution the aggregate indebtedness of the state was limited to $100,000 except in case of war, invasion or insurrection, or in case a measure authorizing a greater indebtedness should be submitted by the legislature to the electorate and should receive a majority of the votes cast. The constitution limits the indebtedness of a county to 5 % of the value of its taxable property and that of a city, town or school district to 3%, except that the question may be submitted to a vote of the tax-payers affected when it is deemed necessary to construct a sewerage system or procure a water supply.

History. — The first exploration within the borders of Montana was made in 1743 by Sieur de la Verendrye, who in that year led an expedition up the Missouri river to the Great Falls and near where Helena now stands; the first exploration in that part of the state which lies west of the main range of the Rocky Mountains was made by Meriwether Lewis and William Clark in 1805. That part which lies east of the mountains was included in the Louisiana Purchase of 1803 and became succes- sively a part of Missouri Territory in 1812, of Nebraska Territory in 1854, of Dakota Territory in 1861 and of Idaho Territory in 1863; that which lies west of the mountains became successively a part of Oregon Territory in 1848, of Washington Territory in 1853 and of Idaho Territory in 1863. In 1864 Montana Terri- tory was created, and in 1889 this Territory was admitted to statehood. The report of Lewis and Clark attracted many traders and trappers, and within a few years the Missouri Fur Company, the Rocky Mountain Fur Company, the Hudson Bay Company

and the American Fur Company had established fortified trading posts on the Missouri, the Yellowstone, the Marias, the Milk and other rivers; the most prominent among these was Fort Benton, which was established in 1846 at the head of navigation on the Missouri, and was made the head quarters of the American Fur Company. In 1841 Father

Peter John De Smet (1801-1872), a Belgian Jesuit missionary established Saint Mary's Mission in Bitter Root Valley, but, as the Indians repeatedly attacked the mission, it was abandoned in 1850. Fort Owen was, however, established in its place and continued for several years the chief settlement west of the mountains.

The development of Montana was scarcely begun when the discoveries of gold were made at Bannack, Beaverhead Valley, in 1862, at Virginia city, Alder Gulch, in 1863 and at Helena, Last Chance Gulch, in 1864. Several thousand people now rushed in, and before the Territorial government was created, the gold districts and the roads thereto suffered from a reign of law- lessness. The citizens organized a " vigilance committee " and hanged many- of the outlaws. Many traders and trappers were butchered by the Indians, who became still more troublesome after the invasion of the Territory by the gold-seekers, and the surveying of railway routes had been undertaken. Treaties and military operations were at first of no avail, but in 1876 the United States government took steps to reduce them to sub- mission, and Generals George Crook (1828-1890), Alfred Howe Terry (1827-1890) and John Gibbon (1827-1896), with 2700 troops (besides the Crow scouts) were sent against the Sioux under Sitting Bull, Crazy Horse and others. On the 17th of June General Crook with 1000 men defeated a large force of the Indians near the Rosebud river. On the 22nd of June General George A. Custer was sent up the Rosebud, and on the morning of the 25th passed over the divide of the Little Big Horn, where the Sioux were soon discovered. Custer divided his regiment into four commands, his own comprising 262 men. Continuing a few miles down stream, he came upon

what was supposed to be a single Sioux village; the Indians, however, proved to number from 8000 to 10,000, including 2500 to 3000 warriors. Custer was soon completely surrounded and the entire command, save a single Crow scout, was slaughtered. This was, however, the beginning of the end of the Indian troubles. On the 29th of September a band under American Horse was defeated and their leader killed; in October some 5000 Indians surrendered; and on the 22nd of April 1877, 2000 more under Crazy Horse laid down their arms. General Crook and Colonel Nelson A. Miles especi- ally distinguished themselves. In October 1877 the Nez Perces under Chief Joseph after a masterly retreat from Idaho of over 1000 m., probably unequalled in Indian warfare, were hemmed in by greatly superior forces and captured in the Bear Paw Mountains in Chouteau county.

In most of the territorial or state elections the Democrats, or the Democrats and Populists united, have been triumphant, a Republican governor having been elected only in 1892; but the contests have often been ardent and bitter. In 1889 the Democrats were charged with fraud in the 34th election precinct of Silverbow county, and, the dispute remaining unsettled, two legislatures were seated. Each legislature elected two sena- tors to the United States Senate, which, having a Republican majority, seated the Republicans. More notable, however, was the feud between W. A. Clark and Marcus Daly, both Demo- crats. William Andrews Clark (b. 1839) removed in 1856 from Pennsylvania to Iowa, in 1862 to Colorado and in 1863 to Mon- tana, where he became the wealthiest mine-owner. Marcus Daly (184 2- 1 900) went from Ireland about 1857 to New York City, and thence to California and Nevada, and in 1876 reached Butte, Montana. In 1882 he discovered one of the richest copper deposits in the world. Clark aspired to be a United States senator, but by ridiculing Daly, provoked a powerful opposition. Clark was one of the two Democratic claimants who had been denied a seat in the senate in 1890. Three years later he was again nominated, but Daly prevented his election. Clark secured his election

to the senate in 1899, but Daly furnished to the Committee on Elections and Privileges such evidence of bribery and fraud that it decided against seating him. Daly died on the 12th of November 1900, and in 1901 Clark was elected senator for the full term, which expired in 1907, when he was succeeded by Joseph Moore Dixon (b. 1867), a Republican.

The governors of Montana have been as follows: —
Territorial. Sidney Edgerton ….... 1864-1865

Thomas Meagher (acting) 1 865-1 866

Green Clay Smith 1 866-1 869

James Monroe Ashley 1869-1870

Benjamin F. Potts 1870-1883

John Schuyler Crosby 1883-1884

B.. Piatt Carpenter 1884-1885

Samuel Thomas Hauser 1885-1887

Preston Hopkins Leslie 1887-1889

Benjamin F. White 1889-

State. Joseph Kemp Toole …. Democrat 1889-1893

John Ezra Rickards …. Republican 1893-1897

Robert Burns Smith . . . Democrat and Populist 1897-1901 Joseph Kemp Toole …. Democrat 1901-1909

Edwin L. Norris …. ” 1909-

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MONTANELLI, GIUSEPPE (1813-1862), Italian statesman and author, was born at Fucecchio in Tuscany, and in 1840 was appointed law professor at Pisa. He contributed to the Antologia, a celebrated Florentine review, and in 1847 founded a newspaper called L' Italia, the programme of which was " Reform and Nationality." In 1848 Montanelli served with the Tuscan student volunteers at the battle of Curtatone, where he was wounded and taken prisoner by the Austrians. On being liberated he returned to Tuscany, and the grand duke Leopold II, knowing that he was popular with the masses, sent him to Leghorn to quell the disturbances. In October, Leopold, much against his inclinations, asked him to form a ministry. He accepted, and on the 10th of January 1849, induced the grand duke to establish a national constituent assembly. But Leopold, alarmed at the turn affairs were taking, fled from Florence, and Montanelli, Guerrazzi and Mazzini were elected " triumvirs " of Tuscany. Like Mazzini, Montanelli advocated the union of Tuscany with Rome. But after the restoration of the grand duke, Montanelli, who was in Paris, was tried and condemned by default; he remained some years in France, where he became a partizan of Napoleon III. On the formation of the kingdom of Italy he returned to Tuscany and was elected member of parliament; he died in 1862. He

was an enthusiastic, but a fickle and ambitious demagogue, and he achieved a better reputation as a writer.

His most important literary work is his Memorie sulV Italia e specialmente sulla Toscana dal 1814 al 1850, in 2 vols. (Turin, 1853) ; he also wrote // Partito nazionale italiano (Turin, 1856), L'Impero, il papato, e la democrazia in Italia (Florence, 1859) : and Dell' ordina- mento nazionale in Italia (Florence, 1862). His dramatic poem La Tentazione and his tragedy Camma achieved some success in their day. See Assunta Marradi, G. Toscanelli e la Toscana dal 1813 al 1862 (Rome, 1909).

MONTAfiES, JUAN MARTINEZ (c. 1580-1649), Spanish sculptor, was born at Alcala-la-real, in the province of Granada. His master was Pablo de Roxas, his first known work (1607) being a boy Christ, now in the sacristy of the capella antigua in the cathedral of Seville. The great altar at Santiponce near Seville, was completed in 181 2. Montanes executed most of his sculpture in wood, covered with a surface of polished gold, and coloured. Other works were the great altars at Santa Clara in Seville and at San Miguel in Jerez, the Conception and the realistic figure of Christ crucified, in the Seville cathedral; the figure of St John the Baptist, and the St Bruno (1620); a tomb for Don Perez de Guzman and his wife (1619); the St

Ignatius and the St Francis of Borja in the university church of Seville. Montanes died in 1649, leaving a large family. His works are more realistic than imaginative, but this, allied with an impeccable taste, produced remarkable results. The equestrian statue of King Philip IV., caste in bronze by Pietro Tacca in Florence and now in Madrid, was modelled by Montanes. He had many imitators, his son Alonzo Martinez, who died in 1668, being among them.

See B. Haendeke, Studien zur Geschichte der spanischen Plastik (Strassburg, 1900) ; F. Gomez, Historia de la escultura en Espana (Madrid, 1885).

MONTANISM, a somewhat misleading name for the movement in the 2nd century which, along with Gnosticism, occupied the most critical period in the history of the Early Church. It was the overthrow of Gnosticism and. Montanism that made the ” Catholic ” Church. The credit of first discerning the true significance of the Montanistic movement belongs to Ritschl. 1 In this article an account will be given of the general significance of Montanism in relation to the history of the Church in the 2nd century, followed by a sketch of its origin, development and decline.

1. From the middle of the 2nd century a change began to take place in the outward circumstances of Christianity. The Christian faith had hitherto been maintained in a few small congregations scattered over the Roman Empire. These con- gregations were provided with only the most indispensable constitutional forms (” Corpus sumus de conscientia religionis, de unitate disciplinae, de spei foedere “). This state of things passed away. The Churches soon found numbers within their pale who stood in need of supervision, instruction and regular control. The enthusiasm for a life of holiness and separation from the world no longer swayed all minds. In many cases sober convictions or submissive assent supplied the want of spontaneous enthusiasm. There were many who did not become, but who were, and therefore remained, Christians. Then, in addition to this, Christians were already found in all ranks and occupations — in the Imperial palace, among the officials, in the abodes of labour and the halls of learning, amongst slaves and freemen. Should the Church take the decisive step into the world, conform to its customs, and acknowledge as far as possible its authorities ? Or ought she, on the other hand, to remain a society of religious devotees, separated and shut out from the world? That this was the question at issue is obvious enough now, although it could not be clearly perceived at the time. It was natural that warning voices should then be raised in the Church against secular tendencies, that the well- known counsels

about the imitation of Christ should be held up in their literal strictness before worldly Christians. The Church as a whole, however, under pressure of circumstances rather than by a spontaneous impulse, decided otherwise. She marched through the open door into the Roman state, and settled down there to Christianize the state by imparting to it the word of the Gospel, but at the same time leaving it every- thing except its gods. On the other hand, she furnished herself with everything of value that could be taken over from the world without overstraining the elastic structure of the organiza- tion which she now adopted. With the aid of its philosophy she created her new Christian theology; its polity furnished her with the most exact constitutional forms; its jurisprudence, its trade and commerce, its art and industry, were all taken into her service; and she contrived to borrow some hints even from its religious worship. With this equipment she undertook, and carried through, a world-mission on a grand scale. But believers of the old school protested in the name of the Gospel against this secular Church. They joined an enthusiastic movement which had originated in a remote province, and had at first a merely local importance. There, in Phrygia, the cry for a strict Christian life was reinforced by the belief in a new and final outpouring of the Spirit — a coincidence which has been observed elsewhere in Church history — as, for instance, among the early Quakers and in the Irvingite movement. These

1 Entstehung der altkatholischen Kirche, 2nd ed. Bonn. (1857).

zealots hailed the appearance of the Paraclete in Phrygia, and surrendered themselves to his guidance. In so doing, however, they had to withdraw from the Church, to be known as ” Mon- tanists,” or ” Kataphrygians,” and thus to assume the character of the sect. Their enthusiasm and their prophesyings

were denounced as demoniacal; their expectation of a glorious earthly kingdom of Christ was stigmatized as Jewish, their passion for martyrdom as vainglorious and their whole conduct as hypocritical. Nor did they escape the more serious imputation of heresy on important articles of faith; indeed, there was a disposition to put them on the same level with the Gnostics. The effect on themselves was what usually follows in such circumstances. After their separation from the Church, they became narrower and pettier in their conception of Christianity. Their asceticism degenerated into legalism, their claim to a monopoly of pure Christianity made them arrogant. As for the popular religion of the larger Church, they scorned it as an adulterated, manipulated Christianity. But these views found very little acceptance in the 3rd century, and in the course of the 4th they died out:

2. Such is, in brief, the position occupied by Montanism in the history of the ancient Church. The rise and progress of the movement were as follows.

At the close of the reign of Antoninus Pius— probably in the year 156 (Epiphanius) — Montanus appeared at Ardabau in Mysia, near the Phrygian border, bringing revelations of the ” Spirit ” to Christendom. Montanus claimed to have a pro- phetic calling in the very same sense as Agabus, Judas, Silas, the daughters of Philip, Quadratus and Ammia, or as Hermas at Rome. At a later time, when the validity of the Montanistic prophecy was called in question, the adherents of the new move- ment appealed explicitly to a sort of prophetic succession, in which their prophets had received the same gift which the daughters of Philip, for example, had exercised in that very country of Phrygia. The burden of the new prophecy seems to have been a new standard of moral obligations, especially with regard to marriage, fasting and martyrdom. But Montanus had larger schemes in view. He wished to organize a special com- munity of true Christians to wait for the coming of their Lord. The small Phrygian towns of Pepuza and Tymion were selected as the headquarters of his church. Funds

were raised for the new organization, arid from these the leader and missionaries, who were to have nothing to do with worldly life, drew their pay. Only two women, Prisca and Maximilla, were moved by the Spirit; like Montanus, they uttered in a state of frenzy the commands of the Spirit, which urged men to a strict and holy life. This does not mean that visions and significant dreams may not have been of frequent occurrence in Montanistic circles. 1

For twenty years this agitation appears to have been confined to Phrygia and the neighbouring provinces. But after the year 177 a persecution of Christians broke out simultaneously in many provinces of the Empire. Like every other persecution it was regarded as the beginning of the end. It would seem that before this time Montanus had disappeared from the scene; but Maximilla, and probably also Prisca, were working with redoubled energy. And now, throughout the provinces of Asia Minor, in Rome, and even in Gaul, amidst the raging of persecution, attention was attracted to this remarkable movement. The desire for a sharper exercise of discipline, and a more decided renunciation of the world, combined with a craving for some plain indication of the Divine will in these last critical times, had prepared many minds for an eager acceptance of the tidings from Phrygia. And thus, within the large congregations where there was so much that was open to censure in doctrine and constitution and morals, conventicles were formed in order that Christians might prepare themselves by strict discipline for the day of the Lord.

1 Theodotus, ” the first steward of the New Prophecy,” was a fellow-worker with Montanus, and almost certainly a prophet. Later on, Firmilian, writing to Cyprian, mentions a prophetess who appeared in Cappadocia about A.D. 236, and Epiphanius (Haer. 49) tells of another called Quintilla. — (Ed.)

Meanwhile in Phrygia and its neighbourhood — especially in Galatia, and also in Thrace — a

controversy was raging between the adherents and the opponents of the new prophecy. Between 150 and 176 the authority of the episcopate had been immensely strengthened, and along with it a settled order had been intro- duced into the Churches. As a rule, the bishops were resolute enemies of the Montanistic enthusiasm. It disturbed the peace and order of the congregations, and threatened their safety. Moreover, it made demands on individual Christians such as very few could comply with. But the disputation which Bishops Zoticus of Cumana and Julian of Apamea arranged with Maxi- milla and her following turned out disastrously for its promoters. The ” spirit ” of Maximilla gained a signal victory, a certain Themiso in particular having reduced the bishops to silence. Sotas bishop of Anchialus attempted to refute Prisca, but with no better success (Eusebius, Hist. eccl. v. 19). These proceedings were never forgotten in Asia Minor, and the report of them spread far and wide. In after times the only way in which the discomfiture of the bishops could be explained was by asserting that they had been silenced by fraud or violence. This was the commencement of the excommunication or secession of the Montanists in Asia Minor. Not only did an extreme party arise in Asia Minor rejecting all prophecy and the Apocalypse of John along with it, but the majority cf the Churches and bishops in that district appear (c. 178) to have broken off all fellowship with the new prophets, while books were written to show that the very form of the Montanistic prophecy was sufficient proof of its spuriousness. 2 In Gaul and Rome the prospects of Montanism seemed for a while more favourable. The confessors of the Gallican Church at Lyons were of opinion that communion ought to be maintained with the zealots of Asia and Phrygia; and they addressed a letter to this effect to the Roman bishop, Eleutherus. There was a momentary vacillation even in Rome. Nor is this to be wondered at. The events in Phrygia could not appear new and unprecedented to the Roman Church. If we may believe Tertullian, it was Praxeas of Asia Minor, the relentless foe of Montanism, who succeeded in persuading the Roman

bishop to withhold his letters of conciliation. 3

Early in the last decade of the 2nd century two considerable works 4 appeared in Asia Minor against the Kataphrygians. The first, by a bishop or presbyter whose name is not known, is addressed to Abircius bishop of Hierapolis, and was written in the fourteenth year after the death of Maximilla — i.e. appa- rently about the year 193. The other was written by a certain Apollonius forty years after the appearance of Montanus, consequently about 196. From these treatises we learn that the adherents of the new prophecy were very numerous in Phrygia, Asia and .Galatia (Ancyra), that they had tried to defend themselves in writing from the charges brought against them (by Miltiades), that they possessed a fully developed independent organization, that they boasted of many martyrs, and that they were still formidable to the Church in Asia Minor. Many of the small congregations had gone completely over to Montanism, although in large towns, like Ephesus, the opposite party maintained the ascendancy. Every bond of intercourse was broken, and in the Catholic Churches the worst calumnies were retailed about the deceased prophets and the leaders of the societies they had founded. In many Churches outside of Asia Minor a different state of matters prevailed. Those who accepted the message of the new prophecy did not at once leave the Catholic Church in a body. They simply formed small conventicles within the Church. Such, for example, appears to have been the case in Carthage (if we may judge from the Acts of the martyrs Perpetua and Felicitas) at the commence- ment of the persecution of Septimius Severus about the year 202. But even here it was impossible that an open rupture

2 Miltiades, irepl toO lift Seiv irpo^Ti\v Iv hcaraaeL \akeiv. At the same time as Miltiades, if not earlier, Apollinaris of Hierapolis also wrote against the Montanists.

3 It was Zephynnus in A.D. 202 who took the decisive step of refusing to communicate with the Asiatic Montanists. — (Ed.)

4 Quoted in Eusebius, Hist. Eccl. v. 16-18.

should be indefinitely postponed. The bishops and their flocks gave offence to the spiritualists on so many points that at last it could be endured no longer. The latter wished for "more fasting, the prohibition of second marriages, a frank, courageous profession of Christianity in daily life, and entire separation from the world; the bishops, on the other hand, sought to make it as easy as possible to be a Christian, lest they should lose the greater part of their congregations. And lastly, the bishops were compelled more and more to take the control of discipline into their own hands, while the spiritualists insisted that God Himself was the sole judge in the congregation. On this point especially a conflict was inevitable. It is true that there was no rivalry between the new organization and the old, as in Asia and Phrygia, for the Western Montanists recognized in its main features the Catholic organization as it had been developed in the contest with Gnosticism; but the demand that the " organs of the Spirit " should direct the whole discipline of the congregation contained implicitly a protest against the actual constitution of the Church. Even before this latent antagonism was made plain there were many minor matters which were sufficient to precipitate a rupture in particular congregations.. In Carthage, for example, it would appear that the breach between the Catholic Church and the Montanistic conventicle was caused by a disagreement on the question whether or not virgins ought to be veiled. For nearly five years (202-207) the Carthaginian Montanists strove to remain within the Church, which was as dear to them as it was to their oppo- nents. But at length they quitted it, and formed a congregation of their own.

It was at this juncture that Tertullian, the most famous theologian of the West, left the Church whose cause he had so manfully upheld against pagans and

heretics. He too had come to the conviction that the Church had forsaken the old paths and entered on a way that must lead to destruction. The writings of Tertullian afford the clearest demonstration that what is called Montanism was, at any rate in Africa, a reaction against secularism in the Church. There are other indications that Montanism in Carthage was a very different thing from the Montanism of Montanus. Western Montanism, at the beginning of the 3rd century, admitted the legitimacy of almost ^very point of the Catholic system. It allowed that the bishops were the successors of the apostles, that the Catholic rule of faith was a complete and authoritative exposition of Christianity, and that the New Testament was the supreme rule of the Christian life. Montanus himself and his first disciples had been in quite a different position. In his time there was no fixed, divinely instituted congregational organization, no canon of New Testament Scriptures, no anti-Gnostic theology, and no Catholic Church. There were simply certain communities of believers bound together by a common hope, and by a free organization, which might be modified to any required extent. When Montanus proposed to summon all true Christians to Pepuza, in order to live a holy life and prepare for the day of the Lord, there' was nothing whatever to prevent the execution of his plan except the inertia and lukewarmness of Christendom. But this was not the case in the West at the beginning of the 3rd century. At Rome and Carthage, and in all other places where sincere Montanists were found, they were confronted by the imposing edifice of the Catholic Church, and they had neither the courage nor the inclination to undermine her sacred foundations. This explains how the later Montanism never attained a position of influence. In accepting, with slight reservations, the results of the development which the Church had undergone during the fifty years from 160 to 210 it reduced itself to the level of a sect. Tertullian exhausted the resources of dialectic in the endeavour to define and vindicate the relation of the spiritualists to the " psychic " Christians; but no

one will say he has succeeded in clearing the Montanistic position of its fundamental inconsistency.

Of the later history of Montanism very little is known. But it is at least a significant fact that prophecy could not be resuscitated. Montanus, Prisca, and Maximilla were always

recognized as the inspired authorities. At rare intervals a vision might perhaps be vouchsafed to some Montanistic old woman, or a brother might now and then have a dream that seemed to be of supernatural origin; but the overmastering power of religious enthusiasm was a thing of which the Montanists knew as little as the Catholics. Their discipline was attended with equally disappointing results. In place of an intense moral earnestness, we find in Tertullian a legal casuistry, a finical morality, from which no good could ever come. It was only in the land of its nativity that Montanism held its ground till the 4th century. It maintained itself there in a number of close communities, probably in places where no Catholic congregation had been formed; and to these the Novatians at a later period attached themselves. In Carthage there existed down to the year 400 a sect called Tertullianists; and in their survival we have a striking testimony to the influence of the great Carthaginian teacher. On doctrinal questions there was no real difference between the Catholics and the Montanists. The early Montanists (the prophets themselves) used expressions which seem to indicate a Monarchian conception of the person of Christ. After the close of the 2nd century we find two sections amongst the Western Montanists, just as amongst the Western Catholics — there were some who adopted the Logos-Christology, and others who remained Monarchians. 1

Sources. — The materials for the history of Montanism, although plentiful, are fragmentary, and require a good deal of critical sifting. They may be divided into four groups: (1) The utterances of Montanus, Prisca and Maximilla 2 are our most

important sources, but unfortunately they consist of only twenty-one short sayings. (2) The works written by Tertullian after he became a Montanist furnish the most copious information — not, however, about the first stages of the movement, but only about its later phase, after the Catholic Church was established. (3) The oldest polemical works of the 2nd century, extracts from which have been preserved, especially by Eusebius (Hist. Eccles. bk. v.), form the next group. These must be used with the utmost caution, because even the earliest orthodox writers give currency to many misconceptions and calumnies. (4) The later lists of heretics, and the casual notices of Church fathers from the 3rd to the 5th century, though not containing much that is of value, yet contain a little. 3

1 It is evident that Montanism was by no means homogeneous. Too often the primitive ” heresy of the Phrygians ” has been studied in the light of the matured system of Tertullian. One great diver- gence is manifest : Tertullian never himself deviated from orthodoxy and vehemently asserts the orthodoxy of all Montanists, but both Montanus (“I am the Father and the Son and the Holy Ghost “) and Maximilla (” I am Word and Spirit and Power “) used language which has a distinctly ” monarchian ” flavour. There were really divided views on the question of the Divine Monarchy among the Montanists as among the Catholics. The orthodox party were known as the Cataproclans, the heterodox as Cataeschinites, and both appealed to the oracles of their prophets. Other influences tending to diversity were the rise of later prophets and visionaries, the per- sonality of prominent members of the sect (like Tertullian himself, who gave to Montanism much more than he received from it) , and the power of local environment. An examination of Phrygian as dis- tinct from African Montanism leads to the following conclusions: (1) The Phrygians claimed to have received the prophetic gift by way of succession just as the bishops traced their office back to the apostles; Tertullian seems to ignore the intermediate steps between the apostles and Montanus; (2) the ” ecstasy ”’ of the African section was much more restrained than the ravings of the Phrygians; (3) the original Montanists followed the example of the Phrygian native cults in assigning a prominent place to women, Tertullian on the other hand (De virg. vel. 9) says, ” It is not permitted to a woman to speak in church, nor yet to teach, nor to baptize, nor to offer, nor to assume any office which belongs to a man, least of all the priest- hood; ” (4) while both sections gave to prophets the power of absolution, the Phrygians extended it to martyrs also — at Carthage the Catholics did this contrary to the views of Tertullian. There is also good reason to doubt whether the Phrygian Montanists were anything like so ascetic and desirous of martyrdom as has been

generally considered. Apollonius (Eusebius, Hist. Eccl. v. 16) accuses them of covetousness and tells us that Themiso purchased his freedom from imprisonment by a considerable payment. Sir William Ramsay has also shown that martyrdoms in Phrygia were rare during the end of the 2nd and the whole of the 3rd century, a spirit of religious compromise prevailing between the Christian and pagan populations (see a paper by H. J. Lawlor in the Journal of Theological Studies for Jul}', 1908, vol. ix. 481).

2 Collected by Munter and by Bonwetsch, Geschichte des Montan- ismus, p. 197.

3 On the sources see Bonwetsch, pp. 16-55.

Literature. — Ritschl'sinvestigations.ref erred to above, supersede the older works of Tillemont, Wernsdorf, Mosheim, . Walch, Neander, Baur and A. Schwegler (Der Montanismus und die christliche Kirche des 2ten Jahrhunderts, Tubingen, 1841). The later works, of which the best and most exhaustive is that of N. Bonwetsch, Die Geschichte des Montanismus (1881), all follow the lines laid down by Ritschl. See also Gottwald, De montanismo Tertulliani (1862); Reville, " Tertullien et le montanisme " in the Revue des deux ntondes (Nov. I, 1864); Stroelin, Essai sur le montanisme (1870); iDe Soy res, Montanism and the Primitive Church (London, 1878); W. Cunningham, The Churches of Asia (London, 1880); Renan, " Les Crises du Catholicisme Naissant " in Rev. d. deux mondes (Feb. 15, 1881); H. Weinel, Die Wirkungen des Geistes und der Geister im nachapostol. Zeitalter (Freiburg, 1899); G. G. Selwyri, The Christian Prophets (London, 1900) ; Bonwetsch, art. " Montan- ismus " in Hauck-Herzog's Realencyklopadie. Special points of importance in the history of Montanism have been investigated by Lipsius, Overbeck, Weizsacker (Theol. Lit.-Zeitung, Nov. 4, 1882), Harnack, Das Monchthum, seine Ideale

und seine Geschichte, 2nd ed., 1882; Eng. trans., 1901 ; and Z. f. Kirchengesch. iii. 369-408), and H. J. Lawlor. Weizsacker's short essays are extremely valu- able, and have elucidated several important points previously overlooked. (A. Ha.)

MONTARGIS, a town of central France, capital of an arron- dissement in the department of Loiret, 47 m. E.N.E. of Orleans by rail. Pop. (1906), 11,038. The town is traversed by the Vernisson, by numerous arms of the Loing, and by the Briare canal, which unites with the canal of Orleans a little below it. It has a church (Ste Madeleine), dating in part from the 12th century and including a fine choir of Renaissance architecture, and still preserves portions of its once magnificent castle (12 th to 15th centuries), which, previous to the erection of Fontaine- bleau, was a favourite residence of the royal family. A hand- some modern building contains the town-hall, public library, and museum; in the courtyard is a bronze group, " The Dog of Montargis "; the town has a statue of Mirabeau, born in the neighbourhood. Montargis is the seat of a sub-prefecture, and has tribunals of first instance and of commerce and colleges for both sexes. It manufactures paper, gold chains, rubber, tar, asphalt, chemical manures, woodwork and leather. The town is an agricultural market, and its port has trade in coal, timber, sheep and farm produce.

Montargis was formerly the capital of the Gatinais. Having passed in 1188 from the Courtenay family to Philip Augustus, it long formed part of the royal domain. In 1528 Francis I. gave it as dowry to Renee d'Este, daughter of Louis XII., the famous Huguenot princess; from her it passed to her daughter Anne, and through her to the dukes of Guise; it was repurchased for the Crown in 1612. From 1626 till the Revolution the territory was the property of the house of Orleans. Montargis was several times taken or attacked by the English in the 15th century, and is particularly noted for its successful defence in 1427. Both Charles VII. and Charles VIII. held court in the town; it was the latter who set the famous Dog of Montargis to fight a duel with his master's

murderer whom he had tracked and captured.

MONTAUBAN, ARTHUR DE (d. 1479), French magistrate and prelate, belonged to one of the great families of Brittany. To satisfy a private grudge against Gilles, brother of Duke Francis II. of Brittany, he intrigued to such good purpose that Gilles was arraigned for treason, and finally assassinated in prison in 1450. When Montauban's duplicity was discovered he was deprived of his office of bailli of Cotentin and banished. He then turned monk, and through the support of his brother, John de Montauban (1412–1466), Louis XL's favourite, obtained the archbishopric of Bordeaux in 1468. He died in Paris on the 9th of March 1479.

MONTAUBAN, a town of south-western France, capital of Tarn-et-Garonne, 31 m. N. of Toulouse by the Southern railway. Pop. (1906), town, 16,813; commune, 28,688. The town, built mainly of a reddish brick, stands on the right bank of the Tarn at its confluence with the Tescou. Its fortifications have been replaced by boulevards beyond which extend numerous suburbs, while on the left bank of the Tarn is the suburb of Villebourbon, which is connected with the town by a remarkable bridge of the early 14th century. It is a brick structure over 200 yds. in length, and though its fortified towers have disappeared it is

otherwise in good preservation. The hotel de ville, on the site of a castle of the counts of Toulouse and once the residence of the bishops of Montauban, stands at the east end of the bridge. It belongs chiefly to the 17th century, but some portions are much older, notably an underground chamber known as the Hall of the Black Prince. Besides the municipal offices it contains a valuable library, and a museum with collections of antiquities and pictures. The latter comprise most of the work (including his " Jesus among the Doctors ") of Jean Ingres, the celebrated painter, whose birth in Montauban is commemorated by an elaborate monument. The Place Nationale is a square of the 17th century, entered at each corner by gateways giving access to a large

open space surrounded by houses carried on double rows of arcades. The prefecture, the law-courts and the remaining public buildings are modern. The chief churches of Montauban are the cathedral, remarkable only for the possession of the ” Vow of Louis XIII.,” one of the masterpieces of Ingres, and the church of St Jacques (14th and 15th centuries), the facade of which is surmounted by a handsome octagonal tower. Mont- auban is the seat of a bishop, a prefect and a court of assize. It has tribunals of first instance and of commerce, a chamber of commerce and a board of trade arbitration, lycees and a training college, schools of commerce and viticulture, a branch of the Bank of France, and a faculty of Protestant theology. The commercial importance of Montauban is due rather to its trade in agricultural produce, horses, game and poultry, than to its industries, which include nursery-gardening, cloth-weaving, cloth-dressing, flour-milling, wood-sawing, and the manufacture of furniture, silk-gauze and straw hats. The town is a junction of the railways of the Southern and Orleans companies, and communicates with the Garonne by the Canal of Montech.

With the exception of Mont-de-Marsan, Montauban is the oldest of the bastides of southern France. Its foundation dates from 1 1 44 when Alphonse Jourdain, count of Toulouse, granted it a liberal charter. The inhabitants were drawn chiefly from Montauriol, a village which had grown up around the neighbour- ing monastery of St Theodard. In the 13th century the town suffered much from the ravages of the Albigensians and from the Inquisition, but by 13 17 it had recovered sufficiently to be chosen by John XXII. as the head of a diocese of which the basilica of St Theodard became the cathedral. By the treaty of Bretigny (1360) it was ceded to the English; but in 1414 they were expelled by the inhabitants. In 1560 the bishops and magistrates embraced Protestantism, expelled the monks, and demolished the cathedral. About ten years later it became one of the Huguenot strongholds, and formed a small independent republic. It was the headquarters of the

Huguenot rebellion of 1621, and was vainly besieged by Louis XIII. for eighty-six days; nor did it submit until after the fall of La Rochelle in 1629, when its fortifications were destroyed by Richelieu. In the same year the plague cut off over 6000 of its inhabitants. The Protestants again suffered persecution after the repeal of the Edict of Nantes.

MONTAUSIER, CHARLES DE SAINTE-MAURE, Due de

(1610-1690), French soldier, was born on the 6th of October 1610, being the second son of Leon de Sainte-Maure, baron de Montausier. His parents were Huguenots, and he was educated at the Protestant College of Sedan under Pierre du Moulin. He served brilliantly at the siege of Casale in 1630. Becoming marquis de Montausier by the death of his elder brother in 1635, he was the recognized aspirant for the hand of Mme de Rambouillet's daughter Julie Lucine d'Angennes (1607-1671). Having served under Bernard of Saxe-Weimar in Germany in 1634 he returned to the French service in 1636, and "fought in the Rhenish campaigns of the following years. He was taken prisoner at Rantzau in November 1643, and only ransomed after ten months' captivity. On his return to France he became a lieutenant-general. On the 15th of July 1645 he married " the incomparable Julie, " thus terminating a courtship famous in the annals of French literature because of the Guirlande de Julie, a garland of verse consisting of madrigals by Montausier, Jean Chapelain, Guillaume Colletet, Claude de

Malleville, Georges de Scudery, Pierre Corneille (if M. Uzanne is correct in the attribution of the poems signed M.C.), Philippe Hubert, Simon Arnauld de Pomponne, 1 Jean Desmarests de Saint Sorlin, Antoine Gombaud (»e nain de la Princesse Julie) and others. It was copied by the famous calligraphist N. Jarry in a magnificent MS., on each page of which was painted a flower, and was presented to Julie on her

fete day in 1641. The MS. is now in possession of the Uzes family, to whom it passed by the marriage of Julie's daughter to Emmanuel de Crussol, due d'Uzes.

Montausier had bought the governorship of Saintonge and Angoumois, and became a Roman Catholic before his marriage. During the Fronde he remained, in spite of personal grievances against Mazarin, faithful to the Crown. On the conclusion of peace in 1653 the marquis, who had been severely wounded in 1652, obtained high favour at court in spite of the roughness of his manners and the general austerity which made the Parisian public recognize him as the original of Alceste in the Misanthrope. Montausier received from Louis XIV. the order of the Saint Esprit, the government of Normandy, a dukedom, and in 1668 the office of governor of the dauphin, Louis. He initiated the series of classics Ad usum Delphini, directed by the learned Huet, and gave the closest attention to the education of his charge, who was only moved by his iron discipline to a hatred of learning. Court gossip assigned some part of Montausier's favour to the complaisance of his wife, who, appointed lady-in-waiting to the queen in 1664, favoured Louis XIV. 's passion for Louise de la Valliere, and subsequently protected Mme de Montespan, who found a refuge from her husband with her. He died on the 17th of November 1690.

See P6re Nicolas Petit, Vie du due de Montausier (1729); Puget de Saint Pierre, Histoire du due de Montausier (1784) ; Amedee Roux, Un Misanthrope a la cour de Louis XIV. Montausier (i860); O. Uzanne, La Guirlande de Julie (1875); E. Flechier, Oraisons funebres du due et de la duchesse de Montausier (Paris, 1691); and contemporary memoirs.

MONTBELIARD, a town of eastern France, capital of an arron- dissement in the department of Doubs, 49 m. N.E. of Besancon on the Paris-Lyon line between that town and Belfort. Pop. (1906), town, 8723; commune, 10,455. Montbeliard is situated 1050 ft. above sea-level on the right bank of the Allaine at its junction with the Luzine (Lizaine or Lisaine). It is

an impor- tant point in the frontier defences of France since 1871. Forts on outlying hills connect it with Belfort on the one side and (through Blamont and the Lomont fortifications) with Besancon on the other. The old castle of the counts of Montbeliard is now used as barracks; its most conspicuous features, the Tour Bossue and the Tour Neuve, date respectively from 1425 and 1594. Most of the inhabitants are Protestant, and the church of St Martin, built early in the 17th century, now serves as a Protestant place of worship. The old market-hall and some old houses of the 16th century also remain. A bronze statue of George Cuvier, the most illustrious native of Montbeliard, and several fountains adorn the town. Montbeliard is the seat of a sub-prefect and has a tribunal of first instance, a board of trade-arbitrators, a communal college, a practical school of industry, a chamber of arts and manufactures and a museum of natural history. Since 1870 a considerable impetus has been given to its prosperity by the Alsatian immigrants. Its industries include watch and clock making and dependent trades, cotton spinning and weaving, the manufacture of hosiery, textile machinery, tools, nails and wire, and brewing. There is commerce in wine, cheese, wood and Montbeliard cattle.

After belonging to the Burgundians and Franks, Montbeliard (Mons Peligardi) was, by the treaty of Verdun (843), added to Lorraine. In the nth century it became the capital of a count- ship, which formed part of the second kingdom of Burgundy and latterly of the German Empire. Its German name is Mompelgard. In 1397 it passed by marriage to the house of Wurttemberg, to whom it belonged till 1793. It resisted the attacks of Charles the Bold (1473), and Henry I. of Lorraine,

1 (1618-1699), a son of Arnauld d'Andelly and minister of foreign affairs in succession to Lionne.

(1587 and 1588), duke of Guise, but was taken in 1676 by Marshal Luxemburg, who razed its fortifications. The tolerance of the princes of Wurttemberg attracted to the town at the end of the

1 6th century a colony of Anabaptists from Frisia, and their descendants still form a separate community in the neighbour- hood. In 1793 the inhabitants voluntarily submitted to annex- ation by France. In 1871 the battle of the Lisaine between the French and Germans was fought in the neighbourhood and partly within its walls.

MONTBRISON, a town of oast-central France, capital of an arrondissement in the department of Loire, France, 21m. N.W. of St Etienne, on the railway from Clermont to St Etienne. Pop. (1906), 6564. It is situated on a volcanic hill overlooking the Vizezy, a right-hand affluent of the Lignon du Nord. The principal buildings are the once collegiate church of Notre- Dame d'Esperance, founded about 1220 but not finished till the 15th century, and the 14th-century edifice known as the Salle de la Diana (Decana), which was restored by Viollet-le^ Due. There is a statue of the poet Victor de Laprade (d. 1883), a native of the town. Montbrison is the seat of a sub-prefect, of a court of assize and of a tribunal of first instance. There are liqueur-distilleries and flour-mills, and silk ribbons are manufactured; there is considerable commerce in grain.

Montbrison belonged to the counts of Forez during the middle ages. In 1801 it became the capital of its department in place of Feurs, but in 1856 the more important town of St. Etienne was substituted for it.

MONTBRUN, LOUIS PIERRE, Count (1770-1812), French cavalry general, served with great distinction in the cavalry arm throughout the wars of the Revolution and the Consulate, and in 1800 was appointed to command his regiment, having served therein from trooper upwards. At Austerlitz (Dec. 2, 1805) he was promoted general of brigade. He earned further distinction in Germany and Poland as a dashing leader of horse, and in 1808 he was sent into Spain. Here occurred an incident which unfavourably influenced his whole career. He found himself obliged to overstay his leave of absence in

order to protect the lady who afterwards became his wife. Napoleon was furious, and deprived him of his command, and Montbrun was awaiting his master's' decision when an oppor- tunity came to retrieve his reputation. Some doubt exists as to the events of the famous cavalry charge at the Somosierra, but Montbrun's share in it was most conspicuous. Soon after- wards he was promoted to be general of division, and in 1809 his cavalry took no inconsiderable part in the victories of Eckmiihl and Raab. He was employed in the Peninsula, 1810- 181 1. He was killed, when commanding a cavalry corps, at the beginning of the battle of Borodino (Sept. 7, 1812). Mont- brun was considered, as a leader of heavy cavalry, second only to Kellermann of all the generals of the First Empire.

MONTCALM DE SAINT VERAN, LOUIS JOSEPH, Makquis de (17 1 2-1 759), French soldier, was born at Condiac near Nimes on the 28th of February 1712, 2 and entered the army in 1721, becoming captain in 1727. He saw active service under Berwick on the Rhine in 1733, and in 1743, having become a colonel of infantry, he served in Bohemia under Maillebois, Broglie and Belleisle. He became intimate with Francois de Chevert (1695-1769), the gallant defender of Prague, and in Italy repeatedly distinguished himself, being promoted brigadier in 1747, shortly before the disastrous action of Exilles, in which he was severely wounded. In 1749 he received the colonelcy of a cavalry regiment, and in 1756, with the rank of mare'chal de camp, he was sent to command the French troops in Canada. In the third year of his command, having been meanwhile promoted lieutenant-general, he defended Quebec (q.v.) against General Wolfe. The celebrated siege ended with the battle

2 A younger brother, Jean Louis Pierre (or Philippe) Elizabeth Montcalm de Condiac (1719-1726), was a child of astonishing pre- cocity. At the age of four he read Latin; at six he understood Greek and Hebrew. It was for his benefit that the bureau typo- graphique — a mechanism for teaching children reading, writing and arithmetic at the same time

that it amused them — was contrived by their tutor Louis Dumas (1676-1744).

of the Heights of Abraham (Sept. 12, 1759), in which Wolfe was killed and Montcalm mortally wounded. The French com- mander died two days later, while the place, with which his name and Wolfe's are for ever associated, was still in the hands of the garrison.

Bibliography. — See Canada : History • and Seven Years' War, also Parkman's Montcalm and Wolfe. The chief French authorities are Pinard, Chronologic militaire, v. 616 (1762) ; Montcalm et le Canada francais, by F. Joubleau (Paris, 1874) and C. de Bonne- chose (Paris, 1877); Le Moine, La Memoire de Montcalm vengee (Montreal, 1889).

MONTCEAU-LES-MINES, a town of east-central France, in the department of Saone-et-Loire, 14 m. S. by W. of Le Creusot on the Paris-Lyon railway. Pop. (1906), town, 9701; commune, 26,305. Its importance is due chiefly to its position as the centre of the Blanzy coal basin, on the Canal du Centre, which, is connected with the coalfield by numerous lines of railway. Its manufacturing establishments include weaving and spinning factories, iron and copper foundries, and engineering work- shops.

MONT CENIS, a pass (6893 ft.) in Savoy (France) which forms the limit between the Cottian and Graian Alps. A carriage road was built across it between 1803 and 1810 by Napoleon, while a light railway (named after its inventor, Mr. Fell, and worked by English engine-drivers) was opened alongside the road in 1868, but was destroyed in 1871, on the opening of the tunnel. This tunnel (highest point 4249 ft.) is really 17 m. west of the pass, below the Col de Frejus. From Chambery the line runs up the Isere valley, but soon bears through that of the Arc or the Maurienne past St Jean de Maurienne to Modane (61 m. from Chambery). The tunnel is 8 m. in

length, and leads to Bardonneche, some way below which, at Oulx (18 m. from Modane) the line joins the road from the Mont Genevre. Thence the valley of the Dora Riparia is followed to Turin (64! m. from Modane). The carriage road mounts the Arc valley for 16 m. from Modane to Lanslebourg, whence it is 8 m. to the hospice, a little way beyond the summit of the pass. The descent lies through the Cenis valley to Susa (37 m. from Modane) where the road joins the railway. Tc the south-west of the Mont Cenis is the Little Mont Cenis (7166 ft.) which leads from the summit plateau (in Italy) of the main pass to the Etache valley on the French slope and so to Bramans in the Arc valley (7 m. above Modane). This pass was crossed in 1689 by the Vaudois, and by some authors is believed to have been ” Hannibal’s Pass.” (W. A. B. C.)

MONTCHRETIEN, ANTOINE DE (1575 or 1576-1621), French dramatist and economist, son of an apothecary at Falaise named Mauchrestien, was born about 1576. In one of his numerous duels he had the misfortune to kill his opponent. He con- sequently took refuge in England, but through the influence of James I., to whom he dedicated his tragedy, L’Ecossaise, he was allowed to return to France, and established himself at Auxonne-sur-Loire, where he set up a steel foundry. In 1621 he abandoned this enterprise to serve on the Huguenot side in the civil wars. He raised troops in Maine and Lower Nor- mandy, but was killed in a skirmish near Tourailles on the 8th of October 162 1. There is no evidence that he shared the religious opinions of .the party for which he fought, and in any case he belonged to the moderate party rallied round Henry IV. In 161 5 he published a valuable Traiti de Veconomie politique, based chiefly on the works of Jean Bodin. He had the good fortune to write before the pruning processes of Vaugelas and Balzac had been applied to the language, and M. Lanson praises him as one of the best prose-writers of his time.

His dramas are Sophonisbe (1596), afterwards remodelled as La Cartaginoise; L’Ecossaise, Les Lacenes, David, Aman (in 1601); Hector (1604). As

plays they have little technical merit, but they contain passages of great lyrical beauty. In L' Ecossaise Elizabeth first pardons Mary Queen of Scots, and no explanation is given of the change that leads to her execution. Aman has been compared not too unfavourably with Esther, and the hatred of Haman for Mordecai is expressed with more

vigour than in Racine's play. All Montchretien's heroes face death without fear. M. Petit de Julleville finds the character- istic note of his plays in the same cult of heroism which was later to inspire the plays of Corneille. Poet, economist, iron- master, and soldier, Montchr6tien represents the many-sided activity of a time before literature had become a profession, and before its province had been restricted in France to polite topics.

The tragedies were edited in 1901 by M. Petit de Julleville with notice and commentary; the Traite de Veconomie politique in 1889 by Th. Funck Brentano, whose estimate of Montchr6tien is severely criticized by W. I. Ashley in the Eng. Hist. Rev. (Oct. 1891). See also fimile Faguet, La Tragedie au XVI me si'ecle, ch. xi. (1883); G. Lanson, Revue des deux monies (Sept. 1891).

MONTCLAIR, a town of Essex county, New Jersey, U.S.A., 5 m. N.N.W. of Newark. Pop. (1910 census) 21,550. It is served by the Erie and the Delaware, Lackawanna & Western railways, and by electric lines to Caldwell and Newark. It is situated at the base and on the slopes of the Orange Mountains (its altitude above the sea varying from 217 to about 665 ft.), has an irregular street plan, and is a residential suburb of New York and other neighbouring cities. Montclair has excellent public schools. Among the town's institutions are the Mountainside hospital, a state normal school (1908), Montclair academy (1887), a public library, and two orphan asylums. An annual Bach festival was first held here in June 1905. The lower part of Montclair was settled about 1675 and gradually became known as Cranetown, which name it retained until 181 2. In that year Bloomfield, including Cranetown, was

organized as a separate township. In 1868 Cranetown, then popularly known as West Bloomfield, with the addition of the Dutch-settled Speertown, was incorporated as Montclair. Montclair became a town in 1894.

See Henry Whittemore, History of Montclair (New York, 1894).

MONT-DE-MARSAN, a town of south-west France, capital of the department of Landes at the confluence of the Midou and the Douze, 92 m. S. of Bordeaux on the Southern railway between Morcenx and Tarbes. Pop. (1906), 9059. Most of the buildings are in the older quarter, on the peninsula between the two rivers forming the Midouze. La Pepiniere, a beautiful public garden, extends along the right bank of the Douze. A keep of the 14th century, now used for military purposes, was built by Gaston Phoebus, count of Foix, to overawe the inhabitants, and goes by the name of Nou-li-Bos (in modern French ” Tu ne l’y veux pas “). The finest of the modern buildings is an officers’ club, which contains a small museum. A court of assizes sits in the town; the local institutions comprise a tribunal of first instance, a branch of the Bank of France, and a lycee. The industries include distillation of turpentine and resinous oils, tanning, the founding and forging of metal, wood-sawing; and manufactures of machinery and straw envelopes for bottles. There is trade in resin, wine, brandy, timber, cattle, horses and other live stock.

Mont-de-Marsan, the first of the Bastides (q.v.) of the middle ages, dates from 1141, when it was founded by Pierre, vicomte de Marsan, as the capital of his territory. In the 13th century it passed to the viscounts of Beam, but the harsh rule of Gaston Phoebus and some of his successors induced the people to favour the English. The territory was united to the French Crown on the accession of Henry IV.

MONTDIDIER, a town of northern France, capital of an arron- dissement in the department of Somme, 23 m.

S.E. of Amiens by rail. Pop. (1906), 4159. The town, situated on an eminence on the right bank of the Don, dates from the Merovingian period, and perhaps owes its name to the imprisonment of the Lombard king Didier in the 8th century. The church of St Pierre, dating chiefly from the 15th century, has a beautiful portal of the 16th century and contains the tomb of Raoul III., count of Crepy (12th century), fonts of the nth century and other works ■ of art. The church of St Sepulcre belongs, with the exception of the modern portal, to the 15th and 16th centuries. In the interior there is a well-known ” Holy Sepulchre ” of the

latter period. The law-court, once the castle, partly dating from the 12th century, possesses fine tapestries of the 17th century. A statue commemorates the birth at Montdidier of Antoine Parmentier (1737-1813), with whose name are connected the beginnings of potato-culture in France. The town has a sub-prefecture and a tribunal of first instance; its industries include tanning and the manufacture of zinc-white.

Held first by its own lords, afterwards by the counts of Crepy and Valois, Montdidier passed to the Crown in the 12th century, at the end of which it was granted a charter of liberties. The town offered a brave and successful resistance to the Spanish troops in 1636.

MONT-DORE-LES-BAINS, a watering-place of central France in the department of Puy-de-D6me, situated at a height of 3440 ft., on the right bank of the Dordogne not far from its source, and 31 m. by road S.W. of Clermont-Ferrand. Pop. (1906), 1677. The Monts Dore close the valley towards the south. The thermal springs of Mont Dore, now numbering twelve, were known to the Romans. Bicarbonate of soda, iron and arsenic are the principal ingredients of the waters, which are used both for drinking and

bathing, baths of high temperature being characteristic of the treatment; they are efficacious in cases of pulmonary consumption, bronchitis, asthma, and nervous and rheumatic paralysis. From the elevation and exposure of the valley, the climate of Mont-Dore-les-Bains is severe, and the season only lasts from the 15th of June to the 15th of September. The bath-house was rebuilt in 1891-1894. In the " park," along the Dordogne, relics from the old Roman baths have been collected. The surrounding country, with its fir woods, pastures, waterfalls and mountains, is very attrac- tive. To the south is the Puy de Sancy (6188 ft.), the loftiest peak of central France.

MONTEAGLE, THOMAS SPRING-RICE, 1st Baron (1790-1866), English statesman, son of S. E. Rice and Catherine Spring, came of a Limerick family, whose ancestor was Sir Stephen Rice (1637-1715), chief baron of the Irish exchequer and a leading Jacobite. In 1820 he became Whig member for Limerick (from 1832 member for Cambridge); and after holding minor offices became secretary for war and the colonies in 1834 and in 1835-1839 chancellor of the exchequer. He was dis- appointed in not obtaining the speakership, but in 1839 was created Baron Monteagle of Brandon (a title intended earlier for his ancestor Sir Stephen Rice), and made controller of the exchequer. He differed from the government as regards the exchequer control over the treasury, and the abolition of the old exchequer (q.v.) was already determined upon when he died on the 7th of February 1866. His eldest son, Stephen Edmund Spring-Rice (1814-1865), deputy chairman of the board of customs, having predeceased him, he was succeeded in the title by his grandson, Thomas, 2nd baron (b. 1849). Another son was father of S. E. Spring-Rice (1856-1902), of the treasury, and of Sir Cecil A. Spring-Rice (b. 1859), the diplomatist.

MONTEAGLE, WILLIAM PARKER, 4 th Baron, and iith Baron Morley (1575-1622), was the eldest son of Edward Parker, 10th Baron Morley (d. 1618), and of Elizabeth, daughter and heiress of William Stanley, 3rd Baron Monteagle (d. 1581). When quite a youth he

married Elizabeth, daughter of Sir Thomas Tresham, and was styled Lord Monteagle in right of his mother. He was allied with many Roman Catholic families, and during the reign of Elizabeth was in sympathy with their cause. He received knighthood when with Essex in Ireland in 1599, and in 1601 took part in the latter's rebellion in London, when he was punished by imprisonment and a fine of £8000. He subsequently in 1602 joined in sending the mission to Spain inviting Philip III. to invade England. He was intimate with Catesby and others, and according to Father Garnet expressed an opinion some few months before gunpowder plot that the Romanists had a good opportunity of making good their claims by taking up arms against the king. It is certain that he was one of those who acquiesced in James I.'s accession and assisted Southampton in securing the Tower for the king. He was taken into favour, and received a summons to attend the parlia-

ment of the 5th of November 1605 as Lord Monteagle. On the 26th of October 1605, while sitting at supper at Hoxton, he received the celebrated letter giving warning of the gun- powder plot, probably written by Francis Tresham. After having caused it to be read aloud by Ward, a gentleman in his service and an intimate friend of Winter, one of the chief conspirators, he took it to Whitehall and showed it to Lord Salisbury and other ministers. On the 4th of November he accompanied Lord Suffolk, the lord chamberlain, in his visit to the vault under the parliament house, where Guy Fawkes was found. Monteagle received £700 a year for his services in averting the disaster. In 1609 he was chosen a member of the council of the Virginia Company and subscribed to its funds. The same year " disorders in his house " are reported, probably referring to his harbouring of Roman Catholic students from St Omer {Cal. of St Pap: Dom: 1603-1610, p. 533). In 1618, on the death of his father, he was summoned to parliament as Baron Morley and Monteagle. He died on the 1st of July 1622 at Great Hallingbury, Essex, where he was buried. By his marriage with Elizabeth Tresham he had, besides daughters, three sons, the

eldest of whom, Henry, (d. 1655) succeeded him as 12th Baron Morley and 5th Baron Monteagle. These baronies fell into abeyance when Henry's son Thomas died "about 1686.

MONTE CASSINO, an isolated hill overhanging the town of Cassinum, about midway between Rome and Naples. Hither St Benedict migrated from Subiaco in the early years of the 6th century, and established the monastery that became the metropolis of Western monachism. About 580-590 it was sacked by the Lombards, and the monks fled to Rome, where they were established at the Lateran basilica. The monastery was rebuilt in 720, again destroyed by the Saracens in 884, and restored seventy years later. It reached its highest point of prosperity and influence from 1059 to 1105, under Desiderius (who became Pope Victor III. in 1087) and Oderisius. The abbot became overlord of an extensive territory and bishop of several dioceses: now, though not a bishop, he is ordinary of seven dioceses. At the dissolution of monasteries in 1866 Monte Cassino was spared, owing mainly to a remonstrance by English well-wishers of United Italy. The monastery became a national monument and the monks were recognized as custodians. There is a large secondary school with 250 boys, and rich archives.

See L. Tosti, Storia detta badia di M.C. (1841; 2nd ed., 1888); Wetzer u. Welte, Kirchenlexicon (2nd ed.) and Herzog, Realencyklo- padie (3rd ed.). (E. C. B.)

MONTECATINI, two much-frequented mineral baths of Tuscany, Italy. (1) Mohtecatini in Val di Cecina, in the province of Pisa, 5 m. W. of Volterra. Pop. (1901), 5009. The water is saline, with a temperature of 78-8° F. There are copper mines, which have been worked since the 15th century, 1358 ft. above sea-level. (2) Montecatini in Val di Nievole, in the province of Lucca, 7 m. W. by S. of Pistoja, 105 ft. above sea- level. Pop. (1901), 3048 (Bagni di Montecatini); 2856 (Monte- catini). The springs, which number ten, are saline, and range in temperature from 82-4° to 86° F. The water is both

drunk and used for bathing by some 40,000 visitors annually, and is exported in bottles. There is also a natural vapour bath (8o°-95° F.) in the Grotta Giusti (so-called from the satirist Giuseppe Giusti, a native of the place), at Monsummano near by, discovered in 1849. Another attraction of the place is the gardens of Collodi. At the town of Montecatini, on the hill above (951 ft.), the Florentines were defeated by Uguccione della Faggiuola of Pisa in 1315.

MONTE CORVINO, GIOVANNI DI (c. 1247-13 28), Franciscan missionary, traveller and statesman, founder of the earliest Roman Catholic missions in India and China, and archbishop of Peking. In 1272 he was commissioned by the emperor Michael Palaeologus, to Pope Gregory X., to negotiate for the reunion of Greek and Latin churches. From 1275 to 1289 he laboured incessantly as a missionary in the Nearer and Middle East. In 1 289 he revisited the Papal Court, and was sent out as Roman legate to the Great Khan, the Ilkhan of Persia, and other leading personages of the Mongol world, as well as to the

"emperor of Ethiopia" or Abyssinian Negus. Arriving at Tabriz, then the chief city of Mongol Persia, and indeed of all Western Asia, Monte Corvino moved down to India to the Madras region or " Country of St Thomas, " from which he wrote home, in December 1291 (or 1292), the earliest noteworthy account of the Coromandel coast furnished by any Western European. He next appears in " Cambaliech " or Peking, and wrote letters (of Jan. 8, 1305, and Feb. 13, 1306), describing the progress of the Roman mission in the Far East, in spite of Nestorian opposition; alluding to the Roman Catholic community he had founded in India, and to an appeal he had received to preach in " Ethiopia " and dealing with overland and oversea routes to " Cathay," from the Black Sea and the Persian Gulf respectively. In 1303 he received his

first colleague, the Fran- ciscan Arnold of Cologne; in 1307 Pope Clement V. created him archbishop of Peking, and despatched seven bishops to consecrate and assist him; three only of these arrived (1308). Three more suffragans were sent out in 131 2, of whom one at least reached East Asia. A Franciscan tradition maintains that about 13 10 Monte Corvino converted the Great Khan (i.e. Khaishan Kuluk, third of the Yuen dynasty; 1307-1311) : this has been disputed, but he unquestionably won remarkable suc- cesses in North and East China. Besides three mission stations in Peking, he established one near the present Amoy harbour, opposite Formosa. At his death, about 1328, heathen vied with Christian in honouring him. He was apparently the only effective European bishop in the Peking of the middle ages.

The MSS. of Monte Corvino's Letters exist in the Laurentian Library, Florence (for the Indian Epistle) and in the National Library, Paris, 5006 Lat. — viz. the Liber de aetatibus, fols. 170, v.- 1 72, r. (for the Chinese). They are printed in Wadding, Annates minorum (a.d. 1305 and 1306) vi. 69-72, 91-92 (ed. of 1733, &c), and in the Munchner gelehrte Anzeigen (1855), No. 22, part m, pp. 171-175. English translations, with valuable comments, are in Sir H. Yule's Cathay, i. 197-221. See also Wadding, Annates, v. 195-198, 199-203, vi. 93, &c, 147. &c., 176, &c, 467, &c. ; C R. Beazley, Dawn of Modern Geography, iii. 162-178, 206-210; Sir H. Yule, Cathay, i. 165-173- (C - R - B -)

MONTECRISTO, (anc. Oglasa), an island of Italy, belonging to the province of Leghorn, 25 m. S. of Elba. Its highest point is 2126 ft. above sea-level, and its area about 6 sq. m. It contains the ruins of a Camaldulensian monastery, founded in the 13th century and destroyed in the 16th, and is the private property of the king of Italy, who has a shooting-lodge there. The fame of the island is due to the novel, Le Comte de Monte- cristo, by the elder Dumas.

MONTECUCCULI (Montecuccoli), RAIMONDO, Count of (1609-1680), prince of the holy Roman Empire and

Neapolitan duke of Melfi, Austrian general, was born on the 21st of February 1608/9, at the castle of Montecucculo in Modena. His family was of Burgundian origin and had settled in north Italy in the 10th century. At the age of sixteen Montecucculi began as a private soldier under his uncle, Count Ernest Montecucculi, a distinguished Austrian general (d. 1633). Four years later, after much active service in Germany and the Low Countries, he became a captain of infantry. He was severely wounded at the storming of New Brandenburg, and again in the same year (1631) at the first battle of Breitenfeld, where he fell into the hands of the Swedes. He was again wounded at Lutzen in 1632, and on his recovery was made a major in his uncle's regiment. Shortly afterwards he became a lieutenant-colonel of cavalry. He did good service at the first battle of Nordlingen (1634), and at the storming of Kaiserslautern in the following year won his colonelcy by a feat of arms of unusual brilliance, a charge through the breach at the head of his heavy cavalry. He fought in Pomerania, Bohemia and Saxony (surprise of Wolmirstadt, battles of Wittstock and Chemnitz), and in 1639 he was taken prisoner at Melnik and detained for two and a half years in Stettin and Weimar. In captivity he studied, not only military science, but also geometry in Euclid, history in Tacitus, and architecture in Vitruvius, and planned his great work on war. On his release he distinguished himself again in Silesia. In 1643 he went to Italy, by the emperor's request, and made a successful campaign in Lombardy. On his return to Germany

he was promoted lieutenant-field-marshal and obtained a seat in the council of war. In 1645-46 he served in Hungary against Prince Rakoczy of Transylvania, on the Danube and Neckar against the French, and in Silesia and Bohemia against the Swedes. The victory of Triebel in Silesia won him the rank of general of cavalry, and at the battle of Zusmarshausen in 1648 his stubborn rearguard fighting rescued the imperialists from annihilation. For some years after the peace of Westphalia

Montecucculi was chiefly concerned with the business of the council of war, though he went to Flanders and England as the representative of the emperor, and to Sweden as the envoy of the pope to Queen Christina, and at Modena his lance was victorious in a great tourney. In 1657, soon after his marriage with Countess Margarethe Dietrichstein, he took part in, and after a time commanded, an expedition against Rakoczy and the Swedes who had attacked the king of Poland. He became field- marshal in the imperial army, and with the Great Elector of Brandenburg completely defeated Rakoczy and his allies (peace of Oliva, 1660). From 1661 to 1664 Montecucculi with inferior numbers defended Austria against the Turks; but at St Gotthard Abbey, on the Raab, he defeated the Turks so completely that they made a truce for twenty years .(Aug. 1, 1664). He was given the Golden Fleece, and became president of the council of war and director of artillery. He also devoted much time to the compilation of his various works on military history and science. He opposed the progress of the French arms under Louis XIV., and when the inevitable war broke out received command of the imperial forces. In the campaign of 1673 he completely out-man ceuvred his great rival Turenne on the Neckar and the Rhine, and secured the capture of Bonn and the junction of his own army with that of the prince of Orange on the lower Rhine. He retired from the army when, in 1674, the Great Elector was appointed to command in chief, but the brilliant successes of Turenne in the winter of 1674 and 1675 brought him back. For months the two famous commanders manoeuvred against each other in the Rhine valley, but on the eve of a decisive battle Turenne was killed and Montecucculi promptly invaded Alsace, where he engaged in a war of manoeuvre with the great Conde. The siege of Philipsburg was Montecucculi’s last achievement in war. The rest of his life was spent in military administration and literary and scientific work at Vienna. In 1679 the emperor made him a prince of the empire, and shortly afterwards he received the dukedom of Melfi from the king of Naples. Montecucculi died at Linz on the 16th of October

1680, as the result of an accident. With the death of his only son in 1698 the principality became extinct, but the title of ‘ count descended through his daughters to two branches, Austrian and Modenese. As a general, Montecucculi shared with Turenne and Conde the first place amongst European soldiers of his time. His Memorie della guerra profoundly influenced the age which followed his own; nor have modern conditions rendered the advice of Montecucculi wholly valueless.

Authorities. — The Memorie della guerra, Sec, was published at Venice in 1703 and at Cologne in the following year. A Latin edition appeared in 1718 at Vienna, a French version at Paris in 1 7 12, and the German Kriegsnachrichten des Fursten Raymundi Montecuccoli at Leipzig in 1736. Of this work there are MSS. in various libraries, and many memoirs on military history, tactics, fortification, &c, written in Italian, Latin and German, remain still unedited in the archives of Vienna. The collected Opere di Rai- mondo Montecuccoli were published at Milan (1807), Turin (1821) and Venice (1840), and include political essays and poetry.

See Campori, Raimondo Montecuccoli (Florence, 1876); Spenholtz, Aureum vellus seu catena, &c. (Vienna, 1668) ; memoir prefaced to the Memorie (Cologne edition) ; this appears also in v. der Groeben’s Neuer Kriegsbibliothek, vi. 230 (Breslau, 1777); Morgenstern, Oester- reichs Helden (St Polten, 1782) ; Schweigerd, Oesterreichs Helden (Vienna, 1853); Paradisi, Elogio storico del conte Raimondo Monte- cucculi (Modena, 1776); Schels, Oesterreichische militarische Zeit- schrift (Vienna, 1818, 1828 and 1842); Pezzl, Lebensbeschreibung Montecucculis (Vienna, 1792); Hormayr, Oesterreichischer Plutarch, XIII. (Vienna, 1808); Reilly, Biographic der beriihmtesten Feldherrn Oesterreichs (Vienna, 1813) ; Wurzbach, Biographisches Lexikon des Kaiserthums, &c, pt. 19 (Vienna, 1868); Teuffenbach, Vaterldnd- isches Ehrenbuch (Vienna and Teschen, 1877); Die Hofkriegsraths, prdsidenten (Vienna, 1874); Weingartner, Heldenbuch (Teschen, 1882); Grossmann, Archiv fur ost. Geschichte (Vienna, 1878); also

supplement to Militar. Wochenblatt (Berlin, 1878) ; Organ des militar- wissenschafll. Vereins (Vienna, 1881); Reale instituto veneto di scienze, viii. 5, 6 (Venice, 1881); Rivista militate Italiana (March and April 1882); Allgemeine deutsche Biographie, vol. xxii. (Leipzig, 1885). Important controversial works are those of Turpin and Warnery, two distinguished soldiers of the 18th century {Commen- taires sur les memoires, &c. (Paris), 1769, and Commentaires sur les comm. . . . du comte Turpin, Breslau, 1777). A critical estimate of Montecucculi's works will be found in Jahns Gesch. der Kriegs- wissenschaften, ii. 1 1 62-1 178 (Leipzig, 1890).

MONTEFALCO, a town of the province of Perugia, Italy, 6 m. S.W. of Foligno, situated on a hill, 1550 ft. above sea-level. Pop. (1901), 3397 (town); 5726 (commune). Its churches con- tain a number of pictures of the Umbrian school; S. Francesco has good frescoes (scenes from the life of S. Francis) of 1452, by Benozzo Gozzoli, in the choir. There is also a communal picture-gallery in the picturesque Palezzo Comunale.

MONTEFIASCONE, a town and episcopal see of the province of Rome, Italy, built on a hill (2077 ft.) on the S.E. side of the Lake of Bolsena, 70 m. by rail N.W. of Rome. Pop. (1901), 3041 (town); 9731 (commune). The cathedral (1519) is one of the earliest structures by Sammicheli, S. Maria della Grazie is also by him. The town has in San Flaviano (built in 1032, repaired and enlarged in the Gothic style late in the 14th century), a curious double church of importance in the history of architec- ture (cf. G. T. Rivoira, Origini dell' architettura lombarda, i. 326 sqq.) ; in its interior some 14th- century frescoes were discovered in 1896. In the crypt is the grave of a traveller, who succumbed to excessive drinking of the local wine known as Est, est, est. The story is that his valet who preceded him wrote " est " on the doors of all the inns where

good wine was to be had, and that here the inscription was thrice repeated. It is possible that Montefiascone occupies the site of the Fanum Voltumnae, at which the representatives of the twelve chief cities of Etruria met in the days df their independence; while under the Empire the festival was held near Volsinii.

MONTEFIORE, SIR MOSES HAIM (1784–1885), Jewish philanthropist, eldest son of Joseph Elias Montefiore, a London merchant, and of Rachel, daughter of Abraham Lumbroso de Mattos Mocatta, was born at Leghorn, on the 24th of October 1 784. His paternal ancestors were Jewish merchants who settled at Ancona and Leghorn in the 17th century, whilst his grand- father, Moses Haim Montefiore, emigrated from the latter town to London in 1758. Montefiore entered the Stock Exchange, his uncle purchasing for him at a cost of £1200 the right to practise as one of the twelve Jewish brokers licensed by the city of London. Although belonging to the Sephardic or ” Spanish ” congregation of Jews, he married in 181 2 Judith, a daughter of Levi Barent Cohen, of the ” German ” Jews, another of whose daughters was the wife of Nathan Mayer Rothschild, the head of the great banking firm; this relationship led to a close con- nexion in business between Montefiore and that house, and his brother Abraham married Henrietta Rothschild, a sister of the financier. In 1824 Montefiore, having amassed a fortune, retired from the Stock Exchange. From his forty-third year Montefiore devoted all his energies to ameliorating the lot of his co-religionists. His first pilgrimage to Palestine was undertaken in 1827, and resulted in a friendship with Mehemet Ali which was to lead to much practical good. Immediately on his return, Montefiore began to take an active part in the struggle which British Jews were then carrying on to obtain full political and civic rights. In 1837 he became the city of London’s second Jewish sheriff, and was knighted. In 1838, accompanied by Lady Montefiore, he started on a second voyage to Palestine, in order to submit to Mehemet Ali a scheme for Jewish coloni- zation in Syria. Though

political disturbances rendered his efforts again unsuccessful, the year 1840 brought Montefiore once mote before Mehemet, this time to plead the cause of some Jews imprisoned at Damascus on a charge of ritual murder. He obtained their release, and on his way back wrung from the Porte a decree giving Jews throughout Turkey the utmost privileges accorded to aliens. In 1846 the threatened re-issue in Russia of an Imperial ukase (first promulgated in 1844) ordering the withdrawal of all Jews from within 50 versts of the

German and Austrian frontiers, caused Montefiore to proceed to St Petersburg, where in an interview with the tsar he suc- ceeded in getting the ukase rescinded. On his return, Queen Victoria, on the recommendation of Sir Robert Peel, made him a baronet. In 1859 a case of injustice which attracted the atten- tion of all Europe brought Sir Moses to the gates of the Vatican. A Jewish child named Mortara had been secretly baptized by its nurse and stolen from its mother, who died of grief. Cardinal Antonelli, in the name of the pope, refused to give up the boy, who became a priest. In 1863 we find Montefiore on a mission in Constantinople to obtain from the Sultan, Abdul Aziz, the confirmation of his predecessor's decrees in favour of the Jews; in 1864 in Morocco to combat an outbreak of anti-Semitism; in 1866 in Syria, relieving the distress resulting from a plague of locusts and an epidemic of cholera; and in 1867 in Rumania, once more pleading the cause of the oppressed Jews with Prince Charles. In 1872 Montefiore was deputed by the British Jews to present to Alexander II. their congratulations on the bicen- tenary of the birth of Peter the Great, and was received by the tsar with great honour at the Winter Palace. His seventh and last pilgrimage to the Holy Land was made in 1875, of which he wrote an account in his Narrative of a Forty Days' Sojourn in the Holy Land, published in that year. The last decade of his life was passed in comparative quiet upon his estate near Ramsgate, in Kent; and there, after having received general congratulations on the completion ©f his hundredth year, he passed

peacefully away on the 28th of July 1885. Sir Moses Montefiore was a strictly orthodox Jew, scrupulously observant of both the spirit and the letter of the Scriptures; in his grounds he had a synagogue built where services are still held twice a day, a college where ten rabbis live and expound the Jewish law, and a mausoleum that contains the remains of himself and of Lady Montefiore, who died in 1862.

MONTEFRIO, a town of southern Spain, in the province of Granada, on the river Bilano. Pop. (1900), 10,725. Montefrio is largely Moorish in character, and dominated by a Moorish castle. Being built midway between the Sierra de Priego and Sierra Parapanda, and commanding the open valley between these ranges, it became one of the chief frontier fortresses of the Moors in the 15th century. Its industries include manufactures of cotton stuffs, alcohol and soap.

MONTEGUT, JEAN BAPTISTE JOSEPH EMILE (1825-1895), French critic, was born at Limoges on the 14th of June 1825. He began to write for the Revue des deux mondes in 1847, contributing between 185 1 and 1857 a series of articles on the English and American novel, and in 1857 he became chief literary critic of the review. Emile Montegut translated Essais de philosophic americaine (1850) from Emerson; Revolution de 1688 (2 vols. 1853) from Macaulay's History; and also produced the CEuvres completes (10 vols. 1868-1873) of Shakespeare. Among his numerous critical works are Ecrivains modernes d'Angleterre (3rd series, 1885-1892) and Heures de lecture d'un critique (1891), studies of John Aubrey, Pope, Wilkie Collins and Sir John Mandeville. Montegut died in Paris on the nth of December

1895.

MONTEIL, AMANS ALEXIS (1769-1850), French historian, was born at Rodez in 1769, and died at Cely (Seine-et-Marne) in 1850. His tastes were historical, and he taught history at Rodez, at Fontainebleau and at St Cyr. He held that a dis- proportionate importance had been given to kings, their ministers and

generals, and that it was necessary rather to study the people. In his Histoire des franqais des divers Stats, ou histoire de France aux cinq derniers siecles (10 vols., 1828-1844) he undertook to describe the different classes and occupations of the community. For this he made a collection of manuscripts, which he sold in 1835 (many of them passed into the library of Sir Thomas Philipps) , drawing up a catalogue under the singular title of TraitS de matSriaux manuscrits de divers genres d'histoire. He boasted of having been the first to write really " national " history, and he wished further to show this in a memoir entitled L' Influence de I'histoire des divers Stats, ou comment jut allSe la France si elle eut eu cette histoire (1&40; reprinted in 1841 under

the title: Les Francais pour la premiere fois dans Vhistoire de France, ou poetique de Vhistoire des divers Mats). Monteil did not invent the history of civilization, but he was one of the first in France, and perhaps in Europe, to point out its extreme importance. He revised the third edition of his history himself (S vols., 1848); a fourth appeared after his death with a preface by Jules Janin (5 vols., 1853).

MONTEITH, the name given to a large bowl, often made of silver, with a movable rim and scalloped edges, from which wine glasses, punch ladle, &c, could be hung, so that they might be cooled in the water with which it was filled. According to Anthony Wood (Life and Times, iii. 84, quoted in the New English Dictionary) the name was given to the bowl from a " fantastical Scot . . . Monsieur Monteigh who . . . wore the bottome of his cloake or coate so notched," i.e. scalloped.

MONTELEONE CALABRO, a city of Calabria, Italy, in the province of Catanzaro, beautifully situated on an eminence gently sloping towards the Gulf of Sta

Eufemia, 1575 ft. above sea-level, 70 m. N.N.E. of Reggio di Calabria by rail. Pop. (1901), 10,066 (town); 13,481 (commune). It was almost totally destroyed by earthquake in 1783, but under the French occupation it was rebuilt and made the capital of a province. It suffered, however, considerably in the earthquake of 1905. The castle was built by Frederick II. The principal church contains some sculptures by the Gagini of Palermo.

Monteleone is identical with the ancient Hipponium, said to be a Locrian colony and first mentioned in 388 B.C., when its inhabitants were removed to Syracuse by Dionysius. Restored by the Carthaginians (379), occupied by the Bruttii (356), held for a time by Agathocles of Syracuse (294), and afterwards again occupied by the Bruttii, Hipponium ultimately became as Vibo Valentia a flourishing Roman colony, founded in 239 or 192 B.C. It was important as the point where a branch from Scolacium (Squillace) on the east coast road joined the ViaPopillia. The harbour established by Agathocles proved of great service as a naval station to Caesar and Octavian in their wars with Pompeius Magnus and Sextus Pompeius, and remains of its massive masonry still exist at the village of Bivona on the coast, while the fort occupies the site of a temple. Its tunny-fish were famous. In the town itself there are remains of a theatre, of Roman baths (?), a mosaic pavement in the church of St Leoluca (patron saint of Monteleone), and some Latin inscriptions. The town walls too of the Greek city can be traced for their whole extent, about 4 m. "They are well constructed of regular parallelograms of a sandy tufa, laid in headers and stretchers. The Roman town occupied only a part of the Greek site, the portion occupied by the modern town, the streets of which still preserve the Roman arrangement. It was supplied " with water by an aqueduct, the reservoir of which is situated at the village of Papaglionti. The Capialbi and Cordopatri families have private collections of antiquities.

See V. Capialbi in Mem. Inst. (Rome, 1832), pp. 159 sqq.; F. Lenormant, La Grande-Grice (Paris, 1882),

iii. 155 sqq. (T. As.)

MONTELIMAR, a town of south-eastern France, capital of an arrondissement in the department of Drome, near the left bank of the Rhone, 93 m. S. of Lyons on the railway to Marseilles. Pop. (1906), town, 9162; commune, 13,554. The ancient castle is now used as a prison. Remains of the ramparts and four old gates are also preserved. The chief public institutions are the sub-prefecture, the tribunal of first instance and the communal college. The industries include flour-milling, silk-throwing and spinning, and the manufacture of hats, lime, farming implements, preserved foods and nougat.

Montelimar was called by the Romans Acunum. At a later period it belonged to the family of Adhemar and received the name Monteil d'Adhemar, whence the present name. Towards the middle of the 14th century it was sold by them partly to the dauphins of Viennois and partly to the pope, and in the next century it came into the possession of the Crown. During the religious wars it valiantly resisted Gaspard de Coligny in 1570, but was taken by the Huguenots in 1587.

MONTEMAYOR (or Montemor), JORGE (i52o?is6i), Spanish novelist and poet, of Portuguese descent, was born about 1520 at Montemor o Velho (near Coimbra), whence he derived his name, the Spanish form of which is Montemayor. He seems to have studied music in his youth, and to have gone to Spain in 1543 as chorister in the suite of the Portuguese Infanta Maria, first wife of Philip II. In 1552 he went back to Portugal in the suite of the Infanta Juana, wife of D. Joao, and on the death of this prince in 1554 returned to Spain. He is said to have served in the army, to have accompanied Philip II. to England in 1555, and to have travelled in Italy and the Low Countries; but it is certain that his poetical works were published at Antwerp in 1554, and again in 1558. His reputation is based on a prose work, the Diana, a pastoral romance published about 1559. Shortly afterwards Montemayor was killed in Piedmont, appar ently in a love affair; a late

edition of the Diana gives the exact date of his death as the 26th of February 1561. The Diana is generally stated to have been printed at Valencia in 1542; but, as the Canto de Orfeo refers to the widowhood of the Infanta Juana in 1554, the book must be of later date. It is important as the first pastoral novel published in Spain; as the starting-point of a universal literary fashion; and as the indirect source, through the translation included in Googe's Eglogs, epytaphes and sonnets (1563), of an episode in the Two Gentlemen of Verona. Though Portuguese was Montemayor's native language, he only used it for two songs and a short prose passage in the sixth book of the Diana. His mastery of Spanish is amazing, and even Cervantes, who judges the verses in the Diana with unaccustomed severity, recognizes the remarkable merit of Montemayor's prose style. That he pleased his own generation is proved by the seventeen editions and two continuations of the Diana published in the '1 6th century, by parodies, imitations and renderings in French and English.

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MONTENEGRO, a country of south-eastern Europe, forming an independent kingdom situated upon the western side of the Balkan Peninsula, and possessing a small coast-line on the Adriatic Sea. The name is the Venetian variant of the Italian Monte Nero, and together with the Albanian Mai Esiya, the Turkish Kara-dagh, and the Greek Mavro Vouno, reproduces the native, or Serb, Tzrndgora, "the Black Mountain"; it is derived from the dark appearance of Mount

Lovchen, the culminating summit of Montenegro proper, of which the northern and eastern declivities, those which are viewed from the country itself, are in shadow for the greater part of the day. 1 The dusky pine forests, which once clothed the mountain and of which remnants exist on its northern slope, contributed to its sombre aspect. Up to the end of the 15th century, when its territory became restricted to the mountainous districts immediately north and east of Mount Lovchen, the kingdom was known as the Zenta or Zeta, but the name Tzrnagora was probably used locally in this region from the time of the earliest Slavonic settlements.

Montenegro extends between 41° 55′ and 43° 21′ N., and between 18 30′ and 20° E.; its greatest length from north to south is about 100 m.; its greatest breadth from east to west about 80 m. It is bounded by the Adriatic Boundaries. on the S., the seaboard extending for 28 m.; by the Primore, a strip of the Dalmatian littoral, on the S.W. and W.; by the Austrian (formerly Turkish) provinces

1 Cf. the similarly-named Tzrna Planina in eastern Montenegro, Tcherni Vrkh, the culminating summit of Mount Vitosh in Bulgaria, and Mavro Vouno in the island of Salamis. Various other explana- tions of the name Montenegro, mostly of a fanciful character, have been put forward: see Kurt Hassert, ” Der Name Montenegro ” in Globus, No. 67, pp. m-113 (Leipzig, 1895).

of Bosnia and Herzegovina on the N W. and N.; by the Ottoman empire both in the sanjak of Novibazar, on the N. and N.E., and also in the vilayets of Kossovo and Scutari on the N.E., E. and S.E. Its area, as officially estimated after the treaty of Berlin had been enforced in 1880, amounts to 3255 sq. m., or considerably less than half the size of Wales. The present frontier, which was not finally delimited till 1881, ascends the Boyana river from its mouth

as far as Lake Sass (Shas), then follows the river Megured to the summit of Mount Bratovitza, reaching Lake Scutari at a spot opposite the island of Goritza Topal. Crossing the lake north- east to a point a little south-east of Plavnitza, and leaving the territory of the Hoti and Klementi tribes to the south, and the districts of Kutchka Kraina to the north, it passes north of the districts of Plava and Gusinye and reaches the western end of the Mokra Planina, where it turns to the north-west. After crossing the Lim at its junction with the Skula, it coincides with the old frontier for some distance; then reaching the Tara at Maikovatz, it follows the course of that river to its junction with the Piva: turning southwards, it reaches the old frontier once more at Klobuk, and, passing between the district of Grahovo and the Krivoshian Mountains, approaches to within a few miles of the Bocche di Cattaro: then, following the maritime mountain ridges for a considerable distance, it rejoins the coast a little south of Spizza.

Physical Features. — Montenegro, which forms the meeting-point of the Dalmatian, Bosnian and Albanian ranges, seems at first a mere chaos of mountains. It is, however, naturally divided into three parts, each with its own character. (1) Fertile and well-watered plains, not unlike those of Lombardy, border the river Zeta, and after its junction with the Moratcha extend along the course of that river to Lake Scutari. A fringe of similar lowland forms the maritime plain extending between the Sutorman range and the mouth of the Boyana. (2) Westward, under the shadow of Lovchen, is the Katunska, or " Shepherds' Huts," the cradle of Montenegrin liberty. This region presents a surface of hard crystal- line rock, bare and calcined, with strata sinking to the south-west at an angle often of 70 . The rocks have been split by atmospheric agencies into huge prismatic blocks, and the cracks have been gradually worn into fissures several fathoms deep. In some places the interior of the stony mass is hollowed out into galleries and caves, some of great length; during the rainy season subterranean landslips

frequently produce local earthquakes, extending over an area of 10 or 12 m. The small basins of Cettigne and Niegush are practically the only cultivable districts in this region. (3) Over the entire north stretch the massive mountain chains which link the Herzegovinian Alps to those of Albania, the scenery recalling that of Switzerland or the Tirol. In the north-west there are finely wooded tracts extending north of Nikshitch to the Dormitor moun- tain group. The Dormitor district contains rich grassy uplands dotted with numerous small lakes, from which it derives its name of Yezera (the lakes) ; the rivers Tara and Piva flow through magnifi- cent gorges clothed with rich forests, and unite near the extreme north of the frontier. On the north-east are the high but rounded Brda Mountains, covered with virgin forest or Alpine pastures, and broken here and there by jagged dolomitic peaks. In the district of the Vasoyevitchi, which surrounds the little town of Andriyevitza, is the fine double peak of Kom, and, a little to the south-west, the summit of Maglitch, commanding a magnificent view over the wooded valley of Gusinye to the great Prokletia range in Albania. 1 The contrast between the rich undulating landscape of the northern regions and the sterile calcined rocks of Montenegro proper is very remarkable.

The Montenegrin mountain system is divided into four masses : (1)

the group enclosed by the Tara and Piva rivers with Dormitor, one of

the highest mountains in the peninsula (9146 ft.), Yablo-

Moantam v y rkh (7II3 ft ^ and the Vr khove Pochoratz (6601

f. y , ™ , ft.); (2) the group between the Zeta and the Moratcha

pZm^Zn with Ostri-Kuk (7546 ft.), Vlasulya (7533 ft-), Brnik formation. (686o ft) and Maganik (662I

ft .)- (3) t h e ranges between

the Moratcha and Tara with Sto (7323 ft.) and Gradishte (7156 ft.) ; and (4) those between the upper Tara and the upper Lim with Kom, the second highest mountain in the country (Kom Kutchki, 8032 ft., Kom Vasoyevitchki, 7946 ft.), separating the districts of the Vasoye- vitchi on the north-east from that of the Kutchi on the south-west, and Visi tor (6936 ft.) on the frontier. In Montenegro proper the only prominent summit is Lovchen (5653 ft.), between Cettigne and the western frontier. Between Lake Scutari and the sea is the Sutorman range with the fine pyramidal summit of Rumiya (5148 ft.)

1 This mountain must be distinguished from the higher Maglitch (7699 ft.), on the northern frontier, near the junction of the rivers Tara and Piva.

overhanging Antivari. The prevailing formations of the north and east are Palaeozoic sandstones and schists, with underlying trap Throughout Montenegro the following have been identified: (i) Palaeozoic schists, (2) Wirfen strata of Lower Trias, (3) Trap of the Palaeozoic and Wirfen strata, (4) Triassic limestone, (5) Jurassic limestone, (6) Cretaceous limestone, (7) Flysch, in part certainly Eocene, (8) Neogenic or younger Tertiary formations.

The watershed between the Adriatic and the Black Sea crosses the country from west to east in a very irregular line, the southern districts being drained by the Zeta-Moratcha river system, which finds its way to the Adriatic by Lake W versaatl Scutari and the Boyana, while the streams from the Lakes - northern districts form the headwaters of the Drina, which reaches the Danube by way of the Save. The Zeta, rising in Lake Slano, near Nikshitch, is remarkable for its subterranean passage beneath a mountain range 1000 ft. high. At Ponor, not far from that

English Miles

Emery Wdljccr sc

town, the water vanishes in a deep chasm, reappearing at a distance of several miles on the other side of the mountains. Its whole course to its junction with the Moratcha is about 30 m. Rising in the Yavorye Planina, the Moratcha sweeps through mountain gorges till it reaches the plain of Podgoritza; then for a space it almost disappears among the pebbles and other alluvial deposits, nor does it again show a current of any considerable volume till it approaches Lake Scutari. In the neighbourhood of Dukle 2 and Leskopolye it flows through a precipitous ravine from 50 to 100 ft. high. In the dry season it is navigable from the lake to Zhabliak. The whole course is about 60 m. Of the left-hand tributaries of the Moratcha the Sem or Tzem deserves to be men- tioned for the magnificent canon through which it flows between Most Tamarui and Dinosha. On the one side rise the mountains of the Kutchi territory on the other the immense flanks of the Prokletia range — the walls of the gorge varying from 2000 to 4000 ft. of vertical height. Lower down the stream the rocky banks approach so close that it is possible to leap across without trouble. The Sem rises in northern Albania, and has a length of 70 m. The Rieka issues full-formed from an immense cave south-east of Cettigne and falls into Lake Scutari. The three tributaries of the Drina which belong in part to Montenegro are the Piva, the Tara, and the Lim, respectively 55, 95 and 140 m. in length. The Tara forms the northern boundary of the kingdom for more than 50 m., but the Lim flows beyond the border after the first 30 m. of its course. The western half of Lake Scutari, or Skodra, belongs to Montenegro;

2 Duklea is the name still borne by the ruins of the Roman Doclea, often, but wrongly, written Dioclea, from its association with the Emperor Diocletian.

the eastern, with Scutari itself, to Albania. It is a magnificent sheet of water, measuring about 135 sq. m., with an average depth of two to three fathoms. The northern end is studded with picturesque islands. The level of Lake Scutari underwent several changes in the 19th century; notably when the Drin, an Albanian river, which before 1830 entered the Adriatic near San Giovanni di Medua, changed its course so as to join the Boyana just below its exit from the lake. This raised the level of the lake, flooding the lower valleys of its tributary streams and permanently enlarging its area. A few small lakes are scattered among the mountains, and it is evident that their number was formerly much greater. Montenegro proper (i.e. the departments of Katunska, Rietchka and Lieshanska) is almost absolutely waterless, the only stream being the Rieka, which

f>robably drains the Cettigne basin by an underground outlet. Its ower course is practically an inlet from Lake Scutari, and is navigable up to the town of Rieka. The upland plain of Cettigne, now water- less, was doubtless the bed of a lake at no very distant (geological) period ; it is still sometimes flooded after heavy rains. The scarcity of water largely contributed to the successful defence of the country against Turkish invasion : the few springs are hidden in deep crannies among the rocks, and the inhabitants are accustomed to preserve melted snow for use during the summer. On the other hand, the Brda 1 and north-eastern districts are abundantly watered. The maritime district possesses two small streams.

Climate. — The climate generally resembles that of northern Albania ; it is severe in the higher regions, and comparatively mild in the valleys, while in the maritime districts of Antivari and Dulcigno it may be compared with that of central Italy. The mean annual temperature is about 58 ° F. Snow lies for most of the year on many heights, and in some of the darker gorges it is never thawed. The

high basin of Cettigne (2093 ft.) is deeply covered with snow during the winter months, and the capital is sometimes almost inaccessible ; in summer the days are hot, but the nights are cool and frequently chilly. The climate is generally healthy except in a few marshy districts.

Flora and Fauna. — The Alpine vegetation of the summits gives way to pine forests in the sub-Alpine zone (about 6000 ft.) ; below these the beech, and then the oak, the walnut, the wild pear, and wild plum make their appearance; the fig-tree, the mulberry, and the vine grow in the middle Zeta and Moratcha valleys, the myrtle, orange, laurel and olive in the lower Moratcha region, and more abundantly in the Tzrmnitza and maritime districts. In the forest districts the beech is the prevailing tree up to a height of about 5000 ft. The chestnut forms little groves in the country between the sea and Lake Scutari but never ascends more than 1000 ft. Pomegranate bushes grow wild, and in many parts of the south cover the foot of the hills with dense thickets, the crimson blossoms of which are one of the special charms of the spring landscapes. The leave s, of the sumach (Rhus cotinus), which flourishes in the warmer districts, are exported for use in dye-works; the Pyrethrum cinerariaefolium supplies material for the manufacture of insect-powder; the fruit of the wild plum (Corn'us maseula), as well as the grape, is employed for the production of raki or rakiya, a mild spirit, which is a favourite beverage with the people. Bears are still found in the higher forests; wolves, and especially foxes, over a much wider area. A few chamois still roam on the loftiest summits, the roebuck is not infrequent in the backwoods, the wild boar may be met with in the same district, and the hare is abundant wherever the ground is covered with herbage. There are one or two species of snakes in the country, including the poisonous Illyrian viper (Viper a ammodytes). Esculent frogs, tree frogs, the common tor- toise, and various kinds of lizards are all common. Scorpions and numerous reptiles infest the arid rocks of the Katunska. The list of birds

includes golden eagles and vultures, twelve species of falcons, several species of owls, nightingales, larks, buntings, hoo- poes, partridges, herons, pelicans, ducks (ten species), nightjars, &c. Immense flocks of water-fowl haunt the upper reaches of Lake Scutari. The rivers abound with trout, tench, carp and eels; the trout of the Moratcha are especially fine. More important from an economic point of view is the scoranze (Leuciscus alburnus: Servian uklieva), a kind of sardine, which supplies an article of food and merchandise to a considerable portion of the population. The fish, which enter the Rieka inlet of Lake Scutari during the winter, are taken with nets during a few weeks in the spring, when the fishing season is inaugurated with a religious service; they are salted and exported in large quantities to Trieste and the Dalmatian coast. The annual take is valued at £4000. The sea-fisheries are of less value. As regards mineral resources, traces of iron, copper and coal are said to exist; there is a natural petroleum spring in the neighbourhood of Virbazar.

Agriculture and Stock-farming. — Except in the lowlands, which serve as the granary of Montenegro, furnishing wheat, maize, barley, rye; potatoes and capsicums, there is little tillage. Methods and implements are alike primitive. In the Katunska the peasants are glad to enclose the smallest spaces of the fertile red soil which is

'The name Brda (literally " mountains ") signifies in ordinary speech the mountain-group east of the Zeta which was incorporated in the principality in 1796. It figures in the prince's title, but is not otherwise used in official documents.

left after rain in the crevices of the rocks, and one may see harvests only a few yards square. The vineyards produce excellent grapes, but wine production, which might become an important industry, is at present limited to home consumption. Tobacco is largely cultivated, especially in the neighbourhood of Podgoritza ; the annual produce amounts to 550,000 lb. Stock-raising is more largely

carried on than agriculture. In the north droves of swine fatten on the mast of the beech woods; goats and large flocks of sheep, cele- brated for their thick fleeces, thrive on the high pastures, and the lower slopes afford excellent grazing for larger stock. The native breed of cattle is small, but among other efforts made to improve it a stock-farm is maintained by Prince Nicholas near Nikshitch. The horses, as elsewhere in the Balkan Peninsula, are diminutive, wiry and intelligent. Bee-keeping is practised in the Kutchi districts, and mulberries are grown for silkworms.

Commerce and Industries.— The exports, valued at £80,265 m 1906, include cattle (large and small), smoked and salted meat known as castradina, cheese, undressed hides, scoranze, sumach, pyrethrum, tobacco and wool. The imports, valued in the same year at £239,505, consist mainly of manufactured articles, such as iron utensils and weapons, soap, candles, &c, and colonial products. In 1904, when Montenegro renounced its commercial treaties, the old 8 % ad valorem duty levied on imports was in many cases raised to 25 %. This caused much discontent among the people, who had been growing steadily poorer since 1900; and many families emigrated. The exportation of cattle is greatly hindered by the high tariff imposed on the Austrian frontier, which is productive of much illicit trading. There are practically no manufactures: the men disdain industrial employment, while the women are occupied by household duties or work in the fields. A brewery and a cloth factory, however, exist at Nikshitch, a soda-water factory at Cettigne, and an olive-oil refinery at Antivari. The coarser cloth worn by the peasants is home-made; the finer kind worn by the wealthier class is imported.

Communications. — The progress of trade and the development of the natural resources of the country must largely depend on improved means of communication. In this direction considerable progress has already been achieved. Montenegro possessed in 1907 228 m. of excellent carriage roads, admirably engineered and main- tained. The

remarkable zigzag road from Cattaro to Niegush and Cettigne was completed in 1881 ; it was afterwards prolonged to Rieka, Podgoritza, Danilovgrad (where a fine bridge across the Zeta was erected in 1870), and Nikshitch. Another road connects Podgoritza with its port, Plavnitza, on Lake Scutari ; a third runs from Antivari to Rieka, and unites the sea-coasts with the richest districts of the interior. The ports of Antivari and Dulcigno are insufficiently sheltered, but are capable of considerable improvement; both are places of call for the Austrian Lloyd steamers, and a regular service between Antivari and Bari on the Italian coast is maintained by the " Puglia " Steamship Company. The Boyana is navigable by sea-going vessels as far as Oboti (12J m. from its mouth), where cargoes from Scutari must be transferred to small river craft. Important harbour works were inaugurated in 1905 at Antivari by the I talo- Montenegrin Compagnia d 'Antivari, which in the same year began the construction of a railway from that port to Virbazar on Lake Scutari. Four steamers belonging to the same company ply on the lake. Postal and telegraphic communication is fairly complete. There were, in 1906, 16 post offices and 20 telegraph stations, with 412 miles of wire. The number of letters posted in that year was 91,250. The telegraph is much used by the people: the number of telegrams sent in 1906 was 54,750.

Population.— In 1882 the population of Montenegro was esti- mated as low as 160,000 by Schwartz. A more usual estimate is 230,000. According, however, to information officially fur- nished at Cettigne, the total number of inhabitants in 1900 was 311,564, of whom 293,527 belonged to the Orthodox Church; 12,493 were Moslems and 5544 were Roman Catholics; 71,528, or 23%, were literate and 240,036, or 77%, were illiterate. The total number in 1907 was officially given as 282,000. The population is densest in the fertile eastern districts ; Montenegro proper is sparsely inhabited. Emigration is greatly increasing, especially to America; the number of emigrants is given as 6674 in 1905 and 4346 in 1906. The bulk of the inhabitants belongs to

the Serbo-Croatian branch of the Slavonic race. There were about 5000 Albanians resident in the country in 1900, besides a small colony of gipsies, numbering about 800, a few of whom have abandoned their nomadic life and settled on the soil. The Moslems, whose thrift and industry have won encouragement from the Crown, greatly decreased for some years after 1880 owing to emigration. The capital of Montenegro is Cettigne (3200 inhabitants in 1900, 5138 in 1907). The chief commercial centres are Podgoritza (12,347) and Nikshitch (6872), with the ports of Antivari (2717) and Dulcigno (5166). These towns are described under separate headings. Danilovgrad (1226) on the

Zeta was founded in 1871 by Prince Nicholas and named after his predecessor, Danilo II. In the vicinity is Orialuka, the prince's palace, with its mulberry nurseries. Spuzh (1000), a little lower on the east bank of the Zeta, possesses a fortified acropolis. Niegush or Nyegosh (1893), on the road from Cettigne to Cattaro, is the ancestral abode of the ruling family, which originally came from Niegush in Herzegovina. Zhabliak (1200), near Lake Scutari, was the capital until late in the 15th century. It was a Venetian stronghold. Rieka (1768), near the northern end of Lake Scutari, derives some commercial importance from its position. Grahovo (1000), in the extreme west, is famous for the Turkish defeats of 1851 and 1876. Other small towns are Kolashin, Virbazar and Andriyevitza.

The Montenegrins present all the characteristics of a primitive race as yet but little affected by modern civilization. Society National is still in that early stage at which personal valour Character- is regarded as the highest virtue, and warlike prowess Istics. constitutes the principal, if not the only, claim to

pre-eminence. The chiefs are distinguished by the

splendour of their arms and the richness of their costume; women occupy a subject position; the physically infirm often adopt the profession of minstrels and sing the exploits of their countrymen like the bards of the Homeric age. A race of warriors, the Monte- negrins are brave, proud, chivalrous and patriotic; on the other hand, they are vain, lazy, cruel and revengeful. They possess the domestic virtues of sobriety, chastity and frugality, and are well-mannered, affable and hospitable, though somewhat con- temptuous of strangers. They are endowed in no small degree with the high-flown poetic temperament of the Serb, race, and delight in interminable recitations of their martial deeds, which are sung to the strains of the gusla, a rudimentary one-stringed fiddle. Dancing is a favourite pastime. Two characteristic forms are the slow and stately ring-dance (kolo), 1 in which women sometimes participate, though it is usually performed by a circle of men; and the livelier measure for both sexes (oro), in which the couples face one another, leaping high into the air, while each man encourages his partner by rapid revolver-firing. The oro is the traditional dance in the Katunska district. Women chant wild dirges, generally improvised, over the dead; mourners try to excel one another in demonstrations of grief; and funerals are celebrated by an orgy very like an Irish ” wake.” Like most imaginative peoples, the Montenegrins are extremely superstitious, and belief in the vampire, demons and fairies is almost universal. Among the mountains they can converse fluently at astonishing distances. The physical type contrasts with that of the northern Serbs: the features are more pro- nounced, the hair is darker, and the stature is greater. The men are tall, often exceeding 6 ft. in height, muscular, and wonder-fully active, displaying a cat-like elasticity of movement when scaling their native rocks; their bearing is soldier-like and manly, though somewhat theatrical. The women, though frequently beautiful in youth, age rapidly, and are short and stunted, though strong, owing to the drudgery imposed on them from childhood; they work in the fields, carry heavy

burdens, and are generally treated as inferior beings. Like the Albanians, the Montenegrins take great pride in personal adornment. The men wear a red waistcoat, embroidered with gold or black braid, over which a long plaid is sometimes thrown in cold weather; a red girdle, in the folds of which pistols and yataghans are placed ; loose dark-blue breeches and white stockings, which are generally covered with gaiters. The opanka, a raw-hide sandal, is worn instead of boots; patent leather long boots are sometimes worn by military officers and a few of the wealthier class. The head- dress is a small cap (kapa), black at the sides, in mourning for Kossovo; red at the top, it is said, in token of the blood shed then and afterwards. On the top near the side, five semicircular bars of gold braid, enclosing the king's initials, are supposed to represent the five centuries of Montenegrin liberty. There

1 The ring-dance, known as the kolo (literally, " wheel ") in all Serb countries, corresponds with the Bulgarian horo (to be dis- tinguished from the Montenegrin oro), and is almost universal throughout the Balkan Peninsula; it is seldom, however, danced in the rocky Katunska district, where level spaces are rare.

is little authority, however, for this and other fanciful interpre- tations of the pattern, which was adopted in the reign of Peter I.; the red fez, from which the kapa probably derives its colour, was previously worn. A blue or green mantle is sometimes worn in addition by the chiefs. The poorer mountaineers are often dressed in coarse sacking, but all without exception carry arms. The women, as befits their servile condition, are generally clothed in black, and wear a black head-dress or veil; on Sundays and holidays, however, a white embroidered bodice, silver girdle, and bright silk skirt are worn beneath an open coat. Over this is placed a short, sleeveless jacket of red, blue, or violet velvet, according to the wearer's age. Unmarried girls are allowed to wear the red kapa,

but without the embroidered badge. The Vasoyevitch tribe retain the Albanian costume, in which white predominates. Turkish dress is often seen at Antivari, Dulcigno and Podgoritza. The dwelling-houses are invariably of stone, except in the eastern districts, where wooden huts are found. As a rule, only the mansions of cattle-owners have a second storey: the ground floor, which is dark and un ventilated, is occupied by the animals; the upper chambers, in which the family reside, are reached by a ladder or stone staircase. Chim- neys are rare, and the smoke of the fireplace escapes through the windows (if any exist) or the open doorway. The principal food of the people is rye or maize cake, cheese, potatoes and salted scoranze; their drink is water or sour milk; meat is seldom tasted, except on festive occasions, when raki and red wine are also enjoyed. The Montenegrins are great smokers, especially of cigarettes; in the districts which formerly belonged to Turkey the men, whose dignity never permits them to carry burdens, may be seen going to market with the chibAk, or long pipe, slung across their backs. The mother possesses little influence over her sons, who are trained from their earliest infancy to cultivate warlike pursuits and to despise the weaker sex. Betrothals often take place in early childhood. Young men who are attached to each other are accustomed to swear eternal brother- hood (pobratimstvo) ; the bond, which receives the sanction of the Church, is never dissolved. Marriages between Montenegrins and converted Turkish girls are a common source of blood-feuds. The zadruga, or house-community, under the rule of a stareshina, or house-father, is found in Montenegro as in other Slavonic lands (see Servia). The tribal system still exists, but possesses less significance than in Albania, owing to the centralization of • authority at Cettigne. The tribe (pleme, pi. plemena) is subdivided into clans (bratstva).

Constitution and Government. — Notwithstanding the creation of an elective senate in 1831, the grant of a so-called constitution in 1868, and the

establishment of a responsible ministry in 1874, the government remained autocratic till 1905, the whole power, even the control of religion and finance, which the consti- tution of 1868 had conceded to the senate, being centred in the hands of the prince, who in 1910 assumed the title of king. The senate, instituted by Peter II. with the object of limiting the power of the tribal chieftains, was in 1881 merged in a council of state, the members of which, six in number, were nominated and dismissed by the prince. The council supervises measures to be laid before the Skupshlina, or national assembly, and exercises a disciplinary control over officials. The ministry comprises six departments: (1) the interior, with separate sections for public works, posts and telegraphs, commerce and industry, shipping, sanitary service and agriculture; (2) foreign affairs; (3) war; (4) finance; (5) justice; and (6) education. On the 19th of December 1905 a new constitution was proclaimed by Prince Nicholas. A Skupshtina was instituted, consisting of 62 elected deputies, 9 ex officio members (the higher ecclesiastical and civil dignitaries), and 3 generals nominated by the prince. The Skupshtina is elected by manhood suffrage for a period of four years, and is summoned annually on the 31st of October. In conjunction with the Crown it exercises the legislative power; the ministers are responsible to it as well as to the Crown. The constitution affords financial supervision to the Skupshtina, which elects a board of control and votes an annual budget; it guarantees liberty of the person, of religious belief, and of the

press, together with the right of public meeting, and abolishes the death penalty for political offences.

Administration and Justice. — For purposes of local administra- tion the country is divided into 5 departments (oblasii), each governed by a prefect

(upravitel), and 56 districts (kapetanati) , each under an official styled kapetan. The prefects and kapetans are nominated by the king on the recommendation of the minister of the interior. Rural communes, each under an elected kmet, or mayor, exist in Montenegro as in all Slavonic countries. The kmets act as justices of the peace, and there is an appeal from their decisions to the courts of first instance (kapetanski sudove), of which there is one in each district, the kapetan acting as judge. In each of the five departments there is a superior court (oblasni sud), with a president and two judges; at Cettigne there is a high court of justice (veliki sud), which is the final court of appeal. The ultimate appeal to the prince was abolished in 1902, when Prince Nicholas laid aside his judicial functions, retaining only the prerogative of pardon. The judges, who are_removable, are nominated by the king on the recommendation of the minister of justice. With a single exception there are no professional advocates in Montenegro; each man is his own counsel, bringing his own witnesses. The local gendarmerie, numbering 150 men, is distributed in the five departments. The kapetanati have replaced the former local divisions according to plemena; in each of the communes there is one or more of the bratstva. The codification of the law, which had previously been administered according to un- written custom, was first undertaken by Peter I. in 1796. An improved code, issued by Danilo II. in 1855, still contained many quaint enactments. The excellent code drawn up by Professor Bogishitch, a native of Ragusa, in 1888, was revised and enlarged in 1899. It contains elements from various foreign systems scientifically adapted to national usages and requirements. A large number of judicial reforms were carried out by Count Voiinovitch, who succeeded Professor Bogishitch in 1899; in 1905 a new code of civil procedure was promulgated, and a criminal code in the following year. The only prison is at Podgoritza. In the old prison at Cettigne, closed after 1902, many of the inmates were free to walk in and out at pleasure. Some were burdened with fetters, rather as a

punishment than for restraint. Until the completion of an asylum in 1903, dangerous lunatics were confined in prison. The commonest offences are murder and robbery; despite vigorous measures taken by the king and his predecessors, the blood-feud, or vendetta, cannot be stamped out, being approved, and even enforced, by public sentiment. Only women are held exempt from the duty of avenging their next-of-kin; they have been known, however, to undertake it, disguising themselves in male attire. A man who kills his slanderer, or otherwise avenges his honour, often receives a nominal term of imprisonment. Robbery, if practised by means of raids across the frontier, is popularly regarded as a venal offence. Other forms of crime are rare, and foreigners may traverse all parts of the kingdom, except the neighbourhood of the Albanian border, in perfect safety. The death penalty was first introduced by Peter I. Executions are carried out by a firing party selected from the various tribes, in order to prevent the relatives of the criminal from exacting vengeance. Exceptional severity is shown in the treatment of political offenders, who in some instances have been subjected to solitary confinement for years without trial.

Finance. — Financial statistics are not published. The total receipts were estimated in 1907 at 2,773,690 Austrian krone, 1 the principal sources of income being the taxes on land, houses and cattle, the monopolies of tobacco, salt, petroleum and alcohol, and the customs dues. The total expenditure was estimated at 2,730,994 krone, the principal items being: civil list, &c, 189,586 krone; ministry of interior, 574,822 krone; of foreign affairs, 144,547 krone; of justice, 232,710 krone; of finance, 592,561 krone; of war, 133,696 krone; of worship and education, 269,208 krone; service of national debt, 244,500 krone. The public debt is under £300,000. The contribution of Montenegro to the Ottoman debt has not been fixed. From time to time considerable subventions have been

1 The krone = iod. English.

received from Russia and Austria. The annual Russian subsidy, mainly for military and educational purposes, is stated to be about £40,000. Montenegro has no mint; Austrian paper money and coins are generally employed together with Montenegrin nickel and bronze coins struck in Austria. Turkish gold and silver are also in circulation. The former Turkish and Venetian weights and measures have been superseded by the French.

Defence.— The Montenegrin is a born warrior ; his weapons, which he never lays aside, are his most precious possession, and distinction in battle is the sole object of his ambition. Persons of all classes wear a revolver in the kolan or waistband. ” You might as well take from me my brother as my rifle,” says a native proverb; and rifles are almost universally carried near the Albanian frontier, where the tribesmen on either side are in a state of chronic hostility. Brave to a fault, an unerring marksman, hardy, agile, crafty and enduring, the Montenegrin has few rivals in the practice of guerrilla warfare. The traditional method of fighting is by ambuscade; the enemy is enticed into some intricate defila, surrounded, and harassed by rifle-fire; then the mountaineers, throwing aside their firearms, deliver a swift attack with the hanjar, or yataghan, which they wield with terrific effect. A number of heads cut off in battle adorned the parapet of a small tower outside Cettigne, called the ” Turks’ Tower,” as late as 1850. When reduced to extremity the Montenegrins often committed suicide rather than fall into the hands of the enemy, the last cartridge being reserved for this purpose; disabled comrades who could not be removed used to be beheaded , in 1876 a Montenegrin offered to perform this kindly service for. a Russian officer who was wounded at Klobuk. Savage methods of warfare, however, have been strongly discountenanced by King Nicholas and his predecessor. Till the middle of the 19th century the forces of the principality consisted of undisciplined bands of tribesmen under local chiefs, whose rivalries often proved injurious to the

national cause. The supreme command, however, always rested with the prince. The nucleus of a permanent corps was created by Peter II., who formed a bodyguard of picked men known as perianiki, from the feathers (pera) which adorned their caps. The name' is still borne by a small corps (20 men in 1907) which guards the residences of the king and his sons, but the feathers are no longer worn. In 1853 Danilo II. ordered the enrolment of all persons capable of bearing arms, and instituted a military hierarchy of voievodes (generals), sirdars (colonels) and kapetans; the organiza- tion^ which was based on the tribal system, was remodelled by Servian officers in 1870, when the chiefs were brought to Cettigne to receive military instruction. In the same year arms of precision were introduced : the cost and complex structure of the new weapons threatened to cause serious difficulty, but Russian aid was soon forthcoming. Since 1870, though arms and ammunition are manu- factured on a small scale within the kingdom, the chief supplies have come from Russia. In 1895 the tsar presented Prince Nicholas with 30,000 Berdan rifles, besides ordnance and other war material, and in 1898 sent a further gift of 35,000 Moskovska rifles. Every able-bodied citizen must serve in the army, except Moslems, who are exempt on payment of a capitation tax. The military organization has undergone a gradual transformation under Prince Nicholas in conformity with the changed circumstances of the country and the requirements of modern warfare. The militia system on the tribal basis is maintained, but in 1896 a permanent battalion of 500 men was established at Cettigne, and two years later another at Podgoritza, each under a komandir, or major, 4 captains and 15 lieutenants. A permanent brigade of artillery was formed at Nik- shitch in 1897. In 1905 these were abolished through motives of economy. There is a standing corps of officers, but no standing army. All young men of military age go through an obligatory period of twelve days' service at the various local military centres. Candidates for a commission afterwards proceed to a military school at Podgoritza for one year; the best and most

promising then receive commissions as pod-oftzieri or sous-officiers, and are sent for a further course of instruction of two years to military schools either at Cettigne for the infantry, or at Nikshitch for the artillery. They then receive full commissions and are sent to the local centres to superintend the training of the militia, thus gradually superseding the old militia officers, and replenishing the standing corps of officers of the regular army. Officers who have completed a course of study abroad are allowed to wear a distinctive emblem on the kapa. The war strength is estimated at from 38,000 to 42,000 men, the infantry being composed of about 32,000 men of the first ban and of 5000 or 6000 of the second or reserve (which, however, would scarcely be employed in the field), the artillery of about 1500. Con- siderable deduction must be made from these numbers in view of the emigration of recent years ; according to some authorities between 20,000 and 22,000 men of military age are absent in America and elsewhere. It is expected, however, that many of these would return should the country become involved in war. The infantry is divided into 11 brigades, each containing from 4 to 6 battalions; the total number of battalions is 56. The battalion is composed of a varying number of tchete, or companies, each of which belongs to a separate clan and has its own bairaktar, or standard-bearer. The younger men of the first ban are occasionally exercised in the neighbourhood of their homes on Sundays and holidays. They are armed with the Moskovska (repeating) rifle, but a Berdan rifle is

also kept in each household. The artillery was composed in 19 10 of 18 siege, 25 field and 38 mountain guns, with 4 howitzers, 15 mortars and 18 machine-guns (6 Gatling and 12 Maxim-Nordenfeldt) ; the principal arsenal is at Spuzh, where the heavier guns are kept, the others are distributed among 8 of the 1 1 local brigades. The perianiki, whose numbers

were increased by Prince Danilo, were disbanded in 1898, when steps were taken to form a bodyguard of 3000 picked men under Prince Mirko, King Nicholas's second son, but the project was abandoned in view of the jealousies to which the selection gave rise. Owing to the lack of open country there is no cavalry. In 1894 the sultan presented Prince Nicholas with equipment for a small mounted body-guard (32 men), and offered the services of three instructors. This corps, however, ceased to exist in 1898. About 20,000 men can concentrate at a given spot within 48 hours. The signal for mobilization is mainly given by telegraph; bonfires, trumpet-calls and volley-firing are also employed. The warriors were formerly summoned by sten- torian couriers, who shouted from the tops of the mountains. An ambulance corps has been formed. Transport is deficient, all draught animals, however, in the country have been registered and a few carts have been provided. The wives and daughters of the troops provide the commissariat, and carry the ammunition.

Religion. — The Montenegrin Church is an autocephalous branch of the Eastern Orthodox communion. In 1894 it formally vin- dicated its independence against the claims of the Russian synod. The vladikas, or prince-bishops, formerly depended on the patriarch- ate of Ipek. The theocratic system of government which existed from 1516 to 1851 tended to unite the patriotic and the religious instincts of the people. Since the separation of the spiritual and temporal powers in 1 851, the see of Cettigne, in which the diocese of Ostrog is included, has been occupied by a metropolitan {metropolit) , who possesses a nominal jurisdiction over Scutari and the Primore. In judgments relative to divorce his verdicts may be reversed by the king. Otherwise he is supreme in matters spiritual. There are 159 parishes of the Orthodox Church, 10 Roman Catholic parishes under the archbishop of Antivari and 10 Mahommedan parishes under a mufti. The churches are small unpretending structures, almost all exactly alike; a handsome cathedral, however, has been erected at

Nikshitch. The principal monasteries, in addition to the convent at Cettigne, are those of St Nicholas, on the Moratcha, and of St Basil at Ostrog. The monastic order is almost extinct ; the parochial clergy, who numbered about 400 in 1900, are only distinguishable from the laity by their beards; they wear the national costume, carry weapons, take part in warfare, and follow the ordinary avocations of the peasantry. Even the old vladikas discarded the episcopal robe, except when engaged in sacerdotal duties. The clergy are still for the most part extremely ignorant.

Education. — The Bogoslovia, a seminary for the instruction of the young priests and schoolmasters, was established at Cettigne in 1869. It is maintained by a subvention from the emperor of Russia, while the empress supports the Zhenski Tzrnogorski Institut, an excellently managed school for girls (98 pupils in 1907). Government lecturers go on circuit to instruct the older men. They may be seen on Sundays, not only distributing general information, but teaching the shepherds how to safeguard their flocks from disease, and the lowland cultivators how to tend their vines and tobacco crops. An agricultural college at Podgoritza supplements their work. Primary educaticm is compulsory. In the rural dis- tricts it is free; in the towns a small fee is charged. In 1906 there were 112 primary schools in the principality with 150 teachers and 9756 pupils; and two secondary schools (at Cettigne and Podgoritza) with 21 professors and about 1000 pupils; the Mos- lems and Roman Catholics have separate schools. There are also gymnasia, or high schools, at Cettigne and Podgoritza, with about 700 pupils. Students desirous of higher education proceed abroad, for the most part to the university in Belgrade. The progress of education under Prince Nicholas was very remarkable. In the time of his predecessor, Danilo II., who taught the sons of his chieftains in the palace, there were only three schools in the principality. In 1876, at the beginning of the war, there were 52 schools, with 62 teachers and 3159 pupils. The schools were closed

during the war, and at its conclusion only 22 could be reopened, owing to want of funds. Elementary education was reorganized in 1878.

Language and Literature. — The Montenegrin language is practically identical with the Serbo-Croatian: it exhibits certain dialectical variations, and has borrowed to some extent from the Turkish and Italian. Existing manuscripts and printed books, chiefly psalters and gospels, bear witness to a period of literary culture among the clergy contemporaneous with the activity of the printing-press at Obod. This was established in 1493, a few years after Caxton set up his first press in Westminster. It was destroyed by the Turks in 1566, after sending out copies of the gospel into all Slavonic countries. The folk-songs, however, of which the first collection was made in the reign of Peter II., constitute the bulk of the national literature. The poems of that ruler are accounted among the classics of the Servian language, especially his Gorski Vienatz, or " Mountain Wreath," a drama describing the massacre of the Montenegrin Moslems by their Christian kinsmen in 1702. The reigning family has produced a succession of poets; the songs of Mirko Petrovitch,

the father of Prince Nicholas, and the lyrics and dramas of Prince Nicholas himself enjoy great celebrity. The Grlitze, or " Turtle- doves," a kind of almanac published at Cettigne by Milakovitch between 1835 and 1839, contained poems, tales, statistics and an abridgment of the Montenegrin annals down to 1 830 ; it was succeeded in the time of Danilo II. by the Orlitch, or " Eaglet." The first Montenegrin newspaper, the Tzrnogoratz, or " Montenegrin," founded in 1870, was prohibited on the Austrian frontier, and soon disappeared; it was replaced by the Glas Tzrnogortza, or " Voice of the Montenegrin," a semi-official publication. There were in 1910 three other journals in the kingdom.

Antiquities. — In Montenegro, as in Albania, the monuments of early civilization bear witness to Roman rather than to Greek influence. Roman remains

occur in many parts of the country east of the Zeta, and early Latin churches exist at Dulcigno (Ulcinium) and other places. “The organization and forms of the churches, the architecture and ornamentation, point to the West and not to the East.” It is evident that Latin civilization was firmly planted in Illyria before the barbarian incursions of the 6th century. Latin sepulchral inscriptions and some finely cut marble blocks have been found at Berane, a little beyond the eastern frontier, and at Budimlye in its neighbourhood. Especially interest- ing and important are the extensive ruins of Doclea, now known as Dukle, the birthplace of the Emperor Diocletian. The city, which received the franchise under the Flavian emperors, occupied a remarkable site at the junction of the rivers Zeta and Moratcha. The outer walls are standing in many places, and excavations carried out in 1893 by M. Rovinski and Messrs J. A. R. Munro, Milne and Anderson revealed a considerable portion of the ground- plan, including several streets and a forum. Among the buildings are a fine civil basilica, with a great inscription on the architrave, two small temples, an early Christian basilica, and a later church; several inscriptions, columns, richly worked capitals and tracery, and mosaic pavements have been brought to light. At Medun there are remnants of polygonal masonry. Illyrian forts are found in many parts of the country. The ravages of the Turks obliterated almost every trace of medieval culture. The fortress of Obod, the site of the famous printing-press, is a heap of ruins; a fragment of one of the first missals printed here is shown at Cettigne; it bears the date 1494. Other editions are preserved at the monastery of Tzai’nitza, on the Bosnian side of the frontier, and at Moscow. The precious books and relics stored in the monastery of Ivan the Black at Cettigne perished with the destruction of the monastery in 1687. The building, the home of the reigning vladikas, had been previously sacked by the Turks in 1623, and was again destroyed by them in 1714. In the fortress-monastery of St Nicholas (founded in 1252), which overlooks the headwaters of

the Moratcha, are some interest- ing and well-preserved frescoes which date from the 13th century. The monastery of Ostrog, about twelve miles from Nikshitch, is a comparatively recent foundation, dating from the 18th century. It has been styled ” the Lourdes of the Balkans,” owing to its reputa- tion for miraculous cures, and is visited annually by thousands of Orthodox pilgrims, and even by Roman Catholics and Moslems. The upper portion, situated in the cleft of a precipitous rock, was in 1768 and again in 1862 successfully defended by a handful of men against the Turks.

History. — The history of Montenegro as an independent state begins with the battle of Kossovo (1389), but the country had enjoyed periods of independence or semi-independence at various epochs before that event. It formed a portion of the district of Praevalitana in the Roman province of Illyria, and, lying on the borderland of the empires of the West and East, it alternately shared the fortunes of either till the close of the 5th century. It was then conquered by the Ostrogoths (a.d. 493), but half a cen- tury later definitely passed under Byzantine rule, having already acknowledged the ecclesiastical authority of Constantinople, a circumstance which determined the course of its subsequent history. Illyria and Dalmatia succumbed to the great Serbo- Croat invasion of the 6th and 7th centuries; the Serb race by which Montenegro is now inhabited occupied the country about the middle of the 7th century. A confederacy of Serb states was formed under zhupans, or feudal princes, dependent on the grand zhupan, who was nominally the vassal of the Greek emperor. The Serb principality of the Zeta, or Zenta, originally included the Herzegovina, Cattaro and Scutari, as well as the Montenegro of to-day, and was ruled by a zhupan resident at Doclea. The principality, though retaining its zhupans, was practically united with the Servian kingdom between 1159 and 1356 under the Nemanya dynasty, which sprang from Doclea, After the death of the great Servian tsar Dushan in 1356 the feudatory princes of

his empire became more or less independent, and the powerful family of Balsha established a dynasty in the Zeta, eventually transferring its capital from Doclea to Scutari.

11*

MONTENEGRO

After the fatal defeat of Kossovo, which extinguished the inde- pendence of Servia for more than four centuries (see Servia), George Balsha, the ruling prince of the Zeta, withdrew to the mountainous portion of his realm, which became an asylum for many of the Servian nobles and for others who had been outlawed or persecuted by the Turkish conqueror. The principality now owned no suzerain, and the history of its heroic struggle with the Turks began. The long record of warfare is varied by conflicts with the Venetians, who at times allied themselves with the mountaineers, but usually deserted them in the hour of need. The Balsha family became extinct in 142 1, and a new dynasty was founded by Stephan Tzernoyevitch, or Tzemovitch, who fixed his capital at Zhabliak on the north-east side of Lake Scutari, and joined with his relative, the famous Scanderbeg (q.v.) in many campaigns against the Turks. After the Turkish conquest of Bosnia in 1463, of the Herzegovina in 1476 and of Albania in 1478, and the surrender of Scutari by the Venetians in 1479, the Montenegrins found themselves surrounded on all sides by the Ottoman power, and the struggle was henceforth for existence. Abandoned by Venice and unable to obtain succour from any Christian state, Ivan the Black, the son and successor of Stephan, set fire to Zhabliak in 1484, and withdrew with his people to the mountain village of Tzetinye (Cettigne) which has ever since been the capital of the little principality. Here he founded the famous monastery and created a bishopric in order to establish the spiritual power at the seat of government. Ivan was one of the greatest heroes of Montenegrin history: according to the national legend, he still sleeps in a cave near his fortress of Obod — to awake when the hour arrives for the

expulsion of the Turks from Europe.

The Tzernoyevitch dynasty came to an end in 1516, and from this date till 1696 the mountaineers were ruled by the vladikas

or bishops of Cettigne, elected by assemblies of the Vladikas. chiefs and people, and consecrated by the patriarch

of Ipek. The elective vladikas were aided in matters relating to national defence by a civil governor. The institution of a theocratic sovereignty probably saved the country from absorption in the Turkish Empire, the supreme power being vested in a sacrosanct person, whose position was unattainable by ambitious chieftains, and whose holy office precluded the possi- bility of his defection to Islam. The earlier vladikas were left comparatively unmolested By the Turks, and were enabled to devote their attention to the issue of numerous psalters, missals and gospels from the printing-press at Obod. But the beginning of the 17th century was marked by renewed Turkish aggression. Cettigne was taken in 1623 and again in 1687, when the monas- tery of Ivan the Black was blown up by the monks; a tribute was for a time imposed on the mountaineers, but the bolder spirits maintained their resistance in the heights, and the invading armies found it impossible to prolong their stay in these inhospitable regions.

In 1696 it was decided to continue the hereditary principle with the theocratic system, and Danilo Petrovitch of Niegush,

the first ruler of the present reigning family, was ofPetro?* nominated vladika with power to select his successor vHch. from among his relatives. The succession was

henceforth regularly from uncle to nephew, owing to the rule of celibacy imposed on the monastic order. The reign of Danilo I. was memorable for the massacre of the Moslems settled in the principality (the ” Montenegrin vespers “) on Christmas Eve 1702,

the great defeat of the Turkish invaders at Tzarevlatz (17 12), the capture of Cettigne by the Turks and the destruction for the third time of its monastery (17 14), and the inauguration of the intimate relations which have ever since existed with Russia by the visit of the vladika to Peter the Great in 1715. With Russian aid Danilo was enabled in some degree to repair the ruin which had overtaken his little realm. In the time of his successor Sava (1737-1782) an impostor named Stephan Mali, who represented himself as the Russian emperor Peter III., won the confidence of the Montenegrins, and governed the country with ability for several years (1768-1773), the mountaineers defeating the combined efforts of the Turks and

Venetians to remove him. He was eventually assassinated by a Greek suborned by the pasha of Scutari. Peter I. (1 782-1830), the greatest of the vladikas, took part in the war of Austria and Russia against Turkey (1788-92), but was abandoned by his allies in the. treaties of Sistova and Jassy. He nevertheless completely routed the Turks in the battle of Krussa (1796), annexed the Brda region to the principality, and obtained a formal recognition of Montenegrin independence from the sultan in 1799. In concert with the Russians he besieged the French in Ragusa (1806), and in 1813-14 expelled them from the Bocche di Cattaro with the aid of a British fleet under Admiral Fremantle. The much-coveted seaport, however, was almost immediately occupied by an Austrian force. Peter I. reor- ganized the internal administration and promulgated the first Montenegrin code of laws. After his death he was canonized as a saint by the people. His successor Peter II. (1830-1851), a poet, statesman and reformer, as well as a capable military chief, instituted a senate (1831), abolished the office of civil governor (1832), revived the national printing-press, and did much to educate and civilize his people. He was buried by his desire on the summit of Mount Lovchen that his spirit might survey his beloved land. He was the last of the vladikas; his nephew Danilo II. (1851-1860) at once declined

the ecclesiastical dignity, and assuming the title of gospodar, or prince, settled the succession on his direct male descendants. He defeated the Turks near Ostrog in 1853, but refrained from attacking them during the Crimean War. His pacific policy produced much discontent among the warlike mountaineers, which culmi- nated in an open revolt. His demand for the recognition of Montenegrin independence and other claims were set aside by the Congress of Paris. In 1858 his brother Mirko, ” the Sword of Montenegro,” routed the Turks with great slaughter at Grahovo. In 1855 Danilo II. promulgated a new code, assuring civil and religious liberty to his subjects. On the nth of August i860 he was shot at Persano on the Bocche di Cattaro by a Montenegrin whom he had exiled after the revolt, and died two days afterwards. He left no male offspring, and was succeeded by Nicholas, the son of his brother Mirko.

Shortly after the accession of Prince Nicholas (Aug. 13, i860), an insurrection broke out in Herzegovina, and the sym- pathy which the mountaineers displayed with their Christian kinsmen led to a rupture with Turkey Nicholas. (1862). Notwithstanding the heroic defence of Ostrog by the prince’s father, Mirko, the war proved disastrous, owing to the superior armament and discipline of the Turkish troops, and severe terms were imposed on the principality by the convention of Scutari (Aug. 31). During the fourteen years of peace which followed, the country suffered greatly from pestilence and famine. Within this period a series of reforms were carried out by the prince: the army was rearmed and reor- ganized, an educational system was initiated, and a constitution under which the prince surrendered various prerogatives to the Senate was granted. In 1869 the Krivoshians, or Serb inhabitants of the northern shores of the Bocche di Cattaro, rose against the Austrian government; the excitement in Montenegro was intense, but the prince succeeded in checking the warlike ardour of his subjects. The revolt in Bosnia and Herzegovina in 1875 had more important consequences for the principality. On the 2nd of July 1876 Prince Nicholas, in alliance with Prince

Milan of Servia, declared war against Turkey and invaded Herzegovina. A victory was gained at Vuchidol (July 28), and Medun was captured; but the Servian army suffered reverses, and an armistice was arranged in November. In the following spring the determination of Russia to take the field against Turkey encouraged the Montenegrins to renew the war. The Turks succeeded in occupying Ostrog, but were subsequently repulsed; the greater part of their forces was soon withdrawn to Bulgaria, and Prince Nicholas captured successively Nikshitch, Antivari and Dulcigno. The recovery of the seaboard, which had belonged to Montenegro in the middle ages, was perhaps the principal achievement of the war. The enlargement of territory stipulated for by Russia under the treaty

of San Stefano (March 3, 1878) would have brought Montenegro into close contiguity with Servia, thus facilitating the eventual union of the Serb race and closing the path of Austria towards the Aegean. The Berlin Treaty (article xxviii.) gave to Monte- negro Nikshitch, Spuzh, Podgoritza, Plava, Gusinye and Antivari, but restored Dulcigno to Turkey. The resistance of the Moslem inhabitants of Plava and Gusinye to annexation led to long negotiations, and eventually the ” Corti Compromise ” was agreed to by a conference of the Powers at Constantinople (April 18, 1880). Plava and Gusinye were to be restored to Turkey, while the Montenegrin frontier was extended so as to include the Hoti and the greater part of the Klementi tribes. This arrangement, which could hardly have proved successful, was not carried out by Turkey, and the Powers subsequently decided to annex Dulcigno to Montenegro in exchange for Plava and Gusinye. The Porte interposed delays, though consenting in principle, and the Albanian League (see Albania) assumed a menacing attitude. On the 28th of September the fleets of the Powers under Admiral Seymour appeared off Dulcigno, and the British government shortly afterwards proposed to

occupy Smyrna. On the nth of November the Porte yielded; on the 22nd the Turkish troops defeated the Albanians, and on the 25th Montenegro obtained possession of Dulcigno. The present fron- tier, as already described, was shortly afterwards delimited by an international commission. With the exception of some frontier troubles, the years since 1880 have been spent in peace, and the country has advanced in prosperity under the autocratic but enlightened rule of Prince Nicholas. The relations with Turkey, the traditional foe, have improved, while those with Austria have become less friendly. In July 1893 the four-hundredth anniversary of the foundation of the printing-press at Obod was celebrated at Cettigne, several foreign universities and learned bodies being represented at the festivities. In September 1896 the bi-centenary of the Petrovitch dynasty was commemorated. The marriage in the same year of Princess Helen, fourth daughter of Prince Nicholas, with the crown prince of Italy, subsequently King Victor Emmanuel III., led to an increase of Italian influence in the principality. In December 1900 Prince Nicholas assumed the title ” Royal Highness.” In October 1906 the first Monte- negrin parliament assembled at Cettigne; and on the 28th of August 1910, Prince Nicholas (q.v.) assumed the title of king.

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MONTE OLIVETO MAGGIORE, a monastery of Tuscany, Italy, 6 m. S. of Asciano. It was founded in 1320, and is mainly celebrated for the beautiful frescoes in the monastery court, which are by Luca Signorelli (1497-1498) and Antonio Bazzi, called Sodoma (1505), representing scenes from the legend of St Benedict. The church and library contain fine inlaid wood-work by Fra Giovanni da Verona.

MONTEPULCIANO, a town and episcopal see of the province of Siena, Tuscany, Italy, 44 m. S.E. of Siena by rail. Pop. (1901). 6288 (town); 15,384 (commune). The town, 6 m, W. of

the station, crowns the summit of a hill (1984 ft.), and is surrounded by medieval walls. It is not traceable in history before a.d. 715. It was under the protection of Siena till 1202, when it declared for Florence and thenceforward passed from one mistress to the other, until early in the 16th century when it finally became Florentine. In 1561 it became an episcopal see. Most of the buildings belong to the Renaissance; except the castle, the 14th-century Palazzo Pubblico, and the portals of two or three churches, especially that of S. Maria (13th century). There are a number of fine private

houses, some built by Antonio da Sangallo the elder (14557–1534) and Baldassare Peruzzi (1481–1536) and others by Vignola (1507– I573)– The beautiful church of the Madonna di S. Biagio — probably Sangallo's masterpiece — was built in 1518–1537. The cathedral built by Bartolommeo Ammanati (1570), modified by Ippolito Scalza, and completed in 1680 (with the exception of the fagade, which is still unfinished) contains a large altar-piece by Taddeo di Bartolo of Siena, and the fragments of an imposing monument erected in 1427–1436 by the Florentine architect Michelozzo in honour of Bartolommeo Aragazzi, secretary of Pope Martin V., which was taken down in the 18th century. The facade of S. Agostino is probably also Michelozzo's work Montepulciano is famous for its wine, and was the birthplace of the scholar and poet Angelo Anbrogini (1454–1494), generally known as Poliziano (Politian) and of Cardinal Bellarmine

(1542–1621).

See F. Bargagli-Petrucci, Montepulciano, Chiusi, &c. (Bergamo,

1907).

MONTEREAU, a town of northern France, in the department of Seine-et-Marne at the confluence of the Yonne with the Seine, 21 m. S.E. of Melun by rail. Pop. (1906), 7870. The church dates from the 13th century, with a facade of the Renaissance period. The industries include the manufacture of porcelain, fire-proof and decorative bricks, boots and shoes and agricultural machines and colours, varnish, &c. Among the institutions are a tribunal of commerce and a chamber of arts and manu-factures.

Montereau was in the beginning of the 15th century a place of some importance. Here, on the bridge over the Yonne, Jean Sans-Peur, duke of Burgundy was assassinated in the presence of the Dauphin, afterwards Charles VII., in 1419. In 1438 the town was captured by Charles VII., and during the wars of

religion it was several times taken and retaken. In 1814 Napoleon gained a victory at Montereau over the Wiirttemberg troops under .Schwarzenberg, and in memory of this his statue has been erected on the bridge.

MONTEREY, a city of Monterey county, California, U.S.A., on the Pacific coast, about 90 m. in a straight line S. by E. from San Francisco, at the S.E. extremity of the Gulf of Monterey, a great open bay 22 m. wide from headland to headland and facing S.W. The harbour is protected by a peninsula extending N.W. Pop. (1900), 1748, largely of Spanish descent; (1910) 49 23^ It is served by the Southern Pacific railroad, and for freight by the Pacific Coast Steamship Co. It is built in an amphi- theatre formed by gently sloping pine-clad hills. In 1881 the Southern Pacific Company erected the Del Monte hotel, with beautiful grounds several miles in extent, and since then the city has come to be one of the favourite resorts of the Pacific coast. The difference between the mean temperatures of the coldest and warmest months of the year (rarely below 47 or above 66° F. respectively) is from io° to 20 ; while the ther- mometer rarely registers below freezing or above 80° F. Within the city limits there is a United States Army post, the Presidio of Monterey, with a musketry school. There are sardine canneries here and good salmon and other fishing; some salmon are shipped to Germany to be smoked. In 1907 the south side of the Gulf of Monterey was made by the state legislature into a preserve for squid and other food for salmon. To San Francisco, Hawaii, Alaska, and elsewhere, Monterey ships annually about 60,000 tons of crude oil, piped here into great steel tanks from the Coalinga oil fields mm. away. Sand lime brick is manufactured here,

Before the coming of the Americans, Monterey was the gayest and most ambitious city of California. It was discovered by Sebastian Vizcaino in December 1602,

and was named in honour of the then viceroy of New Spain. For a time all trace was lost of Monterey, but in May 1770 the bay was found again by Junipero Serra and Captain Gaspar de Portola.. The San Carlos mission of the Franciscans was founded on the 3rd of June 1770, and a presidio was completed in 1778. Near Monterey, in Carmel Valley, whither the mission was almost immediately removed, Father Junipero built a church, in which his remains now rest. In 1891 a statue, representing Junipero stepping from a boat, was erected on the site of the old Mexican fort, on a hill near the landing-place of both Vizcaino and Junipero. Monterey necessarily played a prominent part in the jealousies that divided the north and south; the rivalry of Los Angeles for the dignity of capital being a powerful influence in politics from 1827-1846. In 1845 Los Angeles gained the prize, but in 1847 the American authorities again made Monterey the capital. Even in these years the treasury, custom-house and military headquarters had remained at Monterey. In 1818 it was captured and momentarily held by a Buenos Aires privateer. Here, in 1842, Commodore T. ap C. Jones raised the flag of the United States for a day, and here on the 7th of July 1846, Commodore J. D. Sloat again raised the same flag, which this time was not to come down again. The first American newspaper on the Pacific coast was published at Monterey; and the convention that framed the first constitution of the state met here in September 1849 in Colton Hall, still standing and originally built for a schoolhouse by Walter D. Colton, the first alcalde under American rule. Monterey was never the capital of the new state, and its importance declined after the discovery of gold near Sacramento, San Francisco becoming the leading city. In 1872 the county-seat was removed from Monterey to Salinas. For many years Monterey remained one of the most Spanish towns of California, and though tourists have somewhat disturbed its peace and checked its decay, it still retains much of the quaint aspect and the drowsy content- ment of spirit of Mexican days. Since 1900 the population has considerably increased.

MONTERREY (usually spelled Monterey in English), a city of Mexico and capital of the state of Nuevo Leon, 606 m. by the old wagon road, and 671 m. by the Mexican National railway N. by W. of the city of Mexico, in lat. 25* 40′ N., long. ioo° 25′ W. Pop. (1900), 62,266. Railway communications are provided by the Mexican National with the United States, with the national capital and southern Mexico, and with Matamoros, and by the Belgian line with Tampico on the Gulf coast, and with Trevino, or Venadito, on the Mexican International line, which gives access to the iron deposits of Durango. The city stands 1624 ft. above sea-level, between two spurs of one of the Sierra Madre ranges — the Cerro de la Silla (4149 ft.) on the east, and the Cerro de las Mitras (3618 ft.) on the west. The Santa Catarina river furnishes water-power for some of its industries. The surrounding district is fertile, and the rainfall about 22 in. The climate is dry and mild, and the city is frequented in winter by invalids from the United States. Monterrey is laid out with broad, straight streets crossing each other at right angles, and spreads over a large area. It is the see of the bishop of Linares, and has a large cathedral, a bishop's palace and numerous churches. Among the public edifices are the govern- ment palace, municipal hall, national college, girls' college, medical school, public hospital, theatre and penitentiary. Its public works include an interesting old reservoir, called the " Ojo de Agua," and the " Puente Nuevo " (new bridge). Monterrey is the most important centre of northern Mexico, and large sums of foreign capital have been invested in its industries. Among its manufactories are woollen mills, smelting works, brass and iron foundries, a steel producing plant, saw- mills, flour-mills, breweries, and a carriage and wagon factory.

Monterrey was founded in 1560 under the name of Santa Lucia de Leon; and in 1596, as Monterrey, was raised to the dignity of a city. In 1777 it became the see of a bishop, now

suffragan to the archbishop of Guadalajara. Daring the war between Mexico and the United States General Zachary Taylor arrived before the city on the 19th of September 1846, with about 6600 men. Monterrey was defended by a Mexican force of about 10,000 under General Pedro de Ampudia. On the 20th Colonel John Garland (1792-1861) assaulted the lower (north-eastern) part of the city; he was driven back, but captured one of the forts. The attacks on the ether forts on the east were unsuccessful. On the 21st and 22nd General W. J. Worth carried the forts west of Monterrey, and on the 23rd attacked the western part of the city, the troops slowly working their way toward the central plaza. On the same day American troops again advanced from the east, and were again forced back. On the morning of the 24th the terms of a capitulation were agreed upon — the Mexicans were permitted to retire, retaining their small arms and one field battery of six pieces with twenty-one rounds of ammunition, and an armistice of eight weeks was arranged. A disastrous flood, caused by heavy rains and the sudden overflow of the Santa Catarina river on the 28th of August 1909, swept away about one-fourth of the city, drowning 1 200-1400 persons, and destroying about $12,000,000 (Mex.) worth of property.

MONTE SAN GIULIANO, a town and episcopal see of Sicily, in the province of Trapani, 2 m. E.N.E. of Trapani, on the summit of an isolated bare hill, 2465 ft. above the sea. Pop. of commune (1901), 28,939; of town, about 3000. The town occupies the site of the ancient Eryx, a city of the Elymi, a people who claimed to be sprung from a mixed settlement of Trojans and Phocians after the fall of Troy (E. A. Freeman, History of Sicily, i. 195, 542), but regarded as |3dp|8apoi by the Greeks. The city was famous for the temple of Venus Erycina, to the foundations of which a wall of 12 courses of

masonry in the castle probably belongs. The worship was a relic of the Phoenician cult of Astarte. In 415 B.C. the Athenian envoys were shown the treasure of the temple at Eryx as available for the expenses of the war, which treasure turned out to be only silver-gilt and not of solid gold (Thucydides vi. 46). The town must have become a part of the Carthaginian dominion in 405 B.C. It was seized by Pyrrhus in 278 B.C., and was ceded to Rome at the end of the First Punic War. In Roman times the temple (like that of Diana Tifatana, near Capua) possessed territory of its own, being dependent neither on the state nor on any neighbouring town, and a considerable number of female slaves. The place was the residence of the quaestor in charge of the western half of the island, and Verres, as praetor, seems to have spent a good deal of time here. Considerable portions of the city wall are preserved on the north-west; on the east and south the precipitous cliffs formed a sufficient defence. The remains date from a reconstruction of Roman times, 1 in which the material of two earlier periods has been used: the large blocks belonging to the original fortifications bear Phoenician masons' marks; but the long line of towers at regular intervals is a thoroughly Roman characteristic. The castle, dating from the middle ages, with three lofty towers guarding the entrance, occupies the south-eastern extremity of the town. The cathedral, founded in 13 14, has a fine porch and Gothic facade.

MONTE SAN SAVINO, a town of Tuscany, Italy, in the province of Arezzo, from which it is 12 m. S.W. by road, 1083 ft. above sea-level. Pop. (1901), 4810 (town); 8498 (commune). It was the birthplace of the sculptor and architect Andrea Contucci, generally known as Sansovino (1460-1529), and there are various works in the town by him, a loggia opposite the Palazzo Municipale (itself by Antonio da Sangallo the elder and one of his best works), the monastery courts of S. Agostino and S. Giovanni Battista, and some sculptures.

MONTE SANT' ANGELO, a town of Apulia, Italy, in the

pro- vince of Foggia, 10 m. N. of Manfredonia by road, 2765 ft. above sea-level, on the southern slopes of Monte Gargano. Pop. (1901), 17,369 (town); 21,997 (commune). It has a castle and a famous

1 This has been demonstrated by O. Richter, liber antike Stein- metzzeichen (Berlin, 1885), pp. 43-51.

sanctuary of S. Michele, founded in 491 over a cave in which the archangel is said to have appeared to S. Laurentius, arch- bishop of Sipontum; the bronze doors, made in Constantinople, bear the date 1076. The octagonal campanile dates from 1273. The portal of S. Maria Maggiore is noteworthy. The Tomba di Rotari is a domed building of the Norman period. To the north lies the highest point of the Monte Gargano (3460 ft.). Strabo speaks of an oracle of Calchas on the top of the mountain, and a healing spring at Podalirius at the bottom, 12 m. from the sea. See S. Beltramelli, II Gargano (Bergamo, 1907).

MONTESPAN, FRANCOISE-ATHENAlS DE PARDAILLAN,

Marquise de (1641-1707), mistress of Louis XIV., was born at the chateau of Tonnay-Charente (Charente-Inferieure), the daughter of Gabriel de Rochechouart, due de Mortemart. She was educated at the Convent of St Mary at Saintes, and when she was twenty she became maid-of-honour to Queen Maria Theresa. She married in January 1663 L. H. de Pardaillan de Gondrin, marquis de Montespan, who was a year younger than herself. By him she had two children, L. H. Pardaillan de Gondrin, due d'Antin, born in 1665, and a daughter. Her brilliant and haughty beauty was only one of the Montespan's charms; she was a cultivated and amusing talker who won the admiration of such competent judges as Saint-Simon and Mme de Sevigne. Nevertheless she was a profound believer in witchcraft, and La Reynie, the chief judge of the court before which the famous poisoning cases were brought, places her first

visits to La Voisin (q.v.) in 1665. She received from the sorceress love powders concocted of abominable ingredients for Louis XIV., and in 1666 the ” black mass ” was said by the priest Etienne Guibourg over her with the usual horrible cere- monial. In 1667 she gained her end, becoming Louis XIV. ‘s mistress in July. Montespan astounded the court by openly resenting his wife’s position. He made a scandal by accusing Mme de Montausier of acting as go-between in order to secure the governorship of the dauphin for her husband. He even wore mourning for his wife. Montespan was arrested, but released after a few days’ imprisonment. The first of the seven children whom Mme de Montespan bore to the king was born in March 1669, and was entrusted to Mme Scarron, the future Mme de Maintenon, who acted as companion to Mme de Montespan while the king was away at the wars. Her children were legitimatized in 1673 without mention of the mother’s name for fear that Montespan might claim them. The eldest, Louis Auguste, became due de Maine, the second, Louis Cesar, comte de Vexin, and the third, Louise Francoise, demoiselle de Nantes (afterwards duchess of Bourbon). Mean- while Montespan had been compelled to retire to Spain, and in 1674 an official separation was declared by the procureur-gSneral Achille de Harlay, assisted by six judges at the Chatelet. When Louis’s affections showed signs of cooling, Mme de Montespan had recourse to magic. In 1675 absolution was refused to the king, with the result that his mistress was driven from the court for a short time. It has been thought that she had conceived the intention of poisoning even as early as 1676, but in 1679 Louis’s intrigue with Angelique de Fontanges and her own relegation to the position of superintendent of the queen’s household brought matters to a crisis. Mile de Fontanges died a natural death in 1681, though poisoning was suspected. Meanwhile suspicion was thrown on Mme de Montespan’s connexion with La Voisin and her crew by the frequent recur- rence of her maid’s name, Mile Desoeillets, in the evidence brought before the Chambre Ardente. From the end of 1680 onwards Louvois, Colbert and Mme de Maintenon

all helped to hush up the affair and to prevent further scandal about the mother of the king's legitimatized children. Louis XIV. continued to spend some time daily in her apartments, and apparently her brilliance and charm in conversation mitigated to some extent her position of discarded mistress. In 1691 she retired to the Convent of St Joseph with a pension of half a million francs. Her father was governor of Paris, her brother, the due de Vivonne, a marshal of France, and one of her sisters,

Gabrielle, whose vows were but four years old, became abbess of the wealthy community of Fontevrault. Besides the expenses of her houses and equipage Mme de Montespan spent vast sums on hospitals and charities. She was also a generous patron of letters, and befriended Corneille, Racine and La Fontaine. The last years of her life were given up to penance. When she died at Bourbon l'Archambault on the 27th of May 1707 the king forbade her children to wear mourning for her. Real regret was felt for her by the duchess of Bourbon and by her younger children— Francoise Marie, Mile de Blois (1677-1749), married in 1692 to the future regent Orleans, then due de Chartres, and Louis Alexandre, comte de Toulouse (1678-1737).

See P. Clement, Madame de Montespan et Louis XIV. . (Paris, 1869); monographs by Arsene Houssaye (1865) and by H. Williams (I 9°3); a ' s0 J- Jair> Louise de la Valliere (Eng. trans., 1908); F. Funck-Brentano, Le Drame des poisons (1899); A. Durand, " Un Episode du grand regne " in Rev. des questions hist. (Paris, 1868); the contemporary memoirs of Mme de Sevigne, of Saint-Simon, of Bussy-Rabutin and others; also the proceedings of the Chambre Ardente preserved in the Archives de la Bastille (Arsenal Library) and the notes of La Reynie preserved in the Bibliotheque Nationale. She figured in V. Sardou's play, L' Affaire des poisons (1907).

MONTESQUIEU, CHARLES LOUIS DE SECONDAT, Baron de la Brede et de (1689-1755), French philosophical historian, was born at the chateau of La Brede, about

10 m. south-east of Bordeaux, in January 1689, and was baptized on the 1 8th of that month. His mother was Marie Francoise de Penel, the heiress of a Gascon-English family. She had brought La Brede as a dowry to his father, Jacques de Secondat, a member of a good if not extremely ancient house, which seems first to have risen to importance in the early days of the 16th century. The title of Montesquieu came from his uncle, Jean Baptiste de Secondat, " president a mortier " in the parliament of Bordeaux — an important office, which, as well as his title, he left to his nephew. Montesquieu was in his youth known as M. de la Brede. His mother died when he was seven years old, and when he was eleven he was sent to the Oratorian school of Juilly, near Meaux, where he stayed exactly five years, and where, as well as afterwards at Bordeaux, he was thoroughly educated. The family had long been connected with the law, and Montesquieu was destined for that profession. His father died in 1713, and a year later Montesquieu was admitted counsellor of the parliament. In little more than another twelvemonth he married Jeanne Lartigue, an heiress and the daughter of a knight of the order of St Louis, but plain, somewhat ill-educated, and a Protestant. Montesquieu does not seem to have made the slightest pretence of affection or fidelity towards his wife, but there is every reason to believe that they lived on perfectly good terms. In 17 16 his uncle died, leaving him his name, his important judicial office and his whole fortune.

He continued to hold his presidency for twelve years, and took part in the proceedings of the Bordeaux Academy, to which he contributed papers on philosophy, politics and natural science. He also wrote much less serious things, and it was during the earlier years of his presidency that he finished, if he did not begin, the Lettres persanes. They were completed before 1721, and appeared in that year anonymously, with Cologne on the title-page, but they were really printed and published at Amsterdam. In the guise of letters written by and to two Persians of distinction travelling in Europe,

Montes- quieu not only satirized unmercifully the social, political, ecclesiastical and literary follies of his day in France, but indulged in a great deal of the free writing which was charac- teristic of the tale-tellers of the time. But what scandalized grave and precise readers naturally attracted the majority, and the Lettres persanes were very popular, passing, it is said, through four editions within the year, besides piracies. Then the vogue suddenly ceased, or at least editions ceased for nearly nine years to appear. It is said that a formal ministerial prohibition was the cause of this, and it is not improbable; for. though the regent and Guillaume Dubois must have enjoyed the book thoroughly, they were both shrewd enough to per- ceive that underneath its playful exterior there lay a spirit of

very inconvenient criticism of abuses in church and state. The fact is that the Lettres persanes is the first book of what is called the Philosophe movement. It is amusing to find Voltaire describing the Lettres as a ” trumpery book,” a ” book which anybody might have written easily.” It is not certain that, in its peculiar mixture of light badinage with not merely serious purpose but gentlemanlike moderation, Voltaire could have written it himself, and it is certain that no one else at that time could.

The reputation acquired by this book brought Montesquieu much into the literary society of the capital, and he composed for, or at any rate contributed to, one of the coteries of the day the clever but rather rhetorical Dialogue de Sylla et d’Eucrate, in which the dictator gives an apology for his conduct. For Mile de Clermont, a lady of royal blood, a great beauty and a favourite queen of society, he wrote the curious prose- poem of the Temple de Gnide. This is half a narrative, half an allegory, in the semi-classical or rather pseudo-

classical taste of the time, decidedly frivolous and dubiously moral, but of no small elegance in its peculiar style. A later jeu d ‘esprit of the same kind, which is almost but not quite certainly Montes- quieu’s, is the Voyage d Paphos, in which his warmest admirers have found little to praise. In 1725 Montesquieu was elected a member of the Academy, but an almost obsolete rule requiring residence in Paris was appealed to, and the election was annulled. It is doubtful whether a hankering after Parisian society, or an ambition to belong to the Academy, or a desire to devote himself to literary pursuits of greater importance, or simple weariness of not wholly congenial work determined him to give up his Bordeaux office. In 1726 he sold the life-tenure of his office, reserving the reversion for his son, and went to live in the capital, returning, however, for half of each year to La BrMe. There was now no further formal obstacle to his reception in the Academie Francaise, but a new one arose. Ill-wishers had brought the Lettres persanes specially under the minister Andre Hercule de Fleury’s attention, and Fleury, a precisian in many ways, was shocked by them. There are various accounts of the way in which the difficulty was got over, but all seem to agree that Montesquieu made concessions which were more effectual than dignified. He was elected and received in January 1728.

Almost immediately afterwards he started on a tour through Europe to observe men, things and constitutions. He travelled through Austria to Hungary, but was unable to visit Turkey as he had proposed. Then he made for Italy, where he met Chesterfield. At Venice, and elsewhere in Italy, he remained nearly a year, and then journeyed by way of Piedmont and the Rhine to England. Here he stayed for some eighteen months, and acquired an admiration for English character and polity which never afterwards deserted him. He returned, not to Paris, but to La Br&de, and to outward appearance might have seemed to be settling down as a squire. He altered his park in the English fashion, made

sedulous inquiries into his own genealogy, arranged an entail, asserted, though not harshly, his seignorial rights, kept poachers in awe and so forth. But these matters by no means engrossed his thoughts. In his great study at La Brede (a hall rather than a study, some 60 ft. long by 40 wide) he was constantly dictating, making abstracts, revising essays, and in other ways preparing his main book. He may have thought it wise to soften the transition from the Lettres persanes to the Esprit des lois, by interposing a publication graver than the former and less elaborate than the latter. The Considerations sur les causes de la grandeur et de la dicadence des Romains appeared in 1734 at Amsterdam, without the author's name. This, however, was perfectly well known; indeed, Montesquieu formally presented a copy to the French Academy. But the author's reputation as a jester stuck to him, and the salons affected to consider the Lettres persanes and the new book respectively as the " grandeur " and the " d6cadence de " M. de Montesquieu; but more serious readers at once perceived its extraordinary merit, and it was eagerly read abroad. A copy of it exists or existed which had the singular misfortune to be annotated by Frederick the Great, and to be abstracted from

the Potsdam library by Napoleon. It is said, moreover, by competent authorities to have been the most enduringly popular and the most widely read of all its author's works in his own country, and it was certainly been the most frequently and carefully edited. Merely scholastic criticism may of course object to it, as to every other book of the time, the absence of the exactness of modern critical inquiry into the facts of history; but the virtue of Montesquieu's book is in its views, not in its facts. It is (putting Bossuet and Giovanni Vico aside) almost the first important essay in the philosophy of history. The point of view is entirely different from that of Bossuet, and it seems entirely improbable that Montesquieu knew anything of Vico. In the Grandeur et dicadence the characteristics of the Esprit des lois appear with the necessary subordination to a narrower subject.

Two things are especially noticeable in it: a peculiarity of style, and a peculiarity of thought. The style has a superficial defect. The page is broken up into short paragraphs of but a few lines each, which look very ugly, which irritate the reader by breaking the sense, and which prepare him to expect an undue and ostentatious sententiousness. On the other hand, the merits of the expression are very great. It is grave and destitute of ornament, but extraordinarily luminous and full of what would be called epigram, if the word epigram had not a certain connotation of flippancy about it. It is a very short book; for, printed in large type with tolerably abundant notes, it fills but two hundred pages in the standard edition of Montesquieu's works. But no work of the century, except Turgot's second Sorbonne Discourse, contains, in pro- portion to its size, more weighty and original thought on historical subjects, while Montesquieu has over Turgot the immense advantage of style.

Although, however, this ballon d'essai, in the style of his great work, may be said to have been successful, and though much of that work was, as we have seen, in all probability already composed, Montesquieu was in no hurry to publish it. He went on " cultivating the garden " diligently both as a student and as an improving landowner. He wrote the sketch of Lysimaque for Stanislaus Leczinski; he published new and final editions of the Temple de Gnide, of the Lettres persanes, of Sylla et Eucrate (which indeed had never been published, properly speaking). After allowing the Grandeur et dicadence to be reprinted without alterations some half-dozen times, he revised and corrected it. He also took great pains with the education of his son Charles and his daughter Denise, of whom he was extremely fond. He frequently visited Paris, where his favourite resorts were the salons of Mme de Tencin and Mme d'Aiguillon. Yet it seems that he did not begin the final task of composition till 1743. Two years of uninterrupted work at La Brede finished the greater part of it, and two more the rest. It was finally published at Geneva in the autumn of 1748,

in two volumes quarto. The publication was, however, preceded by one of those odd incidents which in literature illustrate Clive's well-known saying about courts-martial in war. Monte- squieu summoned a committee of friends, according to a very common practice, to hear and give an opinion on his work. It was an imposing and certainly not an unfriendly one, con- sisting of Charles Jean Francois Henault, Helvetius, the financier Etienne de Silhouette, the dramatist Joseph Saurin, Crebillon the younger, and, lastly, Fontenelle — in fact, all sorts and conditions of literary men. They unanimously advised the author not to publish a book which has been described as " one of the most important books ever written," and which may be almost certainly ranked as the greatest book of the French 1 8th century.

Montesquieu, of course, did not take his friends' advice. In such cases no man ever does, and in this case it was certainly fortunate. The Esprit des lois represents the reflections of a singularly clear, original, and comprehensive mind, corrected by forty years' study of men and books, arranged in accordance with a long deliberated plan, and couched in language of re- markable freshness and idiosyncrasy. In the original editions the full title runs L' Esprit des lois: ou du rapport que les lois

doivent avoir avec la constitution de chaque gouvernement, les mceurs, le climat, la religion, le commerce, &c. It consists of thirty-one books, which in some editions are grouped in six parts. Speaking summarily, the first part, containing eight books, deals with law in general and with forms of government; the second, containing five, with military arrangements, with taxation, &c; the third, containing six, with manners and customs, and their dependence on climatic conditions; the fourth, containing four, with economic matters; and the fifth, containing three, with religion. The last

five books, forming a kind of supplement, deal specially with Roman, French, and feudal law. The most noteworthy peculiarity of the book to a cursory reader lies in the section dealing with effects of climate, and this indeed was almost the only characteristic which the vulgar took in, probably because it was easily susceptible of parody and reductio ad absurdum. The singular spirit of moderation which distinguishes its views on politics and religion was indeed rather against it than in its favour in France, and Helvetius, who was as outspoken as he was good-natured, had definitely assigned this as the reason of his unfavourable judgment. On the other hand, if not destructive it was sufficiently critical, and it thus raised enemies on more than one side. It was long suspected, but is now positively known, that the book (not altogether with the goodwill of the pope) was put on the Index, and the Sorbonne projected, though it did not carry out, a regular censure. To all these objectors the author replied in a masterly difense; and there seems to be no foundation for the late and scandalous stories which represent him as having used Mme de Pompadour's influence to suppress criticism. The fact was that, after the first snarlings of envy and incompetence had died away, he had little occasion to complain. Even Voltaire, who was his decided enemy, was forced at length to speak in public, if not in private, com- plimentarily of the Esprit, and from all parts of Europe the news of success arrived.

Montesquieu enjoyed his triumph rather at La Brede than at Paris. He was becoming an old man, and, unlike Fontenelle, he does not seem to have preserved in old age the passion for society which had marked his youth. He certainly spent much of his later years in the country, though he sometimes visited Paris, and on one visit procured the release of his admirer Laurent Angliviel de La Beaumelle from an imprisonment which La Beaumelle had suffered at the instance of Voltaire. He is said also to have been instrumental in obtaining a pension for Alexis Piron. Nor did he by any means neglect literary

composition. The curious little romance of Arsace et Isminie, a short and unfinished treatise on Taste, many of his published Pensies, and much unpublished matter date from the period subsequent to the Esprit des lots. He did not, however, live many years after the appearance of his great work. At the end of 1754 he visited Paris, with the intention of getting rid of the lease of his house there and finally retiring to La Brede. He was shortly after taken ill with an attack of fever, which seems to have affected the lungs, and in less than .a fortnight he died, on the 10th of February 1755, aged sixty-six. He was buried in the church of St Sulpice with little pomp, and the Revolution obliterated all trace of his remains.

The literary and philosophical merits of Montesquieu and his position, actual and historical, in the literature of France and of Europe, are of unusual interest. At the beginning of the next century the vicomte de Bonald classed him with Racine and Bossuet, as the object of a ” religious veneration ” among Frenchmen. But Bonald was not quite a suitable spokesman for France, and it may be doubted whether the author of the Esprit des lois has ever really occupied any such position in his own country. For a generation after his death he remained indeed the idol and the great authority of the moderate reforming party in France. Montesquieu is not often quotable, or quoted, at the present day, and the exact criticism of our time challenges the accuracy of his facts. Although he was really the founder, or at least one of the founders, of the sciences of comparative politics and of the philosophy of history, his descendants and

followers in these sciences think they have outgrown him. In France his popularity has always been dubious and contested. It is a singular thing that for more than a century there was no properly edited edition of his works, and nothing even approaching a complete biography of him, the place of the latter being occupied by the meagre and rhetorical Eloges of the last century. According to his chief admirers, he is hardly read at all in France to-day, and they attempt to explain the fact by confessing

that Montesquieu, great as he is, is not altogether great according to French principles. It is not only that he is an Anglo-maniac, but that he is rather English than French in style and thought. He is almost entirely dispassionate in politics, but he lacks the unswerving deductive consistency which Frenchmen love in that science. His wit, it is said, is quaint and a little provincial, his style irregular and in no definite genre.

Some of these things may be allowed to exist and to be defects in Montesquieu, but they are balanced by merits which render them almost insignificant. It is on his three principal works that his fame does and must rest. Each one of these is a masterpiece in its kind. It is doubtful whether the Lettres persanes yield at their best either in wit or in giving lively pictures of the time to the best of Voltaire's similar work, though they are more unequal. There is, moreover, the great difference between Montesquieu and Voltaire that the former is a rational reformer, and not a mere persifleur or frondeur, to whom fault- finding is more convenient than acquiescence for showing off his wit. Of course this last description does not fully or always describe Voltaire, but it often does. It is seldom or never applicable to Montesquieu. Only one of Voltaire's own charges against the book and its author must be fully allowed. He is said to have replied to a friend who urged him to give up his habit of sneering at Montesquieu, " II est coupable de lese-po6sie," and this is true. Not only are Montesquieu's remarks on poetry childish (he himself occasionally wrote verses, and very bad ones), but he is never happy in purely literary appreciation. The Considerations are noteworthy, not only for the complete change of style (which from the light and mocking tone of the Lettres becomes grave, weighty and sustained, with abundance of striking expression), but for the profundity and originality of the views, and for the completeness with which the author carries out his plan. These words — except, perhaps the last clause — apply with increasing force to the Esprit des lois. The book

has been accused of desultoriness, but this arises, in part at least, from a misapprehension of the author's design. At the same time, it is impossible to deny that the equivocal meaning of the word " law," which has misled so many reasoners, has sometimes misled Montesquieu himself. For the most part, however, he keeps the promise of his sub-title (given above) with fidelity, and applies it with exhaustive care. It is only in the last few books, which have been said to be a kind of appendix, that something of irrelevancy suggests itself. The real importance of the Esprit des lois, however, is not that of a formal treatise on law, or even on polity. It is that of an assemblage of the most fertile, original and inspiriting views on legal and political subjects, put in language of singular suggestiveness and vigour, illustrated by examples which are always apt and luminous, permeated by the spirit of temperate and tolerant desire for human improvement and happiness, and almost unique in its entire freedom at once from doctrin- airism, from visionary enthusiasm, from egotism, and from an undue spirit of system. As for the style, no one who does not mistake the definition of that much used and much misused word can deny it to Montesquieu. He has in the Esprit little ornament, but his composition is wholly admirable. Yet another great peculiarity of this book, as well as of the Considera- tions, has to be noticed. The genius of the author for generali- zation is so great, his instinct in political science so sure, that even the falsity of his premises frequently fails to vitiate his conclusions. He has known wrong, but he has thought right.

The best edition of Montesquieu is that o£ Edouard Laboulaye (7 vols., Paris, 1875-1879), the best biography that of Louis Vian

(Paris, 2nd ed., 1879). The bibliography of Montesquieu was dealt with by L. Dangeau in 1874.

There is known to exist at La Brede a great mass of MS. materials for the Esprit des lots, additional . Lettres persanes, essays, and fragments of all kinds, diaries, letters, notebooks and so forth. The present possessors, however, who represent Montesquieu, long refused permission to examine these to all editors and critics, and they were chiefly known .by a paper contributed in 1834 to the Transactions of the Academy of Agen. At last in 1891 Baron Charles de Montesquieu published Deux opuscules of his ancestors, and in 1899 Baron Gaston de Montes- quieu added Pensees, &c. Nothing, however, of much interest has yet appeared. For a thorough student L'Esprit de Montesquieu by A. Charaux (1885) has value, for it is written, with some ability, from a point of view now very uncommon, that of a convinced Roman Catholic, anti-parliamentarian and anglophobe critic, who regards Montesquieu as an " evangelist of social atheism " and the like. The view is quite untenable but useful as a corrective. An article by Churton Collins on " Montesquieu in England " {Quarterly Review, No. 394, April 1903) may be also consulted.

(G. Sa.)

MONTESQUIOU-FEZENSAC, ANNE PIERRE, Marquis de (1739-1798), French general and writer, was born in Paris on the 17th of October 1739, of an ancient family of Armagnac. He was brought up with the children of the king of France, and showed some taste for letters. He entered the army in 1754, was successively colonel of the Grenadiers and the Royal- Vaissaux regiment, and in 1780 was made marechal-de-camp. Some pieces of verse and several comedies gained him admission to the French Academy in 1784. He was elected deputy to the states general of 1789 by the nobles of Paris, and, animated by Liberal ideas, he soon joined the Third Estate, and seconded Necker's financial schemes. He served on the committee charged with the issue of assignats, and was named president of the Constituent Assembly on the 14th of March 1791. In May 1791 he was promoted lieutenant-general, served under Lafayette, and in February 1792 was given the command of the

Army of the South. In September of the same year he completed the conquest of Savoy, but in November 1792 he was accused of royalist leanings, and had to take refuge in Switzerland. In 1795 his name was erased from the list of emigres and he returned to Paris, where he died on the 30th of December 1798.

See P. L. Roederer, £loge de Montesquiou, reprinted in Roederer's Works (1853-1859).

MONTESSON, CHARLOTTE JEANNE BERAUD DE LA HAYE DE RIOU, Marquise de (1737-1805), was born in Paris of an old Breton family. About 1754 she married Jean Baptiste, marquis de Montesson, who died in 1769. Her beauty and intelligence attracted the attention of Louis Philippe, duke of Orleans, whom she secretly married in 1773 with the authori- zation of the king. For har husband's amusement she set up a little theatre and wrote several plays, in the acting of which she herself took part. She was imprisoned for some time during the Terror, but was released after the fall of Robespierre, became the friend of the empress Josephine, and was a prominent figure at the beginning of the empire.

The best edition of her works appeared under the title of CEuvres anonymes in 1782-1785. See' Charles C0II6, Journal (1868); the Memoirs of St Simon, Madame de Genlis, the duchesse d'Abrantes and Mme de Levis; G. Strenger, " La Societe de la marquise de Montesson," in the Nouvelle revue (1902) ; J. Turquan, Madame de Montesson douairiere £ Orleans (Paris, 1904) ; and G. Capon and R. Ive-Plessis, Les Theatres clandestins du xviii" siecle (1904).

MONTEVERDE, CLAUDIO (1567-1643), Italian priest and musician, was born- at Cremona in May 1567; he was engaged at an early age as violist to the duke of Mantua, and studied composition under Ingegneri, the duke's maestro di capella. His bold experiments, while bringing upon him the attacks of Artusi and Banchieri (q.v.), led to discoveries which exercised a lasting influence upon the progress of musical art. He was the first to make deliberate use of unprepared dissonances, or what are now known as

fundamental discords. These dis- cords constituted a revolution against the laws of 16th century music. He employed them first in his madrigals, where they are a sign of decadence, but afterwards introduced them into music of another kind with such excellent effect that their

value was universally recognized. Before 1595 Monteverde was married to the singer Claudia Cattaneo, who died in 1607. In 1602 he succeeded Ingegneri as maestro di capella; and in 1607 he produced, for the marriage of Francesco Gonzaga, his first opera, Ariana, in which he employed the newly-discovered discords with irresistible effect. Though he did not invent the lyric drama — Peri's Euridice having been produced at Florence in 1600 — he raised it to a level which distanced all contemporary competition. His second opera, Orfeo, composed in 1608, was even more successful than Ariana. In 16 13 Monteverde was invited to Venice, as maestro di capella at St Mark's, with a stipend of 300 ducats, which in 1616 was raised to 400. Here he composed much sacred music, the greater part of which is lost. In 1630 he wrote another grand opera, Proserpina rapita. He did not become a priest until 1632. In 1639 he produced L'Adone, and in 1641 Le Nozze di Enea and II Ritorno d'Ulisse. He died in Venice on the 29th of November 1643. Monteverde's harmonic innovations and power of musical rhetoric seemed to put an end to the school of Palestrina, and led the way to modern music. (See Music.)

MONTEVIDEO, SAN FELIPE Y SANTIAGO DE, capital and chief port of Uruguay, and capital of the department of Monte- video, on the northern shore of the Rio de la Plata estuary, 120 m. E.S.E. of Buenos Ayres, in lat. 34 54′ 33″ S., long. 56° 12′ 18″ W. Pop. (1908, estimate), 312,946. The old city (ciudad vieja) occupies a low rocky headland that projects westward between the estuary and an almost circular bay which forms the harbour; it was once enclosed with walls and defended by small forts, all of which have been removed. The new city {ciudad nueva and ciudad novisima) extends eastward over a beautiful tract of rolling country and is extending north- ward around

the eastern shore of the bay. The site of the old city resembles a whale's back in shape; it slopes gently to its western extremity at Punta Sarandi and to the water's edge on either side. The general plan is that of rectangular squares, except at the western extremity of the old city and its union with the newer or extra-mural city, on the line of the old ram- parts, known as Calle de la Ciudadela. The streets are well paved and have sufficient slope at all points to give easy surface drainage; Montevideo has the reputation of being one of the cleanest cities of the world. The rainfall is ample (about 44 in. a year), and the prevailing winds help to clean the streets. The westerly winds, however, sometimes bring across the bay the offensive smells of the great abattoirs and meat-curing establish- ments (saladeros) at the foot of the Cerro. The mean annual temperature is about 62° F. An abundant water supply is brought from the Santa Lucia River, 32 m. distant, with a receiv- ing reservoir at Piedras, 100 ft. above the level of the Plaza de la Independencia. The ciudad vieja is largely devoted to com- mercial, shipping and financial interests. The government edifices, large retail shops and most of the fine urban residences are in the ciudad nueva, while most of the urban industries, the railway stations and the dwellings of the poorer classes are in the ciudad novisima. Beyond these is a fringe of suburbs (La Union and Paso Molino), and on the western side of the bay is the straggling suburb of Cerro, largely industrial in character. In 1908 eight tramway lines (all electric but one) extended out to these suburbs, some of the lines extending to the bathing resorts of Ramirez and Pocitos and the Buceo cemeteries on the eastern coast.

The principal street, which is considered one of the finest boulevards in South America, is the Calle 18 de Julio, extending eastward from the Plaza de la Independencia to the suburb of Cordon; one of its features is its Sunday morning market, occupying the whole street from the Plaza de la Independencia to the Plaza Libertad, a distance of half a mile — a

survival of the old market that existed here at the fortified entrance to the walled town in the earlier years of its history. There are seven plazas, or squares, within the urban limits: Zabala or Rincon, Constitution or Matriz, Independencia, Libertad or Cagancha, Treinte y Tres, Flores and Frutos; and two suburban parks or public gardens: the Paseo del Prado and Parque

Urba.no. The Plaza de la Independencia stands at the junction of the old and new towns and is the centre of the city's political and social life. This square is distinguished for a uniform and nearly completed line of colonnades in front of the buildings surrounding it. The Paseo del Prado, which ranks high among the public gardens of South America, is beautifully situated beyond the suburb of Paso Molino, 3 m. from the city. The Paseo was originally the quinta of a German of cultivated tastes named Joseph Buschenthal, who spent a fortune in its adorn ment. The Parque Urbano, at the Playa Ramirez bathing resort, is a modern creation. The buildings of Montevideo are chiefly of brick and broken stone, covered outside with plaster and stucco, of one to three storeys, with flat roofs, usually surmounted by a square tower, or mirador. The roofs, or azoteas, are largely used for domestic purposes, or roof gardens. The city contains a large number of handsome edifices, both public and private, among which are the Bolsa, Government House, municipal hall, cathedral, Cabildo, Hospital de Caridad, insane asylum, Italian hospital, Teatro Solis, Athenaeum, and the Club Uruguayo. ■ The Bolsa (exchange), custom-house, cathedral, and Cabildo are in the old town; the Bolsa is a copy of the Bordeaux exchange. The cathedral faces on the Plaza de la Constitution. Its two square towers rise 133 ft. above the pavement, and these, with the large dome behind, rise far above the surrounding buildings and make a very conspicuous landmark. The church was consecrated in 1804, and in 1869 was raised to the

dignity of a cathedral. Montevideo is now the seat of a small archiepiscopal see with only two suffragan dioceses. Directly across the plaza is the old Cabildo, a plain, heavy-looking two-storeyed edifice of the colonial period, the seat of municipal administration during Spanish rule, but now occupied by the two chambers of the Uruguayan Congress and by the higher police authorities of the city.

The people of Montevideo maintain more than forty charitable associations, including the Caridad (charity) hospital on Calle 25 de Mayo, and the insane asylum in the suburb of La Union, both built and largely supported from the proceeds of frequent lottery drawings. They also maintain a beggars' asylum and a foundlings' asylum. The national museum (founded in 1830) and public library (founded 1833) are in one wing of the Solis theatre. There are a British hospital (founded 1857, the present edifice dating from 1867) chiefly for the use of sailors, an Anglican church in Calle Santa Teresa dating from 1847, and a handsome Italian hospital of modern construction. The university, in Calle Uruguay, has faculties of law, medicine, letters, mathe- matics, engineering, and some minor groups of studies, including agriculture and veterinary science. The government maintains two normal schools, a school of arts and trades (artes y oficios), and a military school.

The harbour of Montevideo consists of a shallow bay, circular in shape and about 25 m. from shore to shore, and an outer roadstead exposed to the violent winds of this latitude, where the larger ocean-going steamers were compelled to anchor before the construction of the new port works. In 1899 the Uruguayan government entered into a contract for the dredging of the bay, the construction of two long breakwaters, the dredging of a channel to deep water, and the construction of a great basin and docks in front of the city. Surtaxes were imposed on imports and exports to meet the expenditure, and work was begun in 1901. In 1908 the breakwaters and the greater part of the dredging had been completed,

and the en- trance channel, with a minimum depth of 24J ft., permitted the admission of large steamers. Another important improvement, for which a concession was given to an English syndicate and work was begun in 1909, is the construction of an embankment and new shore line on the south side of the city, to be finished in five years at a cost of $7,211,116. There are three large dry docks connected with the port, known as the Maua (275 ft. long, inside) and the Gounouilhou (300 ft.) on the east side of the bay, and Jackson & Cibils (450 ft.) on the west side at the foot of the Cerro. Four railways terminate at Montevideo, one of them (the Central Uruguay) extending to the Brazilian

frontier. In 1908 20 lines of ocean-going steamers made regular calls at the port and several lines of river steamers ran to Buenos Aires and the ports of the Parana, Paraguay and Uruguay rivers. The exports consist 'chiefly of livestock, jerked beef, hides, wool, and other animal products, wheat, flour, corn, linseed, barley, hay, tobacco, sealskins, fruit, vegetables, and some minor products. Manufactures exist only to a limited extent and chiefly for domestic consumption.

The suburbs of Montevideo include the fashionable bathing resorts of Playa Ramirez and Pocitos on the coast east of the city, the inland suburbs of Paso Molino and La Union, and the industrial town of Cerro, across the bay. The Flores Island quarantine station is 12 m. east of the city. The station was formerly on Rat Island (within the bay), which is now used as a public deposit for inflammables. The chief point of interest in this suburb is the conical hill known as the Cerro, or " mount," from which the city takes its name, on which stands an old Spanish fort, sometimes garrisoned and sometimes used for the incarceration of political prisoners. Its elevation is 486 ft. (Reclus), and a lighthouse rises from within the fort carrying a revolving light that can be seen 25 m. at sea.

Montevideo was founded in 1726 through the efforts of Don Mauricio Zabala, governor of Buenos Aires,

who wished to check the advance of the Portuguese on this side of the La Plata. A small military post had existed there since 1717, but efforts to create a town had been fruitless until Zabala offered to make hidalgos of the first settlers and to give them cattle and sheep. The first families to accept this offer came from the Canary Islands in 1726 under the direction of Don Francisco Alzeibar; they were followed by others from Andalusia and some of the Spanish-American settlements. Its growth at first was slow, but on the abolition of the Cadiz monopoly in 1778 it became a free port and its trade increased so rapidly that it soon became one of the chief commercial centres of South America. The city was captured in 1807 by a British expedition under Sir Samuel Auchmuty, but was abandoned when the expedition against Buenos Aires under General Whitelocke was defeated. In 1808 the governor of Montevideo established an independent junta, but after the Buenos Aires declaration of independence in 1810 the Spanish forces were concentrated in Montevideo and held it until expelled in 1814 by the Argentine land and sea forces under General Alvear and Admiral Brown. The dissensions following the expulsion of the Spanish and the rivalries of Argentina and Brazil over the possession of Uruguay, then commonly termed the "Banda Oriental," greatly reduced the population of the city and partially destroyed its trade. It was made the capital of the republic in 1828 and had partially recovered its population and trade when the disas- trous struggle with Rosas, dictator of Buenos Aires, broke out and the city was subjected to a nine years' siege (1843-52), the investment being conducted by General Oribe, and the defence by General Paz. In 1864-1865 Brazil intervened in the affairs of the republic, blockaded the port, and reinstated ex-president Flores. The war with Paraguay that followed, which lasted until 1870, made Montevideo the base of supplies for the Brazilian army and navy and added largely to its trade and wealth. The valuation of the city and suburbs, which was $14,156,000 in i860, was $74,000,000 in 1872. In addition to the reckless speculation of this period, there were continued

political dissensions, repeated dictatorships and financial mis- management on the part of the government. Not the least of these burdens were the personal and irregular drafts of some of the executives upon the treasury and revenue officers, particu- larly the custom-house of this port, upon which the republic depended for the major part of its revenue. The commercial and financial collapse that followed lasted through the greater part of the last three decades of the century; but settled govern- ment and improved finances subsequently contributed to a slow but steady recovery in the trade and industrial activities of the city.

MONTE VULTURE (anc. Vultur), a mountain of Basilicata, Italy, in the province of Potenza, the summit of which is about

5 m. S. of Melfi. It is an extinct volcano rising to 4365 ft. above sea-level, belonging in Roman times to Apulia, and lying on the boundary between it and Lucania. The crater is densely overgrown with oaks and beeches which harbour wild boars and wolves. There are two small lakes. On the banks of the upper lake stand the Capuchin monastery of San Michele and the picturesque ruined church of Sant' Ippolito. The city of Rionero in Volture is pleasantly situated 27 m. by rail N. of Potenza, at the foot of Monte Vulture. Pop. (1001), 11,834. It does not seem to be older than the first half of the 17th century. In 1851 it suffered severely from an earthquake.

See G. de Lorenzo, Venosa e la regione del Vulture (Bergamo,

1906).

MONTFAUCON, BERNARD DE (1655-1741), French scholar and critic, was born at the chateau of Soulage (now Soulatge, in the department of Aube, France), on the 13th of January 1655. Belonging to a noble and

ancient line, and destined for the army, he passed most of his time in the library of the family castle of Roquetaillade, devouring books in different languages and on almost every variety of subject. In 1672 he entered the army, and in the two following years served in Germany under Turenne. But ill-health and the death of his parents brought him back to his studious life, and in 1675 he entered the cloister of the Congregation of St Maur at La Daurade, Toulouse, taking the vows there on the 13th of May 1676. He lived successively at various abbeys — at Soreze, where he specially studied Greek and examined the numerous MSS. of the convent library, at La Grasse, and at Bordeaux; and in 1687 he was called to Paris, to collaborate in an edition of Athanasius and Chrysostom, contemplated by the Congregation. From 1698 to 1701 he lived in Italy, chiefly in Rome in order to consult certain manuscripts, those available in Paris being insufficient for the edition of Chrysostom. After a stay of three years he returned to Paris, and retired to the abbey of St-Ger- main-des-Pr6s, devoting himself to the study of Greek and Latin MSS. and to the great works by which he established his reputation. He died suddenly on. the 21st of December 1741. His first publication, in which he was assisted by Jacques Loppin and Antoine Pouget, was the first volume of a never- completed series of previously unpublished Analecta graeca (1688). In 1690 appeared La VSrile de I'histoire de Judith. Athanasii opera omnia, still the best edition of that Father, was issued with a biography and critical notes in 1698. In connexion with this may be mentioned Colleclio nova palrum et scriptorum graecorum (1706), containing some newly dis- covered works of Athanasius, Eusebius of Caesarea, and the Topographia Christiana of Cosmas Indicopleustes. His copious Diarium italicum (1702) gives an account of the principal libraries of Italy and their contents; this work has been translated into English by J. Henley (1725). The Palaeographia graeca (1708), illustrating the whole history of Greek writing and the variations of the characters, has not yet been superseded; in its own field it is as original as

the De re diplomalica of Mabillon. In 1 7 13 Montfaucon edited Hexaplorum origenis quae supersunt, not superseded till the work of Field (1875); and between 1718 and 1738 he completed his edition of Joannis Chrysostomi opera omnia. His L'Antiquiti expliquee et reprisenUe en figures (1719) laid the foundation of archaeological knowledge. It was continued by him in Les Monumens de la monarchie francoise, 1720-1733. Both these works have been translated into English. Montfaucon 's Bibliotheca bibliothecarum manuscriptarum (1739) is a list of the works in MS. in the libraries with which he was acquainted.

A list of his works will be found in Bibliotheque des ecrivains de la congregation de Saint-Maur, by C. de Lame (1882), and in the article in the Nouvelle biographie generate, which gives an account of their scope and character; see also Emmanuel de Broglie, La Societe de Vabboye de St-Germain-des-Pris au 18° sibcle: Bernard de Montfaucon el les bernardins (2 vols., Paris, 1891).

MONTFERRAT, COUNT OF, a title derived from a territory south of the Po and east of Turin, and held by a family who were in the 12th century one of the most considerable in Lombardy.

In 1 147 a count of Montferrat took part in the Second Crusade; but the connexion with the Holy Land begins to be intimate in 1 176. In that year William Longsword, eldest of the five sons of Count William III., came to the kingdom of Jerusalem, on the invitation of Baldwin IV. and the baronage, and married the heiress of the kingdom, Sibylla. He died within a few months; but his wife bore a posthumous son, who became Baldwin V. Count William III. himself (uncle to Philip of France and brother-in-law to Conrad III.) afterwards came to the Holy Land to watch over the interests of his grandson; and he was among the prisoners taken by Saladin at Hittin in 1 187. Shortly after the battle of Hittin there appeared in Palestine the ablest and most famous of the family, Count William's second son, Conrad. Conrad, following the family tradition, and invited

by the emperor Isaac Angelus, had gone to serve at the court of Constantinople. He soon became a considerable person; married Isaac's sister, and defeated and killed a usurper; but he was repaid by ingratitude and suspicion, and fled from Constantinople to Palestine in 1187. Putting into Tyre he was able to save the city from the deluge of Mahom- medan conquest which followed Saladin's victory at Hittin. He established himself firmly in Tyre (refusing admission to Guy, the king of Jerusalem); and from it he both sent appeals for aid to Europe — which largely contributed to cause the Third Crusade — and despatched reinforcements to the crusaders, who, from 1188 onwards, were engaged in the siege of Acre. His elder brother had been the husband of the heiress Sibylla; and on the death of Sibylla, who had carried the crown to Guy de Lusignan by her second marriage, Conrad married her younger sister, Isabella, now the heiress of the kingdom, and claimed the crown (1190). The struggle between Conrad and Guy paralysed the energies of the Christians in 1191. While Richard I. of England espoused the cause of Guy, who came from his own county of Poitou, Philip Augustus espoused that of Conrad. After the departure of Philip, Conrad fomented the opposition of the French to Richard, and even intrigued with Saladin against him. But he was the one man of ability who could hope to rule the debris of the kingdom of Jerusalem with success; he was the master of an Italian statecraft which gave him the advantage over his ingenuous rival; and Richard was finally forced to recognize him as king (April 1192). In the very hour of success, however, Conrad was struck down by the emissaries of the Old Man of the Mountain (the chief of the Assassins).

Still another son or Count William III. achieved distinction. This was Boniface of Montferrat, the younger brother of Conrad, who was chosen leader of the Fourth Crusade in 1201, on the death of Theobald of Champagne. In the winter of 1 201-1 202 he went to Germany to visit Philip of Swabia; and there it has been suggested, he arranged the diversion of the Fourth Crusade to Constantinople (see Crusades). Yet

in the course of the crusade he showed himself not unsubmissive to Innocent III., who was entirely opposed to such a diversion. After the capture of Zara, however, he joined the crusaders, and played a great part in all the events which followed till the capture of Constanti- nople by the Latins in 1204. But Baldwin of Flanders was elected emperor over his head; and his irritation was not wholly allayed by the grant of Macedonia, the north of Thessaly, and Crete (which he afterwards sold to Venice). In 1207 he died, killed in battle with the Bulgarians. He left a son Demetrius, who assumed the title of king of Thessalonica, which the father had never borne (cf. Luchaire, Innocent III:: La question d'Orient, p. 190). In 1222 Demetrius lost his kingdom to Theodore Angelus, and the house of Montferrat its connexion with the East.

See Savio, Studi storici sul marchese Guglielmo III. di Monferrato (Turin, 1885); Ilgen, Markgraf Konrad von Montferrat (1880); and also the works of Cerrato (Turin, 1884) and Desimoni (Genoa, 1886).

MONTFLEURY (d. 1667), French actor, whose real name was Zacharie Jacob, was born in Anjou during the last years of the 16th century. He was enrolled as one of the pages to the due de Guise, but he ran away to join some strolling players,

assuming the name of Montfleury. About 1635 he was a valued member of the company at the H6tel de Bourgogne, and he was in the original cast of the Cid (1636) and of Horace (1640). Richelieu thought highly of him, and when in 1638 Montfleury married the actress Jeanne de la Chalpe (d. 1683), the cardinal desired the ceremony to take place at his own country house at Rueil. Montfleury died in Paris from the rupture of a blood- vessel, while playing the part of Orestes in Andromaque, in December 1667. He was the author of a tragedy, La Mort d'Asdrobal, performed in 1647.

MONTFORT, the name of a famous French family long seated at Montfort l'Amauri, near Paris, descended from a certain William, a descendant of the counts of Flanders, who flourished during the latter part of the 10th century, and who built a castle at Montfort l'Amauri. Until 1209, when Simon IV. took the title of count, William and his successors were known as barons de Montfort. This Simon IV. de Montfort (c. 1160- 1218), a son of Simon III. (d. 1181), is chiefly known for the very active part which he took in the crusade against the Albi-genses. Twice he went to Palestine as a crusader, and in 1209, answering the call of Pope Innocent III., he joined the host which marched against the enemies of the Church in Languedoc. He became vicomte of Beziers and of Carcassonne, and was soon the leader of the crusaders. He took place after place, defeated Raymond VI., count of Toulouse, at Castelnaudary, and about a year later (September 12 13) gained a victory over Raymond's ally, Peter II., king of Aragon, under the walls of Muret. Simon then turned his attention to administering and organizing Languedoc. After a lively discussion in the Lateran Council of 1 215, the pope, somewhat reluctantly, confirmed him in the possession of the greater part of the lands of the count of Toulouse, and after two more years of warfare he was killed whilst besieging the city of Toulouse on the 25th of June 12 18. The count's eldest son, Amauri de Montfort (1102-1241), was unable to hold his own, although Philip Augustus sent some troops to his assistance in 1222. He abandoned his interests in the south of France in favour of the new king Louis VIII., and in 1239 he went on crusade to the Holy Land, dying soon afterwards at Otranto. In 1230 Amauri was made constable of France. Simon IV. had a brother, Guy de Montfort (d. 1228), who shared his military exploits both in Asia and in Europe, and who was afterwards employed by Louis VIII. to negotiate with the pope at Rome. He was killed before Vareilles on the 31st of January 1228. In 1294 Yolande (d. 1322), the heiress of the Montforts, married Arthur II., duke of Brittany, and the county of Montfort became part of this duchy. Their son, John, count of Montfort,

claimed Brittany in opposition to Charles, count of Blois, and at length secured the duchy. Except for one interval his descendants held it until it was united with the French crown at the end of the 1 5th century.

See A. Molinier, Catalogue des actes de Simon et d'Amaury de Montfort (1873); and C. Douais, La Soumission de la vicomte de Carcassonne par Simon de Montfort et la croisade contre Raimond VI.

(1884).

MONTFORT, SIMON DE, earl of Leicester (d. 1265), English statesman and soldier, was born in France about the year 1200. He was the fourth and youngest son of Simon IV. de Montfort (see above), the leader of the Albigensian crusade, by Alicia de Montmorenci. Simon IV., whose mother was an heiress of the Beaumont family, claimed in her right, and received from King John, the earldom of Leicester (1207), only to lose it again through espousing the French side in the wars between that sovereign and Philip Augustus. The young Simon, of whose youth and education nothing is recorded, came to England in 1230 and attached himself to Henry III., obtaining with the consent of his sole surviving brother Amauri a re-grant of the family earldom. Simon was for a time unpopu- lar with the English and closely attached to the royal party. He gave, however, an early proof of religious fervour, and of an unbending harshness, by the expulsion of all the Jews who had settled in his borough of Leicester to practise usury. In 1238 he obtained the hand of the king's sister Eleanor, the widow

of the younger William Marshal. The king approved of the match, but it was resented by his brother Richard of Cornwall and the baronage, and objections were raised on the ground that Eleanor had previously taken vows of chastity. With some difficulty Earl Richard was pacified; and Montfort obtained the pope's confirmation of the marriage by a personal visit to Rome. In 1239, however, the influence of detractors and a quarrel over some

obscure financial trans- actions in which he appears to have used Henry's name without a formal warrant led to a breach between himself and the king. The earl and his wife went for a time to France; and, though a nominal reconciliation with the king was soon effected, both departed on crusade with Richard of Cornwall in 1240. Eleanor was left behind in Apulia while her husband proceeded to the Holy Land. He acquitted himself with distinction, and there was some thought among the Frankish barons of appointing him to act as regent of the Latin kingdom of Jerusalem. But he returned in 1241, took part in Henry's disastrous French expedition of 1242, and was readmitted to full favour. Between 1243 and 1248 he received many gifts from the king; he stood forward in parliament as a mediator between the court party and the opposition; it is only from the correspondence of his friends Grosseteste and Adam de Marsh that we learn of his dissatisfaction with the condition of church and state. He was keenly interested in Grosseteste's proposals for ecclesiastical reformation, and was considered the mainstay of the reforming party. In 1 248 he again took the cross, with the idea of following Louis IX. to Egypt. But, at the repeated requests of the king and council, he gave up this project in order to act as governor in the unsettled and disaffected duchy of Gascony. Bitter complaints were excited by the rigour with which the earl suppressed the excesses of the seigneurs and of contending factions in the great communes. Henry yielded to the outcry and instituted a formal inquiry into the earl's administration. Montfort was formally acquitted on the charges of oppression, but his accounts were disputed by the king, and he retired in disgust to France (1252). The nobles of France offered him the regency of the kingdom, vacant by the death of the Queen-mother Blanche of Castile, but he preferred to make his peace with Henry (1253), in obedience to the exhortations of the dying Grosseteste. He helped the king in dealing with the disaffection of Gascony; but their reconciliation was a hollow one, and in the parliament of 1254 the earl led the opposition in resisting a demand for a subsidy. In

1256 and 1257, when the discontent of all classes was coming to a head, Montfort nominally adhered to the royal cause. He undertook, with Peter of Savoy, the queen's uncle, the difficult task of extricating the king from the pledges which he had given to the pope with reference to the crown of Sicily; and Henry's writs of this date mention the earl in friendly terms. But at the " Mad Parlia- ment " of Oxford (1258) Montfort appeared side by side with the earl of Gloucester at the head of the opposition. It is said that Montfort was reluctant to approve the oligarchical constitu- tion created by the Provisions of Oxford, but his name appears in the list of the Fifteen who were to constitute the supreme board of control over the administration. There is better ground for believing that he disliked the narrow class-spirit in which the victorious barons used their victory; and that he would gladly have made a compromise with the moderate royalists whose policy was guided by the Lord Edward, Henry's eldest son. But the king's success in dividing the barons and in fostering a reaction rendered such projects hopeless. In 1261 Henry revoked his assent to the Provisions, and Montfort left the country in despair.

He returned in 1263, at the invitation of the barons, who were now convinced of the king's hostility to all reform; and raised a rebellion with the avowed object of restoring the form of government which the Provisions had ordained. For a few weeks it seemed as though the royalists were at his mercy; but he made the mistake of accepting Henry's offer to abide by the arbitration of Louis IX. of France. At Amiens, in January 1264, the French king decided that the Provisions were unlawful and

invalid. Montfort, who had remained in England to prepare for the worst, at once resumed the war, and thus exposed himself to accusations of perjury, from

which "he can only be defended on the hypothesis that he had been led to hope, for a genuine compromise. Though merely supported by the towns and a few of the younger barons, he triumphed by superior generalship at Lewes (May 14, 1264), where the king, the Lord Edward, and Richard of Cornwall fell into his hands. Montfort used his victory to set up the government by which his reputation as a statesman stands or falls. The weak point in his scheme was the establishment ot a triumvirate (consisting of himself, the young earl of Gloucester, and the bishop of Chichester) in which his colleagues were obviously figureheads. This flaw, however, is mitigated by a scheme, which he simultaneously promulgated; for establishing a thorough parliamentary control over the executive, not excepting the triumvirs. The parliament which he summoned in 1265 was, it is true, a packed assembly; but it can hardly be supposed that the representation which he granted to the towns (see Parliament and Representation) was intended to be a temporary expedient. The reaction against his government was baronial rather than popular; and the Welsh Marchers particularly resented Montfort's alliance with Llewellyn of North Wales. Little consideration for English interests is shown in the treaty of Pipton which sealed that allia-nce (June 22, 1265). It was by the forces of the Marchers and the strategy of Edward that Montfort was defeated at Evesham (Aug. 4) . Divided from the main body of his supporters, whose strength lay in the east and south, the earl was out- numbered and surrounded before reinforcements could reach him. For years after his death he was revered by the commons as a martyr, and the government had no little difficulty in reducing the remnants of his baronial supporters. His character has suffered in the past from indiscriminate eulogy as much as from detractors. He was undoubtedly harsh, masterful, impatient and ambitious. But no mere adventurer could have won the friendship of such men as Marsh and Grosseteste; their verdict of approval may be the more unhesitatingly admitted since it is not untempered with criticism.

The original authorities are those for the reign of Henry III. The best biographies are those by R. Pauli (trans. C. M. Goodwin, London, 1876); G. W. Prothero (London, 1877); C. Bemont (Paris, 1884). See also the letters of Adam de Marsh in J. S. Brewer's Monumenta franciscana, vol. i (Rolls series, 1858); H. R. Luard, Epistolae Roberti Grosseteste (Rolls, series, 1861); F. S. Stevenson, Robert Grosseteste (London, 1899)- W. H. Blaauw, The Barons' War (Cambridge, 1871). (H. W. C. D.)

MONTGAILLARD, JEAN GABRIEL MAURICE ROQUES,

Comte de (1761-1841), French political agent, was born at Montgaillard, near Villefranche (Haute Garonne), on the 16th of November 1761. His parents belonged to the minor nobility, and he was educated at the military school of Soreze, where he attracted the notice of the comte de Provence (afterwards Louis XVIII.) . After serving for some years in the West Indies Maurice de Roques returned to France. In 1789 he was estab- lished in Paris as a secret diplomatic agent, and though he emigrated to England after the 10th of August 1792, he returned six weeks later to Paris, where his security was most probably purchased by services to the revolutionary government. He was again serving the Bourbon princes when he met Francis II. of Austria at Ypres in 1794 and saw Pitt in London, where he published his Etat de la France au mots de mai 1794, predicting the fall of Robespierre. He was employed by Louis XVIII. to secure Austrian intervention on behalf of Mme Royale (afterwards duchess of Angouleme), still a prisoner in the Temple, and he drew up the proposition made by the prince to Charles Pichegru, the details of which appear in his " Memoire sur la trahison de Pichegru " {Moniteur, April 18, 1804). In June 1796 he made a journey to Italy in the hope of opening direct relations with Bonaparte. On his return to the princes at Blankenburg he was regarded with suspicion, and he departed for Paris to await events. He is thought to have indicated the possession by the comte d'Antraigues, agent of the princes, <»f documents compromising Pichegru. In April 1798 he

surrendered to Claude Roberjot, the Hamburg minister of the Directory, further papers relating to the matter. He followed Roberjot to Holland, and there wrote a memorandum to prove that the only hope for France lay in the immediate return of Bonaparte from Egypt, followed by assumption of the supreme power. This note reached Alexandria by way of Berlin and Constantinople. When he ventured to return to Paris in the hope of recognition from the First Consul he was imprisoned, and on his release he was kept under police supervision. Napoleon, who appreciated his real insight into European politics and his extraordinary knowledge of European courts, attached him to his secret cabinet in spite of his intriguing and mendacious character. He received a salary of 14,000 francs, reduced later to 6000, for reports on political questions for Napoleon's use, and for pamphlets written to help the imperial policy. He tried to dissuade Napoleon from the Austrian marriage and the Russian campaign, and counselled the limitation of the empire within the Rhine, the Alps and the Pyrenees. The Bourbon restoration made no change in his position; he was maintained as confidential adviser on foreign and home politics, and gave shrewd advice to the new government. His career ended with the old monarchy, and he died in obscurity at Chaillot on the 8th of February 1 841.

His Souvenirs, which must be read with the utmost caution, were edited by Clement de Lacroix (3rd ed., 1895); his Memoires diplomatiques (1805-18 19) were published by the same editor in 1896. His Etat de la France was translated into English by Edmund Burke. His other writings include Ma conduite pendant le cours de la revolution francaise (London, 1795); Histoire secrete de Coblentz dans la revolution des francais (London, 1795); De La France et de V Europe sous le gouvernement de Bonaparte (Lyons, 1904) ; Situation de T Angleterre en 181 1 (Paris, 181 1) ; De la restauration de la monarchie des Bourbons et du retour d, I'ordre (Paris, 1814); and Histoire de France depuis 182$ jusqu'd, 1830 (Paris, 1839).

MONTGELAS, MAXIMILIAN JOSEF GARNERIN, Count von (1759-1838), Bavarian statesman, came of a noble

family in Savoy. His father John Sigmund Garnerin, Baron Mont- gelas, entered the military service of Maximilian Joseph III., elector of Bavaria, and married the countess Ursula von Trauner. Maximilian Josef, their eldest son, was born on the 10th of September 1759. He was educated successively at Nancy, Strassburg and Ingolstadt. Being a Savoyard on his father's side, he naturally felt the French influence, which was then strong in Germany, with peculiar force. To the end of his life he spoke and wrote French more correctly and with more ease than German. In 1779 he entered the public service in the depart- ment of the censorship of books. The elector Charles Theodore, who had at first favoured him, became offended on discovering that he was associated with the Illuminati, the supports of the anti-clerical movement called the Aufklarung. Montgelas therefore went to Zweibriicken, where he was helped by his brother Illuminati to find employment at the court of the duke, the head of a blanch of the Wittelsbach famil) . From this refuge also he was driven by orthodox enemies of the Illuminati. The brother of the duke of Zweibrucken— Maximilian Joseph — took him into his service as private secretary. When his employer succeeded to the duchy Montgelas was named minister, and in that capacity he attended the conference of Rastadt in 1798, where the reconstruction of Germany, which was the consequence of the French .Revolution, was in full swing. In 1799 the duke of Zweibrucken succeeded to the electorate of Bavaria, and he kept Montgelas as his most trusted adviser. Montgelas was the inspirer and director of the policy by which the electorate of Bavaria was turned into a kingdom, and was very much increased in size by the annexation of church lands, free towns and small lordships. As this end was achieved by undeviating servility to Napoleon, and the most cynical disregard of the rights of Bavaria's German neighbours, Mont- gelas became the type of an unpatriotic politician in the eyes of all Germans who revolted against the supremacy of France. From his own conduct and his written defence of his policy it is clear that such sentiments as theirs appeared to be merely childish

to Montgelas. He was a thorough politician of the

18th-century type, who saw and attempted to see nothing except that Bavaria had always been threatened by the house of Habsburg, had been supported by Prussia for purely selfish reasons, and could look for useful support against these two only from France, who had selfish reasons of her own for wishing to counterbalance the power both of Austria and Prussia in Germany. As late as 1-813, when Napoleon's power was visibly breaking down, and Montgelas knew the internal weakness of his empire well from visits to Paris, he still continued to maintain that France was necessary to Bavaria. The decision of the king to turn against Napoleon in 1814 was taken under the influence of his son and of Marshal Wrede rather than of Montgelas, though the minister would not have been influenced by any feeling of sentimentality to adhere to an ally who had ceased to be useful. In internal affairs Montgelas carried out a policy of secularization and of administrative centralization often by brutal means, which showed that he had never wholly renounced his opinions of the time of the Enlightenment move- ment. His enemies persuaded the king to dismiss him in 181 7, and he spent the remainder of his life in retirement till his death in 1838. He had married the countess von Arco in 1803, and had eight children; in 1809 he was made a count.

See Denkwiirdigkeiten des bayr. Staatsministers Maximilian Graf von Montgelas, a German version of the French original, ed. by Ludwig Graf v. Montgelas (Stuttgart, 1887); Brief e des Stadts- ministers Grafen Montgelas, ed. by Julie von Zerzog (Regensburg, 1853); Dumoulin Eckart, Bayern unter dem Mmisterium Montgelas (Munich, 1894).

MONT GENEVRE, a very easy and remarkable pass (6083 ft.) between France and Italy, which is now

considered by high authorities to have been crossed by Hannibal, as it certainly was by Julius Caesar, Charles VIII., and in the war of 1859. An excellent carriage-road mounts in 7 m. from Briancon, at the very head of the Durance valley, to the pass. On the French side of the divide is the village of Bourg Mont Genevre, and on the Italian side that of Clavieres, both inhabited all the year round, as the pass runs east and west, and is thus sheltered from the north wind. A descent of 5 m. leads down to Cesanne in the Doria Riparia valley, which is followed for 5 m. more to Oulx (17 m. from Briancon), on the Mont Cenis

railway.

MONTGOMERIE, ALEXANDER (c. i55°-c. 1610), Scottish poet, was the second son of Hugh Montgomerie of Hessilhead, Ayrshire, and was born about the middle of the 16th century. 1 He spent some part of his youth in Argyleshire and afterwards lived for a time at Compston Castle, in Galloway. He was in the service of the regent Morton; thereafter, on the regent's demission of office in 1578, in that of thf king, James VI. In 1583 the grant by the Crown of a pension of 500 marks was confirmed; and three years later he set out on a tour through France, Flanders and other countries. He appears to have got into trouble, to have been imprisoned abroad, and to have lost favour at the Scottish court, and (for a time) his pension. We have no record of his closing years.

Montgomerie's chief poem is the Cherry and the Slae, first printed in 1597 (two impressions). It was frequently reprinted in the 17th and 18th centuries, and appeared twice in Latin guise in 1631, in Dempster's Cerasum et sylvestre prunum, opus poematicum. It is included in the collected edition of Montgomerie's Poems, by David Irving (1821), and by James Cranstoun, for the Scottish Text Society (1887). The text in the latter is a composite of 930 lines from the second impression of 1597 {u.s.) and 666 lines from the version in Allan Ramsay's (q.v.) Ever Green (1724); but a better text, from a MS. in the Laing collection in the university of Edinburgh,

has been prepared (1907) for the Scottish Text Society by Mr George Stevenson.- The poem, written in the complicated alliterative fourteen-lined stanza, is a confused allegory— the confusion

1 Alexander’s brother, Robert Montgomerie (d. 1609), was made bishop or archbishop, of Glasgow, in 1581, an appointment which was strongly objected to by the General Assembly. The long struggle which ensued was only terminated by Montgomerie s resignation of the see in 1587.

being due to the fact that sections of the poem were written at different times— on Youth’s choice between a richly laden cherry-tree on a high crag and a sloe ” bush ” at his feet. His other poems are: The Fly ting betwixt Montgomery and Polwari (1629; 1st ed., 1621), which reproduces the literary habit of the Fly ting of Dunbar and Kennedie; a series of 70 sonnets; a large number of miscellaneous poems, amatory and devotional; and The Mindes Melodie, Contayning certayne Psalmes of the Kinglie Prophete Dayvid, apply ed to a new pleasant tune (Edinburgh, 1605) . The formal value of Montgomerie’s verse was fittingly acknowledged by James VI. in his early critical essay Ane Schort Treatise conteining some reulis and cautelis to be observit and eschewit in Scatlis Poesie, where the author makes three quotations from Montgomerie’s poems, then in circulation in manuscript. Montgomerie had written a sonnet to his majesty, which is prefixed to the Essayes of a Prentise.

Montgomerie stands apart from the courtier-poets Ayton, Stirling, and others, who write in the literary English of the South. He carries on the Middle Scots tradition, and was not without influence in the vernacular revival, in Allan Ramsay iTiti his successors. ** ^* ^*/

MONTGOMERY, GABRIEL, SEIGNEUR DE LORGES, Comte de (c. i53°-i574), French soldier, became a lieutenant in the king of France’s Scottish guards, of which his father was captain, and engaged in police operations against the Protestants. Having

inadvertently caused the death of King Henry II. in a tournament (June 30, 1559) he was disgraced and retired to his estates in Normandy. He studied theological questions and espoused the cause of the Reformers. In 1562 he allied himself with the prince of Conde, took Bourges, and defended Rouen from September to October 1562 against the royal army. In the third War of Religion he occupied Beam and Bigorre (1569). Escaping from the massacre of St Bartholomew, he went to England and returned with a fleet for the relief of La RocheUe (1573), but soon had to withdraw to Cornwall. Returning to Normandy in 1574, he defended Domfront, which was being besieged by Marshal de Matignon, but was forced to capitulate on the 25th of May. He was sentenced to death by the parlement, and beheaded in Paris on the 26th of June 1574.

See L, Marlet, he Comte de Montgomery (Paris, 1890).

MONTGOMERY, JAMES (1771-1854), British poet and journalist, son of a Moravian minister, was born on the 4th of November 1771, at Irvine in Ayrshire, Scotland. Part of his boyhood was spent in Ireland, but he received his education in Yorkshire, at the Moravian school of Fulneck near Leeds. He edited the Sheffield Iris for more than thirty years. When he began his career the position of a journalist who held pronounced views on reform was a difficult one, and he twice suffered imprisonment (in 1795 and 1796). His Wanderer of Switzerland (1806), describing the French occupation, attracted considerable attention. The author was described by Lord Byron in a footnote to English Bards and Scotch Reviewers, as ” a man of considerable genius,” whose Wanderer of Switzer- land was worth a thousand ” Lyrical Ballads.” The book had been mercilessly ridiculed by Jeffrey in the Edinburgh Review (1807), but in spite of this Montgomery achieved a wide popu- larity with his later volumes of verse: The. West Indies (1810); The World Before the Flood (1812); Greenland (1819); Songs of Zion (1822); The Pelican Island (1826). On account of the religious character of his poetry, he is sometimes confounded with Robert Montgomery, very much to the injustice

of his reputation. His verses were dictated by the inspiring force of humanitarian sentiment, and he was especially eloquent in his denunciation of the slave trade. The influence of Campbell is apparent in his earlier poems, but in the Pelican Island, his last and best work as a poet, he evidently took Shelley as his model. His reputation now rests chiefly on his hymns, about a hundred of which are still in current use. His Lectures on Poetry and General Literature (1833) show considerable breadth of sympathy and power of expression. A pension erf

£150 was bestowed on him by Sir Robert Peel in 1835. He died at Sheffield on the 30th of April 1854.

His poems were collected and edited by himself in 1841. The voluminous Memoirs, published in seven volumes (1 856-1 858) by John Holland and James Everett, contain valuable' information on English provincial politics.

MONTGOMERY, RICHARD (1736-1775), American soldier, was born in Co. Dublin, Ireland, in 1736. Educated at St Andrew's and at Trinity College, Dublin, he entered the British army in 1756, becoming captain six years later. He saw war service at Louisbourg in 1757 and in the Lake Champlain expedition of 1759, and as adjutant of his regiment (the 17th foot) he shared in the final threefold advance upon Montreal. Later he was present at Martinique and Havana. In 1772 he left the army, settled in New York, and married a daughter of Robert R. Livingston. Three years later he was a delegate to the first provincial congress of New York, and became brigadier-general in the Continental army. He was sent with Schuyler on the Canadian expedition, and, on Schuyler's falling ill, the command devolved upon him. Hampered by the in- clemency of the season and the gross indiscipline of the troops, he went forward, gaining a few minor successes and capturing the colours of the 7th (Royal) Fusiliers, and met

Benedict Arnold's contingent at Point aux Trembles. They pushed on to Quebec barely 800 strong, but an assault was made on the 31st of December 1775, and almost at the first discharge Montgomery was killed. The body of the American general was honourably interred by the Quebec garrison. Congress caused a memorial to be erected in St Paul's church, New York, and in 1818 his remains were conveyed thither from Quebec.

MONTGOMERY, ROBERT (1807–1855), English poet, natural son of Robert Gomery, was born at Bath in 1807. He was educated at a private school in Bath, and founded an unsuc- cessful weekly paper in that city. In 1828 he published TheOmni- presence of the Deity, which hit popular religious sentiment so exactly that it ran through eight editions in as many months. In 1830 followed The Puffiad (a satire), and Satan. An exhaustive review in Blackwood by John Wilson, followed in the thirty-first number by a burlesque of Satan, and two articles in the first volume of Fraser, ridiculed Montgomery's pretensions and the excesses of his admirers. But his name was immortalized by Macaulay's famous onslaught in the Edinburgh Review for April 1830. As a poet, he deserved every word of Macaulay's severe censure, though the brutality of the attack cannot be defended. This exposure did not, however, diminish the sale of his poems; The Omnipresence of the Deity reached its 28th edition in 1858. In 1830 Montgomery entered Lincoln College, Oxford, graduating B.A. in 1833 and M.A. in 1838. Taking holy orders in 1835 he obtained a curacy at Whittington, Shropshire, which he exchanged in 1836 for the charge of the church of St Jude, Glasgow. In 1843 he removed to the parish of St Pancras, London, when he was minister of Percy Chapel. He died at Brighton in 1855. He also wrote The Messiah (1832), Woman, the Angel of Life (1833), Oxford (183 1), and many devotional and theological works.

MONTGOMERY, a city of Alabama, U.S.A., the capital of the state and the county-seat of Montgomery county, situated (about 162 ft. above the sea) S.E. of the centre of the state, on the left bank of the

Alabama river, which is here navigable. Pop. (1900), 30,346, of whom 17,229 were of negro descent and 666 were foreign-born; (1910, census), 38,136, Montgomery is served by the Louisville & Nashville, the Mobile & Ohio, the Atlantic Coast Line, the Seaboard Air Line, the Central of Georgia, and the Western of Alabama railways, and by freight steamers plying between Montgomery and Mobile. Among the principal buildings are the state capitol, near which is a Confederate soldiers' monument (erected by the women of Alabama), the county court-house, the Federal building, the Carnegie library, the masonic temple and the First National Bank and Bell buildings. The public institutions include the city infirmary and St Margaret's hospital, the latter under the direc- tion of the Sisters of Charity. The city has about 100 acres

of parks, Oak Park being the most important. Situated in the " Cotton Belt " of Alabama, Montgomery handles 160,000- 200,000 bales annually. Truck-gardening is an important industry. The Alabama state fair is held here annually. Among the manufactures are fertilizers, machine-shop products, cotton goods, lumber products, cigars, harness, beer, stone- ware, and bricks. The value of the factory products in 1905 was $3,877,653 (an increase of 31-7% over that in 1900). The leading newspapers are the Montgomery Advertiser (morning) and the Montgomery Journal (evening).

The site of Montgomery was once occupied by an Indian village known as Ecunchatty. The first permanent white settlement was made in 1814 by Arthur Moore. In 1817 Samuel Dexter of Massachusetts laid out a town and named it New Philadelphia. In 181 9 it was united with East Alabama Town, an adjoining settlement on the river, under the present name (in honour of General Richard Montgomery), and a third settle- ment, Alabama Town, later became a part of Montgomery. Montgomery was first incorporated in 1837. The place soon became the commercial emporium of the Alabama " Cotton Belt." In 1847 it became the capital of the state instead of Tuscaloosa. On the 7th of January 1861, the State

Convention through which Alabama seceded from the Union met in the capitol; at the same place delegates from six states met, on the 4th* of February, and organized the Confederate States of America. Montgomery was the capital of the new government (hence the popular name ” Cradle of the Confederacy “) until May 1 86 1, when that honour was transferred to Richmond, Virginia. It was the seat of Confederate military factories, and on the 1 2th of April 1865 it was captured by Federal troops. Montgomery received a new city charter in 1905.

MONTGOMERY, a town and district of British India, in the Lahore division of the Punjab. The town has a station on the North-Western railway about half-way between Lahore and Multan. Pop. (1901), 6602. It was founded in 1864 on the opening of the railway, and called after Sir Robert Montgomery, then lieutenant-governor. It is situated in a desolate upland, and though not unhealthy is singularly comfortless..

The District of Montgomery lies in the Bari Doab, or tract between the Sutlej and the Ravi, extending also across the latter river. Area, 4771 sq. m.. In the former tract a fringe of cultivated lowland skirts the bank of either river, but the whole interior upland consists of a desert plateau partially overgrown with brushwood and coarse grass, and in places with impenetrable jungle. On the farther side of the Ravi, again, the country at once assumes the same desert aspect. The population in 1901 was 463,586, showing an apparent decrease of 0-4 % in the decacre due to emigration to the Chenab Colony. The principal crops are wheat, pulse, cotton and fodder. Camels are bred for export. The leading manufactures are of cotton and silk, and lacquered woodwork, and there are factories for ginning and pressing cotton. The district is traversed by the main line of the North-Western railway, from Lahore to Multan, and is irrigated by the Upper Sutlej inundation canal system, and also from the Ravi.

From time immemorial the Rechna Doab has formed the home of a wild race of pastoral Jats, who have constantly maintained a sturdy independence against

the successive rulers of northern India. The sites of Kot Kamalia and Harappa contain large mounds of antique bricks and other ruins, while many othei remains of ancient cities or villages lie scattered along the river bank, or dot the now barren stretches of the central waste. The pastoral tribes of this barren expanse do not appear to have paid more than a nominal allegiance to the Moslem rulers, and even in later days, when Ranjit Singh extended the Sikh supremacy as far as Multan, the population for the most part remained in a chronic state of rebellion. British influence was first exercised in the district in 1847, when an officer was deputed to effect a summary settlement of the land revenue. Direct British rule was effected on the annexation of the Punjab in 1849. There was a general rising of the wild clans during the Mutiny of 1857, several actions being fought before order was restored.

MONTGOMERY (Tre’ Faldwyn) , a municipal and parliamentary borough, market town, and the county town of Montgomery- shire, Wales, situated on a wooded hill near the east bank of the Severn, 7 m. S. of Welshpool (Cambrian railway). Pop. (1901), 1034. The principal feature of the town is the ruined castle. Not far off are the traces of an extensive British fort, and, about a mile east, the line of Offa’s Dyke, forming the Shropshire boundary. The borough was incorporated by Henry III., when the castle was enlarged, and was the scene of frequent contests between that king and Llewelyn the Great. In the 14th century the castle was held by the Mortimers, from whom it passed to the Yorkists. The Crown gave it, in the 1 5th century, to the Herberts of Cherbury, one of whom, in 1644, surrendered it to the Parliamentarians, who dismantled it.

MONTGOMERYSHIRE (Welsh Swydd Tre’ Faldwyn, Bald- wyn’s town shire), a county of Wales, bounded N. by Denbigh, N.E. and E. by Shropshire, S. by Radnor and

Cardigan, W. and N.W. by Merioneth. Its length from S.E. to N.W. is about 30 m.; N.E. to S.W. it measures about 35 m. The surface is broken, though the highest hills are only round the county borders — to the north Berwyn (stretching into Denbighshire); to the south-west Plinlimmon (q.v.); east, the Breidden hills; south, the Kerry hills. The principal rivers and streams are: the Severn, flowing east and north; the Wye, farther south; the Dyfi, Vyrnwy (Fyrnwy), Clywedog, Tanat and Rhiw. Except the Wye and Dyfi, the principal streams are tributaries of the Severn. Lake Vyrnwy, formed in 1888, is the chief water-supply of Liverpool. The Montgomeryshire canal, some 24 m. long, is connected with the Shropshire Union and Ellesmere canals, The county was formerly a recognized source of oak timber for the navy.

Geologically, the county is occupied almost exclusively by Ordovician and Silurian rocks. The latter, mainly Wenlock beds bordered by a fringe of Llandovery rocks, lie in the form of a com- plex syncline down the centre of the county from a few miles north of Lake Vyrnwy through Llangadfan, Llanfyllin, Llanfair, Welsh-

Eool, Montgomery and Newtown. The boundary is very irregular, etween Newtown and Kerry hill Ludlow beds come in, and on the edge of the forest of Clun the Old Red Sandstone just crosses the boundary into this county. North and south of the Silurian tract the Ordovician rocks occupy the remaining area; they contain bands of andesite and felsite in the Berwyn hills, also east of Criggion and south-west of Corndon. In the last-named hill there is a large laccolitic mass of dolerite and a similar rock occurs at Criggion. At Machynlleth slate is worked in the Ordovician, and numerous metalliferous mines exist in the neighbourhood of Newtown from which lead, silver and zinc are obtained. Glacial deposits are prevalent over much of the county.

The climate is mild, and the soil generally fertile, especially in the Severn valley, though towards Merionethshire there are heath and moss. Small

holdings (under about 50 acres) tend to diminish The hardy, small, mountain pony is still to be found here. Hunters and cart-horses are bred. Sheep-breeding is practised, and Shropshire downs are superseding the little duns. Of the relatively few green crops potatoes are the most important; oats are the principal grain. Permanent pasture covers a large area. Hill pasture is also extensive. Woollen cloth and flannel manufacture have revived considerably.

The Cambrian railway, entering Montgomeryshire in the north-east, by Llanymynech, crosses it to the south-west with branches to Llanfyllin, Westbury and Van. There is also a branch from Caersws to Glandyfi (Glandovey) junction, with the coastwise branch of the same company.

The area of the ancient and administrative counties is 510,111 acres, or 797 sq. m., with a population of 54,901 in 1901. Many of the people know no English, and Welsh is everywhere the favourite speech. The county returns one member to parliament, and includes the Montgomery district of parliamentary boroughs : Llanfyllin (pop. 1632), Llanidloes (2770), Montgomery (1034), Machynlleth, Newtown and Welshpool (6121). The first three and last of these are municipal boroughs. The urban districts are: Newtown and Llanllwchaiarn (6500), and Machynlleth (2038). The county is in the North Wales and Chester circuit, assizes being held alternately at Newtown and Welshpool.

Welshpool borough has a separate commission of the peace, but no separate court of quarter sessions. The ancient county (in Bangor, Hereford, and St Asaph dioceses) has 59 ecclesiastical parishes or districts, with parts of n others.

History and Antiquities. — The Welsh name of Baldwyn’s town shire is taken from a Norman who did homage to William the Conqueror for this division of Wales. The English name is from Roger de Montgomery, earl of Shrewsbury (temp. William Rufus). At the coming of the Romans this county was part of the

Ordovices' territory (Britannia secunda), and there are remains of Roman encampments and fortifications at Caersws, Mathrafal, and near Montgomery. The roads connecting these stations can often be traced. Vestiges of a Roman camp are visible near Welshpool. Machynlleth was perhaps the Roman Maglona. Remains of old British camps are to be seen at Dolarddyn, on Breidden hill and at Caereinion. There are many cairns and barrows. Crossing the county was the Via Devana, joined by other roads. From the Roman evacuation under Flavius Honorius (d. a.d. 423) little is known of Montgomery until Wales was subdivided into three districts at the death of Rhodri Fawr, when Montgomery was included in Powys (Powys Gwenwynwyn, Upper Powys). Powys Castle was founded in 1108. About the end of the nth century, probably, was built Baldwyn's Castle, taken later by the Welsh and retaken by Roger de Montgomery. In 1345 Roger Mortimer held it. At Carno, n m. from Newtown and 17 from Machynll- eth, a battle decisive of North Wales sovereignty was fought in 946, and in 1081 the rightful heir, Gruffydd ab Cynan, together with Rhys ab Tudur, prince of South Wales, here killed in battle Trahaern ab Caradoc, the usurper, and most of his men. At Machynlleth is seen Owen Glendower's senate house (1402) where he was crowned prince of Wales.

MONTH (a common Teutonic word, cf. Ger. Mond, Du. maand, Dan. maaned, &c, and cognate with Lat. mensis, Gr. iiT)v, &c, in other branches of the Indo-Germanic family; all ultimately from the root seen in the word for the moon in nearly all those languages), originally the period between two returns of the new moon ; generally called a lunar and sometimes a synodic or illuminative month. The anomalistic month is the mean time taken by the moon in passing from one perigee to the next ; the sidereal month is the mean time in which the moon makes a circuit among the stars; the tropical month is the mean time in which the moon traverses 360 of longitude; the nodical or draconic month is the mean time taken by the moon in passing from one rising node to the next ; the solar month is one-twelfth of

a tropical year. The lengths of the various months are: synodic = 29-53059 days; anomalistic = 27-55460, sidereal = 27-32166, tropical = 27-32156, nodical = 27-21222, solar = 30-43685. (For the calendar months see Calendar.)

In law a month may mean either a lunar month, that is, a period of twenty-eight days, or a calendar month. At common law, ” month ” generally means a lunar month, although in mercantile matters it has been generally understood to mean a calendar month, but there is no general exception giving it that meaning in commercial documents. It can only have that meaning where according to the ordinary rules of construc- tion a secondary meaning can be admitted (Bruner v. Moore, 1904, 1 Ch. 305). In bills of exchange or promissory notes month means a calendar month (Bills of Exchange Act, 1882, s. 14 [4]). Where a servant is engaged subject to a month’s notice or payment of a month’s wages month is interpreted as a calendar month (Gordon v. Potter, 1 F. & F. 644). In acts of parliament passed before the year 1850 month, unless other- wise specially interpreted, means lunar month, but in all acts passed since that date, month, unless words be added showing that lunar month was intended, means calendar month (Inter- pretation Act 1889, s. 3). In the rules of the supreme court and in the county court rules month means a calendar month. In mercantile contracts in computing the period of a month the day from which the time is to begin to run is excluded, but in sentences of imprisonment the day on which the sentence begins is included, so that the numerically corresponding

day in the month in which the sentence expires would be excluded.

MONTHOLON, CHARLES TRISTAN, Marquis de (1782- 1853), was born at Paris. He was trained for a military career, and in his tenth year shared in the

expedition of Admiral Truguet to the coast of Sardinia. Entering the army in 1798, he rose with rapidity and avowed himself, when chef d'escadron in Paris at the time of the coup d'etat of Brumaire (November 1799), entirely devoted to Bonaparte. He served with credit in the ensuing campaigns, and distinguished himself at the battle of Aspern-Essling (May 1809) where he was wounded. At the end of that campaign on the Danube he received the title of count and remained in close attendance on Napoleon, who confided to him several important duties, among others, a mission to the Archduke Ferdinand at Wurzburg. At the time of the first abdication of Napoleon at Fontainebleau (April n, 18 14), Montholon was one of the few generals who advocated one more attempt to rally the French troops for the overthrow of the allies. After the second abdication (June 22, 1815) he with his wife accompanied the emperor to Rochefort, where Napoleon and his friends finally adopted the proposal, which emanated from Count Las Cases (q.v.), that he should throw himself on the generosity of the British nation and surrender to H.M.S. " Bellerophon." Montholon afterwards, at Plymouth, asserted that the conduct of Captain Maitland of the " Bellerophon " had been altogether honourable, and that the re* sponsibility for the failure must rest largely with Las Cases. Mon- tholon and his wife accompanied the ex-emperor to St Helena. To Montholon chiefly, Napoleon dictated the notes on his career which form so interesting, though far from trustworthy, a commentary on the events of the first part of his life. Mon- tholon is known to have despised and flouted Las Cases, though in later writings he affected to laud his services to Napoleon. With Gourgaud, who was no less vain and sensitive than himself, there was a. standing feud, which would have led to a duel but for the express prohibition of Napoleon. Las Cases left the island in November 1816, and Gourgaud in January 1818; but Montholon, despite the departure of his wife, stayed on at Longwood to the end of the emperor's life (May, 1821). In a letter written to his wife he admitted that Napoleon died of cancer, though he afterwards

encouraged the belief that death was due to a liver complaint aggravated by the climate and by the restrictions to which Napoleon was subjected. After that event Montholon and Bertrand became reconciled to Sir Hudson Lowe (q.v.) ; but this did not prevent him, on his return to France, from vilifying that much abused man. Colonel Basil Jackson found him very frank as to the politique de Long- wood which aimed at representing Napoleon as a martyr, and Sir Hudson Lowe as his persecutor. Montholon admitted that an ” angel from heaven as governor would not have pleased them.” Montholon had to spend’ many years in Belgium; and in 1840 acted as ” chief of staff ” in the absurd ” expedition ” conducted by Louis Napoleon from London to Boulogne. He was condemned to imprisonment at Ham, but was released in 1847; he then retired to England and published the Ricits de la captivite de Napoleon a Ste Helene. In 1849 he became one of the deputies for the Legislative Assembly under the Second French Republic. He died on the 21st of August 1853.

See Recueil de pieces authentiques sur le captif de Ste Helene: suivi de lettres de MM . . . . le General Montholon, &c. (Paris, 1 82 1) ; Mimoires pour servir a I’histoire de France sous Napoleon (ed. Gourgaud and Montholon, Paris, 1823; Eng. ed., London, 1823; new ed., Paris, 1905); Recits de la captivitS de I’empereur Napoleon & Ste HMene (2 vols., Paris, 1847). Also the Marquise de Montholon’s Souvenirs de Ste Helene, 1815-16 (Paris, 1901). Of Montholon’s own writings the only one of note is De I’Armee francaise (1834). For the conversations of Montholon with Basil Jackson in 1828, see Lieut. -Colonel Basil Jackson, Notes and Reminiscences of a Staff Officer (London, 1903). (J. Hl. R.)

MONTH’S MIND, in medieval and later England a service and feast held one month after the death of anyone in his or her memory. Bede speaks of the day as commemorationis dies. These ” Minding days ” were of great antiquity, and were sur- vivals of the Norse minne or ceremonial drinking to the dead.

“Minnying Days,” says Blount, ” from the Saxon Lemynde, days which our ancestors called their Monthes mind, their Year’s mind and the like, being the days whereon their souls- (after their deaths) were had in special remembrance, and some office or obsequies said for them, as Orbits, Dirges.” The phrase is still used in Lancashire. Elaborate instructions for the conduct of the commemorative service were often left in wills. Thus, one Thomas Windsor (who died in 1479) orders that ” on my moneth’s minde there be a hundred children within the age of sixteen years, to say for my soul,” and candles were to be burned before the rood in the parish church and twenty priests were to be paid by his executors to sing Placebo, Dirige, &c. In the correspondence of Thomas, Lord Cromwell, one in 1536 is mentioned at which a hundred priests took part in the mass. Commemorative sermons were usually preached, the earliest printed example being one delivered by John Fisher, bishop of Rochester, on Margaret, countess of Richmond and Derby, in 1509.

MONTILLA, a town of southern Spain, in the province of Cordova, 32 m. S. of the city of Cordova, by the Cordova- Bobadilla railway. Pop. (1900), 13,603. The oil of the district is abundant and good; and it is the peculiar flavour of the pale dry light wine of Montilla that gives its name to the sherry known as Amontillado. Montilla was the birthplace of ” The Great Captain,” Gonzalo or Gonsalvo of Cordova (1453-1515), an d contains the ruined castle of his father, Pedro Fernandez de Cordova.

MONTLOSIER, FRANCOIS DOMINIQUE DE REYNAUD, Comte de (1755-1838), French publicist, was born at Clermont-Ferrand (Puy-de-D6me) on the 16th of April 1755, the youngest of a large family belonging to the poorer nobility. He was returned in 1791 to the Constituent Assembly, where he sat on the Royalist side, and he emigrated on its dissolution in Sep- tember 1 791. He was received into the emigrant army at Cob- lenz after some protest against the Liberal leanings he had shown in the Assembly. After the cannonade of Valmy, he withdrew to Hamburg, and thence to London, where he avoided English society, moving exclusively

among the French exiles. In his Courrier de Londres, published in London, he advocated modera- tion and the abandonment by the exiles of any idea of revenge. He was recalled to Paris in 1801, with permission to publish his paper in London. The Courrier was soon suppressed, neverthe- less, its editor being compensated by a comfortable sinecure in the ministry of foreign affairs. Next year he sold his pen to the government to edit the violent anti-English Bulletin de Paris. At Napoleon's request he undertook an account of the ancient monarchy of France, which should serve as a justification for the empire. After four years' labour Montlosier submitted his work to a specially appointed committee, by which it was rejected because of the stress laid on the feudal limitations of the royal authority. The work De la monarchie francaise . . . ou recherches sur les anciennes institutions francaises . . . et sttr les causes qui ont amene la revolution . . . appeared in 1814 in three volumes, a fourth and supplementary volume in the next year containing a preface hostile to Napoleon. His views were no more acceptable to Louis XVIII. than they had been to the emperor, and he devoted himself to agriculture until he was roused by the clerical and reactionary policy of Charles X. His anti-clerical Memoire A consulter sur un systeme rUigieux, politique . . . (1826) rapidly passed through eight editions. He had no part in the revolution of 1830, but supported Louis Philippe's government and entered the House of Peers in 1832. He died on the 9th of December 1838 at Blois. Ecclesiastical burial was denied him because he had refused to abjure his anti-clerical writings.

Among his works should be mentioned : Memoires sur la revolution francaise, le consulat, I'empire, la restoration, et les principaux evenements qui I'ont suivie (2 vols., 1829).

MONTLUC (or Monluc), BLAISE DE LASSARAN-MASSEN-COME, Seigneur de (c. 1502-1577), marshal of France, was born about 1502, at the family seat near Condom in the modern department of Gers. He was the eldest son, and his family was a good one, but, like most

gentlemen of Gascony, he had to

trust to his sword. He served first as a private archer and man-at-arms in Italy, with Bayard for his captain, fought all through the wars of Francis I., and was knighted on the field of Cerisoles (1544), to which victory he had brilliantly contributed as adviser to the young duke of Enghien. Having apparently enjoyed no patronage, he was by this time a man of middle age. Thenceforward, however, his merits were recognized. His chief feat was the famous defence of Siena (1555), which he has told so admirably. When the religious wars broke out in France, Montluc, a staunch royalist, held Guyenne for the king. Henry III. made him in 1574 marshal of France, an honour which he had earned by nearly half a century of service and by numerous wounds. He died at Estillac near Agen in 157 7- Montluc's eminence above other soldiers of his day is due to his Commen- taires de Messire Blaise de Montluc (Bordeaux, 1592), in which he described his fifty years of service (1 521-1574). This book, the " soldier's Bible " (or " breviary," according to others), as Henry IV. called it, is one of the most admirable of the many admirable books of memoirs produced by the unlearned gentry of France at that time. . It is said to have been dictated, which may possibly account in some degree for the singular vivacity and picturesqueness of the style.

The Commentaires are to be found conveniently in the collection of Michaud and Poujoulat, but the standard edition is that of the Societe de I'histoire de France, ed. by M. de Ruble (5 vols., 1865- 1872). See Rustow, Militarische Biographien, v. i. (Zurich, 1858).

MONTLUQON, a town of central France, capital of an arron- dissement, and the most important industrial centre in the department of Allier. Pop. (1906), 31,888. It is situated on the Cher, 50 m. S.W. of

Moulins by the Orleans railway. The upper town, on an eminence on the right bank, consists of steep, narrow, winding streets, and preserves several buildings of the 15th and 16th centuries; the lower town, traversed by the Cher, is the seat of the industries, which embrace the manufacture of glass, chemicals, mirrors, sewing-machines, and iron and steel production. The Commentry coal-mines and Neris, a town with thermal springs, are a few miles distant to the south-east. Of the churches, Notre-Dame is of the 15th century, St Pierre partly of the 12th and St Paul modern. The town-hall, with a library, occupies the site of an old Ursuline convent, and two other convents are used as college and hospital. Overlooking the town is the castle rebuilt by Louis II., duke of Bourbon, and taken by Henry IV. during the religious wars; it serves as a barracks. Montlucon is the seat of a sub-prefect and has tribunals of first instance and of commerce, a board of trade arbitration, a chamber of commerce and a lycee. The town, which formed part of the duchy of Bourbon, was taken by the English in 1171, and by Philip Augustus in 1181; the English were beaten under its walls in the 14th century.

MONTMORENCY, the name of one of the oldest and most distinguished families in France, derived from Montmorency, now in the department of Seine-et-Oise, in the immediate neighbourhood of Enghien and St Denis, and about 9 m. N.N.W. of Paris. The family, since its first appearance in history in the person of Bouchard I., sire de Montmorency in the 10th century, has furnished six constables and twelve marshals of France, several admirals and cardinals, numerous grand officers of the Crown and grand masters of various knightly orders, and was declared by Henry IV. to be, after that of the Bourbons, the first house in Europe. Matthieu I., sire de Montmorency, received in 1 138 the post of constable, and died in 1 160. His first wife was Aline, the natural daughter of Henry I. of England; his second, Adelaide or Alice of Savoy, widow of Louis VI. and mother of Louis VII., and according to Duchesne, he shared the regency of France with

Suger, during the absence of the latter king on the second crusade. Matthieu II. had an important share in the victory of Bouvines (1214), and was made constable in 1218. During the reign of Louis VIII. he distin- guished himself chiefly in the south of France (Niort, La Rochelle, Bordeaux). On the accession of Louis IX. he was one of the chief supports of the queen-regent Blanche of Castile, and was successful in reducing all the vassals to obedience. He died in

1230. His younger son, Guy, in right of his mother, became head of the house of Montmorency-Laval. Anne de Mont- morency (q.v.), so named, it is said, after his godmother Anne of Brittany, was the first to attain the ducal title (1551). His eldest son, Francois de Montmorency (1530-1579), was married to Diana, natural daughter of Henry II. ; another son, Henri I. de Montmorency (1534-1614), who became due de Montmorency on his brother's death in 1579, had been governor of Languedoc since 1563. As a leader of the party called the Politiques he took a prominent part in the French wars of religion. In 1593 he was made constable, but Henry IV. showed some anxiety to keep him away from Languedoc, which he ruled like a sover- eign prince. Henry II. (1595-1632), son of duke Henry I., succeeded to the title in 1614, having previously been made grand admiral. He also was governor of Languedoc. In 1625 he defeated the French Protestant fleet under Soubise, and seized the islands of Re and Oleron, but the jealousy of Richelieu deprived him of the means of following up these advantages. In 1628-1629 he was allowed to command against the duke of Rohan in Languedoc; in 1630 he defeated the Piedmontese, and captured Prince Doria, at Avigliana, and took Saluzzo. In the same year he was created marshal. In 1632 he joined the party of Gaston, duke of Orleans, and placed himself at the head of the rebel army, which was defeated by Marshal Schomberg at Castelnaudary (Sept. 1, 1632); severely wounded, he fell into the enemy's hands, and, abandoned by Gaston, was executed as a traitor at Toulouse on the 30th of October. The title passed to his sister

Charlotte-Marguerite, princess of Conde.

From the barons of Fosseux, a branch of the Montmorency family established in Brabant in the 15th century, sprang the seigneurs de Boutteville, among whom was the duellist Francois de Montmorency-Boutteville, who was beheaded in 1627. His son, Francois Henri, marshal of France, became duke of Piney- Luxemburg by his marriage with Madeleine Charlotte Bonne Therese de Clermont, daughter of Marguerite Charlotte de Luxemburg, duchesse de Piney. Charles Francois Frederic, the son of the marshal, was created duke of Beaufort in 1688 and duke of Montmorency in 1689. In 1767 the title of duke of Beaufort-Montmorency passed by marriage to another branch of the Montmorency-Fosseux. This branch becoming extinct in 1862, the title was taken by the due de Valencay, who be- longed to the Talleyrand-Perigord family and married one of the two heiresses of this branch (1864). There were many other branches of the Montmorency family, among others that of the seigneurs of Laval (

MONTMORENCY, ANNE, Due de (1493-1567), constable of France, was born at Chantilly, and was brought up with the future King Francis I., whom he followed into Italy in 151 5, distinguishing himself especially at Marignano. In 15 16 he became governor of Novara; in 1520 he was present at the Field of Cloth of Gold, and afterwards had charge of important negotiations in England. Successful in the defence of Mezieres (15 21), and as commander of the Swiss troops in the Italian campaign of the same year, he was made marshal of France in 1522, accompanied Francis into Italy in 1524, and was taken prisoner at Pavia in 1525. Released soon afterwards, he wasone of the negotiators of the treaty of Madrid, and in 1530 recon- ducted the king's sons into France. On the renewal of the war by Charles V.'s invasion of France in 1536, Montmorency compelled the emperor to raise the siege of Marseilles; he afterwards accompanied the king of France into Picardy, and on the ter- mination of the Netherlands campaign marched to the relief of Turin. In 1538, on the ratification of the ten years'

truce, he was rewarded with the office of constable, but in 1541 he fell into disgrace, and did not return to public life until the accession of Henry II. in 1547. In 1548 he repressed the insurrections in the south-west, particularly at Bordeaux, with great severity,

and in 1549-50 conducted the war in the Boulonnais, negotiating the treaty for the surrender of Boulogne on the 24th of March 1550. In 1551 his barony was erected into a duchy. Soon afterwards his armies found employment in the north-east in connexion with the seizure of Metz, Toul and Verdun by the French king. His attempt to relieve St Quentin resulted in his defeat and captivity (Aug. 10, 1557), and he did not regain his liberty until the peace of Cateau-Cambresis in 1559. Supplanted in the interval by the Guises, he was treated with coldness by the new king, Francis II., and compelled to give up his master- ship of the royal household — his son, however, being appointed marshal by way of indemnity. On the accession of Charles IX. in 1560 he resumed his offices and dignities, and, uniting with his former enemies, the Guises, played an important part in the Huguenot war of 1562. Though the arms of his party were victorious at Dreux, he himself fell into the hands of the enemy, and was not liberated until the treaty of Amboise (March 19, 1563). In 1567 he again triumphed at St Denis, but received the death-blow of which he died at Paris, on the 15th of March, 1567.

See F. Decrue, Anne de Montmorency (Paris, 1885), and Anne, due de Montmorency (Paris, 1889).

MONTMORENCY, MATHIEU JEAN FELICITfi DE MONT-MORENCY-LAVAL, Due de (1 766-1826), French politician, was born in Paris on the 10th of July 1766. He served with his father, the vicomte de Laval, in America, and returned to France imbued with democratic opinions. Mathieu de Montmorency was

governor of Compiegne when he was returned as deputy to the states-general in 1789, where he joined the Third Estate and sat on the left of the Assembly. He moved the abolition of armorial bearings on the 19th of June 1790. The dissolution of the Constituent Assembly in September 1791 set him free to join Liickner's army on the frontier early in the next year. After the revolution of the 10th of August he abandoned his revolutionary principles; and he took no part in politics under the empire. At the Restoration he was promoted marechal de camp, and accompanied Louis XVIII. to Ghent during the Hundred Days. At the second restoration he was made a peer of France, and two years later received the title of viscount. He adopted strong reactionary and ultramontane views, and became minister of foreign affairs under Villele in 1821. He recommended armed intervention' in Spain at the Congress of Verona in October 1822, but he resigned in December, being compensated by the title of duke and the cross of the Legion of Honour in the next year. He was elected to the French Academy in 1825, though he appears to have had small qualifications for the honour, and in the next year became tutor to the six-year-old Henri, duke of Bordeaux (afterwards known as the comte de Chambord). He died two months after receiving this last appointment, on the 24th of March 1826.

See Vetillard, Notice sur la vie de M. le due Mathieu de Mont- morency (Le Mans, 1826), and, for his curious relations with Mme de Stael, P. Gautier, Mathieu de Montmorency et Mme de Stael, d'apres les lettres inedites de M. de Montmorency a Mme Necker de Saussure (1908).

MONTMORENCY, a town of northern France in the department of Seine-et-Oise, 25 m. from the right bank of the Seine and 1 1 m. N. of Paris by rail. Pop. (1906), 5723. In the middle ages it was the seat of the family of Montmorency. There is a church built for the most part in the 16th century by Anne de Mont- morency. The town is a well-known resort of Parisians. To the north-east lies the fine forest of Montmorency. Bleaching and dyeing and the

manufacture of lime plaster, bricks and tiles are carried on. About a mile south-west lies Enghien-les-Bains (pop. 4925), the waters of which are used in cases of catarrh and skin disease.

MONTMORILLON, a town of western France, capital of an arrondissement in the department of Vienne, on the Gartempe, 34 m. E.S.E. of Poitiers by rail. Pop. (1906), 3924. The ecclesiastical seminary occupies a building of the 12th century, formerly an Augustinian convent. The convent church is Romanesque in style and there is a curious two-storied chapel

of octagonal form, of the same period. The church of Notre- Dame is a combination of Romanesque and Gothic, dating from the 1 2th and 13th centuries.

MONTMORIN DE SAINT HEREM, ARMAND MARC, Comte de (1745-1792), French statesman, belonged to a cadet branch of a noble family of Auvergne. He was gentleman-in-waiting to Louis XVI. when dauphin, and was subsequently appointed ambassador at Madrid. From Madrid he was suddenly summoned to the governorship of Brittany, and in 1787 was appointed by the king to succeed Vergennes in the ministry of foreign affairs. Montmorin was a devoted admirer of Necker, whose influence at the court he was mainly instrumental in maintaining. He retired when Necker was dismissed on the 1 2th of July 1789, but on Necker's recall after the taking of the Bastille again resumed his office, which he continued to hold till October 1791. Mirabeau (q.v.) had approached him so early as December 1788, with a plan for the policy to be pursued by the court towards the new states general; but Montmorin, offended by Mirabeau's attacks on Necker and by his Histoire secrete de la cour de Berlin, refused to see him. With the progress of the Revolution, however, this attitude was changed. The comte de la Marck was exerting himself to bring Mirabeau into touch with the court (see Mirabeau), and for this purpose it was important to secure the assistance of Montmorin. The convenience of an understanding between the two men was obvious; and they were soon on the closest

terms. While Montmorin continued minister in name, Mirabeau became so in fact. Montmorin did not dare to come to a decision without consulting his masterful friend, but on the other hand neither Mirabeau nor La Marck were under any illusions as to the broken character of the reed on which they had perforce to lean. Mira- beau complained bitterly that Montmorin was ” slack ” (flasque) and a ” poltroon ” {gavache). On the other hand, La Marck thought that Montmorin’s feebleness was occasionally useful in restraining Mirabeau’s impetuosity. The death of Mirabeau in April 1791 was a severe blow to Montmorin, the difficulty of whose position was enormously increased after the flight of the royal family to Varennes, to which he was not privy. He was forced to resign office, but still continued to advise Louis, and was one of the inner circle of the king’s friends, called by the revolutionists “the Austrian Committee.” In June 1792 his papers were seized at the foreign office, without anything in- criminating being discovered; in July he was denounced, and after the 10th of August was proscribed. He took refuge in the house of a washerwoman, but was discovered, haled before the Legislative Assembly, and imprisoned in the Abbaye, where he perished in the September massacres. His relative, Louis Victor Henri, marquis de Montmorin de Saint Herem, head of the elder branch, also perished in the massacre.

See A. Bardoux, Pauline de Montmorin, comlesse de Beaumont: £tudes sur la fin du XVIII 1 ”” Steele (Paris, 1884), for a defence of Montmorin’s policy ; F. Masson, Le Departement des affaires etrangeres pendant la revolution, 1787-1804, ch. ii. (Paris, 1877) ; A. de Bacourt, Correspondance entre Mirabeau et le comte de La Marck, 1789-1791 (3 vols., Paris, 1851), contains many letters of Montmorin; ” Corre- spondence of the Comte de Moustier with the Comte de Montmorin,” in the Amer. Hist. Rev., vol. viii. (1902-1903).

MONTORO, a town of southern Spain, in the province of Cordova, 27 m. E. by N. of the city of Cordova, on the Madrid- Cordova railway. Pop. (1900), 14,581.

Montoro was the Epora of the Romans, and became an important Moorish fortress in the middle ages, but it has been largely modernized. It stands on a rocky peninsula on the south bank of the Guadalquivir, here crossed by a fine bridge of four arches dating from the 16th century. Oil is largely manufactured, and there is considerable trade in timber, agricultural produce and livestock.

MONTPELIER, a city, the capital of Vermont, U.S.A., and the county-seat of Washington county, on the Winooski river, 40 m. (by rail) E.S.E. of Burlington. Pop. (1900), 6266 (952 foreign-born); (1910), 7856. Montpelier is served by the Central Vermont and the Montpelier & Wells River railways. Barre granite is mined extensively in the vicinity, and the city manu- factures marble and granite products, flour, lumber, saddlery

hardware and wood-working machinery. The principal building is the state house, crowned by a statue of Agriculture by Larkin G. Mead. The state house was first occupied in 1836. It was almost completely destroyed by fire in 1857, and was subsequently rebuilt and enlarged. Other prominent features of the city are the United States government building, the county court house, the Montpelier seminary and the Wood art gallery, a collection consisting principally of paintings by Thomas Waterman Wood (1823-1903), a native of Montpelier. The township of Montpelier, named from the city in France, was granted to a company of sixty proprietors in 1780. The first permanent settlement was made in 1787; and the township was organized in 1791 under a charter of 1781, replaced by another in 1804. In 1805 it was selected as the capital of the state, and in 1808 the legislature met here for the first time. At first the township was a part of Orange county, but in 1810 Washington county was created, and in 181 1 Montpelier became the seat of government of the new county. In 1849 East Montpelier was set apart as a

separate township, and in 1894 the township of Montpelier was chartered as a city.

MONTPELLIER, a town of southern France, capital of the department of Herault, about 7 m. from the Mediterranean, and 31 m. S.W. of Nimes on the Paris-Lyon railway between that town and Cette. Pop. (1906), 65,983. Montpellier, the seat of a university and the principal place of lower Languedoc, is situated in a fruitful plain less than a mile from the right bank of the small river Lez. Composed for the most part of narrow winding streets, the town has at the same time several spacious thorough- fares and some fine squares and promenades, notably the much- frequented Place de la Comedie, the Esplanade and the Peyrou. The last terminates in a terrace commanding a magnificent view of the coasts of the Mediterranean, and of the Pyrenees and Alps. On the terrace is situated the reservoir of the town, the water being brought from a distance of about 8 m. by an aqueduct. In the centre of the square is an equestrian statue of Louis XIV., while opposite the entrance is the Porte de Peyrou, a triumphal arch erected at the end of the 1 7th century to commemorate the achievements of Louis XIV. The Boulevard Henri IV. to the north leads past the botanical garden, founded in 1593 and thus the oldest in France, the medical college, and the cathedral; to the east the Rue Nationale leads to the palace of justice, the prefecture, and the citadel. The cathedral (14th century), which until 1536 was the church of a Benedictine monastery, suffered severely during the religious wars, and about the middle of the 19th century the choir and one of the four towers at the angles of the nave were rebuilt in the style of the 13th century. The monastery, after being converted into the bishop’s palace, has since 1795 been occupied by the famous medical school. A gallery devoted to the portraits of professors since 1239 contains one of Rabelais. Close to the medical school is the Tour des Pins, the chief relic of the medieval fortifications. The museum (Musee Fabre) contains rich collec- tions of Italian, Flemish, Dutch and modern French paintings

and of French sculptures. Its nucleus was the collection given to it by the painter F. X. P. Fabre (1766-1837), born at Mont- pellier. The principal public buildings are the palace of justice — ■ a modern structure, the theatre and the prefecture, also modern. Montpellier possesses old houses of the 15th and 16th centuries. The Lez is canalized so as to connect Montpellier with the canal du Midi and with the sea at Palavas. The town has a consider- able trade in wine, brandy, fruit and silk. The principal indus- trial establishment is a manufactory for candles and soap. There are also tanneries, distilleries and manufactories of cotton and woollen goods, chemicals, casks, hosiery and chocolate. The town is the centre of an acadSmie (educational division) and has long been renowned as a seat of learning. Montpellier university comprises faculties of medicine, law, science and letters, and a higher school of pharmacy. Montpellier is also the seat of a bishop and a prefect, of courts of appeal and assizes, tribunals of first instance and of commerce, a chamber of commerce, a board of trade arbitration, and headquarters of the XVI. army corps.

Montpellier first rose into importance after the destruction of Maguelonne by Charles Martel in 737. In the 10th century it consisted of two portions, Montpellier and Montpellieret, held from the bishops of Maguelonne by the family of Guilhem. The Guilhems were succeeded, through marriage, by the house of Aragon, a member of which in 1349 sold his rights to Philip of Valois, Montpellieret having already in 1 292 been ceded to the Crown by the bishops. In 1141 Montpellier acquired a charter afterwards materially extended, and the same century saw the rise of its school of medicine. Several of the ablest teachers of that school were members of an important Jewish colony estab- lished in the town. It had a school of law in 1 160, and a univer- sity was founded by Pope Nicholas IV. towards the close of the 13th century. Louis IX. granted to Montpellier the right of free trade with the whole of the kingdom, a privilege which greatly increased its prosperity. The

importance of the town was enhanced when the bishopric of Maguelonne was transferred thither in 1536. During the wars of religion the town was a stronghold of the Protestants, who captured it in 1567. It strenuously supported the duke of Rohan in his revolts and in 1622 only succumbed to Louis XIII. after a siege of eight months. In 1628 the duke was defeated there and the walls of the town razed, the royal citadel built in 1624 being, however, spared. Louis XIII. made Montpellier the seat of one of the geniraliUs of Languedoc, and the states of that province met there during the 17th and 18th centuries.

See A. C. Germain, Histoire du commerce de Montpellier anterieure- ment a I'ottverture du port de Cette (2 vols., Montpellier, 1861), and Histoire de la commune de Montpellier (3 vols., Montpellier, 1851); Aigrefeuille, Histoire de la ville de Montpellier (4 vols., Montpellier,

1875-1882).

MONTPENSIER, COUNTS AND DUKES OF. The French lordship of Montpensier (department of Puy-de-D6me), which became a countship in the 14th century, was sold in 1384 by Bernard and Robert de Ventadour to John, duke of Berry, whose daughter Marie brought the countship to her husband, John I., duke of Bourbon, in 1400. The countship was subsequently held by Louis de Bourbon, younger son of Duke John, and by his descendants up to Charles de Bourbon-Montpensier, the famous constable, who became duke of Bourbon by his marriage with his cousin, Suzanne de Bourbon, in 1505. Confiscated by King Francis I., the countship was restored in 1538 to Louise de Bourbon, sister of the constable, and widow of the prince de La Roche-sur-Yon, and to her son Louis (15 13-1582), and was erected into a duchy in the peerage of France (duche-pairie) in 1539. Marie, daughter and heiress of Henri de Bourbon, duke of Montpensier, brought the duchy to her husband Gaston, duke of Orleans, brother of Louis XIII. , whom she married in 1626, and their daughter and heiress (see below), known as " La Grande

Mademoiselle," was duchess of Montpensier. The title subsequently remained in the Orleans family, and was borne in particular by Antoine Philippe (1775-1807), son of Philippe " Egalite," and Antoine Marie Philippe Louis (1824- 1890), son of King Louis Philippe and father-in-law of King Alphonso XII. of Spain.

MONTPENSIER, ANNE MARIE LOUISE D'ORLEANS, Duchesse de (1627-1693), French memoir-writer, was born at the Louvre on the 29th of May 1627. Her father was Gaston of Orleans, " Monsieur," the brother of Louis XIII. Her mother was Marie de Bourbon, heiress of the Montpensier family. Being thus of the blood-royal of France on both sides, and heiress to immense property, she appeared to be very early destined to a splendid marriage. It was perhaps the greatest misfortune of her life that " la grande mademoiselle " was encouraged to look forward to the throne of France as the result of a marriage with Louis XIV., who was, however, eleven years her junior. Ill- luck, or her own wilfulness, frustrated numerous plans for marry- ing her to persons of exalted station, including even Charles II. of England, then prince of Wales. She was just of age when the Fronde broke out, and, attributing as she did her disappointments to Mazarin, she sympathized with it not a little. In the new or second Fronde she not only took nominal command of one of the

armies on the princes' side, but she literally and in. her own person took Orleans by escalade. However, she had to retreat to Paris, where she practically commanded the Bastille and the adjoining part of the walls. On the 2nd of July 1652, the day of the battle of the Faubourg Saint Antoine, between the Frondeurs under Conde and the royal troops under Turenne, Mademoiselle saved Conde and his beaten troops by giving orders for the gates under her control to be opened and for the cannon of the Bastille to fire on the royalists. In the heat of

the emeute which followed she installed herself in the Hotel de Ville, and played the part of mediatrix between the opposed parties. Her political importance lasted exactly six months, and did her little good, for it created a lifelong prejudice against her in the mind of her cousin, Louis XIV. She was for some years in disgrace, and resided on her estates. It was not till 1657 that she reappeared at court, but, though projects for marrying her were once more set on foot, she was now past her first youth. She was nearly forty, and had already corresponded seriously with Mme de Motteville on the project of establishing a ladies' society " sans mariage et sans amour," when a young Gascon gentleman named Puyguilhem, afterwards celebrated as M. de Lauzun (q.v.), attracted her attention. It was some years before the affair came to a crisis, but at last, in 1670, Mademoiselle solemnly demanded the king's permission to marry Lauzun. Louis, who liked Lauzun, and who had been educated by Mazarin in the idea that Mademoiselle ought not to be allowed to carry her vast estates and royal blood to anyone who was himself of the blood- royal, or even to any foreign prince, gave his consent, but it was not immediately acted on, as the other members of the royal family prevailed with Louis to rescind his permission. Not long afterwards Lauzun, for another cause, was imprisoned in Pignerol, and it was years before Mademoiselle was able to buy his release from the king by settling no small portion of her estates on Louis's bastards. The elderly lovers (for in 1681, when Lauzun was released, he was nearly fifty, and Mademoiselle was fifty-four) were then secretly married, if indeed they had not gone through the ceremony ten years previously. But Lauzun tyrannized over his wife, and it is said that on one occasion he addressed her thus, "Louise d'Orleans, tire-moi mes bottes," and that she at once and finally separated from him. She lived for some years afterwards, gave herself to religious duties, and finished her Memoires, which extend to within seven years of her death (April 9, 1693), and which she had begun when she was in disgrace thirty years earlier. These Memoires (Amster- dam, 1729) are of

very considerable merit and interest, though, or perhaps because, they are extremely egotistical and often extremely desultory. They are to be found in the great collection of Michaud and Poujoulat, and have been frequently edited apart. Her Eight Beatitudes has been edited by E. Rodocanachi as Un Ouvrage de piete inconnu (1908).

See the series of studies on La Grande Mademoiselle, by ″ Arvede Barine ″ (1902, 1905). (G. Sa.)

MONTREAL, a city of the Dominion of Canada, its leading seat of commerce and principal port of entry, as well as the centre of many of its important industries. It is situated on the south-east of the island of Montreal, at the confluence of the Ottawa and St Lawrence rivers, in the county of Hochelaga and province of Quebec. The observatory in the grounds of McGill Univer- sity, in the city, has been determined to be in 45 30′ 17″ N. lat., and 73 34′ 40-05″ W. long. The city holds a fine position at the head of ocean navigation, nearly a thousand miles inland, and at the foot of the great system of rivers, lakes and canals upon which the commerce of the interior is carried to the Atlantic seaboard. The ship channel below Montreal permits the passage of ocean vessels drawing 30 ft. at low water. The deepening of the channel, largely due to the initiative of Montreal merchants, was begun in 1844 by the government of Canada. The work was transferred to the Harbour Commissioners of Montreal in 1850. The depth of the channel was then n ft. Fifteen years later it had gradually been increased to 20 ft.; and in 1888, when the work was taken over by the Dominion government, the depth was 27 ft. 6 in. The Lachine canal,

with the chain of artificial waterways that succeeded it, opened the way for the shipping of the Great Lakes. The first sod in the digging of the Lachine canal was turned in July 182 1 by John Richardson of Montreal. The same public-spirited mer- chant presided in April of the following year at the preliminary meeting which led to the formation of the committee of trade, itself the

forerunner of Montreal's indispensable board of trade. Even before the close of the French regime in Canada efforts had been made to cut a canal across the island of Montreal, and M.de Catalogne succeeded in building a waterway practicable for the canoes of the fur-traders. The more ambitious canal commenced in 182 1 was completed four years later, at a cost of $440,000. Before its completion, however, the increasing draught of inland shipping made it practically useless, and in 1843 work was begun on an enlargement. Since then the canal has been repeatedly deepened, to keep pace with the requirements of lake shipping, until to-day a 14-ft. channel is available. In the meantime the rival method of rail transportation was taking shape, and in 1836 the first Canadian railway was opened, between Laprairie, opposite Montreal and St Johns, in the eastern townships. In 1848 a second railway, from Longueuil to St Hyacinthe, was opened; both these projects owing their exis- tence to the enterprise of Montreal citizens. The broad St Lawrence, however, still lay between the city and the outside world. In 1854 work was commenced upon the famous Victoria tubular bridge, designed by Robert Stephenson and A. M. Ross. The bridge was opened by King Edward VII., then prince of Wales, in i860. In 1898 it was replaced by the Victoria Jubilee bridge, built on the piers of the old bridge. At the foot of Lake St Louis, some distance above the Victoria Jubilee bridge, the Canadian Pacific railway crosses the river on a graceful cantilever bridge with two central spans each 408 ft. long. Montreal is on the Canadian Pacific, Grand Trunk, Intercolonial, Canadian Northern, New York Central, Rutland, Central Vermont and Delaware & Hudson railways'. During the season of navigation several lines of well-appointed steamers maintain communication with Liverpool, London, Glasgow, Bristol and other British and European ports, as well as the principal ports on the river and gulf of St Lawrence and the Great Lakes. A system of electric railways covers every section of the city and affords easy communication with the suburbs and neighbouring towns.

Built originally along the water-front, Montreal has in the course of years swept back over a series of terraces — former levels of the river or of a more ancient sea — to the foot of Mount Royal. Held there, it has been forced around the mountain on either side. Mount Royal, from which the city derives its name and so much of its natural beauty, is a mass of trap-rock thrown up through the surrounding limestone strata to a height of 733 ft.' above the level of the sea. Under the direction of Frederick Law Olmsted, it was converted into a magnificent park. Be r tween mountain and river the Lachine canal winds through the plain. In the middle of the river lies the beautifully wooded St Helen's island, rising to a height of 150 ft., above the water, and itself commanding an excellent view of the city. The island, named after Helen Boulle, wife of Champlain, belonged at one time to the barons of Longueuil. The British government pur- chased it for military purposes, and it still contains a battery of guns and barracks, the latter tenantless, since the island has been loaned to the city for use as a public park.

The city is substantially built, grey limestone, quarried from the mountain, predominating in the public and many of the private edifices. On the south of the Place d'Armes, a small enclosure covering the site of an ancient burying-ground, stands the parish church of Notre Dame, whose Gothic outlines form one of the striking features of the city. Designed by James O'Don- nell, the church was built in 1824 to take the place of an earlier structure dating back to 1672. The existing church is 255 ft. long and 134 ft. wide, and accommodates 10,000 worshippers. Its twin towers (227 ft.) contain ten bells, one of which, known as " Le Gros Bourdon," weighs 24,780 lb, the largest in America. Two others weigh respectively 6041 and 3633 lb. Beside the church stands the historic seminary of St Sulpice, one of the

few remaining relics of the days of French rule. This ancient building is now used for the offices of the Order of Sulpicians, founded by the Abb6 Olier in the early half of the 17th century. This zealous enthusiast had sent out Paul de Chomedy, sieur de Maisonneuve, in 1641 to establish the missionary enterprise which afterwards developed into the city of Montreal, and six years later the Abbe de Quelus, with three devoted companions, landed at Ville-Marie de Montreal and laid the foundations of the future powerful Order of Sulpicians. The seigneury of Montreal, acquired by Olier in 1640, is still held by the Sulpi- cians, and as they have retained large blocks of land in the heart of the city as well as elsewhere on the island, these "Gentlemen of the Seminary," as they were locally called, rank among the wealthiest societies in America. The head offices of the Bank of Montreal face Notre Dame church, on the north of the Place d'Armes, and several other of the leading banking institutions of the city have their quarters in the immediate neighbourhood. In the Place d'Armes itself stands a striking figure in bronze erected to the memory of the founder of Montreal, Maisonneuve. At the base are a series of bas-reliefs setting forth historical incidents connected with the early history of the town. The monument is the work of a Canadian sculptor, Louis Philippe Hubert, C.M.G. The Roman Catholic cathedral of St James stands upon Dominion Square. It is an almost exact reproduc- tion, reduced to one-half the scale, of St Peter's at Rome. The building, projected by the late Archbishop Bourget to replace the old church on St Denis street destroyed in the great fire of 1852, was begun in 1868. On the west of the square stand the Windsor Street station of the Canadian Pacific railway; St George's (Anglican) church, which possesses a fine chime of bells; and the Windsor Hotel. A statue of Sir John Macdonald occupies the centre of the square. Close to the historic Bon- secours Market stands the church of Notre Dame de Bonsecours, founded by Sister Marguerite Bourgeois in 1673 as a sanctuary for a miraculous statue of the Virgin. The original church was burned in 1754, and the present

building, erected in 1771, an example of Norman architecture transplanted to the New World, narrowly escaped destruction to make room for a railway station. Curiously enough, it remained for a number of English Protestants to secure the preservation of this relic of the French period. Jacques Cartier Square, adjoining Bonsecours Market, is notable for its column and statue of Nelson, erected in 1808. As the Roman Catholic cathedral owes its existence to the energy and enthusiasm of Archbishop Bourget, so Christ Church cathedral must always be associated with the name of the first resident Anglican bishop of Montreal, Dr Fulford. The church is a fine example of the Early English style of architecture. Beside it stands a memorial of Bishop Fulford, modelled after the famous Martyr’s Memorial at Oxford.

The mixture of races and creeds, which is so striking a charac- teristic of Montreal life, has not only endowed the city with many beautiful churches, but also with varieties of philanthropic insti- tutions. Each of the several national societies — St George's, St Andrew's, St Patrick's, and that of the French-Canadian patron saint, St Jean Baptiste, to mention no others — looks after the welfare of its own adherents. Of the several hospitals, the most venerable is the Hotel Dieu, founded in 1644 by Mme de Bouillon, a French lady of high rank. The original building, in the early days of Ville Marie, stood without the fort, and was fortified to withstand the attacks of the Iroquois. The site is now covered by a block of warehouses on St Paul Street. The present buildings, completed in 1861, contain both a hospital and nunnery. The Order of the Grey Nuns, founded by a Canadian lady, Mme d'Youville, in 1737, cares for hundreds of foundlings and aged and infirm people in the great hospital in Guy Street. The Montreal General hospital was founded in 1819 by public subscriptions, and the Royal Victoria hospital is a monument to the generosity of Lord Strathcona and Lord Mount-Stephen. Besides these should be mentioned the Notre Dame, the Western and the Children's Memorial hospitals. Separate hospitals for contagious diseases are maintained both by the Roman Catholics and Protestants.

Montreal provides for the education of its young people through two distinct systems of public schools, one for Roman Catholics, the other for Protestants, each governed by a board of commis- sioners. The schools are maintained by an annual tax based upon the assessment, two-fifths of 1 % being levied upon the Protestant section of the community for the support of the Protestant schools, and one-quarter of 1 % upon the Catholics for their schools. Unlike the neighbouring provinces of Ontario, Quebec makes no provision for a state university. But James McGill (1744-1813) left property, valued at the time of his death at £30,000, for the foundation of a university, one college of which was to bear his

name. A royal charter conferring uni- versity powers was obtained in 1821. During early years slow progress was made, but with the appointment of Sir William Dawson as principal, in 1855, the institution entered on a career of prosperity. It now embraces five faculties: arts, applied science, law, medicine, agriculture, and comprises the following: McGill College, Montreal, the original foundation; the Royal Victoria College for Women, Montreal, built and endowed by Lord Strathcona; four affiliated theological colleges in Montreal; the Macdonald College, erected and endowed by Sir William C. Macdonald, at Ste Anne de Bellevue, 20 m. from the city; the McGill University College of British Columbia, Van- couver, B.C.; and three affiliated colleges: Stanstead Wesleyan College, Stanstead, P. Q.; Victoria College, Victoria, B.C.; Alberta College, Edmonton. The finely-equipped Macdonald scientific laboratories, with the Redpath Museum and University Library (114,000 vols, in 1907), form part of a noble group of buildings on the campus in Montreal. Disastrous fires in April 1907 wiped out two buildings and destroyed the splendid medical museum, but the plans for rebuilding provided for further extension and improvement. Previous to the fires the property of the university in buildings in Montreal, including equipment and endowment, was valued at $6,000,000.

The French university of Laval, the chief seat of which is in the city of Quebec, also maintains a branch at Montreal, established in 1877. It embraces the faculties of arts, law, medicine and theology, the latter conducted through the Seminary of St Sulpice. The college library has been enriched by a rare collec- tion of Canadian books and manuscripts, bequeathed by Judge Louis Francois Georges Baby (1834-1906), of Montreal. The medical school, which now occupies a portion of the university building, formerly held its sessions in the historic Chateau de Ramesay, built by the Chevalier de Ramesay, governor of Montreal, in 1704, and occupied after the conquest by the British governors of Canada, until the stoning of Lord Elgin and the burning of

the Parliament Buildings in 1849 brought about the removal of the seat of government from Montreal. The Chateau de Ramesay is now the fitting home of a public collection of historic relics. Of other educational institutions in the city the most important is St Mary's College, founded in 1848 by the Jesuits, and removed to the present building in 1855. The archives boast a notable collection of early Canadian manu- scripts, upon which Francis Parkman drew in preparing his histories of New France.

Montreal's position as the chief doorway of the outgoing and incoming trade of the Dominion is largely due to the foresight of her great merchants. With the gradual opening up of means of communication by land and water, and the development of her facilities for handling the exports and imports of the country, the city has increased rapidly in importance, until to day one- third of the imports of the Dominion come through Montreal, and nearly 30 % of the exports. In shipments of grain Montreal has outstripped all her rivals on the continent except New York and New Orleans, and the building of the Georgian Bay canal will, by materially shortening the distance between the western grainfields and European 'markets, give her a very considerable advantage over both these ports. In dairy produce she is already the chief export centre of the continent. Montreal is also the financial centre of Canada, and in it are to be found the head offices of more than 2 5 important banks, of the leading insur- ance companies, and of the two greatest railways of the country.

Montreal is governed by a mayor and 36 aldermen, elected every two years. The city returns 5 members to the Dominion House of Commons and 6 to the Provincial Legislature of Quebec.

The population of Montreal, according to .the census

of 1901, was 266,826. With the suburbs, it was estimated in 1907 at over 405,000, about three-fifths French.

The history of the town is steeped in romance. From that first remarkable scene, so graphically described by Francis Parkman, when, on the 18th of May 1642, Maisonneuve and his little band of religious enthusiasts landed upon the spot where the Montreal Custom House now stands, and planted, in the words of the saintly Dumont, a grain of mustard seed destined to overshadow the land, the history of the town was to be intimately associated with missionary enterprise and such missionary heroism as the world has rarely seen. Montreal began as a religious colony, but its very situation, on the outer confines of civilization and at the door of the Iroquois country, forced it to become a military settlement, a fortified town with a military garrison. Similarly its position, even then an ideal one from a commercial point of view, made it the dominating centre of the fur-trade. For a hundred years after its foundation these three influences held sway, more or less mutually antagonistic, the streets of Montreal presenting an animated picture of sombre priests and jovial soldiers, savage hunters in their native finery and more than half-savage fur traders. Within another hundred years, although both priests and soldiers were still to be seen on her streets, they had become but atoms in a larger and more varied population. The fur trader of New France, merged after the conquest in the fur trader of the North West Company — which had its origin in Montreal — remained for a time the one picturesque survival of earlier and more romantic days. Finally, he too disappeared in the multiform and strenuous life of the modern city.

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(Montreal, 1890) ; H. Beaugrand, Le Vieux Montreal (Montreal, 1884) ; Dollier de Casson, Histoire du Montreal, 1640-1672 (Mont- real, 1868) ; J. D. Borthwick, Montreal, its history, &c. (Montreal, 1875). (L.J. B.)

MONTRfiSOR, CLAUDE DE BOURDEILLE, Comte de (c. 1606-1663), French intriguer and memoir- writer, was the grand- nephew of Pierre de Brantome. He was the second favourite of Gaston, duke of Orleans, the weak brother of Louis XIII., succeeding Antoine de Laage, due de Puylaurens, in this position in 1635. He planned the assassination of Cardinal Richelieu at the camp of Amiens in 1636, a plan which failed through the cowardice of Orleans. Montr6sor was obliged to spend the next six years on his estate, but in 1642 he entered into the plot of Cinq Mars against Richelieu. On its failure he escaped to England, but his estates were confiscated. Returning after Richelieu's death, he entered into the intrigues of the period just preceding the Fronde, and was imprisoned in the Bastille, then in Vincennes, having risked his safety by coming back from exile in Holland to aid the duchess of Chevreuse. Mazarin attempted to win him over in vain, but in 1653 he made his submission to the victorious minister, and from that time on played no part in public life. He had three children by Mile de Guise, with whom he had a lasting liaison.

His MSmoires have preserved his name from the oblivion other- wise awaiting such intriguers ; they are written with naive frankness and are extremely interesting. They are printed by A. Petitot and Monmerque in Collection des memoires relatifs a I'histoire de France (Paris, 1876).

MONTREUIL, GERBERT DE (J. 13th century), French trouvere, author of the Roman de la violette. He dedicated his poem (c. 1 221) to the Countess Marie of Ponthieu, wife of Simon, count of Dammartin and a

niece of Philip Augustus. The count

Gerard de Nevers of the story stakes his domains on the fidelity of his wife Euriant. Lisiard by calumniating Euriant wins the wager, but in the end the traitor is exposed, and, after many adventures, Euriant is reinstated. Another version of the story is given in the Roman du comte de Poitiers and in the tale in the Decameron (ii. 9) en which Shakespeare founded Cymbeline. Lyrics are inserted in the narrative of the Roman de la violette, as they had been in the Conte de la rose (1200), known also as Guillaume de Dole. A prose version, dating from the early 15th century, provided Wilhelmine de Chezy with the material for her libretto of Weber's opera, Euryanthe (1823).

See Hist. litt. de la France, xxii. 782, xviii. 760, xxii. 826; Le comte de Poitiers (ed. F. Michel, 1831); Le Roman de la violette (ed. F. Michel, 1834); Le Conte de la rose (ed. Servois, 1893); F. Kraus, ttber Gerbert de Montreuil (Erlangen, 1897) ; Rudolf Ohle, Shake- speares Cymbeline und seine romanischen Vorlaufer (Berlin, 1890).

MONTREUIL-SOUS-BOIS, a town of northern France in the department of Seine, 5 m. E. of Paris, on the slope and summit of a hill, about 1 m. N. of Vincennes. Pop. (1906), 35,831. Montreuil is specially noted for its extensive peach orchards. The manufactures include paint, oils and varnish, glass and chemical products.

MONTREUIL-SUR-MER, a town of northern France, capital of an arrondissement in the department of Pas-de-Calais, 24 m. S. by E. of Boulogne by rail. Pop. (1906), 2883. The town with its old citadel and ramparts, due largely to Vauban, is prettily situated on an eminence on the left bank of the Canche 10 m. from the English Channel. The chief buildings are the church of St Saulve (12th, 13th and 16th centuries), and a hospital founded in 1200 and rebuilt in the 19th century, with a fine chapel in the Flamboyant style. The buildings of the old abbey of Ste Austreberthe, founded originally in the

nth century, still remain. Montreuil is the seat of a sub-prefect and has a tribunal of first instance and a preparatory infantry school. The town owes its origin to a monastery established in the 7 th century by St Saulve, bishop of Amiens.

MONTREUX, the general name applied to the villages situated along the shore at the east of the Lake of Geneva in Switzer- land, from Clarens to Veytaux: sometimes the name is specially given to Vernex only. These villages form part of 3 communes, those of Le Chatelard (including Clarens and Vernex) and of Les Planches (including Territet), while a bit (not Chillon) of that of Veytaux is alone included. The total population of this ” agglo- meration ” was 14,144 in 1900, mostly French-speaking, while there were 9730 Protestants to 4301 Romanists and 55 Jews. There are railway stations at Clarens (15 m. south-east of Lau- sanne), at Vernex (§ m. on), and Territet (1 m. on, or |m. from Veytaux, which is i| m. north of Villeneuve), as well as an electric tramway along the shore of the lake, and frequent com- munication over the lake by steamer. From Territet there is a mountain railway past Glion and Caux nearly to the top of the Rochers de Naye (6710 ft.), while from Vernex the Montreux- Bernese-Oberland railway mounts past Les Avants, pierces the ridge of the Col de Jaman by a tunnel, and so reaches (14 m.) Montbovon in the Gruyere portion of the upper Sarine valley. At first foreigners were attracted by the cheapness and good air of the region, added to the grape cure. As the delights of clear, cold weather in winter and of tobogganing (here called ” luging ") and skiing became appreciated, the higher hotels (such as Les Avants, Caux, Glion) were frequented at that season, as well as at other times. It is stated that in 1902 31,473 foreigners (in 1903, 39,493) visited Montreux, 7634 being Germans, 7327 English, and 5651 French. Montreux was not a Roman settlement, but otherwise its history is similar to that of Vevey.

MONTROND, CASIMIR, Comte de (1768-1843), French diplomatic agent, was the son of a military officer; his mother, Ang61ique Marie d’Arlus, comtesse de

Montrond (d. 1827), was a royalist writer, said to be the author of the Troubadour bearnois, a song which has the refrain ” Louis, lefils de Henri, Est prisonnier dans Paris.” Casimir was imprisoned in 1794 in St Lazare, where he met the divorced duchesse de Fleury (nee Franquetot de

Coigny), the ” jeune captive ” of Andre Chenier’s famous verses. He bought her freedom and his own with ioo louis. They married and crossed to London, but the union proved unhappy, and they were divorced on their return to Paris.

Turning to the fashionable world, Casimir de Montrond became famous for his successes. He was the confidant and political agent of Talleyrand, and his inside knowledge of politics enabled him to make a large fortune on the Bourse. In 1809 he was disgraced for some imprudent comments on the imperial system, and exiled from Paris. After spending some time at Antwerp he removed to Spa, where he was on intimate terms with Pauline Borghese, and in 1811 he returned to Antwerp; here he was arrested by Napoleon’s orders and sent to the fortress of Ham. After a month’s imprisonment he received permission to reside, under police supervision, at Chatillon-sur-Seine, whence he presently escaped to England. He returned to France at the first Bourbon restoration, and during the Hundred Days was entrusted with a mission to Vienna to convert Talleyrand to Napoleon’s interests, to see Metternich and Nesselrode, and to bring back if possible Marie Louise and the king of Rome. The second restoration restored him to his social triumphs, though he was always under police supervision, and on Talleyrand’s fall he accompanied him to Valencay and continued to help with his intrigues. He followed Talleyrand to London in 1832. Montrond returned to Paris some time before his death in

See H. Welschinger, ” L’Ami de M. de Talleyrand,” in the Revue de Paris (Feb. 1895) ; Lanzac de Laborie, La Domination fran- $aise en Belgique (1895); and Amedee Pichot, Souvenirs sur M. de Talleyrand (1870).

MONTROSE, MARQUESSES AND DUKES OF. David Lind- say, 5th earl of Crawford (c. 1440-1495), was created duke of Montrose in 1488 (the first dukedom conferred in Scotland on a person not of royal blood), as a reward for remaining loyal to James III. during the rebellion of Angus and Prince James. Montrose was deprived of his dukedom by James IV., but it was restored in 1489 for life only. On his death in 1495 the title therefore became extinct.

In 1505, William, 4th Lord Graham, whose wife Annabella Drummond was the duke’s niece, was created earl of Montrose; and this title was held by his descendants till 1644, when James Graham, 5th earl, was created marquess of Montrose and earl of Kincardine. This was the celebrated marquess of Montrose (q.v.) of the Civil War, whose son and successor, James (c. 1631-1669), was known as ” the Good Marquess.” The latter refused to vote at the trial of his hereditary enemy the marquess of Argyll in 1661, admitting that he could not act impartially in such a matter; and the two noblemen afterwards became firm friends. The good marquess died in 1669, and was succeeded by his son James, 3rd marquess of Montrose (d. 1684). The 4th marquess, son of the last mentioned, who was also named James (d. 1742), was lord high admiral of Scotland in 1705, and lord president of the council in 1706. He was an ardent supporter of the Hano- verian succession; he also favoured the union of Scotland with England, for his services in regard to which he was created duke of Montrose and marquess of Graham in 1707, becoming in the same year one of the first representative peers of Scotland in the parliament of Great Britain. He was one of the regents of the kingdom on the death of Queen Anne, and was appointed a secretary of state by George I. He took an active part in

suppress- ing the Jacobite rising in 171 5, after which he was made keeper of the great seal in Scotland. He died in 1742. During his life- lime his son David was raised to the peerage of Great Britain with the title of Earl Graham; and on David's death without issue in 1731 this earldom passed under a special remainder to his brother William (c. 1710-1790), who on his father's death in 1742 succeeded to the dukedom also. William's son James, 3rd duke of Montrose (1755-1836), held office in Pitt's administrations in 1783 and 1804, and in that of the duke of Portland in 1807. He obtained the annulment of the law prohibiting Highlanders from wearing the kilt. He.was succeeded by his son James (1799-1874), who held office under the earl of Derby in 1852, and again in 1858

and 1866, and was father of Douglas Beresford Malise Ronald, 5th duke (b. 1852). In 1853 James Lindsay, 24th earl of Craw- ford, claimed the title of duke of Montrose on the ground that the patent granted to his ancestor David Lindsay in 1488 (see above) had not been effectively rescinded, but his petition was dismissed by the House of Lords.

MONTROSE, JAMES GRAHAM, Marquess cf (161 2-1650), was born in 161 2, and became 5th earl of Montrose (see above) by his father's death in 1626. He was educated at St. Andrews, and at the age of seventeen married Magdalene Carnegie, daughter of Lord Carnegie (afterwards earl of Southesk). Not long after the outbreak of the Scottish troubles in 1637 he joined the party of resistance, and was for some time one of its most energetic champions. He had nothing puritanical in his nature, but he shared in the ill-feeling aroused in the Scottish nobility by the political authority given by Charles to the bishops, and by Hamilton's influence with the king, and also in the general indignation at the scheme of imposing upon Scotland a liturgy which had been drawn up at the instigation of the English court and corrected by Archbishop Laud. He signed the Covenant, and was told off to suppress the opposition to the popular cause which arose around Aberdeen and in the country of the Gordons. Three

times, in July 1638, and in March and June 1639, Montrose entered Aberdeen, where he succeeded in effecting his object, on the second occasion carrying off the head of the Gordons, the marquess of Huntly, as a prisoner to Edinburgh, though in so doing, for the first and last time in his life, he violated a safe- conduct.

In July 1639, after the signature of the treaty of Berwick, Montrose was one of the Covenanting leaders who visited Charles. This change of policy on his part, frequently ascribed to the fascination of the king's conversation, arose in reality from the nature of his own convictions. He wished to get rid of the bishops without making presbyters masters of the state. His was essentially a layman's view of the situation. Taking no account of the real forces of the time, he aimed at an ideal form of society in which the clergy should confine themselves to their spiritual duties, and the king, after being enlightened by open communi- cation with the Scottish nation, should maintain law and order without respect of persons. In the Scottish parliament which met in September, Montrose found himself in opposition to Argyll, who had made himself the representative of the Presby- terian and national party, and of the middle classes. Montrose, on the other hand, wished to bring the king's authority to bear upon parliament to defeat this object, and offered him the support of a great number of nobles. He failed, because Charles could not even then consent to abandon the bishops, and because no Scottish party of any weight could be formed unless Presbyterianism were established ecclesiastically.

Rather than give way, Charles prepared in 1640 to invade Scotland. Montrose was of necessity driven to play something of a double part. In August 1640 he signed the Bond of Cumber- nauld as a protest against the " particular and direct practising of a few," in other words, against the ambition of Argyll. But he took his place amongst the defenders of his country, and in the same month he displayed his gallantry in action at the forcing of the Tyne

at Newburn. After the invasion had been crowned with success, Montrose still continued to cherish his now hopeless policy. On the 27th of May 1641 he was summoned before the Committee of Estates charged with intrigues against Argyll, and on the nth of June he was imprisoned in Edinburgh Castle. When Charles visited Scotland to give his formal assent to the abolition of Episcopacy, Montrose communicated to him his belief that Hamilton was a traitor. It had indeed been alleged, on Clarendon's authority, that he proposed to murder Hamilton and Argyll; but this is in all probability only one of Clarendon's many blunders. (See S. R. Gardiner, Hist, of England, 1603-1642, x. 26). Upon the king's return to England Montrose shared in the amnesty which was tacitly accorded to ail Charles's partisans.

For a time Montrose retired, perforce, from public life. After the Civil War began in England (see Great Rebellion) he

constantly pressed Charles to allow him to make a diversion in Scotland. Hamilton's impracticable policy of keeping Scotland neutral for long stood in the way of Charles's consent. But in 1644, when a Scottish army entered England to take part against the king, Montrose, now created a marquess, was at last allowed to try what he could do. He set out to invade Scotland with about 1000 men. But his followers deserted, and his condition appeared hopeless. Disguised as a groom, he started on the 18th of August with only two gentlemen to make his way to the Highlands. Highlanders had never before been known to com- bine together, but Montrose knew that most of the clans detested Argyll, and the clans rallied to his summons. About 2000 disciplined Irish soldiers had crossed the sea to assist him. In two campaigns, distinguished by rapidity of movement, he met and defeated his opponents in six battles. At Tippermuir and Aberdeen he routed

Covenanting levies; at Inverlochy he crushed the Campbells, at Auldearn, Alford and Kilsyth his victories were obtained over well-led and disciplined armies. At Dundee he extricated his army from the greatest peril, and actually called his men off from the sack that had begun — a feat beyond the power of any other general in Europe. The fiery enthusiasm of the Gordons and other clans often carried the day, but Montrose relied more upon the disciplined infantry which had followed Alastair Macdonald from Ireland. His strategy at Dundee and Inverlochy, his tactics at Aberdeen, Auldearn and Kilsyth furnished models of the military art, but above all his daring and constancy marked him out as the greatest soldier of the war, Cromwell alone excepted. His career of victory was crowned by the great battle of Kilsyth (Aug. 15, 1645). Now Montrose found himself apparently master of Scotland. In the name of the king, who now appointed him lord-lieutenant and captain-general of Scotland, he summoned a parliament to meet at Glasgow on the 20th of October, in which he no doubt hoped to reconcile loyal obedience to the king with the establishment of a non-political Presbyterian clergy. That parliament never met. Charles had been defeated at Naseby on the 14th of June, and Montrose must come to his help if there was to be still a king to proclaim. David Leslie, the best of the Scottish generals, was promptly despatched against Montrose to anticipate the in- vasion. On the 12th of September he came upon Montrose, deserted by his Highlanders and guarded only by a little group of followers, at Philiphaugh. He won an easy victory. Mon- trose cut his way through to the Highlands; but he failed to organize an army. In September 1646 he embarked for Norway.

Montrose was to appear once more on the stage of Scottish history. In June 1649, burning to revenge the death of the king, he was restored by the exile Charles II. to the now nominal lieutenancy of Scotland. Charles however did not scruple shortly afterwards to disavow his noblest supporter in order to become a king on terms dictated by Argyll and

Argyll's adherents. In March 1650 Montrose landed in the Orkneys to take the com- mand of a small force which he had sent on before him. Crossing to the mainland, he tried in vain to raise the clans, and on the 27th of April he was surprised and routed at Carbiesdale in Ross-shire. After wandering for some time he was surrendered by Macleod of Assynt, to whose protection, in ignorance of Macleod's political enmity, he had entrusted himself. He was brought a prisoner to Edinburgh, and on the 20th of May sentenced to death by the parliament. He was hanged on the 21st, with Wishart's laudatory biography of him put round his neck. To the last he protested that he was a real Covenanter and a loyal subject.

The principal authorities for Montrose's career are Wishart's Res gestae, &e. (Amsterdam, 1647); Patrick Gordon's Short Abridg- ment of Britane's Distemper (Spalding Club) ; and the comprehensive work of Napier, Memorials of Montrose, is abundantly documented, containing Montrose's poetry, in which is included his celebrated lyric " My dear and only love."

MONTROSE, a royal, municipal, and police burgh and seaport of Forfarshire, Scotland. It is situated 30! m. N.E. of Dundee by the North British railway and is also connected with the Caledonian railway company's system by a branch to Dubton. Pop. (1901), 12,427. The town occupies a considerable area on a

sandy peninsula, and is bounded on the E. by the North Sea, on the N. by the North Esk, on the S. by the South Esk, and. on the W. by Montrose Basin, a large depression, about 7 m. in circuit. The reclamation of the Basin has been attempted, but an embankment constructed by Dutch dikers for this purpose was demolished in a few hours by a storm. In the mouth of the channel of the South Esk lies the island of Rossie, or Inchbrayock (pop. 160), which in 1829 was connected with the burgh by means of a suspension bridge 432 ft. long and by a drawbridge with the south bank near the fishing village of Ferryden (pop. 1330). The harbour lies between the

suspension bridge and the sea, and is provided with a wet dock. The links form one of the best golf-courses in Scotland and are played over by several clubs. Besides the staple industry of flax-spinning, there are manufactures of linen, canvas, sheetings, starch, soap, chemicals, rope and manures, while iron-founding, tanning and brewing are also carried on. The fisheries are of very consider- able importance and the shipping is usually brisk. There is a large trade, especially in timber (the chief import), mainly with Baltic ports and Canada. The parish church is a plain structure, but has a handsome steeple 200 ft. high. The principal buildings include the town-hall, the academy on the links, dating from 1820, though its predecessor belonged to the 1 6th century; the museum, Dorward's house of refuge, erected in 1839; the infirmary and the royal asylum at Sunnyside on the outskirts to the north-west. Panmure barracks are not far from the wet dock. In High Street are statues to Sir Robert Peel and Joseph Hume. Montrose is governed by a provost, bailies and council, and unites with Arbroath, Brechin, Forfar and Inverbervie (the Montrose burghs) in returning one member to parliament, a district group that was represented for many years by John Morley. Montrose received its charter from David I., and was made a royal burgh in 1352. It was destroyed by fire in 1244. Here Edward I. accepted John Baliol's surrender of the kingdom on the 10th of July 1296. Sir James Douglas sailed from the port in 1330 bound for the Holy Land with the heart of Robert Bruce; and here, too, the Old Pretender embarked in 1716 for France after the failure of his cause. In 1745 the town threw in its lot with the Hanoverians, a fact which lent zest to the daring capture of the " Hazard " sloop of war off Ferryden, by Captain David Ferrier of Brechin, a thorough-going Jacobite.

MONT ST MICHEL, a rocky islet of western France, off the coast of the department of Manche, some 6 m. N. of Pontorson. Pop. (1906), 238. It forms a towering mass of granite about 3000 ft. in circumference and 165 ft. in height, rising near the mouth of the

Couesnon nearly a mile from the shore, to which it is united by a causeway. The fortress-abbey to which Mont St Michel owes its fame stands upon the more precipitous side of the islet towards the north and west, the sloping portion towards the east and south being occupied by houses. A strong machicolated and turreted wall surrounds the rock, running along its base on the south, ascending half- way up the cliff on the north, on which side it stands close to the abbey wall, and again descending on the west. The northern and oldest portion of the ramparts dates from the 13th century; the single gateway by which they are pierced is on the south and is a good example of the military architec- ture of the 15th century. The single street of the island curves from the gateway up to the abbey, ending in flights of steps leading to the donjon or chatelet. It is bordered by old houses, among which is one built by Bertrand du Guesclin in 1366, and contains a parish church of the 15th century. The abbey itself consists of an assemblage of buildings in three storeys upon massive foundations around the church, the most important portion, the Merveille, extending to the north. The floor of the church, built partly on the rock, partly upon founda- tions, and, at the east end, over a crypt, is on a level with the uppermost storey of the monastic buildings. To the north of and below the apse lies the group of buildings known as the Belle- Chaise. It comprises the chatelet (15th century), a square entrance structure strengthened by flanking turrets and machico- lation, the adjoining guard-room (13th century) with the salle

des ofnciers above it, and behind all the Tour Perrine. The Merveille (i 203-1 264) consists of two continuous buildings of three storeys, that on the east containing, one above the other, the hospitium (aumdnerie), refectory and dormitory, that on the west the cellar, knights’ hall (salle des chevaliers) and cloister. Of the apartments, all of

the finest Gothic architecture, the chief are the refectory, divided down the centre by columns and lighted by large embrasured windows, and the knights' hall, a superb chamber, the vaulting of which is supported on three rows of cylindrical pillars. The cloister, one of the purest and most graceful works of the 13th century, is surrounded by double lines of slender columns carrying pointed arcades, between which delicate floral designs are carved. The exterior wall of the Merveille is of remarkable boldness; reaching a height of 108 ft., it is supported by twenty buttresses and pierced with a variety of openings. The church, which rises high above the buildings clustering round it, consists of transepts and four bays of the nave of Romanesque architecture and of a fine choir (1450–1 521) in the Flamboyant Gothic style with a triforium surmounted by lofty windows. This choir replaced one which collapsed in 1431. In 1776 three of the seven bays of the nave were pulled down, and soon after the incongruous western front was added. The finest part of the exterior is the choir, which is ornamented with a profusion of carved pinnacles and balustrading. The central tower terminates in a Gothic spire surmounted by a gilded bronze statue of St Michael.

Mont St Michel was a sacred place from the earliest times. In the 8th century an oratory was established there by St Aubert, bishop of Avranches, in obedience to the commands of an appari- tion of St Michael. The place soon became a noted resort of pilgrims, not only from all parts of France, but also from Great Britain, Ireland and Italy. In 966 Richard I., duke of Normandy, founded in place of the oratory a Benedictine monastery, which in the succeeding century received a considerable share of the spoils of the conquest of England. In 1203 the monastery was burnt by the troops of Philip Augustus, who afterwards furnished large sums for its restoration (La Merveille). St Louis made a pilgrimage to Mont St Michel, and afterwards supplied funds which were spent on the fortifications. A garrison and military governor

subordinate to the abbot were also installed. During the last thirty years of the Hundred Years' War the abbey offered a persistent resistance to the English. In 1469 Louis XL instituted the Order of St Michel, which held its meetings in the salle des chevaliers. During the Wars of Religion, the Huguenots repeatedly made unsuccessful attempts to seize the fortress, which opened its gates to Henry IV. in 1595 after his abjuration. In 1622 the Benedictine monks of Mont St Michel were replaced by monks of the Congregation of St Maur. In the 18th and 19th centuries the abbey was used as a prison for political offenders, serving this purpose until 1863, when an extensive restoration, begun in 1838, was resumed. The building is the property of the Commission of Historical Monuments, which has carried on the work of restoration with great architectural and antiquarian ability.

MONTSERRAT, or Monserrat, a remarkable mountain and monastery in north-east Spain, 30 m. N.W. of Barcelona. The mountain is of grey conglomerate; its main axis trends from W.N.W. to E.S.E., and its circumference is about 18 m. The loftiest point is the Turo de San Jeronimo, also called Mirador and La Miranda (4070 ft.), which commands a view of the Pyrenees, and the Mediterranean Sea as far as the Balearic Islands. On the east the base of the Montserrat is washed by the river Llobregat. The Montserrat consists of jagged pinnacles and spires {penascos) rising abruptly from the base of the mass, which is cloven by many ravines, and- abounds with steep precipices. It is the mons serratus of the Romans, the monte serrado of the Spaniards, and is thus named either in allusion to its jagged appearance, like the teeth of a saw, or because it is split, as if sawn by the vast fissure of the Valle Malo, which extends from north-west to east. This occurred, say the Spanish legends, at the time of the Crucifixion, when the rocks were rent. In medieval German legends, which located here the castle of the Holy Grail, the

mountain is called Monsalwatsch, a name analogous to the modern Catalan form Montsagrat " sacred

mountain." From Monistrol, a village on the north-east, with a station on the Barcelona-Lerida railway, the monastery can be reached either by the carriage road built in 1857, or by the mountain railway opened in 1892. The ascent is also frequently made by a bridle path from the village of Collbato, on the south-west, where there are some interesting caverns.

The monastery stands 2910 ft. above sea-level upon a narrow platform on the edge of the Valle Malo. It owes its existence to an image of the Virgin, said to have been carved by St Luke, and brought to Barcelona by St Peter in a.d. 30. When the Moors invaded the province in 717 the image was taken to Montserrat, where a Benedictine convent appears to have already existed, and hidden in a cave. In 880 Gondemar, bishop of Vich, was attracted to the cave by sweet sounds and smells, and there found the image, which he determined to take to Manresa. But at a certain spot on the mountain the image refused to proceed farther; there it was consequently deposited, and a chapel was erected to contain it. Round the chapel a nunnery was built, and in 976 this was enlarged and converted into a second Benedictine convent. The old monastery (monas- terio antiguo) is chiefly in ruins. The cloisters, belfry and part of the church were Gothic of the 1 5th century. The church of the new monastery (monasteyio actual) was built in Renaissance style under Philip II. (1 560-1 592) ; in 181 1 it was partially burned, and in 1880 a Romanesque apse was added. New buildings for the monks were erected under Ferdinand VII. (1784-1833), but left partly unfinished. During the Napoleonic wars (1808-14) it was despoiled of the vast treasures which had accumulated during the middle ages. In 1835, as a result of the Carlist insurrection, the convent was deprived of its estates and the number of monks reduced to about twenty. The monks are largely occupied by the management of a school of sacred music. In 1874 the convent, which by a grant of Pope Benedict XIII. had been an independent abbey since 1410, was made subject to the bishops of Barcelona.

Nuestra Sefiora de Montserrat, Patrona de Cataluna (" Our Lady of Montserrat, Patron Saint of Catalonia "), is one of the most celebrated images in Spain, and her church is visited annually by more than 60,000 pilgrims. The image is small, black, and carved of wood, but possesses magnificent robes and jewels. In September 1881 it was solemnly crowned by Leo XIII., who sent a crown from Rome for that purpose. As the celebrity and sanctity of Montserrat increased, so did the number of devotees. Ignatius Loyola (1491–1556) laid his sword upon the altar of the Virgin, and, placing himself under her protection, started from Mont- serrat to begin his new life. Many eminent Spaniards, weary of the world, have retired to this monastery to end their days. Some preferred solitary hermitages perched among the rocks. Of these there were fifteen, eleven of which once formed a via sacra, ending at the summit of San Jeronimo. They were destroyed by the French, but the ruins of some remain. There are also caves in the mountain, some of which were formerly occupied by monks. The most celebrated of these are the cave of the Virgin, in which the santa imagen remained hidden until found by Gondemar, and the cave of Fray Juan Garin, a notorious sinner, who ended his days in the practice of revolting penances at Montserrat.

MONTSERRAT, an island in the British West Indies, one of the five presidencies in the colony of the Leeward Islands. Pop., mostly negroes (1901)* 12,215. It lies 27 m. S.W. of Antigua, in 16° 45′ N. and 62° 7′ W.; is n m. long and 7 m. broad, and has a total area of 32I sq. m. The island is a cluster of rugged volcanic peaks rising from the Caribbean Sea, their summits clothed with forests; the still active Soufriere (3000 ft.) in the south being the highest point. The average temperature is 8i° F., the hottest weather being usually tempered by cool sea breezes; the rainfall averages 94 in. per annum. There is a plentiful supply of water, and the roads are macadamized and well drained. The principal products are sugar and raw and concentrated lime-juice. Minerals are also found. Montserrat has a

local legislature of six members, nominated by the Crown, and sends representatives to the general legislative council of the colony. Education is compulsory, and the majority of the schools are managed by the Church of England, to which most of the islanders belong; but the Wesleyans and the Roman

Catholics also support schools. Plymouth (pop. 1461), the chief town, stands on an open roadstead on the south-west coast.

The island was discovered by Columbus in 1493, who named it after Monserrado, a mountain in Spain. It was colonized by the British under Sir Thomas Warner in 1632, and was taken by the French in 1664. Restored to the British in 1668, it capitu- lated to the French in 1782, but was again restored in 1784.

MONTT, MANUEL '(1809-1880), Chilean statesman, was born on the 5th of September 1809. He had a distinguished career as a scholar, and was introduced into public life during the presidency (1831-1841) of Arieto by Diego Portales. Montt distinguished himself by his courage in the crisis that followed upon Portales' assassination in 1837, though only holding a sub- ordinate post in the government, and afterwards he held several ministerial offices, and during the presidency (1841-1851) of Bulnes he became minister of justice and public instruction, and later of the interior. He was elected president in 1851 and again in 1856, and though the Liberals chafed under his rule, and two revolutions, in 1851 and 1859, took place during his administra- tion, he governed Chile with an energy and wisdom that laid the foundation of her material prosperity. He was ably assisted by his minister of the interior Antonio Varas, and it was from the union of the two statesmen that the well-known ultra-conserva- tive faction, the Montt-Varistas, took their name. His presid- ency was

marked by the establishment of railways, telegraphs, banks, schools and training-colleges. Qn giving up his post in 1 86 1 he became president of the Supreme Court of Justice, a position which he held up to his death on the 20th of September 1880. His son Jorje (b. 1846) was president of Chile in 1891-1896, and a younger son, Pedro (d. 1910), in 1906-1910.

See P. B. Figueroa, Diccionario biografico de Chile, 1550-1887 (Santiago, 1888); and J. B. Suarez, Rasgos biograficos de hombres notables de Chile (Valparaiso, 1886).

MONTUCLA, JEAN ETIENNE (1725-1799), French mathematician, was born at Lyons on the 5th of September 1725. In 1754 he published an anonymous treatise entitled Histoire des recherches sur la quadrature du cercle, and in 1758 the first part of his great work, Histoire des mathimatiques, the first history of mathematics worthy of the name. He was appointed intendant- secretary of Grenoble in 1758, secretary to the expedition for colonizing Cayenne in 1764, and ” premier commis des batiments ” and censor-royal for mathematical books in 1765. The Revolution deprived him of his income and left him in great destitution. The offer in 1795 of a mathematical chair in. one of the schools of Paris was declined on account of his infirm health, and he was still in straitened cirumstances in 1798, when he published a second edition of the first part of his Histoire. In 1778 he re-edited Jacques Ozanam’s Recreations mathimatiques, after- wards published in English by Charles Hutton (4 vols., London, 1803). He died on the 18th of December 1799. His Histoire was completed by J. J. Le F. de Lalande, and published at Paris in 1799-1802 (4 vols.).

MONTYON, ANTOINE JEAN BAPTISTE ROBERT AUGET, Baron de (1733-1820), French philanthropist, was born in Paris on the 23rd of December 1733. His father was a maitre des comptes; he was educated for the law, and became advocate at the Chatelet in 1755, master of requests to the council of state in 1760, and intendant successively of Auvergne, Provence and La

Rochelle. He had repeatedly shown great independence of character, protesting against the accusation of Caradeuc de La Chalotais in 1766, and refusing in 1771 to suppress the local courts of justice in obedience to Maupeou. He was made a councillor of state in 1775 by the influence of Louis de Bourbon, duke of Penthievre, and in 1780 he was attached to the court in the honorary office of chancellor to the comte d'Artois (after- wards Charles X.). He followed the princes into exile, and lived for some years in London. During the emigration period he spent large sums on the alleviation of the poverty of his fellow immigrants, returning to France only at the second restoration. Between 1780 and 1787 he had founded a series of prizes, the awards to be made by the French academy and the academies of science and medicine. These prizes fell into abeyance during

the revolutionary period, but were re-established in 181 5. Montyon died on the 29th of December 1820, bequeathing 10,000 francs for the perpetual endowment of each of the following prizes: for the discovery of the means of rendering some mechanical process less dangerous to the workman; for the perfecting of any technical improvement in a mechanical process; for the book which during the year rendered the greatest service to humanity; the " prix de vertu " for the most courageous act on the part of a poor Frenchman — the awards being left as before to the learned academies. He also left 10,000 francs to each of the Parisian hospitals.

Montyon wrote a series of works, chiefly on political economy : £loge de Michel de Vhopital (Paris, 1777) ; Recherches et considerations sur la population de la France (1778), a share of which is attributed to his secretary, Moheau ; Rapport fait d, Louis XVIII. (Constance, 1796), in which he maintained in opposition to Calonne's Tableau de I'Europe that France had always possessed a constitution, which had, however, been violated by the kings of France; L'etat statistique du Tunkin (181 1); and ParticularitSs . . . sur les minis- tres des finances en France (18 12).

See Lacretelle,. ” Discours sur M. Montyon,” in the Recueil de I’ academie (1820-1829) ; Querard.io France litteraire, vol. vi. (1834); and, further, F. Labour, M. de Montyon d’apres des documents inedits (Paris, 1880) ; G. Dumoulin, Montyon (Paris, 1884) ; and especially L. Guimbaud, Auget de Montyon (1909).

MONUMENT (Lat. monumentum or monimentum; from monere, to advise, bring to mind, remind; the German equivalent is Denkmal), literally that which serves to keep alive the memory of a person, an event, or a period. The word is thus applied to a column, statue, or building erected for that particular purpose, as ” The Monument ” (i.e. of the Great Fire) in London; to all the various memorials which man throughout the ages has raised over the buried dead, the barrows and cairns of pre- historic times, the representation of the living figure of the dead, brasses, busts, &c, or the varying forms, allegorical or otherwise, taken by the tombstones of the modern cemetery. In a wider sense ” monument ” is used of all survivals of a past age, in which sense it may include all the vestiges of prehistoric man, dolmens, menhirs, remains of lake-dwellings, stone-circles, and the like, buildings large and small, cities, castles, palaces, and examples of domestic architecture, which have any interest, historic or artistic, as well as movable artistic or archaeological treasures, which exist in private or public collections, or which are discovered by excavation, &c. In a more restricted sense the word ” monument ” is also applied to a comprehensive treatise on any particular subject — such as the Monumenta typographic^ or an historical collection such as the Monumenta Germaniae historica. In the English law of conveyancing a ” monument ” is an object fixed in the soil, whether natural or artificial, and referred to in a document, and used as evidence for the delineation of boundaries or the situation of a particular plot of land, &c.

For a description of various kinds of monuments see such articles as Archaeology; Stone Monuments; Effigies, Monumental; Brasses; Sculpture; many particular monu- ments, such as Stonehenge, are

treated under their respective names, or in the articles on the towns, &c, in which they stand.

The present article deals with the preservation, by government action, local or central, of the evidences and remains of past history and civilization, and, incidentally, with similar action extended to sites and places of natural beauty and interest, which the Germans call Naturdenkmdler, natural monuments. The important work of G. Baldwin Brown, The Care of Ancient Monu- ments, published in 1905, is practically the only book in English on this subject. It contains a most ample bibliography for each country and gives many references to various periodicals in different languages. In 1897 was issued a report (C. 8443, Miscell. Reports, 2) from British representatives abroad as to ” the statutory provisions existing in foreign countries for the preservation of historical buildings.” Reference also should be made to The Care of Natural Monuments (1909), by H. Con wentz, Prussian State Commissioner for the Care of Natural Monuments.

The chief question at issue is, how far does the national

artistic or historic interest of a monument, in the widest sense of the word, justify the interference of the state with the right of a private owner, whether corporate body or individual, to do what he likes with his own? Nearly every European country other than the United Kingdom has given a decided answer to this question. It may be noticed, as showing the extreme reluctance to state interference in the United Kingdom, that a clause, laying on an owner of a monument, scheduled under the Monu- ment Act 1882, the obligation of offering it for purchase to the state if he wished to destroy it, was struck out of that act.

The main lines followed by legislation or regulation

for the preservation of monuments may be briefly indicated. Central organizations of commissions and conservators, with a staff of architects, inspectors, and archaeological or artistic experts for consultation, are established. These may have large legal powers of enforcing their decisions, or may act chiefly by advice or persuasion. The national treasures are catalogued and scheduled, and the value estimated in an exhaustive inventory, in many cases supplemented by local inventories. In many cases, unfortunately, a valuable monument has been destroyed through ignorance of its value. A special form of inventory, carrying with it legal consequences, is that known as the classement system; of this form the French is the typical example. In this only the outstanding monuments find a place, and such either become national property altogether, or the protection and preservation is undertaken by the state, or may be left in the hands of the private owner; but in any case the monument cannot be destroyed, restored or repaired without the consent of the central authority. The classement system has been criticized as tending to depreciate the consideration paid to such monu- ments as do not appear in the list — monuments non-class&s. The British Monument Acts adopt a narrow kind of classe- ment in the schedule attached to the 1882 act. Most states have powers of expropriation or compulsory purchase of private property on grounds of public utility, and English law is no exception — as in the case of the compulsory purchase of land for railways. The majority of states have made the pro- tection of monuments such a matter of public utility. Further, the exportation of artistic or historic treasures, i. e. movable monuments, has been controlled by the state, notably in the case of Italy and Greece, Turkey and Egypt. Connected with this side of the question is the control by the state of excavations undertaken by private persons, even on their own property. In Germany considerable protection is effected by the powers given to municipalities to make by-laws, respecting not only the preservation of the monuments, but also the erection of new buildings that may interfere with

the monuments or with the general characteristic appearance (Stadtbild) of the town. This is also the case in Italy, where there are frequent regulations as to town-planning (piano regolamentd) .

The following is a brief account of the measures adopted in the principal countries of the world for the preservation and protection of their artistic and historic treasures.

United Kingdom. — There are four acts: the Ancient Monu- ments Protection Acts of 1882, 1900 and iqio, and the Ancient Monuments Protection (Ireland) Act 1892. The act of 1882, due primarily to Lord Avebury, then Sir John Lubbock, provided that a list of monuments 1 in Great Britain and Ireland should be made to which the act was to apply; the number of these monuments was sixty-eight, all being of the kind known as prehistoric (barrows, stone-circles, dolmens, &c). An owner of one of these scheduled monuments may by deed place it in the guardianship of the commissioners of works, who are then responsible for its preservation and can protect it even against the owner. The commissioners may purchase any of the scheduled monuments, but only by agreement, the compulsory clauses of the Lands Clauses Consolidation Acts being expressly excluded, though any purchase is to be made under those acts. An owner of any monument other

1 The names of the monuments so scheduled are given in an appendix to Sir R. Hunter's Lecture on the Preservation of Places, of Interest and Beauty (1907).

than those scheduled may place it in the care of the com- missioners. The funds for the working of the act are to be provided by parliament, and an inspector of ancient monu- ments was appointed. General Pitt-Rivers, the first inspector appointed, found that without compulsory powers the act was useless, and for many years did not draw his official salary. After his death in 1900 the office was left unfilled until 1910. The act of 1892 applied to Ireland only, and is supplementary to

that of 1882, which applied to the whole of the United Kingdom. The Irish act gave to the commissioners of public works in Ireland powers — only to be exercised with the consent of the owner — of applying the act of 1882 to any monument possessing such public interest as might render it worthy of preservation. It is to be noticed that after the disestablishment of the Irish Church certain unused churches of artistic or historic interest were placed in the charge of the commissioners as national monuments, with a sum of £50,000 to defray expenses. The Irish commissioners have therefore monuments in their care other than those scheduled in the acts, and may apply towards the expenses of the preservation of the scheduled monuments any surplus over from the fund above mentioned. The act of 1900 applied the Irish act to Great Britain, but the powers have not been exercised by the first commissioner of works. The act also gave the powers of the act of 1892 to county councils, allowed the authorities, local or central, to make arrangements for the preservation of monuments with owners or others, including societies, and to receive subscriptions for the same object, and also provided for public access to such monuments as are in the guardianship of the commissioners under the act. The acts of 1892 and 1900, though allowing buildings of historic or other interest to be placed under the care of the commissioners, exclude buildings occupied as a dwelling-place by any person other than a caretaker and his family. The act of 1910 gives to the commissioners of works power to acquire by bequest buildings of historic or architectural interest. The act of 1900 had given power to acquire such by gift or purchase, and the act of 1882 had given power by bequest also, but only referred to prehistoric remains. The London County Council possesses powers of purchasing by agreement any building of historic or other interest under a General Powers Act of 1898, and exercised these in 1900 by purchasing a 17th century house in Fleet Street (known as Cardinal Wolsey's palace). It will be seen that the United Kingdom possesses no official commission, no

conservators, no consultative official body, and no compulsory powers of expro- priation. The acts dealing with the subject are entirely permis- sive. Towards the making of a national inventory the first step taken was the appointment in 1908 of three royal commissions, for England, Scotland and Wales respectively, ” to make an inventory of the ancient and historical monuments and construc- tions connected with or illustrative of the contemporary culture, civilization and conditions of life of the people from the earliest times “: to the year 1700 in the case of England; 1707 in that of Scotland; for Wales no date is specified; and ” to specify those which seem worthy of preservation.” The Housing, Town Plan- ning, &c. Act 1909, §45, and the Development and Road Im- provement Funds Act, 1909, excepts the sites of ancient monu- ments or of other objects of historical interest from compulsory acquisition for the purposes of those acts. The Finance Act 1896, §20, granted a qualified exemption from estate duty to pictures, prints, books, MSS., works of art, scientific collections and other things not yielding income, as appear to the Treasury to be of national, scientific or historic interest; this exemption only ex- tends where such property is settled to be enjoyed in kind in succession by different persons; if the property is sold or is in the possession of a person competent to dispose of it, it becomes liable to estate duty. The Finance Act 1909 extends the exemption to legacy and succession duty, removes the restriction to settled property, and adds ” artistic ” to ” national and historic interest.” The Committee for the Survey of the Memorials of Greater London, supported by the London County Council, has begun a complete register and survey of the historic buildings of London. Apart from the numerous national and archaeological

societies, whose proceedings contain invaluable accounts of practically every monument of interest

throughout the kingdom, there are two societies directly formed with the object of monument preservation in its widest sense, the Society for the Protection of Ancient Buildings, founded in 1877, and the National Trust for Places of Historic Interest and Natural Beauty, constituted in 1894 under the Joint Stock Companies Acts for the purchase and preservation of sites and buildings, which it can hold in perpetuity for the benefit of the public. In 1907 the latter was dissolved and re-incorporated as a statutory body by the National Trust Act 1907. It possesses twenty- eight properties, amounting to 2000 acres, and twelve interesting buildings.

India. — The Archaeological Survey of Upper India was estab- lished in 1862, with a director-general at its head, and surveys for other parts of India were also begun later. The chief object of these was the making of an inventory, and the preservation of the monuments was neglected. In 1878 a curator of ancient monuments was appointed. A period of activity with regard to monument preservation set in during the viceroyalty of Lord Curzon; this culminated in the Ancient Monuments Preservation Act of 1904. The main provisions are as follows: The local government of any province may declare any monument to be a ” protected monument within the meaning of the act,” and when so declared no one may injure, remove or alter it under penalty of a fine or imprisonment. This, however, does not apply to the owner, except when the government has, by purchase or gift, or by taking over the guardianship of the monument, assumed the duty of preserving it. This assumption of guardianship is by agreement with the owner. Power of expropriation under the Land Acquisition Act 1894 is given if a monument protected under the act is threatened with destruction or injury, or if an owner refuse to come to an agreement with the authority for its guardianship. The act includes movable antiquities, and the governor-general in council can prohibit their exportation. Control over excavations is also given.

Egypt. — A Commission of Egyptology (Comiti permanent d'Sgyptologie) has the care of the monuments of early Egyptian civilization. The monuments of the Arab occupation afe in the charge of a separate commission {Comiti de conservation des monuments do I'art arabe). The Commission of Egyptology acts under khedival decrees of 1883, 1897 and 1891. By the first the state claims control over all antiquities and declares the contents of the Giza (Gizeh) Museum, now the National Museum of Egyptian Antiquities, and of any future collection, to be the property of the state and inalienable. The second decree penal- izes any injury to monuments or attempt to appropriate a monument belonging to the state. The third deals with excava- tions; permission must be granted by the director-general of museums; objects discovered belong to the state and must go to the museum, but a part of the objects will be granted to the discoverer under special regulations, the government reserving the right to special objects with compensation for the expense of excavation.

France.— The Commission des monuments historiques was established in 1837. It is attached to and acts through the department of the minister of public instruction and of the fine arts, who is the president of the commission. There are thirty members, partly nominated by the minister out of names selected by the commission, partly ex officio, such as the directors of civil buildings and national palaces and of public worship. The buildings which these officials control are, however, not directly under the commission. The presence of a certain number of deputies on the commission secures its representation in the legislature. Upon the commission fall the following duties: (a) The classement or selection of the monuments of national interest, artistic, historic, or both, for the schedule of protected monu- ments. A particular portion of a building, such as a door, window, &c, may be alone protected, (b) The restoration and repair of the monuments so classed, (c) A general power of giving advice and watching

the monuments of the country as a whole. The commission has the charge of the Musee Cluny, and

is also the centre for all inquiries, reports, &c. The official staff of the commission consists of four general inspectors, one of whom, since the Monument Act of 1887, has charge of the movable monuments, and of forty architects, who have a subordinate staff of inspectors of works. Since 1830 a sum has been voted yearly for the finances of the commission. The largest sum (£120,000) that has appeared in the budget was voted in 1896; there are, however, other sources of revenue available.

The Monument Act of 1887. — This, together with certain administrative decrees, gave legal powers to the commission, which it had hitherto lacked, or had only been able to enforce by a difficult process of expropriation if owners, whether private or public, of monuments classes objected to the work of the com- mission. If a monument classS belong to the state or is under the administration of a minister other than the minister of public instruction and fine arts, or if it belong to any public body, such as a department or commune in whose hands the churches mainly lie, the consent of these controlling bodies must be given, other- wise the decision is left to the conseil d'etat. If the owner be a private person, his consent is also necessary to the classement. If he refuses, the minister may expropriate the monument by compulsory purchase, which must have the consent of the conseil d'itat. Once a monument has been classe, it cannot be destroyed even partially, and no repairs or other work can be effected upon it without the consent of the minister. An action, for damages only, lies against a person infringing the law in this respect. The act deals also with the classement and protection of movable objects of national interest, historic or artistic, but only if they belong to the state, when they cannot be alienated, or to public bodies, when the consent of the minister is required for repairs or alienation. The act does not affect movables belonging to private persons. Owing to the numerous thefts from churches, museums, and other

places, which attracted particular attention in 1907, proposals have been made for the better protection of such objects, as well as of those in private collections, by gather- ing together the objects at present scattered in churches, &c, into provincial and local museums, and also by charging an entrance fee for museums, &c. With regard to the discovery of monuments by excavation works or accident, the minister must receive immediate notice from the mayor of the commune through the prefect of the department, and will decide what is to be done. If such discovery is on private property he may proceed to expropriation. The act applies to Algeria. Here all objects of archaeological or artistic interest are reserved to the state, if on ground belonging to the government or granted by it to public bodies or private persons or in military occupation. The act is similarly extended to all French protectorates. Tunis has more stringent regulations; for by a decree of the bey, 1886, the consent of the owner to the classement of a monument is not required, and penalties under the French penal code attach to infringements.

There is a strong feeling in France as to the protection and preservation of sites of natural beauty. A Societe pour la pro- tection des pay sages was founded in 1901, and in 1904 the minister of public works issued a circular to the government engineers emphasizing the obligation of preserving and, if possible, enhanc- ing the natural beauties of any locality in which public works were being carried out. An act (Loi organisant la protection des sites et monuments naturels de caractere artistique) was adopted in 1906, extending a protection to such sites analogous to that under the Monument Act (Appendix B in Sir R. Hunter’s Lecture, already cited, gives the regulations under this measure).

A law of 1 9 10 prohibits the affixing of bills or advertisements on monuments and sites officially recognized as historical and in sites recognized as picturesque by the law of 1906. The prefect also fixes a zone near such sites or monuments within

which advertisement is prohibited.

Societies, both national and local, are numerous and active in France, but the centralizing policy does not favour any close working with the commission. The most important are the Society nationale des anliquaires de France, founded in 1804, and the Societe jranqaise d'archeologie pour la conservation et

description des monuments historiques, founded in 1834, by the archaeologist Arcisse de Caumont (1802–1873). Its publication, the Bulletin monumental, is extremely valuable. In 1887 was founded the Comite des monuments jranQais, which confines itself more particularly to the practical side of monument preservation and protection, and publishes an illustrated periodical, L' Ami des monuments. Of the numerous local societies the semi-official Commission du vieux Paris and the private Societe des amis des monuments parisiens and the Commission municipale du vieux Lyon may be mentioned.

Germany. — Legislation and administration with regard to monuments and their protection are not imperial, but are matters for the various states. Of these Hesse-Darmstadt alone has a Monument Act (1902), but in nearly all the states the system adopted for monument preservation and protection has been the appointment of conservators (Denkmalpfleger) , with commissions attached, and a careful system of inventory. There are also in many of the states decrees and administrative orders. In Prussia provincial conservators and commissions, appointed in 1 89 1, assist the central conservator. The general absence of special legislation leaves private owners of monuments amenable only to advice and persuasion and to the pressure of public opinion. The official and legal control exercised by the conservators and commissions is restricted to

those monuments which belong to the state. The wide powers, however, given to local and municipal authorities in Germany, enable much to be done without state legislation. Many towns have powers to make by-laws regulating building and street-planning with a view not only of the preservation of the actual monuments but also of what is known as Siadtbild, the characteristic appearance given to a town by its ancient buildings, walls, gateways, &c. The regulations of many of the Bavarian towns are excellent examples of what can be done in this way.

The final control of the monuments of Hesse-Darmstadt is in the hands of the minister of the interior, who presides over a Denkmalrat, or council on monuments, consisting of owners of historical monuments, members of societies interested in such objects, and representatives of the Catholic and Protestant Churches. There is also a general conservator. The act protects Naturdenkmaler, such as water-courses, rocks, and even trees. No excavations can be carried on without permission, and all finds must be reported to the local authority.

The principal German society is the Gesamtverein der deutschen Geschichts- und Altertumsverein, founded in 1852. This is a general association of all the various societies throughout Germany. There are also many societies in the various towns, as well as local associations more directly concerned with the practical protection and preservation of monuments. The chief periodical — perhaps the most important of any dealing with the subject in Europe — is Die Denkmalpflege, published first in 1899. It is connected with the society known as Heimatschutz, the ” defence of home.”

[Italy. — There is a long history of monument regulation, dating back to a provision against the destruction of monuments in the statutes of the city of Rome of the 14th century and to the appointment of Raphael by Leo X. as controller of the city’s monuments. Throughout the various states of Italy during the 17th, 18th and 19th centuries till the

unification of the kingdom, stringent regulations by decree or statute were in force to preserve the relics of the past in which the country is so peculiarly rich. Mariotti (La Legislazione delle belle arti, 1892) gives a full account of many of these regulations. It must suffice here to mention the Doria Pamphili Edict of 1802 and the Pacca Edict of 1820, named after the two Cardinal-Camerlenghi subscribing the same. It was not until 1902 that an act was passed for the whole of Italy. This act, with a supplementary act of 1903, and the code of regulations (Regolamento) of 1904, has been superseded by the acts of 1907 and 1909 and the Regolamento of 1910, which constitute the whole body of the provisions in force for the protection of monuments. The minister of public instruction is the final authority, and under him the director-general of antiquities and fine arts.

The Superior Council of Antiquities and Fine Arts, created by the law of 1907, consists of 21 members; it is divided into three sections of 7 members each for antiquities, medieval and modern art, and contemporary art respectively. All the members of each, are nominated by royal decree, and so are three members of the third, being elected, one by the architects, one by the sculptors, and one by the painters of Italy. This is an advisory body. The minister presides, and the director-general can be present and has a vote. The administrative organization under the director-general consists of the divisional superintendencies (each having a group of provinces under it) divided into three categories: (a) 18 superintendencies of monuments (preservation, administration, and surveillance of monuments even in private hands); (b) 14 superintendencies of archaeological excavations and museums (with control of objects in private hands and of the offices for exportation); (c) 15 superintendencies of galleries, medieval and modern museums and objects of art. Under each superintendent is a staff of directors of monuments, museums and galleries, of inspectors, architects, secretaries, custodians, &c. The nominations to the

superior grades are by competition. There are offices for the examination of objects before exporta- tion in those towns in which there reside a superintendent of monuments or a director of a gallery or a museum in which it is necessary. The official organizations are assisted by (a) honorary inspectors, nominated by royal decree in any commune or circondario where it may seem advisable; (b) provincial commis- sions, meeting in the chief town of each province, composed of not less than 7 members, nominated by royal decree, and including of right the superintendents, and meeting normally twice a year.

The monuments within the purview of the act of 1909 and its administration comprise all movable (including MSS., incunabula, rare engravings and coins) and immovable objects of historical, archaeological, palaeo-ethnological or artistic value and interest,so long as they are not less than fifty years old nor the work of living persons. Such objects, if they belong to the state, a province, a commune, a religious corporation or any recognized corporation (enle morale), cannot be parted with at all, except as from one such body to another, and this only with the leave of the ministry; and the authorities of such bodies must present to the ministry an inventory of such objects. Nor may repairs or alterations be made to them without the consent of the ministry, which has the right to interfere by regulations (such as, e.g., the prohibition of the use of tapers, &c, which are liable to damage a picture) for the preservation and restoration (and in extreme cases even the removal) of such objects, if necessary, the latter being at the expense of the body to which they belong in so far as it can afford it. Any private person owning or possessing any object falling under the law, the importance and interest of which has been notified to him as the regulations provide, cannot transfer his property in or abandon his possession of it without informing the ministry, which has the right of pre-emption within two months (or four in case of financial pressure owing to many simultaneous

offers) at the price for which he has contracted to sell it; and, if it is subject to damage and the proprietor will not provide for its repair, it may be expropriated by the state, by a province or commune — or even by bodies which have legal personality and aim at the preservation of such objects for the public enjoyment. It has not yet been possible, however, to secure the right of search nor of public access; so long as an object is well kept up by the owner, he may refuse the right of access except to the officials.

The exportation of objects of importance is forbidden, even if their importance has not been notified to the owner, who is under the obligation to advise the government of his intention to export, it having the right of pre-emption within two or four months, as the case may be; and even if the government does not purchase the object, it may still return it to the proprietor, forbidding him to export it. The objects exported are subject to a progressive tax, with a maximun of 20%. Objects tempo- rarily imported from foreign countries, and re-exported within five years, are not subject to tax. Temporary exportation, if

permitted, is allowed on deposit of the tax; and if objects of importance are allowed to be sent from one part of Italy to another (especially to the islands), this is done by the government at the owner's expense.

As to excavations, in every case application to excavate must be made to the minister, who has a general supervision over the work and may stop it temporarily or assume the conduct of it. The state can excavate on private ground, but pays compensation; and can expropriate ground on which it wishes to excavate or on which discoveries have been made, the " archaeological value " not being reckoned. As to finds, if the state conducts the

exca- vation, the owner retains one-fourth of the value or of the objects discovered at the choice of the state, the rest belongs to the state. In other cases, and in the case of chance discoveries (notice of which must be given immediately) , the state takes one-half, but if the excavation is conducted by foreign institutions or persons, then the discoveries must be given to a public museum, or if part is handed over to the finder, it must be kept in such a way as to be accessible to the Italian public. The ministry gives periodical reports of all work carried out by the authorities in the Notizie degli Scavi and the Bollettino d'arte, both of which appear every month. The funds at the disposal of the ministry for purchases include (a) a sum of £40,000 already invested, (b) the interest upon £160,000 rentes regularly paid in, (c) other sums from sales of publications, fines, &c. ; (d) an annual credit voted in the budget (£12,000 in 1909-1910), forming an account called the monte di belle arti.

The regulations issued in 1910 for the execution of the new law consist of some 200 articles in three divisions — one dealing with the artistic and historical patrimony of Italy and its internal administration, a second with the question of exportation, and the third with financial matters. (T. As.)

Greece. — The earliest regulations are those contained in the law of 1837, promulgated by royal decree. This has been replaced by the Monument Act of 1899, but the principles of the earlier law remain, and the later act still lays down " the most extensive claim that any state has ever put forward in the matter of monuments," viz. that " all objects of antiquity in Greece, as the productions of the ancestors of the Hellenic people, are regarded as the common national possession of all Hellenes." The department in charge of the administration of the act is that of the minister of religion and public instruction. There is a central commission working with local commissions and a body of conservators, The control of this executive is in the hands of the ephor-general of antiquities. The act protects

medieval monuments as well as those of classical Greece. All immovable monuments are public property, but compensation is to be paid to private owners if such monuments are to be preserved. Movable antiquities, if worthy of preservation by the state, must be placed in public museums. If discovered on private property the owner receives half the value, and may keep those not removed to a museum; all, however, must be registered. Excavations can be made anywhere by the state, and permission for private work must be first obtained. Expropriation is allowed. The export of antiquities is strictly forbidden under severe penalties, and the infringement of the various provisions of the act can be punished by heavy fines or imprisonment.

Austria-Hungary. — There is no legislation for the empire as a whole. In Austria there is a central commission, established 1850, 'whose authority is regulated by rescripts of 1873 and 1899 of the minister of religion and education. It consists of twenty members selected from experts in history, art and archaeology; there is also a numerous body of conservators who have districts covering the country assigned to them. They have no executive powers, but report on all new works likely to injure monuments, make inventories, influence public opinion, and work with archaeological societies for the general protection of ancient monuments. Hungary, on the other hand, has a Monument Act of 1881. With regard to any existing monument, the minister of religion and education decides whether it is worth preserving. Then the owner, whether

public or private, must preserve it at his own cost. If that is impossible the minister may expropriate it. Compulsory purchase may also be resorted to for the purpose of excavation. Belgium. — There is no monument legislation, but there is a royal commission, resembling that of Austria, founded in 1835, and a royal decree of 1824 prevents alienation of objects of interest contained in churches or alienation or reconstruction of churches without state permission. An inventory has been in progress since 1861, and the commission publishes a Bulletin.

By a communal law of 1836 local administrations have to submit proposals for the destruction or repair of monuments to the committee of the provincial council, and must obtain royal approval. Expropriation on the ground of public utility may be resorted to for the protection of a threatened monument in the hands of a private owner.

Holland. — A state commission (Rijkscommissie) was estab- lished in 1903, and began an inventory of all monuments, movable and immovable. Any proposed alteration or demolition of buildings of interest in a town must be reported by the burgomaster to the minister of the interior. The annual budget of the minister of the interior contains sums to be allotted for the repair of specified monuments.

Switzerland. — Legislation is in the hands of the cantons; Vaud, Neuchatel and Bern have passed Monuments Acts, modelled on that of France. The federal government may allot an annual grant for the acquisition and upkeep of national monuments and for excavations. There is a federal commission, established in 1886, whose functions, mainly those of other countries, are exercised by the Swiss Society for the Preservation of Monuments of Historical Art.

The preservation of scenery and of natural monuments is considered a matter of great importance, and in 1905 was founded a Swiss society which has a branch in the United Kingdom, La Ligue pour la conservation de la Suisse pittoresque — Die schweizerische Vereinigung fur Heimatschutz. The special object of the society is the prevention of the defacement of Alpine scenery by funicular and other railways, mountain-lifts, power-stations, &c. It was successful in protecting the falls of the Rhine at Schaffhausen from a Zurich eiectric-power scheme.

Denmark. — The means adopted are an excellent example of what can be done without legislation by appeals made by a central authority working with expert knowledge to an enlight- ened public opinion and to national sentiment. The authority consists of

an inspector of ancient monuments and the directorate of the Museum of Northern Antiquities at Copenhagen, exercising the functions of a royal commission that was established in 1807 and dissolved in 1849. The successful preservation of anti- quities is also due to an old law, modified by royal decrees of 1737 and 1752, by which all finds of gold, silver and precious objects belong to the state, and to a declaration of 1848 that all monuments on the Crown domains are national property and are to be specially reserved in case of sale. Many private owners have followed the example of the Crown. G. Baldwin Brown {op. cit. p. 188 seq.) gives some interesting examples of the success of the directorate of the museum in preserving monu- ments by appeals to ecclesiastical owners, projectors of railways and other works, and companies engaged in reclaiming land.

Sweden. — There is a state antiquary (Riksantikvar) , appointed first by Gustavus Adolphus; the functions of a commission are exercised by the Royal Academy of Science, History and Antiquities, founded in 1786. There is an elaborate and stringent code of regulations protecting monuments, contained in royal decrees of 1867, 1873 and 1886. These are based on the edict of Charles XI. (1666), declaring all ancient monuments under royal protection. Sweden possesses one of the fullest inventories contained in the antiquarian topographical archives. Norway. — Here there is also a state-subsidized society, Foreningen til norske Fortidsmindesmaerkers Bevaring, founded in 1844, which acts much as a commission, and advises the state official.

Russia. — The care of ancient monuments is in the charge

of the ministry of the imperial court, of which the Imperial Archaeological Commission, founded in 1859,

is a department. The Imperial Academy of the Fine Arts is joined in this charge with the commission, whose duties resemble in the main those of the commissions of other countries. By a circular of 1901 a complete inventory of the monuments of the country was ordered to be made by the local authorities.

Spain.- — A monument commission was established in 1844; it works under regulations issued in 1865. It is composed of the Royal Academies of Fine Arts and of History, corresponding members of which form commissions for the provinces of the kingdom. A complete inventory of all monuments is being made. The minister in charge is that of public instruction and of the fine arts.

Portugal.— A decree of John V. (1721) protected the monu- ments of ancient times; in 1840 this protection was extended to medieval monuments. An inventory was begun in 1841. A council of national monuments was established in 1901 by a royal decree, with a code of regulations. The French system of classement is adopted, and the regulations under the French act of 1887 are generally followed. The minister responsible is that of public works, commerce and industry.

Turkey. — The regulations, as embodied in an irade of 1884, are very stringent, and the principle adopted is that of Greece, that all objects of antiquity belong to the state. The private owner of such has no power of disposition, and must not injure nor destroy them. All excavations are under the control of the government, and permission must be first obtained. The exportation of finds is forbidden, and all movables discovered belong to the Imperial Museum. If these finds are the result of excavations, one-twentieth of the value goes to the discoverer; if of accidental discovery, the owner of the soil and the state divide.

United States.— With regard to the remains of prehistoric man, earthworks, barrows, &c, some of those states, such as Ohio, which are specially rich

in such monuments, have par- ticular laws protecting individual remains, e.g. the earthworks in Warren county. The state exercises control over other remains of interest, e.g. the Eagle earthworks in Licking county. There is also an archaeological and historical society, partly maintained by the state, with the object of the better preserva- tion of the evidences of the prehistoric occupation. In North Dakota a state historical commission was created in 1895 "to collect and preserve the records and relics pertaining to the early history, settlement and development of North Dakota." The sites of the battle-fields, and statues, &c, erected in commemoration of the War of Independence or the Civil War, are preserved by various methods — by state or municipal regulations, by the action of incorporated bodies or trustees, &c. Most of the states rely on statutory prohibitions of malicious damage to protect their monuments and old buildings, &c. (C. We.)

MONVEL (1745-1812), French actor and dramatic writer, whose real name was Jacques Marie Boutet, was born in Lune- ville on the 25th of March 1743. He was a small, thin man without good looks or voice, and yet he became one of the greatest comedians of his time. After some years of apprenticeship in the provinces, he made his debut in 1 770 at the Comedie Francaise in Mir ope and, Zenaide; he was received sociStaire in 1772. For some reason unknown Monvel secretly left Paris for Sweden about 1 78 1, and became reader to the king, a post which he held for several years. At the Revolution he returned to Paris, embraced its principles with ardour, and in 1791 joined the theatre in the rue Richelieu(the rival of the Comedie Francaise), which, under Talma, with Dugazon, his sister Mme Vestris, Grandmesnil (1737-1816) and Mme Desgarcins, was soon to become the Theatre de la Republique. After the Revolution Monvel returned to the reconstituted Comedie Francaise with all his old companions, but retired in 1807. Monvel was made a member of the Institute in 179s. He wrote six plays (four of them performed

at the Comedie Francaise), two comedies, and fifteen comic operas, seven with music by N. Dezede (1740-1792), eight by Nicolas d'Alayrac (1753-1809. He also

published an historical novel, FrSdSgonde et Brunehaut (1776). He was professor of elocution at the Conservatoire. Monvel's two daughters, Miles Mars atnSe and cadette, were well-known actresses.

MONZA (locally Monscia), a city of Lombardy, Italy, in the province of Milan, 8 m. by rail N.N.E. of that city, with which it is also connected by both steam and electric trams. It lies on the Lambro, a tributary of the Po, 532 ft. above sea-level. Pop. (1906), 32,000 (town); S3,33o(commune). Of the medieval fortifications little remains save the Porta d'Agrate. Near it is the nunnery in which the nun of Monza (see Manzoni's Pro- messi sposi) was enclosed. The cathedral of St John Baptist is the principal object of interest; Theodelinda's basilica of 590 was enlarged at the close of the 13th century by throwing the atrium into the main building, and the present fine black- and-white marble facade was erected about the middle of the 14th by Matteo da Campione, and restored in 1899-1901. On the left-hand side of the front rises an incongruous brick-built tower, 278 ft. high, erected by Pellegrini in 1 592-1606. Within the church are the iron crown of Lombardy, supposed to have been beaten out of one of the nails used at the Crucifixion, and the treasury containing the relics of Theodelinda, comprising her crown, fan and comb of gold, and the golden hen and seven chickens, representing Lombardy and her seven provinces, and crosses, reliquaries, &c, of the Lombard and Gothic periods. The interior has been modernized; there is a fine relief by Matteo da Campione in the organ-loft, representing the coronation of a king, and some 15th-century frescoes with scenes from the life of Theodelinda. Next to the cathedral in artistic importance come the church of Santa Maria in Istrada, and the broletto or old palace of the commune, usually styled the Arengario;

the former (founded in 1357) has a rich terra-cotta facade of 1393, and the latter is raised on a system of pointed arches, and has a tall square tower terminating in machicolations surrounding a sharp central cone. The royal palace of Monza (built in 1777 for the archduke Ferdinand) lies not far from the town on the banks of the Lambro. Cotton goods and felt hats are the staple products of the flourishing Monza industry; then dyeing, organ-building, and a publishing trade.

Monza (anc. Modicia) was not a place of consequence till it attracted the eye of Theodoric; and its first important associa- tions are with Theodelinda. During the period of the republics Monza was sometimes independent, sometimes subject to Milan. The Visconti, who ultimately became masters of the city, built a castle in 1325 on the site now occupied by the Palazzo Durini. In the course of its history Monza stood thirty-two sieges, and was repeatedly plundered — notably by the forces of Charles V. The countship (1499-1796) was purchased in 1546 by the wealthy banker Durini, and remained in his family till the Revolution. At Monza King Humbert was assassinated on the 29th of July 1900.

MONZONITE, the group-name of a type of rocks which have acquired it from their most celebrated occurrence, that of Monzoni in Tirol. The rocks are of granitic appearance, usually rather dark grey in colour and fine to moderately coarse grained. The special characteristic which distinguishes them from granites and ordinary syenites is the presence of plagioclase and orthoclase felspars in nearly equal amounts. Labradorite, andesine and oligoclase are present, usually in well-shaped crystals, often zoned; orthoclase forms large irregular plates in which the other minerals are embedded. There is rarely any considerable amount of quartz, though in a few of these rocks this mineral occurs (the quartz-monzonites). Other features are the abundance of augite, pale green or brownish green, and of large bronze-coloured plates of biotite which are of quite irregular shapes and full of enclosures. Hypersthene or bronzite is less common, but dark

brown and green hornblende are sometimes abundant. Olivine also may be present; when the rock contains this in notable quantity it may be called an olivine monzonite. Numerous large prisms of apatite often characterize micro-sections of monzonites, and zircon, iron ores and pyrites are frequent accessory minerals.

The monzonites of Tirol show a great variability in appearance, structure, and the relative proportions of their minerals. They tend to pass into rocks which have been called diabases and gabbros, and near the margins of the outcrop facies very rich in pyroxene (pyroxenites) occur. Many authors believe that this variety of types is associated with the fact that the monzonites occupy a middle place as regards their chemical composition between the acid and the basic igneous rocks, and that such a magma is naturally somewhat unstable, and likely to split up or differentiate into partial magmas of more siliceous and less siliceous character. The monzonites in fact approach rather closely to the calculated mean composition of the outer portion of the earth’s crust and from a molten magma of this nature it is natural to suppose that all kinds of igneous rocks have been derived.

Rocks of monzonitic facies occur also in Norway, where they have been described as akerites. They contain quartz, orthoclase and plagioclase, augite and dark brown biotite; hornblende and hypersthene also may be present. Some of them have porphyritic rather than granitic texture, especially near the margins of the laccolites. From a study of these and other occurrences Brogger proposed to define the monzonites as orthoclase-plagioclase rocks in which the two chief classes of felspar occur in nearly equal quantities (as distinguished from the orthoclase rocks or granites and syenites and the

plagioclase rocks or diorites and gabbros).

At Yogo Peak and Beaver Creek in Montana, U.S.A., there are masses of granitoid rock which bear a close resemblance to the monzonites of Tirol. Two main types occur: (a) yogoite, which differs little from monzonite, and (b) shonkinite, which is a more basic rock richer in plagioclase and augite; this rock contains olivine and in places passes into dark pyroxenites. In shonkinite also a little nepheline may be present. In several places in the west of Scotland^ (Argyllshire) intrusive bosses are known which consist of an olivine-bearing rock closely related to monzonite. It has been called kentallenite because it is quarried at Kentallen in Argyllshire. Large crystals of pale green augite and irregular plates of biotite which enclose idiomorphic plagioclase felspar are conspicuous in micro-sections of this rock, and the abundance of olivine is rather greater than is usual in the monzonites; it is associated with diorites of lamprophyric character and dark pyroxenites and peridotites.

The following analyses show the chemical peculiarities of the principal rocks of the monzonite group : —

Si0 2 A1 2 3 Fe 2 3 FeO MgO CaO K 2 Na 2 Monzonite, Monzoni . 54-20 1573 3-67 5-40 3-40 8-50 4-42 3-07 Yogoite, Yogo Peak . 54-42 14-28 3-32 4-13 6-12 7-72 4-22 3-44 Kentallenite,Argyllshire52-OQ 11-93 I-8 4 7 XI 12-48 7-84 3-01 2-04

(J. S. F.)

MOOD, (r) (O. Eng. mod, a word common to Teutonic lan- guages; cf. Ger. Mut; Du. moed, mind, courage), a particular state of mind or feeling. (2) (Adapted from Lat. modus, measure), a grammatical term for one of the various forms into which the conjugation is grouped, showing whether the verb is used as a predicate, a wish, a command, &c. In syllogistic logic the term is used of the various classes into which the ” figures ” of valid syllogisms are

divided. (See Syllogism.)

MOODKEE, or Mudki, a town in the Ferozepore district of the Punjab, India. Pop. (1001), 2977. It is situated 26 m. S. of the Sutlej, on the old road from Ferozepore to Karnal, and is notable as the scene of the first battle (Dec. 18, 1845) in the first Sikh war. (See Sikh Wars.)

MOODY, DWIGHT LYMAN (RYTHER) (1837-1899), Ameri- can evangelist, was born in the village of East Northfield (Northfield township), Massachusetts, on the 5th of February 1837. His father died in 1841, and young Dwight, a mis- chievous independent boy, got a scanty schooling. In 1854 he became a salesman in a shoe-store in Boston; in 1855 he was "converted"; and in 1856 he went to Chicago and started business there. Beginning with a class gathered from the streets, he opened (1858) a Sunday school in North Market Hall, which was organized in 1863 as the Illinois Street Church, and afterwards became the Chicago Avenue Church, of which he was layman pastor. In i860 he gave up business and devoted himself to city missionary work. He was prominent in raising money for Farwell Hall in Chicago (1867), and in 186 5-1869 was president of the Chicago Young Men's Christian Association. Ira David Sankey (1840-1908) joined him in Chicago in 1870 and helped him greatly by the singing of hymns; and in a series

of notable revival meetings in England (1873-1875, 1881-1884, 1891-1892) and America they carried on their gospel campaign, and became famous for the Moody and Sankey Gospel Hymns. In 1879 Moody opened the Northfield seminary for young women, at Northfield, Mass., and in 1881 the adjacent Mount Hermon school for boys; in each a liberal practical education centres about Bible training; the boys do farm- work and the girls house-work. In 1889 he opened in Chicago the Bible Institute, and there trained Christian workers in Bible study and in practical methods of social reform; at Northfield in 1890 he opened a Training School in domestic science in the Northfield Hotel, formerly used only in

summer for visitors at the annual conferences, of which the best known are the Bible (or Christian Workers') Conference, first held at Northfield in 1880, and the Students' (or College Men's) Conference, first held in 1887.

Moody died at Northfield on the 22nd of December 1899. His sermons were colloquial, simple, full of conviction and point. In his theology he laid stress on the Gospel and on no sectarian opinions — he was, however, a pre-millenarianite— and he worked with men as much more " advanced " than himself as Henry Drummond, whom he eagerly defended against orthodox attack, and George Adam Smith. Moody's sermons were sold widely in English, and in German, Danish and Swedish versions.

See the (official) Life of Dwight L. Moody (New York, 1900), by his son, W. R. Moody (b. 1869), and the estimate in Henry Drummond's Dwight L. Moody: Impressions and Facts (New York, 1900), with an introduction by George Adam Smith.

MOOLVIE (an Urdu variant of Arabic maulavi, a derivative of mullah, a man learned in the law), the name used in India of a man learned in Mahommedan law, and hence used generally of a teacher or as a complimentary title of one learned in any branch of knowledge.

MOON, SIR RICHARD, ist Baronet (1814-1899), English railway administrator, was the son of a Liverpool merchant, and was born on the 23rd of September 1814. The history of his life is practically the history of the London & North- western railway for the period in which he lived. When he first became a member of the board in 1847, the company had just come into existence by the amalgamation of the London & . Birmingham, the Manchester & Birmingham, and the Grand Junction lines, and it was during his long connexion with it — first as director and then (from 1862 to 1891) as chair- man — that its system was developed substantially into what it is now. The Chester & Holyhead, the Lancaster & Carlisle, and many smaller lines were gradually added to it,

either by leasing or by complete absorption, and finally in 1877 an act was obtained consolidating all into one homogeneous whole. Throughout his career, Sir Richard Moon's powers of organization and his genius for what may be called railway diplomacy were of the greatest advantage to the company, and to him it owed in very large measure its commanding position. An extremely hard worker himself, he expected equal diligence of his subordinates; but energy and capacity did not go unre warded, for he made promotions, not by standing or seniority, but by merit. Sir Richard Moon, who was created a baronet in 1887, died at Coventry on the 17th of November 1899.

MOON (a common Teutonic word, cf. Ger. Mond, Du. maan, Dan. maane, &c, and cognate with such Indo-Germanic forms as Gr. ftfjv. Sans, mas, Irish mi, &c. ; Lat. uses luna, i.e. lucna, the shining one, lucere, to shine, for the moon, but preserves the word in mensis, month; the ultimate root for "moon" and " month " is usually taken to be me-, to measure, the moon being a measurer of time), in astronomy, the name given to the satellite of any planet, specifically to the only satellite of the earth.

The subject of the moon may be treated as twofold, one branch being concerned with the aspects, phases and consti- tution of the moon; the other with the mathematical theory of its motion. As the varying phenomena presented by the moon grow out of its orbital motion, the general character of the latter will be set forth in advance.

A luminous idea of the geometrical relations of the moon.

earth and sun will be gained from the figure, by imagining the sun to be moved towards the left, and placed at a distance of 20 ft. from the position of

the earth, as represented at the right-hand end of the figure. We have here eight positions of the moon, Mi, M2, &c, as it moves round the earth E. The general average distance of the sun is somewhat less than four hundred times that of the moon. We have next to conceive that, as the earth performs its annual revolution round the sun in an orbit whose diameter, as represented on the diagram, is nearly 40 ft., it carries the orbit of the moon with it. Con- ceiving the plane of the earth's motion, which is that of the ecliptic, to be represented by the surface of the paper, the orbit of the moon makes a small angle of a little more than 5° with this plane. Conceiving the line NN' to be that of the nodes at any time, and the earth and lunar orbit to be moving in the direction of the straight arrows, the earth will be on one side of the ecliptic from M 2 to M 6 , and on the other side from M 6 to Mi, intersecting it at the nodes. The absolute direction of the line of nodes changes but slowly as the earth and moon revolve; consequently, in the case shown in the figure, the line

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of nodes will pass through the sun after the earth has passed through an arc nearly equal to the angle Mi N. Six months later the direction of the opposite node will pass through the sun. Actually, the line of nodes is in motion in a retrograde direction, the opposite of that of the arrows, by i9'3° per year, thus making a revolution in 18.6 years, or 6,793-39 days. (See Eclipse.)

The varying phases of the moon, due to the different aspects presented by an opaque globe illuminated by the sun, are too familiar to require explanation. We shall merely note some points which are frequently overlooked: (1) the crescent phase of the moon is shown only when the moon is less than 90 from the sun; (2) the bright convex outline of the crescent

is then on the side toward the sun, and that the moon is seen full only when in opposition to the sun, and therefore rising about the time of sunset. In consequence of the orbital motion the moon rises, crosses the meridian, and sets, about 48 m. later every successive day. This excess is, however, subject to wide variation, owing to the obliquity of the ecliptic and of the lunar orbit to the equator, and therefore to the horizon. The smaller the angle which the orbit of the moon, when near the point of rising, makes with the horizon the less will be the retardation. Near the autumnal equinox this angle is at a minimum; hence the phenomenon of the ” harvest moon,” when for several successive days the difference of times of rising on one day and the next may be only from 15 to 20 minutes. Near the vernal equinox the case is reversed, the interval between two risings of the nearly full moon being at its maximum, and between two settings at its minimum. Generally, when the rising is accelerated the setting is retarded, and vice versa.

The moon always presents nearly the same face to the earth, from which it follows that, when referred to a fixed direction in space, it revolves on its axis in the same time in which it performs its revolution. Relatively to the direction of the earth there is really no rotation. The rate of actual rotation is substantially uniform, while the arc through which the moon moves from day to day varies. Consequently, the face which the moon presents to the earth is subject to a corresponding variation, the globe as we see it slightly oscillating in a period nearly that of revolution. This apparent oscillation is called libralion, and its amount on each side of the mean is commonly between 6° and 7 . There is also a libration in latitude, arising from the fact that the axis of rotation of the moon is not

precisely perpendicular to the plane of her orbit. This libration is more regular than that in longitude, its amount being about 6° 44′ on each side of the mean. The other side of the moon is therefore invisible from the earth, but in

consequence of the libration about six-tenths of the lunar surface may be seen at one time or another, while the remaining four-tenths are for ever hidden from our view.

It is found that the direction of the moon's equator remains nearly invariable, with respect to the plane of the orbit, and therefore revolves with that plane in a nodal period of 18 -6 years. This shows that the side of the moon presented to us is held in position as it were by the earth, from which it also follows that the lunar globe is more or less elliptical, the longer axis being directed toward the earth. The amount of the ellipticity is, however, very small.

Two phenomena presented by the moon are plain to the naked eye. One is the existence of dark and bright regions, irregular in form, on its surface; the other is the complete illumination of the lunar disk when seen as a crescent, a faint light revealing the dark hemisphere. This is due to the light falling from the sun on the earth and being reflected back to the moon. To an observer on the moon our earth would present a surface more than ten times as large as the moon presents to us, con- sequently this earth-light is more than ten times brighter than our moonlight, thus enabling the lunar surface to be seen by us.

The surface of the moon has been a subject of careful tele- scopic study from the time of Galileo. The early observers seem to have been under the impression that the dark regions might be oceans; but this impression must have been corrected as soon as the telescope began to be improved, when the whole visible surface was found to be rough and mountainous. The work of drawing up a detailed description of the lunar surface, and laying its features down on maps, has from time to time occupied telescopic observers. The earliest work of this kind, and one of the most elaborate, is the Selenographia of Hevelius, a magnificent folio volume. This contains the first complete map of the moon. Names borrowed from geography and classical

mythology are assigned to the regions and features. A system was introduced by Riccioli in his Almagestum novum of desig- nating the more conspicuous smaller features by the names of eminent astronomers and philosophers, while the great dark regions were designated as oceans, with quite fanciful names: Mare imbrium, Oceanus procellarum, &c. More than a century elapsed from the time of. Hevelius and Riccioli when J. H. Schroter of Lilienthal produced another profusely illustrated description of lunar topography.

The standard work on this subject during the 19th century was long the well-executed description and map of W. Beer and J. H. Madler, published in 1836. It was the result of several years' careful study and micrometric measurement of the features shown by the moon. The volume of text gives descriptive details and measurement of the spots and heights of the mountains.

In recent times photography has been so successfully applied to the mapping of our satellites as nearly to supersede visual observation. The first photograph of the moon was a daguerreo- type, made by Dr J. W. Draper of New York in 1840; but it was not possible to do much in this direction until the more sensitive process of photographing on glass was introduced instead of the daguerreotype. The taking of photographs of the moon then excited much interest among astronomical observers of various countries. Bond at the Harvard obser- vatory, De la Rue in England, and Rutherford in New York, produced lunar photographs of remarkable accuracy and beauty. The fine atmosphere of the Lick observatory was well adapted to this work, and a complete photographic map of the moon on a large scale was prepared which exceeded in precision of detail any before produced. The most extended and elaborate work of this sort yet undertaken is that of Maurice Loewy (1833-1907) and Pierre Puiseux at the Paris observatory, of which the first part was published in 1895.

The broken and irregular character of the surface is most evident near the boundary between the dark and

illuminated portions, about the time of first quarter. The most remarkable

feature of the surface comprises the craters, which are scattered everywhere, and generally surrounded by an approximately circular elevated ring. Yet another remarkable feature com- prises bright streaks, branching out in various directions and through long distances from a few central points, especially that known as Tycho.

The height of the lunar mountains is a subject of interest. It cannot be stated with the same definiteness that we can assign heights to our terrestrial mountains,- because there is no fixed sea-level on the moon to which elevations can be referred. The only determination that can be made on the moon is that of the height above some neighbouring hollow, crater or plain. The most detailed measures of this sort were made by Beer and Miidler, who give a great number of such heights. These generally range between 500 and 3000 toises, or 3000 and 20,000 English feet. The highest which they measured was Newton, 3727 toises, or 24,000 ft.

The general trend of lunar investigation has been against the view that there is any resemblance between the surfaces of the moon and of the earth, except in the general features already mentioned. No evidence has yet been found that the moon has either water or air. The former, if it existed at all, could be found only in the more depressed portions; and even here it would evaporate under the influence of the sun’s rays, forming a vapour which, if it existed in considerable quantity, would in some way make itself known to our scrutiny. The most delicate indication of an atmosphere would be through the refraction of the light of a star when seen coincident with the limb of the moon. Not the slightest change in the direction of such a star when in this position has ever been detected, and it

is certain that if any occurs it can be but a minute fraction of a second of arc. As an jatmosphere equal to ours in density would produce a deviation of an important fraction of a degree, it may be said that the moon can have no atmosphere exceeding in density the g oVff that of the earth.

Devoid of air and atmosphere, the causes of meteorological phenomena on the earth are non-existent on the moon. The only active cause of such changes is the varying temperature produced by the presence or absence of the sun's rays. The range of temperature must be vastly wider than on the earth, owing 'to the absence of an atmosphere to make it equable. Elaborate observations of the heat coming from the moon at its various phases were made and discussed in 1871-1872 by Lord Rosse. Among his results was that during the progressive phases from before the first quarter till the full moon the heat received increases in a much greater proportion than the light, from which it followed that the former was composed mainly of heat radiated from the moon itself in consequence of the temperature which it assumed under the sun's rays. So far as could be determined, 86% of the heat radiated was by the moon itself, and 14% reflected solar heat. But it seems probable that this disproportion may be somewhat too great. Rosse's determinations, like those of his predecessors, were made with the thermopile. After S. P. Langley devised his bolometer, which was a much more sensitive instrument than the thermopile, he, in conjunction with F. W. Very, applied it to determine the moon's radiation at the Allegheny observa- tory. His results for the ratio of the total radiation of the full moon to that of the sun ranged from 1 : 70,090 to 1 : 110,000, which were in substantial agreement with those of Rosse, who found 1 : 82,000. When Langley published his work the law of radiation as a function of the temperature was not yet estab- lished. He therefore wrongly concluded that the highest tem- perature reached by the moon approximated to the freezing- point of water. Stefan's law of radiation, on the other hand, shows that the temperature must have been about the

boiling- point in order that the observed amount of heat might be radiated. This is in fair agreement with the computed tempera- ture due to the sun's radiation upon a perpendicular absorbing surface when no temperature is lost through conduction to the interior. The agreement thus brought about between the results deduced from the law of radiation and the most delicate observa-

tions of the quantity of heat radiated is of great interest, as showing that the theory of cosmicai temperature now rests upon a sound basis. There is ; however, still room for improved determinations of the moon's heat by the use of the bolometer in its latest form.

Possibility of Changes on the Moon. — No evidence of life on the moon has ever been brought out by the minutest telescopic scrutiny, nor does life seem possible in the absence of air and water. Some bright spots are visible by the earth-light when the moon is a thin crescent, which were supposed by Herschel to be volcanoes in eruption. But these are now known to be nothing more than spots of unusual whiteness, and if any active volcano exists it is yet to be discovered. Still, the question whether everything on the moon's surface is absolutely unchange- able is as yet an open one, with the general trend of opinion toward the affirmative, so far as any actual proof from observa- tion is concerned. The spot which has most frequently exhibited changes in appearance is near the centre of the visible disk, marked on Beer and Madler's map as Linne. This has been found to present an aspect quite different from that depicted on the map, and one which varies at different times. But the question still remains open whether these variations may not be due wholly to the different phases of illumination by the sunlight as the latter strikes the region from various directions.

Intensity of Moonlight. — An interesting and important quantity is the ratio of moonlight to sunlight. This has been measured for the full moon by various investigators, but the results are not as

accordant as could be desired. The most reliable deter- minations were made by G. P. Bond at Harvard and F. Zollner at Leipzig, in i860 and 1864. The mean result of these two determinations is the ratio 1 : 570,000. We may therefore say that the intensity of sunlight is somewhat more than half a million times that of full moonlight. A remarkable feature of the reflecting power of the moon, which was made known by Zollner's observations, is that the proportion of light reflected by a region on the Toon is much greater when the light falls perpendicularly, which, is the case near the time of full moon, and rapidly becomes less as the light is more oblique. This result was traced by Zollner to the general irregularity of the lunar surface, and the inference was drawn that the average slope of the lunar elevation amounts to 47°.

Motion of the Moon. — The orbit of the moon around the earth, though not a fixed curve of any class, is elliptical in form, and may be represented by an ellipse which is constantly changing its form and position, and has the earth in one of its foci. The eccentricity of the ellipse is in the general average about 0-055, whence the moon is commonly more than j\ further from the earth at apogee than at perigee. The line of apsides is in continual motion, generally direct, and performs a revolution in about 12 years. The inclination to the ecliptic is a little more than 5 , and the line of nodes performs a revolu- tion in the retrograde direction in 18-6 years. The parallax of the moon is determined by observation from two widely separated points; the most accurate measures are those made at Greenwich and at the Cape of Good Hope. The distance of the moon can also be computed from the law of gravity, the problem being to determine the distance at which a body having the moon's mass would revolve around the earth in the observed period. The measures of parallax agree perfectly with the computed distance in showing a mean parallax of 57′ 2-8″, and a mean distance of 238,800 miles. The period of revolution, or the lunar month, depends upon the point to which the revolution is referred.

Any one of five such direc- tions may be chosen, that of the sun, the fixed stars, the equinox, the perigee, or the node. The terms synodical, sidereal, tropical, anomalistic, nodical, are applied respectively to these months, of which the lengths are as follow: —

Deviation from

Length. sidereal month.

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Tropical month …. 27-32156 „ — o-oooio „

Anomalistic month . . . 27-55460 „ +0-23294 „

Nodical month …. 27-21222 „ -0-10944 „

MOON Plate I.

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Ksu^W ^3

^^^^^^HKjjjp
VIJBBVJVJVJVJVJVJVJVJVJVJVJVJVJVJVJVJVJVJBJ

fl^v ^j?*" ^^^I^HflHflflifl^HtfliflHnH

BEJ^ReFVj^. ^^flHffBBI

Bfl| . JBBii&kll^jJBi ^BBH BV^H

R3I BBt" `^H

B/' ^^"^JPfiflvflH bKTI^tB BBjBH

Hbw^^IH

BPtt^V*I^BB^Bl BBt 1 bbri^bI B^Bf * *!9flk^BH BflY
ffB

BBp s^BflBBBflBflBflBBF _tfflBHBBBBBi

BBBr . `jjvji BPBBr "^BBnlflBH'^Bfl

Bffyir " ` a ISbb^^bI ^^^^

flBBBBBBBBBBBBBBBBBBBBBIBL W. 4 ^ r*

#^ t • .f***'' JB

BBJBJBJBJBJBJB^BE’ .

. _ ^^^

THE MOON (Age 14A ih.),

S

Maria or Seas.

A.

Mare Crisium.

B.

Foecundi talis.

C.

Nectaris.

D.

Tranquillitatis

E.

Serenitatis.

F.

Lacus Somniorum.

G,

” Mortis.

H.

Mare Frigoris,

k

Sinus Roris.

Mare Imbrium. W

L.

Oceanus Procellarum.

M

Mare Vaporum.

N.

Humorum.

0.

" Nubium.

Mountains.

(a) Caucasus.

(b) Apennines.

(f) Alps.

(d) Carpathians.

XVIIL80*.

o

1890,

October

27.

I.

Byp

Volcanoes. Apollonius.

>^

2.

3-

Firmicus. Taruntius.

Q N

4–

Secchi.

*,« 1

5– 6.

Macrobius. Vitruvius.

V

7– 8.

Posidonius. Plato.

*” \

9–

Aristillus.

[redacted]m

E

10. 11.

Autolycus. Archimedes.

–* —

V 1

12.

Julius Caesar.

13–

Boscovich.

°

14.

Copernicus.

X

15–

Herodotus.

Jf

16.

17– 18.

19–

Kepler. Borda.

Bohnenberger Tycho.

By permission of Lick Observatory.

This diagram is a key to some of the features reproduced in the photograph.

Plate II.

MOON

I. TYCHO, THEOPHILL'S, 1900, October 12.

2. MARE MURIUM, &c, 1901, November 21.

3. MARE SKRENITATIS, 1901, August 3.

4. BULLIALDUS, COPERNICUS, 1901, November 20.

By permission of Yerkes Observatory.

MOON

Other numerical particulars relating to the moon are: —

Mean distance from the earth (earth's radius as 1) . . 60-2634

Mean apparent diameter 31′ 51-5

Diameter in miles 2159-6

Moon's surface in square miles 14,600,000

Diameter (earth's equatorial diameter as 1) . . . 0-2725

Surface (earth's as 1) 0-0742

Volume (earth's as 1) 0-0202

Ratio of mass to earth's mass 1 1 : 81-53 * -0 47

Density (earth's as 1) 0-60736

Density (water's as 1, and earth's assumed as 5) . . . . 3-46 Ratio of gravity to gravity at the earth's surface . . 1:6

Inclination of axis of rotation to ecliptic …. 1° 30′ 11-3″

The Lunar Theory.

The mathematical theory of the moon's motion does not yet form a well-defined body of reasoning and doctrine, like other branches of mathematical science, but consists of a series of researches, extending through twenty centuries or more, and not easily welded into a unified whole. Before Newton the problem was that of devising empirical curves to formally represent the observed inequalities in the motion of the moon around the earth. After the establishment of universal gravi- tation as the primary law of the celestial motions, the problem was reduced to that of integrating the differential equations of the moon's motion, and testing the completeness of the results by comparison with observation. Although the precision of the mathematical solution has been placed beyond seiious doubt, the problem of completely reconciling this

solution with the observed motions of the moon is not yet completely solved. Under these circumstances the historical treatment is that best adopted to give a clear idea of the progress and results of research in this field. Modern researches were developed so naturally from the results of the ancients that we shall begin with a brief mention of the work of the latter.

It is in the investigation of the moon's motion that the merits of the ancient astronomy are seen to the best advantage. In the hands of Hipparchus the theory was brought to a degree of precision which is really marvellous when we compare it either with other branches of physical science in that age or with the views of contem- porary non-scientific writers. The discoveries of Hipparchus were : —

1. The Eccentricity of the Moon's Orbit. — He found that the moon moved most rapidly near a certain point of its orbit, and most slowly hear the opposite point. The law of this motion was such that the phenomena could be represented by supposing the motion to be actually circular and uniform, the apparent variations being ex- plained by the hypothesis that the earth was not situated in the centre of the orbit, but was displaced by an amount about equal to one-twentieth of the radius of the orbit. Then, by an obvious law of kinematics, the angular motion round the earth would be most rapid at the point nearest the earth, that is at perigee, and slowest at the point most distant from the earth, that is at apogee. Thus the apogee and perigee became two definite points of the orbit, indi- cated by the variations in the angular motion of the moon.

These points are at the ends of that diameter of the orbit which passes through the eccentrically situated earth, or, in other words, they are on that line which passes through the centre of the earth and the centre of the orbit. This line was called the line of apsides. On comparing observations made at different times it was found that the line of apsides was not fixed, but made a complete revolu-

tion in the heavens, in the order of the signs of the zodiac, in about nine years.

2. The Numerical Determination of the Elements_of the Moons Motion. — In order that the two capital discoveries just mentioned should have the highest scientific value, it was essential that the numerical values of the elements involved in these complicated motions should be fixed with precision. This Hipparchus was enabled to do by lunar eclipses. Each eclipse gave a moment at which the longitude of the moon was 180° different from that of the sun. The latter admitted of ready calculation. Assuming the mean motion of the moon to be known and the perigee to be fixed, three eclipses, observed in different points of the orbit, would give as many true longitudes of the moon, which longitudes could be employed to determine three unknown quantities — the mean longi- tude at a given epoch, the eccentricity, and the position of the perigee. By taking three eclipses separated at short intervals, both the mean motion and the motion ot the perigee would be known beforehand, from other data, with sufficient accuracy to reduce all the observations to the same epoch, and thus to leave only the three elements already mentioned unknown. The same three elements being again determined from a second triplet of eclipses at as remote an epoch a= oossible, the difference in the

1 A. R. Hinks, ” Mass of the Moon, from Observations of Eros, 1900-1901,” M. N. Roy. Ast. Soc, iooq, Nov.. p. 73.

longitude of the perigee at the two epochs gave the annual motion of that element, and the difference of mean longitudes gave the mean motion.

The eccentricity determined in this way is more than a degree in error, owing to the effect of the evection, which was unknown to Hipparchus. The result of the latter inequality is brought out when it is sought to determine the eccentricity of the orbit from the observations near the time of the first and last quarter. It was thus found by Ptolemy

that an additional inequality existed in the motion, which is now known as the evection. The relations of the quantities involved may be shown by simple trigonometric formulae. If we put g for the moon's anomaly or distance from the perigee, and D for its elongation from the sun, the inequalities in question as now known are —

6-20° sin g (equation of centre)

+ 1-27° sin (2D-g) (evection).

During a lunar eclipse we always have D = i8o°, very nearly, and 2D = 360°. Hence the evection is then — 1-2° sin g, and con- sequently has the same argument g as the equation of centre, so that it is confounded with it. The value of the equation of centre derived from eclipses is thus—

6-29° sin g — 1-27° sin g = 5-02° sin g. Therefore the eccentricity found by Hipparchus was only 5°, and was more than a degree less than its true value. At first quarter we have D=90 c and 2D = 180°. Substituting this value of 2D in the last term of the above equation, we see that the combined equation of the centre and evection are, at quadrature — 6-29° sin g+i"27° sin g = 7-56° sin g.

Thus, in consequence of the evection, the equation of the centre comes out 2° 30′ larger from observations at the moon's quarters than during eclipses.

The next forward step was due to Tycho Brahe. He found that, although the two inequalities found by Hipparchus and Ptolemy correctly represented the moon's longitude near con- junction and opposition, and also at the quadratures, it left a large outstanding error at the octants, that is when the moon was 45 or 135° on either side of the sun. This inequality, which reaches the magnitude of nearly 1°, is known as the variation. Although Tycho Brahe was an original discoverer of this inequality, through whom it became known, Joseph Bertrand of Paris claimed the discovery for Abu '1-Wefa, an

Arabian astronomer, and made it appear that the latter really detected inequalities in the moon's motion which we now know to have been the variation. But he has not shown, on the part of the Arabian, any such exact descrip- tion of the inequality as is necessary to make clear his claim to the discovery. We may conclude the ancient history of the lunar theory by saying that the only real progress from Hipparchus to Newton consisted in the more exact determination of the mean motions of the moon, its perigee and its line of nodes, and in the discovery of three inequalities, the representation of which re- quired geometrical constructions increasing in complexity with every step.

The modern lunar theory began with Newton, and consists in determining the motion of the moon deductively from the theory of gravitation. But the great founder of celestial mechanics em- ployed a geometrical method, ill-adapted to lead to the desired result; and hence his efforts to construct a lunar theory are of more interest as illustrations of his wonderful power and correctness in mathematical reasoning than as germs of new methods of research. The analytic method sought to express the moon's motion by integ- rating the differential equations of the dynamical theory. The methods may be divided into three classes: —

1. Laplace and his immediate successors, especially G. A A. Plana (1781-1864), effected the integration by expressing the time in terms of the moon's true longitude. Then, by inverting the series, the longitude was expressed in terms of the time.

2. By the second general method the moon's co- ordinates are obtained in terms of the time by the direct integration of the differential equations of motion, retaining as algebraic symbols the values of the various elements. Most of the elements are small numerical fractions: e, the eccentricity of the moon's orbit, about 0-055; e `, the eccentricity of the earth's orbit, about 0-017- T, the sine of half the inclination of the moon's orbit, about 0-046; m, the ratio of the mean motions of the moon and earth,

about 0-075. The expressions for the longitude, latitude and parallax appear as an infinite trigonometric series, in which the coefficients of the sines and cosines are themselves infinite series proceeding according to the powers of the above small numbers. This method was applied with success by Pontecoulant and Sir John W. Lubbock, and afterwards by Delaunay. By these methods the series converge so slowly, and the final expressions for the moon's longitude _ are so long and complicated, that the series has never been carried far enough to ensure the accuracy of all the terms. This is especially the case with the development in powers of m, the convergence of which has often been questioned.

3. The third method seeks to avoid the difficulty by using the numerical values of the elements instead of their algebraic symbols. This method has the advantage of leading to a more rapid and certain

determination of the numerical quantities required. It has the disadvantage of giving the solution of the problem only for a particular case, and of being inapplicable in researches in which the general equations of dynamics have to be applied. It has been employed by Damoiseau, Hansen and Airy.

The methods of the second general class are those most worthy of study. Among these we must assign the first rank to the method of C. E. Delaunay, developed in his Theorie du mouvement de la lune (2 vols., i860, 1867), because it contains a germ which may yet develop into the great desideratum of a general method in celestial mechanics.

Among applications of the third or numerical method, the most successful yet completed is that of P. A. Hansen. His first work, Fundamenta nova, appeared in 1838, and contained an exposition of his ingenious and peculiar methods of computation. During the

twenty years following he devoted a large part of his energies to the numerical computation of the lunar inequalities, the redeter- mination of the elements of motion, and the preparation of new tables for computing the moon's position. In the latter branch of the work he received material aid from the British government, which published his tables on their completion in 1857. The com- putations of Hansen were published some seven years later by the Royal Saxon Society of Sciences.

It was found on comparing the results of Hansen and Delaunay that there are some outstanding discrepancies which are of sufficient magnitude to demand the attention of those interested in the mathe- matical theory of the subject. It was therefore necessary that the numerical inequalities should be again determined by an entirely different method.

This has been done by Ernest W. Brown, whose work may be regarded not only as the last word on the subject, but as embody- ing a seemingly complete and satisfactory solution of a problem which has absorbed an important part of the energies of mathe- matical astronomers since the time of Hipparchus. We shall try to convey an idea of this solution. We have just mentioned the four small quantities e, e', y and m, in terms of the powers and pro- ducts of which the moon's co-ordinates have to be expressed. Euler conceived the idea of starting with a preliminary solution of the problem in which the orbit of the moon should be supposed to lie in the ecliptic, and to have no eccentricity, while that of the sun was circular. This solution being reached, the additional terms were found, which were multiplied by the first power of the several eccentricities and of the inclination. Then the terms of the second order were found, and so on to any extent. In a series of remark- able papers published in 1877-1888 Hill improved Euler's method, and worked it out with much more rigour and fullness than Euler had been able to do. His most important contribution to the subject consisted in working out by extremely elegant mathe- matical processes the

method of determining the motion of the perigee. John Couch Adams afterwards determined the motion of the node in a similar way. The numerical computations were worked out by Hill only for the first approximation. The subject was then taken up by Brown, who in a series of researches pub- lished in the Memoirs of the Royal Astronomical Society and in the Transactions of the American Mathematical Society extended Hill's method so as to form a practically complete solution of the entire problem. The principal feature of his work was that the quantity m, which is regarded as constant, appears only in a numerical form, so that the uncertainties arising from development in a series accruing to its powers is done away with.

The solution of the main mathematical problem thus reached is that of the motion of three bodies only — the sun, earth and moon. The mean motion of the moon round the earth is then invariable, the longitude containing no inequalities of longer period than that of the moon's node, 18-6 y. But Edmund Halley found, by a comparison of ancient eclipses with modern observations, that the mean motion had been accelerated. This was confirmed by Richard Dunthorne (1711-1775). Corresponding to this observed fact was the inference that the action of the planets might in some way influence the moon's motion. Thus a new branch of the lunar theory was suggested — the determination by theory of the effect of planetary action.

The first step in constructing this theory was taken by Laplace, who showed that the secular acceleration was produced by the secular diminution of the earth's orbit. He computed the amount as about 10″ per century, which agreed with the results derived by Dunthorne from ancient eclipses. Laplace's immediate suc- cessors, among whom were Hansen, Plana and Pontecoulant, found a larger value, Hansen increasing it to 12-5″, which he intro- duced into his tables. This value was found by himself and Airy to represent fairly well several ancient eclipses of the sun, notably the supposed one of Thales. But Adams in 1853 1 showed that the previous

computations of the acceleration were only a rude first approximation, and that a more rigorous computation reduced the result to about one-half. This diminution was soon fully con- firmed by others, especially Delaunay, although for some time Pontecoulant stoutly maintained the correctness of the older result. But the demonstration of Adam's result was soon made

1 Philosophical Transactions, 1853.

conclusive, and a value which may be regarded as definitive has been derived by Brown. With the latest accepted diminution of the eccentricity, the coefficient is 5-91 ".

The question now arose of the origin of the discrepancy between the smaller values by theory, and the supposed values of 12″ derived from ancient eclipses. In 1856 William Ferrel showed that the action of the moon on the ocean tidal waves would result in a retardation of the earth's rotation, a result, at first unnoticed, which was inde- pendently reached a few years later by Delaunay. The amount of retardation does not admit of accurate computation, owing to the uncertainty both as to the amount of the oceanic friction from which it arises and of the exact height and form of the tidal wave, the action of the moon on which produces the effect. But any rough estimate that can be made shows that it might well be supposed much larger than is necessary to produce the observed differences of 6″ per century. It was therefore surprising when, in 1877, Simon Newcomb found, by a study of the lunar eclipses handed down by Ptolemy and those observed by the Arabians — data much more reliable than the vague accounts of ancient solar eclipses — that the actual apparent acceleration was only about 8-3″. This is only 2-4″ larger than the theoretical value, and it seems difficult to suppose that the effect of the tidal retardation can be as small as this. This suggests that the retardation may be in great part compensated by some accelerating cause, the existence of which is not yet well established. The following is a summary of the present state of the

question: —

The theoretical value of the acceleration, assuming the day to be constant, is 5 - 9i”

Hansen’s value in his Tables de la lune is 12-19

Hansen’s revised, but still theoretically erroneous,

result is 12-56

The value which best represents the supposed eclipses — (1) of Thales, (2) at Larissa, (3) at Stikkelstad — is about 11-7

The result from purely astronomical observation is 8-3

• Inequalities of_ Long Period. — Combined with the question of secular acceleration is another which is still not entirely settled — that of inequalities of long period in the mean motion of the moon round the earth. Laplace first showed that modern observations of the moon indicated that its mean motion was really less during the second half of the 18th century than during the first half, and hence inferred the existence of an inequality having a period of more than a century.

The existence of one or more such inequalities has been fully confirmed by all the observations, both early and recent, that have become available since the time of Laplace. It is also found by computation from theory that the planets do produce several appreciable inequalities of long period, as well as a great number of short period, in the motion of the moon. But the former do not correspond to the observed inequalities, and the explanation of the outstanding differences may be regarded to-day as the most perplexing enigma in astronomy. The most plausible explana- tion is that, like the discrepancy in the secular acceleration, the ob- served deviation is only apparent, and arises from slow fluctuations in the earth’s rotation, and therefore in our measure of time pro- duced by the

motion of great masses of polar ice and the variability of the amount of snowfall on the great continents. Were this the case a similar inequality should be found in the observed times of the transits of Mercury. But the latter do not certainly show any deviation in the measure of time, and seem to preclude a deviation so large as that derived from observations of the moon. This suggests that inequalities in the action of the planets may have been still overlooked, the subject being the most intricate with which celestial mechanics has to deal. But this action has been recently worked up with such completeness of detail by Radau, Newcomb and Brown, that the possibility of any unknown term seems out of the question. r The enigma therefore still defies solution.

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MOONSEED, in botany, a common name for Menispermum, a genus of climbing deciduous shrubs, containing one

species in North America and another in Eastern Asia. The former, M. canadense, is a handsome plant, suited to damp and shady walls, with large reniform peltate leaves and yellowish flowers borne in profusion on long pendulous racemes.

MOONSTONE, a variety of felspar, showing in certain direc- tions a bluish opalescence, whence its value as an ornamental stone. When cut with a convex surface it displays a soft milky reflection, forming a luminous band, but not sharply defined as in cat's-eye. The ordinary moonstone is a translucent variety of orthoclase known as adularia (see Orthoolase), whence the peculiar sheen has been called " adularescence." The effect is probably caused by interference from twin lamellae, or by numerous enclo- sures of microscopic laminae, definitely orientated, and it has been suggested that these may often be flakes of kaolin due to incipient decomposi- tion of the felspar. Practically all the moonstone of commerce comes from. Ceylon, principally from the Dumbara district of the Central Province. It occurs as pebbles and irregular masses in the gem-gravels and clay-deposits, and is also obtained by quarrying an adularia leptynite, as described by Dr. A. K. Coomaraswamy. Very similar in some respects to moonstone is the chatoyant soda-felspar which was called by T. Sterry Hunt peristerite, from Gr. irepio-Tepa, a dove, in allusion to the resemblance of its lustre to that of the bird's neck. The original peri- sterite was from Bathurst, near Perth, Lanark county, Ontario, but it occurs also at Macomb, St Lawrence county, New York.

MOONWORT, or Moon-tern, in botany, the popular name of a small fern (Botrychium Lunaria), belonging to the order Ophioglossaceae (see Ferns). It has a tuberous root-stock and a stout fleshy glabrous frond 3 to 6 in. long, with a sterile and fertile portion; the former bears several pairs of close-set, semi-circular or moon-shaped pinnae, the latter

From Strasburger's Lehrbuch der Bolanik, by permission of Gustav Fischer.

Botrychium Lunaria.

is pinnately branched and covered, on the face opposed to the sterile portion, with small globose spore-cases which burst transversely. It is a widely distributed plant in the north and south temperate and cold zones, and is found in pastures and grassy banks in Britain.

MOOR. (1) A heath, an unenclosed stretch of waste or uncultivated land, covered with heather; also such a heath preserved for game-shooting, particularly for the shooting of grouse. The O. Eng. mor, bog, moor, is represented in other Teutonic languages; cf. Dan. mor, Ger. Moor, O. Du. moer, &c; from an O. Du. adjectival form moerasch comes Eng. morass a bog. Probably mere, marsh, are not to be connected with these words. (2) The verb " to moor," to fasten a ship or boat to the shore, to another vessel, or to an anchor or buoy, by cables, &c, is probably from the root seen in mod. Du. meren, which also gives the English nautical term " marline." small strands of rope used for lashings or seizings, and " marline-spike," a small iron tool for separating the strands of rope, &c.

MOORCROFT, WILLIAM (c. 1770-1825), English traveller, was born in Lancashire, about 1770. He was educated as a surgeon in Liverpool; but on completing his course he resolved to devote himself to veterinary surgery, and, after studying the subject in France, began practice in London. In 1795 he published a pamphlet of directions for the medical treatment of horses, with special reference to India, and in 1800 a Cursory Account of the Methods of Shoeing Horses. Having been offered by the East India Company the inspectorship of their Bengal stud, Moorcroft left England for India in 1808. Under his care the stud rapidly improved; in order to perfect the breed he resolved to undertake a journey into Central Asia to obtain a stock of Turkoman horses. In company with Captain William Hearsey, and encumbered with a stock of merchandise for the purpose of establishing trade relations between India and Central Asia, Moorcroft left

Josimath, well within the mountains, on the 26th of May 1812. Proceeding along the valley of the Dauli, they reached the summit of the frontier pass of Niti on the 1st of July. Descending by the towns of Darba and Gartok, Moorcroft struck the main upper branch of the Indus near its source, and on the 5th of August arrived at the sacied lake of Manasarowar. Returning by Bhutan, he was detained some time by the Ghurkas, and reached Calcutta in November. This journey only served to whet Moorcroft's appetite for more extensive travel, for which he prepared the way by sending out a young Hindu, who succeeded in making extensive explora- tions. In company with him and George Trebeck, Moorcroft set out on his second journey in October 1819. On the 14th of August the source of the Beas (Hyphasis) was discovered, and subsequently that of the Chenab. Leh, the capital of Ladakh, was reached on the 24th of September, and here several months were spent in exploring the surrounding country. A com- mercial treaty was concluded with the government of Ladakh, by which the whole of Central Asia was virtually opened to British trade. Kashmir was reached on the 3rd of November 1822, Jalalabad on the 4th of June 1824, Kabul on the 20th of June, and Bokhara on the 25th of February 1825. At Andkhui, in Afghan Turkestan, Moorcroft was seized with fever, of which he died on the 27th of August 1825, Trebeck surviving him only a few days. But according to the Abbe Hue, Moorcroft reached Lhasa in 1826, and lived there twelve years, being assassinated en his way back to India in 1838. In 1841 Moor- croft's papers were obtained by the Asiatic Society, and pub- lished, under the editorship of H, H. Wilson, under the title of Travels in the Himalayan Provinces of Hindustan and the Punjab, in Ladakh and Kashmir, in Peshawur, Kabul, Kunduz and Bokhara, from i8iq to 1825.

See Graham Sandberg, The Exploration of Tibet (1904).

MOORE, ALBERT JOSEPH (1841–1893), English decorative painter, was born at York on the 4th of September 1841. He was the youngest of the fourteen children of the artist, William Moore, of York who in the

first half of the 19th century enjoyed a considerable reputation in the North of England as a painter of portraits and landscape. In his childhood Albert Moore showed

an extraordinary love of art, and as he was encouraged in his tastes by his father and brothers, two of whom after- wards became famous as artists — John Collingham Moore, and Henry Moore, R.A. — he was able to begin the active exercise of his profession at an unusually early age. His first exhibited works were two drawings which he sent to the Royal Academy in 1857. A year later he became a student in the Royal Academy schools; but after working in them for a few months only he decided that he would be more profitably occupied in inde- pendent practice. During the period that extended from 1858 to 1870, though he produced and exhibited many pictures and drawings, he gave up much of his time to decorative work of various kinds, and painted, in 1863, a series of wall decorations at Coombe Abbey, the seat of the earl of Craven; in 1865 and 1866 some elaborate compositions: ″ The Last Supper ″ and ″ The Feeding of the Five Thousand ″ on the chancel walls of the church of St Alban's, Rochdale; and in 1868 ″ A Greek Play,″ an important panel in tempera for the proscenium of the Queen's Theatre in Long Acre. His first large canvas, ″ Elijah's Sacrifice,″ was completed during a stay of some five months in Rome at the beginning of 1863, and appeared at the Academy in 1865. A still larger picture, ″ The Shunamite relating the Glories of King Solomon to her Maidens,″ was exhibited in 1866, and with it two smaller works, ″ Apricots ″ .and ″ Pomegranates.″ In these Albert Moore asserted plainly the particular technical conviction which for the rest of his life governed the whole of his practice, and with them he first took his place definitely among the most original of British painters. Of his subsequent works the most notable are ″ The Quartette ″ (1869), ″ Sea Gulls ″ (1871),

” Follow-my-Leader ” (1873), “Shells” (1874), “Topaz” (1879), “Rose Leaves” (1880), ” Yellow Marguerites ” (1881), ” Blossoms ” (1881), “Dreamers” (1882), “Reading Aloud” (1884), “Silver” (1886), “Midsummer” (1887), “A River Side” (1888), “A Summer Night ” (1890), ” Lightning and Light ” (1892), ” An Idyll ” (1893), and ” The Loves of the Winds and the Seasons,” a large picture which was finished only a few days before his death. He died on the 25th of September 1893, at his studio in Spenser Street, Westminster. Several of his pictures are now in public collections; among the chief are ” .Blossoms,” in the National Gallery of British Art; ” A Summer Night ” in the Liverpool Corporation Gallery; ” Dreamers ” in the Birmingham Corporation Gallery; and a water-colour, ” The Open Book,” in the Victoria and Albert Museum, South Ken- sington. In all his pictures, save two or three produced in his later boyhood, he avoided any approach to story-telling, and occupied himself exclusively with decorative arrangements of lines and colour masses. The spirit of his art is essentially classic, and his work shows plainly that he was deeply influenced by study of antique sculpture; but he was not in any sense an archaeological painter, nor did he attempt reconstructions of the life of past centuries. Artistically he lived in a world of his own creation, a place peopled with robust types of humanity of Greek mould, and gay with bright-coloured draperies and brilliant-hued flowers. As an executant he was careful and certain; he drew finely, and his colour-sense was remarkable for its refinement and subtle appreciation. Few men have equalled him as a painter of draperies, and still fewer have approached his ability in the application of decorative principles to pic- torial art.

MOORE, EDWARD (1712-1757), English dramatist and miscellaneous writer, the son of a dissenting minister, was born at Abingdon, Berkshire, on the 22nd of March 1712. He was the author of the domestic tragedy of The Gamester, originally produced in 1753 with Garrick in the leading character of Beverley the gambler. As a poet he

produced clever imitations of Gay and Gray, and with the assistance of George, 1st Lord Lyttelton, Lord Chesterfield and Horace Walpole, conducted The World (1753-1757), a weekly periodical on the model of the Rambler. Moore collected bis poems under the title of Poems, Fables and Plays in 1756. He died in Lambeth on the 1st of March 1757. His Dramatic Works were published in 1788.

MOORE, GEORGE (1853-), Irish novelist and poet, was born in Ireland, son of George Henry Moore, M.P., a well- known orator and politician. He studied art in London and finished his education in Paris. He was a regular contributor to various London magazines when he published his first volume, in verse, The Flowers of Passion (1877). A second, Pagan Poems, appeared in 1881. As a novelist he followed the French school of Flaubert and Zola, and became prominent for deliberate realism. His powerful Mummer's Wife (1885) had decidedly repulsive elements. But Zolaism meanwhile was a thing to which the reading public was gradually becoming acclimatized. George Moore's Esther Waters (1894), a strong story with an anti-gambling motive, had a more general success, and was followed by Evelyn Innes (1898), a novel of musical life, and its sequel, Sister Teresa (1901). He interested himself in the Irish Gaelic revival, and was one of the founders of the Irish Literary Theatre. His play, The Strike at Arlingford (three acts, in prose, 1893), was written for the Independent Theatre, and his satirical comedy, The Bending of the Bough (1900), dealing with Irish local affairs, was played by the Irish Literary Theatre in Dublin. His Diarmuid and Grania, written with Mr. W. B. Yeats, was produced by Mr. F. R. Benson's company at the same theatre in 1901. The Untilled Field (1903) and The Lake (1905) are romantic pictures of Irish life. Moore had originally come to the front in London about 1888 as an art critic, and his published work in that line includes Impressions and Opinions (1891) and Modern Painting (1893, 2nd ed., 1897). Among his other books are A Drama in Muslin, (1886), A Mere Accident (1887), Parnell and His Island (1887), Mike Fletcher

(1887), Spring Days (1888), Vain Fortune (1890), Celibates (1895), Confessions of a Young Man (1888), and Memoirs of My Dead Life (1906).

MOORE, GEORGE FOOT (1851-), American Biblical scholar, was born in West Chester, Pennsylvania, on the 15th of October 1851, the son of William Eves Moore (1823-1899), a prominent Presbyterian minister, long the permanent clerk of the Presbyterian General Assembly. The son graduated at Yale in 1872 and at Union Theological Seminary in 1877, was ordained in 1878, and from 1878 to 1883 was pastor of the Putnam Presbyterian Church, Zanesville, Ohio. He was Hitchcock professor of the Hebrew language and literature in Andover Theological Seminary in 1883-1902, and was president of its faculty in 1899-1901; in 1902 he became professor of theology and in 1904 professor of the history of religion at Harvard University. His chief critical work dealt with the Hexateuch, and more particularly the Book of Judges (Com- mentary, 1895; text, translation and notes, 1898; text with critical notes, 1900).

MOORE, HENRY (1831-1895), English painter, the ninth son of William Moore, of York, and brother of Albert Joseph Moore, was born in that city on the 7th of March 1831. His artistic education was chiefly supervised by his father, but he also attended the York School of Design, and worked for a short time in the Royal Academy Schools. He first exhibited at the Academy in 1853, and was a constant contributor to its exhibi- tions till his death. At the outset of his career he occupied himself mostly with landscapes and paintings of animals, executed with extraordinary detail in imitation of the prevailing taste of the Pre-Raphaelite Brotherhood; but in 1857, while on a visit to the West of England, he made his first attempts as a sea-painter. His success was immediate, and it had the effect of diverting him almost entirely from landscapes. Among his most important canvases must be reckoned ” The Pilot Cutter ” in 1866, ” The Salmon Poachers ” in 1869, ” The Lifeboat” in 1876, “Highland Pastures” in 1878, “The Beached Margent of the Sea ” in 1880,

" The Newhaven Packet " (bought by the Birmingham Corporation), and " Catspaws off the Land " (bought by the Chantrey Fund trustees); in 1885, " Mount's Bay " (bought by the Manchester Corporation) in 1886, " Nearing the Needles " in 1888, " Machrihanish Bay, Cantyre," in 1892, " Hove-to for a Pilot " in 1893, and " Glen Orchy," a landscape, in 1895. He was elected an associate

of the Royal Society of Painters in Water Colours in 1876, and a full member in 1880; an associate of the Royal Academy in 1885, and an academician in 1893; and at Paris, in 1887, where he exhibited "The Newhaven Packet " and "The Clearness after Rain," he received a grand prix and was made a knight of the Legion of Honour. He died at Margate on the 22nd of June 1895. His works are marked by admirable appreciation of nature, and by a rare understanding of wave-form and colour and of the subtleties of atmospheric effect ; and as a sea-painter he may fairly be regarded as almost without a rival.

MOORE, JOHN (1729-1802), Scottish physician and writer, was born at Stirling in 1729, the son of a clergyman. After taking his medical degree at Glasgow, he served with the army in Flanders, then proceeded to London to continue his studies, and eventually to Paris, where he was attached to the household of the British ambassador. His novel Zeluco (1789), a close analysis of the motives of a selfish profligate, produced a great impression at the time, and indirectly, through the poetry of Byron, has left an abiding mark on literature. Byron said that he intended Childe Harold to be " a poetical Zeluco," and the most striking features of the portrait were undoubtedly taken from that character. Moore's other works have a less marked individuality, but his sketches of society and manners in France, Germany, Switzerland, Italy and England furnish valuable materials for the social historian. In 1792 he accom- panied Lord Lauderdale

to Paris, and witnessed some of the principal scenes of the Revolution. His Journal during a Resi- dence in France (1793) is the careful record of an eye-witness, and is frequently referred to by Carlyle. He died in London on the 21st of January 1802, leaving five sons, the eldest of whom was General Sir John Moore. James Moore (1763–1834), who wrote Sir John's Life, was also the author of some important medical works, and Sir Graham Moore (1764–1843), saw much active naval service and became an admiral.

MOORE, SIR JOHN (1761–1809), British general, the son of John Moore, was born at Glasgow on the 13th of November 1 76 1. From his early years he intended to become a soldier, learned the Prussian firing exercise, and was " always operating in the field and showing how Geneva could be taken." By the duke of Hamilton's influence he obtained an ensigncy in the 51st foot (1776), learned his drill at Minorca, and in 1778 was ap- pointed captain-lieutenant in a new regiment raised by Hamilton for service in the American War. Moore remained in America to the peace of 1783, after which the Hamilton regiment was disbanded. In 1784 he was returned by the Hamilton interest as member of parliament for the united boroughs of Lanark, Selkirk, Peebles and Linlithgow. In parliament, though he never spoke, he seems to have taken his duties very seriously, and to have preserved an independent position, in which he won the friendship of Pitt and the respect of Burke, and (more important still) the friendship of the duke of York. In 1787 he became major in the 60th (now King's Royal Rifles), but in the following year he was transferred to his old corps, the 51st. In 1792 Moore sailed with his corps to the Mediterranean. He was too late to assist at Toulon, but was engaged throughout the operations in Corsica, and won particular distinction at the taking of Calvi, where he was wounded. Soon after this he became adjutant-general to Sir Charles Stuart, with whom he formed a close friendship. After the expulsion of the French Moore became very intimate with many of the leading Corsican patriots, which intimacy was so obnoxious

to Sir Gilbert Elliot (later Lord Minto) that Moore was eventually ordered to leave the island in forty-eight hours, though Elliot wrote in warm terms of his ability. Pitt and the duke of York thought still more highly of Colonel Moore, who was soon sent out to the West Indies in the local rank of brigadier-general. Here he came under the command of Sir Ralph Abercromby, whose most valued adviser and subordinate Moore soon became. In the Santa Lucia expedition he won further distinction by his conduct at the capture of the Vigie and Morne Fortune, and when Sir Ralph left the island he appointed Moore governor and military commander. In 1798 he accompanied Abercromby

to Ireland as a major-general, and during the rebellion was actively engaged in command of a corps in the south, defeating a large force of the Irish, and saving Wexford from destruction after the battle of Vinegar Hill (June 21). His services were in universal request, and Abercromby had him appointed to the command of a brigade destined for the expedition to Holland. At the action of Egmont-op-Zee, on the 2nd of October 1799, his brigade lost very heavily, and he himself was wounded for the fourth time, on this occasion severely. On his return from Holland he was made colonel of the 52nd regiment, with which he was connected for the rest of his career, and which under his supervision became one of the finest regiments in Europe.

Throughout the Egyptian expedition he commanded the reserve. The 28th and 42nd regiments in this corps gained great distinction at the battle of Alexandria, where Moore himself was again wounded. He returned to duty, however, before the surrender of the French forces to General Hutchinson, and added so much to his reputation by his conduct in this brilliant campaign that after the short peace came to an end he was appointed to command the force assembled at Shorncliffe camp (1803) as a part of the army intended to meet the projected invasion of Napoleon. Here were trained some of the best regiments of the service, amongst others the 43rd, 52nd' and 95th Rifles, the regiments which

afterwards formed the famous ” Light Division ” and won in the Peninsula an unsurpassed reputation, not only for the skilful performance of the duties of light troops, but also for invincible steadiness in the line of battle. These corps (now represented in the army by the 1st and 2nd battalions of the Oxfordshire Light Infantry and the Rifle Brigade) bore the impress of Moore’s training for thirty years and more, and as early as 1804, on account of the ” superior state ” of the 52nd, tne king granted the officers exceptional promotion (August 29, 1804). The system of light infantry tactics taught at Shorncliffe was not invented by Moore; but he had always advocated the creation of these troops, and he supervised the training which produced such great results. While at Shorncliffe he renewed his intimacy with Pitt, who was then residing at Walmer Castle, and his close friendship with Lady Hester Stanhope led to the erroneous belief that he was betrothed to her. On his return to office Pitt caused Moore to be made a Knight of the Bath, and about the same time came his promotion to the rank of lieutenant-general. Fox, when he succeeded to office, showed the same appreciation of Moore, and in 1806 sent him to the Mediterranean as second- in-command to his brother, General H. E. Fox. In the various minor expeditions of the time Moore had a share, at first as a subordinate, but soon, when Fox went home on account of ill- health, as commander-in-chief of the British army employed in the Mediterranean. About this time he formed an attachment for Caroline Fox (afterwards the wife of Sir William Napier), to whom, however, he did not offer marriage, fearing to ” influence her,” by his high position and intimacy with her father, ” to an irretrievable error for her own future contentment ” (Lifeof Sir C. Napier, i. 39). In 1808 Moore was ordered to the Baltic, to assist Gustavus IV., king of Sweden, against Russia, France and Denmark. The conduct of the king, who went so far as to place Sir John Moore under arrest when he refused to acquiesce in his plans, ruined any chance of successful co-operation, and the English general returned home, making his escape in disguise. He was at once

ordered to proceed with his division to Portugal, where he was to be under the command of Sir Hew Dalrymple and Sir Harry Burrard. To Moore, as a general of European reputation, who had held a chief command, the appointment of two senior officers to be over him appeared as a bitter insult, though his resentment did not divert him from his duty. He met his reward, for when, in the excitement caused by the con- vention of Cintra, Dalrymple and Burrard were ordered home, Moore was left in command of the largest British army that had been employed since the commencement of the war. Wellesley, who returned home with the other generals, showed his appreciation of Moore, and in an interesting letter {Wellington Despatches, Oct. 8, 1808) expressed his desire to use his own

great political influence to effect a reconciliation between Moore and the ministers. ,

It was not long before the Spaniards summoned Sir John Moore's army to assist them against the advance of Napoleon, and the troops were marched into Spain, Salamanca being their rendezvous. There Moore remained for a month, calling up Sir David Baird's corps from Corunna to assist him. Soon, however, the overwhelming success of the emperor's attack threatened to isolate Moore, and it was then that he formed the magnificent resolution of marching northwards against the French line of retreat. The bold and skilful operations which followed this step will be found outlined in the article Peninsular War. Moore's advance paralysed the Emperor's victorious armies. Napoleon himself turned against the British army, which was soon in grave danger, but Spain was saved. Under these circumstances took place the famous retreat on Corunna. The indiscipline of a large proportion of the troops made it painful and almost disastrous, but the reserve under Edward Paget, in which served Moore's old Shorncliffe regiments, covered itself with glory

in the ceaseless rearguard fighting which marked every step of the retreat. The march ended with the glorious battle of Corunna (Jan. 16, 1809), where, early in the day, Sir John Moore received his death wound. He would not suffer his sword to be unbuckled, though the hilt galled his wound, and so he was borne from the field. His last hours were cheered by the knowledge of victory, and his only care was to recommend his friends, and those who had distinguished themselves, to the notice of the government. He died with the name of Lady Hester Stanhope on his lips. By his own wish he was buried, before dawn on the 17th, in the ramparts of Corunna. Marshal Soult designed that a monument should be erected, with an inscription framed by himself, and the Spanish general La Romana afterwards carried out Soult's wishes. The temporary monument thus erected was made permanent in 181 1 by Sir Howard Douglas, acting for the prince regent. The duke of York issued to the army on the 1st of February a noble order in which reference was made to the services of the general, and, above all, to the fact that " the life of Sir John Moore was spent among the troops." A memorial was erected in St Paul's Cathedral by order of parliament early in 1809, and his native city of Glasgow erected in George Square a bronze statue by Flaxman. The poem by the Rev. Charles Wolfe, " The Burial of Sir John Moore," became one of the most popular in the language. The best-known portrait of Sir John Moore is that by Sir Thomas Lawrence, P.R.A.

For many years controversy, largely political, raged over the events of the Corunna campaign, and only at a later period has any examination of Sir John Moore's merits and services been made in a dispassionate spirit. Mistakes were doubtless made in the retreat, but it is sufficient to accept Napoleon's view that they were probably inseparable from the difficulties with which Moore was surrounded. His greatest claim to renown is, however, independent of his conduct of armies in the field. He was the finest trainer of men that the British army has ever known. He had the true gift of

the great man, judgment of character. While Wellington, whose work would have been vain but for Moore's achievements, perpetually complained of his officers and formed no school, Moore's name is associated with the career of all who made their mark. The history of the Light Division is sufficient in itself to indicate the results of Moore's training on the rank and file. In opposition to the majority, who regarded the lash and the gallows as the source of discipline, he sought always and by every means to develop the moral qualities no less than the physical. Of the senior officers Hope, Graham, Edward Paget, Hill and Craufurd all felt and submitted to his ascendancy. The flower of the younger generation, Colborne, Hardinge and the Napiers, even though they gained their laurels under Wellington and in chief command, were ever proud to call themselves " Sir John Moore's men."

See, besides the works mentioned in the article Peninsular War, J. C. Moore, Life of Sir John Moore (1833) ; Sir J. F. Maurice,

Sir John Moore's Journal (1904); and the Records of the 52nd (Oxfordshire Light Infantry). A shorter memoir will be found in Twelve British Soldiers (London, 1899).

MOORE, THOMAS (1779–1852), Irish poet, was born in Dublin on the 28th of May 1779. His father was John Moore, a prosperous grocer and wine merchant, and his mother's maiden name was Anastasia Codd. In 1793 Tom Moore's name first appeared in print, as a contributor of some verses " To Zelia," to a Dublin periodical, the Anthologia Hibemica. In the same year Roman Catholic students began to be admitted to Trinity College, Dublin, and in 1794 Moore's name was entered on the books, curiously enough, as a Protestant. At Trinity he made friends with Robert Emmet, and was nearly dragged into the plots of the United Irishmen. The events of 1798 and the execution of Emmet in 1803 made a deep impression on him. The words of Emmet's address to his judges, asking the charity of silence — " Let no man write

my epitaph ″ — are enshrined by Moore in one of his lyrics, "Oh, breathe not his name!" (Irish Melodies, 1808). The next song in the same collection — ″ When he who adores thee ″ — also owes its inspiration to Emmet's fate, and the conscientious Orientalism of Lalla Rookh does not conceal the pre-occupation of the writer with the United Irishmen when he writes of ″ The Fire Worshippers," and with Emmet and Sarah Curran when he describes the loves of Hafed and Hinda, especially in the well-known song, ″ She is far from the Land where her young Hero sleeps." In 1798 Moore graduated, and in the next year left for England to keep his terms at the Middle Temple.

He rapidly became a social success in London. Joseph Atkinson, secretary in Ireland to the ordnance board, had been attracted to Moore in Dublin at first by his gifts as a singer. He now gave him an introduction to Francis Rawdon-Hastings, 2nd earl of Moira, who invited him to his country seat at Doning- ton Park, Leicestershire. Here Moore became a frequent guest. He had brought with him from Ireland a translation of the Odes of Anacreon, and the prince of Wales consented to have the volume dedicated to him. It was issued in 1800 with notes and a list of distinguished subscribers. His social successes involved him in expenses far beyond his means. His publisher had advanced him money, and he resolved to pay his debt by the anonymous publication of his juvenile poems, The Poetical Works of the Late Thomas Little, Esq. (1801), a collection of love poems which Moore afterwards regretted. Through Lord Moira's influence he was, in 1803, appointed registrar of the admiralty prize-court at Bermuda. He went there to take possession of the post, but soon tired of the monotonous life, and in 1804, after appointing a deputy, returned to England by way of the United States and Canada. In 1806 he published Epistles, Odes and other Poems, chiefly dealing with his im- pressions of travel. The volume contained the ″ Canadian Boat Song ″ (″ Faintly as tolls the evening chime "), and some love poems of the same kind as those connected with the name of ″ Mr Little." Jeffrey made an unjustifiable

onslaught on this collection in the Edinburgh Review for July 1806. Moore was in his view ” the most licentious of modern versifiers, and the most poetical of those who, in our time, have devoted their talents to the propagation of immorality,” and the book was a ” public nuisance.” Moore challenged Jeffrey, and a duel was arranged at Chalk Farm. The police interrupted the proceedings. Jeffrey’s pistol was found to be unloaded, and the ludicrous affair ended in a fast friendship between them.

The success of the satirical epistles in the 1806 volume encouraged Moore to produce further work of a similar kind, Corruption and Intolerance, Two Poems (1808), and The Sceptic: a Philosophical Satire (1809), but the heroic couplet and the manner of Pope did not suit his talents. At the end of 1806 he went to Dublin, and, with the exception of about six months in 1807 spent at Donington Park, the next three years were spent in Ireland. Here he met Miss Elizabeth Dyke, an actress, who became his wife in March 181 1. They lived at first in London, but soon removed into the country, to Kegworth, near Lord Moira’s seat, and then to Mayfield Cottage, near

Ashbourne, Derbyshire. Moore had to spend much of his time in London, for the popularity of his songs led to an agreement with his publisher to increase the success of these by singing them himself at great houses. The inception of his Irish Melodies dates from 1807, and many of the best were written during the three years of his Irish visit. He had already published separate songs, some of them set to music of his own, when William Power suggested to him in 1807 the task of fitting words to a series of Irish airs supplied by Sir John Stevenson. He could not have found a task more exactly suited to his powers, and for a quarter of a century he enjoyed a regular income of £500 a year from Power for writing words to music. The first number of the Irish Melodies appeared in 1808, and contained some of his

best and most popular work. The rest appeared between 1808 and 1834. In 1816 Stevenson and Moore published Sacred Songs, followed by a second number in 1824. In 1818 they began to adapt melodies from other nations. The first number of National Airs appeared in 1818, and was followed by others in 1820, 1822, 1826, and 1827.

After 181 2 he broke ground in a new field — political squib- writing. His first butt was the prince regent, once his friend and patron, whose foibles, fatness, love for cutlets and curacoa, for aged mistresses and practical jokes, were ridiculed with the lightest of clever hands. His earlier political poems appeared in the Morning Chronicle, but in 1813 he published a thin volume of Intercepted Letters: The Twopenny Post Bag. Other volumes of squibs, most of which passed through several editions, followed: The World at Westminster (1816), The Fudge Family in Paris (1818), The Journal of a Member of the Pococurante Society (1820), Fables for the Holy Alliance (1823), Odes on Cash, Corn, Catholics, and other Matters (1828), The Fudge Family in England (1835). The only failure among his satirical writings was Tom Crib's Memorial to Congress (1819) for which he had made an elaborate study of thieves' argot.

In i8r4 he contracted with the firm of Longmans to supply a metrical romance on an Eastern subject, which should contain at least as many lines as Scott's Rokeby, the publishers bind- ing themselves to pay 3000 guineas on delivery. Moore had begun Lalla Rookh two years before. He was a careful and laborious writer, and retired to a cottage in the neighbourhood of Donington Park, where with the help of Lord Moira's library he read himself slowly into familiarity with Eastern scenery and manners. He was already far advanced in his work when Byron in The Giaour and again in The Bride of Abydos largely forestalled him. The depression following on the peace of 1815 deferred the publication of Lalla Rookh until 181 7. It was an immediate success. The Eastern local colouring which dazzled Moore's contemporaries has, however, faded, and the interest

still existing in the poem is chiefly due to the under- current of Irish patriotism which he cleverly worked into it. Immediately after the completion of Lalla Rookh, Moore removed with his family to Sloperton Cottage, Wiltshire, where he was close to Bowood, Lord Lansdowne's country seat. Moore's plans were interrupted by the embezzlement of some £6000 by the deputy he had left in Bermuda, for whose default he was fully liable. To avoid a debtors' prison Moore retired to the Continent. He visited Byron in Italy, and in October 1810 received from him the first part of the Memoirs. The con- tinuation was sent to Moore in Paris the next year, with Byron's suggestion that the reversion of the MS. should be sold. Moore did not remain long in Italy, but made his home in Paris, where he was joined by his wife and children. He was not able to return to England until 1822, when the Bermuda affair was compromised by a payment through Longmans of £1000. Moore had had many offers of help, but preferred to be indebted to his publishers only. During his exile he had written another Oriental poem, The Loves of the Angels (1822), which was hardly less popular than Lalla Rookh. He now became a contributor of satirical verse to The Times, the connexion lasting until 1827. He now wrote his Memoirs of the Life of Sheridan, first contemplated in 1814, which appeared, after some delay, in 1825. The Memoirs of Captain Rock (1824), in which he gives a

humorous but convincing account of English misgovernment in Ireland, was the result of a tour with Lord Lansdowne in western Ireland. His prose tale, The Epicurean, appeared in 1827, and the Legendary Ballads in 1830. In 1831 he completed his Life and Death of Lord Edward Fitzgerald, probably his best piece of prose work.

The death of Byron in 1824 raised the question of the publi- cation of his Memoirs. Moore had parted with them in 1821 to John Murray for £2000. After they had come into Murray's possession, Moore began to have doubts about the propriety of publishing them, and an arrangement was therefore made that the

£2000 should be regarded as a loan, to be repaid during Byron's lifetime, and that the MS. should be retained as a security. When Byron died the Memoirs were still unredeemed, and the right of publication therefore rested with Murray. Moore now borrowed the money from Longmans and induced Murray to give up his claim. The money was paid, and, after a heated discussion with Byron's executors, the MS. was burnt. It was partly the pressure of the debt thus contracted, and partly the expressed wish of Byron, that induced Moore to undertake for Murray The Letters and Journals of Lord Byron, with Notices of his Life (1830). The difficult task was executed with great skill and tact, and it remains, with all its defects and omissions, a valuable record.

Moore's countrymen desired him to accept a seat in parlia- ment for Limerick. The offer was accompanied by a scheme to present Moore with an estate in the county worth £300 a year. It was made through the poet Gerald Griffin, who has left on record an account of the interview. Moore declined the honour. In 1830 he allowed himself to be drawn into a project for writing a History of Ireland (4 vols., 1835, 1837, 1840 and 1846) for Lardner's Cyclopaedia. He hoped that by writing the history of Ireland he might arouse in his own country- men an interest in their past, and open the eyes of Englishmen to the misgovernment of the country. He had neither the historical training nor the despatch in writing which enabled Scott to scribble off the companion volumes on Scotland, and the history sat like a nightmare on him, and was left unfinished on the melancholy collapse of his powers in 1845. He had, however, the temper of the student, and was always a voracious reader.

Moore's last years were harassed by pecuniary difficulties, and by the weakness and misconduct of his sons, the elder of whom retired from the English army to enter the foreign legion of France. After the death of his last child in 1845, Moore became a total wreck, but he lived until the 25th of February 1852. He left sufficient provision for his wife in the Diary which he kept chiefly on her behalf.

His other works are, A Letter to the Roman Catholics of Dublin (1810); A Melologue upon National Music (181 1); an operetta, M.P. or The Blue Stocking (181 1) ; A Set of Glees (1827) ; The Summer Fete (1831); Evenings in Greece (1826–1832); Travels of an Irish Gentleman in Search of a Religion; Alciphron, a Poem (1839).

See Memoirs, Journal and Correspondence of Thomas Moore (8 vols., 1853–1856), ed. by Lord John Russell, which contains an immense quantity of biographical material; The Poetical Works of Thomas Moore, Collected by Himself (10 vols., 1840–1842); also Notes from the Letters of Thomas Moore to his Music Publisher, James Power (1854); and Prose and Verse, Humorous, Satirical and Sentimental., by Thomas Moore, with suppressed passages from the Memoirs of Lord Byron . . . (1878), which includes Moore's con- tributions to the Edinburgh Review (1814–1834). Among modern editions of Moore's Poetical Works may be mentioned that by Charles Kent (the Centenary ed., 1879), and that by W. M. Rossetti (1880). Memoirs of Moore are prefixed to these editions. There are many contemporary references to him, especially in the journals and letters of Byron. There is an excellent life, by Stephen Gwynn, ThomasMoore (1905), written for the " English Men of Letters Series." See also monographs on wloore, by G. Vallat (1886 and 1895), an essay on him as the poet " of Irish opposition and revolt " in Georg Brandes, Main Currents in Nineteenth Century Literature (vol. iv., 1875; Eng. trans., 1905).

MOORHEAD, a city and the county-seat of Clay county, Minnesota, U.S.A., opposite Fargo, North Dakota, on the E. bank of the Red River and about 215 m. N.W. of Minne- apolis. Pop. (1890), 2088; (1900), 3730; (1005), 4794; (1910),

the Northern Pacific railways. The city is the seat of one of the state normal schools (1888) and of Concordia College (Norwegian Lutheran; 1891), which in 1007–1908 had 500 students. Moorhead, named in honour of James K. Moorhead (1806–

1884), a Republican representative in Congress from Pennsyl- vania in 1839–1869, was settled in 1871, was incorporated as a village in 1875, and was chartered as a city in 1881.

MOOR-HEN, 1 the name by which a bird, often called water- hen and sometimes gallinule, is most commonly known in England. An earlier name was moat-hen, which was appropriate in the days when a moat was the ordinary adjunct of most considerable houses in the country. It is the Gallinula chloropus of ornithologists, about the size of a small bantam-hen, but with the body much compressed (as is usual with members of the family Rallidae, to which it belongs), its plumage above is of a deep olive-brown, so dark as to appear black at a short distance, and beneath iron-grey, relieved by some white stripes on the flanks, with the lower tail-coverts of pure white — these last being very conspicuous as the bird swims. A scarlet frontlet, especially bright in the spring of the year, and a red garter on the tibia render it very showy. Though often frequenting the neighbourhood of man, the moor-hen seems unable to overcome the inherent stealthy habits of the Rallidae, and hastens to hide itself on the least alarm; but under exceptional circum- stances it may be induced to feed, yet always suspiciously, with tame ducks and poultry. It appears to take wing with difficulty, and may be often caught by an active dog; but, in reality, it is capable of sustained flight, its longer excursions being chiefly performed by night, when the peculiar call-note it utters is frequently heard as the bird, itself invisible in the darkness, passes overhead. The nest is a mass of flags, reeds, or other aquatic plants, often arranged with much neat- ness, almost always near the water's edge, where a clump of rushes is generally chosen; but should a mill-dam, sluice-gate, or boat-house afford

a favourable site, advantage will be taken of it, and not unfrequently the bough of a tree at some height from the ground will furnish the place for a cradle. The eggs, from seven to eleven in number, resemble those of the coot but are smaller, lighter, and brighter in colour, with spots or blotches of reddish-brown. The common moor-hen is exten- sively spread throughout the Old World, being found also at the Cape of Good Hope, in India and in Japan. In America it is represented by a very closely allied form, G. galeata, so called from its rather larger frontal helm, and in Australia by another, G. tenebrosa, which generally wants the white flank-markings. Both closely resemble G. chloropus in general habits, as does also the G. pyrrhorrhoa of Madagascar, which has the lower tail-coverts buff instead of white. Celebes and Amboyna possess a smaller cognate species, G. haematopus, with red legs; tropical Africa has the smallest of all, G. angulata. One of the most remarkable varieties is the G. nesiotis of Tristan da Cunha, 2 which has wholly lost the power of flight. 3 Among other forms are the common Gallinula (Erythra) phoenicura, and Gallicrex cristata of India, as well as the South American species classed in the genus Porphyriops, and the remarkable Australian genus Tribonfx contains three species, 4 which seem to be more terres- trial "than aquatic in their haunts and habits.

.Allied to all these is the genus Porphyria, including the bird so named by classical writers, and perhaps a dozen other species often called sultanas and purple water-hens, for they all have a plumage of deep blue— some becoming violet, green, or black in parts, but preserving the white lower tail-coverts, so generally characteristic of the' group; and their beauty is enhanced by their scarlet bill and legs. ' Two, P. alleni of the Ethiopian region' and the South American P. parva, are of, small size.

1 Not to be confounded with " Moor-cock " or " Moor-fowl," names formerly in general use for the red grouse.

13 A ;sdmewhat.tritermediate form seems to be presented by the moorhen of the island of St Denis, to the north of Madagascar {Proc "Zool. Soc, 1 867, p. 1036).

*Ann. N'dt: History, 3rd series,xx. 123.

Of the larger species, P. caeruleus is the " Porphyrio " of the ancients, and inhabits certain localities on both sides of the Mediterranean, while the rest are widely dispersed within the tropics, and even beyond them, as in Australia and New Zealand. But this last country has produced a more exaggerated forfh, Notornis, which has an interesting and perhaps unique history. First described from a fossil skull by Sir R. Owen, 5 and then thought to be extinct, an example was soon after taken alive, 6 the skin of which (with that of another procured like the first by Walter Mantell) may be seen in the British Museum. Other fossil remains were from time to time noted by Sir R. Owen 7 ; but it began to be feared that the bird had ceased to exist, 8 until a third example was taken about the year 1879, the skin and most of the bones of which, after undergoing examination in New Zealand by Sir W. Buller and T. J. Parker, 9 found their way to the museum of Dresden, where A. B. Meyer discovered the recent remains to be specifically distinct from the fossil, and while keeping for the latter the name N. mantelli gives the former that of N. hochstetteri. What seems to have been a third species of Notornis formerly inhabited Lord Howe's Island, but is now extinct. Whether the genus Aptornis, of which Owen described the remains from New Zealand, was most nearly allied to Notornis and Porphyrio cannot here be decided. T. J. Parker considers it a " development by degeneration of an ocydromine type." (See Ocydrome.) (A. N.)

MOORS (Lat. Mauri; Gr. Mavpoi, dark men), the name which, as at present used, is loosely applied to any native of Morocco, but in its stricter sense only to

the townsmen of mixed descent. In this sense it is also used of the Mahom- medan townsmen in the other Barbary states. It has been by some connected with the Hebrew and Phoenician mahur, western. Wetzstein derives it from mahir, a corruption of Amasir with its plurals Imdzir and Masir, archaic forms of the Berber native name Amazigh, the free. From Mauri, the classic name for the north-western African tribes, the north- western districts of that continent came to be called by the Romans Mauretania. The term ″ Moors ″ has no real ethno- logical value. The tribes known to the Romans by that name were undoubtedly of Berber stock (see Berbers). They first appear in history at the time of the Jugurthine War (iio-loif B.C.), when Mauretania west of the Mulucha was under the government of a king called Bocchus, and appears to have constituted a regular and organized state. It retained its independence till the time of Augustus, who in 25 B.C. bestowed the sovereignty of the previously existing kingdom upon Juba II., king of Numidia, at the same time uniting it with the western portion of Numidia, from the Mulucha to the Arnpsaga, which received the name of Mauretania Caesariensis, while the province that had previously constituted the kingdom, Or Mauretania proper, came to be known as Mauretania Tingitana (see Mauretania). With the rest of North Africa Mauretania was overrun by the Arabs in the″ 7th century. The subsequent conquest of Spain was effected chiefly by Berber tribes, but the Moslems in the peninsula — known to the Christian nations as Moors — always had a strong strain of Arab blood and in most respects became Arabized. The race was also influenced con- siderably by intermarriage with the natives of Spain, and when the Moors were′ finally expelled from that country they had become almost entirely distinct from their Berber kinsfolk, to whom they were known as Andalusians. While the mountainous parts of Morocco continued to be occupied by pure Berber people, the Shluh or Shilluh, the Andalusian Moors flocked to

B Proc Zool. Soc, 1848, p. 7; Trans, iii. 336, pi.

lvi.

6 Proc 1850, pp. 209-214, pi. xxi. ; Trans, iv. 60-74, pi. xxv.

7 Thus the leg-bones and what appeared to him the sternum were described and figured {Trans, iv. pp. 12, 17, pis. ii, iv.), and the pelvis and another femur (vii. pp. 369, 373, pis. xlii., xliii.) ; but the supposed sternum afterwards proved not to' be that of Notornis, and Owen {Proc I882, p. 689) rectified the error, to which his attention had been drawn, and which he had already suspected {Trans, viii. 120).

^Notwithstanding the evidence, which presented some incon- gruities, offered by Mr Mackay (/Ms,, 1867, p. 144). ` * Trans. N. Zeal. Inst. xiv. 238-258.
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the coast towns and the plains of Morocco, occupied largely by. Arabs. The name Moor is however still applied to the populations speaking Arabic who inhabit the country extending from Morocco to the Senegal, and to the Niger as far east as Timbuktu, i.e. the western Sahara. In this vast region and in all the towns of Barbary many of the Andalusians settled.

The Moors are ethnically a very hybrid race with more Arab than Berber blood. A common mistake is to regard them as a black race, as indicated by the old English phrase " Black-a- Moor," i.e. black as a Moor. They are a white race, though often sunburnt and bronzed for generations, and both their children and those who have lived in the cities might pass anywhere as Europeans.

The typical Moors of Morocco are a handsome race, with skin the colour of coffee-and-milk, with black eyes and black silky hair, and the features of Europeans. They wear a full beard, and are

characterized by a marked dignity of demeanour. There is a general tendency to obesity, which is much admired by the Moors in their women, young girls being stuffed like chickens, with paste-balls mixed with honey, or with spoonfuls of olive oil and sesame, to give them the necessary corpulence. The Moors are an intellectual people, courteous in manner and not altogether unlettered; but they are cruel, revengeful and bloodthirsty. Among the pirates who infested the Mediterranean none were worse than the Moors.

They are fanatical Mahommedans, regarding their places of worship as so sacred that the mere approach of a Jew or a Christian is forbidden. The Moors are temperate in their diet and simple in their dress, though among the richer classes of the towns the women cover themselves with silks, gold and jewels, while the men indulge to excess their love of fine horses and splendid arms. The national fault is gross sensuality. The position of women is little better than a pampered slavery. They are uneducated, indolent and vicious. Such education as the children receive is of a superficial kind. Slavery flourishes, and slave auctions, conducted like those of cows and mules, take place on the afternoons of stated days, affording a lounge for the rich Moors, who discuss the " goods " offered and seek for bargains. This public sale of slaves was prohibited in the coast towns, c. 1850, under pressure from European powers, but means are found to evade the prohibition.

Of games the young Moors play a great number; the principal one is a kind of football, more like that of Siam and Burma than that of England; wrestling and fencing are popular, but the chief amusement of the adult Moors is the " powder-play " (laab el bdrtid), which consists of a type of military tournament, the horsemen going through lance and musket exercises or charging in review fashion, firing volleys as they gallop. Other recreations much in favour throughout Morocco are music, singing, jugglery, snake-charming and acrobatic performances. As professional story-tellers many

Moors are remarkable, but the national music is monotonous and not very harmonious.

See Dr Arthur Leared, Morocco and the Moors (1891); Budgett Meakin, The Moorish Empire (1899) ; and The Moors (1902); Frances Macnab, A Ride in Morocco (1902); and see under Morocco; Mauretania; Berbers, &c.

MOOSE, the North American Indian (Algonquian) name of the North American representative of the European elk (q.v.). The word is said to mean ″ cropper ″ or ″ trimmer,″ from the animal's habit of feeding on the branches of trees.

MOOT, a meeting or assembly, in O. Eng. mot, gentot, a word of which ″ to meet ″ is a derivative. ″ Moot ″ or it's alternative form ″ mote ″ is the common term for the assemblies of the people of the hundred, burgh, &c, in the history of early English institutions, and especially for the national assembly or council, the Witenagemot. The name survives in ″ moot hall,″ the term still given to town-halls and council buildings in some towns in England, as at Aldeburgh. From its meaning of assembly, the word was applied to a debate or discussion, especially of the discussion of a hypothetical case by law students at the Inns of Court. These moots are still carried on at Gray's Inn. As an adjective. ″ moot ″ means doubtful, undecided.

MOP, a bunch of cloth, rags or coarse yarn, fastened to a pole and serving as a broom or brush for swabbing up wet floors or other surfaces and for cleaning generally. The word is usually taken to be an adaptation of Lat. mappa, cloth, napkin, cf. "map." A particular application of the term in provincial English is to an annual hiring or statute-fair, a ″ mop-fair,″ at which domestic and agricultural servants out of places attended, carrying a broom, a mop or other implement indicative of their calling.

MOPLAH (Malayalam mappila), a fanatical Mahommedan

sect found in Malabar. The Moplahs, who number upwards of a million, are believed to be descended from Arab immigrants, who landed on the western coast of India in the 3rd century after the Hegira. They are remarkable for the fanaticism displayed in successive attacks upon the Hindus, and they have several times resisted British troops. A regiment of the Indian army was recruited among them, but the experiment proved a failure, and the Moplah Rifles were disbanded in April 1907.

MOPSUS, in Greek legend, the name of two seers. (1) Son of Ampyx (or Ampycus) and the nymph Chloris, a Lapith of Oechalia in Thessaly. He took part in the Calydonian boar hunt and accompanied the Argonauts as their prophet. He died from the bite of a serpent which sprang from the blood of the Gorgon Medusa. He is represented on the chest of Cypselus as boxing with Admetus. He was afterwards worshipped as a hero and an oracle was consecrated to him. (2) Son of Rhacius (or Apollo) and Manto, daughter of Teiresias. The rival seer Calchas is said to have died of chagrin because the predictions of Mopsus were fulfilled, while his own proved incorrect. Together with another seer, Amphilochus, Mopsus founded Mallus in Cilicia after the return from Troy; and in a quarrel for its possession both lost their lives. According to Pausanias (vii. 3, 2) Mopsus expelled the native inhabitants of Caria, and built the town of Colophon. Mopsus was worshipped as a god by the Cilicians, and had two famous oracles at Colophon and Mallus. His name survives in the town of Mopsuesfia (M6\pov 'Ecrrta) and the spring of Mopsucrene. Mopsus appears to be the incarnation of Apollo of Claros.

MOQUEGUA, a maritime province of southern Peru, bounded N. by the departments of Arequipa and Puno, and S. by the republic of Chile. Area, 5550 sq. m.; pop. (1906 estimate), 31,920. The province extends from the Pacific coast eastward to the Cordillera Occidental, which forms the boundary line with Puno and the republic of Bolivia. Eastern Moquegua is volcanic, and is broken by the high range that forms the western rim of the Titicaca basin. Among the

volcanoes in the province are Tutupacu, the last eruption of which occurred in 1802, Huaynaputina and Hachalayhua, which were in violent eruption in 1606, Coropuna, Ornate, Ubinas and Candarave — the last three still showing signs of activity. This region is also subject to severe earthquake shocks. On the lower slopes of the Cordillera there are fertile irrigated valleys which produce grapes and olives for commercial purposes, and a considerable variety of fruits, cereals and vegetables for local consumption. The best-known grape-producing districts are Moquegua (capital) and Locumba — the product being converted into wine and brandy for export. The capital is Moquegua (pop. about 5000 in 1906), in the upper valley of the Ilo River, 4500 ft. above sea-level, and 65 m. by rail from the small port of Ilo on the Pacific coast.

Moquegua was formerly one of the three provinces forming a department of the same name. The other two provinces (Tacna and Arica) were held for indemnity by Chile after the war of 1879-1883 with the understanding (treaty of Ancon, March 8, 1884) that at the expiration of ten years a plebiscite should be taken in the two provinces to determine whether they should remain with Chile, or return to Peru — the country to which they should be annexed to pay the other 10,000,000 pesos. Chile did not comply with this treaty agreement, and in 19 10 still held both provinces.

MORA, JOS£ (1638-1725), Spanish sculptor, was a pupil of Alonzo Cano. He died in Granada in 1725 and was buried in

the Albaicin church. His work can be usefully studied in the eight statues in the Capella del Cardenal in the Cordova Cathedral and in the figures of St Bruno and St Joseph in the Cartuja near Granada.

See B. Haendeke, Studien zur Geschichte der spanischen Plastik (Strassburg, 1900).

MORA, or Morra (Ital. delay), a game, universally popular in Italy, in which one player endeavours to guess instantly the number of fingers held up by the other. Ancient Egyptian sculptors represent a game of this kind, and it was played by the Romans, who called it micare digitis, or finger-flashing. It is known to the Chinese and to certain tribes of the Pacific Islands. There are several methods of playing mora, but in the one most common in Italy the two players, placed face to face, throw out at the same instant one or more fingers of one hand, each crying out simultaneously a number guessed to be that of his adversary's exposed fingers. A correct guess counts one; if both guess correctly or wrongly there is no score. The game, which is generally five or nine points, is played for stakes, and with extraordinary swiftness.

MORACEAE, in botany, an order of dicotyledons, belonging to the series Urticiflorae, to which belongs also the nettle family (Urticaceae, q.v). It contains about 60 genera with about 1000 species, mostly trees or shrubs, widely distributed in the

Fig (Ficus carica), Shoot bearing Leaves and Fruit..

1, Inflorescence cut lengthwise to show the numerous flowers crowded on the inner surface.

2, A female flower, enlarged. 3, Fruit cut lengthwise.

warmer parts of the earth. The largest genus, Ficus (the fig, q.v.) , contains 600 species spread through tropical and sub-tropical regions, and includes the common fig of the Mediterranean region {Ficus carica), the banyan (F. bengalensis) , and the india- rubber plant (F. elastica) ; many of the species are epiphytic, sometimes clinging so tightly round the host-plant with their roots as to strangle it. Morus (mulberry, q.v.) contains ten species of trees or bushes in north temperate regions and in

the mountains of the tropics. Artocarpus, including A. incisa (bread-fruit, q.v.), and A. integrifolia (jack-tree), has forty species, chiefly natives in the Indian Archipelago. The plants are rich in latex which may be very poisonous as in Antiaris toxicaria, the Upas- tree (q.v.) of Java, or sweet and nutritious as in Brosimum galactodendron, the cow-tree (q.v.) of Venezuela. The latex

often yields caoutchouc as in species of Ficus (e.g. F. elastica), Cecropia (q.v), a tropical American genus with thirty to forty species, and others.

End of Shoot showing Stipule, s, of India-rubber Plant (Ficus

elastica).

The leaves, which are entire or more or less divided, are stipulate, the stipules being small and lateral as in Morus and allied general or intrapetiolar, each pair uniting to form a cap round the younger leaves, as in Ficus and allied genera, and very well shown in F. elastica, the common india-rubber plant of greenhouses. The plants are monoecious or dioecious, and the small unisexual flowers are borne in cymose inflorescences which are condensed into ap- parent racemes, spikes or heads/ In the fig they coalesce to form a fleshy hollow axis on the inner face of which the flowers are situated, while in Dorstenia they form a flat, often lobed, expansion with the flowers sunk on the upper face. The flower resembles

Mulberry (Morus nigra), Shoot bearing Leaves and Fruit.

i, Catkin of male flowers. 3, Spike of female flowers.

2, One male flower. 4, Single female flowers,

that of Urticaceae; there are generally four free or more or less united perianth leaves, with, in the male. flower, a stamen opposite each perianth leaf ; the filaments are incurved in the mulberry and

allied genera and straight in the fig and its allies. Artocarpus has only one stamen. The female flower contains two carpels in the median plane, the posterior one of which is often more or less aborted. Each developed ovary chamber contains a solitary pendulous more or less curved ovule. The fruit is an achene or drupe, often sur- rounded by the fleshy perianth and still further complicated by the union of fruits of different flowers as in mulberry, the develop- ment of a fleshy receptacle as in fig, or as in Artocarpus (bread- fruit), by the union of fruits, perianth and axis into a solid fleshy mass. The embryo is generally curved and surrounded by a fleshy endosperm.

From the evidence of leaf-fossils it is probable that the genus Ficus existed as far north as Greenland in the Cretaceous era and was generally distributed in North America and Europe in the Tertiary period up to miocene times.

MORADABAD, a city and district of British India, in the Bareilly division of the United Provinces. The city is on the

right bank of the river Ramganga, 655 ft. above sea-level, and has a station on the Oudh & Rohilkhand railway, 868 miles from Calcutta. Pop. (1001), 75,128. It was founded in 1625 by Rustam Khan, who built the fort which overhangs the river bank, and the fine Jama Masjid or great mosque (1631). The town forms a large centre of trade in country produce. It has a special industry in ornamental brassware, sometimes plated with lac or tin, which is then engraved. Cotton weaving and printing is also carried on.

The District of Moradabad lies east of the Ganges and west of the native state of Rampur. Area, 2285 sq. m. It lies within the great Gangetic plain, and is demarcated into three sub- divisions by the

rivers Ramganga and Sot. The eastern tract consists of a submontane country, with an elevation slightly greater than the plain below, and is traversed by numerous streams descending from the Himalayas. The central portion consists of a level central plain descending at each end into the valleys of the Ramganga and Sot. The western section has a gentle slope towards the Ganges, with a rapid dip into the lowlands a few miles from the bank of the great river. In addition to Moradabad the principal towns are Amroha (?.».), Sambhal (39,715) and Chaudansi (25,711).

For the early history of Moradabad see Bareilly. It passed into the possession of the British in 1801. The population in 1001 was 1,191,993, showing an increase of i-i% in the decade. Mahommedans are more numerous than in any other district of the province, forming more than one-third of the total. The principal crops are wheat, rice, millet, pulse, sugar-cane and cotton. The main line of the Oudh & Rohilkhand railway traverses the district from south to north, with branches towards Aligarh and Rampur. A third branch from Moradabad city towards Delhi crosses the Ganges at Garhmukhteshwar by a bridge of eleven spans of 200 ft. each.

MORAES, FRANCISCO DE (c. 1500-1572), Portuguese romance writer, was probably born at the close of the 15th century. We know very little of his life, except that he was treasurer of the household to King John III., and he is first found in Paris in the suite of the Portuguese ambassador, D. Francisco de Noronha, who had gone there in 1540. He was a commander of the Order of Christ, and was called O Palmeirim on account of his authorship of the famous romance of chivalry Palmeirim de Inglaterra; in 1572 he was assassinated at Evora. He appears to have written his book in France (perhaps in Paris) in 1544, dedicating it to the Infanta D. Maria, daughter of King Manoel, but the first extant Portuguese edition only came out in 1567. A Spanish version was published as early as 1548, and on the strength of this many critics have contended that the book was originally written in that language and

that Moraes only trans- lated it into Protuguese. Both tradition and a critical exami- nation of the Portuguese and Spanish texts, however, tell over- whelmingly in favour of the first being the original with Moraes as its author. The episode of the four French ladies shows an intimate acquaintance with the court of Francis I., where Moraes spent some years, and one of these ladies named Torsi is the one he loved and to whom he addressed some verses entitled ” Desculpa de huns amores.” The Palmeirim de Inglaterra belongs to another branch of the same cycle as the Amadis de Gaula; the two romances are the best representatives of their class, and for their merits were spared from the auto dafe to which Cervantes condemned other romances of chivalry in D. Quixote. It has “a well-marked plot, clearly drawn characters, and an admirable style, and has been reckoned a Portuguese classic from the time of its issue.

Bibliography. — The Palmerin of England, by W. E. Purser (Dublin, 1904), contains an exhaustive study of the romance and the controversy concerning its authorship, with a sketch of the plot. TTie existing Portuguese editions bear the dates 1567, 1592, 1786 and 1852, while translations exist in Spanish, Italian and French. An English version from the French by A. Munday was first pub- lished in 1609. In 1807 Robert Southey issued in 4 vols. 4to an incomplete translation from the Portuguese which is really a revision of Munday. In addition Moraes wrote some Dialogues, which were published at Evora in 1624 and are incorporated in the last two editions of Palmeirim de Inglaterra. (E. Pr.)

MORAINE, a term adopted from the French for the rocky material carried downwards on the outside of a glacier, and deposited at its sides and foot. The position of the moraine with regard to the glacier is indicated by the names applied to it. The lateral moraine is the fringe of rock fragments at the glacier side. The glacier is always slowly moving down the valley. There are always points in the valley where rock falls are more frequent than in other places. The glacier as it moves forward

catches this material and carries it onward in a long heaped line distributing it evenly all down the valley sides. When two glacial valleys converge into one valley two lateral moraines unite at the point of junction and form a median moraine in the resultant broader glacier, which now has two lateral moraines and one median. All this material carried by the glacier is deposited where the glacier ends, and forms the terminal moraine, frequently in the form of a crescentic dam across the valley. This material is carried farther down- wards by stream action and distributed; otherwise the end of all glacier valleys would be blocked with debris against which the ice would be piled to a great height, and the glacier would finally become stationary. The material pushed forward beneath the glacier is sometimes called the ground moraine, the part left beneath the ice the lodge moraine, that carried to the edge and dropped the dump moraine, and that carried forward the push moraine. (See Glacier.)

MORAN, EDWARD (1829–1901), American artist, was born at Bolton, Lancashire, England, on the 19th of August 1829. He emigrated with his family to America at the age of fifteen, and subsequently settled in Philadelphia, where after having followed his father's trade of weaver, he became a pupil of James Hamilton and Paul Weber. In 1862 he became a pupil of the Royal Academy in London; he established a studio in New York in 1872, and for many years after 1877 lived in Paris. He was a painter of marine subjects and examples of his work are in many prominent collections. Among his canvases are thirteen historical paintings, intended to illustrate the marine history of America from the time of Leif Ericsson to the return of Admiral Dewey's fleet from the Philippines in 1899. He died in New York City on the 9th of June 1901. His sons (Edward) Percy Moran (b. 1862) and Leon Moran (b. 1864), and his brothers Peter Moran (b. 1842) and Thomas Moran (q.v.), also became prominent American artists.

MORAN, THOMAS (1837–), American artist, was born at Bolton, Lancashire, England, on the 12th of January

1837, and emigrated with his parents to America in 1844, the family settling in Philadelphia. After having been apprenticed for some years to a wood-engraver, he studied under his brother Edward and under James Hamilton, in Philadelphia, and later studied in London, Paris and Italy. In 1871 he accompanied Professor F. V. Hayden's exploring expedition to the Yellowstone, and in 1873 he went down the Colorado with Major J. W. Powell's famous exploring party; and on these two trips he made sketches for two large pictures, " The Grand Canon of the Yellow-stone " and " Chasm of the Colorado River," both of which were bought by the United States government and are now in the Capitol at Washington. He became a member of the National Academy of Design in 1884 and of the American Water Color Society. His wife, Mary Nimmo Moran (1842-1899), who was born in Strathaven, Scotland, and emigrated to America in 1852, was also an artist, and was particularly prominent as an etcher.

MORAR, a town of Central India, in the native state of Gwalior, 3 m. E. of Gwalior city. Pop. (1901), 19,179. It was formerly a British military cantonment and residence of a political agent, but in 1886, when the fortress of Gwalior was restored to Sindhia, the troops at Morar were withdrawn to Jhansi, and the extensive barracks were likewise made over to Sindhia. In the Mutiny of 1857 Morar was the scene of the most serious uprising in Central India. It is a centre for local trade, and has an important tanning industry.

MORAT (Ger. Murten), a small town on the east shore of the Lake of Morat, in the Swiss canton of Fribourg, and by rail

14 m. N. of Fribourg or i8j m. W. of Bern. In 190© its population was 2263, of whom 1840 were German-speaking and 1969 were Protestants. It is a most picturesque little town, overlooked by the 13th-

century castle and the quaint tower of the Rathhaus, while it is still surrounded by its 15th century walls that are studded at intervals with watch towers. In 1264 it exchanged its position as a free imperial city (enjoyed since 1218) for the rule of the count of Savoy. In 1475 it was taken by the Swiss at the commencement of their war with Charles the Bold, duke of Burgundy, whose ally was the duchess of Savoy. But in 1476 it was besieged by Charles, though it held out till the Swiss army arrived in haste and utterly defeated (22nd June) the Burgundians. An obelisk a little way south- west of the town stands on the site of the bone-house (destroyed by the French in 1798, wherein the remains of many victims had been collected. Morat was ruled in common from 1475 to 1798 by Bern and Fribourg, being finally annexed to Fribourg in 1814. The Lake of Morat has an area of 10J sq. m., and is connected with that of Neuchatel by way of the Broye canal. On its shores many lake dwellings have been found.

See F. L. Engelhard, Der Stadt Murten Chronik (Bern, 1828); G. F. Ochsenbein, Die Urkunden der Belagerunz u. Schlacht von Murten (Freiburg, 1876); H. Wattelet, Die Schlacht bei Murten (Fribourg, 1894). (W. A. B. C.)

MORATA, OLYMPIA FULVIA (1526-1555), Italian classical scholar, was born at Ferrara. Her father, who had been tutor to the young princes of the ducal house of Este, was on intimate terms with the most learned men of Italy, and the daughter grew up in an atmosphere of classical learning. At the age of twelve she was able to converse fluently in Greek and Latin. About this time she was summoned to the palace as companion and instructress of the younger but equally gifted Anne, daughter of Renee, duchess of Ferrara. Olympia's father having died a convert to Protestantism, she met with a cold reception at the palace, and withdrew to her mother's house. Olympia now embraced the doctrines of Luther and Calvin. About the end of 1550 she married a young student of medicine and philosophy, Andrew Grunthler of Schweinfurt in Bavaria. In 1554 she accompanied

Grunthler to his native place, where he had been appointed physician to the garrison of Spanish troops. In 1553 the margrave Albert of Brandenburg on one of his plundering expeditions took possession of Schwein- furt, and was in turn besieged by the Protestants. At length Albert evacuated the place, and Olympia and her husband made their escape. They finally succeeded in reaching Heidelberg (1554), where a medical lectureship had been obtained for Grunthler through the influence of the Erbach family, by whom they had been hospitably entertained during their flight. Here she died on the 25th of October in the following year.

Bibliography. — The scanty remains of her works — letters, dia- logues, Greek verses — were collected and published by Celio Secundo Curione (1558). Monographs by Caroline Bowles, wife of Robert Southey the poet (1834), J. Bonnet (1850; Eng. trans., Edinburgh, 1854), and R. Turnbull (Boston, 1846); see also Caroline Gearey, Daughters of Italy (1886).

MORATALLA, a town of eastern Spain, in the province of Murcia, 40 m. W.N.W. of the city of Murcia. Pop. (1900), 12,689. Moratalla is built on a mountainous peninsula, almost surrounded by the Grande and Benamor, small rivers which meet and flow eastward to join the Segura. The town is a labyrinth of narrow, crooked streets, and some of its houses are Moorish in character. Its chief buildings are the modern hospital and theatre, and the 17th-century church. It has manufactures of coarse cloth, spirits and soap. The nearest railway station is Calasparra, 6 m. east, on the Murcia- Albacete railway.

MORATfN, LEANDRO ANTONIO EULOGIO MELIT6N FERNANDEZ DE (1760-1828), Spanish dramatist and poet, the son of N. F. de Moratin, was born at Madrid on the 10th of March 1760. Though his poetical tastes were early developed, his father apprenticed him to a jeweller. At the age of eighteen Moratin won the second prize of the Academy for a heroic poem on the conquest of Granada, and two years afterwards he attracted more general attention with his Leccidn poetica, a satire

upon

the popular poets of the day. He was appointed secretary to Cabarrus on a special mission to France in 1787. On his return to Spain, Moratin was tonsured and presented to a sinecure benefice in the diocese of Burgos, and in 1786 his first play, El Viejo y la nina, was produced at the Teatro del Principe. Owing to the opposition of the clerical party, it was speedily withdrawn. The prose comedy, El Cafi 6 la comedia nueva, given at the same theatre six years afterwards, at once became popular. On the fall of Florida Blanca, Moratin found another patron in Godoy, who provided him with a pension and the means for foreign travel; he accordingly visited England, where he began a prose translation of Hamlet, printed in 1798 but never performed. From England he passed to the Low Countries, Germany, Switzerland and Italy, and on his return to the Peninsula in 1796 was appointed official translator to the foreign office. In 1803 he produced El Bardn in its present form; originally written (1791) as a zarzuela, it was shamelessly plagiarized by Andr6s de Mendoza, but the recast, a far more brilliant work, still keeps the stage. It was followed in 1804 by La Mogigata, written between 1797 and 1803. This piece was favourably received, and an attempt to suppress it on religious grounds failed. Moratin's crowning triumph in original comedy was El Si de las Ninas (1806), which was performed night after night to crowded houses, ran through several Spanish editions in a year, and was soon translated into a number of foreign languages. In 1808 Moratin was involved in the fall of Godoy, but in 18 11 accepted the office of royal librarian under Joseph Bonaparte^ — a false step, which alienated from him all sympathy and compelled him to spend his last years in exile. In 181-2 his Escuela de los maridos, a translation of Moliere's Ecole des maris, was produced at Madrid, and in 1813 El Medico d Palos (a translation of Le MSdecin malgrS lui) at Barcelona. From 1814 to 1828 Moratin lived in Italy and France, compiling a work on the early Spanish drama (Origenes del teatro espanol). He died at

Paris on the 21st of June 1828.

The most convenient edition of his works is that given in vol. ii. of the Biblioteca de, autores espanoles ; this is supplemented by the Obras postumas (3 vols., Madrid, 1867–1868).

MORATfN, NICOLAS FERNANDEZ DE (1737–1780), Spanish poet and dramatist, was born at Madrid in 1737. He was educated at the Jesuit College in Calatayud and afterwards studied law at the university of Valladolid. In 1772 he was called to the bar; four years afterwards he was nominated to the chair of poetry at the imperial college. He died on the nth of May 1780. A partisan of French methods, Moratin published in 1762 his Desengana al teatro espanol, a severe criticism of the national drama, particularly of the auto sacramental; and his protests were partly responsible for the prohibition of autos three years afterwards (June 1765). In 1762 he also published a play entitled La Petimetra. Neither the Petimetra nor the Lucrecia (1763), an original tragedy still more strictly in accordance with French conventions, was represented on the stage, and two subsequent tragedies^ Hormesinda (1770) and Guzmdn el Bueno (1777), were played with no great success. In 1764 Moratin published a collection of pieces, chiefly lyrical, under the title of El Poeta, and in 1765 a short didactic poem on the chase {Diana 6 arte de la caza). His ” epic canto ” on the destruction of his ships by Cortes (iff 5 Naves de Curie’s destruidas) failed to win a prize offered by the Academy in 1777, and was published posthumously (1785). But a better idea of Moratin’s talent is afforded by his anacreontic verses and by his Carta histdrica sobre el origen y progresos de las fiestas de toros en Espana.

His works are included in the Biblioteca de autores espanoles, vol. ii.

MORATORIUM (from Lat. morari, to delay), a term used to express a legal authorization postponing for a specified time the payment of debts or obligations. The term is also sometimes used to mean the period

over which the indulgence or period of grace stretches, the authorization itself being called a moratory law. A moratory law is usually passed in some special period of political or commercial stress; for instance, on several occasions during the Franco-German War the French government passed

moratory laws. Their international validity was discussed at length and upheld in Rouquette v. Overman, 1875, L. R. 10 Q. B.

.5,25- ^

MORAVIA (Ger., Mahren; Czech, Morava), a margraviate and crownland of Austria, bounded E. by Hungary, S. by Lower Austria, W. by Bohemia and N. by Prussian and Austrian Silesia. Area, 8583 sq. m. Physically Moravia may be described as a mountainous plateau sloping from north to south, just in the opposite direction of the adjoining Bohemia plateau, which descends from south to north, and bordered on three sides by mountain ranges. On the north are the Sudetes, namely the Altvater Gebirge, with the highest peaks the Grosser Schneeberg (4664 ft.) and the Altvater (4887 ft.), which sink gradually towards the west, where the valley of the Oder forms a break between the German mountains and the Carpathians. The latter separate Moravia from Hungary. Parallel to the Carpa- thians are the Marsgebirge (1915 ft.) and its continuation, the Steinitzer Wald (1450 ft.). On the west are the so-called Bohemian-Mr ravian Mountains, forming the elevated east mar- gin of Bohemia. The principal passes are those at Iglau and Zwittau to Bohemia and the Wlara Pass to Hungary. Almost the whole of Moravia belongs to the basin of the March or Morava, from which it derives its name and which rises within its territory in the Sudetes. It traverses the whole country in a course of 140 m., and enters the Danube near Pressburg. Its principal tributaries are the Thaya, the Hanna, the Iglawa with the

Zwittawa and the Schwarzawa, &c. The Oder also rises among the mountains in the north-east of Moravia, but soon turns to the north and quits the country. With the exception of a stretch of the March, none of the rivers are navigable. Amongst the mineral springs worth mentioning are the sulphur springs at Ullersdorf, the saline ones at Luhatschowitz and the alkaline springs at Toplitz.

Owing to the configuration of the soil, the climate of Moravia varies more than might be expected in so small an area, so that, while the vine and maize are cultivated successfully in the south- ern plains, the weather in the mountainous districts is somewhat rigorous. The .mean annual temperature at Briinn is 48° F. Of the total area 54-8% is occupied by arable land, 7% by meadows, S`7% by pasturages, 1-2% by gardens, 0-5% by vineyards, while 27-4% are forests. The principal products are corn, oats, barley, potatoes, rye, beetroot, hemp, flax, hay and other fodder. Forestry is greatly developed; the breed of sheep in the Carpathians is of an improved quality, and the horses bred in the plain of the Hanna are highly esteemed. The mineral wealth of Moravia, consisting chiefly of coal and iron, is very considerable. Coals are extracted at Neudorf, Lesitz, Ratisko- witz and Ceic; lignite at Rossitz, Oslavan and Mahrisch-Ostrau. Iron-ore is found at Zoptau, Blansko, Adamsthal, Witkowitz, Rossitz and Stefanau. Other minerals found here are graphite, alum, potter's clay and roofing-slate, and, besides, famous silver- mines were worked at Iglau during the middle ages. From an industrial point of view Moravia belongs to the foremost pro- vinces of the Austrian Empire. The principal manufactures are woollen, linen, cotton, cast-iron goods, beet-sugar, leather and brandy. The cloth industry was introduced in the 14th century at Iglau, where it soon obtained a great reputation; it developed afterwards at Olmiitz, and since the middle of the 18th century it has its principal centre at Briinn. The linen industry is con- centrated at Schonberg, Mistek, Wiesenberg andHeidenpiltsch; while the cotton industry has its principal seat at Sternberg.

The chief iron-foundries are to be found at Witkowitz, Stefanau^ Zoptau and Rossitz; while industrial machines are manufactured at Briinn, Blansko and Adamsthal. Large works of earthenware are established at Znaim and Frain.

Moravia had in 1900 a population of 2,435,081 inhabitants, which is equivalent to 284 inhabitants per sq. m. It belongs to the group of old Slavonic states which have preserved their nationality while losing their political independence. Of the total population 71-36% were Slavs, who were scarcely distinguishable from their Bohemian neighbours. The name of .Czech, however, is usually reserved for the Bohemians, while

the Slavs of Moravia and West Hungary are called Moravians and Slovacs. The Germans form 27-9% of the population,. and are found mostly in the towns and in the border districts. Fully 95% of the inhabitants are Roman Catholics, under the ecclesi- astical jurisdiction of the archbishop of Olmiitz and the bishop of Briinn; 2-7% Protestants and 2% Jews. In educational matters Moravia compares favourably with most of the Austrian provinces. It is well provided with schools of every description, and the number of illiterates is steadily decreasing. The local diet is composed of 100 members, of which the archbishop of Olmiitz and the bishop of Briinn are members ex officio. To the Reichsrat at Vienna Moravia sends 36 members. For adminis- trative purposes Moravia is divided into 34 districts and 6 towns, with autonomous muncipalities : Briinn (pop., 108,944), the capital, Iglau (24,387), Olmiitz (21,933), Znaim (16,261), Kremsier (13,991) and Ungarisch-Hradisch (5137). Other prin- cipal towns are Konigsfeld (11,022), Goding (10,231), Mahrisch- Ostrau (30,125), Witkowitz (19,128), Mahrisch-Schonberg (11,636), Zwittau (9063), Neutitschein (11,891), Prerau (16,738), Prossnitz (24,054), Sternberg (15,195) and Trebitsch (10,597).

History. — At the earliest period of which we have any record Moravia was occupied by the Boii, the

Celtic race which has perpetuated its name in Bohemia. Afterwards it was inhabited by the Germanic Quadi, who accompanied the Vandals in their westward migration; and they were replaced in the 5th century by the Rugii and Heruli. The latter tribes were succeeded about the year 550 a.d. by the Lombards; and these in their turn were soon forced to retire before an overwhelming invasion of Slavs, who on their settlement there took the name of Moravians (German, Mehranen or Mdhrcn) from the river Morava. These new colonists became the permanent inhabitants of this district, and in spite of the hostility of the Avars on the east founded the kingdom of Great Moravia, which was considerably more extensive than the province now bearing the name. Towards the end of the 8th century they aided Charle^ magne in putting an end to the Avar kingdom, and were re- warded by receiving part of it, corresponding to North Hungary, as a fief of the German emperor, whose supremacy they also acknowledged more or less for their other possessions. After the death of Charlemagne the Moravian princes took advantage of the dissensions of his successors to enlarge their territories and assert their independence, and Rastislaus (c. 850) even formed an alliance with the Bulgarians and the Byzantine emperor. The chief result of the alliance with the latter was the conversion of the Moravians to Christianity by two Greek monks, Cyril and Methodius, despatched from Constantinople (863) . Rastislaus finally fell into the hands of Louis the German, who blinded him, and forced him to end his days as a monk; but his successor, Svatopluk (d. 894), was equally vigorous, and extended the kingdom of Great Moravia to the Oder on the west and the Gran on the east. At this period there seemed a strong probability of the junction of the north-western and souths eastern Slavs, and the formation of a great Slavonic power to east of the German empire. This prospect, however, was dis- sipated by the invasions of the Magyar hordes in the 10th century, the brunt of which was borne by Moravia. The invaders were encouraged by the German monarchs and aided by the dis- sensions and mismanagement of the successors of

Svatopluk, and in a short time completely subdued the eastern part of Great Moravia. The name of Moravia was henceforth confined to the district to which it now applies. For about a century the possession of this marchland was disputed by Hungary, Poland and Bohemia, but in 1029 it was finally incorporated with Bohemia, and so became an integral part of the German empire. Towards the close of the 1 2th century Moravia was raised to the dignity of a margraviate, but with the proviso that it should be held as a fief of the crown of Bohemia. It henceforth shared the fortunes of this country, and was usually assigned as an apanage to younger members of the Bohemian royal house. In 1410 Jobst, margrave of Moravia, was made emperor of Germany, but died a few months after his election. In 1526, on the death of Louis II. of Hungary Moravia came with the rest

of that prince's possessions into the hands of the Austrian house. During the Thirty Years' War the depopulation of Moravia was so great that after the peace of Westphalia the states-general published an edict giving every man permission to take two wives, in order to " repeople the country." After the Seven Years' War Moravia was united in one province with the remnant of Silesia, but in 1849 it was made a separate and independent crownland. The most noticeable feature of recent Moravian history has been the active sympathy of its inhabitants with the anti-Teutonic home-rule agitation of the Bohemian Czechs.

See Die Lander Oesterreich-Ungarns in Wort und Bild, vol. 8 (Vienna, 1881-1889, 15 vols.); Die osterreichisch-ungarische Mon- archie in Wort und Bild, vol 17 (Vienna, 1886-1902, 24 vols.); B. BretholZi Geschichte Mahrens (Briinn, 1893, &c).

MORAVIAN BRETHREN, or Moravian Church, a Christian communion founded in the east of Bohemia. For some

years after the death of John Huss (1415), the majority of his followers were split into two contending factions: the Hussite Wars began; and the n.et result of the conflict seemed to be that while the Utraquists, content with the grant of the cup to the laity, were recognized by the pope as the national Church of Bohemia (1433), the more radical Taborites were defeated at the battle of Lipan (1434) and ceased to exist. But with this result some of Huss's followers, who wished to preserve his spiritual teaching, were not content. They laid great stress on purity of morals; and con- vinced that the Utraquist Church was morally corrupt, they founded a number of independent societies, first at Kremsir and Meseritsch in Moravia, and then at Wilenow, Diwischau and Chelcic in Bohemia. At this crisis Peter of Chelcic became the leader of the advanced reforming party. In ethics he anticipated much of the teaching of Tolstoy; in doctrine he often appealed to the authority of Wyclifie; and in some of his views it is possible to trace the influence of the Waldenses. He interpreted the Sermon on the Mount literally, denounced war and oaths, opposed the union of Church and State, and declared that the duty of all true Christians was to break away from the national Church and return to the simple teaching of Christ and His apostles. His followers were known as the Brethren of Chelcic, and wore a distinctive dress. His most noted supporter was John Rockycana, archbishop-elect of Prague. He was pastor of the Thein Church (1444), preached Peter's doctrines, recommended his works to his hearers, and finally, when these hearers asked him to lead them, he laid their case before King George Podiebrad, and obtained permission for them to settle in the deserted village of Kunwald, in the barony of Senftenberg. It was here that the new community was founded (1457 or 1458). At their head was Gregory, the patriarch; a layman, said later to be Rockycana's nephew; in Michael Bradacius, the priest of Senftenberg, they found a spiritual teacher; and fresh recruits came streaming in, not only from the other little societies at Kremsir, Meseritsch, Chelcic, Wilenow and Diwischau, but also

from the Waldenses, the Adamites, the Utraquist Church at Koniggratz, and the univer- sity of Prague They called themselves Jednota Bratrska, i.e. the Church or Communion of Brethren; and this is really the correct translation of their later term, Unitas fratrum. At the Synod of Lhota (14.67), they broke away entirely from the papacy, elected ministers of their own, and had Michael Bradacius consecrated a bishop by Stephan, a bishop of the Waldenses. At the synod of Reichenau (1495), they rejected the authority of Peter of Chelcic, and accepted the Bible as their only standard of faith and practice. In doctrine they were generally broad and radical. They taught the Apostles' Creed, rejected Purga- tory, the worship of saints and the authority of the Catholic Church, practised infant baptism and confirmation, held a view on the Sacrament similar to that of Zwingli, and, differing some- what from Luther in their doctrine of justification by faith, declared that true faith was " to know God, to love Him, to do His commandments, and to submit to His will." With the Brethren, however, the chief stress was laid, not on doctrine, but on conduct. For this purpose they instituted a severe system of discipline, divided their members into three classes — the Perfect,

the Proficient, and the Beginners,, and appointed over each congregation a body of lay elders. For the same purpose they made great use of the press. In 1501 Bishop Luke of Prague edited the first Protestant hymn-book; in 1502 he issued a catechism, which circulated in Switzerland and Germany and fired the catechetical zeal of Luther; in 1565 John Blahoslaw translated the New Testament into Bohemian; in 1570-1593 the Old Testament was added; and the whole, known as the Kralitz Bible, is used in Bohemia still. The constitution was practically Presbyterian. At the head of the Church was a body of ten elders, elected by the synod; this synod consisted of all the ministers, and acted as the supreme legislative authority; and the bishops ruled in their respective dioceses, and had a share in the general oversight. The growth of the Brethren was

rapid. In 1549 they spread into Great Poland; in the latter half of the century they opened many voluntary schools, and were joined by many of the nobility; and the result was that by 1609, when Rudolph II. granted the Letter of Majesty, they were half the Protestants in Bohemia and more than half in Moravia.

At the very height of their power, however, they were almost crushed out of existence. The cause was the outbreak of the Thirty Years' War (1618). At the battle of the White Hill (1620) the Bohemian Protestants were routed; the Brethren were driven from their homes; the Polish branch was absorbed in the Reformed Church of Poland; and then many fled, some to England, some to Saxony, and some even to Texas. For a hundred years the Brethren were almost extinct. But their bishop, John Amos Comenius (1 592-1672), held them together. With an eye to the future, he published their Ratio disciplinae, collected money for the " Hidden Seed " still worshipping in secret in Moravia, and had his son-in-law, Peter Jablonsky, consecrated a bishop, and Peter passed on the succession to his son Daniel Ernest Jablonsky.

The revival of the Moravian Brethren was German in origin. Of the " Hidden Seed " the greater number were Germans; they were probably descended from a colony of German Waldenses, who had come to Moravia in 1480 and joined the Church of the Brethren; and, therefore, when persecution broke out afresh they naturally fled to the nearest German refuge. With Chris- tian David, a carpenter, at their head, they crossed the border into Saxony, settled down near Count Zinzendorf's estate at Berthelsdorf, and, with his permission, built the town of Herrn- hut (1722-1727). But under Zinzendorf the history of the Moravians took an entirely new turn. He was a fervent Lutheran of the Pietist type; he believed in Spener's " ecclesiola " concep- tion; and now he tried to apply the conception to the Moravian refugees. For some years he had a measure of success. Instead of reviving Moravian orders at once, the settlers attended the Berthelsdorf parish

church, regarded themselves as Lutherans, agreed to a code of ″ statutes ″ drawn up by the count, accepted the Augsburg Confession as their standard of faith, and, joining with some Lutheran settlers in a special Communion service in Berthelsdorf (Aug. 13, 1727), had such a powerful unifying experience that modern Moravians regard that day as the birthday of the renewed Moravian Church. From that period two conflicting ideals were at work among the Moravians. In form the Moravian Church was soon restored. Before long persecution broke out against Herrnhut; the count sent a band of emigrants to Georgia; and as these emigrants would require their own ministers, he had David Nitschmann consecrated a bishop by Jablonsky (1735). In this way the Moravian orders Were maintained; the ″ ecclesiola ″ became an independent body, and the British parliament recognized the Brethren as ″ an ancient Protestant Episcopal Church″ (1749, 22 Geo. II. cap. 120). And yet, on the other hand, Zinzendorf's conception continued long in force. It hampered the Brethren's progress in Germany, and explains the smallness of their numbers there. Instead of aiming at Church extension, they built settlements on the estates of friendly noblemen, erected Brethren's and Sisters' houses, and cultivated a quiet type of spiritual life. It is true that they evangelized all over Germany; but this part of their work was known as the Diaspora (1 Pet. i. 1); and the idea

underlying this word is that the Brethren rhinister to the ″ scattered ″ in other Churches without drawing them into the Moravian Church. In Germany, therefore, the importance of the Moravians must be measured, not by their numbers, but by their influence upon other Christian bodies. It was from the Moravians that Schleiermacher learnt his religion, and they even made a passing impression on Goethe; but both these men were repelled by their doctrine of the substitutionary sufferings of Christ.

In reply to the very natural question why the Moravians began their work in England, the answer given by history is that John Wesley, on his voyage to Georgia (1735) met some Moravian emigrants; that on his return he met Peter Boehler, who was on his way to North Carolina; that through Boehler's influence both John and Charles Wesley were " converted " (1738). For a few years they took an active share in the Evangelical Revival (1738–1755); but Zinzendorf's " ecclesiola " policy prevented their growth, and not till 1853 did the English Moravians resolve to aim at " the extension of the Brethren's Church." In foreign missions the distinctive feature about the Moravians is, not that they were so early in the field (1732), but that they were the first Protestants to declare that the evangelization of the heathen was the duty of the Church as such. Hitherto it had been a part of colonial policy. It was this that made their missions so influential.

Present Condition. — I. Enterprises: (1) Foreign missions in Labrador, Alaska, Canada, California, West Indies, Nicaragua, Demerara, Surinam, Cape Colony, Kaffraria, German East Africa, North Queensland, West Himalaya. (2) Leper Home near Jerusalem (1867). (3) Diaspora in Germany, Switzerland, France, Denmark, Norway, Russia, Poland. (4) Church extension in Germany, Great Britain, North America. (5) Boarding Schools: German

grovince, 14; British, 7; American, 5. (6) Church Revival in Bohemia and Moravia, begun in 1869, and sanctioned by the Austrian government (1880).

II. Orders and Constitution. — The orders of the ministry are bishops, presbyters, deacons. But the bishops have no dioceses. Their chief function is to ordain, and to act as " intercessors." The supreme legislative board is the General Synod. It consists of delegates elected by each province, certain ex officio members, and representatives from the mission field. At present the Moravian Church is divided into four provinces, German, British, American North and American South (North Carolina).

In provincial matters each province is independent, holds its own synods, makes its own laws, and elects its own governing board; but the General Synod meets, on the average, every ten years at Herrnhut, and its regula- tions are binding in all the provinces. The foreign missions are managed by a mission board, elected by the General Synod. There is also a standing court of appeal, known as Unity's Elders' Conference, and consisting of the Mission Board and four provincial boards. It is the Church's representative in the eyes of the law. In Germany the official title of the Church is Evangelische BrUder- Unitat; in Austria, Evangelische Briider-Kirche; in England and America, Moravian Church.

III. Doctrine. — At the last General Synod (1909) they repeated their old fundamental principle that " the Holy Scriptures are our only rule of faith and practice " ; but at the same time they declared that their interpretation of Scripture agreed substantially with the Nicene Creed, the Westminster and Augsburg Confessions, and the Thirty-nine Articles. Since 1879 their leading doctrines have been formulated as follows: (1) the total depravity of man; (2) the real Godhead and real humanity of Christ ; (3) justification and redemp- tion through the sacrifice of Christ; (4) work of the Holy Spirit;

(5) good works as fruits of the Spirit; (6) fellowship of believers; (7) second coming of Christ; (8) resurrection of the dead to life or judgment.

IV. Ceremonies. — At morning worship the service consists of a litany, scripture lessons, sermon, singing, extempore prayer. At the evening service a litany is rarely used. The Communion is celebrated once a month. Infant Baptism is practised. There are three modes of admission to membership: in the case of the unbaptized, adult baptism (not immersion) ; in other cases confirma- tion or reception. Members from other Churches are generally admitted by reception.

V. Church Policy. — It is now held by some Moravians that their Church offers a via media between Anglicanism and Dissent. At the last meeting of the Lambeth Conference (1907) some overtures, on certain conditions, were made for (a) joint consecration of bishops,

(6) joint ordination of ministers, (c) interchange of pulpits. In response the Moravians, at the General Synod (1909), welcomed the offer, but also declared their wish (a) to preserve their independence as a ” Protestant Episcopal Church “; (6) to co-operate freely as heretofore with other Evangelical Churches. On this question negotiations are still in progress.

VI. Statistics 1909.

Province.

Congregations.

Communicants

German .

23

6,213

British .

42

3.782

American (N.)

. . 96

13,932

American (S.)

26

4,019

Bohemia

12

684

Foreign Field

245

33.466

Total . 444 62,096

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MORAY, 1 THOMAS RANDOLPH, ist Earl of (d. 1332), Scottish warrior and statesman, was the only son of Thomas Randolph of Nithsdale, who had been chamberlain of Scotland, and through his mother Lady Isabel Bruce he was nephew to King Robert the Bruce. Randolph joined Bruce after the murder of the Red Comyn, and was present at his coronation in 1306. In June of that year he was captured by Aymer de Valence in a fight at Methven, and saved his life by becoming Edward's man. He joined in the hunt for Bruce, but in 1308 he was captured by Sir James Douglas and imprisoned. He began by defying his uncle, but presently made his submission, becoming the friendly rival of the exploits of Sir James Douglas and the confidant of Brace's plans. In 1312 or 1314 the Scottish king made him earl of Moray and lord of Man and Annandale, while the estates held from Edward I. were confiscated. By a brilliant feat of arms he captured and destroyed Edinburgh Castle early in 13 14, scaling the rock by a path pointed out by a certain William Francois who had made use of it in a love intrigue. On the eve of Bannock-burn Randolph was posted in a wood in charge of the van with orders to prevent the English from throwing

cavalry into Stirling. On the approach of a body of three hundred English horse under Sir Robert Clifford, Sir Henry de Beaumont and Sir Thomas Gray, Randolph came out of cover, and his spearmen, drawn up in a square, were vainly attacked on all sides by the English, who were driven to retreat on the appearance of Sir James Douglas with reinforcements; these, however, took no share in the action, the site of which is still known as Randolph's Field. The next day found Randolph in command of the centre of the Scottish battle. He shared in Edward Brace's expedition to Ireland in 1315, and returned to Scotland in 13 17 with Robert Bruce. With Sir James Douglas Randolph was closely allied and the two were associated in a series of brilliant exploits. In 1318 they seized the town of Berwick by escalade; being aided by the treachery of one of the burgesses, Simon of Spalding, and reinforced by Bruce they became masters Of the castle some months later. In the next spring they made a raid on the northern English counties, laying waste the country as far as York, where they hoped to seize the English queen. They routed the militia hastily raised by William de Melton, archbishop of York, in a fight known as the " Chapter of Myton" because of the number of clerics who fell in the battle. Edward II., who was laying siege to Berwick, sought in vain to intercept them on their return journey. Later in the year the two Scottish nobles again raided England, and at length Edward II. signed a truce for two years. In 1322 Moray shared in Douglas's exploit at Byland Abbey. In the next year he was one of the Scottish ambassadors charged to conclude a truce with England, and was further sent to Avignon to persuade the pope to acknowledge

1 In general, for " Moray " see Murray, the spelling having been constantly interchangeable. The present earls keep the spelling Moray.

Bruce's claims by addressing him as king of

Scotland. In the spring of 1326 he was again in France, when he concluded an offensive and defensive alliance between France and Scotland. The death of Bruce in 1329 made Moray regent of Scotland and guardian of the young king David II. in accordance with enact- ments made by the Scottish parliaments of 1315 and 1318. He died at Musselburgh on the 20th of July 1332, while preparing to resist an invasion by the English barons. Allegations of poisoning are made both by Barbour and Wyntoun, but without substantial grounds.

Moray married Isabel, daughter of Sir John Stewart of Bonkyll. His son Thomas, the 2nd earl, was killed at the battle of Dupplin in 1332; his second son John, the 3rd earl, was killed at Neville's Cross in 1346. The earldom then became extinct and the estates passed to their sister Agnes (c. 1312-1360), countess of Dunbar and March, known as " Black Agnes," and celebrated for her gallant defence of Dunbar Castle in 1337 and 1338. (See March, Earls of.)

MORBHANJ, or Mayurbhanj, a native state of India, in the Orissa division of Bengal. Area 4243 sq. m.; pop. (1001), 610,383, showing an increase of 14-7% in the preceding decade; revenue, £64,000. It contains a large proportion of mountain and forest, where wild elephants are numerous, and also some of the richest iron ores in India. The capital is Baripada (pop. 5613), which is connected by a narrow-gauge line with the Bengal-Nagpur railway.

MORBIHAN, a department of western France on the Atlantic seaboard, formed of part of Lower Brittany, and bounded S.E. by the department of Loire-Inferieure, E. by that of Ille-et- Vilaine, N. by C6tes-du-Nord, and W. by Finistere. Area, 2738 sq. m. Pop. (1906), 573,152. From the Montagnes Noires on the northern frontier the western portion of Morbihan slopes southward towards the Atlantic, being watered by the Elle, the Blavet with its affluent the Scorff, and the Auray; the eastern portion, on the other hand, dips towards the south-east in the direction of the course of the Oust and

its feeders, which fall into the Vilaine. Though the Montagnes Noires contain the highest point (974 ft.) in the department, the most striking orographic feature of Morbihan is the dreary, treeless; streamless tract of moorland and marsh known as the Landes of Lanvaux, which extends (W.N.W. to E.S.E.) with a width of from 1 to 3 miles for a distance of 31 miles between the valley of the Claie and that of the Arz (affluents of the Oust). A striking contrast to this district is afforded by the various inlets of the sea, whose shores are clothed with vegetation of exceptional richness, large fig-trees, rose-laurels, and aloes growing as if in Algeria. The coast-line is exceedingly irregular: the mouth of the Vilaine, the peninsular of Ruis, the great gulf of Morbihan (Inner Sea), from which the department takes its name, and the mouth of the Auray, the long Quiberon peninsula attached to the mainland by the narrow isthmus of Fort Penthievre, the deep-branching estuary of Etel, the mouths of the Blavet and the ScorS uniting to form the port of Loricnt, and, finally, on the borders of Finistere the mouth of the Laita, follow each other in rapid succession. Off the coast lie the islands of Groix, Belle-lie (q.v.), Houat and Hoedik. Vessels drawing 13 ft. can ascend the Vilaine as far as Redon; the Blavet is canalized throughout its course through the department; and the Oust, as part of the canal from Nantes to Brest, forms a great waterway by Redon, Josselin, Rohan and Pontivy. The climate of Morbihan is characterized by great moisture and mildness. Unproductive heath occupies more than a quarter of the department, about a third of which is arable land. Rye, buckwheat and wheat, potatoes and mangels are the chief crops; hemp and flax are also grown. Horned cattle are the chief livestock and bee-keeping is extensively practised. The sea-ware gathered along the coast helps greatly to improve the soil of the region bordering thereon. Outside of Lorient (q.v.), a centre for naval construc- tion, there is little industrial activity in Morbihan. The catching and curing of sardines and the breeding of oysters (Auray, St Armel, &c.) form the business of many of the inhabitants of the coast, who also fish

for anchovies, lobsters, &c, for tinning.

The forges of Hennebont are of some importance for the produc- tion of sheet-tin.

The department is served by the Orleans railway. It is divided into four arrondissements — Vannes, Lorient, Ploermel and Pontivy — with 37 cantons and 256 communes. The capital Vannes is the seat of a bishopric of the province of Rennes. The department belongs to the region of the Xlth army corps and to the academie (educational division) of Rennes, where also is its court of appeal. The principal places are Vannes, Lorient, Ploermel, Pontivy, Auray, Hennebont, Carnac and Locmaria- quer, the last two famous for the megalithic monuments in their vicinity. Other places of interest are Erdeven and Plouharnel, also well known for their megalithic remains; Elven, with two towers of the 15th century, remains of an old stronghold; Josselin which has the fine chateau of the Rohan family and a church con- taining the tomb (15th century) of Olivier de Clisson and his wife'; Guern with a chapel of the 15th and 16th centuries and le Faouet with a chapel of the 15th century; Quiberon, which is associated with the disaster of the French imigris in 1795; Sarzeau, near which is the fortress of Sucinio (13th and : 1:5th centuries); Ste Barbe with a chapel, dating from about the end of the 15th century, finely situated, overlooking the Elle; St Gildas-de-Ruis, with a ruined Romanesque church and other remains of a Benedictine abbey of which Abelard was for a time abbot. The principal pardons (religious festivals) of the depart- ment are those of Ste Anne-d' Auray and St Nicolas-des-Eaux.

MORCAR, EARL {fl. 1066), son of Earl Elfgar, brother of Edwin, earl of the Mercians. They assisted the Northumbrians to expel Tostig, of the house of Godwin, in 1065 and Morcar was chosen earl by the rebels. Harold, Tostig's brother, consented to this extension of the power of the Mercian house. In spite of this concession, and the help which he gave them against Tostig and Harold Hardrada, the two brothers left him to fight alone at Hastings. After

trying to secure the crown for their own house, they submitted to William, but lost their earldoms. They attempted to raise the North in 1068, and failed ignomini ously. They were pardoned, but Morcar afterwards joined Hereward in the Isle of Ely (107 1), while Edwin perished in attempting to raise a Welsh rebellion. Morcar died in prison; at what date is unknown. `

See E. A. Freeman, Norman Conquest and William Rufus, voLi.

MORDECAI BEN HILLEL, a German rabbi, who died as a martyr at Nuremberg in 1298. His great legal (Halachic) work is usually cited as " the Mordecai," and its value consists in its thorough use of the medieval authorities. It acquired wide authority, and was one of the sources of the Code of Joseph Card. Mordecai was also the author of Responsa.

See L. Ginzberg in Jew. Ency. ix. 10-13.

MORDVINIANS, otherwise called Mordva, Mordvs, or Mordvins, a people numbering about one million, belonging to the Ural-Altaic family, who inhabit the middle Volga provinces of Russia and spread in small detached communities to the south and east of these. Their settlement in the basin of the Volga is of high antiquity. One of the two great branches into which they are divided, the Erzya, is perhaps the same as the Aorses mentioned by Ptolemy as dwelling between the Baltic Sea and the Ural Mountains. Strabo mentions also the Aorses . as in- habitants of the country between the Don, the Caspian Sea and the Caucasus. The Russians made raids on the Mordvins in the 1 2th century, and after the fall of Kazan rapidly invaded and colonized their country.

The Mordvins are now found in the governments of Simbirsk, Penza, Samara and Nizhniy-Novgorod, as well as Saratov and Tambov. But their villages are dispersed among those of the Russians, and they constitute only 10 to 12% of the population in the four first-named governments, and from 5 to 6% in the last two. They are unequally distributed over

this area in ethnographical islands, and constitute as much as 23 to 44% of the population of several districts of the governments of Tambov, Simbirsk, Samara and Saratov, and only 2 or 3 % in other districts of the same provinces. They are divided into two great

tranches, the Erzya (Erza, or Ersa) and the Moksha, differing somewhat in their physical features and language. The southern branch, or the Moksha, have a darker skin and darker eyes and hair than the northern. A third branch, the Karatays, found in Kazan, appears to be mixed with Tatars. The language is a branch of the Western Finnish family, and most nearly allied to the Cheremissian, though presenting many peculiarities (see Finno-Ugric). The Mordvins have largely abandoned their own language for Russian; but they have maintained a good deal of their old national dress, especially the women, whose profusely embroidered skirts, original hair-dress large ear-rings which sometimes are merely hare-tails, and numerous necklaces cover- ing all the chest and consisting of all possible ornaments, easily distinguish them from Russian women. They have mostly dark hair, but blue eyes, generally small and rather narrow. Their cephalic index is very near to that of the Finns. They are brachycephalous or sub-brachycephalous, and a few are mesati- cephalous. They are finely built, rather tall and strong, and broad-chested. Their chief occupation is agriculture; they work harder and (in the basin of the Moksha) are more prosperous than their Russian neighbours. Their capacities as carpenters were well known in Old Russia, and Ivan the Terrible used them to build bridges and clear forests during his advance on Kazan. They now manufacture wooden ware of various sorts. They are also masters of apiculture, and the commonwealth of bees often appears in their poetry and religious beliefs. They have a con- siderable literature of popular songs and legends, some of them recounting

the doings of a king Tushtyan who lived in the time of Ivan the Terrible. Nearly all are Christians; they received baptism in the reign of Elizabeth, and the Nonconformists have made many proselytes among them. But they still preserve much of their own mythology, which they have adapted to the Christian religion. According to some authorities, they have preserved also, especially the less russified Moksha, the practice of kidnapping brides, with the usual battles between the party of the bridegroom and that of the family of the bride. The worship of trees, water (especially of the water-divinity which favours marriage), the sun or Shkay, who is the chief divinity, the moon, the thunder and the frost, and of the home-divinity Kardaz- serko still exists among them; and a small stone altar or flat stone covering a small pit to receive the blood of slaughtered animals can be found in many houses. Their burial customs seem founded On ancestor-worship. On the fortieth day after the death of a kinsman the dead is not only supposed to return home but a member of his household represents him, and, coming from the grave, speaks in his name.

The language is treated of in Ahlquist's Versuch einer Mokscha- mordwinischen Grammatik nebst Texten und W drier- Verzeichniss (St Petersburg, 1861), and their history, customs and religion by Smirnov (trans, by Boyer), " Les Populations finnoises de la Volga " (in Publications de Vecole des langues orientates, vivantes, 1898). Much valuable information respecting customs, religion, language and folk-lore will be found in papers by Paasonen, Heikel, Ahlquist, Mainof and others printed in the Journal de la SocUte Finno- Ougrienne and the Finnisch-ugrische Forschungen. (C. El.)

MORE, HANNAH (1745^1833), English religious writer, was born at Stapleton, near Bristol, on the 2nd of February 1745. She may be said to have made three reputations in the course of her long life: first, as a clever verse- writer and witty talker in the circle of Johnson, Reynolds and Garrick; next, as a writer on moral and religious subjects on the Puritanic side; and lastly, as a practical

philanthropist. She was the youngest but one of the five daughters of Jacob More, who, though a member of a Presbyterian family in Norfolk, had become a member of the English Church and a strong Tory. He taught a school at Stapleton in Gloucestershire. The elder sisters established a boarding-school at Bristol, and Hannah became one of their pupils when she was twelve years old. Her first literary efforts were pastoral plays, suitable for young ladies to act, the first being written in 1762 under the title of A Search after Happiness (2nd ed. 1773). Metastasio was one of her literary models; on his opera of Attilio regulo she based a drama, The Inflexible Captive, published in 1774. She gave up her share in the school

in view of an engagement of marriage she had contracted with a Mr Turner. The wedding never took place, and, after much reluctance, Hannah More was induced to accept from Mr Turner an annuity which had been settled on her without her knowledge. This set her free for literary pursuits, and in 1772 or 1773 she went to London. Some verses on Garrick's Lear led to an acquaintance with the actor-playwright; Miss More was taken up by Elizabeth Montague ; and her unaffected enthusiasm,simplicity , vivacity, and wit won the hearts of the whole Johnson set, the lexicographer himself included, although he is said to have told her that she should " consider what her flattery was worth before she choked him with it." Garrick wrote the prologue and epilogue for her tragedy Percy, which was acted with great success at Covent Garden in December 1777. Another drama, The Fatal Falsehood, produced in 1779 after Garrick's death, was less successful. The Garricks had induced her to live with them; and after Garrick's death she remained with his wife, first at Hampton Court, and then in the Adelphi. In 1781 she made the acquaintance of Horace Walpole, and corresponded with him from that time. At Bristol she discovered a poetess in. Mrs Anne Yearsley (1756-1806), a milkwoman, and raised a consider-able sum of money for her benefit. " Lactilla," as Mrs Yearsley was called, wished to receive the

capital, and made insinuations against Miss More, who desired to hold it in trust. The trust was handed over to a Bristol merchant ajid eventually to the poetess.

Hannah More published Sacred Dramas in 1782, and it rapidly ran through nineteen editions. These and the poems Bas-Bleu and Florio (1786) mark her gradual transition to mere serious views of life, which were fully expressed in prose in her Thoughts on the Importance of the Manners of the Great to General, Society (1788), and An Estimate of the Religion of the Fashionable World (1790). She was intimate with Wilberforce and Zachary Macaulay, with whose evangelical views she was in entire sym- pathy. She published a poem on Slavery in 1788. In 1785 she bought a house, at Cowslip Green, near Wrington, near Bristol, where she settled down to country life with her sister Martha, and wrote many ethical books and tracts: Strictures on Female Educa- tion (1799), Hints towards forming the Character of a Young Princess (1805), Coelebs in Search of a Wife (only nominally a story, 1809), Practical Piety (1811), Christian Morals .(1813), Character of St Paul (1815), Moral Sketches (1819). The tone is uniformly animated; the writing fresh and vivacious; her favour- ite subjects the minor self-indulgences and infirmities. She was a rapid writer, and her work is consequently discursive and form- less; but there was an originality and force in her way of putting commonplace sober sense and piety that fully accounts for, .her extraordinary popularity. The most famous of her books was Coelebs in Search of a . Wife, which had an enormous circulation among pious people. Sydney Smith attacked it with violence in the Edinburgh Review for its general priggishness. It is interesting to note that the model Stanley children have been said to be drawn from T. B. Macaulay and his sister. She also wrote many spirited rhymes and prose tales, the earliest of which was Village Politics (1792), by "Will Chip," to counteract the doctrines of Tom Paine and the influepce of the French Revolution. The success of Village Politics induced her to begin the series

of ” Cheap Repository Tracts,” which were for three years produced by Hannah and her sisters at the rate of three a month. Perhaps the most famous of these is The Sheph-erd of Salisbury Plain, describing a family of phenomenal frugality and contentment. This was translated into several languages. Two million copies of these rapid and telling sketches were circulated in. one ye§j, teaching the poor in rhetoric of most ingenious homeliness 40 rely upon the virtues of content, sobriety, humility, industry, reverence for the British Constitution, hatred of the French, trust in God and in the kindness of the gentry.

Perhaps the best proof of Hannah More’s sterling worth was her indefatigable philanthropic work — her long-continued exer- tions to improve the condition of the children in the mining districts of the Mendip Hills near her home at Cowslip Green and Barley Wood. The More sisters met with a good deal of

opposition in their good works. The farmers thought that education, even to the limited extent of learning to read, would be fatal to agriculture, and the clergy, whose neglect she was making good, accused her of Methodist tendencies. In her old age, philanthropists from all parts made pilgrimages to see the bright and amiable old lady, and she retained all her faculties till within two years of her death, dying at Clifton, where the last five years of her life were spent, on the 7th of September 1833.

See The Life of Hannah More, with Notices of Her Sisters (1838), by the Rev. Henry Thompson. The article in the Diet. Nat. Biog. is by Sir Leslie Stephen. Some letters of Hannah More, with a very slight connecting narrative, were published in 1872 by William Roberts as The Life of Hannah More. See also Hannah More (1888), by Charlotte M. Yonge, in

the ″ Eminent Women ″ series, and Hannah More (New York and London, 1900), by ″ Marion Harland.″ Letters of Hannah More to Zachary Macaulay were edited (i860) by Arthur Roberts. The contemporary opposition to her may be seen in an abusive Life of Hannah More, with a Critical Review of Her Writings (1802), by the ″ Rev. Archibald Macsarcasm ″ (William Shaw, rector of Chelvey, Somerset).

MORE, HENRY (1614–1687), English philosopher of the Cambridge Platonist school, was born at Grantham in 1614. Both his father and his mother, he tells us, were ″ earnest followers of Calvin,″ but he himself ″ could never swallow that hard doctrine.″ In 1631 he was admitted at Christ's College, Cambridge, about the time Milton was leaving it. He immersed himself ″ over head and ears in the study of philosophy,″ and fell for a time into a scepticism, from which he was delivered by a study of the ″ Platonic writers.″ He was fascinated especially by Neoplatonism, and this fascination never left him. The Theologid germanica also exerted a permanent influence over him. He took his bachelor's degree in 1635, his master's degree in 1639, and immediately afterwards was chosen fellow of his college. All other preferment he refused, with one exception. Fifteen years after the Restoration he accepted a prebend in Gloucester Cathedral, but only to resign it in favour of his friend Dr Edward Fowler, afterwards bishop of Gloucester. He would not accept the mastership of his college, to which, it is understood, he would have been preferred in 1654, when Cudworth was appointed. He drew around him many young men of a refined and thoughtful turn of mind, but among all his pupils the most interesting was a young lady of noble family. This lady, pro- bably a sister of Lord Finch, subsequently earl of Nottingham, a well-known statesman of the Restoration, afterwards became Lady Conway, and at her country seat at Ragley in Warwick- shire More continued at intervals to spend ″ a considerable part of his time.″ She and her husband both appreciated him, and amidst the woods of this retreat he composed several of his books. The

spiritual enthusiasm of Lady Conway was a considerable factor in some of More's speculations, none the less that she at length joined the Quakers. She became the friend not only of More and Penn, but of Baron van Helmont and Valentine Greatrakes, mystical thaumaturgists of the 17th century. Ragley became a centre not only of devotion but of wonder-working spiritualism. 1 From this, his genius suffered, and the rationality which distinguishes his earlier is much less conspicu- ous in his later works. He was a voluminous writer both in verse and in prose, but his works, except the Divine Dialogues (1688), are now of little interest. This treatise, animated and sometimes brilliant, is valuable for modern readers in that it condenses his general view of philosophy and religion.

Henry More represents the mystical and theosophic side of the Cambridge movement. The Neoplatonic extravagances which lay hidden in the school from the first came in his writings to a head, and merged in pure phantasy. He can never be spoken of, however, save as a spiritual genius and a significant figure in British philosophy, less robust and in some respects less learned than Cudworth, but more interesting and fertile in thought, and more genial in character. From youth to age he describes him- self as gifted with a buoyant temper. His own thoughts were to him a never-ending source of pleasurable excitement. This mystical elevation was the chief feature of his character, a certain

1 The place and its religious marvels are glanced at in the romance of John Inglesant (ch. xv.).

radiancy of thought which carried him beyond the common life without raising him to any artificial height, for his humility and charity were not less conspicuous than his piety. The last ten years of his life were uneventful. He died on the 1st of September 1687, and was buried in the chapel of the college he loved.

Before his death More issued complete editions of

his works, his Opera theologica in 1675, and his Opera philosophica in 1678. The chief authorities for his life are Ward's Life (1710) ; the prefatio generalissima prefixed to his Opera omnia (1679) ; and also a general account of the manner and scope of his writings in an Apology published in 1664. The collection of his Philosophical Poems (1647), in which he has " compared his chief speculations and experiences," should also be consulted. An elaborate analysis of his life and works is given in Tulloch's Rational Theology, vol. ii. (1874) > see a l so R- Zimmermann, Henry More und die vierte Dimen- sion des Raums (Vienna, 1881). (For his ethical theory, as contained in the Enchiridion Ethicum, see Ethics.)

MORE, SIR THOMAS (1478-1535), English lord chancellor, and author of Utopia, was born in Milk Street in the city of London, on the 7th of February 1478. He received the rudi- ments of education at St Anthony's School in Threadneedle Street, at that time under Nicolas Holt, held to be the best in the city. He was early placed in the household of Cardinal Morton, archbishop of Canterbury. Admission to the cardinal's family was esteemed a high privilege, and was sought as a school of manners and as an introduction to the world by the sons of the best families in the kingdom. Young Thomas More obtained admission through the influence of his father, Sir Thomas, then a rising barrister and afterwards a justice of the court of king's bench. The usual prognostication of future distinction is attributed in the case of More to Cardinal Morton, " who would often tell the nobles sitting at table with him, where young Thomas waited on him, whosoever liveth to trie it shall see this child prove a notable and rare man." * At the proper age young More was sent to Oxford, where he is said vaguely to have had Colet, Grocyn and Linacre for his tutors. 2 All More himself says is that he had Linacre for his master in Greek. Learning Greek was not the matter of course which it has since become. Greek was not as yet part of the arts curriculum, and to learn it volun- tarily was ill looked upon by

the authorities. Those who did so were suspected of an inclination towards novel and dangerous modes of thinking, then rife on the Continent and slowly finding their way to England. More's father, who intended his son to make a career in his own profession, took the alarm; he removed him from the university without a degree, and entered him at New Inn to commence at once the study of the law. After com- pleting a two-years' course in New Inn, an inn of chancery, More was admitted in February 1496 at Lincoln's Inn, an inn of court. " At that time the Inns of Court and Chancery presented the discipline of a well-constituted university, and, through professors under the name of readers and exercises under the name of moorings, law was systematically taught " (Campbell). In his professional studies More early distinguished himself, so that he was appointed reader-in-law in Furnival's Inn; but he would not relinquish the studies which had attracted him in Oxford. We find him delivering a lecture to audiences of " all the chief learned of the city of London." 3 The subject he chose was a compromise between theology and the humanities, being St Augustine's De civitate. In this lecture More sought less to expound the theology of his author than to set forth the philosophical and historical contents of the treatise. The lecture-room was a church, St Lawrence Jewry, placed at his disposal by Grocyn, the rector.

Somewhere about this period of More's life two things happened which gave in opposite directions the determining impulse to his future career. More's was one of those highly susceptible natures which take more readily and more eagerly than common minds the impress of that which they encounter on their first contact with men. Two principal formsof thought and feeling were at this date in conflict, rather unconscious than declared, on English soil. Under the denomination of the " old learning," the senti- ment of the middle ages and the idea of Church authority was

1 Life by B. R.

1 Ibid.

a Roper, Life.

established and in full possession of the religious houses, the universities, and the learned professions. The foe that was advancing in the opposite direction, though without the con- science of a hostile purpose, was the new power of human reason animated with the revived sentiment of classicism. In More's mind both these hostile influences found a congenial home. Each had its turn of supremacy, and in his early years it seemed as if the humanistic influence would gain the final victory. About the age of twenty he was seized with a violent access of devotional rapture. He took a disgust to the world and its occupations, and experienced a longing to give himself over to an ascetic life. He took a lodging near the Charterhouse, and subjected himself to the discipline of a Carthusian monk. He wore a sharp shirt of hair next his skin, scourged himself every Friday and other fasting days, lay upon the bare ground with a log under his head, and allowed himself but four or five hours' sleep. This access of the ascetic malady lasted but a short time, and More recovered to all outward appearance his balance of mind. For the moment the balance of his faculties seemed to be restored by a revival of the antagonistic sentiment of humanism which he had imbibed from the Oxford circle of friends, and specially from Erasmus. The dates as regards More's early life are uncertain, and we can only say that it is possible that the acquaintance with Erasmus might have begun during Erasmus's first visit to England in 1499. Tradition has dramatized their first meeting into the story given by Cresacre More 1 — that the two happened to sit opposite each other at the lord mayor's table, that they got into an argument during dinner, and that, in mutual astonishment at each other's wit and readiness,

Erasmus exclaimed, ” Aut tu es Morus, aut nullus,” and the other replied, ” Aut tu es Erasmus, aut diabolus ! ” Rejecting this legend, which bears the stamp of fiction upon its face, we have certain evidence of acquaintance between the two men in a letter of Erasmus, with the date ” Oxford, 29th October 1499.” If we must admit the correctness of the date of Ep. 14 in the collection of Erasmus’s Epistolae, we should have to assume that their acquaintance had begun as early as 1497. It rapidly ripened into warm attachment. This contact with the prince of letters revived in More the spirit of the ” new learning;” and he returned with ardour to the study of Greek, which had been begun at Oxford. The humanistic influence was sufficiently strong to save him from wrecking his life in monkish mortification, and even to keep him for a time on the side of the party of progress. He acquired no inconsiderable facility in the Greek language, from which he made and published some translations. His Latin style, though wanting the inimitable ease of Erasmus and often offending against idiom, is yet in copiousness and propriety much above the ordinary Latin of the English scholars of his time.

More’s attention to the new studies was always subordinate to his resolution to rise in his profession, in which he was stimu- lated by his father’s example. As early as 1502 he was appointed under-sheriff of the city of London, an office then judicial and of considerable dignity. He first attracted public attention by his conduct in the parliament of 1 504, by his daring opposition to the king’s demand for money. Henry VII. was entitled, according to feudal laws, to a grant on occasion of his daughter’s marriage. But he came to the House of Commons for a much larger sum than he intended to give with his daughter. The members, unwilling as they were to vote the money, were afraid to offend the king, till the silence was broken by More, whose speech is said to have moved the house to reduce the subsidy of three- fifteenths which the Government had demanded to £30,000. One of the chamberlains went and told his master that he had been thwarted

by a beardless boy. Henry never forgave the audacity; but, for the moment, the only revenge he could take was upon More's father, whom upon some pretext he threw into the Tower, and he only released him upon payment of a fine of £1 00. Thomas More even found it advisable to withdraw from public life into obscurity. During this period of retirement the old dilemma recurred. One while he devoted himself to the sciences, " perfecting himself in music, arithmetic, geometry and 1 Life, p. 93-

astronomy, learning the French tongue, and recreating his tired spirits on the viol," 2 or translating epigrams from the Greek anthology; another while resolving to take priest's orders.

From dreams of clerical celibacy he was roused by making acquaintance with the family of John Colt of New Hall, in Essex. The " honest and sweet conversation " of the three daughters attracted him, and though his inclination led him to prefer the second he married the eldest, Jane, in 1505, not liking; to put the affront upon her of passing her over in favour of her younger sister. The death of the old king in 1 509 restored him to the practice of his profession, and to that public career for which his abilities specially fitted him. From this time there was scarce a cause of importance in which he was not engaged. His professional income amounted to £400 a year, equal to £4000 in present money, and, " considering the relative profits of the law and the value of money, probably indicated as high a station as £10,000 at the present day " (Campbell). It was not long before he attracted the attention of the young king and of Wolsey. The spirit with which he pleaded before the Star Chamber in a case of The Crown v. The Pope recom- mended him to the royal favour, and marked him out for em- ployment. More obtained in this case judgment against the Crown. Henry, who was present in person at the trial, had the good sense not to resent the defeat, but took the counsel to whose advocacy it was due into his service. In 1514 More was made master of the requests, knighted, and sworn a member of the privy

council. He was repeatedly employed on embassies to the Low Countries, and was for a long time stationed at Calais as agent in the shifty negotiations carried on by Wolsey with the court of France. In 1519 he was compelled to resign his post of under-sheriff to the city and his private practice at the bar. In 1521 he was appointed treasurer of the exchequer, and in the parliament of 1523 he was elected Speaker. The choice of this officer rested nominally with the house itself, but in practice was always dictated by the court. Sir Thomas More was pitched upon by the court on this occasion in order that his popularity with the Commons might be employed to carry the money grant for which Wolsey asked. To the great disappointment of the court More remained firm to the popular cause, and it was greatly owing to his influence that its demands were resisted. From this occurrence may be dated the jealousy which the cardinal began to exhibit towards More. Wolsey made an attempt to get him out of the way by sending him as ambassador to Spain. More defeated the design by a personal appeal to the king, alleging that the climate would be fatal to his health. Henry, who saw through the artifice, and was already looking round for a more popular successor to Wolsey, made the gracious answer that he would employ More otherwise. In 1 525 More was appointed chancellor of the duchy of Lancaster, and no pains were spared to attach him to the court. The king frequently sent for him into his closet, and discoursed with him on astronomy, geometry and points of divinity. This growing favour, by which many men would have been carried away, did not impose upon More. He discouraged the king's advances, showed `reluctance to go to the palace, and seemed constrained when there. Then the king began to come himself to More's house at Chelsea, and would dine with him without previous notice. William Roper, husband of More's eldest daughter, mentions one of these visits, when the king after dinner walked in the garden by the space of an hour holding his arm round More's neck. Roper afterwards congratu- lated his father-in-law on the distinguished honour which had been shown him. " I

thank our Lord," "was the reply, " I find his grace my very good lord indeed; and I believe he doth as singularly favour me as any subject within this realm. Howbeit, son Roper, I may tell thee I have no cause to be proud thereof, for if my head would win him a castle in France it should not fail to go." As a last resource More tried the expedient of silence, dissembling his wit and affecting to be dull. This had the desired effect so far that he was less often sent for. But it did not alter the royal policy, and in 1529, when a successor had to be 1 Roper, Life.

found for Wolsey, More was raised to the chancellorship^ The selection was justified by More's high reputation, but it was also significant of the modification which the policy of the court was then undergoing. It was a concession to the rising popular party, to which it was supposed that More's politics inclined him. The public favour with which his appointment had been received was justified by his conduct as judge in the court of chancery. Having heard causes in the forenoon between eight and eleven, after dinner he sat again to receive petitions. The meaner the suppliant was the more affably he would speak to him and the more speedily he would despatch his case. In this respect he formed a great contrast to his predecessor, whose arrears he soon cleared off. One morning being told by the officer that there was not another cause before the court, he ordered the fact to be entered on record, as it had never happened before. He not Only refused all gifts — such as had been usual — himself, but took measures to prevent any of his connexions from interfering with the course of justice. One of his sons-in-law, Heron, having a suit in the chancellor's court, and refusing to agree to any reasonable accommodation, because the judge " was the most affectionate father to his Children that ever was in the world," More thereupon made a decree against him.

Unfortunately for Sir Thomas More, a lord chancellor is not merely a judge, but has high political functions to perform. Iii raising More to that eminent position, the king had not merely considered his professional distinction but had counted upon his avowed liberal and reforming tendencies. In the Utopia, which, though written earlier, More had allowed to be printed as late as 1516, he had spoken against the vices of power, and declared for indifference of religious creed with a breadth of philosophical view of which there is no other example in any Englishman of that age. At the same time, as he could not be suspected of any sympathy with Lutheran or Wickliffite heretics, he might fairly be regarded as qualified to lead the party which aimed at reform in State and Church within the limits of Catholic orthodoxy.' But in the king's mind the public questions of reform were entirely sunk in the personal one of the divorce. The divorce was a point upon which Sir Thomas would not yield. And, as he r saw that the marriage with Anne Boleyn was determined upon, he petitioned the king to be allowed to resign the Great Seal, alleging failing health. With much reluctance the royal permission was given and the resignation accepted, on the 10th of May 1532, with many gracious expres- sions of goodwill on the part of the king. The promise held out of future bounty was never fulfilled, and More left office, as he had entered it, a poor man, His necessitous condition was so notorious that the clergy in convocation voted him a present of £5000. This he peremptorily refused, either for himself or for his family, declaring that he " had rather see it all cast into the Thames." Yet the whole of his income after resigning office did not exceed £100 a year.

Hitherto he had maintained a large establishment, not on the princely scale of Wolsey, but in the patriarchal fashion of having all his sons-in-law, with their families, under his roof. When he resigned the chancellorship he called his children and grandchildren together to explain his reduced circumstances. " If we wish to live together," said

he, ” you must be content to be cOhtributories together. But my counsel is that we fall riot to the lowest fare first: we will not, therefore, descend to Oxford fare, nor to the fare of New Inn,’ but we will begin with Lincoln’s Tnri diet, where many right worshipful men of great account and good years do live full well; which if we find ourselves the first year riot able to maintain, then we will in the next year come down to Oxford fare, where many great learned and ancient fathers and doctors are continually conversant; while if our purses stretch nOt to maintain neither, then may we after, with bag and wallet, go a-begging together, hoping that for pity some good folks will give us their charity.” ■ More was how able, as he writes to Erasmus, to return to the life which had always been his ambition, when, free from business and public affairs, he might give himself up to his favourite

studies and to the practices of his devotion. Of the Chelsea interior Erasmus has drawn a charming picture, which may vie with Holbein’s celebrated canvas, “The Household of Sir Thomas More.”

” More has built, near London, upon the Thames, a modest yet commodious mansion. There he lives surrounded by his numerous family, including his wife, his son, and his son’s wife, his three daughters and their husbands, with eleven grandchildren. There is not any man living so affectionate to his children as he, and he loveth his old wife as if she were a girl of fifteen. Such is the excellence of his disposition that whatsoever happeneth that could not be helped, he is as cheerful and as well pleased as though the best thing possible had been done. In More’s house you would see that Plato’s Academy was revived again, only, whereas in the Academy the discussions turned upon geometry and the power of numbers, the house at Chelsea is a veritable school of Christian religion. In it is none, man or woman, but readeth or studieth the liberal arts, yet is their chief care of piety. There is never any seen idle; the head of the house governs it not by a lofty carriage and oft rebukes, but by gentleness and amiable manners. Every member

is busy in his place, performing his duty with alacrity ; nor is sober mirth wanting." 1

But More was too conspicuous to be long allowed to enjoy the happiness of a retired life. A special invitation was sent him by the king to attend the coronation of Anne Boleyn, accompanied with the gracious offer of £20 to buy a new suit for the occasion! More refused to attend, and from that moment was marked out for vengeance. A first attempt made to being him within the meshes of the law only recoiled with shame upon the head of the accusers. They were maladroit enough to attack him on his least vulnerable side, summoning him before the privy council to answer to a charge of receiving bribes in the adminis- tration of justice. One Parnell was put forward to complain of a decree pronounced against him in favour of the contending party Vaughan, who he said had presented a gilt cup to the chancellor. More stated that he had received a cup as a New Year's gift. Lord Wiltshire, the queen's father, exultingly cried out, " So, did I not tell you, my lords, that you would find this matter true?" "But, my lords," continued More, "having pledged Mrs Vaughan in the wine wherewith my butler had filled the cup, I restored the cup to her." Two other charges of a like nature wtere refuted as triumphantly. But the very futility of the accusations must have betrayed to More the bitter determination of his enemies to compass his destruction. Foiled in their first ill-directed attempt, they were compelled to have recourse to that tremendous engine of regal tyranny, the law of treason. A bill was brought into parliament to attaint Elizabeth Barton, a nun, who was said to have held treason- able language. Barton turned out afterwards to have been an impostor, but she had duped More, who now lived in a super- stitious atmosphere of convents and churches, and he had given his countenance to her supernatural pretensions. His name, with that of Fisher, was accordingly included in the bill as an accom- plice. When he came before the council it was at once apparent that the charge of treason Could not be

sustained, and the efforts of the court agents were directed to draw from More some approbation of the king's marriage. But to this neither cajolery nor threats could move him. The preposterous charge was urged that it was by his advice that the king had com- mitted himself in his book against Luther to an assertion of the pope's authority, whereby the title of " Defender of the Faith " had been gained, but in reality a sword put into the pope's hand to fight against him. More was able to reply that he had warned the king that this very thing might happen, that upon some breach of amity between the crown of England and the pope Henry's too pronounced assertion of the papal authority might be turned against himself, " therefore it were best that place be amended, and his authority more slenderly touched." "Nay," replied the king, "that it shall not; we are so much bound to the see of Rome that we cannot do too much honour unto it. Whatsoever impediment be to the contrary, we will set forth that authority to the utmost ; for we have received from that see our crown imperial," " which," added More, " till his grace with his own mouth so told me 1 Ep. 426, Appendix.

I never heard before." Anything more defiant and exasperating than this could not well have been said. But it could not be laid hold of, and the charge of treason being too ridiculous to be proceeded with, More's name was struck out of the bill. When his daughter brought him the news, More calmly said, " I' faith, Meg, quod differtur, non aufertur: that which is postponed is not dropt." At another time, having asked his daughter how the court went and how Queen Anne did, he received for answer, " Never better; there is nothing else but dancing and sporting." To this More answered, " Alas, Meg, it pitieth me to remember unto what misery, poor soul, she will shortly come; these dances of hers will prove such dances that she will spurn our heads off like footballs; but it will not

be long ere her head will dance the like dance." * So the speech runs in the Life by More's great-grandson; but in the only trust- worthy record, the life by his son-in-law Roper, More's reply ends with the words, " she will shortly come." In this, as in other instances, the later statement has the appearance of having been an imaginative extension of the earlier.

In 1 534 the Act of Supremacy was passed and the oath ordered to be tendered. More was sent for to Lambeth, where he offered to swear to the succession, but steadily refused the oath of supre-macy as against his conscience. Thereupon he was given in charge to the abbot of Westminster, and, persisting in his refusal, was four days afterwards committed to the Tower. After a close and even cruel confinement (he was denied the use of pen and ink) of more than a year, he was brought to trial before a special commission and a packed jury. Even so More would have been acquitted, when at the last moment Rich, the solicitor- general, quitted the bar and presented himself as a witness for the Crown. Being sworn, he detailed a confidential con- versation he had had with the prisoner in the Tower. He affirmed that, having himself admitted in the course of this conversation " that there were things which no parliament could do — e.g. no parliament could make a law that God should not be God," Sir Thomas had replied, " No more could the parliament make the king supreme head of the Church." By this act of perjury a verdict of " guilty " was procured from the jury. The execution of the sentence followed within the week, on the 7th of July 1535. The head was fixed upon London Bridge. The vengeance of Henry was not satisfied by this judicial murder of his friend and servant; he enforced the confiscation of what small property More had left, expelled Lady More from the house at Chelsea, and even set aside assign- ments which had been legally executed by More, who foresaw what would happen before the commission of the alleged treason. More's property was settled on Princess Elizabeth, afterwards queen, who kept possession of it till her death.

Sir Thomas More was twice married, but had children only by his first wife, who died about 1511. His only son, John, married an heiress, Ann Cresacre, and was the grandfather of Cresacre More, Sir Thomas More's biographer. His eldest daughter, Margaret (1505–1544), married to William Roper (1496–1578), an official of the court of king's bench and a member of parliament under Henry VIII., Edward VI. and Mary, is one of the foremost women in the annals of the country for her virtues, high intelligence and various accomplishments. She read Latin and Greek, was a proficient in music, and in the sciences so far as they were then accessible. Her devotion to her father is historical; she gave him not only the tender affection of a daughter but the high-minded sympathy of a soul great as his own.

More was not only a lawyer, a wit, a scholar, and a man of wide general reading; he was also a man of cultivated taste, who delighted in music and painting. He was an intimate friend of Holbein, whose first introduction to England was as a visitor to More in his house at Chelsea, where the painter is said to have remained for three years, and where he probably first met Henry VIII. Holbein painted portraits of Sir Thomas and his family. More was beatified by Leo XIII. in 1886.

The Epistola ad Dorpium exhibits More emphatically

on the 1 Cresacre More, p. 231.

side of the new learning. It contains a vindication of the study of Greek, and of the desirability of printing the text of the Greek Testament— views which at that date required an enlightened understanding to enter into, and which were condemned by the party to which More afterwards attached himself. On the other hand, he can at the most be doubtfully exculpated from the charge of having tortured men and children for heresy. It is admitted by himself that he inflicted punishment for religious opinion. Erasmus only ventures to say in his friend's defence " that while he was chancellor no man was put to death for these pestilent opinions, while so many suffered death in France and

the Low Countries." His views and feelings contracted under the combined influences of his professional practice and of public employment. In the Utopia, published in Latin in 1516 (1st English translation, 1551), he not only denounced the ordinary vices of power, but evinced an enlightenment of sentiment which went far beyond the most statesmanlike ideas to be found among his contemporaries, pronouncing not merely for toleration, but rising even to the philosophical con- ception of the indifference of religious creed. It was to this superiority of view, and not merely to the satire on the administration of Henry VII., that we must ascribe the popu- larity of the work in the 16th century. For as a romance the Utopia has little interest either of incident or of character. It does not, as has been said, anticipate the economical doctrines of Adam Smith, and much of it is fanciful without being either witty or ingenious. The idea of putting forward political and philosophical principles under the fiction of an ideal state was doubtless taken from Plato's Republic. The Utopia in turn suggested the literary form adopted by Bacon, Hobbes, Filmer, and other later writers; and the name of the book has passed into the language as signifying optimistic but impracticable ideals of reform.

For a bibliography of More's numerous works see the article in the Diet. Nat. Biog. and the Catalogue of the Alfred Cock collection of books and portraits of or relating to Sir Thomas More which is preserved in the Guildhall Library, London. The more important of his works and their editions are here given. Luciani dialogi . . . compluria opuscula ab Erasmo Roterodamo et Thoma Mora . . . traducta (Paris, 1506 and 1514; Venice, Aldus, 1516, &c.) was accomplished by Erasmus and More in 1505. The Lyfe of John Picus, earle of Mirandula . . . printed by Wynkyn de Worde in 1510, translated by More from the Venice ed. of 1498, was edited by J. M. Rigg for the Tudor Library in 1890. Historie of the pittiful Life and unfortunate Death of Edward the Fifth and the then Duke of York with . . . Richard the Third was

written, according to Rastell, in 1513, and first printed in a corrupt version in Grafton's continuation of Harding in 1543; it is included by Rastell in his 1557 edition of More's Workes, but it has been suggested that the Latin original was by Cardinal Morton; as the History of King Richard III. it was edited by J. R. Lumby for the Pitt Press in 1883. The Libellus vere aureus . . . better known as Utopia, was printed at Louvain in 1516, under the superintendence of Erasmus, and appeared in many subsequent editions, many of them of great bibliographical value, the finest being the Basel edition of 1518. It was translated into the chief languages of Europe, and into English by Ralph Robinson as A fruteful and Pleasaunt Worke of the best State of a Publyque Weale, and of the newe Yle called Utopia (Abraham Nell, 1551) ; modern editions are by J. Dibdin (2 vols., 1808), Professor E. Arber (English Reprints, 1869), by J. R. Lumby for the Pitt Press (1879), by William Morris at the Kelmscott Press (1893), by J. Churton Collins for the Clarendon Press (1904), by R. Steele for the King's Classics (1908), &c. Other translations of Utopia are by Gilbert Burnet (1684) and by A. Cayley {Memoirs of More, 2 vols., 1808). Against Luther and Tyndale Sir T. More wrote A Dyaloge of Syr Thomas More, Knt., written in 1528 and printed by John Rastell in 1529; Sir Thomas More's Answere to the fyrste parte of the Poyson'd book . . . The Souper of the Lorde (William Rastell, !53 2) with a " Second Parte " in 1533. The Apologye of Syr Thomas More, written in 1533, is a defence of his own polemical style and of the treatment of heretics by the clergy. A Dyaloge of Comfort against Tribulacion, printed by Rastell in 1533, was destined primarily for More's family.

More's English works were collected by William Rastell and published as The Worke of Sir Thomas More Knyght by CawOod, Waly and Tottel in 1557; his Latin works Thomae Mori . . . Lucubrationes were partially collected at Basel 1563 and in 1566 (omnia opera) at Louvain ; a fuller edition drawn chiefly from these two appeared at Frankfort and Leipzig in

1689. Modern selections were edited by W. J. Walter (Baltimore, 1841), by T. E. Bridgett {Wisdom and Wit of Blessed Thomas More, London, 1891). His

correspondence with Erasmus is partly included in the editions of the Letters of Erasmus, and much of his correspondence is calendared in Gairdner's Letters and Papers of Henry VIII., the letters written to his family in his last days being found in vol. viii.

The Mirror of Vertue in Worldly Greatness; or, the Life of Syr Thomas More was written by his son-in-law William Roper about the end of Mary's reign. It was preserved in MS. during the reign of Elizabeth, and handed down in copies, many of which were carelessly made. It was not given to the press till 1626, with the date of Paris. Reprints were made by Hearne (Oxford, 1716), by Lewis (1729, 1731), who added an appendix of documents, and by Singer (1817, 1822) and for the King's Library (1902). Roper's Life is the source of all the many subsequent biographies. More's Life in MS. (Harleian 6253 and elsewhere), anonymous, but by Nicolas Harpsfield, was also written in Mary's reign. All that is material in this MS. is taken from Roper. Another anonymous Life, written in 1599, printed in Wordsworth's Ecclesiastical Biography, ii. 43-185, is chiefly compiled from Roper and Harpsfield. The preface is signed Ro. Ba. (Robert Barnstaple ?). William Rastell's Life of More, of which fragments are preserved in the Arundel Coll. (Brit. Mus.), is, un- happily, lost. Thomas Stapleton {Tres Thomae, s. res gestae S. Thomae apostoli, S. Thomae archiepiscopi Caniuariensis, Thomae Mori (Douay, 1588; Cologne, 1612) and the Vila Thomae Mori (separately), (Gratz, 1689) translates Roper, interweaving what material he could find scattered through More's works and letters and the notices of him in the writings of his contemporaries. Cresacre More, great-grand- son of Sir Thomas, compiled a new

life about the year 1627. It was printed at Paris without date, but, according to the editor, J. Hunter, in 163 1. The title of this edition is. The Life and Death of Sir Thos. More, Lord High Chancellour of England, and with new title-page, 1642, 1726, 1828. This biography is cited by the subse- quent biographers as an independent authority. But it is almost entirely borrowed from Roper and Stapleton. The additions made have sometimes the appearance of rhetorical amplifications of Roper's simple statements. At other times they are decorative miracles. The whole is couched in that strain of devotional exaggeration in which the lives of the saints are usually composed. The author seems to imply that he had received supernatural communications from the spirit of his ancestor. Already, only eighty years after More's execution, hagiography had taken possession of the facts and was transmuting them into an edifying legend. Cresacre More's Life cannot be alleged as evidence for any facts which are not other- wise vouched. It has been remarked by Hunter that More's life and works have been all along manipulated for political purposes, and in the interest of the holy see. In Mary's reign, and in the tide of CathoKc reaction, Roper and Harpsfield wrote lives of him; Ellis Heywood dedicated his // Moro (Florence, 1556) a fanciful account of More's life at Chelsea, to Cardinal Pole, and Tottell reprinted the folio of his English works. Stapleton prepared his Tres Thomae in 1588, when the recovery of England to the see of Rome was looked for by the Spanish invasion. In 1599, when there was a prospect of a disputed succession, the anonymous Life by Ro. Ba was com- posed; and soon after Charles had allied himself with a Catholic, the Life by Cresacre More issued from the press. Hunter might have added that Stapleton was being reprinted at Gratz at the time when the conversion of England was expected from James II. The later lives of Sir Thomas More have been numerous, the best being those by G. T. Rudhart Thomas Morns, aus den Quellen bearbeitet (Nurem- berg, 1829) ; by T. E. Bridgett, Life and Writings of Sir Thomas More (1891) ; and by W. H. Hutton,

Life and Writings of Sir Thomas More (1891). Other lives are by J. Hoddesdon (London, 1652, 1662); by Sir A. Cayley (2 vols., London, 1808); by Sir J. Mackintosh, Lardner's Cab. Cyclop. (London, 1831, 1844); and in Mores Works (London, 1845) ; by Lord Campbell in Lives of the Chancellors (vol. i., 1848-1850) ; by D. Nisard in Renaissance et Reforme (Paris, 1855) ; by Baumstark (Freiburg, 1879) ; by F. Seebohm in the Oxford Reformers of 1408 (London, 1867). A biographical study on More's Latin poems is Philomorus, by J. H. Marsden (2nd ed., London, 1878). Cf. John Bruce, " Inedited documents rel. to the imprisonment and condemnation of Sir T. More," in Archaeologia. xxvii. 361-374); Sou they, Sir Thomas More, or Colloquies on the Progress and Prospects of Society (London, 1829) ; Anne Manning, The Household of Sir Thomas More (1851, reprinted in King's Novels, 1905): S. Lee, Great Englishmen of the Sixteenth Century (1904). The tragedy of Sir Thomas More, edited by A. Dyce for the Shakespeare Society in 1844, and connected by some commentators with Shakespeare, was written about 1590, and therefore gives a nearly contemporary view of More. A later playwright, James Hurdis, made More's career the subject of a play in 1792. (M. P.)

MOREAS, JEAN (1856-1910), French poet, born at Athens on the 15th of April 1856, was the grandson of Papadiomonto- poulos, one cf the heroes of Missolonghi. He was one of the leaders of the symbolist movement in French poetry, advocating a relaxation of the stringent rules governing French verse; but his early volumes of poems, Les Syrles (1884), Les CantUenes (1886), and Le Pelerin passionnt (1891) won recognition beyond the limits of this school. In the XIX' siecle (August 11,

1885) he formulated the principles of the symbolists, defending them from the appellation of " decadent," and in the literary supplement of the Figaro (Sep 18, 1886) he published a manifesto justifying the innovations of the new school as the natural development of the prosody of Baudelaire, Mallarme and Verlaine. Le Pelerin passionni was sympathetically reviewed by Anatole France. As time

went on he repudiated the licence claimed by the symbolists, and became the leader of an offshoot from the main body known as the ecole romane, the chief members of which are Raymond de la Tailhede, Maurice du Plessys, Ernest Raynaud, and the critic Charles Maurras. Moreas and his new followers returned to the traditional severity of French versification, and to the classical and antique tradition. His later volumes are Poesies, 1886- 1896 (1898), and Stances (6 vols., complete ed. 1905), Histoire de Jean de Paris, *o'i de France (1902), Voyage en Grece en 1897 (1902), Contes de la vieille France (io°3)> and a classic drama in verse, Iphiginie a Aulis (1904), in close imitation of Euripides, which was repre- sented on the 24th of August 1903 in the ancient theatre of Orange, and subsequently at the Odeon in Paris. He died on the 31st of March 1910.

See Anatole France, La Vie litlSraire (4th sen, 1892) ; A. van Bever and P. Leautaud, Poetes d'aujourd'hui, 1880-1900 (nth ed., 1905); P. Berthelot, art. " Symbolisme " in La Grande encyclopidie; and J. de Gourmont, Jean Moreas, biographie critique (1905).

MOREAU, GUSTAVE (1826-1898), French painter, was born in Paris on the 6th of April 1826. His father was an architect, who, discerning the lad's promise, sent him to study under Picot, a second-rate artist but clever teacher. The only influence which really affected Moreau's development was that of the painter Chasseriau (1819-1857), with whom he was intimate when they both lived in the Rue Frochot, and of whom we find reminiscences even in his later works. Moreau's first picture was a " Pieta " (1852), now in the cathedral at Angoulerne. In the Salon of 1853 he exhibited a " Scene from the Song of Songs " (now in the Dijon Museum) and the " Death of Darius " (in the Moreau Gallery, Paris), both conspicuously under the influence of Chasseriau. To the Great Exhibition of 1855 he sent the " Athenians with the Minotaur " (in the Museum at Bourg-en-Bresse) and " Moses putting off his Sandals within Sight of the Promised Land." " Oedipus and the

Sphinx," begun in 1862, and exhibited at the Salon of 1864, marked the beginning of his best period, during which he chose his subjects from history, religion, legend and fancy. In 1865 he exhibited " Medea and Jason " and " The Young Man and Death "; in 1866, the " Head of Orpheus " (in the Luxembourg Gallery); " Hesiod and the Muse," a drawing; and " The Peri," a drawing; " Prometheus " (in the Moreau Gallery) ; " Jupiter and Europa," a "Pieta," and "The Saint and the Poet," in 1869. After working in obscurity for seven years, he reappeared at the Salon in 1876 with " Hercules and the Hydra," " Saint Sebastian," " Salome Dancing " (presented to the Luxembourg by M. Hayem); and in 1878 with "The Sphinx's Riddle solved." " Jacob," and " Moses on the Nile." Moreau exhibited for the last time at the Salon of 1880, when he contributed " Helen " and " Galatea "; to the Great Exhibition of 1889 he again sent the " Galatea " and " The Young Man and Death." He took prize medals at the Salon in 1864, 1865, 1869 and 1878. He was made knight of the Legion of Honour in 1875 and officer in 1883. He succeeded Delaunay as professor at the Ecole des Beaux Arts, and his teaching was highly popular. When he died, on the 18th of April 1898, he bequeathed to the state his house, containing about 8000 pictures, water-colours, cartoons and drawings, which form the Moreau Gallery, one of the best organized collections in Paris, arranged by M. Rupp, his executor, and, together with Delaunay and Fromentin, one of his closest friends.

See Ary Renan, Moreau (Paris, 1900) ; Paul Flat, Le Musee Gustave Moreau (Paris, 1900).

MOREAU, HEGESIPPE (1810-1838), French lyric poet, was born in Paris on the 9th of April 1810. In his early youth his parents, who were poor, migrated to Provins, where the

mother went into service and the father took the

post of usher in a public school. He went to Paris before 1830, and lived a Bohemian life. He was habitually houseless, and exposed himself to the dangers of a cholera hospital in the great epidemic of 1832 simply to obtain shelter and food. Then he revisited Provins and published a kind of satirical serial called Diogbne. Some years of this life entirely ruined his health, and it was only just before his death that he succeeded in getting his collected poems published, selling the copyright for £4 sterling and 80 copies of the book. This volume, Myosotis, was received not unfavourably, but the author's death on the 20th of December 1838, in a refuge of the destitute, created an interest in it which was proportionately excessive. Moreau's work has a strong note of imitation, especially in his earlier songs, dis- tinguished from those of his model, Beranger, chiefly by their elegiac note. Some of his poems, such as the elegy La Votilzie (1837) and the charming romance La Fermiere (1835), have great sweetness and show incontestable poetic power. Moreau wrote some charming prose stories: Le Gui de chine, La Souris blanche, &c;

MOREAU, JEAN VICTOR MARIE (1763-1813), French general, was born at Morlaix in Brittany on the 14th of February 1763. His father was an avocat in good practice, and instead of allowing him to enter the army, as he attempted to do, insisted on his studying law at the university of Rennes. Young Moreau showed no inclination for law, but revelled in the freedom of a student's life. Instead of taking his degree he continued to live with the students as their hero and leader, formed J.hem into a sort of army, which he commanded as their provost, and when 1789 came he commanded the students in the daily affrays which took place at Rennes between the young noblesse and the populace. In 1791 he was elected a lieut.- colonel of the volunteers of Ille-et-Vilaine. With them he served under Dumouriez, and in 1793 the good order of his battalion, and his own martial character and republican principles secured his promotion as general of brigade. Carnot, who had an eye for the true qualities of a general, promoted

him to be general of division early in 1794, and gave him command of the right wing of the army under Pichegru, in Flanders. The battle of Tourcoing established his military fame, and in 1795 he was given the command of the Army of the Rhine-and-Moselle, with which he crossed the Rhine and advanced into Germany. He was at first completely successful, won several victories and penetrated to the Isar (see French Revolutionary Wars), but at last had to retreat before the archduke Charles. However, the skill he displayed in conducting his retreat — which was considered a model for such operations — greatly enhanced his own reputation, the more so as he managed to bring back with him more than 5000 prisoners. In 1797 he again, after prolonged difficulties caused by want of funds and material, crossed the Rhine, but his operations were checked by the conclusion of the preliminaries of Leoben between Bonaparte and the Aus- trians. It was at this time he found out the traitorous corre-spondence between his old comrade and commander Pichegru and the emigre prince de Cond6. He had already appeared as Pichegru's defender against imputations of disloyalty, and now he foolishly concealed his discovery, with the result that he has ever since been suspected of at least partial complicity. Too late to clear himself, he sent the correspondence to Paris and issued a proclamation to the army denouncing Pichegru as a traitor. He was dismissed, and it was only when in 1799 the absence of Bonaparte and the victorious advance of Suvarov made it necessary to have some tried and experienced general in Italy that he was re-employed. He commanded the Army of Italy, with little success, for a short time before being appointed to the Army of the Rhine, and remained with Joubert, his successor in Italy, till Novi had been fought and lost. Joubert fell in the battle, and Moreau then conducted the retreat of the army to Genoa, where he handed over the command to Championnet. When Bonaparte returned from Egypt he found Moreau at Paris, greatly dissatisfied with the Directory both as a general and as a republican, and obtained his assistance in

the coup d'itat of 18 Brumaire, when Moreau commanded the force which confined two of the directors in the Luxembourg. In reward, the First Consul again gave him command of the Army of the Rhine, with which he forced back the Austrians from the Rhine to the Isar. On his return to Paris he married Mile Hullot, a Creole of Josephine's circle, an ambitious woman who gained a complete ascendancy over him, and after spending a few glorious weeks with the army in Germany and winning the celebrated victory of Hohenlinden (Dec. 3, 1800) he settled down to enjoy the fortune he had acquired during his campaigns. His wife collected around her all who were discontented with the aggrandisement of Napoleon. This " club Moreau " annoyed Napoleon, and encouraged the Royalists, but Moreau, though not unwilling to become a military dictator to restore the republic, would be no party to an intrigue for the restoration of Louis XVIII. All this was well known to Napoleon, who seized the conspirators. Moreau's condemnation was procured only by great pressure being brought to bear by Bonaparte on the judges; and after it was pronounced the First Consul treated him with a pretence of leniency, commuting a sentence of im- prisonment to one of banishment. Moreau passed through Spain and embarked for America, where he lived in quiet and obscurity for some years at Morrisville, New Jersey, till news came of the destruction of the grande arm&e in Russia. Then, probably at the instigation of his wife, he committed the last and least excusable of the series of well-meant political errors that marked his career. Negotiations were set on foot with an old friend in the circle of republican intriguers, Bernadotte, who, being now crown prince of Sweden and at the head of an army opposing Napoleon, introduced Moreau to the tsar Alexander. In the hope of returning to France to re-establish the regime of popular government, Moreau gave advice to the allied sovereigns as to the conduct of the war, but fortunately for his fame as a patriot he did not live to invade France. He was mortally wounded while talking to the tsar at the battle of Dresden on the 27th of August 1813, and died on the

2nd of September. He was buried at St Petersburg. His wife received a pension from the tsar, and was given the rank of marechale by Louis XVIIL, but his countrymen spoke of his ” defection ” and compared him to Dumouriez and Pichegru.

Moreau’s fame as a general stands very high, though he was far from possessing Napoleon’s transcendent gifts. His com- binations were skilful and elaborate, and his temper always unruffled when most closely pressed. Moreau was a sincere republican, though his own father was guillotined in the Terror. He was fortunate in the moment of his death, though he would have been more so had he died in America. He seems by his final words, ” Soyez tranquilles, messieurs; c’est mon sort,” not to have regretted being removed from his equivocal position as a general in arms against his country.

The literature on Moreau is copious, the best book being C. Jochmus, General Moreau — Abriss einer Geschichte seines Lebens unci seiner Feldziige (Berlin, 1814). A more ordinary work is A. de Beauchamp, Vie politique, militaire, et privee du General Moreau, translated by Philippart (London, 1814) ; and there is a curious tract on his death in Russian, translated into English under the title, Some Details Concerning General Moreau and his Last Moments, by Paul Svinin (London, 1814).

MOREAU DE SAINT MERY, MEDERIC LOUIS ELIE (1750-1819), French politician, was born at Fort de France, in the island of Martinique, on the 28th of January 1750. He came to Paris at the age of nineteen, and became an avocat at the parlement of Paris. He subsequently returned to Martinique to practise law, and in 1780 was appointed member of the colonial council of San Domingo. Returning to Paris in 1 784, he received a commission to study the legislation of the French colonies, and published Lois et constitutions des colonies jrancaises de I’Amerique sous le Vent de 1550 A 1785. In 1789 he was president of the assembly of the electors of Paris, played an active part in the early days of the Revolution, and was designated by

Martinique deputy to the Constituent Assembly. His moderate ideas were the occasion of his arrest after the 10th of August 1792, but he contrived to escape to the United States, opened

a bookseller's shop at Philadelphia, and published Description topographique et politique de la partie espagnole et de la partie francaise de I'lle de Saint-Domingue (1796-17518). Returning to France in 1700, he became historiographer to the navy and councillor of state, and drafted in part the colonial and maritime code. In 1 802 he was appointed by the First Consul administrator of the duchies of Parma, Piacenza, and Guastalla, but was dis- missed in 1806 for slackness in repressing insubordination. From that date until his death he lived on a pension paid him by the Empress Josephine, who was a kinswoman of his.

See Fournier-Tescay, Discours prononce aux obseques de Moreau le 30 Janvier 1819; Silvestre, Notice sur Moreau (Paris, 1819).

MORECAMBE, a municipal borough, watering-place and seaport in the Lancaster parliamentary division of Lancashire, England, on Mcrecambe Bay, 236 m. N.W. by N. from London by the London & North-Western railway; served also by the Midland railway. Pop. (1901), 11,798. A fine promenade extends along the shore; there are a quay and a pier, a winter garden, and all the appointments of a seaside resort. The Midland railway is the harbour authority. The town was incorporated in 1902, and the corporation consists of a mayor, 6 aldermen and 16 councillors. The former alternative name was Poulton-le-Sands. Area, 1801 acres.

MOREL, the surname of several French classical scholars and printers in the 16th and 17th centuries, known for their editions of classical authors and the Fathers. (1) Guillaume Morel

(1505–1564) was born at Tilleul in Normandy. After acting as proof-reader in a Paris firm, he set up for himself, and subsequently succeeded Turnebus as king's printer in 1555. His most important work was Thesaurus vocum omnium latin- arum, containing a number of quotations from Greek authors, taken from hitherto unpublished MSS. in the Paris library. (2) Federic (as he always called himself, not Frederic) Morel, surnamed the Elder (15 23–1 583), was born in Champagne. He was of noble family, and was not connected with Guillaume Morel. About 1550 he married the daughter of the famous printer, Michel de Vascosan, in 1557 set up in business in the rue Saint Jean de Beauvais, and in 1571 was appointed printer to the king. His chief publications were the Declamationes of Quintilian and L' Architecture de Philibert Delorme. (3) Federic Morel, son of the preceding, surnamed the Younger (1558–1630), was one of the greatest Greek scholars of his time. In addition to the management of his father's business, to which he succeeded, he held the professorship of eloquence at the College de France. The number of his translations and commen- taries on the Fathers and classical authors (Aristotle, Dio Chrysostom, Strabo) was very large; special mention may be made of his revised edition of Amyot's translation of Plutarch and his Latin translations of some of the dissertations of Maximus of Tyre, of Libanius, Hierocles and Theodoret. His commen- tary on the Psalms is still considered valuable. (4) Claude Morel (1 574–1626), brother of the preceding, also published editions of many of the Fathers and other authors, with learned prefaces and notes. (5) Charles Morel (1602–1640) was printer and secretary to the king. He followed the example of the other members of his family, and issued the works of Clement of Alexandria, Gregory of Nazianzus, Cyril, Synesius and Chrysostom, and the Concilia generalia et provindalia of the German theologian Severin Bini. (6) Gilles Morel, brother of the preceding (the dates of his birth and death are unknown), was the last representative of this learned family. The number of his publications was small, but some of them were of great importance, the chief being the

Grande bibliotheque des peres, in 17 folio vols. (1643).

See M. Maittaire, Historia typographorum aliquot parisiensium (1717), for all the above; Federic Morel the elder is the subject of a monograph by J. Dumoulin (Paris, 1901).

MORELIA (formerly Valladolid), a city of Mexico and capital of the state of Michoacan, 125 m. direct and 234 m. by rail W. by N. of the city of Mexico, near the southern margin of the great Mexican plateau, 6398 ft. above sea-level, in lat. 'I5°42′ N. long., ioo° 54′ W. Pop. (1900), 37,278, partly Indians

and mestizos. Morelia is served by a branch of the Mexican National railway; its station is outside the city, with which it is connected by a small tramway line. The city is built on a rocky hill rising from the Guayangareo valley, which gives to it a strikingly picturesque appearance. It has the usual rectangular plan, with several pretty squares and straight, clean, well-paved streets. Facing the plaza mayor, now called the Plaza de los Martires because of the execution there of the patriot Matamoros in 1814, is the cathedral, one of the finest specimens of the old Spanish renaissance church architecture in Mexico.

Among its interior adornments is an onyx font, some fine wood carving in the choir, and the silver doors to the shrines of its chapels. Opposite the cathedral is the government palace, which also contains the public library. The municipal government is housed in an ancient tobacco factory converted to public uses, and a fine old Capuchin convent now serves as a pubb'c hospital. The Paseo, or public park, is distinguished for its fine trees and flowers. The Morelianos are noted for their love of music, and musical competitions are held each year, the best band being sent to the city of Mexico to compete with similar organizations from other states. The public water- supply is brought into the city over a fine old aqueduct (3 m. in length, carried on arches), which was built in 1785 by the

bishop of the diocese as a famine relief work. In common with the state of Michoacan, Morelia is a stronghold of clericalism and conservatism. A large number of private schools are maintained through Church influence in opposition to the public schools. Conspicuous among these is a large girls' school. Another institution is the college of San Nicolas de Hidalgo, which was founded at Patzcuaro in 1540 by Bishop Quiroga (who had been sent into Michoacan to redress the wrongs committed by Nuno de Guzman), was removed to Valladolid (Morelia) a few years later to be combined with a local college, and was rebuilt in 1882. It is the oldest existing Collegiate institution in Mexico; in it Hidalgo once taught and Morelos was a student. The city's manufactures include cotton, woollen and silk textiles, cigars and cigarettes, and dulces, or sweetmeats, Morelia being noted throughout Mexico for the latter, particularly for a variety called Guayabate.

Morelia, first known as Valladolid, was founded in 1541 by Viceroy Mendoza. In 1582 Valladolid replaced Patzcuaro as the capital of Michoacan. It was the birthplace of both Morelos and Iturbide, and was captured by Hidalgo at thg beginning of the revolutionary outbreak of 1810–n, and by Iturbide in 1821 when on his march to Mexico City, where he was crowned emperor. Its name was changed to Morelia in 1828, in honour of the revolutionary leader Jose Maria Morelos y Pavon, and in 1863 it was made the see of an archbishop.

MORELL, JOHN DANIEL (1816–1891), British educationalist, was born on the 18th of June at Little Baddow, Essex, where his father was minister of the Congregational church (1 799–1852): He proceeded to Homerton College in 1833, where he studied theology under Dr Pye Smith. He then entered Glasgow University, where he took his M.A. degree in 1841. Subse- quently he studied philosophy and theology under Fichte at Bonn, and returned to England to undertake the pastorate of the Congregational church at Gosport. After three years' Work, he decided to give up the ministry in favour

of philosophical work. As early as 1846 he made his name by his Historical and Critical View of the Speculative Philosophy of Europe in the Nineteenth Century, which brought him to the notice of Lord Lansdowne, who made him an inspector of schools. From 1848 till 1876 he was active in this capacity. As a result of his experience he published numerous educational works, e.g. The Analysis of Sentences (1852), The Essentials of English Grammar and Analysis (1855), Handbook of Logic (1855), Grammar of the English Language (1857) . He also published four lectures on The Philosophical Tendencies of the Age (1848), The Philosophy of Religion (1849), Fichte' s Contributions to Moral Philosophy (i860), Philosophical Fragments (1878), An Introduc- tion to Mental Philosophy on the Inductive Method (1884). He died on the 1st of April 1891.

MOREL-LADEUIL, LEONARD (1820-1888), French gold- smith and sculptor, was born at Clermont-Ferrand. He was apprenticed first to Morel, a manufacturer of bronzes, under whom he became one of the most expert chasers, or ciseleurs, in France, and then to Antoine Vechte, to acquire the art of repousse (q.v.) — the art in which he was to excel. He studied further under J. J. Feuchdre and then attracted the notice of the comte d'Orsay and the due de Morny, through whose recommendation the French government, desirous of popu- larizing the idea of the new Imperialism, commissioned him to produce the " Empire Shield." Napoleon III. notified his warm approval, but the trade, annoyed that a craftsman should obtain commissions direct, resented the innovation and thenceforward boycotted the young artist, whose beautiful and poetic vase, "Dance of the Willis" (the spirits dancing round the vase, above the lake represented on a dish below) none would take. He was encouraged nevertheless by a foreign dealer in Paris, Marchi, who employed him on statuettes, mainly religious in character, until 1859, when Messrs Eikington, in view of the great

exhibition of 1862, engaged him to work in Birmingham for three years in repoussS, assuring him a free hand. Following his silver ″ Night ″ came ″ Day,″ and then the "Inventions" vase, which placed him at once at the top of his profession. This was followed by the beautiful plateau called ″ Dreams,″ which was subscribed for (£1 500) by Birmingham as the town wedding- gift to the prince and princess of Wales. Morel-Ladeuil's contract was then renewed for five years, but as a matter of fact he remained with the firm for twenty-three years at their London house, the first result being his masterpiece the ″ Milton Shield: Paradise Lost ″ (in repousse steel and silver), which was the sensation of the Paris Exhibition. It was bought by the English government for £3000, and thousands of copies made by ″ galvanoplastie ″ or electrotype were sold and spread all over the world. Then after ″ The Months ″ came another masterpiece, the ″ Helicon Vase,″ in steel, silver, and gold, priced at £6000, which in course of time was presented by the ladies and gentlemen of the royal house to Queen Victoria on her first jubilee. For the Philadelphia Exhibition (1876) Morel- Ladeuil produced ″ A Pompeian Lady at her Toilet,″ following it in 1878 with the ″ Bunyan Shield,″ a companion to the Milton. After putting forth his reliefs ″ The Merry Wives of Windsor,″ ″ The Merchant of Venice,″ and ″ Much Ado about Nothing,″ in view of his failing health he retired to Boulogne, where he died of angina pectoris on the 15th of March 1888, and was buried with much ceremony at Clermont-Ferrand. His total work, apart from the productions of his youth, numbers 35 pieces, which richly reveal his elegant and refined fancy and grace, his feeling for correct and dainty ornament, and his love of pure art marked by an elevated if rather sentimental taste and a noble style.

See L'CEuvre de Morel-Ladeuil, sculpteur-ciseleur, by L. Morel (Paris, 1904).

MORELLET, ANDRE (1 727-1819), French economist and miscellaneous writer, was born at Lyons on the 7th of March 1727. He was one of the last survivors of

the philosophes, and in this character he figures in many memoirs, such as Mme de Remusat's. He was educated by the Jesuits in his native town, and at the Sorbonne; he then took holy orders, but his designation of abbe was the chief thing clerical about him. He had a ready and biting wit, and Voltaire called him " L'Abbe Mord-les." His work was chiefly occasional, and the most notable parts of it were a smart pamphlet in answer to Charles Pa'lissot's scurrilous play Les Philosophes (which procured him a short sojourn in the Bastille for an alleged libel on Palissot's patroness, the princesse de Robeck), and a reply to Galiani's Commerce des bles (1770). Later, he made himself useful in quasi-diplomatic communications with English statesmen, and was pensioned, being, moreover, elected a member of the Academy in 1785. A year before his death in Paris on the 12th of January 1819 he brought out four volumes of Melanges delittirature et de philosophie du X VIII' Steele, composed chiefly

of selections from his former publications, and after his death appeared his valuable Mimoires sur le X VIII' slide et la Revolution (2 vols., 1821).

A bibliography of his numerous works is given in Qufirard's La France litteraire, vol. vi. ; see also Sainte-Beuve, Causeries du lundi, vol. i.

MORELLI, GIOVANNI (1816-1891), Italian patriot and art critic, was born at Verona on the 16th of February 1816. He was educated first at Bergamo, the home of his mother, who had removed thither on the death of her husband; and then at Aarau in Switzerland. At the age of eighteen he commenced his university career at Munich, being debarred as a Protestant from entering any Italian college, and became the pupil of Ignatius Dollinger, the celebrated professor Of anatomy and physiology. Natural philosophy and medicine were the studies to which he specially devoted himself, but he was also keenly interested in all scientific and literary pursuits. At Munich, and later at Erlangen, Berlin and Paris, his brilliant gifts and independence of thought and judgment attracted the attention of the

most distinguished men of the day. In Paris he became intimate with Otto Miindler, and his intercourse with that eminent art critic was not without its effect in deter- mining the direction of his future studies; and, during a summer spent in Switzerland, he formed a friendship with Louis Agassiz, whose teaching made a deep and lasting impression upon him. On his return to Italy in 1840 he became associated in Florence with that band of patriots who were strenuously labouring for the deliverance of their country from the oppressive Austrian rule. He took an active part in the war of 1848, and was subsequently chosen by the provisional Lombard government to plead the cause of Italian unity before the German parlia- ment assembled at Frankfort; In i860, in recognition of the great services rendered to his country by Morelli, Victor Emmanuel named him a citizen of the Sardinian kingdom, and in the following year he was elected deputy for Bergamo to the first free Italian parliament. He was a staunch supporter of Cavour, and, though never a leading politician, exercised a considerable influence over the most prominent statesmen of the Right, who valued his sound judgment, integrity, moderation and foresight. One of his first acts after his election was to draw the attention of parliament to the urgent need of reform in the administration of matters relating to the fine arts. In con- sequence of his representations, a commission was appointed with the object of bringing under government control all works of art which could be considered public property. The com- mission, of which Morelli was named president, began its work in Umbria and the Marches, and he appointed as his secretary G. B. Cavalcaselle, who was then engaged in collecting materials for a work on Italian art. According to one who knew Morelli well, much that Cavalcaselle then learned from his chief was embodied in the well-known History of Painting, which was published in 1864 in conjunction with Sir Joseph Crowe.

The immediate result of Morelli's first labours in the Marches was the passing of the law, which bears

his name, strictly pro- hibiting the sale of works of art from public and religious institutions. In 1873 he was named a senator of the kingdom of Italy, having voluntarily resigned his seat in the Lower House owing to the increasingly democratic tendencies of the Chamber. In Rome, the seat of the government since 1870, he spent several months of each year; but his settled home was Milan, whither he had removed from Bergamo in 1874. Here he published some of his researches into the history of Italian art. In order to be free to speak his mind unreservedly, he determined to adopt a pseudonym and to write in German. His first contributions, a series of articles on the Borghese Gallery, were published in Lutzow's Zeilschrijtfur bildende Kunsl between ; the years 1874 and 1876. Posing as an art-loving Russian, who puts forth his opinions with the utmost diffidence, he adopted the pseudonym of Ivan Lermolieff — an anagram of his own name with a Russian termination — and described his essays as Ein kritischer Versuch, translated from the Russian I by Johannes Schwarze, this time a Germanized form of Morelli. 1

The originality of the method recommended by the author for studying art, the general soundness of his critical opinions, and the many new (and apparently correct) attributions suggested for pictures in the Borghese Gallery and elsewhere, attracted the attention of all students of art; but failure attended every attempt to discover the identity of the Russian critic. In 1880 Morelli published a small book under the same pseudonym, entitled, Die Werke italienischer Meister in den Galerien von Miinchen, Dresden und Berlin. The appearance of this volume, which was cast in so original a form that it was altogether unlike anything which had preceded it in the realm of art scholarship, created an extraordinary sensation. The daring opinions expressed by the author struck at the roots of all existing art criticism, and were

often diametrically opposed to the views of the most renowned art historians of the day. The importance of the work could not be denied, and in spite of determined opposition and searching and bitter attacks, it gained general recognition as a standard work which no serious student of art could ignore. It inaugurated a new and more scientific method of criticism, and marks an epoch in the art studies of the 19th century. The book was translated into English in 1883, with Morelli's own name upon the title-page, and a few years later into Italian. In the decade between 1 880 and 1 890 he contributed three articles to German periodicals : Perugino oder Rafael, Rqffaels Jugendentwickelung, Nock einmal das venezianische Skizzenbuch. Being addressed to critics who had challenged his opinions, they are somewhat polemical in character, but contain a mass of information, more especially about drawings. He also wrote a skit on art connoisseurship in Europe, intending to publish it in English as the reflections of an American on the follies of art critics in the Old World; but he never carried out his intention, though some portion of the MS. was embodied in the first part of his Critical Studies. This volume, the first of a series of three which, under the title of Kunstkritische Studien, was to contain all Morelli's contribu- tions to art literature, was published in 1890. The first part, cast in dialogue form, contains a detailed exposition of his method. Then follow The Borghese Gallery, a reissue of his former articles with many important additions, and The Doria Gallery, an entirely new contribution. The second volume deals with the galleries of Munich and Dresden, and is a revised edition of the first two parts of the original book of 1880; but here again copious additions rendered it practically a new book. The third volume was to treat of the Berlin Gallery, and was also to contain an exhaustive account of the drawings of Italian masters, but it was destined never to be carried out. Morelli was taken seriously ill towards the middle of February 1891, and was found to be suffering from heart disease and other com- plications; a fortnight later he died at Milan,

on the 28th of February. His collection of drawings by the old masters he bequeathed to his pupil, Dr Frizzoni, and his pictures, over 100 in number, to the city of Bergamo, where they are now exhibited as the Galleria Morelli in two rooms of the Accademia Carrara. A striking half-length portrait by Lenbach, who presented it to his friend in 1886, forms part of the collection. In memory of Morelli a bronze bust of him by a Milanese artist has been placed in the Brera; but his features are more worthily presented in a second portrait by Lenbach and in a life-like pastel sketch executed by the Empress Frederick in 1884, when he was her guest at Baveno. After the death of Morelli the first two volumes of his Critical Studies were published in English, Sir Henry Layard, one of his most intimate friends, contributing to the first a biographical sketch of the author; and the fragmentary MS. of the third volume was published in German by Dr Frizzoni, under whose editorship an Italian translation of the first volume has also been issued.

Morelli found art criticism uninspired, unscientific and practically worthless. To be of any real value he held that historical, documentary and traditional knowledge respecting works of art was only of secondary importance as compared with the evidence to be derived from the study of the pictures themselves. He contended that art criticism must be conducted

on scientific principles and follow a strict course of inductive reasoning. A painting should be subjected to a searching analysis, and its component parts and minutest details submitted to methodical and exact investigation.

The study of the individual parts and forms was, in his estimation, of the highest importance, for they were not mere incidents, but the outward and visible seal of an artist's character stamped upon his work, and obvious to all who had eyes to see. By diligent observation of the forms the rudiments of the language of art might be mastered, and the first step taken towards initiating a methodized system of

study. The education of a critic consists chiefly in learning to compare, and Morelli soon recognized the value of systematic comparison in the study of art. By the combined methods of critical analysis and com- parative observation he found the clue he had so long been seeking. Studying one day in the Uffizi, it suddenly struck him that in a picture by Botticelli containing several figures the drawing of the hands was remarkably similar in all; that the same characteristic but plebeian type, with bony fingers, broad square nails, and dark outlines, was repeated in every figure. Turning to the ears, he observed that they also were drawn in an individual manner, and that in the numerous figures in which the ear was visible the same typical form recurred. Having noted these fundamental forms, he proceeded to an examination of other works by this painter, and found that the same forms were exactly repeated, together with other individual traits which seemed distinctive of the master: the characteristic type of head and expression, the drawing of the nostrils, the vitality of movement, the disposition of drapery, harmony of colour (where it had not been tampered with by the restorer), and quality of landscape. In all Botticelli's true works the presence of these and other characteristics proclaimed their genuineness. In paintings where the forms and types were those of the painter, but where vitality, movement, and all deeper qualities were absent, Morelli recognized works executed from the master's cartoons; while in pictures where neither types nor forms responded to the test, and where only a general family likeness connected them with Botticelli, he discerned the productions of pupils and imitators. After applying his method to the works of Botticelli, he proceeded to examine those of other Florentine masters, and afterwards of painters of other Italian schools, everywhere meeting with results to him not less convincing. If the drawing of the hand and ear were not always conspicuous, there were other peculiarities of this language of form to aid in the identification of a master: the treatment of the hair, as in Piero dei Franceschi; the indication of the sinews, as in

Foppa; the drawing of the eye, as in Liberate da Verona; the modelling of the eyelid and upper lip, as in Ambrogio de Predis; the form of the feet, as in Luini. In short, all apparently insignificant details were of importance in his plan of study, for to him they were like the signature of the master. (C. J. F.*)

MORELOS, an inland state of Mexico on the southern slope of the great Mexican plateau, lying S. of the Federal District, with the states of Puebla on the E. and S.E., Guerrero on the S., and Mexico on the W., N. and N.E. Pop. (1900), 161,697, including a large percentage of Indians and mixed bloods. Area, 2773 sq. m. Its surface is roughly broken by mountain ranges extending southward from the Sierra de Ajusco, forming numerous valleys opening southward. It is drained by the Amacusac river, a northern tributary of the Mescala, or Balsas. There is a wide variation of climate for so small a territory, the higher elevations of the Sierra de Ajusco being cold and humid (the Mexican Central crosses the range at an elevation of 9974 ft.); the lower spurs mild, temperate and healthy, the lower valleys subtropical, hot and unhealthy. The rainfall is light in the lower regions and irrigation is generally employed. Notwithstanding its mountainous character, Morelos is one of the most flourishing agricultural states of Mexico, producing sugar, rice, Indian corn, coffee, wheat, fruit and vegetables. Although the state is supposed to have several of the minerals found in this part of Mexico (silver, cinnabar, iron, lead, gold, petroleum and coal), its mining industries continue undeveloped

and neglected. San Antonio, a suburb of Cuernavaca, is noted for its pottery, which is highly attractive in form and colour, and finds a ready market among the visitors to that city. Morelos is traversed by two railway lines — the Interoceanic from N.E. to S.W., and the Mexican Central almost N. and S., the

latter affording direct communication between the national and state capitals.

The capital, Cuernavaca (pop. 9584 in 1900), 47 m. S. of the city of Mexico on the Mexican Central railway, is one of the most picturesque towns in Mexico. It dates from the time of Cortes, who built for himself a residence there, and had the town included in the royal grant to himself in 1529. Maximilian had a villa there, and many of the public men of Mexico, natives of the lowlands, have made their homes there rather than in the national capital. The palace of Cortes is now occupied by the state legislature and by various public offices, and Maxi- milian's villa by a school.

After the capital the largest city in the state is Cuautla Morelos, or Ciudad Morelos (pop. 6269 in 1900), 27 m. east by south of Cuernavaca, on the Interoceanic railway, and in a rich sugar- producing district. Some of the largest and most modern sugar-mills of Mexico are in the Cuautla district. There are hot sulphur springs here. The town is celebrated in Mexican history for the intrepid defence of the place by Jose Maria Morelos (1765-1815), the patriot leader, against a greatly superior royalist force, from the 19th of February to the 2nd of May 181 2, when he cut his way through the attacking army and escaped. Other important towns are Yautepec (6139 in 1900), 16 m. east of Cuernavaca, on the Interoceanic line; Tetecala, 13 m. south-west of the capital, a characteristic Indian town near the pyramid of Xochicalco, and Jojutla, 21 m. south of the capital, on the Interoceanic railway near the southern boundary of the state. An interesting local pheno- menon is that of lake Tequesquiten, which was formed by the subsidence of a large area of ground about the middle of the 19th century, carrying with it an old town of the same name. The hollow filled with water, and the spire of the old church is still to be seen in the middle of the lake.

MORESNET, a small neutral state lying on the borders of Prussia and Belgium, 4 m. S.W. of Aix-la-Chapelle, and em- bracing an area of nearly 1400

acres. Its only village is that of Neutral Moresnet, also called Kelmis or Kalmis, with 2800 inhabitants. Just over the Prussian frontier is Prussian Moresnet, with 650 inhabitants, and in Belgium is Belgian Moresnet, with about 1200. Moresnet, strictly Montzen- Moresnet, is, as its name implies, a mountain, under which is the extremely valuable zinc mine owned by the " Vieille Montagne Company," which is a Belgian undertaking. The profit of the customs is divided between the two states, but a tendency has been observed to convert it gradually into a German possession. The state of Moresnet owes its origin to the general European settlement of 181 5. No agreement could be reached about the ownership of this small district, and it was made a neutral state under the joint government of Prussia and Belgium. This arrangement lasted until 1841, when Moresnet was given an administration of its own, this being composed of a burgomaster and a council of ten members. The inhabitants decide individually whether they will perform military service for Prussia or for Belgium, and also whether they will accept the jurisdiction of the Prussian or of the Belgian courts.

See Hoch, Un Territoire oublii au centre de I'Europe (Bern, 1881); Schroder, Das grenzstreitige Gebiet von Moresnet (Aix-la-Chapelle, 1902) ; and Spandau, Zur Geschichte von Neutral- Moresnet (Aix-la-Chapelle, 1904).

MORETON BAY CHESTNUT, a tall tree known botanically as Castanospermum australe (natural order Leguminosae), native of Queensland and New South Wales. The pods are almost cylindrical, about 9 in. long and 2 in. broad, and are divided interiorly by a spongy substance into three to five cells, each of which contains a large chestnut-like seed. The seeds are roasted and eaten by the natives; the timber, which somewhat

resembles walnut, is soft, fine-grained, and takes a good polish, but is not durable.

MORETO Y CAVANA, AGUSTIN (1618-1661), Spanish

dramatist and playwright, was baptized at Madrid on the 9th of April 1618. He graduated at Alcala in December 1639, and resided in Madrid till 1654, when he removed to Toledo, took orders, and became chaplain to the primate Baltasar de Moscoso y Sandoval. He died at Toledo on the 28th of October 1661, while engaged on Santa Rosa, a play which was completed by Pedro Francisco Lanini. The first volume of his dramas was published in 1654; the second and third volumes appeared in 1676. The most celebrated of his pieces is El Desden con el Desdin, imitated by Moliere in La Princesse d'£lide, by Gozzi in La Principessa filosofa, and by Schreyvogel in Donna Diana. It is characteristic that four episodes in El Desdin con el Desdin are taken from four separate plays of Lope de Vega's {La Vengadora de las mujeres, Las MUagros del desprecio, De Corsario A corsario, and La Hermosa fea). Moreto borrows from Castro, Tirso de Molina and others to an extent which is indicated at length in Fitzmaurice-Kelley's Littirature espagnole (Paris, 1904), but his adaptation shows great dexterity and charm.

MORETTO, IL (" The Blackamoor," a term which has not been particularly accounted for), the name currently bestowed upon Alessandro Bonvicino (1498-1554), a celebrated painter of Brescia, Venetian school. He was born at Rovato, in the Brescian territory, in 1498, and studied, first under Fioravante Ferramola of Brescia, afterwards, still youthful, with Titian in Venice. His own earlier method, specially distinguished by excellent portrait-painting, was naturally modelled on that of Titian. Afterwards he conceived a great enthusiasm for Raphael (though he does not appear to have ever gone to Rome), and his style became partially Raphaelesque. It was, however, novel in its combination of diverse elements, and highly attractive — with fine pencilling, a rich yet not lavish use of perspective and decorative effects, and an elegant opposition of light and shade. The human figure is somewhat slender in Bonvicino's paintings, the expression earnestly religious, the flesh-tints varied, more so

than was common in the Venetian school. The backgrounds are generally luminous, and the draperies well modified in red and yellow tints with little inter- mixture of blue. The depth of Bonvicino's talent, however, was hardly in proportion to its vigour and vivacity; and he excelled more in sedate altarpieces than in subjects of action, and more in oil-painting than in fresco, although some fine series of his frescoes remain, especially that in the villa Marti- nengo at Novarino, near Brescia. Among his celebrated works in the city are — in the church of S. Clemente, the " Five Virgin Martyrs," and the " Assumption of the Madonna " (this latter may count as his masterpiece) ; in S. Nazaro e Celso, the " Coro- nation of the Madonna "; in S. Maria della Grazie, " St Joseph "; in S. Maria de' Miracoli, " St Nicholas of Bari." In the Vienna Gallery is a " St Justina " (once ascribed to Pordenone) ; in the Stadel Institute, Frankfort, the " Madonna enthroned between Sts Anthony and Sebastian "; in the Berlin Museum, a colossal " Adoration of the Shepherds," and a large votive picture (one of the master's best) of the " Madonna and Child," with infant angels and other figures above the clouds, and below, amid a rich landscape, two priests; in the National Gallery, London, St Bernardin and other saints and two impressive portraits. II Moretto is stated to have been a man of child-like personal piety, preparing himself by prayer and fasting for any great act of sacred art, such as the painting of the Virgin-mother. His dated works extend from 1524 to 1554, and he was the master of the pre-eminent portrait-painter Moroni. He died on the 22nd of December 1554.

MORGAGNI, GIOVANNI BATTISTA (1682-1771), Italian anatomist, was born on the 25th of February 1682 at ForH. 1 His parents were in comfortable circumstances, but not of the nobility ; it appears from his letters to G. M. Lancisi that Morgagni was ambitious of gaining admission into that rank, and it may

1 His statue was erected at ForH in 1875, and the

town library preserves fourteen manuscript volumes of his writings.

be inferred that he succeeded from the fact that he is described on a memorial tablet at Padua as ” nobilis forolensis.” At the age of sixteen he went to Bologna to study philosophy and medicine, and he graduated with much eclat as doctor in both faculties three years later (1701). He acted as prosector, to A. M. Valsalva (one of the distinguished pupils of Malpighi), who held the office of “demonstrator anatomicus ” in the Bologna school, and whom he assisted more particularly in preparing his celebrated work on the Anatomy and Diseases of the Ear, published in 1 704. Many years after (1740) Morgagni edited a collected edition of Valsalva’s writings, with important additions to the treatise on the ear, and with a memoir of the author. When Valsalva was transferred to Parma Morgagni succeeded to his anatomical demonstratorship. At this period he enjoyed a high repute in Bologna; he was made president of the Academia Inquietorum when in his twenty-fourth year, and he is said to have signalized his tenure of the presidential chair by discouraging abstract speculations, and by setting the fashion towards exact anatomical observation and reasoning. He published the substance of his communications to the Academy in 1706 under the title of Adversaria anatomica, the first of a series by which he became favourably known throughput Europe as an accurate anatomist; the book included ” Observa- tions on the Larynx, the Lachrymal Apparatus, and the Pelvic Organs in the Female.” After a time he gave up his post at Bologna, and occupied himself for the next two or three years at Padua, where he had a friend in Domenico Guglielmini (1655^ 1710), professor of medicine, but better known as a writer on physics and mathematics, whose works he afterwards edited (1719) with a biography. Guglielmini desired to see him settled as a teacher at Padua, and the

unexpected death of Guglielmini himself made the project feasible, Antonio Vallis- neri (1661-1730) being transferred to the vacant chair, and Morgagni succeeding to the chair of theoretical medicine. He came to Padua in the spring of 171 2, being then in his thirty- first year, and he taught medicine there with the most brilliant success until his death on the 6th of December 1771.

When he had been three years in Padua an opportunity occurred for his promotion (by the Venetian senate) to the chair of anatomy, in which he became the successor of an illustrious line of scholars, including A. Vesalius, G. Fallopius, H. Fabricius, Gasserius, and A. Spigelius, and in which he enjoyed a stipend that was increased from time to time by vote of the senate until it reached twelve hundred gold ducats. Shortly after coming to Padua he married a lady of Forli, of noble parentage, who bore him three sons and twelve daughters. Morgagni enjoyed an unequalled popularity among all classes. He was of tall and dignified figure, with blonde hair and blue eyes, and with a frank and happy expression; his manners were pojished, and he was noted for the elegance of his Latin style. He lived in harmony with his colleagues, who are said not even to have envied him his unprecedentedly large stipend; his house and lecture-theatre were frequented " tanquam officina sapientiae " by students of all ages, attracted from all parts of Europe; he enjoyed the friendship and favour of distinguished Venetian senators and of cardinals; and successive popes conferred honours upon him. Before he had been long in Padua the students of the German nation, of all the faculties there, elected him their patron, and he advised and assisted them in the purchase of a house to be a German library and club for all time. He was elected into the imperial Caesareo-Leopoldina Academy in 1708 (originally located at Schweinfurth), and to a higher grade in 1732, into the Royal Society in 1724, into the Paris Academy of Sciences in 1.731, theSt Petersburg Academy in 1735, and the Berlin Academy in 1754. Among his more celebrated pupils

were Antonio Scarpa (who died in 1832, connecting the school of Morgagni with the modern era), Domenico Cotugno (1736–1822), and L. M. A. Caldani (1725–1813), the author of 1 the magnificent atlas of anatomical plates published in 2 vols, at Venice in 1801–1814.

In his earlier years at Padua Morgagni brought out (1717–1719) five more series of the Adversaria anatomica, by which his reputation was first made: but for more than' twenty years after the last of

these his strictly medical publications were few and casual (on gall- stones, varices of the vena cava, cases of stone, and several memo- randa on medico-legal points, drawn up at the request of the curia). Classical scholarship in those years occupied his pen more than anatomical observation. It was not until 1761, when he was in his eightieth year, that he brought out the great work which, once for all, made pathological anatomy a science, and diverted the course Qf medicine into new channels of exactness or precision — the De Sedibus et causis morborum per anatomem indagatis, which during the succeeding ten years, notwithstanding its bulk, was reprinted several times (thrice in four years) in its original Latin, and was translated into French (1765), English (1769, 3 vols. 4to), and German (1771). Some account of this remarkable work remains now to be given.

The only special treatise on pathological anatomy previous to that of Morgagni was the work of Theophile Bonet of Neuchatel, Sepul- chretum: sive anatomia practica ex cadaveribus morbo denatis, first published (Geneva, 2 vols, folio) in 1679, three years before Morgagni was born; it was republished at Geneva (3 vols., folio) in 1700, and again at Leyden in 1709. Although the normal anatomy of the body had been comprehensively, and in some parts exhaustively, written by Vesalius and Fallopius, it had not occurred to any one to examine and describe systematically the anatomy of diseased organs and parts. Harvey, a century after Vesalius, naively re- marks that there is more to be learned

from the dissection of one person who had died of consumption or other chronic malady than from the bodies of ten persons who had been hanged. F. Glisson, indeed (1597-1677), shows, in a passage quoted by Bonet in the preface to the Sepulchretum, that he was familiar with the idea, at least, of systematically comparing the state of the organs in a series of cadavera, and of noting those conditions which invariably accompanied a given set of symptoms. The work of Bonet was, however, the first attempt at a system of morbid anatomy, and, although it dwelt mostly upon curiosities and monstrosities, it enjoyed much repute in its day; Haller speaks of it as "an im- mortal work, which may in itself serve for a pathological library." Morgagni, in the preface to his own work, discusses the defects and merits of the Sepulchretum: it was largely a compilation of other men's cases, well and ill authenticated ; it was prolix, often inaccurate and misleading from ignorance of the normal anatomy, and it Was wanting in what would now be called objective impartiality — a quality which was introduced as decisively into morbid anatomy by Morgagni as it had been introduced two centuries earlier into normal human anatomy by Vesalius. Morgagni has narrated the circumstances under which the De Sedibus took origin. Having finished his edition of Valsalva in 1 740, he was taking a holiday in the country, spending much of his time in the company of a young friend who was curious in many branches of knowledge. The conversation turned upon the Sepulchretum of Bonet, and it was suggested to Morgagni by his dilettante friend that he should put on record his own observations. It was agreed thatletters on the anatomy of diseased , organs and parts should be written for the perusal of this favoured youth (whose name is not mentioned); and they were continued from time to time until they numbered seventy. Those seventy letters constitute the De sedibus et causis morborum, which was given to the world as a systematic treatise in 2 vols., folio (Venice, 1 761), twenty years after the task of epis- tolary instruction was begun. The letters are arranged in five books, treating of the morbid

conditions of the body a capite ad calcem, and together containing the records of some 646 dissections. Some of these are given at great length, and with a precision of state' ment and exhaustiveness of detail hardly surpassed in the so-called " protocols " of the German pathological institutes of the present time; others, again, are fragments brought in to elucidate some question that had arisen. The symptoms during the course of the malady and other antecedent circumstances are always prefixed with more or less fulness, and discussed from the point of view of the conditions found after death. Subjects in all ranks of life, including several cardinals, figure in this remarkable gallery of the dead! Many of the cases are taken from Morgagni's early experiences at Bologna, and from the records of his teachers Valsalva and H. F. Albertini not elsewhere published. They are selected and arranged with method and purpose, and they are often (and somewhat casually) made the occasion of a long excursus on general pathology and therapeutics. The range of Morgagni's scholarship, as evidenced by his references to early and contemporary literature, is astonishing. It has been contended that he was himself not free from prolixity, the besetting sin of the learned ; and Certainly the form and arrange- ment of his treatise are such as to make it difficult to use in the present day, notwithstanding that it is well indexed in the original edition, in that of Tissot (3 vols., 4to, Yverdun, 1779), and in more recent editions. It differs from modern treatises in so far as the symptoms determine the order and manner of presenting the ana- tomical facts. Although Morgagni was the first to understand and to demonstrate the absolute necessity of basing diagnosis, prognosis and treatment on an exact and comprehensive knowledge of anatomical conditions, he made no attempt (like that of the Vienna school sixty years later) to exalt pathological anatomy into a science disconnected from clinical medicine and remote from practical needs. His orderliness of anatomical method (implying his skill

with the scalpel), his precision, his exhaustiveness, and his freedom from bias, are his essentially modern or scientific qualities; his scholarship and high consideration for classical and foreign work, his sense of practical ends (or his common sense), and the breadth of his intellectual horizon prove him to have lived before medical science had become largely technical or mechanical. His treatise was the commencement of the era of steady or cumulative progress in pathology and in practical medicine. Symptoms from that, time ceased to be made up into more or less conventional groups, each of which was a disease; on the other hand, they began to be viewed as ■" the cry of the suffering organs," and it became possible to develop Thomas Sydenham's grand conception of a natural history of disease in a catholic or scientific spirit.

A biography of Morgagni by Mosca was published at Naples in 1768. His life may also be read in A. Fabroni's Vitae illustr. Italor., and a convenient abridgment of Fabroni's memoir will be found prefixed to Tissot's edition of the De sedibus,. &c. A collected edition of his works was published at Venice in 5 vols, folio, in 1765. (C C.)

MORGAN, DANIEL (1736–1802), American soldier, was born in Hunterdon county, New Jersey, in the winter of 1736, of Welsh ancestry. In 1753 he removed to Virginia. In June 1775, soon after the outbreak of the War of Independence, he was commissioned a captain of Virginia riflemen, and he marched his company to Boston in 21 days. In the winter of 1775 he accompanied General Benedict Arnold to Canada, and in the assault on Quebec (Dec. 31) he and his riflemen penetrated well into the city, where he was hemmed in and was forced to surrender. On the 7th of August 1776 he was discharged on parole; on the 12th of November he was com- missioned colonel of the nth Virginia; and soon afterwards he was released from his parole. In the summer of 1777 he was engaged in minor skirmishes in New Jersey, and early in Septem- ber joined General Horatio Gates, then engaged in

the campaign against General Burgoyne. At the first battle of Saratoga (Sept. 19) he was, until Arnold's arrival late in the day, the ranking officer on the field; and in the second battle (Oct. 7) also took a prominent part. Morgan rejoined Washington in November near Philadelphia. In March 1770 he was commis- sioned by Congress colonel of the 7th Virginia; but in July, suffering from poor health and dissatisfied because Congress did not advance him further in rank, he resigned from the army and retired to Virginia. After the battle of Camden, however, he joined Gates (then in command in the South) at Hillsborough, North Carolina, and on the 1st of October took command of a corps. On the 13th of the same month Congress tardily raised him to the rank of brigadier-general. In January 1781 Cornwallis and Tarleton attempted to entrap him, but at the Cowpens (Jan. 17) he defeated Tarleton and then escaped from Cornwallis into North Carolina. Apparently Morgan sug- gested to Greene (who had superseded Gates) that general's plan of battle at Guilford Court House on the 15th of March. In December 1793 he was commissioned major-general of Virginia militia, and in November 1794 commanded troops sent to suppress the Whisky Insurrection in western Pennsylvania. He was a Federalist representative in Congress in 1 797-1 799, and died in Winchester, Virginia, on the 6th of July 1802.

See James Graham, The Life of General Daniel Morgan of the Virginia Line (New York, 1856) ; and Rebecca McConkey, The Hero of Cowpens (rev. ed., New York, 1885).

MORGAN, EDWIN DENNISON (1811-1883), American mer- chant and philanthropist, one of the " war governors " of New York state, was born in Washington, Berkshire county, Massa- chusetts, on the 8th of February 181 1. He was first a clerk and then a partner in his uncle's store at Hartford, Connecticut, and became head of the New York firm of E. D. Morgan & Co. (formed in 1847). He engaged in politics, first as a Whig and then as a Republican. In 1849 he was elected president of the Board of Assistant Aldermen of New York City; he was a member

of the state senate in 1850-1853 and procured the passage of the bill providing for the establishment of Central Park in New York City; in 1855-1858 he was state commissioner of immigration; from 1859 to 1863 he was governor of New York, being the first Republican executive of the state; in 1863-1869 he was United States senator from New York. He died in New York City on the 14th of February 1883. Morgan

was one of the founders of the Republican party, and was chairman of the National Republican Committee in 1856-1864 and in 1872. He was one of the most efficient and able of the wSr-governors; even before the outbreak of the Civil War he did much to prepare the state government for it, and from September 1861 to January 1863 he was in command of the military department of New York, with the rank of major-general of volunteers. He was a liberal donor to Union Theo- logical Seminary, Williams College and other institutions. His collection of paintings and sculpture, much of which had long been loaned to the Metropolitan Museum, was sold in January

1886.

MORGAN, SIR HENRY (c. 1635-1688), Welsh buccaneer, and lieutenant-governor of Jamaica, was the eldest son of Robert Morgan of Llanrhymny in Glamorganshire! He is said to have been kidnapped as a boy at Bristol and sold as a slave at Barbadoes, thence making his way to Jamaica, and is possibly to be identified with the Captain Morgan who accompanied the expedition of John Morris and Jackman when Vildemos, Trujillo and Granada were taken. In 1666 he commanded a ship in Edward Mansfield's expedition which seized the island of Provi- dence or Santa Catalina, and when Mansfield was captured and killed by the Spaniards shortly afterwards Morgan was chosen by the buccaneers as their " admiral." In 1668 he was com- missioned by Sir Thomas Modyford, the governor of Jamaica, to capture some Spanish prisoners, in order to discover details of the threatened attack on Jamaica; and

collecting ten ships with 500 men south of Cuba, he landed and marched to Puerto Principe, which he took and pillaged; and afterwards accom- plished the extraordinary feat of taking by storm the fortified and well-garrisoned town of Porto Bello on the mainland. The governor of Panama, astonished at this daring adventure, in vain attempted to drive out the invaders, and finally Morgan consented to evacuate the place on the payment of a large ransom. These exploits had considerably exceeded the terms of Morgan's commission and had been accompanied by frightful cruelties and excesses; but the governor endeavoured to cover the' whole under the necessity of allowing the English a free hand to attack the Spaniards whenever possible. Morgan was almost immediately entrusted with another expedition by Modyford against the Spaniards, and proceeded to ravage the coast of Cuba. In January 1669 the largest of his ships was blown up accidentally in the course of a carousal on board, Morgan and his officers narrowly escaping destruction. In March he sacked Maracaibo, and afterwards Gibraltar. Returning to Maracaibo, he found three Spanish ships waiting to intercept him; but these he destroyed or captured, recovered a considerable amount of treasure from one which had sunk, exacted a heavy ransom as the price of his evacuating the place, and finally by an ingenious stratagem eluded the enemy's guns altogether and escaped in safety. On his return to Jamaica he was again reproved, but not punished by Modyford. The Spaniards on their side were moreover acting in the same way, and a new commission was given to Morgan, as commander-in-chief of all the ships of war in Jamaica, to levy war on the Spaniards and destroy their ships and stores, the booty gained in the expedition being the only pay. Accordingly, after ravaging the coast of Cuba and the mainland, Morgan determined on an expedition to Panama. He recaptured the island of Santa Catalina on the 15th of December 1670, and On the 27th gained possession of the castle of Chagres, killing 300 of the garrison. Then with 1400 men he ascended the Chagres river, and after overcoming perils and obstacles of all kinds he appeared before

Panama on the 1 8th of January 167 1, defeated a much larger force than his own, and took the city. The fame of this brilliant exploit was, however, again obscured by abominable scenes of cruelty and debauchery, during which a galleon containing a consider- able part of the booty escaped. Moreover, on returning to Chagres the members of the expedition found themselves cheated of their fait share of the spoil, 1 while Morgan escaped with a

1 Cal. of St Pap. America & West Indies 1669–1674, Nos. 580 and 798; Exquemelin (ed. 1898), 237.

few ships to Jamaica, leaving the rest to get home as best they could. On his return he received the thanks of the governor and council; but meanwhile on the 8th of July, 1670, a treaty had been signed between Spain and England, and both Mody- ford and Morgan were ordered home under arrest to answer for their conduct. Morgan, however, soon succeeded in gaining the king's favour, and in the autumn of 1674 he was appointed lieutenant-governor of Jamaica and was knighted, leaving England in December. After such a career as his it is not surprising that Morgan's conduct as a responsible official of the government was not very creditable. He was charged by Lord Vaughan, afterwards earl of Carbery, the governor, soon after his appointment, of persisting in encouraging privateering; he intrigued against his colleagues and successive governors of Jamaica, with the hope of superseding them; raised factious dissensions; and supported the outrageous conduct of his brother, Captain Charles Morgan, a terrible ruffian, and his kinsman, Colonel Byndlos, taking part in their brawls and drunken orgies. He was finally, on the 12th of October 1683, suspended in Jamaica from all his employments; a decision which was con- firmed by the government at home after hearing Morgan's defence; but he was restored to his

place in the council on the 1 8th of July 1688, shortly before his death, which took place in August.

See A. O. Exquemelin (one of Morgan's buccaneers), Buccaneers of America (1684, reprinted in 1891); A. Morgan, History of the Family of Morgan (1901).

MORGAN, JOHN HUNT (1825–1864)', American Confederate soldier, was born in Huntsville, Alabama, on the 1st of June 1825, and was brought up on a farm near Lexington, Kentucky, to which his parents removed in 1830. In the Mexican War he was a first lieutenant of a Kentucky cavalry regiment. On the outbreak of the Civil War he was captain of the Lexington Rifles (organized in 1857); in September 1861 he succeeded in getting out of Lexington the company's arms after the issue of the order for the disarming of the state guard, and late in the same month reached the Confederate camp at Woodson- ville on the Green river. He proved himself an able scout, and was made captain of a cavalry company and commander of a cavalry " squadron," including two other companies, which in February 1862, with General A. S. Johnston's other forces, withdrew from Kentucky to Corinth, Mississippi. He was commissioned a colonel after the battle of Shiloh, and in July 1862, starting from eastern Tennessee, made the first of his famous raids. He routed a Federal force at Lebanon, destroyed much rolling stock and other railway property, and threatened Louisville and Cincinnati. In August and September he took part in General Braxton Bragg's invasion of Kentucky, and again threatened Ohio. In December he defeated the Union garrison at Hartsville, Tennessee, taking prisoners, valuable stores, and many cattle; was commissioned brigadier-general for this success; and soon afterward again raided Kentucky. To cover Bragg's movement from Tullahoma to Chattanooga Morgan made, in July 1863, his famous raid into Indiana and Ohio. Bragg had instructed him to confine himself to Kentucky, but Morgan hoped to gain recruits in Indiana, where opposition to the war was strong. With 2460 men he crossed the Cumber- land near Burkesville, Kentucky, on the 2nd of July;

on the 5th captured a garrison at Lebanon; and on the 13th entered Ohio near Harrison. The regular cavalry, under Generals E. H. Hobson and James M. Shackelford, was now close behind him, and his way was beset by quickly gathering militia. He marched through the suburbs of Cincinnati on the night of the 13th and on the 1 8th got to Portland, near Buffington Island, where he attempted to cross on the next day; but gunboats and steamers prevented him. In a sharp battle he lost 600 or more men. As many more surrendered soon afterwards, and about 300 crossed the river. On the 26th he surrendered to General Shackelford at New Lisbon. He was imprisoned with 70 of his men in the penitentiary at Columbus, from which on the night of the 27th of November he and six of his companions escaped by a tunnel they had dug. In the spring of 1864 he

was put in virtual command of the Department of South-western Virginia, which included eastern Tennessee, and late in August he took command at Jonesboro, Georgia. On the 4th of Sep- tember he was shot in a garden in Greenville, Tennessee, having been betrayed, it appears, to the Federals. Morgan had an excellent eye for topographical details, and by the swiftness of his movements and his sudden blows kept Kentucky in con- tinual alarm. His lieutenant, Basil W. Duke, says that his force at no time reached 4000, but that it 'killed and wounded nearly as many of the enemy and captured more than 15,000."

See Basil W. Duke, History of Morgan's Cavalry (Cincinnati, 1867).

MORGAN, JOHN PIERPONT (1837-1913), American financier and banker, was born in Hartford, Connecticut, on the 17th of April 1837, a son of Junius Spencer Morgan (1813-1890), who was a partner of George Peabody and the founder of the house of J. S. Morgan & Co. in London. He was educated at the English High School in Boston and at the University of Got- tingen. In 1857-1860 he worked in the New York banking house of Duncan, Sherman & Co.; from i860 to 1864 was agent and attorney in New York for

George Peabody & Co. of London, and afterwards for its successor, J. S. Morgan & Co., of which he became head; in 1864–1871 was a member of the firm of Dabney, Morgan & Co.; and in 1871 he entered the firm of Drexel, Morgan & Co., in which he was associated with Anthony J. Drexel, of Philadelphia, upon whose death in 1893 he became senior partner. In 1895 the firm became J. P. Morgan & Co. Closely associated with Drexel & Co. of Philadelphia, Morgan, Harjes & Co. (successors to Drexel, Harjes & Co.) of Paris, and Morgan, Grenfell & Co. (before 1910 J. S. Morgan & Co.) of London, it became, largely owing to Mr Morgan's ability, one of the most powerful banking houses in the world. It carried through the formation of the United States Steel Corporation (which took over the business of Andrew Carnegie and others), harmonized the coal and railway interests of Pennsylvania, and purchased the Leyland line of Atlantic steamships and other British lines in 1902, thus effecting an Atlantic shipping " com- bine " (See Steamship Lines) ; and it, or the banking houses which it succeeded, reorganized the following railways : Albany & Susque- hanna (1869); the Chesapeake & Ohio, and the Cleveland, Cincinnati, Chicago & St Louis (1888); the Erie and the Reading (1895); the New York & New England (1896); the Northern • Pacific (1897); the Baltimore & Ohio (1899), &c; and in 1895 it supplied the United States government with $62,000,000 in gold to float a bond issue and restore the treasury surplus of $100,000,000. Mr Pierpont Morgan was a prominent member of the Protestant Episcopal Church; an enthusiastic yachtsman, whose " Columbia " defeated the " Shamrock " in 1899 and 1 901 for the " America's " cup; a notable collector of books, pictures, and other art objects, many loaned or given to the Metropolitan Museum of Art (of which he was president), and many housed in his London house and in his private library on 36th Street, near Madison Avenue, New York City; and a generous benefactor of the American Museum of Natural History, the Metropolitan Museum of Art, Harvard University (especially its medical school), the Lying-in Hospital of the city of New York and the

New York trade schools.

MORGAN, LEWIS HENRY (1818–1881), American ethnologist, was born near Aurora, New York, on the 21st of November 1818. He graduated in 1840 at Union College, then studied law, was admitted to the bar, and practised his profession with success at Rochester, New York. Soon after leaving college Morgan went among the Iroquois, living as far as he could their life and studying their social organization. In October 1847 he was formally adopted into the Hawk gens of the Seneca tribe, and received the name " Ta-ya-da-wah-kugh." The fruit of his researches was The League of the Iroquois (1851; new ed. 1904), which, says J. W. Powell, " was the first scientific account of an Indian tribe ever given to the world." The success of the book encouraged him to further research, resulting in his Systems of Consanguinity and Affinity of the Human Family (1869). In 1877 he added to his reputation by publishing

Ancient Society, or Researches in the Lines of Human Progress from Savagery, through Barbarism, to Civilization, in which he divided the progress of culture into seven stages — ″ lower savagery,″ ″ middle savagery,″ ″ upper savagery,″ ″ lower barbarism,″ ″ middle barbarism ″ and ″ upper barbarism,″ and ″ civilization.″ The book was in four parts, dealing with (1) the growth of intelligence through inventions and diseovaries; (2) the growth of the idea of government; (3) the growth of the idea of the family; and (4) the growth of the idea of property. Morgan was a member of the New York assembly in 1861 and of the New York senate in 1868–1869. In 1880 he was president of the American Association for the Advancement of Science. He died in Rochester, New York, on the 17th of December 1881. In addition to the works above mentioned and many magazine articles, he published The American Beaver and his Works (1868) and Houses and House-life of the American Aborigines

(1881).

MORGAN, SYDNEY, Lady (c. 1783–1859), British authoress, daughter of Robert Owenson, an Irish actor, was born in 1783 in Dublin. She was one of the most vivid and hotly discussed literary figures of her generation. She began her career with a precocious volume of poems. She collected Irish tunes, for which she composed the words, thus setting a fashion adopted with signal success by Tom Moore. Her St Clair (1804), a novel of ill-judged marriage, ill-starred love, and impassioned nature-worship, in which the influence of Goethe and Rousseau was apparent, at once attracted attention. Another novel, The Novice of Si Dominick (1806), was also praised for its qualities of imagination and description. But the book which made her reputation and brought her name into warm controversy was The Wild Irish Girl (1806), in which she appeared as the ardent champion of her native country, a politician rather than a novelist, extolling the beauty of

Irish scenery, the richness of the natural wealth of Ireland, and the noble traditions of its early history. She was known in Catholic and Liberal circles by the name of her heroine " Glorvina." Patriotic Sketches and Metrical Fragments followed in 1807. Miss Owenson entered the household of the marquess of Abercorn, and in 181 2, per- suaded by Lady Abercorn, she married the surgeon to the household, Thomas Charles Morgan, afterwards knighted; but books still continued to flow from her facile pen. In 1814 she produced her best novel, O'Donnell. She was at her best in her descriptions of the poorer classes, of whom she had a thorough knowledge. Her elaborate study (1817) of France under the Bourbon restoration was attacked with outrageous fury in the Quarterly, the authoress being accused of Jacob- inism, falsehood, licentiousness and impiety. She took her revenge indirectly in the novel of Florence Macarthy (1818), in which a Quarterly reviewer, Con Crawley, is insulted with supreme feminine ingenuity. Italy, a companion work to her France, was published in 182 1; Lord Byron bears testimony to the justness of its pictures of life. The results of Italian historical studies were given in her Life and Times of Sahator Rosa (1823). Then she turned again to Irish manners and politics with a matter-of-fact book on Absenteeism (1825), and a romantic novel, The O'Briens and the O'Flahertys (1827). From Lord Melbourne Lady Morgan obtained a pension of £300. During the later years of her long life she published The Book of the Boudoir (1829), Dramatic Scenes from Real Life (1833), The Princess (1835), Woman and her Master (1840), The Book without a Name (1841), Passages from my Autobiography (1859). She died on the 14th of April 1859.

Her autobiography and many interesting letters were edited with a memoir by W. Hepworth Dixon in 1862.

MORGAN, THOMAS (d. 1743), English deist, of Welsh ex- traction, became an independent minister, but soon after 1720 lost his position owing to the growing unorthodoxy of his views. He took up medicine and became a freethinker, though he

describes himself as a Christian deist. He was an energetic controversialist. Among his works are Philosophical Principles of Medicine (1725); Collection of Tracts (1726), essays dealing with the Trinitarian controversy; The Moral Philosopher (17 37),

a dialogue between a Christian Jew, Theophanus, and a Christian deist, Philalethes. He died on the 14th of January

1742/3–

MORGANATIC MARRIAGE, a form of marriage properly peculiar to the German peoples, but also found in the royal families of other European countries. It is one in which the contracting parties are not by birth of equal status or rank (ebenbiirtig) , and under which the wife, if not ebenbiirtig, does not take the rank of her husband, and the children, whether it be the wife or husband that is of lower rank, have no right of succession to the dignities, fiefs or entailed property of the parent of higher rank. This equality by birth was formerly throughout Germany the necessary condition to a complete and perfect marriage, but it is now only applicable to members of reigning houses or of the higher nobility (hoher Adel), and it is thus of force among the ″ mediatized ″ princes of the German Empire. In the constitution of the various states, and in the ″ house laws ″ (Hausgesetze) of the reigning families, the rules are laid down as to what constitutes ebenburtigkeit . Generally it may be said that members of a present or former reigning house, either in Germany or Europe, would be recognized as ebenbiirtig, but a former morganatic marriage would be taken as destroying the qualification. In Great Britain the regula- tions as to the marriages of members of the royal family are contained in the Royal Marriage Act 1772 (see Marriage). The term ″ morganatic marriage ″ is applied generally to any marriage of a person of royal blood with one of inferior rank. The origin of the term, in medieval Latin matrimonium ad morganaticam, is usually taken to refer to the Morgengabe, i.e. the morning gift,

made by a husband. to his wife on marriage. The German name is Ehe zur linken Hand (marriage by the left hand, whence the phrase a ” left-handed marriage “), the husband of such marriage ceremonies giving the left instead of the right hand to the bride. Such marriages are recognized as fully binding by the Church, and the children are legitimate, and no other marriage can take place during the lifetime of the contracting parties.

MORGANTOWN, a city and the county-seat of Monongalia county, West Virginia, U.S.A., on the Monongahela river, about 50 m. S.E. of Wheeling. Pop. (1890), ion; (1900), 1895; (1910 census), 9150. The city is served by the Baltimore & Ohio and the Morgantown & Kingwood railways, and by several steamboat lines, the Monongahela being navigable to Fairmont, about 25 m. above Morgantown. Morgantown is the seat of the West Virginia University (co-educational), formed from the Monongalia Academy (incorporated, 1814) and the Woodburn Female Seminary (incorporated, 1858), and chartered in 1867 as the Agricultural College of West Virginia; in 1868 the present name was adopted. In 1908 the university had 80 instructors and 1534 students. Coal, glass-sand and limestone are found in the vicinity of Morgantown. The first settlement here was made about 1768 by the brothers David and Zackwill Morgan, and was named in honour of the latter. It was incorporated as Morgan’s Town in 1785; and in 1905 a city charter was granted to it after the annexation of Greenmont (pop. 1900, 349), Seneca (pop. 1900, 723), and South Morgantown (pop. 1900, 405).

MORGARTEN, the name of the pasture slopes that descend westwards to the south end of the lake of Aegeri in the Swiss canton of Zug, about 2 m. by road from the Sattel station on the railway line from Schwyz to Zurich. It was at the foot of these slopes and on the shore of the lake that the small Swiss force defeated the large Austrian army, advancing from Zug on Schwyz, on the 15th of November 1315, and so laid the foundations of Swiss liberty. As the lake has shrunk, the exact site of the battle has been disputed. It seems most probable

that it took place near the Haselmatt Chapel, in the territory of Zug, where is the official monument, but some hold that the real site was in Schwyz territory, near the old tower and battle chapel of Schornen, in the gorge between the lake and Sattel.

The original accounts of the battle are collected in part iii. (1884) of

the Milteilungen of the Historical Society of Schwyz. See also the careful study in K. Biirkli's Ein Denkmal am Morgarten wo ist sein Platzf (Zug, 1895).

MORGEN, a unit of measurement of land in Holland and the Dutch colonies, and hence still current in South Africa, equiva- lent to about 2 acres. It is also used in Prussia, Norway and Denmark, where it equals about two-thirds of an acre. The word is usually taken to be the same as the German and Dutch word for " morning," the area of a " morgen " being equal to that covered by a morning's ploughing.

MORGHEN, RAFFAELLO SANZIO (1758-1833), Italian en- graver, was born at Naples on the 19th of June 1758. He received his earliest instructions from his father, himself an engraver; but, in order to be initiated more fully in the art, he was afterwards placed as a pupil under the celebrated Volpato. He assisted this master in engraving the famous pictures of Raphael in the Vatican, and the print which represents the miracle of Bolsena is inscribed with his name. He married Volpato's daughter, and, being invited to Florence to engrave the masterpieces of the Florentine Gallery, he removed thither with his wife in 1782. His reputation now became so great as to induce the artists of Florence to recommend him to the grand duke as a fit person to engrave the " Last Supper " of Leonardo da Vinci; apart, however, from the dilapidated state of the picture itself, the drawing made for Morghen was

unworthy of the original, and the print, in consequence, although an admirable production, fails to convey a correct idea of the style and merit of Leonardo. Morghen's fame, however, soon extended over Europe; and the Institute of France, as a mark of their admi- ration of his talents, elected him an associate in 1803. In 181 2 Napoleon invited him to Paris and paid him the most flattering attentions. He died at Florence on the 8th of April 1833.

A list of the artist's works, published at Florence in 18 10, com- prised 200 compositions; the number was afterwards considerably increased. Amongst the mdst remarkable, besides those already mentioned, may be noticed the Transfiguration from Raphael, a Magdalen from Murillo, a Head of the Saviour from da Vinci, the Car of Aurora from Guido, the Hours and the Repose in Egypt from Poussin, the Prize of Diana from Domenichino, the Monument of Clement XIII. from Canova, Theseus vanquishing the Minotaur, Francesco Moncado after Van Dyck, portraits of Dante, Petrarch, Ariosto, Tasso, and a number of other eminent men. His prints have hardly maintained the reputation which they enjoyed during the artist's lifetime. Though carefully and delicately executed, they are somewhat mechanical and wanting in force and spirit.

MORHIER, SIMON (d. c. 1450), provost of Paris during the English occupation in the 15th century, was seigneur of Gilles, near Nogent-le-Roi, in the Chartrain country. Being a member of the duke of Burgundy's party, he was appointed provost at Paris by John, duke of Bedford, on the ist of December 1422. He was taken prisoner at the siege of Montargis in 1427, and again at the battle of Rouvrai in 1429; but in September of the latter year he repulsed Joan of Arc's attack upon Paris. After a campaign in Cotentin in 1435, he was once more taken prisoner at the bridge of Charenton in 1436. Remaining faithful to the English party, he became captain of Dreux, a councillor of Henry VI., and treasurer of France and Normandy. He assisted in the defence of Meaux (1439), of Creil and of Pontoise (1441), and must have died between 1450 and 1456.

See the Nouvelle biographie generate, vol. xxxvi. ; and a note on Simon Morhier in the memoirs of the Antiquarian Society of France, vol. xxv.

MORHOF, DANIEL GEORG (1639–1691), German man of letters, was born at Wismar on the 6th of February 1639. He first studied jurisprudence and then lilerae humaniores at the university of Rostock, where his elegant Latin versification procured for him in 1660 the chair of poetry. In 1665 he went to the new university of Kiel as professor of eloquence and poetry; this chair he exchanged for that of history in 1673. He died at Liibeck on the 30th of July 1691. Of his numerous writings the most important are Unterricht von der deutschen Sprache und Poesie (1682; 3rd ed., 1718), the first attempt in Germany at a systematic survey of European literature, and Polyhistor, sive de auctorum notitia el rerum commentarii (Liibeck,

1688, not completed till 1707; 4th ed., 1747), a kind of encyclo- paedia of the knowledge and learning of his time.

See Eymer, Morhof und sein Polyhistor (in the Xenia Austriaca, Vienna, 1893) ; and biography by R. v. Liliencron in Allgem. Deutsche Biographie (1885).

MORIAH, an obscure place-name of ancient Palestine with apparently two distinct connotations. (1) A land entirely un- known, on a mountain in which Abraham offered Isaac (Gen. xxii. 2). The text is probably corrupt: some have suggested ” land of the Amorites,” others ” land of Midian.” The etymo- logy of the word is equally obscure. Traditionally, of course, ” the land of Moriah ” is identified with the site of the Temple at Jerusalem, 1 except by the Samaritans and a few western scholars (such as Dean Stanley) who accept their belief that the mountain was Gerizim. (2) The upper part of the hill of Ophel, the threshing floor of Araunah, upon which Solomon erected the Temple, is once called Mount Moriah (2 Chron. iii. 1). Whether this name be derived from the corruption in Genesis or not cannot be definitely decided; it very likely is. The

testimony of Jose- phus, who often names the temple hill ” Moriah,” is of course not original, and of no weight. (R. A. S. M.)

MORIER, JAMES (1780-1849), English traveller and author, was born in 1780. Through the influence of his uncle, Admiral William Waldegrave, Baron Radstock, he entered the diplomatic service, and as secretary to Lord Elgin followed the grand vizier in the Egyptian campaign. An account of his Eastern experi- ences was published in 181 2, under the title A Journey through Persia, Armenia and Asia Minor to Constantinople in 1808-Q. From 1810 to 1816 he was the British representative at the court of Persia, and after his return he published A Second Journey through Persia to Constantinople between the years 1810 and 1816. His knowledge of Eastern life and manners he also turned to account in the composition of several entertaining romances. The most popular of these were The Adventures of Hajji Baba of Ispahan (1824), The Adventures of Hajji Baba of Ispahan in England (1828), Zohrab the Hostage (1832), and A yesha the Maid of Kars (1834). Morier died at Brighton on the 23rd of March

1849.

MORIER, SIR ROBERT BURNETT DAVID (1826-1893), British diplomatist, was born at Paris on the 31st of March 1826. He was descended from a family of diplomatists of Huguenot origin, the best known of whom were his father David, consul- general for France and minister at Bern, and his uncle James, the author of The Adventures of Hajji Baba. After a somewhat defective private education he came up to Balliol College, Oxford. Here he attracted the notice of Jowett, under whose influence his brilliant but wayward mind obtained the disci- pline of which it stood in need. The relation of tutor and pupil developed into a friendship of rare warmth. Writing towards the close of his life, Jowett, who inspired more devoted friend- ships than any man of his time, spoke of Morier as his kindest and best friend for forty-five years. On leaving Oxford, Morier at first obtained an appointment in the

Education Department, but resigned in 1852, and in the following year became attache at Vienna. In the succeeding years he was attached in turn to almost every court in Germany. Restless in temperament and unconventional in method, he plunged into the vortex of German politics to a degree that did not always accord with the traditions of diplomacy. The most important years of his career in Germany were from 1866 to 1871, when he was secretary of legation at Darmstadt. Here he became a trusted adviser of the crown princess, and through her acquired an intimate friendship with the crown prince (afterwards the emperor Frederick III.), whose antagonism to Bismarck's reactionary policy met with cordial support from Morier's sturdy Liberalism. Bismarck, already jealous of British influence at court, honoured Morier with a hatred not lessened by the fact that Morier's knowledge of German politics was unrivalled outside Germany. On leaving Darmstadt, Morier became charge d'affaires, first at Stuttgart

1 Some of the sects transfer the scene of the sacrifice to the " Chapel of Abraham " in the precincts of the Holy Sepulchre Church.

and then at Munich, and in 1876 was appointed minister at Lisbon. From 1881 to 1884 he was minister at Madrid. In December 1884 he became ambassador at St Petersburg, and almost immediately had to face the alarming situation created by the Russian advance to Penjdeh. Thanks to his efforts, a war that at one moment seemed inevitable was averted. His great popularity at the Russian court contributed towards a marked improvement in the relations between the two countries. Bismarck took alarm at the lessening influence of Germany over Russia, and tried to procure Morier's downfall. The Kblnische Zeitung declared in December 1888 that Morier had made use of his position at Darmstadt during the Franco-German War to betray the movements of the German troops to Marshal Bazaine. The

authority for this charge was an alleged declaration made by Bazaine to the German military attache at Madrid. Bazaine had died in September, but Morier had heard rumours in July of the charge brought against him, and had procured from Bazaine a written denial, which he now published in The Times. Apart from this, it was clearly shown that Morier could not have transmitted the information by the alleged date, and that Bazaine, according to the testimony of his own books and of other officers, received the information in question by reports from the front. As a matter of fact, Morier was an ardent champion of the German cause. His correspondence with Jowett shows the latter vainly endeavouring to convince his friend that the French were in the right. Public opinion everywhere, except in the German Conservative press, attributed the charge to political motives. Morier's failing health caused him, at his own request, to be appointed Lord Dufferin's successor at Rome in 1891; but it was felt that he could not be spared from St Petersburg, and there he remained till forced to find a milder climate. It was then too late, and he died at Montreux in Switzerland on the 1 6th of November 1893.

MORIKE, EDUARD FRIEDRICH (1804–1875), German poet, was born at Ludwigsburg on the 8th of September 1804. In 1834 he was appointed pastor of Kleversulzbach near Weinsberg, and in 1851 became professor of literature at the Katharinen- stif t in Stuttgart. This office he held until his retirement in 1 866 ; but he continued to live at Stuttgart until his death on the 4th of June 1875. Morike is the most lyrically gifted of all the poets belonging to the so-called Swabian school which gathered round Uhland. His poems, Gedichte (1838; 22nd ed., 1905), are mostly lyrics, graceful in style, original in conception, often humorous, but expressed in simple and natural language. He also wrote a somewhat fantastic Idylle vom Bodensee, oder Fischer Martinund die Glockendiebe (1846; 2nd ed., 1856), and published a collection of hymns, odes, elegies and idylls of the Greeks and Romans, entitled

Klassische Blumenlese (1840), and several novels and narratives, among the former Maler Nolten (1832; 6th ed., 1901), which enjoyed great popularity.

Morike's Gesammelte Schriflen were first published in 4 vols, (in 1878) ; the most recent editions are those edited by R. Krauss (6 vols., 1905), and the Volksausgabe, published by Goschen (4 vols., 1905). Selections from his literary remains were published by R. Krauss in Eduard Morike als Gelegenheitsdichter (1895), and his correspondence with Hermann Kurz, Moritz von Schwind, and Theodor Storm, by J. Bachtold (1885–1891) ; an edition of Morike's Ausgewahlte Brief e, in 2 vols., appeared I 903–1904. See F. Notter, Eduard Morike (1875); and H. Fischer, Eduard Morike (1881); K. Fischer, E. Morike (1901); H. Maync, E. Morike (1902); K. Fischer, Morikes kunsllerisches Schaffen und dichterische Schopfungen (1903).

MORILLON, a name commonly given by fowlers to the female or immature male of the Golden-Eye (q.v.), the Clangula glaucion of modern ornithology, under the belief — which still very generally obtains among them, as it once did among naturalists — that they formed a distinct species of duck. The mistake no doubt originated in, and is partly excused by, the facts that the birds called Morillons were often of opposite sexes, and differed greatly from the adult male Golden-Eye, whose full and beautiful plumage is not assumed until the second year. . The word is used in French in precisely the same form, but it is in that language applied to the Tufted Duck, Fuligula cristala, and is derived, according to Littre, from more, signifying black. (A. N.)

MORIN, JEAN (latinized Joannes Morinus) (1591–1659), French theologian, was born in 1591 at Blois, of Protestant parents. He learned Latin and Greek at Rochelle, and con- tinued his studies at Leiden, subsequently removing to Paris. His conversion to the Roman Church is ascribed to Cardinal du Perron. In 1618 he joined the congregation of the Oratory, and in due course took priest's orders. In 1625 he visited England in the train of Henrietta Maria; in

1640 he was at Rome, on the invitation of Cardinal Barberini, and was received with special favour by Pope Urban VIII. He was, however, soon recalled to Paris by Richelieu, and the rest of his life was spent in inces- sant literary labour. The Histoire de la diliwance de l`6glise chretienne par I'emp. Constantin, et de la grandeur et souverainete- temporelle donnee & I'eglise romaine par les rois de France (1630) gave great offence at Rome, and a Declaration (1654), directed against faults in the administration of the Oratory, was strictly suppressed. So, too, his great work on penance gave equal offence to the Jesuits and to Port-Royal, and even after his death, in 1659, the polemical vehemence of his Exercita- tiones biblicae, and the exaggeration of his assertion " apud neotericos Haereticos verba Scripturarum non esse integra, non superficiem, non folia, nedum sensum, medullam et radicem rationis " long led Protestants to treat his valuable contribu- tions to the history of the Hebrew text as a mere utterance of Popish prejudice.

Morin was a voluminous and prolix writer on ecclesiastical anti- quities. His principal works in this field are Commentarius historicus de disciplina in administralione sacramenti poenitentiae XIII. primis seculis in eccl. occid. et hucusque in orient, observata (1651), and Comm. de sacris ecclesiae ordinaiionibus secundum antiquos et recenii- ores latinos, graecos, syros et babylonios (1655), which expresses those irenical views on the subject of ordination which recommended Morin to Urban VIII. The literary correspondence of Morin appeared in 1682 under the title of Antiqultates ecclesiae orientalis (edited by R. Simon).

Morin's chief fame, however, rests on his biblical and critical worK. By his editio princeps of the Samaritan Pentateuch and Tar- gum, in the Paris Polyglott, he gave the first impulse in Europe to the study of this dialect, which he acquired without a teacher (framing a grammar for himself) by the study of MSS. then newly brought to Europe. Not unnaturally he formed a very exaggerated view of the value of the Samaritan tradition of the text

(Exercitationes in utrumque Samaritanorum Pentateuchum, 1631). A similar tone of exaggerated depreciation of the Massoretic Hebrew text, coloured by polemical bias against Protestantism, mars his greatest work, the posthumous Exercitationes biblicae de hebraeici graecique textus sinceritate (1660), in which, following in the footsteps of Cappellus, but with incomparably greater learning, he brings irrefragable argu- ments against the then current theory of the absolute integrity of the Hebrew text and the antiquity of the vowel points.

MORION (the French form of a word occurring in Spanish as morrion, Ital. morione, usually connected with the Span, morra, top or crown of the head), a light round-shaped head-piece or helmet (q.v.). The chief characteristics are a brim, an upright comb running along the crown from back to front, and the absence of guards for the face, ears or neck. The brim was bent sharply upwards at the front and back, and the piece was generally worn tilted backward so as to cover the neck. The morion and the cabasset, a pear-shaped headpiece with a flatter brim and no comb, were the typical infantry helmets of the 16th and early 17th centuries. It was sometimes worn unaccim- panied by any body armour.

MORISCOS (i.e. Utile Moors), the name given to the Spanish Mahommedans who accepted baptism and their descendants. Many, if not most, of them were in reality of the same race as the Christians, and were descended from converts to Islam, Those Mahommedans who retained their religion under Christian rulers were known as Mudejars, a word of Arabic origin which has been interpreted as meaning ” those who remained ” or “were left.” Until the 15th century they were numerous, and enjoyed free exercise of their religion, which was secured to them by capitulations and treaties. Their number had been con- siderably diminished by the time of the conquest of Granada in 1492. By the terms of the capitulation of the city freedom of worship was secured to the Mahommedans. But the policy of the Catholi.c sovereigns, who desired to establish unity of faith

among their subjects, and the influence of the Church, soon led to violations of the treaty. The first Christian archbishop of Granada, Talavera, made some progress in converting the people peacefully. But at the end of 1499 Cardinal Jimenez insisted on adopting coercive measures. A rebellion ensued, and the Mahommedans were suppressed. Want of power, or other obstacles, delayed the final extinction of tolerated Mahom- medanism in all parts of Spain, but by 1525 it was every- where suppressed. The last remains of it were crushed in Valencia, where the Mahommedans were furiously attacked by the Christian peasantry during the great agrarian revolt known as the Germania, 1520-1521. As they were dependent on the protection of the landlords, the Mahommedans were docile tenants, and their competition weighed heavily on the Christians. The same quality of industry remained to the Moriscos, and excited the envy of their Christian fellow countrymen. The feelings with which they were regarded are admirably shown by Cervantes (who shared them to the full) in his " Conversation of the Two Dogs." In 1568 the govern- ment of Philip II. issued an edict, which ordered them to re- nounce all their Moorish ways of life and to give up their children to be educated by Christian priests. The result was a rebellion in Granada, which was put down with great difficulty. The Moriscos were expelled from Granada and scattered over other parts of Spain. Many fled to Africa, where the more spirited among them took to piracy at Algiers and other ports. They still maintained relations with their kinsfolk in Spain, and the whole coast suffered from their incursions. The Moriscos entered into relations with other enemies of Spain, and notably, with France. Henry IV. included a plan for supporting a Morisco rebellion in the great scheme for the destruction of the Spanish monarchy, which he was about to put into execution when he was murdered on the 14th of May 1610. These intrigues were known to the Spanish government and inspired it

with terror. The expulsion of the whole body of Moriscos was decided on in

1608, and the edict was published on the 22nd of September

1609. The expulsion was carried out with great cruelty. The number driven out has been variously estimated at 120,000 or at 3,000,000. In some known cases the expelled Moriscos suffered martyrdom in Africa as Christians. A few were left in Spain as domestic slaves, and some contrived to return in secret. Cases of crypto-Mahommedanism continued to come before the Inquisition till the 18th century.

See The Moriscos of Spain: their Conversion and Expulsion, by H. C. Lea (London, 1901).

MORISON, JAMES AUGUSTUS COTTER (1832-1888), British author, was born in London on the 20th of April 1832. His father, who had made a large fortune as the inventor and pro- prietor of " Morison's Pills," settled in Paris till his death in 1840, and Cotter Morison thus acquired not only an acquaintance with the French language, but a profound sympathy with France and French institutions. In later life he resided for some years in Paris, where his house was a meeting-place for eminent men of all shades of opinion. He was educated at Highgate grammar school and Lincoln College, Oxford. Here he fell under the influence of Mark Pattison, to whom his impressionable nature perhaps owed a certain over-fastidiousness that characterized his whole career. He also made the acquaintance of the leading English Positivists, to whose opinions he became an ardent convert. Yet he retained a strong sympathy with the Roman Catholic religion, and at one time spent several weeks in a Catholic monastery. One other great influence appears in the admirable Life of St Bernard, which he published in 1863 — that of his friend Carlyle, to whom the work is dedicated, and with whose style it is strongly coloured. Meanwhile he had been a regular contributor, first to the Literary Gazette, edited by his friend John Morley, and then to the Saturday Review at its most

brilliant epoch. In 1868 he published a pamphlet entitled Irish Grievances shortly stated. In 1878 he published a volume on Gibbon in the ″ Men of Letters ″ series, marked by sound judg- ment and wide reading. This he followed up in 1882 with his Macaulay in the same series. It exhibits, more clearly perhaps

than any other of Morison's works, both his merits and his defects. Macaulay's bluff and strenuous character, his rhetorical style, his unphilosophical conception of history, were entirely out of harmony with Morison's prepossessions. Yet in his anxiety to do justice to his subject he steeped himself in Macau- lay till his style often recalls that which he is censuring. His brief sketch, Mme de Maintenon: une etude (1885), and some magazine articles, were the only fruits of his labours in French history. Towards the close of his life he meditated a work showing the application of Positivist principles to conduct. Unfortunately, failing health compelled him to abandon the second or constructive part: the first, a brilliant piece of writing which attempts to show the ethical inadequacy of revealed religion and is marked in parts by much bitterness, was published in 1887 under the title of The Service of Man. He died in London on the 26th of February 1888.

MORITZ, KARL PHILIPP (1 757–1 793), German author, was born at Hameln on the Weser on the 15th of September 1757, of humble parentage. After receiving a scanty schooling, he was apprenticed to a hat- maker, but was later enabled to study philosophy at Erfurt and Wittenberg and in 1777 became teacher in a school at Dessau. While on a tour through Italy in 1786 he became acquainted with Goethe, who interested himself in him. On his return, he was appointed professor of archaeology and aesthetics, at the academy of art in Berlin, and in this city he died on the 26th of June 1793. Of Moritz's writings on aesthetic, archaeological and philosophical subjects, the little treatise Uber die bildende Nachahmung des Schonen (1788; re- printed 1888) and Die Gotterlehre (1791; 10th ed., 1855, a reprint in Reclam's Universalbibliothek, 1878) are important;

interesting, too, are the accounts of his travels, Reisen eines Deutschen in England (1788; repr. 1903; also trans, into Eng.) and Reisen eines Deutschen in Italien (3 vols., 1792–1793). As an author he is best known by his two novels, Anton Reiser (1785–1790; new ed. by L. Geiger, 1886) and Andreas Hartknopf (1786), which are mainly autobiographical.

See K. F. Klischnig, Erinnerungen aus den zehn letzten Lebens- jahren meines Freundes Anton Reiser (1794); Varnhagen von Ense, Denkwurdigkeiten, vol. iv. (1838) ; and M.Dessoir, Karl Philipp Moritz als Aesthetiker (1889).

MORLAIX, a town of western France, capital of an arron- dissement in the department of Finistere, 37 m. E.N.E. of Brest on the railway to Rennes. Pop. (1906), 13,875. Morlaix lies between 4 and 5 m. from the English Channel in a narrow valley where two small streams unite to form the Dossen, the channel of which forms its port. Below the town the river widens into an estuary, the mouth of which is commanded by an old fortress, the Chateau du Taureau, built in 1 542 to protect the town against the English. The railway from Paris to Brest crosses the valley on a striking two-storeyed viaduct some 200 ft. above the quays. Morlaix contains a considerable number of wooden houses of the 15th, 16th and 17th centuries. These have large covered courts, with huge open fireplaces and carved wooden staircases, supported on pillars, leading from the court to the upper storeys.

Morlaix has a sub-prefecture, tribunals of first instance and of commerce, a chamber of commerce, and colleges for boys and girls. The industries include the manufacture of tobacco occupying about 900 hands, tanning, brewing and the manufac- ture of casks, wooden shoes and candles; there is an active trade in grain, butter, oil-seeds, vegetables, leather, wax, honey and in horses and other livestock, which are exported by sea. The port, consisting of an outer tidal harbour and an inner basin, admits vessels drawing 17 ft. at spring tides and 12 ft. at neap tides.

Judging by the numerous coins found on the spot, the site of Morlaix was probably occupied in the time of the Romans. The counts of Leon held the lordship in the 12th century, but the dukes of Brittany disputed possession with them, and in 1187 Henry II. of England, guardian of Arthur of Brittany, made himself master of the town after a siege of several weeks. During the Hundred Years' War Morlaix was held by the French and the English in turn, and pillaged by the latter in 1522. Queen

Mary of Scots, on her way to be married to the dauphin, made solemn entry into Morlaix in 1548. The town having joined the League, the castle was taken by storm in the name of Henry IV. in 1594.

MORLAND, GEORGE (1 763-1804), English painter of animals and rustic scenes, was born in London on the 26th of June 1763. His grandfather, George H. Morland, was a subject painter, three of whose popular pictures were engraved by Watson and Dawe in 1769. The son, H. R. Morland, father of George, was also an artist and engraver, and picture restorer, at one time a rich man, but later in reduced circumstances. His pictures of laundry-maids especially were very popular in their time, and were reproduced in mezzotint. They represented ladies of some importance who desired to be painted, according to the fashion of the day, engaged in domestic work. Morland's mother was a Frenchwoman, who possessed a small independent property of her own; she is believed to have been the Maria Morland who exhibited twice at the Royal Academy in 1785 and 1786, although some writers have stated that Maria Morland was not the mother, but one of the sisters of George Morland.

At a very early age Morland produced sketches of remarkable promise, exhibiting some at the Royal Academy in 1773, when he was but ten years old, and continuing to exhibit at the Free Society in 1775

and 1776, and at the Society of Artists in 1777, and then sending again to the Royal Academy in 1778, 1779 and 1780. His very earliest work, however, was produced even before that tender age, as his father kept a drawing which the boy had executed when he was but four years old, representing a coach and horses and two footmen. He was a student at the Royal Academy in early youth, but only for a very short time. From the age of fourteen he was apprenticed to his father for seven years, and by means of his talent appears to have kept the family together. He had opportunities at this time of seeing some of the greatest artists of the day, and works by old masters, but even then a strange repugnance for educated society showed itself, and no persuasion, for example, could ever allure him within reach of the Angerstein gallery, where he would have been a welcome visitor. Before his apprenticeship came to an end, Romney offered to take Morland into his studio for three years, with a salary of £300 a year, but the offer was rejected, and as soon as his freedom came, he left his dull, respectable home, with its over-strict discipline, and began a career of reckless prodi- gality which has hardly a parallel in art biography. In 1785 he was in France, whither his fame had preceded him, and where he had no lack of commissions, and in the following year he married Anne, the sister of William Ward, the engraver, and settled down in High Street, Marylebone.

Mrs Morland was a beautiful and virtuous woman, and through- out the whole of her husband's profligate career was deeply attached to him. It was at this time that he painted the six pictures known as the Laetitia series, engraved by J. R. Smith, and, just preceding his marriage, four other didactic works, " The Idle and the Industrious Mechanic " and " The Idle Laundress and the Industrious Cottager," engraved by Blake, had been produced by him. Shortly after his marriage Morland resided at Pleasant Passage, Hampstead Road, and at that time his reputation was rapidly increasing, while as he was the sole vendor of his own productions, his

expenditure, although very extravagant, was not beyond his income. Soon, however, he moved to Warren Place, and there, although he was making a thousand a year by his pictures, he lived at such an expensive rate that he began the series of financial difficulties which finally ruined him. His wild frolics about town, and the prodigal line of conduct upon which he had entered, resulted in a heavy accumulation of debt, but in 1789 he set himself to clear off his encumbrances, and did so in fifteen months. He then removed to Leicester Square, later to Tavistock Row, then to St Martin's Lane, and finally to Paddington, and was at that time at the very height of his reputation.

After moving to a larger house in Winchester Row, his financial position became so embarrassed that he had to fly from his creditors into Leicestershire, where he indulged to the full his

delight in animal life. After a year, however, he returned to London and settled in Charlotte Street, when his difficulties increased, and time after time he had to obtain letters of licence, in order to avoid being arrested by his creditors. At last, however, he had to cross the water, and change his place of abode from time to time, keeping it as secret as possible, and we hear of him at Lambeth, at East Sheen, in the Minories, Kentish Town, Soho, Newington, Kennington Green and Hackney, while he had numerous adventures in eluding the attention of those who desired to capture him.

In 1799 he escaped to the Isle of Wight, and settled down for some time at Yarmouth, but returned to London at the end of the year, was arrested and sent to King's Bench prison, where he lived within the rules, occupying a small furnished house in St George's Fields, but keeping his exact residence a secret. In 1S02 he was liberated, but in 1803 had to place himself in the custody of the Marshalsea, in order to avoid his creditors. Afterwards he visited Brighton and other places, and by his riotous living brought himself to such a state of health that fits of an apoplectic nature became frequent, and he was

for a time paralysed! On the 19th of October 1804 he was arrested by a publican and conveyed to a sponging-bouse, where, in attempting to make a drawing which could be sold in discharge of the debt, he was seized with a fit which proved the beginning of brain fever. He died on the 29th of the same month. His wife survived him only three days, the news of his death bringing on convulsive fits from which she died on the 2nd of November. Their remains were interred together in the burying-place of St James's Chapel.

The finest of his pictures were executed between 1790 and 1794, and amongst them his picture of the inside of a stable, in the National Gallery, may be reckoned as a masterpiece. His works deal with scenes in rustic and homely life, depicted with purity and simplicity, and show much direct and instinctive feeling for nature. His colouring is mellow, rich in tohe, and vibrant in quality, but, with all their charm, his works reveal often signs of the haste with which they were painted and the carelessness with which they were drawn. He had a supreme power of observation and great executive skill, and he was able to select the vital constituents of a scene `and depict even the least inter- esting of subjects with artistic grace and brilliant representation. His pictures are never crowded; the figures in them remarkably well composed, often so cleverly grouped as to conceal any inaccuracies of drawing, and to produce the effect of a very successful composition. As a painter of English scenes he takes the very highest position, and his work is marked by a spirit and a dash, always combined with broad, harmonious colouring. Many of his best works have been well rendered in mezzotint by J. R. Smith, W. Ward, P. Dawe, G. Keating, S. W. Reynolds and other engravers. He exhibited regularly at the Royal Academy from 1784 down to 1804, but few of his academy pictures can be identified owing to the inadequate description of them afforded by their titles.

Four biographies of him appeared shortly after his

death, written by W. Collins (1805), F. W. Blagdon (1806), J. Hassell (1806) and George Dawe (1807). Later biographies are those by Ralph Richardson (1895), J. T. Nettleship (1898) and G. C. Williamson (1904 and 1907). (G. C. W.)

MORLANWELZ, a town of Belgium in the province of Hainaut, 15 m. E. of Mons. It lies in the centre of the coal-mines district and has extensive foundries and ironworks. Pop. (1904), 8200.

MORLEY, BARONS AND EARLS OF— In 1299 William de Morley of Morley in Norfolk was summoned to parliament as a baron, and his son Robert (d. 1360) was a celebrated warrior, being largely responsible for the English victory at Sluys and fighting at Crecy. His descendant Robert, the 6th baron (d. 1443), had no sons, but he left a daughter Alianore, who married William Lovel (d. 1476), and Lovel was summoned to parliament as Lord Morley, ranking as the 7th holder of the title. He left a son Henry, who was killed in 1489, and Henry's heir was his sister Alice, the wife of Sir William Parker (d. 1510), hereditary marshal of Ireland. Their son Henry Parker (1476-1556) became the 10th baron, as he was summoned to the House of

Lords as Lord Morley in 1523. He was a man of literary attain- ments and translated some of the writings of Plutarch, Boccaccio, Petrarch, Seneca, Cicero and others into English. Most of these are only found in manuscript, but his Tryumphes of Fraunces Petrarcke was published a second time in 1887. His eldest son Henry (d. 1553) died during his father's lifetime, leaving a son Henry (d. 1577) who became nth Baron Morley on his grand- father's death. His son Edward (d. 1618), one of the judges of Mary Queen of Scots, succeeded to the barony; and Edward's son and successor was William Parker, 4th Lord Monteagle (q.v.). The barony of Morley remained united with that of Monteagle until the death of

William's grandson Thomas about 1686, when it fell into abeyance.

John Parker, 1st earl of Morley (1772–1840), only son of John Parker (1735–1788), who was created Baron Boringdon in 1784, but was no relation of the previous barons Morley, was a promi- nent supporter of Pitt and of Canning. In 1815 he was created earl of Morley. He was a public benefactor to Plymouth and its neighbourhood. He was succeeded by his son Edmund Henry Parker (1810–1864), whose son, Albert Edmund, the 3rd earl (1843–1905), was chairman of committees in the House of Lords from 1889 to 1905, after having been under-secretary for war and first commissioner of works. In 1905 his son, Edmund Robert (b. 1877), became 4th earl.

MORLEY, GEORGE (1597–1684), English bishop, was born in London and educated at Westminster and Oxford. In 1640 he was presented to the sinecure living of Hartfield, Sussex, and in the following year he was made canon of Christ Church and exchanged to the rectory of Mildenhall, Wiltshire. He preached before the Commons in 1642, but his sermon gave offence, and when in 1647 he took a prominent part in resisting the parlia- mentary visitation of Oxford University he was deprived of his canonry and living. Leaving England he joined the court of Charles II., and became one of the leading clergy at The Hague. Shortly before the Restoration he came to England on a highly successful mission to gain for Charles the support of the Presby- terians. In 1660 he regained his canonry, and soon became dean of Christ Church. In the same year he was consecrated bishop of Worcester. At the Savoy conference of 1661 he was chief representative of the bishops. He was translated to the see of Winchester in 1662. His works are few and chiefly polemical, e.g. The Bishop of Worcester's Letter to a friend for Vindication of himself from the Calumnies of Mr Richard Baxter (London,

1662).

MORLEY, HENRY (1822–1894), British man of letters,

was born in London on the 15th of September 1822. After unhappy experiences at English schools, he was sent to the Moravian school at Neuwied, whose system strongly influenced his sub- sequent theories of education. It was intended that he should follow his father's profession of medicine, and in 1844 he bought a share in a practice at Madeley, Shropshire. Plunged into debt by his partner's dishonesty, he set up a small school for young children at Liscard, near Liverpool. His principle was to abolish all punishment, to make his pupils regard their work as interesting instead of repellent, and to form their character by appealing exclusively to higher motives. This scheme, carried out with much ingenuity, proved a complete success. Mean- while he had devoted his spare time to writing. His contri- butions to magazines attracted the notice of Charles Dickens, on whose invitation in 185 1 he settled in London as a regular contributor to Household Words. He was also on the staff of the Examiner, which he edited from 1861 to 1867. Meanwhile he had devoted much research to a life of Palissy the Potter (1852), which was at the same- time a picture of life in medieval France. Encouraged by its favourable reception, he followed it up with lives of Jerome Cardan (1854) and Cornelius Agrippa (1856), and subsequently of Clement Marot (1870). His dramatic criticisms were reprinted in 1866 under the title of The Journal of a London Playgoer, 1851–1866. In 1857 he was appointed evening lecturer in English literature at King's College, and in 1865 became, in succession to David Masson, professor of English literature at University College, London. His First Sketch of English Litera-

ture (1873), a comprehensive and useful manual, reached its 34th thousand during the author's lifetime. He published in 1864 the first volume of a monumental history of English litera- ture entitled English Writers, which he eventually carried in eleven volumes down to the death of Shakespeare. He was indefatigable as a popularizer of good literature. After editing a standard text of Addison's Spectator, he brought out a vast number of

classics at low prices in Morley's Universal Library, Cassell's National Library, and the Carisbrooke Library. His ready speech, retentive memory, earnest purpose, and bright styfe made him perhaps the most popular lecturer of his day. His teaching work at University College was marked by equally extraordinary success. In 1882 he accepted a post that made great calls on his time and energy — the principalship of Univer- sity Hall. This institution was partly a place of residence for students of University College, and partly the home of Man- chester New College. During this time he rendered further services to the cause of education in London not only by his work on the council of University College, but by his advocacy of a teaching university for London. In 1889 he resigned the prin- cipalship of University Hall and his professorship at University College, and retired to Carisbrooke, Isle of Wight, intending to devote his leisure to the completion of the great task of his life, English Writers. But with his work only half achieved he died on the 14th of May 1894.

MORLEY [of Blackburn], JOHN MORLEY, Viscount (1838-), English statesman and author, was born at Black- burn on the 24th of December 1838, being the son of Jonathan Morley, surgeon. He matriculated at Lincoln College, Oxford, in 1856, and after taking his degree in 1859 came up to London with the determination of seeking distinction by literature. He almost immediately became editor of the moribund Literary Gazette, which not all his ability could preserve from extinction. Gradually, however, he became known as a philosopher and a Radical, and as one of the ablest and most incisive contributors to the literary and political press of the day. His sympathies as a thinker seem to have been at this time chiefly with Positivism, though he never embraced Comte's doctrine in its hierarchical aspects; but he acquired a reputation as an agnostic, which became confirmed in the popular mind when he somewhat aggressively spelt God in one of his essays with a small "g." In 1868 he was editor for a short time of the daily Morning Star, which

came to an end in 1870. In 1867 he succeeded G. H. Lewes in the editorship of the Fortnightly Review, which he con- ducted with brilliant success until 1883, when he was elected to parliament; he then assumed in exchange, but not for long, the lighter duties of the editorship of Macmillan's Magazine. He had been connected with Messrs Macmillan since the commence- ment under his editorship, in 1878, of the "English Men of Letters " series, a collection of biographies of various merit, in which nothing is better than the editor's own contribution in his Life of Edmund Burke, itself an extension of his article in the 9th edition of this encyclopaedia (1876). Since 1880 he had also been editor of the Pall Mall Gazette, which had been turned into a Liberal paper (see Newspapers).

In 1883 Mr Morley, who had twice unsuccessfully attempted to enter parliament, was returned for Newcastle-upon-Tyne at a by-election. The prestige thus acquired led to his presiding over a great Liberal congress at Leeds in the same year; and, although the platform never seemed his natural element, the literary finish of his style and the transparent honesty of his reasoning rapidly gained him a prominent position in the House of Commons. When, in February 1886, Mr Gladstone returned to office as a Home Ruler, Mr Morley, who had never before held any public appointment, filled one of the most important posts in the cabinet as secretary for Ireland. He had always expressed his sympathy with the Irish Nationalist movement. He had no opinions to recant, no pledges to explain away. He is credited with an especial influence over Mr Gladstone in the matter of Home Rule, and in particular with having kept him steady in the Bill of 1886 to his original purpose of entirely separating the Irish from the British legislature, a provision which pressure

from their own party afterwards compelled both of

them to abandon. After the severe defeat of the Gladstonian party at the general election of 1886, Mr Morley led a life divided between politics and letters until Mr Gladstone's return to power in 1892, when he resumed his former office. He had been re-elected for Newcastle in circumstances entirely honourable to himself, a determined attempt having been made to exclude him in con- sequence of his resistance to an Eight Hours' Labour Bill, of which he disapproved as an undue interference in principle with the rights of adult labour. His constituents showed their appreciation of his integrity by returning him with a majority of 1739; but the resistance to his views on the labour question went on in his constituency, and was assisted by Joseph Cowen's persistent campaign in the principal Newcastle newspaper against the general lines of Mr Morley's somewhat doctrinaire and anti-imperialistic views on politics. The result was that at the election of 1895 he lost his seat, but soon found another in Scotland, for the Montrose Burghs. He had during the interval taken a leading part in parliament, but his tenure of the chief secretaryship of Ireland was hardly a success. The Irish gentry, of course, made things as difficult for him as possible, and the path of an avowed Home Ruler installed in office at Dublin Castle was beset with pitfalls. In the intestine disputes which agitated the Liberal party during Lord Rosebery's adminis- tration, and afterwards, Mr Morley sided with Sir William Harcourt, and was the recipient and practically co-signatory of his letter resigning the Liberal leadership in December 1898.

Mr Morley's activities were now again turned to literature, the political views most characteristic of him, on the Boer war in particular, being practically swamped by the overwhelming predominance of Unionism and Imperialism. His occasional speeches, however, denouncing the Government policy towards the Boers and towards the war, though not representing the popular side, always elicited a respectful hearing, if only for the eloquence of their language and the undoubted sincerity of the

speaker. As a man of letters his work was practically concluded at this period, and may briefly be characterized. His position as a leading English writer had early been determined by his monographs on Voltaire (1872), Rousseau (1873), Diderot and the Encyclopaedists (1878), Burke (1879), and Walpole (1889). Burke as the champion of sound policy in America and (as Mr Morley deems) of justice in India, Walpole as the pacific minister under- standing the true interests of his country, fired his imagination. His Life of Oliver Cromwell (1900) revises Gardiner as Gardiner revised Carlyle. The Life of Cobden (1 881) is an able defence of that statesman's views rather than a critical biography or a real picture of the period. Mr Morley's contributions to political journalism and to literary, ethical and philosophical criticism were numerous and valuable. They show great individuality of character, and recall the personality of John Stuart Mill, with whose mode of thought he had many affinities. As in letters, so in politics. A philosophical Radical of a somewhat mid-19th- century type, and highly suspicious of the later opportunistic reaction (in all its forms) against Cobdenite principles, he yet retained the respect of the majority whom it was his usual fate to find against him in English politics by the indomitable consistency of his principles and by sheer force of character and honesty of conviction and utterance.

After the death of Mr Gladstone Mr Morley was principally engaged upon his biography, until it was published in 1903. Representing as it does so competent a writer's sifting of a mass of material, the Life of Gladstone was a masterly account of the career of the great Liberal statesman; traces of Liberal bias were inevitable but are rarely manifest; and in spite of the a priori unlikelihood of a full appreciation of Mr Gladstone's powerful religious interests from such a quarter, the whole treatment is characterized by sympathy and judgment. Among the coro- nation honours of 1902, Mr Morley was nominated an original member of the new Order of

Merit; and in July 1902 he was presented by Mr Carnegie with the late Lord Acton's valuable library, which, on the 20th of October, he in turn gave to the university of Cambridge.

When Sir Henry Campbell-Bannerman formed his cabinet at the end of 1905 he was made secretary of state for India. In this position he was conspicuous in May 1907 and afterwards for his firmness in sanctioning extreme measures for dealing with the outbreak in India of alarming symptoms of sedition. Though he was bitterly attacked by some of the more extreme members of the Radical party, on the ground of belying his democratic principles in dealing with India, his action was generally recog- nized as combining statesmanship with patience; and, though uncompromising in his attitude towards revolutionary propa- ganda, he showed his popular sympathies by appointing two distinguished native Indians to the council, and taking steps for a decentralization of the administrative government. When Sir Henry Campbell-Bannerman resigned in 1908 and Mr Asquith became prime minister, Mr Morley retained his post in the new cabinet ; but it was thought advisable to relieve him of the burden imposed by a seat in the House of Commons, and he was trans- ferred to the upper house, being created a peer with the title of Viscount Morley of Blackburn. His subsequent career at the India office will always be associated with his extensive remodelling (1908-1909) of the system of government in India so as to introduce more fully the representative element (see India). Whatever might be the outcome of this crucial reform, the pre- paration and execution of Lord Morley's scheme were carried through by him with a statesmanlike and philosophic detach- ment, and in a spirit of balanced reason, which earned for him the increased respect of all parties in the state. (H. Ch.)

MORLEY, SAMUEL (1809-1886), English manufacturer and politician, was born at Homerton, not then a part of London, on the 15th of October 1809, the youngest son of a Nottingham hosier. His father, John, and his uncle, Richard, were the founders of the already prosperous Nottingham firm of I. & R. Morley,

dealers in hosiery made in the cottages of the local knitters, and as early as 1797 they had opened a London ware- house, in the counting-room of which Samuel Morley began his career at sixteen. On his father's retirement in 1840 he became practical head of the London concern, and when his brothers retired in 1855 sole owner. In i860 he was sole owner also of the Nottingham business. Under excellent management the business grew rapidly into the largest of the kind in the world, with huge mills at Nottingham and in Leicestershire and Derbyshire employing thousands of hands. In 1865 Morley was elected M.P. for Nottingham, and from 1868-1885 he sat for one of the Bristol divisions. He was a strong Liberal and a whole-hearted supporter of Gladstone, who in 1885 offered him a peerage. He was one of the principal proprietors of the London Daily News, the chief Liberal organ of the period, and it was owing to him that its price was reduced from 3d. to id. and its losses turned to great gains. Morley was a deeply religious man. Like his father before him, he was a Dissenter, and for many years he strongly opposed every scheme of state inter- ference with education. He was keenly interested in the temper- ance movement, and during the closing years of his life his public energies were chiefly confined to its promotion. His philanthropy was active, his charity widespread and munificent, and he was a model employer. He died on the 5th of September 1886. His son, Arnold Morley (b. 1849), was Liberal M.P. for Nottingham from 1880-1885, and for East Nottingham from 1885-1895. From 1886-1892 he was chief Liberal whip, and from 1892-1895 postmaster-general.

See Edwin Hodder, Life of Samuel Morley (1887) ; Frederic M. Thomas, /. & R. Morley: a Record of a Hundred Years (1900).

MORLEY, THOMAS (1557-1603), English musical composer, was born in 1557, as may be gathered from the date of his motet, " Domine non est," composed " aetatis suae 19 anno domini 1576," and preserved in Sadler's Part-Books (Bodleian Library). He was a pupil of William Byrd, but nothing is known as to

his origin and very little as to the incidents of his career. In the account of the entertainments given at Elvetham by the earl of Hertford in 1591 in honour of Queen Elizabeth, it is stated that there was " a notable consort of six Musitions," whose music so pleased the quee'n " that in grace and favour thereof, she gave

a newe name unto one of their Pavans, made long since by Master Thomas Morley, then Organist of Paules Church." This statement, however, lacks corroboration, and if Morley ever held the post he must have done so for a very short time. On the 5th of July 1588 he was admitted Mus. Bac. at Oxford. Four years later (July 24, 1592) he entered the Chapel Royal, where he successively filled the offices of epistler and gospeller. From the dedication to his first book of canzonets it seems that in 1595 Morley was married. His wife's Christian name was Margaret, and before her marriage she apparently held some post in the household of Lady Periam, wife of the lord chief baron of the exchequer. On the nth of September 1598 Morley received a licence for twenty-one years to print ruled music-paper and song-books in English, Latin, French or Italian. His rights under this grant were assigned by him to various publishers. In Burgon's Life of Gresham it is stated (ii. 465) that the registers of St Helen's, Bishopsgate, show that Morley lived in that parish. This is inaccurate, and there is no proof that the family of the same name residing in St Helen's between 1594 and 1600 was related to the composer. In the preface to his Plaine and Easie Introduction to Practicall Musicke (1597), Morley gives as one of his reasons for undertaking that work that he led a solitary life, " being compelled to keepe at home," pre- sumably owing to ill health. On the 7th of October 1602 his place in the Chapel Royal was filled up, and on the 25th of October 1603 administration of his goods was granted to his widow. This document {Act Book, 1603,

fol. 171) describes him as " late parishioner of St Botolph's near Billingsgate," but the registers of that parish contain no entries relating to him. Morley was incontestably one of the greatest of the secular Elizabethan composers. His madrigals, canzonets and ballets are as remark- able for their beauty as they are for their admirable workmanship, and his Introduction to Practicall Musicke, in spite of its frequent obscurity, is an invaluable source of information as to the state of musical science in England at the end of the 16th century. His works are: (1) Canzonets to Three Voices (1593; 2nd ed., 1606; 3rd ed., 163 1 ; Ger. trans. : Cassel, 1612, and Rostock, 1624); (2) Madrigals to Four Voices (1594; 2nd ed., 1600); (3) First Book of Ballets to Five Voices (1595; an Ital. ed. appeared in London in the same year; 2nd ed., 1600; Ger. ed., Nuremberg, 1609); (4) First Book of Canzonets to Two Voices (1595; 2nd ed., 1619); (5) Canzonets or Short Little Songs to Four Voices, selected out of Italian Authors (1597); (6) Canzonets to Five and Six Voices (1597); (7) A Plaine and Easie Introduction to Practicall Musicke (1597; 2nd ed., 1608; 3rd ed., 1771); (7) Madrigals to Five Voices, selected out of Italian Authors (1598); (8) The First Book of Consort Lessons, made by divers authors, b°c. (1599; 2nd ed., 1611); (9) The First Book of Airs to Sing and Play to the Lute with the Base Viol (1600) ; (10) The Triumphs of Oriana to Five and Six Voices, composed by divers several authors (1601). Besides the above, services, anthems, motets and virginal pieces by Morley are to be found in various collec- tions, both printed and manuscript. (W. B. S.*)

MORLEY, a municipal borough in the Morley parliamentary division of the West Riding of Yorkshire, England, 4 m. S.S.W. of Leeds, on the Great Northern and London & North- Western railways. Pop. (1901), 23,636. The town-hall was opened in 1895; and a park, for which the ground was presented by Lord Dartmouth, in 1890. The chief industries are connected with woollen cloth, machinery for the treatment of wool, coal and stone. The borough, incorporated in 1885, is under a mayor, 7 aldermen

and 21 councillors. Area, 3385 acres. In the neighbourhood are ruins of a mansion, Howley Hall, dating from 1590, which, garrisoned for the parliament, sustained a heavy siege from the royalists during the Civil War.

MORMAOR, or Mormaer (from two Gaelic words mor, great, and maor, a steward or bailiff) , a title used to designate the rulers of the seven provinces into which Celtic Scotland, i.e. the part of the country north of the Forth and the Clyde, was divided. These seven mormaorships, or original ” earldoms ” of Scotland, as they were afterwards called, were: Angus, Athole with

Gowry, Caithness with Sutherland, Fife, Mar with Buchan, Moray with Ross, and Stratherne with Menteith.

MORMONS, the common name given to the Church of Jesus Christ of Latter-Day Saints, a religious sect founded by Joseph Smith, jun., at Manchester, New York, in 1830, and since 1848 largely concentrated about Salt Lake City, Utah. Smith was born on the 23rd of December 1805 at Sharon, Windsor county, Vermont, from which place in 1815 or 1816 his parents, who like his grandparents were superstitious, neurotic, seers of visions, and believers in miraculous cures and in heavenly voices and direct revelation, removed to New York, where they settled on a small farm near Palmyra, Wayne county (then Ontario). In 18 19 they removed to Manchester, in what is still Ontario county, about 6 m. from Palmyra. In Manchester Joseph, a good-natured, lazy boy, suffering from a bad heredity physically and psychically, began to have visions which seem to have accom- panied epileptoid seizures (his mother’s father had falling fitsy, from which he recovered apparently before he became of age. The boy’s father was a digger for hidden treasure and used a divining rod to find proper places to dig wells, and about this time the son became a crystal gazer and by the use of a ” peep- stone ” discovered the whereabouts of pretended hidden treasure. He said (in 1838) that on the night of the 21st of

September 1823 the angel Moroni appeared to him three times, and told him that the Bible of the western continent, the supplement to the New Testament, was buried on a hill called Cumorah, now co'mmonly known as Mormon Hill. It seems almost certain that he told other and earlier stories of how he came to find the gold plates, and it is possible that before this time there was a story current in Canada of the recovery of a " Gold Bible." It was not until the 22nd of September 1827 that (as he said) he dug up, on the hill near Manchester, a stone box, in which was a volume, 6 in. thick, made of thin gold plates 8 in. by 7 in., and fastened together by three gold rings. The plates were covered with small writing in characters which, it was said, Professor Charles Anthon 1 declared were in the " reformed Egyptian tongue "; with the golden book Smith claimed that he found a breastplate of gold and a pair of supernatural spectacles, consisting of two crystals set in a silver bow, and called " Urim and Thummim"; by aid of these the mystic characters could be read. Being himself unable to read or write fluently, Smith employed as amanuenses: first Martin Harris (1793–1875); then his own wife, Emma; after the middle of April 1829, Oliver Cowdery, a blacksmith and school teacher; and David Whitmer (1805–1888); to them, from behind a curtain, he dictated a translation, for the printing and publish- ing of which Martin Harris paid, in spite of the continued opposition of his wife to the scheme. An edition of 5000 copies of The Book of Mormon 2 was printed early in 1830 in the printing office of the Wayne Sentinel at Palmyra. It was accompanied by " The Testimony of the Three Witnesses," a sworn statement of Oliver Cowdery, David Whitmer and Martin Harris that an angel of God had shown them the plates of which the book was a translation, and by " The Testimony of the Eight Witnesses," four of them Whitmers and three of them Smiths (Joseph's father and his brothers Hyrum and Samuel). Soon afterwards, according to Smith, the plates disappeared, being taken away by the angel Moroni.

The Book of Mormon, in which Joseph Smith was declared to be God's " prophet," with all power and entitled to all obedience,

1 Martin Harris took a copy in Smith's hand of certain " carac- tors " (so Smith spelled it) to Dr Anthon, who at first thought it " a hoax upon the learned," but, after hearing the story of the diamond spectacles and that Harris had been asked to pay for the publication of the book, said that it was a fraud on Harris. He recognized the miscellaneous and haphazard nature of the " carac- tors," of which facsimiles are given by Riley, p. 81, and Linn, p. 40. Riley thinks that the " caractors " were automatic writing, and that " unconscious cerebration played a large part in the evolving of the gold plate scheme.''

2 More than a dozen years afterwards Smith, when asked if " Mormon " was not connected with the Greek word for " hobgoblin " ("Mormo"is thus used in 17th- century English), explained that it meant " more good," from the " Egyptian mon," " with the addition of more, or the contraction mor."

professes to give the history of America from its first settlement by a colony of " Jaredites " from among the crowd dispersed by the confusion of tongues at the Tower of Babel down to the year 5 a.d. These settlers in course of time destroyed one an- other. In 600 B.C. Lehi, his wife, and four sons, with ten friends, all from Jerusalem, landed on the coast of Chile. Upon the death of Lehi, the divine appointment to the leadership of Nephi, the youngest son, roused the resentment of his elder brothers, who were in consequence condemned to have dark skins and to be an idle, mischievous race, the " Lamanites " or North-American Indians. Between 'the Nephites and the bad Hebrews a fierce war was maintained for centuries, until finally, in spite of divine intervention in the person of the risen

Christ, who here founded a Church with the same organization " as was enjoyed on the Eastern Continent," the Nephites fell away from the true faith, and in 384 a.d. were nearly annihilated in a battle at the hill of Cumorah, in Ontario county, New York. Among the handful that escaped were Mormon and his son Moroni, the former of whom collected the sixteen books of records, kept by successive kings and priests, into one volume, which on his death was supple- mented by his son with some personal reminiscences and by him buried in the hill of Cumorah, where he was divinely assured that the book would one day be discovered by God's chosen prophet. This is Smith's account of the book: it was a contention of the early anti-Mormons, now however discredited, that The Book of Mormon as published by Smith was rewritten with few changes from an unpublished romance, The Manuscript Found, written before 1812 by Solomon Spaulding 1 (1761-1816), a minister and iron-founder who had become greatly interested in the pre- historic mounds of Ohio and wrote a romance to explain their origin and the Hebrew origin of the North-American Indians. The style of the book is poor; the speeches of primitive Indian chiefs are filled with the phraseology of the 19th-century camp- meeting; there are long extracts from the Westminster Con- fession, and a speech of Nephi contains a statement of doctrine which corresponds with heretical views held in Smith's own time in the presbytery of Geneva, in which his home lay.

The time was singularly favourable to the founding of a new sect: religious unrest and receptiveness were prevalent; and western New York was the scene of the foundation of various new communities between 1789, when Jemima Wilkinson founded " Jerusalem " in Yates county, New York, and 1848, when the Fox sisters gave their first spiritualistic manifestations about ten miles from Joseph Smith's home. His book and his claim to divine authority, upheld by frequent revelations, soon drew many followers to Smith. A Church was formally organ- ized on the 6th of April 1830 at Fayette, Seneca

county, New York; and in June a conference of about thirty members met at Fayette. Smith and Cowdery had previously (May, 1829) baptized each other, in alleged accordance with the instruc- tion of John the Baptist, who had ordained them, conferring ” the priesthood of Aaron “; while Peter, James and John afterwards made them priests of ” the order of Melchisedec.”

1 It was supposed that Sidney Rigdon had been a compositor in a Pittsburg printing-office, that he had stolen Spaulding’s manuscript from this office, or had made a surreptitious copy of it, and that he entered into a plot with Smith to use this material for a new Bible. In support of this are vague stories of a mysterious visitor to Smith at the time he was making his translation; and the argument that Smith did not, and Rigdon did, know enough to get the book in shape. But there is no actual proof that Rigdon lived in Pittsburg or was employed in a printer’s shop there as early as when Spaulding’s ” copy ” must have been left with the printer; and there is no evi- dence that Rigdon knew anything of Mormonism until after the pub- lication of The Book of Mormon. The discovery by Professor J. H. Fairchild, in 1884, in Honolulu of a manuscript romance by Spaulding (now in the library of Oberlin College, Ohio), which did not agree at all in style or matter with The Book of Mormon, does not entirely settle the matter, as this romance is so different in character from the story read by Spaulding to some of his friends in 1811-1812, that if it was really Spaulding’s, it must have been a later work than The Manuscript Found. Even, however, if it be true that Smith used Spaulding’s story, his own additions to it must have been large, for parts of the Book seem autobiographic, and one incident seems to be based on the anti-Masonic excitement prevalent in New York state after the disappearance of William Morgan in 1826 — ten years after the death of Solomon Spaulding.

In October 1830 Smith sent out Parley Parker Pratt (1807- 1857), Oliver Cowdery, Ziba Peterson, and Peter Whitmer, jun., as missionaries. One of their

first converts, in Mentor, Lake county, Ohio, was Sidney Rigdon (1793–1876), whom Pratt had formerly known, who had preached as a Baptist in 1819–1828 — a part of this time in Pittsburg — who had then joined Alexander Campbell and Walter Scott in establishing the Disciples of Christ, and who was pastor of a church in Mentor. Rigdon was baptized, became a Mormon leader, and, after a ″ revelation ″ of December 1830, made a new translation of the Bible, in which prophecies of the coming of Joseph Smith and the nature of The Book of Mormon are inserted in the 50th chapter of Genesis and the 29th chapter of Isaiah respectively. This translation was not published until 1866 and is not in use in the Mormon churches. In January 183 1 Smith, who had been ″ persecuted ″ in his New York home, where several lawsuits, all unsuccessful, had been brought against him, accompanied Rigdon to Ohio, where at Kirtland (a few miles south-west of Mentor), Lake county, Ohio, the preaching of the new sect was very successful, partly because Pratt and Rigdon were so well known to the Disciples in north- eastern Ohio. Smith at this time seems to have intended to make the New Jerusalem at Kirtland; there he established a general store, a steam saw-mill and a tannery, bought land, platted a great city, and built a stone temple, which was con- secrated in 1836. But the church was ″ persecuted ″ again, especially by apostates; on the 25th of March 1832 Smith and Rigdon were tarred and feathered at Hiram, 2 Portage county, where they were then living. In February 1834 the Church was fairly organized; already on the 8th of March 1833 Smith, Rigdon, and Frederick G. Williams had been styled the first presidency, and were entrusted with the keys of the last kingdom. About this time the licentiousness of Smith might have led to the dissolution of the Church but for Brigham Young (1801–1877), a Vermont painter and glazier, who was baptized in 1832 and soon afterwards was ordained elder. Young's indomitable will, per- suasive eloquence, executive ability, shrewdness and zeal soon made their influence felt, and, when a further step was taken in 1835 towards the organization of a hierarchy by the institution

of the quorum of the "twelve apostles," 3 who were sent out as proselytizing missionaries among the " gentiles," Young was ordained one of the Twelve and despatched to preach through- out the eastern states. In 1836 the Kirtland Safety Society Bank was organized (in accordance with a "revelation" to Smith); as it was unchartered it issued notes under the name of "The Kirtland Safety Society anti-BANK- ing Co."; but in March 1837 Rigdon and Smith, the secretary and treasurer, .were charged with violating the state law against unchartered banks, and they were convicted in October; the society appealed, claiming that it was not a bank but an association, but in November the " bank " suspended payments and in Jan. 1838 Smith and Rigdon left the state for Missouri. In 1836-1837 there had been a deter- mined attempt to depose Smith and make David Whitmer head of the Church; Rigdon and Young successfully opposed this movement, which was backed by Whitmer, Pratt, Williams and Harris. Probably in June 1837 (or in July 1838) there was organized under the leadership of Captain " Fear Not " (David W. Patten) a band called " The Daughter of Zion " (see Mic. iv. 13), the " Big Fan " (Jer. xv. 7), " Brothers of Gideon," and finally "Sons of Dan," or " Danites " (Gen. xlix. 17), bound to secrecy under penalty of death, and formed to punish all who opposed the Church and its supreme head. Numerous crimes and outrages were attributed to them. 4 In the winter

2 Rigdon had formerly been well known and respected in Hiram, which was a stronghold of the Disciples; there he had taught Latin and Greek to the father of Mrs James Abram Garfield.

3 Young received at this time the title of " The Lion of the Lord " ; Lyman Wright and Parley Pratt, who also became apostles, were called respectively " The Wild Ram of the Mountains " and " The Archer of Paradise."

4 The existence of this organization has been denied by Mormons, but there is abundant evidence that it did exist. See Linn, pp. 212-214, an d Bancroft, pp.

124-126; the latter, friendly to the Mormons, says (p. 124) that of the existence of the Danites "there is no question."

of 1 830-1 83 1 Pratt, Cowdery and two others had gone as far west as Jackson county, Missouri; in June 1831 Rigdon and Smith joined them there near what is now Independence and (in August) laid corner-stones of Zion and of a Mormon temple; thereafter Mormon immigration to Missouri increased rapidly; and in the early part of 1838 Smith and Rigdon fled to the new settlement called Far West (now Kerr) in Caldwell county, Missouri, which had been made in 1836-1837. Thither many of the saints had taken refuge, having been forcibly driven 1 from Independence and Big Blue in November and December 1833, and having been induced to remove from Clay county after staying there in 1833-1836. In Caldwell and Daviess counties Smith's troubles, however, continued to increase. His profligacy had repelled many of his leading supporters and bred internal dissensions, while from the outside the brethren were harassed and threatened by the steadily growing hostility of the native Missourians. At Far West on the 4th of July 1838 Rigdon preached his " salt sermon " from Matt. v. 13, urging his hearers to wage " a war of extermination " on those who disturbed them. To such a height did the conflicts with the " gentiles " grow that they assumed the proportions of a civil war, and necessitated the calling out of the state militia. A company of Danites from Far West put some Missourian militia to flight but lost their own leader Captain Patten; the gentiles then attacked a Mormon settlement at Hawn's Mill (near Far West) and killed in cold blood about a score of the Mormons. Late in October Far West surrendered to an overwhelming force of militia. Smith and Rigdon with others were arrested and imprisoned on a charge of treason, murder and felony, and their followers to the number of 15,000 crossed over into Illinois and settled near

Commerce, Hancock county. Smith, who succeeded in escaping from custody, had rejoined the Mormons in Illinois, and there they were cordially welcomed, especially by the politicians of both parties, who hoped to secure the Mormon vote in the presidential campaign of 1840; and when they founded (on the site of Com- merce) the city of Nauvoo, they readily obtained (Dec. 1840) from the state legislature a charter which made the city practi- cally independent of the state government and gave Smith nearly unlimited civil power. He organized a military body called the Nauvoo Legion (also incorporated by the legislature), of which he was commander, being commissioned "lieutenant- general " by the governor of Illinois in 1841; Smith allowed Dr John C. Bennett, an Illinois politician and a new convert, to be the city's first mayor. Foundations of a new temple were laid on the 6th of April 1841 and the temple (83 by 128 ft.) was dedicated on the 1st of May 1846. The city grew very rapidly; a university of the city of Nauvoo was established, among its professors being Rigdon and Orson Pratt (1811–1881), a mathe- matician, who was called " The Gauge of the Law." In 1842 Smith was charged with instigating an attempt, made by O.P. Rockwell, a Mormon of Nauvoo, to assassinate ex-Governor L. W. Boggs of Missouri; it was impossible to hold either Rock- well or Smith after their indictment and arrest, since the Nauvoo municipal court had the power to determine cases of habeas corpus; the influence of Dr Bennett, who had quarrelled with Smith, was not strong enough to outweigh the power of the Mormon vote with the state authorities, and Smith was not held when in June 1843 he was arrested on the old charge of treason- able acts committed in Missouri. His downfall was brought about in a very different manner.

The Book of Mormon had forbidden polygamy: " There shall not any man have save it be one wife, and concubines he shall have none, for I the Lord God delighteth 2 in the chastity of women. . . . For if I will, saith the Lord of Hosts, raise up seed unto me, I will command my people, otherwise they shall

hearken unto these things." The conditional clause may indicate that Smith from the first had intended to make polygamy a part of the

1 One of the early charges against the Mormons in Missouri was that they invited free negroes and mulattoes to settle with them; and this rather than any disgust at their religious teachings may have been the first source of opposition to them.

1 Such solecisms are not infrequent in the Mormon Bible.

creed of the Church. There is some evidence that even in Ohio polygamy had been secretly practised by Smith and less probably by other elders. In Illinois there seems to have been no secret about Smith's cohabiting with other women. On the 12th of July 1843 he had a revelation expressly establishing and approving polygamy. This revelation was not published officially until 1852, but its purport immediately became known in Nauvoo and aroused great indignation. Dr R. D. Foster, whose wife Smith seems to have coveted, and whom Smith had accused of theft and immorality, William Law and Wilson Law, wealthy Canadian converts, and Sylvester Emmons, a member of the council, established a newspaper the Expositor, which was to work for the repeal of the city charter, " to correct the abuse of the unit power, to advocate disobedience to political revelations "; the first and only number (June 7, 1844) told of Hyrum Smith's reading to the council the " revelation on the eternity of the marriage covenant, including plurality of wives," of Joseph Smith's methods and success in winning spiritual wives, and of the prophet's political ambitions. The city council tried the editors of the Expositor, the Smiths denying the " revelation" on plural marriage, and on the 10th of June the Expositor printing office was razed. Foster and the Laws fled to Carthage. There was a general uprising against the Mormons and Smith put Nauvoo under martial law; buj; his most able lieutenants were absent, 3 the legion surrendered its arms, and Joseph and Hyrum Smith and others were arrested on the charge of treason (June

25, 1844) and were imprisoned at Carthage. On the night of the 27th a mob, with the collusion of the militia guard, broke into the prison and shot the two brothers dead.

Rigdon, the survivor of the first presidency, and Brigham Young, who were absent from Illinois at the time of Smith's death, were rivals for Smith's place; Young succeeded in having the Council of Twelve, of which he was head, made the supreme authority, and then had Rigdon 4 tried for threatening treason and " cut off from the Church." Young had still to meet the opposition of Joseph Smith's family, who claimed for his son, Joseph, the right of succession, and for a time supported the claims of James J. Strang (1813-1856) of Wisconsin, who had been baptized in February 1844, who told of revelations he had received, who settled with his followers on Beaver Island, Michigan, in 1847, was crowned " King of Zion " there in July 1850, and was killed by some of his followers there in June 1856, when his kingdom broke up. In January 1845 the Nauvoo city charter was repealed; hostility and suspicion against the Mormons increased; there were " burnings " of Mormon property in the outlying country and retaliation by the Nauvoo Legion under a pro-Mormon sheriff; a commission of four members (including Stephen A. Douglas), appointed by the governor, arranged with the Mormon authorities in October 1845 that they should all leave the state next spring. In May and June 1846 most of the Mormons left Nauvoo; in September the city was cannonaded and it again surrendered to the gentiles.

Five companies of Mormon volunteers joined the force under. Colonel Stephen W. Kearny which marched to California in the winter of 1846-1847; but this was rather in the nature of assist- ance from the general government, which provided for their western transportation, than a proof of Mormon patriotism. An exploring party under Brigham Young entered (July 24, 1847) the Great Salt Lake valley and chose it as a place for their new city. Young then returned to Winter Quarters, near what is now Florence, Nebraska, and there on the 5 th of December 1847 was

chosen president as Smith's successor. Under his leader- ship, and in accordance with a scheme " revealed " to him and announced in January 1847, the march was organized in a

3 Brigham Young, Orson Pratt, and others of the Twelve were campaigning for Smith's candidacy for president of the United States, a campaign which he had undertaken because neither Henry Clay nor John C. Calhoun would give him satisfactory pledges as to the attitude he would take toward the Mormons if elected president.

4 Rigdon attempted, with brief success, to establish in Pittsburg a Church of Christ, independent of the Latter Day Saints, but based on much the same plan. He spent his last years at Friendship, Allegany county, New York.

masterly way; the main body, for instance, in its trip across the prairies made flour in a mill built by YoUng and reaped grain sowed months before by an advance guard. The first migration arrived in Salt Lake City in September, and the population of the new settlement before the close of 1848 was about 5000. The city did not prosper, however, during the first few years of its settlement; but in 1849 and 1850 it became a dep6t and outfitting place for the immigrants to California in the gold excitement. The great improvement of the country under systematic irrigation (here first used on a large scale in the United States) was another factor in the industrial growth of the settlement. As early as 1837 Mormon missionary work had begun in Great Britain, and many foreign converts had immigrated to Ohio, Missouri and Illinois; in December 1847, in a " general epistle " to the Church, Young urged all Mormons in Europe to emigrate as speedily as possible; 120 British saints immigrated in February 1848; a general "emigrating fund " was established in 1849, an(i tne Perpetual Emigration Fund Company was

incorporated in 1850; but in 1855 when there were 4425 emigrants, according to the British agency, as a result of an attempt to cut down expenses, proper provision was not made for their transportation from Iowa City, only hand-carts or push-carts being supplied, and one-sixth of a party of 400 died of starvation or exhaustion in a winter march across the plains.

When the Mormons first went west they thought they would escape from the jurisdiction of the United States, but the treaty of Guadalupe Hidalgo at the close of the Mexican War trans- ferred the region to the United States. In March 1849 a conven- tion at Salt Lake City organized the " State of Deseret,"of which Brigham Young was elected governor; a general assembly meeting in July sent a delegate to the Federal Congress and asked through Stephen A. Douglas for admission into the Union as a state or as a Territory; and on the 9th of September 1850 Utah was admitted as a Territory, of which Young became governor. He forced three non-Mormon district judges to leave the Territory in 1 851, and by his open opposition to Lieut .-Colonel Edward Jenner Steptoe, U.S. A., who was stationed in Salt Lake City in the winter of 1854-1855 with about 300 soldiers on the way to California, and who was appointed governor of Utah in December 1854, forced Steptoe to decline the nomination. In 1855-1856 actual violence seems to have been offered to Judges George B. Stiles and W. W. Drummond; and about the same . time Federal Indian agents in Utah complained that Mormon missionaries to the Indians were rousing them to hostilities against the United States. The defiant attitude of the Mormon Church towards the United States was thus being continually brought to the notice of the Federal authorities by official reports and by officials fugitive from Utah ; and at the same time popular sentiment was stirred against Mormonism by constant rumour of violence in Utah against non-Mormons and apostates and by the official publication, in August 1852, of the " revelation on the eternity of the marriage covenant, including plurality of wives." In- 1853 Young put

down autocratically the "Gladden- ites," followers of Gladden Bishop, who opposed polygamy. In 1856 the Mormon "Reformation" had begun: its principal factors were an elaborate system of confession to missionaries of the Church; the apparent inspiration by the Church of assassina- tion of any suspected of hostility to the Church, of opposition to the ambition of its leaders, or of an intention to escape from Utah and the control of Young; and the doctrine of " blood atonement," which was introduced by Jedediah Morgan Grant (1817–1856) and by which the only remission for certain sins was the shedding of the sinner's blood, so that, according to Brigham Young, " Cutting people off from the earth … is to save them, not to destroy them." Many outrages were com- mitted by a Mormon band of desperadoes who called themselves " Wolf-hunters." Young's agents doubtless killed William P. Parish of Springville, Utah, early in 1857, apparently because he was planning to remove to California; at about the same time a party of six, including two brothers named Aikin, travelling from San Francisco were arrested as spies, were acquitted, and

then were attacked in their camp and murdered, one at least by an assassin who claimed that Young had given him the order; and at Mountain Meadows in Washington county, in the south-western part of Utah, on the nth of September 1857, about 120 immigrants on their way to southern California, having been attacked four days before by Indians and Mormons and having made a bold defence, were tricked by a flag of truce carried by Mormons who pretended to be a rescuing party, and were killed by armed Mormon troops, 1 seventeen of the younger children being spared.

In 1857 President Buchanan 2 appointed Alfred Cumming (then superintendent of Indian affairs on the Upper Missouri) as governor of the Territory in place of Young, and sent 1500 men to Utah under Colonel Albert Sidney Johnston. On the 15th of September Young issued a proclamation forbidding all armed forces from entering the Territory, calling to arms all forces in the territory, and declaring

martial law. On the 5th and 6th of October a band of mounted Mormons under Major Lot Smith captured and burnt three supply- trains of the Federal troops; soon afterwards 800 oxen were cut out from another supply-train and were driven to Salt Lake City. The main body of the Federal troops under Colonel Johnston went into winter quarters in November at Black's Forks, near Fort Bridger. But in the spring of 1858, through the intervention of Thomas L. Kane of Pennsylvania, who had probably been baptized by Young in 1847 and seems to have been a Mormon agent in the East, and who now received letters of authority from President Buchanan, the Mormons were induced to make a merely formal submission to Federal authority. Governor Cumming acquiesced in this settlement of affairs, by which the actual victory was with the Saints. A peace commission sent to Utah in the summer of 1858 carried to the Mormons a presidential proclamation by which they received pardon for their treason. Practically all the Federal troops were withdrawn from Utah in the summer of i860; soon afterwards Governor Cumming left the Territory to join the Confederate army. One of his immediate successors, John W. Dawson of Indiana, late in 1861 was forced to leave the territory, having been terribly beaten by several Mormons who professed (with apparent truth) to avenge an insult to a woman. In 1862, because the Mormons were suspected of sympathizing with the Confederate States, Colonel P. E. Connor, in command of the military district of Utah (and Nevada), actually marched United States troops into Salt Lake City. Governor Stephen S. Harding, appointed in 1862, proved less tractable than previous governors; a mass meeting in March 1863 undertook to secure his removal; and injunehe and a Federal judge were displaced, possibly by the influence of Young (whom Harding had arrested for polygamy but who was not indicted), through capitalists interested in western mail-express and telegraph projects. The Church became less hostile to the Federal government toward the close of the Civil War, as it became apparent that the Confederacy was to be defeated.

Young made a successful effort in 1868-1869 to assure the industrial and commercial control of Utah: after Colonel Connor established Camp Douglas in the immediate vicinity of Salt Lake

1 There is no positive proof that this massacre was ordered by the authorities. John Doyle Lee, who was executed in 1877 for the massacre, was a prominent Mormon, had been " adopted " as a spiritual son of Brigham Young in Nauvoo, was one of the founders of Provo and other Mormon settlements in southern Utah, a probate judge, afterwards a member of the Territorial legislature, and his statement implicates the Church. Lee said that he was sacrificed to justice. The only charge against the immigrants seems to have been that they were from Arkansas, and that all Arkansans had forfeited their lives because it was in Arkansas (near Van Buren) that Parley Parker Pratt, the Mormon Isaiah, was killed on the 13th of May 1857 by Hector H. McClean, with whose wife Pratt had eloped. It seems probable that sentiment was aroused against the Arkansans by false stories of their poisoning wells, burning fences, &c.

2 Buchanan's message (Dec. 8, 1857) stating that Young and his followers apparently intended " to come into collision with the government of the United States " and his sending troops to Utah were considered by his critics as attempts to create an issue which would overshadow the slavery question and to draw away from the army an important force.

City it became increasingly difficult for the Mormon authorities to prevent trade with gentile stores in the city; and in 1869 there was incorporated the Zion Co-operative Mercantile Institu- tion, to which practically all retailers in the territory were forced to sell out. In 1869 the Pacific Railroad reached Salt Lake City and by lessening its isolation, lessened its control by Young. His power

was shaken somewhat, and the general tone of Mormonism was improved greatly by the ″ Godbeite. move- ment,″ led by W. S, Godbe and E. L. T. Harrison, who with T. B. H. Stenhouse, author of The Rocky Mountain Saints (1874), Edward W. Tullidge, who wrote an official History oj Salt Lake City, and others, had established in 1868 the Utah Magazine, which attacked Young's despotism. Although Godbe and Harrison were ″ cut off ″ from the Church they succeeded in founding the Salt Lake Tribune (1870), the first permanent pro- test in Utah against Young. At the same time the power of the Latter-Day Saints and Young's autocracy were threatened by the growth of the Reorganized Church of Jesus Christ of Latter-Day Saints, which was formed in 1852 upon the an- nouncement of the doctrine of polygamy, which declared that polygamy had been foisted upon the Church and that Brigham Young was an interloper, and which chose Joseph Smith III. (son of Joseph Smith, jun.; born in 1832) as its head in i860; in 1863 and in 1869 representatives of the Reorganized Church preached in Salt Lake City.

As early as 1862 Congress had passed the Morrill Act (intro- duced by Justin S. Morrill) ″ to punish and prevent the practice of polygamy in the Territories,″ but in 1867 the presiding officers of the Utah legislature, petitioning for the repeal of this act, declared that ` the judiciary of this Territory has not, up to the present time, tried any case under said law.″ Attempts to pass some extreme measures in 1866 and in 1869-1870 failed. In October 1871 a grand jury in Utah indicted Young and others for violating a Territorial statute against improper cohabitation; but in April 1872 the Supreme Court of the United States (Chilton v. Englebrech) practically declared the jury incompetent as it had been impanelled by a Federal (and not by a Territorial) marshal, and in October 1873 the same court {Snow v. The United Stales) ruled that the attorney-general appointed by the president in a territory could try no cases save those in which the Federal govern- ment was a party, thus putting the prosecution of polygamy cases into the hands of the

locally elected attorney-general. But on the 23rd of June 1874 President Grant signed the Poland Act, 1 " in relation to courts and judicial officers in the Territory of Utah," which provided for prosecution by the United States attorney-general (not the locally elected official) in criminal cases in Federal courts in the Territory, for the impanelling of grand and petit jurors by the United States marshal, and for the challenge of any juror practising or believing in polygamy on a trial for adultery or polygamy, and otherwise corrected the defects in the Territorial law as pointed out by the Supreme Court, so that prosecutions for polygamy might no longer be a mere farce. But the law was little more than a dead letter: there were few prosecutions, and the only conviction was that of Young's secretary, George Reynolds, whose case dragged on from 1874 to 1879. In 1873 Ann Eliza Young, called " Wife No. 19," brought a suit for divorce against Brigham Young; the defendant was at various times imprisoned and fined for failure to pay alimony pendente lite ; and in 1877 the judge decided that the marriage was void as polygamous.

Young died in Salt Lake City on the 29th of August 1877; he left an estate of more than $2,000,000, and was survived by about 25 wives and more than 40 children. The Church owes much to him, for he was an able leader. It has been said of him that he was " for daring a Cromwell, for intrigue a

iThis act, introduced by Luke Potter Poland (1815-1887) of Vermont, was bitterly opposed by the Congressional delegate from Utah, George Q. Cannon (1827-1901), an Englishman by birth, a prominent Mormon missionary in Hawaii and Great Britain, and Parley P. Pratt's successor as apostle. He had been elected in 1872, and there was a long fight to prevent his being seated because he was a polygamist.

Machiavelli, for executive force a Moses, and for utter absence of conscience a Bonaparte." It must be borne in mind that to him, more than to anyone or anything else, was due the long struggle of the

Church against the United States. His only doctrinal contribution to the Church was in 1852 when, in a sermon, he said that our Father could be none other than the first Man; that Adam came into the garden of Eden in a celestial body and with one of his wives; and that "He is our Father and our God, and the only God with whom we have to do."

Young's successor in the presidency — acting president until 1880 — was John Taylor (1808-1887), an Englishman by birth, who was living at Toronto when P. P. Pratt converted him in 1836; he was a missionary in England in 1840; then went to Nauvoo and was wounded when Smith was killed; preached in France and Germany, and translated The Book of Mormon into French. His first counsellor, appointed in 1880, was George Q. Cannon, who was probably the real administrator. On the 22nd of March 1882 President Arthur approved the Edmunds Act, drafted by George F. Edmunds of Vermont, which dis- franchised polygamists in the Territories, made ineligible for jury duty in prosecutions for bigamy, polygamy, or unlawful cohabi- . tation all who practised polygamy or believed in it, and made polygamy punishable by a maximum fine of $500 and imprison- ment of not more than five years, and cohabitation with more than one woman punishable by a maximum fine of $300, im- prisonment for not more than six months, or both. The act was opposed because it was ex post facto. Under the Edmunds Act and the Edmunds-Tucker Act of March 1887 about 1200 persons were convicted of polygamy or unlawful cohabitation in Utah, Idaho and Arizona. The law was so rigidly enforced that about 12,000 were disfranchised, and the president of the Church had to spend his last years in hiding, and many other prominent Mormons escaped " on the underground." The Edmunds-Tucker Act of 1887 dissolved the Perpetual Emigra- tion Company and the corporation of the Church of Jesus Christ of Latter-Day Saints; and the Supreme Court in May 1890, on the ground that the Church was an organized rebellion, upheld the constitutionality of the confiscation of the Church property. On the 24th of September 1890 Wilford

Woodruff 2 (1807–1898), who had been chosen to succeed President Taylor in 1889, and who was himself a polygamist, issued a manifesto declaring ” that my advice to Latter-Day Saints is to refrain from con- tracting any marriage forbidden by the law of the land “; and on the 6th of October the general conference of the Church , approved Woodruff’s manifesto and accepted ” his declaration concerning plural marriages as authoritative and binding.” This apparent rescindment of ” revelation ” was explained by Mormon scholars as Smith had explained the abandonment of the New Jerusalem in Missouri — the Saints were prevented from carrying out the commands contained in a revelation, but as they had tried to obey, they would not be punished for dis- obedience. 3 On the 4th of January 1893, in response to a petition from the officials of the Church pledging the member- ship thereof to faithful obedience to the laws against polygamy, &c, President Harrison issued a general pardon to all liable to the penalties of the Edmunds-Tucker Act, on condition that they had not violated its provisions since the 1st of November 1890 and should not violate them in future. On the 4th of January 1896 Utah was admitted to the Union as a state, one of the conditions made by Congress being that polygamy should be prohibited by the state constitution, and that this prohibition be repealable only with the consent of the United States and of the people of the state; and article iii. of the constitution reads: ” The following ordinance shall be irrevocable without the con- sent of the United States and the people of this state: Perfect

2 Woodruff was born in Connecticut, became a Mormon in 1832, in 1839 was made an apostle, in 1840 and in 1845 was a missionary to England, preached throughout the United States; wrote Leaves from my Journal (1881), and was called in the Church “Wilford the Faithful.”

3 In 1831 the Order of Enoch, or United Order, was established, providing for a community of goods; when the people proved unable to keep this law, the ” lesser law of tithing ‘ was given to them in 1838.

toleration of religious sentiment is guaranteed. No inhabitant of this state shall ever be molested in person or property on account of his or her mode of religious worship; but polygamous or plural marriages are for ever prohibited." In March 1S96 the escheated property of the Church still in possession of the United States government was restored, but the Church was not again incorporated, its legal business being transacted by its president as trustee-in-trust for the body of religious worshippers known as the Church of Jesus Christ of Latter-Day Saints; each ward of the Church has, however, been incorporated, and its bishop is its executive head. In 1898 President Woodruff died and was succeeded by Lorenzo Snow (1814-1901), a native of Ohio, converted to Mormonism in 1836. In 1898 Brigham Henry Roberts (b. 1857), an Englishman by birth and a Mormon leader, was elected to Congress from Utah; as he had three wives there was objection to his taking his seat in 1899 in the 56th Congress; and on the 25th of January 1900 by a vote of 268 to 50 he was excluded from his seat. In 1903 Reed Smoot (b. 1862), an apostle of the Church, was elected to the United States Senate, where there was an attempt to exclude him (not on the ground that he was a polygamist, for there was no suspicion of his having violated the law, but because the apostles of the Church still advocated polygamy); the Senate Committee on Privileges and Elections reported in favour of his exclusion; but on the 20th of February 1907 the Senate voted against his ex- clusion (42-28). According to Senator Smoot there were in 1906 not more than 500 householders in Utah who were polygamous; only six of the twelve apostles, and only one chosen since April 1900, were polygamous; and of the fourteen general authorities chosen between 1890 and 1906 twelve were monogamists. Joseph Fielding Smith (b. 1838), a nephew of the prophet, being a son of Hyrum Smith, succeeded to the presidency in 1901; he was a polygamist, and in March 1907, soon after the birth of what was said to

be his forty-third child, he pleaded guilty when charged with breaking the law against polygamy and was fined

$300.

The growth of the Latter-Day Saints has been largely in foreign countries. Missionary work in southern Canada was begun in 1833 by Orson Pratt, and in 1836 his brother, Parley P. Pratt, organized a mission in Toronto; in 1837 the work was begun in Liverpool, which is still the headquarters in Great Britain; in Ireland the work met with little success; from Germany missionaries were expelled in 1851 and in 1853; the Book of Mormon was translated into Italian by Lorenzo Snow in 1852; a Hawaiian version was made in 1856 by George Q. Cannon; and the missions in Scandinavia were begun about 1850. In the earlier years of the Church all converts were urged to migrate to Utah, and the glowing accounts of life there doubtless increased their number; the later policy of the Church, to which it was forced after 1887, when the Perpetual Emigration Fund was dissolved and assisted immigration was forbidden by the Federal government, was for converts to remain in their native countries. In England (and to a lesser degree on the Continent) the announcement of the doctrine of plural marriage was a disadvantage to the Church, and many converts transferred their allegiance to the Josephites, or Re- organized Church of Jesus Christ of Latter-Day Saints, who always opposed polygamy and attempted to prove that such doctrines had been foisted on the Church by Brigham Young, who had supplanted Joseph Smith's true successor, Joseph Smith III.

In 1908 the total number of Latter-Day Saints in the United States (chiefly in Utah and the neighbouring states) was estimated at 350,000, and there were besides about 48,000 members of the Reorganized Church. In Utah there are four great Mormon temples — at Salt Lake City (1893), Manti (1888), Logan (1884) and St George (1877). The Reorganized Church has twice been de- clared by United States Courts the legal successor of the Church founded by Joseph

Smith, jun.; it holds that ″ the doctrines of polygamy, human sacrifice, or killing men to save them, Adam being God, Utah being Zion or the gathering place of the saints, are doctrines of devils ″ ; its headquarters are in Lamoni, Iowa, whither it was removed from Piano, Illinois, in 1881; it has several churches in Canada, the largest being at London, Ontario, and Toronto, and it is the owner of a Temple lot at Kirtland, Illinois.

The Temple lot at Independence, Missouri, is owned by the small band of Mormon schismatics (organized in Illinois in 1835) who call themselves ″ The Church of Jesus Christ,″ and are known as Hedrickites; the Utah Church considers Independence as the holy city, and made a large settlement there in 1907.

The general morality of the Mormons seems to have been high for a frontier community; there was no gambling nor drunken- ness. The Saints, notably in the time of Brigham Young, were fond of dancing, and the Deseret Dramatic Association was formed and a theatre was built in the early years of the settlement in Utah.

Government. — The Mormon hierarchy is highly complicated. At the head of the body is a president, who possesses supreme authority, and is successor to Joseph Smith, jun., ″ Seer, Translator, Prophet ″ ; the president is supported by two counsellors. These three are supposed to be the successors of Peter, James and John, constitute what is known as the ″ first presidency,″ seem to typify the Trinity, and are the head of the priesthood of Melchisedec. Then comes the ″ patriarch,″ whose chief duty is to bless and lay on hands, and after him the ″ twelve apostles,″ forming a travelling high council. Of these the president is ex officio one, and endowed with authority equal to the other eleven. Their duties are important. They ordain all other officers, elders, priests, teachers and deacons, lead all religious meetings, and administer the rites of baptism and sacra- ment. The ″ quorum of the twelve ″ is second in power to the ″ quorum of

the first presidency," and acts in case the president dies or is disabled. Fourth come the seven presidents of the " seventies " or " seventies' quorums," each body comprising seventy elders; there are about 140 seventies in all, each of which has seven presidents, and every seven one president. These seventies make annual reports, and are the missionaries and propa- gandists of the body. Fifth come the " high priests, " whose chief duty is to officiate in all the offices of the church in the absence of any higher authorities. The priesthood of Melchisedec is made up of the officials just named — president, two counsellors, patriarch, apostles, presidents of seventies, elders and high priests. In the Aaronic priesthood, which is subordinate to the priesthood of Melchisedec, and is occupied rather with temporal affairs, the highest office is that of the presiding bishop, who superintends the collection of tithes; other Aaronic officials are styled priests, teachers and deacons. The Church is made up of about 50 stakes (21 in Utah), each having a presidency (a president and two counsellors), and is divided into wards, which are subdivided into districts, each of which has a certain number of teachers, a meeting-house, Sunday school, day school, and dramatic, debating and literary societies. `

Doctrine.— A system of polytheism has been grafted on an earlier form of the creed, according to which there are grades among the gods, the place of supreme ruler of all being taken by the primeval Adam of Genesis, who is the deity highest in spiritual rank, while Christ, Mahomet, Joseph Smith and Brigham Young also par- take of divinity. The business of these deities is the propagation of souls to people bodies begotten on earth, and the sexual relation permeates the creed. The saints on leaving this world are deified, and their glory is in proportion to the number of their wives and children ; hence the necessity and justification of polygamy (although its practice is not now authorized by the Church), and the practice of having many wives sealed to one saint. Marriage, if

accompanied by the ecclesiastical ceremony of " sealing," is for eternity, and is a necessary pre-requisite to heavenly bliss. A man may be sealed to any number of women, but no woman may be sealed to more than one man. Both marriage and sealing by proxy are permitted to assure salvation to women who die unsealed. This system of spiritual wives or celestial marriage is based on the idea that a woman cannot be saved except through her husband. Polygamous marriage is supposed to make possible the procreation of enough bodies for thousands of spirits which have long awaited incarnation. Especially in their earlier years the Mormons believed in faith healing, and Joseph Smith bade them " trust in God when sick, and live by faith and not by medicine or poison." Their distinguishing points of faith are : religiously, a belief in a continual divine revelation through the inspired medium of the prophet at the head of the Church; morally, polygamy, though this is con- demned in the Book of Mormon, as has been noticed above; and, socially, a complete hierarchical organization. They believe in the Bible as supplemented by the Book of Mormon, the Book of Doctrine, and revelation through the president of the Church; in the gift of prophecy, miracles and casting out devils ; in the imminent approach of the end of the world; in their own identity with the apocalyptic saints who shall reign with Christ in a temporal kingdom, either- in Missouri (at Independence) or in Utah; in the resurrection of the body; in absolute liberty of private judgment in religious matters; and in the salvation of a man only if he believes in Christ's atone- ment, repents, is baptized by immersion by a Christ-appointed apostle and receives the laying on of hands for the gift of the Holy Ghost by duly-authorized apostles. Among their minor rules as laid down in A Word of Wisdom supposed to have been revealed to Joseph Smith (Feb. 27, 1833), are these recommenda- tions: that it is not good to drink wine or strong drink, except at the Lord's Supper (and even then it should be home-made grape-

wine), or to use hot drinks or tobacco — the former being meant for the washing of the body and the latter for the healing of bruises and sick cattle; man's proper food is herbs and fruit; that for beasts and fowls, grain ; and, except in winter and in case of famine and severe cold, flesh should not be eaten by man. Infant baptism is also condemned, but the children of saints who have reached their eighth year should be baptized. The deceased, also, can be baptized by proxy, and in this way — " baptism for the dead " (i Cor. xv. 29) — Washington, Franklin and others have been vicariously baptized into the Church, since, according to the Mormons, there was no valid baptism between the time of the corruption of the primitive Church and the establishment of the Church of Latter-Day Saints.

Bibliography. — The Book of Mormon, first printed in 1830, has been reprinted and translated frequently. Smith also wrote a History of Joseph Smith, being extracts from his journal, published in 1842-1846 in Times and Seasons, a church periodical, and a Book of Commandments, for the Government of the Church of Christ (Zion, Jackson county, Missouri, 1833), and " compiled " a Book of Doctrine and Covenants of the Church of the Latter-Day Saints (Kirtland, Ohio, 1835, and often reprinted); and The Pearl of Great Price: Being a choice Selection from the Revelations, Translations and Narratives of Joseph Smith, First Prophet, and Revelator to the Church of Jesus Christ of Latter-Day Saints (Liverpool, 1851 ; Salt Lake City, 1891). The best bibliographies are in H. H. Bancroft's History of Utah (San Francisco, 1889), vol. xxi. of the History of the Pacific Stales of North America, in which the effort to avoid bias against the Mormons has made the work biassed in their favour, and in I. Woodbridge Riiey's The Founder of Mormonism, a Psycho- logical Study of Joseph Smith, Jr. (New York, 1902), the first in- quiry by a trained psychologist into Smith's case. More important than either of these works is William Alexander Linn's The Story of the Mormons from the Date of their Origin to the Year 1

901 (New York, 1902) ; Linn, unlike Riley, thinks it proved that Rigdon used the ″ Spaulding manuscript ″ in the preparation of the Book of Mormon. E. W. Tullidge's History of Salt Lake City (Salt Lake City, 1886) and Orson F. Whitney's History of Utah (4 vols., Salt Lake City, 1892–1898) are valuable general works by Mormon writers; the leaders of the Reorganized Saints, Joseph Smith III and Herman C. Smith, wrote A History of the Church of Jesus Christ of Latter-Day Saints (Lamoni, Iowa, 1901); and Tullidge, a member of the same branch, wrote a Life of Joseph the Prophet (Piano, Illinois, 2nd ed., 1880). Edward H. Anderson's Brief History of the Church of Latter-Day Saints (3rd ed., 1905) and J. E. Talmage's Story of Mormonism (reprinted, 1907) are regarded by Mormons as authentic. Early attacks on Mormonism are E. D. Howe's Mormonism Unveiled (Painesville, Ohio, 1834) and Pomeroy Tucker's Origin and Progress of the Mormons (New York, 1867). And among works descriptive of Mormonism in Utah written by Gentiles the more important are : History of the Mormons of Utah: their Domestic Polity and Theology (Philadelphia, 1852), by Lieut. J. W. Gunnison of the U.S. Topographical Engineers, who took part in surveys preliminary to building a transcontinental railway; Utah and the Mormons (New York, 1854), by B, G. Ferris, secretary of Utah Territory in 1 852–1 853 ; Horace Greeley, Overland Journey from New York to San Francisco in 1859 (New York, i860); Jules Remy, Journey to Great Salt Lake City (London, 1861) ; and The City of the Saints, and across the Rocky Mountains to California (London, 1861), by Richard F. Burton, who spent a month in Salt Lake City in i860. There is much valuable material in the Reports of the Utah Commission appointed under the Edmunds Act, in Testi- mony before the Senate Committee in the Smoot case (1903–1905), and in the Report of the Committee on Privileges and Elections (Senate Report 4253, 59th Congress, 1st Session), also in the Smoot case.

MORMYR. The mormyrs {Mormyridae) are one of the most remarkable families of the Malacopterygian fishes, confined to the fresh waters of tropical Africa and

the Nile. About 100 species, referred to two sub-families and ten genera, are now known, a great number of new forms having recently been discovered in the Congo. They are curious-looking, highly aberrant fishes, very variable in the extent of the vertical fin and in the form of the body, and especially the head, which may be either extremely abbreviated or elongated into a rostrum, with or without a dermal appendage or " feeler." The shape of the head has suggested many of the specific names which have been given to these fish, such as elephas, lapirus, tamandua, caballus, ovis, ibis, numenius, &c. Some forms are eel-shaped. The mormyrs are further remarkable for the enormous development of the brain and for the problematic organ which sur- mounts it; also as being among the few fishes in which an electric organ has been discovered. This organ, situated on each side of the caudal region, is derived from the muscular system and is of feeble power; it was long considered as " pseudoelectric,"

Very little is known of the habits of these fishes. Professor G. Fritsch, of Berlin, during his stay in Egypt for the purpose of experimenting on electric fishes, observed that they perish very rapidly when removed from the water, and he had the greatest difficulty in keeping some alive in an aquarium for two or three days. Captain S. Flower has recently been more successful, and the mormyrs have proved a great success in the Gezira aquarium, near Cairo, examples of the species having lived from ten to twenty-six months. The species with comparatively large mouths feed principally on fishes and crustaceans, the others on tiny animals and vegetable and more or less decomposed matter. P. Delhez, on the Congo, found that many are attracted to the borders of the river in the neighbourhood of human dwellings, where they feed on the refuse thrown into the water. It is probable that the species with a rostrum use it to procure small prey hidden between stones or buried in the mud, and that the fleshy mental appendage with which they are provided is a tactile organ compensating the

imperfection of the vision in the search for food. Until quite recently absolutely nothing was known of the breeding-habits and development. To the late J. S. Budgett we owe some very interesting observations made in the Gambia on Gymnarchus niloticus, which makes a nest, and the larvae of which are provided with filamentous external gills.

Venerated by the ancient Egyptians, the mormyrs are often represented on hieroglyphics and mural paintings as well as in bronze models. The " Oxyrhynchus," remarkable for its long, curved snout, is the most frequently depicted. A revision cf the Mormyridae has been published by G. A. Boulenger in the Proc. Zool. Soc. (1898), with a bibliographical index to the various anatomical and physiological contributions. The skull has been minutely studied by W. G. Ridewood, Journ. Linn. Soc. (Zool. xxix., 1904, p. 188). Figures of the most remarkable forms will be found in Boulenger's Poissons nouveaux du Congo, Ann. Mus. Congo (Zool. i. and ii., 1898-1902), and in his Fishes of the Nile (London, 1907, 4 00). On the breeding habits of Gymnarchus, cf. J. S. Budgett, Trans. Zool. Soc. (1901), xvi. 126. (G. A. B.)

MORNAY, PHILIPPE DE (1549-1623), seigneur du Plessis- Marly, usually known as Du-Plessis-Mornay or Mornay Du Plessis, French Protestant, was born at Buhy in Normandy on the 5th of November 1549. His mother had leanings toward Protestantism, but his father sought to counteract her influence by sending him to the College de Lisieux at Paris. On his father's death in 1559, however, the family formally adopted the reformed faith. Mornay studied law and jurisprudence at Heidelberg in 1565 and the following year Hebrew and German at Padua. On the outbreak of the second religious war in 1567, he joined the army of Conde, but a fall from his horse prevented him from taking an active part in the campaign. His career aa Huguenot apologist began in 1571 with the work Dissertation sur l`6glise visible, and as diplomatist in 1572 when he under-took a confidential mission for Admiral de Coligny to William the Silent, prince of Orange. He escaped

the St Bartholomew massacre by the aid of a Catholic friend, and took refuge in England. Returning to France towards the end of 1573, he participated during the next two years with various success in the campaigns of Henry of Navarre. He was taken prisoner by the duke of Guise on the 10th of October 1575, but not being recognized was ransomed for a small sum. Shortly afterwards he married Charlotte Arbaleste at Sedan. Mornay was grad- ually recognized as the right-hand man of the king of Navarre, whom he represented in England from 1577 to 1378 and again in 1580, and in the Low Countries 1 581-1582. With the death of the duke of Alencon-Anjou in 1 584, by which Henry of Navarre was brought within sight of the throne of France, the period of Mornay's greatest political activity began, and after the death of the prince of Conde in 1588 his influence became so great that he was popularly styled the Huguenot pope. He was present at the siege of Dieppe, fought at Ivry, and was at the siege of Rouen in 1591-92, until sent on a mission to the court of Queen Elizabeth. He was bitterly disappointed by Henry IV. 's abjuration of Protestantism in 1593, and thenceforth gradually withdrew from the court and devoted himself to writing. He founded in 1593 the Protestant academy or

university at Saumur, which had a distinguished history until its suppression by Louis XIV. in 1683. In 1 598 he published a work on which he had long been engaged, entitled De L'insti- tution, usage et doctrine du saint sacrement de I'eucharistie en Veglise ancienne, containing about 5000 citations from the scriptures, fathers and schoolmen. Jacques Davy Du Perron, bishop of Evreux, afterwards cardinal and archbishop of Sens, accused him of misquoting at least 500, and a public disputation was held at Fontainebleau on the 4th of May 1600. Decision was awarded to Du Perron on nine points presented, when the disputation was interrupted by

the illness of Mornay. His last years were saddened by the loss of his only son in 1605 and of his devoted wife in 1606, and were marked only by perfecting the Huguenot organization. He was chosen a deputy in 1618 to represent the French Protestants at the synod of Dort, and though prohibited from attending by Louis XIII. , he contributed materially to its deliberations by written communications. He was deprived of the governorship of Saumur at the time of the Huguenot insurrection in 1621, and died in retirement on his estate of La For£t-sur-Sevre on the nth of November 1623.

His principal works, in addition to De L 'institution, usage et doctrine du saint sacrement de I'eucharistie en Veglise ancienne (La Rochelle, 1598), mentioned above, are Excellent discours de la vie et de la mort (London, 1577), a bridal present to Charlotte Arbaleste; Traite de Veglise ou Von traite des principales questions qui ont eti mues sur ce point en nostre temps (London, 1578) ; TraM de la verite de la religion chretienne contre les athees, tpicuriens, payens, juifs, mahometans et autres infideles (Antwerp, 1581); Le myst'ere d'iniquite, c'est & dire, I'histoire de la papaute (Geneva, 161 1). Two volumes of Memoires, from 1572 to 1589, appeared at La ForSt (1624-1625), and a continuation in 2 vols, at Amsterdam (1652) ; a more complete but very inaccurate edition (Memoires, correspondences, et vie) in 12 vols, was published at Paris in 1624-

1625.

See the life of Mornay written by his wife for the instruction of their son, Memoires de Mme Duplessis-Mornay, vol. i. in the ed. of Memoires et correspondances de Duplessis-Mornay (Paris, 1824-1825); E. and E. Haag, La France protestante, article " Mornay "; J. Ambert, Du Plessis- Mornay (Paris, 1847) ; E. Stahelin, Der tSbertritt K. Heinrichs IV. von Frankreich zur katholischen Kirche (Basel, 1856); Weiss, Du Plessis Mornay cemme Mologien (Strass- burg, 1867). There is a good article " Du Plessis-Mornay " by T. Schott in

Hauck's Realencyklopadie, and another by Grube in Kirchenlsxikon.

MORNING, properly the dawn of day, sunrise, but extended to the whole early part of the day, from the dawn to midday. " Morning " (M. Eng. morwening) was formed on the analogy of " evening," from " morn," in M. Eng. morwen, and originally meant the coming of the sunrise, as " evening," the coming of the close of the day (O. Eng. afnung, from cejen, eve). The 0. Eng. morgen represents the common Teutonic word for the dawn; the ultimate source has been assigned to the root, seen in "murk," "murky," meaning to be dark, or, with more proba- bility, to the root mergh, to twinkle, shine (cf. Lith. mirga), and further to the root mar, as in Gr. fiapnalpeiv, to shine (cf. Lat. marmor, marble). The M. Eng. morwen dropped the n and became morwe, " morrow," which properly means " morning," but was soon used of the day following the present.

The " morning-star " (Ger. Morgenstem) was a military weapon of the middle ages, consisting of a mace or club with a ball head studded with spikes; the spiked ball was sometimes swung loose from the head of the mace by a chain. The weapon was also known as a " holy water sprinkler." The "morning-gift," earlier " moryeve," Ger. Morgengabe, was the present given to a bride by her husband on the morning after the marriage. The custom is probably connected with the origin of the term " morganatic marriage " (see Morganatic).

MORNY, CHARLES AUGUSTE LOUIS JOSEPH, Due de (1811-1865), French statesman, was the natural son of Hortense Beauharnais (wife of Louis Bonaparte, and queen of Holland) and Charles Joseph, comte de Flahaut (q.v.), and therefore half- brother of Napoleon III. He was born in Paris on the 21st of October 1811, and his birth was duly registered in a certificate which made him the legitimate son of Auguste Jean Hyacinthe Demorny, described as a landowner of St. Domingo. M.

Demorny was in fact an officer in the Prussian army

and a native of St Domingo, though he owned no land there or else- where. After a brilliant school and college career he received a commission in the army, and next year entered the staff college and became lieutenant. The comte de Morny, as he was called by a polite fiction, served in Algeria in 1834-35 as aide-de-camp to General Camille Alphonse Trezel, whose life he saved under the walls of Constantine. When he returned to Paris in 1838 he secured a solid position in the business world by the establish- ment of a great beetroot-sugar industry at Clermont in Auvergne, and by writing a pamphlet Sur la question des sucres in 1838. In these and other lucrative speculations he was helped by the beautiful and wealthy wife of the Belgian ambassador, Charles Joseph, comte Lehon, until there were few great commercial enterprises in Paris in which he had not an interest. Although he sat as deputy for Clermont-Ferrand from 1842 onwards he took at first no important part in party politics, but he was heard with respect on industrial and financial questions. He supported the government of Louis Philippe, because revolution threatened his commercial interests, but before the catastrophe of 1848, by which he was temporarily ruined, he meditated conversion to the legitimist cause represented by the comte de Chambord. His attitude was expressed by the mot with which he is said to have replied to a lady who asked what he would do if the Chamber were ″ swept out.″ ″ Range myself on the side of the broom handle,″ was his answer. Presently he was admitted to the intimate circle of Louis Napoleon, and he helped to engineer the coup d'etat of the 2nd of December 1851 on the morrow of which he received the ministry of the interior. After six months of office, during which he had shown commendable moderation and tact to his political opponents, he resigned his portfolio, ostensibly because he disapproved of the confiscation of the Orleans property but really because Napoleon, influenced by Morny's rivals, resented his pretensions to a foremost place in the government and his desire to insist on his claims as a member of the Bonaparte family. He now resumed his

financial speculations, and when in 1854 he became president of the Corps Legislatif, a position which he filled with consummate dignity and tact for the rest of his life, he used his official rank to assist his schemes.

Politics and high finance with Morny went hand in hand. In 1856 he was sent as special envoy to the coronation of Alexander II. of Russia; he executed his mission with prodigal splendour, and brought home a wife, Princess Sophie Troubetzkoi, who by her connexions greatly strengthened his social position. In 1862 Morny, whose power was at its culminating point, was created a duke. It is said that he aspired to the throne of Mexico, and that the French expedition sent to place Maximilian on the throne was prompted by Napoleon's desire to thwart this ambition. In any case, in spite of occasional dissensions, Morny's influence with the emperor remained very great, and the liberal traditions which he had retained enabled him to serve the imperial cause by his influence with the leaders of the opposition, the most conspicuous of whom, Emile Ollivier, was detached from his colleagues by his efforts. But while he was laying the foundations of the " Liberal Empire " his health, undermined by a ceaseless round of political and financial business, of gaiety and dissipation, was giving way, and was further injured by indulgence in quack medicines. The emperor and the empress visited him just before his death in Paris on the 10th of March 1865.

Morny's valuable collection of pictures was sold after his death. In spite of his undoubted wit and social gifts Morny failed to secure the distinction he desired as a dramatist, and none of his pieces which appeared under the pseudonym of M. de St Remy — Sur la grande route ; Monsieur Choufleury restera chez lui, and the Finesses du mari among others — met with any considerable success on the stage.

The figure of the due de Morny is familiar to the general reader in the due de Mora of Le Nabab of Alphonse Daudet, who had been one of his secretaries. See F. Loliee, Le Due de Morny et la

societe du second empire (1909). Earlier accounts are by H. Castille, M. de Morny (1859), and Arthur de la Gu6ronniere, Etudes et portraits

politique! (1856). See the literature dealing with Napoleon III., and the article on Flahaut de la Billarderie; also F. Loliee, Le Due de Morny, adapted by B. O'Donnell. A volume, Extraits des memoires de Morny: Une Ambassade en Russie 1856, was published in 1892.

MORO, ANTONIO (c. 1512–1575), otherwise known as Sir Anthony More, the eminent portrait-painter, was born at Utrecht in 1512 according to some, but in 1525 according to Karl van Mander in his Het Leven der Schilders. He studied his art under Jan Schoorel; and after making a professional visit to Italy he commenced to paint portraits in the style of Hans Holbein. His rise to eminence was rapid. In 1552 he was invited to Madrid by the emperor Charles V. to execute a likeness of Prince Philip. Two years afterwards he was in London painting the portrait of Queen Mary. For this picture an annual salary and, as some suppose, the honour of knighthood were conferred upon him. On the death of Mary in 1558 Moro returned to Spain, and lived there for two years in great honour with Philip II., executing, in addition to portraits, several copies after Titian. His death took place at Antwerp about 1575. Among his figure-pictures Van Mander specifies the " Circum- cision of Christ," executed for Antwerp Cathedral, as one of the most notable. His portraits are full of individuality, and characterized by firm and solid rendering of flesh. Several admirable examples are preserved in Madrid; among the rest the portrait of Queen Mary of England, which has been excellently etched by Milius (V 'Art, Dec. 8, 1878). " Moro's style," says Stanley in his Dutch and Flemish Painters, " so much resembles that of Holbein as to frequently create a doubt to which of them a portrait is to be attributed; but he is not

so clear and delicate in his colouring (perhaps from having painted so much in Spain) as that master."

MOROCCO (El Maghrib el Aksa, " The Farthest West," i.e. of the Mahommedan world), an independent state of North Africa, bounded on the N. by the Mediterranean, on the E. by Algeria, on the S. (indefinitely) by the Sahara, and on the W. by the Atlantic as far south as Wad Dra'a. Its landward limits can only be vaguely defined. The eastern frontier towards Algeria, determined by the treaty of 1844, is a purely conven- tional line starting from the mouth of a small stream called the Skis and running across country in a general S.S.E. direction. In 1900 this was given a westerly trend to the south of the Atlas by the annexation of the Figig, Igli and Tuat oases by France. The southern boundaries expand and contract according to the power and acivity of the central authorities. Behm and Wagner, who included Figig, Tuat, Kenatsa and other oases, estimated (in 1882) the then area of the sultanate at 305,548 sq. m. The allegiance of many of the tribes within this compass is questionable and intermittent, and the loss of the district from Figig to Tuat, which is not accurately defined, has considerably reduced the area. Morocco is ■ still the portion of Northern Africa about which European information is most defective, and all maps are still to a considerable extent composed of unscientific material eked out by probabilities and conjecture.

The Mediterranean Coast Lands. — The seaward aspect of Morocco only is known in detail. To the Mediterranean it presents for about 200 m. the rugged profile of the Rif hills (still unexplored), which generally end in lines of cliff broken at intervals by narrow sweeps of sandy beech, but occasionally open up into beautiful and fertile valleys.. About 6 m. west of the Skis lies the mouth of the river Mulwiya; and 10 m. farther on, opposite Cabo del Agua (Ras Sidi Bashir), is a group of dry and barren islands, owned by Spain, known as Chaffarinas or Jazair Zafran (Spanish las Chafarinas), which protect the best roadstead on the

Rif coast. Between Point Quiviana and Melilla runs a low and sandy shore in front of a great salt marsh, the Mar Chica of the Spaniards. Melilla (Melillya) is a fortified rock convict station or presidio, held by the Spaniards since 1497, forming a peninsula connected by lines of rampart with Fort Rosario on the heights behind. The fine semicircular bay of Alhucemas is the seaward end of one of the most beautiful valleys in the Rif, clothed with verdure and dotted with hamlets.' A Spanish presidio occupies one of the larger of the Alhucemas islands (Al-Mazemma), which are identified with the Ad Sex Insulas of the itineraries. Another Spanish presidio crowns the island rock Pefion de Velez; and in the valley off which it lies stood a town known to the Spaniards as Velez de Gomera, to the Arabs as Badis,

which continued to be a place of importance in the 16th century. The so-called Bay of Tetuan (Tettawan) — the town is just visible from the sea — is little more than the straight stretch of coast between Cape Mazari on the south and Cape Negro or Negrete on the north ; but the prominence of these two headlands gives it an appearance of depth. From Cape Negro northwards to Ceuta the most notable object is the summit of Jebel Musa, which, though situated on the Strait of Gibraltar, towers above the intervening hills. Ceuta (Sibta), the most important of the Spanish settlements in Morocco, occupies a peninsula — the head, Mt Acho, standing about 4 m. out to sea, and the neck being low and narrow. It marks the eastern end of the strait. Westwards, the first point of.interest is again Jebel Musa, the Elephas of Strabo, and the Apes' Hill of English charts. About 20 m. farther along the coast lies the Bay of Tangier (Tanja), one of the finest harbours in Morocco. West from Tangier runs the Jebel Kebir (rising to a little over 1000 ft.), the seaward extremity of which forms Cape Spartel, the north-west angle of the African continent, known to the ancients as Ampelusia or Cotes Promontorium. The lighthouse, 312 ft. above sea-level, built in 1865 at the cost of the sultan of Morocco, and maintained at the joint expense of England, France, Italy and

Spain, is the only one on the western coast. It is provided with a fixed intermittent white light, visible for 36 m.

The Atlantic Coast Line. — The Atlantic coast of Morocco is remarkable for its regularity ; it has not a single gulf or noteworthy estuary; the capes are few and for the most part feebly marked. Southward from Cape Spartel the shore sinks rapidly till it is within a few feet of the sea-level. In the low cliff which it forms about 4i m. from the lighthouse there is a great quarry, which from remote antiquity has yielded the hand-mills used in the Tangier district. A stretch of low marshy ground along the Tahaddart estuary — W. Muharhar and W. el-Kharrub — agrees with Scylax's Gulf of Cotes (Tissot). Eight m. farther lies Azila, the ancient Colonia Julia Constantia Zilis, with a Moorish and Jewish population of about 1200. For the next 16 m., between Azila and Laraish (Laraiche), the coast has a tolerably bold background of hills, Jebel Sarsar forming an important landmark for the latter town which, with its Phoenician, Roman and medieval remains, is historically one of the most interesting places in Morocco. A line of reddish cliffs about 300 ft. high runs south for about 10 m. from the W. Lekkus, at whose mouth the town is built; then the coast sinks till it reaches the shrine of Mulai Bu Selham on an eminence 220 ft. high. Between Mulai Bu Selham (often wrongly called " Old Mamora ") and a similar height crowned by the tomb of Sidi Abd Allah Jelali lies the outlet of the Blue Lake (Marja Zarka), 10 or 12 m. long. Farther south, and separated from the sea by an unbroken line of rounded hills (230-260 ft.), is the much more extensive lagoon of Ras ed-Dura, which in the dry season becomes a series of marshy meres, but in the rainy season fills up and discharges into the Sebu. Eastward it is connected with the Marjat el-Gharb, fed by the W. Meda. On the south side of the outlet of the Sebu lies Mehediya (otherwise misnamed New Mamora or Mehduma) founded by Abd el-Mumin, and named after the Muwahhadi Mahdi. It was held by Spain from 1614 to 1681. Twenty miles farther is the

mouth of the Bu Ragrag, with Salli (Sla) on the north side, long famous for its piracies, and still one of the most fanatical places in the empire, and on the south side Rabat, with its conspicuous Hassan tower, and Sheila with its interesting ruins. Onward for 100 m. to Point Azammur and the mouth of the Um er-Rabi'a river a line of hills skirts the sea ; the shore is for the most part low, and, with the exception of capes at Fedala (a small village, originally a port, partly rebuilt by Mulai Isma'il, and completed by Mahommed XVlI., who opened it to Europeans between 1760 and 1773) and Dar el-Baida or Casablanca, it runs in a straight line west-south-west. Azammur (Berber for " The Wild Olives," viz. of the Sheikh Bu Shaib) — once the frontier town of the kingdom of Fez — stands on an eminence about ij m. from the sea on the south side of the Um er-Rabi'a, here some 150 ft. wide, deep and red, with an obstructing bar. The bay of Mazagan, a few miles to the south, curves westward with a boldness of sweep unusual on this coast. About 8 m. to the south, and less than I m. inland, lie the extensive ruins of Tit, a town which proved a thorn in the side of the Portuguese of Mazagan till they destroyed it. At Cape Blanco (so called from its white cliffs) the coast, which bulged out at Cape Mazagan, again bends south to resume much the same general direction for 55 m. to Cape Cantin. On this stretch the only point of interest is the site of the vanished Walidiya, formerly El-Ghait, with an excellent harbour, formed by an extensive lagoon, which by a little dredging would become the safest shipping station on the whole Morocco seaboard. About 18 m. farther lies Saffi (Asfi), the most picturesque spot on the west coast, with the high walls and quare towers of its Portuguese fortifications shown to advantage by the ruggedness of the site. Sixty miles farther south lies Mogador, beyond which the coast becomes more and more inaccessible and dangerous in winter, being known to navigators as the " Iron Coast." From Cape Sim (Ras Tagriwalt), 10 m. south of Mogador, the direction is due south to Cape Ghir (Ighir Ufrani), the termination of Jebel Ida fl Tanan, a spur of the

Atlas. Beyond this headland lies Agadir (Agadir Ighir), the Santa Cruz Mayor or Santa Cruz de Berberia

MOROCCO

of the Spaniards, formerly known as the Gate of the Sudan. 1 It is a little town with white battlements three-quarters of a mile in circumference, on a steep eminence 600 ft. high. In the 16th century it was seized by the Portuguese; but in 1536 it was captured by Mulai Ahmad, one of the founders of the Sa'adi dynasty. Some 60 m. farther south, at the mouth of a river known by the same name, is the roadstead of Massa, with a mosque popularly reputed the scene of Jonah's restoration to terra firma. This port 2 was regularly visited by the Genoese traders in the 1 6th century, who exported skins, gum, wax, gold and indigo. Another 50 m. farther south lies Ifni, a landing-place easily recognizable by the shrine of Sidi Worzek, a few miles to the

Character of the Interior. — The backbone of the country is the Great Atlas (Daren of the Berbers), for which see Atlas. The principal rivers take their rise in the Atlas Mountains, and the headwaters of the Mulwiya, the Sebu, the Urn er Rabi'a, the Dra'a and the Ziz all rise between 32° 20′ and 32 30′ N., and between 3 30′ and 5° W. The Mulwiya (Mulucha and Malva of Pliny, &c.) is the river which the French have long wished to make the western boundary of Algeria. Its course is largely unexplored save by native French officials. About 34° 20′ N. General Colvile found it some 200 yds. wide but quite

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south of whichis the Cape Non 3 of the Portuguese. The better known Cape Nun lies 5 or 6 m. north of the W. Nun, at" the mouth of which is Assaka, a port which the sultan of Morocco opened to foreign trade in 1882, but closed after six months. From Assaka to the mouth of the Dra′a the country continues broken and fertile, but farther south it is flatter and more sandy, so that with the Dra′a the Sahara may be said to begin.

1 This must not be confounded with Santa Cruz de Mar Pequena, a post established in 1476 somewhere on this coast by Herrera, lord of the Canary Islands. After obtaining permission to re- occupy the post in 1861, the Spanish government was unable to identify it, though in all probability the original site was the lagoon known as Puerto Cansado, much farther south. But this is now too remote a spot to be worth colonizing, hence the desire to substi- tute some other. Ifni, on old maps Gueder, was chosen (1878), there being some evidence to show that it was possibly the true Site of the ancient fort.

2 See Valentin Ferdinand, Beschreibung West Afrikas (Mem. of the Acad, of Munich, 3rd Class, pt. viii.).

3 No, Non, Nor, Naum, Nao, are among the various readings. • It was another Cape Non to the south of Cape Bojador which seems to have given rise to the proverb, Quern pasar cabo de Nao ou tornara ou nao.

See Bol. de la Soc. Geogr. (Madrid, 1880), p. 316.

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shallow; about 25 m. east of its source, where it is crossed by the route to Ziz, it is already a powerful stream with a deep bed cut in the granite rock, and shortly afterwards it is joined by the W. Sgimmel, a still larger affluent (Roklfs). Of the lesser streams which flow into the Mediterranean it is enough to mention the W. Martil or Martin (otherwise W. Bu Sfiha, W. Ras, W. Mejeksa), which falls into the Bay of Tetuan, and is identified with the Tamuda of Pliny and Thaluda of Ptolemy. On the Atlantic seaboard there are a number of comparatively small streams north of the Sebu, the chief of which is the winding W. Lekkus, with several tributaries. The Sebu (the Subur magnificus et navigabilis of Pliny) may be compared to the Thames in length and width, though not in steadiness and depth of current. At Meshra'at el-Ksiri, about 70 m. from its mouth, it is about 10 ft. deep in the month of May and more than 460 ft. wide; and, though its banks are 21 ft. high, extensive inundations occur. The tide ascends as far as El-Kantara, 15 m. above Ma'mora, and steam barges with a small draught of water could make their way to the ford just mentioned, and

possibly even as far as Fez. Affluents of the Sebu are W. Mikkes and W. Redem (90 m. long). The swift and muddy current of W. Beht usually loses itself in a swamp before it reaches the main stream. The Bu Ragrag, which debouches between Rabat and Salli, is about the same length as the Beht, but of much more importance. It. and the Um er-Rabfa (mother of grass), although their mouths are widely separated, drain the northern slopes of the central Atlas. The impetuous Um er- Rabi'a, with a rocky bed and many rapids, is perhaps as large as the Sebu. W. el-Abiad, W. Akhdar and W. Tessaut are the principal

affluents. This last is separated by about 10 m. only from the valley of the Tansift, the river which flows to the north of the city of Marrakesh; and by the W. Nefls, the Asif el-Mal (Asif is Berber for river), the W. Usbi, and other smaller tributaries, receives the waters of about 180 m. of the Atlas range.

The valley between^the Atlas and the Anti-Atlas is traversed by the W. Sus, whose ever-flowing stream is sufficient to turn the whole district into a garden. The Massa or W. al-Ghas, though its headwaters drain only one or two of the lesser valleys at the south-west end of the Anti-Atlas, is "about 50 yds. from bank to bank at the mouth, with a depth at high water and in the proper channel of something over a fathom." Farther south is the Assaka, known to European geographers as the W. Nun; and finally the W. Dra'a is reached, which in length exceeds all the rivers of Morocco, but, except in spring, when the snows are melting in the highlands, remains throughout its lower reaches a dry sandy channel. In the upper valleys however innumerable streams from the south side of the main chain of the Atlas, the W. Dades from the east, and the Asif Marghen, W. el-Molah, or Warzazet from the west, flow through populous and fertile valleys, and uniting to form the Dra'a cut their way southward through a gorge in the Jebel Soghar, which, as the name implies, is a lower range running parallel to the Atlas proper. For the next 130 m. the stream holds S.S.E., drained at every step by the irrigation canals which turn this region into a green oasis, till at last its dwindling current bends westward to the sebkha (salt marsh) of Debaya. For a few weeks once a year the thawrfloods fill this shallow but extensive basin and rush onwards to the Atlantic; but in summer it dries up, and, like the bed of the river for some distance below, is covered with flourishing crops. From the south of the Atlas still farther east descend other streams, the W. Zlz (with its tributaries the W. Todgha and W. Gheris), the W. Ghlr, the W. Kenatsa, &c, which, after watering the oases of Med- ghara, Tafllalt

(Sajilmasa), Kenatsa, &c, lose themselves in the sands of the Sahara.

[Geology. — The Atlas Mountains, which are built up of a series of ridges rising to 12,000 ft. to the east of Morocco, form the backbone of the country. The central and highest portions consist of slates, crystalline limestones and schists of Archean, Pre-Cambrian and possibly of Cambrian ages. They are much folded and broken through by numerous intrusions of basalts and diorites. The mass of Jebel Tezah is composed of mica-schists and porphyries which appear to bear closer resemblances to the metatnorphic rocks of Egypt than to the Archean crystalline formation of Central Africa. The strata of the central ridges are succeeded By a great thickness of purple marls, red sandstones, conglomerates and calcareous rocks, occurring in faulted, folded and detached areas and recently considered to range from Silurian to Trias. Later palaeozoic rocks of Devonian and Carboniferous ages also form a broad zone extending into the Sahara on the southern and south-eastern flanks. The whole of the Cretaceous system is represented by the shales and lime- stones occurring between the coast and the edge of the plateau above Morocco, but do not enter into the composition of the High Atlas.

Moraines, made up largely of unstriated blocks of porphyry, have been reported from the Upper Atlas. At the foot of the mountains, extensive mounds of boulder beds are developed on an immense scale and were considered by Maw to belong to the Glacial Epoch. Between Damnat and the sea, however, the signs of a former glacia- tion appear to be insignificant. No moraines occur here, and consequently the glacial origin of the boulder beds described by Maw has been disputed. They are probably alluvial cones brought down from the High Atlas and mountainous regions. From Mogador to 60 m. inland, and over the plains around Marrakesh, a tufaceous deposit forming a hard crust, several feet thick, follows every undu- lation of the ground. Immense accumulations of tufa are met with in the limestone areas of the mountains. The chief tectonic

struc- tures which trend N. 20 E. belong to the Alpine and Mediterranean

systems. The Cretaceous and Tertiary rocks are involved in these movements, which, however, were moulded on an earlier folding affecting the palaeozoic reeks of the Atlas region. The sundering of Africa from Europe at the Straits of Gibraltar took place in late Tertiary times; while the elevation of the Barbary coast to a height of 50 to 70 ft. is of Recent date.]

Climate. — The climate is good, and produces a hardy race. Shielded by the Atlas from the hot winds of the Sahara, the coast of the Atlantic offers great attractions to those suffering from chest complaints. Tangier is a recognized health resort, and Mogador and Rabat await development as such. Rain falls only between September and April; on the Atlantic coast it is brought by the south-west wind, and on the Mediterranean sometimes also by the east wind, or sharki, otherwise dry and somev/hat trying to invalids. The wonderfully temperate climate of Mogador is due in a great measure to trustworthy trade-winds. In Tangier and Mogador the thermometer seldom rises over 8o° F. or sinks below 40°, although inland the extremes are much greater; and while on the plains or in low-lying cities the heat grows intense, snow gleams on the Atlas nearly all the year round. The best months for visiting the interior are September (if rain has fallen), October, November and the early part of December, or May and June.

Fauna. — The absence of woodland keeps wild animals in check. Besides the lion, which exists in very limited numbers — and, accord- ing to local proverbs, with diminished courage — the spotted leopard, panther, hyaena, jackal, lynx, fox, wild boar, porcupine, antelope and gazelle are the most important. The audad or wild sheep is found in the more inaccessible parts of the Atlas. Rabbits swarm in the country to the north of the Bu Ragrag, and since 1870 they have crossed this stream, which used to be their southern limit. Hares are generally

common. Rats are from time to time a plague to agriculturists, and the jerboa is frequently met with. A kind of ground-squirrel, the sibsib, occurs in the southern provinces. Monkeys of the same species as those of Gibraltar frequent the neighbourhood of Jebel Musa or Apes' Hill. The common wild birds include blackbirds, goldfinches, linnets, greenfinches, robins, wagtails, skylarks and crested larks, swifts, magpies, cuckoos, lapwings, rollers, several shrikes, as well as turtle-doves, nightingales, jays and buff- backed egrets. The house-sparrow is not found ; between Marrakesh and Mogador its place is taken by a beautiful bird (Emberiza strio- lata), locally called tabih, or " doctor." The birds of prey include eagles, vultures, ospreys, buzzards, falcons, harriers, kestrels, kites, ravens and hawks. Hawking is still indulged in by some of the country governors, and the Moors are very fond of hunting, many keeping greyhounds. The Barbary partridge is the main resource of the sportsman, though he may also bag several other varieties of partridge, bustards, guinea-fowl, plovers, grouse, snipe, quail, curlew, ducks and other water-fowl. Along the coast there is no lack of gulls, gannets, pelicans, flamingoes, herons, whimbrel, oyster- catchers, &c. Most towns have their colony of storks. Several- venomous snakes and two vipers are found, but are not common, and the same may be said of scorpions and tarantulas, but centipedes are more numerous. Human parasites are, however, most to be guarded against. M.osquitos give little trouble save in towns or near water. Invasions of locusts are serious, but intermittent. Lizards, chameleons, tortoises and frogs are familiar objects; it is from Morocco that the small tortoises hawked about the streets of London are usually obtained.

Of domestic animals the mule is the great beast of burden, though camels, mares and asses are also employed. The horse is usually a sturdy little animal, but far below the ancient reputation of the Bar- bary steed. It is seldom used as a draught animal. Roughly broken when young, his mouth is soon

spoiled by barbarous bits, and his feet by square shoes. The finest animals are said to be bred in Shiadhma and Abda. In form and size the mules are much superior and usually fetch two or three times the price of the horse. The horned cattle are not unlike Alderneys; but being practically untended, and the oxen having to do the ploughing, they furnish a very different quality of milk, yielding it only while the calf looks on ; the sheep, for the improvement of which, also, nothing is done, have spiral horns (not infrequently four), rounded foreheads and long, fine wool ; the goats, which furnish the famous leather, needing eyen less care are still more abundant. Domestic fowls are kept in great numbers; they are of the Spanish type, small and prolific.

The bonito and mackerel fishery off the coast of Casablanca and Tangier attracts fishers from Spain, Portugal and other parts of Europe. Occasionally a small shoal may be found as far south as Mogador. Soles, turbot, bream, bass, conger eel and mullet are common along the coast, and southern Morocco is visited occasion- ally by shoals of a large fish called the azlimzah (sciaena aquila), rough scaled and resembling a cod, and the tasargelt {Temnodon saltator), the ″ blue fish ″ of North America. Crayfish, prawns, oysters and mussels swarm in the rocky places, but the natives have no proper method of catching them, and edible crabs seem unknown. The tunny, pilchard and sardine, and a kind of shad known as the ″ Mogador herring,″ all prove at times of practical importance. The catching of the shabel, a species of shad, mis-called ″ Barbary salmon ″ is a great industry on the principal rivers of the coast, and vast numbers of the fish, which are often from 5 to 15 lb in weight are dried and salted. They ascend from the sea in spring. Barbels

and a few other small fish. swarm in the streams, but for the angler there is little real sport.

Flora. — From the presence of a large proportion of plants of cen- tral and northern Europe (none of the northern plants, however, being of alpine or arctic type) and the absence of southern types characteristic of the sub-tropical zone, Ball concluded that ″ the Morocco flora is altogether a portion of that great Mediterranean flora which, with local peculiarities, one finds from the Indus to the Atlantic Islands,″ but that ″ the mountain flora of Morocco is a southern extension of the European temperate flora, with little or no admixture of extraneous elements, but so long isolated from the neighbouring regions that a considerable number of new specific types have been developed.″ Of the individual plants none are more remarkable than the arar and the argan.. The former {Callitris quadrivalvis, or Thuja articulata of Shaw) is a cypress-like tree that grows on the Atlas both in Morocco and Algeria. It furnishes gum sandarach; and its beautiful and enduring timber has been identified with the alerce with which the Cordova cathedral (mosque) was roofed, and with the citrus-wood, arbor vitae, of the ancient Romans. The argan, Elaeodendron argan {Argania sideroxylon) is confined to a tract of country extending about 150 m. along the coast, from the river Tansift almost to the river Sus, and about 30 m. in breadth; and it is found nowhere else in the world. The fruit, which ripens between May and August, is an olive-looking nut, greedily eaten by camels, mules, goats, sheep and horned cattle (but not by horses) for the sake of the fleshy pericarp, and crushed by the natives to extract the oil from the kernel. Though ″ its strong and fulsome savour ″ renders it nauseous to the European palate, this oil is largely used in the cookery of southern Morocco. The ″ prickly pear ″ and the aloe form part of the features of the landscape from the coast up to the slopes of the mountains, but neither is indigenous. The cork tree has lost ground enormously though it probably forms the staple of the Ma'mora forest, which extends for some 20 m. between the Bu Ragrag and the Sebu. The palmetto is often locally very abundant, but the most common wild tree on the plains is the thorny

lotus or mimosa: in the mountainous regions it is reduced to a mere scrub. Lentisks, arbutus, oleanders, junipers and broom are also common, but vast stretches of country are devoid of either trees or shrubs. Citrons, lemons, limes (sweet and sour), apricots, plums, melons, mulberries, walnuts and chest- nuts are common in many parts. Tetuan and Laraish are famous for oranges, Mequinez for quinces, Marrakesh for pomegranates, Fez for figs, Tafilalt and Akka for dates, Sus for almonds, Dukalla for melons, Tagodast, Edanan and Rabat for grapes, and Tarudant for olives. The grape is extensively cultivated, but principally for eating ; the Jews manufacture crude but palatable wines. Sugar, once grown in Sus, to supply the demands of the whole of Morocco, has dis- appeared as have also cotton and indigo. Indian hemp and tobacco are cultivated under the restrictions of an imperial monopoly — the former (of prime quality) being largely used as hashish, the latter, though never smoked, as snuff. Barley is the most usual cereal; but excellent crops of wheat, maize, millet, rye, beans, peas, chick- peas and canary seed are also obtained. Potatoes, tomatoes, cab- bages and beets have been introduced from abroad; otherwise the ordinary vegetables are peas, beans, turnips, onions, garlic, capsicums, cucumbers, marrows and carrots. Sweet herbs are extensively grown for use in cooking and in the preparation of tea.

In some of the Atlas valleys there is a wealth of timber, enormous conifers, 10 to 12 ft. in girth of stem, oaks, &c, but the greater part of the country has been cleared of forest,"exhibiting only brushwood, and the lesser fruit-trees. Cowan, writing more immediately of the country between Morocco and Mogador, speaks of " drifts of asphodel, white lilies, blue convolvuli, white broom flowers, thyme and lavender, borage, marigold, purple thistles, colossal daisies and poppies"; and Trotter tells how for miles the undulating plateau of Kasar Fara'on was covered with wild flowers, whose varied colours, and the partiality with which each species confined itself to certain ground, gave to the

landscape a brilliant and unique appearance. _ Dark blue, yellow and red — iris, marigold and poppy — occurred in patches an acre in size ; farther on whole hills and valleys were of a delicate blue tint from convolvulus and borage. At times the traveller's tent is pitched on a carpet of mignonette — • — indigenous to the country — at times on a carpet of purple bugloss. In the country of the Beni Hasan squills are so abundant that the fibres of the bulbs are used instead of hair in making tent-cloth; and in the north of Al Kasar al-Kebir the moors are covered for miles with a beautiful white heather. From such gorgeous combinations of colour one can well imagine that the Moors drew the inspiration of their chromatic art; bu.. the season of floral splendour is brief, and under the hot sun everything soon sinks into the monotony of straw. 1

Inhabitants. — No well-founded estimate exists as to the number of inhabitants within the Moorish Empire, and the suggestions

'The botany of Morocco has been explored by Balansa (1867), Hooker, Ball and Maw (1871), Rein and Fritsch (1873), Ibrahim Ammeribt (a Berber collector, 1873, 1876), the Rabbi Mardochee Abi Serur (1872-1873) ; and the results have been systematically arranged in Cosson's Compendium florae atlanticae : ou Flore des Stats barbaresques (Paris, 1881, &c). .

vary between five and ten millions. The majority of the inhabitants are pastoral and agricultural in their pursuits; but while large stretches of country are inhabited sparsely or not at all, other parts, especially along the Atlas slopes, are closely-dotted with considerable villages whose hardy occupants cultivate every foot of level surface which it is possible to till and irrigate. Three races inhabit Morocco, and the members of two others are continually being introduced. The most numerous and important are the aboriginal Berbers (q.v.) — known locally also as Amazigb — who inhabit the mountainous districts, and whose blood to a greater

or less extent permeates the whole population. These were the people who thrice conquered Spain — once from the Visigoths, and twice from their less stalwart co-religionists. It has been its constant reinforce- ment by this Berber element that has maintained the indepen- dence of Morocco alone among the countries of North Africa. The plains are for the most part occupied by Arabs (q.v.), intro- duced in the nth and 12th centuries, long after the so-called ″ Arab invasion ″ of the 7th century, which would have left few traces but for the Moslem missionaries who came after them. A large number of the plainsmen are, however, composite Arabicized Berbers, known to foreigners as ″ Moors ″ (q.v.), to which division also the mixed race of the towns belongs. Arabs are never found in the mountains save as religious teachers or authorities, but only a small proportion of them continue nomadic.

The third race which may be considered native is the Jewish, consisting of two distinct sections: those settled among the Berbers from time immemorial, speaking their language, and in addition a hideously corrupt Arabic; and those, expelled from Europe within comparatively modern times, who have got little farther than the ports, where they speak Spanish with the addition of Arabic. These latter are the most progressive and flourishing of all the inhabitants of Morocco, and in their hands is much of the foreign trade. It is a remarkable fact that several of the so-called Berber tribes are believed to have been of Jewish origin, having embraced Islam on the coming of Mulai Idrls. To these white races constant additions of a negro element are being added by the slave-trade with the western Sudan, while inter-marriages between negro and Arab or Berber have produced a proportion of mulattos.

The last class consists of the small colonies of Europeans settled at the ports, for the most part engaged in trade. The largest of these colonies, in this case principally Spanish, is found in Tangier. All such foreigners are under the local jurisdiction of their own consular courts. They possess more- over the right of claiming the protection of their

authorities for natives entrusted with their interests, without which, in the absence of justice, commerce with the interior would be impossible.

Language. — The language of Morocco is Berber, of which several dialects are spoken, notably that of the Rif, towards Algeria, and the Shilha of central Morocco and the Sus. Of these very little is known ; but they do not essentially differ from one another or from those of Algeria, notwithstanding considerable variations of pronunciation and a varying proportion of Arabic or other admixtures, there being no written standard to maintain. On the plains and coast of central Morocco, however, Arabic has superseded Berber, as the language of creed and court. Since the 15th century, when Ibn Khaldun found the Arabic of Morocco very corrupt, it has made great strides, and having always been a foreign tongue with the Koran as its model, it has escaped many of the faults into which Eastern Arabic outside Arabia has fallen. This is especially notice- able in the correct Arab value given to the alphabet and in the strictly classical use of many terms, especially among the litterati of Fez.

Provinces and Towns. — Political divisions can hardly be said to exist in the Moorish Empire to-day, although it is formed of what were at one time or other the independent kingdoms of Fez and Marrakesh, and the important provinces of Sus, Tafilalt and `the Rif, together with the Saharan oases. As administrative units the various subdivisions change according to the relative strength of tribesmen and government. Central Morocco, between the two spurs of the Atlas ending towards Rabat and at Cape Ghir, is, however, naturally parcelled out by its rivers into the districts of Tamsna, Sha-wlya, Dukalla, Abda, Shiadhma and Haha, running from north to south along the coast, and Sraghna and Rahamna lying inland from the last three.

There are only three great inland cities, each of which in turn serves as metropolis: Fez, Mequinez and Marrakesh. The towns next in importance are the seaports of Tangier, Casablanca (Dar el Baida), Mogador, Mazagan, Saffi, Salli-Rabat, Laraish and Tetuan. All these places are separately noticed. The ports of Agadir Ighir, Azammur and Azila being closed to trade, are in a decayed condition. On the Mediterranean shore, along the coast of Er-Rit, the Spaniards have for centuries possessed Ceuta, Penon de Velez, Alhucemas and Melilla; in 1848 they appropriated the Chaffarinas Islands. Inland, besides the three cities named, are the sacred towns of Mulai Idris, Zarhon, Sheshawan and Wazzan (the last-named of which alone is open to Europeans), and the minor towns of Al Kasar, Sifru, Taza, Dibdu and Ujda in northern Morocco (once the kingdom of Fez) ; Damnat, El Kla, Sidi Rahal, Zettat and Amzmiz in central Morocco (once the kingdom of Marrakesh); Tarudant, High, Tiznit and Glimin in southern Morocco (once the kingdom of Sus.)

The town of Mulai Idris Zarhon lies to the north of Mequinez. James Jackson, who in 1 801 managed to pay a hurried visit, is the only European known to have entered its gates. It is a place of apparently 1500 to 2000 inhabitants, compact, and with several large buildings, the principal of which is the shrine of Mulai Idris, the founder of the Moorish Empire, round which the place has grown. Wazzan is the seat of a sharif or noble descended from Mulai Idris, whose family has been greatly reverenced for over two hundred years. It was built by Mulai Abd Allah es-Sharif (d. 1675), and is open to European visitors, which Sheshawan (or Shefshawan), another sacred city of sharifs, founded in 1471, a day's ride into the mountains south of Tetuan, is not. Sifru is picturesquely situated amidst gardens, a short day's ride from Fez. Taza is a considerable trading centre on the route between Fez and the Algerian frontier. The population, in Leo's time 20,000, is now 5000, of whom 800 are Jews. Dibdu, to the east of Taza, is a small but important Jewish centre. About 120 m. east of Taza, and only 10 from

the frontier, is Ujda (Oudjda of the French), in the midst of an orange grove. Marrakesh is the only really large city of central Morocco. Damnat is a walled town of magnificent situation in the Atlas, east of Marra- kesh, between which and the Um er-Rabi'a are the less important Sidi Rahal and El Kla. Amzmiz lies in the Atlas, south-west of Marrakesh. Tarudant, the capital of Sus, is situated between the Atlas and the river Sus; it is a place of from 30,000 to 40,000 inhabitants, already a flourishing town in the 12th century, rebuilt by the Sa'adi Dynasty early in the 16th, and refortified by El Hasan IV. in 1882. Tiznit, which lies to the south, until then but a village, was in 1882 converted into a town by El Hasan IV., and walled. High (1300 ft.) above a stream which joins the Massa, is the chief town of Tazirwalt, the state of Sidi Hisham, an independent princi- pality founded by Sidi Ahmed ii Musa; and Glimin or Agelmin, in like manner is the chief town of the Wad Nun district. Tagaost, about 40 m. inland from Ifni, was formerly a large city, and in the 1 6th century the seat of a Spanish factory trading in archil.

Communications.— Regular and fairly frequent steamship services link Morocco with the principal ports of the world, though in some instances transshipment at Gibraltar is necessary. The tourist traffic has grown greatly since the last quarter of the 19th century. Great Britain, Spain, France and Germany have postal agencies, running competing courier mails along the coast and to the capitals, while Great Britain, France and Spain have laid telegraphic cables from Gibraltar, Oran and Tarifa respectively to Tangier; but the extension of wires inland, save for telephones and electric light, was prohibited up to 1909. A railway about 24 m. long, connecting Casablanca and Ber Reshid, was opened in September 1908. This was the first line built in Morocco. There is also a railway from Melilla to some neighbouring mines. In general travelling in the interior is what it was a thousand years ago. There being practically no made roads and few bridges, vehicular traffic is out of the question,

and even the transport of goods and persons on the backs of animals lacks the facilities provided in some Eastern lands — as Persia, for instance — in regular posting stations and caravanserais, here known as fandaks. Travellers have therefore to carry tents and all con veniences desired. Throughout the central Moroccan plains it is generally perfectly safe to travel unguarded, but in mountainous districts it is customary to be accompanied by a mounted policeman (makhazni) whose duty is as much to pievent travellers attempting exploration as to afford them protection.

Resources of the Country. — The natural products of the country remain almost entirely undeveloped. In applications for conces- sions for mining and other exploitation, the government has seen the possibility of further complications with Europe: so that if, by whole- sale bribery, any grant was obtained a nullifying clause was inserted, or the first occasion seized to raise anew insuperable obstacles. After the conference at Algeciras in 1906, however, the government was obliged to grant various concessions. The breeding of horses or cattle and the rearing of birds for European markets increase in spite of restriction and heavy dues. One of the most promising of recent developments has been the growing supply of chickens, eggs, and fruit to Europe — even to England. The fisheries also are capable of great expansion, and are at present almost entirely in the hands of Portuguese and Spaniards.

Agriculture. — It is still true, as in the time of Addison, that the

Moors ” seldom reap more than will bring the year about,” and the failure of a single harvest causes inevitable dearth. Only a small part of the available land is cultivated; and the cultivated portion possessed by each tribe is divided into three parts, one only of which is sown each year. With a plough of the most primitive description the Moorish peasant scarcely scratches the surface of the soil; his harrow is a few branches of trees

weighted with heavy stones. The corn is cut close to the ear with short serrated sickles, and the straw is left standing. Underground granaries or matmoras are excavated beneath the tufaceous crust which covers much of the lowlands, sometimes capable of holding 2000 quarters; they preserve their contents in good condition for many years.

Mineral Wealth. — That mineral deposits of great value exist in Morocco there is little doubt. At Jebel Hadid or the Iron Mountain, in Abda, disused mines may still be visited, and in Sus iron has long been worked. In the Bern Madan hills near Tetuan are mines, closed, it is said, by the sultan 'Abd er-Rahman; but whether they furnished copper or lead authorities differ. On the road to Kenatsa, Rohlfs saw lead and antimony worked. Antimony especially seems to be abundant to the south of the Atlas; Rohlfs found it in a very pure state near Tesna, and Dr Allen saw splendid veins of it north of the Dra'a. That goid existed in Sus was long suspected; Gatell proved it. Rock-salt occurs in the mountains north of Fez, in the valley of the W. Martil, and probably in Jebel Zarhon. In several places, as in the route from Saffi to Morocco, are brine lakes, from which the salt is collected and exported as far as Central Africa.

Manufactures. — The manufactures are few, and the most famous — leather — is now either exported undressed to Marseilles or Phila- delphia, or is counterfeited by machinery in London or Paris. With the exception of slippers and shawls supplied to Moors established in the Levant, manufactured exports consist principally of carpets, rugs, trays, arms and " curios " for decorative purposes. . For home use the Moors do much spinning, weaving, and dyeing, chiefly of wool ; but although it is possible to dress superbly in native-made articles, every year sees an increasing importation of Manchester and Yorkshire goods, rivalled by the cheaper products of Barcelona and Austria — in the iast case with great success.

Commerce. — The external trade of Morocco is mainly

with Great Britain, France, Germany and Spain. The proportion of trade taken by Britain, formerly fully 50 % of the whole, had decreased in 1905 to 32 %, in which year France's share was 39 %, that of Germany nearly 12 % and that of Spain 5 %. Statistics as to its value are difficult to obtain, and not altogether trustworthy; the British consul at Tangier, writing in 1906, declared : " No information is to be obtained from the Moorish custom-houses and no statistics whatever are published by the Moorish government." From such sources as were available the exports in 1873 (a year of phenomenally good crops) were valued at about £1,500,000 and the imports at £934,000. Twenty years later (1903) the exports were valued at £1,601,000 and the imports at £2,656,000. A British consular return gave the value of the trade in 1906 as: Exports £1,756,109, imports £2,976,900. According to French official returns the value of trade fell in 1907 to £3,200,000, but had risen in 1908 to £4,400,000. This includes the trade through the eight open Moroccan ports (Tangier, Tetuan, Laraish, Rabat, Casablanca, Mazagan, Saffi and Mogador), the trade through Melilla, and that by the land frontier with Algeria. The trade with Algeria is valued at from £300,000 to -£500,000 a year. Statistics as to the considerable trade done by caravans crossing the Sahara are entirely lacking.

The chief articles of exports are skins and hides, sheep, oxen and goats, wool, barley, eggs, beeswax, almonds and slippers. Maize, peas and chick-peas are also considerable exports in years of good crops. Cotton goods form the chief articles of import (exceeding £800,000 in value in 1906), sugar, tea, flour and semolina coming next. Other imports include cloth, candles, iron and hardware, wines and spirits. Wheat and oxen are imported overland from Algeria.

Finance. — The only part of the revenue which can be estimated with any degree of accuracy are the customs, which during the early years of the 20th century yielded about £500,000 per annum. Under the provisions of the act of Algeciras the Morocco State

Bank was established in 1907. It is a limited liability company and subject to the law of France. The capital of the bank is £800,000 and the head office is at Tangier. The directors represent the various groups subscribing the capital, French financiers contributing a share twice as large as that of any other group in return for the relinquishment of the right of France to take up all new loans at the rate of the lowest tender. The bank holds a concession from the state for forty years, and acts as its treasurer and financial agent. It alone has the power of issuing notes. A Moorish high commis- sioner and four censors (representing the Bank of England, the Bank of France, the Bank of Spain and the German Imperial Bank) watch over the working of the bank. In all legal disputes in which the bank is concerned the Federal Court at Lausanne is the final authority. There is a Moorish coinage based on that of the Latin Union; Spanish money is also legal tender.

Moorish weights and measures vary from town to town, but in the foreign trade the decimal system has almost entirely superseded the native chaos. Credit is allowed by European houses at their peril, and in some lines profits are cut ruinously fine or done away

with altogether by dishonest practices, many arising out of the long credit in vogue.

Government. — The Moorish government is a limited autocracy, the theoretically absolute power of the sultan being greatly circumscribed by the religious influences which in a measure support him, and by the official proletariat with which he is surrounded. The central government is known as the maghzen or makhzan (an Arabic word primarily meaning storehouse), a term also applied to the whole administrative body and collectively to the privileged tribes from whose ranks the state

officials are recruited. At the head of the administration are wazirs or ministers of state, who possess no power independent of the sultan's will. The wazirs in general accompany the court, but the minister for foreign affairs is stationed at Tangier. Local administration is directed by the governors of provinces and towns, who are nominated by the wazir ed dakhaldni (minister of the interior). The subordinate town officials are appointed by the governor, and sheiks direct the affairs of the villages. All appointments are practically without pay, office holders being expected to obtain remuneration from " presents," i.e. bribes and extortion. Attached to the government service are a number of tribes (called maghzen tribes), who furnish the sultan's body-guard, garrison certain towns, and perform other duties in return for exemption from taxation. There was no regular assessment for taxation, but such organized spoliation as might be required for public or private ends. That part of the empire where the sultan's authority is supreme is known as Mad el-maghzen (government country); those regions where the sultan's authority is precarious are called blad es-siba (the unsubmissive country).

All the powers are represented in Tangier by diplomatic and consular officials, whose independent jurisdiction over their respective fellow-subjects leads to the frequent confusion of justice. The evidence of non-Mahommedans is not accepted in Moorish courts, where venality reigns, and unprotected Jews suffer constant injustice, besides daily indignities, for which they repay themselves by superior astuteness.

Army. — A half-organized army — service in which is partly hered- itary, partly forced — is periodically employed in collecting taxes at sword-point, and in " eating up " the provinces; with it the custom is (or was) for the sultan to go forth to war each summer, spending the winter in one of his capitals. The only approach to a regular army consists of certain hereditary troops furnished by the maghzen tribes, the Bokhara (black), the Udaia (mulatto),

the Ashragah and Ashrardah (white), and the Gaish, who form a body of police, Makhhaznia (mixed), all of whom are horsemen. The infantry (Askaria) are mostly rough levies; only a small portion being well trained under European officers. No accurate estimate can be formed of the total available forces, and the arms are of every pattern. There is no navy, but the government possesses several small steamers, one or two mounting guns.

Religion. — The religion of Morocco is Islam, the Moors being among the strictest followers of Mahomet. The divisions of the East are unknown, and their tenets include the principal teachings of both Shias and Sunnis, but, as employing the Maleki ritual, they must be classed with the latter. Recognizing their own sultan as Amir el Mu'minin (" Commander of the Faithful ") and Khalifa of God on earth, they acknowledge no other claimant to that position, and have few dealings with the Turks, whom they consider corrupt. They have not yet given way extensively to strong drink.

Missions. — The Franciscans for six and a half centuries did brave work in the country, since the founder of their order offered himself for that task in 1214, and many of them, including several British and Irish missionaries, suffered martyrdom; but they have long abandoned attempts to convert the Moors. The London Jewish Society was established in Mogador in 1875, and since 1883 various Protestant agencies support a considerable number of missionaries, men and women, including doctors anfl nurses.

Education. — The level of education could hardly be lower, although most males have an opportunity of learning to recite or read the Koran, if not to write. Only traders trouble about arithmetic. Youths who desire to pursue their studies attend colleges in Fez or elsewhere to acquire some knowledge of Mahommedan theology, logic, composition and jurisprudence.

Literature and Travel. — Journalism is entirely foreign, and was introduced in 1883, at the same

time as the printing-press, Spanish, French and English newspapers being established in quick succession. The sultan el Hasan III. set up a lithographic establishment in Fez, from which a valuable series of Arabic theological, legal and historical works have been issued, but most noteworthy of all is the publication in Cairo in 1895 of an Arabic history of Morocco, in four volumes, by

a native of Salli, Ahmad bin Khalid en-Nasiri. A most practical step was taken by the French, on the conclusion of the agreement with Great Britain in 1904, in the establishment of a state-subventioned Mission scientifique au Maroc, which, in addition to establishing at Tangier the only public library in the empire, engaged a number of able students in research work, the results of which are embodied in the periodical publications Archives marocaines (6 vols., 1904-1906) and L'Afrique francaise.

Other forward steps have been taken in the production of several important volumes on the country and in serious attempts to explore the Atlas. The vicomte de Foucauld attained the first place by his intrepid journeys as a Jew through the forbidden regions and by his workman-like geographical records; Joseph Thomson did good work in the Great Atlas, though within a limited area; the vicomte de la Martiniere excavated some of the Roman remains; Mr Walter B. Harris made a bold journey to Tafilalt ; and the marquis de Segonzac and Louis Gentil added to the knowledge of the Atlas by interesting expeditions. 1 A hydrographic mission under A. H. Dy6 also did valuable work (1905-1909). An equally important service was ren- dered by the compilation by Sir R. Lambert Playfair and Dr Robert Brown of an invaluable Bibliography of Morocco to the end of i8qi (1893), containing over two thousand entries.

History. — The prehistoric antiquities of Morocco are of considerable interest. In the cave at Cape Spartel Tissot found regularly shaped arrow-heads, and in the north of the country he met with dolmens,

barrows and cromlechs, just as in Algeria or Tunisia. The dolmens usually form a trapezium, and the body seems to have been buried with the knees drawn up to the chin. At M'zorah, a quaint little village of widely- scattered houses built of rough blocks of yellow soft sandstone, about 8 or 10 m. south-east from Azila, stands a group of mega-lithic monuments of some interest. They have been visited and described by many travellers, but Watson's account is the most detailed. Round the base of a mound (15 ft. high) of yellow sandstone lies a circle of sixty-seven large stones, one of which (at the west side) is more than 20 ft. high. In the vicinity are several other groups, some of still larger blocks. Roman roads (see Africa, Roman) seem to have run from Tan- gier southwards to the neighbourhood of Mequinez (Miknasa) , and from Azila to the south of Rabat; and Roman sites are in several instances marked by considerable remains of masonry. At Kasar Fara'on (Pharaoh's Castle), on the western slope of J. Zarhon, are the ruins of Volubilis. The enceinte, constructed of large stones and flanked by round towers, is 12,000 ft. in extent. Four gates are still recognizable, and a triumphal arch erected in a.d. 216 in honour of Caracalla and Julia Domna. The stones of this site have been used for Mequinez Miknas. Banasa (Colonia Aelia, originally Valentia) is identified with the ruins of Sidi Ali Bu Jenun, and Thamusida with those of Sidi Ali b. Hamed. At Shammish, up the river from Laraish, the city of Lixus (Trinx of Strabo) has splendid specimens of Punic and Roman stonework, and the similar remains on the headland of Mulai Bu Selham probably belong to the Mudelacha of Polybius. Of early Moorish architecture good examples are comparatively few and badly preserved. Besides those in Fas, Miknas, and Marrakesh, it is sufficient to mention the mausoleum of the Beni-Marin (13th to 16th centuries) at Sheila, which, with the adjoining mosque, is roofless and ruined, but possesses a number of funeral inscriptions.

The earliest records touching on Morocco are those of Hanno's Periplus, which mentions that

Carthaginian colonies were planted along the coast. The savage and inhospitable tribes with whom they came in contact included cave-dwellers; but megalithic remains point to a yet earlier race. It is not till the last century B.C. that Moroccan Berbers are found supplying troops to Pompey or Sertorius, and later, under Augustus, becoming themselves incorporated in the Roman province of Maure- tania (q.v., and also Africa, Roman). But the Roman province reached only to the Bu Ragrag, on which Sala, now Salli, was its outpost; Volubilis, near Mequinez, being its principal, if not its only, inland city. In the fifth century a.d. the country became subject to the Vandals and, about 618, to the Goths.

1 Gentil, in La Giographie, No. 3 (1908), describes the Siroua region, which, N.N.W. of Tikirt, connects the Anti Atlas and the High Atlas. The Siroua volcano compares with the finest volcanoes of Europe.

The coming of the Arabs under `Oqba (`Okba) in 682 was of

far greater moment, though it was not till twenty years later

that his successor, Musa ibn Nosair, undertook a

/ * „f a _ successful expedition as far as Tafilalt and the Dra'a. Invasion, *". . .

682-710. The force of ten thousand Arabs and Egyptians with whom Tariq (Tarik) ibn Zaid held the Tangier district in 710 was trebled by the enrolment of the Berbers, who enabled him next year to invade Spain, burning his boats behind him (see Caliphate, § C. Abbasids). But the Moroc- can Berbers chafed beneath the Arab rule, and in 739 successfully revolted, setting up their first independent ruler, Maisara. Their kinsmen in Spain followed suit with

equal success, and though subdued for a time, they retained their independence in certain parts till the nth century, when, as masters of Granada, they subjugated their implacable foes, the Arabs; and finally, under the Murabti and Muwahhadi dynasties, conquered all Mahommedan Spain.

The recorded history of the Moorish Empire commences with the settlement near the Roman ruins of Volubilis in a.d. 788 of Idris the elder (Idrls b. Abdallah), one of the fugitive Dynasties, descendants of Mahomet during the struggles between rival claimants of the caliphate. Islam had then been established in these parts for eighty years, but Idris and his son, Idris II., the builder of Fez, extended its influence, uniting the Berbers into a kingdom. Their line controlled a limited portion of northern Morocco for nearly two centuries, in part supplanted by the Miknasa in 922, until displaced by the Maghrawa in 988. These two dynasties were exterminated in 1 06 1 by Yusef I. (bin Tashfln), founder of the Murabti dynasty of Berbers (Almoravides), who added the remainder of Morocco, most of Spain and Portugal, and Tlemcen. Their principal existing monument is the city of Marrakesh. In 1149 the Murabti power was overthrown by another religious leader, `Abd elMuminat the head of the Muwahhadi — i.e. ″ Unitarian ″ — horde (Almohades), under whom the Moorish Empire reached its zenith at the close of the 12th century. It then included, in addition te the Murabti realm, what now are Algeria, Tunisia and Tripoli, extending to the frontier of Egypt, which they were prevented from occupying by the rise of Saladin. Before the middle of the 13th century they had been driven out of Spain, and had lost all but what is now known as Morocco, whence, between 121 7 and 1269, they were ousted by the Beni Marin (Marinides). To them we owe the Giralda, Hasan and Kutublya towers of Seville, Rabat and Marrakesh respectively, the Torre de Oro at Seville, Gibraltar Castle, and the towns of Rabat and Al kasar. It was under their rule that Francis of Assisi despatched to Morocco the first Christian missionaries of modern times. (See Almoravides and

Almohades.)

The new dynasty differed from the two which had preceded it in being frankly part of a Berber tribe, the Zenata, who carved out a kingdom for themselves. Having assisted Beni Marin j ne Murabtis and Muwafrhadis respectively at the 1213-1524. battles of El Arcos (1195) and Las Navas (1212), the defection of their amir on that occasion offered an opportunity for Abd-el-Hakk, the son of their general, to attempt the overthrow of the reigning house. At first the Beni Marin professed allegiance to Tunis, where the Hafsis, a branch of the Muwahhadis, had thrown off the Moorish yoke and secured acknowledgement in northern Morocco and parts of Spain. But they were soon in a position to proclaim complete independence, and by the time that Abu Bakr, the third son of Abd-el-Hakk to succeed him, died, in 1258, they held sway over all that is now known as Morocco, and 1269 saw the death of the last Muwahhadi prince.

On the death of Abu Bakr there succeeded Yakub II., one of the few amirs of Morocco who have left a name for just adminis- tration and for philanthropic undertakings. Although of strict religious habits, he displayed no bigotry, studying philosophy, and entering into friendly intercourse with Europeans, whom he encouraged to trade with Salli. In 1261, 1275 and 1277- 1279, he undertook successful expeditions to Spain, and again in ■1284, this time, in alliance with Alphonso of Leon, against his

rebel son Sancho. But Alphonso dying during the struggle, Yakub found himself master of his country, and Sancho had to acknowledge his suzerainty. All Mahommedans within his realm were freed from all taxes, and all the Arabic manu- scripts of the country — thirteen loads — were despatched to the college Yakub had built in Fez.

But Yakub did not live to reap the benefits of his conquest, which were enjoyed by his son, Yusef IV. (1286), who was courted by his father's old foes, entering into amicable relations with Tunis, Egypt,

Arabia and the neighbouring European states. With the contemporaneous Beni Zeiyan dynasty of Tlemcen, sworn foes of his house, however, he was still at war when stabbed (1307) in the new town of Tlemfen, which he had built while conducting a siege of the old town. A second siege was begun in 1335, and Tlemcen fell in 1337 to the fourth ruler of the dynasty, Ali V., Abu `1 Hasan, better known as ” The Black Sultan.” Unsuccessful in his invasion of Spain and Tunisia, Ali had eventually to abdicate in 13 51 in favour of hi? rebel son, the famous ” Abu Ainan,” Faris I., who during a short reign recovered Algeria and Tunisia.

The Beni Marin were soon driven back, till a few years later Tlemcen alone remained to them, and this they held only till !3S9 (see Tlemsen). Thereafter their empire became habit- ually divided between rival claimants, and the Portuguese began to obtain footholds on the coast, Ceuta being lost to them in 141 5, Al Kasar in 1458, and Azila and Tangier in 1471.

On the failure of the Beni Marin the amirate was seized by Sa’id III., ” El Wattas,” head of another branch, founder of the short-lived Wattasi dynasty. His reign is memor- Wa((Ssi able as that in which the ” Catholic Princes ” Dynasty, expelled his co-religionists from Spain, the last t471 ` lS48 ` amir of Granada and many others taking refuge in Morocco, where in 1492 they built for themselves Tetuan. His son, Mahomet VIII., surnamed ” the Portuguese,” because so long a prisoner of that people, had to suffer the loss to Portugal of practically all his Atlantic ports but Salli-Rabat, and of Pefion de Velez to Spain, which had a few years previously captured Melilla. Although two more reigns carried the dynasty down to 1550, it has barely left its mark upon the country. From the beginning of the new century a rising power had been making itself felt in the south, over which the Wattasis never held sway.

The family of sharifs or ” nobles ” — that is, descendants of Mahomet — popularly known as the

Sa'adi or Hasani (Hosaini), settled in the Dra'a district, but originally came from sa'adi Yanboa, near Medina. Their opportune religious Dynasty, leadership rallied the disjointed members of the tS24 ~ 1668 - empire for a jehad against the Portuguese, but ultimately, on the death of Mahomet VIII., when in possession of the kingdom of Marrakesh, the sharifs defeated his successor and arranged a formal division of the country at the Um er-Rabi'a. At the head of the movement were then the two sons of the sharif who had started it, Ahmed III. and Mahomet IX., between whom rivalry broke out, resulting in the success of the latter, who by 1550 found himself the master of the whole empire on carrying off the last Wattasi amir Mahomet and espousing his daughter.

On the assassination of Mahomet IX. in 1557, the succession passed by a previous agreement to his brother's son, 'Abd-Allah IV., who secured himself against the possible rivalry of his brothers by putting ten of the twelve to death. One of the survivors, however, Abd-el-Malek I., deposed Abd-Allah's son, Mahomet XL, whose appeal to Sebastian of Portugal for assis- tance, brought about the celebrated " battle of the three kings," in which they all perished in 1578 near Al Kasar. This opened the way to the most famous of his line, Ahmed IV., Ed-Dhahebi, or " the Golden," who proclaimed himself caliph, the last (nominal) Abbasid holder of that office having been superseded by the Turks on their conquest of Egypt in 1517. He entered into friendly relations with Queen Elizabeth and other European potentates, and the oases of Tuat, &c, were added to his domin- ions, which embraced also Timbuktu, whence came gold and tobacco. Ahmed fell a victim of the plague in 1603, and the

succession was disputed by three of his sons. In 1608 one of them, Zldan, became supreme and reigned twenty years. To subdue rebellions Zldan twice

obtained the assistance of English troops from Charles I., and, like his father, employed large numbers of European artificers in the various palaces he built or completed. The two sons who succeeded him had both become drunkards from intercourse with these foreigners, but a third, Mahomet XIII., called from prison to reign in 1636, proved himself a wise and beneficent ruler. But his friendship for Europeans displeased the more fanatical among his subjects, and after a futile attempt on the part of a central Moroccan ” saint ” of great reputation to oust him, and the ” Christians ” on the coast as well, another family of sharifs was invited from Tafilalt to undertake the task, and by 1649 they were masters of Fez.

Before tracing the history of the Filali dynasty, which still holds its own, it will be convenient to refer briefly to the relations European w hich subsisted then (17th century) and for many Relations years afterwards, apart from wars with Spain and w”* Portugal, between the Moors and Europeans. From

Morocco. ^ ear iy p art Q f (.jjg. I3t ij cen tury there are records

of Christian mercenaries and others in the Moorish service, while intermittent trading expeditions had already brought the principal European ports of the Mediterranean into touch with Morocco. The settlement of European traders in Moorish ports does not appear to have commenced till later; but it soon became an important factor, for the Moors have always appreciated the advantages of foreign commerce, and thus the way was opened up for diplomatic intercourse and treaty privileges. Even while their rovers were scouring the seas and making slaves of the foreigners captured, foreign merchants were encouraged to trade among them under guarantees and safe-conducts. Thus originated all the rights enjoyed by foreigners in Morocco to-day, as subsequently confirmed by treaties. France was the first to appoint a consul to Morocco, in 1577, Great Britain only doing so a century later. For centuries the treatment of foreign envoys in Morocco was most

humiliating, the presents they brought being regarded in the light of tribute. It was not till the year 1900 that the custom was abolished of mounted sultans under umbrellas receiving ambassadors on foot and bareheaded.

While, from the European point of view, the pirates of the Barbary coast were a bloodthirsty set of robbers, in no way

to be distinguished from the sweepings of Western Rovers. civilization who scoured the seas farther east, from

the standpoint of the Moors they were the pious religious warriors for the faith, who had volunteered to punish the Nazarenes for rejecting Mahomet, and it is difficult to realize the honour in which their memory is held save by comparison with that of the Crusaders, in which the positions were exactly reversed. The Moorish rovers approached as nearly to an organized navy as anything the country ever possessed, and at times they were fitted out by the state, to whom their prizes therefore belonged. They made descents on the opposite coasts, even as far as Devon and Cornwall, carrying off the population of whole hamlets.

Salli, Ma' mora (Mehediya), Laraish, Tangier, Ceuta, Tetuan, and Badis were their principal rendezvous in Morocco, and their vessels, an assortment of almost every known build and rig of the day, varied greatly in numbers and size. It is probable, however, that contemporary writers greatly over-estimated their importance. They appear to have flourished chiefly throughout the 16th, 17th and 18th centuries, and to have attained the zenith of their power during the latter part of the 17 th century. A great impetus was given to their raids by the expulsion of the Moors from Spain in 1610, and their operations were facilitated later by the recovery of most of the Moorish ports from foreign hands. The varying influence of the different European states could be gauged at first by the prices they were compelled to pay to ransom their captive subjects, and later by

the annual tribute which they were willing to present to protect their vessels. Some countries continued the payment

well into the 19th century, although the slavery of Christians in Morocco had been abolished by treaty in 1814.

During the time that piracy flourished hundreds of thousands of foreigners suffered captivity, torture and death in Morocco rather than abjure their faith, the one condition on which a measure of freedom within Morocco slaves'.'' was offered to them. The horrors of that time were keenly felt in Christendom, and collections were constantly made at church doors for the ransom of Moorish captives. Frequent expeditions for that purpose were undertaken by members of religious brotherhoods, not a few of whom themselves became martyrs. The lot of the European slave was infinitely worse than that of the negro who indifferently embraced Islam, and was at once admitted to equality in all points save freedom. They were principally employed on public works or in galleys under the task-master's lash, both men and women being sub- jected to every indignity.

The record of the Filali dynasty may now be considered. The first of this line proclaimed infFez was Mahomet fhsu XIV., but the first of European fame was his brother, Dynasty, Rashid II., " The Great Tafilatta," as he was styled < /W9 --> by the English, who then occupied Tangier, sultan from 1664 to 1672. With him opened a terrible epoch of bloodshed and cruelty, only once revived since — during the short reign of El Yazld (1790-1792) — the horrors of which for both natives and Europeans, are often indescribable. It reached its climax under his brother Isma'Il. A man of wonderful vitality, his reign lasted 55 years (1672-1727), during which his fierce grasp never relaxed. Many hundreds of sons and countless daughters were born to him in a harem rivalling that of Solomon, for which he even asked a daughter of Louis XIV. Having, as he supposed, driven the English from Tangier, he laid unsuc-

cessful siege to Ceuta for 26 years, but otherwise his military measures were confined to subduing internal enemies, in which he was supported by his faithful black troops, the Bokharis, and also by a foreign legion of renegades.

For 30 years after Isma'il's death one son after another was set up by the Bokharis, seven succeeding — some of them more than once— till one, Abd-Allah V., who partook of his father's bloodthirsty nature, ended his sixth turn of power in 1757. Then, at last, this dynasty provided a beneficent sovereign in the person of his son, Mahomet XVI., during whose reign of 33 years the land prospered. By him Mogador was built and Mazagan, the last hold of the Portuguese, recovered. He was followed by the wretch Yazld, his son by an English or Irish woman, whose reign was fortunately cut short while contending with four rival brothers, two of whom in turn succeeded him, the second, Sulaiman II., proving as wise a ruler as his father. Under his reign (1795-1822) piracy was abolished, but the policy, maintained till the end of the century, of having as little as possible to do with foreigners was initiated.

By Sulaiman's direction the imperial umbrella passed to his nephew, Abd-er-Rahman II., on whom he could rely to maintain his policy. Although disposed to promote foreign trade, he made a futile attempt in 1828 to revive piracy, which the Austrians frustrated by reprisals next year. Following this was the war of 1830 with France over the partition of Algeria, as a result of which the Moors renounced all claim to Tlemcen and entered into agreements the infraction of which led to a second war between the two in 1844, during which Tangier and Mogador were bombarded. A bombardment of Salli in 185 1 secured for the French the settlement of various claims, and when Abd-er-Rahman died, in 1859, the Spaniards were threatening Tetuan.

War being declared, the Spaniards marched on the town, which they captured after two months, and held till peace was signed six months later on their own

terms. The vanquished sultan, Mahomet XVII., reigned till his death in 1873, when his son, El Hasan III., succeeded, having the usual fight to secure the supremacy. In comparison with his predecessors El Hasan was mild and gentle, too much so to maintain continual

peace among the more turbulent of his subjects. From early in the century Sus had practically maintained independence, but in 1882 was reduced to submission, as also were subsequently the other great Berber centres, one by one, till the land had rest. Fighting between the Riflans and Spaniards in 1894 having involved the sultan in the payment of some £650,000 indemnity, he was on his way to recover this from the culprits when he died in camp and was interred at Rabat.

El-Hasan's death was kept secret till the coffin reached its destination, so that a peaceful proclamation was secured for ` Abd-el-`Aziz IV., his son by a Circassian slave who The Reign p OSSesse ^ great influence over him. His trusted °A*blY.' chamberlain, Si Ahmed ben Musa, became Wazir regent, and put down all opposition, ruling with a firm, wise hand till 1900, when he died just as his ward attained his majority. Drastic changes thereon took place, and a new set of ministers came into power. The young sultan now showed himself desirous of acquiring and practising foreign arts and of introducing foreign reforms. Under his mother's advice he sought especially the. friendship and advice of Great Britain, on whose disinterested friendship he believed he could rely. But lack of training and experience frustrated his praiseworthy efforts, and he became the prey of schemers and speculators, who pandered to his worst traits and squandered his treasure.

This turn of affairs aroused the fanaticism of his people, and in 1902 the Berber tribes of the

Algerian frontier rose in rebellion under Jelali Zarhoni, nicknamed ” Bu Hamara,” who claimed to be fighting on behalf of the sultan’s brother Mahomet, already imprisoned in Mequinez for revolt. 1 Unable to subdue the rebellion, which did not, however, affect the rest of the empire, ‘Abd-el-‘Aziz borrowed money from France to reorganize his army, but failed to effect his purpose. Mean- while a local sharif, Mulai Ahmed er-Raisuli, made himself master of the district round Tangier, holding even foreigners to ransom, and creating a false impression abroad as to the general state of the empire.

The end appeared near when by a declaration, signed in London on the 8th of April 1904, Great Britain, in return for concessions in Egypt, agreed not to interfere with French action in Morocco. In this declaration, one of the series of arrangements marking the establishment of the entente cordiale, France declared that she had no intention of changing the political status of Morocco. She designed, however, a system of ” pacific penetration,” and administrative, economic, financial and military reforms— re- forms which the Moorish court did not desire. By a separate con- vention with Spain in October 1904 the interests of that country were safeguarded, and it seemed that the Anglo-French agree- ment had the approval of all the powers. Some weeks before its conclusion its terms had been communicated to Germany, and four days after its signature Count Bulow had stated in the Reichstag that there was no ground to apprehend that German interests (” essentially economic “) in Morocco would be disregarded. During the remaining months of 1904, however, and in the opening months of 1005, the international situation was changed. Germany had viewed with concern the increased influence of France in Europe, but remained quiescent until after the reverses to the Russian arms in Manchuria, when it was judged in Berlin that the time had arrived for Germany to become the arbiter of European policy; and the means to demonstrate her position were found in the Moroccan

question. After having turned a deaf ear to the demands of the Pan- Germanic party for the " vindication " of German rights in Morocco, after in fact nearly a year of acquiescence in the pre- dominant position of France in that country 2 the German

1 Mulai Mahomet, eldest son of El Hasan and a generally popular prince, was released from prison by Abd-el-'Aziz early in 1908 and placed in command of his army. On the defeat of 'Aziz by Mulai Hand, Mahomet contemplated seizing the throne. He was, however, imprisoned by Hafid in the palace at Fez, where he was reported to have died, in mysterious circumstances, in June 1909.

2 Shown inter alia by the landing of 500 Algerian troops at Tangier (a step taken to secure the release of Ion Perdicaris and his stepson, captives of Raisuli), and of a detachment at Rabat.

government now complained of being ignored in the Anglo- French arrangement and proceeded to extend its patronage to 'Abd-el-'Aziz. On the 31st of March 1905 the German emperor landed at Tangier and had conferences with the sultan's repre- sentatives. The emperor was reported to have declared that he had come to enforce the sovereignty of the sultan, the integrity of Morocco, and the equality of commercial and econornic interests. The effect of this intervention was soon apparent. The sultan rejected the scheme of reforms proposed by France, and at the suggestion of Germany issued Tf e . invitations to the powers to meet his representatives conference and advise him concerning the reforms needed. The French foreign minister, M. Delcass6, held that there was no need for a conference, but Prince Biilow used menacing language and after a period of much stress M. Delcasse resigned (June, . 1905), the French government thereupon agreeing to the holding of a conference. So far the German policy had triumphed; the conference met at Algeciras on the 16th of January 1906 and engaged in the delicate task of reconciling French claims for predominance with the German demand of equality for all. The

British delegates gave firm support to their French colleagues, while Austria proved ″ a brilliant second ″ to Germany. With great difficulty a scheme of reforms was elaborated, Germany having previously acknowledged the privileged position of France along the Moroccan-Algerian frontier. The general act embodying the resolutions of the conference was signed on the 7th of April; it was accepted by the sultan on the 18th of June, and the ratifications of the act by the other powers were deposited at the Spanish Foreign Office on the 31st of December 1906. The act provided for a Moorish police force from 2000 to 2500 strong, distributed among the eight open ports of Morocco, to be commanded by Moorish kaids, assisted by French and Spanish instructors and officers, with a Swiss inspector-general— the arrangement to continue for five years. The act provided also for the institution of a state bank (see supra § Finance). Other provisions dealt with (a) the acquisition of land round the ports by foreigners, and the consequent payment by them of the regulated or tertib taxes; (b) the more efficient control of the customs adminis- tration, first by an annual assessment of the average values of all imports as a basis for the tariff during the following year, and, secondly, by a strict supervision of the administration itself; and © the authority of the state over the public services and public works, tenders for which were to be adjudicated impartially without reference to the nationality of the bidder.

Throughout 1906 the country was in a disturbed condition, and while a Franco-Spanish demonstration off Tangier succeeded in obtaining the removal of Raisuli from the governor- ship of the town, various outrages occurred (includ- ffam * ing the murder of a Frenchman in the suburbs of ^aa.″ Tangier) for which no satisfaction could be obtained. At length the murder of Dr. Emile Mauchamp at Marrakesh on the 19th of March 1907 determined the French to take prompt action, and Ujda was occupied (March 29) by Algerian troops, the French government determining to hold the town until satisfaction had been given

to their demands. This satisfaction 'Abd-el-'Aziz promised in May, and some progress was made towards carrying out the Algeciras programme, the state bank being organized in July 1907. Meantime the weakness of the sultan's rule was illustrated in many quarters: near Tangier by the continued activity of Raisuli, that chieftain securing in June another European captive — Sir Harry Maclean, 3 who after over seven months' detention had to be ransomed by the British government for £20,000.

3 Kaid Sir Harry Maclean (b. 1848) after serving in the British army became instructor to the Moorish army, which he accompanied in several expeditions. He was also colonel of the sultan's body- guard. For services rendered to the British government he was made a C.M.G. in 1898 and a K.C.M.G. in 1901. On the occasion of his capture he had gone, as he thought, to receive the submission of Raisuli, and had with him one or two attendants only. The sum paid for his ransom was subsequently refunded — as to £15,000 by Raisuli himself and^the remainder by Mulai Hafid.

At Casablanca at this time works were in progress, with the sanction of the sultan, for improving the harbour. The works were beyond the ramparts, close to the Moslem cemetery; and the neighbouring tribesmen (the Shawia) were excited by reports that the cemetery had been desecrated. On the 30th of July they attacked the European labourers and killed nine of them (three French, three Spaniards, and three Italians), afterwards entering the town and raiding the Jewish quarter. Refugees fled by boat to Tangier with news of the massacre. The French government decided to occupy Casablanca, and a strong naval and military force was sent thither. Before the arrival of the troops the commander of the cruiser " Galilee " landed a party (Aug. 5) to guard the French consulate. The passage of the detachment was opposed, whereupon the " Galil6e," aided by the " Du Chayla " bombarded the town.

Casablanca was at the same time entered by the tribesmen, who began a general ca pillage. On the 7 th the French troops arrived and were landed, and further fighting took place. Before order was restored nearly every inhabitant had been killed or wounded or had fled;' the dead alone numbered thousands. The European colony was, however, saved. Though masters of the town, the French found the Shawia tribes still full of fight, and, first under General Drude and afterwards (Jan. 1908) under General Amade, the French proceeded to the reduction of the Shawia country. At one time the expeditionary force numbered 15,000 men. 1 By June 1908 the district was quiet and there- after the strength of the force was gradually reduced. 2

The action of France at Casablanca aroused the fanaticism of the tribes of Tafllalt and those dwelling near the Algerian border. In November 1907 the Beni Snassen crossed the frontier and were not reduced to submission until after" hard fighting. Another outbreak occurred in April 1908, when a French column in the Guir district, west of Figig was surprised, and had difficulty in beating back the enemy. In that and a subsequent engage- ment, which resulted in the dispersal of the foe in May, the French casualties were over 200. French and Moorish commissioners were then appointed to preserve order along the frontier.

While thus engaged on the eastern frontier and on the Atlantic

coast of Morocco France had given financial and moral support

to `Abd-el-` Aziz, whose position was threatened

`•Abd-li- b y his brother Mulai HaM - 0n the 16th of Au 8 ust •Aziz. 1 9°7j within a fortnight of the bombardment of

Casablanca, the ulema of Marrakesh had declared `Abd-el-` Aziz deposed and Hafid sultan; and from September onwards the tribes round Casablanca

opposing the French were supported by troops sent from Marrakesh. Aziz having been furnished with money by the state bank, he was enabled to reach the seaport of Rabat at the head of his army in September 1907. There he was visited by the French minister and appeared willing to grant all the demands of France in return for help against his brother. A loan was forthcoming but no military assistance save that some of 'Abd-el-' Aziz's troops were taken by a French warship to Mazagan. While desultory fighting between the supporters of the rival brothers was proceeding Hafid was proclaimed sultan at Fez on the 4th of January 1908; Hafid now sought support from France, Germany, and other powers, and moving from Marrakesh passed the French

1 A Spanish force of 600 men was also sent to Casablanca. Throughout the crisis Spain, with some misgiving, co-operated in the actions of France.

2 In September 1908 the German consul at Casablanca gave safe-conduct to six deserters from the Foreign Legion, of whom three were Germans. On the way to embark for Hamburg, and while under guard fiom the German consulate, all six deserters were forcibly arrested by a French patrol. The matter created great excitement both in Germany and France, chiefly from the demand of the German government that France should express regret for the action of its agents before the facts were fully established. A way of escape was found in the formula " the two governments, regretting the events which occurred at Casablanca, . . . refer the matter to arbitration . . . and agree to express regret . . . according to the judgment of the court." The case then went to The Hague Court of Arbitration, which gave its decision in May 1909, substantially in favour of France. In July the French government pardoned the deserters.

lines in the Shawia country, entered Mequinez in May and Fez in June 1908. At length 'Abd-el-' Aziz made an effort to reassert his authority and with a force numbering 4000 he left Rabat in July for Marrakesh. He reached the neighbourhood of that city on the 2nd

of August, having received the adhesion of numerous tribes, including the Shawia. On the 19th he started for the final march on Marrakesh. He appears to have been betrayed, for hardly had his force started when it was assailed on all sides, whereupon the tribesmen deserted in a body and the ″ regulars ″ ran away. The day was irretrievably lost and ‘Abd-el-‘ Aziz sought safety in flight. On the 22nd he arrived at Settat in the Shawia country, and within the French lines, with only a handful of followers. For a short time he talked of continuing the struggle, but ended by accepting a pension from his brother Hafid and was assigned a residence in Tangier. That town, the last in Morocco to acknowledge Hafid, did so on the 23rd of August; the change of sultans being accomplished without any disturbance of public order.

Germany was anxious for the immediate recognition of Hafid and caused some perturbation in France by a circular to the powers to that effect dated the 2nd of September; . the French and Spanish governments replied by sultan. proposals for guarantees that Hafid would respect the Act of Algeciras. This course received general assent and Hafid having’ given the guarantees demanded he was formally recognized as sultan at the beginning of 1909. His relations with Europe were made easier by the conclusion, in February 1909, of a Franco-German agreement designed to avoid all cause of misunderstanding between those powers in Morocco. Germany put on record that her interests in the sultanate were ″ only economic,″ and France agreeing to ″ safeguard economic equality ″ Germany undertook not to impede the political interests of France in the country.

The weakness of the central government was exemplified by the inability of Mulai Hafid to control the Rif tribesmen, who in July 1909 killed a number of European labourers in the neighbourhood of the Spanish fortress of Melilla (q.v.). Spain sent an army of 50,000 men to vindicate its authority. After a severe campaign the Riffians were reduced to submission (Nov. 1909). Though powerless in the Rif,

Mulai Hafid's army succeeded in defeating Bu Hamara's force and in capturing (Aug. 1909) that pretender, otherwise known as el Roghi. 3 Bu Hamara and many of his followers were taken to Fez. The tortures inflicted upon them evoked strong protests from the European powers. In 1910 Mulai Hafid obtained a loan, chiefly from France, of £4,000,000; the greater part of the loan went to liquidate claims by Europeans against the maghzen.

Amirs and Sultans 4 of Morocco I. — Idrisi Dynasty (Arab), A.D. (Capital, Fez.)

788. Idrls I.

791. Rashld (regent).

804. Idrls II.

828. Mahomet I.

836. 'Ali I.

848. Yahya I.

881. Yahya II.

894. 'Ali II.

Yahya III.

904. Yahya IV.

(Interregnum from 917.)

922. El Hasan I. " El Hajjam." (Fez lost to the Miknasa 925.)

935. El Kenniin (at Hajrat en-Nasr).

948. Abu'lAish Ahmed.

954. El Hasan II. (at Basra).

961. 'Abd-AUah I.

970. Mahomet II. (Subjugated by the Maghrawa 985.)

II. — Miknasa Dynasty (Berber). (Capital, Fez.) 925. Musa I. ” Ibn Abd-el- “Aafia.” 938. Madln. 952. Ibrahim I. 973. El Burl. 1014. El Kasem I.

3 For an account of Bu Hamara’s career see Questions diplomat- iques (Oct. 16, 1909). * Title of sultan adopted about 1640. `,

III. — Maghrawa Dynasty (Berber). (Capital, Fez.)

988. Ziri ibn `Atia.

1000. El Muaz.

1026. Hammama.

1039. Dunas.

1060. El Fatuh and `Ajisa. 1065. El Moannasir. 1067. Tamim.

IV. — Murabti Dynasty (Berber). (Capital, Marrakesh.)

1061. Yusef I. (Bin Tashfin.) 1 106. `Alt III.

1 143. Tashfin I.

1 145. Ibrahim II.

1 146. Ishak.

V. — Muwahhadi Dynasty (Berber). (Capitals, Marrakesh and Seville.) 1 145. `Abd-el-Mumin. 1 163. Yusef II., ” Abu Ya’kab.” 1 184. Ya’kub I., ” Abu Yusef el Mansur.” 1 199. Mahomet III., ” En-Nasir.” 1214. Yusef III., ” Abu Yakub el Mustansir.”

1223. `Abd-el-Wahid, ” El Makhluwi.”

1224. `Abd-Allah IL, ” Abu Mahomet.” 1226. Yahya V., ” £.1 Mu’tasim.” 1229. Idris III., ” El Mamun.”

1232. Rashid 1., ” Abd-el-Wahid.”

1242. ‘AH IV., ” Es-Said el Mu’tadid.” (Mequinez lost to Beni

Marin 1245.) 1248. ‘Omar I., ” El Mortada.” (Fez lost to Beni Marin, 1248.) 1266. Idris IV., ” Abu Dabbus el Wathik.” (Marrakesh lost

to Beni Marin, 1269.)

VI. — Beni Marin Dynasty (Berber). (Capitals, Fez, Mequinez and

Marrakesh.) 1213. ‘Abd-el-Hakk. 1217. “Othman I., ” Abu Said I.” 1239. Mahomet IV., ” Abu Marraf.” 1244. Abu Bakr.

1258. Yakub II., “bin ‘Abd-el-Hakk.” 1286. Yusef IV.

1307. ‘Amr, ” Abu Thabit,”

1308. Sulaiman I., ” Abu Rebi’a.” 1310. ‘Othman II., ” Abu Said II.” 1320. ‘Omar II. (at Sajilmasa). 1331. ‘Ali V., ” Abu’l Hasan.” 1351. Faris I., ” Abu’Ainan.”

1358. Sa’id I. (a child).

1359. Ibrahim III., ” Abu Salem.” (“Tashfin II., ” Abu ‘Omar.”

1361. J. ‘Abd-el-Halim (in Sajilmasa).

[Mahomet V. 1366. *Abd-el-‘Aziz I. 1372. Mahomet VI., ” Es-Said.”

_ [Ahmed I., “Abu’l “Abbas” (in Fez). 1 ^/4- ^‘Abd-er-Rahman I. (in Marrakesh). 1384. Musa II. and Ahmed II., ” Es Mustansir.”

1386. Mahomet VII., “El Wathik.”

1387. Ahmed I. (2nd reign).

1393. ‘Abd-el-‘Aziz II., ” Abu Faris.” 1396. Faris II., ” El Mutawakkil-” 1408. Abu Sa’id III. 1416.

Sa'id II. and Yakub III.

1425. `Abd-Allah III. (after whom the record of this dynasty ceases).

VII.— Wattasi Dynasty (Berber). (Capital, Fez.) 1471. Sa'id III., " Es-Sheikh el Wattas." 1500. Mahomet VIII., "The Portuguese." 1530. Ahmed III. (in Fez). 1548. Mahomet X. (Defeated by the Sharifs, 1550.)

VIII. — Sa'adi Dynasty (Arab). (Capitals, Fez, Mequinez and

Marrakesh.) .„. (Ahmed III. (in Marrakesh). I5Z4 ` \Mahomet IX. (in Tarudant). 1557- `Abd-Allah, " El Ghalib." 1574- Mahomet XL, " El Mutawakkil." 1576. `Abd-el-Malek I., " El Muatasim." 1578. Ahmed IV., " El Mansur " or " Dhahebi." 1603. Mahomet XII., " Es-Sheikh."

`Abd-el-`Aziz III., " Abu Faris." 1608. Zidan. 1628. `Abd-el-Malek II. 1631. El Walid. 1636. Mahomet XIII., " Es-Sheikh Es-Saghir." (Fez lost to the

Filalis, 1649.) 1654. Ahmed V., " El Abbas."

1658. `Abd-el-Karim in Marrakesh. (Overthrown by Filalis,

1668.)

IX. — Filali Dynasty (Arab). (Capitals, Fez, Mequinez and Marrakesh.) Mahomet XIV, " Es-Sharif." Rashid II.

Isma'Il, " The Bloodthirsty." Ahmed VI., " Ed-Dhahebi II." `Abd-el-Malek III., " Abu Merwan." `Abd-Allah V., " El Mortada." •AH VI.

Mahomet XV., " Uld er-Riba." El Mustadi. ZIn el `Abdln. Mahomet XVI. El Yazid. El Hisham. Sulaiman II. `Abd-er-Rahman II. Mahomet XVII. El Hasan III. `Abd-el-`Aziz IV. Hand.

1649. 1664. 1672. 1727. 1728. 1729.

1734– 1736. 1738. 1745– 1757– 1790. 1792.

1795–

1822.

1859– 1873. 1894. 1908.

Note. — The dates given are those in which the various rulers acquired sovereign power. Many had already secured the allegiance of certain provinces some time before, and many retained such allegiance long after the greater portion of the empire had accepted a successful rival. European nations in several instances treated with men who were not at the time actual sovereigns, and in some cases were never such.

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MORON DE LA FRONTERA, or Moron (anc. Arumi), a town of southern Spain, in the province of Seville; 32 m. S.E. of the city of Seville. Pop. (1900) 14,190. Moron occupies an irregular site upon broken chalk hillocks near the right bank of the Guadaira. It is connected by rail with Utrera on the Cadiz & Seville line. On the highest elevation to the eastward are the ruins of the ancient castle, of considerable importance during the Moorish period, when Moron, as its full name implies, was a frontier fortress; the castle was afterwards used as a palace by the counts of Urefia. In 1810–1811 it was fortified by the French, but blown up by them in the following year. The chief public building of Moron is the large parish church, which dates from the 16th century. Moron is alsc famous throughout Spain for its marble and its chalk {cal de Mordn), from which the whitewash extensively used in the Peninsula is derived.

MORONE, GIOVANNI (1509–1580), Italian cardinal, was born on the 25th of January 1509 at Milan, where his father, Count Ieronimo Morone (d. 1529), was grand chancellor. His father, who had been imprisoned for opposing encroachments on the liberties of Milan by Charles V. (whom he afterwards cordially supported), removed to Modena, where his youngest son had most of his early education. Proceeding to Padua he studied jurisprudence with distinction. In return for im- portant service rendered by his father, he was in 1527 nominated by Clement VIII. to the see of Modena, and consecrated in 1533 after a contest. From 1535 he was constantly entrusted by Paul III. with diplomatic missions; he was nuncio (1536) to Ferdinand, king of the Romans, and legate to the diet of Spires (1542) having successfully resisted

the transfer of the diet to Hagenau on account of the plague (1540). On the 31st of May 1542 he was created cardinal, and was further nominated protector of England, Hungary, Austria, of several religious orders, and of the santa casa at Loreto. With the cardinals Paul Parisio and Reginald Pole he was deputed to open the Council of Trent (Nov. 1, 1542), the place of meeting having been a concession to his diplomacy. The legates arrived on the 22nd of November, but no council assembled. The death of Paul III. (1549) deprived him of a good friend. The views of the Reformers had spread in his diocese, and he was suspected of temporizing with them. He resigned his see (155c) in favour of the Dominican Egidio Foscherari, reserving to himself an annual pension and the patronage of livings. Julius III., at the instance of the duke of Milan, gave him (1553) the rich see of Novara (which he resigned in 1560 for the see of Albano) and sent him as nuncio to the diet of Augsburg (1555), from which he was immediately recalled by the death of Julius (March 23). In June 1557 Paul IV. imprisoned him in the castle of St Angelo (with others, including Pole, and Foscherari), on suspicion of Lutheran heresy. The prosecution entirely failed, and Morone might have had his liberty, but refused to

leave prison unless Paul IV. publicly acknowledged his innocence. He remained incarcerated till the pope's death (Aug. 18, iSS^i an d took part in the election of Pius IV. Ochino, in the twenty –eighth of his Dialogi XXX., 1563 has a colloquy on the treatment of heretics, between Pius IV. and Morone, in which the latter maintains: " Errantes in viam revocandi, non occidendi." This really hits the position of Morone, a sincere Catholic, to whom persecution was abhorrent. He presided at the Tridentine Council from the 10th of April to the 4th cf December 1563, and endeavoured to exercise a conciliatory influence. At the end of 1564 Foscherari died, and Morone was reinstated in the see of Modena. On the death of Pius IV. (1565) he came near to being elected pope. His last days were easy; he died at Rome on the 1st of December 1580,

and was buried at S. Maria sopra Minerva. His writings comprise a few letters and orations. His career is that of a good man, struggling for the welfare of his Church against corruptions not essential to the system to which he was devoted.

See J. G. Frick, ″ De Joanne Morono,″ in J.G. Schelhom's Amoeni- tates literariae, vol. xii. (1730) ; ″ G. Moroni,″ Dizionario di erudizione (1847) ; N. Bernabei, Vita del cardinale G. Moroni (1885) ; M. Young, Life and Times of Aonio Paleario (i860); C. Benrath, in Hauck s Realencyklopaiie (1903). (A. Go.*)

MORONI, GIAMBATTISTA (c. 1510–1578), Italian portrait- painter of the Venetian school, was born at Albino near Bergamo about 1510 (or perhaps a few years later), and became a pupil of Bonvicino named II Moretto. Beyond the. record of his works very few particulars regarding him have reached us. Titian, under whom also Moroni, while still very young, is said to have studied (but this appears hardly probable), had at any rate a high opinion of his powers: he said that Moroni made his por- traits ″ living ″ or ″ actual ″ (veri). In truthful and animated portraiture Moroni ranks near Titian himself. His portraits do not indeed attain to a majestic monumental character; but they are full of straightforward life and individuality, with genuine unforced choice of attitude, and excellent texture and arrangement of draperies. There is a certain tendency to a violet- tint in the flesh, and the drawing and action of the hands are not first-rate. The earliest inscribed date discovered for any of his works is 1553. As leading samples may be men- tioned — in the TJfiizi Gallery, Florence the ″ Nobleman pointing to a Flame,″ inscribed ″ Et quid volo nisi ut ardeat ? ″ ; in the National Gallery, London, the portraits of a Tailor, a member of the Fenaroli family, Canon Ludovico de' Terzi, and others; in the Berlin Gallery, his own portrait; and in Stafford House, the seated half-figure of the Jesuit Ercole Tasso, currently termed ″ Titian's Schoolmaster ″ — not as indicating any real connexion between the sitter and Titian, but only

the consum- mate excellence of the work. Besides his portraits, Moroni painted, from youth to his latest days, the ordinary round of sacred compositions; but in these he falls below his master II Moretto. One of the best is the ” Coronation of the Virgin,” in S. Alessandro della Croce, Bergamo; also in the cathedral of Verona, ” SS Peter and Paul,” and in the Brera of Milan, the ” Assumption of the Virgin.” Moroni was engaged upon a ” Last Judgment,” in the church of Corlago, when he died on the 5th of February 1578. (W. M. R.)

MOROSINI, a noble Venetian family, probably of Hungarian extraction, which gave many doges, statesmen, generals and admirals to the Venetian Republic, and cardinals to the Church. It first became prominent at the time of the emperor Otho II. owing to its rivalry with the Caloprini family, whom it succeeded in subjugating by the end of the 10th century. Domenico Morosini (d. n 56), elected doge in 1148, waged war with success against the Dalmatian corsairs, recapturing Pola and other Istrian towns from them. Marino Morosini (d. 1252) was elected doge in 1249; Michele was doge from June 1382, until his death in October of the same year.

Andrea Morosini (1558-1618) was a famous historian and was entrusted by the Venetian senate with the task of continuing Paolo Paruta’s Annali Veneti, in Latin. His history of Venice was published by his brother in 1623 (Venice), and translated into

Italian by Senator Girolamo Molin (Venice, 1782). Among his other works are: Le Imprese ed espedilioni di terra santa, &rc. (Venice, 1627); De iis quae veneta respublica ad I striae or as gessit, &c. (in the Corner-Duodo collection of MSS. ; De forma reipublicae venetae in MS. in the Bibliotheque Nationale in Paris. His life has been written by Luigi Lollin (1623), by Niccolo Crasso (1621), and by Antonio Palazzoli (1620).

Francesco Morosini (1618-1694) was one of the greatest captains of his time. As a young man he fought against the Turks and the pirates, and after signally distinguishing himself at the battle of Naxos in 1650 he was appointed commander-in- chief of the Venetian navy. He then conducted a series of successful campaigns against the Turks, but was recalled in consequence of the intrigues of his rival the Provveditore Antonio Barbaro (1661). But when Candia was attacked by a large force, under the terrible vizir Keuprili, Morosini was sent to relieve the fortress in 1667; the siege lasted eighteen months, but Morosini, in spite of his prodigies of valour, was forced to surrender to save the surviving inhabitants. He was tried, but acquitted of all blame, and on the renewal of the war with the Turkish Empire in 1684 he was again appointed commander- in-chief, and after several brilliant victories he reconquered the Peloponnesus and Athens; on his return to Venice he was loaded with honours and given the title of " Peloponnesiaco." In 1688 he was elected doge, and in 1693 he took command of the Venetian forces against the Turks for the fourth time; the enemy which had been cruising in the archipelago withdrew at his approach, so great was the terror inspired by his name. While wintering at Napoli di Romania (Nauplia) he died on the 6th of January 1694.

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MORPETH, a market town and municipal and parliamentary borough of Northumberland, England, situated in a fine valley on the Wansbeck, 175 m. N. of Newcastle by the North Eastern railway the junction of several branches with the main line.

Pop. (1901), 6158. The Wansbeck winds round the town on the west, south and east, and a rivulet, the Cottingburn, bounds it on the north. The parish church of St Mary, a plain building of the 14th century, is situated on Kirk Hill, a short distance from the town. It has a good example of a Jesse window. Nothing remains of the old castle except the gateway. The valley of the Wansbeck above Morpeth is well wooded and very picturesque. By its side are fragments of Newminster Abbey, a wealthy foundation of the 12th century, occupied by monks from Fountains in Yorkshire; and Mitford, with its Norman and Early English church, and ruins of a Norman castle and a manor-house of the 17th century. To the north of Morpeth a good specimen of the peel tower of the 1 5th century is seen at Cockley Park. Industries of Morpeth include tanning, brewing, malting, iron and brass founding, and the manufacture of flannels, agricultural implements, and bricks and tiles. The parliamentary borough, within the Wansbeck division of the county, returns one member and extends 8 m. eastward to the coast, including the town of Blyth. Morpeth is governed by a mayor, 4 aldermen and 12 councillors. Area, 328 acres.

The manor of Morpeth is said to have been granted to William de Merlay soon after the Conquest and passed with the borough from his family to those of Graystock, Dacre and Howard, earls of Carlisle, with whom it remains. The town is a borough by prescription and grew up round the castle attributed to the above William de Merlay. About the end of the 12th century Roger de Merlay the younger granted the burgesses right to hold of him and his heirs " as freely as the charter of the king purported which he held of the king by gift." Charles II. incorporated the town in 1662 under the government of two bailiffs who were chosen every year in the following manner: the bailiffs for the

time being chose two juries from whom the commonalty elected four burgesses, and from these four the steward of the lord of the manor appointed the bailiffs for the ensuing year. This was continued

until the Municipal Reform Act of 1835. In 1 200 a market on Wednesday and a fair on the Feast of St Mary Magdalene were granted to Roger de Merlay, and in 1285 the fair was extended for two days. The market rights still belong to the lord of the manor.

MORPHEUS, in Roman mythology, one of the sons of Somnus, the god of sleep. He was a personification, apparently invented by Ovid (Metam. xi. 635), of the power that calls up human shapes (fiop^ai) of all kinds to the dreamer. His brothers Phobetor and Phantasus assumed the forms of all kinds of animals and inanimate things.

MORPHINE, the chief alkaloid of opium (q.v.), to which the medicinal action of the former is mainly due. It is not used itself in medicine owing to its insolubility in water and ether. The preparations of morphine are incompatible with salts of iron, copper and mercury, .also with lime water and alkaline earths and substances containing tannin. With ferric chloride it forms a deep red colour.

The preparations of morphine in the British Pharmacopoeia are as follow: from Morphinae Hydrochloridum are made five sub- preparations: (1) Liquor Morphinae Hydrochloridi, strength 1% or about 45 grs. of the hydrochloride to the fl. oz.; (2) Suppositoria Morphinae, made with a basis of oil of theobroma, strength | gr. of morphine hydrochloride in each; (3) Tinctura Chloroformi et Morphinae, strength tV gr. in 10 minims; (4) Trochiscus Mor phinae, j'y gr. in each ; (5) Trochiscus Morphinae et Ipecacuanhae, strength jV gr. of morphine hydrochloride and ^ gr. ipecacuanha in each. From Morphinae Acetas, a white soluble amorphous powder, is made Liquor Morphinae Acetalis, strength I % or \ grs. of the acetate to I fl. oz. From Morphinae Tartras, a white crys talline powder, are prepared, Injeclio Morphinae Hypodermica, containing 5% of morphine tartrate, and Liquor Morphinae Tartratis. Morphinae Sulphatis is not official in the British Phar- macopeia but is official in the United States, the U.S. P. Trochisci Morphinae et Ipecacuanhae and Pulvis Morphinae Compositus (Tully's powder) being

made from it. Hypodermic tabloids of morphine sulphate either alone or combined with atropine are much in use. Various non-official preparations of morphine are in use, such as dionin, heroin, glycaphorm and peronin.

Therapeutics. — Morphine is an analgesic and hypnotic, reliev- ing pain and producing deep sleep. As contrasted with opium it differs in being less astringent and constipating. Morphine is the greatest anodyne we possess, and no drug yet discovered equals it in pain-relieving power. The most frequent mode of administration is the hypodermic method, on account of the extreme rapidity with which it is absorbed. In pain due to violent sciatica relief and even permanent cure has been obtained by the injection of morphine directly into the muscle of the affected part, and in the treatment of renal and hepatic colic morphine given subcutaneously will relieve the acute pain conse- quent on the passage of biliary and urinary calculi. A violent paroxysm of asthma may be arrested by the administration pf morphine subcutaneously, but the practice should not be con- tinued, as there is great danger in a chronic disease that the patient may become the victim of morphinism. Morphine is recognized as one of the most useful drugs in the treat- ment of eclampsia, early injection often arresting the fits. In the cough of phthisis minute doses are of service, but in this particular disease morphine is frequently better replaced by codeine or by heroin, which checks irritable coughs without the narcotism following upon the administration of morphine. In bronchitis with profuse expectoration the use of morphine is particularly dangerous, as it is likely to check the cough so necessary for getting rid of the secretion, but in the converse condition it usefully allays the harassing cough by diminishing the excitability of the respiratory centre. In the dyspnoea of advanced valvular disease of the heart morphine relieves the distress and restlessness, and induces sleep. It should however be withheld if the heart has undergone fatty degeneration. Morphine is a sheet anchor in the

later stages of cancer and other painful diseases, rendering the life of the patient one of comparative comfort. If given in excess the drug is eliminated by way of the intestines and kidneys. It

is also excreted in the milk; hence the danger in the adminis- tration of large doses of morphine to nursing mothers.

Morphine-scopolamine anaesthesia was introduced in 1902 by Steinbiickel. It has been used by some surgeons for the production of anaesthesia previous to the administration of ether or chloroform, but the use of the method is now more usually relegated to obstetric practice.

Morphinism (Morphinomania). — Chronic morphine poisoning is very common, as morphine taken constantly creates a habit. Once acquired the habitue depends on the drug for a comfortable existence, and as the organism becomes quickly tolerant of the alkaloid the original dose no longer suffices. The total amount of morphine indulged in by the habitual morphinist may reach an astonishing figure; 15 grs. a day is said to be common, and some medical writers record quantities such as 60 to 70 grs. in the 24 hours in extreme cases. The early stages of morphinism are marked by moral degeneration ; the patient seems to lose all-sense of right and wrong, and Will lie most plausibly and even thieve to obtain the drug ; personal disorderliness, disregard of time, neglect of business and decline of family affection become soon evident. Physical symptoms also appear; the face assumes an earthy colour, the body wastes, constipation is usually present to an extreme degree, the secretions become arrested, loss of appetite and indigestion follow and the mouth is parched. The nails become brittle and the skin dry, sterility shows itself in women and sexual impotence in men. While not directly causing death, morphin-

ism so lowers the bodily powers that the patient is easily carried off by some intercurrent malady. The sudden withdrawal of the drug from a morphine habitue is followed by a train of alarming symptoms. As the time approaches for the usual dose there is marked restless- ness, followed by excitement and later by chills, pallor, sinking, nausea, with perhaps vomiting and diarrhoea. Horrible mental depression and melancholia are present, and there may be hallucina- tions of vision and hearing passing into violent delirium. At this stage collapse may set in, the patient become faint, the limbs twitch, the radical pulse become imperceptible, and unconsciousness super- vene. The condition may even go on to a fatal result should morphine be continuously withheld, but injection of even a small quantity of morphine causes these symptoms to cease abruptly. The sudden withdrawal of morphine should therefore never be practised with takers of large quantities of the drug, but gradually diminishing doses given by the physician should be substituted. For the success- ful treatment of morphinism, complete isolation of the patient is necessary in a place where he is supervised so that he can obtain no morphine. Isolation in a home is far the best, as friends may give way to entreaties and servants be bribed. The ″ tapering off ″ of the dose is the best method. Absence from home and strict super- vision lasting over a long period, usually a year, are necessary to prevent relapse. The lowered bodily health requires to be built up, and a long sea voyage under adequate supervision is usually recommended.

MORPHOLOGY, (Gr. ixop4>i], form), a term introduced by Goethe to denote in biology the study of the unity of type in organic form (for which the Linnaean term ″ Metamorphosis ″ had formerly been employed). It now usually covers the entire science of organic form. There are numerous restricted senses of the term in various sciences, but here we shall deal with it as a substantive side of zoology and botany.

Historical Outline. — If we disregard such vague

likenesses as those expressed in the popular classifications of plants by size into herbs, shrubs and trees, or of terrestrial animals by habit into beasts and creeping things, the history of morphology begins with Aristotle. Founder of comparative anatomy and taxonomy, he established eight great divisions (to which are appended certain minor groups) — Viviparous Quadrupeds, Birds, Oviparous Quadrupeds and Apoda, Fishes, Malakia, Mala- costraca, Entoma, and Ostracodermata — distinguishing the first four groups as Enaima (" with blood ") from the remaining four as Anaima (" bloodless "). In these two divisions we recognize the Vertebrata and Invertebrata of J. B. P. A. Lamarck, the first four groups corresponding with the Mammals, Birds, Reptiles, Fishes, whilst the others agree more loosely with the Cephalopods, Crustacea, Insecta, and Echinoderms with Mollusca other than the Cephalopods. Far from committing the mistake attributed to him of reckoning Bats as Birds, or Cetaceans as Fishes, he discerned the true affinities of both, and erected the latter into a special yevos beside the Viviparous Quadrupeds, more on account of their absence of limbs than of their aquatic habit. Not only is his method inductive, and his groups founded on the aggregate of known characters, but he foreshadows such generalizations as those of the correlation of organs, and of

the progress of development from a general to a special form after- wards established by G. L. Cuvier and K. E. von Baer respectively. In the correspondence he suggests between the scales of Fishes and the feathers of Birds, or in that hinted at between the fins of Fishes and the limbs of Quadrupeds, the idea of homology is nascent; and from the compilation of his disciple Nicolaus of Damascus, who regards leaves as imperfectly developed fruits, he seems almost to have anticipated the idea of the metamorphosis of plants. Even after the reappearance of Aristotle's works in the 13th century, little can be recorded but revivals of his conclusions. Monographs on groups of plants and animals frequently appeared, those of P.

Belon on Birds and G. Rondelet on Fishes being among the earliest; and in the former of these (1555) we find a comparison of the skeletons of Bird and Man in the same posture and as nearly as possible bone for bone — an idea which, despite the contemporaneous renais- sance of human anatomy initiated by Vesalius, disappeared for centuries, unappreciated save by the surgeon Ambroise Pare. B. Palissy, like Leonardo da Vinci before him, discerned the true nature of fossils; and such flashes of insight continued to appear from time to time during the 17th century. Thus, Joachim Jung recognized ” the distinction between root and stem, the difference between leaves and foliaceous branches, the transition from the ordinary leaves to the folia floris,” and W. Harvey anticipated the generalizations of modern embryology by his researches on development and his theory of epigenesis.

The encyclopaedic period of which Gesner is the highest representative was continued by Aldrovandi and others in the 17th century; but, aided by the Baconian movement, then influencing all scientific minds, it developed into one of genuinely systematic aim. At this stage of progress the most important part was taken by John Ray, whose classi- ficatory labours among plants and animals were crowned with success. He first expelled the fabulous monsters and prodigies of which the encyclopaedists had handed on the tradition from medieval times, and succeeded, particularly among plants, in distinguishing many natural groups, for which his own terms sometimes survive — e.g. Dicotyledons and Monocotyledons, Umbelliferae and Leguminosae. The true precursor of Linnaeus, he introduced the idea of species in natural history, and reformed the practice of definition and terminology. Of the works which followed up Ray’s systematic labours, none can be even named until we come to those of his great successor Linnaeus, whose grasp of logical method and lucidity of thought and expression enabled him to reform and reorganize the whole labours of his predecessors into a compact and definite ” systema

naturae." The very genius of order, he established modern taxonomy, not only by the introduction of the binomial nomenclature and the renovation of descriptive terminology and method, but by the subordination of the species under the successive higher categories of genus, order and class, so recon- ciling the analytic and synthetic tendencies of his predecessors. Although the classification of plants by the number of their essential organs is highly artificial, it must be remembered that this artificiality is after all only a question of degree, and that he not only distinctly recognized its provisional character but collected and extended those fragments of the natural system with which A. de Jussieu soon afterwards began to build. His classification of animals, too, was largely natural, and, though on the whole he lent his authority to maintain the notion of three kingdoms of nature, he at least at one time discerned the fundamental unity of animals and vegetables, and united them in opposition to the non-living world as Organisata. At the same time he was still far more a scholastic naturalist than a modern investigator.

While the artificial system was at the zenith of its usefulness, Bernard de Jussieu was arranging his gardens on the lines afforded by the fragmentary natural system of Linnaeus. His ideas were elaborated by his nephew Antoine de Jussieu, who published diagnoses of the natural orders, so giving the system its modern character. Its subsequent elaboration and definite establishment are due mainly to the labours of Pyrame de

Candolle and Robert Brown. The former concentrated his own long life and that of his son upon a new " systema naturae," the colossal Prodromus systematis naturalis (20 vols., 1818-1873), in which 80,000 species were described and arranged. Mean- while the penetrative genius of Brown enabled him to unravel such structural complexities as those of Conifers

and Cycads, Orchids and Proteaceae, thus demonstrating the possibility of ascertaining the systematic position of even the most highly modified floral types. Both Candolle and Brown were thus no mere systematists, but genuine morphologists of the modern school.

The labours of Bernard and Antoine de Jussieu initiated a parallel advance in zoology, the joint memoir on the classifica- tion of mammals with which Cuvier and Geoffroy St-Hilaire almost began their career receiving its dominant impulse from the " genera " of Antoine. Cuvier's works correspond in zoology to those of the whole period from the Jussieus to Brown, and epitomize the results of that line of advance. Although in some respects preceded by A. von Haller and J. Hunter, who compared, though mainly with physiological aim, the same parts in different organisms, and much more distinctly by Vicq d' Azyr, the only real comparative anatomist of the 18th century, he opens the era of detailed anatomical research united with exact comparison and clear generalization. The Regne animal (181 7) and the theory of types (vertebrate, molluscan, articu- late, and radiate) are the results of this union of analysis and synthesis and mark the reconstitution of taxonomy on a new basis, henceforth to be no longer a matter of superficial description and nomenclature but a complete expression of structural resemblances and differences. In Germany, L. H. Bojanus, J. F. Meckel, C. T. E. von Siebold and Johannes Miiller, with his many pupils, carried on the work; in France, too, a succession of brilliant anatomists, such as A. De Quatre- fages, A. Milne-Edwards and H. de Lacaze-Duthiers, were his intellectual heirs; and in England he has been admirably represented by Sir R. Owen.

It is now necessary to return to Linnaeus, whose more specula- tive writings contain, though encumbered by fantastic hypo- theses, the idea of floral metamorphosis. About the same time, and quite independently, C. F. Wolff, the embryologist, stated the same theory with greater clearness, for the first time distinctly reducing the plant to an axis

bearing appendages — the vege- tative leaves — which become metamorphosed into bud-scales or floral parts through diminution of vegetative force. Thirty years later the same view was again independently developed by Goethe in his now well-known pamphlet (Versuch die Meta- morphose der Pflanzen zuerklaren, Gotha, 1790). In this brilliant essay the doctrine of the fundamental unity of floral and foliar parts is clearly enunciated, and supported by arguments from anatomy, development and teratology. All the organs of a plant are thus modifications of one fundamental organ — the leaf — and all plants are in like manner to be viewed as modifica- tions of a common type — the Urpflanze. Whether, as some historians hold, his ″ Urpflanze ″ was a mere ideal archetype, bringing forth as its fruit the innumerable metaphysical abstrac- tions of the Naturphilosophie, and leading his countrymen into all the extravagances of that system; or whether, as E. H. Haeckel maintains, it represented a concrete ancestral form, so anticipating the view of modern evolutionists, it is certain that to him F. W. S. von Schelling was indebted for the founda- tion upon which he erected his philosophic edifice, as also that Goethe shared the same ideas. It must be remembered that he lived and made progress for forty years after the publication of this essay, that he was familiar with the whole scientific move- ment, and warmly sympathized with the evolutionary views of Lamarck and Geoffroy St-Hilaire; it is not therefore to be wondered at that his writings should furnish evidence in favour of each and every interpretation of them. His other morphological labours must not be forgotten. Independently of Vicq d′ Azyr, he discovered the human premaxillary bone; independently of L. Oken, he proposed the vertebral theory of the skull; and before S. C. Savigny, he discerned that the jaws of insects were the limbs of the head.

In 1813 A. P. de Candolle published his Theorie Uimentaire de la botanique, which he developed into the classic Organc- graphie vegUale (1827). He established his theory of symmetry, reducing all

flowers to ″ symmetrical ″ groupings of appendages on an axis and accounting for their various forms by cohesion and adhesion, by arrested or excessive development. The next advance was the investigation by W. P. Schimper and A. Braun of phyllotaxis— the ascending spiral arrangement of foliar and floral organs — thus further demonstrating their essential unity.

The term morphology was first introduced by Goethe in 181 7, in a subsequent essay {Zur Naturwissenschaft iiberhaupt, besonders zur Morphologie). It did not come into use in botany until its popularization by Auguste de St-Hilaire in his Morphologie vtgUale (1841), and in zoology until later, although De Blainville, who also first employed the term type, had treated the external forms of animals under ″ morphologie.″ Though the Naturphiloso- phie of Schelling and its countless modifications by his followers, its mystic theories of ″ polarization ″ and the like, its apparatus of assumption and abstraction, hypothesis and metaphor, cannot here be discussed, its undoubted services must not be forgotten, since it stimulated innumerable reflective minds to the earnest study of natural science, gave a powerful impulse to the study of comparative anatomy and vindicated the claims of philosophic synthesis over those of analytic empiricism. Among its many adherents, some are of more distinctly theo- logical type; others metaphysical, others mystical or poetic, others, again, more especially scientific; but its most typical and picturesque figure is Lorenz Oken, who epitomizes alike the best and the worst features of the school, and among whose innumerable pseudo-morphological dreams there occasionally occurred suggestions of the greatest fruitfulness — notably, for instance, the independent statement of the vertebral theory of the skull.

By far the most distinguished anatomist of the transcendental school is Geoffroy St-Hilaire, who being comparatively free from the extravagances of Oken, and uniting a depth of morpho- logical insight scarcely inferior to that of Goethe with greater

knowledge of facts and far wider influence and reputation in the scientific world, had greater influence on the progress of science than either. He started from the same studies of ana- tomical detail as Cuvier, but, influenced by Buffon's view of unity of plan and by the evolutionary doctrines of Lamarck, diverged into new lines, and again reached that idea of serial homology of which we have so frequently noted the independent origin. His greatest work, the Philosophie anatomique (1818-1823), contains his principal doctrines. These are: (1) the theory of unity of organic composition, identical in spirit with that of Goethe; (2) the theory of analogues, according to which the same parts, differing only in form and in degree of develop- ment, should occur in all animals; (3) the " principe des con- nexions," by which similar parts occur everywhere in similar relative positions; and (4) the " principe du balancement des organes," upon which he founded the study of teratology, and according to which the high development of one organ is allied to diminution of another. The advance in morphological theory is here obvious; unfortunately, however, in eager pursuit of often deceptive homologies, he wandered into the transcen- dentalism of the Naturphilosophie, and seems utterly to have failed to appreciate either the type theory of Cuvier or the discoveries of Von Baer. He defended Buffon's and Bonnet's earlier view of unity of plan in nature; and the controversy reached its climax in 1830, when he maintained the unity of structure in Cephalopods and Vertebrates against Cuvier before the Academy of Sciences. On the point of fact he was of course utterly defeated; the type theory was thenceforward fully accepted and the Naturphilosophie received its death-blow. Such was the popular view; only a few, like the aged Goethe, whose last literary effort was a masterly critique of the con- troversy, discerned that the very reverse interpretation was the deeper and essential one, that a veritable " scientific revolu- tion " was in progress, and that the supremacy of homological and synthetic over descriptive and analytic studies was

thenceforward assured. The irreconcilable feud between the two leaders really involved a reconciliation for their followers; theories of homological anatomy had thenceforward to be strictly subjected to anatomical and embryological verification, while anatomy and embryology acquired a homological aim. This union of the solid matter and rigorous method of Cuvier with the generalizing spirit and philosophic aims of Geoffroy is well illustrated in the works of Owen.

The further evolution of the idea of homology is sketched below, while the extent and rapidity of the subsequent progress of the knowledge of all the structural aspects of plants and animals alike make a historical survey impossible up to the appearance of the Origin of Species (1859). The needful solution was effected by Darwin. The " Urpflanze " of Goethe, the types of Cuvier, and the like, at once became intelligible as schematic representations of ancestral organisms, which in various and varying environments, have undergone differentiation into the vast multitude of existing forms. All the enigmas of structure become resolved; " representative " and " aberrant," " progres- sive " and "degraded," "synthetic" and "isolated," "persistent " and " prophetic " types no longer baffle comprehension; conformity to type represented by differentiated or rudimentary organs in one organism is no longer contradicted by their entire disappearance in its near allies, while systematist and morpholo- gist become related simply as specialist and generalizer, all through this escape from the Linnaean dogma of the fixity of species. The phenomena of individual development receive interpretation in terms of ancestral history; and embryology thus becomes divided into ontogeny and phylogeny — the latter, too, coming into intimate relation with palaeontology — while classification seeks henceforth the reconstruction of the genealogical tree. All these results were clearly

developed in Haeckel's Generelle Morphologic (1866), while the valuable contemporaneous Principles of Biology of Herbert Spencer also gave special attention to the relation of morphology to physiology.

Individuality.— Probably no subject in the "whole range of biology has been more extensively discussed than that of the nature of organic individuality. The history of the controversy is of interest, since besides leading up to solid results it serves, perhaps better than any other case, to illustrate the slow emergence of the natural sciences from the influence of scholastic thought. Starting from the obvious unity and indivisibleness of Man and other higher animals, and adopting some definition such as that of C. F. B. Mirbel, " Tout §tre organise, complet dans ses parties, distinct et separe des autres etres, est un individu," it was attempted times without number to discover the same conception elsewhere in nature, or rather to impose it upon all other beings, plants and animals alike. The results of different inquirers were of course utterly discrepant. It seemed easy and natural to identify a tree or herb corresponding to the individual animal, yet difficulties at once arose. Many apparently distinct plants may arise from a common root, or a single plant may be decomposed into branches, twigs, shoots, buds or even leaves, all often capable of separate existence. These, again, are decompos- able into tissues and cells, the cells into nucleus, &c, and ultimately into protoplasmic molecules, these finally into atoms — the inquiry thus passing outside organic nature altogether and meeting the old dispute as to the ultimate divisibility of matter. In short, as Haeckel remarks, scarcely any part of the plant can be named which has not been taken by some one for the individual. It is necessary, therefore, briefly to notice some of the principal works on the subject, and these may conveniently be taken in descending order.

While H. Cassini practically agreed with Mirbel in attempting to regard separate plants as individuals, the widest interpretation of the individual is that

of G. Gallesio (1816), who proposed to regard as an individual the entire product of a single seed, alike whether this developed ihto a uni-axial plant extended continuously like a banyan, or multiplied asexually by natural or artificial means like the weeping-willow or the Canadian pondweed, of each of which, on this view, there is only a single individual in Britain, happily discontinuous.

At once the oldest and most frequently maintained view is that which regards the bud or shoot consisting of a single axis with appendages as the plant-individual, of which the tree represents a colony, like a branched hydroid polyp. This conception, often attributed to Aristotle, but apparently without foundation, appears distinctly in the writings of Hippocrates and Theophrastus— the latter saying, "The bud grows on the tree like a plant in the ground." The aphorism of Linnaeus, " Gemmae totidem herbae," is well known ; and in this view C. F. Wolff and Humboldt concurred, while Erasmus Darwin supported it by an appeal to the facts of anatomy

and development. The most influential advocate of the bud theory during the first half of the loth century was, however, Du Petit- Thouars, who, although starting much as usual with a " principe unique d'existence,"- supported his theory on extensive though largely incorrect observations on stem structure and growth. For him the tree is a colony of phytons, each being a bud with its axillant leaf and fraction of the stem and root. Passing over numerous minor authors, we come to the central work of Alex. Braun (1853), in which, as Sachs has clearly pointed out, the illegitimate combina- tion of Naturphilosophie with inductive morphology reaches its extreme. He reviews, however, all preceding theories, admits the difficulty of fixing upon any as final, since the plant, physiologically considered, is rather a dividuum than an individuum, and proposes as a compromise, or indeed as a partial cutting of the knot, the

adoption of the shoot, as the morphological individual, comparable to an animal, especially because, unlike the cell, leaf, &c, it includes all the representative characters of the species. Darwin and Spencer on the whole also accept the bud or shoot as at any rate the most definite individual.

The theory of metamorphosis naturally led Goethe, Oken and others to regard the leaf as the individual, while Johannes Miiller, J. J. S. Steenstrup and others adopted the same view on various physiological grounds. C. Gaudichaud elaborated a theory inter- mediate between this view and that of Du Petit-Thouars, according to which the plant was built up of individuals, each consisting of a leaf with its subjacent internode of stem, which was regarded as the leaf-base, and this was supported by Edward Forbes and others, while the nominally converse view — that of the leaf as a mere outward expansion of the stem-segment — was proposed by C. F. Hochstetter.

Though sundry attempts at identifying various tissues, such as the fibro-vascular bundles, as the constituent individuals may be passed over, those associated with the cell theory are of great impor- tance. T. Schwann decided in favour of the cell and regarded the plant as a cell-community, in which the separate elements were like the bees of a swarm- — a view virtually concurred in in all essen- tial respects by M. Schleiden, R. Virchow and other founders of the cell theory. Yet, although the structure and functions of the plant are ultimately and specially cellular, it is impossible to ignore the fact that, save in the very lowest organisms, these are subordi- nated and differentiated into larger aggregates, and form virtually but the bricks of a building, and hence the later theories outlined above. Of attempts to find the individual in the nucleus or the protoplasm granules it is unnecessary to speak further.

So far the theories of absolute individuality. The conception of relative individuality was first clearly expressed by Alphonse de Candolle and

Schleiden, both of whom take the cell, the shoot and the multi-axial plant as forming three successive and subordinated categories. K. W. von Nageli too recognized not only the necessity of establishing such a series (cell, organ, bud, leafy axis, multi-axial plant) but the distinction between morphological and physiological individualities afterwards enunciated by Haeckel.

Passing over the difficulties which arise even among the Protozoa we find that a similar controversy (fully chronicled in Haeckel's Kalkschwdmme) has raged over the individuality of sponges. While the older observers were content to regard each sponge-mass as an individual, a view in which J. N. Lieberkuhn and other monographers substantially concurred, the application of the microscope led to the view suggested by James Clark, and stoutly supported by Saville Kent, that the sponge is a city of amoeboid or infusorian individuals. H. J. Carter looked upon the separate ampullaceous sacs as the true individuals, while others, defining the individual by the possession of a single exhalent aperture, distinguish sponges into solitary and social.

For the higher animals the problem, though perhaps really even more difficult, is less prominent. As Haeckel points out, the earlier discussions and even the comparatively late essay of Johannes Miiller take an almost purely psychological or at least a physiological point of view; and the morphological aspect of the inquiry only came forward when the study of much lower forms, such as Cestoid worms (see Platyelmia) or Siphonophores (see Hydrozoa), had raised the difficulties with which botanists had so long been familiar. With the rapid progress of embryology, too, arose new problems; and in 1842 Streenstrup introduced the conception of an " alternation of generation " as a mode of origin of distinct individ- uals by two methods, for him fundamentally similar, the sexual from impregnated females and the asexual from unimpregnated " nurses " — a view adopted by Edward Forbes and many other naturalists, but keenly criticized by W. B.

Carpenter and T. H. Huxley. In R. Leuckart's remarkable essay on polymorphism (1853) the Siphonophora were analysed into colonies, and their varied organs shown to be morphologically equivalent, while the alternate generations of Steenstrup were reduced to a case of polymorphism in development. Leuckart further partly distinguished individuals of different orders, as well as between morphological and physiological individuals.

In. 1 852 Huxley, starting from such an undoubted homology as that of the egg-producing process of Hydra with a free-swimming Medusoid, pointed out that the title of individual, if applied to the latter, must logically be due to the former also, and avoided this confusion between organ and individual by defining the individual

animal, as Gallesio had done the plant, as the entire product of an impregnated ovum — the swarm of Aphides or free Medusae which in this way might belong to a single individual being termed Zooids.

In Carus's System of Animal Morphology (1853) another theory was propounded, but the problem then seems to have fallen into abeyance until 1865, when it formed the subject of a prolonged and fruitful discussion in the Principles of Biology. Adopting the cell (defined as an aggregate of the lowest order, itself formed of physio- logical units) as the morphological unit, H. Spencer points out that these may either exist independently, or gradually exhibit unions into aggregates of the second order, like the lower Algae, of which the individuality may be more or iess pronounced. The union of such secondary aggregates or compound units into individuals of a yet higher order is then traced through such intermediate forms as are represented by the higher seaweeds or the liverworts, from the thallus of which the axes and appendages of Monocotyledons and Dicotyledons are ingeniously

derived. The shoot of a flowering plant is thus an aggregate of the third order; it branches into an aggregate of the fourth or higher order, and finally as a tree "acquires a degree of composition too complex to be any longer defined." Proceeding to animals, the same method is applied. The Protozoa are aggregates of the first order. These, like plants, exhibit transitions, of which Radiolarians, Foraminifera and sponges are taken as examples,. to such definite compound wholes as Hydra; and such secondary aggregates multiply by gemmation into permanent aggregates of the third order, which may exhibit all degrees of integration up to that of the Siphonophora, where the individu- alities of the Polyps are almost lost in that of the aggregate form. The whole series of articulated animals are next interpreted as more or less integrated aggregates of the third order, of which the lower Annelids are the less developed forms, the Arthropods the more highly integrated and individualized. Molluscs and vertebrates are regarded as aggregates of the second order.

In 1866 appeared a morphological classic, the Generelle Morpho- logic of Haeckel. Here pure morphology is distinguished into two sub-sciences — the first purely structural, tectology, which regards the organism as composed of organic individuals of different orders ; the second essentially stereometric, promorphology. To tectology, defined as the science of organic individuality, a large section of the work is devoted. Dismissing the theory of absolute individuality as a metaphysical figment, and starting from the view of Schleiden, De Candolle and Nageli of several successive categories of relative individuals, he distinguishes more clearly than heretofore the physiological individual (or Hon), characterized by definiteness and independence of function, from the morphological individual (or morphon), characterized similarly by definiteness of form; of the latter he establishes six categories, as follows : —

1. Plasiides (cytodes and cells), or elementary

organisms.

2. Organs (cell-stocks or cell-fusions), simple or homoplastic or-

gans (tissues), or heteroplastic organs. Organ-systems, organ-apparatuses.

3. Antimeres (opposite or symmetrical or homotypic parts), e.g.

rays of radiate animals, " halves of bilaterally symmetrical animals."

4. Metameres (successive or homodynamous parts), e.g. stem-

segments of Phanerogams, segments or zoonites of Annelids or vertebrates.

5. Personae, shoots or buds of plants, polyps of Coelenterates,

&c, " individuals " in the narrowest sense among the higher animals.

6. Corms (stocks or colonies), e.g. trees, chains of Salpae, polyp-

stocks, &c. In his subsequent monograph on calcareous sponges, and in a final paper, he somewhat modifies these categories by substituting one category of extreme comprehensiveness, that of the idorgan, in place of the three separate orders of organs, antimeres and meta- meres. The idorgan (of course clearly distinguished from the physiological organ or biorgan) is finally defined as a morphological unit consisting of two or more plastids, which does not possess the positive character of the person or stock. These are distinguished into homoplasts or homo-organs and alloplasis or alloe-organs, the former including, as subdivisions, plastid-aggregates and plastid-fusions, the latter idomeres, antimeres and metameres. The former definition of the term antimere, as denoting at once each separate ray of a

radiate, or the right and left halves of a bilaterally sym- metrical animal, is corrected by terming each ray a paramere, and its symmetrical halves the antimeres. Thus an ordinary Medusoid has four parameres and eight antimeres, a starfish five and ten. The conception of the persona is largely modified, not only by with- drawing the comparison of the animal with the vegetable shoot and by omitting the antimere and metamere as necessary constituents, but by taking the central embryonic form of all the Metazoa — the gastrula (fig. 1) and its assumed ancestral representative, the gas- traea — as the simplest and oldest form of persona. The different morphological stages to which it may attain are classified into three series: (1) Monaxonial inarticulate personae, i.e. uniaxial and un- segmented without antimeres or metameres, as in sponges or lowest Hydroids; (2) Stauraxonial inarticulate personae with antimeres, but without metameres, e.g. coral, medusa, turbellarian, trematode, bryozoon; (3) Stauraxonial articulate personae with antimeres and

1 \ 1 (After Haeckel.)

Fig. 1. — Gastrula in optical section, showing primitive opening and digestive cavity (blasto- pore and arch-enteron), as also outer and inner layers, ectoderm and en- doderm.

metameres, e.g. annelids, arthropods, vertebrates. The colonies of protozoa are mere idorgans. True corms, composed of united personae, occur only among sponges, hydroids, siphonophores, corals, bryozoa, tunicates and echinoderms, of which the apparent parameres are ` regarded as highly centralized personae of a radially budded worm colony; and these can be classified according to the morphological rank of their constituent personae. They usually arise by gemmation from a single per- sona, yet in sponges and corals occasion- ally by fusion of several originally distinct persons or corms. The theory of successive subordinate orders of in- dividuality being thus not only derived from historical criticism of previous theories but

brought into conformity with the actual facts of development and descent — various groups of organisms being referred to their several categories — the remaining problem of tectology, that of the relation of the morphological to the physiological in- dividuality, is finally discussed. Of the latter, three categories are proposed: (1) the " actual bion or complete physio- logical individual," this being the com- pletely developed organic form which has reached the highest grade of morphological individuality proper to it as a representative of, e.g. its species; (2) the " virtual bion or potential physiological individual," including any incompletely developed form of the former from the ovum upwards; and (3) the "partial bion or apparent physiological individual," such fragments of the actual or virtual bion as may possess temporary indepen- dence without reproducing the species — this latter category having, however, inferior importance.

Haeckel's theory, indeed in its earlier form, has been adopted by C. Gegenbaur and other morphologists, also in its later form by G. Jager, who, however, rejects the category of idorgan on the ground of the general morphological principle that every natural body which carries on any chemical changes with its environment be- comes differentiated into more or less concentric layers; but the subject, especially as far as animals are concerned, was again discussed in a large work by E. Perrier. Starting from the cell or plastid, he terms a permanent colony a m&ride, and these may re- main isolated like Sagitta or Rotifer, or may multiply by gemmation to form higher aggregates which he terms zoides. Such zoides may be irregular, radiate or linear aggregates, of which the two former classes especially are termed demes. The organ — Haeckel' s idorgan — is excluded, since tissues and organs result from division of labour in the anatomical elements of the merides, and so have only a secondary individuality, " carefully to be distinguished from the individuality of those parts whose direct grouping has formed the organism, and

which live still, or have lived, isolated from one another." Perrier further points out that the undifferentiated colonies are sessile, as sponges and corals, while a free state of exist- ence is associated with the concentration and integration of the colony into an individual of a higher order.

So far the various theories of the subject; detailed criticism is impossible, but some synthesis and reconciliation must be attempted. Starting from the cell as the morphological unit, we find these forming homogeneous aggregates in some Protozoa and in the early development of the ovum. But integration into a whole, not merely aggregation into a mass, is essential to the idea of individu- ality; the earliest secondary unit, therefore, is the gastrula or meride. This stage is permanently represented by an unbranched hydroid or sponge or by a planarian. These secondary units may, however, form aggregates either irregular as in most sponges, in- definitely branched as in the hydroids and actinozoa, or linear as in such planarians as Catenula. Such aggregations, colonies or demes, not being aggregated, do not fully reach individualitj' of the third order. This is attained, however, for the branched series by such forms as Siphonophores among Hydrozoa, or Renilla or Pen- natula among Actinozoa; for linear aggregates again by the higher worms, and still more fully by arthropods and vertebrates. Aggre- gates of a yet higher order may occur, though rarely. A longi- tudinally dividing Nais or laterally branched Syllis are obviously aggregates of these tertiary units, which, on Haeckel's view, become integrated in the Echinoderm, which would thus reach a complete individuality of the fourth order. A chain of Salps or a colony of Pyrosoma exhibits an approximation to the same rank, which is more nearly obtained by a radiate group of Botryllus around their central cloaca, while the entire colony of such an ascidian would represent the individual of the fifth order in its incipient and unintegrated state — these and the preceding intermediate forms being, of course, readily intelligible, and indeed, as Spencer has shown,

inevitable on the theory of evolution.

The exclusion of tissues and organs from rank in this series is thus seen to necessarily follow. Ectoderm and endoderm Cannot exist alone; they and the organs into which they differentiate

arise merely, as Jager expresses it, from that concentric lamination, or, with Perrier, from that polymorphism of the members of the colony, which is associated with organic and social existence. The idea of the antimere is omitted, as being essentially a promorpho- logical conception (for a medusoid or a starfish, though of widely distinct order of individuality, is equally so divisible) ; that of the metamere is convenient to denote the secondary units of a linear tertiary individual; the term persona, however, seems unlikely to survive, not only on account of its inseparable psychological connotations, but because it has been somewhat vaguely applied alike to aggregates of the second and third order; and the term colony, corm or deme may indifferently be applied to those aggre- gates of primary, secondary, tertiary or quaternary order which are not, however, integrated intq a whole, and do not reach the full individuality of the next higher order. The term zooid is also objectionable as involving the idea of individualized organs, a view natural while the medusoid gonophores of a hydrozoon were looked at as evolved of its homologue in Hydra, whereas the latter may be a degenerate form of the former. Passing to the vegetable world, here, as before? the cell is the unit of the first order, while aggregates representing almost every stage in the insensible evolu- tion of a secondary unit are far more abundant than among animals. Complete unity of the second order can hardly be allowed to the - thallus, which Spencer proposes to compound and integrate into tertiary aggregates — the higher plants; as in animals, the embryo- logical method is preferable, both as avoiding

gratuitous hypothesis and as leading to direct results. Such a unit is clearly presented by the embryo of higher plants in which the cell-aggregate is at once differentiated into parts and integrated into a whole. Such an embryo possesses axis and appendages as when fully developed (fig. 2). The latter, however, being as organs mere lateral expansions of the concentric layers into which the plant embryo, like the animal, is differentiated, and so neither stages of evolution nor capable of separate existence, are not entitled to individual rank. The embryo, the bud, shoot or uniaxial plant, all thus belong to the second order of individuality, like the hydroid they resemble. Like the lower coelenterates, too, aggregates of such axes are formed by branching out from their low degree of integration. Such colonies can hardly be termed individuals of the third, much less of higher, order, at least without somewhat abandoning that unity of treatment of plants and animals without which philosophical biology disappears. Individuality of the second order is most fully reached by the flower — the most highly differentiated and integrated form of axes and appendages. Such a simple inflorescence as a raceme or umbel approximates to unity of the third order, to which a composite flower-head must be admitted to have attained while a compound inflorescence is on the way to a yet higher stage.

If, as seems probable, a nomenclature be indispensable for clear expression, it may be simply arranged in conformity with this view. Starting from the unit (After Sachs) °f tne nrs * or der, the plastid or monad,

Fig. 2. — Embryo of and t ermi . n g any undifferentiated ag- Dicotyledon, showing inci- *”»? de ™, we have a monad-deme

pient axis and appendages, TT*tw Z •”•° V eCOI L da 5 y ?T ° T

as also the three concentric ^f′ *» ™%f f ro ^ h fyadrdemes,

emhrvnnir lavprs lnt ° a tnad ' thlS formln g (riad-demes,

embryonic layers. and thege when differentiated becoming

tetrads, the botryllus-colony with which the evolution of compound individuality terminates being a tetrad-deme. The separate living form, whether monad, dyad, triad, or tetrad, requires also some dis- tinguishing name, for which persona will probably ultimately be found most appropriate, since such usage is most in harmony with its inevitable physiological and psychological connotations, while the genealogical individual of Gallesio and Huxley, common also to all the categories, may be designated with Haeckel the ovum-product or ovum-cycle, the complete series of forms needed to represent the species being the species-cycle (though this coincides with the former save in cases where the sexes are separate, or polymorphism occurs) . For such a peculiar case as Diplozoon paradoxum, where two separate forms of the same species coalesce, and still more for such hetero- geneous individuality as that of a lichen, where a composite unit arises from the union of two altogether distinct forms — fungus and alga — yet additional categories and terms are required.

Promorphology. — Just as the physiologist constantly seeks to interpret the phenomena of function in terms of mechanical, physical, and chemical laws, so che morphologist is tempted to inquire whether organic as well as mineral forms are not alike reducible to simple mathematical law. And just as the crystallographer constructs an ideally perfect mathematical form from an imperfect or fragmentary crystal, so the morphologist has frequently attempted to reduce the complex-curved surfaces of organic beings to definite mathe- matical expression. Canon Moseley {Phil. Trans., 1838) succeeded in showing, by a combination of measurement and mathematical analysis, that the curved surface of any turbinated or discoid shell might be considered as generated by the revolution,

about the axis of the shell, of a curve, which continually varied its dimensions

according to the law of the logarithmic spiral. For Goodsir this logarithmic spiral, now carved on his tomb, seemed a fundamental expression of organic curvature and the dawn of a new epoch in natural science — that of the mathematical investigation of organic form— and his cwn elaborate measurements of the body, its organs, and even its component cells seemed to yield, now the triangle, and again the tetrahedron, as the fundamental form. But such supposed results, savouring more of the Naturphilosophie than of sober mathematics, could only serve to discourage further inquiry and interest in that direction. Thus we find that even the best treatises on botany and zoology abandon the subject, satisfied with merely contrasting the simple geometrical ground-forms of crystals with the highly curved and hopelessly complicated lines and surfaces of the organism.

But there are other considerations which lead up to a mathematical conception of organic form, those namely of symmetry and regularity. These, however, are usually but little developed, botanists since Schleiden contenting themselves with throwing organisms into three groups — first, absolute or regular; second, regular and radiate; third, symmetrical bilaterally or zygomorphic — the last being capable of division into two halves only in a single plane, the second in two or more planes, the first in none at all. ft. C. C. Burmeister, and more fully H. G. Bronn, introduced the fundamental improve- ment of defining the mathematical forms they sought not by the surfaces but by axes and their poles; and Haeckel has developed the subject with an elaborateness of detail and nomenclature which seems unfortunately to have impeded its study and acceptance, but of which the main results may, with slight variations chiefly due to Jager (Lehrb. d. Zool. i. 283), be briefly outlined.

A. ANAXONIA : Forms destitute of axes, and consequently wholly irregular in form, e.g. Amoebae

and many sponges.

B. AXONIA : Forms with definite axes.

I. Homaxonia, all axes equal.

(o) Spheres, where an indefinite number of equal axes can

be drawn through the middle point, e.g. Sphaerozoum. (b) Polyhedra, with a definite number of like axes. Of these a considerable number occur in nature, for example, many radiolarians (fig. 3), pollen-grains, &c, and they are again classifiable by the number and regularity of their faces.

II. Protaxonia, where all the parts are arranged round a main axis, and of these we distinguish —

1. Monaxonia, with not more than one definite axis. Here are distinguished (a) those with similar poles, spheroid (Coccodiscus) and cylinder (Pyrosoma) and (b) those with dissimilar poles, cone (Conulina).

2. Stauraxonia, where, besides the main axes, a definite number of secondary F IG - 3- — Radiolanan axes are placed at right angles, and the (Ethmosphaera), an stereometric ground-form becomes a irregular endosphaeric pyramid. Here, again, may be dis- polyhedron with equi- tinguished (a) those with poles similar, angular faces. Type Stauraxonia homopola, where the stereo- °′ Homaxonia.

metric form is the double pyramid (fig. 4), and (6) those with

poles _ dissimilar, Stauraxonia heteropola, where the stereometric

form is the single pyramid, and where we

distinguish a basal, usually oral, pole

from an apical, aboral or anal pole.

The bases of these may be either regular

or irregular polygons, and thus a new

classification into Homostaura and

Heterostaura naturally arises.

The simpler group, the Homostaura, may have either an even or an odd number of sides, and thus among the Homostaura we have even-sided and odd-sided, single and double pyramids. In those Homostaura with an even number of sides, such as medusae, the radial and inter-radial axes have similar poles; but in the series with an odd number of sides, like most echinoderms, each of the transverse axes is half radial and half semi-radial (fig. 5). Of the group of regular double pyramids the twelve-sided pollen-grain of Passiflora

(fig. 4) may be taken as an example, Fig. 4. — Pollen of Pas- having the ground-form of the hexagonal sion Flower, as example of system, the hexagonal dodecahedron. Stauraxonia homopola. Of the equal even-sided single pyramids Ground-form a regular (Heteropola homostaura), Alcyonium, double pyramid of six Geryonia, Aurelia may be taken as sides, examples of the eight-sided, six-sided,

and four-sided, pyramids while those with an odd number of sides may be illustrated by Ophiura or Primula with five sides, and the flower of lily or rush with three sides.

In the highest and most complicated group, the Heterostaura,

the basal polygon is no longer regular but amphithect (Ajuc££0t|ktso = double-edged). Such a polygon has an even number of sides, and can be divided into symmetrical halves by each of two planes intersecting at right angles in the middle point, and thus dividing the whole figure into four congruent polygons. The longer of these axes may be

termed lateral, the shorter the equatorial or dorso-ventral; and these two axes, along with the main axes, always define the three dimensions of space. Ctenophores (fig. 6) furnish examples of eight-sided amphi- thect pyramids, some Madrepore Corals of six-sided, Crucifers, some Medusae, and Cestodes of four-sided amphithect pyramids.

In these forms the poles of the dorso- ■ctr- p ci- fi v, ventral and lateral axes are similar, and,

- rG - 5- Starnsn, an ag ; h preceding Monaxonia and examp e of Heteropola Stauraxoni £ he cen s tre of the bod is homostaura. Ground- defined fa ` ,. and h ar£ there | ore form a regular single termgd tentraxonia, while the Pro- pyramid of five sides. taxonia whJch &re defined fcy thdr

central point are called Centrostigma. There are, however, other forms, and these the most complicated, in which the poles of at

Fig. 6. — Ctenophore (is wcfeam). Fig. 7. — Spatangus. Ground Ground-form an eight-sided form a five-sided half amphi- double amphithect pyramid. thect pyramid,

least the dorso-ventral axis are unlike, and in which the body is thus defined not with reference to a line but to a median plane, and these have accordingly received the name of Centroptpeda. Their ground-form is a polygon with an even number of sides, which can only be divided into two symmetrical halves by the one median plane. It can be obtained by halving an amphithect pyramid of double the number of sides, and is consequently termed a half amphithect pyramid (fig. 7). The whole amphithect pyramid may be most conveniently obtained by the reduplication of the ground-form as if in a mirror. Of half amphithect pyramids there are again two forms, termed by Haeckel Amphipleura and Zygo- pleura, the former including the ” bilaterally symmetrical ” or irregularly radiate forms of previous authors, such as Spatangus Viola, Orchis,

while the Zygopleura include forms bilaterally symmetrical in the strictest sense, in which not more than two radial planes, and these at right angles to each other, are present. The sterometric ground-form is a half rhombic pyramid. Haeckel again divides these, according to the number of antimeres, into Tetrapleura and Dipleura.

Promorphology has thus shown that the reigning dogma of the fundamental difference of organic and mineral forms is false, and that a crystallography of organic forms is possible — the form of the cell or the cell-aggregate differing from the crystal merely by its more or less viscous state of aggregation, its inherited peculi- arities, and its greater adaptability to the environment. The classification into bilateral and radiate forms which usually does duty for more precise promorphological conceptions must be aban- doned as hopelessly confusing essentially different forms, or at least must be rigidly restricted — the term radial to regular and double pyramids, the term bilateral to the Centropipeda if not indeed to dipleural forms. Similarly the topographical and relative terms, anterior and posterior, upper and under, horizontal and vertical, must be superseded by the terms above applied to the axes and their poles, oral and aboral, dorsal and ventral, right and left.

Nature of Morphological Changes. — The main forms of organic structure being analysed and classified and their stage of individu- ality being ascertained, the question next arises, by what morpho- logical changes have they arisen, and into what categories can these modes of differentiation be grouped? They at first sight seem innumerable, yet in reality are few. Goethe somewhat vaguely generalized them for the flower as ascending and descending meta- morphosis, expansion and contraction of organs, &c. ; but the first attempt at careful enumeration seems to be that of Auguste de St Hilaire, who recognized defects of development, adherences, excesses of production or ” d6doublements,” metamorphosis and displacement of organs. Subsequent authors have variously treated the subject; thus Asa Gray

enumerates as modifications of the

flower — coalescence, adnation, irregularity, abortion, non-alter- nation or anteposition, multiplication,, enation, unusual develop- ment of the axis, and other morphological modifications connected with fertilization. These are obviously too numerous, as may be best shown by a single comparison with the view of an animal morphologist. Thus Huxley, in discussing the arrangement of the Vertebrata, recognizes only three processes of modification, not only in the ancestral evolution of the Equidae, but in the individual development of animals generally; these are ″ (1) excess of develop- ment of some parts in relation to others, (2) partial or complete suppression of certain parts, (3) coalescence of parts originally distinct.″ The particular form of excess of development which results in the repetition of parts, and the morphological changes due to partial or complete fusion, of such repeated parts receive special treatment in the article Metamerism.

Nature of Morphological Correspondence — Categories of Homology. — To indicate all the steps by which the idea of morphological re- semblance has been distinguished from that of physiological would be to examine the whole history of morphology; it must suffice to discuss the terminology of the subject which has, as ever, served not only as an index but as an engine of progress. For these two distinct forms of resemblance the terms homology and analogy gradually became specialized, and were finally established and clearly defined by Owen in 1843—″ the former as the same organ in different animals under every variety of form and function (e.g. fore- limbs of Draco volans and wings of Bird) ; the second as a part or organ in one animal which has the same function as another part or organ in a different animal {e.g. parachute of Draco and wings of Bird).″ He further distinguishes three kinds of homology:

(1) special, being ″ that above defined, namely, the correspondence of a part or organ determined by its

relative position and con- nexions with a part or organ in a different animal, the determina- tion of which homology indicates that such animals are constituted on a common type," e.g. basilar process of human occipital with basi-occipital of fish; (2) general, that " higher relation in which a part or series of parts stands to the fundamental or general type, involving a knowledge of the type on which the group in question is constituted," e.g. the same human bone and centrum of the last cranial vertebra; (3) serial homology, " representative or repetitive relation in the segments of the same skeleton " (demonstrated when general and special homologies have been determined) ; thus usually the basi-occipital and basi-sphenoid are " homotypes." These terms were henceforth accepted by naturalists; but the criterion of analogy and homology became for L. Agassiz and other embryologists developmental as well as comparative, refer- ence to the ideal archetype becoming less and less frequent. Passing over the discussions of L. Agassiz and Bronn, of which the latter is criticized and partly incorporated by Haeckel, we find the last-named (1) placing serial under general homology;

(2) erecting categories of homology partially corresponding to those of individuality — (a) homotypy (of antimeres), hence dis- tinct from that of Owen, (b) homodynamy (of metameres), (c) homonomy (of parts arranged on transverse axes) ; (3) defining special homology in terms of identity of embryonic origin. In 1870 this latter point was more fully insisted upon by Ray Lankester, who, decomposing it into two others, proposed to supersede the term homology by homogeny, being the corre- spondence of common descent, and homoplasy, denoting any superinduced correspondence of position and structure in -parts embryonically distinct. Thus, the fore-limb of a mammal is homogenous with that of a bird, but the right and left ventricles of the heart in both are only homoplastic, these having arisen inde- pendently since the divergence of both groups from a uni-ventricu- late ancestor in relation to similarity of physiological needs. St G.

Mivart next proposed to retain homology as a generic term, with homogeny and homoplasy as two species under it, and carried the analysis into great detail, distinguishing at first twenty-five, but later fifteen, kinds of correspondence: (1) parts similar in function only, e.g. legs of lizard and lobster; (2) parts similar both in function and relative position, wings of bat and bird; (3) parts of common descent, fore-limb of horse and rhinoceros; (4) parts of similar embryonic origin, whatever be their racial genetic relations, e.g. occipitals of panther and perch; (5) parts of dissimilar embryonic origin, whatever be their racial genetic relations, e.g. legs of Diptera; (6, 7, 8, 9, 10) laterally, vertically, serially, antero- posteriorly and radially homologous parts; (11) subordinate serial homologues, e.g. joints of antenna; (12 and 13) secondary and terti- ary subordinate serial homologues; (14 and 15) special and general homologies (in Owen's sense). In his Kalkschwdmme Haeckel proposed to term homophyly the truly phylogenetic homology in opposition to homomorphy, to which genealogic basis is wanting; and finally Von Jhering has published a repetition of Lankester's view.

In this discussion, as in that of individuality, it is evident that we are dealing with numerous logical cross-divisions largely corre- sponding, no doubt, to the complex web of inter-relations presented by nature, yet remaining in need of disentanglement. Though we must set aside analogies of functional activity, the resemblances in external shape or geometric ground-form which correspond to these, e.g. Hydrozoa and Bryozoa, Fishes and Cetaceans, mimetic

organisms, are nevertheless, as our historic survey showed, the first which attract attention; and these homoplastic or homomorphic forms, as Haeckel has shown, come as fairly within the province of the

promorphologist as do isomorphic crystals within that of his an-organological colleague the crystallographer. Here, too, would be considered " radial," " vertical," " lateral " homology, " homotypy of antimeres," and all questions of symmetry, for which Haeckel's nomenclature of homaxonial, homopolic, &c, is distinctly preferable. Entering the field of tectology or morphology in the ordinary sense, we may next consider whether two organisms com- pared are of the same category of individuality — are homocategoric ; and under this serial homology, for instance, would come as a minor division, the correspondence between the units or parts of units of a linear dyad-deme or triad. From a third point of view, that of the embryologist, we trace the development of each multi- cellular organism (1) from the embryonic layers and systems into which the secondary unit (gastrula or plant embryo) differentiates, (2) from a unit-deme or unit of the inferior order or orders of individuality. The parts and units thus recognized by ontogenetic research, respectively or successively homodermic, homosystemic and homodemic, may then conveniently be termed (indifferently save for considerations of priority) either " specially homologous, " homogenous," " homophylic," or " homogenetic," in the language of phylogenetic theory. These three great classes of morphological correspondence — promorphological, tectological and embryological — may or may not coincide. But the completest homology, in which all forms of resemblance unite and from which they differen- tiate, is that expressed in the cell theory, or rather in that ovum theory which underlies it, and which Agassiz therefore not unjustly regarded as " the greatest discovery in the natural sciences of modern times."

Orientation and Subdivisions of Morphology. — The position of morphology in the classification of the sciences and the proper mode of subdividing it cannot be discussed within these limits, although the latter is especially the subject of much disagreement. The position above assumed, that of including under morphology the whole statical

aspects of the organic world, is that of Haeckel, Spencer, Huxley and most recent animal morphologists ; botanists frequently, however, still use the term under its earlier and more limited significance (see Plants: Morphology).

(P.Ge.;P.C.M.)

MORPHY, PAUL CHARLES (1837–1884), American chess player, was born in New Orleans, Louisiana, on the 22nd of June 1837, the son of Alonzo Morphy (1798–1856) and his wife, whose maiden name was Le Carpentier. The father, the son of a well- to-do Spanish immigrant, was a prominent jurist and legislator and, like his brother Ernest, passionately fond of chess. Learn- ing the moves from his father at the age of ten, Paul gave evidence of such extraordinary precocity that in less than two years he was able to defeat all the amateurs of his native city. While still at school he competed successfully with such strong players as Eugene Rousseau and the Hungarian master J. Lowenthal. He attended the Jesuit college of St Joseph at Spring Hill, Alabama, and applied himself to the study of the law, being admitted to the bar of Louisiana in 1858. During the autumn of 1857 he took part in the first American chess congress at New York, winning the first prize from sixteen competitors, including the well-known L. Paulsen. Morphy went to Europe in the spring of 1858 and entered upon a series of triumphs, both in regular matches and in blindfold play, that proved him to be one of the best players of the time. The winter of 1858–1859 was passed in Paris, where he was destined to gain his greatest triumphs, practically winning the championship of the world by beating Adolf Anderssen, champion of Germany, by a score of 7–2, with two games drawn. Another feat was his simul- taneous blindfold match against eight strong French players, six of whom he defeated. At this time he was in his twenty- second year. Returning to the United States in 1859, he in- tended to establish himself in the practice of the law at New Orleans, but the outbreak of the Civil War frustrated these plans. His devotion to chess had already begun to

affect his health. He spent the year 1863 in Paris, returning to New Orleans in 1864, but his health was now permanently impaired. He became insane, and at last he died in New Orleans in 1884.

See Exploits and Triumphs of Paul Morphy, by F. M. Edge (New York, 1859); Morphy' s Games, edited by J. Lowenthal (New York, i860) ; Paul Morphy, by Max Lange (Leipzig, 1881).

MORRILL, JUSTIN SMITH (1810-1898), American political leader and financier, was born at Strafford, Vermont, on the 14th of April 1810. He was a clerk in a store at Strafford in 1825-

1828, and at Portland, Maine, in 1828-1831, and was a merchant and then a farmer in his native town in 1831-1855. He was elected to the national house of representatives as an anti- slavery Whig in 1854, soon afterwards joining the new Republican party, and served in the house from 1855 until 1867. From 1867 until his death in Washington on the 28th of December 1898 he represented Vermont in the Senate. In the house he was continuously a member of the ways and means committee (of which he was chairman in 1865-1867), and in the Senate of the finance committee (of which he was chairman in 1877-1879, 1881-1893 and 1893-1898). Soon after entering Congress he became the acknowledged leader of the protectionists, and at the request of John Sherman, then chairman of the ways and means committee, he prepared a new tariff bill, which was introduced in the house in March i860. To this relatively conservative bill, which substituted in many instances ad valorem for specific duties, and was intended by its author to be a revenue as well as a protective measure, were added many amendments which made the bill more strongly protectionist, and in some cases were vigorously opposed by Morrill. The bill was finally passed by the Senate on the 20th of February 1861, and was signed by President Buchanan on the 2nd of March following. Morrill is probably best known as the author of the Land Grant Act of 1862, which led to the development of the highly important system of state educational institutions,

aided by the Federal government. On the 14th of December 1857, Morrill introduced in the house a bill ″ donating public lands to the several states and Territories which may provide colleges for the benefit of agriculture and the mechanic arts.″ This bill passed both houses, but was vetoed in February 1 859 by President Buchanan on the ground that it would cause friction between the states, that it would be uneconomical, that it might encourage fraudulent speculation, that it would injure existing institutions, and that it was unconstitutional. A similar bill was introduced by Morrill on the 16th of December 1861, and five months after- wards was presented to the Senate by Benjamin Wade of Ohio. The measure had a negative report from committee in the house, and was strongly opposed in the Senate; but it passed both branches, and on the 2nd of July 1862 was signed by President Lincoln. This measure provided for the foundation and main- tenance of colleges ″ where the leading object shall be, without excluding other scientific and classical studies, and including military tactics [which had not been included in the original bill], to teach such branches of learning as are related to agriculture and the mechanic arts. . . in order to promote the liberal and practical education of the industrial classes in the several pursuits and professions in life.″ In 1890 Morrill introduced in the Senate the so-called ″ Second Morrill Act,″ under which $25,000 is given annually by the Federal government to each of the ″ land-grant ″ colleges.

MORRIS [Morrison], CLARA (1840-), American actress, was born in Toronto, Ontario, and at the age of seventeen joined a stock company in Cleveland, Ohio. Her first New York appearance (1870) was under Augustin Daly in an adaptation of Wilkie Collins's Man and Wife; and she won considerable success as Cora in U Article 47, Camille, Miss Multon and similar emotional parts. In 1874 she married Frederick C. Harriott, and soon afterwards began to write novels and to contribute to magazines. She published her Life on the Stage in 1901, and Life of a Star in 1906.

MORRIS, GOUVERNEUR (1752–1816), American statesman, was born in the old Morrisania manor house, in what is now the city of New York, on the 31st of January 1752. He graduated at King's College (now Columbia University) in 1768, studied law, and was admitted to the bar in 1771. New York, then in the midst of the political disturbances which preceded the out- break of the War of American Independence, offered a good opportunity for a public career, and Morris had the aristocratic connexions which tradition required. 1 An extreme aristocrat 1 His great grandfather, Richard Morris, having fought in Crom- well's armies, emigrated to America on the restoration of Charles II., and founded the manor of Morrisania, in what was then New Nether- land. His grandfather, Lewis Morris (1671–1746), inherited this

in his political views, he distrusted the democratic tendencies of the Whigs, but a firm belief in the justice of the American cause led him to join their ranks. His half-brother, Staats Long Morris (1 728–1800), was a Tory, fought in the British army, and became a major-General. Gouverneur served in the New York Provincial Congress in 1776–1777, was perhaps the leading advo- cate in that body of a declaration of independence, and after the Congress had become (July 1776) the " Convention of the Representatives of the state of New York," he served on the committee of that body which prepared the first draft of the state constitution. He served in the Continental Congress in 1777— 1779, and was enthusiastic in his support of Washington. In 1778 he was selected chairman of the committee to treat with Lord North's conciliation commissioners, and as such presented the famous report, adopted by a unanimous vote of Congress, which declared that the recognition of independence must pre- cede any negotiations for peace. He settled in Philadelphia as a lawyer, and in February 1780 he published in Philadelphia a series of essays on finance, in which

he criticized the issue of legal-tenders, denounced laws passed for the benefit of the debtor class, and urged the people to tax themselves for the common good. From 1781 to 1785 he was assistant to Robert Morris (q.v.), superintendent of finance. In 1782 he prepared an elaborate report on the coinage, suggesting the use of the decimal system and of the terms dollar and cent. With some modifications introduced by Jefferson, notably the adoption of a higher unit of value (the dollar instead of one-tenth of a cent), this plan constitutes the basis of the present American system. Morris was one of Pennsylvania's representatives in the constitutional convention of 1787, and took an active part in the debates. His influence was weakened, however, by his cynicism and by his ultra-aristocratic views. He favoured a strong executive holding during good behaviour, an aristocratic senate appointed by the president for life, and the restriction of the suffrage to free- holders. The struggle which the frontier settlers of Pennsyl- vania had made in the state legislature to secure unlimited issues of paper money and the enactment of laws favourable to the debtor class prejudiced him against the West, and he tried to introduce into the constitution a clause guaranteeing forever the political supremacy of the states east of the Alleghanies. He was instrumentaHn securing the executive veto and in defeat- ing the proposal that the legislature should elect the president. He also gave able support to the nationalistic and anti-slavery factions in the convention. He was the member of the committee of revision selected to draft the constitution in its final form, and that document is a monument to the vigour and simplicity of his literary style. In 1787 he bought Morrisania from Staats Long Morris, and returned to New York to live.

He went to France in February 1789 on private business, and remained abroad for nine years, passing most of the time in Paris, London, and the German capitals. In 1792 he acted as financial agent in a daring attempt to secure the escape of the king and queen from Paris. He was appointed United States minister to France in 1792, and was the only representative of a foreign country who remained at his post throughout the Reign of Terror; but his ill-concealed attitude of hostility to the Revolu-

manor and also a large estate from his uncle in Monmouth county, East Jersey. He was an influential advocate of the surrender of the proprietary government of the Jerseys to the Crown (1702), became a member of the New Jersey Council in 1703, was suspended by Governor Cornbury in 1704, was elected a member of the Assembly in 1707 and led that body in opposition to Cornbury, was reappointed to the Council under Governor Lovelace in 1708, was again suspended in 1709 by Lieut.-Governor Ingoldsby, was made President of the Council in 1710 under Governor Hunter, and in 1711, during Hunter's administration (1710-1719), of which he was a staunch supporter, was made a justice of the supreme court of New Jersey. He was chief justice of New York from about 1720 until 1733, was sent to England by the popular party late in 1734 to present their grievances to the king, and was governor of New Jersey from 1738 until his death on the 21st of May 1746. Gouverneur Morris's father, Lewis Morris (1698-1762), closed a long public career as judge of the vice-admiralty court of New York; his mother was descended from a French Protestant refugee, who had come to America to escape the persecu- tion of Louis XIV.

tion gave offence, and in return for the recall of Genet, at the request of the United States, the French government, in 1794, asked for the recall of Morris. Business and pleasure, however, still detained him in Europe for four years longer. He returned to New York in 1798, resumed the practice of his profession, re-entered politics, and sat in

the United States Senate as a Feder- alist from 1800 to 1803. As early as 1801 Morris became interested in projects for improving the communication between the Hudson river and Lake Erie, and from i8iotoi8i6he was chairman of the board of canal commissioners, which after exploring the country prepared plans for the Erie Canal. He was bitterly opposed to the war of 1812, and openly advocated the formation of a northern confederacy to escape the rule of the "Virginia dynasty." He died at Morrisania on the 6th of November

1816.

His half-brother, Lewis Morris (17 26-1 798), a signer of the Declaration of Independence, was educated at Yale, served in the Continental Congress from 1775 until early in 1777, and went on a mission to the western frontier in 1775 to win over the Indians from the British to the American side. He joined the army as brigadier-general of militia in June 1778, and served in the New York Senate in 1777-1781 and 1784-1790.

See The Diary and Letters of Gouverneur Morris (2 vols., New York, 1888), edited by Anne Cary Morris; Jared Sparks, Life of Gouverneur Morris (3 vols., Boston, 1832), the first volume being a biography and the second and third containing Morris's miscellaneous writings and addresses ; and Theodore Roosevelt, Gouverneur Morris (Boston, 1888), in the " American Statesmen " series.

MORRIS, JOHN (1810-1886), English geologist and palaeon- tologist, was born at Homerton, London, on the 19th of February 1 8 10. He was brought up to the business of a pharmaceutical chemist. Early in life he published observations on the Tertiary and Post-Tertiary deposits in the Thames valley, and on fossil plants and various invertebrata, in the Magazine of Natural History, the Annals of Nat. Hist, and other journals. In 1845 he issued his Catalogue of British Fossils (2nd ed., 1854), a work of essential service to geology. He was also author (with John Lycett) of A Monograph of the Mollusca

from the Great Oolite (Palaeontographical Soc, 1850–1853). In 1855 he became pro- fessor of Geology in University College, London, a post which he held until 1877. In i868–i87oand i877–i878he was president of the Geologists' Association. He was awarded the Lyell medal by the Geological Society in 1876, and was made Hon. M.A. of Cambridge in 1878 in acknowledgment of his services as deputy Woodwardian professor during the final illness of Sedgwick. He died in London on the 7th of January 1886.

MORRIS, SIR LEWIS (1833–1907), British poet, eldest son of Lewis Edward William Morris and Sophia, daughter of John Hughes of Carmarthen, was born at Penbryn in 1833. His great grandfather, Lewis Morris (1700–1765), had been a well-known Welsh poet and antiquary. He was educated at Sherborne School and Jesus College, Oxford, where he took first classes in classics (1853 and 1855). He won the chancellor's prize for an English essay in 1858, was called to the bar in 1861, and elected hon. fellow of his old college in 1877. He practised for twenty years as a conveyancing counsel, retiring from active legal work in 1 88 1. He was energetic on behalf of educational movements in Wales, and contested Welsh constituencies in the Liberal interest, but without success. He was knighted in 1896, and became also a Jubilee-medallist and Knight of the Redeemer of Greece. Comparatively late in life Sir Lewis Morris made his appearance as a writer of verse with three series of miscellaneous poems, called Songs of Two Worlds, published respectively in 1872, 1874 and 1875. These little volumes proved him to have a refined taste and a gentle metrical fluidity, which soon won for his work considerable popularity. In 1876 and 1877 he made a more important venture with The Epic of Hades, an attempt to re-tell the stories of Hellenic mythology with a certain modern and allegorical setting. This work, though it is somewhat strained in sentiment and is not free from artistic infelicities, contains his best verse and has passages of undeniable force and effect. His later work follows too closely upon the influence of Tennyson, from which he is never altogether free;

but his earnest

didacticism, genial optimism and evident sincerity have- given his work a thoroughly wholesome moral influence. Among his other books were Gwen (1880), Songs Unsung (1883), Gycia (1886), A Vision of Saints (i&qo), Idylls and Lyrics (1896) and The New Rambler (1906). He died at Carmarthen on the 13th of November 1907.

MORRIS, RICHARD (1 833-1 894), English philologist, was born in London on the 8th of September 1833. In 187 1 he was ordained in the Church of England, and from 1875-1888 was head master of the Royal Masonic Institution for Boys, near London. His first published work was The Etymology of Local Names (1857). Between 1862 and 1880 he prepared twelve volumes for the Early English Text Society, edited Chaucer (1866) and Spenser (1869) from the original manuscripts, and published Specimens of Early English (1867). His educational works, Historical Outlines of English Accidence (1872), Elementary Lessons in Historical English Grammar (1874) and English Grammar (1874), had a large sale and exercised a real influence. The rest of his life he devoted to the study of Pali, on which he became a recognized authority. He died at Harold Wood, Essex, on the 12th of May 1894.

MORRIS, ROBERT (1 734-1806), American financier, a signer of the Declaration of Independence, was born in Liverpool, England, on the 3 1st of January 1 734. He emigrated to America in 1747, entered a mercantile house, and in 1754 became a member of a prosperous firm, which was known successively as Willing, Morris & Co., Willing, Morris & Inglis and Willing, Morris & Swanwick. In the conflict with the mother country Morris took the side of the colonists, but associated himself with the conservative group of Pennsylvania Whigs who followed the lead of John Dickinson and James

Wilson, rather than with the more radical faction represented by Thomas Paine. He was vice-president of the Pennsylvania Committee of Safety (1775-1776), and a member of the Continental Congress (1775-1778). At first he disapproved of the Declaration of Inde- pendence, but he joined the other members in signing it on the 2nd of August. He retired from Congress in 1778, and was at once sent to the legislature, serving in 1778-1779 and in 1780-1781. His greatest public service was the financing of the War of Independence. As chairman or member of various committees he practically controlled the financial operations of Congress from 1776 to 1778, and when the board system was superseded in 1 78 1 by single-headed executive departments he was chosen superintendent of finance. With the able co-operation of his assistant, Gouverneur Morris — who was in no way related to him — he filled this position with great efficiency during the trying years from 1781 to 1784. For the same period he was also agent of marine, and hence head of the navy department. Through requisitions on the states and loans from the French, and in large measure through money advanced out of his own pocket or borrowed on his private credit, he furnished the means to transfer Washington's army from Dobbs Ferry to Yorktown (1781). In 1781 he established in Philadelphia the Bank of North America, chartered first by Congress and later by Pennsyl- vania, the oldest financial institution in the United States, and the first which had even partially a national character. A confusion of public and private accounts, due primarily to the fact that his own credit was superior to that of the United States, gave rise to charges of dishonesty, of which he was acquitted by a vote of Congress. He was a member of the Federal Con- vention of 1787, but took little part in its deliberations beyond making the speech which placed Washington in nomination for the presidency of the body. On the formation of the new gov- ernment he was offered, but declined, the secretaryship of the treasury, and urged Hamilton's appointment in his stead. As United States senator, 1 789-1 795, he supported the Federalist policies

and gave Hamilton considerable assistance in carrying out his financial plans, taking part, according to tradition, in arranging a bargain by which certain Virginia representatives were induced to vote for the funding of the state debts in return for the location of the Federal capital on the Potomac. After the war he gradually disposed of his mercantile and banking

interests and engaged extensively in western land speculation. At one time or another he owned wholly or in major part nearly the entire western half of New York state, two million acres in Georgia and about one million each in Pennsylvania, Virginia and South Carolina. The slow development of this property, the failure of a London bank in which he had funds invested, the erection of a palatial residence in Philadelphia, and the dishonesty of one of his partners, finally drove him into bankruptcy, and he was confined in a debtors' prison for more than three years (1 798–1 801). He died in Philadelphia on the 7th of May 1806.

The best biography is E. P. Dberholtzer's Robert Morris, Patriot and Financier (New York, 1903), based upon the Robert Morris papers in the Library of Congress; see also W. G. Sumner's The Financier and the Finances of the American Revolution (New York,

1891).

MORRIS, WILLIAM (1834–1896), English poet and artist, third child and eldest son of William Morris and Emma Shelton, was born at Elm House, Walthamstow, on the 24th of March 1834. His grandfather was a respected tradesman in Worcester, and his father, who was born in that town in 1797, came up to London in 1820, and entered the office of a firm of discount brokers, in which he afterwards assumed a partnership. As a child the poet was delicate but studious. He learnt to read very early, and by the time he was four years old was familiar with most of the Waverley novels. When he was six the family moved to Woodford Hall, where new

opportunities for an out-of- door life brought the boy health and vigour. He rode about Epping Forest, sometimes in a toy suit of armour, became a close observer of animal nature, and was able to recognize any bird upon the wing. At the same time he continued to read whatever came in his way, and was particularly attracted by the stories in the Arabian. Nights and by the designs in Gerard's Herbal. He studied with his sisters' governess until he was nine, when he was sent to a school at Walthamstow. In his thirteenth year his father died, leaving the family well-to-do; the home at Woodford was broken up, as being unnecessarily large; and in 1848 William Morris went to Marlborough, where his father had bought him a nomination. Morris was at the school three years, but got very little good from it beyond a taste for architecture, fostered by the school library, and an attraction towards the Anglo- Catholic movement. He made but slow progress in school work, and at Christmas 1851 was removed and sent to a private tutor for a year. In June 1852 he matriculated at Exeter College, Oxford, but, as the college was full, he did not go into residence till January 1853. He at once made friends, who stood him in good stead all his life, foremost among whom were Edward Burne- Jones, who was a freshman of his year, and a little Birmingham group at Pembroke. They were known among themselves as the "Brotherhood"; they read together theology, ecclesiastical history, medieval poetry, and, among moderns, Tennyson and Ruskin. They studied art, and fostered the study in the long vacations by tours among the English churches and the Continental cathedrals. Moreover, Morris began at this time to write poetry, and many of his first pieces, afterwards destroyed, were held by sound judges to be equal to anything he ever did. Both Morris and Burne- Jones had come to Oxford with the intention of taking holy orders, but as they felt their way they both came to the conclusion that there was more to be done in the direction of social reform than of ecclesiastical work, and that their energies would be best employed outside the priesthood. So Morris decided to become an architect, and for the better

propagation of the views of the new brotherhood a magazine was at the same time projected, which was to make a speciality of social articles, besides poems and short stories.

At the beginning of 1856 the two schemes came to a head together. Morris, having passed his finals in the preceding term, was entered as a pupil at the office of George Edmund Street, the well-known architect; and on New Year's Day the first number of The Oxford and Cambridge Magazine appeared. The expenses of this very interesting venture were borne entirely

by Morris, but after the issue of No. i he resigned the formal editorship to his friend Fulford. Many distinguished com- positions appeared in its pages, but it gradually languished, and was given up after a year's experiment. The chief immediate result was the friendship between Morris and Dante Gabriel Rossetti (q.v.), which sprang up from a successful attempt to secure Rossetti as a contributor. In the summer of 1856 Street removed to London, and Morris accompanied him, working very hard both in and out of office hours at architecture and painting. But Rossetti persuaded him that he was better suited for a painter, and after a while he devoted himself exclusively to that branch of art. It was in the summer that the two friends visited Oxford, and finding the new Union debating-hall in course of construction, offered to paint the bays. Seven artists volun- teered help, and the work was hastily begun. Morris worked with feverish energy, and on finishing the portion assigned to him proceeded to decorate the roof. The work was done too soon and too fast, the colours began to fade at once, and are now barely decipherable; but the broken designs, so long as any vestige remains, will always be interesting as a relic of an im- portant aesthetic movement and as the first attempt on Morris's part towards decorative art (see Rossetti). Early in 1858

Morris published The Defence of Guenevere, which was almost unnoticed by contemporary criticism, but is now recognized as one of the pearls of Victorian poetry.

On 26th April 1859 Morris married Jane Burden, a beautiful Oxford girl, who had sat to him as a model, and settled tem- porarily at 41 Great Ormond Street, London. Meanwhile he set about building for himself at Upton a house which was to be the embodiment of all his principles of decorative art. Furniture, decorations, household utensils and every article of daily use were specially designed, and in the summer of i860 the house was ready for occupation. The furnishing of it had suggested a fresh activity; Morris now determined to embark upon decora- tion as a career. A small company was formed, consisting of D. G. Rossetti, Philip Webb, Burne-Jones, Madox Brown, Faulkner and Marshall, and in January 1862 started business under the title of Morris, Marshall, Faulkner & Co., with offices at 8 Red Lion Square. The prospectus set forth that the firm would undertake church decoration, carving, stained glass, metal-work, paper-hangings, chintzes and carpets. The business, after inevitable vicissitudes, flourished, but the " house beauti- ful " at Upton proved to be unhealthily situated. Serious illness obliged the family to remove to town, and in November 1863 they resettled at 26 Queen Square, Bloomsbury. Morris was now unceasingly busy, but he found time also for literature. In June 1867 he published The Life and Death of Jason, which was at once successful; and in April 1868 the first two parts of The Earthly Paradise. The rest of this wonderful storehouse of poetic romance appeared in two volumes in 1869 and 1870. In the following year he was again looking for a country house, and lighted upon Kelmscott manor house, in the Upper Thames valley, which he took at first in joint- tenancy with Rossetti and used principally as a holiday home. In 1872 appeared Love- is Enough, structurally the most elaborate of his poems for its combination of the epic and dramatic spirits; and in the autumn he began to translate the shorter

Icelandic sagas, to which his enthusiasm had been directed by two inspiring journeys to Ice- land. Business worries, however, interrupted him; it was found necessary to reconstruct the company owing to its having grown out of proportion with the existing division of profit and labour. Long negotiations ensued, and in March 1875 the old firm was dissolved. Morris now became sole manager and proprietor, although the other members of the old firm continued, in varying degrees, to give him the advantage of their assistance and advice.

Meanwhile the epic mood had possessed Morris very strongly, and, in addition to his work upon the sagas, he had actually finished and (in 1875) published a verse translation of the Aeneid, which is interesting rather for its individuality than for any fidelity to the spirit of the original. In the following year appeared Sigurd the Volsung, a version Ml of heroic vigour,

movement and vitality, but somewhat too lengthy and inco- herent in design to preserve the epic interest intact to the British taste. This splendid burst of poetic activity, however, had raised him to a place among the first poets of his time; and in 1877 an attempt was made to induce him to accept the professor- ship of poetry at Oxford. But he felt himself lacking in the academic spirit, and wisely declined. At this time a fresh outlet for his energy was furnished by his foundation in 1877 of the Society for the Protection of Ancient Buildings, which sprang into being as a practical protest against a scheme for restoring and reviving Tewkesbury Abbey. He began, too, to take an active interest in politics over the Eastern Question, but his enthusiasm was at the moment a flash in the pan. Finding that events were going against his judgment, Morris, as was so often the case with him, shrugged his shoulders and broke free from the movement.

Still, although he found it hard to sit close to a definite party, Morris continued to be spasmodically interested in political movements. During the next few years, indeed, the interest gained ground with

him steadily. He became treasurer of the National Liberal League in 1879, but after the Irish coercive measures of 1881 he finally abandoned the Liberal party, and drifted further and further into Socialism. For ten or twelve years this movement had been gaining ground in England, and the Social Democratic Federation was formed in 1881. In January 1883, within a week of his election to an honorary fellowship at Exeter, Morris was enrolled among its members. Thenceforward for two years his advocacy of the cause of Social- ism absorbed not only his spare time, but the thought and energy of all his working hours. For it he even neglected literature and art. In March 1883 he gave an address at Manchester on " Art, Wealth and Riches "; in May he was elected upon the executive of the federation. In September he wrote the first of his Chants for Socialists. About the same time he shocked the authorities by pleading in University Hall for the wholesale support of Socialism among the undergraduates at Oxford. Nevertheless, the federation began to weaken. At the franchise meeting in Hyde Park in 1884 it was unable to get a hearing. Morris, however, had not yet lost heart. Internal dissensions in 1884 led to the foundation of the Socialist League, and in February 1885 a new organ, Commonweal, began to print Morris's splendid rallying-songs. Still, differences of opinion and degree prevented concerted action; and when, after the Trafalgar Square riots in February 1886, Morris remonstrated with the anarchic section he was denounced by the advanced party and ever afterwards was regarded with suspicion. In 1889 he was deposed from the management of Commonweal, and gradually lost all confidence in the movement as an active force.

Long before that time, however, Morris had returned to the paramount interests of his life — to art and literature. When his business was enlarged in 1881 by the establishment of a tapestry industry at Merton, in Surrey, Morris found yet another means for expressing the medievalism that inspired all his work, whether on paper or at the loom. In 1887 he published his translation of the Odyssey, which had

many of the qualities and defects of his Aeneid, and is much more interesting as an experiment than valuable as a ” Homeric echo.” In the Commonweal appeared News from Nowhere, published in book form in 1891, describing an England in which the principles of communism have been realized. He then added another to his many activities; he assumed a direct interest in typography. In the early seventies he had devoted much attention to the arts of illumination and calligraphy. He himself wrote several manuscripts, with illuminations of his own devising. From this to attempts to beautify the art of modern printing was but a short step. The House of the Wolfings, printed in 1889 at the Chiswick Press, was the first essay in this direction; and in the same year, in The Roots of the Mountains, he carried his theory a step further. Some fifteen months later he added a private printing-press to his multifarious occupations, and started upon the first volume issued from the Kelmscott Press, his own GUitering Plain. Yot the last few years of his life this new interest remained “the

absorbing one. A series of exquisite books, which gain in value every year, witnesses to the thorough and whole-hearted fashion in which he invariably threw himself into the exigencies of his life-work.

The last years of his life were peacefully occupied. He was sounded as to whether he would accept the laureateship upon the death of Tennyson, but declined, feeling that his tastes and his record were too remote from the requirements of a court appointment. His last piece of work, the crowning glory of his printing-press, was the Kelmscott Chaucer, which had taken nearly two years to print, and fully five to plan and mature. It was finished in June 1896, and before it was in his hands he already . knew that his working day was over. His vigour had been slowly declining for some time, and he sank gradually during the autumn, dying on the

3rd of October 1896. He was buried in Kelmscott churchyard, followed to the grave by the workmen whom he had inspired, the members of the league which he had supported, the students of the art gild he had founded, and the villagers who had learnt to love him.

Essentially the child of the Gothic revival, he had put an ineffaceable stamp on Victorian ornament and design, his place being that of a follower of Ruskin and Pugin, but with a greater practical influence than either. In house decoration of all kinds — furniture, wall-papers and hangings (which he preferred to paper), carpet- weaving, and the painting of glass and tiles, needlework, tapestry — he formed a school which was dominated by his protest against commercialism and his assertion of the necessity for natural decoration and pure colour, produced by hand work and inspired by a passion for beauty irrespective of cheapness or quickness of manufacture (see Arts and Crafts).

The truest criticism of William Morris is that attributed to his friend, the poet Swinburne, who said that he was always more truly inspired by literature than by life. His Socialism, though it made a brave show at times, was at heart a passionate enthu- siasm for an inaccessible artistic ideal. Morris, indeed, was not primarily interested in men at all, but in objects. His poetry deals, it is true, with the human passions, but the emotion is always seen as in a picture; he is more concerned with the atti- tude of the group than with the realization of a character. He had very little adaptability in dealing with his fellows; the crowd, as a crowd, fired his enthusiasm, but he was unable to cope with the individuals that composed it. Many of his colleagues bear witness to his generosity and magnanimity, but as a general principle he certainly lacked the wider humanity. This is the one failing of his art: it is also the shortcoming of his poetry. Granted this, there is left an immense amount that will always command admiration. The spirit of beauty breathes in every line; a sense of music and of colour is everywhere abundant; the

reader moves, as it were, under a canopy of apple-blossom, over a flower-starred turf, to the faint harmony of virginals. Nor does the poet lack power and vigour when an adventurous story is to be told. The clash of arms breaks upon his pagan paradise with no uncertain sound; he is swift in narrative, breathless in escapade. And over all hangs the faint atmosphere of medieval- ism, of an England of green gardens and grey towers, of a London " small and white and clean," of chivalry and adventure in every brake. The critic has also to remember the historical value of Morris's literary influence, following upon the prim domesticities of early Victorian verse, and breaking in upon Tennyson's least happy phase of natural homeliness.

See the Life and Letters, in 2 vols. (Longmans), by J. W. Mackail. An article on " William Morris and his Decorative Art," by Lewis F. Day, appeared in the Contemporary Review for June 1903. (A. Wa.)

MORRIS, a city and the county-seat of Grundy county, Illinois, U.S.A., on the north bank of the Illinois river, about 62 m. S.W. of Chicago. Pop. (1900), 4273; (1910) 4563. Morris is served by the Chicago, Rock Island & Pacific railway, and by the Illinois & Michigan canal. Electric power is derived from the Illinois river at Marseilles, 111. (pop. in 1910, 3291), about 15 m. west. Morris (named in honour of Isaac P. Morris, a commissioner of the Illinois & Michigan canal) was settled in 1834, and was chartered as a city in 1857.

MORRIS-DANCE, or Morrice-Dance (Span. Morisco, Moorish), an old English dance, which is said by various authorities to have been introduced by John of Gaunt from Spain or borrowed from the French or Flemings. That it was a develop- ment of the morisco-dance or Spanish fandango is not invali- dated by the fact that the morisco was for one person only, for, although latterly the morris-dance was represented by various characters, uniformity in this respect was not always observed. There are few

references to it earlier than the reign of Henry VII., but it would appear that in the reign of Henry VIII. it was an almost essential part of the principal village festivities. In earlier times it was usually danced by five men and a boy dressed in a girl's habit, who was called Maid Marian. There were also two musicians; and, at least sometimes, one of the dancers, more gaily and richly dressed than the others, acted as " foreman of the morris." The garments of the dancers were ornamented with bells tuned to different notes so as to sound in harmony. Robin Hood, Friar Tuck and Little John were characters ex- traneous to the original dance, and were introduced when it came to be associated with the May-games. At Betley, in Stafford- shire, there is a painted window, of the time of Henry VIII. or earlier, portraying the morris — the characters including Maid Marian, Friar Tuck, the hobby-horse, the piper, the tabourer, the fool and five other persons apparently representing various ranks or callings. The hobby-horse, which, latterly at least, was one of the principal characters of the dance, consisted of a wooden figure attached to the person of the actor, who was covered with trappings reaching to the ground, so as to conceal his feet. The morris-dance was abolished along with the May-games and other festivities by the Puritans, and, although revived at the Restoration, the pageant gradually degenerated in character and declined in importance. Maid Marian latterly was personated by a clown, who was called Malkin or Marykin. The interest of the subject has revived in recent years in connexion with the new movements associated with folk-music generally.

See The Morris Book, by Cecil J. Sharp and H. C. Macllwaine. Among older authorities see Douce, " Dissertations on the Ancient Morris Dance," in his Illustrations of Shakespeare (1839); Strutt, Sports and Pastimes of the People of England; Brand, Popular Antiquities (1849).

MORRISON, ARTHUR (1863-), English novelist, was born in Kent on the 1st of November 1863. He was for a short time a clerk in the civil service, and in

1890 took to journalism. He had already published scattered tales and sketches of low life in London when W. E. Henley, with whom he was connected as a contributor to the National Observer, suggested their publication in volume form. Tales of Mean Streets (1894) immediately attracted attention, and this was followed by A Child of the J ago (1896), the scene of which is laid between High Street, Shoreditch, and Bethnal Green Road. Cunning Murrell (1900), The Hole in the Wall (1902), and the detective stories, Martin Hewitt, Investigator (1894), which had sequels in 1894 and 1896, and The Green Eye of Gorma, are among his other works.

MORRISON, RICHARD JAMES (1795–1874), English astro- loger, commonly known by his pseudonym ” Zadkiel,” was born on the 15th of June 1795. He served in the Royal Navy, but resigned with the rank of lieutenant in 1829. He then devoted himself to the study of astrology, and in 1831 issued The Herald of Astrology, subsequently known as Zadkiel’ s Almanac. In this annual pamphlet Morrison, over the signature ” Zadkiel Tao-Sze,” published predictions of the chief events of the coming year. In 1863 Morrison brought a libel action against Admiral Sir Edward Belcher, who had accused him of obtaining money by charlatanism in the form of crystal-gazing. He was awarded twenty shillings damages, but was deprived of his costs. Morrison died on the 5th of April 1874.

MORRISON, ROBERT (1782–1834), the first Protestant missionary to China, was born of Scottish parents at Buller’s Green, near Morpeth, on the 5th of January 1782. After re- ceiving an elementary education in Newcastle, he was appren- ticed to a lastmaker, but his spare hours were given to theology, and in 1803 he was received into the Independent Academy at

Hoxton. In the following year he offered his services to the London Missionary Society, and after he had attended David Bogue's college at Gosport and studied Chinese under a native teacher, he was appointed to Canton in 1807. After a year of much hardship he became translator to the East India Company's factory there in 1809, and worked at a Chinese Gram- mar and a translation of the New Testament, both published in 1 8 14. In 181 7 he published A View of China for Philological Purposes, and his translation of the Old Testament (in which William Milne collaborated) was completed in the following year. His next enterprise was the establishment (1820) of an Anglo- Chinese college at Malacca for " the reciprocal cultivation of Chinese and European literature." Here too were trained native Chinese evangelists who could proceed to the mainland and carry on Christian work with comparative immunity. In 1821 Morri- sons's Chinese Dictionary, in six 4to volumes, a monumental work, was published by the East India Company, at a cost of £12,000. Leaving China at the close of 1823, Morrison spent two years in England, where he was elected a fellow of the Royal Society. Returning to China in 1826, he set himself to promote education and to prepare a Chinese commentary on the Bible and other Christian literature. He died at Canton on the 1st of August 1834. Morrison was admirably fitted for the pioneering work accomplished by his grammar and dictionary; and his establishment of a dispensary, manned by a native who had learned the main principles of European treatment, marks him out as the forerunner of modern medical missions.

His Memoirs, compiled by his widow, were published in 1839. See also R. Lovett, History of the London Missionary Society, vol. ii. ch. xix. ; C. S. Home, The Story of the L. M. S. ch. v.; Townsend, Robert Morrison (1888).

MORRISTOWN, a town and the county-seat of Morris county, New Jersey, U.S.A., on the Whippany river, 31 m.(by rail) W. of New York City. Pop. (1890) 8156; (1900) 11,267; (1910 census) 12,507. It is served by the Delaware, Lackawanna & Western, the

New Jersey & Pennsylvania and the Morristown & Erie railways. Morristown is situated on a table-land sur- rounded by picturesque hills. It is primarily a residential suburb of New York, and has many handsome residences and a number of large estates. Near its centre is a public park, in which is a soldiers' monument (59 ft. in height). At Morris Plains, about 4 m. to the north, is a state hospital for the insane (1876).

Morristown, officially named in 1740 in honour of Lewis Morris (1671-1746), then governor of New Jersey, and grand- father of Gouverneur Morris, was settled about 17 10, under the name of West Hanover, by Puritans, who were attracted here by the presence of iron ore. From January to May 1777, and again from December 1779 to June 1780, Morris- town was occupied by the American army under Washington. Behind the court-house is the site of Fort Nonsense, built at Washington's orders, largely to keep his soldiers employed. In December 1770-January 1780 General Benedict Arnold was tried before a court martial presided over by General Robert Howe (1732-1785) in the Dickerson tavern here, still standing. In Morristown, at the old Speedwell ironworks (almost completely destroyed by fire in 1909), was made a part of the machinery of the " Savannah," the first steamboat that crossed the Atlantic, and here Samuel F. B. Morse and Alfred Vail completed the invention of the electric telegraph. Morristown was incorporated as a town in 1865.

See A. M. Sherman, Historic Morristown, New Jersey; The Story of its First Century (Morristown, 1905) and Julia K. Colles, Authors and Writers Associated with Morristown (Morristown, 1893).

MORSK, SAMUEL FINLEY BREESE (1791-1872), American artist and inventor, was born at Charlestown, Massachusetts, on the 27th of April 1791, son of Jedidiah Morse (1761-1826), Congregational minister there and a writer on geography, and a grandson of Samuel Finley, president of the college of New Jersey. At the age of fourteen he entered Yale

College, where he graduated in 1810 and where under the instruction of Jeremiah Day and Benjamin Silliman he received the first impulse towards electrical studies. In 181 1 Morse, whose tastes during his early

years led him more strongly towards art than towards science, became the pupil of Washington Allston, and accompanied his master to England, where he remained four years. His success at this period as a painter was considerable. In 1825 he was one of the founders of the National Academy of Design, and was its first president, from 1826 until 1845. The year 1827 marks the revival of Morse's interest in electricity. It was at that time that he learned from J. F. Dana of Columbia College the elementary facts of electromagnetism. As yet, however, he was devoted to his art, and in 1829 he again went to Europe to study the old masters.

The year of his return, 1832, may be said to close the period of his artistic and to open that of his scientific life. On board the packet-ship " Sully," while discussing one day with his fellow- passengers the properties of the electromagnet, he was led to remark : " If the presence of electricity can be made visible in any part of the circuit, I see no reason why intelligence may not be transmitted by electricity." In a few days he had completed rough drafts of the necessary apparatus, which he displayed to his fellow-passengers. 1 During the twelve years that followed Morse was engaged in a painful struggle to perfect his invention and secure for it a proper presentation to the public. In poverty he pursued his new enterprise, making his own models, moulds and castings, denying himself the common necessaries of life. It was not until 1836 that he completed any apparatus that would work, and finally, on the 2nd of September 1837, the instrument was exhibited to a few friends in the building of the university of the City of New York, where a circuit of 1 700 ft. of copper wire had been set up, with such satisfactory results as to awaken the practical interest of the Messrs Vail, iron and brass workers in New Jersey, who thenceforth became

associated with Morse in his undertaking. Morse's petition for a patent was soon followed by a petition to Congress for an appropriation to defray the ex- pense of subjecting the telegraph to actual experiment over a length sufficient to establish its feasibility and demonstrate its value. The committee on commerce, to whom the petition was referred, reported favourably. Congress, however, adjourned without making the appropriation, and meanwhile Morse sailed for Europe to take out patents there. The trip was not a success. In England his application was refused, and, while he obtained a patent in France, it was subsequently appropriated by the French government without compensation to himself. His negotiations also with Russia proved futile, and after a year's absence he returned to New York. In 1 843 Congress passed the long-delayed appropriation, steps were at once taken to construct a telegraph from Baltimore to Washington, and on the 24th of May 1844 it was used for the first time. In 1847 Morse was compelled to defend his invention in the courts, and successfully vindicated his claim to be called the original inventor of the electromagnetic recording telegraph. In 1858 the representatives of Austria, Belgium, France, the Netherlands, Piedmont, Russia, the Holy See, Sweden, Tuscany and Turkey appropriated the sum of 400,000 francs in recognition of the use of his instruments in those countries. He died on the 2nd of April 1872, at New York, where his statue in bronze now stands in the Central Park. (See Telegraph.) He introduced into America Daguerre's process of photography, patented a marble-cutting machine in 1823, and in 1842 made experiments with telegraphy by a submarine cable.

See S. Irenaeus Prime, Life of S. F. B. Morse (New York, 1875).

MORSE, the ornamented brooch by which a cope is fastened. The usual form is a large circular clasp made of gold or silver and studded with jewels. A 14-century " morse " ornamented with translucent enamel is in the British Museum. The word comes through the O. Fr. mors, from the Lat. morsus, the

catch of a buckle, from mordere, to bite.

MORSHANSK, a town of Russia, in the government of Tambov, 50 m. N. of the city of Tambov, on the Tsna river. Pop. (1900), 25,913. The village of Morsha was founded in the middle of

. 1 Five years later the captain of the ship identified under oath Morse's completed instrument with that which Morse had explained on board the " Sully " in 1832.

the 17th century, and received municipal institutions in 1779; but within a very few years it became a wealthy town, owing to its situation in a very fertile district. Since it was brought into railway communication with Ryazhsk (81 m. west on the railway between Moscow and Ryazan) it has become the chief centre for the trade in wheat raised in the governments of Tambov, Penza, Saratov and in the eastern districts of the government of Ryazan. There are also extensive dealings in flour, hemp-seed, tallow and potash.

MORTAGNE, a town of northern France, capital of an arron- dissement in the department of Orne, 24 m. E.N.E. of Alencon by rail. Pop. (1906), 3383. A vaulted entrance (15th century), relic of an old stronghold, and the church of Notre-Dame (15th and 1 6th centuries) with a fine northern portal are of interest. The town is the seat of a sub-prefecture and of a tribunal of first instance, and is a celebrated market for horses of the Perche breed. Mortagne, once capital of the Perche, dates from the 10th century.

MORTAIN, a small town in the department of La Manche, France, the chief town of an arrondissement and seat of a sub-prefect. It is beautifully situated on a rocky hill rising above the gorge of the Cance, a tributary of the Selune. The parish

church of St Evroult is a magnificent example of the transitional style o,f the early 13th century, with a massive tower of the 14th and a Norman doorway dating from the original collegiate church (1058). Close to the town is the Abbaye- Blanche, founded as a Benedictine convent in 1105 and soon afterwards affiliated to Citeaux. The church is a perfect example of a Cistercian monastic church of the late 12th century, and por- tions of the 12th-century cloisters also survive. The population is between 2000 and 3000.

Mortain was ; in the middle ages, the head of an important comte, reserved for the reigning house of Normandy. In or about 1049 Duke William took it from his cousin William, ″ the warling,″ and bestowed it on his half-brother, Robert, ‘ thenceforth known as ″ count of Mortain,″ whose vast posses- sions in England after the Conquest (1066) gave name to ″ the small fees of Mortain,″ which owed less (knight) service than others. Robert was succeeded as count by his son William, who rebelled against Henry I., was captured at the battle of Tinchebrai (1106) and forfeited his possessions. Some years later, Henry bestowed the comte on his nephew Stephen, who became king in 1135. On Stephen’s death (1154) his surviving son William became count of Mortain, but when he died childless in 11 59 the comte was resumed by Henry II. On the accession of Richard I. (1889) he granted it to his brother John, who was thenceforth known as count of Mortain till he ascended the throne (1199). With his loss of Normandy the comtS was lost, but after the recapture of the province by the House of Lancaster, Edmund Beaufort, a grandson of John of Gaunt, was created count of Mortain and so styled till 1441, when he was made earl of Dorset.

As the counts are often described as ″ earls ″ of Mortain (or even of ″ Moreton ″) the title is sometimes mistaken for an English one. It has also, through erroneous spelling, been some- times wrongly derived from Mortagne-en-Perche. (J. H. R.)

MORTAR, the name (1) of a vessel in which any

material may be crushed or pounded, and (2) given to various compositions used in building and consisting of lime and cement with sand or other fine aggregate, well mixed by manual labour or machinery with a proper quantity of clean water (see below, and also Brickwork). The Latin name both for such a vessel and for the material as mixed in it, is mortarium. The earlier English form morter, from Fr. mortier, has been in modern English more closely adapted to the spelling of the Latin original. As applied to a vessel, the name is chiefly used for one employed in the preparation of drugs, which are pounded or triturated in the ″ mortar ″ by means of a pestle (Lat. pistillum; pinsere, to pound). The name has also been given, from a resemblance in shape to the vessel, to a short thick piece of ordnance, resting on a ″ bed ″ formerly used for high-angle fire. The barrel was always very short, normally even shorter than it was wide, and

sometimes even resembled a bowl in shape. The place of the mortar in artillery is now taken by the howitzer. In modern times the name ″ mortar ″ is occasionally used for a particularly short howitzer. (See Ordnance.)

Building Mortar. — The sand forming the aggregate is placed on the mixing platform and formed into a ring within which lime in the required proportion is placed; it is then gently but thoroughly sprinkled with clean water through the rose of a watering-can or hose-pipe. The lime is covered with the sand and left undisturbed for a day or two to slake, and the whole mass is then turned over and well mixed with the larry. The mortar is often used immediately the materials are thoroughly incorporated, but it should rather be kept covered over with sacks until well tempered. For large works a mortar mill working by hand, steam, or other power effects a considerable economy. Stone chippings, clean, hard, broken bricks or furnace clinkers may take the place of sand when the mill is employed, as the action of grinding reduces any large pieces to small sandlike particles.

The remarks above apply to ordinary lime mortar. Mortar of hydraulic lime, cement mortar, or mortar gauged with cement, must be mixed up in quantities sufficient only for immediate use. Any material not used at the time, or at least the same day, will be wasted ; cement cannot be reworked after it has begun to set as its setting properties are destroyed.

Slaking is a most important part in the process of making mortar. There are three methods of slaking lump lime — the first by immersion, the second by sprinkling with water, and the third by exposing the lime to the atmosphere and leaving it to slaking. absorb moisture. Different qualities of lime require varying amounts of water, but the average quantity is about a gallon and a half to every bushel of lime. It should be all added at one time and the mass then left to slake undisturbed. Hot limes are often used for mortar. These are unsuitable for plastering unless slaked for a long period. It will at once be seen that when mortars composed of these limes are used immediately after mixing, slaking must continue for a long time, drying up the moisture necessary for setting, and causing the mortar to crumble to dust in the joints of the brickwork. This fact gives us the reason for the old Roman enactment which set forth that lime should be slaked for three years before using. In the south of Europe it is the custom to slake lime the season before it is used.

The practical application of mortar to building work, and the methods of pointing the joints of brickwork and stonework, are described and fully illustrated in the article on Brickwork.

The results of many careful tests and experiments serve to show that the hardening of mortar is due to several causes acting collec- tively. With ordinary lime mortars the chief causes of Hardening hardening are the absorption of carbonic acid from the air f Mortar and the combination of part of the water with the lime, which unites with some of the silica of which the sand is composed and forms silicate of

lime. The initial setting is due to the evaporation of the excess of water and to the production of minute crystals of hydrate of lime which slowly absorbs carbonic acid gas from the air. With mortar of rich lime an outer crust is thus formed on the exposed parts which prevents ready access of air to the interior and retards setting. In illustration of this peculiar property of lime to remain soft, some remarkable cases may be mentioned. One of the bastions erected by Vauban in 1666 was removed by General Treissart, in 1822, a hundred and fifty six years after erection. The lime in the interior of the masonry, where it was inaccessible to the action of the atmosphere, was found to be quite soft. Dr John of Berlin mentions that in removing a pillar 9 ft. in diameter in the church of St Peter, Berlin, eighty years after erection, the mortar in the interior was found to be quite soft. Sir C. W. Pasley, in removing the old wharf wall at Chatham dockyard in 1834, found that the work executed in lime mortar was easily removable, the mortar being in a state of pulp. The brickwork, built with Roman cement, it was found necessary to blast.

The Romans were convinced that it was owing to prolonged and thorough slaking that their works in plaster became so hard and were not defaced by cracks. L. B. Alberti mentions in his writings that he once discovered in an old trough some lime which had been left there five hundred years and that it was quite soft and fit for use.

The setting and hardening of hydraulic limes and cements are due mainly to crystallization brought about by the action of water on the silicate of lime, and not by mere absorption of carbonic acid gas from the atmosphere. As a consequence we find that this variety of limes and cements has the valuable property of setting hard while immersed in water and in many cases growing increasingly hard with the lapse of time.

Opinions differ very widely on the question of the suitability for building purposes of limes or cements which contain an appreciable proportion of

magnesia, many experts holding the view Magnesla ._ that the expansion which often occurs in floors and other * works of concrete from one to four years after laying may ° ar ` be justly attributed to the presence of this substance. For mortars, however, it may be assumed that the presence of magnesia is not detrimental to the value of the matrix, but on the contrary may be a source of strength, for experiments show that it reduces the energy of.

slaking and increases that of the setting processes. Cements con- taining magnesia are pronounced both by Vicat and Chatoney to resist the dissolving action of sea- water better than those in which no magnesia is present, and it is pretty well established by experience that cements derived from argillo-magnesian limestones furnish a durable cement for construction in the sea.

The old mortar of the Romans, which proves its great property of endurance by many of their works still remaining, was in all proba- bility composed of lime mixed with pozzolana or " trass." These materials are similar in character and are obtained from extinct volcanoes — in the case of the Romans from the Italian volcanoes, but also from extinct volcanoes in the valleys of the Rhine and in Holland. Good as these mortars undoubtedly were, it may be safely asserted that no cement or mortar has been discovered to excel in strength, or in durability in all climates, the Portland cement of the present day. The best varieties of this material are made in England, the country of its origin, much of the continental and American product being deficient in the qualities which combine to make a good cement. (For the properties of Portland cement and the method of its manufacture see Cement.)

The comparative strengths under tensile stress of grey-lime mortar, Portland-cement mortar, and Portland-cement mortar with the addition of lime,

are given in the following table, which is the result of a series of tests by G. R. Redgrave.

Proportions by Measure.

Breaking Weight per sq. in. in lb.

Sand.

Cement.

Lime.

Water.

2 6

10 6

10

1 1 1 1

1

0–50 0–83

1–33 1–25

2–00

1–50 2–50

36–89 (average of three tests)

103–79 50–16

73–47 42–34

It is a good plan, where the question of cost precludes the use of mortar made entirely of cement, to add to lime mortar mixed in the usual proportions a small quantity of Portland cement. This is termed ” gauged ” lime mortar. By this addition the strength is greatly increased and the extra cost is but slight. The following table shows the force required to tear apart common stock bricks bedded in

mortar, mixed in proportions Adhesion common i y use d, and left to set and harden for four of Mortar. weeks _

Adhesive Strengths of Lime and Cement Mortars.

White chalk, lime and sand . Barrow lias do. Do. do. Portland cement …. Do. ....

Proportions.

1 to 3 1 to 3 1 to 4 1 to 4 1 to 6

4I ft. per sq. in.

9 t> ><

23 1 ″

*52 »» ‘»

These results show clearly that the adhesive strength of mortar varies according to the proportion of sand used, the power of resist- ance of the mortar to the force brought to bear upon it decreasing as the proportion of sand is increased.

The primary cause of the premature decay which sometimes takes place in mortars and like material is due to the presence of mud and decayed vegetable and animal matter in the sand, or possibly in the lime or cement itself. It is therefore of great importance Decay of to use a perfectly clean sand for the aggregate, and to Mortar. select a lime or cement of good quality for the matrix, care being taken that no foreign matters detrimental to the mortar be introduced during the processes of preparation. _ ,

The effect of salt in mortars as a preventive of the destructive effects of frost has not as yet been thoroughly determined, and the Pft . t few experiments that have been carried out show varying results. In some German experiments, cubes of stone were joined together with cement mixed with water of different characters, ranging from pure rain-water

to water containing from 2 to 8% of salt. Before the cement was set the blocks were exposed in air at a temperature varying from 20° F. to freezing-point, after which they were kept for seven days in a warm room. The samples were then examined with these results: The cement mixed with pure water was quite crumbled, having lost all its tenacity. The cement made with water containing 2 % of salt was in rather better condition, while that containing 8% of salt had not suffered from its ex- posure to frost. The use of salt causes much efflorescence on the face of the work, and should therefore not be used where this would be undesirable. Nor should salt be employed for work that is to be subsequently painted. The mortar for the brick facing of the Forth Bridge below water was composed of one part of Portland cement and one part of sand mixed with salt water in a mill. Briquettes made from this compound withstood a tensile stress of an average of 365 lb per square inch when a week old, and of 510 ft at five

weeks after mixing. Salt has no effect upon the strength of a mortar, although it retards the setting process somewhat.

Cement mixed with a percentage of sugar (usually 2 % and under) has been used with varying success. In India sugar is a frequent ingredient in mortar, probably because it has the effect of preventing too rapid setting ; it also retards the drying fj*™ - m of the material. The sugar must be dissolved in the water Mortar. used for gauging, as the results obtained when the sugar is mixed with the other ingredients in a dry state are not good. The addition of sugar to water enables it to take up about fourteen times more lime than pure water. It is supposed by many writers who have studied the methods of the ancients that old Roman mortars contained strong ale, wort or other saccharine matter, and it is probable that the use of sugar with lime passed from India to Egypt and Rome. The fol- lowing is an extract from the Roorkee Treatise

on Engineering, a work of reference published in India: ” It is common in this country to mix a small quantity of the coarsest sugar, ` goor ` or ` jaghery,′ as it is termed, with the water used for mixing up mortar. Experi- ments were made with bricks joined together by mortar consisting of one part of common shell lime to one and a half parts of sand, one

Cound of ` jaghery ` being mixed with each gallon of water. The ricks were left for thirteen hours and after that time the average breaking weight of the joints in twenty trials was 6$ ft per square inch. In twenty-one specimens joined with the same mortar without the ` jaghery ` the breaking weight was 4! lb per square inch.”

Of the saccharine matters used in mortar treacle seems to give the best results, rough cane sugar being next in effectiveness; beetroot sugar is not a good material to use.

The by-laws made by the London County Council in 1891 under sec. 16 of the Metropolis Management and Buildings Act Amend- ment Act 1878 require that ” the mortar to be used in g y .L aws the construction of walls must be composed of freshly affecting the burned lime and clean, sharp sand or grit without earthy composition matter, in the proportions of one of lime to three of sand .u, or grit.” The cement to be used must be Portland cement or other cement of equal quality to be approved by the district surveyor, mixed with clean, sharp sand or grit in proportions of one of cement to four of sand or grit. Burnt ballast or broken brick may be substituted for sand or grit, provided such material be properly mixed with lime in a mortar mill.

The varieties of lime and cement chiefly used for mortar in the British Isles are set forth below : —

Pure or fat limes should not be used for mortar. Grey stone lime, feebly hydraulic, makes a good mortar, but should not be employed for work below ground or in other damp situations. It j^i mes m/j

is obtained chiefly at Dorking, Hailing, Lewes and cements for Merstham. It is used in the proportion of one part to noT t ar> two or three parts of sand. An analysis of the lime from Castle Bytham gives the following composition : —

Silica …..... 14-00

Iron oxide and alumina

Lime

Magnesia

Carbon dioxide

Water and loss

4-25

77-00

1-25

6-90

2-60

IOO-OO

Blue lias lime is eminently hydraulic and should be used in good class work. Its use is a necessity for foundations and work in damp situations where Portland cement is not employed. It is used in the proportions of one part to one or two parts of sand. The best- known varieties are obtained from Watchet in Somersetshire, Barrow-on-Soar in Leicestershire, Rugby in Warwickshire, and Lyme Regis in Dorsetshire. A typical lias lime shows on analysis the following composition : —

Iron oxide …..

2-87

Alumina …..

6-83

Lime …...

65-84

Magnesia ….

I-OO

Sulphuric anhydride

1-36

Water and carbon dioxide .

3-85

Insoluble matter and loss .

0-72

100-00

Portland cement is the best matrix known, since it is the most powerful and the most durable. It is used for mortar wherever great strength, hard-wearing properties, and resistance to damp are required. It should weigh 112 ft per striked bushel and be ground fine enough to pass through a sieve having 2500 meshes to the square inch and leave not more than 10% residue. Test briquettes after setting under water for seven days should stand a tensile strain of 350 ft on a square inch. It is used in the proportions of one part of cement to from one to five parts of sand.

Portland cement of a similar character to the English cement, but somewhat less powerful, is largely made in America. The principal seat of manufacture is Coplay, Pa., where the first

American Portland cement was manufactured in 1874 by

Mr. David O. Saylor.

The chief works of reference on this subject are G. R. Burnell, Limes, Cements, Mortars ; Rivington, Notes on Building Construction ; F. W. Taylor and S. E. Thompson, A Treatise on Concrete, Plain and Reinforced. (J. Bt.)

(MORTARA ; EDGAR, an Italian Jew, of a Bologna family, whose abduction in early childhood (1858) by the Inquisition occupied for several years the attention of European diplomacy. Edgar Mortara, when between five and six years of age, fell ill. His nurse, a Catholic, arranged with her priest for his baptism in that faith, unknown to his parents, on the 24th of June 1858. She had acted in the same way with his elder brother, who had been ill a year or two previously, but on his recovery the boy continued to be educated as a Jew. This time she determined to make sure of her convert. Everything was concerted in advance with the ecclesiastical authorities, and immediately after the baptism both child and nurse disappeared. The story became public property, and protest was aroused in nearly every European country. The English and French governments made representations to the Vatican, but Pius IX., through the medium of the Civiltd, Caltolica, maintained that the question at issue was a spiritual one, outside his temporal jurisdiction. He accordingly declined to take any action, meanwhile indicating the direction of his sympathies by making Mortara his ward. In 1861 the Mortara family induced the Italian government to demand the prosecution 01 the nurse. The Vatican replied that she had entered a nunnery, and sub- sequently, on the threat of intervention by Prussia, induced the Mortara family to withdraw their plaint. After the capture of Rome by the Italian troops in 1870 Edgar Mortara had the opportunity of reverting to Judaism, but he refused to do so, and not long afterwards became an Augustinian.

MORTARA, a town of Lombardy, Italy, in the province of Pavia, 354 ft. above sea-level, a railway junction situated between the Ticino and the Po, 32

m. by rail S.W. of Milan. Pop. (1001), 7298 (town); 8697 (commune). Lines run to Milan, Pavia, Alessandria, Casale Monferrato and Vercelli. The church of San Lorenzo is in the Gothic style of the 14th century with a brick facade. Outside the town is the Lombard Romanesque church of S. Albino. Mortara has iron-works and manufactures of hats and cheese. Here the Austrians defeated the Piedmontese in 1849.

MORTGAGE (an old French legal word, meaning " dead pledge," translated in medieval Latin mortuum vadium), 1 the securing " money or money's worth " by making it a charge upon property, real or personal, so that if the debt be not paid by a time agreed upon by the parties, the creditor may foreclose or sell the property and pay himself out of the proceeds. In English law this is done by an actual or executory conveyance of the property to the creditor, subject only to its being defeated if the debt should be paid at the time fixed — an arrangement to which the law has attached peculiar incidents designed to carry out its real object.

The history of mortgage transactions in Roman law shows three well-marked stages. ` In the beginning the estate was conveyed absolutely to the creditor, who made a covenant (fiducia) to reconvey it when the debt should be paid. All the interest, however, in the meantime passed from the debtor to the creditor, and should the latter refuse to reconvey there was no remedy to the original owner except a personal action. In the second stage (that of pignus) the property did not pass to the creditor; he merely received possession of the thing pledged, together with certain rights of sale, &c, in the event of payment not being made at the time appointed. Lastly, without parting with the possession even of the pledge the debtor could create a lien or charge (hypotheca) over it in favour of the creditor, who

1 Coke on Littleton gives the following explanation of the meaning': " It seemeth that the cause why it is called mortgage is, for that it is doubtful

whether the feoffor will pay at the day limited such summe or not, and if he doth not pay, then the land which is put in pledge upon condition for the payment of the money is taken from him for ever, and so dead to him upon condition, &c. And if he doth pay the money, then the pledge is dead as to the tenant, &c."

acquired thereby a right on failure of payment to follow the thing by real action against the possessor, whosoever he might be, and to repay himself from the proceeds of his sale.

The mortgage of English law is the result of two distinct influences. Its origin and form belong to the common law; the restrictions by which it is made to serve the purpose of a security only, and nothing more, belong to the courts of equity. In the eye of the common law the mortgagee was the owner of the estate conveyed in the mortgage; in equity the mortgagor remains the real owner, and the mortgagee is merely an encumbrancer. A, the owner of land in freehold, conveys to B and his heirs, with a proviso that on repayment of money lent by B to A, on a future day, with interest until payment, B or his heirs will reconvey the estate to A and his heirs, and that, until default be made in payment, A and his heirs may hold without interruption from B and his heirs. This is a common mortgage of land, and at law, after failure of payment, the land belonged absolutely to the mortgagee, while in the meantime, before payment, the legal estate was considered to be vested in him, subject only to being defeated by payment at the proper time. The court of chancery first interfered in the reign of James I. to decree a redemption after forfeiture, and a case in the reign of Charles I. decides that payment after forfeiture has the same effect as payment before. The right of the mortgagor to redeem his estate after it has been forfeited, according to the terms of the deed, is called his equity of redemp- tion. No agreement between the parties was suffered to oust the jurisdiction of the court, or to deprive the debtor of his equity of redemption. And this equity, at first regarded as a mere right of the debtor,

became established in course of time as an estate in land which descended to the heirs of the mortgagor. On the other hand, the interest of the mortgagee is part of his personal estate, and passes to his executor and not to his heir. In spite of the terms of the mortgage, the owner of the land is still the owner, and the mortgagee is a creditor for the money he advanced and the interest thereon. It may be a question whether a given deed is a conveyance or a mortgage, and the court, in deciding, will look at all the circum- stances of the case, and will treat it as a mortgage when it was the real intention of the parties that it should operate as a security only. Thus, if the price was grossly inadequate, if the purchaser was not let into immediate possession, if he accounted for the rents to the grantor, retaining an amount equivalent to interest, if the expense of the deed was borne by the grantor, there would be reason to believe that the conveyance was only meant to be a mortgage. And ” once a mortgage, always a mortgage “; no subsequent agreements can change its character.

A mortgagee may, however, on default of payment file a bill of foreclosure requiring the mortgagor to pay the amount of the debt with interests or costs by an appointed day, or submit to be deprived of his equity of redemption. The effect of failure to pay by the time appointed would be to make the mortgagee absolute owner of the estate; but the court in any foreclosure suit may, at the request of either side, order a sale instead of a foreclosure. And a power of sale is now implied as one of the incidents of the mortgage, unless forbidden or varied by express destination. The mortgagee is entitled to retain out of the proceeds of the sale the amount of his principal, interest and costs, the surplus belonging to the mortgagor. A mortgagor cannot require the creditor to receive payment before the time appointed in the deed; and, on default of payment at the appointed time, he must give the creditor six months’ notice of his intention to pay off the mortgage, so that the creditor may have time ” to look out for a fresh security for his money.”

When the same land is successively mortgaged to different persons, their rights take priority according to their chrono- logical order. But the operation of equitable doctrines in the formation of the law of mortgage leads to an important modification of this rule. Of the successive mortgagees, the 1 first only takes the legal estate, and this, according to the maxim

of the court of chancery, will turn the scale when there is an equality of equitable rights between two contracting parties. Thus, if the third mortgagee had no notice at the time of making his advance of the existence of the second mortgagee, the equities of the two claimants are supposed to be equal, and if nothing else intervened priority of time would decide the order of their rights. But if the third mortgagee gets an assignment of the first mortgage, he can tack his third mortgage to the first, and so postpone the second mortgagee. And if the first mort- gagee himself makes an additional advance after the date of the second mortgage, but without notice of it, his whole debt will take precedence of the second mortgage. A similar result of equitable rules is seen in the consolidation of securities. Two separate estates, mortgaged at different times and for different sums of money by the same mortgagor to the same mortgagee, are regarded as consolidated, so that the whole of the land becomes security for the whole of the money, and the owner cannot redeem either mortgage without redeeming the other. If the mortgagor should have mortgaged another estate for more than its value, the holder of the deficient security may buy in the first mortgage, consolidate it with his own, and exclude the second mortgagee.

An equitable mortgage is constituted simply by the deposit of title-deeds in security for money advanced. The enactment of the Statute of Frauds that no action shall be brought on ” any contract or

sale of lands," &c, or any interests in or concerning them unless the agreement be in writing and signed by the party to be charged, has been cited as incompatible with the recognition of equitable mortgages, but it is argued by Lord Abinger that the act was never meant to affect such a transaction. The deeds which are the evidence of title could not be recovered in an action at law, and, if they were claimed in equity, the court would require the claimant to do equity by repaying the money borrowed on the deposit. Any sub- sequent legal mortgagee, having notice of the deposit, will be postponed to the equitable mortgagee, and when the legal mortgagee has not inquired as to the title-deeds the court will impute to him such knowledge as he would have acquired if he had made inquiry. A Welsh mortgage is one in which an estate is conveyed to a creditor, who takes the rents and profits in lieu of interest and without account, the estate being redeemable at any time on payment of the principal. Any form of property, with few exceptions, may be mortgaged.

United States. — In the United States there has been express legislation dealing with mortgages of land in most of the states. For the most part legislation has followed the lines of the English law, but there is a great variation in the extent to which the principles of equity have been substituted for the rules of common law. In some states, the mortgage deed is held to create a seizin of and an estate in the premises, with all its common law incidents, to be enforced if need be by ejectment. In others, the mortgagee's rights are limited to such as the rules of equity prescribe, and may not be enforced by a suit at law. In yet others, the mortgagee's interest is not deemed an estate at all, but is here only to be enforced by the sale of the premises as a means of paying the debt.

See Fisher on Mortgages; Coote on Mortgages; Ashburner on Mortgages ; L. A. Jones, Treatise on the Law of Corporate Bonds and Mortgages (Indianapolis, 1907).

MORTIER, EDOUARD ADOLPHE CASIMIR JOSEPH, Duke or Treviso (1768-1835), marshal of France, was born at Cateau Cambresis on the 13th of February 1768, and entered the army as a sub-lieutenant in 1791. He served in the campaigns of 1792 and 1793 on the north-eastern frontier and in the Nether- lands, and subsequently on the Meuse and the Rhine. In the war against the second coalition in 1799 he was promoted successively general of brigade and general of division. His conduct of the French occupation of Hanover led Napoleon to include Mortier in the first list of marshals created in 1804. He commanded a corps of the grande armee in the Ulm campaign in which he distinguished himself particularly by his brilliant action, of Durrenstein; in 1806 he was again in Hanover and

north-western Germany, and in 1807 he served with the grande armte in the Friedland campaign. In 1808 he was. created duke of Treviso, and shortly afterwards he commanded an army corps in Napoleon's campaign for the recapture of Madrid. He remained in Spain for two campaigns, winning the victory of Oca&a in November 1809. In 1812 and 1813 he commanded the Young Guard, and in the "defensive" campaign of 1 814 he rendered brilliant services in command of rearguards and covering detachments. In 1815, after the flight of Louis XVIII., he rejoined Napoleon and was given a high command, but at the opening of the Waterloo campaign he fell ill. After the second restoration he was for a time in disgrace, but in 1819 he was readmitted to the Chamber of Peers and in 1825 received the Order of the Saint Esprit. In 1830-1831 he was ambassador of France at St Petersburg, and in 1834-1835 minister of war and president of the council of ministers. In 1835, while accompanying Louis Philippe to a review, the marshal with eleven other persons was killed by the bomb aimed at the king by Fieschi (July 28, 1835).

MORTIFICATION, a term used in pathology and surgery, signifying a local death (Lat. mors) in the animal body. A portion of the body may die in consequence of the disturbance of its nutrition by inflammation,

or of a cutting off of the blood- supply, as by pressure `upon, or injury to, the blood-vessels. A comparatively slight injury affecting a portion of the body imperfectly supplied with blood may give rise to an inflam- matory condition which in a healthy part might pass unnoticed, but which, in consequence of imperfect nutrition, may end in mortification. If the flow of arterial blood only is arrested, the part depending upon it for nutrition becomes numb, cold and shrivelled, and the form of mortification known as dry gangrene occurs. This is apt to be met with in oldish persons with diseased vessels and feeble heart-action, especially if the blood is rendered less nutritious by the presence of diabetes or of kidney disease. The rule of treatment in all cases of threatened mortification is to keep the part warm by flannel or cotton-wool, but to avoid all methods which unduly hurry the returning circulation. Such increase would give rise to excessive reaction, which, in tissues already weakened, might actually produce mortification. When the part is dead it should be wrapped up in dry antiseptic dressings to prevent putrefaction. The surgeon should then wait until the " line of demarcation," a linear ulceration, between the living and the dead part is evident, and then, if the case permits, should amputate at a higher level. In spreading gangrene, in which acute sepsis is present, and in which no line of demarcation forms, the best chance for the patient is promptly to amputate high up in sound tissues. In these cases the blood is generally poisoned, and if the patient recovers from the primary shock of the operation, the disease may reappear in the stump, and lead to a fatal result. -^

Frost-bite. — Under the influence of cold, the blood-vessels contract, and less blood is conveyed to the tissues. Frost-bite is particularly apt to attack the feet, the hands, and the tips of the ears. The condition is unassociated with pain, for the reason that the nerves are benumbed. As no blood is passing into the skin, the parts look like tallow, and thus attract the attention of the

companions of the frost-bitten man, who perhaps has no thought of there being anything amiss. But because the tissues are frost-bitten it does not follow that they will not recover. The great danger is that, as the blood in the vessels becomes thawed, there will be so much reactionary flow through the tissues that acute inflammation will follow. And this inflammation of the damaged tissues is very likely to cause mortification. The re-establishment of the circulation, therefore, should be undertaken with the greatest possible care. The frost-bitten individual must not be brought near a fire nor even into a warm room. Nothing warm should come in contact with the affected parts. The best thing to do is to rub them with snow or with cold water. The thawing is associated with much pain, and in the case of the hand or foot this may be diminished by raising the part, so as to help the return of the venous blood to the heart. If mortification follows, the parts

become black, and care should be taken to prevent their becoming invaded by the germs of putrefaction. (E. O.*)

MORTILLET, LOUIS LAURENT GABRIEL DE (1821-1898), French anthropologist, was born at Meylau, Isere, on the 29th of August 1821. He was educated at the Jesuit college of Chambery and at the Paris Conservatoire. Becoming in 1847 proprietor of La Revue indipendante, he was implicated in the Revolution of 1848 and sentenced to two years' imprisonment. He fled the country and during the next fifteen years lived abroad, chiefly in Italy. In 1858 he turned his attention to ethnological research, making a special study of the Swiss lake-dwellings. He returned to Paris in 1864, and soon afterwards was appointed curator of the museum at St. Germain. He became mayor of the town, and in 1885 he was elected deputy for Seine-et-Oise. He had meantime founded a review, Mate- riaux pour

I'histoire positive et philosophique de I'homme, and in conjunction with Broca assisted to found the French School of Anthropology. He died at St Germain-en-Laye on the 25th of September 1898. Of his published works the best known are Le Prehistorique (1882); Origines de la chasse, de la peche et de l' agriculture (1890); Les Negres et la civilisation egyptienne (1884).

MORTIMER {Family). The Mortimers of Wigmore, earls of March and Ulster, were of a stock akin to the dukes of Nor- mandy and to many great houses of the duchy. Their ancestor Hugh, bishop of Coutances in 990, had at least three sons by a niece of Herfast the Dane, forefather of the Norman earls of Hereford, and brother-in-law of Duke Richard I. The eldest of these sons was Ralph, father of William of Warenne, earl of Surrey. The second was Roger of Mortemer-en-Brai, in the Pays de Caux, who, like his elder brother, is called filius episcopi. If we assume that Roger was born before his father's consecration, he must have lived to a great age. In the battle fought within*his own village of Mortemer, Roger was a leader of the force which defeated the French, but, releasing an enemy of his duke, he was punished by the loss of his castle, which was given to his nephew, William of Warenne. The chronicle of Ordericus Vitalis makes the Conqueror relate in a long death-bed speech how he had thrust Roger out of Normandy, and, though reconciled to him, had not restored the castle " in which he saved my enemy." It is somewhat remarkable that the Mortemers, thus early deprived of the castle at the source of the Eaulne, yet handed down a surname derived from it. Here also it may be noted that although Mortimer and Warenne branch off from their common stock before the beginnings of armorial bearings, the two houses assumed arms, which speak plainly enough of their common origin. The Mortimers' chief seat 111 Normandy became St Victor-en-Caux, where in 1074, by the last recorded act of Roger and his wife Hawise, the priory became an abbey. Roger's age would have forbidden him to be with the duke at Hastings, but, according to Wace,

his son Hugh was in the fight, and Ralph the third son was probably among the knights.

By the deaths of his elder brothers, Ralph de Mortemer became heir to his father's lands. He followed his kinsman, William Fitz-Osbern, the earl of Hereford, to the marches of Wales, and the Domesday book for Hereford and Shropshire marks the growth of the Mortimer power in those countries. He remained loyal during the rising of the 2nd earl of Hereford, and was enriched by grants of many of the earl's forfeited estates, among them the castle town of Wigmore, which became the chief seat of Mortimer and Cleobury, thereafter called Cleobury Mortimer. His Domesday lands lie in eleven counties, but the most important are found in North Hereford and South Shrop- shire. Although keeping apart from the treason of Earl Roger, Ralph rose in 11 88 with the other barons of the March, but was reconciled to William II., whom he afterwards supported in Normandy. He was living in 1104 a partisan of Henry I., and must have died soon afterwards. Hugh de Mortimer, who is found as his successor, a great Herefordshire baron in n 40, may have been either the son of Ralph's old age, or a grandson, the son of another Ralph. During the reign of Stephen, Hugh

occupied himself with local feuds, but seized the royal castle of Bridgnorth. So great was his power in the marches, that he alone, deserted by the earl of Hereford, armed and held his three castles against Henry II. Although forced at last to submit, he was allowed to keep Wigmore and the ruins of Cleobury. This proud baron died at Cleobury (c. 1181) in the habit of a canon of the abbey which he had founded at Wigmore.

Ralph de Mortimer, the 5th baron of Wigmore (d. 1246), married Gwladys the Swart, daughter of Llewelyn the Great, prince of Wales, and by her was father of Roger, whose bride, Maude de B reuse, daughter and co-heir of that William de B reuse whom Llewelyn had hanged, brought in a third of the honour of Breuse of Brecknock, and a share of the honour of the earls marshal. So came the lordship of

Radnor with other lands, and, as Eyton justly remarks, the history of the Mortimers ceases to be a provincial record. The last-named Roger stood steadfast for the Crown during Henry III.`s struggle with his barons. He found the fleet horse that carried Edward from his captivity. He led the rear-guard at Evesham, where his marchers hacked the head from earl Simon, and sent it to their lady at Wigmore. ” After that victory,” says Eyton, ” no privilege, reward or honour was too great for Mortimer to ask.” Dying in 1282, he was succeeded by Edmund, the eldest surviving son (d. 1304), Roger, a third son, founding the line of Mortimer of Chirk.

By Margaret de Fiennes, a kinswoman of Queen Eleanor of Castile, Edmund Mortimer had, with other issue, a son and heir, Roger (b. 1287), whose great inheritance was increased on his marriage with Joan, daughter and heir of Peter de Geneville, her grandmother being a co-heir of Lacy. The whole of the Geneville lands, with the half of the Lacy fief in England and Ireland, came through her to the Mortimers, who now added the castle town of Ludlow and half Meath to their estates. As the king’s lieutenant in Ireland during Edward Bruce’s invasion of 1316, Roger Mortimer defeated the Lacys, his wife’s jealous kinsfolk, and made her inheritance secure. With the aid of his uncle Roger Mortimer of Chirk, he assured the Mortimer power on the Welsh marches. During the war with the Despensers, the force of the Mortimers was cast against the king and his favourites, but after Bridgnorth Castle had been taken and fired, uncle and nephew submitted and suffered a harsh captivity for two years in the Tower of London. The uncle died in his prison, whence the nephew made a famous escape to France. At the court of Charles IV. the exile met Isabel, the queen of England, and early in 1326 the scandal of her close friendship with the lord of Wigmore had reached England. When the queen and her mercenaries from Germany and Hainaut landed at an English port in September, Mortimer was with her, and he followed the flight of the king to Wales. He was among the judges of the elder Despenser at Bristol, and of the

younger, his chief enemy, at Hereford. After the parliament had deposed Edward II. and made the young Edward king in his stead, Roger, as the queen's paramour, ruled England. Enriched by the lands of the Despensers, and by those of the earl of Arundel, beheaded at his command, Mortimer, who was created earl of March in 1328, never ceased to add greedily to his possessions and offices. When he held a Round Table, he summoned to it, with the young king and the queen-mother, almost all the nobles of the kingdom, and was, says Robert of Avesbury, " as it were, king over them all." But his fate followed suddenly upon these doings. Lancaster turned in vain upon the aggrandized march-lord, but the young king, impatient of his own puppet-like place in Mortimer's polity, worked secretly and surely for his fall. Montague's men-at-arms entered Notting- ham Castle by night, and joining the king, seized the favourite in his chamber next the queen. Mortimer, with the courage of his race, turned to bay and struck dead a knight who was the king's steward. But he was hurried to London and condemned by the peers; his death followed suddenly. Like any foot-pad, he was drawn at the horse-tail to the elms of Tyburn, where his body hung two days upon the common gallows.

The earl's son and heir, Edmund Mortimer, had been married to Elizabeth of Badlesmere, heir of her brother Giles. He died the year after his father's fall, and his young son Roger, as he grew up, was restored to a great part of their forfeited inheritance. This Roger fought at Crecy in " the king's battle." A founder of the Order of the Garter, he was summoned as a baron and obtained a reversal of his grandfather's attainder. In 1 3 5 5 he was summoned as earl of March. On the death of his grandmother, Ludlow Castle became the chief seat of his house. But following his king in the invasion of Burgundy, he died suddenly at Rouvray in 1360. His wife, a grand-daughter of that William Montague, earl of Salisbury, who had captured his grandfather

at Nottingham, survived him two-and-twenty years.

His only son, Edmund, a boy nine years, old, succeeded him as 3rd earl of March (1351-1381). A bride was found for him in the royal house. His marriage with Philippa, daughter of Lionel of Antwerp, duke of Clarence, by Elizabeth de Burgh, the heir of Ulster, added the earldom of Ulster to his style, and brought his issue into the direct succession of the Crown. Like so many of his race, he died young, of a chill caught in fording a Munster river on a winter's day, and his countess was dead before him. Elizabeth, their eldest child, became the wife of the famous Harry Percy, called Hotspur. Their second was Roger, who succeeded to his father's two earldoms as a boy of seven, and was at once appointed lieutenant of Ireland. His marriage was given to the earl of Kent, who married him to his daughter, Eleanor Holand, the niece of King Richard. In the parliament of 1385 the king named him as heir-presumptive to the throne. The panegyrists of his family are loud in their praise of his knightly doings and his great beauty, but they speak also of his lion-like ferocity, of his lasciviousness, and of his neglect of divine things. When in Ireland he defied the statute of Kilkenny, and ordered his garments and horse-harness after the fashion of an Irish chieftain. He wore the Irish mantle on the day in 1398 when, in one of his petty wars with the Leinster men, he was struck down at Kells as he charged far before his horsemen. The body, mangled by Irish skenes and axes, was brought home to be laid by his fathers in their abbey of Wigmore.

Once more a child succeeded to the earldoms. Edmund, 4th earl of March, was six years old at his father's death, and was, for the king's party, the heir-presumptive of the kingdom. But in 1399 the boy's fate was changed by the coming to power of the Lancastrian party, and Henry IV. 's first parliament recognized Henry's son as heir-apparent. Although Edmund and his brother Roger were brought up honourably with the new king's younger children, they were in strict custody until the king's death,

broken only by the attempt of their uncle, Sir Edmund Mortimer, and his father-in-law, Owen Glyndwyr, to carry them off from Windsor to Wales, where the young earl would have been proclaimed king. Henry V., however, released the earl and restored his lands, and absolved March from any share in the plot of the earl of Cambridge, who had married Anne, sister of the earl. March served the king in his French wars, although a dysentery caught in the camp at Harfleur seems to have kept him from his share in the glory of Agincourt. On the accession of Henry VI. the earl was appointed to the lieutenancy of Ireland which had been held by his father and grandfather, and in Ireland, on the 19th of January 1425, he died suddenly of the plague. His wife, Anne, daughter of Edmund, earl of Stafford, had borne him no child, and thus, his brother being dead before him, the illustrious house of the Mortimers, earls of March and Ulster, became extinct. Their lands and earldoms passed to Richard, duke of York, son of Richard of Cambridge, by the last earl's sister, and the great name of Mortimer disappeared from the English baronage.

Authorities. — Victoria History of the Counties of England — Intro- ductions to Domesday book for Hereford and Shropshire; Ey ton's Antiquities of Shropshire; Dictionary of National Biography; Dugdale's Mcmasticon; Stapleton's Rotuli Scaccarii Normanniae; G. E. C.'s Complete Peerage; Rymer's Foedera; Journal of the British Archaeological Association, vol. xxiv. Inquests, post mortem, close, patent and charter rolls, &c. (O. Ba.)

MORTISE, or Mortice (adapted from the Fr. mortaise; cf. Ital. mortise and Spanish mortaja; the origin is unknown; Celtic equivalents, such as Gaelic moirteis, are of French origin), a term for a socket or cavity cut in a piece of wood, or other material, into which a corresponding projecting end, a " tenon," fits, the two when fitted together forming a " mortise-joint," for fastening two beams or other pieces of timber together.

MORTLAKE, a village in the Kingston parliamentary

division of Surrey, England, on the Thames, 6j m. W. of London. Pop. of parish, which includes East Sheen (1901), 7774. It has been associated with the Oxford and Cambridge boat-race since 1845, the race finishing here. The village appears in Domesday, and the manor belonged to the Archbishops of Canterbury until the time of Henry VIII., when it passed by exchange to the Crown. From the early part of the 17th century until after the civil wars Mortlake was celebrated for a manufacture of tapestry.

MORTMAIN (O. Fr. mortemain; med. Lat. mortua manus, dead hand), the state or condition of lands or tenements when held by a corporation in perpetual or inalienable tenure. Aliena- tion in mortmain having the effect of depriving the lord of the incidents of seignory, which arose through the death or felony of the tenant or failure of his heirs, many English statutes were passed directed against such alienation. The earliest is that of Henry III. 36 (Magna Carta) ; others being 7 Edward 1. 13 (De Viris Religiosis); 13 Edward I. 32; 15 Richard II. 5; and 23 Henry VIII. 10. .The present law is regulated by the Mortmain and Charitable Uses Act 1888, as amended by the act of 1891.

MORTON, JAMES DOUGLAS, 4TH Earl of (c. 1525-1581), Scottish statesman, was the second son of Sir George Douglas of Pittendriech. Before 1543 he married Elizabeth (d. 1574), daughter of James Douglas, 3rd earl of Morton, a grandson of James Douglas (d. c. 1500), who was created earl of Morton in 1458. The 3rd earl's wife was Catherine, an illegitimate daughter of James IV. In 1553 James Dougla^ succeeded to the title and estates of his father-in-law, and in 1 563 he became lord high chancellor of Scotland. Though his sympathies were with the reformers, he took no part in the combination of Protestant barons in 1565, but he headed the armed force which took possession of Holyrood palace in March 1566 to effect the assassination of Rizzio, and it was to his house that the leading conspirators adjourned while a messenger was sent to obtain Mary's signature to the " bond of security." The queen, before complying with the request,

escaped to Dunbar, and Morton and the other leaders fled to England. Having been pardoned, Morton returned to Scotland early in 1567, and with 600 men appeared before Borthwick Castle, where the queen after her marriage with Bothwell had taken refuge. He was present at the remarkable conference at Carberry Hill, and he also took an active part in obtaining the consent of the queen at Lochleven to an abdication. He led the army which defeated the queen's forces at Langside in 1568, and he was the most valued counsellor of the earl of Murray during the latter's brief term of office as regent. On the death of the earl of Mar (Oct. 28, 1572), Morton, who had been the most powerful noble during this regency, and also during that of the earl of Lennox, at last reached the object of his ambition by being elected regent. In many respects Morton was an energetic and capable ruler. He effected at Perth, in February 1573, with the aid of Elizabeth's envoy, a pacification with Huntly, the Hamiltons, and the Catholic nobles who supported Mary. Only the castle of Edinburgh held out, and this, aided by English artillery, he succeeded in taking after a brave resistance by Kirkcaldy of Grange and Maitland of Lethington.

The ensuing execution of these men, the bravest and the ablest Scotsmen of that age, put an end to the last chance of Mary's restoration by native support. But while all seemed to favour Morton, there were under-currents which combined to procure his fall. The Presbyterian clergy were alienated by his leaning to Episcopacy, and all parties in the divided Church by his seizure of its estates. Andrew Melville, who had succeeded to the leadership of Knox, was more decided than Knox against any departure from the Presbyterian model, and refused to be

won by a place in his household. The powerful earl of Argyll and Atholl, a Stuart and Roman Catholic,

united with Alexander Erskine, governor of Stirling, who now had the custody of the young king, and others in a league which received so much support that Morton bent before the storm and offered to resign. He surrendered the castle of Edinburgh, the palace of Holyrood, and the royal treasures, retiring to Lochleven, where he busied him- self in laying out gardens. But his ambition could not deny itself another stroke for power. Aided by the young earl of Mar, he got possession of Stirling Castle and the person of the' king. Civil war was avoided only by the influence of Sir Robert Bowes, the English ambassador. A nominal reconciliation was effected, and a parliament at Stirling introduced a new govern- ment. Morton, who secured an indemnity, was president of the council, but Atholl remained a privy councillor in an enlarged council with the representatives of both parties. Shortly after- wards Atholl died of poison, it was said, and suspicion pointed to Morton. His return to power was brief, and the only im- portant event was the prosecution of the two Hamiltons, who still supported Mary and saved their lives by flight to England. The final fall of Morton came from an opposite quarter. In September 1579 Esme Stuart, the king's cousin, came to Scotland from France, gained the favour of James by his courtly manners, and received the lands and earldom of Lennox, the custody of Dumbarton Castle, and the office of chamberlain. One of his dependants, Captain James Stuart, son of Lord Ochiltree and brother-in-law of Knox, had the daring to accuse Morton at a meeting of the council in Holyrood of complicity in the murder of Darnley, and he was at once committed to custody. Some months later Morton was condemned by an assize for having taken part in that crime, and the verdict was justified by his confession that Bothwell had revealed to him the design, although he denied participation in its execution. He was executed by the maiden — a guillotine he had himself brought from England — on the 2nd of June 1581.

The attainted earldom of Morton passed by charter at his death to a grandson of the 3rd earl, John, 7th

Lord Maxwell (1553–1593), who had previously claimed the title. In 1586, however, the attain- der was rescinded in favour of Archibald Douglas, 8th earl of Angus (q.v.), a nephew of the 4th earl. Various earls of Morton have now to be distinguished.

Sir William Douglas (d. 1606), who ranks as 6th or 7th earl of Morton, was the 4th earl's near kinsman, being the son of Sir Robert Douglas of Lochleven (d. 1547), and was closely associated with him in his career, the two men being occasionally confused in the histories. He was the custodian at Lochleven Castle of Queen Mary. By the 4th earl's will he succeeded in 1588 to the earfdom of Morton, on the death of Archibald, 8th earl of Angus; but Lord Maxwell's title of Morton, which had been revoked in 1585, was revived in 1587 and 1592, so that both men were in possession, and a conflict arose. Sir William Douglas was succeeded by his grandson William (1582–1649), known as 7th or 8th earl of Morton, lord high treasurer of Scotland, a zealous Royalist, who on the outbreak of the Great Rebellion provided £100,000 for the cause by selling his Dalkeith estates to the Buccleuch family; and though John, 8th Lord Maxwell (c. 1586–1613), also claimed the earldom, he was attainted in 1609 and his rights then failed, his titles and estates being restored in 1618 to his brother Robert, with the title of earl of Nithsdale (1620) in lieu of Morton. Among later earls of Morton mention may be made of James (1702–1768), 14th earl (or, as sometimes numbered, 1 6th), who became president of the Royal Society (1764), and was a distinguished patron of science, and particularly of astronomy. In 1746 he visited France, and was imprisoned in the Bastille, probably as a Jacobite. The present earl of Morton is his descendant.

MORTON, JOHN (c. 1420–1500), archbishop of Canterbury, cardinal and statesman, belonged to a family which had migrated from Nottinghamshire into Dorset, and was born either at Bere Regis or Milborne St Andrew. Educated at the neighbouring Benedictine abbey of Cerne and at Balliol College, Oxford, he graduated in law, and followed that

profession in the ecclesiastical courts in London, where he attracted the notice of Archbishop Bourchier. He is said (Diet. Nat. Biog.) to have been "at once admitted to the privy council"; but probably this is a mistake for the ordinary council, of which Morton might well have been made a member when he was appointed master in chancery and chancellor of the duchy of Cornwall. He received a good deal of ecclesiastical preferment

from the Lancastrian party, was present, if he did not fight on the losing side, at the battle of Towton in 1461, and was sub- sequently attainted by the victorious Yorkists. He lived with the exiled court of Margaret of Anjou at Bar until 1470, and took an active part in the diplomacy which led to the coalition of Warwick and Clarence with the Lancastrians and Louis XL, and indirectly to Edward IV. `s expulsion from the throne. Morton landed with Warwick at Dartmouth on the 13th of September 1470, but the battle of Tewkesbury finally shattered the Lancastrian hopes, and Morton made his peace with Edward IV., probably through the mediation of Archbishop Bourchier.

In March 1473 Morton was made master of the rolls, and Edward found employment for his diplomatic talents; he was sent on a mission to Hungary in 1474, and was one of the nego- tiators of the Treaty of Pecquigny in 1475. In 1479, after receiving a number of minor ecclesiastical promotions, he was elected bishop of Ely. He was one of the executors of Edward IV.`s will in 1483, and the story of the future Richard III., while preparing Morton's arrest, joking with him about the strawberries the bishop grew in his garden at Holborn is well known and apparently authentic. Oxford University in vain petitioned for Morton's release, and after some weeks in the Tower he was entrusted to the duke of Buckingham's charge at Brecknock. Here Morton encouraged Buckingham's designs against Richard, and put him into communication with the queen dowager, Elizabeth Woodville, and with Henry Tudor, earl of Richmond. He escaped from Brecknock Castle to Flanders, avoided Buckingham's fate, and devoted his

energies during the next two years to creating a party in England and abroad in the interests of the earl of Richmond.

When Richmond secured the crown as Henry VII. Morton became his principal adviser. He succeeded Bourchier as archbishop of Canterbury in i486 and Alcock as lord chancellor in 1487; and he was responsible for much of the diplomatic, if not also of the financial, work of the reign, though the ingenious method of extortion popularly known as ” Morton’s fork ” seems really to have been the invention of Richard Fox (q.v.), who succeeded to a large part of Morton’s influence. Morton no doubt impressed Lancastrian traditions upon Henry VII., but he cannot be credited with any great originality as a states- man, and Henry’s policy was as much Yorkist as Lancastrian. The fact that parliament continued to meet fairly often so long as Morton lived, and was only summoned once by Henry VII. after the archbishop’s death, may have some significance; but more probably it was simply due to the circumstance that Morton’s death synchronized with Henry’s achievement of a security in which he thought he could almost dispense with parliamentary support and supplies. As an ecclesiastic Morton followed orthodox Lancastrian lines: in 1489 he obtained a papal bull enabling him to visit and reform the monasteries, and he proceeded with some vigour against the abuses in the abbey of St Albans. In 1493 he was created a cardinal, and in 1495 was elected chancellor of the university of Oxford. He encouraged learning to the extent of admitting Sir Thomas More into his household, and writing a Latin history of Richard III., which More translated into English. He con- structed ” Morton’s Dyke ” across the fens from Wisbech to Peterborough, repaired the episcopal palace at Hatfield and the school of canon law and St Mary’s Church at Oxford. He died at Knole on the 12th of October 1500, and was buried in the crypt of Canterbury Cathedral.

Besides the authorities cited in the Diet. Nat. Biogr, see the recently published calendar of Patent Rolls, 1461-1485, passim; W. Busch, England under

the Tudors (1892); J. Gairdner, Henry VII. (1889) and Lollardy and the Reformation (1908), and Political History of England, vols. iv. and v. (Longmans). (A. F. P.)

MORTON, JOHN MADDISON (1811–1891), English playwright, was born at Pangbourne, on the 3rd of January 181 1. He was the author of Box and Cox (1847) and a number of other farces. In later life, however, he failed to maintain his success, and eventually became a Charterhouse pensioner, dying on the 19th of December 1891.

His father, Thomas Morton (i764?–i838), also a well-known

dramatist, was the author of Columbus, or a World Discovered (1792); Speed the Plough (1798); The School of Reform, or How to Rule a Husband (1805); A Roland for an Oliver (1819); and other pieces.

MORTON, LEVI PARSONS (1824–), American banker and politician, was born at Shoreham, Vermont, on the 16th of May 1824. 1 He was in business at Hanover, New Hampshire, in 1843–1849 and in Boston in 1840–1854. He then became a partner in a New York dry-goods house. He established in 1863 the banking house of L. P. Morton & Company (dissolved 1899), with a London branch which had Sir John Rose (1820–1888) as its principal member. The American firm assisted in funding the national debt at the time of the resumption of specie payments, and the London house were fiscal agents of the United States government in 1873–1884, and as such received the $15,500,000 awarded by the Geneva Arbitration Court in settlement of the " Alabama Claims " against Great Britain. In 1899 Morton became president of the Morton Trust Company in New York City. He was a Republican representative in Congress in 1879–1881, United States minister to France in 1881–1885, vice-president of the United States during the presidency

of Benjamin Harrison in 1889–1893, and in 1 895–1 896 was governor of New York, signing as such the ” Greater New York ” bill and the liquor-tax measure known as the ” Raines law.” In 1896 he was a candidate for the presi- dential nomination in the Republican national convention.

MORTON, OLIVER PERRY (1823–1877), American political leader, ” war governor ” of Indiana, was born in Salisbury, Wayne county, Indiana, on the 4th of August 1823. After studying for two years (1843–1845) at Miami University, he practised law at Centerville, Indiana, and in 1852 was judge of the sixth judicial circuit of Indiana. In February 1856 he was a member of the Pittsburg convention which led to the organization of the national Republican party, and in the same year he was a candidate for governor of Indiana; he was defeated, but his campaign resulted in the effective organization of the new party in his state. He was elected’ lieutenant-governor in i860, and when Henry S. Lane (181 1- 1881), the governor, resigned, on the 16th of January 1861, Morton became governor. In 1864 he was re-elected. In meeting all the extraordinary demands resulting from the Civil War he displayed great energy and resourcefulness, and was active in thwarting the schemes of the secessionists in the neighbouring state of Kentucky, and of the Knights of the Golden Circle, the Order of American Knights, and the Sons of Liberty (secret societies of Southern sympathizers and other opponents of the war) in Indiana. In 1863 a hostile legislature sought to deprive him of all control over the militia, and failing in this, adjourned without making the appropriations necessary for carrying on the state government. In this predicament Morton appointed a bureau of finance, and appealed for financial aid to private individuals, bankers, the counties, and even the Federal government. The response was so prompt that he was able to conduct affairs practically single-handed until 1865, when a legislature more favourable to his policies assembled. In 1865, when Morton had a paralytic stroke and went to Europe for treatment, the

president entrusted him with a confidential mission to Napoleon III. concerning the withdrawal of the French troops from Mexico. Morton resigned as governor in January 1867 to accept a seat in the United States Senate, in which he served during the rest of his life. He was recognized as one of the leaders of the Radical wing of his party, voting in favour of Johnson's impeachment, and being especially active on behalf of negro suffrage. In 1870 Grant offered to appoint him minister to Great Britain, but he declined the honour on perceiving that a Democrat would succeed him in the Senate.

1 His earliest ancestor in America was George Mourt, or Morton (d. 1624), a merchant of York, England, who seems to have been in London in 1621–1622 as financial agent for the Plymouth colonists. He published Mourt's Relation, or Journal of the Beginning and Proceedings of the English Plantation at Plimoth (1622), apparently written by William Bradford and Edward Wihslow, and went to Plymouth, Mass., in the " Anne " in 1623.

He was a candidate for the Republican nomination for the presidency in 1876, and at the national convention of his party received 124 votes on the first ballot; the nomination, however, finally went to Rutherford B. Hayes. He died at Indianapolis on the 1st of November 1877.

See William D. Foulke, Life of Oliver P. Morton (2 vols., Indiana- polis, 1899).

MORTON, THOMAS (1564–1659), English bishop, was born at York, and was educated at York and Halifax grammar- schools and St John's College, Cambridge, where he became fellow on taking his degree. He was ordained in 1592, and held the office of university lecturer in logic till in 1598 he was presented to the living of Long Marston, Yorkshire. He gained a considerable reputation as a Protestant controversialist, and published numerous works against Roman Catholicism, chief among them being the Apologia catholica (1605) and A Catholicke Appeale (1609). He held successively the deaneries

of Gloucester (1606), Winchester (1609), and a canonry at York (1610). In 1616 he became bishop of Chester, in 1618 bishop of Lichfield and Coventry, and in 1632 bishop of Durham. On the abolition of the episcopate in 1646 he was assigned a pension, but it was never paid, and the remainder of his life was passed in retirement.

MORTON, THOMAS (c. 1 500–1646), usually called Thomas Morton of Merrymount, English adventurer in America, was a lawyer of Clifford's Inn, London, and seems to have practised in the west of England. He spent three months in America in 1622; returned in 1625, and settled at Mount Wollaston, in what is now Quincy, Massachusetts; and in 1626, when most of the settlers removed to Virginia, he assumed command of the settlement, and renamed it Merrymount. 2 Morton, a Royalist rake, soon became a thorn in the flesh of the sober colonists at Plymouth. On May-Day in 1627 his companions erected a May-pole, and, assisted by Indians, indulged in all the revelry and licence then customary in England. " The setting up of this May-pole was a lamentable spectacle to the precise Separatists that lived at New Plimmouth," says Morton. " They termed it an Idoll; yea, they called it the Calf of Horeb, and stood at defiance with the place, . . . threatening to make it a woefull mount and not a merry mount." In disregard of a royal proclamation, Morton sold rum and fire-arms to the natives, not only injuring the trade of Plymouth, but also endangering the safety of the colonists. Morton was therefore arrested and sent to England; and when John Endecott, with a patent from the council for New England, arrived soon afterward he visited Merrymount, which lay within his jurisdiction, rebuked the inhabitants, cut down the May-pole, and renamed the place Mount Dagon. In 1629 Morton returned to America, but was arrested on trivial charges by the Massachusetts authorities, and was confined in the stocks. Later his house was burned and he was sent to England, where he spent a term in the Essex gaol. After his release he wrote his New English Canaan (1637), in which he describes the Indians and the natural features of the country,

and heaps ridicule upon the New England colonists. In 1643 Morton returned to America. He was imprisoned in Boston in the following year, and was tried before the general court for complaining against the colony before the Privy Council; he was recommitted to gaol pending the gathering of further evidence, and after a year's confinement was fined £100 and released. He retired to Agamenticus (now York), Maine, and in 1646 died poverty-stricken.

See the New English Canaan, edited by Charles Francis Adams (Publications of the Prince Society, vol. ix., Boston, 1883); C. F. Adams, Three Episodes of Massachusetts History (Boston, 1896); and, for a more favourable view of Morton, A Few Observations on the Prince Society's Edition of the New English Canaan, revised and reprinted from the Churchman (New York, 1883). Morton's adventures have furnished material for Nathaniel Hawthorne's short story, The Maypole of Merrymount, and for John Lothrop Motley's novels, Morton's Hope (1839) and Merry Mount (1849).

MORTUARY (Med. Lat. mortuarium, from mortuus, dead), of or belonging to the dead, or, in particular, to the burial

2 In his book Morton indulges his fondness for punning and display of Latinity by calling the place Mare-Mount (Hill by the sea).

of the dead. The chief modern use of the word is for a building in which dead bodies awaiting burial may be temporarily kept, for the purpose of inquiry, identification, post-mortem examination, &c. But it has also been applied to many subjects connected with death and burial. In monastic institutions it was the duty of the almoner to send round to other monastic houses notice of the death of a member, asking for prayers for the soul of the dead. This notice was often beautifully illuminated. On being returned with the endorse- ment of the monastery to

which it had been sent, it would be copied into the roll. Both the notice and the roll were known as a mortuarium, or mortuary (see Abbot F. H. Gasquet's English Monastic Life, 1904). In the English Church a "mor- tuary " was in certain places a customary oblation or offering paid out of the estate of a deceased person to the church to which he belonged. An act of 1529 (21 Hen. VIII. c. 6) limited the amount to be paid in mortuaries, the highest being of the value of 10s. in estates above £40. Mortuaries, where customary, can only be enforced in the ecclesiastical courts. The custom has entirely died out, though claims have been made from time to time.

MORVAN, an elevated region forming the northern continua- tion of the central plateau of France, and extending over a large part of the department of Nievre, and over portions of those of Yonne, Cote-d'Or and Saone-et-Loire. Its area is a little over 1000 sq. m. The average elevation is about 1600 ft., the culminating point the Bois-du-Roi, attaining 2959 ft. It is traversed by the Yonne, which has its source on Mt Prenelay (2789 ft)., by the Cure and by several affluents of the Arroux. Geologically it consists chiefly of gneiss and granite. It contains much good pasturage and is abundantly wooded, the exploitation of its forests affording employment to large numbers of the inhabitants.

MORVI, a native state of India, in Kathiawar, within the Gujarat division of Bombay. Area, 822 sq. m.; pop. (1901), 87,496, showing a decrease of 17% in the decade, due to famine; estimated revenue, £48,000; tribute, £4000. The chief, whose title is Thakur sahib, is a Jadeja rajput, of the same clan as the rao of Cutch. The chief products are cotton and grain. The town of Morvi is situated on the river Machhu, 22 m. from the sea and 35 from Rajkot; pop. (1901) 17,820.

MORVILE, HUGH DE, one of the four English knights who perpetrated the murder of Becket. He appears in the service of Henry II. from n 58. His principal estate was at Burgh- on-Sands. After the

archbishop's murder Hugh and his asso- ciates at first took refuge in Knaresborough Castle; afterwards the king sent them to obtain absolution from the pope. The story runs that all four were enjoined to go on pilgrimage to the Holy Land, but it is not known whether. Hugh made his expiation in this way. The date of his death is unknown, but it was in or before 1202/3, when we find his English lands in the hands of his two daughters as co-heiresses.

See Eyton's Itinerary of Henry II.; Ramsay, Angevin England.

MORYSON, FYNES (1566-1630), English traveller and writer, was the son of a Lincolnshire gentleman, Thomas Moryson, member of parliament for Grimsby. After being educated at Cambridge, where he gained a fellowship at Peterhouse, Fynes Moryson spent many years in travel on the continent of Europe, in Palestine, and in Asia Minor. In 1600 he became secretary to Sir Charles Blount, lord-deputy of Ireland, in which country his brother, Sir Richard Moryson, held an important government appointment. In 1617 Moryson published an account of his travels and of his experiences in Ireland, where he witnessed O'Neill's rebellion, in a voluminous work entitled An Itinerary. He died on the 12th of February 1630. The Itinerary was originally intended to consist of five parts; but only three were printed, a fourth being preserved in manuscript in the library of Corpus Christi College, Oxford (partially printed in 1903 in Charles Hughes's Shakespeare's Europe). Another part of the Itinerary was republished in 1735 with the title History of Ireland 15QQ-1603, with a short Narrative of the State of the Kingdom from

n6g; and in 1890 Henry Morley included in the " Carisbrooke Library " a volume, Ireland under Elizabeth and James I., de- scribed by Spenser, Sir John Danes and Fynes Moryson. The Itinerary is a work of great value to the historian as a truthful picture of the social conditions prevailing in Europe at the beginning of the 17th century.

MOSAIC (corresponding to Lat. opus musivum, from Gr. liovouov, an artificial grotto often decorated with mosaics; the word is only found in the sense of mosaic in late Greek, which generally uses ^7^0X6717^0), the fitting together of many, generally small, pieces of marble, opaque glass, coloured clays, or other substances, so as to form a pattern.

Ancient Mosaic— The earliest existing specimens of mosaic belong to one of the less important branches of the art — namely, the ornamentation on a small scale of jewellery, ivory thrones, and other furniture, or more rarely of some elaborate architectural ornament. Most of this sort of mosaic resembles in execution what are called cloisonne enamels. In the Louvre and in the British Museum are preserved some very beautiful ivory carvings in low relief, some from Nineveh and others from Egypt, in which figures of deities, ornaments formed of the lotus and papyrus plants and royal cartouches are enriched by small pieces of glass, or lapis-lazuli and other gem-like stones, which are let into holes made in the ivory. Each minute piece is separated from the next by a thin wall or cloison of ivory, about as thick as cardboard, which thus forms a white outline and sets off the brilliance of the coloured stones.

Excavations at Tel-el- Yehudia in Lower Egypt have brought to light some mosaics on a larger scale, but treated in the same way. These are caps of columns, wall tiles, and other objects, either of white limestone or earthenware, in which designs, chiefly some forms of the papyrus, are formed by bits of glass or enamelled earthenware, let into a sinking in the tile or column. This form of mosaic was employed by the Greeks: the Erech- theum at Athens, built in the middle of the 5th century B.C., had the bases of some of its white marble columns ornamented with a plait-like design, in which pieces of coloured glass were inserted to emphasize the main lines of the pattern.

Another, quite different, sort of mosaic was known to the Egyptians of the Ptolemaic and Roman periods.

This is made entirely of glass and is extremely minute. The finest known specimen is in the British Museum: it is a small tablet about I in. square, apparently the bezel of a ring, on which is represented the sacred hawk — every feather on the bird's wing being produced with a great number of colours and tints, each quite distinct, and so minute that a strong magnifying glass is required to distinguish its details,

The way in which this mosaic was produced is extremely ingenious. Numbers of long sticks of various-coloured glass were arranged in such a way that their ends produced the figure of the hawk; other sticks of blue glass were placed all round so as to form the ground. The whole bundle of sticks of glass when looked at endwise now presented the figure of the hawk with a blue background, immensely larger than it after- wards became. The bundle was then heated till the sticks melted together, and the whole thick rod, softened by fire, was drawn out to a greatly diminished thickness. A slice of the rod was then cut off and its faces polished — the design, much reduced in size, of course being equally visible at both sides of the slice; and thus the microscopic minuteness of the mosaic was produced with astonishing delicacy and refinement; many slices, each showing the same mosaic, could be cut from the same rod.

Far more important was the use of mosaic on a large scale, either for pavements or for walls and vaulted ceilings. We are told by Pliny (H. N. xxxvi. r84) that the practice of decorating pavements " after the fashion of painting " was due to the Greeks, and there is no reason to doubt the truth of this statement, although no mosaic pavement discovered in Greece can be dated with certainty to a period preceding the Roman occupa- tion. This is true even of the pavement in the temple of Zeus at Olympia (fig. 1; Olympia, Baudenkmaler, vol. ii. pi. cv.).

The simplest classification of mosaics is that of Gauckler (Daremberg and Saglio, Dictionnaire des antiquites, s.v. ” Musi- vum Opus “), who distinguishes the following: —

a. Opus tessellatum, consisting of cubes of marble or stone, regularly disposed in simple patterns. This was largely used for pavements, especially in Roman times.

b. Opus vermiculatum, consisting of cubes (not always regu- larly shaped) generally of coloured marble 1 or more precious

Fig. i. — Greek Pavement from the Temple of Zeus at Olympia.

materials, when these were obtainable, disposed so as to obtain a pictorial effect. The art of mosaic is mainly concerned with this branch of work.

c. Opus musivum, properly applied to the mosaic decoration of walls and vaulted ceilings {earner ae), in which cubes of glass or enamel were used. The glass was rendered opaque by the addition of oxide of tin, and coloured with other metallic oxides; when melted it was cast into flat slabs, generally about \ in. thick, and then broken into small cubes.

d. Opus sectile, a species of marqueterie in marble or other coloured materials used to produce pictures and patterns. Under the later empire a particular variety of this, called opus alexandrinum’* mainly composed of porphyry, red and green, 3 was much in use.

Judging from the description given by Vitruvius (vii. i), and an examination of numerous specimens of Roman tessellated mosaics, the process of manufacture was the following. The earth was first carefully rammed down to a firm and even surface; on this was laid a thick bed of stones, dry rubbish, and lime, called ” rudus,” from 6 to 9 in. deep, and above this another layer, 4 to 6 in. thick, called ”

nucleus," of one part of lime to three of pounded brick, mixed with water; on this, while still soft, the pattern could be sketched out with a wooden or metal point, and the tesserae or small bits of marble stuck into it, with their smoothest side uppermost. Lime, pounded white marble, and water were then mixed to the consistency of cream, forming a very hard-setting cement, called marmoratum. This cement, while fluid, was poured over the marble surface, and well brushed into all the interstices between the tesserae. When the concrete and cement were both set, the surface of the pavement was rubbed down and polished.

The usual Roman pavement was made of pieces of marble, averaging from half to a quarter of an inch square, but rather

1 In the less prosperous provinces of the empire, such as Britain, these costly materials could not be obtained, and native sandstone, &c, was used.

2 The biographer of Severus Alexander {Hist. Aug., c. 25, 7) attributes the invention of opus alexandrinum to that emperor; but this is clearly a false derivation. This technique was doubtless invented at Alexandria.

3 This latter is often, but wrongly, called serpentine.

irregular in shape. A few other, but quite exceptional, kinds of mosaic pavements have been found, such as that at the Isola Farnese, 9 m. from Rome, made of tile-like slabs of green glass, and a fine " sectile " pavement on the Palatine Hill, made of various-shaped pieces of glass, in black, white, and deep yellow. In some cases — e.g. in the " House of the Faun " at Pompeii — glass tesserae in small quantities have been mixed with the marble ones, for the sake of greater brilliance of colour.

Few countries are richer than England in remains of Roman mosaics; the great pavements of York, Woodchester, Cirencester, and many other places are

as elaborate in design and as skilfully executed as any that now exist even in Rome itself. In what- ever country these mosaics are found, their style and method of treatment are always much the same; the materials only of which the tesserae are made vary according to the stone or marble supplied by each country. In England, for instance, limestone or chalk often takes the place of the white marble so common in Italian and North African mosaics; while, instead of red marble, a fine sort of burnt clay or red sandstone is generally used; other makeshifts had to be resorted to, and many of the Romano- British mosaics are made entirely without marble. It is perhaps partly owing to the great wealth of Northern Africa in marbles of many colours and of varying shades that the finest of all Roman mosaics have been found in Algeria and Tunis, especially those from Carthage, some of which have been brought to the British Museum. See Archaeo- logia, xxxviii. 202.

The range of colour in the marble tesserae is very great, and is made use of with wonderful taste and skill: there are three or four different shades of red, and an equal number of yellows and greens, the last colour in all its tints being almost peculiar to this part of Africa, and one of the most pleasant and har- monious in almost any combination. Deep black, browns and

Fig. 2. — —Part of a Persian's Head from the Battle of Issus.

bluish-greys are also abundant. The mosaics from Carthage are no less excellent in design than in the richness and beauty of their materials. Large spaces are filled by grand sweeping curves of acanthus and other leaves, drawn with wonderful boldness and freedom of hand, and varied with great wealth of invention. Without the use of very small tesserae, much rich- ness of effect is given by gradations of tints, suggesting light and

shade, without a painful attempt to represent actual relief. The colours of the marbles used here and elsewhere by the Romans are so quiet and harmonious that it would have been almost impossible to produce with them a harsh or glaring design, and when used with the skill and strong artistic feeling of the mosaic workers at Carthage the result is a real masterpiece of decorative design.

The finest of the later examples in Rome is that which decorates the vault of the ambulatory of the circular church of S. Costanza, built by Constantine the Great, outside the walls of Rome. This very interesting mosaic might from its style and materials have been executed in the 1st century, and is equal in beauty to any work of the kind in Italy. It shows no trace whatever of the Byzantine influence which, in the next century, introduced into Italy a novel style of mosaic, in materials of the most glittering splendour. Sur- vivals of this classical style of mosaic are found in North Africa and the East. At Kabr-Hiram, near Tyre, Renan discovered among the ruins of a small three-apsed Christian church of the 4th century A.D. a fine mosaic pavement, covering the nave and aisles, thoroughly classical in style. A very similar mosaic, of about the same date, was discovered at Nebi Yunas, near Sidon.

Medieval Mosaics. — These may be divided into four principal classes: (1) those used to decorate walls and vaults, made of glass cubes; (2) those for pavements, made of marble, partly in large shaped pieces, and partly in small tesserae; (3) glass in small pieces, either rectangular or triangular, used to enrich marble pulpits, columns, and other architectural features; (4) wood mosaics.

1. In the Byzantine period the glass cube mosaic was exclu- sively employed in mural decoration. At first natural colouring was used, and backgrounds, if not in local colour, were generally blue; but the use of gold, both for backgrounds and for the high lights

on drapery, &c, gradually prevailed. Owing to the intense conservatism of Byzantine art, no regular stages of progression can be traced in this class of mosaic. Some of the 5th-century mosaics at Ravenna are, in every way, as fine as those of the 12th, and it was not till the end of the 13th century that any important change in style took place. The mosaics of the 9th century are inferior in drawing and general treatment to those both of the earlier and later time, while in Italy at least this art was almost entirely extinct during the 10th and nth centuries. Extreme splendour of colour and jewel-like brilliance combined with the most stately grandeur of form are the main characteristics of this sort of decoration.

A ” majesty,” or colossal central figure of Christ with saints standing on each side, is the most frequent motive. In many cases, especially in the 5th and 6th centuries, Christ was represented as a lamb, to whom the twelve apostles, in the form of sheep, are paying adoration. Christ, the Good Shepherd, is sometimes de- picted as a beardless youth, seated among a circle of sheep — the treatment of the motive being obviously taken from Pagan represen- tations of Orpheus playing to the beasts. The tomb of Galla Placidia has a good example of this subject, with much of the old Roman grace in the drawing and composition. Frequently the Virgin Mary, or the patron saint of the church, occupies the central space in the apse, with ranges of other saints on each side. *

The ” Doom,” or Last Judgment, is a favourite subject for domes and sanctuary arches ; the Florence. baptistery has one of the grandest mosaic pictures of this subject, executed in the 13th century. The earlier baptisteries usually have the scene of Christ’s baptism — the river Jordan being sometimes personified in a very classical manner, as an old man with flowing beard, holding an urn from which a stream pours forth. S. Vitale at Ravenna has in the sanctuary a very interesting representation of Justinian and his empress Theo- dora (see fig. 3), attended by a numerous suite of courtiers and

ladies ; these mosaics are certainly of the 6th century, and may be contem- porary with Justinian, though the fact that he and Theodora are each represented with a circular nimbus appears to indicate that they were not then alive.

In mosaics of the best periods the treatment of the forms and draperies is broad and simple, a just amount of relief being expressed by delicate gradations of tints. In mosaics of the 9th century the drawing is very awkward, and the folds of the robes are rudely expressed in outline, with no suggestion of light and shade.

A further application of this work was to the decoration of broad bands over the columns of the nave, as at S. Maria Maggiore in Rome, 4th century, and in the two churches of S. Apollinare at Ravenna, 6th century. In some cases almost the whole

interior of the church was encrusted in this magnificent way,' as at Monreale Cathedral, the Capella Palatina of Palermo, and S. Mark's at Venice.

In these churches the mosaics cover soffits and angles entirely, and give the effect of a mass of solid gold and colour producing the utmost conceivable splendour of decoration. 1 In many cases vaulted ceilings were covered with these mosaics, as the tomb of Galla Placidia, a.d. 450, and the two baptisteries at Ravenna, 5th and 6th centuries. For exteriors, the large use of mosaic was usually confined to the west facade, as at S. Miniato, Florence; S. Maria Maggiore, Rome; and S. Mark's,

Fig. 3. — Mosaic of Theodora and Attendants, from S. Vitale, Ravenna ; over life size.

Venice. In almost all cases the figures are represented on a gold ground, and gold is freely used in the dresses and ornaments — rich jewels and embroidery being represented in gold, silver, sparkling reds, blues and other colours, so as to give the utmost splendour of effect to the figures

and their drapery.

The revival of the art of painting in Italy and the introduction of fresco work in the 14th century gave the deathblow to the

1 Unfortunately the world-wide fame of S. Mark's and the other great churches of Italy has subjected these extraordinary works to the fatal process of " restoration," and wherever any sign of decay in the cement backing (the tesserae themselves are quite indestruct- ible) has given the least excuse the " restorers " have destroyed whole masses of ancient work, and supplied its place with worthless modern copies. The mosaics of the S. Mark's baptistery, and of the apses at S. Miniato, at Pisa, and many other places have in this way been wantonly renewed in recent times.

true art 01 wail-mosaics. Though at first the simple and archaic style of Cimabue and his pupils Jacopo da Turrita, Giotto, and Taddeo Gaddi was equally applicable to painting or mosaic, yet soon the development of art into greater realism and complexity required a method of expression unfettered by the necessities and canons of mosaic work. Pietro Cavallini, a Roman artist, was one of the last who worked according to the old traditions. His mosaic of the birth of the Virgin in S. Maria in Cosmedin, Rome, executed about the middle of the 14th century, is not without merit, though his superior knowledge of form has only caused his composition to be somewhat feeble and insipid com- pared with the works of the earlier artists. Even in the 15th century a few good mosaics were produced at Venice and else- where. The mosaics from Titian's pictures on the west end of S. Mark's at Venice, Raphael's in the Chigi Chapel in S. Maria del Popolo, and many large pictures in S. Peter's in Rome are the most striking examples of these.

The following list, in chronological order, comprises a selection from among the most important glass wall-mosaics during the period when mosaic-working was a real art. 1

4th Century. Rome. S. Costanza.

S. Maria Maggiore — square panels over the

columns of the nave. S. Pudenziana.

S. Giovanni in Laterano — chapel of SS. Rufina e Seconda. Naples. S. Restituta — baptistery.

5 th Century. Ravenna. Orthodox Baptistery — vault.

Tomb of Galla Placidia — vault, 450. Archbishop's Chapel — vault. Rome. S. Paolo fuori le mura — triumphal arch.

S. Maria Maggiore — square pictures over nave

columns, and triumphal arch (?), S. Sabina — figures on west wall. Milan. S. Ambrogio, Chapel of S. Satiro— vault.

Fundi. Cathedral — apse.

Nolo. Cathedral — apse.

6th Century. Ravenna. Arian Baptistery — vault.

S. Apollinare Nuovo — apse and nave, with 9th-

century additions. S. Vitale — apse and whole sanctuary, c. 547. S. Apollinare in Classe — apse and nave, 549. Rome. SS. Cosmas and Damian — apse.

Milan. S. Lorenzo, Chapel of S. Aquilinus — vault.

Constantinople. S. Sophia — walls and vault, c. 550. Thessalonica. Church of St George — apse, &c. ; and S. Sophia —

dome and apse. Trebizond. S. Sophia — apse.

7th Century. Rome. S. Agnese fuori le mura — apse,

626.

S. Teodoro. S. Stefano Rotondo. S. Venanzio, baptistery of Lateran. Jerusalem. ” Dome of the Rock ” — arches of ambulatory,

688.

8th Century. Rome. Baptistery of S. Giovanni in Laterano.

SS. Nereus and Achilles. Jerusalem. Mosque of Al-Aksa — on dome.

Mount Sinai. Chapel of the Transfiguration.

0th Century. Rome. S. Cecilia in Trastevere — apse.

S. Marco — apse. S. Maria della Navicella — apse, and ” Chapel of

the Column.” S. Prassede — triumphal arch. Milan. S. Ambrogio — apse, 832.

v 10th Century.

Cordova. Mihrab (sanctuary) of Mosque.

nth Century. Jerusalem. ” Dome of the Rock ” — base of cupola, 1027.

Constantinople. Church of S. Saviour — walls and domes.

12th Century. Venice. S. Mark’s — narthex, apse and walls of nave and

aisles.

1 It must be remembered that the earlier mosaics have in most cases suffered much from restoration.

Capua.

Torcello.

Murano.

Salerno'.

Palermo.

Monreale. Bethlehem. Cefalu. Rome.

Florence. Rome.

Cathedral — apse.

Cathedral — apse.

Cathedral — apse.

Cathedral — apse.

Capella Palatina, begun 1132 — the whole walls.

Church of La Martorana — vault.

Cathedral — the whole walls, 1170-1190.

Church of the Nativity, 1 169.

Cathedral — apse, 1 148.

S. Clemente — apse.

S. Francesca Romana — apse.

S. Maria in Trastevere — apse.

13 th Century. Baptistery vault, begun c. 1225 by Fra Jacopo. S. Miniato — -apse and west front. S. Paolo fuori le mura — apse. S. Clemente — triumphal arch, 1297. S. Giovanni in Laterano — apse by Jacopo da

Turrita, 1290. S. Maria Maggiore — apse and west end by Jacopo

da Turrita and Taddeo Gaddi. S. Maria in Trastevere — apse by Pietro Cavallini,

1291.

14th Century. Baptistery, finished by Andrea Tafi. Cathedral — east apse by Cimabue, 1302, north

and south apses by his pupils. S. Peter's — navicella, in atrium by Giotto. S. Maria in Cosmedin — on walls by Pietro

Cavallini, c. 1340. SS. Giovanni e Paolo — in arch over effigy of Doge Morosini. The Byzantine origin of these great wall-mosaics, wherever they are found, is amply proved both by internal and documentary evidence. The gorgeous mosaics of S. Sophia and S. Saviour's in Constantinople, 6th century, and the later ones in the monasteries of Mount Athos, at Salonica and at Daphne near Athens, are identical in style with those of Italy of the same date. Moreover, the even more beautiful mosaic work in the " Dome of the Rock " at Jerusalem, 7th and nth centuries, and that in the sanctuary of the great mosque of Cordova, of the 10th century, are known to be the work of Byzantine artists, in spite of their thoroughly Oriental design. The same is the case with the rarer mosaics of Germany, such as those in S. Gereon at Cologne and at Parenzo.

A very remarkable, almost unique, specimen of Byzantine mosaic is now preserved in the " Opera del Duomo," Florence. This is a diptych of the nth century, of extremely minute, almost micro- scopic work, in tesserae of glass and metal, perhaps the only example of tesserae made of solid metal. It has figures of saints and inscrip- tions, each tessera being scarcely larger than a pin's head. This beautiful diptych originally belonged to the imperial chapel in Constantinople, and was brought to Florence in the 14th century.

2. The second medieval class, mosaic pavements, though of great beauty, are of less artistic importance. This so-called opus alexandrinum is very common throughout Italy and in the East, and came to greatest perfection in the 13th century. It is made partly of small marble tesserae forming the main lines of the pattern, and partly of large pieces used as a ground

Florence. Pisa.

Rome.

Venice.

Fig. 4. — Marble Mosaic at Monreale Cathedral.

or matrix. It is generally designed in large flowing bands which interlace and enclose circles, often of one stone sliced from a column. The finest example is that at S. Mark's, Venice, of the 1 2th century. The materials are mainly white marble, with green and red porphyry, and sometimes glass.

MOSAIC

Besides the countless churches in Italy possessing these beautiful pavements, such as S. Lorenzo, S. Marco, S. Maria Maggiore, and S. Maria in Trastevere, in Rome, there are in England, in the Chapel of the Confessor, and in front of the high altar at Westminster, very fine specimens of this work, executed about 1 268 by a Roman artist called Odericus, who was brought to England by Abbot Ware, on the occasion of a visit made by the latter to Rome. Another English example is the mosaic pavement in front of the shrine of Becket at Canterbury; this is probably the work of an Englishman, though the materials are foreign, as it is partly inlaid with bronze, a peculiarity never found in Italy. Palermo and Monreale are especially rich in examples of sectile mosaic, used both for pavements and walls — in the latter case generally for the lower part of the walls the upper part being covered with the glass mosaics. Fig. 4 gives a specimen of this mosaic from Monreale cathedral. Its chief characteristic is the absence of curved lines, so largely used in the splendid opus Alexandrinum of Italy, arising from the fact that this class of Oriental design was mainly used for the delicate panelling in wood on their pulpits, doors, &c. — wood being a material quite unsuited for the production of large curves.

3. Glass mosaic, used to ornament ambones, pulpits, tombs, bishops' thrones, baldacchini columns,

architraves, and other

marble objects, is chiefly Italian. The designs, when it is used to enrich flat surfaces, such as panels or architraves, are very similar to those of the pavements last described. The white marble is used as a matrix, in which sinkings are made to hold the glass tesserae; twisted columns are fre- quently ornamented with a spiral band of this glass mosaic, or flutings are suggested by parallel bands on straight columns. The cloisters of S. Giovanni in Laterano and S. Paolo f uori le mura have splendid examples of these enriched shafts and architraves.

This style of work was largely employed from the 6th to the 14th centuries. One family in Italy, the Cosmati, during the whole of the 13th century, was especially skilled in this craft. The pulpit in S. Maria in Ara Coeli, Rome, is one of the finest speci- mens (see fig. 5), as are also the ambones in S. Clemente and S. Lorenzo, and that in Salerno cath- edral. The tomb of Henry III. (i2oi),andthe shrine of the Confessor (1269) at

specimens of this work are at Cairo and Damascus, and are used chiefly to decorate the magnificent pulpits and other woodwork in the mosques. The patterns are very delicate and complicated, worked in inlay of small pieces of various coloured woods, often further enriched by bits of mother-of-pearl and minutely carved ivory. This art was also practised largely by the Copts of Egypt, and much used by them to ornament the magnificent iconostases and other screens in their churches.

Another application of wood to mosaic work, called " intar- siatura," was very common in Italy, especially in Tuscany and Lombardy, during the 15th and early 16th centuries. Its chief use was for the decoration of the stalls and lecterns in the church choirs. Very small bits of various coloured woods were used to produce geometrical patterns, while figure subjects, views of buildings with strong

perspective effects, and even land- scapes, were very skilfully produced by an inlay of larger pieces. Ambrogio Borgognone, Raphael, and other great painters, often drew the designs for this sort of work. The mosaic figures in the panels of the stalls at the Certosa near Pavia were by Borgognone, and are extremely beautiful. The stalls in Siena cathedral and in S. Pietro de' Casinensi at Perugia, the latter from Raphael's designs, are among the finest works of this sort, which are very numerous in Italy. It has also been used on a smaller scale to ornament furniture, and especially the " Cassoni," or large trousseau coffers, on which the most costly and elaborate decorations were often lavished.

Authorities— Classical. An excellent account of the subject, with full references, is given by Gauckler in Daremberg and Saglio, Dictionnaire des antiquites, s.v. " Musivum opus "; the translations there given of the loci classici of Pliny are, however, inaccurate. Amongst earlier works the following are important: G. Ciampini' Vetera monumenta (1690–1699); A. Furietti, . De musivis (1752); S. Lysons, Roman Antiquities of Woodchester (1797) and Reliquiae bntannico-romanae (1813); F. Mazois, Ruines de Pompei (18 12- 1838) ; Real museo borbonico (1824–1857) ; F. Artaud, Histoire de la pemture en mosaique (1835) ; Monumentos arquitectonicos de Espana (1859–1883) ; Wilmowsky, Romische Mosaiken aus Trier und dessen Umgegend (1888).

Christian. — Theophilus, Diversarum artium schedula, ii. 15; S Kensington Museum Art Inventory, pt. i. (1870); Renan, Mission de Phenicie (1875) ; Garrucci, Arte cristiana (1872–1882), vol. iv. ; De Rossi, Musaici cristiani di Roma (1876–1894); Parker, Archaeology of Rome, and Mosaic Pictures in Rome and Ravenna (1866) ; Barbet de \°, Uy ` Les Mosai q. ues chretiennes de Rome (1857) ; Gravina, Duomo di Monreale, Palermo (1859 seq.) ; Serradifalco, Monreale ed altre chiese siculo-normanne (1838); Salazaro, Mon. dell' arte merid. d' Italia

(1882) (1849)

(1854)

Texier

Fig. 5.— Part of Marble Pulpit with glass mosaic, church of Ara Coeli, Rome.

Westminster are the only examples of this work in England. They were executed by ” Petrus civis Romanus,” probably a pupil of the Cosmati.

In India, especially during the 17th century, many Mahommedan buildings were decorated with fine marble inlay of the class now called ” Florentine.” This is sectile mosaic, formed by shaped pieces of various coloured marbles let into a marble matrix. A great deal of the Indian mosaic of this sort was executed by Italian workmen; the finest examples are at Agra, such as the Taj Mahal.

4. Mosaics in wood are largely used in Mahommedan build- ings, especially from the 14th to the 17th centuries. The finest

M. D. Wyatt, Geometrical Mosaics of the Middle Ages

Salzenberg, Alt-christliche Baudenkmale von Constantinopel

Pulgher, Eglises byzantines de Constantinople (1883);

and Pullan, Byzantine Architecture (1864); Quast, Alt-christ-

hche Bauwerke von Ravenna (1842); J. P. Richter, Die Mosaiken

von Ravenna (1878) ; M. de Vogue, Eglises de la terre sainte (i860) ;

Milanesi, Del Arte del vetro pel musaico (16th century, reprinted at

Bologna in 1864); Rohault de Fleury, Monuments de Pise (1866);

J. Kreutz, Basilica di S. Marco, Venezia (1843); Gaily Knight

Ecclesiastical Architecture of Italy (1842-1844); C. G. Fossati, Aya.

Sophia (1852); A. N. Didron, ” La peinture en mosaique,” Caz. des

B-Arts, xi. 442 ; Gerspach, La Mosaique (1883) ; A.

L. Frothingham,

Les mosaiques de Grottaferrata," Gaz. arch. (1883) ; E. Muntz, La Mosaique chretienne pendant les premiers siecles (1893) I G. Clausse, Basihques et mosaiques chretiennes (1893) ; Ainalov, Mosaiken des IV u.V. Jahrhunderts (1895) ; P. Saccardo, Les Mosaiques de Saint Marc a. Venise (1896) ; A. A. Pavlovsky, Iconographie de la chapelle palatine (1895); DiMarzo, Delle Belle arti in Sicilia; Sangiorgi, II Battistero della basilica Ursiana di Ravenna (1900) ; J. Kurth, Die Mosaiken der christlichen Aera, I. Die Mosaiken von Ravenna (1902) • ■ J P Richter and A. C. Taylor, The Golden Age of Classic Christian Art (1904; on the mosaics of S. Maria Maggiore, which the authors assign to the 2nd or 3rd century a.d. ; some excellent reproductions are given) ; Schmitt and Kluge, " Kachrie Djami " (Bulletin de I'institut impenale russe d. Constantinople, xi., 1906; text in Russian).

Moslem. — Hessemer, Arabische und alt-italienische Bauver- zierungen (1853); Prisse dAvennes, L'Art arabe (1874-1880); Prangey, Mosquee de Cordoue (1830) ; Owen Jones, Alhambra (1842) ; De Vogue, Temple de Jerusalem (1864); Texier, Asie Mineure (1862) and L'Armenie et la Perse (1842-1852); Bourgoin, Les Arts arabes (1868) ; Coste, Monuments modernes dela Perse (1867) ; Flandin and Coste, Voyage en Perse (1843-1854) ; Gayet, L'Art arabe (1893).

Wood Mosaic-Tarsia. — Omati del coro di S. Pietro Cassinense di Perugia (1830); Caffi, various works on Rafaello de Brescia and other intarsiatori (1851); Tarsie ed intagli di S. Lorenzo in Genova (1878); and Scherer, Technik und Geschichte der Intarsia (1891).

(J. H. M.;H. S.J.)

Modern Mosaic. — -The art of mosaic for mural decoration has never been deeply implanted in the artistic sensibilities of the north of Europe, nor has it been employed much either in France, or Germany, or England. It ceased to be generally adopted in Italy when fresco, oil and tempera painting came into vogue. Gothic architecture is ill-suited to its robust claims as a decorative art; and the incoming fashion for the latest and least interesting development of classical architecture, ” Palladian,” divorced not only it, but mural painting also, from all architectural schemes. To be properly consequent and effective, buildings, ecclesiastical or public, should be constructed with the intention of being covered almost entirely by mosaics, which demand rich environment, marble or other colour; mosaic is essentially a colour medium. It is therefore scarcely surprising that when mural decoration became pre- eminently pictorial, and gestures and expression grew compli- cated, elaborate, and naturalistic, an art limited in its powers of presenting such manifestation of realistic design was relegated into the limbo of obscurity.

There are no instances of the use of mosaic in England after the Roman occupation. The Normans, who derived it from the Greeks and Saracens, and adopted it in Sicily, did not import it either to France or England. Although English churches, and French also, were highly decorated with polychromy from early times up to the 16th century, there is no evidence of mosaic ever having been used. The revival of a school of mosaicists in Rome during the 17th century, employed in the decoration of St Peter’s, and here and there sparsely engaged in other churches, led to the idea which Wren would have carried into effect, namely, making use of mosaic for the cathedral of St Paul’s in London; but his scheme, if it was ever really entertained, was not carried out, as we all know; and the art, which might have become the fashion in England, remained an exotic. Even late into the years of the 19th century mosaic decoration was regarded by classical purists as a barbarous art, and the glorious

decorations in that material to be seen in Sicily, Italy, Greece, Asia Minor and Russia were disregarded as works of high art. They were in many cases cut out to provide room for extravagant and vulgar designs in fresco or tempera, unmeaning, undeco- rative, and wholly abominable as decoration. Those Roman mosaics over the altars in St Peter's, being copies of celebrated oil pictures, while they cannot be denied excellence as such and marvellous dexterity, reveal the worst possible taste, for they attempt to represent adequately, in cubes, touches of the brush ` which were spontaneous, fluid, thick and thin, and as sensitive and spontaneous as the finger pressure on the violin string, so accurate that the least deviation from absolute position produces discord.

The restrictions on mosaic are many, and some are obvious. In the first place, mosaic is not suited for a small scale of design. It is true that in the Opera del Duomo in Florence there is a miniature mosaic (executed in the 12th century) of extraordinary beauty, which must have taken a lifetime to execute; but still this remains a curiosity, a bit of craftsmanship rather than a great work of art. There is also a copy of Mr Holman Hunt's " Finding the Saviour in the Temple," executed for Clifton College by assistants in Messrs Powell's establishment in White- friars, London; it is admirably done, no doubt, but it is a long way behind the original, which is a design wholly ill adapted to mosaic. There are several other instances, notably one by Mr H. Holiday of " The Last Supper," where mosaic has been employed to translate a beautiful design which would have been more satisfactorily executed either in oil or water colours. The primal and most obvious limitation is in matters of detail — • detail as regards a multiplicity of forms, many gradations either of colour or tone and naturalistic accidents. In this respect good mosaic is like good basso relievo; it is accomplished by firmly pronounced outlines, unconfused masses, large planes unbroken up by small adjuncts, and generalized and convention- alized

forms and simple colour. So all small curves, as well as small tints, should be eliminated, because it is not in the nature of the material to do them justice. One can scarcely conceive

a choice less happy for mosaic than the centre group taken out of the upper portion of the Disputa fresco in the Vatican by Raphael, yet this florid piece of work, so facile in creation, was chosen to be executed on the eastern wall of the morning chapel in St Paul's.

It is useless to illustrate the many similar mistakes that have been made. They were made in some of the earlier work in the choir of St Paul's. The best example of mosaic on a small scale is in Ravenna, the tomb of Galla Placidia; the best upon a large scale is the great Christ at the east end of the cathedral at Monreale. These two works absolutely justify the means to the end. Interesting are the designs made by Sir Edward Burne- Jones for the mosaics for the American church in Rome, but the execution and colour are alike monotonous. The cathedral of Chester contains a series of mosaic pictures designed by Mr Clayton. The Guards' chapel in St James's is adorned likewise by the same artist, under the direction of the late Sir Arthur Blomfield. In the chapel for the school at Giggleswick are mosaics designed by T. G. Jackson, R.A., admirably and broadly treated in true mosaic character; these were executed in situ, and not, according to the modern habit, upon paper, away from their environment and by a foreign firm. Those mosaic pictures which are placed in niches in the great gallery of South Ken- sington Museum are failures qud mosaic, though the designs in many instances are fine, notably those by Lord Leighton and Val Prinsep; but their execution is uninteresting, because the cubes are laid so flatly and so evenly that they suggest an oil picture appliquS upon a flat ground.

Messrs Powell have been employed on several occasions to decorate churches with mosaic. This firm has adopted the old style, and rejected the new

one initiated by Dr Salviati of Venice. If we observe the surface of a fine Greek mosaic, such as that of Andrea Tafi in the Baptistery of Florence, or the few remains of unrestored mosaic in St Mark's, Venice, or indeed other works scattered over Italy, we shall see that it is rough, not smooth; that the cubes are irregular in shape; that there is always a space of the ground colour left, red or white, and visible between each cube. In modern mosaic, with rare exceptions, restoration or other, the cubes have been jammed up closely together, and the surface is as smooth as a piece of paper; thereby is engendered a mechanical and uninteresting surface, over which light plays with monotony, and hence that brilliant and scintillating effect so essentially the character of true mosaic is absent. This defect— and it is a grave one — is evident in the works in mosaic more or less recently set up in Paris, notably in the apse of the Pantheon, the east end of the Madeleine, and the vaulting of the great staircase of the Louvre. Those in the apse are finely designed, but scarcely look like mosaic, those in the Madeleine still less so, and the last not at all.

The artist who designs for this material must set aside all the principles he has learned to estimate in paint, either of oil or tempera. As an instance of a painter, pre-eminently delicate in his colour and tone, failing as a mosaic designer we may quote Cimabue, whose beautiful designs in the cathedral at Pisa would have been far more effective had the artist painted them upon the wall with the medium in the requirements of which he was so great a master. The same criticism may apply to the mosaics in recent years set up on the west front of Santa Maria del Fiore in Florence. The very first principles which go to make a fine picture are just those which should be avoided in mosaic- — • elaborate modelling, delicate transitions of light and shade and picturesque effects of dark and light, materialistic resemblance indeed. The designer for mosaic should ever bear in mind his material, ■ and in his designs for it he should accentuate those

characteristics which belong essentially and specifically to mosaic and to no other technique. If he is a painter, he must forget his lessons in that art and take up with new ones — those which teach broad masses of colour obtained in lines. He will find that effects gained by a technique employed in oil colour look bald and ridiculous when translated into mosaic. Water- colour and pastel are by far the best media for cartoons to be copied in mosaic. We do not know how these were executed

in ancient days; probably the design was drawn on the wall, and there were no cartoons. The master not only invented, but he was the master-workman also, and that is how it should be. The probability is that the custom of drawing the design upon the wall practised by the early frescanti was the survival of a method adopted by the mosaicists, just as their method repeated that of Roman and Greek wall-painters. Of course this direct method leads to a large style, a style harmonizing with environ- ment, scale, &c. ; the tendency is to draw large in a large building, to draw small in a small one. Anyhow, this is quite certain, that all the fine Byzantine and 13th century mosaics, as well as wall paintings, were executed in situ and not away, as was the usual custom in England and elsewhere until recently.

Mr Harry Powell has permitted the writer to make use of some of his reflections upon the mosaicist's art in the following notes. The mosaicist should not separate the artistic from the technical details of his craft. He must study not only the decorative effect, form, colour and spacing of his design, but the surface to be covered as well as the materials with which he builds.

Surface. — Good brick-work, the mortar joints slightly cut back, affords the best foundation for mosaic. The hollow and sharp- edged joints provide a

key for the cement into which the cubes will be set, and they diminish the risk of sagging, a not uncommon event if the cement is not welded to the wall by being well pressed into the joints. If the mosaic is to be applied on stone, the stone must be notched and well roughened to provide support. Whether the surface is brick or stone, it must be well saturated with boiled oil to prevent suction, because if too much suction takes place the powder only of the cement will remain and the cubes will drop out. Cement. — A cement suitable for mosaic is one which retains its tenacity, which can be applied in layers, which sets slowly, and which is not liable to change colour after long exposure. These conditions are best met by an oil cement. One consisting of equal weights of white oxide of zinc and carbonate of zinc, mixed with double boiled oil and containing small proportions of wax, gold size and slacked lime gives good results. This cement can either be white or red, white where greyness of tone is desirable, red where a richer effect is desirable. It is generally mixed with a small portion of oxide of iron or oxide of manganese, which prevents the whiteness of the joints from rendering adjacent tints grey from a distance.

Atmospheric Corrosion. — As the atmosphere of modern towns is more corrosive than that of medieval Venice or medieval Rome, it is important that, in choosing the cement and the materials to be imbedded in it, the mosaicist should be certain that they are impervious to atmospheric impurities.

Glass. — Although marble, mother of pearl, and other substances have been, and are still, occasionally used, the predominant material in ancient as well as modern mosaics is glass. When prepared with due regard to the continuing proportions of its ingredients, glass is impervious to the action of ordinary acids, and is practically indestructible. It can be made to assume almost every shade and tint of colour (see Glass). There are many kinds of glass, but for mosaic work either a potash-lead or a soda-lime glass is usually employed. Both of these glasses can be rendered opaque by mixing with the

ingredients either oxide of tin or a mixture of felspar and fluorspar. Glass rendered opaque by the admixture of felspar and fluorspar has a bright, vitreous, easily cleaned surface, and readily develops brilliant colours.

Production of Colours. — Colours are obtained by mixing and melting with the ingredients of the opaque glass small proportions of certain metallic oxides. Oxide of chalk gives a purple blue; ftxide of copper gives a peacock blue ; oxide of copper with oxide of iron gives a green; oxide of copper mixed with oxide of iron and a strong reducing agent gives a red ; oxide of chromium a green ; oxide of nickel a purple; oxide of uranium a yellow; and oxide of manganese a violet — or a black if a larger quantity of oxide is used.

Manufacture of Glass Slabs. — The mixtures, in a state of powder, are shovelled into crucibles standing round the grate of a furnace, and when fusion is complete the viscous glass can be coiled upon the heated end of an iron rod and removed for use, very much in the way that thick treacle may be coiled round the bowl of a spoon. A mass of molten glass, thus collected, is allowed to fall upon a flat iron table, and is pressed into a slab about 6 in. square and i in. thick. The slabs are removed to an oven, where they are allowed to cool slowly, and when cool are removed and broken by a hammer cr a miniature guillotine into tesserae or cubes The fractured edge of the tesserae is used for the surface of the mosaic. Gold and Silver Slabs. — The tesserae containing gold or silver leaf are as impervious to surface corrosions from the effects of atmosphere as the solid colours. The process of manufacturing a gold or silver slab for mosaic work is to spread the metallic leaf on a very thin tray of transparent glass, about 5 in. in diameter,

and after it has been heated to press upon the surface of the leaf a mass of molten glass, so as to create cohesion between the molten glass and the glass tray through the pores of the metallic leaf. The slabs thus formed contain gold, silver or

platinum leaf hermeti- cally imprisoned between two layers of glass. The slabs are cut up into tesserae or cubes by means of a diamond or glass-cutter's wheel. Only one surface can be used for mosaic work.

Tinted Metals. — By using coloured glass for the thin glass trays which form the surface of the metallic slabs a variety of tinted metallic effects are obtained. Moreover, if the glass which is to form the background is coloured, and if the slab after it has been cooled is strongly reheated, the leaf becomes sufficiently disin- tegrated to allow the colour of the background to show through, with the result that the colour effect of the metallic leaf is modified.

Palette and Tools. — The palette of the mosaic worker is a shallow box with many partitions, each division containing different- coloured tesserae. The only tools required are clippers, for shaping the tesserae, and a pointed awl for pricking through the cartoon into the cement the outlines of the design. Although the process and tools are simple, it requires prolonged training of mind, hand, eye and fingers to enable a workman to create in mosaic a living representation as distinguished from a lifeless copy of the master craftsman's design.

Drawing directly on the Wall. Curved Surfaces. — If the mosaicist desires to draw his cartoon directly upon the wall, a necessary procedure where curved surfaces are presented, he goes to work in the following manner. He causes a model to be made to scale of a dome, semi-dome or spandrel and upon it he draws his design with a brush in strong red pigment, having previously squared up the whole surface to scale. This done, he causes the dome, semi-dome or spandrel to be covered over with thick brown paper. This being attached to the wall with white lead sufficient only to give temporary adhesion, the brown paper is squared up to the scale of the small sketch; each square being relatively numbered. The master then sets his pupils to work to draw mechanically and copy accurately from the small design on to the full-sized dome, semi-dome or

spandrel. This done, the master follows on, correcting with charcoal or brush until the whole design is developed in strong outline. Having made a slightly coloured sketch, the master with the aid of his pupils proceeds to mix all the tints in water-colour, adding colla di pesce or fish glue, and a little honey to prevent cracking. He then applies every tint separately, keeping each distinct, and above all minding that the local colours of all half-tints are different from the colour of all shadows. This done, he dips his brush in black and draws all the outlines, the thickness of which depends upon the distance which will intervene between his work and the spectator; in order that the black may not appear cold from a distance, he will add to one side of the line, a red line, thicker or thinner than the black, according to the effect he wishes to produce. It is sometimes effective to add upon the other side of the black line a green line, so that the purple effect of the black and red shall be modified.

Colour. — We now come to the great question of colour and how to obtain it simply, and so that from a distance a blurred and woolly effect is not obtained. There should be a marked and sharp definition between all tints; they should not he. fused; they should look sharply defined, as the squares upon a chess- board, and appear crude and brutal. The work which looks least refined near at hand looks more finished at a distance. Red and blue lines alternately laid, either more red or more blue as the purple is intended to tend towards red or blue, make the best purple. Green is best made with yellow and blue lines, the masses being separated by red lines, and the shadows of green should be red or blue: if red, they should be outlined with blue; if blue, with red. Red should be treated flatly, shaded with a deeper red, which should be of a warmer tone than the lights. Blue should be shaded with blue or red; and it is well to mix green tesserae with the blue in the lights, and again green tesserae with the blue or red shades to modify crudity. Pure white should be very sparingly used: it expands greatly at

a distance. The best white is that which is of the tone of Naples yellow. Whenever it is necessary to use pure white, either a yellow or pink line should be set on one side of it.

It is impossible to keep the flesh too simple. The local colour, i.e. a red orange, is the staple colour. Features should be drawn

in strong red or burnt sienna, or a rich brown. The outlines of limbs or the contours of faces should be made first with a green line, a little darker than the local tints, then a red line darker still, then a black or brown line. While draperies are capable of being treated with endless variety. Their shadows may be green, red, blue, grey or yellow. If the white drapery is to take a neutral tone when seen from a distance, all these tints should be employed, because when mixed those positive colours appear neutral when seen from afar.

Gold drapery has a fine effect. Bright gold expands to four times the width of the line, so that the lines of gold should be thin. It may be that the gold drapery is to appear greenish; when that is desirable the folds should be drawn in green outlined with red. All deep shades should be treated with red and hot browns. As gold expands so considerably, a larger interval should be left between the tesserae than between any other colour, even white. Each tessera should have a thin space of the ground colour round it. The tesserae should never be jammed: it is that which causes so many modern mosaics to look like oil-cloth or chromolithographs.

The Finished Cartoon. — The finished cartoon, having been coloured in lines, should look exactly like the finished mosaic as regards effect; and the master, in making his cartoon, should always bear in mind that he is designing for mosaic, and not making a

finished picture. The cartoon, when complete, is taken off the wall and cut up in pieces. Each piece is then carefully traced. The space upon the wall corresponding to each section is then covered with cement, but only upon that portion of the space which can be worked in mosaic in a day. The mosaic worker then applies the portion of the tracing upon the wet cement, and with a sharp point he pricks through the paper upon the lines thereon drawn; on removing the tracing he will find indents within the surface of the cement, which give him his cue to all the forms. Setting up the coloured design by his side, he takes the tesserae, which exactly correspond in colour and tone with those on the drawing, and begins his work, commencing from the outline and working inwards towards the centre, the lightest portion being left to the last. Here comes in the real test whether the craftsman is capable or the reverse. This is soon judged by the master, who will put the work in and out until he is satisfied with the result. Unless the master has himself gone through the drudgery of laying the cubes he can be no teacher. He must be a craftsman as well as a designer, and must know by experience and practice in a very difficult craft what the material can do with ease and what it is not called upon to do by reason of its inherent limitations. If he has not so trained himself he is certain to pictorialize what he should conventionalize; and, moreover, he will set technical difficulties in the way which are impossible to overcome. He must aim at the greatest simplicity without dullness, at producing the greatest effect by the simplest means, and to do that he must know his material or fail. (W. B. Ri.)

MOSBY, JOHN SINGLETON (1833-), American soldier, was born in Edgemont, Powhatan county, Virginia, on the 6th of December 1833. He graduated at the university of Virginia in 1852, was admitted to the bar in 1855, and practised law in Bristol, Washington county, Virginia, until the beginning of the Civil War, when he joined the cause of the South. He enlisted as a private in the Washington Mounted Rifles, which became a part of General J. E.

B. Stuart's 1st Virginia Cavalry, and of which he was adjutant for a time. In June 1862, after having gone over the ground alone on scouting duty, he accompanied Stuart in his ride round McClellan's entire army. Early in 1863 he secured Stuart's permission to undertake a quasi-inde- pendent command. In Fairfax county and then in Fauquier and Loudoun counties (known as Mosby's Confederacy), within the Federal lines, he raised, mounted, armed and equipped a force of irregulars. On the night of the 8th of March 1863, with about 30 men, he penetrated the Federal lines at Fairfax Court-House and took 33 prisoners, including Brigadier-General Edwin H. Stoughton, commanding the 2nd Vermont brigade; and he became famous for other such exploits. In the North

he was regarded as a guerilla who disregarded the rules of war, and in the autumn of 1864, Sheridan, acting under orders from Grant, shot and hanged seven of Mosby's men without trial; in November Mosby retaliated by hanging seven of Custef's cavalry- men. Eventually, on the 21st of April 1865, twelve days after the surrender of General Lee, he disbanded his men and surrendered; and through the influence of General Grant, who later became his personal friend, he was paroled. He returned to his legal practice, joined the Republican party, canvassed Virginia in 1872 for General Grant, in 1878-1885 was United States consul at Hong-Kong, and after practising law in San Francisco, was assistant attorney in the Federal Department of Justice from 1004 to 1910. He wrote Mosby's Reminiscences and Stuart's Cavalry Campaigns(Boston, 1887), and— a defence of Stuart and of Lee — Stuart's Cavalry in the Gettysburg Campaign (New York, 1908).

See J. Marshall Crawford, Mosby and his Men (New York, 1867) ; A. Monteiro, War Reminiscences by the Surgeon of Mosby's Command (Richmond, Virginia, 1890) ; James J. Williamson, Mosby's Rangers (New York, 1909); John W. Munson, Reminiscences of a Mosby Guerrilla (New York, 1906); John H. Alexander, Mosby's Men (New York, 1907) ; and Partisan Life with Mosby (New York, 1867), by John Scott, who

drafted the Partisan Ranger Law, under which Mosby's command operated.

MOSCHELES, IGNAZ (1 794–1870), Bohemian pianist, was born at Prague on the 30th of May 1794, and studied music at the Conservatorium under the direction of Dionys Weber. At the age of fourteen he made his first appearance before the public in a pianoforte concerto of his own composition with marked success. In 1814 he prepared, with Beethoven's con- sent, the pianoforte arrangement of Fidelio, afterwards pub- lished by Messrs Artaria. In the following year he published his celebrated Variationen uber den Alexandermarsch, a concert piece of great difficulty, which he played with so great effect that he was at once recognized as the most brilliant performer of the day. He then started on a tour, during the course of which he visited most of the great capitals of Europe, making his first appearance in London in 1822, and there securing the friendship of Muzio Clementi and John Cramer. For a concert given by the latter he wrote his famous Hommage d Handel, a duet for two pianofortes, which afterwards became a lasting favourite with the public. During a visit to Berlin in 1824 he first became acquainted with Mendelssohn, then a boy of fifteen; and a friendship sprang up between them which was severed only by Mendelssohn's early death (see Brief e von Mendelssohn- Bartholdy an Ignaz und Charlotte Moscheles, 1888). In 1826 Moscheles married Charlotte Embden at Hamburg, and settled permanently in London. He was undoubtedly for some con- siderable time the greatest executant of his age; but, using his brilliant touch as a means and not as an end, he consistently devoted himself to the further development of the true classical school, interpreting the works of the great masters with con- scientious fidelity, and in his extempore performances, which were of quite exceptional excellence, exhibiting a fertility of invention which never failed to please the most fastidious taste. In 1837 Moscheles conducted Beethoven's Ninth Symphony at the* Philharmonic Society's concerts with extraordinary success, and by his skilful use

of the baton contributed to the prosperity of this association. During the course of his long residence in London he laboured incessantly in the cause of art, until the year 1846, when, at Mendelssohn's earnest solicitation, he removed to Leipzig to carry on a similar work at the Conservatorium, then recently founded. In this new sphere he worked with unabated zeal for many years, dying on the 10th of March 1870. Moscheles' numbered works extend to 142, apart from minor pieces; his most important compositions are his Pianoforte Concertos, Sonatas and Studies {Etudes, op. 70; and Characteristische Studien, op. 95); Hommage a Handel; and his three Allegri di bravura.

See The Life of Moscheles (1873), a translation by A. D. Coleridge of Mme Moscheles' Aus Moscheles Leben (1872).

MOSCHEROSCH, JOHANN MICHAEL (1 601–1669), German satirist, was born at Willstadt, near Strassburg, on the 5th of March 1601. He received a careful early education at the

Latin School at Strassburg, and in 1620 began his academic career as a student of jurisprudence. After being for some years tutor in the family of the Graf von Leiningen-Dachsburg, he finally became privy councillor to the landgravine of Hesse- Cassel. He died at Worms on the 4th of April 1669. Under the name of " Der Traumende," Moscherosch was a member of the Fruchtbringende Gesellschaft, a society founded by Prince Ludwig of Anhalt-Cothen, in 161 7, for the purification of the German language and the fostering of German literature. His most famous work is the Wunderliche und wahrhajfiige Gesichte Philanders von Sittewald (anagram of Willstadt) (1642-1643), for which he took as his model the Suefios (visions) of the famous Spaniard Francisco Gomez de Quevedo y Villegas (1580-1645). Hardly inferior to the " visions " is the Insomnis cura

parentum, Christliches V ermdchtnis eines Vaters, which was published at Strassburg in 1643 and again in 1647. Note- worthy is also Die Patientia, discovered in 1897 in MS. in the municipal library at Hamburg.

Selections from Moscherosch's writings have been published by W. Dittmar (1830), F. Bobertag (in Kurschner's Deutsche National- literatur, xxxii., 1884), and K. Miiller (in Reclam's Universalbib- liothek). Reprints of the Insomnis cura parentum and Patientia have been published by L. Pariser (1893 and 1897), who is also the author of Beitrdge zu einer Biographie von Moscherosch (1891). See also M. Nickels, Moscherosch als Pddagog (1883); J. Wirth Moscherosch's Gesichte (1

MOSCHOPULUS ("little calf," probably a nickname), MANUEL, Byzantine commentator and grammarian, lived during the end of the 13 th and the beginning of the 14th century. His chief work is `Epcoriy/iara ypafifiariKa, in the form of question and answer, based upon an anonymous epitome of grammar, and supplemented by a lexicon (avWoyri) of Attic nouns. He was also the author of scholia on the first and second books of the Iliad, on Hesiod, Theocritus, Pindar and other classical and later authors; of riddles, letters, and a treatise on the magic squares. His grammatical treatises formed the foundation of the labours of such promoters of classical studies as Manuel Chrysoloras, Theodorus Gaza, Guarini, and Con- stantine Lascaris.

A selection from his works under the title of Manuelis Moschopuli opuscula grammatica was published by F. N. Titze (Leipzig, 1822); see also C. Krumbacher, Geschichte der byzantinischen Litteratur (1897) and M. Treu, Maximi monachi Planudis epistulae (1890), p. 208.

MOSCHUS, Greek bucolic poet and friend of the Alexandrian grammarian Aristarchus, was born at Syracuse and flourished about 1 50 B.C. He was the author of a short epic poem, Europa, and a pretty little epigram, Love, the Runaway, imitated by

Torquato Tasso and Ben Jonson. The epitaph on Bion of Smyrna, wrongly supposed to have been his tutor, was in all probability written about the time of Sulla (see F. Biicheler in Rheinisches Museum, xxx., 1875). The poem on Megara (the wife of Heracles) is probably not his, but a few other pieces, undoubtedly genuine, have been preserved. His poems are nearly all in hexameters. They are usually printed in editions of Bion and Theocritus, and have been translated into many European languages.

The text has been edited by U. von Wilamowitz-M Ollendorff, in the Oxford Scriptorum classicorum bibliotheca (1905); there are English translations by J. Banks in Bohn's Classical Library (1853), and by Andrew Lang (1889), together with Bion and Theocritus. See F. Susemihl, Geschichte der griechischen Litteratur in der Alexan- drinerzeit. i. 231 (1891), and article Bion.

MOSCOW (Russian Moskva), a government of Central Russia, bounded by the governments of Tver on the N.W., Vladimir and Ryazan on the E., Tula and Kaluga on the S., and Smolensk on the W., and having an area of 12,855 sq. m. The surface is undulating, with broad depressions occupied by the rivers, and varies in elevation from 500 to 850 ft. The government is situated in the centre of the Moscow coal-basin, which extends into the neighbouring governments. Its geology has been carefully studied, and it appears that in the Tertiary period the surface of this province was already continental; but during the Cretaceous period it was to some extent overflowed by the sea. Jurassic deposits are represented by their upper divisions

only; the lower ones, as well as Triassic and Permian deposits, are wanting. The Carboniferous deposits are of a deep-sea origin, and are only represented by the upper division which lies upon Devonian deposits, discovered in an artesian well at Moscow at a depth of 1508 ft. The pendulum anomaly, men- tioned by Kaspar Gottfried Schweitzer (1816-1873), has been investigated. It appears in a zone 10 m. wide and about 95 m. long from west to

east, and is positive (+io-6″) to the north of Moscow and negative (— 2-7″) to the south.

The government is drained by the Volga, which skirts it for a few miles on its northern boundary, by the navigable Sestra, which brings it into communication with the canals leading to St Petersburg, by the Oka, and by the Moskva. The Oka and Moskva from a remote period have been important channels of trade, and continue to be so notwithstanding the development of the railways. The Oka brings the government into water communication with the Volga. Extensive forests (39 % of the entire area) still exist. The soil is somewhat unpro- ductive; agriculture is carried on everywhere, but only two districts export corn, all the others being more or less dependent on extraneous supplies. The principal crops are rye, oats, barley, potatoes, with some flax, hemp and hops.

The population, 1,913,700 in 1873, numbered 2,430,549 in 1897, and 2,733,300 in 1906. They are nearly all Great-Russians and belong to the Greek Church (4% Nonconformists). The importance of the Moscow government as a manufacturing centre is steadily increasing, and it now stands first in Russia. The chief factories are for cottons, woollens, silks, clothing, chemicals, sugar refineries, distilleries, iron-work's. There is besides a very great variety of minor industries — such as those concerned with gold thread and gold brocades, gold and silver jewelry, bronze, perfumery, sweets, tobacco, tanneries, gutta-percha, furniture, carriages, wall-paper, toys, baskets, lace, and papier-mache. The government is divided into 13 districts.

The prehistoric archaeology of Moscow has been carefully studied. This district has been inhabited since the Stone Age. Bronze implements are rare, and there are places where instru- ments of stone, bone and iron are found together. The inhabi- tants who constructed the burial mounds in the 10th to 12th centuries seem to have been of Finnish origin, and were poorer, as a rule, than their contemporaries on

the Volga.

MOSCOW, (Russian Moskva), the second capital of the Russian empire, and chief town of the government of the same name, in 55° 45′ N. and 37 37′ E., on both banks of the river Moskva, a tributary of the Oka. It is by rail 400 m. from St Petersburg, 1017 from Odessa, and 814 from Warsaw. It lies to the north of the most densely peopled parts of Russia (the " black-earth region "), whilst the country to the north of it is rather thinly peopled as far as the Volga, and very sparsely beyond that. The space between the middle Oka and the Volga, however, was the cradle of the Great-Russian nationality (Novgorod and Pskov excluded); and four or five centuries ago Moscow had a quite central position with regard to that region.

The present city covers an area of 32 sq. m. (about 40 when the suburbs are included). In the centre, on the left bank of the Moskva, stands the Kreml or Kremlin, occupying the Borovitsky hill. To the east of the Kremlin is the Kitay-Gorod, formerly the Great Posad, the chief centre of trade. The Byelyi-Gorod, which was formerly enclosed by a stone wall (whence the name), surrounds the Kremlin and the Kitay-Gorod on the west, north, and north-east. A line of boulevards now occupies the place of its wall (destroyed in the 18th century), and forms a first circle of streets round the centre of Moscow. The Zemlyanoy-Gorod (earthen enclosure) surrounds the Byelyi-Gorod, including the Zamoskvoryechie on the right bank of the Moskva. The earthen wall and palisade that formerly enclosed it no longer exist, their place being taken by a series of broad streets with gardens on both sides — the Sadovaya, or Gardens Street. The fourth enclosure (the Kamer College earthen wall) was made during the reign of Catherine II. ; it is of irregular shape, and encloses the outer parts of Moscow,

whilst the suburbs and the villages which have sprung up on the highways extend some miles beyond.

The Kremlin is an old fort of pentagonal (nearly triangular) shape, about 100 acres in extent, occupying a hilf 130 ft. above the level of the Moskva. It is enclosed by a high stone battle- mented wall 2430 yds. in length, restored during the 19th century, and having nineteen towers. Its five gates are sur- mounted by ” towers and are all noteworthy. The Spaskiya (Saviour’s) Gate was erected in 1401 by a Milanese architect; the Gothic tower (203 ft.) that surmounts it was added in 1626 by the English architect, Holloway. A sacred picture of the Saviour (the ” palladium of Moscow “) was placed upon it in 1647, and all who pass through the gate uncover. The towers surmounting the other four gates were erected by order of Ivan III. Of the sacred buildings of the Kremlin the most venerated is the Uspenskiy cathedral. The former church of this name was erected in 1326 by the tsar, Ivan Kalita, but, on its falling into disrepair, a new one was built on the same place in 1475–1479, by the Bolognese architect, Fioraventi, in the Lombardo- Byzantine style, with Indian cupolas. It was restored each time after being pillaged or burnt in 1493, I 547> 1682 and 181 2. It contains the oldest and most venerated holy pictures in Russia, one of which is attributed to the metro- politan Peter, another to St Luke. The cathedral possesses also the throne of Vladimir I., and numerous relics of saints, some of which date from the 14th century. The Russian metropolitans and patriarchs were consecrated in this cathedral, as well as the tsars after Ivan IV. The Arkhangel cathedral, on the opposite side of the square, was originally built in 1333, and a new one was erected in its place in 1 505–1 508. It contains the tombs of the tsars from Ivan Kalita (1340) to Ivan Alexeivich (1696), and possesses vast wealth. The Blagovyeshchensk cathedral, recalling the churches of Mount Athos (in Turkey), was first built in 1397, rebuilt in 1484–1489, and restored in 1883–1896; the remarkable pictures of Rublev (1405) are still preserved. It

was the private chapel of the tsars, and in it they are baptized and married. Vestiges of a very old church, that of the Saviour in the Wood, contemporaneous with the foundation of Moscow, still exist in the yard of the palace. A stone church took the place of the old wooden structure in 1330, and was rebuilt in 1527. The Voznesensky convent, erected in 1389-1393, and restored in the end of the 19th century, is the burial-place of wives and sisters of the tsars. The Chudov monastery, erected in 1358-1365 and rebuilt in 1771, was the residence of the metropolitans of Moscow and a state prison. Close by, the great campanile of Ivan Veliky, erected in the Lombardo-Byzantine style by Boris Godunov, in 1600, rises to the height of 271 ft. (318 ft. including the cross), and contains many bells, one of which weighs 64^ tons. Close by is the well-known Tsar-Kolokol (king of the bells), 65 ft. in circumference round the rim, 19 ft. high, and weighing 198J tons. It was cast in 1735, and broken during the fire of 1737 before being hung. The treasury of the patriarchs in the campanile of Ivan Veliky contains not only such articles of value as the sakkos (episcopal robes) of the metropolitans with 70,000 pearls, but also very remarkable monuments of Russian archaeology. The library has 500 Greek and 1000 very rare Russian MSS., including a Gospel of the 8th century.

The great palace of the tsars, erected in 1838-1849, is a fine building in white stone with a gilded cupola. It contains the terems, or rooms erected by Tsar Michael Feodorovich for the young princes his sons in 1636 (restored in 1836-1849, their former character being maintained), a remarkable memorial of the domestic life of the tsars in the 17 th century. In the treasury of the tsars, in the Orujeynaya Palata, now public museums, the richest stores connected with old Russian archaeology are preserved — crowns, thrones, dresses, various articles of house- hold furniture belonging to the tsars, Russian and Mongolian arms, carriages, &c. The Granovitaya Palata, another wing of the great palace, consists of a single-vaulted apartment built

in 1473–1490, and is used as a state banqueting hall.

The four sides of the Senate Square are occupied by buildings

of various dates, from the 1 5th century onwards. Among them is the imposing senate, now the law courts, erected by Catherine 11.(1771–1785). Facing it is the arsenal (1701–1736). Thetemple of the Saviour, begun in 181 7 in commemoration of the events of the French campaign of 1812, was abandoned in 1827, and a new one was built during 1838–1883 on a hill on the bank of the Moskva, at a short distance from the Kremlin. Its style is Lombardo-Byzantine, with modifications suggested by the military taste of Nicholas I.

The Kitay-Gorod, which covers 121 acres, is the chief com- mercial quarter of Moscow. It contains the new bazaars, a triple block of buildings erected in 1 888–1 893 in sandstone, at a cost of over £1,630,800, and the Gostinoy Dvor, consisting of several stone buildings divided into 1200 shops. The Red Square, 900 yds. long, with a stone tribunal in the middle, which was formerly the forum, market cross and place of execu- tion separates the bazaar from the Kremlin. At its lower end stands the fantastic Pokrovsky Cathedral (usually known as Vasili Blazhennyi), one of the wonders of Moscow, on account of its towers, all differing from each other and representing, in their variety of colours, pine-apples, melons and the like. It was begun by Ivan the Terrible in 1554 to commemorate the conquest of Kazan, but not completed until 1679. It was plundered and desecrated by the French in 181 2, but restored in 1839–1845. The exchange, built in 1838 and restored in 1873, is very lively, and its ” exchange artels ” (associations of nearly 2000 brokers) are worthy of remark. Banks, houses of great commercial firms, streets full of old book-shops carrying on a very large trade, and finally the Tolkuchy rynok, the market of the poorest dealers in old clothes, occupy the Kitay-Gorod, side by side with restaurants of the highest class. In

this quarter are also situated the house of the Romanovs, the reigning dynasty of Russia, rebuilt and refurnished in 1859 in exact conformity with its former shape; and the printing-office of the synod of the Orthodox Greek Church, founded in 1563 and containing about 600 MSS. and 10,000 very old printed books, together with a typographical museum. At the entrance to the Kitay-Gorod stands the chapel of the highly venerated Virgin of Iberia, a copy made in 1648, of a holy picture placed on the chief gate of the monastery of Mt Athos.

The northern parts of the Byelyi-Gorod are also the centre of a lively trade. Here are situated the Okhotnyi Ryad (poultry and game market) and the streets Tverskaya, Petrovka and Kuznetsky-Most the rendezvous of the world of fashion. Here also are the theatres, the industrial art museum, imperial bank (1894), and Rozhdestvensky convent (founded in 1386). In the south-west of the Byelyi-Gorod, opposite the Alexander Garden on the west side of the Kremlin, stand the university (see below), museum of domestic industries, Rumyantsev Museum and church of the Redeemer. This last, built in the form of a Greek cross in 1837-1883 at a cost of nearly £1,600,000, is dominated by five gilded domes and faced externally with marble. The interior is harmoniously decorated with gold and marble, and adorned with pictures by Verestctagin and other Russian artists. In the east of the city are three monasteries all dating from the 14th century.

The Zemlyanoy-Gorod, which has arisen from villages that surrounded Moscow, exhibits varied characteristics. In the neighbourhood of the railway stations it has busy centres of traffic; other parts are manufacturing quarters, whilst others — for instance, the small quiet streets on the west of the boulevard Prechistenka, called the old Konushennaya, with their wooden houses and spacious courtyards — are the true abodes of the families of the old, for the most part decayed, but still proud, nobility. The Zamoskvoryechie, on the right bank of the Moskva, is the abode of the patriarchal merchant families.

The climate of Moscow is cold and continental, but healthy. The average annual temperature is 40-1° F. (Jan., 14 ; July, 66-5°). The summer is warm (64-2°), and the winter cold and dry (15-8°), great masses of snow lying in the streets. The spring, as is usually the case in cold continental climates, is beautiful. The prevailing winds are south-west and south,

The river Moskva is frozen, on the average, for 153 days (from Nov. 12 to April 13).

The Moskva is crossed by five bridges; a branch of it, or rather a channel, makes an elongated island in the middle of the city. Water of excellent quality, principally from the Mytishchi springs and pounds, 11 m. distant, has since 1893 been led to fountains in different parts of the city, whence it is distributed by watermen.

The population was estimated at only 150,000 in the middle of the 18th century, and at 250,000 in 1812. Since 1870 it has been growing at the rate of about 25 % per annum; (1872), 601,969; (1882), 753,469; (1902), 1,092,360, or including the suburbs 1,173,427; (est. 1907), 1,359,254. The housing problem is of great importance in Moscow, as it appears that over 10% of the domiciles are underground. And while the average for the city is two occupants to each room, there are more than 10,000 domiciles which have more than four occupants to each room, representing one-fourth of the population. The average mortality is consequently high, namely 28 per 1000 ($i per 1000 if the children inmates of the Foundling House be included). Fires occur very frequently. The inhabitants are mostly Great- Russians. They belong chiefly to the Orthodox Greek Church, or are Nonconformists; the Lutherans number 2% and the Roman Catholics 1 %.

Since the 14th century Moscow has been an important com- mercial city. About the end of the 15th century its princes transported to Moscow, Vladimir, and other Russian towns no fewer than 18,000 of the richest Novgorod merchant families, and took over the entire trade of that city, entering into direct relations with Narva and Livonia. The annexation of Kazan (1552) and the conquest of Siberia (1 580-1600) gave a new importance to Moscow, bringing it into direct commercial relations with Khiva, Bokhara and China, and supplying it with Siberian furs. The fur-trade had a great fascination for all European merchants in the 16th century, and an English company, having received the monopoly of the Archangel trade, caused their merchandise to be sent by the White Sea instead of by the Baltic. Moscow thus became the centre for nearly the entire trade of Russia, and the tsar himself engaged in large commercial operations. Situated at the intersection of six important highways, Moscow was the storehouse and exchange- mart for the merchandise of Europe and Asia. The opening of the port at St Petersburg affected its commercial interest unfavourably at first; but the Asiatic trade and internal trade of Moscow have since then enormously increased. Here are concentrated the traffic in grain, in hemp and in oils sent to the Baltic ports; in tea, brought both by way of Siberia and of St Petersburg; in sugar, refined here in large quantities; in grocery wares for the supply of more than half Russia and all Siberia; in tallow, skins, wool, metals, timber, wooden wares, iron and steel goods, wine, drugs, raw cotton, silk and all other produce of the manufactures of middle Russia. As a railway centre the city plays so predominant a part that | to £ of all the goods carried by the railways of European Russia are loaded or unloaded at Moscow. The banks, including the mortgage banks, are the most important in Russia.

From the 15th century onwards the villages around Moscow were renowned for the variety of small industries which they carried on; the first large manufactures in cottons, woollen fabrics, silk,

china and glass in Great-Russia were established at Moscow in the 17th and 18th centuries. After 1830, in con- sequence of protection tariffs, the manufactories in the govern- ment of Moscow rapidly increased in number; but two-thirds of them are now concentrated in the capital. Moscow is in fact the principal manufacturing city in the empire, employing about 100,000 operatives in her mills and factories. Nearly one-half of them are engaged in the textile industries, especially calico-printing. Next in importance comes the preparation of food-stuffs, followed by the metal and metallurgical industries and the chemical works.

Moscow has many educational institutions and scientific societies. The university, founded in 1755, exercised a powerful

influence on the intellectual life of Russia during the years 1830-1848; and it still continues to be the most frequented Russian university. In 1904 it had over 5000 students, who are mostly poor. The library contains some 286,000 volumes, and has rich collections in mineralogy, geology and zoology. Among the museums the Rumyantsev, now connected with the so-called public museum, occupies the first rank. It contains a library of 700,000 volumes and 2300 MSS., remarkable collec- tions of old pictures, sculptures and prints, as well as an extensive mineralogical collection, and an ethnographical collection representing very accurately the various races of Russia. The private museum of Prince Golitsui contains a good collection of paintings and MSS. The Shchukin Museum contains Russian antiquities, pictures and objects of industrial art. A number of excellent free libraries have been opened, two of "them con- taining valuable collections of books and MSS. The remarkable Tretyakov gallery of pictures, chiefly of the Russian school, has been presented (1892) by its owner to the city. The phil- anthropic institutions include the vast foundling hospital (1764). The municipal relief of the poor was entirely reorganized in 1894, partly on the Elberfeld system and partly on quite new and original lines.

Moscow is surrounded by beautiful parks and picturesque suburbs. Of the former one of the most frequented is the Petrovsky Park, to the north-west, with a castle built in 1776, burnt by the French in 181 2, but rebuilt in 1840. A little farther out is the Petrovskoye Razumovskoye estate, with an agricul- tural academy (1865) and its dependencies (botanical garden, experimental farm, &c). Another large park and wood surround an imperial palace (1796) in the village of Ostankino. The private estates of Kuzminski, Kuskovo and Kuntsevo are also surrounded by parks; the last has remains of a very old grave- yard, supposed tc belong to the pagan period. In the south- west, on the right bank of the Moskva, which here makes a great loop to the south, are the Vorobyevy hills, which are accessible by steamer from Moscow, and afford one of the best views of the capital. In the loop of the Moskva is situated the Novo-Dyevichy or Virgins' convent, erected in 1524 and con- nected with Sophia, sister of Peter the Great, and many events of Russian history. In the south, on the road to Serpukhov, is the village of Kolomenskoye, founded in 1237, a favourite residence of Ivan the Terrible and Peter the Great, with a church built in 1537, a striking monument of Russian architecture, restored in 1880. The monastery Nikolo-Ugryeshskiy, 12 m. from the city, between the Kursk and Ryazan railways, occupies a beautiful site and is much visited by Moscow mer- chants, to venerate a holy picture by which Dmitry Donskoi is said to have been blessed before going to fight (1380) the Mongols. In the north, the forest of Sokolniki, covering 4§ sq. m., with its radial avenues and numerous summer residences, is the part of Moscow most frequented by the middle classes.

History. — The Russian annals first mention Moscow in 1147 as a place where Yuri Dolgoruki, prince of Suzdal, met Svya- toslav of Syeversk and his allies. The site was inhabited from a very remote antiquity by the Merya and Mordvinians, whose remains are numerous in the neighbourhood, and it was well peopled by Great-Russians in the 12th century. To

the end of the 13th century Moscow remained a dependency of the princes of Vladimir, and suffered from the raids of the Mongols, who burned and plundered it in 1237 and 1293. Under Daniel, son of Alexander Nevsky (1261–1302), the prince of Moscow first acquired importance for the part he took in the wars against the Lithuanians. He annexed to his principality Kolomna, situated at the confluence of the Moskva with the Oka. His son in 1302 annexed Pereyaslavl Zalesky, and in the following year Mozhaisk (thus taking possession of the Moskva from its source to its mouth), and so inaugurated a policy which lasted for centuries, and consisted in the annexation by purchase and other means of the neighbouring towns and villages. In 1300 the Kremlin, or fort, was enclosed by a strong wall of earth and timber, offering a protection to numerous emigrants from the

Tver and Ryazan principalities. Under Ivan Kalita (1325–1341) the principality of Vladimir — where the princes of Kiev and the metropolitan of Russia had taken refuge after the wars that desolated south-western Russia — became united with Moscow; and in 1325 the metropolitan Peter established his seat at Moscow, thus giving new importance and powerful support to the young principality. In 1367 the Kremlin was enclosed within stone walls, which proved strong enough to resist the Lithuanians under Olgierd (1368 and 1371). Kalita's grandson, Dmitry Donskoi, annexed the dominions of Starodub and Rostov, and took part in the renowned battle of Kulikovo (1380), on the Don in the government of Tula, where the Russians ventured for the first time to oppose the Mongols in a great pitched battle. Two years after the battle of Kulikovo Moscow was taken' and plundered (for the last time) by. Toktamish, khan of the Golden Horde of the Mongols.

The increase of the principality continued during the first half of the 15th century, and at the death

of Vasili (or Basil) the Blind, in 1462, it included not only the whole of what is now the government of Moscow, but also large parts of the present governments of Kaluga, Tula, Vladimir, Nijniy-Novgorod, Kostroma, Vyatka, Vologda, Yaroslav and Tver. It was not however until the reign (1462-1505) of Ivan III. that the prince of Moscow set up claims to other parts of Russia, and called himself " Ruler of all Russia." In 1520 Moscow was said to contain 45,000 houses and 100,000 inhabitants. Ivan IV. annexed Novgorod and Pskov to Moscow, and subdued Kazan and Astrakhan. But after his reign Moscow suffered from a long series of misfortunes. In 1547 two conflagrations destroyed nearly the whole of the city, and a few days later the Tatar khan of the Crimea advanced against it with 100,000 men. He was compelled to retire from the banks of the Oka, but in 1571, taking advantage of the state into which Russia was brought by the extravagances of Ivan, he took Moscow and burned all the city outside the Kremlin. The gates of the Kremlin having been shut, thousands of people perished in the flames, and the annals record that of the 200,000 who then formed the population of Moscow, only 30,000 remained. In 1591 the Tatars of the Crimea were again in Moscow and avenged their repulse from the Kremlin on the inhabitants of the unfortified town. Mean- while the political influence of the boyars had gradually increased. The peasants, who settled on their lands, or on the estates which the prince bestowed upon his boyars, had become serfs; and the political tendency of the boyars, supported by the wealthier middle classes (which had also a rapid development in the same century), was to become rulers of Russia, like the noblesse of Poland. During the reign of Feodor or Theodore (1584-1598), Boris Godunov, the regent, ordered the murder of the heir to the throne, Demetrius, son of Ivan IV., and himself became tsar of Russia. Moscow suffered severely in the struggle which ensued, especially when the populace rose and exterminated the Polish garrison, on which occasion the whole of the city outside the Kremlin was again burned and plundered. But in compensation it acquired in the eyes of the nation a greatly

increased importance, as a stronghold against foreign invasions. The Novo-dyevichy or Virgins' nunnery, which the Poles be- sieged (1610) without taking, was invested with a higher sanctity. The city also by-and-by recovered its commercial importance, and this the more as other commercial cities were ruined, or fell into the hands of foreigners; and thirty years later Moscow was again a wealthy city. Owing, however, to the ever-increas- ing concentration of power in the hands of the tsar, and the steady development of autocracy, it lost much of its political importance, and assumed more and more, especially under Alexis Mikhailovich (1645-1676), the character of a private estate of the tsar, its suburbs becoming mere dependencies of his vast household.

During the whole of the 17th century Moscow continued to be the scene of many troubles and internal struggles. The people several times revolted against the favourites of the tsar, and were subdued only by cruel executions, in which the streltzy — a class of citizens and merchants rendering hereditary military

service — supported the tsar. Afterwards appeared the raskol or nonconformist movement, and in 1648, when the news spread that Stenka Razin was advancing on Moscow "to settle his accounts with the boyars," the populace was kept from rising only by severe repressive measures and by the defeat of the invader. Later on, the streltzy themselves engaged in a series of rebellions, which led the youthful Peter the Great to suppress them (1698) amid streams of blood. The opposition encountered at Moscow to his plans of reforming Russia according to his ideal of military autocracy, the conspiracies of the boyars and merchants, the distrust of the mass of the people, all compelled him afterwards to leave (1703) the city, and to seek, as his ancestors had done, a new capital. This he founded at St Petersburg on the very confines of the military empire he was trying to establish.

In the course of the 18th century Moscow became the

seat of a passive and discontented opposition to the St Petersburg government. Peter the Great, wishing to see Moscow like other capitals of western Europe, ordered that only stone houses should be built within the walls of the town, that the streets should be paved, and so on; but his orders were only partially executed. In 1722 the Kremlin was restored. In 1739 the city became once more the prey of a great conflagration; two others followed in 1748 and 1753, and gave an opportunity for enlarging some streets and squares. Catherine II. tried to conciliate the nobility, and applied herself to benefit the capital with new and useful buildings, such as the senate house, the foundlings' and several other hospitals, salt stores, &c.

The last public disaster was experienced by Moscow in 1812. On the 13th of September, six days after the battle of Borodino, the Russians troops evacuated Moscow, and the next day the French occupied the Kremlin. The same night, while Napoleon was waiting for a deputation of Moscow notables, and received only a deputation of the rich raskolnik merchants, the capital was set on fire through the carelessness of its own inhabitants (it was no heroic deed of Roztopchin's), the bazaar, with its stores of wine, spirits and chemical stuffs, becoming the prey of the flames. The inhabitants abandoned the city, and it was pillaged by the French troops, as well as by Russians them- selves, and the burning of Moscow became the signal of a general rising of the peasants against the French. The want of supplies and the impossibility of wintering in a ruined city, continually attacked by cossacks and peasants, compelled Napoleon to leave Moscow on the 19th of October, after he had unsuccessfully attempted to blow up certain parts of the Kremlin.

(P. A. K.; J. T. Be.)

MOSEL (Fr. Moselle), a river of France and Germany, a left-bank tributary of the Rhine. It rises at an altitude of 241 1 ft. on the west flank of the Vosges, close to the Franco- German frontier, and a

little N. of the Ballon d' Alsace. It flows first N.W. through the French department of Vosges, bends towards N. through that of Meurthe-et-Moselle, forms the Franco-German frontier for a short distance below Pagny, and enters Lorraine. From Sierck to Wasserbillig it forms the frontier between the Rhine Province and Luxemburg, then, turning N.E., it follows a sinuous course and reaches the Rhine at Coblenz. The principal towns on the banks of the Mosel are, in France: Remiremont, Epinal, Toul and Pont- a-Mousson; in Germany: Metz, Diedenhofen, Trier (Treves) and Coblenz. The Mosel receives the waters of the Moselotte, Meurthe, Seille and Saar (its principal tributary) on the right, and the Madon, Orne and Sauer on the left. Navigation for small vessels extends downwards from Fronard, a little below Nancy, the Mosel canal affording communication from a point above Metz to the frontier. In the lower part of the valley are the vineyards from which the well-known Mosel wines are produced. The valley of the Mosel, especially the part between Trier and Kochem, is noted both for picturesque scenery and for many sites, of antiquarian interest. The length of the river is 314 mt

MOSELLE-LINE, the designation of a line of French barrier forts (forts d'arret) on the upper Moselle between the fortresses

of Epinal and Belfort (see these articles, also Metjse Line and articles referred to therein). The purpose of this line, the separate forts of which command the relatively few lines of advance from upper Alsace through the Vosges, is to deflect a possible German invasion from Alsace either towards Belfort or towards the open gap between Epinal and Toul called the Trouee d'Epinal.

MOSEN, JULIUS (1803-1867), German poet and author, was born at Marieney in the Saxon Vogtland on the

8th of July, 1803. He studied law at Jena, and, after two years in Italy, at Leipzig. In 1834 he settled in Dresden as an advocate. He had meanwhile shown great literary promise by his Lied vom Ritter Wahn (183 1). This was followed by the more philosophical Ahasver (1838), and by a volume of poems, Gedichte (1836, 2nd ed., 1843), among which Andreas Hofer and Die letzten Zehn vom vierten Regiment have become popular. He wrote the historical plays Heinrich der Finkler (Leipzig, 1836), Cola Rienzi, Die Braiite von Florenz, Wendelin und Helene and Kaiser Otto III. (the. four last being published in his Theater 1842), and a politico-historical novel, Der Kongress von Verona (1842), which was followed by a charming collection of short stories (Bilder im Moose, 1846). In 1844 Mosen accepted the appointment of dramaturge at the Court Theatre in Oldenburg, but he was soon afterwards stricken with paralysis, and after remaining an invalid for many years, died at Oldenburg on the 10th of October 1867. Of his later works may be mentioned Die Dresdner Gemdldegatterie (1844), and the tragedies Herzog Bernhard (1855) and Der Sohn des Fursten (1858).

A collection of his works, Samtliche Werke, appeared in 8 vols. (1863; new ed., by his son, with a biography; 6 vols., 1880).

MOSER, JOHANN JAKOB (1701-1785), German jurist, was born at Stuttgart on the 18th of January 1701. He studied at the university of Tubingen, where, at the early age of nineteen, he was appointed extraordinary professor of law. In 1729 he became ordinary professor, and in 1736 he accepted a chair and directorship in the university of Frankfort-on-the-Oder. On account, however, of differences with King Frederick William I. of Prussia, he resigned these offices in 1739 and retired to Ebersdorf, a village in the principality of Reuss, where for several years he devoted himself wholly to study, and especially to the production of his Deutsches Staatsrecht. In 1751 he was recalled to Wurtemberg as district counsellor, and in 1759 was imprisoned at Hohentwiel on account of the steps he had taken in connexion with this office against certain

tyrannical proceed- ings of the duke. In 1764 he received his liberty and was restored to office. He died on the 30th of September 1785. Moser was the first to discuss in an adequate form the subject of European international law. He wrote more than 500 volumes, his principal works being Deutsches Staatsrecht (1737-1754), Neues deutsches Staatsrecht (1766-1775), Deutsches Staatsarchiv (1751-1757), Grundriss der heutigen Staalsverfassung von Deutsch- land (1754).

See Schmid, Das Lehen J. J. Mosers (1868); Schulze, /. J. Moser, der Vater des deutschen Staatsrechts (1869).

MOSER, JUSTUS (1720-1794), German publicist and states- man, was born at Osnabriick on the 14th of December, 1720. Having studied jurisprudence at the universities of Jena and Gottingen, he settled in his native town as a lawyer. The confidence he inspired among his fellow citizens soon led to his being appointed advocatus patriae (state attorney). On the appointment of the duke of York (son of George III. of England) to the lay Protestant bishopric of Osnabriick, he was attached to the person of the new ruler as legal adviser, and continued in this office of trust for twenty years. From 1762 to 1768 he was justiciarius (chief justice) of the criminal court in Osnabriick; and in 1768 was made Geheimer Referendar (privy councillor of justice). He died at Osnabriick on the 8th of January 1794. Not only as a statesman and administrator, but also as a publicist, Moser occupied a leading position among the men of his time. His history of Osnabriick (1768; 2nd ed. 1780; 3rd ed. 1819) is a masterly work. In his Patriotische Phantasien (i77S _ i786; 2nd ed. by his daughter, I. W. J. von Voigts, 1804;

new ed. by R. Zollner, 1871) he shows himself in advance of his times, pleading as he does for a national organic development of a state in the place of arbitrary laws imposed by the sovereign. His Vermischte Schriften (published by F. Nicolai with a bio- graphy, 1 797-1 798) also display a deep

insight into human nature and sparkle with humour and witty sallies. Moser was also a poet of some repute and wrote a tragedy, Arminius (1749). A statue of him by Drake was unveiled in Osnabriick in 1836.

His collected works, Samtliche Werke, were published by B. R. Abeken (10 vols., 1842–1844). See J. Kreyssig, Justus Moser (1857); L. Rupprecht, Justus Mosers soziale und volkswirtschaftliche Anschauungen (1892) ; K. Mollenhauer, Mosers Anleil an der Wieder- belebung des deutschen Geistes (1896).

MOSES (Gr. Muvarjs, Mojotjs), the great Jewish lawgiver, prophet and mediator, and leader of the Israelites from Egypt to the eastern borders of the promised land. The records of his life and work are noticed in the articles Exodus, Numbers, Deuteronomy, where the several sources of the narratives are described. He appears in Midian at the ″ Mount of God ″ (Horeb) dwelling with its priest Jethro (

The story of the youth of Moses is, as is commonly the case with great heroes, of secondary origin; moreover, the circum- stances of his birth as related in Exod. ii. find numerous parallels in legend elsewhere, e.g. in the story of the historical Sargon (L. W. King, Early Bab. Kings, ii. 87 sqq.), in the myths of Osiris and many others (see, at length, A. Jeremias's Das Alte Test, im Lichte des alten Orients, 1906, pp. 408 sqq.; Bab. im N. Test. p. 30 seq.). The story of the adoption of Moses by the Egyptian princess appealed to later imagination (Josephus, Ant. ii. 9, 10; Acts vii. 20–22), and many fanciful fables grew up around this and the other biblical statements. The name Mosheh, explained by the fact that the princess ″ drew him ″ (mdshah) out of the waters, means properly ″ one who draws"; a derivation from Eg. mes(u), "child," finds more favour, but is not certain.

At the holy mount, Moses received the divine revelation and was commissioned to bring the people a three-days' journey out of Egypt to sacrifice at

this spot (Exod. iii. 12, 18; v. 3; viii. 27). The deity revealed himself in a new name, Yahweh, and with signs and wonders fortified Moses for his task. On his return he experienced a remarkable incident which is obscurely asso- ciated with the rite of circumcision. 1 The plagues with which the reluctant Pharaoh was coerced culminated in the destruction of all the first-born, and Israel escaped to the Red Sea. The pursuing Egyptians were drowned, and the miraculous preserva- tion of the chosen people at the critical moment marks the first stage in the national history. 2 (See Exodus, The.)

The other events need not be detailed. Kadesh (holy) was

1 Exod. iv. 24-26 ; it possibly explains the transference of the rite from the bridegroom to the new-born son. For a recent discussion, see H. P. Smith, Journ. Bib. Lit. (1906), pp. 14-24; and the article Circumcision (with J. G. Frazer's essay in the Independent Review 1904, pp. 204-218).

2 The plagues appear to have been amplified. In Exod. iv. three signs are given: the hand of Moses is stricken with leprosy and restored (the sign for Moses) ; his rod becomes a serpent (cf . vii. 8-13, the sign for Pharaoh) ; and the water is turned into blood (cf. vii. 17 sqq.). If Pharaoh still remains obdurate his first-born is threatened (iv. 21 sqq.). As regards the crossing of the Red Sea, a perfectly rationalizing explanation can be found: with a strong east wind its waters could temporarily recede and permit a passage (see Journ. Vict. Inst. xxvi. 28; xxviii. 268, 277). To the Israelites, however, it was a miracle, an unexpected intervention on the part of Yahweh, and the first of many marvels which he performed on behalf of the people of his choice. To rationalize this or any of the series misses the whole point of the religious history.

the chief centre. This was the scene of the ″ strife ″ at Meribah (striving) where Yahweh ″ shewed himself holy ″ (Num. xx. 1–13); a parallel account joins the name with Massah (trial, proof) where Yahweh ″ proved ″ the people (Exod. xvii. 1–7). These two names (Deut. ix. 22, xxxii. 51) with their″ significant meanings recur with varying nuances (Ps. lxxxi. 7, xcv. 8 seq.). Here also in the wilderness of Shur, and possibly at En-mishpat (well of judgment, i.e. Kadesh, Gen. xiv. 7), Yahweh made for Israel ″ statute and judgment ″ and ″ proved them.″ This is apparently viewed as the goal of the three-days′ journey (Exod. xv. 22–25). I n this district the defeat of the Amalekites is more naturally located (Exod. xvii. ; cf. 1 Sam. xxvii. 8) and here, finally, for some cause, now obscured, Moses and his brother Aaron (q.v.) incurred Yahweh′s displeasure (Num. xx. 12, xxvii. 14; Deut. xxxii. 51; Ps. cvi. 3). Pisgah or Mt Nebo (the name suggests a foreign god), to the north-east of the Dead Sea became the scene of the death of Moses; his burial-place was never known (Deut. xxxiv.).

In estimating the work of one who stands at the head of the religious and legal institutions of Israel, it is necessary to refrain from interpreting the traditions from a modern legal standpoint or in the light of subsequent ideas and beliefs for which the sources themselves give no authority. Much confusion has been caused by attributing to Moses more than the Pentateuch itself claims, and by misunderstanding the meaning of later references (Mat. xix. 8; Mark vii. 10, x. 5; xii. 26; Luke xx. 37; John vii. 2 2) . Moreover, it is necessary to allow that the traditions relating to both Moses and Aaron underwent change. The priesthoods of Shiloh and Dan could boast of an illustrious origin (1 Sam. ii. 27 seq., Judges xviii. 30), but the religious practices associated with the former especially were not those of the purest type. When Aaron himself is connected with the worship of the golden calf, and when to Moses is attributed a brazen serpent which the reforming king Hezekiah was the first to destroy, it is evident that religious conceptions

developed in the course of ages. Although Moses was venerated as a prophet (Hos. xii. 13), a mediator (Jer. xv. 1) and a leader (Mic. vi. 4; Isa. lxiii. 11), much of the legal procedure ascribed to him must belong on internal grounds (religious, ethical and sociological evidence) to a post- Mosaic age. Many of the Mosaic laws find parallels and analogies in all ages outside the sphere of Israelite influence, notably in the laws codified several centuries previously by the Babylonian king Khammurabi (see Babylonian Law). The practice of finding in ancient authority a precedent for institutions new and old (cf. the law of booty, 1 Sam. xxx. 23, with that ascribed to Moses in Num. xxxi. 25 sqq.) is quite in accordance with Oriental custom and explains the growth of the present extremely complex sources. But this very development of Mosaism implies the existence of an original nucleus or substratum, although the recovery of its precise extent is very difficult. The legislation on Mt Sinai (Horeb) which apparently occupies a very important place in tradition (Exod. xx. sqq.) is really secondary (cf. W. R. Smith, Prophets of Israel, p. in); more prominence is evidently to be ascribed to the influence of the half-Arabian Jethro or Hobab, and this must be taken into consideration with what is known of Kenite and kindred clans (Exod. xviii. ; Num. x. 29-33 ! see Jethro; Kenites). 1 Yahweh appears to have been known to them before he revealed himself to Moses, and the ancestors of the Israelites are recognized as worshippers of Yahweh, but are on another level (Exod. vi. 3). The traditions would seem to point to the institution of new principles in the religion of Yahweh, and would associate with it not merely Moses but those foreign elements which are subsequently found in Israel and Judah. See Jews, § § s, 14, 20.

Bibliography. — See further articles, Aaron; Decalogue; Hebrew Religion; Levites. For the introductory questions, W. Robertson Smith's Old Test, in Jewish Church and Prophets of Israel are most helpful; see also J.-M. Lagrange, Hist. Crit. and the Old Testament (Eng., E. Myers, 1905), pp.

148–179; Wellhausen's

1 See K. Budde, Religion of Israel to the Exile, ch. i. According to Gen. iv. 26, so far from the name Yahweh having been made known to Israel by Moses (Exod. iii. 13 sqq., vi. 2 sqq.), the worship goes back to the earliest ages.

Prolegomena is a conclusive elaboration of the initial stages of criticism. . All subsequent studies vary according to the writer's standpoint; W. R. Harper, Amos and Hosea (Internat. Critical Commentary), pp. 84 sqq., gives a convenient summary. Among particular discussions may be named Cheyne, Ency. Bib. s.v., E. Meyer, Israeliten, pp. 1–103; and the mythological treatment by H. Winckler, Gesch. Isr., ii. 86–95 ; A. Jeremias, Alte Test.,loc. cit. ; and Ed. Stucken, Astralmythen d. Hebraer, &c, pp. 431 sqq. For Jewish and other legends (to which Jude 9 alludes), see Beer, Leben Moses (1863), M. Griinbaum, Neue Beitrage z. sem. Sagenkunde (5893), pp. 152 sqq.; the Assumption of Moses, ed. R. H. Charles (1897) ; W. Tisdall, Sources of the Qur an (1905) ; and Ency. Bib. col. 3218, § 21 (with references). For the stories of Manetho, &c, Ewald, Hist. Isr., ii. 76 sqq.; Kittel, Hist. i. 26 seq., may be supple- mented by Willrich, Juden u. Griechen vor d. makkab. Erhebung (1895), pp. 53 sqq.; G. Maspero, Rec. de travaux (1905), xxvii. 13 sqq., 22 seq. (S. A. C.)

MOSES, ASSUMPTION OF, an extra-canonical apocalyptic work of the Old Testament. The Assumption or Ascension of Moses (`Avafoi\l/is Mwixrews) is a prophecy of the future relating to Israel, put into the mouth of Moses, and addressed to Joshua just before the great lawgiver died. Founded upon the book of Deuteronomy, it is brief and unpoetical. But it seems to have been large at first, for according to Nicephorus it consisted of 1400 stichs. It contains a brief history of Israel from Moses to the Messianic age. The most striking feature in this work is the writer's scathing condemnation of the priesthood before, during, and after the Maccabean period, and an unsparing depreciation of the Temple

services.

This book was lost for many centuries till a large fragment of it was discovered and published by Ceriani in 1861 (Monumenta sacra I. i. 55-64) from a palimpsest of the 6th century. Very little was known about the contents of this book prior to this discovery. One passage found in this fragment is quoted in the Acta synodi Nicaenae, ii. 18. Most of the other references relate to the strife of Michael and Satan about the body of Moses, and ascribe it to the Ascensio Mosis, i.e. 'A^dXiji^is Mwucr^ws.

Various other works have been attributed to Moses, such as the Petirath Moshe, the f$ifiho% \6yoiv ^vittikuiv Muvaias, The Exodus of Moses (in Slavonic), &c. See Charles, Assumption of Moses, pp.- xiv.-xvii. ; Schiirer, Gesch. desjud. Volkes, iii. 220-221.

Date.— The book has been assigned to most dates between the death of Herod the Great and that of Bar-Cochba. But this text precludes any date after a.d. 70. The true date appears to lie between 4 B.C. and a.d. 30. Herod is already dead (vi. 6), hence it is after 4 B.C.; and Herod's sons are to rule for shorter periods than their father, hence it must have been composed before these princes had reigned thirty-four years — i.e. before a.d. 30. But there are grounds for assuming that a.d. 7 is probably the earlier limit (see Charles , op. cit. lv.-iviii.).

Author.— The author was not an Essene, for he recognizes animal sacrifices and cherishes the Messianic hope. He was not a Sadducee, for he looks forward to the establishment of the Messianic Kingdom (x.). Nor yet was he a Zealot, for the quietistic ideal is upheld (ix.), and the kingdom is established by God Himself (x.). He was clearly a Pharisaic Quietist, a Pharisee of a fast disappearing type, recalling in all respects the Chasid of the early Maccabean times, and upholding the old tradi- tions of quietude and resignation. His object is to protest against the growing secularization of the Pharisaic party through its

adop- tion of popular Messianic beliefs and political ideals. But his appeal was in vain, and so the secularization of the Pharisaic movement culminated in due course in the fall of Jerusalem.

The Latin Version a Translation from the Greek. — That our Latin text is derived from the Greek there can be no question. Thus Greek words are transliterated, as " chedrio " from Kt&pbo>, " heremus " from ipy/ios; Greek idioms are reproduced, as " usque nos ducicaptivos," = in>s toO fipas alxp.a^uria6fjvai., and retranslation into Greek is frequently necessary in order to correct the misrenderings of the translator or the corruptions already inherent in the Greek. Finally, fragments of the Greek version are still preserved.

The Greek a Translation from the Hebrew. — That the Greek was in turn derived from a Semitic original was denied by Hilgenfeld, Volkmar and others. But Ewald, Schmidt-Merx, Colani, Carriere, Hausrath, Dalman, Rosenthal and Burkitt decide in favour of a Semitic. R. H. Charles (op. cit. xxxviii.-xlv.) is of opinion that it is possible to prove that the Greek goes back not to an Aramaic but to a Hebrew original, on the following grounds: (1) Hebrew

idiomatic phrases survive in the text. Thus tircumibo (ii. 7) = "I will protect," i.e. anion (cf. Deut. xxxii. 10), and in sacerdotes vocabuntur = eis Upets \CKifiT\aovrai, !!ni?: D'WB ^v (cf. I Chron. xxiii. 14, and Isa. xlviii.2), = " they will call themselves priests." (2) Frequently it is only through retranslation that we can understand the source of corruptions in the text. (3) In some cases we must translate not the Latin but the Hebrew presupposed by it. Thus in i. 7, successor = bt.i £oxos=rmra t must be rendered " minister."

The Book may be the lost Testament of Moses. — The present book is possibly the long lost Aiaflijm;

Majwius mentioned in some of the ancient lists, for it never speaks of the assumption of Moses, but always of his natural death (i. 15, iii. 13, x. 14). About a half of the original Testament is preserved in the Latin Version. The latter half probably dealt with questions about the Creation (see Fabric. Cod. pseud. V. T., ii. 844; Acta synodi Nicaenae, ii. 20). With this ″ Testament ″ the ″ Assumption,″ to which almost all the patristic references and that of Jude are made, was subsequently edited.

Some views of Author. — Our author's views on Moses are remarkable. He writes that Moses was prepared from before the foundation of the world to be the mediator of God's covenant with his people (i. 14, iii. 12). During his life he was Israel's intercessor with God (xi. 11, 17). Praying on their behalf as a ″ great angel ″ (xi. 17), ″ a sacred spirit who was worthy of the Lord manifold and incompre- hensible ″ (xi. 16). Apparently his relation to Israel did not cease with death, as he was to be their intercessor in the spiritual world (xii. 6). His death was an ordinary one (i. 15, iii. 13, x. 12, 14), but no single place was worthy to mark the place of his burial, for his sepulchre was from the rising to the setting sun, and from the south to the confines of the north — yea, the whole world was his sepulchre (xi. 8). On the doctrine of good works our author's views are allied to Old Testament conceptions rather than to the rabbinic doctrine of man's righteousness, which bulks so largely in Jewish literature from a.d. 50 onwards. So far from representing man's righteousness as involving merit over against God, our author represents the greatest hero of Israel as declaring ″ Not for any virtue or strength of mine, but in His compassion and long-suffering was He pleased to call me ″ (xii. 7.)

Literature. — Editions of the Latin text: Ceriani Monumenla sacra et profana, I. i. 55-64 (1861); Hilgenfeld, Nov. test, extra canonem receptum, 107-135 (1876); Volkmar, Mose Prophetie und Himmelfahrt (1867) ; Schmidt and Merx, Die Assumptio Mosis (Merx, Archiv. f. wissensch. Erf. des A. Ts.

I. ii. m-152; 1868); Charles, The Assumption of Moses (translation, with notes and intro- duction, 1897); Clemen, in Kautzsch's Apocr. und Pseud., II. 311- 331. Critical inquiries. — For a full account of these see Schilrer iii. 222 ; Charles op. cit. xxi-xxviii. (R. H. C.)

MOSES OF CHORENE, Armenian historian, was a native of Khor'ni in Taron, a district of the Armenian province of Turu- beran. According to the History of Armenia which bears his name he was a pupil o.f the two fathers of Armenian literature, the patriarch or catholicos Sahak the Great and the vartabed Mesrob. Shortly after 431 he was sent by these men to Alex- andria to study the Greek language and literature, and thus prepare himself for the task of translating Greek writings into Armenian. Moses took his journey by Edessa and the sacred places of Palestine. After finishing his studies in the Egyptian capital he set sail for Greece; but the ship was driven by contrary winds to Italy, and he seized the opportunity of paying a flying visit to Rome. He then visited Athens, and towards the end of winter (440) arrived in Constantinople, whence he set out on his homeward journey. On his arrival in Armenia he found that his patrons were both dead. The History of Armenia speaks of its author as an old, infirm man, constantly engaged in the work of translating. In the later Armenian tradition we find other notices of this celebrated man 1 — such as, that he was the nephew of Mesrob, that he was publicly complimented by the emperor Marcian, that he had been ordained bishop of Bagrewand by the patriarch Giut, and that he was buried in the church of the Apostolic Cloister at Mush in the district of Taron; but these accounts must be received with great caution. This remark applies especially to the statement of Thomas Ardsruni, 2 that Moses, like his Hebrew prototype, lived to the age of 120 years, and recorded his own death in a fourth book of his great work. The same caution must be extended to another tradition, based on an arbitrary construction of a passage in Samuel of Ani, which places his death in the year 489.

The History of Armenia, 3 or, as the more exact

title runs, the

1 Collected by Langlois, Collection des historiens de Varmenie, ii. 47 seq.

2 In Brosset, Collection d historiens arminiens, i. 68.

- The oldest MS. is that of S. Lazaro of the 12th century. Colla-

Genealogical Account of Great Armenia, consists of three books, and reaches down to the death of Saint Mesrob, in the second year of Yazdegerd II. (Feb. 17, 440) . 4 It is dedicated to Sahak Bagratuni (who was afterwards chosen to lead the revolted Armenians in the year 481), as the man under whose auspices the work had been undertaken. This work, which in course of time acquired canonical authority among the Armenians, is partly compiled from sources which we yet possess, viz. the Life of Saint Gregory by Agathangelos, the Armenian translation of the Syriac Doctrine of the Apostle Addai, the Antiquities and the Jewish War of Josephus, and above all the History of Mar A has Katina (still preserved in the extract from the book of Sebeos), 6 who, however, did not write, as Moses alleges, in Syriac and Greek, at Nisibis, about 131 B.C., but was a native of Medsurch, and wrote in Syriac alone about a.d. 383, or shortly thereafter. Besides these, Moses refers to a whole array of Greek authorities, which were known to him from his constant use of Eusebius, but which cannot possibly have related all that he makes them relate. 6 Although Moses assures us that he is going to rely entirely upon Greek authors, the contents of his work show that it is mainly drawn from native sources. He is chiefly indebted to the popular ballads and legends of Armenia, and it is to the use of such materials that the work owes its permanent value. Its impor- tance for the history of religion and mythology is, in truth, very considerable, a fact which it is the great merit of Emin 7 and Dulaurier 8 to have first pointed out.

For political history, on the other hand, it is of much less value than was formerly assumed. In particular, it is not a history of the people or of the country, but a history of the Armenian aristocracy, and, in opposition to the Mamikonian tendency which pervades the rest of the older Armenian historical literature, it is written in the interest of the rival Bagratunians. Down to the 3rd century it is proved by the contemporary Graeco-Roman annals to be utterly untrustworthy — but even for the times of Armenian Christianity it must be used far more cautiously than has been done, for example, by Gibbon. The worst feature is the confusion in the chronology, which, strange to say, is most hopeless in treating of the contemporaries of Moses himself. What can be thought of a writer who assigns to Yazdegerd I. (390-420) the eleven years of his predecessor Bahram IV., and the twenty- one years of Yazdegerd I. to his successor Bahram V. (420-439)? A. von Gutschmid 9 at one time attempted to explain this unhistorical character of the narrative from a tendency arising out of the peculiar ecclesiastical and political circumstances of Armenia, situated as it was between the eastern Roman and the Persian empires, circumstances which were substantially the same in the 5th as they were in the two following centuries. In the course of further investigations, however, he came to the conclusion that, besides the many false statements which Moses of Khor'ni makes about his authorities, he gives a false account of himself. That is to say, the author of the History of Armenia is not the venerable translator of the 5th century, but some Armenian writing under his name during the years between 634 and 642. The proof is furnished on the one hand by the geographical and ethnographical nomenclature of a later period tions of MSS. of Etchmiadzin and Jerusalem are given by Agop Garinian, Tiflis (1858), 4to.' The book has been edited and translated by Whiston (London, 1736, 4to) ; and by Le Valliant de Florival (Venice and Paris, s.a., 1841), 2 vols. 8vo.

4 The commencement of this king's reign has been

fixed by Noldeke (Geschichle der Sassaniden aus Tabari, p. 423) as 4th August 438; and this date has subsequently been established by documentary evidence from the fact of the martyrdom of Pethion (see Hoffmann, Auszilge aus syrischen Akten persischer Martyrer, p. 67).

6 Translated in Langlois, i. 195 seq.

6 For the following statements, the evidence may be found in the article ″ Ueber die Glaubwiirdigkeit der Armenischen Geschichte des Moses von Khoren,″ by Alfred von Gutschmid, in the Berichte der phil. histor. Classe der konigl. sachs. Gesellschaft der Wissenschaften (1876), p. 1 seq.

7 The Epic Songs of Ancient Armenia (Arm.) (Moscow, 1850).

8 ″ Etudes sur les chants historiques et les traditions populaires de Tancienne Armeriie,″ in the Journ. asiat., iv., ser. 19 (1852), p. 5 seq.

9 ″ Ueber die Glaubwiirdigkeit,″ &c, p. 8 seq.

and similar anachronisms, 1 which run through the whole book and are often closely incorporated with the narrative itself, and on the other hand by the identity of the author of the History with that of Geography, a point on which all doubt is excluded by a number of individual affinities, 2 not to speak of the similarity in geographical terminology. The critical decision as to the authorship of the Geography must settle the question for the History also.

The Geography is a meagre sketch, based mainly on the Choro- graphy of Pappus of Alexandria (in the end of the 4th century), and indirectly on the work of Ptolemy. Only Armenia, the Persian Empire, and the neighbouring regions of the East are independently described from local information, and

on these sections the value of the little work depends. Since the first published text 3 contains names like ” Russians” and ” Crimea,” Saint Martin in his edition 4 denied that it was written by Moses, and assigned its origin to the 10th century. It was shown, however, by L. IndjidjeanHhat these are interpolations, which are not found in better manuscripts. And in fact it is quite evident that a book which gives the division of the Sassanid Empire into four spahbehships in pure old Persian names cannot possibly have been composed at a long interval after the time of the Sassanidae. But of course it is equally clear that such a book cannot be a genuine work of Moses of Khor’ni; for that division of the empire dates from the early part of the reign of King Chosroes I. (531–579). 6 Accordingly K. P. Patkanow, 7 to whom we are indebted for the best text of the Geography, is of opinion that we have in it a writing of the 7th century. If the limits within which the Geography was composed are to be more nearly defined, we may say that, from isolated traces of Arab rule 8 (which in Armenia dates from 651), it must have been written certainly after that year, and perhaps about the year 657.’

Another extant work of Moses is a Manual of Rhetoric, in ten books, dedicated to his pupil Theodorus. It is drawn up after Greek models, in the taste of the rhetoric and sophistry of the later imperial period. The examples are taken from Hermogenes, Theon, Aphthonius, and Libanius; although the author is also acquainted with lost writings — e.g. the Peliades of Euripides. On account of the divergence of its style from that of the History of Armenia, Armenian scholars have hesitated to ascribe the Rhetoric to Moses of Khor’ni; but, from what has been said above, this is rather to be regarded as a proof of its authenticity.

Smaller works bearing the same honoured name are — the Letter to Sahak Arderuni; the History of the Holy Mother of God

1 Instances of these may be found in i. 14, where the arrangement of Armenian provinces, I., II., III., IV., introduced in the year 536, is carried back to Aram, an older contemporary of Ninus; and in the passage .iii. 18, according to which Shapur II. penetrated to Bithynia, although the Persians did not reach that till 608.

2 See the confusion, common to both books, between Cappadocia I. and Armenia I., in consequence of which Mazaca and Mt Argaeus are transferred to the latter locality {Hist. i. 14; Geogr. Saint Martin's ed., ii. 354); also the passages which treat of China and Dchenbakur (Hist. ii. 81 ; Geogr. ii. 376), &c.

3 Edition with translation by Whiston (London, 1736, 4to).

4 In the Memoires historiques et geographiques sur I'Armenie (Paris, 1819, 8vo), ii. 310 seq.

5 Antiquities of Armenia (Arm.), iii. 303 seq.

6 See Noldeke's Tabari, p. 155, seq.

` Armjanskaja geographija vii. waka por. Ch. (pripisiw awschajasja Moiseju Chorenskomu) (St Petersburg, 1877, 8vo). Before him Kiepert (in the Monatsb. d. Berliner Akad. (1873, p. 599 seq.) had substantially arrived at the right conclusion when he assigned the portions of the Geography referring to Armenia to the time between Justinian and Maurice. (See also Abhandlungen der kbniglichen Gesellschaft der Wissenschaften zu Gbttingen, philol. hist. Klasse, Neue Folge, Band iii. Nro. 2, 1901) (in which Dr J. Marquart edits with commentary under the title Eransahr the sections of the geography relating to Persia)

8 The passage about the trade of Basra, which was founded in 635, is decisive on this point (Saint Martin's edition, ii. 368)._

9 The peculiar interest which the author (Saint Martin, ii. 340) takes in the origin of the Slavs in

Thrace is best explained by the war against them which called the emperor Constans II. away from the East in the year 657. In other respects the writer displays the most complete indifference, and even ignorance, with regard to the state of affairs in the West.

and her Image (in the cloister of Hogotsvanch in the district Andzevatsi of the province of Vaspurakan), which is also addressed to Sahak; and the Panegyric on Saint Rhipsime. Of the sacred poems attributed to him, there is only one short prayer, contained in the hymnal of Sharakan, which can really claim him as its author.

Of works passing under the name of Moses of Khor'ni, the following are regarded by the historians of Armenian literature as spurious: a History (distinct from the Panegyric) of the wanderings of Saint Rhipsime and her Companions; a Homily on the Transfiguration of Christ; a Discourse on Wisdom {i.e., the science of grammar) ; the Commentaries on grammar (an exposi- tion of Dionysius Thrax). In the case of the grammatical writings, it has been suggested that there may have been some confusion between Moses of Khor'ni and a Moses of Siunich, who lived in the 7th century.

Literature. — The date of the History of Moses has been discussed in many monographs. See especially the brochure of A. Carriere, Nouvelles sources de Mo'ise de Khoren (Vienna, 1893), who sets it in the 8th century. A Russian critic, J. Khalateants, arrives at a similar conclusion in his Armianskie Epos (Moscow, 1896). F. C. Cony- beare, in an article on "The date of Moses of Khoren," in the Byzan- tinische Zeitschrift, vol. x., and in a second in vol. ii, entitled "The Relation of the Paschal Chronicle to Malalas," challenges Professor Carriere's arguments, and contends that the History of Moses is a late 5th-century work, much interpolated in the immediately suc- ceeding centuries. (A. v. G. ; F. C. C.)

MOSHEIM, JOHANN LORENZ VON (c. 1694-1755), German

Lutheran divine and Church historian, was born at Liibeck on the 9th of October, 1694 or 1695. After studying at the gymnasium of his native place, he entered the university of Kiel (1716), where he took his master's degree in 1718. In 1719 he became assessor in the philosophical faculty at Kiel. His first appearance in the field of literature was in a polemical tract against John Toland, Vindiciae antiquae christianorum disci- plinae (1720), which was soon followed by a volume of Obser- vation's sacrae (1721). These works, along with the reputation he had acquired as a lecturer and preacher, secured for him a call to Helmstadt as professor crdinarius in 1723. The Institu- tionum historiae ecclesiasticae libri IV. appeared in 1726, and in the same year he was appointed by the duke of Bruns- wick abbot of Marienthal, to which dignity and emolument the abbacy of Michaelstein was added in the following year. Mosheim was much consulted by the authorities when the new university of Gottingen was being formed; especially in the framing of the statutes of the theological faculty, and the provisions for making the theologians independent of the ecclesiastical courts. In 1747 he was made chancellor of the university. He died at Gottingen on the 9th of September. Among his other works were De rebus christianorum ante Constantinum commentarii (1753), Ketzer-Geschichte (2nd ed. 1748), and Sittenlehre der heiligen Schrift (1735-53). His exege- tical writings, characterized by learning and good sense, include Cogitationes in N. T. loc. select. (1726), and expositions of 1 Cor. (1741) and the two Epistles to Timothy (1755). In his sermons {Heilige Reden) considerable eloquence is shown, and a mastery of style which justifies the position he held as president of the German Society.

There are two English versions of the Institutes, that of Archibald Maclaine, published in 1764, and that of James Murdock (1832), which is the more correct. Murdock's translation was revised and re-edited by James Seaton Reid in 1848, and by H. L. Hastings in 1892 (Boston). An English translation of the De rebus chris- tianorum was published by

Murdock in 1851.

MOSLER, HENRY (1841-), American artist, was" born at New York, on the 6th of June 1841, the family removing to Cincinnati when he was about ten years old. Studying drawing by himself, he became a draughtsman for a comic paper, the Omnibus (Cincinnati), in 1855; in 1859-1861 he studied under James H. Beard, and in 1862-63, during the Civil War, was an art correspondent of Harper's Weekly. In 1863 he went to Diisseldorf, where for almost three years he was at the Royal Academy schools; he subsequently went to Paris, where he studied for a short time under Ernest Hebert. His " Le Retour,"

from the Paris Salon of 1879, was the first American picture ever bought for the Luxembourg. He received a silver medal in Paris 1889, and gold medals at Paris, 1888, and Vienna, 1893. Examples of his work are in the Sydney Art Museum, N.S.W., and the art museums of Springfield, Mass., Cincinnati, Ohio and New York. His son, Gustave Henry Mosler (1875-1906), a pupil of his father and of Leon Bonnat, exhibited at the Salon in Paris, receiving a medal for his " De Profundis " in 1891; his portrait of Governor J. W. Stewart is in the State House, Montpelier, Vermont, and his " Empty Cradle " is in the Toledo Art Club.

MOSQUE (through Fr. mosquie; Span, mezquita, from Arab. masjid,^ sajada, to adore), the house of prayer in the

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Fig. 1. — Plan of Mosque of `Amr, Old Cairo,

1, ICibleh. 5, Fountain for ablution.

2, Minbar. 6, 6, Rooms built later.

3, Tomb of `Amr. 7, Minaret.

4, Dikka. 8, Latrines.

Mahommedan religion, consisting generally of a large open court (sahn) surrounded by arcades (liwan), with a fountain {mida-a) in the centre of the court, for the ablutions neces- sary before prayer. The principal feature in the mosque is the niche (mihrab), which is sunk in a wall built at right angles to a line drawn from Mecca, and indicates the direction towards which the Moslem should turn when engaged in prayer. The arcades in front of the Mecca niche were sometimes of con- siderable depth, and constituted the prayer chamber (maksura), portions of which were occasionally enclosed with lattice work. By the side of the niche was the pulpit (minbar), and some- times in front of the latter a platform (dikka) raised on columns, from which chapters from the Koran were read to the people.

Most mosques have endowed property, which is administered by a warden (nazir), who also appoints the imams and other officials. The larger mosques have two imams: one is called (in Arabia and Egypt) the khatib, and he preaches the sermon on Fridays (the Moslem Sabbath); the other, the ratib, reads the Koran, and recites the five daily prayers, standing close to the mihrab, and leading the congregation, who repeat the prayers with him, and closely follow his postures. The imams do not form a priestly sect ; they generally have other occupations, such as teaching in a school or keeping a shop, and may at any time be dismissed by the warden, in which case they lose the title of imam. Moslem women, as a rule, are expected to say their prayers at home, but in some few mosques they are admitted to one part specially screened off for them.

The earliest mosque erected was that at Mecca, which con- sisted of a great court, in the centre of which was the Ka'ba or Holy Stone. The court was surrounded with arcades, all of which constituted the prayer chamber, so that its plan is neces- sarily different to the normal type; the existing buildings date only from the first half of the 17th century, as the whole mosque was destroyed by a torrent in 1626.

The normal type referred to is best represented in the mosque of 'Amr (see 'Amr-ibn-el-Ass) at Fostat, Cairo; built in a.d. 643 it still retains its original arrangement, though partly rebuilt and increased in its dimensions. The mosque (see fig. 1), now in a somewhat ruined condition, covers an area of about 130,000 sq. ft. with an open court, 240 ft. sq., .and a sanctuary or prayer chamber, 106 ft. deep, there being a central avenue and ten aisles on either side. The columns and capitals were all taken from ancient buildings, Egyptian, Roman and Byzantine, and they carry arches of different forms, semicircular, pointed and horseshoe.

The columns and other materials of the mosque of el-Aksa at Jerusalem were taken by Abdalmalik (a.d. 690) from the ruins of Justinian's church of St Mary on Mount Sion, and the central avenue or nave built with them presents the appearance of a Christian church; it however runs north and south, the Mecca niche being at the south end; originally there were seven aisles on each side, now reduced to three. The Kubbet-es- Sakhra, or Dome of the Rock, at Jerusalem, is only a shrine erected over the sacred rock, so that the title often ascribed to it as " the mosque of Omar " is misleading.

The mosque of the Omayyads in Damascus was built by the Caliph Walid in a.d. 705 on the foundations of the basilican church of St John: its plan differs therefore from the normal type in that its arcades run east and west, and the transept in the centre becomes the prayer chamber. The Mecca niche is sunk in the doorway of a Roman temple which formerly occupied the same site, and the substructure of the

minaret at the south-west angle is of still more ancient date. The great court on the north side has a lofty cloister round it, so that in many respects it follows the normal type.

The mosque of Ahmad Ibn Tulun, in Cairo (a.d. 879), is the first mosque erected in which the materials were not taken from ancient buildings; it has therefore a special interest as being the earliest genuine example of the Mahommedan style (see Architecture: Mahommedan). The walls, piers and arches, are all built in brick, cowered with stucco, a great portion of which is preserved down to the present day. The plan is of the normal type, with a great court in the centre, a prayer cham- ber four aisles deep on the Mecca side (south-east), and a double aisle on the other three sides. All the arches are pointed and slightly horseshoe, preceding therefore by about two and a half centuries the introduction of the pointed arch into Europe. The piers carrying the arches have shafts at their angles, the earliest examples known, and the decoration of the walls con- sists of friezes, borders, and impost-bands, all enriched with conventional patterns interwoven with cufic characters and modelled in stucco. The windows in the outer walls are filled with pierced stone screens of geometrical design. The architect is said to have been a Coptic Christian who deprecated the destruc- tion of ancient buildings to obtain columns and blocks of stone, and who undertook to design a mosque which should be built entirely in brick, which when coated with stucco and appro- priate decorative designs would rival its predecessors.

The next important mosque is that of Kairawan in Tunisia, which was founded by Sidi Okba in a.d. 675, but was partly rebuilt and added to in the following two centuries. Its court covers an area of 38,000 sq. ft., and its prayer chamber is 150 ft. deep, having a central avenue and eight aisles on each side.

The chief interest of the mosque at Kairawan lies in its being the prototype of the great mosque at

Cordova, which was built by Abdarrahman in a.d. 780; the earliest portion of the mosque is the prayer chamber (135 ft. wide by 220 ft. deep), which is in front of the entrance gateway to the great court, and consists of a central avenue with five aisles on each side. In a.d. 961 this

portion was extended 150 ft. in the rear by Hakim II., the mihrab and Mecca wall being rebuilt; about 20 years later a further enlargement was made, and eight more aisles were added along the whole eastern side, so that the prayer chamber covered an area of over 148,000 sq. ft. In the 13th century a portion of Hakim's addition was pulled down to make way for the first cathedral, which was dedicated to the Virgin. The most beautiful portion of the mosque, however, still exists in the prayer chamber of Hakim, where are to be found the earliest examples of the cusped arch and the origin of many of the geometrical patterns in stucco at the Alhambra.

The mosque of el Azhar, " the splendid," was begun about A.D. 970 by Jauhar, the general of the Fatimite Caliph Moizz,

who captured Fostat and founded el Kahira, the present town of Cairo. It was based, therefore, on the great mosque at Kairawan, and although more or less rebuilt, it still pre- serves its original plan. It has a special interest in being the chief uni- versity of the Moslem world, containing some thousands of students (mujawirin), for whom certain parts of the mosque friwaq) are screened off, according to the country from which they come. Thus special parts are re- served for natives of the various provinces of Egypt, of Morocco, Syria, Arabia, India, Turkey, &c. Each student can, if he is too poor to hire lodgings, live, eat and sleep in the mosque. Each has a large chest in which to keep his

Fig. 2. — Plan of Mosque of Sultan Hasan, Cairo. I, 2, Main entrance.

3, Court open to sky.

4, 5, Fountains. 6, 6, North and south vaulted transepts

(the dotted lines show the curve clothes and books; these

of the vault). 8, 9, Dikka. 10, Sanctuary. n, Minbar.

12, Kibleh.

13, Door to tomb.

14, Domed tomb-chamber.

15, Tomb within screen.

16, Kibleh.

17, 17, Minarets.

18, 19, 20, Various entrances to mosque.

2 1 , Small rooms connected with service

of the mosque.

22, Sultan's private entrance.

are piled against the walls to a height of seven or eight feet. The students pay no fees, but the richer ones give presents to the lecturers, who sit on the matting in various parts of the sanctuary or cloister, while the students sit round each lecturer in

a circle. The usual course of study lasts for three years, though some students remain for much longer. The chief of the lecturers, called the Sheik el-Azhar, receives about £100 a year, the others little or nothing, as regular pay. The Koran, sacred and secular law, logic, poetry, arithmetic, with some

medicine and geography, are the chief subjects of study.

Of other mosques in Cairo, the finest is that of Sultan Hasan (fig. 2), completed in a.d. 1360. It differs from the normal type in many respects, as it includes residences for various sects, so that portions of it, with the several storeys externally, resemble an immense mansion or warehouse, and this would seem to have led to an important change inside, as instead of a cloister of two or more aisles there - are four immense halls all covered with pointed barrel vaults. Beyond the Mecca wall is the tomb of the founder, covered with an immense dome.

The entrance doorway on the north-east side is over 80 ft. in

height, its summit being decorated with stalactite vaults, one

of the grandest features in Mahommedan architecture, only

equalled by the magnificent portals of the mosques in India

The central square court, of moderate dimensions, with halls and

great recesses, is followed in other examples in Cairo, among

which the Tomb Mosque of Kait-Bey (c. a.d. 1470) is the most

graceful (fig. 3). In this case the central court is roofed over,

and has an octagon lantern in

the centre; the recesses are

covered with horizontal ceilings

carried on great beams, the whole being elaborately carved, coloured and gilded; the tomb is covered with the later type of dome, built in stone, and elaborately carved outside with delicate conventional patterns in relief.

Although the conquest of Persia by the Arabs took place in a.d. 641 there are no remains of mosques there earlier than the 13th century, and the oldest example at Tabriz is evidently, as far as its plan is concerned, a copy of a Byzantine church, departing entirely therefore from the normal plans. 1 The great Fig. 3. mosque at Isfahan, built by Shah Abbas the Great (1585–1629), has one great court (225 ft. by 170 ft.) and two smaller ones, all with fountains in them. The prayer chamber is a lofty struc- ture, quite unlike those of Egypt and Kairawan, with a dome

75 ft. in diameter and halls on

each side divided into two aisles,

each compartment being covered with a dome, in this respect

also not following the early normal type, in which domes were

only found over tombs.

The mosques of Constantinople are all copies more or less of S. Sophia: they have courts in front with a range of arcades round, and the centre portion forms the prayer chamber, the side aisles serving as passages. The central dome has but a slight elevation outside, but with the numerous cupolas round, and the minarets, it forms a picturesque group which is wanting in the mosques of Kairawan, Cordova, and other examples in North Africa.

In India as in other countries the Mahommedans took possession of the ancient buildings and adapted them to their religious requirements. The materials of the native styles of India, however, did not lend themselves to their utilization as in Syria, Egypt and North Africa, where the columns and capitals formed the substructure of the arcades which surrounded their courts. In the earliest mosque at old Delhi, they adopted the piers and bracketed capitals of the Jaina builders, whom they probably employed to build their mosque. They, however, had no confidence in the arch, which, as the Hindu says, ” never sleeps but is always tending to its own destruction,” so that the pointed arch, which had almost become the emblem of the Mahommedan religion, had to be dispensed with for the covered aisles which surrounded the great court, and in the triple entrance gateway the form of an arch only was retained, as it was con- structed with horizontal courses of masonry for the haunches, and with long slabs of stone resting one against the other at the top. A similar construction was employed in the great mosque at Ajmere, built a.d. 1200-1211 at the

same time as the Delhi mosque. The objection to the arch is more clearly shown

1 It is very generally held that this ” Blue Mosque ” dates only from the 15th century (see Tabriz).

—Mosque-tomb of Sultan Kait-Bey, Cairo. I, Main entrance.

Lobby and cisterns for

ablution. Great minaret. Kibleh. „, Minbar.

6, Sultan’s tomb-chamber.

7, The tomb within a screen.

8, Dikka.

(For views of interior and exterior, see Architecture.)

in the entrance gateway of the Lai Darwaza or Red Gate mosque at Jaunpur, where an arch (of two rings of ogee shape) is carried by a solid wall, built under it, which is pierced with three doorways with bracket-capitals and architraves, returning therefore to trabeated construction. The covered aisles of the court of the Jumma Musjid at Jaunpur are in three storeys with piers, bracket-capitals and architraves, bearing therefore no resemblance to the arcades of Kairawan and Cordova, and constituting a different style. There is however one feature which throughout the Mahommedan mosques in India is always found, viz. the dome. But this also in India is built in horizontal courses, so that the form only and not the construction of the Cairene domes is followed. The chief peculiarity of the mosques at Ahmedabad is that, as the style progressed, it became more Indian; in the Jumma Musjid (a.d. 1420) and the Queen’s mosque at Mirzapur, the pointed arch exists only in the

facades of the prayer chambers; in the mosques built 30 to 40 years later the whole is constructed without a single arch, all the pillars have bracket-capitals, and the domes, which are of very slight elevation, are all built in the trabeated style. As a contrast to the Ahmedabad mosques, the Kadam Rasul mosque at Gaur in Bengal possesses some characteristics which resemble those of the mosque of Tulun in Cairo, possibly due to the fact that it is entirely built in brick, with massive piers carrying pointed arches.

The climax of Mahommedan work in India is reached in that of the Mogul emperors at Agra, Delhi and Fatehpur-Sikri, in which there is a very close resemblance in design to the mosques of Syria, Egypt, and Persia; the four-centred arch, which is in the Mogul style, finds general acceptance, and was probably derived from Persian sources. The mosque at Fatehpur-Sikri possesses in its great southern gateway, built by Akbar in the second half of the 16th century, the masterpiece of Indo-Saracenci architecture. As a rule, the mosques of India followed the normal plan, with a great central court and aisles round and a prayer chamber in front of the Mecca wall, which in India is always at the west end. (R. P. S.)

MOSQUITO (Span, mosquito, a gnat, diminutive of mosca, a fly), a term originally applied to many species of small blood-

Fig. 1.

A, Larva of Anopheles. F, Female Anopheles costalis,

B, Pupa of Anopheles. Loew.

C, Larva of Stegomyia. G, Head of 9 Culex.

D, Pupa of Culex. H, Head of

E, Egg-float and further enlarged J, Head of cf Culex.

detached egg of Culex. K, Eggs of Anopheles.

sucking Diptera (q.v.), belonging to various families, but now by common consent restricted to those known to naturalists as Culicidae, or gnats. Before the year 1899 mosquitoes had never been collected systematically, and had received little notice from entomologists, so that but few genera and com- paratively few species were known. Although it had long been suspected that these insects were in some way connected with malaria and other diseases, while that the species now called Stegomyia calopus was the carrier of yellow fever had been asserted by Finlay as early as 1881, it was not until the closing years of the 19th century that the brilliant researches of Ross in

India, and of Grassi and others in Italy, directed the attention of the whole civilized world to mosquitoes as the exclusive agents in the dissemination of malarial fever. The result has been that in subsequent years mosquitoes have been collected, studied and described by naturalists and medical men in all parts of the globe. Nearly 100 genera and about 700 species of mosquitoes are now recognized, but in all probability the total number of species is not less than 1000.

In general appearance mosquitoes resemble many harmless midges {Chironomidae) , but may be distinguished by the follow- ing characters. (1) The prolongation of the lower lip or labium into a prominent proboscis, which in the female sex contains the full complement of piercing organs found in blood-sucking Diptera, namely paired mandibles, paired maxillae, a tubular hypopharynx (the common outlet of the salivary glands), and an upper lip or labrum. (2) The presence of variously formed scales on the body and its appendages: the head is clothed with scales, the thorax with hairs or scales, and the abdomen with either hairs or scales, or both; the legs and veins of the wings are always covered with scales, and the palpi are often (as in some Anophelinae) conspicuously scaly. (3) The fact that the costal or marginal vein runs completely round the wing. The wings exhibit six longitudinal veins (seven in Heptaphlebomyia) , two

of which are characteristically forked. The antennae, usually bottle-brush shaped (plumose) in the male sex, are less hairy in the female. The palpi vary in form and in the number of their component segments, and the proboscis, though usually straight, may be curved (as in Megarhinus) or otherwise modified in shape.

In dividing the Culicidae into genera reliance is placed chiefly s upon characters derived from the scales on the three divisions of ` the body and on the wings. A fairly satisfactory attempt at group- ing the genera has been made by Lutz (1904), who divides the family in the first place into the Euculicidae, with a piercing proboscis {i.e. all ordinary mosquitoes), and the Culicimorphae or forms with- out a piercing proboscis (Mochlonyx, Corethra, &c). It has since been proposed to treat the Culicimorphae as a distinct family under the title Corethridae, and it is probable that with this modification Lutz's scheme will meet with general acceptance. The Euculicidae are divided into the Asiphonatae { = Anophelinae) , the larvae of which have no respiratory siphon, and the Siphonatae, or forms in which a respiratory siphon is present in the larval state. The divisions of the Siphonatae are the Ankylorhynchae (genera with curved proboscis, e.g. Megarhinus and Toxorhynchites) and Ortho- rhynchae _ (genera with straight proboscis). The latter again are divided into Metanopsilae (in which the metanotum or posterior region of the thorax is bare) and Metanotrichae (in which the metano- tum is clothed with bristles or scales). The Metanopsilae are made up of the Heteropalpae [palpi long in the male, short in the female ; sub-families Culicinae {Culex, &c.) and Heptaphlebomyinae {Hepta- phlebomyia)] _ and Micropalpae [palpi short in both sexes; sub- families Aedinae {Aedes, &c.) and Haemagoginae {Haemagogus, Uranotaenia, &c.)]. The Metanotrichae are similarly divided on the basis of the palpal characters into two groups, the Heteropalpae or Hyloconopinae {Joblotia, Rhynchomyia, &c.) and Micropalpae or Dendromyinae {Wyeomyia, Sabethes, Limatus, &c).

The old genus Anopheles (characterized by the palpi being long in both sexes) is now divided into a number of genera according to the character and shape of the scales on the different regions of the body and on the wings. These genera make up the sub-family Anophelinae, and together include over 100 species. The genus Culex, from which the family takes its name, though it has been similarly split up, is still in its restricted sense larger than any other, and some 200 species are comprised in it alone.

Mosquitoes are found in all parts of the world. Even within the Arctic Circle they are in many localities abundant and excessively bloodthirsty during the short summer. Under such conditions the deeply-rooted nature of the blood-sucking instinct is most remarkable; for insects whose ancestors for many generations may not have tasted blood will seek for it with the utmost keenness and pertinacity so soon as an opportu- nity presents itself. Some species are normally phytophagous, and the vast majority, at any rate, appear to be capable of continuing to exist and reproducing their kind upon a purely vegetarian diet. As a rule the blood-sucking habit is confined to the females, but in the case of a few species it is said to be common to both sexes. The thirst for blood is stimulated by heat, and in temperate climates it is only during hot weather that mosquitoes are troublesome. Some species of mosquitoes, such

as the common gnat (Culex pipiens), are rarely found away from human habitations; others seldom or never enter houses, but are met with either in more or less open country, or in the recesses of forests and woods. In Europe and North America the continued existence of species is ensured by the hibernation of impregnated females, or else the winter is passed in the egg or occasionally in the larval state. In tropical climates with a well-marked dry season

mosquitoes pass into a semi-dormant condition during the period when there is little water in which to deposit their eggs. Culicidae are by no means confined to low- lying districts, and have even been met with in the Himalayas at an altitude of 13,000 feet. The wide distribution of certain species is undoubtedly attributable to the agency of ships and trains; under natural conditions mosquitoes seldom travel far from their breeding grounds, although the powers of flight of some species are greater than has been supposed.

The preliminary stages of all mosquitoes are passed in water, either fresh or salt, stagnant or slightly moving. The nature of the breeding-place varies greatly according to the species, and while many of the mosquitoes that infest houses will breed even in the smallest accidental accumulation of water such as may have collected in a discarded bottle or tin, the larvae of other species less closely associated with man are found in natural pools or ditches, at the margins of slow-moving streams, in collections of water in hollow trees and bamboo-stumps, or even in the water-receptacles of certain plants. The eggs are usually deposited on the water itself, and while in the case of certain species, such as Culex pipiens or the widely distributed C. faligans, they are agglutinated together in masses known as ″ boats ″ or ″ rafts ″ containing from 50 to 400 ova, those of others, such as the Anophelinae and many Culicinae (e.g. Steg- omyia calopus), are laid separately. The larvae are active and voracious little grub-like creatures (known in the United States as ″ wrigglers ″), with large heads and jaws provided with a pair of brushes, which sweep food-particles into the mouth. Their food consists of minute animal and vegetable organisms,

(Redrawn by permission from Farmers Bulletin 155, Bureau of Ent, U.S. Dept. of Agriculture.)

Fig. 2. — Stegomyia calopus (Culex fasciatus, Stegomyia fasciata).

algae, and probably decaying vegetable matter; they

are often cannibals, and feed on their own species. The larvae of species belonging to the Culicinae have a prominent breathing tube, or respiratory siphon, on the penultimate (eighth) abdominal segment, and when taking in air hang head downwards (often nearly vertically) from the surface film. Larvae of Anophelinae, on the other hand — which are grey, green or brown in colour, and often extremely difficult to see — have no respiratory siphon

and lie almost horizontally at the surface; they frequently appear as though anchored by the tail to a weed or other object, and possess the curious faculty of completely rotating the head so as to browse on the surface film. Mosquito pupae are comma- shaped (see fig. 1), and breathe by means of a pair of respiratory trumpets on the thorax.

The majority of mosquitoes are dull in hue, but certain species are brilliantly coloured or conspicuously banded or spotted with white. The Anophelinae have narrow bodies, and generally spotted wings, and when at rest keep body and proboscis in a straight line, often at a considerable angle with the supporting surface; in this way they can be distinguished from Culicinae, which have a humped-up thorax with which the proboscis forms an angle, and in the resting position keep the body parallel to the support.

The disseminators of malaria are exclusively Anophelinae, but even among these it is only certain species that are dangerous, since the others appear to be incapable of acting as hosts of the parasites. Stegomyia calopus, on the other hand, a very widely distributed species and the almost certain carrier of yellow fever, belongs to the Culicinae. In the case of filariasis due to Filaria bancrofti, which is common throughout the Tropics, the embryos of the parasite are disseminated by various Culicinae and Anophelinae (Culex pipiens in Queensland; C. fatigans in the West Indies; Myzomyia rossii in India; Pyretophorus costalis in a large portion of tropical Africa; &c). Six or seven species of mosquitoes are also the intermediate hosts of

Filaria immitis, which infests the right auricle and pulmonary artery of the dog, and occurs throughout the tropics, in southern Europe, the United States of America, and elsewhere. There is reason to believe that malaria, yellow fever and filariasis are not the only diseases disseminated by mosquitoes. (E. E. A.)

MOSQUITO COAST AND RESERVE (Mosquitia or Reserva Mosquita), a division of the republic of Nicaragua, officially styled the department of Zelaya. Pop. (1905), about 15,000. Although its name is sometimes applied to the whole eastern seaboard of Nicaragua — and even to Mosquitia in Honduras, i.e. the coast region as far west as the Rio Negro or Tinto— the Mosquito Coast is more accurately defined as a narrow strip of territory, fronting the Caribbean Sea, and extending from about n° 45′ to 14 10′ N. It stretches inland for an average distance of 40 m″., and measures about 225 m. from north to south. In the north, its boundary skirts the river Wawa; in the west, it corresponds with the eastern limit of the Nicaraguan highlands; in the south, it is drawn along the river Rama. The chief towns are Bluefields or Blewfields, Magdala on Pearl Cay, Prinzapolca on the river of that name, Vounta near the mouth of the Cuculaia, and Carata near the mouth of the Wawa. Bluefields (pop. about 2000) is the capital and the largest town. It is the seat of a Moravian mission, and has a good harbour, with regular steamship services to Greytown in Nicaragua, and to New Orleans. It exports bananas and other fruit.

The Mosquito Coast is so called from its principal inhabitants, the Misskito Indians, whose name was corrupted into Mosquito by European settlers and has been entirely superseded by that form except in the native dialects. The Mosquito Indians, of whom there are several tribes, are an unusually intelligent people, short of stature and very • dark-skinned. Their colour is said to be due to intermarriage with shipwrecked slaves.

The first white settlement in the Mosquito country was made in 1630, when the agents of an English

chartered company— of which the earl of Warwick was chairman and John Pym treasurer — occupied two small cays, and established friendly relations with the Indians. From 1655 to 1850 Great Britain claimed a protectorate over the Mosquito Indians; but little success attended the various endeavours to plant colonies, and the pro- tectorate was disputed by Spain, the Central American republics, and the United States. The opposition of the United States was due very largely to the fear that Great Britain would acquire a privileged position in regard to the proposed interoceanic canal. In 1848, the seizure of Greytown (San Juan del Norte)

by the Mosquito Indians, with British support, aroused great excitement in the United States, and even involved the risk of war. But by the Clayton-Bulwer Treaty of 1850 both powers pledged themselves not to fortify, colonize or exercise dominion over any part of Central America; and in November 1859 Great Britain delegated its protectorate to Honduras. This caused great dissatisfaction among the Indians, who shortly afterwards revolted; and on the 28th of January i860 Great Britain and Nicaragua concluded the treaty of Managua, which transferred to Nicaragua the suzerainty over the entire Caribbean coast from Cape Gracias a Dios to Greytown, but granted autonomy to the Indians in the more limited Mosquito Reserve (the area described above). The local chief accepted this change on condition that he should retain his local authority, and receive a yearly subvention of £1000 until 1870. But on his death in 1864 Nicaragua refused to recognize his successor. The reserve nevertheless continued to be governed by an elected chief, aided by an administrative council, which met in Bluefields; and the Indians denied that the suzerainty of Nicaragua connoted any right of interference with their internal affairs. The question was referred for arbitration to the emperor of Austria, whose award published in 1880, upheld

the contention of the Indians, and affirmed that the suzerainty of Nicaragua was limited by their right of self-government. After enjoying almost complete autonomy for fourteen years, the Indians voluntarily surren- dered their privileged position, and on the 20th of November 1894 their territory was formally incorporated in that of the republic of Nicaragua, as the department of Zelaya.

Bibliography. — See " A Bibliography of the Mosquito Coast of Nicaragua," by Courtney de Kalb, in Bulletin of the American Geog. Soc, vol. xxvi. (1894) ; and " Studies of the Mosquito Shore in 1892," by the same author, and in the same publication, vol. xxv. (1893). " A Forgotten Puritan Colony," in No. 165 of Blackwood's Magazine (Edinburgh, 1898), described the attempt at colonization made in 1630. See also " Die Streit um die Mosquito-Kiiste," by J. Richter, in Zeitschr. f. Gesellschaft d. Erdkunde, No. 30 (Berlin, 1895).

MOSS, a seaport of Norway, in Smaalenene amt (county), on the east shore of Christiania Fjord, 37 m. S. of Christiania by the Gothenburg railway. Pop. (1900), 8941. Here was signed, on the 14th of August 1814, the convention which united Norway to Sweden. Timber and wood pulp are chief exports, grain and coal are imported. The port affords 13 to 22 ft. of water beside the quays.

MOSSAMEDES, a town of Portuguese West Africa, capital of the district of Mossamedes, on the south side of Little Fish Bay (Bay of Mossamedes or Angra do Negro). Pop. about 5000. The harbour affords excellent anchorage. A railway (over 100 m. long) starts from the harbour and crosses the semi-desert coast region to the fertile Chella plateau. Mossamedes is the headquarters of an important fishing industry (see La Geografhie, March 1908).

MOSSEL BAY, the name of a bay, town and division of the Cape province, South Africa. The bay lies midway between Table Bay (Cape Town) and Port Elizabeth roadstead. Like most of the South African bays it does not afford good anchorage. Westward, however,

it is sheltered by Cape St Blaize, on which is a lighthouse. The town lies on the west side of the bay, Cape St Blaize stretching beyond to the S.E. Mossel Bay is 250 m. by sea and 312 m. by rail E. by S. of Cape Town. Pop. (1904), 4500. The port ranks fourth in importance among the seaports of the Cape and does a large forwarding trade. Vessels load and discharge by means of lighters. Mossel Bay is a station on the direct Cape Town-Port Elizabeth railway. The Mossel Bay division of the province has an area of 707 sq. m., and a population (1904) of 10,700, of whom 49 % were whites.

MOSSLEY, a market town and municipal borough in the Prestwich parliamentary division of Lancashire, England, io| m. E.N.E. from Manchester, by the London & North-Western railway. Pop. (1901), 13,452. It lies in the valley of the Tame, close to the junction of the boundaries of Lancashire, Cheshire and Yorkshire, and is surrounded by sharply-rising high ground, especially eastward. The Huddersfield canal passes it. Across the river from the town ancient earthworks (Bucton Castle), of

British origin, are seen, and a Roman road passing them, and running north and south is also traceable. Mossley has foundries, mill-works, woollen factories, and large cotton-spinning mills. It was incorporated in 1885, and the corporation consists of a mayor, 6 aldermen, and 16 councillors. Area, 3622 acres.

MOSSOP, HENRY (1729-1774), Irish actor, was born in Dublin, and made his first stage appearance there, at the Smock Alley Theatre, as Zanga in Young's tragedy, The Revenge, in 1749. His first London appearance was made in 1751 under Garrick's management, as Richard III. He returned to Ireland in 1759, and, playing with Barry, added to his laurels, but when he attempted management on his own account, he ruined Barry and went bankrupt himself, dying in poverty on the 27th of December 1774.

MOST, JOHN [JOSEPH] (1846-1906), German- American anarchist, was born in Augsburg, Bavaria, on the 3th

of February 1846. He was apprenticed to a bookbinder, worked at this trade in Germany, Austria, Italy and Switzerland in 1863-1868, and then became a writer of Socialist pamphlets and paragraphs, and editor of Socialist sheets in Chemnitz and Vienna, both suppressed by the authorities, and of the Freie Presse in Berlin, being repeatedly arrested for his violent and cynical attacks on patriotism and conventional religion and ethics, and for his gospel of terrorism, preached in prose and in many songs such as those in his Proletarier-Liederbuch (5th ed., 1875). Some of his experiences in gaol were recounted in Die Bastille am Plotzen- see: Blatter aus meinem Gefdngniss-Tagebuch (1876). In 1874- 1878 he was a member of the German Reichstag, but he failed to be re-elected, was expelled by the Socialist organization, went to France but was forced to leave in 1879, and then settled in London. There he founded the " red " organ — it was printed in red — Die Freiheit, in which he expressed his delight in June 1881 over the assassination of Alexander II, of Russia and for this was imprisoned for a year and a half. He then resumed the publication of Die Freiheit in New York. He was imprisoned in 1886, again in 1887, and in 1902, the last time for two months for publishing after the assassination of President McKinley an editorial in which he argued that it was no crime to kill a ruler. He died in Cincinnati on the 17th of April 1906. See his Memoiren (New York, 1903). - _

M0STA6ANEM, chief town of an arrondissement in the department of Oran, Algeria, 44 m. E.N.E. of Oran, on a plateau 278 ft. high, half a mile from the Mediterranean coast. The town is separated into European and native quarters by a deep ravine, the Ain Sefra, through which passes a considerable stream. The native quarter, called Tijit, occupies the eastern slopes of the ravine and the level ground above, and is dominated by the kubbas of two marabouts. A railway line, completed in 1889, 122 m. long, connects Mostaganem with Tiaret, the most convenient place for visiting the Jedars monuments.

(See Algeria.)

Mostaganem occupies the site of a Roman town. The ancient harbour was destroyed by earthquake in the reign of the em- peror Gallien. The present port is entirely artificial. The existing town appears to date from the time of the Almoravides, who built the citadel, now turned into a prison. It passed into the possession of the rulers of Tlemcen and was captured by Arouj Barbarossa in 1516, and became part of his brother Khair-ed-Din's kingdom. In the 16th century the town enjoyed a period of great commercial prosperity, and its population rose to 40,000. The re-awakening of the town dates from the French occupation in 1833. Pop. (1906) of the town, 19,528, of the commune 22,011, of the arrondissement, comprising 27 com- munes, 332,684.

In the vicinity of Mostaganem are the Dahra mountains, honey- combed with caves. In 1845, in one of these caves, a French force, commanded by Colonel Pelissier, afterwards commander-in-chief of the French army in the Crimea, destroyed over 800 Arabs — men, women and children — by suffocation, by filling the mouths of the cave with faggots and then setting them on fire.

MOSTAR, the capital of Herzegovina, situated 81 m. S.W. of Serajevo, on the river Narenta, and on the railway from Serajevo

to Ragusa. Pop. (1900), about 14,50° including the garrison. Mostar is the seat of Roman Catholic and Orthodox bishops, a district court, and an Austrian garrison. Half Turkish, half Italian in character, it commands the gateway through which all heavy traffic must pass on the seaward road. A single arch of great beauty, 8o§ ft. in span, and 61 ft. high, leads to the Roman Catholic quarter, on the right bank of the river. This bridge has been the theme of many legends, and its origin has been much debated.

Probably it was built by the Turks, in the 15th or 1 6th century, after Italian designs; but some antiquaries ascribe its foundation to the Romans. Since 1881, when an iron bridge was opened, its use has been confined to foot passen- gers. Mostar possesses a gymnasium, a school of viticulture, and a massive Orthodox cathedral.

The present name of the city has been derived from the Serbo- Croatian most, a bridge, and star, old. Its earlier Slavonic name was ViWinicha. Whether it may be identified with Pons Vetus, Andretium, Bistuae, Saloniana, or Sarsenterum, it certainly dates from Roman times. Mostar was enlarged in 1440 by Radivoi Gost, mayor of the palace to Stephen, first duke of St Sava. Immediately on their conquest of Herzegovina it was chosen by the Turks as their headquarters. The environs of the city are interesting. Within a few miles are the sources of the Buna, a small affluent of the Narenta, which issues from a cavern at the foot of Podvelez, amid scenery celebrated for its wild grandeur.

See Sir G. Wilkinson, Dalmalia and Montenegro (London, 1848), vol. ii. (view and plan at pp. 59, 60) ; J. Asboth, An Official Tour through Bosnia and Herzegovina (London, 1890), pp. 255–262 ; and R. Munro, Bosnia and Herzegovina (Edinburgh, 1900), pp. 179–188.

MOSUL, a town of Mesopotamia, capital of a Turkish vilayet and sanjak of the same name, on the right bank of the Tigris, in 36 35′ N., 43° .3′ E. Pop. 40,000 (Moslems 31,500, Christians 7000, Jews 1500). In Mosul, as in Bagdad, only part of the space within the walls is covered with buildings and the rest is occupied by cemeteries; even the solid limestone walls of the ancient town are half in ruins, being serviceable only in the direction of the river, where they check inundations. Of the town gates at present in use, five are on the south, two on the west, two on the north, and the great bridge gate on the east. Leaving Mosul by the last named, the traveller first crosses a stone bridge, 157 ft. long; then a kind of island (140 ft.), which is

overflowed only in spring and summer by the Tigris; next a stretch of the river which, at such times as it is not fordable, is spanned by a bridge of boats, the bridge proper covering only one-sixth of the full width of the stream. During the season of low water excellent vegetables, particularly water-melons, are grown upon the islands and dry portions of the river-bed.

The interior of Mosul has an insignificant appearance, only a few of the older buildings being left, among which may be men- tioned the Great Mosque, with its leaning minaret, formerly a church dedicated to St Paul. The streets are for the most part badly paved and very narrow, a small square in the market- place, overlooked by airy coffee-booths, being almost the only open space. The shops are few and poor. The industry in comparison with former times, when the town had so considerable a manufacture in muslin as to give its name to that fabric, is very unimportant; trade also, which is almost exclusively in the hands of native merchants, has fallen off greatly, although the town remains the collecting and distributing centre for the north Mesopotamian desert and Kurdistan. The exports and most of the imports pass through Bagdad. Mosul is the meeting- point of roads from Aleppo, Diarbekr, Bitlis, north and west Persia and Bagdad; and it is on the projected line of railway from Constantinople to the Persian Gulf. Gall nuts, gathered on the neighbouring Kurdish mountain slopes, are mostly exported, but are also made use of by native dyers ; and Hides, wax, cotton and gum are sold. Christians and Moslems have lived together on better terms here than elsewhere. Both are animated by an active local patriotism, and both honour the same patron saints, Jirjis (St George) and Jonah; the grave of the latter is pointed out on an artificial mound on the left bank of the Tigris.

The language of the people of Mosul is a dialect of Arabic, partly influenced by Kurdish and Syriac. The Moslems call themselves either Arabs or Kurds, but the prevalent type, very different from the true Arabian of Bagdad, proves the Aramaean origin of

many of their number. Of the Christians the commu- nity of the Chaldaeans, i.e. those who have gone over from Nestorianism to Catholicism, seems to be the most important; there are also Syrian Catholics and Jacobites. Mosul has for several centuries been a centre of Catholic missionary activity, the Dominicans especially, by the foundation of schools and printing-offices, having made a marked impression upon an intelligent and teachable population. There are very few Protestants. The town is the seat of British, French and Russian consulates.

Mosul shares the severe alternations of temperature experi- enced by upper Mesopotamia. The summer heat is extreme, and in winter frost is not unknown. Nevertheless the climate is considered healthy and agreeable; copious rains fall in general in winter. The drinking water is got from the muddy Tigris. At the north-east corner of the town is a sulphur spring, and 4 leagues to the south there is a hot sulphur spring (Hammam "Ali), much frequented by invalids.

Mosul probably occupies the site of a southern suburb of ancient Nineveh (q.v.) but it is very doubtful whether the older name of Mespila can be traced in the modern Al-Mausil (Arab., " the place of connexion ") ; it is, however, certain that a town with the Arabic name Al-Mausil stood here at the time of the Moslem conquest (636 a.d.). The town reached its greatest prosperity towards the beginning of the decline of the caliphate, when it was for a time an independent capital. The dynasty of the Hamdanids reigned in Mosul from 934, but the town was con- quered by the Syrian Okailids in 990. In the nth century it belonged to the Seljuks, and in the 12th, under the sway of the Atabegs, particularly of Zenki, it had a short period of splendour. Saladin besieged it unsuccessfully in 1182. The Persians occu- pied Mosul for a short time in 1623, until it was, soon after- wards, recovered by sultan Murad IV; The governorship of the pashalik was long hereditary in the originally Christian family of the 'Abd-al-Jalil, until the Porte, during

the course of the 19th century, succeeded after a long and severe contest in establishing a more centralized system of government.

The Vilayet of Mosul lies mainly east of the Tigris. It is divided into three sanjaks, Mosul, Shehrizor and Suleimanieh, and has an area of 29,000 sq. m. Pop. 295,000 (Moslems 245,000, Yezidis 15,000, Christians 30,000 and Jews 5000).

See Karl Ritter, "Asien," vol. vii. in Die Erdkunde (Berlin, 1844). A map of the town accompanies J. Cernik's paper, " Studienexpedi- tion durch die Gebiete des Euphrat und Tigris," in Erganzungsheft No. 45 of Petermanns Mitteilungen (Gotha, 1876); Parry, Six Months in a Syrian Monastery (1895); E. Sachau, Am Euphrat und Tigris (Berlin, 1899); Baron von Oppenheim, Vom Mittelmeer zum Persischen Golf (Berlin, 1900).

MOSZKOWSKI, MORITZ (1854-), Polish musical com- poser, was born at Breslau, and studied at Dresden and Berlin. He started as a pianist, and had a great success at the chief Euro- pean centres. He was made a member of the Berlin Academy in 1899. In 1897 he settled in Paris. He became a prolific com- poser both for pianoforte and for orchestra, but is best known by his Spanish dances, written for four hands on the piano, and his waltzes. His opera Boabdil was performed at Berlin in 1892.

MOTALA, a town of Sweden, in the district (Ian) of Oster- gotland, on the east side of Lake Vetter at the outflow of the river Motala, 175 m. S.W. by W. of Stockholm by rail. Pop. (1900), 3047. It is on the Gota canal route (q.v.). The town was founded in 1880, but the Motala mechanical works, 2 m. east, were founded in 1823 by the Gota Canal Company under the direction of Daniel Fraser, an Englishman. Iron war-ships, rail- way locomotives, iron bridges, machinery, &c, are built; the company has branches in Norrkoping, Gothenburg, and elsewhere.

MOTANABBI, strictly Al MtjtanabbI 1 (Abu-t-Tayyib Ahmad ibn al-Husain of Ktjfa) (91 5/6-965), the most

famous represen- 1 I.e. ” he who plays the prophet.”

tative of the last period of Arabic poetry, was the son of a water- carrier, and is said to have picked up much of the literary knowledge for which he was afterwards famous by haunting the book-stalls of his native city. He spent too, some years of his youth among the nomads of the Syro- Arabian desert, learning their purer dialect, and becoming imbued with their self-reliant spirit. Thus he grew up a brave proud man, a gallant warrior as well as a poet, not easily satisfied either with wealth or honours, indifferent to the Koran and to the fasts and prayers of Islam, but untainted by the looseness of morals common to Ihe poets of those days. At first he essayed a perilous road to distinction, appearing in the character of a prophet in the desert between the Euphrates and Syria, where he formed a consider- able party, but was arrested by the governor of Emesa (Horns). A prison cooled his enthusiasm. The name of al-Mutanabbl clung to him, however, and is that by which he is still commonly known. Regaining his liberty, he had to struggle for a time with poverty and neglect. But his poetical talents at length found him patrons, and in 948 he became attached to the court of the famous warrior and patron of letters, Saif ad-daula, prince of Aleppo, to whom many of the best fruits of his muse were dedi- cated, and by whose side he approved his valour in the field. But he had rivals who knew how to inspire jealousy between him and the prince, and an angry scene with the grammarian Khalawaih, in which the latter closed a philological dispute by striking Motanabbi, in the very presence of the prince and without rebuke from him, led the poet to leave the court and seek a new career in the realm of the Ikshlds (957). He now took as his patron and the object of his eulogies Kafur, the regent of Egypt — a black eunuch who knew how to open the poet’s lips by great gifts and honours. Motanabbi, however, sought a higher reward, the government of

Sidon, and at length broke with Kafur, wrote satires against him, and had to fly for his life to Kufa (961). His next great patron was 'Adod ad-daula of Shiraz, and on a journey from Shiraz to Kufa he was waylaid and slain by a chieftain of the Asad, whose kinsfolk he had satirized (September 965).

The poetry of Motanabbi is to European taste much less attractive than the verses of the ancient Arab poets, being essen- tially artificial and generally unreal, though it has great technical merits and displays lively fancy and considerable inventive power.

Oriental taste places him on a very high pedestal, as may be judged from the fact that more than forty commentaries were written on his Dvwan (H. Khal., iii. 306). Dieterici's edition of the poet (Berlin, 1858-1861), gives the commentary of Wahidi (d. 1075) ; the Egyptian edition of 1870 has the commentary of 'Ukbari (d. 12 19). A convenient edition is that published with a commen- tary of Nasif ul-Yaziji at Beirut (1882). See R. A. Nicholson, A Literary History of the Arabs (London, 1907), pp. 304-313.

MOTET, a musical art-form of paramount importance in the 1 6th century. The word is of doubtful etymology, and probably its various uses and forms in the 13th and 14th centuries connect with more than one origin. Thus motulus suggests modulus or melody; and probably represents the notion underlying the use of the term motetus or motellus to designate one of the middle parts in a vocal combination. On the other hand the obvious connexion between the Italian word motletlo (diminutive of motto) with the French mot (in the sense of bon mot) is in conformity with the use of a profane art-form contem- porary with the conductus and rondel of these early epochs of music.

The only really definite and mature art-form denoted by the word motet is that of the 16th-century pieces of ecclesiastical music in one or two (rarely more) continuous movements, for the most part on Biblical or other ecclesiastical prose texts. The word is,

however, used for any single Latin-text composition in continuous form, not set sectionally verse by verse, and not forming a permanent part of the mass. Thus Palestrina's Stabat mater is included among his motets; though the text is metrical and rhymed, and the style, though continuous, is far from being that of the typical polyphonic motet. The title of motet is also occasionally loosely used for non-ecclesiastical

works, such as many of the numbers in the Magnum opus musicum of Orlando di Lasso and the dedicatory motet at the beginning of Palestrina's fifth book. And in this way it is sometimes applied to compositions not to Latin text ; as in Josquin's Diploration da Jehan Okenheim, where all except the canto jermo is in French.

The most important kind of motet is that which is intimately connected with the solemn mass for a particular holy day. Such motets are sung between the Credo and the Sanctus of the mass. Thef are, in typical cases, founded on the Gregorian tones of their texts, and the mass is founded on the same themes, thus giving the whole service a musical unity which has never since been approached in any church music even under Bach. When a motet was not founded on Gregorian tones it was still possible for the composer to design a mass on the same themes, and most of the titles of 16th-century masses, when they do not indicate a secular origin, indicate either the motet or the Gregorian tones on which they are founded. Thus Palestrina's masses Assumpta est Maria; O admirabile commercium; Dum complerentur; Hodie Christus natus est; Dies santificatus; Veni sponsa Christi, and the second Missa Tu es Petrus, are magni- ficent examples selected almost at random from the masses which the composer has founded on his own motets of the same name. When such masses are performed, whether in a concert- room or church, it is indisputable that the motet ought always to be included. Sometimes one composer founded a mass on another composer's motet; thus Soriano's fine Missa, Nos autem gloriari, is based upon a motet by Palestrina. When a motet was

in two movements the second movement almost always ended with the last clauses of the first, both in text and in music, thereby sometimes producing a distinctly modern impression of da capo form.

In later times the term motet is little more than a name for any choral composition of clearly single design; and the fact that such compositions have often been sung, like the 16th- century motet, between the Credo and Sanctus of High Mass, has nothing to do with their character as an art-form. Bach's motets are great German choral works in several movements, with no written accompaniment, though there is internal and external evidence that they were accompanied from score by the organ. Handel's motets belong to his Italian period and are simply Latin cantatas of various kinds, with instrumental accompaniment. The later meanings attached to the word are quite indefinite, and have no common idea, except that the motet is nowadays the shortest kind of sacred choral music.

(D. F. T.)

MOTH, in entomology, any lepidopterous insect belonging to the division Heterocera, as distinguished from the Rhopalocera, or butterflies; formerly confined to the small nocturnal insect (belonging to the genus Tinea), which breeds in fur, clothes, &c. (see Lepidoptera). The word in O Eng. is mo\e, and corresponds to Ger. Motte.

MOTHER, the term for the female parent of a child. The word, like father, is common to Indo-European languages, cf. in Teutonic languages, Ger. Mutter, Du. moeder, Swed. and Dan. moder; Gothic is the exception in Teutonic languages, the word being aithei, cf. atta, father; from Lat. mater come, in Romanic, Fr. mere, Ital., Span, and Port., madre. Greek has ixifrqp, (Attic and Ionic), juanjp (Doric). The Russian word is mat. The Sansk. mata points to an original derivation from a stem ma, to measure, or make. Of the many transferred applications of " mother " may be mentioned those to the church, to nature, to the earth, and to a city

or nation, as the parent of other cities, nations, colonies, &c. As a title ″ mother ″ is particularly applied to the head of a religious community of women. For ″ mother-of-pearl ″ see Pearl. There is a particular applica- tion of ″ mother ″ to the scum which rises to the surface of a liquor during the process of fermentation, and also to a mass of gummy stringy consistency formed in vinegar in the process of acetous fermentation, hence known as ″ mother of vinegar ″ (see Vinegar). This is usually, however, taken to be another word altogether, and connected with Du. modder, mud, mire.

MOTHERWELL, WILLIAM (1797-1835), Scottish poet, anti- quary and journalist, was born at Glasgow on the 13th of October 1797, the son of an ironmonger. At the age of fifteen he was apprenticed in the office of the sheriff-clerk at Paisley, and appointed sheriff-clerk depute there in 1810. He spent his leisure in collecting materials for a volume of local ballads which he published in 1810 under the title of The Harp of Renfrewshire. In 1827 he published a further instalment in Minstrelsy Ancient and Modern, prefaced by an excellent historical introduction. He contributed verses to newspapers and magazines, Jeanie Morrison, My Heid is like to rend, Willie, and Wearie's Cauld Well being his best-known poems. He became editor of the Paisley Advertiser in 1828, and of the Glasgow Courier in 1830.

A small volume of his poems was published in 1832, and a larger volume with a memoir in 1846, reissued, with additions, in 1848.

MOTHERWELL, a municipal and police burgh of Lanarkshire, Scotland. Pop. (1851), 900; (1901), 30,418. It is situated near the right bank of the Clyde, 13 m. S.E. of Glasgow by the Caledonian railway. It takes its name from an old well dedi- cated to the Virgin, and owes its rapid increase to

the coal and iron mines in the neighbourhood. It has large iron and steel works, bridge-building being a distinctive industry. Boilers, steam-cranes and ironmongers' ware are also made, and there are brick, tile and fireclay works. The public buildings include the town-hall, theatre and hospital; the park was presented in commemoration of Queen Victoria's Jubilee.

MOTION (Lat. molio, from mover e, to move), in English law, an application made to a court during the progress of an action, and either before or after judgment has been pronounced. The object of a motion is to invoke the assistance of the court in matters that are of a pressing character, and require to be speedily dealt with. A motion differs from a petition in that it is made viva voce in open court and is founded on a written state- ment. Motions are either motions of course or special motions. A motion of course is made ex parte without notice, and is not mentioned in court, the party being entitled as of right. Motions of course are confined to the chancery division of the High Court. A special motion is made in open court, and must be supported by proper evidence. Special motions are made either ex parte or on notice. On all ex parte applications the utmost good faith must be observed. Ex parte motions, in the king's bench division, are usually made to a divisional court. A motion for judgment is a proceeding whereby a party to an action moves for judgment of the court in his favour. See Rules of the Supreme Court, Ors. xl., lii.

MOTION, LAWS OF. Before the time of Galileo (1564-1642) hardly any attention had been paid to a scientific study of the motions of terrestrial bodies. With regard to celestial bodies, however, the case was different. The regularity of their diurnal revolutions could not escape notice, and a good deal was known 2000 years ago about the motions of the sun and moon and planets among the stars. For the statement of the motions of these bodies uniform motion in a circle was employed as a fundamental type, combinations of motions of this type being

constructed to fit the observations. This procedure — which was first employed by the great Greek astronomer Hipparchus (2nd century B.C.), and developed by Ptolemy three centuries later — did not afford any law con- necting the motions of different bodies. Copernicus (i473 - 1543) employed the same system, and greatly simplified the application of it, especially by regarding the earth as rotating and the sun as the centre of the solar system. Kepler (1571- 1630) was led by his study of the planetary motions to reject this method of statement as inadequate, and it is in fact incapable of giving a complete representation of the motions in question. In 1609 and 1619 Kepler published his new laws of planetary motion, which were subsequently shown by Newton to agree with the results obtained by experiment for the motion of terrestrial bodies.

The earliest recorded systematic experiments as to the motion of falling bodies were made by Galileo at Pisa in the latter years of the 16th century. Bodies of different substances were

employed, and slight differences in their behaviour accounted for by the resistance of the air. The result obtained was that any body allowed to fall from rest would, in a vacuum, move relatively to the earth with constant ^Gravity? acceleration; that is to say, would move in a straight line, in such a manner that its velocity would increase by equal amounts in any two equal times. This result is very nearly correct, the deviations being so small as to be almost beyond the reach of direct measurement. It has since been discovered, however, that the magnitude of the acceleration in question is not exactly the same at different places on the earth, the range of variation amounting to about \ %. Galileo proceeded to measure the motion of a body on a smooth, fixed, inclined plane, and found that the law of constant acceleration along the line of slope of the plane still held, the acceleration decreasing in magnitude as the angle of inclination was reduced ; and he inferred that a body, moving on a smooth horizontal plane, would move with uniform velocity in a straight line if the resistance of the air, and

friction due to contact with the plane, could be elimi- nated. He went on to deal with the case of projectiles, and was led to the conclusion that the motion in this case could be re- garded' as the result of superposing a horizontal motion with uniform velocity and a vertical motion with constant accelera- tion, the latter identical with that of a merely falling body; the inference being that the path of a projectile would be a parabola except for deviations attributed to contact with the air, and that in a vacuum this path would be accurately followed. The method of superposition of two motions may be illustrated by such examples as that of a body dropped from the mast of a ship moving at uniform speed. In this case it is found that the body falls relatively to the ship as if the latter were at rest, and alights at the foot of the mast, having consequently pursued a parabolic path relatively to the earth.

The importance of these results, limited though their scope was, can hardly be overrated. They had practically the effect of suggesting an entirely new view of the subject, namely, that a body uninfluenced by other matter might be expected to move, relatively to some base or other, with uniform velocity in a straight line; and that, when it does not move in this way, its acceleration is the feature of its motion which the surrounding conditions determine. The acceleration of a falling body is naturally attributed to the presence of the earth ; and, though the body approaches the earth in the course of its fall, it is easily recognized that the conditions under which it moves are only very slightly affected by this approach. Moreover, Galileo recognized, to some extent at any rate, the principle of simple superposition of velocities and accelerations due to different sets of circumstances, when these are combined (see Mechanics). The results thus obtained apply to the motion of a small body, the rotation of which is disregarded. When this case has been sufficiently studied, the motion of any system can be dealt with by regarding it as built up of small portions. Such portions, small enough for the position and motion of each to be sufficiently specified by those of a point, are called ” particles.”

Descartes helped to generalize and establish the notion of the fundamental character of uniform motion in a straight line, but otherwise his speculations did not point in the direc- tion of sound progress in dynamics; and the next p° rce , ga substantial advance that was made in the principles of the subject was due to Huygens (1629–1695). He attained correct views as to the character of centrifugal force in connexion with Galileo’s theory; and, when the fact of the variation of gravity (Galileo’s acceleration) in different latitudes first became known from the results of pendulum experiments, he at. once perceived the possibility of connecting such a variation with the fact of the earth’s diurnal rotation relatively to the stars. He made experiments, simultaneously with

Wallis and Wren, on the collision of hard spherical bodies, and his statement of the .results (1669) included a clear enunciation of the conservation of linear momentum, as demonstrated for these cases of collision, and apparently correct in certain other cases, mass being estimated by weight. But Huygens's most important contribution to the

subject was his investigation, published in 1673, of the motion of a rigid pendulum of any form. This is the earliest example of a theoretical investigation of the rotation of rigid bodies. It involved the adoption of a point of view as to the relation between the motions of bodies of different forms, which practically amounted to a perception of the principle of energy as applied to the case in question.

We owe to Newton (1642–1727) the consolidation of the views which were current in his time into one coherent and universal Galileo- system, sometimes called the Galileo–Newton theory, Newton but commonly known as the "laws of motion";

eory ' and the demonstration of the fact that the motions of the celestial bodies could be included in this theory by means of the law of universal gravitation. A full account of his results was first published in the Principia in 1687.

Such statements as that a body moves in a straight line, and that it has a certain velocity, have no meaning unless the base, relative to which the motion is to be reckoned, is defined. Ac- cordingly, in the extension of Galileo's results for the purpose of a universal theory, the establishment of a suitable base of reference is the first step to be taken. Newton assumed the possibility of choosing a base such that, relatively to it, the motion of any particle would have only such divergence from uniform velocity in a straight line as could be

expressed by laws of acceleration dependent on its relation to other bodies. He used the term " absolute motion " for motion relative to such a base. Many writers on the subject distinguish such a base as " fixed.'.' The name " Newtonian base " will be used in this article. Assuming such a base to exist, Newton admitted at the outset the difficulty of identifying it, but pointed out that the key to the situation might be found in the identification of forces; that is to say, in the mutual character of laws of acceleration as applied to any given body and any other by whose presence its motion is influenced. In this connexion he took an important step by distinguishing clearly the character of " mass " as a universal property of bodies distinct from weight.

There can be no doubt that the development of correct views as to mass was closely connected with the results of experiments with regard to the collision of hard bodies. Suppose two small smooth spherical bodies which can be regarded as particles to be brought into collision, so that the velocity of each, relative to any base which is unaffected by the collision, is suddenly changed. The additions of velocity which the two bodies receive respec- tively, relative to such a base, are in opposite directions, and if the bodies are alike their magnitudes are equal. If the bodies though of the same substance are of different sizes, the magni- tudes of the additions of velocity are found to be inversely pro- portional to the volumes of the bodies. But if the bodies are of different substances, say one of iron and the other of gold, the ratio of these magnitudes is found to depend upon something else besides bulk. A given volume of gold is found to count for this purpose for about two and a half times as much as the same volume of iron. This is expressed by saying that the density of gold is about two and a half times that of iron. In fact, experi- ments upon the changes of velocity of bodies, due to a mutual influence between them, bring to light a property of bodies which may be specified by a quantity proportional to their

volumes in the case of bodies which are perceived by other tests to be of one homogeneous substance, but otherwise involving also another factor.

The product of the volume and density of a body measures what is called its " mass." The mass of a body is often loosely defined as the measure of the quantity of matter in it. This definition correctly indicates that the mass of any portion of matter is equal to the sum of the masses of its parts, and that the masses of bodies alike in other respects are equal, but gives no test for comparison of the masses of bodies of different substances; this test is supplied only by a comparison of motions. When, as in the case of contact, a mutual relation is perceived between the motions of two particles, the changes of velocity are in oppo- site directions, and the ratio of their magnitudes determines the ratio of the masses of the particles; the motion being reckoned

relative to any base which is unaffected by the change. It is found that this gives a consistent result; that is to say, if by an experiment with two particles A and B we get the ratio of their masses, and by an experiment with B and a third particle C we get the ratio of the masses of B and C, and thus the ratio of the masses of A and C, we should get the same ratio by a direct experiment with A and C. For the numerical measure of mass that of some standard body is chosen as a unit, and the masses of other bodies are obtained by comparison with this. Masses of terrestrial bodies are generally compared by weighing; this is found by experiment to give a correct result, but it is applicable only in the neighbourhood of the earth. Familiar cases can readily be found of the perception of the mass of bodies, inde- pendently of their tendency to fall towards the earth. The mass of any portion of matter is found to be permanent under chemical and other changes, and this fact adds to its importance as a physical quantity. The study of the structure of atoms has suggested a connexion of mass with electrical phenomena which implies its dependence on motion; but this is not incon- sistent with the

observed fact of its practical constancy, to a high degree of accuracy, for bodies composed of atoms.

The Galileo-Newton theory of motion is that, relative to a suitably chosen base, and with suitable assignments of mass, all accelerations of particles are made up of mutual (so-called) actions between pairs of particles, whereby the two particles forming a pair have accelerations in opposite directions in the line joining them, of magnitudes inversely proportional to their masses. The total acceleration of any particle is that obtained by the superposition of the component accelerations derived from its association with the other particles of the system severally in accordance with this law. The mutual action between two particles is specified by means of a directed quantity to which the term ″ force ″ is appropriated. A force is said to act upon each of two particles forming a pair, its magnitude being the product of mass and component acceleration of the particle on which it acts, and its direction that of this component acceleration. Thus each mutual action is associated with a pair of equal forces in opposite directions. Instead of the operation of superposing accelerations, we may compound the several forces acting on a particle by the parallelogram law (see Mechanics) into what may be called the resultant force, the total acceleration of the particle being the same as if this alone acted. The theory depends for its verification and application upon the fact that forces can be identified and classified. They can be recognized by Application their reciprocal character, and it is found to be of the possible to connect them by permanent laws with the Tbeory - recognizable physical characteristics of the systems in which they occur. A generalization of Galileo's results takes the form that under constant conditions of this kind, force (defined in terms of motion) is constant, and that the superposition of two sets of conditions, if their independence can be secured, results in super- position of the forces associated with them separately. Par- ticular laws

of force may be suggested by a study of the simplest cases in which they are manifested, and from them results may be obtained by calculation as to the motions of systems of any given structure. Such results may be tested by direct observation.

It should be noted that, within a limited range of application to terrestrial mechanics, the most convenient way of attacking the question of the relations of forces to the physical statics conditions of their occurrence may be by balancing their several effects in producing motion; thus avoiding in the first instance both the choice of a base and the consideration of mass. This procedure is useful as a preliminary step in the study of the subject. It does not, however, afford a convenient starting-point for a general theory, because it is apt to involve some confusion of phenomena which, from the point of view of the Galileo-Newton theory, are distinct in character.

Newton's law of gravitation affords the most notable example of the process of verification of a law of force, and incidentally of the Galileo-Newton theory. As a law of acceleration of the planets relatively to the sun, its approximate agreement with

Kepler's third law of planetary motion follows readily from a consideration of the character of the acceleration of a point

moving uniformly in a circle. Newton tells us that tion. "' ^is agreement led him to adopt the law of the inverse

square of the distance about 1665-1666, before Huygens's results as to circular motion had been published. At the same time he thought of the possibility of terrestrial gravity extending to the moon, and made a calculation with regard to it. Some

years later he succeeded in showing that Kepler's elliptic orbit for planetary motion agreed with the assumed law of attrac- tion; he also completed the co-ordination with terrestrial gravity by his investigation of the attractions of homogeneous spherical bodies. Finally, he made substantial progress with more exact calculations of the motions of the solar system, especially for the case of the moon. The work of translating the law of gravitation into the form of astronomical tables, and the comparison of these with observations, has been in progress ever since. The dis- covery of Neptune (1846), due to the influence of this planet on the motion of Uranus, may be mentioned as its most dramatic achievement. The verification is sufficiently exact to establish the law of gravitation, as providing a statement of the motions of the bodies composing the solar system which is correct to a high degree of accuracy. In the meantime seme confirmation of the law has been obtained from terrestrial experiments, and observations of double stars tend to indicate for it a wider if not universal range. It should be noticed that the verification was begun without any data as to the masses of the celestial bodies, these being selected and adjusted to fit the observations.

The case of electro-magnetic forces between two conductors carrying electric currents affords an example of a statement of motion in terms of force of a highly artificial kind. It can only be contrived by means of complicated mathematical analysis. In this connexion a statement in terms of force is apt to be dis- placed by more direct and more comprehensive methods, and the attention of physicists is directed to the intervention of the ether. The study of such cases suggests that the statement in terms of force of the relations between the motions of bodies may be only a provisional one, which, though it may summarize the effect of the actual connexions between them sufficiently for some practical purposes, is not to be regarded as representing them completely. There are indications of this having been Newton's own view.

The Newtonian base deserves some further consideration. It is defined by the property that relative to it all accelerations

of particles correspond to forces. This test involves Base. on ty changes of velocity, and so does not distinguish

between two bases, each of which moves relatively to the other with uniform velocity without rotation. The estab- lishment of a true Newtonian base presumes knowledge of the motions of all bodies. But practically we are always dealing with limited systems, so any actual determination must always be regarded as to some extent provisional. In the treatment of the relative motions of a limited system, we may use a confessedly provisional base, though it may be necessary to introduce corrections, either exact or approximate, to take account either of the existence of bodies outside the system, or of the rotation of the base employed relative to a more correct one. Such correc- tions may be made by the device of applying additional unpaired, or what we may call external, forces to particles of the system. These are needed only so far as they introduce differences of accelerations of the several particles. The earth, which is commonly employed as a base for terrestrial motions, is not a very close approximation to being a Newtonian base. Differ- ences of acceleration due to the attractions of the sun and moon are not important for terrestrial systems on a small scale, and can usually be ignored, but their effect (in combination with the rotation of the earth) is very apparent in the case of the ocean tides. A more considerable defect is due to the earth having a diurnal rotation relative to a Newtonian base, and this is never wholly ignored. Take a base attached to the centre of the earth, but without this diurnal rotation. A small body hanging by a string, at rest relatively to the earth, moves relatively to this

base uniformly in a circle; that is to say, with constant accelera- tion directed towards the earth's axis. What is done is to divide the resultant force

due to gravitation into two components, one of which corresponds to this acceleration, while the other one is what is called the ” weight ” of the body. Weight is in fact not purely a combination of forces, in the sense in which that term is defined in connexion with the laws of motion, but corresponds to the Galileo acceleration with which the body would begin to move relatively to the earth if the string were cut. Another way of stating the same thing is to say that we introduce, as a correction for the earth’s rotation, a force called ” centrifugal force,” which combined with gravitation gives the weight of the body. It is not, however, a true force in the sense of corresponding to any mutual relation between two portions of matter. The effect of centrifugal force at the equator is to make the weight of a body there about -35% less than the value it would have if due to gravitation alone. This represents about two-thirds of the total variation of Galileo’s acceleration between the equator and the poles, the balance being due to the ellipticity of the figure of the earth. In the case of a body moving relatively to the earth, the introduction of centrifugal force only partially corrects the effect of the earth’s rotation. Newton called attention to the fact that a falling body moves in a curve, diverging slightly from the plumb-line vertical. The divergence in a fall of 100 ft. in the latitude of Greenwich is about rSrin. Foucault’s pendulum is another example of motion relative to the earth which exhibits the fact that the earth is not a Newtonian base.

For the study of the relative motions of the solar system, a provisional base established for that system by itself, bodies outside it being disregarded, is a very good one. No correction for any defect in it has been found necessary; moreover, no rota- tion of the base relative to the directions of the stars without proper motion has been detected. This is not inconsistent with the law of gravitation, for such estimates as have been made of planetary perturbations due to stars give results which are insignificant in comparison with

quantities at present measurable.

For the measurement of motion it must be presumed that we have a method of measuring time. The question of the standard to be employed for the scientific measurement of Measure- time accordingly demands attention. A definition of meatot the measurement dependent on dynamical theory has Time. been a characteristic of the subject as presented by some writers, and may possibly be justifiable; but it is neither necessary nor in accordance with the historical development of science. Galileo measured time for the purpose of his experiments by the flow of water through a small hole under approximately constant conditions, which was of course a very old method. He had, however, some years before, when he was a medical student, noticed the apparent regularity of successive swings of a pendu- lum, and devised an instrument for measuring, by means of a pendulum, such short periods of time as sufficed for testing the pulse of a patient. The use of the pendulum clock in its present form appears to date from the construction of such a clock by Huygens in 1657. Newton dealt with the question at the begin- ning of the Principia, distinguishing what he called ″ absolute time ″ from such measures of time as would be afforded by any particular examples of motion; but he did not give any clear definition. The selection of a standard may be regarded as a matter of arbitrary choice; that is to say, it would be possible to use any continuous time-measurer, and to adapt all scientific results to it. It is of the utmost importance, however, to make, if possible, such a choice of a standard as shall render it unneces- sary to date all results which have any relation to time. Such a choice is practically made. It can be put into the form of a definition by saying that two periods of time are equal in which two physical operations, of whatever character, take place, which are identical in all respects except as regards lapse of time. The • validity of this definition depends on the assumption that operations of different kinds all agree in giving the same measure of time, such allowances as experience

dictates being made for changing conditions. This assumption has successfully stood all

tests to which it has been subjected. All clocks are constructed on the basis of this method of measurement; that is to say, on the plan of counting the repetitions of some operation, adopted solely on the ground of its being capable of continual repetition with a certain degree of accuracy, and possibly also of automatic compensation for changing conditions. Practically clocks are regulated by reference to the diurnal rotation of the earth relatively to the stars, which affords a measurement on the repeti- tion principle agreeing with other methods, but more accurate than that given by any existing clock. We have, however, good reasons for regarding it as not absolutely perfect, and there are some astronomical data the tendency of which is to confirm this view.

The most important extension of the principles of the subject since Newton's time is to be found in the development of the theory of energy, the chief value of which lies in the Energy." f act ^at it has supplied a measurable link connecting the motions of systems, the structure of which can be directly observed, with physical and chemical phenomena having to do with motions which cannot be similarly traced in detail. The importance of a study of the changes of the vis viva depend- ing on squares of velocities, or what is now called the " kinetic energy " of a system, was recognized in Newton's time, especially by Leibnitz; and it was perceived (at any rate for special cases) that an increase in this quantity in the course of any motion of the system was otherwise expressible by what we now call the " work " done by the forces. The mathematical treatment of the subject from this point of view by Lagrange (1736–1813) and others has afforded the most important forms of statement of the theory of the motion of a system that are available for

practical use. But it is to the physicists of the 19th century, and especially to Joule, whose experimental results were published in 1 843-1849, that we practically owe the most notable advance that has been made in the development of the subject — namely, the establish- ment of the principle of the conservation of energy (see Ener- getics and Energy). The energy of a system is the measure of its capacity for doing work, on the assumption of suitable con- nexions with other systems. When the motion of a body is checked by a spring, its kinetic energy being destroyed, the spring, if perfectly elastic, is capable of restoring the motion; but if it is checked by friction no such restoration can be immediately effected. It has, however, been shown that, just as the com- pressed spring has a capacity for doing work by virtue of its configuration, so in the case of the friction there is a physical effect produced — namely, the raising of the temperature of the bodies in contact, which is the mark of a capacity for doing the same amount of work. Electrical and chemical effects afford similar examples. Here we get the link with physics and chem- istry alluded to above, which is obtained by the recognition of new forms of energy, interchangeable with what may be called mechanical energy, or that associated with sensible motions and changes of configuration.

Such general statements of the theory of motion as that of Lagrange, while releasing us from the rather narrow and strained view of the subject presented by detailed analysis of motion in terms of force, have also suggested a search for other forms which a statement of elementary principles might equally take as the foundation of a logical scheme. In this connexion the interesting scheme formulated by Hertz (1894) deserves notice. It is important as an addition to the logic of the subject rather than on account of any practical advantages which it affords for purposes of calculation.

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(W. H. M.)

MOTIVE (from Lat. movere, to move), in psychology, a general term signifying any element of consciousness which prompts an agent to a decision. The older psychology usually regarded motives as strictly analogous to mechanical forces exerting pressure or tension, and explained human action as necessarily determined by the resultant of various, possibly conflicting, motives. Contemporary psychological research tends to show with increasing clearness that we must recognize a power of decision in the self, and that the analogy of mechanical forces is inadequate to explain the facts. On this view motives will be regarded as solicitations to act in a certain direction, while the self decides by throwing its volitional weight on the side of the motive which it regards as preferable. The solicitations may come from the most diverse sources: they may be mere desires to avoid some pain or to gratify some appetite; or they may be of higher origin, such as the motive of patriotism, or the desire to advance knowledge. Purposes or ends are often termed motives. " Con- flict of motives " means sometimes a conflict of purposes, when the agent has adopted two different lines of action and has difficulty in combining them; or it may mean a

conflict of solici- tations. It is better to call purposes or ends by those names when they have been definitely adopted by the agent : while they are still under deliberation the term ″ motive ″ may be used.

MOTLEY, JOHN LOTHROP (1814–1877), American historian, son of Thomas Motley, was born on the 15th of April 1814 at Dorchester (now a part of Boston) , Massachusetts, and graduated at Harvard in 1831. He then studied at Gottingen and Berlin, becoming a friend of Bismarck at Gottingen, and after a period of European travel returned in 1834 to America, where he con- tinued his legal studies. In 1837 he married Mary Benjamin (d. 1874), a sister of Park Benjamin, and in 1839 he published anonymously a novel entitled Morton's Hope, or the Memoirs of a Provincial. In 1841 he entered the diplomatic service as secretary of legation in Russia, but resigned his post within three months. Returning to America, he soon entered definitely upon a literary career. Besides contributing various historical and critical essays to the North American Review, including a remarkable essay on the Polity of the Puritans, he published in 1849, again anonymously, a second novel, entitled Merry Mount, a Romance of the Massachusetts Colony. About 1846 the project of writing a history of Holland had begun to take shape in his mind, and he had already done a large amount of work on this subject when, finding the materials at his disposal in the United States inadequate, he went to Europe in 1851. The next five years were spent at Dresden, Brussels and the Hague in investigation of the archives, which resulted in 1856 in the publication of The Rise of the Dutch Republic, which became very popular. It speedily passed through many editions, was translated into French, and also into ` Dutch, German and Russian. In i860 Motley published the first two volumes of its continuation, The United Netherlands. This work was on a larger scale, and embodied the results of a still greater amount of original research. It was brought down to the truce of 1609 by two additional volumes, published in 1867. In 1 86 1, just after

the Civil War had broken out in America, Motley wrote two letters to The Times defending the Federal position, and these letters, afterwards reprinted as a pamphlet entitled Causes of the Civil War in America, made a favourable impression on President Lincoln. Partly owing to this essay, Motley was appointed United States minister to Austria in 186-1, a position which he filled with great success until his resignation in 1867. Two years later he was sent to represent his country in London, but in November 1870 he was recalled by President Grant. After a short visit to Holland, he again took up his residence in England, where the Life and Death of John Barneveld appeared in two volumes in 1874. Ill health now began to interfere with his literary work, and he died at Frampton Court, near Dorchester, Dorset, on the 29th of May 1877, leaving three daughters. The merits of Motley as an historian are undeniably great. He has

told the story of a stirring period in the history of the world with full attention to the character of the actors and strict fidelity to the vivid details of the action. But it may safely be said that his tale is best where most unvarnished, and probably no writer of the same rank has owed less to the mere sparkle of highly polished literary style.

An excellent edition of his historical works was published in nine volumes in London in 1903-1904. See the Correspondence of John Lothrop Motley, edited by G. W. Curtis (New York, 1889); O. W. Holmes, John Lothrop Motley, a Memoir (Boston, 1878); M. D. Conway, Biographical Introduction to The Rise of the Dutch Republic (London, 1896); and John Lothrop Motley and his Family: Further Letters and Records (1910), edited by his daughter, Mrs Susan St John Mildmay.

MOTLEY, i.e. of many colours, a term particularly used of the parti-coloured dress of the professional

" fool " (q.v.) of the middle and later ages. The origin of the word is probably to be found in " mote " (O. Eng. mot), a particle of dust, &c, hence a spot or patch. " Mottle," a blotch or spot, is probably a back formation of motley.

MOTMOT. According to Hernandez in his Historia avium Novae Hispaniae (p. 52), published at Rome in 1651, this is the Mexican name of a bird which he described well enough to leave no doubt as to what he meant; but the word being soon after printed Momot by Nieremberg and others gave rise to the Latin- ized Momotus, invented by M. J. Brisson as a generic term, which has since been generally adopted by ornithologists, though motmot has been retained as the English form. Linnaeus knew of only one species of motmot, and referred it to his genus Ramphastos (properly Rhamphastus) under the name of R. momota. This is the Momotus brasiliensis of modern ornitho- logists, and from its geographical range cannot be the original Motmot of Hernandez, but is most likely the " Guira guainumbi " of Marcgrave.

The motmots form the sub-family Momotinae, which with the Todinae (see Tody) form the family Momotidae of Coraciiform birds, the nearest allies being rollers (q.v.) and kingfishers (q.v.). In outward appearance the motmots have an undoubted resem- blance to bee-eaters, but, though beautiful birds, various shades of blue and green predominating in their plumage, they do not exhibit such decided and brilliant colours; and, while the bee- eaters are only found in the Old World, the motmots are a purely Neotropical form, extending from southern Mexico to Paraguay, and the majority of species inhabit Central America. Their ordinary food is small reptiles and fruits, and insects caught on the wing. The nest of one species, as observed by Robert Owen, is at the end of a hole bored in the bank of a watercourse, and the eggs are pure white and glossy (Ibis, 1861, p. 65). Little else has been recorded of their ways.

The Momotidae form but a small group, containing

about six genera, of which the best known are: Momotus, Baryphthengus, Hylomanes, Eumomota, Aspatha and Prionorhynchus , and the number of species is very small. While all have a general resemblance in the serrated edges of the bill and many other characters, Momotus has the normal number of twelve rectrices, while the rest have only ten, which in Hylomanes have the ordinary configuration, but in adult examples of all the others the shaft of the median pair is devoid of barbs for the space of about an inch a little above the extremity, so as to produce a spatulate appearance, such as is afforded by certain humming-birds known as ” racquet-tails ” (see Humming-Bird), kingfishers of the genus Tanysiptera (see Kingfisher), and parrots of the group Prioniturus. C. Waterton (Wanderings, Journey 2, chap, iii.), mentioning the species M. brasiliensis by its native name ” houtou,” long ago asserted that this peculiarity was produced by the motmot itself nibbling off the barbs, and this extraordinary statement, though for a while doubted, has since been shown by O. Salvin (Proc. Zool. Society, 1873, pp. 429-433), on A. Bartlett’s authority, to be perfectly true. (A. N.)

MOTORS, ELECTRIC. Fundamentally, electric motors are electric generators reversed in function: they convert into mechanical energy the continued stresses between two electro-

magnetic fields relatively movable, just as generators convert into electromagnetic stresses the mechanical energy applied to them. Since no transformation of energy is ever absolutely quantitative, the conversions just considered are not accomplished without loss of energy to about the same extent in both cases. The sources of this loss are ohmic loss in the conductors, hysteresis, friction of bearings and brushes, air friction and eddy currents; the sum of these losses in large modern machines does not exceed S or 6 %. The torque of the motor is the dynamical result of the electromagnetic stresses between the magnetic field of the motor and that due to the armature currents, the latter field being proportional to the strength

of the current sheet due to the numerical strength of the current and the number of its effective convolutions. This applies to all types of motors, if one re- members that whenever either of these two stress factors is a periodic variable, as in the case of alternating motors, the torque is proportional to their geometrical co-directed product and not merely to their numerical product. At this point it will be convenient to distinguish between the various types of motors. The first broad distinction is between continuous-current and alternating-current motors, a distinction rather of convenience than of necessity, for in point of fact the two depend upon the same broad principles and can be considered on precisely the same lines.

Electric motors may be conveniently divided as follows: —

(A) Continuous Current.

1. Separately excited.

2. Series- wound constant current.

3. Series- wound constant potential.

4. Series-wound interdependent current and potential.

5. Shunt-wound constant potential.

(B) Alternating Current.

1. Synchronous constant potential.

2. Induction-polyphase constant potential.

3. Induction-monophase constant potential.

4. Repulsion-commutating.

5. Series-commutating.

Of these, the series-wound constant potential, shunt-wound constant potential, and polyphase induction motors do a very large proportion of the

active work of power transmission: the first mentioned furnish power for electric railways; the second chiefly power distribution from public electric supply stations; while the third are mainly relied upon in long-distance trans- mission systems. The fourth and fifth groups of class (B) are old in principle but have been slow in practical development. They include many modifications and transition forms not involving radical changes in the principles or properties of the machines. Their chief use has been for electrical traction, with reference to which they have, in the main, been developed, and their per- formance is best at low frequency, 15 to 25 cycles per second.

In class (A) in general, for a certain value of the torque current must be forced through the armature against the motor electro- motive force which results from the rotation of the armature in a given field. This demands a certain greater applied electro- motive force to produce the current required, which is determined by the effective electromotive force, equal to the geometrical difference between the applied and motor electromotive forces, and by the impedance of the armature. For steady currents this last is of course the same as the ohmic resistance, just as for steady electromotive force the geometrical and the numerical difference of the applied and motor electromotive forces are coincident. The torque depends, as heretofore noted, on the field strength and the strength of the current sheet due to the current thus determined. For small values of the torque the speed practically depends upon the applied electromotive force and the field, so that if the former and the latter be constant the speed is also sensibly constant. This is likewise the case if the armature resistance be very small; and in general the variations of speed at constant potential are determined by the product of this resistance and the torque, while the absolute speed depends essentially upon the field strength. Motors for low speed or high

electromotive force must have both a strong field and many- turns upon the armature, so that both the fundamental stresses may be large. As the field is generally strong — to secure economy of iron — low-voltage and high-voltage machines differ principally in the number of armature turns. For variable speed, this latter factor being fixed, field strength and applied electro- motive force are the factors easily altered, and most of the speed variation is accomplished by changing one or both of them. Torque, neglecting field distortion, is at a maximum when the current is the greatest possible at the given applied voltage — that is, when the motor is at rest. With a small armature resistance this current is generally far too great for convenience; hence the motors are usually started with a rheostat in series with the winding if the current is not limited by the generator itself. The torque then depends on the sum of the resistances in circuit, and can be made just sufficient to start the motor under the required load. By the same device the motor can run at reduced speed, although with a considerable loss of energy in the rheostat ; it is indeed, as a rule, difficult to get effective speed variation in motors of any kind without serious loss of energy. The field can be changed within wide limits only by a considerable increase of the iron in the magnetic circuit, the applied electromotive force cannot usually be varied except by increasing the resistances in circuit, and the number of armature turns cannot be varied with- out complication, although the effective number can be modified by shifting the brushes, probably at the expense of sparking. Altogether, if the speed variation demanded be more than 1 5 or 20%, it causes, in one way or another, considerable expense and trouble, particularly if each speed must be closely held irrespec- tive of load. No large change in absolute speed can readily be made without considerable change in the percentage variation of speeds at various loads. Practically, the best results are ob- tained from motors of very low

armature resistance, in which the field or the applied electromotive force, or both, are varied. The whole problem is nearly identical with the production of constant potential or constant current from generators driven at constant speed, and is solved by similar means. For any one absolute speed a generator can be made to give constant potential, nearly irrespective of load, by compound winding. Similarly, a motor may give a very nearly constant speed at constant potential by a differential winding in series with the armature, weakening the field as the armature current rises. This device, however, obviously increases the energy required for magnetization, and decreases the effective torque at starting. Practically, the best continuous-current motors can be made to hold their speed to within 1 or 2 % from no load to full load. Commercial machines, however, generally vary from 5 to 10% in speed. With respect to the direction or rotation of a motor, the torque changes sign with a change of sign in either field or armature current, but not with a change of sign in both. The input of the motor is numeri- cally equal to the product of the current and the applied electromotive force, while the output is determined by the product of the current and motor electromotive force; hence the .efficiency of the motor as a transformer of energy is the ratio between these two quantities. The output is a maximum when the applied electromotive force is double the motor electromotive force, and the efficiency is a maximum when the motor and applied electromotive forces are substantially equal. At the point of maximum output the speed is that sufficient to reduce the current to one-half its static value. No motor is worked at or near this point, except momentarily, on account of the low efficiency and severe heating in the armature. These theoretical values are slightly modified in practical machines by the small miscellaneous losses subject to independent variations. The practical output of electric motors is limited in machines of normal design by the temperature they can safely endure. As a rule the working temperature, which is commonly reached only after six hours or more of

continuous running, should not rise more than 40° to 50° F. above the temperature of the surrounding air. In case of traction motors and others subjected to occasional severe overloads, separated by periods of rest or of subnormal load, the temporary rise of temperature tolerated may be much

higher, say 6o° to 75° F., after a run of an hour or so. The temperature of the air is assumed at 70° F. in most cases, and the temperature of the motor-windings is preferably ascertained by the rise in electrical resistance due to the heating. Thermo-meters can seldom be so applied as to measure the full heating effect.

The actual output obtainable from a motor structure of given dimensions under these conditions with respect to heating, depends chiefly upon the practicable rotative speed of the arma- ture, since the chief losses are proportional to the torque, while the mechanical output at given torque is approximately pro- portional to the speed. Most makers utilize a single structure for several standard motors varying in speed and output, a 15 h.p. machine at, say, 1200 r.p.m. becoming a 10 h.p. at 800 r.p.m. or a 20 h.p. at 1600 r.p.m. There is no practically fixed relation between the rating and the speed, although it is approximately linear, for in winding the same carcass for different speeds the ratings are settled rather by commercial convenience than by exact determinations. Motors generally have approximately the same efficiencies as the corresponding sizes of generators. Small motors, say from 1 to 5 h.p., are commonly of 70-80% efficiency at full load, medium sized machines of 5 to 50 h.p. about 80 to 90%, and the larger sizes run up to 95% or there- abouts. In the effort to get low-speed motors without immoder- ately increasing the cost they are generally dropped a little in efficiency and allowed to run hotter than if wound for higher speeds.

The weight of motors per h.p. of output is therefore very variable. In machines of medium size and speed it is likely to be 50 to 75 lb per h.p., falling to

30 or 40 in large or specially high speed machines, and rising to 80 or 100 lb in small or very low speed motors. High-voltage motors, particularly if small, lose somewhat in relative output on account of the space taken up by the necessary insulation.

In all ordinary motors the magnetization of the iron is, for economy of material, pushed high; and hence the field, even at heavy loads, is fairly stable and the conditions of commutation remain good. When, however, motors are designed to stand severe overloads, or to admit of a wide range of speed regulation by varying the field strength, the commutation is likely to be unstable, and severe sparking may result. To meet this condition the commutating-pole motor — really a recrudescence of an old idea — has been introduced on a considerable scale. In this construction auxiliary pole pieces, excited by series coils from the motor circuit, are set midway between the ordinary field poles. The office of these poles is to neutralize the magneto-motive force due to the armature winding, thus checking field distortion, and also to ensure the proper reversal of the current in the armature coil directly under the brush. Of the total magneto-motive force due to the windings of the commutating pole, the major part, perhaps three-fourths, is devoted to the former work and the remainder to the latter, the proportion varying widely according to the design of the motor. The result of this construction is excellent, sparkless commutation being ensured over a wide range of load and field strength. The com- mutating-pole motor is intrinsically more expensive and slightly less efficient than the ordinary type, but for the particular kind of service it is designed to perform is extremely effective. It gives promise of especial value in high-voltage traction motors.

(A) 1. Separately excited Motors are interesting principally on account of the very efficient method of speed regulation possible by their use. In this method the field of the motor is excited from the supply mains, and the armature current is furnished by a motor- generator running at constant speed. A

rheostat in the shunt field of the latter element enables the applied electromotive force to be varied to any desired extent, and hence the working motor can be given full torque at any speed up to that assigned by the maximum value of the electromotive force which can be applied to the armature. Moreover, if the armature resistance be small, the motor is fairly self-regulating at all speeds. The effect is rather startling, since the motor may be giving a very great torque when it is merely turning over at a few revolutions per minute: and although the process is complicated, it leads to excellent results, and is widely used where delicate speed regulation is required.

(A) 2. Series-wound Constant-current Motors were early worked to a considerable extent on arc-lights circuits, but have now passed out of use save in a small number of constant-current power-transmission systems on the continent of Europe. In these motors the motor electromotive force is directly proportional to the output, the torque being constant. They will not start with more than a certain definite load, but once started the speed will increase until added work (internal or external) balances the torque. The type is intrinsically bad in speed regulation, and must be treated by the same methods as are adopted to secure constant current in arc machines. The most successful device in most cases is to vary the field strength by shunting the field coils or to vary the number of effective arma- ture conductors by shifting the brushes. Both methods are carried out mechanically rather than by purely electrical means — in the first case by ah automatic rheostat, and in the second by an auto- matic brush shifter, but neither is wholly satisfactory. Neverthe- less, such motors have proved capable of excellent commercial service in some of the European plants, especially in the larger sizes.

(A) 3. Series-wound Constant-potential Motors comprise nearly all motors used for electric traction — aggregating not less, probably, than one and a half million horse-power; hence they are of great practical importance. These traction motors are usually highly specialized machines with very powerful armatures and fields strongly saturated at all working values of the current. The brushes have an invariable position. Such motors behave much like separately- excited motors, having a rather large armature resistance. Speed regulation has to be obtained by varying the applied electromotive force. In early traction motors this variation depended upon insert- ing a rheostat; in modern practice it is customary to employ two, or even four, identical motors on each car, operated in series for low speeds and in parallel for full speed. In practice, however, resist- ances are inserted when necessary, to prevent too sudden changes of speed and to secure intermediate steps between those obtained by the series-parallel connexions. In rare instances a still further variation is secured by the use of a field only partially saturated at ordinary loads.

(A) 4. Series-wound Motors with Interdependent Current and Poten- tial are used only in connexion with generators of similar design, motor and generator forming a dynamical unit. This system is occasionally used with good results in power transmission. Assuming the motor field to be saturated, if the speed is to be constant the applied electromotive force must rise with the load to an amount depending on the resistances in circuit. If the corresponding generator has a field less fully saturated, the increase in current demanded by the increment of torque in the motor can be made not only to raise the applied electromotive force enough to compensate for armature resistance, but for the total resistances in circuit, including the line. With this difference in saturation the motor will automatically maintain constant speed. The fields of the machines need not be designed for a given saturation, since shunting them with a suitable resistance will give the same result.

(A) 5. Shunt-wound Motors at Constant Potential are the main- stay of continuous-current distributions for industrial purposes. At constant potential the field remains sensibly constant and the torque is directly proportional to the current. The motor then behaves much like a separately-excited motor, and the armature resistance being generally very small, the speed is very nearly constant, vary- ing less than 5 % from no load to full load in the best commercial machines. Operating on a compound-wound generator, a single motor of this type can be made to regulate with great precision, as in the previous case. If the motor field be only moderately satu- rated, its strength, and hence the motor electromotive force, rises and falls with the applied electromotive force; and there- fore at constant load these motors run at very nearly constant speed, in spite of small variations of voltage. If speed variation be required, it can be obtained to a moderate extent by a rheostat in the field circuit. At starting a rheostat is necessary in the armature circuit. The differentially wound modification is now seldom used.

(B) 1. Synchronous Alternating-current Motors. — The simplest starting point in the consideration of this class is the continuous- current generator. This machine actually generates within the armature alternating currents; and if the commutator be replaced by two or more slip-rings connected symmetrically to two or more points on the armature winding, alternating currents, monophase or polyphase, according to the number of connexions and the points touched, can be withdrawn therefrom. The simplest case involves only two slip-rings, joined to the winding at diametrically opposite points. Consider two such modified machines as motor and genera- tor. The condition of complete reversibility is that the instantane- ous values of the currents, and the instantaneous values of the angular displacements between poles and armature coils, shall be equal throughout. This evidently requires that the rotation of the motor should be synchronous, pole for pole, with that of the

generator. Here, as before, the torque depends on the two fundamental stresses, but the torque has no determinate sign in the absence of an initial rotation. The instantaneous value of the torque depends on the instantaneous value of the current and on its angular displacement. The speed of the motor being invariable, its motor electromotive force depends only on the effective excitation, including

the armature reactions, and it may or may not, according tn the conditions of load, be in phase with the impressed electromotive force. In the case of the continuous-current motor, the motoi output is numerically equal to the product of current and motoi electromotive force; and since, in the alternating circuit, these quantities are usually not in phase, in alternating motors the activity is determined by the co-directed part of their product. The current in the alternating motor depends, not on the ohmic resistance alone, but upon the impedance and upon the geometrical difference between the applied and motor electromotive forces. At a given applied electromotive force, and an armature impedance assumed constant, the fundamental variables in the motor are the output, motor electromotive force, and motor current. The two last factors are interdependent, so that the current may have a wide range of values, according to the excitation, while the output remains constant, or, itself remaining constant, may cover a variety of values of the power corresponding to different excitations. These changes involve changes in the phase angle between the motor electromotive force and the current, so that at given output the power-factor of the motor — that is, the ratio between the numerical and geome- trical products of current and electromotive force — may be given various values at will by changing the field excitation of the motor, a most unique and valuable property. If the motor electromotive force be fixed and the output varied, the phase angle between current and motor electromotive force varies by reason of the arma- ture taking up a new angular position with respect

to the field, backward for increasing load, forward for decreasing load. The minimum value of the current for a given load is reached when the excitation is such that the applied electromotive force and current are in phase, at which point the real and the apparent energy in the circuit coincide. The input can then be accurately measured by voltmeter and ammeter readings, and the motor is working at its best efficiency for the given load. For greater values of the motor electromotive force the current leads in phase with respect to the applied electromotive force; for less values it lags. The former condition is accompanied by the rising of the electromotive force at the motor terminals, the latter by its fall. It therefore becomes possible to use a synchronous motor, if the necessary current due to the load be not too great, as a voltage and phase regulator upon an alternating circuit, a _ function very valuable in power-trans- mission work. If the excitation be set to produce leading phase at small loads* the phase angle will gradually diminish as the load rises, and then, passing through zero, increase again with the lagging current, thus holding the power«factor near to unity at all working loads. In a well-designed synchronous motor, by proper initial adjustment of the field, the power-factor can easily be kept between 0-95 and I from quarter load to full load, and very close to unity within the ordinary working range. Save for its inability to start independently, the synchronous motor is a highly desirable addition to a transmission system. Starting is generally accomplished by the help of an induction motor or other auxiliary power, and the motor is treated exactly like an alternator, to be thrown in parallel with the supply circuit. A synchronous motor will pull itself up to synchronism if brought near to its synchronous speed, but this requires a very large amount of current. Operating from a generator of its own, it can be brought to speed by giving it a small initial rotation and raising the generator speed very carefully and gradu- ally, when the two machines will accelerate in synchronism. Poly- phase synchronous motors obey

these same general laws; they can, however, be started as quasi-induction motors with an open field circuit, the pole faces serving as secondary conductors, but require so large currents in thus starting themselves that it is better practice to bring them to speed by extraneous means.

Synchronous motors sometimes cause serious trouble by " pump- ing," a phenomenon closely allied to the surging of current between alternators in parallel, and due to similar causes. If not due to defective governing of the prime mover, it usually starts with a change of load or of phase, producing fluctuations in the electromo- tive force in the system great enough to interfere seriously with incandescent lighting, and continuing with nearly uniform amplitude and frequency for hours if unchecked. The amplitude varies with the conditions, but in the same machine the frequency is nearly constant. The fluctuation affects both the armature and the field circuits, the latter inductively by changes in the armature magneto- motive force, but it can as a rule be controlled by varying the exci- tation until a neutral point is found, usually when the phase angle is near to zero. Motors with solid pole pieces give little trouble of this sort, the oscillations being rapidly damped by the eddy currents. In motors with laminated fields the most effective remedy is cham- fering away the edges of the pole pieces so as to admit heavy copper shoes running along and under the edges, and even bridging the spaces between the pole pieces. The eddy currents in these shoes completely check the " pumping."

Synchronous and other Converters. — It seems here appropriate to refer to these converting devices, not in their general functions, but merely in so far as they are directly related to motor practice. The synchronous converter proper is in effect a synchronous motor, in spite of its commutating function. Owing to the fact that the direct current voltage is dependent on the alternating current voltage of supply, the converter cannot advantageously be used to control

the power factor by variation of the field strength, but the field can be adjusted once for all to hold the power factor reasonably near unity, provided independent means are available for so adjusting the applied alternating voltage as to give the required result at the commutator. If close regulation of the direct-current voltage is not demanded the converter field can be used more freely. As a matter of fact the synchronous converter finds its chief use in electric traction where close regulation is not important, and motor-generators in one form or another have been found more suitable for electric-lighting work. The synchronous converters have the liability to ” pumping ” or ” hunting,” to which reference has already been made, sometimes even of sufficient amplitude to throw the machine out of step, and are often provided with the shoes or bridges found useful with ordinary synchronous motors.

Synchronous motor-generators, so far as the motor function is concerned, present no peculiarities at all. Synchronous commuta- tors, ” permutators,” and the like, usually have motor- parts _ of very moderate capacity, and must be kept rigorously free of hunting in order to preserve the conditions of commutation.

In many instances, particularly in American practice, motor generators with induction motors have been used for ease of starting and to secure immunity from hunting. A modification of interest from the motor standpoint is found in the ” cascade converter.” In this machine the rotor of an induction motor is directly coupled to the armature of a commuting converter of equal output, the windings of the two being in series and approximately equivalent. In this case the normal motor-electromotive force is reached at approximately half synchronous speed, and half the energy is de- livered to the output end of the

machine by the rotor acting as frequency changer, the rest by torque on the shaft. Commutation takes place therefore at half the initial frequency, which is often a great advantage.

(B) 2. Polyphase Induction Motors. — Speaking broadly, an induc- tion motor is one in which the armature current is introduced into the armature windings by electromagnetic induction instead of by brushes. It is at once an alternating current transformer and an alternating current motor, operating in the latter function by virtue of the current received from the former. In the commonest form the alternating currents are of two or more phases inter- acting in carrying on these duplicate functions. Induction motors consist of two concentric masses of laminated iron taking the form of short hollow cylinders, of which the outer is fixed and the inner fitted to revolve. The outer surface of the inner drum and the inner surface of the outer drum are slotted or perforated to receive the primary and secondary windings of the apparatus. The outer winding is usually the primary, and the inner (or armature) winding the secondary. The primary winding is almost universally a multi polar drum in character; the secondary is, in the most highly devel- oped motors, of the same character, but very often consists merely of numerous insulated armature bars united at each end of the drum by a common end-plate or end-ring, forming the structure usually known as a ” squirrel-cage ” winding. In polyphase motors of the usual type the primary drum winding is. in duplicate or triplicate, resembling very closely the armature winding in a two- or three- phase generator. The actions which go on in these motors have been the subject of much debate; most of the theoretical discussions of the matter have been based upon the concept of a rotary magneti- zation produced by two simple sinusoidal magnetisms superimposed in quadrature upon the same core, or, in the case of a three-phase motor, three superimposed in a similar symmetrical manner. This hypothesis is often most convenient, being merely an application of the . general physical thesis that

two equal simple harmonic motions in quadrature produce circular motion, as in the case of the conical pendulum. All the results of this hypothesis follow, however, from the introduction of two alternating magnetizations, acting in quadrature in time but independently; and one or the other view of the matter is convenient according as, in the structure considered, the effective magnetizations do or do not produce a definite physical resultant. There is no discrepancy between the two hypotheses; they are merely two points of view of the same phenomena. In the general case, one need make no supposition as to the existence or non-existence of the physical resultant rotary magnetization; it is merely necessary to note that if one phase-winding predominately produce a magnetic field, and the other a current in the rotary member fitted to react with that field, torque will result, whether the two phase-windings act upon the same magnetic structure or upon two entirely separate magnetic structures merely connected by the leads which deliver current from one to the other.

Induction motors having both these forms of structure are in successful use. If one considers the latter case, the two-phase- windings have exchanged functions every 90 in the two-phase structure, each phase-winding serving to produce a magnetic field and to deliver, almost as if it were merely a pair of brushes, current to react with this field alternately, and the two halves of the motor structure exchange functions every oo°. Considering the motor in which the two-phase-windings are superimposed on the same core, there is a virtual magnetic resultant rotating at a speed determined by the frequency of the current and the number of poles, and setting up induced currents in the secondary member, which currents are so disposed as to react with the field to produce

rotary motion. At rest, the secondary electromotive force produced by the machine as a transformer is a maximum ; when the motor is running at speed, unloaded, it is a minimum, and an increment of load causes the secondary member merely to slip behind

synchronous speed far enough to receive an increment of transformed energy sufficient to carry the new load. If the secondary member is of very low resistance, the slip behind synchronism is very small, even at full load — less than 2 % in motors developed for this particular property. An increase of secondary resistance produces increased falling behind from synchronous speed ; and if resistance be added to the secondary member by interpolating rheostats in its circuits, the motor can be made to produce uniform torque over a very wide range of speed, as is the case with continuous current motors. The percentage of slip is the percentage of energy lost in the secondary member, as likewise in continuous-current motors if one regards their synchron- ous speed as that at which the motor electromotive force would equal that impressed. Polyphase induction motors start, when properly designed, with a very powerful torque, even up to three or four times the full load running torque of the same motor. With a very low-resistance secondary member this torque demands an immensely large current, the structure acting almost like a short-circuited transformer, and the lag in the secondary circuit is con- siderable^ In motors in which this large starting current is objec- tionable, it may be reduced very greatly by interpolating resistances in the secondary circuits at starting, the effect of these being to diminish the lag in the secondary circuit and to decrease the demand for primary current. A certain critical value of this resistance gives a maximum torque per ampere in the primary circuit with a given motor, being approximately that total secondary resistance which equals the secondary reactance. For maximum torque obviously both resistance and reactance should be equal and as small as possible. Where a small primary current in starting is of consider- able importance, this extra resistance is frequently introduced at starting and cut out afterwards, particularly in cases where large torque is necessary. If great starting torque is not necessary, the primary electromotive force is often diminished by inductive resist- ances, or a change in the connexions of the transformer from

which the motor is fed. Both methods of starting are in commercial use on a very large scale.

In efficiency and closeness of speed regulation and good general running properties polyphase induction motors approximate very closely to the best continuous-current practice. They produce, however, a certain amount of lag between primary electromotive force and current, which causes the apparent input to be larger than the real input, as generally happens in alternating-current work. The ratio between the real and the apparent watts input is the power factor of the motor. In well-designed modern machines this is usually from 85 to 90% at rated load; it should seldom fall below the former figure, and rarely rises more than 1 or 2 % above the latter, though in rare instances power-factors as high as 94 or 95 % have been obtained. Condensers have sometimes been employed in connexion with such motors to increase the power-factor, and with considerable success, particularly in maintaining the power-factor at low and moderate loads; but their use is generally unnecessary, and condensers of sufficient capacity at any reasonable value of the voltage have proved troublesome to build and maintain. The weakest point in these polyphase induction motors is the importance of employing a very small clearance between armature and field, in order to increase the power-factor by making the structure more efficient, considered merely as a transformer. The clearances in ordinary use are seldom greater than ^ in., even in motors as large as 100 h.p., and in smaller machines are frequently not more than •5 1 , in. Induction motors, however, possess many valuable proper- ties, and are the mainstay of long-distance power-transmission work at the present time.

(B) 3. Monophase Induction Motors closely resemble the poly- phase motor in construction, but have only a single-phase winding in the primary. The theories of their action are very similar to those of polyphase motors. The essential point of difference is that the stable angular displacement between the field magnetization and the armature currents which

co-act with it is obtained in the polyphase motor by the time-displacements in the several phase windings, while in the single-phase motor it is obtained by the angular space-displacement of the armature, which has to be set up by an initial rotation. Single-phase motors therefore are not inherently self-starting, and run in either direction equally well when once started. The torque is always in the direction of the initial rotation. This rotation is sometimes given by hand and sometimes by auxiliary phase-windings supplied by derived current from the main circuit, or merely short-circuited on themselves and receiving induced currents from the main winding. Both these devices give a small initial torque in a definite direction, setting up a so-called elliptical rotary field, i.e. one produced by the composi- tion of two unequal magnetizations, in this case at some indeter- minate angle, seldom large. Once up to speed, the single-phase motors act much like the polyphase. They are conspicuously weak in the matter of power-factor, however, as well as in that of starting- torque, and have as yet not come into very extensive commercial use, although under special conditions they have been and are successfully employed. A theoretically interesting form of induction

motor is a modification which runs at absolutely synchronous speed, receiving the necessary energy in the secondary not in virtue of slip behind synchronous speed, but from great difference in wave form between the primary and secondary circuits, so that energy due^o harmonics of the fundamental frequency is periodically received by the armature in spite of synchronism in speed. Such motors are not employed commercially, but sometimes find a field for usefulness in the laboratory.

(B) 4. Repulsion-commutating Motors constitute a class of single- phase alternating-current motors which has risen to considerable commercial

importance. They are fundamentally induction motors in the sense that the armature currents are supplied by the inductive action of the field. The armature winding is, however, provided with a commutator and (for a two-pole motor) two diametri- cally opposite brushes, which are short-circuited on each other and placed at an angle with the line of field magnetization. By this device the magnetic axis of the armature is held at a fixed angle with the field flux, so that the condition for steady torque is always fulfilled, its amount depending on the position of the brushes. Were these either in line with, or exactly at right angles to, the field poles, the torque would be zero — in the first case from lack of angular displacement, in the second from lack of secondary current. The brushes being skewed, however, the secondary current is maintained at a suitable value, and the motor runs in a definite direction. The general principle is merely that of a transformer with a movable secondary under magnetic thrust. During reversal of the current the torque relation remains fixed, since the primary and secondary currents both change sign, preserving the magnetic relations as in a series-wound continuous-current machine.

If such a motor is of moderate reactance, the currents are large and the torque very considerable. The repulsion-commutating connexion is considerably used as a starting device for single-phase induction motors, the commutator being short-circuited as a whole when the armature reaches synchronous speed. Thereafter the machine operates as a pure induction motor of the sort just described. The advantage of this change is that the commutator is eliminated, save at starting, and the motor becomes practically a constant speed machine like any other properly-designed simple induction motor. Such motors can be made to start if necessary with several times the normal running torque and a nearly proportionate increase of current. The short-circuiting of the commutator is generally performed automatically by a centrifugal governor. When at speed, efficiency and power factor are those of the typical motor of

class(B)3.

The pure repulsion-commutating motor, worked as such, on the other hand, resembles a series-wound motor in its characteristics, having no fixed speed and being capable of running far above nominal synchronism. This results from the fixed angular relation maintained by the brushes between the armature and field magneti- zations, whereby the torque conditions are preserved. Above the nominal synchronous speed, however, difficulties of commutation set in, so that some modifications of this simple type are desirable for wide ranges of speed. The_ power factors of these motors compare well, both in starting and in running, with those of the best pure induction motors, and their efficiencies are similar. These machines are reversible, serving as alternating generators when driven mechan- ically at ″ negative ″ speed.

Instead of simply skewing the brush line in the repulsion motor, an entirely analogous effect may be produced by dividing the field coils into pairs placed in quadrature, the brush line being parallel to one pair and at right angles to the other. This merely amounts to dividing the function of the original field physically into its components, a change which sometimes tends to improve the stability of the- running conditions.

A more radical departure is found in the group of so-called ″ com- pensated-repulsion ″ motors, of which there are several members, due to various inventors, all material improvements on the pure repulsion type just described. Their common characteristic is that while possessing like simple commutator-repulsion motors, a trans- former field acting upon the armature as secondary, and a pair of short-circuiting brushes holding the resulting armature magnetiza- tion in definite alignment, they also send the primary current in series through the armature via a second pair of brushes in quad- rature with the first. The substantial effect of this series connexion is to cut down the virtual reactance of the armature as the speed rises,

practically annulling it at synchronous speed. In alternating motors the motor-electromotive force is not merely that due to the motion of the armature conductors but the geometrical resultant of this and the reactance E.M.F.`s. In the motor here considered and analogous machines an auxiliary E.M.F. is applied either as here, conductively or inductively, in such direction as to compensate more or less perfectly the armature reactance E.M.F. The result is to secure, at least for a certain speed, a power factor near unity, as in the motor under discussion, although the starting conditions are not particularly good and the performance deteriorates above synchronism. In some motors of this type the compensating E.M.F. is introduced by an auxiliary winding in series and in quad- rature with the main field, instead of by supplementary brushes. The modifications of the general scheme are rather numerous, and out of them have come some excellent single-phase motors now widely used for traction purposes.

(B) 5. Series Commutating Motors. — This important and interest- ing type is derived directly from the ordinary series motor for continuous current. The torque in these does not change sign with reversal of the current in both field and armature, and consequently alternating current can still produce in them unidirectional torque. Practically the first step toward an alternating current series motor is lamination of the field to reduce parasitic currents; the second is to keep down the reactance. A laminated field motor performs fairly well at a frequency of 10 periods or thereabouts, but to render it useful at ordinary frequencies requires modification in design. The motor E.M.F. being as before the geometrical sum of the reactance E.M.F. and that due to motion of the armature conductors, the first improvement can be made by making the latter dominant, i.e. by making the armature relatively very powerful. The plain series commutating motor has then a relatively weak laminated field and a powerful armature. To check trouble with commutation due to short-circuiting

coils under a brush, it usually has high resistance commutator leads, and thus equipped is capable of very fair performance, having the same general characteristics as the continuous-current series motor. Even so the armature reactance is somewhat excessive, so that with this simple construction the power factor is apt to be bad. Practically the plain series commu- tating motor is hardly used at all, but rather modifications of it corresponding very closely to those mentioned in connexion with the repulsion motor. In other words, an auxiliary electromotive force tending to annul the reactance E.M.F. of the armature is imposed upon the armature circuit. This is accomplished generally by a " compensating coil " in series and in space-quadrature with the main field. In another modification the compensating coil is closed upon itself, forming a short-circuited secondary, to which the armature itself acts as primary. The end to be attained is the addition of an E.M.F. such that the vector sum of the E.M.F.'s in the armature shall reduce as nearly as may be to the E.M.F. due to the motion of the armature conductors, as in a continuous-current motor. Obviously it is difficult to secure full compensation for all loads and speeds, but it can be made nearly complete for some particular load and speed.

These " series-compensated " motors behave much like continuous- current series motors, and, when properly designed, run well on continuous current. They have been developed particularly for heavy traction purposes, to which they are well adapted, owing to their ability to work well at all speeds. They give a very high maximum power factor and a reasonably good one over a consider- able range of speed and load. Obviously both the field proper and the compensating field can be made subject to regulation to increase the range of successful action. Motors of this type have already come into successful use for fast and heavy railway service. Com- mutation appears to be reasonably good, although it is a far more difficult problem than with continuous-current machines.

The efficiency and output for unit weight in all alternating- current motors is a little less favourable than with continuous- current motors. In the last resort the supply of energy to a single-phase motor is essentially discontinuous, and there is inevitable extra loss from hysteresis and parasitic currents, whether the motor is single phase or polyphase. The result is that an alternating- current motor requires, other things being similar, more or better material, and loses a little more energy than a continuous-current motor of equal output. Motor design is a compromise, and while any one property can be exaggerated, it will be at the expense of others. One could probably build, for instance, a series-compensated motor of as high efficiency or as large output per unit weight as any commercial motor, but there would be sacrifice somewhere, in cost if not conspicuously elsewhere. As a matter of fact, the difference in efficiency usually amounts only to a very few per cents., and the difference in output per unit weight to a few more. The gain in the use of alternating-current motors is in facility and economy of distribution, which in many cases is far more than enough to overweigh any inherent disabilities in the machines themselves. Hence they are coming steadily into extended use. (L. Bl.)

MOTOR VEHICLES. The term ″ motor-car ″ is one which was primarily employed in America to denote the car or carriage containing the electro-motor used for propelling an electric tramcar or train of carriages on rails, but of late years it has been more usually applied in Great Britain to light automobile or mechanically-propelled carriages running on common roads. On the continent of Europe and in the United States the usual expression for these vehicles is ″ automobile ″; the term ″ auto- car ″ has also been employed. We shall deal here first with the history of mechanically propelled carriages, and with the evolution of the lighter type used for conveying people for pleasure and sport; and secondly with the heavier type used for the carriage of goods.

Light Vehicles. — The first practical steam carriage

was made by Richard Trevethick in 1802 (fig. 1), though Cugnot had produced a rudimentary one in France in 1769; but very little was done in

this direction until 1824, from which date a number of these vehicles were constructed and used with considerable success, taking the form of stage coaches propelled by steam, and weighing some 3 or 4 tons unloaded. Some of these ran regular passenger services, notably between Cheltenham and Gloucester, attaining average speeds of 10 to 14 m. per hour; but great

Fig. 1. — Trevethick's Steam Carriage of 1802: side view and plan.

opposition was met with owing to the narrow prejudice of those whose interests related to horse-haulage, and every obstruction was offered in the shape of prohibitive tolls and legislative enactments. The result was that steam carriages were driven off the roads in favour of railways, although the select committee of the House of Commons appointed in 1831 to inquire into the subject reported completely in favour of their adoption (as did also that of 1873). In 1861 the first Locomotives on Highways Act was passed, but the crushing blow came in 1865, when the legislature prescribed (1) that the number of persons required to drive the locomotive should be increased to three; (2) that a man should precede with a red flag; (3) that the maximum limit of speed should be reduced to 4 m. per hour; and (4) that they should be forbidden ever to blow off steam, &c. These restric- tions were confirmed rather than relieved by the 1878 act. Although these acts were created to deal with heavy traction, the famous 1881 appeal in the court of queen's bench placed every type of self-propelled vehicle, from a traction engine down

to Bateman's steam tricycle, under their narrow limitations. This resulted in the development of the heavy traction engine, and light motor vehicles were little more heard of in Great Britain. There were a few exceptions, however, notably the steam vehicles of Rickett (i860), Carrett (1861), Tangye (1862), Yarrow (1862), Holt (1866), Todd (1870), Perkins (1870), Mackenzie (1875) and Blackburn (1878), and some electrical carriages made by Elwell (1884), Ward (1886) and Volk (1888). An important departure was that of Butler, who constructed in 1885 what is believed to be the first vehicle (a tricycle) propelled by an internal combustion engine in England (fig. 2); he used the vapour of benzoline exploded electrically. Later, Roots successfully employed heavy oil, as did Knight. The chief prohibitory clauses of the acts were repealed in 1896, when the development of the internal-combustion engine had opened up entirely new prospects and suggested new possibilities.

Gottlieb Daimler's invention in 1885 of the internal-combus- tion motor using petroleum spirit was the first step towards the production of the modern self-propelled road vehicle, the next

step being the recognition in 1887 of the advantages of Daimler's system by M. Levassor and his application of that system to the propulsion of a carriage. In the nine years that immediately followed French manufacturers spent large sums of money in experimenting with and developing the motor-car, and by 1896, when the Enabling Act was passed, there were a few practical

Butler's Motor Tricycle of 1885.

vehicles in England but, perhaps, fewer probable buyers. British makers, starting as they did in the wake of the French manufacturers, were able to profit by the experience gained by the latter, and thus to avoid many otherwise inevitable mis- takes; they may not be able to claim to have originated many of the fundamental details of the modern motor-car, but their experience was gained at a

comparatively small cost.

Gottlieb Daimler's engine marked a great advance in the production of a source of motive power, for its efficiency was large as compared with its total weight, whilst the simplicity of its fuel system brought it within the scope of the person of average mechanical instincts and intelligence, for, even in its early days, the internal-combustion motor did not demand that its user should possess an intimate knowledge of engineering. Daimler fitted one of his motors to a bicycle in 1885, and after- wards applied the system to the propulsion of boats, one or more of which were running on the river Seine in connexion with the Paris Exhibition of 1887. It was this fact that brought the invention to the notice of M. Levassor, of the firm of Panhard & Levassor, makers of wood-working machinery, who saw the possibilities of its application to the propulsion of a road carriage. MM. Panhard & Levassor secured the French patents from Daimler, and M. Levassor devised the transmission system which, as far as its general scheme is concerned, is unaltered to-day, despite many efforts on the part of skilful inventors and designers to secure something better. M. Levassor placed the engine in front, the axis of the crank-shaft being parallel with the side members of the frame of the vehicle. The drive was taken through a clutch to a set of reduction gears and thence to a differential gear on a countershaft from which the road wheels were driven by chains. With all the modifications of details, the combination of clutch, gear-box and transmission remains

unaltered, so that to France, in the person of M. Levassor, must be given the honour of having led in the development of the motor-car.

Progress in the improvement of design was slow until

the year 1894, when a great impetus was given to the French industry by the organization, by the Petit Journal, of a trial run of motor vehicles from Paris to Rouen. The measure of success attained by the cars caused considerable surprise, and in the year 1895 a race was organized from Paris to Bordeaux and back, a distance of 744 m., when the winning vehicle covered the journey at a mean speed of 15 m. per hour. From that date onward, until 1908, racing played an important part in the development of the motor-car; in fact, it is not going too far to say that, up to 1904, it played a vitally important part therein. The effect was a rapid development in speed, efficiency and reliability, and others besides the sportsman and the individual seeking for new sensations were attracted towards the new vehicle. Racing was not indulged in in England or Scotland, the authorities having no power to close the roads for the purpose.

radical changes in previously-existing designs. So far as British makers were concerned, the Mercedes fashion was allowed to predominate, but some of the older French makers were less willing to follow the lead of the great German house. This fact assisted the British makers to forge ahead in their competition with the French. But the great factor in the triumph of British motor engineering arose from the fact that, in England, there was a great wealth of knowledge concerning the properties of steels and steel alloys, and that knowledge, which was advancing all the time, was turned to such good use that it is safe to say that, in only the very best of French cars is the same strength and efficiency obtained from the same weight of metal as would be used in the construction of quite a number of British cars. Lightness of moving parts has led to increased engine efficiency and to economy of fuel, whilst the inert parts of the mechanism — the frame and other fixed details — by being lighter, call for a smaller expenditure of power to overcome their inertia. Apart from the employment of special steels for motor-car construction, in which England took a leading part, many improvements

FlG. 3. — The 40-50 h.p. Six-cylinder Rolls-Royce Pullman-Limousi

In July 1902, Mr S. F. Edge, driving a 50 h.p. Napier car, won the Gordon-Bennett Cup in the course of the open race from Paris to Vienna. This trophy has played an important part in the history of the motor-car. It was offered for compe- tition among cars, entered by recognized National Automobile Clubs, no more than three cars being permitted to represent a country, and every car had to be built entirely in the country of its origin. The length of the race had to be not less than 500 kilometres (310^ m.). The first two races in 1900 and 1901 had been won by French cars and, as these contests had been run concurrently with the big city-to-city races, the importance of the Gordon-Bennett race was overshadowed. But it stood out in bold relief when an English car wrested the international trophy from its French rivals in 1902. The Automobile Club of Great Britain and Ireland (now the Royal Automobile Club) at once secured parliamentary sanction for the use of certain roads in Ireland for a limited period, and proceeded to organize a race worthy of the issue at stake. The race was won by the Mercedes car, the latest production of the famous house of Daimler.

The Mercedes car set quite a new fashion, for it showed advancement in a large number of its mechanical details, and many of these details were either copied or used as the basis for

isine.

in design and method have originated in Great Britain. For instance, the multiple-disk clutch, which permits a car to be started without shock, is an English invention, as are the detachable wheel, the spare wheel and the six-cylindered engine. The latter, introduced by the Napier Company and employed extensively by them, by Rolls-Royce and others, has exerted a great influence upon British tastes, because it created a growing dislike to noise, one of the consequences being the rapid

develop- ment of the silent car.

The representatives of Great Britain in the Gordon-Bennett race of 1903 were selected by means of a series of eliminating trials, and in 1904 and 1905 races were held annually in the Isle of Man for the same purpose. In the years 1906, 1907 and 1908 races were held in that island with such limitations on fuel or on the diameter of the cylinders as were calculated to encourage the development of small but efficient transmissions, and it has been conceded generally that these races served an extremely useful purpose.

Concurrently with its development into a reliable, silent, odourless and smokeless power-propelled vehicle, the motor-car gradually came into more general use. It no longer appealed only to a few but gained converts daily, and its final triumph came when it began seriously to displace the horsed vehicle.

becoming the private carriage of the wealthier classes to-be used on all occasions.

If the motor-car in the guise of a private carriage has developed at an astonishing rate, its adaptation to the needs of the com- munity, as a public service vehicle, has been even more rapid. The first cabs placed on the streets of London in 1903 were by no means a success, but the cabs constructed by the French house of Renault and first introduced in London in 1906 rapidly effected a revolutionary change in the means of individual transport. Apart from the improved speed of the motor-cabs, they gained popularity because of the use, on each one of them, of the taxi- meter, showing at a glance the amount of the fare, thus preventing overcharge on the part of the driver. One effect of the employ-

ment of motor-cabs and motor-omnibuses has been to reduce slightly the total number of vehicles, and to quicken a large volume of the traffic; it is now being recognized that to increase the speed of the whole of the traffic of London by about `5 m. an hour is practically equivalent to doubling the width of the whole of the main streets.

The new British act of 1903, which was enacted for three years only, was, during the parliamentary session of 1906 and subsequent sessions, continued from year to year because of the difficulty that was experienced in reconciling conflicting views about the control of motor-cars. The 1903 act raised the speed limit to 20 m. per hour and gave the local government board power to close to motor traffic such roads as, on inquiry, might be deemed unsuited therefor, and to impose a speed limit of 10 m. an hour or less in dangerous places, such as narrow streets in a town or through a village. A few serious accidents in England, and many abroad, have kept alive the fear that the motor-car is a dangerous vehicle that should be restrained or held in check by stringent legislation. Thus from 1904 onwards, the motorist was under continuous police supervision. Police traps, or measured distances, over which the motor-car is timed by the police, were established in most of the counties of England, and, whilst, without a doubt, many real offenders were caught, it is equally true that many an innocent driver was unfairly accused, whilst motorists guilty merely of technical infringements of the law were summoned.

The attitude of the police in showing little or no leniency in the application of the law probably, however, did good in other directions, although these were not contemplated either by the law-givers or the police themselves. It considerably limited the use of excessively powerful cars (for example, a 60 or 90 h.p. car that could easily attain 60 m. an hour), and experience has demonstrated the fact that, intersected as England is with a network of narrow roads carrying considerable traffic, there is little opportunity for the full power of such a car

to be used. The result has been that the comparatively low-powered vehicle has been developed in efficiency, bringing with it the advantages of economy in running, simplicity of mechanical details, cheapness of maintenance and ease of control and management.

The principle of the internal-combustion engine has not been altered since Daimler's day, but the mechanical details of the engine have undergone constant revision and improvement, until in 1910 it was safe to say that a four-cylindered engine, with a cylinder bore of 4 in., constructed, we will presume, in 1899, might have developed 20 h.p. or less, whereas engines of the same cylinder bore made in 1908 and 1909 actually developed 60 h.p. and more, and the attainment of even greater efficiency was in sight in 1910. Experience showed that the saving of weight meant greater economy in fuel and also in tires, the two principal items in the upkeep of the motor-car. Engine design has undergone unceasing improve- ment, and constructional methods have been continuously advanced, with the end in view of attaining lightness, not only in the moving parts, but in the inert parts. Lightness in reciprocating parts, such as the pistons, connecting rods and valves, has enormously improved crank-shaft speed. Cylinder castings are now made far lighter, whilst the water jacketing, for dissipating the excess of heat from the cylinder walls, is now"

of sufficiently ample proportions and, in consequence, better lubrication of the cylinder walls can be maintained. This again conduced to piston speed. The induction valves of engines of the earlier types were opened under atmospheric pressure, the reduced pressure in the cylinder, caused by the downward movement of the piston, enabling the pressure of the outer atmosphere to open the valve against its light spring, and to carry in a charge of the carburetted air that constituted the explosive mixture. But it was found that the automatic or atmospheric inlet valve opened late on the induction stroke and closed early, so that the engine only received an attenuated charge.

One of the earliest improvements in engine design, therefore, was the employment of the mechanically-operated inlet valve operated by a cam exactly as the exhaust valve is operated. This valve could be fully opened as soon as the piston had begun its downward or induction stroke, and could be held open during the momentary period when the piston was at rest at the bottom of the stroke, thus ensuring a full charge of explosive mixture. The method of exploding the charge in the cylinder has under- gone revolutionary changes. The first method, that of heating the exterior of a closed tube connected with the cylinder, quickly gave way to electric ignition because it was found that the charges could not be exploded by the hot tube until the piston had reached the top of its stroke, and, at the comparatively high piston speed of these engines, the piston had moved some distance on its downward stroke before the exploded gas had begun to expand. Electric ignition was an improvement because it enabled a " lead " to be given to the explosion, a low voltage current (from four to six volts of about one ampere being sufficient for the purpose) being automatically switched on to the primary circuit of a coil, the induced current in the secondary circuit being of a voltage sufficiently high (calculated at from 5000 to 10,000 volts of a very small amperage) to jump across a gap left in a sparking plug inserted in the cylinder. By rotating the body of the switch (called the contact breaker) the ignition could be timed to suit exactly the speed of the pistons and, in this way, greater piston speed was obtainable. The great development of this system was the introduction by Mr F. R. Simms, in conjunction with Herr Bosch, of the magneto machine, known as the Simms-Bosch magneto, the prototype for many such appliances. This machine, in its simplest elements, produces a low voltage current (assumed to be of about eight or ten volts) by the rotation of an armature in the magnetic field of a set of magnets, the rotation being effected through the timing-gear wheels of the engine. The low tension current is conveyed through a primary circuit inducing the secondary current which is employed for igniting the

charges. The advantages of the magneto are, firstly, that the primary current is created by the engine, and that the need for an accumulator as a source of that current is avoided and, secondly, that the spark is more efficient because the faster the armature is revolved the more, intense is the primary current and the induced current, consequently, the charge is ignited more rapidly. The magneto machine has almost entirely displaced the accumulator system for ordinary running, although, as the latter makes for easier starting, it is often fitted as an addition.

Great gain in power has been secured from improvements in the lubrication of the internal-combustion engine. It is now recognized that a small supply of oil to the journals and bearings of such an engine is insufficient, but in the early days it was found difficult to give the journals and bearings more oil without too much getting on to the cylinder walls, because the latter were lubricated by the oil that was thrown on to them by the spinning action of the webs of the crank-shaft and by the connecting-rod ends, these latter dipping into a well of oil in the lower part of the crank-case. The modern method has overcome this difficulty. The cranks and connecting-rod ends no longer dip into the oil, for the latter drains away into a sump or reservoir below the base of the crank chamber. Thence it is passed through a filter and pumped to ducts which convey the oil under pressure to the crank-shaft journals. Sometimes it is conducted thence along ducts bored in the crank-shaft and

through the webs and crank-pins, whence it feeds the connecting- rod bearings, enough squirting out to splash on to the cylinder walls. Sometimes, a shallow trough is placed under each con- necting-rod

end, to hold oil to a certain depth and no more, and a scoop on the big end collects enough oil to effect the lubrication of the connecting-rod bearings and cylinder walls. The aim has been to secure definite lubrication of all moving parts, and, at the same time, to prevent oil being present on the cylinder walls in such quantities as will permit the piston to carry it up into the combustion chamber. Any oil present in the combustion chamber is burnt during the explosion, but, its combustion being imperfect, smokiness of the exhaust is the result. By reducing the oil on the cylinder walls to the minimum necessary for lubrication, smoking has been abolished, whilst clogging, or carbonizing, of the valves has been materially reduced.

Methods of carburation have also undergone improvement, so that the carburation shall not materially vary with varying engine speed. The only other feature in the engine that calls for mention is the method of cooling. With the introduction

The 40-50 h.p. Six-cylinder Rolls-Royce Engine (valve side, showing also position of magneto).

Fig. 4. — The 40-50 h.p. Six-cylinder Rolls-Royce Engine (carburettor side, showing also high- tension distributor, and position of centrifugal water pump).

of the honeycomb type of radiator, by which the water is made to flow through canals an eighth or a sixteenth of an inch wide, the efficiency of the cooling system has been doubled because of the large amount of surface, in a given size of radiator, for dissipating the heat. A fan is generally employed, either situated behind the radiator and driven by the engine, or the flywheel is vaned so as to induce a current of air through the radiator.

To deal now with the transmission mechanism, the drive is taken through a clutch and gear-box as in the earliest days, but, for the final drive, chain transmission to the road wheels running on a fixed axle has largely given place to propeller drive on

to a live axle. The leather-faced conical clutch, although still employed, has in many cases given way to the multiple-disk clutch in which a number of disks bearing against each other, either flat in section, or (as in the Hele-Shaw clutch) having annular tapered grooves, are contained in an oil-tight box. These plates are capable of being separated laterally from each other when " out of gear," or brought into frictional contact with each other when it is desired to start the car. Metal-to-metal cone clutches, expanding metal shoe clutches, single metal plate clutches and coil spring clutches have all at some time found favour with de- signers wishing to avoid a leather clutch. Hydraulic and electro-mag- netic clutches have also been tried, but these have not gained any vogue. In the matter of the gear- box, the sliding into mesh of the gear-wheels as employed by Levassor is still the standard practice, although that pioneer himself regarded the method as barbarous, and looked upon it as a mere temporary expe- dient. But details of the gear-box have materially improved. A single lever is usually employed for engag- ing any of the forward gears or the reverse, so that the mistake of simul- taneously engaging a reverse and a forward gear is not possible. The spur-wheels are generally mounted in pairs on two sleeves, so that, by means of a selector mechanism that compels one sleeve to be brought to the neutral position before the other can be moved, no two gears can ever be engaged together. By means of " dog clutches," the clutch shaft can generally be coupled direct with the bevel-wheel driving the back axle, the " drive " on the highest gear being thus transmitted without passing through any spur-wheels. This reduces noise and frictional losses. Except for cars of great weight, chain transmission is fast dying out, the power being generally transmitted through a propeller shaft (with universal joints at one or both ends) to a bevel-drive on the back axle; such axle being divided into two revolving or " live " axles carrying the differential gear between them. The bevel-wheels, differential gear and live axles are enclosed and run in a lubricant.

Wire suspension wheels are grow- ing considerably in favour, a saving in weight being thus effected. The liability of the pneumatic tire to de- flation, through a puncture or burst,

has led to the introduction of detachable rims and detachable wheels. The detachable rim is borne on the periphery of the wheel (which is bonded) and secured in position by various methods. When the tire is punctured or damaged the rim and tire are removed bodily and replaced by a spare rim with its tire already in position and inflated, a change capable of being effected in five minutes or less. The detachable wheel is mounted upon a shell which fits over and is secured to a sleeve,

four cylinders (according to the choice of the riders) developing some 3 to 8 h.p. with magneto ignition and belt drive. The engine was usually started by the rider running alongside the machine, and causing the machine to rotate the crank-shaft through the belt and pulley until the initial explosion was obtained, when he would jump into the seat. Trailers were employed at first for carrying passengers, but, the length of the combined vehicle being between nine and ten feet, a side-car,

Fig. 5. — Plan View of the 40-50 h.p. Six-Cylinder_Rolls- Royce Chassis (1910 type).

which latter turns and is secured upon the fixed axle. In the case of tire trouble, the wheel intact is removed from the sleeve (which in the case of a driving-wheel carries the driving fittings, the brake-drums, &c.) and a duplicate wheel is substituted. The pneumatic tire has undergone continuous improvement, particularly in the matters of the selection of the material and the proportioning of the strength of the ” body ” to the

work which the tire is to be called upon to perform. Various methods have been devised for the prevention of skidding or " side-slip " on greasy surfaces, and, whilst certain mouldings on the rubber treads have proved advantageous, the method most adopted is that in which a large number of steel studs stand about a quarter of an inch above the surface of the tire.

It will be seen that the general lines of the car of 1889 have not required to be radically altered. Every detail has been improved so that the cars are more efficient, easier to control and manage, and infinitely more comfortable, but, in essence, Levassor's scheme is as good to-day as it was when planned by him.

The steam car is made by five or six British manufacturers at the most, whereas the actual manufacturers of petrol cars in Great Britain numbered at the end of the year 1909 about seventy, whilst some four hundred other firms were actively engaged in the construction of cars and their parts, accessories and sundries. But the steam car appeals to those men who are or have been steam engineers, and to them the management of the steam generator and the burners constitutes no difficulty. The limitations under which the early steam car laboured have, in the main, disappeared, for the modern steamer can travel nearly as far without requiring to refill the boiler as a petrol car can travel without replenishment of the fuel tank. The electric car is still the luxury to be employed in towns and in covering short distances, for the weight of the accumulators has not been greatly reduced, despite sensational announcements made from time to time. §

An interesting feature of the motor movement has been the steady growth in popularity of the motor cycle. The motor tricycle was developed up to the year 1903, and then gradually became displaced by the motor bicycle, which had been intro- duced in 1901. Motor bicycles gradually increased in popularity, until in numbers they were in excess of cars. The standard machines of 1909 had an air-

cooled motor of one, two or even

placed at the side of the cycle and secured thereto by detachable fittings, largely displaced the trailer and also the " fore-car," in which the passenger was carried in a body placed in front of three- and four-wheeled cycles.

The rapid growth of the motor movement in Great Britain may be judged from the fact that by the 30th of September 1905 the number of motor vehicles of all kinds registered had totalled to 74,038, and by the 30th of September 1908, three years afterwards, to no less than 154,415. Of these, 137,323 were registered in England and Wales, 10,907 in Scotland, and 6185 in Ireland. 71,405 were private motor-cars; 12,104 were trade motor-cars; 5880 were public service vehicles and 65,026 were motor cycles.

A year later (Sept. 30, 1909) the figures showed a further remarkable increase, the total number of vehicles registered in the United Kingdom being 183,773, giving an increase of 29,358 in the year. Of these, private motor-cars numbered 84,840; trade motor-cars 15,181; public service vehicles 8752; and motor cycles 75,000. The numbers registered in England and Wales were : 74 ,748 private motor-cars; 13,961 trade motor-cars; 8131 public service vehicles and 66,341 motor cycles, or 163,181 in all. The figures for Scotland were: 6157 private motor-cars; 1056 trade motor-cars; 584 public service vehicles and 5296 motor cycles or 13,093 in all. The figures for Ireland were: 3935 private motor-cars; 164 trade motor-cars; 37 public service vehicles and 3363 motor cycles, or 7499 in all. In the year private motor-cars in the United Kingdom increased by 18-8%; trade motor-cars by 55-4%; public service vehicles by 48-8 %, and motor-cycles by 15-3 %.

It is possible to obtain a better idea of the number of motor vehicles in use from the returns of the commissioners of inland revenue. The total number of privately-owned cars for which licences were issued in 1908 was 48,019, of motor cycles 35,784, and of motor-driven hackney carriages 17,300. These figures

may be compared with the registration figures already given for the year ending the 30th of September 1908. As accounting partly for the difference, a certain proportion of the registered vehicles (seeing that the figures include all vehicles in use on and after the 1st of January 1904, less those in respect of which the registrations have been cancelled) must have fallen into disuse and some vehicles will have been sold out of the country, whilst others will have been sold and re-registered with different authorities. But the life of the mechanism of a car, in one form or another, is of con- siderable length (there were, for instance, in use in 1910, as com- mercial vehicles, motor chassis that were put on the road in 1896), and it is considered that many registered but unlicensed cars remain for years capable of rendering useful service in emergencies or on special occasions, such as at election periods.

In 1906 an act of parliament authorized a census of production, which was taken in 1908, the statistics relating to 1907. These figures show that the output of complete motor vehicles in the United Kingdom in that year was 11,700 completed cars and chassis, and 3600 motor cycles, the total value of the productive work

done in the motor trade being £6,327,000 inclusive of repair work and the production of parts and accessories.

The number of cars and chassis imported into and retained in the country (those imported and afterwards re-exported being excluded from the statistics) in 1909 was 7747 as compared with 6530 in 1908. The absence of a classification, in 1907 and previous years, for chassis prevents further comparison in the matter of numbers, but taking the

value of the motor-cars, parts and acces- sories imported into and retained in the United Kingdom, there is a total of £4,170,121 in 1907, £3,753,140 in 1908, and £3,922,781 in 1909; the average value per car falling from £432 in 1907 to £333 in 1909. The value of the motor cycles and their parts imported into and retained in the country was £71,101 in 1907, £52,206 in 1908, and £48,327 in 1909.

The number of British made cars and chassis exported in 1909 was 2802 as compared with 2441 in 1908, and of British made motor cycles 1893 in 1909 as compared with 1048 in 1908 and 800 in 1907; the total value of the exports of cars, parts, chassis and motor cycles in 1909 being £1,669,361 as compared with £1,315,913 in 1908 and £1,378,180 in 1907.

With the growth of the motor-car movement there have, naturally, been great developments in the outside industries catering for the motorist. Most affected by that movement has been the oil trade, considerable changes having taken place. In the distillation of crude petroleum for the production of lamp oils, &c, quantities' of volatile spirit were obtained, the outlet for which, formerly, was small, as the spirit was mainly used for cleaning purposes. With the introduction of the petrol motor this spirit came into demand, and, as the demand increased, the situation changed and the crude petroleum had to be distilled mainly for spirit, thus leaving a surplus of the heavier oils. The situation was largely met by a gradual conversion of the petrol-consumers from spirit of 68o specific gravity to a spirit of '715 specific gravity, whilst for com mercial motors even heavier grades were employed. The quantity of -715 spirit obtainable from a given quantity of crude oil is considerably greater than the quantity of -68o that could be produced, so that a better balance between the demand for motor spirit and that for lamp oil has been effected. The total quantity of motor spirit used in the United Kingdom in 1909 was 60,000,000 gallons, of which about one-half came from the Dutch

East Indies, whilst a third came from America. Rumania supplied about 6,000,000 gallons and Russia about 3,000,000 gallons. Large quantities of lubricating oil were obtained from America, whilst the remainder (about one-tenth of the total) came from Russia.

France is the centre of the motor-car industry in Europe, and up to the year 1906 it undoubtedly led in the production of motor vehicles, but in that year the United States of America, as we shall have occasion to note, took the lead. The number of private cars in use in France had risen from 1438 in 1899 to about 23,000 in the year 1909, whilst industrial vehicles have increased even more rapidly in number. The following figures are obtained from the taxation schedules: —

Number of Vehicles in use.

Year.

Total.

Pleasure Cars.

Industrial Cars.

1899

1-438

234

1,672

1900

2,354

543

2,897

1901

4427

959

5,386

1902

7,358

1,849

9,207

1903

9,922

3,062

12,984

1904

12,519

4,588

17,107

1905

15,011

6,532

21,543

1906

17,358

8,904

26,262

1907

19,601

11,685

31,286

1908

22,252

15,334

37,586

1909

26,000

20,000

46,000

The figures for the year, in the absence of the official return, are estimated.

The average h.p. per car (pleasure vehicles) has steadily risen from 5-06 in 1901 to 13-28 in 1908, the number of cars seating more than two persons having increased in greater proportion than those seating one or two persons.

The export of French motor vehicles had risen in value from 4,259,000 francs in 1899 to 144,352,000 francs in 1907. In 1908 the exports fell to 127,300,000 francs, and in 1909 an improvement to about 145,594,000 francs had taken place. The imports of foreign motor vehicles to France rose from 473,000 francs in 1899 to 8,676,000 francs in 1907, and since that period there has been an annual decrease.

In Germany the number of motor vehicles of all kinds in use on the first of January in each year is shown in the following table: — Year. Number of motor vehicles.

1907 ….. 27,026

. 1908 36,022

1909 ….. 41,729

I9IO 41,941

In 1910 45% of the total consisted of motor cycles, 49-3% con- sisted of pleasure vehicles and 5-7 % consisted of commercial vehicles, the proportion of pleasure vehicles having consistently risen in the four years.

The development of motoring and of the motor industry in the United States has been exceedingly rapid. As good roads multiply and extend the use of cars must be still further developed. The American farmer has discovered that he can make considerable use of the motor-car in connexion with his industry, and this fact largely accounts for the demand for high-wheeled buggies, and for vehicles having ample clearance between the machinery and the road level.

In the early days of the movement the American taste inclined towards steam cars, and the mistaken view that the vehicle driven by an internal-combustion engine could never be made to run as silently as a steam car was generally held. But in Europe the petrol engine became refined so rapidly that its equality with the steam engine in the matter of silence, together with its superiority in the matter of simplicity and suitability for the man who is not an engineer, soon created for it a popularity that prevented any material expansion of the business in steam cars. The makers of steam cars in America are able to cope with the major portion of the world's demand for this particular type of vehicle.

The introduction of the Dingley tariff, assessing an import duty of 45% ad valorem on motor-cars (in the classification of " manufactured metal "), added to a further charge of about 5 % for freight, encouraged American capitalists to embark upon the manufacture of motor-cars, and in 1899 thirty manufacturers produced 600 cars. In 1909 the number produced by 200 concerns was 114,891. Set out in tabular form such figures as are obtainable are very striking : —

Cars Produced.

Year.

Number.

Value.

$

1899

600

1 ,290,000

1903

10,576

16,000,000

1904

13,766

24,500,000

1905

20,787

42,000,000

1906

23,000

50,000,000

1907

42,694

105,000,000

1908

49,952

83,000,000

1909

114,891

135,000,000

1910

200,000

225,000,000

The number of cars for 1906 is approximated and the number of cars and their value for the year 1910 are based upon the estimated output of the various manufacturers. In 1908, whilst the number of cars constructed showed an increase over the number for 1907, the total value had decreased owing to the commercial crisis of that year. In 1909 those manufacturers who had formed the Association of Licensed Automobile Manufacturers, and who agreed to recognize the validity of the Selden patents, paid licence fees upon 94,891 cars, the remaining 20,000 cars being estimated as the output of the concerns that did not belong to the association.

Of the 200,000 motor vehicles estimated to be constructed in 1910, 165,000 were to be petrol-driven pleasure cars, 30,000 were to be petrol-driven high-wheeled buggies, and 5000 steam and electric carriages and commercial vehicles.

The history of the Selden patent may be given briefly A patent was applied for on the 8th of May 1879 by George B. Selden, of Rochester, New York, for a gas compression engine for propelling road vehicles. A patent was granted to him on the 5th of November 1895 for an improvement in road engines, and he claimed that any vehicle propelled by an internal-combustion engine, manufactured since that time, was an infringement of his rights under the patent. At the commencement of the year 1910, 71

manufacturers admitted this claim and paid to the Association of Licensed Automobile Manufacturers lj% of the catalogue price of their products as licence fees.

The imports of motor vehicles into the United States of America are not numerous, as will be seen from the following figures :—

!433 cars imported J oi7 ,, ,, 1387 „

1902 . . 265 cars imported 1906 .

1903 . . 267 ,, . ,, 1907 .

1904 . . 605 ,, ,, 1908 .

1905 . . 1054 „

The exports rose from $599,927 in value in the year 1902 to $5,502,241 in 1907 with a falling off & $5,277,847 in 1908.

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Heavy Commercial Vehicles

Heavy types of motor-cars are now widely employed for commercial purposes. The earliest British-built type was the steam-propelled wagon, and its evolution was largely encouraged and hastened by important competitive trials, at Liverpool, in the years 1898, 1899 and 1901, which were conducted by the Self-Propelled Traffic Association. Other series of trials were held by the Royal Agricultural Society of England and the Royal Automobile Club.

From the end of 1896 to early in 1905 no commercial motor vehicle was legal in England if its unladen weight exceeded 3 tons, and this limitation caused much financial loss to pur- chasers who overloaded them. The Heavy Motor Car Order of 1904, which came into force on the 1st of March 1905, increased the maximum unladen weight to 5 tons, whilst limiting the gross weight to 12 tons; by the same order, the combined unladen weight of a motor wagon and the single trailer which it is allowed to draw was fixed at 65 tons. In effect, the gross weight of a trailer and its load may not exceed 8 tons, thus yielding a total gross weight, for loaded wagon and loaded trailer, of 20 tons. Excesses in any particular cause a commercial motor to be treated as a " heavy locomotive," or traction engine, when its freedom of movement, speed, &c, are restricted more severely.

Miniature traction engines, constructed to comply with the requirements of the Motor Car Acts and

Orders, have progressed since 1905; they are chiefly used where it is a convenience to separate the power and carrying units, as by furniture-removal and other contractors.

The working cost of a steam wagon with a 5-ton load, in Great Britain, inclusive of provision for interest on capital, depreciation and maintenance, varies from 73d. to 9d. per mile

run, on an average basis of 180 m. a week; with a trailer carrying another 3 tons the corresponding figures vary from 9d. to is. per mile run, according to nature of roads, gradients and fuel available. The inclusive working cost of a tractor, on mac-adamized roads, is generally about 15% less than for a 5-ton wagon, but a standard tractor cannot haul more than a gross load of 8 tons behind the drawbar — except on dry and level roads. On granite setts the extra vibration often causes undue wear and tear, unless the suspension of the tractor be very good.

Vehicles in which the power is derived from internal-combus- tion engines are commonly known as ″ petrol ″ vehicles. Petro- leum spirit of 0-700 specific gravity is usually the fuel, but many are now supplied with spirit of 0-760 specific gravity; the range of boiling points is the criterion of satisfactory use — not the density. Petrol vehicles are, practically, stoutly-built motor- cars, and some of the models now in use have been developed from accepted designs of lighter types. There are, however, numerous manufacturers who construct solely for utility pur- poses. Below net loads of 2 tons, the petrol-propelled vehicle

Summary of Working Costs for Petrol-driven Vehicles (Exclusive of Management) in England.

Particulars.

(Petrol at iod. per gall.) Average weekly mileage .

Driver’s wages …. Fuel (petroleum spirit) Oils and

grease …. Rubber tires …. Repairs (material and wages' Rent, rates and lighting . Insurance and claims . Depreciation …. Interest on capital.

Totals

Net loads carried : Costs in pence per vehicle-mile.

10 cwt.

400

0-84

o-55

0-12

0-50

o-55

0-12 0-12 0-65

0-15

3-60

I ton

400

0-84 0-77

0-12

o-75

0-85

0-15 0-24 0-90 0-25

4-87

2 tons

390

1 -oo

o-95

0-14

i-i5

1-03 0-25

o-35

1-06

o-33

6-26

3 tons

350

1-09 1-25 0-16 1-50 1-17 0-40 0-42 1-36 0-47

7-82

5 tons

300

i-6o

1-67 0-24 2-60

1-55 0-50 0-65

i-6o

0-64

11-05

1 Steam

1873)

has a virtual monopoly of use in England; above that, it shares the trade with steam. A tabular

statement of current working costs of approved petrol vehicles is published herewith.

Before proceeding to describe and illustrate representative types of vehicles, tractors and special machines, a brief summary of the outstanding points in the English statutes and orders which apply to heavy motor-cars may well be given. Any motor-car with an unladen weight in excess of 2 tons is held to be a ″ heavy motor-car,″ and a ″ trailer ″ means a vehicle drawn by a heavy motor-car. The expression ″ axle weight ″ means the aggregate weight transmitted to the surface of the road or other base whereon the heavy motor-car or the trailer moves or rests by the several wheels attached to that axle when the heavy motor-car or trailer is loaded. The expression ″ weight,″ in relation to a heavy motor-car or trailer when unladen, means the weight exclusive of the weight of any water, fuel or accumulators used for the purpose of propul- sion. All hea - y motor-cars have to be registered with a county council, cou? ty borough, or other registering authority, and owners haw to declare, on suitable forms, the unladen weight, the axle w ight of each axle, and the diameter of each wheel. When a 7 »gistration certificate is issued it bears these data, in additi' n to a statement of the width and the material of the tyre on each wheel, and the highest rate of speed at which the heavy motor-car may be driven. The owner, after registration, must cause to be painted, or otherwise plainly marked, upon some conspicuous part of the offside of the heavy motor-car, the registered weight unladen, and the registered axle weight of each axle, whilst, upon the near side of the heavy motor-car, he must similarly cause to be painted the highest rate of speed at which it may travel. Width of tires, which in no case may be less than 5 in., varies in relation to imposed load and wheel diameter, and a table of these is issued by the local government board. It is specified that ″ the width shall not be less than that

number of half-inches which is equal to the number of units of registered axle weight of the axle to which the wheel is attached." Taking a wheel 3 ft. in diameter as a basis, the unit of registered axle weight is -j\ cwt.: this unit increases in the proportion of 1 cwt. per 12 in. increase of diameter, and decreases at the rate of 1 cwt. for every 6 in. reduction in diameter below 3 ft. The speeds at which heavy motor-cars may travel vary from 5 m. an hour to 12 m. an hour. Heavy motor-cars fitted with tires of a soft or elastic material may travel at higher rates of speed than if they were not so fitted.

Any motor-car used for trade purposes, but whose unladen weight does not exceed 2 tons, is allowed to travel as fast as 20 m. an hour, and is regarded as an ordinary motor-car.

Motor-buses. — The first double-deck motor-bus, of the type of which upwards of 1000 are in regular service in London, was licensed by the police authorities in September of 1904. The type of chassis employed is practically identical with those used for loads of 3 tons in the goods-haulage branches of the industry, and the accompanying chart, which is prepared from

Number of London Motorbuacm ■ in Commission"

Art" tr TV timnntUntiinr' n

data exclusively collected by the Commercial Motor (London), indicates the growth in the totals since the inception of this departure in the public conveyance of passengers. The growth of motor-bus traffic has resulted in the displacement of some 25,000 horses and 2200 horse omnibuses, during the five years ending the 30th of June 1010, and it is estimated that there will be practically no horse omnibuses in London, except upon a few suburban

routes, by the end of 191 1. The inclusive working cost of a London motor-bus, with good management, varies

between 9d. and rod. per mile, which figures cover interest, depreciation and administration.

Successful provincial motor-bus undertakings, in the United Kingdom, are numerous, and those at Eastbourne, Keighley and Hull may be particularly mentioned of municipal under- takings, whilst the Great Western Railway Company alone has 130 such vehicles at work.

Motor-cabs.- — Spasmodic efforts to introduce motor-cabs in London were made during the years 1905 and 1906. It was, however, only in the month of March 1907 that the General Motor-cab Company put the first 100 vehicles of its present large fleet into regular service. The growth of motor-cabs is indicated by the following numbers, for which the author is indebted to the Commercial Motor (London), and these are of vehicles licensed at the dates given: December 31, 1905, 19; December 31, 1906, 96; December 31, 1907, 723; December 31, 1908, 2805; April 30, 1909, 3203; April 30, 1910, 4941. It is estimated that, at the 30th of June 1910, there are only 1200 horse-drawn hansoms in regular use, and not more than 2500 horse-drawn four-wheelers, in London. In 1904 London had a total of 11,055 horse-drawn hackney carriages, and two self-propelled hackney carriages. The London hiring rate for motor-cabs fitted with taximeters is: for the first mile or part thereof, 8d., subject to an additional charge at the rate of 2d. per 25 minutes for any waiting time or travelling below the rate of 6 m. per hour; 2d. per additional 440 yds., or 25 minutes of waiting or of travel- ling below 6 m. an hour; with the addition of 2d. per package for any package carried outside, and 6d. for a bicycle and 6d. each for each passenger above two, for any distance. The horse- drawn hansom-cab is is. for the first 2 m., with 6d. for each additional mile or part of a mile, and with a charge of 8d. per 15 minutes of waiting, after the first 15 minutes completed. Taximeter cabs

cannot be engaged by time in London, but horse-drawn cabs may be so engaged at 2s. 6d. per hour for a hansom, and at 2s. per hour for a four-wheeler. The taxicab rates apply throughout the Metropolitan Police area, which in some direc- tions extends as far as 20 m. from Charing Cross, but horse- vehicle rates (except those of time) are doubled for any distance beyond a four-mile radius.

Steam Vehicles. — Steam wagons may, generally speaking, now be divided into three distinct types, and these are dis- tinguished chiefly by the particular form of final drive adopted by the designer. There are in general use by the well-known

Driving Quia

Figs. 6-a — Standard and Representative Types of Present-day Steam-wagon Construction.

makers, at the present day, only three methods of effecting such a drive: (1) by means of spur or double-helical gear to a live back axle, as illustrated in figs. 6 and 7; (2) with two side chains transmitting the drive from a differential intermediate counter- shaft to the wheels on a fixed back axle, as shown in fig. 8; and (3) by means of a single chain transmitting the drive from an intermediate shaft to a differential gear on a live back axle, as depicted in fig. 9.

The transmission on the first type of vehicle (figs. 6 and 7) is by means of gearing throughout, and is completely enclosed, thus ensuring protection from dust, and more perfect lubrication. Change gears to give two speeds are provided. This form of drive necessitates a special disposition of the spring mounting, in order to ensure that there shall be no sliding motion taking place between the teeth of the reducing gear, due to the distance between the centres of the countershaft and the back axle varying with the changes in the spring deflexion. The gear drive offers advantages which, for heavy loads, are not offered by any other form of drive.

The features which are common to all steam wagons of the second of these types are: vertical fire-tube or water-tube boiler; horizontal compound engine; two-

speed gear; differential counter- shaft; and two sprockets which transmit the final drive, through chains, to the rear road wheels. The exact form which the boiler takes is a point which has considerably exercised the ingenuity of individual designers, in order to arrive at one that can be cheaply produced,

Fig. 10. — The Unique Type of Steam Wagon made by the Yorkshire Patent Steam Wagon Co.

efficient, simple of construction, easy to clean and repair, strong and reliable, and one which will not prime. The vertical type of boiler lends itself admirably to the general design of a steam wagon, because it takes up so little of the total length of the vehicle, whilst the fittings can be mounted in much more accessible positions than are possible with the majority of loco-type boilers. The efficiency is not, however, so high as is the case with the latter type. It may be generally stated that boilers of the vertical class, as used on 5-ton or 6-ton steam wagons, have a total heating surface of about 90 to 95 sq. ft., with about 4 sq. ft. of grate area, and the working pressure is from 200 lb to 225 lb per square inch. The usual and necessary fittings include: pressure-gauge; two safety-valves, two check-valves, and a blow-off cock. The feed water is normally supplied to the boiler by a plunger pump driven from the crank-shaft. The compound engine has all the valve motion completely enclosed and running in an oil-bath, and is provided with means whereby high-pressure steam can be supplied to the low-pressure cylinder, in order that extra power may momen- tarily be obtained. The change-speed gear pinions, cut from solid steel, are most often mounted on an extension of the crank-shaft, and mesh with machine-cut gear wheels which are mounted on the intermediate shaft, on which the differential gear is also mounted. The gears provide for two ratios of reduction from engine to road wheels; the higher one is for all ordinary running, and the lower one is for steep hills or for very bad roads. The outer ends of the differential shafts are fitted with chain sprockets, from which the drive is

taken to the back wheels by means of chains.

The third type (fig. 9) of steam wagon is particularly business- like in appearance, and sound in construction and design. It

is the outcome of many years' experience in the design of road locomotives, on the lines of which it is constructed. The loco- type of boiler is very economical in fuel consumption, and is a very efficient steamer. Comparing this type of boiler with the vertical type, the former can be made of a much lighter construe^ tion for a given rate of evaporation, and the smoke-box door at the forward end offers a most simple and easy means of access to the smoke tubes for cleaning purposes. No vertical boiler offers such ready means of effecting this operation. The engine, which is mounted over the boiler in this type, is in full view of the driver, and, should it become necessary to make any repair or adjustment when on the road, this can easily be effected with- out grovelling under the wagon or removing any of the load. Objection may be raised to the position of the engine, on the score of its necessitating such a long chain drive to the back axle; this objection has not been sustained in practice, as many wagons employing this form of drive have been running for lengthy periods without giving any trouble on that score. The engine, which is a compound one, is close up to the source from whence it is supplied with steam, and consequently receives the steam in a much drier condition; there is less condensation in the main steam-pipe, because the length of this is reduced to a minimum. The short steam-pipes should tend to lessen the risk of their being broken from the sagging or twisting of the frame, a fault which is not unknown with vehicles having the engine a considerable distance from the boiler. This type, like types 1 and 2, also has two change-speed pinions, mounted on an intermediate shaft. These pinions may be of the sliding type, or may be operated by means of dog-clutches. The pinions mesh with two wheels that are mounted on a counter- shaft, on which is also fixed a chain-sprocket, from which the drive is

transmitted, through a long chain, to a chain-wheel surrounding the differential gear mounted on the back axle. Traction-engine type of steering gear, with revolving fore- carriage, is most generally adopted, and is rendered sufficiently rapid in its movement by suitable gear, operated by a diagonal shaft and wheel, from the driver's footplate.

Fig. 10 shows the general disposition of the main parts of a " Yorkshire " steam- wagon. This machine follows the general lines of those of type 3, so far as transmission gearing is concerned, but its boiler is of very distinctive construction, as may be seen from the sectional view in fig. 11; its engine is one of the vertical compound type, and is mounted directly behind the driver.

^JTIL

FlG. II. — The Yorkshire Steam Wagon Co.`s ingenious Loco-type Transverse Boiler.

The Sheppee steam-wagon, or " steam-gas " vehicle as it is some- times termed, on account of the high degree of superheat to which the steam is raised, and which superheat gives to the steam many of the characteristics of gas, is shown in fig. 24, and, it may be seen, this wagon is entirely dissimilar to any other machine with which this article deals. The generator and paraffin burner are housed within a " bonnet," and the temperature of the steam is controlled by a very simple form of thermostat. After leaving the engine, some of the heat in the exhaust steam is utilized to heat up the feed water before it is passed into the generator; the steam then passes in series through two condensers — one in front and one underneath the vehicle.

Another vehicle which embodies many novel and practical features is the new Leyland steamer, the construction of which includes one of the well-known Leyland fire-tube boilers, as shown

in fig. 1 8, a three-cylinder, single-acting, vertical engine, and an all-gear drive to the rear wheels.

Boilers. — The locomotive type of boiler is shown diagrammatically in figs. 12–15. The first of these four diagrams illustrates the

of heat is provided in the mass of the heated tubes, and the rapidity of flame application by the burner, and not in a mass of heated water. The steam, too, is very highly superheated, and necessitates the use of a specially-designed engine with mushroom valves.

Figs. 12–15. — Fig- I2 shows the Belpaire type of fire-box construction as compared with the more usual type shown in fig. 13. Fig. 14 and fig. 15 show the form of locomotive boiler fitted by Sidney Straker & Squire, Ltd. The back of the fire-box is sloped so as to accommodate the gear shafts without unduly lengthening the frame.

Belpaire type of fire-box outer shell, and, by its side fig. 13 shows the older form of construction. The Belpaire fire-box is a develop- ment of recent years, and its undoubted superiority over the older type is meeting with increasing recognition amongst boiler makers. The sloping back plates of the fire-box, as shown in fig. 15, are intended to give plenty of room for the housing of the change-speed gearing without undue lengthening of the vehicle or reduction of the area of the fire-grate.

Fig. 19 shows one form ot paraffin burner, which type is used in conjunction with semi-flash boilers. The fuel is first vaporized, by being passed through a heated coil.

Steam Engines for Vehicles and Tractors. — The Bentley superheated steam engine, which is fitted to Colonel Crompton's tractor, is shown in fig. 20.

It has four high-pressure cylinders, and four in which low-pressure steam is operative. In a number of tests which were made

otKAurr wzzur.

WATER LEVEL GRADIENT t««.

VUSIK.E PLI»

Figs. 16, 17, 18. — Fig. 16 shows the Toward Vertical Boiler, fig. 17 Alley & MacLellan's Sentinel Water-tube Boiler, and fig. 18 the Vertical Smoke-tube Boiler fitted on Leyland Steam Wagons. The smoke tubes in the last-named boiler are provided with copper sleeves to prevent corrosion.

Figs-. 16, 17 and 18 show vertical boilers made, respectively, by Toward, of Newcastle, Alley & MacLellan, of Glasgow, and the Leyland Co., of Leyland. The smoke tubes of the last-named boiler are provided with copper sleeves, the object of which is the prevention of corrosion of the outer surfaces of the tubes. All- copper tubes have been tried, but they are too soft to withstand the abrasive action of the fine particles of coke which are ejected from the fire.

In flash or semi-flash boilers, or steam generators, such as are fitted by the Darracq-Serpollet Co., the Sheppee Motor Co., of York, and to the tractor made to the designs of Colonel Crompton, C.B. (fig. 26), only a very small volume of water is at any time in the tubes. The tubes are exceptionally strong and thick, and they are made of cold-drawn steel; the water is only forced into them stroke for stroke of the engine. The essential difference between this class of generator and any ordinary motor-wagon boiler, whether of the water-tube or fire-tube patterns, is that the reserve I Fig. 19. — The Lune Valley Paraffin Burner.

HEAVY]

MOTOR VEHICLES

with an engine of this type it was found possible to work it on an expenditure of 13 lb of water per brake-horse-power hour. Another interesting superheated steam engine is the two-

type does not necessitate the fitting of eccentrics ; the second system entails the use of one eccentric for each cylinder; whilst Stephenson's system necessitates the provision of two eccentrics per cylinder.

Fig. 20. — The Bentley Eight-cylinder Diagonal Tandem-compound Superheated-Steam Engine.

cylinder, double-acting engine made by the Sheppee Co., and Steam Tractors. — The great popularity which the light steam illustrated^ in fig. 21. In this engine the cam-shaft by which the tractor • ig undoubtedly due t0 its extreme usefulness in steam and exhaust valves are operated is situated midway 01 the , ` ` , , . . J , .

cylinders' length, and is driven by bevel gearing from the crank- cases where the employment of steam wagons could not prove shaft. Fig. 22 shows a combined steam and hand-operated remunerative. For brickmakers, builders, market gardeners water pump, for use in conjunction with either of the engines and a host of others whose business demands that separate mentioned. loads of heavy material must be moved from place to place

without involving terminal delays, the tractor offers a simple and ready means of attaining the desired end. The first cost is comparatively low, and such a " steam horse " can be kept constantly at work if there is sufficient demand. A steam tractor is economical and efficient; it can be used on roads where a steam wagon would be impracticable on account of its

Fig. 21. — The Sheppee Motor Co.`s compact Double-acting Superheated " Steam-gas " Engine.

The Sentinel wagon, built by Alley & MacLellan, Ltd., is perhaps the only heavy steam wagon with a two-cylinder, simple, double-acting engine controlled by cam-actuated poppet valves; this engine is shown in section in fig. 23, and, in some respects, it greatly resembles the Sheppee engine.

The four special engines already named — those by Leyland, Bentley, Sheppee and Alley & MacLellan — differ totally from the type which is fitted most usually on steam-propelled com- mercial motors, yet they are very practical examples of special practice. The majority of steam vehicles are provided with two- cylinder compound engines, in which the steam distribution is effected and controlled by one or other of the proved link motions, such as the Joy, the Solms or the Stephenson. The first-named

Fig. 22. — The Sheppee Combined Steam-driven or Hand-operated Water-pump.

great axle weight, and, when not used for hauling, it can be put to other work such as driving pumps or builders' machinery, or for a host of other purposes requiring a portable power installa- tion. The fact that the motor is separate from the wagon, or trailer, which conveys the load, and can haul a loaded trailer to its destination, leave it, and return with, or for, another loaded trailer, without waiting for the first load to be unshipped, not only makes this class of motor extremely useful to agricul- turists and others, but it makes for greater efficiency, in a large number of cases, because the power unit is not allowed to stand idle during the loading or unloading operations. Another vital point is the low annual cost of maintenance.

Since the passing of the 1903 Motor Car Act, and the coming into force of the 1904 Heavy Motor Car Order, many of the well-known makers of road locomotives have turned their atten- tion to the production of a machine which would come within the prescribed constructional limits, and would meet popular demand. These machines are built on proved traction-

engine lines, but with all the parts of suitably reduced size so far as is consistent with strength and the work which the machines are

called upon to perform. The locomotive type of boiler, with large fire-box, a heating surface of about 65 sq. ft., and a grate area of some 3 sq. ft., is used by the leading makers.

»CBANKCASC SUSPENSION PLATE

REVERSING LINK.*

Fig. 23. — Alley & MacLellan's Twin-cylinder Steam-engine as fitted to the Sentinel wagons. The steam and exhaust ports are operated by a cam-shaft.

Some of the early tractors were fitted with single-cylinder engines, but, although this type is still supplied by several makers, the more general practice is to provide a compound engine, with a multiplying valve which admits high-pressure steam into the low-pressure cylinder, thus enabling the engine to develop considerably more than its normal power for short periods. The engine is mounted over the boiler, with its crank- shaft at right angles to the axis of the barrel. Two changes of gear ratio are usually provided ; one for normal running, and a lower one for very soft ground or steep hills. The driving axle is of the differential or live type, and provided with means for locking the compensating gear and rendering it inoperative

Fig. 24. — The Sheppee " Steam-gas " or Superheated Steam Vehicle.

when necessary, as would be the case if one driving-wheel were on hard ground and the other one on soft or greasy ground. A winding-drum is fitted, and this may be driven by the engine without, at the same

time, driving the tractor: this result is

attained by making the drum free on the axle but providing means of securely locking it thereto when desired. A flywheel generally fitted to one end of the crank-shaft, and this may be used for driving external machinery. ,

Many makers have recently given much attention to the improve- ment of the spring-suspension systems of their respective machines, and chief amongst these is William Foster & Go., Ltd., of Lincoln, in which company's " Wellington " tractors the effective spring base has been so vastly increased that it may safely be termed the most stable of steam tractors. The life of all the working parts of a tractor may be considerably lengthened by the elimination of road shocks, or the prevention of their transmission, through the gearing, to the engine and the boiler plates. Foster's tractor is illustrated, in diagrammatic form, in fig. 25.

Dr&w

Fig. 25.-

-Foster's " Wellington " Compound Steam Tractor with outside spring suspension.

An ingenious machine of the tractor class is that built to the designs of Colonel Crompton, and shown in fig. 26. This machine is intended for military purposes, or for operation in undeveloped countries. Steam is generated in a " semi-flash " boiler, and is used expansively in a four-pair, diagonal-compound engine of the type shown in fig. 20. A two-speed epicyclic gear is enclosed by the flywheel casing, and the power is then transmitted, by worm gearing, to a differential countershaft, and from sprockets on the ends of this shaft the drive is finally transmitted to the 7 ft. diameter road wheels by means of side chains. In this tractor, very long bearing springs are employed, and these are situated below the axle, so that, instead of the springs resting on the axle boxes, the whole frame

and the power plant is suspended from the axle boxes. When hauling a load, the winding cable is permanently secured to the drawbar, and, when the machine becomes ” bogged ” or is otherwise unable to haul its trailer directly by the drawbar, a single bolt may readily be removed from the drawbar, and the winding cable may then be paid out as the tractor proceeds alone. The trailer may then be hauled up by means of the cable. The average of a number of tests with this machine, made while hauling a gross load of 8 tons, showed that its burners consumed from -65 to 85 of a gallon of shale oil for each mile travelled, and that the con sumption of water was at the rate of -5 gallon per mile. The gross weight of the machine, with sufficient fuel and water for well over 100 m. of running, is about 7 tons.

Vehicles Driven by Internal-Combustion Engines. — The general principles of the working of a steam engine are better understood than are those of the gas or oil engine, owing to the wide use of the former class of prime mover since the early part of last century, but it is beginning to dawn upon the public at large that the internal-combustion engine, or the ” petrol ” motor, as it is more popularly termed by those who talk or write about motor vehicles, is even more simple than the steam engine.

The fundamental reason for the use of the words ” internal combustion ” is that the fuel, in the case of the petrol engine, is burnt (or fired) inside the working cylinder, whereas it is burnt externally in the case of a steam engine, i.e. underneath the boiler or generator. The number of units of heat which can be turned into useful work is very much greater in the case of internal combustion than of external combustion, the efficiency of the petrol engine in this respect being, on the average, about three times as great in practice as is found to be the case with typical steam engines other than those where highly-superheated

steam is used, and where the whole of the parts are maintained in the best condition. The amount of petroleum spirit, or of paraffin, required to propel a steam vehicle 1 m. would, other conditions being equal, propel a vehicle fitted with an internal-combustion engine over a distance of 3 m.

The essential parts of any internal-combustion system are: the carburetter; the engine; the radiator; the clutch; the change-speed gears and the final transmission. The carburetter is a vessel in which the liquid fuel is converted into a combustible gas or vapour, for, as there is no connexion to any gas main, the ordinary petrol engine has to make its gas " on the premises." The production of the gas is automatic, and calls for practically no attention from the driver, because, once the engine is started, the necessary aspiration to draw through the correct quantities of air and fuel is provided by the action of the valves and pistons.

A smart turn of the starting handle is required to set the pistons and crankshaft in motion, so that an initial supply of the combustible mixture may reach one of the cylinders. This first, charge of gas is automatically ignited by an electric spark, the current for which is furnished and controlled without the necessity for any hand regulation, and there is then nothing

Fig. 26. — Colonel Crompton's Superheated Steam Tractor,

further for the driver to do, as regards power, except to move a convenient lever which opens or closes a " throttle " valve between the cylinders and the carburetter.

An internal-combustion engine would get very hot if no precaution were taken to cool it, and it is usual to surround the cylinder with water spaces. These spaces are called jackets, and the water is forced

through them, either by a pump or by thermo-siphon (natural circulation) action. It is expedient to keep down the weight of water, and for that reason pipes, tubes or small boxes are built up in such a manner that a large cooling surface is exposed to the air. A fan, which is driven from the crankshaft of the engine by gear or a belt, is employed to aid this cooling by reason of the increased volume of air that passes round the outside of the components of the radiator members. The general scheme is the same, both for heavy and light motor-cars.

It is very important that the driver should have a convenient means of separating the engine from the driving mechanism, and of putting the two in connexion again, whenever it becomes necessary, without jar or shock. The common practice is to use a leather-faced, circular member with a coned face, and to control the amount of " grip " between this member and a corresponding enclosing member attached to the engine fly- wheel by means of a pedal and springs. When the driver wishes to disengage the two members, he has merely to depress the foot lever. It will be clear that a clutch of this description can be made to engage without any difficulty, there being no fixed positions or steps such as one associates with the ordinary jaw- clutch, and this gradual application of the load can only be accom- plished by the aid of two or more surfaces in frictional contact, and by the holding together of these surfaces by the pressure of one or more strong springs. The Hele-Shaw multiple-disk clutch gives very good results, and is easy for drivers to use in traffic.

An internal-combustion engine cannot develop power unless

the crank-shaft can rotate at a relatively high number of revolu- tions, and the rate of doing work is lowest when the angular velocity is at its minimum. It is, therefore, necessary to intro- duce a system of levers between the engine and the road wheels, in order to permit the number of revolutions of the crankshaft to be maintained when hill

climbing, or when the vehicle is carrying a heavy load, and the common practice is to introduce

Fig. 27. — The well-known 16 h.p. Two-ton Albion Chassis, three or four sets of different sizes of toothed wheels, any pair of which can be put into engagement by the movement of a single lever, which lever is placed near the driver's right hand as a rule. The lowest of these gear ratios, i.e. the one which allows the crankshaft to make the greatest number of revolutions to one revolution of the road wheels, is required for starting purposes, and the highest gear ratio, i.e. the one which allows the road wheels to make the greatest number of revolutions in relation to those of the crankshaft, is employed for high-speed travelling on the road. From the last change-speed shaft the power must be transmitted to the road wheels through a differential gear and through one or other of the types of final drive which are now employed by representative makers. The great distinction from the axle of a horse-drawn vehicle is that there must be both a mechanical connexion, yet a differen- tial action, between the two back wheels. The wheels on horse vehicles revolve loosely on the axle, and one can overrun the other at curves, but the special device known as the " differential gear " has to be introduced into all motor vehicles between the

Fig. 28. — Halley's Van or Lorry Chassis with 20 h.p. Engine, change-speed gears and the driven road wheels. Such a device permits one of the two driving wheels to be driven round at a quicker angular speed than the other, the difference being determined by the radius of the curve around which the vehicle is turning.

The most common form of final drive is, perhaps, that in which two "roller" or "silent" chains transmit the power from

sprockets on the ends of the differential shaft to chain rings which are bolted to the rear road wheels. Figs. 27, 28 and 29 show typical vehicles, ranging in load capacity from 30 cwt. to 6 tons, on which the side-chain method of final drive is adopted. One of the chief advantages of the side-chain drive lies in the fact that there is, with it, less weight below the springs than with any other form of final drive. The only parts below the springs are: the fixed back axle; the chain rings (bolted to the road wheels); the road wheels themselves; the road- wheel brakes and part of the weight of the chains. The differential gear and chain sprockets are carried in a countershaft casing, which is securely bolted to the main frame.

Fig. 29. — A typical Six-ton Petrol Wagon Chassis, by Commercial Cars, Ltd., Luton.

In a number of very successful vehicles the final drive is transmitted by means of spur pinions. These are mounted on the ends of bevel-driven differential shaft, and mesh with internally toothed or externally-toothed gear rings on the road wheels. Milnes-Daimler and De Dion commercial vehicles are amongst the machines on which the internally-toothed form of gear is employed, whilst Ryknield is the most representative vehicle embodying the externally-toothed form of final drive.

The direct drive, from the ends of the differential shaft, as is shown in fig. 30, is another type of final transmission that has met with a considerable amount of success, particularly on the Leyland machines of five-ton and six-ton capacity. The differen- tial gear and the bevel-drive reducing gear are both enclosed within a casing that is bolted to a fixed back axle; the ends of the driving shaft pass through tunnels in the axle body; and claw pieces on the outer ends of the differential shaft engage with similar claws on the road-wheel hubs. The two last-named forms of gear are highly efficient, provided the pitch and shape of the teeth

are carefully considered and the designs provide for the encasing of all the pinions and gear rings.

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Differential Gear,

Fig. 30. — The Back Axle of the Leyland Six-ton Petrol Wagon.

The only other type of final drive which is used to any great extent for commercial motors is that which employs a hardened and ground steel worm meshing with a machine-cut phosphor- bronze worm wheel which is bolted to the differential-gear cage of a live back axle. The employment of this type of gear for the final transmission on commercial motors generally leads to

increased efficiency, on account of the ease with which all the parts can be enclosed in an oil-tight casing. It also gives silence of running. The strongest advocate of the worm drive for heavy vehicles is the Guildford manufacturer, Dennis Bros., Ltd., one of which company's machines is illustrated in fig. 31. Although there are many difficulties in the matter of the manufacture of worm gearing, they are not insurmountable, and, given proper attention at the hands of the designer, followed by

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Fig. 31. — A typical Worm-driven Live-axle Chassis, by Dennis Bros., Ltd., of Guildford.

accurate workmanship, probably no other mechanical means of transmitting power can approach it for smooth and silent operation. Both thrust bearings on the worm shaft should be on one side of the worm, to avoid lack of truth in meshing if any heating occurs between the worm and the wheel. There are many examples of the worm drive to be found in London on public-service passenger vehicles, and also on

delivery vans. One of the great charms of this type of transmission is that a very large gear reduction may be obtained without making the worm wheel unduly large in diameter; this is an important factor in the design of a back axle, as every inch of road clearance is of value for operating on rough country roads. As a large gear reduction is thus rendered possible on the back axle, it will readily be understood that the change-speed gear-box may be made considerably smaller than would be necessary for a bevel- driven live axle, where a large gear reduction is not permissible, both on account of its size and because such a gear would be very noisy in its working.

Fig. 32. — The Hallford-Stevens Petrol-electric Chassis.

Although the use of tooth wheels is still the only practical method of obtaining variable transmission for motor vehicles, the fundamental defects of transmission in this way are inherent to the system and must always be present; they are now less apparent, thanks to the remarkable improvement which has taken place in the use of suitable materials and improved design.

It is still the hope of some manufacturers that a form of infinitely variable change-speed device will be produced, which will

Fig. 33. — 70 h.p. Six-cylinder Dennis Fire-engine with Gwynne Centrifugal Pump.

replace the step-by-step movement of toothed gearing; the two chief directions in which this has been attempted are electrical and hydraulic. Of these two, electrical devices are really

Fig. 34. — 60 h.p. Six-cylinder Halley Fire-engine

with Centri- fugal Pump.

step by step, and the hydraulic method is apparently the only one that permits of infinite variation. Enormous sums of money have been spent in the search for an effective hydraulic

Fig. 35. — One of Barford & Perkins's Water-ballast Rollers, xviii. 30

gear; the work of Hall, Pittler, Janhay, Hele-Shaw, Renault and others is, perhaps, the best known. It must be confessed, however, that in 1910 none of these gears could be said to be on the market for motor vehicles, although hydraulic gears were being successfully applied in connexion with other problems, such as the steering of ships, the movement of turrets, &c.

Electrical transmission systems, too, have been tried, and appear to have been attended with more success than those of the hydraulic type. Such systems include vehicles which carry heavy batteries of accumulators, the current from which is utilized for the driving of the vehicle by means of electric motors. Other variations include the Haflford-Stevens system, shown in fig. 32, in which it may be seen the petrol engine drives a dynamo, and the current is then caused to drive an electric motor at each side of the chassis. Each motor drives one of the

Fig. 36. — Marshall's 30 h.p. Agricultural Tractor, back road wheels, through a worm and worm wheel. The changes of vehicle speed are effected by altering the method of grouping the electrical windings of the dynamo and motor field-magnets and armatures. This system of control is known as the series-parallel, and is effected by a single lever, which actuates a mechanical switch, or " controller."

In one of the most-recently-introduced petrol-electric systems — the " K.P.L." system, as worked by the Daimler Co., of Coventry — each of the rear road wheels is provided with a separate power unit,

consisting of a four-cylinder petrol engine, which is direct coupled to a dynamotor, the armature of the latter being coupled to a worm which meshes with a worm wheel attached to the road wheel. A small electrical storage battery forms part of the system, and this receives the excess of current from the dynamotors when the whole power of the engine is not required for the propulsion of the vehicle. When the machine is being driven up a steep incline, or when it is required to travel in a reverse direction, the battery may be called upon to supply current to the dynamotor, and, in this manner, the power of the engine is augmented by the dynamotors' working as electric motors.

Still another petrol-electric system is that invented by Mr Thomas. In this system, which is at the same time the simplest and most practical form of petrol-electric transmission, two dynamotors and an epicyclic gear are employed so that the electrical load is at no time greater than one half of the total load; consequently, the risk of a " burn out " of the windings, as the result of sudden and unforeseen periods of overload, is materially minimized.

Special Applications. — Amongst the special applications of the petrol-engined commercial vehicle is the motor fire-engine, which has brought to the front in this branch several enter- prising motor manufacturers, amongst whom Dennis Bros., of Guildford, Halley, of Glasgow, and Leyland, of Preston, are prominent. The general construction of the chassis closely follows the lines of other petrol vehicles of equal load capacity, but the gear-box tail-shaft is prolonged to the after-end of the machine, and is direct-coupled to the rotary member of a multi- stage centrifugal pump. In the Dennis fire-engine, the vacuum which is necessary in

order to lift the water in the suction hose is obtained by means of priming the pump chamber, further assisted by a water ejector and a small water tank which is carried on the machine. This machine is shown in fig. 33, whilst fig. 34 shows the successful motor fire-engine built by Halley's Industrial Motors, Ltd., of Yoker, Glasgow. In the latter machine, as also in the Leyland and other fire-engines which employ centrifugal pumps, the vacuum is created by means of reciprocating air pumps. These machines have given very satisfactory results in the hands of practical firemasters, in various parts of the United Kingdom and abroad. Merry- weather and Shand-Mason, who were formerly builders of steam fire-engines, now also build petrol-engined machines, these makers favouring reciprocating water pumps.

Other special applications of the internal-combustion motor are for grass mowing and rolling, and for road mending and rolling gravel paths, &c. One of the latter type of machines is shown in fig. 35. In this machine a petrol or paraffin engine

Fig. 37. — 45 h.p. Thornycroft Military Oil Tractor.

drives a water-ballast roller through the medium of a clutch, a simple form of change-speed gear-box, and a single roller chain. The leading roller, by which steering is effected, is also filled with water, in order to obtain the dead weight necessary for rolling. Marshall, Sons & Co., Ltd., of Gainsborough, Thorny- croft, of Basingstoke, and Broom & Wade, of High Wycombe, have also produced special machines for agricultural and military purposes, and one of the smallest tractors built by the first-named maker is shown in fig. 36. The engine is one of the two-cylinder type, consuming paraffin fuel, and driving the live back axle through a substantial gear-box and a final drive of the externally-toothed type. Such a machine is well below the weight limit for heavy motor-cars. Fig. 37 shows a more powerful oil tractor by Thornycroft. This machine is the same type which was so successful in the tractor trials pro- moted by the

British War Department in March 1909. It is capable of hauling a gross load of seven tons practically

anywhere, and even of lifting that load vertically by means of its winding cable. The engine has four cylinders, and the fuel may be paraffin, alcohol or crude oil. (E. S.. S.)

MOTRIL, a town of southern Spain in the province of Granada, at the foot of an offshoot of the Sierra Nevada and on the edge of a rich alluvial plain, about 1 m. from the Mediterranean and 40 m. S.S.E. of Granada, with which it is connected by a good carriage road. Pop. (1900), 18,528. The climate is semi-tropical, and the vega or plain of Motril has been found peculiarly adapted for the culture of sugar-cane and sugar-beet. In the district, and especially at Salobrefia, 3 m. west, there are numerous sugar- factories; cotton is also grown and manufactured, and alcohol, flour, soap, iron goods and cotton stuffs are among the other industrial products. The neighbourhood is rich in zinc and lead; and copper is also found. Motril itself is a port of the second class, but the anchorage at Calahonda, \ m. south-east, is much better. Grapes, barley, esparto grass, dry figs, almonds and zinc are exported.

MOTT, LUCRETIA [Coffin] (1793-1880), American reformer, was born at Nantucket, Massachusetts, on the 3rd of January 1793. She was descended on her mother's side from Peter Folger, one of the first settlers of Nantucket, and the grand- father of Benjamin Franklin; her father's ancestors, also, were among the first settlers of Nantucket. At thirteen she was sent to a Friends' boarding school, at Nine Partners, near Poughkeepsie, New York, where James Mott (1 788-1868), who like her was of old Quaker stock and whom she married in 181 1, was then a teacher. In 18 10 James Mott entered the employ of Lucretia's father in Philadelphia, but the business was not successful and in 181 7 Lucretia opened a small school under the care of the Pine Street Monthly Meeting, but gave it up a year afterwards and in the same year was recognized by the Friends

as an ” acknowledged minister.” Her husband had as early as 1822 espoused the cause of Elias Hicks against the ” Orthodox ” Friends, and in 1827, when the Society divided, Lucretia joined the Hicksites. Hicks’s teachings on slavery had impressed both James and Lucretia; in 1830 James gave up a lucrative cotton commission business that he might not profit from the products of slave labour; and both took an active part in the campaign against slavery. About 1840 Mrs Mott also took up the cause of woman’s rights. On lecturing tours she and her husband travelled as far west as Indiana and into Maryland and Virginia. In 1848 she addressed the Anti- Sabbath Convention in Boston, and with Elizabeth Cady Stanton, whom she had first met in London in 1840, called a convention ” to discuss the social, civil and religious condition and rights of women,” which met at Seneca Falls and passed a ” Declara- tion of Sentiments,” modelled on the Declaration of Indepen- dence. Her husband, who was prominent among the founders of Swarthmore College (1864), died in Brooklyn, New York, on the 26th of January 1868; and Mrs Mott died on the nth of November 1880 near Philadelphia.

See James and Lucretia Mott: Life and Letters (Boston, 1884), edited by their granddaughter, Mrs Anna Davis Hallowell.

MOTT, VALENTINE (1785-1865), American surgeon, was born at Glen Cove, New York, on the 20th of August 1785. He graduated at Columbia College, studied under Sir Astley Cooper in London, and also spent a winter in Edinburgh. After acting as demonstrator of anatomy he was appointed professor of surgery in Columbia College in 1809. From 1811 to 1834 he was in very extensive practice as a surgeon, and most suc- cessful as a teacher and operator. He tied the innominate artery in 1818; the patient lived twenty-six days. He performed a similar operation on the carotid forty-six times with good results; and in 1827 he was also successful in the case of the common iliac. He is said to have performed one thousand amputations and one hundred and sixty-five lithotomies. After spending seven years in Europe (1

834-1 841) Mott returned to New York and founded the university medical college of that city. He translated A. A. L. M. Velpeau's Operative Surgery, and was foreign associate of the Imperial Academy of Medicine of Paris. He died on the 26th of April 1865.

MOTTEUX, PIERRE ANTOINE (1663-1718), English translator and dramatist, of French parentage, was born at Rouen on the 25th of February 1663. After the revocation of the Edict of Nantes he settled in London with his kinsman and godfather, Paul Dominique Motteux. He acted as an auctioneer of pictures, and in 1706 he had a shop in Leadenhall Street for the sale of lace, stuffs, Chinese and Japanese commodities, duly advertised in the Spectator by his friend Richard Steele. He had not been six years in England when he obtained sufficient mastery of the language to edit the monthly The Gentleman's Journal, which contained verses by himself and by the chief wits of the day. In 1693 he edited the third book, hitherto unpublished, of Sir Thomas Urquhart's translation of Rabelais, and in the next year printed the first and second books of Urquhart's translation. In 1694 he completed Urquhart's work by a translation of the fourth and fifth books, which, although not to be compared with the racy, nervous writing of Urquhart, shows a perfect mastery of colloquial English and an intimate and adequate sense of Rabelais's meaning. The complete trans- lation appeared in five volumes in 1693-1694, and was reprinted as The Whole Works of Francis Rabelais, M.D. (2 vols., 1708), described as the work of " Sir T. Urchard, Knight, Mr Motteux and others." His first play, a comedy in five acts entitled Love's Jest, was produced at Lincoln's Inn Fields in 1696, and next year followed The Loves of Mars and Venus. He wrote other works for the stage of no great consequence. More important than his dramatic work is his History of the Renowned Don Quixote de la Mancha (4 vols., 1701; 2nd ed., 171

2), ” trans- lated from the original by many hands and published by Peter Motteux,” one of the most masterly and spirited translations in English. His later years appear to have been given to the shop in Leadenhall Street. He was murdered on the 18th of February 17 18 at a house of ill fame in Star Court, near St Clement’s Church, London, under circumstances which have never come to light. The manner of his death was no criterion of his life, which appears to have been sober and decent.

An excellent life by Henri van Laun is prefixed to the 1880 reprint (4 vols.) of J. G. Lockhart’s edition of Motteux’s Don Quixote. See also a prefatory note by Charles Whibley in vol. iii. of Sir T. Urquhart’s Rabelais (Tudor Translations, 1900), reprinted from a rare 1693-1694 edition.

MOTTEVILLE, FRANCHISE BERTAUT DE (c. 1621-1689), French memoir writer, was the daughter of Pierre Bertaut, a gentleman of the king’s chamber, and niece of the bishop-poet Jean Bertaut. Her mother, a Spaniard, was the friend and private secretary of Anne of Austria, wife of Louis XIII. At the age of seven Francoise was also made a member of the queen’s household and given a pension. The influence of Richelieu, however, who wished to separate the queen from her Spanish connexions, exiled mother and daughter to Normandy, where in 1639 the young girl was married to Nicolas Langlois, seigneur de Motteville, president of the Chambre des Comptes of Rouen. He died two years later at the age of eighty-two, and in 1642 the queen summoned Mme de Motteville to court, being now her own mistress by the death of Richelieu and Louis XIII. Through all the intrigues and troubles of the Fronde Mme de Motteville preserved the honourable reputation of being devoted to her mistress without any party ties or interests. Some letters of hers are preserved — especially a curious correspondence with ” La Grande Mademoiselle ” on marriage, but her chief work is her Memoires, which are in effect a history of Anne of Austria, written briefly till the date of Mme de Motteville’s return to court, and then with fullness. They give a faithful picture of the life

of the court at that time.

The best edition of her Memoires is that of M. F. Riaux (2nded., Paris, 1891, 4 vols.), containing the essay by Sainte-Beuve from vol. v. of his Causeries du lundi. The Memoirs were translated into English in 1726 and again by K. P. Wormeley in 3 vols., 1902. For details concerning her family see Recherches sur Madame de Motteville et sur safamille, by Charles de Beaurepaire (Rouen, 1900).

MOTTL, FELIX (1856-), German conductor and composer, was born near Vienna, and had a successful career at the Vienna Conservatoire. - He became known as a gifted conductor

of Wagner's music, and in 1876 was engaged for the Ring des Nibelungen at Bayreuth. From 1881 to 1903 he was conductor at the Carlsruhe Opera, and made a wide reputation for his activity there, particularly in producing the works of Wagner and Berlioz. In 1886 he directed the performance of Tristan und Isolde at Bayreuth. In later years he visited London and New York, and became known as one of the most brilliant conductors of his day; and in 1904 he was made a director of the Academy of Music at Berlin. He composed some operas, of which Agnes Bernauer (Weimar, 1880) was the most suc- cessful, and numerous songs and other music.

MOTTO (an Italian word, from Late Lat. muttum, a low sound, a mutter or murmur, cf. mutere, to mutter; the Latin word also gives Fr. mot, word), a " legend " consisting of a significant phrase or sentence, sometimes even of a single word attached to an emblem or device, and, in heraldry, placed on a scroll below the achievement or above the crest. Mottoes express sometimes a sentiment, a favourite principle, emphasize the meaning or symbolism of the emblem or device, and, in heraldry, often allude to one or more of the " charges " in the coat of arms, &c.

There are many publications which give lists of some of the best- known mottoes, such as Fairbairn, Book

of Family Crests, 1856; Wachbourne, Book of Family Crests (2 vols., 1882); Chassant and Tansin, Dictionnaire des devises historiques et Mraldiques, &c. (1878) ; Dielitz, Die Wahl- und Denksprilche, Feldgeschreie, Losungen, Schlacht- und Volksrufe, besonders des Miltelalters und der Neuzeit (4 vols., 1888). Gatfield's Guide to Printed Books and MSS. relating to Heraldry (1892) contains a bibliography.

MOTYA, an ancient Phoenician settlement in Sicily, on a low island [mod. 5. Pantaleo], 5 m. north of Lilybaeum [mod. Marsala]. It was the centre of the Phoenician trade in Sicily. It was accessible from the mainland by a mole, which is still used as a track for wagons. The line of the city wall, of rough rectangular blocks of stone without mortar, may still be traced all round the coast, with two gates, one on the north towards the mole, which is still in part preserved, and one on the south. The date of its foundation is uncertain. In 398 B.C. it was taken after a desperate struggle (which, owing to the height and strength of the houses, continued even after a breach had been made in the city wall) by Dionysius of Syracuse, but recovered in the next year: it was, however, abandoned by the Carthaginians, and its place taken by Lilybaeum on the mainland. (T. As.)

MOUCHEZ, AMEDEE ERNEST BARTH&LEMY (1821-1892), French astronomer, was born at Madrid of French parents on the 24th of August 1821. At the age of sixteen he entered the naval school at Brest, and after serving with distinction in various ships, was appointed in 1856 to the command of the " Bisson." Towards the close of the Franco-Prussian War he made an admirable defence of Brest, and his organization of the French expedition to the island of St Paul to observe the transit of Venus in 1874 obtained his election to the Academy of Sciences and his promotion as commander of the Legion of Honour. On the 27th of June 1878 he succeeded Urbain Leverrier as director of the National Observatory of Paris, and was raised to the rank of rear-admiral. The fourteen years of his directorship were marked by a great increase in the activity of the institution.

The observatory grounds were enlarged; two powerful instruments of the novel kind known as coude equatorials were installed; a spectroscopic department was established, and the gigantic task of re-observing all Lalande's stars was completed. He published twenty-one volumes of Annates, as well as the first two volumes of the great Catalogue de I'observatoire de Paris; founded the Bulletin astronomique, and set on foot two schools of practical astronomy, one at Paris, the other at Montsouris, for the special instruction of naval and military officers, explorers and surveyors. His most memorable work, however, was the inauguration of international operations for charting the heavens. The advances in stellar photography made by Paul and Prosper Henry and others suggested to him the magnificent idea of obtaining, through the collaboration of astronomers in all parts of the world, an

autographic picture of the entire sphere containing more than fifty million stars, which should faithfully record in future ages the state of the sky at the end of the 19th century. Although he did not live to see its completion, he had the satisfaction of knowing that the ultimate success of this vast scheme was assured. He died suddenly at his country seat at Wissous, near Antony, on the 25th of June 1892.

See Month. Notices Roy. Aslr. Society, liii. 226; Observatory, xv. 305 (D. Klumpke) ; Nature, xlvi. 253 ; Rapport annuel sur V observatoire de Paris pour I'annee 1892. (A. M. C.)

MOUFLON, or Muflon, the wild sheep (Ovis musimon) of Corsica and Sardinia, where it is now very local. The ewes are either hornless or provided with quite small horns, the hornless form being probably characteristic of one island and the horned of the other. The rams carry good horns, and in summer show

a conspicuous light saddle-shaped mark on the otherwise dark-coloured coat. The Armenian mouflon (0. orientalis), of Persia, Armenia, and the Troodos range of Cyprus^ is typically a larger and redder sheep, with the horns curving in the reverse direction; but the Cyprian race is small. (See Sheep.) .

MOULD. (1) (O. Eng. tnolde, from a Teutonic root meaning to grind, reduce to powder, cf. "meal"), loose fine earth, rich in organic- matter, on the surface of cultivated ground, especially the made garden soil suitable for the growth of plants. In the sense of a furry growth, consisting of minute fungi found on animal or vegetable substances exposed to damp, the word may be either an extension of " mould," earth, or an adaptation of an early " moul," with an additional d due to " mould." '' Moul " is a Scandinavian word, cf. Swed. mogla, to grow musty, and the Eng. colloquial " muggy." (2) A form or pattern, particularly one by means of which plastic materials may be made into shapes, whence " moulding," the form which the material so shaped takes. The word comes through the 0. Fr. modle, molle, from Lat. modulus, a measure, or standard. The English " model " is another derivative of the same word.

MOULDINGS, the term in architecture for the decorative treatment given to projecting or receding features in stone, wood and other materials, by means of curved forms, whereby those features are accentuated and varied owing to the play of light and shade on the surfaces. The principal characteristics of all the European styles are to be found in the mouldings employed in them and in their ornamental decoration: In some of the earlier styles, such as the Assyrian and the Persian, there are no mouldings: coloured bands in brick, enamelled tiles or beton, were deemed sufficient to mark the divisions of their storeys or to decorate their buildings. The Egyptians employed two mouldings only, the cavetto (fig. 1), a deep moulding some-times of great dimensions which crowned their pylons, temples and decorative shrines, and the

torus, a semicircular projecting moulding which was carried above the architrave and down the quoins of their buildings. The Greeks were the first to recognize, in their temples, the special value possessed by mouldings which, occupying an intermediate position between

Fig. 1.

Fig 2.

Fig. 3.

Fig. 4.

the ornamental sculptures and the simple architectural lines of the main structure, gave a richly decorative effect to the latter without interference with the beauty of the former.

The Classic mouldings may be divided into two classes, simple and compound; to the former belong the cavetto (of small dimensions when compared with the Egyptian cavetto) and the Scotia (fig. 2), employed for the bases of columns, which are seen below the eye, both concave mouldings, whilst the ovolo or echinus — Fr. ove or quart de rond — (figs. 3 and 4)

and the torus are convex mouldings. The compound mouldings are those composed of curves of contrary flexure, such as the cymarecta or cymatium (fig. 5), of which the upper part is concave and the lower convex, a moulding constantly employed for the upper member of the cornice, and the cyma-reversa or ogee (fig. 6) — Fr. talon — in which the upper portion is convex.

Fig. 8.

Fig. 5. Fig. 6. Fig. 7.

The Greeks sometimes varied the ogee moulding, the upper portion of which is turned back and the lower portion brought forward, and to this the term quirked ogee (fig. 7) is given. Another Greek

moulding of compound form is the bird's

beak (fig. 8), employed as a drip moulding above the corona. Of smaller dimensions is the astra- gal (fig. 9), a moulding invariably carved with the bead and reel, which in Greek work is constantly ' 9' used in conjunction with the en- riched echinus and cyma-reversa mouldings (figs. 18, 20) and below the necking of Ionic capitals: and the listel or fillet, employed chiefly in the separation of curved mouldings one from the other; in the cymatium constituting its upper termination (fig. 5), and in the Scotia (fig. 2) its upper and lower border. In Classic work generally the cavetto is only employed for the apophyge under the capital and over the base, but in Roman work, as in the theatre of Marcellus, it sometimes took the place of the cymatium of the cornice. Although extremely simple in its form, the finest Greek moulding, and the one to which the Greeks apparently attached the greatest value, was the echinus under the abacus of the Doric capital. The earliest archaic example exists in the capital of the shafts flanking the tomb of Agamemnon at Mycenae (a, fig. 10), where it consisted of a large torus decorated

Fig. 10.

with the chevron (see Capitals), and an apophyge carved with the petals of a flower; a similar decoration of the apophyge is found in two or three early Doric capitals, as at Paestum and- Metapontum, but this is the only example known in which the echinus of the Doric capital was carved, though traces of painting and gilding have been found on them. Other examples showing the gradual development of the echinus are shown in fig. 10; b being from the temple at Corinth, c from the Parthenon at Athens, d from the portico at Delos, e an early Roman example (c. 60 B.C.) of the temple at Cori, and / from the theatre of Marcellus, where it nearly approaches the quarter round always employed in late Roman work and in the Renaissance.

There is one other important decorative feature

which forms the most characteristic feature of the bedmould of the Ionic cornice, viz. the dentil cornice (fig. n), derived originally from the ends of the squared timbers which carried the cornice of the primitive Ionic temple, and in the earlier stone examples copied more or less literally; it subsequently in the 4th century was introduced as a part of the bedmould of the cornice of the Ionic Order, the temple of Minerva Polias at Priene in Asia Minor being one of the best examples. It consists of a series of projecting blocks with intervals between them equal to half

the width of the block. In the Greek Corinthian Order it was first introduced into the Choragic monument of Lysicrates. It was constantly employed by the Romans in their temples of the Ionic and Corinthian Orders, the finest example being in the bedmould of the temple of Castor in Rome, where it is twice the height of the other mouldings.

In the Romanesque style the mouldings consist almost entirely of rounds and hollows, the former known as the bowtel,

Fig. ii.

Fig. 12.

Fig. 13.

and in England, France, Spain and Germany employed to decorate or soften the angle of an arch mould. As the Roman- esque arch frequently consisted of two or more rings of arches, projecting one in front of the other, to which rings the term ” order ” is sometimes given, the repetition of this simple moulding constituted an ample decoration by itself, but in the Norman work in England and the north of France there is found the constant recurrence of mouldings broken into zigzag lines and other decorations coming under the head of orna- mental

mouldings described below. The simple bowtel (fig. 12) was retained in France far into the Gothic period, but in the Early English style the mouldings (fig. 13) became lighter, being more boldly cut than in the Romanesque styles. Here again, as in the earlier style, each ring or order is enriched with a succession of alternate rounds and hollows, the latter very deeply cut, and a few small fillets. The bowtel also is brought out to an angle which is sometimes emphasized by a small fillet; this is sometimes called the keel moulding from its re-semblance in section to the bottom of a ship. Sometimes the angle of the ring is splayed, and the mouldings are worked on the splay, and this is very often found in the mouldings of the ribs of a vault (fig. 130), giving greater lightness to the rib. The mouldings of the Decorated period (fig. 14) are more diversi-

Fig. 13a.

Fig. 14.

Fig. 15.

fied than those of the Early English, and the hollows towards the end of the period become shallower and broader,, ogees being frequently employed. One of the chief characteristics of the Perpendicular period (fig. 15) is the prevalence of large shallow hollows and the employment of two ogees in close contact with the convex sides next each other.

The French mouldings of the Gothic period in Normandy and adjacent parts follow very much on the same lines as those in England, but in the south of France and in Germany they are very much simpler, and one rarely finds the deep hollow which forms the chief characteristic of English mouldings. In French flamboyant and late German Gothic work the mouldings run through, penetrating one another; these in Germany were sometimes cut off, having the appearance of the smaller stems of a tree from which some of the boughs have been lopped.

Ornamental Moulding’;. — Although the mouldings in Greek and Roman architectural works are in general form much the

same, they vary materially in their profiles and also in the refinement of their enrichment with carving. It is probable that the earliest decoration of mouldings was confined to tie painting only of their surfaces, and in one or two of the more archaic examples traces of painting only are found on them. The desire to accentuate the ornament would seem to have led the Greeks at a very early date to incise or raise in relief the decorative designs which originally were painted only; at first this was done very sparingly, and in the earlier buildings but few mouldings were employed; in course of time they increased in number, and in the Augustan period in Rome the carving extended to the flat surfaces of the corona, and the fascia and soffits of the architrave.

The four principal Classic mouldings, so far as their enrichment with carving is concerned, were the cyma-recta or cymatium; the cyma-reversa or ogee; the echinus or ovolo; and the torus. The cymatium was almost always decorated with a conven- tional treatment of the flower of the acanthus plant, known generally as the anthemion and sometimes as the honeysuckle; the finest example is that which is found in the cornice of the north doorway of the Erechtheum (fig. 16). Al- though in some cases the flower of the acanthus is repeated in the Roman cymatium, the rigidity of the other lines does not seem to have appealed to the Roman sculptor, who preferred more foliage, such as is shown in the cymatium

Fig. 16.

Fig. 17.

of the Forum of Nerva (fig. 17), there being endless variety of design in Roman examples. The ogee- moulding in Greek work was always carved (fig. 18) with the Lesbian leaf (Fr. rais-de- cceur; Ger.

Herzlaub), which in Roman work received a peculiar interpretation of the original design; not understanding the

Fig. 18.

Fig. 19.

modelling of the leaf and requiring a deeper shadow, the Roman drilled holes in it and evolved another composition of two leaves, so that the outer edge of the Lesbian leaf formed a trefoil cusp (Fr. talon trifle), constituting a new description of border, as shown in fig. 19, from the temple of Castor at Rome. The ovolo moulding, whether employed in the bedmould of a cornice, on the capital of an anta, or in the Ionic capital, was always carved (fig. 20) with the egg and dart enrichment (Fr. ove el dard; Ger. Eierstab), which was spread out wider by the

Fig. 20.

Fig. 21.

Roman carver, while holes pierced on each side of the tongue changed its design into that of the egg and tongue (fig. 21). In both the enriched ogee and the carved ovolo the design was never complete without the bead and reel underneath (figs. 20 and 21), there being always two beads and four reels to each leaf or egg. When employed as the crowning moulding of an architrave, the ogee is always capped by a fillet; and the same applies to the cymatium of the cornice. When the ogee mould- ing was of small size and employed in a subordinate position, as is constantly done in Roman work, crowning the modillion

or subdividing the fascia of the architrave, a simpler leaf pattern was employed.

Though not a moulding, the modillion, which was

invented by the Romans to give additional support to the corona, forms part of the bedmould of the cornice, and may therefore be described here. It consists of a small bracket (fig. 22), the

design of which was probably derived from the vertical console bracket which carried the cornice of the Greek doorways, but which in the Roman cornice was employed horizontally. The de- sign of the outer side is that of an Ionic volute with its cushion ;

Fig. 22.

on the inner side the volute is reversed and is of greater size, the soffit being masked by a leaf.

The torus moulding of the base in early examples was fluted but not carved, and the earliest example so treated is that found in the base of the columns of the Erechtheum, where it was enriched with the triple guilloche. In the temple of Apollo Branchidae, near Miletus in Asia Minor, where they would seem to have attempted to rival the figure decoration of the temple of Diana at Ephesus, the torus mouldings were elaborately carved with the acanthus plant and the laurel leaf; but it was in the Augustan age in Rome that the greatest elaboration was given to the torus of the base; in the Ara Pads, set up in a.d. 13, it was carved with the double guilloche; the finest Roman example of an enriched torus being that of the base of the Trajan column in Rome, which is carved with laurel leaves tied at intervals with bands.

The principal enriched Byzantine moulding is that known as

the Venetian dentil (fig. 23), in consequence of its constant

• employment in Venice and the towns in

y”*r““5f””’*U^-^ ‘ ts vicinity. Its earliest appearance,

l`7/ftr”-~-L • l*b*#* however, is in Sta Sophia at Constan-

rlmL^Hr~8B~~\ tinople (a.d. 537). The other carved

“^^^Sil^BjIf Byzantine mouldings are those which

Fig. 23. ””■•J throughout Syria form richly carved

string-courses, taking the place of the Classic cornice, and the

hood moulds of arches. The Byzantine string-course, which is

found in St Mark’s, Venice, and in most of

the towns bordering on the Adriatic, is a

cyma-recta carved with the acanthus leaf.

The enrichments of the mouldings of the Romanesque style are of great variety; in parts of Italy and in the south of France they were largely influenced by Byzantine work; but in Sicily, Apulia, Normandy and England the Normans introduced a series of purely geometrical forms in which the chief peculiarity is the rare occurrence of foliage. The most characteristic example is that of Fig. 24. the zigzag or chevron (figs. 24, 25), of which

there are many varieties; then follow the single and double billet (fig. 26), the double cube, the (indented, the beakhead (fig. 27), &c. In the transition period in England, flowers and foliage begin to be intro- duced, and the rosette (fig. 28), the _ dog-tooth (fig. 29), which develops

’” into a four-leaf flower, and the

ball flower (fig. 30) follow, these being all carved in the hollow

of cavetto mouldings. In the Decorated and Perpendicular styles, the flowers and foliage introduced in mouldings become more natural, till

one reaches the Tudor rose (fig. 31), a precise copy of the flower, beyond which it was difficult to go.

Fig. 26.

Fig. 27.

Fig. 28. Fig. 29.

In the 1 6th century the enrichment of mouldings passed through a transitional stage, being half Gothic and half Classic, and on the introduction of the purer Italian style Roman profiles and decoration were again employed. The Greek revival at

Fig. 30. Fig. 31.

the commencement, and the Gothic revival in the middle, of the 19th century naturally brought about a reaction in favour either of purer Classic forms or of Gothic work, but the ver- nacular types could not be displaced by the passing fashion, and the influence of Robert Adam is again paramount to-day. (R. P. S.)

MOULIN (Fr. moidin, a mill), in physical geography, the name given to the swirling cascades which are formed by glacier streams pouring into crevasses, and result in the formation of giant's kettles.

MOULIN QUIGNON, a quarry near Abbeville, France, cele- brated for the discovery in 1863 by Boucher de Perthes of a human jaw-bone believed to be referable to the Quaternary period. By his collection of flints Boucher de Perthes had been the first to attempt to establish the existence of man in remote ages; but it had been objected that if the flints were indeed the work of man, human remains would have been found in association with them. Considerable excitement therefore was created both in England and France by the " find " of bones at Moulin Quignon, and a commission of inquiry was appointed. The report was favourable to the genuineness of the relics, but latterly doubts have arisen as to whether they can be regarded as earlier than the Neolithic age.

MOULINS, a town of central France, capital of the depart- ment of Allier, 121 m. by rail N.W. of Lyons. Pop. (1906), 18,997. The town is situated on the right bank of the Allier, which is here crossed by a remarkable bridge of the 18th century about 1000 ft. in length. Moulins did not attain any importance till the 14th century, before which it consisted chiefly of some mills belonging to the dukes of Bourbon. The medieval town occupied a small area, the boundaries of which are marked on the N.E. and S. by the central boulevards occupying the site of the old moats. The modern town, expanding from this nucleus, is limited on the east and south by the railway, the southern portion being traversed by agreeable promenades. To the north is the spacious avenue known as the Cours de Bercy, close by the hospital and the lycee. The more interesting buildings lie within the old enceinte. The chief of these is the cathedral, which consists of a huge choir of the 15th and 1 6th centuries, and a nave in the early Gothic style but modern in construction and terminated by two towers with stone spires rising to a height of 312 ft. The church possesses a fine triptych attributed to Domenico Ghirlandajo (d. 1494), and fine windows of the 15th and 16th centuries. Among the oldest buildings in the town are the square tower of the 14th century (used as a prison) which is the chief relic of 'the chateau of the dukes of Bourbon, and a belfry of the 15th century. Part of an old Jesuit college serves as the court-house, which contains an archaeological museum. The library, which possesses a valu- able Bible of 1115, is part of the h6tel-de-ville. Numerous mansions of the 15th and 16th centuries border the streets of the

old quarter of the town. There is a statue of the poet Theodore de Banville, born at Moulins in 1823. The town is the seat of a prefect, a bishop, and a court of assizes, and has tribunals of first instance and commerce, and a branch of the Bank of

France. Yzeure, 1 £ m. E. of Moulins, has an interesting Roman- esque church (12th century); 7} m. W.S.W. of Moulins is Souvigny, formerly famous for its Cluniac priory. Its church, a fine building of the nth and 12th centuries, restored in the 15th century, contains the splendid tombs of Louis II. and Charles I., dukes of Bourbon in the 15th century, and other tombs of the Bourbon family, now in ruins.

Moulins became the residence of the dukes of Bourbon about the middle of the 14th century, and capital of the duchy towards the end of the 15th century. In 1566, under Charles IX., an important assembly of notables was held in the town, at which the judicial system of France was reorganized.

MOULMEIN (or Maulmein), the port and headquarters of Amherst district and Tenasserim division of Lower Burma. The population in igoi was 58,346, and the increase in the last quarter of a century has been very slight. Ship-building, which formerly was an important industry, has now been given up, but there is still a considerable export of teak and rice, and there are several steam rice- and saw-mills. The total exports average more than a million sterling. Three steamers run weekly to Rangoon. Germany and Siam are represented by consuls; Persia, Denmark, and Norway and Sweden by vice-consuls; and Italy and the United States of America by consular agents. The garrison of Madras native infantry, formerly stationed in the town, was withdrawn in 1898. The town, which has the appearance of being on a river, the Salween, is really on the sea, with the island of Bilugyun in front. It is one of the most picturesque ports in the East. There is a branch of the Bank of Bengal, and two newspapers are published — one in English and one in Burmese.

MOULT, a term for the shedding of feathers at the periodic renewal of the plumage by birds, and so transferred to the periodic shedding of the old skin, shell, &c, by other animals. The word is seen in O. Eng. in the verb bimHtian, to exchange; from Lat. mutare, to change; cf. mod. Ger. mausen,

mausern; the earlier forms in English are mout, mute; the insertion of the /, as in "fault," dates from the 16th century.

MOULTON, LOUISE CHANDLER (1835–1908), American poet, story- writer and critic, daughter of Lucius L. Chandler, was born in Pomfret, Connecticut, in 1835. In 1855 she married a Boston publisher, William U. Moulton (d. 1898), under whose auspices her earliest literary work had appeared in The True Flag. Her first volume of collected verse and prose, This, That and the Other (1854), was followed by a story, Juno Clifford (1855), and by My Third Book (1859); her literary output was then interrupted until 1873 when she resumed activity with Bed-time Stories, the first of a series of volumes, including Firelight Stories (1883) and Stories told at Twilight (1890). Meanwhile she had taken an important place in American literary society, writing regular critiques for the New York Tribune from 1870 to 1876 and a weekly literary letter for the Sunday issue of the Boston Herald from 1886 to 1892. In 1876 she published a volume of notable Poems (renamed Swallow-flights in the English edition of 1877) and visited Europe, where she began close and lasting friend- ships with leading men and women of letters. Thenceforward she spent the summers in London and the rest of the year in Boston, where her salon was one of the principal resorts of literary talent. In 1889 another volume of verse, In the Garden of Dreams, confirmed her reputation as a poet. She also wrote several volumes of prose fiction, including Miss Eyre from Boston and Other Stories, and some descriptions of travel, including Lazy Tours in Spain (1896). She was well known for the extent of her literary influence, the result of a sympathetic personality combined with fine critical taste. She died in Boston on the 10th of August 1908.

See Lilian Whiting, Louise Chandler Moulton (Boston, 1910).

MOULTRIE, JOHN (1799–1874), English poet, was born in London on the 30th of December 1799. He was educated at

Eton, and many of his best verses were contributed to the Etonian. He entered Trinity College, Cambridge, in 1819, and in 1822 began to reside at the Middle Temple. Three years later he was ordained, and was presented to the living of Rugby by Lord Craven. At Rugby he became intimate with Thomas Arnold, to whom two of his best sonnets are addressed. He died at Rugby on the 26th of December 1874. He published several volumes of verse during his lifetime, and a complete edition of his poems was published (2 vols., 1876) with a memoir by Derwent Coleridge. They include, amongst much that is dull, some popular pieces, ” Godiva,” ” Three Minstrels,” an account of meetings with Wordsworth, Coleridge and Tennyson, ” My Brother’s Grave,” and some excellent hymns.

MOULTRIE, WILLIAM (1730–1805), American soldier, was born in Charleston, South Carolina, on the 23rd of November 1 730. His father, a physician, and a graduate of the University of Edinburgh, migrated to Charleston before 1729. The son was elected to the Commons House of the Assembly in 1754, 1769 and 1772; and in 1760 he was captain of a provincial regiment in the expedition under Governor William H. Lyttelton against the Cherokees. Although he was connected by many ties to the British, he espoused the American cause on the outbreak of the War of Independence, and was a member of the first provincial congress (1775) of South Carolina, which in June made him a colonel of the Second South Carolina regiment; and he was a member of the second provincial con- gress (1775–1776). On Fort Johnson, on James Island in Charleston harbour, he raised what is said to have been the first American battle-flag — blue, with a white crescent in the dexter corner, inscribed with the word ” Liberty “; the flag was devised by him in September 1775. In March 1776 he took command of a palmetto fort which he had built on Sullivan’s Island, off Charleston, which he held against the attack of Admiral Sir Peter Parker on the 28th of June, and which soon after the battle was renamed Fort Moultrie by the General Assembly. He was thanked by Congress, was made a brigadier-

general in the continental army in September 1776, and was placed in command of the department of Georgia and South Carolina. He dislodged the British from Beaufort, South Carolina, in February 1779, and in April made it possible for the city of Charleston to put itself into a state of defence by delaying the advance of General Augustine Prevost. He was one of those who advised against the surrender of Charleston, where he commanded the garrison until the arrival of General Benjamin Lincoln. His imprisonment after the surrender of Charleston (May 1780) lasted until his exchange with others for General Burgoyne in February 1782. In October 1782 he was made a major-general. He was governor of South Carolina in 1785-1787 and in 1 792-1 794. He died in Charleston on the 27th of September 1805.

He wrote Memoirs of the Revolution so far as it Related to the States of North and South Carolina (2 vols., 1802).

MOUND, now used in the sense of a pile or heap of earth, artificial or natural, especially such a pile raised over a grave or burial-place, a tumulus, or as a means of defence, and so used to translate Lat. agger. The earliest use in English is for a hedge or other boundary between adjoining lands; this only survives dialectically. The word is obscure in origin, but was early influenced by ” mount,” i.e. hill; Lat. mons, montis. A connexion with 0. Eng. mund, guardianship, hand, has been suggested. The ” orb,” i.e. a globe of gold surmounted by a cross, as forming part of the regalia (q.v.), is often known as a ” mound “; this is a translation of Fr. monde; Lat. tnundus, world.

MOUND-BUILDERS, in North America, the name given to the prehistoric inhabitants who chiefly centred in the valleys of the Mississippi and Ohio, and who seem to have possessed a measure of civilization far in excess of that of the North American Indians when first met by the whites. The remark- able mounds, which have given occasion for the name, are fortified enclosures and tumuli of the most varied appearance, round, conical, or in the shape of

animals. They are scattered

over an immense tract of country from the great lakes to the Gulf of Mexico, and from the Rockies to the Atlantic, but are specially frequent in the valley of the Mississippi, along its left tributaries, in Arkansas, Kansas and the basin of the Ohio. But the old theory that the mound-builders were a distinct race of highly civilized agriculturists, who had lived from remote antiquity in the regions of the mounds and were eventually exterminated by the nomadic hordes coming from the northward, represented to-day by the present Indians, is no longer supported by the principal American ethnologists, who hold that the Indians are their descendants.

In Ohio there are thousands of mounds, some in the form of circles, others four-sided, and in a few cases eight-sided. Some- times a square and a circle are united. Altar-mounds, small rounded heaps of earth, are found in Ohio. At their centre is a basin-shaped mass of hard clay showing effects of fire. These basins are 3 or 4 ft. across, and contain ashes and charcoal. Upon these altars are found many objects.

The most famous mound in Ohio is the ″ Great-Serpent,″ in Adams county. It lies upon a narrow ridge between three streams which unite. It is a gigantic serpent made in earth. Across the widely-opened jaws it measures 75 ft.; the body just behind the head measures 30 ft. across and is 5 ft. high; and, following the curves, the length is 1348 ft. The tail is in a triple coil. In front of the monster is an elliptical enclosure with a heap of stones at its centre. Beyond this is a form somewhat indistinct, thought by some to be a frog.

In Wisconsin the most interesting mounds are the effigy mounds — earthen forms of mammals, birds and

reptiles — usually in groups and of gigantic size. Among them are buffalo, moose, elk, deer, fox, wolf, panther and lynx. Some panthers have tails 350 ft. long, and some eagles measure 1000 ft. from tip to tip of outspread wings. Occasionally the figures are cut or sunk in the earth, and near them are hundreds of simple burial mounds. It seems most probable that the purpose of these effigy mounds are totemic, and that they were objects of worship as guardians of the villages.

Further south in west Tennessee another class of mound is found. This contains graves made of slabs of stone set on edge. The simplest have six stones, two at the sides, two at the ends, one at the top and one at the bottom. Sometimes there is one of these graves in a mound, sometimes many. In one, 12 m. from Nashville, 45 ft. across and 12 ft. high, were found a hundred skeletons, mostly in stone graves ranged one above the other. The skeletons in the upper graves had been buried stretched at full length. The lower graves were short and square, and the bones in them had been cleaned and piled in little heaps.

The mound-builders were Stone-Age men, and made many beautiful objects of stone, shell, bone and beaten metals, but they had no knowledge of smelting. That they were not one race is proved by a study of the skulls from the mounds.

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MOUNDSVILLE, a city and the county-seat of Marshall county, West Virginia, U.S.A., on the Ohio river, 12 rn. S. of Wheeling. Pop. (1900) 5632; (1910) 8918. It is served by the Baltimore & Ohio railroad, by an electric line to Wheeling, and by boats to

Pittsburg, Cincinnati and intermediate ports. Near Moundsville, at the mouth of Grave Creek, is Grave Creek Mound, one of the largest relics of the "American mound- builders"; it is in the form of a regular cone, and is about 320 ft. in diameter at the base and 70 ft. in height. Two sepulchral chambers were discovered in it in 1838. In the upper chamber, about half-way between the centre of the base and the apex, was a single skeleton, adorned with beads, copper bracelets and plates of mica; in the lower chamber, directly under the upper and partly in the natural earth, were two

skeletons, one adorned with beads and the other without ornament. On the sides and top of the lower chamber was a framework of timbers, which seems to indicate that the mound is of comparatively recent date. The city of Moundsville was formed in 1866 by the consolidation of the town of Moundsville (laid out on the Ohio river in 1831, and incorporated in 1832), and the town of Elizabethtown (laid out, about i m. from the river, in 1798, and incorporated in 1830).

MOUNET-SULLY, JEAN (1841-), French actor, was born at Bergerac, on the 28th of February, 1841. He entered the Conservatoire at the age of twenty-one, and took the first prize for tragedy. In 1868 he made his debut at the Odeon without attracting much attention. His career was interrupted by the Franco-Prussian War, and the liking he developed for soldiering had almost decided him to give up the stage, when he was offered the opportunity of playing the part of Oreste in Racine's Andromaque at the Comedie Francaise in 1872. His striking presence and voice and the passionate vigour of his acting made an immediate impression, and the eventual result was his election as socittaire in 1874. He became one of the mainstays of the Comedie Franchise, and distinguished himself in a great variety of tragic and romantic parts. Perhaps his most famous impersonation was that of Oedipus in L'Oedipe roi, a French version by Jules Lacroix of Sophocles's drama. This was first performed in the old Roman amphitheatre at Orange in 1888. Other

prominent parts in Mounet-Sully's repertoire were Achille in Racine's Iphigenie en Aulide, Hippolyte in Phedre, Hamlet, the title parts in Victor Hugo's Hernani and Ruy Bias, Francis I. in Le Roi s'amuse, and Didier in Marion Delorme. He was created chevalier of the Legion of Honour in 1889. He also wrote a play, La Buveuse de larmes, and in 1906, in collaboration with Pierre Barbier, La Vieillesse de Don Juan in verse.

MOUNIER, JEAN JOSEPH (1758-1806), French politician, was born at Grenoble (Isere) on the 12th of November 1758. He studied law, and in 1783 obtained a judgeship at Grenoble. He took part in the struggle between the p^rlements and the court in 1788, and promoted the meeting of the estates of Dauphine at Vizille (July 20, 1788), which on the eve of the Revolution created an immense stir. He was secretary of this assembly, and drafted the cahiers of grievances and remon- strances presented by it to the king. Thus brought into prominence, Mounier was unanimously elected deputy of the third estate to the states general of 1789. There, and in the Constituent Assembly, he was at first an upholder of the new ideas, pronouncing himself in favour of the union of the Third Estate with the two privileged orders, proposing the famous oath of the Tennis Court, assisting in the preparation of the new constitution, and demanding the return of Necker. On the 28th of September 1789 he was elected president of the Constituent Assembly. Being unable, however, to approve the proceedings which followed, Mounier withdrew to Dauphine, gave in his resignation as deputy, and, becoming suspect, took refuge in Switzerland in 1790. He returned to France in 1801, was named by Bonaparte prefect of the department of Ille- et-Vilaine, which he reorganized, and in 1805 was appointed councillor of state. He died in Paris on the 28th of January 1806. His principal writings are Considerations sur les gouverne- ments (1789); Recherches sur les causes qui ont empeche les Francais de devenir libres (1792), and De i'lnfluence attribute aux philosophes, aux francs- masons et aux illumines sur la revolution de la

France (1801).

See F. A. Aulard, Les Orateurs de I'assemblee constituante (2nd ed., Paris, 1905); De Lanzac de Laborie, Un Royaliste liberal en 1789; J. J, Mounier (Paris, 1887) ; A. Rochas, Biographie du Dauphine (Paris, 1856); Berriat St Prix, Eloge historique de M. Mounier (1806); F. Boianovski, " Quelques lettres inedites de J. J. Mounier," in the Revue historique (1898).

MOUNT, WILLIAM SIDNEY (1807–1868), American artist, was born at Setauket, Long Island, New York, on the 26th of November 1807. He studied in the schools of the National Academy of Design, New York, and in 1832 was made a full Academician. Among his better-known works are " Turning

the Grindstone " and " Farmer's Nooning," Jonathan Sturgis collection; "Turn of the Leaf," Lenox Library, New York; " Bargaining for a Horse," New York Historical Society; " Raffling for a Goose," M. O. Robert's collection; " Long Story," Corcoran Art Gallery, Washington; and "War News," Metropolitan Museum of Art, New York. He died at Setauket, Long Island, on the 19th of November 1868. His brother, Shepard Alonzo Mount (1804–1868), also an artist, best known as a portrait painter, became a National Academician in 1842.

MOUNTAIN (O. Fr. montaigne; popular Lat. montanea, an adjectival form from the classical mons, montis, whence Eng. " mount," a form usually used along with the name of an individual mountain, e.g. Mt Everest), a natural elevation of the earth's surface. The term properly connotes height superior to that of a hill (O. Eng. hyll, cognate with Lat. collis); but the distinction depends on the prominence of a given elevation in relation to its surroundings, and in some degree to the bold or gentle character of its outline.

For the classification of mountains according to the various processes of their formation, see Geography, § Principles of Geo- graphy; and for further details Geology, § viii.

MOUNTAIN, THE (La Montagne), the name applied during the French Revolution to a political group, whose members, called Montagnards, sat on the highest benches in the Assembly. The term, which was first used during the session of the Legis- lative Assembly, did not come into general use until 1703. At the opening of the Convention the Montagnard group comprised . men of very diverse shades of opinion, and such cohesion as it subsequently acquired was due rather to the opposition of its leaders to the Girondist leaders than to any fundamental hostility between the two groups. The chief point of distinction was that the Girondists were mainly theorists and thinkers, whereas the Mountain was composed almost entirely of uncom- promising men of action. During their struggle with the Girondists, the Montagnards gained the upper hand in the Jacobin Club, and for a time Jacobin and Montagnard were synonymous terms. The Mountain was successively under the sway of such men as Marat, Danton, and Robespierre, and the group finally disappeared after Robespierre's death and the successes of the French arms.

See also the articles Jacobins, Girondists and French Revo- lution.

MOUNTAIN ASH, an urban district of Glamorganshire, south Wales, in the Aberdare valley on the Cynon, a west bank tributary of the Taff, with stations on the Taff Vale and Great Western railways, 18 m. N.E. of Cardiff. Pop. (1001), 31,093. A branch of the Glamorganshire canal passes through the place. At the beginning of the 19th century Mountain Ash was a small village known only by its Welsh name of Aberpenar, but from 1850, with the development of its collieries, the popu- lation rapidly increased. The district has an area of 10,504 acres and comprises; besides Mountain Ash proper, a string of villages, the chief being Cwmpenar, Penrhiwceiber,

Abercynon or Aberdare Junction (at the confluence of the Cynon with the Taff) and Ynysybwl, 3 m. to the west on the Clydach. The public buildings include St Margaret's (1862) and St Winifred's (1883), the parish churches of Mountain Ash and Penrhiwceiber respectively; old and new town halls (1864 and 1904), cottage hospital (1896), and a library institute and public hall erected in 1899, at a cost of £8000, by the workmen of Nixon's Navigation collieries. There is a park of 7 acres given in 1897, by Lord Aberdare, whose residence, Duffryn, is in the district. There are also a workmen's institute and a public hall at Penrhiwceiber. The older part of the urban district is included in the parliamen- tary borough of Merthyr Tydfil, and also shares with Merthyr and Aberdare the services of a stipendiary magistrate.

MOUNTAINEERING, the art of moving about safely in moun- tain regions, avoiding the dangers incidental to them, and attain- ing high points difficult of access. It consists of two main divisions, rock-craft and snow-craft. Rock-craft consists in the intelligent selection of a line of route and in gymnastic

skill to follow the line chosen. In snow-craft the choice of route is the result of a full understanding of the behaviour of snow under a multitude of varying conditions; it depends largely upon experience, and much less upon gymnastic skill. The dangers which the craft of climbing has been developed to avoid are of two main kinds: the danger of things falling on the travel- ler and the danger of his falling himself. The things that may fall are rocks, ice and snow; the traveller may fall from rocks, ice or snow, or into crevasses in ice or snow. There are also dangers from weather. Thus in all there are eight chief dangers: falling rocks, falling ice, snow-avalanches, falls from difficult rocks, falls from ice slopes, falls down snow slopes, falls into crevasses, dangers from weather. To select and follow a route avoiding these dangers is to exercise the climber's craft.

Falling Rocks. — Every rock mountain is falling to pieces, the process being specially rapid above the snow-line. Rock-faces are constantly swept by falling stones, which it is generally possible to dodge. Falling rocks tend to form furrows in a mountain face, and these furrows (couloirs) have to be ascended with caution, their sides being often safe when the middle is stone- swept. Stones fall more frequently on some days than on others, according to the recent weather. Local experience is a valuable help on such a question. The direction of the dip of rock strata often determines whether a particular face is safe or dangerous; the character of the rock must also be considered. Where stones fall frequently debris will be found below, whilst on snow slopes falling stones cut furrows visible from a great distance. In planning an ascent of a new peak such traces must be looked for. When falling stones get mixed in considerable quantity with slushy snow or water a mud avalanche is formed (common in the Himalaya). It is necessary to avoid camping in their possible line of fall.

Falling Ice. — The places where ice may fall can always be determined beforehand. It falls in the broken parts of glaciers (seracs) and from overhanging cornices formed on the crests of narrow ridges. Large icicles are often formed on steep rock- faces, and these fall frequently in fine weather following cold and stormy days. They have to be avoided like falling stones. Seracs are slow in formation, and slow in arriving (by glacier motion) at a condition of unstable equilibrium. They generally fall in or just after the hottest part of the day, and their debris seldom goes far. A skilful and experienced ice-man will usually devise a safe route through a most intricate ice-fall, but such places should be avoided in the afternoon of a hot day. Hanging glaciers (i.e. glaciers perched on steep slopes) often discharge themselves over steep rock-faces, the snout breaking off at intervals. They can always be detected by their debris below. Their track should be avoided.

Snow Avalanches. — These mainly occur on steep

slopes when the snow is in bad condition, early in the year, or after a recent fresh fall. Days when snow is in bad condition are easily recognized; on such days it maybe inadvisable to traverse snow-slopes which at another time may be as safe as a high-road. Beds of snow collected on rock-ledges in bad weather fall off when a thaw comes, and are dangerous to rock-climbers. Snow that has recently fallen upon ice slopes is always liable to slip off bodily. Such falling masses generally make the lower part of their descent- by couloirs. Snow avalanches never fall in unex- pected places, but have their easily recognizable routes, which can be-a voided in times of danger by experienced mountaineers.

Falls from Rocks.— The skill of a rock-climber is shown by his choice of handhold and foothold, and his adhesion to those he has chosen. Much depends on a correct estimate of the firmness of the rock where weight is to be thrown upon it. Many loose rocks are quite firm enough to bear a man's weight, but experience is needed to know which can be trusted, and skill is required in transferring the weight to them without jerking. On all difficult rocks the rope is the greatest safeguard for all except the first man in the ascent, the last in the descent. In such places a party of three or four men roped together, with a distance of 15 to 20 ft. between one and another, will be

able to hold up one of their number (except the top man) if one only moves at a time and the others are firmly placed and keep the rope tight between them, so that a falling individual may be arrested before his velocity has been accelerated. In very difficult places help may be obtained by. throwing a loose rope round a projection above and pulling on it; this method is specially valuable in a difficult descent. The rope usually employed is a strong Manila cord called Alpine Club rope, but some prefer a thinner rope used double. On rotten rocks the rope

must be handled with special care, lest it should start loose stones on to the heads of those below. Similar care must be given to handholds and footholds, for the same reason. When a horizontal traverse has to be made across very difficult rocks, a dangerous situation may arise unless at both ends of the traverse there be firm positions. Even then the end men gain little from the rope. Mutual assistance on hard rocks takes all manner of forms: two, or even three, men climbing on one another's shoulders, or using for foothold an ice-axe propped up by others. The great principle is that of co-operation, all the members of the party climbing with reference to the others, and not as independent units; each when moving must know what the man in front and the man behind are doing. After bad weather steep rocks are often found covered with a veneer of ice {verglas), which may even render them inaccessible. Climbing-irons (crampons, steigeisen) are useful on such occasions.

Ice Slopes. — Climbing-irons are also most useful on ice or hard snow, as by them step-cutting can sometimes be avoided, and the footing at all times rendered more secure. True ice slopes are rare in Europe, though common in tropical mountains, where newly-fallen snow quickly thaws on the surface and becomes sodden below, so that the next night's frost turns the whole into a mass of solid ice. An ice slope can only be sur- mounted by step-cutting. For this an ice-axe is needed, the common form being a small pick-axe on the end of a pole as long as from the elbow of a man to the ground. This pole is used also as a walking-stick, and is furnished with a spike at the foot.

Snow Slopes axe very common, and usually easy to ascend. At the foot of a snow or ice slope is generally a big crevasse, called a bergschrund, where the final slope of the mountain rises from a snow-field or glacier. Such bergschrunds are generally too wide to be strided, and must be crossed by a snow bridge, which needs careful testing and a painstaking use of the rope. A steep snow slope in bad condition may be dangerous, as the

whole body of snow may start as an avalanche. Such slopes are less dangerous if ascended directly than obliquely, for an oblique or horizontal track cuts them across and facilitates movement of the mass. New snow lying on ice is specially dangerous. Experience is needful for deciding on the advisability of advancing over snow in doubtful condition. Snow on rocks is usually rotten unless it be thick; snow on snow is likely to be sound. A day or two of fine weather will usually bring new snow into sound condition. Snow cannot lie at a very steep angle, though it often deceives the eye as to its slope. Snow slopes seldom exceed 40 . Ice slopes may be much steeper. Snow slopes in early morning are usually hard and safe, but the same in the afternoon are quite soft and possibly dangerous; hence the advantage of an early start.

Crevasses. — These are the slits or deep chasms formed in the substance of a glacier as it passes over an uneven bed. They may be open or hidden. In the lower part of a glacier the crevasses are open. Above the snow-line they are frequently hidden by arched-over accumulations of winter snow. The detection of hidden crevasses requires care and experience. After a fresh fall of snow they can only be detected by sounding with the pole of the ice-axe, or by looking to right and left where the open extension of a partially hidden crevasse may be obvious. The safeguard against accident is the rope, and no one should ever cross a snow-covered glacier unless roped to one, or better to two, companions.

Weather. — The main group of dangers caused by bad weather centre round the change it effects in the condition of snow and

rock, making ascents suddenly perilous which before were easy, and so altering the aspect of things as to make it hard to find the way or retrace a route. In storm the man who is wont to rely on a compass has great advantage over a merely empirical follower of his eyes. In large snow-fields it is, of course, easier to go wrong than on rocks, but a trained intelligence is the best companion and the surest

guide.

History. — The first recorded mountain ascent after Old Testament times is Trajan's ascent of Etna to see the sun rise. The Roche Melon (11,600 ft.) was climbed in 1358. Peter III. of Aragon climbed Canigou in the Pyrenees in the last quarter of the 13th century. In 1339 Petrarch climbed Mt Ventou near Vaucluse. In 1492 the ascent of Mt Aiguille was made by order of Charles VIII. of France. The Humanists of the 16th century adopted a new attitude towards mountains, but the disturbed state of Europe nipped in the bud the nascent mountaineering of the Zurich school. Leonardo da Vinci climbed to a snow-field in the neighbourhood of the Val Sesia and made scientific observations. Konrad Gesner and Josias Simler of Zurich visited and described mountains, and made regular ascents. The use of axe and rope were locally invented at this time. No mountain expeditions of note are recorded in the 17 th century. In 1744 the Titlis was climbed — the first true snow-mountain. Pococke and Windham's historic visit to Chamonix was made in 1741, and set the fashion of visiting the glaciers. The first attempt to ascend Mont Blanc was made in 1 775 by a party of natives. In 1 786 Dr Michel Paccard and Jacques Balmat gained the summit for the first time. De Saussure followed next year. The Jungfrau was climbed in 1811, the Finsteraarhorn in 181 2, and the Zermatt Breithorn in 1813. Thenceforward tourists showed a tendency to climb, and the body of Alpine guides began to come into existence in con-sequence. Systematic mountaineering, as a sport, is usually dated from Sir Alfred Wills's ascent of the Wetterhorn in 1854. The first ascent of Monte Rosa was made in 1855. The Alpine Club was founded in London in 1857, and soon imitated in most European countries. Edward Whymper's ascent of the Matterhorn in 1865 marks the close of the main period of Alpine conquest, during which the craft of climbing was in-vented and perfected, the body of professional guides formed and their traditions fixed. Passing to other ranges, the ex- ploration of the Pyrenees was concurrent with that of the Alps. The Caucasus

followed, mainly owing to the initiative of D.W. Freshfield; it was first visited by exploring climbers in 1868, and most of its great peaks were climbed by 1888. Trained climbers turned their attention to the mountains of North America in 1888, when the Rev. W. S. Green made an expedition to the Selkirks. From that time exploration has gone on apace, and many English and American climbing parties have surveyed most of the highest groups of snow-peaks; Pike's Peak (14,147 ft.) having been climbed by Mr E. James and party in 1820, and Mt Saint Elias (18,024 ft.) by the duke of the Abruzzi and party in 1897. The exploration of the highest Andes was begun in 1879-1880, when Whymper climbed Chimborazo and explored the mountains of Ecuador. The Cordillera between Chile and Argentina was attacked by Dr Giissfeldt in 1883, who ascended Maipo (17,752 ft.) and attempted Aconcagua (23,393 ft.). That peak was first climbed by the Fitzgerald expedition in 1897. The Andes of Bolivia were explored by Sir Martin Conway in 1898. Chilean and Argentine expeditions revealed the structure of the southern Cordillera in the years 1885-1898. Sir Martin Conway visited the mountains of Tierra del Fuego in 1898. The Alps of New Zealand were first attacked in 1882 by the Rev. W. S. Green, and shortly afterwards a New Zealand Alpine Club was founded, and by their activities the exploration of the range was pushed forward. In 1895 Mr E. A. Fitzgerald made an important journey in this range. Of the high African peaks, Kilimanjaro was climbed in 1889 by Dr Hans Meyer, Mt Kenya in 1889 by J. E. S. Mackinder, and a peak of Ruwenzori by H. J. Moore in 1900. The Asiatic moun- tains have as yet been little climbed, though those that lie within the British Empire have been surveyed. In 1892 Sir Martin

Conway explored the Karakoram Himalayas, and climbed a peak of 23,000 ft. In 1895 A. F. Mummery made a fatal attempt to ascend Nanga Parbat, whilst in 1899

D. W. Fresh- field took an expedition to the snowy regions of Sikkim. In 1899, 1903, 1906 and 1908 Mrs Fannie Bullock Workman made ascents in the Himalayas, including one of the Nun Kun peaks (23,300 ft.). A body of Gurkha sepoys were trained as expert mountaineers by Major the Hon. C. G. Bruce, and a good deal of exploration has been accomplished by them. The only mountains of the northern polar region that have been explored are those of Spitzbergen by Sir Martin Conway's expeditions in 1896 and 1897, and the peaks in the north of Norway and the Lofotens by various Alpine Club and Norwegian parties. (W. M. C.)

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MOUNT BARKER, a town of Hindmarsh county, South Australia, at the foot of the mountain of the same name, 345 m. by rail E. of Adelaide. It has an extremely fine climate and is much frequented as a health resort in summer, It is the centre of a populous and fertile district producing quantities of fruit, wheat and dairy produce; important cattle sales are held weekly, and there are several engineering works, flour mills and tanneries in the town, which also is the seat of a wattle-bark industry. Pop. about 2000; but the inhabitants of the Mount Barker district number over 34,000.

MOUNT CARMEL, a borough of Northumberland county, Pennsylvania, U.S.A., at the head of Shamokin Creek, about 50 m. N.N.E. of Harrisburg. Pop. (1890), 8254; (1900), 13,179, of whom 3772 were foreign-born: (1910 census) 17,532. It is served by the Lehigh Valley, the Philadelphia & Reading, and the Shamokin Division of the Northern Central (Pennsylvania system) railways. Anthracite coal abounds here, and the mining and shipping of it, together with the manufac- ture of mining machinery and miners' supplies are the borough's principal industries. This locality was settled late in the 18th century. About 1848 Mount Carmel was laid out as a town, and in 1862 was chartered as a borough.

MOUNT CLEMENS, a city and the county seat of Macomb county, Michigan, U.S.A., on Clinton river, about 5 m. (about 2m. in direct line) from its entrance into Lake Saint Clair, and 20 m. N. by E. of Detroit, Pop. (1890) 4748; (1900) 6576 (1194 foreign-born); (1904, state census) 7108; (1910) 7707. It is served by the Grand Trunk railway and by two electric lines to Detroit. The mineral waters of Mount Clemens are beneficial to patients suffering from rheumatism, blood diseases and nervous disorders. The city's principal manufactures are beet sugar, barrels and other cooperage products, wagons, carriages, sleighs and agricultural implements. Mount Clemens was settled in 1802, was incorporated as a village in 1837, and was chartered as a city in 1879.

MOUNT DESERT, an island in Hancock county, Maine, U.S.A. It is about 16 m. long and 10 m. wide in its widest part, with an approximate area of 100 sq. m. and a population (1910) of 8014. The Maine Central railroad runs a ferry from its nearest station on the mainland (Mount Desert Ferry), and the island is also accessible during the warmer months by steamship lines from New York, Boston, Portland, and several other ports. On the north across Mount Desert Narrows, a bridge connects the island with the mainland. Eagle Lake, at the north-east base of Green Mountain, is a beautiful sheet of water about 25 m. long, and 5 m. wide, and Great Pond, 4 m. long, lies near Somesville between Beech Hill and

Western Mountain. There are numerous

outlying rocky islets. The surface of Mount Desert is generally so rocky that the greater part of it has never been inhabited or cultivated, but wherever there is a thin soil the hills are wooded with spruce, alder, birch, maple and mountain ash. The hilly scenery, the cool summer climate, and the facilities for boating and fishing attract many thousands of visitors each summer, and the maintenance of the permanent population is derived very largely from the summer residents. The Penobscot and Passamaquoddy Indians come here in the season to sell their basket-work, toy canoes, moccasins, bows and arrows, &c. The villages most frequented by summer visitors are Bar Harbor (q.v.) on the north-east coast; Northeast Harbor, Southwest Harbor and Seal Harbor on the south coast; and Somesville, at the head of Somes Sound. Along the western shore are several quaint old hamlets.

Mount Desert 'Island was discovered and named by Samuel de Champlain on the 5th of September 1604. French Jesuits established a settlement, St Sauveur, at the entrance to Somes Sound in 1609, but this was destroyed four years later by Samuel Argall. In 1688 the island was granted by Louis XIV. to Sieur de la Mothe Cadillac, but no permanent settlement was established until 1762, when the general court of Massachusetts granted one-half of the island to Governor Francis Bernard and under his encouragement a settlement was begun at Southwest Harbor. During the War of Independence all the American estates of Bernard were confiscated, but in 1785 his former interest in Mount Desert was conveyed to his son, John, and two years later heirs of Cadillac, among them his granddaughter, Mme de Gregoire, who had come to Maine in 1786, received from the general court a grant for the remaining portion. Until the summer visitors came, the settlers gained only a scanty liveli- hood, chiefly by fishing, lumbering, boat building and farming. Practically all of them lived along the shore; they had boats, but few horses, and the roads were only rough trails. There is no record of any mail service until 1820, and as

late as 1870 the only means of reaching the island was by stage from Bangor or by steamboat twice a week from Portland.

See George E. Street, Mount Desert, a History (Boston, 1905).

MOUNTEBANK (Ital. monlambanco, montimbanco, from mon- tare, to climb up on, mount, and banco, bench, cf. saltimbanco, an acrobat' or dancer, one who dances or leaps on a bench), a wandering juggler, story-teller, seller of quack medicines, &c, who performs his entertainment on a platform or raised bench, hence any charlatan or quack.

MOUNTED INFANTRY, infantry soldiers who ride instead of marching on foot from one place to another. As combatants they are infantry pure and simple, being neither armed nor trained to fight on horseback, and their special characteristic is the power to move from one point to another with great rapidity. They are therefore useful (a) in wars, such as colonial wars, in which cavalry proper finds no scope for its activity, and (b) in performing duties for which mounted troops, but not necessarily troops that can fight mounted, are required. In these two r61es mounted infantry is obviously a substitute for cavalry. As cavalry is both a most expensive arm and one which cannot be improvised, there is an ever-recurring tendency in all armies to consider it as being more ornamental than useful, and in con-sequence to substitute mounted infantry under one name or another (the original dragoons for example were mounted infantry) for " shock action " cavalry. In recent times, owing to the development of the long-ranging magazine rifle, this tendency has been intensified to such a degree that Russia, for example, converted the whole of her cavalry into dragoons — the term being used in its old sense — and trained it to act dis- mounted in large bodies. It is however significant of the failure of this wholesale conversion that after the Russo-Japanese War the regiments that were formerly hussars and lancers were reorganized as such and ceased to be styled and trained as dragoons.

It is difficult, but at the same time important, to differentiate between dragoons or ” mounted rifles,” as they are often called to-day, and mounted infantry in a narrower sense of the word.

Mounted rifles are half cavalry, mounted infantry merely specially mobile infantry. The American cavalry in the Civil War, the Boers in the South African War, the Russians in the Manchurian campaign, • were mounted rifles, and the question of their advantages and disadvantages, as compared with what is generally called “regular” cavalry, is purely a cavalry one. The main question as regards mounted infantry is whether its existence as a special arm is justified by the kind and degree of assistance which it is peculiarly qualified to give to the other arms in war. If this be answered in the affirmative for a particular army, then that army, having raised mounted infantry, may require of it such additional services as it would be more or less uneconomical to assign to regular cavalry. Mounted infantry in this case may and in fact does assume the role of mounted rifles; for example, in the British regular army the duties of divisional mounted troops are performed by mounted infantry, while in the territorial army the same duties are performed by yeomanry mounted rifles.

In the British mounted infantry, which is the only force in any army specially trained as such, 1 the course of instruction lasts four months and is based on the assumption that officers and men under instruction are already fully trained as infantry {M.I. Training, 1909). All words of command, bugle sounds, formations, &c, are similar to those used in the infantry, and as a rule spurs are forbidden. The mounted infantry horse is a handy cob (14-2 to 15). The organization adopted is by battalions and companies, each company having 6 officers and 153 men, and the battalion consisting of three such companies and a machine-gun section. Mounted

infantry battalions and companies do not exist in peace, but are formed on mobilization from the qualified men available who can be spared from the infantry. Since many more men are trained than would be required for the 24 or 26 companies forming part of the expedi- tionary force, the arm is capable of considerable expansion, while the men first selected for the service are in every way picked men. As already mentioned its duties are (a) with respect to the cavalry, first to assist and secondly to supplement or replace it — by the judicious use of the rifle, and (b) with respect to the infantry to relieve the unmounted man as far as possible of reconnoitring and orderly duties, and above all of the necessity of hurried and exhausting movements to seize points of support.

Cyclists. — The application of the bicycle to military purposes was first suggested in Great Britain, and military cycling became the special and almost exclusive property of the volunteer force, in which, when cycling became universally popular and the machines cheap, practically all battalions had sections and most of them companies of cyclists. In those days, however, the want of a common organization separated the yeomanry from the volunteers, and the latter, possessing no mounted troops of its own, employed its numerous cyclists in recon- noitring, protective and orderly work indifferently. Pro- visional battalions were frequently formed, and in spite of their heterogeneous composition and inadequate staff they proved capable of manoeuvring as units. Movements in brigade were practised at Aldershot in 1901, the brigade composed of 3 battalions of about 650 rifles each, drawn from some forty volunteer infantry units under training at the time, being trained in combined movements by parallel roads and night marching, as well as in field operations. When the fusion of the yeomanry and volunteers in the territorial force (1907–1908) released cyclists from the duties of mounted troops which had hitherto been imposed on them, the cyclist companies in the infantry battalions were disbanded, and their place

taken by 10 cyclist battalions specially trained for protective work in large tactical bodies. The regular army, which is generally employed in almost roadless countries, only maintains a few cyclists for orderly work.

Amongst the regular armies that of France was certainly

1 The infantry " mounted scouts " of the Russian and French armies are simply auxiliaries and have no existence apart from their regiments.

the pioneer in the matter of cycling. Infantry support for cavalry is a fundamental principle of the French doctrine of tactics, and this infantry support in so well-roaded a country as France naturally takes the form of strong cyclist groups. The French military cyclists are equipped with a folding bicycle, which allows of cross-country movement being undertaken without leaving the bicycles unguarded. In Germany very few military cyclists are maintained— one small section in each infantry or cavalry regiment. The field service regulations permit the grouping of these sections for united action as a company, but only under special circumstances. In Italy, however, whole battalions of the fast-moving light troops, Bersaglieri, have been within recent years provided with the cycle.

Cyclists are mounted infantry in the strictest possible sense of the phrase. They possess over all horsemen the incalculable advantages of being able to make longer marches; for they can cover 80 or 90 m. a day for several days; 2 of exemption from forage anxieties; of freedom from the necessity in action of leaving one-third or one-quarter of the men to hold the horses; and of actual speed, an ordinary cyclist being able to move faster along a good road than a staff officer mounted on a thoroughbred. On the other hand cyclist troops can never be as free to move across country as horsemen; a cyclist column, owing to its speed and great length in proportion to its numbers, is peculiarly

liable to surprise; and the condition of the roads or a strong head wind materially reduces its rate of marching.

MOUNTFORT, WILLIAM (c. 1664–1692), English actor and dramatic writer, was the son of a Staffordshire gentleman. His first stage appearance was with the Dorset Garden company about 1678, and by 1682 he was taking important parts, usually those of the fine gentleman. Mountfort wrote a number of plays, wholly or in part, and many prologues and epilogues. He married, in 1686, Susanna Percival (see Verbrtjggen, Mrs), the actress. Owing to jealousy of Mrs Bracegirdle's supposed interest in Mountfort, Captain Richard Hill, an adventurer, who had annoyed her with persistent attentions, accompanied by Charles, fifth Baron Mohun, murdered Mountfort in Howard Street, Strand, on the 9th of December 1692. Hill made his escape. Lord Mohun was tried by his peers and acquitted by a vote of 69 to 14.

MOUNT GAMBIER, a town of Grey county, South Australia, 305 m. by rail S.E. of Adelaide. It stands on the northern base of the mountain of the same name, an extinct volcano. It is a handsome town with many fine buildings of white limestone and grey and red dolomite, which abound in the neighbourhood, the church of St Paul being the finest edifice of its kind outside Adelaide. The agricultural society has a good showground where two shows are held annually. Two splendid lakes lie near the town — Blue Lake, 160 acres in extent, and Valley Lake, 97 acres, from the first of which the water-supply of the town is derived. Mount Gambier is the centre of one of the richest grain-growing districts in Australia. Pop. (1901), 3162; and including the suburbs, about 8000.

MOUNT HOLYOKE COLLEGE, the pioneer institution in America for the higher education of women, situated in the village of South Hadley, Massachusetts, near Mount Holyoke. It was founded by Mary Lyon (q.v.), and was chartered as Mount Holyoke Female Seminary in 1836 (opened in 1837), but the name was changed to Mount Holyoke College in 1893. Besides the

recitation halls and laboratories there are. the D wight Memorial art building (1901), a library building (1905), the John Payson Williston observatory, botanical gardens (1901), a gymnasium, a hospital, and seven residence halls. For under- graduates the college offers two years of work in prescribed courses in Latin, Greek, French, German, English, history, Biblical literature, profane literature, physics, and chemistry, and two years of work in elective courses; for graduates it offers one year of advanced work, including courses in education designed for those preparing to teach. To make college expenses

2 The loss of men by accidents to the machines, punctures, &c, has been shown in manoeuvres to be nearly negligible.

lighter and to ″ promote a spirit of democracy and of considera- tion for others ″ every student helps either in housework or in the academic departments. In 1908–1909 the college had no instructors and 748 students.

MOUNTJOY (or Montjoy), BARONS AND VISCOUNTS. Sir Walter Blount (d. 1474), of Elvaston, Derbyshire, grandson of Sir Walter Blount, who was an adherent of John of Gaunt, succeeded his father, Sir Thomas Blount, as treasurer of Calais in 1460, becoming governor a year later as a reward for service rendered to King Edward IV. at the battle of Towton. Edward conferred on him rich estates forfeited by the earl of Devon; and in 1465 Blount was made lord high treasurer and created Baron Mountjoy. This creation is noteworthy as one of the earliest examples of a baronial title not being of a territorial character; nor the title of a dignity already existing. Blount’s great-grandfather had married Isolda, daughter and heiress of Sir Thomas de Mountjoy, and the title was probably chosen to commemorate this alliance.

William Blount, 4 th Baron Mountjoy (c. 1478–1534), was famous as a scholar and patron of learning. He was a pupil of Erasmus, who called him inter nobiles

doctissimus. His friends included Colet, More and Grocyn. He held a command in the force sent to suppress Perkin Warbeck's rebellion in 1497- In 1513 he was appointed governor of Tournai, and his letters to Wolsey and Henry VIII. describing his vigorous government of the town are preserved in the British Museum. He was present with Henry VIII. at the Field of the Cloth of Gold in 1520, and at the meeting with Charles V. in 1522. He had been master of the mint since 1509, and chamberlain to Catherine of Aragon since 151 2. It fell to him in this office to announce to the queen Henry's intention to divorce her; he also signed the letter to the pope conveying the king's threat to repudiate the papal supremacy unless the divorce were granted. Mountjoy, who was one of the wealthiest English nobles of his time, died in 1534. His son Charles, 5th Baron Mountjoy (1516–1544), was also a patron of learning.

Charles Blount, earl of Devonshire and 8th Baron Mountjoy (1 563–1606), lord-lieutenant of Ireland, grandson of the pre- ceding, was the most notable of the later holders of the title. The favour which his youthful good looks procured for him from Queen Elizabeth excited the jealousy of the earl of Essex, and led to a duel between the two courtiers, who, however, soon became close friends. Between 1586 and 1598 he was much on the continent, serving in the Netherlands and in Brittany. He joined Essex and Sir Walter Raleigh in their expedition to the Azores in 1597, his brother, Sir Christopher Blount (1565-1601), who was afterwards executed for complicity in Essex's treason, being also of the party. In 1600 Mountjoy went to Ireland as lord deputy in succession to Essex, where he succeeded in suppressing the rebellion of Hugh O'Neill, earl of Tyrone, whom Essex had failed to subdue. In July 1601 Mountjoy made himself master of Lough Foyle, and in the following December he defeated O'Neill's Spanish auxiliaries at Kinsale, and drove them out of the country. In 1602 the earl of Tyrone made his submission to Mountjoy in Dublin (see O'Neill); and on the accession of James I. Mountjoy was continued in his office with the more distinguished title of

lord-lieutenant. Returning to England, he was one of Sir Walter Raleigh's judges in 1603; and in the same year he was made master of the ordnance and created earl of Devonshire, extensive estates being also granted to him. He died in London on the 3rd of April 1606. About 1590 Mountjoy took as his mistress Penelope, wife of Lord Rich and sister of the earl of Essex. After the death of her brother in 1601, Lady Rich was divorced from her husband in the ecclesiastical courts. Mountjoy, by whom she had already had several children, was married to the lady in 1605 by his chaplain, William Laud, afterwards archbishop of Canterbury. As he left no legitimate children the earl's titles became extinct at his death.

His eldest natural son by Lady Rich, Mountjoy Blount (c. 1 597-1666), inherited a large property by his father's will, and was a favourite with James I. The family title was revived

in his favour in 1618, when he was created Baron Mountjoy of Mountjoy Fort, Co. Tyrone, in the peerage of Ireland; and Baron Mountjoy of Thurveston, Derbyshire, in the peerage of England. In 1628 he was further created earl of Newport in the Isle of Wight. In the same year he was appointed to com- mand, with the rank of rear-admiral, the expedition for the relief of Rochelle; in 1634 he was made master of the ordnance. • He took the popular side at the beginning of the trouble between Charles I. and the parliament, and was an eager opponent of Strafford. When the Civil War broke out, however, Newport served in the royalist army, and took part in the second battle of Newbury in 1644. In January 1646 he was taken prisoner and confined in London on parole. He died at Oxford on the 12th of February 1666, leaving two surviving sons, who in turn succeeded to the earldom of Newport and barony of Mountjoy Both titles became extinct on the death of Henry, the younger of these sons, in 1681.

In 1683 Sir William Stewart (1653-1692), who owned large property in the counties of Donegal and Tyrone, and whose grandfather was created a baronet in 1623, was raised to the peerage of Ireland as Baron Stewart of Ramelton, Co. Donegal, and Viscount Mountjoy. Having served abroad, Mountjoy returned to Ireland in 1687, where he became brigadier- general. At the revolution he remained loyal to James II.; but being a Protestant he was distrusted by Tyrconnel,' the viceroy, and was removed with his troops from Londonderry to Dublin. When the gates of Londonderry were closed against James s representative, Tyrconnel sent Mountjoy and Robert Lundy with a force to the north. After negotiations which resulted m Lundy being admitted as governor to the city Mountjoy was sent with Sir Stephen Rice to Paris to report on the state of affairs to James II. On their arrival, Rice acting on secret instructions, denounced Mountjoy as a traitor, and the latter was thrown into the Bastille, where he remained till 1692. He then went over to William III., and was killed at Steinkirk on the 3rd of August 1692.

William, 3rd Viscount Mountjoy (1709-1769), was in 1745 created earl of Blesington, his mother having been sister and sole heiress of Charles, 2nd and last Viscount Blesington. On his death without issue in 1769 all his titles became extinct. Anne Stewart, daughter and heiress of Alexander Stewart, second son of the above-mentioned William, 1st Viscount Mountjoy, married Luke Gardiner, vice-treasurer of Ireland; and her grandson, Luke Gardiner (1 745-1 798), who inherited a large portion of the Mountjoy family estates, was created Baron Mountjoy of Mountjoy, Co. Tyrone (1789), and Viscount Mountjoy (1795), both in the peerage of Ireland; but on the death without male issue in 1829 of his son Charles John, who in 1816 was created earl of Blesington, all these titles again became extinct.

Thomas Windsor, or Hickman- Windsor (c. 1670-1738), second son of Thomas, Lord Windsor de Stanwell, 1st earl of Plymouth, was in 1699 created Viscount Windsor of Black- castle, in the peerage of Ireland.

In 171 2 he was created a peer of Great Britain with the title of Baron Mountjoy of the Isle of Wight, being descended in the female line from Sir Andrew Windsor (c. 1475–1543), 1st Baron Windsor de Stanwell, who married Elizabeth Blount, sister and co-heir of Edward, 2nd Baron Mountjoy of the first creation, who died an infant in 1475- On the death of Thomas's son Herbert in 1758 the title of Mountjoy again became extinct; but it was revived in favour of John Stuart, earl of Bute, who married Charlotte Jane Hickman- Windsor, Herbert's daughter and sole heiress, and who in 1796 was created Viscount Mountjoy of the Isle of Wight, earl of Windsor, and marquess of the county of Bute, all of which titles are held by his descendant, the present marquess of Bute.

See Sir Alexander Croke, The Genealogical History of the Croke family originally named Le Blount (2 vols., Oxford, 1823). For the Irish lord deputy, see also W. B. Devereux, Lives and Letters of the Devereux, Earls of Essex (2 vols., London, 1853); Fynes Moryson,

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MOUNTMELLICK, a market town of Queen's county, Ireland, pleasantly situated on the Owenass (an affluent of the Barrow) which nearly encircles it. Pop. (1901), 2407. It is the terminus of a branch of the Great Southern & Western railway, 75 m. N. of Maryborough and 583 W.S.W. of Dublin. A branch of the Grand Canal also reaches the town, providing - water communication with Dublin, and with Waterford by the river Barrow. There are industries of malting, tanning, woollen and salt manufactures, and iron-founding. A settlement of Quakers has contributed largely to the prosperity of the town. A provincial school of the Leinster Society of Friends was founded here in 1796.

MOUNT MORGAN, a municipality of Raglan county, Queensland, Australia, 28 m. by rail S.S.W. of Rock-hampton. Pop. (1901), 6280. Railway communication was opened in 1898. The town has been considered to stand on the richest gold site in Australia, the gold being very fine and pure.

MOUNT SORREL, a market town in the Loughborough (Mid) parliamentary division of Leicestershire, on the river Soar, 7 m. N. of Leicester. Pop. (1901), 2417. The Sileby station on the Midland main line lies if m. E. The position is beautiful, a steep hill, once crowned by a castle, rising above the well- wooded valley. At Barrow-upon-Soar, 2J m. N. (pop. 2409; Barrow and Quorn railway station), lime is worked extensively. The village of Quorndon or Quorn, i§ m. N.W., is the head- quarters of the well-known Quorn hunt. Quorndon is an urban district (pop. 2173).

MOUNTSTEPHEN, GEORGE STEPHEN, Baron (1829-), Canadian financier, was born on the 5th of June 1829 at Duff- town, Banffshire, Scotland, the son of William Stephen and Elspeth Smith. He was educated at the parish school, after which he was for a time a herd boy. In 1850 he went to Canada and soon became a prominent business man in Montreal. In 1878 he joined with his cousin, Donald Smith (afterwards Lord Strathcona), in the purchase of the St Paul & Pacific railway. This led to his interest in the development of western Canada, and from 1881 onwards he was associated with his cousin in the construction of the Canadian Pacific railway, for his services in connexion with which he was in 1886 made a baronet, in 1891 raised to the peerage; and in 1905 made G.C.V.O. In 1888 he left Canada, and thereafter lived in England and Scotland. He gave lavishly to charity and education, and with Lord Strathcona built and endowed the Royal Victoria hospital at Montreal.

MOUNT-TEMPLE, WILLIAM FRANCIS COWPER-TEMPLE, Baron (1811-1888), English politician, second son 01 the 5th Earl Cowper, was born at Brocket Hall, Hertfordshire, on the 13th of December 1811. He was

educated at Eton, and entered the Royal Horse Guards,, attaining the rank of brevet-major in 1852. His mother, Emily Mary, was sister to the prime minister, Lord Melbourne, whose secretary William Cowper became in 1835 ; in this year he entered parliament as member for Hertford, which he continued to represent until 1863. As commissioner of works (1860-1866) he carried the bills for the Thames Embankment (1862), and for the new law courts (1863); but he is best known for the amendment, known as the ″ Cowper-Temple clause,″ which he introduced into the second reading of the Education Bill of 1870, that no catechism nor denominational teaching of any kind should be included in the religious instruction given in rate-aided schools. His mother, who married Lord Palmerston as her second husband, died in 1869, and under his stepfather's will William Cowper succeeded to some of the Palmerston estates in Ireland and Hampshire, and assumed the additional name of Temple. He was M.P. for South Hampshire from 1868 until 1880 when he was raised to the peerage as Baron Mount-Temple of Mount- Temple, Sligo. He died at Broadlands, near Romsey, on the 16th of October 1888. He was twice married, but left no children, the Palmerston estates descending to the Right Hon. Evelyn Ashley (1836-1907), who was under-secretary of state for the colonies from 1882 to 1885.

MOUNT VERNON, a city and the county-seat of Jefferson county, Illinois, U.S.A., about 75 m. E. by S. of St Louis. Pop. (1890), 3 2 33; (1900). S 2 i6 (111 foreign-born); (1910), 8007. It is served by the Chicago & Eastern Illinois, the Louisville & Nashville, the Wabash, Chester & Western, and the South- ern railways. It is the headquarters of the fourth appellate court district of the state. Mount Vernon was settled in 1819, incorporated as a village in 1837 and chartered as a city in 1872. Many of its buildings were destroyed by a cyclone on the 19th of February 1888.

MOUNT VERNON, a city and the county-seat of Posey county, Indiana, U.S.A., on the Ohio river, in the extreme south-west corner of the state. Pop. (1890)

4705; (1900), 5132, including 892 negroes and 262 foreign-born; (1910), 5563. It is served by the Evansville & Terre Haute, the Louisville & Nashville, and the Evansville & Mount Vernon (electric) railways. The city is a trading centre for the surrounding farming region. It has a valuable river trade, and various manufactures. The first settle- ment here was made in 1803, and in 1819 a town was laid out and named Mount Vernon. It became the county-seat in 1825, and was incorporated as a town in 1846 and chartered as a city in 1865.

MOUNT VERNON, a town of Linn county, Iowa, U.S.A., 16 m. E. of Cedar Rapids. Pop. (1900), 1629; (1910, U.S. census), 153a. Mount Vernon is served by the Chicago & North Western railway. It is the seat of Cornell College (Methodist Episcopal; coeducational), which was opened as the Iowa Conference Seminary in 1853, and was chartered in 1857 under its present name, adopted in honour of William W. Cornell (1823-1870), an iron manufacturer of New York City and a benefactor of the institution. Cornell College includes a col- legiate department, an academy, a conservatory of music, a school of art, a school of oratory and a summer school; in 1907- 1908 it had 40 instructors and 755 students. Mount Vernon was settled in 1842, was laid out in 1847, and was incorporated as a town in 1869.

MOUNT VERNON, a city of Westchester county, in south- eastern New York, U.S.A., on the Bronx river and Eastchester Creek, 13 m. from the Grand Central station, New York City. Pop. (1890), 10,830; (1900), 20,346, of whom 5265 were foreign- born (many being Italians) and 516 negroes; (1910, census), 30,919. It is served by the New York Central & Hudson River and the New York, New Haven & Hartford railways, and by electric lines to New York City, Yonkers, New Rochelle, &c. The city has various manufactures, but in the main is a residential suburb of New York ; the finest residences are in the eastern, cen- tral and north-eastern sections, the last being known as Chester Hill; the foreign-born element is largely concentrated in the western part. Mount Vernon is in the township of Eastchester, which was settled from

Connecticut in 1664, possibly in the hope of pushing Connecticut's boundary nearer the Hudson. It was called " Ten Farms " or East Chester. A parish of the same name was established in 1693, but was disallowed in England. About 1682 the " Ten Farmers " established a free school. In 1764 the foundations were laid of the present St Paul's (Protestant Episcopal), which was used through a part of the American War of Independence as a British military hospital. St Paul's churchyard dates back to the close of the 17th century. Along the White Plains road (now Lincoln Avenue) Washington retreated, pursued by General Henry Clinton, before the battle of White Plains in 1776. The city of Mount Vernon was founded in 1851 by several realty companies. The postal authorities objected to the name Monticello, originally used, and Mount Vernon was adopted instead. Mount Vernon was incorporated as a village in 1853 and was first chartered as a city in 1892. West Mount Vernon was founded by the Teutonic Homestead Association and was annexed to Mount Vernon in 1869.

See William S. Coffey, " East Chester," pp. 720-764 of vol. ii. of J. T. Scharf's History of Westchester County, N. Y. (2 vols., Phila- delphia, 1886).

MOUNT VERNON— MOUSE

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MOUNT VERNON, a city and the county-seat of Knox county, Ohio, U.S.A., on the Kokosing river, about 45 m. N.E. of Columbus. Pop. (1890), 6027; (1900), 6633, including 359 foreign- born and 239 negroes; (1910), 9087. Mount Vernon is served by the Baltimore & Ohio and the Cleveland, Akron & Columbus, railways. The city is the seat of the state hospital for tuber- culosis, has a fine court- house, a public library, and various manufacturing establishments. Natural gas is found in the vicinity. Mount Vernon was laid out in 1805; it became the county-seat in 1807, was incorporated as a town in 1845, an d became a city in 1853.

MOUNT VERNON, the former home of George Washington, in Fairfax county, Virginia, U.S.A., on the Potomac river, 15 m. below Washington, D.C., reached by steamer from Wash- ington and by electric railway from Alexandria, Virginia. The mansion-house, which is the centre of interest, stands on a bluff overlooking the river. The house is built of wood, but the siding is of wide thick boards so panelled as to give the appear- ance of cut and dressed stonework. The rooms contain much of the furniture which was in them when they were occupied by General Washington and his family; and the furniture that had been lost has been in part replaced by other furniture of historic interest and of the style in use in Washington's day. In the main hall hangs a glass casket containing the key to the Bastille which Washington received from Lafayette in 1790. From each end of the house a curved colonnade and a pavement lead westerly to a row of out-buildings which partially enclose a bowling green and spacious lawn with shaded drives and walks, and beautiful gardens (with trees planted by Washington, Franklin, Jefferson, Lafayette and others). A short distance south-west of the mansion-house and between it and the wharf is a plain brick tomb, which was built by Washington's direction on a site chosen by himself, and contains the remains of Washington and Mrs Washington (removed to this tomb from the old family vault in 1831), and of about thirty relatives — members of the Washington, Blackburn, Corbin, Bushrod, Lewis and Custis families.

The estate, originally called " Little Hunting Creek Planta- tion," was devised in 1676 by John Washington (the first of the family in America) to his son, Lawrence, who in turn devised it to his daughter, Mildred, by whom (and her husband Roger Gregory) it was deeded in 1726 to her brother Augustine (George Washington's father). On Augustine's death (1743) it passed to Lawrence (George's half-brother), who built in 1743 the villa which forms the middle portion of the present mansion-house and named the estate Mount Vernon, in honour of his former commander, Admiral Edward

Vernon (1684-1757). Lawrence left it (1752) to his widow Anne Fairfax (who in the same year married George Lee) with the proviso that it should pass at her death to George Washington, who meanwhile rented the estate, gaining full possession at her death in 1761. In 17 84-1 7 85 he enlarged the villa into the mansion-house with its present dimensions by building an addition at each end, erected several of the out-buildings, and adorned the grounds, all according to his own plans and specifications. At General Washington's death (1799) Mount Vernon passed to his widow; at her death (1802) it passed to his nephew, Bushrod Washington, and at Bushrod Washington's death (1829) to his nephew John Augustine Washington, who devised it in 1832 to his widow, by whom it was devised in 1835 to their son John A. Washington. This last was authorized by his father's will to sell the estate to the United States government, and in 1847 offered the property for $100,000, but the offer was refused. In i860 the mansion-house and 200 acres of the original estate, fast falling into decay, were bought for $200,000 (much of which had been raised through the efforts of Edward Everett) by the Mount Vernon Ladies' Association of the Union. This association under its charter (1856) bound itself to restore the estate as far as possible to the condition in which it was in the lifetime of Washington and to keep it sacred to his memory, and Virginia agreed to exempt it from taxation as long as these terms were fulfilled.

See B. J. Lossing, The Home of Washington: or Mount Vernon and its Associations (Hartford, 1870).

MOURNING (from the verb " to mrjurn," to be sorrowful, 0. Eng. murnan; ci. O.H.G. mornen, Goth, maurnan, to be anxious, O.N. moma, to pine away; by some referred to root seen in Gr. txkpLfiva, sorrow, by others to root mer-, to die), the expression of grief or sorrow particularly for the dead; more specifically the outward or conventional signs of such grief. The public exhibition of this grief for the dead has taken various forms among different races and in different ages, from shaving of the head, or allowing the beard and hair to grow, from

disfiguring the face and uttering loud wailing cries, to the wearing of clothes of a particular colour, now among Western races usually black, and to the purely conventional custom of using black-edged note-paper, cards, &c. (See further Funeral Rites.)

MOUSE, in its original sense probably the name of the semi- domesticated house-mouse (Mus musculus), the type of the genus Mus and of the family Muridae. Zoologically, there is no distinction between mice and rats; these names being employed respectively for most or all of the smaller and larger ″ mouse-like ″ and ″ rat-like ″ representatives of the Muridae, whether they belong to the genus Mus or not. It is true indeed that in zoological nomenclature some of these are distinguished as ″ voles ″ (see Vole), but this is not in accord with popular usage, where such creatures come under the designation either of water-rats or field-mice. The distinctive characters of the typical mice (and rats), i.e. those included in the genus Mus, are dealt with in the article Rodentia. With the exception of Madagascar, the genus Mus ranges over practically the whole of the Old World, having indigenous representatives even in Australasia; while the house-mouse, with man's involuntary aid, has succeeded in establishing itself throughout the civilized world. The following is a brief notice of the species of true mice (that is to say, those generally included in the genus Mus) inhabiting the British Isles. These are three in number. M. musculus, the house-mouse, originally a native of Central Asia, has spread to all the inhabited parts of the globe. M. sylvaticus, the wood or long-tailed field-mouse, is a species common in many parts of England, often taking to barns and out-houses for shelter during the winter. It is of about the same size and pro- portions as M. musculus, but of a bright reddish-grey colour, with a pure white belly. M. minutus, the harvest-mouse, is the smallest of the European mice, seldom exceeding 2J or 3 in. in length; and of a yellowish-red colour, with comparatively short ears and tail. It lives entirely

away from houses, commonly taking up its abode in wheat or hay fields, where it builds a round grass nest about the size of a cricket-ball, in which it brings up its young. Its range extends from England to Japan. In regard to the first it is noteworthy that house-mice isolated on a small sandbank near Dublin have developed a special colouring of their own; also that distinct local varieties, M . musculus muralis and M. m. faeroensis, inhabit respectively St Kilda and the Faeroes. In Central Asia there exists a wild mouse (M. bactrianus), and likewise a second species (M. wagneri), with the habits of a house-mouse, both of which are closely allied to M. musculus; while there is a third kind (M. gentilis), also nearly related, in the deserts of North Africa. According to Major G. E. H. Barrett-Hamilton it is probable that M. bactrianus and M. musculus are respectively desert and house modifications descended from some Central Asian ancestor more or less nearly allied to M. wagneri. As regards the other two British species, it must suffice to say that there are several local races of each; Mus sylvaticus being represented by several in the British Isles, although there is but one British representative of M . minutus. It may be added that by some naturalists both M. sylvaticus and M . minutus are separated from Mus as Micromys.

See G. E. H. Barrett-Hamilton, " Note on the Harvest-Mice of the Palaearctic Region," Annals and Magazine of Nat. History (April 1899); "On the Species of the genus Mus inhabiting St Kilda," Proc. Zool. Soc. (London, 1899); "On Geographical and Individual Variation in Mus sylvaticus and its Allies," op. cit. (1900) ; W. E. Clarke, " On Forms of Mus musculus, with Description of a New Subspecies from the Faeroe Islands," Proc. Roy. Phys. Soc. (Edinburgh, 1904), vol. xv. (R. L.*)

HOUSE-BIRD (Du. Muisvogel), the name by which in Cape Colony and Natal the members of the genus

Coitus of M. J. Brisson are known — probably from their singular habit of creeping along the boughs of trees with the whole tarsus applied to the branch. By the earlier systematists, Colius was placed among the Fringillidae; but the investigations of J. Murie and A. H. Garrod on its internal structure showed that it was not a true Passerine, and it is now placed in a separate family, Coliidae, amongst Coraciiform birds, near the trogons and swifts (q.v.). The Coliidae are small birds, with a rather

finch-like bill, a more or less crested head, a very long tail, and generally of a dun or slate-coloured plumage that sometimes brightens into blue or is pleasingly diversified with white or chestnut. They feed almost wholly on fruits, but occasionally take insects, in quest of which they pass in bands of fifteen or twenty from tree to tree. Seven species are believed to exist, all belonging to the Ethiopian region (of which the Family is one of the most characteristic), and ranging from Abyssinia southwards. Three species inhabit Cape Colony. (A. N.)

MOUSSORGSKY, MODESTE PETROVICH (1835-1881), Russian composer, was born at Karevo, government of Pskov, in March 1835, and entered the army at an early age. He came of a musical family, and was himself a talented amateur, and an acquaintance with Balakirev and Dargomijsky led him to more serious study of composition, so that in 1857 he left the army and devoted himself to music, though this step entailed his earning his living as a government clerk and a prolonged period of poverty. His greatest opera, Boris Godounov, based on Pushkin's drama, was produced in St Petersburg in 1874, and on it his reputation stands as one of the finest creative composers in the ranks of the modern Russian school. He also wrote a number of songs and orchestral works, of a realistic national type. In later life he suffered much from ill-health, and died in St Petersburg on the 16th (28th) of March 1881.

MOUSTACHE, or Mustachio, the hair worn unshaven on the upper lip (see Beard). The spelling "moustache," now the most common in English usage, is the French form of Ital. mustachio, an adaptation of a Doric dialectical /ii>ora£, upper lip, also hair on the lip; this is generally taken to be a variant of naaTa%, jaws, mouth, connected with naaaadai, to chew; cf. " mastic," chewing-gum, and " masticate," to chew.

MOUSTERIAN, the name given by the French anthropologist G. de Mortillet to the second epoch of the Quaternary Age, and to the earliest in his system of cave-chronology. It is so named from a cave (Le Moustier), on the right bank of the Vezere, an affluent of the Dordogne, above Les Eyzies and Tayac, which has yielded typical palaeolithic implements. The epoch was characterized by cold wet climate, by the supposed existence

of Man of the Olom type, that is, nearly as dolichocephalous as the Neanderthal type, but with superciliary ridges flat, and frontal bones high, and by the occurrence of the musk-ox, the horse, the cave-bear, Rhinoceros lichorhinus and the mammoth. The typical implements are flint points or spear-heads, left smooth and flat on one side, as struck from the cave, pointed and edged from the other side; a scraper treated in the same way, but with edge rather upon the side than at the end, as in the succeeding Solutrian and Madelenian epochs. Relics of the Mousterian age have been also found in Belgium, southern Germany, Bohemia and southern England, some of the " finds " including human remains.

MOUTH AND SALIVARY GLANDS. The mouth (A.S. muft), in anatomy, is an oval cavity at the beginning of the alimentary canal in which the food is masticated. The opening is situated between the lips, and at rest its width reaches to the first premolar tooth on each side.

The lips (A.S. lippa) are fleshy folds, surrounding the opening of the mouth, and are formed, from

without inward, by skin, superficial fascia, orbicularis oris muscle, submucous tissue, containing numerous labial glands about the size of a small pea, and mucous membrane. In the deeper part of each lip Iks the coronary artery, while in the mid-line is a reflection of the mucous membrane on to the gum forming the fraenum labii.

The cheeks (A.S. ceace) form the sides of the mouth and are continuous with the lips, with which their structure is almost identical save that the buccinator muscle replaces the orbicularis oris and the buccal glands the labial. In the subcutaneous fascia is a distinct mass of fat, specially large in the infant, which is known as the sucking pad. On the buccal surface of the cheek, opposite the second upper molar tooth, is the papilla which marks the opening of the parotid duct, while, just behind, are four or five molar glands, larger than the buccal, the ducts of which open opposite the last molar tooth. The mucous membrane of the cheek, like that of the rest of the mouth, is of the stratified squamous variety (see Epithelial Tissues) and is reflected on to the gums.

The gums (A.S. gdma) consist of mucous membrane connected by thick fibrous tissue to the periosteum of the jaws. Round the base of the_ crown of each tooth the membrane rises up into a little collar.

The vestibule of the mouth is the space between the lips and cheeks superficially and the gums and teeth deeply. It commu- nicates with the true cavity of the mouth by the clefts between the teeth and by the space behind the last molar teeth.

The roof of the mouth is concave transversely and antero- posteriorly, and is formed by the hard and soft palate. The hard palate consists of mucous membrane continuous with that of the gums and bound to the periosteum of the palatine processes of the maxillae and palate bones by firm fibrous tissue. In the mid-line is a slight ridge, the palatine raphe, which ends in front in a little eminence called the palatine papilla, marking the position of the

anterior palatine canal. From the anterior part of the raphe five or six transverse ridges or rugae of the mucous membrane run outward. (For a description of the soft palate see Pharynx.)

The floor of the mouth can only be seen when the tongue is raised, then the reflection of the mucous membrane from the gums to it is exposed. In the mid-line is a prominent fold called the fraenum linguae, and on each side of this a sublingua papilla, on to the summit of which the duct of the submaxillary gland opens. Running outward and backward from this is a ridge called the plica sublingualis, which marks the upper edge of the sublingual gland, and on to which most of the ducts of that gland open. (For a description of the Tongue and the Teeth see special articles on those structures.)

The salivary glands are the parotid, submaxillary and sub- lingual, though the small scattered glands such as the labial, buccal, molar, lingual, &c, probably have a similar function.

The parotid gland (Gr. irapk beside, ots ear), is the largest of these glands, and is situated between the ear and the ramus of the man- dible. In a transverse section through the head about the level of

the mouth the gland looks more or less triangular, its outer wall or base being bounded by the parotid fascia, its anterior by the jaw, and its posterior by the mastoid process and sterno mastoid muscle. Where the anterior and posterior walls meet to form the apex is the styloid process. Above the gland reaches to the zygoma, and below to the level of the angle of the jaw, where a strong process of the deep cervical fascia, called the stylo-mandibular ligament, separates it from the submaxillary gland; indeed the parotid is often described as lying in a bag formed by deep cervical fascia. The outline of the gland is obscured by several processes, one of which, the facial lobe, runs forward, superficial to. the masseter muscle, accom- panying the duct. A separate part bf this is called the socia paro- tides ; another, known as the pterygoid lobe, passes forward, deep to the ramus of the jaw, to the space between the two pterygoid muscles. A third wraps round the front of the styloid process and may be

Stenson's duct Orifice of duct; Parotid gland

Masseter (cut)

Mucous membrane

(cut)

Deep process of

submaxillary gland

Mylohyoid muscle

(cut)

Submaxillary gland

Lower border of

mandible

Mylohyoid muscle

Anterior belly of

digastric

Hyoid bone

of Bartholin (rare) Wharton's duct Duct of sublingual gland

Sublingual gland

From A, Birmingham Cunningham's Text Book of Anatomy.

Fig. i. — The Salivary Glands and their Ducts. The greater portion of the body of the mandible has been removed to expose the sublingual and the deeper parts of the submaxillary glands. Four ducts of the sublingual gland are shown opening on the floor of the mouth over the gland, a fifth is shown opening into the anterior end of Wharton's duct. The course of Wharton's duct is shown by a dotted line.

termed the pre-styloid lobe, while a fourth, the post-styloid, insinu- ates itself behind that process. The upper part of the prestyloid lobe sometimes reaches the back part of the glenoid cavity, and is then called the glenoid lobe. All these processes, however, are very variable, and depend a good deal on the position of the head and neck. The facial nerve, the temporo-maxillary vein, and the termination of the external carotid artery, among other structures, are embedded in the gland.

The parotid duct (Stensen's duct) crosses the upper part of the masseter and then pierces the buccinator on its way to the mouth; it is about 2 in. long. Its position is described in the article on Anatomy {Superficial and Artistic), and its opening in the earlier part of this article.

The submaxillary gland lies deep to the posterior half of the body of the lower jaw; it is about the size of a walnut, and has an ex- ternal, internal and inferior surface. The external surface rests against the submaxillary fossa in the jaw, the internal is in contact with the mylohyoid and hyoglossus muscles, while the inferior is subcutaneous. The whole gland is enclosed in a sac of deep cervical fascia, while a process, from which the duct arises, passes deep to the mylohyoid. The facial artery is embedded in the upper part of the gland. The submaxillary duct (Wharton's duct) runs forward to the sublingual papilla already mentioned.

The sublingual gland is placed further forward than the sub- maxillary; it is like an almond in shape though larger; its outer

flattened surface rests against the sublingual fossa in the lower jaw, while the inner one is in contact with the genio-hyoglossus muscle, the submaxillary duct and the lingual nerve. Its upper edge forms the sublingual fold {plica sublingualis) in the mucous membrane of the mouth, and along this its ducts, which are small and numerous, open ; these are sometimes called the ducts of Rivini, but the term " sublingual ducts " is simpler and more expressive. Occasionally an anterior sublingual duct {duct of Bartholin) opens with or into the submaxillary duct.

Embryology. The fore-gut (see Alimentary Canal) at first ends blindly, ventral to the region of the hind brain, while in front of it is the overhanging fore-brain. When the heart develops, ventral to the fore-gut, it also projects forward toward the fore-brain, so that a transverse cleft, without any lateral boundaries and lined by ecto- derm, is left between these two structures. This is the itomato-

daeum or primitive mouth, the ectoderm of which rests against the entoderm of the fore-gut to form the bucco-pharyngeal membrane, and so separates the two chambers. The position of this'membrane does not correspond to the fauces or hinder limits of the adult mouth, but is much more oblique, so that the front part of the roof of the pharynx is formed by stomatodaeum while the greater part of the floor of the permanent mouth is fore-gut. During the third week the membrane disappears, and it is probable that to its early atrophy is due the fact that no traces of it can be seen in the adult. Growing down from the region of the fore-brain is the fronto-nasal process, which forms the nose and the middle piece of the upper lip, while the lateral parts of the mouth are closed in by two processes, on each side of which the lower or mandibular process rapidly meets its fellow in the mid-line to form the lower jaw and lip, thus separating the heart from the mouth cavity. The upper or maxillary process grows inward more slowly, but at last joins with the fronto-nasal process, and in the adult the lines of union are seen on each side as ridges of skin which run down from the nostril to the margin of tiie lip, and enclose that slightly depressed vertical gutter to which the term philtrum is given. Besides forming the philtrum the fronto-nasal process is responsible for that part of the roof of the mouth which corresponds to the premaxillary bones, an area marked out by lines drawn on each side from between the lateral incisor and canine teeth to the pala-tine papilla. At first the cavities of the mouth and nose are one, but they are later divided by the palatal processes, which grow in like shelves from the maxillary processes and meet in the mid-line. The submaxillary and sublingual salivary glands develop as -solid outgrowths of the buccal epithelium which are canalized later, while the parotid according to Hammar {Archiv. f. mikr. Anat. LXL, 1902) appears first as a groove. The parotid is ectodermal in origin, all the others entodermal.

For further details and literature see Quain's Anat. vol. i. (London, 1908); J. P. McMurrich Development

of the Human Body (London, 1907) ; O. Hertwig, Handbuch der Entwickelungslehre Th. II., (Jena). Comparative Anatomy. In the acrania (amphioxus) the mouth is developed on the left side and gradually shifts to the mid-line; later an extra chamber, the oral hood, is formed in front of it, the external opening of which is provided with bristle-like cirrhi, so that in the adult the mouth is merely an aperture in the velum or membrane which separates the oral hood from the pharynx.

In the cyclostomata (lampreys and hags) the mouth is a suctorial organ, and resembles a funnel, the narrow end of which opens into the pharynx. It is always open and is provided with horny teeth and a tongue. At this low stage of the vertebrate scale no jaws have yet appeared, but in the larval lamprey (ammocoetes) an oral hood, resembling that of amphioxus, is present. In the fishes jaws are present and the mouth can be closed at will. In the elasmobranchs (sharks and rays) the opening is crescentic and situated well on the ventral surface of the head, but in other fishes it is at the .anterior end of the body. Until the dipnoi (mud fish) are reached there is no communication between the mouth and the nose* but in these fishes the internal or posterior nares open into the front part of the roof of the mouth, thus adapting them to air-breathing. In the Amphibia the mouth has usually an enormous gape, and the position of the posterior nares resembles that of the dipnoi. It will be noticed that at this stage of phylogeny the condition resembles that of the ontogeny of man before the palatal processes appear. The premaxillary part of the fronto-nasal process separates the nasal cavity from the mouth in front, but behind that the cavity is the rudiment of the mouth and nose which no palate has yet appeared to separate. In Reptiles the hard palate appears, and henceforward the digestive and respiratory tracts only form one passage in the pharynx. In mammals definite lips provided with muscles first appear, though the Monotremes have such specialized mouths that lips are not found in that order. Many monkeys have the

vestibule enlarged to form the cheek pouches. (F. G. P.)

Surgery of the Mouth. In surgical operations upon the interior of the mouth which are likely to be accompanied with much bleeding, it is much the

custom now to have the patient lying upon his back, with the head hanging over the end of the table, so that the blood may sink into the dome of the pharynx and escape by the nostrils, instead of running the risk of finding its way into the windpipe and lungs. (See Cleft Palate.)

Mumps. — Inflammation of the parotid gland is apt to occur as an epidemic, children being chiefly attacked. The disease, which is highly infectious, is called mumps, and is associated with much swelling below and in front of the ear, or ears. There is stiffness of the jaw and there is a difficulty in swallowing. There is slight local tenderness, and the temperature may, per- haps, run up a degree or two. For the sake of others, the child should be kept away from school for three or four weeks.

Salivary Calculus. — Sometimes a deposit of phosphate and carbonate of lime slowly takes place from the saliva, and gives rise to the formation of a small concretion in the duct of one of the salivary glands. When the concretion blocks the duct, so that the saliva is unable to find its way into the mouth, a fluid swelling forms behind the blockage, giving rise to incon- venience and unsightliness. The swelling is at its greatest during a meal, when the secretion of the saliva is necessarily rapid; subsequently it disappears, recurring, however, at the next meal-time. In many cases the patient is conscious of the fact of there being a hard, movable ” kernel,” the size, perhaps, of a barleycorn, a cherry-stone or even of a small

almond, in the course of the duct. In the removal of the calculus every endeavour should be made to effect its escape into the mouth, as, if the skin were incised for its extraction, the wound might refuse to heal, a salivary fistula resulting. (E. O.*)

MOUTHPIECE (Fr. embouchure; Ger. Mundstiick; Ital. bocchino), in music, that part of a wind instrument into which the performer directs his breath in order to induce the regular series of vibrations to which musical sounds are due. The mouthpiece is either taken into the mouth or held to the lips; by an extension of the meaning of the word, mouthpiece is also applied to the corresponding part of an organ-pipe through which the compressed wind is blown, and containing the sharp edge known as " lip," or the reed necessary for the production of sound. The quality of a musical tone is due primarily to the form or method of vibration by means of which sound-waves of a distinctive character are generated, each consisting of a pulse or half wave of compression and of a pulse of rarefaction; the variety in the quality of tone, or " timbre," obtainable in various wind instruments is in a great measure due to the form and construction of the mouthpiece, taken in combination with the form of the column of air within the tube and consequently of the bore of the latter. The principal functions of the mouth piece are (i) to facilitate the production of the natural harmonic scale of the instrument; (2) to assist in correcting errors in pitch as the ear directs; (3) to enable the performer to obtain the dynamic variations whereby he translates his emotional interpretation of the music into sound. Mouthpieces, therefore, serve as a means of classifying wind instruments. They fall into the following divisions: —

1. The syrinx or pan-pipe mouthpiece consists merely of the open end of the tube across (not into) which the player directs his breath in a current which impinges obliquely against the sharp edge of the pipe, producing the series of shocks or pulses required in the air stream from his lips; this in

turn, when in a state of vibration, serves to generate the sound-waves within the pipe. This principle was embodied in the nay, or long oblique flute of the ancient Egyptians, which was probably the first mouthpiece discovered and put into practical use by prehistoric man. A modification of this principle has been applied to the transverse flute (q.v.), in which the air stream or exciting current is directed across a lateral hole in the head joint of the instrument.

2. The whistle mouthpiece is based on that of the flute with this modification, that the air current, instead of being com- pressed by the lips of the performer and then directed through ambient air to break against the sharp edge of the lateral hole, is compressed mechanically in passing through a narrow channel

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so constructed within the mouthpiece that the stream of air impinges with force against the sharp edge of a lip cut into the pipe below the channel. The principle of the whistle mouth- piece has been applied with slight modifications to a variety of instruments such as the recorder {q.v.) family in England (Fr. flute a bee, flute douce, flute anglaise; Ger. Schnabelflote, Plockflote; Ital. flauto dolce, in which the channel assumes the form of a beak, the flageolet (q.v.), the penny whistle, &c. All these whistle or fipple pipes have at all times enjoyed great popularity owing to the ease with which they can be played. 1

The flute or flue-work of an organ is the result of the adapta- tion of the same principle to both open and stopped pipes (fig. 1). Compressed air is fed in at an even pressure through the foot AB, and passing through the slit or channel EC, impinges with force against the lip D, producing the requisite series of pulsations in the pipe FF. By this elimination of the human element in the organ, all possibility of communicating the emotion of the performer becomes impossible. With a rigid mouthpiece any increase in

wind pressure would affect the pitch, causing the note to become unsteady or to jump to the harmonics; the result could in no case be a crescendo.

3. Reed Mouthpieces. — There are three kinds of reed mouthpieces: the double, the single or beating, and the free reed. The function of the reed, a term originally applied to part of a stalk of the Arundo donax or saliva, but now extended to any vibrating tongue of wood or metal, is to break up an exciting current of air, otherwise flowing in an uninterrupted even stream, into regular beats or pulses, corresponding with the beats or vibrations of the reed. Reeds proper or wooden vibrators, being flexible, are com- pelled to vibrate synchronously with the column of air within the tube and to ac- commodate their frequency of vibration to the length of the tube as it varies according to the lateral holes which remain open. 2

A. The double reed is the most primitive and probably the oldest of the reed mouthpieces; it was used by the ancient Egyptians. 3 / flattened at one end and inserted into a pipe having at the mouthpiece end the same diameter as the straw contains all the rudimentary features of the double-reed mouthpiece common to the members of the oboe family, i.e. cor anglais, bassoon, contra-fagotto, to the sarrusophone, and to the chaunter of the bagpipe. The earliest Greek aulos (q.v.) was probably played by means of a double reed, since the mouthpiece was known as feuTos, signifying a pair of like things. The oboe reed (fig. 2) is made from two pieces of reed stalk, flattened and thinned at the end and bound together with waxed thread, thus forming a tube with a constriction in the middle, above which the section is oval and below circular.

A double-reed mouthpiece may be enclosed in an air-chamber or reservoir, as in the 16th-century cromorne (q.v.), in the chaunter of the bagpipe (q.v.), in the reeds of organ-pipes and in certain instruments popular in France during the 17th century known as ” hautbois de Poitou.” In all of these the air-chamber is supplied with compressed

air by the mouth of the performer, whose lips do not come into contact with the reed, a method which makes the production of harmonics impossible, and thus restricts the natural scale. As soon as the practice of over-blowing, i.e. the production of harmonics by increased pressure of breath accompanied by a proportional tension of the lips, became known, the air-chamber

1 See Rev. F. W. Galpin, ” The Whistles and Reed Instruments of the American Indians of the North-West Coast,” Proc. Musical Assoc. (1903-1904), p. 115, with illustrations.

2 See Victor Mahillon, Elements d’acoustique musicale (Paris, 18 73). PP- 167 and 83.

3 A case excavated in Egypt was found to contain two pipes, and in addition five pieces of reed without bore or holes, and three pieces of straw suitable for making double-reed mouthpieces. See Victor Loret, ” Les FWtes 6gyptiennes antiques,” Journal anatique (Paris, 1889), [8], xiv. pp. 119, 200, 201 (note), 207, 211 and 217.

‘a From V, Mahillon, Elements d’acou- stique, by permission of C. Mahillon.

A straw Fig. 1. — Diagram of a flue-pipe.

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of the oboe was discarded and the reed taken directly into the mouth. It is certain that the ancient Greeks obtained the full compass of the aulos by overblowing, since the process by which a modern performer on the oboe or clarinet obtains the harmonics is described by Aristotle 1 and others. 2

The vibrating length of the reed is controlled by taking the latter more or less deeply into the mouth and by varying the pressure of the lips upon it; the shorter the free end the higher the pitch of the note or harmonic obtained. The action of the lips on

the reed is imitated to some extent in reed organ-pipes by means of a tuning-wire, with the difference that, the lips being mobile, different notes can be obtained from the same pipe, whereas in the organ each reed is adapted to its own pipe and gives one note only.

B. The beating- or single-reed mouthpiece, also known as the clarinet mouthpiece, is likewise of great antiquity; the principle is the same as that of the modern Egyptian arghoul (q.v.), which has been traced once at least in the hieroglyphics and in a fresco from the tombs at Saqqara. 3 The mouthpiece of the arghoul is the primitive form of beating-reed known popularly in rural dis- r tricts as a ″ squeaker.″ A lateral slit is made in

Rudall, Carte & Co a piece of reed and a littIe ton gue is detached by slitting the reed back from the slit towards Fig. 2. — Oboe a knot. The breath causes the reed-tongue to double-reed close and open the aperture at regular intervals, mouthpiece. and the exciting agent here acts by means of a series of concussions. The metal vibrator known as the beating-reed of organ reed-pipes is similarly con- structed, except that the tongue is a separate piece of metal fixed by means of nuts over an aperture, the vibrating length being regu lated by means of a tuning-wire (see Free Reed Vibrator). The clarinet mouthpiece (fig. 3) has the appearance of a beak with the ^^ point bevelled and thinned at the edge to ri^ correspond with the end of the reed, shaped like a spatula. The underpart of the mouth- piece is flattened in order to form a table for the support of the reed, which is adjusted thereon with great nicety by means of a ligature or metal band fastened by screws. A longitudinal aperture I in. long and \ in. wide, communicating with the bore, is cut in M the table and covered by the reed, so that ii′J the only opening is at the point, where for the distance of f to | in. the reed is thinned and the table curves backwards, leaving a gap of about I mm. between itself and the reed-tongue (for the Bt> clarinet). The curve FlG. 3. — Clarinet of the table and the dimensions of the gap Mouthpiece. are

therefore of considerable importance,

o, The mouthpiece, The reed is set in vibration by the breath , the position of the of the performer, and being flexible it beats bore inside being against the table, alternately opening and indicated by dot- closing the gap, and producing, as already mentioned above, a series of concussions in harmony with the vibrations of the air- column within the tube, according to the length determined by the opening of the lateral holes and keys.

C. The free-reed, illustrated under Free Reed Vibrator, is similar in construction to the beating-reed, but the metal vibrator is cut slightly smaller than the aperture, through which it passes freely, alternately opening and closing it without concussion and with complete elasticity. The main difference in practice between these two outwardly similar reeds is a very important one. The reed being free remains uncontrolled, and increased pressure of wind therefore produces not an harmonic overtone but a crescendo. The principal use of the free-reed is in the harmonium (q.v.) and in the reed-work of organs on the continent of Europe. In English organs the beating-reed is almost universal. The free-reed is further used in the Chinese cheng (q.v.), through which it became known in Europe in the 1 8th century, and in the accordion, concertina and mouth-organ, under which headings its acoustic properties are more fully discussed.

4. Cup-Mouthpieces. — Brass wind instruments are played by means of cup or funnel-shaped mouthpieces, generally made of

1 See De audih. p. 804a.

2 Porphyrius (ed. Wallis), pp. 249 and 252.

3 See Victor Loret, L'Egypte au temps des Pharaons (Paris, 1889), illustrated on pp. 139 and 143. The author gives no information as to this fresco except that it is in the Musee Guimet; it is probably identical with the second of the mural paintings

described on p. 190 of the Petit guide illustre du Musee Guimet (Paris, 1890).

ted lines. , The single- beating-reed.

silver. The principal feature of the cup is the shape of the aperture in the bottom, where it communicates with the bore of the tube (known as the ″ grain ″ or ″ throat ″), and its dis- tance from the rim. The shallower the cup the more suitable it is for producing the higher harmonics. The lips of the per- former rest lightly but firmly against the rim of the mouth- piece, vibrating like double reeds from the force of the breath and communicating these vibrations in the form of pulses to the breath as it issues from them in a stream. This stream or exciting current passes into the cup ready to generate sound- waves in the air column contained within the main tube. If, as in the trumpet and in a lesser degree in the trombone, the curve of the bottom of the cup terminates at the hole in an abrupt angle, the quality of the tone developed is brilliant and blaring, being broken up by the sharp edge of the throat. In the horn, which has a funnel- shaped mouthpiece, the timbre is in com- plete contrast when the instrument is properly played, 4 being elastic, sonorous and very mellow, qualities which may be attri- buted to the absence of angle or bottom to the cup, the sides gradually sloping and converging insensibly into the bore of the tub e- (K. S.)

MOVERS, FRANZ KARL (1806-1856), German Roman Catholic divine and Orientalist, was bom at Koesfeld in West- phalia, on the 17th of July 1806. He studied theology and Oriental languages at Miinster, was parish priest at Berkum near Bonn from 1833 to 1839, and professor of Old Testament theology in the Catholic faculty at Breslau from 1839 to his death on the 28th of September 1856. His elaborate works, Die Phonizier (1841-1850) and Phonizische Texte, erkldrt (1845- 1847), attained a high reputation. Of his other writings two biblical studies were of some

importance, his Kritische Unter- suchungen iiber die alttestamentliche Chronik (1834), and his Latin essay on the two recensions of the text of Jeremiah, De utriusque recensionis vaticiniorum Jeremiae . . .indole et orieine

(1837).

MOW. (1) To cut down standing hay or corn with a scythe or with machinery drawn by a horse or mechanical power (see Reaping). The word in O.Eng. is mawan. a verb common to the West German languages, cf. Du. maaien, Ger. mahen; the root is also seen in ″ meadow,″ Gr. aixdv and Lat. meter e, to reap, cut, cf. messis, harvest. (2) A stack or rick of hay, corn, and sometimes also of beans, peas or other crops. The word in O.Eng. is muga, muha, and is cognate with Swedish and Norwegian muga, heap, cf. Swedish attmoge, crowd of people, Danish almuc. ″ Mow″ is chiefly dialectal in England, where it is a common name, e.g. the Barley Mow, on the sign-boards of country inns. From these two words must be distinguished (3) ″ mow,″ a grimace, now obsolete or purely literary, and generally found in combination with ″ mop,″ cf. ″ mopping and mowing ″ in King Lear, iv. 1. 64. This is the same word as the modern Fr. moue, pout, which is of obscure origin.

MOWAT, SIR OLIVER (1820-1903), Canadian judge and statesman (Q.C. 1856, LL.D. 1872, K.C.M.G. 1892, G.C.M.G. 1897), was the son of John Mowat, who fought in the Peninsular War under Sir Arthur Wellesley (afterwards duke cf Wellington). Born at Kingston, Ontario, on the 22nd of July, 1820, he was educated by private tuition and in 1836 began the study of law under Mr (afterwards the Rt Hon. Sir) John A. Macdonald. Called to the bar in 1841, he soon became a leading Chancery counsel and in 1856 ″ took silk.″ He entered parliament in 1858 as a Liberal and in 1863 became postmaster-general. He took a prominent part in the proceedings of the Quebec Confer- ence of 1864, which settled the terms of the Confederation of the British North American provinces, and in the same year was appointed vice-

chancellor of Upper Canada. Eight years afterwards (1872) the Hon. Edward Blake resigned the premier-ship of the province of Ontario, and Mowat was called to fill the vacant post. He continued to be premier of Ontario until the 13th of July 1896. Assisted by able colleagues and holding always a strong majority in the house, he gave to Ontario a

4 The horn may be so played, by forcing the breath in a certain manner, that its timbre approximates to that of the trumpet.

body of laws many of which have been copied by other provinces of the dominion and by several states of the American Union. In eight important cases which he argued before the Judicial Committee of H.M. Privy Council, he established, as against the contention of Sir John A. Macdonald, the proposition that the provincial legislatures were co-ordinate with and not subordinate to the parliament of Canada. To weaken his influence the Conservatives at Ottawa attempted to extend the boundaries of Manitoba, thereby reducing the area of Ontario; but Mr Mowat again appealed to the Judicial Committee and was again successful. According to Sir John A. Macdonald, Ontario con- tained under the "Quebec Act" only 116,782 sq. m.; but Mr Mowat gave it an area of 260,862 sq. m. When he returned home after this great victory he received an ovation unparalleled in the history of any Canadian statesman. One of his prominent characteristics was his loyalty to Britain. Between 1886 and 1896 Canadian trade was depressed, and men were leaving the country in thousands for the United States. Dr Goldwin Smith and other prominent men advocated commercial union with the United States, viz. that the two countries should maintain a uniform tariff against the rest of the world, with free trade as between themselves. Sir Oliver Mowat saw in this " veiled annexation," and by letters, speeches and pamphlets he crushed the movement so completely as

to make his party more imperialist than the Conservatives had ever been. In July 1896 he was called to the senate of Canada and made minister of justice. In November 1897 he was appointed lieutenant-governor of his native province, and this office he held until he died at Government House, Toronto, on the 19th of April 1903.

See C. R. W. Biggar, Sir Oliver Mowat, a Biographical Sketch (Toronto, 1905). (C. R. W. B.)

MOWBRAY, the name of an Anglo-Norman baronial house, derived from Montbray (Manche) in Normandy south of St Lo. It was founded at the Conquest by Geoffrey (de Montbray), bishop of Coutances. His brother's son Robert, who rebelled with him against William Rufus on the Conqueror's death, was made, after their reconciliation, earl of Northumberland, as his uncle's heir but was forfeited and imprisoned for life on rebelling again in 1095. A sister of Bishop Geoffrey was mother by Roger d'Aubigny (of Aubigny in the Cotentin) of two sons, Nigel and William, who were ardent supporters of Henry I., and were rewarded by him with great estates in England. William was made king's butler, and was father of William d'Aubigny (" de Albini "), first earl of Arundel (see Arundel); Nigel was rewarded with the escheated fief of Geoffrey de la Guerche, of which Melton (Mowbray) was the head, and with forfeited lands in Yorkshire. Nigel married, by dispensation, the wife of his cousin, the imprisoned earl, but afterwards divorced her, and by another wife was father of a son Roger, who took the name of Mowbray.

Roger, a great lord with a hundred knights' fees, was captured with King Stephen at the battle of Lincoln, joined the rebellion against Henry II. (ir73), founded abbeys, and went on crusade. His grandson William, a leader in the rising against King John, was one of the 25 barons of the Great Charter, as was his brother Roger, and was captured fighting against Henry III. at the rout of Lincoln (1217). His grandson Roger (1266-1298), who was summoned to parliament by Edward I., was father of John (1286-1322), a warrior and warden of the

Scottish March, who, joining in Thomas of Lancaster's revolt, was captured at Boroughbridge and hanged. His wife, a Braose heiress, added Gower in South Wales and the Bramber lordship in Sussex to the great possessions of his house. Their son John (d. 1361) was father, by a daughter of Henry earl of Lancaster, of John, Lord Mowbray (c. 1328–1368), whose fortunate alliance with the heiress of Lord Segrave, by the heiress of Edward I.'s son Thomas, earl of Norfolk and marshal of England, crowned the fortunes of his race. In addition to a vast accession to their lands, the earldom of Nottingham and the marshalship of England were bestowed on them by Richard II., and the dukedom of Norfolk followed (see Norfolk, Thomas Mowbray, 1st duke of).

The 1st duke left two sons, of whom Thomas the elder was only recognized as earl marshal. Beheaded for joining in Scrope's conspiracy against Henry IV. (1405), he was succeeded by his brother John, who was restored to the dukedom of Norfolk in 1424. His son John, the third duke, was father of John, 4th and last duke, who was created earl of Warrenne and Surrey in his father's lifetime (1451). At his death (1475) his vast inheritance devolved on his only child Anne, who was married as an infant to Edward IV. 's younger son Richard (created duke of Norfolk and earl of Nottingham and Warrenne), but died in 148 1.

The next heirs of the Mowbrays were then the Howards and the Berkeleys, representing the two daughters of the first duke. Between them were divided the estates of the house, the Mow- bray dukedom of Norfolk and earldom of Surrey being also revived for the Howards (1483), and the earldom of Nottingham (1483) and earl marshalship (1485) for the Berkeleys. Both families assumed the baronies of Mowbray and Segrave, but Henry Howard was summoned in his father's lifetime (1640) as Lord Mowbray, which was deemed a recognition of the Howards' right; their co-heirs, from 1777, were the Lords Stourton and the Lords Petre, and in 1878 Lord Stourton was summoned as Lord Mowbray and Segrave. The former dignity is claimed as the premier barony,

though De Ros ranks before it. Lord Stourton's son claimed, but unsuccessfully, in 1901–1906 the earldom of Norfolk (13 1 2), also through the Mowbrays. Of the Mowbray estates the castle and lordship of Bramber is still vested in the dukes of Norfolk. The heraldic badge of the house was a mulberry-tree. (J. H. R.)

MOWBRAY, HARRY SIDDONS (1858-), American artist, was born of English parents at Alexandria, Egypt, on the 5th of August 1858. Left an orphan, he was taken to America by an uncle, who settled at North Adams, Mass. After a year at the United States Military Academy at West Point, he went to Paris and entered the atelier of Leon Bonnat, his first picture, " Aladdin," bringing him to public notice. He was made a full member of the National Academy of Design in 1891. Subsequently he was best known for his decorative work, especially " The Transmission of the Law," Appellate Court House; ceiling for the residence of F. W. Vanderbilt; and the ceiling and walls of the library of the University Club — all in New York. This last was executed in Rome, where, in 1903, he was made director of the American Academy.

MOWBRAY, ROBERT (d. 11 25), a Norman who was appointed earl of Northumberland between 1080 and 1082. In 1088 he and his uncle Geoffrey, bishop of Coutances, sided with Robert, duke of Normandy, against William Rufus, but they were pardoned at the close of the rebellion. In 1091 Mowbray defeated Malcolm Canmore of Scotland, who had invaded England, and in 1093 surprised and slew this king near Alnwick; soon after this event he succeeded to his uncle's vast estates. In 1095 he led a rebellion which had for its object the transference of the crown from the sons of the Conqueror to Stephen of Aumale. Rufus marched against the earl in person, and Mow- bray shut himself up in Bamborough Castle, but he was captured by treachery, escaped, and was captured again. He was then deprived of his possessions and kept a prisoner for the rest of his life, nearly thirty years.

See E. A. Freeman, William Rufus, especially

Appendices C. C. F. F. (Oxford, 1882).

MOXON, EDWARD (1801–1858), British poet and publisher, was born at Wakefield in 1801. In 1826 he published a volume of verse, entitled The Prospect, and other Poems, which was received with some favour. In 1830 Moxon was started by Samuel Rogers as a London publisher in New Bond Street. The first volume he issued was Charles Lamb's Album Verses. Removing to Dover Street, Piccadilly, Moxon published an illustrated edition of Rogers's Italy, £10,000 being spent upon the illustrations. Wordsworth entrusted him with the publi- cation of his works from 1835 onwards, and in 1839 he issued the first complete edition of Shelley's poems. Some passages in Queen Mao were the cause of a charge of blasphemy being

made against Moxon in 1841. The case was tried before Lord Denman. Serjeant Talfourd defended Moxon, but the jury- returned a verdict of guilty, and the offensive passages were for a time eliminated. In 1840 he published Browning's Sordello; and in succeeding years works by Lord Houghton, Tom Hood, Barry Cornwall, Lord Lytton, Browning and Tennyson appeared. Edward Moxon died on the 3rd of June 1858, his business being continued by Mr J. B. Payne and Mr Arthur Moxon, who in 1865 published Swinburne's Alalanta in Calydon-; but in 1871 it was taken over by Messrs Ward, Lock & Tyler.

HOXOS, Mojos, Mohos, a tribe of South American Indians living around the head-waters of the Madeira river, northern Bolivia, particularly on both banks of the Mamorfi. They submitted to Inca domination, but in 1564 gallantly repulsed the Spaniards. A century later, however, the Jesuits were welcomed, and the Moxos became devout Catholics. They number some

30,000.

MOZAMBIQUE [Sao Sebastiao de Mozambique], a town of Portuguese East Africa, seat of a Roman Catholic bishopric in the province of Goa, in 15° 4′ S., 4o °44′ E. The town occupies the whole of a small coral island at the mouth of Mossoril Bay. The name Mozambique, used first to designate the island, was also given to the town and extended to the whole of the Portuguese possessions on the east coast of Africa. There are three forts, of which the principal, St Sebastian, at the northern extremity of the island was built in 15 10 entirely of stone brought from Portugal. It is quadrangular, and has bastioned walls nearly 70 ft. high. In it are mounted some modern guns. The harbour is small, but deep enough to admit vessels drawing 25 feet.

The inhabitants, who number about 7000, consist chiefly of Mahommedan negroes of mixed descent speaking a dialect of the Makwa language. There are Parsee, Banyan, Goanese and Arab traders, and about 300 Europeans, besides half-caste Portuguese. The annual average value of the imports for the three years 1904-1906 was £97,035, of the exports £71,636. The import trade is chiefly with Great Britain and India, the articles in chief demand being cotton, coloured shawls and hardware. The exports are chiefly groundnuts, rubber of inferior quality, sesamum and other oil seeds, tortoise-shell and ebony. Germany has a large share of the exports.

Mozambique was discovered by Vasco da Gama in 1498. There was then a flourishing Arab town on the island, of which no trace exists. The history of the Portuguese town is closely identified with that of the province, for which see Portuguese East Africa. The commercial and political importance of Mozambique has been eclipsed by Lourenco Marques.

MOZARAB [Spanish Mozdrabe, a corruption of the Arabic Musta'rib, coll. Mustariba], a general term for persons not Arab by race who have assimilated themselves to the Arabs. It was applied by the Moslems in Spain to the Christian communities existing among them, in Cordova, Seville, Toledo and other large cities, in the exercise of their own

laws and religion. The ancient liturgy used by the Christians of Toledo is commonly known as Mozarabic.

MOZART, WOLFGANG AMADEUS 1 (1756–1791), German composer, was born at Salzburg on the 27th of January 1756. He was educated by his father, Leopold Mozart, a violinist of high repute in the service of the archbishop of Salzburg. When only three years old he shared the harpsichord lessons of his sister Maria, five years his senior. A year later he played minuets, and composed little pieces, some of which are still preserved in Maria's music-book. When five years old he performed in public for the first time, in the hall of the university. In 1762 Leopold Mozart took Wolfgang and Maria on a musical tour, during the course of which they played before most of the sovereigns of Germany. The little "Wolferl's" 2 charming appearance and disposition endeared him to every one; and so innocent and natural were his manners that at Vienna he sprang

1 In the baptismal register his name stands, Joannes Chrysostomus Wolfgangus Theophilus (Lat. Amadeus, Ger. Gottlieb). i The German diminutive of Wolfgang.

upon the empress's lap and kissed her. The emperor Francis I. sat by his side while he played, and called him his " little magi- cian." When he slipped one day on the polished floor the arch- duchess Marie Antoinette, afterwards queen of France, lifted him up, whereupon he said, " You are very kind; when I grow up I will marry you." Yet, in spite of the petting he received at court, he remained as gentle and docile as ever, and so amenable to parental authority that he used to say, " Next after God comes my father." In 1763 the whole family started again. Wolferl now sang, composed, and played on the harpsi- chord, the organ and the violin, winning golden opinions every- where. At every court he visited he was loaded with caresses and presents; but the journeys were expensive, and the family terribly poor. In Paris they lodged at the Bavarian embassy, giving performances on a grand scale both there and at Versailles, where Wolferl's organ-playing was even more admired than his performance

on the harpsichord. Here, also, he published his first compositions — two sets of sonatas for the harpsichord and violin.

On the 10th of April 1764 Leopold Mozart brought his family to England, engaging a lodging in Cecil Court, St Martin's Lane, whence he afterwards removed to' Frith Street, Soho. On the 27th of April and the 19th of May Wolferl played before the royal family with immense success, accompanying the queen in a song and playing at sight anything that the king set before him. He now made his first attempt at the composition of a symphony; published a third set of sonatas, dedicated to the queen; and wrote an anthem for four voices entitled God is our Refuge, for presentation to the British Museum. 3 On the 17th of September 1765 the family left England for the Hague, where they remained some time, and where in March 1766 the young composer made his first attempt at an oratorio, commanding in Holland a success as great as that he had already attained in London, and astonishing his hearers at Haarlem by performing on what was at that time the largest organ in the world. In September 1767 he paid a second visit to Vienna, and at the suggestion of the emperor Joseph II. composed an opera buffa, La Finta semplice, which, though acknowledged by the company for which it was written to be " an incomparable work," was suppressed by a miserable cabal. The archbishop of Salzburg hearing of this commanded a representation of the rejected work in his palace, and appointed the young composer his " maestro di capella." The office, however, was merely an honorary one, and, since it did not involve compulsory residence, Leopold Mozart determined to complete his son's education in Italy, to which country he himself accompanied him in December 1769.

Wolfgang, now nearly fourteen years old, was already an accomplished musician, needing experience rather than instruc- tion, and gaining it every day. At Milan he received a commis- sion to write an opera for the following Christmas. Arriving in Rome on the Wednesday in Holy Week, he went at once to the Sistine Chapel to hear the celebrated Miserere of

Gregorio Allegri, which, on returning to his hotel, he wrote down from memory note for note — a feat which created an immense sensa- tion, for at that time the singers were forbidden to transcribe the music on pain of excommunication. Returning to Rome towards the end of June, he was invested by the pope with the order of ” The Golden Spur,” of which he was made a cavaliere, 4 an honour which he prized the more highly because, not many years before, it had been conferred upon Gluck. In July he paid a second visit to Bologna, when the Accademia Filarmonica, after subjecting him to a severe examination, admitted him to the rank of ” compositore,” notwithstanding a statute restricting this preferment to candidates of at least twenty years old. The exercise which gained him this distinction is a four-part composi- tion (Kochel’s Catalogue, No. 86) in strict counterpoint on the antiphon Quaerite primum, written in the severe ecclesiastical style of the 16th century and abounding in points of ingenious imitation and device.

8 The original autograph is numbered ” Select Case C, 21, d.” 4 Auratae militiae eques.

In October 1770 Wolfgang and his father returned to Milan for the completion and production of the new opera. The libretto, entitled Mitridate, Re di Ponto, was furnished by an obscure poet from Turin, to the great disappointment of the young maestro, who had hoped to set a drama by Metastasio. The progress of the work was interrupted from time to time by the miserable intrigues which seem inseparable from the lyric stage, exacerbated in this particular case by the jealousy of the resident professors, who refused to believe either that an Italian opera could be written by a native of Germany, or that a boy of fourteen could manage the orchestra of La Scala, at that time the largest in Europe. Fortunately the detractors were effec-

tively silenced at the first full rehearsal; and on the 26th of December Wolfgang took his seat at the harpsichord and directed his work amidst a storm of genuine applause. The success of the piece was unprecedented. It had a continuous run of twenty nights, and delighted even the most captious critics.

Wolfgang's triumph was now complete. After playing with his usual success in Turin, Verona, Venice, Padua and other Italian cities, he returned with his father to Salzburg in March 1 771, commissioned to compose a grand dramatic serenata for the approaching marriage of the archduke Ferdinand, and an opera for La Scala, to be performed during the season of 1773. The wedding took place at Milan on the 21st of October; and the serenata, Ascanio in Alba, was produced with an effect which completely eclipsed the new opera of Hasse, Ruggiero, composed for the same festivity. Hasse generously uttered the often- quoted prophecy, " This boy will cause us all to be forgotten." 1

During the absence of Wolfgang and his father the good archbishop of Salzburg died; and in the spring of the year 1772 Hieronymus, count of Colioredo, was elected in his stead, to the horror of all who were acquainted with his real character. The Mozart family did their best to propitiate their new lord, for whose installation Wolfgang, after his return from Milan, composed an opera, II Sogno di Scipione; but the newly-elected prelate had no taste for art, and was utterly incapable of appre- ciating the charm of any intellectual pursuit whatever. For a time, however, things went on smoothly. In October the father and son once more visited Milan for the preparation and production of the new opera, Lucio Silla, which was produced at Christmas with a success quite equal to that of Mitridate, and ran between twenty and thirty nights.

In the meantime Wolfgang continued to produce new works with incredible rapidity. In 1775 he composed an opera for Munich, La Finta giardiniera, produced on the 13th of January. In the following March he

set to music Metastasio's dramatic cantata, // Re pastore. Concertos, masses, symphonies, sonatas and other important works, both vocal and instrumental, followed each other without a pause. And this fertility of invention, instead of exhausting his genius, seemed only to stimulate it to still more indefatigable exertions. But the pecuniary return was so inconsiderable that in 1777 Leopold Mozart asked the archbishop for leave of absence for the purpose of making a professional tour. This was refused on the ground of the prelate's dislike to " that system of begging." Wolfgang then requested permission to resign his appointment, which was only an honorary one, for the purpose of making the tour with his mother. The archbishop was furious; but the plan was carried out at last, and on the 23rd of September the mother and son started for Munich. The results were not encouraging. Leopold hoped that his son, now twenty-one years old, might obtain some profitable court appointment; but in this he was disappointed. And, worse still, poor Wolfgang fell in love at Mannheim with Aloysia Weber, a promising young vocalist, whose father, the prompter of the theatre (uncle of the great composer Weber), was very nearly penniless. On hearing of this Leopold ordered his wife and son to start instantly for Paris, where they arrived on the 23rd of March 1778. Wolfgang's usual success, however, seemed on this occasion to have deserted him. His reception was a cold one; and, to add to his misery, his mother fell seriously ill and died on the 3rd of July. Reduced 1 " Questo ragazzo ci fard dimenticar tutti."

almost to despair by this new trouble, he left Paris in September, rested for a while on his way home in Mannheim and Munich, was received by Aloysia Weber with coldness almost amounting to contempt, and in June 1779 returned to Salzburg, hoping against hope that he might make some better terms with the archbishop, who relented so far as to attach a salary of 500 florins (about £50) to his " concertmeister's " appointment, with leave of absence in case he should be engaged to write an opera elsewhere.

Two years later the desired opportunity presented itself. He was engaged to compose an opera for Munich for the carnival of 1781. The libretto was furnished by the abbate Varesco, court chaplain at Salzburg. On the 29th of January 1781 the work was produced under the title of Idomeneo, re di Creta, with triumphant success, and thenceforth Mozart's position as an artist was assured; for this was not only the finest work he had ever written but incontestably the finest opera that had ever yet been placed upon the stage in any age or country.

And now the archbishop's character exhibited itself in its true colours. Art for its own sake he utterly disdained; but it flattered his vanity to retain a famous artist in his service with the power of insulting him at will. On hearing of the success of Idomeneo he instantly summoned the composer to Vienna, where he was spending the season. Mozart lost not a moment in presenting himself, but he soon found his position intolerable. That he should be condemned to dine with his patron's servants was the fault of the age, but the open disrespect with which the lowest menials treated him was due to the archbishop's example. His salary was reduced from 500 to 400 florins, he was left to pay his own travelling expenses, and he was not permitted to add to his means by giving a concert on his own account or to play anywhere but at the archiepiscopal palace. Archbishop Hieronymus was hated at court, and most of all by the emperor Joseph, who, on retiring to Laxenburg for the summer, did not place his name on the list of invited guests. This offended him "so deeply that he left Vienna in disgust. The household were sent on to Salzburg, but Mozart was left to find lodgings at his own expense. Thereupon he sent in his resignation; and for this act of contumacy was insulted by the archbishop in terms too vulgar for translation. He persevered, however, in his resolution, taking lodgings in a house rented by his old friends the Webers, and vainly hoping for pupils, since Vienna at this season was perfectly empty. Happily he had a sincere though not a generous well-wisher in the emperor,

and a firm friend in the archduke Maximilian. By the emperor's command he wrote a German opera, Die- Entfiihrung aus dent Serail, which on the 16th of July 1782 was received with acclama- tion, and not long afterwards was performed with equal success at Prague. This great work raised the national " Singspiel " to a level commensurate with that which Idomeneo had already attained for the Italian " opera seria."

The next great event in Mozart's life was not what one would have wished for him. Though Aloysia Weber had long since rejected him, his renewed intimacy with the family led to an imprudent marriage with her younger sister, Constance, a woman neither his equal in intellect nor his superior in prudence. The wedding took place at St Stephen's on the 16th of August 1782. By the end of the year the thriftless pair were deeply in debt. Mozart composed incessantly, played at numberless concerts, and was in greater favour than ever at court and with the nobility; but to the last day of his life his purse was empty. He had, however, many kind friends, not the least affectionate of whom was the veteran Haydn, who was sincerely attached to him. With Gluck he was on terms of courteous intercourse only. Salieri detested him, and made no secret of his dislike.

Mozart's next dramatic venture was a German singspiel in one act, Der Schauspieldirektor, produced at Schonbrunn, on the 7th of February 1786. Not quite three months later, on the 1st of May, he produced his marvellous Le Nozze di Figaro, the libretto for which was adapted from Beaumarchais by the abb6 da Ponte. The reception of this magnificent work was enthusiastic. But Vienna was a hotbed of intrigue. Everything that could

be done by jealous plotters to mar the composer's success was done, and that so effectively that

Mozart declared he would never bring out another opera in the city which treated him so meanly. Fortunately, Figaro, like Die Entfiihrung, was repeated with brilliant success at Prague. Mozart went there to hear it, and received a commission to write an opera for the next season, with a fee of 100 ducats. Da Ponte furnished a libretto, founded on Tirso de Molina's tale, El Convidado de piedra, and entitled 77 Don Giovanni. By the 28th of October 1787 the whole was ready with the exception of the overture, not a note of which was written. This circumstance has led to the idea that it was composed in haste, but it is certain that Mozart knew it all by heart and transcribed it during the night from memory, while his wife told fairy tales to keep him awake.

The opera was produced on the 29th of October with extra- ordinary effect, and the overture, though played without rehearsal, was as successful as the rest of the music. 1 Yet, when reproduced in Vienna, Don Giovanni pleased less than Salieri's comparatively worthless Tarare.

On returning to Vienna Mozart was appointed kammer-compositor to the emperor, with a salary of 800 gulden (£80). In April 1789 he accompanied Prince Lichnowski to Berlin, where King Frederick William II. offered him the post of " kapellmeister " with a salary of 3000 thalers (£450). Though most unwilling to quit the emperor's service, he informed him of the offer and requested leave to resign his appointment in Vienna. " Are you going to desert me, then? " asked the emperor; and Mozart, wounded by the reproach, remained, to starve. The emperor now commissioned Mozart to compose another Italian opera, which was produced on the 26th of January 1790 under the title of Cosi fan tutte. Though the libretto by Da Ponte was too stupid for criticism, the music was delicious, and the opera would probably have had a long run but for the emperor's death on the 20th of February. In March 1791 Mozart consented to write a German opera upon an entirely new plan for Schikaneder, the manager of the little theatre in the Wieden suburb. The piece was to be

addressed especially to the Freemasons, and to contain ceaseless allusions both in the words and music to the secrets of the brotherhood. Deeply interested in the affairs of a body of which he was himself a member, Mozart excelled himself in this new work, which took shape as Die Zauberflote. He was rewarded for his labours by a brilliant artistic success, but Schikaneder alone reaped the financial benefit of the speculation.

Before the completion of Die Zauberflote a stranger called on Mozart, requesting him to compose a Requiem and offering to pay for it in advance. He began the work under the influence of superstitious fear, believing that the messenger had been sent from the other world to forewarn him of his own approaching death. Meanwhile he received a commission to compose an opera, La Clemenza di Tito, for the coronation of the emperor Leopold II. at Prague. He worked incessantly and far beyond his strength. The coronation took place on the 6th of September, and its splendours threw the opera very much into the shade. Die Zauberflote was produced on the 30th of September and had a splendid run. But the Requiem still remained unfinished; the stranger therefore made another appointment, paying a further sum in advance. Mozart worked at it unremittingly, hoping to make it his greatest work. In the Requiem he sur- passed himself, but he was not permitted to finish it. When the stranger called the third time the composer was no more. The score of the Requiem was reverently completed by Siissmayer, whose task may have been simplified by instructions received from Mozart on his deathbed. It is now known that the work was commissioned by Count Walsegg, who wished to perform it as his own.

Mozart died on the 5th of December 1791, apparently from typhus fever, though he believed himself poisoned. His funeral was a disgrace to the court, the emperor, the public, society itself. On the afternoon of the 6th his body was hurried to a

1 Michael Kelly, in his Reminiscences, has left a delightful account of the circumstances.

pauper's grave; and because it rained, Van Swieten, Siissmayer, and three other " friends " turned back and left him to be carried to his last long home alone. (W. S. R.)

Mozart's work falls conveniently into three periods, though O. Jahn makes out, more accurately, five. Our first period may be said, in sober seriousness, to begin at the age of five and to merge into the second somewhere about the age of sixteen or seventeen. It was fortunate that the infancy of the sonata- forms (q.v.) coincided with the infancy of Mozart; for while this coincidence gave his earliest attempts a marvellous resemblance to the work of the fully-grown masters of the time, it secured for his mental activity a healthy and normal relation to the musical world which infant prodigies can never attain in a modern artistic environment. The little pieces composed by Mozart in his fifth and sixth years are a fascinating study in the un swerving progress made by a child who masters every step, not by some miraculous intuition that enables him to dispense with learning, but by a hardly less miraculous directness of thought that prevents him from either making the same mistake twice or exactly repeating a form once mastered. The violin sonatas written in London and Paris at the age of seven in no way fall below the accepted standards of the period, while they already show that variety of invention and experiment which, by the time he was twelve, caused some sober-minded critics to regard him as a dangerous person. His studies in the severer contra- puntal forms speedily gave him the greatest technical mastery of choral music attained since Bach; and more than one stray piece of church music, or movement from a mass or litany, written before he was fifteen, deserves to take rank as a true masterpiece of which the date is immaterial. At the age of fifteen we see a loss of freshness, especially in the numerous operas which show at its worst that hopeless condition of operatic art from which only Gluck's most drastic reforms could rescue it. Fortunately, Mozart had at fifteen acquired more than enough technique to rest upon; and thus the

growing boy could keep his spirits up, continuing his public successes and indulging his easy sense of mastery, without putting a strain upon his brain which nature need revenge then or afterwards.

Lucio Silla, though loaded with conventional bravura arias, nevertheless shows him approaching the age of seventeen with clear signs of a man's power, and in higher qualities than mere variety and fancy. Some of its recitatives and choruses strike a solemn dramatic note hitherto undreamt of in stage music, except by Gluck. La Finta giardiniera first gave Mozart scope for the exercise of his wonderful stage-craft and power of characterization. Though it has not kept the stage, yet it marks the beginning of Mozart's true operatic career, just as the Masses in F and D, written in the same year, mark the close of his first really representative period as a composer of church music. It is, however, difficult to draw such lines definitely; for there is • no period of Mozart's career in which he did not practise all art- forms at once; and the difficulty of drawing inferences as to the relative importance of different forms in his intellectual develop- ment is increased by his invariable mastery, which seems to depend neither on method nor on inspiration. Most of the pianoforte sonatas and many of the best-known violin sonatas belong to his early manhood. To the same period also belong those unfortunate masses which, together with several spurious works, were at one time so popular, and have since been accepted as evidence that he had not the depth of feeling and earnestness necessary for church music. Idomeneo and Die Entfiihrung are currently regarded as quite early works, but they are later than any of the masses except the great unfinished work in C minor, and there is some really great church music of his later period in the shape of stray pieces, litanies and vespers (i.e. collections of psalms sung at evening service) which is almost totally neglected, and which shows a consistent solemnity and richness of style no less in keeping with Mozart's new artistic develop- ments than worthy of the glories of Handel and Bach.

Idomeneo is the only opera of Mozart which unmistakably shows the influence of Gluck; because, with the exception of La Clemenza di Tito, it is the only opera seria by which Mozart is

known; and only a serious opera on a classical subject could furnish occasion for Gluck's phraseology and range of feeling to appear at all. How profoundly and independently Mozart seizes Gluck's method and style may best be seen by comparing the oracle scenes in Idomeneo and Alceste. In the management of the chorus, however, Mozart has, as was to be expected, incomparably the advantage. He has all, or rather more than all, Gluck's power for portraying panic and managing, by the motion of his music, the flight of a crowd; but he also has an inexhaustible harmonic and contrapuntal invention which lay beyond Gluck's scope.

The problems of comic opera presented a far more fruitful field. In Die Entfiihrung he speedily showed a dramatic grasp for which opera seria, in spite of all the influence of Gluck, gave, him no scope. He had a wonderful feeling for character, and did not imagine, like many French and other disseminators of musical- dramatic ideas (including, in moments of weakness, even Gluck himself), that the expression of character in music was a mere matter of harping on special types of phrase. His melodic invention was clearly and subtly characteristic without man- nerism. It is of hardly minor importance that his own literary sense was far higher than that of many a writer of ostensibly superior general culture; and that Osmin, the most living figure in Die Entfiihrung, is Mozart's creation, words and all.

After Die Entfiihrung, Mozart's record is a series of master- pieces, accompanied, but not interrupted, by a running commen- tary of pieces d'occasion. With

rare exceptions, everything he writes illustrates the perfect solution of an art-problem, and he often achieves an artistic triumph with the most eccentric materials. The modern organist can find since Bach no grander piece in his repertory than the two fantasias which Mozart wrote for the barrel of a musical clock. Shortly before his death he wrote a beautiful adagio and rondo for the glass harmonica, to which he devised the curious but eminently natural accompani- ment of flute, oboe, viola and violoncello. And when at an earlier period it occurred to him to write some processional music for two flutes, five trumpets and four drums, the result, although not artistically important, might well have seemed to indicate long experience in handling the combination. His work in the larger instrumental forms is further discussed in the articles Sonata Forms and Instrumentation. While Mozart's treat- ment of form has often been attacked as conventional, and his range of thought despised as childish, his instrumentation and general sense of euphony are at the present day more un- reservedly admired by the most progressive propagandists than anything else in classical art.

Mozart's later operas, from Figaro onwards, represent the nearest approach to a perfect art-form attainable in pre- Wagner- ian opera. What he might have attained in serious opera had he been spared to see the solemn triumphs the French operatic stage realized in the austere sincerity of Cherubini and Mehul it is impossible to guess. But we cannot doubt that a Mozart of yet riper experience than we have known would have given tragic opera a history in which Fidelio did not stand in lonely splendour. For- Mozart, however, serious opera was an Italian art form, only temporarily rescued from the tyranny of bravura singers by Gluck. After Idomeneo he handled it only once, at the very close of his career, and then, as if to seal its fate, in a piece d'occasion with an impossibly dull and unsympathetic libretto {La Clemenza di Tito). For comedy, however, his harmonic and rhythmic range was perfectly adapted; and in Figaro he had the advantage of a

libretto which was already a finished literary product of consummate stagecraft before it ever became an opera. The perpetual surprises of its absurdly complex intrigues impose no real strain, for no one attempts to follow them ; but they keep every character on the stage in a state of excitement which is so heightened and differentiated by the music that, while Beaumarchais's Mariage de Figaro has its modest but definite place in literature, Mozart's Figaro is, with all its lightness of touch, one of the most ideal classics in all art. The subject is not edifying; but Mozart does not analyse it from that point of view. His characters are irresponsible, mischievous

and fairy-like. Theirs is the world described by Lamb — " the Utopia of gallantry, where pleasure is duty and the manners perfect freedom."

In Don Giovanni the matter is less clear. Mozart rose, not only in the music of the ghostly statue, but also in the music of Donna Anna and Donna Elvira, to heights that can only be called sublime; yet he never lost sight of the true methods of that comedy of gallantry to which Don Giovanni stands in some sense as a grotesque tragic finale. It is the business of an artistic intellect to grasp the artistic possibility of a world in which the " Utopia of gallantry " is at war with a full-blooded and incipi- ently moral humanity until the critical moment determines, not the breaking up of the artistic unity, but the right conclusion of the story. If it is absurd to treat Donna Anna and Donna Elvira as Wagnerian heroines, and so to complain of the inadequacy and conventionality of much of their utterances and attitudes; so, also, is it no less absurd to regard them as " secretly rather gratified than otherwise to be on Don Giovanni's list." Donna Elvira has suffered more cruelly from stolidly tragic singers and no less stolidly flippant critics than she ever suffered from Don Giovanni himself. She comes upon the stage expressing herself in thoroughly conventional music, and we are told that the formulas of Italian opera are inadequate for the expression of her sorrows. Look at the sforzando in

the second violins at the words Ah se ritrovo I'empio. Mozart is depicting a young girl facing a position she does not in the least understand; expressing herself in stereotyped phrases as much from inexperience of their meaning as from lack of anything that may better say what she really feels. What Mozart's music with exquisite humour and simplicity expresses is as yet nothing more serious than the wish to scratch Don Giovanni's eyes out; as soon as his character is revealed to her in Leporello's comic aria of the " catalogue," she determines that others at all events shall not suffer as she has suffered; and from that moment her character steadily develops in seriousness and dignity. She is not all strength, and Don Giovanni fools her to the top of her bent ; but nevertheless Mozart realizes, on hints of which the librettist was hardly conscious, a consistent scheme of development as dramatic as it is in keeping with the most sublime possibilities of comic opera. Yet it is a common practice to insert Elvira's last confession of weakness, the aria Mi tradi, immediately after Leporello's catalogue aria! Perhaps the first place where an intelligent tradition of Mozart as a comic genius of the highest type has been restored is Munich, where the standard set under the conductorship of Richard Strauss will not soon be forgotten.

In Cost fan tutte Mozart's struggles with an absurd libretto show even clearer evidence of the accuracy and power of his genius than when he is working under conditions where success is possible. Space forbids our dwelling further on this subject, nor can we do more than glance at his last great opera, Die Zauberflote. Beethoven thought it his greatest work; for the simple literal-minded sincerity with which Beethoven regarded the question of operatic libretto made Figaro frivolous and Don Giovanni scandalous in his sight. Mozart's very serious interest in freemasonry, which in its solemn ritual furnished an edifying contrast to the frivolity and uncongeniality of the existing state of church music, inspired him with the most sublime ideas

hitherto brought upon the operatic stage. He was further stimulated by the feeling that freemasonry was to some extent a persecuted institution; and the circumstance that his librettist was a skilful stage manager secured for him that variety of action and effect- iveness of entry and exit, compared with which an intelligible plot is of almost negligible importance as a source of inspiration to the classical composer, or even as a means of retaining popular favour. Thus Die Zauberflote is an achievement unique in opera; combining as it does the farcical gorgeousness of a pantomime with the solemnity of a ritual and the contemporary interest of a political satire.

From the solemnity of masonic ritual there is but one step to that most pathetic of unfinished monuments, Mozart's Requiem. The finished portions of this work contain the most sublime and perfect church music between Bach and the Missa solemnis of

Beethoven. The unauthentic portions, supplied by Sussmayer, are so well designed that even their comparative slightness of material hardly militates against the suggestion that he may have had some inkling of Mozart's intentions. In particular, the return of the first number at the words Lux aetema, which enables Sussmayer to end with ten pages of authentic Mozart, is splendidly placed (though Mozart is reported to have contem- plated an independent final number) ; while the latter part of the Lacrimosa, though not in Mozart's handwriting, must surely have been dictated by him. The instrumentation of the in- complete numbers is based for the most part on highly authentic evidence, though there are doubtful points; but that of the supplied numbers, especially the Benedictus, is far below the intellectual level of their design. In this, his last work, as in many wonderful polyphonic experiments immediately before it, Mozart showed unmistakable signs of the growth of a new style,

which would undoubtedly have had an influence even more powerful on the history of music as being embodied in works surpassing his ripest known achievements as these surpass the marvellous productions of his childhood. Nevertheless, what he has given us is unique, and the intelligent love of Mozart's work is a liberal education in the meaning of art.

Mozart's extant works (as catalogued by Kochel in 626 items, beginning with minuets written at the age of four and ending with the Requiem) comprise 20 masses (including the Requiem and the great unfinished Mass in C minor); 8 sets of vesperae and litanies; 40 smaller Latin pieces of church music; 6 cantatas and oratorio works, of which the greatest, Davidde penitente, is adapted from the C minor Mass; 17 " organ sonatas " {i.e. little movements for organ and an organ-loft band, for use in church) ; 23 operas (includ- ing fragments and operettas) ; 66 arias and other pieces for insertion into operas or for concert use; 41 songs with pianoforte accompani- ment ; 23 canons (mostly rounds) ; 1 7 pianoforte sonatas ; 5 fantasias and a Handelian suite (unfinished) ; 22 smaller pianoforte pieces ; 36 cadenzas to his own pianoforte concertos; II works for piano- forte & quatre mains; 45 sonatas, including fragments and variations, for pianoforte and violin; 8 pianoforte trios; 2 pianoforte quartets and I quintet for pianoforte and wind; 2 duets for violin and viola; 2 string trios; 29 string quartets; 2 quartets for flute and strings;

1 quartet for oboe and strings; 9 string quintets, of which I is for the singular combination of I violin, 2 violas, violoncello and horn, and another is the famous clarinet quintet; 49 symphonies; 33 cassations, serenades and divertimenti, many for the oddest or- chestral or solo combinations; 27 smaller orchestral and other pieces, also often for strange combinations of surprising beauty; 29 sets of orchestral dances; 6 violin concertos (the 6th is either quite spurious or extremely corrupt) and 4 single violin movements;

2 double concertos (one for 2 violins, the other for violin and viola) ; 10 concertos and concert pieces for various wind instruments (flute, horn, bassoon, clarinet, flute and harp) ; 27 pianoforte concertos (including one for 2 and one for 3 pianofortes) and a concert rondo. Then there is an enormous number of fragments, many of them peculiarly promising, as if Mozart was full of ideas that were in advance of even his mastery of form; there is, for example, a magnificent and comparatively early opening tutti for a double concerto for pianoforte and violin, and a very large string quartet movement in A (probably a finale), which breaks off at an exciting moment at the beginning of its development.

No composer's reputation has suffered more from forgeries and false attributions than Mozart's and the tale begun during the lifetime of his widow is not yet ended at the present day. The concertante for 4 wind instruments which recently went triumphantly round the orchestral societies of Europe as a long-lost work written during Mozart's visit to Paris (though it is not for the same instruments) is not so bad as the notorious forged masses, but it is, to any one acquainted with Mozart's style at any period of his career, almost as obviously spurious. Mozart often wrote without thought, but never, even when he was six years old, without mastery; and there is much genuine work that is as dull as this concertante, but none that is obviously constructed by a fool. A panegyric of the concertante has been inserted in the latest (posthumous) editions of Jahn's biography, which it is very difficult to believe would have met with that great scholar's approval.

On the other hand, twelve recently discovered divertimenti for 2 clarinets and bassoon are delightful little works which, with all their slightness, only Mozart, and Mozart in full maturity, could have written. A seventh violin concerto appeared in November 1907, and, though inferior to the earlier ones, is undoubtedly genuine, every detail and quality of its

organization being exactly in keeping with Mozart's progress in 1777, its alleged date.

Many genuine works are known in spurious forms; thus the motet Splendente te Deus is an unauthorized arrangement of a chorus from Kbnig Thamos, and most of the flute-music mentioned in the

article Flute in Grove's Dictionary (new ed.) consists of spuriout arrangements, while several important genuine works are ignored.

(D. F. T.)

MOZDOK, a town of Russia, in Caucasia, and in the province of Terek, on the left bank of the river Terek, 605 ft. above sea- level, in 43 41′ N. and 44 39′ E., 50 m. N. of Vladikavkaz. The population, 8760 in 1863, numbered 14,583 in 1897, and consisted of Kabardians, Chechens, Ossetes, Georgians and Armenians. Built in 1763 by the prince of Kabardia, Mozdok soon became an important point in the Russian advance towards the Caucasus, and was fortified. In 1840 it was attacked by the Circassian patriot Shamyl and 5000 mountaineers. The melons and water-melons of Mozdok are widely famed; and vine-growing and silkworm breeding prosper.

MOZI.EY, JAMES BOWLING (1813-1878), English theologian, was born at Gainsborough, Lincolnshire, on the 15th of September 1813, and was educated at Oriel College, Oxford. He was elected to a fellowship at Magdalen in 1840. He took an active part in the Oxford movement, but could no more follow Newman into the Roman communion " than fly." He was joint editor of the Christian Remembrancer, but withdrew from the position because of his substantial agreement with the famous Gorham decision. He was one of the earliest supporters of the Guardian. In 1856 he became vicar of Shoreham, in 1869 canon of Wor- cester, and in 1871 regius professor of divinity at Oxford. He died at Shoreham on the 4th of January 1878.

He wrote A Treatise on the Augustinian Doctrine of

Predestination (1855); The Primitive Doctrine of Baptismal Regeneration (1856); A Review of the Baptismal Controversy (1862); Subscription to the Articles: a Letter (1863) ; Lectures on Miracles, being the Bampton Lectures for 1865; and Ruling Ideas in Early Ages and their relation to the Old Testament Faith (1877). Essays, Historical and Theo- logical, appeared in 1878 (2 vols.), with a biographical preface by his sister Anne, who also edited some of his Letters (1884).

MOZLEY, THOMAS (1806–1893), English divine and writer, was born at Gainsborough in 1806, the son of a bookseller and publisher in that town. From Charterhouse school he pro- ceeded to Oriel College, Oxford, where he became the pupil, and subsequently the intimate friend, of John Henry Newman. In 1831 he was ordained, and became, in 1836, rector of Cholderton, Wiltshire. He was, from its beginning, a strong supporter of the Tractarian movement, and after contributing for some time to the British Critic, the chief organ of the movement, succeeded Newman as editor in 1841. In 1843 he was on the point of joining the Roman Catholic Church. Newman, however, strongly advised him to take two years to reflect, and long before that period had elapsed Mozley had determined to remain an Anglican. In 1844 he began to write leading articles for The Times, and continued to do so regularly for many years. In 1847 he resigned his country living and settled in London, but in 1868 accepted the living of Plymtree, Devonshire. From 1876– 1880 he was rural dean of Ottery St Mary's, Devon. He resigned his living in 1880, and removed to Cheltenham, where he died on the 17th of June 1893.

He was the author of Reminiscences, chiefly of Oriel, and the Oxford Movement, published in 1882.

MPONGWE (Pongos), a settled Bantu people of the Gabun, West Africa, constantly confused with the Mpangwe or Fang (?.».). The Mpongwe, who call themselves Ayogo or " the Wise," have a rich collection of national songs, myths and traditions, and the tribal elders know the "Hidden Words," a

kind of secret language of unknown origin. Their language, a Bantu dialect, has been the means of communication between the tribes of the interior and the Europeans. The family organization is intricate and very similar to the Roman patria potestas; wives, children and slaves being all subservient to the father, who alone is really free. They practise the poison ordeal, and reverence vague and malignant spirits who require propitiation by offerings and ceremonies. The ghosts of the dead are especially feared.

MTSENSK (popularly Amchensk), a town of Russia, in the government of Orel, on the navigable Zusha River, 17 m. from its confluence with the Oka, and on the Moscow & Kursk rail- way, 32 m. N.E. of the city of Orel. Pop. (1900), 9390. It is

mentioned in the Russian chronicles as early as 1147. From 1320 to 1530 it was under the rule of Lithuania; in the latter year it was taken by Russia, and became one of her chief strongholds against the raids of the Tatars. It is now an important centre for trade in grain, hemp, hemp-seed oil, tobacco and spirits.

MTSKHET, a decayed town of Russian Transcaucasia, in the government of Tifiis, 13 m. by rail N.N.W. of the city of Tiflis, at the confluence of the Aragva with the Kura, at an altitude of 1515ft. Pop. (1897), 1221. One of the oldest places in Georgia, it was the capital of that country until supplanted by Tiflis in the last year of the 5th century a.d. The most ancient seat of the Georgian kings was the castle of Arma-tsikhe, Armasis, or Harmozica, crowning a hill opposite to Mtskhet. The most memorable relic of the latter is the cathedral, said to have been originally founded in the 4th century, though the existing building dates from the 15th century and was restored in the 1 8th. In the graveyard attached to this convent graves have been

opened which yielded objects of the Iron and Stone ages, and others of the era of the Roman emperor Augustus.

MUBARRAD, or Mobarrad [Abu-1 `Abbas Mahommed ibn Yazld ul-Azdl] (c. 826-898), Arabian grammarian, was born in Basra, and became the leader of the Basran grammarians against the Kufan school. His judgment, however, was independent, as is shown by his attack on some points in the grammar of Siba- waihi, the greatest writer of his own school. He died at Bagdad.

His main work is the grammatical one known as the Kamil {Perfect), which has been edited by W. Wright (Leipzig, 1864 seq.), and published at Constantinople (1869) and Cairo (1891). Two or three other works exist in MS. ; cf. C. Brockelmann, Gesch. der arabischen Litteratur, i. 109 (Weimar, 1898). (G. W. T.)

MUCH WENLOCK, a market town in the municipal borough of Wenlock (g.v.), and the Ludlow parliamentary division of Shropshire, England, 163 m. N.W. from London on the Great Western railway. It lies at the north end of Wenlock Edge, a range running south-west from the Severn valley. A priory was founded here as a nunnery by St Milburg, granddaughter of Penda, about 680, and after being destroyed by the Danes was refounded by Leofric in 1017. Afterwards it was remodelled by Roger de Montgomery for Cluniac monks. There are beautiful remains of the priory church, chiefly Early English; but there is a chapter-house of ornate Norman work. The prior's house, still inhabited, is a remarkable specimen of 1 sth-century work, adjoin- ing and incorporating remains in earlier styles. The parish church of Holy Trinity, close to the ruins, is of mixed styles from Norman onwards. There is a picturesque half-timbered guild- hall (1 589). Trade is mainly agricultural, but there are limestone quarries in the neighbourhood. Wenlock received the grant of a market from Henry III. in 1224. It was incorporated by Edward IV. in 1448, when it also received the privilege of returning members to parliament, but in

1885 it ceased to have separate representation.

MUCIANUS, LICINIUS, Roman general and statesman, lived during the 1st century a.d. His name shows that he had passed by adoption from the Mucian to the Licinian gens. About a.d. 55 he was sent by Claudius, who had become suspicious of his intimacy with Messallina, to Armenia with Domitius Corbulo. Under Nero he regained the imperial favour. After the death of Galba (69), Mucianus and Vespasian (who was at the time in Judaea) both swore allegiance to Otho, but when the civil war broke out Mucianus persuaded Vespasian to take up arms against Vitellius, who had seized the throne. It was agreed that Vespasian should stay behind to settle affairs in the East, while Mucianus made his way through Asia Minor and Thrace to attack Vitellius. He reached Rome the day after the death of Vitellius, and found Domitian, Vespasian's son, at the head of affairs, but until the arrival of Vespasian the real master of Rome was Mucianus. But he never wavered in his allegiance to Vespasian, whose favour he retained in spite of his arrogance. As no mention is made of Mucianus during the reigns of Titus or Domitian, he probably died during the reign of Vespasian. He was a clever writer and historian. He made a collection of the speeches and letters of the Romans of the older republican period, probably

including a corpus of proceedings of the senate (Acta senatus), and was the author of a work, chiefly dealing with the natural history and geography of the East, which is often quoted by Pliny as an authority, especially for fabulous statements.

See monograph by L. Brunn (Leipzig, 1870).

MUCIC ACID, C 6 H 10 O 8 or HOOC-(CHOH) 4 COOH, is obtained by the oxidation of milk, sugar, dulcite, galactose, quercite and most varieties of gum by nitric acid. It forms a crystalline powder which melts at 213 C. It is insoluble in alcohol, and nearly insoluble in cold water. When heated with pyridine to 140 C, it is converted into allomucic

acid. When digested with fuming hydrochloric acid for some time it is converted into aa! furfurane dicarboxylic acid (see Furfurane) ; while on heating with barium sulphide it is transformed into a — thiophene car boxylic acid (see Thiophene). The ammonium salt yields on dry distillation carbon dioxide, ammonia, pyrrol and other substances. The acid when fused with caustic alkalies yields oxalic acid.

MUCILAGE (from Late Lat. mucilago, a mouldy juice, from mucere, to be mouldy), a term which denotes a viscid or glutinous mixture of water and any gummy vegetable substance (see Gum). Mucilages are useful in medicine as vehicles for various insoluble and other drugs, and in the arts as thickeners (in calico-printing, dyeing, &c.) . The British pharmacopoeia contains the mucilages of acacia and tragacanth.

MUCKERS (Ger. Muckern, i.e. canting bigots, hypocrites), the nickname given to the followers of the teaching of Johann Heinrich Schonherr (1770-1826) and Johann Wilhelm Ebel (1784- 1861). Schonherr, the son of a non-commissioned officer at Memel in Prussia, was educated at the university of Konigsberg, where at that time the theological faculty, under the influence of Kantian idealism, was strongly rationalist in tendency. The lad, who was miserably poor, was dissatisfied with a philosophy which stopped short of an explanation of the ” thing in itself,” and, having been reared in the strictest orthodoxy, he set to work to develop, with the aid of the Bible, a philosophy of his own. In the end he believed himself to have reached ultimate knowledge, and became the prophet of a dualistic theosophy 1 so closely analogous to Gnosticism that it might have been taken for a deliberate revival, had not Schonherr’s lack of education precluded any such idea. Among his converts was Ebel, who from 18 10 onwards gained a great reputation in Konigsberg as an earnest preacher of the orthodox doctrines of “sin, grace and redemption, and in 1816 was appointed ” archdeacon,” i.e. principal pastor, at the old

church in Konigsberg. In the pulpit he was orthodox; but he gathered about him a select circle of the initiated, to whom in private he taught Schonherr's doctrines. Schonherr himself sank into the background, and eventually died in 1826. But Ebel continued his teaching, and was joined in 1827 by Heinrich Diestel, also a Lutheran pastor of Konigsberg. They became father confessors to a wide circle of silly fashionable people in the Prussian capital. In view of their peculiar teaching as to the purification of the flesh," which involved the minute regulation of the intercourse of married people, scandal was

1 Schonherr distinguished two primal powers or principles— one male and active, the other female and passive — having both person- ality and volition; he called them Light and Darkness, Fire and Water. They moved freely in the void, and from their ultimate contact God and the world sprang into being. Evil came into existence owing to the fall of Lucifer, a Light-being created by God, who in revenge lent his aid to the powers of Darkness. Sin came with the Fall of Man; and this infection, inherited with the blood, necessitated redemption in order to restore the harmony of the primal powers. This was the work of Christ, who descended into a world the inhabitants of which are divided into children of Light and chil- dren of Darkness. The power of the Holy Ghost, emanating from Christ, perfects the higher natures in whom Christ's " law of right- eousness " is represented and who to a certain extent share in his being; it becomes their duty to obtain control over the lower natures so as to struggle against the powers of Darkness in them — powers which can be overcome by prayer, fasting and self-mortification generally. The end was near and the triumph of the Light assured. Anti-christ (Napoleon) had already appeared, and when Christ came he would find no faith on the earth (Luke xviii. 8) because faith would be swallowed up in knowledge.

inevitable. Matters came to a head in 1835, when Count Finckenstein, himself formerly an initiate, denounced the two pastors and accused them of immorality. Diestel wrote two violent tirades against the count, who brought an action for slander and won it. The evidence taken in the case was then laid before the consistory, and proceedings followed which became famous as the " Konigsberger Religionsprozess " (1835-1841), 1 ending in sentences of deprivation on both Ebel and Diestel. The charges of actual immorality were dismissed; but there is no doubt that some of their followers established practices akin to those of the Agapemone and the Perfectionists. Some of them migrated to Brazil, where in 1874 at Porto Alegre a company of them came into collision with the military.

See J. I. Mombert, Faith Victorious (London, 1882); Hepworth Dixon, Spiritual Wives (1868); and, more especially, the article on Schonherr, by P. Tschackert, in Herzog-Hauck, Realencyklopadie (3rd. ed., Leipzig, 1906), xvii. 676.

MUCUNA, a genus of twining plants, belonging to the natural order Leguminosae, and natives of the tropics. M. pruriens is popularly known as cowhage or cowitch, a corruption of the Hindu Kiwach. It is a tall annual climber with large dark purple pea-like flowers, and golden-brown velvety pods recalling those of the sweet pea, the hairs or bristles on which often raise blisters on the skin. It is common in the tropical regions of India, Africa and America, and the hairs on the pod have long been used in medicine as a vermifuge.

MUDANIA (anc. Apamea Myrlea), a town of Asia Minor, on the south coast of the Sea of Marmora, and the port of Brusa. It is connected with Brusa by a railway and a carriage road, and with Constantinople by steamers. Olive oil is produced. Pop., 5900, of which two-thirds are Greeks.

MUDHOL, a native state of India in the southern

division of Bombay. Area, 368 sq. m.; pop. (1901), 63,001; revenue, £20,000. It was a Mahratta principality dating from Mahom- medan rule before the rise of Sivaji. The family name of the chief is Ghorpade. The town of Mudhol stands on the left bank of the Ghatprabha; pop. (1901), 8359.

MUDIE, CHARLES EDWARD (1818-1890), English publisher and founder of Mudie's Lending Library, was born at Chelsea on the 1 8th of October 1818, the son of a secondhand bookseller and newsagent. In 1840 he established a stationery and book- selling business in Bloomsbury, London. He was the first publisher of James Russell Lowell's poems in England, and of Emerson's Man Thinking. In 1842 he began to lend books. This department proved so successful that in 1852 he moved his " Select Library " to larger premises in New Oxford Street, London. In i860 these premises were substantially enlarged, and branches of the business established, and in 1864 " Mudie's " was converted into a limited company. Mudie himself died on the 28th of October 1890. - ■ , ■

MUFF, an article of outdoor apparel, open at either end, for holding the hands in and keeping them warm, generally made of fur, but also of velvet, silk, &c. Muffs are now only used in England by women, but in the 17th and 18th centuries were fashionable for men. In Roman times the place of the glove was taken by long sleeves (manicae) reaching to the hand, and in winter special sleeves of fur were worn (cf. Cic. Phil. ii. n, 26). In Medieval Latin we find the word muffulae, defined by Du Cange (Gloss., s.v.) as chirothecae pellitae el hibernae. He quotes from a cartulary of the year 81 7, of the issuing to monks of sheep- skin coverings to be used during the winter. These may have been, as the Roman certainly were, separate coverings for each hand, although the cartulary cited also distinguishes the glove for summer from the muffulae for winter wear. The O. Fr. moujle meant a thick glove or mitten, and from this the Du. mof, Walloon mouffe, and thence Eng. " muff," are probably derived. From the Fr. tnoufle have come the various uses, verbal and substantival, of " muffle," viz. to wrap round for protection, for

deadening sound &c, and for a chamber or receptacle in a furnace to protect objects from contact with fire while exposed to heat. The slang use of ” muff ” for a clumsy, awkward person is of late origin. It appears in the middle of the 19th century. 1 The contemptuous designation Muckern dates from this time.

MUFFLING, FRIEDRICH KARL FERDINAND, Feeiherk von, called WEISS (1775–1851). Prussian general field marshal, was born on the 12th of June 1775, and entered the Prussian army in 1790. In 1799 he contributed to a military dictionary edited by Lieutenant W. von Leipziger, and in the winter of 1802–1803, being then a subaltern, he was appointed to the newly-formed general staff as “quartermaster-lieutenant.” He had already done survey work, and was now charged with survey duties under the astronomer F. X. von Zach (1754–1832). In 1805, when in view of a war with France the army was placed on a war footing, Muffling was promoted captain and assigned to the general staffs, successively, of General von Wartensleben, Prince Hohenlohe and Bliicher. In 1806 he served under Hohenlohe, the duke of Saxe- Weimar, and Bliicher, and was included in the capitulation of the latter’s corps at Rattkau, after which he entered the civil service of the duke of Weimar. He rejoined the army on the outbreak of the War of Liberation in i8i3,and was placed on the headquarters staff of the army of Silesia. His business qualities and common sense were greatly valued, though the temperamental differences between Muffling and Gneisenau often led to friction, especially as the former was in a measure the representative of the antiquated ” topographical ” school of strategists, to whom (rightly in the main) the disaster of Jena was attributed. In the interval between the first occupation of Paris and the Hundred Days, Muffling served as chief of the staff to the Russian general Barclay de Tolly and to General Kleist von Nollendorf. He was Prussian commissioner at the duke of Wellington’s headquarters in the Waterloo campaign, and was involved in the various controversies

which centred round the events of the 16th of June 1815. After the final fall of Napoleon he served on the staff of the army of occupation in France and was for some months military governor of Paris. He spent a part of his time on the Rhine in survey work, and was employed by Frederick William III. in various diplomatic missions. In 1821 he became chief of the general staff at Berlin, and though he has been accused of indulging his taste for topographical work at the expense of training for war, his work was not wasted, for he gave an excellent organization to the general staff, and executed elaborate and useful surveys. In 1829 he visited Constantinople and St Petersburg in connexion with negotiations for peace between Russia and Turkey. He took a prominent part in the military and civil history of Prussia, and from 1838–1847 was governor of Berlin. Failing health compelled his retirement in the latter year, and he died on the 16th of January 1851, at his estate of Ringhofen near Berlin.

Under the initials of C(arl) von W(eiss), he wrote various important works on military art and history : Operationsplan der preuss–sdchs. Armee 1806 (Weimar, 1807); marginalia on the archduke Charles's Grundsatze der hbheren Kriegskunst fur die Generale der oeslerr. Armee, and on Riihle von Lilienstern's Bericht uber die Vor gauge lei der Hohenloheschen Armee 1806; Die preussisch–russische Kam– pagne Us zum Waffenstillstande 1813 (Berlin, 1813); Geschichte der Armeen unter Wellington und Bliicher 181s (Stuttgart, 18 17); Zur Kriegsgesch. der Jahre 1813–1814: die Feldzilge der schlesischen Armee von der Beendigung de's Waffenstillstandes bis zur Eroberung von Paris (Berlin, 1824); Betrachtungen uber die grossen Operationen und Schlachten 1813–1813 {Berlin, 1825); Napoleons Strategie 1813 (Berlin, 1827) ; and an essay on the Roman roads on the lower Rhine (Berlin, 1834). Muffling was also the inventor of a system of hachur– ing for maps. His reminiscences, Aus meinem Leben, were published at Berlin in 1851.

MUFTl, 2 a consulting canon–lawyer in Islam, who,

upon application, gives fatwds (fetvas) or legal opinions on points of canon law (see Mahommedan Law). These are asked and given in strictly impersonal form, but the cadi, or judge, then applies them to the case and decides in accordance with them. In theory, any learned man whose opinion is respected and whose advice is sought can give fatwas. But generally in a Muslim state there are muftis specifically appointed by the government, one for each school of canon law in each place. Each of these renders opinions in accordance with the law-books of his school;

2 The use of the word for plain or civilian clothes worn instead of uniform is originally Anglo-Indian. It may have been suggested by the loose flowing robes of the stage " mufti," and thus implied any easy dress worn by an officer when out of uniform.

he has no scope for free interpretation; everything is fixed there, and he must follow the precedents of the elders. In Turkey there is a chief mufti, called the Sheikh al-Islam, whose office was created by the Ottoman sultan, Mahommed II., in 1453, after the capture of Constantinople. He is, in a sense, the head of the ecclesiastical side of the state, that controlled by canon law; while the grand vizier is at the head of secular matters. Although his powers are delegated by the sultan-caliph, and he is appointed and can be dismissed by him, yet in his fatwa-issuing power he is independent. The sultan may dismiss him before he has a chance to issue a fatwa; but if he once issues it the result is legally automatic, even though it means the deposition of the sultan himself. Thus it was by a fatwa of the Sheikh al-Islam that the sultan Abdul Hamid was deposed.

See Juynboll, De mohammedaansche Wet., 40 sqq.; De Slane's trans, of Ibn Khaldun's Prolegomines, I. lxxviii. 447 seq. ; Turkey in Europe, by "Odysseus,"

131 seq.; Young, Corps de droit ottoman, I. x., 285, 289. (D. B. Ma.)

MUGGLETON, LODOWICKE (1600–1698), English sectarian, was born in Bishopsgate Street, London. His father was a farrier, but he himself was bred to be a tailor. In 1651 he began to have revelations, and to proclaim himself and his cousin John Reeve, whose journeyman he was, as the two witnesses mentioned in Rev. xi. 3. In 1652 they put out their " commission book " under the title The Transcendent Spirituall Treatise. An exposition of their doctrines was published in 1656 under the title of The Divine Looking-Glass. Among other views (besides the doctrine of the divine mission of the authors) this work taught that the distinction of the three persons in the Trinity is merely nominal, that God has a real human body, and that He left Elijah as His vicegerent in heaven when He Himself descended to die on the cross. Muggleton's opinions gained some notable adherents, but also called forth much opposition. In 1653 he was imprisoned for blasphemy, and twice (1660 and 1670) his own followers temporarily repudiated him. His attack on the Quakers drew forth William Penn's book, The New Witnesses proved old Heretics (1672). In 1677 Muggleton was tried at the Old Bailey, convicted of blasphemy, and fined £500. Reeve died in 1658, but Muggleton survived till 1698.–

His collected works, including the posthumous Acts of the Witnesses, were published in 1756; and in 1832 some sixty Muggletonians subscribed to bring out a new edition of The Works of J. Reeve and L. Muggleton (in 3 vols. 4to). Even as late as 1846 The Divine Looking-Glass was reprinted by members of the then almost extinct sect. See A. Jessopp, The Coming of the Friars (1888).

MUGWUMP, in American political slang, a name applied to any independent voter, and especially to those independents in the Republican party who refused to support James G. Blaine, when nominated by that party for the presidency in 1884; as since adopted in England it usually means one who stays neutral

and votes for no party. Originally " mugwump " (mogkiomp) was a North American Indian word, in the Massachusett dialect of the Algonquian, meaning " great man " (mogki, great; omp, man); and in New England it was used of self-conceited politicians.

MUHAMRAH (Mohammerah), a town of Persia, in the province of Arabistan, in 30 26′ N., 48 n′ E., on the Hafar canal, which joins the Karun with the Shatt el Arab, and flows into the latter 40 m. above its mouth at Fao and about 20 m. below Basra. It has post and telegraph offices, and a population of about 5000. With the opening of the Karun river, as far as Ahvaz, to international navigation in 1889, Muhamrah acquired greater importance, and its customs, which until then were leased to the governor for £1500 per annum, rose considerably, and paid £8000 until taken over by the central customs department under Belgian officials in 1902. It is estimated that the value of the imports and exports into and from Muhamrah, excluding specie, is about £300,000 per annum, paying customs amounting to about £18,000. Until 1847, when it definitely became Persian territory in accordance with art. ii. of the treaty of Erzerum, Muhamrah was alternately claimed and occupied by Persia and Turkey, its ruler, an Arab sheikh, helping either power as he found it convenient. Since then the governor of the town and

adjoining district has been a sheikh of the K'ab or Chaab Arabs, a powerful tribe of the Shi'ah branch of Islam. At the close of the Anglo-Persian campaign in 1857 Muhamrah was taken by a British force.

MUHLBERG, a town of Germany, in Prussian Saxony, on the left bank of the Elbe, 8 m. below Riesa. Pop. (1905), 3380. It carries on a considerable trade by water in timber and corn. Muhlberg is famous for the victory gained here, on the 24th of April 1547, by the emperor Charles V. over the elector of Saxony, John Frederick.

See Lenz. Die Schlacht bei Muhlberg (Gotha, 1879); and Bertram, Chronik der Stadt Muhlberg (Torgau, 1864).

MUHLENBERG, HENRY MELCHIOR (1711–1787), German-American Lutheran clergyman, was born in Einbeck, Hanover, on the 6th of September 171.1. When he was twelve years old his father, a member of the city council, died. The son entered the university of Gottingen in 1735, and his work among the poor of Gottingen led to the establishment of the present orphan house there. In 1738 he went to Halle to finish his theological studies; he was a devoted worker iri the Franckesche Stiftung, which later served as a partial model for his great-grandson's community at St Johnland , Long Island. He was deacon at Gross- hennersdorf, in Upper Lusatia, in 1739–1741. In 1742, in reply to a call from the Lutheran churches of Pennsylvania, he went to Philadelphia, and was joined from time to time, especially in 1 745 , by students from Halle. Muhlenberg occupied himself more particularly with the congregation at New Providence (now Trappe), though he was practically overseer of all the Lutheran churches from New York to Maryland. In 1 748 he organized the first Lutheran synod in America. Muhlenberg married in 1745 Anna Maria Weiser, daughter of J. Conrad Weiser, a well-known Indian interpreter, and herself said to have had Indian blood in her veins; by her he had eleven children. Throughout the War of Independence he and his sons (see below) were prominent patriots. He died at Trappe on the 7th of October 1787. The importance of his work in organizing and building up the Ameri- can Lutheran Church, of which he has been called the Patriarch, can hardly be exaggerated; but his example in preaching in English as well as in German was, unfortunately fo-r the growth of the Lutheran Church, not followed by his immediate successors. He had no sympathy with the Old Lutherans and their strict orthodoxy — on the contrary he was friendly with the Reformed congregations, and with George Whitefield and the Tennents. See Life and Times by William J. Mann (Philadelphia, 1887).

MUHLENBERG, JOHN PETER GABRIEL (1746–1807), American preacher and soldier, son of H. M. Muhlenberg

(q.v.), was born at Trappe, Pennsylvania, on the 1st of October 1746. With his two brothers he was educated in Germany. He entered the Lutheran ministry, had charge of churches at New German- town and Bedminster, New Jersey, and after 1772 of a church in Woodstock, Virginia, and there in 1775 raised the 8th Virginia (German) regiment, of which he was made colonel; in February 1777 he became a brigadier-general in the Continental Army; and in September 1783 was breveted major-general. He took part in the battles of Brandywine, Germantown and Monmouth, and at Yorktown commanded the first brigade of light infantry. After the war he removed to Pennsylvania. He was a member of the Virginia convention of 1776, was vice-president of the supreme-executive council of Pennsylvania in 1 787-1 788, and was a representative in Congress in 1789-1791, in 1793-1795, and in 1799-1801. In 1801 he was elected as a Democratic- Republican to the United States Senate, but immediately resigned to become supervisor of revenue for the district of Pennsylvania. He became collector of the port of Philadelphia in 1803. He was a friend of Thomas Jefferson and of James Monroe.

See Life by Henry A. Muhlenburg (Philadelphia, 1849).

His brother, Frederick Augustus Conrad Muhlenberg (1750-1801), became his father's assistant in Philadelphia in 1770; was pastor of the Christ (or Swamp) German Lutheran Church of New York City from 1773 to 1776; and in 1777-1779 was assistant to his father at New Hanover. In 1 7 79-1 780 he was

3 member of the Continental Congress, in 1 780-1 783 of the Penn- sylvania general assembly (then consisting of only one house), and in 1 780-1 790 of the state constitutional convention. He was president of the Pennsylvania convention which ratified the federal constitution, and was a member in 1 789-1 797 of the national House of Representatives, of which he was speaker in

1789–1791 and 1793–1795. On the 29th of April 1796, as chair- man of the committee of the whole, he cast the deciding vote for the laws necessary to carry out Jay's treaty.

Another brother, Gotthile Henry Ernest Muhlenberg (i753 –I 8i5), was a prominent Lutheran clergyman, and was pastor of a church in Lancaster, Pennsylvania, from 1779 to his death; but he is best known as a botanist, and published Catalogus plantarum Americae septentrionalis (1813) and Descriptio uberior graminum et plantarum calamariarum Americae septentrionalis indignarum et circurum (181 7).

See John M. Maisch, G. H. E. Muhlenberg als Bolaniker (1886).

Gotthilf's son, Henry Augustus Muhlenberg (1782–1844), was pastor of a Lutheran Church in Reading, Pennsylvania, in 1802–1828, was a Democratic representative in Congress in 1829- 1838, and was United States minister to Austria in 1838–1840.

MUHLENBERG, WILLIAM AUGUSTUS (1 796–1877), American philanthropist and Protestant Episcopal clergyman, great-grandson of H. M. Muhlenberg and grandson of F. A. C. Muhlenberg, was born in Philadelphia, Pennsylvania, on the 16th of September 1796. He graduated at the university of Pennsylvania in 18 15. In 181 7 he was ordained a deacon in the Protestant Episcopal Church, and became assistant to Bishop William White (1 748–1 836) in the rectorship of Christ Church, St Peter's and St James's, Philadelphia. In 1820 he was ordained priest and until 1826 was rector of St James's Church, Lancaster, Pennsylvania. Largely owing to his efforts, Lancaster was the second public school district created in the state. His interest in church music and hymnody prompted his pamphlet of 1821, A Plea for Christian Hymns; he drew up for the use of his own parish a collection of Church Poetry (1823); and in 1823 he was appointed by the General Convention a member of the committee on psalms and

hymns, whose collection, approved in 1826, contained several of Muhlenberg's own compositions, including " I would not live alway," " Shout the glad tidings," and " Saviour, who thy flock art feeding." From 1826 to 1845 he was rector of St George's, Flushing, Long Island, where in 1827 he became head of the Flushing Institute, probably the first Protestant Episcopal " church school " in the United States. He founded a St Paul's College, to include the institute, but the panic of 1837 and the refusal of a charter by the state legislature brought it to an end; and the property was sold a few years after Muhlenberg left Flushing. The methods of this institute were however copied widely; church schools sprang up everywhere; and St Paul's School, Concord, New Hampshire, and the Groton School in Massachusetts were established in accordance with his ideas. In 1845 he removed to New York City, where in 1846 he became rector of the Church of the Holy Communion, a " free " church built by his sister, Mrs Mary A. Rogers. Here Muhlenberg founded the first American order of Protestant Episcopal deaconesses, the Sisterhood of the Church of the Holy Com- munion, begun in 1845 and formally organized in 1852. The work of the sisterhood led to Muhlenberg's establishment of St Luke's Hospital (opened in 1858), for which his congregation made offerings each St Luke's Day after 1846. In 1866 he founded on Long Island the Church Industrial Community of St Johnland. He bought 53s acres (mostly wooded), with a shore front of if m. on Long Island Sound, near King's Park, 4.5 m. from New York City, to be a home for the aged and for young children, especially cripples. 1 The plan was not reformatory nor purely

1 The Society of St Johnland, incorporated in 1870, has a chapel, the Church of the Testimony of Jesus (1869), St John's Inn, the home for old men (also built in 1869), Sunset Cottage, a home for twelve aged couples, Muhlenberg House for old women, the Fabbri Home, the Sunbeam Cottage (given by Mr and Mrs Cornelius Vanderbilt in 1881) Lawrence House, for babies, a library and village hall, a

kindergarten, a school house, and the ” mansion,” Dr Muhlenberg’s home at St Johnland and later the home of Sister Anne Ayres, his biographer, during her superintendence of the society.

charitable, and a moderate rent was charged for the cottages. In the St Johnland cemetery is the grave of Dr Muhlenberg, who died on the 8th of April 1877 in St Luke’s Hospital, New York City. His ideal of the church was that it was missionary and evangelical as well as catholic with formal government and ritual; hence he called himself an ” evangelical Catholic ” and wrote the Evangelical Catholic Papers, which were collected and published by Anne Ayres in 1875–1877.

See Anne Ayres, Life and Work of William Augustus Muhlenberg (New York, 1880), and W. W. Newton, Dr Muhlenberg (Boston, 1890), in the ” American Religious Leaders ” series.

MUHLHAUSEN, a town of Germany, in Prussian Thuringia, on the right bank of the Unstrut, 25 m. N.W. of Gotha by rail. Pop. (1905), 34,359. It consists of a new and an old town, surrounded by five suburbs, and has numerous old churches and towers. The most interesting churches are those of St Mary and of St Blasius, dating respectively from the 14th and the 12th century; the town-hall is also a fine medieval structure. The chief industries are the spinning and weaving of woollen and cotton. Other manufactures include needles, machinery, cigars, soap, hosiery, furniture and shoes. There are also establish- ments for dyeing, tanning, lime-burning, iron-making, brewing and the preparation of liqueurs.

Muhlhausen is one of the oldest towns in Thuringia, and is said to have been fortified in 925. Its early importance is shown by the grant of privileges made to it by the German King Henry I., and by the diet held here in 1135. During the Reformation period Muhlhausen became notorious as one of the chief

seats of the Anabaptists. Thomas Miinzer, one of their leaders, was captured in the vicinity and executed in the town. Internal dissensions and injuries received during the Thirty Years' War and the Seven Years' War afterwards reduced Muhlhausen to unimportance. In 1802 it lost its independence and passed to Prussia, in 1807 it was attached to the kingdom of Westphalia, but in 181 5 it again became Prussian. The Teutonic Order established itself at Muhlhausen in 1200.

See E. Heydenreich, Aus der Ceschichte der Reichsstadt Muhl- hausen (Halle, 1900); Nebelsieck, ReformationsgescMchte der Stadt Muhlhausen (Magdeburg, 1905); Herquet, Urkundenbuch der ehemaligen freien Reichsstadt Muhlhausen (Halle, 1874); F. Stephan, Verfassungsgeschichte der Reichsstadt Muhlhausen (Sondershausen, 1886) ; Jordan, Chronik der Stadt Muhlhausen (Muhlhausen, 1900- 1906); and Fiihrer durch Muhlhausen und Umgegend (1901).

MUIR, JOHN (1810-1882), Scottish Orientalist, was born on the 5th of February 1810 in Glasgow, where his father, William Muir (d. 1821), was a merchant. He was educated at the grammar school of Irvine, the university of Glasgow, and the East India Company's College at Haileybury. He went to India in 1829, and served with distinction in various offices, as assistant secretary to the board of revenue, Allahabad, as collector at Azimgarh, as principal of the Victoria College, Benares, and as civil and session judge at Fatehpur. He encouraged the study of Sanskrit, and furthered schemes for the enlightenment and amelioration of the Hindus. In 1853 he retired and settled in Edinburgh, where he continued his Indian labours. In 1862 he endowed the chair of Sanskrit in the university of Edinburgh, and was the main agent in founding the Shaw fellowship in moral philosophy. He was a D.C.L. of Oxford, LL.D. of Edinburgh and Ph.D. of Bonn, and was one of the first to receive the distinction of CLE. He died on the 7th of March 1882.

In 1858 appeared vol. i. of his Original Sanskrit

Texts (2nd ed., 1868) ; it was on the origin of caste, an inquiry intended to show that it did not exist in the Vedic age. Vol. ii. (ist ed., i860; 2nd, 1871) was concerned with the origin and racial affinities of the Hindus, exhibiting all the then available evidences of their connexion, their linguistic, social and political kinship, with the other branches of the Indo-European stock. Vol. iii. (ist ed., 1861 ; 2nd, 1868) was on the Vedas, a full inquiry as to the ideas of their origin, authority and inspiration held both by the Vedic and later Indian writers. Vol. iv. (ist ed., 1863; 2nd, 1873) was a comparison of the Vedic with the later representations of the principal Indian deities, an exhibition of the process by which three gods hardly known to the Vedic hymns became the deities of the former Hindu Trimurti. Vol. v, (1870) was on the Vedic mythology. Dr Muir was also the author of a volume of Metrical Translations from the Sanskrit, an anonymous work on Inspiration, several works in Sanskrit, and many essays in the Journal of the Royal Asiatic Society and elsewhere.

MUIR, SIR WILLIAM (1819-1905), Scottish Orientalist, brother of the preceding, was born at Glasgow on the 27 th of April 181 9. He was educated at Kilmarnock Academy, at Glasgow and Edinburgh Universities, and at Haileybury College, and in 1837 entered the Bengal Civil Service. He served as secretary to the governor of the North- West Provinces, and as a member of the Agra revenue board, and during the Mutiny he was in charge of the intelligence department there. In 1865 he was made foreign secretary to the Indian Government. In 1867 he was knighted (K.C.S.I.), and in 1868 he became lieutenant- governor of the North- West Provinces. In 1874 he was appointed financial member of the Council, and retired in 1876, when he became a member of the Council of India in London. He had always taken an interest in educational matters, and it was chiefly through his exertions that the

central college at Allaha- bad, known as Muir's College, was built and endowed. In 1885 he was elected principal of Edinburgh University in succession to Sir Alexander Grant, and held the post till 1903, when he retired. Sir William Muir was a profound Arabic scholar, and made a careful study of the history of the time of Mahomet and the early caliphate. His chief books are a Life of Mahomet and History of Islam to the Era of the Hegira; Annals of the Early Caliphate; The Caliphate, an abridgment and continuation of the Annals, which brings the record down to the fall of the caliphate on the onset of the Mongols; The Koran: its Composition and Teaching; and The Mohammedan Controversy, a reprint of five essays published at intervals between 1885 and 1887. In 1881 he delivered the Rede lecture at Cambridge on The Early Cali- phate and Rise of Islam. He married in 1840 Elizabeth Huntly Wemyss (d. 1897), and had five sons and six daughters; four of his sons served in India, and one of them, Colonel A. N. Muir (d. 1899), was acting resident in Nepal.

MUKADDASI ` [the appellation of Shams ad Din Abu Abdallah Mahommed ibn Ahmad] {fl. 967-985), Arabian traveller, author of a Description of the Lands of Islam which is the most original and among the most important of Arabic geographies of the middle ages. His family name was Al Bashari. His paternal grandfather was an architect who constructed many public works in Palestine, especially at Acre, and his mother's family was opulent. His maternal grandfather, a man of artistic and literary tastes, migrated to Jerusalem from Jurjan province in Persia, near the frontier of Khorasan. His descriptions rest on extensive travels through a long series of years. His first pilgrimage was made at the age of twenty (in a.h. 356 = a.d. 967), but his book was not published till a.h. 375 (a.d. 985-986), when he was forty years old.

The two MSS. (at Berlin and Constantinople) represent a later recension (A.H. 378). The book became known in Europe through the copy brought from India by Sprenger, and was edited by Pro- fessor M.

J. de Goeje as the third part of his Bibliotkeca Geograph- orum Arabicorum (Leiden, 1877). See also the English translation (unfinished) by G. S. A. Ranking and R. F. Azoo, in Bibliotheca, Indica, New Series, Nos. 899, 952, 1001 (Bengal Asiatic Society, 1897–1901); Mukaddasi's Syrian chapter has been separately translated and edited in English by Guy le Strange (London, Pales- tine Pilgrims Text Society, 1886); in German by J.Gildemeister in Zeitschrift des deutschen Palastina-Vereins, vol. vii. (1884).

MUKDEN (Chinese Shtngking), the capital of Manchuria, on the Hun-ho, no m. N.E. of Niuchwang, in 41 51′ N., 123 38′ E., with a population of 250,000. It is a centre for trade and also for missionary enterprise. It was formerly the headquarters of the Manchu dynasty, and their tombs lie within its confines. Mukden is a fine town, with splendid walls, about a mile long each way. The suburbs extend a considerable distance from the city and are surrounded by mud walls. In the centre of the town stands a small palace surrounded by an inner wall and roofed with yellow tiles. The boots and pack of Nurhachu, the founder of the present Chinese dynasty, who was a pedlar, are preserved there. Nurhachu's son, the emperor T'ien-tsung (1627–1636), built temples to heaven and earth in the neighbourhood of the city in imitation of those at Peking. These are much dilapidated. Four or five miles to the east of the town stands the Fu-ling or " happy tomb," where the remains of Nurhachu rest, the outer 1 Al Mukaddasi = " the Jerusalemite."

gates of which are adorned with a green majolica representation of an imperial dragon. The Emperor K'ien lung (1726–1796) wrote a poem on Mukden, which was translated into French by Pere Amiot and attracted the attention of Voltaire. During the Russo-Japanese War in 1905 some of the heaviest fighting took place before Mukden, what is known as the " battle of Mukden " covering operations from the 19th of February till the Japanese occupied Mukden on the 10th of March and the Russians retreated northward on the 12th.

MUKDISHU (Magodoxo), a seaport of Italian Somaliland, East Africa, in 2° 1′ N., 45 24′ E. It is built on the sandy coast which separates the Webi Shebeli fron the sea. The harbour is open. Mukdishu, formerly extensive, is largely in ruins; it consists of two villages, Hamarhwin to the south and Shingani to the north. There are some houses in the Moorish style and a mosque among the ruins bears date 636 a.h. {i.e. a.d. 1238). Between the two settlements is the governor's palace and north of the town is a massive square tower built by the Portuguese in the 16th century. The population, about 5000, is mainly com- posed of descendants of negro slaves known as Abesh. There are also Somali, Arab and Hindu settlers. Mukdishu is mentioned by Marco Polo and described by Ibn Batuta as an " immense " city. This was in the early part of the 14th century. It was a flourishing port and had many fine mosques when captured by the Portuguese (about 15 10). Under Portugal the place fell into decay. It passed in the 17th century into the possession of the imams of Muscat, but in the 18th century became practically independent. It was reconquered by Seyyid Said c. 1830, and on the division of his dominions fell to Zanzibar. In 1892 it was transferred to Italy (see Somaliland, Italian). The name of the town is spelt in a great variety of ways, including Madeigascar, whence the name of the island of Madagascar. Alfred Grandidier points out that the Portuguese, misled by Marco Polo's descrip- tion of Mukdishu as an island, fancied they had discovered the land of which he wrote when they touched at Madagascar.

MULA, a town of eastern Spain, in the province of Murcia; on the left bank of the Mula, a small right-hand tributary of the Segura, periodically liable to destructive floods. Pop. (1900), 12,731. The Sierra Espuna rises on the south to a height of nearly 5200 ft. Mula has a small trade in agricultural produce, wine and olive oil. About 4 m. east are two groups of houses known as the Bafios de Mula, with warm sulphurous springs of considerable local repute.

MULATTO (Span, and Port, mulato, diminutive of mulo, Lat. mulus, a mule, used as denoting a hybrid

origin), a person one of whose parents is of a white race and the other a negro. In Latin America such half-breeds are sometimes called mestizos.

MULBERRY 2 (botanically Morus; nat. ord. Moraceae), a genus of about ten species growing in the temperate regions of the northern hemisphere and in the mountains of the tropics. They are deciduous trees or shrubs with alternate, toothed, often three-lobed leaves and unisexual flowers in catkin-like inflorescences.

The black mulberry {Morus nigra), a native of western Asia, spread westwards in cultivation at an early period; it was cultivated by the Greeks and Romans, and in northern Europe by the 9th and 10th centuries. Up to the 15th century it was extensively grown in Italy for rearing silkworms, but has since been superseded by M. alba. It is now mainly cultivated for its oblong purplish-black compound fruit — the so-called sorosis, formed from the whole female" inflorescence in which the perianth leaves of the single flowers have become fleshy — which is wholesome and palatable if eaten fresh before acetous fermentation has set in. The mulberry succeeds as a standard in the warmer parts of England, especially in sheltered situations, but in the north of England and the less favoured parts of Scotland it requires the assistance of a wall. The standard trees require no other pruning or training than an occasional thinning out of the branches, and are generally planted on lawns, to prevent the fruit being damaged when it

2 Mulberry stands for murberry or morberry, i.e. morus and " berry," cf. Ger. maulbeere, O.H.G. millberi, mArberi.

falls. The tree succeeds best in a rich, deep, and somewhat moist loam, but grows well in any good garden ground. It is usually propagated either by

cuttings or layers, which latter, if made from the older branches of the tree, come sooner into bearing. Cuttings planted in the spring should consist of well-ripened shoots of the preceding year, with a joint of two- year-old wood at their base, or if planted in autumn should have the shoots well matured, and furnished with a heel of two-year-old wood. The branches and even stout limbs are sometimes employed as cuttings instead of the younger shoots, especially when the object is to obtain a bearing tree quickly.

Mulberry {Moms nigra) Shoot bearing Fruit.

1, Catkin of male flowers . 3, Cluster of female flowers.

4, Two female flowers.

2, A male flower.

The branch should be planted deeply in autumn in good soil, and if necessary supported in an upright position by a stake. The most common mode of propagation, however, is by layering the young branches. The mulberry may be grown in pots, and gently forwarded in an orchard house, and under these con- ditions the fruit acquires a richness of flavour unknown in the fruit ripened out of doors. If cultivated in this way it requires abundance of water while the fruit is swelling, and also frequent dressings of artificial fertilizers.

The white mulberry (M. alba), so called from its nearly white fruit, is the one mainly employed in sericulture. It is a native of China and has been cultivated from the earliest times in Asia and since the 12th century in Europe, especially in the Mediterranean region. There are many varieties, among which the Philippine mulberry (var. multicaulis) is perhaps most highly esteemed. The Indian species, M. indica (not to be confounded with Morinda citrijolia, a rubiaceous tree, sometimes also called Indian mulberry), is also cultivated for the same purpose.

M. rubra, the North American red mulberry, is the largest of the genus, often reaching a height of 70 ft. It produces dark red berries much inferior in flavour, however, to those of M. nigra.

Broussonetia papyrifera, a member of a closely allied genus, is the paper mulberry, a native of Burma, China and Polynesia, and widely cultivated in Japan, where the bark is used for paper-making. The Tapa-cloth of the South Sea Islands is also made from it. The plant is a shrub or small tree with large mulberry-like lobed or entire hairy leaves. Several forms are cultivated, differing chiefly in the shape of the leaves.

HULDE, a river of Germany, a left-bank tributary of the Elbe. It is formed by the confluence, just below Kolditz, of the Zwickauer Mulde, which rising in the Vogtland of Saxony passes Zwickau, Glauchau and Rochlitz, and the Freiberger Mulde, which, rising in the Bohemian Erzgebirge, touches

Freiberg, Dobeln and Leisnig. The united river flows north to Grimma and thence past Wurzen, Eilenburg and Bitterfeld to Dessau, where it joins the Elbe. The total length of the united river is 75 m.

MULE (Lat. mulus), a term not unfrequently applied to the produce of any two creatures of different species, and synonymous with hybrid, but in its ordinary acceptation em- ployed to designate the offspring or " cross " between the equine and asinine species. There are two kinds of mule — the Mule proper (Equus asinus, var. y; Mulus; Fr. Mulet or Grand mulet; Ger. Grosser Maulesel), which is the hybrid produce of a male ass with a mare, and the Hinny (Equus asinus, var. 8; Hinnus; Fr. Bardot or Petit mulet; Ger. Kleiner Maulesel), the offspring of the stallion and female ass. The mule is the more valuable of the two, and to its production the attention of breeders is entirely directed.

In its short thick head, long ears, thin limbs, small narrow hoofs, short mane, absence of chestnuts (horny growths) inside the hocks, and tail destitute

of hair at the root the mule is asinine; while in height and body, shape of neck and croup, uniformity of coat, and in teeth it is equine. It has the voice neither of the ass nor of the horse, but emits a feeble hoarse noise. The most common colour of the mule is a brown or bay-brown — bay, or bright bay, or piebald being rare; a chestnut tint is sometimes noticed. It possesses the sobriety, patience, endurance and sure-footedness of the ass, and the vigour, strength and courage of the horse. As a beast of burden it is preferable to the horse, being less impatient under the pressure of heavy weights, while the skin being harder and less sensitive renders it more capable of resisting sun and rain.

The mule has been in use from early times; the inhabitants of Mysia and Paphlagonia are said to have been the first breeders. With the Greeks and Romans, the latter especially, the mule was valued, being employed to draw carriages and carry loads. In modern times it has been largely used for military transport.

The principal mule countries in Europe are the south of France, Spain, Portugal and Italy, where they are used for pack and draught. The French mules are most numerous on the borders of the Pyrenees, in Gascony, and in Poitou. In Spain mules are used in the Catalan provinces, in the mountainous districts of Andalusia, and in the province of Alicante. Good draught-mules are bred in La Mancha and in the districts on the slopes of the Pyrenees, where they are employed to carry loads. But in Spain, Italy, and some other countries they are also extensively used in carriages; in Spain particularly, where large, fine mules are bred for this purpose, a pair of these animals will often cost more than a pair of horses. The mules of Asia Minor, Syria, Cyprus, Egypt and Algeria, as well as those of the district between the Tigris and the Persian frontier and in North China, are good. In the Punjab provinces of British Intlia many excellent mules are bred, breeding being promoted by the government. Good mules are reared in North and South America, the principal districts for breeding them in the United

States being Texas, Missouri, Mississippi* Tennessee, Alabama, Georgia, Arkansas and Kentucky. The Kentucky mules are well shaped and showy, being derived from nearly thoroughbred mares known as Kentucky trotters, while those reared in Missouri are hardy. The Mexican mule, bred by a male ass out of a mustang mare, is also a hardy, strong and useful animal.

France is perhaps the most important mule-raising country in Europe, four centres being more particularly devoted to this kind of industry: Poitou, the mountainous districts of central France, the Pyrenees and Dauphine. The mules of these different parts differ chiefly in height; those of Poitou are large, powerful, and long in the body, and are mainly exported to the departments of Languedoc and Provence, as well as to Spain, Italy and America; those of Dauphine are of medium height, with a short, thick body; while those of the centre and the Pyrenees are lighter and smaller, but more active.

Mule-breeding in Poitou is supposed to date from the time of Philip V. of Spain, when the particular breeds of horses and

asses were imported into that region and Gascony. But there is evidence to show that as early as the 10th century the mules of Poitou were of excellent quality.

MULGRAVE, EARLDOM OF, a title dating from 1626, when Edmund Sheffield, 3rd Baron Sheffield of Butterwicke, was created earl of Mulgrave. He was succeeded by his grandson Edmund, the 2nd earl, who was one of the nine true peers who sat in Oliver Cromwell’s House of Lords. Edmund’s son John, 3rd earl, was created marquess of Normanby in 1694, and duke of Buckingham and Normanby in 1703; but on the death of his son, the 2nd duke, without heirs in

1735, the titles became extinct. The 2nd duke devised the estates of the Sheffield family to his mother Catherine, a natural daughter of James II., who had married as her first husband the 3rd earl of Annesley, by whom she had a daughter Catherine, who married William Phipps and had a son Constantine Phipps. The latter succeeded to the estate of Mulgrave in Yorkshire in 1743 on the death of his grandmother, and in 1767 he was created Baron Mulgrave of New Ross in the peerage of Ireland. His son was created a peer of Great Britain in 1790 with the title of Baron Mulgrave of Mulgrave; and the latter's brother Henry, the next in succes- sion, who was secretary of state for foreign affairs in 1805 and held other high government offices, was created Viscount Normanby and earl of Mulgrave in 181 2. The 2nd earl of this creation, who like his father held several high cabinet offices, was advanced in the peerage at the coronation of Queen Victoria, being created marquess of Normanby in 1838.

MULHAUSEN (Fr. Mulhouse), a town of Germany, in Upper Alsace, on the 111, an affluent of the Rhine, and the Rhine- Rhone canal, about 56 m. S. of Strassburg and 21 m. N.W. of Basel by rail. The old town, surrounded by arms of the 111, has narrow and irregular streets, while to the south, on the canal, lie the handsome villas and promenades of the new town. Most of the older buildings have made Way for factories, so that the town-hall, dating from 1551, is an almost solitary witness to the town's medieval prosperity. The most important interest of Mulhausen centres in the making of cotton goods. This industry was introduced in 1746, and has since prospered in the hands of several wealthy families which are closely connected by intermarriage, and lend each other support. A large pro- portion of the inhabitants of the town and the neighbourhood is engaged in woollen and other textile manufactures, the products of which are exported to all parts of the world. The manufactures of machinery, especially locomotives and railway plant, chemicals, and hardware are also important. A note- worthy feature

is the attention paid by the manufacturers to the well-being of their workpeople. In 1853, Johann Heinrich Dollfus (1800-1887), mayor of the town, founded the ″ artisans′ town ″ {cite ouvriere) to the north-east of the old town, consisting of about 1 200 model dwellings with public bath-, wash- and bake- houses, and library. The houses were let on a system by winch the occupant became the owner after the payment of a certain number of instalments. Of recent years, however, the opera- tives have moved into the suburbs, leaving the model houses of the ″ artisans′ town ″ to small tradesmen. A ″ societe indus- trielle″ for the encouragement of original discovery and invention among the workmen has existed since 1825, and there are various benevolent societies. Mulhausen carries on an active trade in grain, wine, colonial produce and timber, which is facilitated by its river harbour. After the annexation of Alsace to Germany in 1871 the French sympathies of the inhabitants were shown by the extraordinary decrease in their number. The population has since increased, amounting in 1905 to 94,514, of whom about two-thirds are Roman Catholics.

Mentioned as early as 717, Mulhausen was raised to the rank of a free town of the empire in n 98, and received very extensive privileges from Rudolph of Hapsburg in 1273. It suffered considerably in the various wars of the middle ages, but generally managed to maintain its independence. In 1466 it formed an alliance with the Swiss, and this became a permanent union in 1515. By the peace of Westphalia (1648) it was recognized as an independent ally of the Swiss League. In 1797 it sought

incorporation with France from motives of commercial policy, and in 1871 it passed to Germany.

See A. Metzger, La Republique de Mulhouse 717-1708 (Basel, 1884) ; Schall, Das Arbeiterqiiartier von Mulhausen (Berlin, 1877) ; Herkner, Die ober-elsdssische Baumwollindustrie und ihre Arbeiter (Strassburg, 1887) ; and E. Tourmer, Mulhausen im 16. Jahrhundert (Illyach, 1894).

MULHEIM-AM-RHEIN, a town of Germany, in the Prussian Rhine province, on the right bank of the Rhine, 2 m. below Cologne, of which it is practically a suburb, and on the main lines of railway Cologne-Diisseldorf and Cologne-Elberfeld. Pop. (1905), 50,807. There are important manufactures of silk, ribbons, velvet, sailcloth, tobacco, vinegar, yarn and chemicals, in addition to rolling-mills, boiler works, telegraph works, breweries, tanneries and a ship-building yard. Mulheim also carries on a brisk trade by rail and river.

Of ancient foundation, Miilheim received municipal rights in 1322. Its industrial prosperity is in great part due to the influx of Protestants expelled from Cologne at the beginning of the 17th century. In 1784 the town suffered severely from an inundation caused by the rapid breaking-up of the ice on the Upper Rhine.

MULHEIM-AN-DER-RUHR, a town of Germany, in the Prussian Rhine province, on the Ruhr, an affluent of the Rhine, about 7 m. W. from Essen and at the intersection of several railways. Pop. (1905), 93,598. It has a parish church dating from the 12th century. Like most of the towns in this district, Mulheim finds its chief industry in iron-working, and contains numerous blast-furnaces, rolling-mills, foundries and engine- works; it also carries on manufactures of leather, wool, cotton, calico, tobacco, paper, beer, and other miscellaneous goods. An enormous traffic, by river and rail, is carried on in coal, and there is also a considerable trade in timber and colonial produce. In the neighbourhood are important sandstone quarries, glass- works, and a carpet manufactory. Mulheim was formerly included in the duchy of Berg, and became a town in 1508. In 1 81 5 it passed to Prussia.

MULJI, KURSENDAS (1832-1875), Indian journalist and social reformer, was born on the 25th of July 1832, of a family belonging to the Bhatia or trading caste of western India. Being repudiated by his family on account of his views on widow remarriage, he became a vernacular schoolmaster, and started a weekly

paper in Gujarati called The Satya Prakash. In this he attacked the immoralities of the Maharajas or hereditary high priests of the Vallabhacharya sect of Vaishnavism to which the Bhatias belong. In a suit for libel brought against him in the High Court at Bombay in 1862, he won a victory on the main issue. After a visit to England on business in connexion with the cotton trade, which was not successful and brought on him excommunication from his caste, he was appointed in 1874 to administer a native state in Kathiawar during the minority of the chief; and there he died in August 1875.

See History of the Sect of Maharajas or Wallabhacharyas of Western India (1865).

MULL, the largest island of the Inner Hebrides, Argyllshire, Scotland. Pop. (1901), 4334. It is bounded on the W. and S. by the Atlantic, on the N. and N.E. by the Sound of Mull, and on the E. and S.E. by the Firth of Lome. It has an area of about 367 sq. m., its greatest length being 27 m. and its greatest breadth 20 m. The coast is much indented, the principal sea- lochs being Loch Mingary, Loch Cuan, Loch Tua, Loch-na-Keal, Loch Scridain, Loch Buy, Loch Spelve and Loch Don. Among several freshwater lakes Loch Frisa, Loch Ba and Loch Uisg are the chief. The principal mountains are Ben More (3185 ft.), Ben Buy (2354 ft.) and Ben Creach (2289 ft.). In the basaltic cliffs near Carsaig are numerous arches and caverns. The Drevailing rocks are igneous (generally basaltic, gabbro in the mountains in the south-east, granite in the Ross). The valleys are filled up with lava flows and volcanic ashes of Miocene age. At a few places there are gneissose rocks, chalk, sandstone lias and quartz porphyry. Sheep and cattle are raised, and barley, oats and potatoes grown. Owing to the damp climate the island is better suited for grazing than for cultivation.

Granite and freestone are quarried. Ben More deer forest and the excellent fishing and shooting attract many sportsmen. There are several ancient castles, the principal being those of Duart and Aros. Close to the former is a lighthouse erected in memory of William Black, the novelist (d. 1898). About midway between Mull and Lismore is the Lady Rock, visible at low water, on which, in 1523, Lachlan Maclean of Duart exposed his wife, a daughter of the second earl of Argyll, expect- ing that she would be drowned by the flowing tide. She was, however, saved by her clansfolk and her husband was afterwards slain by her brother. Joanna Baillie (1762-1851) made the incident the leading theme of her drama of The Family Legend. Tobermory (" the Well of Mary," so called from a spring of local celebrity) is the only town (pop. 1175)- It is placed on a pretty bay, the houses standing on tree-clad heights. It was founded in 1788 as a station for fishing-boats, and the herring fishery is still of some consequence. It has regular communica- tion by steamer with Stornoway, Oban and Glasgow. Off the north-western shore of Mull, separated by a narrow strait, lies the isle of Ulva, 4! m. long and 2% m. broad, whose inhabitants are mostly engaged in fishing and kelp-gathering. Close to Ulva, and practically one with it at low tide, is the isle of Gometra, about 1 1 m. long and 2 m. broad, the people of which are chiefly occupied with fishing. Little Colonsay lies about 2 m. south of Ulva. Farther west is the small group of the Treshnish Isles.

MULL. (1) A soft plain muslin exported largely from England to India, &c, and used also in some qualities for summer dresses in the home trade. The name is an abbreviation of the Hindu mulmul. (2) A word, derived from the same root as seen in " meal " and " mill," meaning that which is ground or reduced in other ways to powder or small particles. Thus a snuff-box is in Scotland called a " mull," from the early machines in which the tobacco was ground. Large snuff-mulls, which remained stationary on a table, as opposed to the small portable boxes, often

took the form of a ram's head ornamented in silver. Possibly from the ground or grated spices with whicn ale or wine is flavoured when heated, comes the expression " mulled," as applied to such a beverage. The colloquial expression " to make a mull," i.e. to muddle or make a failure of something, also perhaps connected with " to mull," to reduce to powder. (3) The Scots word " mull," meaning a promontory or headland, as the Mull of Galloway, the Mull of Kintyre, represents the Gaelic maol, cf. Icelandic muli in the same sense; this may be the same as muli, snout, cf. Ger. Maul.

MULLAH (Arabic maula, a term which originally expresses the legal bond connecting a former owner with his manumitted slave, both patron and client being called maula, and thus suggests the idea of patronage), in Mahommedan countries, a learned man, a teacher, a doctor of the law, In India the term is applied to the man who reads the Koran, and also to a Mussulman schoolmaster. In countries like Afghanistan the mullahs exert an influence over the populace which sometimes rivals that of the amir himself, and they have been responsible for many disturbances in Kabul. Among the democratic tribes of the north-west frontier of India they almost take the place of a secular chief. In the Indian frontier risings of 1897-98 the " mad mullah " of Swat led the attack upon the Malakand, while the Hadda mullah was largely responsible for the risings amongst the Mohmands, Afridis and Orakzais. The leader of the risings in Somaliland in 1899-1910 was similarly known as the " mad mullah."

MULLER, FERDINAND VON, Baron (1825-1896), German botanist and explorer, was born at Rostock on the 30th of June 1825, and was educated, after the early death of his parents, in Schleswig. He studied the flora of Schleswig and Holstein from 1840 to 1847, when he emigrated to South Australia and travelled through the colony from 1848 to 1852, discovering and describing a large number of plants previously unknown. In 1852 he was appointed government botanist for Victoria, and examined its flora, and especially the Alpine vegetation of Australia, which

graphic naturalist, he joined the expedition sent out under Augustus Gregory by the duke of Newcastle, secretary of state for the colonies. He explored the river Victoria and other portions of North Australia, was one of the four who reached Termination Lake in 1856, and accompanied Gregory's expedi- tion overland to Moreton Bay. From 1857 to 1873 he was director of the Botanical Gardens, Melbourne, and not only introduced many plants into Victoria, but made the excellent qualities of the blue gum tree {Eucalyptus globulus) known all over the world, and succeeded in introducing it into the south of Europe, North and South Africa, California, and the extra- tropical portions of South America. For these services he was decorated by many foreign countries, including France, Spain, Denmark and Portugal; was created K.C.M.G. in 1879, baron of the kingdom of Wurtemberg in 1871, and F.R.S. in 1 86 1. He published eleven volumes of Fragmenta phyto- graphica Australiae (1862-1881), two volumes of the Plants of Victoria (1860-1865), and other books on the Eucalyptus, Myopo- raceae, Acacias, and Salsolaceae, all profusely illustrated. He also co- operated in the production of G. Bentham's Flora Australiensis. He took a leading part in promoting Australian exploration, especially the Burke and Wills expedition, which was the first to cross the continent, and in the various attempts to unravel the mystery which attended the fate of his fellow- countryman Ludwig Leichhardt (1 813-1848). He died at Melbourne on the 9th of October 1896.

MULLER, FRIEDRICH (1749-1825), German poet, dramatist and painter, usually known as Maler (i.e. painter) Muller, was born at Kreuznach on the 13th of January 1749. He studied painting at Zweibnicken, and in 1774-1775 settled in Mannheim, where in 1777 he was appointed court painter. In 1778 he was enabled by a public subscription to visit Italy, which remained his home for the rest of his life. In 1780 he became a Roman Catholic. He was unfavourably influenced by the study of Italian models, and gradually gave up painting and devoted himself to

the study of the history of art; his services as cicerone were especially in demand among German visitors to Rome. Before he left Mannheim he had tried his hand at literature, under the influence of the Sturm und Drang move- ment. A lyric drama, Niobe (1778), attracted little attention; but Fausts Leben dramatisiert (1778) appealed to the turbulent spirit of the time, and Goto und Genoveva (begun in 1776, but not published till 1811) was an excellent imitation of Goethe's Gotz von Berlichingen. He struck out a more independent path in his idylls, notably Die Schafschur. (1775) and Das Nusskernen (181 1), in which, emancipating himself from the artificiality of Gessner, he reproduced scenes — not without a touch of satire — from the German peasant life of his day. He died at Rome on the 23rd of April 1825.

Maler Miiller's Werke appeared in 3 vols. (1811–1825); in 1868 H. Hettner published two volumes of Dichtungen von Maler Muller, which contain most of his writings. Gedichle von Maler Friedrich Muller; eine NacUese zu dessen Werken appeared in 1873, and his Fausts Leben was reprinted by B. Seuffert in 1881. See A. Sauer, " Stiirmer und Dranger," vol. iii. (Kurschner's Deutsche National-literatur, vol. 8i, 1883); and B. Seuffert, Maler Muller (1877).

MULLER, GEORGE (1805–1898), English preacher and philanthropist, was born near Halberstadt, Germany, on the 27th of September 1805, the son of an exciseman. He sub- sequently became a naturalized British subject. Educated in Germany, he resolved in 1826 to devote himself to missionary work, and in 1828 went to London to prepare for an appointment offered him by the Society for promoting Christianity among the Jews. In 1830 however he gave up the idea of missionary work, and became minister of a small congregation at Teign- mouth, Devonshire. He contended that the temporal as well as the spiritual needs of life could be supplied by prayer, and on this principle abolished pew rents and refused to take a fixed salary. After two years at Teignmouth, Muller removed to Bristol, where he

spent the rest of his life. He devoted himself particularly to the care of orphan children. He began by taking a few under his charge, but in course of time their number increased to 2000, settled in five large houses erected for the

purpose at Ashley Down, near Bristol. The money required for the carrying on of this work was voluntarily contributed, mainly as a result of the wide circulation of Miiller's narrative The Lord's Dealings with George Mutter. When he was over seventy he started on a preaching mission, which lasted nearly seventeen years and included Europe, America, India, Australia and China. He died at Bristol on the 10th of March 1898.

See A. T. Pierson, George Mutter of Bristol (1899).

MULLER, JOHANNES PETER (1801–1858), German physiologist and comparative anatomist, was born at Coblenz on the 14th of July 1801. In 1819 he entered Bonn University, where he became privatdocent in 1824, extraordinary professor of physiology in 1826, and ordinary professor in 1830. In 1883 he removed to the university of Berlin, where he filled the chair of anatomy and physiology with great distinction until his death on the 28th of April 1858. Miiller made numerous researches in various departments of physiology, and in particular he extended knowledge as to the mechanism of voice, speech and hearing, and as to the chemical and physical properties of lymph, chyle and blood. The appearance of his Handbuch der Physiologie des Menschen between 1833 and 1840 (translated into English by Dr William Baly, and published in London in 1842) marked the beginning of a new period in the study of physiology. In it, for the first time, the results of human and comparative anatomy, as well as of chemistry and other departments of physical

science, were brought to bear on the investigation of physiological problems. The most important portion of the work was that dealing with nervous action and the mechanism of the senses. Here he stated the principle, not before recognized, that the kind of sensation following stimulation of a sensory nerve does not depend on the mode of stimulation but upon the nature of the sense-organ. Thus light, pressure, or mechanical stimulation acting on the retina and optic nerve invariably produces luminous impressions. This he termed the law of the specific energy of sense substances. In the later part of his life he chiefly devoted himself to comparative anatomy. Fishes and marine invertebrata were his favourite subjects. Miiller numbered such distinguished physiologists as H. von Helmholtz, E. Du Bois Reymond and K. F. W. Ludwig among his pupils.

In addition to his Handbuch der Physiologie, his publications in- clude Zur vergleichenden Physiologie des Gesichtssinns (1826); t/ber die phantastischen Gesichtserscheinungen (1826); Bildungsgeschichte der Genitalien (1830), in which he traced the development of the Miillerian duct; De glandularum secernentium structura (1830); Vergleichende Anatomie der Myxinoiden (1834-1843); Systematische Beschreibung der Plagiostomen (1841) with F. G. J. Henle; System der Asteriden (1842) with F. H. Troschel; and Horae ichthyologicae (1845-1849) with the same. After the death of J. F. Meckel (1781- 1833) he edited the Archiv fur Anatomie und Physiologie.

MULLER, JOHANNES VON (1752-1809), Swiss historian, was born on the 3rd of January 1752 at Neunkirch, near Schaffhausen, where his father was pastor. In 1760 the family removed to Schaffhausen. In his youth his maternal grand- father, Schoop (d. 1757), roused in him an interest in the history of his country. At the age of eight he is said to have written a history of Schaffhausen, and at eleven he knew the names and dates of all the kings of the four great monarchies. His ardour for historical studies was further stimulated by Schlozer, when

Miiller went (1769) to the university of Gottingen, nominally to study theology. In July 1771 he undertook a sketch of Swiss history (no detailed history of Switzerland having so far been written) for a publisher of Halle, but his theological studies and the preparation of a Latin dissertation on the Bettum cimbricum (publ. in 1772) prevented much progress. In April 1772 he passed his theological examination, and soon after became professor of Greek at the Collegium Humanitatis. Early in 1774, on the advice of his friend Charles Victor de Bonstetten, he gave up this post and became tutor in the Tronchin family at Geneva. But in 1775 he resigned this position also, and passed his time with various friends in Geneva and Vaud, engaged in carrying his historical scheme Into effect. Having accumulated much material, he began the actual composition

of his work in the spring of 1776, and the printing in the summer of 1777. But difficulties arose with the censor, and matters came to a standstill. In 1778-1779 Miiller delivered a brilliant set of lectures on general history, which were not published till 1839 under the title of Vierundzwanzig Biicher attgemeiner Geschichte. In 1780 the first volume (extending to 1388) of his Geschichten der Schweizer appeared, nominally at Boston (to avoid the censor), though really at Bern; and it was well received. In 1781 he published at Berlin, in French, his Essais historiques. He was on his way back to Switzerland when the landgrave of Hesse Cassel named him professor of history. He stayed at Cassel till 1783, publishing in 1782 his Reisen der Papste, a book wherein certain leanings towards Romanism are visible. On his return to Geneva (1783) he accepted the post of reader to the brother of his old patron, Tronchin, and occupied himself with remodelling his published work of 1780. In order to im- prove his financial position, he accepted early in 1786 the post of librarian to the elector-archbishop of Mainz, who bestowed many important offices upon him and obtained his elevation to nobility from the emperor in 1791. In

June 1786 he issued vol. i. (reaching to 1412) and two years later vol. ii. (to 1436) of the definitive form of his Swiss history, which was received with great praise. In 1787 he issued an important political tract, Zur Darstellung des Furstenbundes. But in October 1792 Mainz was taken by the French, so that Miiller had to seek for another post. In February 1793 he entered the service of the emperor as an imperial aulic councillor. At Vienna he spent many years, becoming chief librarian of the imperial library in 1800, and in 1795 he issued vol. iii. (to 1443) of his Swiss history. In 1804 he became historiographer, war councillor, and member of the Academy at Berlin. In 1805 vol. iv. (to 1475) appeared. But in 1806 he became strongly inclined towards Napoleon, by whom he was received in audience (Nov. 1806), and from whom he accepted (end of 1807) the office of secretary of state for the kingdom of Westphalia, exchanging this position early in 1808 for the posts of privy councillor and general director of public instruction. At the end of 1808 he published vol. v. (to 1489) of his great work. He died at Cassel on the 29th of May 1809. His Swiss History now possesses a literary value only, but it was an excellent work in every way for the 18th century.

Miiller's works were published under the care of hiE brother at Tubingen, in 27 vols. (1810–1819), and re-issued, in 40 vols., at Stuttgart (1831–1835). The Swiss History was re-issued at Leipzig and Zurich, in 15 vols. (1824–1853), with continuations by Glutz- Blozheim (to 1517), Hottinger (to 1531), Vulliemin (to 1712), and Monnard (to 1815). A French translation of the German edition (as above) appeared, in 18 vols., at Paris and Geneva (1837–1851).

See the biographies by Heeren (1809), Doring (1835) and Monnard (1839); also in G. v. Wyss's Geschichte der Historiographie in der Schweiz (Zurich, 1895), pp. 305–311, and in the Festschrift der Stadt Schaffhausen (Schaffhausen, 1891), pt. v. pp. 83–99. F. Schwarz's pamphlet, /. von Miiller und seine Sckweizergeschichte (B&le, 1884), traces the genesis

of the History. Miiller's letters to Fiisslin (1771-1807) were issued at Zurich (1812), and those to Ch. Bonnet, &c, at Stuttgart (1835). Those addressed to him by various friends were published by Maurer-Constant, in 6 vols. (Schaffhausen, 1839- 1840); and those written to him (1789-1809) by his brother, J. G. Miiller, appeared, under the editorship of E. Haug, at Frauenfeld, in 2 vols. (1891-1892). (W. A. B. C.)

MULLER, JULIUS (1801-1878), German Protestant theologian, was born at Brieg on the 10th of April 1801. He studied at Breslau, Gottingen and Berlin, first law, then theology; and in 1839 became professor ordinarius of theology at Halle (1839). In 1848 he helped to found the Deulsch-evang. Kirchen- lag, and two years later founded and edited (1850-1861), with Neander and K. I. Nitzsch,the Deutsche Zeitschrift fur christliche Wissenschaft und christtiches Leben. He died at Halle on the 27th of September 1878. A disciple of Neander and friend of Richard Rothe, Miiller bitterly opposed the philosophy of Hegel and the criticism of F. C. Baur. His book, Uber den Gegensatz des Protestantismus und des Calholicismus (1833), called forth a reply from Baur, and he was one of those who attacked D. Strauss's Life of Jesus. In 1846 he had been deputed to attend the General Evangelical Synod at Berlin. Here he supported the Consensus-Union, and afterwards defended

himself in the pamphlets Die ersle Generalsynode der evang. Landeskirche Preussens (1847) and Die evangelische Union, ihr Wesen und gottliches Recht (1854). His chief work, however, was Die christliche Lehre der Siinde (2 vols., 1830; 5th ed., 1867; Eng. trans, from 5th ed.), in which he carried scholasticism so far as "to revive the ancient Gnostic theory of the fan of man before all time, a theory which found no favour amongst his theological friends " (Otto Pfleiderer).

Muller's other works include Dogmat. Abhandlungen (1870), and Das christliche Leben (3rd ed., 1847). See M. Kahler, Julius Muller (1878); L. Schultze, Julius Muller (1879) and Julius Muller als Ethiker (1895).

MULLER, KARL OTFRIED (1797–1840), German scholar, was born at Brieg in Silesia on the 28th of August 1797. He was educated partly in Breslau, partly in Berlin, where his enthusiasm for the study of Greek literature, art and history was fostered by the influence of Bockh. In 181 7, after the publication of his first work, Aegineticorum liber, he received an appointment at the Magdaleneum in Breslau, and in 1819 he was made adjunct professor of ancient literature in the university of Gottingen, his subject being the archaeology and history of ancient art. His aim was to form a vivid conception of Greek life as a whole; and his books and lectures marked an epoch in the development of Hellenic studies. M tiller's position at Gottingen being rendered unpleasant by the political troubles which followed the accession of Ernest Augustus (duke of Cumber- land) to the throne of Hanover in 1837, he applied for permission to travel; and in 1839 he left Germany. In April of the following year he reached Greece, having spent the winter in Italy. He investigated the remains of ancient Athens, visited many places of interest in Peloponnesus, and finally went to Delphi, where he began excavations. He was attacked by intermittent fever, of which he died at Athens on the 1st of August 1840.

Among his historical works the foremost place belongs to his Geschichten hellenischer Stdmme und Stddte: Orchomenos und die Minyer (1820), and Die Dorier (1824; Eng. trans, by H. Tufnell and Cornewall Lewis, 1830, including the essay Uber die Make- donier, on the settlements, origin and early history of the Macedonians). He introduced a new standard of accuracy in the cartography of ancient Greece. In 1828 he published Die Etrusker, a treatise on Etruscan antiquities. His Prolegomena zu einer wissenschaftlichen Mythologie (1825; Eng. trans., J. Leitch, 1844), in which he avoided the

extreme views of G. F. Creuzer and C. A. Lobeck, prepared the way for the scientific investigation of myths; while the study of ancient art was promoted by his Handbuch der Archdologie der Kunst (1830; Eng. trans., J. Leitch, 1847), and Denkmaler der alien Kunst (1832), which he wrote in association with C Osterley. In 1840 appeared in England his History of thz Literature of Ancient Greece; the original German work from which ^ had been translated being issued in Germany in 1841 (4th ed. by E. Heitz, 1882). Chapters i.-xxii. were translated by Sir George Cornewall Lewis; chapters xxiii.xxxvi. by J. W. Donaldson, who carried the work down to the taking of Constan tinople by the Turks. It is still one of the best books on the subject. Muller also published an admirable translation of the Eumenides of Aeschylus with introductory essays (1833), and new editions of Varro (1833) and Festu: (1839).

See memoir of his life by his brother Eduard, prefixed to the post- humous edition of K. O. Muller's Kleine deutsche Schriften (1847); F. Liicke, Erinnerungen an K. 0. Muller (Gottingen, 1841); F. Ranke, K. 0. Muller, ein Lebensbild (Berlin, 1870); C. Bursian, Geschichte der klassischen Philologie in Deutschland (1883), ii. 1007- 1028; C. Dilthey, Otfried Muller (Gottingen, 1898); E. Curtius, Altertum und Gegenwart; and J. W. Donaldson's essay On the Life and Writings of Karl Otfried Muller in vol. i. of the English transla- tion of the history of Greek literature. A biography composed from his letters was published by O. and E. Kern, K. O. Muller, Lebensbild in Briefen an seine Eltern (1908); see also J. E. Sandys, Hist, of Classical Scholarship, iii. (1908), 213-216.

MULLER, LUCIAN (1836-1898), German scholar, was born at Merseburg in Prussian Saxony on the 17th of March 1836. Having studied at Berlin and Halle, he resided for five years in Holland, where he collected the materials for his Geschichte

der klassischen Philologie in den Niederlanden (1869). Unablt to obtain a university appointment in

Germany, he accepted (1870) the professorship of Latin at the Imperial Historico- Philological Institute in St Petersburg. There he died on the 24th of April 1898. Muller was a disciple of the methods of Bentley and Lachmann. His De re metrica poetarum latinorum (1861; 2nd ed., 1894) represents a landmark in the investigation of the metrical system of the Roman poets (the dramatists excepted), and his Metrik der Griechen und Romer (2nd ed., 1885) is an excellent treatise in a small compass (Eng. trans, by S. B. Platner, Boston, Mass., 1892).

His other chief publications were: C. Lucili saturarum reliquiae (1872), including the fragments of Accius and Sueius; Leben und Werke des Gaius Lucilius (1876; suppt. Luciliana, 1884); text of Horace (1869; 3rd ed., 1897) ; Quintus Horatius Flaccus, eine litterar- historische Biographic (1880) ; Quintus Ennius (1884), an introduction to the study of Roman poetry; Q. Enni carminum reliquiae (1884); Livi Andronici et Cn. Naevi fabularum reliquiae (1885); Der saturn- ische Vers und seine Denkmaler (1885); Noni Marcelli compendiosa doctrina (1888); De Pacuvii fabulis (1889); De Accii fabulis dis- putatio (1890).

MULLER, WILHELM (1794-1827), German lyric poet, was born at Dessau on the 7th of October 1794, the son of a shoe- maker. He was educated at the gymnasium of his native town and at the university of Berlin, where he devoted himself to philological and historical studies. In 1813-1814 he took part, as a volunteer, in the national rising against Napoleon. In 181 7 he visited Italy, and in 1820 published his impressions in Rom, Romer und Rbmerinnen. In 1818 he was appointed teacher of classics in the Dessau school, and in 1820 librarian to the ducal library. He died at Dessau on the 30th of September 1827. Muller's earliest lyrics are contained in a volume of poems, Bundesbluten, by several friends, which was published in 1816. His literary reputation was made by the Gedichte aus den hinterlassenen Papieren eines reisenden Waldhornisten (2vols.,i82i- i&24),a.ndtheLiederderGriechen(i&2i-i&24). The latter collection was Germany's chief tribute of

sympathy to the Greeks in their struggle against the Turkish yoke, a theme which inspired many poets of the time. Two volumes of Neugriechische Volkslieder, and Lyrische Reisen und epigrammatische Spazier-gange, followed in 1825 and 1827. Muller also wrote a book on the Homerische Vorschule (1824; 2nd. ed., 1836), translated Marlowe's Faustus, and edited a Bibliothek der Dichtungen des 17. Jahrhunderts { 182 2-1827; 10 vols.). His poetic genius was kindred to that of the composer Schubert, who set many of his lyrics to music.

Wilhelm Muller's Gedichte were first collected in 1837 (4th ed., 1858); edited by his son, F. Max Muller (1868); there are also numerous more recent editions, notably one in Reclam's Universal-biblioChek (1894); critical edition by J. T. Hatfield (1906). Muller's Vermischte Schriften were edited with a biography by G. Schwab (3 vols., 1830). See F. Max Muller's article in the Allgemeine deu>.-che Biographie; O. Franck, " Zur Biographie des Dichters W. Muller" (Mitteilungen des Vereins fiir anhaltische Geschichte, 1887); J. T. Hatfield, " W. Miillers unveroffentlichtes Tagebuch und seine ungedruckten Briefe " (Deutsche Rundschau, 1902).

MULLER, WILLIAM JAMES (1812-1845), English landscape and figure painter, was born at Bristol on the 28th of June 1812, his father, a Prussian, being curator of the museum. He first studied painting under J. B. Pyne. His early subjects deal mainly with the scenery of Gloucestershire and Wales, and he learned much from his study of Claude, Ruysdael, and earlier landscape-painters. In 1833 he figured for the first time in the Royal Academy with his " Destruction of Old London Bridge — Morning," and next year he made a tour through France, Switzerland and Italy. Four years later he visited Athens, extending his travels to Egypt, and in the sketches executed during this period and the paintings produced from them his power and individuality are apparent. Shortly after his return he left Bristol and settled in London, where he exhibited regularly. In 1840 he again visited France, where he executed a series of sketches of Renaissance architecture, twenty-five of

which were lithographed and published in 1841, in a folio entitled The Age of Francis I. of France. In 1843 he accom- panied, at his own request and his own charges, the government

expedition to Lycia, where he made a number of masterly sketches. He died at Bristol on the 8th of September 1845.

The print room of the British Museum possesses, through the bequest of Mr John Henderson, a rich collection of Muller's sketches. A biography by N. Neal Solly was published in 1875.

MULLET, the name of two different kinds of fishes, distin- guished as red mullets and grey mullets.

Red mullets (genus Mullus, the name given by the ancient Romans) are marine fishes, with two short dorsal fins remote from each other: the first is composed of feeble spines, the second of branched rays; the anal fin is similar to the second dorsal. The body is covered with large thin scales. The form of the head is peculiar; its anterior profile slopes downwards to the small mouth, which has very small and feeble teeth, and from which two cylindrical barbels are suspended. These organs of touch are generally laid backwards and hidden in a groove between the branches of the lower jaw, but can be erected and called into action independently. About forty different species of red mullets are known, chiefly from the tropical and sub- tropical parts of the Indo-Pacific ocean. In European waters two forms are known which have received different specific names, Mullus surmuletus and Mullus barbatus. The former in addition to the general red colour has three to five bright yellow bands along the sides from head to tail; these are absent in the other form. It has been proved that this is not a sexual difference, the two forms are varieties or species. The striped form is usually found on the coasts of

England, where the plain form is rare or absent. In the Mediterranean both kinds occur, but it is probable that the striped form, which is larger, is more common in the Atlantic and the plain form in Mediterranean and southern waters.

Red mullets do not attain any considerable size, the largest of the tropical species weighing only two or three pounds. They are ground-feeders, evidently using their barbels in dis- covering their food, which consists of Crustacea, worms, and, in the larger species, of small fishes; that they feed on putrid flesh is not borne out by the evidence drawn from their feeble jaws and dentition, but it is probable that they are attracted to a decomposing body by the presence of the small crustaceans which feast upon it. Although the colours of these fishes are brilliant, they are simple and evanescent; only a few of the tropical species exhibit ornamentations in the form of black spots or bands. In many, as also in the European species, red colour prevails, and its preservation after death is considered to enhance the fitness of the fish for the table, and consequently its market value. To produce the intensity of this red colour, fishermen scale the red mullet immediately before its death, a process by which the red pigment cells or chromatophores are excited to ex- pand; fishes which are allowed to die in the water show little red, and therefore red mullets caught by the trawl are less valuable than those obtained in a trammel-net, by which the majority are secured alive. All the species are esteemed as food; but none equals the European species, which was held in exaggerated esteem by the gourmands of Rome. They exhibited the living fish and allowed them to die at the table immediately before they were consigned to the cook; they kept them in large reservoirs until they were wanted, and paid fabulous prices for fishes somewhat above the average size. Little is known about the habits of red mullets; during winter they retire into deep water, late in spring and during summer they approach the coasts and enter even brackish water, but the state of their sexual organs shows that they

do not come towards the shore to breed. At Naples they spawn from May to August, and their ova are buoyant and transparent. In June, July and August the young are about an inch long, and already furnished with the two barbels.

The grey mullets form a widely different and distinct family, Mugilidae. They are not exclusively marine, but enter brackish water, live always close to the shore, and some of the tropical forms inhabit the pure fresh water of streams and rivulets, without, however, penetrating far inland. Their body is elegantly formed, wedge-shaped, and covered with scales of

moderate size, firmly adherent to the skin. The two short dorsal fins are remote from each other, and the anterior is composed of four stiff spines. The anal fin is similar to the second dorsal; the caudal fin strong and bilobed. The form of the snout is peculiar; the mouth narrow, transverse in the true Mdgil, and without, or with but feeble, teeth. About seventy different species are known, from almost every coast of the temperate and tropical zones; they swim in small schools and are abundant wherever they occur. Two species are found on the British coasts — Mugil capito and Mugil chelo, the first being the more common. Some of the fresh-water grey mullets of the tropics, especially those of the West Indian and Indo-Pacific islands, have the mouth more lateral or have distinct though minute teeth; they therefore have been formed into separate genera, Agonostoma and Myxus.

Grey mullets, at least some of the species, grow to a weight of 10 or 12 lb; but the fish which usually come into the market rarely exceed half that weight. Those in which distinct teeth are developed feed principally on small aquatic animals, whilst the diet of those without teeth consists of animalcules or minute organic substances mixed with the mud or sand which they swallow in large quantities; also confervoid growths to which small shells adhere are freely taken. To prevent the gills from being clogged by sand or mud, a peculiar apparatus

separates these organs from the pharynx. Each branchial arch is provided on each side, in its whole length, with a series of closely-set gill-rakers, each series fitting into the series of the adjoining arch; they constitute together a sieve permitting the passage of the water, while retaining other substances in the cavity destined for mastication. The structure of the intestinal tract is also adapted to the diet of these fishes. One portion of the stomach is globular and surrounded by a thick mass of muscles, the cavity being small and coated with a tough epithelium. . This structure reminds us of the stomach of birds, in which it also serves for the trituration of hard sub- stances. The intestine itself is six or seven times as long as the fish. Grey mullets are plainly coloured, generally greenish on the upper parts and more or less silvery on the side. They are wholesome food, well flavoured when taken out of clean water. In the fish-farms of western Italy grey mullets are among the principal fish cultivated. (J. T. C.)

MULLIGATAWNY, the name, derived from the Tamil milagu-tannir {i.e. pepper water), given to a favourite hot East Indian soup, made with curry-powder and otherwise highly seasoned, and served usually with rice.

MULLINGAR, a market-town, and the county town of county Westmeath, Ireland, near the river Brosna and on the Royal canal, 50 m. W. by N. of Dublin. Pop. (1901), 4500. It is a junction on the Midland Great Western railway where the branch for Longford, Sligo and Cavan leaves the main line. The principal churches are the parish church (1813) with tower and spire, and the Roman Catholic cathedral for the diocese of Meath. Tanning, brewing, and the manufacture of coarse woollens are carried on, and the town is the centre for the agri- cultural trade of the district. Mullingar was one of the ancient palatinate towns, but its present appearance is modern. It possessed an Augustine convent founded in 1227, and a Dominican convent founded in 1239, but both were dissolved by Elizabeth. The town was the headquarters of William III. before the siege of

Athlone. It formerly returned two members to parliament, but was disfranchised at the Union in 1800. Mullingar is a centre for the trout-fishing in the Westmeath loughs, being in proximity to Loughs Ennell and Owel.

MULLION (corrupted from ” munnion ” ; this is derived from Fr. moignon, stump), in architecture, the English term for the perpendicular pieces of stone, sometimes like columns, some- times like slender piers, which divide the bays or lights of windows or screen work from each other; equivalents are Fr. meneau, Ital. regolo, ■ Ger. Fensterpfoste. H. Wedgwood (Diet, of Eng. Etym.) points out that the mullion is ” the stump of the division before it breaks out into the tracery of the window.” In all styles, in less important work, the mullions are often

simply plain chamfered, and more commonly have a flat hollow on each side. In larger buildings there is often a bead or bowtel on the edge, and often a single small column with a capital; these are more frequent in foreign work than in English. Instead of the bowtel they often finish with a sort of double ogee. As tracery grew richer, the windows were divided by a larger order of mullion, between which came a lesser or subordinate set of mullions, which ran into each other.

MULLNER, AMANDUS GOTTFRIED ADOLF (1774–1829), German dramatic poet, nephew of Gottfried August Biirger, (g.v.), was born at Langendorf near Weissenfels on the 18th of October 1774. After studying law at Leipzig he established himself as advocate at Weissenfels and made his debut as an author with the novel Incest, oder der Schutzgeist von Avignon (1799). He next wrote a few comedies for an amateur theatre in Weissenfels; these were followed by more pretentious pieces: Der angolische Kater (1809) and Der Blitz (1814, publ. 1818), after French models.

With his tragedies, however, Der neun- und-zwanzigste Februar (181 2), and especially Die Schuld (18 13; publ. 1816), Milliner became the representative of the so-called Schicksalsdramatiker, and for several years ″ fate-tragedies ″ on the model of Die Schuld dominated the German stage. His later plays, Konig Yngurd (1817) and Die Albaneserin (1820), were less important. Notwithstanding his literary success, Milliner did not neglect his profession, and was given the title of Hofrat; he also edited various journals, and had a reputation as a vigorous if somewhat acrimonious critic. He died at Weissenfels on the nth of June 1829.

Milliner's Vermischte Schriften appeared in 2 vols. (1824-1826) ; his Dramatische Werke in 8 vols. (1828 ; 2nd ed., 1832). In 1830 four supplementary volumes were published containing mainly criticism. See F. K. J. Schiitz, Milliners Leben, Charakter und Geist (1830J; J. Minor, Die Schicksalsiragodie in ihren Hauptverlretern (1883), and the same author's volume, ″ Das Schicksalsdrama ″ (1884), in Kurschner's Deutsche Nationalliteratur, vol. 151.

MULOCK, SIR WILLIAM (1843-), Canadian statesman and jurist, was born at Bond Head, Ontario, on the 19th of January 1843, the son of T. H. Mulock, M.D. From 1882 to 1905 he was a prominent member of the Liberal party in the Federal house; postmaster-general from 1896 to 1905, and minister of labour from 1900 to 1905. He introduced many improvements into the Canadian postal service, and in 1898 in face of much opposition induced the Inter-Imperial Postal Conference to adopt the principle of penny postage within the British Empire. In 1905 he resigned office, and was appointed chief justice of the exchequer division of the High Court of the province of Ontario. From 1881 to 1900 he was vice-chancellor of the university of Toronto, and was largely responsible for the success of the movement leading to the federation between that body and the Victoria University (Methodist).

MULREADY, WILLIAM (1786-1863), English subject

painter, was born at Ennis, Co. Clare, on the 30th of April 1786. When he was about five years old his father, a leather-breeches maker by trade, removed to London, where the son received a tolerable education, chiefly under Catholic priests. He was fond of reading, and fonder still of drawing. 1 When eleven years old Mulready was employed by an artist named Graham as the model for a figure in his picture of " Solomon Blessed by his Father David." The painter's interest in the lad did much to confirm his artistic proclivities; and, having studied at home for two years, Mulready applied for advice to Banks the sculptor, who sent him to a drawing school and permitted him to work in his own studio. In 1800 he was admitted a student of the Academy, and two years later he gained the silver palette of the Society of Arts. About this time he was associated with John Varley, the eccentric water-colour painter and drawing-master, whom he assisted in the tuition of his pupils, who included Cox, Fielding, Linnell, William Hunt, and

_ 1 Some reproductions of his early attempts in this direction are given, along with details of his life, in a scarce volume for the young, entitled The Looking-Glass, written by William Godwin under the nom de plume of Theophilus Marcliffe, and published in 1805.

Turner of Oxford. At eighteen he married a sister of Varley's, and at twenty-four he was the father of four sons. The marriage was unhappy, and the pair separated before many years. He " tried his hand at everything," as he said, " from a miniature to a panorama." He painted portraits, taught drawing, and up till 1809 designed illustrations to a series of children's penny books. His first pictures were classical and religious subjects of no great merit, and the early works which he sent to the Academy were mainly landscapes; but he soon discovered his special aptitude for genre-painting, and in 1809 produced the "Carpenter's Shop," and in 181 1 the "Barber's Shop," pictures influenced by the example of Wilkie and the Dutch painters. In 1813 he exhibited his " Punch," a more original and sponta-

neous work, which brought the artist into notice, and two years later his ″ Idle Boys ″ procured his election as associate. Next year he received full academic honours, and the election was justified by the ″ Fight Interrupted ″ which he then exhibited. It was followed by the ″ Wolf and the Lamb ″ (1820), the ″ Convalescent ″ (1822), ″ Interior of an English Cottage″ (1828), ″ Dogs of Two Minds ″ (1830), the ″ Seven Ages ″ (1838), and in 1839 and 1840 by the ″ Sonnet and First Love,″ two of the most perfect and poetical of the artist's works. In 1840 he designed an allegorically covered postal envelope (the ″ Mulready envelope,″ soon discontinued 2) for Rowland Hill, and a set of illustrations to The Vicar of Wakefield, which were succeeded by his paintings of the ″ Whistonian Controversy ″ (1844), ″ Choosing the Wedding Gown ″ (1846), and ″ Sophia and Burchell Haymaking ″ (1849). His later works, like the ″ Bathers ″ (1849), ″ Mother teaching her Children ″ (1859), and the ″ Toy Seller ″ (1862), show declining powers, mainly attributable to failing health. The last evening of his life was spent at a meeting of the Academy, of which, for nearly fifty years, he had been a most active and efficient member. He died of heart disease on the 7th of July 1863.

MULTAN, or Mooltan, a city, district and division of British India, in the Punjab. The city is 4 m. from the left bank of the Chenab, near the ancient confluence of the Ravi with that river. It has a station on the North-Western railway. Pop. (1901), 87,394. The city is enclosed on three sides by a wall, but open towards the south, where the dry bed of the old Ravi intervenes between the houses and citadel. Large and irregular suburbs have grown up outside the wall since the annexation in 1849. Within the city Droper, narrow and tortuous streets, often ending in cuts de sac, fill almost the whole space; but one broad bazaar runs from end to end. The principal buildings include the shrines of two Mahommedan saints and the remains of an ancient Hindu temple. The cantonments form the head-quarters of a brigade in the 3rd division of the

northern army. Multan has manufactures of carpets, silk and cotton goods, shoes, glazed pottery and enamel work, and an annual horse fair. It is moreover one of the most important trade-centres in the Punjab. It is a station of the Church Missionary Society.

The District .or Multan occupies the lower angle of the Bari Doab, or tract between the Sutlej and the Chenab, with an extension across the Ravi. Area, 6107 sq. m. The population in 1901 was 710,626, showing an increase of 11-7% in the pre- ceding decade, due to the extension of irrigation. The principal crops are wheat, millets, pulse, oiLseeds, cotton and indigo. There are factories for ginning and pressing cotton. Indigo is made only by native processes. Irrigation is largely con- ducted by inundation channels from the boundary rivers, but the centre of the district is barren. The district is traversed by the main line of the North-Western railway from Lahore,

2 " Considerable diversion was created in the city to-day [May 1, 1840] by the appearance of the new penny-post devices for envelopes, half-sheet letters, and bits of sticking-plaster for dabbing on to letters. . . . [The elephants on the Mulready cover] are symbolic of the lightness and rapidity with which Mr Rowland Hill's penny-post is to be carried on. . . . Withal the citizens are rude enough to believe that these graphic embellishments will not go down at the price of is. 3d. per dozen for the envelopes, ... and of is. id. per dozen for the . . sticking-plaster." This banter is from the money article of an eminent daily paper.

which crosses the Sutlej by the Empress Bridge opposite Baha- walpur. It is also entered by the branch from Lyallpur to Khanewal junction, crossing the Ravi.

The early Arab geographers mention Multan as forming part of the kingdom of Sind, which was conquered for the caliphate by Mahommed bin Kasim in the middle of the 8th century. On the dismemberment of the Mogul Empire in the middle of the 18th century, Multan fell to the Afghans, who held it with difficulty against the Sikhs. At length, in 1818, Ranjit Singh after a long siege carried the capital by storm; and in 182 1 he made over the administration of Multan with five neighbouring districts to Sawan Mai, who raised the province to a state of prosperity by excavating canals and inducing new inhabitants to settle. After the establishment of the council of regency of Lahore, difficulties arose between Mulraj, son and successor of Sawan Mai, and the British officials, which led to his rebellion, and culminated in the second war and the annexation of the whole of the Punjab. The city of Multan, after a stubborn defence, was carried by storm in January 1849. The district at once passed under direct British rule, and order was not disturbed even during the Mutiny. .

The Division of Multan is the south-western division of the Punjab. It was abolished in 1884, but reconstituted in 1001. Its area is 29,516 sq. m. and its population in 1901 was 3,014,675. It includes the six districts of Mianwali, Jhang, Lyallpur, Multan, Muzaffargarh, and Dera Ghazi Khan.

MULTIPLEPOINDING, in Scots law, the technical term for a form of action by which conflicting claims to the same fund or property are determined. The action is brought either by the holder or by a claimant in his name. All who have any claims in the fund or property in question are ordered to appear and give in their claims; the court then prefers them according to their respective rights, and the holder of the fund or pro- perty in dispute on payment or delivery is absolved from any further claim in regard to it. It corresponds to the process of inter-pleader in English law.

MULTITUBERCULATA, a group of extinct mammals, mostly of small size, whose remains are met with in strata

ranging from the Trias to the Eocene, both in Europe and in North America. They are mostly known by their lower jaws, and take their name from the fact that the grinding teeth (fig. 2, m. 1 and 2; and fig. 3 a. b. c.) bear two or three longitudinal rows of tubercles, or are provided with tubercles round the edges. From this feature these otherwise unknown animals are believed to be related to the existing egg-laying mammals (duck-billed platypus and spiny ant-eater) , constituting the order Monotremata, and are therefore provisionally placed near that group. The largest representative of the Multituberculata is Polymastodon from the Lower Eocene of New Mexico; the same beds also yield the smaller Ptilodus; while from corre- sponding strata at Rheims, in France, has been obtained the nearly allied Neoplagiaulax. The latter takes its name from its resemblance to Plagia-ulax (figs. 1 and 2) from the Purbeck

Fig. 1. — Lower Jaw of Plagiaulax becclesi, from the Purbeck Strata of Swanage. ”

strata of Swanage, Dorsetshire, which was one of the first- known members of the group. These have cutting teeth in front and multituberculate molars behind. Allodon and Ctena- codon represent the group in the Cretaceous of North America; and the English Purbeck genus Bolodon, in which all the cheek- teeth are multituberculate, also belongs here. Stereognathus (fig. 3) is another English Upper Oolitic type. Single teeth from the Rhaetic of England and Wiirttemberg described as Microlestes apparently indicate the earliest member of the group. A skull

from the Upper Triassic Karoo beds of South Africa described as Tritylodon longaevus, which has multituberculate molar teeth, was also at first placed in this group, but has been subsequently regarded as a reptile, although Dr R. Broom considers that the

Fig. 2. — Lower Jaw of Plagiaulax Fig. 3. — Fragment

of Jaw of minor, from Swanage. p. 1–4 Stereognathus oolithicus in premolars ; m. 1 and 2 molars. matrix. a b c, molars.

original determination is correct. Possibly a fore-limb from the same formation described as Theriodesmus phylarchus indicates a similar or allied animal. Not improbably Tritylodon indicates a direct link between the multituberculate mammals and the anomodont reptiles of the Permian and Trias. (R. L.*)

MUMMERS, bands of men and women in medieval and later England and elsewhere, who, during periods of public festivity, particularly at Christmas, dressed in fantastic clothes and wearing masks or disguised as animals, serenaded the people outside their houses or joined in the revels within. In a more restricted sense the term is applied to the actors in the old English rural folk plays of St George, &c. ; and ″ mumming ″ thus becomes a contemptuous synonym for any form of stage playing. The origin of the word mummer (older spelling′ ″ mommer,″ Fr. momeur) is not satisfactorily explained; but the verb ″ to mum″ means both to mutter and to be silent, and ″ mummer ″ apparently comes from one or both of these senses. Mumming seems to have been a survival of the Roman custom of masquerading during the annual orgies of the Satur- nalia. ″ The disguisyng and mummyng that is used in Christe- mase tyme,″ Langley writes in his synopsis of Polydore Virgil, ″ in the Northe partes came out of the feasts of Pallas, that were done with visars and painted visages, named Quinqatria of the Romaynes.″ Aubanus, writing of mumming in Germany, says that ″ in the Saturnalia there were frequent and luxurious feast- ings amongst friends, presents were mutually sent, and changes of dress made: that Christians have adopted the same customs, which continue to be used from the Nativity to the Epiphany: that exchanges of dress too, as of old among the Romans, are common, and neighbours by mutual invitation visit each other in the manner which the Germans call mummery.″ Christmas was the grand season for mumming in England. Some were disguised as bears,

others as unicorns, or wore deer's hide and antler's or ram's horns. Mumming led to such outrages that Henry VIII. issued a proclamation declaring the wearing of a mask or disguise a misdemeanour. Stow gives an account of an elaborate mummery held in 1377 by the London citizens to amuse the son of the Black Prince, then living at Kennington (Survey, 1603, p. 97). In Scotland, where mumming still exists at Christmas, Hogmanay, New Year's Day and Handsel Monday, mummers are called " guisards." They usually present on these four nights a rude drama called Gaialian, which, in various versions, is common throughout the Lowlands of Scotland (see Chambers's Popular Rhymes, p. 170).

MUMMIUS, LUCIUS (2nd century B.C.), surnamed Achai'cus, Roman statesman and general. Consul in 146 B.C. Mummius was appointed to take command of the Achaean War, and having obtained an easy victory over the incapable Diaeus, entered Corinth unopposed. All the men, women, and children were put to the sword, the statues, paintings and works of art were seized and shipped to Rome, and then the place was reduced to ashes. The apparently needless cruelty of Mummius in Corinth, by no means characteristic of him, is explained by Mommsen as due to the instructions of the senate, prompted by the mercantile party, which was eager to get rid of a dangerous commercial rival. According to Polybius, his inability to resist the pressure

of those around him was responsible for it. In the subsequent settlement of affairs, Mummius exhibited considerable adminis- trative powers and a high degree of justice and integrity, which gained him the respect of the inhabitants. He specially abstained from offending their religious susceptibilities. On his return to Rome he was honoured with a triumph. In 142 he was censor with the younger Scipio Af ricanus, whose severity frequently brought him into collision with his more

lenient colleague. Mummius was the first novus homo of plebeian origin who received a distinctive cognomen for military services. His indifference to works of art and ignorance of their value is shown by his well-known remark to those who contracted for the shipment of the treasures of Corinth to Rome, that "if they lost or damaged them, they would have to replace them." For the theatrical pageants exhibited by him he erected a theatre with improved acoustical conditions and seats after the Greek model, thus marking a distinct advance in the construction of places of entertainment.

His brother, Spurius Mummius, a man of greater refinement and intellectual powers, accompanied Lucius as his legate to Achaea, whence he sent letters to his friends at Rome, describing his experiences in humorous verse. These letters, which were still popular a hundred years later, were the first example of a distinct class of Roman poetry — the poetic epistle. Both he and his brother are alluded to by Cicero as mediocre orators, whose style was simple and old-fashioned, although Lucius, as a Stoic, was more concise.

MUMMY (from the Persian mumiai, pitch or asphalt), a dead body, as preserved by the ancient Egyptian method of embalm- ing. The preservative climate of Upper Egypt and the belief of the Egyptians in life after death must be the causes which led them to take unusual care for preserving the bodies of their dead. In prehistoric times in Egypt the dead were laid in the graves on mats in the crouching position common in the burials of primitive peoples, and were supplied with jars of food, flint instruments, &c. Perhaps the attempt was already made to preserve the bodies by drying or otherwise. In a few instances, such bodies, probably more than five thousand years old, have been found with skin and hair well preserved though dried and shrunken; usually everything but the bones has decayed. With the advent of the Dynasties the bodies of some of the principal people are found lying extended at full length. By the time of the Vlth Dynasty it was usual to lay the corpse on its left side in the attitude

of sleep, and a wooden coffin was often provided upon which were inscribed magic formulae that had already been employed for ages in ritual. In the Middle Kingdom necropolis of Beni Hasan, Garstang found many intact inter- ments in coffins, and in one case the body was well preserved. Several were accompanied by boxes divided into four compart- ments and inscribed with the names of the four deities who represented the internal organs of the body. This indicates that the custom of taking out these organs and wrapping them separately was already in vogue in the most lavish form of burial. But the parcels, examined by an expert, contained no trace of organic remains, proving how much the Egyptians depended on magic imitations and make- believe. It was not until the New Kingdom that the processes of embalming reached a high degree of elaboration. Later still, in the last millennium B.C., it seems that even the bodies of the poor were pickled. The embalmers were accustomed to keep the corpse in all for seventy days before burial (cf. Gen. 1. 3; Herod, ii. 86), to be soaked, wrapped in linen bandages, and put in the coffin. This is confirmed by the monuments as far back as the age of Rameses II. (c. 1300 i.e.) and may be conjectured to have been established still earlier.

The Egyptians did not stop at the mummification of the human body; sacred animals,, birds, reptiles, fishes, and even insects were treated in a similar way, and the meat offerings deposited with the wealthy dead were likewise "preserved." Vast cemeteries of animals which belonged to the revered species have been discovered; more especially may be mentioned that of the cats at Bubastis, the remains of which, charred by some

great fire, until recently filled numberless chambers of crude brick in the ruins at Zagazig. In the hawk cemeteries birds were pickled and buried in long bundles, forming sometimes an assortment that is not without incongruitie's from the naturalist's point of view. From a few of these bundles may be extracted not only numbers of raptorial birds, large and small, including owls, but also the hawk-like

cuckoo, the shrike, and even the swallow. The larger animals were represented in mummies by the head and a selection of the bones. Bones of bulls and male calves, especially crania, were collected and formed into huge ox-like mummies.

What the Egyptians really thought of mummification can only be partially guessed. Custom, changing in some degree from century to century, governed their practice, and no doubt was regulated by the priests. At first the luxury of mummifi- cation was reserved for the king, who was identified with Osiris and was buried with an abundance of ritual and magic words. But the king required his courtiers, and his courtiers in turn needed their servants in permanent attendance. Partly in consequence of this, the deification of the king, with all its concomitants, was gradually extended through the ranks of the noble and wealthy until it came within the reach of the humblest, and even animals shared the honour of deification after death. Finally, in a papyrus of the Roman age, the word "god" is practically defined as "buried," i.e. with due rites. Beliefs regarding the gods and life after death were self-contradictory and variable, but none interfered with the custom of preserving the body. It was always the prayer that the soul (bai) should be able to revisit the corpse (khat), and some inscriptions show an expectation of the body itself being revivified, " the mouth speaking," "the legs walking," and everything conforming with its previous terrestrial life. At the same time the ko ("life," "activity," and almost "ghost,") which clung to the neighbourhood of the tomb and enjoyed the ghosts of offerings in ghostly fashion, had some of the independent enterprise which the bai possessed in abundance. The mummified corpse as a divine thing — not the mere khat — was called the sahu (an old word meaning "noble") or ikh, which in the latter period meant a spirit or demon. As the corpse was found generally to disappear and decay in spite of preservative magic, especially in the early ages, various substitutes were resorted to; statues and statuettes were thought efficacious, but, apart from

their costliness, even these were subject to decay or destruction by violence, and in the absence of anything more substantial the Egyptians doubtless reflected that magic words alone in the last resort made everything right.

Under the Old Kingdom the attendance on and services for a dead magnate — the sacrifices and libations at his tomb — were left, together with endowments, to a staff of priests, called "servants of the ko(ka)," whose offices were hereditary. This system led to disputes and neglect, and was so unworkable that we find in the texts of the Middle Kingdom the whole responsibility put upon one well-endcwed "ko-servant," who passed on his office to a single heir. How these things were managed during the New Kingdom we do not know. In the last thousand years B.C. the life of the Egyptians consisted largely in every kind of religious and superstitious observances. Papyri of the Ptolemaic age or somewhat earlier afford much information about the people of the necropolis. In this age the choachytae, as the Greeks called them ("libation priests," or "shrine-openers" in Egyptian), belonged to an inferior grade of the priesthood, equivalent to the pastophori of the deities, and were organized in gilds for the different cemeteries. A single choachyte would have an interest, not always the sole interest, in a large number of mummies, and these interests could be disposed of by will or contract, bought and sold. The taricheutae, or embalmers, had no permanent interest in the mummies they prepared.

Thanks to the great care expended on the preservation of the royal dead, although the mummies of all the other kings have disappeared, a wonderful series of the Theban kings and queens of the New Kingdom from the XVIIth Dynasty to the XXIst

Dynasty has come down to us. It comprises some of the most notable figures in Egyptian history —

Ahmosi (Amasis) I., who freed Egypt from the Hyksos, Tethmosis I. and III., the con- querors of Syria and makers of the empire, Amenophis III., the great builder, whose likeness is preserved in the colossi of Memnon, probably also his son, Amenophis IV. (Akhenaton), the heretic king, and Seti (Sethos) I. and his son Rameses II. The mummy of Seti I. is in the finest possible preservation, but others, after being brutally plundered, were rewrapped by the piety of later generations.

In Lower Egypt practically all the mummies have perished ; but in Upper Egypt, as they were put out of reach of the inundation, the cemeteries, in spite of rifling and burning, yield immense numbers of preserved bodies and skeletons; attention has from time to time been directed to the scientific examination of these in order to ascertain race, cause of death, traces of accident or disease, and the surgical or medical processes which they had undergone during life, &c. This department of research has been greatly developed by Dr Elliott Smith in Cairo. He has examined not only the more recently found of the royal mum- mies, but also multitudes of skeletons, &c, which have been brought from the official excavations of the government and from other work. His researches, in particular instances, prove their high importance for the history of disease, for characterization of the races inhabiting Egypt, and in other ways. The cemeteries just south of the First Cataract on a first examination reveal a prehistoric race of Egyptian type, a group of male negro mercenaries, a group of male prisoners executed by hanging during the New Kingdom, while from a necropolis of Christian foreigners of about the 6th century comes the first instance of gout in an ancient body from Egypt. Among the prehistoric people are many female skeletons with a fractured right ulna sustained in warding off blows, and some of these women had died while still wearing splints. Circum- cision is traceable on all the male bodies which are in a state to show its effects. The royal mummies furnish evidence of age at death as well as of health and

physical character. A series of forty-four mummies of priests and priestesses of the XXIst Dynasty furnished the material for an important monograph. Earlier, the processes of mummification produced a skeleton merely clothed in a dry and shrunken skin. At this time, however, the flesh was replaced by a stuffing of sawdust, sand, or other lasting material, introduced with great skill through a few incisions and apertures, so that the natural forms were completely restored. The heart was left in place, but the liver, lungs, stomach and intestines were pickled and wrapped separately and then restored to the body cavity. Later, the form was reproduced by elaborate external wrappings of the different parts of the body before the final swathing; later still, in the Ptolemaic age, by coarse padding with plenty of linen and pitch. The XXIst Dynasty marks the highest level of the art. The Christians of the early centuries, looking for corporeal resurrection, avoided the incisions, extraction of organs, &c, practised by their pagan forefathers, and buried the body entire after pickling it in salt. Their stricter leaders, however, objected to a custom which so easily led to the worship of relics and the continuance of pagan observances; and with the advent of Islam embalming fell into disuse.

Outside Egypt mummification was practised amongst the ancient Peruvians, who took advantage of the desiccating

atmosphere and salt soil of their caves for preserving the dead in good condition without any embalming process. Among the Guanches of the Canary Islands, however, the Egyptian methods of emptying the body and padding he skin were closely paralleled.

A word may be added about the use of mummy in medicine. The name, as has been poirfted out above, is derived from the Persian mumiai, meaning pitch or asphalt, which substance occurs frequently in the prescriptions of the Greek and Roman medical writers. Medieval physicians in the East conceived

the happy idea that the highest virtue would exist in that which had been already employed by the Egyptian priests in preserving the human body. Thus the bituminous and fatty matters found about the mummies and their wrappings were employed as a sovereign remedy, particularly for wounds and contusions, and a brisk trade began in these ” exudations ” of mummies. This led further to the medicinal use of fragments of the mummies themselves; and, finally, the starting-point was lost sight of, so that the dried or prepared flesh of criminals became one of the standard forms of mummy in the pharma- copoeia. It was not till the 18th century that the importance of mummy in all its forms waned, and in some of the least progressive quarters of central Europe it survived even to the middle of the 19th.

See T. J. Pettigrew, A History of Egyptian Mummies (London, 1834) ; G. Elliott Smith, A Contribution to the Study of Mummification in Egypt (Cairo, 1906) ; The Archaeological Survey of Nubia Bulletins (Cairo, 1908 seq.); Dr Lortet and M. C. Gaillard, La Faune momifiee de Vancienne Egypte (Lyons, 1905) ; A. Wiedemann, ” Mumie als Heilmittel,” in Zeitschrift des Vereins fur rheinische und westfdlische Volkskunde (1906). (F. Ll. G.)

MUMPS (syn. Cynanche parotidaea, parotitis; also, ” The Branks “), a specific infectious disease characterized by inflam- matory swelling of the parotid and other salivary glands, fre- quently occurring as an epidemic, and affecting mostly young persons. The name “mumps ” (O. Eng. ” to mump,” meaning to sulk) originated, no doubt, in the patient’s appearance. The disease generally sets in with symptoms of a cold or catarrh accompanied with slight febrile disturbance; but soon the nature of the ailment is announced by the occurrence of swelling and stiffening in the region of the parotid gland in front of the ear. The swelling speedily increases in size and spreads down- wards towards the neck and under the jaw, involving the rjdmerous glands in that locality. The effect is to produce much disfigurement, which becomes still greater

should the inflammation spread, as often happens, to the glands on the other side of the face and neck. Pain is present in the swollen parts, but it is seldom severe, nor is there much redness or any tendency to suppuration. There is, however, considerable interference with the acts of mastication and swallowing. After continuing for four or five days the swelling and other symptoms abate, and the parts are soon restored to their normal condition. During the period of convalescence there occasionally occur some swelling and tenderness in other glands, such as the testicles in males {orchitis), and the mammae or ovaries (oopher-itis) in females, and possibly involvement of the pancreas, but these are of short duration and usually of no serious significance. Mumps is in general a mild disease, and requires little treatment beyond a gentle laxative, the application of warm fomentations to the swollen and painful parts, the use of soft food, and rest.

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Numbers, Partition of.

‘ Nematoda {in part) ; Nematomorpha;

■ Nemertina (in pari)

Nicholas, Henry; Northumberland, John Dudley, duke of.

Murchison.

■ Mutian; Myconius, Friedrich;

. Myconius, Oswald.

Neoplatonism (in part).

Nishapur.

‘Nestorians (in part); Nestorius (in pari); New Jerusalem Church; Nicholas of Basel. Mythology;

Name (Local and Personal Names) .

Alfred Newton, F.R.S.

See the biographical article :

Newton, Alfred.

Nestor;

Nidiflcation (in part); Nightingale; Noddy; Nutcracker; Nuthatch; Ocydrome.

Natal (in part).

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B, S. P.

B. W.» C.F.M.B.

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C. K. S. CM. C. ML

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C. R* B*

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f Neckam; -j Nikitin; [Norden, John.

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J Northumbria.

f Muscular System; ■\ Nerve; [Nervous System.

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IX

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Nests and Colora.

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Nero; Nerva.

History, 1814-iQoj.

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See the biographical article: Crowe, Sir Joseph Archer.

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Nicholas (King of Monte- negro).

Nunez de Arce.

Music Halls.

Name: Greek and Roman

Names; ■ Norieum.

Mural Decoration (in part); Niello.

X

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The Development of the European Nations; The Life of Pitt; &c.

Joseph Jacobs, Litt.D.

Professor of English Literature in the New York Jewish Theological Seminary of America. Formerly President of the Jewish Historical Society of England. Corre- sponding Member of the Royal Academy of History, Madrid. Author of Jews of Angevin England; Studies in Biblical Archaeology; &c,

Joseph Jackson Lister, M.A., F.R.S. Fellow of St John's College, Cambridge.

Nethinim.

{

Mycetozoa.

John Louis Emil Dreyer.

Director of Armagh Observatory. Kepler ; &c.

Author of Planetary Systems from Thales to -j Observatory.

J. M. Brydon. J

Architect of Chelsea Town Hall and Polytechnic, &c. I.

John Malcolm Mitchell. (

Sometime Scholar of Queen's College, Oxford. Lecturer in Classics, East London -1 College (University of London). Joint-editor of Grote's History of Greece. {

Rev. John Punnett Peters, Ph.D., D.D. j

Canon Residentiary, P. E. Cathedral of New York. Formerly Professor of Hebrew in J the University of Pennsylvania. Director of the University Expedition to Babylonia, 1 1888-1895. Author of Nippur, or Explorations and Adventures on the Euphrates. 1

Rev. James Sibree, F.R.G.S. I

Principal Emeritus, United College (L.M.S. and F.F.M.A.), Antananarivo, Mada- J gascar. Member de l'Academie Malgache. Author of Madagascar and its People; 1 Madagascar before the Conquest; A Madagascar Bibliography; &c. <

Rev. John Sutherland Black, M.A., LL.D.

Assistant-editor of the oth edition of the Encyclopaedia Britannica. Joint-editor of -\ the Encyclopaedia Biblica.

John Smith Flett, D.Sc, F.G.S.

Petrographer to H.M. Geological Survey. Formerly Lecturer on Petrology in Edinburgh University. Neill Medallist of the Royal Society of Edinburgh. Bigsby " Medallist of the Geological Society of London.

John Scott Keltie, LL.D., F.S.S., F.S.A. (Scot.).

Secretary, Royal Geographical Society. Knight of Swedish Order of North Star. Commander of the Norwegian Order of St Olaf . Hon. Member, Geographical – Societies of Paris, Berlin, Rome, &c. Editor of Statesman's Year Book. Editor of the Geographical Journal.

John Thomas Bealby.

Joint-author of Stanford's Europe. Formerly Editor of the Scottish Geographical ■ Magazine. Translator of Sven Hedin's Through Asia, Central Asia and Tibet; &c.

Joseph Thomas Cunningham, M.A., F.Z.S.

Lecturer on Zoology at the South-Western Polytechnic, London. Formerly Fellow of University College, Oxford. Assistant Professor of

Natural History in ” the University of Edinburgh. Naturalist to the Marine Biological Association.

James Thomson Shotwell, Ph.D.

Professor of History in Columbia University, New York City.

James Williams, M.A., D.C.L., LL.D. r

All Souls’ Reader in Roman Law in the University of Oxford, and Fellow of Lincoln -j Navigation Laws. College. L

Nesfield.

Naucrary; Neoplatonism (in part).

Nejef; Nippur.

Nossi-be.

Nestorius (in part).

Mylonite; Napoleonite; Neck; Nepheline-Syenite; Nephelinites; Obsidian.

National Debt (in part).

Nikolayev (in part); Nizhniy-Novgorod (in part); .Novgorod (in part).

Mussel (in part); Nautilus; . Octopus.

Neeker (in part).

Naturalism.

Naturalization.

James Ward, LL.D.

See the biographical article: Ward, James.

John Westlake, K.C., LL.D., D.C.L.

Professor of International Law, Cambridge, 1888-1908. One of the Members for United Kingdom of International Court of Arbitration under the Hague Convention, 1900-1906. Author of A Treatise on Private International Law, or the Conflict of Laws; Chapters on the Principles of International Law. part i. ” Peace “; part ii. ” War.”

John Walter Gregory, D.Sc, F.R.S. f

Professor of Geology at the University of Glasgow. Professor of Geology and 1 New South Wales: Geology;

Mineralogy in the University of Melbourne, 1900-1904. Author of The Dead Heart 1 New Zealand: Geology.

of Australia; &c. [

James Whitbread Lee Glaisher, M.A., D.Sc, F.R.S. f

Fellow of Trinity College, Cambridge. Formerly President of the Cambridge J yinier John Philosophical Society, and the Royal Astronomical Society. Editor of Messenger 1 ‘ ‘ of Mathematics and the Quarterly Journal of Pure and Applied Mathematics. L

Kathleen Schlesinger. f Mu .f “f. 1 Box;

Editor of the Portfolio of Musical Archaeology. Author of The Instruments of the \ Na ” Violin; Orchestra. L Nay; Oboe (in part).

INITIALS AND HEADINGS OF ARTICLES

XI

L. J. S.

L. R. F.

L. V.’

L. W. K.

M. Ja.

M. N. T.

N. D. M. 0. J. R. H.

O.K.

P. A. K.

P. G. P. Gi.

P. G. K. P. La.

R. A. W.

R. C. T.

R. G. R. J. M.

R. L.* R. La.

Leonard James Spencer, M.A. f Muscovite’

Assistant in Department of Mineralogy, British Museum. Formerly Scholar of j N … .’ Sidney Sussex College, Cambridge, and Harkness Scholar. Editor of the Minera- | HBpneiine; logical Magazine. [NiCCOllte.

Lewis Richard Farneix, M.A., Litt.D. r

Fellow and Senior Tutor of Exeter College, Oxford University Lecturer in Classical J „ Archaeology; Wilde Lecturer in Comparative Religion. Corresponding Member 1 Mystery, of Imperial German Archaeological Institute. Author of Evolution of Religion; &c. [

LUICI VlLLARI. r

Italian Foreign Office (Emigration Dept.). Formerly Newspaper Correspondent J K , v > A

in East of Europe. Italian Vice-Consul in New Orleans, 1906, Philadelphia, 1907, 1 Naples, Kingdom Of.

and Boston, U.S.A., 1907-1910. Author of Italian Life in Town and Country; &c. [

Leonard William King, M.A., F.S.A. f

King’s College, Cambridge. Assistant in Department of Egyptian and Assyrian Antiquities, British Museum; Lecturer in Assyrian at King’s College and London University. Author of The Seven Tablets of Creation; &c.

Morris Jastrow, Ph.D.

Professor of Semitic Languages, University of Pennsylvania. of the Babylonians and Assyrians; &c.

Marcus Niebuhr Tod, M.A.

Fellow and Tutor of Oriel College, Oxford. University Lecturer in Epigraphy. Joint-author of Catalogue of the Sparta Museum.

The Rt. Hon. Lord Northcliffe. r

Founder of the Daily Mail ; Chief Proprietor of The Times, and other papers and J Newspapers: periodicals. Chairman of the Associated Newspapers, Ltd., and the Amalgamated 1 papers. Press, Ltd. . I

Newton Dennison Mereness, A.M., Ph.D. Author of Maryland as a Proprietary Province.

Osbert John Radcliffe Howarth, M.A.

Christ Church, Oxford. Geographical Scholar, 1901. British Association.

Author of Religion

Nippur: The Deluge Fragment.

J Nebo; Nergal; Ninib;

[Nusku; Oannes.

Nauarchia.

Price of News-

Assistant Secretary of the

Otto Krummel, Ph.D.

Professor of Geography in the University of Kiel, and Lecturer in the Imperial Navai Academy. Author of Handbuch der Ozeanographie.

Prince Peter Alexeivitch Kropotkin.

See the biographical article : Kropotkin, Prince P. A.

Percy Gardner. LL.D., Litt.D., F.S.A.

See the biographical article: Gardner, Percy.

New York {in part).

J Norway: Geography and

[Statistics.

Ocean and Oceanography (in

part) .

New Siberia Archipelago; Nikolayev (in part) ; Nizhniy-Novgorod {in part) ; Novgorod {in part).

Myron.

Peter Giles, M.A., LL.D., Litt.D. r

Fellow and Classical Lecturer of Emmanuel College, Cambridge, and University J N. Reader in Comparative Philology. Formerly Secretary of the Cambridge Philo-] 0. logical Society. Author of Manual of Comparative Philology. I

Paul George Konody. T

Art Critic of the Observer and the Daily Mail. Formerly Editor of The Artist. \ Neer, Van der {in pari).

Author of The Art of Walter Crane; Velasquez, Life and Work; &c. I

Philip Lake, M. A., F.G.S. r

Lecturer on Physical and Regional Geography in Cambridge University. Formerly J »_„„„„„. D ; • 1 r< ±r s

of the Geological Survey of India. Author of Monograph of British Cambrian 1 florwa y- Physical Geography.

Trilobites. Translator and Editor of Keyser's Comparative Geology. I

Robert Alexander Wahab, C.B., C.M.G., CLE. (

Colonel, Royal Engineers. Formerly H.M. Commissioner, Aden Boundary De- j Weid limitation, and Superintendent, Survey of India. Served with Tirah Expeditionary 1 '

Force, 1897-1898; Anglo-Russian Boundary Commission, Pamirs, 1895; & c – ˆ

Sir Richard Carnac Temple, Bart., CLE.

Lieut.-Colonel. Formerly Chief Commissioner, Andaman and Nicobar

Islands. Hon. Fellow of Trinity Hall, Cambridge. Joint-author of Andamanese Language; &c.

Richard Garnett, LL.D., D.C.L.

See the biographical article: Garnett, Richard.

Nicobar Islands.

J Newman, Francis William; t Newton, Sir C. T.

Formerly Editor of the St James's J. Murray, Lord George.

Ronald John MacNeill, M.A.

Christ Church, Oxford. Barrister-at-Law. Gazette, London.

Richard Lydekker, M.A., F.R.S., F.G.S. , F.Z.S. f Muntjac;

Member of the Staff of the Geological Survey of India, 1874-1882. Author of J M us k Ox* Catalogue of Fossil Mammals, Reptiles and Birds in British Museum ; The Deer] „ , , ' of All Lands ; The Game Animals of Africa ; &c. I MylOOOn.

Robert Latouciie.

Archivist of the department of Tarn et Garonne. Maine au X. et au XL siecle.

Author of Histoire du comte du -I Normandy.

Xll R. N. B.

R. S. B.

R. S. P. R. S. T.

S. A. C.

INITIALS AND HEADINGS OF ARTICLES

Robert Nisbet Bain (d. 1909).

Assistant Librarian, British Museum, 1883-1909. Author of Scandinavia: the Political History of Denmark, Norway and Sweden, 1513-1900 ; The First Romanovs, 1613-1725 ; Slu.von.ic Europe: the Political History of Poland and Russia from 1469 to 1796; &c.

Sir Robert Stawell Ball, F.R.S., LL.D.

Lowndean Professor of Astronomy and Geometry, University of Cambridge. . Director of the Cambridge Observatory and Fellow of King's College. Royal Astronomer of Ireland, 1874-1892. Author of The Story of the Heavens; <&c.

Reginald Stuart Poole, LL.D.

See the biographical article: Poole, Reginald Stuart.

Ralph Stockman Tarb. f

Professor of Physical Geography, Cornell University. Special Field Assistant of the -1 New York (in part). U.S. Geological Survey. Author of Physical Geography of New York State. I

Stanley Arthur Cook, M.A. f

Lecturer in Hebrew and Syriac, and formerly Fellow, Gonville and Caius College, j Cambridge. Editor for the Palestine Exploration Fund. Examiner in Hebrew and J Aramaic, London University, 1904-1908. Council of Royal Asiatic Society, 1904- 1905. Author of Glossary of Aramaic Inscriptions ; The Law of Moses and the Code of Hammurabi; Critical Notes on Old Testament History; Religion of Ancient Palestine; &c.

Nadasdy; Nansen, Hans; Nikon.

Nebular Theory.

Numismatics (in part).

Nabataeans (in part); Nazarite (in pari).

StC. S. H. V.*

S. K.

S.N. T. As.

f . A. C.

T. A. 1. T. A. J.

T. Ba.

T. P. C. T. H. T, H. H.*

T. M. L. T. iff. R. D.

V.M.

Nicole.

Viscount St Cyres.

See the’biographical article, Iddesleigh, 1st Earl of.

Sydney Howard Vines, M.A., D.Sc, F.R.S., F.L.S. f

Professor of Botany in the University of Oxford. Fellow of Magdalen College, J Naegeli. Oxford. Hon. Fellow of Christ’s College, Cambridge. Fellow of the University of | London. Author of Student’s Text Book of Botany; &c. *-

Sten Konow, Ph.D. f

Professor of Indian Philology in the University of Christiania. Officier de l’Academie J Mund&S. Franchise. Author of Stamavidhana Brahmana; The Karpuramanjari; Munda] and Dravidian. L

\ Neptune (Planet).

Simon Newcomb, D.Sc, LL.D.

See the biographical article : Newcomb, Simon.

Thomas Ashby, M.A., Litt.D.

Director of British School of Archaeology at Rome. Formerly Scholar of Christ Church, Oxford. Craven Fellow, 1897. Conington Prizeman, 1906. Member of the Imperial German Archaeological Institute. Author of The Classical Topography of the Roman Campagna.

Timothy Augustine Coghlan, I.S.O. f w

Agent-General for New South Wales. Government Statistician, New South Wales, J » ew Sout n Wales:

Nemorensis Lacus; Nepi; Nola; Nomentana, Via; Nomentum; Nora; Norba; No vara; Nuceria Alfaterna; Nuoro.

1886-1905. Author of Wealth and Progress of New South Wales;

Statistical Account \ of Australia and New Zealand; &c. L

Geography and Statistics.

f Name: Law; I Octroi.

Hon. Sec. Anthropo- \ Negro (in part).

j Neo-Caesarea, Synod of. ■j Narses (Roman General).

Thomas Allan Ingram, M.A., LL.D. Trinity College, Dublin.

Thomas Athol Joyce, M.A.

Assistant in Department of Ethnography, British Museum, logical Society.

Sir Thomas Barclay. f Neutrality

Member of the Institute of International Law. Member of the Supreme Council of „ L . , . „

the Congo Free State. Officer of the Legion of Honour. Author of Problems of i North Sea Fisheries Conven-

International Practice and Diplomacy; &c. M. P. for Blackburn, 1910. [tion.

Theodore Freylinghuysen Collier, Ph.D.

Assistant Professor of History, Williams College, Williamstown, Mass.

Thomas Hodgkin, LL.D., Litt.D.

. See the biographical article: Hodgkin, Thomas.

Sir Thomas Hungerford Holdich, K.C.M.G., K.C.I.E., D.Sc, F.R.S. f Muscat;

Colonel in the Royal Engineers. Superintendent, Frontier Surveys, India, 1892- J North-West Frontier PrO- 1898. Gold Medallist, R.G.S. (London), 1887. H.M. Commissioner for the Perso- | , Beluch Boundary, 1896. Author of The Indian Borderland; The Gales of India; &c. L vmce –

Rev. Thomas Martin Lindsay, M.A., D.D. f

Principal and Professor of Church History, United Free Church College, Glasgow. -{ Occam, William of. Author of Life of Luther ; &c. L

Thomas William Rhys Davids, LL.D., Ph.D.

Professor of Comparative Religion, Manchester University. President of the Pali Text Society. Fellow of the British Academy. Secretary and Librarian of Royal – Asiatic Society, 1885-1902. Author of Buddhism; Sacred, Books of the Buddhists; Early Buddhism; Buddhist India; Dialogues of the Buddha; &c.

Victor Charles Mahillon. f

Principal of the Conservatoire Royal de Musique at Brussels. Chevalier of the S Oboe (in part). Legion of Honout, [

NSgarjuna; Nikaya.

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INITIALS AND HEADINGS OF ARTICLES xiii

W. A. B. C. Rev. William Augustus Brevoort Coolidge, M.A., F.R.G.S., Ph.D. (Bern).

Fellow of Magdalen College, Oxford. Professor of English History, St David's

College, Lampeter, 1 880-1881. Author of Guide du Haut Dauphini; The Range of '-j Neuchatel.

the Todi; Guide to Grindelwald; Guide to Switzerland'. The Alps in Nature and in

History, &c. Editor of The Alpine Journal, 1880-1881 ; &c.

W. A. P. Walter Alison Phillips, M.A. f Murat . Nibeluneenlied*

Formerly Exhibitioner of Merton College and Senior Scholar of St John's College, ■!„..,' r , , „ . .' Oxford. Author of Modern Europe; &c. I Nicholas I. [of Russia).

W. BL William Blain, C.B. (d. 1908). f National Debt: Conversions

Principal Clerk and First Treasury Officer of Accounts, 1903-1908. \ (in part).

W.Cr. Walter Crane. r.-rw.,™ (Mural Decoration (m ˆrt).

See the biographical article : Crane, Walter. (\ r j

W. E. G. Sir William Edmund Garstin, G.C.M.G. f

Governing Director, Suez Canal Co. Formerly Inspector-General of Irrigation,-! Nile (in part). Egypt. Adviser to the Ministry of Public Works in Egypt, 1904-1908. I

W. F. C. William Feilden Craies, M.A. i Nonfeasance .

Barrister-at-Law, Inner Temple. Lecturer on Criminal Law, King's College,-^ ”“““mo”””! London. Editor of Archbold's Criminal Pleading (23rd edition). [_ Obscenity.

W. F. R. William Fiddian Reddaway, M.A. r

Censor of Non-Collegiate Students, Cambridge. Fellow and Lecturer of King's J Norway: History 1 307-1814. College. Author of ” Scandinavia,” in Vol. xi. of the Cambridge Modern History. I ”

W. F. W. Walter Francis Willcox, LL.B., Ph.D. r

Chief Statistician, United States Census Bureau. Professor of Social

Science and

Statistics, Cornell University. Member of the American Social Science Association -j Negro (United States).

and Secretary of the American Economical Association. Author of The Divorce I

Problem: A Study in Statistics ; Social Statistics oj the United Stales ; &c. I

W. G.* Walcot Gibson, D.Sc, F.G.S. f

H.M. Geological Survey. Author of The Gold-Bearing Rocks of the S. Transvaal ; 1 Natal: Geology. Mineral Wealth of Africa ; The Geology of Coal and Coal-mining ; &c. I

W. H. Be. Rev. William Henry Bennett, M.A., D.D., D.Litt. f

Professor of Old Testament Exegesis in New and Hackney Colleges, London. J Nimrod; Formeily Fellow of St John's College, Cambridge; Lecturer in Hebrew at Firth 1 Noah. College, Sheffield. Author of Religion of the Post-Exilic Prophets ; &c. I

W. H. F. Sir William Henry Flower, F.R.S. /'w-rniiiai

See the biographical article: Flower, Sir W. H. | narwnai,

W. H. P. Walter Herries Pollock, M.A. f

Trinity College, Cambridge. Editor of Saturday Review, 1 883-1 894. Author of -j MllSSet, Alfred de. Lectures on French Poets ; Impressions of Henry Irving ; &c. [

W. J. H. William Jacob Holland, A.M., D.D., LL.D., D.Sc, Ph.D. f

Director of the Carnegie. Institute, Pittsbi.rg'. President of the American Association i Museums Of Science. of Museums, 1907-1909. Editor of Annals and Memoirs of Carnegie Museum. I

W. L. F. Walter Lynwood Fleming, A.M., Ph.D. f

Professor of History in Louisiana State University. Author of Documentary -j Nullification. History of Reconstruction; &c. [

W. L. G. William Lawson Grant, M.A. f

Professor of Colonial History, Queen's University, Kingston, Canada. Formerly J *[„„„ ■a r „„ c „,-.„i r tr„„„j„\ Beit Lecturer in Colonial History, Oxford University. Editor of Acts of the Privy 1 WeW ijrunswi0K {Canada). Council (Canadian Series). I

William Morris ….„„. i Mural Decoration (in Part).

See the biographical article: Morris, William. [ˆui»u»m» r » ; ,

William Morris Davis, D.Sc, Ph.D. f

Professor of Geology in Harvard University. Formerly Professor of Physical \ North America. Geography. Author of Physical Geography; &c. [

William Michael Rossetti. J „ ...

See the biographical article : Rossetti, Dante G. \ ffluri ” 0 >

William O'Connor Morris (d. 1904). f

Formerly Judge of County Courts, Ireland; and Professor of Law to the King's J O'Connell Daniel Inns, Dublin. Author of Great Commanders of Modern Times; Irish History; 1 '

Ireland, 1708-1808; &c. I

W. P. R. The Hon. William Pember Reeves.

Director of London School of Economics. Agent-General and High Commissioner

for New Zealand, 1896-1909. Minister of Education, Labour, and lustice, New 1 New Zealand.

Zealand, 1891-1896. Author of The Long White Cloud: a History of New Zealand;

&c.

W. R. E. H. William Richard Eaton Hodgkinson, Ph.D., F.R.S. (Edin.), F.C.S. f

Professor of Chemistry and Physics, Ordnance College , Woolwich. Formerly J Nitroglycerin Professor ofChemistry and Physics, R.M.A., Woolwich. Part-author of Valentin- I Hodgkinson's Practical Chemistry; &c. v

W. R. M.*

W.R.S.

W. S. H.

W. T. A. W. W. R.*

INITIALS AND HEADINGS OF ARTICLES

William Richard Morfill, M.A. (d. igio). r

Formerly Professor of Russian and other Slavonic Languages in the University of J Nagtnr Oxford. Curator of the Taylorian Institution, Oxford. Author of Russia ; Slavonic 1 *

Literature; &c. I

William Robert Martin. f

Captain, R.N. Formerly Lecturer at the Royal Naval College, Greenwich. Author-ˆ Navigation, of Treatise on Navigation and Nautical Astronomy; &c. [_

f Nabataeans (in part); William Robertson Smith, LL.D. J Nazarite (in part);

See the biographical article: Smith, William Robertson. 1 Numeral;

lObadiah (in part).

William Symington M'Cormick, M.A., LL.D. f

Secretary to the Carnegie Trust of the Scottish Universities. Formerly Professor -{ Oecleve. of English, University College, Dundee. Author of Lectures on Literature; &c.

Walker Tallmadge Arndt, M.A.

William Walker Rockwell, Lic.Theol.

Assistant Professor of Church History, Union Theological Seminary, New York.

| New York (in part). i Nimes, Councils ol

PRINCIPAL UNSIGNED ARTICLES

Munich.

Murad.

Huratori.

Mushroom.

Mutilation.

Mysore.

Narcissus.

Narcotics.

Nashville.

Nassau.

Nebraska.

Nevada.

New Caledonia

Newcastle, Dukes of. Newcastle-upon-Tyne. New England. New Guinea. New Hampshire. New Hebrides. New Jersey. New Mexico. New Orleans. New York City. Ney.

Niam-Niam. Nicaragua.

Nice.

Nickel.

Nightingale, Florence.

Nimes.

Nitro-Compounds.

Nitrogen.

Norfolk, Earls and Dukes

of. Norfolk. Northampton, Earls and

Marquesses of. Northamptonshire. North Carolina.

North Dakota. Northumberland, Earls and

Dukes of. Northumberland. Norwich. Nottingham. Nottinghamshire. Novaya Zemlya. Nuremberg. Nursing. Nut. Oak. Oates, Titus.

ENCYCLOPAEDIA BRITANNICA

ELEVENTH EDITION

VOLUME XIX

MUN, ADRIEN ALBERT MARIE DE, Count (1841-), French politician, was born at Lumigny, in the department of Seine-et-Marne, on the 28th of February 1841. He entered the army, saw much service in Algeria (1862), and took part in the fighting around Metz in 1870. On the surrender of Metz, he was sent as a prisoner of war to Aix-la-Chapelle, whence he returned in time to assist at the capture of Paris from the Commune. A fervent Roman Catholic, he devoted himself to advocating a patriarch type 6f Christian Socialism. His elo- quence made him the most prominent member of the Cercles Catholiques d'Ouvriers, and his attacks on Republican social policy at last evoked a prohibition from the minister of war. He thereupon resigned his commission (Nov. 1875), and in the following February stood as Royalist and Catholic candidate for Pontivy. The influence of the Church was exerted to secure his election, and the pope during its progress sent him the order of St Gregory. He was returned, but the election was declared invalid. He was re-elected, however, in the following August, and for many years was the most conspicuous leader of the anti-Republican party. " We form," he said on one occasion, "the irreconcilable Counter-Revolution." As far back as 1878 he had declared himself opposed to universal suffrage, a declaration that lost him his seat from 1879 to 1881. He spoke strongly against the expulsion of the French princes, and it was chiefly through his influence that the support of the Royalist party was given to General Boulanger. But as a faithful Catholic he obeyed the encyclical of 1892, and declared his readiness to rally to a Republican government, provided that it respected religion. In the following January he received from the pope a letter commending his action, and encouraging him in his social reforms. He was defeated at the general election of that year, but in 1894 was returned for Finistere (Morlaix). In 1897 he succeeded Jules Simon as a member of the French

Academy. This honour he owed to the purity of style and remarkable eloquence of his speeches, which, with a few pamphlets, form the bulk of his published work. In Ma voca- tion sociale (1908) he wrote an explanation and justification of his career.

HUN, THOMAS (1571-1641), English writer on economics, was the third son of John Mun, mercer, of London. He began by engaging in Mediterranean trade, and afterwards settled down in London, amassing a large fortune. He was a member of the committee of the East India Company and of the standing commission on trade appointed in 1622. In 1621 Mun published A Discourse of Trade from England unto the East Indies. But it is by his England's Treasure by Forraign Trade that he is XIX. 1

remembered in his history of economics. Although written possibly about 1630, it was not given to the public until 1664, when it was " published for the Common good by his son John," and dedicated to Thomas, earl of Southampton, lord high treasurer. In it we find for the first time a clear statement of the theory of the balance of trade.

MUNCHAUSEN, Baron. This name is famous in literary history on account of the amusingly mendacious stories known as the Adventures of Baron Munchausen. In 1785 a little shilling book of 49 pages was published in London (as we know from the Critical Review for December 1785), called Baron Munchausen' 's Narrative of his Marvellous Travels and Campaigns in Russia. No copy is known to exist, but a second edition (apparently identical) was printed at Oxford early in 1786. The publisher of both these editions was a certain Smith, and he then sold it to another bookseller named Kearsley, who brought out in 1786 an enlarged edition (the additions to which were stated in the 7th edition not to be by the original author), with illustra- tions under the title of Gulliver Reviv'd: the Singular Travels, Campaigns, Voyages, and- Sporting Adventures of Baron Munnik- houson, commonly pronounced Munchausen; as he relates them over a bottle when surrounded by his friends. Four editions rapidly succeeded, and a free German translation by the poet Gottfried August Burger, from the fifth edition, was printed at Gottingen in 1786. The seventh English edition (1793), which is the usual text, has the moral sub-title, Or the Vice of Lying properly exposed, and had further new additions. In 1792 a Sequel appeared, dedicated to James Bruce, the African traveller, whose Travels to Discover the Nile (1790) had led to incredulity and ridicule. As time went on Munchausen increased in popu- larity and was translated into many languages. Continuations were published, and new illustrations provided (e.g. by T. Rowlandson, 1809; A. Crowquill, 1859; A.

Cruikshank, 1869; the French artist Richard, 1878; Gustave Dore, 1862; W. Strang and J. B. Clark, 1895). The theme of Baron Munchausen, the ” drawer of the long-bow ” par excellence, has become part of the common stock of the world’s story-telling.

The original author was at first unknown, and until 1824 he was generally identified with Burger, who made the German translation of 1786. But Burger’s biographer, Karl von Rein- hard, in the Berlin Gesellschafter of November 1824, set the matter at rest by stating that the real author was Rudolf Erich Raspe (q.v.). Raspe had apparently become acquainted at Gottingen with Hieronymus Karl Friedrich, Freiherr von Munchhausen, of Bodenwerder in Hanover. This Freiherr von Munchhausen (1720-1797) had been in the Russian service and

served against the Turks, and on retiring in 1760 he lived on his estates at Bodenwerder and used to amuse himself and his friends, and puzzle the quidnuncs and the dull-witted, by relating extraordinary instances of his prowess as soldier and sportsman. His stories became a byword among his circle, and Raspe, when hard up for a living in London, utilized the suggestion for his little brochure. But his narrative owed much also to such sources, known to Raspe, as Heinrich Bebel’s Facetiae bebelianae (1508), J. P. Lange’s Deliciae academicae (1665), a section of which is called Mendacia ridicula, Castiglione’s Cortcgiano (1528), the Travels of the Finkenritter, attributed to Lorenz von Lauterbach in the 16th century, and other works of this sort. Raspe can only be held responsible for the nucleus of the book; the additions were made by book- sellers’ hacks, from such sources as Lucian’s Vera hisloria, or the Voyages imaginaires (1787), while suggestions were taken from Baron de Tott’s Memoirs (Eng. trans. 1785), the contem- porary aeronautical feats of Montgolfier and Blanchard, and any topical ” sensations ” of the moment, such as Bruce’s explora- tions in Africa. Munchausen is thus a medley, as we have it, a classical instance of the fantastical mendacious literary genre.

See the introduction by T. Seccombe to Lawrence and Bullen’s edition of 1895. Adolf Ellisen, whose father visited Freiherr von Munchhausen in 1 795 and found him very uncommunicative, brought out a German edition in 1849, with a valuable essay on pseudology in general. There is useful material in Carl Muller-Fraureuth’s Die deulschen Lugendichtungen auf Munchhausen (1881) and in Griesbach’s edition of Burger’s translation (1890).

MUNCH-BELLINGHAUSEN, ELIGIUS FRANZ JOSEPH,

Freiherr von (1806-1871), Austrian poet and dramatist (who wrote under the pseudonym ” Friedrich Halm ,;), was born at Cracow on the 2nd of April 1806, the son of a district judge. Educated at first at a private school in Vienna, he afterwards attended lectures at the university, and in 1826, at the early age of twenty, married and entered the government service. In 1840 he became Regierungsrat, in 1845 Hofrat and custodian of the royal library, in 1861 life member of the Austrian Herren- haus (upper chamber), and from 1869 to 1871 was intendant of the two court theatres in Vienna. He died at Hiitteldorf near Vienna on the 22nd of May 1871. MUnch-Bellinghausen’s dramas, among them notably Griseldis (1835; publ. 1837; nth ed.. 1896), Der Adept (1836; publ. 1838), Camoens (1838), Der Sohn der WUdnis (1842; 10th ed., 1896), and Der Fechter von Ravenna (185}; publ. 1857; 6th ed., 1894), are distinguished by elegance of language, melodious versification and clever construction, and were for a time exceedingly popular.

His poems, Gedichte, were published in Stuttgart, J 850 (new ed.. Vienna. 1877). His works, Scimtliche Werke, were published in eight volumes (1856-1864), to which four posthumous volumes were added in 1872. Ausgewahlte Werke, ed. by A. Schlossar, 4 vols. (1904). See F. Pachler, Jvgend und Lehrjahre des Dichters F. Halm (‘877); J. Simiani, Gedenkblatter an F. Halm (1873). Halm’s correspondence with Enk von der Burg has been published by R. Schachinger (1890).

MUNCIE, a city and the county-seat of Delaware county, Indiana, U.S.A., on the West Fork of the White river, about 57 m. N.E. of Indianapolis. Pop. (1880), 5210; (1890), 11,345; (1900) 20,942, of whom 1235 were foreign-born; (1910 census) 24.005. It is served by the Central Indiana, the Chicago, Cincinnati & Louisville, the Cleveland, Cincinnati, Chicago & St Louis, the Pittsburgh, Cincinnati, Chicago & St Louis, the Fort Wayne, Cincinnati & Louisville, and the Lake Erie & Western railways, and by the Indiana Union Traction, the Dayton & Muncie Traction, and the Muncie & Portland Traction (electric inter-urban) railways. The city is built on level ground (altitude 950 ft.), and has an attractive residential section. It is one of the principal manufacturing centres in Indiana, owing largely to its situation in the natural gas belt. In 1900 and in 1905 it was the largest producer of glass and glassware in the United States, the value of its product in 1905 being $2,344,462. Muncie (named after the Munsee Indians, one of the three principal divisions of the Delawares) was settled about 1833 and was chartered as a city in 1865.

MUNDAS. The Munda {Munda) family is the least numerous of the linguistic families of India. It comprises several dialects spoken in the two Chota Nagpur plateaux, the adjoining districts of Madras and the Central Provinces, and in the Mahadeo hills. The number of speakers of the various dialects, according to the census of 1901, are as follow: Santali, 1,795,113; Mundari, 460,744; Bhumij, 111,304; Birhar, 526; Koda, 23,873; Ho, 371,860; Tun, 3880; Asurl, 4894; Korwa, 16,442; Korku, 87,675; Kharia, 82,506; Juang, 10,853; Savara, 157,136; Gadaba, 37,230; total, 3,164,036. Santali, Mundari, Bhumij, Birhar, Koda, Ho, Turl, Asurl and Korwa are only slightly differing forms of one and the same language, which can be called Kherwari, a name borrowed from Santali tradition. Kherwari is the principal Munda language, and quite 88% of all the speakers of Munda tongues belong to it. The Korwa dialect, spoken in the western part of Chota Nagpur, connects Kherwari with the remaining Munda languages. Of these it is most closely related to the Kurku language of the Mahadeo hills in the Central Provinces. Kurku, in its turn, in important points agrees with Kharia and Juang, and Kharia leads over to Savara and Gadaba. The two last-mentioned forms of speech, which are spoken in the north-east of the Madras Presidency, have been much influenced by Dravidian languages.

The Munda dialects are not in sole possession of the ‘territory where they are spoken. They are, as a rule, only found in the hills and jungles, while the plains and valleys are inhabited by people speaking some Aryan language. When brought into close contact with Aryan tongues the Munda forms of speech are apt to give way, and in the course of time they have been partly superseded by Aryan dialects. There are accordingly some Aryanized tribes in northern India who have formerly belonged to the Munda stock. Such are the Cheros of Behar and Chota Nagpur, the Kherwars, who are found in the same localities, in Mirzapur and elsewhere, the Savaras, who formerly extended as far north as Sha’habad, and others. It seems possible to trace an old Munda element in some Tibeto-Burman dialects spoken in the Himalayas from Bashahr eastwards.

By race the Mundas are Dravidians, and their language was likewise long considered as a member of the Dravidian family. Max Muller was the first to distinguish the two families. He also coined the name Munda for the smaller of them, which has later on often been spoken of under other denominations, such as Kolarian and Kherwarian. The Dravidian race is generally considered as the aboriginal population of southern India. The Mundas, who do not appear to have extended much farther towards the south than at present, must have mixed with the Dravidians from very early times. The so-called Nahall dialect of

the Mahadeo hills seems to have been originally a Munda form of speech which has come under Dravidian influ- ence, and finally passed under the spell of Aryan tongues. The same is perhaps the case with the numerous dialects spoken by the Bhils. At all events, Munda languages have apparently been spoken over a wide area in central and north India. They were then early superseded by Dravidian and Aryan dialects, and at the present day only scanty remnants are found in the hills and jungles of Bengal and the Central Provinces,

Though the Munda family is not connected with any other languages in India proper, it does not form an isolated group. It belongs to a widely spread family, which extends from India in the west to Easter Island in the eastern Pacific in the east. In the first place, we find a connected language spoken by the Khasis of the Khasi hills in Assam. Then follow the Mon- Khmer languages of Farther India, the dialects spoken by the aboriginal inhabitants of the Malay Peninsula, the Nancowry of the Nicobars, and, finally, the numerous dialects of Austro- nesia, viz. Indonesic, Melanesic, Polynesic, and so on. Among the various members of this vast group the Munda languages are most closely related to the Mon-Khmer family of Farther India. Kurku, Kharia, Juang, Savara and Gadaba are more closely related to that family than is Kherwari, the principal Munda form of speech.

We do not know if the Mundas entered India from without.

If so, they can only have immigrated from the east. At all events they must have been settled in India from a very early period. The Sabaras, the ancestors of the Savaras, are already mentioned in old Vedic literature. The Munda languages seem to have been influenced by Dravidian and Aryan forms of speech. In most characteristics, however, they differ widely from the neighbouring tongues.

The Munda languages abound in vowels, and also possess a richly developed system of consonants. Like the Dravidian languages, they avoid beginning a word with more than one consonant. While those latter forms of speech shrink from pronouncing a short conso- nant at the end of words, the Mundas have the opposite tendency, viz. to shorten such sounds still more. The usual stopped consonants — viz. k, c (i.e. English ch), t and p — are formed by stopping the current of breath at different points in the mouth, and then letting it pass out with a kind of explosion. In the Munda language this operation can be

abruptly checked half-way, so that the breath does not touch the organs of speech in passing out. The result is a sound that makes an abrupt impression on the ear, and has been described as an abrupt tone. Such sounds are common in the Munda languages. They are usually written k', c', t' and p'. Similar sounds are also found in the Mon-Khmer languages and in Indo-Chinese.

The vowels of consecutive syllables to a certain extent approach each other in sound. Thus in Kherwari the open sounds & (nearly English a in all) and a (the a in care) agree with each other and not with the corresponding close sounds o (the o in pole) and e (the e in pen). The Santali passive suffix ok' accordingly becomes dk' after ii or d ; compare sdn-dk', go, but dal-ok', to be struck.

Words are formed from monosyllabic bases by means of various additions, suffixes (such as are added after the base), prefixes (which precede the base) and infixes (which are inserted into the base itself). Suffixes play a great r61e in the inflexion of words, while prefixes and infixes are of greater importance as formative additions. Compare Kurku k-on, Savara on, son ; Kharia ro-mong, Kherwari mu, nose ; Santali bor, to fear; bo-to-r, fear; dal, to strike; da-pa-l, to strike each other.

The various classes of words are not clearly distinguished. The same base can often be used as a noun, an adjective or a verb. The words simply denote some being, object, quality, action or the like, but they do not tell us how they are conceived.

Inflexion is effected in the usual agglutinative way by means of additions which are " glued " or joined to the unchanged base. In many respects, however, Munda inflexion has struck out peculiar lines. Thus there is no grammatical distinction of gender. Nouns can be divided into two classes, viz. those that denote animate beings and those that denote inanimate objects respectively. There are three numbers — the singular, the dual and the plural. On the other hand, there are no real cases, at least in the most typical Munda languages. The direct and the indirect object are indicated by means of certain additions to the verb. Certain relations in time and space, however, are indicated by means of suffixes, which have probably from the beginning been separate words with a definite meaning. The genitive, which can be considered as an adjective preceding the governing word, is often derived from such forms denoting locality. Compare Santali hdr-rd, in a man; hdr-rdn, of a man.

Higher numbers are counted in twenties, and not in tens as in the

Dravidian languages.

The pronouns abound in different forms. Thus there are double sets of the dual and the plural of the pronoun of the first person, one including and the other excluding the person addressed. The Rev. A. Nottrott aptly illustrates the importance of this distinction by remarking how it is necessary to use the exclusive form if telling the servant that ” we shall dine at seven.” Otherwise the speaker will invite the servant to partake of the meal. In addition to the usual personal pronouns there are also short forms, used as suffixes and infixes, which denote a direct object, an indirect object, or a genitive. There is a corresponding richness in the case of demonstrative pronouns. Thus the pronoun ” that ” in Santali has different forms to denote a living being, an inanimate object, something seen, something heard, and so on. On the other hand, there is no relative pronoun, the want being supplied by the use of indefinite forms of the verbal bases, which can in this connexion be called relative participles. The most characteristic feature of Munda grammar is the verb, especially in Kherwari. Every independent word can perform the function of a verb, and every verbal form can, in its turn, be used as a noun or an adjective. The bases of the different tenses can there- fore be described as indifferent words which can be used as a noun, as an adjective, and as a verb, but which are in reality none of them. Each denotes simply the root meaning as modified by time. Thus in Santali the base dal-ket’, struck, which is formed from the base dal, by adding the suffix kef of the active past, can be used as a noun (compare dal-ket’ -ko, strikers, those that struck), as an adjective (compare dal-ket’ -Mr, struck man, the man that struck), and as a verb. In the last case it is necessary to add an a if the action really takes place; thus, dal-ket’ -a, somebody struck. –

It has already been remarked that the cases of the direct and . indirect object are indicated by adding forms of the personal

pronouns to the verb. Such pronominal affixes are inserted before the assertive particle a. Thus the affix denoting a direct object of the third person singular is e, and by inserting it in dal-ket’-a we arrive at a form dal-ked-e-a, somebody struck him. Similar affixes can be added to denote that the object or subject of an action belongs to somebody. Thus Santali hdpdn-in-e dal-kef -iako-lin-a, son-my-he struck-theirs-mine, my son who belongs to me struck theirs.

In a sentence such as har kora-e dal-ked-e-a, man boy-he struck- him, the man struck the boy, the Santals first put together the ideas man, boy, and a striking in the past. Then the e tells us that the striking

affects the boy, and finally the a indicates that the whole action really takes place. It will be seen that a single verbal form in this way often corresponds to a whole sentence or a series of sen tences in other languages. If we add that the most developed Munda languages possess different bases for the active, the middle and the passive, that there are different causal, intensive and recipro- cal bases, which are conjugated throughout, and that the person of the subject is often indicated in the verb, it will be understood that Munda conjugation presents a somewhat bewildering aspect. It is, however, quite regular throughout, and once the mind becomes accustomed to these peculiarities, they do not present any difficulty to the understanding.

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Eart i. (Wien, 1888), p. 229; Sten Konow, ” Munda and Dravidian anguages ” in Grierson’s Linguistic Survey of India, iv. 1 and sqq. (Calcutta, 1906). (S. K.)

MUNDAY (or Monday), ANTHONY (c. 1553-1633), English dramatist and miscellaneous writer, son of Christopher Monday, a London draper, was born in 1 553-1554. He had already appeared on the stage when in 1576 he bound himself apprentice for eight years to John Allde, the stationer, an engagement from which he was speedily released, for in 1578 he was in Rome. In the opening lines of his English Romayne Lyfe (1582) he avers that in going abroad he was actuated solely by a desire to see strange countries and to learn foreign languages; but he must be regarded, if not as a spy sent to report on the English Jesuit College in Rome, as a journalist who meant to make literary capital out of the designs of the English Catholics resident in France and Italy. He says that he and his companion, Thomas Nowell, were robbed of all they possessed on the road from Boulogne to Amiens, where they were kindly received by an English priest, who entrusted them with letters to be delivered in Reims. These they handed over to the English ambassador in Paris, where under a false name, as the son of a well-known English Catholic, Munday gained recommendations which secured his reception at the English College in Rome. He was treated with special kindness by the rector, Dr Morris, for the sake of his supposed father. He gives a detailed account of the routine of the place, of the dispute between the English and Welsh students, of the carnival at Rome, and finally of the martyrdom of Richard Atkins (? 1 559-1 581). He

returned to England in 1 578-1 579, and became an actor again, being a member of the Earl of Oxford's company between r579 and 1584. In a Catholic tract entitled

A True Reporte of the death of M. Campion (1581), Munday

is accused of having deceived his master Allde, a charge which he refuted by publishing Allde's signed declaration to the con- trary, and he is also said to have been hissed off the stage. He was one of the chief witnesses against Edmund Campion and his associates, and wrote about this time five anti-popish pamphlets, among them the savage and bigoted tract entitled A

Discoverie of Edmund Campion and his Confederates whereto

is added the execution of Edmund Campion, Raphe Sherwin, and Alexander Brian, the first part of which was read aloud from the scaffold at Campion's death in December 1581. His political services against the Catholics were rewarded in 1584 by the post of messenger to her Majesty's chamber, and from this time he seems to have ceased to appear on the stage. In 1 598-1 599, when he travelled with the earl of Pembroke's men in the Low Countries, it was in the capacity of playwright to furbish up old plays. He devoted himself to writing for the booksellers and the theatres, compiling religious works, translating Amadis de Gaule and other French romances, and putting words to popular airs. He was the chief pageant- writer for the City from 1605

to 1616, and it is likely that he supplied most of the pageants between 1592 and 1605, of which no authentic record has been kept. It is by these entertainments of his, which rivalled in success those of Ben Jonson and Middleton, that he won his greatest fame ; but of all the achievements of his versatile talent the only one that was noted in his epitaph in St Stephens, Coleman Street, London, where he was buried on the 10th of August 1633, was his enlarged edition (1618) of Stow's Survey of London. In some of his pageants he signs himself " citizen and draper of London," and in his later years he is said to have followed his father's trade.

Of the eighteen plays between the dates of 1584 and 1602 which are assigned to Munday in collaboration with Henry Chettle, Michael Drayton, Thomas Dekker and other dramatists, only four are extant. John a Kent and John a Cumber, dated 1595, is supposed to be the same as Wiseman of West Chester, produced by the Admiral's men at

the Rae Theatre on the 2nd of December 1594. A ballad of British Sidanen, on which it may have been founded was entered at Stationers' Hall in 1579. The Downfall of Robert Earl of Huntingdon, afterwards called Robin Hood of merrie Sherwodde (acted in February '599) was followed in the same month by a second part, The Death of Robert Earl of Huntingdon (printed 1601), in which he collaborated with Henry Chettle. Munday also had a share with Michael Dray- ton, Robert Wilson and Richard Hathway in the First Part of the history of the life of Sir John Oldcastle (acted 1599), which was printed in 1600, with the name of William Shakespeare, which was speedily withdrawn, on the title page. William Webbe (Discourse of English Poelrie, 1586) praised him for his pastorals, of which there remains only the title, Sweet Sobs and Amorous Complaints of Shep- herds and Nymphs; and Francis Meres (Palladis Tamia, 1598) gives him among dramatic writers the exaggerated praise of being " our best plotter." Pen Jonson ridiculed him in The Case is Altered as Antonio Balladino, pageant poet. Munday's works usually appeared under his own name, but he sometimes used the pseudonym of " Lazarus Piot." A. H. Bullen identifies him with the Shepherd Tony " who contributed " Beauty sat bathing by a spring " and six other lyrics to England's Helicon (ed. Bullen, 1899, p. 15).

The completest account of Anthony Munday is T. Seccombe's article in the Diet. Nat. Biog. A life and bibliography are prefixed to the Shakespeare Society s reprint of John a Kent and John a Cumber (ed. J. P. Collier, 1851). His two " Robin Hood" plays were edited by J. P. Collier in Old Plays (1828), and his English Romayne Lyfe was printed in the Harleian Miscellany, vii. 136 seq. (ed. Park, 181 1). For an account of his city pageants see F. W. Fairholt, Lord Mayor's Pageants (Percy Soc, No. 38, 1843).

MUNDELLA, ANTHONY JOHN (1825-1897), English educa- tional and industrial reformer, of Italian extraction, was born at Leicester in 1825. After a few years spent at an elementary school, he was apprenticed to a hosier at the age of eleven; He afterwards became successful in business in Nottingham, filled several civic offices, and was known for his philanthropy. He was sheriff of Nottingham in 1853, and in 1859 organized the first courts of arbitration for the settlement of disputes between masters and men. In November 1868 he was returned to parliament for Sheffield as an advanced Liberal. He represented that constituency until November 1885, when he was returned for the Brightside division of Sheffield, which he continued to represent until his death. In the Gladstone ministry of 1880 Mundella was vice-president of the council, and shortly after- wards was nominated fourth charity commissioner for England a"nd Wales.

In February 1886 he was appointed president of the board of trade, with a seat in the cabinet, and was sworn a member of the privy council. In August 1892, when the Liberals again came into power, Mundella was again appointed president of the hoard of trade, and he continued in this position until 1804, when he resigned office. His resignation was brought about by his connexion with a financial company which went into liquidation in circumstances calling for the official intervention of the board of trade. However innocent his own connexion with the company was, it involved him in unpleasant public discussion, and his position became untenable. Having made a close study of the educational systems of Germany and Switzerland, Mundella was an early advocate of compulsory education in England. He rendered valuable service in con- nexion with the Elementary Education Act of 1870, and the educational code of 1882, which became known as the ” Mundella. Code,” marked a new departure in the regulation of public elementary schools and the conditions of the Government

grants. To his initiative was chiefly due the Factory Act of 1875, which established a ten-hours day for women and children in textile factories; and the Conspiracy Act, which removed certain restrictions on trade unions. It was he also who established the labour department of the board of trade and founded the Labour Gazette. He introduced and passed bills for the better protection of women and children in brickyards and for the limitation of their labours in factories; and he effected substantial improvements in the Mints Regula- tion Bill, and was the author of much other useful legislation. In recognition of his efforts, a marble bust of himself, by Boehm, subscribed for by 80,000 factory workers, chiefly women and children, was presented to Mrs Mundella. He died in London on the 21st of July 1897.

MUNDEN, JOSEPH SHEPHERD (1758-1832), English actor, was the son of a London poulterer, and ran away from home to join a strolling company. He had a long provincial experience as actor and manager. His first London appearance was in 1790 at Covent Garden, where he practically remained until 181 1, becoming the leading comedian of his day. In 1813 he was at Drury Lane. He retired in 1824, and died on the 6th of February 1832.

MUNDEN, a town of Germany, in the Prussian province of Hanover, picturesquely situated at the confluence of the Fulda and the Werra, 21 m. N.E. of Cassel by rail. Pop. (1905), 10,755. It is an ancient place, municipal rights having been granted to it in 1 247. A few ruins of its former walls still survive. The large Lutheran church of St Blasius (i4th-isth centuries) contains the sarcophagus of Duke Eric of

Brunswick-Calenberg (d. 1540). The 13th-century Church of St Aegidius was injured in the siege of 1625-26 but was subsequently restored. There is a new Roman Catholic church (1895). The town hall (1619), and the ducal castle, built by Duke Eric II. about 1570, and rebuilt in 1898, are the principal secular buildings. In the latter is the municipal museum. There are various small industries and a trade in timber. Mtinden, often called ” Hanno- versch-Mlinden ” (i.e. Hanoverian Mtinden), to distinguish it from Prussian Minden, was founded by the landgraves of Thuringia, and passed in 1247 to the house of Brunswick. It was for a time the residence of the dukes of Brunswick-Luneburg. In 1626 it was destroyed by Tilly.

See Willigerod, Geschichte von Milnden (Gottingen, 1808); and Henze, Fuhrer durch Mtinden m:d Umgegend (Mtinden, 1900).

MUNDRUCUS, a tribe of South American Indians, one of the most powerful tribes on the Amazon. In 1788 they completely defeated their ancient enemies the Muras. After 1803 they lived at peace with the Brazilians, and many are civilized.

MUNDT, THEODOR (1808-1861), German author, was born at Potsdam on the 19th of September 1808. Having studied philology and philosophy at Berlin, he settled in 1832 at Leipzig, as a journalist, and was subjected to a rigorous police supervision. In 1839 he married Klara Mtiller (1814-1873), who under the name of Luise Muhlbach became a popular novelist, and he removed in the same year to Berlin. Here his intention of entering upon an academical career was for a time thwarted by his collision with the Prussian press laws. In 1842, however, he was permitted to establish himself as privatdocent. In 1848 he was appointed professor of literature and history in Breslau, and in 1850 ordinary professor and librarian in Berlin; there he died on the 30th of November 1861. Mundt wrote extensively on aesthetic subjects, and as a critic he had considerable influence in his time. Prominent among his works are Die Kunst der deutschen Prosa (1837); Geschichte der Liter atur der Gegenwart (1840); Aesthetik; die Idee der Schonheit und des Kunstwerks im Lichte unserer Zeit (1845, new ed. 1868); Die Gotterwelt der aiten Volker (1846, new ed. 1854). He also wrote several historical novels; Thomas Milnzer (1841); Mendoza, der Vater der Schelmen (1847) and Die Matador e (1850). But perhaps Mundt’s chief title to fame was his part in the emancipation of women, a “theme which he elaborated in his Madonna, Unter- haltungen mit einer Heiligen (1835).

MUNICH

MUNICH (Ger. Munchen), a city of Germany, capital of the kingdom of Bavaria, and the third largest town in the German Empire. It is situated on an elevated plain, on the river Isar, 25 m. N. of the foot-hills of the Alps, about midway between Strassburg and Vienna. Owing to its lofty site (1700 ft. above the sea) and the proximity of the Alps, the climate is changeable, and its mean annual temperature, 49 to 50 F., is little higher than that of many places much farther to the north. The annual rainfall is nearly 30 in. Munich lies at the centre of an important network of railways connecting it directly with Strassburg (for Paris), Cologne, Leipzig, Berlin, Rosenheim (for Vienna) and Innsbruck (for Italy via the Brenner pass), which converge in a central station.

Munich is divided into twenty-four municipal districts, nine- teen of which, including the old town, lie on the left bank of the Isar, while the suburban districts of Au, Haidhausen, Giesing, Bogenhausen and Ramersdorf are on the opposite bank. The old town, containing many narrow and irregular streets, forms a semicircle with its diameter towards the river, while round its periphery has sprung up the greater part of modern Munich, including the handsome Maximilian and Ludwig districts. The walls with which Munich was formerly surrounded have been pulled down, but some of the gates have been left. The most interesting is the Isartor and the Karlstor, restored in 1835 and adorned with frescoes. The Siegestor (or gate of victory) is a modern imitation of the arch of Constantine at Rome, while the stately Propylaea, built in 1854-1862, is a reproduction of the gates of the Athenian Acropolis.

Munich owes its architectural magnificence largely to Louis I. of Bavaria, who ascended the throne in 1825, and his successors; while its collections of art entitle it to rank with Dresden and Berlin. Most of the modern buildings have been erected after celebrated prototypes of other countries and eras, so that, as has been said by Moriz Carriere, a walk through Munich affords a picture of the architecture and art of two thousand years. In carrying out his plans Louis I. was seconded by the architect Leo von Klenze, while the external decorations of painting and sculpture were mainly designed by Peter von Cornelius, Wilhelm von Kaulbach and Schwanthaler. As opportunity offers, the narrow streets of the older city are converted into broad, straight boulevards, lined with palatial mansions and public buildings. The hygienic improvement effected by these changes, and by a new and excellent water supply, is shown by the mortality averages — 40-4 per thousand in 1871-1875, 30-4 per thousand in 1881-1885, and 20-5 per thousand in 1003-1004. The archi- tectural style which has been principally followed in the later public buildings, among them the law

courts, finished in 1897, the German bank, St Martin's hospital, as well as in numerous private dwellings, is the Italian and French Rococo, or Renais- sance, adapted to the traditions of Munich architecture in the 17th and 18th centuries. A large proportion of the most notable buildings in Munich are in two streets, the Ludwigstrasse and the Maximilianstrasse, the creations of the monarchs whose names they bear. The former, three-quarters of a mile long and 40 yds. wide, chiefly contains buildings in the Renaissance style by Friedrich von Gartner. The most striking of these are the palaces of Duke Max and of Prince Luitpoid; the Odeon, a large building for concerts, adorned with frescoes and marble busts; the war office; the royal library, in the Florentine palatial style; the Ludwigskirche, a successful reproduction of the Italian Romanesque style, built in 1829-1844, and containing a huge fresco of the Last Judgment by Cornelius; the blind asylum; and, lastly, the university. At one end this street is terminated by the Siegestor, while at the other is the Feldher- renhalle (or hall of the marshals), a copy of the Loggia dei Lanzi at Florence, containing statues of Tilly and Wrede by Schwan- thaler. Adjacent is the church of the Theatines, an imposing though somewhat over-ornamented example of the Italian Rococo style; it contains the royal burial vault. In the Maxi- milianstrasse, which extends from Haidhausen on the right bank of the Isar to the Max-Joseph Platz, King Maximilian II. tried to introduce an entirely novel style of domestic architecture,

formed by the combination of older forms. At the east end it is closed by the Maximilianeum, an extensive and imposing edifice, adorned externally with large sculptural groups and internally with huge paintings representing the chief scenes in the history of the world. Descending the street, towards the west are passed in succession the old buildings of the Bavarian national museum, the government buildings in which the Com- posite style of Maximilian has been most consistently carried out, and the mint. On the north side of the Max-Joseph Platz lies the royal palace, consisting of the Alte Residenz, the Konigsbau, and the Festsaalbau. The Alte Residenz dates from 1601 to 1616; its apartments are handsomely fitted up in the Rococo style, and the private chapel and the treasury contain several crowns and many other interesting and valuable objects. The Festsaalbau, erected by Klenze in the Italian Renaissance style, is adorned with mural paintings and sculp- tures, while the Konigsbau, a reduced copy of the Pitti Palace at Florence, contains a series of admirable frescoes from the Niebelungenlied by Julius Schnorr von Carolsfeld. Adjoining the palace are two theatres, the Residenz or private theatre, and the handsome Hof theater, accommodating 2500 spectators. The

Allerheiligen-Hofkirche, or court-church, is in the Byzantine style, with a Romanesque facade.

The Ludwigstrasse and the Maximilianstrasse both end at no great distance from the Frauenplatz in the centre of the old town. On this square stands the Frauenkirche, the cathedral church of the archbishop of Munich-Freising, with its lofty cupola capped towers dominating the whole town. It is imposing from its size, and interesting as one of the few examples of indigenous Munich art. On the adjacent Marienplatz are the old town- hall, dating from the 14th century and restored in 1865, and the new town-hall, the latter a magnificent modern Gothic erection, freely embellished with statues, frescoes, and stained- glass windows, and enlarged in 1900-1905. The column in the centre of the square was erected in 1638, to commemorate the defeat of the Protestants near Prague by the Bavarians during the Thirty Years' War.

Among the other churches of Munich the chief place is due to St Boniface's, an admirable copy of an early Christian basilica. It is adorned with a cycle of religious paintings by Heinrich von Hess (1798-1863), and the dome is supported by sixty- four monoliths of grey Tyrolese marble. The parish church of Au, in the Early Gothic style, contains gigantic stained-glass windows and some excellent wood-carving; and the church of St John in Haidhausen is another fine Gothic structure. St Michael's in the Renaissance style, erected for the Jesuits in 1 583-1 595, contains the monument of Eugene Beauharnais by Thorwaldsen. The facade is divided into storeys, and the general effect is by no means ecclesiastical. St Peter's is inter- esting as the oldest church in Munich (12th century), though no trace of the original basilica remains. Among newer churches the most noticeable are the Evangelical church of St Luke, a Transitional building, with an imposing dome, finished in 1896, and the Gothic parochial church of the Giesing suburb, with a tower 312 ft. high and rich interior decorations (1866-1884).

The valuable collections of art are enshrined in handsome buildings, mostly in the Maximilian suburb on the north side of the town. The old Pinakothek, erected by Klenze in 1826- 1836, and somewhat resembling the Vatican, is embellished externally with frescoes by Cornelius and with statues of twenty- four celebrated painters from sketches by Schwanthaler. It contains a valuable and extensive collection of pictures by the earlier masters, the chief treasures^ being the early German and Flemish works and the unusually numerous examples of Rubens. It also affords accommodation to more than 300,000 engravings, over 20,000 drawings, and a large collection of

vases. Opposite stands the new Pinakothek, built 1846-1853, the frescoes on which, designed by Kaulbach, show the effects of wind and weather. It is devoted to works by painters of the last century, among which Karl Rottmann's Greek landscapes are perhaps the most important. The Glyptothek, a building by Klenze in the Ionic style, and adorned with several groups and

single statues, contains a valuable series of sculptures, extending from Assyrian and Egyptian monuments down to works by Thorwaldsen and other modern masters. The celebrated Aeginetan marbles preserved here were found in the island of Aegina in 1811. Opposite the Glyptothek stands the exhibition building, in the Corinthian style, it was finished in 1845, an d is used for periodic exhibitions of art. In addition to the museum of plaster casts, the Antiquarium (a collection of Egyptian, Greek and Roman antiquities under the roof of the new Pinakothek) and the Maillinger collection, connected with the historical museum, Munich also contains several private galleries. Fore- most among these stand the Schack Gallery, bequeathed by the founder, Count Adolph von Schack, to the emperor William II. in 1894, rich in works by modern German masters, and the Lotzbeck collection of sculptures and paintings. Other struc- tures and institutions are the new buildings of the art association; the academy of the plastic arts (1874-1885), in the Renaissance style; and the royal arsenal (Zeughaus) with the military museum. The Schwanthaler museum contains models of most of the great sculptor's works.

The immense scientific collection in the Bavarian national museum, illustrative of the march of progress from the Roman period down to the present day, compares in completeness with the similar collections at South Kensington and the Musee de Cluny. The building which now houses this collection was erected in 1894-1000. On the walls is a series of well-executed frescoes of scenes from Bavarian history, occupying a space of 16,000 sq. ft. The ethnographical museum, the cabinet of coins, and the collections of fossils, minerals, and physical and optical instruments, are also worthy of mention. The art union, the oldest and most extensive in Germany, possesses a good collection of modern works. The chief place among the scientific institutions is due to the academy of science, founded in 1759. The royal library contains over 1,300,000 printed volumes and 30,000 manuscripts. The observatory is equipped with instruments by the celebrated Josef Fraunhofer.

At the head of the educational institutions of Munich stands the

university, founded at Ingolstadt in 1472, removed to Landshut in 1800, and transferred thence to Munich in 1826. In addition to the four usual faculties there is a fifth — of political economy. In connexion with the university are medical and other schools, a priests' seminary, and a library of 300,000 volumes. The polytechnic institute (Technische Hochschule) in 1899 acquired the privilege of conferring the degree of doctor of technical science. Munich contains several gymnasia or grammar-schools, a military academy, a veterinary college, an agricultural college, a school for architects and builders, and several other technical schools, and a conservatory of music. The general prison in the suburb of Au is considered a model of its kind; and there is also a large military prison. Among other public buildings, the crystal palace (Glas-palast) , 765 ft. in length, erected for the great exhibition of 1854, is now used, as occasion requires, for temporary exhibitions. The Wittelsbach palace, built in 1843-1850, in the Early English Pointed style, is one of the residences of the royal family. Among the numerous monuments with which the squares and streets are adorned, the most important are the colossal statue of Maximilian II. in the Maximilianstrasse, the equestrian statues of Louis I. and the elector Maximilian I., the obelisk erected to the 30,000 Bavarians who perished in Napoleon's expedition to Moscow, the Wittelsbach fountain (1895), the monument commemorative of the peace of 1871, and the marble statue of Justus Liebig, the chemist, set up in 1883.

The English garden (Englischer Garten), to the north-east of the town, is 600 acres in extent, and was laid out by Count Rumford in imitation of an English park. On the opposite bank of the Isar, above and below the Maximilianeum, extend the Gasteig promenades, commanding fine views of the town. To the south-west of the town is the Theresienwiese, a large common where the popular festival is celebrated in October. Here is situated the Ruhmeshalle or hall of fame, a Doric colonnade containing busts of eminent Bavarians. In front of it is a

colossal bronze statue of Bavaria, 170 ft. high, designed by Schwanthaler. The botanical garden, with its large palm-house, the Hofgarten, surrounded with arcades containing frescoes of Greek landscapes by Rottmann, and the Maximilian park to the east of the Isar, complete the list of public parks.

The population of Munich in 1905 was 538,393. The per- manent garrison numbers about 10,000 men. Of the population, 84% are Roman Catholic, 14% Protestants, and 2% Jews. Munich is the seat of the archbishop of Munich-Freising and of the general Protestant

consistory for Bavaria. About twenty newspapers are published here, including the Allgemeine Zeitung. Some of the festivals of the Roman Church are cele- brated with considerable pomp; and the people also cling to various national fetes, such as the Metzgersprung, the Schaffler- tanz, and the great October festival.

Munich has long been celebrated for its artistic handicrafts, such as bronze-founding, glass-staining, silversmith's work, and wood-carving, while the astronomical instruments of Fraunhofer and the mathematical instruments of Traugott Lieberecht von Ertel (1778-1858) are also widely known. Lithography, which was invented at Munich at the end of the 18th century, is extensively practised here. The other industrial products include wall-paper, railway plant, machinery, gloves and artificial flowers. The most characteristic industry, however, is brewing. Four important markets are held at Munich annually. The city is served by an extensive electric tramway system.

History. — The Villa Munichen or Forum ad monachos, so called from the monkish owners of the ground on which it lay, was first called into prominence by Duke Henry the Lion, who established a mint here in n 58, and made it the emporium for the salt coming from Hallein and Reichenhall. The Bavarian dukes of the Wittelsbach house occasionally resided at Munich, and in 1255 Duke Louis made it his capital, having previously surrounded it with walls and a moat. The town was almost entirely destroyed by fire in 1327, after which the emperor Louis the Bavarian, in recognition of the loyalty of the citizens, rebuilt it very much on the scale it retained down to the beginning of the r9th century. Among the succeeding rulers those who did most for the town in the erection of handsome buildings and the foundation of schools and scientific institutions were Albert V., William V., Maximilian I., Max Joseph and Charles Theodore. In 1632 Munich was occupied by Gustavus Adolphus, and in 1705, and again in r742, it was in possession of the Austrians. In 1 791 the fortifications were razed.

Munich's importance in the history of art is entirely of modern growth, and may be dated from the acquisition of the Aeginetan marbles by Louis I., then crown prince, in 1812. Among the eminent artists of this period whose names are more or less identified with Munich were Leo von Klenze (1784-ˆ64), Joseph Daniel Ohlmuller (1 791-1839), Friedrich von Gartner (i792-r847), and Georg Friedrich Ziebland (ˆ800-1873), the architects; Peter von Cornelius (1783-1867), Wilhelm von Kaul- bach (1804-1874), Julius Schnorr von Carolsfeld (1794-1872), and Karl Rottmann, the painters; and

Ludwig von Schwanthaler, the sculptor. Munich is still the leading school of painting in Germany, but the romanticism of the earlier masters has been abandoned for drawing and colouring of a realistic character. Karl von Piloty (1826-1886) and Wilhelm Diez (1839-1907) long stood at the head of this school.

See Mittheilungen des statistischen Bureaus der Stadt Munchen (vols, i.-v., 1875-1882); Sold, Munchen mit seinen Umgebungen (1854); Reber, Bautechnischer Ftihrer durch die Stadt Munchen (1876) ; Daniel, Handbuch der Geographie (new ed., 1895); Prantl, Geschichte der Ludwig- Maximilians Universitdt (Munich, 1872); Goering, 30 Jahre Munchen (Munich, 1904) ; von Ammon, Die Gegend von Munchen geologisch geschildert (Munich, 1895); Kronegg, lUustrierte Geschichte der Stadt Munchen (Munich, 1903) ; the Jahrbuch fur Miinchener Geschichte, edited by Reinhardstottner and Trautmann (Munich, 1887-1894); Aufleger and Trautmann, Alt-Milnchen in Bild und Wort (Munich, 1895) ; Rohmeder, Munchen als Handelsstadt (Munich, 1905); H. Tinsch, Das Stadtrecht von Munchen (Bamberg, 1891); F. Pecht, Geschichte der miinchener Kunst im 19 Jahrhundert (Munich, 1888) ; and Trautwein, Ftihrer durch Munchen (20th ed., 1906). There is an English book on Munich by H. R. Wadleigh (1910).

MUNICIPALITY— MUNICIPIUM

MUNICIPALITY, a modern term (derived from Lat. muni- cipium; see below), now used both for a city or town which is organized for self-government under a municipal corporation, and also for the governing body itself. Such a corporation in Great Britain consists of a head as a mayor or provost, and of superior members, as aldermen and councillors, together with the simple corporators, who are represented by the governing body; it acts as a person by its common seal, and has a perpetual succession, with power to hold lands subject to the restrictions of the Mortmain laws; and it can sue or be sued. Where necessary for its primary objects, every corporation has power to make by-laws and to enforce them by penalties, provided they are not unjust or unreasonable or otherwise inconsistent with the objects of the charter or other instrument of foundation.

See Borough, Commune, Corporation, Local Government, Finance, &c, and for details of the functions of the municipal government see the sections under the general headings of the different countries and the sections on the history of these countries.

MUNICIPIUM (Lat. munus, a duty or privilege, capere, to take), in ancient Rome, the term applied primarily to a status, a certain relation

between individuals or communities and the Roman state; subsequently and in ordinary usage to a com- munity, standing in such a relation to Rome. Whether the name signifies the taking up of burdens or the acceptance of privileges is a disputed point. But as ancient authorities are unanimous in giving munus in this connexion the sense of ” duty ” or ” service,” it is probable that the chief feature of municipality was the performance of certain services to Rome. 1 This view is confirmed by all that we know about the towns to which the name was applied in republican times. The status had its origin in the conferment of citizenship upon Tusculum in 381 B.C. (Livy vi. 26; cf. Cic. pro Plane. 8, 19), and was widely extended in the settlement made by Rome at the close of the Latin War in 338 b.c. (see Rome, History). Italian towns were then divided into three classes: (1) Coloniae civium Romanorum, whose members had all the rights of citizen- ship; (2) municipia, which received partial citizenship; (3) foeder- atae civitates (including the so-called Latin colonies), which remained entirely separate from Rome, and stood in relations with her which were separately arranged by her for each state by treaty (joedus). The municipia stood in very different degrees of dependence on Rome. Some, such as Fundi (Livy viii. 14; cf. ibid. 19), enjoyed a local self-government only limited in the matter of jurisdiction; others, such as Anagnia (Livy ix. 43; Festus, de verb, significatione, s.v. ” municipium,” p. 127, ed. Miiller), were governed directly from Rome. But they all had certain features in common. Their citizens were called upon to pay the same dues and perform the same service in the legions as full Roman citizens, but were deprived of the chief privileges of citizenship, those of voting in the Comitia (jus suffragii), and of holding Roman magistracies (Jus honorum). It would also appear from Festus (op. cit. s.v. praefeclura, p. 233) that juris- diction was entrusted in every municipium to praefecti juri dicundo sent out from Rome to represent the Praetor Urbanus. 2 The conferment of municipality can therefore hardly have been regarded as other than an imposing of burdens, even in the case of those cities which retained control of their own affairs. But after the close of the second Punic War, when Rome had become the chief power, not only in Italy, but in all the neigh- bouring lands round the Mediterranean, we can trace a growing tendency among the Italian cities to regard citizenship of this great state as a privilege, and to claim complete citizenship as a reward of their services in helping to build up the Roman power. During the 2nd century B.C. the jus sitffragii and jus honorum were conferred upon numerous municipia (Livy xxxviii. 36, 37), whose citizens were then enrolled in the Roman tribes. They can have exercised their public rights but seldom, owing to their distance from Rome; but the consulships of C. Marius,

1 For a contrary view, however, see Marquardt, Rom. Staatsverw. i. p. 26, n. 2 (2nd ed., Leipzig, 1881), and authorities there cited.

5 For a different view see Willems, Droit public romain, p. 381 (Louvain, 1874),

a municeps of Arpinum (between 107 and 100 B.C.), and the strength of the support given to Tiberius Gracchus in the assembly by the voters from Italian towns (133 b.c.) show what an important influence the members of these municipia could occasionally exercise over Roman politics. The cities thus privileged, however, though receiving complete Reman citizen ship, were not, as the logic of public law might seem to demand, incorporated in Rome, but continued to exist as independent urban units; and this anomaly survived in the municipal system which was developed, on the basis of these grants of citizen- ship, after the Social War. That system recognized the municeps as at once a citizen of a self-governing city community, and a member of the city of Rome, his dual capacity being illustrated by his right of voting both in the election of Roman magistrates and in the election of magistrates for his own town.

The result of the Social War which broke out in 91 B.C. (see Rome: History) was the establishment of a new uniform municipality throughout Italy, and the obliteration of any important distinction between the three classes established after the Latin War. By the Lex Julia of 90 B.C. and the Lex Plautia Papiria of 89 B.C. every town in Italy which made application in due form received the complete citizenship. The term municipium was no longer confined to a particular class of Italian towns but was adopted as a convenient name for all urban communities of Roman citizens in Italy. The organization of a municipal system, which should regulate the governments of all these towns on a uniform basis, and define their relation to the Roman government, was probably the work of Sulla, who certainly gave great impetus to the foundation in the provinces of citizen colonies, which were the earliest municipia outside Italy, and enjoyed the same status as the Italian towns. Julius Caesar extended the sphere of the Roman municipal system by his enfranchisement of Cisalpine Gaul, and the consequent inclusion of all the towns of that region in the category of municipia. He seems also to have given a more definite organization to the municipia as a whole. But, excepting those in Cisalpine Gaul, the municipal system still embraced no towns outside Italy other than the citizen colonies. Augustus and his successors adopted the practice of granting to existing towns in the provinces either the full citizenship, or a partial civitas known as the jus Latii. This partial civitas does not seem to have been entirely replaced, as in Italy, by the

grant of full privileges to the communities possessing it, and the distinction survived for some time in the provinces between coloniae, municipia juris Rotnani, and municipia juris Latini. But the uniform system of administration gradually adopted in all three classes rendered the distinction entirely unimportant, and the general term municipium is used of all alike. The incorporation of existing towns, hitherto non-Roman, in the uniform municipal system of the principate took place mainly in the eastern part of the Empire, where Greek civiliza- tion had long fostered urban life. In the west city commu- nities rapidly sprang up under direct Roman influence. The development of towns of the municipal type on the sites where legions occupied permanent quarters can be traced in several of the western provinces; and it cannot be doubted that this development became the rule wherever a body of Roman subjects settled down together for any purpose and permanently occupied a region. At any rate by the end of the 1st century of the principate municipia are numerous in the western as well as the eastern half of the Empire, and the towns are every- where centres of Roman influence.

Of the internal life of the municipia very little is known before the Empire. For the period after Julius Caesar, however, we have two important sources of information. A series of municipal laws gives us a detailed knowledge of the constitution imposed, with slight variations, on all the municipia; and a host of private inscriptions gives particulars of their social life. The municipal constitution of the 1st century of the principate is based upon the type of government common to Greece and Rome from earliest times. The government of each town consists of magistrates, senate and assembly, and is entirely

independent of the Roman government except in certain cases of higher civil jurisdiction, which come under the direct cog- nisance of the praetor urbanus at Rome. On the other hand, each community is bound to perform certain services to the Imperial govjrnment, such as the contribution of men and horses for military service, the maintenance of the imperial post through its neighbourhood, and the occasional entertain- ment of Roman officials or billeting of soldiers. The citizens were of two classes: (i) cives, whether by birth, naturalization or emancipation, (2) incolae, who enjoyed a partial citizenship based on domicile for a certain period. Both classes were liable to civic burdens, but the incolae had none of the privi- leges of citizenship except a limited right of voting. The citizens were grouped

in either tribes or curiae, and accordingly the assembly sometimes bore the name of Comitia Tributa, sometimes that of Comitia Curiata. The theoretical powers of these comitia were extensive both in the election of magis- trates and in legislation. But the growing influence of the senate over elections on the one hand, and on the other hand the increasing reluctance of leading citizens to become candidates for office (see below), gradually made popular election a mere form. The senatorial recommendation of the necessary number of candidates seems to have been merely ratified in the comitia; and a Spanish municipal law of the 1st century makes special provision for occasions on which an insufficient number of candidates are forthcoming. In Italy, however, the reality of popular elections seems to have survived to a later date. The inscriptions at Pompeii, for instance, give evidence of keenly contested elections in the 2nd century. The local senate, or curia, always exercised an important influence on municipal politics. Its members formed the local nobility, and at an early date special privileges were granted by Rome to provincials who were senators in their native towns. For the composition, powers, and history of the provincial senate see Decueio. The magistrates were elected annually, and were six in number, forming three pairs of colleagues. The highest magistrates were the Ilviri (Duoviri) juri dicundo, who had charge, as their name implies, of all local jurisdiction, and presided over the assembly. Candidates for this office were required to be over 25 years of age, to have held one of the minor magistracies, and to possess all the qualifications required of members of the local senate (see Decurio). Next in dignity were the Ilviri aediles, who had charge of the roads and public buildings, the games and the corn-supply, and exercised police control through- out the town. They appear to have been regarded as sub- ordinate colleagues (collegae minore.i) of the Ilviri juri dicundo, and in some towns at least to have had the right to convene and preside over the comitia in the absence of the latter. Indeed many inscriptions speak of IVviri (Quattuorviri) consisting of two IVviri juri dicundo and two IVviri aediles; but in the majority of cases the former are regarded as distinct and superior magistrates. The two quaestores, who appear to have controlled finance in a large number of municipia, cannot be traced in others; and it is probable that in the municipia, as at Rome, the quaestorship was locally instituted, as need arose, to relieve the supreme magistrates of excessive business. Other municipal magistrates frequently referred to in the inscriptions are the quinquennales and praefecti. The quinquennales super- seded the Ilviri or IVviri juri dicundo every five years, and differed from them only in possessing, in addition to their other powers, those exercised in Rome before the time of Sulla by the censors. Two classes of praefecti are found in the municipalities under

the Empire, both of which are to be distinguished from the officials who bore that name in the municipia before the Social War. The first class consists of those praefecti who were nominated as temporary delegates by the Ilviri, when through illness or compulsory absence they were unable to discharge the duties of their office. The second class, referred to in inscriptions by the name of praefecti ab decuribnibus creati lege Petronia, seem to have been appointed by the local senate in case of a complete absence of higher magistrates, such as would have led in Rome to the appointment of an interrex.

From a social point of view the municipia of the Roman Empire may be treated under three heads: (1) as centres of local self- government, (2) as religious centres, (3) as industrial centres. (1) The chief feature of the local government of the towns is the wide- spread activity of the municipal authorities in improving the general conditions of life in the town. In the municipalities, as in Rome, provision was made out of the public funds for feeding the poorest part of the population, and providing a supply of corn which could be bought by ordinary citizens at a moderate price. In Pliny's time there existed in many towns public schools controlled by the municipal authorities, concerning which Pliny remarks that they were a source of considerable disturbance in the town at the times when it was necessary to appoint teachers. He himself encouraged the establishment of another kind of municipal school at Como, where the leading townspeople subscribed for the maintenance of the school, and the control, including the appointment of teachers, remained in the hands of the subscribers. Physicians seem to have been maintained in many towns at the public expense. The water- supply was also provided out of the municipal budget, and controlled by magistrates appointed for the purpose. To enable it to bear the expense involved in all these undertakings, the local treasury was generally assisted by large benefactions, either in money or in works, from individual citizens; but direct taxation for municipal purposes was hardly ever resorted to. The treasury was filled out of the proceeds of the landed possessions of the community, especially such fruitful sources of revenue as mines and quarries, and out of import and export duties. It was occasionally subsidized by the emperor on occasions of sudden and exceptional calamity.

2. The chief feature in the religious life of the towns was the important position they occupied as centres for the cult of the emperor. Caesar-worship as an organized cult developed spontat neously in many provincial towns during the reign of Augustus, and was fostered by him and his successors as a means of promoting in these centres of vigour and prosperity a strong loyalty to Rome and the emperor, which was ohe of the firmest supports of the latter's

power. The order of Augustales, officials appointed to regulate the worship of the emperor in the towns, occupied a position of dignity and importance in provincial society. It was composed of the lead- ing and the wealthiest men among the lower classes of the popula- tion. By the organization of the order on these lines Augustus secured the double object of maintaining Caesar-worship in all the most vigorous centres of provincial life, and attracting to himself and his successors the special devotion of the industrial class which had its origin in the mv.nicipia of the Roman Empire, and has become the greatest political force in modern Europe.

3. The development of this free industrial class is the chief feature of the municipia considered as centres of industry and handicraft. The rise to power of the equestrian order in Rome during the last century of the Republic had to some extent modified the old Roman principle that trade and commerce were beneath the dignity of the governing class ; but long after the fall of the Republic the aristo- cratic notion survived in Rome that industry and handicrafts were only fit for slaves. In the provincial towns, however, this idea was rapidly disappearing in the early years of the Empire, and even in the country towns of Italy the inscriptions give evidence not much later of the existence of a large and flourishing free industrial class, proud of its occupation, and bound together by a strong esprit de corps. Already the members of this class show a strong tendency to bind themselves together in gilds (collegia, sodalitates), and the existence of countless associations of the kind is revealed by the inscriptions. The formation of societies for religious and other purposes was frequent at Rome from the earliest times in all classes of the free population. After the time of Sulla these societies were regarded by the government with suspicion, mainly on account of the political uses to which they were turned, and various measures were passed for- their suppression in Rome and Italy. This policy was continued by the early emperors and extended to the whole Empire, but in spite of opposition the gilds in the provincial towns grew and flourished. The ostensible objects of nearly all such collegia of which we have any knowledge were twofold, the maintenance of the worship of some god, and provision for the performance of proper funerary rights for its members. But under cover of these two main objects, the only two purposes for which such combinations were allowed under the Empire, associations of all kinds grew up. The organization of the gilds was based on that of the municipality. Each elected its officers and treasurers at an annual meeting, and every five years a revision of the list of members was held, correspond- ing to that of the senators held quinquennially by the city magis- trates. It is doubtful how far these societies served

to organize and improve particular industries. There is no evidence to show that any societies during the first three centuries consisted solely of workers at a single craft. But there can be little doubt that the later craft gilds were a development, through the industrial gilds of the provincial towns, of one of the most ancient features of Roman life.

Remarkable concord seems generally to have existed in the municipia between the various classes of the population. This is accounted for partly by the strong civic feeling which formed a bond of unity stronger than most sources of friction, and

partly to the general prosperity of the towns, which removed any acute discontent. The wealthy citizen seems always to have had to bear heavy financial burdens, and to have enjoyed in return a dignity and an actual political preponderance which made the general character of municipal constitutions distinctly timocratic.

The policy adopted by the early emperors of encouraging, within the limits of a uniform system, the independence and civic patriotism of the towns, was superseded in the 3rd and 4th centuries by a deliberate effort to use the towns as instru- ments of the imperial government, under the direct control of the emperor or, his representatives in the provinces. This policy was accompanied by a gradual decay of civic feeling and municipal enterprise, which showed itself mainly in the un- willingness of the townsmen to become candidates for local magistracies, or to take up the burdens entailed in membership of the municipal senate. Popular control of the local government of the towns was ceasing to be a reality as early as the end of the 1st century of the Empire. Two centuries later local government was a mere form. And the self-governing com- munities of the middle ages were a restoration, rather than a development, of the flourishing and independent municipalities of the age of Augustus and his immediate successors.

Authorities. — C. Bruns, Fontes juris romani, c. III., No. 18, and c. IV. (Freiburg, 1893), for Municipal Laws and references to Mommsen's commentary in C.I.L. ; E. Kuhn, Stadtische u. biirgerliche Verfassung des rom. Reichs (Leipzig, 1864): Marquardt, Romische Slaatsverwallung, I. i. (Leipzig, 1881); Toutain. in Daremberg- Saglio Dictionnairc des antiquites grecques et romaines, s.v. " Munici- pium "; S. Dill, Roman Society from Nero to Marcus Aurelius, c. 2 and 3 (London, 1904). For the gilds see Mommsen, De collegiis et sodaliciis Romanorum (Keil, 1843); Liebenam, Geschichte u. Organi- sation des

rom. Vereinswesens (Leipzig, 1890). (A. M. Cl.)

MUNIMENT, a word chiefly used in the plural, as a collective term for the documents, charters, title-deeds, &c. relating to the property, rights and privileges of a cotporation, such as a college, a family or private person, and kept as ” evidences ” for defending the same. Hence the medieval usage of the word munimenium, in classical Latin, a defence, fortification, from mnnire, to defend.

MUNI RIVER SETTLEMENTS, or Spanish Guinea, a Spanish protectorate on the Guinea Coast, West Africa, rectangular in form, with an area of about 9800 sq. m. and an estimated population of 150,000. The protectorate extends inland about 125 miles and is bounded W. by the Atlantic, N. by the German colony of Cameroon, E. and S. by French Congo. The coast- line, 75 m. long, stretches from the mouth of the Campo in 2 10′ N. to the mouth of the Muni in i° N., on the north arm of Corisco Bay. The small islands of Corisco (q.v.), Elobey Grande, Elobey Chico and Bana in Corisco Bay also belong to Spain.

From the estuary of the Campo the coast trends S.S.W. in a series of shallow indentations, until at the bold bluff of Cape San Juan it turns eastward and forms Corisco Bay. The coast plain, from 12 to 25 m. wide, is succeeded by the foot-hills of the Crystal Mountains, which traverse the country in a north to south direction. These are a table-land, from which rise granitic hills 700 to 1200 ft. above the general level, which is about 2500 ft. above the sea. The mountainous region, which extends inland beyond the Spanish frontier, contains many narrow valleys and marshy depressions. The greater part of the country forms the basin of the river Benito, which, rising in French Congo a little east of the frontier, flows through the centre of the Spanish protectorate and enters the sea, after a course of 300 m., about midway between the Campo and Muni estuaries. The southern bank of the lower course of the Campo and the northern bank of the lower course of the Muni, form part of the protectorate. The mouths of the Campo and Benito are obstructed by sand bars, whereas the channel leading to the Muni is some 36 ft. deep and the river itself is more than double that depth. It is from this superiority of access that the country has been named after the Muni River. The course of all the rivers is obstructed by rapids in their descent from

the table-land to the plain. The greater part of the country is covered with dense primeval forest. This forest growth is due to the fertility of the soil and the great rainfall, Spanish Guinea with the neighbouring Cameroon country possessing one cf the heaviest rain records of the

world. The humidity of the climate joined to the excessive heat (the average tempera- ture is 78 F.) makes the climate trying. In the eastern parts of the protectorate the forest is succeeded by more open country. Among the most common trees are oil-palms, rubber-trees, ebony and mahogany. The forests are the home of monkeys and of innumerable birds and insects, often of gorgeous colouring. In the north-east of the country elephants are numerous.

The inhabitants are Bantu-Negroid, the largest tribe repre- sented being the Fang (q.v.), called by the Spaniards Pamues. They are immigrants from the Congo basin and have pushed before them the tribes, such as the Benga, which now occupy the coast-lands. The villages of the Fang are usually placed on the top of small hills. They cultivate the yam, banana and manioc, and are expert fishers and hunters. The European settlements are confined to the coast. There are trading stations at the mouths of the Campo, Benito and Muni rivers, at Bata, midway between the Campo and Benito, and on Elobey Chico. There are cocoa, coffee and other plantations, but the chief trade is in natural products, rubber, palm oil and palm kernels, and timber. Cotton goods and alcohol are the principal imports. Trade is largely in the hands of British and German firms. The annual value of the trade in 1903-1906 was about £100,000.

Spain became possessed of Fernando Po at the end of the i8tb century, and Spanish traders somewhat later established ” factories ” on the neighbouring coasts of the mainland, but no permanent occupation appears to have been contemplated. During the 19th century a number of treaties were concluded between Spanish naval officers and the chiefs of the lower Guinea coast, and when the partition of Africa was in progress Spain laid claim to the territory between the Campo river and the Gabun. Germany and France also claimed the territory, but in 1885 Germany withdrew in favour of France. After protracted negotiations between France and Spain a treaty was signed in June 1900 by which France acknowledged Spanish sovereignty over the coast region between the Campo and Muni rivers and the hinterland as far east as 11° 20′ E. of Greenwich, receiving in return concessions from Spain in the Sahara (see Rio de Org), and the right of pre-emption over Spain’s West African possessions. In 1901-1902 the eastern frontier was delimited, being modified in accordance with natural features. The newly acquired territories were placed under the superintendence of the governor-general of Fernando Po, sub-governors being stationed at Bata, Elobey Chico and Corisco.

See R. Beltran y Rozpide, La Guinea espanola (Madrid, 1901), and Guinea continental espanola (Madrid, 1903); H. Lorin, ” Les colonies

espagnoles du golfe de Guinee ” in Quest, dip. et col., vol. xxi. (1906) ; E. L. Perea, ” Estado actual de los territories espafioles de Guinea ” in Reiiista de geog. colon, y mercantil (Madrid, 1905) ; J. B. Roche, Aupays des Pahouins (Paris, 1904). A good map compiled by E. dAlmonte on the scale of 1 :200,ooo was published in Madrid in 1903. Consult also the works cited under Fernando Po.

MUNKACS, a town of Hungary, in the county of Bereg, 220′ m. E.N.E. of Budapest by rail. Pop. (1900), 13,640. It is situated on the Latorcza river, and on the outskirts of the East Beskides mountains, where the hills touch the plains. Its most noteworthy buildings are the Greek Catholic cathedral and the beautiful castle of Count Schonborn. In the vicinity, on a steep hill 580 ft. high, stands the old fort of Munkacs, which played an important part in Hungarian history, and was especially famous for its heroic defence by Helene Zrinyi, wife of Emeric Tokoli and mother of Francis Rakoczy II., for three years against the Austrians (1685-1688). It was afterwards used as a prison. Ypsilanti, the hero of Greek liberty, and Kazinczy, the regenerator of Hungarian letters, were confined in it. According to tradition, it was near Munkacs that the Hungarians, towards the end of the 9th century, entered the country. In 1896 in the fort was built one of the ” millennial

monuments ” established at seven different points of the kingdom.

MUNKACSY, MICHAEL VON (1844-1000), Hungarian painter, whose real name was Michael (Miska) Leo Lieb, was the third son of Michael Lieb, a collector of salt-tax in Munkacs, Hungary, and of Cacilia Rock. He was born in that town on the 20th of February 1844. In 1848 his father was arrested at Miskolcz for complicity in the Hungarian revolution, and died shortly after his release; a little earlier he had also lost his mother, and became dependent upon the charity of relations, of whom an uncle, Rock, became mainly responsible for his maintenance and education. He was apprenticed to a carpenter, Langi, in 1855, but shortly afterwards made the acquaintance of the painters Fischer and Szamossy, whom he accompanied to Arad in 1858. From them he received his first real instruction in art. He worked mainly at Budapest during 1863-1865, and at this time first adopted, from patriotic motives, the name by which he is always known. In 1865 he visited Vienna, returning to Budapest in the following year, and went thence to Munich, where he contributed a few drawings to the

Fliegende Blatter. About the end of 1867 he was working at Diisseldorf, where he was much influenced by Ludwig Knaus, and painted (1868- 1869) his first picture of importance, ” The Last Day of a Condemned Prisoner,” which was exhibited in the Paris Salon in 187c, and obtained for him a medaille unique and a very considerable reputation. He had already paid a short visit to Paris in 1867, but on the 25th of January 1872 he took up his permanent abode in that city, and remained there during the rest of his working life. Munkacsy’s other chief pictures are ” Milton dictating Paradise Lost to his Daughters ” (Paris Exhibition, 1878), ” Christ before Pilate ” (1881), ” Golgotha ” (1883), ” The Death of Mozart ” (1884), ” Arpad, chief of the Magyars, taking possession of Hungary,” painted for the new House of Parliament in Budapest, and exhibited at the Salon in 1893, and ” Ecce Homo.” He had hardly completed the latter work when a malady of the brain overtook him, and he died on the 30th of April 1900, at Endenich, near Bonn. Just before his last illness he had been offered the directorship of the Hungarian State Gallery at Budapest. Munkacsy’s masterly characterization, force and power of dramatic composition secured him a great vogue for his works, but it is doubtful if his reputation will be maintained at the level it reached during his lifetime. ” Christ before Pilate ” and ” Golgotha ” were sold for £32,000 and £35,000 respectively to an American buyer. Munkacsy received the following awards for his work exhibited at Paris: Medal, 1870, Medal, 2nd class; Legion of Honour, 1877; Medal of Honour, 1878; Officer of the Legion, 1878; Grand Prix, Exhibition of 1889; Commander of the Legion, 1889.

See F. Walther Ilges, ” M. von Munkacsy,” Kiinstler Mono- graphien (1899); C. Sedelmeyer, Christ before Pilate (Paris, 1886); J. Beavington Atkinson, ” Michael Munkacsy,” Magazine of Art (1S81). (E. F. S.)

MUNNICH, BURKHARD CHRISTOPH, Count (1683-1767), Russian soldier and statesman, was born at Neuenhuntorf, in Oldenburg, in 1683, and at an early age entered the French service. Thence he transferred successively to the armies of Hesse-Darmstadt and of Saxony, and finally, with the rank of general-in-chief and the title of count, he joined the array of Peter II. of Russia. In 1732 he became field-marshal and president of the council of war. In this post he did good service in the re-organization of the Russian army, and founded the cadet corps which was destined to supply the future genera- tions of officers. In 1734 he took Danzig, and with 1736 began the Turkish campaigns which made Miinnich’s reputation as a soldier. Working along the shores of the Black Sea from the Crimea, he took Ochakov after a celebrated siege in 1737, and in 1739 won the battle of

Stavutschina, and took Khotin (or Choczim), and established himself firmly in Moldavia. Marshal Miinnich now began to take an active part in political affairs, the particular tone of which was given by his rivalry with Biron, or Bieren, duke of Courland. But his activity was brought to a close by the revolution of 1741; he was arrested on his way

to the frontier, and condemned to death. Brought out for

execution, and withdrawn from the scaffold, he was later sent to Siberia, where he remained fcr several years, until the accession of Peter III. brought about his release in 1762. Catherine II., who soon displaced Peter, employed the old field-marshal as director-general of the Baltic ports. He died in 1767. Feld- marschall Miinnich was a fine soldier of the professional type, and many future commanders, notably Loudon and Lacy, served their apprenticeship at Ochakov and Khotin. As a statesman he is regarded as the founder of Russian Philhellenism. He had the grade of count of the Holy Roman Empire. The Russian 37th Dragoons bear his name.

He wrote an Hbauche pour donner une idee de la forme de V empire i« Russie (Leipzig, 1774), and his voluminous diaries have anpeared in various publications — Herrmann, Beitrage zur Geschichte des russischen Reichs (Leipzig. 1843). See Hempel, Leben Miinnichs (Bremen, 1742) ; Ralem, Geschichte des F. M. Graf en Miinnich (Oldenburg, 1803 ; 2nd ed., 1838) ; Kostomarov, Peldmarschall Miinnich {Russische Geschichte inBiographien,v. 2).

MUNRO, SIR HECTOR (1726-1805), British general, son of Hugh Munro of Novar, in Cromarty, was born in 1726, and entered the army in 1749. He went to Bombay in 1761, in command of the 89th regiment, and in that year effected the surrender of Mahe from the French. Later, when in command of the Bengal army, he suppressed a mutiny of sepoys at Patna, and on the 23rd of October 1764 won the victory of Buxar against Shuja-ud-Dowlah, the nawab wazir of Oudh, and Mir Kasim, which ranks amongst the most decisive battles ever fought in India. Returning home, he became in 1768 M.P. for the Inverness Burghs, which he continued to represent in parliament for more than thirty years, though a considerable portion of this period was spent in India, whither he returned in 1778 to take command of the Madras army. In that year he took Pondicherry from the French, but in 1780 he was defeated by Hyder Ali near Conjeeveram, and forced .to fall back on St Thomas's Mount. There Sir Eyre Coote took over command of the army, and in 1781 won a signal victory against Hyder Ali at Porto Novo, where Munro was in command of the right

division. Negapatam was taken by Munro in November of the same year; and in 1782 he returned to England. He died on the 27th of December 1805.

MUNRO, HUGH ANDREW JOHNSTONE (1819-1885), British scholar, was born at Elgin on the 19th of October 1819. He was educated at Shrewsbury school, where he was one of Kennedy's first pupils, and proceeded to Trinity College, Cam- bridge, in 1838. He became scholar of his college in 1840, second classic and first chancellor's medaliist in 1842, and fellow of his college in 1843. He became classical lecturer at Trinity College, and in 1869 was elected to the newly-founded chair of Latin at Cambridge, but resigned it in 1872. The great work on which his reputation is mainly based is his edition of Lucretius, the fruit of the labour of many years (text only, i vol., i860; text, commentary and translation, 2 vols., 1864). As a textual critic his knowledge was profound and his judgment unrivalled; and he made close archaeological studies by frequent travels in Italy and Greece. In 1867 he published an improved text of Aetna with commentary, and in the following year a text of Horace with critical introduction, illustrated by specimens of ancient gems selected by C. W. King. His knowledge and taste are nowhere better shown than in his Criticisms and Elucidations of Catullus (1878). He was a master of the art of Greek and Latin verse composition. His contri- butions to the famous volume of Shrewsbury verse, Sabrinae corolla, are among the most remarkable of a remarkable collec- tion. His Translations into Latin and Greek Verse were privately printed in 1884. Like his translations into English, they are characterized by minute fidelity to the original, but never cease to be idiomatic. He died at Rome on the 30th of March 1885.

See Memoir by J. D. Duff, prefixed to a re-issue of the trans, of Lucretius in " Bohn's Classical Library " (1908).

MUNRO, Monro or Monroe, ROBERT (d. c. 1680), Scots general, was a member of a well-known family in Ross-shire, the Munroes of Foulis. With several of his kinsmen he served in the continental wars under Gustavus Adolphus; and he

appears to have returned to Scotland about 1638, and to have taken some part in the early incidents of the Scottish rebellion against Charles I. In 1642 he went to Ireland, nominally as second in

command under Alexander Leslie, but in fact in chief command of the Scottish contingent against the Catholic rebels. After taking and plundering Newry in April 1642, and ineffec- tually attempting to subdue Sir Phelim O'Neill, Munro succeeded in taking prisoner the earl of Antrim at Dunluce. The arrival of Owen Roe O'Neill in Ireland strengthened the cause of the rebels (see O'Neill), and Munro, who was poorly supplied with provisions and war materials, showed little activity. Moreover, the civil war in England was now creating confusion among parties in Ireland, and the king was anxious to come to terms with the Catholic rebels, and to enlist them on his own behalf against the parliament. The duke of Ormonde, Charles's lieutenant-general in Ireland, acting on the king's orders, signed a cessation of hostilities with the Catholics on the 15th of September 1643, and exerted himself to despatch aid to Charles in England. Munro in Ulster, holding his commission from the Scottish parliament, did not recognize the armistice, and his troops accepted the solemn league and covenant, in which they were joined by many English soldiers who left Ormonde to join him. In April 1644 the English parliament entrusted Munro with the command of all the forces in Ulster, both English and Scots. He thereupon seized Belfast, made a raid into the Pale, and unsuccessfully attempted to gain possession of Dundalk and Drogheda. His force was weakened by the necessity for sending troops to Scotland to withstand Montrose; while Owen Roe O'Neill was strengthened by receiving supplies from Spain and the pope. On the 5th of June 1646 was fought the battle of Benburb, on the Blackwater, where O'Neill routed Munro, but suffered him to withdraw in safety to Carrickfergus. In 1647 Ormonde was compelled to come to terms with the English parliament, who sent commissioners to Dublin in June of that year. The Scots under Munro refused to surrender Carrick- fergus and Belfast when ordered by the parliament to return to Scotland, and Munro was superseded by the appointment of Monk to the chief command in Ireland. In September 1648 Carrickfergus was delivered over to Monk by treachery, and Munro was taken prisoner. He was committed to the Tower I of London, where he remained a prisoner for five years. In 1654 he was permitted by Cromwell to reside in Ireland, where he had estates in right of his wife, who was the widow of Viscount Montgomery of Ardes. Munro continued to live quietly near Comber, Co. Down, for many years, and probably died there about 1680. He was in part the original of Dugald Dalgetty in Sir Walter Scott's Legend of Montrose.

See Thomas Carte, History of the Life of James, Duke of Ormonde (6 vols., Oxford, 1851); Sir J. T. Gilbert, Contemporary History of Affairs in Ireland 1641-1652 (3 vols., Dublin, 1879-1880) and History of the

Irish Confederation and the War in Ireland (7 vols., Dublin, 1882-1891); John Spalding, Memorials of the Troubles in Scotland and England (2 vols., Aberdeen, 1850); The Montgomery MSS., 1603-1703, edited by G. Hill (Belfast, 1869); Sir Walter Scott, The Legend of Montrose, author's preface.

MUNRO, SIR THOMAS (1761-1827), Anglo-Indian soldier and statesman, was born at Glasgow on the 27th of May 1761, the son of a merchant. Educated at Glasgow University, he was at first intended to enter his father's business, but in 1789 he was appointed to an infantry cadetship in Madras. He served with his regiment during the hard-fought war against Hyder Ali (1780-83), and again in the first campaign against Tippoo (1790-92). He was then chosen as one of four military officers to administer the Baramahal, part of the territory acquired from Tippoo, where he remained for seven years, learning the principles of revenue survey and assessment which he afterwards applied throughout the presidency of Madras. After the final downfall of Tippoo in 1799, ne spent a short time restoring order in Kanara; and then for another seven years (1800-1807) he was placed in charge of the northern districts " ceded " by the nizam of Hyderabad, where he introduced the ryotwari system of land revenue. After a long furlough in England, during which he gave valuable evidence upon

matters connected with the renewal of the company's charter, he returned to Madras in 1814 with special instructions to reform the judicial and police systems. On the outbreak of the Pindari War in 1817, he was appointed as brigadier-general to command the reserve division formed to reduce the southern territories of the Peshwa. Of his signal services on this occasion Canning said in the House of Commons: " He went into the field with not more than five or six hundred men, of whom a very small pro- portion were Europeans. . . . Nine forts were surrendered to him or taken by assault on his way; and at the end of a silent and scarcely observed progress he emerged . . . leaving everything secure and tranquil behind him." In 1820 he was appointed governor of Madras, where he founded the systems of revenue assessment and general administration which substantially remain to the present day. His official minutes, published by Sir A. Arbuthnot, form a manual of experience and advice for the modern civilian. He died of cholera on the 6th of July 1827, while on tour in the " ceded " districts, where his name is preserved by more than one memorial. An equestrian statue of him, by Chantrey, stands in Madras city.

See biographies by G. R. Gleig (1830), Sir A. Arbuthnot (1881) and J. Bradshaw (1894).

MUNSHI, or Moonshi, the Urdu name of a writer or secretary, used in India of the native language teachers or secretaries employed by Europeans.

MUNSTER, 6E0RG, Count zu (1776-1844), German palae- ontologist, was born on the 17th of February 1776. He formed a famous collection of fossils, which was ultimately secured by the Bavarian state, and formed the nucleus of the palaeontological museum at Munich. Count Munster assisted Goldfuss in his great work Pctrefacta Germaniae. He died at Bayreuth on the 23rd of December 1844.

MUNSTER, SEBASTIAN (1489-1552), German geographer, mathematician and Hebraist, was born at Ingelheim in the Palatinate. After studying at Heidelberg and Tubingen, he entered the Franciscan order, but abandoned it for Luther- anism about 1529. Shortly afterwards he was appointed court preacher at Heidelberg, where he also lectured in Hebrew and Old Testament exegesis. From 1536 he taught at Basel, where he published his Cosmographia universalis in 1544, and where he died of the plague on the 23rd of May 1552. A disciple of Elias Levita, he was the first German to edit the Hebrew Bible (2 vols., fol., Basel, 1 534-1 535); this edition was accom- panied by a new Latin translation and a large number of anno- tations. He published more than one Hebrew grammar, and was the first to prepare a Grammatica chaldaica (Basel, 1527). His lexicographical labours included a Dictionarium chaldaicum (1527), and a Dictionarium trilingue, of Latin, Greek and Hebrew (1530). But his most important work was his Cosmo- graphia, which also appeared in German as a Beschreibung oiler Lander, the first detailed, scientific and popular description of the world in Miinster's native language, as well as a supreme effort of geographical study and literature in the Reformation period. In this Munster was assisted by more than one hundred and twenty collaborators.

The most valued edition of the Cosmographia or Beschreibung is that of 1550, especially prized for its portraits and its city and costume pictures. Besides the works mentioned above we may notice Miinster's Germaniae descriptio of 1530, his Novus orbis of 1532, his Mappa Europae of 1536, his Rhaetia of 1538, his editions of Solinus, Mela and Ptolemy in 1 538-1 540 and among non- geographical treatises his Horologiographia, 1531, on dialling (see Dial), his Organum uranicum of 1536 on the planetary motions, and his Rudimenta mathematica of 1551. His published maps numbered

See V. Hantzsch, Sebastian Munster (1898), in vol. xviii. of the Publications of the Royal Society of Sciences of Saxony, Historical-Philological Section).

MUNSTER, a town of Germany, in the district of Upper Alsace, 16 m. from Colmar by rail, and at the foot of the Vosges Mountains. Pop. (1905), 6078. Its principal industries are spinning, weaving and bleaching. The town owes its origin to a Benedictine abbey, which was founded in the 7th century, and at one time it was a free city of the empire. In its

neighbourhood is the ruin of Schwarzenberg. The Munstertal, or Gregoriental, which is watered by the river Fecht, is famous for its cheese.

See Rathgeber, Miinster-im-Gregoriental (Strassburg, 1874) and F. Hecker, Die Stadt und das Tal zu Miinster im St Gregoriental (Munster, 1890).

MUNSTER, a town of Germany, capital of the Prussian pro- vince of Westphalia, and formerly the capital of an important bishopric. It lies in a sandy plain on the Dortmund-Ems canal, at the junction of several railways, 107 m. S.W. of Bremen on the line to Cologne. Pop. (1885), 44,060; (1905) 81,468. The town preserves its medieval character, especially in the ” Prinzipal-Markt ” and other squares, with their lofty gabled houses and arcades. The fortifications were dismantled during the 1 8th century, their place being taken by gardens and promenades. Of the many churches of Munster the most important is the cathedral, one of the most striking in Germany, although disfigured by modern decorations. It was rebuilt in the 13th and 14th centuries, and exhibits a combination of Romanesque and Gothic forms; its chapter-house is specially fine. The beautiful Gothic church of St Lambert (14th century) was largely rebuilt after 1868; on its tower, which is 312 ft. in height, hang three iron cages in which the bodies of John of Leiden and two of his followers were exposed in 1536. The church of St Ludger, erected in the Romanesque style about n 70, was extended in the Gothic style about 200 years later; it has a tower with a picturesque lantern. The church of St Maurice, founded about 1070, was rebuilt during the 19th century, and the Gothic church of Our Lady dates from the 14th century. Other noteworthy buildings are the town-hall, a fine Gothic building of the 14th century, and the

Stadtkeller, which contains a collection of early German paintings. The room in the town- hall “called the Friedens Saal, in which the peace of Westphalia was signed in October 1648, contains portraits of many ambas- sadors and princes who were present at the ceremony. The Schloss, built in 1767, was formerly the residence of bishops of Munster. The private houses, many of which were the winter residences of the nobility of Westphalia, are admirable examples of German domestic architecture in the 16th, 17th and 18th centuries. The university of Munster, founded after the Seven Years’ War and closed at the beginning of the 19th century, was reopened as an academy in 1818, and again attained the rank of a university in 1902. It possesses faculties of theology, philosophy and law. In connexion with it are botanical and zoological gardens, several scientific collections, and a library of 120,000 volumes. Munster is the seat of a Roman Catholic bishop and of the administrative and judicial authorities of Westphalia, and is the headquarters of an army corps. The Westphalian society of antiquaries and several other learned bodies also have their headquarters here. Industries include weaving, dyeing, brewing and printing, and the manufacture of furniture and machines. There is a brisk trade in cattle, grain and other products of the neighbourhood.

History. — Munster is first mentioned about the year 800, when Charlemagne made it the residence of Ludger, the newly- appointed bishop of the Saxons. Owing to its distance from any available river or important highway, the growth of the settlement round the monasterium was slow, and it was not until after 1186 that it received a charter, the name Munster having supplanted the original name of Mimegardevoord about a century earlier. During the 13th and 14th centuries the town was one of the most prominent members of the Hanseatic League. At the time of the Reformation the citizens were inclined to adopt the Protestant doctrines, but the excesses of the Anabaptists led in 1535 to the armed intervention of the bishop and to the forcible suppression of all divergence from the older faith. The Thirty Years’ War, during which Munster suffered much from the Protestant armies, was ter- minated by the peace of Westphalia, sometimes called the peace of Munster, because it was signed here on the 24th of October 1648. The authority of the bishops, who seldom resided at Munster, was usually somewhat limited, but in 1661 Bishop

Christoph Bemhard von Galen took the place by force, built a citadel, and deprived the citizens of many of their privileges. During the Seven Years’ War Munster was occupied both by the French and by their foes. Towards the close of the 1 8th century the town was recognized as one of the intellectual centres of Germany.

The bishopric of Munster embraced an area of about 2500 sq. m. and contained about 350,000 inhabitants. Its bishops, who resided generally at Ahaus, were princes of the empire. In the 17th century Bishop Galen, with his army of 20,000 men, was so powerful that his alliance was sought by Charles II. of England and other European sovereigns. The bishopric was secularized and its lands annexed to Prussia in 1803.

See Geisberg, Merkwiirdigkeiten der Stadt Munster (1877) ; Erhard, Geschichle Munsfers (1837); A. Tibus, Die Stadt Munster (Munster, 1882) ; Hellinghaus, Quellen und Forschungen zur Geschichte der Stadt Miinster (Munster, 1898); Pieper, Die alte Universitat Munster 1773-1818 (Munster, 1902). See also Tucking, Geschichte des Stifts Munster unter C. B. von Galen (Munster, 1865).

MUNSTER, a province of Ireland occupying the S.W. part of the island. It includes the counties Clare, Tipperary, Limerick, Kerry, Cork and Waterford (q.v. for topography, &c). After the occupation of Ireland by the Milesians, Munster (Mumha) became nominally a provincial kingdom ; but as the territory was divided between two families there was constant friction and it was not until 237 that Oliol Olum established himself as king over the whole. In 248 he divided his kingdom between his two sons, giving Desmond {q.v., Des-Mumha) to Eoghan and Thomond (Tuadh-Mumha) or north Munster to Cormac. He also stipulated that the rank of king of Munster should belong in turn to their descendants. In this way the kingship of Munster survived until 1194; but there were kings of Desmond and Thomond down to the 16th century. Munster was originally of the same extent as the present province, excepting that it included the district of Ely, which belonged to the O'Carrols and formed a part of the present King's County. During the 16th century, however, Thomond was for a time included ih Connaught, being declared a county under the name of Clare (q.v.) by Sir Henry Sidney. Part of Munster had been included in the system of shiring generally attributed to King John. In 1570 a provincial presidency of Munster (as of Connaught) was established by Sidney, Sir John Perrot being the first president, and lasted until 1672. Under Perrot a practically new shiring was carried out.

MUNSTER AM STEIN, a watering-place of Germany, in the Prussian Rhine province, on the Nahe, i\ m. S. of Kreuznach, on the railway from Bingerbriick to Strassburg. Pop. (1905), 915. Above the village are the ruins of the castle of Rhein- grafenstein (12th century), formerly a seat of the count palatine of the Rhine, which was destroyed by the French in 1689, and those of the castle of Ebernburg,

the ancestral seat of the lords of Sickingen, and the birthplace of Franz von Sickingen, the famous landsknecht captain and protector of Ulrich von Hutten, to whom a monument was erected on the slope near the ruins in 1889. The spa (saline and carbonate springs), specific in cases of feminine disorders, is visited by about 5000 patients annually.

See Welsch, Das Sol- und Thermalbad Munster am Stein (Kreuz- nach, 1886) and Messer, Fuhrer durch Bad Kreuznach und Miinster am Stein (Kreuznach, 1905).

MUNSTERBERG, HUGO (1 863-) , German- American psycho-physiologist, was born at Danzig. Having been extraordinary professor at Freiburg-im-Breisgau, he became in 1892 pro- fessor of psychology at Harvard University. Among his more important works are Beitrdge zur experimentellen Psychologie (4 vols., Freiburg, 1889-1892); Psychology and Life (New York, 1899); Grundziige der Psychologie (Leipzig, 1900); American Traits from the Point of View of a German (Boston, 1901); Die Amerikaner (several ed.; Eng. trans. 1904); Science and Idealism- (New York, 1906); Philosophie der Werte (Leipzig, 1908); Aus Deutsch-Amerika (Berlin, 1908); Psychology and Crime (New York, 1908). He has been prominently identified with the modern developments of experimental psychology

(see Psychology), and his sociological writings display the acuteness of a German .philosophic mind as applied to the study of American life and manners.

MUNSTERBERG, a town of Germany, in the Prussian pro- vince of Silesia, on the Oblau, 36 m. by rail S. of Breslau. Pop. (1905), 8475. It is partly surrounded by medieval walls. It has manufactures of drain-pipes and fireproof bricks; there are also sulphur springs. Miinsterberg was formerly the capital of the principality of the same name, which existed from the 14th century down to 1791, when it was purchased by the Prussian crown. Near the town is the former Cistercian abbey of Heinrichau.

MUNTANER, RAMON (1265-1336?), Catalan historian, was born at Peralada (Catalonia) in 1265. The chief events of his career are recorded in his chronicle. He accompanied Roger de Flor to Sicily in 1300, was present at the siege of Messina, served in the expedition of the Almogavares against Asia Minor, and became the first governor of

Gallipoli. Later he was appointed governor of Jerba or Zerbi, an island in the Gulf of Gabes, and finally entered the service of the infante of Majorca. On the 15th of May 1325 (some editions give the year 1335) he began his Chronica, o descripcio dels fets, e hazanas del inclyt rey Don laume Primer, in obedience, as he says, to the express command of God who appeared to him in a vision. Muntaner's book, which was first printed at Valencia in 1558, is the chief authority for the events of his period, and his narrative, though occasionally prolix, uncritical and egotistical, is faithful and vivid. He is said to have died in 1336.

His chronicle is most accessible in the edition published by Karl Lanz at Stuttgart in 1844.

MUNTJAC, the Indian name of a small deer typifying the genus Cervulus, all the members of which are indigenous to the southern and eastern parts of Asia and the adjacent islands, and are separated by marked characters from all their allies. For the distinctive features of the genus see Deer. As regards general characteristics, all muntjacs are small compared with the majority of deer, and have long bodies and rather short limbs and neck. The antlers of the bucks are small and simple;

The Indian Muntjac (Cervulus muntjac). the main stem or beam, after giving off a short brow-tine, in- clining backwards and upwards, being unbranched and pointed, and when fully developed curving inwards and somewhat down- wards at the tip. These small antlers are supported upon pedicles, or processes of the frontal bones, longer than in any other deer, the front edges of these being continued downwards as strong ridges passing along the sides of the face above the eyes. From this feature the name rib-faced deer has been suggested for the muntjac. The upper canine teeth of the males are large and sharp, projecting outside the mouth as tusks, and loosely implanted in their sockets. In the females they are much smaller.

Muntjacs are solitary animals, even two being rarely seen together. They are fond of hilly ground covered with forests, in the dense thickets of which they pass most of their time, only coming to the skirts of the woods at morning and evening to graze. They carry the head and neck low and the hind-quarters high, their action in running being peculiar and not elegant, somewhat resembling the pace of a sheep. Though with no power of sustained speed or extensive leaping, they are remark- able for flexibility of body and facility of creeping through tangled underwood. A popular name with Indian sportsmen is " barking deer," on account of the alarm-cry — a kind of short shrill bark, like that of a fox, but louder. When attacked by dogs, the males

use their sharp canine teeth, which inflict deep and even dangerous wounds.

In the Indian muntjac the height of the buck is from 20 tc 22 in. ; allied types, some of which have received distinct names, occur in Burma and the Malay Peninsula and Islands. Among these, the Burmese C. muntjac grandicornis is noteworthy on account of its large antlers. The Tibetan muntjac (C. lachrymans), from Moupin in eastern Tibet and Hangchow in China, is somewhat smaller than the Indian animal, with a bright reddish-brown coat. The smallest member of the genus (C. reevesi) occurs in southern China and has a reddish-chestnut coat, speckled with yellowish grey and a black band down the nape. The Tenasserim muntjac (C. feae), about the size of the Indian species, is closely allied to the hairy-fronted muntjac (C. crinifrons) of eastern China, but lacks the tuft of hair on the forehead. The last-mentioned species, by its frontal tuft, small rounded ears, general brown coloration, and minute antlers, connects the typical muntjacs with the small tufted deer or tufted muntjacs of the genus Elaphodus of eastern China and Tibet. These last have coarse bristly hair of a purplish-brown colour with light markings, very large head-tufts, almost concealing the minute antlers, of which the pedicles do not extend as ribs down the face. They include E. cephalophus of Tibet, E. michianus of Ningpo, and E. ichangensis of the mountains of Ichang. (R. L.*)

MUNZER, THOMAS (c. 1480-1525), German religious enthu- siast, was born at Stolberg in the Harz near the end of the 15th century, and educated at Leipzig and Frankfort, graduating in theology. He held preaching appointments in various places, but his restless nature prevented him from remaining in one position for any length of time. In 1520 he became a preacher at the church of St Mary, Zwickau, and his rude eloquence, together with his attacks on the monks, soon raised him to influence. Aided by Nicholas Storch, he formed a society the principles of which were akin to those of the Taborites, and claimed that he was under the direct influence of the Holy Spirit. His zeal for the purification of the Church by casting out all unbelievers brought him into conflict with the governing body of the town, and he was compelled to leave Zwickau. He then went to Prague, where his preaching won numerous ad- herents, but his violent language brought about his expulsion from this city also. At Easter 1523 Munzer came to Allstedt, and was soon appointed preacher at the church of St John, where he made extensive alterations in the services. His violence, however, aroused the hostility of Luther, in retaliation for which Munzer denounced the Wittenberg teaching. His preaching soon produced an uproar in Allstedt, and after holding his

own for some time he left the town and went to Miihlhausen, where Heinrich Pfeiffer was already preaching doctrines similar to his own. The union of Munzer and Pfeiffer caused a disturb- ance in this city and both were expelled. Munzer went to Nuremberg, where he issued a writing against Luther, who had been mainly instrumental in bringing about his expulsion from Saxony. About this time his teaching became still more violent. He denounced established governments, and advocated common ownership of the means of life. After a tour in south Germany he returned to Miihlhausen, overthrew the governing body of the city, and established a communistic theocracy. The Peasants' War had already broken out in various parts of Germany; and as the peasantry around Miihlhausen were imbued with Miinzer's teaching, he collected a large body of men to plunder the surrounding country. He established his camp at Frankenhausen; but on the 15th of May 1525 the peasants were dispersed by Philip, landgrave of Hesse, who captured Munzer and executed him on the 27th at Miihlhausen. Betore his

death he is said to have written a letter admitting the justice of his sentence.

His Aussgetriickte Emplossung des falschen Glaubens has been edited by R. Jordan (Muhlhausen, 1901), and a life of Munzer, Die Histori von Thome Miintzer des Anfengers der duringischen Uffrur, has been attributed to Philip Melanchthon (Hagenau, 1525). See G. T. Strobel, Leben, Schriften und Lehren Thomd Miintzers (Nuremberg, 1795); J. K. Seidemann, Thomas Munzer (Leipzig, 1842); O. Merx, Thomas Munzer und Heinrich Pfeiffer (Gottingen, 1889); G. Wolfrau, Thomas Munzer in Allstedt (Jena, 1852).

MUNZINGER, WERNER (1832-1875), Swiss linguist and traveller, was born at Olten in Switzerland, on the 21st of April 1832. After studying natural science, Oriental languages and history, at Bern, Munich and Paris, he went to Egypt in 1852 and spent a year in Cairo perfecting himself in Arabic. Entering a French mercantile house, he went as leader of a trading expe- dition to various parts of the Red Sea, fixing his quarters at Massawa, where he acted as French consul. In 1855 he removed to Keren, the chief town of the Bogos, in the north of Abyssinia, which country he explored during the next six years. In 1861 he joined the expedition under T. von Heuglin to Central Africa, but separated from him in November in northern Abyssinia,

proceeding along the Gash and Atbara to Khartum. Thence, having meantime succeeded Heuglin as leader of the expedition, he travelled in 1862 to Kordofan, failing, however, in his attempt to reach Darfur and Wadai. After a short stay in Europe in 1863, Munzinger returned to the north and north-east border- lands of Abyssinia, and in 1865, the year of the annexation of Massawa by Egypt, was appointed British consul at that town. He rendered valuable aid to the Abyssinian expedition of 1867-68, among other things exploring the almost unknown Afar country. In acknowledgment of his services he received the C.B. In 1868 he was appointed French consul at Massawa, and in 187 1 was named by the khedive Ismail governor of that town with the title of bey. In 1870, with Captain S. B. Miles, Mun- zinger visited southern Arabia. As governor of Massawa he annexed to Egypt the Bogos and Hamasen provinces of northern Abyssinia, and in 1872 was made pasha and governor-general of the eastern Sudan. It is believed that it was on his advice that Ismail sanctioned the Abyssinian enterprise, but on the war assuming larger proportions in 1875 the command of the Egyptian troops in northern Abyssinia was taken from Munzinger, who was selected to command a small expedition intended to open up communication with Menelek, king of Shoa, then at enmity with the negus Johannes (King John) and a potential ally of Egypt. Leaving Tajura Bay on the 27th of October 1875 Munzinger started for Ankober with a force of 350 men, being accompanied by an envoy from Menelek. The desert country to be traversed was in the hands of hostile tribes, and on reaching Lake Aussa the expedition was attacked during the night by Gallas — Mun- zinger, with his wife and nearly all his companions, being killed.

Munzinger's contributions to the knowledge of the country, people and languages of north-eastern Africa are of solid value. See Proc. R.G.S., vol. xiii. ; Journ. R.G.S., vols, xxxix., xli. and xlvi. (obituary notice); Petermanns Mitteilungen for 1858, 1867, 1872., et seq. ; Dietschi and Weber, Werner Munzinger, ein Lebensbild ('875); J- v. Keller-Zschokke, Werner Munzinger Pasha (1890). Munzinger published the following works: liber die Sitten und das Recht der Bogos (1859) ; Ostafrikanische Studien (1864 ; 2nd ed., 1883 ; his most valuable book) ; Die deutsche Expedition in Ostafrika (1865) ; Vocabulaire de la langue de Tigre (1865), besides papers in the geo- graphical serials referred to, and a memoir on the northern borders of Abyssinia in the Zeitschrift fur allgemeine Erdkunde, new series, vol. iii.

MURAD, or Amurath, the name of five Ottoman sultans.

Murad I., surnamed Khudavendighiar (1319-1389), was the son of

Orkhan and the Greek princess Nilofer, and succeeded his father in 1359. He was the first Turkish monarch to obtain a definite footing in Europe, and his main object throughout his career was to extend the European dominions of Turkey. The revolts of the prince of Caramania interfered with the realization of this plan, and trouble was caused from this quarter more than once during his reign until the decisive battle of Konia (1387), when the power of the prince of Caramania was broken.

The state of Europe facilitated Murad's projects: civil war and anarchy prevailed in most of the countries of Central Europe, where the feudal system was at its last gasp, and the small Balkan states were divided by mutual jealousies. The capture of Adrianople, followed by other conquests, brought about a coalition under the king of Hungary against Murad, but his able lieutenant Lalashahin, the first beylerbey of Rumelia, defeated the allies at the battle of the Maritsa in 1363. In 1366 the king of Servia was defeated at Samakov and forced to pay tribute. Kustendil, Philippopolis and Nish fell into the hands of the Turks; a renewal of the war in 1381 led to the capture of Sofia two years later. Europe was now aroused; Lazar, king of Servia, formed an alliance with the Albanians, the Hungarians and the Moldavians against the Turks. Murad hastened back to Europe and met his enemies on the field of Kossovo (1389). Victory finally inclined to the side of the Turks. When the rout of the Christians was complete, a Servian named Milosh Kabilovich penetrated to Murad's tent on pretence of communicating an important secret to the sultan, and stabbed the conqueror. Murad was of independent character and remarkable intelligence. He was fond of pleasure and luxury, cruel and cunning. Long relegated to the command of a distant province in Asia, while his brother Suleiman occupied an enviable post in Europe, he became revengeful; thus he exercised great cruelty in the repression of the rebellion of his son Prince Sauji, the first instance of a sultan's son taking arms against his father. Murad transferred the Ottoman capital from Brusa to Adrianople, where he built a palace and added many embellishments to the town. The development of the feudal system of timars and ziamets and its extension to Europe was largely his work.

Murad II. (1403-1451) succeeded his father Mahommed I. in 1421. The attempt of his uncle Prince Mustafa to usurp the throne, supported as it was by the Greeks, gave trouble at the outset of his reign, and led to the unsuccessful siege of Constantinople in 1422. Murad maintained a long struggle against the Bosnians and Hungarians, in the course cf which Turkey sustained many severe reverses through the valour of Janos Hunyadi. Accordingly in 1444 he

concluded a treaty at Szegedin for ten years, by which he renounced all claim to Servia and recognized George Brancovich as its king. Shortly after this, being deeply affected by the death of his eldest son Prince Ala-ud-din, he abdicated in favour of Mahommed, his second son, then fourteen years of age. But the treacherous attack, in violation of treaty, by the Christian powers, imposing too hard a task on the inexperienced young sovereign, Murad returned from his retirement at Magnesia, crushed his faithless enemies at the battle of Varna (Novemebr 10, 1444), and again withdrew to Magnesia. A revolt of the janissaries induced him to return to power, and he spent the remaining six years of his life in warfare in Europe, defeating Hunyadi at Kossovo (October 17-19, 1448). He died at Adrianople in 1451, and was buried at Brusa. By some considered as a fanatical devotee, and by others as given up to mysticism, he is generally described as kind and gentle in disposition, and devoted to the interests of his country.

Murad III. (1546-1595), was the eldest son of Selim II., and succeeded his father in 1574. His accession -marks the definite beginning of the decline of the Ottoman power, which had only been maintained under Selim II. by the genius of the all-powerful grand vizier Mahommed Sokolli. For, though Sokolli remained in office until his assassination in October 1578, his authority was undermined by the harem influences, which with Murad III. were supreme. Of these the most powerful was that of the sultan's chief wife, named Safie (the pure), a beautiful Venetian of the noble family of Baffo, whose father had been governor of Corfu, and who had been captured as a child by Turkish corsairs and sold into the harem. This lady, in spite of the sultan's sensuality and of the efforts, temporarily successful, to supplant her in his favour, retained her ascendancy over him to the last. Murad had none of the qualities of a ruler. He was good-natured, though cruel enough on occasion: his accession had been marked by the murder, according to the

custom then established, of his five brothers. His will-power had early been undermined by the opium habit, and was further weakened by the sensual excesses that ultimately killed him. Nor had he any taste for rule; his days were spent in the society of musicians, buffoons and poets, and he himself dabbled in verse-making of a mystic tendency.

His one attempt at reform, the order forbidding the sale of intoxicants

so as to stop the growing intemperance of the janissaries, broke down on the opposition of the soldiery. He was the first sultan to share personally in the proceeds of the corruption which was undermining the state, realizing especially large sums by the sale of offices. This corruption was fatally apparent in the army, the feudal basis of which was sapped by the confiscation of fiefs for the benefit of nominees of favourites of the harem, and by the intrusion, through the same influences of foreigners and rayahs into the corps of janissaries, of which the discipline became more and more relaxed and the temper increasingly turbulent. In view of this general demoralization not even the victorious outcome of the campaigns in Georgia, the Crimea, Daghestan, Yemen and Persia (1578-1590) could prevent the decay of the Ottoman power; indeed, by weakening the Mussulman states, they hastened the process, since they facilitated the advance of Russia to the Black Sea and the Caspian.

Murad, who had welcomed the Persian War as a good oppor- tunity for ridding himself of the presence of the janissaries, whom he dreaded, had soon cause to fear their triumphant return. Incensed by the debasing of the coinage, which robbed them of part of their pay, they invaded the Divan clamouring for the heads of the sultan's favourite, the beylerbey of Rumelia, and of the defterdar (finance minister), which were thrown to them (April 3, 1589). This was the first time that the janissaries had invaded the palace: a precedent to be too often followed. The outbreak of another European war in 1592 gave the sultan an opportunity of ridding himself of their presence. Murad died in 1595, leaving to his successor a legacy of war and anarchy.

It was under Murad III. that England's relations with the Porte began. Negotiations were opened in 1579 with Queen Elizabeth through certain British merchants; in 1580 the first Capitulations with England were signed; in 1583 William Harebone, the first British ambassador to the Porte, arrived at Constantinople, and in 1593 commercial Capitulations were signed with England granting the same privileges as those enjoyed by the French. (See Capitulations.)

Murad IV. (1611-1640) was the son of Sultan Ahmed I., and succeeded his uncle Mustafa I. in 1623. For the first nine years of his reign his youth prevented him from taking more than an observer's part in affairs. But the lessons thus learnt were sufficiently striking to mould his whole character and policy. The minority of the sultan gave full play to the anarchic elements in the state; the soldiery, spahis and janissaries, conscious of their power and reckless through impunity, rose in revolt whenever the whim seized them, demanding privileges

and the heads of those who displeased them, not sparing even the sultan's favourites. In 163 1 the spahis of Asia Minor rose in revolt, in protest against the deposition of the grand vizier Khosrev: their representatives crowded to Constantinople, stoned the new grand vizier, Hafiz, in the court of the palace, an

His severity has remained legendary. Death was the penalty for the least offence, and no past services — as Koes Mahommed was to find to his cost — were admitted in extenuation. The use of tobacco, coffee, opium and wine were forbidden on pain of death; eighteen persons are said to have been put to death in a single day for infringing this rule. During his whole reign, indeed, supposed offenders against the sultan's authority were done to death, singly or in thousands. The tale of his victims is said to have exceeded 100,000.

But if he was the most cruel, Murad was also one of the most manly, of the later sultans. He was of gigantic strength, which he maintained by constant physical exercises. He was also fond of hunting, and for this reason usually lived at Adrianople. He broke through the alleged tradition, bequeathed by Suleiman the Magnificent to his successors, that the sultan should not command the troops in person, and took command in the Persian war which led to the capture of Bagdad (1638) and the conclusion of an honourable peace (May 7, 1639). Early in 1640 he died, barely twenty-nine years of age. The cause of his death was acute gout brought on by excessive drinking. In spite of his drunkenness, however, Murad was a bigoted Sunni, and the main* cause of his campaign against Persia was his desire to extirpate the Shia heresy. In the intervals of his campaignings and cruelties the sultan would amuse his entourage by exhibit- ing feats of strength, or compose verses, some of which were published under the pseudonym of Muradi.

See, for details of the lives of the above, J. von Hammer-Purgstall, Geschichte des osmanischen Reiches (Pest, 1840), where further authorities are cited.

Murad V. (1840-1904), eldest son of Sultan Abd-ul-Mejid, was born on the 21st of September 1840. On the accession of his uncle Abd-ul-Aziz, Prince Mahommed Murad Effendi — as he was then called — was deprived of all share in public affairs and imprisoned, owing to his opposition to the sultan's plan for altering the order of succession. On the deposition of Abd-ul-Aziz on the 30th of May 1876, Murad was haled from his prison by a mob of softas and soldiers of the " Young Turkey " party under Suleiman Pasha, and proclaimed " emperor by the grace of God and the will of the people." Three months later,

however, his health, undermined by his long confinement, gave way; and on the 31st of August he was deposed to make room for his younger brother, Abd-ul-Hamid II. He was kept in confinement in the Cheragan palace till his death on the 29th of August 1904.

See KeYatry, Mourad V., prince, sultan, prisonnier d'ttat 1840- 1876 (Paris, 1878); Djemaleddin Bey, Sultan Murad V., the Turkish Dynasty Mystery, 1876-1895 (London, 1895).

MURAENA, the name of an eel common in the Mediterranean, and highly esteemed by the ancient Romans; it was afterwards

Muraena picta, from the Indo-Pacific.

applied to the whole genus of fishes to which the Mediterranean species belongs, and which is abundantly represented in tropical and sub-tropieal seas, especially in rocky parts or on coral reefs. Some ninety species are known. In the majority a long fin runs from the head along the back, round the tail to the vent,

but all are destitute of pectoral and ventral fins. The skin is scaleless and smooth, in many species ornamented with varied and bright colours, so that these fishes are frequently mistaken for snakes. The mouth is wide, the jaws strong and armed with formidable, generally sharply pointed, teeth, which enable the Muraena not only to seize its prey (which chiefly consists of other fishes) but also to inflict serious, and sometimes danger- ous, wounds on its enemies. It attacks persons who approach its places of concealment in shallow water, and is feared by fishermen.

Some of the tropical Muraenas exceed a length of 10 ft., but most of the species, among them the Mediterranean species, attain to only half that length. The latter, the " morena " of the Italians and the Muraena helena of ichthyologists, was considered by the ancient Romans to be one of the greatest delicacies, and was kept in large ponds and aquaria. It is not confined to the coasts of southern Europe, but is spread over the Indian Ocean, and is not uncommon on the coasts of Australia. Its body is generally of a rich brown, marked with large yellowish spots, each of which contains smaller brown spots.

MURAL DECORATION, a general term for the art of ornament- ing wall surfaces. There is scarcely one of the numerous branches of

decorative art which has not at some time or other been applied to this purpose. 1 For what may be called the practical or furnishing point of view, see Wall-coverings. Here the subject is treated rather as part of the history of art. i. Reliefs sculptured in Marble or Stone.- — This is the oldest method of wall-decoration, of which numerous examples exist. The tombs and temples of Egypt are rich in this kind of mural ornament of various dates, extending over nearly 5000 years. These sculptures are, as a rule, carved in low relief; in many cases they are ” counter-sunk,” that is, the most projecting parts of the figures do not extend beyond the flat surface of the ground. Some unfinished reliefs discovered in the rock-cut tombs of Thebes show the manner in which the sculptor set to work. The plain surface of the stone was marked out by red lines into a number of squares of equal size. The use of this was probably twofold: first, as a guide in enlarging the design from a small drawing, a method still commonly practised; second, to help the artist to draw his figures with just proportions, following the strict canons which were laid down by the Egyptians. No excessive realism or individuality of style arising from a careful study of the life-model was permitted. 2 When the surface had been covered with these squares, the artist drew with a brush dipped in red the outlines of his relief, and then cut round them with his chisel.

When the relief was finished, it was, as a rule, entirely painted over with much minuteness and great variety of colours. More rarely the ground was left the natural tint of the stone or marble, and only the figures and hieroglyphs painted. In the case of sculpture in hard basalt or granite the painting appears often to have been omitted altogether. The absence of perspective effects and the severe self-restraint of the sculptors in the matter of composition show a sense of artistic fitness in this kind of decoration. That the rigidity of these sculptured pictures did not arise from want of skill or observation of nature on the part of the artists is apparent when we examine their representations of birds and animals; the special characteristics of each creature and species were unerringly caught by the ancient Egyptian, and reproduced in stone or colour, in a half-symbolic way, suggesting those peculiarities of form, plumage, or movement which are the ” differentia ” of each, other ideas bearing less directly on the point being eliminated.

The subjects of these mural sculptures are endless; almost every possible incident in man’s life here or beyond the grave is reproduced with the closest detail. The tomb of Tih at Sakkarah (about 45-00 B.C.) has some of the finest and earliest specimens of these mural sculptures, especially rich in illustra-

1 See also Ceramics ; Mosaic ; Painting ; Sculpture ; Tafestry ; Tiles; also Egypt; Art and Archaeology; Greek Art.; Roman Art; &c.

2 During the earliest times — more than 4000 years before our era — there appear to have been exceptions to this rule.

tions of the domestic life and occupations of the Egyptians. The latter tombs, as a rule, have sculptures depicting the religious ritual and belief of the people, and the temples combine these hieratic subjects with the history of the reigns and victor es of the Egyptian kings.

The above remarks as to style and manner of execution may be applied also to the wall-sculptures from the royal palaces of Nineveh and Babylon, the finest of which are shown by inscrip- tions to date from the time of Sennacherib to that of Sardana- palus (from 705 to 625 B.C.). These are carved in low relief with almost gem-like delicacy of detail on enormous slabs of white marble. The sacred subjects, generally representing the king worshipping one of the numerous Assyrian gods, are mostly large, often colossal in scale. The other subjects, illustrating the life and amusements of the king, his prowess in war or hunting, or long processions of prisoners and tribute-bearers coming to do him homage, are generally smaller and in some cases very minute in scale (fig. 1). The arrangement of these reliefs.

Fig. i. — Assyrian Relief , on a Marble Wall-slab from the Palace of Sardanapalus at Nineveh.

in long horizontal bands, and their reserved conventional treat- ment are somewhat similar to those of ancient Egypt, but they show a closer attention to anatomical truth and a greater love for dramatic effect than any of the Egyptian reliefs. As in the art of Egypt, birds and animals are treated with greater realism than human figures. A relief in the British Museum, representing a lioness wounded by an arrow in her spine and dragging helplessly her paralysed hind legs, affords an example of wonderful truth and pathos. Remarkable technical skill is shown in all these sculptures by the way in which the sculptors have obtained the utmost amount of effect with the smallest possible amount of relief, in this respect calling strongly to mind a similar peculiarity in the work of the Florentine Donatello.

The palace at Mashita on the hajj road in Moab, built by the Sasanian Chosroes II. (a.d. 614-627), is ornamented on the exterior with beautiful surface sculpture in stone. The designs are of peculiar interest as forming a link between Assyrian and Byzantine art, and they are not remotely connected with the decoration on Moslem

buildings of comparatively modern date. 3

Especially in Italy during the middle ages a similar treatment

3 Among the Mashita carvings occurs that oldest and most widely spread of all forms of Aryan ornament — the sacred tree between t*o animals. The sculptured slab over the ” lion-gate ” at Mycenae has the other common variety of this motive — the fire-altar between the beasts. These designs, occasionally varied by figures of human worshippers instead of the beasts, survived long after their meaning had been forgotten ; even down to the present day they frequently appear on carpets and other textiles of Oriental manufacture.

of marble in low relief was frequently used for wall-decoration. The most notable example is the beautiful series of reliefs on the west front of Orvieto Cathedral, the work of Giovanni Pisano and his pupils in the early part of the 14th century. These are small reliefs, illustrative of the Old and New Testaments, of graceful design and skilful execution. A growth of branching foliage serves to unite and frame the tiers of subjects.

Of a widely different class, but of considerable importance in the history of mural decoration, are the beautiful reliefs, sculp- tured in stone and marble, with which Moslem buildings in many parts of the world are ornamented. These are mostly geometrical patterns of great intricacy, which cover large surfaces, frequently broken up into panels by bands of more flowing ornament or Arabic inscriptions. The mosques of Cairo, India and Persia, and the domestic Moslem buildings of Spain are extremely rich in this method of decoration. In western Europe, especially during the 15th century, stone panelled-work with rich tracery formed a large part of the scheme of decoration in all the more splendid buildings. Akin to this, though without actual relief, is the stone tracery — inlaid flush into rough flint walls — which was a mode of ornament largely used for enriching the exteriors of churches in the counties of Norfolk and Suffolk. It is almost peculiar to that district, and is an example of the skill and taste with which the medieval builders adapted their method of ornamentation to the materials in hand.

2. Marble Veneer. — Another widely used method of mural decoration has been the application of thin marble linings to wall-surfaces, the

decorative effect being produced by the natural beauty of the marble itself and not by sculptured reliefs. One of the oldest buildings in the world, the so-called ” Temple of the Sphinx ” among the Giza pyramids, is built of great blocks of

. granite, the inside of the rooms being lined with slabs of semi-transparent African alabaster about 3 in. thick. In the 1st cen- tury thin veneers of richly coloured marbles were largely used by the Romans to decorate brick and stone walls. Pliny (H. N. xxxvi. 6) speaks of this practice as being a new and degenerate invention in his time. Many examples exist at Pompeii and in other Roman buildings. Numerous Byzantine churches, such as St Saviour’s at Constantinople, and St George’s, Thessalonica, have the lower part of the internal walls richly ornamented in this way. It was commonly used to form a dado, the upper part of the building being covered with mosaic. The cathedral of Monreale and other Siculo-Norman buildings owe a great deal of their splendour to these linings of richly variegated marbles. In most cases the main surface is of light-coloured marble or alabaster, inlaid bands of darker tint or coloured mosaic being used to divide the surface into panels. The peculiar Italian- Gothic of northern and central Italy during the 14th and 15th centuries, and at Venice some centuries earlier, relied greatly for its effects on this treatment of marble. St Mark’s at Venice and the cathedral of Florence are magnificent examples of this work used externally. Both inside and out most of the richest examples of Moslem architecture owe much to this method of decoration; the mosques and palaces of India and Persia are in many cases completely lined with the most brilliant sorts of marble of contrasting tints.

3. Wall-Linings of Glazed Bricks or Tiles. — This is a very important class of decoration, and from its almost imperishable nature, its richness of colour, and its brilliance of surface is capable of producing a splendour of effect only rivalled by glass mosaics. In the less important form — that of bricks modelled or stamped in relief with figures and inscriptions, and then coated with a brilliant colour in siliceous enamel — it was largely used by the ancient Egyptians and Assyrians as well as by the later Sasanians of Persia. In the nth and 1 2th centuries the Moslems of Persia brought this art to great perfection, and used it on a large scale, chiefly, though not invariably, for internal walls. The main surfaces were covered by thick earthenware tiles, overlaid with a white enamel. These were not rectangular, but of various shapes, mostly some form of a star, arranged so as to fit closely together. Delicate and minute patterns were then

painted on the tiles, after the first firing, in a copper-like colour with strong metallic lustre, produced by the deoxidization of a metallic salt in the process of the second firing. Bands and friezes with Arabic inscriptions, modelled boldly in high relief, were used to break up the monotony of the surface. In these, as a rule, the projecting letters were painted blue, and the flat ground enriched with very minute patterns in the lustre-colour. This combination of bold relief and delicate painting produces great vigour and richness of effect, equally telling whether viewed in the mass or closely examined tile by tile. In the 15th century lustre-colours, though still largely employed for plates, vases and other vessels, especially in Spain, were little used for tiles; and another class of ware, rich in the variety and brilliance of its colours, was extensively used by Moslem builders all over the Mahommedan world. The most sumptuous sorts of tiles used for wall-coverings are those of the so-called ” Rhodian ” and Damascene wares, the work of Persian potters at many places. Those made at Rhodes are coarsely executed in comparison with the produce of the older potteries at Isfahan and Damascus (see Ceramics). These are rectangular tiles of earthenware, covered with a white ” slip,” and painted in brilliant colours with slight conventionalized representations of various flowers, especially the rose, the hyacinth and the carnation. The red used is applied in considerable body, so as to stand out in slight relief. Another class of design is more geometrical, forming regular repeats; but the most beautiful compositions are those in which the natural growth cf trees and flowers is imitated, the branches and blossoms spreading over a large surface covered by hundreds of tiles without any repetition. One of the finest examples is the ” Mecca wall ” in the mosque of Ibrahim Agha, Cairo; and other Egyptian mosques are adorned in the same way (fig. 2). Another variety, the special production of Damascus,

Fig. 2. — One of the Wall-tiles from the Mosque of Ibrahim Agha, Cairo. (10 in. square.)

has the design almost entirely executed in blue. It was about a.d. 1600, in the reign of Shah Abbas I., that this ctess of pottery was brought to greatest perfection, and it is in Persia that the most magnificent examples are found, dating from the 12th to the 17th centuries. The most remarkable examples for- beauty and extent are the mosque at Tabriz, built by Ali Khoja in the 1 2th century, the ruined tomb of Sultan Khodabend (a.d. 1303- 13 16) at Sultaniyas, the palace of Shah Abbas I. and the tomb of Abbas II. (d. a.d. 1666) at Isfahan, all of which buildings are covered almost entirely inside and out.

■ Another important class of wall-tiles are those manufactured by the Spanish Moors, called ” azulejos,” especially during the 14th century. These are in a very different style, being designed

to suggest or imitate mosaic. They have intricate inter- lacing geometrical patterns marked out by lines in slight relief; brilliant enamel colours were then burned into the tile, the projecting lines forming boundaries for the pigments. A rich effect is produced by this combination of relief and colour. They are mainly used for dadoes about 4 ft. high, often sur- mounted by a band of tiles with painted inscriptions. The Alhambra and Generalife Palaces at Granada, begun in the 13th century, but mainly built and decorated by Yusuf I. and Mahommed V. (a.d. 1333-1391), and the Alcazar at Seville have the most beautiful examples of these ” azulejos.” The latter building chiefly owes its decorations to Pedro the Cruel (a.d. 1364), who employed Moorish workmen for its tile-coverings and other ornaments. Many other buildings in southern Spain are enriched in the same way, some as late as the 16th century.

Almost peculiar to Spain are a variety of wall-tile the work of Italians in the 16th and 17th centuries. These are effective, though rather coarsely painted, and have a rich yellow as the predominant colour. The Casa de Pilatos and Isabel’s Chapel in the Alcazar Palace, both at Seville, have the best specimens of these, daiing about the year 1 500. In other Western countries tiles have been used more for pavements than for wall-decoration.

4. Wall-Coverings of Hard Stucco, frequently enriched with Reliefs. — The Greeks and Romans possessed the secret of making a hard kind of stucco, creamy in colour, and capable of receiving a polish like that of marble; it would stand exposure to the weather. Those of the early Greek temples which were built, not of marble, but of stone, such as the Doric temples at Aegina, Phigaleia, Paestum and Agrigentum, were all entirely coated inside and out with this material, an admirable surface for the further polychromatic decoration with which all Greek buildings seem to have been ornamented. Another highly artistic use of stucco among the Greeks and Romans, for the interiors of buildings, consisted in covering the walls and vaults with a smooth coat, on which while still wet the outlines of figures,

figures of nymphs, cupids, animals and wreaths, all of which are

models of grace and elegance, and remarkable for the dexterous way in which a few rapid touches of the modelling tool or thumb have produced a work of the highest artistic beauty (fig. 3). Roman specimens of this sort of decoration are common, fine examples have been found in the baths of Titus and numerous tombs near Rome, as well as in many of the houses of Pompeii.

Fig. 3. — Modelled Stucco Wall-Relief, from a Tomb in Magna Graecia. (About half full size.)

groups and other ornaments were sketched with a point; more stucco was then applied in lumps and rapidly modelled into delicate relief before it had time to set. Some tombs in Magna Graecia of the 4th century B.C. are decorated in this way with

Fig. 4. — Stucco Wall-Relief, from the Alhambra.

These are mostly executed with great skill and frequently with good taste, though in some cases, especially at Pompeii, elaborate architectural compositions with awkward attempts at effects of violent perspective, modelled in slight relief on flat wall-surfaces, produce an unpleasing effect. Other Pompeian examples, where the surface is divided into flat panels, each containing a figure or group, have great merit for their delicate richness, without offending against the canons of wall-decoration, one of the first conditions of which is that no attempt should be made to disguise the fact of its being a solid wall and a flat surface.

The Moslem architects of the middle ages made great use of stucco ornament both for external and internal walls. The stucco is modelled in high or low relief in great variety of geo- metrical patterns, alternating with bands of more flowing ornament or long Arabic inscriptions. Many of their buildings, such as the mosque of Tulun at Cairo (a.d. 879), owe nearly all their beauty to this fine stucco work, the purely architectural shell of the structure being often simple and devoid of ornament. These stucco reliefs were, as a rule, further decorated with delicate painting in gold and colours. The Moorish tower at Segovia in Spain is a good example of this class of ornament used externally. With the exception of a few bands of brick and the stone quoins at the angles, the whole exterior of the tower is covered with a network of stucco reliefs in simple geometrical patterns. The Alhambra at Granada and the Alcazar at Seville have the richest examples of this work. The lower part of the walls is lined with marble or tiles to a height of about 4 ft. and above that in many cases the whole surface is encrusted with these reliefs, the varied surface of

which, by producing endless gradations of shadow, takes away any possible harshness from the brilliance of the gold and colours (fig. 4).

During the 16th century, and even earlier, stucco wall-reliefs were used with considerable skill and decorative effect in Italy, England and other Western countries. Perhaps the most graceful

examples are the reliefs with which Vasari in the 16th century encrusted pillars and other parts of the court in the Florentine Palazzo Vecchio, built of plain stone by Michelozzo in 1454. Some are of flowing vines and other plants winding spirally round the columns. The English examples of this work are effectively designed, though coarser in execution. The outside of a half-timbered house in the market-place at Newark-upon- Trent has high reliefs in stucco of canopied figures, dating from the end of the 15th century. The counties of Essex and Suffolk are rich in examples of this work used externally; and many 16th-century houses in England have fine internal stucco decoration, especially Hardwicke Hall (Derbyshire), one of the rooms of which has the upper part of the wall enriched with life-sized stucco figures in high relief, forming a deep frieze all round.

5. Sgraffito. — This is a variety of stucco work used chiefly in Italy from the 16th century downwards, and employed only for exteriors of buildings, especially the palaces of Tuscany and northern Italy. The wall is covered with a coat of stucco made black by an admixture of charcoal; over this a second thin coat of white stucco is laid. When it is all hard the design is produced by cutting and scratching away the white skin, so as to show the black under-coat. Thus the drawing appears in black on a white ground. This work is effective at a distance, as it requires a bold style of handling, in which the shadows are indicated by cross-hatched lines more or less near together. 1 Flowing ara- besques mixed with grotesque figures occur most frequently in sgraffito. In recent years the sgraffito method has been revived; and the result of Mr Moody's experiments may be seen on the east wall of the Royal College of Science in Exhibition Road, London.

6. Stamped Leather. — This was a magnificent and expensive form of wall-hanging, chiefly used during the 16th and 17 th centuries. Skins, generally of goats or calves, were well tanned and cut into rectangular shapes. They were then covered with

Fig. 5. — Italian Stamped Leather; 16th century. silverJeaf, which was varnished with a transparent yellow lacquer making the silver look like gold. The skins were then stamped or embossed with patterns in relief, formed by heavy pressure from metal dies, one in relief and the other sunk. The reliefs were then painted by hand in many colours, generally brilliant 1 A good description of the process is given by Vasari, Tre arti del disegno, cap. xxvi.

in tone. Italy and Spain (especially Cordova) were important seats of this manufacture; and in the 17th century a large quantity was produced in France. Fig. 5 gives a good example of Italian stamped leather of the 16th century. In England, chiefly at Norwich, this manufacture was carried on in the 17th and 18th centuries. In durability and richness of effect stamped leather surpasses most other forms of movable wall- decoration.

7. Painted Cloth. — Another form of wall-hanging, used most largely during the 15th and 16th centuries, and in a less extensive way a good deal earlier, is canvas painted to imitate tapestry. English medieval inventories both of ecclesiastical and domestic goods frequently contain items such as these: ” stayned cloths for hangings,” ” paynted cloths with stories and batailes,” or ” paynted cloths of beyond sea work,” or ” of Flaunder’s work.” Many good artists working at Ghent and Bruges during the first half of the 15th century produced fine work of this class, as well as designs for real tapestry. Several of the great Italian artists devoted their skill in composition and invention to the painting of these wall-hangings. The most important existing example is the series of paintings of the triumph of Julius Caesar executed by Andrea Mantegna (1485-1492) for Ludovico Gonzaga, duke of Mantua, and now at Hampton Court. These are usually, but wrongly, called ” cartoons,” as if they were designs meant to be executed in tapestry; this is not the case, as the paintings themselves were used as wall-hangings. They are nine in number and each compartment, 9 ft. square, was separated from the next by a pilaster. They form a continuous procession, with life- sized figures, remarkable for their composition, drawing and delicate colouring — the latter unfortunately much disguised by ” restoration.” Like most of these painted wall-hangings, they are executed in tempera, and rather thinly painted, so that the pigment might not crack off through the cloth falling slightly into folds. Another remarkable series of painted cloth hangings are those at Reims Cathedral. In some cases dyes were used for this work. A MS. of the 15th century gives receipts for ” painted cloth,” showing that sometimes they were dyed in a manner similar to those Indian stuffs which were afterwards printed, and are now called chintzes. These receipts are for real dyes, not for pigments,

and among them is the earliest known description of the process called “setting” the woad or indigo vat, as well as a receipt for removing or ” discharging ” the colour from a cloth already dyed. Another method employed was a sort of ” encaustic ” process; the cloth was rubbed all over with wax, and then painted in tempera; heat was then applied so that the colours sank into the melting wax, and were thus firmly fixed upon the cloth.

8. Printed Hangings and Wall-Papers. — The printing of various textiles with dye-colours and mordants is probably one of the most ancient arts. Pliny (H. N. xxxv.) describes a dyeing process employed by the ancient Egyptians, in which the pattern was probably formed by printing from blocks. Various methods have been used for this work — wood blocks in relief, engraved metal plates, stencil plates and even hand- painting; frequently two or more of these methods have been employed for the same pattern. The use of printed stuffs is of great antiquity among the Hindus and Chinese, and was certainly practised in western Europe in the 13th century, and perhaps earlier. The Victoria and Albert Museum has 13th-century specimens of block-printed silk made in Sicily, of beautiful design. Towards the end of the 14th century a great deal of block-printed linen was made in Flanders, and largely imported into England.

Wall-papers did not come into common use in Europe till the 1 8th century, though they appear to have been used much earlier by the Chinese. A few rare examples exist in England which may be as early as the 16th century; these are imitations, generally in flock, of the fine old Florentine and Genoese cut velvets, and hence the style of the design in no way shows the date of the wall-paper, the same traditional patterns being reproduced for many years with little or no change. Machinery enabling paper to be made in long strips was not invented till

the end of the 18th century, and up to that time wall-papers were printed on small square pieces of hand-made paper, difficult to hang, disfigured by numerous joints, and comparatively costly; on these accounts wall-papers were slow in superseding the older modes of mural decoration. A little work by Jackson of Battersea, printed in London in 1744, throws some light on the use of wall-papers at that time. He gives reduced copies of his designs, mostly taken from Italian pictures or antique sculpture during his residence in Venice. Instead of

flowing patterns covering the wall, his designs are all pictures— landscapes, architectural scenes or statues— treated as panels, with plain paper or painting between. They are all printed in oil, with wooden blocks worked with a rolling press, apparently an invention of his own. They are all in the worst possible taste, and yet are offered as great improvements on the Chinese papers which he says were then in fashion. Fig. 6 is a good English

Fig. 6.— Early 18th-century Wall-Paper. (22 in. wide.) example of 18th-century wall-paper printed on squares of stout hand-made paper 22 in. wide. The design is apparently copied from an Indian chintz.

In the 10th century in England, a great advance in the designing of wall-papers was made by William Morris and his school.

9. Painting.— This is naturally the most important and the most widely used of all forms of wall-decoration, as well as perhaps the earliest.

Egypt (see Egypt: Art and Archaeology) is the chief store- house of ancient specimens of this, as of almost all the arts. Egyptian 0win S to tiie intimate connexion between the Paintings, sculpture arid painting of early times, the remarks above as to subjects and treatment under the head of Egyptian wall-sculpture will to a great extent apply also to the paintings. It is an important fact, which testifies to the antiquity of Egyptian civilization, that the earliest paintings, dating more than 4000 years before our era, are also the cleverest both in drawing and execution. In later times the influence of Egyptian art, especially in painting, was important even among

distant nations. In the 6th century B.C. Egyptian colonists, introduced by Cambyses into Persepolis, influenced the painting and sculpture of the great Persian Empire and throughout the valley of the Euphrates. In a lesser degree the art of Babylon and Nineveh had felt considerable Egyptian influence several centuries earlier. The same influence affected the early art of the Greeks and the Etrurians, and it was not till the middle of the 5th century B.C. that the further development and perfecting of art in Greece obliterated the old traces of Egyptian mannerism. After the death of Alexander the Great, when Egypt came into the possession of the Lagidae (320 B.C.), the tide of influence flowed the other way, and Greek art modified though it did not seriously alter the characteristics of Egyptian painting and sculpture, which retained much of their early formalism and severity. Yet the increased sense of beauty, especially in the human face, derived from the Greeks was counterbalanced by loss of vigour; art under the

Ptolemies became a dull copyism of earlier traditions.

The general scheme of mural painting in the buildings of ancient Egypt was complete and magnificent. Columns, mouldings and other architectural features were enriched with patterns in brilliant colours; the flat wall-spaces were covered with figure-subjects, generally in horizontal bands, and the ceilings were ornamented with sacred symbols, such as the vulture or painted blue and studded with gold stars to symbolize the sky. The wall-paintings are executed in tempera on a thin skin

(Taken from Loftie's Ride in Egypt.)

Fig. 7.— Egyptian Wall-Painting of the Ancient Empire in the Bulak Museum.

of fine lime, laid over the brick, stone or marble to form a smooth and slightly absorbent coat to receive the pigments, which were most brilliant in tone and of great variety of tint. Not employing fresco, the Egyptian artists were not restricted to "earth colours," but occasionally used purples, pinks and greens which would have been destroyed by fresh lime. The blue used is very beautiful, and is generally laid on in considerable body— it is frequently a " smalt " or deep-blue glass, coloured by copper oxide, finely powdered. Red and yellow ochre, carbon-black, and powdered chalk-white are most largely used. Though in the paintings of animals and birds considerable realism is often seen (fig. 7), yet for human figures certain conventional colours are employed, e.g. white for females' flesh, red for the males, or black to indicate people of negro race. Heads are painted in profile, and little or no shading is used. Considerable knowledge of harmony is shown in the arrangement of the colours; and otherwise harsh combinations of tints are softened and brought into keeping by thin separating lines of white or yellow. Though at first sight the general colouring, if seen in a museum, may appear crude, yet it should be remembered that the internal paintings were much softened by the dim light in Egyptian buildings, and ˆ those outside were subdued by contrast with the brilliant sunshine under which they were always seen.

The rock-cut sepulchres of the Etrurians supply the only existing specimens of their mural painting; and, unlike the tombs of Egypt, only a small proportion appear to have been decorated in this way. The actual dates f ˆmi of these paintings are very uncertain, but they range possibly from about the 8th century B.C. down to almost the Christian era. The tombs which possess these paintings are

mostly square-shaped rooms, with slightly-arched or gabled roofs, excavated in soft sandstone or tufa hillsides. The earlier ones show Egyptian influence in drawing and in composition: they are broadly designed with flat unshaded tints, the faces in profile, except the eyes, which are drawn as if seen in front. Colours, as in Egypt, are used conventionally — male flesh red, white or pale yellow for the females, black for demons. In one respect these paintings differ from those of the Egyptians; few colours are used — red, brown, and yellow ochres, carbon-black, lime or chalk-white, and occasionally blue are the only pigments. The rock-walls are prepared by being covered with a thin skin of lime stucco, and lime or chalk is mixed in small quantities with all the colours; hence the restriction to ” earth pigments,” made necessary by the dampness of these subterranean chambers. The process employed was in fact a kind of fresco, though the stucco ground was not applied in small patches only sufficient for the day’s work; the dampness of the rock was enough to keep the stucco skin moist, and so allow the necessary infiltration of colour from the surface. Many of these paintings when first discovered were fresh in tint and uninjured by time, but they are soon dulled by exposure to light. In the course of centuries great changes of style naturally took place; the early Egyptian influence, probably brought to Etruria through the Phoenician traders, was succeeded by an even more strongly-marked Greek influence — at first archaic and stiff, then developing into great beauty oi drawing, and finally yielding to the Roman spirit, as the degradation of Greek art advanced under their powerful but inartistic Roman conquerors.

Throughout this succession of styles — Egyptian, Greek and Graeco-Roman — there runs a distinct undercurrent of individu- ality due to the Etruscans themselves. This appears not only in the drawing but also in the choice of subjects. In addition to pictures of banquets with musicians and dancers, hunting and racing scenes, the workshops of different craftsmen and other domestic subjects, all thoroughly Hellenic in sentiment, other paintings occur which are very un-Greek in feeling. These represent the judgment and punishment of souls in a future life. Mantus, Charun and other infernal deities of the Rasena, hideous in aspect and armed with hammers, or furies depicted as black-bearded demons winged and brandishing live snakes, terrify or torture shrinking human souls. Others, not the earliest in date, represent human sacrifices, such as those at the tomb of Patroclus — a class of subjects which, though Homeric, appears rarely to have been

selected by Greek painters. The constant import into Etruria of large quantities of fine Greek painted vases appears to have contributed to keep up the supremacy of Hellenic influence during many centuries, and by their artistic superiority to have prevented the development of a mere original and native school of art. Though we now know Etruscan painting only from the tombs, yet Pliny mentions (H. N. xxxv. 3) that fine wall-paintings existed in his time, with colours yet fresh, on the walls of ruined temples at Ardea and Lanuvium, executed, he says, before the founding of Rome. As before mentioned, the actual dates of the existing paintings are uncertain. It cannot therefore be asserted that any existing specimens are much older than. 600 B.C., though some, especially at Veii, certainly appear to have the characteristics of more remote antiquity. The most important of these paintings have been discovered in the cemeteries of Veii, Caere, Tarquinii, Vulci, Cervetri and other Etruscan cities.

Even in Egypt the use of colour does not appear to have been

more universal than it was among the Greeks (see Greek Art),

who applied it freely to their marble statues and

Painting. re hefs, the whole of their buildings inside and out,

as well as for the decoration of flat wall-surfaces.

They appear to have cared little for pure form, and not to have

valued the delicate ivory-like tint and beautiful texture of their

fine Pentelic and Parian marbles, except as a ground for coloured

ornament. A whole class of artists, called fryaX/tdrcoi' eyKavuroi,

were occupied in colouring marble sculpture, and their services

were very highly valued. 1 In some cases, probably for the sake of

1 This process, circumlitio, is mentioned by Pliny (H. N. xxxv. 40).

hiding the joints and getting a more absorbent surface, the marble, however pure and fine in texture, was covered with a thin skin of stucco made of mixed lime and powdered marble. An alabaster sarcophagus, found in a tomb near Corneto, and now in the Etruscan museum at Florence, is decorated outside with beautiful purely Greek paintings, executed on a stucco skin as hard and smooth as the

alabaster. The pictures represent combats of the Greeks and Amazons. The colouring, though rather brilliant, is simply treated, and the figures are kept strictly to one plane without any attempt at complicated perspective. Other valuable specimens of Greek art, found at Herculaneum and now in the Naples Museum, are some small paintings, one of girls playing with dice, another of Theseus and the Minotaur. These are painted with miniature-like delicacy on the bare surface of marble slabs; they are almost monochromatic, and are of the highest beauty both in drawing and in gradations of shadow — quite unlike any of the Greek vase-paintings. The first-mentioned painting is signed AAE2ANAP02 A0HNAIO2. It is probable that the strictly archaic paintings of the Greeks, such as those of Polygnotus in the 5th century B.C., executed with few and simple colours, had much resemblance to those on vases, but Pliny is wrong when he asserts that, till the time of Apelles (c. 350-310 B.C.), the Greek painters only used black, white, red and yellow. 2 Judging from the peculiar way in which the Greeks and their imitators the Romans used the names of colours, it appears that they paid more attention to tones and relations of colour than to actual hues. Thus most Greek and Latin colour-names are now untranslatable. Homer's " wine- like sea " {o'ivaip), Sophocles's " wine-coloured ivy " {(Ed. Col.), and Horace's " purpureus olor " probably refer less to what we should call colour than to the chromatic strength of the various objects and their more or less strong powers of reflecting light, either in motion or when at rest. Nor have we any word like Virgil's " flavus," which could be applied both to a lady's hair and to the leaf of an olive-tree. 3

During the best periods of Greek art the favourite classes of subjects were scenes from poetry, especially Homer and con- temporary history. The names Tnvanodi\ia) and oroa xoikiAtj were given to many public buildings from their walls being covered with paintings. Additional interest was given to the historical subjects by the introduction of portraits; e.g. in the great picture of the battle of Marathon (490 B.C.), on the walls of the oroct TrotKiXi? in Athens, portraits were given of the Greek generals Miltiades, Callimachus, and others. This picture was painted about forty years after the battle by Polygnotus and Micon. One of the earliest pictures recorded by Pliny (xxxv. 8) represented a battle of the Magnesians (c. 716 B.C.); it was painted by Bularchus, a Lydian artist, and bought at a high price by King Candaules. Many other important Greek historical paintings are mentioned by Pausanias and earlier writers. The Pompeian mosaic of the defeat of the Persians by Alexander is probably a Romanized copy from some celebrated Greek painting; it obviously was not designed for mosaic work.

Landscape painting appears to have been unknown among the Greeks, even as a background to figure-subjects. • The poems especially of Homer and Sophocles show that this was not through want of appreciation of the beauties of nature, but partly, probably, because the main object of Greek painting was to tell some definite story, and also from their just sense of artistic fitness, which prevented them from attempting in their mural decorations to disguise the flat solidity of the walls by delusive effects of aerial perspective and distance.

It is interesting to note that even in the time of Alexander the Great the somewhat archaic works of the earlier painters were still appreciated. In particular Aristotle praises Polygnotus,

2 Pliny's remarks on subjects such as this should be received with caution. He was neither a scientific archaeologist nor a practical artist.

8 So also a meaning unlike ours is attached to Greek technical words — by rbvos they meant, not " tone," but the gradations of lig;ht and shade, and by &p/jioyri the relations of colour. See Pliny, H. N. xxxv. 5; and Ruskin, Mod. Painters, pt. iv. cap. 13.

both for his power of combining truth with idealization in his portraits and for his skill in depicting men's mental characteristics; on this account he calls him 6 ij0o7p

A large number of Roman mural paintings (see also Roman Art) now exist, of which many were discovered in the private houses and baths of Pompeii, nearly all dating Painting, between a.d. 63, when the city was ruined by an earthquake, and a.d. 79, when it was buried by Vesuvius. A catalogue of these and similar paintings from Herculaneum and Stabiae, compiled by Professor Helbig, comprises 1966 specimens. The excavations in the baths of Titus and other ancient buildings in Rome, made in the early part of the 16th century, excited the keenest interest and admiration among the painters of that time, and largely influenced the later art of the Renaissance. These paintings, especially the " grotesques " or fanciful patterns of scroll-work and pilasters mixed with semi-realistic foliage and figures of boys, animals and birds, designed with great freedom of touch and inventive power, seem to have fascinated Raphael during his later period, and many of his pupils and contemporaries. The " loggie " of the Vatican and of the Farnesina palace are full of carefully studied

16th-century reproductions of these highly decorative paintings. The excavations in Rome have broujht to light some mural paintings of the 1st century a.d., perhaps superior in execution even to the best of the Pompeian series (see Plate).

The range of subjects found in Roman mural paintings is large — mythology, religious ceremonies, genre, still life and even landscape (the latter generally on a small scale, and treated in an artificial and purely decorative way), and lastly history. Pliny mentions several large and important historical paintings, such as those with which Valerius Maximus Messala decorated the wallsof the Curia Hostilia, to commemorate his own victory over Hiero II. and the Carthaginians in Sicily in the 3rd century B.C. The earliest Roman painting recorded by Pliny was by Fabius, surnamed Pictor, on the walls of the temple of Salus, executed about 300 b.c. (H.N. xxxv. 4).

Pliny (xxxv. 1) laments the fact that the wealthy Romans of his time preferred the costly splendours of marble and por- phyry wall-linings to the more artistic decoration of paintings by good artists. Historical painting seems then to have gone out of fashion; among the numerous specimens now existing few from Pompeii represent historical subjects; one has the scene of Massinissa and Sophonisba before Scipio, and another of a riot between the people of Pompeii and Nocera, which happened 59 a.d.

Mythological scenes, chiefly from Greek sources, occur most frequently: the myths of Eros and Dionysus are especial favourites. Only five or six relate to purely Roman mythology.

1 One instance only of a tomb-painting is mentioned by Pausanias (vii. 22). Some fine specimens have been discovered in the Crimea, but not of a very early date; see Stephani, Compte rendu, &c, (St Petersburg, 1878), &c.

We have reason to think that some at least of the Pompeian pictures are copies, probably at third or fourth hand, from celebrated Greek originals. The frequently repeated subjects of Medea meditating the murder of her children and Iphigenia at the shrine of the Tauric Artemis suggest that the motive and composition were taken from the originals of these subjects by Timanthes. Those of Io and Argus, the finest example of which is in the Palatine ” villa of Li via ” and of Andromeda and Perseus, often repeated on Pompeian walls, may be from the originals by Nicias.

In many cases these mural paintings are of high artistic merit, though

they are probably not the work of the most distinguished painters of the time, but rather of a humbler class of decorators, who reproduced, without much original invention, stock designs out of some pattern-book. They are, however, all remarkable for the rapid skill and extreme ” verve ” and freedom of hand with which the designs are, as it were, flung on to the walls with few but effective touches. Though in some cases the motive and composition are superior to the execution, yet many of the paintings are remarkable both for their realistic truth and technical skill. The great painting of Ceres from Pompeii, now in the Naples Museum, is a work of the highest merit.

In the usual scheme of decoration the broad wall-surfaces are broken up into a series of panels by pilasters, columns, or other architectural forms. Some of the panels contain pictures with figure-subjects; others have conventional ornament, or hanging festoons of fruit and flowers. The lower part of the wall is painted one plain colour, forming a dado; the upper part some- times has a well-designed frieze of flowing ornaments. In the better class of painted walls the whole is kept flat in treatment, and is free from too great subdivision, but in many cases great want of taste is shown by the introduction of violent effects of architectural perspective, and the Space is broken up by com- plicated schemes of design, studded with pictures in varying scales which have little relation to their surroundings. The colouring is on the whole pleasant and harmonious — unlike the usual chromo-lithographic copies. Black, yellow, or a rich deep red are the favourite colours for the main ground of the walls, the pictures in the panels being treated separately, each with its own background.

An interesting series of early Christian mural paintings exists in various catacombs, especially those of Rome and Naples. They are of value both as an important link in the g ar /„ history of art and also as throwing light on the christian mental state of the early Christians, which was dis- Painting in tinctly influenced by the older faith. Thus in the ^’ earlier paintings of about the 4th century we find Christ repre- sented as a beardless youth, beautiful as the artist could make him, with a lingering tradition of Greek idealization, in no degree like the ” Man of Sorrows ” of medieval painters, but rather a kind of genius of Christianity in whose fair outward form the peace and purity of the new faith were visibly symbolized, just as certain distinct attributes were typified in the persons of the gods of ancient Greece. The favourite early subject, ” Christ the Good Shepherd ” (fig. 8), is represented as Orpheus playing on his lyre to a circle of beasts, the pagan origin of the picture being shown by the Phrygian cap and by the presence of lions, panthers and other incongruous animals among the listen- ing sheep. In other cases Christ is depicted standing with a

sheep borne on His shoulders like Hermes Criophoros or Hermes Psychopompos — favourite Greek subjects, especially the former, a statue of which Pausanias (ix. 22) mentions as existing at Tanagra in Boeotia. Here again the pagan origin of the type is shown by the presence in the catacomb paintings of the pan- pipes and pedum, special attributes of Hermes, but quite foreign to the notion of Christ. Though in a degraded form, a good deal survives in some of these paintings, especially in the earlier ones, of the old classical grace of compos'tion and beauty of drawing, notably in the above-mentioned representations where old models were copied without any adaptation to their new meaning. Those of the 5th and 6th centuries follow the classical

MURAL DECORATION

A WALL PAINTING IN TIIE MUSEO NAZIONALE. AT ROME. FROM A ROMAN VILLA DISCOVERED IN IS7S, EARLY IMPERIAL STYLE

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MURAL DECORATION

lines, though in a rapidly deteriorating style, until the introduc- tion of a foreign — the Byzantine — element, which created a fresh starting-point on different lines. The old naturalism and survival of classical freedom of drawing is replaced by stiff, conventionally hieratic types, superior in dignity and strength to the feeble compositions produced by the degradation into which the native art of Rome had fallen. The designs of this second period of Christian art are similar to those of the mosaics,

Fig. 8. — Painted Vault from the Catacombs of St CalHxtus, Rome. In. the centre Orpheus, to represent Christ the Good Shepherd, and round are smaller paintings of various types of Christ.

such as many at Ravenna, and also to the magnificently illumi- nated MSS. For some centuries there was little change or development in this Byzantine style of art, so that it is impossible in most cases to be sure from internal evidence of the date of any painting. This to some extent applies also to the works of the earlier or pagan school, though, roughly speaking, it may be said that the least meritorious pictures are

the latest in date.

These catacomb paintings range over a long space of time; some may possibly be of the 1st or .2nd century, e.g. those in the cemetery of Domitilla, Rome; others are as late as the 9th century, e.g. some full-length figures of St Cornelius and St Cyprian in the catacomb of St Callixtus, under which earlier paintings may be traced. In execution they somewhat resemble the Etruscan tomb-paintings; the walls of the catacomb passages and chambers, excavated in soft tufa, are covered with a thin skin of white stucco, and on that the mural and ceiling paintings are simply executed in earth colours. The favourite subjects of the earliest paintings are scenes from the Old Testament which were supposed to typify events in the life of Christ, such as the sacrifice of Isaac (Christ's death), Jonah and the whale (the Resurrection), Moses striking the rock, or pointing to the manna (Christ the water of life, and the Eucharist), and many others. The later paintings deal more with later subjects, either events in Christ's life or figures of saints and the miracles they performed. A fine series of these exists in the lower church of S. Clemente in Rome, apparently dating from the 6th to the 10th centuries; among these are representations of the passion and death of Christ — subjects never chosen by the earlier Christians, except as dimly foreshadowed by the Old Testament types. When Christ Himself is depicted in the early catacomb paintings it is in glory and power, not in His human weakness and suffering.

Other early Italian paintings exist on the walls of the church of the Tre Fontane near Rome, and in the Capella di S. Urbano alia Caffarella, executed in the early part of the nth century. The atrium of S. Lorenzo fuori le mura, Rome, and the church

first half of the 13th century, which show no artistic improve- ment over those at S. Clemente four or five centuries older.

It was not in fact till the second half cf the 13th century that stiff traditional Byzantine forms and colouring began to be superseded by the revival of native art in Italy by the painters of Florence, Pisa and Siena. During the first thirteen centuries of the Christian era mural painting appears to have been for the most part confined to the repre- sentation of sacred subjects. It is remarkable that during the earlier centuries council after council of the Christian Church forbade the painting of figure-subjects, and especially those of any Person of the Trinity; but in vain. In spite of the zeal of bishops and others, who sometimes with their own hands defaced the pictures of Christ on the walls of the churches, in spite of threats of excommunication, the for- bidden paintings by degrees became more numerous, till the walls of almost every church throughout Christendom were decorated with whole series of pictured stories. The useless prohibition was becoming obsolete when, towards the end of the 4th century, the learned Paulinus, bishop of Nola, ordered the two basilicas which he had built at Fondi and Nola to be adorned with wall- paintings of sacred subjects, with the special object, as he says, of instructing and refining the ignorant and drunken people. These painted histories were in fact the books of the unlearned, and we can now hardly realize their value as the chief mode of religious teaching in ages when none but the clergy could read or write.

During the middle ages, just as long before among the ancient Greeks, coloured decoration was used in the widest possible manner not only for the adornment of flat walls, English but also for the enrichment of sculpture and all the Mural fittings and architectural features of buildings, P^“tbig. whether the material to be painted was plaster, stone, marble or wood. It was only the damp and frosts of northern climates that to some extent limited the external use of colour to the less exposed parts of the outsides of buildings. The varying tints and texture of smoothly worked stone appear to have given no pleasure to the medieval eye; and in the rare cases in which the poverty of some country church prevented its walls from being adorned with painted ornaments or pictures the whole surface of the stonework inside, mouldings and carving as well as flat wall-spaces, was covered with a thin coat of whitewash. Internal rough stonework was invariably concealed by stucco, forming a smooth ground for possible future paintings. Un- happily a great proportion of mural paintings have been de- stroyed, though many in a more or less mutilated state still exist in England. It is difficult (and doubly so since the so-called ”

restoration ” of most old buildings) to realize the splendour of effect once possessed by every important medieval church. From the tiled floor to the roof all was one mass of gold and colour. The brilliance of the mural paintings and richly coloured sculpture and mouldings was in harmony with the splendour of the oak-work — screens, stalls, and roofs — all decorated with gilding and painting, while the light, passing through stained glass, softened and helped to combine the whole into one mass of decorative effect. Colour was boldly applied everywhere, and thus the patchy effect was avoided which is so often the result of the modern timid and partial use of painted ornament. Even the figure-sculpture was painted in a strong and realistic manner, sometimes by a wax encaustic process, probably the same as the circumlitio cf classical times. In the accounts for expenses in decorating Orvieto cathedral wax is a frequent item among the materials used for painting. In one place it is mentioned that wax was supplied to Andrea Pisano (in 1345) for the decoration of the beautiful reliefs in white marble on the lower part of the west front.

From the nth to the 16th century the lower part of the walls, generally 6 to 8 ft. from the floor, was painted with a dado — the favourite patterns till the 13th century being either a sort of sham masonry with a flower in each rectangular space (fig. 9), or a conventional representation of a curtain with

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regular folds stiffly treated. Above this dado ranges of pictures with figure-subjects were painted in tiers one

above the other, each picture frequently surrounded by a painted frame with arch and gable of architectural design. Painted bands of chevron or other geometrical ornament till the 13th century, and flowing ornament afterwards, usually divide the tiers of pic- tures horizontally and form the top and bottom boundaries of

Fig. cj.-Wall-Paintingof the 13th th * dado – ˆ the case of a century. ” Masonry pattern.” church, the end walls usually

have figures to a larger scale. On the east wall of the nave over the chancel arch there was generally a large painting of the ” Doom ” or Last Judgment. One of the commonest subjects is a colossal figure of St Chris- topher (fig. 10) usually on the nave wail opposite the

principal

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Fig. 10. — Wall-Painting of St Christopher. (Large life-size.)

entrance — selected because the sight of a picture of this saint was supposed to bring good luck for the rest of the day. Figures were also often painted on the jambs of the windows and on the piers and soffit of the arches, especially that opening into the chancel.

The little Norman church at Kempley in Gloucestershire (date about 1 1 00) has perhaps the best-preserved specimen of the com- plete early decoration of a chancel. 1 The north and south walls are occupied by figures of the twelve apostles in architectural niches, six on each side. The east wall had single figures of saints at the sides of the central window, and the stone barrel vault is covered with a representation of St John's apocalyptic vision — Christ in majesty surrounded by the evangelistic beasts, the seven candlesticks and other figures. The chancel arch itself and the jambs and mouldings of the windows have stiff geometrical designs, and over the arch, towards the nave, is a large picture of the " Doom." The whole scheme is very complete, no part of the internal plaster or stonework being undecorated with colour. Though the drawing is rude, the figures and their drapery are treated broadly and with dignity. Simple earth colours are used, painted in tempera on a plain white ground, which covers alike both the plaster of the rough walls and the smooth stone of the arches and jambs.

In the 13th century the painters of England reached a high point of artistic power and technical skill, so that paintings were produced by native artists equal, if not superior, to those of the same period anywhere on the Continent. The central paintings on the walls of the chapter-house and on the retable of the high altar of Westminster Abbey are not surpassed by

1 See Archaeologia, vol. xlvi. (1880).

any of the smaller works even of such men as Cimabue and Duccio di Buoninsegna, who were living when these Westminster paintings were executed. Unhappily, partly through the poverty and anarchy brought about by the French wars and the Wars of the Roses, the development of art in England made little progress after the beginning of the 14th century, and it

Fig. 11. — 15th-century English Painting — St John the Evangelist.

was not till a time when the renaissance of art in Italy had fallen into decay that its influence reached the British shores. In the 15th century some beautiful work, somewhat affected by Flemish influence, was produced in England (fig. n), chiefly in the form of figures painted on the oak panels of chancel and chapel screens, especially in Norfolk and Suffolk; but these cannot be said to rival the works of the Van Eycks and other painters of that time in Flanders. To return to the 13th century, the culminating period of English art in painting and sculpture, much was owed to Henry III.‘s love for and patronage of the fine arts; he employed a large number of painters to decorate his various castles and palaces, especially the palace of Westminster, one large hall of which was known as the “painted

chamber ” from the rows of fine pictures with which its walls were covered. After the 13th century the ” masonry pattern ” was disused for the lower parts of walls, and the chevrony and other stiff patterns for the borders were replaced by more flowing designs. The character of the painted figures became less monumental in style; greater freedom of drawing and treatment was adopted, and they cease to recall the archaic majesty and grandeur of the Byzantine mosaics.

It may be noted that during the 14th century wall-spaces unoccupied by figure-subjects were often covered by graceful flowing patterns, drawn with great freedom and rather avoiding geo- metrical repetition. Fig. .12, from the church of Stanley St Leonard’s, Gloucestershire, is a good character- istic specimen of 14th-century decora- tion; it is on the walls of the chancel, filling up the spaces between the painted figures; the flowers are blue, and the lines red on a white ground. In some cases the motive of the „ _, . _ design is taken from encaustic tiles,

teSˆEngˆ“Tth-cˆ – at Bengeo Church, Herts, where tury Wail-Painting. ttle wa U 1S divided into squares, each

containing an heraldic lion. This imitative notion occurs during all periods — masonry, hanging curtains, tiles and architectural features such as niches and canopies being very frequently represented, though always in a simple decorative fashion with no attempt at actual deception — not probably from any fixed principle that shams were wrong, but because the good taste of the medieval painters taught them that a flat unrealistic treatment gave the best and most

decorative effect. Thus in the 15th and 1 6th centuries the commonest forms of unpictorial wall- decoration were various patterns taken from the beautiful damasks and cut velvets of Sicily, Florence, Genoa and other places in Italy, some form of the ” pine-apple ” or rather ” arti-choke ” pattern being the favourite (fig. 13), a design which,

Fig. 13. — 15th-century Wall-Painting, taken from a Genoese or Florentine velvet design.

developed partly from Oriental sources, and coming to perfection at the end of the 15th century, was copied and reproduced in textiles, printed stuffs and wall-papers with but little change down to the present century — a remarkable instance of survival in design. Fig. 14 is a specimen of 15th-century English decora- tive painting, copied from a 14th-century Sicilian silk damask. Diapers, powderings with flowers, sacred monograms and sprays of blossom were frequently used to ornament large surfaces in a simple way. Many of these are extremely beautiful (fig. 15).

Subjects of Medieval Wall-Paintings. — In churches and domestic buildings alike the usual subjects represented on the walls were specially selected for their moral and religious teaching, either

Fig. 14.— 15th-century Wall -Painting, the design copied from a 13th-century Sicilian silk damask.

stories from the Bible and Apocrypha, or from the lives of saints,

or, lastly, symbolical representations setting forth some important

theological truth, such as figures of virtues and vices, or the Scala

humanae salvationis, showing the perils and temptations of the

human soul in its struggle to escape hell and gain paradise — a rude

foreshadowing of the great scheme worked out with such perfection

by Dante in his Commedia. A fine example of this subject exists

on the walls of Chaldon church, Surrey. 1 In the selection of saints

for paintings in England,

those of English origin are

naturally most frequently

represented, and different districts had certain local favourites. St Thomas of Canterbury was one of the most widely popular; but few examples now remain, owing to Henry VIII. ‘s special dislike to this saint and the strict orders that were issued for all pictures of him to be destroyed. For a similar reason most paintings of saintly popes were obliterated.

Methods of Execution. — Though Eraclius, who probably wrote before the 10th century, mentions the use of an oil-medium, yet till about the 13th century mural paintings appear to have been exe- cuted in the most simple way, in tempera mainly with earth colours applied on dry stucco; even when a smooth stone surface was to be painted a thin coat of whitening or fine gesso was laid as a ground. In the 13th century, and perhaps earlier, oil was com- monly used both as a medium for the pigments and also to make a varnish to cover and fix tempera paintings. The Van Eycks introduced the use of dryers of a better kind than had yet been used, and so largely extended the application of oil-painting. Before their time it seems to have been the custom to dry wall- paintings laboriously by the vise of charcoal braziers, if they were in a position where the sun could not shine upon them. This is

1 See Collections of Surrey Archaeol. Soc. vol. v. pt. ii. (1871).

Fig. 15. — Powderings used in 15th- century Wall-Painting. –

specially recorded in the valuable series of accounts for the expenses of wall-paintings in the royal palace of Westminster during the reign of Henry III., printed in Vetusta monumenta, vol. vi. (1842). All the materials used, including charcoal to dry the paintings and the wages paid to the artists, are given. The materials mentioned are plumbum album et rubeum, viridus, vermilio, synople, acre, azura, aurum, argentum, collis, oleum, vernix.

Two foreign painters were employed — Peter of Spain and William of Florence — at sixpence a day, but the English painters seem to

Fig. 16. — Pattern in Stamped and Moulded Plaster, decorated with gilding and transparent colours; 15th-century work.

have done most of the work and received higher pay. William, an English monk in the adjoining Benedictine abbey of West- minster, received two shillings a day. Walter of Durham and various members of the Otho family, royal goldsmiths and moneyers, worked for many years on the adornment of Henry 1 1 1. ‘s palace and were well paid for their skill. Some fragments of paintings from the royal chapel of St Stephen are now in the British Museum. They are delicate and carefully painted subjects from the Old Testament, in rich colours, each with explanatory inscrip- tion underneath. The scale is small, the figures being scarcely a foot high. Their method of execution is curious._ First the smooth stone wall was covered with a coat of red, painted in oil, probably to keep back the damp ; on that a thin skin of fine gesso (stucco) has been applied, and the outlines of the figures marked with a point; the whole of the background, crowns, borders of dresses, and other ornamental parts have then been modelled and stamped with very minute patterns in slight relief, impressed on the surface of the gesso while it was yet soft. The figures have then been painted, apparently in tempera, gold leaf has been applied to the stamped reliefs, and the whole has been covered with an oil varnish. It is difficult to realize the labour required to cover large halls such as the above chapel and the ” painted chamber,” the latter about 83 ft. by 27 ft., with this style of decoration.

In many cases the grounds were entirely covered with shining metal leaf, over which the paintings were executed; those parts, such as the draperies, where the metallic lustre was wanted, were painted in oil with transparent colours, while the flesh was painted in opaque

tempera. The effect of the bright metal shining through the rich colouring is magnificent. This minuteness of much of the medieval wall-decoration is remarkable. Large wall-surfaces and intricate mouldings were often completely covered by elaborate gesso patterns in relief of almost microscopic delicacy (fig. 16). The cost of stamps for this is among the items in the Westminster accounts. These patterns when set and dry were further adorned with gold and colours. So also with the architectural painting; the artist was not content simply to pick out the various members of the mouldings in different colours, but he also frequently covered each bead or fillet with painted flowers and other patterns, as delicate as those in an illuminated MS. — so minute and highly- finished that they are almost invisible at a little distance, but yet add greatly to the general richness of effect. All this is neglected in modern reproductions of medieval painting, in which both touch and colour are coarse and harsh — caricatures of the old work, such as disfigure the Sainte Chapelle in Paris, and many cathedrals in France, Germany and England. Gold was never used in large quantities without the ground on which it was laid

being broken up by some such delicate reliefs as that shown in fig. 16, so its effect was never dazzling, (W. Mo.; J. H. M.)

Mural painting in England fell into disuse in the 16th century, until attempts to revive it were made in the 19th century. For domestic purposes wood panelling, stamped leather, and tapestry were chiefly used as wall-coverings. In the reign of Henry VIII., probably in part through Holbein's influence, a rather coarse tempera wall-painting, German in style, appears to have been common. 1 A good example of arabesque painting of this period in black and white, rudely though boldly drawn and Holbeinesque in character, was discovered in 1881 behind the panelling in one of the canons' houses at Westminster. Other examples exist at Haddon Hall (Derbyshire) and elsewhere.

Many efforts have been made in England to revive fresco painting. The Houses of Parliament bear witness to this, the principal works there being those of William Dyce and Daniel Maclise. That of G. F. Watts, whose ease] work also is generally distinguished by its mural feeling, is full of serious purpose and dignity of conception. " Buono fresco " (the painting in tempera upon a freshly laid ground of plaster while wet), "spirit fresco " or Gambier-Parry method (the painting with a spirit medium upon a specially prepared plaster or canvas ground 2), and "water- glass " painting (wherein the method is similar to water-colour painting on a prepared plastered wall, the painting when finished being covered with a chemical solution which

hardens and protects the surface), have all been tried. Other processes are also in the experimental stage, such as that known as Keim's, which has been successfully tried by Mrs Merritt in a series of mural paintings in a church at Chilworth. Unless, however, some means can be found of enabling the actual painted wall to resist the natural dampness of the English climate, it does not seem likely that true fresco painting can ever be naturalized in Great Britain. Of two of the few modern artists entrusted with important mural work in England, Ford Madox Brown and Frederick J. Shields, the former distinguished especially for his fine series of mural paintings in the Manchester town-hall, in the later paintings there adopted the modern method of painting the design upon canvas in flat oil colour, using a wax medium, and afterwards affixing the canvas to the wall by means of white lead. This is a usual method with modern decorators. Mr Shields has painted the panels of his scheme of mural decoration in the* chapel of the Ascension at Bays water, London, also upon canvas in oils, and has adopted the method of fixing them to slabs of slate facing the wall so as to avoid the risk of damp from the wall itself. Friezes and frieze panels or ceilings in private houses are usually painted upon canvas in oil and affixed to the wall or inserted upon their strainers, like pictures in a frame. (Walter Crane has used fibrous plaster panels, painting in ordinary oil colours with turpentine as a medium, as in Redcross Hall.) Recently there has been a revival of tempera painting, and a group of painters are producing works on panel and canvas painted in tempera or fresco secco, with yolk of egg as a medium, according to the practice of the early Italian painters and the directions of Cennino Cennini. A pure luminous quality of colour is produced, valuable in mural decoration and also durable, especially under varnish. (W. Ce.)

MURANO (anc. Ammariuno), an island in the Venetian lagoon about 1 m. north of Venice. It is 5 m. in circumference, and a large part of it is occupied by gardens. It contained 5436 inhabitants in i()or, but was once much more populous than it is at present, its inhabitants numbering 30,000. It was a favourite resort of the Venetian nobility before they began to build their villas on the mainland; and in the 15th and 16th centuries its gardens and casinos, of which some traces remain, were famous. It was here that the literary clubs of the Vigilanti, the Studiosi and the Occulti, used to meet.

■•Shakespeare, Henry IV., Part. II. act 11. sc. i: " Falstaff. And for thy walls, a pretty slight drollery, or the story of the prodigal, or the German hunting in walerwork, is worth a thousand of these bed-hangings and these fly-bitten tapestries."

2 It was in this method that the lunettes by Lord Leighton at the Victoria and Albert Museum were painted on the plaster wall. The same painter produced a fresco at l.yndhurst Church, Hants.

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The town is built upon one broad main canal, where the tidal current runs with great force, and upon several smaller ones. The cathedral, S. Donato, is a fine basilica, of the 12th century. The pavement (of im) is as richly inlaid as that of St Mark's, and the mosaics of the tribune are remarkable. The exterior of the tribune is beautiful, and has been successfully restored. The church of St Peter the Martyr (1509) contains a fine picture by Gentile Bellini and other works, and S. Maria degli Angeli also contains several interesting pictures. Murano has from ancient times been celebrated for its glass manufactories. When and how the art was introduced is obscure, but there are notices of it as early as the nth century; and in 1250 Christo- foro Briani attempted the imitation of agate and chalcedony. From the labours of his pupil Miotto sprang that branch of the glass trade which is concerned with the imitation of gems. In the 15th century the first crystals were made, and in the 17 th the various gradations of coloured and iridescent glass were invented, together with the composition called " aventu- rine "; the manufacture of beads is now a main branch of the trade. The art of the glass-workers was taken under the protection of the Government in 1275, and regulated by a special code of laws and privileges; two fairs were held annually, and the export of all materials, such as alum and sand, which enter into the composition of glass was absolutely forbidden. With the decay of Venice the importance of the Murano glass-works declined; but A. Salviati (1816-1800) rediscovered many of the old processes, and eight firms are engaged in the trade, the most renowed being the Venezia Murano Company and Salviati. The municipal museum contains a collection of glass illustrating the history and progress of the art.

The island of Murano was first peopled by the inhabitants of Altino. It originally enjoyed independence under the rule of its tribunes and judges, and was one of the twelve confederate islands of the lagoons. In the 12th century the doge Vital Micheli II. incorporated Murano in Venice and attached it to the Sestiere of S. Croce. From that date it was governed by a Venetian nobleman with the title of podesta. whose office lasted sixteen months. Murano, however, retained its original constitution of a greater and a lesser council for the transaction of

municipal business, and also the right to coin gold and silver as well as its judicial powers. The interests of the town were watched at the ducal palace by a nuncio and a solicitor; and this constitution remained in force till the fall of the republic.

See Venezia e le sue Lagune; Paoletti, II Fiore di Venezia; Bus- solin, Guida alle fabbriche vetrarie di Murano; Romanin, Storia documentata di Venezia, i. 41.

MURAS, a tribe of South-American Indians living on the Amazon, from the Madeira to the Purus. Formerly a powerful people, they were defeated by their neighbours the Mundrucus in 1788. They are now partly civilized. Each village has a chief whose office is hereditary, but he has little power. The Muras are among the lowest of all Amazonian tribes.

MURAT, JOACHIM (1767-1815), king of Naples, younger son of an innkeeper at La Bastide-Fortuniere in the department of Lot, France, was born on the 25th of March 1767. Destined for the priesthood, he obtained a bursary at the college of Cahors, proceeding afterwards to the university of Toulouse, where he studied canon law. His vocation, however, was certainly not sacerdotal, and after dissipating his money he enlisted in a cavalry regiment. In 1789 he had attained the rank of marechal des logis, but in 1790 he was dismissed the regiment for in- subordination. After a period of idleness, he was enrolled, through the good offices of J. B. Cavaignac, in the new Constitu- tional Guard of Louis XVI. (1791). In Paris he gained a reputa- tion for his good looks, his swaggering attitude, and the violence of his revolutionary sentiments. On the 30th of May 1792, the guard having been disbanded, he was appointed sub-lieutenant in the 21st Chasseurs a. cheval, with which regiment he served in the Argonne and the Pyr6nees, obtaining in the latter campaign the command of a squadron. After the 9th Thermidor, however, and the proscription of the Jacobins, with whom he had

conspicuously identified himself, he fell under suspicion and was recalled from the front.

Returning to Paris (179s), he made the acquaintance of Napoleon Bonaparte, another young officer out of employment, who soon gained a complete ascendancy over his vain, ambitious and unstable nature. On the 13th Vendemiaire, when Bonaparte, commissioned by Barras, beat down with cannon the armed insurrection of the Paris sections against the Convention, Murat was his most active and courageous lieutenant, and was rewarded by the lieutenant-colonelcy

of the 21st Chasseurs and the appoint- ment of first aide de camp to General Bonaparte in Italy. In the first battles of the famous campaign of 1796 Murat so distinguished himself that he was chosen to carry the captured flags to Paris. He was promoted to be general of brigade, and returned to Italy in time to be of essential service to Bonaparte at Bassano, Corona and Fort St Giorgio, where he was wounded. He was then sent on a diplomatic mission to Genoa, but returned in time to be present at Rivoli. In the advance into Tirol in the summer of 1797 he commanded the vanguard, and by his passage of the Tagliamento hurried on the preliminaries of Leoben. In 1 798 he was for a short time commandant at Rome, and then accompanied Bonaparte to Egypt. At the battle of the Pyramids he led his first famous cavalry charge, and so distinguished himself in Syria that he was made general of division (October, 1 799) . He returned to France with Bonaparte, and on the 18th Brumaire led into the orangery of Saint Cloud the sixty grenadiers whcse appearance broke up the Council of Five Hundred. After the success of the coup d'etat he was made commandant of the consular guard, and on the 20th of January 1800 he married Caroline Bonaparte, youngest sister of the first consul. He commanded the French cavalry at the battle of Marengo, and was afterwards made governor in the Cisalpine Republic. As commander of the army of observa- tion in Tuscany he forced the Neapolitans to evacuate the Papal States and to accept the treaty of Florence (March 28, 1801). In January 1804 he was given the post of governor of Paris, and in this capacity appointed the military commission by which the due d'Enghien was tried and shot (March 20) ; in May he was made marshal of the empire; in February 1805 he was made grand admiral, with the title of prince, and invested with the grand eagle of the Legion of Honour. He commanded the cavalry of the Grand Army in the German campaign of 1805, and was sc conspicuous at Austerlitz that Napoleon made him grand duke of Berg and Cleves (March 15, 1806). He com- manded the cavalry at Jena, Eylau, and Friedland, and in r8o8 was made general-in-chief of the French aimies in Spain. He entered Madrid on the 25th of March, and on the 2nd of May suppressed an insurrection in the city. He did much to prepare the events which ended in the abdication of Charles IV. and Ferdinand VII. at Bayonne; but the hopes he had cherished of himself receiving the crown of Spain were disappointed. On the 1st of August, however, he was appointed by Napoleon to the throne of Naples, vacated by the transference of Joseph Bonaparte to Spain.

King Joachim Napoleon, as he styled himself, entered Naples in September, his handsome presence and open manner gaining him instantaneous popularity. Almost his first act as king was to attack

Capri, which he wrested from the British; but, this done, he returned to Naples and devoted himself to establish- ing his kingship according to his ideas, a characteristic blend of the vulgarity of a parvenu with the essential principles of the Revolution. He dazzled the lazzaroni with the extravagant splendour of his costumes; he set up a sumptuous court, created a new nobility, nominated marshals. With an eye to the over- throw of his legitimate rival in Sicily, he organized a large army and even a fleet; but he also swept away the last relics of the effete feudal system and took efficient measures for suppressing brigandage. From the first his relations with Napoleon were strained. The emperor upbraided him sarcastically for his ” monkey tricks ” (singeries) ; Murat ascribed to the deliberate ill-will of the French generals who served with him, and even to Napoleon, the failure of his attack on Sicily in 1810. He resented

bis subordination to the emperor, and early began his pose as an Italian king by demanding the withdrawal of the Fren’ch troops from Naples and naturalization as Neapolitans of all Frenchmen in the service of the state (1811). Napoleon, of course, met this demand with a curt refusal. A breach between the brothers- in-law was only averted by the Russian campaign of 181 2 and Napoleon’s invitation to Murat to take command of the cavalry in the Grand Army. This was a call which appealed to all his strongest military instincts, and he obeyed it. During the disastrous retreat he showed his usual headstrong courage; but in the middle of December he suddenly threw up his command and returned to Naples. The reason of this was the suspicion, which had been growing on him for two years past, that Napoleon was preparing for him the fate of the king of Holland, and that his own wife, Queen Caroline, was plotting with the emperor for his dethronement. To Marshal Davout, who pointed out to him that he was only king of Naples ” by grace of the emperor and the blood of Frenchmen,” he replied that he was king of Naples as the emperor of Austria was emperor of Austria, and that he could do as he liked. He was, in fact, already dreaming of exchanging his position of a vassal king of the French Empire for that of a national Italian king. In the enthusiastic reception that awaited him on his return to Naples on the 4th of February there was nothing to dispel these illusions. All the Italian parties flocked round him, flattering and cajoling him: the patriots, because he seemed to them loyal and glorious enough to assume the task of Italian unification; the partisans of the dis- possessed princes, because they looked upon him as a convenient

instrument and as simple enough to be made an easy dupe.

From this moment dates the importance of Murat in the history of Europe during the next few years. He at once, without consulting his minister of foreign affairs, despatched Prince Cariati on a confidential mission to Vienna; if Austria would secure the renunciation of his rights by King Ferdinand and guarantee the possession of the kingdom of Naples to himself, he would place his army at her disposal and give up his claims to Sicily. Austria herself, however, had not as yet broken definitively with Napoleon, and before she openly joined the Grand Alliance, after the illusory congress of Prague, many things had happened to make Murat change his mind. He was offended by Napoleon's bitter letters and by tales of his slighting comments on himself; he was alarmed by the emperor's scarcely veiled threats; but after all he was a child of the Revolution and a born soldier, with all the soldier's instinct of loyalty to a great leader, and he grasped eagerly at any excuse for believing that Napoleon, in the event of victory, would maintain him on his throne. Then came the emperor's advance into Germany, supported as yet by his allies of the Rhenish Confederation. On the fatal field of Leipzig Murat once more fought on Napo- leon's side, leading the French squadrons with all his old valour and dash. But this crowning catastrophe was too much for his wavering faith. On the evening of the 16th of October, the first day of the battle, Metternich found means to open a separate negotiation with him: Great Britain and Austria would, in the event of Murat's withdrawal from Napoleon's army and refusal to send reinforcements to the viceroy of Italy, secure the cession -to him of Naples by King Ferdinand, guarantee him in its possession, and obtain for him further advantages in Italy. To accept the Austrian advances seemed now his only chance of continuing to be a king. At Erfurt he asked and' obtained the emperor's leave to return to Naples; " our adieux," he said, " were not over-cordial."

He reached Naples on the 4th of November and at once informed the Austrian envoy of his wish to join the Allies, suggesting that the Papal States, with the exception of Rome and the surrounding district, should be made over to him as his reward. On the 31st of December Count Neipperg, after- wards the lover of the empress Marie Louise, arrived at Naples with powers to treat. The result was the signature, on the nth of January 1814, of a treaty by which Austria guaranteed to Murat the throne of Naples and promised her good offices to secure the assent of the other Allies. Secret additional articles

stipulated that Austria would use her good offices to secure the renunciation by Ferdinand of his rights to Naples, in return for an

indemnity to hasten the conclusion of peace between Naples and Great Britain, and to augment the Neapolitan kingdom by territory embracing 400,000 souls at the expense of the states of the Church.

The project of the treaty having been communicated to Castlereagh, he replied by expressing the willingness of the British government to conclude an armistice with ” the person exercising the government of Naples ” (Jan. 22), and this was accordingly signed on the 3rd of February by Bentinck. It was clear that Great Britain had no intention of ultimately recognizing Murat’s right to reign. As for Austria, she would be certain that Murat’s own folly would, sooner or later, give her an opportunity for repudiating her engagements. For the present the Neapolitan alliance would be invaluable to the Allies for the purpose of putting an end to the French dominion in Italy. The plot was all but spoilt by the prince royal of Sicily, who in an order of the day announced to his soldiers that their legitimate sovereign had not renounced his rights to the throne of Naples (Feb. 20); from the Austrian point of view it was compromised by a proclamation issued by Bentinck at Leghorn on the 14th of March, in which he called on the Italians to rise in support of the ” great cause of their fatherland.” From Dijon Castlereagh promptly wrote to Bentinck (April 3) to say that the proclamation of the prince of Sicily must be disavowed, and that if King Ferdinand did not behave properly Great Britain would recognize Murat’s title. A letter from Metternich to Marshal Bellegarde, of the same place and date, insisted that Bentinck ‘s operations must be altered; the last thing that Austria desired was an Italian national rising.

It was, indeed, by this time clear to the allied powers that Murat’s ambition had o’erleaped the bounds set for them. ” Murat, a true son of the Revolution,” wrote Metternich, in the same letter, ” did not hesitate to form projects of con- quest when all his care should have been limited to simple calculations as to how to preserve his throne. . . . He dreamed of a partition of Italy between him and us. . . . When we refused to annex all Italy north of the Po, he saw that his calculations were wrong, but refused to abandon his ambitions. His attitude is most suspicious.” ” Press the restoration of the grand-duke in Tuscany,” wrote Castlereagh to Bentinck; ” this is the true touchstone of Murat’s intentions. We must not suffer him to carry out his plan of extended dominion; but neither must we break with him and so abandon Austria to his augmented intrigues.”

Meanwhile, Murat had formally broken with Napoleon, and on the 16th cf January the French envoy quitted Naples. But the treason by which he hoped to save his throne was to make its loss inevitable. He

had betrayed Napoleon, only to be made the cat's-paw of the Allies. Great Britain, even when con- descending to negotiate with him, had never recognized his title; she could afford to humour Austria by holding out hopes of ultimate recognition, in order to detach him from Napoleon; for Austria alone of the Allies was committed to him, and Castle- reagh well knew that, when occasion should arise, her obliga- tions would not be suffered to hamper her interests. With the downfall of Napoleon Murat's defection had served its turn; moreover, his equivocal conduct during the campaign in Italy ' had blunted the edge of . whatever gratitude the powers may have been disposed to feel; his ambition to unite all Italy south of the Po under his crown was manifest, and the statesmen responsible for the re-establishment of European order were little likely to do violence to their legitimist principles in order to maintain on his throne a revolutionary sovereign who was proving himself so potent a centre of national unrest.

At the very opening of the congress of Vienna Talleyrand, with astounding effrontery, affected not to know " the man "

1 He had contributed to the defeats of the viceroy Prince Eugene in January and February 1814, but did not show any eagerness to press his victories to the advantage of the Allies, contenting himself with occupying the principality of Benevento.

who had been casually referred to as " the king of Naples "; and he made it the prime object of his policy in the weeks that followed to secure the repudiation by the powers of Murat's title, and the restoration of the Bourbon king. The powers, indeed, were very ready to accept at least the principle of this policy. " Great Britain," wrote Castlereagh to Lord Liverpool on the 3rd of September from Geneva, " has no objection, but the reverse, to the restoration of the Bourbons in Naples." 1 Prussia saw in Murat the protector of the malcontents in Italy. 2 Alexander I. of Russia had no sympathy for any champion of Liberalism in Italy save himself. Austria confessed " sub sigillo " that she shared " His Most Christian Majesty's views as to the restoration of ancient dynasties." 3 The main difficul- ties in the way were Austria's treaty obligations and the means by which the desired result was to be obtained.

Talleyrand knew well that Austria, in the long run, would break faith with Murat and prefer a docile Bourbon on the throne of Naples to

this incalculable child of the Revolution; but he had his private reasons for desiring to ” score off ” Metternich, the continuance of whose quasidiplomatic liaison with Caroline Murat he rightly suspected. He proposed boldly that, since Austria, in view of the treaty of Jan. n, 1814, was naturally reluctant to undertake the task, the restored Bourbon king of France should be empowered to restore the Bourbon king of Naples by French arms, thus reviving once more the ancient Habsburg-Bourbon rivalry for dominion in Italy. 4

Metternich, with characteristic skill, took advantage of this situation at once to checkmate France and to disembarrass Austria of its obligations to Murat. While secretly assuring Louis XVIII. , through his confidant Blacas, that Austria was in favour of a Bourbon restoration in Naples, he formally intimated to Talleyrand that a French invasion of Italian soil would mean war with Austria. 6 To Murat, who had appealed to the treaty of 18 14, and demanded a passage northward for the troops destined to oppose those of Louis XVIII. , he explained that Austria, by her ultimatum to France, had already done all that was necessary, that any movement of the Neapolitan troops outside Naples would be a useless breach of the peace of Italy, and that it would be regarded as an attack on Austria and a rupture of the alliance. Murat’s suspicions of Austrian sincerity were now confirmed; 6 he realized that there was no question now of his obtaining any extension of territory at the expense of the states of the Church, and that in the Italy as reconstructed at Vienna his own position would be intolerable. Thus the very motives which had led him to betray Napoleon now led him to break with Austria. He would secure his throne by proclaiming the cause of united Italy, chasing the Austrians

1 F.O. Vienna Congress, vii.

J Mem. of Hardenberg, F.O. Cong. Pruss. Arch. 20. Aug. 14- June 15.

‘ Metternich to Bombelles. Jan. 13, 1815, enclosed in Castle- reagh to Liverpool of Jan. 25. F.O. Congr. Vienna, xi.

- Sorel, viii. 411 seq.

‘ Cf. a ” most secret ” communication to be made to M. de Blacas (in Metternich to Bombelles, Vienna, Jan. 13, 1815). Murat’s aggressive attitude, and the unrest in Italy, are largely due to the threatening attitude of France. . . . H.I.M. is not prepared to risk a rising of Italy under ” the national flag.” How will France coerce Naples? By sending an army into Italy across our states, which would thus become infected with revolutionary views? .... The emperor could not allow

such an expedition. When Italy is settled — and we will not allow Murat to keep the Marches . . . he will lose prestige, and then . . . will be the time for Austria to give effect to the views which, all the time, she shares with His Most Christian Majesty." (In Castlereagh to Liverpool, " private," Jan. 25, 1815. F.O. Vienna Congr. xi.)

- That they were fully justified is clear from the following extract from a letter of Metternich to Bombelles at Paris (dated Vienna, Jan. 13, 1815). " Whether Joachim or a Bourbon reigns at Naples is for us a very subordinate question. . . . When Europe is established on solid foundations the fate of Joachim will no longer be problematical, but do not let us risk destroying Austria and France and Europe, in order to solve this question at the worst moment it would be put on the tapis. . . . This is no business of the Congress, but let the Bourbon Powers declare that they maintain their claims." (In Castlereagh's private letter to Lord Liverpool, Jan. 15, 1815, F.O. Vienna Congr. xi.)

from the peninsula, and establishing himself as a national king.

To contemporary observers in the best position to judge the enterprise seemed by no means hopeless. Lord William Bentinck, the commander of the English forces in Italy, wrote to Castlereagh 7 that, " having seen more of Italy," he doubted whether the whole force of Austria would be able to expel Murat; " he has said clearly that he will raise the whole of Italy; and there is not a doubt that under the standard of Italian indepen- dence the whole of Italy will rally." This feeling, continued Bentinck, was due to the foolish and illiberal conduct of the restored sovereigns; the inhabitants of the states occupied by the Austrian troops were " discontented to a man "; even in Tus- cany " the same feeling and desire " universally prevailed. All the provinces, moreover, were full of unemployed officers and soldiers who, in spite of Murat's treason, would rally to his standard, especially as he would certainly first put himself into communication with Napoleon in Elba; while, so far as Bentinck could hear of the disposition of the French army, it would be " dangerous to assemble it anywhere or for any purpose." The urgency of the danger was, then, fully realized by the powers even before Napoleon's return from Elba; for they were well aware of Murat's correspondence with him. On the first news of Napoleon's landing in France, the British government wrote to Wellington 8 that this event together with " the proofs of Murat's treachery " had removed " all remaining scruples " on their part, and that they were now " prepared to enter into a concert for his removal," adding that Murat should, in the event of his resigning peaceably, receive " a pension and all considera- tion." The rapid

triumph of Napoleon, however, altered this tone. ” Bonaparte’s successes have altered the situation,” wrote Castlereagh to Wellington on the 24th, adding that Great Britain would enter into a treaty with Murat, if he would give guarantees ” by a certain redistribution of his forces ” and the like, and that in spite of Napoleon’s success he would be ” true to Europe.” In a private letter enclosed Castlereagh suggested that Murat might send an auxiliary force to France, where ” his personal presence would be unseemly.” 9

Clearly, had King Joachim played his cards well he had the game in his hands. But it was not in his nature to play them well. He should have made the most of the chastened temper of the Allies, either to secure favourable terms from them, or to hold them in play until Napoleon was ready to take the field. But his head had been turned by the flatteries of the ” patriots”; he believed that all Italy would rally to his cause, and that alone he would be able to drive the ” Germans ” over the Alps, and thus, as king of united Italy, be in a position to treat on equal terms with Napoleon, should he prove victorious; and he determined to strike without delay. On the 23rd the news reached Metternich at Vienna that the Neapolitan troops were on the march to the frontier. The Allies at once decided to commission Austria to deal with Murat; in the event of whose defeat, Ferdinand IV. was to be restored to Naples, on promising a general amnesty and giving guarantees for a ” reasonable ” system of government. 10

Meanwhile, in Naples itself there were signs enough that Murat’s popularity had disappeared. In Calabria the indiscrimi- nate severity of General Manhes in suppressing brigandage had made the government hated; in the capital the general dis- affection had led to rigorous policing, while conscripts had to be dragged in chains to join their regiments. 11 In these circum- stances an outburst of national enthusiasm for King Joachim was hardly to be expected; and the campaign in effect proved a complete fiasco. Rome and Bologna were, indeed, occupied with- out serious opposition; but on the 12th of April Murat’s forces received a check from the advancing Austrians at Ferrara and on the 2nd of May were completely routed at Tolentino. The

‘ Letter dated Florence, Jan. 7, 1815. F.O. Vienna Congr. xi.

8 F.O. Vienna Congr. xii., Draft to Wellington dated March 12.

9 F.O. Vienna Congr. xii.

10 Ibid. Wellington to Castlereagh, Vienna, March 25.

u F.O. Cong, xi.; Munster to Castlereagh, Naples, Jan. 22.

Austrians advanced on Naples, when Ferdinand IV. was duly- restored, while Queen Caroline and her children were deported to Trieste.

Murat himself escaped to France, where his offer of service was contemptuously refused by Napoleon. He hid for a while near Toulon, with a price upon his head; then, after Waterloo, refusing an asylum in England, he set out for Corsica (August). Here he was joined by a few rash spirits who urged him to attempt to recover his kingdom. Though Metternich offered to allow him to join his wife at Trieste and to secure him a dignified position and a pension, he preferred to risk all on a final throw for power. On the 28th of September he sailed for Calabria with a flotilla of six vessels carrying some 250 armed men. Four of his ships were scattered by a storm; one deserted him at the last moment, and on the 8th of October he landed at Pizzo with only 30 companions. Of the popular enthusiasm for his cause which he had been led to expect there was less than no sign, and after a short and unequal contest he was taken prisoner by a captain named Trenta-Capilli, whose brother had been executed by General Manhes. He was im- prisoned in the fort of Pizzo, and on the 13th of October 181 5 was tried by court-martial, under a law of his own, for disturbing the public peace, and was sentenced to be shot in half an hour. After writing a touching letter of farewell to his wife and children, he bravely met his fate, and was buried at Pizzo.

Though much good may be said of Murat as a king sincerely anxious for the welfare of his adopted country, his most abiding title to fame is that of the most dashing cavalry leader of the age. As a man he was rash, hot-tempered and impetuously brave; he was adored by his troopers who followed their idol, the ” golden eagle,” into the most terrible fire and against the most terrible odds. Napoleon lived to regret his refusal to accept his services during the Hundred Days, declaring that Mu’rat’s presence at Waterloo would have given more con- centrated power to the cavalry charges and might possibly have changed defeat into victory.

By his wife Maria Annunciata Carolina Murat had two sons. The elder, Napoleon Achille Murat (1801-1847), during his father’s reign prince royal of the Two Sicilies, emigrated about 182 1 to America, and settled near Tallahassee, Florida, where in 1826-1838 he was

postmaster. In 1826 he married a great-niece of Washington. He published Lettres d'un citoyen des Itlats-Unis a un de ses amis d' Europe (Paris, 1830); Esquisse morale et politique des £,tats-Unis (ibid. 1832) ; and Exposition des principes du gouvernemenl republicain tel qu'il a itt perfections en Amerique (ibid. 1833). He died in Florida on the 15th of April

1847.

The second son, Napoleon Lucien Charles Murat (1803- 1878), who was created prince of Ponte Corvo in 1813, lived with his mother in Austria after 1815, and in 1824 started to join his brother in America, but was shipwrecked on the coast of Spain and held for a, while a prisoner. Arriving in 1825, two years later he married in Baltimore a rich American, Georgina Frazer (d. 1879); but her fortune was lost, and for some years his wife supported herself and him by keeping a girls' school. After several abortive attempts to return to France, the revolution of 1848 at last gave him his opportunity. He was elected a member of the Constituent Assembly and of the Legislative Assembly (1849), was minister plenipotentiary at Turin from October 1849 to March 1850, and after the coup d'etat of the 2nd of December 1851 was made a member of the consultative commission. On the proclamation of the Empire, he was recognized by Napoleon III. as a prince of the blood royal, with the title of Prince Murat, and, in addition to the payment of 2,000,000 fr. of debts, was given an income of 150,000 fr. As a member of the Senate he distinguished himself in 1861 by supporting the temporal power of the pope, but otherwise he played no conspicuous part. The fall of the Empire in Sep- tember 1870 involved his retirement into private life. He died on the 10th of April 1878, leaving three sons and two daughters. (1) Joachim, Prince Murat (1834-1901), in 1854 married Maley Berthier, daughter of the Prince de Wagram, who bore him a

son, Joachim (b. 1856), who succeeded him as head of the family, and two daughters, of whom the younger, Anna (b. 1863), became the wife of the Austrian minister Count Goluchowski.

(2) Achille (1847-1895), married Princess Dadian of Mingrelia.

(3) Louis (b. 1851), married in 1873 to the widowed Princess Eudoxia Orbeliani (nie Somov), was for a time orderly officer to Charles XV.' of Sweden. (4) Caroline (b. 1832), married in 1850 Baron Charles de Chassiron and in 1872 Mr John Garden (d. 1885). (5) Anna (b. 1841), married in 1865 Antoine de Noailles, due de Mouchy.

Authorities. — See A. Sorel, L'Europe et la revolution francaise (8 vols., 1885-1892) passim, but especially vol. viii. for Murat's policy after the 1812; Helfert, Joachim Murat, seine letzten Kampfe und sein Ende (Vienna, 1878); G. Romano, Ricordi muratiani (Pavia, 1890) ; Correspondance de Joachim Murat, Juillet 1791- Juillet 1808, ed A. Lumbroso (Milan, 1899); Count Murat, Mural, lieutenant de Vempereur en Espagne (Paris, 1897); Guardione, Gioacchino Murat in Italia (Palermo, 1899); M. H. Weil, Prince Eugene et Murat (5 vols., Paris, 1901-1904) ; Chavenon and Saint- Yves, Joachim Murat (Paris, 1905) ; Lumbroso, L'Agonia di un regno; Gioacchino Murat al Pizzo (Milan, 1904). See also the bibliography to Napoleon I. (W. A. P.)

MURATORI, LUDOVICO ANTONIO (1672-1750), Italian scholar, historian and antiquary, was born of poor parents at Vignola in the duchy of Modena on the 21st of October 1672. While young he attracted the attention of Father Bacchini, the librarian of the duke of Modena, by whom his literary tastes were turned toward historical and antiquarian research. Having taken minor orders in 1688, Muratori proceeded to his degree of doctor in utroque jurebdoie 1694, was ordained priest in 169 j and appointed by Count Carlo Borromeo one of the doctors of the Ambrosian library at Milan. From manuscripts now placed under his charge he made a selection of materials for several volumes (Anecdota), which he published with notes. The reputation he acquired was such that the duke of Modena offered him the situation of keeper of the public archives of the duchy. Muratori hesitated, until the offer of the additional post of librarian, on the resignation of Father' Bacchini, deter- mined him in 1700 to return to Modena. The preparation of numerous valuable tracts on the history of Italy during the middle ages, and of dissertations and discussions on obscure points of historical and antiquarian interest, as well as the publication of his various philosophical, theological, legal, poetical and other works absorbed the greater part of his time. These brought him into communication with the most distinguished scholars of Italy, France and Germany. But they also exposed him in his later years to envy. His enemies spread abroad the rumour that the pope, Benedict XIV., had discovered in his writings passages savouring of heresy, even of atheism. Muratori appealed to the pope, repudiating the accusation. His Holiness assured him of his protection, and, without expressing his approbation of the opinions in question of the learned antiquary, freed him from the imputations of his enemies. Muratori died on the 23rd of January 1750, and was buried with much pomp in the church of Santa Maria di Pomposa, in connexion with which he had laboured as parish priest for many years. His remains were removed in 1774 to the church of St Augustin. Muratori

is rightly regarded as the ” father of Italian history.” This is due to his great collection, Rerum italicarum scriptores, to which he devoted about fifteen years’ work (1723-1738). The gathering together and editing some 25 huge folio volumes of texts was followed by a series of 75 dissertations on medieval Italy (Antiquitates italicae medii aevi, 1738-1742, 6 vols, folio). To these he added a Novus thesaurus inscriplionutn (4 vols., 1 739-1 743), which was of great importance in the develop- ment of epigraphy. Then, anticipating the action of the learned societies of the 19th century, he set about a popular treatment of the historical sources he had published. These Annali d’ltalia (1744-1749) reached 12 volumes, but were imperfect and are of little value. In addition to this national enterprise (the Scriptores were published by the aid of the Spcieta palatina of Milan) Muratori published Anecdota ex ambrosianae biUio- thecaecodd. (2 vols. 4to, Milan, 1697, 1698; Padua, 1713);

Anecdota graeca (3 vols. 4to, Padua, 1709); Antichita Estens

(2 vols, fol., Modena, 1717); Vita e rime di F. Petrarca (1711), and Vita ed cpere di L. Castelvetro (1727).

In biblical scholarship Muratori is chiefly known as the dis- coverer of the so-called Muratorian Canon, the name given to a fragment (85 lines) of early Christian literature, which he found in 1740, embedded in an 8th-century codex which forms a compendium of theological tracts followed by the five early Christian creeds. The document contains a list of the books of the New Testament, a similar list concerning the Old Testament having apparently preceded it. It is in barbarous Latin which has probably been translated from original Greek — the language prevailing in Christian Rome until c. 200. There is little doubt that it was composed in Rome and we may date it about the year 190. Lightfoot inclined to Hippolytus as its author. It is the earliest document known which enumerates the books in order.

The first line of the fragment is broken and speaks of the Gospel of St Mark, but there is no doubt that its compiler knew also of St Matthew. Acts is ascribed to St Luke. He names thirteen letters of St Paul but says nothing of the Epistle to the Hebrews. The alleged letters of Paul to the Laodiceans and Alexandrians he rejects, ” for gall must not be mixed with honey.” The two Epistles of Peter and the Epistle of James are not referred to, but that of Jude and two of John are accepted. He

includes the Apocalypse of John and also the Apocalypse of Peter. The Shepherd of Hermas he rejects as net of apostolic origin, but this test of canonicity is not consistently applied for he allows the ” Wisdom written by the friends of Solomon in his honour.” He rejects the writings of the Gnostics Valentinus and Basilides, and of Montanus.

The list is not an authoritative decree, but a private register of what the author considers the prevailing Christian sentiment in his neighbourhood. He notes certain differences among the Gospels, because not all the evangelists were eye-witnesses of the life of Jesus; yet Mark and Luke respectively have behind them the authority of Peter and of Paul, who is thus regarded as on a footing with the Twelve. The Fourth Gospel was written by John at the request of the other apostles and the bishops on the basis of a revelation made to Andrew. The letters of Paul are written to four individuals and to seven different churches, like the seven letters in the Apocalypse of John.

It is interesting to notice the coincidence of his list with the evidence gained from Tertullian for Africa and from Irenaeus for Gaul and indirectly for Asia Minor. Before the year 200 there was widespread agreement in the sacred body of apostolic writings read in Christian churches on the Lord’s Day along with the Old Testament.

Muratori’s Letters, with a Life prefixed, were published by Lazzari, (2 vols., Venice, 1783). His nephew, F. G. Muratori, also wrote a Vita del celebre Ludov. Ant. Muratori (Venice, 1756). See also A. G. Spinelli ” Bibliographia delle lettere e stampa di L. A. Muratori ” in Bolletino dell’ institute* slorico italiano (1888), and Carducci’s preface to the new Scriptores. The Muratorian Canon is given in full with a translation in H. M. Gwatkin’s Selections from Early Christian Writers. It is also published as No. I of H. Lietzmann’s Kleins Texte fiir theologische Vorlesungen (Bonn, 1902). See also Journal of Theological Studies, viii. 537.

MURAVIEV, MICHAEL NIKOLAIEVICH, Count (1845-1900), Russian statesman, was born on the 19th of April 1845. He was the son of General Count Nicholas Muraviev (governor of Grodno), and grandson of the Count Michael Muraviev, who became notorious for his drastic measures in stamping out the Polish insurrection of 1863 in the Lithuanian provinces. He was educated at a secondary school at Poltava, and was for a short time at Heidelberg University. In 1864 he entered the chancel- lery of the minister for foreign affairs at St Petersburg, and was soon afterwards attached to the Russian legation at Stuttgart, where he attracted the notice of Queen Olga of

Wurttemberg. He was transferred to Berlin, then to Stockholm, and back again to Berlin. In 1877 he was second secretary at the Hague. During the Russo-Turkish War of 1878 he was a delegate of the Red Cross Society in charge of an ambulance train provided

by Queen Olga of Wurttemberg. After the war he was succes- sively first secretary at Paris, chancellor of the embassy at Berlin, and then minister at Copenhagen. In Denmark he was brought much into contact with the imperial family, and on the death of Prince Lobanov in 1897 he was appointed by the Tsar Nicholas II. to be his minister of foreign affairs. The next three and a half years were a critical time for European diplomacy. The Chinese and Cretan questions were disturbing factors. As regards Crete, Count Muraviev's policy was vacillating; in China his hands were forced by Germany's action at Kiaochow. But he acted with singular Ugerete with regard at all events to his assurances to Great Britain respecting the leases of Port Arthur and Talienwan from China; he told the British ambassador that these would be " open ports," and afterwards essentially modified this pledge. When the Tsar Nicholas inaugurated the Peace Con- ference at the Hague, Count Muraviev extricated his country from a situation of some embarrassment ; but when, subsequently, Russian agents in Manchuria and at Peking connived at the agitation which culminated in the Boxer rising of 1900, the relations of the responsible foreign minister with the tsar became strained. Muraviev died suddenly on the 21st of June 1900, of apoplexy, brought on, it was said, by a stormy interview with the tsar.

MURCHISOH, SIR RODERICK IMPEY (1792-1871), British geologist, was born at Tarradale, in eastern Ross, Scotland, on the 19th of February 1792. His father, Kenneth Murchison (d. 1796), came of an old Highland clan in west Ross-shire, and having been educated as a medical man, acquired a fortune in India; while still in the prime Of life he returned to Scotland, where, marrying one of the Mackenzies of Fairburn, he purchased the estate of Tarradale and settled for a few years as a resident Highland landlord. Young Murchison left the Highlands when three years old, and at the age of seven was sent to the grammar school of Durham, where he remained for six years. He was then placed at the military college, Great Marlow, to be trained for the army. With some difficulty he passed the examinations, and at the age of fifteen was gazetted ensign in the 36th regiment. A year later (1808) he landed with Wellesley in Galicia, and was present at the actions of Rorica and Vimiera. Subsequently under Sir John Moore he took part in the retreat to Corunna and the final battle there. This was his only active service. The defeat of Napoleon at Waterloo seeming to close the prospect of advancement in the military

profession, Murchison, after eight years of service, quitted the army, and married the daughter of General Hugonin, of Nursted House, Hampshire. With her he then spent rather more than two years on the Continent, particularly in Italy, where her cultivated tastes were of signal influence in guiding his pursuits. He threw himself with all the enthusiasm of his character into the study of art and antiquities, and for the first time in his life tasted the pleasures of truly intellectual pursuits.

Returning to England in 1818, he sold his paternal property in Ross-shire and settled in England, where he took to field sports. He soon became one of the greatest fox-hunters in the midland counties; but at last, getting weary of such pursuits and meeting Sir Humphry Davy, who urged him to turn his energy to science, he was induced to attend lectures at the Royal Institution. This change in the current of his occupations was much helped by the sympathy of his wife, who, besides her artistic acquirements, took much interest in natural history. Eager and enthusiastic in whatever he undertook, he was fasci- nated by the young science of geology. He joined the Geological Society of London and soon showed himself one of its most active members, having as his colleagues there such men as Sedgwick, W. D. Conybeare, W. Buckland, W. H. Fitton and Lyell. Exploring with his wife the geology of the south of England, he devoted special attention to the rocks of the north- west of Sussex and the adjoining parts of Hants and Surrey, on which, aided by Fitton, he wrote his first scientific paper, read to the society in 1825. Though he had reached the age of thirty- two before he took any interest in science, he developed his taste and increased his knowledge so rapidly that in the first

three years of his scientific career he had explored large parts of England and Scotland, had obtained materials for three important memoirs, as well as for two more written in conjunction with Sedgwick, arid had risen to be a prominent member of the Geological Society and one of its two secretaries. Turning his attention for a little to Continental geology, he explored with Lyell the volcanic region of Auvergne, parts of southern France, northern Italy, Tirol and Switzerland. A little later, with Sedgwick as his companion, he attacked the difficult problem of the geological structure of the Alps, and their joint paper giving the results of their study will always be regarded as one of the classics in the literature of Alpine geology.

It was in the year 1831 that Murchison found the field in which the chief work of his life was to be accomplished. Acting on a suggestion made to him by Buckland he betook himself to the borders of Wales, with the view of endeavouring to discover whether the greywacke rocks underlying the Old Red Sandstone could be grouped into a definite order of succession, as the Secondary rocks of England had been made to tell their story by William Smith. For several years he continued to work vigor- ously in that region. The result was the establishment of the Silurian system — under which were grouped for the first time a remarkable series of formations, each replete with distinctive organic remains oL'zt than and very different from those of the other rocks of England. These researches, together with descriptions of the coal-fields and overlying formations in south Wales and the English border counties, were embodied in The Silurian System (London, 1839), a massive quarto in two parts, admirably illustrated with map, sections, pictorial views and plates of fossils. The full import of his discoveries was not at first perceived; but as years passed on the types of exigence brought to light by him from the rocks of the border counties of England and Wales were ascertained to belong to a geological period of which there are recognizable traces in almost all parts of the globe. Thus the term " Silurian," derived from the name of the old British tribe Silures, soon passed into the vocabulary of geologists in every country.

The establishment of the Silurian system was followed by that of the Devonian system, an investigation in which, aided by the palaeontological assistance of W. Lonsdale, Sedgwick and Murchison were fellow-labourers, both in the south-west of England and in the Rhineland. Soon afterwards Murchison projected an important geological campaign in Russia with the view of extending to' that part of the Continent the classification he had succeeded in elaborating for the older rocks of western Europe. He was accompanied by P. E. P. de Verneuil (1805- 1873) and Count A F. M. L. A. von Keyserling (1815-1801), in conjunction with whom he produced a magnificent work on Russia and the Ural Mountains. The publication of this mono- graph in 1845 completes the first and most active half of Murchi- son's scientific career. In 1846 he was knighted, and in the same year he presided over the meeting of the British Association at Southampton. During the later years of his life a large part of his time was devoted to the affairs of the Royal Geographical Society, of which he was in 1830 one of the founders, and he was president 1843-1845, 1851-1853, 1856-1859 and 1862-1871. So constant and active were his exertions on behalf of geographical exploration that to a large section of the contemporary public he was known rather as a

geographer than a geologist. He particu- larly identified himself with the fortunes of David Livingstone in Africa, and did much to raise and keep alive the sympathy of his fellow-countrymen in the fate of that great explorer.

The chief geological investigation of the last decade of his life was devoted to the Highlands of Scotland, where he believed he had succeeded in showing that the vast masses of crystalline schists, previously supposed to be part of what used to be termed the Primitive formations, were really not older than the Silurian period, for that underneath them lay beds of limestone and quartzite containing Lower Silurian (Cambrian) fossils. Subse- quent research, however, has shown that this infraposition of the fossiliferous rocks is not their original place, but has been brought about by a gigantic system of dislocations, whereby

successive masses of the oldest gneisses, have been torn up from below and thrust bodily over the younger formations.

In 1855 Murchison was appointed director-general of the geological survey and director of the Royal School of Mines and the Museum of Practical Geology in Jermyn Street, London, in succession to Sir Henry De la Beche, who had been the first to hold these offices. Official routine now occupied much of his time, but he found opportunity for the Highland researches just alluded to, and also for preparing successive editions of his work Siluria (1854, ed. 5, 1872), which was meant to present the main features of the original Silurian System together with a digest of subsequent discoveries, particularly of those which showed the extension of the Silurian classification into other countries. His official position gave him further opportunity for the exercise of those social functions for which he had always been distinguished, and which a considerable fortune inherited from near relatives on his mother's side enabled him to display- on a greater scale. His house in Belgrave Square was one of the great centres where science, art, literature, politics and social eminence were brought together in friendly intercourse. In 1863 he was made a K.C.B., and three years later was raised to the dignity of a baronet. The learned societies of his own country bestowed their highest rewards upon him: the Royal Society gave him the Copley medal, the Geological Society its Wollaston medal, and the Royal Society of Edinburgh its Brisbane medal. There was hardly a foreign scientific society of note which had not his name enrolled among its honorary members. The French Academy of Sciences awarded him the prix Cuvier, and elected him one of its eight foreign members in succession to Faraday.

One of the closing public acts of Murchison's life was the founding of a chair of geology and mineralogy in the university of Edinburgh, for which he gave the sum of £6000, an annual sum of £200 being likewise provided by a vote in parliament for the endowment of the professorship. While the negotiations with the Government in regard to this subject were still in progress, Murchison was seized with a paralytic affection on 2rst of November 1870. He rallied and was able to take interest in current affairs until the early autumn of the following year. After a brief attack of bronchitis he died on the 22nd of October 1871. Under his will there was established the Murchison Medal and geological fund to be awarded annually by the council of the Geological Society in London.

See the Life of Sir Roderick I. Murchison, by Sir A. Geikie (2 vols., 1875)- (A. Ge.)

MURCIA, a maritime province of south-eastern Spain, bounded on the E. by Alicante, S.E. and S. by the Mediterranean Sea, W. by Almeria and Granada and N. by Albacete. Pop. (1900), 577,987; area, 4453 sq. m. The extent of coast is about 75 m.; from Cape Palos westwards to Villaricos Point (where Almeria begins) it is fringed by hills reaching their greatest elevation immediately east of Cartagena; northwards from Cape Palos to the Alicante boundary a low sandy tongue encloses the shallow lagoon called Mar Menor. Eastward from the Mar Menor and northward from Cartagena stretches the plain known as El Campo de Cartagena, but the surface of the rest of the province is diversified by ranges of hills, belonging to the same system as the Sierra Nevada, which connect the mountains of Almeria and Granada with those of Alicante. The general direction of these ranges is from south-west to north-east ; they reach their highest point (5150 ft.) on the Sierra de Espufia, between the Mula and Sangonera valleys. They are rich in iron, copper, argentiferous lead, alum, sulphur, and saltpetre. Mineral springs occur at Mula, Archena (hot sulphur), and Alhama (hot chalybeate). The greater part of the province drains into the Mediterranean, chiefly by the Segura, which enters it in the north-west below Hellin in Albacete, and leaves it a little above Orihuela in Alicante; within the province it receives on the left the Arroyo del Jua, and on the right the Caravaca, Quipar, Mula, and Sangonera. The smaller streams of Nogalte and Albujon fall directly into the Mediterranean and the Mar Menor respectively. The climate is hot and dry, and

agriculture is largely dependent on irrigation, which, where practicable, has been carried on since the time of the Moors. Wheat, barley, maize, hemp, oil, and wine (the latter somewhat rough in quality) are produced; fruit, especially the orange, is abundant along the course of the Segura; mulberries for seri- culture are extensively grown around the capital; and the number of bees kept is exceptionally large. Esparto grass is gathered on the sandy tracts. The live stock consists chiefly of asses, mules, goats and pigs; horses, cattle and sheep being relatively few. Apart from agriculture, the principal industry is mining, which has its centre near Cartagena. Large quantities of lead and esparto, as well as of zinc, iron and copper ores, and sulphur, are exported. The province is traversed by a railway which connects Murcia with Albacete and Valencia; from Alcantarilla there is a branch to Lorca and Baza. Near the capital and other large towns there are good roads, but the means of communication are defective in the remoter districts. This deficiency has somewhat retarded the development of mining, and, although it has been partly overcome by the construction of light railways, many rich deposits of ore remain unworked. The chief towns are Murcia, the capital, Cartagena, Lorca, La Union, Mazarron, Yecla, Jumilla, Aguilas, Caravaca, Totana, Cieza, Mula, Moratalla, and Cehegin. Other towns with more than 7000 inhabitants are Alhama, Bullas, Fuente Alamo, Molina and Torre Pacheco.

The province of Murcia was the first Spanish possession of the Carthaginians, by whom Nova Carthago was founded. The Romans included it in Hispania Tarraconensis. Under the Moors the province was known as Todmir, which included, according to Edrisi, the cities Murcia, Orihuela, Cartagena, Lorca, Mula and Chinchilla. The kingdom of Murcia, which came into independent existence after the fall of Omayyads (see Caliphate) included the present Albacete as well as Murcia. It became subject to the crown of Castile in the 13th century. Until 1833 the province of Murcia also included Albacete.

MURCIA, the capital of the Spanish province of Murcia; on the river Segura, 25 m. W. of the Mediterranean Sea. Pop. (1900), 111,539. Murcia is connected by rail with all parts of Spain, and is an important industrial centre, sixth in respect of population among the cities of the kingdom. It has been an episcopal see since 1291. It is built nearly in the centre of a low-lying fertile plain, known as the huerta or garden of Murcia, which includes the valleys of the Segura and its right-hand tribu- tary the Sangonera, and is surrounded by mountains. Despite the proximity of the sea, the climate is subject to great varia- tions, the summer heat being severe, while frosts are common in winter. The city is built mainly on the left bank of the Segura, which curves north-

eastward after receiving the Sangonera below Murcia, and falls into the Mediterranean about 30 m. N.E. A fine stone bridge of two arches gives access to the suburb of San Benito, which contains the bull-ring. As a rule the streets are broad, straight and planted with avenues of trees, but the Calle de Plateria and Calle de la Traperia, which contain many of the principal shops, are more characteristically Spanish, being lined with old-fashioned balconied houses, and so narrow that wheeled traffic is in most parts impossible. In summer these thoroughfares are shaded by awnings. The Malecon, or embank- ment, is a fine promenade skirting the left bank of the Segura; the river is here crossed by a weir and supplies power .to several silk-mills. The principal square is the Arenal or Plaza de la Constitucion, planted with orange trees and adjoining the Glorieta Park The cathedral, dating from 1388- 1467, is the work of many architects; in the main it is late Gothic, but a Renaissance dome and a tower 480 ft. high were added in 1521, while a Corinthian fagade was erected in the 18th century. There are some good paintings and fine wood-carving in the interior. Other noteworthy buildings are the colleges of San Fulgencio and San Isidro, the bishops' palace, the hospital of San Juan de Dios, the Moorish Alhondiga, or grain warehouse, the buildings of the municipal and provincial councils and the Contraste, which is adorned with sculptured coats-of-arms, and was originally designed to contain standard weights and

measures; it has become a picture-gallery. There are two training schools for teachers, a provincial institute and a museum. Since 1875 the industrial importance of Murcia has steadily increased. Mulberries (for silkworms), oranges and other fruits are largely cultivated in the huerta, and the silk industry, which dates from the period of Moorish rule, is still carried on. Manu- factures of woollen, linen and cotton goods, of saltpetre, flour, leather and hats, have been established in more modern times, and Murcia is the chief market for the agricultural produce of a large district. A numerous colony of gipsies has settled in the west of the city.

Murcia was an Iberian town before the Punic Wars, but its name then, and under Roman rule, is not known, though some have tried to identify it with the Roman Vergilia. To the Moors, who took possession early in the 8th century, it was known as Medinat Mursiya. Edrisi described it in the 12th century as populous and strongly fortified. After the fall of the caliphate of Cordova it passed successively under the rule of Almeria, Toledo and Seville. In n 72 it was taken by the Almohades, and from 1223 to 1243 it became the

capital of an independent kingdom. The Castilians took it at the end of this period, when large* numbers of immigrants from north-eastern Spain and Provence settled in the town; French and Catalan names are still not uncommon. Moorish princes continued to rule in name over this mixed population, but in 1269 a rising against the suzerain, Alphonso the Wise, led to the final incorporation of Murcia (which then included the present province of Albacete) into the kingdom of Castile. During the War of the Spanish Succession Bishop Luis de Belluga defended the city against the archducal army by flooding the huerta. In 1810 and 1812 it was attacked by the French under Marshal Soult. It suffered much from floods in 1651, 1879 aj id 1907, though the construc- tion of the Malecon has done much to keep the Segura within its own channel. In 1829 many buildings, including the cathedral, were damaged by an earthquake.

MURDER, in law, the unlawful killing of a person with malice aforethought (see Homicide). The O. Eng. morSor comes ulti- mately from the Indo-European root mar-, to die, which has also given Lat. mors, death, and all its derivatives in English, French and other Rom. languages; cf. Gr. j3por6s, for noprSs, mortal. The O. Eng. form, Latinized as murdrum, murtrum, whence Fr. meurtre, is represented in other Teutonic languages by a cognate form, e.g. Ger. Mord, Du. moord.

MURDOCK, WILLIAM (1754-1839), British inventor, was born near the village of Auchinleck in Ayrshire on the 21st of August 1754. His father, John Murdoch (as the name is spelt in Scotland), was a millwright and miller, and William was brought up in the same occupation. In 1777 he entered the employment of Boulton & Watt in the Soho works at Birming- ham, and about two years afterwards he was sent to Cornwall to superintend the fitting of Watt's engines. It is said that, while staying at Redruth he carried a series of experiments in the distillation of coal so far that in 1792 he was able to light his cottage and offices with gas, but the evidence is not conclusiveˆ However, after his return to Birmingham about 1799, he made such progress in the discovery of practical methods for making, storing and purifying gas that in 1802 a portion of the exterior of the Soho factory was lighted with it in celebration of the peace of Amiens, and in the following year it was brought into use for the interior. Murdock was also the inventor of important improvements in the steam-engine. He was the first to devise an oscillating engine, of which he made a model about 1784; in 1786 he was busy — somewhat to the annoyance of both Boulton and Watt— with a steam carriage or road locomotive; and in 1799 he invented the long D slide valve. He is also believed to have been the real deviser of the sun and planet motion

patented by Watt in 1781. In addition his ingenuity was directed to the utilization of compressed air, and in 1803 he constructed a steam gun. He retired from business in 1830, and died at Soho on the 15th of November 1839.

At the celebration of the centenary of gas lighting in 1892, a bust of Murdock was unveiled by Lord Kelvin in the Wallace Monument.

Stirling, and there is also a bust of him by Sir F. L. Chantrey at Handsworth Church, where he was buried. His ” Account of the Application of Gas from Coal to Economical Purposes ” appeared in the Phil. Trans, for 1808.

MURE, SIR WILLIAM (1594-1657), Scottish writer, son of Sir William Mure of Rowallan, was born in 1594. His mother was Elizabeth, sister of the poet Alexander Montgomerie (g.v.). He was a member of the Scottish parliament in 1643, and took part in the English campaign of 1644. He was wounded at Marston Moor, but a month later was commanding a regiment at Newcastle. He died in 1657. He wrote Dido and Aeneas; a translation (1628) of Boyd of Trochrig’s Latin Hecatombe Christiana; The True Crucifixe for True Catholikes (1629) ; a paraphrase of the Psalms; the Historie and Descent of the House of Rowallane; A Counter-buff to Lysimachus Nicanor; The Cry of Blood and of a Broken Covenant (1650); besides much miscellaneous verse and many sonnets.

A complete edition of his works was edited by William Tough for the Scottish Text Society (2 vols., 1898). Mure’s Lute-Book, a musical document of considerable interest, is preserved in the Laing collection of MSS. in the library of the university of Edinburgh.

MURE, WILLIAM (1799-1860), Scottish classical scholar, was born at Caldwell, Ayrshire, on the 9th of July 1799. He was educated at Westminster School and the universities of Edinburgh and Bcnn. From 1846 to 1855 he represented the county of Renfrew in parliament in the Conservative interest, and was lord rector of Glasgow University in 1847-1848. For many years he devoted his leisure to Greek studies, and in 1850-1857 he published five volumes of a Critical History of the Language and Literature of Ancient Greece, which, though uncompleted and somewhat antiquated, is still useful. He died in

London on the 1st of April i860.

-MURENA, the name of a Roman plebeian family from Lanuvium, belonging to the Licinian gens, said to be derived from the fondness of one of the family for lampreys (murenae) . The principal members of the family were Lucius Licinius Murena, who was defeated by Mithradates in Asia in 81 B.C., and his son Lucius Licinius Murena, who was defended by Cicero in 62 B.C. against a charge of bribery (Cic. Pro Murena). The son was for several years legate of Lucius Licinius Lucullus in the third Mithradatic War. In 65 he was praetor and made himself popular by the magnificence of the games provided by him. As administrator of Transalpine Gaul after his praetorship he gained the goodwill of both provincials and Romans by his impartiality. In 62 he was elected consul, but before entering upon office he was accused of bribery by Servius Sulpicius,an unsuccessful competitor, supported by Marcus Porcius Cato the younger and Servius Sulpicius Rufus, a famous jurist and son of the accuser. Murena was defended by Marcus Licinius Crassus (afterwards triumvir), Quintus Hortensius and Cicero, and acquitted, although it seems probable that he was guilty. During his consulship he passed a law (lex Junia Licinia) which enforced more strictly the provision of the lex Caecilia Didia— that laws should be promulgated three nundinae before they were proposed to the comitia, and further enacted that, in order to prevent forgery, a copy of every proposed statute should be deposited before witnesses in the aerarium.

MURETUS, the Latinized name of Marc Antoine Muret (1526-1585), French humanist, who was born at Muret near Limoges on the 12th of April 1526. At the age of eighteen he attracted the notice of the elder Scaliger, and was invited to lecture in the archiepiscopal college at Auch. He afterwards taught Latin at Villeneuve, and then at Bordeaux. Some time before 1552 he delivered a course of lectures in the college of Cardinal Lemoine at Pari?, which was largely attended, Henry II. and his queen bˆing among his hearers. His success made him many enemies, and he was thrown into prison on a disgraceful charge, but released by the intervention of powerful friends. The same accusation was brought against him at Toulouse, and he only saved his life by timely flight. The records of the town show that he was burned in effigy as a Huguenot and as shame- fully immoral (1554). After a wandering and insecure life of

some years in Italy, he received and accepted the invitation of the Cardinal Ippolyte d'Este to settle in Rome in 1559- In 1561 he revisited France as a member of the cardinal's suite at the conference between Roman Catholics and Protestants held at Poissy. He returned

to Rome in 1563. His lectures gained him a European reputation, and in 1578 he received a tempting offer from the king of Poland to become teacher of jurisprudence in his new college at Cracow. Muretus, however, who about 1576 had taken holy orders, was induced by the liberality of Gregory XIII. to remain in Rome, where he died on the 4th of June 1585.

Complete editions of his works: editio princeps, Verona (1727- 1730); by D. Ruhnken (1789), by C. H. Frotscher (1834-1841); two volumes of Scripta selecta, by J. Frey (1871); Variae lectiones, by F. A. Wolf and J. H. Fasi (1791-1828). Muretus edited a number of classical authors with learned and scholarly notes. His other works include Juvenilia et poemata varia, orationes and epistolae.

See monograph by C. Dejob (Paris, 1881); J. E. Sandys, Hist. Class. Schol., (2nd ed., 1908), ii. 148-152.

MUREXIDE (NH4-C 8 H 4 N 5 6 ,H 2 0), the ammonium salt of purpuric acid. It may be prepared by heating alloxantin in ammonia gas to ioo° C, or by boiling uramil with mercuric oxide (J. v. Liebig, F. Wohler, Ann., 1838, 26, 319), 2C 4 H 5 N 3 3 +0 = NH 4 C 8 H4N 5 06+H 2 0. W. N. Hartley (Jour. Chem. Soc, 1905, 87, 1 791) found considerable difficulty in obtaining specimens of murexide sufficiently pure to give concordant results when examined by means of their absorption spectra, and conse quently devised a new method of preparation for murexide. In this process alloxantin is dissolved in a large excess of boiling absolute alcohol, and dry ammonia gas is passed into the solution for about three hours. The solution is then filtered from the precipitated murexide, which is washed with absolute alcohol and ■dried. The salt obtained in this way is in the anhydrous state. It may also be prepared by digesting alloxan with alcoholic ammonia at about 78 C; the purple solid so formed is easily soluble in water, and the solution produced is indistinguishable from one of murexide.

On the constitution of murexide see also O. Piloty (Ann., 1904, 333. 3. °) ; R- Mohlau (Ber., 1904, 37, 2686) ; and M. Slimmer and J. Stieglitz (Amer. Chem. Jour., 1904, 31, 661).

MURFREESBORO, a city and the county-seat of Rutherford county, Tennessee, U.S.A., near the Stone River, 32 m. S.E. of Nashville. Pop. (1890), 3739; (1900), 3999 (2248 negroes); (1910), 4679. It is served by the Nashville Chattanooga & St Louis railway. It is in an agricultural region where cotton is an important crop, and has a considerable trade in red cedar, hardwood, cotton, livestock and

grain; it has also various manufactures. At Murfreesboro are Soule College for girls (Methodist Episcopal South; 1852), Tennessee College for girls (Baptist, 1906), Mooney School for boys (1901), and Bradley Academy for negroes. Murfreesboro was settled in 181 1; was incorporated in 181 7, and from 1819 to 1825 was the capital of the state. It was named in honour of Colonel Hardy Murfree (1752-1809), a native of North Carolina, who served as an officer of North Carolina troops in the War of Independence, and after 1807 lived in Tennessee. About 2 m. west of the city the battle of Murfreesboro, or Stone River (q.v.), was fought on the 31st of December 1862 and the 2nd of January

1863.

MURGER, HENRY (1822-1861), French man of letters, was born in Paris on the 24th of March 1822. His father was a German concierge and a tailor. At the age of fifteen Murger was sent into a lawyer's office, but the occupation was uncongenial and his father's trade still more so; and he became secretary to Count Alexei Tolstoi. He published in 1843 a poem entitled Via dolorosa, but it made no mark. He also tried journalism, and the paper Le Castor, which figures in his Vie de Boheme as having combined devotion to the interests of the hat trade with recondite philosophy and elegant literature, is said to have existed, though shortlived. In 1848 appeared the collected sketches called Seines de la vie de Boheme. This book describes the fortunes and misfortunes, the loves, studies, amusements and sufferings of a group of impecunious students, artists and

men of letters, of whom Rodolphe represents Murger himself, while the others have been more or less positively identified. Murger, in fact, belonged to a clique of so-called Bohemians, the most remarkable of whom, besides himself, were Privat d'Angle- mont and Champfleury. La Vie de Boheme, arranged for the stage in collaboration with Theodore Barriere, was produced at the Varietes on the 22nd of November 1849, and was a triumphant success; it afterwards formed the basis of Puccini's opera, La Boheme (1898). From this time it was easy for Murger to live by journalism and general literature. He was introduced in 1851 to the Revue des deux mondes. But he was a slow, fastidious and capricious worker, and his years of hardship and dissipation had impaired his health. He published among other works Claude et Marianne in 1851 ; a comedy,

Le Bonhomme Jadis in 1852; Le Pays Latin in 1852; Adeline Protat (one of the most graceful and innocent if not the most original of his tales) in 1853; and Les Buveurs d'eau in 1855. This last, the most powerful of his books next to the Vie de Boheme, traces the fate of certain artists and students who, exaggerating their own powers and disdaining merely profitable work, come to an evil end not less rapidly than by dissipation. Some years before his death, which took place in a maison de santi near Paris on the 28th of January 1861, Murger went to live at Marlotte, near Fontainebleau, and there he wrote an unequal book entitled Le Sabot rouge (i860), in which the character of the French peasant is uncomplimentarily treated.

See an article by A. de Pontmartin in the Revue des deux mondes (October 1 861).

MURGHAB, a river of Afghanistan, which flows into Russian territory. It rises in the Firozkhoi highlands, the northern scarp of which is defined by the Band-i-Turkestan, and after traversing that plateau from east to west it turns north through deep defiles to Bala Murghab. Beyond this, in the neighbour- hood of Maruchak, it forms for a space the boundary-line between Afghan and Russian Turkestan; then joining the Kushk river at Pul-i-Khishti(Tash Kupri)it runs north to Merv, losing itself in the sands of the Merv desert after a course of about 450 m., its exact source being unknown. In the neighbourhood of Bala Murghab it is 50 yds. broad and some 3 ft. deep, with a rapid current. In the lower part of its course it is flanked by a remarkable network of canals. The ancient city of Merv, which was on its banks, was the great centre of medieval Arab trade, and Buddhist caves are found in the scarped cliffs of its right bank near Panjdeh.

MURI, a province of the British protectorate of Northern

Nigeria. It lies approximately between 9° and 11° 40′ E. and

7° 10′ and 9° 40′ N. The river Benue divides it through its

length, and the portion on the southern bank of the river is

watered by streams flowing from the Cameroon region to the

Benue. The province is bordered S. by Southern Nigeria,

S.E. by German territory (Cameroon), E. by the province of

Yola, N. by Bauchi, W. by Nassaravva and Bassa. The district

of Katsena-Allah extends south of the Benue considerably west of 9 E., the approximate limit of the remainder of the province. Muri has an area of 25,800 sq. m. and an estimated population of about 828,000. The province is rich in forest products and the Niger Company maintains trading stations on the river. Cotton is grown, and spinning thread, weaving and dyeing afford occupation to many thousands. The valley of the Benue has a climate generally unhealthy to Europeans, but there are places in the northern part of the province, such as the Fula settlement of Wase on a southern spur of the Murchison hills, where the higher altitude gives an excellent climate. Muri includes the ancient Jukon empire together with various small Fula states and a number of pagan tribes, among whom the Munshi, who extend into the provinces of Nassarawa and Bassa, are among the most turbulent. The Munshi occupy about 4000 sq. m. in the Katsena-Allah district. The pagan tribes in the north of the province are lawless cannibals who by constant outrages and murders of traders long rendered the main trade route to Bauchi unsafe, and cut off the markets of the Benue valley and the Cameroon from the Hausa states. Only two routes, one via Wase and the other via Gatari, pass through this belt. In the south of the province a similar belt of hostile pagans closed the access to the Cameroon except by two routes, Takum and Beli. For Hausa traders to cross the Muri province was a work of such danger and expense that before the advent of British administration the attempt was seldom made.

Muri came nominally under British control in 1900. The principal

effort of the administration has been to control and open the trade routes. In 1904 an expedition against the northern cannibals resulted in the capture of their principal fortresses and the settlement and opening to trade of a large district, the various routes to the Benue being rendered safe. In 1905 an expedition against the Munshi, rendered necessary by an unprovoked attack on the Niger Company's station at Abinsi, had a good effect in reducing the riverain portion of this tribe to submission. The absence of any central native authority delayed the process of bringing the province under administrative control. Its government has been organized on the same system as the rest of Northern Nigeria, and is under a British resident. It has been divided into three administrative divisions — east, central and west — with their respective head- quarters at Lau, Amar and Ibi. Provincial and native courts of justice have been established. The telegraph has been carried to the town of Muri. Muri is one of the provinces in which the slave trade was most active, and its position between German territory and the Hausa states rendered it in the early days of the British administration a favourite route for the smuggling of slaves.

MURILLO, BARTOLOMfi ESTEBAN (1617-1682), Spanish painter, son of Gaspar Esteban Murillo and Maria Perez, was born at Seville in 16 17, probably at the end of the year, as he was baptized on the first of January 1618. Esteban-Murillo appears to have been the compound surname of the father, but some inquirers consider that, in accordance with a frequent Andalusian custom, the painter assumed the surname of his maternal grandmother, Elvira Murillo, in addition to that of his father. His parents (the father an artisan of a humble class), having been struck with the sketches which the boy was accustomed to make, placed him under the care of their distant relative, Juan del Castillo, the painter. Juan, a correct draughtsman and dry colourist, taught him all the mechanical parts of his profession with extreme care, and Murillo proved himself an apt pupil. The artistic appliances of his master's studio were not abundant, and were often of the simplest kind. A few casts, some stray fragments of sculpture and a lay figure formed the principal aids available for the Sevillian student of art. A living model was a luxury generally beyond the means of the school, but on great occasions the youths would strip in turn and proffer an arm or a leg to be studied by their fellows. Objects of still life, however, were much studied by Murillo, and he early learnt to hit off the ragged urchins of Seville. Murillo in a few years painted as well as his master, and as stiffly. His two pictures of the Virgin, executed during this period, show how thoroughly he had mastered the style, with all its defects. Castillo was a kind man, but his removal to Cadiz

in 1639-1640 threw his favourite pupil upon his own resources. The fine school of Zurbaran was too expensive for the poor lad; his parents were either dead or too poor to help him, and he was compelled to earn his bread by painting rough pictures for the ” feria ” or public fair of Seville. The religious daubs exposed at that mart were generally of as low an order as the prices paid for them. A ” pintura de la feria ” (a picture for the fair) was a proverbial expression for an execrably bad one; yet the street painters who thronged the market-place with their “clumsy saints and unripe Madonnas ” not unfrequently rose to be able and even famous artists. This rough-and-ready practice, partly for the market-place, partly for converts in Mexico and Peru, for whom Madonnas and popular saints were produced and shipped off by the dozen, doubtless increased Murillo’s manual dexterity; but, if we may judge from the picture of the ” Virgin and Child” shown in the Murillo-room at Seville as belonging to this period, he made little improvement

in colouring or in general strength of design. Struck by the favourable change which travel had wrought upon the style of his brother artist Pedro de Moya, Murillo in 1642 resolved to make a journey to Flanders or Italy. Having bought a large quantity of canvas, he cut it into squares of different sizes, which he converted into pictures of a kind likely to sell. The American traders bought up his pieces, and he found himself sufficiently rich to carry out his design. He placed his sister, who was dependent on him, under the care of some friends, and without divulging his plans to any one set out for Madrid. On reaching the capital he waited on Velazquez, his fellow-townsman — then at the summit of his fortune— and asked for some introduc- tion to friends in Rome. The master liked the youth, and offered him lodging in his own house, and proposed to procure him admission to the royal galleries of the capital. Murillo accepted the offer, and here enjoyed the masterpieces of Italy and Flanders without travelling beyond the walls of Madrid. The next two years were chiefly spent in copying from Ribera, Vandyck and Velazquez; and in 1644 he so astonished the latter with some of his efforts that they were submitted to the king and the court. His patron now urged him to go to Rome, and offered him letters to smooth his way; but Murillo preferred returning to his sister and his native Seville.

The friars of the convent of San Francesco in Seville had about this time determined to adorn the walls of their small cloister in a manner

worthy of their patron saint. But the brotherhood had no money ; and after endless begging they found themselves incapable of employing an artist of name to execute the task. Murillo was needy, and offered his services; after balancing their own poverty against his obscurity the friars bade him begin. Murillo covered the walls with eleven large pictures of remarkable power and beauty — displaying by turns the-strong colouring of Ribera, the lifelike truthfulness of Velazquez, and the sweetness of Vandyck. Among them were to be found representations of San Francesco, of San Diego, of Santa Clara and of San Gil. These pictures were executed in his earliest style, commonly called his frio or cold style. It was based chiefly on Ribera and Caravaggio, and was dark with a decided outline. This rich collection is no longer in Seville; Marshal Soult carried off ten of the works. The fame of these productions soon got abroad, and ” El Claustro Chico ” swarmed daily with artists and critics. Murillo was no longer friendless and unknown. The rich and the noble of Seville overwhelmed him with their commissions and their praises.

In 1648 Murillo married a wealthy lady of rank, Dona Beatriz de Cabrera y Sotomayor, of the neighbourhood of Seville, and his house soon became the favourite resort of artists and connoisseurs. About this time he was associated with the land- scape-painter Yriarte — the two artists interchanging figures ‘ and landscapes for their respective works; but they did not finally agree, and the co-operation came to an end. Murillo now painted the well-known ” Flight into Egypt,” and shortly afterwards changed his earliest style of painting for his calido or warm style. His drawing was still well defined, but his outlines became softer and his figures rounder, and his colouring gained in warmth and transparency. His first picture of this style, according to Cean Bermudez, was a representation of ” Our Lady of the Conception,” and was painted in 1652 for the brotherhood of the True Cross; he received for it 2500 reals (£26). In 165s he executed his two famous paintings of ” San Leandro ” and ” San Isidoro ” at the order of Don Juan Federigo, archdeacon of Carmona, which are now in the cathedral of Seville. These are two noble portraits, finished with great care and admirable effect, but the critics complain of the figures being rather short. His next picture, the ” Nativity of the Virgin,” painted for the chapter, is regarded as one of the most delightful specimens of his calido style. In the following year (1656) the samebody gave him an orderfor a vast picture of San Antonio de Padua, for which he received 10,000 reals (£104). This is one of his most celebrated performances, and still hangs in the baptistery of the cathedral. It was ” repaired ” in 1833; the grandeur of the design, however, and the singular richness

of the colouring may still be traced. The same year saw him engaged

on four large semicircular pictures, designed by his friend and patron Don Justino Neve y Yevenes, to adorn the walls of the church of Santa Maria la Blanca. The first two (now in Madrid) were meant to illustrate the history of the Festival of Our Lady of the Snow, or the foundation of the Roman basilica of Santa Maria Maggiore. The one represents the wealthy but childless Roman senator and his lady asleep and dreaming; the other exhibits the devout pair relating their dream to Pope Liberius. Of these two noble paintings the Dream is the finer, and in it is to be noticed the commence- ment of Murillo's third and last style, known as the vaporoso or vapoury. It should be noted, however, that the three styles are not strictly separable into date-periods; for the painter alternated the styles accordingly to his subject-matter or the mood of his inspiration, the calido being the most frequent. In the vaporoso method the well-marked outlines and careful drawing of his former styles disappear, the outlines are lost in the misty blending of the light and shade, and the general finish betrays more haste than was usual with Murillo. After many changes of fortune, these two pictures now hang in the Academy at Madrid. The remaining pieces executed for this small church were a " Virgin of the Conception " and a figure of " Faith." Soult laid his hands on these also, and they have not been recovered.

In 1658 Murillo undertook and consummated a task which had hitherto baffled all the artists of Spain, and even royalty itself. This was the establishing of a public academy of art. By superior tact and good temper he overcame the vanity of Valdes Leal and the presumption of the younger Herrera, and secured their co-operation. The Academy of Seville was accordingly opened for the first time in January 1660, and Murillo and the second Herrera were chosen presidents. The former continued to direct it during the following year; but the calls of his studio induced him to leave it in other hands. It was then flourishing, but not for long.

Passing over some half-length pictures of saints and a dark- haired Madonna, painted in 1668 for the chapter-room of the cathedral of his native city, we enter upon the most splendid period of Murillo's career. In 1661 Don Miguel Manara Vicen- telo de Leca, who had recently turned to a life of sanctity from one of the wildest profligacy, resolved to raise money for the restoration of the dilapidated Hospital de la Caridad, of whose pious gild he was himself a member. Manara commissioned his friend Murillo to paint eleven pictures for this edifice of San Jorge. Three of these pieces represented the " Annunciation," the " Infant Saviour," and the " Infant St John." The remaining eight are considered Murillo's masterpieces. They consist of " Moses striking the Rock," the " Return of the Prodigal," " Abraham

receiving the Three Angels," the "Charity of San Juan de Dios," the " Miracle of the Loaves and Fishes," " Our Lord healing the Paralytic," " St Peter released from Prison by the Angel," and " St Elizabeth of Hungary." These works occupied the artist four years, and in 1674 he received for his eight great pictures 78,115 reals or about £800. The " Moses, " the " Loaves and Fishes," the " San Juan," and the three subjects which we have named first, are still at Seville; the French carried off the rest, but the " St Elizabeth " and the " Prodigal Son " are now back in Spain. For compass and vigour the " Moses " stands first; but the " Prodigal's Return " and the " St Elizabeth " were considered by Bermudez the most perfect of all as works of art. The front of this famous hospital was also indebted to the genius of Murillo; five large designs in blue glazed tiles were executed from his drawings. He had scarcely completed the undertakings for this edifice when his favourite Franciscans again solicited his aid. He accordingly executed some twenty paintings for the humble little church known as the Convent de los Capucinos. Seventeen of these Capuchin pictures are preserved in the Museum of Seville. Of these the " Charity of St Thomas of Villanueva " is reckoned the best. Murillo himself was wont to call it " su lienzo " (his own picture). Another little piece of extraordinary

merit, which once hung in this church, is the " Virgin of the Napkin," believed to have been painted on a " servilleta " and presented to the cook of the Capuchin brotherhood as a memorial of the artist's pencil.

In 1670 Murillo is said to have declined an invitation to court, preferring to labour among the brown coats of Seville. Eight years afterwards his friend the canon Justino again employed him to paint three pieces for the Hospital de los Venerables: the " Mystery of the Immaculate Conception," " St Peter Weeping," and the " Blessed Virgin." As a mark of esteem, Murillo next painted a full-length portrait of the canon. The spaniel at the feet of the priest has been known to call forth a snarl from a living dog. His portraits generally, though few, are of great beauty. Towards the close of his life Murillo executed a series of pictures illustrative of the life of " the glorious doctor " for the Augustinian convent at Seville. This brings us to the last work of the artist. Mounting a scaffolding one day at Cadiz (whither he had gone in 1681) to execute the higher parts of a large picture of the " Espousal of St Catherine," on which he was engaged for the Capuchins of that town, he stumbled, and fell so violently that

he received a hurt from which he never recovered. The great picture was left unfinished, and the artist returned to Seville to die. He died as he had lived, a humble, pious, brave man, on the 3rd of April 168* in the arms of the chevalier Pedro Nunez de Villavicencio, an intimate friend and one of his best pupils. Another of his numerous pupils was Sebastian Gomez, named ” Murillo’s Mulatto.” Murillo left two sons (one of them at first an indifferent painter, afterwards a priest) and a daughter — his wife having died before him.

Murillo has always been one of the most popular of painters — not in Spain alone. His works show great technical attainment without much style, and a strong feeling for ordinary nature arid for truthful or sentimental expression without lofty beauty or ideal elevation. His ecstasies of Madonnas and Saints are the themes of some of his most celebrated achievements. Take as an example the ” Immaculate Conception ” (or ” Assumption of the Virgin,” for the titles may, with reference to Murillo’s treatments of this subject, almost be interchanged) in the Louvre, a picture for which, on its sale from the Soult collection, one of the largest prices on record was given in 1852, some £24,600. His subjects may be divided into two great groups — the scenes from low life (which were a new experiment in Spanish art, so far as the subjects of children are concerned), and the Scriptural, legendary and religious works. The former, of which some salient specimens are in the Dulwich Gallery, are, although undoubtedly truthful, neither ingenious not sym- pathetic; sordid unsightliness and roguish squalor are their foundation. Works of this class belong mostly to the earlier years of Murillo’s practice. The subjects in which the painter most excels are crowded compositions in which some act of saintliness, involving the ascetic or self-mortifying element, is being performed — subjects which, while repulsive in some of their details, emphasize the broadly human and the expressly Catholic conceptions of life. A famous example is the picture, now in the Madrid Academy, of St Elizabeth of Hungary washing patients afflicted with the scab or itch, and hence commonly named ” El Tifioso.” Technically considered, it unites his three styles of painting, more especially the cold and the warm. His power of giving atmosphere to combined groups of figures is one of the marked characteristics of Murillo’s art; and he may be said to have excelled in this respect all his predecessors or con- temporaries of whatever school.

Seville must still be visited by persons who wish to study Murillo thoroughly. A large number of the works which used to adorn this city have, however, been transported else- whither. In the Prado Museum at Madrid are forty-five specimens of Murillo — the ” Infant Christ and the Baptist ” (named ” Los Niftos della Concha “), ” St Ildefonso

vested with a Chasuble by the Madonna," &c. ; in the Museo della Trinidad, " Christ and the Virgin appearing to St Francis in a Cavern " (an. immense composition), and various others. In the National

Gallery, London, the chief example is the " Holy Family "; this was one of the master's latest works, painted in Cadiz. In public galleries in the United Kingdom there are altogether twenty-four examples by Murillo; in those of Spain, seventy-one, Murillo, who was the last pre-eminent painter of Seville, was an indefatigable and prolific worker, hardly leaving his painting- room save for his devotions in church; he realized large prices, according to the standard of his time, and made a great fortune. His character is recorded as amiable and soft, yet independent, subject also to sudden impulses, not unmixed with passion.

See Stirling, Annals of the Artists of Spain (3 vols., London, 1848); Richard Ford, Handbook for Spain (London, 1855); Curtis, Catalogue of the Works of Velasquez and Murillo (1883); L. Alfonso, Murillo, el hombre, &c. (1886); C. Justi, Murillo (illustrated, 1892) ; P. Lefort, Murillo et ses elhes (1892) ; F. M. Tubino, Murillo, su epoca, &c. (1864; Eng. trans., 1879); Dr G. C. Williamson, Murillo (1902) ; C. S. Ricketts, The Prado (1903). (W. M. R.)

MURIMUTH, ADAM (c. 1 274-1347), English ecclesiastic and chronicler, was born in 1274 or 1275 and educated in the civil law at Oxford. Between 1312 and 1318 he practised in the' papal curia at Avignon. Edward II. and Archbishop Winchelsey were among his clients, and his legal services secured for him canonries at Hereford and St Paul's, and the precentorship of Exeter Cathedral. In 133 1 he retired to a country living (Wraysbury, Bucks), and devoted himself to writing the history of his own times. His Continuatio chronicarum, begun not earlier than 1323, starts from the year 1303, and was carried up to 1347, the year of his death. Meagre at first, it becomes fuller about 1340 and is specially valuable for the history of the French wars. Murimuth has no merits of style, and gives a bald narrative of events. But he incorporates many documents in the latter part of his book. The annals of St. Paul's whidh have been edited by Bishop Stubbs, are closely related to the work of Murimuth, but probably not from his pen. The Continuatio was carried on, after his death, by an anonymous writer to the year 1380.

The only complete edition of the Continuatio chronicarum is that by E. M. Thompson (Rolls series, 1889). The preface to this edition, and to W. Stubbs's Chronicles of Edward I. and II., vol. i. (Rolls series, 1882), should be consulted. The anonymous continuation is printed in

T. Hog's edition of Murimuth [Eng. Hist. Soc. , London, 1846). (H. W. C. D.)

MURNER, THOMAS (1475-1537?), German satirist, was born on the 24th of December 1475 at Oberehnheim near Strass- burg. In 1490 he entered the order of Franciscan monks, and in 1495 began a wandering life, studying and then teaching and preaching in Freiburg-in-Breisgau, Paris, Cracow and Strassburg. The emperor Maximilian I. crowned him in 1505 poeta lawreatusT, in 1506, he was created doctor theologiae, and in 1513 was ap- pointed custodian of the Franciscan monastery in Strassburg) an office which, on aqcount of a scurrilous publication, he was forced to vacate the following year. Late in life, in 1518, he began the study of jurisprudence at the university of Ba$el, and in 15 19 took the degree of doctor juris. After journeys in Italy and England, he again settled in Strassburg, but, disturbed by the Reformation, sought an exile at Lucerne in Switzerland in 1526. In 1533 he was appointed priest of Oberehnheim, where he died in 1537, or, according to some accounts, in 1536. Murner was an energetic and passionate character, who made enemies wherever he went. There is not a trace of human kindness in his satires, which were directed against the cor- ruption of the times, the Reformation, and especially against Luther. His most powerful satire — and the most virulent German satire of the period — is Von dem grossen luiherischen Narren, wie ihn Dr Murner beschworen hat. Among others may be mentioned Die Narrenbeschworung (151 2); Die Schelmep,- zunft (151 2); Die Gauckmatt, which treats of enamoured fools (1519), and a translation of Virgil's Aeneid (1515) dedicated to the emperor Maximilian I. Murner also wrote the humor- ous Chartiludium logicae (1507) and the Ludus sludentum freiburgensium (1511), besides a translation of Justinian's Inslitutiones (1519).

All Murner's more important works have been republished in

critical editions ; a selection was published by G. Balke in Kurschner's Deutsche Nationalliteratur (1890). Cf. W. Kawerau, Murner und die Kirche des Mittelalters (1890); and by the same writer, Murner und die deutscke Reformation (1891); also K. Ott, Uber Murner s Verhdltniss zu Geiler (1896).

MUROM, a town of Russia, in the government of Vladimir, on the craggy left bank of the Oka, close to its confluence with the Tesha,

108 m. by rail S.E. of the city of Vladimir. Pop. (1900), 12,874. Muron has an old cathedral. It is the chief entrepot for grain from the basin of the lower Oka, and carries on an active trade with Moscow and Nizhniy-Novgorod. It is famed, as in ancient times, for kitchen-gardens, especially for its cucumbers and seed for canaries. Its once famous tanneries have lost their importance, but the manufacture of linen has increased; it has also steam flour- mills, distilleries, manufactories of soap and of iron implements.

MURPHY, ARTHUR (1727-1805), Irish actor and dramatist, son of a Dublin merchant, was born at Clomquin, Roscommon, on the 27th of December 1727. From 1738 to 1744, under the name of Arthur French, he was a student at the English college at St Omer. He entered the counting-house of a mer- chant at Cork on recommendation of his uncle, Jeffery French, in 1747. A refusal to go to Jamaica alienated French's interest, and Murphy exchanged his situation for one in London. By the autumn of 1752 he was publishing the Gray's Inn Journal, a periodical in the style of the Spectator. Two years later he became an actor, and appeared in the title-rdles of Richard III. and Othello; as Biron in Southerne's Fatal Marriage; and as Osmyn in Congreve's Mourning Bride. His first farce, The Apprentice, was given at Drury Lane on the 2nd of January 1756. It was followed, among other plays, by The Upholsterer (1757), The Orphan of China (1759), The Way to Keep Him (1760), All in the Wrong (1761), The Grecian Daughter (1772), and Know Your Own Mind (1777). These were almost all adaptations from the French, and were very successful, securing for their author both fame and wealth. Murphy edited a political periodical, called the Test, in support of Henry Fox, by whose influence he was called to the bar at Lincoln's Inn, although he had been refused at the Middle Temple in 1757 on account of his connexion with the stage. Murphy also wrote a biography of Fielding, an essay on the life and genius of Samuel Johnson and translations of Sallust and Tacitus. Towards the close of his life the office of a commissioner of bankrupts and a pension of £200 were conferred upon him by government. He died on the 18th of June 1805.

MURPHY, JOHN FRANCIS (1853-), American landscape painter, was born at Oswego, New York, on the nth of December 1853. He first exhibited at the National Academy of Design in 1876, and was made an associate in 1885 and a full academician two years later. He became a member of the Society of American Artists (1901) and o£ the American Water Color Society.

MURPHY, ROBERT (1806-1843), British mathematician, the son of a poor shoemaker, was born at Mallow, in Ireland, in 1806. At the age

of thirteen, while working as an apprentice in his father's shop, he became known to certain gentlemen in the neighbourhood as a self-taught mathematician. Through their exertions, after attending a classical school in his native town, he was admitted to Caius College, Cambridge, in 1825. Third wrangler in 1829, he was elected in the same year a fellow of his college. A course of dissipation led him into debt; his fellowship was sequestered for the benefit of his creditors, and he was obliged to leave Cambridge in December 1832. After living for some time with his relations in Ireland, he repaired to London in 1836, a penniless literary adventurer. In 1838 he became examiner in mathematics and physics at London University. He had already contributed several mathematical papers to the Cambridge Philosophical Transactions (1831-1836), Philosophical Magazine (1833-1842), and the Philosophical Transactions (1837), and had published Elementary Principles of the Theories of Electricity (1833). He now wrote for the " Library of Useful Knowledge " a Treatise on the Theory of Algebraical Equations (1839). He died on the 12th of March 1843.

MURPHYSBORO, a city and the county-seat of Jackson county, Illinois, U.S.A., in the south part of the state, on the Big Muddy River, about 57 m. N. of Cairo. Pop. (1890), 3880; (1900), 6463, including 557 foreign-born and 456 negroes; (1910), 7485. It is served by the Illinois Central, the Mobile & Ohio and the St Louis, Iron Mountain & Southern railways. It is the centre for a farming region, in which there are deposits of coal, iron, lead and shale, and there are various manufactures in the city. Murphysboro was incorporated in 1867, and re- incorporated in 1875.

MURRAIN (derived through O. Fr. marine, from Lat. mori, to die), a general term for various virulent diseases in domesticated animals, synonymous with plague or epizooty. The principal diseases are dealt with under Rinderpest; Pleuropneumonia; Anthrax; and Foot and Mouth Disease. See also Veter- inary Science.

MURRAY (or Moray), EARLS OF. The earldom of Moray was one of the seven original earldoms of Scotland, its lands corre- sponding roughly to the modern counties of Inverness and Ross. Little is known of the earls until about 1314, when Sir Thomas Randolph, a nephew of King Robert Bruce, was created earl of Moray (q.v.), and the Randolphs held the earldom until 1346, when the childless John Randolph, 3rd earl of this line and a soldier of repute, was killed at the battle of Neville's Cross. According to some authorities the earldom was then held by John's sister Agnes (c. 1312-1369) and her husband, Patrick Dunbar, earl of March or Dunbar (c. 1 285-1368).

However this may be, in 1359 an English prince, Henry Plantagenet, duke of Lancaster (d. 1361), was made earl of Moray by King David II.; but in 1372 John Dunbar (d. 1391), a grandson of Sir Thomas Randolph and a son-in-law of Robert II., obtained the earldom. The last of the Dunbar earls was James Dunbar, who was murdered in August 1429, and after this date his daughter Elizabeth and her husband, Archibald Douglas (d. 1455), called themselves earl and countess of Moray.

The next family to bear this title was an illegitimate branch of the royal house of Stuart, James IV. creating his natural son, James Stuart (c. 1490-1544), earl of Moray. James died without sons, and after the title had been borne for a short time by George Gordon, 4th earl of Huntly (c. 1514-1562), who was killed at Corrichie in 1562, it was bestowed in 1562 by Mary Queen of Scots upon her half-brother, an illegitimate son of James V. This was the famous regent, James Stuart, earl of Moray, or Murray (see below), who was murdered in January 1570; after this event a third James Stuart, who had married the regent's daughter Elizabeth (d. 1591), held the earldom. He, who was called the " bonny earl," was killed by his heredi- tary enemies, the Gordons, in February 1592, when his son James (d. 1638) succeeded to the title. The earldom of Moray has remained in the Stuart family since this date. Alexander, the 4th earl (d. 1701), was secretary of state for Scotland from 1680 to 1689; and in 1796 Francis, the 9th earl (1737-1810), was made a peer of the United Kingdom as Baron Stuart.

See vol. vi. of Sir R. Douglas's Peerage of Scotland, new ed. by Sir J. B. Paul (1909).

MURRAY, ALEXANDER STUART (1841-1904), British archaeologist, was born at Arbroath on the 8th of January 1841, and educated there, at Edinburgh high school and at the universities of Edinburgh and Berlin. In 1867 he entered the British Museum as an assistant in the department of Greek and Roman antiquities under Sir Charles Newton, whom he suc- ceeded in 1886. His younger brother, George Robert Milne Murray (b. 1858), was made keeper of the botanical department in 1895, the only instance of two brothers becoming heads of departments at the museum. In 1873 Dr Murray published a Manual of Mythology, and in the following year contributed to the Contemporary Review two articles — one on the Homeric question — which led to a friendship with Mr Gladstone, the other on Greek painters. In 1880-1883 he brought out his History of Greek Sculpture, which at once became a standard work. In 1886 he was selected by the Sncietv of Antiquaries of Scotland to deliver the Rhind lectures on

archaeology, out of

which grew his Handbook of Greek Archaeology (1892). In 1894-1896 Dr Murray directed some excavations in Cyprus undertaken by means of a bequest of £2000 from Miss Emma Tournour Turner. The objects obtained are described and illustrated in Excavations in Cyprus, published by the trustees of the museum in 1900. Among Dr Murray's other official publications are three folio volumes on Terra-cotta Sarcophagi, White Athenian Vases and Designs from Greek Vases. In 1S98 he wrote for the Portfolio a monograph on Greek bronzes, founded on lectures delivered at the Royal Academy in that year, and he contributed many articles on archaeology to standard publications. In recognition of his services to archaeo- logy he was made LL.D. of Glasgow University in 1887 and elected a corresponding member of the Berlin Academy of Sciences in 1900. He died in March 1904.

MURRAY, DAVID (1849-), Scottish painter, was born in Glasgow, and spent some years in commercial pursuits before he practised as an artist. He was elected an associate of the Royal Academy in 1891 and academician in 1905; and also became an associate of the Royal Scottish Academy and of the Royal Society of Painters in Water Colours, and a member of the Royal Scottish Water Colour Society. He is a landscape painter of distinction, and two of his pictures, "My Love is gone a-sailing " (1884) and " In the Country of Constable " (1903), have been bought for the National Gallery of British Art. " Young Wheat," painted in 1890, is one of his most noteworthy works.

MURRAY, EUSTACE CLARE GRENVILLE (1824-1881), English journalist, was born in 1824, the natural son of the 2nd duke of Buckingham. Educated at Magdalen Hall (Hertford College), Oxford, he entered the diplomatic service through the influence of Lord Palmerston, and in 1851 joined the British embassy at Vienna as attachˆ. At the same time he agreed to act as Vienna correspondent of a London daily paper, a breach of the conventions of the British Foreign Office which cost him his post. In 1852 he was transferred to Hanover, and thence to Constantinople, and finally, in 1855, was made consul-general at Odessa. In 1868 he returned to England, and devoted himself to journalism. He contributed to the early numbers of Vanity Fair, and in 1869 founded a clever but abusive society paper, the Queen's Messenger. For a libel published in this paper Lord Carrington horsewhipped him on the doorstep of a London club.

Murray was subsequently charged with perjury for denying on oath his authorship of the article. Remanded on bail, he escaped to Paris, where he subsequently lived, acting as correspondent of various London papers. In 1874 he helped Edmund Yates to found the World. Murray died at Passy on the 20th of December 1881.

His score of books, several of which were translated into French and published in Paris, include French Pictures in English Chalk (1876-1878); The Roving Englishman in Turkey (1854); Men of the Second Empire (1872); Young Brown (1874); Sidelights on English Society (1881); and Under the Lens: Social Photographs (1885).

MURRAY, LORD GEORGE (1694-1760), Scottish Jacobite general, fifth son of John, 1st duke of Atholl," by his first wife, Catherine, daughter of the 3rd duke of Hamilton, was born at Huntingtower, near Perth, on the 4th of October 1694. He joined the army in Flanders in June 1712; in 1715, contrary to their father's wishes, he and his brothers, the marquis of Tullibardine and Lord Charles Murray, joined the Jacobite rebels under the earl of Mar, each brother commanding a regiment of men of Atholl. Lord Charles was taken prisoner at Preston, but after the collapse of the rising Lord George escaped with Tullibardine to South Uist, and thence to France. In 17 19 Murray took part in the Jacobite attempt in conjunction with the Spaniards in the western highlands, under the command of Tullibardine and the earl marischal, which terminated in "the affair of Glenshiel " on the 10th of June, when he was wounded while commanding the right wing of the Jacobites. After hiding for some mdnths in the highlands he reached Rotter- dam in May 1720. There is no evidence for the statement that Murray served in the Sardinian army, and little is known of his

life on the continent till 1724, when he returned to Scotland, where in the following year he was granted a pardon. The duke of Atholl died in 1724 and was succeeded in the title by his second son James, owing to the attainder of Tullibardine; and Lord George leased from his brother the old family property of Tullibardine in Strathearn, where he lived till 1745.

On the eve of the Jacobite rising of 1745 the duke of Perth made overtures to Lord George Murray on behalf of the Pretender; but even after the landing of Charles Edward in Scotland in July, accompanied by Tullibardine, Murray's attitude remained doubtful. He accompanied his brother the duke to Crieff on the 21st of August to pay his respects to Sir John Cope, the commander of the government troops, and he permitted the duke to appoint him deputy-sheriff of

Perthshire. It has been suggested that Murray acted with duplicity, but his hesitation was natural and genuine; and it was not till early in September, when Charles Edward was at Blair Castle, which had been vacated by the duke of Atholl on the prince's approach, that Murray decided to espouse the Stuart cause. He then wrote to his brother explaining that he did so for conscientious reasons, while realizing the risk of ruin it involved. On joining the Jacobite army Lord George received a commission as lieu- tenant-general, though the prince ostentatiously treated him with want of confidence; and he was flouted by the Irish adven- turers who were the Pretender's trusted advisers. At Perth Lord George exerted himself with success to introduce discipline and organization in the army he was to command, and he gained the confidence of the highland levies, with whose habits and methods of fighting he was familiar. ■ He also used his influence to prevent .the exactions and arbitrary interference with civil rights which Charles was too ready to sanction on the advice of others. At Prestonpans, on the 21st of September, Lord George, who led the Jacobite left wing in person, was practically com- mander-in-chief, and it was to his able generalship that the victory was mainly due. During the six weeks' occupation of Edinburgh he did useful work in the further organization and disciplining of the army. He opposed Charles's plan of invading England, and when his judgment was overruled he prevailed on the prince to march into Cumberland, which he knew to be favourable ground for highlander tactics, instead of advancing against General Wade, whose army was posted at Newcastle. He conducted the siege of Carlisle, but on the surrender of the town on the 14th of November he resigned his command on the ground that his authority had been insufficiently upheld by the prince, and he obtained permission to serve as a volunteer in the ranks of the Atholl levies. The dissatisfaction, however, of the army with the appointment of the duke of Perth to succeed him compelled Charles to reinstate Murray, who accord- ingly commanded the Jacobites in the march to Derby. Here on the 5th of December a council was held at which Murray urged the necessity for retreat, owing to the failure of the English Jacobites to support the invasion and the absence of aid from France. As Murray was supported by the council the retreat was ordered, to the intense chagrin of Charles, who never forgave him; but the failure of the enterprise was mainly chargeable to Charles himself, and it was not without justice that Murray's aide de camp, the chevalier Johnstone, declared that " had Prince Charles slept during the whole of the expedition, and allowed Lord George Murray to act for him according to his own judgment, he would have found the crown of Great Britain on his head when he awoke.' 1 Lord George commanded the rear-guard during the retreat; and this task, rendered

doubly dangerous by the proximity of Cumberland in the rear and Wade on the flank, was made still more difficult by the incapacity and petulance of the Pretender. By a skilfully fought rear- guard action at Clifton Moor, Lord George enabled the army to reach Carlisle safely and without loss of stores or war material; and on the 3rd of January 1746 the force entered Stirling, where they were joined by reinforcements from Perth. The prince laid siege to Stirling Castle, while Murray defeated General Hawley near Falkirk ; but the losses of the Jacobites by sickness and desertion, and the approach of Cumberland, made retreat

to the Highlands an immediate necessity, in which the prince was compelled to acquiesce; his resentment was such that he gave ear to groundless suggestions that Murray was a traitor, which the latter's failure to capture his brother's stronghold of Blair Castle did nothing to refute.

In April 1746 the Jacobite army was in the neighbourhood of Inverness, and the prince decided to give battle to the duke of Cumberland. Charles' took up a position on the left bank of the Nairn river at Culloden Moor, rejecting Lord George's Murray advice to select a much stronger position on the opposite bank. The battle of Culloden, where the Stuart cause was ruined, was fought on the 16th of April 1746. On the following day the duke of Cumberland intimated to his troops that " the public orders of the rebels yesterday was to give us no quarter"; Hanoverian news-sheets printed what purported to be copies of such an order, and the historian James Ray and other con- temporary writers gave further currency to a calumny that has been repeated by modern authorities. Original copies of Lord George Murray's " orders at Culloden " are in existence, one of which is among Cumberland's own papers, while another was in the possession of Lord Hardwicke, the judge who tried the Jacobite peers in 1746, and they contain no injunction to refuse quarter. After the defeat Murray conducted a remnant of the Jacobite army to Ruthven, and prepared to organize further resistance. Prince Charles, however, had determined to aban- don the enterprise, and at Ruthven Lord George received an order dismissing him from the prince's service, to which he replied in a letter upbraiding Charles for his distrust and mismanage- ment. Charles's belief in the general's treachery was shared by several leading Jacobites, but there appears no ground for the suspicion. From the moment he threw in his lot with the exiled

prince's cause Lord George Murray never deviated in his loyalty and devotion, and his generalship was deserving of the highest praise; but the discipline he enforced and jealousy of his authority made enemies of some of those to whom Charles was more inclined to listen than to the general who gave him sound but unwelcome advice.

Murray escaped to the continent in December 1746, and was graciously received in Rome by the Old Pretender, who granted him a pension; but in the following year when he went to Paris Charles Edward refused to see him. Lord George lived at various places abroad until his death, which occurred at Medem- blik in Holland on the nth of October 1760. He married in 1728 Amelia, daughter and heiress of James Murray of Strowan and Glencarse, by whom he had three sons and two daughters. His eldest son John became 3rd duke of Atholl in 1764; the two younger sons became lieutenant-general and vice-admiral respectively in the British service.

See A Military History of Perthshire, ed. by the marchioness of Tullibardine (2 vols., London, 1908), containing a memoir of Lord George Murray and a facsimile copy of his orders at Culloden; The Atholl Chronicles, ed. by the duke of Atholl (privately printed) ; The Chevalier James de Johnstone, Memoirs of the Rebellion in 1745 (3rd ed., London, 1822) ; James Ray, Compleat Historie of the Rebel- lion, 1745-1746 (London, 1754); Robert Patten, History of the late Rebellion (2nd ed., London, 1717); Memoirs of Sir John Murray of Broughton, ed. by R. F. Bell (Edinburgh, 1898); Andrew Henderson, History of the Rebellion, 1745-1746 (2nd ed., London, 1748).

(R. J. M.) MURRAY, JAMES (c. 17 19-1704), British governor of Canada, was a younger son of Alexander Murray, 4th Lord Elibank (d, 1736). Having entered the British army, he served with the 15th Foot in the West Indies, the'Netherlands and Brittany, and became lieutenant-colonel of this regiment by purchase in 1751. In 1757 he led his men to North America to take part in the war against France. He commanded a brigade at the siege of Louisburg, was one of Wolfe's three brigadiers in the expedition against Quebec, and commanded the left wing of the army in the famous battle in September 1759. After the British victory and the capture of the city, Murray was left in command of Quebec; having strengthened its fortifications and taken measures to improve the morale of his men, he defended it in April and May 1760 against the attacks of the French, who were goon compelled to raise the siege. The British troops had been

decimated by disease, and it was only a remnant that Murray now led to join General Amherst at Montreal, and to be present when the last

batch of French troops in Canada surrendered. In October 1760 he was appointed governor of Quebec, and he became governor of Canada after this country had been formally ceded to Great Britain in 1763. In this year he quelled a dangerous mutiny, and soon afterwards his alleged partiality for the interests of the French Canadians gave offence to the British settlers; they asked for his recall, and in 1766 he retired from his post. After an inquiry in the House of Lords, he was exonerated from the charges which had been brought against him. In 1774 Murray was sent to Minorca as governor, and in 1781, while he was in charge of this island, he was besieged in Fort St Philip by a large force of French and Spaniards. After a stubborn resistance, which lasted nearly seven months, he was obliged to surrender the place; and on his return to England he was tried by a court-martial, at the instance of Sir William Draper,; who had served under him in Minorca as lieutenant- governor. He was acquitted and he became a general in 1783. He died on the 18th of June 1794. Murray's only son was James Patrick Murray (1 782-1834), a major-general and member of parliament.

MURRAY, SIR JAMES AUGUSTUS HENRY (1837-), British lexicographer, was born at Denholm, near Hawick, Roxburghshire, and after a local elementary education proceeded to Edinburgh, and thence to the university of London, where he graduated B.A. in 1873. Sir James Murray, who received honorary degrees from several universities, both British and foreign, was engaged in scholastic work for thirty years, from 1855 to 1885, chiefly at Hawick and Mill Hill. Daring this time his reputation as a philologist was increasing, and he was assistant examiner in English at the University of London from 1875 to !879 and president of the Philological Society of London from 1878 to 1880, and again from 1882 to 1884. It was in connexion with this society that he undertook the chief work of his life, the editing of the New English Dictionary, based on materials collected by the society. These materials, which had accumulated since 1857, when the society first projected the publication of a dictionary on philological principles, amounted to an enormous quantity, of which an idea may be formed from the fact that Dr Furnivall sent in " some ton and three-quarters of materials which had accumulated under his roof." After negotiations extending over a considerable period, the contracts between the society, the delegates of the Clarendon Press, and the editor, were signed on the 1st of March 1879, and Murray began the examination and arrangement of the raw material, and the still more troublesome work of re-animating and main- taining the enthusiasm of " readers." In 1885 he removed from Mill Hill to Oxford, where his Scriptorium came to rank among the institutions of

the University city. The first volume of the dictionary was printed at the Clarendon Press, Oxford, in 1888. A full account of its beginning and the manner of working up the materials will be found in Murray ‘s presidential address to the Philological Society in 1879, while reports of its progress are given in the addresses by himself and other presidents in subsequent years. In addition to his work as a philologist, Murray was a frequent contributor to the transac- tions of the various antiquarian and archaeological societies of which he is a member; and he wrote the article on the English language for this Encyclopaedia. In 1885 he received the honorary degree of M.A. from Balliol College; he was an original fellow of the British Academy, and in 1908 he was knighted.

MURRAY (or Moray), JAMES STUART, Earl of (c. 1531- 1570), regent of Scotland, was an illegitimate son of James V. of Scotland by Margaret, Erskine, daughter of John Erskine, earl of Mar. In 1538 he was appointed prior of the abbey of St Andrews in order that James V. might obtain possession of its funds. Educated at St Andrews University, he attacked, in September 1549, an English force which had made a descent on the Fife coast, and routed it with great slaughter. In addition to the priory of St Andrews, he received those also of Pittenweem and M&con in France, but manifested no vocation

for a monastic life. The discourses of Knox, which he heard at Calder, won his approval, and shortly after the return of the reformer to Scotland in 1559, James Stuart left the party of the queen regent and joined the lords of the congregation, who resolved forcibly to abolish the Roman service. After the return of Queen Mary in 1561, he became her chief adviser, and his cautious firmness was for a time effectual in inducing her to adopt a policy of moderation towards the reformers. At the beginning of 1562 he was created earl of Murray, a dignity also held by George Gordon, earl of Huntly, who, however, had lost the queen’s favour. Only a few days later he was made earl of Mar, but as this title was claimed by John, Lord Erskine, Stuart resigned it and received a second grant of the earldom of Murray, Huntly by this time having been killed in battle. Henceforward he was known as the earl of Moray, the alternative Murray being a more modern and less correct variant. About this time the earl married Anne (d. 1583), daughter of William Keith, 1st Earl Marischal.

After the defeat and death of Huntly, the leader of the Catholic party,

the policy of Murray met for a time with no obstacle, but he awakened the displeasure of the queen by his efforts in behalf of Knox when the latter was accused of high treason; and as he was also opposed to her marriage with Darnley, he was after that event declared an outlaw and took refuge in England. Returning to Scotland after the murder of Rizzio, he was pardoned by the queen. He contrived, however, to be away at the time of Darnley's assassination, and avoided the tangles of the marriage with Bothwell by going to France. After the abdication of Queen Mary at Lochleven, in July 1567, he was appointed regent of Scotland. When Mary escaped from Lochleven (May 2, 1568), the duke of Chatel- herault and other Catholic nobles rallied to her standard, but Murray and the Protestant lords gathered their adherents, defeated her forces at Langside, near Glasgow (May 13, 1568), and compelled her to flee to England. Murray displayed promptness in baffling Mary's schemes, suppressed the border thieves, and ruled firmly, resisting the temptation to place the crown on his own head. He observed the forms of personal piety; possibly he shared the zeal of the reformers, while he moderated their bigotry. But he reaped the fruits of the conspiracies which led to the murders of Rizzio and Darnley. He amassed too great a fortune from the estates of the Church to be deemed a pure reformer of its abuses. He pursued his sister with a calculated animosity which would not have spared her life had this been necessary to his end or been favoured by Elizabeth. The mode of producing the casket letters and the false charges added by Buchanan, deprive Murray of any claim to have been an honest accuser. His reluctance to charge Mary with complicity in the murder of Darnley was feigned, and his object was gained when he was allowed to table the accusation without being forced to prove it. Mary remained a captive under suspicion of the gravest guilt, while Murray ruled Scotland in her stead, supported by nobles who had taken part in the steps which ended in Bothwell's deed. During the year between his becoming regent and his death several events occurred for which he has been censured, but which were necessary for his security: the betrayal to Elizabeth of the duke of Norfolk and of the secret plot for the liberation of Mary; the imprisonment of the earl of Northumberland, who after the failure of his rising in the north of England had taken refuge in Scotland; and the charge brought against Maitland of Leth- ington of complicity in Darnley's murder. Lethington was committed to custody, but was rescued by Kirkaldy of Grange, who held the castle of Edinburgh, and while there " the chame- leon," as Buchanan named Maitland in his famous invective, gained over those in the castle, including Kirkaldy. Murray was afraid to proceed with the charge on the day of trial, while Kirkaldy and Maitland held the castle, which became the stronghold of the deposed queen's party.

It has been suspected that Maitland and Kirkaldy were cognizant of the design of Hamilton of Bothwellhaugh to murder Murray, for he had been with them in the castle. This has been ascribed to private

vengeance for the ill-treatment of his wife; but the feud of the Hamiltons with the regent is the most reasonable explanation. As he rode through Linlithgow Murray was shot on the 21st of January 1570 from a window by Hamilton, who had made careful preparation for the murder and his own escape. He was buried in the south aisle of St Giles Cathedral, Edinburgh, amid general mourning. Knox preached the sermon and Buchanan furnished the epitaph, both panegyrics. The elder of his two daughters, Elizabeth, married James Stuart (d. 1592), son of James, 1st Lord Doune, who succeeded to the earldom of Murray in right of his wife.

The materials for the life of Murray are found in the records and documents of the time, prominent among which are the various Calendars of State Papers. Mention must also be made of the many books which treat of Mary, Queen of Scots, and of the histories of the time — especially J. A. Froude, History of England, and Andrew Lang, History of Scotland.

MURRAY, JOHN, the name for several generations of a great firm of London publishers, founded by John McMurray (1745- 1 793)> a native of Edinburgh and a retired lieutenant of marines, who in 1768 bought the book business of William Sandby in Fleet Street, and, dropping the Scottish prefix, called himself John Murray. He was one of the twenty original proprietors of the Morning Chronicle, and started the monthly English Review (1783-1796). Among his publications were Mitford's Greece, Langhorne's Plutarch's Lives, and the first part of Isaac DTsraeli's Curiosities of Literature. He died on the 6th of November 1793.

John Murray (2) (1778-1843), his son, was then fifteen. During his minority the business was conducted by Samuel Highley, who was admitted a partner, but in 1803 the partner- ship was dissolved. Murray soon began to show the courage in literary speculation which earned for him later the name given him by Lord Byron of " the Anak of publishers." In 1807 he took a share with Constable in publishing Marmion, and became part owner of the Edinburgh Review, although with the help of Canning he launched in opposition the Quarterly Review (Feb. 1809), with William Gifford as its editor, and Scott, Canning, Southey, Hookham Frere and John Wilson Croker among its earliest contributors. Murray was closely connected with Constable, but, to his distress, was compelled in 1813 to break this association

On account of Constable's business methods, which, as he foresaw, led to disaster. In 181 1 the first two cantos of Childe Harold were brought to Murray by R. C. Dallas, to whom Byron had presented them. Murray paid Dallas 500 guineas for the copyright. In 181 2 he bought the pub- lishing business of William Miller (1769-1844), and migrated to 50, Albemarle Street. Literary London flocked to his house, and Murray became the centre of the publishing world. It was in his drawing-room that Scott and Byron first met, and here, in 1824, after the death of Lord Byron, the MS. of his memoirs, considered by Gifford unfit for publication, was destroyed. A close friendship existed between Byron and his publisher, but for political reasons business relations ceased after the publication of the 5th canto of Don Juan. Murray paid Byron some £20,000 for his various poems. To Thomas Moore he gave nearly £5000 for writing the life of Byron, and to Crabbe £3000 for Tales of the Hail. He died on the 27th of June 1843.

His son, John Murray (3) (1808-1892), inherited much of his business tact and judgment. " Murray's Handbooks " for travellers were issued under his editorship, and he himself wrote several volumes (see his article on the " Handbooks " in Murray's Magazine, November 1889). He published many books of travel; also Campbell's Lives of the Chancellors, The Speaker's Commentary, Smith's Dictionaries; and works by Hallam, Gladstone, L'yell, Layard, Dean Stanley, Borrow, Darwin, Living- stone and Samuel Smiles. He died on the 2nd of April 1892, and was succeeded by his eldest son, John Murray (4) (b. 1&51), under whom, in association with his brother, A. H. Hallam Murray, the firm was continued.

See Samuel Smiles, A Publisher and his Friends, Memoirs and Correspondence of the late John Murray . . . (1891), for the second John Murray; a series of three articles by F. Espinasse on " The

House of Murray," in The Critic (Jan. i860); and a paper by the same writer in Harper's New Monthly Magazine (Sept. 1885). See the Letters and Journals of Byron (ed. Prothero, 1898-1901).

MURRAY, JOHN (1778-1820), Scottish chemist, was born at Edinburgh in 1778 and died there on the 22nd of July 1820. He graduated M.D. at St Andrews in 1814, and attained some reputation as a lecturer on chemistry and materia medica. He was an opponent of Sir Humphry Davy's theory of chlorine, supporting the view that the

substance contained oxygen, and it was in the course of experiments made to disprove his argu- ments that Dr John Davy discovered phosgene or carbonyl chloride. He was a diligent writer of textbooks, including Elements of Chemistry (1801); Elements of Materia Medica and Pharmacy (1804), A System of Chemistry (1806), and (anony- mously) A Comparative View of the Huttonian and Neptunian Systems of Geology. He is sometimes confused with another John Murray (1 786-1851), a popular lecturer at mechanics' institutes. The two men carried on a dispute about the inven- tion of a miners' safety lamp in the Phil. Mag. for 181 7.

MURRAY, SIR JOHN (1841-), British geographer and naturalist, was born at Coburg, Ontario, Canada, on the 3rd of March 1841, and after some years' local schooling studied in Scotland and on the Continent. He was then engaged for some years in natural history work at Bridge of Allan. In 1868 he visited Spitsbergen on a whaler, and in 1872, when the voyage of the " Challenger " was projected, he was appointed one of the naturalists to the expedition. At the conclusion of the voyage he was made principal assistant in drawing up the scientific results, and in 1882 he became editor of the Reports, which were completed in 1896. He compiled a summary of the results, and was part -author of the Narrative of the Cruise and of the Report on Deep-sea Deposits. He also published numerous important papers on oceanography and marine biology. In 1808 he was made K.C.B., and the received many distinctions from the chief scientific societies of the world. Apart from his work in connexion with the " Challenger " Reports, he went in 1880 and 1882 on expeditions to explore the Faeroe Channel, and between 1882 and 1894 was the prime mover in various biological investigations in Scottish waters. In 1897, with the generous financial assistance of Mr Laurence Pullar and a staff of specialists, he began a bathymetrical survey of the fresh-water lochs of Scotland, the results of which, with a fine series of illustrations and maps, were published in 1910 in six volumes. He took a leading part in the expedition which started in April 1910 for the physiological and biological investigation of the North Atlantic Ocean on the Norwegian vessel " Michael Sars."

MURRAY, LINDLEY (1745-1826), Anglo-American gram- marian, was born at Swatara, Pennsylvania, on the 22nd of April 1745. His father, a Quaker, was a leading New York merchant. At the age of fourteen he was placed in his father's office, but he ran away to a school in Burlington, New Jersey. He was brought back to New York, but his arguments against a commercial career prevailed, and he was allowed to study law. On being called to the bar he practised successfully in New York. In 1783 he was able to retire, and in 1784 he left America

for England. Settling at Holgate, near York, he devoted the rest of his life to literary pursuits. His first book was Power of Religion on the Mind (1787). In 1795 he issued his Grammar of the English Language. This was followed, among other analogous works, by English Exercises, and the English Reader. These books passed through several editions, and the Grammar was the standard textbook for fifty years throughout England and America. Lindley Murray died on the 16th of January 1826.

See the Memoir of the Life and Writings of Lindley Murray (partly autobiographical), by Elizabeth Frank (1826); Life of Murray, by W. H. Egle (New York, 1885).

MURRAY (or Moray), SIR ROBERT (c. 1600-1673), one of the founders of the Royal Society, was the son of Sir Robert Murray of Craigie, Ayrshire, and was born about the beginning of the 17th century. In early life he served in the French army, and, winning the favour of Richelieu, rose to the rank of colonel.

On the outbreak of the Civil War he returned to Scotland and collected recruits for the royal cause. The triumph of Ci.omwell compelled him for a time to return to France, but he took part in the Scottish insurrection in favour of Charles II. in 1650, and was named lord justice clerk and a privy councillor. These appointments, which on account of the overthrow of the royal cause proved to be at the time only nominal, were confirmed at the Restoration in 1660. Soon after this Sir Robert Murray began to take a prominent part in the deliberations of a club instituted in London for the discussion of natural science, or, as it was then called, the ” new philosophy.” VWiien it was proposed to obtain a charter for the society he undertook to interest the king in the matter, the result being that on the 15th of July 1662 the club was incorporated by charter under the designation of the Royal Society. Murray was its first president. He died in June 1673.

MURRAY, the largest river in Australia. It rises in the Australian Alps in 36° 40′ S. and 147 E., and flowing north-west skirts the borders of New South Wales and Victoria until it passes into South Australia, shortly after which it bends south- ward into Lake Alexandrina, a shallow lagoon, whence it makes its way to the sea at Encounter Bay by a narrow opening at 35° iS’ S. and 138 55′ E. Near its source the Murray Gates, precipitous rocks, tower above it to the height of 3000 ft.; and the earlier part of its course is tortuous and uneven. Farther on it loses so much by evaporation in some parts as to become a series of pools. Its length till it debouches into Lake Alexandrina is n 20 m., its

average breadth in summer is 240 ft., its average depth about 16 ft.; and it drains an area of about 270,000 sq. m. For small steamers it is navigable as far as Albury. Periodically it overflows, causing wide inundations. The principal tributaries of the Murray are those from New South Wales, including the Edward River, the united streams of the Murrumbidgee and Lachlan, and the Darling or Callewatta. In 1829 Captain Sturt traced the Murrumbidgee River till it debouched into the Murray, which he followed down to Lake Alexandrina, but he was compelled, after great hardships, to return without discovering its mouth. In 1831 Captain Barker, while attempting to discover this, was murdered by the natives.

MURRAY COD (Oligorus macquariensis) , one of the largest of the numerous fresh-water Perciform fishes of Australia, and the most celebrated for its excellent flavour. It belongs to the family Serranidae. Its taxonomic affinities lie in the direc- tion of the perch and not of the cod family. The shape of the body is that of a perch, and the dorsal fin consists of a spinous

Murray Cod.

and rayed portion, the number of spines being eleven. The length of the spines varies with age, old individuals having shorter spines — that is, a lower dorsal fin. The form of the head and the dentition also resemble those of a perch, but none of the bones of the head has a serrated margin. The scales are small. The colour varies in different localities; it is generally brownish, with a greenish tinge and numerous small dark green spots. As implied by the name, this fish has its headquarters in the Murray River and its tributaries, but it occurs also in the northern parts of New South Wales. It is the most important food fish of these rivers, and is said to attain a length of more than 3 ft. and a weight of 120 lb.

MURREE, a town and sanatorium of British India, in the Rawalpindi district of the Punjab, 7517 ft. above the sea, about five hours' journey by cart-road from Rawalpindi town, and the starting-point for Kashmir. The houses are built on the

summit and sides of an irregular ridge, and command magnifi- cent views over forest-clad hills and deep valleys, studded with villages and cultivated fields, with the snow-covered peaks of Kashmir in the

background. The population in iooi was 1844; but these figures omit the summer visitors, who probably number 10,000. The garrison generally consists of three mountain batteries. Since 1877 the summer offices of the provincial government have been transferred to Simla. The Murree brewery, one of the largest in India, is the chief industrial establishment. The Lawrence Military Asylum for the children of European soldiers is situated here.

MURSHIDABAD, or Moorsheedabad, a town and district of British India, in the Presidency division of Bengal. The administrative headquarters of the district are at Berhampur. The town of Murshidabad is on the left bank of the Bhagirathi or old sacred channel of the Ganges. Pop. (iqoi), 15,168. The city of Murshidabad was the latest Mahommedan capital of Bengal. In 1704 the nawab Murshid Kulia Khan changed the seat of government from Dacca to Maksudabad, which he called after his own name. The great family of Jagat Seth maintained their position as state bankers at Murshidabad from generation to generation. Even after the conquest of Bengal by the British, Murshidabad remained for some time the seat of administration. Warren Hastings removed the supreme civil and criminal courts to Calcutta in 1772, but in 1775 the latter court was brought back to Murshidabad again. In 1 790, under Lord Cornwallis, the entire revenue and judicial staffs were fixed at Calcutta. The town is still the residence of the nawab, who ranks as the first nobleman of the province with the style of nawab bahadur of Murshidabad, instead of nawab nazim of Bengal. His palace, dating from 1837, is a magnificent building in Italian style. The city is crowded with other palaces, mosques, tombs, and gardens, and retains such industries as carving in ivory, gold and silver embroidery, and silk-weaving. A college is maintained for the education of the nawab's family.

The District of Murshidabad has an area of 2143 sq. m. It is divided into two nearly equal portions by the Bhagirathi, the ancient channel of the Ganges. The tract to the west, known as the Rarh, consists of hard clay and nodular limestone. The general level is high, but interspersed with marshes and seamed by hill torrents. The Bagri or eastern half belongs to alluvial plains of eastern Bengal. There are few permanent swamps; but the whole country is low-lying, and liable to annual inundation. In the north-west are a few small detached hillocks, said to be of basaltic formation. Pop. (1001), 1,333,184, show- ing an increase of 6-6% in the decade. The principal industry is that of silk, formerly of much importance, and now revived with government assistance. A narrow-gauge railway crosses the district, from the East Indian line at Nalhati to Azimganj on the Bhagirathi, the home of many rich Jain merchants; and a branch of the Eastern

Bengal railway has been opened.

MUS, the name of a Roman family of the plebeian Decian gens. (1) Publius Decius Mas won his first laurels in the Samnite War, when in 343 B.C., while serving as tribune of the soldiers, he rescued the Roman main army from an apparently hopeless position (Livy vii. 34). In 340, as consul with T. Manlius Torquatus as colleague, he commanded in the Latin War. The decisive battle was fought near Mt Vesuvius. The consuls, in consequence of a dream, had agreed that the general – whose troops first gave way should devote himself to destruction, and so ensure victory. The left wing under Decius became disordered, whereupon, repeating after the chief pontiff the solemn formula of self-devotion he dashed into the ranks of the Latins, and met his death (Livy viii. 9). (2) His son, also called Publius, consul for the fourth time in 295, followed the example of his father at the battle of Sentinum, when the left wing which he commanded was shaken by the Gauls (Livy x. 28). The story of the elder Decius is regarded by Mommsen as an unhistorical ” doublette ” of what is related on better authority of the son.

MUSAEUS, the name of three Greek poets. (1) The first was

a mythical seer and priest, the pupil or son of Orpheus, who was said to have been the founder of priestly poetry in Attica. According to Pausanias (i. 25) he was buried on the Museum hill, south-west of the Acropolis. He composed dedicatory and purificatory hymns and prose treatises, and oracular responses. These were collected and arranged in the time of Peisistratus by Onomacritus, who added interpolations. The mystic and oracular verses and customs of Attica, especially of Eleusis, are connected with his name (Herod, vii. 6; viii. 96; ix. 43). A Titanomachia and Theogonia are also attributed to him (G. Kinkel, Epicorum graecorum jragmenta, 1878). (2) The second was an Ephesian attached to the court of the kings of Pergamum, who wrote a Perseis, and poems on Eumenes and Attalus (Su'idas, s.v.). (3) The third (called Grammaticus in all the MSS.) is of uncertain date, but probably belongs to the beginning of the 6th century a.d., as his style and metre are evidently modelled after Nonnus. He must have lived before Agathias (530-582) and is possibly to be identified with the friend of Procopius whose poem (340 hexameter lines) on the story of Hero and Leander is by far the most beautiful of the age (editions by F. Passow, 1810; G. H. Schafer, 1825; C. Dilthey, 1874). The little love-poem Alpheus and Arethusa {Anthol. pal. ix. 362) is also ascribed to Musaeus.

MUSA KHEL, a Pathan tribe on the Dera Ghazi Khan border of the Punjab province of India. They are of Kakar origin, numbering 4670 fighting men. They enter British territory by the Vihowa Pass, and carry on an extensive trade, but are not dependent on India for the necessaries of life. They are a peaceful and united race, and have been friendly to the British, but at enmity with the Khetrans and the Baluch tribes to the south of their country. In 1879 the Musa Khels and other Pathan tribes to the number of 5000 made a demonstration against Vihowa, but the town was reinforced and they dispersed. In 1884 they were punished, together with the Kakars, by the Zhob Valley Expedition.

MUSAUS, JOHANN KARL AUGUST (1735-1787), German author, was born on the 29th of March 1735 at Jena, studied theology at the university, and would have become the pastor of a parish but for the resistance of some peasants, who objected that he had been known to dance. In 1760 to 1762 he published in three volumes his first work, Grandison der Zweite, afterwards (in 1 781-1 782) rewritten and issued with a new title, Der deutsche Grandison. The object of this book was to satirize Samuel Richardson's hero, who had many sentimental admirers in Germany. In 1763 Musaus was made master of the court pages at Weimar, and in 1769 he became professor at the

Weimar gymnasium. His second book — Physiognomische Reisen — did not appear until 1778-1779. It was directed against Lavater, and attracted much favourable attention. In 1782 to 1786 he published his best work V olksmarchen der Deutschen. Even in this series of tales, the substance of which Musaus collected among the people, he could not refrain from satire. The stories, therefore, lack the simplicity of genuine folk-lore. In 1785 was issued Freund Heins Erscheinungen in Holbeins Manier by J. R. Schellenberg, with explanations in prose and verse by Musaus. A collection of stories entitled Straussfedern, of which a volume appeared in 1787, Musaus was prevented from completing by his death on the 28th of October 1787.

The V olksmarchen have been frequently reprinted (Dusseldorf, 1903, &c). They were translated into French in 1844, and three of the stories are included in Carlyle's German Romance (1827) ; Musaus's Nackgelassene Scriften were edited by his relative, A. von Kotzebue (1791). See M. M tiller, J. K. A. Musaus (1867), and an essay by A. Stern in Beitrage zur Literaturgeschichte des 18. Jahr- hunderts (1893).

MUSCAT, Muskat or Maskat, a town on the south-east coast of Arabia, capital of the province of Oman. Its value as a naval base is derived from its 'position, which commands the entrance to the Persian Gulf. The town of Gwadar, the chief port of Makran, belongs to Muscat, and by arrangement with the sultan the British occupy that port with a telegraph station of the Indo-Persian telegraph service. An Indian political residency is established at Muscat. In geographical

position it is isolated from the interior of the continent. The mountains rise behind it in a rugged wall, across which no road exists. It is only from Matrah, a northern suburb shut off by an intervening spur which reaches to the sea, that land com- munication with the rest of Arabia can be maintained. Both Muscat and Matrah are defended from incursions on the land- ward side by a wall with towers at intervals. Muscat rose to importance with the Portuguese occupation of the Persian Gulf, and is noted for the extent of Portuguese ruins about it. Two lofty forts, of which the most easterly is called Jalali and the western Merani, occupy the summits of hills on either side the cove overlooking the town; and beyond them on the seaward side are two smaller defensive works called Sirat. All these are ruinous. A low sandy isthmus connects the rock and fortress of Jalali with the

mainland, and upon this isthmus stands the British residency. The sultan's palace is a three-storeyed building near the centre of the town, a relic of Portuguese occupation, called by the Arabs El Jereza, a corruption of Igrezia (church). This term is probably derived from the chapel once attached to the buildings which formed the Portuguese governor's residence and factory. The bazaar is insignificant, and its most considerable trade appears to be in a sweetmeat prepared from the gluten of maize. Large quantities of dates are also exported.

History. — The early history of Muscat is the history of Portu- guese ascendancy in the Persian Gulf. When Albuquerque first burnt the place after destroying Karyat in 1508, Kalhat was the chief port of the coast and Muscat was comparatively unimportant. Kalhat was subsequently sacked and burnt, the great Arab mosque being destroyed, before Albuquerque returned to his ships, " giving many thanks to our Lord." From that date, through 114 years of Portuguese ascendancy, Muscat was held as a naval station and factory during a period of local revolts, Arab incursions, and Turkish invasion by sea; but it was not till 1622, when the Portuguese lost Hormuz, that Muscat became the headquarters of their fleet and the most important place held by them on the Arabian coast. In 1650 the Portu- guese were finally expelled from Oman. Muscat had been reduced previously by the humiliating terms imposed upon the garrison by the imam of Oman after a siege in 1648. For five years the Persians occupied Oman, but they disappeared in 1 74 1. Under the great ruler of Oman, Said ibn Sultan (1804- 1856), the fortunes of Muscat attained their zenith; but on his death, when his kingdom was divided and the African possessions were parted from western Arabia, Muscat declined. In 1883- 1884, when Turki was sultan, the town was unsuccessfully besieged by the Indabayin and Rehbayin tribes, led by Abdul Aziz, the brother of Turki. In i8$5 Colonel Miles, resident at Muscat, made a tour through Oman, following the footsteps of Wellsted in 1835, and confirmed that traveller's report of the fertility and wealth of the province. In 1898 the French acquired the right to use Muscat as a coaling station.

See Stiffe, " Trading Ports of Persian Gulf," vol. ix. Geog. Journal, and the political reports of the Indian government from the Persian Gulf. Colonel Miles's explorations in Oman will be found in vol. vii. Geog. Journal (1896). (T. H. H.*)

MUSCATINE, a city and the county-seat of Muscatine county, Iowa, U.S.A., on the Mississippi river (here crossed by a wagon bridge), at the apex of the " great bend," in the south-east part of the state. Pop.

(1890), 11,454; (1900)) i4,°73> of whom 2352 were foreign-born; (igio census) 16,178. It is served by the Chicago Milwaukee & Saint Paul, the Chicago Rock Island & Pacific, and the Muscatine North & South railways. It is built on high rocky bluffs, and is the centre of a pearl- button industry introduced in 1891 by J. F. Boepple, a German, the buttons being made from the shells of the fresh-water mussel found in the neighbourhood; and there are other manu- factures. Coal is mined in the vicinity, and near the city are large market-gardens, the water-melons growing on Muscatine Island (below the city) and sweet potatoes being their most important products. The municipality owns and operates the waterworks. Muscatine began as a trading-post in 1833. It

was laid out in 1836, incorporated as a town under the name of Bloomington in 1839, and first chartered as a city, under its present name, in 185 1.

MUSCHELKALK, in geology, the middle member of the German Trias. It consists of a series of calcareous, marly and dolomitic beds which lie conformably between the Bunter and Keuper formations. The name Muschelkalk (Fr., cakaire coquillier; conchy lien, formation of D'Orbigny) indicates a characteristic feature in this series, viz. the frequent occurrence of lenticular banks composed of fossil shells, remarkable in the midst of a singularly barren group. In its typical form the Muschelkalk is practically restricted to the German region and its immediate neighbourhood; it is found in Thuringia, Harz, Franconia, Hesse, Swabia, and the Saar and Alsace districts. Northward it extends into Silesia, Poland and Heligo- land. Representatives are found in the Alps, west and south of the Vosges, in Moravia, near Toulon and Montpellier, in Spain and Sardinia; in Rumania, Bosnia, Dalmatia, and beyond this into Asia in the Himalayas, China, Australia, California, and in North Africa (Constantine). From the nature of the deposits, as well as from the impoverished fauna, the Muschelkalk of the type area was probably laid down within a land-locked sea which, in the earlier portion of its existence, had only imperfect communications with the more open waters of the period. The more remote representatives of the formation were of course deposited in diverse conditions, and are only to be correlated through the presence of some of the Muschelkalk fossils.

In the " German " area the Muschelkalk is from 250-350 ft. thick;' it is readily divisible into three groups, of which the upper and lower are pale thin-bedded limestones with greenish- grey marls, the middle group being mainly composed of gypsiferous and saliniferous marls

with dolomite. The Lower Muschelkalk consists, from below upwards, of the following rocks, the ochreous Wellen Dolomit, lower Wellen Kalk, upper Wellen Kalk (so called on account of the wavy character of the bedding) with beds of ” Schaumkalk ” (a porous cellular limestone), and Oolite and the Orbicularis beds (with Myopkoria orbicularis). In the Saar and Alsace districts and north Eifel, these beds take on a sandy aspect, the ” Muschelsandstein.” The Middle Muschelkalk or Anhydrite group, as already indi- cated, consists mainly of marls and dolomites with beds of anhydrite, gypsum and salt. The salt beds are worked at Hall, Friedrichshall, Heilbronn, Stettin and Erfurt. It is from this division that many of the mineral springs of Thuringia and south Germany obtain their saline contents. The cellular nature of much of the dolomite has given rise to the term ” Zellendolomit.” The Upper Muschelkalk (Hauptmuschelkalk, Friedrichshallkalk of von Alberti) consists of regular beds of shelly limestone alternating with beds of marl. The lower portion or ” Trochitenkalk ” is often composed entirely of the fragmentary stems of Encrintts liliiformis; higher up come the ” Nodosus ” beds with Ceratites compressus, C. nodosus, and C. semipartitus in ascending order. In Swabia and Franconia the highest beds are platy dolomites with Tringonodus Sander- gensis and the crustacean Bairdia. Stylolites are common in all the Muschelkalk limestones. The Alpine Muschelkalk differs in many respects from that of the type area, and shows a closer relationship with the Triassic Mediterranean sea; the more important local phases will be found tabulated in the article Trias.

In addition to the fossils mentioned above, the following are Muschelkalk forms: Terebratulina vulgaris, Spiriferina Mantzeli and 5. hirsuta, Myophoria vulgaris, Rhynchotites hirundo, Ceratites Miinsteri, Ptychites studeri, Balatonites balatonicus, Aspidura scutulata, Daonella Lommeli, and in the Alpine region several rock- forming Algae, Bactryllium, Gyroporella, Diplopora, &c.

(J. A. H.)

MUSCLE AND NERVE {Physiology). 1 Among the properties of living material there is one, widely though not universally present in it, which forms the pre-eminent characteristic of

1 The anatomy of the muscles is dealt with under Muscular System, arid of the nerves under Nerve and Nervous System.

muscular cells. This property is the liberation of some of the energy contained in the chemical compounds of the cells in such a way as to give mechanical work. The mechanical work is obtained by movement resulting from a change, it is supposed, in the elastic tension of the framework of the living cell. In the fibrils existing in the cell a sudden alteration of elasticity occurs, resulting in an increased tension on the points of attachment of the cell to the neighbouring elements of the tissue in which the cell is placed. These yield under the strain, and the cell shortens between those points of its attachment. This shortening is called contraction. But the volume of the cell is not biilty. ‘ appreciably altered, despite the change of its shape, for its one diameter increases in proportion as its other is diminished. The manifestations of contractility by muscle are various in mode. By Ionic contraction is meant a prolonged and equable state of tension which yields under analysis no element of intermittent character. This is mani- fested by the muscular walls of the hollow viscera and of the heart, where it is the expression of a continuous liberation of energy in process in the muscular tissue, the outcome of the latter’s own intrinsic life, and largely independent of any con- nexion with the nervous system. The muscular wall of the blood-vessels also exhibits tonic contraction, which, however, seems to be mainly traceable to a continual excitation of the muscle cells by nervous influence conveyed to them along their nerves, and originating in the great vaso motor centre in the bulb. In the ordinary striped muscles of the skeletal musculature, e.g. gastrocnemius, tonic contraction obtains; but this, like the last mentioned, is not autochthonous in the muscles themselves; it is indirect and neural, and appears to be maintained reflexly. The receptive organs of the muscular sense and of the semi-circular canals are to be regarded as the sites of origin of this reflex tonus of the skeletal muscles. Striped muscles possessing an autochthonous tonus appear to be the various sphincter muscles.

Another mode of manifestation of contractility by muscles is the rhythmic. A tendency to rhythmic contraction seems dis- coverable in almost all muscles. In some it is very marked, for example in some viscera, the spleen, the bladder, the ureter, the uterus, the intestine, and especially in the heart. In several of these it appears not unlikely that the recurrent explosive libera- tions of energy in the muscle tissue are not secondary to recurrent explosions in nerve cells, but are attributable to decompositions arising sua sponte in the chemical substances of the muscle cells themselves in the course of their living.

Even small strips of the muscle of the heart, if taken immediately after the death of the animal, continue, when kept moist and warm and supplied with oxygen, to ” beat ” rhythmically for hours. Rhythmic contraction is also characteristic of certain groups of skeletal muscles, e.g. the respiratory. In these the rhythmic activity is, however, clearly secondary to rhythmic discharges of the nerve cells constituting the respiratory centre in the bulb. Such discharges descend the nerve fibres of the spinal cord, and through the intermediation of various spinal nerve cells excite the respiratory muscles through their motor nerves. A form of contraction intermediate in character between the tonic and the rhythmic is met in the auricle of the heart of the toad. There slowly successive phases of increased and of diminished tonus regularly alternate, and upon them are superposed the rhythmic ” beats ” of the pulsating heart.

” The beat,” i.e. the short-lasting explosive contraction of the heart muscle, can be elicited by a single, even momentary, application of a stimulus, e.g. by an induction shock. Similarly, such a single stimulus elicits from a skeletal muscle a single ” beat,” or, as it is termed, a ” twitch.” In the heart muscle during a brief period after each beat, that is, after each single contraction of the rhythmic series, the muscle becomes inexcitable. It cannot then be excited to contract by any agent, though the inexcitable period is more brief for strong than for weak stimuli. But in the skeletal, voluntary or striped muscles a second stimulus succeeding a previous so

Excit- ability.

quickly as to fall even during the continuance of the contraction excited by a first, elicits a second contraction. This second contraction starts from whatever phase of previous contraction the muscle may have reached at the time. A third stimulus excites a third additional contraction, a fourth a fourth, and so on. The increments of contraction become, however, less and less, until the succeeding stimuli serve merely to maintain, not to augment, the existing degree of contraction. We arrive thus by synthesis at a summation of ” beats ” or of simple contrac- tions in the compound, or ” tetanic,” or summed contraction of the skeletal muscles. The tetanic or summed contractions are more extensive than the simple, both in space and time, and liberate more energy, both as mechanical work and heat. The tension developed by their means in the muscle is many times greater than that developed by a simple twitch.

Muscle cells respond by changes in their activity to changes in their environment, and thus are said to be ” excitable.” They are, however,

less excitable than are the nerve cells which innervate them. The change which excites them is termed a stimulus. The least stimulus which suffices to excite is known as the stimulus of threshold value. In the case of the heart muscle this threshold stimulus evokes a beat as extensive as does the strongest stimulus; that is, the intensity of the stimulus, so long as it is above threshold value, is not a function of the amount of the muscular response. But in the ordinary skeletal muscles the amount of the muscular contraction is for a short range of quantities of stimulus (of above threshold value) proportioned to the intensity of the stimulus and increases with it. A value of stimulus, however, is soon reached which evokes a maximal contraction. Further increase of contraction does not follow further increase of the intensity of the stimulus above that point.

Just as in a nerve fibre, when excited by a localized stimulus, the excited state spreads from the excited point to the adjacent unexcited ones, so in muscle the ” contraction,” when excited at a point, spreads to the adjacent uncontracted parts. Both in muscle and in nerve this spread is termed conduction. It is propagated along the muscle fibres of the skeletal muscles at a rate of about 3 metres per second. In the heart muscle it travels much more slowly. The disturbance travels as a wave of contraction, and the whole extent of the wave-like disturbance measures in ordinary muscles much more than the whole length of any single muscle fibre. That the excited state spreads only to previously unexcited portions of the muscle fibre shows that even in the skeletal variety of muscle there exists, though only for a very brief time, a period of inexcitability. The duration of this period is about ˆ—Jir of a second in skeletal muscle.

When muscle that has remained inactive for some time is excited by a series of single and equal stimuli succeeding at intervals too prolonged to cause summation the succeeding contractions exhibit progressive increase up to a certain degree. The tenth contraction usually exhibits the culmination of this so-called ” staircase effect.” The explanation may lie in the production of CO2 in the muscle. That substance, in small doses, favours the contractile power of muscle. The muscle is a machine for utilizing the energy contained in its own chemical compounds. It is not surprising that the chemical substances produced in it by the decomposition of its living material should not be of a nature indifferent for muscular life. We find that if the series of excitations of the muscle be prolonged beyond the short stage of initial improvement, the contractions, after being well maintained for a time, later decline in force and speed, and ultimately dwindle even to vanishing point. This decline is said to be due to muscular fatigue. The muscle recovers on being allowed to rest unstimulated for a

while, and more quickly on being washed with an innocuous but non-nutritious solution, such as -6%, NaCl in water. The washing seems to remove excreta of the muscle's own production, and the period of repose removes them perhaps by diffusion, perhaps by breaking them down into innocuous material. Since the

muscle produces lactic acids during activity, it has been sug- gested that acids are among the " fatigue substances " with which muscle poisons itself when deprived of circulating blood. Muscles when active seem to pour into the circulation substances which, of unknown chemical composition, are physiologically recognizable by their stimulant action on the respiratory nervous centre. The effect of the fatigue substances upon the contrac- tion of the tissue is manifest especially in the relaxation process. The contracted state, instead of rapidly subsiding after dis- continuance of the stimulus, slowly and only partially wears off, the muscle remaining in a condition of physiological " contracture." The alkaloid veratrin has a similar effect upon the contraction of muscle; it enormously delays the return from the contracted state, as also does epinephrin, an alkaloid extracted from the suprarenal gland.

Nervous System. — The work of Camillo Golgi (Pa via, 1885 and onwards) on the minute structure of the nervous system has led to great alteration of doctrine in neural physi- ology. It had been held that the branches of the nerve cells, that is to say, the fine nerve fibres — since all nerve fibres are nerve cell branches, and all nerve cell branches are nerve fibres— which form a close felt-work in the nervous centres, there combined into a network actually con- tinuous throughout. This continuum was held to render possible conduction in all directions throughout the grey matter of the whole nervous system. The fact that conduction occurred preponderantly in certain directions was explained by appeal to a hypothetical resistance to conduction which, for reasons unascertained, lay less in some directions than in others. The intricate felt-work has by Golgi been ascertained to be a mere interlacement, not an actual anastomosis network; the branches springing from the various cells remain lifelong unattached and unjoined to any other than their own individual cell. Each neuron or nerve cell is a morphologically distinct and discrete unit connected functionally but not structurally with its neigh- bours, and leading its

own life independently of the destiny of its neighbours. Among the properties of the neuron is con- ductivity in all directions. But when neurons are linked together it is found that nerve impulses will only pass from neuron A to neuron B, and not from neuron B to neuron A; that is, the transmission of the excited state or nervous impulse, although possible in each neuron both up and down its own cell branches, is possible from one nerve cell to another in one direction only. That direction is the direction in which the nerve impulses flow under the conditions of natural life. The synapse, therefore, as the place of meeting of one neuron with the next is called, is said to valve the nerve circuits. This determinate sense of the spread is called the law of forward direction. The synapse appears to be a weak spot in the chain of conduction, or rather to be a place which breaks down with comparative ease under stress, e.g. under effect of poisons. The axons of the motor neurons are, inasmuch as they are nerve fibres in nerve trunks, easily accessible to artificial stimuli. It can be demonstrated that they are practically indefatigable— repeatedly stimulated by electrical currents, even through many hours, they, unlike muscle, continue to respond with unimpaired reaction. Fatfeue ˆ et w ˆ en tne muscular contraction is taken as index of the response of the nerve, it is found that unmis- takable signs of fatigue appear even very soon after commence- ment of the excitation of the nerve, and the muscle ceases to give any contraction in response to stimuli applied indirectly to it through its nerve. But the muscle will, when excited directly, e.g. by direct application of electric currents, contract vigorously after all response on its part to the stimuli (nerve impulses) applied to it indirectly through its nerve has failed. The inference is that the ” fatigue substances ” generated in the muscle fibres in the course of their prolonged contraction injure and paralyse the motor end plates, which are places of synapsis between nerve cell and muscle cell, even earlier than they harm the contractility of the muscle fibres themselves. The alkaloid curarin causes motor paralysis by attacking in a selective way this junction of motor nerve cell and striped muscular fibre.

Non-myelinate nerve fibres are as resistant to fatigue as are the myelinate.

The neuron is described as having a cell body or perikaryon from which the cell branches — dendrites and axon — extend, and it is this perikaryon which, as its name implies, contains the nucleus. It forms the trophic centre of ,˚„ ar y the cell, just as the nucleus-containing part of every cell is the trophic centre of the whole cell. Any part of the cell cut off from the nucleus-containing part dies down: this is as true of nerve cells as of amoeba, and in regard to the neuron it

constitutes what is known as the Wallerian degeneration. On the other hand, in some neurons, after severance of the axon from the rest of the cell (spinal motor cell), the whole nerve cell as well as the severed axon degenerates, and may eventu- ally die and be removed. In the severed axon the degenera- tion is first evident in a breaking down of the naked nerve filaments of the motor end plate. A little later the breaking down of the whole axon, both axis cylinder and myelin sheath alike, seems to occur simultaneously throughout ins entire length distal to the place of severance. The complex fat of the myelin becomes altered chemically, while the other com- ponents of the sheath break down. This death of the sheath as well as of the axis cylinder shows that it, like the axis cylinder, is a part of the nerve cell itself.

In addition to the trophic influence exerted by each part of the neuron on its other parts, notably by the perikaryon on the cell branches, one neuron also in many instances in- fluences the nutrition of other neurons. When, for instance, the axons of the ganglion cells of the retina are severed by section of the optic nerve, and thus their influence upon the nerve cells of the visual cerebral centres is set aside, the nerve cells of those centres undergo secondary atrophy (Cadden's atrophy). They dwindle in size; they do not, however, die. Similarly, when the axons of the motor spinal cells are by severance of the nerve trunk of a muscle broken through, the muscle cells undergo " degeneration " — dwindle, become fatty, and alter almost beyond recognition. This trophic influence which one neuron exerts upon others, or upon the cells of an extrinsic tissue, such as muscle, is exerted in that direction which is the one normally taken by the ?^. t natural nerve impulses. It seems, especially in ˆ eurons _ the case of the nexus between certain neurons, that the influence, loss of which endangers nutrition, is associ- ated with the occurrence of something more than merely the nervous impulses awakened from time to time in the leading nerve cell. The wave of change (nervous impulse) induced in a neuron by advent of a stimulus is after all only a sudden augmentation of an activity continuous within the neuron — a transient accentuation of one (the disintegrative) phase of the metabolism inherent in and inseparable from its life. The nervous impulse is, so to say, the sudden evanescent glow of an ember continuously black-hot. A continuous lesser " change " or stream of changes sets through the neuron, and is distributed by it to other neurons in the same direction and by the same synapses as are its nerve impulses. This gentle continuous activity of the neuron is called its tonus. In tracing the tonus of neurons to a source, one is always led link by link against the current of nerve force — so to say, "up

stream” — to the first beginnings of the chain of neurons in the sensifacient surfaces of the body. From these, as in the eye, ear, and other sense organs, tonus is constantly initiated. Hence, when cut off from these sources, the nutrition of the neurons of various central mechanisms suffers. Thus the tonus of the motor neurons of the spinal cord is much lessened by rupture of the great afferent root cells which normally play upon them. A prominent and practically important illustration of neural tonus is given by the skeletal muscles. These muscles exhibit a certain constant condition of slight contraction, which dis- appears on severance of the nerve that innervates the muscle. It is a muscular tonus of central source consequent on the continual glow of excitement in the spinal motor neuron, whose outgoing end plays upon the muscle cells, whose ingoing

end is played upon by other neurons — spinal, cerebral and cerebellar.

It is with the neural element of muscle tonus that tendon pheno- mena are intimately associated. The earliest-studied of these, the ” knee-jerk,” may serve as example of the class. It is a brief ex- tension of the limb at the knee-joint, due to a simple contraction of the extensor muscle, elicited by a tap or other short mechanical stimulus applied to the muscle fibres through the tendon of the muscle. The jerk is obtainable only from muscle fibres possessed of neural tonus. If the sensory nerves of the extensor muscle be severed, the ” jerk ” is lost. The brevity of the interval between the tap on the knee and the beginning of the resultant contraction of the muscle seems such as to exclude the possibility of reflex development. A little experience in observations on the knee-jerk imparts a notion of the average strength of the “jerk.” Wide departures from the normal standard are met with and are sympto- matic of certain nervous conditions. Stretching of the muscles antagonistic to the extensors — namely, of the flexor muscles — reduces the jerk by inhibiting the extensor spinal nerve cells through the nervous impulses generated by the tense flexor muscles. Hence a favourable posture of the limb for eliciting the jerk is one ensuring relaxation of the hamstring muscles, as when the leg has been crossed upon the other. In sleep the jerk is diminished, in deep sleep quite abolished. Extreme bodily fatigue diminishes it. Con- versely, a cold bath increases it. The turning of attention towards the knee interferes with the jerk; hence the device ot directing the person to perform vigorously some movement, which does not involve the

muscles of the lower limb, at the moment when the light blow is dealt upon the tendon. A slight degree of contraction of muscle seems the substratum of all attention. The direction of attention to the performance of some movement by the arm ensures that looseness and freedom from tension in the thigh muscles which is essential for the provocation of the jerk. The motor cells of the extensor muscles, when preoccupied by cerebral influence, appear refractory. T. Ziehen has noted exaltation of the jerk to follow extirpation of a cortical centre.

Although the cell body or perikaryon of the neuron, with its contained nucleus, is essential for the maintenance of the life of the cell branches, it has become recognized la Neurons. ˆaX. the actual process and function of “con- duction ” in many neurons can, and does, go on without the cell body being directly concerned in the conduction. S. Exner first showed, many years ago, that the nerve impulse travels through the spinal ganglion at the same speed as along the other parts of the nerve trunk — that is, that it suffers no delay in transit through the perikarya of the afferent root- neurons. Bethe has succeeded in isolating their perikarya from certain of the afferent neurons of the antennule of Carcinus. The conduction through the amputated cell branches continues unimpaired for many hours. This indicates that the conjunction between the conducting substance of the dendrons and that of the axon can be effected without the intermediation of the cell body. But the proper nutrition of the conducting substance is indissolubly dependent on the cell branches being in continuity with the cell body and nucleus it contains. Evidence illustrating this nexus is found in the visible changes produced in the perikaryon by prolonged activity induced and maintained in the conducting branches of the cell. As a result the fatigued cells appear shrunken, and their reaction to staining reagents alters, thus showing chemical alteration. Most marked is the decrease in the volume of the nucleus, amounting even to 44% of the initial volume. In the myelinated cell branches Of the neuron, that is, in the ordinary nerve fibres, no visible change has ever been demonstrated as the result of any normal activity, however great — a striking contrast to the observations obtained on the perikarya. The chemical changes that accompany activity in the nerve fibre must be very small, for the production of CO-: is barely measurable, and no production of heat is observable as the result of the most forced tetanic activity.

The nerve cells of the higher vertebrata, unlike their blood cells, their connective tissue cells, and even their muscle cells, Orowth la early, and indeed in embryonic life, lose power of iScrvous multiplication. The number of them formed is system, definitely closed at an early period of the individual life. Although, unlike so many other cells,

thus early sterile for reproduction of their kind, they retain for longer than most cells a high power of individual growth. They continue to grow, and

to thrust out new branches and to lengthen existing branches, for many years far into adult life. They similarly possess power to repair and to regenerate their cell branches where these are injured or destroyed by trauma or disease. This is the explana- tion of the repair of nerve trunks that have been severed, with consequent degeneration of the peripheral nerve fibres. As a rule, a longer time is required to restore the motor than the sensory functions of a nerve trunk.

Whether examined by functional or by structural features, the conducting paths of the nervous system, traced from beginning to end, never terminate in the centres of that system, but pass through them. All ultimately emerge as efferent channels. Every efferent channel, after entrance in the central nervous system, sub- divides; of its subdivisions some pass to efferent channels soon, others pass further and further within the cord and brain before they finally reach channels of outlet. All the longest routes thus formed traverse late in their course the cortex of the cerebral hemisphere. It is this relatively huge development of cortex cerebri which is the pre-eminent structural character of man. This means that the number of ” longest routes ” in man is, as compared with lower animals, disproportionately great. In the lower animal forms there is no such nervous structure at all as the cortex cerebri. In the frog, lizard, and even bird, it is thin and poorly developed. In the marsupials it is more evident, and its excitation by electric currents evokes movements in the musculature of the crossed side of the body. Larger and thicker in the rabbit, when excited it gives rise in that animal to movements of the eyes and of the fore-limbs and neck; but it is only in much higher types, such as the dog, that the cortex yields, under experimental excitation, definitely localized foci, whence can be evoked movements of the fore-limb, hind-limb, neck, ‘ eyes, ears and face. In the monkey the proportions it assumes are still greater, and the number of foci, for distinct movements of this and that member, indeed for the individual joints of each limb, are much more numerous, and together occupy a more extensive surface, though relatively to the total surface of the brain a smaller one.

Experiment shows that in the manlike (anthropoid) apes the differentiation of the foci or ‘centres ” of movement in the motor field of the cortex is even more minute. In them areas are found whence

stimuli excite movements of this or that finger alone, of the upper lip without the lower, of the tip only of the tongue, or of one upper eyelid by itself. The movement evoked from a point of cortex is not always the same; its character is determined by movements evoked from neighbouring points of cortex immediately antecedently. Thus a point A will, when excited soon subsequent to point B, which latter yields pro- trusion of lips, itself yield lip-protrusion, whereas if excited after C, which yields lip-.retraction, it will itself yield lip-retrac- tion. The movements obtained by point-to-point excitation of the cortex are often evidently imperfect as compared with natural movements — that is, are only portions of complete normal movements. Thus among the tongue movements evoked by stigmatic stimulation of the cortex undeviated protrusion or retraction of the organ is not found. Again, from different points of the cortex the assumption of the requisite positions of the tongue, lips, cheeks, palate and epiglottis, as components in the act of sucking, can be pro- voked singly. Rarely can the whole action be provoked, and then only gradually, by prolonged and strong excitation of one of the requisite points, e.g. that for the tongue, with which the other points are functionally connected. Again, no single point in the cortex evokes the act of ocular converg- ence and fixation. All this means that the execution of natural movements employs simultaneous co-operative activity of a number of points in the motor fields on both sides of the brain together.

The accompanying simple figure indicates better than any verbal description the topography of the main groups of foci in the motor field of a manlike ape (chimpanzee). It will be

noted from it that there is no direct relation between the extent of a cortical area and the mass of muscles which it controls. The mass of muscles in the trunk is greater than in the leg, and in the leg is greater than in the arm, and in the arm is many times greater than in the face and head; yet for the last the cortical area is the most extensive of all, and for the first-named is the least extensive of all.

The motor field of the cortex is, taken altogether, relatively to the size of the lower parts of the brain, larger in the anthropoid than in the inferior monkey brains. But in the anthropoid

Anus ttyaglna*.

*%ˆH2.».- Abdomen

Knee

Toes

Chest

Fingers 6 thumb.

Sulcus centraUSf.

M&sticaZian

come to be furnished more and mOre with fibres that are fully myelinate. At the beginning of its history each is unprovided with myelinate nerve fibres. The excitable foci of the cerebral cortex are well myelinated long before the unexcitable are so. The regions of the cortex, whose conduction paths are early completed, may be arranged in groups by their connexions with sense-organs: eye-region, ear-region, skin and somaesthetic region, olfactory and taste region. The areas of intervening cortex, arriving at Structural completion later than the above sense-spheres, are called by some association-spheres, to indicate the view that they contain the neural mechanisms of reactions (some have said ” ideas “) associated with the sense perceptions elaborated in the several sense- spheres.

The name “motor area” is given to that region of cortex whence, as D. Ferrier’s investigations showed, motor reactions of the facial and Seasori- limb muscles are regularly aiid easily motor evoked. This region is often called the Cenirss. sensori-motor cortex, and the term somaesthetic has also been used and seems appropriate. It has been found that disturbance of sensation, as well as disturbance of movement, is often incurred by its injury. Patients in whom, for purposes of diagnosis, it has been electrically excited, describe, as the initial effect of the stimulation, tingling and obscure but locally-limited sensations, referred to the part whose muscles a moment later are thrown into co-ordinate activity. The distinction, therefore, between the movement of the eyeballs, elicited from the occipital (visual) cortex, and that of the hand, elicited from the cortex in the region of the central sulcus (somaesthetic), is not a difference between Mirfai motor and sensory, for both are sensori-motor in the

Diagram of the Topography of the Main Groups of Foci in the Motor Field nature of their reactions; the difference is only a

of Chimpanzee.

brain still more increased even than the motor field are the great regions of the cortex outside that field, which yield no definite movements under electric excitation, and are for that reason known as ” silent.” The motor field, therefore, though absolutely larger, forms a smaller fraction of the whole cortex of the brain than in the lower forms. The statement that in the anthropoid (orang-outan) brain the groups of foci in the motor fields of the cortex are themselves separated one from another by sur- rounding inexcitable cortex, has been made and was one of great interest, but has not been confirmed by subsequent observation. That in man the excitable foci of the motor field are islanded in excitable surface similarly and even more extensively, was a natural inference, but it had its chief basis in the observations on the orang, now known to be erroneous.

In the diagram there is indicated the situation of the cortical centres for movement of the vocal cords. Their situation is at the lower end of the motor field. That they should lie there is interesting, because that place is close to one known in man to be associated with management of the movements concerned in speech. When that area in man is injured, the ability to utter words is impaired. Not that there is paralysis of the muscles of speech, since these muscles can be used perfectly for all acts other than speech. The area in man is known as the motor centre for speech; in most persons it exists only in the left half of the brain and not in the right. In a similar way damage of a certain small portion of the temporal lobe of the brain produces loss of intelligent apprehension of words spoken, although there is no deafness and although words seen are perfectly apprehended. Another region, ” the angular region,” is similarly related to intelligent apprehension of words seen, though not of words heard.

When this differentiation of cortex, with its highest expres- sion in man. is collated with the development of the cortex as studied in the successive phases of its growth and ripening in the human infant, a suggestive analogy is obvious. The nervous paths in the brain and cord, as they attain completion,

difference between the kind of sense and sense-organ in the two cases, the muscular apparatus in each case being an appanage of the sensual.

That the lower types of vertebrate, such as fish, e.g. carp, possess practically no cortex cerebri, and nevertheless execute ” volitional ” acts involving high co-ordination and suggesting the possession by them of associative memory, shows that for the existence of these

phenomena the cortex cerebri is in them not essential. In the dog it has been proved that after removal from the animal of every vestige of its cortex cerebri, it still executes habitual acts of great motor complexity requiring extraordinarily delicate adjustment of muscular contraction. It can walk, run and feed; such an animal, on wounding its foot, will run on three legs, as will a normal dog under similar mischance. But signs of associative memory are almost, if not entirely, wanting. Throughout three years such a dog failed to learn that the attendant's lifting it from the cage at a certain hour was the preliminary circumstance of the feeding- hour; yet it did exhibit hunger, and would refuse further food when a sufficiency had been taken. In man, actually gross sensory defects follow even limited lesions of the cortex. Thus the rabbit and the dog are not absolutely blinded by removal of the entire cortex, but in man destruction of the occipital cortex produces total blindness, even to the extent that the pupil of the eye does not respond when light is flashed into the eye.

Examination of the cerebellum by the method of Wallerian

degeneration has shown that a large number of spinal and

bulbar nerve cells send branches up into it. These _ . „ _ . . , . Cerebelmm.

seem to end, for the most part, in the grey cortex

of the median lobe, some, though not the majority, of them decussating across the median line. The organ seems also to receive many fibres from the parietal region of the cerebral hemisphere. From the organ there emerge fibres which cross to the opposite red nucleus, and directly or indirectly reach the thalamic region of the crossed hemi- sphere. The pons or middle peduncle, which was regarded,

on the uncertain ground of naked-eye dissection of human anatomy, as commissural between the two lateral lobes of the cerebellum, is now known to constitute chiefly a cerebro- cerebellar decussating path. Certain cerebellar cells send processes down to the cell-group in the bulb known as the nucleus of Deiters, which latter projects fibres down the spinal cord. Whether there is any other or direct emergent path from the cerebellum into the spinal cord is a matter on which opinion is divided.

Injuries of the cerebellum, if large, derange the power of executing movements, without producing any detectable derangement of sensation. The derangement gradually dis- appears, unless the damage to the organ be very wide. A reeling gait, oscillations of the body which impart a zigzag direction to the wall-, difficulty in standing, owing to unsteadi- ness of limb, are common in cerebellar disease. On the other hand, congenital defect amounting to absence of one cerebellar hemisphere has been found to occasion practically no symptoms whatsoever. Not a hundredth part of the cerebellum has remained, and yet there has existed ability to stand, to walk, to handle and lift objects in a fairly normal way, without any trace of impairment of cutaneous or muscular sensitivity. The damage to the cerebellum must, it would seem, occur abruptly or quickly in order to occasion marked derangement of function, and then the derangement falls on the execution of movements. One aspect of this derangement, named by Luciani astasia, is a tremor heightened by or only appearing when the muscles enter upon action — " intention tremor." Vertigo is a frequent result of cerebellar injury: animals indicate it by their actions; patients describe it. To interpret this vertigo, appeal must be made to disturbances, other than cerebellar, which like- wise occasion vertigo. These include, besides ocular squint, many spatial positions and movements unwonted to the body: the looking from a height, the gliding over ice, sea-travel, to some persons even travelling by train, or the covering of one eye. Common to all these conditions is the synchronous rise of perceptions of spatial relations between the self and the environment which have not, or have rarely, before arisen in synchronous combination. The tactual organs of the soles, and the muscular sense organs of limbs and trunk, are originating perceptions that indicate that the self is standing on the solid earth, yet the eyes are at the same time originating perceptions that indicate that the solid earth is far away below the standing self. The combination is hard to harmonize at first; it is at least not given as innately harmonized. Per- ceptions regarding the " me " are notoriously highly charged with " feeling," and the conflict occasions the feeling insuffi- ciently described as " giddiness." The cerebellum receives paths from most, if not from all, of the afferent roots. With certain of these it stands associated most closely, namely, with the vestibular, representing the sense organs which furnish data for appreciation of positions and movements of the head, and with the channels, conveying centripetal impressions from the apparatus of skeletal movement. Disorder of the cere- bellum sets at variance, brings discord into, the space-percep- tions contributory to the movement. The body's movement becomes thus imperfectly adjusted to the spatial requirements of the act it would perform.

In the physiological basis of sense exist many impressions which, apart from and devoid of psychical accompaniment, reflexly influence motor (muscular) innervation. It is with this sort of habitually apsychical reaction that the cerebellum is, it would seem, employed. That it is apparently devoid of psychical concomitant need not imply that the impressions concerned in it are crude and inelaborate. The seeming want of reaction of so much of the cerebellar structure under artificial stimulation, and the complex relay system revealed in the histology of the cerebellum, suggest that the impressions are elaborate. Its reaction preponderantly helps to secure co- ordinate innervation of the skeletal musculature, both for maintenance of attitude and for execution of movements. Sleep. — The more obvious of the characters of sleep (q.v.) are

essentially nervous. In deep sleep the threshold-value of the stimuli for the various senses is very greatly raised, rising rapidly during the first hour and a half of sleep, and then declining with gradually decreasing decrements. The muscles become less tense than in their waking state: their tonus is diminished, the upper eyelid falls, and the knee-jerk is in abeyance. The respiratory rhythm is less frequent and the breathing less deep ; the heart-beat is less frequent; the secretions are less copious; the pupil is narrow; in the brain there exists arterial anaemia with venous congestion, so that the blood-flow there is less than in the waking state.

It has been suggested that the gradual cumulative result of the activity of the nerve cells during the waking day is to load the brain tissue with ” fatigue-substances ” . . . which clog the action of the cells, and thus periodi- sleep. cally produce that loss of consciousness, &c, which is sleep. Such a drugging of tissue by its own excreta is known in muscular fatigue, but the fact that the depth of sleep progres- sively increases for an hour and more after its onset prevents complete explanation of sleep on similar lines. It has been urged that the neurons retract during sleep, and that thus at the synapses the gap between nerve cell and nerve cell becomes wider, or that the supporting cells expand between the nerve cells and tend to isolate the latter one from the other. Certain it is that in the course of the waking day a great number of stimuli play on the sense organs, and through these produce disintegra- tion of the living molecules of the central nervous system. Hence during the day the assimilatory processes of these cells are overbalanced by their wear and tear, and the end-result is that the cell attains an atomic condition less favourable to further disintegration than to reintegration. That phase of cell life which we are accustomed to call ” active ” is accompanied always by disintegration. When in the cell the assimilative processes exceed

dissimilative, the external manifestations of energy are liable to cease or diminish. Sleep is not exhaustion of the neuron in the sense that prolonged activity has reduced its excitability to zero. The nerve cell just prior to sleep is still well capable of response to stimuli, although perhaps the thres- hold-value of the stimulus has become rather high, whereas after entrance upon sleep and continuance of sleep for several hours, and more, when all spur to the dissimilation process has been long withheld, the threshold-value of the sensory stimulus becomes enormously higher than before. The exciting cause of sleep is therefore no complete exhaustion of the available material of the cells, nor is it entirely any paralysing of them by their excreta. It is more probably abeyance of external function during a periodic internal assimilatory phase.

Two processes conjoin to initiate the assimilatory phase. There is close interconnexion between the two aspects of the double activity that in physiological theory constitute the chemical life of protoplasm, between dissimilation and assimilation. Hering has long insisted on a self-regulative adjustment of the cell metabolism, so that action involves reaction, increased catabolism necessitates after-increase of anabolism. The long-continued incitement to catabolism of the waking day thus of itself predisposes the nerve cells towards rebound into the opposite phase; the increased cata- bolism due to the day's stimuli induces increase of anabolism, and though recuperation goes on to a large extent during the day itself, the recuperative process is slower than, and lags behind, the dis- integrative. Hence there occurs a cumulative effect, progressively increasing from the opening till the closing hours. The second factor inducing the assimilative change is the withdrawal of the nervous system from sensual stimulation. The eyes are closed, the maintenance of posture by active contraction is replaced by the recumbent pose which can be maintained by static action and the mere mechanical consistence of the body, the ears are screened from noise in the quiet chamber, the skin from localized pressure by a soft, yielding couch. The effect of thus reducing the excitant action of the environment is to give consciousness over more to mere revivals by memory, and gradually consciousness lapses. A remarkable case is well authenticated, where, owing to disease, a young man had lost the use of all the senses save of one eye and of one ear. If these last channels were sealed, in two or three minutes' time he invariably fell asleep.

If natural sleep is the expression of a phase of decreased excit- ability due to the setting in of a tide of anabolism in the cells of the nervous system, what is the action of narcotics ? They lower the

external activities of the cells, but do they not at the same time lower the internal, reparative, assimilative activity of the cell that in natural sleep goes vigorously forward preparing the system for the next day's drain on energy? In most cases they Seem to f'anotlcs l° wer both the internal and the external activity of the nerve cells, to lessen the cell's entire metabolism, to reduce the speed of its whole chemical .movement and life. Hence it is not surprising that often the refreshment, the recuperation, obtained From and felt after sleep induced by a drug amounts to nothing, or to worse than nothing. But very often refreshment is undoubtedly obtained from such narcotic sleep. It may be supposed that in the latter case the effect of the drug has been to ensure occurrence of that second predisposing factor mentioned above, of that withdrawal of sense impulses from the nerve centres that serves to usher in the state of sleep. In certain conditions it may be well worth while by means of narcotic drugs to close the portals of the senses for the sake of thus obtaining stillness in the chambers of the mind; their enforced quietude may induce a period in which natural rest and repair continue long after the initial unnatural arrest of vitality due to the drug itself has passed away.

Hypnotism. — The physiology of this group of " states " is, as regards the real understanding of their production, eminently vague (see also Hypnotism). The conditions which tend to in- duce them contain generally, as one element, constrained visual attention prolonged beyond ordinary duration. Symptoms attendant on the hypnotic state are closure of the eyelids by the hypnotizer without subsequent ■ attempt to open them by the hypnotized subject; the pupils, instead of being constricted, as for near vision, dilate, and there sets in a condition superficially resembling sleep. But in natural sleep the action of all parts of the nervous system is subdued, whereas in the hypnotic the reactions of the lower, and some even of the higher, parts are exalted. Moreover, the reactions seem to follow the sense impressions with such fatality, that, as an inference, absence of will-power to control them or suppress them is suggested. This reflex activity with " paralysis of will " is characteristic of the somnambulistic state. The threshold-value of the stimuli adequate for the various senses may be extraordinarily lowered. Print of microscopic size may be read; a watch ticking in another room can be heard. Judgment of weight and texture of surface is exalted; thus a card can in a dark room be felt and then re-selected from the re-shuffled pack. Akin to this condition is that in which the power of

maintaining muscular effort is in- creased; the individual may lie stiff with merely head and feet supported on two chairs; the limbs can be held outstretched for hours at a time. This is the cataleptic state, the phase of hypno- tism which the phenomena of so-called ” animal hypnotism ” resemble most. A frog or fowl or guinea-pig held in some unnatural pose, and retained so forcibly for a time, becomes ” set ” in that pose, or rather in a posture of partial recovery of the normal posture. In this state it remains motionless for various periods. This condition is more than usually readily induced when the cerebral hemispheres have been removed. The decerebrate monkey exhibits ” cataleptoid ” reflexes. Father A. Kircher’s experimentum mirabile with the fowl and the chalk line succeeds best with the decerebrate hen. The attitude may be described as due to prolonged, not very intense, discharge from reflex centres that regulate posture and are probably intimately connected with the cerebellum. A sudden intense sense stimulus usually suffices to end this tonic discharge. It completes the movement that has already set in but had been checked, as it were, half-way, though tonically maintained. Coincidently with the persistence of the tonic contraction, the higher and volitional centres seem to lie under a spell of inhibition; their action, which would complete or cut short the posture-spasm, rests in abeyance. Suspension of cerebral influence exists even more markedly, of course, when the cerebral hemispheres have been ablated.

But a potent — according to some, the most potent — factor in hypnotism, namely, suggestion, is unrepresented in the production of so-called animal hypnotism. We know that one idea suggests another, and that volitional movements are the outcome of ideation. If we assume that there is a material process at the basis of ideation, we may take the analogy of the concomitance between a spinal reflex movement and a skin

sensation. The physical ” touch ” that initiates the psychical ” touch ” initiates, through the very same nerve channels, a reflex movement responsive to the physical ” touch,” just as the psychical ” touch ” may be considered also a response to the same physical event. But in the decapitated animal we have good arguments for belief that we get the reflex movement alone as response; the psychical touch drops out. Could we assume that there is in the adult man reflex machinery which is of higher order than the merely spinal, which employs much more complex motor mechanisms than they, and is connected with a much wider range of sense organs; and could we assume that this reflex machinery, although usually associated in its action with memorial and volitional processes, may in certain circumstances be sundered from these latter and unattendant on them — may in fact

continue in work when the higher processes are at a standstill — then we might imagine a condition resembling that of the somnambulistic and cataleptic states of hypnotism.

Such assumptions are not wholly unjustified. Actions of great complexity and delicacy of adjustment are daily executed by each of us without what is ordinarily understood as volition, and without more than a mere shred of memory attached thereto. To take one's watch from the pocket and look at it when from a familiar clock-tower a familiar bell strikes a familiar hour, is an instance of a habitual action initiated by a sense perception outside attentive consciousness. We may suddenly remember dimly afterwards that we have done so, and we quite fail to recall the difference between the watch time and the clock time. In many instances hypnotism seems to establish quickly reactions similar to such as usually result only from long and closely attentive practice. The sleeping mother rests undisturbed by the various noises . of the house and street, but wakes at a slight murmur from her child. The ship's engineer, engaged in conversation with some visitor to the engine- room, talks apparently undisturbed by all the multifold noise and rattle of the machinery, but let the noise alter in some item which, though unnoticeable to the visitor, betokens importance to the trained ear, and his passive attention is in a moment caught. The warders at an asylum have been hypnotized to sleep by the bedside of dangerous patients, and " suggested " to awake the instant the patients attempt to get out of bed, sounds which had no import for them being inhibited by suggestion. Warders in this way worked all day and performed night duty also for months without showing fatigue. This is akin to the " repetition " which, read by the schoolboy last thing overnight, is on waking " known by heart." Most of us can wake somewhere about a desired although unusually early hour, if overnight we desire much to do so.

Two theories of a physiological nature have been proposed to account for the separation of the complex reactions of these conditions of hypnotism from volition and from memory. R. P. H. Heidenhain's view is that the cortical centres of the hemisphere are inhibited by peculiar conditions attaching to the initiatory sense stimuli. W. T. Preyer's view is that the essential condition for initiation is fatigue of the will-power under a prolonged effort of undivided attention.

Hypnotic somnambulism and hypnotic catalepsy are not the only or the most profound changes of nervous condition that hypnosis can induce. The physiological derangement which is the basis of the abeyance of volition may, if hypnotism be profound, pass into more widespread derangement, exhibiting itself as the hypnotic lethargy.

This is associated not only with paralysis of will but with profound anaesthesia. Proposals have been made to employ hypnotism as a method of producing anaesthesia for surgical purposes, but there are two grave objections to such employment. In order to produce a sufficient degree of hypnotic lethargy the subject must be made extremely susceptible, and this can only be done by repeated hypnotization. It is necessary to hypnotize patients every day for several weeks before they can be got into a degree of stupor sufficient to allow of the safe execution of a surgical operation. But the state itself, when reached, is at least as dangerous to life as is that produced by inhalation of ether, and it is more difficult to recover from. Moreover, by the processes the subject has gone through he has had those physiological activities upon which his volitional power depends excessively deranged, and not improbably permanently enfeebled. (C. S. S.)

MUSCOVITE, a rock-forming mineral belonging to the mica group (see Mica). It is also known as potash-mica, being a potassium, hydrogen and aluminium orthosilicate, H2KAl 3 (SiO,j)3.

MUSCULAR SYSTEM

5 1

As the common white mica obtainable in thin, transparent cleavage sheets of large size it was formerly used in Russia for window panes and known as ” Muscovy glass “; hence the name muscovite, proposed by J. D. Dana in 1850. It crystallizes in the monoclinic system; distinctly developed crystals, however, are rare and have the form of rough six-sided prisms or plates: thin scales without definite crystal outlines are more common. The most prominent feature is the perfect cleavage parallel to the basal plane (c in the figure), on which the lustre is pearly in character.

The hardness is 2-2 1, and the spec, grav. 2-8-2-0. The plane of the optic axes is perpendicular to the plane of symmetry and the acute bisectrix nearly normal to the cleavage; the optic axial angle is 60-70 , and double refraction is strong and negative in sign.

Muscovite frequently occurs as fine scaly to almost compact aggregates, especially when, as is often the case, it has resulted by the alteration of some other mineral, such as felspar, topaz, cyanite, &c. ; several varieties depending on differences in structure have been distinguished. Fine scaly varieties are damourite, margarodite (from Gr. txapyaplr-qs, a pearl), gilber- tite, sericite (from o-qpwbs, silky),

&c. In sericite the fine scales are united in fibrous aggregates giving rise to a silky lustre: this variety is a common constituent of phyllites and sericite- schists. Oncosine (from 67/cocris, intumescence) is a compact variety forming rounded aggregates, which swell up when heated before the blowpipe. Closely related to oncosine are several compact minerals, included together under the name pinite, which have resulted by the alteration of iolite, spodumene and other minerals. Other varieties depend on differences in chemical composition. Fuchsite or ” chrome-mica ” is a bright green muscovite containing chromium; it has been used as a decorative stone. Oellacherite is a variety containing some barium. In phengite there is more silica than usual, the com- position approximating to H2KAI 3 (Si 3 8)3-

Muscovite is of wide distribution and is the commonest of the micas. In igneous rocks it is found only in granite, never in volcanic rocks; but it is abundant in gneiss and mica-schist, and in phyllites and clay-slates, where it has been formed at the expense of alkali-felspar by dynamo-metamorphic processes. In pegmatite-veins traversing granite, gneiss or mica-schist it occurs as large sheets of commercial value, and is mined in India, the United States and Brazil (see Mica), and to a limited extent, together with felspar, in southern Norway and in the Urals. Large sheets of muscovite were formerly obtained from Solovetsk Island, Archangel. (L. J. S.)

MUSCULAR SYSTEM {Anatomy 1). The muscular tissue (Lat. musculus, from a fancied resemblance of certain muscles to a little mouse) is of three kinds: (1) voluntary or striped muscle; (2) involuntary or unsiriped muscle, found in the skin, walls of hollow viscera, coats of blood and lymphatic vessels, &c. ; (3) heart muscle. The microscopical differences of these different kinds are discussed in the article on Connective Tissues. Here only the voluntary muscles, which are under the control of the will, are to be considered.

The voluntary muscles form the red flesh of an animal, and are the structures by which one part of the body is moved at will upon another. Each muscle is said to have an origin and an insertion, the former being that attachment which is usually more fixed, the latter that which is more movable. This distinction, however, although convenient, is an arbitrary one, and an example may make this clear. If we take the pectoralis major, which is attached to the front of the chest on the one hand and to the upper part of the arm bone on the other, the effect of its contraction will obviously be to draw the arm towards the chest, so that its origin under ordinary circumstances is said to be from the chest while its insertion is into the arm; but if, in

climbing a tree, the hand grasps a branch above, the muscular contraction will draw the chest towards the arm, and the latter will then become the origin. Generally, but not always, a 1 For physiology, see Muscle and Nerve.

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muscle is partly fleshy and partly tendinous; the fleshy contractile part is attached at one or both ends to cords or sheets of white fibrous tissue, which in some cases pass round pullies and so change the direction of the muscle's action. The other end of these cords or tendons is usually attached to the periosteum of bones, with which it blends. In some cases, when a tendon passes round a bony pulley, a sesamoid bone is developed in it which diminishes the effects of friction. A good example of this is the patella in the tendon of the rectus femoris (fig. 1, P.).

Every muscle is supplied with blood vessels and lymphatics (fig. 1, v, a, I), and also with one or more nerves. The nerve supply is very important both from a medical and a morpho- logical point of view. The approxi- mate attachments are also important, because unless they are realized the action of the muscle cannot be understood, but the exact attach- ments are perhaps laid too great stress ' on in the anatomical teaching of medical students. The study of the actions of muscles is, of course, a physiological one, but teaching the subject has been handed over to the anatomists, and the results have been in some respects unfortunate. Until very recently the anatomist studied only the dead body, and his one idea of demonstrating the action of a muscle was to expose and then to pull it, and whatever happened he said was the action of that muscle. It is now generally recognized that no movement is so simple that only one muscle is concerned in it, and that what a muscle may do and what it really does do are not necessarily the same thing. As far as the deeper muscles are concerned, we still have only the anatomical method to depend upon, but with the superficial muscles it should be checked by causing a living person to perform certain movements and then studying which muscles take part in them.

For a modern study of muscular actions, see C. E. Beevor's Croonian Lectures for 1903 (London, 1904).

Muscles have various shapes : they may be fusiform, as in fig. 1 , conical, riband-like, or flattened into triangular or quadrilateral sheets. They may also be attached to skin, cartilage or fascia instead of to bone, while certain muscles surround openings which they constrict

and are called sphincters. The names of the muscles have gradually grown up, and no settled plan has been used in giving them. Sometimes, as in the coraco-brachialis and thyro-hyoid, the name describes the origin and insertion of the muscle, and, no doubt, for the student of human anatomy this is the most satisfactory plan, since by learning the name the approximate attachments are also learnt. Sometimes the name only indicates some peculiarity in the shape of the muscle and gives no clue to its position in the body or its attachments; examples of this are biceps, semilendinosus and pyriformis. Sometimes, as in the. flexor carpi ulnaris and corrugator supercilii, the use of the muscle is shown. At other times the position in the body is indicated, but not the attachments, as in the tibialis anticus and peroneus longus, while, at other times, as in the case of the pectineus, the name is only misleading. Fortunately the names of the describers themselves are very seldom applied to muscles; among the few examples are Horner's muscle and the

-P

L.M

Fig. 1. — The Rectus Mus- cle of the Thigh; to show the constituent parts of a muscle. R, The fleshy belly.

Tendon of origin.

Tendon of insertion.

Nerve of supply.

Artery of supply.

Vein.

Lymphatic vessel.

The patella.

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muscitlar band of Treitz. The German anatomists at the Basel conference lately proposed a uniform Latin and Greek nomencla- ture, which, though not altogether satisfactory, is gaining ground on the European continent. As there are some four hundred

Epicranial aponeurosis Aetrahens aurem

transverse wrinkles in the forehead. The anterior, posterior and superior auricular muscles are present but are almost functionless in man. The orbicularis palpebrarum forms a sphincter round the eyelids, which it closes, though there is little doubt that parts of the muscle can act separately and cause various expressions. The side of

Parotid

gland

Steeno-

uastoid

Frontalis

Orbicularis palpebrarum pyramidalis nasi

Compressor naris

Levator laeii superioris alaeque nasi

Levator labii superioris

ZygOMATICCS MINOR

Depressor alae nasi Zygomaticus major Stenson’s duct Orbicularis oris Risorius Buccinator Depressor anguli oris Depressor labii inierioris

Masseter Platysma myoides

From A. M. Patetson, Cunningham’s Text Book of Anatomy.

Fig. 2. — The Muscles of the Face and Scalp (muscles of expression).

muscles on each side of the body it will be impossible here to attempt more than a mere sketch of them; for the details the anatomical textbooks must be consulted.

Muscles of the Head and Face (see fig. 2).-*-The scalp is moved by a large flat muscle called the occipito-frontalis, which has two muscular bellies, the occipitalis and frontalis, and an intervening epicranial aponeurosis; this muscle moves the scalp and causes the

the nose has several muscles, the actions of which are indicated by their names; they are the compressor, two dilatores and the depressor alae nasi, while the levator labii superioris et alae nasi sometimes goes to the nose. Raising the upper lip, in addition to the last named, are the levator labii superioris proprius and the levator anguli oris, while the zygomaticus major draws the angle of the mouth outward. The lower lip is depressed by the depressor labii inferioris and depressor anguli oris, while the orbicularis oris acts as a sphincter to the mouth.

Epicranial aponeurosis

Temporal muscle

Auriculo-temporal nerve’

Superficial temporal

artery

External carotid artery- Internal lateral ligament Posterior auricular artery Lingual nerve; Mylo-hyoid nerve Parotid gland

Inferior dental nerve Masseter (cut)

Temporal branch of buccal nerve

I Temporal branches of) inferior maxillary nerve

External pterygoid Posterior dental artery Posterior dental nerve Long buccal nerve

Pterygomandibular ligament

Mental branch of inferior dental nerve

From A. M. Paterson, Cunningham’s Text Book of Anatomy.

Fig. 3. — Pterygoid Region.

The buccinator muscle in the substance of the cheeks rises from the upper and lower jaws and runs forward to blend with the orbicularis oris. All the foregoing are known as muscles of expression and all are supplied by the seventh or facial nerve. The temporal muscle at the side of the cranium (fig. 3) and the masseter (fig. 2), which rises from the zygoma, close the mouth, since both are inserted into the ramus of the mandible; while, rising from the pterygoid plates, are the external and internal pterygoid muscles (fig. 3), the former of which pulls forward the condyle, and so the whole mandible, while the latter helps to close the mouth by acting on the angle of the lower jaw. This group of muscles forms the masticatory set, all of which are supplied by the third division of the fifth nerve. For the muscles of the orbit, see Eye ; for those of the soft palate and pharynx, see Pharynx ; and for those of the tongue, see Tongue

both triangles to the hyoid bone. Where it passes deep to the sterno-mastoid it has a central tendon which is bound to the first rib by a loop of cervical fascia. Rising from the styloid process are three muscles, the stylo-glossus, stylo-hyoid and stylo-pharyngeus, the names of which indicate their attachments. Covering these muscles of the anterior triangle is a thin sheet, close to the skin, called the platysma, the upper fibres of which run back from the mouth over the cheek and are named the risorius (fig. 2) ; this sheet is one of the few remnants in man of the skin musculature or panni- culus carnosus of lower Mammals. With regard to the nerve supply of the anterior triangle muscles, all those which go to the tongue are supplied by the hypoglossal or twelfth cranial nerve, while the muscles below the hyoid bone are apparently supplied from this nerve but really from the upper cervical nerves (see Nerve,

Sternocleido- mastoid

Mylo-hyoid

Digastric

•Hyoglossus

Stylo-hyoid

■Middle constrictor

Thyro-hyoid

Inferior constrictor

[O-HY0ID

■Inferior constrictor ■Sterno-hyotd Sterno-thyroid

From A. M. Paterson, Cunningham's Text Book of Anatomy.

Fig. ,4. — The Triangles of the Neck (muscles).

Muscles of the Neck (fig. 4).— Just below the mandible is the iigastric, which, as its name shows, has two bellies and a central tendon; the anterior belly, supplied by the fifth nerve, is attached to the mandible near the symphysis, the posterior supplied by the seventh of the mastoid process, while the central tendon is bound to the hyoid bone. Stretching across from one side of the lower jaw to the other and forming a floor to the mouth is the mylo-hyoid muscle ; posteriorly this reaches the hyoid bone, and in the mid-line has a tendinous raphe separating the two halves of the muscle. Rising from the manubrium sterni and inner part of the clavicle is the Stemo-cleido-mastoid, which is inserted into the mastoid process and superior curved lines of the occipital bone; when it contracts it makes the face look over the opposite shoulder, and it is supplied by the spinal accessory nerve as well as by branches from the cervical plexus. It is an important surgical landmark, and forms a diagonal across the quadrilateral outline of the side of the neck, dividing it into an anterior triangle with its apex downward and a posterior with its apex upward. In the anterior triangle the relative positions of the hyoid bone, thyroid cartilage and sternum should be realized, and then the hyo-glossus, thyro-hyoid, sterno-hyoid and sterno-thyroid muscles are explained by their names. The omo-hyoid muscle rises from the upper border of the scapula and runs across

Cranial; and Nerve, Spinal). The posterior triangle is formed by the sterno-mastoid in front, the trapezius behind, and the clavicle below ; in its floor from above downward part of the following muscles are seen: complexus, splenius, levator anguli scapulae, scalenus medius and scalenus anticus. Sometimes a small piece of the scalenus posticus is caught sight of behind the scalenus medius. The splenius rotates the head to its own side, the levator anguli scapulae raises the upper angle of the scapula, while the three scalenes run from the transverse processes of the cervical vertebrae and fix or raise the upper ribs. The

trapezius (fig. 5) arises from the spines of the thoracic vertebrae and the ligamentum nuchae, and is inserted into the outer third of the clavicle and the spine of the scapula ; it is used in shrugging the shoulders and in drawing the upper part of the scapula toward the mid-dorsal line. Its nerve supply is the spinal accessory and third and fourth cervical nerves. When the super- ficial muscles and complexus are removed from the back of the neck, the sub-occipital triangle is seen beneath the occipital bone. Exter- nally it is bounded by the superior oblique, running from the trans- verse process of the atlas to the lateral part of the occipital bone, internally by the rectus capitis posticus major, passing from the spine of the axis to the lateral part of the occipital bone, and inferiorly by the inferior oblique joining the spine of the axis to the transverse

process of the atlas. These muscles move the head on the atlas and the atlas on the axis. They are supplied by the posterior branch of the first cervical nerve.

Muscles of the Trunk. — The trapezius has already been de- scribed as a superficial muscle of the upper part of the back ; in the loin region the latissimus dorsi (fig. 5) is the superficial muscle, its origin being from the lower thoracic spines, lower ribs and lumbar

Complexes’

Sterno-mastoid Splenitis capitis

SPLENIUi COLLI

Serratus posticus superior Levator anguli scapulae

forming the semispinalis and multifidus spinae muscles. The latissimus dorsi and rhomboids are supplied by branches of the brachial plexus of nerves, while the deeper muscles get their nerves from the posterior primary divisions of the spinal nerves (see Nerve, Spinal). On the anterior part of the thoracic region the pectoralis major runs from the clavicle, sternum and ribs, to the humerus (fig. 6) ; deep to this is the pectoralis minor, passing from the upper ribs to

Sterno-mastoid

Rhomboideus minor

Rhomboideus

MAJOR

Teres major <

Gluteal fascia Fascia over gluteus maxiinus (cut)

Gluteus maxtmus

From A. M. Paterson, Cunningham's Text Book of Anatomy.

Fig. 5. — Superficial Muscles of the Back.

fascia, and it is inserted into the upper part of the arm bone or humerus. When the trapezius is cut, the rhomboid muscles (major and minor) passing from the upper thoracic spines to the vertebral border of the scapula are seen, and deep to these is the serratus posticus superior passing from nearly the same spines to the upper ribs. On reflecting the latissimus dorsi the serratus posticus inferior is seen running from the lower thoracic spines to the lower ribs. When these muscles are removed the great mass of the erector spinae is exposed, familiar to every one as the upper cut of the sirloin or ribs of beef; it runs all the way up the dorsal side of the vertebral column from the pelvis to the occiput, the complexus already mentioned being its extension to the head. It i3 longitudinally segmented into many different bundles to which special names are given, and it is attached to the various vertebrae and ribs as it goes up, thus straightening the spinal column. Deep to the erector spinae are found shorter bundles passing from one vertebra to another and

the coracoid process. The serratus magnus is a large muscle rising by serrations from the upper eight ribs, and running back to the vertebral border of the scapula, which it draws forward as in the fencer's lunge. Between the ribs are the external and internal inter- costal muscles; the former beginning at the tubercle and ending at the junctions of the ribs with their cartilages, while the latter only begin at the angle of the ribs but are prolonged on to the sternum, so that an iuterchondral as well as an intercostal part of each muscle is recognized. The fibres of the external intercostals run downward and forward, those of the internal downward and backward (see Respiration). The abdominal walls are formed of three sheets of muscle, of which the most superficial or external oblique (fig. 6) is attached to the outer surfaces of the lower ribs; its fibres run downward and forward to the pelvis and mid-line of the abdomen, the middle one or internal oblique is on the same plane as the ribs, and its fibres run downward and backward,

while the transversaiis

is attached to the deep surfaces of the ribs, and its fibres run horizontally forward. Below, all these muscles are attached to the crest of the ilium and to Poupart's ligament, which is really the lower free edge of the external oblique, while, behind, the two deeper ones, at all events, blend with the fascia lumborum. As they approach the mid-ventral line they become aponeurotic and form the sheath of the rectus. The rectus abdominis (fig. 6) is a flat muscular band which runs up on each side of the linea alba or mid-ventral line of the abdomen from the pubis to the ribs and sternum. This muscle has certain tendinous intersections or lineae transversaˆ, the positions

Sterno-mastoid

rotating muscles pass from the scapula to the upper end of the humerus; these are the subscapuloris passing in front of the shoulder joint, the supraspinatus above the joint, and the infraspinatus and teres minor behind. The teres major (fig. 5) comes from near the lower angle of the scapula, and is inserted with the latissimus dorsi into the front of the. surgical neck of the humerus. The coraco- brachialis (fig. 7) passes from the coracoid process to the middle of the humerus in front of the shoulder joint, while the brachialis anticus passes in front of the elbow from the humerus to the coronoid process of the ulna. Passing in front of both shoulder and elbow is

StTBCLAVJUS

Coracoid process

Pectoraus major (divided)

Pectoralts

MINOR

.Pectoralts major (divided)

Pyramidalis abdominis

Poupart's ligament External abdominal ring

Triangular fascia

From A. M. Paterson, Cunningham's Text Book of Anatomy.

Fig. 6. — Anterior Muscles of the Trunk.

of which are noticed in the article Anatomy (Superficial and A rtistic) , and the morphology of which is referred to later. In front of the lowest part of the rectus is sometimes a small triangular muscle called the pyramidalis. The quadratus lumborum is a muscle at the back of the abdominal wall which runs between the last rib and the crest of the ilium. In front of the bodies of the vertebrae is a prevertebral or hypaxial musculature, of which the rectus capitis anticus major and minor muscles and longus colli in the neck and the psoas in the loins form the chief parts, the latter being familiar as the undercut of the sirloin of beef, while the pelvis is closed below by a muscular floor formed by the levator ani and coccygeus muscles. The diaphragm is explained in a separate article.

Muscles of the Upper Extremity. — Thedeltoid (seefigs.7and8i is the muscle which forms the shoulder cap and is used in abducting the arm to a right angle with the trunk; it runs from the clavicle, acromial process and spine of the scapula, to the middle of the humerus, and is supplied by the circumflex nerve, Several short

the biceps (fig. 7), the long head of which rises from the top of the glenoid cavity inside the joint, while the short head comes from the coracoid process. The insertion is into the tubercle of the radius. These three muscles are all supplied by the same (musculo-cutaneous) nerve. At the back of the arm is the triceps (fig. 8) which passes behind both shoulder and elbow joints and is the great extensor muscle of them; its long head rises from just below the glenoid cavity of the scapula, while the inner and outer heads come from the back of the humerus. It is inserted into the olecranon process of the u'.na and is supplied by the musculo-spinal nerve. The muscles of the front of the forearm form superficial and deep sets (see fig. 7). Most of the superficial muscles come from the internal condyle of the humerus. From without inward they are the pronator radn teres going to the radius, the flexor carpi radialis to the base of the index metacarpal bone, the palmaris longus to the palmar fascia, the flexor sublimis digitorum to the middle phalanges of the fingers, ! and the flexor carpi ulnaris to the pisiform bone. The important

points of practical interest about these muscles are noticed in the article Anatomy {Superficial and Artistic). In addition to these the brachio-radialis is a flexor of the forearm, though it arises from the outer supracondylar ridge of the humerus. It is supplied by the musculo-spiral nerve, the flexor carpi ulnaris by the ulnar, the rest by the median. The deep muscles of the front of the forearm consist of the flexor longus poUicis running from the radius to the terminal phalanx of the thumb, the flexor profundus digitorum from the ulna to the terminal phalanges of the fingers, and the pronator quadratics

Insertion of pectoralis minor

Deltoid

Axillary artery

Musculo- cutaneous nerve Median nerve (outer head)

Insertion of m0ˆmˆgt U »—a««BSgPˆ.‘X~-¥ edian ne ™> PKTOiuusˆˆ| Hˆ||ilHmˆ[ˆˆS (“““ahead)

UAJOR WftlliijHill ˆˆKST-ˆ—Ulnar nerve

coraco-brai

Short head of biceps Long head of biceps

Brachialis anticus

rjceps (inner head)

Musculo-cutaneous nerve Musculo-spiral nerve

Brachio-radialis

Extensor carpi radialis longior

Radial artery (cut)

Extensor ossrs

METACARPI POIXICIS

Radial artery (cut)

Anterior annular ligament.

Semilunar fascia of biceps

Pronator radii teres Deep fascia of forearm

Flexor carpi radialis

Palmare longus Flexor carpi ulnaris Flexor sublime digitorum

Flexor longus polucis ” Pronator quadratus Ulnar artery

Ulnar nerve

From A. M. Paterson, Cunningham’s Text Book of Anatomy. Fig. 7. — Superficial Muscles on the Front of the Arm and Forearm.

passing across from the lower third of the ulna to the same amount of the radius. These three muscles are supplied by the anterior interosseous branch of the median nerve, but the flexor profundus digitorum has an extra twig from the ulnar. The extensor muscles at the back of the forearm are also divided into superficial and deep sets (see fig. 8). The former rise from the region of the external condyle of the humerus, and consist of the extensor carpi radialis longior and brevior inserted into the index and medius metacarpal bones, the extensor communis digitorum to the middle and distal

phalanges of the fingers, the extensor minimi digiti, the extensor carpi ulnaris passing to the metatarsal bone of the minimus, and the supinator brevis wrapping round the neck of the radius to which it is inserted. The aconeus which runs from the external condyle to the olecranon process is really a part of the triceps. The deep muscles rise from the posterior surfaces of the radius and ulna, and are the extensor ossis metacarpi pollicis, the name of which gives its insertion, the extensor brevis pollicis to the proximal phalanx, and the extensor longus pollicis to the distal phalanx of the thumb, while

Trapezius

Triceps

External intermuscular septum

Deltoid

Infraspinatus

Teres major

‘ — Latisslmus dorsi

Extensor carpi radialis longior

Extensor carpi radialis

BREVIOR

Deep fascia of forearm

Extensor communis digitorum

Extensor carpi ulnaris

Extensor ossis metacarpi pollicis

Extensor brevis polucis

Extensor mtntmi digiti

Tendons of extensors of carpus

Posterior annular ligament Extensor longus pollicis Extensor indicis

From A. M. Paterson, Cunningham’s Text Boot 0/ Anatomy. Fig. 8. — The Muscles on the Back of the Arm, Forearm and Hand.

the extensor indicis joins the extensor communis slip to the index finger; all these posterior muscles are supplied by the posterior interosseous nerve. In front and behind the wrist the tendons are bound down by the anterior and posterior annular ligaments, while on the flexor surface of each finger is a strong fibrous sheath or theca for the flexor tendons. The ball of the thumb is occupied by short muscles called the thenar group, while hypolhenar muscles are found in the ball of the little finger. The four lumbrical muscles (fig. 9, d) run from the flexor profundus digitorum tendons to those of the

extensor communis between the heads of the metacarpal bones, while, rising from the shafts of these bones, are the three palmar and four dorsal interosseous muscles (fig. 9, e) which also are inserted into the extensor tendons. The two outer lumbricals and the thenar muscles are supplied by the median nerve; all the other hand muscles by the ulnar.

Muscles of the Lower Extremity. — On the front of the thigh the quadriceps extensor muscles are the most important: there are four of these, the rectus femoris (fig. 1) with its straight and reflected heads rising from just above the acetabulum, the crureus, deep to this, from the front of the femur, and the vastus externus and internus wrapping round the femur on each side from the linea aspera. All these are inserted into the patella, or rather the patella is a sesamoid bone developed where their common tendon passes round the lower

big toe, and the peroneus tertius, a purely human muscle inserted into the base of the fifth metatarsal bone. All these are supplied by the anterior tibial nerve.

The external group comprises the peroneus longus and brevis, rising from the outer surface of the fibula and inserted into the tarsus (fig. 11), the longus tendon passing across the sole to the base of the first metatarsal bone, the brevis to the base of the fifth metatarsal. These are supplied by the musculo-cutaneous nerve.

Fig. 9. — Tendons attached to a Finger.

a, The extensor tendon. e, An interosseous muscle.

b, Deep flexor. /, Tendinous expansion from the lum-

c, Superficial flexor. brical and interosseous muscles

d, A lumbrical muscle. joining the extensor tendon.

end of the femur when the knee is bent. The distal part of this tendon, which passes from the patella to the tubercle of the tibia, is the ligamentum patellae. The sartorius is a long riband-like muscle running from the anterior superior spine of the ilium to the inner surface of the tibia, obliquely across the front of the thigh. It forms the outer boundary of Scarpa's triangle, the inner limit of which is the adductor longus and the base Poupart's ligament. The floor is formed by the iliacus from the iliac fossa of the pelvis, which joins the psoas, to be inserted with it into the lesser trochanter, and by the pectineus running from the upper ramus of the pubis to

i'ust below the insertion of the last muscles. The adductor muscles, ongus, brevis and magnus, all rise from the subpubic arch, and are inserted into the linea aspera of the femur, so that they draw the femur toward the middle line. The gracilis (fig. 10) is part of the adductor mass, though its insertion is into the upper part of the tibia. The extensor muscles of the front of the thigh are supplied by the

anterior crural nerve, but the adductor group on the inner side from the obturator. The pectineus is often supplied from both sources. On the back of the thigh the gluteus maximus (figs. 5 and 10) plays an important part in determining man's outline (see Anatomy : Superficial and Artistic). It rises from the sacral region, and is inserted into the upper part of the femur and the deep fascia of the thigh, which is very thick and is known as the fascia lata; the muscle is a great extensor of the hip and raises the body from the stooping position. The gluteus medius rises from the ilium, above the hip joint, and passes to the great trochanter; it abducts the hip and enables the body to be balanced on one leg, as in taking a step for- ward. The gluteus minimus is covered by the last muscle, and passes from the ilium to the front of the great trochanter, thus rotating the hip joint inward. Some of its anterior fibres are sometimes separate from the rest, and are then called the scansorius (see Joints). When the gluteus maximus is removed, a number of short externally rotating muscles are seen, rising from the pelvis and inserted into the great trochanter (fig. 10) ; these are, from above downward, the pyrtformis, gemellus superior, obturator internus, gemellus inferior and quadraius femoris. They are all supplied by special branches of the sacral plexus. On cutting the quadratus femoris a good deal of the obturator externus can be seen, coming from the outer surface of the obturator membrane and passing to the digital fossa of the great trochanter. Unlike the rest of this group, it is supplied by the obturator nerve. Coming from the anterior part of the crest of the ilium is the tensor fasciae femoris, which is inserted into the fascia lata, as is part of the gluteus maximus, and the thickened band of fascia which runs down the outer side of the thigh from these to the head of the tibia is known as the ilio tibial band. The tensor fasciae femoris. gluteus medius and minimus, are supplied by the superior gluteal nerve, the gluteus maximus by the inferior gluteal. At the back of the thigh are the hamstrings rising from the tuberosity of the ischium (fig. 10); these are the semimembranosus and semitendinosus, passing to the inner part of the upper end of the tibia and forming the internal hamstrings, and the biceps femoris or external hamstring, which has an extra head from the shaft of the femur and is inserted into the head of the fibula. These muscles are supplied by the great sciatic nerve and extend the hip joint while they flex the knee. In the leg, as distinguished from the thigh, are three groups of muscles, anterior, external and posterior. The anterior group (fig. 11) all come from the front of the tibia and fibula, and consist of the extensor longus digitorum, extending the middle and distal phalanges of the four outer toes, the extensor proprius hallucis, extending the

gracilis’

Adductor magnus 1

semitendinosus’

Semimembranosus

Sartorius tendon

Biceps tendon (along with peroneal nerve)

Gastrocnemius

From A. M. Paterson, Cunningham’s Text Book of Anatomy.,

Fig. 10. — The Muscles on the Back of the Thigh.

The posterior group is divided into a superficial and a deep set. The superficial is composed of the gastrocnemius, the two heads of which rise from the two condyles of the femur, the soleus, which rises from the upper parts of the back of the tibia and fibula, the plantaris, which comes from just above the external condyle of the femur, and the popliteus which, although on a deeper plane, really belongs to this group and rises by a tendon from the outer condyle while its fleshy part is inserted into the upper part of the back of the tibia. The gastrocnemius and soleus unite to form the tendo A chillis, which is attached to the posterior part of the calcaneum, while the plantaris runs separately as a very thin tendon to the same place. These muscles are supplied by the internal popliteal nerve. The deep set is formed by three muscles which rise from the posterior surfaces of the tibia and fibula, the flexor longus digitorum, the tibialis posticus,

and the flexor longus hallucis from within outward. Their tendons all pass into the sole, that of the flexor longus digitorum being inserted into the terminal phalanges of the four outer toes, the flexor longus hallucis into the terminal phalanx of the big toe, while the tibialis posticus sends expansions to most of the tarsal bones. The nerve supply of this group is the posterior tibial. On the dorsum of the foot is the extensor brevis digitorum (fig. n). which helps to extend

SOLEOS’

Extensor longus. digitorum

PERONEUS LONGUS’

PERONEUS BREVIS’

Lower portion of

anterior annulai

ligament

Tendon of peroneus.

TERTIUS

Innermost slip op

extensor brevis

digitorum

Embryology, ’”■’:”

The development of the muscular system is partly known from the results of direct observation, and partly inferred from the study of the part of the nervous system whence the innervation is derived. The unstriped muscle is formed from the mesenchyme cells of the somatic and splanchnic layers of the mesoderm (see Embryology). but never, as far as we know, from the mesodermic somites. The heart muscle is also developed from mesenchymal cells, though trie changes producing its feebly striped fibres are more complicated. The skeletal or real striped muscles are derived either from the meso- dermic somites or from the branchial arches. As the mesodermic somites are placed on each side of the neural canal in the early embryo, it is obvious that the greater part of the trunk musculature spreads gradually round the body from the dorsal to the ventral side and consists of a series of plates called myotomes (fig. 12). The muscle fibres in these plates run in the long axis of the embryo, and are at first separated from those of the two neighbouring plates by thin fibrous intervals called myocommata. In some, cases these

From A. M. Paterson, Cunningham’s Text Book of Anatomy. Fig. 11. — Muscles of the Front of the Right Leg and Dorsum of the Foot.

the four inner toes, while in the sole are four layers of short muscles,

the most superficial of which consists of the abductor hallucis, the flexor brevis digitorum, and the abductor minimi digiti, the names of which indicate their attachments. The second layer is formed by muscles which are attached to the flexor longus digitorum tendon ; they are the accessorius, running forward to the tendon from the lower surface of the calcaneum, and the four lumbricales, which rise from the tendon after it has split for the four toes and pass between the toes to be inserted into the tendons of the extensor longus digitorum on the dorsum. The third layer comprises the flexor brevis hallucis, adductor obliquus and adductor transversus hallucis and the flexor brevis minimi digiti. The fourth layer contains the three plantar and four dorsal interosseous muscles, rising from the metatarsal bones and inserted into the proximal phalanges and extensor tendons in such a way that the plantar muscles draw the toes towards the line of the second toe while the dorsal draw them away from that line. Of these sole muscles the flexor brevis digitorum, flexor brevis hallucis, abductor hallucis and the innermost lumbrical are supplied by the internal plantar nerve, while all the rest are supplied by the external plantar.

From A. M. Paterson, Cunningham's Text Book oj Anatomy. Fig. 12. — Scheme to Illustrate the Disposition of the Myotomes in the Embryo in Relation to the Head, Trunk and Limbs. A, B, C, First three cephalic myotomes. N, I, 2, 3, 4, Last persisting cephalic myotomes. C, T, L, S, Co., The myotomes of the cervical, thoracic, lumbar,

sacral and caudal regions. I., II., III., IV., V., VI., VII., VIII., IX., X., XL, XII., Refer to the cranial nerves and the structures with which they may be embryologically associated.

myocommata persist and even become ossified, as in the ribs, but more usually they disappear early, and the myotomes then unite with one another to form a great muscular sheet. In the whole length of the trunk a longitudinal cleavage at right angles to the surface occurs, splitting the musculature into a- dorsal and ventral part, supplied respectively by the dorsal and ventral primary divisions of the spinal nerves. From the dorsal part the various muscles of the erector spinae series are derived by further longitudinal cleavages either tangential or at right angles to the surface, while the ventral part is again longitudinally split into mesial and lateral portions. A transverse section of the trunk at this stage, therefore, would show the cut ends of three longitudinal strips of muscle: (1) a mesial ventral, from which the rectus, pyramjdalis sterno-hyoid, omo- hyoid and sterno-thyroid muscles are derived ; (2) a lateral, ventral, forming the flat muscles of the abdomen, intercostals and part of the sternomastoid and trapezius;

and (3) the dorsal portion already noticed. The mesial ventral part is remarkable for the persistence of remnants of myocommata in it, forming the lineae transversae of the rectus and the central tendon of the omo-hyoid. The lateral part in the abdominal region splits tangentially into three layers.

the external and internal oblique and the transversalis, the fibres of which become differently directed. In the thoracic region the intercostals probably indicate a further tangential splitting of the middle or internal oblique layer, because the external oblique is continued headward superficially to the ribs and the transversalis deeply to them. The more cephalic part of the external oblique layer probably disappears by a process of pressure or crowding out owing to the encroachment of the serratus magnus, a muscle which its nerve supply indicates is derived from the lower cervical myo- tomes. The deeper parts of the lateral mass of muscles spread to the ventral surface of the bodies of the vertebrae, and form the hypaxial muscles — such as the psoas, longus colli and recti capitis antici. The nerve supply indicates that the lowest myotomes taking part in the formation of the abdominal walls are those supplied by the first and second lumbar nerves, and are represented by the cremaster muscle in the scrotum. In the perineum, however, the third and fourth sacral myotomes are represented, and these muscles are differentiated largely from the primitive sphincter which sur- rounds the cloacal orifice, though partly from vestigial tail muscles (see P. Thompson, Journ. Anat. and Phys., vol. xxxv; and R. H. Paramore, Lancet, May 21, 1910). In the head no distinct myotomes have been demonstrated in the mammalian embryo, but as they are present in more lowly vertebrates, it is probable that their develop- ment has been slurred over, a process often found in the embryology of the higher forms. Probably nine cephalic myotomes originally existed, of which the first gives rise to the eye muscles supplied by the third nerve, the second to the superior oblique muscle supplied by the fourth nerve, and the third to the external rectus supplied by the sixth nerve. The fourth, fifth and sixth myotomes are sup- pressed, but the seventh, eighth and ninth possibly form the muscles of the tongue supplied by the twelfth cranial nerve.

Turning now to the branchial arches, the first branchiomete is innervated by the fifth cranial nerve, and to it belong the masseter, temporal, pterygoids, anterior belly of the digastric, mylo-hyoid,

tensor tympani and tensor palati, while from the second branchio- Jiere, supplied by the seventh or facial nerve, all the facial muscles of expression and the stylo-hyoid and posterior belly of the digastric are derived, as well as the platysma, which is one of the few remnants of the panniculus carnosus or skin musculature of the lower mam- mals. From the third branchiomere, the nerve of which is the ninth or glossopharyngeal, the stylo-pharyngeus and upper part of the pharyngeal constrictors are formed, while the fourth and fifth gill arches give rise to the muscles of the larynx and the lower part of the constrictors supplied by the vagus or tenth nerve. It is possible that parts of the sterno-mastoid and trapezius are also branchial in their origin, since they are supplied by the spinal accessory or eleventh nerve, but this is unsettled. The limb musculature is usually regarded as a sleeve-like outpushing of the external oblique stratum of the lateral ventral musculature of the trunk, and it is believed that parts of several myotomes are in this way pushed out in the growth of the limb bud. This process actually occurs in the lower vertebrates, and the nerve supplies provide strong presumptive evidence that this is the real phylogenetic history of the higher forms, though direct observation shows that the limb muscles of mammals are formed from the central mesoderm of the limb and at first are quite distinct from the myotomes of the trunk. A possible explana- tion of the difficulty is that this is another example of the slurring over of stages in phylogeny, but this is one of many obscure morpho- logical points. The muscles of each limb are divided into a dorsal and ventral series, supplied by dorsal and ventral secondary divisions of the nerves in the limb plexuses, and these correspond to the original position of the limbs as they grow out from the embryo, so that in the upper extremity the back of the arm, forearm and dorsum of the hand are dorsal, while in the lower the dorsal surface is the front of the thigh and leg and the dorsum of the foot.

For further details see Development of the Human Body, by J. P. McMurrich (London, 1906), and the writings of L. Bolk, Morphol. Jahrb. vols, xxi-xxv.

Comparitive Anatomy.

In the acrania (e.g. amphioxus) the simple arrangement of myo- tomes and myocommata seen in the early human embryo is perma- nent. The myotomes or muscle plates are < shaped, with their apices pointing towards the head end, each being supplied by its own spinal nerve. In the fishes this arrangement is largely persis- tent, but each limb of the < is bent on itself, so that the myotomes have now the shape of a $, the central angle of which corresponds to the lateral line of the fish. In

the abdominal region, however, the myotomes fuse and rudiments of the recti and obliqui abdominis muscles of higher types are seen. In other regions too, such as the fins of fish and the tongue of the Cyclostomata (lamprey), specialized muscular bundles are separated off and are coincident with the acquirement of movements of these parts in different directions. In the Amphibia the limb muspulature becomes much more complex as the joints are formed, and many of the muscles can be homologized with those of mammals, though this is by no means always the case, while, in the abdominal region, a superficial delamination occurs, so that in many forms a superficial and deep rectus abdominis occurs as well as a cutaneus abdominis delaminated from the external oblique. It is probable that this delamination is the precursor of

the panniculus carnosus or skin musculature of mammals. The branchial musculature also becomes much more complex, and the mylo-hyoid muscle, derived from the first branchial arch and lying beneath the floor of the mouth, is very noticeable and of great importance in breathing.

In the reptiles further differentiation of the muscles is seen, and with the acquirement of costal respiration the external and internal intercostals are formed by a delamination of the internal oblique stratum. In the dorsal region several of the longitudinal muscles which together make up the erector spinae are distinct, and a very definite sphincter cloacae is formed round and cloacal aperture. In mammals certain muscles vary in their attachments or presence and absence in different orders, sub-orders and families, so that, were it not for the large amount of technical knowledge required in recognizing them, they might be useful from a classificatory point of view. There is, however, a greater gap between the musculature of Man and that of the other Primates than there is between many different orders, and this is usually traceable either directly or indirectly to the assumption of the erect position.

The chief causes which produce changes of musculature are: (1) splitting, (2) fusion, (3) suppression either partial or complete, (4) shifting of origin, (5) shifting of insertion, (6) new formation, (7) transference of part of one muscle to another. In many of these cases the nerve supply gives an important clue to the change which has been effected. Splitting of a muscular masses often the result, of one part of a muscle being used separately, and a good example of this is the deep flexor mass of the forearm. In the lower mammals this mass rises from the flexor surface of the radius and ulna, and supplies tendons to the terminal phalanges of all five digits, but in man the

thumb is used separately, and, in response to this, that part of the mass which goes to the thumb is completely split off into a separate muscle, the flexor longus pollicis. The process, however, is going farther, for we have acquired the habit of using our index finger alone for many purposes, and the index slip of the flexor profundus digitorum is in us almost as distinct a muscle as the flexor longus pollicis. Fusion may be either collateral or longitudinal. The former is seen in the case of the flexor carpi ulnaris. In many mammals {e.g. the dog), there are two muscles inserted separately into the pisiform bone, one rising from the internal condyle of the humerus, the other from the olecranon process, but in many others (e.g. man) the two muscles have fused. Longitudinal fusion, is seen in the digastric, where the anterior belly is part of the first (man- dibular; branchial arch and the posterior of the second or hyoid arch ; ‘ in this case, as one would expect, the anterior belly is supplied by the fifth nerve and the posterior by the seventh. Partial suppression of a muscle is seen in the rhomboid sheet; in the lower mammals this rises from the head, neck and anterior (cephalic) thoracic spines, but in man the head and most of the neck part is completely sup- pressed. Complete suppression of a muscle is exemplified in the omo-trachelian, a muscle which runs from the cervical vertebrae to the acromian process and fixes the scapula for the strong action of the triceps in pronograde mammals; in man this strong action of the triceps is no longer needed for progression, and the fixing muscle has disappeared. Shifting of origin is seen in the short head of the biceps femoris. This in many lower mammals (e.g. rabbit) is a muscle running from the tail to the lower leg; in many others (e.g. monkeys and man) the origin has slipped down to the femur, and in the great anteater it is evident that the agitator caudae has been used as a muscle slide, because the short head of the biceps or tenuissimus has once been found rising from the surface of this muscle. Shifting of an insertion is not nearly as common as shifting of an origin; it is seen, however, in the peroneus tertius of man, in which part of the extensor longus digitorum has acquired a new attachmentto the base of the fifth metatarsal bone.’ The new 1 formation of a muscle is seen in the stylo-hyoideus alter, an occasional human muscle; in this the stylo-hyoid ligament has been converted into a muscle. The transference of part of one muscle to another is well shown by the human adductor magnus ; here the fibres which pass from the tuber ischii to the condyle of the femur have a nerve supply from the great sciatic instead of the obturator, and in most lower mammals are a separate part of the hamstrings known as the presemimembranosus.

For further details see Bronn’s Classen tind Ordnungen des Thier-

reichs; ” The Muscles of Mammals,” by F. G. Parsons, Jour. Anat. and Phys. xxxii. 428 ; also accounts of the musculature of mammals, by Windle and Parsons, in Proc. Zool. Soc. (1894, seq.); Humphry, Observations in Myology (1874). (F. G. P.)

MUSES, THE (Gr. MoOom, the thinkers), in Greek myth- ology, originally nymphs of springs, then goddesses of song, and, later, of the different kinds of poetry and of the arts and sciences generally. In Homer, who says nothing definite as to their names or number, they are simply goddesses of song, who dwell among the gods on Olympus, where they sing at their banquets under the leadership of Apollo Musagetes. According to Hesiod (Theog. 77), who first gives the usually accepted names and number, they were the daughters of Zeus and Mnemosyne, the personification of memory; others made them children of

Uranus and Gaea. Three older Muses (Mneme, Melete, Aoide) were sometimes distinguished, whose worship was said to have been introduced by the Aloidae on Mt Helicon (Pausanias ix. 29). It is probable that three was the original number of the Muses, which was increased to nine owing to their arrangement in three groups of three in the sacred choruses. Round the altar of Zeus they sing of the origin of the world, of gods and men, of the glorious deeds of Zeus; they also honour the great heroes; and celebrate the marriages of Cadmus and Peleus, and the death of Achilles. As goddesses of song they protect those who recognize their superiority, but punish the arrogant — such as Thamyris, the Thracian bard, who for having boasted himself their equal was deprived of sight and the power of song. From their connexion wiih Apollo and their original nature as inspiring nymphs of springs they also possess the gift of prophecy. They are closely related to Dionysus, to whose festivals dramatic poetry owed its origin and development. The worship of the Muses had two chief seats — on the northern slope of Mt Olympus in Pieria, and on the slope of Mt Helicon near Ascra and Thespiae in Boeotia. Their favourite haunts were the springs of Castalia, Aganippe and Hippocrene. From Boeotia their cult gradually spread over Greece. As the goddesses who presided over the nine principal departments of letters, their names and attributes were: Calliope, epic poetry (wax tablet and pencil); Euterpe, lyric poetry (the double flute); Erato, erotic poetry (a small lyre) ; Melpomene, tragedy (tragic mask and ivy wreath); Thalia, comedy (comic mask and ivy wreath); Poly- hymnia (or Polymnia),

sacred hymns (veiled, and in an attitude of thought) ; Terpsichore, choral song and the dance (the lyre) ; Clio, history (a scroll); Urania, astronomy (a celestial globe). To these Arethusa was added as the muse of pastoral poetry. The Roman poets identified the Greek Muses with the Italian Camenae (or Casmenae), prophetic nymphs of springs and god- desses of birth, who possessed a grove near the Porta Capena at Rome. One of the most famous of these was Egeria, the counsellor of King Numa.

See H. Deiters, Ueber die Verehrung der Musen bei den Griechen (1868); P. Decharme, Les Muses (1860); J. H. Krause, Die Musen (1871); F. Rodiger, Die Musen (1875); O. Navarre in Daremberg and Saglio's Dictionnaire des antiquMs, and O. Bie in Roscher's Lexikon der Mythologie, the latter chiefly for representations of the Muses in art.

MUSET, COLIN (fl. 1200), French trouvere, was poet and musician, and made his living by wandering from castle to castle singing his own songs. These are not confined to the praise of the conventional love that formed the usual topic of the trouvhres, but contain many details of a singer's life. Colin shows naive gratitude for presents in kind from his patrons, and recommends a poet repulsed by a cruel mistress to find consolation in the bons morceaux qu'on mange devant un grand feu. One of his patrons was Agnes de Bar, duchess of Lorraine (d. 1226).

See' Hist. litt. de la France, xxiii. 547-553 ; also a thesis, De Nicolas Museto (1893), by J. B6dier.

MUSEUMS OF ART. 1 The later 19th century was remarkable for the growth and development of museums, both in Great Britain and abroad. This growth, as Professor Stanley Jevons predicted, synchronizes with the advancement of education. Public museums are now universally required; old institutions have been greatly improved, and many new ones have been founded. The British parliament has passed statutes conferring upon local authorities the power to levy rates for library and museum purposes, while on the continent of Europe the collection and exhibition of objects of antiquity and art has becfime a recognized duty of the state and municipality alike.

A sketch of the history of museums in general is given below, under Museums of Science. The modern museum of art differs essentially from its earlier prototypes. The aimless collection of curiosities and bric-a-brac, brought together without method

1 Under the term ” museum ” (Gr. fiovottov, temple of the muses) we accept the ordinary distinction, by which it covers a collection of all sorts of art objects, while an art gallery (g.p.) confines itself cractically to pictures.

or system, was the feature of certain famous collections in by- gone days, of which the Tradescant Museum, formed in the 17th century, was a good example. This museum was a miscellany without didactic value; it contributed nothing to the advance- ment of art; its arrangement was unscientific, and the public gained little or no advantage from its existence. The modern museum, on the other hand, should be organized for the public good, and should be a fruitful source of amusement and instruc- tion to the whole community. Even when Dr Waagen described the collections of England, about 1840, private individuals figured chiefly among the owners of art treasures. Nowadays in making a record of this nature the collections belonging to the public would attract most attention. This fact is becoming more obvious every year. Not only are acquisitions of great value constantly made, but the principles of museum administration and development are being more closely defined. What Sir William Flower, an eminent authority, called the ” new museum idea ” (Essays on Museums, p. 37) is pervading the treatment of all the chief museums of the world. Briefly stated, the new principle of museum development — first enunciated in 1870, but now beginning to receive general support — is that the first aim of public collections shall be education, and their second recreation. To be of teaching value, museum arrangement and classification must be carefully studied. Acquisitions must be added to their proper sections; random purchase of ” curios ” must be avoided. Attention must be given to the proper display and cataloguing of the exhibits, to their housing and preservation, to the lighting, comfort and ventilation of the galleries. Furthermore, facilities must be allowed to those who wish to make special study of the objects on view. ” A museum is like a living organism: it requires continual and tender care; it must grow, or it will perish ” (Flower, p. 13).

Great progress has been made in the classification of objects, a highly important branch of museum work. There are three possible systems — namely, by date, by material and „ by nationality. It has been found possible to (/ ™* combine the systems to some extent; for instance, in the ivory department of the Victoria and Albert Museum, South Kensington, London, where the broad classification is by material, the objects being further subdivided according to their age, and in a minor degree according to their nationality. But as yet there is no general preference of one system to another. Moreover, the principles of classification are not easily laid down; e.g. musical

instruments: should they be included in art exhibits or in the ethnographical section to which they also pertain? Broadly speaking, objects must be classified according to the quality (apart from their nature) for which they are most remark- able. Thus a musket or bass viol of the 16th century, inlaid with ivory and highly decorated, would be properly included in the art section, whereas a common flute or weapon, noteworthy for nothing but its interest as an instrument of music or destruc- tion, would be suitably classified as ethnographic. In England, at any rate, there is no uniformity of practice in this respect, and though it is to be hoped that the ruling desire to classify according to strict scientific rules may not become too preva- lent, it would nevertheless be a distinct advantage if, in one or more of the British museums, some attempt were made to illustrate the growth of domestic arts and crafts according to classification by date. Examples of this classification in Munich, Amsterdam, Basel, Zurich and elsewhere afford excellent lessons of history and art, a series of rooms being fitted up to show in chronological order the home life of our ancestors. In the National Museum of Bavaria (Munich) there is a superb suite of rooms illustrating the progress of art from Merovingian times down to the 19th century. Thus classification, though studied, must not check the elasticity of art museums; it should not be allowed to interfere with the mobility of the exhibits — that is to say, it should always be possible to withdraw specimens for the closer inspection of students, and also to send examples on loan to other museums and schools of art — an invaluable system long in vogue at the Victoria and Albert Museum, and one which should be still more widely adopted. An axiom of museum law

is that the exhibits shall be properly shown. ” The value of a museum is to be tested by the treatment of its contents ” (Flower, p. 24). But in many museums the chief hindrance to study and enjoyment is overcrowding of exhibits. Although a truism, it is necessary to state that each object should be properly seen, cleaned and safeguarded; but all over the world this rule is forgotten. The rapid acquisition of objects is one cause of overcrowding, but a faulty appreciation of the didactic purpose of the collection is more frequently responsible.

In Great Britain, museum progress is satisfactory. Visitors are numbered by millions, access is now permitted on Sundays and week-days alike, and entrance fees are being con- Promsf.” sisterly reduced;

in this the contrast between Great Britain and some foreign countries is singular. A generation or so ago the national collections of Italy used to be always open to the public. Pay-days, however, were gradually established, with the result that the chief collections are now only visible without payment on Sundays. In Dresden payment is obligatory five days a week. The British Museum never charges for admission. On the other hand, the increase in continental collections is more rapid than in Great Britain, where acquisitions are only made by gift, purchase or bequest. In other European countries enormous collections have been obtained by revolutions and conquest, by dynastic changes, and by secularizing religious foundations. Some of the chief treasures of provincial museums in France were spoils of the Napoleonic armies, though the great bulk of this loot was returned in 1 81 s to the original owners. In Italy the conversion of a monastery into a museum is a simple process, the Dominican house of San Marco in Florence offering a typical example. A further stimulus to the foundation of museums on the continent is the comparative ease with which old buildings are obtained and adapted for the collections. Thus the Germanisches Museum of Nuremberg is a secularized church and convent; the enormous collections belonging to the town of Ravenna are housed in an old Camaldulensian monastery. At Louvain and Florence municipal palaces of great beauty are used; at Nimes a famous Roman temple; at Urbino the grand ducal palace, and so on. There are, however, certain disadvantages in securing both building and collection ready-made, and the special care devoted to museums in Great Britain can be traced to the fact that their cost to the community is considerable. Immense sums have been spent on the buildings alone, nearly a million sterling being devoted to the new buildings for the Victoria and Albert Museum in London. Had it been possible to secure them without such an outlay the collections themselves would have been much increased, though in this increase itself there would have been a danger, prevalent but not yet fully realized in other countries, of crowding the vacant space with specimens of inferior quality. The result is that fine things are badly seen owing to the masses of second-rate examples; moreover, the ample space available induces the authorities to remove works of art from their original places, in order to add them to the museums. Thus the statue of St George by Donatello has been taken from the church of Or San Michele at Florence (on {he plea of danger from exposure), and is now placed in a museum where, being dwarfed and under cover, its chief artistic value is lost. The desire to make financial profit from works of art is a direct cause of the modern museum movement in Italy. One result is to displace and thus depreciate many works of art, beautiful in their original places, but quite insignificant when put

into a museum. Another result is that, owing to high entrance fees, the humbler class of Italians can rarely see the art treasures of their own country. There are other collections, akin to art museums, which would best be called biographical museums. They illustrate the life and work of great artists or authors. Of these the most notable are the museums commemorating Durer at Nuremberg, Beethoven at Bonn, Thorwaldsen at Copenhagen, Shakespeare at Stratford and Michelangelo at Florence. The sacristies of cathedrals often contain ecclesiastical objects of great value, and are shown to the public as museums. Cologne, Aachen, Milan, Monza and Reims have famous treasuries. Many Italian cathedrals have

small museums attached to them, usually known as ” Opera del Duomo.”

United Kingdom. — The influence and reputation of the British Museum are so great that its original purpose, as stated in the preamble of the act by which it was founded (1753, c. 22), may be quoted: ” Whereas all arts and sciences Museum. have a connexion with each other, and discoveries in natural philosophy and other branches of speculative know- ledge, for the advancement and improvement whereof the said museum or collection was intended, do, or may in many instances give help and success to the most useful experiments and under- takings . . .” The “said museum ” above mentioned referred to the collection of Sir Hans Sloane, to be purchased under the act just quoted. Sir Hans Sloane is therein stated, ” through the course of many years, with great labour and expense, to have gathered together whatever could be procured, either in our own or foreign countries, that was rare and curious.” In order to buy his collections and found the museum a lottery of £300,000 was authorized, divided into 50,000 tickets, the prizes varying from £10 to £10,000. Provision was made for the adequate housing of Sir Robert Cotton’s books, already bought in 1700 (12 and 13 Will. III. c. 7). This act secured for the nation the famous Cottonian manuscripts, “of great use and service for the knowledge and preservation of our constitution, both in church and state.” Sir Robert’s grandson had preserved the collection with great care, and was willing that it should not be ” disposed of or embeziled,” and that it should be preserved for public use and advantage. This act also sets forth the oath to be sworn by the keeper, and deals with the appointment of trustees. This is still the method of internal government at the British Museum, and additions to the Board of Trustees are made by statute, as in 1824, in acknowledgment of a bequest. The trustees are of three classes: (a) three principal trustees, namely the Primate, the Lord Chancellor and the Speaker; (b) general trustees, entitled ex officio to the position in

virtue of ministerial office; (c) family, bequest and nominated trustees. A standing committee of the trustees meets regularly at the museum for the transaction of business. The great departments of the museum (apart from the scientific and zoological collections, now placed in the museum in Cromwell Road, South Kensington) are of printed books, MSS., Oriental books, prints and drawings, Egyptian and Assyrian antiquities, British and medieval antiquities, coins and medals. Each of these eight departments is under a keeper, with an expert staff of subordinates, the head executive officer of the whole museum being styled director and chief librarian. The museum has been enriched by bequests of great importance, especially in the library. Recent legacies have included the porcelain bequeathed by Sir Wollaston Franks, and the valuable collection of works of art (chiefly enamels and gold-smithery) known as the Waddesdon bequest — a legacy of Baron F. de Rothschild. The most important group of acquisi- tion by purchase in the history of the museum is the series of Greek sculptures known as the Elgin Marbles, bought by act of parliament (56 Geo. III. c. 99).

There are four national museums controlled by the Board of Education, until recently styled the Department of Science arid Art. The chief of these is the Victoria and Albert Museums of Museum at South Kensington. This museum has a '** Board 0/ dependency at Bethnal Green, the Dublin and Edacatioa – Edinburgh museums having been now removed from its direct charge. There is also a museum of practical geology in Jermyn Street, containing valuable specimens of pottery and majolica. The Victoria and Albert Museum owed its inception to the Exhibition of 1851, from the surplus funds of which 12 acres of land were bought in South Kensington. First known as the Department of Practical Art, the museum rapidly established itself on a broad basis. Acquisitions of whole collections and unique specimens were accumulated. In 1857 the Sheepshanks gallery of pictures was presented; in 1879 the India Office trans- ferred to the department the collection of Oriental art formerly belonging to the East India Company; in 1882 the Jones bequest of French furniture and decorative art (1 740-1810) was received;

in 1884 the Patent Museum was handed over to the department. Books, prints, MSS. and drawings were bequeathed by the Rev. A. Dyce and Mr John Forster. Meanwhile, gifts and purchases had combined to make the collection one of the most important in Europe. The chief features may be summarized as consisting of pictures,

including the Raphael cartoons lent by the king; textiles, silks and tapestry; ceramics and enamels; ivory and plastic art, metal, furniture and Oriental collections. The guiding principle of the museum is the illustration of art applied to industry. Beauty and decorative attraction is perhaps the chief characteristic of the exhibits here, whereas the British Museum is largely archaeological. With this object in view, the museum possesses numerous reproductions of famous art treasures: casts, facsimiles and electrotypes, some of them so well contrived as to be almost indistinguishable from the originals. An art library with 75,000 volumes and 25,000 prints and photographs is at the disposal of students, and an art school is also attached to the museum. The museum does considerable work among provincial schools of art and museums, ” circulation ” being its function in this connexion. Works of art are sent on temporary loan to local museums, where they are exhibited for certain periods and on being withdrawn are replaced by fresh examples: The subordinate museum of the Beard of Education at Bethnal Greenand that at Edinburgh call for no comment, their contents being of slender value. The Dublin Museum, though now controlled by the Irish Department, may be mentioned here as having been founded and worked by the Board of Education. Apart from the fact that it is one of the most suitably housed and organized museums in the British Isles, it is remarkable for its priceless collection of Celtic antiquities, belonging to the Royal Irish Academy, and transferred to the Kildare Street Museum in 1890. Among its most famous specimens of early Irish art may be mentioned the shrine and bell of St Patrick, the Tara brooch, the cross of Cong and the Ardagh chalice. The series of bronze and stone implements is most perfect, while the jewels, gold ornaments, torques, fibulae, diadems, and so forth are such that, were it possible again to extend the galleries (thus allowing further classification and exhibition space), the collection would surpass the Danish National Museum at Copenhagen, its chief rival in Europe.

The famous collections of Sir Richard Wallace (d. 1890) having been bequeathed to the British nation by his widow, the public other has acquired a magnificent gallery of pictures, National together with a quantity of works of art, so important and Quasi- as to make it necessary to include Hertford House among national museums. French art predominates, and the examples of bronze, furniture, and porcelain are as fine as those to be seen in the Louvre. Hertford House, however, also contains a most remarkable collection of armour, and the examples of Italian faience, enamels, bijouterie, &c, are of first-rate interest. The universities of Cambridge and Oxford have museums, the latter including the Ashmolean collec- tions, a valuable bequest of majolica from D. Fortnum, and some important

classical statuary, now in the Taylorian Gallery. Christ Church has a small museum and picture gallery. Trinity College, Dublin, has a miniature archaeological collection, containing some fine examples of early Irish art. The National Museum of Antiquities of Scotland, controlled by the Board of Manufactures, was formed by the Scottish Society of Antiquaries, and has a comprehensive collection of Scottish objects, lay and religious. The Tower of London contains armour of historic and artistic interest, and the Royal College of Music has an invaluable collection of musical instruments, presented by Mr George Donaldson. Art museums are also to be found in several public schools in the United Kingdom.

The Museums Act of 1845 enabled town councils to found and maintain museums. This act was superseded by another passed in 1850, by Mr William Ewart, which in its turn has museums, been replaced by amending statutes passed in 1855, 1866, 1868 and 1885. The Museums and Gymna- siums Act of 1891 sanctioned the provision and maintenance of

National Museums.

museums for the reception of local antiquities and othef objects of interest, and allows a 3d. rate, irrespective of other acts. Boroughs have also the right to levy special rates under private municipal acts, Oldham affording a case in point. Civic museums must still be considered to be in their infancy. Although the movement is now firmly established in municipal enterprise, the collections, taken as a whole, are still somewhat nondescript. In many cases collections have been handed over by local societies, particularly in geology, zoology and other scientific, departments. There are about twelve museums in which Roman antiquities are noticeable, among them being Leicester, and the Civic Museum of London, at the Guildhall. British and Anglo-Saxon relics are important features at Sheffield and Liverpool; in the former case owing to the Bateman collection acquired in 1876; while the Mayer collection presented to the latter city contains a highly important series of carved ivories. At Salford, Glasgow and Manchester industrial art is the chief feature of the collections.. Birmingham, with perhaps the finest provincial collection of industrial art, is supported by the rates to the extent of £4200 a year. Its collections (including here, as in the majority of great townsman important gallery of paintings) are entirely derived from gifts and bequests. Birmingham has made a reputation for special exhibitions of works of art lent for a time to the corporation. These loan exhibitions, about which occasional lectures are given, and of which cheap illustrated catalogues are issued, have largely contributed to the great

popularity and efficiency of the museum. Liverpool, Preston, Derby and Sheffield owe their fine museum buildings to private generosity. Other towns have museums which are chiefly supported by subscriptions, e.g. Chester and Newcastle, where there, is a fine collection of work by Bewick the engraver. At Exeter the library, museum, and art gallery, together with schools of science and art, are combined in one building. Other towns may be noted as having art museums : Stockport, Notting- ham (Wedgwood collection), Leeds, Bootle, Swansea, Bradford, Northampton (British archaeology), and Windsor. There are museums at Belfast, Larne, Kilkenny and Armagh. The cost of the civic museum, being generally computed with the mainten- ance of the free library, is not easily obtained. In many cases the librarian is also curator of the museum; elsewhere no curator at all is appointed, his work being done by a caretaker. In some museums there is no classification or cataloguing and the value of existing collections is impaired both by careless treatment and by the too ready acceptance of worthless gifts; often enough the museums are governed by committees of the corporation whose interest and experience are not great.

Foreign Museums. — Art museums are far more numerous on the continent of Europe than in England. In Germany progress has been very striking, their educational aspect being closely studied. In Italy public collections, which are ten times more numerous than in England, are chiefly regarded as financial assets. The best examples of classification are to be found abroad, at Vienna, Amsterdam, Zurich, Munich and Gizeh in Egypt. The Musee Carnavalet, the historical collection of the city of Paris, is the most perfect civic museum in the world. The buildings in which the objects can be most easily studied are those of Naples, Berlin and Vienna. The value of the aggregate collections in any single country of the great powers, Russia excepted, probably exceeds the value of British collections. At the same time, it must be remembered that masses of foreign collections represent expropriations by the city and the state, together with the inheritance of royal and semi-royal collectors. In Germany and Italy, for instance, there are at least a dozen towns which at one time were capitals of principalities. In some countries the public holds over works of art the pre-emptive right of purchase. In Italy, under the law known as the Editto Pacca, it is illegal to export the more famous works of art. Speaking generally, the cost of maintaining municipal museums abroad is very small, many being without expert or highly-paid officials, while admission fees are often considerable. Nowhere in the United Kingdom are the collections neglected in a manner

through which certain towns in Italy and Spain have gained an unenviable name.

Berlin and Vienna have collections of untold richness, and the public are freely admitted. Berlin, besides its picture gallery Germany an d architectural museum, has a collection of Christian and antiquities in the university. The old museum, a

Austria. royal foundation, is renowned for its classical sculp- ture and a remarkable collection of medieval statuary, in which Italian art is well represented. The new museum is also noteworthy for Greek marbles, and contains bronzes and engravings, together with one of the most typical collections of Egyptian art. Schliemann's discoveries are housed in the Ethnographic Museum. The Museum of Art and Industry, closely similar in object and arrangement to the Victoria and Albert Museum in London, contains collections of the same character — enamels, furniture, ceramics, &c. Vienna also has one of these museums (Kunstgewerbe), in which the great value of the examples is enhanced by their judicious arrangement. The Historical Museum of this city is interesting, and the Imperial Museum (of which the structure corresponds almost exactly with a plan of an ideal museum designed by Sir William Flower) is one of the most comprehensive extant, containing armour of world-wide fame and the choicest specimens of indus- trial art. Prague, Innsbruck and Budapest are respectively the homes of the national museums of Bohemia, Tirol and Hungary. The National Museum of Bavaria (Munich) has been completed, and its exhibition rooms, 100 in number, show the most recent methods of classification, Nuremberg, with upwards of eighty rooms, being its only rival in southern Germany. Mainz and Trier have Roman antiquities. Hamburg, Leipzig and Breslau have good " Kunstgewerbe " collections. In Dresden there are four great museums — the Johanneum, the Albertinum, the Zwinger and the Griine Gewolbe — in which opulent art can best be appreciated; the porcelain of the Dresden galleries is superb, and few branches of art are unrepresented. Gotha is remarkable for its ceramics, Brunswick for enamels (in the ducal cabinet) . Museums of minor importance exist at Hanover, Ulm, Wiirzburg, Danzig and Liibeck.

The central museum of France, the Louvre, was founded as a public institution during the Revolutionary period. It contains the collections of Francois I., Louis XIV., and the Napoleons. Many works of art have been added to it from royal palaces, and collections formed by dis- tinguished connoisseurs (Campana, Sanvageot, La Caze) have been

incorporated in it. The Greek sculpture, including the Venus of Melos and the Nike of Samotlirace, is of pre-eminent fame. Other departments are well furnished, and from a technical point of view the manner in which the officials have overcome structural difficulties in adapting the palace to the needs of an art museum is most instructive. The Cluny Museum, bought by the city . in 1842, and subsequently transferred to the state, supplements the medieval collections of the Louvre, being a storehouse of select works of art. It suffers, however, from being overcrowded, while for purposes of study it is badly lighted. At the same time the Maison Cluny is a well-furnished house, decorated with admirable things, and as such has a special didactic value of its own, corresponding in this respect with Hertford House and the Poldi-Pezzoli Gallery at Milan — collections which are more than museums, since they show in the best manner the adaptation of artistic taste to domestic life. The French provincial museums are numerous and important. Twenty-two were established early in the 19th century, and received .1000 pictures as gifts from the state, numbers of which were not returned in 1815 to the countries whence they were taken. The best of these museums are at Lyons; at Dijon, where the tombs of Jean sans Peur and Philip the Bold are preserved; at Amiens, where the capital Musee de Picardie was built in 1850; at Marseilles and at Bayeux, where the " Tapestry " is well exhibited. The collec- tions of Lille, Bordeaux, Toulouse, and Avignon are also impor- tant. The objects shown in these museums are chiefly local gleanings, consisting largely of church plate, furniture, together

with sculpture, Carved wood, and pottery, nearly everything being French in origin. In many towns Roman antiquities and early Christian relics are preserved (e.g. Autun, Nimes, Aries and Luxeuil). Other collections controlled by municipalities are kept at Rouen, Douai, Montpellier, Chartres -(iˆth-century sculptures), Grenoble, Toulon, Ajaecio, Epinal (Carolingian objects), Besancon, Bourges, Le Mans (with the remarkable enamel of Geoffrey of Anjou), Nancy, Aix and in many other towns. As a rule, the public is admitted free of charge, special courtesy being shown to foreigners. In many cases the collections are ill cared for and uncatalogued, and little money is provided for acquisitions in the civic museums; indeed, in this respect the great national institutions contrast unfavourably with British establishments, to which purchase grants are regularly made.

The national, civic and papal museums of Italy are so numerous that a few only can be mentioned. The best arranged and best classified collection is the Museo Nazionale: at Naples, containing many thousand examples of Roman art, chiefly obtained from the immediate neighbourhood. For historical importance it ranks as primus inter

pares with the collections of Rome and the Vatican. It is, however, the only great Italian museum where scientific treatment is consistently adopted. Other museums of purely classical art are found at Syracuse, Cagliari and Palermo. Etruscan art is best displayed at Arezzo, Perugia (in the university), Cortona, Florence (Museo Archeologico), Volterra and the Vatican. The Florentine museums are of great importance, consisting of the archaeological museum of antique bronzes, Egyptian art, and a great number of tapestries. The Museo Nazionale, housed in the Bargello (a.d. 1260), is the central depository of Tuscan art. Numerous examples. of Delia Robbia ware have been gathered together, and are fixed to the walls in a manner and position which reduce their value to a minimum. The plastic arts of Tuscany are represented by Donatello, Verrocchio, Ghiberti, and Cellini, while the Carrand collection of ivories, pictures, and varied medieval specimens is pf much interest. This- museum, like so many others, is becoming seriously overcrowded, to the lasting detriment of churches, market-places, and streets, whence these works of art are being ruthlessly removed. Thepublic is admitted free one day a week, and the receipts are devoted to art and antiquarian purposes (“. tasse . . . destinate . . . alia conver- sazione dei monumenti,, all’ ampliamento degli scavi, ed’ all’ incremento dei instituti … nella citta.”ˆLaw of 1875, §5). The museums of Rome are numerous, the Vatican alone contain ing at least six — Museo Clementino, of classical art, with the Laocoon, the Apollo Belvedere, and other masterpieces; the Chiaramonti, also of classical sculpture; the Gallery of Inscrip- tions; the Egyptian, the Etruscan and the Christian museums. The last is an extensive collection corresponding with another papal museum in the Lateran Palace, also known as the Christian Museum (founded 1843), and remarkable for its sarcophagi arid relics from the catacombs. The Lateran has also a second museum known as the Museo Profano. Museums belonging to the state are equally remarkable. The Kircher Museum deals with prehistoric art, and contains the ” Preneste Hoard.” The Museo Nazionale (by the Baths of Diocletian), the Museo Capi- tolino, and the Palazzo dei Conservatori contain innumerable specimens of the finest classical art, vases, bronzes, mosaics, and statuary, Greek as well as Roman. Among provincial museums there are few which do not possess at least one or two objects of signal merit. Thus Brescia, besides a medieval collection, has a famous bronze , Victory. Pesaro, Urbino, and the Museo Correr at Venice have admirable examples pf majolica; Milan, Pisa and Genoa have general archaeology combined with a good proportion of mediocrity. The civic museum of Bologna is comprehensive and well arranged, having Egyptian, classical, and Etruscan collections, besides many things dating from the ” Bella Eppca ” of Italian art. At Ravenna alone can

the Byzantine art of Italy be properly understood, and it is most deplorable that the superb collections in its fine galleries should remain uncatalogued and neglected. Turin, Siena, Padua, and other towns have civic museums. •

Russia.

The Ryks, Museum at Amsterdam, containing the national collections of Holland, is a modern building in which a series Belgium of historical rooms are furnished to show at a glance and the artistic progress of the Dutch at any given period.

Holland. N me rooms are also devoted to the chronological display of ecclesiastical art. Besides the famous paintings, this museum (the sole drawback of which is the number of rooms which have no top light) contains a library, many engravings, a comprehensive exhibit of armour, costume, metal-work, and a department of maritime craftsmanship. Arnhem and Haarlem have municipal collections. At Leiden the university maintains a scholarly collection of antiquities. The Hague and Rotterdam have also museums, but everything in Holland is subordinated to the development of the great central depository at Amsterdam, to which examples are sent from all parts of the country. In Belgium the chief museum, that of ancient industrial art, is at Brussels. It contains many pieces of medieval church furniture and decoration, but in this respect differs only in size from the civic museums of Ghent and Luxemburg and the Archbishop's Museum at Utrecht. In Brussels, however, there is a good show of Frankish and Carolingian objects. The city of Antwerp maintains the Musee Plan tin, a printing establishment which has survived almost intact, and presents one of the most charming and instructive museums in the world. As a whole, the museums of Belgium are disappointing, though, per contra, the churches are of enhanced interest, not having been pillaged for the benefit of museums.

New museums are being founded in Russia every year. Kharkoff and Odessa (the university) have already large collec- tions, and in the most remote parts of Siberia it is curious to find carefully chosen collections. Krasno- yarsk has 12,000 specimens, a storehouse of Buriat art. Irkutsk the capital, Tobolsk, Tomsk (university), Khabarovsk, and Yakutsk have now museums. In these Russian art naturally predominates. It is only at Moscow and St Petersburg that

Western art is found. The Hermitage Palace in the latter city contains a selection of medieval objects of fabulous value, there being no less than forty early ivories. But from a national point of view these collections are insignificant when compared with the gold and silver objects illustrating the primitive arts and ornament of Scythia, Crimea and Caucasia, the high standard attained proving an advanced stage of manual skill. At Moscow (historical museum) the stone and metal relics are scarcely less interesting. There is also a museum of industrial art, the speci- mens of which are not of unusual value, but being analogous to the Kunstgewerbe movement in Germany, it exercises a whole- some influence upon the designers who study in its schools.

American museums are not committed to traditional systems, and scientific treatment is allowed its fullest scope. They exist in great numbers, and though in some cases their exhibits are chiefly ethnographic, a far wider range of art objects is rapidly being secured. The National Museum at Washington, a branch of the Smithsonian Institution (q.v.), while notable for its American historical and ethnological exhibits, has the National Gallery of Art. The Metropolitan Museum of Art (held by trustees for the benefit of the city of New York) has in the Cesnola collection the most complete series of Cypriot art objects. It has also departments of coins, Greek sculpture and general examples of European and American art. The Museum of Fine Arts at Boston is very comprehensive, and has a remarkable collection of ceramics, together with good reproductions of antique art. There are museums at St Louis, Chicago, Pittsburg, Brooklyn, Cincinnati, Buffalo and Washington, as well as Montreal in Canada; and the universities of Harvard, Chicago, Pennsylvania and Yale have important collections.

The Swiss National Museum is situated at Zurich, and though

of medium size (50 rooms), it is a model of arrangement and

organization. Besides the special feature of rooms

Countries, illustrating the historical progress of art, its collection

of stained glass is important. Basel also (historical

museum) is but little inferior in contents or system to the Zurich

America.

establishment. Geneva has three collections. Lausanne holds the museum of the canton, and Bern has a municipal collection. All these

institutions are well supported financially, and are much appreciated by the Swiss public. The art museums of Stockholm, Christiania and Copenhagen rank high for their intrinsic excellence, but still more for their scientific and didactic value. Stockholm has three museums: that of the Royal Palace, a collection of costume and armour; the Northern Museum, a large collection of domestic art; the National Museum, containing the prehistoric collections, gold ornaments, &c, classified in a brilliant manner. The National Museum of Denmark at Copenhagen is in this respect even more famous, being probably the second national collection in the world. The arrangement of this collection leaves little to be desired, and it is to be regretted that some British collections, in themselves of immense value, cannot be shown, as at Copenhagen, in a manner which would display their great merits to the fullest degree. There is also at Copenhagen a remarkable collection of antique busts (Gamle Glyptotek), and the Thorwaldsen Museum con- nected with the sculptor of that name. Norse antiquities are at Christiania (the university) and Bergen. Athens has three museums, all devoted to Greek art: that of the Acropolis, that of the Archaeological Society (vases and terra-cotta) and the National Museum of Antiquities. The state owns all discoveries and these are accumulated at the capital, so that local museums scarcely exist. The collections, which rapidly increase, are of great importance, though as yet they cannot vie with the aggregate in other European countries. The Museum of Egyptian Antiquities (Cairo), founded by Mariette Bey at Bulak, afterwards removed to theGiza palace and developed by Maspero, is housed in a large building erected in 1902, well classified, and liberally supported with money and fresh acquisitions. Minor museums exist at Carthage and Tunis. At Constantinople the Turkish Museum contains some good classical sculpture and a great deal of rubbish. The Museo del Prado and the Archaeo- logical Museum at Madrid are the chief Spanish collections, containing numerous classical objects and many specimens of Moorish and early Spanish art. In Spain museums are badly kept, and their contents are of indifferent value. The museums of the chief provinces are situated at Barcelona, Valencia, Granada and Seville. Cadiz and Cordova have also sadly neglected civic collections. The National Museum of Portugal at Lisbon requires no special comment. The progress of Japan is noticeable in its museums as in its industrial enterprise. The National Museum(Weno Park, Tokyo) is large and well arranged in a new building of Western architecture. KiotS and Nara have excellent museums, exclusively of Oriental art, and two or three other towns have smaller establishments, including com- mercial museums. There are several museums in India, the chief one being at Calcutta, devoted to Indian antiquities.

The best history of museums can be found in the prefaces and introductions to their official catalogues, but the following works will be useful for reference : Annual Reports presented to Parliament (official) of British Museum and Board of Education; Civil Service Estimates, Class IV., annually presented to Parliament; Second Report of Select Committee of House of Commons on Museums of Science and Art Department (official; I vol., 1898) ; Annual Reports of the Museum Association (London) ; Edward Edwards, The Fine Arts in England (London, 1840); Professor Stanley Jevons, ” Use and Abuse of Museums,” printed in Methods of Social Reform (London, 1882) ; Report of Committee on Provincial Museums. Report of British Association (London, 1887); Thos. Greenwood, Museums and Art Galleries (London, 1888) ; Professor Brown Goode, Museums of the Future, Report on the National Museum for 1889 (Washington, 1 891) ; Principles of Museum Administration ; Report of Museum Association (London, 1895); Mariotti, La Legislazione dette belle arti. (Rome, 1892) ; L. Benedite, Rapport sur I ‘organisation . . . dans les musies de la Grande Bretagne (official; Pans, 1895); Sir William Flower, Essays on Museums (London, 1898); Le Gallerie nazionali italiane (3 vols., Rome, 1894) ; D. Murray, Museums: Their History and Use, with Bibliography and List of Museums in the United Kingdom (3 vols., 1904). (B.)

MUSEUMS OF SCIENCE. The ideal museum should cover the whole field of human knowledge. It should teach the truths of all the sciences, including anthropology, the science which deals with man and all his works in every age. Afl tfie

sciences and all the arts are correlated. The wide separation of collections illustrative of the arts (see Museums of Art above) from those illustrative of the sciences, and their treatment as if belonging to a wholly different sphere, is arbitrary. Such separation, which is to-day the rule rather than the exception, is due to the circumstances of the origin of many collections, or in other cases to the limitations imposed by poverty or lack of space. Many of the national museums of continental Europe had their beginnings in collections privately acquired by monarchs, who, at a time when the modern sciences were in their infancy, entertained themselves by assembling objects which appealed to their love of the beautiful and the curious. The pictures, marbles, bronzes and bric-a-brac of the palace became the nucleus of the museum of to-day, and in some notable cases the palace itself was

converted into a museum. In a few instances these museums, in which works of art had the first place, have been enriched and supplemented by collections illustrative of the advancing sciences of a later date, but in a majority of cases these collections have remained what they were at the outset, mere exponents of human handicraft in one or the other, or all of its various departments. Some recent great foundations have copied the more or less defective models of the past, and museums devoted exclusively to the illustration of one or the other narrow segment of knowledge will no doubt continue to be multiplied, and in spite of their limited range, will do much good. A notable illustration of the influence of lack of space in bringing about a separation of anthropological collections from collections illustrative of other sciences is afforded by the national collection in London. For many years the collections of the British Museum, literary, artistic and scientific, were assembled in ideal relationship in Bloomsbury, but at last the accumulation of treasure became so vast and the difficulties of administration were so pressing that a separation was decided upon, and the natural history collections were finally removed to the separate museum in Cromwell Road, South Kensington. But the student of museums can never fail to regret that the necessities of space and financial considerations compelled this separation, which in a measure destroyed the ideal relationship which had for so many years obtained.

The ancient world knew nothing of museums in the modern sense of the term. There were collections of paintings and statuary in the temples and palaces of Greece and Rome; the homes of the wealthy were everywhere adorned by works of art ; curious objects of natural history were often brought from afar, as the skins of the female gorillas, which Hanno after his voyage on the west coast of Africa hung up in the temple of Astarte at Carthage; Alexander the Great granted to his illustrious teacher, Aristotle, a large sum of money for use in his scientific researches, sent him natural history collections from conquered lands, and put at his service thousands of men to collect specimens, upon which he based his work on natural history; the museum of Alexandria, which included within its keeping the Alexandrian library, was a great university composed of a number of associated colleges; but there was nowhere in all the ancient world an institution which exactly corresponded in its scope and purpose to the modern museum. The term ” museum,” after the burning of the great institution of Alexandria, appears to have fallen into disuse from the 4th to the 17 th century, and the idea which the word represented slipped from the minds of men.

The revival of learning in the 15th century was accompanied by an

awakening of interest in classical antiquity, and many persons laboured eagerly upon the collection of memorials of the past. Statuary, inscriptions, gems, coins, medals and manu- scripts were assembled by the wealthy and the learned. The leaders in this movement were presently followed by others who devoted themselves to the search for minerals, plants and curious animals. Among the more famous early collectors of objects of natural history may be mentioned Georg Agricola (1490-1555), who has been styled ” the father of mineralogy.” By his labours the elector Augustus of Saxony was induced to establish the Kunst und Naturalien Kammer, which has since expanded into the various museums at Dresden. One of his contempo- xix. 3

raries was Conrad Gesner of Zurich (1516-1565), ” the German Pliny,” whose writings are still resorted to by the curious. Others whose names are familiar were Pierre Belon (151 7-1564,), professor at the College de France; Andrea Cesalpini (1519-1603), whose herbarium is still preserved at Florence; Ulissi Aldrovandi (1522-1605), remnants of whose collections still exist at Bologna; Ole Worm (1588-1654), a Danish physician, after whom the so- called ” Wormian bones ” of the skull are named, and who was one of the first to cultivate what is now known as the science of prehistoric archaeology. At a later date the collection of Albert Seba (1665-1736) of Amsterdam became famous, and was purchased by Peter the Great in 17 16, and removed to St Petersburg. In Great Britain among early collectors were the two Tradescants; Sir John Woodward (1665-1728), a portion of whose collections, bequeathed by him to Cambridge University is still preserved there in the Woodwardian or Geological Museum; Sir James Balfour (1600-1657), and Sir Andrew Balfour (1630- 1694), whose work was continued in part by Sir Robert Sibbald (1641-1722). The first person to elaborate and present to modern minds the thought of an institution which should assemble within its walls the things which men wish to see and study was Bacon, who in his New Atlantis (1627) broadly sketched the outline of a great national museum of science and art.

The first surviving scientific museum established upon a substantial basis was the Ashmolean Museum at Oxford, founded by Elias Ashmole. The original collection had been made by the Tradescants, father and son, gardeners who were in the employment of the duke of Buckingham and later of King Charles I. and his queen; it consisted of ” twelve cartloads of curiosities,” principally from Virginia and Algiers, which the younger Tradescant bequeathed to Ashmole, and which, after much litigation with Tradescant’s widow, he gave to Oxford upon condition that a suitable building should be provided.

This was done in 1682 after plans by Sir Christopher Wren. Ashmole in his diary makes record, on the 17th of February 1683, that ” the last load of my rareties was sent to the barge, and this afternoon I relapsed into the gout.”

The establishment of the German academy of Naturae Curiosi in 1652, of the Royal Society of London in 1660, and of the Academie des Sciences of Paris in 1666, imparted a powerful impulse to scientific investigation, which was reflected not only in the labours of a multitude of persons who undertook the formation of private scientific collections, but in the initiation by crowned heads of movements looking toward the formation of national collections, many of which, having their beginnings in the latter half of the 17th century and the early years of the 18th century, survive to the present day.

The most famous of all English collectors in his time was Sir Hans Sloane (1660-1753), whose vast collection, acquired at a great outlay of money, and including the collections of Petiver, Courten, Merret, Plukenet, and Buddie — all of which he had purchased — was by his will bequeathed to the British nation on condition that parliament should pay to his heirs the sum of £20,000, a sum far less than that which he had expended upon it, and representing, it is said, only the value of the coins which it contained. Sloane was a man who might justly have said of himself ” humani nihil a me alienum puto “; and his collection attested the catholicity of his tastes and the breadth of his scientific appetencies. The bequest of Sloane was accepted upon the terms of his will, and, together with the library of George II., which had likewise been bequeathed to the nation, was thrown open to the public at Bloomsbury in 1759 as the British Museum. As showing the great advances which have occurred in the administration of museums since that day, the following extract taken from A Guide- Book to the General Contents of the British Museum, published in 1761, is interest- ing: “. . . fifteen persons are allowed to view it in one Company, the Time allotted is two Hours; and when any Number not exceeding fifteen are inclined to see it, they must send a List of their Christian and Sirnames, Additions, and Places of Abode, to the Porter’s Lodge, in order to their being entered in the Book; in a few Days the respective Tickets will be made out, specifying

the Day and Hour in Which they are to come, which, on being sent

for, are delivered. If by any Accident some of the Parties are prevented from coming, it is proper they send their Ticket back to the Lodge, as nobody can be admitted with it but themselves. It is to be remarked that the fewer Names there are in a List, the sooner they are likely to be admitted to see it." The establishment of the British Museum was coincident in time with the development of the systematic study of nature, of which Linnaeus was at that time the most distinguished exponent. The modern sciences, the wonderful triumphs of which have revolutionized the world, were just emerging from their infancy. Museums were speedily found to furnish the best agency for preserving the records of advancing knowledge, so far as these consisted of the materials upon which the investi- gator had laboured. In a short time it became customary for the student, either during his lifetime or at his death, to entrust to the permanent custody of museums the collections upon which he had based his studies and observations. Museums were thenceforth rapidly multiplied, and came to be universally regarded as proper repositories for scientific collections of all kinds. But the use of museums as repositories of the collec- tions of the learned came presently to be associated with their use as seats of original investigation and research. Collections of new and rare objects which had not yet received attentive study came into their possession. Voyages of exploration into unknown lands, undertaken at public or private expense, added continually to their treasures. The comparison of newer collections with older collections which had been already made the subject of study, was undertaken. New truths were thus ascertained. A body of students was attracted to the museums, who in a few years by their investigations began not only to add to the sum of human knowledge, but by their publications to shed lustre upon the institutions with which they were connected. The spirit of inquiry was wisely fostered by private and public munificence, and museums as centres for the diffusion of scientific truth came to hold a well-recognized position. Later still, about the middle of the 19th century, when the importance of popular education and the necessity of popularizing knowledge came to be more thoroughly recognized than it had heretofore been, museums were found to be peculiarly adapted in certain respects for the promotion of the culture of the masses. They became under the new impulse not merely repositories of scientific records and seats of original research, but powerful educational agencies, in which by object lessons the most important truths of science were capable of being pleasantly imparted to multitudes. The old narrow restrictions were thrown down. Their doors were freely opened to the people, and at the beginning of the 20th century the movement for the establishment of museums assumed a magnitude scarcely, if at all, less than the

movement on behalf of the diffusion of popular knowledge through public libraries. While great national museums have been founded and all the large municipalities of the world through private or civic gifts have established museums within their limits, a multitude of lesser towns, and even in some cases villages, have established museums, and museums as adjuncts of universities, colleges and high schools have come to be recognized as almost indispensable. The movement has assumed its greatest proportions in Great Britain and her colonies, Germany, and the United States of America, although in many other lands it has already advanced far.

There are now in existence in the world, exclusive of museums of art, not less than 2000 scientific museums which possess in themselves elements of permanence, some of which are splendidly supported by public munificence, and a number of which have been richly endowed by private benefactions.

Great Britain and Ireland. — The greatest museum in London is the British Museum. The natural history department at South Kensington, with its wealth of types deposited there, constitutes the most important collection of the kind in the world. The Museum of Practical Geology in Jermyn Street contains a beautiful and well-arranged collection of minerals and a very complete series of specimens illustrative of the

petrography and the invertebrate paleontology of the British Islands. The botanical collections at Kew are classic, and are as rich in types as are the zoological collections of the British Museum. The Hunterian Museum of the Royal College of Surgeons contains a notable assemblage of specimens illustrating anatomy, both human and comparative, as well as pathology. In London also a number of private owners possess large collec- tions of natural history specimens, principally ornithological, entomological and conchological, in some instances destined to find a final resting place in the national collection. One of the most important of these great collections is that formed by F. Ducane Godman, whose work on the fauna of middle America, entitled Biologia ccntrali-americana, is an enduring monument to his learning and generosity. The Hon. Walter Rothschild has accumulated at Tring one of the largest and most important natural history collections which has ever been assembled by a single individual. It is particularly rich in rare species which are either already extinct or verging upon extinction, and the ornithological and entomological collections are vast in extent and rich in types. Lord Walsingham has at his country seat, Merton Hall, near Thetford, the largest and most perfect collection of the microlepidoptera of the

world which is in existence.

The Ashmolean Museum and the University Museum at Oxford, and the Woodwardian Museum and the University Museum at Cambridge, are remarkable collections. The Free Public Museum at Liverpool is in some respects one of the finest and most successfully arranged museums in Great Britain. It contains a great wealth of important scientific material, and is rich in types, particularly of birds. The Manchester Museum of Owens College and the museum in Sheffield have in recent years accomplished much for the cause of science and popular educa- tion. The Bristol Museum has latterly achieved considerable growth and has become a centre of much enlightened activity. The Royal Scottish Museum, the herbarium of the Royal Botanical Garden, and the collections of the Challenger Expe- dition Office in Edinburgh, are worthy of particular mention. The museum of the university of Glasgow and the Glasgow Museum contain valuable collections. The museum of St Andrews University is very rich in material illustrating marine zoology, and so also are the collections of University College at Dundee. The Science and Art Museum of Dublin and the Public Museum of Belfast, in addition to the works of art which they contain, possess scientific collections of importance.

There are also in Great Britain and Ireland some two hundred smaller museums, in which there are collections which cannot be overlooked by specialists, more particularly by those interested in geology, paleontology and archaeology.

India. — The Indian Museum, the Geological Museum of the Geological Survey of India, and the herbarium of the Royal Botanic Garden in Calcutta, are richly endowed with collections illustrating the natural history of Hindostan and adjacent countries. The finest collection of the vertebrate fossils of the Siwalik Hills is that found in the Indian Museum. The Victoria and Albert Museum in Bombay and the Government Museum in Madras are institutions of importance.

Australia. — The Queensland Museum, and the museum of the Geological Survey of Queensland located in Brisbane, and the National Museum at Melbourne, Victoria, represent important beginnings. Sydney, the capital of New South Wales, is the centre of considerable scientific activity. The museums connected with the university of Sydney, the museum of the Geological Survey of New South Wales, and the Australian Museum, all possess valuable collections. The museum at Adelaide is noteworthy.

New Zealand. — Good collections are found in the Otago Museum,

Dunedin, the Canterbury Museum at Christ Church, the Auckland Museum at Auckland, and the Colonial Museum at Wellington.

South Africa. — The South African Museum at Capetown is a flourishing and important institution, which has done excellent work in the field of South African zoology. A museum has bedn established at Durban, Natal, which gives evidence of vitality.

Egypt. — Archaeological studies overshadow all others in the land of the Nile, and the splendid collections of the great museum of antiquities at Cairo find nothing to parallel them in the domain of the purely natural sciences. A geological museum was, however, established in the autumn of 1903, and in view of recent remarkable palcontological discoveries in Egypt possesses brilliant opportunities

Canada. — In connexion with the Universite Laval in Quebec, the McGill University in Montreal, and the university of Toronto in ‘Ontario, beginnings of significance have been made. The Peter Redpath Museum of McGill College contains important collections in all branches of natural history, more particularly botany. The provincial museum at Victoria, British Columbia, is growing in importance. A movement has been begun to establish at Ottawa a museum which shall in a sense be for the Dominion a national establishment.

France. — Paris abounds in institutions for the promotion of culture. In possession of many of the institutions of learning, such as the £cole Nationale Superieure des Mines, the Inslitut National Agronomique, and the various learned societies, are collections of greater or less importance which must be consulted at times by specialists in the various sciences. The Museum d’Histoire Naturelle in the Jardin des Plantes is the most comprehensive and important collection of its kind in the French metropolis, and while not as rich in types as the British Museum, nevertheless contains a vast assemblage of classic specimens reflecting the labours of former generations of French naturalists. Unfortunately, much of the best material, consisting of the types of species obtained by the naturalists of French voyages of exploration, have been too long exposed to the intense light which fills the great building and have become bleached and faded to a great degree. The zeal to popularize knowledge by the display of specimens has conflicted with the purpose to preserve the records of science, a fact

which French naturalists themselves universally admit. As in England, so also in France, there are a number of virtuosi, who have amassed fine private collections. One of the very largest and finest of all the entomological collections of the world is that at Rennes, belonging to the brothers Oberthiir, upon which they have expended princely sums. The Museum des Sciences Naturelles of Lyons is in some respects an important institution.

Belgium. — Brussels has been called ” a city of museums.” The Musee du Congo and the Musee Royal d’Histoire Naturelle du Belgique are the two most important institutions from the standpoint of the naturalist. The former is rich in ethnographic and zoological material brought from the Congo Free State, and the latter contains very important paleontological collections.

Holland. — The zoological museum of the Koninklijk Zoologisch Genootschap, affiliated with the university at Amsterdam, is well known. The royal museums connected with the university of Leideri are centres of much scientific activity.

Denmark. — -The National Museum at Copenhagen is particularly rich in Scandinavian and Danish antiquities.

Sweden. — In Stockholm, the capital, the Nordiska Museet is devoted to Scandinavian ethnology, and the Naturhistoriska Riks- Museum is rich in paleontological, botanical and archaeological collections. Great scientific treasures are also contained in the museums connected with the university of Upsala.

Norway. — Classic collections especially interesting to the student of marine zoology are contained in the university of Christiania.

Germany. — Germany is rich in museums, some of which are of very great importance. The Museum fur Naturkunde, the ethno- graphical museum, the anthropological museum, the mineralogical museum and the agricultural museum in Berlin are nobie institutions, the first mentioned being particularly rich in classical collections. Hamburg boasts an excellent natural history musei’m and ethno- graphical museum, the Museum Godeffroy and the Museum Umlauff. There are a number of important private collections in Hamburg. The municipal museum in Bremen is important from the standpoint of the naturalist and ethnologist. The Roemer Museum at Hildes- heim is one of the best provincial museums in Germany. Dresden even niore justly than Brussels may be called ” a city of museums,” and the mineralogical, archaeological, zoological and anthropological museums are

exceedingly important from the standpoint of the naturalist. Here also in private hands is the greatest collection of palaearctic lepidoptcra in Europe, belonging to the heirs of Dr Otto Staudinger. The ethnographical museum at Leipzig is rich in collections brought together from South and Central America. The natural history museum, the anatomical museum and the ethno- graphical musjum in Munich are important institutions, the first mentioned being particularly rich in paleontological treasures. The natural history museum of Stuttgart is likewise noted for its important paleontological collections. The Senckenbergische Naturforsckende Gesellschaft museum at Frankfort-on-the-Main contains a very important collection of ethnographical, zoological and botanical material. The museum of the university at Bonn, and more particularly the anatomical museum, are noteworthy. In connexion with almost all the German universities and in almost all the larger towns and cities are to be found museums, in many of which there are important assemblages illustrating not only the natural history of the immediate neighbourhood, but in a multitude of cases containing important material collected in foreign lands. One of the most interesting of the smaller museums lately established is that at Lubeck, a model in its way for a provincial museum.

Austro-Hungary. — The Imperial Natural HistoryMuseuminVienna is one of the noblest institutions of its kind in Europe, and possesses one of the finest mineralogical collections in the world. It is rich also in botanical and conchological collections. There are important

ethnographical and anthropological collections at Budapest. The natural history collections of the Bohemian national museum at Prague are well arranged, though not remarkably extensive.

Russia. — The Rumiantsof Museum in Moscow possesses splendid buildings, with a library of over 700,000 volumes in addition to splendid artistic treasures, and is rich in natural history specimens. It is one of the most magnificent foundations of its kind in Europe. There are a number of magnificent museums in St Petersburg which contain stores of important material. Foremost among these is the museum of the Imperial Academy of Sciences, rich in collec- tions illustrating the zoology, paleontology and ethnology, not only of the Russian Empire, but also of foreign lands. There are a number of provincial museums in the larger cities of Russia which are growing in importance.

Italy. — Italy is rich in museums of art, but natural history collections are not as strongly represented as in other lands. Con- nected with the various universities are collections which possess more or less

importance from the standpoint of the specialist. The Museo Civico di Storia Naturale at Genoa, and the collections preserved at the marine biological station at Naples, have most interest for the zoologist.

Spain. — There are no natural history collections of first importance in Spain, though at all the universities there are minor collections, which are in some instances creditably cared for and arranged.

Portugal. — The natural history museum at Lisbon contains important ornithological treasures.

Eastern Asia. — The awakening of the empire of Japan has resulted among other things in the cultivation of the modern sciences, and there are a number of scientific students, mostly trained in European and American universities, who are doing excellent work in the biological and allied sciences. Very creditable beginnings have been made in connexion with the Imperial University at Tokio for the establishment of a museum of natural history. At Shanghai there is a collection, gathered by the Chinese branch of the Royal Asiatic Society, which is in a decadent state, but contains much good material. Otherwise as yet the movement to establish museums has not laid strong hold upon the inhabitants of eastern Asia. At Batavia in Java, and at Manila in the Philippine Islands, there are found the nuclei of important collections.

United States. — The movement to establish museums in the United States is comparatively recent. One of, the very earliest collections (1802), which, however, was soon dispersed, was made by Charles Willson Peale [q.v.). The Academy of Natural Sciences in Philadelphia, established in 18 12, is the oldest society for the promotion of the natural sciences in the United States. It possesses a very important library and some most excellent collections, and is rich in ornithological, conchological and botanical types. The city of Philadelphia also points with pride to the free museum of archaeology connected with the university of Pennsylvania, and- to the Philadelphia museums, the latter museums of commerce, but which incidentally do much to pro- mote scientific knowledge, especially in the domain of ethnology, botany and mineralogy. The Wistar Institute of Anatomy is well endowed and organized. The zoological museum at Harvard University, Cambridge, Massachusetts, is associated with the names of Louis and Alexander Agassiz, the former of whom by his learning and activity as a collector, and the latter by his munificent gifts, as well as by his important researches, not only created the institution, but made it a potent agency for the advancement of science. The Peabody Museum of American Archaeology and

Ethnology, likewise connected with Harvard University, is one of the greatest institutions of its kind in the New World. The Essex Institute at Salem, Massa- chusetts, is noteworthy. The Butterfield Museum, Dartmouth College, Hanover, New Hampshire, and the Fairbanks Museum of Natural Science (1891) at St Johnsbury, Vermont, are important modern institutions. In the museum of Amherst College are preserved the types of the birds described by J. J. Audubon, the shells described by C. B. Adams, the mineralogical collections of Charles Upham Shepard, and the paleontological collections of President Hitchcock. In Springfield (1898) and Worcester, Massachusetts, there are excellent museums. The Peabody Museum of Natural History at Yale University, New Haven, Connecticut, contains much of the paleontological material described by Professor O. C. Marsh. The New York State Museum at Albany is important from a geological and paleontological standpoint. The American Museum of Natural History in New York City, founded in 1869, provision for the growth and enlargement of which upon a scale of the

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Gallery of Reptiles

Gallery of Birds

THE CARNEGIE INSTITUTE

Pittsburg, Penn.,U.S.A.

Plan of First Floor.

Gallery of Fishes

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Open Court

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Reference.

A. Main Entrance to Institute

B. Entrance to Main Auditorium

C. Main Entrance to Library

1. Administration Rooms of Institute

2. Public Comfort Rooms

3. Administrative Rooms of Library

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Loan Department of ˆ

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Gallery of Useful Arts, Ceramics, etc.

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utmost magnificence has been made, is liberally supported both by public and private munificence. The ethnographical, paleontological and archaeological material gathered within its walls is immense in extent and superbly displayed. The museum of the New York botanical garden in Bronx Park is a worthy rival to the museums at Kew. The Brooklyn Institute of Arts and Sciences combines with collections illustrative of the arts excellent collections of natural history, many of which are classic.

The United States National Museum at Washington, under the control of the Smithsonian Institution, of which it is a depart- ment, has been made the repository for many years past of the scientific and artistic collections coming into the possession of the government. The growth of the material entrusted to its keeping has, more particularly in recent years, been enormous, and the collections have wholly outgrown the space provided in the original building, built for it during the incumbency of Professor Spencer F. Baird as secretary of the Smithsonian Institution. The congress of the United States has in recent years made provision for the erection of a new building upon the Mall in Washington, to which the natural history collections are ultimately to be transferred, the old buildings to be retained for the display of collections illustrating the progress of the arts, until replaced by a building of better construction for the same purpose. The United States National Museum has published a great deal, and has become one of the most important agencies for the diffusion of scientific knowledge in the country. It is liberally supported by the government, and makes use of the scientific men connected with all the various departments of activity under government control as agents for research. The collections of the United States Geological Survey, as well as many of the more important scientific collections made by the Department of Agriculture, are deposited here.

As the result of the great Columbian international exposition, which took place in 1893, a movement originated in the city of Chicago, where the exposition was held, to form a permanent collection of large proportions. The great building in which the international exposition of the fine arts was displayed was preserved as the temporary heme for the new museum. Marshall Field contributed $1,000,000 to the furtherance of the enterprise, and in his honour the institution was called ” The Field Columbian Museum.” The growth of this institution was very rapid, and Mr. Field, at his death, in 1906,

bequeathed to the museum $8,000,000, half to be applied to the erection of a new building, the other half to consti- tute an endowment fund, in addition to the revenues derived from the endowment already existing. The city of Chicago provides liberally for the support of the museum, the name of which, in the spring of 1906, was changed to ” The Field Museum of Natural History.” The city of St Louis has taken steps, as the result of the international exposition of 1904, to emulate the example of Chicago, and the St Louis Public Museum was founded under hopeful auspices in 1905.

Probably the most magnificent foundation for the advance- ment of science and art in America which has as yet been created is the Carnegie Institute in the city of Pittsburg. The Carnegie Institute is a complex of institutions, consisting of a museum of art, a museum of science, and a school for the education of youth in the elements of technology. Affiliated with the museums of art and science, and under the same roof, is the Central Free Library of Pittsburg. The buildings erected for the accommodation of the institute, at the entrance to Schenley Park, cost $8,000,000, and Mr Andrew Carnegie provided liberally for the endowment of the museums of art and science and the technical school, leaving to the city of Pittsburg the maintenance of the general library. The natural history collections contained in the museum of science, although the institution was only founded in 1896, are large and important, and are particularly rich in mineralogy, geology, paleontology, botany and zoology. The entomological collections are among the most important in the new world. The concho- logical collections are vast, and the paleontological collections

are among the most important in America. The great Bayet collection is the largest and most complete collection represent- ing European paleontology in America. The Carnegie Museum contains natural history collections aggregating over 1,500,000 specimens, which cost approximately £125,000, and these are growing rapidly. The ethnological collections, particularly those illustrating the Indians of the plains, and the archaeological collections, representing the cultures more particularly of Costa Rica and of Colombia, are large.

In connexion with almost all the American colleges and universities there are museums of more or less importance. The Bernice Pauahi Bishop museum at Honolulu is an institution established by private munificence, which is doing excellent work in the field of Polynesian ethnology and zoology.

Other American Countries. — The national museum in the city of

Mexico has in recent years been receiving intelligent encouragement and support both from the government and by private individuals, and is coming to be an institution of much importance. National museums have been established at the capitals of most of the Central American and South American states. Some of them represent considerable progress, but most of them are in a somewhat languish- ing condition. Notable exceptions are the national museum in Rio de Janeiro, the Museu Paraense (Museu Goeldi), at Para, the Museu Paulista at Sao Paulo, and the national museum in Buenos Aires. The latter institution is particularly rich in paleontological collections. There is an excellent museum at Valparaiso in Chile, which in recent years has been doing good work. (W. J. H.)

MUSGRAVE, SAMUEL (1732-1780), English classical scholar and physician, was born at Washfield, in Devonshire, on the 29th of September 1732. Educated at Oxford and elected to a Radcliffe travelling fellowship, he spent several years abroad. In 1766 he settled at Exeter, but not meeting with professional success removed to Plymouth. He ruined his prospects, however, by the publication of a pamphlet in the form of an address to the people of Devonshire, in which he accused certain members of the English ministry of having been bribed by the French government to conclude the peace of 1763, and declared that the Chevalier d'Eon de Beaumont, French minister plenipotentiary to England, had in his possession documents which would prove the truth of his assertion. De Beaumont repudiated all knowledge of any such transaction and of Musgrave himself, and the House of Commons in 1770 decided that the charge was unsubstantiated. Thus discredited, Musgrave gained a precarious living in London by his pen until his death, in reduced circumstances, on the 5th of July 1780. He wrote several medical works, now forgotten; and his edition of Euripides (1778) was a considerable advance on that of Joshua Barnes.

See W. Munk, Roll of the Royal College of Physicians, ii. (1878).

MUSH, the chief town of a sanjak of the same name of the Bitlis vilayet of Asiatic Turkey, and an important military station. It is situated at the mouth of a gorge in the mountains on the south side of the plain, the surrounding hills being covered with vineyards and some oak scrub. There are few good houses; the streets are ill-paved and winding, while the place and its surroundings are extremely dirty. The castle, of which there are some remains, is said to have been built by Mushig, an Armenian king of the province Daron, who founded the town. A khan, with two stone lions (Arab or Seljuk) in bas-relief, deserves notice, but the bazaar is poor, although pretty embroidered

caps are produced. Good roads lead to Erzerum and Bitlis. There are 1400 inhabitants, consisting of Kurds and Armenians, about equally divided. The climate is healthy but cold in winter, with a heavy snow fall. Mush is the seat of the Gregorian and Roman Catholic Armenian bishops and some American mission schools. Some miles to the west at the edge of the' plain is the celebrated monastery of Surp Garabed or St John the Baptist, an important place of Armenian pilgrimage.

Mush plain, 35 m. long by 12 broad, is very fertile, growing wheat and tobacco, and is dotted with many thriving Armenian villages. The Murad or eastern Euphrates traverses the western end of the plain and disappears into a narrow mountain gorge there. Vineyards are numerous and a fair wine is produced.

Wood is scarce and the usual fuel is tezek or dried cow-dung. There are several sulphur springs, and earthquakes are frequent and sometimes severe. It was on the plain of Mush that Xenophon first made acquaintance with Armenian houses, which have little changed since his day.

MUSHROOM. 1 There are few more useful, more easily recognized, or more delicious members of the vegetable kingdom than the common mushroom, known botanically as Agaricus campestris (or Psalliola campestris). It grows in short grass in the temperate regions of all parts of the world. Many edible fungi depend upon minute and often obscure botanical characters for their determination, and may readily be con- founded with worthless or poisonous species; but that is not the case with the common mushroom, for, although several other species of Agaricus somewhat closely approach it in form and colour, yet the true mushroom, if sound and freshly gathered, may be distinguished from all other fungi with great ease. It almost invariably grows in rich, open, breezy pastures, in places where the grass is kept short by the grazing of horses, herds and flocks. Although this plant is popularly termed the " meadow mush- room," it never as a rule grows in meadows. It never grows in wet boggy places, never in woods, or on or about stumps of trees. An exceptional specimen or an uncommon variety may sometimes be seen in the above-mentioned abnormal places, but the best, the true, and common variety of the table is the produce of short, upland, wind-swept pastures. A true mushroom is never large in size; its cap very seldom exceeds 4, at most 5 in. in diameter. The large examples measuring from 6 to 9 or

more in. across the cap belong to Agaricus arvensis, called from its large size and coarse texture the horse mushroom, which grows in meadows and damp shady places, and though generally wholesome is coarse and sometimes indigestible. The mushroom usually grown in gardens or hot-beds, in cellars, sheds, &c, is a distinct variety known as Agaricus horlensis. On being cut or broken the flesh of a true mushroom remains white or nearly so, the flesh of the coarser horse mushroom changes to buff or sometimes to dark brown. To summarize the characters of a true mushroom — it grows only in pastures; it is of small size, dry, and with unchangeable flesh; the cap has a frill; the gills are free from the stem, the spores brown-black or deep purple-black in colour, and the stem solid or slightly pithy. When all these char- acters are taken together no other mushroom-like fungus— and nearly a thousand species grow in Britain — can be con- founded with it.

The parts of a mushroom consist chiefly of stem and cap ; the stem has a clothy ring round its middle, and the cap is furnished under- neath with numerous radiating coloured gills. Fig. 1 (1) represents a section through an infant mushroom, (2) a mature example, and (3) a longitudinal section through a fully developed mushroom. The cap d, e is fleshy, firm and white within, never thin and watery; externally it is pale brown, dry, often slightly silky or floccose, never viscid. The cuticle of a mushroom readily peels away from the flesh beneath, as shown at F. The cap has a narrow dependent margin or frill, as shown at G, and in section at 11; this dependent frill originates in the rupture of a delicate continuous wrapper, which in the infancy of the mushroom entirely wraps the young plant; it is shown in its continuous state at J, and at the moment of rupture at K. The gills underneath the cap L, M, N are at first white, then rose-coloured, at length brown-black. A point of great importance is to be noted in the attachment of the gills near the stem at o, P ; the gills in the true mushroom are (as shown) usually more or less free from the stem, they never grow boldly against it or run down it; they may sometimes just touch the spot where the stem joins the bottom of the cap, but never more; there is usually a slight channel, as at p, all round the top of the stem. When a mushroom is perfectly ripe and the gills are brown-black in colour, they throw down a thick dusty deposit of fine brown-black or purple-black spores; it is essential to note the colour. The spores on germination make a white felted mat, more or less dense, of mycelium; this, when compacted with dry, half-decomposed dung-, is the mushroom spawn of gardeners. The stem is firm, slightly pithy up the middle, but never hollow; it bears a floccose ring near its middle, as illustrated at Q } Q; this ring originates by the rupture of

the thin general wrapper K of the infant plant.

Like all widely spread and much-cultivated plants, the edible ‘The earlier 15th-century form of the word was musseroun,

muscheron, &c, and was adapted from the French mousseron, which

is generally connected with mousse, moss.

mushroom has numerous varieties, and it differs in different places and under different modes of culture in much the same way as our kitchen-garden plants differ from the type they have been derived from, and from each other. In some instances these differences are so marked that they have led some botanists to regard as distinct species many forms usually esteemed by others as varieties only.

Fig. 1. — Pasture Mushroom (Agaricus campestris).

A small variety of the common mushroom found in pastures has been named A. pratensis; it differs from the type in having a pale reddish-brown scaly top, and the flesh on being cut or broken changes to pale rose-colour. A variety still more marked, with a darker brown cap and the flesh changing to a deeper rose, and sometimes blood-red, has been described as A. rufescens. The well-known compact variety of mushroom-growers, with its white cap and dull purplish clay-coloured gills, is A. horterisis. Two sub- varieties of this have been described under the names of A. Buchanani and A. elongatus, and other distinct forms are known to botanists. A variety also grows in woods named A. silvicola; this can only be distinguished from the pasture mushroom by its elongated bulbous stem and its externally smooth cap. There is also a fungus well known to botanists and cultivators which appears to be inter- mediate between the pasture variety and the wood variety, named A. vapor arms. The large rank horse mushroom, now generally referred to as A. arvensis, is probably a variety of the pasture mush room ; it grows in rings in woody places and under trees and hedges in meadows; it has a large scaly round cap, and the flesh quickly changes to buff or brown when cut or broken ; the stem too is hollow. An unusually scaly form of this has been described as A. villaticus and another as A . augustus.

A species, described by Berkeley and Broome as distinct from both the pasture mushroom and horse mushroom, has been pub- lished under the name of A. elvensis. This grows under oaks, in clusters — a most unusual character for the mushroom, and is said to be excellent for the table. An allied fungus peculiar to woods, with a less fleshy cap than

the true mushroom, with hollow stem, and strong odour, has been described as a close ally of the pasture mushroom under the name of A. silvaticus; its qualities for the table have not been recorded.

Many instances are on record of symptoms of poisoning, and even death, having followed the consumption of plants which have passed as true mushrooms; these cases have probably arisen from the examples consumed being in a state of decay, or from some mis- take as to the species eaten. It should always be specially noted whether the fungi to be consumed are in a frech and wholesome condition, otherwise they act as a poison in precisely the same way as does any other semi-putrid vegetable. Many instances are on record where mushroom-beds have been invaded by a growth of strange fungi and the true mushrooms have been ousted to the advan- tage of the new-comers. When mushrooms are gathered for sale, by persons unacquainted with the different species mistakes are of frequent occurrence. A very common spurious mushroom in markets is A. velutinus, a slender, ringless, hollow-stemmed, black- gilled fungus, common in gardens and about dung and stumps; it is about the size of a mushroom, but thinner in all its parts and far more brittle ; it has a black hairy fringe hanging round the edge of the cap when fresh. Another spurious mushroom, and equally common in dealers' baskets, is A . lacrymabundus ; this grows in the same posi- tions as the last, and is somewhat fleshier and more like a true mush- room ; it has a hollow stem and a slight ring, the gills are black-brown mottled and generally studded with tear-like drops of moisture. In both these species the gills distinctly touch and grow on to the stem. Besides these there are numerous other black-gilled species which find a place in baskets — some species far too small to bear

any resemblance to a mushroom, others large and deliquescent, generally belonging to the stump- and dung-borne genus Coprinus. The true mushroom itself is to a great extent a dung-borne species, therefore mushroom-beds are always liable to an invasion from other dung-borne forms. The spores of all fungi are constantly floating about in the air, and when the spores of dung-infesting species alight on a mushroom-bed they find a nidus already prepared that exactly suits them; and if the spawn of the new-comer becomes more profuse than that of the mushroom the stranger takes up his position at the expense of the mushroom. There is also a fungus named Xylaria vaporaria, which sometimes fixes itself on mushroom- beds and produces such an

enormous quantity of string-like spawn that the entire destruction of the bed results. This spawn is some- times so profuse that it is pulled out of the beds in enormous masses and carted away in barrows.

Sometimes cases of poisoning follow the consumption of what have really appeared to gardeners to be true bed-mushrooms, and to country folks as small horse mushrooms. The case is made more complicated by the fact that these highly poisonous forms now and then appear upon mushroom-beds to the exclusion of the mush- rooms. This dangerous counterfeit is A. fastibilis, or sometimes A. crustuliniformis, a close ally if not indeed a mere variety of the first. A description of one will do for both, A. fastibilis being a little the more slender of the two. Both have fleshy caps, whitish, moist and clammy to the touch ; instead of a pleasant odour, they have a dis- agreeable one; the stems are ringless, or nearly so; and the gills, which are palish-clay-brown, distinctly touch and grow on to the solid or pithy stem. These two fungi usually grow in woods, but sometimes in hedges and in shady places in meadows, or even, as has been said, as invaders on mushroom-beds. The paie clay-coloured gills, offensive odour, and clammy or even viscid top are decisive characters. A reference to the accompanying illustration (fig. 2), which is about one-half natural size, will give a good idea of A. fastibilis ; the difference in the nature of the attachment of the gills near the stem is seen at R, the absence of a true ring at s, and of a pendent frill at T. The colour, with the exception of the gills, is not unlike that of the mushroom. In determining fungi no single character must be relied upon as conclusive, but all the characters must be taken together. Sometimes a beautiful, somewhat slender, fungus peculiar to stumps in woods is mistaken for the mushroom in A. cervinus; it has a tall, solid, white, ringless stem and somewhat thin brown cap, furnished underneath with beautiful rose-coloured gills, which are free from the stem as in the mushroom, and which

Fig. 2. — Poisonous Mushroom (Agaricus fastibilis).

never turn black. It is probably a poisonous plant, belonging, as it does, to a dangerous cohort. Many other species of Agaricus more or less resemble A. campsstris, notably some of the plants found under the sub-genera Lepiota, Volvaria, Pholiota and Psalliota; but when the characters are noted they may all with a little care be easily distinguished from each other. The better plan is to discard at once all fungi which have not been gathered from open pastures; by this act alone more than nine-tenths of worthless and poisonous species will be excluded.

In cases of poisoning by mushrooms immediate medical advice should be secured. The dangerous principle is a narcotic, and the symptoms are usually great nausea, drowsiness, stupor and pains in the joints. A good palliative is sweet oil; this will allay any corrosive irritation of the throat and stomach, and at the same time cause vomiting.

Paris mushrooms are cultivated in enormous quantities in dark underground cellars at a depth of from 60 to 160 ft. from the surface. The stable manure is taken into the tortuous passages of these cellars, and the spawn introduced from masses of dry dung where it occurs naturally. In France mushroom-growers do not use the compact blocks or bricks of spawn so familiar in England, but much smaller flakes or " leaves " of dry dung in which the spawn or mycelium can be seen to exist. Less manure is used in these cellars than we generally see in the mushroom-houses of England, and the surface of each bed is covered with about an inch of fine white stony soil. The beds are kept artificially moist by the application of water brought from the surface, and the different galleries bear crops in succession. As one is exhausted another is in full bearing, so that

by a systematic arrangement a single proprietor will send to the surface from 300 lb to 3000 lb of mushrooms per day. The passages sometimes extend over several miles, the beds sometimes occupying over 20 m., and, as there are many proprietors of cellars, the produce of mushrooms is so large that not only is Paris fully supplied, but vast quantities are forwarded to the different large towns of Europe; the mushrooms are not allowed to reach the fully expanded condi- tion, but are gathered in a large button state, the whole growth of the mushroom being removed and the hole left in the manure covered with fine earth. The beds remain in bearing for six or eight months, and then the spent manure is taken to the surface again for garden and field purposes. The equable temperature of these cellars and their freedom from draught is one cause of their great success; to this must be added the natural virgin spawn, for by continually using spawn taken from mushroom-producing beds the potency for reproduction is weakened. The beds produce mushrooms in about six weeks after this spawning.

The common mushroom (Agaricus campestris) is propagated by spores, the fine black dust seen to be thrown off when a mature speci- men is laid on white paper or a white dish ; these give rise to what is known as the " spawn " or mycelium, which consists of whitish threads permeating dried dung or similar substances, and which, when planted in a proper medium, runs through the mass, and even- tually develops the fructification known as the mushroom. This spawn

may be obtained from old pastures, or decayed mushroom beds, and is purchased from nurserymen in the form of bricks charged with the mycelium, and technically known as mushroom spawn. When once obtained, it may be indefinitely preserved. It may be produced by placing quantities of horse-dung saturated with the urine of horses, especially of stud horses, with alternate layers of rich earth, and covering the whole with straw, to exclude rain and air; the spawn commonly appears in the heap in about two months afterwards. The droppings of stall-fed horses, or of such as have been kept on dry food, should be made use of.

The old method of growing mushrooms in ridges out of doors, or on prepared beds either level or sloping from a back wall in sheds or cellars, may generally be adopted with success. The beds are formed of horse-droppings which have been slightly fermented and frequently turned, and may be made 2 or 3 ft. broad and of any length. A layer of dung about 8 or 10 in. thick is first deposited, and covered with a light dryish earth to the depth of 2 in.; and two similar layers with similar coverings are added, the whole being made narrower as it advances in height. When the bed is finished, it is covered with straw to protect it from rain, and also from parching influences. In about ten days, when the mass is milkwarm, the bed will be ready for spawning, which consists of inserting small pieces of spawn bricks into the sloping sides of the bed, about 6 in. asunder. A layer of fine earth is then placed over the whole, and well beaten down, and the surface is covered with a thick coat of straw. When the weather is temperate, mushrooms will appear in about a month after the bed has been made, but at other times a much longer period may elapse. The principal things to be attended to are to preserve a moderate state of moisture and a proper mild degree of warmth; and the treatment must vary according to the season.

These ordinary^ ridge beds furnish a good supply towards the end of summer, and in autumn. To command a regular supply, how- ever, at all seasons, the use of a mushroom-house will be found very convenient. The material employed in all cases is the droppings of horses, which should be collected fresh, and spread out in thin layers in a dry place, a portion of the short litter being retained well mois- tened by horse-urine. It should then be thrown together in ridges and frequently turned, so as to be kept in an incipient state of fer- mentation, a little dryish friable loam being mixed with it to retain the ammonia given off by the dung. With this or a mixture of horse-dung, loam, old mushroom-bed dung, and half -decayed leaves, the beds are built up in successive layers of about 3 in. thick, each layer being beaten firm, until the bed is 9 or 10 in. thick. If the heat exceeds 8o°,

holes should be made to moderate the fermentation. The beds are to be spawned when the heat moderates, and the surface is then covered with a sprinkling of warmed loam, which after a few days is made up to a thickness of 2 in., and well beaten down. The beds made partly of old mushroom-bed dung often contain sufficient spawn to yield a crop, without the introduction of brick or cake spawn, but it is advisable to spawn them in the regular way. The spawn should be introduced an inch or two below' the surface when the heat has declined to about 75 , indeed the bed ought never to exceed 8o°. The surface is to be afterwards covered with tay or litter. The atmospheric temperature should range from 60 ° to 65 till the mushrooms appear, when it may drop a few degrees, but not lower than 55 . If the beds require watering, water of about 8o° should be used, and it is preferable to moisten the covering of litter rather than the surface 01 the beds themselves. It is also beneficial, especially in the case of partially exhausted beds, to water with a dilute solution of nitre. For a winter supply the beds should be made towards the end of August, and the end of October. Slugs and woodlice are the worst enemies of mushroom crops.

The Fairy-ring Champignon. — This fungus, Marasmius Oreades, is more universally used in France and Italy than in England, although it is well known and frequently used both in a fresh and in a dry state in England. It is totally different in appearance from the

pasture mushroom, and, like it, its characters are so distinct that there is hardly a possibility of making a mistake when its peculiari- ties are once comprehended. It has more than one advantage over the meadow mushroom in its extreme commonness, its profuse growth, the length of the season in which it may be gathered, the total absence of varietal forms, its adaptability for being dried and preserved for years, and its persistent delicious taste. It is by many esteemed as the best of all the edible fungi found in Great Britain. Like the mushroom, it grows in short open pastures and amongst the short grass of open roadsides; sometimes it appears on lawns, but it never occurs in woods or in damp shady places. Its natural habit is to grow in rings, and the grassy fairy-rings so frequent amongst the short grass of downs and pastures in the spring are generally caused by the nitrogenous manure applied to the soil in the previous autumn by the decay of a circle of these fungi. Many other fungi in addition to the fairy-ring champignon grow in circles, so that this habit must merely be taken with its other

characters in cases of doubt.

A glance at the illustration (fig. 3) will show how entirely the fairy-ring champignon differs from the mushroom. In the first place, it

Fig. 3. — The Fairy-ring Champignon (Marasmius oreades).

is about one-half the size of a mushroom, and whitish-buff in every part, the gills always retaining this colour and never becoming salmon-coloured, brown or black. The stem is solid and corky, much more solid than the flesh of the cap, and perfectly smooth, never being furnished with the slightest trace of a ring. The buff- gills are far apart (v), and in this they greatly differ from the some- what crowded gills of the mushroom; the junction of the gills with the stem (w) also differs in character from the similar junction in the mushroom. The mushroom is a semi-deliquescent fungus which rapidly falls into putridity in decay, whilst the champignon dries up into a leathery substance in the sun, but speedily revives and takes its original form again after the first shower. To this character the fungus owes its generic name (Marasmius) as well as one of its most valuable qualities for the table, for examples may be gathered from June to November, and if carefully dried may be hung on strings for culinary purposes and preserved without deterioration for several years; indeed, many persons assert that the rich flavour of these fungi increases with years. Champignons are highly esteemed (and especially is this the case abroad) for adding a most delicious flavour to stews, soups and gravies.

A fungus which may carelessly be mistaken for the mushroom is M. peronatus, but this grows in woods amongst dead leaves, and has a hairy base to the stem and a somewhat acrid taste. Another is M. urens; this also generally grows in woods, but the gills are not nearly so deep, they soon become brownish, the stem is downy, and the taste is acrid. An Agaricus named A. dryophilus has sometimes been gathered in mistake for the champignon, but this too grows in woods where the champignon never grows; it has a hollow instead of a solid stem, gills crowded together instead of far apart, and flesh very tender and brittle instead of tough. A small esculent ally of the champignon, named M. scovodonius, is sometimes found in pastures in Great Britain ; this is largely consumed on. the Continent, where it is esteemed for its powerful flavour of garlic. In England, where garlic is not used to a large extent, this fungus is not sought for. Another small and common species, M. porreus, is pervaded with a garlic flavour to an equal extent with the last. A third species, M. alliaceus, is also strongly impregnated with the scent and taste of onions or garlic. Two

species, M. impudicus and M. foetidus, are in all stages of growth highly foetid. The curious little edible Agaricus esculentus, although placed under the sub-genus Collybia, is allied by its structure to Marasmius. It is a small bitter species common in upland pastures and fir plantations early in the season. Although not gathered for the table in England, it is greatly prized in some parts of the Continent.

MUSIC. — The Greek hovclkt] (sc. r'txv)), from which this word is derived, was used very widely to embrace all those arts over which the Nine Muses (Mouotu) were held to preside. Contrasted with yvuvaoTiicq (gymnastic) it included those branches of education concerned with the development of the mind as opposed to the body. Thus such widely different arts and sciences as mathematics, astronomy, poetry and literature

generally, and even reading and writing would all fall under HovaiKi}, besides the singing and setting of lyric poetry. On the educational value of music in the formation of character the philosophers laid chief stress, and this biased their aesthetic analysis. 'Apuovia (harmony), or apnoviKr\ (sc. rtyvri), rather than novaucri, was the name given by the Greeks to the art of arranging sounds for the purpose of creating a definite aesthetic impression, with which this article deals.

I. — General Sketch 1. Introduction. — As a mature and independent art music is unknown except in the modern forms realized by Western civilization; ancient music, and the non-European music of the present day, being (with insignificant exceptions of a character which confirms the generalization) invariably an adjunct of poetry or dance, in so far as it is recognizable as an art at all. The modern art of music is in a unique position; for, while its language has been wholly created by art, this language is yet so perfectly organized as to be in itself natural; so that though the music of one age or style may be at first unintelligible to a listener who is accustomed to another style, and though the listener may help himself by acquiring information as to the char- acteristics and meaning of the new style, he will best learn to understand it by merely divesting his mind of prejudices and allowing the music to make itself intelligible by its own self- consistency. The understanding of music thus finally depends neither upon technical knowledge nor upon convention, but upon the listener's immediate and familiar experience of it; an experience which technical knowledge and custom can of course aid him to acquire more rapidly, as they strengthen his memory and enable him to fix impressions by naming them.

Beyond certain elementary facts of acoustics (see Sound), modern music shows no direct connexion with nature inde- pendently of art; indeed, it is already art that determines the selection of these elementary acoustic facts, just as in painting art determines the selection of those facts that come under the cognizance of optics. 1 In music, however, the purely acoustic principles are incomparably fewer and simpler than the optical principles of painting, and their artistic interaction transforms them into something no less remote from the laboratory experiments of acoustic science than from the unorganized sounds of nature. The result is that while the ordinary non- artistic experiences of sight afford so much material for plastic art that the vulgar conception of good painting is that it is deceptively like nature, the ordinary non-artistic experience of sound has so little in common with music that musical realism is, with rare though popular exceptions, generally regarded as an eccentricity.

This contrast between music and plastic art may be partly explained by the mental work undergone, during the earliest infancy both of the race and of the individual, in interpreting sensations of space. When a baby learns the shape of objects by taking them in his hands, and gradually advances to the discovery that his toes belong to him, he goes through an amount of work that is quite forgotten by the adult, and its complexity and difficulty has perhaps only been fully realized through the experience of persons who have been born blind but have acquired sight at a mature age by an operation. Such work gives the facts of normal adult vision an amount of organic principle that makes them admirable raw material for art. The power of distinguishing sensations of sound is associated with no such mental skill, and is no more complex than the power of distinguishing colours. On the other hand, sound is the principal medium by which most of the higher animals both express and excite emotion; and hence, though until

1 Thus Chinese and Japanese art has attained high organization without the aid of a veracious perspective ; while, on the other hand, its carefully formulated decorative principles, though not realistic, certainly rest on an optical and physiological basis. Again, many modern impressionists justify their methods by an appeal to pheno- mena of complementary colour which earlier artists possibly did not perceive and certainly did not select as artistic materials.

codified into human speech it does not give any raw material for art, yet so powerful are its primitive effects that music (in the bird-song sense of sound indulged in for its own attractive- ness) is as long prior to language as the brilliant colours of animals and flowers are prior to painting (see Song). Again, sound as a warning or a menace is eminently important in the history of the instinct of self-preservation; and, above all, its production is instantaneous and instinctive.

All these facts, while they tend to make musical expression an early phenomenon in the history of life, are extremely unfavourable to the early development of musical art. They invested the first musical attempts with a mysterious power over listener and musician, by re-awakening instincts more powerful, because more ancient and necessary, than any that could ever have been appealed to by so deliberate a process as that of drawing on a flat surface a series of lines calculated to remind the eye of the appearance of solid objects in space. It is hardly surprising that music long remained as imperfect as its legendary powers were portentous, even in the hands of so supremely artistic a race as that of classical Greece ; and what- ever wonder this backwardness might still arouse in us vanishes when we realize the extreme difficulty of the process by which the principles of the modern art were established.

2. Non-harmonic and Greek Music. — Archaic music is of two kinds — the unwritten, or spontaneous, and the recorded, or scientific. The earliest musical art-problems were far too difficult for conscious analysis, but by no means always beyond the reach of a lucky hit from an inspired singer; and thus folk- music often shows real beauty where the more systematic music of the time is merely arbitrary. Moreover, folk-music and the present music of barbarous and civilized non-European races furnish the study of musical origins with material analogous to that given by the present manners and customs of different races in the study of social evolution and ancient history. We may mention as examples the accurate comparison of the musical scales of non-European races undertaken by A. J. Ellis {On the Musical Scales of Various Nations, 1885); the parallel researches and acute and cautious reasoning of his friend and collaborator, A. J. Hipkins {Dorian and Phrygian reconsidered from a Non-harmonic Point of View, 1902); and, perhaps most of all, the study of Japanese music, with its remarkable if uncertain signs of the beginning of a harmonic tendency, its logical coherence, and its affinity to Western scales, points in which it seems to show a great advance upon the Chinese music from which most of it is derived {Music and Musical Instruments of Japan, by J. F. Piggott, 1893). The reader will find detailed accounts of ancient Greek music in the article on that subject

in Grove's Dictionary of Music and Musicians (new ed., ii. 223) and in Monro's Modes of Ancient Greek Music (Clarendon Press, 1894), while both the Greek music itself, and the steps by which it passed through Graeco-Roman and early Christian phases to become the foundation of the modern art, are traced as clearly as is consistent with accuracy in The Oxford History of Music, vol. i., by Professor Wooldridge. Sir Hubert Parry's Evolution of the Art of Music {" International Scientific Series," originally published under the title of The Art of Music) presents the main lines of the evolution of modern musical ideas in the clearest and most readable form yet attained.

Sir Hubert Parry illustrates in this work the artificiality of our modern musical conceptions by the word " cadence," which to a modern musician belies its etymology, since it normally means for him no " falling " close but a pair of final chords rising from dominant to tonic. Moreover, in consequence of our harmonic notions we think of scales as constructed from the bottom upwards; and even in the above-mentioned article in Grove's Dictionary all the Greek scales are, from sheer force of habit, written upwards. But the ancient and, almost universally, the primitive idea of music is like that of speech, in which most inflections are in fact cadences, while rising inflexions express less usual sentiments, such as surprise or interrogation. Again, our modern musical idea of " high "

and " low " is probably derived from a sense of greater and less vocal effort; and it has been much stimulated by our harmonic sense, which has necessitated a range of sounds incomparably greater than those employed in any non-harmonic system. The Greeks derived their use of the terms from the position of notes on their instruments; and the Greek hypate was what we should call the lowest note of the mode, while nete was the highest. Sir George Macfarren has pointed out {Ency. Brit., 9th ed., art. " Music ") that Boethius (c. a.d. 500) already fell into the trap and turned the Greek modes upside down. 1

Another radical though less grotesque misconception was also already well exploded by Macfarren; but it still frequently survives at the present day, since the study of non-harmonic scales is, with the best of intentions, apt rather to encourage than to dispel it. The more we realize the importance of differences in position of intervals of various sizes, as producing differences of character in scales, the more irresistible is the temptation to regard the ancient Greek modes as differing from each other in this way. And the temptation becomes greater instead of less when we have succeeded in thinking away our modern harmonic notions. Modern harmonization enormously increases the differences of expression between modes of which the

melodic intervals are different, but it does this in a fashion that draws the attention almost entirely away from these differences of interval ; and without harmony we find it extremely difficult to distinguish one mode from another, unless it be by this different arrangement of intervals. Nevertheless, all the evidence irresistibly tends to the conclusion that while the three Greek genera — diatonic, chromatic, and enharmonic — were scales differing in intervals, the Greek modes were a series of scales identical in arrangement of interval, and differing, like our modern keys, only in pitch. The three genera were applied to all these modes or keys, and we have no difficulty in understanding their modifying effects. But the only clue we have to the mental process by which in a preharmonic age different characteristics can be ascribed to scales identical in all but pitch, is to be found in the limited compass of Greek musical sounds, corresponding as it does to the evident sensitive- ness of the Greek ear to differences in vocal effort. We have only to observe the compass of the Greek scale to see that in the most esteemed modes it is much more the compass of speaking than of singing voices. Modern singing is normally at a much higher pitch than that of the speaking voice, but there is no natural reason, outside the peculiar nature of modern music, why this should be so. It is highly probable that all modern singing would strike a classical Greek ear as an outcry; and in any case such variations of pitch as are inconsiderable in modern singing are extremely emphatic in the speaking voice, so that they might well make all the difference to an ear un- accustomed to organized sound beyond the speaking compass. Again, much that Aristoxenus and other ancient authorities say of the character of the modes (or keys) tends to confirm the view that that character depends upon the position of the mese or keynote within the general compass. Thus Aristotle {Politics, v. (viii.) 7, 1342 b. 20) states that certain low-pitched modes suit the voices of old men, and thus we may conjecture that even the position of tones and semitones might in the Dorian and Phrygian modes bring the bolder portion of the scale in all three genera into the best regions of the average young voice, while the Ionian and Lydian might lead the voice to dwell more upon semitones and enharmonic intervals, and so account for the heroic character of the former and the sensual character of the latter (Plato, Republic, 398 to 400).

Of the Greek genera, the chromatic and enharmonic (especially

1 It is worth adding that in the 16th century the great contrapun- tal composer Costanzo Porta had been led by doubts on the subject to the wonderful conclusion that ancient Greek music was poly- phonic, and so constructed as to be invertible; in illustration of which theory he and Vincentino composed four-part motets in each of the Greek

genera (diatonic, chromatic and enharmonic), Porta's being constructed like the 12th and 13th fugues in Bach's Kunst der Fuge so as to be equally euphonious when sung upside down! (See Hawkins's History of Music, i. 1 12 !}

the latter) show very clearly the origin of so many primitive scales in the interval of the downward fourth. That interval (e.g. from C to G) is believed to be the earliest melodic relation- ship which the ear learnt to fix; and most of the primitive scales were formed by the accretion of auxiliary notes at the bottom of this interval, and the addition of a similar interval, with similar accretions, below the former. In this way a pentatonic scale, like that of so many Scotch melodies, can easily be formed (thus, C, A, G; F, D, C) ; and though some primitive scales seem to have been on the nucleus of the rising fifth, while the Siamese now use two scales of which not a single note within the octave can be accounted for by any known principle, still we may consider that for general historic purposes the above example is typical. The Greeks divided their downward fourth into four notes, called a tetrachord; and by an elaborate system of linking tetrachords together they gave their scale a compass of two octaves. The enharmonic tetrachord, being the most ancient, gathered the lower three notes very closely to the bottom, leaving the second note no less than a major third from the top, thus — C,Ab, G', G; (where G' stands for a note between Ab and G). The chromatic tetrachord was C, Bbb, Ab, G; and the diatonic tetrachord was C, Bb, Ab, G. It is this last that has become the foundation of modern music, and the Greeks themselves soon preferred it to the other genera and found a scientific basis for it. In the first place they noticed that its notes (and, less easily, the notes of the chromatic scale) could be connected by a series of those intervals which they recognized as concordant. These were, the fourth; its converse, or inversion, the fifth; and the octave. The notes of the enhar- monic tetrachord could not be connected by any such series. In the articles on Harmony and Sound account is given of the historic and scientific foundations of the modern conception of concord; and although this harmonic conception applies to simultaneous notes, while the Greeks concerned themselves only with successive notes, it is nevertheless permissible to regard the Greek sense of concord in successive notes as con- taining the germ of our harmonic sense. The stability of the diatonic scale was assured as early as the 6th century

B.C. when Pythagoras discovered (if he did not learn from Egypt or India) the extremely simple mathematical proportions of its intervals. Arid this discovery was of unique importance, as fixing the intervals by a criterion that could never be obscured by the changes of taste and custom otherwise inevitable in music that has no conscious harmonic principles to guide it. At the same time, the foundation of a music as yet immature and ancillary to drama, on an acoustic science ancillary to a priori mathe- matics, was not without disadvantage to the art; and it is arguable that the great difficulty with which during the medieval beginnings of modern harmony the concords of the third and sixth were rationalized may have been increased by the fact that the Pythagorean system left these intervals con- siderably out of tune. In preharmonic times mathematics could not direct even the most observant ear to the study of those phenomena of upper parliah of which Helmholtz, in 1863, was the first to explain the significance; and thus though the Greeks knew the difference between a major and minor tone, on which half the question depended, they could not possibly arrive at the modern reasons for adding both kinds of tone in order to make the major third. (See Sound.)

Here we must digress in order to illustrate what is implied by our modern harmonic sense; for the difference that this makes to our whole musical consciousness is by no means uni- versally realized. Music, as we now understand it, expresses itself in the interaction of three elements — rhythm, melody and harmony. The first two are obviously as ancient as human consciousness itself. Without the third a musical art of per- manent value and intelligibility has not been known to attain independent existence. With harmony music assumes the existence of a kind of space in three dimensions, none of which can subsist without at least implying the others. When we hear an unaccompanied melody we cannot help interpreting it in the light of its most probable harmonies. Hence, when

it does not imply consistent harmonies it seems to us quaint or strange; because, unless it is very remote from our harmonic conceptions, it at least implies at any given moment some simple harmony which in the next moment it contradicts. Thus our inferences as to the expression intended by music that has not come under European influence are unsafe, and the pleasure we take in such music is capricious. The effort of thinking away our harmonic preconceptions is probably the most violent piece of mental gymnastics in all artistic experience, and furnishes much excuse for a sceptical attitude as to the artistic value of preharmonic music, which has at all events never become even partially independent of poetry and dance. Thus the rhythm of classical Greek music seems to have

been entirely identical with that of verse, and its beauty and expression appreciated in virtue of that identity. From the modern musical point of view the rhythm of words is limited to a merely monotonous uniformity of flow, with minute undulations which are musically chaotic (see Rhythm). The example of Greek tragedy, with the reports of its all-pervading music (in many cases, as in that of Aeschylus, composed by the dramatist himself) could not fail to fire the imaginations of modern pioneers and reformers of opera; and Monteverde, Gluck and Wagner convinced themselves and their contemporaries that their work was, amongst other things, a revival of Greek tragedy. But all that is known of Greek music shows that it represents no such modern ideas, as far as their really musical aspect is concerned. It represents, rather, an organization of the rise and fall of the voice, no doubt as elaborate and artistic as the organization of verse, no doubt powerful in heightening the emotional and dramatic effect of words and action, but in no way essential to the understanding or the organization of the works which it adorned. The classical Greek preference for the diatonic scale indicates a latent harmonic sense and also that temperance which is at the foundation of the general Greek sense of beauty; but, beyond this and similar generalities, all the research in the world will not enable us to understand the Greek musician's mind. Non-harmonic music is a world of two dimensions, and we must now inquire how men came to rise from this " flatland " to the solid world of sound in which Palestrina, Bach, Beethoven and Wagner live.

3. Harmonic Origins .ˆAlthough the simultaneous blending of different sounds was never seriously contemplated by the Greeks, yet in classical times they were fond of singing with high and low voices in octaves. This was called magadizing, from the name of an instrument on which playing in octaves was rendered easy by means of a bridge that divided the strings at two-thirds of their length. While the practice was esteemed for the beauty of the blending of different voices, it was tolerated only because of the peculiar effect of identity furnished by the different notes of the octave, and no other interval was so used by the Greeks. In the article on Harmony the degrees of identity-in- difference which characterize the simpler harmonic intervals are analysed, and the main steps are indicated by which the more complicated medieval magadizing uses of the fourth and fifth (the sympkonia, diaphonia or organum of Hucbald) gave way (partly by their own interchange and partly through experiments in the introduction of ornaments and variety) to the modern conception of harmony as consisting of voices or parts that move independently to the exclusion of such parallel motion. In The Oxford History of Music,

vols. i. and ii., will be found abundant examples of every stage of the process, which begins with the organum or diaphony that prevailed until the death of Guido of Arezzo (about 1050) and passes through the discant, or measured music, of the r3th century, in which rhythm is first organized on a sufficiently firm basis to enable voices to sing contrasted rhythms simultaneously, while the new harmonic criterion of the independence of parts more and more displaces and shows its opposition to the old criterion of parallelism.

The most extraordinary example of these conflicting principles is the famous rota ” Sumer is icumen in,” a 13th-century round in four parts on a canonic ground-bass in two. Recent researches

have brought to light a number of works in the forms of motet, conduclus, rondel (neither the later rondo nor the round, but a kind of triple counterpoint), which show that ” Sumer is icumen in ” contains no unique technical feature; but no work within two centuries of its date attains a style so nearly intelligible to modern ears. Its richness and firmness of harmony are such that the frequent use of consecutive fifths and octaves, in strict accordance with 13th-century principles, has to our ears all the effect of a series of grammatical blunders, so sharply does it contrast with the smooth counterpoint of the rest. In what light this smooth counterpoint struck contemporaries, or how its author (who may or may not be the writer of the Reading MS., John of Fornsete) arrived at it, is not clear, though W. S. Rockstro’s amusing article, ” Sumer is icumen in,” in Grove’s Dictionary, is very plausible. All that we know is that music in England in the 13th century must have been at a comparatively high state of development; and we may also conjecture that the tuneful character of this wonderful rota has something in common with the unwritten but famous songs of the aristocratic troubadours, or trouveres, of the 12th and 13th centuries, who, while disdaining to practise the art of accompaniment or the art of scientific and written music, undoubtedly set the fashion in melody, and, being themselves poets as well as singers, formed the current notions as to the relations between musical and poetic rhythm. The music of Adam de la Hale, surnamed Le Bossu d’ Arras (c. 1230-1288), shows the transformation of the troubadour into the learned musician; and, nearly a century later, the more ambitious efforts of a greater French poet (like his contemporary Petrarca, one of Chaucer’s models

in poetic technique), Guillaume de Machault {fi. 13 50) , mark a further technical advance, though they are not appreciably more intelligible to the modern ear.

In the next century we find an Englishman, John Dunstable, who had as early as 1437 acquired a European reputation; while his works were so soon lost sight of that until recently he was almost a legendary character, sometimes revered as the ” inventor ” of counterpoint, and once or twice even identified with St Dunstan! Recently a great deal of his work has come to light, and it shows us (especially when taken in connexion with the fact that the early Netherlandish master, G. Dufay, did not die until 1474, twenty-one years after Dunstable) that English counterpoint was fully capable of showing the composers of the Netherlands the path by which they were to reach the art of the ” Golden age.” In such examples of Dunstable’s work as that appended to the article ” Dunstable ” in Grove’s Dictionary (new ed., i. 744) we see music approaching a style more or less consistently intelligible to a modern ear; and in English Carols of the 15th Century (1801) several two-part compositions of the period, in a style resembling Dunstable’s, have been made accessible to modern readers and filled out into four-part music by the editor ” in accordance with the rules of the time.” And though it may be doubted whether Mr Rockstro’s skill would not have been held in the 15th century to savour overmuch of the Black Art, still the success of his attempt shows that the musical conceptions he is dealing with are no longer radically different from those of our modern musical consciousness.

4. The Golden Age. — The struggle towards the realization of mature musical art seems incredibly slow when we do not realize its difficulty, and wonderfully rapid as soon as we attempt to imagine the effort of first forming those harmonic conceptions which are second nature to us. Even at the time of Dunstable and Dufay the development of the contrapuntal idea of inde- pendence of parts had not yet so transformed the harmonic consciousness that the ancient parallelisms or consecutive fourths and fifths that were the backbone of discant could be seen in their true light as contradictory to the contrapuntal method. By the beginning of the 16th century, however, the laws of counterpoint were substantially fixed; practice was for a while imperfect, and aims still uncertain, but skill was increasing and soon became marvellous; and in 16th-century music we leave the archaic world altogether. Henceforth music

may show various phenomena of crudeness, decadence and transition, but its transition-periods will always derive light from the past,

whatever the darkness of the future.

In the best music of the 16th century we have no need of research or mental gymnastics, beyond what is necessary in all art to secure intelligent presentation and attention. Its materials show us the ” three dimensions ” of music in their simplest state of perfect balance. Rhythm, emancipated from the tyranny of verse, is free to co-ordinate and contrast a multi- tude of melodies which by the very independence of their flow produce a mass of harmony that passes from concord to concord through ordered varieties of transitional discord. The criterion of discord is no longer that of mere harshness, but is modified by the conception of the simplicity or remoteness of the steps by which the flux of independent simultaneous melodies passes from one concord, or point of repose, to another. When the music reaches a climax, or its final conclusion, the point of repose is, of course, greatly emphasized. It is accordingly the ” cadences ” or full closes of 16th-century music that show the greatest resemblance to the harmonic ideas of the present day; and it is also at these points that certain notes were most frequently raised so as to modify the ecclesiastical modes which are derived more or less directly from the melodic diatonic scale of the Greeks, and misnamed, according to inevitable medieval misconceptions, after the Greek modes. 1

In other passages our modern ears, when unaccustomed to the style, feel that the harmony is strange and lacking in definite direction; and we are apt to form the hasty conclusion that the mode is an archaic survival. A more familiar acquaintance with the art soon shows that its shifting and vague modulations are no mere survival of a scale inadequate for any but melodic purposes, but the natural result of a state of things in which only two species of chord are available as points of repose at all. If no successions of such chords were given prominence, except those that define key according to modern notions based upon a much greater variety of harmony, the resulting monotony and triviality would be intolerable. Moreover, there is in this music just as much and no more of formal antithesis and sequence as its harmony will suffice to hold together. Lastly, we shall find, on comparing the masterpieces of the period with works of inferior rank, that in the masterpieces the most archaic modal features are expressive, varied and beautiful; while in the inferior works they are often avoided in favour of ordinary modern ideas, and, when they occur, are always accidental and monoto- nous, although in strict conformity with the rules of the time. The consistent limitations of harmony, form and rhythm have the further consequence that the only artistic music possible within them is purely vocal. The use of instruments is little more than a necessary evil for the support of

voices in case of insufficient opportunity for practice; and although the origins of instrumental music are already of some artistic interest in the 1 6th century, we must leave them out of our account if our object is to present mature artistic ideas in proper proportions. The principles of 16th-century art-forms are discussed in more detail in the article on Contrapuntal Forms. Here we will treat the formal criteria on a general basis; especially as with art on such simple principles the distinction between one art-form and another is apt to be either too external or too subtle for stability. With music there is a stronger probability than in any other art that merely mechanical devices will be self-evident, and thus they may become either dangerous or effective. With the masters of the Netherlands they speedily became both. Two adjacent groups of illustrations in Burney's 1 The technical nature of the subject forbids us to discuss the origin and characteristics of the great Ambrosian and Gregorian collections of melodic church music on which nearly all medieval and 16th-century polyphony was based, and from which the ecclesi- astical modes were derived. Professor Wooldridge in The Oxford History of Music, i. 20-44, has shown the continuity of this early Christian music with the Graeco- Roman music, and the origin of its modes in the Ptolemaic modification (c. A. D. 150) of the Greek diatonic scale ; while a recent defence of the ecclesiastical tradi- tion of a revision by St Gregory will be found in the article on " Gregorian music " in Grove's Dictionary (new ed.), ii. 235.

[GENERAL SKETCH

History of Music will show on the one hand the astonishing way in which early polyphonic composers learnt to " dance in fetters," and, on the other hand, the expressive power that they attained by that discipline. Burney quotes from the venerable 15th-century master Okeghem, or Okenheim, some canons so designed as to be singable in all modes. They are by no means extreme cases of the ingenuity which Okenheim and his pupils often employed; but though they are not very valuable artistically (and are not even correctly deciphered by Burney) 1 they prove that mechanical principles may be a help rather than a hindrance to the attainment of a smooth and plastic style. Burney most appropriately follows them with Josquin Des Pres's wonderful Deploration de Jehan Okenheim, in which the tenor sings the plain chant of the Requiem a degree below its proper pitch, while the other voices sing a pastoral dirge in French. The device of

transposing the plain chant a note lower, and making the tenor sing it in that position through- out the whole piece, is obviously as mechanical as any form of acrostic: but it is happily calculated to impress our ears, even though, unlike Josquin's contemporaries, most of us are not familiar with the plain chant in its normal position; because it alters the position of all the semitones and gives the chant a plaintive minor character which is no less impressive in itself than as a contrast to the orthodox form. And the harmonic superstructure is as fine an instance of the expressive possibilities of the church modes at their apogee from modern tonality as could be found anywhere. A still nobler example, which we may perhaps acclaim as the earliest really sublime masterpiece in music, is Josquin's Miserere, which is accessible in a modern edition. In this monumental work one of the tenor parts is called Vagans, because it sings the burden Miserere mei Deus at regular intervals, in an almost monotonous wailing figure, wandering through each successive degree of the scale throughout the composition. The effect, aided as it is by consummate rhetorical power in every detail of the surrounding mass of . harmony and counterpoint, is extremely expressive; and the device lends itself to every shade of feeling in the works of the greatest of all Netherland masters, Orlando di Lasso. Palestrina is less fond of it. Like all more obvious formal devices it is crowded out of his Roman art by the exquisite subtlety of his sense of proportion, and the exalted spirituality of his style which, while it allows him to set the letters of the Hebrew alphabet in the Lamentations of Jeremiah in much the same spirit as that in which they would be treated in an illuminated Bible, forbids him to stimulate a sense of form that might distract the mind from the sense of mystery and awe proper to objects of devout contemplation. Yet in one of his greatest motets, Tribularer si nescirem, the burden of Josquin's Miserere appears with the same treatment and purpose as in its prototype.

But with the lesser Flemish masters, and sometimes with the greatest, such mechanical principles often became not only inexpressive but absolutely destructive to musical effect. The ingenuity necessary to make the stubborn material of music plastic was not so easily attainable as the ingenuity necessary to turn music into a mathematical game; and when Palestrina was in his prime the inferior composers so outnumbered the masters to whom music was a devout language, and so degraded the art, not only by ousting genuine musical expression but by foisting secular tunes and words into the church services, that one of the minor questions with which the Council of Trent was concerned was whether polyphonic church music should be totally abolished with other abuses, or whether it was

capable of reform. Legendary history relates that Palestrina submitted for judgment three masses of which the Missa papae Marcelli proved to be so sublime that it was henceforth accepted as the ideal church music (see Palestrina). This tale is difficult to reconcile with the chronology of Palestrina's works, but there is no doubt that Palestrina was officially recognized by the Church as a bulwark against bad taste. But we must not allow this to mislead us as to the value of church music before

1 The correct version will be found in The Oxford History of Music, fi. 215.

Palestrina. Nor must we follow the example of Baini, who, in his detestation of what he is pleased to call fiammingo squalore, views with uncritical suspicion any work in which Palestrina does not confine himself to strictly Italian methods of expression. A notion still prevails that Josquin represents counterpoint in an anatomical perfection into which Palestrina was the first to breathe life and soul. This gives an altogether inadequate idea of 16th-century music. Palestrina brought the century to a glorious close and is undoubtedly its greatest master, but he is primus inter pares; and in every part of Europe music was represented, even before the middle of the century, by masters who have every claim to immortality that sincerity of aim, completeness" of range, and depth and perfection of style can give. It has been rightly called the golden age of music, and our chronological table at the end of this article gives but an inadequate idea of the number of its masters whom no lover of music ought to neglect. It is not exclusively an age of church music. It is also the age of madrigals, both secular and spiritual; and, small as was its range of expression, there has been no period in musical art when the distinctions between secular and ecclesiastical style were more accurately maintained by the great masters, as lis abundantly shown by the test cases in which masses of the best period have been based on secular themes. (See Madrigal.)

5. The Monodic Revolution and its Results. — Like all golden ages, that of music vanished at the first appearance of a knowledge beyond its limitations. The first and simplest realization of mature art is widespread and nourishes a veritable army of great men; its masterpieces are innumerable, and its organization is so complete that no narrowness or specialization can be felt in the nature of its limitations. Yet these are exceedingly close, and the most modest attempt to widen them may have disastrous results. Many experiments were tried before Pales- trina's death and throughout the century, notably by the elder and younger Gabrieli. Perhaps Palestrina himself

is the only great composer of the time who never violates the principles of his art. Orlando di Lasso, unlike Palestrina, wrote almost as much secular as sacred music, and in his youth indulged in many eccentricities in a chromatic style which he afterwards learnt to detest. But if experiments are to revolu- tionize art it is necessary that their novelty shall already embody some artistic principle of coherence. No such principle will avail to connect the Phrygian mode with a chord containing Aft; and, however proud the youthful Orlando di Lasso may be at being the first to write A#, neither his early chromatic experiments nor those of Cipriano di Rore, which he admired so much, left a mark on musical history. They appealed to nothing deeper than a desire for sensational variety of harmony; and, while they carried the successions of chords far beyond the limits of the modes, they brought no new elements into the chords themselves.

By the beginning of the 17th century the true revolutionary principles Were vigorously at work, and the powerful genius of Monteverde speedily made it impossible for men of impres- sionable artistic temper to continue to work in the old style when such vast new regions of thought lay open to them. In the year of Palestrina's death, 1594, Monteverde pub- lished, in his third book of madrigals, works in which without going irrevocably beyond the letter of 16th-century law he showed far more zeal for emotional expression than sense of euphony. In 1599 he published madrigals in which his means of expression involve harmonic principles altogether incompatible with 16th- century ideas. But he soon ceased to place confidence in the madrigal as an adequate art-form for his new ideals of expression, and he found an unlimited field in musical drama. Dramatic music received its first stimulus from a group of Florentine dilettanti, who aspired amongst other things to revive the ideals of Greek tragedy. Under their auspices the first true opera ever performed in public, Jacopo Peri's Euridice, appeared in 1600. Monteverde found the conditions of dramatic music more favourable to his experiments than those of choral music, in which both voices and ears are at their highest sensibility

to discord. Instruments do not blend like voices; and players, producing their notes by more mechanical means, have not the singer's difficulty in making combinations which the ear does not

readily understand.

The one difficulty of the new art was fatal: there were no limitations. When Monteverde introduced his unprepared discords, the effect upon musical style was like that of intro- ducing modern metaphors into classical Greek. There were no harmonic principles to control the new material, except those which just sufficed to hold together the pure 16th-century style; and that style depended on an exquisite continuity of flow which was incompatible with any rigidity either of har- mony or rhythm. Accordingly there were also no rhythmic principles to hold Monteverde's work together, except such as could be borrowed from types of secular and popular music that had hitherto been beneath serious attention. If the 17th century seems almost devoid of great musical names it is not for want of incessant musical activity. The task of organizing new resources into a consistent language was too gigantic to be accomplished within three generations. Its fascinating dramatic suggestiveness and incalculable range disguised for those who first undertook it the fact that the new art was as difficult and elementary in its beginnings as the very beginning of harmony itself in the 13th and 14th centuries. And the most beautiful compositions at the beginning of the 17th century are rather those which show the decadence of 16th-century art than those in which the new principles were most consistently adopted. Thus the madrigals of Monteverde, though often dull and always rough, contain more music than his operas. On the other hand, almost until the middle of the 17th century great men were not wanting who still carried on the pure polyphonic style. Their asceticism denotes a spirit less compre- hensive than that of the great artists for whom the golden age was a natural environment; but in parts of the world where the new influences did not yet prevail even this is not the case, and a composer like Orlando Gibbons, who died in 1625, is well worthy to be ranked with the great Italian and Flemish masters of the preceding century.

But the main task of composers of the 17th century lay elsewhere; and if the result of their steady attention to it was trivial in comparison with the glories of the past, it at least led to the glories of the greater world organized by Bach and Handel. The early monodists, Monteverde and his fellows, directed attention to the right quarter in attempting to express emotion by means of single voices supported by instruments; but the formless declamation of their dramatic writings soon proved too monotonous for permanent interest, and such method as it showed became permanent only by being codified into the formulas of recitative, which are, for the most part, very happy idealizations of speech-cadence, and which accordingly survive as dramatic elements in music at the present day, though, like all

rhetorical figures, they have often lost meaning from careless use. 1 It was all very well to revolutionize current conceptions of harmony, so that chords were no longer considered, as in the days of pure polyphony, to be the result of so many independent melodies. But in art, as elsewhere, new thought eventually shows itself as an addition to, not a substitute for, the wisdom of ages. Moreover, it is a mistake, though one endorsed by high authorities, to suppose that the 16th-century composers did not appreciate the beauty of successions of chords apart from polyphonic design. On the contrary, Palestrina and Orlando di Lasso themselves are the greatest masters the world has ever seen of a style which depends wholly on the beauty of masses of harmony, entirely devoid of polyphonic detail, and held together by a delicately balanced rhythm in which obvious symmetry is as carefully avoided as it is in the successions of chords themselves. Nevertheless, the monody of the 17 th century is radically different in principle, not only because chords are used which were an outrage on 16th-

J The ” invention ” of recitative is frequently ascribed to this or that monodist, with as little room for dispute as when we ascribe the invention of clothes to Adam and Eve. All monody was recita- tive, if only from inability to organize melodies.

century ears, but because the fundamental idea is that of a solo voice declaiming phrases of paramount emotional interest, and supported by instruments that play such chords as will heighten the poignancy of the voice. And the first advance made on this chaotic monody consisted, not in the reintroduction of vitality into the texture of the harmonies, but in giving formal symmetry and balance to the vocal surface. This involved the strengthening of the harmonic system, so that it could carry the new discords as parts of an intelligible scheme, and not merely as uncontrollable expressions of emotion. In other words, the chief energies of the successors of the monodists were devoted to the establishment of the modern key-system; a system in comparison with which the subtle variety of modal concord sounded vague and ill-balanced, until the new key-system itself was so safely established that Bach and Beethoven could once more appreciate and use essentially modal successions of chords in their true meaning.

The second advance of the monodic movement was in the cultivation of the solo voice. This developed together with the cultivation of the violin, the most capable and expressive of the instruments used to support it. Monteverde already knew how to make interesting experiments with violins, such as directing them to play pizzicato, and accompanying an excited description of a duel by rapidly repeated strokes on a major chord, followed by sustained dying harmonies in

the minor. By the middle of the century violin music is fairly common, and the distinction between Sonata da Mesa and Sonata da camera appears (see Sonata). But the cultivation of instru- mental technique had also a great effect on that of the voice; and Italian vocal technique soon developed into a monstrosity that so corrupted musical taste as not only to blind the contem- poraries of Bach and Handel to the greatness of their choral art, but, in Handel's case, actually to swamp a great deal of his best work. The balance between a solo voice and a group of instruments was, however, successfully cultivated together with the modern key-system and melodic form; with the result that the classical aria, a highly effective art-form, took shape. This, while it totally destroyed the dramatic character of opera for the next hundred years, yet did good service in furnishing a reasonably effective means of musical expression which could encourage composers and listeners to continue cultivating the art until the day of small things was past. The operatic aria, as matured by Alessandro Scarlatti, is at its. worst a fine oppor- tunity for a gorgeously dressed singer to display feats of vocal gymnastics, either on a concert platform, or in scenery worthy of the Drury Lane pantomime. At its best it is a beautiful means of expression for the devout fervour of Bach and Handel. At all times it paralyses dramatic action, and no more ironic revenge has ever overtaken iconoclastic reformers than the historic development by which the purely dramatic declama- tion of the monodists settled down into a series of about thirty successive displays of vocalization, designed on rigidly musical conventions, and produced under spectacular conditions by artificial sopranos as the highest ideal of music-drama.

The principal new art-forms of the 17th century are then, firstly, the aria (not the opera, which was merely a spectacular condition under which people consented to listen to some thirty arias in succession) ; and, secondly, the polyphonic instrumental forms, of which those of the suite or sonata da camera were mainly derived from the necessity for ballet music in the opera (and hence greatly stimulated by the taste of the French court under Louis XIV.), while those of the sonata da chiesa were also inspired by a renaissance of interest in polyphonic texture. The sonata da chiesa soon settled into a conventionality only less inert than that of the aria because violin technique had wider possibilities than vocal; but when Lulli settled in France and raised to a higher level of effect the operatic style suggested by Cambert, he brought with him just enough of the new instru- mental polyphony to make his typical form of French overture (with its slow introduction in dotted rhythm, and its quasi-fugal allegro) worthy of the important place it occupies in Bach's and Handel's art.

MUSIC

[GENERAL SKETCH

Meanwhile great though subordinate activity was also shown in the evolution of a new choral music dependent upon an instru- mental accompaniment of more complex function than that of mere support. This, in the hands of the Neapolitan masters, was destined to lead straight to the early choral music of Mozart and Haydn, both of whom, especially Mozart, subsequently learnt its greater possibilities from the study of Handel. But the most striking choral art of the time came from the Germans, who never showed that thoughtless acquiescence in the easiest means of effect which was already the bane of Italian art. Consequently, while the German output of the 17th century fails to show that rapid attainment of modest maturity which gives much Italian music of the period a permanent if slight artistic value, there is, in spite of much harshness, a stream of noble polyphonic effort in both organ and choral music in Germany from the time of H.Schiitz (who was born in 1585 and who was a great friend and admirer of Monteverde) to that of Bach and Handel just a century later. Nor was Germany inactive in the dramatic line, and the 17th-century Italian efforts in comic opera, which are so interesting and so unjustly neglected by historians, found a parallel, before Handel's maturity, in the work of R. Keiser, and may be traced through him in Handel's first opera, Almira.

The best proof of the insufficiency of 17th-century resources is to be found in the almost tragic blending of genius and failure shown by our English church music of the Restoration. The works of Pelham Humfrey and Blow already show the qualities which with Purcell seem at almost any given moment to amount to those of the highest genius, while hardly a single work has any coherence as a whole. The patchiness of Purcell's music was, no doubt, increased by the influence of French taste then predominant at court. When Pelham Humfrey was sixteen, King Charles II., as Sir Hubert Parry remarks, " achieved the characteristic and subtle stroke of humour of sending him over to France to study the methods of the most celebrated composer of theatrical music of the time in order to learn how to compose English church music." Yet it is impossible to see how such ideas as Purcell's could have been presented in more than French continuity of flow by means of any designs less powerful than those of Bach and Handel. Purcell's ideas are, like those of all great artists, at least sixty years in advance of the normal intellect of the time. But they are unfortunately

equally in advance of the only technical resources then conceivable; and Purcell, though one of the greatest contrapuntists that ever lived, is probably the only instance in music of a man of really high genius born out of due time. Musical talent was certainly as common in the 17th century as at any other time; and if we ask why, unless we are justified in counting Purcell as a tragic exception, the whole century shows not one name in the first artistic rank, the answer must be that, after all, artistic talent is far more common than the interaction of environment and character necessary to direct it to perfect artistic results.

6. Bach and Handel. — It was not until the 18th century had begun that two men of the highest genius could find in music a worthy expression of their grasp of life. Bach and Handel were born within a month of each other, in 1685, and in the same part of Saxony. Both inherited the tradition of polyphonic effort that the German organists and choral writers had steadily maintained throughout the 17th century; and both profited by the Italian methods that were penetrating Germany. In Bach's case it was the Italian art-forms that appealed to his sense of design. Their style did not affect him, but he saw every possi- bility which the forms contained, and studied them the more assiduously because they were not, like polyphonic texture, his birthright. In recitative his own distinctively German style attained an intensity and freedom of expression which is one of the most moving things in art. Nevertheless, if he handled recitative in his own way it was not for want of acquaintance with the Italian formulas, nor even because he despised them; for in his only two extant Italian works the scraps of recitative are strictly in accordance with Italian convention, and the arias show (when we allow for their family likeness with Bach's

normal style) the most careful modelling upon Italian forms. Again, as is well known, Bach arranged with copious additions and alterations many concertos by Vivaldi (together with some which though passing under Vivaldi's name are really by Germar contemporaries); and, while thus taking every opportunity of assimilating Italian influences in instrumental as well as in vocal music, he was no less alive to the importance of the French overture and suite forms. Moreover, he is very clear as to where his ideas come from, and extremely careful to maintain every art-form in its integrity. Yet his style remains his own through- out, and the first impression of its resemblance to that of his German contemporaries diminishes the more the period is studied. Bach's art thus forms one of the most perfectly systematic and complete records a life's work has ever achieved. His art forms might be arranged in a sort of biological scheme, and their interaction and

genealogy has a clearness which might almost be an object of envy to men of science even if Bach had not demonstrated every detail of it by those wonderful re writings of his own works which we have described elsewhere (see Bach).

Handel's methods were as different from Bach's as his circum- stances. He soon left Germany and, while he never betrayed his birthright as a great choral writer, he quickly absorbed the Italian style so thoroughly as to become practically an Italian. He also adopted the Italian forms, but not, like Bach, from any profound sense of their possible place in artistic system. To him they were effective, and that was all. He did not trouble himself about the permanent idea that might underlie an art- form and typify its expression. He has no notion of a form as anything higher than a rough means of holding music together and maintaining its flow; but he and Bach, alone among their contemporaries, have an unfailing sense of all that is necessary to secure this end. They worked from opposite points of view: Bach develops his art from within, until its detail, like that of Beethoven's last works, becomes dazzling with the glory of the whole design; Handel at his best is inspired by a magnificent scheme, in the execution of which he need condescend to finish of detail only so long as his inspiration does not hasten to the next design. Nevertheless it is to the immense sweep and breadth of Handel's choral style, and its emotional force, that all subsequent composers owe their first access to the larger and less mechanical resources of music. (See Handel.)

7. The Symphonic Classes. — After the death of Bach and Handel another change of view, like that Copernican revolution for which Kant sighed in philosophy, was necessary for the further development of music. Once again it consisted in an inversion of the relation between form and texture. But, whereas at the beginning of the 17th century the revolution consisted mainly in directing attention to chords as, so to speak, harmonic lumps, instead of moments in a flux of simultaneous melodies; in the later half of the 18th century the revolution concerned the larger musical outlines, and was not complicated by the discovery of new harmonic resources. On the contrary, it led to an extreme simplicity of harmony. The art of Bach and Handel had given perfect vitality to the forms developed in the 18th century, but chiefly by means of the reinfusion of polyphonic life. The formal aspects (that is, those that decree the shapes of aria and suite-movement and the balance and contrasts of such choruses as are not fugues) are, after all, of secondary importance; the real centre of Bach's and Handel's technical and intellectual activity is the polyphony; and the more the external shape occupies the foreground the more the work assumes the character of light music. In the article

Sonata Forms we show how this state of things was altered, and attention is there drawn to the dramatic power of a music in which the form is technically prior to the texture. And it is not difficult to understand that Gluck's reform of opera would have been a sheer impossibility if he had not dealt with music in the sonata style, which is capable of changing its character as it unfolds its designs.

The new period of transition was neither so long nor so inter- esting as that of the 17th century. The contrast between the

squalid beginnings of the new art and the glories of Bach and Handel is almost as great as that between the monodists and Palestrina, but it appeals far less to our sympathies, because it seems like a contrast between noble sincerity and idle elegance. The new art seems so easy-going and empty that it conceals from us the necessity of the sympathetic historical insight for which the painful experiments of the monodists almost seem to cry aloud. And its boldest rhetorical experiments, such as the fantasias of Philipp Emanuel Bach, show a security of harmony which, together with the very vividness of their realization of modern ideas, must appear to a modern listener more like the hollow rhetoric of a decadent than the prophetic inspiration of a pioneer. And, just as in the 17th century, so in the time before Haydn and Mozart, the work that is most valuable artis- tically tends to be that which is of less importance historically. The cultivation of the shape of music at the expense of its texture was destined to lead to greater things than polyphonic art had ever dreamt of; but no living art could be achieved until the texture was brought once more into vital, if subordinate, relation to the shape. Thus, far more interesting artistically than the epoch-making earlier pianoforte works of Philipp Emanuel Bach are his historically less fruitful oratorios, and his symphonies, and the rich polyphonic modifications of the new principles in the best works of his elder brother Friedemann. Yet the tran- sition-period is hardly second in historic importance to that of the 17th century; and we may gather from it even more direct hints as to the meaning of the tendencies of our own day.

As in the 17th century, so in the 18th the composers and critics of Haydn's youth, not knowing what to make of the new tendencies, and conscious rather of the difference between new and old ideas than of

the true nature of either, took refuge in speculations about the emotional and external expression of music; and when artistic power and balance fail it is very con- venient to go outside the limits of the art and explain failure away by external ideas. Fortunately the external ideas were capable of serious organic function through the medium of opera, and in that art-form music was passing out of the hands of ■ Italians and assuming artistic and dramatic life under Gluck. The metaphysical and literary speculation which overwhelmed musical criticism at this time, and which produced paper warfares and musical party-feuds such as that 'between the Gluckists and the Piccinists, at all events had this advantage over the Wagnerian and anti-Wagnerian controversies of the last genera- tion and the disputes about the legitimate function of instru- mental music at the present day — that it was speculation applied exclusively to an art-form in which literary questions were directly concerned, an art-form which moreover had up to that time been the grave of all the music composers chose to put into it. But as soon as music once more attained to consistent principles all these discussions became but a memory. If Gluck's music had not been more musical as well as more dramatic than Piccini's, all its foreshadowing of Wagnerian principles would have availed it no more than it availed Monteverde.

When the new art found symphonic expression in Haydn and Mozart, it became music pure and simple, and yet had no more difficulty than painting or poetry in dealing with external ideas, when these were naturally brought into it by the human voice or the conditions of dramatic action. It had once more become an art which need reject or accept nothing on artificial or extraneous grounds. Beethoven soon showed how gigantic the scale and range of the sonata style could be, and how tremendous was its effect on the possibilities of vocal music, both dramatic and choral. No revolution was needed to accomplish this. The style was perfectly formed, and for the first and so far the only time in musical history a mature art of small range opened out into an equally perfect one of gigantic range, without a moment of decadence or destruction. The chief glory of the art that culminates in Beethoven is, of course, the instrumental music, all of which comes under the head of the sonata-forms (q.v.).

Meanwhile Mozart raised comic opera, both Italian and German, to a height which has never since been approached

within the classical limits, and from which the operas of Rossini and his successors show a decadence so deplorable that if " classical music " means " high art " we must say that classical opera buffa begins and ends in Mozart. But Gluck, finding his dramatic ideas encouraged by

the eminent theatrical sensibilities of the French, had already given French opera a stimulus towards the expression of tragic emotion which made the classics of the French operatic school well worthy to inspire Beethoven to his one noble operatic effort and Weber to the greatest works of his life. Cherubini, though no more a Frenchman than Gluck, was Gluck's successor in the French classical school of dramatic music. His operas, like his church music, account for Beethoven's touching estimation of him as the greatest composer of the time. In them his melodies, elsewhere curiously cold and prosaic, glow with the warmth of a true classic; and his tact in developing, accelerating and suspending a dramatic climax is second only to Mozart's. Scarcely inferior to Cherubini in mastery and dignity, far more lovable in temperament, and weakened only by inequality of invention, Mehul deserves a far higher place in musical history than is generally accorded him. His most famous work, Joseph, is of more historical importance than his others, but it is by no means his best from a purely musical point of view, though its Biblical subject impelled Mehul to make extremely successful experiments in " local colour " which had probably considerable influence upon Weber, whose admiration of the work was boundless. One thing is certain, that the romantic opera of Weber owes much of its inspiration to the opera comique of these masters. 1

8. From Beethoven to Wagner. — After Beethoven comes what is commonly though vaguely described as the "romantic" movement. In its essentials it amounts to little more than this, that musicians found new and prouder titles for a very ancient and universal division of parties. The one party set up a convenient scheme of form based upon the average procedure of all the writers of sonatas except Haydn and Beethoven, which scheme they chose to call classical; while the other party devoted itself to the search for new materials and new means of expression. The classicists, if so they may be called, did not quite approve of Beethoven; and while there is much justification for the charge that has been brought against them of reducing the sonata-form to a kind of game, they have for that very reason no real claim to be considered inheritors of classical traditions. The true classical method is that in which matter and form are so united that it is impossible to say which is prior to the other. The pseudo-classics are the artists who set up a form conveniently like the average classical form, and fill it with something conveniently like the average classical matter, with just such difference as will seem like an advance in brilliance and range. The romanticists are the artists who realize such a difference between their matter and that of previous art as impels them to find new forms for it,- or at all events to alter the old forms

considerably. But if they are successful the difference between their work and that of the true classics becomes merely external; they are classics in a new art-form. As, however, this is as rare as true classical art is at the best of times, romanti- cism tends to mean little more than the difference between an unstable artist who cannot master his material and an artist who can, whether on the pseudo-classical or the true classical plane. The term ” romantic opera ” has helped us to regard Weber as a romanticist in that sphere, but when we call his instru- mental works “romantic” the term ceases to have really valuable meaning. As applied to pieces like the Concertstiick, the Invitation a la danse, and other pieces of which the external subject is known either from Weber’s letters or from the titles of the pieces themselves, the term means simply ” programme- music ” such as we have seen to be characteristic of any stage in which the art is imperfectly mastered. Weber’s programme- music shows no advance on Beethoven in the illustrative resources of the art; and the application of the term ” romantic ”

1 We must remember in this connexion that the term Optra comique means simply opera with spoken dialogue, and has nothing to do with the comic idea.

to his interesting and in many places beautiful pianoforte sonatas has no definite ground except the brilliance of his piano- forte technique and the helplessness in matters of design (and occasionally even of harmony) that drives him to violent and operatic outbreaks.

Schubert also lends some colour to the opposition between romantic and classical by his weakness in large instrumental designs, but his sense of form was too vital for his defective training to warp his mind from the true classical spirit; and the new elements he introduced into instrumental music, though not ratified by concentration and unity of design, were almost always the fruits of true inspiration and never mere struggles to escape from a difficulty. His talent for purely instrumental music was incomparably higher than Weber’s, while that for stage-drama, as shown in the most ambitious of his numerous operas, Fierra- bras, was almost nil. But he is the first and perhaps the greatest classical song writer. It was Beethoven’s work on a larger scale that so increased the possibilities of handling remote harmonic

sequences and rich instrumental and rhythmic effects as to prepare for Schubert a world in which music, no less than literature, was full of suggestions for that concentrated expres- sion of a single emotion which distinguishes true lyric art. And, whatever the defects of Schubert's treatment of larger forms, his construction of small forms which can be compassed by a single melody or group of melodies is unsurpassable and is truly classical in spirit and result.

Schumann had neither Schubert's native talent for larger form nor the irresponsible spirit which allowed Schubert to handle it uncritically. Nor had he the astounding lightness of touch and perfect balance of style with which Chopin con- trolled the most wayward imagination that has ever found expression in the pianoforte lyric. But he had a deep sense of melodic beauty, a mastery of polyphonic expression which for .all its unorthodox tendency was second only to that of the greatest classics, and an epigrammatic fancy which enabled him to devise highly artistic forms of music never since imitated with success though often unintelligently copied. In his songs and pianoforte lyrics his romantic ideas found perfectly mature expression. Throughout his life he was inspired by a deep reverence which, while it prevented him from attempting to handle classical forms with a technique which he felt to be inadequate, at the same time impelled him as he grew older to devise forms on a large scale externally resembling them. The German lyric poetry, which he so perfectly set to music, strength- ened him in his tendency to present his materials in an epi- grammatic and antithetic manner; and, when he took to writing orchestral and chamber music, the extension of the principles of this style to the designing of large spaces in rigid sequence furnished him with a means of attaining great dignity and weight of climax in a form which, though neither classical nor strictly natural, was at all events morctrue in its relationship to his matter than that of the pseudo-classics such as Hummel or even Spohr. Towards the end of his short life, before darkness settled upon his mind, he rose perhaps to his greatest height as regards solemnity of inspiration, though none of his later works can compare with his early lyrics for artistic perfection. Be this as it may, his last choral works, especially the latter parts of Faust (which, unlike the first part, was written before his powers failed), show that the sense of beauty and polyphonic life with which he began his career was always increasing; and if he was led to substitute an artificial and ascetic for a natural and classical solution of the difficulties of the larger art-forms it was only because of his insight into artistic ideals which he felt to be beyond his attainment. He shared with Mendelssohn the inevit- able misunderstanding of those contemporaries who grouped all music under one or other of the two

heads, Classical and Romantic.

There is good reason to believe that Mendelssohn died before he had more than begun to show his power, though this may be denied by critics who have not thought of comparing Handel's career up to the age at which Mendelssohn's ceased. And his mastery, resting, like Handel's, on the experience of a boyhood

comparable only to Mozart's, was far too easy to induce him as a critic to reconcile the idea of high talent with distressing intellectual and technical failure. This same mastery also tended to discredit his own work, both as performer and composer, in the estimation of those whose experience encouraged them to hope that imperfection and over-excitement were infallible signs of genius. And as his facility actually did co-operate with the tendencies of the times to deflect much of his work into pseudo-classical channels, while nevertheless his independence of form and style kept him at all times at a higher level of interest and variety than any mere pseudo-classic, it is not to be wondered that his reputation became a formidable object of jealousy to those apostles of new ideas who felt that their own works were not likely to make way against academic opposition unless they called journalism to their aid.

Nothing has more confused, hindered and embittered the careers of Wagner and Liszt and their disciples than the paper warfare which they did everything in their power to encourage. No doubt it had a useful purpose, and, as nothing affords a greater field for intrigue than the production of operas, it is at least possible that the gigantic and unprecedentedly expensive works of Wagner might not even at the present day have obtained a hearing if Wagner himself had been a tactful and reticent man and his partisans had all been discreet lovers and practisers of art. As to Wagner's achievement there is now no important difference of opinion. It has survived all attacks as the most monumental result music has achieved with the aid of other arts. Its antecedents must be sought in many very remote regions. The rediscovery, by Mendelssohn, of the choral works of Bach, after a century of oblivion, revealed the possi- bilities of polyphonic expression in a grandeur which even Handel rarely suggested; and inspired Mendelssohn with impor- tant ideas in the designing of oratorios as wholes. The complete fusion of polyphonic method with external and harmonic design had, under the same stimulus, been carried a step further than Beethoven by means of Schumann's more concentrated harmonic and lyric expression. That wildest of all romanticists, Berlioz, though he had less polyphonic sense than any composer who ever before or since attained distinction, nevertheless

revealed important new possibilities in his unique imagination in orches- tral colour. The breaking down of the barriers that check continuity in classical opera was already indicated by Weber, in whose Euryanthe the movements frequently run one into the other, while at least twenty different themes are discoverable in the opera, recurring, like the Wagnerian leit-motif, in apt transformation and logical association with definite incidents and persons.

But many things undreamed of by Weber were necessary to complete the breakdown of the classical barriers; for the whole pace of musical motion had to be emancipated from the influence of instrumental ideas. This was the most colossal reformation ever attempted by a man of real artistic balance; and even the undoubted, though unpolished, dramatic genius shown in Wag- ner's libretti (the first in which a great composer and dramatist are one) is but a small thing in comparison with the musical problems which Wagner overcomes with a success immeasur- ably outweighing any defects his less perfect literary mastery allowed to remain in his dramatic structure and poetic diction. Apart from the squabbles of Wagnerian and anti-Wagnerian journalism, the chief difficulty of his supporters and antagonists really lay in this question of the pace of the music and the consequent breadth of harmony and design. The opening of the Walkiire, in which, before the curtain rises, the sound of driving rain is reproduced by very simple sequences that take sixteen long bars to move a single step, does not, as instrumental music, compare favourably for terseness and variety with the first twenty bars of the thunderstorm in Beethoven's Pastoral Symphony, where at least four different incidents faithfully portray not only the first drops of rain and the distant thunder, but all the feelings of depression and apprehension which they inspire, besides carrying the listener rapidly through three different keys in chromatic sequence. But Beethoven's storm

is idealized, in its whole rise and fall, within a space of five minutes. Wagner's task is to select five real minutes near the end of the storm and to treat them with no greater variety than the action of the drama demands. When we have learnt to dissociate our minds from irrelevant ideas of an earlier instru- mental art, we find that Wagner's broad spaces contain all that is necessary. Art on a large scale will

always seem to have empty spaces, so long as we expect to find in it the kind of detail appropriate to art on a smaller scale.

Wagner's new harmonic resources are of similar and more complex but not less legitimate origin. In Derfliegende Hollander they are, like his wider rhythmic sweep, imperfectly digested; in fact, much of his work before the Meistet singer is, in patches, debased by the influence of Meyerbeer. But in his later works the more closely his harmonic language is studied the more conclusively does it show itself to be a logical and mastered thing. His treatment of key is, of course, adapted to a state of things in which the designs are far too long for the mind to attach any importance to the works ending in the key in which it began. To compare Wagner's key-system with that of a symphony is like comparing the perspective and composition of a panorama with the perspective and composition of an easel picture. Indeed the differences are precisely analogous in the two cases; and Wagner's sense of harmony and key turns out on investigation to be the classical sense truly adapted to its new conditions. For this very reason it is in detail quite irrele- vant to symphonic art; and there was nothing anti-Wagnerian in the reasons why Brahms had so little to do with it in his music, although every circumstance of the personal controversies and thinly disguised persecutions of Brahms's youth were enough to give any upholder of classical symphonic art a rooted prejudice to everything bearing the name of " romantic."

Side by side with Wagner many enthusiasts place Liszt; and it is. indisputable that Liszt had in mind a larger and slower flow of musical sequence closely akin to Wagner's, and, no doubt, partly independent of it; and moreover, that one of Liszt's aims was to apply this to instrumental music. Also his mastery and poetic power as a pianoforte player were faithfully reflected in his later treatment of the orchestra, and ensured an extra- ordinary rhetorical plausibility for anything he chose to say. But neither the princely magnanimity of his personal character, which showed itself in his generosity alike to struggling artists and to his opponents, nor the great stimulus he gave (both by his compositions and his unceasing personal efforts and encour- agement) to new musical ideas on romantic lines, ought at this time of day to blind us to the hollowness and essential vulgarity of his style. These unfortunate qualities did not secure for his compositions immediate popular acceptance; for they were outweighed by the true novelty of his aims. But recently they have given his symphonic poems an attractiveness which, while it has galvanized a belated interest in those works, has made many critics blind to their historical importance as the founda- tion of new forms which have undergone a development of sensational brilliance under Richard Strauss.

Meanwhile the party politics of modern music did much to distract public attention from the works of Brahms, who carried on the true classical method of the sonata-forms in his orchestral and chamber music, while he was no less great and original as a writer of songs and choral music of all kinds. He also developed the pianoforte lyric and widened its range. Without losing its characteristic unity it assumed a freedom and largeness of expression hitherto only attained in sonatas. Hence, however, Brahms's work, like Bach's, seemed, from its continuity with the classical forms, to look backward rather than forward. Indeed Brahms's reputation is in many quarters that of an academic reactionary; just as Bach's was, even at a time when the word " academic " was held to be rather a title of honour than of reproach. When the contemporary standpoints of criticism are established by the production of works of art in which the new elements shall no longer be at war with one another and with the whole, perhaps it will be recognized once more that the idea of progress has no value as a critical standard unless

it is strictly applied to that principle by which every work of art must differ in every part of its form from every other work, precisely as far as its material differs and no further. Then, perhaps, as the conservative Bach after a hundred years of neglect revealed himself as the most profoundly modern force in the music of the 19th century,

while that of his gifted and progressive sons became a forgotten fashion as soon as their goal was attained by greater masters, so may the musical epoch that seems now to have closed be remembered by posterity as the age, not of Wagner and the pioneer Liszt, but the age of Wagner and Brahms.

It will also in all probability be remembered as the age in which the performer ceased to be necessarily the intellectual inferior of the composer and musical scholar. With the excep- tion of Wagner and Berlioz every great composer, since Palestrina sang in the papal choir, has paid his way as a performer; but Joseph Joachim was the first who threw the whole mind of a great composer into the career of an interpreter; and the example set by him, Biilow, Clara Schumann and Jenny Lind, though followed by very few other artists, sufficed to dispel for ever the old association of the musical performer with the mounte- bank.

Joachim's influence on Brahms was incalculable. The two composers met at the time when new musical tendencies were beginning to arouse violent controversy. At the age of twenty- one Joachim had produced in his Hungarian Concerto a work of high classical mastery and great nobility, and his technique in form and texture was then considerably in advance of Brahms's. For some years Joachim and Brahms interchanged contrapuntal exercises, and many of the greatest and most perfect of Brahms's earlier works owe much to Joachim's criticism. Yet it is impossible to regret that Joachim did not himself carry on as a composer the work he so nobly began, when we realize the enormous influence of his playing in the history of modern music. By it we have become familiar with a standard of truthfulness in performance which all the generous efforts of Wagner and Liszt could hardly have rendered independent of their own special propaganda. And by it the record of classical music has been made a matter of genuine public knowledge, with a unique freedom from those popularizing tendencies which invest vulgar error with the authority of academic truth.

In this respect there is a real change in the nature of modern musical culture. No serious composer at the present day would dedicate a great work to an artist who, like F. Clement, for whom Beethoven wrote his Violin Concerto, would perform the work in two portions and between them play a sonata for the violin on one string with the violin upside down. But it is hardly true that Wagner and Liszt produced a real alteration in the standard of general culture among musicians. Their work, especially Wagner's, appealed, like Gluck's, to many specific literary and philosophical interests, and they themselves

were brilliant talkers; but music will always remain the most self-centred of the arts, and men of true culture will measure the depth and range of the musician's mind by the spontaneity and truthfulness of his musical expression rather than by his volubility on other subjects. The greatest musicians have not often been masters of more than one language; but they have always been men of true culture. Their humanity has been illuminated by the constant presence of ideals which their artistic mastery keeps in touch with reality.

Chronological Table

Pythagoras, c. 582-500 b.c Determines the ratios of the diatonic

scale. Aristoxenus, fl. 320 B.C. Our chief authority on classical Greek

music. Ptolemy, fl. a.d. 130. Astronomer, geographer, mathematician

and writer on music. Reforms the Greek modes so as to prepare

the way for the ecclesiastical modes. St Ambrose. Arranges the Ambrosian tones of church music,

a.d. 384. Hucbald, c. 840-930. Systematizer of Diaphonia or OrgMum

(called by him Symphonia), and inventor of a simple and in- genious notation which did not survive him.

[RECENT MUSIC

Guido of Arezzo, c. 990-1050. Theorist and systematizer of musical notation and solmization.

Franco of Cologne, nth century author of treatises on musical rhythm. Works under the name of Franco appear at dates and places which have led to the assumption of the existence of three different authors, who, however, have been partly explained away again; and the nth century is sometimes called the Franconian period of discant.

Discantus positio vulgaris. An anonymous treatise written before 1 150 ; is said to contain the earliest rules for " measured music," i.e. (or music in which different voices can sing different rhythms.

The Reading MS., c. 1240 (British Museum, MS. Had., 978, fol. lib.),

contains the rota ” Sumer is icumen in.”

Walter Odington, fl. 1280. English writer on music, and composer.

Adam de la Hale, 1230-1288) Connecting-links between the trouba-

Machault,/Z. 1350 J dours and the archaic contrapuntists.

John Dunstable, died 1453. English contrapuntal composer.

G. Dufay, died 1474. Netherland contrapuntal composer.

(These two are the principal founders of artistic counterpoint.)

Josquin Des Pres, 1 445-1 521. The first great composer.

Masters of the Golden Age [In the following list when a name is not qualified as ” church composer ” or ” madrigalist,” the composer is equally great in both lines ; but the qualification must not be taken as exclusive.]

Netherland Masters. J. Arcadelt, c. 1514-1560. Madrigalist. Clemens non Papa, died before 1558.

Jrlando di Lasso, born between 1520 and 1530; died 1594. Jan P. Sweelinck, 1362-1621. Organist, theorist and church com- poser.

French Masters.

E. Genet, surnamed Carpentrasso, fl. 1520. Church composer. C. Goudimel. Killed in the massacre of Lyons, 1572.

Italian Masters. Palestrina, c. 1525-1594. L. Marenzio, c. 1560; died 1599.

Anerio, Felice c. 1560- 1630, and G. Francesco, c. 1 567-1620, brothers. Church composers.

Spanish Masters.

C. Morales, 1512-1553 1 „ , . . , ,

F. Guerrero, c. 1 528-1 599 I Exclusively church com- T. L. de Victoria or ViUoria, fl. 1580 J P° sers –

English Masters. T. Tallis, c. 1515; died 1585. Church composer. W. Byrd, 1542 or 1 543-1 623. Greatest as church composer. J. Wilbye, fl.

1600. Madrigalist. T. Money, fl. 1590. Theorist and madrigalist. Orlando Gibbons, 1583-1625.

German Masters. J. Handl, or Gallus, c. 1550-1591. Hans Leo Hasler or Hassler, 1564-1612. Church composer.

G. Aichinger, c. 1 565-1628. Church composer.

The Monodists

Cavalieri's ha Rappresentazione di Anima e di Corpo, posthumously produced in 1600. The first oratorio, one of the first works dependent on instrumental accompaniment, and one of the first with a " figured bass " indicating by figures what chords are to be used.

Peri's Euridice, 1600. The first opera.

Monteverde, 1 567-1 643. Great pioneer of modern harmony. The Renaissance cf Texture

H. Schtitz, 1585-1672. Combines monodic and polyphonic prin- ciples in German church music and Italian madrigal.

G. Frescobaldi, 1583-1644. Organ composer.

Alessandro Scarlatti, 1659-1725. Founder of the aria-form of Handelian opera, and of the Neapolitan school of composition.

J. B. Lulli, 1633-1687. The first classic of French opera.

H. Purcell, c. 1658; died 1695.

A. Corelli, 1653-1713. The first classic of the violin in the forms of suite (or sonata da camera), sonata da chiesa and concerto.

F. Couperin, 1668-1733. French composer of suites (ordres) and much

addicted to giving fanciful titles to his pieces which are some- times " programme music " in fact as well as name.

J. P. Rameau, 1683-1764. French opera writer, harpsichordist and theorist.

D. Buxtehude, 1637-1707.

J. S. Bach, 1685-1750.

G. F. Handel, 1685 -1759.

The Sonata Epoch Domenico Scarlatti, 1685- 1 757, son of Alessandro. Harpsichord

virtuoso and master of a special early type of sonata. K. Phillpp Emanuel Bach, 1 7 14-1788, third son of Sebastian Bach.

The principal pioneer of the sonata style. G. W. Gluck, 1714-1787. Reformer of opera, and the first classic of 1 essentially dramatic music. F. J. Haj'dn, 1732-1809.

W. A. Mozart, 1 756-1 791. Beethoven, 1770-1827.

Cherubini, 1760-1842. A classic of French opera and of church music.

The Lyric and Dramatic or " Romantic " Period [In this list the only qualifications given are those of which the complex conditions of modern art make definition easy as well as desirable; and, as throughout this table, the definitions must not be taken as exclusive. The choice of names is, however, guided by the different developments represented : thus accounting for glaring omissions and artistic disproportions.] Weber, 1 786-1 826. Master of romantic opera. Schubert, 1 797-1 828. The classic of song. Mendelssohn, 1 809-1 847.

Chopin, 1 809-1 849. Composer of pianoforte lyrics. Berlioz, 1803-1869. Master of impressionist orchestration. Schumann, 1810-1856.

Wagner, 1813-1883. Achieves absolute union of music with drama. Liszt, 181 1-1886. Pianoforte virtuoso and pioneer of the symphonic

poem. Bruckner, 1824-1896. The symphonist of the Wagnerian party. Brahms, 1 833-1 897. Classical symphonic and lyric composer. Joachim, 1831-1907. Violinist, composer and teacher. Brahms's

chief fellow-worker in continuing the classical tradition. Tschaikovsky, 1840-1893. Dvorak, 1 841-1904.

Richard Strauss, 1864- Development of the symphonic

poem. (D. F. T.)

II. — Recent Music Under separate biographical headings, the work of the chief modern composers in different countries is dealt with; and

‘here it will be sufficient to indicate the general current of the art, and to mention some of the more prominent among recent composers.

Germany. — On the death of Brahms, the great German composers seemed, at the close of the 19th century, to have left no successor. Such merely epigonal figures as A. Bungert (b. 1846) and Cyrill Kistler (1848-1907) could not be regarded as important; and E. Humperdinck’s (b. 1854) striking success with Hansel und Gretel (1893) was a solitary triumph in a limited genre. The outstanding figure, at the opening of the 20th century, was Richard Strauss (q.v.) ; but it was not so much now in composition, as in the high excel- lence of executive art, that Germany still kept up her hegemony in European music, by her schools, her great conductors and instru- mentalists, and her devotion as a nation to the production of musical works.

France. — From the earliest days of their music, the French have had the enviable power of assimilating the great innovations which were originated in other countries, without losing their habit of warmly appreciating that which their own countrymen produce. That which happened with the Netherlandish composers of the 16th century, and with Lulli in the 17th, was repeated, more or less exactly, with Rossini in the early part of the 19th century and with Wagner at its close. During the last quarter of the 19th century all that is represented by the once-adored name of Gounod was discarded in favour of a style as different as possible from his. The change was mainly due to the Belgian musician, Cesar Auguste Franck (1822-1890), who established a kind of informal school of symphonic and orchestral composition, as opposed to the con- ventional methods pursued at the Paris Conservatoire. Massenet •vas left as almost the only representative of the older school, and from Edouard Lalo (1823-1892) to G. Charpentier (b. i860), all the younger composers of France adopted the newer style. With these may be mentioned Alfred Bruneau (b. 1857), an d Gabriel Faur6 (b. 1845). Camille Saint-Saens (b. 1835), however, remained the chief representative of the sound school of composition, if only by reason of his greater command of resources of every kind and his success in all forms of music. Among the newer school of composers the most original unquestionably was Debussy (q.v.), and among others may be mentioned Ernest Reyer (b. 1823), the author of some ambitious and sterling operas; F. L. V. de Joncieres (b. 1839), an enthusiastic follower of Wagner, and a composer of merit; Emanuel Chabrier (1841-1894), a man of extraordinary gift, who wrote one of the finest opSras comiques of modern times, Le Roi malgre lui (1887) ; Charles Marie Widor (b. I845), an earnest musician of great accomplishment; and Vincent d’Indy (b. 1851), a strongly original writer, alike in dramatic, orchestral and chamber

compositions. In the class of lighter music, which yet lies above the level of opira bouffe, mention must be made of Leo Delibes (1836-1891) and Andr<6 Messager (b. 1855). In describing the state of music in France, it would be wrong to pass over the work done by the great conductors of various popular orchestral concerts, such as Jules E. Pasdeloup (1819-1887), Chas. Lamoureux (1834- 1S99), and Judas [Edouard] Colonne (b. 1838).

Italy. — In Italy during the last quarter of the 19th century many important changes took place. The later development in the style of Verdi (q.v.) was only completed in Otello (1887) and Falstaff (1893), while his last composition, the four beautiful sacred vocal works, show how very far he had advanced in reverence.

solidity of style and impressiveness, from the time when he wrote his earlier operas. And Arrigo Boito's Mefistofele had an immense influence on modern Italian music. Among the writers of " abso- lute " music the most illustrious are G. Sgambati (b. 1843) and G. Martucci (b. 1856), the latter's symphony in D minor being a fine work. Meanwhile a younger operatic school was growing up, of which the first production was the Flora mirabilis of Spiro Samara (b. 1861), given in 1886. Its culmination was in the Cavalleria rusticana (1890) of Pietro Mascagni (b. 1863), the Pagliacci (1892) of R. Leoncavallo (b. 1858), and the operas of Giacomo Puccini (b. 1858), notably Le Villi (1884), Manon Lescaut (1893), La Bohhne (1896), Tosca (1900), and Madama Butterfly (1904). The oratorios of Don Lorenzo Perosi (b. 1872) had an inter- esting influence on the church music of Italy (see Palestrina).

Russia. — The new Russian school of music originated with M. A. Balakirev (b. 1836), who was instrumental in founding the Free School of Music at St Petersburg, and who introduced the music of Berlioz and Liszt into Russia; he instilled the principles of "advanced" music into A. P. Borodin (18ˆ4-1887), C. A. Cui (b. 1835), M. P. Moussorgsky (1 839-1 881), "and N. A. Rimsky- Korsakov (1844-1908), all of whom, as usual with Russian com- posers, were, strictly speaking, amateurs in music, having some other profession in the absence of any possible opportunity for making money out of music in Russia. The most remarkable man among their

contemporaries was undoubtedly Tschaikovsky (q.v.). A. Liadov (b. 1855) excels as a writer for the pianoforte, and A. Glazounov (b. 1865) has composed a number of fine orchestral works.

United States. — Of the older American composers, only John Knowles Paine (d. 1906) and Dudley Buck (d. 1909), both born in 1839, and Benjamin Johnson Lang (1837-1909), need be mentioned. Paine, professor of music at Harvard University, and composer of oratorios, orchestral music, &c, ranks with the advanced school of romantic composers. Dudley Buck was one of the first American composers whose names were known in Europe ; and if his numerous cantatas and church music do not reach a very high standard according to modern ideas, he did much to conquer the general apathy with regard to the existence of original music in the States. Lang, prominent as organist and conductor, also became distinguished as a composer. George Whitefield Chadwick (b. 1854) has produced many orchestral and vocal works of original merit. Though the works of Clayton Johns (b. 1857) are less ambitious, they have won more popularity in Europe, and his songs, like those of Arthur Foote (b. 1853), Reginald De Koven (b. 18.59), and Ethelbert Nevin (1862-1901), are widely known. Edward Alexander McDowell (q.v.) may be regarded as the most original modern American composer. Walter Johannes Damrosch (b. 1862), the eminent conductor of the New York Symphony Orchestra, and of various operatic undertakings, has established his position as an original and poetic composer, not only by his opera, The Scarlet Letter, but by such songs as the intensely dramatic ” Danny Deever.” Dr Horatio William Parker’s (b. 1863) oratorio settings of the hymn ” Hora novissima ” and of “The Wanderer’s Psalm ” are deservedly popular. Their masterly workmanship and his power of expression in sacred music mark him as a distinct personality. Numerous orchestral as well as vocal works have not been heard out of America, but a group of songs, newly set to the words of familiar old English ditties, have obtained great success. Mrs H. H. A. Beach, the youngest of the prominent composers of the United States and an accomplished pianist, has attained a high reputation as a writer in all the more ambitious forms of music. Many of her songs and anthems have obtained wide popularity. The achievements of the United States are, however, less marked in the production of new composers than in the attention which has been paid to musical education and appreciation generally. Henry E. Krehbiel (b. 1854), the well-known critic, was especially prominent in drawing American attention to Wagner and Brahms. The New York Opera has been made a centre for the finest artists of the day, and the symphony concerts at Boston and Chicago have been unrivalled for

excellence. It is worthy of note that no country has produced a greater number of the most eminent of recent singers. Mesdames E. Eames, Nordica. Minnie Hauck, Susan Strong, Suzanne Adams, Sybil Sanderson, Esther Paljiser, Evangeline Florence, and very many more among leading sopranos, with Messrs E. E. Oudin, D. Bispham and Denis O'Sullivan, to name but three out of the host of excellent male artists, proved the natural ability of the Americans in vocal music; and it might also be said that the more notable English- speaking pupils of the various excellent French schools of voice- production are American with hardly an exception.

United Kingdom. — English music requires more detailed notice, if only because of the striking change in the national feeling with regard to it. The nation had been accustomed for so long to consider music as an exotic, that, notwithstanding the glories of the older schools of English music, the amount of attention paid to everything that came from abroad, and the rich treasures of tradi- tional and distinctively English music scattered through the country, • the majority of educated people adhered to the common belief that England was not a musical country. The beauty and the enormous . quantity of traditional Irish music, the enthusiasm created in Scotland by trumpery songs written in what was supposed to be

an imitation of the Scottish style, the existence of the Welsh Eisteddfodau, were admitted facts; but England was supposed to have had no share in these gifts of nature or art, and the vogue of foreign music, from Italian opera to classical symphonies, was held ; as evidence of her poverty, instead of being partly the reason of the national sterility. In the successive periods during which the music of Handel and Mendelssohn respectively had been held as all-sufficient for right-thinking musicians, success could only be attained, if at all, by those English musicians who deliberately set themselves to copy the style of these great masters; the few men who had the determination to resist the popular movement were' either confined, like the Wesley s, to one branch of music in which some originality of thought was still allowed that of the Church, or, like Henry Hugo Pierson in the days of the Mendelssohn worship, were driven to seek abroad the recognition they could not obtain at home. For a time it seemed as if the great vogue of Gounod would exalt him into a third artistic despot; but no native com- poser had even the energy to imitate his Faust; and, by the date of The Redemption (1882) and Mors el vita (1885), a renaissance of English music had already begun.

For a generation up to the 'eighties the affairs of foreign opera in England were rather depressing; the rival houses presided over by the

impresarios Frederick Gye (1810-1878) and Colonel J. H. Mapleson (1828-1901) had been going from bad to worse; the traditions of what were called “the palmy days ” had been for- gotten, and with the retirement of Christine Nilsson in 1881, and the death of Therese J. A. Tietjens in 1877, the race of the great queens of song seemed to have come to an end. It is true that Mme Patti was in the plenitude of her fame and powers, but the number of her impersonations, perfect as they were, was so small that she alone could not support the weight of an opera season, and her terms made it impossible for any manager to make both ends meet unless the rest of the company were chosen on the principle enunciated by the husband of Mme Catalani, ” Ma femme et quatre ou cinq poupees.” Mme Albani (b. 1851) had made her name famous, but the most important part of her artistic career was yet to come. She had already brought Tannhduser and Lohengrin into notice, but in Italian versions, as was then usual; and the great vogue of Wagner’s operas did not begin until the series of Wagner concerts given at the Royal Albert Hall in 1877 with the object of collecting funds for the preservation of the Bayreuth scheme, which after the production of the Nibelungen trilogy in 1876 had become involved in serious financial difficulties. The two seasons of German opera at Drury Lane under Dr Hans Richter (b. 1843) in 1882 and 1884, and the production of the trilogy at Her Majesty’s in 1882, under Angelo Neumann’s managership, first taught stay-at-home Englishmen what Wagner really was, and an Italian opera as such (i.e. with Italian as the exclusive language employed and the old ” star ” system in full swing) ceased to exist as a regular institution a few years after that. The revival of public interest in the opera only took place after Mr (afterwards Sir) Augustus Harris (1852-1896) had started his series of operas at Drury Lane in 1887. In the following season Harris took Covent Garden, and since that time the opera has been restored to greater public favour than it ever enjoyed, at all events since the days of Jenny Lind. The clever manager saw that the public was tired of operas arranged to suit the views of the prima donna and no one else, and he cast the works he produced, among which were Un Balto in maschera and Les Huguenots, with due attention to every part. The brothers Jean and Edouard de Reszke, both of whom had appeared in London before — the former as a baritone and the latter during the seasons 1880-1884 — were even stronger attractions to the musical public of the time than the various leading sopranos, among whom were Mme Albani, Miss M. Mac-intyre, Mme Melba, Frau Sucher and Mme Nordica, during the earlier seasons, and Mme Eames, Mile Ravogli, MM. Lassalle and P. H. Plangon, and many other Parisian favourites later. As time went on, the excellent custom obtained of giving each work in the language in

which it was written, and among the distinguished German artists who were added to the company were Frau M. Ternina, Frau E. Schumann-Heink, Frau Lilli Lehmann and many more. Since Harris's death in 1896 the traditions started by him were on the whole well maintained, and as a sign of the difference between the present and the former position of English composers, it may be mentioned that two operas by F. H. Cowen, Signa and Harold, and two by Stanford, The Veiled Prophet and Much Ado about Nothing, were produced. To Signor Lago, a manager of more enterprise than good fortune, belongs the credit of reviving Gluck's Orfeo (with the masterly impersonation of the principal character by Mile Giulia Ravogli), and of bringing out Cavalleria rusticana, Tschaikovsky 's Eugen Onegin and other works.

If it be just to name one institution and one man a r the creator of such an atmosphere as allowed the genius of English composers to flourish, then that honour must be paid to the Crystal Palace and August Manns, the conductor of its Saturday concerts. At first engaged as sub-conductor, under a certain Schallehn, at the building which was the lasting result of the Great Exhibition o c 1 85 1, he became director of the music in 1855; so for the better part of half a century his influence was exerted on behalf of the best music of all schools, and especially in favour of anything of

English growth. Through evil report and good report he supported his convictions, and for many years he introduced one English composer after another to a fame which they would have found it hard to gain without his help and that of Sir George Grove, his loyal supporter. In 1862, when Arthur Sullivan had just returned from his studies in Leipzig, his Tempest music was produced at the Crystal Palace, and it is beyond question that it was this success and that of the succeeding works from the same hand which first showed Englishmen that music worth listening to might be pro- duced by an English hand. Sullivan reached the highest point of his achievement in The Golden Legend (1886), his most important contribution to the music of the renaissance. An important part of the Crystal Palace music was that the concerts did not follow. but led, popular taste; the works of Schubert, Schumann and many other great masters were given constantly, and the whole repertory of classical music was gone through, so that a constant attendant at these concerts would have

become acquainted with the whole range of the best class of music. From 1859 onwards the classical chamber-music could be heard at the Popular Concerts started by Arthur Chappell, and for many years their repertory was not less catholic than that of the Crystal Palace undertaking ; that in later times the habit increased to a lamentable extent of choosing only the ” favourite ” (i.e. hackneyed) works of the great masters does not lessen the educational value of the older concerts. The lovers of the newer developments of music were always more fully satisfied at the concerts of the Musical Union, a body founded by John Ella in 1844, which lasted until 1880. From 1879 onwards the visits of Hans Richter, the conductor, were a feature of the musical season, and the importance of his work, not only in spread- ing a love of Wagner’s music, but in regard to every other branch of the best orchestral music, cannot be exaggerated. Like the popular concerts, the Richter concerts somewhat fell away in later years from their original purpose, and their managers were led by the popularity of certain pieces to give too little variety. The importance of Richter’s work was in bringing forward the finest English music in the years when the masters of the renaissance were young and untried. Here were to be heard the orchestral works of Sir Hubert Parry, Sir Charles Villiers Stanford, Sir A. Campbell Mackenzie and Dr F. H. Cowen ; and the names of these composers were thus brought into notice much more effectually than could have been the case in other surroundings. Meanwhile outside London the work of the renaissance was being carried on, notably at Cambridge, where by the amalgamation of various smaller societies with the University Musical Society, Stanford created in 1875 a splendid institution which did much to foster a love of the best music for many years ; and at Oxford, where private meetings in the rooms of Hubert Parry brought about the institu- tion of the Musical Club, which has borne fruit in many ways, though only in the direction of chamber-music. The Bach Choir, founded by Mr Arthur Duke Coleridge in 1875, and conducted for the first ten years of its existence by Mr Otto Goldschmidt and subsequently by Professor Stanford, worked on purely uncommercial lines ever since its foundation, and besides many important works of Bach, it brought forward most important compositions by Englishmen, and had a prominent share in the work of the renais- sance. Parry’s earlier compositions had a certain austerity in them which, while it commanded the homage of the cultivated few, prevented their obtaining wide popularity; and it was not until the date of his choral setting of Milton’s Ode at a Solemn Mustek that he found his true vein. In this and its many successors, produced at the autumn festivals, though very rarely given in London, there was a nobility of utterance, a sublimity of concep- tion, a mastery of resource, that far

surpass anything accomplished in England since the days of Purcell; while his ” Symphonic Varia- tions ” for orchestra, and at least two of his symphonies, exhibit his command of the modern modifications of classical forms in great perfection. Like Parry, Stanford first caught the ear of the public at large with a choral work, the stirring ballad-setting of Tennyson’s Revenge; and in all his earlier and later works alike, which include compositions in every form, he shows himself a supreme master of effect; in dramatic or lyrical handling of voices, in orchestral and chamber-music, his sense of beauty is unfailing, and while his ideas have real distinction, his treatment of them is nearly always the chief interest of his works. The work of the musical renaissance has been more beneficially fostered by these two masters than by any other individuals, through the medium of the Royal College of Music. In 1876 the National Training School of Music was opened with Sullivan as principal; he was succeeded by Sir John Stainer in 1881, and the circumstance that such artists as Mr Eugen d’Albert and Mr Frederic Cliffe received there the foundation oftheir musical education is the only important fact connected with the institution, which in 1882 was succeeded by the Royal College of Music, under the directorship of Sir George Grove, and with Parry and Stanford as professors of composition. In 1894 Parry succeeded to the directorship, and before and after this date work of the best educational kind was done in all branches of the art, but most of all in the important branch of composition. Mackenzie’s place among the masters of the renaissance is assured by his romantic compositions for orchestra — such as La Belle dame sans merci and the two ” Scottish Rhapsodies “; some of his choral

works, such as the oratorios, show some tendency to fall back into the conventionalities from which the renaissance movement was an effort to escape; but in The Cottar’s Saturday Night; The Story of Sayid; Vent, Creator Spiritus, and many other things, not except- ing the opera Colomba or the witty ” Britannia ” overture, he shows no lack of spontaneity or power. As principal of the Royal Academy of Music (he succeeded Macfarren in 1888) he revived the former glories of the school, and the excellent plan by which it and the Royal College unite their forces in the examinations of the Associated Board is largely due to his initiative. The opera just mentioned was the first of the modern series of English operas brought out from 1883 onwards by the Carl Rosa company during its tenure of Drury Lane Theatre: at the time it seemed as though English opera had a chance of getting permanently established, but the enterprise, being a purely private and individual one, failed to have a lasting effect upon the art of the country, and after the production of two operas by Mackenzie, two by Arthur

Goring Thomas, one by F. Corder, two by Cowen and one by Stanford, the artistic work of the company grew gradually less and less important. In spite of the strong influence of French ideals and methods, the music of Arthur Goring Thomas was remarkable for individuality and charm ; in any other country his beautiful opera Esmeralda would have formed part of the regular repertory; and his orchestral suites, cantatas and a multitude of graceful and original songs, remain as evidence that if his career had been prolonged, the art of England might have been enriched by some masterpiece it would not willingly nave let die. After a youth of extraordinary pre-cocity, and a number of variously successful attempts in the more ambitious and more serious branches of the art, Cowen found his chief success in the treatment of fanciful or fairy subjects, whether in cantatas or orchestral works; here he is without a rival, and his ideas are uniformly graceful, excellently treated and wonderfully effective. His second tenure of the post of conductor of the Phil- harmonic Society showed him to be a highly accomplished conductor. In regard to English opera two more undertakings deserve to be recorded. In 1891 the Royal English Opera House was opened with Sullivan's Ivanhoe, a work written especially for the occasion* the absence of anything like a repertory, and the retention of this one work in the bills for a period far longer than its attractions could warrant, brought the inevitable result, and shortly after the production of a charming French comic opera the theatre was turned into the Palace Music Hall. The charming and thoroughly characteristic Shamus O'Brien of Stanford was successfully pro- duced in 1896 at the Opera Comique theatre. This work brought into public prominence the conductor Mr Henry J. Wood (b. 1870), who exercised a powerful influence on the art of the country by means of his orchestra, which was constantly to be heard at the Queen's Hall, and which attained, by continual performance together, a degree of perfection before unknown in England. It achieved an important work in bringing music within the reach of all classes at the Promenade Concerts given through each summer, as well as by means of the Symphony Concerts at other seasons.

The movement thus started by Mr Wood increased and spread remarkably in later years. His training of the Queen's Hall Orchestra was characterized by a thoroughness and severity pre- viously unknown in English orchestras. This was partly made possible by the admirable business organization which fostered the movement in its earlier years ; so many concerts were guaranteed that it was possible to give the players engagements which included a large amount of rehearsing. The result was soon apparent, not only in the raising of

the standard of orchestral playing, but also in the higher and more intelligent standard of criticism to which performances were subjected both by experts and by the general public. The public taste in London for symphonic music grew so rapidly as to encourage the establishment of other bodies of players, until in 1910 there were five first-class professional orchestras giving concerts regularly in London — the Philharmonic Society, the Queen's Hall Orchestra, the London Symphony Orchestra (described by Dr Hans Richter as " the finest orchestra in the world "), the New Symphony Orchestra under Mr Landon Ronald (b. 1873), a composer and conductor of striking ability, and Mr Thomas Beecham s Orchestra. Mr Beecham, who had come rapidly to the front as a musical enthusiast and conductor, paid special attention to the work of British compbsers. Manchester, Birming- ham, Liverpool and Edinburgh, had their own orchestras; and it might be said that the whole of the United Kingdom was now permeated with a taste for and a knowledge of orchestral music. The effect of this development has influenced the whole of the musical life of England. The symphony and the symphonic poem have taken the place so long held by the oratorio in popular taste; and English composers of any merit or ability find it possible to get a hearing for orchestral work which at the end of the :9th century would have had to remain unperformed and unheard. The result has been the rapid development of a school of English orchestral composers — a school of considerable achievement and still greater promise.

The new school of English writers contains many names of skilled composers. Sir Edward Elgar established his reputation by his vigorous Caractacus and the grandiose imaginings of his Dream of Gerontius, as by orchestral and chamber compositions of

decided merit and individuality, and by being the composer of a symphony which attained greater and wider fame than any similar work since the symphonies of Tschaikovsky. Mr Edward German (b. 1862) won great success as a writer of incidental music for plays, and in various lighter forms of music, for which his great skill in orchestration and his knowledge of effect stand him in good stead. The quality of Mr Frederic Cliffe's orchestral works is extremely high. Dr Arthur Somervell (b. 1863), who succeeded Stainer as musical adviser to the Board of Education, first came into promi- nence as a

composer of a number of charming songs, notably a fine song-cycle from Tennyson's Maud, but his Mass and various orchestral works and cantatas and pianoforte pieces show his conspicuous ability in other forms. Various compositions written by Mr Hamish MacCunn (b. 1868), while still a student at the Royal College of Music, were received with acclamation; but his later work was not of equal value, though his operas Jeanie Deans and Diarmid were successful. Mr Granville Bantock (b. 1868), an ardent supporter of the most advanced music, has written many fine things for orchestra, and Mr William Wallace (b. 1861), in various orchestral pieces piayed at the Crystal Palace and elsewhere, and in such things as his " Freebooter " songs, has shown strong individuality and imagination. Mr Arthur Hinton (b. 1869) has produced things of fanciful beauty and quaint origi- nality. Miss Ethel M. Smyth, whose Mass was given at the Royal Albert Hall in most favourable conditions, had her opera Fantasio produced at Weimar and Carlsruhe, and Der Wald at Covent Garden. Miss Maud Valerie White's graceful and expressive songs brought her compositions into wide popularity; and Mme Liza Lehmann made a new reputation by her cycles of songs after her retirement from the profession of a singer. The first part of Mr S. Coleridge-Taylor's (b. 1875) Hiawatha scenes was performed while he was still a student at the Royal College, and so great was its popularity that the third part of the trilogy was commissioned for performance by the Royal Choral Society. Mr Cyril Scott is a composer who aims high, though with a somewhat strained originality. Dr H. Walford Davies (b. 1869) and W. Y. Hurlstone (1876-1906) excel in the serious kind of chamber-music and use the classic forms with notable skill; and Mr R. Vaughan Williams, in his songs and other works, has shown perhaps the most conspicuous talent among all of the younger school.

English executive musicians have never suffered from foreign competition in the same degree as English composers, and the success of such singers as Miss Anna Williams, Miss Macintyre, Miss Marie Brema, Miss Clara Butt, Miss Agnes Nicholls, Messrs Santley, Edward Lloyd, Ben Davies, Plunket Greene and Ffrangcon Davies; or of such pianists as Miss Fanny Davies and Mr Leonard Borwick, is but a continuance of the tradition of British excellence.

The scientific study of the music of the past has more and more decidedly taken its place as a branch of musical education; the learned writings of W. S. Rockstro (1823-1895), many of them made public first in the Encyclopaedia Britannica and Grove's Dictionary of Music, made the subject clear to many who had been groping in the dark before; and the actual performance of old music has been undertaken not only by the Bach Choir, but by the Magpie Madrigal Society under

Mr Lionel Benson's able direction. In vocal and instrumental music alike the musical side of the Inter- national Exhibition of 1885 did excellent work in its historical concerts; and in that branch of archaeology which is concerned with the structure and restoration of old musical instruments, important work has been done by Mr A. J. Hipkins (1826-1903; so long connected with the firm of Broad wood), the Rev. F. W. Galpin. Arnold Dolmetsch and others. The formation of the Folk-Song Society in 1899 drew attention to the importance and extent of English traditional music, and did much to popularize it with singers of the present day.

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MUSICAL-BOX, an instrument for producing by mechanical means tunes or pieces of music. The modern musical-box is an elaboration of the elegant toy musical snuff-box in vogue during the 18th century. The notes or musical sounds are pro- duced by the vibration of steel teeth or springs cut in a comb or fiat plate of steel, reinforced by the harmonics generated in the solid steel back of the comb. The teeth are graduated in length from end to end of the comb or plate, the longer teeth giving the deeper notes; and the individual teeth are accurately attuned, where necessary, by filing or loading with lead. Each tone and semitone in the scale is represented by three or four separate teeth in the comb, to permit of successive repetitions of the same note when required by the music. The teeth are acted upon and musical vibrations produced by the revolution of a brass cylinder studded with projecting pins, which, as they move round, raise and release the proper teeth at due intervals according to the nature of the music. A single revolution of the cylinder com- pletes the performance of each of the several pieces of music for which the apparatus is set, but upon the same cylinder there may be inserted pins for performing as many as thirty-six separate airs. This is accomplished by making both the points of the teeth and the projecting pins which raise them very fine, so that a very small change in the position of the cylinder is sufficient to bring an entirely distinct set of pins in contact with the teeth. In the more elaborate musical-boxes the cylinders are removable, and may be replaced by others containing distinct sets of music. In these also there are combinations of bell, drum, cymbal and triangle effects, &c. The revolving motion of the cylinder is effected by a spring and clock-

work which on some modern instru- ments will work continuously for an hour and a half without winding, and the rate of revolution is regulated by a fly regulator. The headquarters of the musical-box trade is Geneva, where the manufacture gives employment to thousands of persons.

The musical-box is a type of numerous instruments for producing musical effects by mechanical means, in all of which a revolving cylinder or barrel studded with pins is the governing feature. The position of the pins on the barrel is determined by two considera- tions: those of pitch and of time or rhythm. The degrees of pitch or semitones of the scales are in the direction of the length of the cylinder, while those of time, or the beats in the bars, are in the path of the revolution of the cylinder. The action of the pins is practically the same for all barrel instruments; each pin serves to raise some part of the mechanism for one note at the exact moment and for the exact duration of time required by the music to be played, after which, passing along with the revolution of the cylinder, it ceases to act. The principle of the barrel operating by friction, by percussion or by wind on reeds, pipes or strings governs carillons or musical bells, barrel organs, mechanical flutes, celestial voices, harmoniphones, violin-pianos and the orchestrions and polyphons in which a combination of all orchestral effects is attemDted. In the case of wind instruments, such as flutes, trumpets, oboes, clarinets, imitated in the more complex orches- trions, the pins raise levers which open the valves admitting air, compressed by mechanical bellows, to various kinds of flue-pipes, and to others fitted with beating and free reeds. The sticks used for striking bells, drums, cymbals and triangles are set in motion in a similar manner. A fine set of full-page drawings, published at Frankfort in 1615, 1 makes the whole working of the pinned barrel quite clear, and establishes the exact relation of the pins to the music produced by the barrel so unmistakably that some bars of the piece of music set on the cylinder can be made out. The prototype of the 19th-century musical-box is to be found in the Netherlands where during the 15th century the dukes of Burgundy encouraged the invention of ingenious mechanical musical curiosities such as ” organs which played of themselves,” musical snuff-boxes, singing birds, curious clocks, &c. A principle of more recent introduction than the studded cylinder consists of sheets of perforated paper or card, somewhat similar to the Jacquard apparatus for weaving. The perforations correspond in position and length to the pitch and duration of the note they represent,

1 See S. de Caus, Lts forces mouvantes; and article Barrel Organ.

and as the web or long sheet of paper passes over the instrument the perforated holes are brought in proper position and sequence under the influence of the suction or pressure cf air from a bellows, and thereby the notes are either directly acted on, as in the case of reed instruments, or the opening and closing of valves set in motion levers or liberate springs which govern special notes. The United States are the original home of the instruments controlled by perforated paper known as orguinettes, organinas, melodeons, &c. All these instruments are being gradually replaced in popular favour by the piano-players and the gramophone. (K. S.)

MUSICAL NOTATION, a pictorial method of representing sounds to the ear through the medium of the eye. It is probable that the earliest attempts at notation were made by the Hindus and Chinese, from whom the legacy was transferred to Greece. The exact nature of the Greek notation is a subject of dispute, different explanations assigning 1680, 1620, 990, or 138 signals to their alphabetical method of delineation. To Boethius we owe the certainty that the Greek notation was not adopted by the Latins, although it is not certain whether he was the first to apply the fifteen letters of the Roman alphabet to the scale of sounds included within the two octaves, or whether he was only the first to make record of that application. The reduction of the scale to the octave is ascribed to St Gregory, as also the naming of the seven notes, but it is not safe to assume that such an ascription is accurate or final. Indications of a scheme of notation based, not on the alphabet, but on the use of dashes, hooks, curves, dots and strokes are found to exist as early as the 6th century, while specimens in illustration of this different method do not appear until the 8th. The origin of these signs, known as neumes (vev/xara, or nods), is the full stop (functus), the comma (virga), and the mound or undulating line (clivus), the first indicating a short sound, the second a long sound, and the third a group of two notes. The musical intervals were suggested by the distance of these signals from the words of the text. The variety of neumes employed at different times, and the fluctuations due to handwriting, have made them extremely difficult to decipher. In the 10th century a marked advance is shown by the use of a red line traced horizontally above the text to give the singer a fixed note (F = fa), thus helping him to approximate the intervals. To this was added a second line in yellow (for C = ut), and finally a staff arose from the further addition of two black lines over these. The difficulty of the subject is complicated for the student by the fact that an incredible variety of notations coexisted at one period, all more or less representing attempts in the direction of the modern system. A variety of experiments resulted in the assignment of the four-lined

staff to sacred music and of the five-lined staff to secular music. The yellow and red colours were replaced by the use of the letters F and C (fa and ut) on the lines. This use of letters to indicate clef is forestalled in a manuscript of Guido of Arezzo's Micrologus, dating from the 12th century, in which is the famous hymn to St John, printed with neumes on a staff of three lines (see Guipo of Arezzo). The use of letters for indicating clefs has survived to the present day, our clef signatures being modified forms of the letters C, F and G, which have passed through a multitude of shapes. Before the 12th century there is no trace of a measured notation (i.e. of a numerical time division separating the component parts of a piece of music) . It is at the time of Franco of Cologne 2 that measured music takes its rise, together with the black notation in place of neumes, which disappeared altogether by the end of the 14th century. Writing four hundred years after St Gregory, Cottonius complains bitterly of the defects in the system of neumes: " The same marks which Master Trudo sang as thirds, were sung as fourths by Master Albinus; while Master Salomo asserts that fifths are the notes meant, so at last there were as many methods of singing as teachers of the art." Pos- sibly the reckless multiplication of lines in the staff may have contributed to the obscurity of which Cottonius complains. In the black notation, which led to the modern system, the square note with a tail d) is the long sound; the square note

2 The principles of Franco are found in the treatises of Walter Odington, a monk of Evesham who became archbishop of Canterbury in 1228.

without a tail (■) is the breve; and the lozenge shape (♦) is the semibreve. In a later development there were added the double / ongˆand the minum {(j). The breve, according to Franco of Cologne, was the unit of measure. The development of a fixed time division was further continued by Philippe de Vitry. It has been noted with well-founded astonishment that at this time the double time (i.e. two to the bar) was unknown, in spite of this being the time used in marching and also illustrated in the process of breathing. Triple time (i.e. three to the bar) was regarded as the most perfect because it Was indivisible. It was as if there lay some mysterious enchantment in a number that could not be divided into equal portions without the fraction. " Triple time, " says Jean de Muris, " is called perfect, according to Franco, a man of much skill in his art, because it hath its

name from the Blessed Trinity which is pure and true perfection." Vitry championed the rights of imperfect time and invented signs to distinguish the two. The perfect circle O represented the perfect or triple time; the half circle C the imperfect or double-time. This C has survived in modern notation to indicate four-time, which is twice double-time; when crossed (J! it means double-time. The method of dividing into perfect and imperfect was described as prolation. The addition of a point to the circle or semi-circle (© Q) indicated major pro- lation; its absence, minor prolation. The substitution of white for black notation began with the first year of the 14th century and was fully established in the 15th century.

It has already been shown how the earlier form of alphabetical notation was gradually superseded by one based on the attempt to represent the relative height and depth of sounds pictorially. The alphabetical nomenclature, however, became inextricably associated with the pictorial system. The two conceptions reinforced each other; and from the hexachordal scale, endowed with the solmization of ut, re, mi, fa, sol, la — which was a device for identifying notes by their names when talked of, rather than by their positions when seen on a page of music — arose the use of what are now known as accidentals. Of these it may here be said that the flat originated from the necessity of sinking the B of the scale in order to form a hexachord on the note F in such a way as to cause the semitone to fall in the right place — which in the case of all hexachords was between the third and fourth notes. This softened B was written in a rounded form thus: b (rotundum) , while the original B remained square thus: (3 (quadrum). The original conception of the sharp was to cross or lattice the square B, by which it was shown that it was neither to be softened nor to remain unchanged. The flat, which originated in the 10th century, appears to have been of far earlier date than the sharp, the invention of which has been ascribed to Josquin Des Pres (1450-1521). The B-sharp was called B cancellatum, the cross being formed thus j%. The use of key signatures constructed out of these signs of sharp and flat was of comparatively late introduction. The key signature states at the beginning of a piece of music the sharps and fiats which it contains within the scale in which it is written. It is a device to avoid repeating the sign of sharp and flat with every fresh occasion of their occurring. The exact distinction between what were accidental sharps or flats, and what were sharps or flats in the key, was still undetermined in the time of Handel, who wrote the Suite in E containing the " Harmonious Black- smith " with three sharps instead of four. The double \>\> (some- times written fr or /3) and the double sharp X (sometimes written)&, "^ or ˆ) are Conventions of a much later date, called into

existence by the demands of modern music, while the sign of natural (q) is the outcome of the original B quadra- tion or square B |j.

The systems known as Tonic Sol Fa and the Galin-Paris- Cheve methods do not belong to the subject of notation, as they are ingenious mechanical substitutes for the experimentally devel- oped systems analysed above. The basis of these substitutes is the reference of all notes to key relationship and not to pitch. Authorities. — E. David and M. Lussy, Hisioire de la notation musicale (Paris, 1882) ; H. Riemann, Notenschrift und Notendrutk (1896) ; C. F. Abdy Williams, The Story of Notation (1903) ; Robert

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germ of a ” smoking- theatre.”

While the drama progressed as a recognized public entertains ment in England, and was provided with its own buildings, in the town, or certain, booths at the fairs, the Crown exercised its patronage in favour of certain individuals, giving them power to set up playhouses at any time in any parts of London and Westminster. The first and most important grant was made by Charles II. to his ” trusty and well-beloved ” Thomas Killigrew ” and Sir William Davenant.” This was a personal grant, not connected with any particular sites or buildings, and is known in theatrical history as the ” Killigrew and Davenant patent.” Killigrew was the author of several unsuccessful plays, and Sir William Davenant, said to be an illegitimate child of William Shakespeare, was a stage manager of great daring and genius. Charles II. had- strong theatrical leanings, and had helped to arrange the court ballets at Versailles for Louis XIV. The Killigrew and Davenant patent in course of time descended, after a fashion, to the Theatres Royal, Covent Garden and Drury Lane, and was and still is the chief legal authority governing these theatres. The ” minor ” and outlying playhouses were carried on under the Music and Dancing Act of George II., and the annual licences were granted by the local magistrates. >

The theatre proper having emancipated itself from the inn or tavern, it was now the turn of the inn or tavern to develop into an independent place of amusement, and to lay the foundation of that enormous middle-class and lower middle-class institution of interest which we agree to term the music hall. It rose fro* the most modest, humble and obscure beginning — from the public-house bar-parlour, and its weekly ” sing-songs,” chiefly supported by voluntary talent from the “harmonic meetings:” of the ” long-room V upstairs, generally used as a Foresters’ of Masonic club-room, where one or two professional singers, were engaged and a regular chairman was appointed, to the ” assem- bly-room ” entertainments at certain hotels, where private balls and school festivals formed part of an irregular series. The district ” tea-garden,” which was then an agreeable feature .of suburban life— the suburbs being next door to the city and the country next door to the Suburbs— was the first to show, dramatic

ambition, and to erect in some portion of its limited but leafy grounds a lath-and-plaster stage large enough for about eight people to move

upon without incurring the danger of falling off into the adjoining fish pond and fountain. A few classical statues in plaster, always slightly mutilated, gave an educational tone to the place, and with a few coloured oil-lamps hung amongst the bushes the proprietor felt he had gone as near the ” Royal Vauxhall Gardens ” as possible for the small charge of a sixpenny refreshment ticket. There were degrees of quality, of course, amongst these places, which answered to the German beer- gardens, though with inferior music. The Beulah Spa at Norwood, the White Conduit House at Pentonville, the York- shire Stingo in the Marylebone Road, the Monster at Pimlico, the St Helena at Rotherhithe, the Globe at Mile End, the Red Cow at Dalston, the Highbury Barn at Highbury, the Manor House at Mare Street, Hackney, the Rosemary Branch at Hoxton, and other rus-in-urbe retreats, were up to the level of their time, if rarely beyond it.

The suspended animation of the law — the one Georgian act, which was mainly passed to check the singing of Jacobite songs in the tap-rooms and tea-gardens of the little London of 1730, when the whole population of the United Kingdom was only about six millions — encouraged the growth eventually of a number of ” saloon theatres ” in various London districts, which were allowed under the head of “Music and Dancing” to go as far on the light dramatic road as the patent theatres thought proper to permit. The 25 Geo. II. c. 36, which in later days was still the only act under which the music halls of forty millions and more of people were licensed, was always liberally interpreted, as long as it kept clear of politics.

The ” saloon theatres,” always being taverns or attached to taverns, created a public who liked to mix its dramatic amuse- ments with smoking and light refreshments. The principal ” saloons ” were the Effingham in the Whitechapel Road, the Bower in the Lower Marsh, Lambeth, the Albert at Islington, the Britannia at Hoxton, the Grecian in the City Road, the Union in Shoreditch, the Stingo at Paddington and several others of less importance. All these places had good com-panies, especially in the winter, and many of them nourished leading actors of exceptional merit. The dramas were chiefly rough adaptations from the contemporary French stage, occasionally flying as high as Alexandre Dumas the elder and Victor Hugo. Actors of real tragic power lived, worked and died in this confined area. Some went to America, and acquired fame and fortune; and among others, Frederick Robson, who was trained at the Grecian, first when it was the leading saloon theatre and afterwards when it became the leading music hall (a distinction with little difference), fought his way to the front after the abolition of the ” patent rights ” and was accepted as the greatest tragi-comic actor of his time. The Grecian saloon theatre,

better known perhaps, with its pleasure garden or yard, as the Eagle Tavern, City Road, which formed the material of one of Charles Dickens's Sketches by Boz, was a place managed with much taste, enterprise and discretion by its pro- prietor, Mr Rouse. It was the " saloon " where the one and only attempt, with limited means, was ever made to import almost all the original repertory of the Opera Comique in Paris, with the result that many musical works were presented to a sixpenny audience that had never been heard before nor since in England. Auber, Herold, Adolphe Adam, Boieldieu, Gretry, Donizetti, Bellini, Rossini and a host of others gave some sort of advanced musical education, through the Grecian, to a rather depressing part of London, long before board schools were established. The saloon theatres rarely offended the patent houses, and when they did the law was soon put in motion to show that Shake- speare could not be represented with impunity. The Union Saloon in Shoreditch, then under the direction of Mr Samuel Lane, who afterwards, with his wife, Mrs Sara Lane, at the Britannia Saloon, became the leading local theatrical manager of his day, was tempted in 1834 to give a performance of Othello. It was " raided " by the then rather " new police," and all the actors, servants, audience, directors and musicians were taken

into custody and marched off to Worship Street police station, confined for the remainder of the night, and fined and warned in the morning. The same and only law still exists for those who are helping to keep a " disorderly house," but there are no holders of exclusive dramatic patent rights to set it in motion. The abolition of this privileged monopoly was effected about this time by a combination of distinguished literary men and drama- tists, who were convinced, from observation and experience, that the patent theatres had failed to nurse the higher drama, while interfering with the beneficial freedom of public amusements.

The effect of Covent Garden and Drury Lane on the art of acting had resulted chiefly in limiting the market for theatrical employment, with a consequent all-round reduction of salaries. They kept the Lyceum Theatre (or English Opera House) for years in the position of a music hall, giving sometimes two performances a night, like a " gaff " in the New Cut or White- chapel. They had not destroyed the " star " system, and Edmund Kean and the boy Betty — the " Infant Roscius " — were able to command sensational rewards. In the end Charles Dickens, Sir Edward Bulwer-Lytton, Sir Thomas Noon Talfourd and others got the patents abolished, and the first step towards free trade in the drama was secured.

The effect of this change was to draw attention to the ” saloon theatres,” where during the performances smoking, drinking, and even eating were allowed in the auditorium. An act was soon passed, known as the Theatres Act (1843), appointing a censor of stage-plays, and placing the London theatres under the control of a Crown officer, changing with ministries. This was the lord chamberlain for the time being. The lord chamber- lain of this period drew a hard-and-fast line between theatres under his control, where no smoking and drinking were allowed ” in front,” and theatres or halls where the old habits and customs of the audience were not to be interfered with. These latter were to go under the jurisdiction of the local magistrates, or other licensing authorities, under the 25 Geo. II. c. 36 — the Music and Dancing Act — and so far a divorce was decreed between the taverns and the playhouses. The lord chamberlain eventually made certain concessions. Refreshment bars were allowed at the lord chamberlain’s theatres in unobstrusive positions, victualled under a special act of William IV., and private smoking-rooms were allowed at most theatres on appli- cation. All this implied that stage plays were to be kept free from open smoking and drinking, and miscellaneous entertain- ments were to enjoy their old social freedom. The position was accepted by those ” saloon theatres ” which were not tempted to become lord chamberlain houses, and the others, with many additions, started the first music halls.

Amongst the first of these halls, and certainly the very first as far as intelligent management was concerned, was the Can- terbury in the Lower Marsh, Lambeth, which was next door to the old Bower Saloon, then transformed into a ” minor theatre.” The Canterbury sprang from the usual tavern germ, its creator being Mr Charles Morton, who honourably earned the name of the ” doyen of the music halls.” It justified its title by cultivating the best class of music, and exposed the prejudice and unfairness of Planche’s sarcasm in a Haymarket burlesque — ” most music hall — most melancholy.” Mr Charles Morton added pictorial art to his other attractions, and obtained the support of Punch, which stamped the Canterbury as the ” Royal Academy over the water.” At this time by a mere accident Gounod’s great opera of Faust, through defective inter- national registration, fell into the public domain in England and became common property. The Canterbury, not daring to present it with scenery, costumes and action, for fear of the Stage-play Act, gave what was called ” An Operatic Selection,” the singers standing in plain dresses in a row, like pupils at a school examination or a chorus in an oratorio at Exeter Hall. The music was well rendered by a thoroughly competent com- pany, night after night, for a long period, so that by the time the opera

attracted the tardy attention of the two principal opera managers at Her Majesty's Theatre in the Haymarket and Covent Garden Theatre, the tunes most popular were being

whistled by the " man in the street," the " boy in the gutter " and the tradesman waiting at the door for orders.

With the Canterbury Hall, and its brother the Oxford in Oxford Street — a converted inn and coaching yard— built and managed on the same lines by Mr Charles Morton, the music halls were well started. They had imitators in every direction — some large, some small, and some with architectural pretensions, but all anxious to attract the public by cheap prices and physical comforts not attainable at any of the regular theatres.

With the growth and improvement of these " Halls," the few old cellar " singing-rooms " gradually disappeared. Evans's in Covent Garden was the last to go. Rhodes's, or the Cyder Cellars in Maiden Lane, at the back of the Adelphi Theatre; the Coal Hole, in the Strand, which now forms the site of Terry's Theatre; the Doctor Johnson, in Fleet Street (oddly enough, within the precincts of the City of London) disappeared one by one, and with them the compound material for Thackeray's picture of " The Cave of Harmony." This " Cave," like Dickens's " Old Curiosity Shop," was drawn from the features of many places. To do the " cellars " a little justice, they represented the manners of a past time — heavy suppers and heavy drinks, and the freedom of their songs and recitations was partly due to the fact that the audience and the actors were always composed of men. Thackeray clung to Evans's to the last. It was his nightly " chapel of ease " to the adjoining Garrick Club. In its old age it became decent, and ladies were admitted to a private gallery, behind screens and a convent grille. Before its death, and its revival in another form as a sporting club, it admitted ladies both on and off the stage, and became an ordinary music hall.

The rise and progress of the London music halls naturally excited a good deal of attention and jealousy on the part of the regular theatres, and this was increased when the first Great Variety Theatre was opened in Leicester Square. The building was the finest example of Moorish architec- ture on a large scale ever erected in England. It was burnt down in the ' eighties, and the present theatre was built in its

place. Originally it was ” The Panopticon,” a palace of ” recreative science,” started under the most distinguished direction on the old polytechnic institution lineSj and with ample capital. It was a commercial failure, and after being tried as an ” American Circus,” it was turned into a great variety theatre, the greatest of its kind in Europe, under the name of the Alhambra Palace. Its founder was Mr E.T. Smith, the energetic theatrical manager, and its developer was Mr Frederick Strange, who came full of spirit and money from the Crystal Palace. He produced in 1865 an ambitious ballet — the Dagger Ballet from Auber’s Enfant prodigue, which had been seen at Drury Lane Theatre in 1851, translated as ” Azael.”

The Alhambra was prosecuted in the superior courts for infringing the Stage-play Act — the 6 & 7 Vict. c. 68. The case is in the law reports — Wigan v. Strange; the ostensible plaintiffs being the well-known actors and managers Horace Wigan and Benjamin Webster, supported by J. B. Buckstone, and many other theatrical managers. A long trial before eminent judges, with eminent counsel on both sides, produced a decision which was not very satisfactory, and far from final. It held that, as far as the entertainment went, according to the evidence tendered, it was not a ballet representing any distinct story or coherent action, but it might have been a ” divertissement ” — a term suggested in the course of the trial. A short time after this a pantomime scene was pro- duced at the same theatre, called Where’s the Police? which had a clown, a pantaloon, a columbine and a harlequin, with other familiar characters, a mob, a street and even the traditional red-hot poker. This inspired proceedings by the same plaintiffs before a police magistrate at Marlborough Street, who inflicted the full penalties — £20 a performance for 12 performances, and costs. An appeal was made to the West- minster quarter sessions, supported by Serjeant Ballantine and opposed by Mr Hardinge Giffard (afterwards Lord Chan-

cellor Halsbury), and the conviction was confirmed. Being heard at quarter sessions, there is no record in the law reports.

These and other prosecutions suggested the institution of a parliamentary inquiry, and a House of Commons select committee was appointed in 1866, at the instigation of the music halls and variety theatres. The committee devoted much time to the inquiry, and examined many witnesses— amongst the rest Lord Sydney, the lord chamberlain, who had no personal objection to undertake the control of these comparatively young places of amusement and recreation. Much of the evidence was directed against the Stage-play Act, as the difficulty appeared to be to define what was not a. stage play. Lord

Denman, Mr Justice Byles, and other eminent judges seemed to think that any song, action or recitation that excited the emotions might be pinned as a stage-play, and that the old ‘definition — ” the representation of any action by a person (or persons) acting, and not in the form of narration ” — could be supported in the then state of the law in any of the higher courts. The variety theatres on this occasion were encouraged by what had just occurred at the time in France. Napoleon III., acting under the advice of M. Michel Chevalier, passed a decree known as La Liberte” des thidtres, which fixed the status of the Parisian and other music halls. Operettas, ballets of action, ballets, vaudevilles, pantomimes and all light pieces were allowed, and the managers were no longer legally confined to songs and acrobatic performances. The report of the select committee of 1866, signed by the chairman, Mr (afterwards Viscount) Goschen, was in favour of granting the variety theatres and music halls the privileges they asked for, which were those enjoyed in France and other countries.

Parliamentary interference and the introduction of several private bills in the House of Commons, which came to nothing, checked, if they did not altogether stop, the prosecutions. The variety theatres advanced in every direction in number and im- portance. Ballets grew in splendour and coherency. The lighting and ventilation, the comfort and decoration of the various ” palaces ” (as many of them were now called) improved, and the public, as usual, were the gainers. Population in- creased, and the six millions of 1730 became forty millions and more. The same and only act (25 Geo. II. c. 36), adequate or inadequate, still remained. London is defined as the ” administrative county of London,” and its area — the 20-miles radius — is mapped out. The Metropolitan Board of Works retired or was discharged, and the London County Council was created and has taken its place. The London County Council, with extended power over structures and structural alterations, acquired the licensing of variety theatres and music halls from the local magistrates (the Middlesex, Surrey, Tower Hamlets and other magistrates) within the administrative county of London. The L. C. C. examine and enforce their powers. They have been advised that they can separate a music from a dancing licence if they like, and that when they grant the united licence the dancing means the dancing of paid performers on a stage, and not the dancing of the audience on a platform or floor, as at the short- lived but elegant Cremorne Gardens, or an old-time ” Casino.” They are also advised that they can withhold licences, unless the applicants agree not to apply for a drink licence to the local magistrates sitting in brewster sessions, who still retain their control

over the liquor trade. Theatre licences are often with- held unless a similar promise is made — the drink authority in this case being the Excise, empowered by the Act of William IV. (5 & 6 Will. IV. c. 39, s. 7).

The spread of so-called ” sketches ” — a kind of condensed drama or farce — in the variety theatres, and the action of the London County Council in trying to check the extension of refreshment licences to these establishments, with other grounds of discontent on the part of managers (individuals or ” limited companies “), led to the appointment of a second select com- mittee of the House of Commons in 1892 and the production of another blue-book. The same ground was gone over, and the same objections were raised against a licensing authority

which is elected by public votes, only exists for three years before another election is due, and can give no guarantee for the continuity of its judgments. The consensus of opinion (as in 1866) was in favour of a state official, responsible to parliament — like the Home Office or the Board of Trade — the preference being given to the lord chamberlain and his staff, who know much about theatres and theatrical business. The chairman of the committee was the Hon. David Plunkett (after- wards Lord Rathmore), and the report in spirit was the same as the one of 1866. Three forms of licence were suggested: one for theatres proper, one for music halls, and one for concert rooms.

Though the rise and progress of the music hall and variety theatre interest is one of the most extraordinary facts of the last half of the 19th century, the business has little or no corporate organization, and there is nothing like a complete registration of the various properties throughout the United Kingdom. In London the ” London Entertainments Pro- tection Association,” which has the command of a weekly paper called the Music Hall and Theatre Review, looks after its interests. In London alone over five millions sterling of capital is said to be invested in these enterprises, employing 80,000 persons of all grades, and entertaining during the year about 25,000,000 people. The annual applications for music licences in London alone are over 300. (J. Hd.)

MUSK (Med. Lat. tnuscus, late Gr. yhaxos, possibly Pers. tnushk, from

Sansk. mushka, the scrotum), the name originally given to a perfume obtained from the strong-smelling substance secreted in a gland by the musk-deer (q.v.), and hence applied to other animals, and also to plant's, possessing a similar odour. The variety which appears in commerce is a secretion of the musk-deer; but the odour is also emitted by the musk-ox and musk-rat of India and Europe, by the musk-duck (Biziura lobata) of West Australia, the musk-shrew, the musk-beetle {Calichroma moschata), the alligator of Central America, and by several other animals. In the vegetable kingdom it is present in the common musk {Mimulus moschatus), the musk- wood of the Guianas and West Indies (Guarea, spp.), and in the seeds of Hibiscus Abelmoschus (musk-seeds). To obtain the perfume from the musk-deer the animal is killed and the gland com- pletely removed, and dried, either in the sun, on a hot stone, or by immersion in hot oil. It appears in commerce as " musk in pod," i.e. the glands are entire, or as " musk in grain," in which the perfume has been extracted from its receptacle. Three kinds are recognized: (1) Tong-king, Chinese or Tibetan, imported from China, the most valued; (2) Assam or Nepal, less valuable; and (3) Karbardin or Russian (Siberian), imported from Central Asia by way of Russia, the least valuable and hardly admitting of adulteration. The Tong-king musk is exported in small, gaudily decorated caddies with tin or lead linings, wherein the perfume is sealed down; it is now usually transmitted direct by parcel post to the merchant.

Good musk is of a dark purplish colour, dry, smooth and unctuous to the touch, and bitter in taste. It dissolves in boiling water to the extent of about one-half; alcohol takes up one-third of the substance, and ether and chloroform dissolve still less. \ grain of musk will distinctly scent millions of cubic feet of air without any appreciable loss of weight, and its scent is not only more penetrating but more persistent than that of any other known substance. In addition to its odoriferous principle, it contains ammonia, cholesterin, fatty matter, a bitter resinous substance, and other animal principles. As a material in perfumery it is of the first importance, its powerful and enduring odour giving strength and permanency to the vegetable essences, so that it is an ingredient in many compounded perfumes.

Artificial mttsk is a synthetic product, having a similar odour to natural musk. It was obtained by Baur in 1888 by condensing toluene with isobutyl bromide in the presence of aluminium chloride, and nitrating the product. It is a symtrinitro-ˆ-butyl toluene. Many similar preparations have been made, and it appears that the odour depends upon the symmetry of the three nitro groups.

MUSK-DEER (Moschus moschifems), an aberrant member of the deer family constituting the sub-family Cervidae Moschinae

(see Deer). Both sexes are devoid of antler appendage; but in this the musk-deer agrees with one genus of true deer {Hydrelaphus), and as in the latter, the upper canine teeth of the males are long and sabre-like, projecting below the chin, with the ends turned somewhat backwards. In size the musk- deer is rather less than the European roe-deer, being about 20 in. high at the shoulder. Its limbs, especially the hinder pair, are long; and the feet remarkable for the great development of the lateral pair of hoofs and for the freedom of motion

The Musk-deer {Moschus moschiferus) .

they all present, which must be of assistance to the animal in steadying it in its agile bounds among the crags of its native haunts. The ears are large, and the tail rudimentary. The hair covering the body is long, coarse, and of a peculiarly brittle and pith-like character, breaking easily; it is generally of a greyish-brown colour, sometimes inclined to yellowish-red, and often variegated with lighter patches. The musk-deer inhabits the forest districts in the Himalaya as far west as Gilgit, always, however, at great elevations — being rarely found in summer below 8000 ft. above the sea-level, and ranging as high as the limits of the thickets of birch, rhododendron and juniper, among which it mostly conceals itself in the day- time. The range extends into Tibet, Siberia and north- western China; but the musk-deer of Kansu has been separated as a distinct species, under the name of M. sifanicus. Musk- deer are hardy, solitary and retiring animals, chiefly nocturnal in habits, and almost always found alone, rarely in pairs and never in herds. They are exceedingly active and surefooted, having perhaps no equal in traversing rocks and precipitous giound; and they feed on moss, grass, and leaves of the plants which grow on the mountains.

Most mammals have certain portions of the skin specially modified and provided with glands secreting odorous and fatty substances characteristic of the particular species. The special gland of the musk-deer, which has made the animal so well known, and has proved the cause of unremitting persecution to its possessor, is found in the male only, and is a sac about the size of a small orange, situated beneath the skin of the abdomen, the orifice being immediately in front of the preputial aperture. The secretion with which the sac is filled is dark brown or chocolate in colour, and when fresh of the consistence of ” moist gingerbread,” but becoming dry and granular after keeping (see Musk). The Kansu (M. sifanicus) differs from the typical species in

having longer ears, which are black on the outer surface.

MUSKEGON, a city and the county-seat of Muskegon county, Michigan, U.S.A., on Muskegon lake, an expansion of Muskegon river near its mouth, about 4 m. from Lake Michigan and 38 m. N.W. of Grand Rapids. .Pop. (1890), 22,702; (1900), 20,818, of whom 6236 were foreign-born;

(1910 census) 24,062. It is served by the Grand Trunk, the Pere Marquette, the Grand Rapids & Indiana, and the Grand Rapids, Grand Haven & Muskegon (electric) railways, and by steamboat lines to Chicago, Milwaukee and other lake ports. There are several summer resorts in the vicinity. As the gifts of Charles H. Hackley (1837-1905), a rich lumberman, the city has an endowment fund to the public schools of about $2,000,000; a manual training school, which has an endowment of $600,000, and is one of the few endowed public schools in the United States; a public library, with an endowment of $275,000; a public hospital with a $600,000 endowment; and a poor fund endowment of $300,000. In Hackley Park there are statues of Lincoln and Farragut, and at the Hackley School there is a statue of McKinley; all three are by C. H. Niehaus. The municipality owns and operates its water-works. Muskegon lake is 5 m. long and 15 m. wide, with a depth of 30 to 40 ft., and is ice-free throughout the year. The channel from Muskegon lake to Lake Michigan has been improved to a depth of 20 ft. and a width of 300 ft. by the Federal government since 1867. From Muskegon are shipped large quantities of lumber and market-garden produce, besides the numerous manufactures of the city. The total value of all factory products in 1904 was $6,319,441 (39-6% more than in 1900), of which more than one-sixth was the value of lumber. A trading post was established here in 181 2, but a permanent settlement was not established until 1834. Muskegon was laid out as a town in 1849, incorporated as a village in 1861, and chartered as a city in 1869. The name is probably derived from a Chippewa word, maskeg or muskeg, meaning ” grassy bog,” still used in that sense in north-western America.

MUSKET (Fr. mousquet, Ger. Muskete, &c), the term generally applied to the firearm of the infantry soldier from about 1550 up to and even beyond the universal adoption of rifled small arms about 18 50- 1860. The word originally signified a male sparrowhawk (Italian moschetto, derived perhaps ultimately from Latin musca, a fly) and its application

to the weapon may be explained by the practice of naming firearms after birds and beasts (cf. falcon, basilisk). Strictly speaking, the word is inapplicable both to the early hand-guns and to the arquebuses and calivers that superseded the hand-guns. The ” musket ” proper, introduced into the Spanish army by the duke of Alva, was much heavier and more powerful than the arquebus. Its bullet retained sufficient striking energy to stop a horse at 500 and 600 yards from the muzzle. A writer in 1598 (quoted s.v. in the New English Dictionary) goes so far as to say that ” One good musket may be accounted for two callivers.” Unlike the arquebus, it was fired from a rest, which the ” musketeer ” stuck into the ground in front of him. But during the 17th century the musket in use was so far improved that the rest could be dispensed with (see Gun). The musket was a matchlock, weapons with other forms of lock being distinguished as wheel-locks, firelocks, snaphances, &c, and soldiers were similarly distinguished as musketeers and fusiliers. On the disuse, about 1690-1695, of this form of firing mechanism, the term ” musket ” was, in France at least, for a time discon- tinued in favour of ” fusil,” or flint-lock, which thenceforward reigned supreme up to the introduction of a practicable per- cussion lock about ‘ 1830-1840. But the term ” musket ” survived the thing it originally represented, and was currently used for the firelock (and afterwards for the percussion weapon). To-day it is generically used for military firearms anterior to the modern rifle. The original meaning of the word musketry has remained almost unaltered since 1600; it signifies the fire of infantry small-arms (though for this ” rifle fire ” is now a far more usual term), and in particular the art of using them (see Infantry and Rifle). Of the derivatives, the only one that is not self-explanatory is musketoon. This was a short, large-bore musket somewhat of the blunderbuss type, originally designed for the use of cavalry, but afterwards, in the 18th century, chiefly a domestic or coachman’s weapon.

MUSKHOGEAN STOCK, a North American Indian stock. The name is from that of the chief tribe of the Creek confederacy,

the Muskogee. It includes the Creeks, Choctaws, Chickasaws, Seminoles and other tribes. Its territory was almost the whole state of Mississippi, western Tennessee, eastern Kentucky, Alabama, most of Georgia, and later nearly all Florida. Musk- hogean traditions assign the west and north-west as the original home of the stock.- Its history begins in 1527, on the first landing of the Spaniards on the Gulf Coast. The Muskhogean peoples were then settled agriculturists with an elaborate social organization, and living in villages, many of which were fortified (see Indians: North American).

MUSKOGEE, a city and the county-seat of Muskogee county, Oklahoma, U.S.A., about 3 m. W. by S. of the confluence of the Verdigris, Neosho (or Grand) and Arkansas rivers, and about 130 m. E.N.E. of Oklahoma City. Pop. (1900), 4154; (1907), 14,418, of whom4298 were negroes and 332 Indians; (1910), 25, 278. It is served by the St Louis & San Francisco, the Midland Valley, the Missouri, Kansas & Texas, and the Missouri, Oklahoma & Gulf railways. Fort Gibson (pop. in ig 10, 1344), about 5 m. N.E. on the Neosho, near its confluence with the Arkansas, is the head of steam-boat navigation of the Arkansas; if is the site of a former government fort and of a national cemetery. Muskogee is. the seat of Spaulding Institute (M.E. Church, South) and Nazareth Institute (Romajn Catholic), and at Bacone, about 2 m. north-east, is.Jniliaii University (Baptist, opened 1884). • Muskogee is the commercial centre of an agricultural and stock-raising region, is surrounded by an oil and natural gas field of considerable extent producing a high grade of petroleum, and has a large oil refinery, railway shops (of the Midland Valley and the Missouri, Oklahoma & Gulf railways), cotton gins, cotton compresses, and cotton-seed oil and flour mills. The municipality owns and operates the water-works, the water supply being drawn from the Neosho river. Muskogee was founded about 1870, and became the chief town of the Creek Nation (Muskogee) and the metropolis and administrative centre of the former Indian Territory, being the headquarters of the Union Indian Agency to the Five Civilized Tribes, of the United States (Dawes) Commission to the Five Civilized- Tribes, and of a Federal land office for the allotment of lands to the Creeks and Cherokees, and the seat of a Federal Court. The city was chartered in 1898; its area was enlarged in 1908, increasing its population.

MUSK-OX, also known as musk-buffalo and musk-sheep, an Arctic American ruminant of the family Bovidae (q.v.), now representing a genus and sub-family by itself. Apparently the musk-ox (Ovibos moschatus) has little or no near relation- ship to either the oxen or the sheep; and it is not improbable that its affinities are with the Asiatic takin (Budorcas) and the extinct European Criotherium of the Pliocene of Samos. The musky odour from which the animal takes its name does not appear to be due to the secretion of any gland.

In height a bull musk-ox stands about 5 ft. at the shoulder. The head is large and broad. The horns in old males have extremely broad bases, meeting in the middle line, and covering the brow and crown of the head. They are directed at first downwards by the side of the face, and then turn upwards and forwards, ending in the same plane as the eye. The basal half is dull white, oval in section and coarsely fibrous, the

middle part smooth, shining and round, and the tip black. In females and young males the horns are smaller, and their bases separated by a space in the middle of the forehead- The ears are small, erect, pointed, and nearly concealed in the hair. The space between the nostrils and the upper lip is covered with short close hair, as in sheep and goats, without any trace of the bare muzzle of oxen. The greater part of the animal is covered with long brown hair, thick, matted and curly on the shoulders, so as to give the appearance of a hump, but elsewhere straight and hanging down — that of the sides, back and haunches reaching as far as the middle of the legs and entirely concealing the very short tail. There is also a thick woolly under-fur, shed in summer, when the whole coat comes off in blanket-like masses. The hair on the lower jaw, throat and chest is long and straight, and hangs down like a beard or dewlap,, thouglr

there is no loose fold of skin in this situation. The limbs are stout and short, terminating in unsymmetrical hoofs, the external being rounded, the internal pointed, and the sole partially covered with hair.

Musk-oxen at the present day are confined to the most northern parts of North America, where they range over the rocky Barren Grounds between lat. 64 and the shores of the Arctic Sea. Its southern range is gradually contracting, and it appears that it is no longer met with west of the Mackenzie river, though formerly abundant as far as Eschscholtz Bay.

The Musk-ox (Ovibos moschatus). Northwards and eastwards it extends through the Parry Islands and Grinnell Land to north Greenland, reaching on the west coast as far south as Melville Bay; and it also occurs at Sabine Island on the east coast. The Greenland animal is a distinct race (O. m. wardi), distinguished by white hair on the forehand; and it is suggested that the one from Grinnell Land forms a third race. As proved by the discovery of fossil remains, musk-oxen ranged during the Pleistocene period over northern Siberia and the plains of Germany and France, their bones occurring in river-deposits along with those of the rein- deer, mammoth, and woolly rhinoceros. They have also been found in Pleistocene gravels in several parts of England, as Maidenhead, Bromley, Freshfield near Bath, Barnwood near Gloucester, and in the brick-earth of the Thames valley at Cray- ford, Kent; while their remains also occur in Arctic America.

Musk-oxen are gregarious in habit, assembling in herds of twenty or thirty head, or sometimes eighty or a hundred, in which there are seldom more than two or three full-grown males. They run with considerable speed, notwithstanding the shortness of their legs. They feed chiefly on grass, but also on moss, lichens and tender shoots of the willow and pine. The female brings forth one young in the end of May or begin- ning of June, after a gestation of nine months. The Swedish expedition to Greenland in 1899 found musk-oxen in herds of varying size — some contained only a few individuals, and in one case there were sixty-seven.' The peculiar musky odour was perceived from a distance of a hundred yards; but accord- ing to Professor Nathorst there was no musky taste or smell in the flesh if the carcase were cleaned immediately the animals were killed.

Of late years musk-oxen have been exhibited alive in Europe; and two examples, one of which lived from 1899 till 1903, have been brought to England. The somewhat imperfect skull of an extinct species of musk-ox from the gravels of the Klondike has enabled Mr W. H. Osgood to make an important addition to our knowledge of this remarkable type of ruminant. The skull, which is probably that of a female, differs from the ordinary musk-ox by the much smaller and shorter horn-cores, which are widely separ- ated in the middle line of the skull, where there is a groove-like depression running the whole length of the forehead. The sockets of the eyes are also much less prominent, and the whole fore-part of the skull is proportionately longer. On account of these and other differences (for which the reader may refer to the original paper, published in vol. xlviii. of the Smithsonian Miscellaneous Collections)

its describer refers the Klondike skull to a new genus, with the title Symbos tyrrelli, the specific name being given in honour of its discoverer. This, however, is not all, for Mr Osgood points out that a skull discovered many years ago in the vicinity of Fort Gibson, Oklahoma, and then named Ovibos or Bootherium cavifrons, evidently belongs to the same genus. That skull indicates a bull, and the author suggests that it may possibly be the male of Symbos tyrrelli, although the wide separation of the localities made him hesitate to accept this view. Perhaps it would have been better had he done so, and taken the name Symbos cavifrons for the species. A third type of musk-ox skull is, however, known from North America, namely one from the celebrated Big-Bone Lick, Kentucky, on which the genus and species Bootherium bombifrons was estab- lished, which differs from all the others by its small size, convex forehead and rounded horn-cores, the latter being very widely separated, and arising from the sides of the skull. This specimen has been regarded as the female of Symbos

cavifrons; but this view, as pointed out by Mr Osgood, is almost certainly incorrect, and it represents an entirely distinct form.

This, however, is not the whole of the past history of the musk- ox group ; and in this connexion it may be mentioned that palaeontological discoveries are gradually making it evident that the poverty of America in species of horned ruminants is to a great extent a feature of the present day, and that in past times it possessed a considerable number of representatives of this group. One of the latest additions to the list is a large sheep-like animal from a cave in California, apparently representing a new generic type, which has been described by E. L. Furlong in the publications of the University of California, under the name of Preptoceras sinclairi. It is represented by a nearly complete skeleton, and has doubly- curved horns and sheep-like teeth. In common with an allied ruminant from the same district, previously described as Eucera- therium, it seems probable that Preptoceras is related on the one hand to the musk-ox, and on the other to the Asiatic takin, while it is also supposed to have affinities with the sheep. If these extinct forms really serve to connect the takin with the musk-ox, their systematic importance will be very great. From a geographical point of view nothing is more likely, for the takin forms a type confined to Eastern Asia (Tibet and Szechuen), and it would be reasonable to expect that, like so many other peculiar forms from the same region, they should have representatives on the American side of the Pacific. (R. L.*)

MUSK-RAT, or Musquash, the name of a large North Ameri- can rat-like rodent mammal, technically known as Fiber zibe- thicus, and belonging to the mouse-tribe (Muridae). Aquatic in habits, this animal is related to the English water-rat and therefore included in the sub-family Microtinae (see Vole). It is, however, of larger size, the head and body being about 12 in.

The Musk-rat (Fiber zibethicus).

in length and the tail but little less. It is rather a heavily- built animal, with a broad head, no distinct neck, and short limbs, the eyes are small, and the ears project very little beyond the fur. The fore-limbs have four toes and a rudimentary thumb, all with claws; the hind limbs are larger, with five distinct toes, united by short webs at their bases. The tail is laterally compressed, nearly naked, and scaly. The hair much resembles that of a beaver, but is shorter ; it consists of a thick soft under- fur, interspersed with longer stiff, glistening hairs, which overlie and conceal the former, on the upper surface and sides of the

body. The general colour is dark umber-brown, almost black on the back and grey below. The tail and naked parts of the feet are black. The musky odour from which it derives its name is due to the secretion of a large gland situated in the inguinal region, and present in both sexes.

The ordinary musk-rat is one of several species of a genus peculiar to America, where it is distributed in suitable localities in the northern part of the continent, extending from the Atlantic to the Pacific, and from the Rio Grande to the barren grounds bordering the Arctic seas. It lives on the shores of lakes and rivers, swimming and diving with facility, feeding on the roots, stems and leaves of water-plants, or on fruits and vegetables which grow near the margin of the streams it inhabits. Musk-rats are most active at night, spending the greater part of the day concealed in their burrows in the bank, which consist cf a chamber with numerous passages, all of which open under the surface of the water. For winter quarters they build more elaborate houses of conical or dome-like form, composed of sedges, grasses and similar materials plastered together with mud. As their fur is an important article of commerce, large numbers are annually killed, being either trapped or speared at the mouths of their holes. (See also Rodentia.)

MUSK-SHREW, a name for any species of the genus Crocidura of the family Soricidae (see Insectivora). The term is generally used of the common grey musk-shrew (C. coertdea) of India. Pr Dobson believed this to be a semi-domesticated variety of the brown musk-shrew (C. murina), which he considered the original wild type. The head and body of a full-grown specimen measure about 6 in.; the tail is rather more than half that length; and bluish-grey is the usual colour of the fur, which is paler on the under surface. Dr Blanford states that the story of wine or beer becoming impregnated with a musky taint in consequence of this shrew passing over the bottles, is less credited in India than formerly owing to the discovery that liquors bottled in Europe and exported to India are not liable to be thus tainted.

MUSLIM IBN AL-HAJJAJ, the Imam, the author of one of the two books of Mahommedan tradition called Sahih, ” sound,” was born at Nishapur at some uncertain date after a.d. 815 and died there in 875. Like al-Bukhari (q.v.), of whom he was a close and faithful friend, he gave himself to the collecting, sifting and arranging of traditions, travelling for the purpose as far as Egypt. It is plain that his

sympathies were with the traditionalist school or opposed to that which sought to build up the system of canon law on a speculative basis (see Mahommedan Law). But though he was a student and friend of Ahmad ibn Hanbal (q.v.) he did not go in traditionalism to the length of some, and he defended al-Bukhari when the latter was driven from Nishapur for lefusing to admit that the utterance (lafz) of the Koran by man was as uncreated as the Koran itself (see Mahommedan Religion; and Patton's Ahmad ibn Hanbal, 32 sqq.). His great collection of traditions is second in popularity only to that of al-Bukhari, and is commonly regarded as more accurate and reliable in details, especially names. His object was more to weed out illegitimate accretions than to furnish a traditional basis for a system of law. Therefore, though he arranged his material according to such a system, he did not add guiding rubrics, and he regularly brought together in one place the different parallel versions of the same tradition. His book is thus historically more useful, but legally less suggestive. His biographers give almost no details as to his life, and its early part was probably very obscure. One gives a list of as many as twenty works, but only his Sahih seems to have reached us.

See further, de Slane's transl. of Ibn Khallikan, iii. 348 sqq, and of Ibn Khaldun's Prolegomenes, ii. 470, 475; Goldziher, Muhammedan- ische Studien, ii. 245 sqq., 255 sqq.; Brockelmann, Geschichte der arab. Lilt., i. 760 seq.; Macdonald, Development of Muslim Theology, 80, 147 seq.; Dhahabi Tadhkira (edit. 01 Hyderabad), ii. 165 sqq.

(D. B. Ma.)

MUSLIN (through Fr. tnousseline from It. mussolino, diminu- tive of Mussolo, i.e. the town Mosul in Kurdistan) a light cotton cloth said to have been first made at Mosul, a city of Mesopo- tamia. Muslins have been largely made in various parts of India, whence they were imported to England towards the end

of the 17th century. Some of these Indian muslins were very fine and costly. Among the specialties are Ami muslin, made in the Madras presidency, and Dacca muslin, made at Dacca in Bengal. Muslins of many kinds are now made in Europe and America, and the name is applied to both plain and fancy cloths, and to printed calicoes of light texture. Swiss muslin is a light variety, woven in stripes or figures, originally made in Switzerland. Book muslin is made in Scotland from very fine yarns. Mulls, jaconets, lenos, and other cloths exported to the East and elsewhere are sometimes described as muslins. Muslin is used for dresses, blinds, curtains, &c.

MUSONIUS RUFUS, a Roman philosopher of the 1st century A.D., was born in Etruria about a.d. 20-30. He fell under the ban of Nero owing to his ethical teachings, and was exiled to the island of Gyarus on a trumped-up charge of participation in Piso's conspiracy. He returned under Galba, and was the friend of Vitellius and Vespasian. It was he who dared to bring an accusation against P. Egnatius Celer (the Stoic philosopher whose evidence had condemned his patron and disciple Soranus) and who endeavoured to preach a doctrine of peace and good- will among the soldiers of Vespasian when they were advancing upon Rome. So highly was he esteemed in Rome that Vespasian made an exception in his case when all other philosophers were expelled from the city. As to his death, we know only that he was not living in the reign of Trajan. His philosophy, which is in most respects identical with that of his pupil, Epictetus, is marked by its strong practical tendency. Though he did not altogether neglect .logic and physics, he maintained that virtue is the only real aim of men. This virtue is not a thing of precept and theory but a practical, living reality. It is identical with philosophy in the true sense of the word, and the truly good man is also the true philosopher.

Suidas attributes numerous works to him, amongst others a number of letters to Apollonius of Tyana. The letters are certainly unauthentic; about the others there is no evidence. His views were collected by Claudius (or Valerius) Pollio, who "wrote 'Axo- li.vriiwvtbna.Ta Movawvlov toO 4n\oa6ov, from which Stobaeus obtained his information. See Ritter and Preller §§ 477, 488, 489; Tacitus, Annals, xv. 71 and Histories, iii. 81; and compare articles Stoics and Epictetus.

MUSPRATT, JAMES (1703-1886), British chemical manu- facturer, was born in Dublin on the 12th of August 1793. At the age of fourteen he was apprenticed to a wholesale druggist, but his apprenticeship was terminated in 1810 by a quarrel with his master, and in 181 2 he went to Spain to take part in the Peninsular War. Lack of influence prevented him from getting a commission in the cavalry, but he followed the British army on foot far into the interior, was laid up with fever at Madrid, and, narrowly escaping capture by the French, succeeded in making his way to Lisbon. There he joined the navy, but after taking part in the blockade of Brest he was led to desert, through the harshness of the discipline on the second of the two ships in which he served. Returning to Dublin about 1814, he began the manufacture of chemical products, such as hydro- chloric and acetic acids and turpentine, adding prussiate oi potash a few years later. He also had in view the manufacture of alkali from common salt by the Leblanc process, but on the one hand he could not command the capital for the plant, and on the other saw that Dublin was not well situated for

the experi- ment. In 1822 he went to Liverpool, which was at once a goo

government of a prohibitive duty on sulphur Muspratt found a substitute in iron pyrites, which was thus introduced as the raw material for the manufacture of sulphuric acid. He was always anxious to employ the best scientific advice available and to try every novelty that promised advantage. He was a close friend of Liebig, whose mineral manures were compounded at his works. He died at Seaforth Hall, near Liverpool, on the 4th of May 1886. After his retirement in 1857 his business was continued in the hands of four of his ten. children.

His eldest son, James Sheridan Muspratt (1821-1871), studied chemistry under Thomas Graham at Glasgow and London and under Liebig at Giessen, and in 1848 founded the Liverpool College of Chemistry, an institution for training chemists, of which he also acted as director. From 1854 to i860 he was occupied in preparing a dictionary of Chemistry . . . as applied and relating to the Arts and Manufactures, which was translated into German and Russian, and he published a translation of Plattner's treatise on the blow-pipe in 1845, and Outlines of Analysis in 1849. His original work included a research on the sulphites (1845), and the preparation of toluidine and nitro-aniline in 1845-1846 with A. W. Hofmann.

MUSSCHENBROEK, PIETER VAN (1692-1761), Dutch natural philosopher, was born on the 14th of March 1692 at Leiden, where his father Johann Joosten van Musschenbroek (1660-1707) was a maker of physical apparatus. He studied at the university of his native city, where he was a pupil and friend of W. J. s'G. Grayesande. Graduating in 1715 with a dissertation, De aeris praesentia in humoribus animalium, Mus- schenbroek was appointed professor at Duisburg in 1719. In 1723 he was promoted to the chair of natural philosophy and mathematics at Utrecht. In 1731 he declined an invitation to Copenhagen, and was promoted in consequence to the chair of astronomy at Utrecht in 1732. The attempt of George II. of .England in 1737 to attract him to the newly-established university of Gottingen was also unsuccessful. At length, however, the claims of his native city overcame his resolution to remain at Utrecht, arid he accepted the mathematical chair at Leiden in 1739, where, declining all offers from abroad, he remained till his death on the 9th of September 1761.

His first important production was Epitome elementorum physico-mathematicorum (l2mo, Leiden, 1726) — a work which was afterwards gradually altered as it passed through several editions, and which appeared at length (posthumously, ed. by Johann Lulofs, one of his colleagues as Leiden) in 1762, under the title of Introductio ad philosophiam naturalem. The Physicae experimentales et geometricae dissertationes (1729) threw new light on magnetism, capillary attraction, and the cohesion of bodies. A Latin edition with notes (1731) of the Italian work Saggi di natitrali esperienze fatte nell-V Accademia del Cimento contained among many other investigations a description of a new instrument, the pyrometer, which Musschenbroek had invented, and of several experiments which he had made on the expansion of bodies by heat. Musschenbroek was alsp the author cf Elementa physica (8vo, 1729), and his name is associated with the invention of the Leyden jar (q.v.).

MUSSEL (O. Eng. muscle, Lat. musculus, diminutive of mus, mouse, applied to small sea fish and mussels), a term applied in England to two families of Lamellibranch Molluscs — the marine Mylilacea, of which the edible mussel, Mytilus edulis, is the representative; and the fresh- water Unionidae, of which the river mussel, Unio pictorum, and the swan mussel, Anodonta cygnea, are the common British examples. It is not obvious why these fresh-water forms have been associated popularly with the Mytilacea under the name mussel, unless it be on account of the frequently very dark colour of their shells. They are somewhat remote from the sea mussels in structure, and have not even a common economic importance.

The sea mussel {Mytilus edulis) belongs to the second order of the class Lamellibranchia (q.v.), namely the Filibranchia, distinguished by the comparatively free condition of the gill- filaments, which, whilst adhering to one another to form gill- plates, are yet not fused to one another by concrescence. It is also remarkable for the small size of its foot and the large development of two glands in the foot — the byssus-forming and the byssus-cementing glands. The byssus is a collection of

horny threads by which the sea mussel (like many other Lamellibranch or bivalve molluscs) fixes itself to stones, rocks or submerged wood, but is not a permanent means of attachment, since it can be discarded by the animal, which, after a certain amount of locomotion, again fixes itself by new secretion of byssus from the foot. Such movement is more frequent in young mussels than in the full-grown. Mytilus possesses no siphonal tube-like productions of the margin of the mantle-skirt, nor any notching of the same, representative of the

siphons which are found in its fresh-water ally, the Dreissensia polymorpha.

Mytilus edulis is an exceedingly abundant and widely distri- buted form. It occurs on both sides of the northern Atlantic and in the Mediterranean basin. It presents varieties of form and colour according to the depth of water and other circum- stances of its habitat. Usually it is found on the British coast encrusting rocks exposed at low tides, or on the flat surfaces formed by sandbanks overlying clay, the latter kind of colonies being known locally as " scalps." Under these conditions it forms continuous masses of individuals closely packed together, sometimes extending, over many acres of surface and numbering millions. The readiness with which the young Mytilus attaches itself to wicker-work is made the means of artificially cultivating and securing these molluscs for the market both in the Bay of Kiel in North Germany and at the mouth of the Somme and other spots on the coast of France.

Natural scalps are subject to extreme vicissitudes: an area of many acres may be destroyed by a local change of current producing a deposit of sand or shingle over the scalp, or by exposure to frost at low tide in winter, or by accumulation of decomposing vegetable matter. The chief localities of natural scalps on the British coast are Morecambe Bay in Lancashire and the flat eastern shores, especially that of the Wash of Lincoln, and similar shallow bays. These scalps are in some cases in the hands of private owners, and the Fisheries Department has made arrangements by which some local authorities, e.g. the corporation of Boston, can lease layings to individuals for the purpose of artificial cultivation.

The sea mussel is scarcely inferior in commercial value to the oyster. In 1873 the value of mussels exported from Antwerp alone to Paris to be used as human food was £280,000. In Britain their chief consumption is in the deep-sea line fishery, where they are held to be the most effective of all baits. Twenty-eight boats engaged in haddock-fishing at Eyemouth used between October 1882 and May 1883 920 tons of mussels (about 47,000,000 in- dividuals), costing nearly £1800 to the fishermen, about one-half of which sum was expended on the carriage of the mussels. The quantity of mussels landed on Scottish coasts has decreased in recent years owing to the decline in the line fisheries. In 1896 the quantity was over 243,000 cwts., valued at £14,950; in 1902 it was only 95,663 cwts., valued at £5976. In the statistics for England and Wales mussels are not separately distinguished. Many thou- sand tons of mussels are wastefully employed as manure by the farmers on lands adjoining scalp-

producing coasts, as in Lancashire and Norfolk, three half-pence a bushel being the price quoted in such cases. It is a curious fact, illustrative of the ignorant pro- cedure and arbitrary fashions of fisher-folk, that on the Atlantic seaboard of the United States the sea mussel, Mytilus edulis, though common, is not used as bait nor as food. Instead, the soft clam, Mya arenaria, a Lamellibranch not used by English or Norwegian fishermen, though abundant on their shores, is employed as bait by the fishermen to the extent of ij million bushels per annum, valued at £120,000. At the mouth of the river Conway in North Wales the sea mussel is crushed in large quantities in order to extract pearls of an inferior quality which are occasionally found in these as in other Lamellibranch molluscs (Gwyn Jeffreys).

Mytilus edttlis is considered of fair size for eating when it is 2 in. in length, which size is attained in three years after the spat or young mussel has fixed itself. Under favourable circumstances it will grow much larger than this, specimens being recorded of 9 in. in length. It is very tolerant of fresh water, fattening best, as does the oyster, in water of density 1014 (the density of the water of the North Sea being 1026). Experiments made by removing mussels from salt water to brackish, and finally to quite fresh water show that it is even more tolerant of fresh water than the oyster; of thirty mussels so transferred all were alive after fifteen days. Mytilus edulis is occasionally poisonous, owing to conditions not satisfactorily determined.

The fresh-water Mussels, Anodonta cygnea, Unio pictorum,

and Unio margaritiferus belong to the order Eulamellibranchia of Lamellibranch Molluscs, in which the anterior and posterior adductor muscles are equally developed. An account of the anatomy of Anodon is given in the article Lamellibranchia. Unio differs in no important point from Anodonta in internal structure. The family Unionidae, to which these genera belong, is of world-wide distribution, and its species occur only in ponds and rivers. A vast number of species arranged in several genera and sub-genera have been distinguished, but in the British Islands the three species above named are the only claimants to the title of “fresh-water mussel.”

Anodonta cygnea, the Pond Mussel or Swan Mussel, appears to be entirely without economic importance. Unio pictorum, the common river mussel (Thames), appears to owe its name to the fact that the

shells were used at one time for holding water-colour paints as now shells of this species and of the sea mussel are used for holding gold and silver paint sold by artists' colourmen, but it has no other economic value. Unio margaritiferus, the pearl mussel, was at one time of considerable importance as a source of pearls, and the pearl mussel fishery is to this day carried on under peculiar state regulations in Sweden and Saxony, and other parts of the continent. In Scotland and Ireland the pearl mussel fishery was also of im- portance, but has altogether dwindled into insignificance since the opening up of commercial intercourse with the East and with the islands of the Pacific Ocean, whence finer and more abundant pearls than those of Unio margaritiferus are derived.

In the last forty years of the 18th century pearls were exported from the Scotch fisheries to Paris to the value of £100,000; round pearls, the size of a pea, perfect in every respect, were worth £3 or £4. The pearl mussel was formerly used as bait in the Aberdeen cod fishery.

Literature. — For an account of the anatomy of Mytilus edulis the reader is referred to the treatise by Sabatier on that subject (Paris, 1875). The essay by Charles Harding on Molluscs used for Food or Bait, published by the committee of the London Inter- national Fisheries Exhibition (1883), may be consulted as to the economic questions connected with the sea mussel. The develop- ment of this species is described by Wilson in Fifth Ann. Rep. Scot. Fish. Board (1887). (E. R. L.; J. T. C.)

MUSSELBURGH, a municipal and police burgh of Midlothian, Scotland, si m – E. of Edinburgh by the North British railway. Pop. (1001), 11,711. The burgh, which stretches for a mile along the south shore of the Firth of Forth, is intersected by the Esk and embraces the village of Fisherrow on the left bank of the river. Its original name is said to have been Eskmouth, its present one being derived from a bed of mussels at the mouth of the river. While preserving most of the ancient features of its High Street, the town has tended to become a suburb of the capital, its fine beach and golf course hastening this development. The public buildings include the town-hall (dating from 1762 and altered in 1876), the tolbooth (1590), and the grammar school. Loretto School, one of the foremost public schools in Scotland, occupies the site of the chapel of Our Lady of Loretto, which was founded in 1534 by Thomas Duthie, a hermit from Mt Sinai. This was the favourite shrine of Mary of Guise, who betook herself hither at momentous crises in her history. The 1st earl of Hertford destroyed it in 1544, and after it was rebuilt the Reformers demolished it again, some of its stones being used in erecting the tolbooth. In the west end

of the town is Pinkie House, formerly a seat of the abbot of Dunfermline, but transformed in 1613 by Lord Seton. It is a fine example of a Jacobean mansion, with a beautiful fountain in the middle of the court-yard. The painted gallery, with an elabor- ate ceiling, 100 ft. long, was utilized as a hospital after the battle of Pinkie in 1547. Prince Charles Edward slept in it the night following the fight at Prestonpans (1745). Near the tolbooth stands the market cross, a stone column with a unicorn on the top supporting the burgh arms. At the west end of High Street is a statue of David Macbeth Moir (" Delta," 1 798-1851), Musselburgh's most famous son. The antiquity of the town is placed beyond doubt by the Roman bridge across the Esk and the Roman remains found in its vicinity. The chief bridge, which carries the high road from Edinburgh to Berwick, was built by John Rennie in 1807. The principal industries include paper-making, brewing, the making of nets and twine, bricks, tiles and pottery, tanning and oil-refining, besides saltworks and seed-crushing

works. The fishery is confined to Fisherrow, where there is a good harbour. The Links are the scene every year of the Edinburgh race meetings and of those of the Royal Caledonian Hunt which are held every third year. Archery contests also take place at intervals under the auspices of the Royal Company of Archers. Most of the charitable institutions — for instance, the convalescent home, fever hospital, home for girls and Red House home — are situated at Inveresk, about 15 m. up the Esk, About 1 m. south-east is the site of the battle of Pinkie, and 25 m. south-east, on the verge of Haddingtonshire, is Carberry Hill, where Mary surrendered to the lords of the Congregation in 1567, the spot being still known as Queen Mary's Mount. Musselburgh joins with Leith and Portobello (the Leith Burghs) in returning one member to parliament.

MUSSET, LOUIS CHARLES ALFRED DE (1810-1857), French poet, play-writer and novelist, was born on the nth of December 1810 in a house in the middle of old Paris, near the Hotel Cluny. His father, Victor de Musset, who traced his descent back as far as 1 140, held several ministerial posts of importance. He brought out an edition of J. J. Rousseau's works in 1821, and followed it soon after with a volume on the Genevan's life and writing. In Alfred de Musset's childhood there were various things which fostered his imaginative power. He and his brother Paul (born 1804, died 1880), who afterwards wrote a biography of Alfred, delighted in reading old romances together, and in assuming the characters of the heroes in those romances. But it was not until about 1826 that Musset gave any definite sign of the mental force which afterwards distinguished him. In the summer of 1827 he won the second prize (at the College Henri

IV.) by an essay on “The Origin of our Feelings.” In 1828, when Eugene Scribe, Joseph Duveyrier, who under the name of Melesville, was a prolific playwriter and sometimes collaborator with Scribe, and others of note were in the habit of coming to Mme de Musset’s house at Auteuil, where drawing-room plays and charades were constantly given, Musset, excited by this companionship, wrote his first poem. This, to judge from the extracts preserved, was neither better nor worse than much other work of clever boys who may or may not afterwards turn out to be possessed of genius. He took up the study of law, threw it over for that of medicine, which he could not endure, and ended by adopting no set profession. Shortly after his first attempt in verse he was taken by Paul Foucher to Victor Hugo’.s house, where he met such men as Alfred de Vigny, Prosper Merimee, Charles Nodier and Sainte-Beuve. It was under Hugo’s influence, no doubt, that he composed a play. The scene was laid in Spain, and some lines, showing a marked advance upon his first effort, are preserved. In 1828, when the war between the classical and the romantic school of literature was growing daily more serious and exciting, Musset had published some verses in a country newspaper, and boldly recited some of his work to Sainte-Beuve, who wrote of it to a friend, ” There is amongst us a boy full of genius/’ At eighteen years old Musset produced a translation, with additions of his own, of De Quincey’s ” Opium-Eater.” This was published by Mame, attracted no attention, and has been long out of print. His first original volume was published in 1829 under the name of Contes d’Espagne et d’ltalie, had an immediate and striking success, provoked bitter opposition, and produced many unworthy imitations. This volume con- tained, along with far better and more important things, a fantastic parody in verse on certain productions of the romantic school, which made a deal of noise at the time. This was the famous ” Ballade a. la lune ” with its recurring comparison of the moon shining above a steeple to the dot over an i. It was, to Musset’s delight, taken quite seriously by many worthy: folk.

In December 1830 Musset was just twenty years old, and was already conscious of that curious double existence within him so frequently symbolized in his plays— in Octave and C61io for instance (in Les Caprices de Marianne), who also stand for the two camps, the men of matter and the men of feeling — which he has elsewhere described as characteristic of his

generation. At this date his piece the Nuit vinitienne was pro- duced by Harel, manager of the Odeon. The exact causes of its failure might now be far to seek; unlucky stage accidents had something to do with it, but there seems reason to believe that there was a strongly organized opposition. However this may be, the result was disastrous to the French stage; for it put a complete damper on the one poet who, as he afterwards showed both in theoretical and in practical writings, had the fine insight which took in at a glance the merits and defects both of the classical and of the romantic schools. Thus he was strong and keen to weld together the merits of both schools in a new method which, but for the fact that there has been no successor to grasp the wand which its originator wielded, might well be called the school of Musset. The serious effect produced upon Musset by the failure of his Nuit vinitienne is curiously illustrative of his character. A man of greater strength and with equal belief in his own genius might have gone on appealing to the public until he compelled them to hear him. Musset gave up the attempt in disgust, and waited until the public were eager to hear him without any invitation on his part. In the case of his finest plays this did not happen until after his death; but long before that he was fully recognized as a poet of the first rank and as an extraordinary master of character and language in prose writing. In his complete disgust with the stage after the failure above referred to there was no doubt something of a not ignoble pride, but there was something also of weakness — • of a kind of weakness out of which it must be said sprang some of his most exquisite work, some of the poems which could only have been written by a man who imagined himself the crushed victim of difficulties which were old enough in the experience of mankind, though for the moment new and strange to him.

Musset now belonged, in a not very whole-hearted fashion, to the ” Cenacle,” but the connexion came to an end in 1832. In 1833 he published the volume called Un Spectacle dans un fauteuil. One of the most striking pieces in this — ” Namouna ” — was written at the publisher’s request to fill up some empty space; and this fact is noteworthy when taken in conjunction with the horror which Musset afterwards so often expressed of doing anything like writing ” to order ” — of writing, indeed, in any way or at any moment except when the inspiration or the fancy happened to seize him. The success of the volume seemed to be small in comparison with that of his Contes d’Espagne, but it led indirectly to Musset ‘s being engaged as a contributor to the Revue des deux mondes. In this he published, in April 1833, Andri del Sarto, and he followed this six weeks later with Les Caprices de Marianne. This play afterwards took and holds rank as

one of the classical pieces in the repertory of the Thtdtre Francois. After the retirement in 1887 from the stage of the brilliant actor Delaunay the piece dropped out of the Francais repertory until it was replaced on the stage by M. Jules Claretie, administrator-general of the Comidie Francaise, on the 10th of January 1906. Les Caprices de Marianne affords a fine illustration of the method referred to above, a method of which Musset gave something like a definite explanation five years later. This explanation was also pub- lished in the Revue des deux mondes, and it set forth that the war between the classical and the romantic schools could never end in a definite victory for either school, nor was it desirable that it should so end. ” It was time,” Musset said, ” for a third school which should unite the merits of each.” And in Les Caprices de Marianne these merits are most curiously and happily combined. It has perhaps more of the Shakespearian quality — the quality of artfully mingling the terrible, the grotesque, and the high comedy tones — which exists more or less in all Musset’s long and more serious plays, than is found in any other of these. The piece is called a comedy, and it owes this title to its extra- ordinary brilliance of dialogue, truth of characterization, and swiftness in action, under which there is ever latent a sense of impending fate. Many of the qualities indicated are found in others of Musset’s dramatic works and notabty in On ne badine pas avec Vamour, where the skill in insensibly preparing his hearers or readers through a succession of dazzling comedy

scenes for the swift destruction of the end is very marked. But Les Caprices de Marianne is perhaps for this particular purpose of illustration the most compact and most typical of all.

The appearance of Les Caprices de Marianne in the Revue (1833) was followed by that of ” Rolla,” a symptom of the maladie du siecle. Rolla, for all the smack which is not to be denied of Wertherism, has yet a decided individuality. The poem was written at the beginning of Musset’s liaison with George Sand, and in December 1833 Musset started on the un- fortunate journey to Italy. It was well known that the rupture of what was for a time a most passionate attachment had a disastrous effect upon Musset, and brought out the weakest side of his moral character. He was at first absolutely and completely struck down by the blow. But it was not so well known until Paul de Musset pointed it out that the passion expressed in the Nuit de decembre, written about twelve months after the journey to Italy, referred not to George Sand but to another and quite a different woman. The story of the Italian journey and its results are told under the guise of fiction from two points of view in the two volumes called respectively Elle et lui by George Sand, and Lux et elle by Paul de Musset. As to the

permanent effect on Alfred de Musset, whose irresponsible gaiety was killed by the breaking off of the connexion, there can be no doubt.

During Musset's absence in Italy Fanlasio was published in the Revue, Lorenzaccio is said to have been written at Venice, and • not long after his return On ne badine pas avec Vamour was written and published Jn the Revue. In 1835 he produced Lucie, La Nuit de mai, La Quenouille de Barberine, Le Chandelier, La Loi sur la presse, La Nuit de dicembre, and La Confession d'un enfant du siecle, wherein is contained what is probably a true account of Musset's relations with George Sand. The Confession is excep- tionally interesting as exhibiting the poet's frame of mind at the time, and the approach to a revulsion from the Bonapartist ideas amid which he had been brought up in his childhood. To the supreme power of Napoleon he in this work attributed that moral sickness of the time which he described. " One man," he wrote, " absorbed the whole life of Europe; the rest of the human race struggled to fill their lungs with the air that he had breathed." When the emperor fell, " a ruined world was a resting-place for a generation weighted with care." The Con- fession is further important, apart from its high literary merit, as exhibiting in many passages the poet's tendency to shun or wildly protest against all that is disagreeable or difficult in human life — a tendency to which, however, much of his finest work was due. To 1836 belong the Nuit d'aoiil, the Lettre d Lamartine, the Stances d la Malibran, the comedy II ne faut jurer de rien, and the beginning of the brilliant letters of Dupuis and Cotonet on romanticism. 77 ne faut jurer de rien is as typical of Musset's comedy work as is Les Caprices de Marianne of the work in which a terrible fatality underlies the brilliant dialogue and keen polished characterization. In 1837 was published Un Caprice, which afterwards found its way to the Paris stage by a curious road. Mme Allan-Despreaux, the actress, heard of it in St Petersburg as a Russian piece. On asking for a French translation of the play she received the volume Comedies el proverbes reprinted from the Revue des deux mondes. In 1837 appeared also some of the Nouvelles. In 1839 Musset began a romance called Le Poete dichu, of which the existing fragments are full of passion and insight. In 1840 he passed through a period of feeling that the public did not recognize his genius — as, indeed, they did not — and wrote a very short but very striking series of reflections headed with the words "A trente ans," which Paul de Musset published in his Life. In 1841 there came out in the Revue de Paris Musset's " Le Rhin alle- mand," an answer to Becker's poem which appeared in the Revue des deux mondes. This fine war-song made a great deal of noise, and brought to the poet quantities of challenges from German officers. Between this date and 1845 he

wrote compara- tively little. In the last named year the charming ” proverbe ” II faut qu’une porte soil ouverte ou fermie appeared. In 1847

Un Caprice was produced at the Theatre Francais, and the employment in it of such a word as ” rebonsoir ” shocked some of the old school. But the success of the piece was immediate and marked. It increased Musset’s reputation with the public in a degree out of proportion L to its intrinsic importance; and indeed freed him from the burden of depression caused by want of appreciation. In 1848 // ne faut jurer de rien was played at the Theatre Francais and the Chandelier at the Theatre Historique. Between this date and 1851 Betline was pro- duced on the stage and Carmosine written; and between this time and the date of his death, from an affection of the heart, on the 2nd of May 1857, the poet produced no large work of importance.

Alfred de Musset now holds the place which Sainte-Beuve first accorded, then denied, and then again accorded to him — as a poet of the first rank. He had genius, though not genius of that strongest kind which its possessor can always keep in ;heck. His own character worked both for and against his success as a writer. He inspired a strong personal affection in his contemporaries. His very weakness and his own conscious- ness of it produced such beautiful work as, to take one instance, the Nuit d’octobre. His Nouvelles are extraordinarily brilliant; his poems are charged with passion, fancy and fine satiric power; in his plays he hit upon a method of his own, in which no one has dared or availed to follow him with any closeness. He was one of the first, most original, and in the end most successful of the first-rate writers included in the phrase ” the 1830 period.” The wilder side of his life has probably been exaggerated; and bis brother Paul de Musset has given in his Biographie a striking testimony to the finer side of his character. In the later years of his life Musset was elected, not without opposition, a member of the French Academy. Besides the works above referred to, the Nouvelles el conies and the CEuvres poslhumes, in which there is much of interest concerning the great tragic actress Rachel, should be specially mentioned.

The biography of Alfred de Musset by his brother Paul, partial as it naturally is, is of great value. Alfred de Musset has afforded matter for

many appreciations, and among these in English may be mentioned the sketch (1890) of C. F. Oliphant and the essay (1855) of F. T. Palgrave. See also the monograph by ArvSde Barine (Madame Vincens) in the " Grands 6crivains frangais " series. Musset's correspondence with George Sand was published intact for the first time in 1904.

A monument to Alfred de Musset by Antonin Merci6, presented by M. Osiris, and erected on the Place du Theatre Francais, was duly " inaugurated " on the 24th of February 1906. The ceremony took place in the vestibule of the theatre, where speeches were delivered by Jules Claretie, Francois Copp6e and others, and Mounet-Sully recited a poem, written for the occasion by Maurice Magre. (W. H. P.)

MUSSOORIE, or Masuri, a town and sanitarium of British India, in the Dehra Dun district of the United Provinces, about 6600 ft. above the sea. Pop. (1901), 6461, rising to 15,000 in the hot season. It stands on a ridge of one of the lower Himalayan ranges, amid beautiful mountain scenery, and forms with Naini Tal the chief summer resort for European residents in the plains of the United Provinces. The view from Mussoorie over the valley of the Dun and across the Siwalik hills to the plains is very beautiful, as also is the view towards the north, which is bounded by the peaks of the snowy range. Mussoorie practically forms one station with Landaur, the convalescent depot for European troops, 7362 ft. above the sea. Some distance off, on the road to Simla, is the cantonment of Chakrata, 7300 ft. It was formerly approached by road from Saharanpur in the plains, 58 m. distant, but in 1900 the railway was opened to Dehra, 21 m. by road. There are numerous schools for Europeans, including St George's college, the Philander-Smith institute, the Oak Grove school of the East Indian railway, and several Church of England and Roman Catholic institutions, together with a cathedral of the latter faith. The first brewery in India was established here in 1850. The town has botanical gardens, and is the summer headquarters of the Trigonometrical Survey.

MUSTAFA RESKID PASHA (1800-1858), Turkish statesman and diplomatist, was born at Constantinople in 1800. He

entered the public service at an early age and rose rapidly, becoming ambassador at Paris in 1834 and in London 1836, minister for foreign affairs 1837, again ambassador in London 1838, and in Paris 1841. Appointed vali of Adrianople in 1843, he returned as ambassador to

Paris in the same year. Between 1845 ar >d ˆ57 he was six times grand vizier. One of the greatest and most brilliant statesmen of his time, thoroughly acquainted with European politics, and well versed in affairs, he was a convinced if somewhat too ardent partisan of reform and the principal author of the legislative remodelling of Turkish administrative methods known as the Tanzimat. His ability was recognized alike by friend and by foe. In the settlement of the Egyptian question in 1840, and during the Crimean War and the ensuing peace negotiations, he rendered valuable services to the state.

MUSTANG, the wild or semi-wild horse of the prairies of America, the descendant of the horses imported by the Spaniards after the conquest in the 16th century (see Horse). The word appears to be due to two Spanish words, mestrenco, or mostrenco, defined by Minsheu (1599) as “a strayer. ” Mestrenco (now mesteno) means ” wild, having no master,” and appears to be derived from mesta, a grazier-association, which among other functions appropriated any wild cattle found with the herds.

MUSTARD. The varieties of mustard-seed of commerce are produced from several species of the genus Brassica (a member of the natural order Cruciferae). Of these the principal are the black or brown mustard, Brassica nigra (Sinapis nigra), the white mustard, Brassica alba, and the Sarepta mustard, B. juncea. Both the white and black mustards are cultivated to some extent in various parts of England. The white is to be found in every garden as a salad plant; but it has come into increasing favour as a forage crop for sheep, and as a green manure, for which purpose it is ploughed down when about to come into flower. The black mustard is grown solely for its seeds, which yield the well-known condiment. The name of the condiment was in French moustarde, mod. moutarde, as being made of the seeds of the plant pounded and mixed with must (Lat. muslum, i.e. unf ermented wine) – 1 The word was thus transferred to the plant itself. When white mustard is cultivated for its herbage it is sown usually in July or August, after some early crop has been removed. The land being brought into a fine tilth, the seed, at the rate of 1 2 lb per acre, is sown broadcast, and covered in the way recommended for clover seeds. In about six weeks it is ready either for feeding off by sheep or for ploughing down as a preparative for wheat or barley. White mustard is not fastidious in regard to soil. When grown for a seed crop it is treated in the way about to be described for the other variety. For this purpose either kind requires a fertile soil, as it is an exhausting crop. The seed is sown in April, is once hoed in May, and requires no further culture. As soon as the pods have assumed a brown colour the crop is reaped and laid down in handf uls, which lie until dry enough

for thrashing or stacking. In removing it from the ground it must be handled with great care, and carried to the thrashing-floor or stack on cloths, to avoid the loss of seed. The price depends much on its being saved in dry weather, as the quality suffers much from wet. This great evil attends its growth, that the seeds which are unavoidably shed in harvesting the crop remain in the soil, and stock it permanently with what proves a pestilent weed amongst future crops.

White mustard is used as a small salad — generally accompanied by garden cress — while still in the seed leaf. To keep up a supply the seed should be sown every week or ten days. The sowings in the open ground may be made from March till October, earlier or later according to the season. The ground should be light and rich, and the situation warm and sheltered. Sow thickly in rows 6 in. apart, and slightly cover the seed, pressing the surface smooth with the back of the spade. When gathering the crop, cut the young plants off even with the ground, or pull 1 There were two kinds of mustum, one the best for keeping, produced after the first treading of the grapes, and called mustum lixivum; the other, mustum tortivum, obtained from the mass, of trodden grapes by the wine-press, was used for inferior purposes.

them up and cut off the roots, beginning at one end of a row. From October to March the seeds should be sown thickly in shallow boxes and placed in a warm house or frame, with a temperature not below 65°.

Brassica nigra occurs as a weed in waste and cultivated ground throughout England and the south of Scotland, but is a doubtful native. It is a large branching annual 2 to 3 ft. high with stiff, rather rough, stem and branches, dark green leaves ranging from Jyrate below to lanceolate above, short racemes of small bright yellow flowers one-third of an inch in diameter and narrow smooth pods. B. alba is more restricted to cultivated ground and has still less claim to be considered a native of Great Britain; it is distinguished from black mustard by its smaller size, larger flowers and seeds, and spreading rough hairy pods with a long curved beak.

The peculiar pungency and odour to which mustard owes much of its value are due to an essential oil developed by the action of water on two peculiar chemical substances contained in the black seed. These

bodies are a glucoside termed by its discoverers myronate of potassium, but since called sinigrin, C10H18KNS2O10, and an albuminoid body, myrosin. The latter substance in presence of water acts as a ferment on sinigrin, splitting it up into the essential oil of mustard, a potassium salt, and sugar. It is worthy of remark that this reaction does not take place in presence of boiling water, and therefore it is not proper to use very hot water (above 120 F.) in the preparation of mustard. The explanation is th?t myrosin is decomposed by water above this temperature. Essential oil of mustard is in chemical constitution an isothiocyanate of allyl CsHjMCS. It is prepared artificially by a process, discovered by Zinzin, which consists in treating bromide of allyl with thiocyanate of ammonium and distilling the resultant thiocyanate of allyl. The seed of white mustard contains in place of sinigrin a peculiar gluco- side called sinalbin, C30H44N2S2O16, in several aspects analogous to sinigrin. In presence of water it is acted upon by myrosin, present also in white mustard, splitting it up into acrinyl isothio- cyanate, sulphate of sinapin and glucose. The first of these is a powerful rubefacient, whence white mustard, although yielding no volatile oil, forms a valuable material for plasters. The seeds of Brassica juncea have the same constitution and properties as black mustard, as a substitute for which they are extensively cultivated in southern Russia; the plant is also cultivated abundantly in India. Both as a table condiment and as a medicinal substance, mustard has been known from a very remote period. Under the name of roiru it was used by Hippocrates in medicine. The form in which table mustard is now sold in the United Kingdom dates from 1720, about which time Mrs Clements of Durham hit on the idea of grinding the seed in a mill and sifting the flour from the husk. The bright yellow farina thereby produced under the name of ” Durham mustard ” pleased the taste of George I., and rapidly attained wide popularity. As it is now prepared mustard consists essentially of a mixture of black and white farina in certain proportions. Several grades of pure mustard are made containing nothing but the farina of mustard-seed, the lower qualities having larger amounts of the white cheaper mustard; and corresponding grades of a mixed preparation of equal price, but containing certain proportions of wheaten or starch flour, are also prepared and sold as ” mustard condiment.” The mixture is free from the unmitigated bitterness and sharpness of flavour of pure mustard, and it keeps much better. The volatile oil distilled from black mustard seeds after maceration with water is official in the British Pharmacopeia under the title Oleum sinapis volatile. It is a yellowish or colourless pungent liquid, soluble only in about fifty parts of water, but readily so in ether and in alcohol. From it is prepared, with camphor, castor oil and alcohol, the linimentum

sinapis. The official sinapis consists of black and white mustard seeds powdered and mixed. The advan- tage of mixture depends upon the fact that the white mustard seeds have an excess of the ferment myrosin, and the black, whilst some- what deficient in myrosin, yield a volatile body as compared with the fixed product of the white mustard seeds. From this mixture is prepared the charta sinapis, which consists of cartridge paper covered with a mixture of the powder and the liquor caoutchouc, the fixed oil having first been removed by benzol, thus rendering the glucoside capable of being more easily decomposed by the ferment.

Used internally as a condiment, mustard stimulates the salivary but not the gastric secretions. It increases the peristaltic move- ments of the stomach very markedly. One drachm to half an ounce of mustard in a tumblerful of warm water is an efficient emetic, acting directly upon the gastric sensory nerves, long before any of the drug could be absorbed so as to reach the emetic centre in the medulla oblongata. The heart and respiration are reflexly stimu- lated, mustard being thus the only stimulant emetic. Some few other emetics act without any appreciable depression, but in cases of

Coisoning with respiratory or cardiac failure mustard should never e forgotten. In contrast to this may be mentioned, amongst the external therapeutic applications of mustard, its frequent power of relieving vomiting when locally applied to the epigastrium.

The uses of mustard leaves in the treatment of local pains are well known. When a marked counter-irritant action is needed, mustard is often preferable to cantharides in being more manageable and in causing a less degree of vesication ; but the cutaneous damage done by mustard usually takes longer to heal. A mustard sitz bath will often hasten and alleviate the initial stage of menstruation, and is sometimes used to expedite the appearance of the eruption in measles and scarlatina. The domestic remedy of hot water and mustard for children’s feet in cases of cold or threatened cold may be of some use in drawing the blood to the surface and thus tending to prevent an excessive vascular dilatation in the nose or bronchi. The proportion of an ounce of mustard to a gallon of water is a fair one and easily remembered. But by far the most important therapeutic application of mustard is as a unique emetic.

MUSTARD OILS, organic chemical compounds of general formula R-NCS. They may be prepared by the action of carbon bisulphide on primary amines in alcoholic or ethereal solution, the alkyl dithio-carbamic compounds formed being then precipitated with mercuric

chloride, and the mercuric salts heated in aqueous solution,

2RNH 2 GSˆ 3R H ˆ l2 [RHNCS 2] 2 Hg_>HgS+H 2 S+ 2 RNCS;

or the isocyanic esters may be heated with phosphorus penta- sulphide (A. Michael and G. Palmer, Amer. Chem. Jour., 1884, 6, 257). They are colourless liquids with a very pungent irritating odour. They are readily oxidized, with production of the corre- sponding amine. Nascent hydrogen converts them into the amine, with simultaneous formation of thio-formaldehyde, RNCS+4H = R-NH 2 +HCSH. When heated with acids to ioo° C, they decompose with formation of the amine and libera- tion of carbon bisulphide and sulphuretted hydrogen. They combine directly with alcohols, mercaptans, ammonia, amines and with aldehyde ammonia.

Methyl mustard oil, CH 3 NCS, melts at 35° C. and boils at 119 C. Allyl mustard oil, CaHsNCS, is the principal constituent of the ordinary mustard oil obtained on distilling black mustard seeds. These seeds contain potassium myronate (CioH I8 NS20]oK) which in presence of water is hydrolysed by the myrosin present in the seed,

CoHisNSsOioK = CeHnOs + KHSO4 +C 3 H 6 NCS. It may also be prepared by heating allyl sulphide with potassium, sulphocyanide. It is a colourless liquid boiling at I50‘7° C. I. combines directly with potassium bisulphite. Phenyl mustard oi v C 6 H 6 N CS, is obtained by boiling sulphocarbanilide with concentrated hydrochloric acid, some triphenylguanidine being formed at the same time. It is a colourless liquid boiling at 222 C. When heated with copper powder it yields benzonitrile.

MUSTER (Mid. Eng. mostre, moustre, adapted from the similar O. Fr. forms; Lat. monstrare) , originally an exhibition, show, review, an exhibition of strength, prowess or power. One of the meanings of this common Romanic word, viz. pattern, sample, is only used in commercial usage in English {e.g. in the cutlery trade), but it has passed into Teutonic languages, Ger. Muster, Du. monster. The most general meaning is for the assembling of soldiers and sailors for inspection and review, and more particularly for the ascertainment and verification of the numbers on the roll. This use is seen in the Med. Lat. monstrum and monstratio, “recensio militum” (Du Cange, Gloss, s.v.). In the “enlistment” system of army organization during the 1 6th and 17th centuries, and later in certain special survivals, each regiment was ” enlisted ” by its colonel and reviewed by special officers, “muster-masters,” who vouched for the members on the pay roll of the regiment representing its actual strength. This was a

necessary precaution in the days when it was in the power of the commander of a unit to fill the muster roll with the names of fictitious men, known in the military slang of France and England as passe-volants and “faggots” respectively. The chief officer at headquarters was the muster-master-general, later commissary general of musters. In the United States the term is still commonly used, and a soldier is ” mustered out ” when he is officially discharged from military service.

MUSURUS, MARCUS (c. 1470-1517), Greek scholar, was born at Rhithymna (Retimo) in Crete. At an early age he became a pupil of John Lascaris at Venice. In 1505 he was made professor of Greek at Padua, but when the university was closed in 1509 during the war of the league of Cambrai he

returned to Venice, where he filled a similar post. In 1516 he was summoned to Rome by Leo X., who appointed him arch- bishop of Monemvasia (Malvasia) in the Peloponnese, but he died before he left Italy. Since 1493 Musurus had been associated with the famous printer Aldus Manutius, and belonged to the “Neacademia,” a society founded by Manutius and other learned men for the promotion of Greek, studies. Many of the Aldine classics were brought out under Musurus’s supervision, and he is credited with the first editions of the scholia of Aristo- phanes (1498), Athenaeus (1514), Hesychius (1514), Pausanias

(1516).

See R. Menge’s De M. Musuri vita studiis ingenio, in vol. 5 of M. Schmidt’s edition of Hesychius (1868).

MUTE (Lat. mutus, dumb), silent or incapable of speech. For the human physical incapacity see Deaf and Dumb. In phonetics iq.v.) a “mute” letter is one which (like p or g) repre- sents no individual sound. The name of “mutes” is given, for obvious reasons, to the undertaker’s assistants at a funeral. In music a “mute” (Ital. sordino, from Lat. surdus, deaf) is a device for deadening the sound in an instrument by checking its vibra- tions. Its use is marked by the sign c.s. (con sordino), and its cessation by i.s. (senza sordino). In the case of the violin and other stringed instruments this object is attained by the use of a piece of brass, wood or ivory, so shaped as to fit on the bridge without touching the strings and hold it so tightly as to deaden

or muffle the vibrations. In the case of brass wind instruments a leather, wooden or papier mache pad in the shape of a pear with a hole through it is placed in the bell of the instrument, by which the passage of the sound is impeded. The interference with the pitch of the instruments has led to the invention of elaborately constructed mutes. Players on the horn and trumpet frequently use the left hand as a mute. Drums are muted or "muffled" either by the pressure of the hand on the head, or by covering with cloth. In the side drum this is effected by the insertion of pieces of cloth between the membrane and the "snares," or by loosening the "snares." The muting of a pianoforte is obtained by the use of the soft-pedal.

MUTIAN, KONRAD (14 71-15 26), German humanist, was born in Homberg on the 15th of October 147 1 of well-to-do parents named Mut, and was subsequently known as Konrad Mutianus Rufus, from his red hair. At Deventer under Alex- ander Hegiushehad Erasmus as schoolfellow ; proceeding(i486) to the university of Erfurt, he took the master's degree in 1492. From 1495 he travelled in Italy, taking the doctor's degree in canon law at Bologna. Returning in 1502, the landgraf of Hesse promoted him to high office. The post was not congenial; he resigned it (1503) for a small salary as canonicus in Gotha. Mutian was a man of great influence in a select circle especially connected with the university of Erfurt, and known as the Mutianiscker Bund, which included Eoban Hess, Crotus Rubeanus, Justus Jonas and other leaders of independent thought. He had no public ambition; except in correspondence, and as an epigrammatist, he was no writer, but he furnished ideas to those who wrote. He may deserve the title which has been given him as "precursor of the Reformation," in so far as he desired the reform of the Church, but not the establishment of a rival. Like Erasmus, he was with Luther in his early stage, but deserted him in his later development. Though he had personally no hand in it, the Epistolae obscurorum virorum (due especially to Crotus Rubeanus) was the outcome of the Reuchlinists in his Bund. He died at Gotha on the 30th of March (Good Friday) 1526.

See F. W. Kampschulte, Die Universitdt Erfurt (1858-1860); C. Krause, Eobanus Hessus (1879); L. Geiger, in Allgemeine Deutsche Biog. (1886) ; C. Krause, Der Briefwechsel des Mutianus Rufus (1885) ; another collection by K. Gillert (1890). (A. Go.*)

MUTILATION (from Lat. mulilus, maimed). The wounding, maiming and disfiguring of the body is a practice common among savages and systematically pursued by many entire races. The varieties of mutilation are as numerous as the instances of it are widespread. Nearly every part of the body is the object of mutilation, and nearly

every motive common to human

beings — vanity, religion, affection, prudence — has acted in giving rise to what has been proved to be a custom of great antiquity. Some forms, such as tattooing and depilation, have stayed on as practices even after civilization has banished the more brutal types; and a curious fact is that analogous mutilations are found observed by races separated by vast distances, and proved to have had no relations with one another, at any rate in historic times. Ethnical mutilations have in certain races a great sociological value. It is only after sub- mission to some such operation that the youth is admitted to full tribal rights (see Initiation). Tattooing, too, has a semi- religious importance, as when an individual bears a representa- tion of his totem on his body; and many mutilations are tribe marks, or brands used to know slaves.

Mutilations may be divided into: (1) those of the skin; (2) of the face and head ; (3) of the body and limbs ; (4) of the teeth ; (5) of the sexual organs.

1. The principal form of skin-mutilation is tattooing (g.f.), the ethnical importance of which is very great. A practice almost as common is depilation, or removal of hair. This is either by means of the razor, e.g. in Japan, by depilatories, or by tearing out the hairs separately, as among most savage peoples. The parts thus mutilated are usually the eyebrows, the face, the scalp and the pubic regions. Many African natives tear out all the body hair, some among them (e.g. the Bongos) using special pincers. Depilation is common, too, in the South Sea Islands. The Andaman islanders and the Boto- cudos of Brazil shave the body, using shell-edges and other primitive instruments.

2. Mutilations of the face and head are usually restricted to the lips, ears, nose and cheeks. The lips are simply perforated or distended to an extraordinary degree. The Botocudos insert disks of wood into the lower lip. Lip-mutilations are common in North America, too, on the Mackenzie river and among the Aleutians. In Africa they are frequently practised. The Manganja women pierce the upper lips and introduce small metal shields or rings. The Mittu women bore the lower lip and thrust a wooden peg through. In other tribes little sticks of rock crystal are pushed through, which jingle together as the wearer talks. The women of Senegal increase the natural thickness of the upper lip by pricking it repeat- edly until it is permanently inflamed and swollen. The ear, and particularly the lobe, is almost universally mutilated, from the ear- rings of the civilized West to the wooden disks of the Botocudos. The only peoples who are said not. to wear any form of ear ornament are the Andaman islanders, the

Neddahs, the Bushmen, the Fuegians and certain tribes of Sumatra. Ear mutilation in its most exag- gerated form is practised in Indo-China by the Mois of Annam and the Penangs of Cambodia, and in Borneo by the Dyaks. They extend the lobe by the insertion of wooden disks, and by metal rings and weights, until it sometimes reaches the shoulder. In Africa and Asia earrings sometimes weigh nearly half a pound. Livingstone said that the natives of the Zambesi distend the per- foration in the lobe to such a degree that the hand closed could be passed through. The Monbuttus thrust through a perforation in the body of the ear rolls of leaves, or of leather, or cigarettes. The Papuans, the inhabitants of the New Hebrides, and most Melanesian peoples carry all sorts of things in their ears, the New Caledonians using them as pipe-racks. Many races disfigure the nose with perforations. The young dandies of New Guinea bore holes through the septum and thrust through pieces of bone or flowers, a mutilation found, too, among New Zealanders, Australians, New Caledonians and other Polynesian races. In Africa the Bagas and Bongos hang metal rings and buckles on their noses; the Aleutians cords, bits of metal or amber. In women it is the side of the nose which is usually perforated; rings and jewelled pendants (as among Indian and Arabic ramen, the ancient Egyptians and Jews), or feathers, flowers, coral, &c. (as in Polynesia), being hung there. Only one side of the nose is usually perforated, and this is not always merely decorative. It may denote social position, as among the Ababdes in Africa, whose unmarried girls wear no rings in their noses. The male Kulus of the Himalaya wear a large ring in the left nostril. Malays and Polynesians sometimes deform the nose by enlarging its base, effecting this by compression of the nasal bones of the newly born.

The cheeks are not so frequently mutilated. The people of the Aleutian and Kurile Islands bore holes through their cheeks and place in them the long hairs from the muzzles of seals. The Guaranis of South America wear feathers in the same manner. In some countries the top of the head or the skin behind the ears of children is burnt to preserve them from sickness, traces of which mutilation are said to be discoverable on some neolithic skulls; while some African tribes cut and prick the neck close to the ear. By many peoples the deformation of the skull was anciently practised. Herodotus, Hippocrates and Strabo mention such a custom among peoples of the Caspian and Crimea. Later similar practices were found existing among Chinese mendicant sects, some tribes of Turkestan, the Japanese priesthood, in Malaysia, Sumatra, Java and

the south seas. In Europe it was not unknown. But the discovery of America brought to our knowledge those races which made a fine art of skull-deformities. At the present day the custom is still observed by the Haidas and Chinooks, and by certain tribes of Peru and on the Amazon, by the Kurds of Armenia, by certain Malay peoples, in the Solomon Islands and the New Hebrides. The reasons for this type of mutilation are uncertain. Probably the idea of distinguishing themselves from lower races was predominant in most cases, as for example in that of the Chinook Indians, who deformed the skull to distinguish themselves from their slaves. Or it may have been through a desire to give a ferocious appearance to their warriors. The deformation was always done at infancy, and often in the case of both sexes. It was, however, more usually reserved for boys, and sometimes for a single caste, as at Tahiti. Different methods prevailed: by bands, bandages, boards, com- presses of clay and sandbags, a continued pressure was applied to the half-formed cranial bones to give them the desired shape. Hand-kneading may also possibly have been employed.

3. Mutilations of the body or limbs by maiming, lopping off or deforming, are far from rare. Certain races (Bushmen, Kaffirs and Hottentots) cut off the finger joints as a sign of mourning, especially for parents. The Tongans do the same, in the belief that the evil spirits which bring diseases into the body would escape by the wound. Diseased children are thus mutilated by them. Con- tempt for female timidity has caused a curious custom among the Gallas (Africa). They amputate the mammae of boys soon after birth, believing no warrior can possibly be brave who possesses them. The fashion of distorting the feet of Chinese ladies of high rank has been of long continuance and only recently prohibited.

4. Mutilations of the teeth are among the most common and the most varied. They are by breaking, extracting, filing, inlaying or cutting away the crown of the teeth. Nearly every variety of dental mutilation is met with in Africa. In a tribe north-east of the Albert Nyanza it is usual to pry out with a piece of metal the four lower incisors in children of both sexes. The women of certain tribes on the Senegal force the growth of the upper incisors outwards so as to make them project beyond the lower lips. Many of the aboriginal tribes of Australia extract teeth, and at puberty the Australian boys have a tooth knocked out. The Eskimos of the Mackenzie River cut down the crown of the upper incisors so as not to resemble dogs. Some Malay races, too, are said to blacken their teeth because dogs have white teeth. This desire to be unlike animals seems to be at the bottom of

many dental mutilations. Another reason is the wish to distinguish tribe from tribe. Thus some Papuans break their teeth in order to be unlike other Papuan tribes which they despise. In this way such practices become traditional. Finally, like many mutilations, those of the teeth are trials of endurance of physical pain, and take place at ceremonies of initiation and at puberty. The Mois (Stiengs) of Cochin-China break the two upper middle incisors with a flint. This is always ceremoniously done at puberty to the accompaniment of feasting and prayers for those mutilated, who will thus, it is thought, be preserved from sickness. Among Malay races the filing of teeth takes place with similar ceremony at puberty. In Java, Sumatra and Borneo the incisors are thinned down and shortened. Deep transverse grooves are also made with a file, a stone, bamboo or sand, and the teeth filed to a point. The Dyaks of Borneo make a small hole in the transverse groove and insert a pin of brass, which is hammered to a nail-head shape in the hollow, or they inlay the teeth with gold and other metals. The ancient Mexicans also inlaid the teeth with precious stones.

5. Mutilations of the sexual organs are more ethnically important than any. They have played a great part in human history, and still have much significance in many countries. Their antiquity is undoubtedly great, and nearly all originate with the idea of initiation into full sexual life. The most important, circumcision (q.v.), has been transformed into a religious rite. Infibulation (Lat. fibulaˆ a clasp), or the attaching a ring, clasp, or buckle to the sexual organs, in females through the labia majora, in males through the prepuce, was an operation to preserve chastity very commonly practised in antiquity. At Rome it was in use; Strabo says it was prevalent in Arabia and in Egypt, and it is still native to those regions (Lane, Modern Egyptians, 1. 73; Arabic Lexicon, s.v. ” hafada”). Niebuhr heard that it was practised bn both shores of the Persian Gulf and at Bagdad (Description de V Arabie, p. 70). It is common in Africa (see Sir H. H. Johnston, Kilimanjaro Expedition, 1886), but is there often replaced by an operation which consists in stitching the labia majora together when the girl is four or five years old. Castration is practised in the East to supply guards for harems, and was employed in Italy until the time of Pope Leo XIII. to provide ” soprani ‘ for the papal choir; it has also been voluntarily submitted to from religious motives (see Eunuch). The operation has, however, been resorted to for other purposes. Thus in Africa it is said to have been used as a means of annihilating conquered tribes. The Hottentots and Bushmen, too, have the curious custom of removing one testicle when a boy is eight or nine years old, in the belief that this partial emasculation renders the victim fleeter of foot for the chase. The most dreadful of these

mutilations is that practised by certain Australian tribes on their boys. It consists of cutting open and leaving exposed the whole length of the urethral canal and thus rendering sexual intercourse impossible. According

to some authorities it is hatred of the white man and dread of slavery which are the reasons of this racial suicide. Among the Dyaks and in many of the Melanesian islands curious modes of ornamentation of the organs (such as the kalang) prevail, which are in the nature of mutilations.

Penal Use. — Mutilation as a method of punishment was common in the criminal law of many ancient nations. In the earliest laws of England mutilation, maiming and dismemberment had a prominent place. ” Men branded on the forehead, without hands, feet, or tongues, lived as examples of the danger which attended the com- mission of petty crimes and as a warning to all churls ” (Pike’s History of Crime in England, 1873). The Danes were more severe than the Saxons. Under their rules eyes were plucked out; noses, ears and upper lips cut off ; scalps town away ; and sometimes the whole body flayed alive. The earliest forest-laws of which there is record are those of Canute (1016). Under these, if a freedman offered violence to a keeper of the king’s deer he was liable to lose freedom and property ; if a serf, he lost his right hand, and on a second offence was to die. One who killed a deer was either to have his eyes put out or lose his life. Under the first two Norman kings mutilation was the punishment for poaching. It was, however, not reserved for that, as during the reign of Henry I. some coiners were taken to Winchester, where their right hands were lopped off and they were castrated. Under the kings of the West Saxon dynasty the loss of hands had been a common penalty for coining (The Obsolete Punishments of Shropshire, by S. Meeson Morris). Morris quotes a case in John’s reign at the Salop Assizes in 1203, where one Alice Crithecreche and others were accused of murdering an old woman at Lilleshall. Convicted of being accessory, Crithecreche was sentenced to death, but the penalty was altered to that of having her eyes plucked out. During the Tudor and Stuart periods mutilations were a common form of punishment extra-judicially inflicted by order of the privy council and the Star Chamber. There are said to be preserved at Playford Hall, Ipswich, instruments of Henry VIII. ‘s time for cutting off ears. This penalty appears to have been inflicted for not attending church. By an act of Henry VIII. (33 Hen. VIII. c. 12) the punishment for ” striking in the king’s court or house ” was the loss of the right hand. For writing a tract on The Monstrous Regimen of Women a Nonconformist divine (Dr W. Stubbs) had his right hand lopped off. Among many cases of severe

mutilations during Stuart times may be mentioned those of Prynne, Burton, Bastwick and Titus Oates.

MUTINY (from an old verb ” mutine,” 0. Fr. mutin, meutin, a sedition; cf. mod. Fr. 6meule; the original is the Late Lat. mota, commotion, from mover e, to move), a resistance by fprce to recognized authority, an insurrection, especially applied to a sedition in any military or naval forces of the state. Such offences are dealt with by courts-martial. (See Military Law and Court Martial.)

MUTSU, MUNEMITSU, Count (1842-1896), Japanese states- man, was born in 1842 in Wakayama. A vehement opponent of ” clan government ” — that is, usurpation of administrative posts by men of two or three fiefs, an abuse which threatened to follow the overthrow of the Tokugawa shogunate — he con spired to assist Saigo’s rebellion and was imprisoned from 1878 until 1883. While in prison he translated Bentham’s Utilitarian- ism. In 1886, after a visit to Europe, he received a diplomatic appointment, and held the portfolio of foreign affairs during the China- Japan War (1894-95), being associated with Prince (then Count) Ito as peace plenipotentiary. He negotiated the first of the revised treaties (tnat with Great Britain), and for these various services he received the title of count. He died in Tokyo in 1896. His statue in bronze stands before the foreign office in Tokyo.

MUTSU HITO, Mikado, or Emperor, or Japan (1852-), was born on the 3rd of November 1852, succeeded his father, Osahito, the former emperor, in January 1867, and was crowned at Osaka on the 31st of October 1868. The country was then in a ferment owing to the concessions which had been granted to foreigners by the preceding shogun Iyemochi, who in 1854 concluded a treaty With Commodore Perry by which it was agreed that certain ports should be open to foreign trade. This convention gave great offence to the more conservative daimios, and on their initiative the mikado suddenly decided to abolish the shogunate. This resolution was not carried out without strong opposition. The reigning shogun, Keiki, yielded to the decree, but many of his followers were not so complaisant, and it was only by force of arms that the new order of things was imposed on the country. The main object of those who had advocated the change was to lead to a reversion to the

primitive condition of affairs, when the will of the mikado was absolute and when the presence in Japan of the hated foreigner was unknown. But the reactionary party was not to be allowed to monopolize revolutions. To their surprise and discomfiture, the powerful daimios of Satsuma and Choshu suddenly declared themselves to be in favour of opening the country to foreign intercourse, and of adopting many far-reaching reforms. With this movement Mutsu Hito was cordially in agreement, and of his own motion he invited the foreign representatives to an audience on the 23rd of March 1868. As Sir Harry Parkes, the British minister, was on his way to this assembly, he was attacked by a number of two-sworded samurai, who, but for his guard, would doubtless have succeeded in assassinating him. The outrage was regarded by the emperor and his minis- ters as a reflection on their honour, and they readily made all reparation within their power. While these agitations were afoot, the emperor, with his advisers, was maturing a political constitution which was to pave the way to the assumption by the emperor of direct personal rule. As a step in this direction, Mutsu Hito transferred his capital from Kioto to Yedo, the former seat of the shoguns' government, and marked the event by renaming the city Tokyo, or Eastern Capital. In 1869 the emperor paid a visit to his old capital, and there took as his imperial consort a princess of the house of Ichijo. In the same year Mutsu Hito bound himself by oath to institute certain reforms, the first of which was the establishment of a deliberative assembly. In this onward movement he was supported by the majority of the daimios, who in a supreme moment of patriotism surrendered their estates and privileges to their sovereign. This was the death-knell of the feudalism which had existed for so many centuries in Japan, and gave Mutsu Hito the free hand which he desired. A centralized bureaucracy took the place of the old system, and the nation moved rapidly along the road of progress. Everything European was eagerly adopted, even down to frock-coats and patent-leather boots for the officials. Torture was abolished (1873), and a judicial code, adapted from the Code Napoleon, was authorized. The first railway— that from Yokohama to Tokyo — was opened in 1872; the European calendar was adopted, and English was introduced into the curriculum of the common schools. In all these reforms Mutsu Hito took a leading part. But it was not to be expected that such sweeping changes could be effected without opposition, and thrice during the period between 1876 and 1884 the emperor had to face serious rebellious movements in the provinces. These he succeeded in suppressing; and even amid these pre- occupations he managed to inflict a check on his huge neighbour, the empire of China. As the government of this state declared that it was incapable of punishing

certain Formosan pirates for outrages committed on Japanese ships (1874), Mutsu Hito landed a force on the island, and, having inflicted chastisement on the bandits, remained in possession of certain districts until the compensation demanded from Peking was paid. The un- paralleled advances which had been made by the government were now held by the emperor and his advisers to justify a demand for the revision of the foreign treaties, and negotiations were opened with this object. They failed, however, and the consequent disappointment gave rise to a strong reaction against everything foreign throughout the country. Foreigners were assaulted on the roads, and even the Russian cesarevich, after- wards the tsar Nicholas II., was attacked by would-be assassins in the streets of Tokyo. A renewed attempt to revise the treaties in 1894 was more successful, and in that year Great Britain led the way by concluding a revised treaty with Japan. Other nations followed, and by 1901 all those obnoxious clauses suggestive of political inferiority had finally disappeared from the treaties. In the same year (1894) war broke out with China, and Mutsu Hito, in common with his subjects, showed the greatest zeal for the campaign. He reviewed the troops as they left the shores of Japan for Korea and Manchuria, and personally distributed rewards to those who had won distinction. In the war with Russia, 1904-5, the same was the case, and it was to. the virtues of their emperor that his generals loyally ascribed

the Japanese victories. In his wise patriotism, as in all matters, Mutsu Hito always placed himself in the van of his countrymen. He led them out of the trammels of feudalism; by his progressive rule he lived to see his country advanced to the first rank of nations; and he was the first Oriental sovereign to form an offensive and defensive alliance with a first-rate European power. In 1869 Mutsu Hito married Princess Haru, daughter of Ichijo Tadaka, a noble of the first rank. He has one son and several daughters, his heir-apparent being Yoshi Hito, who was born on the 31st of August 1879, and married in 1900 Princess Sada, daughter of Prince Kujo, by whom he had three sons before 1909. Mutsu Hito adopted the epithet of Meiji, or ” Enlightened Peace,” as the nengo or title of his reign. Thus the year 1901, according to the Japanese calendar, was the 34th year of Meiji.

MUTTRA, or Mathura, a city and district of British India in the Agra division of the United Provinces. The city is on the right bank of the Jumna, 30 m. above Agra; it is an important railway junction. Pop. (1901), 60,042. It is an ancient town, mentioned by Fa Hien as a centre of Buddhism about a.d. 400; his successor Hsiian Tsang, about 650, states that it then con- tained twenty Buddhist monasteries and five Brahmanical temples. Muttra has suffered more from

Mahommedan plunder than most towns of northern India. It was sacked by Mah- mud of Ghazni in 1017-18; about 1500 Sultan Sikandar Lodi utterly destroyed all the Hindu shrines, temples and images; and in 1636 Shah Jahan appointed a governor expressly to " stamp out idolatry." In 1669-70 Aurangzeb visited the city and continued the work of destruction. Muttra was again captured and plundered by Ahmad Shah with 25,000 Afghan cavalry in 1756. The town still forms a great centre of Hindu devotion, and large numbers of pilgrims flock annually to the festivals. The special cult of Krishna with which the neighbour- hood is associated seems to be of comparatively late date. Much of the prosperity of the town is due to the residence of a great family of seths or native bankers, who were conspicuously loyal during the Mutiny. Temples and bathing-stairs line the river bank. The majority are modern, but the mosque of Aurangzeb, on a lofty site, dates from 1669. Most of the public buildings are of white stone, handsomely carved. There are an American mission, a Roman Catholic church, a museum of antiquities, and a cantonment for a British cavalry regiment. Cotton, paper and pilgrims' charms are the chief articles of manufacture.

The District or Muttra has an area of 1445 sq. m. It consists of an irregular strip of territory lying on both sides of the Jumna. The general level is only broken at the south-western angle by low ranges of limestone hills. The eastern half con- sists for the most part of a rich upland plain, abundantly irrigated by wells, rivers and canals, while the western portion, though rich in mythological association and antiquarian remains, is comparatively unfavoured by nature. For eight months of the year the Jumna shrinks to the dimensions of a mere rivulet, meandering through a waste of sand. During the rains, how- ever, it swells to a mighty stream, a mile or more in breadth. Formerly nearly the whole of Muttra consisted of pasture and woodland, but the roads constructed as relief works in 1837-1838 have thrown open many large tracts of country, and the task of reclamation has since proceeded rapidly. The population in 1901 was 763,099, showing an increase of 7 % in the decade. The principal crops are millets, pulse, cotton, wheat, barley and sugar cane. The famine of 1878 was severely felt. The eastern half of the district is watered by the Agra canal, which is navigable, and the western half by branches of the Ganges canal. A branch of the Rajputana railway, from Achnera to Hathras, crosses the district; the chord line of the East India, from Agra to Delhi, traverses it from north to south; and a new line, connecting with the Great Indian Peninsula, was opened in 1905.

The central portion of Muttra district forms one of the most sacred spots in Hindu mythology. A circuit of 84 kos around Gokul and

Brindaban bears the name of the Braj-Mandal, and

carries with it many associations of earliest Aryan times. Here Krishna and his brother Balarama fed their cattle upon the plain; and numerous relics of antiquity in the towns of Muttra, Gobardhan, Gokul, Mahaban and Brindaban still attest the sanctity with which this holy tract was invested. During the Buddhist period Muttra became a centre of the new faith. After the invasion of Mahmud of Ghazni the city fell into insignificance till the reign of Akbar; and thenceforward its history merges in that of the Jats of Bharatpur, until it again acquired separate individuality under Suraj Mai in the middle of the 1 8th century. The Bharatpur chiefs took an active part in the disturbances consequent on the declining power of the Mogul emperors, sometimes on the imperial side, and at others with the Mahrattas. The whole of Muttra passed under British rule in 1804.

See F. S. Growse, Maihura (Allahabad, 1883).

MUTULE (Lat. mutulus, a stay or bracket), in architecture the rectangular block under the soffit of the cornice of the Greek Doric temple, which is studded with guttae. It is supposed to represent the piece of timber through which the wooden pegs were driven in order to hold the rafter in position, and it follows the rake of the roof. In the Roman Doric order the mutule was horizontal, with sometimes a crowning fillet, so that it virtually fulfilled the purpose of the modillion in the Corinthian cornice.

MUZAFFAR-ED-DlN, shah of Persia (1853-1907), the second son of Shah Nasr-ed-Dln, was born on the 25th of March 1853. He was in due course declared vail ahd, or heir-apparent, and invested with the governorship of Azerbaijan, but on the assassination of his father in 1896 it was feared that his elder brother, Zill-es-Sultan, the governor of Isfahan, might prove a dangerous rival, especially when it was remembered that Muzaffar-ed-Din had been recalled to Teheran by his father upon his failure to suppress a Kurd rising in his province. The British and Russian governments, in order to avoid wide- spread disturbances, agreed however to give him their support. All opposition was thus obviated, and Muzaffar-ed-Din was duly enthroned on the 8th of June 1896, the Russian general Kosakowsky, commander of the Persian Cossacks, presiding over the ceremony with drawn sword. On this occasion the new shah announced the suppression of all purchase

of civil and military posts, and then proceeded to remit in perpetuity all taxes on bread and meat, thus lightening the taxation on food, which had caused the only disturbances in the last reign. But whatever hopes may have been aroused by this auspicious beginning of the reign were soon dashed owing to the extrava- gance and profligacy of the court, which kept the treasury in a chronic state of depletion. Towards the end of 1896 the Amin-es-Sultan, who had been grand vizier during the last years of Nasr-ed-DIn's reign, was disgraced, and Muzaffar-ed- Dln announced his intention of being in future his own grand vizier. The Amin-ad-Dowla, a less masterful servant, took office with the lower title of prime minister. During his short administration an elaborate scheme of reforms was drawn up on paper, and remained on paper. The treasury continued empty, and in the spring of 1898 Amin-es-Sultan was recalled with the special object of filling it. The delay of the British government in sanctioning a loan in London gave Russia her opportunity. A Russian loan was followed by the establishment of a Russian bank at Teheran, and the vast expansion of Russian influence generally. At the beginning of 1900 a fresh gold loan was negotiated with Russia, and a few months later Muzaffar-ed-Din started on a tour in Europe by way of St Petersburg, where he was received with great state. He subsequently went to Paris to visit the Exhibition of 1900, and while there an attempt on his life was made by a madman named Francois Salson. In spite of this experience the shah so enjoyed his European tour that he determined to repeat it as soon as possible. By the end of 1901 his treasury was again empty; but a fresh Russian loan replenished it and in 1902 he again came to Europe, paying on this occasion a state visit to England. On his way back

he stopped at St Petersburg, and at a banquet given in his honour by the tsar toasts were exchanged of unmistakable significance. None the less, during his visit to King Edward VII. the shah had been profuse in his expressions of friendship for Great Britain, and in the spring of 1903 a special mission was sent to Teheran to invest him with the Order of the Garter.

The shah's misguided policy had created widespread dis- affection in the country, and the brunt of popular disfavour fell on the atabeg (the title by which the Amin-es-Sultan was now known), who was once more disgraced in September 1903. The war with Japan now relaxed the Russian pressure on Teheran, and at the same time dried up the source of supplies; and the clergy, giving voice to the general misery and discontent, grew more and more outspoken in their denunciations of the shah's misrule. Nevertheless Muzaffar-ed-Din defied public opinion by making another journey to Europe in 1905; but, though received with the customary distinction at St Petersburg, he failed to obtain further supplies. In the summer of 1006 popular discontent culminated in extraordinary demonstrations at Teheran, which practically amounted to a general strike. The shah was forced to yield, and proclaimed a liberal con- stitution, the first parliament being opened by him on the 12th of October 1906. Muzaffar-ed-Din died on the 8th of January 1907, being succeeded by his son Mahommed Ali Mirza.

MUZAFFARGARH, a town and district of British India, in the Multan division of the Punjab. The town is near the right bank of the river Chenab, and has a railway station. Pop. (1901), 4018. Its fort and a mosque were built by Nawab Muzaffar Khan in 1 794-1 796.

The District or Muzaffargarh occupies the lower end of the Sind-Sagar Doab. Area, 3635 sq. m. In the northern half of the district is the wild thai or central desert, an arid elevated tract with a width of 40 m. in the extreme north, which gradually contracts until it disappears about 10 m. south of Muzaffargarh town. Although apparently a table-land, it is really composed of separate sandhills, with intermediate valleys lying at a lower level than that of the Indus, and at times flooded. The towns stand on high sites or are protected by embankments; but the villages scattered over the lowlands are exposed to annual inundations, during which the people abandon their grass-built huts, and take refuge on wooden platforms attached to each house. Throughout the cold weather large herds of camels, belonging chiefly to the Povindah merchants of Afghanistan, graze upon the sandy waste.

The district possesses hardly any distinct annals of its own, having always formed part of Multan (q.v.). The population in 1901 was 405,656, showing an increase of 6-4% in the decade, due to the extension of irrigation. The principal crops are wheat, pulse, rice and indigo. The most important domestic animal is the camel. The district is crossed by the North- western railway, and the boundary rivers are navigable, besides furnishing numerous irrigation channels, originally constructed under native rule.

MUZAFFARNAGAR, a town and district of British India, in the Meerut division of the United Provinces. The town is 790 ft. above the sea, and has a station on the North-Western railway. Pop. (1901), 23,444. It is an important trading centre and has a manufacture of blankets. It was founded about 1633 by the son of Muzaffar Khan, Khan-i-Jahan, one of the famous Sayid family who rose to power under the emperor Shah Jahan. The District or Muzaffarnagar has an area of 1666 sq. m. It lies near the northern extremity of the Doab or great alluvial plain between the Ganges and the Jumna, and shares to a large extent in the general monotony of that level region. A great : portion is sandy and unfertile; but under irrigation the soil is rapidly improving, and in many places the villagers have succeeded in introducing a high state of cultivation. Before the opening of the canals Muzaff arnagar was liable to famines caused by drought ; but the danger from this has been mini- mized by the spread of irrigation. It is traversed by four main canals, the Ganges, Anupshahr, Deoband and Eastern Jumna.' Its trade is confined to the raw materials it produces. The*

climate of the district is comparatively cool, owing to the proximity of the hills; and the average annual rainfall is $3 in. The population in 1901 was 877,188, showing an increase of J 3'5 % i Q tne decade, which was a period of unexampled prosperity. The principal crops are wheat, pulse, cotton and sugar-cane. The district is crossed by the North-Western railway from Delhi to Saharanpur.

Hindu tradition represents Muzaffarnagar as having formed a portion of the Pandava kingdom of the Mahabharata; authentic history, however, dates from the time of the Moslem conquests in the 13th century, from which time it remained a dependency of the various Mahommedan dynasties which ruled at Delhi until the practical downfall of the Mogul Empire in the middle of the 18th century. In 1788 the district fell into the hands of the Mahrattas. After the fall of

Aligarh, the whole Doab as far north as the Siwalik hills passed into the hands of the British without a blow, and Muzaffarnagar became part of Saharanpur. It was created a separate jurisdiction in 1824. During the Mutiny there was some disorder, chiefly occasioned by official weakness, but no severe fighting. See Muzaffarnagar District Gazetteer (Allahabad, 1903). MUZAFFARPUR, a town and district of British India, in the Patna division oif Bengal. The town is on the right bank of the Little Gandak river, and has a railway station. Pop. (1001), 45,617. The town is well laid out, and is an important centre of trade, being on the direct route from Patna to Nepal. It is the headquarters of the Behar Light Horse volunteer corps and has a college established in 1899.

The District 03? Muzaitarpor has an area of 3035 sq. m. It was formed in January 1875 out of the great district of Tirhoot, which up to that time was the largest and most populous district of Lower Bengal. The district is an alluvial plain between the Ganges and the Great Gandak, the Baghmat and Little Gandak being the principal rivers within it. South of the Little Gandak the land is somewhat elevated, with depressions containing lakes toward the south-east. North of the Baghmat the land is lower and marshy, but is traversed by elevated dry ridges. The tract between the two rivers is lowest of all and liable to floods. Pop. (1901), 2,754,790, showing an increase o£ 1-5 % in the decade. Average density, 914 per sq. m., being exceeded in all India only by the neighbouring district of Saran. Indigo (superseded to some extent, owing to the fall in price, by sugar) and opium are largely grown. Rice is the chief grain crop, and cloth, carpets and pottery are manufactured. The district is traversed in several directions by the Tirhoot system of the Bengal and North-Western railway. It suffered from drought in 1873-1874, and again in 1897-1898.

See Muzaffarpur District Gazetteer (Calcutta, 1907).

MUZIANO, GIROLAMO (1528-1592), Italian painter, was ‘born at Acquafredda, near Brescia, in 1528. Under Romanino, an imitator of Titian, he studied his art, designing and colouring according to the principles of the Venetian school. But it was riot until he had left his native place, still in early youth, and had repaired to Rome about 1550, that he came into notice. There his pictures soon gained for him the surname of II Giovane de’ paesi (the young man of the landscapes) ; chestnut-trees are predominant in these works. He next tried the more elevated style of historical painting. He imitated Michelangelo in giving great prominence to the anatomy of his figures, and became fond of painting persons emaciated by abstinence or even disease. His great picture of the ” Resurrection of Lazarus” at once established his

fame. Michelangelo praised it, and pronounced its author one of the first artists of that age. It was placed in the church of Santa Maria Maggiore, but was afterwards transferred to the Quirinal Palace. Muziano, with dogged perseverance (at one time he shaved his head, so as not to be tempted to go out of doors), continued to proceed in the path on which he had entered. He grew excellent in depicting foreign and military costumes, and in introducing landscapes into his historical pieces after the manner of Titian. Mosaic working also occupied his attention while he was employed as

superintendent at the Vatican; and it became under his hands a perfect imitation of painting. His ability and industry soon gained for him a handsome fortune. Part of this he expended in assisting to found the Academy of St Luke in Rome. He died in 1592, and was buried in the church of Santa Maria Maggiore.

Many of Muziano's works are in the churches and palaces of Rome; he also worked in Orvieto and Loreto. In Santa Maria degli Angeli, Rome, is one of his chief works, " St Jerome preaching to Monks in the Desert " ; his " Circumcision " is in the church of the Gesu, his " Ascension " in the Araceli, and his " St Francis receiv- ing the Stigmata " in the church of the Conception. A picture by him, representing Christ washing the feet of His disciples, is in the cathedral of Reims.

MUZZIOLI, GIOVANNI (1854-1894), Italian painter, was born in Modena, whither his family had removed from Castel- vetro, on the 10th of February 1854. From the time that he began to attend the local academy at the age of thirteen he was recognized as a prodigy, and four years later, by the unanimous vote of the judges, he gained the Poletti scholarship entitling him to four years' residence in Rome and Florence. After his return to Modena, Muzzioli visited the Paris Exhibition, and there came under the influence of Sir L. Alma Tadema. His first important picture was " In the Temple of Bacchus " (1881); and his masterpiece, " The Funeral of Britannicus," was one of the chief successes of the Bologna Exhibition of 1888. From 1878 to his death (August 5, 1894) Muzzioli lived in Florence, where he painted the altar-piece for the church of Castelvetro.

See History of Modern Italian Art, by A. R. Willard (London,

1898).

MWERU, a large lake of Eastern Central Africa, traversed by the Luapula or upper Congo. It lies 3000 ft. above the sea; measures about 76 m. in length by some 25 in breadth, and is roughly rectangular, the

axis running from S.S.W. to N.N E. It is cut a little south of its centre by 9 S. and through its N.E. corner passes 29 E. At the south end a shallow bay extends to 9° 31′ S. East of this, and some miles further north, the Luapula enters from a vast marsh inundated at high water; it leaves the lake at the north-west corner, making a sharp bend to the west before assuming a northerly direction. ‘ Besides the Luapula, the principal influent is the Kalungwizi, from the east. Near the south end of the lake lies the island of Kilwa, about 8 m. in length, rising into plateaus 600 ft. above the lake. Here the air is cool and balmy, the soil dry, with short turf and clumps of shady trees, affording every requirement for a sanatorium. Mweru was reached by David Livingstone in 1867, but its western shore was first explored in 1890 by Sir Alfred Sharpe, who two years later effected its circumnavigation. The eastern shores from the Luapula entrance to its exit, together with Kilwa Island, belong to British Central Africa; the western to the Belgian Congo.

MYAUNGMYA, a district in the Irrawaddy division of lower Burma, formed in 1803 out of a portion of Bassein district, and reconstituted in 1903. It has an area of 2663 sq. m., and a population (1901) of 278,119, showing an increase of 49% in the decade and a density of 104 inhabitants to the square mile. Among the population were about 12,800 Christians, mostly Karens. The district is a deltaic tract, bordering south on the sea and traversed by many tidal creeks. Rice cultivation and fishing occupy practically all the inhabitants of the district. The town of Myaungmya had 47 11 inhabitants in 1901.

MYCENAE, one of the most ancient cities of Greece, was situated on a hill above the northern extremity of the fertile Argive plain — fiuxco “Apyeos tirxo/36roto. Its situation is ex- ceedingly strong, and it commands all the roads leading from Corinth and Achaea into the Argive plain. The walls of Mycenae are the greatest monument that remains of the Heroic age in Greece; part of them is similar in style and doubtless con- temporary in date with the walls of the neighbouring town Tiryns. There can therefore be little doubt that the two towns were the strongholds of a single race, Tiryns commanding the sea-coast and Mycenae the inner country. Legend tells of the rivalry between the dynasties of the Pelopidae at Mycenae

and of the Proetidae at Argos. In early historic times Argos had obtained the predominance. The Mycenaeans, who had temporarily

regained their independence with the help of Sparta, fought on the Greek side at Plataea in 479 B.C. The long warfare between the two cities lasted till 468 B.C., when Mycenae was dismantled and its inhabitants dispersed. The city never revived; Strabo asserts that no trace of it remained in his time, but Pausanias describes the ruins. For the character of Mycenaean art and of the antiquities found at Mycenae see Aegean Civilization.

The extant remains of the town of Mycenae are spread over the hill between the village of Charvati and the Acropolis. They consist of some traces of town walls and of houses, and of an early bridge over the stream to the east, on the road leading to the Heraeum. The walls of the Acropolis are in

of thin slabs of stone set up on end, with others laid across the top of them; at the part of this enclosure nearest to the Lion Gate is an entrance. Some have supposed the circle of slabs to be the retaining wall of a tumulus; but its structure is not solid enough for such a purpose, and it can hardly be anything but a sacred enclosure. It was within this circle that Dr H. Schliemann found the five graves that contained a marvellous wealth of gold ornaments and other objects; a sixth was sub- sequently found. Above one of the graves was a small circular altar, and there were also several sculptured slabs set up above them. The graves themselves were mere shafts sunk in the rock. Dr Schliemann identified them with the graves of Agamemnon, Cassandra, and their companions, which were shown to Pausanias within the walls; and there can be little doubt that they are the graves that gave rise to the tradition,

Based on a plan in Schuchhardt's Schliemann' s Excavations.

Fig. i. — Plan of the Citadel of Mvcenae.

the shape of an irregular triangle, and occupy a position of great natural strength between two valleys. They are preserved to a considerable height on all sides, except where the ravine is precipitous and they have been carried away by a landslip; they are for the most part built of irregular blocks of great size in the so-called " Cyclopian " style; but certain portions, notably that near the chief gate, are built in almost regular courses of squared stones; there are also some later repairs in polygonal masonry. The main entrance is called the Lion Gate, from the famous triangular relief which fills the space above its massive lintel. This represents two lions confronted, resting their front legs on a low altar-like structure on which is a pillar which stands between them. The device is a translation into stone of a type not

uncommon in gem-cutter's and goldsmith's work of the " Mycenaean " age. The gate is approached by a road commanded on one side by the city wall, on the other by a projecting tower. There is also a postern gate on the north side of the wall, and at its eastern extremity are two apertures in the thickness of the wall. One of these leads out on to the rocks above the southern ravine, the other leads to a long staircase, completely concealed in the wall and the rocks, leading down to a subterranean well or spring. Just within the Lion Gate is a projection of the wall surrounding a curious circular enclosure, consisting of two concentric circles

though the historical identity of the persons actually buried in them is a more difficult question. Outside the circle, especially to the south of it, numerous remains of houses of the Mycenaean age have been found, and others, terraced up at various levels, occupy almost the whole of the Acropolis. On the summit, approached by a well-preserved flight of steps, are the remains of a palace of the Mycenaean age, similar to that found at Tiryns, though not so complicated or extensive. Above them are the foundations of a Doric temple, probably dating from the last days of Mycenaean independence in the 5th century.

Numerous graves have been found in the slopes of the hills adjoining the town of Mycenae. Most of these consist merely of a chamber, usually square, excavated in the rock, and approached by a " dromos " or horizontal approach in the side of a hill. They are sometimes provided with doorways faced with stucco, and these have painted ornamentation. Many of these tombs have been opened, and their contents are in the Athens museum. Another and much more conspicuous kind of tomb is that known as the beehive tomb. There are eight of them at Mycenae itself, and others in the neighbourhood. Some of them were visible in the time of Pausanias, who calls them the places where Atreus and his sons kept their treasures. There can, however, be no doubt that they were the tombs of princely families. The largest and best preserved of them, now

commonly called the Treasury of Atreus, is just outside the Lion Gate. It consists of a circular domed chamber, nearly 50 ft. in diameter and in height; a smaller square chamber opens out of it. It is approached by a horizontal avenue 20 ft. wide and 115 II – long, with side walls of squared stone sloping up to a height of 45 ft. The doorway was

flanked with columns of alabaster, with rich spiral ornament, now in the British Museum; and the rest of the facade was very richly decorated, as may be seen from Chipiez's fine restoration. The inside of the vault was ornamented with attached bronze ornaments, but not, as is sometimes stated, entirely lined with bronze. It is generally supposed that these tombs, as well as those excavated in the rock, belong to a later date than the shaft-tombs on the Acropolis.

See H. Schliemann, Mycenae (1879) ; C. Schuchhardt, Schliemann's Excavations (Eng. trans., 1891) ; Chr. Tsountas, Mvurjixu ko.1 MvkˆcukAs ■rikiTiaiibs (1895); Tsountas and Manatt, Tlie Mycenaean Age (1897); Perrot and Chipiez, Histoire de Vart aans Vantiquiti, vol. vi., L'art Myctnienne. Various reports in Ilpaxrucd rfjt ipx- irmplas and in 'Kˆr)/«pJs dpx<"o*o7""7. (E. Gr.)

MYCETOZOA (Myxomycetes, Schleimpilze) , in zoology, a group of organisms reproducing themselves by spores. These are produced in or on sporangia which are formed in the air and the spores are distributed by the currents of air. They thus differ from other spore-bearing members of the animal kingdom (which produce their spores while immersed in water or, in the case of parasites, within the fluids of their hosts), and resemble the Fungi and many of the lower green plants. In relation with this condition of their fructification the structures formed at the spore-bearing stage to contain or support the spores present a remarkable resemblance to the sporangia of certain groups of Fungi, from which, however, the Mycetozoa are essentially different.

Although the sporangial and some other phases have long been known', and Fries had enumerated 192 species in 1829, the main features of their life-history were first worked out in 1859- 1860 by de Bary (1 and 2). He showed that in the Mycetozoa the spore hatches out as a mass of naked protoplasm which almost immediately assumes a free-swimming flagellate form (urospore), that after multiplying by division this passes into an amoeboid phase, and that from such amoebae the Plasmodia arise, though the mode of their origin was not ascertained by him.

The Plasmodium of the MycetozOa is a mass of simple proto- plasm, without a differentiated envelope and endowed with the power of active locomotion. It penetrates the interstices of decaying vegetable matter, or, in the case of the species Badhamia utricularis, spreads as a film on the surface of living fungi; it may grow almost indefinitely in size, attaining under favourable conditions several feet in extent. It constitutes the dominant phase of the life-history. From the

Plasmodium the sporangia take their origin. It was Cienkowski who (in 1863) contributed the important fact that the Plasmodia arise by the fusion with one another of numbers of individuals in the amoeboid phase — a mode of origin which is now generally recognized as an essential feature in the conception of a Plasmodium, whether as occurring among the Mycetozoa or in other groups (7). De Bary clearly expressed the view that the life-history of the Mycetozoa shows them to belong not to the vegetable but to the animal kingdom.

The individual sporangia of the Mycetozoa are, for the most part, minute structures, rarely attaining the size of a mustard- seed, though, in the composite form of aethalia, they may form cake-like masses an inch or more across (fig. 21). They are found, stalked or sessile, in small clusters or distributed by the thousand over a wide area many feet in diameter, on the bark of decaying trees, on dead leaves or sticks, in woods and shrub- beries, among the stems of plants on wet moors, and, generally, at the surface in localities where there is a substratum of decaying vegetable matter sufficiently moist to allow the Plasmodium to live. Tan-heaps have long been known as a favourite habitat of Fuligo septica, the Plasmodia of which, emerging in bright yellow masses at the surface prior to the sporangial (in this case aethalial) phase, are known as ” flowers of tan.” The

film-like, expanded condition of the Plasmodium, varying in colour in different species and traversed by a network of vein- like channels (fig. 5), has long been known. The plasmodial stage was at one time regarded as representing a distinct group of fungi, to which the generic name Mesenterica was applied. The species of Mycetozoa are widely distributed over the world in temperate and tropical latitudes where there is sufficient moisture for them to grow, and they must be regarded as not inconsiderable agents in the disintegrating processes of nature, by which complex organic substances are decomposed into simpler and more stable chemical groups.

Classification. — The Mycetozoa, as here understood, fall into three main divisions. The Endosporeae, in which the spores are contained within sporangia, form together with the Exosporeae, which bear their spores on the surface of sporophores, a natural group characterized by forming true plasmodia. They con- stitute the Euplasmodida. Standing apart from them is the small group of the mould-like Sorophora, in which the amoeboid individuals only come together immediately prior to spore- formation and do not completely fuse with one another.

A number of other organisms living on vegetable and animal bodies, alive or dead, and leading an entirely aquatic life, are included by

Zopf (31) under the Mycetozoa, as the ” Monadina,” in distinction from the ” Eumycetozoa,” consisting of the three groups above mentioned. The alliance of some of these (e.g. Protomonas) with the Mycetozoa is probable, and was accepted by de Bary, but the relations of other Monadina are obscure, and appear to be at least as close with the Heliozoa (with which many have in fact been classed). The limits here adopted, following de Bary, include a group of organisms which, as shown by their life-history, belong to the animal stock, and yet alone among animals 1 they have acquired the habit, widely found in the vegetable kingdom, of developing and distributing their spores in air.

Class MYCETOZOA. Sub-class 1. — Euplasmodida. 2 Division 1. — Endosporeae. Cohort 1 . — Amaurosporales. Sub-cohort 1. — Calcarineae. Order 1. Physaraceae. Genera: Badhamia, Physarum, Physarella, Trichamphora, Erionema, Cienkowskia, Fuligo, Craterium, Leocarpus, Chondrioderma, Diachaea. Order 2. Didymiaceae. Genera : Didymiwn, Spumaria, Lepido- derma.

Sub-cohort 2. — Amaurochaetineae. Order 1. Stemonitaceae. Genera: Stemonitis, Comatricha, Ener-

thenema, Echinostelium, Lamproderma, Clastoderma. Order 2. Amaurochaetaceae. Genera: Amaurochaete, Brefeldia. Cohort 2. — Lamprosporales. Sub-cohort I. — Anemineae. Order 1. Heterodermaceae. Genera: Lindbladia, Cribfaria,

Dictydium. Order 2. Licaeceae. Genera : Licea, Orcadella.

Order 3. Tubulinaceae. Genera : Tubulina, Siphoptychium, Alwisia. Order 4. Reticulariaceae. Genera: Dictydiaethalium, Enteridium,

Reticularia. Order 5. Lycogalaceae. Genus : Lycogala.

Sub-cohort 2. — Calonemineae. Order 1. Trichiaceae. Genera:. Trichia, Oligonema, Hemitrichia,

Cornuvia. Order 2. Arcyriaceae. Genera: Arcyria, Lachnobolus, Perichaena. Order 3. Margaritaceae. Genera : Margarita, Dianema, Proto- trichia, Listerella.

Division 2. — Exosporeae. Order I. Ceratiomyxaceae. Genus: Ceratiomyxa.

Sub-class 2. — Sorophora. Order 1. Guttulinaceae. Genera: Copromyxa, Guttulina, Guttu-

linopsis. Order 2. Dictyosteliaceae. Genera: Dictyostelium, Acrasis, Poly- sphondylium.

1 Bursulla, a member of Zopf's Monadina, likewise forms its spores in air.

2 The classification of the Euplasmodida here given is that of A. and G. Lister (22), the outcome of a careful study of the group extending over more than twenty-five years. The writer of this article desires to express his indebtedness to the opportunities he has had of becoming familiar with the work of his father, Mr A. Lister, F.R.S., whose views on the affinities and life-history of the Mycetozoa he has endeavoured herein to summarize.

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MYCETOZOA

LIFE-HISTORY OF THE MYCETOZOA

EUPLASMODIDA

Endosporeae. We may begin our survey of the life-history at the point where the spores, borne on currents of air, have settled among wet decaying vegetable matter. Shrunken when dry, they rapidly absorb water

and resume the spherical

■© > shape which is found in

®' nearly all species. Each

is surrounded by a spore

wall, sheltered by which

the protoplasm, though

losing moisture by drying,

may remain alive for as

many as four years. In

several cases it has been

found to give the chemical

reaction of cellulose. It

is smooth or variously

sculptured according to

the species. Within the

protoplasm may be seen

the nucleus, and one or

more contractile vacuoles

c. . . ,. , . , , make their appearance.

i.'— Stages in the Hatching of the After the spore has lain

Spores of Dtdymtum difforme. in water f or a period

The unruptured spore. varying from a few hours

1 he protoplasmic contents of the spore to a (j ay or two t h e wall

emerging It contains a nucleus with bursts and the contained

the (light) nucleolus, and a contractile protoplasm slips out and

After A. Lister.

Fig.

a, b,

vacuole (shaded).

c, The same, free from the spore wall.

d, Zoospore, with nucleus at the base of the flagellum, and contractile vacuole.

e, A zoospore with pseudopodial processes at the posterior end, to one of which a bacillus adheres. Two digestive vacuoles in the interior contain in- gested bacilli.

/, Amoeboid phase with .flagellum.

lies free in the water as a minute colourless mass, presenting amoeboid movements (fig. i, c). It soon assumes an elongated piriform shape, and a flagellum is developed at the narrow end, attaining a length equal to the rest retracted f the body. The minute zoospore, thus equipped,

swims away with a characteristic dancing motion. The proto plasm is granular within but hyaline externally (fig. I, d). The nucleus, lying at the end of the body where it tapers into the flagellum, is limited by a definite wall and contains a nuclear

network and a nucleolus. It often presents the appearance of being drawn out into a point towards the flagellum, and a bell-like structure [first described by Plenge (27)], staining more darkly than the rest of the protoplasm, extends from the base of the flagellum and invests the nucleus (fig 2, a and c). The other end of the zoospore may be evenly rounded (fig. I, d) or it may be produced into short pseudo- podia (fig. 1, e). By means of these the zoospore Captures bacteria which are drawn into the body and enclosed in digestive vacuoles. A contractile vacuole is also present near the hind end. Considerable movement may be observed among the granules of the interior, and in the large zoospores of Amaurochaete atra this may amount to an actual streaming, though without the rhythm characteristic of the plasmodial stage.

Other shapes may be temporarily assumed by the zoospore.

Attaching itself to an object it may become amoeboid, either with (fig. I,/) or without (fig. 2, c) the temporary retraction of the flagel- lum ; or it may take an elongated slug-like shape and creep with the flagellum extended in front, with tactile and apparently exploratory movements.

That the zoospores of many species of the Endosporeae feed on bacteria has been shown by A. Lister (18). New light has recently been thrown on the matter by Pinoy (26), who has worked chiefly with Sorophora, in which, as shown below, the active phase of the life-history is passed

Fig. 2. — Zoospores of Badhamia panicea, stained. In a and c the bell-like struc- ture investing the nucleus is clearly seen.

After A. Lister.

Fig. 3. — Three stages in the division of the Zoospore of

Reticularia Lycoperdon.

mainly in the state of isolated amoebae. Pinoy' finds that the amoebae of this group live on particular species of bacteria, and that r the presence of the latter is a necessary condition for the develop-, ment of the Sorophora, and even (as has been recognized by other workers) for the hatching of their spores. Pinoy's results indicate, though not so conclusively, that bacteria are likewise the essential food of the Euplasmodida in the early phases of their life-history. The zoospores do, however, ingest other solid bodies, e.g. carmine granules (Saville Kent, 15).

The zoospores multiply by binary fission, the flagellum being withdrawn and the nucleus undergoing mitotic division, with the; formation of a well-marked achromatic spindle (fig. 3). ,

It is probable that fission occurs more than once in the zoospore" stage; but there is not satisfactory evidence to show how often it may be repeated. 2

At this, as at other phases of the life-history, a resting stage may be assumed as the result of drying, but also from other and unknown causes. The flagel- lum is withdrawn and the protoplasm, becoming spheri- cal, secretes a cyst wall. The organism thus passes into the condition of a microcysi, from which when dry it may be awakened to renewed activity by wetting.

At the end of the zoospore stage the organism finally withdraws its flagellum and assumes the amoeboid shape. It is now known as an amoe- bula. The amoebulae become endowed, as was first recog- nized by Cjenkowski, with mutual attraction, and on meeting fuse with one another. Fig. 4 represents a group of such amoebulae. Several have already united to form a common mass, to which others, stifl_ free, are verging, mass

After A. Lister.

Fig. 4. — Amoebulae of Didymium difforme uniting to form a Plas- modium. The common mass contains digestive vacuoles (v). The clear spherical bodies are ig. The protoplasmic microcysts and an empty spore- thus arising is the plas- shell is seen to the left. modium. The fusion between

the protoplasmic bodies of the amoebulae which unite to form it is complete. Their nuclei may be traced for some time in the young Plasmodium and no fusion between them has been observed at this

stage (20). As the Plasmodium increases in size by the addition of amoebulae the task of following the fate of the individual nuclei by direct observation becomes impossible.

The appearance of an active Plasmodium of Badhamia- utricularis, which, as we have seen, lives and feeds on certain fungi, is shown, in fig. 5. It consists of a film of protoplasm, of a bright yellow colour, varying in size up to a foot or more in diameter. It is traversed by a network of branching and anastomosing channels, which divide up and are gradually lost as they approach the margin where the, protoplasm forms a uniform and lobate border. Elsewhere the

1 Figures I, 4, and 11-22 are from the British Museum Guide to the British Mycetozoa. The other figures are from Lankester's Treatise on Zoology, part 1. Introduction and Protozoa. Fascicle I. Article Mycetozoa.

Fig. 5. — Part of the Plasmodium of Badhamia utricularis.

main trunks of the network may lie free with little or no connecting film between them and their neighbours. The plasmodia of other species, which live in the interstices of decaying vegetable matter, are less easily observed, but on emerging on the surface prior to

2 Pinoy states (26) that the spores of Spumaria alba, cultivated with bacteria on solid media, hatch out into amoebae, which under these conditions do not assume the flagellate stage. The amoeba from a spore was observed to give rise by three successive divisions to eight amoebulae. ,

? > ore formation they present an essentially similar appearance, here is, however, great variety in the degree of concentration or expansion presented by Plasmodia, in relation with food supply, moisture and other circumstances. The plasmodia move slowly about over or, in the substratum, concentrating in regions where food supply is abundant, and leaving those where it is exhausted.

On examining under the microscope a film which has spread over a cover-slip, the channels are seen to be streams of rapidly moving granular protoplasm. This movement is rhythmic in character, being directed alternately towards the margin of an advancing region of the plasmodium, and away from it. As a channel is watched the stream of

granules is seen to become slower, and after a momentary pause to begin in the opposite direction. In an active Plasmodium the duration of the flow in either direction varies from a minute and a half to two minutes, though it is always longer when in the direction of the general advance over the substratum. When the flow of the protoplasm is in this latter direction the border be- comes turgid, and lobes of hyaline protoplasm are seen (under a high magnification) to start forward, and soon to become filled with granu- lar contents. When the flow is reversed, the margin becomes thin from the drainage away of its contents. A delicate hyaline layer invests the Plasmodium, and is apparently less fluid than the material flowing in the channels.' The phenomena of the rhythmic movement of the protoplasm are not inconsistent with the vievr that they result from alternating contraction and relaxation of the outer layer in different regions of the plasmodium, but any dogmatic statement as to their causation appears at present inadvisable.

Fig. 6.

a, Part of a stained Plasmodium of Badhamia utricularis. n, Nuclei.

b, Nuclei, some in process of simple (amitotic) division.

c, Part of a Plasmodium in which the nuclei are in simultaneous

mitotic division. d-f, Other stages in this process.

Minute contractile vacuoles may be seen in great numbers in the thin parts of the plasmodium between the channels. In stained preparations nuclei, varying (in Badhamia utricularis) from 2-5 to 5 micromillimeters in diameter, are found abundanlly in the granular protoplasm (fig. 6, b). They contain a nuclear reticulum and one or more well-marked nucleoli. In any stained plasmodium some nuclei may be found, as shown in the figure 6, which appear to be in some stage of simple (amitotic) division, and this is, presumably, the chief mode in which the number of the nuclei keeps pace with the rapidly growing plasmodium. There is, however, another mode of nuclear division in the plasmodium which has hitherto been observed in one recorded instance (19, p. 541), the mitotic (fig. 6, c-f), and this appears to befall all the nuclei of a plasmodium simul- taneously. What the relation of these two modes of nuclear division may be to the life-history is obscure.

That the amitotic is the usual mode of nuclear division is indicated by the very frequent occurrence of these apparently dividing nuclei and

also by the following experiment. A plasmodium of Badhamia utricularis spreading over pieces of the fungus Auricularia was observed to increase in size about fourfold in fourteen hours, and during this time a small sample was removed and stained every quarter of an hour. The later stainings showed no diminution in the number of nuclei in proportion to the protoplasm, and yet none of the sample showed any sign of mitotic division (20, p. 9). It would appear therefore that the mode of increase of the nuclei during this period was amitotic.

Prowazek (28) has recently referred to nuclear stages, similar to those here regarded as of amitotic division, but has interpreted them as nuclear fusions. He does not, however, discuss the mode of multiplication of nuclei in the plasmodium.

In the group of the Calcareae, granules of carbonate of lime are abundant in the plasmodia, and in all Mycetozoa other granules of undetermined nature are present. The colour of plasmodia varies in different species, and may be yellow, white, pink, purple or green. The colouring matter is in the form of minute drops, and in the Calcareae these invest the lime granules.

Nutrition. — The plasmodium of Badhamia utricularis, advancing over the pilei of suitable fungi, feeds on the superficial layer dissolving the walls of the hyphae (17). The protoplasm may be seen to contain abundant foreign bodies such as spores of fungi or sclerotium cysts (vide infra) which have been taken in and are undergoing digestion. It has been found experimentally (11) that pieces of coagulated proteids are likewise taken in and digested in vacuoles. On the other hand it has been found that plasmodia will live, ultimately producing sporangia, in nutrient solutions (9). 1 It would appear therefore that the nutrition of plasmodia is effected in part by the ingestion of solid foodstuffs, and in part by the absorption of material in solution, and that there is great variety in the com- plexity of the substances which serve as their food.

Sclerotium. — As the result of drought, the plasmodium, having become much denser by loss of water, passes into the sclerotial condition. Drawing together into a ■■».

thickish layer, the protoplasm divides jP^^^S^ijeL^ ^S^i up into a number of distinct masses, “‘ •**■”•• ” !J / = ” = !».•■• •’- each containing some 10 to 20 nuclei,

and a cyst wall is excreted round each

mass (fig. 7). The whole has now a

hard brittle consistency. In this state

the protoplasm will remain alive for

two or three years. On the addition – T

of water the cvst walls are ruptured FlG – 7- — Section of the

and in part absorbed, their contents Plasmodium of Badhamia

join together, and the active streaming utricularis when passing into

condition of the plasmodium is re- the condition of sclerotium.

sumed. It is to be noted, however, ». The nuclei contained in

that the sclerotial condition may be the young sclerotial cysts.

assumed under other conditions than dryness, and sclerotia may

even be formed in water.

The existence of the sclerotial stage affords a ready means of obtaining the plasmodium for experimental purposes. If a cultiva- tion of the plasmodium of Badhamia utricularis on suitable fungi {Stereum, Auricularia) is allowed to become partially dry the Plas- modium draws together and would, if drying were continued, pass into the sclerotial stage on the fungus. If now strips of wet blotting- paper are placed so as to touch the plasmodium, the latter, attracted by the moisture, crawls on the blotting-paper. If this is now removed and allowed to dry rapidly, the plasmodium passes into sclerotium on it. 2 By this means the plasmodium is removed from the partially disintegrated and decayed fungus on which it has been feeding, and a clean sclerotium is obtained, which, as above stated, remains alive for years (21, p. 7). An easy method for obtaining small plasmodia for microscopic examination is to scatter small fragments, scraped from a piece of the hard sclerotium, over cover-slips wetted with rain- water and kept in a moist atmosphere. In twelve to twenty- four hours small plasmodia will be seen spreading on the cover-slips and these may be mounted for observation.

The plasmodial stage ends by the formation of the sporangia. The plasmodium withdraws from the interstices of the material among which it has fed, and emerges on the surface in a diffuse or

concentrated mass. In the case of Badhamia utricularis it may withdraw from the fungus on which it has been feeding, or change into sporangia on it. The mode of formation of the sporangia will be described in the case of Badhamia, some of the chief differences in the process and in the structure of the sporangia in other forms being subsequently noticed.

When the change to sporangia begins the protoplasm of the Plasmodium becomes gradually massed in discrete rounded lobes, about a half to one millimeter in diameter and scattered in clusters over the area occupied by the plasmodium. The reticulum of channels of the plasmodium becomes meanwhile less and less marked. When the whole of the protoplasm is drawn in to the lobes, the circulation ceases. The lobes are the young sporangia. Meanwhile foreign bodies, taken in with the food, are ejected, and the protoplasm secretes on its outer surface a pellicle of mucoid, transparent substance which dries as the sporangia ripen. This invests the young sporangia, and as they rise above the substratum falls together at their bases forming the stalks; extended over the substratum it forms the hypothallus, and in contact with the rounded surface of the sporangium it forms the sporangium-wall. While the sporangium-wall is formed externally a secretion of

1 A solution which has thus been found favourable contains the following mineral salts: KH_2PO_4, K_2HPO_4, $MgSO_4$, KNOa, CA (NOi)j, a free acid, and 5 % of dextrine.

2 If the plasmodium is slowlv dried it is very apt to pass into sporangia.

similar material occurs along branching and anastomosing tracts through the protoplasm of the sporangium, giving rise to the capilhtiwn. The greater part of the lime granules pass out of the protoplasm and are deposited in the capillitium, which in the ripe sporangia of Badhamia is white and brittle with the contained lime (cf. fig. 8). In this genus some granules are found also in the sporangium-wall. Strasburger concludes that the sporangium-wall of Trichia is a modification of cellulose (29).

Fig. 8. — Sporangia of Badhamia panicea, some intact, others (to left) ruptured, exposing the black masses of spores and the capillitium. The

latter is white with deposited lime granules. An empty sporangium is seen above.

It has been stated (16), but the observation requires confirmation, that a fusion of the nuclei in pairs occurs early in the development of the sporangium.

Fig. 10. — Part of a section through a Sporangium of Trichia varia after the spores are formed.

Fig. 9. — Part of a section through a young Sporangium of Trichivaria, showing the mitotic division of the nuclei («) prior to spore formation.

c, Capillitium thread.

At a later stage, after the capillitium is formed, the nuclei undergo a mitotic division which affects all the nuclei of a sporangium simultaneously. This was first described by Strasburger (29). While it

Fig. 11. — Badhamia utricularis,

a, Sporangia.

b, Capillitium spores.

and cluster of

Fig. 12.— Physarum nutans. Sporangia.

Capillitium threads, with frag- ment of the sporangium-wall attached, lime knots at the junctions and spores. is in progress the protoplasm of the sporangium divides, into succes- sively smaller masses, until each daughter nucleus is the centre of a single mass of protoplasm. 1 These nucleated masses are the young

1 In some genera such as Arcyria and Trichia (illustrated in figs. 9 and 10) the division of the protoplasm does not occur until the nuclei have undergone this division. The protoplasm then divides up •bout the daughter nuclei to form the spores.

spores. A spore-wall is soon secreted and the sporangium has now resolved itself into a mass of spores, traversed by the strands of the capillitium and enclosed in a sporangium-wall, connected with the substratum by a stalk. As ripening proceeds, the wall becomes membranous and readily ruptures, and the dry spores may be carried abroad on the currents of air or washed out by rain.

Fig. 13-

Chondrioderma testa- Fig. 14.- ceum. a, Group of three Sporangia. 6, Capillitium, fragment of spor- angium-wall and spores.

Cralerium peduncula- tum.

a, Two Sporangia, in one the lid has fallen away.

b, Capillitium with lime knots and spores.

We may now review some of the main differences in structure presented by the sporangia. They may be stalked or sessile (fig. 13). If the former, the stalk is usually, as in Badhamia utricidaris,

Fig. 15. — Didymium effusum.

a, Two Sporangia, one showing the columella and capillitium.

b, Capillitium, fragment of spor- angium-wall with carbonate of lime in crystals, and spores.

Fig. 16. — Lepidoderma tigrinum.

a, Sporangium; the crystal-line disks of lime are seen attached to the sporangium-wall.

b, Capillitium and spores.

the continuation of the sporangium- walls (figs. 11 and 12), but in Stemonitis and its allies (figs. 17 and 18) it is an axial structure. A central columella may project into the interior of the sporangium, either in stalked (fig. 15) or sessile (fig. 13) forms.

Fig. 17. — Lamproderma irlaeum.

a, Sporangia.

b, A Sporangium deprived of spores, showing the capillitium and remains of the sporangium- wall.

a b

Fig. 18. — Stemonitis splendens.

a, Group of Sporangia (nat. size).

b, Portion of columella and capil- litium, the latter branching to form a superficial network.

The sporangium-wall may be most delicate and evanescent (fig. 17), or consist of a superficial network of threads (fig. 18), which in Dietydium (fig. 19) present a beautifully regular arrangement.

Fig. 19. — Dietydium umblicatum.

a, Group of Sporangia, nat. size.

b, A Sporangium after dispersion of the spores.

Fig. 20. — Arcyria puniest*.

a, Group of Sporangia.

b, Capillitium.

c, Spore.

In Chondrioderma (fig. 13) the wall is double, the inner layer being membranous, the outer thickly encrusted with lime granules. In Craterium the upper part of the sporangium-wall is lid-like and falls away, leaving the spores in an open cup (fig. 14).

The condition of the capillitium is very various. In the Calcari- neae the lime may be generally distributed through it (fig. 11), or a gf> re g at . e d at the nodes of the network in ” lime-knots ” (figs. 12 and 14) or it may be absent from the capillitium altogether. The capillitium attains its highest development in the Calonemineae in which the threads, distinct (in which case they are known as elaters, figs. 9 and 10) or united into a network (fig. 20), present regular thickenings in the form of spiral bands or transverse bars. These threads, altering their shape with varying states of moisture, are efficient agents in distributing the spores. In another group, the Anemineae, the capillitium is absent altogether.

The Didymiaceae are characterized by the fact that the lime, though present in a granular form in the Plasmodium, is deposited on the sporangium-wall in the form of crystals, either in radiating groups (fig. 15) or in disks (fig. 16).

In most Endosporeae the sporangia are separate symmetrical bodies, but in many genera a form of fructification occurs in which

Fig. 22. — Licea flexuosa.

a, Group of Plasmodiocarps.

b, A continuous Plasmodiocarp

Fig. 21. — Fuligo septica.

a, Aethalium.

b, Capillitium threads (with lime-knots) and two spores.

c, Spores, the spores are produced in masses of more or less irregular outline, retaining in extreme cases much of the diffuse character of the Plas- modium. With the spores they contain capillitium, but there are no traces of sporangial walls to be found in their interior. They are known as plasmodiocarps (fig. 22). They are characteristic of certain species, but in others they may be formed side by side with separate sporangia from the same Plasmodium. There is indeed no sharp line to be drawn between sporangia and plasmodiocarps. On the other hand, the crowded condition of the sporangia of some species forms a transition to the large compound fructifications known as aethalta (fig. 21). These, either in their young stages or up to maturity, retain some evidence of their formation by a coalescence of sporangia, and in addition to the capillitium they are generally penetrated by the remains of the walls of the sporangia which have thus united.

Exosporeae. It will be convenient to begin our survey of the life-history

of Ceratiomyxa, the single representative of the Exo- sporeae, at the stage at which the Plasmodium emerges from the rotten wood in which it has fed. At this stage it has been observed to spread as a film over a slide, and to exhibit the network of channels and rhythmic flow of the proto- plasm in a manner precisely similar to that seen in the Endosporeae (20, p. 10). It soon, however, draws to- gether into compact masses, from the surface of which finger-like or antler-like lobes grow upwards. Here too the secretion of a trans- parent mucoid substance occurs, which is at first From Lankster's Treatise on Zoology; figs, a penetrated by the anasto- and c-h after A. Lister; fig. b after Famintzin mosing strands of the andWoronin. protoplasm, but gradually

Fig. 23. — Ceratiomyxa mucida. the latter tends more and

a, Ripe sporophore. more to form a reticular and

b, Maturing sporophore showing the ultimately a nearly continu- development of the spores. ous superficial investment,

c, Ripe spore. Instead of the single covering the mucoid ma- nucleus here indicated there should terial. The latter even- be four nuclei, as in d. tually dries and forms the

d, Hatching spore. exceedingly delicate support e-h, Stages in the development of the of the spores or sporophore

zoospores. (fig. 23, a).

The investing proto-

f)lasm, with its nuclei, having become arranged in an even ayer, undergoes cleavage and thus forms a pavement-like layer of protoplasmic masses, each occupied by a single nucleus

(fig- 23, b). Each of these masses now grows out perpendicularly to the surface of the sporophore. As it does so an envelope is secreted, which, closing in about the base forms a slender stalk. The minute mass, borne on the stalk, becomes the ellipsoid spore, surrounded by the spore-wall. In this manner the whole of the protoplasmic substance of the Plasmodium is converted into spores, borne on supporting structures (stalks and sporophores) , which are formed by secretion of the protoplasm.

In the course of the development of which the external features have now been traced nuclear changes occur of which accounts have been given by Jahn (14) and by Olive (24 and 25). Jahn has shown that prior to the cleavage of the protoplasm a mitotic division of the nuclei takes place, the daughter nuclei of which are those occupying the protoplasmic masses seen in fig. 23 b. 1 After the spore has risen on its stalk two further mitotic divisions occur in rapid succession, and the four-nucleated condition characteristic of the spore of Ceratiomyxa, is thus attained. The spores, on being brought into water, soon hatch (fig. 23, d), and the four nuclei contained in them undergo a mitotic division Meanwhile the protoplasm divides, at first into four, then into eight masses, and the latter acquire flagella, although for some time remaining con- nected with their fellows (fig. 23, e-h). On separating each is a free zoospore.

From observation of cultivations of zoospores the impression is that here, as in the Endosporeae, they multiply by binary division, though no exact observations of the process have been recorded. The zoospores lose their flagella and become amoebulae, but the fusion of the iatter to form Plasmodia has not been directly observed in Ceratiomyxa, although from analogy with the Endosporeae it can hardly be doubted that such fusions occur.

Sorophora.

The Sorophora of Zopf (Acrasiae of Van Tieghem) are a group of microscopic organisms inhabit- ing the dung of herbivorous animals and other decaying vegetable matter. As Pmoy (26) has shown, the presence of a particular species of bacteria with the spores is necessary for their hatching and as the essential food of the amoebulae which emerge from them. There is no flagellate stage, and it is in the form of amoebulae, multiplying by fission, that the vegetative stage of the life-history is passed. At the end of this stage numbers of amoe- bulae draw together to form a ” pseudo-plasmodium.” This appears to be merely an aggre- gation of amoebulae prior to spore formation. The outlines of the individual amoebulae are maintained, and there is no fu- sion between them, as in the formation of the Plasmodium of the Euplasmodida.

In some genera certain of the amoebulae constituting the pseudo-plasmodium are modi- fied into a stalk (simple in Guttulina and Dictyostelium, branched in Polysphondylium, fig. 24, d), along which the other units creep to encyst, and become spores at the end _ or ends of the stalk. In other FlG – 2 4-

From

cases (Copromyxa, fig. 24, a and b) the pseudo-plasmodium is transformed into a mass of encysted spores without the differentiation of supporting structures.

It is not impossible that the Myxobacteriaceae of Thaxter

Lankester’s Treatise on Zoology.

a and b after Fayod; c and d after Brefeld from Zopf.

a and 6, Copromyxa pro

tea, slightly magnified. c and d, Polysphondylium vio-

laceum. c, A young sorus, seen in optical section. A mass of elongated amoebulae are grouped round the stalk, and others are ex- tended about the base, may, as that author suggests, be <ˆ. A sorus approaching maturity, allied to the Sorophora (30).

Review of the Life-Histories of the Mycetozoa — -The data for a comparison of the life-history of the Mycetozoa with those of other Protozoa in respect of nuclear changes are at present incomplete.

« »/ ahn ˆ described two mitotic divisions at this stage, but in Myxomycetenstudien 7— Ceratiomyxa," Ber. deut. bot. Gesellsch. xxvi. a (1908) he shows that only one mitotic division occurs in the maturing sporophore prior to cleavage. Olive gives a preliminary account of- a fusion of nuclei prior to cleavage, but as he has not seen the mitotic division which certainly occurs at this stage his results cannot be accepted as secure.

At some stage or other we are led by analogy to expect that a division of nuclei would occur in which the number of chromosomes would be reduced by one half, that this would be followed by the formation of gametes, and that the nuclei of the latter would subse- quently fuse in karyogamy.

It is clear that both in the Endosporeae and Exosporeae a mitotic division of nuclei immediately precedes spore-formation. This is regarded by Jahn as a reduction division. If this is the case, the zoospores or the amoebulae must in some way represent the gametes. The fusion of the latter to form plasmodia appears to offer a pro- cess comparable with the conjugation of gametes, but though the fusion of the protoplasm of the amoebulae has been often observed no fusion of their nuclei (karyogamy) has been found to accompany it. A fusion of nuclei has indeed been described as occurring in the Plasmodium, or at stages in the development of the sporangia or sporophores, but in no case can the evidence be regarded as satis- factory. 1 Until we have clear evidence on this point the nuclear history of the mycetozoa must remain incomplete.

Jahn's observation of the mitotic division of nuclei preceding spore-formation in Ceratiomyxa gives a fixed point for comparison of the Exosporeae with the Endosporeae. Starting from this divi- sion it seems clear that the spore of Ceratiomyxa is comparable with the

spore of the Endosporeae except that the nucleus of the former has undergone two mitotic divisions.

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MYCONIUS, FRIEDRICH (1490-1546), Lutheran divine, was born on the 26th of December 1490, at Lichtenfels on the Main, of worthy and pious parents, whose family name, Mecum, gave 1 In the work cited in the last footnote Jahn described a fusion of nuclei as occurring in Ceratiomyxa at the stage at which the plasmodium is emerging to form sporophores. Jahn was at first inclined to regard this fusion as the sexual karyogamy of the life- cycle, but the writer learns by correspondence (July 1910) that he is inclined to regard this fusion as pathological, and to look for the essential karyogamy elsewhere.

rise to proud uses of the word as it appears in various places in the Vulgate, whereas Myconius, from the island Myconus, was a proverb for meanness. His schooling was in Lichtenfels and at Annaberg, where he had a memorable encounter with the Dominican, Tetzel, his point being that indulgences should be given pauperibus gratis. His teacher, Staffelstein, persuaded him to enter (July 14, 1510) the Franciscan cloister. That same night a pictorial dream turned his thoughts towards the religious standpoint which he subsequently reached as a Lutheran. From Annaberg he passed to Franciscan commu- nities at Leipzig and Weimar, where he was ordained priest (15 16); he had endeavoured to satisfy his mind with scholastic divinity, but next year his ” eyes and ears were opened ” by the theses of Luther, whom he met when Luther touched at Weimar on his way to Augsburg. For six years he preached his new gospel, under difficulties, in various seats of his order, lastly at Zwickau, whence he was called to Gotha (Aug. 1524) by Duke John at the general desire. Here he married Margaret Jacken, a lady of good family. He was intimately connected with the general progress of the reforming movement, and was especially in the confidence of Luther. Twice he was entrusted (1528 and 1533) with the ordering of the churches and schools in Thuringia. In all the religious disputations and conferences of the time he took a leading part. At the Con- vention of Smalkald

(1537) he signed the articles on his own behalf and that of his friend Justus Menius. In 1 53S he was in England, as theologian to the embassy which hoped to induce Henry VIII. on the basis of the Augsburg Confession, to make common cause with the Lutheran reformation; a project which Myconius caustically observed might have prospered on con- dition that Henry was allowed to be pope. Next year he was employed in the cause of the Reformation in Leipzig. Not the least important part of his permanent work in Gotha was the founding and endowment of its gymnasium. In 1541 his health was failing, but he lived till the 7th of April 1546. He had nine children, four of whom were living in 1542.

Though he published a good many tracts and pamphlets, Myconius was not distinguished as a writer. His Historia reformalionis, referring especially to Gotha, was not printed till 1 715. See Mel- chior Adam, Vitae iheologorum (1706); J. G. Bosseck, F. Myconii Memoriam . . . (1739) ; C. K. G. Lommatzsch, Narratio de F. Myconio (1825); K. F. Ledderhose, F. Myconius (1854); also in Allgemeine deutsche Biog. (1886); O. Schmidt and G. Kawerau in Hauck's Realencyklopadie (1903). (A. Go.*)

MYCONIUS, OSWALD (1488-1552), Zwinglian divine, was born at Lucerne in 1488. His family name was Geisshiisler; his father was a miller; hence he was also called Molitoris. The name Myconius seems to have been given him by Erasmus. From the school at Rottweil, on the Neckar, he went (15 10) to the university of Basel, and became a good classic. From 1 5 14 he obtained schoolmaster posts at Basel, where he married, and made the acquaintance of Erasmus and of Holbein, the painter. In 1516 he was called, as schoolmaster, to Zurich, where (1518) he attached himself to the reforming party of Zwingli. This led to his being transferred to Lucerne, and again (1523) reinstated at Zurich. On the death of Zwingli (1531) he migrated to Basel, and there held the office of town's preacher, and (till 1541) the chair of New Testament exegesis. His spirit was comprehensive; in confessional matters he was for a union of all Protestants; though a Zwinglian, his readiness to compromise with the advocates of consubstantiation gave him trouble with the Zwinglian stalwarts. He had, however, .a distinguished follower in Theodore Bibliander. He died on the 14th of October 1552.

Among his several tractates, the most important is De H. Zwinglii vita el obiiu (1536), translated into English by Henry Bennet (1561). See Melchior Adam, Vila Iheologorum (1620); M. Kirch- hofer, O. Myconius (1813) ; K. R. Hagenbach, J. Oekolampad und O. Myconius (1859); F. M. Ledderhose, in Allgemeine deutsche Biog. (1886) ; B.

Riggenbach and Egli, in Hauck's Realencyklopadie (1903).

(A. Go.*)

MYDDELTON (or Middleton), SIR HUGH, Bart. ■(<;. 1560- 1631), contractor of the New River scheme for supplying London with water, was a younger son of Sir Richard Myddelton, governor of Denbigh Castle. Hugh became a successful London

in

goldsmith, occupying a shop in Bassihaw, or Basinghall Street; he made money by commercial ventures on the Spanish main, being associated in these with Sir Walter Raleigh; and he was also interested in cloth-making. He was an alderman, and then recorder of Denbigh, and was member of parliament for this borough from 1603 to 1628. In 1609 Myddelton took over from the corporation of London the projected scheme for supplying the city with water obtained from springs near Ware, in Hert- fordshire. For this purpose he made a canal about 10 ft. wide and 4 ft. deep and over 38 m. in length, which discharged its waters into a reservoir at Islington called the New River Head. The completion of this great undertaking put a severe strain upon Myddelton's financial resources, and in 1612 he was successful in securing monetary assistance from James I. The work was completed in 1613 and Myddelton was made the first governor of the company, which, however, was not a financial success until after his death. In recognition of his services he was made a baronet in 1622. Myddelton was also engaged in working some lead and silver mines in Cardiganshire and in reclaiming a piece of the Isle of Wight from the sea. He died on the 10th of December 163 1, and was buried in the church of St Matthew, Friday Street, London. He had a family of ten sons and six daughters.

One of Sir Hugh's brothers was Sir Thomas Myddelton (c. 1550-1631), lord mayor of London, and another was William Myddelton (c. 1 5 56-1 62 1) , poet and seaman, who died at Antwerp on the 27th of March 1621.

Sir Thomas was a member of parliament under Queen Eliza- beth and was chosen lord mayor on the 29th of September 1613, the day fixed for the opening of the New River. Under James I. and Charles I. he represented the city of London in parliament, and he helped Rowland Heylyn to publish the first popular edition of the Bible in Welsh. He

died on the 12th of August 1 63 1. Sir Thomas's son and heir, Sir Thomas Myddelton 1586-1666), was a member of the Long Parliament, being an adherent of the popular party. After the outbreak of the Civil War he served in Shropshire and in north Wales, gaining a signal success over the royalists at Oswestry in July 1644, and another at Montgomery in the following September. In 1659, however, he joined the rising of the royalists under Sir George Booth, and in August of this year he was forced to surrender his residence, Chirk Castle. His eldest son, Thomas (d. 1663), was made a baronet in 1660, a dignity which became extinct when William the 4th baronet died in 17 18.

MYELAT, a division of the southern Shan States of Burma, including sixteen states, none of any great size, with a total area of 3723 sq. m., and a population in 190a of 119,415. The name properly means " the unoccupied country," but it has been occupied for many centuries. All central Myelat and great parts of the northern and southern portions consist of rolling grassy downs quite denuded of jungle. It has a great variey of different races, Taungthus and Danus being perhaps the most numerous. They are all more or less hybrid races. The chiefs of the Myelat are known by the Burmese title of gwegunh- mii; i.e. chiefs paying the revenue in silver. The amount paid by the chiefs to the British government is Rs. 99,567. The largest state, Loi Long, has an area of 1600 sq. m., a great part of which is barren hills. The smallest, Nam Hkon, had no more than 4 sq. m., and has been recently absorbed in a neigh- bouring state. The majority of the states cover less than 100 sq. m. Under British administration the chiefs have powers of a magistrate of the second class. The chief cultivation besides rice is sugar-cane, and considerable quantities of crude sugar are exported. There is a considerable potato cultivation, which can be indefinitely extended when cheaper means of export are provided. Wheat also grows very well.

MYELITIS (from Gr. /uu«A6s, marrow) a disease which by inflammation induces destructive changes in the tissues com- posing the spinal cord. In the acute variety the nerve elements in the affected part become disintegrated and softened, but repair may take place; in the chronic form the change is slower, and the diseased area tends to become denser (sclerosed), the

nerve-substance being replaced by connective tissue. Myelitis may affect any portion of the spinal cord, and its symptoms and progress will vary accordingly. Its most frequent site is in the lower part, and its existence there is marked by the sudden or gradual occurrence of weakness of motor power in the legs (which tends to pass into

complete paralysis), impairment or loss of sensibility in the parts implicated, nutritive changes affecting the skin and giving rise to bed-sores, together with bladder and bowel derangements. In the acute form, in which there is at first pain in the region of the spine and much con- stitutional disturbance, death may take place rapidly from extension of the disease to those portions of the cord connected with the muscles of respiration and the heart, from an acute bed-sore, which is very apt to form, or from some intercurrent disease. Recovery to a certain extent may, however, take place; or, again, the disease may pass into the chronic form. In the latter the progress is usually slow, the general health remaining tolerably good for a time, but gradually the strength fails, the patient becomes more helpless, and ultimately sinks exhausted or is cut off by some complication. The chief causes of myeiitis are injuries or diseases affecting the spinal column, extension of inflammation from the membranes of the cord to its substance (see Meningitis), exposure to cold and damp, and occasionally some pre-existing constitutional morbid condition, such as syphilis or a fever. Any debilitating cause or excess in mode of life will act powerfully in predisposing to this malady. The disease is most common in adults. The treatment for myelitis in its acute stage is similar to that for spinal meningitis. When the disease is chronic the most that can be hoped for is the relief of symptoms by careful nursing and attention to the condition of the body and its functions. Good is sometimes derived from massage and the use of baths and douches to the spine-.

MYERS, FREDERIC WILLIAM HENRY (1843-1901), English poet and essayist, son of Frederic Myers of Keswick — author of Lectures on Great Men (1856) and Catholic Thoughts (first collected 1873), a book marked by a most admirable prose style — was born at Keswick, Cumberland, on the 6th of February 1843, and edu- cated at Cheltenham and Trinity College, Cambridge, where he won a long list of honours and in 1865 was appointed classical lecturer. He had no love for teaching, which he soon discon*- tinued, but he took up his permanent abode at Cambridge in 1872, when he became a school inspector under the Education Department. Meanwhile he published, in 1867, an unsuccessful essay for the Seatonian prize, a poem entitled St Paul, which met at the hands of the general public with a success that would be difficult to explain, for it lacks sincerity and represents views which the writer rapidly outgrew. It was followed by small volumes of collected verses in 1870 and 1882: both are marked by a flow of rhetorical ardour which culminates in a poem of real beauty, ” The Renewal of Youth,” in the 1882 collection. His best verse is in heroic couplets. Myers is more likely to be remembered by his two

volumes of Essays, Classical and Modern (1883). The essay on Virgil, by far the best thing he ever wrote, represents the matured enthusiasm of a student and a disciple to whom the exquisite artificiality and refined culture of Virgil's method were profoundly congenial. Next to this in value is the carefully wrought essay on Ancient Greek Oracles (this had first appeared in Hellenica). Scarcely less delicate in phrasing and perception, if less penetrating in insight, is the monograph on Wordsworth (1881) for the " English Men of Letters " series. In 1882, after several years of inquiry and discussion, Myers took the lead among a small band of explorers (including Henry Sidgwick and Richard Hodgson, Edmund Gurney and F. Podmore), who founded the society for Psychical Research. He continued for many years to be the mouthpiece of the society, a position for which his perfervidutn ingenium, still more his abnormal fluency and alertness, admirably fitted him. He contributed greatly to the coherence of the society by steering a mid-course between extremes (the extreme sceptics on the one hand, and the enthusiastic spiritualists on the other), and by helping to sift and revise the cumbrous mass of

Proceedings, the chief concrete results being the two volumes of Phantasms of the Living (1886), to which he contributed the introduction. Like many theorists, he had a faculty for ignoring hard facts, and in his anxiety to generalize plausibly upon the alleged data, and to hammer out striking formulae, his insight into the real character of the evidence may have left something to be desired. His long series of papers on subliminal conscious- ness, the results of which were embodied in a posthumous work called Human Personality and Us Survival of Bodily Death (2 vols. 1903), constitute his own chief contribution to psychical theory. This, as he himself would have been the first to admit, was little more than provisional; but Professor William James has pointed out that the series of papers on subliminal consciousness is " the first attempt to consider the phenomena of hallucination, hypnotism, automatism, double personality and mediumship, as connected parts of one whole subject." The last work published in his lifetime was a small collection of essays, Science and a Future Life (1893). He died at Rome on the 17th of January 1901, but was buried in his native soil at Keswick.

MYINGYAN, a district in the Meiktila division of Upper Burma. It lies in the valley of the Irrawaddy, to the south of Mandalay, on the east

bank of the river. Area, 3137 sq. m. Pop. (1901), 356,052, showing an increase of 1% in the decade and a density of 1 14 inhabitants to the square mile. The greater part of the district is flat, especially to the north and along the banks of the Irrawaddy. Inland the country rises in gently undulating slopes. The most noticeable feature is Popa hill, an extinct volcano, in the south-eastern corner of the district. The highest peak is 4962 ft. above sea-level. The climate is dry and healthy, with high south winds from March till September. The annual rainfall averages about 35 in. The temperature varies between 106 and 70 F. The ordinary crops are millet, sesamum, cotton, maize, rice, gram, and a great variety of peas and beans. The district as a whole is not well watered, and most of the old irrigation tanks had fallen into disrepair before the annexation. There are no forests, but a great deal of low scrub. The lacquer ware of Nyaung-u and other villages near Pagan is noted throughout Burma. A considerable number of Chinese inhabit Myingyan and the larger villages. The headquarters town, Myingyan, stands on the Irrawaddy, and had a population in 1901 of 16,139. It is the terminus of the branch railway through Meiktila to the main line from Mandalay to Rangoon. The steamers of the Irrawaddy Flotilla Company also call here. A cotton-pressing machine was erected here in the time of independent Burma, and still exists.

MYITKYINA, the most northerly of the districts of Upper Burma in the Mandalay division, separated from Bhamo district in 1895. It is cut up into strips by comparatively low parallel ranges of hills running in a general way north and south. The chief plain is that of Myitkyina, covering 600 sq. m. To the east of the Irrawaddy, which bisects the district, it is low-lying and marshy. To the west it rises to a higher level, and is mostly dry. Except in the hills inhabited by the Kachin tribes there are practically no villages off the line of the Irrawaddy. The Indawgyi lake, a fine stretch of water measuring 16 m. by 6, lies in the south-west of the district. A very small amount of cultivation is carried on, mostly without irrigation. Area, 10,640 sq. m.; estimated population (1901) 67,399, showing a density of six persons to the square mile. More than half the total are Kachins, who inhabit the hills on both sides of the Irrawaddy. The headquarters town, Myitkyina, had in 1901 a population of 3618. It is the limit of navigation on the Irrawaddy, and the terminus of the railway from Rangoon and Sagaing.

MYLODON (Gr. for ” mill-tooth ” from nv\6iv and odovs), a genus of extinct American edentate mammals, typified by a species (M . harlani) from the Pleistocene of Kentucky and other parts of the United States, but more abundantly represented in the corresponding formations of South America, especially Argentina and Brazil. The

mylodons belong to the group of ground-sloths, and are generally included in the family Megath- eriidae, although sometimes made the type of a separate family. From Megatherium these animals, which rivalled the Indian

rhinoceros in bulk, differ in the shape of their cheek-teeth; these (five above and four below) being much smaller, with an ovate section, and a cupped instead of a ridged crown-surface, thus resembling those of the true sloths. In certain species of mylodon the front pair of teeth in each jaw is placed some distance in front of the rest and has the crown surface obliquely bevelled by

From Owen. Skeleton of Mylodon robustus (Pleistocene, South America).

wearing against the corresponding teeth in the opposite jaw. On this account such species have been referred to a second genus, under the name of Lestodon, but the distinction scarcely seems necessary. The skull is shorter and lower than in Megatherium, without any vertical expansion of the middle of the lower jaw, and the teeth also extend nearly to the front of the jaws; both these features being sloth-like. In the fore feet the three inner toes have large claws, while the two outer ones are rudimentary and clawless; in the hind-limbs the first tee is wanting, as in Megatherium, but the second and third are clawed. The skin was strengthened by a number of small deeply-embedded bony nodules.

Although the typical M. harlani is North American, the mylodons are essentially a South American group, a few of the representatives of which effected an entrance into North America when that continent became finally connected with South America. Special interest attaches to the recent discovery in the cavern of Ultima Esperanza, South Patagonia, of remains of the genus Glossotherium, or Grypotherium, a near relative of Mylodon, but differing from it in having a bony arch connecting the nasal bones of the skull with the premaxillae; these include a considerable portion of the skin with the hair attached. Ossicles somewhat resembling large coffee-berries had been previously found in association with the bones of Mylodon, and in Glossotherium nearly similar ossicles occur embedded on the inner side of the thick hide. The coarse and shaggy hair is somewhat like that of the sloths. The remains, which include not only the skeleton and skin, but likewise the droppings, were found buried in grass which appears to have been chopped up by man, and it thus seems not only evident that these ground-sloths dwelt in the cave, but that there is a considerable probability of their having been kept there in a semi-

domesti- cated state by the early human inhabitants of Patagonia. The extremely fresh condition of the remains has given rise to the idea that Glossotherium may still be living in the wilds of Patagonia.

Scelidoiherium is another genus of large South American Pleisto- cene ground-sloths, characterized, among other features, by the elongation and slenderness of the skull, which thus makes a decided approximation to the anteater type, although retaining the full series of cheek-teeth, which were, of course, essential to an herbi- vorous animal. The feet resemble those of Megatherium. A much smaller South American species represents the genus Nothrotherium.

In North America Mylodon was accompanied by another gigantic species typifying the genus Megalonyx, in which the fore part of the skull was usually wide, and the third and fourth front toes carried claws. Another genus has been described from the Pleistocene

of Nebraska, as Param'ylodon; it has only four pairs of teeth, and an elongate skull with an inflated muzzle. All the above genera differ from Megatherium in having a foramen on the inner side of the lower end of the humerus. A presumed large ground-sloth from Mada- gascar has been described, on the evidence of a limb-bone, as Brady- therium, but it is suggested by Dr F. Ameghino that the specimen really belongs to a lemuroid. Be this as it may, the North American mammals described as Moropus and Morotherium, in the belief that they were ground-sloths, are really referable to the ungulate group Ancylopoda.

Although a few of the Pleistocene ground-sloths, such as Nothro- pus and Nothrotherium (= Coelodon) , were of comparatively small size, in the Santa Cruz beds of Patagonia few of the representatives of the family much exceeded a modern sloth in size. The best- known generic types are Eucholoeops, Hapalops and Pseudahapalops, of which considerable portions of the skeleton have been disinterred. In these diminutive ground-sloths the crowns of the cheek-teeth approached the prismatic form characteristic of Mega[lo]therium, as distinct from the subcylindrical type occurring in Mylodon, Glossotherium, &c.

By many palaeontologists a group of North American Lower Tertiary mammals, known as Ganodonta, has been regarded as representing the ancestral stock of the ground-sloths and those of other South

American edentates; but according to Professor W. B. Scott this view is incorrect and there is no affinity between the two groups. If this be so, we are still in complete darkness as to the stock from which the South American edentates are derived.

See W. B. Scott, Mammalia of the Santa Cruz Beds, Edentata, Rep., Princeton Exped. to Patagonia, vol. v. (1903-1904); B. Brown A Xew Genus of Ground-Sloth from the Pleistocene of Nebraska, Bull. Amer. Mus. Nat. Hist., xix, 569 (1903). (R. L.*)

MYLONITE (Gr. /xv\uv, a mill), in petrology, a rock which has been crushed and ground down by earth movement and at the same time rendered compact by pressure. Mylonites are fine- grained, sometimes even flinty, in appearance, and often banded in parallel fashion with stripes of varying composition. The great majority are quartzose rocks, such as quartzite and quartz- schist; but in almost any type of rock mylonitic structure may be developed. Gneisses of various kinds, hornblende-schists, chlorite-schists and limestones are not infrequently found in belts of mylonitic rock. The process of crushing by which mylonites are formed is known also as ” granulitization ” and ” cataclasis,” and mylonites are often described as granulites, though the two terms are not strictly equivalent in all their applications. Mylonites occur in regions where there has been considerable metamorphism. Thrust planes and great reversed faults are often bounded by rocks which have all been crushed to fine slabby mylonites, that split readily along planes parallel to the direction in which movement has taken place. These ” crush-belts ” may be only a few feet or several hundred yards broad. The movements have probably taken place slowly without great rise of temperature, and hence the rocks have not recrystallized to any extent.

Crushing and movement on so extensive a scale are to be expected principally in regions consisting of rocks greatly folded and compressed. Hence mylonites are commonest in Archean regions, but may be found also in Carboniferous and later rocks where the necessary conditions have prevailed. Within a short space it is often possible to trace rocks from a normal to a highly mylonized condition, and to follow by means of the microscope all the stages of the process. A sandstone, grit, or fine quartzose conglomerate, for example, when it approaches a mylonitic zone begins to lose its clastic or pebbly structure. The rounded grains of quartz become cracked, especially near their edges, and are then surrounded bv narrow borders, consisting of detached granules: this is due to the pebbles being pressed together and forced to pass one another as the rock yields to the pressures which overcome its rigidity. Then each quartz grain

breaks up into a mosaic of little angular fragments; the rounded pebbles are flattened out and become lenticular or cake- shaped. Finally only a small oval patch of fine interlocking quartz grains is left to indicate the position of the pebble, and if the matrix is quartzose this gradually blends with it and a uniform fine-grained quartzose rock results. If felspar is present it may become crushed like quartz, but often tends to recrystallize as quartz and muscovite, the minute scales of white mica being parallel to the foliation or banding of the rock, and a finely granulitic or mylonitic quartz- scliist is the product. In hornblendic rocks, such as epidiorite, amphibolitc and hornblende-schist, the mineral composition may remain unchanged, but very often chlorite, carbonates and biotite develop, epidote and sphene being also frequent. Biotite- and mus- covite-gneisses yield very perfect mylonites, in which the micas have parallel orientation, giving the rock a flat banding and marked schistosity (see Petrology, PI. iv., fig. 6). When these mylonitic

gneisses contain pink garnet (often with kyanite or sillimanite) they pass into normal granulites ; limestones, if fossilif erous, become changed into finely crystalline masses, often fissile, sometimes with lenticular or augen structure. An interesting variety of mylonite, developed in granite-porphyry and gneiss, is fine, dark and almost vitreous in appearance, consisting mainly of very minute grains of quartz and felspar and resembling flint in appearance. These form threads and vein-like streaks ramifying through the normal rocks. Examples are furnished by the flinty-crushes of west Scot- land and the ” trap-shotten ” gneisses of south India. (J. S. F.)

MYMENSINGH, or Maimansingh, a district of British India, in the Dacca division of Eastern Bengal and Assam. It occupies a portion of the alluvial valley of the Brahmaputra east of the main channel (called the Jamuna) and north of Dacca. The administrative headquarters are at Nasirabad, sometimes called Mymensingh town. Area, 6332 sq. m. Pop. (1901), 3,915,068, showing an increase of 12-8% in the decade. The district is for the most part level and open, covered with well-cultivated fields, and intersected by numerous rivers. The Madhupur jungle is a slightly elevated tract, extending from the north of Dacca district into the heart of Mymensingh; its average height is about 60 ft. above the level of the surrounding country, and it nowhere exceeds 100 ft. The jungle contains abundance of sal, valuable both as timber and for charcoal. The only other elevated tract in the district is on the southern border, where the Susang hills rise. They are for the most part covered with thick thorny jungle, but in parts are barren and rocky. The Jamuna forms the western boundary of Mymensingh for a course of 94 m. It is navigable for large boats throughout the year;

and during the rainy season it expands in many places to 5 or 6 m. in breadth. The Brahmaputra enters Mymensingh at its north-western corner near Karaibari, and flows south-east and south till it joins the Meghna a little below Bhairab Bazar. The gradual formation of chars and bars of sand in the upper part of its course has diverted the main volume of water into the present channel of the Jamuna, which has in consequence become of much more importance than the Brahmaputra proper. The Meghna only flows for a short distance through the south-east portion of the district, the eastern and south-eastern parts of which abound in marshes. The staple crops of the country are rice, jute and oil-seeds. A branch line of the Eastern Bengal railway runs north from Dacca through Nasirabad, &c, to the Jamuna. The district was severely affected by the earthquake of the 12th of June 1897.

MYNGS, SIR CHRISTOPHER (1625-1666), British admiral, came of a Norfolk family. Pepys' story of his humble birth is said to be erroneous. It is probable that he saw a good deal of sea-service before 1648. He first appears prominently as the captain of the " Elisabeth," which after a sharp action brought in a Dutch convoy with two men-of-war as prizes. From 1653 to 1655 he continued to command the " Elisabeth," high in favour with the council of state and recommended for promotion by the flag officers under whom he served. In 1655 he was appointed to the " Marston Moor," the crew of which was on the verge of mutiny. His firm measures quelled the insubordinate spirit, and he took the vessel out to the West Indies, where he remained for some years. The Restoration government retained him in his command, and in 1664 he was made vice-admiral in Prince Rupert's squadron. As vice-admiral of the White he flew his flag at Lowestoft in 1665, and for his share in that action received the honour of knighthood. In the following year he served under the new lord high admiral, Sandwich, as vice- admiral of the Blue. He was on detachment with Prince Rupert when the great Four Days' Battle began, but returned to the main fleet in time to take part, and in this action he received a wound of which he died.

MYONEMES, in Infusoria and some Flagellates, the differ- entiated threads of ectosarc, which are contractile and doubly refractive, performing the function of muscular fibres in the Metazoa.

MYRA (mod. Dembre), an ancient town of Lycia situated a short distance inland between the rivers Myrus and Andracus. In common with that of most other Lycian towns its early history

is not known, and it does not play any part of importance in either Greek or Roman annals. Its fame begins with Chris- tianity. There St Paul touched on his last journey westward (a.d. 62), and changed into ” a ship of Alexandria sailing into Italy.” In the 3rd century the great St Nicholas, born at Patara, was its bishop, and he died and was burfed at Myra. His tomb is still shown, but his relics are supposed to have been trans- lated to Bari in Italy in the nth century. Theodosius II. made Myra the Byzantine capital of Lycia, and as such it was besieged and taken by Harun al-Rashid in 808. The town seems shortly afterwards to have decayed. A small Turkish village occupied the plain at the foot of the acropolis, and a little Greek monastery lay about a mile westward by the church of St Nicholas. The latter has formed the nucleus of modern Dembre, which has been increased by settlers from the Greek island of Castelorizo. Myra has three notable sights, its carved cliff-cemetery, its theatre, and its church of St Nicholas. The first is the most remarkable of the Lycian rock-tomb groups. The western scarp of the acropolis has been sculptured into a number of sepulchres imitating wooden houses with pillared facades, some of which have pediment reliefs and inscriptions in Lycian. The theatre lies at the foot of this cliff and is partly excavated out of it, partly built. It is remarkable for the preservation of its corri- dors. The auditorium is perfect in the lower part, and the scena still retains some of its decoration — both columns and carved entablature. The church of St Nicholas lies out in the plain, at the western end of Dembre, near a small monastery and new church recently built with Russian money. Its floor is far below the present level of the plain, and until recently the church was half filled with earth. The excavation of it was undertaken by Russians about 1,804 an d it cost Dembre dear; for the Ottoman government, suspicious of foreign designs on the neighbouring harbour of Kekova, proceeded to inhibit all sale of property in the plain and to place Dembre under a minor state of siege. The ancient church is of the domed basilica form with throne and seats still existent in the tribunal. In the south aisle as a tomb with marble balustrade which is pointed out as that wherein St Nicholas was laid. The locality of the tomb is very probably genuine, but its present ornament, as well as the greater part of the church, seems of later date (end of 7th century ?). None the less this is among the most interest- ing early Christian churches in Asia Minor. There are also extensive ruins of Andriaca, the port of Myra, about 3 m. west, containing churches, baths, and a great grain store, inscribed with Hadrian’s name. They lie along the course of the Andraki river, whose navigable estuary is still fringed with ruinous quays.

See E. Petersen and F. v. Luschan, Reisen in Lykien, &c. (1889).

(D. G. H.)

MYRIAPODA (Gr. for ” many-legged “), arthropod animals of which centipedes and millipedes are familiar examples. Linnaeus included them in his Insecta Aptera together with Crustacea and Arachnida; in 1796 P. A. Latreille designated them as Myriopodk, making of them, along with the Crustacean Oniscus, one of the seven orders into which he divided the Aptera of Linnaeus. Later on J. C. Savigny, by study of the mouth-parts, clearly distinguished them from Insects and Crustacea. In 1814 W. E. Leach defined them and divided them into Centipedes and Millipedes. In 1825 Latreille carried further the observations of Leach, and suggested that the two groups were very distinct, the millipedes being nearer Crustacea and the centipedes approaching Arachnida and Insecta. Although Latreille’s suggestion has not been adopted, it is recognized that centipedes and millipedes are too far apart to be united as Myriapoda, and they are now treated as separate classes of the Arthropoda. See Centipede (Chiiopoda) and Millipede (Diplopoda).

MYRMIDONES, in Greek legend, an Achaean race, in Homeric times inhabiting Phthiotis in Thessaly. According to the ancient tradition, their original home was Aegina, whence they crossed over to Thessaly with Peleus, but the converse view is now more generally accepted. Their name is derived from a supposed

ancestor, son of Zeus and Eurymedusa, who was wooed by the god in the form of an ant (Gr. jtup/uij£); or from the repeopling of Aegina (when all its inhabitants had died of the plague) with ants changed into men by Zeus at the prayer of Aeacus, king of the island. The word ” myrmidon ” has passed into the English language to denote a subordinate who carries out the orders of his superior without mercy or consideration for others. See Strabo viii. 375, ix. 433; Homer, Iliad, ii. 681 ; schol. on Pindar Nem. iii. 21 ; Clem. Alex., Protrepticon, p. 34, ed. Potter.

MYROBALANS, the name given to the astringent fruits of several species of Terminalia, largely used in India for dyeing and tanning and exported for the same purpose. They are large deciduous trees and belong to the family Combretaceae. The chief kinds are the chebulic or black myrobalan, from Terminalia Chebula, which are smooth, and the beleric, from T. belerica, which are five-angled and covered with a greyish down.

MYRON, a Greek sculptor of the middle of the 5th century B.C. He was born at Eleutherae on the borders of Boeotia and Attica. He worked almost exclusively in bronze: and though he made some statues of gods and heroes, his fame rested principally upon his representations of athletes, in which he made a revolution, by introducing greater boldness of pose and a more perfect rhythm. His most famous works according to Pliny (Nat. Hist., 34, 57) were a cow, Ladas the runner, who fell dead at the moment of victory, and a discus-thrower. The cow seems to have earned its fame mainly by serving as a peg on which to hang epigrams, which tell us nothing about the pose of the animal. Of the Ladas there is no known copy. But we are fortunate in pos- sessing several copies of the discobolus, of which the best is in the Massimi palace at Rome (see Greek Art, PI. iv. fig. 68). The example in the British Museum has the head put on wrongly. The athlete is represented at the moment when he has swung back the discus with the full stretch of his arm, and is about to hurl it with the full weight of his body. The head should Ix, turned back toward the discus.

A marble figure in the Lateran Museum (see Greek Art, PI. iii. fig. 64), which is now restored as a dancing satyr, is almost certainly a copy of a work of Myron, a Marsyas desirous of picking up the flutes which Athena had thrown away (Pausa- nias, i. 24, 1). The full group is copied on coins of Athens, on a vase and in a relief which represent Marsyas as oscillating between curiosity and the fear of the displeasure of Athena.

The ancient critics say of Myron that, while he succeeded admirably in giving life and motion to his figures, he did not succeed in rendering the emotions of the mind. This agrees with the extant evidence, in a certain degree, though not per- fectly. The bodies of his men are of far greater excellence than the heads. The face of the Marsyas is almost a mask; but from the attitude we gain a vivid impression of the passions which sway him. The face of the discus-thrower is calm and unruffled; but all the muscles of his body are concentrated in an effort.

A considerable number of other extant works are ascribed to the school or the influence of Myron by A. Furtwangler in his suggestive Masterpieces of Greek Sculpture (pp. 168-219). These attributions, however, are anything but certain, nor do the arguments by which Furtwangler supports his attributions bear abridgment.

A recently discovered papyrus from Egypt informs us that Myron made statues of the athlete Timanthes, victorious at Olympia in 456 B.C., and of Lycinus, victorious in 448 and 444. This helps us to fix his date. He was a contemporary, but a somewhat older contemporary, of Pheidias and Polyclitus.

(P.G.) MYRRH (from the Latinized form myrrha of Gr. jxv'ppa; the Arabic murr, bitter, was applied to the substance from its bitterness), a gum-resin highly esteemed by the ancients as an unguent and perfume, used for incense in temples and also in embalming. It was one of the gifts offered by the Magi, and a royal oblation of gold, frankincense and myrrh is still annu- ally presented by the sovereign on the feast of Epiphany in the Chapel Royal in London, this custom having been in

existence certainly as early as the reign of Edward I. 1 True myrrh is the product of Balsamodendron {Commiphora) Myrrha, a small tree of the natural order Amyridaceae that grows in eastern Africa and Arabia, but the name is also applied to gum resins obtained from other species of Balsamodendt on.

i. Baisa Bol, Bhesa Bol or Bissa Bol, from Balsamodendron Kataf, resembles true myrrh in appearance, but has a disagreeable taste and is scarcely bitter. It is used in China, mixed with food, to give to milch cows to improve the quality and increase the quantity of milk, and when mixed with lime as a size to impart a gloss to walls. (2) Opaque bdellium produced by B. Playfairii, when shaken with water forms a slight but permanent lather, and on this account is used by the Somali women for cleansing their hair, and by the men to whiten their shields ; it is known as meena harma in Bombay, and was formerly used there for the expulsion of the guinea-worm. (3) African bdellium is from B. africa'num, and like opaque bdellium lacks the white streaks which are characteristic of myrrh and bissa bol, both are acrid, but have scarcely any bitter- ness or aroma. (4) Indian bdellium, probably identical with the Indian drug googul obtained in Sind and Baluchistan from B. Mukul and B. pubescens, Hook, is of a dark reddish colour, has an acrid taste and an odour resembling cedar-wood, and softens in the hand.

As met with in commerce true myrrh occurs in pieces of irregular size

and shape, from § in. to 2 or 3 in. in diameter, and of a reddish-brown colour. The transverse fracture has a resinous appearance with white streaks; the flavour is bitter and aromatic, and the odour characteristic. It consists of a mixture of resin, gum and essential oil, the resin being present to the extent of 25 to 40%, with 25 to 8% of the oil, myrrhol, to which the odour is due.

Myrrh has the properties of other substances which, like it, contain a volatile oil. Its only important application in medi- cine is as a carminative to lessen the griping caused by some purgatives such as aloes. The volatile oils have for centuries been regarded as of value in disorders of the reproductive organs, and the reputation of myrrh in this connexion is simply a survival of this ancient but ill-founded belief.

MYRTLE. The juupros of the Greeks, the myrtus of the Romans, and the myrtle, Myrtus communis (see fig.), of botanists, as now found growing wild in many parts of the Mediterranean region, doubtless all belong to one and the same species. It is a low-growing, evergreen shrub, with opposite leaves, varying in

Myrtle {Myrtus communis).

1. Vertical section of flower, 3. Berry, enlarged.

enlarged. 4. Seed with contained embryo,

2. Plan of flower in horizontal e, much enlarged.

plane.

dimensions, but always small, simple, dark-green, thick in tex- ture, and studded with numerous receptacles for oil. When the leal is held up to the light it appears as if perforated with pin-

1 Liber quotidianus contra-rotulatoris garderobae Edw. I. (London, ‘787), pp, xxxii. and 27.

holes owing to the translucency of these oil-cysts. The fragrance of the plant depends upon the presence of this oil. Another peculiarity of the myrtle is the existence of a prominent vein running round the leaf within the margin. The flowers are borne on short stalks in the axils of the leaves. The flower-stalk is dilated at its upper end into a globose or ovoid receptacle enclosing the 2- to 4-partitioned ovary. From its margin pro- ceed the five sepals, and within them the five rounded, spoon- shaped, spreading, white petals. The stamens spring from the

receptacle within the petals and are very numerous, each consist- ing of a slender white filament and a small yellow two-lobed anther. The style surmounting the ovary is slender, terminating in a small button-like stigma. The fruit is a purplish berry, consisting of the receptacle and the ovary blended into one succulent investment enclosing very numerous minute seeds. The embryo-plant within the seed is usually curved. In cultiva- tion many varieties are known, dependent on variations in the size and shape of the leaves, the presence of so-called double flowers, &c. The typical species is quite hardy in the south of England. The Chilean species, M . Ugni. a shrub with ovate, dark green leaves and white flowers succeeded by globular red or black glossy truit with a pleasant smell and taste, is a greenhouse shrub, hardy in south-west Britain. The common myrtle is the sole representative in Europe of a large genus which has its headquarters in extra-tropical South America, whilst other members are found in Australia and New Zealand. The genus Myrtus also gives its name to a very large natural order, Myrtaceae, the general floral structure of which is like that of the myrtle above described, but there are great differences in the nature of the fruit or seed-vessel according as it is dry or capsular, dehiscent, indehiscent or pulpy; minor differences exist according to the way in which the stamens are arranged. The aromatic oil to which the myrtle owes its fragrance, and its use in medicine and the arts, is a very general attribute of the order, as may be inferred from the fact that the order includes, amongst other genera, Eucalyptus {q.v.), Pimenta and Eugenia (cloves). Myrlol, a constituent of myrtle oil, has been given in doses of 5-15 minims on sugar or in capsules for pulmonary tuberculosis, fetid bronchitis, bronchiectasis, and similar conditions. It appears to lessen expectoration in such cases. The leaves of Myrtus chekan are aromatic and expectorant, and have been used in chronic bronchitis.

MYSIA, the district of N.W. Asia Minor in ancient times inhabited by the Mysi. It was bounded by Lydia and Phrygia on the S., by Bithynia on the N.E., and by the Propontis and Aegean Sea on the N. and W. But its precise limits are difficult to assign, the Phrygian frontier being vague and fluctuating, while in the north-west the Troad was sometimes included in Mysia,- sometimes not. Generally speaking, the northern portion was known as Mysia Minor or Hellespontica and the southern as Major or Pergamene.

The chief physical features of Mysia (considered apart from that of the Troad) are the two mountain-chains, Olympus (7600 ft.) in the north and Temnus in the south, which for some distance separates Mysia from Lydia, and is afterwards prolonged through Mysia to the neighbourhood of the Gulf of Adramyttium. The only considerable

rivers are the Macestus and its tributary the Rhyndacus in the northern part of the province, both of which rise in Phrygia, and, after diverging widely through Mysia, unite their waters below the lake of Apollonia about 15 m. from the Propontis. The Cai'cus in the south rises in Temnus, and from thence flows westward to the Aegean Sea, passing within a few miles of Pergamum. In the northern portion of the province are two considerable lakes, Artynia or Apolloniatis (Abulliont Geul), and Aphnitis (Maniyas Geul), which discharge their waters into the Macestus from the east and west respectively.

The most important cities were Pergamum {q.v.) in the valley of the Cai'cus, and Cyzicus {q.v.) on the Propontis. But the whole sea-coast was studded with Greek towns, several of which were places of considerable importance; thus the northern portion included Parium, Lampsacus and Abydos, and the southern

Assus, Adramyttium, and farther south, on the Elaitic Gulf, Elaea, Myrina and Cyme.

Ancient writers agree in describing the Mysians as a distinct people, like the Lydians and Phrygians, though they never appear in history as an independent nation. It appears from Herodotus and Strabo that they were kindred with the Lydians and Carians, a fact attested by their common participation in the sacred rites at the great temple of Zeus at Labranda, as well as by the statement of the historian Xanthus of Lydia that their language was a mixture of Lydian and Phrygian. Strabo was of opinion that they came originally from Thrace (cf. Bithynia), and were a branch of the same people as the Mysians or Moesians (see Moesia) who dwelt on the Danube — a view not inconsistent with the preceding, as he considered the Phrygians and Lydians also as having migrated from Europe into Asia. According to a Carian tradition reported by Herodotus (i. 171) Lydus and Mysus were brothers of Car — an idea which also points to the belief in a common origin of the three nations. The Mysians appear in the list of the Trojan allies in Homer and are repre- sented as settled in the Caicus valley at the coming of Telephus to Pergamum; but nothing else is known of their early history. The story told by Herodotus (vii. 20) of their having invaded Europe in conjunction with the Teucrians before the Trojan War is probably a fiction; and the first historical fact we learn is their subjugation, together with all the surrounding nations, by Lydian Croesus. After the fall of the Lydian monarchy they

remained under the Persian Empire until its overthrow by Alexander. After his death they were annexed to the Syrian monarchy, of which they continued to form a part until the defeat of Antiochus the Great (190 B.C.), after which they were trans- ferred by the Romans to the dominion of Eumenes of Pergamum. After the extinction of the Pergamenian dynasty (130 B.C.) Mysia became a part of the Roman province of Asia, and from this time disappears from history. The inhabitants probably became gradually Hellenized, but none of the towns of the interior, except Pergamum, ever attained to any importance.

See C. Texier, Asie mineure (Paris, 1839) ; W. J. Hamilton, Researches (London, 1842); J. A. R. Munro in Geogr. Journal (1897, Hellespontica) ; W. von Diest, Petermanns Mirth. (Erganzungsheft 94; Gotha, 1889; Pergamene). (F. W. Ha.)

MYSLOWITZ, a town of Germany, in the Prussian province of Silesia. Pop. (1905), 1 5,845. It lies on the navigable Przemsa, across which an iron bridge leads to the Polish town of Modr- zejow, 120 m. S.E. from Breslau by rail, and an important junction of lines to Oswiecim-Lemberg and Vienna. It contains a Protestant and three Roman Catholic churches, a palace and a gymnasium, and other schools. Extensive coal-mines are worked, and among its other industries are flax-spinning and brick-making. It became a town in 1857.

See Lustig, Geschichte von Myslowitz (Myslowitz, 1867).

MYSORE, a native state of southern India, almost surrounded by the Madras presidency, but in political relations with the governor-general. It is naturally divided into two regions of distinct character — the hill country called the Malnad, on the west, and the more open country known as the Maidan, compris- ing the greater part of the state, where the wide-spreading valleys and plains are covered with villages and populous towns. The drainage of the country, with a slight exception, finds its way into the Bay of Bengal, and is divisible into three great river systems — that of the Kistna on the north, the Cauvery on the south, and the Northern and Southern Pennar and Palar on the east. Owing to either rocky or shallow beds none of the Mysore rivers is navigable, but some are utilized for floating down timber at certain seasons. The main streams, especially the Cauvery and its tributaries, support an extensive system of irrigation by means of channels drawn from immense dams (anicuts), which retain the water at a high level and permit only the overflow to pass down stream. The streams which gather from the hill-sides and fertilize the valleys are embanked at every favourable point in such a manner as to

form a series of reservoirs or tanks, the outflow from one at a higher level supply- ing the next lower, and so on, all down the course of the stream

at short intervals. These tanks, varying in size from small ponds to extensive lakes, are dispersed throughout the country to the number of 20,000; the largest is the Sulekere lake, 40 m. in circumference.

Mysore is perhaps the most prosperous native state in India. Situated on a healthy plateau, it receives the benefit of both the south-west and north-east monsoons, a natural advantage which, in conjunction with its irrigation system, has brought to Mysore a larger degree of immunity from famine than almost any other internal tract of India (always excepting the great calamity of 1876-1877, when one-fourth of the population are believed to have perished). Coffee, sandal-wood, silk, gold and ivory are among the chief products. The famous Kolar gold-fields are worked by electric power, which is conveyed for a distance of 92 m. from the Cauvery Falls. This was the first electric power scheme of magnitude in Asia. A long period of administration by British officers led to the introduction of a system based on British models, which has been maintained under a series of exceptionally able native ministers, and the state can boast of public works, hospitals, research laboratories, &c, unsurpassed in India.

The total area of the state is 29,433 S Q- m -> subdivided into 8 districts, namely: Bangalore, Kolar, Tumkur, Mysore, Hassan, Kadur, Shimoga and Chitaldrug. Pop. (1901), 5,539,399, showing an increase of 18% between 1881 and 1891, and of 12% between 1891 and 1901. The proportion of Hindus (92-1%) is larger than in any province of India, showing how ineffectual was the persecution of Hyder and Tippoo. The Christians (apart from native converts, who are chiefly Roman Catholics) largely consist of the garrison at Bangalore, the families of military pensioners at the same town, coffee- planters and gold-miners. The finances of the state have been very successfully managed under native rule, assisted by large profits from railways and gold-mines. The revenue amounts to about £1,400,000, of which nearly half is derived from land. In accordance with the ” instrument of transfer,” Mysore pays to the British government a tribute of £234,000, as contribution to military defence ; but the full amount was not exacted until 1896. The state maintains a military force, consisting of two regiments of silladar cavalry and three bat- talions of infantry — total, about 2800 men; and also a regiment of imperial service lancers, with a transport corps. An interest- ing political experiment has been made, in the constitution of a representative assembly, composed of 350 representatives of all classes of the

community, who meet annually to hear an account of the state administration for the previous year. The assembly has no power to enact laws, to vote supplies, or to pass any resolution binding upon the executive. But it gives to the leading men of the districts a pleasant opportunity of visiting the capital, and to a limited extent brings the force of public opinion to bear upon the minister. Since 1891 this representa- tive assembly has been elected by local boards and other public bodies.

In the earliest historical times the northern part of Mysore was held by the Kadamba dynasty, whose capital, Banawasi, is mentioned by Ptolemy; they reigned with more or less splendour during fourteen centuries, though latterly they became feuda- tories of the Chalukyas. The Cheras were contemporary with the Kadambas, and governed the southern part of Mysore till they were subverted by the Cholas in the 8th century. Another ancient race, the Pallavas, held a small portion of the eastern side of Mysore, but were overcome by the Chalukyas in the 7th cen- tury. These were overthrown in the 1 2th century by the Ballalas (Hoysalas), an enterprising and warlike race professing the Jain faith. They ruled over the greater part of Mysore, and portions of the modern districts of Coimbatore, Salem and Dharwar, with their capital at Dwarasamudra (the modern Halebid); but in 1310 the Ballala king was captured by Malik Kafur, the general of Ala-ud-din; and seventeen years later the town was entirely destroyed by another force sent by Mahommed Tughlak. After the subversion of the Ballala dynasty, a new and powerful Hindu sovereignty arose at Vijayanagar on the Tungabhadra.

In 1565 a confederation of the Mahommedan kingdoms de- feated the Vijayanagar sovereign at the battle of Talikota; and his descendants ultimately became extinct as a ruling house. During the feeble reign of the last king, the petty local chiefs (palcgars) asserted their independence. The most important of these was the wcdeyar of Mysore, who in 1610 seized the fort of Seringapatam, and so laid the foundation of the present state. His fourth successor, Chikka Deva Raja, during a reign of 34 years, made his kingdom one of the most powerful in southern India. In the middle of the 18th century the famous Mahommedan adventurer Hyder Ali usurped the throne, and by his military prowess made himself one of the most powerful princes of India. His dynasty, however, was as brief as it was brilliant, and ended with the defeat and death of his son Tippoo at

Seringapatam in 1799. A representative of the ancient Hindu line was then replaced on the throne. This prince, Krishnaraja Wodeyar, was only five years old, and until he came of age in 181 1 the state was under the administration of Purnaiya, the Brahman minister of Hyder and Tippoo. When Krishnaraja took over the management of his state he received an orderly and contented principality with a surplus of two crores of rupees. Within twenty years he had driven his subjects into rebellion and involved himself and his state in heavy debt. The British government therefore assumed the administration in 1831, and placed it in the hands of com- missioners. In 1862 no less than 88 lakhs of state debts and of the maharaja!s own liabilities had been liquidated; the entire administration had been reformed, a revised system of land revenue introduced, and many public works executed. The maharaja therefore pressed his claims to a restoration of his powers, but the British government refused the application as incompatible with the true interests of the people of Mysore, and as.not justified by any treaty obligation. In the same year Chamarajendra Wodeyar, afterwards maharaja, was born of the Bettada Kote branch of the ruling house; and in June 1865 Maharaja Krishnaraja adopted him as his son and successor, although he had been informed that no adoption could be recognized except to his own private property, already once more heavily weighted with private debts. In 1867 the policy of government underwent a change; it was determined to secure the continuance of native rule in Mysore, by acknowledging the adoption upon certain conditions which would secure to the people the continued benefits of good administration enjoyed by them under British control. The old maharaja died on the 27th of March 1868, and Chamarajendra Wodeyar was publicly installed as the future ruler of Mysore on the 23rd of September 1868. His education was taken in hand, abuses which had grown up in the palace establishment were reformed, the late maharaja's debts were again paid off, and the whole internal administration perfected in every branch during the minority. On the 25th of March 1881 Maharaja Chamarajendra, having attained the age of 18 years, was publicly entrusted with the administration of the state. He made over to the British government, with full jurisdiction, a small tract of land at Bangalore, forming the " civil and military station," and received in return the island of Seringapatam. But the most important incident of the change was the signing of the " instrument of transfer," by which the young maharaja, for himself and his successors, undertook to perform the conditions imposed upon him. To that agree- ment the maharaja steadfastly adhered during his reign, and the instrument is a landmark in the history of British relations with the protected states of India. The maharaja's first minister was Ranga Charlu, who had been

trained in the British administration of Mysore. He signalized the restoration of native rule by creating the representative assembly. In 1883 Sheshadri Aiyar succeeded Ranga Charlu, and to him Mysore is indebted for the extension of railways and schemes of irrigation, the development of the Kolar goldfields, and the maintenance of the high standard of its administration. The maharaja died at Calcutta on the 28th of December 1894. His eldest son, Krishnaraja Wodeyar, born in 1884, succeeded him, and his widow, Maharani Vanivilas, was appointed regent,

until in 1902 the maharaja was formally invested with full powers by the viceroy in person.

See B. L. Rice, Mysore {2nd ed., Bangalore, 1897); Mysore and Coorg Gazetteer (Calcutta, 1908).

MYSORE, capital of the state of Mysore, India, 10 m. S.W. of Seringapatam on the Mysore State railway. Pop. (1901), 68,111. The city, which is spread over an area of about 7! sq. m., has its nucleus at the foot of the Chamundi hill, in a valley formed by two parallel ridges running north and south. The fort stands in the south of the town, forming a quarter by itself; the ground- plan is quadrangular, each of the sides being about 450 yds. long. The old palace of the maharaja within the fort, built in an extravagant style of Hindu architecture, was partly destroyed by fire in 1897, whereupon a new palace was built on the same site. The principal object of interest in the old palace was the throne, which is said to have been presented to Chikka Deva Raj by the emperor Aurangzeb. The houses of the European residents are for the most part to the east of the town. The residency or government house was built in 1805. The building afterwards used for the district offices was originally built by Colonel Wellesley (duke of Wellington) for his own occupation. The domed building for the public offices in Gordon Park, the Maharaja's College, the Victoria Jubilee Institute, and the law courts are conspicuous. Mysore, though the dynastic capital of the state, was superseded by Seringapatam as the seat of the court from 1610 to 1799, and in 1831, on the British occupation, the seat of administration was removed to Bangalore.

MYSTERY (Gr. pvo-T-qpiov , from Awards, an initiate, fxvuv, to shut the mouth), a general English term for what is secret and excites wonder, derived from the religious sense (see below). It is not to be confounded with the other old word " mystery," or more properly " mistery," meaning a trade or handicraft (Lat. ministerium, Fr. tnStier). For the medieval plays, called mysteries, see Drama; they were so

called (Skeat) because acted by craftsmen.

Greek Mysteries. — It is important to obtain a clear conception of the exact significance of the Greek term p.varr\pwv , which is often associated and at times appears synonymous with the words reXeri7, opyia. We may interpret ” mystery ” in its original Greek meaning as a ” secret ” worship, to which only certain specially prepared people — ol ixvrjdkvres — were admitted after a special period of purification or other preliminary probation, and of which the ritual was so important and perilous that the ” catechumen ” needed a hierophant or expounder to guide him aright. In the ordinary public worship of the state or the private worship of the household the sacrifice with the prayer was the chief act of the ceremony; in the ” mysterion ” something other than a sacrifice was of the essence of the rite; something was shown to the eyes of the initiated, the mystery was a dpa/ia Iivotikov, and dpav and &pr)ap.ocfuvrj are verbal terms expressive of the mystic act. We have an interesting account given us by Theo Smyrnaeus 1 of the various elements and moments of the normal mystic ceremony: first is the KaBapfibs or preliminary purification; secondly, the TeXerijs irapadocns, the mystic communication which probably included some kind of X670S, a sacred exegesis or exhortation; thirdly, the kircnrTela or the revelation to sight of certain holy things, which is the central point of the whole; fourthly, the crowning with the garland, which is henceforth the badge of the privileged; and finally, that which is the end and object of all this, the happiness that, arises from the friendship or communion with the deity. This exposition is probably applicable to the Greek mysteries in general, though it may well have been derived from his know- ledge of the Eleusinian. We may supplement it by a statement of Lucian’s that ” no mystery was ever celebrated without dancing ” (JDe saltat. 15), which means that it was in some sense a religious drama, ancient Greek dancing being generally mimetic, and represented some lepos Aoyos or sacred story as the theme of a mystery-play.

Before we approach the problem as to the content of the mysteries, we may naturally raise the question why certal.) 1 De util. math., Herscher, p. 15.

ancient cults in Greece were mystic, others open and public. An explanation often offered is that the mystic cults are the Pelasgic or

pre-Hellenic and that the conquered populations desired to shroud their religious ceremonies from the profane eyes of the invaders. But we should then expect to find them administered chiefly by slaves and the lower population; on the contrary they are generally in the hands of the noblest families, and the evidence that slaves possessed in any of them the right of initiation is only slight. Nor does the explanation in other respects fit the facts at all. The deities who are worshipped with mystic rites have in most cases Hellenic names and do not all belong to the earliest stratum of Hellenic religion. Besides those of Demeter, by far the most numerous in the Hellenic world, we have record of the mysteries of Ge at Phlye in Attica, of Aglauros and the Charities at Athens, of Hecate at Aegina; a shrine of Artemis Mvala on the road between Sparta and Arcadia points to a mystic cult of this goddess, and we can infer the existence of a similar worship of Themis. Now these are either various forms of the earth-goddess, or are related closely to her, being powers that we call ” chthonian,” associated with the world below, the realm of the dead. We may surmise then that the mystic setting of a cult arose in many cases from the dread of the religious miasma which emanated from the nether world and which suggested a prior ritual of purification as neces- sary to safeguard the person before approaching the holy presence or handling certain holy objects. This would explain the necessity of mysteries in the worship of Dionysus also, the Cretan Zagreus, Trophonius at Lebadeia, Palaemon-Melicertes on the Isthmus of Corinth. They might also be necessary for those who desired communion with the deified ancestor or hero, and thus we hear of the mysteries of Dryops at Asine, of Antinoiis the favourite of Hadrian at Mantineia. Again, where there was hope or promise that the mortal should by communion be able to attain temporarily to divinity, so hazardous an experiment would be safeguarded by special preparation, secrecy and mystic ritual; and this may have been the prime motive of the institution of the Attis-Cybele mystery. (See Great Mother of the Gods.)

For the student of Hellenism, the Eleusinian and Orphic ceremonies are of paramount importance; the Samothracian, which vied with these in attractiveness for the later Hellenic world, were not Hellenic in origin, nor wholly hellenized in char- acter, and cannot be considered in an urticle of this compass.

As regards the Eleusinia, we are in a better position for the investigation of them than our predecessors were; for the modern methods of comparative religion and anthropology have at least taught us to ask the right questions and to apply relevant hypotheses; archaeology . the study of vases, excavations on the site, yielding an

ever-increasing hoard of inscriptions, have taught us much concerning the external organization of the mysteries, and have shown us the beautiful figures of the deities as they appeared to the eye or to the mental vision of the initiated.

As regards the inner content, the secret of the mystic celebra- tion, it is in the highest degree unlikely that Greek inscriptions or art would ever reveal it; the Eleusinian scenes that appear on Attic vases of about the 5th century cannot be supposed to show us the heart of the mystery, for such sacrilegious rashness would be dangerous for the vase-painter. If we are to discover it, we must turn to the ancient literary records. These must be handled with extreme caution and a more careful scrutiny than is often applied. We must not expect full enlightenment from the Pagan writers, who convey to us indeed the poetry and the glow of this fascinating ritual, and who attest the deep and puri- fying influence that it exercised upon the religious temperament, but who are not likely to tell us more. It is to the Christian Fathers we must turn for more esoteric knowledge, for they would be withheld by no scruple from revealing what they knew. But we cannot always believe that they knew much, for only those who, like Clement and Arnobius, had been Pagans in their youth, could ever have been initiated. Many of them uncriti- cally confuse in the same context and in one sweeping verdict

of condemnation Orphic, Phrygian-Sabazian and Attis-Mysteries with the Eleusinian; and we ought not too lightly to infer that these were actually confused and blended at Eleusis. We must also be on our guard against supposing that when Pagan or Christian writers refer vaguely to ” mysteria,” they always have the Eleusinian in their mind.

The questions that the critical analysis of all the evidence may hope to solve are mainly these: (a) What do we know or what can we infer concerning the personality of the deities to whom the Eleusinian mysteries were originally consecrated, and were new figures admitted at a later period ? (&) When was the mystery taken over by Athens and opened to all Hellas, and what was the state-organization provided? (c) What was the inner significance, essential content or purport of the Eleusinia, and what was the source of their great influence on Hellas? (d) Can we attribute any ethical value to them, and did they strongly impress the popular belief in immortality? Limits of space allow us only to adumbrate the results that research on the lines of these questions has hitherto yielded.

The paramount divine personalities of the mystery were in the earliest period of which we have literary record, the mother and the daughter,

Demeter and Kore, the latter being never styled Persephone in the official language of Eleusis; while the third figure, the god of the lower world known by the euphemistic names of Pluto (Plouton) and at one time Eubouleus, the ravisher and the husband, is an accessory personage, comparatively in the background. This is the conclusion naturally drawn from the Homeric hymn to Demeter, a composition of great ritualistic value, probably of the 7th century B.C., which describes the abduction of the daughter, the sorrow and search of the mother, her sitting by the sacred well, the drinking of the Kvnedov or sacred cup and the legend of the pomegranate. An ancient hymn of Pamphos, from which Pausanias freely quotes and which he regards as genuine, 1 appears to have told much the same story in much the same way. As far as we can say, then, the mother and daughter were there in possession at the very beginning. The other pair of divinities known as 6 dibs fi 9ea, that appear in a 5th-century inscription and on two dedicatory reliefs found at Eleusis, have been supposed to descend from an aboriginal period of Eleusinian religion when deities were nameless, and when a peaceful pair of earth-divinities, male and female, were worshipped by the rustic community, before the earth-goddess had pluralized herself as Demeter and Kore, and before the story of the madre dolorosa and the lost daughter had arisen. 2 But for various reasons the contrary view is more probable, that 6 debs and 17 6ea are later cult-titles of the married pair Pluto-Cora (Plouton-Kore), the personal names being omitted from that feeling of reverential shyness which was specially timid in regard to the sacred names of the deities of the underworld. And it is a fairly familiar phenomenon in Greek religion that two separate titles of the same divinity engender two distinct cults.

The question as to the part played by Dionysus in the Eleusinia is important. Some scholars, like M. Foucart, have supposed that he belonged from the beginning to the inner circle of the mystery; others that he forced his way in at a somewhat later period owing to the great influence of the Orphic sects who captured the stronghold of Attic religion and engrafted the Orphic-Sabazian iepbs Xoyos, the story of the incestuous union of Dionysus-Sabazius with Demeter-Kore, and of the death and rendering of Zagreus, upon the primitive Eleusinian faith. A saner and more careful criticism rejects this view. There is no genuine trace discovered as yet in the inner circle of the mysteries of any characteristically Orphic doctrine; the names of Zagreus and Phanes are nowhere heard, the legend of Zagreus and the death of Dionysus are not known, to have been mentioned there. Nor is there any print within or in the precincts of the reKtarˆpiov: the hall of the Minrrat, of the footsteps of the Phrygian deities, Cybele, Attis,

Sabazius. *i- 38, 3; i- 39. 1.

2 See Dittenberger, Sylloge, 13; Corp. inscr. att. 2, 1620 c, 3, 1109; Ephem. archaiol. (1886), irlv. 3; Heberdey in Festschrift fur Benndorf, p. 3, Taf. 4; Von Prott in Aiken. Mittheil. (1899), p. 262.

The exact relation of Dionysus to the mysteries involves the question as to the divine personage called Iacchus; who and what was Iacchus? Strabo (p. 468), who is a poor authority on such matters, describes him as ” the daemon of Demeter, the founder of the leader of the mysteries.” More important is it to note that ” Iacchus ” is unknown to the author of the Homeric hymn, and that the first literary notice of him occurs in the well-known passage of Herodotus (viii. 65), who describes the procession of the mystae as moving along the sacred way from Athens to Eleusis and as raising the cry “Ia«xe. We find Iacchus the theme of a glowing invocation in an Aristophanic Ode (Frogs, 324-398), and described as a beautiful ” young god “; but he is first explicitly identified with Dionysus in the beautiful ode of Sophocles’ Antigone (11 19); and that this was in accord with the popular ritualistic lore is proved by the statement of the scholiast on Aristophanes (Frogs, 482) that the people at the Lenaea, the winter-festival of Dionysus, responded to the command of ” Invoke the god!” with the invocation ” Hail, Iacchus, son of Semele, thou giver of wealth! ” We are sure, then, that in the high tide of the Attic religious history Iacchus was the youthful Dionysus, a name of the great god peculiar to Attic cult; and this is all that here concerns us to know.

We can now answer the question raised above. This youthful Attic Dionysus has his home at Athens; he accompanies his votaries along the sacred way, filling their souls with the exalta- tion and ecstasy of the Dionysiac spirit; but at Eleusis he had no temple, altar or abiding home; he comes as a visitor and departs. His image may have been carried into the Hall of the Mysteries, but whether it played any part there in a passion-play we do not know. That he was a primary figure of the essential mystery is hard to believe, for we find no traces of his name in the other Greek communities that at an early period had insti- tuted mysteries on the Eleusinian model. Apart from Iacchus, Dionysus in his own name was powerful enough at Eleusis as in most other localities. And the votaries carried with them no doubt into the hall the Bacchic exaltation of the Iacchus proces- sion and the nightly revel with the god that preceded the full initiation; many of them also

may have belonged to the private Dionysiac sects and might be tempted to read a Dionysiac signifi- cance into much that was presented to them. But all this is conjecture. The interpretation of what was shown would natur- ally change somewhat with the changing sentiment of the ages; but the mother and the daughter, the stately and beautiful figures presented to us by the author of the homeric hymn, who says no word of Dionysus, are still found reigning paramount and supreme at Eleusis just before the Gothic invasion in the latter days of Paganism. Triptolemus the apostle of corn- culture, Eubouleus — originally a euphemistic name of the god of the under-world, ” the giver of good counsel,” conveying a hint of his oracular functions — these are accessory figures of Eleusinian cult and mythology that may have played some part in the great mystic drama that was enacted in the hall.

The development and organization of the Eleusinia may now be briefly sketched. The legends concerning the initiation of Heracles and the Dioscuri preserve the record of the time when the mysteries were closed against all strangers, and were the privilege of the Eleusinians alone. Now the Homeric hymn in its obvious appeal to the whole of the Greek world to avail themselves of these mysteries gives us to suppose that they had already been thrown open to Hellas; and this momentous change, abolishing the old gentile barriers, may have naturally coincided with, or have resulted from, the fusion of Eleusis and Athens, an event of equal importance for politics and religion which we may place in the prehistoric period. The reign of Peisistratus was an era of architectural activity at Eleusis; but the construction of the /xixtukos

djrapxat or tithe-offerings pf corn to Eleusis, 2 record the far- sighted policy of Periclean Athens, her determination to find a religious support for her hegemony.

At least from the 5th century onwards, the external control and all questions of the organization of the mysteries were in the hands of the Athenian state, the rule holding in Attica as elsewhere in Hellas that the state was supreme over the Church. The head of the general management was the king-archon (archon-basileus) who with his paredros and the four ” epimele- tai ” formed a general committee of supervision, and matters of importance connected with the ritual were decided by the Boule or Ecclesia. But the claim of Eleusis as the religious metropolis was not ignored. The chief of the two priestly families, in whose hands lay the mystic celebration itself and the formal right of admission, was the Eleusinian ” gens ” of the Eumolpidae; it was to their ancestor that Demeter had entrusted her

opyia, and the recognition of their claims maintained the principle of apostolic succession. To them belonged the hierophant (lepoQavTrii) , the high priest of the Eleusinia, whose function alone it was to ” reveal the orgies,” to show the sacred things, and who alone — or perhaps with his consort-priestess — could penetrate into the innermost shrine in the hall; an impres- sive figure, so sacred in person that no one could address him by his personal name, and bound, at one period at least, by a rule of celibacy. We hear also of two ” hierophantides,” female attendants on the older and younger goddesses. In fact, while the male priest predominates in this ritual, the women play a prominent part: as we should expect, considering that the sister-festival of the Thesmophoria was wholly in their hands.

The other old priestly family was that of the ” Kerykes,” to whom the Sqfiovxos belonged, ” the holder of the torch,” the official second in rank to the lepotpavrris. It is uncertain whether this family was of Eleusinian origin; and in the 4th century it seems to have died out, and the office of the 5otSoOxos passed into the hands of the Lycomidae, a priestly family of Phlye, suspected of being devotees of Orphism.

Turning now to the celebration itself, we can only sketch the more salient features here. On the 13th of Boedromion, the Attic month corresponding roughly to our September, the Ephebi (q.v.ˆi marched out to Eleusis, and returned to Athens the next day bringing with them the ” holy- things ” (iepa) to the ” Eleusinion ” in the city; these Upa probably included small images of the goddesses. The 16th was the day of the ayvpfios, the gathering of the catechumens, when they met to hear the address of the hierophant, called the irpoppjjo-is. This was no sermon, but a proclamation bidding those who were dis- qualified or for some reason unworthy of initiation to depart. The legally qualified were all Hellenes and subsequently all Romans above a certain — very youthful — limit of age, women, and as it appears even slaves; barbarians, and those uncleansed of some notorious guilt, such as homicide, were disqualified. We are sure that there was no dogmatic test, nor would time allow of any searching moral scrutiny, and only the Samothracian rites, in this respect unique in the world of classical religion, possessed a system of confessional. The hierophant appealed to the conscience of the multitude; but we are not altogether sure of the terms of his proclamation, which can only be approximately restored from late Pagan and early Christian writers. We know that he demanded of each candidate that he should be “of intelligible speech (i.e. an Hellene) and pure of hand “; and he catechized him as to his condition of ritualistic purity — the food he had eaten or abstained from. It appears also from Libanius that in the

later period at least he solemnly proclaimed that the catechumen should be “pure of soul,” 3 and this spiritual conception of holiness had arisen already in the earlier periods of Greek religious thought. On the other hand we must bear in mind the criticism that Diogenes is said to have passed upon the Eleusinia, that many bad characters were admitted to com- munion, thereby securing a promise of higher happiness than an uninitiated Epaminondas could aspire to.

An essential preliminary was purification and lustration, and 2 Dittenberger, Sylloge, 13. 3 Or. Corinth, iv. 356.

after the assembly the ” mystae ” went to the sea-shore (a\a8e ixiiarai.) and purified themselves with sea-water, and probably with sprinkling of pigs’ blood, a common cathartic medium. After their return from the sea, a sacrifice of some kind was offered as an essential condition of /wr;cris, but whether as a sacrament or a gift-offering to the goddesses it is impossible to determine. On the 19th of Boedromion the great procession started along the sacred way bearing the ” fair young god ” Iacchus; and as they visited many shrines by the way the march must have continued long after sunset, so that the 20th is some- times spoken of as the day of the exodus of Iacchus. On the way each wore a saffron band as an amulet; and the ceremonious reviling to which the ” mystai ” were subjected as they crossed the bridge of the Cephissus answered the same purpose of averting the evil eye. Upon the arrival at Eleusis, on the same night or on the following, they celebrated a midnight revel under the stars with Iacchus, which Aristophanes glowingly describes.

The question of supreme interest now arises: What was the mystic ceremony in the hall? what was said and what was done? We can distinguish two grades in the celebration; the greater was the rtKea and eiroTmKa, the full and satisfying celebration, to which only those were admitted who had passed the lesser stage at least a year before. As regards the actual ritual in the hall of the mystae, much remains uncertain in spite of the unwearying efforts of many generations of scholars to construct a reasonable statement out of fragments of often doubtful evidence. We are certain at least that something was acted there in a religious drama or passion-play, the revelation was partly a pageant of holy figures; the accusations against Aeschylus and Alcibiades would suffice to prove this; and Porphyry speaks of the hierophant and the 8g.8ovxos acting divine parts. What the subject of

this drama was may be gathered partly from the words of Clement — ” Deo (Demeter) and Kore became the personages of a mystic drama, and Eleusis with its Sq,5ovxos celebrates the wandering, the abduction and the sorrow ” (Protrept., p. 12 Potter), partly from Psyche’s appeal to Demeter in Apuleius (Metamorph. 6) — ” by the unspoken secrets of the mystic chests, the winged chariots of thy dragon-ministers, the bridal descent of Proserpine [Persephone], the torch-lit wander- ings to find thy daughter and all the other mysteries that the shrine of Attic Eleusis shrouds in secret.” We may believe then that the great myth of the mother’s sorrow, the loss and the partial recovery of her beloved was part of the Eleusinian passion-play. Did it also include a Upds ya/ xos? We should naturally expect that the sacred story acted in the mystic pageant would close with the scene of reconciliation, such as a holy marriage of the god and the goddess. But the evidence that this was so is mainly indirect, apart from a doubtful passage in Asterius, a writer of questionable authority in the 4th century a.d. {Econom. martyr, p. 194, Combe). At any rate, if a holy marriage formed part of the passion-play, it may well have been acted with solemnity and delicacy. We have no reason to believe that even to a modern taste any part of the ritual would appear coarse or obscene; even Clement, who brings a vague charge of obscenity against all mysteries in general, does not try to substantiate it in regard to the Eleusinia, and we hear from another Christian writer of the scrupulous purity of the hierophant.

It would be interesting to know if the birth of a holy child, a babe Iacchus, for example, was a motive of the mystic drama. The question seems at first sight to be decided by a definite statement of Hippolytus (Philosoph. 5, 8), that at a certain moment in the mysteries the hierophant cried aloud: ” The lady- goddess Brimo has borne Brimos the holy child.” But a careful consideration of the context almost destroys the value of his authority. For he does not pretend to be a first-hand witness, but admits that he is drawing from Gnostic sources, and he goes on at once to speak of Attis and his self-mutilation. The formula may then refer to the Sabazian-Phrygian mystery, which the Gnostics vrtth their usual spirit of religious syncretism would have no scruple in identifying with the Eleusinian. And the

archaeological evidence that has been supposed to support the statement of Hippolytus is deceptive.

Finally, we must not suppose that there could be any very elaborate scenic arrangements in the hall for the representation of Paradise and the Inferno, whereby the rewards of the faithful and the punishments of the damned might be impressively brought home to the mystae.

The excavations on the site have proved that the building was without substructures or under- ground passages. A large number of inscriptions present us with elaborate accounts of Eleusinian expenditure; but there is no item for scenic expenses or painting. We are led to suppose that the pageant-play produced its effect by means of gorgeous raiment, torches and stately figures.

But the mystic action included more than the pageant-play. The hierophant revealed certain holy objects to the eyes of the assembly. There is reason to suppose that these included cer- tain primitive idols of the goddesses of immemorial sanctity; and, if we accept a statement of Hippolytus (loc. cit.) we must believe that the epoptae were also shown ” that great and marvel- lous mystery of perfect revelation, a cut corn-stalk.” The value of this definite assertion, which appears to be an explicit revela- tion of the secret, would be very great, if we could trust it; but unfortunately it occurs in the same suspicious context as the Brimo-Brimos formula, and we again suspect the same uncritical confusion of Eleusinian with Phrygian ritual, for we know that Attis himself was identified in his mysteries with the ” reaped corn,” the ct&xvs a/wj-ros, almost the very phrase used by Hippolytus. Only, it is in the highest degree probable, whether Hippolytus knew anything or not, that a corn-token was shown among the sacred things of a mystery which possessed an original agrarian significance and was intended partly to consecrate and to foster the agricultural life. But to say this is by no means the same as to admit the view of Lenormant 1 and Dr Jevons 2 that the Eleusinians worshipped the actual corn, or revered it as a clan-totem. For of direct corn-worship or of corn-totemism there is no trace either at Eleusis or elsewhere in Greece.

Among the dpcofxtva or ” things done ” may we also include a solemn sacrament, the celebration of a holy communion, in whiSh the votary was united to the divinity by partaking of some holy food or drink? We owe to Clement of Alexandria (Protrept. p. 18, Potter) an exact transcription of the pass-word of the Eleusinian mystae; it ran as follows (if we accept Lobeck’s emendation cf eyyevaanevos for epyaffa/xevos) : ” I have fasted, I have drunk the barley-drink, I have taken [vhe things] from the sacred chest, having tasted thereof I have placed them into the basket and again from the basket into the chest.” We gather from this that some kind of sacrament was at least a preliminary condition of initiation; the mystae drank of the same cup as the goddess drank in her sorrow, partly — as we say — ” in memory of her,” partly to unite themselves more closely with her. We know also from an inscription that the priest of the Samothracian mysteries broke sacred bread and poured out drink for the mystae

(Arch, epigr. Mitth. 1882, p. 8, No. 14). But neither in these nor in the Eleusinian is there any trace of the more mystic sacramental conception, any indication that the votaries believed themselves to be partaking of the actual body of their divinity; 3 for there is no evidence that Demeter was identified with the corn, still less with the barley-meal of which the miKtiiv was compounded. Nor is it likely that the sacra- ment was the pivot of ,the whole mystery or was part of the essential act of the nvrjais itself. In the first place we have an almost certain representation of the Eleusinian sacrament on an archaic vase in Naples, 4 probably of Attic provenance, and the artistic reproduction of a holy act would have been impious and dangerous, if this had belonged to the inner circle of the mystery. Again, there is no mention of sacrament or sacrifice among the five essential parts of jivrio-is given by Theo

1 Daremberg et Saglio, Dictionnaire , \ p. 1066.

2 Introduction to the Study of Religion.

3 This is Dr Jevons's supposition — op. cit — on which he bases an important theory of the whole Eleusinian mysteries and their intrinsic attraction.

4 Farnell, Cults, vol. iii. pi. xv*.

Smyrnaeus, nor in the imaginary narrative of the late rhetorician Sopatros, 1 who supposes the strange case of a man being initiated by the goddesses in a dream: they admit him to their full communion merely by telling him something and showing him something.

Besides the bpwjxtva, then, there were also certain things said in the hall, or in the earlier stages of initiation, which we would gladly discover. Part of these were mystic formulae, one of which has been discussed already, the pass-word of the votaries. We gather also from Proclus and Hippolytus 2 that in the Eleusinian rites they gazed up to heaven and cried aloud " rain " — ve — and gazed down upon the earth and cried "conceive" — not. This ritual charm — we cannot call it prayer — descends from the old agrarian magic which underlay the primitive mystery. What else the votaries may have uttered, whether by way of thanksgiving or solemn litany, we do not know. 3 But there was also a certain lepbs Xoyos, some exposi- tion accompanying the unfolding of the mysteries ; for it was part of the prestige of the

hierophant that he was chief spokesman, ” who poured forth winning utterance and whose voice the catechumen ardently desired to hear ” {Anth. Pal., app. 246); and Galen speaks of the rapt attention paid by the initiated ” to the things done and said in the Eleusinian and Samothracian mysteries ” {De usu part. 7. 14). But we have no trustworthy evidence as to the real content of the X670S of the hierophant. We need not believe that the whole of his discourse was taken up with corn-symbolism, as Varro seems to imply (Aug. De civil. Dei. 20), of that he taught natural philosophy rather than theology, or again, the special doctrine of Euhemerus, as two passages in Cicero {De nalnr. dear. i. 42; Tusc. i. 13) might prompt us to suppose. His chief theme was probably an expo- ■ sition of the meaning and value of the Itpa, as in an Australian initiation rite it is the privilege of the elders to explain the nature of the ” churinga ” to the youths. And his discourse on these may have been coloured to some extent by the theories current in the philosophic speculation of the day. But though in the time of Julian he appears to have been a philosopher of Neo-platonic tendencies, we ought not to suppose that the hierophant as a rule would be able or inclined to rise above the anthropomorphic religion of the times. Whatever symbolism attached to the Upa, the sacred objects shown, was probably simple and natural; for instance, in the Eleusinian, as in Egyptian eschatology, the token of the growing corn may have served as an emblem — though not a proof — of man’s resurrection. The doctrine of the continuance of the soul after death was already accepted by the popular belief, and the hierophant had no need to preach it as a dogma; the votaries came to Eleusis to ensure themselves a happy immortality. And in our earliest record, the Homeric hymn, we find that the mysteries already hold out this higher promise. How, we may ask, were the votaries assured ? M. Foucart in Lcs grands mysleres d’ Eleusis has maintained that the object of the mysteries was much the same as that of the Egyptian Book of the Dead; to provide the mystae with elaborate rules for avoiding the dangers that beset the road to the other world, and for attaining at last to the happy regions; that for this purpose the hierophant recited magic formulae whereby the soul could repel the demons that it might encounter on the path; and that it was to seek this deliverance from the terrors of hell that all Greece flocked to Eleusis. This is in accord with his whole ” egyptizing ” theory concerning the Eleusinia, a theory which, though Egyptian influence cannot a priori be ruled out, is not found in harmony with the facts of the two religious systems. ‘And the particular hypothesis just stated is altogether wanting in direct evidence, or — we

may say — in vraisemblance. There is no hint or allusion to

‘ Rliet. graec. viii. 121.

2 In Tim. 293′ ; Ref. Omn. Haer. 5, 7, p. 146.

3 The other formula which the scholiast on Plato {Gorg. 497 c.) assigns to the Eleusinian rite: ” I have eaten from the timbrel, I have drunk from the cymbal, I have carried the sacred vessel, 1 have crept under the bridal-chamber,” belongs, not to Eleusis, but, as Clement and Firmicus Macernus themselves attest, to Phrygia and to Attis.

be found in the ancient sources suggesting that the recital of magic formulae was part of the ceremony. The Xoyos, what- ever it was, was comparatively unimportant. And the Greek public in general, in its vigorous period when the Eleusinian religion reached its zenith, was not tormented, as modern Europe has at times been, by ghostly terrors of judgment.

The assurance of the hope of the Eleusinian votary was obtained by the feeling of friendship and mystic sympathy, established by mystic contact, with the mother and the daughter, the powers of life after death. Those who won their friendship by initiation in this life would by the simple logic of faith regard themselves as certain to win blessing at their hands in the next.

It is obvious that the mysteries made no direct appeal to the intellect, nor on the other hand revolted it by any oppressive dogmatism. As regards their psychic effect, we have Aristotle’s invaluable judgment: ” The initiated do not learn anything so much as feel certain emotions and are put into a certain frame of mind” (Synes. Dion. p. 48a). The appeal was to the eye and to the imagination through a form of religious mesmerism working by means that were solemn, stately and beautiful. To understand the quality and the intensity of the impression produced, we should borrow something from the modern experi- ences of Christian communion-service, mass, and passion-play, and bear in mind also the extraordinary susceptibility of t\e Greek mind to an artistically impressive pageant.

That the Eleusinia preached a higher morality than that of the current standard is not proved. That they exercised a direct and elevating influence on the individual character is nowhere explicitly maintained, as Diodorus (v. 49) maintains concerning the Samothracian. But on general grounds it is reasonable to believe that such powerful religious experience as they afforded would produce moral fruit in many minds. The genial Aristophanes {Frogs, 455) intimates as much, and Andocides {De myster. p. 36, § 31; p. 44, §

125) assumes that those who had been initiated would take a juster and sterner view of moral innocence and guilt, and that foul conduct was a greater sin when committed by a man who was in the official service of the mother and the daughter.

Besides the greater mysteries at Eleusis, we hear of the lesser mysteries of Agrae on the banks of the Ilissos. Estab- lished, perhaps, originally by Athens herself at a time when Eleusis was independent and closed her rites to strangers, they became wholly subordinated to the greater, and were put under the same management and served merely as a necessary preliminary to the higher initiation into them. Sacrifice was offered to the same great goddesses at both; but we have the authority of Duris {Athenae, 253(f), tri e Samian historian, and the evidence of an Attic painting, called the pir.ax ol ! Nannion, 4 that the predominant goddess in the mysteries at Agrae was Kore. And this agrees with the time of their celebration, in the middle of Anthesterion, when Kore was supposed to return in the young corn. Stephanus {s.v. “Aypa), drawing from an unknown source, declares that the Dionysiac story was the theme of their mystic drama. Hence theorists have supposed that their content was wholly Orphic or that their central motive was the marriage of Dionysus and Kore. The theory has no archaeological or literary support except the passage in Stephanus, nor have we reason for believing that the marriage of these two divinities was recognized in Attic state ritual.

The influence of Eleusis in early times must have been great, for we find offshoots of its cult, whether mystic or not, in other parts of Greece. In Boeotia, Laconia, Arcadia, Crete and Thera, Demeter brought with her the title of “Eleusinia”; and no other explanation is so probable as the obvious one that this name designates ” the goddess of Eleusis,” and though there may have been other places called ” Eleusis,” the only famous religious centre was the Attic. The initiation rites of Demeter at Celeae near Phlius, at Lerna in Argolis, and at Naples, were organized after the pattern of the Eleusinian. But of these and the other Demeter mysteries in the Greek world, 4 Farnell, Cults of the Greek States, vol. iii. p. 242, pi. xvi.

there is little to record that is certain and at the same time of primary importance for the history of religion. The Arcadian city of Pheneus possessed a mystery that boasted an Eleusinian character and origin, yet in the record of it there is no mention of Kore, and we may suspect

that, like other Demeter-worships in the Peloponnese, it belonged to a period when the earth- goddess was revered as a single personality and Kore had not yet emanated from her. We know much more of the details of the great Andanian mysteries in Messenia, owing to the discovery of the important and much-discussed Andanian in- scription of 91 B.C. 1 But what we know are facts of secondary importance only. We gather from Pausanias (4. 33. 4; cf. 4. 1. 5. and 4. 26. 8; 4. 27. 6) that the rites, which he regards as second in solemnity and prestige to the Eleusinian alone, were conse- crated to the MeydXcu deal,. . . the great goddesses, . . . and that Kore enjoyed the mystic title of Hagne, “the holy one.” The inscription has been supposed to correct and to refute Pausanias, but it does not really controvert his statements, which are attested by other evidence; it proves only that other divinities came at a later time to have a share in the mysteries, such as the MeyaAoi dtoi who were probably the Cabeiri (q.v.) . It is clear that the Andanian mysteries included a sacred drama, in which women personated the goddesses. The priestesses were married women, and were required to take an oath that they had lived ” in relation to their husbands a just and holy life.” We hear also of grades of initiation, purification-ceremonies, but of no sacrament or eschatologic promise; yet it is probable that these mysteries, like the Eleusinian, maintained and secured the hope of future happiness.

The Eleusinian faith is not wholly unattested by the grave- inscriptions of Hellas, though it speaks but rarely on these. The most interesting example is the epitaph of a hierophant who proclaims that he has found that ” death was not an evil, but a blessing.” 2

Of equal importance for the private religion of Greece were the Orphic mystic societies, bearing a Thraco-Phrygian tradition into Greece, and associated originally with the name of Dionysus, and afterwards with Sabazius also and the later cult-ideas of Phrygia. 3 The full account of the Dionysiac mysteries would demand a critical study of the Dionysiac religion as a whole, as well as of the private sects thet sprang up under its shadow. It is only possible here to indicate the salient characteristics of those which are of primary value for the history of religion.

Originally a great nature-god of the Thraco-Phrygian stock, powerful over all vegetation and especially revealing his power in the vine, Dionysus was forcing his way into Greece at least as early as the Homeric period, and by the 6th century was received into the public cults of most of the Greek communities. We can gather with some certainty or probability his aboriginal characteristics and the form of his worship. Being a god of the life of the earth, he was also a nether

divinity, the lord of the world of souls, with whom the dead votary entered into privileged communion; his rites were mystic, and nightly celebrations were frequent, marked by wild ecstasy and orgiastic self-abandonment, in which the votary became at one with the divinity and temporarily possessed his powers; women played a prominent part in the ritual; a savage form of sacra- mental communion was in vogue, and the animal victim of whose flesh and blood the votaries partook was at times re- garded as the incarnation of the divinity, so that the god himself might be supposed to die and to rise again; finally we may regard certain cathartic ideas as part of the primeval tradition

1 See Sauppe, Mysterieninschrift von Andania; cf. Foucart's commentary in Le Bas, Voyage archeol. 2, No. 326"; H. Collitz, Dialect-inschriften, 4689.

s Eph. arch. (1883), p. 81.

' The best account of the origin and development of the Dionysiac religion is in Rohde's Psyche, vol. i. ; for Orphic ritual and doctrine see article on " Orpheus " in Roscher's Ausfuhrliches Lexikon der griechischen und romischen Mythologie; Miss Harrison, Prolegomena to the Study of Greek Religion, pp. 455-659, with critical appendix by G. Murray on the Orphic tablets discovered in Crete, near Rome, and in south Italy.

of this religion. Admitted among the soberer cults of the Greek communities, it lost most of its wildness and savagery, while still retaining a more emotional ecstatic character than the rest. But this cooling process was arrested by a new wave of Dionysiac fervour that spread over Greece from the 7th century onwards, bringing with it the name of Orpheus, 4 and engendering at some later date the Orphic brotherhoods (Ihiasi). This religious movement may have started like the earlier one from the lands north of Greece; but Crete and even Egypt are supposed to have contributed much to the Orphic doctrine and ritual. Our earliest authority for the proceedings of the mystery-practitioner who used the name of Orpheus is the well-known passage in Plato's Republic (p. 364a), in which he speaks contemptuously of the itinerant ritualists who knock at the doors of the rich, the vendors of magic incantations, who promise absolution from sins and happiness in the next world to be attained by a ritual of puri- fication and mystic initiation. This record brings to our notice a phenomenon unknown elsewhere in Greek religion; the missionary spirit, the impulse to preach to all who would hear, which foreshadows the breaking down of the gentile religious barriers of the ancient world. And it is probable that some kind of " Orphic " propagandism,

whether through books or itinerant mystery-priests, or both, had been in vogue some time before Plato. We may fairly conjecture that it has to some extent inspired the glowing eschatology of Pindar, who describes the next world as a place of penance and purgation from ancestral or personal taint and of final reward for the purified soul, and who unites this belief with a doctrine of reincarnation. In the Hippolytus of Euripides, Theseus taunts his son with cloaking his immorality under hypocritical ” Orphic ” preten- sions to purity, the pharisaic affectation, for instance, of a ■ vegetarian diet (952-954). Still more important is the fragment of the Cretans of Euripides, attesting the strength of the antiquity of these mystic Dionysiac associations in Crete. The initiated votary proclaims himself as sanctified to Zeus of Ida, to Zagreus — the Orphic name of the nether-world Dionysus — and to the mountain-goddess Rhea-Cybele; he has fulfilled ” the solemn rite of the banquet of raw flesh,” and henceforth he ” robes himself in pure white and avoids the taint of child- birth and funerals and abstains from meat.” And — what is most significant — he calls himself by the very name of his god — he is himself Bd/cxos. In spirit and in most of its details the passage accords well with the Bacchae of Euripides, which reflects not so much the public worship of Greece, but rather the mystic Dionysiac brotherhoods. Throughout this inspired drama the votary rejoices to be one with his divinity and to call himself by his name, and this mystic union is brought about partly, though Euripides may not have known it, through ” the meal of raw flesh ” or the drinking of the blood of the goat or the kid or the bull. The sacramental intention of this is confirmed by abundant proof; even in the state-cult of Tenedos they dressed up a bull-calf as Dionysus and reveren- tially sacrificed it (Ael. Nat. an. 12. 34); those who partook of the flesh were partaking of what was temporarily the body of their god. The Christian fathers at once express their abhorrence of this savage wfwayLa and reveal its true significance (Arnob. Adv. nat. 5. 119); and Firmicus Maternus (De error., p. 84) attests that the Cretans of his own day celebrated a funeral festival in honour of Dionysus in which they enacted the life and the death of the god in a passion-play and ” rent a living bull with their teeth.”

But the most speaking record of the aspirations and ideas of the Orphic mystic is preserved in the famous gold tablets found in tombs near Sybaris, one near Rome, and one in Crete. These have been frequently published and discussed; and here it is only possible to allude to the salient features that concern the general history of religion. They contain fragments of a sacred hymn that must have been in vogue at least as early as the 3rd century B.C., and which was

inscribed in order to

4 The name ‘Opˆeis first occurs in Ibycus, Frag. 10: 6vo/jicuc\vt6v ‘O/ xtrif.

be buried with the defunct, as an amulet that might protect him from the dangers of his journey through the under-world and open to him the gates of Paradise. The verses have the power of an incantation. The initiated soul proclaims its divine descent : “I am the son of Earth and Heaven ” : “I am perishing with thirst, give me to drink of the waters of memory “: ” I come from the pure “: “I have paid the penalty of unrighteousness “: ” I have flown out of the weary, sorrowful circle of life.” His reward is assured him: ” blessed and happy one, thou hast put off thy mortality and shalt become divine.” The strange formula epi < £os « 7a\' 'iirerov, "la kid fell into the milk," has been interpreted by Dieterich (Eine Mithras — Liturgie, p. 174) with great probability as alluding to a conception of Dionysus himself as lpl

We discern, then, in these mystic brotherhoods the germs of a high religion and the prevalence of conceptions that have played a great part in the religious history of Europe. And as late as the days of Plutarch they retained their power of consoling the afflicted (Consol. ad uxor., c. 10).

The Phrygian-Sabazian mysteries, associated with Attis, Cybele and Sabazius, which invaded later Greece and early imperial Rome, were originally akin to these and contained many concepts in common with them. But their orgiastic ecstasy was more violent, and the psychical aberrations to which the votaries were prone through their passionate desire for divine communion were more dangerous. Emasculation was practised by the devotees, probably in order to assimilate themselves as far as possible to their goddess by abolishing the distinction of sex, and the high-priest himself bore the god’s name. Or communion with the deity might be attained by the priest through the bath of blood in the taurobolion (q.v.), or by the gashing of the arm over the altar. A more questionable method which lent itself to obvious abuses, or at least to the imputation of indecency, was the simulation of a sacred marriage, in which the catechumen was corporeally united with the great goddess in her bridal chamber (Dieterich, op. cit. pp. 1 21-134). Prominent also in these Phrygian mysteries were the conception of

rebirth and the belief, vividly impressed by solemn pageant and religious drama, in the death and resur- rection of the beloved Attis. The Hilaria in which these were represented fell about the time of our Easter; and Firmicus Maternus reluctantly confesses its resemblance to the Christian celebration. 1 >

The Eleusinian mysteries are far more characteristic of the older Hellenic mind. These later rites breathe an Oriental spirit, and though their forms appear strange and distorted they have more in common with the subsequent religious phenomena of Christendom. And the Orphic doctrine may have even contributed something to the later European ideals of private and personal morality. 2

Literature. — For citation of passages in classical literature bearing on Greek mysteries in general see Lobeck's Aglaophamus (1829) ; and the collection of material for Demeter mysteries in L. R. Farnell, Cults of the Greek States (1906), iii. 343-367. For general theory and discussion see Dr Jevons, Introduction to the Study of Religion; Farnell, Cults of the Greek States, iii. 127-213; Dyer's The Gods of Greece (1891), ch. v.; M. P. Foucart, Les Grands mysthres d'Eleusis (1900); Andrew Lang, Myth,_ Ritual and Religion (1887), pp. 264-276; Goblet d'Alviella, Eleustnia (1903). See further articles Dionysus; Great Mother of the Gods; Demeter. (L. R. F.)

MYSTICISM (from G'r. ixiiav, to shut the eyes; juiiott/s, one initiated into the mysteries), a phase of thought, or rather perhaps of feeling, which from its very nature is hardly suscep- tible of exact definition. It appears in connexion with the endeavour of the human mind to grasp the divine essence or the ultimate reality of things, and to enjoy the blessedness of actual communion with the Highest. The first is the philosophic side of mysticism ; the second, its religious side. The first effort is theoretical or speculative; the second, practical. The thought that is most intensely present with the mystic is that

1 Farnell, Cults, iii. 299-302.

1 See Archiv fur Religionswiss. (1906), article by Salomon Reinach.

of a supreme, all-pervading, and indwelling power, in whom all things are one. Hence the speculative utterances oi mysticism are always more or less pantheistic in character. On the practical side, mysticism maintains the possibility of direct in- tercourse with this Being of beings — intercourse, not through any external media such as an historical revelation, oracles, answers to prayer, and the like, but by a species of ecstatic transfusion or identification, in which the

individual becomes in very truth ” partaker of the divine nature.” God ceases to be an object to him and becomes an experience. In the writings of the mystics, ingenuity exhausts itself in the invention of phrases to express the closeness of this union. Mysticism differs, therefore, from ordinary pantheism in that its inmost motive is religious; but, whereas religion is ordinarily occupied with a practical problem and develops its theory in an ethical refer- ence, mysticism displays a predominatingly speculative bent, starting from the divine nature rather than from man and his surroundings, taking the symbolism of religious feeling as literally or metaphysically true, and straining after the present realization of an ineffable union. The union which sound religious teaching represents as realized in the submission of the will and the ethical harmony of the whole life is then reduced to a passive experience, to something which comes and goes in time, and which may be of only momentary duration. Mysticism, it will be seen, is not a name applicable to any particular system. It may be the outgrowth of many differing modes of thought and feeling. Most frequently it appears historically, in relation to some definite system of belief, as a reaction of the spirit against the letter. When a religion begins to ossify into a system of formulas and, observances, those who protest in the name of heart-religion are not unfrequently known by the name of mystics. At times they merely bring into prominence again the ever-fresh fact of personal religious experience; at other times mysticism develops itself as a powerful solvent of definite dogmas.

A review of the historical appearances of mysticism will serve to show how far the above characteristics are to be found, separately or in combination, in its different phases.

In the East, mysticism is not so much a specific phenomenon as a natural deduction from the dominant philosophic systems, and the normal expression of religious feeling in the lands in which it appears. Brahmanic pantheism systems. and Buddhistic nihilism alike teach the unreality of the seeming world, and preach mystical absorption as the highest goal; in both, the sense of the worth of human person- ality is lost. India consequently has always been the fertile mother of practical mystics and devotees. The climate itself encourages to passivity, and the very luxuriance of vegetable and animal life tends to blunt the feeling of the value of life. Silent contemplation and the total deadening of consciousness by perseverance for years in unnatural attitudes are among the commonest forms assumed by this mystical asceticism. But the most revolting methods of self-torture and self-destruction are also practised as a means of rising in sanctity. The sense of sin can hardly be said to enter into these exercises — that is, they are not undertaken as penance for personal transgression. They

are a despite done to the principle of individual or separate existence.

The so-called mysticism of the Persian Sufis is less intense and practical, more airy and literary in character. Sufism (q.v.) appears in the 9th century among the Mahommedans of Persia as a kind of reaction against the rigid monotheism and formalism of Islam. It is doubtless to be regarded as a revival of ancient habits of thought and feeling among a people who had adopted the Koran, not by affinity, but by compulsion. Persian literature after that date, and especially Persian poetry, is full of an ardent natural pantheism, in which a mystic apprehension of the unity and divinity of all things heightens the delight in natural and in human beauty. Such is the poetry of Hafiz and Saadi, whose verses are chiefly devoted to the praises of wine and women. Even the most licentious of these have been fitted by Mahommedan theologians with a mystical interpretation.

The delights of love are made to stand for the raptures of union with the divine, the tavern symbolizes an oratory, and intoxica- tion is the bewilderment of sense before the surpassing vision. Very often, if not most frequently, it cannot be doubted that the occult religious significance depends on an artificial exegesis; but there are also poems of Hafiz, Saadi, and other writers, religious in their first intentions. These are unequivo- cally pantheistic in tone, and the desire of the soul to escape and rest with God is expressed with all the fervour of Eastern poetry. This speculative mood, in which nature and beauty and earthly satisfaction appear as a vain show, is the counterpart of the former mood of sensuous enjoyment.

For opposite reasons, neither the Greek nor the Jewish mind lent itself readily to mysticism: the Greek, because of its clear and sunny naturalism; the Jewish, because of its rigid monotheism and its turn towards worldly realism and statutory observance. It is only with the exhaustion of Greek and Jewish civilization that mysticism becomes a prominent factor in Western thought. It appears, therefore, contemporaneously with Christianity, and is a sign of the world-weariness and deep religious need that mark the decay of the old world. Whereas Plato's main problem had been the organization of tlje perfect state, and Aristotle's intellect had ranged with fresh interest over all departments of the knowable, political speculation had become a mockery with the extinction of free political life, and know- ledge as such had lost its freshness for the Greeks of the Roman

Empire. Knowledge is nothing to these men if it does not show them the infinite reality which is able to fill the aching void within. Accordingly, the last age of Greek philosophy is theosophical in character, and its ultimate end is a practical satisfaction. Neoplatonism seeks this in the ecstatic intuition of the ineffable One. The systematic theosophy of Plotinus and his successors does not belong to the present article, except so far as it is the presupposition of their mysticism; but, inas- much as the mysticism of the medieval Church is directly derived from Neoplatonism through the speculations of the pseudo-Dionysius, Neoplatonic mysticism fills an important section in any historical review of the subject.

Neoplatonism owes its form to Plato, but its underlying motive is the widespread feeling of self-despair and the longing for divine illumination characteristic ‘ of the age piat’oolsm. i n which it appears. Before the rise of Neoplaton- ism proper we meet with various mystical or semi- mystical expressions of the same religious craving. The contemplative asceticism of the Essenes of Judaea may be mentioned, and, somewhat later, the life of the Therapeutae on the shores of Lake Moeris. In Philo, Alexandrian Judaism had already seized upon Plato as ” the Attic Moses,” and done its best to combine his speculations with the teaching of his Jewish prototype. Philo’s God is described in terms of absolute transcendency; his doctrine of the Logos or Divine Sophia is a theistical transformation of the Platonic world of ideas; his allegorical interpretation of the Old Testament represents the spiritualistic dissolution of historical Judaism. Philo’s ethical ideal is renunciation, contemplation, complete surrender to the divine influence. Apollonius of Tyana and the so-called Neopythagoreans drew similar ethical consequences from their eclectic study of Plato. Wonder-workers like Alexander the Paphlagonian exhibit the grosser side of the longing for spiritual communion. The traits common to Neoplatonism and all these speculations are well summed up by Zeller (Phttos. der Grkchen, iii. 2. 214) as consisting in: ” (1) the dualistic opposition of the divine and the earthly; (2) an abstract con- ception of God, excluding all knowledge of the divine nature; (3) contempt for the world of the senses, on the ground of the Platonic doctrines of matter and of the descent of the soul from a superior world into the body; (4) the theory of intermediate potencies or beings, through whom God acts upon the world of phenomena; (5) the requirement of an ascetic self-emancipa- tion from the bondage of sense and faith in a higher revelation to man when in a state called enthusiasm.” Neoplatonism appears in the first half of the 3rd century, and has its

greatest representative in Plotinus. He develops the Platonic

philosophy into an elaborate system by means of the doctrine of emanation. The One, the Good, and the Idea of the Good were identical in Plato's mind, and the Good was therefore not deprived of intelligible essence. It was not separated from the world of ideas, of which it was represented as either the crown or the sum. By Plotinus, on the contrary, the One is explicitly exalted above the vovs and the "ideas"; it trans- cends existence altogether (hireiceiva ttjs obalas), and is not cognizable by reason. Remaining itself in repose, it rays out, as it were, from its own fullness an image of itself, which is called vovs, and which constitutes the system of ideas of the intelligible world. The soul is in turn the image or product of the vovs, and the soul by its motion begets corporeal matter. The soul thus faces two ways — towards the vovs, from which it springs, and towards the material life, which is its own product. Ethical endeavour consists in the repudiation of the sensible; material existence is itself estrangement from God. (Porphyry tells us that Plotinus was unwilling to name his parents or his birthplace, and seemed ashamed of being in the body.) Beyond the nadapo-us, or virtues which purify from sin, lies the further stage of complete identification with God {ova e£« afiaprias elvar, dXXa dtov tlvai) . To reach the ultimate goal, thought itself must be left behind; for thought is a form of motion, and the desire of the soul is for the motion- less rest which belongs to the One. The union with transcendent deity is not so much knowledge or vision as ecstasy, coalescence, contact (eKffTao-LS aifSwais, &r], Ennead., vi. 9. 8-9). But in our present state of existence the moments of this ecstatic union must be few and short; "I myself," says Plotinus simply, " have realized it but three times as yet, and Porphyry hitherto not once."

It will be seen from the above that Neoplatonism is not mystical as regards the faculty by which it claims to apprehend philosophic truth. It is first of all a system of complete rationalism; it is assumed, in other words, that reason is capable of mapping out the whole system of things. But, inasmuch as a God is affirmed beyond reason, the mysticism becomes in a sense the necessary complement of the would-be all-embracing rationalism. The system culminates in a mystical act, and in the sequel, especially with Iamblichus and the Syrian Neoplatonists, mystical practice tended more and more to overshadow the theoretical groundwork.

It was probably about the end of the 5th century, just as ancient philosophy was 'dying out in the schools of Athens, that the speculative mysticism of Neoplatonism made a definite lodgment in Christian thought through the literary forgeries of the pseudo-Dionysius (see Dionysius the Areopa- gite) . The doctrines of

Christianity were by that time so firmly established that the Church could look upon a symbolical or mystical interpretation of them without anxiety. The author of the Thcologia mystica and the other works ascribed to the Areopagite proceeds, therefore, to develop the doctrines of Proclus with very little modification into a system of esoteric Christianity. God is the nameless and supra-essential One, elevated above goodness itself. Hence ” negative theology,” which ascends from the creature to God by dropping one after another every determinate predicate, leads us nearest to the truth. The return to God (evoxrw, dkoiats) is the consummation of all things and the goal indicated by Christian teaching. The same doctrines were preached with more of churchly fervour by Maximus the Confessor (580-622). St Maximus represents almost the last speculative activity of the Greek Church, but the influence of the pseudo-Dionysian writings were transmitted to the West in the 9th century by Erigena, in whose speculative spirit both the scholasticism and the mysticism of the middle ages have their rise. Erigena translated Dionysius into Latin along with the commentaries of Maximus, and his system is essentially based upon theirs. The negative theology is adopted, and God is stated to be predicateless Being, above all categories, and therefore not improperly called Nothing. Out of this Nothing or incomprehensible essence the world of ideas or

primordial causes is eternally created. This is the Word or Son of God, in whom all things exist, so far as they have substantial existence. All existence is a theophany, and as God is the beginning of all things, so also is He the end. Erigena teaches the restitution of all things under the form of the Diony- sian adunatio or deificatio. These are the permanent outlines of what may be called the philosophy of mysticism in Christian times, and it is remarkable with how little variation they are repeated from age to age.

In Erigena mysticism has not yet separated itself in any way from the dogma of the Church. There is no revulsion, as later, from dogma as such, nor is more stress laid upon one dogma than upon another; all are treated upon the same footing, and the whole dogmatic system is held, as it were, in solution by the philosophic medium in which it is presented. No distinction is drawn, indeed, between what is reached by reason and what is given by authority; the two are immediately identical for Erigena. In this he agrees with the speculative mystics everywhere, and differentiates himself from the scholas- tics who

followed him. The distinguishing characteristic of scholasticism is the acceptance by reason of a given matter, the truth of which is independent of rational grounds, and which remains a presupposition even when it cannot be under- stood. Scholasticism aims, it is true, in its chief representatives, at demonstrating that the content of revelation and the teaching of reason are identical. But what was matter of immanent assumption with Erigena is in them an equating of two things which have been dealt with on the hypothesis that they are separate, and which, therefore, still retain that external relation to one another. This externality of religious truth to the mind is fundamental in scholasticism, while the opposite view is equally fundamental in mysticism. Mysticism is not the voluntary demission of reason and its subjection to an external authority. In that case, all who accept a revelation without professing to understand its content would require to be ranked as mystics; the fierce sincerity of Tertullian's credo quia ab- surdum, Pascal's reconciliation of contradictions in Jesus Christ, and Bayle's half-sneering subordination of reason to faith would all be marks of this standpoint. But such a temper of mind is much more akin to scepticism than to mysticism; it is characteristic of those who either do not feel the need of philosophizing their beliefs, or who have failed in doing so and take refuge in sheer acceptance. Mysticism, on the other hand, is marked on its speculative side by even an overweening confidence in human reason. Nor need this be wondered at if we consider that the unity of the human mind with the divine is its underlying presupposition. Hence where reason is discarded by the mystic it is merely reason overleaping itself; it occurs at the end and not at the beginning of his speculations. Even then there is no appeal to authority; nothing is accepted from without. The appeal is still to the individual, who, if not by reason then by some higher faculty, claims to realize absolute truth and to taste absolute blessedness.

Mysticism first appears in the medieval Church as the protest of practical religion against the predominance of the dialectical

spirit. It is so with Bernard of Clairvaux (1090- ciairvaux. JI 53)> wn0 condemns Abelard's distinctions and

reasonings as externalizing and degrading the faith. St Bernard's mysticism is of a practical cast, dealing mainly with the means by which man may attain to the know- ledge and enjoyment of God. Reason has three stages, in the highest of which the mind is able, by abstraction from earthly things, to rise to contemplatio or the vision of the divine. More exalted still, however, is the sudden ecstatic vision, such as was granted, for example, to Paul. This is the reward of those

who are dead to the body and the world. Asceticism is thus the counterpart of medieval mysticism; and, by his example as well as by his teaching in such passages, St Bernard unhappily encouraged practices which necessarily resulted in self-delusion. Love grows with the knowledge of its object, he proceeds, and at the highest stage self-love is so merged in love to God that we love ourselves only for God's sake or because God has loved us.

" To lose thyself in some sort, as if thou wert not, and to have no consciousness of thyself at all — to be emptied of thyself and almost annihilated — such is heavenly conversation. ... So to be affected is to become God." " As the little water-drop poured into a large measure of wine seems to lose its own nature entirely and to take on both the taste and the colour of the wine; or as iron heated red-hot loses its own appearance and glows like fire; or as air filled with sunlight is transformed into the same brightness so that it does not so much appear to be illuminated as to be itself light — so must all human feeling towards the Holy One be self-dissolved in unspeakable wise, and wholly transfused into the will of God. For how shall God be all in all if anything of man remains in man? The substance will indeed remain, but in another form, another glory, another power " (De diligendo Deo, c. 10). These are the favourite similes of mysticism, wherever it is found.

Mysticism was more systematically developed by Bernard's contemporary Hugh of St Victor (1096-1141). The Augustinian monastery of St Victor near Paris became the head- quarters of mysticism during the 12th century. It

The Vlctorines.

had a wide influence in awakening popular piety, and the works that issued from it formed the textbooks of mystical and pietistic minds in the centuries that followed. Hugh's pupil, Richard of St Victor, declares, in opposition to dialectic scholasticism, that the objects of mystic contemplation are partly above reason, and partly, as in the intuition of the Trinity, contrary to reason. He enters at length into the con- ditions of ecstasy and the yearnings that precede it. Walter; the third of the Victorines, carried on the polemic against the dialecticians. Bonaventura (1 221-1274) was a diligent student of the Victorines, and in his Itinerarium mentis ad Deum maps out the human faculties in a similar fashion. He introduces the terms " apex mentis " and " scintilla " (also " synderesis" or avvTT)pt)o-v<;) to describe the faculty of mystic intuition. Bonaventura runs riot in phrases to describe the union with God, and his devotional works

were much drawn upon by mystical preachers. Fully a century later, when the system of scholasticism was gradually breaking up under the predomi- nance of Occam's nominalism, Pierre d'Ailly (1350-1425), and his more famous scholar John Gerson (1363-1429), chancellor of the university of Paris, are found endeavouring to com- bine the doctrines of the Victorines and Bonaventura with a nominalistic philosophy. They are the last representatives of mysticism within the limitations imposed by scholasticism.

From the 12th and 13th centuries onward there is observable in the different countries of Europe a widespread reaction against the growing formalism and worldliness of the Church and the scandalous lives of many of the Bar,y clergy. Men began to feel a desire for a theology ^^fc" of the heart and an unworldly simplicity of life. Thus there arose in the Netherlands the Beguines and Beghards, in Italy the Waldenses (without, however, any mystical leaning), in the south of France and elsewhere the numerous sect or sects of the Cathari, and in Calabria the apocalyptic gospel of Joachim of Floris, all bearing witness to the commotion of the time. The lay societies of the Beghards and the Beguines (for men and women respectively) date from the end of the 12th century, and soon became extremely popular both in the Low Countries and on the Rhine. They were free at the outset from any heretical taint, but were never much in favour with the Church. In the beginning of the 13th century the foundation of the Dominican and Franciscan orders furnished a more ecclesiastical and regular means of supplying the same wants, and numerous convents sprang up at once throughout Germany. The German mind was a peculiarly fruitful soil for mysticism, and, in connexion either with the Beguines or the Church organization, a number of women appear about this time, combining a spirit of mystical piety and asceticism with sturdy reformatory zeal directed against the abuses of the time. Even before this we hear of the prophetic visions of Hildegard of Bingen (a contemporary of St Bernard) and Elizabeth of Schonau. In the 13th century

Elizabeth of Hungary, the pious landgravine of Thuringia, assisted in the foundation of many convents in the north of Germany. (For an account of the chief of these female saints see the first volume of W. Preger's Geschichte der deutschen Mystik.) Mechthild of Magdeburg appears to have been the most influential, and her book Das fliessende Licht der Gottheit is important as the oldest work of its kind in

German. It proves that much of the terminology of German mysticism was current before Eckhart's time, Mechthild's clerico-political utterances show that she was acquainted with the " eternal gospel " of Joachim of Floris. Joachim had proclaimed the doctrine of three world-ages — the kingdom of the Father, of the Son, and of the Spirit. The reign of the Spirit was to begin with the year 1 260, when the abuses of the world and the Church were to be effectually cured by the general adoption of the monastic life of contemplation. Very similar to this in appear- ance- is the teaching of Amalric of Bena (d. 1207); but, while the movements just mentioned were reformatory without being heretical, this is very far from being the case with the mystical pantheism derived by Amalric from the writings of Erigena. His followers held a progressive revelation of God in the ages of the Father, Son, and Holy Spirit. Just as the Mosaic dispensation came to an end with the appearance of Christ, so the sacraments of the new dispensation have lost their meaning and efficacy since the incarnation of God as Holy Spirit in the Amalricans. With this opposition to the Church they combine a complete antinomianism, through the identification of all their desires with the impulses of the divine Spirit. Amalric's teaching was condemned by the Church, and his heresies led to the public burning of Erigena's De divisione naturae in 1223. The sect of the New Spirit, or of the Free Spirit as it was afterwards called, spread widely through the north of France and into Switzerland and Germany. They were especially numerous in the. Rhineland in the end of the 13th and during the 14th cen- tury; and they seem to have corrupted the originally orthodox communities of Beghards, for Beghards and Brethren of the Free Spirit are used henceforward as convertible terms, and the same immoralities are related of both. Such was the seed- ground in which what is specifically known as German mysticism sprang up.

In Meister Eckhart (? 1 260-1 3 27) the German mind definitively asserts its pre-eminence in the sphere of speculative mysticism. Eckhart was a distinguished son of the Church; but in reading his works we feel at once that we have passed into quite a different sphere of thought from that of the churchly mystics; we seem to leave the cloister behind and to breathe a freer atmosphere. The scholastic mysticism was, for the most part, practical and psychological in character. It was largely a devotional aid to the realization of present union with God; and, so far as it was theoretical, it was a theory of the faculties by which such a union is attainable. Mysticism was pieced on somewhat incongruously to a scholastically accepted theology; the feelings and the intellect were not brought together. But in Eckhart the attitude of the churchman and traditionalist is entirely abandoned.

Instead of systematizing dogmas, he appears to evolve a philosophy by the free exercise of reason. His system enables him to give a profound signifi- cance to the doctrines of the Church; but, instead of the system being accommodated to the doctrines, the doctrines — and especially the historical facts — acquire a new sense in the system, and often become only a mythical representation of speculative truth. The freedom with which Eckhart treats historical Christianity allies him much more to the German idealists of the 19th century than to his scholastic predecessors.

The political circumstances of Germany in the first half of the 14th century were in the last degree disastrous. The war between the rival emperors, Frederick of Austria and Louis of Bavaria, and the interdict under which the latter was placed in 1324 inflicted extreme misery upon the unhappy people. From some places the interdict was not removed for twenty-six years. Men's minds were pained and disquieted by the conflict of duties and the absence of spiritual consolation. The country

Eckhart

Ruysbroeck.

was also visited by a succession of famines and floods, and in 1348 the Black Death swept over Europe like a terrible scourge. In the midst of these unhappy surroundings religion became more inward in men of real piety and the desire grew among them to draw closer the bonds that united them to one another. Thus arose the society of the Friends of God (Gotiesfreunde) in the south and west of Germany, spreading as far as Switzerland on the one side and the Nether- e ' lands on the other. They formed no exclusive freunde." sect. They often took opposite sides in politics and they also differed in the type of their religious life; but they uniformly desired to strengthen one another in living intercourse with God. Among them chiefly the followers of Eckhart were to be found. Such were Heinrich Suso of Con- stance (1 295-1366) and Johann Tauler of Strassburg (1300-1361) , the two most celebrated of his immediate disciples. Nicolas of Basel, the mysterious layman from whose visit Tauler dates his- true religious life, seems to have been the chief organizing force among the Gottesfreunde. The society counted many members among the pious women in the convents of southern Germany. Such were Christina Ebner of Engelthal near Nuremberg, and Margaretha Ebner of Medingen in Swabia. Laymen also belonged to it, like Hermann of Fritzlar and Rulman Merswin, the rich banker of Strassburg (author of a mystical work, Buck der neun Felsen, on the nine rocks or upwards

steps of contemplation). It was doubtless one of the Friends who sent forth anonymously from the house of the Teutonic Order in Frankfort the famous handbook of mystical devotion called Eine deutsche Theologie, first published in 15 16 by Luther.

Jan van Ruysbroeck (1 294-1381), the father of mysticism in the Netherlands, stood in connexion with the Friends of God, and Tauler is said to have visited him in his seclusion at Groenendal (Vauvert, Griinthal) near Brussels. He was decisively influenced by Eckhart, though there is no- ticeable occasionally a shrinking back from some of Eckhart's phraseology. Ruysbroeck's mysticism is more of a practical than a speculative cast. He is chiefly occupied with the means whereby the unio mystica is to be attained, whereas Eckhart dwells on the union as an ever-present fact, and dilates on its metaphysical implications. Towards the end of Ruysbroeck's life, in 1378, he was visited by the fervid lay-preacher Gerhard Groot (1340-1384), who was so impressed by the life of the com- munity at Groenendal that he conceived the idea of founding a Christian brotherhood, bound by no monastic vows, but living together in simplicity and piety with all things in common, after the apostolic pattern. This was the origin of the Brethren of the Common Lot (or Common Life). The first house of the Brethren was founded at Deventer by Gerhard Groot and his youthful friend Florentius Radewyn; and here Thomas a. Kempis (q.v.) received his training. Similar brother-houses soon sprang up in different places throughout the Low Countries and Westphab'a, and even Saxony.

It has been customary for Protestant writers to represent the mystics of Germany and Holland as precursors of the Reformation. In a sense this is true. But Mystics it would be false to say that these men protested andthe Re- against the doctrines of the Church in the way the formation. Reformers felt themselves called upon to do. There is no sign that Tauler, for example, or Ruysbroeck, or Thomas a Kempis had felt the dogmatic teaching of the Church jar in any single point upon their religious consciousness. Never- theless, mysticism did prepare men in a very real way for a break with the traditional system. Mysticism instinctively recedes from formulas that have become stereotyped and mechanical. On the other hand its claim for spiritual freedom was soon to be found in opposition also to the Reformers.

The wild doctrines of Thomas Munzer and the Zwickau prophets, merging eventually into the excesses of the Later Peasants' War and the doings of the Anabaptists in Qermai Miinster, first roused Luther to the dangerous Mystha. possibilities of mysticism as a disintegrating

force. He was

also called upon to do battle for his principle against men like Caspar Schwenkfeld (1490-1561) and Sebastian Franck (1500- 1545), the latter of whom developed a system of pantheistic mysticism, and went so far in his opposition to the letter as to declare the whole of the historical element in Scripture to be but a mythical representation of eternal truth. Valentin Weigel (1 533-1 588), who stands under manifold obligations to Franck, represents also the influence of the semi-mystical physical speculation that marked the transition from scholasticism to modern times. The final breakdown of scholasticism as a rationalized system of dogma may be seen in Nicolas (or Nicolaus) of Cusa (1401-1464), who distinguishes between the intellectus and the discursively acting ratio almost precisely in the style of later distinctions between the reason and the understanding. The intellect combines what the understanding separates ; hence Nicolas teaches the principle of the coincidentia contradictoriorum. If the results of the understanding go by the name of knowledge, then the higher teaching of the intellec- tual intuition may be called ignorance— ignorance, however, that is conscious of itself, docta ignorantia. ” Intuitio,” ” specu- late, ” ” visio sine comprehensione,” ” comprehensio incom- prehensibilis,” ” mystica theologia,” ” tertius caelus,” are some of the terms he applies to this knowledge above knowledge; but in the working out of his system he is remarkably free from extravagance. Nicolas’s doctrines were of influence upon Giordano Bruno and other physical philosophers of the 15th and 1 6th centuries. All these prrysical theories are blended with a mystical theosophy, of which the most remarkable example is, perhaps, the chemico-astrological speculations of Paracelsus (1493-1541). The influence of Nicolas of Cusa and Paracelsus mingled in Valentin Weigel with that of the Deutsche Theologie, Andreas Osiander, Schwenkfeld and Franck. Weigel, in turn, handed on these influences to Jakob Boehme (1575-1624), philosophas teutonicus, and father of the chief developments of theosophy in modern Germany (see Boehme).

Mysticism did not cease within the Catholic Church at the Reformation. In St Theresa (1515-1582) and John of the Cross Other the counter-reformation can boast of saints second Forms of to none in the calendar for the austerity of their Mysticism, mortifications and the rapture of the visions to which they were admitted. But, as was to

be expected, their mysticism moves in that comparatively narrow round, and consists simply in the heaping up of these sensuous experiences. The speculative character has entirely faded out of it, or rather has been crushed out by the tightness with which the directors of the Roman Church now held the reins of discipline. Their mysticism represents, therefore, no widening or spiritualizing of their theology; in all matters of belief they remain the docile children of their Church. The gloom and harshness of these Spanish mystics are absent from the tender, contemplative spirit of Francois de Sales (1 567-1622); and in the quietism of Mme Guyon (1648-1717) and Miguel de Molinos (1627-1696) there is again a sufficient implication of mystical doctrine to rouse the suspicion *of the ecclesiastical authorities. Quietism, name and thing, became the talk of all the world through the bitter and protracted controversy to which it gave rise between Fenelon and Bossuet.

In the 17th century mysticism is represented in the philo- sophical field by the so-called Cambridge Platonists, and especially by Henry More (1614-1687), in whom the influence of the Kabbalah is combined with a species of christianized Neoplatonism. Pierre Poiret (1646-1719) exhibits a violent reaction against the mechanical philosophy of Descartes, and especially against its consequences in Spinoza. He was an ardent student of Tauler and Thomas a Kempis, and became an adherent of the quietistic doctrines of Mme Bourignon. His philosophical works emphasize the passivity of the reason. The first influence of Boehme was in the direction of an obscure religious mysticism. J. G. Gichtel (1638-1710), the first editor of his complete works, became the founder of a sect called the Angel-Brethren. All Boehme's works were translated into English in the time of the Commonwealth, and regular societies

of Boehmenisls were formed in England and Holland. Later in the century he was much studied by the members of the Philadelphian Society, John Pordage, Thomas Bromley, Jane Lead, and others. The mysticism of William Law (1686-1761) and of Louis Claude de Saint Martin in France (1 743-1 803), who were also students of Boehme, is of a much more elevated and spiritual type. The " Cherubic Wanderer," and other poems, of Johann Scheffler (1624-1677), known as Angelus Silesius, are more closely related in style and thought to Eckhart than to Boehme.

The religiosity of the Quakers, with their doctrines of the " inner light " and the influence of the Spirit, has decided affinities with mysticism; and the autobiography of George Fox (1624-1691), the founder of the sect, proceeds throughout on the assumption of supernatural

guidance. Stripped of its definitely miraculous character, the doctrine of the inner light may be regarded as the familiar mystical protest against for- malism, literalism, and scripture-worship. Swedenborg, though selected by Emerson in his Representative Men as the typical mystic, belongs rather to the history of spiritualism than to that of mysticism as understood in this article. He possesses the cool temperament of the man of science rather than the fervid God ward aspiration of the mystic proper; and the specu- lative impulse which lies at the root of this form of thought is almost entirely absent from his writings. Accordingly, his supernatural revelations resemble a course of lessons in celestial geography more than a description of the beatific vision.

Philosophy since the end of the 1 8th century has frequently shown a tendency to diverge into mysticism. This has been espe- cially so in Germany. The term mysticism is indeed often extended by popular usage and philosophical partisanship to the whole activity of the post-Kantian idealists. In this usage the word would be equivalent to the more recent and scarcely less abused term, tran- scendentalism, and as such it is used even by a sympathetic writer like Carlyle; but this looseness of phraseology only serves to blur important distinctions. However absolute a philosopher's idealism may be, he is erroneously styled a mystic if he moves towards his conclusions only by the patient labour of the reason. Hegel there- fore, to take an instance, can no more fitly be' classed as a mystic than Spinoza can. It would be much nearer the truth to take both as types of a thoroughgoing rationalism. In either case it is of course open to anyone to maintain that the apparent completeness of synthesis really rests on the subtle intrusion of elements of feeling into the rational process. But in that case it might be difficult to find a systematic philosopher who would escape the charge of mysticism; and it is better to remain by long-established and serviceable distinctions. So, again, when Rccdjac defines mysti- cism as " the tendency to draw near to the Absolute in moral union by symbolic means," the definition, as developed by him, is one which would apply to the philosophy of Kant. Recejac's interesting work, Les Fondements de la connaissance mystique (Eng. trans. 1899), though it touches mysticism at various points, and quotes from mystic writers, is in fact a protest against the limitations of experi- ence to the data of the senses and the pure reason to the exclusion of the moral consciousness and the deliverances of " the heart." But such a position is not describable as mysticism in any recognized sense. On the other hand, where philosophy despairs of itself, exults in its own overthrow, and yet revels in the " mysteries " of a speculative Christianity, as in J. G. Hamann (1730-1788), the

term mysticism may be fitly applied. So, again, it is in place where the movement of revulsion from a mechanical philosophy takes the form rather of immediate assertion than of reasoned demonstration, and where the writers, after insisting generally on the spiritual basis of phenomena, either leave the position without further defini- tion or expressly declare that the ultimate problems of philosophy cannot be reduced to articulate formulas. Examples of this are men like Novalis, Carlyle and Emerson, in whom philosophy may be said to be impatient of its own task. Schelling's explicit appeal in the Identitats-philosophie to an intellectual intuition of the Absolute, is of the essence of mysticism, both as an appeal to a supra- rational faculty and as a claim not merely to know but to realize 1 God. The opposition of the reason to the understanding, as formu- lated by S. T. Coleridge, is not free from the first of these faults. The later philosophy of Schelling and the philosophy of Franz von Baader, both largely founded upon Boehme, belong rather to theosophy (q.v.) than to mysticism proper.

Authorities. — Besides the sections on mysticism in the general histories of philosophy by Erdmann, Ueberweg and Windelband, and in works on church history and the history of dogma, reference may be made for the medieval period to Heinrich Schmid, Der Mysticismus in seiner Entstehungsperiode (1824); Charles Schmidt, Essai sur les mystiques du i4 me siecle (1836); Ad. Helfferich, Die christliche Mystik (1842); L. Noack, Die christliche Mystik des

Mittelalters (1853); J. Gorres, Die christliche Mysiik (new ed., 1879-1880) ; Rufus M. Jones, Studies in Mystical Religion (1909). On the German mystics see W. Preger's Geschichte der deutschen Mystik (vol. i. 1874; vol. ii. 1881; vol. iii. 1893). The works of Eckhart and his precursors are contained in F. Pfeiffer's Deutsche Mystiker des 14. Jahrhunderts (1845-1857). (A. S. P.-P.)

MYTHOLOGY (Gr. nvdohoyia, the science which examines hWol, myths or legends of cosmogony and of gods and heroes. Mythology is also used as a term for these legends themselves. Thus when we speak of " the mythology of Greece " we mean the whole body of Greek divine and heroic and cosmo- gonic legends. When we speak of the" science of mythology " we refer to the various attempts which have been made to explain these ancient narratives. Very early indeed in the history of human thought men awoke to the consciousness that

their religious stories were much in want of explanation. The myths of civilized peoples, as of Greeks and the Aryans of India, contain two elements, the rational and what to modern minds seems the irrational. The rational myths are those which represent the gods as beautiful and wise beings. The Artemis of the Odyssey ” taking her pastime in the chase of boars and swift deer, while with her the wild wood-nymphs disport them, and high over them all she rears her brow, and is easily to be known where all are fair,” is a perfectly rational mythic representation of a divine being. We feel, even now, that the conception of a ” queen and huntress, chaste and fair,” the lady warden of the woodlands, is a beautiful and natural fancy which requires no explanation. On the other hand, the Artemis of Arcadia, who is confused with the nymph Callisto, who, again, is said to have become a she-bear, and later a star, and the Brauronian Artemis, whose maiden ministers danced a bear-dance, are goddesses whose legend seems unnatural, and is felt to need explanation. Or, again, there is nothing not explicable and natural in the conception of the Olympian Zeus as represented by the great chryselephantine statue of Zeus at Olympia, or in the Homeric conception of Zeus as a god who ” turns everywhere his shining eyes ” and beholds all things. But the Zeus whose grave was shown in Crete, or the Zeus who played Demeter an obscene trick by the aid of a ram, or the Zeus who, in the shape of a swan, became the father of Castor and Pollux, or the Zeus who was merely a rough stone, or the Zeus who deceived Hera by means of a feigned marriage with an inanimate object, or the Zeus who was afraid of Attes, is a being whose myth is felt to be unnatural and in great need of explanation. It is this irrational and unnatural element — as Max Miiller says, ” the silly, savage and senseless element ” — that makes mythology the puzzle which men have so long found it.

Early Explanations of Myths. — The earliest attempts at a crude science of mythology were efforts to reconcile the legends of the gods and heroes with the religious sentiment which recognized in these beings objects of worship and respect. Closely as religion and myth are intertwined, it is necessary to hold them apart for the purposes of this discussion. Religion may here be defined as the conception of divine, or at least supernatural powers entertained by men in moments of gratitude or of need and distress, in hours of weakness, when, as Homer says, ” all folk yearn after the gods.” Now this conception may be rude enough, and it is nearly related to purely magical ideas, to efforts to secure supernatural aid by magical ceremonies. Still the roughest form of spiritual prayer has for its basis the hypothesis of beneficent beings, visible or invisible. The senseless

stories or myths about the gods are soon felt to be at variance with this hypothesis. As an example we may take the instance of Qing, the Bushman hunter. Qing, when first he met white men, was asked about his religion. He began to explain, and mentioned Cagn. Mr Orpen, the chief magistrate of St John's Terri- tory, asked: " Is Cagn good or malicious? how do you pray to him?" Answer (in a low imploring tone): " 'O Cagn! O Cagn! are we not your children? do you not see our hun- ger? give us food;' and he gives us both hands full " (Cape Monthly Magazine, July 1874). Here we see the religious

view of Cagn, the Bushman god. But in the mythological account of Cagn given by Qing he appears as a kind of grass- hopper, supernaturally endowed, the hero of a most absurd cycle of senseless adventures. Even religion is affected by these irrational notions, and the gods of savages and of many civilized peoples are worshipped with cruel, obscene, and irrational rites. But, on the whole, the religious sentiment strives to transcend the mythical conceptions of the gods, and is shocked and puzzled by the mythical narratives. As soon as this sense of perplexity is felt by poets, by priests, or by most men in an age of nascent criticism, explanations of what is most crude and absurd in the myths are put forward. Men ask themselves why their gods are worshipped in the form of beasts, birds, and fishes; why their gods are said to have prosecuted their amours in bestial shapes; why they are represented as lustful and passion- ate — thieves, robbers, murderers and adulterers. The answers to these questions sometimes become myths themselves. Thus both the Mangaians and the Egyptians have been puzzled by their own gods in the form of beasts. The Egyptians invented an explanation — itself a myth — that in some moment of danger the gods concealed themselves from their foes in the shapes of animals. 1 The Mangaians, according to W. W. Gill, hold that " the heavenly family had taken up their abode in these birds, fishes, and reptiles." 2

A people so curious and refined as the Greeks were certain to be greatly perplexed by even such comparatively pure mythical narratives as they found in Homer, still more by the coarser legends of Hesiod, and above all by the ancient local myths preserved by local priesthoods. Thus, in the 6th century before Christ, Xenophanes of Colophon severely blamed the poets for their unbecoming legends, and boldly called certain myths "the fables of men of old." 3 Theagenes of Rhegium (520 B.C.?), according to the scholiast on Iliad, xx. 67/ was the author of a very ancient system of mythology. Admitting that the fable of the battle of the gods was " unbecoming," if literally understood, Theagenes represented it as an allegorical account of the war of the elements. Apollo, Helios, and Hephaestus

were fire, Hera was air, Poseidon was water, Artemis was the moon, kgu t& Xowra 6/*oia». Or, by another system, the names of the gods represented moral and intellectual qualities. Heraclitus, too, disposed of the myth of the bondage of Hera as allegorical philosophy. Socrates, in the Cratylus of Plato, expounds ” a philosophy which came to him all in an instant,” an explanation of the divine beings based on crude philological analyses of their names. Metrodorus, rivalling some recent flights of conjecture, resolved not only the gods but even heroes like Agamemnon, Hector and Achilles ” into elemental combina- tions and physical agencies.” 6 Euripides makes Pentheus (but he was notoriously impious) advance a ” rationalistic ” theory of the story that Dionysus was stitched up in the thigh of Zeus.

When Christianity became powerful the heathen philosophers evaded its satire by making more and more use of the allegorical and non-natural system of explanation. That method has two faults. First (as Arnobius and Eusebius reminded their heathen opponents), the allegorical explanations are purely arbitrary, depend upon the fancy of their author, and are all equally plausible and equally unsupported by evidence. 6 Secondly, there is no proof at all that, in the distant age when the myths were developed, men entertained the moral notions and physical philosophies which are supposed to be ” wrapped up, ” as Cicero says, ” in impious fables.” Another system of explanation is that associated with the name of Euemerus (316 B.C.). According to this author, the myths are history in disguise. All the gods were once men, whose real feats have been decorated and distorted by later fancy. This view suited Lactantius, St Augustine and other early Christian writers

1 Plutarch, De Iside et Osiride.

2 Myths and Songs from the South Pacific, p. 35 (1876).

3 Xenoph. Fr. i. 42. * Dindorf’s ed., iv. : 6 Grote, Hist, of Greece, (ed. 1869) i. 404. 6 Cf. Lobeck, Aglaophamus, i. 151-152, on allegorical interpreta- tion of myths in the mysteries.

very well. They were pleased to believe that Euemerus ” by historical research had ascertained that the gods were once but mortal men.” Precisely the same convenient line was taken by Sahagun in his

account of Mexican religious myths. As there can be no doubt that the ghosts of dead men have been worshipped in many lands, and as the gods of many faiths are tricked out with attributes derived from ancestor-worship, the system of Euemerus retains some measure of plausibility. While we need not believe with Euemerus and with Herbert Spencer that the god of Greece or the god of the Hottentots was cnce a man, we cannot deny that the myths of both these gods have passed through and been coloured by the imaginations of men who practised the worship of real ancestors. For example, the Cretans showed the tomb of Zeus, and the Phocians (Pausanias x. 5) daily poured blood of victims into the tomb of a hero,' obviously by way of feeding his ghost. The Hottentots show many tombs of their god, Tsui-Goab, and tell tales about his death; they also pray regularly for aid at the tombs of their own parents. 1 We may therefore say that, while it is rather absurd to believe that Zeus and Tsui-Goab were once real men, yet their myths are such as would be developed by people accustomed, among other forms of religion, to the worship of dead men. Very probably portions of the legends of real men have been attracted into the mythic accounts of gods of another character, and this is the element of truth at the bottom of Euemerism.

Later Explanations of Mythology. — The ancient systems of explaining what needed explanation in myths were, then, physical, ethical, religious and historical. One student, like Theagenes, would see a physical philosophy underlying Homeric legends. Another, like Porphyry, would imagine that the meaning was partly moral, partly of a dark theosophic and religious character. Another would detect moral allegory alone, and Aristotle expresses the opinion that the myths were the inventions of legislators "to persuade the many, and to be used in support of law " {Met. xi. 8, 19). A fourth, like Euemerus, would get rid of the supernatural element altogether, and find only an imaginative rendering of actual history. When Christians approached the problem of heathen mythology, they sometimes held, with St Augustine, a form of the doctrine of Euemerus. 2 In other words, they regarded Zeus, Aphrodite and the rest as real persons, diabolical not divine. Some later philosophers, especially of the 17th century, misled by the resem- blance between Biblical narratives and ancient myths, came to the conclusion that the Bible contains a pure, the myths a distorted, form of an original revelation. The abbe Banier published a mythological compilation in which he systematically resolved all the Greek myths into ordinary history. 3 Bryant published (1774) A New System, or an Analysis of Ancient Mythology, wherein an ■Attempt is made to divest Tradition of Fable, in which he talked very learnedly of " that wonderful people, the descendants of Cush," and saw

everywhere symbols of the ark and traces of the Noachian deluge. Thomas Taylor, at the end of the 1 8th century, indulged in much mystical allegorizing of myths, as in the notes to his translation of Pausanias (1794). At an earlier date (1760) De Brosses struck on the true line of interpretation in his little work Du Culte des dicux fetiches, oil paraU'ele de I'ancienne religion de TEgypte avec la religion actuclle de Nigritie. In this tract De Brosses explained the animal-worship of the Egyptians as a survival among a civilized people of ideas and practices springing from the intellectual condition of savages, and actually existing among negroes. A vast symbolical explanation of myths and mysteries was attempted by Friedrich Creuzer. 4 The learning and sound sense of Lobeck, in his Aglaophamus, exploded the idea that the Eleusinian and other mysteries revealed or concealed matter of momentous religious importance. It ought not to be forgotten

1 Hahn, Tsuni-Coam, the Supreme Being of the Khoi-Khoi, p. 1 13.

2 De civ. dei., vii. 18; viii. 26.

3 La Mythologie el les fables expliquees par I'histoire (Paris, 1738; 3 vols. 4to).

- Symbolik und Mythologie der alten Volker (Leipzig and Darmstadt, 1836-1843)-

that Lafitau, a Jesuit missionary in North America, while inclined to take a mystical view of the secrets concealed by Iroquois myths, had also pointed out the savage element surviving in Greek mythology. 5

Recent Mythological Systems. — Up to a very recent date students of mythology were hampered by orthodox traditions, and still more by ignorance of the ancient languages and of the natural history of man. Only recently have Sanskrit and the Egyptian and Babylonian languages become books not absolutely sealed. Again, the study of the evolution of human institutions from the lowest savagery to civilization is essentially a novel branch of research, though ideas derived from an unsystematic study of anthropology are at least as old as Aristotle. The new theories of mythology are based on the belief that " it is man, it is human thought and human language combined, which naturally and necessarily pro- duced the strange conglomerate of ancient fable." 6 But, while there is now universal agreement so far, modern mythologists differed essentially on one point. There was a school (with internal divisions) which regarded ancient fable as almost entirely " a disease of language," that is, as the result of con-

fusions arising from misunderstood terms that have survived in speech after their original significance was lost. Another school (also somewhat divided against itself) believes that misunder- stood language played but a very slight part in the evolu- tion of mythology, and that the irrational element in myths is merely the survival from a condition of thought which was once common, if not universal, but is now found chiefly among savages, and to a certain extent among children. The former school considered that the state of thought out of which myths were developed was produced by decaying language; the latter maintains that the corresponding phenomena of language were the reflection of thought. For the sake of brevity we might call the former the " philological " system, as it rests chiefly on the study of language, while the latter might be styled the " historical " or " anthropological " school, as it is based on the study of man in the sum of his manners, ideas and insti- tutions.

The System of Max Matter. — The most distinguished and popular advocate of the philological school was Max Muller, whose views may be found in his Selected Essays and Lectures on Language. The problem was to explain what he calls " the silly, savage and senseless element " in mythology (Sel. Ess. i. 578). Max Muller says (speaking of the Greeks), " their poets had an instinctive aversion to every- thing excessive or monstrous, yet they would relate of their gods what would make the most savage of Red Indians creep and shudder " — stories, that is, of the cannibalism of Demeter, of the mutilation of Uranus, the cannibalism of Cronus, who swallowed his own children, and the like. " Among the lowest tribes of Africa and America we hardly find anything more hideous and revolting." Max Muller refers the beginning of his system of mythology to the discovery of the connexion of the Indo-European or, as they are called, " Aryan " languages. Celts, Germans, speakers of Sanskrit and Zend, Latins and Greeks, all prove by their languages that their tongues may be traced to one family of speech. The comparison of the various words which, in different forms, are com- mon to all Indo-European languages must inevitably throw much light on the original meaning of these words. Take, for example, the name of a god, Zeus, or Athene, or any other. The word may have no intelligible meaning in Greek, but its counterpart in the allied tongues, especially in Sanskrit or Zend, may reveal the original significance of the terms. " To understand the origin and meaning of the names of the Greek gods, and to enter into the original intention of the fables told of each, we must take into account the collateral evidence supplied by Latin, German, Sanskrit and Zend philology " (Led. on Lang., 2nd series, p. 406). A name may be intelligible in Sanskrit which has no sense in Greek. Thus Athene is

a divine name without meaning in Greek, but Max Muller advances reasons for supposing that it is identical with ahana, ” the dawn,” in Sanskrit. It is his opinion, apparently, that whatever story, is told of Athene must have originally been told of the dawn, and that we must keep this before us in attempting to understand the legends of Athene. Thus again (op. cit. p. 410), he says, ” we have a right to explain all that is told of him ” (Agni, ” fire “) ” as originally meant for fire.” The system is simply this : the original meaning of the names of gods must be ascertained by comparative philology. The names, as a rule, will be found to denote elemental phenomena. And the silly,

6 Mceurs des sauvages (Paris, 1724).

6 Max Muller, Lectures on Language (1864), 2nd series, p. 410.

savage and senseless elements in the legends of the gods will be shown to have a natural significance, as descriptions of sky, storms, sunset, water, fire, dawn, twilight, the life of earth, and other celestial and terrestrial existences. Stated in the barest form, these results do not differ greatly from the conclusions of Theagenes of Rhegium, who held that ” Hephaestus was fire, Hera was air, Poseidon was water, Artemis was the moon, ko.1 raXoixd ofioius.” But Max Miiller’s system is based on scientific philology, not on conjecture, and is supported by a theory of the various processes in the evolution of myths out of language.

It is no longer necessary to give an elaborate analysis of this theory, because neither in its philological nor mythological side has it any advocates who need be reckoned with. The attempt to disengage the history of times forgotten and unknown, by means of analysis of roots and words in Aryan languages, has been unsuccessful, or has at best produced disputable results. Max Miiller’s system was a result of the philological theories that indicated the linguistic unity of the Indo-European or ” Aryan ” peoples, and was founded on an analysis of their language. But myths precisely similar in irrational and repulsive character, even in minute details, tc those of the Aryan races, exist among Australians, South Sea Islanders, Eskimo, Bushmen in Africa, among Solomon Islanders, Iroquois, and so forth. The facts being identical, an identical explanation should be sought, and, as the

languages in which the myths exist are essen- tially different, an explanation founded on the Aryan language is likely to prove too narrow. Once more, even if we discover the original meaning of a god's name, it does not follow that we can explain by aid of the significance of the name the myths about the god. For nothing is more common than the attraction of a more ancient story into the legend of a later god or hero. Myths of un- known antiquity, for example, have been attracted into the legend of Charlemagne, just as the bans mots of old wits are transferred to living humorists. Therefore, though we may ascertain that Zeus means " sky " and Agni " fire," we cannot assert, with Max Miiller, that all the myths about Agni and Zeus were originally told of fire and sky. VVhen these gods became popular they would inevit- ably inherit any current exploits of earlier heroes or gods. These exploits would therefore be explained erroneously if regarded as originally myths of sky or fire. We cannot convert Max Miiller's proposition " there was nothing told of the sky that could not in some form or other be ascribed to Zeus" into " there was nothing ascribed to Zeus that had not at some time or other heen told of the sky." This is also, perhaps, the proper place to observe that names derived from natural phenomena — sky, clouds, dawn and sun — are habitually assigned by Brazilians, Ojibways, Australians and other savages to living men and women. Thus the story originally told of a man or woman bearing the name " sun," " dawn," " cloud," may be mixed up later with myths about the real celestial dawn, cloud or sun. For all these reasons the information obtained from philological analysis of names is to be distrusted. We must also bear in mind that early men when they conceived, and savage men when they conceive, of the sun, moon, wind, earth, sky and so forth, have no such ideas in their minds as we attach to these names. They think of sun, moon, wind, earth and sky as of living human beings with bodily parts and passions. Thus, even when we dis- cover an elemental meaning in a god's name, that meaning may be all unlike what the word suggests to civilized men. A final objection is that philologists differ widely as to the true analysis and real meaning of the divine names. Max Miiller, for example, connects Kronos (Kpoms) with xporos, "time"; Prellerwith upaivw, " I fulfil," and so forth.

The civilized men of the Mythopoeic age were not obliged, as Max Miiller held, to believe that all phenomena were persons, because the words which denoted the phenomena had gender- terminations. On the other hand, the gender-terminations were survivals from an early stage of thought in which personal character- istics, including sex, had been attributed to all phenomena. This condition of thought is demonstrated to be, and to have been, universal among savages, and it

may notoriously be observed among children. Thus Max Miiller's theory that myths are " a disease of language " seems destitute of evidence, and inconsistent with what is historically known about the relations between the language and the social, political and literary condition of men.

Theory of Herbert Spencer. — The system of Herbert Spencer, as explained in Principles of Sociology, has many points in common with that of Max Miiller. Spencer attempts to account for the state of mind (the foundation of myths) in which man personifies and animates all phenomena. According to his theory, too, this habit of mind may be regarded as the result of degeneration, for in his view, as in Max Miiller's, it is not primary, but the result of miscon- ceptions. But, while language is the chief cause of misconceptions with Max Miiller, with Spencer it is only one of several forces all working to the same result. Statements which originally had a different significance are misinterpreted, he thinks, and names of human beings are also misinterpreted in such a manner that early races are gradually led to believe in the personality of phenomena. He too notes " the defect in early speech " — that is, the " lack of words free from implications of vitality " — as one of the causes which " favour personalization." Here, of course, we have to ask Spencer, with Max Miiller, why words in early languages " imply

vitality." These words must reflect the thought of the men who use them before they react upon that thought and confirm it in its mis- conceptions. So far Spencer seems at one with the philological school of mythologists, but he warns us that the misconstructions of language in his system are " different in kind, and the erroneous course of thought is opposite in direction." According to Spencer (and his premises, at least, are correct), the names of human beings in an early state of society are derived from incidents of the moment, and often refer to the period of the day or the nature of the weather. We find, among Australian natives, among Abipones in South America, and among Ojibways in the North, actual people named Dawn.Gold Flower of Day, Dark Cloud, Sun, and so forth. Spencer's argument is that, given a story about real people so named, in process of time and forgetfulness the anecdote which was once current about a man named Storm and a woman named Sunshine will be transferred to the meteorological phenomena of sun and tempest. Thus these purely natural agents will come to be " personalized " (Prin. Soc. 392), and to be credited with purely human origin and human adventures. Another misconception would arise when men had a tradition that they came to their actual seats from this moun- tain, or that lake or river, or from lands across the sea. They will mistake this tradition of local origin for

one of actual parentage, and will come to believe that, like certain Homeric heroes, they are the sons of a river (now personified), or of a mountain, or, like a tribe mentioned by Garcilasso de la Vega, that they are descended from the sea. Once more, if their old legend told them that they came from the rising sun, they will hold, like many races, that they are actually the children of the sun. By this process of forgetfulness and misinterpretation, mountains, rivers, lakes, sun and sea would receive human attributes, while men would degenerate from a more sensible condition into a belief in the personality and vitality of inanimate objects. As Spencer thinks ancestor-worship the first form of religion, and as he holds that persons with such names as sun, moon and the like became worshipped as ancestors, his theory results in the belief that nature- worship and the myths about natural phenomena — dawn, wind, sky, night and the rest — are a kind of transmuted worship of ancestors and transmuted myths about real men and women.. ” Partly by confounding the parentage of the race with a conspicuous object marking the natal region of the race, partly by literal interpretation of birth names, and partly by literal interpretation of names given in eulogy ” (such as Sun and Bull, among the Egyptian kings), and also through ” implicit belief in the statements of forefathers,” there has been produced belief in descent from mountains, sea, dawn, from animals which have become constellations, and from persons once on earth who now appear as sun and moon. A very common class of myths (see Totemism) assures us that certain stocks of men are descended from beasts, or from gods in the shape of beasts. Spencer explains these by the theory that the remembered ancestor of a stock had, as savages often have, an animal name, as Bear, Wolf, Coyote, or what not. In time his descendants came to forget that the name was a mere name, and were misled into the opinion that they were children of a real coyote, wolf or bear. This idea, once current, would naturally .stimulate and diffuse the belief that such descents were possible, and that the animals are closely akin to men.

The chief objection to these processes is that they require, as a necessary condition, a singular amount of memory on the one hand and of forgetfulness on the other. The lowest contemporary savages remember little or nothing of any ancestor farther back than the-grandfather. But men in Spencer’s Mythopoeic age had much longer memories. On the other hand, the most ordinary savage does not misunderstand so universal a custom as the imposition of names peculiar to animals or derived from atmospheric phenomena. He calls his own child Dawn or Cloud, his own name is Sitting Bull or Running Wolf, and he is not tempted to explain his great-grand- father’s name

of Bright Sun or Lively Raccoon on the hypothesis that the ancestor really was a raccoon or the sun. Moreover, savages do not worship ancestresses or retain lively memories of their great-grandmothers, yet it is through the female line in the majority of cases that the animal or other ancestral name is derived. The son of an Australian male, whose kin or totem name is Crane, takes, in many tribes, his mother's kin-name, Swan or Cockatoo, or whatever it may be, and the same is a common rule in Africa and America among races who rarely remember their great-grandfathers. On the whole, then (though degeneracy, as well as progress, is a force in human evolution), we are not tempted to believe in so strange a combination of forgetfulness with long memory, nor so excessive a degeneration from common sense into a belief in the personality of phenomena, as are required no less by Spencer's system than by that of Max Miiller.

Preliminary Problems. — We have stated and criticized the more prominent modern theories of mythology. It is now necessary first to recapitulate the chief points in the problem, and then to attempt to explain therri by a comparison of the myths of various races. The difficulty of mythology is to account for the following among other apparently irrational elements in myths: the wild and senseless stories of the

beginnings of things, of the origin of men, sun, stars, animals, death, and the world in general; the infamous and absurd adven- tures of the gods; why divine beings are regarded as incestuous, adulterous, murderous, thievish, cruel, cannibals, and addicted to wearing the shapes of animals, and subject to death in some stories; the myths of metamorphosis into plants, beasts and stars; the repulsive stories of the state of the dead; the descents of the gods into the place of the dead, and their return thence. It is extremely difficult to keep these different categories of myths separate from each other. If we investigate myths of the origin of the worid, we often find gods in animal form active in the work of world-making. If we examine myths of human descent from animals, we find gods busy there, and if we try to investigate the myths of the origin of the gods, the subject gets mixed up with the mythical origins of things in general.

Our first question will be, Is there any stage of human society, and of the human intellect, in which facts that appear to us to be monstrous and irrational are accepted as ordinary occur- rences of every day life

? E. W. Lane, in his preface to the Arabian Nights, says that the Arabs have an advantage over us as story-tellers. They can introduce such incidents as the change of a man into a horse, or of a woman into a dog, or the intervention of an afreet, without any more scruple than our own novelists feel in describing a duel or the concealment of a will. Among the Arabs the actions of magic and of spirits are regarded as at least as probable and common as duels and concealments of wills in European society. It is obvious that we need look no farther for the explanation of the supernatural events in Arab romances. Now let us apply this system to mythology. It is admitted that Greeks, Romans, Aryans of India in the age of the Sanskrit commentators, Egyptians of the Ptolemaic and earlier ages, were as much puzzled as we are by the mythical adventures of their gods. But is there any known stage of the human intellect in which these divine adventures, and the metamorphoses of men into animals, trees, stars, and converse with the dead, and all else that puzzles us in the civilized mythologies, are regarded as possible incidents of daily human life? Our answer is that everything in the civilized mythologies which we regard as irrational seems only part of the accepted and rational order of things (at least in the case of " medicine-men " or magicians) to contemporary savages, and in the past seemed equally rational and natural to savages concerning whom we have historical information. Our theory is, therefore, that the savage and senseless element in mythology is, for the most part, a legacy from ancestors of the civilized races who were in an intellectual state not higher than that of Australians, Bushmen, Red Indians, the lower races of South America, Mincopies, and other worse than barbaric . peoples. As the ancestors of the Greeks, with the Aryans of India, the Egyptians, and others advanced in civilization, their religious thought was shocked and surprised by myths (originally dating from the period of savagery, and natural in that period) which were preserved down to the time of Pausanias by local priesthoods, or which were stereotyped in the ancient poems of Hesiod and Homer, or in the Brahmanas and Vedas of India, or were retained in the popular religion of Egypt. This theory recommended itself to Lobeck. " We may believe that ancient and early tribes framed gods like themselves in action and in experience, and that the allegorical element in myths is the addition of later peoples who had attained to purer ideas of divinity, yet dared not reject the religion of their ancestors" (Aglaoph. i. 153). The senseless clement in the myths would by this theory be for the most part a " survival." And the age and condition of human thought from which it survived would be one in which our most ordinary ideas about the nature of things and the limits of possibility did not yet exist, when all things were conceived of in quite other fashion — the age, that is, of savagery. It is

universally admitted that ” survivals ” of this kind do account for many anomalies in out institutions, in law, politics, society, even in dress and manners. If isolated fragments of an earlier age abide in these, it is still more probable that other fragments

will survive in anything so closely connected as mythology with the conservative religious sentiment.

If this view of mythology can be proved, much will have been done to explain a problem which we have not yet touched, namely, the distribution of myths. The science of mythology has to account, if it can, not only for the existence of certain stories in the legends of certain races, but also for the presence of stories practically the same among almost all races. In the long history of mankind it is impossible to deny that stories may conceivably have spread from a single centre, and been handed on from races like the Indo-European and the Semitic to races as far removed from them in every way as the Zulus, the Australians, the Eskimo, the natives of the South Sea Islands. But, while the possibility of the diffusion of myths by borrowing and transmission must be allowed for, the hypothesis of the origin of myths in the savage state of the intellect supplies a ready explanation of their wide diffusion. Archaeologists are acquainted with objects of early art and craftsmanship, rude clay pipkins and stone weapons, which can only be classed as ” human,” and which do not bear much impress of any one national taste and skill. Many myths may be called ” human ” in this sense. They are the rough products of the early human mind, and are not yet characterized by the differentiations of race and culture. Such myths might spring up anywhere, among untutored men, and anywhere might survive into civilized literature. Therefore where similar myths are found among Greeks, Australians, Egyptians, Mangaians and others, it is unnecessary to account for their wide diffusion by any hypothesis of borrowing, early or late. The Greek ” key ” pattern found on objects in Peruvian graves was not necessarily borrowed from Greece, nor did Greeks necessarily borrow from Aztecs the ” wave ” pattern which is common to both. The same explanation may be applied to Greek and Aztec myths of the deluge, to Australian and Greek myths cf the original theft of fire. Borrowed they may have been, but they may as probably have been independent inventions.

It is true that some philologists deprecate as unscientific the comparison cf myths which are found in languages not connected with each other. The objection rests on the theory that myths are a disease of language, a morbid offshoot of language, and that the legends in unconnected languages must therefore be kept apart. But, as the

theory which we are explaining does not admit that language is more than a subordinate cause in the development of myths, as it seeks for the origin of myths in a given condition of thought through which all races have passed, we need do no more than record the objection.

The Intellectual Condition of Savages. — Our next step must be briefly to examine the intellectual condition of savages, that is, of races varying from the condition of the Andaman Islanders to that of the Solomon Islanders and the ruder Red Men of the American continent. In a developed treatise on the subject of mythology it would be necessary to criticize, with a minuteness which is impossible here, our evidence for the very peculiar mental condition of the lower races. Max Muller asked (when speaking of the mental condition of men when myths were developed), ” was there a period of temporary madness through which the human mind had to pass, and was it a madness identically the same in the south of India and the north of Iceland? ” To this we may answer that the human mind had to pass through the savage stage of thought, that this stage was for all practical purposes ” identically the same ” everywhere, and that to civilized observers it does resemble ” a temporary madness.” Many races are still abandoned to that temporary madness; many others which have escaped from it were observed and described while still labouring under its delusions. Our evidence for the intellectual ideas of man in the period of savagery we derive partly from the reports of voyagers, historians, missionaries, partly from an examination of the customs, institutions, and laws in which the lower races gave expression to their notions.

As to the first kind of evidence, we must be on our guard against several sources of error. Where religion is concerned, travellers in general and missionaries in particular are biased in several distinct

ways. The missionary is sometimes anxious to prove that religion can only come by revelation, and that certain tribes, having received no revelation, have no religion or religious myths at all. Sometimes the missionary, on the other hand, is anxious to demonstrate that the myths of his heathen flock are a corrupted version of the Biblical narrative. In the former case he neglects the study of savage myths ; in the latter he unconsciously accommodates what he hears to what he calls ” the truth.” The traveller who is not a missionary may either have the same prejudices, or he may be a sceptic about revealed

religion. In the latter case he is perhaps unconsciously moved to put burlesque versions of Biblical stories into the mouths of his native informants, or to represent the savages as ridiculing the Scriptural traditions which he communicates to them. Yet again we must remember that the leading questions of a European inquirer may furnish a savage with a thread on which to string answers which the questions themselves have suggested. ” Have you ever had a great flood ? ” ” Yes ” ” Was any one saved ? ” The question starts the invention of the savage on a deluge-myth, of which, perhaps, the idea has never before entered his mind. There still remain the difficulties of all conversation between civilized men and unsophisticated savages, the tendency to hoax, and other sources of error and confusion. By this time, too, almost every explorer of savage life is a theorist. He is a Spencerian, or a believer in the universal prevalence of the faith in an ” All-Father,” or he looks everywhere for gods who are ” spirits of vegetation.” In receiving this kind of evidence, ther, we need to know the character of our informant, his means of communicating with the heathen, his power of testing evidence, and his good faith. His testimony will have additional weight if supported by the ” undesigned coin- cidences ” of other evidence, ancient and modern. If Strabo and Herodotus and Pomponius Mela, for example, describe a custom, rite or strange notion in the Old World, and if mariners and mission- aries find the same notion or custom or rite in Polynesia or Australia or Kamchatka, we can scarcely doubt the truth of the reports. The evidence is best when given by ignorant men, who are astonished at meeting with an institution which ethnologists are familiar with in other parts of the world.

Another method of obtaining evidence is by the comparative study of savage laws and institutions. Thus we find in Asia, Africa, America and Australia that the marriage laws of the lower races are connected with a belief in kinship or other relationship with animals. The evidence for this belief is thus entirely beyond sus- picion. We find, too, that political power, sway and social influence are based on the ideas of magic, of metamorphosis, and of the power which certain men possess to talk with the dead and to visit the abodes of death. All these ideas are the stuff of which myths are made, and the evidence of savage institutions, in every part of the world, proves that these ideas are the universal inheritance of savages.

Savage men are like ourselves in curiosity and anxiety causas cognoscere rerum, but with our curiosity they do not possess Savage ideas our powers of attention. They are as easily satisfied about the with an explanation of phenomena as they are eager World. £ p 0S3ess an explanation. Inevitably they furnish

themselves with their philosophy out of their scanty stock of acquired ideas, and these ideas and general conceptions seem almost imbecile to civilized men. Curiosity and credulity, then, are the characteristics of the savage intellect. When a phenomenon presents itself the savage requires an explanation, and that explanation he makes for himself, or receives from tradition, in the shape of a myth. The basis of these myths, which are just as much a part of early conjectural science as of early religion, is naturally the experience of the savage as construed by himself. Man's ■ craving to know " the reason why " is already " among rude savages an intellectual appetite," and " even to the Australian scientific speculation has its germ in actual experience." 1 How does he try to satisfy this craving? E. B. Tylor replies, "When the attention of a man in the myth-making stage of intellect is drawn to any phenomenon or custom which has to him no obvious reason, he invents and tells a story to account for it. " Against this statement it has been urged that men in the lower stages of culture are not curious, but take all phenomena for granted. If there were no direct evidence in favour of Tylor's opinion, it would be enough to point to the nature of savage myths them- selves. It is not arguing in a circle to point out that almost all of them are nothing more than explanations of intellectual difficulties, answers to the question, How came this or that phenomenon to be what it is ? Thus savage myths answer the questions — What was the origin of the world, and of men, and of beasts? How came the stars by their arrangement 1 E. B. Tylor, Primitive Culture, i. 369 (1871).

and movements? How are the motions of sun and moon to be accounted for? Why has this tree a red flower, and this bird a black mark on the tail? What, was the origin of the tribal dances, or of this or that law of custom or etiquette? Savage mythology, which is also savage science, has a reply to all these and all similar questions, and that reply is always found in the shape of a story. The answers cannot be accounted for without the previous existence of the questions.

We have now shown how savages come to have a mythology. It is their way of satisfying the early form of scientific curiosity, their way of realizing the world in which they move. But they frame their stories, necessarily and naturally; in harmony with their general theory of things, with what we may call " savage metaphysics." Now early man, as Max Muller says, " not only did not think as we think, but did not think as we suppose he .ought to have thought." The chief distinction between his mode of conceiving the world and ours is his vast extension of the theory of personality. To the savage, and apparently to men more backward than the most backward peoples we know, all nature was a congeries of animated personalities. The

savage's notion of personality is more a universally diffused feeling than a reasoned conception, and this feeling of a personal self he impartially distributes all over the world as known to him. One of the Jesuit missionaries in North America thus describes the Red Man's philosophy: 2 " Les sauvages se persuadent que non seulement les hommes et les autres animaux, mais aussi que toutes les autres choses sont animees." Crevaux, in the Andes, found that the Indians believed that the beasts have piays (sorcerers and doctors) like themselves. 3 This opinion we may name personalism, and it is the necessary condition of savage (and, as will be seen, of civilized) mythology. The Jesuits could not understand how spherical bodies like sun and moon could be mistaken for human beings. Their catechu- mens put them off with the answer that the drawn bows of the heavenly bodies gave them their round appearance. " The wind was formerly a person; he became a bird," say the Bushmen, and g' 00 kal kai, a respectable Bushman once saw the personal wind at Haarfontein. 4 The Egyptians, according to Herodotus (iii. 16), believed fire to be 6r\plov eˆvxov, a live beast. The Bushman who saw the Wind meant to throw a stone at it, but it ran into a hill. From the wind as a person the Bhinyas in India (Dalton, p. 140) claim descent, and in Indian epic tradition the leader of the ape army was the son of the wind. The Wind, by certain mares, became the father of wind-swift steeds mentioned in the Iliad. The loves of Boreas are well known. These are examples of the animistic theory applied to what, in our minds, seems one of the least personal of natural phenomena. The sky (which appears to us even less personal) has been re- garded as a personal being by Samoyeds, Red Indians, Zulus, 5 and traces of this belief survive in Chinese, Greek and Roman religion.

We must remember, however, that to the savage, Sky, Sun, Sea, Wind, are not only persons, but they are savage persons. Their conduct is not what civilized men would attribute to characters so august; it is what uncivilized men think probable and befitting among beings like themselves.

The savage regards all animals as endowed with personality. " lis tiennent les poissons raisonnables, comme aussi les cerfs," says a Jesuit father about the North-American Savase Indians {Relations, loc. cit.). In Australia the Theory of natives believe that the wild dog has the power Maa's Reia' of speech, like the cat of the Coverley witch in the t j2 n ˆ ,,t !i Spectator. The Breton peasants, according to P. Sebillot, credit all birds with language, whichvthey even attempt to interpret. The old English and the Arab superstitions about the language of beasts are examples of this opinion sur- viving among civilized races. The bear in Norway is regarded as almost a man, and

his dead body is addressed and his wrath deprecated by Samoyeds and Red Indians. ” The native bear

2 Relations (1636), p. 114. 3 Voyages, p. 159.

4 South African Folk-Lore Journal (May 1880). 6 E. B. Tylor, op. cit. ii. 256.

Kur-bo-roo is the sage counsellor of the aborigines in all their difficulties. When bent on a dangerous expedition, the men will seek help from this clumsy creature, but in what way his opinions are made known is nowhere recorded.” 1 H.R.School- craft mentions a Red Indian story explaining how “the;bear does not die,” but this tale Schoolcraft (like Herodotus in Egypt) ” cannot bring himself to relate.” He also gives examples of Iowas conversing with serpents. These may serve as examples of the savage belief in the human intelligence of animals. Man is on an even footing with them, and with them can interchange his ideas. But savages carry this opinion much further. Man in their view is actually, and in no figurative sense, akin to the beasts. Certain tribes in Java ” believe that women when delivered of a child are frequently delivered at the same time of a young crocodile.” 2 The common European story of a queen accused of giving birth to puppies shows the survival of the belief in the possibility of such births among civilized races, while the Aztecs had the idea that women who saw the moon in certain circumstances would produce mice. But the chief evidence for the savage theory of man’s close kinship with the lower animals is found in the institution called iotemism (q.v.) — the belief that certain stocks of men in the various tribes are descended by blood descent from, or are developed out of, or otherwise connected with, certain objects animate or inanimate, but especially with beasts. The strength of the opinion is proved by its connexion with very stringent marriage laws. No man (according to the rigour of the custom) may marry a woman who bears the same kin name as himself, that is, who is descended from the same inanimate object or animal. Nor may people (if they can possibly avoid it) eat the flesh of animals who are their kindred. Savage man also believes that many of his own tribe-fellows have the power of assuming the shapes of animals, and that the souls of his dead kinsfolk revert to animal forms.

“E. W. Lane, in his introduction to the Arabian Nights (i. 58), says he

found the belief in these transmigrations accepted seriously in Cairo. H. H. Bancroft brings evidence to prove that the Mexicans supposed pregnant women would turn into beasts, and sleeping children into mice, if things went wrong in the ritual of a certain solemn sacrifice. There is a well-known Scottish legend to the effect that a certain old witch was once fired at in her shape as a hare, and that where the hare was hit there the old woman was found to be wounded. J. F. Lafitau tells the same story as current among his Red Indian flock, except that the old witch and her son took the form of birds, not of hares. A Scandinavian witch does the same in the Egil saga. In Lafitau's tale the birds were wounded by the magic arrows of a medicine man, and the arrow-heads were found in the bodies of the human culprits. In Japan 3 people chiefly transform themselves into badgers. The sorcerers of Honduras (Bancroft, i. 740) " possessed the power of transforming men into wild beasts." J. F. Regnard, the French dramatist, found in Lap- land (1681) that witches could turn men into cats, and could them- selves assume the forms of swans, crows, falcons and geese. Among the Bushmen 4 " sorcerers assume the form of beasts and jackals." M. Dobrizhofer, a missionary in Paraguay (1717-1791), learned that " sorcerers arrogate to themselves the power of changing men into tigers " (Eng. trans., i. 63). He was present at a conversion of this sort, though the miracle beheld by the people was invisible to the missionary. Near Loanda Livingstone noted that " a chief may metamorphose himself into a lion, kill any one he chooses, and resume his proper form." The same accomplishments distinguish the Barotse and Balonda. 6 Among the Mayas of Central America sorcerers could transform themselves " into dogs, pigs and other animals; their glance was death to a victim " (Bancroft, ii. 797). The Thlinkeets hold that their shamans have the same powers. 6 A bamboo in Sarawak is known to have been a man. Metamor- phoses into stones are as common among Red Indians and Australians as in Greek mythology. Compare the cases of Niobe and the victims of the Gorgon's head. 7 Zulus, Red Indians, Aztecs, 8 Andaman Islanders and other races believe that their dead assume the shapes of serpents and of other creatures, often reverting to the form of the animal from which they originally descended. In ancient Egypt

1 R. Brough Smyth, Aborigines of Victoria, i. 446 (1878).

2 J. Hawkesworth, Voyages, iii. 756.

3 Lord Redesdale, Tales of Old Japan (1871).

4 Bleek, Brief Account of Bushman Folk-Lore, pp. 15, 40.

6 Missionary Travels, pp. 615, 642. •W. H. Dall, Alaska, p. 423 (1870).

7 Dorman, Origin of Primitive Superstitions, pp. 130, 134.

8 Sahagun, French trans., p. 226.

” the usual prayers demand for the deceased the power of going and coming from and to everywhere under any form they like.”* A trace of this opinion may be noticed in the Aeneid. The serpent that appeared at the sacrifice of Aeneas was regarded as possibly a ” manifestation ” of the soul of Anchises (Aeneid, v. 84) —

” Dixerat haec, adytis quum lubricus anguis ab imis Septem ingens gyros, septena volumina, traxit,” and Aeneas is

” Incertus, geniumne loci, famulumne parentis Esse putet.” On the death of Plotinus, as he gave up the ghost, a snake glided from under his bed into a hole in the wall. 10 Compare Pliny u on the cave ” in quo manes Scipionis Africani majoris custodire draco dicitur.” The last peculiarity in savage philosophy to which we need call attention here is the belief in spirits and in human intercourse with the shades of the dead. With the savage natural death is not a universal and inevitable ordinance. ” All men must die ” is»a generalization which he has scarcely reached; in his philosophy the proposition is more like this — ” all men who die die by violence.” A natural death is explained as the result of a sorcerer’s spiritual violence, and the disease is attributed to magic or to the action of hostile spirits. After death the man survives as a spirit, sometimes taking an animal form, sometimes invisible, sometimes to be observed ” in his habit as he lived ” (see Apparitions). The philosophy of the subject is shortly put in the speech of Achilles (Iliad, xxiii. 103) after he has beheld the dead Patroclus in a dream: ” Ay me, there remaineth then even in the house of Hades a spirit and phantom of the dead, for all night long hath the ghost of hapless Patroclus stood over me, wailing and making moan.” It is almost superfluous to quote here the voluminous evidence for the intercourse with spirits which savage chiefs and medicine men are believed to maintain. They can call up ghosts, or can go to the ghosts, in Australia, New Caledonia, New Zealand, North America, Zululand, among the Eskimo, and generally in every quarter of the globe. The men who enjoy this power are the same as they who can change themselves and others into animals. They too command the weather, and, says an old French missionary, ” are regarded as very Jupiters, having in their hands the lightning and the thunder ” (Relations, loc. cit.). They make good or bad seasons, and control the vast animals who, among ancient Persians and Aryans of India, as among Zulus and

Iroquois, are supposed to grant or withhold the rain, and to thunder with their enormous wings in the region of the clouds.

Another fertile source of myth is magic, especially the magic designed to produce fertility, vegetable and animal. From the natives of northern and central Australia to the actors in the ritual of Adonis, or the folk among whom arose the customs, of crowning the May king or the king of the May, all peoples have done magic to encourage the breeding of animals as part of the food supply, and to stimulate the growth of plants, wild or cultivated. In the opinion of J. G. Frazer, the human repre- sentatives or animal representatives, in the rites, of the spirit of vegetation; of the corn spirit; of the changing seasons, winter or summer, have been developed into many forms of gods, with appropriate myths, explanatory of the magic, and of the sacrifice of the chief performer. In the same way the adoration of living human beings, the deification of living kings — whose title survives in our king or queen of the May, and in the rex nemorensis, the priest of Diana in the grove of Aricia — has been most fruitful in myths of divine beings. These human beings are often sacrificed, for various reasons, actual or hypothetical, and gods and heroes are almost as likely to be explained as spirits of vegetation now, as they were likely to become solar mythological figures in the system of Max Miuler. It is certainly true that divine beings in most mythologies are apt to acquire solar with other elemental attributes, including vegetable attributes. But that the origins of such mythical beings were, ab initio, either solar or vegetable, or, for that matter, animal, it would often be hard to prove.

Frazer's ideas are to be found in a work of immense erudition, The Golden Bough (London, 1900). Two studies by him, pursuing

9 Records of the Past, x. 10. 10 Plotini vita, pp. 2, 95.

11 H. N. xv. 44, 85.

the same set of ideas in more detail, are Adonis, Attis, Osiris (1906) and Lectures on the Early History of the Kingship (1905). See A. Lang, Magic and Religion (London, 1901), for a criticism in detail of the general theory as set forth in The Golden Bough. Whatever may be said, Frazer has certainly made the most important of recent contributions to the study of mythology. He has fixed the attention of

students on a mass of early ideas, previously much neglected save by VV. Mannhardt, and on the facts of ritual, which preserve these ideas and represent them in a kind of mystery plays.

We are now in a position to sum up the ideas of savages about man's relations to the world. We started on this inquiry because we found that savages regarded sky, wind, sun, earth and so forth as practically men, and we had then to ask, what sort of men, men with what powers ? The result of our exam- ination, so far, is that in savage opinion sky, wind, sun, sea and many other phenomena have, being personal, all the powers attributed to real human persons. These powers and qualities are: (1) relationship to animals and ability to be transformed and to transform others into animals and other objects; (2) magical accomplishments, as — (a) power to visit or to procure the visits of the dead; (b) other magical powers, such as control over the weather and over the fertility of nature in all depart- ments. Once more, the great forces of nature, considered as persons, are involved in that inextricable confusion in which men, beasts, plants, stones, stars, are all on one level of person- ality and animated existence. This is the philosophy of savage life, and it is on these principles that the savage constructs his myths, while theˆe, again, are all the scientific explanations of the universe with which he has been able to supply himself.

Examples of Mythology. — Myths of the origin of the world and man are naturally most widely diffused. Man has every- where asked himself whence things came and how, and his myths are his earliest extant form of answer to this question. So confused and inconsistent are the mythical answers that it is very difficult to classify them according to any system. If we try beginning with myths of creative gods, we find that the world is sometimes represented as pre-existent to the divine race. If we try beginning with myths of the origin of the world, we frequently find that it owes its origin to the activity of pre-existent supernatural beings. According to all modern views of creation, the creative mind is prior to the universe which it created. There is no such consistency of opinion in myths, v/hether of civilized or savage races. Perhaps the plan least open to objection is to begin with myths of the gods. But when we speak of gods, we must not give to the word a modern signifi- cance. As used here, gods merely mean non-natural and powerful beings, sometimes " magnified non-natural men," sometimes beasts, birds or insects, sometimes the larger forces and phenomena of the universe conceived of as endowed with human personality and passions. When Plutarch examined the Osirian myth (De Isid. xxv.) he saw that the " gods " in the tale were really " demons," " stronger than men, but having the divine part not wholly

unalloyed ” — “magnified non- natural men,” in short. And such are the gods of mythology.

In examining the myths of the gods we shall begin with the conceptions of the most backward tribes, and advance to the divine legends of the ancient civilized races. It will appear that, while the non-civilized gods are often theriomorphic, made in accordance with the ideas of non-civilized men, the civilized gods retain many characteristics of the savage gods, and these characteristics are the ” irrational element ” in the divine myths.

Myths of Gods: Savage Ideas. — It is not easy to separate the dis- cussion of savage myths of gods from the problem, Whence and how arose the savage belief in gods? The orthodox anthropological explanation has been that of E. B. Tylor, which closely resembles Herbert Spencer’s ” ghost theory.” By reflection on -dreams, in which the self, or ” spirit,” of the savage seems to wander free from the bounds of time and space, to see things remote, and to meet and recognize dead friends or foes; by speculation on the experiences of trance and of phantasms of the dead or living, beheld with waking eyes; by pondering on the phenomena of shadows, of breath, of death and life, the savage evolved the idea of a separable soul or spirit capable of surviving bodily death. The spirit of the dead may tenant a material object, a ” fetish,” or may roam hungry and comfortless and need propitiation by food, for unpropitiated it is dangerous, or may be reincarnated, or may ” go to its own herd ”

in another world. Again, it is naturally kind to its living kinsfolk, and so may be addressed in prayer. These are the doctrines of animism (q.v.), and, according to the usual anthropological theory, these spirits come to thrive to god’s estate in favourable circum- stances, as where the dead man, when alive, had great mana or wakan, a great share of the ether, so to speak, which, in savage metaphysics, is the viewless vehicle of magical influences. Thus the ghost of the hero or medicine man of a kin or tribe may be raised to divine rank, while again — the doctrine of spirits once developed, and spirits once allotted to the great elemental forces and phenomena of nature, sky, thunder, the sea, the forests — we have the beginnings of depart- mental deities, such as Agni, god of fire; Poseidon, god of the sea; Zeus, god of the sky — though in recent theories Zeus appears to be regarded as primarily the god of the oak tree, a spirit of vegetation. On this theory animism, the doctrine of spirits, is the source of all belief in gods. But it is found that among the lowest or least cultured races, such as the south-eastern tribes of Australia, who do not propitiate ancestral spirits by offerings of food, or address them in prayer, there often

exists a belief in an ” All-Father,” to use Howitt’s convenient expression. This being cannot have been evolved out of the cult of ancestors, where ancestors are not wor- shipped; and he is not even regarded as a spirit, but, in Matthew Arnold’s phrase, as ” a magnified non-natural man.” He existed before death came into the world, and he still exists. His home is in or above the sky, but there was a time when he walked the earth, a potent magic- worker ; endowed mankind with such arts and institu- tions as they possess; and left to them certain rules of life, ethics and ritual. Often he is regarded as the maker of things, or of most things, and of mankind; or mankind are his children, descended from disobedient sons of his, whom he cast out of heaven. Very frequently he is the judge of souls, and sends the good and bad to their own places of reward and punishment. He is usually supposed to watch over human conduct, but this is by no means invariably the case. Sometimes he, like the Atnatu of the Kaitish tribe of central Australia, is only vigilant in matters of ritual, such as cir- cumcision, subincision and the use of the sacred bull-roarer, the Greek pbn(3os. As an almost universal rule, in the lowest culture, no prayers are addressed to this being; he has no sacrifices, no dwell- ing made with hands; and the images of him, in clay, that are made and danced round with invocations of his name at the tribal cere- monies of initiation, are destroyed at the close of the performances. If the name of ” god ” is denied to such beings because they receive little cult, it may still be admitted that the belief might easily develop into a form of theism, independent of and underived from animism, or the ghost theory.

The best account of this All-Father belief in the lowest culture is to be read in R. Howitt’s Native Races of South-East A ustralia. Under the names of Baiame, Pundjcl, Mulkari, Daramulun and many others, the south-eastern tribes (both those Australian who reckon descent in the female and those who reckon Savages. by the male line) have this faith in an All-Father, the attributes varying in various communities. The most highly developed All-Father is the Baiame or Byamee of the Euahlayi tribe of north-western New South Wales, to whom prayers for the welfare of the souls of the dead are, or recently were, addressed- — the tribe dwelling a hundred miles away from the nearest missionary station (Protestant). 1

In the centre of Australia, Atnatu, self-created, is known, as has been said, to the Kaitish tribe, next neighbours of the Arunta of the Macdonnell Hills. Among the Arunta, Mr Strehlow (Globus, May 1907) finds such a being as Atnatu, and also among some other adjacent tribes, as the Luritja. See, too, Strehlow and von Leon- hardi, in Verbffenilichungen aus dem siadlischen V biker-Museum

(Frankfurt-am-Main, 1907, vol. i.). But Messrs B. Spencer and F. J. Gillcn, who discovered Atnatu, did not find any trace of an All-Father among the Arunta, or any other of the tribes to the north and north-east of the centre. Mr Strehlow's branch of the Arunta they did not examine.

It is plain that the All-Father belief, in favourable circumstances, especially if ghost worship remained undeveloped, might be evolved into theism. But all over the savage world, especially in Africa, spirit worship has sprung up and choked the All-Father, who, how- ever, in most savage regions, abides as a name, receiving no sacrifice, and, save among the Masai, seldom being addressed in prayer. A list of such otiose great beings in the background of religion is given in Lang's The Making of Religion (1898).. Since the publica- tion of that book much additional evidence has accrued from Africa and Melanesia, where the belief occurs in a few islands, but, in the majority, is absent or unrecorded. Most of the fresh evidence is given in La Notion de I'itre supreme chez les peuples non-civilises, by Rene Hoffmann (Geneva, 1907). See also the Journal of the Anthropological Institute (1899-1907), vols, xxix., xxxii., xxxiv., xxxv., and the works of Miss Mary Kingsley, and Spieth, Die Ewe- Stamme, Reimer (Berlin, 1906), and Sundermarn in Warneck's Allgemeine Missionszeiischrift, vol. xi. An excellent statement is that of Pere Schmidt, S.V.D., in Anthropos, Bd. III., lift. 3 (1908), pp. 559-611. Tylor's efforts to show that these All-Fathers were derived from missionary or other European influences (Nineteenth

1 See Mrs Langloh Parker's The Euahlayi Tribe.

Century, 1892) have not been successful (see La.ng,Magic and Religion, " The Theory of Loan Gods ") and N.W.Thomas in Man (1905), v., 49 et seq. The All-Father belief is most potent among the lowest races, and always tends to become obsolete under the competition of serviceable ancestral spirits, or gods made in the image of such spirits, who can be bribed by sacrifices or induced by prayers to help man in his various needs.

The belief in the All-Father in south-eastern Australia is concealed from the women and children who, at most, know his exoteric name, often meaning " Our Father," and is revealed only to the initiate, among whom are a very few white men, like Howitt. Mrs Langloh

Parker, of course, vvas not initiated (indeed, no white man has gone through the actual and very painful rites), but confidences were made to her with great secrecy. The All-Father, even at his best, among the Kurnai, Kamilaroi and Euahlayi, is the centre of many grotesque and sportive myths. He usually has a wife and children, not in all cases born, but rather they are emanations. One of these children is often his mediator with men, and has the charge of the rites and the mystic bull-roarer. The relation is that of Apollo to Zeus in Greek myth.

Many of the wilder myths are the expressions of the sportive and humorous faculties. Some arise naturally thus: Baiame, say, originated everything, therefore he originated the grotesque mummeries and dances of the mysteries. To explain these, myths have been developed to show that they arose in some grotesque incident of Baiame's personal existence on earth. Many Greek myths, most derogatory to the dignity of Demeter, Dionysus, Zeus or Hera, arose in the same way, as explanations of buffooneries in the Eleusinian or other mysteries. In medieval literature the most sacred persons of our religion have grotesque associations attached to them in the same manner.

While the All-P'ather belief is common in the tribes of south- eastern Australia, the tribes round Lake Eyre, the Arunta (as known to Messrs Spencer and Gillen), and the other central and northern tribes, are credited with no germs of belief in what is called a supreme, and may truly be styled a superior being. That being, in many cases, but not so commonly in Australia, has a malevolent opposite who thwarts his workman Ahriman to his Ormuzd. In one district, where the superior being is a crow, his opposite is an eagle-hawk. These two birds in many tribes give names to the two great exogamous and intermarrying divisions ; in their case there is a . va et vient of divine, human and theriomorphic elements, just as in the Greek myths of Zeus. As a rule, however, the Australian All- Father is anthropomorphic, and fairly well described in the native term when they speak English as " the Big Man," powerful, death- less, friendly, " able to go everywhere and do everything," " to see whatever you do." The existence of the belief in this being was accepted by T. VVaitz, and, though disputed by many squatters and most anthropologists, is now admitted on the strength of the evidence of Howitt, Cameron, Mrs Langloh Parker, Dav/son, W. E. Roth in Ethnological Studies, and many other close observers. The belief being esoteric, a secret of the initiated, necessarily escaped casual inquirers.

Meanwhile, among some of the Arunta of the centre, among the Dieri and Urabunna tribes near Lake Eyre and their congeners, and among

the tribes north by east of the Arunta, no such belief has been discovered by Messrs Spencer and Gillen, from whom the tribes kept no secrets, or by Mr Siebert, a missionary among the now all but extinct Dieri. There is just a trace of a dim sky-dwelling being, Arawotja, possibly an all but obliterated survival of an All- Father. Howitt speaks too of the Dieri Kutchi, who inspires medicine-men with ideas, but about him our information is scanty. Among all these tribes religion now takes another line, the belief in a supernormal race of Titanic beings, with no superior, who were the first dwellers on earth ; who possessed powers far exceeding those of the medicine-men of to-day; and who, in one way or another, were connected with, or developed from, the totem animals,vege- tables and other objects. These beings modified the face of the country; in Arunta belief rocks and trees arose to mark the places where they finally ” went into the ground ” (Oknanikilla) , and their spirits still haunt certain places such as these; and are reincarnated in native women who pass by. These beings, in Arunta called ” the people of the Alcheringa, or dream time ” (but cf. Strehlow in Globus, ut supra), originated the tribal rites of initiation. In Dieri they are called Mura-Mura, and to them prayers are made for rain, accompanied by rain-making magic ceremonies, which in this case may be a symbolical expression of the prayers. There is a large body of myths about the Alcheringa folk, or Mura-Mura (see Spencer and Gillen, Native Tribes of Central Australia, Native Tribes of Northern Australia, and Howitt, Native Tribes of South- Eastern Australia), and the myths of their wanderings, prodigies and institution of rites and magic are represented in the dances of the mysteries. Most of the magic is worked (Intichiuma in Arunta) by the members of each totem kin or group for the behoof of the totem as an article of food supply. These rites are common in North America, but are worked by members of gilds or societies, not by totem kins.

The belief in these Mura-Mura or Alcheringa folk may obviously develop, in favourable circumstances, into a polytheism like that of Greece, or of Egypt, or of the Maoris. The old Irish gods in the

poetic romances appear to have the same origin and shade away into the fairies. The baser Greek myths of the wanderings, amours and adventures of the gods, myths ignored by Homer, are parallel to the adventures of the Alcheringa people, and the fable of the mutilation of Osiris and the search for the lost organ by Isis, actually occurs among the Alcheringa tales of Messrs Spencer and Gillen. Among the Arunta, the Alcheringa folk are part of a strangely elaborate theory of evolution and of animism, which leaves no room for a creative being, or for a future life of the spirit, which is merely reincarnated at intervals.

Thus the doctrines of evolution and of creation, or the making of things, stand apart, or blend, in the metaphysics and religion of the lowest and least progressive of known peoples. The question as to which theory came first, whether Alcheringaism is a scientific effort that swept away All-Fatherism, or whether All-Fatherism is a religious reaction in despair of science and of the evolutionary doctrine, is settled by each inquirer in accordance with his personal bias. It has been argued that All-Fatherism is an advance, con- ditioned by coastal influences — more rain and more food — con- comitant with a social advance to individual marriage, and reckon- ing of kin in the male line. But tribes far from the sea, as in northern New South Wales and Queensland, have the All-Father belief, with individual marriage and female descent, while tribes of the north coast, with male descent, are credited with no All-Father; and the Arunta, as far as possible from the sea, have no All-Father (save in Strehlow's district), and have individual marriage and male reckon- ing of descent in matters of inheritance; while the Urabunna and Dieri, with female descent and the custom of pirrauru (called " group marriage " by Howitt), are not credited with the All-Father belief. Thus coastal conditions have clearly no causal influence on the development of the All-Father belief. If they had, the natives of central Queensland, remote from the sea, should not have their All-Father (Mulkari), and the natives of the northern and north- eastern coasts should have an All-Father, who is still to seek. The Arunta of Messrs Spencer and Gillen may have possessed and deposed the Altjira superior being of the Arunta known to Mr Strehlow, like the Atnatu of the adjacent Kaitish, or the All-Father of the neighbouring Luritja ; or these beings may be more recent diver- gences of doctrine, departures from pure Alcheringaism with no All- Father. At present, at least, it is premature to dogmatize on these problems. 1

The chief being among the supernatural characters of Bushman mythology is the insect called the Mantis. 2 Cagn or Ikaggen, the Mantis, is sometimes regarded with religious respect as a benevolent god. But his adventures are the merest nightmares of puerile fancy. He has a wife, an adopted daughter, whose real father is the " swallower " in Bushman swallow- ing myths, and the daughter has a son, who is the Ichneumon. The Mantis made an eland out of the shoe of his son-in-law. The moon was also created by the Mantis out of his shoe, and it is red, because the shoe was covered with the red dust of Bushman-land. The Mantis is defeated in an encounter with a cat which happened to be singing a song about a lynx. The Mantis (like Poseidon, Hades, Metis and other Greek gods)was once swallowed, but dis- gorged alive. The swallower was the monster Ilkhwai-hemm. Like

Heracles when he leaped into the belly of the monster which was about to swallow Hesione, the Mantis once jumped down the throat of a hostile elephant, and so destroyed him. The heavenly bodies are gods among the Bushmen, but their nature and adventures must be discussed among other myths of sun, moon and stars. As a creator Cagn is sometimes said to have ” given orders, and caused all things to appear to be made.” He struck snakes with his staff and turned them into men, as Zeus did with the ants in Aegina. But the Bushmen’s mythical theory of the origin of things must, as far as possible, be kept apart from the fables of the Mantis, the Ichneumon and other divine beings. Though animals, these gods have human passions and character, and possess the usual magical powers attributed to sorcerers.

Concerning the mythology of the Hottentots and Namas, we have a great deal of information in a book named Tsuni-Goam, the Supreme Beingof the Khoi-Khoi (1881), by DrT. Hahn. This author collected the old notices of Hottentot myths, and added material from his own researches. The chief god of the Hottentots is a being named Tsuni-Goam, who is universally regarded by his worshippers as a deceased sorcerer. According to one old believer, ” Tsui-Goab ” (an alternative reading of the god’s name) ” was a great powerful chief of the Khoi-Khoi — in fact, he was the first Khoi-Khoib from whom all the Khoi-Khoi tribes took their name.” He is always

1 The drawback to knowledge is the rarity of full acquaintance with native languages. Strehlow, Roth and Ridley seem best equipped on the linguistic side. Spencer and Gillen do not tell us that they have a colloquial knowledge of any Australian language. Gason, author of a work on the Dieri tribe, knew their language well, but several of his statements appear to be inaccurate. Mrs Langloh Parker describes her methods of checking and controlling native statements made in English.

2 Accounts of the Mantis and of his performances will be found in the Cape Monthly MagazineQuly 1874), and in Dr Bleek’s Brief Account of Bushman Folk-Lore.

represented as at war (in the usual crude dualism of savages) with ”

another chief ” named Gaunab. The prayers addressed to Tsui- Goab are simple and natural in character, the ” private ejaculations ” of men in moments of need or distress. As usual, religion is more advanced than mythology. It appears that, by some accounts, Tsui-Goab lives in the red sky and Gaunab in the dark sky. The neighbouring race of Namas have another old chief for god, a being called Heitsi Eibib. His graves are shown in many places, like those of Osiris, which, says Plutarch, abounded in Egypt. He is propi- tiated by passers-by at his sepulchres. He has intimate relations in peace and war with a variety of animals whose habits are some- times explained (like those of the serpent in Genesis) as the result of the curse of Heitsi Eibib. Heitsi Eibib was born in a mysterious way from a cow, as Indra in the Black Yajvr- Veda entered into and was born from the womb of a being who also bore a cow. The Rig-Veda (iv. 18, 1) remarks, ” His mother, a cow, bore Indra, an unlicked calf ” — probably a metaphorical way of speaking. Heitsi Eibib, like countless other gods and heroes, is also said to have been the son of a virgin who tasted a particular plant, and so became pregnant, as in the German and Gallophrygian marchen of the almond tree, given by Grimm and Pausanias. Incest is one of the feats of Heitsi Eibib. Tsui-Goab, in the opinion of his worshippers, as we have seen, is a deified dead sorcerer, whose name means Wounded Knee, the sorcerer having been injured in the knee by an enemy. Dr Hahn tries to prove (by philology’s ” artful aid “) that the name really means ” red dawn,” and is a Hottentot way of speaking of the infinite. The philological arguments advanced are extremely weak, and by no means convincing. If we grant, however, for the sake of argument, that the early Hottentots wor- shipped the infinite under the figure of the dawn, and that, by for- getting their own meaning, they came to believe that the words which really meant ” red dawn” meant ” wounded knee ” we must still admit that the devout have assigned to their deity all the attri- butes of an ancestral sorcerer. In short, ” their Red Dawn,” if red dawn he be, is a person, and a savage person, adored exactly as the actual fathers and grandfathers of the Hottentots are adored. We must explain this legend, then, on these principles, and not as an allegory of the dawn as the dawn appears to civilized people. About Gaunab (the Ahriman to Tsui-Goab s Ormuzd) Dr Hahn gives two distinct opinions. ” Gaunab was at first a ghost, a mischief-maker and evil-doer ” {op. cit. p. 85). But Gaunab he declares to be ” the night-sky ” (p. 126). Whether we regard Gaunab, Heitsi EiWb and Tsui-Goab as originally mythological representations of natural phenomena, or as deified dead men, it is plain that they are now venerated as non-natural human beings, possessing the custom- ary attributes of sorcerers. Thus of Tsui-Goab it is said, ” He could do wonderful things which no other man could do, because he was very

wise. He could tell what would happen in future times. He died several times, and several times he rose again ” (statement of old Kxarab in Hahn, p. 61).

The mythology of the Zulus as reported by H.Callaway {Unkulun-kulu, 1868-1870) is very thin and uninteresting. The Zulus are great worshippers of ancestors (who appear to men in the form of snakes), and they regard a being called Unkulunkulu as their first p.ncestor, and sometimes as the creator, or at least as the maker of men. It does not appear they identify Unkulunkulu, as a rule, with ” the lord of heaven,” who, like Indra, causes the thunder. The word answering to our lord is also applied,” even to beasts, as the lion and the boa.” The Zulus, like many distant races, sometimes attribute thunder to the’” thunder-bird,” which, as in North America, is occasionally seen and even killed by men. ” It is said to have a red bill, red legs and a short red tail like fire. The bird is boiled for the sake of the fat, which is used by the heaven- doctors to puff on their bodies, and to anoint their lightning-rods.” The Zulus are so absorbed in propitiating the shades of their dead (who, though in serpentine bodies, have human dispositions) that they appear to take little pleasure in mythological narratives. At the same time, the Zulus have many ” nursery tales,” the plots and incidents of which often bear the closest resemblance to the heroic myths of Greece, and to the marchen of European peoples. 1 These indications will give a general idea of African divine myths. On the west coast the ” ananzi ” or spider takes the place of the mantis insect among the Bushmen. For some of his exploits Dasent’s Tales from the Norse (2nd ed., Appendix) may be consulted. For South African religion see Lang. Magic and Religion; Dennett, At the Back of the Black Man’s Mind; Junod, Les Barotsa; Spieth, Die Ewe-Stdmme; Frazer, The Golden Bough.

Turning from the natives of Australia, and from African races of various degrees of culture, to the Papuan inhabitants of Melanesia, Mebmeslaa we ˆ n< ˆ t * iat m yth°l°gical ideas are scarcely on a higher _ level. An excellent account of the myths of the Banks

‘ Islanders and Solomon Islanders was given in Journ. Anthropol. Inst. (Feb. 1881) by the Rev. R. H. Codrington. The article contains a critical description of the difficulty with which mis- sionaries obtain information about the prior creeds. The people of the

1 These are collected by Callaway, Zulu Nursery Tales (1 Similar Kafir stories, also closely resembling the popular fictions of European races, have been published by Theal. Many other examples are published in the South African Folk-Lore Journal (1879, 1880).

Banks Islands are chiefly ancestor-worshippers, but they also believe in, and occasionally pray to, a being named I Qat, one of the prehuman race endowed with supernatural powers who here, as elsewhere, do duty as gods. Here is an example of a prayer to Qat — the devotee is supposed to be in danger with his canoe: ” Qate! Marawa! look down on me, smooth the sea for us two that I may go safely on the sea. Beat down for me the crests of the tide-rip ; let the tide-rip settle down away from me, beat it down level that it may sink and roll away, and I may come to a quiet landing-place.” Compare the prayer of Odysseus to the river, whose mouth he had reached after three days’ swimming on the tempestuous sea. ” ‘ Hear me, O king, whosoever thou art, unto thee I am come as to one to whom prayer is made . . . nay, pity me, O king, for I avow myself thy suppliant.’ So spake he, and the god stayed his stream, and with- held his waves, and made the water smooth before him ” {Odyssey v. 450). The prayer of the Melanesian is on rather a higher religious level than that of the Homeric hero. The myths of Qat’s adventures, however, are very crude, though not so wild as some of the Scan- dinavian myths about Odin and Loki, while they are less immoral than the adventures of Indra and Zeus. Qat was born in the isle of Vanua Levu; his mother was either a stone at the time of his birth, or was turned into a stone afterwards, like Niobe. The mother of Apollo, according to Aelian, had the misfortune to be changed into a wolf. Qat had eleven brothers, not much more reputable than the Osbaldistones in Rob Roy. The youngest brother was ” Tangaro Loloqong, the Fool.” His pastime was to make wrong all that Qat made right, and he is sometimes the Ahriman to Qat’s Ormuzd. The creative achievements of Qat must be treated of in the next section. Here it may be mentioned that, like the hero in the Breton marchen, Qat ” brought the dawn ” by introducing birds whose notes proclaimed the coming of morning. Before Qat’s time there had been no night, but he purchased a sufficient allowance of darkness from I Qong, that is, night considered as a person in accordance with the law of savage thought already ex- plained. Night is a person in Greek mythology, and in the four- teenth book of the Iliad we read that Zeus abstained from punishing Sleep ” because he feared to offend swift Night.” Qat produced dawn, for the first time, by cutting, the darkness with a knife of red obsidian. Afterwards ” the fowls and birds showed the morning.” On one occasion an evil power (Vui) slew all Qat’s brothers, and hid them in a food-chest. As in the common ” swallowing-myths ” which we have met among bushmen and Australians, and will find among the Greeks, Qat restored his brethren to life. Qat is always accompanied by a powerful supernatural spider named Marawa. He first made Marawa’s acquaintance when he was cutting down a tree for a canoe. Every

night (as in the common European story about bridge-building and church-building) the work was all undone by Marawa, whom Qat found means to conciliate. In all his future adventures the spider was as serviceable as the cat in Puss in Boots Or the other grateful animals in European legend. Qat's great enemy, Qasavara, was dashed against the hard sky, and was turned into stone, like the foes of Perseus. The stone is still shown in Vanua Levu, like the stone which was Zeus in Laconia. Qat, like so many other " culture-heroes," disappeared mysteriously, and white men arriving in the island have been mistaken for Qat. His departure is sometimes connected with the myth of the deluge. In the New Hebrides, Tagar takes the r&le of Qat, and Suqe of the bad principle, Loki, Ahriman, Tangaro Loloqong, the Australian Crow and so forth. 1'hese are the best known divine myths of the Melanesians. For their All-Fathers see Holmes, /. A. I., vol. xxxv., and O'Farrell, /. A. I., vol. xxxiv., with Sundermann in Warneck's Allgemeine Missionszeitschrifl, vol. xi. 1884.

It is " a far cry " from Vanua Levu to Vancouver Island, and, ethnologically, the Ahts of the latter region are extremely remote from the Papuans with their mixture of Malay and A mer i caa Polynesian blood. The Ahts, however, differ but little savaees. in their mythological beliefs from the races of the Banks '

Islands or of the New Hebrides. In SprOat's Scenes from Savage Life (1868) there is a good account of Aht opinions by a settler who had won the confidence of the natives between i860 and 1868. " There is no end to the stories which an old Indian will relate," says Mr Sproat, when " one quite possesses his confidence." "The first Indian who ever lived " is a divine being, something of a creator, something of a first father, like Unkulunkulu among the Zulus. His name is Quawteaht. He married a pre-existent bird, the thunder- bird T°°tah (we have met him among the Zulus), and by the bird he became the father of Indians. Wispohahp is the Aht Noah, who, with his wife, his two brothers and their wives escaped from the deluge in a canoe. Quawteaht is inferior as a deity to the Sun and Moon. He is the Yama of an Aht paradise, or home of the dead, where " everything is beautiful and abundant." From all that is told of Quawteaht he seems to be an ideal and powerful Aht, imaginatively placed at the beginning of things, and quite capable of intermarriage, with a bird. His creative exploits must be con- sidered later. Quawteaht is the Aht Prometheus Purphoros, or fire : stealer.

Passing down the American continent from the north-west, we

find Yehl the chief hero-god and mythical personage among the

Tlingits. Like many other heroes or gods, Yehl had a miraculous

1 birth. His mother, a Tlingit woman, whose sons had all been

slain, met a friendly dolphin, which advised her to swallow a pebble and a little sea-water. The birth of Yehl was the result. In his youth he shot a supernatural crane, and can always fly about in its feathers, like Odin and Loki in Scandinavian myth. He is usually, however regarded as a raven, and holds the same relation to men and the world as the eagle-hawk Pund-jel does in Australia. His great opponent (for the eternal dualism comes in) is Khanukh, who is a wolf, and the ancestor or totem of the wolf-race of men as Yehl is of the raven. The opposition between the Crow and Eagle-hawk in Australia will be remembered. Both animals or men or gods take part in creation. Yehl is the Prometheus Purphoros of the Tlingits, but myths of the fire-stealer would form matter for a separate section. Yehl also stole water, in his bird-shape, exactly as Odin stole ” Suttung’s mead ” when in the shape of an eagle. 1 Yehl’s powers of metamorphosis and of flying into the air are the common accomplishments of sorcerers, and he is a rather crude form of first father, ” culture-hero ” and creator. 2

Among the Karok Indians we find the great hero and divine benefactor in the shape of, not a raven, nor an eagle-hawk, nor a mantis insect, nor a spider, but a coyote. Among both Karok and Navaho the coyote is the Prometheus Purphoros, or, as the Aryans of India call him, Matarisvan the fire-stealer. Among the Papagos, on the eastern side of the Gulf of California, the coyote or prairie wolf is the creative hero and chief supernatural being. In Oregon the coyote is also the ” demiurge,” but most of the myths about him refer to his creative exploits, and will be more appro- priately treated in the next section.

Moving up the Pacific coast to British Columbia, we find the musk-rat taking the part played by Vishnu, when in his avatar as a boar he fished up the earth from the waters. Among the Tinneh a miraculous dog, who, like an enchanted fairy prince, could assume the form of a handsome young man, is the chief divine being of the myths. He too is chiefly a creative or demiurgic being, answering to Purusha in the Rig Veda. So far the peculiar mark of the wilder American tribe legends is the bestial character of the divine beings, which is also illustrated in Australia and Africa, while the bestial clothing, feathers or fur, drops but slowly off Indra, Zeus and the Egyptian Ammon, and the

Scandinavian Odin. All these are more or less anthropomorphic, but retain, as will be seen, numerous relics of a theriomorphic condition.

See C. Hill-Tout and F. Boas in various publications, and, generally, the volumes of the Bureau of American Ethnology, Washington, U.S.A. For Ti-ra-wa, ” the Ruler of the Universe,” also styled A-ti-us, ” father,” among the Pawnees, see G. B. Grinnell, Pawnee Hero Stories (1893).

Maori and Polynesian Beliefs. — Passing from the lower savage myths, of which space does not permit us to offer a larger selection, we turn to races in the upper strata of barbarism. Among these the Maoris of New Zealand, and the Polynesian people generally, are remarkable for a mythology largely intermixed with early attempts at more philosophical speculation. The Maoris and Mangaians, and other peoples, have had speculators among them not very far removed from the mental condition of the earliest Greek philosophers, Empedocles, Anaximander, and the rest. In fact the process from the view of nature which we call personalism to the crudest theories of the physicists was apparently begun in New Zealand before the arrival of Europeans. In Maori mythology it is more than usually difficult to keep apart the origin of the world and the origin and nature of the gods. Long traditional hymns give an account of the ” becoming out of nothing ” which resulted in the evolution of the gods and the world. In the beginning (as in the Greek myths of Uranus and Gaea), Heaven (Rangi, conceived of as a person) was indissolubly united to his wife Earth (Papa), and be- tween them they begat gods which necessarily dwelt in darkness. These gods were some in vegetable, some in animal form; some traditions place among these gods Tiki the demiurge, who (like Prometheus) made men out of clay. The offspring of Rangi and Papa (kept in the dark as they were) held a council to determine how they should treat their parents, ” Shall we slay them, or shall we separate them?” In the Hesiodic fable, Cronus separates the heavenly pair by mutilating his oppressive father Uranus. Among the Maoris- the god Tutenganahan cut the sinews which united Earth and Heaven, and Tane Mahuta wrenched them apart, and kept them eternally asunder. The new dynasty now had earth to themselves, but Tawhiramatea, the wind, abode aloft with his father. Some of the gods were in the forms of lizards and fishes; some went to the land, some to the water. As among the gods and Asuras of the Vedas, there were many wars in the divine race, and as the incantations of the Indian Brahnianas are derived from those old experiences of the Vedic gods, so are the incantations of the Maoris. The gods of New Zealand, the greater gods at least, may be called ” departmental “; each person who is an elementary force is also the god of that force. As Te Heu, a

powerful chief, said, there is division of labour among men, and so there is among gods. ” One made this, another that; Tane made trees, Ru moun- tains, Tanga-roa fish, and so forth.” 3 The ” departmental ” arrangement prevails among the polytheism of civilized peoples,

1 Dasent, Bragi’s Telling: Younger Edda, p. 94.

2 Bancroft, vol. iv< 3 Taylor, New Zealand, p. 108

and is familiar to all from the Greek examples. Leaving the high gods whose functions are so large, while their forms (as of lizard, fish and tree) are often so mean, we come to Maui, the great divine hero of the supernatural race in Polynesia. Maui in some respects answers to the chief of the Adityas in Vedic mythology ; in others he answers to Qat, Quawteaht, and other savage divine personages. Like the son of the Vedic Aditi, 4 Maui is a rejected and abortive child of his mother, but afterwards attains to the highest reputation. As Qat brought the hitherto unknown night, so Maui settled the sun and moon in their proper courses. He induced the sun to move orderly by giving him a violent beating. A similar feat was per- formed by the Sun-trapper, a famous Red Indian chief. These tales belong properly to the department of solar myths. Maui him- self is thought by E. B. Tylor to be a myth of the sun, but the sun could hardly give the sun a drubbing. Maui slew monsters, invented barbs for fish-hooks, frequently adopted the form of various birds, acted as Prometheus Purphoros the fire-stealer, drew a whole island up from the bottom of the deep ; he was a great sorcerer and magician. Had Maui succeeded in his attempt to pass through the body of Night (considered as a woman) men would have been immortal. But a little bird which sings at sunset wakened Night, she snapped up Maui, and men die. This has been called a myth of sunset, but the sun does what Maui failed to do, he passes through the body of Night unharmed. The adventure is one of the myths of the origin of death, which are almost universally diffused. Maui, though regarded as a god, is not often addressed in prayer. 5

The whole system, as far as it can be called a system, of Maori mythology is obviously based on the savage conceptions of the world which have already been explained. The Polynesian system differs mainly in detail; we have the separation of heaven and earth, the animal-shaped gods, the fire-stealing, the exploits of Maui, and scores of minor myths in W. W. Gill’s Myths and Songs of the South Pacific, in the researches of W. Ellis, of Williams, in G. Turner’s Polynesia, and in many other accessible works.

Mexican and Peruvian Beliefs. — The Maoris and other Polynesian peoples are perhaps the best examples of a race which has risen far above the savagery of Bushmen and Australians, but has not yet arrived at the stage in which great centralized monarchies appear. The Mexican and Peruvian civilizations were far ahead of Maori culture, in so far as they possessed the elements of a much more settled and highly-organized society. Their religion had its fine lucid intervals, but their mythology and ritual were little better than savage ideas, elaborately worked up by the imagination of a cruel and superstitious priesthood. In cruelty the Aztecs surpassed perhaps all peoples of the Old World, except certain Semitic stocks, and their gods, of course, surpassed almost all other gods in blood- thirstiness. But in grotesque and savage points of faith the ancient Egyptians, the Greeks, and the Vedic Indians ran even the Aztecs pretty close.

Bernal Diaz, the old ” conquistador,” has described the hideous aspect of the idols which Cortes destroyed, ” idols in the shape of hideous dragons as big as calves,” idols half in the form of men, half of dogs, and serpents which were worshipped as divine. The old contemporary missionary Sahagun has left one of the earliest detailed accounts of the natures and myths of these gods, but, though Sahagun took great pains in collecting facts, his speculations must be accepted with caution. He was convinced (like Caxton in his Destruction of Troy, and like St Augustine) that the heathen gods were only dead men worshipped. Ancestor-worship is a great force in early religion, and the qualities of dead chiefs and sorcerers are freely attributed to gods, but it does not follow that each god was once a real man, as Sahagun supposes. Euemerism cannot be judiciously carried so far as this. Of Huitzilopochtli, the famed god, Sahagun says that he was a necromancer, loved ” shape- shifting,” like Odin, metamorphosed himself into animal forms, was miraculously conceived, and, among animals, is confused with the humming-bird, whose feathers adorned his statues.” 6 This hum- ming-bird god should be compared with the Roman Picus (Servius, 189). That the humming-bird (Nuitziton), which was the god’s old shape, should become merely his attendant (like the owl of Pallas, the mouse of Apollo, the goose of Priapus, the cuckoo of Hera), when the god received anthropomorphic form, is an example of a process common in all mythologies. Plutarch observes that the Greeks, though accustomed to the conceptions of the animal attendants of their own gods, were amazed when they found animals worshipped as gods by the Egyptians. Miiller 7 mentions the view that the humming-bird, as the most beautiful flying thing, is a proper symbol of the heaven, and so of the heaven-god, Huitzilopochtli. This vein of symbolism is so easy to work that it must be regarded with

distrust. Perhaps it is safer to attribute theriomorphic shapes of

4 Rig Veda, x. 72, 1,8; Muir, Sanskrit Texts, iv. 13, where the fable from the Satapatha-Brakmana is given.

B The best authorities for the New Zealand myths are the old traditional priestly hymns, collected and translated in the works of Sir George Grey, in Taylor's New Zealand, in Shortland's Traditions of New Zealand (1857), in Bastian's Heilige Sage der Polynesier, and in White's Ancient History of the Maori, i. 8-13.

6 See also Bancroft, iii. 288-290, and Acosta, pp. 352-361.

7 Geschichte der amerikanischen Urreligionen, p. 592.

gods, not to symbolism (Zeus was a cuckoo), but to survivals from that quality of early thought which draws no line between man and god and beast and bird and fish. If spiders may be great gods, why not the more attractive humming-birds ? Like many other gods, Huitzilopochtli slew his foes at his birth, and hence received names analogous to Acim°s and $6|3os: Tylor (Primitive Culture, ii. 307) calls Huitzilopochtli an " inextricable compound partheno- genetic god." His sacrament, when paste idols of him were eaten by the communicants, was at the winter solstice, whence it may, perhaps, be inferred that Huitzilopochtli was not only a war-god but a nature-god — in both respects anthropomorphic, and in both bearing traces of the time when he was but a humming-bird, as Yehl was a raven (Miiller, op. cit. p. 595). As a humming-bird, Huitzilo- pochtli led the Aztecs to a new home, as a wolf led the Hirpini, and as a woodpecker led the Sabines. Quetzalcoatl, the Toltec deity, is as much a sparrow (or similar small bird) as Huitzilopochtli is a humming-bird. Acosta says he retained the sparrow's head in his statue. For the composite character of Quetzalcoatl as a "culture- hero " (a more polished version of Qat), as a " nature-god," and as a theriomorphic god see Miiller {op. cit. pp. 583-584). Miiller frankly recognizes that not only are animals symbols of deity and its attributes, not only' are they companions and messengers of deity (as in the period of anthropomorphic religion), but they have been divine beings in and for themselves during the earlier stages of thought. The Mexican " departmental " gods answer to those of other polytheisms; there is an Aztec Ceres, an Aztec Lucina, an Aztec Vulcan, an Aztec Flora, an

Aztec Venus. The creative myths and sun myths are crude and very early in character.

Egyptian Myths. — On a much larger and more magnificent scale, and on a much more permanent basis, the society of ancient Egypt somewhat resembled that of ancient Mexico. The divine myths of the two nations had points in common, but there are few topics more obscure than Egyptian mythology. Writers are apt to speak of Egyptian religion as if it were a single phenomenon of which all the aspects could be observed at a given time. In point of fact Egyptian religion (conservative though it was) lasted through per- haps five thousand years, was subject to innumerable influences, historical, ethnological, philosophical, and was variously represented by various schools of priests. We cannot take the Platonic specula- tions of Iamblichus about the nature and manifestations of Egyptian godhead as evidence for the belief of the peoples who first worshipped the Egyptian gods an innumerable series of ages before Iamblichus and Plutarch. Nor can the esoteric and pantheistic theories of priests (according to which the various beast-gods were symbolic manifestations of the divine essence) be received as an historical account of the origin of the local animal-worships. It has already been shown that the lowest and least intellectual races indulge in local animal-worship, each stock having its parent bird, beast, fish, or even plant, or inanimate object. It has also been shown that these backward peoples recognize a non-natural race of men or animals, or both, as the first fathers, heroes, and, in a sense, gods. Such ideas are consonant with, and may be traced to the confused and nebulous condition of, savage thought. Precisely the same ideas are found at various periods among the ancient Egyptians. If we are to regard the Egyptian myths about the gods in animal shape, and about the non-natural superhuman heroes, and their wars and loves, as esoteric allegories devised by civilized priests, perhaps we should also explain Pund-jel, Qat, Quawteaht, the Mantis god, the Spider creator, the Coyote and Raven gods as priestly inventions, put forth in a civilized age, and retained by Australians, Bushmen, Hottentots, Ahts, Thlinkeets, Papuans, who preserve no other vestiges of high civilization. Or we may take the opposite view, and regard the story of Osiris and his war with Seth (who shut him up in a box and mutilated him) as a dualistic myth, originally on the level of the battle between Gaunab andTsui-Goab, or between Tagar and Suqe. We may regard the local beast- and plant-gods of Egypt as survivals of totems and totem-gods like those of Australia, India, America, Africa, Siberia and other countries. In this article the latter view is adopted. The beast-gods and dualistic and creative myths of savages are looked on as the

natural product of the savage reason and fancy. -The same beast-gods and myths in civilized Egypt are looked on as survivals from the rude and early condition of thought to which such conceptions are natural.

In the most ancient Egyptian records the gods are not pictorially represented, and we have not obtained from these records any descriptions of adoration and sacrifice. There is a prayer to the Sky on the coffin of the king of Dynasty IV., known as Mycerinus to the Greeks. The king describes himself as the child of Sky and Earth. He also somewhat obscurely identifies himself with Osiris. We thus find Osiris very near the beginning of what is known about Egyptian religion. This being is rather a culture-hero, a member of a non-natural race of men like Qat or Manabozho, than a god. His myth, to be afterwards narrated, is found pictorially represented in a tomb and in the late temple of Philae, is frequently alluded to in the litanies of the dead about 1400 B.C., is indicated with reverent awe by Herodotus, and after the Christian era is described at full length by Plutarch. Whether the same myth was current in the far more distant days of Mycerinus, it is, of course, impossible to say with dogmatic certainty. The religious history of Egypt, from perhaps Dynasty X. to Dynasty XX., is interrupted

by an invasion of Semitic conquerors and Semitic ideas. Prior to that invasion the gods, when mentioned in monuments, are always represented by animals, and these animals are the object of strictly local worship. The name of each god is spelled in hieroglyphs beside the beast or bird. The jackal stands for Anup, the hawk for Har, the frog for Hekt, the baboon for Tahuti, and Ptah, Asiri, Hesi, Nebhat, Hat-hor, Neit, Khnum and Amun-hor are all written out phonetically, but never represented in pictures. Different cities had their different beast-gods. Pasht, the cat, was the god of Bubastis; Apis, the bull, of Memphis; Hapi, the wolf , of Sioot; Ba, the goat, of Mendes. The evidence of Herodotus, Plutarch and the other writers shows that the Egyptians of each district refused to eat the flesh of the animal they held sacred. So far the identity of custom with savage totemism is absolute. Of all the explanations, then, of Egyptian animal-worship, that which regards the practice as a survival of totemism and of savagery seems the most satis- factory. So far Egyptian religion only represented her gods in theriomorphic shape. Beasts also appeared in the royal genealogies, as if the early Egyptians had filled up the measure of totemism by regarding themselves as actually descended from animals.

With one or two exceptions, ” the first (semi-anthropomorphic) figures of gods known in the civilized part3 ot Egypt are on the granite

obelisk of Bezig in the Fayyum, erected by Usertesen I. of Dynasty XII., and here we find the forms all full-blown at once. The first group of deities belongs to a period and a district in which Semitic influences had undoubtedly begun to work ” (Petrie). From this period the mixed and monstrous figures, semi-theriomorphic, semi-anthropomorphic, hawk-headed and ram-headed and jackal-headed gods become common. This may be attributed to Semitic influence, or we may suppose that the process of anthropomorphizing therio-morphic gods was naturally developing itself ; for Mexico has shown us and Greece can show us abundant examples of these mixed figures, in which the anthropomorphic god retains traces of his theriomorphic past. The heretical worship of the solar disk inter- rupted the course of Egyptian religion under some reforming kings, but the great and glorious Ramesside Dynasty (XIX.) restored 11 Orus and Isis and the dog Anubis ” with the rest of the semi- theriomorphic deities. These survived even their defeat by the splendid human gods of Rome, and only ” fled from the folding star of Bethlehem.”

Though Egypt was rich in gods, her literature is not fertile in myths. The religious compositions which have survived are, as a rule, hymns and litanies, the funereal service, the " Book of the Dead." In these works the myths are taken for granted, are alluded to in the course of addresses to the divine beings, but, naturally, are not told in full. As in the case of the Vedas, hymns are poor sources for the study of mythology, just as the hymns of the Church would throw little light on the incidents of the gospel story or of the Old Testament. The " sacred legends " which the priests or temple servants freely communicated to Herodotus are lost through the pious reserve of the traveller. Herodotus constantly alludes to the most famous Egyptian myth, that of Osiris, and he recognizes the analogies between the Osirian myth and mysteries and those of Dionysus. But we have to turn to the very late authority of Plutarch (De Iside et Osiride) for an account, confessedly incomplete and expurgated, of what mythology had to tell about the great Egyptian " culture-hero," " daemon," and god. Osiris, Horus, Typhon (Seth), Isis and Nephthys were the children of Seb (whom the Greeks identified with Cronus) ; the myths of their birth were peculiarly savage and obscene. Osiris introduced civilization into Egypt, and then wandered over the world, making men acquainted with agriculture and the arts, as Pund-jel in his humbler way did in Australia. On his return Typhon laid a plot for him. He had a beautiful carved chest made which exactly fitted Osiris, and at an entertainment offered to give it to any one who could lie down in it. As soon as Osiris tried, Typhon had the box nailed up, and threw it into the Tanaite branch of the Nile. Isis wandered, mourning, in search cf the body, as Demeter sought Persephone, and perhaps in Plutarch's late version some incidents may be borrowed from the Eleusinian legend. At length she found the chest, which in her absence was again discovered by Typhon. He mangled the body of Osiris (as so many gods of all races were mangled), and tossed the fragments about. Wherever Isis found a portion of Osiris she buried it ; hence Egypt was as rich in graves of Osiris as Namaqualand in graves of Heitsi Eibib. The phallus alone she did not find, but she consecrated a model thereof ; hence (says the myth) came the phallus-worship of Egypt. Afterwards Osiris returned from the shades, and (in the form of a wolf) urged his son Horus to revenge him on Typhon. The gods fought in animal shape (Birch, in Wilkinson, iii. 144). Plutarch purposely omits as " too blasphe- mous " the legend of the mangling of Horus. Though the graves of these non-natural beings are shown, the priests {De Is. et Os. xxi.) also show the stars into which they were metamorphosed, as the Eskimo and Australians and Aryans of India and Greeks have recog- nized in the constellations their ancient

heroes. Plutarch remarked the fact that the Greek myths of Cronus, of Dionysus, of Apollo and the Python, and of Demeter, ” all the things that are shrouded in mystic ceremonies and are presented in rites,” ” do not fall short in absurdity of the legends about Osiris and Typhon.” Plutarch naturally presumed that the myths which seem absurd shrouded

some great moral or physical mystery. But we apply no such explanation to similar savage legends, and our theory is that the Osirian myth is only one of these retained to the time of Plutarch by the religious conservatism of a race which, to the time of Plutarch, preserved in full vigour most of the practices of totemism. As a slight confirmation of the possibility of this theory we may mention that Greek mysteries retained two of the features of savage mysteries. The first was the rite of daubing the initiated with clay. 1 This custom prevails in African mysteries, in Guiana, among Australians, Papuans, and Andaman Islanders. The other custom is the use of the turndun, as the Australians call a little fish-shaped piece of wood tied to a string, and waved so as to produce a loud booming and whirring noise and keep away the profane, especially women. It is employed in New Mexico, South Africa, New Zealand and Australia. This instrument, the kuto, was also used in Greek mysteries. 2 Neither the use of the nuras nor of the clay can very well be regarded as a civilized practice retained by savages. The hypothesis that the rites and the stories are savage inventions surviving into civilized religion seems better to meet the difficulty. That the Osirian myth (much as it was elaborated and allegorized) originated in the same sort of fancy as the Tacullie story of the dismembered beaver out of whose body things were made is a con- clusion not devoid of plausibility. Typhon’s later career, ” commit- ting dreadful crimes out of envy and spite, and throwing all things into contusion,” was parallel to the proceedings of most of the divine beings who put everything wrong, in opposition to the being who makes everything right. This is perhaps an early ” dualistic ” myth.

Among other_ mythic Egyptian figures we have Ra, who once destroyed men in his wrath with circumstances suggestive of the Deluge; Khnum, a demiurge, is represented at Philae as making man out of clay on a potter’s wheel. Here the wheel is added to the Maori conception of the making of man. Khnum is said to have reconstructed the limbs of the dismembered Osiris. Ptah is the Egyptian Hephaestus;

he is represented as a dwarf; men are said to have come out of his eye, gods out of his mouth — a story like that of Purusha in the Rig Veda. As creator of man, Ptah is a frog. Bubastis became a cat to avoid the wrath of Typhon. Ra, the sun, fought the big serpent Apap, as Indra fought Vrittra. Seb is a goose, called ” the great cackler “; he laid the creative egg. 3

Divine Myths of the Aryans of India. Indra. — The gods of the Vedas and Brahmanas (the ancient hymns and canonized ritual-books of “Aryan India) are, on the whole, of the usual polytheistic type. More than many other gods they retain in their titles and attributes the character of elemental phenomena personified. That personifica- tion is, as a rule, anthropomorphic, but traces of theriomorphic personification are still very apparent. The ideas which may be gathered about the gods from the hymns are (as is usual in heathen religions) without consistency. There is no strict orthodoxy. As each bard of each bardic family celebrates his favourite god he is apt to make him for the moment the pre-eminent deity of all. This way of thinking about the gods leads naturally in the direction of a pantheistic monotheism in which each divine being may be regarded as a manifestation of the one divine essence. No doubt this point of view was attained in centuries extremely remote by sages of the civilized Vedic world. It is easy, however, to detect certain peculiar characteristics of each god. As among races much less advanced in civilization than the Vedic Indians, each of the greater powers has his own separate department, however much his worshippers may be inclined to regard him as an absolute premier with undisputed latitude of personal government. Thus Indra is mainly concerned with thunder and other atmospheric phenomena; but Vayu is the wind, the Maruts are wind-gods, Agni is fire or the god of fire, and so connected with lightning. Powerful as Indra is in the celestial world, Mitra and Varuna preside over night and day. Ushas is the dawn, and Tvashtri is the mechanic among the gods, correspond- ing to the Egyptian Ptah and the Greek Hephaestus. Though lofty moral qualities and deep concern about the conduct of men are attributed to the gods in the Vedic hymns, yet the hymns contain traces (and these are amplified in the ritual books) of a divine chronique scandaleuse. In this chroniaue the gods, like other gods, are adventurous warriors, adulterers, incestuous, homicidal, given to animal_ transformations, cowardly, and in fact charged with all human vices, and credited with magical powers. 4 It would be difficult to speak too highly of the ethical nobility of many Vedic hymns. The ” hunger and thirst after righteousness ” of the sacred

1 Demosthenes, De corona, p. 313, ko.1 KaSalpuiv toiis Tthovptvovs

ko.1

2 Kcotos JvXapiov ov f£?j:7T<« to anapriov, koX ii> toTj TeXtrais iSovtiro tva poifrj . Quoted by Lobeck, Aglaophamus, i. 700, from Bastius ad Gregor., 241, and from other sources; cf. Arnobius, v. c. 19, where the word turbines is the Latin term.

3 Wilkinson, iii. 6.2, see note by Dr Birch. A more detailed account of Egyptian religion is given under Egypt. Unfortunately Egyptologists have rarely a wide knowledge of the myths of the lower races, while anthropologists are seldom or never Egyptologists.

- For examples of the lofty morality sometimes attributed to the gods, see Max Muller, Hibbert Lectures, p. 284; Rig-Veda, ii. 28; iv. 12, 4; viii. 93 seq. ; Muir, Sanskrit Texts, v. 218.

poet recalls the noblest aspirations and regrets of the Hebrew psalmist. But this aspect of the Vedic deities is essentially matter for the science of religion rather than of mythology, which is con- cerned with the stories told about the gods. Religion is always forgetting, or explaining away, or apologizing for these stories. Now the Vedic deities, so imposing when regarded as vast natural forces (as such forces seem to us), so benignant when appealed to as forgivers of sins, have also their mythological aspect. In this aspect they are natural phenomena still, but phenomena as originally conceived of by the personifying imagination of the savage, and credited, like the gods of the Maori or the Australian, with all manner of freaks, adventures and disguises. The Veda, it is true, does not usually dilate much on the worst of these adventures. The Veda contains devotional hymns; we can no more expect much Narrative here than in the Psalms of David. Again, the religious sentiment of the Veda is half-consciously hostile to the stories. As M. A. Barth says, ” Le sentiment religieux a ecarte la plupart de ces mythes, mais il ne les a ecartes tous.” The Brahmanas, on the other hand, later compilations, canonized books for the direction of ritual and sacrifice, are rich in senseless and irrational myths. Sometimes these myths are probably later than the Veda, mere explanations of ritual incidents devised by the priests. Sometimes a myth probably older than the Vedo-s, and maintained in popular tradition, is reported in the Brahmanas. The gods in the Veda are by no means always regarded as equal in supremacy. There were great and small, young and old gods (R. V. i. 27, 13). Elsewhere this is flatly contradicted : ” None of you, oh gods, is small or young, ye are all great ” (R. V. viii. 30, 1). As to the immortality and the origin of the gods, there is no orthodox opinion in the Veda. Many of the myths of the origin of the divine beings are on a level with the Maori theory

that Heaven and Earth begat them in the ordinary way. Again, the gods were represented as the children of Aditi. This may be taken either in a refined sense, as if Aditi were the ” infinite region from which the solar deities rise, 5 or we may hold with the Taittirya-Brahmana 6 that Aditi was a female who, being desirous of offspring, cooked a brahmandana offering for the Sadhyas. Various other fathers and mothers of the gods are mentioned. Some gods, particularly Indra, are said to have won divine rank by ” austere fervour ” and asceticism, which is one of the processes that makes gods out of mortals even now in India. 7 The gods are not always even credited with inherent immortality. Like men, they were subject to death, which they overcame in various ways. Like most gods, they had struggles for pre-eminence with Titanic opponents, the Asuras, who partly answer to the Greek Titans and the Hawaiianfoes of the divine race, or to the Scandinavian giants and the enemies who beset the savage creative beings. Early man, living in a state of endless warfare, naturally believes that his gods also have their battles. The chief foes of Indra are Vrittra and Ahi, serpents which swallow up the waters, precisely as frogs do in Austra- lian and Californian and Andaman myths. It has already been shown that such creatures, thunder-birds, snakes, dragons, and what not, people the sky in the imagination of Zulus, Red Men, Chinese, Peruvians, and all the races who believe that beasts hunt the sun and moon and cause eclipses. 8 Though hostile to Asuras, Indra was once entangled in an intrigue with a woman of that race, accord- ing to the Atharva-Veda (Muir, S. T. v. 82). The gods were less numerous than the Asuras, but by a magical stratagem turned some bricks into gods (like a creation of new peers to carry a vote) — so says the Black Yajur-Veda.”

Turning to separate gods, Indra first claims attention, for stories of Heaven and Earth are better studied under the heading of myths of the origin of things. Indra has this zoomorphic feature in common with Heitsi Eibib, the Namaqua god, 10 that his mother, or one of his mothers, was a cow (R. V. iv. 18, 1). This statement may be a mere way of speaking in the Veda, but it is a rather Hottentot way.” Indra is also referred to as a ram in the Veda, and in one myth this ram could fly, like the Greek ram of the fleece of gold. He was certainly so far connected with sheep that he and sheep and the Kshatriya caste sprang from the breast and arms of Prajapati, a kind of creative being. Indra was a great drinker of soma juice; a drinking-song by Indra, much bemused with soma, is in R. V. x. 119. On one occasion Indra got at the soma by assuming the shape of a quail. In the Taitt. Samh. (ii. 5; i. 1) Indra is said to ” have been guilty of that most hideous crime, the killing of a Brahmana.” 12 Once, though uninvited, Indra

drank some soma that had been prepared for another being. The soma disagreed with Indra; part of it which was not drunk up became Vrittra the serpent, Indra's

6 Muller, Hibbert Lectures, p. 230.

6 Muir, S. T.,v. 55;i-27.

7 See Sir A. Lyall, Asiatic Studies. For Vedic examples, see R.-V. x. 167, 1 ; x. 159, 4; Muir, S. T. v. 15.

8 See Tylpr, Primitive Culture, i. 288, 329, 356.

9 The_ chief authority for the constant strife between gods and Asuras is the Satapatha-Branmana, of which one volume is translated in Sacred Books of the East (vol. xii.).

10 Hahn, Tsuni-Goam, the Supreme Being of the Hottentots, p. 68.

11 See Muir, 5. T., v. 16, 17, for Indra's peculiar achievements with a cow.

12 Sacred Books of the East, xii. 1, 48.

enemy. Indra cut him in two, and made the moon out of half of his body. This serpent was a universal devourer of everything and everybody, like Kwai Hemm, the all-devourer in Bushman mythology. If this invention is a late priestly one, the person who introduced it into the Satapalha-Brahmana must have reverted to the intellectual condition of Bushmen. In the fight with Vrittra, Indra lost his energy, which fell to the earth and produced plants and shrubs. In the same way plants, among the Iroquois, were made of pieces knocked off Chokanipok in his fight with Manabozho. Vines, in particular, are the entrails of Chokanipok. In Egypt, wine was the blood of the enemies of the gods. The Aryan versions of this sensible legend will be found in Satapatha-Brahmana. 1 The civilized mind soon wearies of this stuff, and perhaps enough has been said to prove that, in the traditions of Vedic devotees, Indra was not a god without an irrational element in his myth. Our argument is, that all these legends about Indra, of which only a sample is given, have no necessary connexion with the worship of a pure nature-god as a nature-god would now be constructed by men. The legends are

survivals of a time in which natural phenomena were regarded, not as we regard them, but as persons, and savage persons, Alcheringa folk, in fact, and became the centres of legends in the savage manner. Space does not permit us to recount the equally puerile and barbarous legends of Vishnu, Agni, the loves of Vivasvat in the form of a horse, the adventures of Soma, nor the Vedic amours (paralleled in several savage mythologies) of Pururavas and Urvasi. 2

Divine Myths of Greece. — If any ancient people was thoroughly civilized the Greeks were that people. Yet in the mythology and religion of Greece we find abundant survivals of savage manners and of savage myths. As to the religion, it is enough to point to the traces of human sacrifice and to the worship of rude fetish stones. The human sacrifices at Salamis in Cyprus and at Alos in Achaia Phthiotis may be said to have continued almost to the conversion of the empire (Grote i. 125, ed. 1869). Pausanias seems to have found human sacrifices to Zeus still lingering in Arcadia in the 2nd century of our era. ” On this altar on the Lycaean hill they sacrifice to Zeus in a manner that may not be spoken, and little liking had I to pry far into that sacrifice. But let it be as it, is, and as it hath been from the beginning.” Now ” from the beginning ” the sacrifice, according to Arcadian tradition, had been a human sacrifice. In other places there were manifest commutations of human sacrifice, as at the altar of Artemis the Implacable at Patrae, where Pausanias saw the wild beasts being driven into the flames. 3 . Many other exam- ples” of human sacrifice are mentioned in Greek legend. Pausanias gives full and interesting details of the worship of rude stones, the oldest worship, he says, among the Greeks. Almost every temple had its fetish stone on a level with the pumice stone, which is the Poseidon of the Mangaians. 4 The Argives had a large stone called Zeus Cappotas. The oldest idol of the Thespians was a rude stone. Another has been found beneath the pedestal of Apollo in Delos. In Achaean Pharae were thirty squared stones, each named by the name of a god. Among monstrous images of the gods which Pausanias, who saw them, regarded as the oldest idols, were the three-headed Artemis, each head being that of an animal, the Demeter with the horse’s head, the Artemis with the fish’s tail, the Zeus with three eyes, the ithyphallic Hermes, represented after the fashion of the Priapic figures in paintings on the walls of caves among the Bushmen. We also hear of the bull and the bull-footed Dionysus. Phallic and other obscene emblems were carried abroad in processions in Attica both by women and men. The Greek custom of daubing people all over with clay in the mysteries results as we saw in the mysteries of negroes, Australians and American races, while the Australian turndun was

exhibited among the toys at the mysteries of Dionysus. The survivals of rites, objects of worship, and sacrifices like these prove that religious conservatism in Greece retained much of savage practice, and the Greek mythology is not less full of ideas familiar to the lowest races. The authorities for Greek mythology are numerous and various in character. The oldest sources as literary docu- ments are the Homeric and Hesiodic poems. In the Iliad and Odyssey the gods and goddesses are beautiful, powerful and immortal anthropomorphic beings. The name of Zeus (Skr. Dyaus) clearly indicates his connexion with the sky. But in Homer he has long ceased to be merely the sky conceived of as a person ; he is the

1 Sacred Books of the East, xii. 176, 177.

2 On the whole subject, Dr Muir's Ancient Sanskrit Texts, with translations, Ludwig's translation of the Rig Veda, the version of the Satapatha-Brahmana already referred to, and the translation of the Aitareya-Brahmana by Haug, are the sources most open to English readers. Max Muller's translation of the Rig Veda unfor- tunately only deals with the hymns to the Maruts. The Indian epics and the Puranas belong to a much later date, and are full of deities either unknown to or undeveloped in the Rig Veda and the Brahmanas. It is much to be regretted that the Atharva-Veda, which contains the magical formulae and incantations of the Vedic Indians, is still untranslated, though, by the very nature of its theme, it must contain matter of extreme antiquity and interest.

' Pausanias iii. 16; vii. 18. Human sacrifice to Dionysus, Paus. vii. 21 ; Plutarch, De Is. et Os. 35; Porphyry, De Abst. ii. 55. * Gill, Myths and Songs '^rn the South Pacific, p. 60.

chief personage in a society of immortals, organized on the type of contemporary human society. " There is a great deal of human nature " in his wife Hera (Skr. Svar, Heaven). 6 It is to be remem- bered that philologists differ widely as to the origin and meaning of the names of almost all the Greek gods. Thus the light which the science of language throws on Greek myths is extremely uncertain. Hera is explained as " the feminine side of heaven " by some authori- ties. The quarrels of Hera with Zeus (which are a humorous anthropomorphic study in Homer) are represented as a way of speak- ing about winter and rough weather. The other chief Homeric deities are Apollo and Artemis, children of Zeus by Leto, a mortal mother raised to divinity. Apollo is clearly connected in some way with light, as his name < £oi/3os seems to indicate, and with purity. 6 Homer knows the legend that a giant sought to lay violent hands on Leto (Od. xi. 580).

Smintheus, one of Apollo's titles in Homer, is connected with the field-mouse (oiiivdos), one of his many sacred animals. His names, Au/aos, AvKi)ytvqs, were connected by an- tiquity with the wolf, by most modern writers with the light. According to some legends Leto had been a were-wolf. 7 The whole subject of the relations of Greek gods to animals is best set forth in the words of Plutarch (De Is. et Os. lxxi.), where he says that the Egyptians worship actual beasts, " whereas the Greeks both speak and believe correctly, saying that the dove is the sacred animal of Aphrodite, the raven of Apollo, the dog of Artemis," and so forth. Each Greek god had a small menagerie of sacred animals, and it may be conjectured that these animals were originally the totems of various stocks, subsumed into the worship of the anthropomorphic god. For the new theory of vegetation spirits and corn spirits see The Golden Bough. Apollo, in any case, is the young and beautiful archer-god of Homer ; Artemis, his sister, is the goddess of archery, who takes her pastime in the chase. She holds no considerable place in the Iliad; in the Odyssey, Nausicaa is compared to her, as to the pure and lovely lady of maidenhood. Her name is commonly connected with apTenfc — pure, unpolluted. Her close relations (un-Homeric) with the bear and bear-worship have suggested a derivation from aparos — "Apurcfiis. In Homer her " gentle shafts " deal sudden and painless death ; she is a beautiful Azrael. A much more important daughter of Zeus in Homer is Athene, the " grey- eyed " or (as some take yXavuwins, rather improbably) the " owl- headed "goddess. Her birth from the head of Zeus is not explicitly alluded to in Homer. 8 In Homer, Athene is a warlike maiden, the patron-goddess of wisdom and manly resolution. In the twenty- second book of the Odyssey she assumes the form of a swallow, and she can put on the shape of any man. She bears the aegis, the awful shield of Zeus. Another Homeric child of Zeus, or, according to Hesiod (Th. 927), of Hera alone, is Hephaestus, the lame craftsman and artificer. In the Iliad" will be found some of the crudest Homeric myths. Zeus or Hera throws Hephaestus or Ate out of heaven, as in the Iroquois myth of the tossing from heaven of Ataentsic. There is, as usual, no agreement as to the etymology of the name of Hephaestus. Preller inclines to a connexion with i)00cu, to kindle fire, but Max Miiller differs from this theory. About the close relations of Hephaestus with fire there can be no doubt. He is a rough, kind, good-humoured being in the Iliad. In the Odyssey he is naturally annoyed by the adultery of his wife, Aphrodite, with Arcs. Ares is a god with whom Homer has no sympathy. He is a son of Hera, and detested by Zeus (Iliad, v. 890). He is cowardly in war, and on one occasion was shut up for years in a huge brazen pot. This adventure was even more ignominious than that of Poseidon and Apollo when they were compelled to serve Laomedon

for hire. The payment he refused, and threatened to " cut off their ears with the sword " (Iliad, xxi. 455). Poseidon is to the sea what Zeus is to the air, and Hades to the underworld in Homer. 10 His own view of his social position may be stated in his own words (Iliad, xv. 183, 211). " Three brethren are we, and sons of Cronus, sons whom Rhea bare, even Zeus and myself, and Hades is the third, the ruler of the people in the underworld. And in three lots were all things divided, and each drew a lot of his own, 11 and to me fell the hoary sea, and Hades drew the mirky darkness, and Zeus the wide heaven in clear air and clouds, but the earth and high Olympus are yet common to all."

Zeus, however, is, as Poseidon admits, the elder-born, and there- fore the revered head of the family. Thus Homer adopts the system

6 Cf. Preller, Griechische Mythologie,-. 128, note I, for this and other philological conjectures.

6 The derivation of ‘AttoKKuv remains obscure. The derivation of Leto from XaOelv, and the conclusion that her name means ” the concealer ” — that is, the night, whence the sun is born — is disputed by Curtius (Preller i. 190, 191, note 4), but appears to be accepted by Max Miiller (Selected Essays, i. 386) Latmos being derived from the same root as Leto, Latona, the night.

7 Aristotle, H. An. 6; Aelian, N. A. iv. 4.

8 Her name, as usual, is variously interpreted by various etymologists.

9 xiv. 257; xviii. 395; xix. 91, 132.

10 The root of his name is sought in such words as tt&tos and Trorauds.

11 We learn from the Odyssey (xiv. 209) that this was the custom of sons on the death of their father.

of primogeniture, while Hesiod is all for the opposite and probably earlier custom of Jiingsten-recht, and makes supreme Zeus the youngest of the sons of Cronus. Among the other gods Dionysus is but slightly alluded to in Homer as the son of Zeus and Semele, as the object of persecution, and as connected with the myth of Ariadne. The

name of Hermes is derived from various sources, as from opixav and bpuri, or, by Max Muller, the name is connected with Sarameya (Sky). If he had originally an elemental character, it is now difficult to distinguish, though interpreters connect him with the wind. He is the messenger of the gods, the bringer of good luck, and the conductor of men's souls down the dark ways of death. In addition to the great Homeric gods, the poet knows a whole " Olympian consistory " of deities, nymphs, nereids, sea-gods and goddesses, river-gods, Iris the rainbow goddess, Sleep, Demeter who lay with a mortal, Aphrodite the goddess of love, wife of Hephaes- tus and leman of Ares, and so forth. As to the origin of the gods, Homer is not very explicit. He is acquainted with the existence of an older dynasty now deposed, the dynasty of Cronus and the Titans. In the Iliad (viii. 478) Zeus says to Hera, " For thine anger reck I not, not even though thou go to the nethermost bounds of e?rth and sea, where sit Iapetus and Cronus . . . and deep Tartarus « round about them." " The gods below that are with Cronus " are mentioned (//. xiv. 274; xv. 225). Rumours of old divine wars echo in the Iliad, as (i. 400) where it is said that when the other immortals revolted against and bound Zeus, Thetis brought to his aid Aegaeon of the hundred arms. The streams of Oceanus (i7. xiv. 246) are spoken of as the source of all the gods, and in the same book (290) " Oceanus and mother Tethys " are regarded as the parents of the immortals. Zeus is usually called Cronion and Cronides, which Homer certainly understood to mean " son of Cronus," yet it is expressly stated that Zeus " imprisoned Cronus beneath the earth and the unvintaged sea." The whole subject is only alluded to incidentally. On the whole it may be said that the Homeric deities are powerful anthropomorphic beings, departmental rulers, united by the ordinary social and family ties of the Homeric age, capable of pain and pleasure, living on heavenly food, but refreshed by the sacrifices of men (Od- v. 100, 102), able to assume all forms at will, and to intermarry and propagate the species with mortal men and women. Their past has been stormy, and their ruler has attained power after defeating and mediatizing a more ancient dynasty of his own kindred.

From Hesiod we receive a much more elaborate — probably a more, ancient, certainly a more barbarous — story of the gods and their origin. In the beginning the gods (here used in a wide sense to denote an early non-natural race) were begotten by Earth and Heaven, conceived of as beings with human parts and passions (Hesiod, Theog. 45). This idea recurs in Maori, Vedic and Chinese mythology. Heaven and Earth, united in an endless embrace, produced children which never saw the light. In New Zealand, Chinese, Vedic, Indian and Greek myths the pair had to be sundered. 1 Hesiod enumerates the children

whom Earth bore ” when couched in love with Heaven.” They are Ocean, Coeus, Crius, Hyperion, Iapetus, Theia, Rhea, Themis, Mnemosyne, Phoebe, Tethys and the youngest, Cronus, ” and he hated his glorious father.” Others of this early race were the Cyclopes, Bronte, Sterope and Arge, and three children of enormous strength, Cottus, Briareus (Aegaeon) and Gyes, each with one hundred hands and fifty heads. Uranus detested his offspring, and hid them in crannies of Earth. Earth excited Cronus to attack the father, whom he castrated with a sickle. From the blood of Uranus (this feature is common in Red Indian and Egyptian myths) were born furies, giants, ash-nymphs and Aphrodite. A number of monsters, as Echidna, Geryon and the hound of hell, were born of the loves of various elemental powers. The chief stock of the divine species was continued by the marriage of Rhea (probably another form of the Earth) with Cronus. Their children were Hestia, Demeter, Hera, Hades and Poseidon. All these Cronus swallowed; and this ” swallow-myth ” occurs in Australia, among the Bushmen, in Guiana, in Brittany (where Gargantua did the swallow-trick) and elsewhere. At last Rhea bore Zeus, and gave Cronus a stone in swaddling bands, which he disposed of in the usual way. Zeus grew up, administered an emetic to Cronus, (some say Metis did this), and had the satis- faction of seeing all his brothers and sisters disgorged alive. The stone came forth first, and Pausanias saw it at Delphi (Paus. x. 24). Then followed the wars between Zeus and the gods he had rescued from the maw of Cronus against the gods of the elder branch, the children of Uranus and Gaea — Heaven and Earth. The victory remained with the younger branch, the immortal Olympians of Homer. The system of Hesiod is a medley of later physical speculation and of poetic allegory, with matter which we, at least, regard as savage survivals, like the mutilation of Heaven and the swallow- myth. 2

1 See Tylor, Prim. Cult. i. 326.

2 Bleek, Bushman. Folk-Lore, pp. 6-8. Max Muller suggests another theory {Selected Essays, i. 460) : ” Kpovos did not exist till long after Zeus in Greece.” The name Kpoviuv, or KpoviS-qs, looks like a patronymic. Muller, however, thinks it originally meant only ” connected with time, existing through all time.” Very much later the name was mistaken for a genuine patronymic,

In Homer and in Hesiod myths enter the region of literature, and become, as it were, national. But it is probable that the local myths of various cities and temples, of the ” sacred chapters ” which were told by the priests to travellers and in the mysteries to the initiated, were older in form than the epic and national myths. Of these ” sacred

chapters ” we have fragments and hints in Hero- dotus, Pausanias, in the mythographers, like Apollodorus, in the tragic poets, and in the ancient scholia or notes on the classics. From these sources come almost all the more inhuman, bestial and discreditable myths of the gods. In these we more distinctly perceive the savage element. The gods assume animal forms: Cronus becomes a horse, Rhea a mare; Zeus begets separate families of men in the shape of a bull, an ant, a serpent, a swan. His mistress from whom the Arcadians claim descent becomes a she-bear. It is usual with mythoiogists to say that Zeus is the ” Ail-Father,” and that his amours are only a. poetic way of stating that he is the parent of men. But why does he assume so many animal shapes ? Why did various royal houses claim descent from the ant, the swan, the she-bear, the serpent, the horse and so forth ? We have already seen that this is the ordinary pedigree of savage stocks in Asia, Africa, Australia and America, while animals appear among Irish tribes and in Egyptian and ancient English genealogies. 3 It is a plausible hypothesis that stocks which once claimed descent from animals, sans phrase, afterwards regarded the animals as avatars of Zeus. In the same way ” the Minas, a non-Aryan tribe of Rajpu- tana, used to worship the pig; when the Brahmans got a turn at them, the pig became an avatar of Vishnu ” (Lyall, Asiatic Studies). The tales of divine cannibalism to which Pindar refers with awe, the mutilation of Dionysus Zagreus, the unspeakable abominations of Dionysus, the loves of Hera in the shape of a cuckoo, the divine powers of metamorphosing men and women into beasts and stars — these tales come to us as echoes of the period of savage thought. Further evidence on this point will be given below in a classification of the principal mythic legends. The general conclusion is that many of the Greek deities were originally elemental, the elements being personified in accordance with the laws of savage imagina- tions. But we cannot explain each detail in the legends as a myth of this or that natural phenomenon or process as understood by ourselves. Various stages of late and early fancy have contributed to the legends. Zeus is the sky, but not our sky; he had originally a personal character, and that, a savage or barbarous character. He probably attracted into his legend stories that did not origi- nally belong to him. He became anthropomorphic, and his myth was handled by local priests, by family bards, by national poets, by early philosophers. His legend is a complex embroidery on a very ancient tissue. The other divine myths are equally complex.

See L. R. Farnell, Cults of the Greek States; Miss Jane Harrison, Prolegomena to Greek Religion; and Frazer, The Golden Bough, especially as regards the vegetable or ” probably arboreal ” aspect of

Zeus.

Scandinavian Divine Myths. — The Scandinavian myths of the gods are numerous and interesting, but the evidence on which they have reached us demands criticism for which we lack space. That there are in the Eddas and Sagas early ideas and later ideas tinged by Christian legend seems indubitable, but philological and historical learning has by no means settled the questions of relative purity and antiquity in the myths. The Eddie songs, according to F. Y. Powell, one of the editors of the Corpus poeticum septentrionale (the best work on the subject), ” cannot date earlier ” in their present form ” than the 9th century,” and may be vaguely placed between a.d. 800-1100. The collector of the Edda probably had the old poems recited to him in the 13th century, and where there was a break in the memory of the reciters the lacuna was filled up in prose. ” As one goes through the poems, one is ever and anon face to face with a myth of the most childish and barbaric type,” which ” carries one back to prae-Aryan days.” Side by side with these old stories come fragments of a different stratum of thought, Christian ideas, the belief in a supreme God, the notion of Doomsday. The Scandinavian cosmogonic myth (with its parallels among races savage and civilized) is given elsewhere. The most important god is Odin, the son of Bestla and Bor, the husband of Frigg, the father of Balder and many other sons, the head of the Aesir stock of gods. Odin’s name is connected with that of Wuotan, and referred to the Old High-German verb watan wuot = meare, cum impetu ferri (Grimm, Teut. Myth., Eng. transl.,

and ” Zeus the ancient of days ” became ” Zeus the son of Cronus.” Having thus got a Cronus, the Greeks — and ” the misunderstanding could have happened in Greece only ” — needed a myth of Cronus. They therefore invented or adapted the ” swallow-myth ” so familiar to Bushmen and Australians. This singular reversion to savagery itself needs some explanation. But the hypothesis that Cronus is a late derivation from KpoviSr/s and Kpovlwv is by no means universally accepted. Others derive KpSvos from upalvai, and connect it with Kpovia, a kind of harvest-home festival. Schwartz (Prahistorisch-anthropologische Studien) readily proves Cronus to be the storm, swallowing the clouds. Perhaps we may say of Schwartz’s view, as he says of Preller’s — ” das ist Gedanken- spiel, aber nimmermehr Mythologie.”

3 Elton, Origins of English History, pp. 298—301.

i. 131). Odin would thus (if we admit the etymology) be the swift goer, the ” ganger,” and it seems superfluous to make him (with Grimm) ” the all-powerful, all-permeating being,” a very abstract and scarcely an early conception. Odin’s brethren (in Gylfi’s Mocking) are Vile and Ve, who with him slew Ymir the giant, and made all things out of the fragments of his body. They also made man out of two stocks. In the Hava-Mal Odin claims for himself most of the attributes of the medicine-man. In Loka Senna, Loki, the evil god, says that ” Odin dealt in magic in Samsey.” The goddess Frigg remarks, ” Ye should never talk of your old doings before men, of what ye two Aesir went through in old times.” But many relics of these ” old times,” many traces of the medicine-man and the ” skin-shifter,” survive in the myth of Odin. When he stole Suttung’s mead (which answers somewhat to nectar and the Indian soma), he flew away in the shape of an eagle. 1 The hawk is sacred to Odin; one of his names is ” the Raven-god.” He was usually represented as one-eyed, having left an eye in pawn that he might purchase a draught from Mimir’s well. This one eye is often explained as the sun. Odin’s wife was Frigg; their sons were Thor (the thunder-god) and Balder, whose myth is well known in English poetry. The gods were divided into two — not always friendly — stocks, the Aesir and Vanir. Their relations are, on the whole, much more amicable than those of the Asuras and Devas in Indian mythology. Not necessarily immortal, the gods restored their vigour by eating the apples of Iduna. Asa Loki was a being of mixed race, half god, half giant, and wholly mischievous and evil. His legend includes animal metamorphoses of the most obscene character. In the shape of a -mare he became the mother of the eight-legged horse of Odin. He borrowed the hawk-dress of Freya, when he recovered the apples of Iduna. Another Eddie god, Hoene, is described in phrases from lost poems as ” the long-legged one,” ” lord of the ooze,” and his name is connected with that of the crane. The con- stant enemies of the gods, the giants, could also assume animal forms. Thus in Thiodolf’s Haust-long (composed after the settle- ment of Iceland) we read about a shield on which events from myth- ology were painted; among these was the flight of ” giant Thiazzi in an ancient eagle’s feathers.” The god Herindal and Loki once fought a battle in the shapes of seals. On the whole, the Scan- dinavian gods are a society on an early human model, of beings indifferently human, animal and divine — some of them derived from elemental forces personified, holding sway over the elements, and skilled in sorcery. Probably after the viking days came in the conceptions of the last war of gods, and the end of all, and the theory of Odin All-Father as a kind of emperor in the heavenly world.

The famous tree that lives through all the world is regarded as ” foreign, Christian, and confined to few poems.” There is, almost undoubtedly, a touch of the Christian dawn on the figure and myth of the pure and beloved and ill-fated god Balder, and his descent into hell. The whole subject is beset with critical diffi- culties, and we have chiefly noted features which can hardly be regarded as late, and which correspond with widely distributed mythical ideas.

Dasent’s Prose or Younger Edda (Stockholm, 1842); the Corpus Septentrionale already referred to; C. F. Keary’s Mythology of the Eddas (1882); Pigott’s Manual of Scandinavian Mythology (1838); and Laing’s Early Kings of Norway may be consulted by English students.

Classification of Myths. — It is now necessary to cast a hasty glance over the chief divisions of myths. These correspond to the chief problems which the world presents to the curiosity of untutored men. They ask themselves (and the ‘answers are given in myths) the following questions: What is the Origin of the World ? The Origin of Man ? Whence came the Arts of Life? Whence the Stars? Whence the Sun and Moon? What is the Origin of Death? How was Fire procured by Man? The question of the origin of the marks and characteristics of various animals and plants has also produced a class of myths in which the marks are said to survive from some memorable adventure, or the plants and animals to be metamorphosed human beings. Examples of all these myths are found among savages and in the legends of the ancient civilizations. A few such examples may now be given.

Myths of the Origin of the World. — We have found it difficult to keep myths of the gods apart from myths of the origin of the world and of man, because gods are frequently regarded as creative powers. The origin of things is a problem which has everywhere

1 Indra was a hawk when, ” being well-winged, he carried to men the food tasted by the gods ” (R. V. iv. 26, 4). Yehl, the Tlingit god-hero, was a raven or a crane when he stole the water (Bancroft iii. 100-102). The prevalence of animals, or of god- animals, in myths of the stealing of water, soma and fire, is very remarkable. Among the Andaman Islanders, a kingfisher steals fire for men from the god Puluga (Anthrop. Journal, November

1882).

exercised thought, and been rudely solved in myths. These vary in quality with the civilization of the races in which they are current, but

the same ideas which we proceed to state pervade all cosmo- gonical myths, savage and civilized. All these legends waver between the theory of creation, or rather of manufacture, and the theory of evolution. The earth, as a rule, is supposed to have grown out of some original matter, perhaps an animal, perhaps an egg which floated on the waters, perhaps a fragment of soil fished up out of the floods by a beast or a god. But this conception does not exclude the idea that many of the things in the world — minerals, plants, people, and what not — are fragments of the frame of an animal or non-natural magnified man, or are excretions from the body of a god. We proceed to state briefly the various forms of these ideas. The most backward races usually assume the prior existence of the earth.

The aborigines of the northern parts of Victoria (Australia) believe that the earth was made by Pund-jel, the bird-creator, who sliced the valleys with a knife. Another Australian theory is that the men of a previous race, the Nooralie (very old ones), made the earth.

The problem of the origin of the world seems scarcely to have troubled the Bushmen. They know about ” men who brought the sun,” but their doctrines are revealed in mysteries, and Qing, the informant of Mr Orpen (Cape Monthly Magazine, July 1874), ” did not dance that dance ” — that is, had not been initiated into all the secret doctrines of his tribe. According to Qing, creation was the work of Cagn (the mantis insect), ” he gave orders and caused all things to appear.” Elsewhere in the myth Cagn made or manufactured things by his skill.

As a rule the most backward races, while rich in myths of the origin of men, animals, plants, stones and stars, do not say much about the making of the world. Among people a little more ad- vanced, the earth is presumed to have grown out of the waters. In the Iroquois myth (Lafitau, Mceurs des sauvages, 1724), a heavenly woman was tossed out of heaven, and fell on a turtle, which developed into the world. Another North-American myth assumes a single island in the midst of the waters, and this island grew into the world. The Navaho and the Digger Indians take earth for granted as a starting-point in their myths. The Winnebagos, not untouched by Christian doctrine, do not go farther back. The Great Manitou awoke and found himself alone. He took a piece of his body and a piece of earth and made a man. Here the existence of earth is assumed (Bancroft iv. 228). Even in Guatemala, though the younger sons of a divine race succeed in making the earth where the elder son (as usual) failed, they all had a supply of clay as first material. The Pima, a Central-American tribe, say the earth was made by a pcverful being, and at first appeared ”

like a spider's web." Thir -eminds one of the Ananzi or spider creator of West Africa. The more metaphysical Tacullies of British Columbia say that in the beginning nought existed but water and a musk-rat. The musk-rat sought his food at the bottom of the water, and his mouth was frequently filled with mud. This he kept spitting out, and so formed an island, which developed into the world. Among the Tinneh, the frame of a dog (which could assume the form of a handsome young man) became the first material of most things. The dog, like Osiris, Dionysus, Purusha and other gods, was torn to pieces by giants; the fragments became many of the things in the world (Bancroft i. 106). Even here the existence of earth for the dog to live in is assumed.

Coming to races more advanced in civilization, we find the New Zealanders in possession of ancient hymns in which the origin of things is traced back to nothing, to darkness, and to a metaphysical process from nothing to something, from being to becoming. The hymns may be read in Sir George Grey's Polynesian Mythology, and in Taylor's New Zealand. It has been suggested that these hymns bear traces of Buddhist and Indian influence ; in any case, they are rather metaphysical than mystical. Myth comes in when the Maoris represent Rangi and Papa, Heaven and Earth, as two vast beings, male and female, united in a secular embrace, and finally severed by their children, among whom Tane Mahuta takes the part of Cronus in the Greek myth. The gods were partly elemental, partly animal in character; the lists of their titles show that every human crime was freely attributed to them. In the South Sea Islands, generally, the fable of the union and separation of Heaven and Earth is current ; other forms will be found in Gill's Myths and Songs from the South Pacific.

The cosmogonic myths of the Aryans of India are peculiarly interesting, as we find in the Vedas and Brahmanas and Puranas almost every fiction familiar to savages side by side with the most abstract metaphysical speculations. We have the theory that earth grew, as in the Iroquois story of the turtle, from a being named Uttanapad (Muir v. 335). We find that Brahmanaspati " blew the gods forth from his mouth," and one of the gods, Tvashtri, the mechanic among the deities, is credited with having fashioned the earth and the heaven (Muir v. 354). The " Purusha Sukta," the 90th hymn of the tenth book of the Rig Veda, gives us the Indian version of the theory that all things were made -out of the mangled limbs of Purusha, a magnified non-natural man, who was sacrificed by the gods. As this hymn gives Pin account of the origin of the castes (which elsewhere are scarcely recognized in the

Rig Veda), it is sometimes regarded as a late addition. But we can scarcely think the main conception late, as it is so widely scattered that it meets us in most mythologies, including those of Chaldaea and Egypt, and various North-American tribes. Not satisfied with this myth, the Aryans of India accounted for the origin of species in the following barbaric style. A being named Purusha was alone in the world. He differentiated himself into two beings, husband and wife. The wife, regarding union with her producer as incest, fled from his embraces as Nemesis did from those of Zeus, and Rhea from Cronus, assuming various animal disguises. The husband pursued in the form of the male of each animal, and from these unions sprang the various species of beasts (Satapatha- Brahmana, xiv. 4, 2; Muir i. 25). The myth of the cosmic egg from which all things were produced is also current in the Brah- manas. In the Puranas we find the legend of many successive creations and destructions of. the world a myth of world-wide distribution.

As a rule, destruction by a deluge is the most favourite myth, but destructions by fire and wind and by the wrath of a god are common in Australian, Peruvian and Egyptian tradition. The idea that a boar, or a god in the shape of a boar, fished up a bit of earth, which subsequently became the world, out of the waters, is very well known to the Aryans of India, and recalls the feats of American musk-rats and coyotes already described. 1 The tortoise from which all things sprang, in a myth of the Satapatha-Brahmana, reminds us of the Iroquois turtle. The Greek and Mangaian myth of the marriage of Heaven and Earth and its dissolution is found in the Aitareya-Brahmana (Haug's trans, ii. 308; Rig Veda, i. lxii.). So much for the Indian cosmogonic myths, which are a collection of ideas familiar to savages, blended with sacerdotal theories and ritual mummeries. The philosophical theory of the origin of things, a hymn of remarkable stateliness, is in Rig Veda, x. 129. The Scandinavian cosmogonic myth starts from the abyss, Ginnungagap, a chaos of ice, from which, as it thawed, was produced the giant Ymir. Ymir is the Scandinavian Purusha. A man and woman sprang from his armpit, like Athene from the head of Zeus. A cow licked the hoar-frost, whence rose Bur, whose children, Odin, Vile and Ve, slew the giant Ymir. " Of his flesh they formed the earth, of his blood seas and waters, of his bones mountains, of his teeth rocks and stones, of his hair all manner of plants." This is the story in the Prose Edda, derived from older songs, such as the .Grimnersmal. However the distribution of this singular

myth may be explained, its origin can scarcely be sought in the imagination of races higher in culture than the Tinneh and Tacullies, among whom dogs and beavers are the theriomorphic form of Purusha or Ymir. . ‘ ‘ _” ;.

Myths of the Origin of Man. — These partake of the conceptions of evolution and of creation. Man was made out of clay by a super-natural being. Australia: man was made by Pund-jel. New Zealand: man was made by Tiki; ” he took red clay, and kneaded it with his own blood.” Mangaia: the woman of the abyss made a child from a piece of flesh plucked out of her own side. Melanesia: ” man was made of clay, red from the marshy side of Vanua Levu”; woman was made by Qat of willow twigs. Greece: men were vXa/Tfiara mjXou, figures baked in clay by Prometheus. 2 India: men were made after many efforts, in which the experimental beings did not harmonize with their environment, by Prajapati. In another class of myths, man was evolved out of the lower animals — lizards in Australia; coyotes, beavers, apes and other beasts in America. The Greek myths of the descent of the Arcadians, Myrmidons, children of the swan, the cow, and so forth, may be compared. Yet again, men came out of trees or plants or rocks: as from the Australian wattle-gum, the Zulu bed of reeds, the great tree of the Ovahereros, the rock of the tribes in Central Africa, the cave of Bushman and North-American and Peruvian myth, ” from tree or stone ” (Odyssey, xix. 163). This view was common among the Greeks, who boasted of being autochthonous. The Cephisian marsh was one scene of man’s birth according to a fragment of Pindar, who mentions Egyptian and Libyan legends of the same description.

Myths of the Arts of Life. — These are almost unanimously attributed to ” culture-heroes,” beings theriomorphic or anthropo- morphic, who, like Pund-jel, Qat, Quawteaht, Prometheus, Manabozho, Quetzalcoatl, Cagn and the rest, taught men the use of the bow, the processes (where known) of pottery, agriculture (as Demeter), the due course of the mysteries, divination, and everything else they knew. Commonly the teacher disappears mysteriously. He is often regarded by modern mythologists as the sun >

Star Myths. — ” The stars came otherwise,” says Browning’s Caliban. In savage and civilized myths they are usually meta- morphosed men, women and beasts. In Australia, the Pleiades, as in Greece, were girls. Castor and Pollux in Greece, as in Australia, were young men. Our Bear was a bear, according to Charlevoix and Lafitau, among the North-American Indians; the Eskimo,

1 Black Yajur-Veda and Satapatha-Brahmana; Muir, i. 52.

2 Aristophanes, Aves, 686; Etym. Magn., s.v. ‘Uoviov, Pausanias jaw the clay (Paus. x. iv.). The story is also quoted by Lactantius ‘.rem Hesiod.

according to Egede, who settled the Danish colony in Greenland, regarded the stars ” very nonsensically,” as ” so many of their ancestors”; the Egyptian priests showed Plutarch the stars that had been Isis and Osiris. Aristophanes, in the Pax, shows us that the belief in the change of men into stars survived in his own day in Greece. The Bushmen (Bleek) have the same opinion. The Satapatha-Brahmana (Sacred Books of the East, xii. 284) shows how Prajapati, in his incestuous love, turned himself into a roe- buck, his daughter into a doe, and how both became constellations. This is a thoroughly good example of the savage myths (as in Peru, according to Acosta) by which beasts and anthropomorphic gods and stars are all jumbled together. 3 The Rig Veda contains examples of the idea that the good become stars.

Solar and Lunar Myths. — These are universally found, and are too numerous to be examined here. The sun and moon, as in the Bulgarian ballad of the Sun’s Bride (a mortal girl), are looked on as living beings. In Mexico they were two men, or gods of a human character who were burned. The Eskimo know the moon as a man who visits earth, and, again, as a girl who had her face spotted by ashes which the Sun threw at her. The Khasias make the sun a woman, who daubs the face of the moon, a man. The Homeric hymn to Helios, as Max Miiller observes, ” looks on the sun as a half-god, almost a hero, who had once lived on earth.” This is precisely the Bushman view; the sun was a man who irradiated light from his armpit. In New Zealand and in North America the sun is a beast, whom adventurers have trapped and beaten. Medicine has been made with his blood. In the Andaman Islands the Sun is the wife of the Moon (Jour, of Anlh. Soc, 1882). Among aboriginal tribes in India (Dalton, p. 186) the Moon is the Sun’s bride; she was faithless and he cut her in two, but occasionally lets her shine in full beauty. The Andaman Islanders account for the white brilliance of the moon by saying that he is daubing himself with white clay, a custom common in savage and Greek mysteries. The Red Men accounted to the Jesuits for the spherical forms of sun and moon by saying that their appearance was caused by their bended bows. The Moon in Greek myths loved Endymion, and was bribed to be the mistress of Pan by the present of a fleece, like the Dawn in Australia, whose unchastity was rewarded by a gift of a red cloak of opossum skin. Solar and lunar myths usually account for the observed

phenomena of eclipse, waning and waxing, sunset, spots on the moon, and so forth by various mythical adventures of the animated heavenly beings. In modern folk-lore the moon is a place to which bad people are sent, rather than a woman or a man. The mark of the hare in the moon has struck the imagination of Germans, Mexicans, Hottentots, Sinhalese, and produced myths among all these races. 4

Myths of Death. — Few savage races regard death as a natural event. All natural deaths are supernatural with them. Men are assumed to be naturally immortal, hence a series of myths to account for the origin of death. Usually some custom or " taboo " is represented as having been broken, when death has followed. In New Zealand, Maui was not properly baptized. In Australia, a woman was told not to go near a certain tree where a bat lived ; she infringed the prohibition, the bat fluttered out, and men died. The Ningphoos were dismissed from Paradise and became mortal, because one of them bathed in water which had been tabooed (Dalton, p. 13). In the Atharva Veda, Yama, like Maui in New Zealand, first " spied out the path to the other world," which all men after him have taken. In the -Rig Veda (x. 14), Yama " sought out a road for many." In the Solomon Islands (Jour. Anth, Inst., Feb. 1881), " Koevari was the author of death, by resuming her cast-off skin." The same story is told in the Banks Islands. In the Greek myth (Hesiod, Works and Days, 90), men lived without " ill diseases that give death to men " till the cover was lifted from the forbidden box of Pandora. As to the myths of Hades, the place of the dead, they are far too many to be mentioned in detail. In almost all the gates of hell are guarded by fierce beasts, and in Ojibway, Finnish, Greek, Papuan and Japanese myths no mortal visitor may escape from Hades who has once tasted the food of the dead.

Myths of Fire-stealing. — Those current in North America (where an animal is commonly the thief) will be found in Bancroft, vol. iv. The Australian version, singularly like one Greek legend, is given by Brough Smyth. Stories of the theft of Prometheus are recorded by Hesiod, Aeschylus, and their commentators. Muir and Kuhn may be consulted for Vedic fire-stealing.

Heroic and Romantic Myths. — In addition to myths which are clearly intended to explain facts of the universe, most nations have their heroic and romantic myths. Familiar examples are the stories of Perseus, Odysseus, Sigurd, the Indian epic stories, the adventures of Ilmarinen and Wainamoinen in the Kalewala, and so forth. To discuss these myths as far as they can be considered apart from divine and explanatory tales would demand more space than we have at our

disposal. It will become evident to any student of the romantic myths that they consist of different arrange-

3 See also Vishnu Purana, i. 131.

4 See Cornhill Magazine, ” How the Stars got their Names ” (1882, p. 35), and ” Some Solar and Lunar Myths ” (1882, p. 440)% Max Miiller, Selected Essays, i. 609-611.

ments of a rather limited set of incidents. * These incidents have been roughly classified by Von Hahn. 1 We may modify his arrange- ment as follows.

There is (i) the story of a bride or bridegroom who transgresses a commandment of a mystic nature, and disappears as a result of the sin. The bride sins as in Eros and Psyche, Freja and Oddur, Puraravas and Urvasi. 2 The sin of Urvasi and Psyche was seeing their husbands — naked in the latter case. The sin was against ” the manner of women.” Now the rule of etiquette which forbids seeing or naming the husband (especially the latter) is of the widest distribution. The offence in the Welsh form of the story is naming the partner — a thing forbidden among early Greeks and modern Zulus. Presumably the tale (with its example of the sanction) sur- vives the rule in many cases. (2) ” Penelope formula.” The man leaves the wife and returns after many years. A good example occurs in Chinese legend. (3) Formula of the attempt to avoid fate or the prophecy of an oracle. This incident takes numerous shapes, as in the story of the fatal birth of Perseus, Paris, the Egyptian prince shut up in a tower, the birth of Oedipus. (4) Slaughter of a monster. This is best known in the case of Andro- meda and Perseus. (5) Flight, by aid of an animal usually, from cannibalism, human sacrifice, or incest. The Greek example is Phrixus, Helle, and the ram of the golden fleece. (6) Flight of a lady and her lover from a giant father or wizard father. Jason and Medea furnish the Greek example. (7) The youngest brother the successful adventurer, and the head of the family. We have seen the example of Greek mythic illustrations of ” Jiingsten- recht,” or supremacy of the youngest, in the Hesiodic myth of Zeus, the youngest child of Cronus. (8) Bride given to whoever will accomplish difficult adventures or vanquish girl in race. The custom of giving a bride without demanding bride-price, in reward for a great exploit, is several times alluded to in the Iliad. In Greek heroic myth Jason thus wins Medea, and (in the race) Milanion

wins Atalanta. In the Kalewala much of the Jason cycle, including this part, recurs. The rider through the fire wins Brunhild but this may belong to another cycle of ideas. (9) The grateful beasts, who, having been aided by the hero, aid him in his adventures. Melampus and the snakes is a Greek example. This story is but one specimen of the personal human character of animals in myths, already referred to the intellectual condition of savages. (10) Story of the strong man and his adventures, and stories of the comrades Keen-eye, Quick-ear, and the rest. Jason has comrades • like these, as had Ilmarinen and Heracles, the Greek ” strong man.” (11) Adventure with an ogre, who is blinded and deceived by a pun of the hero’s. Odysseus and Polyphemus is the Greek ex- ample. (12) Descent into Hades of the hero. Heracles, Odysseus, Wainamoinen in the Kalewala, are the best-known examples in epic literature. These are twelve specimens of the incidents, to which we may add (13) ” the false bride,” as in the poem of Berte aux grans Pies, and (14) the legend of the bride said to produce beast-children. The belief in the latter phenomenon is very common in Africa, and in the Arabian Nights, and we have seen it in America. Of these formulae (chosen because illustrated by Greek heroic legends) — (1) is a sanction of barbarous nuptial etiquette; (2) is an obvious ordinary incident; (3) is moral, and both (3) and (1) may pair off with all the myths of the origin of death from the infringe- ment of a taboo or sacred command ; (4) would naturally occur wherever, as on the West Coast of Africa, human victims have been offered to sharks or other beasts; (5) the story of flight from a horrible crime, occurs in some stellar myths, and is an easy and natural invention; (6) flight from wizard father or husband, is found in Bushman and Namaqua myth, where the husband is an elephant ; (7) success of youngest brother, may have been an ex- planation and sanction of ” Jiingsten-recht ” — Maui in New Zealand is an example, and Herodotus found the story among the Scythians; (8) the bride given to successful adventurer, is consonant with heroic manners as late as Homer; (9) is no less consonant with the belief that beasts have human sentiments and supernatural powers; (10) the ” strong man,” is found among Eskimo and Zulus, and was an obvious invention when strength was the most admired of qualities; (11) the baffled ogre, is found among Basques and Irish, and turns on a- form of punning which inspires an ” ananzi ” story in West Africa; (12) descent into Hades, is the natural result of the savage conception of Hades, and the tale is told of actual living people in the Solomon Islands and in New Caledonia; Eskimo Angekoks can and do descend into Hades — it is the prerogative of the necromantic magician; (13) ” the false bride,” found among the Zulus, does not permit of such easy explanation — naturally, in Zululand, the false bride is an animal; (14) the bride accused of

bearing beast-children, has already been disposed of; the belief is inevitable where no distinction worth mentioning is taken between men and animals. English folk-lore has its woman who bore rabbits.

The formulae here summarized, with others, are familiar in the marchen of Samoyeds, Zulus, Bushmen, Hottentots and Red Indians. For an argument intended to show that Greek heroic

1 Griechische una" albanesische Marchen, i. 45. •Tenth Book of Rig Veda and " Brahmana " of Yajur-Veda; Miiller Selected Essays, i. 410.

myths may be adorned and classified marchen, in themselves survivals of savage fancy, see Fortnightly Review, May 1872, " Myths and Fairy Tales." The old explanation was that marchen are degenerate heroic myths. This does not explain the marchen of African, and perhaps not of Siberian races.

In this sketch of mythology that of Rome is not included, because its most picturesque parts are borrowed from or adapted into harmony with the mythology of Greece. Greece, India and Scandi- navia will supply a fair example of Aryan mythology (without entering on the difficult Slavonic and Celtic fields). (A. L.)

MYXOEDEMA (or athyrea), the medical term for a constitu- tional disease (see Metabolic Diseases) due to the degeneration of the thyroid gland, and occurring in adults; it may be con- trasted with cretinism, which is a condition appearing in early childhood. There are two forms, myxoedema proper and opera- tive myxoedema (cachexia strumipriva) . (1) Myxoedema has been termed " Gull's Disease" from Sir William Gull's observa- tions in 1873. Women are more often the victims than men, in a ratio of 6 to 1. It frequently affects members of the same family and may be transmitted through the mother, and it has been observed sometimes to follow exophthalmic goitre. The symptoms are a marked increase in bulk and weight of the body, puffy appearance of skin which does not pit on pressure, the line of the features becoming obliterated and getting coarse and broad, the lips thick and nostrils enlarged, with loss of hair, subnormal temperature and marked mental changes. There is striking slowness of thought and action, the memory becomes defective, and the patient becomes irritable and suspicious. In some instances the condition progresses to that of dementia. The thyroid gland itself is diminished in size, and may become completely atrophied and converted into a fibrous mass. The untreated disease is progressive, but the course is slow and the symptoms may extend over 12 to 15 years, death from asthenia or tuberculosis being the most

frequent ending. (2) Symptoms similar to the above m?y follow complete removal of the thyroid gland. Kocher of Bern found that, in the total removal of the gland by operation, out of 408 cases operative myxoedema occurred in 69, but it is thought that if a small portion of the gland is left, 01 if accessory glands are present, these symptoms will not develop. The treatment of myxoedema is similar to that of cretinism.

MYZOSTOMIDA, a remarkable group of small parasitic worms which live on crinoid echinoderms; they were first dis- covered by Leuckart in 1827. Some species, such as Myzostoma cirriferum, move about on the host; others, such as M. glabrum, remain stationary with the pharynx inserted in the mouth of the crinoid. M. dejormator gives rise to a ” gall ” on the arm of the host, one joint of the pinnule growing round the worm so as to enclose it in a cyst (see fig. E) ; whilst M. pulvinar lives actually in the alimentary canal of a species of Anledon.

A typical myzostomid (see A, B, C) is of a flattened rounded shape, with a thin edge drawn out into delicate radiating cirri. The skin is ciliated. The dorsal surface is smooth ; ventrally there are five pairs of parapodia, armed with supporting and hooked setae, by means of which the worm adheres to its host. Beyond the parapodia are four pairs of organs, often called suckers, but probably of sensory nature, and comparable to the lateral sense organs of Capitellids (Wheeler). The mouth and cloacal aperture are generally at opposite ends of the ventral surface. The former leads to a protrusible pharynx (B), from which the oesophagus opens into a wide intestinal chamber with branching lateral diver- ticula. There appears to be no vascular system. The nervous system consists of a circumoesophageal nerve, with scarcely differ- entiated brain, joining below a large ganglionic mass no doubt representing many fused ganglia (B). The dorsoventral and the parapodial muscles are much developed, whilst the coelom is re- duced mostly to branched spaces in which the genital products ripen. Full-grown myzostomids are hermaphrodite. The male organ © consists of a- branched sac opening to the exterior on each side. The paired ovaries discharge their products into a median coelemic chamber with lateral branches ©, often called the uterus, from which the ripe ova are discharged by a median dorsal pore into the terminal region of the rectum (cloaca). Into this same cloacal chamber open ventrally a pair of ciliated tubes communicating by funnels with the coelom (Nansen and Wheeler); these are possibly nephridia, and excretory in function.

The Myzostomida are protandric hermaphrodites, being functional males when small, hermaphrodite later, and finally

functional females (Wheeler). Small ” males ” are in some species constantly associated with large hermaphrodites, but according to Beard there are in some cases true dwarf males, comparable to the complementary males described by Darwin in the Cirripedia. The embryology of Myzostoma has been

A, Ventral view of Myzostoma.

B, Diagram of Myzostoma, show-

ing the nervous and alimen- tary systems.

C, Diagram of M yzostoma, show-

ing the genital organs (from v. Graf and Wheeler).

D, Larva of Myzostoma glabrum.

(After Beard.)

E, Portion of the arm of Penta-

crinus, showing a cyst containing Myzostoma.

a, Cloacal aperture.

n, Ciliated tube (nephridium?).

ar, Arm.

o, Opening.

c, Cirrus.

ov, Ovary.

cl, ” Cloaca.”

p, Parapodium.

coe, Coelom.

ph, Pharynx.

ct, Swollen pinnule

forming a

s, Sense organ.

cyst.

sp, Sperm-sac.

i. Intestine and its caeca.

vn, Ventral ganglionic mass.

Is, Larval setae.

j, Male opening.

m, Mouth.

9 , Female opening.

studied by Metchnikoff and Beard. Cleavage leads to the formation of an epibolic gastrula and ciliated embryo which hatches as a free-swimming larva remarkably like that of a Polychaete worm (D). The larva is provided with postoral and perianal ciliated bands, and on either side with a bunch of

long provisional setae. The mesoderm becomes segmented, and the parapodia subsequently develop from before backwards; but almost all internal traces of segmentation are lost in the adult. The structure and development of the Myzostomida seem to show that they are nearly related to Polychaeta (see Chaetopoda), though highly modified in relation to their parasitic mode of life.

Authorities. — L. v. Graff, Das Genus Myzostoma (Leipzig, 1877); and ” The Myzostomida,” Challenger Reports (1884), vol. x. ; E. Metchnikoff, Zeit. Wiss. Zool. (1866), vols, v., xyi.; J. Beard, Mitth. Z. St Neapel (1884), vol. v.; W. M. Wheeler, ibid. (1896), vol. xii. (E. S. G.)

MZABITES, or Beni-Mzab, a confederation of Berber tribes, now under the direct authority of France. Of all the Berber peoples the Mzabites have remained freest from foreign admix- ture. Their own country is a region of the Algerian Sahara, about 100 m. south of El-Aghuat. It consists of five oases close together, viz. Ghardaia, Beni-Isguen, El-Ateuf, Melika and Bu Nura, and two isolated oases farther north,

Berrian and Guerrara. The total population numbered at the 1906 census 45,996, of whom about 100 were Europeans and a very small proportion Arabs and Jews. The Mzabites are of small and slender figure, with very short necks and under-developed legs. Their faces are flat, with short nose, thick lips and very deep-set eyes, and their complexion pale. Their dress is a shirt of thick wool, usually many-coloured. They are agriculturists, and are also famed as traders. The butchers, fruiterers, bath-house keepers, road-sweepers and carriers of the African littoral from Tangier to Tripoli are nearly all Mzabites. Their industries, too, are highly organized. The Mzabite burnouses and carpets are found throughout North Africa. Their commercial honesty is proverbial. Nearly all read and write Arabic, though in talking among themselves they use the Zenata dialect of the Berber language, for which, in common with other Berber peoples, they have no written form surviving. They are Mahomme- dans, of the Ibadite sect, and are regarded as heretics by the Sunnites.

According to tradition the Ibadites, after their overthrow at Tiaret by the Fatimites, took refuge during the 10th century in the country to the south-west of Wargla, where they founded an independent state. In 1012, owing to further persecutions, they fled to their present quarters, where they long remained invulnerable. After the capture of El-Aghuat by the French, the Mzabites concluded with the Algerian government, in 1853, a convention by which they engaged to pay an annual con- tribution of £1800 in return for their independence. In Novem- ber 1882 the Mzab country was definitely annexed to Algeria. Ghardaia (pop. 7868) is the capital of the confederation, and next in importance is Beni-Isguen (4916), the chief commercial centre. Since the establishment of French control, Beni-Isguen has become the depot for the sale of European goods. French engineers have rendered the oases much more fertile than they used to be by a system of irrigation works. (See also Algeria.)

See A. Coyne, Le Mzab (Algiers, 1879); Rinn, Occupation du Mzab (Algiers, 1885); Amat, Le M'Zab el les M'Zabites (Paris, 1888). Also Algeria and Berbers.

14,6

N— NABATAEANS

NA letter which regularly follows M in the alphabet, and, like it in its early forms has the first limb longer than the others; thus, written from right to left, V. The Semitic languages gradually diminish the size of the other two limbs, while the Greek and Latin alphabets tend

to make all three of equal length. The earliest name of the symbol was Nun, whence comes the Greek ny (vv). The sound of n varies according to the point at which the contact of the tongue with the roof of the mouth is made; it may be dental, alveolar, palatal or guttural. In Sanskrit these four sounds are dis- tinguished by different symbols: the last two occur in com- bination with stops or affricates of the same series. The French or German n when standing by itself is dental, the English alveolar, i.e. pronounced like the English t and d against the sockets of the teeth instead of the teeth themselves. The guttural nasal is written in English ng as in ring; for the palatal n as in lynch there is no separate symbol. The sound of n stands in the same relation to d as m stands to b; both are ordinarily voiced and the mouth position for both is the same, but in pronouncing n the nasal passage is left open, so that the sound of n can be continued while that of d cannot. This is best observed by pronouncing syllables where the consonant comes last as in and id. When the nasal passage is closed, as when one has a bad cold, m and n cannot be pronounced; attempts to pronounce moon result only in hood. Two important points arise in connexion with nasals: (i) sonant nasals, (2) nasalization of vowels. The discovery of sonant nasals by Dr Karl Brugman in 1876 (Curtius, Studien, 9, pp. 285-338) explained many facts of language which had been hitherto obscure and elucidated many difficulties in the Indo-European vowel system. It had been observed, for ex- ample, that the same original negative prefix was represented in Sanskrit by a, Greek by a, in Latin by in and in Germanic by tin, and these differences had not been accounted for satisfactorily. Dr Brugman argued -that in these and -similar cases the syllable was made by the consonant alone, and the nasal so used was termed a sonant nasal and written n. In most cases Sanskrit and Greek lost the nasal sound altogether and replaced it by a vowel a, a, while in Latin and Germanic a vowel was developed independently before the nasal. In the accusative singular of consonant stems Sans, padam, Gr. iroda, Lat. pedem, Sanskrit and Greek did not, as generally, agree, but it was shown that in such cases there were originally two forms according to the nature of the sound beginning the next word in the sentence. Thus an original Indo-European *pedm, would not be treated precisely in the same way if the next word began with a vowel as it would when a consonant followed. Sanskrit had adopted the form used before vowels, Greek the form before consonants and each had dropped the alternative form. The second point — ■ the nasalizing of vowels — is difficult for an Englishman to under- stand or to produce, as the sounds do not exist in his language. Thus in learning to pronounce French he tends to replace the nasalized vowels by the nearest sounds in English, making the Fr. on a nasalized vowel (0), into Eng. ong, a vowel

followed by a guttural consonant. The nasalized vowels are produced by drawing forward the uvula, the ” tab ” at the end of the soft palate, so that the breath escapes through the nose as well as the mouth. In the French nasalized vowels, however, many phoneticians hold that, besides the leaving of the nasal passage open, there is a change in the position of the tongue in passing from a to a. The nasalized vowels are generally written with a hook below, upon the analogy of the transliteration of such sounds in the Slavonic languages, but as the same symbol is often used to distinguish an ” open ” vowel from a ” close ” one, the use is not without ambiguity. On the other hand, it is not admissible to write d for the nasalized vowel in languages which have accent signs, e.g. Lithuanian. It is possible to nasalize some consonants as well as vowels; nasalized spirants play an

important part in the so-called ” Yankee ” pronunciation of Americans. (P. Gi.j

NAAS (pron. Nace, as in place), a market town of Co. Kildare, Ireland, 20 m. S.W. from Dublin on branches of the Great Southern and Western railway and of the Grand Canal. Pop. (1901) 3836. It is situated among the foothills of the Wicklow Mountains, close to the river Liffey. The town is of great antiquity, and was a residence of the kings of Leinster, the place of whose assemblies is marked by a neighbouring rath or mound. Naas returned two members to the Irish parliament from 1559 until the union in 1800. Of a castle taken by Cromwell in 1650, and of several former abbeys, there are no remains. Punchestown racecourse, 2§ m. S.E., is the scene of well-known steeplechases.

NABATAEANS, a people of ancient Arabia, whose settlements in the time of Josephus {Ant. i. 12. 4; comp. Jerome, Quaest. in Gen. xxv.) gave the name of Nabatene to the border-land between Syria and Arabia from the Euphrates to the Red Sea. Josephus suggests, and Jerome, apparently following him, affirms, that the name is identical with that of the Ishmaelite tribe of Nebaioth (Gen. xxv. 13; Isa. lx. 7), which in later Old Testament times had a leading place among the northern Arabs, and is associated with Kedar (Isa. lx. 7) much as Pliny v. n (12) associates Nabataei and Cedrei. The identification is rendered uncertain by the fact that the name Nabataean is properly spelled with t not t (on the inscriptions, cf. also Arabic Nabat, Nabit, &c.) . Thus the history of the Nabataeans cannot certainly be carried back beyond 312 B.C., at which date they were attacked without success by Antigonus I. Cyclops in their mountain fortress of Petra. They are described by Diodorus (xix. 94 seq.) as being at this time a strong tribe of some 10,000 warriors, pre-eminent among the nomadic

Arabs, eschewing agriculture, fixed houses and the use of wine, but adding to pastoral pursuits a profitable trade with the seaports in myrrh and spices from Arabia Felix, as well as a trade with Egypt in bitumen from the Dead Sea. Their arid country was the best safeguard of their cherished liberty; for the bottle-shaped cisterns for rain-water which they excavated in the rocky or argillaceous soil were, carefully concealed from invaders. Petra (q.v.) or Sela" was the ancient capital of Edom; the Nabataeans must have occupied the old Edomite country, and succeeded to its commerce, after the Edomites took advantage of the Babylonian captivity to press forward into southern Judaea. 1 This migration, the date of which cannot be determined, also made them masters of the shores of the Gulf of 'Akaba and the important harbour of Elath. Here, according to Agatharchides (Geog. Gr. Min., i. 178), they were for a time very troublesome, as wreckers and pirates, to the reopened commerce between Egypt and the East, till they were chastised by the Greek sovereigns of Alexandria.

The Nabataeans had already some tincture of foreign culture when they first appear in history. That culture was naturally Aramaic; they wrote a letter to Antigonus "in Syriac letters," and Aramaic continued to be the language of their coins and inscriptions when the tribe grew into a kingdom, and profited by the decay of the Seleucids to extend its borders northward over the more fertile country east of the Jordan. They occupied Hauran, and about 85 B.C. their king Aretas (Haritha) became lord of Damascus and Coele-Syria. Allies of the first Hasmonaeans in their struggles against the Greeks (1 Mace, v. 25, ix. 35; 2 Mace. v. 8), they became the rivals of the Judaean dynasty in the period of its splendour, and a chief element in the disorders which invited Pompey's intervention in Palestine. The Roman arms were not very successful, and King Aretas retained his whole possessions, including Damascus, as a Roman

1 See Edom, and (for the view that Mai. i. 1-5, refers to the expulsion of Edomites from their land) Malachi.

vassal. 1 As " allies " of the Romans the Nabataeans continued to flourish throughout the first Christian century. Their power extended far into Arabia, particularly along the Red Sea; and Petra was a meeting-place of many nations, though its commerce was diminished by the rise of the Eastern trade-route from Myoshormus to Coptos on the Nile. Under the Roman peace they lost their warlike and nomadic

habits, and were a sober, acquisitive, orderly people, wholly intent on trade and agri- culture (Strabo xvi. 4). They might have long been a bulwark between Rome and the wild hordes of the desert but for the short- sighted cupidity of Trajan, who reduced Petra and broke up the Nabataean nationality (105 a.d.). The new Arab invaders who soon pressed forward into their seats found the remnants of the Nabataeans transformed into felldhin, and speaking Aramaic like their neighbours. Hence Nabataeans became the Arabic name for Aramaeans, whether in Syria or Irak, a fact which has been incorrectly held to prove that the Nabataeans were origin- ally Aramaean immigrants from. Babylonia. It is now known, however, that they were true Arabs — as the proper names on their inscriptions show — who had come under Aramaic influence.

See especially on this last point (against Quatremere, Journ. asiat. xv., vol. ii., 1835), Noldekc in Zeit. d. morgenldnd. Gesell. xvii. 705 seq., xxv. 122 seq. The so-called ” Nabataean Agriculture ” {Faldha Nabatlya), which professes to be an Arabic translation by Ibn Wahshiya from an ancient Nabataean source, is a forgery of the 10th century (see A. von Gutschmid, Z. d. morgenl. Ges. xv. 1 seq.; Noldeke, ib. xxix. 445 seq.). Complete bibliographical information is given by E. Schurer in his sketch of Nabataean history appended to Gesch. d. Jiid. Volkes (1901, vol. i. ; cf. Eng. edition, 1890, i. 2, pp. 345 sqq.); to this may be added the article by H. Vincent, Rev. bibl. vii. 567 sqq., and, for more general informa- tion, R. Dussaud, Les Arabes en Syrie (1907). For early external evidence see H. Winckler, Keil. u. Alte Test. 3 p. 151 seq.; M. Streck, Mitteil. d. vordcrasiat. Gesell. (1906). pt. iii., andKlio, 1906, p. 206 seq. The Nabataean inscriptions (see Semitic Languages) are collected in the Corpus Inscr. Semiticarum of the French Academy, pt. ii.; see also the Academy’s Repertoire d’epigr. sem.; and the discussions, &c.,-in the writings of Clermont-Ganneau (Rec. d’archeol. Orient.) and M. Lidzbarski (Handbuch d. nord-semit. Epig.; Ephemeris f. scm. Epig.). For English readers the selection in G. A. Cooke, North-Semitic Inscriptions (Oxford, 1903) is the most useful.

(W. R. S.;S. A. C.)

NABBES, THOMAS (b. 1605), English dramatist, was born in humble circumstances in Worcestershire. He entered Exeter College, Oxford, in 1621, but left the university without taking a degree, and about 1630 began a career in London as a dramatist. His works include: Co-cent Garden (acted 1633, printed 1638), a prose comedy of small merit; Tottenham Court (acted 1634, printed 1638), a comedy the scene of which is laid in a holiday resort of the London tradesmen; Hannibal

and Scipio (acted I0 35, printed 1637), a historical tragedy; The Bride (1638), a comedy; The Unfortunate Mother (1640), an unacted tragedy; Microcosmus, a Morall Maske (printed 1637) ; two other masques, Spring's Glory and Presentation intended for the Prince his Highnesse on his Birthday (printed together in 1638); and a continuation of Richard Knolles's Generall Historie of the Turkcs (1638). His verse is smooth and musical, and if his language is sometimes coarse, his general attitude is moral. The masque of Microcosmus — really a morality play, in which Physander after much error is reunited to his wife Bellanima, who personifies the soul — is admirable in its own kind, and the other two masques, slighter in construction but ingenious, show Nabbes at his best.

Nabbes's plays were collected in 1639; and Microcosmus was printed in Dodsley'sOW Plays (1744). All his works, with the exception of his continuation of Knolles's history, were reprinted by A. H. Bullen in his Old English Plays (second series, 1887). See also F. G. Fleay, Biog. Chron. of the English Drama (1891).

NABHA, a native state of India, within the Punjab. Area, 966 sq. m. Pop. (1901) 297,949. Its territories are scattered; one section, divided into twelve separate tracts, lies among the territories of Patiala and Jind, in the east and south of the Punjab; the other section is in the extreme south-east. The whole of the territories belong physically to a plain; but they vary in character from the great fertility of the Pawadh region to the aridity of the Rajputana desert. Nabha is one of the Sikh

1 Compare 2 Cor. xi. 32. The Nabataean Aretas or Aeneas there mentioned reigned from 9 B.C. to A.D. 40.

states, founded by a member of the Phulkian family, which established its independence about 1763. The first relations of the state with the British were in 1807-1808, when the raja obtained protection against the threatened encroachments of Ranjit Singh. During the Mutiny in 1857 the raja showed distinguished loyalty, and was rewarded by grants of territory to the value of over £10,000. The imperial service troops of the raja Hira Singh (b. c. 1843; succeeded in 1871) did good service during the Tirah campaign of 1897-98. The chief products of the state are wheat, millets, pulses, cotton and sugar. The estimated gross revenue is £100,000; no tribute is paid. The territory is crossed by the main line and also by several branches of the North- western railway, and is irrigated by the Sirhind canal.

The town of Nabha, founded in 1755, has a station on the Rajpura-Bhatinda branch of the North- Western railway. Pop.

(1901) 18,468.

See Phulkian States Gazetteer (Lahore, 1909).

NABIGHA DHUBYANl [Ziyad ibn Mu'awiyya] (6th and 7th centuries), Arabian poet, was one of the last poets of pre-Islamic times. His tribe, the Bani Dhubyan, belonged to the district near Mecca, but he himself spent most of his time at the courts of Hira and Ghassan. In Hira he remained under Mondhir (Mund- hir) III., and under his successor in 562. After a sojourn at the court of Ghassan, he returned to Hira under Nu'rnan. He was, however, compelled to flee to Ghassan, owing to some verses he had written on the queen, but returned again about 600. When Nu'rnan died some five years later he withdrew to his own tribe. The date of his death is uncertain, but he does not seem to have known Islam. His poems consist largely of eulogies and satires, and are concerned with the strife of Hira and Ghassan, and of the Bani Abs and the Bani Dhubyan. He is one of the six eminent pre-Islamic poets whose poems were collected before the middle of the 2nd century of Islam, and have been regarded as the standard of Arabian poetry. Some writers consider him the first of the six.

His poems have been edited by W. Ahlwardt in the Diwans of the six ancient Arabic Poets (London, 1870), and separately by H. Derenbourg (Paris, 1869, a reprint from the Journal asiatique for 1868). (G.W.T.)

NABOB, a corruption of the Hindostani nawab, originally used for native rulers. In the 18th century, when Clive's victories made Indian terms familiar in England, it began to be applied to Anglo-Indians who returned with fortunes from the East.

NABUA, a town in the extreme S. of the province of Ambos Camarines, Luzon, Philippine Islands, on the Bicol river, about 22 m. S.S.E. of Nueva Caceres, the capital. Pop. (1903) 18,893. Nabua is in the district known as La Rinconada — a name originally given to it on account of its inaccessibility. It is connected by road, railway and the Bicol river (navigable for light-draft boats) with Nueva Caceres. Nabua is the centre of an agricultural region, which produces much rice and some Indian corn, sugar and pepper. The language is Bicol.

NACAIRE, Nakeb, Naquaire (Arab, naqdra), the medieval name for the kettledrum, the earliest representation of which appears in the unique MS. known as the Vienna Genesis (5th or 6th century) . The nacaire was, according to Froissart, among the instruments used at the triumphal entry of Edward III. into Calais. The Chronicles of Joinville

describe the instrument as a kind of drum: ” Lor il fist sonner les tabours que 1′ on appelle nacaires.” Chaucer, in his description of the tournament in the Knight’s Tale, line 1653, also refers to this early kettledrum.

NACHMANIDES (Nahmanides), the usual name of Moses ben Naijman (known also as Ramban), Jewish scholar, was born in Gerona in n 94 and died in Palestine c. 1270. His chief work, the Commentary on the Pentateuch, is distinguished by originality and charm. The author was a mystic as well as a philologist, and his works unite with peculiar harmony the qualities of reason and feeling. He was also a Talmudist of high repute, and wrote glosses on various Tractates, Responsa and other legal works. Though not a philosopher, he was drawn into the controversy that arose over the scholastic method of Maimonides (q.v.). He endeavoured to steer a middle course between the worshippers

and the excommunicators of Maimonides, but he did not succeed in healing the breach. His homiletic books, Epistle on Sanctity (Iggereth ha-qodesh) and Law of Man (Torath ha-Adam), which deal respectively with the sanctity of marriage and the solemnity of death, are full of intense spirituality, while at the same time treating of ritual customs — a combination which shows essential Rabbinism at its best. He occupies an important position in the history of the acceptance by medieval Jews of the Kabbala (q.v.); for, though he made no fresh contributions to the philo- sophy of mysticism, the fact that this famous rabbi was himself a mystic induced a favourable attitude in many who would other- wise have rejected mysticism as Maimonides did. In 1263 Nahmanides was forced to enter into a public disputation with a Jewish-Christian, Pablo Christiani, in the presence of King James of Aragon. Though Nachmanides was assured that perfect freedom of speech was conceded to him, his defence was pronounced blasphemous and he was banished for life. In 1267 he went to Palestine and settled at Acre. He died about 1270. See S. Schechter, Studies in Judaism, first series, pp. 120 seq.; Graetz, History of the Jews (English translation vol. iii. ch. xvi. and xvii.). (I. A.)

NACHOD, a town of Bohemia, Austria, 109 m. E.N.E. of Prague by rail. Pop. (1900) 9899, mostly Czech. It is situated on the Mettau river, at the entrance of the Lewin-Nachod pass. The old castle contains a collection of historical paintings and archives, and there are

several old churches, of which that of St Lawrence is mentioned as the parish church in 1350. The town originally gathered round the castle of Nachod, of which the first lord was a member of the powerful family of Hron, in the middle of the 13th century. It suffered much during the Hussite Wars, and in 1437 was captured by the celebrated robber knight Kolda of 2ampach, and retaken by George of Podebrad in 1456 and included in his estates. It was sold in 1623, and in .1634 given to Ottavio Piccolomini; finally, after many changes of ownership, the castle and titular lordship came in 1840 to the princes of Schaumburg-Lippe. The important engagements fought near the town on the 27th and 28th of June 1866 opened Bohemia to the victorious Prussians.

NACHTIGAL, GUSTAV (1834-1885), German explorer in Central Africa, son of a Lutheran pastor, was born at Eichstedt in the Mark of Brandenburg, on the 23rd of February 1834. After medical study at the universities of Halle, Wurzburg and Greifswald, he practised for a few years as a military surgeon. Finding the climate of his native country injurious to his health, he went to Algiers and Tunis, and took part, as a surgeon, in several expeditions into the interior. Commissioned by the king of Prussia to carry gifts to the sultan of Bornu in acknowledgment of kindness shown to German travellers, he set out in 1869 from Tripoli, and succeeded after two years' journeyings in accomplishing his mission. During this period he visited Tibesti and Borku, regions of the central Sahara not previously known to Europeans. From Bornu he went to Bagirmi, and, proceeding by way of Wadai and Kordofan, emerged from darkest Africa, after having been given up for lost, at Khartum in the winter of 1874. His journey, graphically described in his Sahara und Sudan (3 vols., 1870-1889), placed the intrepid explorer in the front rank of discoverers. On the establishment of a protectorate over Tunisia by France, Nachtigal was sent thither as consul-general for the German empire, and remained there until 1884, when he was despatched by Prince Bismarck to West Africa as special commissioner, ostensibly to inquire into the condition of German commerce, but really to annex territories to the German flag. As the result of his mission Togoland and Cameroon were added to the German empire. On his return voyage he died at sea off Cape Palmas on the 20th of April 1885, and was buried at Grand Bassam.

Nachtigal's travels are summarized in Guslav NachtigaVs Reisen in der Sahara und im Sudan, by Dr Albert Frankel (Leipzig, 1887). A French translation, by J. van Vollenhoven, of that part of his work concerning Wadai, appeared in the Bull, du comite del'Afriq. francaise for 1903 under the title of " Le Voyage de Nachtigal au Ouadai." Nachtigal died

before transcribing his notes on Wadai, and they were edited in the German edition by E. Groddeck.

NADASDY, TAMAS I,, Count, called the great palatine (1498-1562), Hungarian statesman, was the son of Francis I. Nadasdy and was educated at Graz, Bologna and Rome. In 1 52 1 he accompanied Cardinal Cajetan (whom the pope had sent to Hungary to preach a crusade against the Turks) to Buda as his interpreter. In 1525 he became a member of the council of state and was sent by King Louis II. to the diet of Spires to ask for help in the imminent Turkish war. During his absence the Mohacs catastrophe took place, and Nadasdy only returned to Hungary in time to escort the queen-widow from Komarom to Pressburg. He was sent to offer the Hungarian crown to the archduke Ferdinand, and on his coronation (Nov. 3rd, 1527) was made commandant of Buda. On the capture of Buda by Suleiman the Magnificent, Nadasdy went over to John Zapolya. In 1530 he successfully defended Buda against the imperialists. In J 533 hi s jealousy of the dominant influence of Ludovic Gritti caused him to desert John for Ferdinand, to whom he afterwards remained faithful. He was endowed with enormous estates by the emperor, 3 and from 1537 onwards became Ferdinand's secret but most influential counsellor. Subsequently, as ban of Croatia-Slavonia, he valiantly defended that border province against the Turks. He did his utmost to promote education, and the school which he founded at TJj-Sziget, where he also set up a printing-press, received a warm eulogy from Philip Melanchthon. In 1 540 Nadasdy was appointed grand- justiciar; in 1547 he presided over the diet of Nagyszombat, and finally, in 1 559, was elected palatine by the diet of Pressburg. In his declining years he aided the heroic Mikl6s Zrinyi against the Turks.

See Mihaly Horvath, The Life of Thomas Nadasdy (Hung.) (Buda, 1838); T. Nadasdy, Family correspondence of Thomas Nadasdy (Hung.) (Budapest, 1882). (R. N. B.)

NADEN, CONSTANCE CAROLINE WOOBHILL (1858-1889), English author, was born at Edgbaston, on the 24th of January 1858, her father being an architect. Her mother died just after the child's birth, and Constance was brought up in the home of her grandfather. In 1881 she began to study physical science at Mason College, Birmingham. In 1881 she published Songs and Sonnets of Springtime; in 1887, A Modern Apostle, and other Poems. Her poems made such an impression on W. E. Gladstone that he included her, in an article in the Speaker, among the fore- most English poetesses of the day. After her grandfather's death Miss Naden found herself rich, and she travelled in the East and then (1888) settled in London. She died on

the 23rd of December 1889. After 1876 she had paid increasing attention to philosophy, with her friend Dr Robert Lewins, and the two had formulated a system of their own, which they called ” Hylo-Idealism.” Her main ideas on the subject are contained in a posthumous volume of her essays (Induction and Deduction, 1890), edited by Dr Lewins.

NADIA, or Nuddea, a district of British India, in the Presidency division of Bengal. The administrative head- quarters are at Krishnagar. Area, 2793 sq. m.; pop. (1901) 1,667,491. It is a district of great rivers. Standing at the head of the Gangetic delta, its alluvial surface, though still liable to periodical inundation, has been raised by ancient deposits of silt sufficiently high to be permanent dry land. Along the entire north-eastern boundary flows the main stream of the Ganges or Padma, of which all the remaining rivers of the district are offshoots. The BhagirathI on the eastern border, and the Jalangi and the Matabhanga meandering through the centre of the district, are the chief of those offshoots, called distinctively the ” Nadia rivers.” But the whole surface of the country is interlaced with a network of minor streams, communicating with one another by side channels. All the rivers are navigable in the rainy season for boats of the largest burthen, but during the rest of the year they dwindle down to shallow streams, with dangerous sandbanks and bars. In former times the Nadia rivers afforded the regular means of communication between the upper valley of the Ganges and the seaboard; and much of the trade of the district still comes down to Calcutta by this route during the height of the rainy season. But the railways,

with the main stream of the Ganges and the Sundarbans route, now carry by far the larger portion of the traffic. Rice is the staple crop; but the district is not as a whole fertile, the soil being sandy and the methods of cultivation backward. It is traversed by the main line and also by several branches of the Eastern Bengal railway. The battlefield of Plassey was situated in this district, but the floods of the BhagirathI have washed away some part of it.

Nadia or Nabadwip, an ancient capital of Bengal, was formerly situated on the east bank of the Bhagirathi, which has since changed its course. Pop. (1001) 10,880. It is celebrated for the sanctity and learning of its pundits, and as the birthplace of Chaitanya, the Vaishnav reformer of the 16th century. Its Sanskrit schools, called tols,

are well known and of ancient foundation.

NADIM [Abulfaraj Mahommed ibn Ishaq ibn abl Ya'qub un-Nadiml (d. 995), of Bagdad, the author of one of the most interesting works in Arabic literature, the Fihrist ul-Ulum (" list of the books of all nations that were to be found in Arabic ") with notices of the authors and other particulars, carried down to the year 988. A note in the Leiden MS. places the death of the author eight years later. Of his life we know, nothing. His work gives us a complete picture of the most active intellectual period of the Arabian empire. He traces the rise and growth of philology and belles-lettres, of theology, orthodox and heretical, of law and history, of mathematics and astronomy, of medicine and alchemy; he does not despise the histories of knights errant, the fables of Kalila and Dimna, the facetiae of the " boon companions," the works of magic and divination. But to us no part of his work is more interesting than his account of the beliefs of sects and peoples beyond Islam. Here, fortunately, still more than in other parts of his work, he goes beyond the functions of the mere cataloguer; he tells what he learned of China .from a Christian missionary of Nejran, of India from a de- scription of its religion compiled for the Barmecide Yahya; his full accounts of the Sabians of Harran and of the doctrines of Mani are of the first importance for the historian of Asiatic religions.

Imperfect manuscripts of the Fihrist exist in Paris, Leiden and Vienna. The text was prepared for publication by G. Fliigel, and edited after his death by J. Rodiger and A. Miiller (2 vols., Leipzig, 1871-1872). Fliigel had already given a full analysis of the work in the Journal of the German Oriental Society, vol. xiii. (1859), pp. 559-650; cf. E. G. Browne, A Literary History of Persia (London, 1902), pp. 383-387. T. Houtsma supplied a lacuna in Fliigel's edition in the Vienna Oriental Journal, vol. iv. pp. 217 sqq.

NADIR (Arabic nadir, " opposite to," used elliptically for nadir -es-semt, " opposite to the zenith ") , a term used in astronomy for the point in the heavens exactly opposite to the zenith, the zenith and nadir being the two poles of the horizon. It is thus used figuratively of the lowest depth of a person's spirits or the lowest point in a career.

NAEGELI, KARL WILHELM VON "(1817-1891), Swiss botanist, was born on the 27th of March 18 17 near Zurich. He studied botany under A. P. de Candolle at Geneva, and graduated with a botanical thesis at Zurich in 1840. His attention having been directed by M. J. Schleiden, then professor of botany at Jena, to the microscopical study of plants, he engaged more particularly in that branch of research.

Soon after graduation he became Privatdozent and subsequently professor extra- ordinary, in the university of Zurich; in 1852 he was called to fill the chair of botany in the university of Freiburg-in-Breisgau; and in 1857 he was promoted to Munich, where he remained as professor until his death on the nth of May 1891. Among his more important contributions to science were a series of papers in the Zeitschrift fiir wissenschaftliche Botanik (1844- 1846); Die neuern Algensysleme (1847); Gattungen einzelliger Algen (1849); Pflanzenphysiologische Untersuchnngen (1855— 1858), with C. E. Cramer; Beitriige zur •wissenschaftlichen Botanik (1858-1868); a number of papers contributed to the Royal Bavarian Academy of Sciences, forming three volumes of Botanische Mitteilungen (1861-1881); and, finally, his volume, Mechanisch-physiologische Theorie der Abstammungslehre, pub- lished in 1884.

The more striking of his many and varied discoveries are embodied in the Zeitsch. fiir wiss. Bot. In this we begin with Naegeli's extension of Robert Brown's discovery of the nucleus to the principal families of Cryptogams, and the assertion of its universal occurrence in plants, together with the recognition of its vesicular structure. There is further his investigation of the " mucous layer " (Schleimschickt) lining the wall of all normal cells, where he shows that it consists of granular " mucus," which, at an earlier stage, filled the cell-cavity, and which differs chemically from the cell-wall in that it is nitro-genous. This layer he proved to be never absent from living cells — to be, in fact, itself the living part of the cell, a discovery which was simultaneously (1846) made by Hugo von Mohl (1805-1872), who gave to the living matter of the plant-body the name " protoplasm." In connexion with these discoveries, Naegeli controverted Schleiden's view of the universality of free-cell-formation as the mode of cell-multiplication, and showed that in the vegetative organs, at least, new cells are formed by division. In the Zeitschrift, too, is Naegeli's most important algological work — such as the paper on Caulerpa, which brought to light the remarkable unseptate structure of the Siphoneae, and his research on Delesseria, which resulted in the discovery of growth by a single apical cell. This discovery led Naegeli on to the study of the growing-point in other plants. He consequently gave the first accurate account of the apical cell, and of the mode of growth of the stem in various Mosses and Liverworts. Subsequently he observed that in Lycopodium and in Angiosperms the growing-point has no apical cell, but consists of a small-celled meristem, in which the first differentiation of the permanent tissues can be traced. One of the most remarkable discoveries recorded in the Zeitschrift is that of the antheridia and spermatozoids of Ferns and of Pilularia. The Beitrdge

zur wiss. Botanik consists almost entirely of researches into the anatomy of vascular plants, while the main feature of the Pflanzenphysiologische Untersuchnngen is the exhaustive work on the structure, development and various forms of starch-grains. The Botanische Mitteilungen include a number of papers in all departments of botany, many of them being continuations and extensions of his earlier work. In his Theorie der Abstammungslehre Naegeli introduced the idea of a definite material basis for heredity; the substance he termed ” idioplasm.” His theory of evolution is that the idioplasm of any one generation is not identical with that of either its progenitors or its progeny: it is always increasing in complexity, with the result that each succes- sive generation marks an advance upon its predecessor. Hence variation takes place determinately, and in the higher direction only; while variability is the result of internal causes, and natural selection plays but a small part in evolution. Whereas, on the Darwinian theory, all organization is adaptive, according to Naegeli the develop- ment of higher organization is the outcome of the spontaneous evolution of the idioplasm.

More detailed accounts of Naegeli’s life and work are to be found in Nature, 16th October 1891, and in Proc. Roy. Soc, vol. li.

(S. H. V.*)

NAESTVED, a town of Denmark, in the ami (county) of Praesto, near the S.W. coast of Zealand, 59 m. by rail S.W. of Copenhagen. Pop. (1901) 7162. From 1140 to the Reformation it was one of the most important towns of the kingdom, though dependent upon the monastery of St Peter (founded here in 1135). North of the town (i| m.) lies Herlufsholm, where Admiral Herluf Trolle founded a Latin school in 1567, still extant.

NAEVIUS, GNAEUS (c. 264-? 194 B.C.), Latin epic poet and dramatist. There is great uncertainty in regard to his life. From the expression of Gellius (i. 24. 1) characterizing his epitaph as written in a vein of ” Campanian arrogance ” it has been inferred that he was born in one of the Latin communities settled in Campania. But the phrase ” Campanian arrogance ” seems to have been used proverbially for “gasconade”; and, as there was a plebeian gens Naevia in Rome, it is quite as probable that he was by birth a Roman citizen. He served either in the Roman army or among the socii in the first Punic War, and thus must have reached manhood before 241. His career as a dramatic author began with the exhibition of a drama in or about the year C35, and continued for thirty years. Towards the close he incurred the hostility of some of the nobility, espe- cially, it is said, of

the Metelli, by the attacks which he made upon them on the stage, and at their instance he was imprisoned (Plautus, Mil. Glor. 211). After writing two plays during his imprisonment, in which he is said to have apologized for his former rudeness (Gellius iii. 3. 15), he was liberated through the interference of the tribunes of the commons; but he had shortly afterwards to retire from Rome (in or about 204) to Utica. It may have been during his exile, when withdrawn from his active career as a dramatist, that he composed or completed his

r oem on the first Punic war. Probably his latest composition was the epitaph already referred to, written like the epic in Saturnian verse: —

” Immortales mortales si foret fas flere, Flerent divae Camenae Naevium poetam ; Itaque postquam est Orci traditus thesauro Obliti sunt Romai loquier lingua Latina.” l

If these lines were dictated by a jealousy of the growing ascend- ancy of Ennius, the life of Naevius must have been prolonged considerably beyond 204, the year in which Ennius began his career as an author in Rome. As distinguished from Livius Andronicus, Naevius was a native Italian, not a Greek; he was also an original writer, not a mere adapter or translator. If it was due to Livius that the forms of Latin literature were, from the first, moulded on those of Greek literature, it was due to Naevius that much of its spirit and substance was of native growth.

Like Livius, Naevius professed to adapt Greek tragedies and comedies to the Roman stage. Among the titles of his tragedies are Aegisthus, Lycurgus, Andromache or Hector Proficiscens, Equus Trojanus, the last named being performed at the opening of Pompey’s theatre (55). The national cast of his genius and temper was shown by his deviating from his Greek originals, and producing at least two specimens of the fabula praelexta (national drama) one founded on the childhood of Romulus and Remus {Lupus or Alimonium Romuli et Remi), the other called Clastidium, which celebrated the victory of M. Claudius Marcellus over the Celts (222). But it was as a writer of comedy that he was most famous, most productive and most original. While he is never ranked as a writer of tragedy with Ennius, Pacuvius or Accius, he is placed in the canon of the grammarian Volcacius Sedigitus third (immediately after Caecilius and Plautus) in the rank of Roman comic authors. He is there characterized as ardent and impetuous in character and style. He is also appealed to, with Plautus and Ennius,

as a master of his art in one of the prologues of Terence. His comedy, like that of “Plautus, seems to have been rather a free adaptation of his originals than a rude copy of them, as those of Livius probably were, or an artistic copy like those of Terence. The titles of most of them, like those of Plautus, and unlike those of Caecilius and Terence, are Latin, not Greek. He drew from the writers of the old political comedy of Athens, as well as from the new comedy of manners, and he attempted to make the stage at Rome, as it had been at Athens, an arena of political and personal wartare. A strong spirit of partisanship is iecognized in more than one of the fragments; and this spirit is thoroughly popular and adverse to the senatorial ascendancy which became more and more confirmed with the progress of the second Punic war. Besides his attack on the Metelli and other members of the aristocracy, the great Scipio is the object of a censorious criticism on account of a youthful escapade attributed to iiim. Among the few lines still remaining from his lost comedies, we seem to recognize the idiomatic force and rapidity of movement characteristic of the style of Plautus. There is also found that love of alliteration which is a marked feature in all the older Latin poets down even to Lucretius. In one considerable comic fragment attributed to him — the description of a coquette — there is great truth and shrewdness of observation. But we find no trace of the exuberant comic power and geniality of his great con- temporary.

He was not only the oldest native dramatist, but the first author of an epic poem (Bellum Punicum) — which, by combining the representation of actual contemporary history with a mythical background, may be said to have created the Roman type of epic poetry. The poem was one continuous work, but was divided into seven books by a grammarian of a later age. The earlier part of it treated of the- mythical adventures of Aeneas in Sicily, Carthage and Italy, and borrowed from the interview of Zeus and Thetis in the first book of the Iliad the idea of the interview of Jupiter and Venus ; which Virgil has made one of the cardinal passages in the Aeneid. The later part treated of the events of the first Punic war in the style of a metrical chronicle. An important influence in Roman literature and belief, which had its origin in Sicily, first appeared in this poem — the recognition of the mythical connexion of Aeneas and his Trojans with the foundation of Rome. The few remaining fragments produce the impression of vivid and rapid narrative, to which the flow of the native Saturnian verse, in contradistinction to the weighty and complex structure of the hexameter, was naturally adapted.

The impression we get of the man is that, whether or not he actually enjoyed the full rights of Roman citizenship, he was a

1 ” If it were permitted that immortals should weep for mortals, the divine Camenae would weep for Naevius the poet; for since he hath passed into the treasure-house of death men have forgotten at Rome how to speak in the Latin tongue.”

vigorous representative of the bold combative spirit of the ancient Roman commons. He was one of those who made the Latin language into a great organ of literature. The phrases still quoted from him have nothing of an antiquated sound, while they have a genuinely idiomatic ring. As a dramatist he worked more in the spirit of Plautus than of Ennius, Pacuvius, Accius or Terence; but the great Umbrian humorist is separated from his older contemporary, not only by his breadth of comic power, but by his general attitude of moral and political indifference. The power of Naevius was the more genuine Italian gift — the power of satiric criticism — which was employed in making men ridiculous, not, like that of Plautus, in extracting amusement from the humours, follies and eccentricities of life. Although our means of forming a fair estimate of Naevius are scanty, all that we do know of him leads to the conclusion that he was far from being the least among the makers of Roman literature, and that with the loss of his writings there was lost a vein of national feeling and genius which rarely reappears.

Fragments (dramas) in L. Muller, Livi Andronici et Cn. Naevi Fabularum Reliquiae (1885), and (Bellum Punicum) in his edition of Ennius (1884); monographs by E. Klussmann (1843); M. J. Berchem (1861); D. de Moor (1877); Mommsen, History of Rome, bk, iii., ch. 14. On Virgil’s indebtedness to Naevius and Ennius, see V. Crivellari, Quae praecipue hausit Vergilius ex Naevio et Ennio

(1889).

NAEVUS, a term in surgery signifying that form of tumour which is almost entirely composed of enlarged blood-vessels. There are three principal varieties: (1) the capillary naevus, consisting of enlarged capillaries, frequently of a purplish colour, hence the term ” port-wine stain “; (2) the venous naevus, in which the veins are enlarged, of a bluish colour; (3) the arterial naevus, in which there is distinct pulsation, it being composed of enlarged and tortuous arteries. The naevus can be lessened in size by pressure. It generally occurs in the skin or immediately under it; sometimes it lies in the mouth in connexion with the mucous membrane. It is often congenital, hence the term ” mother’s mark,” or it may appear in early childhood. It often grows rapidly, sometimes slowly, and sometimes growth is checked, and it may gradually diminish in size, losing its vascu- larity

and becoming fibrous and non-vascular. This natural cure is followed by less deformity than a cure by artificial means. Various methods are used by surgeons when an operation is called for: (1) the tumour may be excised; (2) a ligature tightly tied may be applied to the base of the tumour; (3) inflammation may be set up in the growth by the injection of irritating agents, — in this way its vascularity may be checked and the formation of fibrous tissue encouraged; (4) the blood in the enlarged vessels may be coagulated by the injection of coagulating agents or by electrolysis.

NAGA HILLS, a district of British India in the Hills division of Eastern Bengal and Assam. It forms part of the mountainous borderland lying between the Brahmaputra valley and Upper Burma. Area, 3070 sq. m.; pop. (1901) 102,402. Towards the N. lie the Patkoi hills, over which British jurisdiction has never been extended; but since 1904 the southern tract, formerly known as the ” area of political control,” has been incorporated in the district, thus extending its E. boundary from the Dikho to the Tizic river. The whole country forms a wild expanse of forest, mountain and stream. The valleys are covered with dense jungle, dotted with small lakes and marshes. Coal is known to exist in many localities, as well as iron ore and petro- leum. The administrative headquarters of the district are at Kohima (pop. 3093), which is garrisoned by two companies of native infantry and a battalion of military police. The Dimapur- Manipur cart-road crosses the hills, connecting Kohima with the Assam-Bengal railway.

Naga means ” naked,” and is the term applied by the Assamese to the wild tribes of the hills, of which the chief clans are called Angami, Ao, Shota, Sema and Rengma. These tribes have shown extraordinary obstinacy in their resistance to the British arms. Between 1832 and 1849 ten armed expeditions were despatched to chastise them, and from 1866 to 1887 there were eight more, a record which exceeds that of the most turbulent

tribes on the North-West Frontier. Since 1892, however, little trouble has been experienced.

See Naga Hills District Gazetteer (Calcutta, 1905).

NAGAR, formerly Bednur, a village and ruined city of Mysore, India; pop. (1901) 715. About 1640 the seat of government of the rajas of

Keladi was transferred to this place. When taken by Hyder Ali in 1763, it is said to have yielded a plunder of twelve millions. In 1783 it surrendered to a British detachment under General Matthews, but being shortly after invested by Tippoo Sultan, the garrison capitulated on condition of safe conduct to the coast. Tippoo violated the stipulation, put General Matthews and the principal officers to death, and imprisoned the remainder of the force.

NAGARJUNA, a celebrated Buddhist philosopher and writer. He is constantly quoted in the literature of the later schools of Buddhism, and a very large number of works in Sanskrit is attributed to him. None of these has been critically edited or translated; and there is much uncertainty as to the exact date of his career, and as to his opinions. The most probable date seems to be the early part of the 3rd century a.d. He seems to have been born in the south of India, and to have lived under the patronage of a king of southern Kosala, the modern Chattisgarh. Chinese and Tibetan authorities differ as to the name of this monarch ; but it apparently is meant to represent an Indian name Satavahana, which is a dynastic title, not a personal name. Of the works he probably wrote one was a treatise advocating the Madhyamaka views of which he is the reputed founder; another a long and poetical prose work on the stages of the Bodhisattva career; and a third a voluminous commentary on the Mahdprajnd-pdrdmitd Sutra. Chinese tradition ascribes to him special knowledge of herbs, of astrology, of alchemy and of medicine. Two medical treatises, one on prescriptions in general, the other on the treatment of eye-disease, are said, by Chinese writers, to be by him. Several poems of a didactic character are also ascribed to him. The best known of these poems is The Friendly Epistle addressed to King Udayana. A translation into English of a Tibetan version of this piece has been published by Dr Wenzel.

Authorities. — H. Wenzel, Journal of the Pali Text Society (1866), pp. 1-32; T. Watters, On Yuan Chwdng, ed. by Rhys Davids and S. W. Bushcll (London, 1904-1905). Taranatha's Geschichte des Buddhismus in Indien, trans. Anton Schiefner (Leipzig, 1869); W. Wassiljew, Der Buddhismus (Leipzig, i860). (T. W. R. D.)

NAGASAKI, a town on the south-west of the island of Kiushiu, Japan, in 32° 44′ N., 129 51′ E., with 163,324 (1905) inhabitants, and a foreign settlement containing a population of 400 (ex- cluding Chinese). The first port of entry for ships coming from the south or the west to Japan, it lies at the head of a beautiful inlet some 3 m. long, which forms a splendid anchorage, and is largely used by ships coming to coal and by warships. Marine products, coal and cotton

goods are the chief exports, and raw cotton, iron, as well as other metals and materials used for ship- building, constitute the principal imports. The value of imports approaches £2,000,000 annually. That of exports has fluctuated considerably. In 1889 it was £1,005,367, but in 1894 it was only £444,839, and does not generally exceed £450,000. The most important industries of the town are represented by the engine works of Aka-no-ura, three large docks and a patent, slip, the property of the Mitsu Bishi Company. Steamers of over 6000 ‘ tons have been constructed at these docks, which, as well as the engine works, are situated on the western shore of the inlet. The brisk atmosphere of business that pervades them does not reach the town on the eastern side, which lies under the shadow of forests of tombstones that cover the over-looking hills. Nagasaki is noted as a coaling station. The coal is obtained chiefly from Takashima, an islet -8 m. S.E. of the entrance to the harbour, and in lesser quantities from two other islets, Naka-no-shima and Ha-shima, which lie about 1 m. farther out. These sources of supply, however, show signs of exhaustion. There are several favourite health resorts in the neighbourhood of Nagasaki, notably Unzen, with its sulphur springs.

Nagasaki owed its earliest importance to foreign intercourse. Originally called Fukae-no-ura (Fukae Bay), it was included in

the fief of Nagasaki Kotaro in the 12th century, and from him it took its name. But it remained an insignificant village until the 16th century, when, becoming the headquarters of Japanese Christianity, and subsequently the sole emporium of foreign trade in the hands of the Dutch and the Chinese, it developed considerable prosperity. The opening of the port of Moji for export trade deprived Nagasaki of its monopoly as a coaling station, and the visits of war vessels were reduced when Russia acquired Port Arthur, Great Britain Wei-hai-wei and Germany Kiaochow. On the north side of the channel by which the harbour is entered there stands a cliff called Takaboko, which, under the name of Pappenberg, has long been rendered notorious by a tradition that thousands of Christians were precipitated from it in the 17 th century because they refused to trample on the Cross. It has been conclusively proved that the legend is untrue.

NAGAUR or Nagore, a town in India, in Jodhpur state of Rajputana, with a station on the Jodhpur-Bikanir railway. Pop. (1901) 13,377. Nagaur is surrounded by a wall more than 4 m. in circuit. It has given its name to a famous breed of cattle.

NAGELSBACH, CARL FRIEDRICH (1806-1859), German classical scholar, was born at Wohrd near Nuremburg on the 28th of March

1806. After studying at Erlangen and Berlin, he accepted in 1827 an appointment at the Nuremberg gymnasium, and was professor of classics at Erlangen from 1842 till his death on the 21st of April 1859. Nagelsbach is chiefly known for his excellent Lateinische Stilistik (1846; 9th ed. by Ivan Miiller, 1905). Two other important works by him are Die Homerische Theologie (1840; 3rd ed. by G. Autenrieth, 1886) and Die Nachhomerische Theologie (1857).

See J. L. Doederlein, Gedachtnissrede fiir Herrn K. F. Nagelsbach (1859); article by G. Autenrieth in Allgemeine Deutsche Biographie, xxiii. (16 ”

NAGINA, a town of British India, in Bijnor district of the United Provinces, on the Oudh & Rohilkhand railway, 48 ni. N.W. of Moradabad. Pop. (1901) 21,412. There is considerable trade in sugar, besides manufactures of guns, glassware (especially bottles for the use of pilgrims carrying the sacred water of the Ganges from Hardwar), ebony wares, hemp-sacking and cotton cloth.

NAGODE, a native state of Central India, in the Baghelkhand agency. Area, 501 sq. m. Pop. (1901) 67,092, showing a de- crease of 20% in the decade, due to famine; estimated revenue, £1 1,000. The chief, whose title is raja, is a Rajput of the Parihar clan. The town of Nagode is 17 m. W. of the British station of Sutna. Pop. (1901) 3887. It was formerly a military canton- ment, and has an Anglo-vernacular school and dispensary. The former capital (until 1720) was Unchahra.

NAGOYA, the capital of the province of Owari, Japan, on the great trunk railway of Japan, 235 m. from Tokyo and 94 m. from Kioto. Pop. (1903) 284,829. It is the fifth of the chief cities in Japan. It lies near the head of the shallow Isenumi Bay, about 30 m. from the port of Yokkaichi, with which it communicates by light-draught steamers and by rail. The castle of Nagoya, erected in 1610, never suffered in war, but in modern times became a military depot; the interior contains much splendid decoration. The central keep of the citadel is a remarkable structure, covering close upon half an acre, but rapidly diminishing in each of its five storeys till the top room is only about 12 yds. square. Gabled roofs and hanging rafters break the almost pyramidal outline; and a pair of gold-plated dolphins 8 ft. high form a striking finial. Both were removed in 1872, and one of them was at the Vienna Exhibition in 1873; but they have been restored to their proper site. The religious buildings of Nagoya include a very fine Buddhist temple, Higashi Hongwanji. Nagoya is well known as one of the great seats of the pottery trade; 13J m. distant are the potteries of Seto, where the first glazed pottery made in Japan was produced by

Kato Shirozaemon, after a visit to China in 1229. From Kato's time Seto continued, during several centuries, to be the chief centre of ceramic production in Japan, the manufacture of porcelain being added to that of pottery in the 19th century. All the

products of the flourishing industry now carried on there and at other places in the province are transported to Nagoya, for sale there or for export. Cotton mills have been established, and an extensive business is carried on in the embroidery of handker- chiefs. Another of its celebrated manufactures is arimatsu- shibori, or textile fabrics (silk or cotton), dyed so as to show spots in relief from which the colour radiates. It is further distin- guished as the birthplace of cloisonne enamelling in Japan, all work of that nature before 1838 — when a new departure was made by Kaji Tsunekichi — having been for purposes of subordinate decoration. Quantities of cloisonne enamels are now produced in the town.

NAGPUR, a city, district and division of British India, in the Central Provinces. The city is 1125 ft. above the sea; railway station, 520 m. E. of Bombay. Pop. (1001) 127,734. The town is well laid out, with several parks and artificial lakes, and has numerous Hindu temples. The prettily wooded suburb of Sita- baldi contains the chief government buildings, the houses . of Europeans, the railway station and the cantonments, with fort and arsenal. In the centre stands Sitabaldi Hill, crowned with the fort. Beyond the station lies the broad sheet of water known as the Jama Talao, and farther east is the city, completely hidden in a mass of foliage. Handsome tanks and gardens, constructed by the Mahratta princes, lie outside the city. The palace, built of black basalt and profusely ornamented with wood carving, was burnt down in 1864, and only the great gate- way remains. The garrison consists of detachments of European and native infantry from Kampti. Nagpur is the headquarters of two corps of rifle volunteers. It is the junction of two im- portant railway systems — the Great Indian Peninsula to Bombay and the Bengal-Nagpur to Calcutta. The large weaving popu- lation maintain their reputation for producing fine fabrics. There are steam cotton mills and machinery for ginning and pressing cotton. The gaol contains an important printing establishment. Education is provided by two aided colleges — the Hislop and the Morris, called after a missionary and a former chief commissioner; four high schools; a law school; an agricultural school, with a class for the scientific training of teachers; a normal school; a

zenana mission for the manage- ment of girls' schools; an Anglican and two Catholic schools for Europeans. There are several libraries and reading rooms, and an active Anjuman or Mahommedan society.

The District op Nagpur has an area of 384 sq. m. Pop. (iqoi) 751,844. It lies immediately below the great tableland of the Satpura range. A second line of hills shuts in the district on the south-west, and a third runs from north to south, parting the country into two plains of unequal size. These hills are all offshoots of the Satpuras, and nowhere attain any great ele- vation. Their heights are rocky and sterile, but the valleys and lowlands yield rich crops of corn and garden produce. The western plain slopes down to the river Wardha, is watered by the Jam and Madar, tributaries of the Wardha, and contains the most highly-tilled land in the district, abounding in fruit trees and the richest garden cultivation. The eastern plain (six times the larger), stretching away to the confines of Bhandara and Chanda, consists of a rich undulating country, luxuriant with mango groves and dotted towards the east with countless small tanks. It is watered by the Kanhan, with its tributaries, which flows into the Wainganga beyond the district. The principal crops are millets, wheat, oil-seeds and cotton. There are steam factories for ginning and pressing cotton at the military canton- ment of Kampti, which was formerly the chief centre of trades. An important new industry is manganese mining. The district is traversed by the two lines of railway which meet at Nagpur city, and several branches are under construction.

The Division of Nagpur comprises the five districts of Nagpur, Bhandara, Chanda, Wardha and Balaghat. Area, 23,521 sq. m. Pop. (iqoi) 3,728,063, showing a decrease of 9% in the decade.

See Nagpur District Gazetteer (Bombay, 1908).

NAGYKANIZSA, a town of Hungary, in the county of Zala, 137 m. S.W. of Budapest by rail. Pop. (1900) 23,255. It possesses distilleries and brick-making factories, and has trade

in cereals and cattle. Nagykanizsa once ranked as the second fortress of Hungary, and consequently played an important part during the wars with the Turks, who, having gained possession of it in 1600, held it until, in 1690, after a siege of two years, it was recovered by the Austrian and Hungarian forces. In 1 702 the fortifications were destroyed.

NAGYKIKINDA, a town of Hungary, in the county of Torontal, 152 m. S.E. of Budapest by rail. Pop. (1900) 24,843, of which about 60% are

Servians. Being one of the centres of production of the famous wheat of the Banat, its flour industry is important. Fruit-farming and cattle-rearing are extensively carried on in the neighbourhood.

NAGYSZEBEN (Ger. Hermannstadt, Rumanian Sibiu), a town of Hungary, in Transylvania, the capital of the county of Szeben, 122 m. S.S.E. of Kolozsvar by rail. Pop. (1900) 26,077, of whom 16,141 were Saxons (Germans), 7106 Rumanians, and 5747 Magyars. It is beautifully situated at an altitude of 141 1 ft. in the fertile valley of the Cibin (Hungarian, Szeben), encircled on all sides by the Transylvanian Alps. It is the seat of a Greek Orthodox (Rumanian) archbishop, and of the super- intendent of the Protestants for the Transylvanian circle. Some parts of Nagyszeben have a medieval appearance, with houses built in the old German style. The most noteworthy of its public buildings is the handsome Protestant Church, begun in the 14th century and finished in 1520, in the Gothic style, containing a beautiful cup-shaped font, cast by Meister Leonhardus in 1438, and a large mural painting of the Crucifixion by Johannes von Rosenau (144s)- In the so-called New Church, comprising the west part of the whole building, which is an addition of the 1 6th century, are many beautiful memorials of Saxon notables. Other buildings are: the Roman Catholic parish church, founded in 1726; the church of the Ursuline nuns, built in 1474; the town hall, an imposing building of the 15th century, purchased by the municipality in 1545 and containing the archives of the ” Saxon nation.” The Brukenthal palace, built in 1777-1787 by Baron Samuel von Brukenthal (1721-1803), governor of Transylvania, contains an interesting picture-gallery with good examples of the Dutch school, and a library. The museum contains a natural history section with the complete fauna and flora of Transylvania, and a rich ethnographical section. Nagyszeben has a law academy, a seminary for Greek Orthodox priests, a military academy and several secondary schools. There are manufactures of cloth, linen, leather, caps, boots, soap, candles, ropes, as well as breweries and distilleries.

The German name of the town is traceable to Hermann, a citizen of Nuremberg, who about the middle of the 12th century established a colony on the spot. In the 13th century it bore the name of Villa Hermanni. Under the last monarchs of the native Magyar dynasty Hermannstadt enjoyed exceptional privileges, and its commerce with the East rose to importance. In the course of the 15th and 16th centuries it was several times besieged by the Turks. At the beginning of 1849 it was the scene of several engagements between the Austrians and Hungarians; and later in the year it was several times taken and retaken by the Russians and Hungarians.

NAGYSZOMBAT (Ger. Tyrnau), a town of Hungary, in the county of Pozsony, 115 m. N.W. of Budapest by rail. Pop. (1900) 12,422. It is situated on the Trnava, and has played an important role in the ecclesiastical history cf Hungary. It gained prominence after 1543, when the archbishop of Esztergom and primate of Hungary made it his residence after the capture of Esztergom by the Turks. In consequence numerous churches and convents were built, and the town acquired the title of ” Little Rome.” It possesses a Roman Catholic seminary for priests, and was the seat of a university founded, in- 1635, which was transferred to Budapest in 1777. In 1820 the archbishop’s residence was again removed to Esztergom. It has an active trade in cereals and cattle.

NAGY-VARAD (Ger. Grosswardein), a town of Hungary, capital of the county of Bihar, 153 m. E.S.E. of Budapest by rail. Pop. (1900) 47,018. It is situated in a plain on both banks of the river Sebeskoros, and is the seat of a Roman Catholic

and of a Greek (Old-United) bishopric. Among its principal buildings are the St Ladislaus parish church, built in 1723, which contains the remains of the king St Ladislaus (d. 1095), the Roman Catholic cathedral, built in 1752-1779, the Greek cathedral, the large palace of the Roman Catholic bishop, built in 1778 in the rococo style, the archaeological and historical museum, with an interesting collection of ecclesiastical art, and the county and town hall. Among the educational establishments are a law academy, a seminary for priests, a modern school, a Roman Catholic and a Calvinistic gymnasium, a commercial academy, a training school for teachers and a secondary school for girls. Nagy-Varad is an important railway junction; it possesses extensive manufactures of pottery and large distilleries, and carries on a brisk trade in agricultural produce, cattle, horses, fruit and wine. About 6 m. S. of the town is the village of Hajo, which contains the Piispok Fiirdo or Bishop’s Baths, with warm saline and sulphurous waters (92 to 103 F.), used both for drinking and bathing in cases of anaemia and scrofula.

Nagy-Varad is one of the oldest towns in Hungary. Its bishopric was founded by St Ladislaus in 1080. The town was destroyed by the Tatars in 1241. Peace was concluded here on the 24th of February 1538 between Ferdinand I. of Austria and his rival John Zapolya, voivode of Transylvania. In 1556 it passed into the possession of

Transylvania, but afterwards reverted to Austria. In 1598 the fortress was un- successfully besieged by the Turks, but it fell into their hands in 1660 and was recovered by the Austrians in 1692. The Greek Old-United or Catholic bishopric was founded in 1776.

NAHE, a river of Germany, a left-bank tributary of the Rhine, rises near Selbach in the Oldenburg principality of Birkenfeld. For some distance it forms the boundary between the Bavarian Palatinate and the Prussian Rhine Province, and it falls into the Rhine at Bingen. Its length is 78 m., but it is too shallow and rocky to be navigable. Its picturesque valley, through which runs" the railway from Bingerbriick to Neunkirchen, is largely visited by tourists.

See Schneegans, Geschichte des Nahetals (Kreuznach, 1890).
NAHUATLAN STOCK, a North and Central American Indian stock. Nahuas or Nahuatlecas was the collective name for the dominant Indian peoples of Mexico at the time of the Spanish conquest, and the Nahuatlan stock consisted of the Nahuas (or Aztecs) and a few scattered tribes in Central America.

NAHUM (Hebrew for " rich in comfort [is God] "), an Old Testament prophet . The name occurs only in the book of Nahum ; in Nehemiah vii. 7 it is a scribal error for " Rehum." Of the prophet himself all that is known is the statement of the title that he was an Elkoshite. But the locality denoted by the designation is quite uncertain. Later tradition associated Nahum with the region of Nineveh, against which he prophesied, and hence his tomb has been located at a place bearing the name of Alkush near Mosul (anc. Nineveh) and is still shown. 1 Accord- ing to Jerome, the prophet was a native of a village in Galilee, which bore the name of Elkesi in the 4th century a.d. (the Galilean town of Capernaum, which probably means " village of Nahum," may also point in the same direction; but cf. John vii. 29, which seems to imply that in the time of Christ no prophet was supposed to have come out of Galilee). E. Nestle has proposed to locate Elkesi " beyond Betogabra " {i.e. Eleuthero- polis, mod. Beit Jibrin) in the tribe of Simeon (cf. Pal. Expl. Fund Quart. Statement, 1879, pp. 136-138).

Book of Nahum. — The original heading of Nahum's prophecy is contained in the second part of the superscription: " [The book of] the vision of Nahum the Elkoshite " (cf. the similar headings in Isaiah, Obadiah and Habakkuk). The first part (" Oracle concerning Nineveh ") is a late editorial insertion, but correctly describes the main contents of the little book.

Contents of the Book. (1) Chapters i. and ii. — The prophecy against

Nineveh in its present form really begins with chap. ii. I, followed immediately by v. 3, and readily falls into three parts, viz. (a) ii. 1, 3-10; (6) ii. 11- 13; and © iii. Here (a) describes in language of considerable descriptive power the assault on Nineveh —

1 Jonah's grave has been located similarly in Nineveh itself.

the city is mentioned by name in ii. 8 (9 Heb. text) — its capture and sack; (b) contains an oracle of Yahweh directed against the king of Assyria (" Behold, I am against thee, saith the Lord of Hosts," v. 13); (c) again gives a vivid picture of war and desolation which are to overtake and humiliate Nineveh, as they have already overtaken No-Amon {i.e. Egyptian Thebes, w. 8-10); the defence is pictured as futile and the ruin complete. The absence of dis- tinctly religious motive from these chapters is remarkable; the divine name occurs only in the repeated refrain, " Behold, I am against thee, saith the Lord of Hosts," ii. 13, iii. 5. They express little more than merely human indignation at the oppression of the world-power, and picture with undisguised satisfaction the storm of war which overwhelms the imperial city.

(2) Chapter i. forms the exordium to the prophecy of doom against Nineveh in the book as it lies before us. Its tone is exalted, and a fine picture is given of Yahweh appearing in judgment: "The Lord (Yahweh) is a jealous God and avengeth; the Lord avengeth and is full of wrath." The effects of the divine anger on the physical universe are forcibly described {yv. 3-6) ; on the other hand, God cares for those " that put their trust in Him " {v. 7), but overwhelms His enemies {w. 8-120); in the following verses (126-15) the joyful news is conveyed to Judah of the fall of the oppressor: — " Behold upon the mountains the feet of him that bringeth good tidings, that publisheth peace! Keep thy feasts, O Judah, perform thy vows; for the wicked one shall no more pass through thee; he is utterly cut off " {v. 15).

Regarding chap. i. and ii. 2(=i. and ii. 1, 3, Heb. text) there has been much discussion in recent years. It was long ago noticed that traces of an alphabetic acrostic survive in this section of the book; throughout the whole of chap. i. there is no reference to Nineveh, though in some of the verses (8-l2a, 14) the enemies of Yahweh are addressed, who have usually been identified with the people or city of Nineveh; in w. 126, 13 and (certainly) v. 15 (= ii. I Heb.) Judah appears to be addressed. The text of i. 1-15, ii. 1-2 has been reconstructed by H. Gunkel and G. Bickell so as to form a complete alphabetic psalm with contents of an eschatological character, and is regarded by them as a later addition to the book. It may be a " generalizing supplement " prefixed by the editor, possibly because the original introduction to

the oracle had been mutilated. It is generally held by critical scholars that i. 1-8, 13, 15, and ii. 2 cer- tainly do not proceed from Nahum; i. 9-12 may, however, belong to the prophet. The phenomena are conflicting and a completely satisfactory solution seems to be impossible.

Date of Nahum's Oracle. — The date of the composition of Nahum's prophecy must lie between 607-606, when Nineveh was captured and destroyed by the Babylonians and Medes, and the capture of Thebes (No-Amon) which is alluded to in iii.. 8-10. This was effected for the second time and most completely by Assur-bani-pal in 663 or 662 B.C. The tone of the prophecy suggests, on the one hand, that the fall of Nineveh is imminent, while, on the other, the reference to Thebes suggests that the disaster that had befallen it was still freshly remembered. On the whole a date somewhat near 606 is more probable. It is noteworthy that no reference is made to the restoration of the northern kingdom of Israel, or the return of its exiles. The poetry of the book is of a high order.

Bibliography. — The Commentaries on the Minor Prophets, especially those of J. Wellhausen, D. W. Nowack and K. Marti (all German) ; G. A. Smith, The Book 0} the Twelve Prophets (2 vols.) ; A. B. Davidson, Nahum, Habakkuk and Zephaniah (Camb. Bible, 1896). (G. H. Bo.)

NAIK, or Nayak, from a Sanskrit word meaning a leader, a title used in India in various senses. In the army it denotes a rank corresponding to that of corporal; and Hyder Ali of Mysore was proud of being called Haidar Naik, analogous to " le petit caporal " for Napoleon. It was also the title of the petty dynasties that arose in S. India on the downfall of the Hindu empire of Vijayanagar in the 16th century.

NAIL (O. Eng. naegal, cf. Dutch, Ger.,Swed.«age/; the word is also related to Lat. unguis, Gr. &vvˆ, Sans, nakhds) a word applied both to the horny covering to the upper surface of the extremities of the fingers and toes of man and the Quadrumana (see Skin and Dermal Skeleton), and also to a headed pin or spike of metal, commonly of iron. The principal use of nails is in wood- work (joinery and carpentery), but they are also employed in numerous other trades. Size, form of head, nature of point, and special uses all give names to different classes of nails. Thus we have tacks, sprigs and brads for very small nails; rose, clasp and clout, according to the form of head; and flat points or sharp points according to the taper of the spike. According to

the method of manufacture nails fall into four principal classes: (i) hand-wrought nails; (2) machine-wrought and cut nails; (3) wire or French nails; and (4) cast nails.

The nailer handicraft was formerly a great industry in the country around Birmingham. The nails are forged from nail- rods heated in a small smith's hearth, hammered on an anvil, the nail length cut off on a chisel and the head formed by dropping the spike into a hole in a " bolster " of steel, from which enough of the spike is left projecting to form the head. In the case of clasp nails the head is formed with two strokes of the hammer, while rose nails require four. The heads of the larger-sized nails are made with an " Oliver " or mechanical hammer, and for ornamental or stamped heads " swages " or dies are employed. The conditions of life and labour among the hand nailers in England were exceedingly unsatisfactory: married women and young children of both sexes working long hours in small filthy sheds attached to their dwellings; their employment was con- trolled by middle-men or nail-masters, who supplied them with the nail-rods and paid for work done, sometimes in money and sometimes in kind on the truck system. Machine-wrought and cut nails have supplanted most corresponding kinds of hand-made nails. Horse nails are still made by hand-labour. These are made from the finest Swedish charcoal iron, hammered out to a sharp point. They must be tough and homogeneous throughout, so that there may be no danger of their breaking over and leaving portions in the hoof.

In 1617 Sir D. Bulmer devised a machine for cutting nail-rods, and in 1790 T. Clifford patented a device for shaping the rods, but the credit of perfecting machinery mainly belongs to American enterprise (the first American patent appears to be that of Ezekiel Reed, dated 1786). The machine, fed with heated (to black heat only) strips of metal, usually mild steel, having a breadth and thickness sufficient for the nail to be made, shears off by its slicer the " nail blank," which, falling down, is firmly clutched at the neck till a heading die strikes against its upper end and forms the head, the completed nail passing out through an inclined shoot. In large nails the taper of the shank and point is secured by the sectional form to which the strips are rolled; brads, sprigs and small nails, on the other hand, are cut from uniform strips in an angular direction from head to point, the strip being turned over after each blank is cut so that the points and heads are taken from opposite sides alternately, and a uniform taper on two opposite sides of the nail, from head to point, is secured. The machines turn out nails with wonderful rapidity, varying with the size

of the nails produced from about 100 to 1000 per minute. Wire or French nails are made from round wire, which is unwound, straightened, cut into lengths and headed by a machine either by intermittent blows or by pressure, but the pointing is accomplished by the pressure of dies. Cast nails, which are cast in sand moulds by the ordinary process, are used principally for horticultural purposes, and the hob-nails or tackets of shoemakers are also cast.

See Peter Barlow, Encyclopaedia of ‘ Arts, Manufactures and Machinery (1848); Bucknall Smith, Wire, Its Manufacture and Uses (New York, 1891).

NAIL VIOLIN (Ger. -Nagelgeige, Nagelharmonica), a musical curiosity invented by Johann Wilde, a musician in the imperial orchestra at St Petersburg. The nail violin or harmonica consists of a wooden soundboard about 13 ft. long and 1 ft. wide bent into a semicircle. In this soundboard are fixed a number of iron or brass nails of different lengths, tuned to give a chromatic scale. Sound is produced by friction with a strong bow, strung with black horsehair. An improved instrument, now in the collection of the Hochschule in Berlin, has two half-moon sound-chests of different sizes, one on the top of the other, forming terraces. In the rounded wall of the upper sound-chest are two rows of iron staples, the upper giving the diatonic scale, atid the lower the intermediate chromatic semitones. History records the name of a single virtuoso on this instrument, which has a sweet bell-like tone but limited technical possibilities; he was a Bohemian musician called Senal, who travelled all over Germany with his instrument about 1 780-1 790. (K. S.)

NAINI TAL, a town and disf.nct of British India, in the Kumaon division of the United Provinces. The town is 6400 ft. above sea-level. Pop. (1901) 7609. Naini Tal is a popular sanatorium for the residents in the plains, and the summer head- quarters of the government of the province. It is situated on a lake, surrounded by high mountains, and is subject to landslides; a serious catastrophe of this kind occurred in September 1880. The approach from the plains is by the Rohilkhand and Kumaon railway from Bareilly, which has its terminus at Kathgodam, 22 m. distant by cart road. There are several European schools, besides barracks and convalescent depot for European soldiers.

The District or Naini Tal comprises the lower hills of Kumaon and the adjoining Tarai or submontane strip. Area, 2677 sq. m. Pop. (1901) 311,237, showing a decrease of 15-4% in the decade. The district includes the Gagar and other foothills of the Himalayas, which reach

an extreme height of nearly 9000 ft. The Bhabar tract at their base consists of boulders from the mountains, among which the hill streams are swallowed up. Forests cover vast tracts of the hill-country and the Bhabar. Beyond this is the Tarai, moist and extremely unhealthy. Here the principal crops are rice and wheat. In the hills a small amount of tea is grown, and a considerable quantity of fruit. The only railway is the line to Kathgodam.

See Naini Tal District Gazetteer (Allahabad, 1904).

NAIRN, a royal, municipal and police burgh and county town of Nairnshire, Scotland. Pop. of the royal burgh (1901) 5089. It is situated on the Moray Firth, at the mouth of the Nairn and on its left bank, 15! m. N.E. of Inverness by the Highland railway. The town, though of immemorial age, shows no signs of its antiquity, being bright, neat and modern. It attracts many summer visitors by its good sea bathing and excellent golf-course. The industries include salmon fishing, deep-sea fishing, the making of rope and twine and the freestone quarries of the neighbourhood. There is a commodious harbour with breakwater and pier. Nairn belongs to the Inverness district group of parliamentary burghs (Forres, Fortrose, Inverness and Nairn). Nairn was originally called Invernarne. (the mouth of the Nairn) . It was made a royal burgh by Alexander I. (d. 1 1 24) , but this charter having been lost it was confirmed by James VI. in 1589.

NAIRNE, CAROLINA, Baroness (1766-1845), Scottish song writer, was born in the ” auld hoose ” of Gask, Perthshire, on the 16th of August 1766. She was descended from an old family which had settled in Perthshire in the 13th century, and could boast of kinship with the royal race of Scotland. Her father, Laurence Oliphant, was one of the foremost supporters of the Jacobite cause, and she was named Carolina in memory of Prince Charles Edward. In the schoolroom she was known as ” pretty Miss Car,” and afterwards her striking beauty and pieasing manners earned for her the name of the ” Flower of Strathearn.” In 1806 she married W. M. Nairne, who became Baron Nairne (see below) in 1824. Following the example set by Burns in the Scots Musical Museum, she undertook to bring out a collection of national airs set to appropriate words. To the collection she contributed a large number of original songs, adopting the signature ” B. B.” — ” Mrs Bogan of Bogan.” The music was edited by R. A. Smith, and the collection was published at Edinburgh under the name of the Scottish Minstrel (1821- 1824). After her husband’s death in 1830 Lady Nairne took up her residence at Enniskerry, Co. Wicklow, but she spent much time abroad. She died at Gask on the 26th of October

1845-

Her songs may -be classed under three heads: (1) those illustrative of the characters and manners of the old Scottish gentry, such as ” The Laird o’ Cockpen,” ” The Fife Laird,” and “John Tod”; (2) Jacobite songs, composed for the most part to gratify her kinsman Robertson, the aged chief of Strowan, among the best known of which are perhaps ” Wha ‘11 be King but Charlie? ” ” Charlie is my darling,” ” The Hundred Pipers,” “He’s owre the Hills,” and “Bonnie Charlie’s noo awa “; and (3) songs’ not included under the above heads, ranging over a variety of subjects from ” Caller Herrin’ ” to the ” Land o’ the

Leal.” For vivacity, genuine pathos and bright wit her songs are surpassed only by those of Burns.

Lady Nairne’s husband, William Murray Nairne (1757-1830). He was descended from Sir Robert Nairne of Strathord (c. 1620- 1683), a supporter of Charles II., who was created Baron Nairne in 1681. After his death without issue the barony passed to his son-in-law, Lord William Murray (c. 1665-1726), the husband of his only daughter Margaret (1669-1747) and a younger son of John Murray, 1st marquess of Athole. William, who took the name of Nairne and became 2nd Baron Nairne, joined the standard of the Jacobites in 171 5; he was taken prisoner at the battle of Preston and was sentenced to death. He was, however, pardoned, but his title was forfeited. His son John (c. 1691- 1770), who but for this forfeiture would have been the 3rd Baron Nairne, was also taken prisoner at Preston, but he was soon set at liberty. In the rising of 1745 he was one of the Jacobite leaders, being present at the battles of Prestonpans, of Falkirk and of Culloden, and consequently he was attainted in 1746; but escaped to France. His son John (d. 1782) was the father of William Murray Nairne, who, being restored to the barony of Nairne in 1824, became the 5th baron. The male line became extinct when his son William, the 6th baron (1808-1837), died unmarried. The next heir was a cousin, Margaret, Baroness Keith of Stonehaven Marischal (1788-1867), wife of Auguste Charles Joseph, comte de Flahaut de la Billarderie, but she did not claim the title. In 1874, however, the right of her daughter, the wife of the 4th marquess of Lansdowne, was allowed by the House of Lords.

For Lady Nairne’s songs, see Lays from Strathearn, arranged with

Symphonies and Accompaniments for the Pianoforte by Finlay Dun (1846); vol. i. of the Modern Scottish Minstrel (1857); Life and Songs of the Baroness Nairne, with a Memoir and Poems of Caroline Oliphant the Younger, edited by Charles Rogers (1869, new ed. 1886). See also T. L. Kington-Oliphant, Jacobite Lairds of Cask

(1870).

NAIRNSHIRE, a north-eastern county of Scotland, bounded \V. and S. by Inverness-shire, E. by Elginshire and N. by the Moray Firth. It has an area of 103,429 acres or 161 6 sq..m., and a coast line of 9 m. and is the fourth smallest county in Scotland. The seaboard, which is skirted by sandbanks danger ous to navigation, is lined by low dunes extending into Elginshire. Parallel with the coast there is a deposit of sand and gravel about 90 ft. high stretching inland for 4 or 5 m. This and the undulating plain behind are a continuation westward of the fertile Laigh of Moray. From this region southward the land rises rapidly to the confines of Inverness-shire, where the chief heights occur. Several of these border hills exceed 2000 ft. in altitude, the highest being Cam Glas (2162 ft.). The only rivers of importance are the Findhorn and the Nairn, both rising in Inverness-shire. The Findhorn after it leaves that county takes a mainly north-easterly direction down Strathdearn for 17 m. and enters the sea to the north of Forres in Elginshire after a total course of 70 m. The Nairn, shortly after issuing from Strathnairn, flows towards the N.E. for 12 m. out of its complete course of 38 m. and falls into the Moray Firth at the county town. There are eight lochs, all small, but the loch of Clans is of particular interest because of its examples of crannogs, i>r lake-dwellings. Nairnshire contains many beautiful woods and much picturesque and romantic scenery.

Geology. — The county is divided geologically into two clearly-marked portions. The southern and larger portion is composed i)f the eastern, Dalradiar. or younger Highland schists with associated granite masses; this forms all the higher ground. The low-lying northern part of the country bordering Moray Firth is occupied by Old Red Sandstone. The schistose rocks are mainly thin bedded micaceous gneisses, schists and quartzites; between Dallaschyle and Creag an Dairnb a more massive higher horizon appears in the centre of a synclinal fold. Porphyritic gneiss is found on the rianks of Cam nan tri-tighearnan. The schists are frequently intersected by dikes of granite, amphibolite, &c. Three masses of granite are found penetrating the schists; the largest lies on the eastern boundary and extends from about Lethen Bar Hill southward by Ardclach and Glenferness to the Bridge of Dulsie. The second mass on the opposite

side of the county belongs mainly to Inverness but the granite reaches into Nairn on the slopes of Bein nan Creagan &nd Ben Buidhe Mhor. A smaller mass near Rait Castle, with large

pink crystals of orthoclase, has been employed as a building stone. On the denuded surface of the schists the Old Red Sandstone was deposited and formerly doubtless covfered most of the county; outlying patches still remain near Drynachan Lodge and near Highland Boath in Muckle Burn. The Lower Old Red rocks are basal breccias followed by shales with calcareous nodules containing fossil fish. The Upper Old Red, which is found usually nearer the coast, is unconformable on the Lower series; it consists of red shales and clays and obliquely bedded sandstones. Glacial deposits are widely spread ; they comprise a Lower Boulder Clay, a series of gravels and sands, followed by an Upper. Boulder Clay, above which comes a series of gravel deposits forming ridges on the moor- land between the Nairn and Findhorn rivers. A fine kame, resting on the plain of sand and gravel, lies between Meikle Kildrummie and Loch Flemington, south of the railway. Traces of the old marine terraces at 100 ft., 50 ft. and 25 ft. are found near the coast, as well as considerable accumulations of blown sand.

Climate and Industries., — The climate is healthy and equable. The temperature for the year averages 47 F., for January 38° F., and for July, 58 F. The mean annual rainfall is 25 in. The soil of the alluvial plain, or Laigh, is light and porous and careful cultiva tion has rendered it very fertile; and there is some rich land on the Findhorn. Although the most advanced methods of agriculture are in use, but a small proportion of the surface is capable of tillage, only one-fifth of the whole area being under crops. The hills are mostly covered with heath and pasture, suitable for sheep, and cattle are kept on the lower lying ground. The county accords many facilities for sport. A few distilleries, some sandstone and granite quarries and the sea and salmon fisheries of the Nairn practically represent flie industries of the shire, apart from agriculture. The Highland Railway from Forres to Inverness crosses the north of the shire.

Population and Government. — In 1891 the population numbered 9155 and in 1901 it was 9291, or 57 persons to the sq. m. Besides the county town of Nairn (pop. 5089), there are the parishes of Ardclach (pop. 772), and Auldearn (pop. of parish 1292, of village 313). Nairn and Elgin shires combine to return one member to parliament, and the county town belongs to the Inverness district group of parliamentary burghs (Forres, Fortrose, Inverness and Nairn). The shire forms a sheriffdom with Inverness and Elgin and a sheriff-substitute sits

alternately at Nairn and Elgin.

History. — The country was originally peopled by the Gaelic or northern Picts. Stone circles believed to have been raised by them are found at Moyness, Auldearn, Urchany, Ballinrait, Dalcross and Croy, the valley of the Nairn being especially rich in such relics. To the north of Dulsie Bridge is a monolith called the Princess Stone. A greater number of the mysterious prehistoric stones with cup-markings occur in Nairn than any- where else in Scotland. Mote hills are also common. Whether there was any effective Roman occupation of the land so far north is an open question, but there is little evidence of it in Nairn, beyond the occasional finding of Roman coins. Columba and his successors made valiant efforts to Christianize the Picts, but it was long before their labours began to tell, although the saint's name was preserved late in the 19th century in the annual fair at Auldearn called " St Colm's Market," while to his biographer Adamnan — corrupted into Evan or Wean — was dedicated the church at Cawdor, where an old Celtic bell also bears this name. By the dawn of the 10th century the Picts had been subdued with the help of the Norsemen, and Nairn, which was one of the districts colonized by the Scandinavians, as part of the ancient province of Moray, soon afterwards became an integral portion of the kingdom of Scotland. Macbeth was one of the kings that Moray gave to Scotland, and his name and memory survive to the present day. Hardmuir, between Brodie and Nairn, is the reputed heath where Macbeth met the witches. Territorially Moray was greatly contracted in the reign of David I. , and thenceforward the history of Nairn merges in the main in that of the bishopric and earldom of Moray (see Elgin). The thane of Cawdor was constable of the king's castle at Nairn, and when the heritable sheriffdom was established towards the close of the 14th century this office was also filled by the thane of the time.

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1899).

NAIROBI, capital of the British East Africa protectorate and of the province of Ukamba, 327 m. by rail N.W. of Mombasa and 257 m. S.E. of Port Florence on Victoria Nyanza. Pop.

(1907) 4737, including 350 Europeans and 1752 Indians. Nairobi is built on the Athi plains, at the foot of the Kikuyu hills and 5450 ft. above the sea; it commands magnificent views of Kilimanjaro and Mt. Kenya. It is the headquarters of the Uganda railway, of the military forces in the protectorate, and of the Colonists' Association. It is divided into European, Indian and native quarters. Midway between the European and Indian quarters stands the town hall. The other public buildings include railway works, places of worship (Protestant, Roman Catholic, Mahommedan and Hindu) and schools, an Indian bazaar, a general hospital and waterworks — the water being obtained from springs 13 m. distant.

The site of Nairobi was selected as the headquarters of the Uganda railway, and the first buildings were erected in 1899. For some time nearly all its inhabitants were railway officials and Indian coolies engaged in the construction of the line. In 1902 the surrounding highlands were found to be suitable for European settlement, and Nairobi speedily grew in importance; in 1907 the headquarters of the administration were transferred to it from Mombasa. The town is provided with clubs, cricket and athletic grounds and a racecourse.

NAIVASHA, the name of a lake, town and province, in British East Africa. The lake, which is roughly circular with a diameter of some 13 m., lies at an altitude of 6135 ft. on the crest of the highest ridge in the eastern rift-valley between the Kikuyu escarpment on the east and the Mau escarpment on the west. It is fed from the north by the rivers Gilgal and Morendat, but has no known outlet. The rivers, which have a minimum dis- charge of 100 cub. ft. per second, run in deep gullies. The water of the lake is fresh; the shore in many places is lined with papyrus. North and north-west the lake is closed in by the volcanic Buru hills; to the south towers the extinct volcano of Longonot. Hippopotami and otters frequent the lake, and on an island about 1 m. from the shore are large numbers of antelopes and other game. Naivasha was discovered in 1883 by Gustav Adolf Fischer (1848-1886), one of the early explorers of the Tana and Masai regions, and the first to demonstrate the continuance of the rift-valley through equatorial Africa. Fischer was followed later in the same year by Joseph Thomson, the Scottish explorer. The railway from Mombasa to Victoria Nyanza skirts the eastern side of the lake, and on the railway close to the lake is built the town of Naivasha, 6230 ft. above the sea, 391 m. N.W. by rail of Mombasa and 193 m. S.E. by rail of Port Florence on Victoria Nyanza. Naivasha province contains much land suitable for colonization by white men, and large areas were leased to

Europeans by the British authorities in 1903 and subsequent years. The East Africa Syndicate acquired a lease of 500 sq. m. in the valley of the Gilgal and surrounding country north of Lake Naivasha. North-west of the lake and along the Molo river the 3rd Lord Delamere obtained a grant of 155 sq. m.

NAJARA, ISRAEL BEN MOSES, Hebrew poet, was born in Damascus and wrote in the latter part of the 16th century (1587- 1599). He was inspired by the mystical school, and his poems are marked by their bold, sensuous images, as well as by a depth of feeling unequalled among the Jewish writers of his age. He often adapted his verses to Arabic and Turkish melodies. To tunes which had been associated with light and even ribald themes, Najara wedded words which reveal an intensity of religious emotion which often takes a form indistinguishable from love poetry. Some pietist contemporaries condemned his work for this reason; but this did not prevent many of his poems from attaining wide popularity and from winning their way into the prayer-book. In fact, Najara could claim the authority of the Biblical ” Song of Songs ” (mystically inter- preted) for his combination of the language of human love with the expression of the relationship between God and humanity.

He published during his lifetime a collection of his poems, Songs of Israel (Zemiroth Israel), in Safed in 1587; an enlarged edition appeared in Venice (1599- 1600). Others of his poems were published at various times, and W. Bacher has described some previously unknown poems of Najara {Revue des gtudes juives, Nos. 116 sec.’).

NAJIBABAD, a town of British India, in the Bijnor district of the United Provinces, 31 m. S.E. of Hardwar. Pop. (1901) 19,568. It was founded in the middle of the 18th century by a Rohilla chief, and still contains several architectural monuments of Rohilla magnificence. It has a station on the Oudh & Rohil- khand railway, with a junction for the branch to Kotdwara. There is considerable trade in timber, sugar and grain, and manufactures of metal-ware, shoes, blankets and cotton cloth.

NAKHICHEVAN, or Nakhjevan, a city of Russian Armenia, in the government of Erivan, 85 m. S.E. of the town of Erivan. It occupies the brow of a spur of the Kara-bagh mountains, 2940 ft. above the sea, and looks out over the valley of the Aras. Pop. (1863) 6251, (1897) 8845. Built and rebuilt again and again, Nakhichevan is full of half - obliterated evidences of former prosperity. The present houses have for the most part been quarried from ancient ruins; of the palace of the princes of Azerbaijan there remains a gateway with a Persian

inscription, flanked by two brick towers; and at a little distance stands the so-called Tower of the Khans, a richly decorated twelve-sided structure, 102 ft. in circumference and 75 ft. in height, dating, to judge by the inscription which runs around the cornice, from the 1 2th century. There are also ruins of a large mosque. Situated on the highroad to Tabriz and Teheran, Nakhichevan has a large transit trade. In the Persian period the city is said to have had 40,000 inhabitants; the population now consists chiefly of Tatars and Armenians, who carry on gardening, make wine and produce silk, salt and millstones.

Armenian tradition claims Noah as the founder of Nakhichevan (the Naxuana of Ptolemy), and a mound of earth in the city is still visited by many pilgrims as his grave. Laid waste by the Persians in the 4th century, Nakhichevan sank into comparative insignificance, but by the 10th century had recovered its prosperity. In 1064 it was taken by Alp Arslan, sultan of the Seljuk Turks, and in the 13th century it fell a prey to the Mongols of Jenghiz Khan. It afterwards suffered frequently during the wars between the Persians, Armenians and Turks, and it finally passed into Russian possession by the peace of Turkman-chai in 1828.

NAKHICHEVAN-ON-THE-DON, a town of southern Russia, in the Don Cossacks territory, 6 m. by rail N.E. of the town of Rostov and on the right bank of the Don. Pop. (1900) 30,883. It was founded in 1780 by Armenian immigrants. It soon became a wealthy place, and still is the administrative centre of the ” Armenian district,” a narrow strip along the banks of the Don, with a population of 27,250. The town has tobacco and wadding factories, tallow-melting works, soap-works, brickworks and tanneries. There is a large trade in cereals and timber.

NAKHON SRI TAMMARAT (also known as Lakhon and formerly as Ligoee), a town of southern Siam, in the division of the same name, about 380 m. S. of Bangkok, on the east coast of the Malay Peninsula. It is one of the most ancient cities of Siam, and contains many buildings and ruins of antiquarian interest. The trade consists chiefly of the export of rice. In the bay, a short distance off, ships can lie safely at all seasons. The population (7000) is chiefly Siamese, but there is an ad- mixture of Burmese, the descendants of prisoners of war and of refugees from Tenasserim. The town is the headquarters of a governor under the high commissioner at Singora. It has for long been a centre of the American Presbyterian Mission to Siam. It was once the capital of a feudatory state, the chief of which ruled the greater part of the Malay Peninsula in the name of the kings of Siam and bore the brunt of all the wars with Malacca and other Malay

states. It lies, however, north of the limit of Malay expansion, and has never at any time come under Malay rule. With the fall of the Siamese capital of Ayuthia in 1767 it became independent, but returned to its allegiance on the founding of Bangkok. In the 17th century British, Portuguese and Dutch merchants had factories here and carried on an extensive trade.

‘ NAKSKOV, a seaport of Denmark, in the amt (county) of Maribo, on a wide bay of the Laalands belt at the west end of the island of Laaland, 31 m. by rail W. of Nykjobing. Pop. (1001) 8310. The church dates from the beginning of the f 25th century. There is a large sugar factory. A great dike,

extending S.E. to Rodby (20 m.), protects the coast against inundation, a serious inroad of the sea having occurred in 1872.

NAMAQUALAND, a region of south-western Africa, extending along the west coast over 600 m. from Damaraland (22° 43′ S.) on the north to 31 S., and stretching inland 80 to 350 m. It is divided by the lower course of the Orange river into two portions— Little Namaqualand to the south and Great Namaquaˆ land to the north. Little Namaqualand forms part of Cape Colony (q.v.), and Great Namaqualand is the southern portion of German South- West Africa (q.v.). The people of Namaqua- land are the purest surviving type of Hottentots, and number some twenty to thirty thousand.

NAMASUDRA, the name adopted by the great caste or tribe who inhabit the swamps of Eastern Bengal, India, whom the higher castes are wont to designate by the opprobrious term of Chandal. Their number in 1001 exceeded 2 millions; but if the cognate Pods and also the Mahommedans of the same ethnical stock were to be added, the total would probably reach n millions.

NAME (O. Eng. nama; cognate forms in Teutonic languages are Dutch naam, Ger. Name, &c, but the word is common to all Indo-European languages; cf. Gr. ovo/xa, Lat. nomen, Sans. naman, &c), the distinguishing appellation by which a person, place, thing or class of persons or things is known.

Local Names. — The study of names and of their survival in civilization enables us in some cases to ascertain what peoples inhabited districts now tenanted by races of far different speech. Thus

the names of mountains and rivers in many parts of England are Celtic — for example, to take familiar instances, Usk, Esk and Avon. There are also local names (such as Mona, Monmouth, Mynwy and others) which seem to be relics of tribes even older than the Celtic stocks, and ” vestiges of non-Aryan people, whom the Celts found in possession both on the Continent and in the British Isles.” 1 The later English name is sometimes the mere translation, perhaps unconscious, of the earlier Celtic appellation, often added to the more ancient word. Penpole Point in Somerset is an obvious example of this redoubling of names. The pre-Aryan place-names of the Aegean are much discussed by philologists. Such a name as Corinthos, with all other words in nthos, as hyacinthos, is thought to be pre-Hellenic. The river-names Gade, Ver, Test and many other monosyllabic river-names in the home counties, appear to be neither English nor Celtic, but have been neglected, being known to few but anglers and rustics. As to the meaning and nature of ancient local names, they are as a rule purely descriptive. A river is called by some word which merely signifies “the water”; a hill has a name which means no more than ” the point,” ” the peak,” ” the castle.” Celtic names are often of a more romantic tone, as Ardnamurchan, ” the promontory by the great ocean,” an admirable description of the bold and steep headland which breasts the wash of the Atlantic. As a general rule the surviving Celtic names, chiefly in Ireland, Wales and Scotland, all contain some wide meaning of poetic appropriateness. The English names, on the other hand, commonly state some very simple fact, and very frequently do no more than denote property, such and such a town or hamlet, ” ton ” or ” ham,” is the property of the Billings, Uffings, Tootings, or whoever the early English settlers in the district may have been. The same attachment to the idea of property is exhibited in even the local names of petty fields in English parishes. Occasionally one finds a bit of half-humorous description, as when a sour, starved and weedy plot is named ” starvacre ” ; but more usually fields are known as ” Thompson’s great field,” ” Smith’s small field,” ” the fouracre,” or the like. The name of some farmer or peasant owner or squatter of ancient date survives for centuries, attached to what was once his property. Thus the science of local names has a double historical value. The names indicate the various races (Celtic, Roman and English in Great Britain) who have set in the form of names the seal of their possession on the soil. Again, the meanings of the names illustrate the characters of

‘Elton, Origins of English History, p. 165; Rhys, Lectures on Celtic Phtlology, pp. 181, 182.

the various races. The Romans have left names connected with camps

(castra, chesters) and military roads; the English have used simple descriptions of the baldest kind, or have ex- hibited their attachment to the idea of property; the Celtic names (like those which the red men have left in America, or the blacks in Australia) are musical with poetic fancy, and filled with interest in the aspects and the sentiment of nature. The British race carries with it the ancient names of an older people into every continent, and titles perhaps originally given to places in the British Isles by men who had not yet learned to polish their weapons of flint may now be found in Australia, America, Africa and the islands of the farthest seas. Local names were originally imposed in a handy local manner. The settler or the group of cave-men styled the neighbouring river " the water," the neighbouring hill " the peak," and these terms often still survive in relics of tongues which can only be construed by the learned.

Personal Names. — The history of personal names is longer and more • complex, but proceeds from beginnings almost as simple. But in personal names the complexity of human character, and the gradual processes of tangling and disentangling the threads of varied human interest, soon come in, and per- sonal names are not imposed once and for all. Each man in very early societies may have many names, in different char- acters and at different periods of his life. The oldest personal names which we need examine here are those which indicate, not an individual, but a group, held together by the conscious sense or less conscious sentiment of kindred, or banded together for reasons of convenience. An examination of customs prevalent among the most widely separated races of Asia, Africa, Australia and America proves that groups conceiving themselves to be originally of the same kin are generally styled by the name of some animal or other object (animate or inanimate) from which they claim descent. This object is known as the " totem " (see Totemism). The groups of supposed kin, however widely scattered in local distribution, are known as wolves, bears, turtles, suns, moons, cockatoos, reeds and what not, according as each group claims descent from this or that stock, and some- times wears a mark representing this or that animal, plant or natural object. Unmistakable traces of the same habit of naming exist among Semitic and Teutonic races, and even among Greeks and Romans. The names chosen are commonly those of objects which can be easily drawn in a rude yet recognizable way, and easily expressed in the language of gesture. In addition to the totem names (which indicate, in each example, supposed blood-kindred), local aggregates of men received local names. We hear of the " hili-men," " the cave-men," " the bush-men," " the coast-men," the " men of the plain," precisely as in the old Attic divisions of Aktaioi, Pediaioi and

so forth. When a tribe comes to recognize its own unity, as a rule it calls itself by some term meaning simply ” the men,” all other tribes being regarded as barbarous or inferior. Probably other neighbouring tribes also call themselves ” the men ” in another dialect or language, while the people in the neighbourhood are known by an opprobrious epithet, as Rakshasas among the early Aryan dwellers in India, or Eskimo (raw-eaters) in the far north of the American continent. Tribal names in Australia are often taken from the tribal term for ” yes ” or ” no “; cf. Languedoc.

Leaving social for personal names, we find that, among most uncivilized races, a name (derived from some incident or natural object) is given at the time of birth by the parents of each new- born infant. Occasionally the name is imposed before the child is born, and the proud parents call themselves father and mother of such an one before the expected infant sees the light. In most cases the name (the earliest name) denotes some phenomenon of nature; thus Dobrizhofer met in the forests a young man styled ” Gold flower of day,” that is, ” Dawn,” his father having been named ” Sun.” Similar names are commonly given by the natives of Australia, while no names are more common among North-American Indians than those derived from sun, moon, cloud and wind. The names of savage persons are not permanent. The name

first given is ordinarily changed (at the ceremony answering to confirmation in the church) for some more appropriate and descriptive nickname, and that, again, is apt to be superseded by various ” honour-giving names ” derived from various exploits. The common superstition against being ” named ” has probably produced the custom by which each individual has a secret name and is addressed, when possible, by some wide term of kinship — ” brother,” ” father ” and the like. The bad luck which in Zulu customs as in Vedic myths attends the utterance of the real name is evaded by this system of addresses. Could we get a savage — an Iroquois, for example — to explain his titles, we would find that he is, say, ” Morning Cloud ” (by birth-name), ” Hungry Wolf ” (by confirmation name). ” He that raises the white fellow’s scalp ” (by honour- giving name), of the Crane totem (by kinship and hereditary name, as understood by ourselves). When society grows so permanent that male kinship and paternity are recognized, the custom of patronymics is introduced. The totem ‘name gives place to a gentile name, itself probably a patronymic in form; or, as in Greece, the gentile name gives place to a local name, derived from the deme. Thus a Roman is called Caius; Julius is his gentile name (of the Julian clan); Caesar is a kind of hereditary nickname A Greek is Thucydides (the name usually derived from the grandfather), the son of Olorus, of the deme of Halimusia.

This system of names answered the purposes of Greek and Roman civilization. In Europe, among the Teutonic races, the stock-names (conceivably totemistic in origin) survive in English local names, which speak of the ” ton ” or ” ham ” of the Billings or Tootings. An examination of these names, as collected in Kemble’s Anglo-Saxons, proves that they were frequently derived from animals and plants. Such English names as ” Noble Wolf ” (Ethelwulf), ” Wolf of War ” and so forth, certainly testify to a somewhat primitive and fierce stage of society. Then came more vulgar nicknames and personal descriptions, as ” Long,” ” Brown,” ” White ” and so forth. Other names are directly derived from the occupation or craft (Smith, Fowler, Sadler) of the man to whom they were given, and yet other names were derived from places. The noble and landowner was sailed ” of ” such and such a place (the German von and Prench dc), while the humbler man was called not ” of ” but ” at ” such a place, as in the name ” Attewell,” or merely by the local name without the particle. The ” de ” might also indicate merely the place of a person’s birth or residence; it was not a proof of noblesse. If we add to these names patronymics formed by the addition of ” son,” and terms derived from Biblical characters (the latter adopted after the Reformation as a re- action against the names of saints in the calendar), we have almost exhausted the sources of

modern English and European names. A contrhual development of custom can be traced, and the analysis of any man's family and Christian names will lead us beyond history into the manners oi races devoid of literary records. ' (A. L.)

Creek Names. — The Greeks had only one, and no family, name; hence the name of a child was left to the discretion of the parents. The eldest son generally took the name of his paternal grand- father, girls that of their grandmother. Genuine patronymics (Phocion, son of Phocus), analogous compounds (Theophrastus, son of Theodorus), or names of similar meaning (Philumenus, son of Eros) also occur. Athenaeus divides names generally into (i) deexfiopa, chiefly derivatives or compounds of the names of gods (Demetrius, Apollonius, Theodorus, Diodotus, Heraclitus, Diogenes); (2) cbea, simple or variously compounded names, especially such as were of good omen for a son's future career (Aristides, Pericles, Sophocles, Alexander), although such hopes were frequently belied by the results. Instances of a subsequent change of name are not uncommon: thus, Plato and Theo- phrastus were originally Aristocles and Tyrtamus.

To obviate the ambiguit3<- and confusion arising from the use of a single name, various expedients were adopted, the commonest being to add the father's name — A-nnoo-devrjs Arinoodkvovs, 'A.Kia@ia.8vis 6 KKavlov. Sometimes the birthplace was added —

'HpoSoros 'AXt/cappcKTcreiis, GovKvSiSris 'AOrjvaios, and sometimes the name of the deme (see Cleisthenes), e.g. Arifj-oadevrj's Tlaiavevs , Nicknames denoting mental or bodily defects or striking peculiarities (e.g. colour of hair) were also favourite methods of discrimination (eg. Savdos, yellow).

Roman Names. — Towards the end of the republic free-born Romans were distinguished by three names and two (or even four) secondary indications. In an inscription the name of Cicero is givenin the following form: M. Tullius M.f. M.n. M.pr. Cor(nelia tribu) Cicero. M (= Marcus) is the praenomen; Tullius, the nomen, the gentile or family name; Cicero, the cognomen. This order, always preserved, is the correct one. M.f. (= Marci Alius), M.n. (= Marci nepos), M.pr. (= Marci pronepos),Cor(nelia tribu) are only used in formal description.

Praenomen (corresponding to the modern Christian name). — Varro gives a list of 32 praenomina, of which 14 had fallen out of use in Sulla's time, the remaining 18 being confined to patrician families. Some of these appear to have been appropriated by particular families, e.g. Appius by the Claudii, Mamercus by the Aemilii. In the

case of plebeian families there was greater latitude and a larger variety of names, but those which became ennobled followed the patrician usage. After the time of Sulla some of the old praenomina were revived, unless they are rather to be regarded as cognomina, which in some families displaced the praenomen proper, as in the case of a certain Africanus Aemilius Regulus.

The nomen {gentile, gentilicium) belonged to all the individual members of the gens and those in any way connected with it (wives, clients, freedmen). In patrician gentes the nomina nearly all ended in -ius (-aeus, -eius, -eus), and are perhaps a sort of patronymic (Iulius from lulus). In some cases the name indicates the place of origin (Norbanus, Acerranus) ; -acus (Divitiacus) is peculiar to Gallic, -na (Caecina, Perperna) to Etruscan, -enus (Arulenus) to Umbrian names. Verres as a gentile name stands by itself; perhaps it was originally a cognomen.

The cognomen (" surname ") was the name given to a Roman citizen as a member of a familia or branch of the gens, whereby the family was distinguished from other families belonging to the same gens. Cognomina were either of local origin (Calatinus, Sabinus) ; or denoted physical peculiarities or moral characteristics (Crassus, Longus, Lentulus, Lepidus, Calvus, Naso) ; or they were really praenomina (Cossus, Agrippa) or derivatives from praenomina or cognomina (Sextinus, Corvinus, Laevinus). The tria nomina (" three names ") in the well-known passage of Juvenal (v. 127) was probably at that time a mark of ingenuitas rather than of nobilitas.

In addition to these three regular names, many Romans had a fourth, cognomen secundum [agnomen was an introduction of the grammarians of the 4th century). These " second surnames " were chiefly bestowed in recognition of great achievements — Asiaticus, Africanus, Creticus, or were part of the terminology in cases of adoption.

Persons adopted took all the three names of their adoptive father, but at the same time, to keep his origin in mind, they added a second cognomen, a derivative in -anus or -inus from his old gentile name; thus, Publius Cornelius Scipio Aemilianus, son of Lucius Aemilius Paullus, adopted by Publius Cornelius Scipio. After the time of Sulla, the derivative was no longer used, one of the old names being substituted without change — Marcus Terentius Varro Lucullus. Under the empire no fixed rule was observed, the most remarkable thing being the very large number of names borne by one person (as many as ?6 occur on an inscription). Especially in the army and amongst the

lower orders, nicknames {signa, vocabula) are of frequent occurrence. Well-known examples are: Caligula; cedo alteram ("another stick, please! "), given to a centurion of flogging pro- pensities; manus ad ferrum ("hand on sword,") of Aurelian when tribune.

Women originally took the name of the head of the family — Caecilia (filia) Metelli, Metella Crassi (uxor). Later, f. (= fiiia) was added after the name of a daughter. Towards the end of the republic women are denoted by their gentile name alone, while under the empire they always have two — the nomen and cognomen of the father (Aeniilia Lepida, daughter of, Lucius Aemilius Lepidus Paullas), or the nomen of both father and mother (Valeria Attia, daughter of Attius Atticus and Valeria Sextina).

Slaves originally had no name, but simply took their master'. praenomen in the genitive followed by -por (=puer): Marcipor, Publipor, Quintipor. Later, when the number of slaves was largely increased, by way of distinction names similar to those common in Greece (national, physical or moral qualities) or simply foreign names were given them. The word puer was subsequently replaced by se.rvus and the form of the name ran: ˆphrodisius Ploti Gai servus; under the empire, Eleutherus C. Julii Florentini (the natural order being preserved in the master's name). When a slave exchanged one master for another, he adopted the name of his old master in an adjectival form in -anus . Cissus Caesaris (.servus) Maecenatianus (formerly a slave of Maecenas). Freedmen used their own name as I a cognomen and took the nomen of him who gave them their freedom

and any praenomen they pleased: L. Livius Andronicus, freedman of M. Livius Salinator. In the time of Caesar, the freedman took the praenomen of the patronus and the gentile name of one of the friends of the latter; thus, Cicero calls his slave Dionysius M. Pomponius Dionysius as a token of friendship for T. Pomponius Atticus.

a- H. F.) Law. — The Christian name, i.e. the name given to a person on admission to baptism into the Christian church, dates back to the early history of the Church. It has been said that the practice of giving a name on baptism was possibly imitated from the Jewish custom of giving a personal name at circumcision. In England individuals were for long distinguished by Christian names only, and the surname (see. below) or family name is still totally ignored by the Church'. As

population increased and intercourse became general, it became necessary to employ some further name by which one man might be known from another, and in process of time the use of surnames became universal, the only exceptions in England being the members of the royal family, who sign by their baptismal names only.

Where the ecclesiastical law does not come into conflict with the common law or has not been changed by it, it still prevails, and therefore it may be said that the name given at baptism may be regarded as practically unalterable. But that a baptismal name is not altogether unalterable has been a matter of contention. A constitution of Archbishop Peckham (ob. 1292) directs that " ministers shall take care not to permit wanton names to be given to children baptized, and if otherwise it be done, the same shall be changed by the bishop at confirmation." And before the Reformation the Office for Confirmation must have contemplated the possibility of such a change, as the bishop is directed therein to ask the child's name before anointing him with the chrism, and afterwards, naming him, to sign him with the cross. But in the second and subsequent Prayer-books all mention of the name in the Office for Confirmation is omitted. Lord Coke was of opinion that such a change was permissible and gives examples (1 Inst. p. 3), but Dr Burn {Ecc. Law, i. 80) held a contrary opinion. Phillimore, however, gives several instances when such a change was made, one, in the diocese of Liverpool, on the nth of June 1886 (see Phillimore, Ecc. Law, i. 517, 518; and also Notes and Queries, 4th ser. vol. vi. p. 17, 7th ser.Vol. ii. p. 17). Inthecaseof those who have not been baptized, but have a name (other than a surname) given them by their parents, such a name acquires force only by repute. The Registration of Births Act, which requires the registration of every birth, makes provision for the insertion of a name, but such provision is purely permissive, and the only object of entering a name on the register is to have an authoritative record of the commencement of repute.

A clergyman of the Church of England is compelled to perform the ceremony of baptism when required by a parishioner, and to give whatever name or names the godparents select, but although the rubrics do not expressly say so, he can object to any name on religious or moral grounds.

The freedom enjoyed in England and the United States as to the kind of Christian name which may be given to a child is somewhat limited in France and Germany. In France, by a decree of the 11 Germinal, an XL, the only names permitted to be recorded in the civil register as Christian names (prenoms) of children were those of saints in the

calendar and the names of personages known in ancient history. Even at the present day an official list is issued (revised from time to time) containing a selection of forenames, and no name of a child will be registered unless it occurs in this list. A limitation more or less similar prevails in Germany and other European countries.

As regards the surname (Fr. surnom, name in addition), custom has universally decreed that a man shall be known by the name of his father. But in England and the United States, at least, this custom is not legally binding; there is no law preventing a man from taking whatever name he has a fancy for, nor are there any particular formalities required to be observed on adopting a fresh surname; but, on the other hand, if a man has been known for a considerable time by the name of his father, or by a name of repute, and he changes it for another, he cannot compel others to address him or designate him by the new one. Neither does the English law recognize the absolute right of any person in any particular name to the extent of preventing anothcr'person from assuming it (Du Boulay v. Du Boutay, 1869, L.R. 2 P.C. 430). If, however, a person adopts a new name and wishes to have it publicly notified and recog- nized in official circles, the method of procedure usually adopted is that by royal licence. This is by petition, prepared and presented through the Heralds' Office. If granted, the royal licence is given under the sign manual and privy seal of the sovereign, counter- signed by the home secretary. In wills and settlements a clause is often inserted whereby a testator or settler imposes upon the takers of the estate an obligation to assume his name and bear his arms. The stamp duty payable for a royal licence in this case is fifty pounds, but if the application is merely voluntary the stamp duty is ten pounds. Where there is a more formal adoption of a surname,

it is usual, for purposes of publicity and evidence, to advertise the change of name in the newspapers and to execute a deed poll setting out the change, and enrol the same in the central office of the Supreme Court.

Both in France and Germany official authorization must be ob- tained for any change of name. By the German Code 1900 (s. 12) if the right to a new- name is disputed by another or his interest is injured thereby, the person entitled can compel the abandonment of the new name.

In England, a wife on marriage adopts the surname of her husband, disregarding entirely her maiden surname; in Scotland the practice usually is for the wife to retain her maiden name for all legal

purposes, adding the name of her husband as an alias. On remarriage the rule is for the wife to adopt the name of the new husband, but an ex- ception to this is tacitly recognized in the case of a title acquired by marriage when the holder remarries a commoner. This exception was very fully discussed in Cowley v. Cowley, 1901 , A.C. 450.

Peers of the United Kingdom when signing their names use only their surnames or peerage designations. It is merely a privileged custom, which does not go back further than the Stuart period. Peeresses sign by their Christian names or initials followed by their peerage designation. Bishops sign by their initials followed by the name of the see. In Scotland it is very usual for landowners to affix to their names the designation of their lands, and this was expressly sanctioned by an act of 1672.

See Ency. Eng. Law, tits. “Christian Name,” “Surname”; W. P. W. Phillimore, Law and Practice of Change of Name; Fox- Davies and Carlyon-Britton, Law concerning Names and Changes of Name. (T. A. I.)

NAMUR, one of the nine provinces of Belgium. It lies between Hainaut on the one side and Liege and Luxemburg on the other, and extends from Brabant up the Meuse valley to the French frontier. Area, 1414 sq. m.; pop. (1904) 357,759. The part north of the Meuse is very fertile, but the rest is covered with forest and is little suited for agriculture. There are a few iron and coal-mines between the Sambre and Meuse, and the quarries are of great importance. Arboriculture, and especially fruit-tree plantation, is on the increase. The province is divided into the three arrondissements of Namur, Dinant and Philippeville, and there are fifteen cantons for judicial purposes.

NAMUR (Flemish, Namen), a town of Belgium, capital of the province of Namur. Pop. (1004) 31,940. It is most pictur- esquely situated at the junction of the rivers Sambre and Meuse, the town lying on the left banks of the two rivers, while the rocky promontory forming the fork between them is crowned with the old citadel. This citadel is no longer used for military purposes, and the hill on which it stands has been converted into a public park, while the crest is occupied by an enormous hotel to which access is gained by a cogwheel railway. Namur is connected with the citadel by two bridges across the Sambre, and from the east side of the promontory there is a fine stone bridge to the suburb of Jambes. This bridge was constructed in the nth century and rebuilt in the reign of Charles V. It is the only old bridge in existence over the Meuse in the Belgian portion of its course. The cathedral of St Aubain or Albin was built in the middle of the 18th

century. The church of St Loup is a century older, and is noticeable for its columns of red marble from the quarry at St Remy near Rochefort. There is a considerable local industry in cutlery, and there are numerous tanneries along the river-side.

The hill of the citadel is perhaps identical with Aduaticum, the fortified camp of the Aduatici captured and destroyed by Julius Caesar after the defeat of the Nervii, although many authorities incline to the plateau of Hastedon, north of the Sambre and of Namur itself, as the more probable site of the Belgic position. Many antiquities of the Roman-Gallic period have been discovered in the neighbourhood and are preserved in the local archaeological museum. Here also are deposited the human fossils of the Stone Age discovered at Furfooz on the Lesse. In the feudal period Namur was always a place of some import- ance, and long formed a marquisate in the Courtenay family. One institution of the medieval period came down to modern times, and was only discontinued in consequence of the fatalities with which it was generally accompanied. This was the annual encounter on the Place d'Armes of rival parties mounted on stilts. Galliot, the historian of Namur, says the origin of these jousts is lost in antiquity, but considers the use of stilts was due

to the frequency with which the town was flooded before the rivers were embanked. Don John of Austria made Namur his headquarters during the greater part of his stay in the Nether- lands, and died here in 1578. As a fortress Namur did not attain the first rank until after its capture by Louis XIV. in 1692, when Vauban endeavoured to make it impregnable; but it was retaken by William III. in 1695. The French recaptured it in 1 702 and retained possession for ten years. In 181 5 Marshal Grouchy on his retreat into France fought an action here with the Prussians under General Pirch. In 1888, under the new scheme of Belgian defence, the citadel and its detached works were abandoned, and in their place nine outlying forts were constructed at a distance of from 3 to 5 m. round the town. All these forts are placed on elevated points. They are in their order, beginning on the left bank of the Meuse and ending on the right bank of the same river: (1) St Heribert, (2) Malonne, (3) Suarlee, (4) Emines, (5) Cognelee, (6) Gelbressee, (7) Maizeret, (8) Andoy and (9) Dave. The whole position is correctly de- scribed as the " tete de pont " of Namur, and in addition to its strong bomb-proof forts it possesses great natural advantages for the defence of the intervals.

NANA FARNAVIS (1 741-1800), the great Mahratta minister at Poona at the end of the 18th century. His real name was Balaji Janardhan Bhanu; but, like many other Mahrattas, he was always known by a kind of nickname. Nana properly means a maternal grandfather; Farnavis is the official title of the finance minister, derived from /arc/ = an account and navis = a writer. He was born at Satara on the 4th of May 1741, and was the son of a Chitpavan Brahman, of the same class as the Peshwa, who held the hereditary office of Farnavis. He escaped from the fatal battle of Panipat in 1761; and from about 1774 was the leading personage in directing the affairs of the Mahratta confederacy, though never a soldier. This was the period when Peshwas rapidly succeeded one another, and there was more than one disputed succession. It was the policy of Nana Farnavis to hold together the confederacy against both internal dissensions and the growing power of the British. He died at Poona on the 13th of March 1800, just before the Peshwa placed himself in the hanls of the British and thus* broke up the Mahratta confederacy. In an extant letter to the Peshwa, the Marquess Wellesley thus describes him: ” The able minister of your state, whose upright principles and honourable views and whose zeal for the welfare and prosperity both of the dominions of his own immediate superiors and of other powers were so justly cele- brated.”

See Captain A. Macdonald, Memoir of Nana Furnuwees (Bombay,

1851).

NANAIMO, a city of British Columbia, on the east coast of Vancouver Island. Pop. (1906) about 6500. It is connected with Victoria by the Esquimalt and Nanaimo railway, and has a daily steamer service to Vancouver, as well as to Comox, Sydney and other points on the coast. It is favourably situated for growing fruit, and mixed farming is carried on to a consider- able extent. There is a large export trade in coal from the neighbouring mines, which is sent chiefly to San Francisco.

NANA SAHIB, the common designation of Dandu Panth, an adopted son of the ex-peshwa of the Mahrattas, Baji Rao, who took a leading part in the great Indian Mutiny, and was proclaimed peshwa by the mutineers. Nana Sahib had a griev- ance against the British government because they refused to continue to him the pension of eight lakhs of rupees (£80,000) which was promised to Baji Rao by Sir John Malcolm on his surrender in 1818. This pension, however, was only intended to be a life grant to Baji Rao himself. For this refusal the Nana bore the British a lifelong grudge, which he washed out in the

blood of women and children in the massacres at Cawnpore. In 1859, when the remnants of the rebels disappeared into Nepal, the Nana was among the fugitives. His death was reported some time afterwards, but his real fate remains obscure.

NANCY, a town of north-eastern France, the capital formerly of the province of Lorraine, and now of the department of Meurthe-et-Moselle, 219 m. E. of Paris on the railway to Strass-

burg. Pop. (1906), town, 98,302; commune (including troops), 110,570. Nancy is situated on the left bank of the Meurthe 6 m. above its junction with the Moselle and on the Marne- Rhine canal. The railway from Paris to Strassburg skirts the city on the south-west side; other railways — to Metz, to Epinal by Mirecourt, to Chateau Salins— join the main line near Nancy, and make it an important junction. The town consists of two portions — the Ville-Vieille in the north-west between the Cours Leopold and the Pepiniere gardens, with narrow and winding streets, and the Ville-Neuve in the south-east with wide straight streets, allowing views of the hills around the city. Between the two lies, the Place Stanislas, a square worthy of a capital city: in the centre stands the statue of Stanislas Leczinski, ruler of Lorraine, and on all sides rise imposing buildings in the 18th- century style— the town hall, episcopal palace, theatre, &c. A fine triumphal arch erected by Stanislas in honour of Louis XV. leads from the Place Stanislas to the Place Carriere, which forms a beautiful tree-planted promenade, containing at its further end the government palace (1760) now the residence of the general commanding the XX. army corps, and adjoins the so-called Pepiniere (nursery) established by Stanislas. Other open spaces in the city are the Place d'AUiance (formed by Stanislas, with a fountain in memory of the alliance between Louis XV. and Maria Theresa in 1756), the Place de l'Academie, the Place St Epvre with a statue of Duke Rene II., the Place Dombasle and the Place de Thiers, the two latter embellished with the statues of Mathieu Dombasle, the agri- culturist, and Adolphe Thiers. • The cathedral in the Ville- Neuve, built in the 18th century, has a wide facade flanked by two dome-surmounted towers, and a somewhat frigid and sombre interior. Of particular interest is the church of the Cordeliers, in the old town, built by Rene II. about 1482 to commemorate his victory over Charles the Bold. Pillaged during the Revolution period, but restored to religious uses in 1825, it contains the tombs of Antony of Vaudemont and his wife Marie d'Harcourt, Philippe of Gueldres, second wife of Rene II., Henry III., count of Vaudemont, and Isabella of Lorraine his wife, Rene II. (a curious monument raised by his widow in 1515) and Cardinal de Vaud6mont (d. 1587). Here also is a chapel built at the beginning of the 17th

century to receive the tombs of the princes of the house of Lorraine. The church of St Epvre, rebuilt between 1864 and 1874 on the site of an old church of the 13th, 14th and 15th centuries, has a fine spire and belfry and good stained glass windows. Bonsecours Church, at the end of the St Pierre Faubourg, contains the mausoleums of Stanislas (by whom it was built) and his wife Catherine, and the heart of their daughter Marie, queen of France, as well as the statue of Notre- Dame de Bonsecours, the object of a well-known pilgrimage. Of the old ducal palace, begun in the 15th century by Duke Raoul and completed by Rene II., there remains but a single wing, partly rebuilt after a fire in 1871. The entrance to this wing, which contains the archaeological museum of Lorraine, is a beautiful specimen of the late Gothic of the beginning of the 16th century. One of the greatest treasures of the collection is the tapestry found in the tent of Charles the Bold after the battle of Nancy. Of the old gates of Nancy the most ancient and remarkable is the Porte de la Craffe (1463). The town hall contains a museum of painting and sculpture, arid there is a rich municipal library. A monument to President Carnot, and statues of Jacques Callot, the engraver, and of General Drouot, both natives of Nancy, and of Claude Gellee stand in various parts of the town.

Nancy is the seat of a bishop, a prefect, a court of appeal and a court of assizes, headquarters of the XX. army corps, and centre of an academie (educational division) with a university comprising faculties of law, medicine, science and letters, and a higher school of pharmacy. There are also tribunals of first instance and of commerce, a board of trade-arbitrators, lycees and training colleges for both sexes, a higher ecclesiastical seminary, a school of agriculture, the national school of forestry, a higher school of commerce, a technical school {ecole professionnelle), a school of arts and crafts (ecole preparatoire des arts et metiers), a chamber

of commerce and a branch of the Bank of France. The industries of Nancy include printing, brewing, cotton- and wool-spinning and the weaving of cotton and woollen goods, and the manufacture of tobacco (by the State), of boots and shoes, straw hats, pottery, casks, embroidery, machinery, engineering material, farm im- plements and iron goods.

At the close of the nth century Odelric of Nancy, brother of Gerard of Alsace, possessed at Nancy a castle which enabled him to defy the

united assaults of the bishops of Metz and Treves and the count of Bar. In the 12th century the town was sur- rounded with walls, and became the capital of the dukes of Lorraine; but its real importance dates from the 15th century, when on the 5th of January 1477 Charles the Bold was defeated by Rene II, and perished at its gates. 1 Enlarged, embellished and admirably refortified by Charles III., it was taken by the French in 1633 (Louis XIII. and Richelieu being present at the siege). After the peace of Ryswick in 1607 it was restored and Duke Leopold set himself to repair the disasters of the past. He founded academies, established manufactures and set about the construction of the new town. But it was reserved for Stanislas Leczinski, to whom Lorraine and Bar were assigned in 1736, to carry out the plans of improvement in a style which made Nancy one of the palatial cities of Europe, and rendered himself the most popular as he was the last of the dukes of Lorraine. The city, which became French in 1766, was occupied by the allies in 1814 and 1815, and put to ransom by the Prussians in 1870. After the Franco-German war the population was greatly increased by the immigration of Alsatians and of. people from Metz and its district.

See C. Pfister, Histoire de Nancy (Paris and Nancy, 1902) ; J. Cayon, Histoire physique, civile, morale et politique de Nancy (Nancy, 1846).

NANDAIR, or Nander, a town of India, in the state of Hyderabad, on the left bank of the Godaveri, with a station on the Hyderabad-Godaveri valley railway, 174 m. N.E. of Hyderabad city. Pop. (1901) 14,184. It is a centre of local trade, with a special industry of fine muslin and gold bordered scarves. As the scene of the murder of Guru Govind, it contains a shrine visited by Sikhs from all parts of India.

NANDGAON, a feudatory state of India, in the Chhattisgarh division of the Central Provinces. Area, 871 sq. m.; pop. (1901) 126,356, showing a decrease of 31% in the decade, due to famine; estimated revenue £23,000; tribute £4600. The state has a peculiar history. Its foundation is traced to a religious celibate, who came from the Punjab towards the end of the 18th century. From the founder it passed through a succession of chosen disciples until 1879, when the British government recognized the ruler as an hereditary chief and afterwards conferred upon his son the title of Raja Bahadur. The state has long been well administered, and has derived additional prosperity from the construction of the Bengal-Nagpur railway, which has a station at Raj-Nandgaon, the capital (pop. 11,094). Here there is a steam cotton mill.

NANDI, an East African tribe of mixed Nilotic, Bantu and Hamitic

origin. With them are more or less closely allied the Lumbwa (correctly Kipsikls), Buret (or Puret) and Sotik (Soot) tribes, as well as the Elgonyi (properly Kony) of Mount Elgon. They have also affinities with the Masai tribes. The Nandi-Lumbwa peoples inhabit the country stretching south from Mount Elgon to about 1° S. and bounded east by the escarp- ment of the eastern rift-valley and west by the territory of the tribes, such as the Kavirondo, dwelling round the Victoria Nyanza. They have given their name to the Nandi plateau. The Hamitic strain in these allied tribes is derived from the Galla; they also exhibit Pygmy elements. Their original home was in the north, and they probably did not reach their present home until the beginning of the 19th century. They differ considerably

1 The battle raged in the district to the S., E. and N. of the town, the operations extending from St Nicolas du Port (S.) to the bridge of Bouxieres (N.). The chief struggle took place on the banks of the stream of Bon Secours, which now runs entirely underground, flowing from the S.W. into the Meurthe. Much of the battlefield is now covered by modern buildings, but S.W. of the town a cross marks the spot where the body of Charles the Bold was discovered.

in physical appearance; some resemble the Masai, being men of tall stature with features almost Caucasian, other are dwarfish with markedly negro features. Like the Masai, Turkana and Suk, the Nandi-Lumbwa tribes were originally nomadic, but they have become agriculturists. They own large herds of cattle. They have a double administrative system, the chief medicine man or Orkoiyol being supreme chief and regulating war affairs, while representatives of the people, called Kiruogik, manage the ordinary affairs of the tribe. The medicine men are of Masai origin and the office is hereditary. The young men form a separate warrior class to whom is entrusted the care of the country. A period of about 7! years is spent in this class, and the ceremony of handing over the country from one ” age ” to the succeeding ” age ” is of great importance. The arms of the warriors are a stabbing spear, shield, sword and club. Many also possess rifles. All the Nandi are divided into clans, each having its sacred animal or totem. They have no towns, each family living on the land it cultivates. The huts are of circular pattern. The Nandi believe in a supreme deity — Asis — who takes a benevolent interest in their welfare, and to whom prayers are addressed daily. They also worship ancestors and consider earthquakes to be caused by the spirits moving in the underworld. They practise circumcision, and girls undergo a similar operation. Spitting is a sign of blessing. Their scanty clothing

consists chiefly of dressed skins. The tribal mark is a small hole bored in the upper part of the ear. Their language is Nilotic and in general construction resembles the Masai. It has been slightly influenced by the Somali tongue. The primitive hunting tribe known as the Wandorobo speak a dialect closely resembling Nandi.

The Nandi at one time appear to have been subject to the Masai, but when the country was first known to Europeans they were independent and occupied the plateau which bears their name. Hardy mountaineers and skilful warriors, they closed their territory to all who did not get special permission, and thus blocked the road from Mombasa to Uganda alike to Arab and Swahili. Caravans that escaped the Masai frequently fell victims to the Nandi, who were adepts at luring them to destruction. When the railway to the Victoria Nyanza was built it had to cross the Nandi country. The tribesmen, who had already shown hostility to the whites, attacked both the railway and the telegraph line and raided other tribes. Eventually (1905-1906) the Nandi were removed by the British to reserves somewhat north of the railway zone (see British East Africa). The Lumbwa reserve lies south of the railway, and farther south still are the reserves of the Buret and Sotik.

See A. C. Hollis, The Nandi: Their Language and Folk-lore, with introduction by Sir Charles Eliot (Oxford, 1909), and the works there cited.

NANDIDRUG, a hill fortress of southern India, in the Kolar district of Mysore, 4851 ft. above the sea. It was traditionally held impregnable, and its storming by Lord Cornwallis in 1791 was one of the most notable incidents of the first war against Tippoo Sultan. It was formerly a favourite resort for British officials during the hot season.

NANGA, the most primitive form of the ancient Egyptian harp. The nanga consisted of a boat-shaped or vaulted body of wood, the back of which was divided down the centre by a sound bar built into the back; on this bar was fixed a cylindrical stick round which one end of the strings was wound, the soundboard or parchment being stretched over the back without interfering with the stick. The other end of the strings was fastened to pegs set in the side of a curved neck, so that the strings did not lie directly over the soundboard. There were but 3 or 4 strings, one note only being obtained from each. Some of these nangas are to be seen at the British Museum.

NANKEEN, a cotton cloth originally made in China, and now imitated in various countries. The name is derived from Nanking, the city in

which the cloth is said to have been originally manufactured. The characteristic yellowish colour of nankeen is attributed to the peculiar colour of the cotton from which it was originally made.

NANKING (” the southern capital “), the name by which Kiang-ning, the chief city in the province of Kiangsu, China, has been known for several centuries. Pop. about 140,000. The city stands in 32 5′ N., 118° 47′ E., nearly equidistant between Canton and Peking, on the south bank of the Yangtsze Kiang. It dates only from the beginning of the Ming dynasty (1368), although it is built on the site of a city which for more than two thousand years figured under various names in the history of the empire. The more ancient city was originally known as Kin-ling; under the Han dynasty (206 B.C. to a.d. 25) its name was con- verted into Tan-yang; by the T’ang emperors (a.d. 618-907) it was styled Kiang-nan and Sheng Chow; by the first sovereign of the Ming dynasty (a.d. 1368-1644) it was created the ” southern capital ” (Nan-king), and was given the distinctive name of Ying-t’ien; and since the accession to power of the present Manchu rulers it has been officially known as Kiang-ning, though still popularly called Nan-king. It was the seat of the imperial court only during the reigns of the first two emperors of the Ming dynasty, and was deserted for Shun-t’ien (Peking) by Yung-lo, the third sovereign of that line, who in 1403 captured the town and usurped the crown of his nephew, the reigning emperor.

The T’aip’ing rebels, who carried the town by assault in 1853, swept away all the national monuments and most of the more conspicuous public buildings it contained, and destroyed the greater part of the magnificent wall which surrounded it. This wall is said by Chinese topographers to have been 96 li, or 32 m., in circumference. This computation has, however, been shown to be a gross exaggeration, and it is probable that 60 li, or 20 m., would be nearer the actual dimensions. The wall, of which only small portions remain, was about 70 ft. in height, measured 30 ft. in thickness at. the base, and was pierced by thirteen gates. Encircling the north, east, and south sides of the city proper was a second wall which enclosed about double the space of the inner enclosure. In the north-east corner of the town stood the imperial palace reared by Hung-wu, the imperial founder of the modern city. After suffering mutilation at the overthrow of the Ming dynasty, this magnificent building was burnt to the ground on the recapture of the city from the T’aip’ing rebels in 1864. But beyond

comparison the most conspicuous public building at Nanking was the famous porcelain tower, which was designed by the emperor Yung-lo (1403-1428) to commemorate the virtues of his mother. Twelve centuries previously an Indian priest deposited on the spot where this monument afterwards stood a relic of Buddha, and raised over the sacred object a smˆii pagoda of three stories in height. During the disturbed times which heralded the close of the Yuen dynasty (1368) this pagoda was utterly destroyed. It was doubtless out of respect to the relic which then perished that Yung-lo chose this site for the erection of his ” token-of-gratitude ” pagoda. The building was begun in 1413. But before it was finished Yung-lo had passed away, and it was reserved for his successor to see the final pinnacle fixed in its place, after nineteen years had been consumed in carrying out the designs of the imperial architect. In shape the pagoda was an octagon, and was about 260 ft. in height, or, as the Chinese say, with that extraordinary love for inaccurate accuracy which is peculiar to them, 32 chang (a chang equals about 1 20 in.) 9 ft. 4 in. and ft, of an inch. The outer walls were cased with bricks of the finest white porcelain, and each of the nine stories into which the building was divided was marked by overhanging eaves composed of green glazed tiles of the same material. The summit was crowned with a gilt ball fixed on the top of an iron rod, which in its turn was encircled by nine iron rings. Hung on chains which stretched from this apex to the eaves of the roof were five large pearls of good augury for the safety of the city. One was supposed to avert floods, another to prevent tires, a third to keep dust-storms at a distance, a fourth to allay tempests, and a fifth to guard the city against disturbances. From the eaves of the several stories there hung one hundred and fifty-two bells and countless lanterns. In bygone days Nanking was one of the chief literary centres of the empire, besides being famous for

its manufacturing industries. Satin, crape, nankeen, cloth, paper, pottery, and artificial flowers were among its chief products.

At Nanking, after its capture by British ships in 1842, Sir Henry Pottinger signed the ” Nanking treaty.” It was made a treaty port by the French treaty of 1858, but was not formally opened. Its proximity to Chinkiang, where trade had established itself while Nanking was still in the hands of the rebels, made its opening of little advantage, and the point was not pressed. In 1899 it was voluntarily thrown open to foreign trade by the Chinese government, and in 1909 it was connected by railway (192 m. long) with Shanghai.

Since 1880 Nanking has been slowly recovering from the ruin caused by the T’aip’ing rebellion. Barely one-fourth of the area within the

walls has been reoccupied, and though its ancient industries are reviving, no great progress has been made. As the seat of the provincial government of Kiang-nan, however, which embraces the three provinces of Kiang-su, Kiang-si, and Ngan-hui, Nanking is a city of first-class importance. The viceroy of Kiang-nan is the most powerful of all the provincial satraps, as he controls a larger revenue than any other, and has the command of larger forces both naval and military. He is also superintendent of foreign trade for the southern ports, including Shanghai, a position which gives him great weight in all political questions. The city contains an arsenal for the manufacture of munitions of war, also powder-mills. A naval college was opened in 1890, and an imperial military college a few years later under foreign instructors. The only foreign residents are missionaries (mostly American), and employes of the Chinese government. The only remaining features of interest in Nanking are the so-called Ming Tombs, being the mausolea of Hung-wu, the founder of the Ming dynasty, and of one or two of his successors, which lie outside the eastern wall of the city. They are ill cared for and rapidly going to decay. Since 1899 the foreign trade has shown a steady increase.

NANNING. a treaty port in the province of Kwangsi, China, on the West river, 250 m. above Wuchow and 470 m. from Canton. Pop. about 40,000. It is the highest point accessible for steam traffic on the West river. From Canton to Wuchow the river has a minimum depth of 8 ft., but on the section from Wuchow to Nanning not more than 3 or 4 ft. are found during winter. The town is the chief market on the southern frontier. Its opening was long opposed by the French government, who had acquired the right to build a railway to it from Tongking, by which they hoped to divert the trade through their own possessions. Navigation by small native boats is open west- wards as far as Paise.

NANSEN, FRIDTJOF (1861-), Norwegian scientist, ex- plorer and statesman, was born at Froen near Christiania on the 10th of October 1861. His childhood was spent at this place till his fifteenth year, when his parents removed to Christiania, where he went to school. He entered Christiania university in 1880, where he made a special study of zoology; in March 1882 he joined the sealing-ship ” Viking ” for a voyage to Greenland waters. On his return in the same year he was appointed curator of the Bergen Museum, under the eminent physician and zoologist Daniel Cornelius D an ielssen (1815-1894). In 1886 he spent a short time at the zoological station at Naples. During this time he wrote several papers and memoirs on zoological and histological subjects, and for one paper on ” The Structure and Combination of the Histological Elements of the Central Nervous

System ” (Bergen, 1887) the Christiania university conferred upon him the degree of doctor of philosophy. But his voyage in the ” Viking ” had indicated Greenland as a possible field for exploration, and in 1887 he set about preparations for a crossing of the great ice-field which covers the interior of that country. The possibility of his success was discountenanced by many Arctic authorities, and a small grant he had asked for was refused by the Norwegian government, but was provided by Augustin Game], a merchant of Copenhagen, while he paid from his private means the greater part of the expenses of the expedition. As companions Nansen had Otto Neumann Sverdrup (b. 1855),

Captain O. C. Dietrichson (b. 1856), a third compatriot, and two Lapps. The expedition started in May 1888, proceeding from Leith to Iceland, and there joining a sealing-ship bound for the east coast of Greenland. On the 17th of July Nansen decided to leave the ship and force a way through the ice-belt to the land, about 10 m. distant, but the party encountered great difficulties owing to ice-pressures, went adrift with the ice, and only reached the land on the 29th, having been carried far to the south in the interval. They made their way north again, along the coast inside the drift ice, and on the 16th of August began the ascent of the inland ice. Suffering severely from storms, intense cold, and other hardships, they reached the highest point of the journey (8920 ft.) on the 5th of September, and at the end of the month struck the west coast at the Ameralik Fjord. On reaching the settlement of Godthaab it was found that the party must winter there, and Nansen used the oppor- tunity to study the Eskimos and gather material for his book, Eskimo Life (English translation, London, 1893). The party returned home in May 1889, and Nansen’s book, The First Crossing of Greenland (English translation, London, 1890), demonstrates the valuable scientific results of the journey. A report of the scientific results was published in Petermanns Mitteilungen (Gotha, 1892). On his return from Greenland Nansen accepted the curatorship of the Zootomic Museum of Christiania university. In September 1889 he married Eva, daughter of Professor Michael Sars of Christiania university, and a noted singer (d. 1907).

In 1890 he propounded his scheme for a polar expedition before the Norwegian Geographical Society, and in 1892 he laid it before the Royal Geographical Society in London (see ” How can the North Polar Region be crossed ?” Geogr. Journal, vol. L), by which time his

preparations were well advanced. His theory, that a drift-current sets across the polar regions from Bering Strait and the neighbourhood of the New Siberia Islands towards the east coast of Greenland, was based on a number of indications, notably the discovery (1884), on drift ice off the south-west coast of Greenland, of relics of the American north polar expedition in the ship ” Jeannette,” which sank N.E. of the New Siberia Islands in 1881. His intention was therefore to get his vessel fixed in the ice to the north of Eastern Siberia and let her drift with it. His plan was adversely criticized by many Arctic authorities, but it succeeded. The Norwegian parliament granted two-thirds of the expenses, and the rest was obtained by subscription from King Oscar and private indi- viduals. His ship, the ” Fram ” (i.e. ” Forward “), was specially built of immense strength and peculiar form, being pointed at bow and stern and having sloping sides, so that the ice-floes, pressing together, should tend, not to crush, but merely to slip beneath and lift her. She sailed from Christiania on the 24th of June 1893. Otto Sverdrup was master; Sigurd Scott Hansen, a Norwegian naval lieutenant, was in charge of the astronomical and meteorological observations; Henrik Greve Blessing was doctor and botanist; and among the rest was Frederik Hjalmar Johansen, lieutenant in the Norwegian army, who shipped as fireman. On the 22nd of September the ” Fram ” was made fast to a floe in 78 50′ N.f 133 37′ E.; shortly afterwards she was frozen in, and the long drift began. She bore the pressure of the ice perfectly. During the winter of 1894-1895 it was decided that an expedition should be made northward over the ice on foot in the spring, and on the 14th of March 1895 Nansen, being satisfied that the “Fram” would continue to drift safely, left her in 84 N., 101 55′ E., and started northward accompanied by Johansen. On the 8th of April they turned back from 86° 14′ N., the highest latitude then reached by man; and they shaped their course for Franz Josef Land. They suffered many hardships, including shortage of food, and were compelled to winter on Frederick Jackson Island (so named by Nansen) in Franz Josef Land from the 26th of August 1895 to the 19th of May 1896. They were uncertain as to the locality, but, after having reached 80° N. on the south coast of the islands, they were travelling westward to reach Spitsbergen, when, on the 17th of June 1896, they fell in with Frederick Jackson and

his party of the Jackson-Harmsworth expedition, and returned to Norway in his ship, the ” Windward,” reaching Vardo on the 13th of August. A week later the ” Fram ” also reached Norway in safety. She had drifted north after Nansen had left her, to 85 57’, and had ultimately returned by the west coast of Spitsbergen. An unprecedented welcome awaited Nansen. In England he gave the

narrative of his journey at a great meeting in the Albert Hall, London, on the 8th of February 1897, and elsewhere. He received a special medal from the Royal Geographical Society, honorary degrees from the universities of Oxford and Cambridge, and a presentation of books (the ” Chal- lenger ” Reports) from the British government, and similar honours were paid him in other countries. The English version of the narrative of the expedition is entitled Farthest North (London, 1897), and the scientific results are given in The Norwegian North Polar Expedition i8g3~i8g6; Scientific Results (London, &c, 1900 sqq.).

In 1905, in connexion with the crisis between Norway and Sweden, which was followed by the separation of the kingdoms, Nansen for the first time actively intervened in politics. He issued a manifesto and many articles, in which he adopted an attitude briefly indicated by the last words of a short work published later in the year: “Any union in which the one people is restrained in exercising its freedom is and will remain a danger ” (Norway and the Union with Sweden, London, 1905). On the establishment of the Norwegian monarchy Nansen was appointed minister to England (1906), and in the same year he was created G.C.V.O.; but in 1908 he retired from his post, and became professor of oceanography in Christiania university. NANSEN, HANS (1598-1667), Danish statesman, son of the burgher Evert Nansen, was born at Flensburg on the 28th of November 1598. He made several voyages to the White Sea and to places in northern Russia, and in 1621 entered the service of the Danish Icelandic Company, then in its prime. For many years the whole trade of Iceland, which he frequently visited, passed through his hands, and he soon became equally well known at Gluckstadt, then the chief emporium of the Iceland trade, and at Copenhagen. In February 1644, at the express desire of King Christian IV., the Copenhagen burgesses elected him burgomaster. During his northern voyages he had learnt Russian, and was employed as interpreter at court when- ever Muscovite embassies visited Copenhagen. His travels had begotten in him a love of geography, and he published in 1633 a ” Kosmografi,” previously revised by the astronomer Longo- montanus. During the siege of Copenhagen by the Swedes in 1658 he came prominently forward. At the meeting between the king and the citizens to arrange for the defence of the capital, Nansen urged the necessity of an obstinate defence. It was he who on this occasion obtained privileges for the burgesses of Copenhagen which placed them on a footing of equality with the nobility; and he was the life and soul of the garrison till the arrival of the Dutch fleet practically saved the city. These eighteen months of storm and stress established his influence in the capital once for all and at the same time knitted him closely to Frederick III., who

recognized in Nansen a man after his own heart, and made the great burgomaster his chief instrument in carrying through the anti-aristocratic Revolution of 1660. Nansen used all the arts of the agitator with extraordinary energy and success. ■ His greatest feat was the impassioned speech by which, on October 8th, he induced the burgesses to accede to the proposal of the magistracy of Copen- hagen to offer Frederick III. the realm of Denmark as a purely hereditary kingdom. How far Nansen was content with the result of the Revolution — absolute monarchy — it is impossible to say. It appears to be pretty certain that, at the beginning, he did not want absolutism. Whether he subsequently regarded the victory of the monarchy and its corollary, the admittance of the middle classes to all offices and dignities, as a satisfactory equivalent for his original demands; or whether he was so overcome by royal favour as to sacrifice cheerfully the political liberties of his country, can only be a matter for conjecture. After the Revolution Nansen continued in high honour, but

he chiefly occupied himself with commerce, and was less and less consulted in purely political matters. He died on the 12th of November 1667.

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NANTERRE, a town of northern France, with a port on the Seine, in the department of Seine, at the foot of Mount Valerien, 8 m. N.W. of Paris on the railway to St Germain. Pop. (igo6), town, 11,874; commune, 17,434. The principal manufactures are chemicals, tallow and aluminium; stone quarried in the vicinity; the town is noted also for its cakes. The combined prison and mendicity depot for the department is a large institution, about 2 m. from the town. Nanterre (the ancient Nemptodurum or Nemetodurum) owes its origin to the shrine of Ste Genevieve (420-512), the patron-saint of Paris, whose name is still associated with various places in the town and district. The shrine is the object of a pilgrimage in September.

NANTES, a city of western France, capital of the department of Loire-Inferieure, on the right bank of the Loire, 35 m. above its mouth, at the junction of the Orleans, Western and State railways, 55 m. W.S.W.

of Angers by rail. In population (town, 118,244; commune, 133,247, in 1906) Nantes is the first city of Brittany. The Loire here divides into several branches forming islands over portions of which the city has spread. It receives on the left hand the Sevre Nantaise, and on the right the Erdre, which forms the outlet of the canal between Nantes and Brest. The maritime port of Nantes is reached by way of the Loire and the ship canal between the island of Carnet and La Martiniere (9 J m.). Vessels drawing as much as 20 ft. 8 in., and at spring tides, 22 ft., can reach the port, which extends over a length of about i| m. The outer port as far as the industrial suburb of Chantenay has a length of over half a mile. The principal quays extend along the right bank of the branch which flows past the town, and on the western shore of the island of Gloriette. Their total length used for trading purposes is 5 m., and warehouses cover an area of 17 acres. A slipway facilitates the repairing of ships. The river port occupies the St Felix and Madeleine branches, and has quays extending for half a mile. Finally, on the Erdre is a third port for inland navigation. The quays are bounded by railway lines along the right bank of the river, which the railway to St Nazaire follows. The older quarter of Nantes containing the more interesting buildings is situated to the east of the Erdre.

The cathedral, begun in 1434 in the Gothic style, was unfinished till the 19th century when the transept and choir were added. There are two interesting monuments in the transept — on the right Michel Colomb's tomb of Francis II., duke of Brittany, and his second wife Marguerite de Foix (1507), and on the left that of General Juchault de Lamoriciere, a native of Nantes, by Paul Dubois (1879). Of the other churches the most interesting is St Nicolas, a modern building in the style of the 13th century, on the right bank of the Erdre. Between the cathedral and the Loire, from which it is separated only by the breadth of ths quay, stands the castle of Nantes, founded in the 9th or 10th century. Rebuilt by Francis II. and the duchess Anne, it is flanked by huge towers and "by a bastion erected by Philip Emmanuel duke of Mercceur in the time of the League. A fine facade in the Gothic style looks into the courtyard. From being the residence of the dukes of Brittany, the castle became a state prison in which Jean-Francois Paul de Gondi, Cardinal de Retz, Nicholas Fouquet, and Marie Louise of Naples, duchess of Berry, were at different times confined; it is now occupied as the artillery headquarters. The chapel in which the marriage of Louis XII. with Anne of Brittany was celebrated was destroyed by an explosion in 1800. The Exchange (containing the tribunal and chamber of commerce), the Grand Theatre, the Prefecture and the town hall are buildings of the last half of the 18th or early 19th century; the law courts date from the middle of the 19th

century. Nantes has an archaeological collection in the Dobree Museum, and in the museum of fine arts a splendid

collection of paintings, modern French masters being well represented; it also has a natural history museum, a large library rich in manuscripts and a botanical garden to the east. The Pommeraye Passage, which connects streets on different levels and is built in stages connected by staircases, dates from 1843. Between the Loire and the Erdre run the Cours St Pierre and the Cours St Andre, adorned at the two ends of the line by statues of Anne of Brittany and Arthur III., Bertrand du Guesclin and Olivier de Clisson, and separated by the Place Louis XVI., with a statue of that monarch on a lofty column. The Place Royale, to the west of the Erdre, the great meeting- place of the principal thoroughfares of the city, contains a monumental fountain with allegorical statues of Nantes and the Loire and its affluents. A flight of steps at the west end of the town leads up from the quay to the colossal cast-iron statue of St Anne, whence a splendid view may be obtained over the valley of the Loire. Several old houses of the 15th and 16th centuries, the fish market and the Salorges (a vast granite building now used as a bonded warehouse) are of interest. Nantes has two great hospitals — St Jacques on the left bank of the Loire, and the Hotel-Dieu in Gloriette Island. It is the seat of a bishopric and a court of assizes, and headquarters of the XL army corps; it has tribunals of first instance and of commerce, a board of trade-arbitrators, a chamber of commerce and a branch of the Bank of France. The educational institu- tions include lycees for both sexes, a training college for girls schools of medicine and pharmacy and law, a preparatory school to higher instruction, science and letters, schools of music, art and navigation, technical and commercial schools, and a school for deaf-mutes and the blind.

Among the more important industries of Nantes are sugar- refining, flour-milling, rice-husking, the manufacture of oil, soap, flour pastes and biscuits, and the preparation of tinned provisions (sardines, vegetables, &c); the manufacture of tin boxes, tiles, chemical manures, acid from chestnut bark, tobacco, leather, wood-pulp for paper, rope, boots and shoes, brushes and glass; saw-milling, shipbuilding, metal founding and the construction of engineering material; and wool and cotton- spinning and the manufacture of cotton and other fabrics, hosiery and knitted goods. Coal and patent fuel (chiefly from Great Britain) are the most important imports; next come phosphates and pyrites; other imports are timber and pulp-wood. The principal exports are bunker-coal (to French colonies), pyrites, slate, hoops and provisions. In the ten years 1898- 1907 the average annual value of the imports was £2,657,000; of the exports £795,000. In 1907 there

entered from foreign countries 738 vessels (209 British) with tonnage of 584,850, and cleared 778 with 154,720 tons of cargo, and 458,538 tons of ballast. Reckoning ships carrying cargo only the figures for the first and last years of the decade 1898- 1907 were: 1898, ships entered, French 209 (tonnage 75,249), foreign 250 (tonnage 154,936); ships cleared, French 173 (tonnage 32,591), foreign 97 (tonnage 27,836): 1907, ships entered, French 186 (tonnage 127,635), foreign 419 (tonnage 361,002); ships cleared, French 126 (tonnage 81,299), foreign 128 (tonnage 45,181).

Before the Roman occupation Nantes was the chief town of the Namnetes and consisted of Condovicnum, lying on the hills away from the river, and of Portus Namnetum, on the river. Under the Romans it became a great commercial and admini- strative centre, though its two parts did not coalesce till the 3rd or 4th century. In the middle of the 3rd century Christianity was introduced by St Clair. Clotaire I. got possession of the city in 560, and placed it under the government of St Felix the bishop, who executed enormous works to cause the Loire to flow under the walls of the castle. After being several times subdued by Charlemagne, Brittany revolted under his successors, and Nominoe, proclaimed king in 842, ordered the fortifications of Nantes to be razed because it had sided with Charles the Bald. The Normans held the town from 843 to 936. About this time began the rivalry between Nantes and Rennes, whose counts disputed the sovereignty of Brittany. Pierre de Dreux, declared duke of Brittany by Philip Augustus, made Nantes his capital,

surrounded it with fortifications and defended it valiantly against John of England. During the Breton wars of succession Nantes took part first with Jean de Montfort, but afterwards with Charles of Blois, and did not open its gates to Monfort till his success was assured and his English allies had retired. In 1560 Francis II. granted Nantes a communal constitution. In the course of the 15th and 16th centuries the city suffered from several epidemics. Averse to Protestantism, it joined the League along with the duke of Mercceur, governor of Brittany, who helped to raise the country into an independent duchy; and it was not till 1598 that it opened its gates to Henry IV., who here signed on the 2nd of May of that year the famous Edict of Nantes which until its revocation by Louis XIV. in 1685 was the charter of Huguenot liberties in France. It was at Nantes that Henry de Talleyrand, count of Chalais, was punished in 1626 for plotting

against Richelieu, that Fouquet was arrested in 1661, and that the Cellamare conspirators were executed under the regent Philip of Orleans. Having warmly embraced the cause of the Revolution in 1789, the city was in 1793 treated with extreme rigour by J. B. Carrier, envoy of the Committee of Public Safety, whose noyades or wholesale drownings of prisoners became notorious. Nantes on more than one occasion vigorously resisted the Vendeans. It was here that the duchess of Berry was arrested in 1832 while trying to stir up La Vendee against Louis Philippe.

NANTES, EDICT OF, the law promulgated in April 1598 by which the French king, Henry IV., gave religious liberty to his Protestant subjects, the Huguenots. The story of the struggle for the edict is part of the history of France, and during the thirty-five years of civil war which preceded its grant, many treaties and other arrangements had been made between the contending religious parties, but none of these had been satis- factory or lasting. The elation of the Protestants at the accession of Henry IV. in 1 589 was followed by deep depression, when it was found that not only did he adopt the Roman Catholic faith, but that his efforts to redress their grievances were singularly ineffectual. In 1594 they took determined measures to protect themselves; in 1597, the war with Spain being practically over, long negotiations took place between the king and their repre- sentatives, prominent among whom was the historian J. A. de Thou, and at last the edict was drawn up. It consisted of 95 general articles, which were signed by Henry at Nantes on the 13th of April 1598, and of 56 particular ones, signed on the 2nd of May. There was also some supplementary matter.

The main provisions of the edict of Nantes may be briefly summarized under six heads: (1) It gave liberty of conscience to the Protestants throughout the whole of France. (2) It gave to the Protestants the right of holding public worship in those places where they had held it in the year 1576 and in the earlier part of 1577; also in places where this freedom had been granted by the edict of Poitiers (1577) and the treaties of Nerac (1579) and of Felix (1580). The Protestants could also worship in two towns in each bailliage and senichausee. The greater nobles could hold Protestant services in their houses; the lesser nobles could do the same, but only for gatherings of not more than thirty people. Regarding Paris, the Protestants could conduct worship within five leagues of the city; previously this prohibition had extended to a distance of ten leagues. (3) Full civil rights were granted to the Protestants. They could trade freely, inherit property and enter the universities, colleges and schools. All official positions were open to them. (4) To deal with disputes arising out of the edict a chamber

was estab- lished in the parlement of Paris {le chambre de Vidit). This was to be composed of ten Roman Catholic, and of six Protestant members. Chambers for the same purpose, but consisting of Protestants and Roman Catholics in equal numbers, were estab- lished in connexion with the pravincial parlements. (5) The Protestant pastors were to be paid by the state and to be freed from certain burdens, their position being made practically equal to that of the Roman Catholic clergy. (6) A hundred places of safety were given to the Protestants for eight years, the expenses of garrisoning them being undertaken by the king.

In many ways the terms of the edict were very generous to the Protestants, but it must be remembered that the liberty to hold public worship was made the exception and not the rule; this was prohibited except in certain specified cases, and in this respect they were less favourably treated than they were under the arrangement made in 1576.

The edict was greatly disliked by the Roman Catholic clergy and their friends, and a few changes were made to conciliate them. The parlement of Paris shared this dislike, and succeeded in reducing the number 6f Protestant members of the chambre de Vidit from six to one. Then cajoled and threatened by Henry, the parlement registered the edict on the 25th of February 1 599. After similar trouble it was also registered by the provincial parlements, the last to take this step being the parlement of Rouen, which delayed the registration until 1609.

The strong political position secured to the French Protestants by the edict of Nantes was very objectionable, not only to the ardent Roman Catholics, but also to more moderate persons, and the payments made to their ministers by the state were viewed with increasing dislike. Thus about 1660 a strong move- ment began for its repeal, and this had great influence with the king. One after another proclamations and declarations were issued which deprived the Protestants of their rights under the edict; their position was rendered intolerable by a series of persecutions which culminated in the dragonnades, and at length on the 18th of October 1685 Louis revoked the edict, thus depriv- ing the Protestants in France of all civil and religious liberty. This gave a new impetus to the emigration of the Huguenots, which had been going on for some years, and England, Holland and Brandenburg received numbers of thrifty and industrious French families.

The history of the French Protestants, to which the edict of Nantes

belongs, is dealt with in the articles France : History, and Huguenots. For further details about the edict see the papers and documents published as Le Troisieme centenaire de I' edit de Nantes (1898); N. A. F. Puaux, Histoire du Protestantisme francais (Paris, 1894) ; H. M. Baird, The Huguenots and the Revocation of the Edict of Nantes (London, 1895); C. Benoist, La Condition des Protestants sous le regime de I'edit de Nantes et apres sa revocation (Paris, 1900) ; A. Lods, L'£dit de Nantes devant le parlement de Paris (1899) ; and the Bulletin historique et litteraire of the Societe de l'Histoire du Protestantisme Francais.

NANTEUIL, ROBERT (1623-1678), French line-engraver, was born about 1623, or, as other authorities state, in 1630, the son of a merchant of Reims. Having received an excellent classical education, he studied engraving under his brother-in- law, Nicholas Regncsson; and, his crayon portraits having attracted attention, he was pensioned by Louis XIV. and appointed designer and engraver of the cabinet to that monarch. It was mainly due to his influence that the king granted the edict of 1660, dated from St Jean de Luz, by which engraving was pronounced free and distinct from the mechanical arts, and its practitioners were declared entitled to the privileges of other artists. He died at Paris in 1678. The plates of Nanteuil, several of them approaching the scale of life, number about three hundred. In his early practice he imitated the technique of his predecessors, working with straight lines, strengthened, but not crossed, in the shadows, in the style of Claude Mellan, and in other prints cross-hatching like Regnesson, or stippling in the manner of Jean Boulanger; but he gradually asserted his full individuality, modelling the faces of his portraits with the utmost precision and completeness, and employing various methods of touch for the draperies and other parts of his plates. Among the finest works of his fully developed period may be named the portraits of Pomponne de Bellievre, Gilles Menage, Jean Loret, the due de la Meilleraye and the duchess de Nemours.

A list of his works will be found in Dumesnil's Le Peintre-graveur francais, vol. iv.

NANTICOKE, a borough of Luzerne county, Pennsylvania, U.S.A., on the North Branch of the Susquehanna river, opposite West Nanticoke, and 8 m. S.W. of Wilkes-Barre. Pop. (1880), 3884; (1890), 10,044; (1900), 12,116, of whom 5055 were foreign-born; (1910 census) 18,877. It is served by the Pennsylvania, the Delaware, Lackawanna & Western and the

Central of New Jersey railways, and by an interurban electric line. Nanticoke is situated in the anthracite coal region, is surrounded by mines, and its industries consist chiefly in mining and shipping coal; it also has various manufactures, and in 1905 the factory product was valued at $358,091. Nanticoke was laid out in 1793, and was incorporated as a borough in 1874. The name is that of an Algonquian tribe of Indians, conspicuous for their dark complexion, who originally lived in Maryland, were conquered by the Iroquois in 1678 and subsequently scattered; the main body removed to lands along the eastern branch of the Susquehanna, where some of them became merged with the Iroquois, and others removed to the Ohio and became merged with the Delaware.

NANTUCKET, a county and township (coextensive) of Massa- chusetts, U.S.A. Its principal part is an island of the same name, 28 m. S. of Cape Cod peninsula; it also includes the island of Tuckernuck, which has an area of 1-97 sq. m., and is used for sheep grazing; Muskeget Island, which has excellent hunting, and of which about one-half is a public park; and the Gravel Islands and other islets. Pop. of the county (1905 state census), 2930; (1910) 2962.

The island, with a minimum length of 15 m., an average width of 25 m., and an area of about 47 sq. m., has a coast-line of 88 m.; it lies within the 10-fathom line, but is separated from the mainland by Nantucket Sound, which is 25 to 30 m. across and has a maximum depth of 50 ft. The surface of Nantucket Island is open, nearly treeless, with a few hills, the highest being 91 ft. above sea-level. The soil is sandy but affords good pasture in some places, and has been farmed with some success; the flora is rich, and includes some rare species. There are a score of fresh-water ponds, the largest being Hummock (320 acres). Copaum (21 acres) was, at the time of the first settlement, a bay and the commonly used harbour, but the present harbour (6 m. long) is that formed by Coatue Beach, a long narrow tongue of land on the N. side of the island. The northern part of Coatue Beach is known as Coskata Beach, and curves to the N.W. ; near its tip is Great Point, where a lighthouse was first built in 1784. There have been many terrible wrecks on the coast, and there are life-saving stations on Muskeget Island, near Maddaket, at Surfside and on Coskata Beach. At the W. end of the island is Tuckernuck Bank, a broad submarine platform, on whose edge are the island of Tuckernuck, on which is a village of the same name, and Muskeget Island. In the S.E. extremity of Nantucket Island is Siasconset (locally ‘Sconset), a summer resort of some vogue; it has a Marconi wireless telegraph station, connecting

with incoming steamers, the Nantucket shoals lightship and the mainland. On a bluff on the S. is the small village of Surfside. Other hamlets are Maddaket, at the \V. end of the island; and Polpis, Quidnet and Wauwinet (at the head of Nantucket harbour) in its E. part.

The principal settlement and /summer resort is the town of Nantucket (on the S.W. end of the harbour), which is served by steamers from New Bedford, Martha's Vineyard and Wood's Hole, and is connected with Siasconset by a primitive narrow- gauge railway. Here there are large summer hotels, old resi- dences built in the prosperous days of whaling, old lean-to houses, old graveyards and an octagonal towered windmill built in 1746. There are two libraries; one founded in 1836, and now a public library in the Atheneum building; and the other in what is now the School of Industrial and Manual Training (1904), founded in 1827 as a Lancasterian school by Admiral Sir Isaac Coffin (17 59-1 839), whose ancestors were Nantucket people. The jethro Coffin House was built in 1686, according to tradition; the Old North Vestry, the first Congregational meeting-house, built in 1711, was moved in 1767, and again in 1834 to its present site on Beacon Hill. The old South Church Tower, a steeple and clock tower, 144 ft. above sea-level, has a fine Portuguese bell, made in 1810. Another old house, built in 1725, was the home of Elihu Coleman, an anti-slavery minister of the Society of Friends, who were very strong here until the close of the first quarter of the 19th century. Near the old Friends' School is the building of the Nantucket Historical Society, which has a

collection of relics. Nantucket was the home of Benjamin Franklin's mother, Abiah, whose father, Peter Folger, was one of the earliest settlers (1663); of Maria Mitchell, and of Lucretia Mott. Adjoining the Maria Mitchell homestead is a memorial astronomical observatory and library, containing the collections of Miss Mitchell and of her brother, Professor Henry Mitchell (1 830-1 902), a distinguished hydrographer. The industries of the island are unimportant; there is considerable cod and scallop fishing. Sheep-raising was once an important industry. Nan- tucket was long famous as a whaling port. As early as the beginning of the 18th century its fleets vied with those of eastern Long Island. In 171 2 a Nantucket whaler, Christopher Hussey, blown out to sea, killed some sperm whales and thus introduced the sperm-oil industry and put an end to the period in which only drift- and shore- or boat-whaling had been carried on — the shore fishery died out about 1760. In 1757 whaling was the only livelihood of the people of Nantucket; and in 1750-1775, although whaling fleets were in repeated danger from French and Spanish privateers, the business, with the allied coopers and other trades, steadily increased. In 1775

the Nantucket fleet numbered 150, and the population was between 5000 and 6000, about 90% being Quakers; but by 1785 the fleet had been shattered, 134 ships being destroyed or captured during the war. Tallow candles as a substitute for whale-oil had been introduced, and the British market was closed by a duty of £18 a ton on oil; a bounty offered by the Massachusetts legis- lature (£5 on white and £3 on yellow or brown spermaceti, and £2 on whale-oil per ton) was of slight assistance. During the war of 181 2 the Nantucket fleet was the only one active; it suffered severely during the war, and in the decade 1820-1830 Nantucket lost its primacy to New Bedford, whose fleet in 1840 was twice as large. Nantucket's last whaler sailed in 1869. Subsequently the island has been chiefly important as a summer resort.

Title to Nantucket and the neighbouring islands was claimed under grants of the Council for New England both by William Alexander, Lord Stirling, and by Sir Ferdinando Gorges. Lord Stirling's agent sold them in 1641 to Thomas Mayhew (1592- 1682) of Watertown, Mass,, and his son Thomas (c. 1616- 1657) for £40, and a little later the elder Mayhew obtained another deed for Martha's Vineyard from Gorges. In 1659 the elder Mayhew sold a joint interest in the greater part of the island of Nantucket for £30 and two beaver hats to nine partners; early in the following year the first ten admitted ten others as equal proprietors, and later, in order to encourage them to settle here, special half-grants were offered to tradesmen. The original twenty proprietors, however, endeavoured to exclude the trades- men from any voice in the government, and this caused strife. Both factions appealed to the governor of New York, that pro- vince having claimed jurisdiction over the islands under the grant to the duke of York in 1664, and, becoming increasingly dissatisfied with that government, sought a union with Massa- chusetts until the islands were annexed to that province by its new charter of 1691. The town of Nantucket was settled in 1661 and was incorporated in 1671. By order of Governor Francis Lovelace it was named Sherburne in 1673, but in 1795 the present name was adopted. Its original site was Maddaket on the W. end of the island; in 1672 it was moved to its present site, then called Wescoe. When counties were first organized in New York, in 1683, Nantucket and the neighbouring islands were erected into Dukes county, but in 1695, after annexation to Massachusetts, Nantucket Island, having been set apart from Dukes county, constituted Nantucket county, and in 1713 Tuckernuck Island was annexed to it.

See the bulletins (1896 sqq.) of the Nantucket Historical Society, established in 1894; F. B. Hough, Papers relating to the Island of Nantucket . . . while under the Colony of New York (Albany, N.Y.,

1856); M. S. Dudley, Nantucket Centennial Celebration; Historic Sites and Historic Buildings (Nantucket, 1895) ; Obed Macy, History of Nantucket (Boston, 1835) ; L. S. Hinchman, Early Settlers of Nantucket (Philadelphia, 1896; 2nd ed., 1901); W. S. Bliss, Quaint Nantucket (Boston, 1896) ; and N. S. Shaler, Geology of Nantucket (Washington, 1889), being U.S. Geological Survey Bulletin, No. 53.

NANTWICH, a market town in the Crewe parliamentary division of Cheshire, England, 161 m. N.W. of London, on the London & North-Western and Great Western railways. Pop. of urban district (1901) 7722. It lies on the river Weaver, in the upper part of its fiat, open valley. The church of St Mary and St Nicholas is a cruciform building in red sandstone, of the Decorated and Perpendicular periods, with a central octagonal tower. The fine old carved stalls are Said to have belonged to Vale Royal Abbey, near Winsford in this county. Nantwich re- tains not a few old timbered houses of the 16th and 17th centuries, but the town as a whole is modern in appearance. The grammar school was founded in 161 1. The salt industry, still the staple of several towns lower down the vale of the Weaver, was so important here in the time of Henry VIII. that there were three hundred salt-works. Though this industry has lapsed, there are brine baths, much used in cases of rheumatism, gout and general debility, and the former private mansion of Shrewbridge Hall is converted into a hotel with a spa. Nantwich has tanneries, a manufacture of boots and shoes, and clothing factories; and corn-milling and iron-founding are carried on. The town is one of the best hunting centres in the county, being within reach of several meets.

From the traces of a Roman road between Nantwich and Middle-wich, and the various Roman remains that have been found in the neighbourhood, it has been conjectured that Nantwich was a salt-‘ town in Roman times, but of this there is no conclusive evidence. The Domesday Survey contains a long account of the laws, customs and values of the salt-works at that period, which were by far the most profitable in Cheshire. The salt-houses were divided between the king, the earl of Chester and certain resident freemen of the neighbourhood. The name of the town appears variously as Wych Manbank, Wie Malban, Nantwich, Lache Mauban, Wysmanban, Wiens Malbanus, Namptewiche. About the year 1070 William Malbedeng or Malbank was created baron of Nantwich, which barony he held of the earl of Chester. In the 13th century the barony fell to three daughters and co-

heiresses, and further subdivisions followed. This probably accounts for the lack of privileges belonging to Nant- wich as a corporate town. The only town charter is one of 1567- 1568, in which Queen Elizabeth confirms an ancient privilege of the burgesses that they should not be upon assizes or juries with strangers, relating to matters outside the town. It is stated in the charter that the right to this privilege had been proved by an in- quisition taken in the 14th century, and had then already been held from time immemorial. There was a gild merchant and also a town bailiff, but the latter office was of little real significance and was soon dropped. There is documentary evidence of a castle at Nant- wich in the 13th century. There is a weekly market on Saturday, held by prescription. In 1283 a three-days' fair to be held at the feast of St Bartholomew was granted to Robert Burnell, bishop of Bath and Wells (then holder of a share of the barony of Nantwich). This is the " Old Fair " or " Great Fair " now held on the 4th of September. Earl Cholmondeley received a grant of two fairs in 1723. Fairs are now held on the first Thursday in April, June, September and December, and a cheese fair on the first Thursday in each month except January. The salt trade declined altogether in the 1 8th century, with the exception of one salt-works, which was kept open until 1856. There was a shoe trade in the town as early as the 17th century, and gloves were made from the end of the 16th century until about 1863. Weaving and stocking trades also flourished in the 18th century. The one corn-mill of Nantwich was converted into a cotton factory in 1789, but was closed in 1874. See James Hall, A History of Nantwich or Wich Milbank (1883).

NAOROJI, DADABHAI (1825-), Indian politician, was born at Nasik on the 4th of September 1825, the son of a Parsi priest. During a long and active life, he played many parts: professor of mathematics at the Elphinstone college (1854); founder of the Rast Goftar newspaper; partner in a Parsi business firm in London (1855); prime minister of Baroda (1874); member of the Bombay legislative council (1885); M.P. for Central Finsbury (1802-1895), being the first Indian to be elected to the House of Commons; three times president of the Indian National Congress. Many of his numerous writings are collected in Poverty and Un-British Rule in India (1901).

NAP, the pile on cloth, the surface of short fibres raised by special processes, differing with the various fabrics, and then smoothed and cut. Formerly the word was applied to the roughness on textiles before shearing. " Nap " in this sense appears in many Teutonic languages, cf . Ger. Noppe, Dutch nop, Nor. napp; the verbal form is noppen or nappen, to trim, cut

short. The word nap also means a short sleep or doze (O. Eng. hnappian). In ” napkin,” a square of damask or other linen, used for wiping the hands and lips or for protecting the clothes at meals, the second part is a common English suffix, sometimes of diminutive force, and the first is from ” nape,” x Low Lat. napa or nappa, a corrupt form of mappa, table-cloth. Nape still survives in ” napery,” a name for household linen in general.

NAPHTALI, in the Bible, the name of an Israelite tribe, the ” son ” of Jacob by Bilhah, Rachel’s maid, and the uterine brother of Dan (Gen. xxx. 8). It lay to the south of Dan in the eastern half of upper Galilee (Josh. xix. 32-39), a fertile mountain- ous district (cf. Gen. xlix. 21; Deut. xxxiii. 23), open to the surrounding influences of Phoenicia and Aram. Apart from its share in the war against Sisera (Judg. iv. seq., see Deborah), little is known of it. It evidently suffered in the bloody conflicts of Damascus with Israel (1 Kings xv. 20), and was depopulated by Tiglath-Pileser IV. (2 Kings xv. 29; Isa. ix. 1). ˆ Naphtali and Dan are ” brothers,” perhaps partly on geographical grounds, but Dan also had a seat in the south (south-west of Ephraim), and the name of the ” mother ” Bilhah is apparently connected with Bilhan, an Edomite and also a Benjamite name (Gen. xxxvi. 27; 1 Chron. vii. 10).

For the view connecting Naphtali (perhaps a geographical rather than a tribal term), or rather its Israelite inhabitants, with the south see the full discussion by H. W. Hogg, Ency. Bib. iii. col. 3332 sqq. with references.

NAPHTHA, a word originally applied to the more fluid kinds of petroleum, issuing from the ground in the Baku district of Russia and in Persia. It is the va6a of Dioscorides, and the naphtha, or bitumen liquidum candidum of Pliny. By the alchemists the word was used principally to distinguish various highly volatile, mobile and inflammable liquids, such as the ethers, sulphuric ether and acetic ether having been known respectively as naphtha sulphurici and naphtha aceti.

The term is now seldom used, either in commerce or in science, without a distinctive prefix, and we thus have the following : —

1. Coal-tar Naphtha. — A volatile commercial product obtained by the distillation of coal-tar (see Coal-tar).

2. Shale Naphtha. — Obtained by distillation from the oil pro- duced by the destructive distillation of bituminous shale (see Paraffin).

3. Petroleum Naphtha. — A name sometimes given (e.g. in the United States) to a portion of the more volatile hydrocarbons distilled from petroleum (see Petroleum).

4. Wood Naphtha. — Methyl alcohol (q.v.).

5. Bone Naphtha. — Known also as bone oil or Dippel's oil. A volatile product of offensive odour obtained in the carbonization of bones for the manufacture of animal charcoal.

6. Caoutchouc Naphtha. — A volatile product obtained by the destructive distillation of rubber. (B. R.)

NAPHTHALENE, CioH 8 , a hydrocarbon discovered in the " carbolic " and " heavy oil " fractions of the coal-tar distillate (see Coal-tar) in 1819 by A. Garden. It is a product of the action of heat on many organic compounds, being formed when the vapours of ether, camphor, acetic acid, ethylene, acetylene,, &c, are passed through a red-hot tube (M. Berthelot, Jahresb., 1 851), or when petroleum is led through a red-hot tube packed with charcoal (A. Letny, Ber., 1878, n, p. 1210). It may be synthesized by passing the vapour of phenyl butylene bromide over heated soda lime (B. Aronheim, Ann., 1874, 171, p. 219); and by the action of ortho-xylylene bromide on sodium ethane tetracarboxylic ester, the resulting tetra-hydronaphthalene tetracarboxylic ester being hydrolysed and heated, when it yields hydronaphthalene dicarboxylic acid, the silver salt of which decomposes on distillation into naphthalene and other products (A. v. Baeyer and W. H. Perkin, junr., Ber., 1884, 17, p. 451):—

r tt ˆCH 2 Br , Na-C(C0 2 R) 2 . r tt CH 2 -C(CO»R) 2 Le 4< -CH 2 Br + Na-C(C0 2 R) 2 " 6 4 ˆCH 2 -C(C0 2 R) 2

I CH 2 -CHC0 2 H , n „ ˆ-CH 2 -C(C0 2 H) 2

C 10 H a

CH 2 -CH-C0 2 H

~CH 2 -C(C0 2 H) 2

1 " Nape," the back of the neck, is of doubtful origin; it may be a variant of " knap," a knob or protuberance.

It is a colourless solid, which melts at 80° C, and boils at 218 C. It crystallizes in the monoclinic system; it is to be noted that a- and /3-naphthol assume almost identical forms, so that these three compounds have been called isomorphous. It is insoluble in water, but is readily soluble in alcohol, and ether. It has a characteristic smell, and is very volatile, distilling readily in a current of steam. It acts as a weak antiseptic. It is used for enriching coal gas, as a vermin killer, in the manufacture of certain azo dyes, and in the preparation of phthalic acid (q.v.). When passed through a red-hot tube packed with carbon it yields /3/3-dinaphthyl, (CioH 7) 2 . It forms a crystalline compound with picric acid. It readily forms addition products with chlorine and with hydrogen; the dichloride, CioH 8 Cl 2 , is obtained as a yellow liquid by acting with hydrochloric acid and potassium chlorate; the solid tetrachloride, Cm H 8 CI4, results when chlorine is passed into naphthalene dissolved in chloroform. Numerous hydrides are known; heated with red phosphorus and hydriodic acid the hydrocarbon yields mixtures of hydrides of composition C10H10 to C10H20. Sodium in boiling ethyl alcohol gives the a-dihydride, Ci H 10 (E. Bamberger, Ber., 1887, 20, p. 1705); and with boiling amyl alcohol the /3-tetrahydride, C10II12 (E. Bamberger, Ber., 1890, 23, p. 1561). The a-tetrahydro- naphthalene is formed when naphthalene is heated with phos- phonium iodide at i7o°-i90° (A. v. Baeyer). Structurally naphthalene may be represented as a fusion of two benzene nuclei, the hydrogen atoms being numbered as in the inset

formula

1, 4, 5, 8 are a-positions, 2, 3, 6, 7 are /3;

1-5 or 4-8 diderivatives are ana. Chemistry, Organic).

whilst 1-8 or 4-5 are peri (see

a-Nilronaphlhalene, Ci H7-NO 2 , is formed by the direct nitration of naphthalene. For its commercial preparation see O. Witt, Die chemische Industrie, 1887, 10, p. 215. It crystallizes in yellow needles, which melt at 61 ° C, and are readily soluble in alcohol. By the action of nitro-sulphuric acid it is converted into a mixture of 1-5 and 1-8 dinitronaphthalenes (P. Friedlander, Ber., 1809,32, P- 353 1)- When heated with aniline and its salts it yields phenyl- rosindulin (German patent 67339 (1888)). fi-Nitronaphthalene is prepared by acting with ethyl nitrite on an alcoholic solution of 2-nitro-a-naphthylamine in the presence of sulphuric acid (E. Lell- mann and A. Remy, Ber., 1886, 19, p. 237), or with freshly prepared potassium cupronitrite on ˆ-naphthalene diazonium sulphate (A. Hantzsch, Ber.,

1900, 33, p. 2553). It crystallizes in small yellow needles which melt at 78 C. and are volatile in steam.

Sulphonic Acids. — Two monosulphonic acids (a and f}) result by acting with sulphuric acid on the hydrocarbon, the a-acid predominating at low temperatures (8o° C. and under) and the /3-acid at higher temperatures (i7O°-20o° C). They are crystalline, hygro- scopic compounds and are employed for the manufacture of the naphthols. Numerous di- and /W-sulphonic acids are known.

a- Naphthoquinone, CioH 6 2 , resembles benzoquinone, and is formed by the oxidation of many o-derivatives of naphthalene with chromic acid. It crystallizes in yellow needles which melt at 125° C. It sublimes readily, is volatile in steam and reduces to the corresponding dihydroxynaphthalenc. /3 Naphtho- quinone is formed by oxidizing 2-amino-a-naphthol (from /3-naphthol-orange by reduction) with ferric chlo- ride. It crystallizes in red needles, which melt at 1 15° C ; it has no smell and is non-volatile (cf . phenan- threnequinone).4/izamiWa£ £,CioH, I (OH) 2 OyNaHS03) the sodium bisulphite compound of 7-8 dioxy-a- naphthoquinone, is a dyestuff used for printing on cotton in the presence of a chromium mordant. The naphthoquinone is prepared by the action of zinc and concentrated sulphuric acid on o-di-nitronaphthalene. A 2-6 naphthoquinone results on oxidizing 2-6 dihydroxynaphthalene with lead peroxide.

a-Naphthoic acid, CioH 7 C0 2 H, is formed by hydro lysis of the nitrile, obtained by distilling potassium- o-naphthalene sulphonate with potassium cyanide (V. Merz, Zeit. f. Chemie, 1868, p. 34), or by heating the sulphonate with sodium formate (V. Meyer, A nn. , 1 870, 156, p. 274). It forms needles which melt at 160 C. ˆ-Naphthoic acid, obtained by boiling |8-methylnaph- thalene with dilute nitric acid, or by hydrolysis of its nitrile (formed when formyl-/3-naphthalide is heated with zinc dust), crystallizes from alcohol in needles which melt at 184 C.

NAPHTHOLS, or Hydroxynaphthalenes, Ci H 7 OH, the naphthalene homologues of the phenols. The hydroxyl group is more reactive than in the phenols, the naphthols being con- verted into naphthylamines by the action of ammonia, and forming ethers and esters much more readily.

a-Naphthol may be prepared by fusing sodium-a-naphthalene sulphonate with caustic soda; by heating a-naphthylamine sulphate with water to 200° C (English Patent 14301 (1892)); and by heating phenyl isocrotonic acid (R. Fittig and H. Erdmann, Ann. 1885, 227, p.

242): C 6 H 6 CH:CH-CH2-C02H = C10H7OH-I-H2O. It forms colourless needles which melt at 94 C; and is readily soluble in alcohol, ether, chloroform, and caustic alkalis. It is volatile in steam. With ferric chloride it gives a dark-blue precipitate of a-dinaphthol, HO-CioH6 – CioH6-OH. Alkaline potassium permanganate oxi- dizes it to phenyl-glyoxyl-ortho-carboxylic acid, HOoC-CoKjCO- C0 2 H. It is reduced by sodium in boiling amyl alcohol solution to ” aromatic ” tetrahydro-a-naphthol (reduction occurring in the ring which does not contain the hydroxyl group). When heated with hydrazine hydrate at 160 C. it gives a-naphthyl hydrazine, CioH7NH-NH2, Nitric acid converts it into nitro-compounds, which are occasion- ally used for dyeing silk and wool.

Martius yellow, CioH 6 (N0 2)20Na-H 2 0, the sodium salt of 2-4 dinitro-o-naphthol (for notation see Naphthalene), is prepared by the action of nitric acid on a-naphthol-2-4-disulphonic acid. It forms orange-yellow plates and dyes wool a golden yellow (from an acid bath)._ Naphthol yellow S., CioH 4 (ONa)(N0 2) 2 S0 3 Na, prepared by the action of nitric acid on a-naphthol-2-4-7-trisulphonic acid, is an orange-yellow powder which dyes wool and silk yellow (from an acid bath).

Numerous mono-, di- and trisulphonic acids of a-naphthol are employed in the preparation of azo dyes. The most important is Nevile and Winther’s acid, CioH 6 (OH)(SOsH)(i-4), formed when diazotized naphthionic acid (o-naphthylamine-4-sulphonic acid) is boiled with dilute sulphuric acid (Nevile and Wintrier, Ber., 1880, 13, p. 1949), or when sodium naphthionate is heated with concen- trated caustic soda solution under pressure at 240 “-260° C. (German patent 46307 (1888)). It melts at 170° C, and is readily soluble in water. With ferric chloride it gives a blue coloration.

ff-Naphthol, C10H7OH, prepared by fusing- sodium ˆ-naphtha- lene sulphonate with caustic soda, crystallizes in plates which melt at 122° C. With ferric chloride it gives a green colouration, and after a time a white flocculent precipitate of a dinaphthol. With sodium in boiling amyl alcohol solution it gives a mixture of alicyclic and aromatic tetrahydro-/3-naphthols (E. Bamberger, Ber., 1890, 23, p. 197). When heated with ammonium formate to 150° C. it forms /3-naphthylamine. With nitrosodimethy- laniline hydrochloride it forms Meldola’s Blue (dimethylamino- naphthophenoxazonium chloride), CisHisNaOCl (R. Meldola, Ber., 1879, 12, p. 2065).

The /3-naphthoI sulphonic acids find extensive application in the colour industry. The most important members are shown in the table :

—

Formula.

Method of Preparation.

Remarks.

2-oxy-8-sulphonic (Baeyer's acid)

From (8-naphthol and concen- trated sulphuric acid at 5o°-6o° C.

Sodium salt soluble in strong alcohol.

2-oxy-6-sulphonic (Schaffer's acid)

From |8-naphthol and concen- trated sulphuric at 100 C.

Sodium salt insoluble in alcohol.

2-oxy-7-sulphonic (F-acid)

By fusion of naphthalene 2-7- disulphonic acid with caustic soda at 200 "-250° C.

Very soluble in water and alcohol.

2-oxy-3'6-disulphonic (R-acid)

Both R- and G-acid from p- naphthol and concentrated sulphuric acid at 100 – no°C.

The sodium salts separ- ated by crystalliza- tion. R-salt insoluble in alcohol ; G-salt soluble.

2-oxy-6- 8-disulphonic (G-acid)

2-oxy-3 • 6- 8-trisulphonic

From 0-naphthol and fuming sulphuric acid at I40°-i6o°C.

Alkaline solutions show green fluorescence.

Nitrosonaphthols or naphthoquinone-oximes, CioH 6 (OH)(NO) or Ci H 6 (: NOH) : O. Two are known, namely -nitroso-a-naphthol or

a-naphthoguinone-oxime, formed by the action of nitrous acid on o-naphthol or of hydroxylamine hydrochloride on a-naphthoquinone (H. Goldschmidt and H. Schmidt, Ber., 1884, 17 p. 2064); and 2-nitroso-a-naphthol (/3-naphthoquinone-oxime), formed by the action of hydroxylamine hydrochloride on /3-naphthoquinone.

NAPHTHYLAMINES, or Aminonaphthalenes, $C_{10}H_7NH_2$, the naphthalene hornologues of aniline, in contrast to which they may be prepared by heating the naphthols with ammonia- zinc chloride.

a-N aphthylamine is prepared by reducing a-nitronaphthalene with iron and hydrochloric acid at about 70° C, the reaction mixture being neutralized with milk of lime, and the naphthy- lamine steam-distilled. It may also be prepared (in the form of its acetyl derivative) by heating a-naphthol with sodium acetate, ammonium chloride and acetic acid (A. Calm, Ber., 1882, 15, p. 616); by heating a-naphthol with calcium chloride-ammonia to 270° C; and by heating pyromucic acid, aniline, zinc chloride and lime to 300 C. (F. Canzonieri and V. Oliveri, Gazz., 1886, 16, p. 493). It crystallizes in colourless needles which melt at 50 C. It possesses a disagreeable faecal odour, sublimes readily, and turns brown on exposure to air. Oxidizing agents (ferric chloride, &c.) give a blue precipitate with solutions of its salts. Chromic acid converts it into a-naphthoquinone. Sodium in boil- ing amyl alcohol reduces it to aromatic tetrahydro-a-naphthyl- amine, a substance having the properties of an aromatic amine, for it can be diazotized and does not possess an ammoniacal smell. Since it does not form an addition product with bromine, reduction must have taken place in one of the nuclei only, and on account of the aromatic character of the compound it must be in that nucleus which does not contain the amino group. This tetrahydro compound yields adipic acid, $(CH_2)_4(CO_2H)_2$, when oxidized by potassium permanganate. The a-naphthylamine sulphonic acids are used for the preparation of azo dyes, these dyes possessing the important property of dyeing unmordanted cotton. The most important is naphthionic acid, i-amino-4- sulphonic acid, produced by heating a-naphthylamine and sulphuric acid to 170-180° C. with about 3% of crystallized oxalic acid. It forms small needles, very sparingly soluble in water. With diazotized benzidine it gives Congo red.

ft- N aphthylamine is prepared by heating /3-naphthol with zinc chloride-ammonia to 200-210° (V. Merz and W. Weith, Ber., 1880, 13, 1300); or in the form of its acetyl derivative by heating (3-naphthol with ammonium acetate to 270-280° C. It forms odourless, colourless

plates which melt at 111-112° C. It gives no colour with ferric chloride. When reduced by sodium in boiling amyl alcohol solution it forms alicyclic tetrahydro-|3- naphthylamine, which has most of the properties of the aliphatic amines; it is strongly alkaline in reaction, has an ammoniacal odour and cannot be diazotized. On oxidation it yields ortho-carboxy-hydrocinnamic acid, HOaC-CstLi-CIˆ-CHrCˆH. Numerous sulphonic acids derived from /3-naphthylamine are known, the more important of which are the 2-8 or Badische, the 2-5 or Dahl, the 2-7 or 5, and the 2-6 or Bronner acid. Of these, the 5-acid and Bronner's acid are of more value technically, since they combine with ortho-tetrazoditolyl to produce fine red dye-stuffs.

NAPIER, SIR CHARLES (1786-1860), British admiral, was the second son of Captain the Hon. Charles Napier, R.N., and grandson of Francis, fifth Lord Napier. He was born at Merchiston Hall, near Falkirk, on the 6th of March 1786. He became a midshipman in 1800, and was promoted lieutenant in 1805. He was appointed to the " Courageux " (74), and was present in her at the action in which the squadron under Sir J. B. Warren took the French " Marengo " (80) and " Belle Poule " (40), on the 13th of March 1806 in the West Indies. After re- turning home with Warren he went back to the West Indies in the '" St George " and was appointed acting commander of the " Pultusk " brig. The rank was confirmed on the 30th of November 1807. In August 1808 he was moved into the " Re- cruit " (18), and in her fought an action with the " Diligent " (18), in which his thigh was broken. In April 1809 he took part in the capture of the " Hautpoult " (74), and was promoted

acting post captain. His rank was confirmed, but he was put on half- pay, when he came home with a convoy. He spent some time at the university of Edinburgh, and then went to Portugal to visit his cousins in Wellington's army. In 181 1 he served in the Mediterranean, and in 1813 on the coast of America and in the expedition up the Potomac. The first years of his leisure he spent in Italy and in Paris, but speculated so much in a steamboat enterprise that by 1827 he was quite ruined. In that year he was appointed to the " Galatea " (42), and was at the Azores when they were held by the count de Villa Flor for the queen of Portugal. He so much impressed the constitutional leaders that they begged him to take command of the fleet, which offer he accepted in February 1833. With it he destroyed the Miguelite fleet off Cape St Vincent on July 5, and on the demand of France was struck off the English navy list. Continuing his Portuguese services, he commanded the land forces on the success- ful defence of Lisbon in 1834, when he was made Grand Com- mander of the Tower and Sword, and Count Cape St Vincent in the peerage of Portugal. On his

return to England he was re- stored to his former rank in the navy 1836, and received command of the ” Powerful ” (84), in 1838. When troubles broke out in Syria he was appointed second in command, and distinguished himself by leading the storming column at Sidon on September 26, 1840, and by other services, for which he was made a K.C.B. He went on half-pay in 1841, and was in 1842 elected M.P. for Marylebone in the Liberal interest, but lost his seat in 1846. He was promoted rear-admiral the same year, and com- manded the Channel fleet from 1846 to 1848. On the outbreak of the Russian War he received the command of the fleet destined to act in the Baltic, and hoisted his flag in February 1854. He refused to attack Cronstadt, and a great outcry was raised against him for not obeying the orders of the Admiralty and attempting to storm the key of St Petersburg; but his inaction has been thoroughly justified by posterity. On his return in December 1854 he was hot again offered a command. He was elected M.P. for Southwark in February 1855, and maintained his seat, though broken in health, until his death on the 6th of November i860. Sir Charles Napier was a man of undoubted energy and courage, but of no less eccentricity and vanity. He caused great offence to many of his brother officers by his behaviour to his superior, Admiral Stopford, in the Syrian War, and was embroiled all his life in quarrels with the Admiralty.

See Major-General E. Napier’s Life and Correspondence of Admiral Sir Charles Napier, K.C.B. (2 vols., London, 1862); Napier’s own War in Syria (2 vols., 1842); The Navy: its past and present state, in a series of letters, edited by Sir W. F. P. Napier (1851); and The History of the Baltic Campaign of 1854, from documents and other materials furnished by Vice-Admiral Sir C. Napier, K.C.B. (1857). See also The Life and Exploits of Commodore Napier (1841) ; and Life of Vice-Admiral Sir C. Napier (1854).

NAPIER, SIR CHARLES JAMES (1782-1853), British soldier and statesman, was born at Whitehall, London, in 1782, being the eldest son of Colonel George Napier (a younger son of the fifth lord Napier), and of his wife, the Lady Sarah Lennox who had charmed King George III. After the custom of those times Charles Napier had been gazetted an ensign in the 33rd regiment in 1794, and in 1797 his father secured for him the appointment of aide-de-camp to Sir James Duff, commanding the Limerick district. Longing for more active service, Napier obtained a commission as lieutenant in the 95th Manningham’s Rifles (Rifle Brigade) in 1800. This newly formed corps was designed to supply a body of light troops for the English army fit to cope with the French voltigeurs and tirailleurs, and was specially trained, at first under the eye of Colonel Coote Manning- ham, and then at Shorncliffe

under the immediate supervision of Sir John Moore. Moore speedily perceived the military qualities of the Napiers, and inspired the three brothers — Charles of the Rifles, George of the 52nd and William of the 43rd — with an enthusiasm which lasted all their lives; but, though happy in his general, Charles Napier quarrelled bitterly with William Stewart, the lieutenant-colonel, and in 1803 left the regiment to accompany General H. E. Fox to Ireland as aide-de-camp. The great influence of his uncle, the duke of

Richmond, and of his cousins, Charles James Fox and the general, procured him in 1804 a captaincy in the staff corps, and in the beginning of 1806 a majority in the Cape regiment. On his way to the Cape, however, he exchanged into the 50th regiment, with which he served in the short Danish campaign under Lord Cathcart in 1807. Shortly after his return from Denmark the 50th was ordered to Portugal, and in command of it Napier shared all the glories of the famous retreat to Corunna. At the battle of Corunna, one of the last sights of Sir John Moore before he fell mortally wounded was the advance of his own old regiment under the command of Charles Napier and Edward Stanhope, and almost his last words were ” Well done, my majors!” The 50th suffered very severely and both the majors were left for dead upon the field. Napier’s life was saved by a French drummer named Guibert, who brought him safely to the headquarters of Marshal Soult. Soult treated him with the greatest kindness, and he was allowed by Ney to return to England to his ” old blind mother ” instead of being interned. After about a year he heard that his exchange had been arranged, and, volunteering for the Peninsula, he joined the light division before Ciudad Rodrigo. As a volunteer he served in the actions on the Coa, and again at Busaco, where he was badly wounded in the face. He was ordered to England, but refused to go, and in March 1811, though barely recovered, he hurried to the front to take part in the pursuit of Massena. After the battle of Fuentes d’Onor, he received the lieutenant-colonelcy of the 102nd jegiment, which had become entirely demoralized at Botany Bay, and when he joined it at Guernsey in 181 1 was one of the worst regiments in the service. When he left it in 1813 it was one of the best. He accompanied it in June 1812 from Guernsey to Bermuda, where he wrought a wonderful change in the spirit both of officers and men. By treating his men as friends he won their love and admiration, and became in a peculiar degree the hero of the British soldiers. After seeing further active service against the United States in

September 1813 he exchanged back into the 50th regiment, and in December 1814, believing all chance of active service to be at an end, went on half pay. He was gazetted one of the first C.B.'s on the extension of the order of the Bath in 1814, and was present as a volunteer at the capture of Cambray, but he just missed the great battle of Waterloo. Though an officer of some experience and more than thirty years of age, he now entered the military college at Farnham, and completed his military education. In 1819 he was appointed inspecting field officer at Corfu, in 1820 was sent on a mission to Ali Pasha at Iannina, and in 182 1 visited Greece, where he became an ardent supporter of the patriot party. From Corfu he was moved in 1822 to Cephalonia, where he remained for eight years as governor and military resident. He was the model of an absolute colonial governor, and showed all the qualities of a benevolent despot. He made good roads and founded great institutions, but every thing must be done by him, and he showed himself averse to interference, whether from the high commissioner of the Ionian Islands, whom it was his duty to obey, or from the feudal magnates of his own little colony, over whom it was his duty to exercise strict supervision. An interesting episode in his command was his communication with Lord Byron when he touched at Cephalonia on his way to take part in the Greek War of Inde- pendence. B yron sent a letter to the Greek committee in London recommending Napier's appointment as commander-in-chief. But after many negotiations the scheme came to nothing. In 1827 Napier, who had two years before been made a colonel in the army, quarrelled with Sir Frederick Adam, the new high commissioner, and in 1830, when Napier was in England on leave, Adam seized his papers and forbade him to return. Napier thereupon, refusing promotion to the residency of Zante, retired in disgust, living for some years in the south of England and, after the death of his wife in 1833, in Normandy. Here he wrote his work on the colonies, and also an historical romance, on William the Conqueror. Another work, entitled Harold, has disappeared. In 1834 he refused the governorship of Australia, still hoping for military employment. In 1837 he was promoted major-general with his brother George, in 1838 he returned to

England and was made a K.C.B.; but he was to wait till 1839 before he received an offer of employment. In that year he was made commanding officer in the northern district, and found his command no sinecure, owing to the turbulent state of the Chartists in the towns of Yorkshire, Lancashire and the Midlands. His behaviour during the tenure of his command is described by William Napier in his life of his brother, and his inability to hold a command which did not carry

supreme authority is plainly portrayed. In this particular instance his sympathies were on the popular side, and, though he maintained law and order with the necessary rigour, he resigned as soon as the crisis had passed, and went to India. He was stationed at Poona, and in September 1842, when troubles were expected there, was ordered to Sind.

His command in Sind from 1842 till August 1847 is the period of his life during which, according to his brother, he made good his title to fame, but his acts, more especially at first, have been most severely criticized. There can be little doubt that from the moment he landed in the province he determined to conquer the amirs, and to seek the first opportunity of doing so. He was to be accompanied by James Outram (q.v.), who had been resident in Sind during the Afghan War, and who felt a great admiration for him, but who had also a warm affection for the amirs, and believed that he could put off the day of their destruc- tion. On the 15th of February 1843, Outram was treacherously assailed at Hyderabad, and on the 17th Napier attacked the Baluch army 30,000 strong with but 2800 men. With these 2800 men, including the 22nd regiment, which would do anything for him, he succeeded in winning the brilliant and decisive victory of Meeanee, one of the most amazing in the history of the British army, in which generals had to fight like privates, and Sir Charles himself engaged in the fray. In the March following, after marching without transport in the most intense heat, he finally destroyed the army of the amirs at the battle of Hyderabad. His success was received with enthusiasm both by the governor-general, Lord Ellenborough, and by the English people, and he was at once made a G.C.B. Whether or not the conquest of Sind at that particular period can be justified, there can be no doubt that Charles Napier was the best adminis- trator who could be found for the province when conquered. Sind, when it carne under English rule, was in a state of utter anarchy, for the Baluchis had formed a military government not unlike that of the Mamelukes in Egypt, which had been extremely tyrannical to the native population. This native population was particularly protected by Sir Charles Napier, who completed the work of the destruction of the Baluch supremacy which he had commenced with the victory of Meeanee. The labour of administration was rendered more difficult by the necessity of repressing the hill tribes, which had been encour- aged to acts of lawlessness by the licence which followed the Afghan War. The later years of his administration were made very stormy by the attacks on the policy of the conquest which had been made in England. He left Sind, after quarrelling with every authority of the presidency of Bombay, and nearly every authority of the whole of India, in August

1847, and received a perfect ovation on his return from all the hero-worshippers of the Napiers, of whom there were many in England. His short stay in England was occupied with incessant struggles with the directors of the East India Company; but the news of the indecisive victory of Chillianwalla created a panic in England, and the East India Company was obliged by public opinion to summon the greatest general of the day to command its armies. Sir Charles started almost at a moment's notice, but on reaching India found that the victory of Gujrat had been won and the Sikh War was over. No taint of envy was in his nature, and he rejoiced that he had not had to supersede Lord Gough in the moment of defeat. His restless and imperious spirit was met by one equally imperious in the governor-general, Lord Dalhousie. The two men were good friends until, in the absence of Dalhousie at sea, Napier took upon himself to alter the regulations regarding the allowances to native troops; the occasion was urgent, as the troops were in a state of mutiny, but on his return Dalhousie

reprimanded the commander-in-chief and reversed his decision. Napier immediately handed in his resignation, and when the duke of Wellington supported Lord Dalhousie and repeated the reprimand he returned to England. He had been credited with foreseeing the Mutiny of 1857, and on the whole with justice. On one occasion he wrote that mutiny was " one of the greatest, if not the greatest, danger threatening India — a danger that may come unexpectedly, and if the first symptoms be not carefully treated, with a power to shake Leadenhall." On the mutiny of the 66th native regiment at Govindgarh he disbanded it, and handed its colours over to a Gurkha regiment, thus showing that he distrusted the high-class Brahman, and recognized the necessity of relying upon a more warlike and more disciplined race. His constitution was undermined by the Indian climate, especially by his fatiguing command in Sind, and on the 29th of August 1853 he died at Portsmouth. The bronze statue of him by G, G. Adams, which stands in Trafalgar Square, London, was erected by public subscription, by far the greater number of the subscribers being, as the inscription records, private soldiers.

The chief authority for Sir Charles Napier's life is his Life and Opinions by his brother (1857) ; consult also MacColl, Career and Character of C. J. Napier (1857); M'Dougall, General Sir C. J. Napier, Conqueror and Governor of Scinde (i860); W. N. Bruce, Sir Charles Napier (1855); and T. R. E. Holmes, Four Famous Soldiers (1889). His

own works are Memoir on the Roads of Cepha- lonia (1825) ; The Colonies, treating of their value generally and of the Ionian Islands in particular; Strictures on the Administration of Sir F. Adam (1833); Colonization, particularly in Southern Australia (1835); Remarks on Military Law and the Punishment of Flogging (1837); A Dialogue on the Poor Laws (1838?); A Letter on the De- fence of England by Corps of Volunteers and Militia (1852); Lights and Shadows of Military Life (trans, from the French, 1840) ; and A Letter to the Right Honourable Sir J. C. Hobhouse on the Baggage of the Indian Army (1849) ; Defects, Civil and Military, of the Indian Government (1853); V/illiam the Conqueror, a Historical Romance, edited by Sir W. Napier (1858). On Sind, consult primarily Sir W. Napier, The Conquest of Scinde (1845); The Administration of Scinde (1851) ; Compilation of General Orders issued by Sir C. Napier (1850); and Outram, The Conquest of Scinde, a Commentary (1846). For his cornmand-in-chief, and the controversy about his resignation, consult J. Mawson, Records of the Indian Command of General Sir C. J. Napier (Calcutta, 1851); Minutes on the Resignation of the late General Sir C. Napier, by Field-Marshal the Duke of Wellington, &c. (1854); Comments by Sir W. Napier on a Memorandum of the Duke of Wellington (1854); Sir William Napier, General Sir C. Napier and the Directors of the East India Company (1857); Sir W. Lee Warner, Life of Lord Dalhousie (1904).

NAPIER, JOHN (1550-1617), Scottish mathematician and inventor of logarithms, was born at Merchiston near Edinburgh in 1550, and was the eighth Napier of Merchiston. The first Napier of Merchiston, ” Alexander Napare,” acquired the Merchiston estate before the year 1438, from James I. of Scotland. He was provost of Edinburgh in 1437, and was otherwise dis- tinguished. His eldest son Alexander, who succeeded him in 1454, was provost of Edinburgh in 1455, 1457 and 1469; he was knighted and held various important court offices under successive monarchs; at the time of his death in 1473 he was master of the household to James III. His son, John Napier of Rusky , the third of Merchiston, belonged to the royal household in the lifetime of his father. He also was provost of Edinburgh at various times, and it is a remarkable instance of the esteem in which the lairds of Merchiston were held that three of them in immediate lineal succession repeatedly filled so important an office during perhaps the most memorable period in the history of the city. He married a great-granddaughter of Duncan, 8th earl of Levenax (or Lennox), and besides this relationship by marriage the Napiers claimed a lineal male cadency from the ancient family of Levenax. His eldest son, Archibald Napier of Edinbellie, the fourth of Merchiston, belonged to the house- hold of James IV. He fought at Flodden and escaped with his life, but

his eldest son Alexander, (fifth of Merchiston) was killed. Alexander's eldest son (Alexander, sixth of Merchiston) was born in 1513, and fell at the battle of Pinkie in 1547. His eldest son was Archibald, seventh of Merchiston, and the father of John Napier, the subject of this article.

In 1549 Archibald Napier, at the early age of about fifteen,

married Janet, daughter of Francis Bothwell, and in the following year John Napier was born. In the criminal court of Scotland, the earl of Argyll, hereditary justice-general of the kingdom, sometimes presided in person, but more frequently he delegated his functions; and it appears that in 1561 Archibald Napier was appointed one of the justice-deputes. In the register of the court, extending over 1563 and. 1564, the justice-deputes named are " Archibald Naper of Merchistoune, Alexander Bannatyne, burgess of Edinburgh, James Stirling of Keir and Mr Thomas Craig." About 1565 he was knighted at the same time as James Stirling, his colleague, whose daughter John Napier subsequently married. In 1582 Sir Archibald was appointed master of the mint in Scotland, with the sole charge of superintending the mines and minerals within the realm, and this office he held till his death in 1608. His first wife died in 1563, and in 1572 he married a cousin, Elizabeth Mowbray, by whom he had three sons, the eldest of whom was named Alexander. 1

As already stated, John Napier was born in 1550, the year in which the Reformation in Scotland may be said to have commenced. In 1563, the year in which his mother died, he matriculated at St Salvator's College, St Andrews. He early became a Protestant champion, and the one extant anecdote of his youth occurs in his address " to the Godly and Christian reader " prefixed to his Plaine Discovery. He writes: —

" In my tender yeares, and barneage in Sanct-Androis at the Schooles, having, on the one parte, contracted a loving familiaritie with a certaine Gentleman, &c. a Papist; And on the other part, being attentive to the sermons of that worthie man of God, Maister Christopher Goodman, teaching upon the Apocalyps, I was so mooved in admiration, against the blindnes of Papists, that could not most evidently see their seven hilled citie Rome, painted out there so lively by Saint John, as the mother of all spiritual whoredome, that not onely bursted I out in continual reasoning against my said familiar, but also from thenceforth, I determined with my selfe (by the assistance of Gods spirit) to employ my studie and diligence to search out the remanent mysteries of that holy Book: as to this houre (praised

be the Lorde) I have bin doing at al such times as conveniently I might have occasion."

The names of nearly all Napier's classfellows can be traced as becoming determinantes in 1566 and masters of arts in 1568; but his own name does not appear in the lists. The necessary inference is that his stay at the university was short, and that only the groundwork of his education was laid there. Although there is no direct evidence of the fact, there can be no doubt that he left St Andrews to complete his education abroad, and that he probably studied at the university of Paris, and visited Italy and Germany. He did not, however, as has been supposed, spend the best years of his manhood abroad, for he was certainly at home in 1571, when the preliminaries of his marriage were arranged at Merchiston; and in 1572 he married Elizabeth, daughter of Sir James Stirling of Keir. About the end of the year 1579 his wife died, leaving him one son, Archibald (who in 1627 was raised to the peerage by the title of Lord Napier), and one daughter, Jane. A few years afterwards he married again, his second wife being Agnes, daughter of Sir James

1 The descent of the first Napier of Merchiston has been traced to " Johan le Naper del Counte de Dunbretan," who was one of those who swore fealty to Edward I. in 1296 and defended the castle of Stirling against him in 1304; but there is no authority for this genea- logy. The legend with regard to the origin of the name Napier was given by Sir Alexander Napier, eldest son of John Napier, in 1625, in these words: " One of the ancient earls of Lennox in Scotland had issue three sons: the eldest, that succeeded him to the earldom of Lennox; the second, whose name was Donald; and the third, named Gilchrist. The then king of Scotland having wars, did convocate his lieges to battle, amongst whom that was commanded was the earl of Lennox, who, keeping his eldest son at home, sent his two sons to serve for him with the forces that were under his command. . . . After the battle, as the manner is, every one drawing and setting forth his own acts, the king said unto them, ye have all done valiantly, but there is one amongst you who hath Na-Peer {i.e. no equal) ; and calling Donald into his presence commanded him, in regard to his worthy service, and in augmentation of his honour, to change his name from Lennox to Napier, and gave him the lands of Gosford, and lands in Fife, and made him his own servant, which discourse is confirmed by evidences of mine, wherein we are called Lennox alias Napier."

Chisholm of Cromlix, who survived him. By her he had five sons and five daughters.

In 1588 he was chosen by the presbytery of Edinburgh one of its commissioners to the General Assembly.

On the 17th of October 1593 a convention of delegates was held at Edinburgh at which a committee was appointed to follow the king and lay before him in a personal interview certain instructions relating to the punishment of the rebellious Popish earls and the safety of the church. This committee consisted of six members, two barons, two ministers and two burgesses — the two barons selected being John Napier of Merchiston and James Maxwell of Calderwood. The delegates found the king at Jedburgh, and the mission, which was a dangerous one, was successfully accomplished. Shortly afterwards another con- vention was held at Edinburgh, and it was resolved that the delegates sent to Jedburgh should again meet the king at Lin- lithgow and repeat their former instructions. This was done accordingly, the number of members of the committee being, however, doubled. These interviews took place in October 1593, and on the 29th of the following January Napier wrote to the king the letter which forms the dedication of the Plaine Discovery.

The full title of this first work of Napier's is given below. 1 It was written in English instead of Latin in order that " hereby the simple of this Iland may be instructed "; and the author apologizes for the language and his own mode of expression in the following sentences: —

" Whatsoever therfore through hast, is here rudely and in base language set downe, I doubt not to be pardoned thereof by /111 good men, who,' considering the necessitie of this time, will esteem it more meete to make hast to prevent the rising againe of Anti- christian darknes within this Iland, then to prolong the time in painting of language "; and " I graunt indeede, and am sure, that in the style of wordes and utterance of language, we shall greatlie differ, for therein I do judge my selfe inferiour to all men: so that scarcely in these high matters could I with long deliberation finde wordes to expresse my minde." 2

Napier's Plaine Discovery is a serious and laborious work, to which he had devoted years of care and thought. In one sense jt may be said to stand to theological literature in Scotland in something of the same position as that occupied by the Canon Mirificus with respect to the scientific literature, for it is the first published original work relating

to theological interpretation, and is quite without a predecessor in its own field. Napier lived in the very midst of fiercely contending religious factions; there was but little theological teaching of any kind, and the work related to what were then the leading political and religious questions of the day.

1 A Plaine Discovery of the whole Revelation of Saint Iohn: set downe in two treatises: The one searching and proving the true interpretation thereof: The other applying the same paraphrastically and historically to the text. Set foorth by John Napier L. of Marchistoun younger. Whereunto are annexed certaine Oracles of Sibylla, agreeing with the Revelation and other places of Scripture. Edinburgh, printed by Robert Walde-grave, printer to the King's Majestie, 1593. Cum prh'ilegio Regali.

2 A Dutch translation was published at Middelburg in 1600 and a second edition in 1607. The work was translated into French by George Thomson, a naturalized Scotsman residing in La Rochelle, and published by him at that town in 1602, under the title Ouverture de tous les secrets de V Apocalypse. . . . Par Jean Napeir (c. a. d.) Nonpareil, Sieur de Merchiston, reveue par lui-mesme, et mise en Francois par Georges Thomson, Escossois. Subsequent editions were published in 1603, 1605 and 1607. German translations were published at Gera in 161 1 and at Frankfort in 1605 and 1627. The second edition in English appeared at Edinburgh in 161 1, and in the preface to it Napier states he intended to have published an edition in Latin soon after the original publication in 1593, but that, as the work had now been made public by the French and Dutch, trans- lations, besides the English editions, and as he was " advertised that our papistical adversaries wer to write larglie against the said editions that are alreadie set out," he defers the Latin edition " till having first seene the adversaries objections, I may insert in the Latin edition an apologie of that which is rightly done, and an amends of whatsoever is amisse." No criticism on the work was published, and there was no Latin edition. A third edition appeared at Edin- burgh in 1645. Corresponding to the first two Edinburgh editions, copies were issued bearing the London imprint and dates 1594 and

161/.

After the publication of the Plaine Discovery, Napier seems to have occupied himself with the invention of secret instruments of war, for in the Bacon collection at Lambeth Palace there is a document, dated the 7th of June 1596 and signed by Napier, giving a list of his inventions for the defence of the country against the anticipated

invasion by Philip of Spain. The docu- ment is entitled ” Secrett Inventionis, proffitabill and necessary in theis dayes for defence of this Iland, and withstanding of strangers, enemies of God’s truth and religion,” 3 and the in- ventions consist of (1) a mirror for burning the enemies’ ships at any distance, (2) a piece of artillery destroying everything round an arc of a circle, and (3) a round metal chariot, so con- structed that its occupants could move it rapidly and easily, while firing out through small holes in it. It has been asserted (by Sir Thomas Urquhart) that the piece of artillery was actually tried upon a plain in Scotland with complete success, a number of sheep and cattle being destroyed.

In 1614 appeared the work which in the history of British science can be placed as second only to Newton’s Principia. The full title is as follows: Mirifici Logarilhmorum Canonis descriptio, Ejusqtte usus, in utraque Trigonometria; ut etiam in omni Logistica Mathematica, Amplissimi, Facittimi, & expeditis- simi explicatio. Authore ac Inventor e Ioanne Neper 0, Bar one Merchistonii, &°c, Scoto. Edinburgi, ex officind Andreae Hart Bibliopolae, CID.DC.XIV. This is printed on an ornamental title-page. The work is a small-sized quarto, containing fifty- seven pages of explanatory matter and ninety pages of tables.

The nature of logarithms is explained by reference to the motion of points in a straight line, and the principle upon which they are based is that of the correspondence of a geometrical and an arithmetical series of numbers. The table gives the logarithms of sines for every minute to seven figures. This work contains the first announcement of logarithms to the world, the first table of logarithms and the first use of the name logarithm, which was invented by Napier.

In 1617 Napier published his Rabdologia,* a duodecimo of one hundred and fifty-four pages; there is prefixed to it as preface a dedicatory epistle to the high chancellor of Scotland. The method which Napier terms ” Rabdologia ” consists in the use of certain numerating rods for the performance of multiplica- tions and divisions. These rods, which were commonly called ” Napier’s bones,” will be described further on. The second method, which he calls the ” Promptuarium Multiplicationis ” on account of its being the most expeditious of all for the perform- ance of multiplications, involves the use of a number of lamellae or little plates of metal disposed in a box. In an appendix of forty-one pages he gives his third method, ” local arithmetic,” which is performed on a chess-board, and depends, in principle, on the expression of numbers in the scale of radix 2. In the Rabdologia he gives the chronological order of his inventions. He

speaks of the canon of logarithms as ” a me longo tempore elaboratum.” The other three methods he devised for the sake of those who would prefer to work with natural numbers; and he mentions that the promptuary was his latest invention. In the preface to the appendix containing the local arithmetic he states that, while devoting all his leisure to the invention of these abbreviations of calculation, and to examining by what methods the toil of calculation might be removed, in addition to the logarithms, rabdologia and promptuary, he had hit upon a certain tabular arithmetic, whereby the more troublesome operations of common arithmetic are performed on an abacus or chess-board, and which may be regarded as an amusement

3 A facsimile of this document is given by Mark Napier in his Memoirs of John Napier (1834), p. 248.

4 Rabdologiae, seu Numerationis per virgulas Libri duo: Cum Appendice de expeditissimo Multiplicationis promptuario. Quibus accessit & Arithmeticae Localis Liber unus. Authore & Inventore Ioanne Neper 0, Barone Merchistonii, &c, Scoto. Edinburgi, Excu- debat Andreas Hart (1617). Foreign editions were published in Italian at Verona in 1623, in Latin at Leiden in 1626 and 1628, and in Dutch at Gouda in 1626. In 1623 Ursinus published Rhabdologia Neperiana at Berlin, and the rods or bones were described in several other works.

rather than a labour, for, by means of it, addition, subtraction, multiplication, division and even the extraction of roots are accomplished simply by the motion of counters. He adds that he has appended it to the Rabdologia, in addition to the promp- tuary, because he did not wish to bury it in silence nor to publish so small a matter by itself. With respect to the calculating rods, he mentions in the dedication that they had already found so much favour as to be almost in common use, and even to have been carried to foreign countries; and that he has been advised to publish his little work relating to their mechanism and use, lest they should be put forth in some one else’s name.

John Napier died on the 4th of April 1617, the same year as that in which the Rabdologia was published. His will, which is extant, was signed on the fourth day before his death. No particulars are known of his last illness, but it seems likely that death came upon him rather suddenly at last. In both the Canonls descriplio and the Rabdologia,

however, he makes refer- ence to his ill-health. In the dedication of the former he refers to himself as ” mihi jam morbis pene confecto,” and in the ” Admonitio ” at the end he speaks of his ” infirma valetudo “; while in the latter he says he has been obliged to leave the calculation of the new canon of logarithms to others “ob in- firmam corporis nostri valetudinem.”

It has been usually supposed that John Napier was buried in St Giles’s church, Edinburgh, which was certainly the burial- place of some of the family, but Mark Napier {Memoirs, p. 426) quotes Professor William Wallace, who, writing in 1832, gives strong reasons for believing that he was buried in the old church of St Cuthbert.

Professor Wallace’s words are —

” My authority for this belief is unquestionable. It is a Treatise on Trigonometry, by a Scotsman, James Hume of Godscroft, Berwickshire, a place still in possession of the family of Hume. The work in question, which is rare, was printed at Paris, and has the date -1 636 on the title-page, but the royal privilege which secured it to the author is dated in October 1635, and it may have been written several years earlier. In his treatise (page 116) Hume says, speaking of logarithms, ‘ L’inuenteur estoit un Seigneur de grande condition, et duquel la posterite est aujourd’huy en possession de grandes dignitez dans le royaume, qui estant sur f’age, et grandement trauaille des gouttes ne pouvait faire autre chose que de s’adonner aux sciences, et principalment aux mathe- matiques et a la logistique, a quoy il se plaisoit infiniment, et auec estrange peine, a construict ses Tables des Logarymes, imprimees a Edinbourg en l’an 1614. ... II mourut l’an 1616, et fut enterre’ hors la Porte Occidentale d’Edinbourg, dans l’Eglise de Sainct Cudbert.’ ”

There can be no doubt that Napier’s devotion to mathematics was not due to old age and the gout, and that he died in 161 7 and not in 1616; still these sentences were written within eighteen years of Napier’s death, and their author seems to have had some special sources of information. Additional probability is given to Hume’s assertion by the fact that Merchiston is situated in St Cuthbert’s parish. It is nowhere else recorded that Napier suffered from the gout. It has been stated that Napier’s mathe- matical pursuits led him to dissipate his means. This is not so, for his will {Memoirs, p. 427) shows that besides his large estates he left a considerable amount of personal property.

The Canonis Descriplio on its publication in 1614, at once attracted

the attention of Edward Wright, whose name is known in connexion with improvements in navigation, and Henry Briggs, then professor of geometry at Gresham College, London. The former translated the work into English, but he died in 1615, and the translation was published by his son Samuel Wright in 1616. Briggs was greatly excited by Napier's invention and visited him at Merchiston in 1615, staying with him a whole month; he repeated his visit in 1616 and, as he states, " would have been glad to make him a third visit if it had pleased God to spare him so long." The logarithms introduced by Napier in the Descriplio are not the same as those now in common use, nor even the same as those now called Napierian or hyperbolic logarithms. The change from the original logarithms to common or decimal logarithms was made by both Napier and Briggs, and the first tables of decimal logarithms were calculated by

Briggs, who published a small table, extending to 1000, in 1617, and a large work, Arilhmelica Logarithmica, 1 containing logarithms of numbers to 30,000 and from 90,000 to 100,000, in 1624. (See Logarithm.)

Napier's Descriplio of 1614 contains no explanation of the manner in which he had calculated his table. This account he kept back, as he himself states, in order to see from the reception met with by the Descriplio, whether it would be acceptable. Though written before the Descriplio it had not been prepared for press at the time of his death, but was published by his son Robert in 1619 under the title Mirifici Logarithmorum Canonis Construction In this treatise (which was written before Napier had invented the name logarithm) logarithms are called " arti- ficial numbers."

The different editions of the Descriptio and Constructio, as well as the reception of logarithms on the continent of Europe, and especially by Kepler, whose admiration of the invention almost equalled that of Briggs, belong to the history of logarithms {q.v.). It may, however, be mentioned here that an English translation of the Constructio of 1619 was published by W. R. Macdonald at Edinburgh in 1889, and that there is appended to this edition a complete catalogue of all Napier's writings, and their various editions and translations, English and foreign, all the works being carefully collated, and references being added to the various public libraries in which they are to be found.

Napier's priority in the publication of the logarithms is un- questioned and only one other contemporary mathematician seems to have conceived the idea on which they depend. There is no anticipation or hint to be found in previous writers, 3 and it is very remarkable that a

discovery or invention which was to exert so important and far-reaching an influence on astronomy and every science involving calculation was the work of a single mind.

The more one considers the condition of science at the time, and the state of the country in which the discovery took place, the more wonderful does the invention of logarithms appear. When algebra had advanced to the point where exponents were introduced, nothing would be more natural than that their utility as a means of performing multiplications and divisions should be remarked; but it is one of the surprises in the history of science that logarithms were invented as an arithmetical improvement years before their connexion with exponents was known. It is to be noticed also that the invention was not the result of any happy accident. Napier deliberately set himself to abbreviate multiplications and divisions — operations of so fundamental a character that it might well have been thought that they were in rerum natura incapable of abbreviation; and he succeeded in devising, by the help of arithmetic and geometry alone, the one

1 The title runs as follows: Arithmetica Logarithmica, she Logarithmorum chiliades triginta. . . . Hos numeros primus invenit clarissimus vir Iohannes Neperus Baro Merchistonij ; eos autem ex eiusdem sententia mutavit, eorumque ortum et usum illustravit Henricus Briggius. . . .

2 The full tftle was : Mirifici Logarithmorum Canonis Constructio; Et eorum ad naturales ipsorum numeros habitudines; una cum Appendice, de olid edque praestantiore Logarithmorum specie conden&d. Quibus accessere Propositiones ad triangula sphaerica faciliore calculo resolvenda: Und, cum Annotationibus aliquot doctissimi D. Henrici Briggii, in eas fif memoratam appendicem. Authore & Inventor e loanne Nepero, Barone Merchistonii, &c. Scoto. Edinburgi, Excude- bat Andreas Hart, Anno Domini 1619. There is also preceding this title-page an ornamental title-page, similar to that of the Descriptio of 1614; the words are different, however, and run — Mirifici Logarithmorum Canonis Descriptio . . . Accesserunt. Opera Posthuma: Primb, Mirifici ipsius canonis constructio, & Logarithmorum ad naturales ipsorum numeros habitudines. Secundb, Appendix de olid, edque praestantiore Logarithmorum specie construenda. Tertib, Propositiones quaedam eminentissimae, ad Triangula _ sphaerica mird facilitate resolvenda. ... It would appear that this title-page was to be substituted for the title-page of the Descriptio of 1614 by those who bound the two books together.

s The work of Justus Byrgius is described in the article Loga- rithm. In that article it is mentioned that a Scotsman in 1594 in a letter to Tycho Brahe held out some hope of logarithms ; it is likely that the person referred to is John Craig, son of Thomas Craig, who has been mentioned as one of the colleagues of John Napier's father as justice-depute.

great simplification of which they were susceptible — a simplifica- tion to which nothing essential has since been added.

When Napier published the Canonis Descriptio England had taken no part in the advance of science, and there is no British author of the time except Napier whose name can be placed in the same rank as those of Copernicus, Tycho Brahe, Kepler, Galileo, or Stevinus. In England, Robert Recorde had indeed published his mathematical treatises, but they were of trifling importance and without influence on the history of science. Scotland had produced nothing, and was perhaps the last country in Europe from which a great mathematical discovery would have been expected. Napier lived, too, not only in a wild country, which was in a lawless and unsettled state during most of his life, but also in a credulous and superstitious age. Like Kepler and all his contemporaries he believed in astrology, and he certainly also had some faith in the power of magic, for there is extant a deed written in his own handwriting containing a con- tract between himself and Robert Logan of Restalrig, a turbulent baron of desperate character, by which Napier undertakes " t« serche and sik out, and be al craft and ingyne that he dow, to tempt, trye, and find out " some buried treasure supposed to be hidden in Logan's fortress at Fastcastle, in consideration of receiving one-third part of the treasure found by his aid. Of this singular contract, which is signed, " Robert Logane of Restalrige " and " Jhone Neper, Fear of Merchiston," and is dated July 1 594, a facsimile is given in Mark Napier's Memoirs. As the deed was not destroyed, but is in existence now, it is to be presumed that the terms of it were not fulfilled; but the fact that such a contract should have been drawn up by Napier himself affords a singular illustration of the state of society and the kind of events in the midst of which logarithms had their birth. Considering the time in which he lived, Napier is singu- larly free from superstition: his Plaine Discovery relates to a method of interpretation which belongs to a later age; he shows no trace of the extravagances which occur everywhere in the works of Kepler; and none of his writings contain allusions to

astrology or magic.

After Napier's death his manuscripts and notes came into the possession of his second son by his second marriage, Robert, who edited the Constructio ; and Colonel Milliken Napier, Robert's lineal male representative, was still in the possession of many of these private papers at the close of the 18th century. On one occasion when Colonel Napier was called from home on foreign service, these papers, together with a portrait of John Napier and a Bible with his autograph, were deposited for safety in a room of the house at Milliken, in Renfrewshire. During the owner's absence the house was burned to the ground, and all the papers and relics were destroyed. The manuscripts had not been arranged or examined, so that the extent of the loss is unknown. Fortunately, however, Robert Napier had transcribed his father's manuscript De Arte Logistica, and the copy escaped the fate of the originals in the manner explained in the following note, written in the volume containing them by Francis, seventh Lord Napier: " John Napier of Merchiston, inventor of the logarithms, left his manuscripts to his son Robert, who appears to have caused the following pages to have been written out fair from his father's notes, for Mr Briggs, professor of geometry at Oxford. They were given to Francis, the fifth Lord Napier, by William Napier of Culcreugh, Esq., heir-male of the above-named Robert. Finding them in a neglected state, amongst my family papers, I have bound them together, in order to preserve them entire. — Napier, 7th March 1801."

An account of the contents of these manuscripts was given by Mark Napier in the appendix to his Memoirs of John Napier, and the manuscripts themselves were edited in their entirety by him in 1839″ under the title De Arte Logistica Joannis Naperi Mer- chistonii Baronis Libri qui supersunt. . Impressum Edinburgi m.dccc.xxx.ix., as one of the publications of the Bannatyne Club. The treatise occupies one hundred and sixty-two pages, and there is an introduction by Mark Napier of ninety-four pages. The Arithmetic consists of three books, entitled — (1) De Computationibus Quantitatum omnibus Logisticae speciebus communium; (2) De Logistica Arithmetical (3) De Logistica Geometrica. At the end of this book occurs the note — " I could find no more of this geo- metricall pairt amongst all his fragments." The Algebra Joannis Naperi Merchistonii Baronis consists of two books: (1) " De nomi- nata Algebrae parte; (2) De positiva sive cossica Algebrae parte," and concludes with the words, " There is no more of his algebra orderlie sett doun." The transcripts are entirely in the handwriting of Robert Napier himself, and the two notes that have been quoted prove that they were made from Napier's own papers.

The title,

which is written on the first leaf, and is also in Robert Napier's writing, runs thus: " The Baron of Merchiston his booke of Arithmeticke and Algebra. For Mr Henrie Briggs, Professor of Geometrie at Oxforde."

These treatises were probably composed before Napier had invented the logarithms or any of the apparatuses described in the Rabdologia; for they contain no allusion to the principle of loga- rithms, even where we should expect to find such a reference, and the one solitary sentence where the Rabdologia is mentioned ("sive omnium facillime per ossa Rhabdologiae nostrae ") was probably added afterwards. It is worth while to notice that this reference occurs in a chapter " De Multiplications et Partitionis compendiis miscellaneis," which, supposing the treatise to have been written in Napier's younger days, may have been his earliest production on a subject over which his subsequent labours were to exert so enormous an influence.

Napier uses abundantes and defectivae for positive and negative, defining them as meaning greater or less than nothing (" Abun- dantes sunt quantitates majores nihilo: defectivae sunt quantitates minores nihilo "). The same definitions occur also in the Canonis Descriptio (1614), p. 5: " Logarithmos sinuum, qui semper majores nihilo sunt, abundantes vocamus, et hoc signo +, aut nullo praeno- tamus. Logarithmos autem minores nihilo defectivos vocamus, praenotantes eis hoc signum -." Napier may thus have been the first to use the expression " quantity less than nothing." He uses " radicatum " for power (for root, power, exponent, his words are radix, radicatum, index).

Apart from the interest attaching to these manuscripts as the work of Napier, they possess an independent value as affording evidence of the exact state of his algebraical knowledge at the time when logarithms were invented. There is nothing to show whether the transcripts were sent to Briggs as intended and returned by him, or whether they were not sent to him. Among the Merchiston papers is a thin quarto volume in Robert Napier's writing contain- ing a digest of the principles of alchemy ; it is addressed to his son, and on the first leaf there are directions that it is to remain in his charter-chest and be kept secret except from a few. This treatise and the transcripts seem to be the only manuscripts which have escaped destruction.

The principle of " Napier's bones " may be easily explained by imagining ten rectangular slips of cardboard, each divided into nine

squares. In the top squares of the slips the ten digits are written, and each slip contains in its nine squares the first nine multiples of the digit which appears in the top square. With the exception of the top squares, every square is divided into two parts by a diagonal, the units being written on one side and the tens on the other, so that when a multiple consists of two figures they are separated by the diagonal. Fig. I shows the slips corre- sponding to the numbers 2, o, 8, 5 placed side by side in contact with one another, and next to them is placed another slip containing, in squares without diagonals, the first nine digits. The slips thus placed in contact give the multiples of the number 2085, the digits in each parallelogram being added together; for example, correspond- ing to the number 6 on the right-hand slip, we have o, 8 + 3, 0 + 4, 2, 1 ; whence we find o, 1, 5, 2, I as the digits, written backwards,

of 6X2085. The use of the slips for the purpose of multiplication is now evident; thus to multiply 2085 by 736 we take out in this manner the multiples corresponding to 6, 3, 7, and set down the digits as they are obtained, from right to left, shifting them back one place and adding up the columns as in ordinary multiplication, viz. the figures as written down are —

12510 6255 14595

1534560

Napier's rods or bones consist of ten oblong pieces of wood or other material with square ends. Each of the four faces of each rod contains multiples of one of the nine digits, and is similar to one of the slips just described, the first rod containing the multiples of o, I, 9, 8, the second of o, 2, 9, 7, the third of o, 3, 9, 6, the fourth of o, 4, 9, 5, the fifth of 1, 2, 8, 7, the sixth of 1, 3, 8, 6, the seventh of 1, 4, 8, 5, the eighth of 2, 3, 7, 6, the ninth of 2, 4, 7, 5, and the tenth of 3, 4, 6, 5. Each rod therefore contains on two of its faces multiples of digits which are complementary to those on the other two faces; and the multiples of a digit and of its complement are reversed in position. The arrangement of the numbers on the rods will be evident from fig. 2, which represents the four faces of the fifth rod. The set of ten rods is thus equivalent to four sets of slips as described above, and by their means we may multiply every number less than 1 1,1 11, and also any number (consisting of course

of not more than ten digits) which can be formed by the top digits of the bars when placed side by side. Of course two sets of rods may be used, and by their means we may multiply every number less than iii,m,lli and so on. It will be noticed that the rods only give the multiples of the number which is to be multiplied, or of the divisor, when they are used for division, and it is evident that they would be of little use to any one who knew the multiplication table as far as 9X9. In multiplications or divisions of any length it is generally convenient to begin by forming a table of the first nine multiples of the multi- plicand or divisor, and Napier's bones at best merely provide such a table, and in an incom- plete form, for the additions of the two figures in the same parallelogram have to be performed each time the rods are used. The Rabdologia attracted more general attention than the loga- rithms, and as has been mentioned, there were several editions on the Continent. Nothing shows more clearly the rude state of arithmetical know- ledge at the beginning of the 17th century than the universal satisfaction with which Napier's invention was welcomed by all classes and re- – garded as a real aid to calculation. Napier also 1 describes in the Rabdologia two other larger rods -I to facilitate the extraction of square and cube roots. In the Rabdologia the rods are called " virgulae," but in the passage quoted above from the manuscript on arithmetic they are referred to as " bones " (ossa).

Besides the logarithms and the calculating rods or bones, Napier's name is attached to certain rules and formulae in spherical trigono- metry. " Napier's rules of circular parts," which include the com- plete system of formulae for the solution of right-angled triangles, may be enunciated as follows. Leaving the right angle out of consideration, the sides including the right angle, the complement of the hypotenuse, and the complements of the other angles are called the circular parts of the triangle. Thus there are five circular parts, a, b, 90 — A, 90 ° — c, 90° — B, and these are supposed to be arranged in this order (i.e. the order in which they occur in the triangle) round a circle. Selecting any part and calling it the middle part, the two parts next it are called the adjacent parts and the remaining two parts the opposite parts. The rules then are —

sine of the middle part = product of tangents of adjacent parts = product of cosines of opposite parts.

These rules were published in the Canonis Descriptio (1614), and Napier has there given a figure, and indicated a method, by means of which they may be proved directly. The rules are curious and interesting, but of very doubtful utility, as the formulae are best

remembered by the practical calculator in their unconnected form.

” Napier’s analogies ” are the four formulae —

tanJ(A + B) = «4fe|^°tiC, tan|(A-B) = s ! n ^ a ~^ cotiC; – cosJ(a + 6) sini(a + i)

Fig. 2.

_ cosj(A-B)

_ sinKA-B).

^tanK tanKa-W-g^tanfc.

tani(a + &) -coslTA

They were first published after his death in the Constructio among the formulae in spherical trigonometry, which, were the results of his latest work. Robert Napier says that these results would have been reduced to order and demonstrated consecutively but for his father’s death. Only one of the four analogies is actually given by Napier, the other three being added by Briggs in the remarks which are appended to Napier’s results. The work left by Napier is, however, rough and unfinished, and it is uncertain whether he knew of the other formulae or not. They are, however, so simply deducible from the results he has given that all the four analogies may be properly called by his name. An analysis of the formulae contained in the Descriptio and Constructio is given by Delambre in vol. i. of his Histoire de VAstronomie moderne.

Tc Napier seems to be due the first use of the decimal point in arithmetic. Decimal fractions were first introduced by Stevinus in his tract La Disme, published in 1585, but he used cumbrous ex- ponents (numbers enclosed in circles) to distinguish the different denominations, primes, seconds, thirds, &c. Thus, for example, he would have written 123-456 as 123(0)4(1)5(2)6(3). In the Rab- dologia Napier gives an ” Admonitio pro Decimali Arithmetica,” in which he commends the fractions of Stevinus and gives an example of their use, the division of 861094 by 432. The quotient is written 1993,273 in the work, and I993,2′7″3’” in the text. This single instance of the use of the decim,al point in the midst of an arith- metical process, if it stood alone, would not suffice to establish a claim for its introduction, as the real introducer of the decimal point is the person who first saw that a point or line as separator was all that was required to distinguish between the integers and fractions, and used it

as a permanent notation and not merely in the course of performing an arithmetical operation. The decimal point is, however, used systematically in the Constructio (1619), there being perhaps two hundred decimal points altogether in the book.

The decimal point is defined on p. 6 of the Constructio in the words: ” In numeris periodo sic in se distinctis, quicquid post periodum notatur fractio est, cujus denominator est unitas cum tot cyphris post se, quot sunt figurae post periodum. Ut 10000000-04 valet idem, quod iooooooo T J,j. Item 25-803, idem quod 25i s /o\ Item 9999998-0005021, idem valet quod 9999998 T – -gg! J oTy, & sic de caeteris.” On p. 8, 10-502 is multiplied by 3-216, and the result found to be 33-774432; and on pp. 23 and 24 occur decimals not attached to integers, viz. -4999712 and 0004950. These examples show that Napier was in possession of all the conventions and attri butes that enable the decimal point to complete so symmetrically our system of notation, viz. (1) he saw that a point or separatrix was quite enough to separate integers from decimals, and that no signs to indicate primes, seconds, &c, were required; (2) he used ciphers after the decimal point and preceding the first significant figure; and (3) he had no objection to a decimal standing by itself without any integer. Napier thus had complete command over decimal fractions and the use of the decimal point. Briggs also used deci- mals, but in a form not quite so convenient as Napier. Thus he prints 63-0957379 as 63 0957379, viz. he prints a bar under the decimals; this notation first appears without any explanation in his ” Lucubrationes ” appended to the Constructio. Briggs seems to have used the notation all his life, but in writing it, as appears from manuscripts of his, he added also a small vertical line just high enough to fix distinctly which two figures it was intended to separate : thus he might have written 63 095 7379. The vertical line was printed by Oughtred and some of Briggs’s successors. It was a long time before decimal arithmetic came into general use, and all through the 17th century exponential marks were in common use. There seems but little doubt that Napier was the first to make use of a decimal separator, and it is curious that the separator which he used, the point, should be that which has been ultimately adopted, and after a long period of partial disuse.

The hereditary office of king’s poulterer (Pultrie Regis) was for many generations in the family of Merchiston, and descended to John Napier. The office, Mark Napier states, is repeatedly men- tioned in the family charters as appertaining to the ” pultre landis ” near the village of Dene in the shire of Linlithgow. The duties were to be performed by the possessor or his deputy; and the king was entitled to demand the yearly homage of a present of poultry from the feudal

holder. The pultrelands and the office were sold by John Napier in 1610 for 1700 marks. With the exception of the pultrelands all the estates he inherited descended to his posterity.

With regard to the spelling of the name, Mark Napier states that among the family papers there exist a great many documents signed by John Napier. His usual signature was ” Jhone Neper,” but in a letter written in 1608, and in all deeds signed after that date, he wrote ” Jhone Nepair.” His letter to the king prefixed to the Plaine Discovery is signed ” John Napeir.” His own children, who sign deeds along with him, use every mode except Napier, the form now adopted by the family, and which is comparatively modern. In Latin he always wrote his name ” Neperus.” The form ” Neper ” is the oldest, as John, third Napier of Merchiston, so spelt it in the 15th century.

Napier frequently signed his name ” Jhone Neper, Fear of Merchiston.” He was ” Fear of Merchiston ” because, more majorum, he had been invested with the fee of his paternal barony during the lifetime of his father, who retained the liferent. He has been sometimes erroneously called ” Peer of Merchiston,” and in the 1645 edition of the Plaine Discovery he is so styled (see Mark Napier’s Memoirs, pp. 9 and 173, and Libri qui supersunt, p. xciv.).

The bibliography of Napier’s work attached to W. R. Macdonald’s translation of the Canonis Constructio (1 889) is complete and valuable. Napier’s three mathematical works are reprinted by N. L. W. A. Gravelaar in Verhandelingen der Kon. Akad. van Wet te Amsterdam, 1. sectie, deel 6 (1899). (J. W. L. G.)

NAPIER, SIR WILLIAM FRANCIS PATRICK (1785-1860), British soldier and military historian, third son of Colonel George Napier (1751-1804), and brother of Sir Charles James Napier (see above), was born at Celbridge, near Dublin, on the 17th of December 1785. He became an ensign in the Royal Irish Artillery in 1800, but at once exchanged into the 62nd, and was put on half-pay in 1802. He was afterwards made a cornet in the Blues by the influence of his uncle the duke of Richmond, and for the first time did actual military duty in this regiment, but he soon fell in with Sir John Moore’s suggestion that he should exchange into the 52nd, which was about to be trained in the famous camp of Snorncliffe. Through Sir John Moore he soon obtained a company in the 43rd, joined that regiment at Shorn- cliffe and became a great favourite with Moore. He served in Denmark, and was present at the engagement of Kioge, and, his regiment being shortly afterwards sent to Spain, he bore himself nobly through the retreat to Corunna, the hardships of which permanently impaired his

health. In 1809 he became

aide-de-camp to the duke of Richmond, lord lieutenant of Ireland, but joined the 43rd when that regiment was ordered again to Spain. With the light brigade (the 43rd, 52nd, and 95th), under the command of General Crauf urd, he marched to Talavera in the famous forced march which he has described in his History, and had a violent attack of pleurisy on the way. He, however, refused to leave Spain, was wounded on the Coa, and shot near the spine at Cazal Nova. His conduct was so conspicuous during the pursuit of Massena after he left the lines of Torres Vedras that he as well as his brother George was recommended for a brevet majority. He became brigade major, was present at Fuentes d'Onor, but had so bad an attack of ague that he was obliged to return to England. In England he married Caroline Amelia Fox, daughter of General Henry Fox and niece of the statesman Fox. Three weeks after his marriage he again started for Spain, and was present at the storming of Badajoz, where his great friend Colonel M'Leod was killed. In the absence of the new lieutenant-colonel he took command of the 43rd regiment (he was now a substantive major) and commanded it at the battle of Salamanca. After a short stay at home he again joined his regiment at the Pyrenees, and did his greatest military service at the battle of the Nivelle, where, with instinctive military insight, he secured the most strongly fortified part of Soult's position, practically without orders. He served with his regiment at the battles of the Nive, where he received two wounds, Orthes, and Toulouse. For his services he was made brevet lieutenant-colonel, and one of the first C.B.'s. ' Like his brother Charles he then entered the military college at Farnham. He commanded his regiment in the invasion of France after Waterloo, and remained in France with the army of occupation until 1819, when he retired on half-pay. As it was impossible for him to live on a major's half-pay with a wife and family, he determined to become an artist, and took a house in Sloane Street, where he studied with George Jones, the academician. – The years he had spent in France he had occupied in improving his general education, for, incredible as it seems, the author of the History of tlie War in the Peninsula could not spell or write respectable English till that time. But his career was to be great in literature, not in art. The tendency appeared in an able review of Jomini's works {Edinburgh Rev.) in 1821, and in 1823 Mr Bickersteth (afterwards Lord Langdale) suggested to him the expediency of writing a history of the Peninsular War. For some time he did not take kindly to the suggestion, but at

last determined to become an author in order to defend the memory of Sir John Moore, and to prevent the glory of his old chief being overshadowed by that of Wellington. The duke of Wellington himself gave him much assistance, and handed over to him the whole of Joseph Bonaparte's correspondence which had been taken at the battle of Vittoria; this was all in cipher, but Mrs Napier, with great patience, discovered the keys. Marshal Soult also took an active interest in the work and arranged for the French translation of Mathieu Dumas. In 1828 the first volume of the History appeared. The publisher, John Murray, indeed, was disappointed in the sale of the first volume and Napier published the remainder himself. But it was at once seen that the great deeds of the Peninsular War were about to be fitly commemorated. The excitement which followed the appearance of each volume is proved by the innumerable pamphlets issued by those who believed themselves to be attacked, and by personal altercations with many distinguished officers. But the success of the book was proved still more by the absence of competition than by these bitter controversies. The histories of Southey and Lord Londonderry fell still-born, and Sir George Murray, Wellington's quartermaster-general, who had determined to pro- duce the history, gave up the attempt in despair. This success was due to a combination of qualities which have justly secured for Napier the title of being the greatest military historian England has produced. When in 1840 the last volume of the History was published, his fame not only in England but in France and Germany was safely established.

His life during these years had been chiefly absorbed in his History, but he had warmly sympathized with the movement

for political reform which was agitating England. The Radicals of Bath and many other cities and towns pressed him to enter parliament, and Napier was actually invited to become the military chief of a national guard to obtain reforms by force of arms. He refused the dangerous honour on the ground that he was in bad health and had a family of eight children. In 1830 he had been promoted colonel, and in 1842 he was made a major- general and given the lieutenant-governorship of Guernsey. Here he found plenty of occupation in controlling the relations between the soldiers and the inhabitants, and also in working out proposals for a complete scheme of reform in the government of the island. While he was at Guernsey his brother Charles . had conquered Sind, and the attacks made on the policy of that conquest brought William Napier again into the field of literature. In 1845 he published his History of the Conquest of Scinde, and in 1851 the corresponding History of the Administration of Scinde — books which in style and vigour rivalled the great History, but which,

being written for controversial purposes, were not likely to maintain enduring popularity. In 1847 he resigned his governorship, and in 1848 was made a K.C.B., and settled at Scinde House, Clapham Park'. In 1851 he was promoted lieu- tenant-general. His time was fully occupied in defending his brother, in revising the numerous editions of his History which were being called for, and in writing letters to The Times on every conceivable subject, whether military or literary. His energy is the more astonishing when it is remembered that he never recovered from the effects of the wound he had received at Cazal Nova, and that he often had to lie on his back for months together. His domestic life was shadowed by the incurable affliction of his only son, and when his brother Charles died in 1853 the world seemed to be darkening round him. He devoted himself to writing the life of that brother, which appeared in 1857, and which is in many respects his most characteristic book. In the end of 1853 his younger brother, Captain Henry Napier, R.N., died, and in r8s5 his brother Sir George (see below). Inspired by his work, he lived on till the year i860, when, broken by trouble, fatigue and ill-health, he died (February 12) at Clapham. Four months earlier he had been promoted to the full rank of general.

As a military historian Sir William Napier is incomparably superior to any other English writer, and his true compeers are Tnucydides, Caesar and Davila. AH four had been soldiers in the wars they describe; all four possessed a peculiar insight into the mainsprings of action both in war and peace; and each possessed a peculiar and inimitable style. Napier always wrote as if he was burning with an inextinguishable desire to express what he was feeling, which gives his style a peculiar spontaneity, and yet he rewrote the first volume of his History no less than six times. His descriptions of sieges and of battles are admirable by themselves, and his analyses of the peculiarly intricate Spanish intrigues are even more remarkable, while the descriptions and analyses are both lit up with flashes of political wisdom and military insight. It is to be noted that he displays the spirit of the partisan, even when most impartial, and defends his opinions, even when most undoubtedly true, as if he were arguing some controverted question. If his style was modelled on anything, it was on Caesar's comment- aries, and a thorough knowledge of the writings of the Roman general will often explain allusions in Napier. The portraits? of Sir John Moore and Colonel M'Leod, and the last paragraphs de- scriptive of the storming of Badajoz, may be taken as examples of his great natural eloquence.

His brother, Sir George Thomas Napier (1784-1855), entered the army in 1800, and served with distinction under Moore and Wellington in

the Peninsula — and lost his right arm at the storming of Badajoz. He became major-general in 1837, K.C.B. in 1838 and lieutenant-general in 1846. He was governor and commander-in-chief at the Cape from 1839 to 1843, during which time the abolition of slavery and the expulsion of the Boers from Natal were the chief events. He was offered, but declined, the chief command in India after Chillianwalla, and also that of the Sardinian army in 1849. He became full general in 1854. He died at Geneva on the 16th of September 1855. His auto-biography, Passages in the Early Military Life of General Sir G. T. Napier, was published by his surviving son, General W. C. E. Napier (the author of an important work on outpost duty), in 1885.

The youngest brother, Henry Edward Napier (1789-1853), served in the navy during the Napoleonic wars, retired as a captain, and wrote a learned Florentine History from the earliest authentic Records to the Accession of Ferdinand III. of Tuscany

(1846-1847).

For Sir William Napier's life, see his Life and Letters, edited by the Right Honourable H. A. Bruce (Lord Aberdare) (2 vols., 1862).

NAPIER AND ETTRICK, FRANCIS NAPIER, Baron (1810- 1898), British diplomatist, was descended from the ancient Scottish family of Napier of Merchistoun, his ancestor Sir Alexander Napier (d. c. 1473) being the elder son of Alexander Napier (d. c. 1454), provost of Edinburgh, who obtained lands at Merchistoun early in the 15th century. Sir Alexander was comptroller of the household of the king of Scotland, and was often sent to England and elsewhere on public business. Of his descendants one Napier of Merchistoun was killed at Sauchie- burn, another fell at Flodden and a third at Pinkie. The seventh Napier of Merchistoun was Sir Archibald Napier (1 534-1608), master of the Scottish mint, and the eighth was John Napier (q.v.) the inventor of logarithms. John's eldest son, Sir Archibald Napier (c. 1576-1645), was treasurer-depute of Scotland from 1622 to i63r, and was created Lord Napier of Merchistoun in 1627. He married Margaret Graham, sister of the great marquess of Montrose, whose cause he espoused, and he wrote some Memoirs which were published in Edinburgh in 1793. His son Archibald, the 2nd lord (1625-1658), fought under Montrose at Auldearn, at Alford, at Kilsyth and at Philiphaugh, and was afterwards with his famous uncle on the

continent of Europe. His son, Archibald, the 3rd lord (d. 1683), was succeeded by special arrangement in the title, first by his nephew, Thomas Nicolson (1669-1686), a son of his sister Jean and her husband Sir Thomas Nicolson, Bart. (d. 1670), and then by his sister Margaret (d. 1706), the widow of John Brisbane (d. 1684). The 6th lord was Margaret's grandson Francis Scott (c. 1702-17 73), a son of Sir William Scott, Bart., of Thirlestane (d. 1725). Francis Scott, who took the additional name of Napier, had a large tamily, his sons including William, the 7th lord, and Colonel George Napier (1751-1804). His famous grandsons are dealt with above. Another literary member of the family was Mark Napier (1798-1879), called by Mr Andrew Lang " the impetuous biographer of Montrose," who wrote Memoirs of John Napier of Merchiston (1834), Montrose and the Covenanters (1838), Memoirs of Montrose (1856), Memorials of Graham of Claverhouse (1850-1862), and a valuable legal work, The Law of Prescription in Scotland (1839 and again 1854). William, 7th Lord Napier (1730-1775), was succeeded as 8th lord by his son Francis (1758- 1823), who, after serving in the English army during the American War of Independence, was lord high commissioner to the general assembly of the Church of Scotland, and compiled a genealogical account of his family which is still in manuscript. His son William John, the 9th lord (1786-1834), who was present at the battle of Trafalgar, was the father of Francis Napier, Lord Napier and Ettrick.

Born on the 15th of September 1819 Francis entered the diplomatic service in 1840, and was employed in successive posts at Vienna, Constantinople, Naples, Washington and the Hague. During this time he earned the highest opinions both at home and abroad. In i860 he became ambassador at St Petersburg, and in 1864 at Berlin. In 1866 he was appointed governor of Madras, and was at once confronted with a serious famine in the northern districts. In dealing with this and other problems he showed great activity and practical sense, and he encouraged public works, particularly irrigation. In 1872 he acted for a few months as Viceroy, after Lord Mayo's assassination; and on Lord Northbrook's appointment to the office he returned to • England, being created a baron of the United Kingdom (Baron Ettrick of Ettrick) for his services. He continued, both in England and in Scotland, to take great interest in social questions. He was for a time a member of the London School Board, and he was chairman of the Crofters' Commission in 1883, the result of which was the appointment of a permanent body to deal with questions affecting the Scottish crofters and cottars. He died at

Florence on the 19th of December 1898, leaving a widow and three sons, the eldest of whom, William John George (b. 1846), succeeded

to his titles.

NAPIER OF MAGDALA, ROBERT CORNELIS NAPIER,

ist Baron (1810-1890), British field-marshal, son of Major Charles Frederick Napier, who was wounded at the storming of Meester Cornells (Aug. 26, 1810) in Java and died some months later, was born at Colombo, Ceylon, on the 6th of December 1810. He entered the Bengal Engineers from Addiscombe College in 1826, and after the usual course of instruction at Chatham, arrived in India in November 1828. For some years he was employed in the irrigation branch of the public works department, and in 1838 he laid out the new hUl station at Darjeeling. Promoted captain in January 1841, he was ap- pointed to Sirhind, where he laid out cantonments on a new principle — known as the Napier system — for the troops returning from Afghanistan. In December 1845 he joined the army of the Sutlej, and commanded the Engineers at the battle of Mudki, where he had a horse shot under him. At the battle of Ferozeshah on the 31st December he again had his horse shot under him, and, joining the 31st Regiment on foot, was severely wounded in storming the entrenched Sikh camp. He was present at the battle of Sobraon on 10th February 1846, and in the advance to Lahore; was mentioned in despatches for his services in the campaign, and received a brevet majority. He was chief engineer at the reduction of Kote-Kangra by Brigadier-General Wheeler in May 1846, and received the thanks of government. He was then appointed consulting engineer to the Punjab resident and council of regency, but was again called to the field to direct the siege of Multan. He was wounded in the attack-on the entrenched position in September 1848, but was present at the action of Shujabad, the capture of the suburbs, the successful storm of Multan on 23rd January 1849, an d the surrender of the fort of Chiniot. He then joined Lord Gough, took part, as commanding engineer of the right wing, in the battle of Gujrat in February 1849, accompanied Sir W. R. Gilbert in his pursuit of the Sikhs and Afghans, and was present at the passage of the Jhelum, the surrender of the Sikh army, and the surprise of Attock. For his services he was mentioned in despatches and received a brevet lieutenant-colonelcy. At the close of the war Napier was appointed civil engineer to the board of administration of the annexed Punjab province, and carried out many important public works during his tenure of office. In December 1852 he commanded a column in the first Hazara expedition, and in the following year against the Boris; and for his services in these campaigns was mentioned in despatches, received the special thanks of government and a brevet-colonelcy. He was appointed military secretary and adjutant-general to Sir James

Outram's force for the relief of Lucknow in the Indian Mutiny in 1857, and was engaged in the actions which culminated in the first relief of Lucknow. He directed the defence of Lucknow until the second relief, when he was severely wounded in crossing a very exposed space with Outram and Havelock to meet Sir Colin Campbell. He was chief of the staff to Outram in the defence of the Alambagh position, and drew up the plan of operations for the attack of Lucknow, which was approved by Sir Colin Camp- bell and carried out by Napier, as brigadier-general commanding the Engineers, in March 1858. On the fall of Lucknow Napier was most favourably mentioned in despatches, and made C.B. He joined Sir Hugh Rose as second-in-command in his march on Gwalior, and commanded the 2nd brigade at the action of Morar on the 16th June. On the fall of Gwalior he was entrusted with the task of pursuing the enemy. With only 700 men he came up with Tantia Topi and 1 2,000 men on the plains of Jaora Alipur, and completely defeated him, capturing all his guns (25), ammunition and baggage. On Sir Hugh Rose's departure he took command of the Gwalior division, captured PaoriinAugust,routedFerozeshah, a prince of the house of Delhi, at Ranode in December, and, in January 1859, succeeded in securing the surrender of Man Singh and Tantia Topi, which ended the war. For his services Napier received the thanks of parliament and of the Indian government, and was made K.C.B.

In January i860 Napier was appointed to the command of the 2nd division of the expedition to China under Sir Hope Grant, and took part in the action of Sinho, the storm of the Peiho forts, and the entry to Peking. For his services he received the thanks of parliament, and was promoted major-general for distinguished service in the field. For the next four years Napier was military member of the council of the governor-general of India and, on the sudden death of Lord Elgin, for a short time acted as governor-general, until the arrival of Sir W. T. Denison from Madras. In January 1865 he was given the com- mand of the Bombay army, in March 1867 he was promoted lieutenant-general, and, later in that year, appointed to command the expedition to Abyssinia, selecting his own troops and making all the preparations for the campaign. He arrived at Anneslcy Bay in the Red Sea early in January 1868, reached Magdala, 420 m. from the coast, in April; stormed the stronghold, freed the captives, razed the place to the ground, returned to the coast, and on the 18th June the last man of the expedition had left Africa. He received for his services the thanks of parlia- ment, a pension, a peerage, the G.C.B. and the G.C.S.I. The

freedom of the cities of London and Edinburgh was conferred upon him, with presentation swords, and the universities bestowed upon him honorary degrees. In 1869 he was elected a fellow of the Royal Society. He held the command-in-chief in India for six years from 1870, during which he did much to benefit the army and to encourage good shooting. He was promoted general in 1874, and appointed a colonel-commandant of the Royal Engineers. In 1876 he was the guest of the German crown prince at the military manoeuvres, and from that year until 1883 held the government and command of Gibraltar. In the critical state of affairs in 1877 he was nominated com- mander-in-chief of the force which it was proposed to send to Constantinople. In 1879 he was a member of the royal com- mission on army organization, and in November of that year he represented Queen Victoria at Madrid as ambassador extra- ordinary on the occasion of the second marriage of the king of Spain. On the 1st of January 1883 he was promoted to be field- marshal, and in December 1886 appointed Constable of the Tower of London. He died in London on the 14th of January 1890. His remains received a state funeral, and were buried in St Paul's Cathedral on the 21st of January. He was twice married, and left a large family by each wife, his eldest son, Robert William (b. 1845), succeeding to his barony. A statue of him on horseback by Boehm was erected at Calcutta when he left India, and a replica of it was afterwards set up to his memory in Waterloo Place, London.

NAPIER, a seaport on the east coast of North Island, New Zealand, capital of the provincial district of Hawke's Bay, 200 m. by rail N.E. of Wellington. Pop. (1906) 9454. The main portion of the town stretches along the flat shoreland of Hawke's Bay, while the suburbs extend over the hills to the north. The site consists of a picturesque peninsula known as Scinde Island. The harbour (Port Ahuriri) is sheltered by a break- water. The cathedral church of St John (1888) for the bishopric of Waiapu, is one of the finest ecclesiastical buildings in New Zealand, imitating the Early English style in brick. An athenaeum, a small hospital, a lunatic asylum, a philosophical society and an acclimatization society are among the public institutions. The town (named after Sir Charles James Napier) is under municipal government, and returns a member to the New Zealand House of Representatives. The district is agri- cultural, and large quantities of wool and tinned and frozen meats are exported. There is railway communication with Wellington, New Plymouth, and the Wairarapa, Wanganui and Manawatu districts. Numerous old native pas or fortified villages are seen in the neighbourhood.

NAPLES (Ital. Napoli, and Lat. Neapolis), formerly the capital of the

kingdom of the Two Sicilies, and since i860 the chief town of the province which bears its name, the smallest province in the kingdom of Italy. It is the largest city in the country, containing 547,503 inhabitants in 1901. It is a prefecture; the see of a cardinal archbishop; the residence of the general

commanding the tenth Army Corps and of the admiral com- manding the second Naval Department of Italy; and it possesses also an ancient and important university.

Naples disputes with Constantinople the claim of occupying the most beautiful site in Europe. It is situated on the northern shore of the Bay of Naples (Sinus Cumanus), in 40 52′ N., 14° 15′ 45″ E., as taken from the lighthouse on the mole. By rail it is distant 151 m. from Rome, but the line is circuitous, and a direct electric line was contemplated in 1907, to run nearer the coast and shorten the distance from the capital by more than 30 m. (For map, see Italy.) The circuit of the bay is about 35 m. from the capo di Miseno on the north-west to the Punta della Campanella on the south-east, or more than 52 m. if the islands of Ischia, at the north-west, and of Capri, at the south entrance, be included. At its opening between these two islands it is 14 m. broad; while another 4 m. separates Capri from the mainland at the Punta della Campanella, and from the opening to its head at Portici the distance is 15 m. It affords good anchorage, with nearly 7 fathoms of water, and is well sheltered, except from winds which blow from points between south-east and south-west. In the latter winds Sorrento should be especially avoided, as no safe anchorage can be found there at less than 15 fathoms, and the same remark applies to Capri with winds from S.W. to N.W. There is a perceptible tide of nearly 9 in.

On the north-east shore east of Naples is an extensive flat, forming part of the ancient Campania Felix, and watered by the small stream Sebeto and by the Sarno, which last in classical times formed the port of Pompeii. From this flat, between the sea and the range of the Apennines, rises Mount Vesuvius, at the base of which, on or near the sea-shore, are the populous villages of San Giovanni Teduccio, Portici, Resina, Torre del Greco, Torre dell' Annunziata, &c, and the classic sites of Herculaneum and Pompeii. At the south-east extremity of the plain, 3 m. beyond the outlet of the Sarno, a great offshoot of the Apennines, branching from the main range near Cava, and projecting as a peninsula more than 12 m. west, divides the Bay of Naples from the bay of Salerno (Sinus Paestanus), and ends in the bold promontory of the Punta della Campanella (Promon- torium Minervae), which is separated by a strait of 4 m. from Capri. On the north slope of this peninsula, where the plain ends and the coast abruptly bends to the

west, stands the town of Castellammare, near the site of Stabiae, at the foot of Monte Sant' Angelo, which rises suddenly from the sea to a height of 4722 ft. Farther west, and nearly opposite to Naples across the bay, are Vico, Meta, Sorrento, Massa and many villages.

The north-west shore to the west of Naples is more broken and irregular. The promontory of Posilipo, which projects due south, divides this part of the bay into two smaller bays — the eastern, with the city of Naples, and the western, or Bay of Baiae, which is sheltered from all winds. A tunnel through the promontory, 2244 ft. long, 21 ft. broad, and in some places as much as 70 ft. high, possibly constructed by Marcus Agrippa in 27 B.C., forms the so-called grotto of Posilipo; at the Naples end stands the reputed tomb of Virgil. Beyond Posilipo is the small island of Nisida (Nesis) ; and at a short distance inland are the extinct craters of Solfatara and Astroni and the lake of Agnano. Farther west, on the coast, and provided with a convenient harbour, stands Pozzuoli (Puteoli), a city containing many Roman remains, but now chiefly remarkable for the large gun- works erected by Messrs Armstrong & Co. ; and beyond it, round the Bay of Baiae, are Monte Nuovo, a hill thrown up in a single night in September 1538; the' classic site of Baiae; the Lucrine Lake; Lake Avernus ; the Lake of Fusaro (A cherusia Palus) ; the Ely sian Fields; and the port and promontory of Misenum. Still farther to the south-west lie the islands of Procida (Prochyta) and Ischia (Pithecusa, Aenaria or Inarime), which divide the Bay of Naples from the extensive Bay of Gaeta. All this country was comprised in classical times under the title of the Phlegrean Fields, and was certainly then more actively volcanic than it now is, although the severe shock of earthquake which occurred in the island of Ischia in 1883 completely destroyed Casamicciola, and did serious damage to Forio, Lacco Ameno and Serrara Fontana, shows that there is great seismic activity in the locality. The whole region abounds with fissures from which steam highly charged with hydrochloric acid is continually issuing, and in many places boiling water is found at a very few feet below the surface.

The city of Naples is built at the base and on the slopes of a range of volcanic hills, and, rising from the shore like an amphi- theatre, is seen to best advantage from the sea. From the summit occupied by the castle of St Elmo a transverse ridge runs south to form the promontory of Pizzofalcone, and divides the city into two natural crescents. The western crescent, known as the I Chiaja ward, though merely a long narrow strip between the sea

and Vomero hill, is the fashionable quarter most frequented by foreign residents and visitors. A fine broad street, the Riviera di Chiaja, begun in the close of the 16th century by Count d'Olivares, and completed by the duke de Medina Celi (1695- 1700), runs for a mile and a half from east to west, ending in the quarter of Mergellina and Piedigrotta at the foot of the hill of Posilipo. In front lie the Villa Communale (first called Reale and subsequently Nazionale) public gardens, the chief promenade of the city, which were first laid out in 1780, and have been successively extended in 1807, in 1834, and again in recent years; and the whole edge of the bay from the Castel dell' Ovo to Mergellina is lined by a massive embankment and carriage- way, the Via Caracciolo, constructed in 1875-1881. The eastern crescent includes by far the largest as well as the oldest portion of Naples — the ports, the arsenal, the principal churches, &c. The best-known thoroughfare is the historic Toledo (as it is still popularly called, though the official name is Via Roma) which runs almost due north from the Piazza (Largo) del Plebiscito in front of the Palazzo Reale, till, as Strada Nuova Di Capodimonte, crossing the Ponte della Sanita (constructed by Murat across the valley between Santa Teresa and Capodi- monte), it reaches the gates of the Capodimonte palace. A drive, the Corso Vittorio Emmanuele, winds along the slopes behind the city from the Str. di Piedigrotta (at the west end of the Riv. di Chiaja) till it reaches the museum by the Via Salvator Rosa. The character of the shore of the eastern crescent has been much altered by the new harbour works, which with the wharves and warehouses have absorbed the Villa del Popolo, or People's Park, originally constructed on land reclaimed from the bay.

The streets of Naples are generally well-paved with large blocks of lava or volcanic basalt. In the older districts there is a countless variety of narrow gloomy streets, many of them steep. The houses are mostly five or six storeys high, are covered with stucco made of a kind of pozzolana which hardens by exposure, and have large balconies and flat roofs. The castle of S. Elmo (S. Ermo, S. Erasmus), which dominates the whole city, had its origin in a fort (Belforte) erected by King Robert the Wise in 1343. The present building, with its rock-hewn fosses and massive ramparts, was constructed by Don Pedro de Toledo at the command of Charles V. in 1535, and was long considered practically impregnable. Damaged by lightning in 1857, it was afterwards restored, and is now a military prison. On a small island (I. del Salvatore, the Megaris of Pliny), now joined to the shore at the foot of the Pizzofalcone by an arch- supported causeway, stands the Castel dell' Ovo (so called from its shape, though medieval legend

associates the name with the enchanted egg on which the magician Virgil made the safety of the city to depend), which dates from 1154. The walls of its chapel were frescoed by Giotto; but the whole building was ruined by Ferdinand II. in 1495, and had to be restored in the 1 6th century. Castel Nuovo, a very picturesque building constructed near the harbour in 1283 by Charles I. of Anjou, contains between the round towers of its facade the triumphal arch erected in 1470 to Alphonso I. and renovated in 1905. It numbers among its chambers the Gothic hall of Giovanni Pisano in which Celestine V. abdicated the papal dignity. Castel del Carmine, founded by Ferdinand I. in 1484, was occupied by the populace in Masaniello's insurrection, was used as a prison for the patriots of 1796, became municipal property in 1878, and is now a prison. The royal palace, begun in 1600 by the Count de Lemos, from designs by Domenico Fontana, partly burned in 1837, and since repaired and enlarged by Ferdinand II., is an enormous building with a sea frontage of 800 ft. and a main facade 554 ft. long and 95 ft. high, exhibiting the Doric, Ionic and Composite orders in its three storeys. The statues on the facade of the palace were erected by King Humbert I. in 1885, and represent the titular heads of the various dynasties which have reigned at Naples, beginning with Ruggiero the Norman (1130); followed by Frederick II. of Suabia (1197); Charles I. of Anjou (1266); Alfonso of Aragon (1442); Charles V. of Spain (1527); Charles III. (Bourbon) of Naples (1744); Gioacchino Murat (1808); and Victor Emmanuel II. (1861).

Naples is the see of a Roman Catholic archbishop, always a cardinal. The cathedral has a chapter of thirty canons, and of the numerous religious houses formerly existing very few have in whole or in part survived the suppression in 1868. The city is divided into fifty parishes purely for ecclesiastical purposes, and there are 237 Roman Catholic churches and 57 chapels.

Most of the churches are remarkable rather for richness in internal, decoration than for architectural beauty. The cathedral of St' Januarius, occupying the site of temples of Apollo and Neptune, and still containing some of their original granite columns, was designed by Nicola Pisano, and erected between 1272 and 1316. Owing to frequent restorations occasioned by earthquakes, it now presents an incongruous mixture of different styles. The general plan is that of a basilica with a nave and two (Gothic vaulted) aisles separated by pilasters. The western facade is of marble and was completed in 1906. Beneath the high altar is a subterranean chapel containing the tomb of St Januarius (San Gennaro), the patron saint of the city ; in the right aisle there is a chapel (Cappella del Tesoro) built between 1608 and 1637 in popular recognition of his having saved Naples in 1527 " from

famine, war, plague and the fire of Vesuvius “; and in a silver tabernacle behind the high altar of this chapel are preserved the two phials partially filled with his blood, the periodical liquefaction of which forms a prominent feature in the religious life of the city. Accessible by a door in the left aisle of the cathedral is the church of Sta Restituta, a basilica of the 7th century, and the original cathedral. Santa Chiara (14th century) is interesting for a fresco ascribed to Giotto (at one time there were many more), and monuments to Robert the Wise, his queen Mary of Valois and his daughter Mary, empress of Constanti- nople.. San Domenico Maggiore, founded by Charles II. in 1285, but completely restored after 1445, has an effective interior particu- larly rich in Renaissance sculpture. In the neighbouring monastery is shown the cell of Thomas Aquinas. San Filippo Neri or dei Gerolomini, erected in the close of the 16th century, has a white marble facade and two campaniles, and contains the tombstone of Giambattista Vico. Sta Maria del Parto, in the Chiaja, occupies the site of the house of Sannazaro, and is named after his poem De Partu Virginis. San Francesco di Paolo, opposite the royal palace, is an imitation of the Pantheon at Rome by Pietro Bianchi di Lugano (1815-1837), and its dome is one of the boldest in Europe. The church of the Certosa (Carthusian monastery) of San Martino, on the hill below St Elmo’s castle, has now become in name, as so many of the churches are in reality, a museum. Dating from the 14th century, and restored by Fonsega in the 17th, it is a building of extraordinary richness of decoration, with paintings and sculpture by Guido Reni, Lanfranco, Caravaggio, D’Arpino, Solimene, Luca Giordano and notably a ” Descent from the Cross ” by Ribera, con- considered the finest work of this master. The monastery has been transformed into a medieval museum, where many specimens illustrating the modern history of Naples may be studied, and some fine specimens of majolica from the southern provinces can be inspected. The view from the south-western balcony is incompar- able. The marble cloister by Fonsega, though rather flamboyant in character, is one of the finest of its kind in existence. Other churches with interesting monuments are Sant’ Anna dei Lombardi, built in 141 1 by Guerrello Origlia, which contains some splendid marble sculpture, especially Rosellino’s ” Nativity “in the Cappella Picco- lomini; Sant’ Angelo a Nilo, which contains the tomb of Cardinal Brancaccio, the joint work of Donatello and Michelozzo; San Giovanni a Carbonara, built in 1344 and enlarged by King Ladislaus in 1400, which contains among much other remarkable sculpture the tomb of the king, the masterpiece of Andrea Ciccione (1414), and that of Sergiami Caracciolo, the favourite of Joanna II., who was murdered in 1432 (the chapel in which it stands is paved with one of the earliest majolica pavements in Italy) ;

San Lorenzo (1324), the Royal Church of the House of Anjou; and, for purely archaeo- logical interest, the Church of Sant' Aspreno, thought to be the oldest Christian church in Italy, in the crypt of the new Borsa or exchange. Persons interested in frescoes will admire those in the former monas- tery at the back of the church of S. Maria Donna Regina and those in the cloister of S. Severino and Sossio. A more ancient Christian monument than any of the convents or churches is the catacombs, which extend a great distance underground and are in many respects finer than those at Rome. The entrance is at the Ospizio dei Poveri di San Gennaro (see Schulze's monograph, Jena, 1877).

Of the secular institutions in Naples none is more remarkable than the National Museum, formerly known as the Museo Borbonico. The building, begun in 1586 for vice-regal stables, and remodelled in 161 5 for the university, was put to its present use in 1790, when Ferdinand IV. proclaimed it his private property independently of the crown, placed in it the Farnese collection which he had inherited from his father, and all the specimens from Herculaneum, Pompeii, Stabiae, Puteoli, Paestum, &c, which till then had been housed in the palace at Portici, and gave it the name of Real Museo Borbonico. In i860

Garibaldi, when dictator at Naples, proclaimed the museum and the territory devoted to excavation to be the property of the nation, since which time it has been called the National Museum. Vast numbers of specimens have since been added to it both by purchase and f.rom excavations, and it is now unique as a treasure house of Italo-Greek and Roman antiquities, besides containing a fine library and an important collection of pictures.

A large additional space for exhibits was made in 1904, when the western half of the second floor was added, and the building as now arranged contains the large bronzes and statues on the ground floor; a gallery of Pompeian frescoes in the entresol; the library, picture gallery and small bronzes on the first floor; and the glass, jewelry, arms, papyri, gems, and the unique collection of Italo- Greek vases, on the second floor. The large bronzes are almost the only ones which have survived from classical times, the most famous of them being the seated Mercury and the dancing Faun; the marbles reckon among their vast number the Psyche, the Capuan Venus, the portraits of Homer and Julius Caesar, as well as the huge group called the Toro Farnese (Amphion and Zethus tying Dirce to its horns), the Farnese Hercules, the excellent though late statues of the Balbi on horseback and a very fine collection of ancient portrait busts.

Modern Buildings. — The Galleria Umberto I. is a large cruci- form arcade opened in 1890. It somewhat resembles the Milan arcade, and has an octagon in the centre, with a cupola. It is highly ornamented with gilt and stucco. A music-hall occupies the basement. The Galleria Principe di Napoli is in a smaller arcade opposite to the National Museum, mainly occupied by shops where reproductions from the museum are sold. The Galleria Vittoria, opened in 1907, is a circular building with handsome dome, situated near the main entrance of the Villa Communale. It is in great part occupied by offices and shops. The Anglican church in Vico San Pasquale was built in 1862 on ground given to the British community by Garibaldi when dictator, and was the first Protestant church erected in Naples. Since the granting of religious liberty evangelical churches have been built by the Presbyterians, Wesleyans, French, Germans and Italians. A Greek church and a Jewish synagogue have also been opened. The Borsa (or exchange) is a fine building in the Piazza of the same name, built over the remains of the very ancient church of Sant' Aspreno, which are

still preserved in the crypt. In front of it is the fine 16th-century Fontana Medina.

Educational and Learned Institutions. — The university of Naples is one of the oldest in Italy, having been founded by Frederick II. in the first half of the 13th century. It had fallen to insignificance under the Bourbons, but since i860 it has rapidly recovered. It comprises five faculties (literature and philosophy, jurisprudence, mathematics, natural science and medicine), and is well equipped with zoological, mineralogical and geological museums, a physio- logical institute, a cabinet of anthropology, and botanical gardens. Originally erected in 1557 for the use of the Jesuits, the university buildings are regarded as the best work of Marco di Pino; the quadrangle, surrounded by a simple but effective peristyle, contains statues of Pietro della Vigna (Frederick's chancellor), Thomas Aquinas and Giordano Bruno. The new building, the shell of which was completed in 1906, faces the Rettifilo, a new wide street which leads from the Borsa in a straight line to the railway station; at the back it joins the former building, which is at a higher level. On the other or north side of the ancient building, and at the back of the Strada Constantinopoli, very large annexes have been formed for the medical school. The famous zoological station at Naples, whose aquarium is the principal building in the Villa Communale, is not connected with the university. It was founded by Dr Dohrn in 1872; a large annexe was added to it a few years later on its western side, and a larger annexe on the eastern side was completed in 1907. The aquarium was originally established at Naples because the flora and fauna of the neighbourhood are more varied than those of any district in Europe. Its Mittheilungen began to be pub- lished in 1878, and portions of a great work on the flora and fauna of Naples come out year by year. It is justly considered the first as well as the oldest of the zoological stations of the world, and the chief universities pay /ioo a year for tables to which they send students. At these tables every necessary is provided, each student having his own tanks with salt water laid on for keeping his speci- mens, and all necessary chemicals being provided. Of other scientific institutions we may mention the observatory on Vesuvius, which is supported entirely by funds from the government, but is annexed informally to the university. Its object is to record earth-movements and volcanic phenomena. The Specola or astronomical observatory is also a government institution, and forms no official part of the university. It is situated on the hill of Capodimonte. The Royal Society of Naples, dating from 1756, was reconstituted

in 1861, and is divided into three academies, namely: moral and political; physical and mathematical; letters, archaeology and fine

arts. The famous Accademia Pontaniana, founded by Antonio Becardella (surnamed Panormita owing to his origin from Palermo) and J. J. Pontanus in 1442, was restored in 1808 and still exists. The Royal School for Oriental Languages owes its existence to Matteo Ripa.who in 1732 established a school for Chinese mission- aries. The Royal Conservatory of Music in S. Pietro a Majella has existed in one form or other since 1760, and has had many famous pupils.

Elementary education has proceeded with great rapidity, and there are ninety public elementary shools in the city, twenty-three ecclesiastical gratuitous school's and many evangelical schools at a very small payment. The higher grade schools are also numerous, and there are special foreign schools established by private enterprise for the education of the children of foreign residents. There are three schools for the blind and two for deaf-mutes.

Libraries — The state archives in Vico San Severo e Sossio contain all the records of past governments; the Notarial archives in Via San Paolo contain all the original notarial acts from 1450 onwards, to the number of 800,000. The Royal national library in the building of the national museum contains 364,000 volumes and 7835 manu- scripts, many of which are of great value. The musical archives are kept here as a separate department. The Royal library of San Giacomo (100,000 vols.) had its origin in the Palace library of the Bourbon times. There may also be mentioned the Royal University library, the Royal Brancacciana library in Via Donnaromita, with 125,000 vols, and 2000 important MSS., the Gerolomini library, mainly of ecclesiastical books and codices, and the Provincial library in Via Duomo, consisting mainly of technical books. The Biblioteca Communale, and the rich collection of seismic and vulcanological books made by the Italian Alpine Club, are both in charge of the Societa di Storia Patria. This literary society was established in !875, by a committee of private gentlemen anxious to record all possible details of the history of the locality. It has a good though not perfect collection of the early Neapolitan newspapers, a complete file of the principal modern ones and many interesting MSS. The society is governed by a council of literary men, and issues publi- cations from time to time. The Zoological Station or Aquarium has a very fine biological library.

Theatres. — The San Carlo opera-house, with its area of 5157 sq. yds. and its pit capable of seating 1000 spectators, is one of the largest in Europe. It was originally built in 1737 under Charles III., but was destroyed by fire in 1816 and completely rebuilt. It was heavily subsidized in the Bourbon times, but now, except for giving the house, which is the property of the municipality, no assistance is granted

from the public funds. The Mercadante is also a municipal theatre, but has no subsidy. The Bellini is a fine opera-house near the museum, and the other chief theatres are the Sannazzaro, Politeama and Fiorentini. Numerous music halls have sprung up of late years, of which the principal is the Salone Margherita in the basement of the Galleria Umberto Primo.

Charities. — Charitable institutions are numerous in Naples. The Reclusorio or poorhouse was founded in the 1 8th century, and besides being a refuge for the indigent poor has a series of industrial schools attached, at which foundling boys are educated and taught trades. The principal hospitals are the Incurabili, Gesu e Maria, Santa Maria della Pace and a hospital for poor priests, which are all under the same management. The Pellegrini is exclusively surgical ; the Santa Maria di Loreto is especially for the inmates of the Reclusorio and for street accidents; the Ospedale Lina for children; and the Ospedale Cotugno for infectious diseases. There is also an International hospital for the treatment of others than Italians, which was built by Lady Harriet Bentinck and is managed by an inter- national committee; a German hospital; and a hospital erected by the representatives of Baron Adolphe de Rothschild. There are two public lunatic asylums in the city, and another at the neighbour- ing town of Aversa; and many private asylums, among which Fleurent, Miano and Ponti Rossi may be mentioned.

Harbour. — At a very early date the original harbour at Naples, now known in its greatly reduced state as Porto Piccolo, and fit only for boats and lighters, became too small. In 1302 Charles II. of Anjou began the construction of the Porto Grande by forming the Molo Grande or San Gennaro, which stretched eastward into the bay, and was terminated by a lighthouse in the 15th century. By the addition of a new pier running north-east from the lighthouse, and protected by a heavily armed battery, Charles III. in 1740 added greatly to the safety of the harbour. In 1826 the open area to the south of the Porto Grande was formed into the Porto Militare by the construction of the Molo San Vincenzo, 1200 ft. long. Shortly after the formation of the new kingdom of Italy attention was called to the insufficiency of the harbour for modern wants ; and new works were begun in 1862. Besides the lengthening of the Molo San Vincenzo to a total of more than 5000 ft., the scheme as now carried out has completely revolutionized the harbour. A cross piece at the end of the Molo San Vincenzo has made the head of that structure into the form of the Greek letter gamma, thus affording considerable protection to the anchorage. New quays have been made all the way from the old Immacolatella landing-place to the new and spacious Capitaneria di

Porto, on the eastern side of which is a new

narbour used mainly for the coal trade, and piers such that the largest liner can lie alongside the jetty. The outer mole of this harbour runs out from the Castel del Carmine towards the south for some 1500 ft. and forms the inner side of the new steam basin, which when nearly completed in 1906 fell in on the farther side, and had to be re-constructed. The depth of this new harbour is from 25 to 30 ft. There are two projecting moles, one to the inner harbour and the second to the steam basin. In 1905 the total tonnage entering the port amounted to 4,698,872 tons, of which the Italians (including their coasting trade) carried 1,410,192 tons in 3687 vessels; the Germans 1,391,585 tons in 356 vessels; the British 1,136,345 tons in 402 vessels; and the French 245,206, tons in 161 vessels. Naples is the principal port for emigration, chiefly to North and South America; 281 emigrant ships sailed in 1905, carrying 216,103 emi- grants. The total imports for that year reached the sum of £5,397,918, and the exports £3,367,805. The articles dealt in are wine, oil, spirits, drugs, tobacco, chemicals, hemp, cotton, wool, silk, timber, paper, leather and hides, metal, glass, cereals and live animals. The largest export was to the United States (£864,562), the next to Great Britain (£701,387), while the largest imports were from Great Britain (£1,233,410) and the United States (£807,564). The speciali- ties of Naples are the manufacture of coral, tortoise-shell, kid gloves and macaroni, but it has been growing also as an industrial centre. The port of Naples is second in the kingdom, and owns no rival save Genoa.

Water Supply. — Since 1884 Naples has had as fine a water supply as any city in Europe. It is derived from the hills in the neighbour- hood of Avellino, and is thought to be the effluent of an underground lake. It rushes out from the hillside and is received in a covered . masonry canal, whence it flows in large iron pipes till it reaches five enormous reservoirs constructed just opposite to the entrance gates of the royal palace at Capodimonte. Hence it comes by natural gravitation into the town at a pressure of five atmospheres, so that it supplies the highest parts of the town with abundant water. The water is so cold that in the hottest summer perishable articles can be preserved by merely securing them in a closed vessel and allowing the water to drip upon it. The supply was brought into the town just after the terrible cholera outbreak of 1884, and as each new standpipe was erected in the streets every well within 200 yds. of it was closed, so that in a short

time no well remained in the town ; and thus a fertile source of infection was eliminated. Every house •in the town and suburbs is now supplied with a constant supply of pure water. The effect on the health of the city has been extra- ordinary. Cholera epidemics, which used to be frequent, have become things of the past, and there is now abundant water for public fountains, walhing the streets and watering gardens both public and private. The old sewers were found quite inadequate to carry off the large increase of water, and besides they all led directly into the bay, causing a terrible odour and rendering the water near the town unwholesome for bathing. This has been remedied by a system of sewers, which after passing by a tunnel through the hill of Posilipo cross the plain beyond and discharge their contents into the open sea on the deserted coast of Cumae, 17 m. from the city of Naples. The old aqueduct, which was constructed in the 17th century by Carnignano and Criminelli and taps the Isclero at Sant' Agata dei Goti, is still available to a certain extent, but its water was never very wholesome, and as it was not laid on to houses but only supplied fountains and house cisterns which have since been filled up, no account need be taken of it. The solitary Leone fountain, a spring which supplied drinking water to the west end of the town, has been dry for many years.

Modern Growth. — Naples, the most densely peopled city in Europe, has increased in modern times at an enormous rate. On the large areas reclaimed from the sea, vast hotels and mansions let in flats have been erected. The gardens at the west end of the town are all built over. The Vomero, once merely a scattered village, is now an important suburb, and a large workmen's quarter has sprung up beyond the railway station to house the populace which was turned out from the centre of the town when the works of the risanamento were undertaken. The increase in population between the census of 1881, when it was 461,962, and the census in 1901 was 85,521. The commune, which includes not only the urban districts (sezioni) of San Ferdinando, Chiaja, S. Giuseppe, Monte Calvario, Awocata, Stella, San Carlo all' Arena, Vicaria, San Lorenzo, Mercato, Pendino and Porto, but also the suburban districts of Vomero, Posilipo, Fuorigrotta, Miano and Piscinola, has been built over in every direction, one great incentive being the creation of an industrial zone to the eastward of the city. This zone has been set aside for the purpose of industrial development, and all persons or companies who set up industrial concerns on it have grants of land at a nominal price, are free of taxes for ten years and have electric force supplied to them at a very low figure. The law came into force in 1906, and was immediately followed by

the erection of a large number of factories, for spinning silk, cotton, jute and wool, and the making of railway plant, auto- mobiles, the building of ships, and in fact almost every kind of industry. After the cholera epidemic of 1884, M. Depretis, then premier, visited Naples, and in the course of a public speech gave vent to the famous dictum ” Bisogna sventrare Napoli ” — ” Naples must be disembowelled! ” Plans were at once made to pull down all the worst slums, and as these lay between the centre of the town and the railway station, a wide street was constructed from the centre of the town to the eastward, and on each side of it wide strips of ground were cleared to afford building sites for shops and offices. The funds for this vast undertaking were found partly by the state, which voted £3,000,000, and as to the rest by the Risanamento Company, which had a capital of £1,200,000. Before beginning operations of demolition it was obviously necessary to provide homes for the poor people who would be turned out, and a large working- class quarter was erected to the north and beyond the railway station. This quarter has wide airy streets and lofty houses, and though perhaps the houses were let at prices which were beyond the purses of the lowest class, the result of their erection was to cause a number of the poorer houses in the old town to be vacated, thus giving an opportunity to the lowest class to be at any rate better housed than they were before. The quarter described above is known as the Rione Vasto. There are also new middle-class quarters at Santa Lucia, Vomero Nuovo and Sant’ Efremo, and better houses in the Via Sirignano, on the Riviera di Chiaja, Via Elena and Via Caracciolo at Mergellina, Via Partenope near the Chiatamone, and an aristocratic quarter in the large extensions made in the Rione Amedeo. The narrow alleys of Porto, Pendino and Mercato have nearly all disappeared, and old Naples has been vanishing day by day. One notable result of the widening of the streets has been the spread of the electric tramways, which traverse the town in various directions and are admirably served by a Belgian company. The city is mainly lighted by electricity, which has also found its way into all the public edifices and most private houses.

Folk-lore. — The attention of antiquarians to the charms against the Evil Eye used by the inhabitants of the Neapolitan provinces was first drawn in 1888, when it was shown that they were all derived from the survival of ancient classical legends which had sprung from various sources in connexion with classical sites in the neighbourhood. These may be divided into three classes: first, the sprig of rue in silver, with sundry emblems attached to it, all of which refer to the worship of Diana, whose shrine at Capua was of considerable importance; secondly, the serpent charms, which formed part of the worship of

Aesculapius, and were no doubt derived largely from the ancient eastern ophiolatry; and lastly charms derived from the legends of the Sirens. A special confirmation is given in this case, as the Siren is represented mounted on her sea- horse crossing the Styx upon the vase of Pluto and Proserpine in the collection of the Naples Museum. This vase dates about 250 B.C., and the Siren charms represent her in the same way, but usually mounted on two sea-horses. The sea-horse and the Siren alone are commonly found as charms; the Siren being sometimes in her fishtail form and sometimes in the form of a harpy.

History. — All ancient writers agree in representing Naples as a Greek settlement, though its foundation is obscurely and differently narrated. The earliest Greek settlement in the neighbourhood was at Pithecusa (Ischia), but the colonists, being driven out of the island by the frequent earthquakes, settled on the mainland at Cumae, where they found a natural acropolis of great strategic value. From Cumae they colonized Dikearchia (Pozzuoli) and probably subsequently Palaeopolis. The site of Palaeopolis has given rise to much discussion, but the researches by R. T. Giinther open completely new ground, and seem to be the correct solution of the problem. He places Palaeopolis at Gaiola Point and has discovered the remains of the harbour, the town hall and various other rudiments of the ancient city. This site, moreover, corresponds with Livy's testimony, and would account for his statement that the towns of Palaeopolis and Neapolis were near together and identical in language and government. This opinion about the site of Palae- opolis has been based on the very considerable alterations which are known to have taken place in the level of the land, and the

extensive submerged foundations of buildings off the southern extremity of Posilipo have been identified with those of the old city Parthenope, as well as Dikearchia, was formed as a new colony from Cumae, and was so called from a legendary connexion of the locality with the siren of that name, whose tomb was still shown in the time of Strabo. Parthenope was situated where Naples now stands, upon the splendid natural acropolis formed by the hill of Pizzofalcone, and defended on the land side by a fosse which is now the Strada di Chiaja, and a massive wall, of which remains may still be traced at the back of the existing houses. To the colonists of Parthenope there came afterwards a considerable addition from Athens and Chalcis, and they built themselves a town which they called Neapolis, or the " new

city," in contradistinction to the old settlement, which in consequence was styled Palaeopolis or the " old city." The name of Parthenope became lost, and the city of Palaeopolis fell into gradual decadence.

In 328 B.C. the Palaeopolitans having provoked the hostility of Rome by their incursions upon her Campanian allies, the consul Publilius Philo marched against them, and having taken his position between the old and the new city, laid regular siege to Palaeopolis. By the aid of a strong Samnite garrison which they received, the Palaeopolitans were long able to withstand the attacks of the consul; but at length the city was betrayed into the hands of the Romans by two of her citizens. Neapolis possibly surrendered to the consul without any resistance, as it was received on favourable terms, had its liberties secured by a treaty, and obtained the chief authority, which previously seems to have been enjoyed by the older city. From that time Palaeopolis totally disappeared from history, and Neapolis became an allied city (foederata civitas) — a dependency of Rome, to whose alliance it remained constantly faithful, even in the most trying circumstances. In 280 B.C. Pyrrhus unsuccessfully attacked its walls; and in the Second Punic War Hannibal was deterred by their strength from attempting to make himself master of the town. During the civil wars of Marius and Sulla a body of partisans of the latter, having entered it by treachery (82 B.C.), made a general massacre of the inhabitants; but Neapolis soon recovered, as it was again a flourishing city in the time of Cicero. It became a municipium after the passing of the lex Julia; under the empire it is noticed as a colonia, but the time when it first obtained that rank is uncertain — possibly under Claudius.

Though a municipal town, Neapolis long retained its Greek culture and institutions; and even at the time of Strabo it had gymnasia and quinquennial games, and was divided into phratriae after the Greek fashion. When the Romans became masters of the world, many of their upper classes, both before the close of the republic and under the empire, from a love of Greek manners and literature or from indolent and effeminate habits, resorted to Neapolis, either for the education and the cultivation of gymnastic exercises or for the enjoyment of music and of a soft and luxurious climate. Hence we find Neapolis variously styled — by Horace otiosa Neapolis, by Martial docta Parthenope, by Ovid in otia natam Parthenopen. It was the favourite residence of many of the emperors; Nero made his first appearance on the stage in one of its theatres; Titus assumed the office of its archon; and Hadrian became its demarch. It was chiefly at Neapolis that Virgil composed his Georgics; and he was buried on the hill of Pausilypus, the modern Posilipo, in its neighbourhood. It was also the favourite

residence of the poets Statius (a.d. 61) and Silius Italicus (a.d. 25), the former of whom was a Neapolitan by birth.

After the fall of the Roman Empire, Neapolis suffered severely during the Gothic wars. Having espoused the Gothic cause in the year 536, it was taken, after a protracted siege, by Belisarius, who turned aside an aqueduct, marched by surprise into the city through its channel, and put many of the inhabitants to the sword. In 542 Totila besieged it and compelled it to surrender, but being soon after recovered by Narses, it remained long a dependency of the exarchate of Ravenna, under the immediate government of a duke, appointed by the East Roman emperors.

When the Lombards invaded Italy and pushed their conquests in the southern provinces, the limits of the Neapolitan duchy were considerably narrowed. In the beginning of the 8th century, at the time of the iconoclastic controversy, the emperor Leo the Isaurian having forced compliance to his edict against the worshipping of images, the Neapolitans, encouraged by Pope Gregory III., threw off their allegiance to the Eastern emperors, and established a republican form of government under a duke of their own appointment. Under this regime Neapolis retained independence for nearly four hundred years, though constantly struggling against the powerful Lombard dukes of Benevento, who twice unsuccessfully besieged it. In LP27, however, Pandulf IV., a Lombard prince of Capua, succeeded in making himself master of it; but he was expelled in 1030 by Duke Sergius, chiefly through the aid of a few Norman adventurers. The Normans, in their turn, gradually superseded all powers, whether Greek, Lombard or republican, which had previously divided the south of Italy, and furthermore checked the Saracens in the advances they were making through Apulia.

From the date at which the south of Italy and Sicily were subjugated by the Normans the history of Naples ceases to be the history of a republic or a city, and becomes that of a kingdom, sometimes separate, sometimes merged, with the kingdom of Sicily, in that of the Two Sicilies. The city of Naples hence- forth formed the metropolis of the kingdom to which it gave its name, owing this pre-eminence to its advantageous position on the side of Italy towards Sicily, and to the favour of successive princes (see Naples, Kingdom of).

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NAPLES, KINGDOM OF, the name conventionally given to the kingdom of Sicily on the Italian mainland (Sicily beyond the Pharos), to distinguish it from that of Sicily proper (Sicily on this side of the Pharos, i.e. Messina), the title of "King of Naples " having only actually been borne by Philip II. of Spain in the 16th century (" King of England and Naples ") and by Joseph Bonaparte and Joachim Murat in the 19th. The history of the kingdom of Naples is inextricably interwoven with that of Sicily, with which for long periods it was united as the kingdom of the Two Sicilies.

For the earlier history of Naples and its territory, as a republic and a dukedom, see Naples above, and for the coming of the Normans see Sicily and Normans. It is sufficient here to state that the leaders of the house of Hauteville, Robert Guiscard and Richard of Aversa, in 1059 did homage to Pope Nicholas II. (q.v.) for all conquests they had made both in the island and upon the mainland, and that in 1130 Roger de Hauteville (Roger II. as " great count " of Sicily) assumed the style of king as Roger I. In this way the south of Italy, together with the adjacent island of Sicily, was converted into one political body, which, owing to the peculiar temper of its Norman rulers and their powerful organization, assumed a more feudal character than any other part of the peninsula. The regno, as it was called by the Italians, constituted a state apart, differing in social institutions, foreign relations, and type of home government, from the commonwealths and tyrannies of upper Italy. The indirect right acquired by the popes as lords paramount over this vast section of Italian territory gave occasion to all the most serious disturbances of Italy between the end of the 13th and the beginning of the 16th centuries, by the introduction of the house of Anjou into Naples and the disputed succession of Angevin and Aragonese princes.

Roger I. was succeeded in 1154 by William I. " the Bad," who died in 1166, being succeeded by his son William II. " the Good," on whose death in 1189 the crown passed to his illegitimate son Tancred. After the death of

The Hohen-

Tancred the emperor Henry VI., of the house of s < au fc ns .

Hohenstaufen, who by his marriage with Constance

or Costanza d'Altavilla, daughter of Roger I. (d. n 54), was

Tancred's rival for the kingdoms of Naples and Sicily, de- scended into Italy in 1104. He easily conquered both the mainland and the island, and Tancred's only son William III. surrendered the crown to him. But with the excuse of a pre- tended plot he put a number of the most conspicuous persons in the kingdoms to death, and had William himself blinded. He then returned to Germany, and during his absence an agita- tion broke out, provoked by the cruelty of his lieutenants and encouraged by his Norman wife. He hurried back to Italy, and repressed the movement with his usual ferocity, but died The in 1 197. Costanza then had her son Frederick

emperor (b. 1194) proclaimed king, and obtained the support Frederick f t j, e H]y See on condition that the kingdom should be once more recognized as a fief of the church. The whole history of the ensuing period of south Italian history turns on the claims of the papacy over the kingdoms of Naples and Sicily, based on the recognition of papal suzerainty in 1053. The Hohenstaufen kings refused to admit this claim; hence the persistent hostility of the popes and the calling in of foreign potentates and armies. Costanza died in 1108, leaving Pope Innocent III. regent and tutor to her son; the pope's authority was contested by various nobles, but in 1 209 Frederick married Costanza, daughter of the king of Aragon, with whose help he succeeded in reducing a large part of Sicily to obedience. Two years later he was elected king of the Romans at the diet of Nuremberg in opposition to Otto IV., and in 1220 he was crowned emperor in Rome by pope Honorius III., but continued to reside in Sicily. He quelled a rising of Sicilian barons and Saracens, and confined 60,000 of the latter at Lucera in Capi- tanata, where they ended by becoming a most loyal colony. After the death of Frederick's wife Pope Honorius III. arranged a marriage for him with Yolande, daughter of John of Brienne (1225). But in 1227 Gregory IX. excommunicated him because he delayed the crusade which he had promised to undertake; and although he sailed the following year, and concluded a treaty with the sultan of Egypt whereby the kingdom of Jerusalem was re-established, the pope was not satisfied and sent an army into Neapolitan territory. On his return Frederick defeated the pontificals, and in 1230 peace was made at San Germano and the excommunication withdrawn. In 1231 he issued the celebrated Constitutions of the Sicilian kingdom at the parliament of Melfi. He

had further quarrels with successive pontiffs, and was excommunicated more than once. In 1246 a number of his own barons and officials of the mainland conspired against his rule, but were crushed with great ferocity, and even his faithful secretary, Tietro della Vigna, fell a victim to the emperor's suspicions. Frederick's last years were embittered by the hostilities following on the crusade which the pope pro- claimed against him and by rebellions in Naples and Sicily. He died in 1250. His policy was anti-feudal and tended to concentrate power into his own hands; hence the frequent risings of the barons. His court at Palermo had been one of the most brilliant in Europe, and attracted learned men from all over the then known world; his somewhat pagan philosophy was afterwards regarded as marking the beginnings of modern rationalism. He opened schools and universities, and he himself wrote poetry in Sicilian dialect.

His son Conrad IV. succeeded to the empire, while to his illegitimate son Manfred he left the principality of Taranto Ma fred an< ˆ tne re 8 enc y ˚f the southern kingdom, to be held in Conrad's name. By his political sagacity and moderati \>n Manfred won a strong party to his side and helped Conrad to subjugate the rebellious barons. The emperor died in 1254, leaving an infant son, Conradin (b. 1252), and Manfred was appointed vicar-general during the latter's minority. Manfred, too, encountered the hostility of the popes, against whom he had to wage war generally with success, and of some of the barons whom the papacy encouraged to rebel; and in 1238, on a rumour of Conradin's death, he was offered and accepted the crown of Naples and Sicily. The rumour proved false, but he retained the crown, promising to leave the kingdom to Conradin at his death and to defend his rights. He now became head of

the Ghibellines or Imperialists of Italy, and his position was strengthened by the marriage of his daughter Costanza to Peter, son of King James of Aragon. But he met with opposition from the turbulent nobility and the clergy, who had been deprived of many privileges, and he failed to conciliate the communes, which were oppressed by taxes and beginning to aspire to autonomy. Innocent IV., in his determination to crush the Hohenstaufens, offered the kingdom in turn to Richard, earl of Cornwall, to Edward, son of Henry III. of England, and to Charles of Anjou, brother of Louis IX. of France. After long negotiations with successive popes, Charles was finally induced by Clement IV. to come to Italy in 1265, agreeing to accept the kingdom of the Two Sicilies as a fief of the church, and in 1266 he marched southward with the privileges of chartesl a crusader (see Charles I., king of Naples and Sicily). The defection of many cities and nobles facilitated his task, and Manfred was forced to retire on

Benevento, where, on the 26th of February, owing to the treachery of a part of his troops, he was defeated and killed. As a result of this victory Charles was soon master of almost the whole kingdom, and he entered Naples, which now became the capital instead of Palermo. He persecuted the nobles who had sided with Manfred, and established a military despotism which proved more oppressive than that of the Hohenstaufens had ever been. Old laws, customs and immunities were ruthlessly swept away, the people were ground down with taxes, and the highest positions and finest estates conferred on French and Provencal nobles. Al- though the southern Italians had long been ruled by foreigners, it was the Angevin domination which thoroughly denationalized them, and initiated that long period of corruption, decadence and foreign slavery which only ended in the 19th century.

Invited by Sicilian malcontents and Ghibellines, Conradin (Ital. Corradino), the last surviving Hohenstaufen, descended

into Italy in 1267 at the head of a small army collected .,

in Germany, and he found many supporters; but King Charles on hearing of his arrival abandoned the siege of Lucera and came to intercept him. A battle took place at Tagliacozzo (August 23rd, 1268), in which the Imperialists were defeated, and Conradin himself was subsequently caught and handed over to Charles, who had him tried for high treason and beheaded (see Conradin). All who had assisted the un- fortunate youth were cruelly persecuted, and the inhabitants of Agosta put to the sword. Thus ended the power of the Hohenstaufens. Although the picturesque figures of Manfred and Conradin awakened sympathy among the people of the kingdom, their authority was never really consolidated and their German knights were hated ; which facts rendered the enterprise of another foreigner like the Angevin comparatively easy.

In Sicily, however, Charles's government soon made itself odious by its exactions, the insolence and cruelty of the king's French officials and favourites, the depreciation of the currency, and the oppressive personal services, Sicilian while the nobles were incensed at the violation of vespers. their feudal constitution. Just as Charles was con- templating an expedition to the East, the Sicilians rose in revolt, massacring the French throughout the island. The malcontents were led by the Salernitan noble Giovanni da Procida, a friend of the emperor Frederick and of Manfred, who had taken refuge at the court of Peter III. of Aragon, husband of Manfred's daughter Costanza. He had induced Peter to make good his somewhat shadowy claims to the crown of Sicily, but while preparations were being made for the

expedition, the popular rising known as the Sicilian Vespers, which resulted in the mass- acre of nearly all the French in the island, broke out at Palermo on Easter Day 1282. Peter reached Palermo in September, and by the following month had captured Messina, the last French stronghold. Pope Martin IV. now proclaimed a crusade against the Aragonese, and the war continued for many years. The Sicilian fleet under Ruggiero di Lauria defeated that of the Angevins at Malta in 1283, and 1284 in the Bay of Naples, where the king's son, Charles the Lame, was captured. Charles I. died in 1286, and, his heir being a prisoner, his grandson, Charles

Robert.

Martel (d. 1295), assumed the regency. Peter died the same year, leaving Aragon to his son Alphonso III. and Sicily to his son James, who was consecrated king in spite of the interdict. The war went on uninterruptedly, for the popes prevented all attempts to arrive at an understanding, as they were determined that the rights of the church should be fully recognized. Charles ch 1 n *^ e Lame, who had been liberated in 1288, having renounced his rights on Sicily, was absolved from his oath by Pope Nicholas IV., who crowned him king of the Two Sicilies and excommunicated Alphonso. The latter's successor James made peace with Boniface VIII. by renouncing Sicily (in exchange for Sardinia and Corsica and the hand of Charles's daughter) and promising to help the Angevins to reconquer the island. But the Sicilians, led by James's brother, Frederick III., 1 who had been governor of the island w/i and was now proclaimed king, determined to resist.

The war went on with varying success, until Charles of Valois, summoned by the pope to conduct the campaign, landed in Sicily and, his army being decimated by disease, made peace with Frederick at Caltabellotta (1302). The Angevins renounced Sicily in favour of Frederick, who was recognized as king of Trinacria (a name adopted so as not to mention that of Sicily), and he was to marry Leonora, daughter of Charles of Valois; at his death the island would revert to the Angevins, but his children would receive compensation else- where. In 1303 the pope unwillingly ratified the treaty. (See Charles II., king of Naples and Sicily, and Frederick III., king of Sicily.)

Charles II. died in 1309 and was succeeded by his second son Robert.

(His eldest son had predeceased him, leaving a son, Charles Robert, or Caroberto, at this time king of Hungary.) Robert now became leader of the Guelphs in Italy, and war between Naples and Sicily broke out once more, when Frederick allied himself with the emperor Henry VII. on his descent into Italy, and proclaimed his own son Peter heir to the throne. Robert led or sent many devastating expedi- tions into Sicily, and hostilities continued under King Peter even after Frederick's death in 1337. Peter died in 1342, leaving an infant son Louis; but just as Robert was preparing for another expedition he too died in the same year. Robert had been a capable ruler, a scholar and a friend of Petrarch, but he lost influence as a Guelph leader owing to the rise of other power- ful princes and republics, while in Naples itself his authority was limited by the rights of a turbulent and rebellious baronage (see Robert, king of Naples). His son Charles had died in 1328 and he was succeeded by his granddaughter Joanna, wife of Andrew of Hungary, but the princes of the blood Journal. anc ˆ tne Darons stirred up trouble, and in 1345 Andrew was assassinated by order of Catherine, widow of Philip, son of Charles II., and of several nobles, not without suspicion of Joanna's complicity.

Andrew's brother Louis, king of Hungary, now came to Italy to make good his claims on Naples and avenge the murder of Andrew. With the help of some of the barons he drove Joanna and her second husband, Louis of Taranto, from the kingdom, and murdered Charles of Durazzo; but as Pope Clement refused to recognize his claims he went back to Hungary in 1348, and the fickle barons recalled Joanna, who returned and carried on desultory warfare with the partisans of Louis of Hungary. Louis of Taranto and Joanna were crowned at Naples by the pope's legate in 1352, but Niccolo Acciaiuoli, the seneschal, became the real master of the kingdom. In 1374 Joanna made peace with Frederick of Sicily, recognizing him as king of Trinacria on condition that he paid her tribute and recognized the pope's suzerainty. She nominated Louis of Anjou her heir, but while the latter was recognized by the antipope Clement VII,, Pope Urban VI. declared Charles of Durazzo (great-grandson of Charles II.) king of Sicily al di qua del Faro (i.e. of Naples). Charles conquered the kingdom and took Joanna prisoner in 1381, and had her murdered the following

l He was the second king of that name in Sicily, but was known as Frederick III. because he was the third son of King Peter.

year. Louis, although assisted by Amadeus VI. of Savoy, failed to drive out Charles, and died in 1384. Charles III. died two years later and the kingdom was plunged into anarchy once more, part of the barons

siding with his seven- ul™ year-old son Ladislas, and part with Louis II. cf Anjou. The latter was crowned by the antipope Clement, while Urban regarded both him and his rival as usurpers. On Urban's death in 1389 Boniface IX. crowned Ladislas , .. . king of Naples, who by the year 1400 had expelled Louis and made himself master of the kingdom. In 1407 he occupied Rome, which Gregory XII. could not hold. But Alexander V., elected pope by the council of Pisa, turned against Ladislas and recognized Louis. Ladislas was defeated in 141 1 and driven from Rome, but reoccupied the city on Louis's return to France. He died in 1414, and was succeeded by his sister Joanna II. (q.v.), during whose reign the kingdom ,.,,,,,,. u sank to the lowest depths of degradation. In 1415 Joanna married James of Bourbon, who kept his wife in a state of semi-confinement, murdered her lover, Pandolfo Alopo, and imprisoned her chief captain, Sforza; but his arrogance drove the barons to rebellion, and they made him renounce the royal dignity and abandon the kingdom. The history of the next few years is a maze of intrigues between Joanna, Sforza, Giovanni Caracciolo, the queen's new lover, Alphonso of Aragon, whom she adopted as her heir, and Louis III. of Anjou, whom we find pitted against each other in every possible combination. Louis died in 1434 and Joanna in 1435 (see Joanna II., queen of Naples). The succession was disputed by Rene of Anjou and Alphonso, but the former eventually renounced his claims and Alphonso was recognized as king of Naples by Pope Eugenius IV. in 1443.

Under Alphonso, • surnamed " the Magnanimous," Sicily was once more united to Naples and a new era was inaugurated, for the king was at once a brilliant ruler, a scholar and a patron of letters. He died in 1458, leaving Naples f^ h ° to his illegitimate son Ferdinand I. (Don Ferrante), nanimous. and Sicily, Sardinia and Aragon to his brother John. Ferdinand found, however, that Alphonso had not really consolidated his power, and he had practically to reconquer the whole country. By 1464″ he was master of the situa- tion, in spite of the attempt of Pope Calixtus III. tm to enforce the claims of the papacy, and that of John of Anjou to enter into the heritage of his ancestors. In alliance with Pope Sixtus IV. and the Milanese he waged war on Lorenzo de' Medici in 1479; but that astute ruler, by visiting Ferdinand in person, obtained peace on favourable terms (1479). In 1485 the disaffection of the barons, due to the king's harshness and the arrogance and cruelty of his .son, found vent in a revolt led by Roberto Sanseverino and Francesco Coppola, which was crushed by means of craft and treachery. Ferdinand died in 1494 full of forebodings as to the probable effects of the invasion of Charles VIII. of France, and Tne was succeeded by Alphonso (see Ferdinand I., king

of invasion Naples). The French king entered Italy in September ot Charles 1495, and conquered the Neapolitan kingdom without much difficulty. Alphonso abdicated, his son Ferrandino and his brother Frederick withdrew to Ischia, and only a few towns in Apulia still held out for the Aragonese. But when the pope, the emperor, Spain and Venice, alarmed at Charles's progress, formed a defensive league against him, he quitted Naples, and Ferrandino, with the help of Ferdinand II. of Spain, was able to reoccupy his dominions. He died much regretted in 1496 and was succeeded by Frederick. The country was torn by civil war and brigandage, and the French continued to press their claims; and although Louis XII. (who had succeeded Charles VIII.) concluded a treaty with Ferdinand of Spain for the partition of Naples, France and Spain fell out in 1502 over the division of the spoils, and with Gonzalo de Cordoba's victory on the Garigliano in December 1502, the whole kingdom was in Spanish hands.

On the death of Ferdinand in 1516, the Habsburg Charles became king of Spain, and three years later was elected emperor as Charles V.; in 1522 he appointed John de Lannoy viceroy of

Revolu tloas.

Naples, which became henceforth an integral part of the Spanish dominions. The old divisions of nobility, clergy and people were Naples a maintained and their mutual rivalry encouraged; the Spanish nobles were Won over by titles and by the splendour posses- of the viceregal court, but many persons of low birth s '°"' w ho showed talent were raised to high positions.

The viceroy was assisted by the Collateral Council and the Sacred College of Santa Chiara, composed of Spanish and Italian members, and there was an armed force of the two nationalities. Spanish rule on the whole was oppressive and tyrannical, and based solely on the idea that the dependencies must pay tribute to the dominant kingdom. During the rule of Don Pedro de Toledo (one of the best viceroys) Naples became the centre of a Protestant movement which spread to the rest of Italy, but was ultimately crushed by the Inquisition. In Sicily Spanish rule was less absolute, for the island had not been conquered, but had given itself over voluntarily to the Aragonese; and the parliament, formed by the three bracci or orders (the militare consisting of the nobility, the ecclesiastic/), of the clergy, and the

demaniale, of the communes), imposed certain limitations on the viceroy, who had to play off the three bracci against each other. But the oppressive character of the government provoked several rebellions. In 1598 an insurrection, headed by the philosopher Tommaso Campanella, broke out in Calabria, and was crushed with great severity. In 1647, during the viceroyalty of the marquis de Los Leres in Sicily, bread riots in Palermo became a veritable revolution, and the people, led by the goldsmith Giovanni d' Alessio, drove the viceroy from the city; but the nobles, fearing for their privileges, took the viceroy's part and turned the people against d' Alessio, who was murdered, and Los Leres returned. On the 7th of July 1647, tumults occurred at Naples in consequence of a new fruit tax, and the viceroy, Count d' Arcos, was forced to take refuge in the Castelnuovo. The populace, led by an ' Amalfi fisherman, known as Masaniello (q.v.), obtained

' arms, erected barricades, and, while professing loyalty to the king of Spain, demanded the removal of the oppressive taxes and murdered many of the nobles. D' Arcos came to terms with Masaniello; but in spite of this, and of the assassination of Masaniello, whose arrogance and ferocity had made him unpopular, the disturbances continued, and again the viceroy had to retire to Castelnuovo and make concessions. Even the arrival of reinforcements from Spain failed to restore order, and the new popular leader, Gennaro Annese, now sought assistance from the French, and invited the duke of Guise to come to Naples. The duke came with some soldiers and ships, but failed to effect anything; and after the recall of d' Arcos the new viceroy, Count d'Ognate, having come to an arrangement with Annese and got Guise out of the city, proceeded to punish all who had taken part in the disturbances, and had Annese and a number of others beheaded.

In 1670 disorders broke out at Messina. They began with a riot between the nobles and the burghers, but ended in an anti- Spanish movement; and while the inhabitants called voLaon at m l ˆ e F rencn , the Spaniards, who could not crush the Messina, rising, called in the Dutch. Louis XIV. sent a fleet under the due de Vivonne to Sicily, which defeated the Dutch under de Ruyter in 1676. But at the peace of Nijmwegen (1679) Louis treacherously abandoned the Messinese, who suffered cruel persecution at the hands of the Spaniards and lost all their privileges. An anti-Spanish conspiracy of Neapolitan nobles, led by Macchia, with the object of proclaiming the archduke Charles of Austria king of Naples, was discovered; but in 1707 an Austrian army conquered the kingdom, and Spanish rule came to an end after 203 years, during which it had succeeded in thoroughly demoralizing

the people.

In Sicily the Spaniards held their own until the peace of

Utrecht in 1 713, when the island was given over to Duke

Skl ‘ y Victor of Savoy, who assumed the title of king. In

Savoy. I 7 I 8 he had to hand back his new possession to

Spain, who, in 1720, surrendered it to Austria and gave

Sardinia to Victor Amadeus. In 1733 the treaty of the Escurial

Charles III.

between France, Spain and Savoy against Austria was signed. Don Carlos of Bourbon, son of Philip V. of Spain, easily conquered both Naples and Sicily, and in 1738 he was recognized as king of the Two Sicilies, Spain renouncing all her claims. Charles was well received, for the country now was an independent kingdom once more. With the Tuscan Bernardo Tanucci as his minister, he introduced many useful reforms, improved the army, which was thus able to repel an Austrian invasion in 1744, embellished the city of Naples and built roads. In 1759 Charles III., having succeeded to the Spanish crown, abdicated that of the Two Sicilies in favour of his son Ferdinand, who became Ferdinand IV. of Naples and III. of Sicily. Being only eight years old, a regency under Tanucci was appointed, and the young king’s education was purposely neglected by the minister, who wished to /£ ”””” dominate him completely. The regency ended in 1767, and the following year Ferdinand married the masterful and ambitious Maria Carolina, daughter of the empress Maria Theresa. She had Tanucci dismissed and set herself to the task of making Naples a great power. With the help of John Acton, an English- man whom she made minister in the place of Tanucci, she freed Naples from Spanish influence and secured a rapprochement with England and Austria.

On the outbreak of the French Revolution the king and queen were not at first hostile to the new movement; but after the fall of the French monarchy they became violently opposed to it, and in 1793 joined the first coalition against France, instituting severe persecutions against all who were remotely suspected of French sympathies. Republicanism, however, gained ground, especially among the aristocracy. In 1796 peace with France was concluded, but in 1798, during Napoleon’s absence in Egypt and after Nelson’s victory at Aboukir, Maria Carolina induced Ferdinand to go to war with France

once more.': Nelson arrived in Naples in September, where he was enthusiastically received. The king, after a somewhat farcical occupation of Rome, which had been evacuated by the French, hurried back to Naples as soon as the French attacked his troops, and although the lazzaroni (the lowest class of the people) were devoted to the dynasty and ready to defend it, he fled with the court to Palermo in a panic on board Nelson's ships. The wildest confusion prevailed, and the lazzaroni massacred numbers of persons suspected of republican sympathies, while the nobility and the educated classes, finding themselves abandoned by their king in this cowardly manner, began to contemplate a republic under French auspices as their only means of salvation from anarchy. In January 1799 the French under Championnet reached Naples, but the lazzaroni, ill-armed and ill-disciplined J J ˆ K . fti as they were, resisted the enemy with desperate jv ap fe s courage, and it was not until the 20th that the invaders ana the were masters of the city. On the 23rd the Partheno- P'rtheno-paean republic was proclaimed. The Republicans were nˆtuc. men of culture and high character, but doctrinaire and unpractical, and they knew very little of the lower classes of their own country. The government soon found itself in financial difficulties, owing to Championnet 's demands for money; it failed to organize the army, and met with scant success in its attempts to "democratize " the provinces. Meanwhile the court at Palermo sent Cardinal Fabrizio Ruffo, a wealthy and influential prelate, to Calabria, to organize a r u Ho counter-revolution. He succeeded beyond expectation, ana the and with his " Christian army of the Holy Faith " s *"" (Esercito Cristiano della Santa Fede), consisting of *•""• brigands, convicts, peasants and some soldiers, marched through the kingdom plundering, burning and massacring. An English squadron approached Naples and occupied the island of Procida, but after a few engagements with the Republican fleet com- manded by Caracciolo, an ex-officer in the Bourbon navy, it was recalled to Palermo, as the Franco-Spanish fleet was expected. Ruffo, with the addition of some Russian and Turkish allies, now marched on the capital, whence the French, save for a small force under Mejean, withdrew. The scattered Republican detachments were defeated, only Naples and Pescara holding

out. On the 13th of June Ruffo and his hordes reached Naples, and after a desperate battle at the Ponte della Maddalena, entered the city.

For weeks the Calabresi and lazzaroni continued to pillage and massacre, and RuSo was unable, even if willing, to restrain them. But the Royalists were not masters of the city, for the French in Castel Sant' Elmo and the Republicans in Castelnuovo and Castel dell' Uovo still held out and bombarded the streets, while the Franco-Spanish fleet might arrive at any moment. Consequently Ruffo was desperately anxious to come to terms with the Republicans for the evacuation of the castles, in spite of the queen's orders to make no terms with the rebels. After some negotiation an armistice was concluded and a capitu- lation agreed upon, whereby the castles were to be evacuated, the hostages liberated and the garrisons free to remain in Naples unmolested or to sail for Toulon.

While the vessels were being prepared for the voyage to Toulon all the hostages in the castles were liberated save four; but on the 24th of June Nelson arrived with his fleet, and on hearing of the capitulation he refused to recognize it save in so far as it concerned the French. Ruffo indignantly declared that once the treaty was signed, not only by himself but by the Russian and Turkish commandants and by the British captain Foote, it must be respected, and on Nelson's refusal he said that he would not help him to capture the castles. On the 26th Nelson changed his attitude and authorized Sir William Hamilton, the British minister, to inform the cardinal that he (Nelson) would do nothing to break the armistice; while Captains Bell and Troubridge wrote that they had Nelson's authority to state that the latter would not oppose the embarcation of the Republicans. Although these expressions were equivocal, the Republicans were satisfied and embarked on the vessels prepared for them. But on the 28th Nelson received despatches from the court (in reply to his own) . in conse- quence of which he had the vessels brought under the guns of his ships, and many of the Republicans were arrested. Caracciolo, who had been caught whilst attempting to escape from Naples, was tried by a court-martial of Royalist officers under Nelson's auspices on board the admiral's flagship, condemned to death and hanged at the yard arm. For the part played by Nelson in these transactions see the articles Caracciolo and Nelson. On the 8th of July, King Ferdinand arrived from Palermo, and the state trials, conducted in the most arbitrary fashion, resulted in wholesale butchery; hundreds of persons were executed, including some of the best men in the country, such as the philosopher Mario Pagano, the scientist Cirillo, Manthone, the minister of war under the re- public, Massa, the defender of Castel dell' Uovo, and Ettore Caraffa, the defender of Pescara, who had been captured by treachery, while thousands of others were immured in horrible dungeons or exiled.

War with France continued until March 1801, when peace was made, and after the peace of Amiens in 1802 the court returned to Naples, where it was well received. But when the European war broke out again in the following year, Napoleon (then first consul) became very exacting in his demands ©n King Ferdinand, who consequently played a double game, appearing to accede to these demands while negotiating with England. After – Austerlitz Napoleon revenged himself by de- claring that ” the Bourbon dynasty had ceased to reign,” and sent an army under his brother Joseph to occupy the kingdom.

Ferdinand and Maria Carolina fled to Palermo in January 1805; in February 1806 Joseph Bonaparte entered Naples as king. A cultivated, well-meaning, not very in- Boaaparte. telligent man, he introduced many useful reforms on a basis of benevolent despotism, abolished feudalism and built roads, but the taxes and forced contributions which he levied proved very burdensome. Joseph’s authority did not exist throughout a large part of the kingdom, where royalist risings, led by brigand chiefs, maintained a state of anarchy, and a British force under Sir John Stuart, which landed in Calabria from Sicily, defeated the French at Maida (July 6th, 1806). Both the French and the royalists committed atrocities,

Bourbon vengeance.

and many conspirators in Naples were tried by the French state courts and shot.

In 1808 Napoleon conferred the crown of Spain on Joseph, and appointed Joachim Murat king of Naples. Murat continued Joseph’s reforms, swept away many old abuses and reorganized the army; and although he introduced Murat. the French codes and conferred many appointments and estates on Frenchmen, his administration was more or less native, and he favoured the abler Neapolitans. His attempts to attack the English in Sicily ended disastrously, but he succeeded in crushing brigandage in Calabria by means of General Manhes, who, however, had to resort to methods of ferocity in order to do so. The king, owing to his charm of manner, his handsome face, and his brilliant personality, gained many sympathies, and began to aspire to absolute independence. He gradually became estranged from Napoleon, and although he followed him to Russia and afterwards took part in the German campaign, he secretly opened negotiations with Austria and Great Britain. In January 18 14 he signed a treaty with Austria, each power guaranteeing the dominions of the other, while Sicily was to be left to Ferdinand. The following month he

proclaimed his separation from Napoleon and marched against Eugene Beauharnais, the French viceroy of Lombardy. But no important engagements took place, and when Napoleon escaped from Elba, Murat suddenly returned to the allegiance of his old chief. He marched at the head of 35,000 men into northern Italy, and from Rimini issued his famous proclamation in favour of Italian independence, which at the time fell on deaf ears (March 30th, 1815). He was subsequently defeated by the Austrians several times and forced to retreat, and on the 18th of May he sailed from Naples for France (see Murat, Joachim). Generals Guglielmo Pepe and Carrascosa now concluded a treaty with the Austrians at Casalanza on favourable terms, and on the 23rd the Austrians entered Naples to restore Bourbon rule.

Ferdinand and Maria Carolina had continued to reign in Sicily, where the extravagance of the court and the odious Neapolitan system of police espionage rendered their presence a burden instead of a blessing to the island. The king a oar bona obtained a subsidy from Great Britain and allowed in Sicily. British troops to occupy Messina and Agosta, so that they might operate against the French on the mainland. A bitter conflict broke out between the court and the parliament, and the British minister, Lord William Bentinck, favoured the opposition, forced Ferdinand to resign his authority and appoint his son regent and introduced many valuable reforms. The queen perpetually intrigued against Bentinck, and The even negotiated with the French, but in 181 2 a more English liberal constitution on British lines was introduced, and c ˆ" sttt "- a Liberal ministry under the princes of Castelnuovo and Belmonte appointed, while the queen was exiled in the following year. But after the fall of Napoleon Sicily ceased to have any importance for Great Britain, and Bentinck, whose memory is still cherished in the island, departed in 1814. Ferdinand succeeded in getting a reactionary ministry appointed, and dissolved parliament in May 181 5, after concluding a treaty with Austria — now freed by Murat's defection from her engage- ments with him — for the recovery of his mainland dominions by means of an Austrian army paid for by himself. On the oth of June Ferdinand re-entered Naples and bound The himself in a second treaty with Austria not to introduce restora- a constitutional government; 1 but at first he abstained ˆ"j? from persecution and received many of Murat's old officers into his army in accordance with the treaty of Casalanza. In October 1815 Murat, believing that he still had a strong party in the kingdom, landed with a few companions at Pizzo

1 The secret article of the treaty of June. 12, 1815, runs as follows: " H.M. the King of the Two Sicilies, in re-establishing the govern- ment

of the kingdom, will not agree to any changes irreconcilable either with the ancient institutions of the monarchy or with the principles adopted by H.I. and R. Austrian Majesty for the internal regime of his Italian provinces." It is to be noted that this did not involve the obligation of interfering with the ancient constitution of Sicily, which Metternich desired to see remain undisturbed.

di Calabria, but was immediately captured by the police and the peasantry, court-martialled and shot.

Ferdinand to some extent maintained French legislation, but otherwise reorganized the state with Metternich's approval on Bourbon lines; he proclaimed himself king of the Two Sicilies at the congress of Vienna, incorporating Naples and Sicily into one state, and abolished the Sicilian constitution (December 1816). In 1818 he concluded a Concordat with the Church, by which the latter renounced its suzerainty over the kingdom, but was given control over education, the censorship and many other privileges. But there Was much disaffection throughout the country, and the Carbonarist lodges, founded in The 1 Murat's time with the object of freeing the country

of 1820. from foreign rule and obtaining a constitution, had made much progress (see Carbonari). The army indeed was honeycombed with Carbonari, and General Pepe, himself a member of the society, organized them on a military basis. In July 1820 a military mutiny broke out at Caserta, led by two officers and a priest, the mutineers demanding a constitution although professing loyalty to the king. Ferdinand, feeling himself helpless to resist, acceded to the demand, appointed a ministry composed of Murat's old adherents, and entrusted his authority to his son. The ultra-democratic single-chamber Spanish constitution of 1812 was introduced, but proved utterly unworkable. The new government's first difficulty was Sicily, where the people had risen in rebellion demanding their own charter of 18 12, and although the Neapolitan troops quelled the outbreak with much bloodshed the division proved fatal to the prospects of liberty.

The outbreak of the military rising in Naples, following so

shortly on that in Spain, seriously alarmed the powers responsible

for the preservation of the peace in Europe. The position was

complicated by the somewhat enigmatic attitude of Russia; for the Neapolitan Liberals, with many of whom Count Capo d' Istria, the Russian minister of foreign affairs, had been on friendly terms, proclaimed that they had the " moral support " of the tsar. This idea, above all, it was necessary for Austria to destroy once for all. The diplomatic negotiations are discussed in the article on the history of Europe (q.v.). Here it suffices to say that these issued in the congress of Troppau (October 1820) and the proclamation of the famous Troppau protocol affirming the right of collective " Europe " to interfere to crush dangerous internal revolutions. Both France and Great Britain protested against the general principle laid down in this instrument; but neither of them approved of the Neapolitan revolution, and neither of them was opposed to an intervention in Naples, provided this were carried out, not on the ground of a supposed right of Europe to interfere, but by Austria for Austrian ends. By general consent King Ferdinand was invited to attend the adjourned congress, fixed to meet at Laibach in the spring of the following year. Under the new constitution, the permission of parliament was necessary before the king could leave Neapolitan territory; but this was weakly granted, after Ferdinand had sworn the most solemn oaths to maintain the constitution. He was scarcely beyond the frontiers, however, before he repudiated his engagements, as exacted by force. A cynicism so unblushing

shocked even the seasoned diplomats of the congress, who would have preferred that the king should have made a decent show of yielding to force. The result was, however, that the powers authorized Austria to march an army into Naples to restore the autocratic monarchy. This decision was notified to the Neapolitan government by Russia, Prussia and Austria — Great Britain and France maintaining a strict neutrality. Meanwhile the regent, in spite of his declaration that he would lead the Neapolitan army against the invader, was secretly undermining the position of the government, and there were divisions of opinion in the ranks of the Liberals themselves. General Pepe Austrian* was sent t0 t ‘ le f ron ti er at the head of 8000 men, but In Naples. was completely defeated by the Austrians at Rieti on the 7th of March. On the 23rd the Austrians entered Naples, followed soon afterwards by the king; every vestige of freedom was suppressed, the reactionary Medici ministry appointed, and the inevitable state trials instituted with the usual harvest of executions and imprisonment. Pepe saved himself by flight. (See Ferdinand IV., king of Naples.)

Ferdinand died in 1825, and his son and successor, Francis I., an unbridled libertine, at once threw off the mask of Liberalism; the corruption of the administration under Medici assumed unheard-of proportions, and every office was openly sold. The Austrian occupation lasted until 1827, having cost the state 310,000,000 lire; but in the meanwhile the Swiss Guard had been established as a further protection for autocracy, and the revolutionary outbreak at Bosco on the Cilento was suppressed with the usual cruelty. (See Francis I., king of the Two Sicilies.)

Francis died in 1830 and was succeeded by his son, Ferdinand II., who

at first awoke hopes that the conditions of the country would be improved. He was not devoid of good qualities, and took an interest in the material welfare Ut of the country, but he was narrow-minded, ignorant and bigoted; he made the administration more efficient, and re- organized the army which became purged of Carbonarism, and such Carbonarist plots as there were in the 'thirties were not severely punished. Ferdinand was impatient of Austrian in- fluence, but on the death of his first wife, Cristina of Savoy, he married Maria Theresa of Austria, who encouraged him in his reactionary tendencies and brought him closer to Austria. An outbreak of cholera in 1837 led to disorders in Sicily, which, having assumed a political character, were repressed by Del Caretto with great severity. The government tended to become more and more autocratic and to rely wholly on the all-powerful police, the spies and the priests; and, although the king showed some independence in foreign affairs, his popularity waned; the desire for a constitution was by no means dead, and the survivors of the old Carbonari gathered round Carlo Poerio, while the Giovane Italia society (independent of Mazzini), led by Benedetto Musolino, took as its motto " Unity, Liberty and Independence." But as yet the idea of unity made but little headway, for southern Italy was too widely separated by geographical conditions, history, tradition and custom from the rest of the peninsula, and the majority of the Liberals — themselves a minority of the population — merely aspired to a constitutional Neapolitan monarchy, possibly forming part of a confederation of Italian states. The attempt of the Giovane Italia to bring about a general revolution in 1843 only resulted in a few sporadic out- breaks easily crushed. The following year the Venetian brothers Bandiera, acting in concert with Mazzini, landed in Calabria, believing the whole country to be in a state T/ 10 .. of revolt; they met with little local support and were attempt quickly captured and shot, but their death aroused much sympathy, and the whole episode was highly significant as being the first attempt made by north Italians to promote revolution in the south. In 1847 a pamphlet by L. Settembrini, entitled " A Protest of the People of the Two Sicilies," appeared anonymously and created a deep impression as a most scathing indictment of the government; and at the same time the election of Pius IX., a pope who was believed to be a Liberal, caused widespread excitement throughout Italy. ' Conspiracy was now rife both in Naples and Sicily, but as yet there was no idea of deposing the king. Many persons were arrested, including Carlo Poerio, who, however, continued to direct the agitation.

On the 1 2th of January 1848 a revolution under the leadership of Ruggiero Settimo broke out at Palermo to the cry of " in- dependence

or the 1812 constitution," and by the end of February the whole island, with the exception of ‘ rhe Messina, was in the hands of the revolutionists. These ˆ siciiy. events were followed by demonstrations at Naples; the king summoned a meeting of generals and members of his family on the 27th of January, and on the advice of Filangieri (q.v.), who said that the army was not to be relied upon, he dismissed the Pietracatella ministry and Del Caretto, and summoned the duke of Serracapriola to form another administra- tion. On the 28th he granted the constitution, and the Liberals Bozzelli and Carlo Poerio afterwards joined the cabinet. The

popular demand was now that Naples should assist the Lombards in their revolt against Austria, for a feeling of Italian solidarity The was g r o wm g U P- The ministry of Carlo Troya suc-

coastltu- ceeded to that of Serracapriola, and after the parlia- tton of mentary elections, in which many extreme Radicals were elected, Ferdinand declared war against Austria (April 7th, 1848). After considerable delay a Neapolitan army under General Pepe marched towards Lombardy in May, while the fleet sailed for Venice. But a dispute between the king and the parliament concerning the form of the royal oath having arisen, a group of demagogues with criminal folly provoked disturbances and erected barricades (May 14th). The king refused to open parliament unless the barricades were removed, and while the moderate elements attempted to bring about conciliation, the ministry acted with great weakness. A few shots were fired — it is not known who fired first — on of May. the I S tn > the Swiss regiments stormed the barricades and street fighting lasted all day. By the evening the Swiss and the royalists were masters of the situation. A new ministry under Prince Cariati was appointed. Parliament was dissolved, the National Guard disbanded and the army recalled from the Po. Fresh elections were held and the new parliament met on the 15th of July, but it had the king, the army and the mob against it, and anti-constitutionalist demonstrations became frequent. After a brief session it was prorogued to the 1st of February 1849, and when it met on that date a deadlock between king and parliament occurred. The Austrian victories in Lom- bardy had strengthened the court party, or Camarilla as it was called, and on the 13th of March the assembly was again dissolved, and never summoned again. The king was at Gaeta, whither the grand-duke of Tuscany and Pius IX. had also repaired to escape from their rebellious

subjects, and the city became the headquarters of Italian reaction.

In Sicily the revolutionists were purely insular in their aspira- tions and bitterly hostile to the Neapolitans, and the attempts Sicily at conc ili a tion, although favoured by Lord Minto,

failed, for Naples wanted one constitution and one parliament, whereas Sicily wanted two, with only the king in common. The Sicilian assembly met in March 1848, and Settimo in his inaugural speech declared that the Bourbon dynasty had ceased to reign, that the throne was vacant and that Sicily united her destinies to those of Italy. Settimo was elected president of the government, but the administration was lacking in states- manship, the treasury was empty, and nothing was done to raise an army. After the Austrian victories King Ferdinand sent a Neapolitan army of 20,000 men under Filangieri to subjugate the island. The troops landed at Messina, of which the citadel had been held by the royalists throughout, and after three days' desperate fighting the city itself was captured and sacked. The British and French admirals imposed a truce with a view to conciliation, and the king offered the Sicilians the Neapolitan constitution and a separate parliament, which they refused. Sicilian troops were now levied throughout the island and the chief command given to the Pole Mieroslawski, but it was too late. Filangieri marched forward taking town after town, and committing many atrocities. In April he reached Palermo while the fleet appeared in the bay; tumults having broken out within the city, the government surrendered on terms which granted amnesty for all except Settimo and forty-two others.

For a few months after the dissolution of the Neapolitan parliament the government abstained from persecution, but with the crushing of the Sicilian revolution its hands Neapolitan were * ree > anc * wnen the commission on the affair of prisons. the 15th of May had completed its labours the state trials and arrests began. The arrest of S. Faucitano for a demonstration at Gaeta led to the discovery of the Unild Italiana society, whose object was to free Italy from domestic tyranny and foreign domination. Thousands of respectable citizens were thrown into prison, such as L. Settembrini, Carlo Poerio and Silvio Spaventa. The trials were conducted with the most scandalous contempt of justice, and moral and physical torture vras applied to extort confessions. The abominable con-

ditions of the prisons in which the best men of the kingdom were immured, linked to the vilest common criminals, was made known to 'the world by the famous letters of W. E. Gladstone, which branded

the Bourbon regime as ” the negation of God erected into a system of government.” The merest suspicion of unorthodox opinions, the possession of foreign newspapers, the wearing of a beard or an anonymous denunciation, sufficed for the arrest and condemnation of a man to years of imprisonment, while the attendibili, or persons under police surveillance liable to imprisonment without trial at any moment, numbered 50,000. The remonstrances of Great Britain and France met with no success. Ferdinand strongly resented foreign interference, and even rejected the Austrian proposal for a league of the Italian despots for mutual defence against external attacks, and internal disorder. In 1856 his life was unsuccessfully attempted by a soldier, and the same year Baron Bentivegna organized a revolt near Palermo, which was quickly suppressed. In 1857 Carlo Pisacane, an ex-Neapolitan officer who had taken part _. in the defence of Rome, fitted out an expedition, with attempt. Mazzini’s approval, from Genoa, and landed at Sapri in Calabria, where he hoped to raise the flag of revolution; but the local police assisted by the peasantry attacked the band, killing many, including Pisacane himself, and capturing most of the rest. The following year, at the instance of Great Britain and France, Ferdinand commuted the sentences of some of the political prisoners to exile. (See Ferdinand II., king of the Two Sicilies) .

In May 1859 Ferdinand died, and was succeeded by his son, Francis II., who came to the throne just as the Franco-Sardinian victories in Lombardy were sounding the death-knell Pmac{s u of Austrian predominance and domestic despotism in Italy (see Italy: History). But although there was much activity and plotting among the Liberals, there was as yet no revolution. Victor Emmanuel, king of Sardinia, wrote to the new king proposing an alliance for the division of Italy, but Francis refused. In June part of the Swiss Guard mutinied because the Bernese government not having renewed the conven- tion with Naples the troops were deprived of their cantonal flag. The mutinous regiments, however, were surrounded by loyal troops and shot down; and this affair resulted in the disbanding of the whole force — the last support of the autocracy. Political amnesties were now decreed, and in September 1859 Filangieri was made prime minister. The latter favoured the Sardinian alliance and the granting of the constitution, and so did the king’s uncle, Leopold, count of Syracuse. But Francis rejected both proposals and Filangieri resigned and was succeeded by A. Statella. In April i860 Victor Emmanuel again proposed an alliance whereby Naples, in return for help in expelling the Austrians from Venetia, was to receive the Marche, while Sardinia would annex all the rest of Italy except Rome. But Francis again refused, and in fact

was negotiating with Austria and the pope for a simultaneous invasion of Modena, Lombardy and Romagna.

In the meantime, however, events in Sicily were reaching a crisis destined to subvert the Bourbon dynasty. The Sicilians, unlike the Neapolitans, were thoroughly alienated from the Bourbons, whom they detested, and after the andthe' peace of Villafranca (July 1859) Mazzini's emissaries, thousand. F. Crispi and R. Pilo, had been trying to organize a rising in favour of Italian unity; and although they merely succeeded in raising a few squadre, or armed bands, in the mountainous districts, they persuaded Garibaldi (q.v.), without the magic of whose personal prestige they knew nothing im- portant could be achieved, that the revolution which he knew to be imminent had broken out. The authorities at Palermo, learning of a projected rising, attacked the convent of La Gangia, the headquarters of the rebels, and killed most of the inmates; but in the meanwhile Garibaldi, whose hesitation had been overcome, embarked on the 5th of May i860, at Quarto, near Genoa, with 1000 picked followers on board two steamers, and sailed for Sicily. On the nth the expedition reached Marsala and landed without opposition. Garibaldi was somewhat coldly received by the astonished population ; but he set forth at once for

Salemi, whence he issued a proclamation assuming the dictator- ship of Sicily in the name of Victor Emmanuel, with Crispi as secretary of state. He continued his march towards Palermo, where the bulk of the 30,000 Bourbon troops were concentrated, gathering numerous followers on the way. On the 15th he attacked and defeated 3000 of the enemy under General Landi at Calatafimi; the news of this brilliant victory revived the revolutionary agitation throughout the island, and Garibaldi was joined by Pilo and his bands. By a cleverly devised ruse he avoided General Colonna's force, which expected him on the Palermo Monreale road, and entering Palermo from Misilmeri received an enthusiastic welcome. The Bourbonists, although they bombarded the city from the citadel and the warships in the harbour, gradually lost ground, and after three days' street fighting their commander, General Lanza, not knowing that the Garibaldians had scarcely a cartridge left, asked for and obtained a twenty-four hours' armistice (May 30th). Garibaldi went on board the British flagship to confer with the Neapolitan generals Letizia and Chretien; Letizia's proposal that the municipality should make a humble petition to the

king was indignantly rejected by Garibaldi, who merely agreed to the extension of the armistice until next day. Then he informed the citizens by means of a proclamation of what he had done, and declared that, knowing them to be ready to die in the ruins of their city, he would renew hostilities on the expiration of the armistice. Although unarmed, the people rallied to him as one man, and Lanza became so alarmed that he asked for an unconditional extension of the armistice, which Garibaldi granted. The dictator now had time to collect ammunition, and the Neapolitan government having given Lanza full powers to treat with him, 15,000 Bourbon troops embarked for Naples on the 7th of June, leaving the revolutionists masters of the situation. The Sardinian Admiral Persano's salute of nineteen guns on the occasion of Garibaldi's official call constituted a practical recognition "of his dictatorship by the Sardinian (Piedmontese) govern- ment. In July further reinforcements of volunteers under Cosenz and Medici, assisted by Cavour, arrived at Palermo with a good supply of arms furnished by subscription in northern Italy. Gari- baldi's forces were now raised to 12,000 men, besides the Sicilian squadre. Cavour's attempt to bring about the annexation of Sicily to Sardinia failed, for Garibaldi wished to use the island as a basis for an invasion of the mainland. Most of the island had now been evacuated by the Bourbonists, but Messina and a few other points still held out, and when the Garibaldians advanced eastward they encountered a force of 4000 of the enemy under Colonel Bosco at Milazzo; on the 20th of July a desperate battle took place resulting in a hard-won Garibaldian victory. The Neapolitan government then decided on the evacuation of the whole of Sicily except the citadel of Messina, which did not surrender until the following year.

The news of Garibaldi's astonishing successes entirely changed the situation in the capital, and on the 25th of June i860 the The kingi after consulting the ministers and the royal

Neapolitan family, granted a constitution, and appointed A. coastltu- Spinelli prime minister. Disorders having taken Won. place between Liberals and reactionaries, Liberio

Romano was made minister of police in the place of Aiossa. Sicily being lost, the king directed all his efforts to save Naples; he appealed to Great Britain and France to prevent Garibaldi from crossing the Straits of Messina, and only just failed (for this episode see under Lacaita, G.). Victor Emmanuel himself wrote to Garibaldi urging him to abstain from an attack on Naples, but Garibaldi refused to obey, and on the 19th of August he crossed with 4500 men and took Reggio by storm. He was soon joined by the rest of his troops, 15,000 in all,

and although the Neapolitan government had 30,000 men in Calabria alone, the army collapsed before Garibaldi's advance, and the Q ™V!* iii people rose in his favour almost everywhere. Francis mainland, offered Garibaldi a large sum of money if he would abstain from advancing farther, and 50,000 men to fight the Austrians and the pope; but it was too late, and on the 6th of September the king and queen sailed for Gaeta. The

40,000 Bourbon troops between Salerno and Avellino fell back panic-stricken, and on the 7th Garibaldi entered Naples alone, although the city was still full of soldiers, and was received with delirious enthusiasm. On the nth a part of the royalists capitulated and the rest retired on Capua. Cavour now decided that Sardinia must take part in the liberation of southern Italy, for he feared that Garibaldi's followers might induce him to proclaim the republic and attack Rome, which would have provoked French hostility; consequently a Piedmontese army occupied the Marche and Umbria, and entered Neapolitan territory with Victor Emmanuel at its head. On the 1st and 2nd of October i860 a battle was fought on the Volturno victor between 20,000 Garibaldians, many of them raw Emmanuel levies, and 35,000 Bourbon troops, and although at"""" first a Garibaldian division under Tiirr was repulsed, QaTibaldu Garibaldi himself arrived in time to turn defeat into victory. On the 26th he met Victor Emmanuel at Teano and hailed him king of Italy, and subsequently handed over his conquests to him. On the 3rd of November a plebiscite was taken, which resulted in an overwhelming majority in favour of union with Sardinia under Victor Emmanuel. Garibaldi departed for his island home at Caprera, while L.C. Farini was appointed viceroy of Naples and M. Cordero viceroy of Sicily. The last remnant of the Bourbon army was concentrated at Gaeta, the siege of which was begun by Cialdini on the 5th of November; on the 10th of January 1861 the French fleet, which Napoleon Gaeta- III. had sent to Gaeta to delay the inevitable fall of the dynasty, was withdrawn at the instance of Great Britain; and although the garrison fought bravely and the king and queen showed considerable courage, the fortress surrendered on the 13th of February and the royal family departed by sea. (See Francis II., King of the Two Sicilies.) The citadel of Messina capitulated a month later, and Civitella del Tronto on the 21st of March. On the 18th of February the first Italian parliament met at Turin and proclaimed Victor Emmanuel king of Italy. Thus Naples and Sicily ceased to be a separate political entity and were absorbed into the united Italian kingdom.

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NAPOLEON I. (1769-1821), Emperor of the French. Napoleon Bonaparte (or Buonaparte, as he almost always spelt the name down the year 1796) was born at Ajaccio in Corsica on the 15th of August 1769. The date of his birth has been disputed, and certain curious facts have been cited in proof of the assertion that he was born on the 7th of January 1768, and that his brother Joseph, who passed as the eldest surviving son, was in reality his junior. Recent research has, however, explained how it came about that a son born on the earlier date received the name Nabulione (Napoleon). The father, Carlo Maria da Buonaparte (Charles Marie de Bonaparte), had resolved to call his three first sons by the names given by his great-grandfather to his sons, namely Joseph, Napoleon and Lucien. This was done; but on the death of the eldest (Joseph) the child first baptized Nabulion received the name Joseph; while the third son (the second surviving son) was called Napoleon. The baptismal register of Ajaccio leaves no doubt as to the date of his birth as given above. For his parents and family see Bonaparte. The father's literary tastes, general inquisitiveness, and powers of intrigue reappeared in Napoleon, who, however, derived from his mother Letizia (a descendant of the Ramolino and Pietra Santa families) the force of will, the power of forming a quick decision and of maintaining it against all odds, which made him so terrible an opponent both in war and in diplomacy. The sterner strain in the mother's nature may be traced to intermarriage with the families of the wild interior of Corsica, where the vendetta was the unwritten but omnipotent law of the land. The Bonapartes, on the other hand, had long concerned themselves with legal affairs at Ajaccio or in the coast towns of the island. They traced their descent to ancestors who had achieved distinction in the political life of medieval Florence and Sarzana; Francesco Buonaparte of Sarzana migrated to Corsica early in the 16th century. What is equally noteworthy, as explaining the characteristics of Napoleon, is that his descent was on both sides distinctly patrician. He once remarked that the house of Bonaparte dated from the coup d'Uat of Brumaire (November 1799); but it is certain the de Buonapartes had received the title of nobility from the senate of the republic of Genoa which, during the 18th century, claimed to exercise sovereignty over Corsica.

It was in the midst of the strifes resulting from those claims that Napoleon Bonaparte saw the light in 1 769. His compatriots had already freed themselves from the yoke of Genoa, thanks to Pasquale

Paoli; but in 1764 that republic appealed to Louis XV. of France for aid, and in 1 768 a bargain was struck by which the French government succeeded to the nearly bankrupt sovereignty of Genoa. In the campaigns of 1768-69 the French gradually overcame the fierce resistance of the islanders; and Paoli, after sustaining a defeat at Ponte-Novo (9th of May 1769), fled to the mainland, and ultimately to England. Napoleon's father at first sided with Paoli, but after the disaster of Ponte-Novo he went over to the conquerors, and thereafter solicited places for himself and for his sons with a skill and persistence which led to a close union between the Bonapartes and France. From the French governor of Corsica, the comte de Marbeuf, he procured many favours, among them being the nomination of the young Napoleon to the military school at Brienne in the east of France.

Already the boy had avowed his resolve to be a soldier. In the large playroom of the house at Ajaccio, while the others amused themselves with ordinary games, Napoleon delighted most in beating a drum and wielding a sword. His elder brother, Joseph, a mild and dreamy boy, had to give way before him; and it was a perception of this difference of temperament which decided the father to send Joseph into the church and Napoleon into the army. Seeing that the younger boy was almost entirely ignorant of French, he took him with Joseph to the college at Autun at the close of the year 1 778. After spending four months at Autun, Napoleon entered the school at Brienne in May 1779.

The pupils at Brienne, far from receiving a military education, were grounded in ordinary subjects, and in no very efficient manner, by brethren of the order, or society, of Minims. The moral tone of the school was low; and Napoleon afterwards spoke with contempt of the training of the " monks " and the manner of life of the scholars. Perhaps his impressions were too gloomy; his whole enthusiasm had been for the Corsicans, who still maintained an unequal struggle against the French; he deeply resented his father's espousal of the French cause; 'and dislike of the conquerors of his native island made him morose and solitary. Apart from decided signs of proficiency in mathe- matics, he showed no special ability. Languages he disliked, but he spent much of his spare time in reading history, especially Plutarch. The firmness of character which he displayed caused him to be recommended in 1782 for the navy by one of the inspectors of the school; but a new inspector, who was appointed in 1783, frustrated this plan. In October 1784 Bonaparte and three other Briennois were authorized, by a letter signed by Louis XVI., to proceed as gentlemen cadets to the military school at Paris. There the education was more thorough, and the discipline stricter, than at Brienne. Napoleon

applied himself with more zest to his studies, in the hope of speedily qualifying himself for the artillery. In this he succeeded. As the result of an examination conducted in September 1785 by Laplace, Bonaparte was included among those who entered the army without going through an intermediate stage.

At the end of October 1785 he closed a scholastic career which had been creditable but not brilliant. He now entered the artillery regiment, La Fere, quartered at Valence, and went through all the duties imposed on privates, and thereafter those of a corporal and a sergeant. Not until January 1786 did he actually serve as junior lieutenant. A time of furlough in Corsica from September 1786 to September 1787 served to strengthen his affection for his mother, and for the island which he still hoped to free from the French yoke. The father having died of cancer at Montpellier in 1 785, Napoleon felt added responsibilites, which he zealously discharged. In order to push forward a claim which Letizia urged on the French government, he proceeded to Paris in September 1787, and toyed for a time with the pleasures of the Palais Royal, but failed to make good the family claim. After gaining a further extension of leave of absence from his regiment he returned to Ajaccio and spent six months more in the midst of family and political affairs. Rejoining his regiment, then in the garrison at Auxonne, after a furlough of twenty-one months, the young officer went through a time of much privation, brightened only by the study of history and cognate subjects. Many of the notes and essays written by him at Auxonne bear witness to his indomitable resolve to master all the details of his profession and the chief facts relating to peoples who had straggled successfully to achieve their liberation. Enthusiasm for Corsica was a leading motive prompting him to this prolonged exertion. His notes on English history (down to the time of the revolution of 1688) were especially detailed. Of Cromwell he wrote: ” Courageous, clever, deceitful, dissimulating, his early principles of lofty republicanism yielded to the devouring flames of his ambition; and, having tasted the sweets of power, he aspired to the pleasure of reigning alone.” At Auxonne, as previously at Valence, Napoleon commanded a small detachment of troops sent to put down disturbances in neighbouring towns, and carried out his orders unflinchingly. To this period belongs his first crude literary effort, a polemic against a Genevese pastor who had criticized Rousseau.

In the latter part of his stay at Auxonne (June 1788- September 1789) occurred the first events of the Revolution which was destined to mould anew his ideas and his career. But his preoccupation about Corsica, the privations to which he and his family were then exposed, and his bad health, left him little energy to expend on purely French

affairs. He read much of the pamphlet literature then flooding the country, but he still pre- ferred the more general studies in history and literature, Plutarch, Caesar, Corneille, Voltaire and Rousseau being his favourite authors. The plea of the last named on behalf of Corsica served

to enlist the sympathy of Napoleon in his wider speculations, and so helped to bring about that mental transformation which merged Buonaparte the Corsican in Bonaparte the Jacobin and Napoleon the First Consul and Emperor.

Family influences also played their part in this transformation. On proceeding to Ajaccio in September 1789 for another furlough, he found his brother Joseph enthusiastic in the democratic cause and acting as secretary of the local political club. Napoleon seconded his efforts, and soon they had the help of the third brother, Lucien, who proved to be most eager and eloquent. Thanks to the exertions of Saliceti, one of the two deputies sent by the tiers etat of Corsica to the National Assembly of France, that body, on the 30th of November 1789, declared the island to be an integral part of the kingdom with right to participate in all the reforms then being decreed. This event decided Napoleon to give his adhesion to the French or democratic party; and when, in July 1 790, Paoli returned from exile in England (receiv- ing on his way the honours of the sitting by the National Assembly) the claims of nationality and democracy seemed to be identical, though the future course of events disappointed these hopes. Shortly before returning to his regiment in the early weeks of 1791 he indited a letter inveighing in violent terms against Matteo Buttafuoco, deputy for the Corsican noblesse in the National Assembly of France, as having betrayed the cause of insular liberty in 1768 and as plotting against it again.

The experiences of Bonaparte at Auxonne during his second stay in garrison were again depressing. With him in his poorly furnished lodgings was Louis Bonaparte, the fourth surviving son, whom he carefully educated and for whom he predicted a brilliant future. For the present their means were very scanty, and, as the ardent royalism of his brother officers limited his social circle, he plunged into work with the same ardour as before, frequently studying fourteen or fifteen hours a day. Then it was", or perhaps at a slightly later date, that he became interested in ˆhe relations subsisting between political science

and war. From L Esprit des lois of Montesquieu he learnt suggestive thoughts like the following: ” L’objet de la guerre, c’est la victoire; celui de la victoire, la conquete; celui de la conquete, l’occupa- tion.” Machiavelli taught him the need of speed, decision and unity of command, in war. From the Traite de tactique (1772) of Guibert he caught a glimpse of the power which a patriotic and fully armed nation might gain amidst the feeble and ill-organized governments of that age.

External events served to unite him more closely to France. The reorganization of the artillery, which took place in the spring of 1 791, brought Bonaparte to the rank of lieutenant in the regiment of Grenoble, then stationed at Valence. He left the regiment La Fere with regret on the 14th of June 1791; but at Valence he renewed former friendships and plunged into politics with greater ardour. Most of his colleagues refused to take the oath of obedience to the Constituent Assembly, after the attempted escape of Louis XVI. to the eastern frontier at mid- summer. Bonaparte took the oath on the 4th of July, but said later that the Assembly ought to have banished the king and proclaimed a regency for Louis XVII. In general, however, his views at that time were republican; he belonged to the club of Friends of the Constitution at Valence, spoke there with much acceptance, and was appointed librarian to the club.

At Valence also he wrote an essay for a prize instituted by his friend and literary adviser, Raynal, at the academy of Lyons. The subject was ” What truths and sentiments is it most important to inculcate to men for their happiness? ” Bonaparte’s essay bore signs of study of Rousseau and of the cult of Lycurgus which was coming into vogue. The Spartans were happy, said the writer, because they had plenty of good, suitable clothing and lodging, robust women, and were able to meet their requirements both physical and mental. Men should live according to the laws and dictates of nature, not forgetting the claims of reason and sentiment. The latter part of the essay is remarkable for its fervid presentment of the charms of scenery and for vigorous declamation against the follies and

crimes of ambitious men. The judges at Lyons placed it fifteenth in order of merit among the sixteen essays sent in.

Thanks to the friendly intervention of the marechal du camp, baron Duteil, Bonaparte once more gained leave of absence for three months and reached Corsica in September i79t. Opinion there was in an excited state, the priests and the populace being inflamed against the anti-clerical decrees of the National Assembly of France. Paoli did

little to help on the Bonapartes; and the advancement of Joseph Bonaparte was slow. Napoleon's admiration for the dictator also began to cool, and events began to point to a rupture. The death of Archdeacon Lucien Bona- parte, the recognized head of the family, having placed property at the disposal of the sons, they bought a house, which became the rendezvous of the democrats and of a band of volunteers whom they raised. In the intrigues for the command of this body Napoleon had his rival, Morati, carried off by force — his first coup d'Stat. The incident led to a feud with the supporters of Morati, among whom was Pozzo di Borgo (destined to be his life-long enemy), and opened a breach between the Bonapartes and Paoli. Bonaparte's imperious nature also showed itself in family matters, which he ruled with a high hand. No one, said his younger brother Lucien, liked to thwart him.

Further discords naturally arose between so masterful a lieutenant as Bonaparte and so autocratic a chief as Paoli. The beginnings of this rupture, as well as a sharp affray between his volunteers and the townsfolk of Ajaccio, may have quickened Bonaparte's resolve to return to France in May 1702, but there were also personal and family reasons for this step. Having again exceeded his time of furlough, he was liable to the severe penalties attaching to a deserter and an imigri; but he saw that the circumstances of the time would help to enforce the appeal for reinstatement which he resolved to make at Paris. His surmise was correct. The Girondin ministry then in power had brought Louis XVI. to declare war against Austria (20th of April 1792) and against Sardinia (15th of May 1792). The lack of trained officers was such as to render the employment and advancement of Bonaparte probable in the near future, and on the 30th of August, Servan, the minister for war, issued an order appointing him to be captain in his regiment and to receive arrears of pay. During this stay at Paris he witnessed some of the great " days " of the Revolution; but the sad plight of his sister, Marianna Elisa, on the dissolution of the convent of St Cyr, where she was being educated, compelled him to escort her back to Corsica shortly after the September massacres.

His last time of furlough in Corsica is remarkable for the failure of the expedition in which he and his volunteers took part, against la Maddalena, a small island off the coast of Sardinia. The breach between Paoli and the Bonapartes now rapidly widened, the latter having now definitely espoused the cause of the French republic, while Paoli, especially after the execution of Louis XVI., repudiated all thought of political connexion with the regicides. Ultimately the Bonapartes had to flee from Corsica (nth of June 1793), an event which clinched Napoleon's decision to identify his fortunes with those

of the French republic. His ardent democratic opinions rendered the change natural when Paoli and his compatriots declared for an alliance with England.

The arrival of the Bonapartes at Toulon coincided with a time of acute crisis in the fortunes of the republic. Having declared war on England and Holland (1st of February 1793), and against Spain (9th of March), France was soon girdled by foes; and the forces of the first coalition invaded her territory at several points. At first the utmost efforts of the republic failed to avert disaster; . for the intensely royalist district of la Vendee, together with most of Brittany, burst into revolt, and several of the northern, central and southern departments rose against the Jacobin rule. The struggle which the constitutionalists and royalists of Marseilles made against the central government furnished Bonaparte with an occasion for writing his first important political pamphlet, entitled ” Le Souper de Beaucaire.” It purports to be a conversation at the little town of Beaucaire

between a soldier (obviously the writer himself) and three men, citizens of Marseilles, Nlmes and Montpellier, who oppose the Jacobinical government and hope for victory over its forces. The officer points out the folly of such a course, and the certainty that the republic, whose troops had triumphed over those of Prussia and Austria, will speedily disperse the untrained levies of Provence. The pamphlet closes with a passionate plea for national unity.

He was now to further the cause of the republic one and indivisible in the sphere of action. The royalists of Toulon had admitted British and Spanish forces to share in the defence of that stronghold (29th of August 1793). The blow to the re- publican cause was most serious: for from Toulon as a centre tiie royalists threatened to raise a general revolt throughout the jouth of France, and Pitt cherished hopes of dealing a death-blow to the Jacobins in that quarter. But fortune now brought Bonaparte to blight those hopes. Told off to serve in the army of Nice, he was detained by a special order of the commissioners of the Convention, Saliceti and Gasparin, who, hearing of the severe wound sustained by Dommartin, the commander of the artillery of the republican forces before Toulon, ordered Bona- parte to take his place. He arrived at the republican head- quarters, then at Ollioules on the north-west of Toulon, on the 16th of September; and it is noteworthy that as early as Sep- tember 10th the commissioners had seen the need

of attacking the allied fleet and had paid some attention to the headland behind l'figuillette, which commanded both the outer and the inner harbour. But there is no doubt that Bonaparte brought to bear on the execution of this as yet vague and general proposal powers of concentration and organization which ensured its success. In particular he soon put the artillery of the besiegers in good order. Carteaux, an ex-artist, at first held the supreme command, but was superseded on the 23rd of October. Doppet, the next commander, was little better fitted for the task; but his successor, Dugommier, was a brave and experienced soldier who appreciated the merits of Bonaparte. Under their direction steady advance was made on the side which Bonaparte saw to be all important; a sortie of part of the British, Spanish and Neapolitan forces on the 30th of November was beaten back with loss, General O'Hara, their commander, being severely wounded and taken prisoner. On the night of the i6th-i7th December, Dugommier, Bonaparte, Victor and Muiron headed the storming column which forced its way into the chief battery thrown up by the besieged on the height behind l'figuillette; and on the next day Hood and Langara set sail, leaving the royalists to the vengeance of the Jacobins. General du Teil, the younger, who took part in the siege, thus commented on Bonaparte's services: " I have no words in which to describe the merit of Bonaparte: much science, as much intelligence and too much bravery. ... It is for you, Ministers, to consecrate him to the glory of the republic." At Toulon Bonaparte made the acquaintance of men who were to win renown under his leadership — Desaix, Junot, Marmont, Muiron, Suchet and Victor.

It is often assumed that the fortunes of Bonaparte were made at Toulon. This is an exaggeration. True, on the 22nd of December 1793 he was made general of brigade for his services; and in February r794 he gained the command of the artillery in the French army ahout to invade Italy; but during the preliminary work of fortification along the coast he was placed under arrest for a time owing to his reconstruction of an old fort at Marseilles which had been destroyed during the Revolution. He was soon released owing to the interposition of the younger Robespierre and of Saliceti. Thereafter he resided successively at Toulon, St Tropez and Antibes, doing useful work in fortifying the coast and using his spare time in arduous study of the science of war. This he had already begun at Auxonne under the in- spiring guidance of the baron du Teil. General du Teil, younger brother of the baron, had recently published a work, L' Usage de Vartillerie nouvelle; and it is now known that Bonaparte derived from this work and from those of Guibert and Bourcet that lead- ing principle, concentration of effort against one point of the

enemy's line, which he had advocated at Toulon and which he everywhere put in force in his campaigns.

On or about the 20th of March 1794 he arrived at the head- quarters of the army of Italy. At Colmars, on the 21st of May 1794, he drew up the first draft of his Italian plan of campaign for severing the Piedmontese from their Austrian allies and for driving the latter out of their Italian provinces. A secret mission to Genoa enabled him to inspect the pass north of Savona, and the knowledge of the peculiarities of that district certainly helped him in maturing his plan for an invasion of Italy, which he put into execution in 1796. For the present he experienced a sharp rebuff of fortune, which he met with his usual fortitude. He was suddenly placed under arrest owing to intrigues or suspicions of the men raised to power by the coup d'etat of Thermidor9-io (July 27-28) 1794. The commissioners sent by the Convention, Albitte, Laporte and Saliceti, suspected him of having divulged the plan of campaign, and on the 6th of August ordered his arrest as being the " maker of plans " for the younger Robes- pierre. On a slighter accusation than this many had perished; but an examination into the details of the mission of Bonaparte to Genoa and the new instructions which arrived from Carnot, availed to procure his release on the 20th of August. It came in time to enable him to share in the operations of the French army against the Austrians that led to the battle of Dego, north of Savona (21st of September), a success largely due to his skilful combinations. But the decline in the energies of the central government at Paris and the appointment of Scherer as com- mander-in-chief of the army of Italy frustrated the plans of a vigorous offensive which Bonaparte continued to develop and advocate.

Meanwhile he took part in an expedition fitted out in the southern ports to drive the English from Corsica. It was a complete failure, and for a time his prospects were overclouded. In the spring-of 1795 he received an order from Paris to proceed to la Vendee in command of an infantry brigade. He declined on the score of ill-health, but set out for Paris in May, along with Marmont, Junot and Louis Bonaparte. At the capital he found affairs quickly falling back into the old ways of pleasure and luxury. " People," he wrote, " remember the Terror only as a dream." That he still pursued his studies of military affairs is shown by the compilation of further plans for the Italian cam- paign. The news of the ratification of peace with Spain brought at once the thought that an offensive plan of campaign in Pied- mont was thenceforth inevitable. Probably these plans gained for him an appointment (20th of August) in the topographical bureau of the committee of Public Safety. But, either from weariness of the life at

Paris, or from disgust at clerical work, he sought permission to go to Turkey in order to reorganize the artillery of the Sultan. But an inspection of his antecedents showed the many irregularities of his conduct as officer and led to his name being erased from the list of general officers (Sep- tember 15th).

Again the. difficulty of the republic was to be his opportunity. The action of the Convention in perpetuating its influence by the imposition of two-thirds of its members on the next popularly elected councils, aroused a storm of indignation in Paris, where the ” moderate ” and royalist reaction was already making headway. The result was the massing of some 30,000 National Guards to coerce the Convention. Confronted by this serious danger, the Convention entrusted its defence to Barras, who appointed the young officer to be one of the generals assisting him. The vigour and tactical skill of Bonaparte contributed very largely to the success of the troops of the Convention over the Parisian malcontents on the famous day of 13 Vend6miaire (October 5th, i79S)> when the defenders of the Convention, sweeping the quays and streets near the Tuilleries by artillery and musketry, soon paralysed the movement at its headquarters, the church of St Roch. The results of this day were out of all proportion to the comparatively small number of casualties. With the cost of about 200 killed on either side, the Convention crushed the royalist or malcontent reaction, and imposed on France a form of government which ensured the perpetuation of

democracy though in a bureaucratic form — the first of those changes which paved the way to power for Bonaparte. For the constitution of the year 1795 which inaugurated the period of I the Directory (1705-1799) see French Revolution. Here we 1 may notice that the perpetuation of the republic by means of the armed forces tended to exalt the army at the expense of the J civil authorities. The repetition of the same tactics by Bonaparte in Fructidor, 1797, served still more decidedly to tilt the balance in favour of the sword, with results which were to be seen at the coup d’etat of Brumaire 1799.

The events which helped the disgraced officer of August 1795 to impose his will on France in November 1799 now claim our attention. The services which he rendered to the republic at Vendemiaire brought as their reward the hand of Josephine de Beauharnais. The influence of Barras with this fashionable lady helped on the match. At

the outset she felt some repugnance for the thin sallow-faced young officer, and was certainly terrified by his ardour and by the imperious egoism of his nature; but she consented to the union, especially when he received the promise of the command of the French army of Italy. The story that he owed this promotion solely to the influence of Barras and Josephine is, however, an exaggeration. It is now known that the plans of campaign which he had drawn up for that army had enlisted the far more influential support of Carnot on his behalf. In January 1796 he drew up another plan for the conquest of Italy, which gained the assent of the Directory. Vendemiaire and the marriage with Josephine (9th of March 1796) were but stepping-stones to the attainment of the end which he had kept steadily in sight since the spring of the year 1794. For the events of this campaign in Italy see French Revolutionary Wars. The success at the bridge of Lodi (10th of May) seems first to have inspired in the young general dreams of a grander career than that of a successful general of the Revolution; while his narrow escape at the bridge of Areola in November strengthened his conviction that he was destined for a great future. The means whereby he engaged the energies of the Italians on behalf of the French Republic and yet refrained from persecuting the Roman Catholic Church in the way only too common among revolutionary generals, bespoke political insight of no ordinary kind. From every dispute which he had with the central authorities at Paris he emerged victorious; and he took care to assure his ascendancy by sending presents to the Directors, large sums -to the nearly bankrupt treasury and works of art to the museums of Paris. Thus when, after the crowning victory of Rivoli (14th of January 1797), Mantua surrendered and the Austrian rule in Italy for the time collapsed, Bonaparte was virtually the idol of the French nation, the master of the Directory and potentially the protector of the Holy See.

It may be well to point out here the salient features in Bona- parte's conduct towards the states of northern Italy. While arousing the enthusiasm of their inhabitants on behalf of France, he in private spoke contemptuously of them, mercilessly sup- pressed all outbreaks caused by the exactions and plundering of his army, and carefully curbed the factions which the new political life soon developed. On his first entry into Milan (15th of May 1796) he received a rapturous welcome as the liberator of Italy from the Austrian yoke; but the instructions of the Directory allowed him at the outset to do little more than effect the organization of consultative committees and national guards in the chief towns of Lombardy. The successful course of the campaign and the large sums which he sent from Italy to the French exchequer served to strengthen his hold over the Directors,

and his constructive policy grew more decided. Thus, when the men of Reggio and Modena overthrew the rule of their duke, he at once accorded protection to them, as also to the inhabitants of the cities of Bologna and Ferrara when they broke away from papal authority. He even allowed the latter to send delegates to confer with those of the duchy at Modena, with the result that a political union was decreed in a state called the Cispadane Republic (16th of October 1796). This action was due in large measure to the protection of Bonaparte.

The men of Lombardy, emboldened by his tacit encouragement, prepared at the close of the year to form a republic, which assumed the name of Transpadane, and thereafter that of Cisalpine. Its constitution was drawn up in the spring of 1797 by committees appointed, and to some extent supervised, by him; and he appointed the first directors, deputies and chief administrators of the new state (July 1797). The union of these republics took place on the 15th of July 1797. The bounds of the thus enlarged Cisalpine Republic were afterwards ex- tended eastwards to the banks of the Adige by the terms of the treaty of Campo Formio; and in November 1797 Bonaparte added the formerly Swiss district of the Valtelline, north-east of Lake Como, to its territory. Much of this work of reorganiza-tion was carried on at the castle of Montebello, or Mombello, near Milan, where he lived in almost viceregal pomp (May- July, 1797). Taking advantage of an outbreak at Genoa, he over- threw that ancient oligarchy, replaced it by a form of government modelled on that of France (June 6th); and subsequently it adopted the name of the Ligurian Republic.

Concurrently with these undertakings, he steadily prepared to strengthen his position in the political life of France; and it will be well to notice the steps by which he ensured the defeat of the royalists in France and the propping up of the directorial system in the coup d'itai of Fructidor 1797. The unrest in France in the years 1795-1797 resulted mainly from the harshness, incom- petence and notorious corruption of the five Directors who, after the 13th of Vendemiaire 1795, practically governed France. All those who wished for peace and orderly government came by degrees to oppose the Directors; and, seeing that the latter clung to Jacobinical catchwords and methods, public opinion tended to become " moderate " or even royalist. This was seen in the elections for one-third of the 750 members composing the two councils of the nation (the Anciens and the Council of Five Hundred); they gave the moderates a majority alike in that of the older deputies and in that of the younger deputies (April 1797), and

that majority elected Barthelemy, a well-known moderate, as the fifth member of the Directory. Carnot, the ablest administrator, but not the strongest man, soon joined Barthilemy in opposing their Jacobinical colleagues — Barras, Rewbell and Larevelliere-Lepeaux. Time was on the side of the moderates; they succeeded in placing General Pichegru, alreadyknown for his tendencies towards constitutional monarchy, in the presidential chair of the Council of Five Hundred; and they proceeded to agitate, chiefly through the medium of a powerful club founded at Clichy, for the repeal of the revolu- tionary and persecuting laws. The three Jacobinical Directors thereupon intrigued to bring to Paris General Lazarre Hoche and his army destined for the invasion of Ireland for the purpose of coercing their opponents; but these, perceiving the danger, ordered Hoche to. Paris, rebuked him for bringing his army nearer to the capital than was allowed by law, and dismissed him in disgrace.

The failure of Hoche led the three Directors to fix their hopes on Bonaparte. The commander of the ever-victorious army of Italy had recently been attacked by one of the moderates in the councils for proposing to hand over Venice to Austria. This cession was based on political motives, which Bonaparte judged to be of overwhelming force; and he now decided to support the Directors and overthrow the moderates. Prefacing his action by a violent tirade against the royalist conspirators of Clichy, he sent to Paris General Augereau, well known for his brusque behaviour and demagogic Jacobinism. This officer rushed to Paris, breathing out threats of slaughter against all royalists, and entered into close relations with Barras. In order to dis- count the chances of failure, Bonaparte warned the three Directors that Augereau was a turbulent politician, not to be trusted over- much. Events, indeed, might readily have gone in favour of the moderates had Carnot acted with decision; but he relapsed into strange inactivity, while Barras and his military tool prepared to coerce the majority. Before dawn of September the 4th (18 Fructidor) Augereau with 2000 soldiers marched against the Tuileries, where the councils were sitting, dispersed

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their military guards, arrested several deputies and seized Barthelemy in his bed. Carnot, on receiving timely warning, fled from the Luxemburg palace and made his way to Switzer- land. The

remembrance of the fatal day of Vendemiaire 1795 perhaps helped to paralyse the majority. In any case exile, and death in the prisons of Cayenne, now awaited the timid champions of law and order; while parliamentary rule sustained a shock from which it never recovered. The Councils allowed the elec- tions to be annulled in forty-nine departments of France, and re-enacted some of the laws of the period of the Terror, notably those against non-juring priests and returned e'migrSs. The election of Merlin of Douay and Francois of Neufchatel as Directors, in place of Carnot and Barthelemy, gave to that body a compactness which enabled it to carry matters with a high hand, until the hatred felt by Frenchmen for this soulless revival of a moribund Jacobinism gradually endowed the Chambers with life and strength sufficient to provoke a renewal of strife with the Directory. These violent oscillations not only weakened the fabric of the Republic, but brought about a situation in which Bonaparte easily paralysed both the executive and the legislative powers so ill co-ordinated by the constitution of the year 1795.

In the sphere of European diplomacy, no less than in that of French politics, the results of the coup d'etat of Fructidor were momentous. The Fructidorian Directors contemptuously rejected the overtures for peace which Pitt had recently made through the medium of Lord Malmesbury at Lille; and they further illustrated their desire for war and plunder by initiating a forward policy in central Italy and Switzerland which opened up a new cycle of war. The coup d'etat was favourable to Bona- parte; it ensured his hold over the Directors and enabled him to impose his own terms of peace on Austria; above all it left him free for the prosecution of his designs in a field of action which now held the first place in his thoughts — the Orient. Having rivalled the exploits of Caesar, he now longed to follow in the steps of Alexander the Great.

At the time of his first view of the Adriatic (February 1797)

he noted the importance of the port of Ancona for intercourse

with the Sultan's dominions; and at that city fortune placed

in his hands Russian despatches relative to the designs of the

Tsar Paul on Malta. The incident reawakened the interest

which had early been aroused in the young Corsican by converse

with the savant Volney, author of Les Ruines, ou meditation sur

les revolutions des empires. The intercourse which he had with Monge, the physicist and ex-minister of marine, during the negotiations with Austria, served to emphasize the orientation of his thoughts. This explains the eagerness with which he now insisted on the acquisition of the Ionian Isles by France and the political extinction of their present possessor, Venice. That city had given him cause for complaint, of which he made the most unscrupulous use. Thanks to the blind complaisance of its democrats and the timid subserviency of its once haughty oligarchs, he became master of its fleet and arsenal (16th of May 1797). Already, as may be seen by his letters to the Directory, he had laid his plans for the bartering away of the Queen of the Adriatic to Austria; and throughout the lengthy negotiations of the summer and early autumn of 1797 which he conducted with little interference from Paris, he adhered to his plan of gaining the fleet and the Ionian Isles; while the house of Habsburg was to acquire the city itself, together with all the mainland territories of the Republic as far west as the River Adige. In vain did the Austrian envoy, Cobenzl, resist the cession of the Ionian Isles to France; in vain did the Directors intervene in the middle of September with an express order that Venice must not be ceded to Austria, but must, along with Friuli, be included in the Cisalpine Republic. To the subtle tenacity of Cobenzl he opposed a masterful violence: he checkmated the Directors,

when they sought to thwart him in this and in other directions,

by sending in once more his resignation with a letter in which he

accused them of ” horrible ingratitude.” He was successful

at all points. The Directors feared a rupture with the man

to whom they owed their existence; and the house of Austria

was fain to make peace with the general rather than expose itself to harder terms at the hands of the Directory.

The treaty of Campo Formio, signed on the 17th of October 1797, was therefore pre-eminently the work of Bonaparte. Already at Cherasco and Leoben he had dictated the preliminaries of peace to the courts of Turin and Vienna quite independently of the French Directory. At Campo Formio he showed himself the first diplomatist of the age, and the arbiter of the destinies of Europe. The terms were on the whole unexpectedly favour- able to Austria. In Italy she was to acquire the Venetian lands already named, along with Dalmatia and Venetian Istria. The rest of the Venetian mainland (the districts between the rivers Adige and Ticino) went to the newly constituted Cisalpine republic, France gaining the Ionian Isles and the Venetian fleet. The Emperor Francis renounced all claims to his former Nether- land provinces, which had been occupied by the French since the summer of 1794; he further ceded the Breisgau to the dis- possessed duke of Modena, agreed to summon a congress at Rastatt for the settlement of German affairs, and recognized the independence of the Cisalpine republic. In secret articles the emperor bound himself to use his influence at the congress of Rastatt in order to procure the cession to France of the Germanic lands west of the Rhine, while France promised to help him to acquire the archbishopric of Salzburg and a strip of land on the eastern frontier of Bavaria.

After acting for a brief space as one of the French envoys to the congress of Rastatt, Napoleon returned to Paris early in December and received the homage of the Directors and the acclaim of the populace. The former sought to busy him by appointing him commander-in-chief of the Army of England, the island power being now the only one which contested French supremacy in Europe. In February 1798 he inspected the preparations for the invasion of England then proceeding at the northern ports. He found that they were wholly inadequate, and summed up his views in a remarkable letter to the Directory (23rd of February), wherein he pointed out two possible

alternatives to an invasion of England, namely, a conquest of the coast of the north-west of Germany, for the cutting off of British commerce with central Europe, or the undertaking of an expedition to the Orient which would be equally ruinous to British trade. The inference was inevitable that, as German affairs were about to be profitably exploited by France in the bargains then beginning at Rastatt, she must throw her chief energies into the Egyptian expedition. One of the needful preliminaries of this enterprise had already received his attention. In November 1797 he sent to Malta Poussielgue, secretary of the French legation at Genoa, on busi- ness which was ostensibly commercial but (as he informed the Directory) ” in reality to put the last touch to the design that we have on that island.” The intrigues of the French envoy in corrupting the knights of the order of St John were completely successful. It remained, however, to find the funds needful for the equipment of a great expedition. Here the difficulties were great. The Directory, after the coup d’etat of Fructidor, had acknowledged a state of bankruptcy by writing off two- thirds of the national debt in a form which soon proved to be a thin disguise for repudiation. The return of a large part of the armed forces from Italy and Germany, where they had lived on the liberated inhabitants, also threw new burdens on the Republic; and it was clear that French money alone would not suffice to fit out an armada. Again, however, the financial situation was improved by conquest. The occupation of Rome in February 1798 enabled Berthier to send a considerable sum to Paris and to style himself ” treasurer to the chest of the Army of England.” The invasion of Switzerland, which Bonaparte had of late persistently pressed on the Directory, proved to be an equally lucrative device, the funds in several of the cantonal treasuries being transferred straightway to Paris or Toulon. The conquest of north and central Italy also placed great naval resources at the disposal of France, Venice alone providing nine sail of the line and twelve frigates (see Bonaparte’s letter of the 15th of November r797), Genoa, Spezzia, Leghorn, Civita Vecchia and Ancona also supplied their quota in warships, transports,

stores and sailors, with the result that the armada was ready for sea by the middle of May 1798. The secrecy maintained as to its destination was equally remarkable. The British govern- ment inclined to the belief that it was destined either for Ireland or for Naples. As the British fleet had abandoned the Mediter- ranean since November 1796 and had recently been disorganized by two serious mutinies,

Bonaparte's plan of conquering Egypt was by no means so rash as has sometimes been represented.

The ostensible aims of the expedition, as drawn up by him, and countersigned by the Directory on the 12th of April, were the seizure of Egypt, the driving of the British from all their possessions in the East and the cutting of the Suez canal. But apart from these public aims there were private motives which weighed with Bonaparte. His relations to the Directors were most strained. They feared his ability and ambition; while he credited them with the design of poisoning him. Shortly before his starting, an open rupture was scarcely averted; and he and his brothers allowed the idea to get abroad that he was being virtually banished from France. It is certain, however, that his whole heart was in the expedition, which appealed to his love of romance and of the gigantic. His words to Joseph Bonaparte shortly before sailing are significant: " Our dreams of a republic were youthful illusions. Since the 9th of Thermidor, the republican instinct has grown weaker every day. To-day all eyes are on me: to-morrow they may be on another. ... I depart for the Orient with all the means of success at my disposal. If my country needs me, if there are additions to the number of those who share the opinion of Talleyrand, Sieyes and Roederer, that war will break out again and that it will be unsuccessful for France, I will return, more sure of the feeling of the nation." He added, however, that if France waged a successful war, he would remain in the East, and do more damage to England there than by mere demonstrations in the English Channel.

The Toulon fleet set sail on the 19th of May; and when the other contingents from the ports of France and Italy joined the flag, the armada comprised thirteen sail of the line, fourteen frigates, many smaller warships and some three hundred trans- ports. An interesting feature of the expedition was the presence on board of several savants who were charged to examine the antiquities and develop the resources of Egypt. The chief had lately become a member of the Institute, and did his utmost to inflame in France that love of art and science which he had helped to kindle by enriching the museums of Paris with the treasures of Italy. By good fortune the armada evaded Nelson and arrived safely off Malta. Thanks to French intrigues, the Knights of Malta offered the tamest defence of their capital. During the week which he spent there, Bonaparte displayed marvellous energy in endowing the city with modern institutions; he even arranged the course of studies to be followed in the university. Setting sail for Egypt on the 19th of June, he again had the good fortune to elude Nelson and arrived off Alexandria on the 2nd of July. For an account of the Egyptian and Syrian campaigns see French

Revolutionary Wars. But here we may point out the influence of the expedition on Egypt, on European politics and on the fortunes of Bonaparte. The chief direct result in the life of the Egyptian people was the virtual destruction of the governing caste of the Mamelukes, the Turks finding it easy to rid themselves of their surviving chiefs and to re-establish the authority of the Sultan. As for the benefits which Bonaparte and his savants helped to confer on Egypt, they soon vanished. The great canal was not begun; irrigation works were started but were soon given up. The letters of Kleber and Menou (the successors of Bonaparte) show that the expenditure on public works had been so reckless liat the colony was virtually bankrupt at the time of Bonaparte's departure; and William Hamilton, who travelled through Egypt in :8o2, found few traces, other than military, of the French occupation. The indirect results, however, were incalculably great. Though for the present the Sultan regained his hold upon Egypt, yet in reality Bonaparte set in motion forces which could not be stayed until the ascendancy of one or other of the western maritime Dowers in that land was definitely decided.

The effects of the expedition in the sphere of world-politics were equally remarkable and more immediate. The British government, alarmed by Bonaparte's attempt to intrigue with Tippoo Sahib, put forth all its strength in India and destroyed the power of that ambitious ruler. Nelson's capture of Malta (5th of September 1800) also secured for the time a sure base for British fleets in the Mediterranean. A Russo-Turkish fleet wrested Corfu from the French; and the Neapolitan Bourbons, emboldened by the news of the battle of the Nile, began hostilities with France which preluded the war of the Second Coalition. In the domain of science the results of the expedition were of unique interest. The discovery of the Rosetta Stone furnished the key to Egyptian hieroglyphics; and archaeology, no less than the more practical sciences, acknowledges its debt of grati- tude to the man who first brought the valley of the Nile into close touch with the thought of the West.

Finally, it should be noted that, amid the failure of the national aims which the Directory and Bonaparte set forth, his own desires received a startlingly complete fulfilment. The war of the Second Coalition having brought about the expulsion of the French from Italy, the Directors were exposed to a storm of indignation in France, not unmixed with contempt; and this state of public opinion enabled the young conqueror within a month of his landing at Frejus (9th of October 1799) easily to prevail over the Directory and the elective councils of the nation. In the spring of 1798 he had judged the pear to be not ripe; in Brumaire 1799 it came off almost at a touch.

In order to understand the sharp swing of the political pendulum back from republicanism to autocracy which took place at Brumaire, it is needful to remember that the virtual failure of the Egyptian Expedition was then unknown. The news of Bonaparte's signal victory over the Turkish army at Aboukir aroused general rejoicings undimmed by any save the vaguest rumours of his reverse at Acre. In the popular imagination he seemed to be the only possible guarantor of victory abroad and order at home. This was unjust to the many men who were working, not without success, to raise the Republic out of its many difficulties. Massena's triumph at Zurich (September 25th-26th, 1799) paralysed the Second Coalition; and, though the Austrians continued to make progress along the Italian riviera, the French Republic was in little danger on that side so long as it held Switzerland.

The internal condition of France was also not so desperate as has often been represented. True, the Directory seemed on the point of collapse; it had been overcome by the popularly elected Chambers in the insignificant coup d'etat of 30 Prairial (18th of June) 1799; when Larevelliere-Lepeaux and Merlin were compelled to resign. The retirement of Rewbell a short time previously also rid France of a turbulent and corrupt administrator. His place was now filled by Sieyes. This ex- priest, this disillusioned Jacobin and skilful spinner of cobweb constitutions, enjoyed for a time the chief reputation in France. His oracular reserve, personal honesty and consistency of aim had gained him the suffrages of all who hoped to save France from the harpies of the Directory and the violent rhetoricians of the now reconstituted Jacobin Club. He was known to dis- approve of the Directory both as an institution in the making of which he had had no hand, and of its personnel, with one excep- tion. This was natural. The new Directors, Gohier and Moulin, were honest but incapable and narrow-minded. As for Barras, his venality and vices outweighed even his capacity for successful intrigue. The fifth Director, Ducos, an ex-Girondin, was sure to swim with the stream. Clearly, then, the Directory was doomed. It was far otherwise with the Councils. A majority of the Ancients was ready to support Sieyes and make drastic changes in the constitution; but in the Council of Five Hundred the prevalent feeling was democratic or even Jacobinical. The aim of Sieyes was to perpetuate the republic, but in a bureau- cratic or autocratic form. With this aim in view he sought to find a man possessing ability in war and probity in civil affairs, who would act as figure-head to his long projected constitution. For a time affairs moved as he wished. The Jacobin Club was

closed, thanks to the ability of Fouche, the new minister of Police; but the hopes of Sieyes were dashed by the death of General Joubert, commander of the Army of Italy, at the disastrous battle of Novi (1 5th of August) . The dearth of ability among the generals left in France (Kleber and Desaix were in Egypt) was now painfully apparent. Moreau was notoriously lethargic in civil affairs. Bernadotte, Jourdan and Augereau had compromised themselves by close association with the Jacobins. The soldiery had never forgiven Massena his peculations after the capture of Rome. One name, and one alone, leaped to men's thoughts, that of Bonaparte.

He arrived from Egypt at the psychological moment, and his journey from Frejus to Paris resembled a triumphant procession. Nevertheless he acted with the utmost caution. A fortnight passed before he decided to support Sieyes in effecting a change in the constitution; and by then he had captivated all men except Bernadotte and a few intransigeant Jacobins. Talleyrand, Roederer, Cambac6res and Real were among his special con- fidants, his brothers Joseph and Lucien also giving useful advice. Of the generals, Murat, Berthier, Lannes and Leclerc were those who prepared the way for the coup d'Hat. Fouche, pulling the wires through the police, was an invaluable helper. The conduct of Barras was known to depend on material considerations.

All being ready, the Ancients on the 18 Brumaire (9th of November) decreed the transference of the sessions of both Councils to St Cloud, on the plea of a Jacobin plot which threatened the peace of Paris. They also placed the troops in Paris and its neighbourhood under the command of Bonaparte. Thereupon Sieyes and Ducos resigned office. Barras, after a cal- culating delay, followed suit. Gohier and Moulin, on refusing to retire, were placed under a military guard; and General Moreau showed his political incapacity by discharging this duty, for the benefit of Bonaparte.

Nevertheless the proceedings of St Cloud on the day following bade fair to upset the best-laid schemes of Bonaparte and his coadjutors. The Five Hundred, meeting in the Orangerie of the palace, had by this time seen through the plot; and, on the entrance of the general with four grenadiers, several deputies rushed at him, shook him violently, while others vehemently demanded a decree of outlawry against the new Cromwell. He himself lost his nerve, stammered, nearly fainted, and was dragged out by the soldiers in a state of mental and physical collapse. The situation was saved solely by the skill of his brother Lucien, then president of the Council. He refused to put the vote of

outlawry, uttered a few passionate words, cast off his official robes, declared the session at an end, and made his way out under protection of a squad of grenadiers. The coup d'etat seemed to have failed. In reality matters now rested with the troops out- side. Stung to action by some words of Sieyes, Bonaparte appealed to the troops of the line in terms which provoked a ready response. Imprecations uttered by Lucien against the brigands and traitors in the pay of England decided the grenadiers of the Council to march against the deputies whom it was their special duty to protect. Drums beat the charge, Murat led the way through the corridors of the palace to the Orangerie, and levelled bayonets ended the existence of the Council. Within the space of ten and a half years from the summoning of the States-General at Versailles (May 1789), parliamentary government fell beneath the sword.

Lucien now consolidated the work of the soldiery by procuring from the Ancients a decree which named Bonaparte, Sieyes and Ducos as provisional consuls, while a legislative commission was appointed to report on necessary changes in the constitution. Lucien also gathered together a small group of the younger deputies to throw the cloak of legality over the events of the day. The Rump proceeded to expel sixty-one Jacobins from the Council of Five Hundred, adjourned its sessions until the 19th of February 1800, and appointed a commission of twenty-five members with power to act in the meantime. Clearly the success of the coup d'etat of Brumaire was due in the last resort to Lucien Bonaparte.

The Parisians received the news of the event with joy, be- lieving that freedom was now at last to be established on a firm basis by the man whose name was the synonym for victory in the field and disinterestedness in civil affairs. " People are full of mirth " (wrote Madame Reinhard, wife of the minister for Foreign Affairs, four days later) " believing that they have regained liberty." She added that all the parties except the Jacobins were full of confidence; and that the nobles now cherished hopes of a reaction, seeing that the reduction of the number of rulers from five to three pointed towards monarchy. Her comment on this delusion is instructive. Three consuls had been appointed, she remarked, precisely in order that power might not be vested in the hands of one man.

Only by degrees did the events of the 19th of Brumaire stand out in their real significance; for the new consuls, installed at the Luxemburg palace, and somewhat later at the Tuileries, took care that the new constitution, which they along with the two commissions were now secretly drawing up, should not be promulgated until Paris and France

had settled down to the ordinary life of pleasure and toil. In the meantime they won credit by popular measures such as the abolition of forced loans and of the objectionable habit of seizing hostages from the districts of the west where the royalist ferment was still strongly working.

The feelings of suprise at the clemency and moderation with which the victors used their powers predisposed men every- where to accept their constitution. Sieyes now sketched its out- lines in vaguely republican forms; thereupon Bonaparte freely altered them and gave them strongly personal touches. The theorist laid before the joint commission his projet, the result of five years of cogitation, only to have it ridiculed by the great soldier. In one respect alone did it suit him. While restoring the principle of universal suffrage, which had been partially abrogated in 1795, Sieyes rendered this system of election practically a nullity. The voters were to choose one-tenth of their number (notabilities of the commune) ; one-tenth of these would form the notabilities of the department; while by a similar decimal sifting, the notabilities of the nation were selected. The final and all-important act of selection from among these men was, however, to be made by a personage, styled the pro- clamateur-ilecleur, who chose all the important functionaries, and, conjointly with the notabilities of the nation, chose the members for the Council of State (wielding the chief executive powers), the Tribunate and the Senate. The latter body would, however, have the power to ” absorb ” the head of the state if he showed signs of ambition. Against this power of absorption Bonaparte declaimed vehemently, asserting also that the proclamateur- electeur would be a mere cochon a I’engrais. In vain did Sieyes modify his scheme so as to provide for two consuls, one holding the chief executive powers for war, the other for peace. This division of powers was equally distasteful to Bonaparte: he formed a kind of cabal within the joint commission, and there intimidated the theorist, with the result already foreseen by the latter. Sieyes, conscious that his political mechanism would merely winnow the air, until the profoundly able and forceful man at his side adapted it to the work of government, relapsed into silence; and his resignation of the office of consul, together with that of Ducos, was announced as imminent. Bonaparte further brushed aside a frankly democratic constitution pro- posed by Daunou, and intimidated his opponents in the joint commission by a threat that he would himself draft a constitution and propose it to the people in a mass vote.

This was what really happened. They looked, on helplessly while he refashioned the scheme of Sieyes. Keeping the electoral machinery almost unchanged (save that the lists of notables were to be

permanent) Bonaparte entirely alteied the upper parts of the constitutional pyramid reared by the philosopher. Improv- ing upon the procedure of the Convention in Vend6miaire 1795, Bonaparte procured the nomination of three consuls in an article of the new constitution; they were Bonaparte (First Consul), Cambaceres and Lebrun. The latter two, uniting with the two retiring consuls, Sieyes and Ducos, were to form the

nucleus of the senate and choose the majority among its full complement of sixty members, the minority being thereafter chosen by co-optation. To the senate, thus chosen ” from above,” was allotted the important task of supervising the constitution, and of selecting, from among the notabilities of the nation, the members of the Corps Ligislatif and the Tribunate. These two bodies nominally formed the legislature, the Tribunate merely discussing the bills sent to it by an important body, the Council of State; while the Corps Legislatif, sitting in silence, heard them defended by councillors of state and criticized by members of the Tribunate; thereupon it passed or rejected such proposals by secret voting. Thus, the initiative in law- making lay with the Council of State; but, as its members were all chosen by the First Consul, it is clear that that important duty was vested really in him. The executive powers were placed almost entirely in his hands, as will be seen by the terms of article 41 which defined his functions: “The First • Consul promulgates the laws; he appoints and dismisses at will the members of the Council of State, the ministers, the ambassadors and other leading agents serving abroad, the officers of the army and navy, the members of local administrative bodies and the commissioners of government attached to the tribunals. He names all the judges for criminal and civil cases, other than the juges de paix (magistrates) and the judges of the Cour de cassation, without having the power to discharge them.” — As for the second and third consuls, their functions were almost entirely con- sultative and formal, their opposition being recorded, but having no further significance against the fiat of the First Consul. Bonaparte’s powers were subsequently extended in the years 1802, 1804 and 1807; but it is clear that autocracy was prac- tically established by his own action in the secret commission of 1799. The new constitution was promulgated on the 15th of December 1799 and in a plebiscite held during January 1800 it received the support of 3,011,007 voters, only 1562 persons voting against it. The fact that the three new consuls had entered upon office and set the constitutional machinery in motion fully six weeks before

the completion of the plebiscite, detracts somewhat from the impressiveness of the vox populi on that occasion.

Bonaparte selected his ministers with much skill. They were Talleyrand, Foreign Affairs; Berthier, War; Abrial, Justice; Lucien Bonaparte, Interior; Gaudin, Finance; Forfait, Navy and Colonies. Maret became secretary of state to the consuls. Bonaparte's selection gave general satisfaction, as also did the personnel of the Council of State (divided into five sections for the chief spheres of government) and of the other organs of state. Many of the furious Terrorists now became quiet and active councillors or administrators, the First Consul adopting the plan of multiplying " places," of overwhelming all officials with work, and of busying the watch-dogs of the Jacobinical party by " throwing them bones to gnaw."

In our survey of the career of Napoleon, we have now reached the time of the Consulate (November 1799-May 1804), which marks the zenith of his mental powers and creative activity. Externally, and in a personal sense, the period falls into two parts. The former of these extends to August 1802, when the powers of the First Consul, which had been decreed for ten years, were prolonged to the duration of his life. But in another and wider sense the Consulate has a well-defined unity; it is the time when France gained most of her institutions and the essentials of her machinery of government.

The reader is referred to the article France {Law and Institutions) for the information respecting the various codes dating from this period, and to the article Concordat for the famous measure whereby Napoleon re-established official relations between the state and the church in France. More pressing even than that question was the regulation of local government. Bonaparte's action in this matter was so characteristic as to deserve close attention. Un- doubtedly the question was one of great importance; for local affairs had fallen into chaos. The aim of the constituent assembly in its departmental system (1 789-1 790) had been to vest local affairs ultimately in councils elected by universal suffrage, alike in the department and in the three smaller areas within it. These councils and the executive officers dependent on them soon proved to be un- able to manage even local affairs efficiently, while they were very

lax in the collection of the national taxes unwisely entrusted to them. Lack of central control over the virtually independent communes (over forty thousand in number) led to a sharp rebound under the Convention, when all matters of importance were disposed of by commissioners appointed by that body. The relations between

national and local authorities fluctuated considerably during the Directory; and it is noteworthy that the constitution of December 1799 placed local administration merely under the control of ministers at Paris. Everything, therefore, portended a change in this sphere, but few persons expected a change so drastic as that which Bonaparte now brought about in the measure of 28 Pluvi&se, year VIII. (16th of February 1800). Certainly no measure marked more clearly the abandonment of democratic ideals. The powers formerly vested in elective bodies were now to be wielded by prefects and sub-prefects, nominated by the First Consul and responsible to him. The elective councils for the department and for the arrondissement (a new area which replaced the " districts " of the year 1795) continued to exist, but they sat only for a fortnight in the year and had to deal mainly with the assessment of taxes for their respective areas. They might be consulted by the prefect or sub-prefect; but they had no hold over him. The municipal councils had slightly larger powers, relating to loans, octrois, &c. But the chief municipal officer, the mayor, was chosen by the prefect. The police of all towns containing more than 100,000 inhabitants was -controlled by the central government.

It is significant that Bonaparte proposed this bill (drafted in the Council of State) to the Tribunate and the Corps Legislatif on the very day on which it was first certainly known that France had accepted the new constitution. The opposition in the Tribunate was sharp, but was paralysed by the knowledge of the fact just named and by the lack of a free press. The bill passed there by 71 votes to 25; and in the Corps Legislatif by 217 to 68. The acquiescence of these bodies in the transition to despotic methods predisposed the public to a similar attitude of rr.ind. At first the sharpness of the change was not fully apparent owing to the tactful choice of prefects made by the First Consul; but before long their very extensive powers were seen to form an important part of the new machinery of autocracy. In this connexion we may note that the disturbances, mainly royalist but sometimes Jacobinical, in several districts of France enabled Bonaparte to propose the estab- lishment in the troubled districts of special tribunals for the trial of all offences tending to disturb the general peace. Here again the Tribunate offered a vehement opposition to the measure, and in spite of official pressure passed the bill only by a majority of eight. Becoming law on 18 Pluvi6se, year IX. (6th of February 1801), it enabled the government to supersede the ordinary judicial machinery for political offences in no fewer than thirty-two departments.

Bonaparte signalized his tenure of power by no very important developments in the sphere of elementary education. This was left to

the local authorities, and led to little result. The more advanced schools, known as ecoles centrales, were reconstituted either as £coles secondares or as lycees by the law of the 30th of April 1802. The former of these were designed for the completion of the training of the most promising pupils in the communal elementary schools, and were left to local control or even to management by private individuals. Far more important, however, were the lycees, where an excellent education was imparted, semi-military in form and under the control of government. It gained valuable powers of patronage by founding 6400 exhibitions (bourses) in connexion with the lycies; 2400 of which were reserved for the sons of soldiers and government officials. The same centralizing tendency is strongly marked in the organization of the university of France, the general principle of which was set forth in May 1806, while the details were arranged by that of March the 17th, 1808. It was designed to control all the educational institutions of France, both public and private; and it did so with two exceptions, the Museum and the College de France. The discipline was strict. Fidelity to the emperor and to the teaching of the Roman Catholic doctrine formed part of the aims of this comprehensive corporation. Its officers were required to obey " the statutes of ffie teaching body, which have for their object uniformity of instruction, and which tend to form for the state citizens attached to their religion, their prince, their country and their family." These words sufficiently illustrate the essentially political character of the institution. Its organization was com- pleted by the decree of the 15th of November 181 1. Napoleon's ideas on the education of girls may be judged by this extract from his speech at the Council of State on the 1st of March 1806: " I do not think that we need trouble ourselves with any plan of in- struction for young females: they cannot be better brought up than by their mothers. Public education is not suitable for them, because they are never called upon to act in public. Manners are all in all to them, and marriage is all they look to."

Returning to the period of the Consulate, we notice the founding of an institution which also had its complete development during the Empire, namely, the Legion of Honour (19th of May 1802). Napoleon intended it as a protest against the spirit of equality which pervaded revolutionary thought. In one respect the new institution marked an enormous advance on titles of nobility, which had been granted nearly always for warlike exploits, or merely as a mark of the favour of the sovereign. The First Consul, on the

other hand, sought to recognize and reward merit in all walks of life. Nevertheless his proposal met with strong opposition in the Corps Legislatif and Tribunate, where members saw that it portended a revival of the older distinction. This was so: abolished in 1790 by the constituent assembly, titles of nobility were virtually restored by Napoleon in 1806 and legally in 1808. Side by side with them there continued to exist the Legion of Honour. It was organized in fifteen cohorts, each comprising seven grand officers, twenty com- manders, thirty officers and 350 legionaries. A stipend, ranging from 5000 francs a year to 250 francs, was attached to each grade of the institution. The benefits attaching to membership and the number of the members were increased during the Empire, when the average number somewhat exceeded thirty thousand. Napoleon's aim of bidding for the support of all able men is disagreeably promi- nent in all details of this institution, which may be looked upon as the tangible outcome of the conviction which he thus frankly ex- pressed: " In ambition is to be found the chief motive-force of humanity; and a man puts forth his best powers in proportion to his hopes of advancement."

The success of Bonaparte in reorganizing France may be ascribed to his determined practicality and to his perception of the needs of the average man. Since the death of Mirabeau no one had appeared who could strike the happy mean and enforce his will on the extremes on either side. Bonaparte did so with a forcefulness rarely possessed by that usually mediocre creature, the moderate man.

It is time now to notice the chief events which ensured the ascendancy of Bonaparte. Military, diplomatic and police affairs were skilfully made to conduce to that result. In the first of these spheres the victory of Marengo (14th of June 1800) was of special importance, as it consolidated the reputation of Bonaparte at a time when republican opposition was gathering strength. As Lucien Bonaparte remarked, if Marengo had been lost — and it was saved only by Desaix and Kellermann — the Bonaparte family would have been proscribed. Negotiations for peace now followed; but they led to nothing, until Moreau's triumph at Hohenlinden (December 2nd, 1800) brought the court of Vienna to a state of despair. By the treaty with Austria, signed by Joseph Bonaparte at Luneville on the 9th of February 1801, France regained all that she had won at Campo Formio, much of which had been lost for a time in the war of the Second Coali- tion. True, she now agreed to recognise the independence of the Cisalpine, Ligurian, Helvetic and Batavian (Dutch) republics; but the masterful acquisitiveness of the First Consul and the weak conduct of Austrian and British affairs at that time soon made that clause of the treaty a

dead letter. Bonaparte mean- while, by dexterous behaviour to Paul I. of Russia, had won the friendship of that potentate, whose resentment against his former allies, Austria and England, facilitated a re-grouping of the Powers. The new Franco-Russian entente helped on the formation of the Armed Neutrality League and led to the con-coction of schemes for the driving of the British from India. But these undertakings were thwarted in March-April 1801 by the murder of the tsar Paul and by Nelson's victory at Copen- hagen. The advent of the more peaceful and Anglophile tsar, Alexander I. (q.v.), brought about the dissolution of the League, and the abandonment of the oriental schemes which Bonaparte had so closely at heart. Another disappointment befel him in the same quarter, the surrender of the French forces in Egypt to the British expedition commanded first by General Abercromby and afterwards by General John Hely«Hutchinson (30th of August 1 801).

These events disposed both Bonaparte and the British cabinet towards peace. He was all powerful on land, they on the sea; and for the present each was powerless to harm the other. Bonaparte in particular discerned the advantages which peace would bring in the consolidation of his position. The beginning of negotiations had been somewhat facilitated by the resignation of Pitt (4th of February 1801) and the advent to office of Henry Addington. Bonaparte, perceiving the weakness of Addington, both as a man and as a minister, pressed him hard; and both the Preliminaries of Peace, concluded at London on the 1st of October 1801, and the terms of the treaty of Amiens (27th of March 1802) were such as to spread through the United Kingdom a feeling of annoyance. In everything which related to the continent of Europe and to the resumption of trade relations between Great Britain and France, Bonaparte had his way; and he abated

his demands only in a few questions relating to India and New-foundland.

The terms of the treaty of Amiens may be thus summarized: Great Britain restored to France the colonial possessions (almost the whole of the French colonial empire) conquered in the late war. Of their many maritime conquests the British retained only the Spanish island of Trinidad and the Dutch settlements in Ceylon. Their other conquests at the expense of these allies of France were restored to them, including the Cape of Good Hope to the Dutch. France recognized the integrity of the Turkish Empire and promised an indemnity to the House of Orange exiled from the Batavian (Dutch) Republic since 1794. She further agreed to evacuate the papal states, Taranto and other towns in the Mediterranean coasts which she had

occupied. The independence of the Ionian Isles (now reconstituted as the Republic of the Seven Islands) was guaranteed. As to Malta, the United Kingdom was to restore it to the order of St John (its possessors previous to 1798) when the Great Powers had guaranteed its independence. It was to receive a Neapolitan garrison for a year, and, if necessary, for a longer time.

No event in the life of Bonaparte was more auspicious than the conclusion of this highly advantageous bargain. By retaining nearly all the continental conquests of France, and by recovering every one of those which the British had made at her expense beyond the seas, he achieved a feat which was far beyond the powers even of Louis XIV. The gratitude of the French for this triumph found expression in a proposal, emanating from the Tribunate, that the First Consul should receive a pledge of the gratitude of the nation. When referred to the senate, the matter underwent secret manipulation, largely through the in- fluence of Cambaceres; but the republican instinct even in the senate was sufficiently strong to thwart the intrigues of the second consul; and that body on the 8th of May merely re-elected Bonaparte for a second term of ten years after the expiration of the first decennial term for which he was chosen. This fell far short of his desires, and he now dexterously referred the whole question to the nation at large. The Council of State. acting on a suggestion made by Cambaceres, now intervened will telling effect. It altered the wording of the senatorial proposal in such a way that the nation was asked to vote on the question : ” Is Napoleon Bonaparte to be made Consul for Life ? ” France responded by an overwhelming affirmative, 3,568,885 votes being cast for the proposal and only 8374 against it.

Napoleon (who now used his Christian name instead of the surname Bonaparte) thereupon sent proposals for various changes in the constitution, which were at once registered by the obsequious Council of State and the Senate on the 4th of August (16 Ther- midor) 1802. Besides holding his powers for life, he now gained the right of nominating his successor. He alone could ratify treaties of peace and alliance, and on his nomination fifty-four senators were added to the senate, which thereafter numbered one hundred and twenty members appointed by him alone. This body received the right of deciding by senatus consulta all questions not provided for by the constitution; the Corps Ligislatif and Tribunate might also thenceforth be dissolved at its bidding. In short, the First Consul now became the irre- sponsible ruler of France, governing the country through the ministry, the Council of State and the Senate. As for the chambers, based avowedly on universal suffrage, their existence thenceforth was ornamental or sepulchral. The constitutional changes of August 1802, initiated solely

by Bonaparte, made France an absolute monarchy. The name of Empire was not adopted until nearly two years later; but the change then brought about was scarcely more than titular.

In order to understand the utter inability of the old republican party to withstand these changes, it is needful to retrace our steps and consider the skilful use made by Bonaparte of plots and disturb- ances as they occurred. As was natural, when he sought to steer a middle course between the Scylla of royalism and the Charybdis of Jacobinism, disturbances were to be expected on both sides of the consular ship of state. The first of these was an unimportant affair, probably nursed by the agents provocateurs of Fouche's ubiquitous police. It purported to be an undertaking entered into by a few

Jacobins, among them Arena, a Corsican, for the murder of Bona- parte at the opera. Arena and his supposed accomplice were arrested (loth of October 1800); and that was virtually the beginning and the end of the plot. Far more serious was the danger to be appre- hended from the royalists. Enraged by Bonaparte's contemptuous refusal to encourage the return of " Louis XVIII." to his own, the royalists began to compass the death of the man whom they had at first naively looked on as a potential General Monk to their Charles 1 1 . Their chief man.#f action was a sturdy Breton peasant, Georges Cadoudal, whos£ peal and courage served to bring to a head plans long talked over by the confidants of the Comte d'Artois (the future Charles X. of France) in London. The outcome of it was the des- patch of some five or six Chouan desperadoes to Paris, three of whom exploded an infernal machine close to Bonaparte's carriage in the narrow streets near the Tuileries (3rd Niv6se [24th of December] 1800). Bonaparte and Josephine escaped uninjured, but several bystanders were killed or wounded. Napoleon's vengeance at once took a strongly practical turn. Despite the evidence which Fouche and others brought forward to incriminate the royalists, the First Consul persisted in attributing the outrage to the Jacobins, had a list of suspects drawn up, and caused the Council of State to declare that a special precautionary measure was necessary. The measure proved to be the deportation of the leading Jacobins; and a cloak of legality was cast over this extraordinary proceeding by a special decree of the senate (avowedly the guardian of the constitution) that this act of the government was a " measure tending to preserve the constitution " (5th of January 1801). The body charged with the guarding of the constitution was

thus brought by Bonaparte to justify its violation; and a way was thus opened for the legalizing of further irregularities. For the present the connivance of the senate at his coup d'etat of Niv6se led to the deportation of one hundred and thirty Jacobins; some were interned in the islands of the Bay of Biscay, while fifty were sent to the tropical colonies of France, whence few of them ever returned. It is to be observed that, before the punishment was inflicted, evidence was forthcoming which brought home the outrage of Nivose to the royalists; but this was all one to Bonaparte; his aim was to destroy the Jacobin party, and it never recovered from the blow. The party which had set up the Committee of Public Safety was now struck down by the very man who through the Directory inherited by direct lineal descent the dictatorial powers instituted in the spring of 1793 for the salva- tion of the republic. It remains to add that the suspects in the plot of, October 1800 were now guillotined (31st of January 1801), and that two of the plotters closely connected with the affair of Nivose were also executed (21st of April). The institution of the special tribunals (already referred to), which enabled Bonaparte to supersede local government in thirty-two of the departments, was another outcome of the bomb conspiracy.

Far more lenient was Bonaparte's conduct towards a knot of dis-contented officers who, in April-May 1802, framed a clumsy plot, known as the "Plot of the Placards," for arousing the soldiery against him. He disgraced or imprisoned the ringleaders, ordered Bernadotte (perhaps the fountain head of the whole affair) to take the waters at Plombieres and drove from office Fouch6, who had sought to screen the real offenders by impugning the royalists.

Bonaparte's action in the years 1 800-1 802 showed that he feared the old republican party far more than the royalists. In April 1802 he procured the passing of a senatus consultum granting increased facilities for the return of the emigres ; with few exceptions they were allowed to return, provided that it was before the 23rd of September 1802, and, after swearing to obey the new constitution, they entered into possession of their lands which had not been alienated; but barriers were raised against the recovery of their confiscated lands. Very many accepted these terms, rallied to the First Consul with more or less sincerity; and their return to France to strengthen the conservative elements in French society. The promulgation of the Concordat (18th of April 1802) and the institution of what was in all but name a state religion tended strongly in the same direction, the authority of the priests being generally used in support of the man to whom Chateaubriand applied the epithet " restorer of the altars." Nevertheless, despite Bonaparte's marvellous skill in rallying moderate

men of all parties to his side, there remained an unconvinced and desperate minority, whose clumsy procedure enabled the great engineer to hoist them with their own petard and to raise himself to the imperial dignity. But before referring to this last proof of the Machiavellian skill of the great Corsican in dealing with plots, it is needful to notice the events which brought him into collision with the British nation.

The treaty of Amiens had contained germs which ensured its dissolution at no distant date; but even more serious was the conduct of Bonaparte after the conclusion of peace. He carried matters with so high a hand in the affairs of Holland, Switzerland and Italy as seriously to diminish the outlets for British trade in Europe. His action in the matters just named, as also in the complex affair of the secularizations of clerical domains in Germany (February 1803), belongs properly to the history of those countries; but we may here note that, even before the

signature of the peace of Amiens (27th of March 1802), he had effected changes in the constitution of the Batavian (Dutch) republic, which placed power in the hands of the French party and enabled him to keep French troops in the chief Dutch fortresses, despite the recently signed treaty of Luneville which guaranteed the independence of that republic. His treatment of the Italians was equally high-handed. In September 1801 he bestowed on the Cisalpine republic a constitution modelled on that of France. Next, he summoned the chief men of the Franco- phile party in that republic to Lyons in the early days of 1802, in order to arrange with them the appointment of the chiefs of the executive. It soon appeared that the real aim of the meeting was to make Bonaparte president. He let it be known that he strongly disapproved of their proposal to elect Count Melzi, the Italian statesman most suitable for the post; and a hint given by Talleyrand showed the reason for his disapproval. The deputies thereupon elected Bonaparte. As for the neighbour- ing land, Piedmont, it was already French in all but name. On the 21st of April 1801 he issued a decree which constituted Piedmont as a military district dependent on France; for various reasons he postponed the final act of incorporation to the 21st of September 1802. The Genoese republic a little earlier underwent at his hand changes which made its doge all-powerful in local affairs, but a mere puppet in the hands of Bonaparte. In central Italy the influence of the First Consul was paramount; for in 1801 he transformed the grand duchy of Tuscany into the kingdom of Etruria for the duke of Parma; and, seeing that that promotion added lustre to the fortunes of the duchess of Parma (a Spanish infanta), Spain consented lamely enough to the cession of

Louisiana to France. The effect of these extraordinary changes, then, was the carrying out of Napoleonic satrapies in the north and centre of Italy in a way utterly inconsistent with the treaty of Luneville; and the weakness with which the courts of London and Vienna looked on at these singular events con- firmed Bonaparte in the belief that he could do what he would with neighbouring states. The policy of the French revolutionists had been to surround France with free and allied republics. The policy of the First Consul was to transform them into tributaries which copied with chameleonic fidelity the political fashions he himself set at Paris.

Of all these interventions the most justifiable and beneficent, perhaps, was that which related to the Swiss cantons. Whether his agents did, or did not, pour oil on the flames of civil strife, which he thereupon quenched by his Act of Mediation, 19th of February 1803, is a complex question. The settlement which he thereby imposed was in many ways excellent; but it was dearly purchased by the complete ascendancy of Bonaparte in all important affairs, and by the claim for the services of a considerable contingent of Swiss troops which he thereafter rigorously enforced.

The re-occupation of Switzerland by French troops in October 1 802 wrought English opinion to a state of indignation against the autocrat who was making conquests more quickly in time of peace than he had done by his sword; and the irritation increased when, on the 29th of January 1803, he publicly stated: ” It is recognized by Europe that Italy and Holland, as well as Switzerland, are at the disposal of France.” Another act of his at that time made still more strongly for war. On the 30th of January he caused the official French paper, the Moniteur, to publish in extenso a confidential report sent by Colonel Sebastiani describing his so-called commercial mission to the Levant. In it there occurred the threatening phrase: ” Six thousand French would at present be enough to conquer Egypt.” An equally significant hint, that the Ionian Isles might easily be regained by France, further helped to open the eyes of the purblind Addington ministry to the resolve of Napoleon to make the Mediterranean a French lake. Ministers were also deeply concerned at the continued occupation of Holland by French troops, which made that country and, therefore, the Cape of Good Hope, absolutely dependent on France. They accordingly resolved not to give up Malta unless Lord Whitworth, the British ambassador at Paris, ” received c satisfactory explanation ”’

relative to the Sebastiani report. Napoleon's refusal to give this, and his complaint that Great Britain had neglected to comply with some of the provisions of the treaty of Amiens, brought Anglo-French relations to an acute phase. By great dexterity he succeeded in turning public attention almost solely to the fact that Britain had not evacuated Malta. This is probably the sense in which we may interpret his tirade against Lord Whitworth at the diplomatic circle on the 13th of March. While not using threats of personal violence, as was generally reported at the time, his language was threatening and offensive. Annoyed by Whitworth's imperturbable demeanour, he ended with these words: " You must respect treaties, then: woe to those who do not respect treaties. They shall answer for it to all Europe." The news of the strengthening of the British army and navy lately announced in the king's speech had perhaps annoyed him; but seeing that his outbursts of passion were nearly always the result of calculation— he once stated, pointing to his chin, that temper only mounted that high with him — his design, doubtless, was to set men everywhere talking about the perfidy of Albion. If so, he succeeded. His own violations of the treaties of Luneville and Amiens were overlooked; and in particular men forgot that the weakening of the Knights of St John by the recent confiscation of their lands in France and Spain, and the pro- tracted delay of Russia and Prussia to guarantee their tenure of power in Malta, furnished England with good reasons for keeping her hold on that island. On the 4th of April the Addington cabinet made proposals with a view to compensation. In return for the great accessions of power to France since the treaty of Amiens (Elba, it may be noted, was annexed in August 1802) Great Britain was to retain Malta for ten years and to acquire the small island of Lampedusa in perpetuity. French troops were also required to withdraw from Holland and Switzer- land, and thus fulfil the terms of the treaty of Luneville. Despite the urgent efforts of Joseph Bonaparte and Talleyrand to bend the First Consul, he refused to listen to these proposals. Finally, on the 7th of May, the British government sent a secret offer to withdraw from Malta as soon as the French evacuated Holland. To this also Napoleon demurred. The rupture, therefore, took place in the middle of May; and on a flimsy pretext the First Consul ordered the detention in France of all English persons.

The reasons for his annoyance are now well known. It is certain that he was preparing to renew the struggle for the mastery of the seas and of the Orient, which must break out if he held to his present resolve to found a great colonial empire. But he needed time in order to build a navy and to prepare for the execution of the schemes for the overthrow of the British power in India, which he had lately outlined

to General Decaen, the new governor of the French possessions in that land. The sailing of Decaen's squadron early in March 1803 had alarmed the British ministers and doubtless confirmed their resolve to have the question of peace or war settled speedily. Whitworth also warned them on the 20th of April that " the chief motives for delay are that they (the French) are totally unprepared for a naval war." This was quite correct. Napoleon wished to post- pone the rupture for fully eighteen months, as is shown by his secret instructions to Decaen. The British government did not know the whole truth; but, knowing the character of Napoleon, it saw that peace was as dangerous as war. In any case, it sent the proposals of the 4th of April in order to test the sincerity of his recent offer of compensation to England. He refused them, mainly, it would seem, because he could not believe that the Addington ministry could be firm; and in his rage at the dis- covery of his error he revenged himself ignobly on British tourists and traders in France.

He now threw all his energies into the task of marshalling the forces of France and his vassal states for the overthrow of " perfidious Albion." Naval ' preparations went on apace at all the dockyards, and numbers of flat-bottomed boats were built or repaired at the northern harbours. Disregarding the neutrality of the Germanic System, Napoleon sent a strong French corps to overrun Hanover, while he despatched General Gouvion St Cyr to occupy Taranto and other dominating

positions in the south-east of the kingdom of Naples. Exactions at the expense of Hanover and Naples helped to lighten the burdens of French finance; Napoleon's sale of Louisiana to the United States early in 1803 for 60,000,000 francs brought further relief to the French treasury; and by pressing hard on his ally, Spain, he compelled her to exchange the armeti help which he had a right to claim, for an annual subsidy of £2,880,000. Through Spain he then threatened Portugabs^vith extinction unless she too paid a heavy subsidy, a demand with which the court of Lisbon was fain to comply.

Thus the first months of the war served to differentiate the two belligerents. England made short work of the French squadrons and colonies; particularly in the West Indies, while Napoleon became more than ever the master of central and southern Europe. The whole course of the war was to emphasize this distinction between the Sea Power and the Land Power; and in this fact lay the source of Napoleon's ascendancy in France and neighbouring lands, as also of his final overthrow.

Napoleon's utter disregard of the neutrality of neighbouring states was soon to be revealed in the course of a royalist plot which helped him to the imperial title. Georges Cadoudal, General Pichegru and other devoted royalists had concocted with the comte d'Artois (afterwards Charles X. of France) in London a scheme for the kidnapping (or more probably the murder) of the First Consul. The French police certainly knew of the plot, allowed the conspirators to come to Paris, arrested them there, and also on the 16th of February 1804 General Moreau, with whom Pichegru had two or three secret conferences. This was much; for Moreau, though indolent and incapable in political affairs, was still immensely popular in the army (always more republican than the civilians) and might conceivably head a republican movement against the autocrat. But far more was to follow. Failing through his police to lure the comte d'Artois to land in Normandy, Napoleon pounced on a scion of the House of Bourbon who was within his reach. The young due d'Enghien was then residing at Ettenheim in Baden near the bank of the Rhine. He had served in the army of his grandfather, the prince of Conde, during the recent war; and Bonaparte believed for a time that he was an accomplice to the CadoudaliPichegru plot. He therefore sent orders to have him seized by French soldiers and brought to Vincennes near Paris. The order was skilfully obeyed, and the prince was hurried before a court-martial hastily summoned at that castle. Before they passed the verdict, Napoleon came to see that his victim was innocent of any participation in the plot. Nevertheless he was executed (21st of March 1804). It is noteworthy that though Napoleon at times sought to shift the responsibility for this deed on Talleyrand or Savary, yet during his voyage to St Helena, as also in his will, he frankly avowed his responsibility for it and asserted that in the like circumstances he would do the same again.

The horror aroused by this crime did not long deaden the feeling, at least in official circles, that something must be done to intro- duce the principle of heredity, as the surest means of counteract- ing the aims of conspirators. The senate, as usual, took the lead in suggesting some

such change in the constitution; and it besought Napoleon ” to complete his work by rendering it, like his glory, immortal.” Other official addresses of the same general tenour flowed in; and even the tribunate showed its docility by proposing that the imperial dignity should be declared hereditary in the family of Bonaparte (3rd of May). Napoleon thereupon invited the senate to ” make known to him its thoughts completely.” The senate and the tribunate each appointed a commission to deal with the matter, with the result which every one foresaw. Carnot alone in the tribunate protested against the measure. The other councils adopted it almost unanimously. The Senatus Consultum of the 18th of May 1804 awarded to Napoleon the title of emperor, the succession (in case he had no heir) devolving in turn upon the descendants of Joseph and Louis Bonaparte (Lucien and Jerome were for the present ex- cluded from the succession owing to their having contracted marriages displeasing to Napoleon). In a plebiscite taken on the subject of the imperial title and the law of succession, there were

3>57 2 >3 2 9 affirmative votes and only 2569 negatives. In this vote lay the justification of the acts of the First Consul and the pledge for the greatness of the emperor Napoleon. The republicans in nearly every case voted for him: and it is significant of the curious trend of French thought that the new imperial con- stitution of the 18th of May 1804 opened with the words: ” The government of the Republic is confided to an emperor, who takes the title Emperor of the French.”

The changes brought about by this constitution were mainly titular. Napoleon’s powers as First Consul for Life were so wide as to render much extension both superfluous and impossible; but we may note here that the senate now gained a further accession of authority at the expense of the two legislative bodies: and practically legislation rested with the emperor, who sent his decrees to the senate to be registered as senatus constilta. Napoleon’s chief aversion, the tribunate, was also divided into three sections, dealing with legislation, home affairs and finance — a division which preluded its entire suppression in 1807. More important were the titular changes Napoleon, as we have seen, did not venture to create an order of nobility until 1808, but he at once established an imperial hierarchy. First came the French princes, namely, the brothers of the emperor; six grand imperial dignities were also instituted, viz. those of the grand elector (Joseph Bonaparte), arch-chancel’or of the empire (Cambaceres), arch-chancellor of state

(Eugene de Beau- harnais). arch-treasurer (Lebrun), constable (Louis Bonaparte), grand admiral (Murat). These six formed the emperor's grand council. Next came the marshals, namely, Berthier, Murat, Massena. Augereau, Lannes, Jourdan, Ney, Soult, Brune, Davout, Bessieres, Moncey, Mortier and Bernadotte. Four generals — Kellermann, Lefebvre, Perignon, Serrurier — received the titles of honorary marshals. Next came dignities of a slightly lower rank, such as those of grand almoner (Fesch), grand marshal of the palace (Duroc), grand chamberlain (Talleyrand), grand master of the horse (Caulain- court), grand huntsman (Berthier), grand master of ceremonies (Segur). These with a host of lesser dignities built up the imperial hierarchy and enabled the court quickly to develop on the lines of the old monarchy, so far as rules of etiquette and self-conscious efforts could reproduce the courtly graces of the ancien regime.

Meanwhile Napoleon was triumphing over the last of the republican generals. Moreau's trial for treason promised to end with an ac-quittal; but the emperor brought severe pressure to bear on the judges (one of whom he dismissed), with the result that the general was declared guilty of participating in the royalist plot. Thereupon Napoleon, in order to grace the new regime by an act of clemency, pardoned Moreau, it being understood that he must leave France. He left immediately for the United States. Sentence of death was passed on the royalist conspirators. On Josephine's entreaties, the emperor commuted the sentence for eight of the well-connected men among them ; Cadoudal and others of lower extraction were executed on the 24th of June. The brave Breton peasant thus summed up the results of his plot: " We meant to give France a king and we have given her an emperor." The mot was literally true. Victories in the field were not more effective in consolidating Napoleon's power than were his own coups d'etat and the supremely skilful use which he made of conspiracies directed against him. He showed his sense of the value of Fouche's services in exploiting the royalist plot of 1 803-1 804 by reconstituting the ministry of police and bestow- ing it upon him. Thenceforth plots were few. Would-be plotters remained quiet from sheer terror of his power and ability, or from a conviction that conspiracies redounded to his advantage.

Napcleon was now able by degrees to dispense with all re- publican forms (the last to go was the Republican Calendar, which ceased on the 1st of January 1806), and the scene at the coronation in Notre Dame on the 2nd of December 1804 was frankly imperial in splendour and in the egotism which led Napoleon to wave aside the pope, Pius VII., at the supreme moment and ciown himself. It is worthy of note

that Josephine then won a triumph over Joseph Bonaparte and his sisters, who had been intriguing to effect a divorce. Napoleon, though he did not bar the door absolutely against such a proceeding, granted her her heart's desire by secretly going through a religious ceremony en the evening before the coronation. It was performed by Fesch, now a cardinal; but Napoleon could afterwards urge the claim that all the legal formalities had not been complied with; and the motive for the marriage may probably be found in the refusal of the pope to appear at the coronation unless the former civil contract was replaced by the religious rite.

As happened at every stage of Napoleon's advancement, the states tributary to France underwent changes corresponding to those occurring at Paris. The most important of these was the erection of monarchy in North Italy. The Italian republic (formerly the Cisalpine republic) became the kingdom of Italy.

At first Napoleon desired to endow Joseph, or, on his refusal, Louis, with the crown of the new kingdom. They, however, refused to place themselves out of the line of direct succession in France, as Napoleon required, in case they accepted this new dignity. Finally, he resolved to take the title himself. The obsequious authorities at Milan at once furthered his design bv sending an address to him, by requesting the establishment of royalty, and on the 15th of March 1805 by offering the crown to him. On the 26th of May he crowned himself in the cathedral at Milan with the iron crown of the old Lombard kings, amidst surroundings of the utmost splendour. On the 7 th of June he issued a decree conferring the dignity of viceroy on Eugene de Beauharnais, his stepson; but everything showed that Napoleon's will was to be law; and the great powers at once saw that Napoleon's promise to keep the crowns of France and Italy separate was meaningless. The matter was of international importance; for by the treaty of Luneville (February 1801) he had bound himself to respect the independence of the two republics of North Italy, the Cisalpine and the Ligurian. The defiance to Austria was emphasized when, on the 4th of June, he promised a deputa- tion from Genoa that he would grant their request (prompted by his agents) of incorporating the Genoese (or Ligurian) republic in the French empire. In the same month he erected the re- public of Lucca into a principality for Bacciochi and his consort, Elisa Bonaparte.

These actions proclaimed so unmistakably Napoleon's in- tention of making Italy an annexe of France as to convince Francis of Austria and Alexander of Russia that war with him was inevitable. The tsar, as protector of the Germanic System, had already been so annoyed by

the seizure of the due d'Enghien on German territory, and by other high-handed actions against the Hanse cities, as to recall his ambassador from Paris. Napoleon showed his indifference to the opinion of the tsar by ordering the seizure of the British envoy at Hamburg, Sir George Rumbold (24th of October) ; but set him free on the remonstrance of the king of Prussia, with whom he then desired to remain on friendly terms. Nevertheless, the general trend of his policy was such as powerfully to help on the formation of the Third Coalition against France — a compact which Pitt (who returned to power in May 1804) had found it very difficult to arrange. Disputes with Russia respecting Malta and the British maritime code kept the two states apart for nearly a year; and Austria was too timid to move. But Napoleon's actions, especially the annexation of Genoa, at last brought the three powers to accord, with the general aim of re-establishing the status quo ante in Ger- many, Holland, Switzerland and Italy, or, in short, of restoring the balance of power which Napoleon had completely upset.

Military affairs in this period are dealt with under Napoleonic Campaigns; but it may be noted here that during the anxious days which Napoleon spent at the camp of Boulogne in the second and third weeks of August 1805, uncertain whether to risk all in an attack on England in case Villeneuve should arrive, or to turn the Grand Army against Austria, the only step which he took to avert a continental war was the despatch of General Duroc to Berlin to offer Hanover to Prussia on consideration of her framing a close alliance with France. It was very unlikely that that peace-loving Court would take up arms against its powerful neighbours on behalf of Napoleon, and his proceedings in the previous months had been so recklessly provocative as to arouse doubts whether he intended to invade England and did not welcome the outbreak of a continental war. But in the case of a man so intensely ambitious, determined and egoistic as Napoleon, a decision on this interesting question is hazardous. Little reliance can be placed on his subsequent statements (as, for instance, to Metternich in 1810) that the huge preparations at Boulogne and the long naval campaign of Villeneuve were a mere ruse whereby to lure the Austrians into a premature declaration of war. It is, however, highly probable that he meant to strike at London if naval affairs went well, but that he was glad to have at hand an alternative which would shroud a maritime failure under military laurels. If so, he succeeded. His habit was, as he said, /aire son theme en deux fa(ons, and he

now took the second alternative. On or about the 25th-27th of August he resolved to strike at Austria. He did so with masterly skill and swiftness, and the triumphs of Ulm and Austerlitz hid from view the disaster of Trafalgar; and the only official reference to that crushing defeat was couched in these terms: ” Storms caused us to lose some ships of the line after a fight imprudently engaged ” (speech to the Legislature, 2nd of March 1806).

The glamour of Austerlitz had very naturally dazzled all Frenchmen. Its results indeed were not only astounding at the time, but were such as to lead up to a new cycle of wars. By the peace of Presburg (26th of December 1805) Napoleon com- pelled Austria to recognize all the recent changes in Italy, and further to cede Venetia, Istria and Dalmatia to the new kingdom of Italy. The Swabian lands of the Habsburgs went to the South German states (allies of Napoleon), while Bavaria also received Tirol and Vorarlberg. The Electors of Bavaria and Wiirttem- berg were recognized as kings.

Nor was this all. Napoleon pressed almost equally hard upon Prussia. That power had been on the point of offering her armed mediation in revenge for his violation of her territory of Anspach; but she was fain to accept the terms which he offered at the sword’s point. When modified in February 1806, after Prussia’s demobilization, they comprised the occupation of Hanover by Prussia, with the proviso, however, that she should exclude British ships and goods from the whole of the north- west coast of Germany. To this demand (the real commence- ment of the ” Continental System”) the Berlin government had to accede, though at the cost of a naval war with England, and the ruin of its maritime trade. Anspach and Bayreuth were also to be handed over to Bavaria, it now being the aim of Napoleon to aggrandize the South German princes who had fought on his side in the late war. In order to strengthen this compact, he arranged a marriage between the daughter of the king of Bavaria and Eugene Beauharnais; and he united the daughter of the Elector of Wiirttemberg in marriage to Jerome Bonaparte, who had now divorced his wife, formerly Miss Paterson of Baltimore, at his brother’s behests. Stephanie de Beauharnais, niece of Josephine, was also betrothed to the son of the duke (now grand duke) of Baden. By these alliances the new Charlemagne seemed to have founded his supremacy in South Germany on sure foundations.

Equally striking was his success in Italy. The Bourbons of

Naples had broken their treaty engagements with Napoleon, though in this matter they were perhaps as much sinned against as sinning. After Austerlitz the conqueror fulminated against them, and sent southwards a strong column which compelled an Anglo- Russian force to sail away and brought about the flight of the Bourbons to Sicily (February 1806). This event opened a new and curious chapter in the history of Europe, that of the fortunes of the Napoleonides. True to his Corsican instinct of attachment to the family, and contempt for legal and dynastic claims, he now began to plant his brothers and other relatives in what had been republics established by the French Jacobins. Eugene Beauharnais had been established *at Milan. Joseph Bonaparte was now advised to take the throne of Naples, and without any undue haggling as to terms, for “those who will not rise with me shall no longer be of my family. I am making a family of kings attached to my federative system.” At the end of March 1806 Joseph became king of the Two Sicilies. A little later the emperor bestowed the two papal enclaves of Benevento and Ponte-Corvo on Talleyrand and Bernadotte respectively, an act which emphasized the hostility which had been growing between Napoleon and the papacy. Because Pius VII. declined to exclude British goods from the Papal States, Napoleon threatened to reduce the pope to the level merely of bishop of Rome. He occupied Ancona and seemed

about to annex the Papal States outright. That doom was postponed; but Catholics everywhere saw with pain the harsh treatment accorded to a defenceless old man. The prestige which the First Consul had gained by the Concordat was now lost by the overweening emperor.

But it was on the banks of the Rhine that the Napoleonic system received its most signal developments. The duchy of Berg, along with the eastern part of Cleves and other annexes, now went to Murat, brother-in-law of Napoleon (March 1806); and that melodramatic soldier at once began to round off his eastern boundary in a way highly offensive to Prussia. She was equally concerned by Napoleon's behaviour in the Dutch Nether- lands, where her influence used to be supreme. On the 5th of June 1806 the Batavian republic completed its chrysalis-like transformations by becoming a kingdom for Louis Bonaparte. " Never cease to be a Frenchman " was the pregnant advice which he gave to his younger brother in announcing the new dignity to him. In that sentence lay the secret of all the dis-agreements between the two brothers. Louis resolved to govern for the good of his subjects. Napoleon determined that he, like all the Bonapartist rulers, should act merely as a Napoleonic satrap. They were to be to him what the counts of the marches were to Charlemagne, warlike feudatories defending the empire or overawing its prospective foes.

Far more was to follow. On the 17 th of July Napoleon signed at Paris a decree that reduced to subservience the Germanic System, the chaotic weakness of which he had in 1797 foreseen to be highly favourable to France. He now grouped together the princes of south and central Germany in the Confederation of the Rhine, of which he was the protector and practically the ruler in all important affairs. The logical outcome of this proceeding appeared on the 1st of August, when Napoleon declared that he no longer recognized the existence of the Holy Roman Empire. The head of that venerable organism, the emperor Francis II., bowed to the inevitable and announced that he thenceforth confined himself to his functions as Francis I., hereditary emperor of Austria, a title which he had taken just two years previously, This tame acquiescence of the House of Habsburg in the re- organization of Germany seemed to set the seal on Napoleon's work. He controlled all the lands from the Elbe to the Pyrenees, and had Spain and Italy at his beck and call. Power such as this was never

wielded by his prototype, Charlemagne.

But now came a series of events which transcended all that the mind of man had conceived. As the summer of 1806 wore on, his policy perceptibly hardened. Negotiations with England and Russia served to show the extent of his ambition. Sicily he was determined to have, and that too despite of all the efforts of the Fox-Grenville cabinet to satisfy him in every other direc- tion. In his belief that he could ensnare the courts of London and St Petersburg into separate and proportionately disadvan- tageous treaties, he overreached himself. The tsar indignantly repudiated a treaty which his envoy, Oubril, had been tricked into signing at Paris; and the Fox-Grenville cabinet (as also its successor) refused to bargain away Sicily. War, therefore, went on. What was more, Prussia, finding that Napoleon had secretly offered to the British Hanover (that gilded hook by which he caught her early in the year), now resolved to avenge this, the last of several insults. Napoleon was surprised by the news of Prussia's mobilization; he had come to regard her as a negligible quantity, and now he found that her unexpected sensitiveness on points of honour was about to revivify the Third Coalition against France.

The war which broke out early in October 1806 (sometimes known as the war of the Fourth Coalition) ran a course curiously like that of 1805 in its main outlines. For Austria we may read Prussia; for Ulm, Jena-Auerstadt; for the occupation of Vienna, that of Berlin; for Austerlitz, Friedland, which again disposed of the belated succour given by Russia. The parallel extends even to the secret negotiations; for, if Austria could have been induced in May 1 807 to send an army against Napoleon's communications, his position would have been fully as dangerous as before Austerlitz if Prussia had taken a similar step. Once more he triumphed owing to the timidity of the central power which had the game in its hands; and the folly which marked the Russian tactics at Friedland (14th of June 1807), as at Austerlitz, enabled him to close the campaign in a blaze of glory and shiver the coalition in pieces.

Now came an opportunity far greater than that which occurred after Austerlitz. The Peace of Presburg was merely continental. That of Tilsit was of world-wide importance. But before refer- ring to its terms we must note an event which indicated the lines on which Napoleon's policy would advance. After occupying the Prussian capital he

launched against England the famous Berlin Decree (21st of November 1806), declaring her coasts to be in a state of blockade, and prohibiting all commerce with them. No ship coming thence was to be admitted into French or allied harbours; ships transgressing the decree were to be good prize of war; and British subjects were liable to imprison- ment if found in French or allied territories. This decree is often called the basis of the Continental System, whereby Napoleon proposed to ruin England by ruining her commerce. But even before Trafalgar he had begun to strike at that most vulnerable form of wealth, as the Jacobins had done before him. Nelson's crowning triumph rendered impossible for the present all other means of attack on those elusive foes; and Napoleon's sense of the importance of that battle may be gauged, not by his public utterances on the subject, but by his persistence in forcing Prussia to close Hanover and the whole coastline of north-west Germany against British goods. That proceeding, in February 1806, constitutes the basis of the Continental System. The Berlin Decree gave it a wide extension. By the mighty blow of Friedland and the astonishing diplomatic triumph of Tilsit, the conqueror hoped speedily to overwhelm the islanders beneath the mass of the world's opposition. Napoleon at Tilsit resembles Polyphemus seeking to destroy Ulysses. The crags which he flung at Britannia did indeed graze the stern and graze the prow of her craft.

The triumph won at Friedland marks in several respects the climax of Napoleon's career. The opportunity was unique; and he now put forth his utmost endeavours to win over to his side the conquered but still formidable tsar. In their first inter- view, held on a raft in the middle of the river Niemen at Tilsit on the 25th of June, the French emperor, by his mingled strength and suppleness of intellect, gained an easy mastery over the impressionable young potentate. Partly from fear of a national Polish rising which Napoleon held in reserve as a last means of coercion, and partly from a subtle resolve to use the French alliance as a means of securing rich domains at the expense of Turkey, Prussia, Sweden and England, Alexander decided to throw over his allies, Prussia and England, and to seize the spoils to which the conqueror pointed as the natural sequel of a Franco-Russian alliance. Napoleon, therefore, had Prussia completely at his mercy; and his conditions to that power bore witness to the fact. The prayers of Queen Louisa of Prussia failed to bend him from his resolve. He refused even to grant her tearful request for Magdeburg. At a later time he reproached himself for not having dethroned the Hohenzollerns outright; but it is now known that Alexander would have forbidden this step, and that he dissuaded Napoleon from withdrawing Silesia from the control of the House of Hohenzollern.

Even so, Prussia was bereft of half of her territories; those west of the river Elbe went to swell the domains of Napoleon's vassals or to form the new kingdom of Westphalia for Jerome Bonaparte; while the spoils which the House of Hohenzollern had won from Poland in the second and third partitions were now to form the duchy of Warsaw, ruled over by Napoleon's ally, the elector (now king) of Saxony. Danzig became nominally a free city, but was to be occupied by a French garrison until the peace. The tsar acquired a frontier district from Prussia, recognized the changes brought about by Napoleon in Germany and Italy, and agreed by a secret article that the Cattaro district on the east coast of the Adriatic should go to France. Equally important was the secret treaty of alliance between France and Russia signed on that same day. By it Napoleon brought the tsar to agree to make war on England in case that power did not accept the tsar's mediation for the conclusion of a general peace. Failing the arrival of a favourable reply from London by the 1st of December 1807, the tsar would help Napoleon to compel Denmark, Sweden and Portugal to close their ports against, and

make war on, Great Britain. Napoleon also promised to mediate between Russia and Turkey in the interests of the former, and (in case the Porte refused to accept the proffered terms) to help Russia to drive the Turks from Europe, "the city of Constantinople and the province of Rumelia alone excepted." This enterprise and the acquisition of Finland from Sweden, which Napoleon also dangled before the eyes of the tsar, formed the bait which brought that potentate into Napoleon's Continental System. Both Russia and Prussia now agreed rigorously to exclude British ships and goods from their dominions.

The terms last named indicate the nature of the aims which Napoleon had in view at Tilsit. That compact was not, as has often been assumed, merely the means of assuring to Napoleon the mastery of the continent and the control of a cohort of kings. That eminence he enjoyed before the collision with Prussia in the autumn of 1806; and he frequently, and no doubt sincerely, expressed contempt of conquests dans cette vieille Europe. The three coalitions against France had not produced a single warrior worthy of his steel. The treaty of Tilsit may more reasonably be looked on as an expedient for piling up enormous political resources with a view to the coercion of Great Britain. If that end could not be achieved by massing the continental states against her in a solid phalanx of commercial war, then Napoleon intended to ensure her ruin by that other enterprise which he had in view early in 1798 (see his letter of the 23rd of February 1798), namely the conquest of the Orient. An expedi- tion against India had recently occupied his thoughts, as may be seen by

the instructions which he issued on the 10th of May 1807 to General Gardane for his mission to Persia. The Orient was, indeed, ever the magnet which attracted him most; and his hostility to England may be attributed to his perception that she alone stood in the way of his most cherished schemes. The treaty of Tilsit, then, far from being merely a European event, was an event of the first importance in what may be termed the Welt-politik of Napoleon. His confidence that his vastly enhanced powers would enable him first to coerce, and thereafter to overthrow, the British empire may be illustrated by his allowing the appearance in 1807 of an official atlas of Australia in which about one- third of that continent figures as "Terre Napoleon."

As usually happened in this strife of the land power and the sea power, Napoleon's continental policy attained an almost complete success, while the naval and oriental schemes which he had more nearly at heart utterly miscarried. The continent accepted the new development of his System. After some diplomatic fencing Russia and Prussia broke with England and entered upon what was, officially at least, a state of war with her. Further, owing to the carelessness of the Prussian negotiator, Napoleon was able to require the exaction of impossibly large sums from that exhausted land, and therefore to keep his troops in her chief fortresses. The duchy of Warsaw and the fortress of Danzig formed new outworks of his power and enabled him to overawe Russia. In home affairs as in foreign affairs his actions bespoke the master. On returning from Tilsit to Paris he relieved Talleyrand of the ministry of foreign affairs, softening the fall by creating him a grand dignitary of the empire. The more subservient Champagny now became what was virtually the chief clerk in the French foreign office; and other changes placed in high station men who were remarkable for docility rather than originality and power. Napoleon also suppressed the Tribunate; and in the year 1808 instituted an order of nobility. During the course of a tour in Italy in December 1807 he gave a sharp turn to that world-compelling screw, the Continental System. By the Milan Decree of the 17th of December 1807, he ordained that every ship which submitted to the right of search now claimed by Great Britain would be considered a lawful prize. The imperious terms in which this decree was couched and its misleading reference to the British maritime code showed that Napoleon believed in the imminent collapse of his sole remaining enemy. This was natural. Britain, it was true, acting on the initiative of George Canning, had seized the Danish fleet, thus forestalling

an action which Napoleon certainly contemplated; but on the other hand Denmark now allied herself with him; and while in Lombardy he heard of the triumphant entry of his troops into Lisbon — an event which seemed to prelude his domination in the Iberian Peninsula and thereafter in the Mediterranean.

The occupation of Lisbon, which led on to Napoleon's inter- vention in Spanish affairs, resulted naturally from the treaty of Tilsit. The coercion of England's oldest ally had long been one of Napoleon's most cherished aims, and was expressly pro- vided for in that compact. To this scheme he turned with a zeal whetted by consciousness of his failure respecting the Danish fleet. On the 27th of October 1807 he signed with a Spanish envoy at Fontainebleau a secret convention with a view to the partitioning of Portugal between France and Spain. Another convention of the same date allowed him to send 28,000 French troops into Spain for the occupation of Portugal, an enterprise in which a large Spanish force was to help them; 40,000 French troops were to be cantonned at Bayonne to support the first corps. Seeing that Godoy, the all-powerful minister at Madrid, had given mortal offence to Napoleon early in the Prussian campaign of 1806 by calling on Spain to arm on behalf of her independence, it passes belief how he could have placed his country at the mercy of Napoleon at the end of the year 1807. The emperor, however, successfully gilded the hook by awarding Algarve, the southern province of Portugal, to Godoy. The north of Portugal was to go to the widow of the king of Etruria (a Spanish Infanta); her realm now passing into the hands of Napoleon. Thus Portugal in 1807, like Venice in 1797, was to provide the means for widely extending the operations of his statecraft.

The natural result followed. Portugal was easily overrun by the allies; but Junot's utmost efforts failed to secure the Portuguese fleet, which, under the protection of a British squadron, sailed away to Brazil with the royal family, the ministers and chief grandees of the realm. In other respects all went well. The French reinforcements which entered Spain managed to secure some of the strongholds of the northern provinces; and the disgraceful feuds in the royal family left the country practically at the emperor's mercy.

The situation was such as to tempt Napoleon on to an under- taking on which he had probably set his heart in the autumn of 1806, that of dethroning the Spanish Bourbons and of replacing them by a Bonaparte. Looking at the surface of the life of Spain, he might well believe in its decay. The king, Charles IV., looked on helplessly at the ruin wrought by the subservience of his kingdom to France since

1796, and he was seemingly blind to the criminal intrigues between his queen and the prime minister Godoy. His senile spite vented itself on his son Ferdinand, whose opposition to the all-powerful favourite procured for him hatred at the palace and esteem everywhere else. Latterly the prince had fallen into disgrace for proposing, without the knowledge of Charles IV., to ally himself with a Bonaparte princess. Here, then, were all the conditions which favoured Napoleon's intervention. He allowed the prince to hope for such a union, and thus enhanced the popularity of the French party at Madrid. Godoy, having the prospect of the Algarve before him, likewise offered no opposition to the advance of Napoleon's troops to the capital; and so it came about that Murat, named by Napoleon his Lieutenant in Spain, was able to enter Madrid in force and without opposition from that usually clannish populace. The course of events, and especially the anger of the people, now began to terrify Charles IV., the queen and Godoy. They prepared for flight to America — a step which Napoleon took care to prevent; and a popular outbreak at Aranjuez decided the king then and there to abdicate (19th of March 1808). Murat, now acting very warily in the hope of gaining the crown of Spain for himself, refused to recognize this act as binding, still more so the accession of Ferdinand VII. Charles thereupon declared his abdication to have been made under duress and therefore null and void. The young king, still hoping for Napoleon's favour, now responded to the suggestion, forwarded by Savary, that an interview with

the emperor would clear up the situation. The same prospect was held out to Charles IV., the queen and Godoy, with the result that the rivals for the throne proceeded to the north of Spain to meet the arbiter of their destinies. Napoleon journeyed to Bayonne and remained there. The claimants, each not know- ing of the movements of the other, crossed the Pyrenees, and Ferdinand on his arrival at Bayonne found himself to be virtually a prisoner in the hands of the emperor. Napoleon had little difficulty in disposing of the father, whose rage against his son blunted his senses in every other direction. As for Ferdinand, the emperor, on hearing the news of a rising in Madrid on the 2nd of May, overwhelmed him with threats, until he resigned the crown into the hands of his father, who had already bargained it away to Napoleon in return for a pension (5 th of May 1808). Princely abodes in France and annuities (the latter to be paid by Spain) — such was the price at which Napoleon bought the crown of Spain and the Indies. Naturally nothing more was heard of the partition of Portugal. According to outward ap- pearance nothing was wanting to complete the emperor's triumph. He is said to have remarked with an oath after Jena that he would make the Spanish Bourbons pay for their recent

bellicose proclamation. If the story is correct, his acts at Bayonne showed once more his custom of biding his time in order to take an overwhelming revenge. That the son of a Corsican notary should have been able to dispose of the Spanish Bourbons in this contemptuously easy way is one of the marvels of history.

But even in this crowning triumph the cramping egotism of his nature — a mental vice which now grew on him rapidly — fatally narrowed his outlook and led him to commit an irre- trievable blunder. In his contempt for the rulers of Spain he forgot the Spanish people. In all the genuine letters of the spring of 1808 — that of March 29th to Murat, no. 13,696 of the Correspondence, is acknowledged to be a forgery — there is not a sign that he regarded the Spaniards as of any account. On the 27th of March he offered the crown of Spain to his brother Louis, king of Holland, in these terms: " The climate of Holland does not suit you; besides Holland can never rise from its ruins. I think of you for the throne of Spain. You will be the sovereign of a generous nation of eleven millions of men and of important colonies." On Louis declining the honour, it devolved on Joseph, king of Naples, who vacated that throne for the benefit of Murat — a source of disappointment and annoyance to both. The emperor pushed on his schemes regardless of everything. The first signs of the rising ferment in Spain were wasted on him. He believed that the arrival of so benevolent a king as Joseph, and the promulgation of a number of useful reforms based on those of the French Revolution, would soothe any passing irritation. If not, then his troops could deal with it as Murat had dealt with the men of Madrid on the 2nd of May. He, therefore, pressed on the march of a corps of French and Swiss troops under Dupont towards Cadiz, in order to take possession of the French sail of the line, five in number, which had been in that harbour since Trafalgar. The importance which he then assigned to naval affairs appears in many letters of the months May to June 1808. He intended that Spain should very soon have ready twenty-eight sail of the line — " ce qui est certes bien peu de chose " — so as to drive away the British squadrons, and then he would strike " de grands coups " in the autumn. Evidently then the Spanish dockyards and warships (when vigorously organized) were to count for much in the schemes for assuring complete supremacy in the Mediterranean and the ultimate overthrow of the British and Turkish empires, which he then had closely at heart.

The Spanish rising of May- June 1808 ruined these plans irretrievably. The men of Cadiz compelled the French warships to surrender, and the levies of Andalusia, closing around Dupont, compelLd him and some 23,000 men to lay down their arms at Baylen (23rd of July).

This disaster, the most serious suffered by the French since Rossbach, sent a thrill through the Napoleonic ‘ vassal states and aroused in Napoleon transports of anger against jJupont. ” Everything is connected with this event,”

he wrote on the 2nd of August, ” Germany, Poland, Italy.” Indeed, along with other serious checks in Spain, which involved the conquest of that land, it cut through the wide meshes of his policy both in Levantine, Central European and commercial affairs. The partition of Turkey had to be postponed; the financial collapse of England could not be expected now that she framed an alliance with the Spanish patriots and had their markets and those of their colonies opened to her ; and the discussions with the tsar Alexander, which had not gone quite smoothly, now took a decidedly unfavourable turn. The tsar saw his chance of improving on the terms arranged at Tilsit; and obviously Napoleon could not begin the conquest of Spain until he felt sure of the conduct of his nominal ally. Still worse was the prospect when Sir Arthur Wellesley with a British force landed in Portugal, gained the battle of Vimiero (21st of August), and brought the French commander, Junot, by the so-called convention of Cintra, to agree to the evacuation of the country by all the French troops. The sea power thus gained what had all along been wanting, a sure basis for the exercise of its force against the land power, Napoleon. Still more important, perhaps, was the change in moral which the Spanish rising brought about. Napoleon’s perfidy at Bayonne was so flagrant as to strip from him the mask of a champion of popular liberty which had previously been of priceless worth. Now he stood forth to the world as an unscrupulous aggressor; moral force, previously marshalled on the side of France, now began to pass to the side of his opponents. The value of that unseen ally he well knew: ” Once again, let me tell you,” he wrote to General Clarke on the 10th of October 1809, ” in war moral and opinion are more than half of the reality.”

Such were the discouraging conditions which weighed him down at the time of the interview with the tsar at Erfurt (September 27th-October 12th, 1808). That event was so important as to require some preliminary explanation. For some five months past the two emperors had been exchanging their views as to the future of the world. Stated briefly they vere these. Napoleon desired to press on the partition of Prussia, Alexander that of Turkey. The tsar, however, was determined to save Prussia if he could; and Napoleon after the first disasters in

Spain saw it to be impossible to uproot the Hohenzollerns; while it was clearly to his interest to postpone the partition of Turkey until he had conquered Spain and Sicily. Austria meanwhile had begun to arm as a precautionary measure; and Napoleon, shortly after his return from Bayonne to Paris, publicly declared that, if her preparations went on, he would wage against her a war of extermination. The threat naturally did not tend to reassure statesmen at Vienna; and the tsar now resolved to prevent the total wreck of the European system by screening the House of Habsburg from the wrath of his ally. For the present Napoleon's ire fell upon Prussia. A letter written by the Prussian statesman, Baron vom Stein, had fallen into the hands of the French and revealed to the emperor the ferment produced in Germany by news of the French reverses in Spain. In that letter Stein urged the need of a national rising of the Germans similar to that of the Spaniards, when the inevitable struggle ensued between Napoleon and Austria. The revenge of the autocrat was characteristic. Besides driving Stein from office, he compelled Prussia to sign a convention(8th of September) for the payment to France of a sum of 140,000,000 francs, and for the limitation of the Prussian army to 42,000 men.

Apart from this advantage, placed in his hands by the imprud- ence of Stein, Napoleon was heavily handiqapped at the Erfurt interview. In vain did he seek to dazzle the tsar by assembling about him the vassal kings and princes of Germany; in vain did he exercise all the intellectual gifts which had captivated the tsar at Tilsit; in vain did he conjure up visions of the future conquest of the Orient; external display, diplomatic finesse, varied by one or two outbursts of calculated violence — all was useless. The situation now was utterly different from that which obtained at Tilsit. Alexander had succeeded in pacifying Finland, and his troops held the Danubian provinces of Turkey — a pledge, as it seemed, for the future conquest of Constantinople.

Napoleon, on the other hand, had utterly failed in his Spanish enterprise; and the tsar felt sure that hie rival fhust soon with- draw French garrisons from the fortresses of the Oder to the frontier of Spain. These facts, and not, as has often been assumed, the treachery of Talleyrand, decided Alexander to assume at Erfurt an attitude of jealous reserve. He refused to join Napoleon in any proposal for the coercion of Austria or the limitation of her armaments. Finally he agreed to join his ally if he (Napoleon) were attacked by the Habsburg power. Napoleon on his side succeeded in adjourning the question of the partition of Turkey; but he awarded the Danubian provinces and Finland to his ally and agreed to withdraw the French garrisons from

the Prussian fortresses on the Oder. On the 12th of October both potentates addressed an appeal to George III. to accord peace to the world on the basis of uti possidetis. Canning assented, provided that envoys of all the states and peoples concerned took part in the negotiations. Whereupon a reply came from Paris (28th of November) that the French emperor refused to admit the envoys of ” the king who reigns in Brazil, the king who reigns in Sicily or the king who reigns in Sweden.” The ” Spanish insurgents ” were equally placed out of court. Clearly, then, Napoleon’s desire for peace was conditional on his being allowed to dictate terms to the rulers and peoples concerned.

Already he had shown that the sword must decide affairs in Spain. After spending a short time in Paris in order to supervise the transfer of his forces from Germany to the Pyrenees, he journeyed swiftly southwards, burst upon the Spaniards, and on the 3rd of December received the surrender of Madrid. There, on the 1 6th of December, he issued a decree (omitted from the official Correspondence) declaring le nomme’ Stein an enemy of France and confiscating his property in the lands allied to France. The great statesman barely succeeded in escaping to Austria, a land in which the hopes of German patriots now centred. En- couraged by the sympathy of all patriotic Germans and the newly found energy of its own subjects, the House of Habsburg now began to prepare for war. Napoleon was then in the midst of operations against Sir John Moore, whose masterly march on Sahagun (near Valladolid) had thwarted the emperor’s plans for a general ” drive ” on to Lisbon. Hoping to punish Moore for his boldness, Napoleon struck quickly north at Astorga, but found that he was too late to catch his foe. At that town he also heard news on the 1st of January 1809, which portended trouble in Germany and perhaps also at Paris. Austria was continuing to arm; and the emperor perceived that the diplomatic failure at Erfurt was now about to entail on him another and more serious struggle. His anxiety was increased by news of sinister import respecting frequent interviews between those former rivals, Talleyrand and Fouche, in which Murat was said to be concerned. Handing over the command to Soult, he hurried back to Paris to trample on the seeds of sedition and to overwhelm Austria by the blows which he showered upon her in the valley of the Danube. Sir John Moore and the statesmen of Austria — the heroic Stadion at their head — failed in their enterprise; but at least they frustrated the determined effort of Napoleon to stamp out the national movement in the Iberian Peninsula. Thereafter he never entered Spain; and the French operations suffered incalculably from the want of one able commander-in-chief.

In the Danubian campaign of 1809 he succeeded; but the stubborn

defence of Austria, the heroic efforts of the Tirolese and the spasmodic efforts which foreboded a national rising in Germany, showed that the whole aspect of affairs was changing, even in central Europe, where rulers and peoples had hitherto been as wax under the impress of his will. The peoples, formerly so apathetic, were now the centre of resistance, and their efforts failed owing to the timidity or sluggishness of governments and the incompetence of some of their military leaders. The failure of the archduke John to arrive in time at Wagram (5th of July), the lack of support accorded by the Spaniards to Wellesley before and after the battle of Talavera (28th of July), and the slowness with which the British government sent forth its great armada against Flushing and Antwerp, a fortnight after

Austria sued for an armistice from Napoleon, enabled that superb organizer to emerge victorious from a most precarious situation. The hatred felt for him by Germans found expression in a daring attempt to murder him made by a well-bred youth named Staps on the 12th of October.

Two days later Napoleon, by means of unworthy artifices, hurried the Austrian plenipotentiaries into signing the treaty of peace at Schonbrunn. The House of Habsburg now ceded Salzburg and the Inn-Viertel to Napoleon (for his ally, the king of Bavaria) ; a great portion of the spoils which Austria had torn from Poland in 1795 went to the grand duchy of Warsaw, or Russia; and the cession of her provinces Carinthia, Carniola and Istria to the French empire cut her off from all access to the sea. After imposing these harsh terms on his enemy, the con- queror might naturally have shown clemency to the Tirolese leader, Andreas Hofer; but that brave mountaineer, when betrayed by a friend, was sentenced to death at Mantua owing to the arrival of a special message to that effect from Napoleon. In other quarters he achieved for the present a signal success. It was his habit to issue important decrees from the capitals of his enemies; and on the 17th of May 1809 he signed at Vienna an edict abolishing the temporal power of the pope and annexing the Papal States, which the French troops had occupied early in the previous year. On the 6th of July 1809 Pius VII. was arrested at Rome for presuming to excommunicate the successor of Charlemagne, and was deported to Grenoble and later on to Savona. The same year witnessed the downfall of Napoleon's persistent enemy, Gustavus IV. of Sweden, who was dethroned by a military movement (29th of March 1809). His successor, Charles XIII.,

made peace with France on the 6th of January 1 8 10, and agreed to adopt the provisions of the Continental System. The aim in all these changes, it will be observed, was to acquire control over the seaboard, or, failing that, the com- merce of all European states.

As ‘happened in the years 1802-1803, Napoleon extended his ” System ” as rapidly in time of peace as during war. The year 18 10 saw the crown set to that edifice by the annexations of Holland and of the north-west coast of Germany. In both cases the operative cause was the same. Neither Louis Bonaparte nor German douaniers could be trusted to carry out in all their stringency the decrees for the entire exclusion of British commerce from those important regions. In the case of King Louis, family quarrels embittered the relations between the two brothers; but it is clear from Napoleon’s letters of November-December 1809 that he had even then resolved to annex Holland in order to gain complete control of its customs and of its naval resources. The negotiations which he allowed to go on with England in the spring of 1810, mainly respecting the independence of Holland, are now known to have been insincere. Fouche, for meddling in the negotiations through an agent of his own, was promptly disgraced; and, when neither England was moved by diplomatic cajolery nor Louis Bonaparte by threats, French troops were sent against the Dutch capital. Louis fled from his kingdom, and on the 9th of July 1810 Holland became part of the French empire. In the next months Napoleon promulgated a series of decrees for effecting the ruin of British commerce, and in December 1810 he decreed the annexation of the north- west coast of Germany, as also of Canton Valais, to the French empire. This now stretched from Liibeck to the Pyrenees, from Brest to Rome; while another arm (only nominally severed from the empire by the Napoleonic kingdom of Italy) extended down the eastern shore of the Adriatic to Ragusa and Cattaro, threatening the Turkish empire with schemes of partition always imminent but never achieved.

It is time now to notice two important events in the life of the emperor, namely his divorce of Josephine and his union with Marie Louise of Austria. The former of these had long been foreseen. The Bonapartes had intrigued for it with their usual persistence, and Napoleon was careful never to make it im- possible. His triumph over Austria in 1809, and especially the attempt of Staps to murder him, clinched his determination to found a dynasty in his own direct line. From Josephine he could

not expect to have an heir. Accordingly, on his return to Paris he caused the news to be broken to her that reasons of state of the most

urgent kind compelled him to divorce her. An affecting scene took place between them on the 30th of November 1809; but Napoleon, though moved by her distress, remained firm; and though the clerics made a difficulty about dissolving the' religious marriage of the 1st of December 1804, the formalities of which were complete save that the parish priest was absent, yet the emperor instituted a chancery for the archbishop of Paris, with the result that that body pronounced the divorce (January 1 8 10). Josephine retired to her private abode, Malmaison, where her patience and serenity won the admiration of all who saw her. Meanwhile the deliberations respecting the choice of her successor had already begun. Opinions were divided in the emperor's circle between a Russian and an Austrian princess; but the marked coolness with which overtures for the hand of the tsar's sister were received at St Petersburg, and the skill with which Count Metternich, the Austrian chancellor, let it be known that a union with the archduchess, Marie Louise, would be welcomed at Schonbrunn, helped to decide the matter. The reasons why the emperor Francis acquiesced in the marriage alliance are well known. Only so could his empire survive. A marriage between Napoleon and a Russian princess would have implied the permanent subjection of Austria. By the proposed step she would weaken the Franco-Russian alliance. But why did Napoleon fix his choice on Vienna rather than St Petersburg? Mainly, it would seem, because he desired hurriedly to screen • the refusal, which might at any time be expected from the Russian court, under the appearance of a voluntary choice of an Austrian archduchess. Further, an alliance with the House of Habsburg might be expected to wean the Germans from all thought of gaining succour from that quarter. The wedding was celebrated first at Vienna by proxy, and at Notre Dame by the emperor in person on the 2nd of April. Though based on merely political grounds, the union was for the time a happy one. He advised his courtiers to marry Germans — " they are the best wives in the world, good, naive and fresh as roses." Metternich, on visiting Compiegne and Paris, found the emperor thoroughly devoted to his bride. Napoleon told him that he was now beginning to live, that he had always longed for a home and now at last had one. Metternich thereupon wrote to his master: " He (Napoleon) has possibly more weaknesses than many other men, and if the empress continues to play upon them, as she begins to realize the possibility of doing, she can render the greatest services to her- self and all Europe." The surmise was too hopeful. Napoleon, though he never again worked as he had done, soon freed himself from complete dependence on Marie Louise; and he never allowed her to intrude into political affairs, for which, indeed, she had not the least aptitude. His real concern for her was evinced shortly before the birth of their son, the

king of Rome, when he gave orders that if the life of both mother and child could not be saved, that of the mother should be saved if possible (20th of March 181 1). This event seemed to place Napoleon's fortunes on a sure basis; but already they were being undermined by events. The marriage negotiations of 1800-1810 had somewhat offended the emperor Alexander; his resentment increased when, at the close of 1 810, Napoleon dethroned the duke of Oldenburg, brother-in- law of the tsar; and the breach in the Franco-Russian alliance widened when the French emperor refused to award fit compensation to the duke or to give to the Russian government an assurance that the kingdom of Poland would never be re- constituted. The addition • of large territories to the grand duchy of Warsaw after the war of 1809 aroused the fears of the tsar respecting the Poles; and he regarded all Napoleon's actions as inspired by hostility to Russia. He, therefore, despite Napoleon's repeated demands, refused to subject his empire to the hardships imposed by the Continental System; at the close of the year 1810 he virtually allowed the entry of colonial goods (all of which were really British borne) and little by little broke away from Napoleon's system. These actions implied war between France and Russia, unless Napoleon allowed such modifications of his rules (e.g. under the license system) as would

avert ruin from the trade and finance of Russia; and this he refused to do.

The campaign of 181 2 may, therefore, be considered as result- ing, firstly, from the complex and cramping effects of the Conti- nental System on a northern land which could not deprive itself of colonial goods; secondly, from Napoleon's refusal to mitigate the anxiety of Alexander on the Polish question; and thirdly, from the annoyance felt by the tsar at the family matters noticed above. Napoleon undoubtedly entered on the struggle with reluctance. He spoke about it as one that lay in the course of destiny. In one sense he was right. If the Continental System was inevitable the war with Russia was inevitable. But that struggle may more reasonably be ascribed to the rigidity with which he carried out his commercial decrees and his diplo- macy. He often prided himself on his absolute consistency, and we have Chaptal's warrant for the statement that, after the time of the Consulate, his habit of following his own opinions and rejecting all advice, even when he had asked for it, became more and more pronounced. It was so now. He took no heed of the warnings uttered

by those sage counsellors, Cambaceres and Talleyrand, against an invasion of Russia, while “the Spanish ulcer ” was sapping the strength of the empire at the other extremity. He encased himself in fatalism, with the result that in two years the mightiest empire reared by man broke under the twofold strain. His diplomacy before the war of 181 2 was less successful than that of Alexander, who skilfully ended his quarrel with Turkey and gained over to his side Sweden. That state, where Bernadotte had latterly been chosen as crown prince, decided to throw off the yoke of the Continental System and join England and Russia, gaining from the latter power the promise of Norway at the expense of Denmark.

Napoleon on his side coerced Prussia into an offensive alliance and had the support of Austria and the states of the Rhenish Confederation. At Dresden he held court for a few days in May 181 2 with Marie Louise: the emperor Francis, the king of Prussia and a host of lesser dignitaries were present — a sign of the power of the modern Charlemagne. It was the last time that he figured as master of the continent.

The military events of the years 1812-1814 are described under Napoleonic Campaigns; and we need therefore note here only a few details personal to Napoleon or some considerations which influenced his policy. Firstly we may remark that the Austrian alliance furnished one of the motives which led him to refrain during the campaign of 181 2 from reconstituting the Polish realm in its ancient extent. To have done so would have been a mortal affront to his ally, Austria. Certainly he needed her support during that campaign; but many good judges have inclined to the belief that the whole-hearted support of Poles and Lithu- anians would have been of still greater value, and that the organi- zation of their resources might well have occupied him during the winter of 1812-1813, and would have furnished him with a new and advanced base from which to strike at the heart of Russia in the early summer of 1 813. If the Austrian alliance was chiefly responsible for his rejection of that statesmanlike plan, which he had before him at Smolensk, it certainly deserves all the hard things said of it by the champions of Josephine.

Another consideration which largely conduced to the disasters of the retreat was Napoleon’s postponement of any movement back from Moscow to the date of October 19th, and this is known to have resulted from his conviction that the tsar would give way as he had done at Tilsit. Napoleon’s habit of clinging to his own preconceptions never received so strange and disastrous an illustration as it did during the month spent at Moscow. On the other hand, his desertion

of the army on the 5th of December, not long after the crossing of the river Beresina, is a thoroughly defensible act. He had recently heard of the attempt of a French republican general, Malet, to seize the public offices at Paris, a quixotic adventure which had come surprisingly near to success owing to the assurance with which that officer proclaimed the news of the emperor's death in Russia. In such a case, the best retort was to return in all haste in order to put more energy into the huge centralized organism which the emperor alone could

work. His rapid return from Spain early in 1809, and now again from Lithuania at the close of 181 2, gives an instructive glimpse into the anxiety which haunted the mind of the autocrat. He believed that, imposing as his position was, it rested on the prestige won by matchless triumphs. Witness his illuminating state- ment to Volney during the Consulate: " Why should France fear my ambition? I am but the magistrate of the republic. I merely act upon the imagination of the nation. When that fails me I shall be nothing, and another will succeed me."

To this cause we may ascribe his constant efforts to dazzle France by grandiose adventures and by swift, unexpected movements. But she had now come profoundly to distrust him. Her thirst for glory had long since been slaked, and she longed for peaceful enjoyment of the civic boons which he had conferred upon her in that greatest period of his life, the Con- sulate. That the Russian campaign of 181 2 was the last device for assuring the success of the Continental System and the ruin of England was nothing to the great mass of Frenchmen. They were weary of a means of pacification which produced endless wars abroad and misery at home. True, England had suffered, but she was mistress of the seas and had won a score of new colonies. France had subjected half the continent; but her hold on Spain was weakened by Wellington's blow at Salamanca; and now Frenchmen heard that their army in Russia was " dead." At home many industries were suffering from the lack of tropical and colonial produce: cane sugar sold at five, and coffee at seven, shillings the pound. The constant use of chicory for coffee, and of woad for indigo, was apt to produce a reaction in favour of a humdrum peaceful policy; and yet, by a recent imperial decree, Frenchmen had the prospect of seeing the use of the new and imperfectly made beet sugar enforced from the 1st of January 1813, after which date all cane sugar was excluded as being of British origin. Shortly before starting for the Russian expedition Napoleon vainly tried to reassure the merchants and financiers of France then face to face with a sharp financial crisis. Now at the close of 181 2 matters were worse, and Napoleon, on reaching Paris, found the nation preoccupied with the task of finding out how many Frenchmen had

survived the Russian campaign.

Yet, despite the discontent seething in many quarters, France responded to his appeal for troops; but she did so mechanically and without hope. Early in January 18 13 the senate promised that 350,000 conscripts should be enrolled; but 150,000 of them were under twenty years of age, and mobile columns had to be used to sweep in the recruits, especially in Brittany, the Nether- lands and the newly annexed lands of North Germany.

In the old provinces of France Napoleon's indomitable will over- came all difficulties of a material kind. Forces, inexperienced but devoted, were soon on foot; and he informed his German allies that he would allow the Russians to advance into Central Germany so as to ensure their destruction. As for the " treason " of General York, who had come to terms with the Russians, it moved him merely to scorn and contempt. He altogether underrated the importance of the national movement in Prussia. If Prussian towns " behaved badly " (he wrote on the 4th of March), they were to be burnt; Eugene was not to spare even Berlin. Prussia (he wrote on the 14th of March) was a weak country. She could not put more than 40,000 men in the field (the number to which he had limited her in September 1808). He therefore heard without dismay at the end of March that Prussia had joined Russia in a league in which Sweden was now an active participant.

It was clear that the spiritual forces of the time were also slipping out of his grasp. Early in January he sought to come to terms with the pope (then virtually a captive at Fontainebleau) respecting various questions then in debate concerning the Concordat. At first the emperor succeeded in persuading the aged pontiff to sign the preliminaries of an agreement, known as the "Fontainebleau Concordat" (25th of January 1813); but, on its insidious character becoming apparent, Pius VII. revoked his consent, as having been given under constraint. Nevertheless Napoleon ordered the preliminary agreement to be

considered as a definitive treaty, and on the 2nd of April gave instructions that one of the refractory cardinals should be carried off secretly by night from Fontainebleau, while the pontiff was to be guarded more closely than before. On these facts becoming known, a feeling of pity for the pope became wide- spread; and the opinion of

the Roman Catholic world gradually turned against the emperor while he was fighting to preserve bis supremacy in Germany. ” I am following the course of events: I have always marched with them.” Such were his words uttered shortly before his departure from Paris (15th of April). They proved that he misread events and misunderstood his own position.

The course of the ensuing campaigns was to reveal the harden- ing of his mental powers. Early in April he sought to gain the help of 100,000 Austrian troops by holding out to Francis of Austria the prospect of acquiring Silesia from Prussia. The offer met with no response, Austria having received from the allies vaguely alluring offers that she might arrange matters as she desired in Italy and South Germany. Napoleon began to suspect his father-in-law, and still more the Austrian chancellor, Metternich; but instead of humouring them, he resolved to stand firm. The Austrian demands, first presented to him on the 16th of May, shortly after his victory of Liitzen, were (1) the dissolution of the grand duchy of Warsaw, (2) the with- drawal of France from the lands of north-west Germany annexed in 1 8 10 and (3) the cession to Austria of the Illyrian provinces wrested from her in 1809. Other terms were held in reserve to be pressed if occasion admitted; but these were all that were put forward at the moment. On this basis Austria was ready to offer her armed mediation to the combatants. Napoleon would not hear of the terms. ” I will not have your armed mediation. You are only confusing the whole question. You say you cannot act for me; you are strong, then, only against me.” This out- burst of temper was a grave blunder. His threats alarmed the Austrian court. At bottom the emperor Francis, perhaps also Metternich, wanted peace, but on terms which the exhaustion of the combatants would enable them to dictate. Yet during the armistice which ensued (June 4th- July 20th; afterwards pro- longed to August 10th) Napoleon did nothing to soothe the Viennese government, and that, too, despite the encouragement which the allies received from the news of Wellington’s victory at Vittoria and the entry of Bernadotte with a Swedish con- tingent on the scene. Austria now proposed the terms named above with the addition that the Confederation of the Rhine must be dissolved, and that Prussia should be placed in a position as good as that which she held in 1805, that is, before the campaign of Jena. On the 27th of June she promised to join the allies in case Napoleon should not accept these terms.

He was now at the crisis of his career. Events had shown that, even after losing half a million of men in Russia, he was a match for her and Prussia combined. Would he now accept the Austrian terms and gain a not disadvantageous peace, for which France was yearning?

These terms, it should be noted, would have kept Napoleon's empire intact except in Illyria; while the peace would have enabled him to reorganize his army and recover a host of French prisoners from Russia. His signing of the armistice seemed to promise as much. To give his enemies a breathing space when they were hard pressed was an insane proceeding unless he meant to make peace. But there is nothing in his words or actions at this time to show that he desired peace except on terms which were clearly antiquated. His letters breathe the deepest resentment against Austria, and show that he burned to chastise her for her " perfidy " as soon as his cavalry was reorganized. His actions at this time have been ascribed to righteous indignation against Metternich's double-dealing; and in a long interview at the Marcolini palace at Dresden on the 26th of June he asked the chancellor point blank how much money England had given him for his present conduct. As for himself he cared little for the life of a million of men. He had married the daughter of the emperor: it was a mistake, but he would bury the world under the ruins. Talk in this Ossian-like vein showed that Napoleon's brain no

longer worked clearly : it was a victim to his egotism and passion. July and the first decade of August came and went, but brought no sign of pacification. The emperor Francis made a last effort to influence his son-in-law through Marie Louise. It was in vain. Nothing could bend that cast iron will. Nothing remained but to break it. On the expiration of the armistice at midnight of August ioth-uth Austria declared war.

After the disastrous defeat of Leipzig (iyth-ipth October 1813), when French domination in Germany and Italy vanished like an exhalation, the allies gave Napoleon another opportunity to come to terms. The overtures known as the Frankfort terms were ostensibly an answer to the request for information which Napoleon made at the field of Leipzig. Metternich persuaded the tsar and the king of Prussia to make a declaration that the allies would leave to Napoleon the " natural boundaries " of France — the Rhine, Alps, Pyrenees and Ocean. The main object of the Austrian chancellor probably was to let Napoleon once more show to the world his perverse obstinacy. If this was his aim, he succeeded. Napoleon on his return to St Cloud inveighed against his ministers for talking so much about peace and declared that he would never give up Holland; France must remain a great empire, and not sink to the level of a mere kingdom. He would never give up Holland; rather than do that, he would cut the dykes and give back that land to the sea. Accordingly on the 1 6th of November he sent a vague and unsatisfactory reply to the allies; and though Caulaincourt (who now replaced Maret as foreign minister) was on the

2nd of December charged to give a general assent to their terms, yet that assent came too late. The allies had now withdrawn their offer. Napoleon certainly believed that the offer was insincere. Perhaps he was right; but even in that case he should surely have accepted the offer so as to expose their insincerity. As it was, they were able to contrast their moderation with his wrongheadedness, and thereby seek to separate his cause from that of France. In this they only partially succeeded. Murat now joined the allies; Germany, Switzerland and Holland were lost to Napoleon; but when the allies began to invade Alsace and Lorraine, they found the French staunch in his support. He was still the peasants' emperor. The feelings of the year 1792 began to revive. Never did Napoleon and France appear more united than in the campaign of 1814.

Nevertheless it led to his abdication. Once more the allies consented to discuss the terms of a general pacification; but the discussions at the congress of Chatillon (5th of February- 19th of March) had no result except to bring to light a proof of Napoleon's insincerity. Thereupon the allies resolved to have no more dealings with him. As his chances of success became more and more desperate, he ventured on a step whereby he hoped to work potently on the pacific desires of the emperor Francis. Leaving Paris for the time to its own resources, he struck eastwards in the hope of terrifying that potentate and of detaching him from the coalition. The move not only failed, but it had the fatal effect of uncovering Paris to the northern forces of the allies. The surrender of the capital, where he had centralized all the governing powers, was a grave disaster. Equally fatal was the blow struck at him by the senate, his own favoured creation. Convoked by Talleyrand on the 1st of April, it pronounced the word abdication on the morrow. For this Napoleon cared little, provided that he had the army behind him. But now the marshals and generals joined the civilians. The defection of Marshal Marmont and his soldiery on the 4th of April rendered further thoughts of resistance futile. To continue the strife when Wellington was firmly established on the line of the Garonne, and Lyons and Bordeaux had hoisted the Bourbon flew de lys, was seen by all but Napoleon to be sheer madness; but it needed the pressure of his marshals in painful interviews at Fontainebleau to bring him to reason.

At last, on the nth of April, he wrote the deed of abdication. On that night he is said to have tried to end his life by poison. The evidence is not convincing; and certainly his recovery was very speedy. On the 20th he bade farewell to his guard and set forth from Fontainebleau for Elba, which the powers

had very reluctantly, and owing to the pressure of the tsar, awarded to him as a possession. He was to keep the title of emperor. Marie Louise was to have the duchy of Parma for herself and her son. She did not go with her consort. Following the advice of her father, she repaired to Vienna along with the little king of Rome. As for France, she received the Bourbons, along with the old frontiers.

Meanwhile Napoleon, after narrow escapes from royalist mobs in Provence, was conducted in the British cruiser " Un- daunted " to Elba. There he spent eleven months in uneasy retirement, watching with close interest the course of events in France. As he foresaw, the shrinkage of the great empire into the realm of old France caused infinite disgust, a feeling fed every day by stories of the tactless way in which the Bourbon princes treated veterans of the Grand Army. Equally threaten- ing was the general situation in Europe. The demands of the tsar Alexander were for a time so exorbitant as to bring the powers at the congress of Vienna to the verge of war. Thus, everything portended a renewal of Napoleon's activity. The return of French prisoners from Russia, Germany, England and Spain would furnish him with an army far larger than that which had won renown in 1 814. So threatening were the symptoms that the royalists at Paris and the plenipotentiaries at Vienna talked of deporting him to the Azores, while others more than hinted at assassination.

He solved the problem in characteristic fashion. On the 26th of February 18 15, when the English and French guardships were absent, he slipped away from Porto Ferrajo with some 1000 men and landed near Antibes on the 1st of March. Except in royalist Provence he received everywhere a welcome which attested the attractive power of his personality and the nullity of the Bourbons. Firing no shot in his defence, his little troop swelled until it became an army. Ney, who had said that Napoleon ought to be brought to Paris in an iron cage, joined him with 6000 men on the 14th of March; and five days later the emperor entered the capital, whence Louis XVIII. had recently fled.

Napoleon was not misled by the enthusiasm of the provinces and Paris. He knew that love of novelty and contempt for the gouty old king and his greedy courtiers had brought about this bloodless triumph; and he felt instinctively that he had to deal with a new France, which would not tolerate despotism. On his way to Paris he

had been profuse in promises of reform and constitutional rule. It remained to make good those promises and to disarm the fear and jealousy of the great powers. This was the work which he set before himself in the Hundred Days (19th of March to 22nd of June 1815). Were his powers, physical as well as mental, equal to the task ? This is doubtful. Certainly the evidence as to his health is somewhat conflicting. Some persons (as, for instance, Carnot, Pasquier, Lavalette and Thiebault) thought him prematurely aged and enfeebled. Others again saw no. marked change in him; while Mollien, who knew the emperor well, attributed the lassitude which now and then came over him to a feeling of perplexity caused by his changed circumstances. This explanation seems to furnish a correct clue. The autocrat felt cramped and chafed on all sides by the necessity of posing as a constitutional sovereign; and, while losing something of the old rigidity, he lost very much of the old energy, both in thought and action. His was a mind that worked wonders in well-worn grooves and on facts that were well under- stood. The necessity of devising compromises with men who had formerly been his tools fretted him both in mind and body. But when he left parliamentary affairs behind, and took the field, he showed nearly all the power both of initiative and of endurance which marked his masterpiece, the campaign of 1814. To date his decline, as Chaptal does, from the cold of the Moscow campaign is clearly incorrect. The time of lethargy at Elba seems to have been more unfavourable to his powers than the cold of Russia. At Elba, as Sir Neil Campbell noted, he became in- active and proportionately corpulent. There, too, as sometimes in 1815, he began to suffer intermittently from ischury, but to no serious extent. On the whole it seems safe to assert that it was the change in France far more than the change in his health

which brought about the manifest constraint of the emper'or in the Hundred Days. His words to Benjamin Constant — " I am growing old. The repose of a constitutional king may suit me. It will more surely suit my son " — show that his mind seized the salient facts of the situation; but his instincts struggled against them. Hence the malaise both of mind and body.

The attempts of the royalists gave him little concern: the due d'Angouleme raised a small force for Louis XVIII. in the south, but at Valence it melted away in front of Grouchy's command; and the duke, on the 9th of April, signed a convention whereby they received a free pardon from the emperor. The royalists of la Vendee were later in moving and caused more trouble. But the chief problem centred in the constitution. At Lyons, on the 13th of March, Napoleon had issued an edict dissolving the existing chambers and ordering the convocation of

a national mass meeting, or Champ de Mai, for the purpose of modifying the constitution of the Napoleonic empire. That work was carried out by Benjamin Constant in concert with the emperor. The resulting Acte additionel (supplementary to the constitutions of the empire) bestowed on France an hereditary chamber of peers and a chamber of representatives elected by the ” electoral colleges ” of the empire, which comprised scarcely one hundredth part of the citizens of France. As Chateaubriand remarked, in reference to Louis XVIII. ‘s constitutional charter, the new constitution — La Benjamine, it was dubbed — was merely a slightly improved charter. Its incompleteness displeased the liberals; only 1,532,527 votes were given for it in the plibiscite, a total less than half of those of the plebiscites of the Consulate. Not all the gorgeous display of the Champ de Mai (held on the 1 st of June) could hide the discontent at the meagre fulfilment of the promises given at Lyons. Napoleon ended his speech with the words: ” My will is that of the people: my rights are its rights.” The words rang hollow, as was seen when, on the 3rd of June, the deputies chose, as president of their chamber, Lanjuinais, the staunch liberal who had so often opposed the emperor. The latter was with difficulty dissuaded from quashing the election. Other causes of offence arose, and Napoleon in his last communication to them warned them not to imitate the Greeks of the later Empire, who engaged in subtle discussions when the ram was battering at their gates. On the morrow (12th of June) he set out for the northern frontier. His spirits rose at the prospect of rejoining the army. At St Helena he told Gourgaud that he intended in 181 5 to dissolve the chambers as soon as he had won a great victory.

In point of fact, the sword alone could decide his fate, both in internal and international affairs. Neither France nor Europe took seriously his rather vague declaration of his contentment with the role of constitutional monarch of the France of 181 5. No one believed that he would be content with the ” ancient limits.” So often had he declared that the Rhine and Holland were necessary to France that every one looked on his present assertions as a mere device to gain time. So far back as the 13th of March, six days before he reached Paris, the powers at Vienna declared him an outlaw; and four days later Great Britain, Russia, Austria and Prussia bound themselves to put 150,000 men into the field to end his rule. Their recollection of his conduct during the congress of Chatillon was the determining fact at this crisis; his professions at Lyons or Paris had not the slightest effect; his efforts to detach Austria from the coalition, as also the feelers put forth tentatively by Fouche at Vienna, were fruitless. The coalitions, once so brittle as to break at the first strain, had now been

hammered into solidity by his blows. If ever a man was condemned by his past, Napoleon was so in

.1815.

On arriving at Paris three days after Waterloo he still clung to the hope of concerting national resistance; but the temper of the chambers and of the public generally forbade any such attempt. The autocrat and Lucien Bonaparte were almost alone in believing that by dissolving the chambers and declaring himself dictator, he could save France from the armies of the powers now converging on Paris. Even Davout, minister of war, advised him that the destinies of France rested solely with

the chambers. That was true. The career of Napoleon, which had lured France far away from the principles of 1780, now brought her back to that starting-point; just as, in the physical sphere, his campaigns from 1796-1814 had at first enormously swollen her bulk and then subjected her to a shrinkage still more portentous. Clearly it was time to safeguard what remained; and that could best be done under Talleyrand's shieM of legiti- macy. Napoleon himself at last divined that truth. When Lucien pressed him to " dare," he replied " Alas, I have dared only too much already." On the 22nd of June he abdicated in favour of his son, well knowing that that was a mere form, as his son was in Austria. On the 25th of June he received from Fouche, the president of the newly appointed provisional government, an intimation that he must leave Paris. He retired to Malmaison, the home of Josephine, where she had died shortly after his first abdication. On the 29th of June the near approach of the Prussians (v \ho had orders to seize him, dead or alive), caused him to retire westwards towards Rochefort, whence he hoped to reach the United States. But the passports which the provisional government asked from Wellington were refused, and as the country was declaring for the Bourbons, his position soon became precarious. On his arrival at Rochefort (3rd of July) he found that British cruisers cut off his hope of escape. On the oth of July he received an order from the provisional government at Paris to leave France within twenty-four hours. After wavering between various plans, he decided on the 13th of July to cast himself on the generosity of the British govern- ment, and dictated a letter to the prince regent in which he com- pared himself to Themistocles seating himself at the hearth of his enemy. His

counsellor, Las Cases, strongly urged that step and made overtures to Captain Maitland of H.M.S. ” Bellerophon.” That officer, however, was on his guard, and, while offering to convey the emperor to England declined to pledge himself in ■any way as to his reception. It was on this understanding (which Las” Cases afterwards misrepresented) that Napoleon on the 15th of July mounted the deck of the ” Bellerophon.” No other course remained. Further delay after the 15th of July would have led to his capture by the royalists, who. were now every- where in the ascendant. In all but name he was a prisoner of Great Britain, and he knew it.

The rest of the story must be told very briefly. The British government, on hearing of his arrival at Plymouth, decided to send him to St Helena, the formation of that island being such as to admit of a certain freedom of movement for the august captive, with none of the perils for the world at large which the tsar’s choice, Elba, had involved. To St Helena, then, he pro- ceeded on board of H.M.S. “Northumberland.” The title of emperor, which he enjoyed at Elba, had been forfeited by the adventure of 1815, and he was now treated officially as a general. Nevertheless, during his last voyage he enjoyed excellent health even in the tropics, and seemed less depressed than his associates, Bertrand, Gourgaud, Las Cases and Montholon. He landed at St Helena on the 17th of October. He resided first at “The Briars ” with the Balcombes, and thereafter at Longwood, when that residence was ready for him. The first governor of the island, General Wilks, was soon superseded, it being judged that he was too amenable to influence from Napoleon; his successor was Sir Hudson Lowe.

Napoleon’s chief relaxations at St Helena were found in the dictation of his memoirs to Montholon, and the compilation of monographs on military and political topics. The memoirs (which may be accepted as mainly Napoleon’s, though Montholon undoubtedly touched them up) range over most of the events of his life from Toulon to Marengo. The military and historical works comprise precis of the wars of Julius Caesar, Turenne and Frederick the Great. He began other accounts of the campaigns of his own age; but they are marred by his having had few trustworthy documents and statistics at hand. On a lower level as regards credibility stands the Mimorial de Sainte- HUbne, compiled by Las Cases from Napoleon’s conversations with the obvious aim of creating a Napoleonic legend. Never- theless the Mimorial is of great interest — e.g. the passage

(iv. 451-454) in which Napoleon reflects on the ruin wrought to his cause by the war in Spain, or that (iii. 130) dealing with his fatal mistake in not dismembering Austria after Wagram, and in marrying

an Austrian princess — ” There I stepped on to an abyss covered with flowers “; or that again (iii. 79) where he represented himself as the natural arbiter in the immense struggle of the present against the past, and asserted that in ten years’ time Europe would be either Cossack or republican. It is noteworthy that in Gourgaud’s Journal de Ste. Helene there are very few reflections of this kind and the emperor appears in a guise far more life-like. But in the works edited by Montholon and Las Cases, where the political aim constantly obtrudes itself, the emperor is made again and again to embroider on the theme that he had always been the true champion of ordered freedom. This was the mot d’ordre at Longwood to his companions, who set themselves deliberately to propagate it. The folly of the monarchs of the Holy Alliance in Europe gained for the writings of Montholon and Las Cases (that of Gourgaud was not published till 1899) a ready reception, with the result that Napoleon reappeared in the literature of the ensuing decades wielding an influence scarcely less potent than that of the grey-coated figure into whose arms France flung herself on his return from Elba. All that he had done for her in the days of the Consulate was remembered; his subsequent proceedings — his tyranny, his shocking waste of human life, his deliberate persistence in war when France and Europe called for a reasonable and lasting peace — all this was forgotten; and the great warrior, who died of cancer on the 5th of May 1821, was thereafter enshrouded in mists of legend through which his form loomed as that of a Prometheus condemned to a lingering agony for his devotion to the cause of humanity. It was this perversion of fact which rendered possible the career of Napoleon III.

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NAPOLEON II., emperor of the French, the style given by the Bonapartists to the son of Napoleon I., Napoleon Francis Joseph Charles, duke of Reichstadt (q.v.). The fact that in 1814, by Napoleon I.'s abdication in his favour, the king of Rome (as he was then styled) became for a few days titular emperor " by the will of the people," was held by Prince Louis Napoleon to justify his own assumption of the style of Napoleon III. which, as seeming to involve a dynastic claim, gave such offence to the legitimist powers, notably the emperor Nicholas I. of Russia.

NAPOLEON III. [Charles Louis Napoleon Bonaparte] (1808-1873), emperor of the French, was born on the 20th of April 1808 in Paris at 8 rue Cerutti (now rue Laffitte), and not at the Tuileries, as the official historians state. He was the third son of Louis Bonaparte (see Bonaparte), brother of Napoleon I., and from 1806 to 1810 king of Holland, and of Hortense de Beauharnais, daughter of General (de) Beauharnais and Josephine Tascher de la Pagerie, afterwards the empress Josephine; hence he was at the same time the nephew and the adopted grandson of the great emperor. Of the two other sons of Louis Bonaparte and Hortense, the elder, Napoleon Charles (1802-1807), died of croup at The Hague; the second, Napoleon Louis (1804-1831), died in the insurrection of the Romagna, leaving no children. Doubts have been cast on the legitimacy of Louis Napoleon; for the discord between Louis Bonaparte, who was ill, restless and suspicious, and his pretty and capricious wife was so violent and open as to justify all conjectures. But definite evidence, in the shape of letters and references in memoirs, enables us to deny that the Dutch Admiral Verhuell was the father of Louis Napoleon,and there is strong evidence of resemblance in character between King Louis and his third son. He early gave signs of a grave and dreamy character. Many stories have been told about his childhood, for example the remark which Napoleon I. is said to have made about him: " Who knows whether the future of my race may not lie in this child." It is certain

that, after the abdication and exile of Louis, Hortense lived in France with her two children, in close relation with the imperial court. During the Hundred Days, Louis Napoleon, then a “child of seven, witnessed the presentation of the eagles to 50,000 soldiers; but a few weeks later, before his departure for Rochefort, the defeated Napoleon embraced him for the last time, and his mother had to receive Frederick William III. of Prussia and his two sons at the chateau of Saint-Leu; here the victor and the vanquished of Sedan met for the first time, and probably played together.

After Waterloo, Hortense, suspected by the Bourbons of having arranged the return from Elba, had to go into exile. The ex- king Louis, who now lived at Florence, had compelled her by a scandalous law-suit to give up to him the elder of her two children. With her remaining child she wandered, under the name of duchesse de Saint-Leu, from Geneva to Aix, Carlsruhe and Augsburg. In 1817 she bought the castle of Arenenberg, in the canton of Turgau, on a wooded hill looking over the Lake of Constance. Hortense supervised her son’s education in person, and tried to form his character. His tutor was Philippe Le Bas, son of the well-known member of the Convention and follower of Robespierre, an able man, imbued with the ideas of the Revolution, while Vieillard, who instructed him in the rudiments, was a democratic imperialist also inspired with the ideal of nationalism. The young prince also studied at the gymnasium at Augsburg, where his love of work and his mental qualities were gradually revealed; he was less successful in mathematics than in literary subjects, and he became an adept at physical exercises, such as fencing, riding and swimming. It was at this time that he acquired the slight German accent which he never lost. Those who educated him never lost sight of the future; but it

was above all his mother, fully confident of the future destiny of the Bonapartes, who impressed on him the idea that he would be king, or at any rate, that he would accomplish some great works. ” With your name,” she said, ” you will always count for something, whether in the old world of Europe or in the new.” If we may believe Mme Cornu, he already at the age of twelve had dreams of empire.

In 1823 he accompanied his mother to Italy, visiting his father at Florence, and his grandmother Letitia at Rome, and dreaming with Le Bas on the banks of the Rubicon. He returned to Arenenburg to

complete his military education under Colonel Armandi and Colonel Dufour, who instructed him in artillery and military engineering. At the age of twenty he was a ” Liberal,” an enemy of the Bourbons and of the treaties of 181 5; but he was dominated by the cult of the emperor, and for him the liberal ideal was confused with the Napoleonic.

The July revolution of 1830, of which he heard in Italy, roused all his young hopes. He could not return to France, for the law of 1816 banishing all his family had not been abrogated. But the liberal revolution knew no frontiers. Italy shared in the agitation. He had already met some of the conspirators at Arenenbeig, and it is practically established that he now joined the associations of the Carbonari. Following the advice of his friend the Count Arese and of Menotti, he and his brother were among the revolutionaries who in February 1831 attempted a rising in Romagna and the expulsion of the pope from Rome. They distinguished themselves at Civita Castellana, a little town which they took; but the Austrians arrived in force, and during the retreat Napoleon Louis, the elder son, took cold, followed by measles, of which he died. Hortense hurried to the spot and took steps which enabled her to save her second son from the Austrian prisons. He escaped into France, where his mother, on the plea of his illness, obtained permission from Louis Philippe for him to stay in Paris. But he intrigued with the republicans, and Casimir-Perier insisted on the departure of both mother and son. In May 1831 they went to London, and afterwards returned to Arenenberg.

For a time he thought of responding to the appeal of some of the Polish revolutionaries, but Warsaw succumbed (September 1 831) before he could set out. Moreover the plans of this young and visionary enfant du sibcle were becoming more definite. The duke of Reichstadt died in 1832. His uncle, Joseph, and his father, Louis, showing no desire to claim the inheritance promised them by the constitution of the year XII., Louis Napoleon henceforth considered himself as the accredited representative of the family. Those who came in contact with him noticed a transformation in his character; he tried to hide his natural sensibility under an impassive exterior, and concealed his political ambitions. He became indeed ” doux entile ” (gentle but obstinate) as his mother called him, persistent in his ideas and always ready to return to them, though at the same time yielding and drawing, back before the force of circum- stances. He endeavoured to define his ideas, and in 1 833 published his Reveries politiques, suivies d’un prqjet de constitution, and Considerations politiques et militaires sur la Suisse; in 1836, as a captain, in the Swiss service, he published a Manuel d’artUlerie, in order to win popularity

with the French army. A phrase of Montesquieu, placed at the head of this work, sums up the views of the young theorist: ” The people, possessing the supreme power, should do for itself all that it is able to do; what it cannot do well, it must do through its elected representatives.” The supreme authority entrusted to the elect of the people was always his essential idea. But the problem was how to realize it. Louis Napoleon could feel vaguely the state of public opinion in France, the longing for glory from which it suffered, and the deep-rooted discord between the nation and the king, Louis Philippe, who though sprung from the national revolution against the treaties of 1815, was yet a partisan of peace at any price. Both Chateaubriand and Carrel had praised the prince’s first writings. Bonapartists and republicans found common ground in the glorious tradition sung by Beranger. A military conspiracy like those of Berton or the sergeants

of La Rochelle, seemed feasible to Napoleon. A new friend of his, Fialin, formerly a non-commissioned officer and a journalist, an energetic and astute man and a born conspirator, spurred him on to action.

With the aid of Fialin and Eleonore Gordon, a singer, who is supposed to have been his mistress, and with the co-operation of certain officers, such as Colonel Vaudrey, an old soldier of the Empire, commanding the 4th regiment of artillery, and Lieutenant Laity, he tried to bring about a revolt of the garrison of Strassburg (October 30, 1836). The conspiracy was a failure, and Louis Philippe, fearing lest he might make the pretender popular either by the glory of an acquittal or the aureole, of martyrdom, had him taken to Lorient and put on board a ship bound for America, while his accomplices were brought before the court of assizes and acquitted (February 1837). The prince was set free in New York in April; by the aid of a false passport he returned to Switzerland in August, in time to see his mother before her death on the 3rd of October 1837.

At any other time this attempt would have covered its author with ridicule. Such, at least, was the opinion of the whole of the family of Bonaparte. But his confidence was unshaken, and in the woods of Arenenberg the romantic-minded friends who remained faithful to him still honoured him as emperor. And now the government of Louis Philippe, by an evil inspiration, began to act in such a way as to make him popular. In 1838 it caused his partisan Lieutenant Laity to be condemned by the Court of Peers to five years’ imprisonment for a pamphlet which he had written to justify the Strassburg affair; then it demanded the expulsion of the prince from Switzerland, and when the Swiss government resisted, threatened war. Having allowed the July

monarch to commit himself, Louis Napoleon at the last moment left Switzerland voluntarily. All this served to encourage the mystical adventurer. In London, where he had taken up his abode, together with Arese, Fialin (says Persigny), Doctor Conneau and Vaudrey, he was at first well received in society, being on friendly terms with Count d'Orsay and Disraeli, and frequenting the salon of Lady Blessington. He met with various adventures, being present at the famous tournament given by Lord Eglinton, and yielded to the charm of his passionate admirer Miss Howard. But it was a studious life, as well as the life of a dandy, that he led at Carlton House Terrace. Not for a minute did he forget his mission: " Would you believe it," the duke of Wellington wrote of him, " this young man will not have it said that he is not going to be emperor of the French. The unfortunate affair of Strassburg has in no way shaken this strange conviction, and his chief thoughts are of what he will do when he is on the throne." He was in fact evolving his programme of government, and in 1839 wrote and published his book: Des Idees napolioniennes, a curious mixture of Bona- partism, socialism and pacificism, which he represented as the tradition of the First Empire. He also followed attentively the fluctuations of French opinion.

Since 1838 the Napoleonic propaganda had made enormous progress. Not only did certain newspapers, such as the Capitole and the Journal du Commerce, and clubs, such as the Culottes de peau carry it on zealously; but the diplomatic humiliation of France in the affair of Mehemet Ali (q.v.) in 1840, with the outburst of patriotism which accompanied it, followed by the concessions made by the government to public opinion, such as, for example, the bringing back of the ashes of Napoleon I., all helped to revive revolutionary and Napoleonic memories.

The pretender, again thinking that the moment had come, formed a fresh conspiracy. With a little band of fifty-six followers he attempted to provoke a rising of the 42nd regiment of the line at Boulogne, hoping afterwards to draw General Magnan to Lille and march upon Paris. The attempt was made on the 6th of August 1840, but failed; he saw several of his supporters fall on the shore of Boulogne, and was arrested together with Montholon, Persigny and Conneau. This time he was brought before the Court of Peers with his accomplices; he entrusted his defence to Berryer and Marie, and took advantage of his trial to appeal to the supremacy of the people, which he alleged.

had been disregarded, even after 1830. He was condemned to detention for life in a fortress, his friend Aladenize being deported, and Montholon, Parquin, Lombard and Fialin being each condemned to detention for twenty years. On the 15th of December, the very day that Napoleon's ashes were deposited at the Invalides, he was taken to the fortress of Ham. The country seemed to forget him; Lamartine alone foretold that the honours paid to Napoleon I. would shed lustre on his nephew. His prison at Ham was unhealthy, and physical inactivity was painful to the prince, but on the whole the regime imposed upon him was mild, and his captivity was lightened by Alexandrine Vergeot, " la belle sabotiere," or Mdlle Badinguet (he was later nicknamed Badinguet by the republicans). His more intel- lectual friends, such as Mme Cornu, also came to visit him and assisted him in his studies. He corresponded with Louis Blanc, George Sand and Proudhon, and collaborated with the journalists of the Left, Degeorge, Peauger and Souplet. For six years he worked very hard " at this University of Ham," as he said. He wrote some Fragments historiques, studies on the sugar- question, on the construction of a canal through Nicaragua, and on the recruiting of the army, and finally, in the Progres du Pas-de-Calais, a series of articles on social questions which were later embodied in his Extinction du pauperisms (1844). But the same persistent idea underlay all his efforts. " The more closely the body is confined," he wrote, " the more the mind is disposed to indulge in flights of imagination, and to consider the possibility of executing projects of which a more active existence would never perhaps have left it the leisure to think." On the 25th of May 1846 he escaped to London, giving as the reason for his decision the dangerous illness of his father. On the 27th of July his father died, before he could accomplish a journey undertaken in spite of the refusal of a passport by the representative of Tuscany.

He was again well received in London, and he " made up for his six years of isolation by a furious pursuit of pleasure." The duke of Brunswick and the banker Ferrere interested them- selves in his future, and gave him money, as did also Miss Howard, whom he later made comtesse de Beauregard, after restoring to her several millions. He was still full of plans and new ideas, always with the same end in view; and for this reason, in spite of his various enterprises, which were sometimes ridiculous, some- times unpleasant in their consequences, and his unscrupulous- ness as to the men and means he employed, he always had a kind of greatness. He always retained his faith in his star. • " They will come to me without any effort of my own," he said to Taglioni the dancer; and again to Lady Douglas, who was counselling resignation, he replied, " Though fortune has twice

betrayed me, yet my destiny will none the less surely be fulfilled. I wait." He was not to wait much longer.

As he well perceived, the popularity of his name, the vague " legend " of a Napoleon who was at once a democrat, a soldier and a revolutionary hero, was his only strength. But by his abortive efforts he had not yet been able to win over this immense force of tradition and turn it to his own purposes. The events which occurred from 1848 to 1852 enabled him to do so. He behaved with extraordinary skill, displaying in the heat of the conflict all the abilities of an experienced conspirator, knowing, " like the snail, how to draw in his horns as soon as he met with an obstacle " (Thiers), but supple, resourceful and unscrupulous as to the choice of men and means in his obstinate struggle for power.

At the first symptoms of revolutionary disturbance he returned to France; on the 25th of February he offered his services to the Provisional Government, but, on being requested by it to depart at once, resigned himself to this course. But Persigny, Mocquard and all his friends devoted themselves to an energetic propaganda in the press, by pictures and by songs. After the 15th of May had already shaken the strength of the young republic, he was elected in June 1848 by four departments, Seine, Yonne, Charente- Inferieure and Corsica. In spite of the opposition of the executive committee, the Assembly ratified his election. But he had learnt to wait. He sent in his resignation from London, merely hazard-

ing this appeal: " If the people impose duties on me, I shall know how to fulfil them." This time events worked in his favour; the industrial insurrection of June made the middle classes and the mass of the rural population look for a saviour, while it turned the industrial population towards Bonapartism, out of hatred for the republican bourgeois. The Legitimists seemed im- possible, and the people turned instinctively towards a Bonaparte.

On the 26th of September he was re-elected by the same departments; on the nth of October the law decreeing the banishment of the Bonapartes was abrogated; on the 26th he made a speech in the Assembly defending his position as a pretender, and cut such a sorry figure that Antony Thouret contemptuously withdrew the amendment by which he had intended to bar him from rising to the presidency. Thus he was able to be a candidate for this formidable power, which had just been defined by the Constituent Assembly and entrusted to the choice of the people, " to Providence," as Lamartine said. In contrast to Cavaignac he was the candidate of the advanced parties,

but also of the monarchists, who reckoned on doing what they liked with him, and of the Catholics, who gave him their votes on condition of his restoring the temporal power to Rome and handing over education to the Church. The former rebel of the Romagna, the Liberal Carbonaro, was henceforth to be the tool of the priests. In his very triumph appeared the ultimate cause of his downfall. On the 10th of December he was elected president of the Republic by 5,434,226 votes against 1,448,107 given to Cavaignac. On the 20th of December he took the oath “to remain faithful to the democratic Republic ... to regard as enemies of the nation all those who may attempt by illegal means to change the form of the established govern- ment.” From this time onward his history is inseparable from that of France. But, having attained to power, he still en- deavoured to realize his cherished project. All his efforts, from the 10th of December 1848 to the 2nd of December 1852 tended towards the acquisition of absolute authority, which he wished to obtain, in appearance, at any rate, from the people.

It was with this end in view that he co-operated with the party of order in the expedition to Rome for the destruction of the Roman republic and the restoration of the pope (March 31, 1849), and afterwards in all the reactionary measures against the press and the clubs, and for the destruction of the Reds. But in opposition to the party of order, he defined his own personal policy, as in his letter to Edgard Ney (August 16, 1849), which was not deliberated upon at the council of ministers, and asserted his intention ” of not stifling Italian liberty,” or by the change of ministry on the 31st of October 1849, when, ” in order to dominate all parties,” he substituted for the men coming from the Assembly, such as Odilon Barrot, creatures of his own, such as Rouher and de Parieu, the Auvergne avocats, and Achille Fould, the banker. ” The name of Napoleon,” he said on this occasion, ” is in itself a programme; it stands for order, authority, religion and the welfare of the people in internal affairs, and in foreign affairs for the national dignity.”

In spite of this alarming assertion of his personal policy, he still remained in harmony with the Assembly (the Legislative Assembly, elected on the 28th of May 1849) in order to carry out ” a Roman expedition at home,” i.e. to clear the administra- tion of all republicans, put down the press, suspend the right of holding meetings and, above all, to hand over education to the Church (law of the 15th of March 1850). But the machiavellian pretender, daily growing more skilful at manceuvring between different classes and parties, knew where to stop and how to keep up a show of democracy. When the Assembly, by the law of the 31st of May 1850, restricted universal

suffrage and reduced the number of the electors from 9 to 6 millions, he was able to throw upon it the whole responsibility for this coup d'etat bour- geois. " I cannot understand how you, the offspring of universal suffrage, can defend the restricted suffrage," said his friend Mme Cornu. " You do not understand," he replied, " I am preparing the ruin of the Assembly." " But you will perish with it," she answered. "On the contrary, when the Assembly is hanging I over the precipice, I shall cut the rope."

In fact, while trying to compass the destruction of the republican movement of the Left, he was taking careful steps to gain over all classes. " Prince, altesse, monsieur, monseigneur, citoyen " (he was called by all these names indifferently at the Elysee), he appeared as the candidate of the most incompatible interests, flattering the clergy by his compliments and formal visits, distributing cigars and sausages to the soldiers, promising the prosperous bourgeoisie " order in the street " and business, while he posed as the " father of the workers," and won the hearts of the peasants. At his side were his accomplices, men ready for anything, whose only hopes were bound up with his fortunes, such as Morny and Rouher; his paid publicists, such as Romieu the originator of the "red spectre"; his cudgel-bearers, the " Ratapoils " immortalized by Daumier, who terrorized the republicans. From the Elysee by means of the mass of officials whom they had at their command, the conspirators extended their activities throughout the whole country.

He next entered upon that struggle with the Assembly, now discredited, which was to reveal to all the necessity for a change, and a change in his favour. In January 1851 he deprived Changarnier of his command of the garrison of Paris. " The Empire has come," said Thiers. The pretender would have pre- ferred, however, that it should be brought about legally, the first step being his re-election in 1852. The Constitution forbade his re-election; therefore the Constitution must be revised. On the 19th of July the Assembly threw out the proposal for revision, thus signing its own death-warrant, and the coup d'itat was resolved upon. He prepared for it systematically. The cabinet of the 26th of October 1851 gave the ministry for war to his creature Saint- Arnaud. All the conspirators were at their posts — Maupas at the prefecture of police, Magnan at the head of the troops in Paris. At the Elysee, Morny, adulterine son of Hortense, a hero of the Bourse and successful gambler, supported his half-brother by his

energy and counsels. The ministry proposed to abrogate the electoral law of 1850, and restore universal suffrage; the Assembly by refusing made itself still more unpopular. By proposing to allow the president of the Assembly to call in armed force, the questors revealed the Assembly's plans for defence, and gave the Elysee a weapon against it (" donnent barre contre elle a l'Elysee "). The propo- sition was rejected (November 17), but Louis-Napoleon saw that it was time to act. On the 2nd of December he carried out his coup d'etat.

But affairs developed in a way which disappointed him. By dismissing the Assembly, by offering the people " a strong government," and re-establishing " a France regenerated by the Revolution of '89 and organized by the emperor," he had hoped for universal applause. But both in Paris and the provinces he met with the resistance of the Republicans, who had re- organized in view of the elections of 1852. He struck at them by mixed commissions, deportations and the whole range of police measures. The decrets-lois of the year 1852 enabled him to prepare the way for the new institutions. On the 1st of December 1852 he became in name what he was already in deed, and was proclaimed Emperor of the French. He was then 44 years old. " The impassibility of his face and his lifeless glance " showed observers that he was still the obstinate dreamer that he had been in youth, absorbed in his Idea. His unshaken conviction of his mission made him conscious of the responsibility which rested on him, but hid from him the hopeless defect in the coup d'itat. To carry out his conviction, he had still only a timid will, working through petty expedients; but here again his confidence in the future made him bold. In a people politically decimated and wearied, he was able to develop freely all the Napoleonic ideals. Rarely has a man been able to carry out his system so completely, though perhaps in these first years he had to take more disciplinary measures than he had intended against the Reds, and granted more favours than was fitting to the Catholics, his allies in December 1848 and December

1858.

The aim which the emperor had in view was, by a concentration of power which should make him " the beneficent motive force

of the whole social order " (constitution of the 14th of January 1852; administrative centralization; subordination of the elected assemblies; control of the machinery of universal suffrage) to unite all classes in " one great national party " attached to the dynasty. His success, from 1852 to 1856, was almost complete. The nation was submissive, and a few scattered plots alone showed that republican ideas persisted

among the masses. As ” restorer of the overthrown altars,” he won over the ” men in black,” among them Veuillot, editor-in-chief of I’Univers, and allowed them to get the University into their hands. By the aid of former Orleanists, such as Billault, Fould and Morny, and Saint-Simonians such as Talabot and the Pereires, he satisfied the industrial classes, extended credit, developed means of communication, and gave a strong impetus to the business of the nation. By various measures, such as subsidies, charitable gifts and foundations, he endeavoured to show that ” the idea of improving the lot of those who suffer and struggle against the difficulties of life was constantly present in his mind.” His was the government of cheap bread, great public works and holidays. The imperial court was brilliant. The emperor, having failed to obtain the hand of a Vasa or Hohenzollern, married, on the 29th of January 1853, Eugenie de Montijo, comtesse de Teba, aged twenty-six and at the height of her beauty.

France was ” satisfied ” in the midst of order, prosperity and peace. But a glorious peace was required; it must not be said that ” France is bored,” as Lamartine had said when the Napoleonic legend began to spread. The foreign policy of the Catholic party, by the question of the Holy Places and the Crimean War (1853-1856), gave him the opportunity of winning the glory which he desired, and the British alliance enabled him to take advantage of it. In the spring of 1 8 5 5 , as a definite success was still slow to come, he contemplated for a time taking the lead of the expedition in person, but his advisers dissuaded him from doing so, for fear of a revolution. In January 1856 he had the good fortune to win a diplomatic triumph over the new tsar, Alexander II. It was at Paris (February 25-March 30) that the conditions of peace were settled.

The emperor was now at the height of his power. He appeared to the people as the avenger of 1840 and 181 5, and the birth to him of a son, Eugene Louis Jean Joseph, on the 16th of March 1856, assured the future of the dynasty. It was then that, strong in ” the esteem and admiration with which he was sur- rounded,” and ” foreseeing a future full of hope for France,” he dreamed of realizing the Napoleonic ideal in its entirety. This disciple of the German philologists, this crowned Carbonaro, the friend of the archaeologists and historians who were to help him to write the Histoire de Cesar, dreamed of developing the policy of nationalism, and of assisting the peoples of all countries to enfranchise themselves.

From 1856 to 1858 he devoted his attention to the Rumanian nationality, and supported Alexander Cuza. But it was above all the

deliverance of Italy which haunted his imagination. By this enterprise, which his whole tradition imposed upon him, he reckoned to flatter the amour-propre of his subjects, and rally to him the liberals and even the republicans, with their passion for propagandism. But the Catholics feared that the Italian national movement, when once started, would entail the downfall of the papacy; and in opposition to the emperor's Italian advisers, Arese and Prince Jerome Napoleon, they pitted the empress, who was frivolous and capricious, but an ardent Catholic. Napoleon III. was under his wife's influence, and could not openly combat her resistance. It was the Italian Orsini who, by attempting to assassinate him as a traitor to the Italian nation on the 14th of January 1858, gave him an opportunity to impose his will indirectly by convincing his wife that in the interests of his own security he must " do something for Italy." Events followed each other in quick succession, and now began the difficulties in which the Empire was to be irrevocably involved. Not only did the Italian enterprise lead to strained relations with Great Britain, the alliance with whom had been the emperor's chief support in Europe, and compromised its credit; but the claims of parties and classes again began to be heard at home.

The Italian war aroused the opposition of the Catholics. After Magenta (June 4, 1859), it was the fears of the Catholics and the messages of the empress which, even more than the threats of Prussia, checked him in his triumph and forced him into the armistice of Villafranca (July n, 1859). But the spread of the Italian revolution and the movement for annexation forced him again to intervene. He appealed to the Left against the Catholics, by the amnesty of the 17th of April 1859. His consent to the annexation of the Central Italian states, in exchange for Savoy and Nice (Treaty of Turin, March 24, i860) exposed him to violent attacks on the part of the ultramontanes, whose slave he had practically been since 1848. At the same time, the free-trade treaty with Great Britain (January 5, i860) aroused a movement against him among the industrial bourgeoisie.

Thus at the end of i860, the very time when he had'hoped that his personal policy was to rally round him once for all the whole of France, and assure the future of his dynasty, he saw, on the contrary, that it was turning against him his strongest sup- porters. He became alarmed at the responsibilities which he saw would fall upon him, and imagined that by an appearance of reform he would be able to shift on

to others the responsibility for any errors he might commit. Hence the decrees of the 24th of November i860 (right of address, ministers without portfolio) and the letter of the 14th of November 1861 (financial reform). From this time onward, in face of a growing opposition, anxiety for the future of his regime occupied the first place in the emperor's thoughts, and paralysed his initiative. Placed between his Italian counsellors and the empress, he was ever of two minds. His plans for remodelling Europe had a certain generosity and grandeur; but internal difficulties forced him into endless manoeuvre and temporization, which led to his ruin. Thus in October 1862, after Garibaldi's attack on Rome, the clerical c6terie of the Tuileries triumphed. But the replacing of M. Thouvenel by M. Drouin de Lhuys did not satisfy the more violent Catholics, who in May 1863 joined the united opposition. Thirty-five opposers of the government were appointed, Re- publicans, Orleanists, Legitimists or Catholics. The emperor dismissed Persigny, and summoned moderate reformers such as Duruy and Behic. But he was still possessed with the idea of settling his throne on a firm basis, and uniting all France in some glorious enterprise which should appeal to all parties equally, and " group them under the mantle of imperial glory." From January to June 1863 he sought this appearance of glory in Poland, but only succeeded in embroiling himself with Russia. Then, after Syria and China, it was the " great inspiration of his reign," the establishment of a Catholic and Latin empire in Mexico, enthusiasm for which he tried in vain from 1863 to 1867 to communicate to the French.

But while the strength of France was wasting away at Puebla or Mexico, Bismarck was founding German unity. In August 1864 the emperor, held back by French public opinion, which was favourable to Prussia, and by his idea of nationality, allowed Prussia and Austria to seize the duchies of Schleswig and Holstein. After his failure in Poland and Mexico and in face of the alarming presence of Germany, only one alliance remained possible for Napoleon III., namely with Italy. He obtained this by the convention of the 15th of September 1864 (involving the with- drawal of the French troops from Rome). But the Catholic party redoubled its violence, and the pope sent out the encyclical Quanta Cura and the Syllabus, especially directed against France. In vain the emperor sought in German affairs a definitive solution of the Italian question. At Biarritz he prepared with Bismarck the Franco-Prussian alliance of April 1866; and hoped to become, to his greater glory, arbiter in the tremendous conflict which was about to begin. But suddenly, while he was trying to rouse public opinion against the treaties of 18 15, the news of the battle of Koniggratz came as a bolt from the blue to ruin his hopes. French interests called

for an immediate intervention. But the emperor was ill, weary and aged by the life of pleasure which he led side by side with his life of work (as is proved by the letters to Mdlle Bellanger) ; he was suffering from a first attack of

his bladder complaint. He knew, moreover, the insufficiency of his troops. After days of terrible suffering, he resigned himself to the annexation by Prussia of northern Germany. ” Now,” said M Drouin de Lhuys, ” we have nothing left but to weep.”

Henceforth the brilliant dream, a moment realized, the realiza- tion of which he had thought durable, was at an end. The Empire had still an uncertain and troubled brilliancy at the Exhibition of 1867. But Berezowski’s pistol shot, which accen- tuated the estrangement from the tsar, and the news of the death of Maximilian at Queretaro, cast a gloom over the later fetes. In the interior the industrial and socialist movement, born of the new industrial development, added fresh strength to the Republican and Liberal opposition. The moderate Imperialists felt that some concessions must be made to public opinion. In opposition to the absolutist ” vice-emperor ” Rouher, whose influence over Napoleon had become stronger and stronger since the death of Morny, Emile Ollivier grouped the Third Party. Anxious, changeable and distraught, the emperor made the Liberal concessions of the 19th of January 1867 (right of inter- pellation), and then, when Ollivier thought that his triumph was near, he exalted Rouher (July) and did not grant the promised laws concerning the press and public meetings till 1868. The opposition gave him no credit for these tardy concessions. There was an epidemic of violent attacks on the emperor; the publica- tion of the Lanlerne and the Baudin trial, conducted by Gam- betta, were so many death-blows to the regime. The Inter- nationale developed its propaganda. The election cf May 1869 resulted in 4,438,000 votes given for the government, and 3,355,000 for the opposition, who also gained 90 representatives. The emperor, disappointed and hesitating, was slow to return to a parliamentary regime. It was not till December that he instructed Ollivier to ” form a homogeneous cabinet representing the majority of the Corps Legislatif ” (ministry of the 2nd of January 1870). But, embarrassed between the Arcadiens, the partisans of the absolute regime, and the republicans, Ollivier was unable to guide the Empire in a constitutional course. At the Tuileries Rouher’s counsel still triumphed. It was he who inspired the ill and wearied emperor, now without confidence or energy, with the idea of resorting to the plibiscite. ” To do away with the risk of a Revolution,” ” to place order and liberty upon a firm footing,” ” to ensure the transmission of the crown to his son,” Napoleon III. again sought the approba- tion of the

nation. He obtained it with brilliant success, for the last time, by 7,358,786 votes against 1,571,939, and his work now seemed to be consolidated.

A few weeks later it crumbled irrevocably. Since 1866 he had been pursuing an elusive appearance of glory. Since 1866 France was calling for " revenge." He felt that he could only rally the people to him by procuring them the satisfaction of their national pride. Hence the mishaps and imprudences of which Bismarck made such an insulting use. Hence the negotiations of Nikols- burg, the " note d'aubergiste " (innkeeper's bill) claiming the left bank of the Rhine, which was so scornfully rejected; hence the plan for the invasion of Belgium (August 1866), the Luxem- burg affair (March 1867), from which M. de Moustier's diplomacy effected such a skilful retreat; hence the final folly which led this government into the war with Prussia (July 1870).

The war was from the first doomed to disaster. It might perhaps have been averted if France had had any allies. But Austria, a possible ally, could only join France if satisfied as regards Italy; and since Garibaldi had threatened Rome (Mentana, 1867), Napoleon III., yielding to the anger of the Catholics, had again sent troops to Rome. Negotiations had taken place in 1869. The emperor, bound by the Catholics, had refused to withdraw his troops. It was as a distant but inevitable consequence of his agreement of December 1848 with the Catholic party that in 1870 the emperor found himself without an ally.

His energy was now completely exhausted. Successive attacks of stone in the bladder had ruined his physique; while his hesitation and timidity increased with age. The influence of the empress over him became supreme. On leaving the

council in which the war was decided upon the emperor threw himself, weeping, into the arms of Princess Mathilde. The empress was delighted at this war, which she thought would secure her son's inheritance.

On the 28th of July father and son set out for the army. They found it in a state of utter disorder, and added to the difficulties by their presence. The emperor was suffering from stone and could hardly sit his horse. After the defeat of Reichs- hoffen, when Bazaine was thrown

back upon Metz, he wished to retreat upon Paris. But the empress represented to him that if he retreated it would mean a revolution. An advance was decided upon which ended in Sedan. On the 2nd of September, Napoleon III. surrendered with 80,000 men, and on the 4th of September the Empire fell. He was taken as a prisoner to the castle of Wilhelmshohe, near Cassel, where he stayed till the end of the war. After the intrigues of Bazaine, of Bismarck, and of the empress, the Germans having held negotiations with the Republic, he was de facto deposed. On the 1st of March the assembly of Bordeaux confirmed this deposition, and declared him ” responsible for the ruin, invasion and dismemberment of France.”

Restored to liberty, he retired with his wife and son to Chislehurst in England. Unwilling even, now to despair of the future, he still sought to rally his friends for a fresh propaganda. He had at his service publicists such as Cassagnac, J. Amigues and Hugelmann. He himself also wrote unsigned pamphlets justifying the campaign of 1870. It may be noted that, true to his ideas, he did not attempt to throw upon others the responsi- bility which he had always claimed for himself. He dreamed of his son’s future. But he no longer occupied himself with any definite plans. He interested himself in pensions for workmen and economical stoves. At the end of 1872 his disease became more acute, and a surgical operation became necessary. He died on the 9th of January 1873, leaving his son in the charge of the empress and of Rouher. The young prince was educated at Woolwich from 1872 to 1875, and in 1870 took part in the English expedition against the Zulus in South Africa, in which he was killed. By his death vanished ail hope of renewing the extraordinary fortune which for twenty years placed the descendant of the great emperor, the Carbonaro and dreamer, at once obstinate and hesitating, on the throne of France.

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NAPOLEON, a round game of cards (known colloquially as " Nap "). Any number may play. The cards rank as at whist, and five are dealt to each player. The deal being completed, the player to the dealer's left looks at his hand and declares how many tricks he would play to win against all the rest, the usual rule being that more than one must be declared; in default of declaring he says " I pass," and the next player has a similar option of either declaring to make more tricks or passing, and so on all round. A declaration of five tricks is called " going Nap." The player who declares to make most has to try to make them, and the others, but without consultation, to prevent him. The declaring hand has the first lead, and the first card he leads makes tne trump suit. The players, in rotation, must follow suit if able. If the declarer succeeds in making at least the number of tricks he stood for he wins whatever stakes are played for; if not he loses. If the player declaring Nap wins he receives double stakes all round; if he loses he only pays single stakes all round. Sometimes, however, a player is allowed to go "Wellington" over "Nap," and even "Blucher" over

" Wellington." In these cases the caller of " Wellington " wins four times the stake and loses twice the stake, the caller of " Blucher " receives six times and loses three times the stake. Sometimes a player is allowed to declare misere, i.e. no tricks. This ranks, as a declaration, between three and four, but the player pays a double stake on three, if he wins a trick, and receives a single on three if he takes none.

NAPOLEONIC CAMPAIGNS.— 1. The era of the Revolutionary and Napoleonic Wars falls into two main divisions, the first of which (1 792-1801) is dealt with under the heading French Revolutionary Wars. In the present article are described the campaigns in central and eastern Europe, directed by Napoleon — no longer one amongst many French generals, nor even a simple primus inter pares, but " Emperor " in the fullest sense — between the years 1805 and 1814. Napoleon's short Sparrish Campaign of 1809 is dealt with under Peninsular War (this article covering the campaigns in Spain, Portugal and southern France 1808-1814), and for the final drama of Waterloo the reader is referred to Waterloo Campaign.

The campaigns described below are therefore —

(a) The Austrian War of 1805 (Ulm and Austerlitz).

(b) The Conquest of Prussia and the Polish Campaign (Jena,

Auerstiidt, Eylau and Friedland).

(c) The Austrian War of 1809 (Eckmiihl, Aspern and Wagram).

(d) The Russian War of 1812 (Borodino and the retreat from

Moscow).

(e) The German ” War of Liberation,” culminating in the Battle

of the Nations around Leipzig.

(f) The last campaign in France, 1814.

The naval history of 1803-1815 includes the culmination and the sequel of the struggle for command of the sea which began in 1793 and reached its maximum intensity on the day of Trafalgar.

2. The Campaign of 1805 may be regarded as a measure of self-defence forced upon Napoleon by the alliance of Russia (April nth), Austria (August gth) and other powers with Great Britain. The possibility had long been before the emperor, and his intention in that event to march straight on Vienna by the valley of the Danube is clearly indicated in his reply (November 27th, 1803) to a Prussian proposal for the neutralization of the South German states. In this he says, ” It is on the road from Strassburg to Vienna that the French must force peace on Austria, and it is this road which you wish us to renounce.” When, therefore, on the 25th of August 1805, he learnt definitely that Villeneuve (see Naval operations below) had failed in his purpose of securing the command of the Channel, which was the necessary preliminary to the invasion of England, it was but the affair of a few hours to dictate the dispositions necessary to transfer his whole army to the Rhine frontier as the first step in its march to the Danube. On this date the army actually lay in the following positions : — I. Corps Bernadotte

II. III.

IV.

V.

VI. VII. Guard

Marmont

Davout

Soult

Lannes

Ney

Augereau

Bessieres

Hanover (Gottingen) Holland

(Camp of Boulogne and other points on the English Channel

Paris.

The corps were, however, by no means fit for immediate service. Bernadotte's corps in Hanover was almost in the position of a beleaguered garrison, and the marshal could only obtain his transport by giving out that he was ordered to withdraw to France. Marmont and Davout were deficient in horses for cavalry and artillery, and the troops in Boulogne, having been drawn together for the invasion of England, had hardly any transport at all, as it was considered this want could be readily supplied on landing. The composition of the army, however, was excellent. The generals were in the prime of life, had not yet learnt to distrust one another, and were accustomed to work under the emperor and with one another. The regimental officers had all acquired their rank before the enemy and knew how to manage their men, and of the men themselves nearly two-thirds had seen active service. The strength of the army lay in its infantry, for both cavalry and artillery were short of horses, and the latter had not yet acquired mobility and skill

in manoeuvring. Napoleon's determination to undertake the invasion of England has often been disputed, but it is hard to imagine what other operation he contemplated, for the outbreak of hostilities with his continental enemies found him ill-supplied with intelligence as to the resources of the country he had then to traverse. To remedy this, Murat and other general officers as well as minor agents were sent ahead and instructed to travel through South Germany in plain clothes with a view to collecting information and mastering the topography. The emperor was, moreover, imperfectly acquainted with the degree

of pre- paration of his adversaries' designs, and when he dictated his preliminary orders he was still unaware of the direction that the allies' advance would assume. That he foresaw the march of events which ultimately drew Mack to Ulm is inconceivable. On the 26th of August, however, he learnt that 100,000 Russians were about to enter Bohemia thence to unite with an Austrian army of 80,000 near the junction of the Inn and Danube, and this information compelled him to alter the general direction of his advance so as to traverse the defiles of the Black Forest north of the Neckar, cavalry only observing the passes to the south.

3. Austrian Army. — The Austrians after the defeats of 1800 had endeavoured to reorganize their forces on the French model, but they were soon to learn that in matters of organization the spirit is everything, the letter very little. They had copied the organization of the French corps, but could find no corps commanders fit to assume the responsibility for these commands. As always in such conditions, the actual control of the smallest movements was still centralized in the hands of the army com- manders, and thus the rate of marching was incredibly slow. They had decided that in future their troops in the field should live by requisition, and had handed over to the artillery, which needed them badly, a large number of horses thus set free from tie transport service, but they had not realized that men accustomed to a regular distribution of rations cannot be trans- formed into successful marauders and pillagers by a stroke of the pen; and they had sent away the bulk of their army, 120,000 under their best general, the archduke Charles, into Italy, leaving Lieut. Field Marshal Mack von Leiberich in Germany, nominally as chief of the staff to the young Prince Ferdinand, but virtually in command, to meet the onset of Napoleon at the head of his veterans. Mack was a man of unusual attainments. He had risen from the ranks in the most caste-ridden army in Europe, and against untold opposition had carried through army reforms which were correct in principle, and needed only time to develop. It was his fate to be made the scapegoat for the disasters which followed, though they need no further explanation than that, at the head of 80,000 men and exercising only restricted powers of command, he was pitted against the greatest strategist of all ages who was responsible to no overlord and commanded, in the fullest sense of the term, an army considerably more than twice as strong.

4. The March on Ulm. — The outbreak of the campaign was hastened by the desire of the Austrian government to feed their own army and leave a bare country for Napoleon by securing the resources of Bavaria. It was also hoped that the Bavarians with their army of

25,000 men would join the allies. In the latter hope they were deceived, and the Bavarians under General Wrede slipped away to Bamberg in time. In the former, how- ever, they were successful, and the destitution they left in their wake almost wrecked Napoleon's subsequent combinations. Mack's march to Ulm was therefore a necessity of the situation, and his continuance in this exposed position, if foolhardy against such an adversary, was at any rate the outcome of the high resolve that even if beaten he would inflict crippling losses upon the enemy. Mack knew that the Russians would be late at the rendezvous on the Inn. By constructing an entrenched camp at Ulm and concentrating all the available food within it, he expected to compel Napoleon to invest and besiege him, and he anticipated that in the devastated country his adversary would be compelled to separate and thus fall an easy prey to the Russians. For that blow he had determined to make his own

army the anvil. But these views obviously could not be pub- lished in army orders, hence the discontent and opposition he was destined to encounter.

5. Movements of the French. — It was on the 21st that Napoleon learnt of Mack's presence in Ulm. On that date his army had crossed the Rhine and was entering the defiles of the Black Forest. It was already beginning to suffer. Boots were worn out, greatcoats deficient, transport almost unattainable and, accord- ing to modern ideas, the army would have been considered incapable of action.

Sept. 28.

Oct. 6.

Oct. 9.

Oct. 16.

Bernadotte .

Wtirzburg

Anspach

Niirnberg

Regensburg

Marmont

Wurzburg

Anspach

Niirnberg

Regensburg

Davout .

Mannheim

Mergentheim

Anspach

Dietfurt

Ney . .

Selz

Crailsheim

Weissenburg

Ingolstadt

Lannes .

Strassburg

Gmiind

Nordlingen

Neuburg

Soult

Landau

Aalen

Donauworth

On the 26th of September, its deployment beyond the mountains was complete, and as Napoleon did not know of Mack's intention to stay at

Ulm and had learned that the Russian advance had been delayed, he directed his columns by the following roads on the Danube, between Donauworth and Ingolstadt, so as to be in a position to intervene between the Austrians and the Russians and beat both in detail. On the 7th of October this movement was completed — the Austrians abandoned the Danube bridges after a show of resistance, retreating westward — and Napoleon, leaving Murat in command of the V. and VI. corps and cavalry to observe the Austrians, pressed on to Augsbuig with the others so as to be ready to deal with the Russians. Learning, however, that these were still beyond striking radius, he determined to deal with Mack's army first, having formed the fixed conviction that , a threat at the latter's communications would compel him to endeavour to retreat southwards towards Tirol. Bernadotte in his turn became an army of observation, and Napoleon joining Murat with the main body marched rapidly westward from the Lech towards the Iller.
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6. Austrian Plans. — Mack's intentions were not what Napoleon supposed. He had meanwhile received (false) information of a British landing at Boulogne, and he was seriously deceived as to the numbers of Napoleon's forces. He was also aware that the exactions of the French had produced deep indignation through- out Germany and especially in Prussia (whose neutrality had been violated, see § 14, below). All this, and the almost mutinous discontent of his generals and his enemies of the court circle, shook his resolution of acting as anvil for the Russians, of whose delay also he was aware, and about the 8th of October he deter- mined to march out north-eastward across the French lines of communication and save his sovereign's army by taking refuge if necessary in Saxony. Believing implicitly in the rumours of a descent on Boulogne and of risings in France which also reached him, and knowing the destitution he had left behind him in his movement to Ulm, when he heard of the westward march of French columns from the Lech he told his army, apparently in all good faith, that the Fi ench were in full march for their own country.

Actually the French at this moment were suffering the most terrible distress — up to the Danube they had still found sufficient food for existence, but south of it, in the track of the Austrians, they found nothing. All march discipline disappeared, the men dissolved into hordes of marauders and even the sternest of the marshals wrote piteous appeals to the emperor for supplies, and for permission to shoot some of their stragglers. But to all these Berthier in the emperor's name sent the stereotyped reply — " The emperor has ordered you to carry four days' provisions, therefore you can expect nothing further — you know the emperor's method of conducting

war.”

7. Action of Albeck or Haslach. — Meanwhile Murat, before the emperor joined him, had given Mack the desired opening. The VI. corps (Ney) should have remained on the left bank of the Danube to close the Austrian exit on that side, but by mistake only Dupont’s division had been left at Albeck, the rest being

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brought over the river. Mack on the 8th had determined to commence his withdrawal, but fortune now favoured the French. The weather during the whole of October had been unusually wet, the swollen Danube overflowed the low ground and the roads had become quagmires. On the south bank, owing to better natural drainage and a drier subsoil, movement was fairly easy, but the Austrians found it almost impossible. On the nth of October, when they began their march, the road along the Danube was swept into the river, carrying with it several guns and teams, and hours were consumed in passing the shortest distances. At length in the afternoon they suddenly fell upon Dupont’s isolated division at Albeck, which was completely surprised and severely handled. The road now lay completely open, but the Austrian columns had so opened out owing to the state of the roads that the leading troops could not pursue their advantage — Dupcnt rallied and the Austrians had actually to fall back towards Ulm to procure food.

8. Elchingen. — For three more days Mack struggled with an unwilling staff and despondent men to arrange a further advance. During these very three days, through a succession of staff blunders, the French failed to close the gap, and on the morning of the 14th of October both armies, each renewing their advance, came in contact at

the bridge of Elchingen. This bridge, all

but a few road-bearers, had been destroyed, but now the French gave an example of that individual gallantry which was char- acteristic of the old revolutionary armies. Running along the beams under a close fire a few gallant men forced their way across. The floor of the bridge was rapidly relaid, and presently the whole of the VI. corps was deploying with unexampled rapidity on the farther side. The Austrians, still in their quag- mire, could not push up reinforcements fast enough, and though Mack subsequently alleged deliberate obstruction and dis- obedience on the part of his subordinates, the state of the roads alone suffices to explain their defeat. Only the right column of the Austrians was, however, involved; the left under General Werneck, to whom some cavalry and the archduke Ferdinand attached themselves, did indeed succeed in getting away, but without trains or supplies. They continued their march, famished but unmolested, until near Heidenheim they suddenly found themselves confronted by what from the diversity of uniforms they took to be an overwhelming force; at the same time the French cavalry sent in pursuit appeared in their rear. Utterly exhausted by fatigue, Werneck with his infantry, some 8oco strong, surrendered to what was really a force of dismounted dragoons and foot-sore stragglers improvised by the commanding officer on the spot to protect the French treasure chests, which at

that moment lay actually in the path of the Austrians. The young archduke with some cavalry escaped.

9. Mack surrounded. — The defeat at Elchingen on the 14th of October sealed the fate of the Austrians, though Mack was still determined to endure a siege. As the French columns coming up from the south and west gradually surrounded him, he drew in his troops under shelter of the fortress and its improvised entrenched camp, and on the 15th he found himself completely surrounded. On the 16th the French field-guns fired into the town, and Mack realized that his troops were no longer under sufficient control to endure a siege. When, therefore, next morning, negotiations were opened by the French, Mack, still feeling certain that the Russians were at hand, agreed to an armistice and undertook to lay down his arms if within the next twenty-one days no relief should arrive. To this Napoleon consented, but hardly had the agreement been signed than he

succeeded in introducing a number of individual French soldiers into the fortress, who began rioting with the Austrian soldiery. Then, sending in armed parties to restore order and protect the inhabitants, he caused the guards at the gates to be overpowered, and Mack was thus forced into an unconditional surrender.

On the 22nd of October, the day after Trafalgar, the remnant of the Austrian army, 23,000 strong, laid down its arms. About 5000 men under Jellachich had escaped to Tirol, 2000 cuirassiers with Prince Ferdinand to Eger in Bohemia, and about 10,000 men under Werneck, had surrendered at Heidenheim. The losses in battle having been insignificant, there remain some 30,000 to account for — most of whom probably escaped individu- ally by the help of the inhabitants, who were bitterly hostile to the French.

10. Napoleon's Advance to Vienna. — Napoleon now hastened to rejoin the group of corps he had left under Bernadotte in observation towards the Russians, for the latter were nearer at hand than even Mack had assumed. But hearing of his misfortune they retreated before Napoleon's advance along the right bank of the Danube to Krems, where they crossed the river and withdrew to an entrenched camp near Olmiitz to pick up fresh Austrian reinforcements. The severe actions of Durrenstein (near Krems) on the nth, and of Hollabriinn on the 16th of November, in which Napoleon's marshals learned the tenacity of their new opponents, and the surprise of the Vienna bridge (November 14) by the French, were the chief incidents of this period in the campaign.

n. Campaign of Austerlitz. — Napoleon continued down the right bank to Vienna, where he was compelled by the con- dition of his troops to call a halt to refit his army. After this was done he continued his movement to Briinn. Thither he succeeded in bringing only 55,000 men. He was again forced to give his army rest and shelter, under cover of Murat's cavalry. The allies now confronted him with upwards of 86,000 men, including 16,000 cavalry. About the 20th of November this force commenced its advance, and Napoleon concentrated in such a manner that within three days he could bring over 80,000 French troops into action around Briinn, besides 17,000 or more Bavarians under Wrede. On the 28th Murat was driven in by the allied columns. That night orders were despatched for a concentration on Briinn in expecta- tion of a collision on the following day; but hearing that the whole allied force was moving towards him he decided to con- centrate south-east of Briinn, covering his front by cavalry on the Pratzen heights. Meanwhile he had also prepared a fresh line of retreat towards Bohemia, and, certain now of having his men in hand

for the coming battle, he quietly awaited events.

The allies were aware of his position, and stilf adhering to the old ” linear ” system, marched to turn his right flank (see Austerlitz). As soon as their strategic purpose of cutting him off from Vienna became apparent, the emperor moved his troops into position, and in the afternoon issued his famous proclamation to his troops, pointing out the enemy’s mistakes and his plan for defeating them. At the same time he issued his orders for his first great battle as a supreme commander. The battle of

Austerlitz began early next morning and closed in the evening with the thorough and decisive defeat of the allies.

12. Jena, 1806. — Around the Prussian army, and particularly the cavalry, the prestige of Frederick the Great’s glory still lingered; but the younger generation had little experience of actual warfare, and the higher com- campSL i„ a , manders were quite unable to grasp the changes in tactics and in the conduct of operations which had grown out of the necessities of the French Revolution. The individual officers of the executive staff were the most highly trained in Europe, but there was no great leader to co-ordinate their energies. The total number of men assigned to the field army was 110,000 Prussians and Saxons. They were organized in corps, but their leaders were corps commanders only in name, for none were allowed any latitude for individual initiative. Ill-judged economies had undermined the whole efficiency of the Prussian army. Two-thirds of the infantry and one-half of the cavalry were allowed furlough for from ten to eleven months in the year. The men were unprovided with greatcoats. Most of the muskets had actually seen service in the Seven Years’ War, and their barrels had worn so thin with constant polishing that the use of full charges at target practice had been forbidden. Above all, the army had drifted entirely out of touch with the civil population. The latter, ground down by feudal tradition and law, and at the same time permeated by the political doctrines of the late 18th century, believed that war concerned the govern- ments only, and formed no part of the business of the ” honest citizen.” In this idea they were supported by the law itself, which protected the civilian against the soldier, and forbade even in war-time the requisitioning of horses, provisions and transport, without payment. Up to the night of the battle of Jena itself, the Prussian troops lay starving in the midst of plenty, whilst the French everywhere took what they wanted. This alone was a sufficient cause for all the misfortunes which followed. 13. Outbreak of the War. — During the campaign of Austerlitz Prussia, furious at the violation of her territory of Anspach, had mobilized, and had sent Haugwitz as

ambassador to Napoleon's headquarters. He arrived on the 30th of November, and Napoleon, pleading business, put off his official reception till after the battle of Austerlitz. Of course the ultimatum was never presented, as may be imagined; Haugwitz returned and the king of Prussia demobilized at once. But Napoleon, well knowing the man he had to deal with, had determined to force a quarrel upon Prussia at the earliest convenient opportunity. His troops therefore, when withdrawn from Austria, were can- toned in south Germany in such a way that, whilst suspicion was not aroused in minds unacquainted with Napoleonic methods, they could be concentrated by a few marches behind the Thuringian forest and the upper waters of the Main. Here the Grand Army was left to itself to recuperate and assimilate its recruits, and it is characteristic of the man and his methods that he did not trouble his corps commanders with a single order during the whole of the spring and summer.

As the diplomatic crisis approached, spies were sent into Prussia, and simultaneously with the orders for preliminary con- centration the marshals received private instructions, the pith of which cannot be better expressed than in the following two quotations from Napoleon's correspondence : —

" Mon intention est de concentrer toutes mes forces sur I'extr6mit6 de ma droite en laissant tout l'espace entre le Rhin et Bamberg entiirement dfigarni, de maniere a avoir pres de 200,000 hommes r6unis sur un meme champ de bataille; mes premieres marches menacent le cceur de la monarchic prussienne " (No. 10,920). " Avec cette immense superiority de forces reunis sur un espace si etroit, vous sentez que je suis dans la volontˆ de ne rien hasarder et d'attaquer l'ennemi partout ou il voudra tenir. Vous pensez bien que ce serait une belle affaire que de se porter sur cette place (Dresden) en un bataillon carre de 200,000 hommes " (Soult, No. 10,941).

14. Advance of the Grande Armee. — On the 7th of October the Grande Arm&e lay in three parallel columns along the roads leading over the mountains to Hof, Schleiz and Kronach; on the right lay the IV. corps (Soult) about Bayreuth; with his cavalry in rear, and behind these the VI. corps (Ney) at Pegnitz; in the centre, Bernadotte's I. corps from Nordhalben, with the

III. corps (Davout) Lichtenfels; Guard and headquarters, I the emperor

was still unaware of the position of his principal Bamberg. The left column was composed of the V. (Lannes) | foe, and Murat with Bernadotte behind him was directed on

Gera for the nth, the remainder of the army con-

JENA CAMPAIGN

Halle

English Miles

at Hemmendorf, with the VII. (Augereau) extending south to the Main at Burgebrach.

Napoleon's object being surprise, all the cavalry except a few vedettes were kept back behind the leading infantry columns and these latter were ordered to advance, on the signal being given, in " masses of manoeuvre, " so as to crush at once any outpost resistance which was calculated upon the time required for the deployment of ordinary marching columns. This order has never since found an imitator, but deserves attentive study as a masterpiece (see H. Bonnal, Manoeuvre d'lena).

To meet the impending blow the Prussians had been extended in a cordon along the great road leading from Mainz to Dresden, Blucher was at Erfurt, Ruchel at Gotha, Hohenlohe at Weimar, Saxons in Dresden, with outposts along the frontier. An offensive move into Franconia was under discussion, and for this purpose the Prussian staff had commenced a lateral con- centration about Weimar, Jena and Naumburg when the storm burst upon them. The emperor gathered little from the confused reports of their purposeless manoeuvres, but, secure in the midst of his " battalion square " of 200,000 men, he remained quite indifferent, well knowing that an advance straight on Berlin must force his enemy to concentrate and fight, and as they would bring at most 127,000 men on to the battlefield the result could hardly be doubtful. On the oth of October the cloud burst. Out of the forests which clothe the northern slopes of the Thuringer Wald the French streamed forth, easily over- powering the resistance of the Prussian outposts on the upper Saale, 1 and once the open country was reached the cavalry under Murat trotted to the front, closely followed by Bernadotte's corps as " general advance guard." The result of the cavalry scouting was however unsatisfactory. On the night of the 10th,

1 At the action of Saalfeld on the 10th, the young and gallant Prince

Louis Ferdinand of Prussia was killed.

tinuing along the roads previously assigned to them.

In the meanwhile, however, the Saxons had been moving from Naumburg through Gera on Jena, Hohenlohe was near Weimar, and all the other divisions of the army had closed in a march eastwards, the idea of an offensive to the south- ward which Napoleon had himself attributed to them having already disappeared.

Reaching Gera at 9 a.m. Murat reported the movement of the Saxons on the previous day, but omitted to send a strong detachment in pursuit. The traces of the Saxons were lost, and Napoleon, little satisfied with his cavalry, author- ized Lasalle to offer up to 6000 frs. reward for information of the Prussian point of concentration. Zwickau °| At 1 a.m. of the 1 2th Napoleon issued his orders. Murat and Bernadotte via Zeitz to Naumburg; Davout (III. corps and a dragoon division) also to Naumburg; Lannes to Jena, Augereau following; Soult to Gera.

15. Prussian Movements. — In the meantime the Prussians were effecting their concentration. Ruchel, who with 15,000 men had been sent into the mountains as an advanced guard for the pro- jected offensive, was recalled to Weimar, which he reached on the 13th. The main body were between Weimar and Apolda during the 12th, and the Saxons duly effected their junction with Hohenlohe in the vicinity of Vierzehnheiligen, whilst the latter had withdrawn his troops all but some outposts from Jena to the plateau about Capellendorf, some 4 m. to the N.W. The whole army, upwards of 1 20,000 men, could therefore have been concentrated against Lannes and Augereau by the afternoon of the 13th, whilst Soult could only have intervened very late in the day, and Davout and Berna- dotte were still too distant to reach the battlefield before the 14th. All the French corps, moreover, were so exhausted by their rapid marches over bad roads that the emperor actually ordered (at 1 a.m. on the 13th) a day of rest for all except Davout, Bernadotte, Lannes and Murat.

The Prussian headquarters, however, spent the 12th and 13th in idle discussion, whilst the troop commanders exerted them- selves to obtain some alleviation for the suffering of their starving men. The defeats undergone by their outpost detach- ment had profbundly affected the nerves of the troops, and on the afternoon of the nth, on the false alarm of a French approach, a panic broke out in the streets of Jena, and it took all the energy of Hohenlohe and his staff to restore order. On the morning of the 12th the Saxon commanding

officers approached Hohenlohe with a statement of the famishing condition of their men, and threatened to withdraw them again to Saxony. Hohenlohe pointed out that the Prussians were equally badly off, but promised to do his best to help his allies. Urgent messages were sent off to the Commissary von Goethe (the poet), at Weimar for permission to requisition food and firewood. These requests, however, remained unanswered, and the Prussians and Saxons spent the night before the battle shivering in their miserable bivouacs.

16. The 13th of October. — During the early morning of the 13th the reports brought to Napoleon at Gera partially cleared up the situation, though the real truth was very different from what he supposed. However, it was evident that the bulk of the Prussians lay to his left, and instructions were at once despatched to Davout to turn westward from Naumburg towards Kosen and to bring Bernadotte with him if the two were still together. The letter, however, ended with the words ” but I hope he is already on his way to Dornburg.” Now Bernadotte

Emery Walker, sc.

had neglected to keep the emperor informed as to his where- abouts. He was still with Davout, but, concluding that he had missed an order directing him to Dornburg, he thought to conceal his error by assuming the receipt of the order evidently alluded to in the last words, and as a result he marched towards Dorn- burg, and his whole corps was lost to the emperor at the crisis of the next day’s battle.

On the road from Gera to Jena Napoleon was met by intelligence from Lannes announcing his occupation of Jena and the discovery of Prussian troops to the northward. Knowing the emperor’s methods, he wisely restrained the ardour of his sub- ordinates and asked for instructions whether to attack or wait. The emperor rode forward rapidly, reached Jena about 3 p.m., and with Lannes proceeded to the Landgrafenberg to reconnoitre. From this point his view was, however, restricted to the im- mediate foreground, and he only saw the camps of Hohenlohe’s left wing. At this moment the Prussians were actually on parade and ready to move off to attack, but just then the ” evil genius ” of the Prussian army, von Massenbach, an officer of the Headquarter Staff, rode up and claiming to speak with the authority of the king and commander-in-chief, induced Hohen- lohe to order his troops back to camp. Of all this Napoleon saw nothing, but

from all reports he came to the conclusion that the whole Prussian army was actually in front of him, and at om_e issued orders for his whole army to concentrate towards Jena, marching all night if need be. Six hours earlier his con- clusion would have been correct, but early that morning the Prussian headquarters, alarmed for the safety of their line of retreat on Berlin by the presence of the French in Naumburg, decided to leave Hohenlohe and Riichel to act as rear-guard, and with the main body to commence their retreat towards the river Unstrutt and the Eckhardtsberge where Massenbach had previously reconnoitred an ” ideal ” battlefield. This belief in positions was the cardinal principle of Prussian strategy in these days. The troops had accordingly commenced their march on the morning of the 13th, and now at 3 p.m. were settling down into bivouac; they were still but a short march from the decisive field.

17. Battle of Jena.-r-On the French side, Lannes’ men were working their hardest, under Napoleon’s personal supervision, to make a practicable road up to the Landgrafenberg, and all night long the remaining corps struggled through darkness towards the rendezvous. By daybreak on the 74th, the anni- versary of Elchingen, upwards of 60,000 men stood densely

battalions were sent forward, and these, delaying their advance till the fog had sufficiently lifted, were met by French skirmishers, and small columns, who rapidly overlapped their flanks and drove them back in confusion. Hohenlohe now brought up the remainder of his command, but in the meanwhile the French had poured across the neck between the Landgrafenberg and the main plateau, and the troops of Soult and Augereau were working up the ravines on either hand. In view of these troops the Prussian line, which had advanced faultlessly as if on parade, halted to prepare its bayonet attack by fire, and, once halted, it was found impossible to get them to go on again. The French who had thrown themselves into houses, copses, &c, picked off the officers, and the flanks of the long Prussian fines swayed and got into confusion. The rival artilleries held each other too thoroughly to be able to spare attention to the infantry, whilst the Prussian cavalry, which had forgotten how to charge in masses of eighty or more squadrons, frittered away their strength in isolated efforts. By 10 a.m. the fourteen battalions which had initiated this attack were outnumbered by three to one, and drifted away from the battlefield. Their places were taken by a fresh body, but this was soon outnumbered and outflanked in its turn. By 2 p.m. the psychic moment had come, and Napoleon launched his guards and the cavalry to complete the victory and initiate the pursuit. ‘ Riichel ‘s division now arrived and made a most gallant effort to cover the retreat, but

their order being broken by the torrent of fugitives, they were soon overwhelmed by the tide of the French victory and all organized resistance had ceased by 4 p.m.

Briefly summarized, the battle came to this — in four successive efforts the Prussians failed because they were locally out- numbered. This was the fault of their leaders solely, for, except for the last attack, local superiority was in each case attainable. Organization and tactics did not affect the issue directly, for the conduct of the men and their junior officers gave abundant proof that in the hands of a competent leader the ” linear ” principle of delivering one shattering blow would have proved superior to that of a gradual attrition of the enemy here, as on the battlefields of the Peninsula and at Waterloo, and this in spite of other defects in the training of the Prussian infantry which simultaneously caused its defeat on the neighbouring field of Auerstadt.

18. Battle of Auerstadt. — Here the superiority of French mobility, a consequence of their training and not necessarily of their system, showed its value most conclusively. Davout in obedience to his orders of the previous morning was marching

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packed on the narrow plateau of the mountain, whilst, below in the ravines on either flank, Soult on the right, and Augereau on the left, were getting into position. Fortunately a dense fog hid the helpless masses on the Landgrafenberg from sight of the Prussian gunners. Hohenlohe had determined to drive the French into the ravine at daybreak, but had no idea as to the numbers in front of him. For want of room, only a few Prussian

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over the Saale at Kbsen, when his advanced guard came in contact with that of the Prussian main army. The latter with at least 50,000 men was marching in two columns, and ought therefore to have delivered its men into line of battle twice as fast as the French, who had to deploy from a single issue, and whose columns had opened out in the passage of the Kosen defile and the long ascent of the plateau above. But the Prussians

attacked at the old regulation speed of seventy-five paces to the minute, and the French manoeuvred at the quick or double of 1 20 or 150. The consequence was that the French always succeeded in reinforcing their fighting line in time to avert disaster. Nevertheless by mid-day their strength was well-nigh exhausted, whilst the Prussian reserve, eighteen battalions of guards under Kalckreuth, stood intact and ready to engage. But at the critical moment the duke of Brunswick fell mortally wounded, and Scharnhorst, his chief of the staff, was at the time absent on another part of the field. Meanwhile rumours from the battle-field at Jena, magnified as usual, began to reach the staff, and these may possibly have influenced Kalckreuth, for when appealed to to attack with his eighteen battalions and win the day, he declined to move without the direct order of the commander-in-chief to do so, alleging that it was the duty of a reserve to cover the retreat and he considered himself personally responsible to the king for the guards entrusted to his care. Even then the day might have been saved had Bliicher been able to find even twenty squadrons accustomed to gallop together, but the Prussian cavalry had been dispersed amongst the infantry commands, and at the critical moment it proved impossible for them to deliver a united and decisive attack.

Seeing further efforts hopeless, Scharnhorst in the duke's name initiated the retreat and the troops withdrew N.W. towards Buttelstedt, almost unmolested by the French, who this day had put forth all that was in them, and withstood victoriously the highest average punishment any troops of the new age of warfare had as yet endured. So desperate had been their resistance that the Prussians unanimously stated Da.vout's strength at double the actual figure. Probably no man but Davout could have got so much out of his men, but why was he left unsupported?

Bernadotte, we have seen, had marched to Dornburg, or rather to a point overlooking the ford across the Saale at the village of that name, and reached there in ample time to intervene on either field. But with the struggle raging before him he remained undecided, until at Jena the decision had clearly fallen, and then he crossed the river and arrived with fresh troops too late for their services to be required.

19. Prussian Retreat. — During the night the Prussians con- tinued their retreat, the bulk of the main body to Sommerda, Hohenlohe's corps towards Nordhausen. The troops had got much mixed up, but as the French did not immediately press the pursuit home, order was soon re-established and a combined retreat was begun towards the mouth of the Elbe and Liibeck. Here help was expected to arrive from England, and the tide might yet have turned, for the Russian armies

were gathering in the east. It was now that the results of a divorce of the army from the nation began to be felt. Instead of seizing all provisions and burning what they could not remove, the Prussian generals enforced on their men the utmost forbearance towards the inhabitants, and the fact that they were obeyed, in spite of the inhumanity the people showed to their sick and wounded country-men, proves that discipline was by no means so far gone as has generally been believed. The French marching in pursuit were received with open arms, the people even turning their own wounded out of doors to make room for their French guests. Their servility awakened the bitterest contempt of their con- querors and forms the best excuse for the unparalleled severity of the French yoke. On the 26th of October Davout reached Berlin, having marched 166 m. in twelve days including two sharp rearguard actions, Bernadotte with his fresh troops having fallen behind. The inhabitants of Berlin, headed by their mayor, came out to meet him, and the newspapers lavished adulation on the victors and abuse on the beaten army. On the 28th Murat's cavalry overtook the remnant of Prince Hohenlohe's army near Prenzlau (N. of Berlin) and invited its capitulation. Unfortunately the prince sent Massenbach to discuss the situa- tion, and the latter completely lost his head. Murat boasted that he had 100,000 men behind him, and on his return Massen- bach implored his chief to submit to an unconditional surrender,

advice which the prince accepted, though as a fact Murat's horses were completely exhausted and he had no infantry what- ever within call. Only Bliicher now remained in the field, and he too was driven at length into Liibeck with his back to the sea.

20. Campaigns in Poland and East Prussia. — Hitherto the French had been operating in a rich country, untouched for half a century past by the ravages of war, but as the necessity for a campaign against the Russians confronted the emperor, he realized that his whole supply and transport service must be put on a different footing. After the wants of the cavalry and artillery had been provided for, there remained but little material for transport work. Exhaustive orders to organize the necessary trains were duly issued, but the emperor seems to have had no conception of the difficulties the tracks — there were no metalled roads — of Poland were about to present to him. Moreover, it was one thing to issue orders, but quite another to ensure that they were obeyed, for they entailed a complete transformation in the mental attitude of the French soldier towards all that he had been taught to consider his duties in the field. Experience only can teach the art of packing wagons and the care of draught animals, and throughout the campaign the small ponies of Poland and East Prussia

broke down by thousands from over loading and unskilful packing.

21. The Russian Army formed the most complete contrast to the French that it is possible to imagine. Though clad, armed and organized in European fashion, the soldiers retained in a marked degree the traditions of their Mongolian forerunners, their transport wagons were in type the survival of ages of experience, and their care for their animals equally the result of hereditary habit. The intelligence of the men and regimental officers was very low, but on the other hand service was practically for life, and the regiment the only home the great majority had ever known. Hence obedience was instinctive and initiative almost undreamt of. Moreover, they were essentially a war- trained army, for even in peace time their long marches to and fro within the empire had most thoroughly inured them to hard- ship and privation. Napoleon might have remembered his own saying, ” La misere est l’ecole du bon soldat.” In cavalry they were weak, for the Russian does not take kindly to equitation and the horses were not equal to the accepted European standard of weight, while the Cossack was only formidable to stragglers and wounded. Their artillery was numerous and for the most part of heavy calibre — 18- and 24-pounders were common — but the strength of the army lay in its infantry, with its incomparable tenacity in defence and its blind confidence in the bayonet in attack. The traditions of Suvarov and his victories in Italy (see French Revolutionary Wars) were still fresh, but there was no longer a Suvarov to lead them.

22. Advance to the Vistula. — Napoleon had from the first been aware of the secret alliance between Prussia and Russia, sworn by their respective sovereigns over the grave of Frederick the Great, and this knowledge had been his principal reason for precipitating hostilities with the former. He remained, however, in complete ignorance of the degree of preparation attained on the Russian side, and since the seizure of Warsaw together with the control of the resources of Poland in men and material it? occupation would afford, was the chief factor in his calculation, he turned at once to the eastward as soon as all further organized resistance in Prussia was ended by the surrender of Prenzlau and Liibeck. Scarcely leaving his troops time to restore their worn-out footgear, or for the cavalry to replace their jaded horses from captured Prussian resources, he set Davout in motion towards Warsaw on the 2nd of November, and the remainder of the army followed in successive echelons as rapidly as they could be despatched.

The cavalry, moving well in advance, dispersed the Prussian dep6ts and captured their horses, as far as the line of the Vistula, where at

last they encountered organized resistance from the outposts of Lestocq's little corps of 15,000 men — all that was left of Frederick the Great's army. These, however, gave way before the threat of the advancing French and after a few trifling skirmishes. Davout entered Warsaw on the 30th of

November, being followed by the V., IV. and Guard corps during the succeeding fortnight, whilst the VI. and VII. weie echeloned to their left, and the VIII. (Mortier) and IX. (Jerome Napoleon) and X. (Lefebvre), all new formations since the outbreak of the war, followed some marches in the rear. Jerome's corps was composed of the Bavarians, Wiirttembergers and Badensers.

Behind these all Prussia was overrun by newly formed units, (3rd and 4th battalions) raised from depot companies, conscripts for 1807, and old soldiers rejoining after sickness or wounds. Napoleon caused these to be despatched to the front immediately after their formation. He had much territory to occupy, and in the long march of on an average 85 days, he considered that they could be organized, equipped and drilled en route.

23. Pultusk. — The Russians meanwhile had been moving slowly forward in two bodies, one under Bennigsen (50,000), the other under Buxhowden (25,000), and the French being at this time in Warsaw, they took up threatening positions about Pultusk, Plock and Prassnitz. From this triangle they harried the French communications with Berlin, and to secure a winter's rest for his men Napoleon determined to bring them to action. On the 23rd of December operations were commenced, but the difficulties of securing information and maintaining communication between the respective columns, so unlike what any of the French had previously encountered, led to a very partial success. The idea had been to induce the Russians to concentrate about Pultusk and, turning their position from its left, ultimately to cut them off from Russia, and if possible to surround them. But in this new and difficult country the emperor found it impossible to time his marches. The troops arrived late at their appointed positions, and after a stubborn rearguard action at Pultusk itself and undecisive fighting elsewhere (Soldau-Golymin) the Russians succeeded in retreating beyond the jaws of the French attack, and Napoleon for the first time found that he had exceeded the limit of endurance of his men. Indeed, the rank and file bluntly told him as

much as he rode with the marching columns. Yield- ing to the inevitable, but not forgetting to announce a brilliant victory in a bulletin, he sent his troops into winter quarters along the Passarge and down the Baltic, enjoining on his corps commanders most strictly to do nothing to disturb their adversary.

24. Campaign of Eylau. — Bennigsen, now commanding the whole Russian army which with Lestocq's Prussians amounted

to 100,000, also moved into winter quarters in the triangle Deutsch-Eylau-Osterode-Allenstein, and had every intention

of remaining there, for a fresh army was already gathering in Russia, the 1st corps of which had reached Nur about 50 m. distant from the French right.

Unfortunately, Ney with his VI. corps about Gilgenberg had received the most poverty-stricken district in the whole region, and to secure some alleviation for the sufferings of his men he incautiously extended his cantonments till they came in contact with the Russian outposts. Apparently seeing in this movement a recommencement of hostilities, Bennigsen concentrated his troops towards his right and commenced an advance westwards towards Danzig, which wars still in Prussian hands. Before his advance both Ney and Bernadotte (the latter, between Ney and the Baltic, covering the siege of Danzig) were compelled to fall back. It then became necessary to disturb the repose of the whole army to counter the enemy's intentions. The latter by this movement, however, uncovered his own communication with Russia, and the emperor was quick to seize his opportunity. He received the information on the 28th of January. His orders were at once issued and complied with with such celerity that by the 31st he stood prepared to advance with the corps of Soult, Ney, Davout and Augereau, the Guard and the reserve cavalry (80,000 men on a front of 60 m.) from Myszienec through Wollenberg to Gilgenberg; whilst Lannes on his right towards Ostrolenka and Lefebvre (X.) #t Thorn covered his outer flanks.

Bernadotte, however, was missing, and this time through no fault of his own. His orders and the despatch conveying Napoleon's instructions fell into the hands of the Cossacks, and just in time Bennigsen's eyes were opened. Rapidly renouncing his previous intentions, he issued orders to concentrate on Allenstein; but this point was chosen too far in advance and he was anticipated by Murat and Soult at that place on the 2nd of February. He then determined to unite his forces at Joukendorf , but again he was too late. Soult and

Murat attacked his rear- guard on the 3rd, and learning from his Cossacks that the French corps were being directed so as to swing round and enclose him, he withdrew by a night march and ultimately succeeded in getting his whole army, with the exception of von Lestocq's Prussians, together in the strong position along the Alle, the centre of which is marked by Preussisch-Eylau. The oppor- tunity for this concentration he owed to the time gained for him by his rearguard at Joukendorf, for this had stood just long enough to induce the French columns to swing in to surround him, and the next day was thus lost to the emperor as his corps had to extend again to their manoeuvring intervals. The truth is that the days were too short and the roads too bad for Napoleon to carry out the full purpose his "general advanced guard" was intended to fulfil. It was designed to hold the enemy in position by the vigour of its attack, thus neutralizing his inde- pendent will power and compelling him to expend his reserves in the effort to rescue the troops engaged. But in forests and snowdrifts the French made such slow progress that no sufficient deployment could be made until darkness put a stop to the fighting. Thus, when late on the 7th of February 1807 Murat and Soult overtook the enemy near Eylau (q.v.) the fighting was severe but not prolonged. This time, however, Bennigsen, with over 60,000 men in position and 15,000 Prussians expected to arrive next morning, had no desire to avoid a battle, and deployed for action, his front protected by great batteries of guns, many of them of heavy calibre, numbering some 200 in all.

During the night Augereau and the Guards had arrived, and Ney and Davout were expected on either flank in the fore- noon. This time the emperor was determined his enemy should not escape him, and about 8 a.m. ordered Soult and Augereau on the left and right respectively to assail the enemy, Murat and the Guards remaining in the centre as reserve. Napoleon's own forces thus became the " general advanced guard " for Ney and Davout, who were to close in on either side and deliver the decisive stroke. But here too the weather and the state of the roads operated adversely, for Ney came up too late, while Davout, in the full tide of his victorious advance, was checked by the arrival of Lestocq, whose corps Ney had failed to intercept,

and the attack of Augereau's corps (VII.), made in a blinding snowstorm, failed with the appalling loss of over 40% killed and wounded. Augereau himself was severely wounded, and the remnant

of his corps was subsequently distributed amongst the other corps. Bennigsen, however, drew off on Ney's arrival, and the French were too much exhausted to pursue him. Again the emperor had to admit that his troops could do no more, and bowing to necessity, he distributed them into winter quarters, where, however, the enterprise of the Cossacks, who were no strangers to snow and to forests, left the outposts but little repose.

A protracted period of rest followed, during which the emperor exerted himself unremittingly to re-equip, reinforce and supply his troops. Hitherto he had been based on the entrenched camp of Warsaw, but he had already taken steps to organize a new line of supply and retreat via Thorn, and this was now completed. At the same time Lefebvre was ordered to press the siege of Danzig with all vigour, and on the 5th of May, after a most gallant resistance, Kalckreuth, who redeemed here his failure of Auerstadt, surrendered. English assistance came too late. By the beginning of June the French had more than made good their losses and 210,000 men were available for field service.

25. Heilsberg and Friedland. — Meanwhile Bennigsen had prepared for a fresh undertaking, and leaving Lestocq with 20,000 Prussians and Russians to contain Bernadotte, who lay between Braunsberg and Spandau on the Passarge, he moved southwards on the 2nd, and on the 3rd and 4th of 'June he fell upon Ney, driving him back towards Guttstadt, whilst with the bulk of his force he moved towards Heilsberg, where he threw up an entrenched position. It was not till the 5th that Napoleon received tidings of his advance, and for the moment these were so vague that he contented himself by warning the remainder of his forces to be prepared to move on the 6th. Next day, however, all doubts were set at rest, and as the Russians advanced south of Heilsberg, he decided to wheel his whole force to the right, pivoting on the III. corps, and cut Bennigsen off from Konigsberg and the sea. On the 8th the VI., III., VIII. and Guard corps, together with a new cavalry reserve corps under Lannes, in all 147,000, stood ready for the operation, and with Murat and Soult as general advanced guard the whole moved forward, driving the Russian outposts before them. Bernadotte, who was to have attacked Lestocq, again failed to receive his orders and took no part in the following operations.

Murat attacked the Russians, who had halted in their entrenched position, on the nth and drove in their outposts, but did not discover the entrenchments. Meanwhile Soult had followed with his infantry in close support, and the emperor himself arriving, ordered him to attack at once. Now the Russians uncovered their entrenchments, and in the

absence of artillery preparation Soult's leading troops received most severe punishment. Fresh troops arriving were sent in to his support, but these also proved insufficient, and darkness alone put an end to the struggle, which cost the French 12,000 killed and wounded.

Bennigsen, however, learning that his right was threatened by the III. corps, and not having as yet completed his concentration, retreated in the night to Bartenstein, and the following day turned sharp to right towards Schippenbeil. The emperor now pressed on towards Friedland, where he would completely control the Russian communications with Konigsberg, their immediate base of supply, but for once the Russians outmarched him and covered their movement so successfully that for the next three days he seems to have completely lost all knowledge of his enemy's whereabouts. Lestocq in the meantime had been forced northwards towards Konigsberg, and Soult with Murat was in hot pursuit. The III., VI., VIII. and Guard corps followed the main road towards Konigsberg, and the former had reached Muhlhausen, the remainder were about Preussisch-Eylau, when Latour Maubourg's dragoons sent in intelligence which pointed to the presence of Bennigsen about Friedland. This was indeed the case. The Russians after passing Schippenbeil had suddenly turned northwards, and on the evening of the

13th were taking up a strong position on the river Alle with Friedland as a centre.

What followed presents perhaps the finest instance of the Napoleonic method. The enemy lay direct to his right, and Murat, the IV. and III. corps had well overshot the mark. Lannes's reserve corps (cavalry), to whom Latour Maubourg reported, lay at Domnau some 10 m. to the right. The latter at once assumed ther61e of advanced guard cavalry and was ordered to observe the enemy at Friedland, Ney following in close support. Davout was turned about and directed on the enemy's right, and the VIII. corps (Mortier), the Guards and the reserve cavalry followed as main body. On the 14th (the anniversary of Marengo) Lannes carried out his role of fighting advanced guard or screen, the emperor's main body gradually came up, and the battle of Friedland (q.v.), notable chiefly for the first display of the new artillery tactics of the French, ended with a general attack about 5 p.m. and the retreat of the Russians, after severe losses, over the Alle. Lestocq was, meanwhile, driven through Konigsberg (which surrendered on the 15th) on Tilsit, and now that he was no longer supported by the Russians, the Prussian commander gave up the struggle.

26. The Austrian Army in i8oq. — Ever since Austerlitz the Austrian

officers had been labouring ˆto reconstitute and reform their army. The archduke Charles was the foremost amongst many workers who had realized that numbers were absolutely needed to confront the new French methods. With these numbers it was impossible to attain the high degree of individual efficiency required for the old line tactics, hence they were com- pelled to adopt the French methods of skirmishers and columns, but as yet they had hardly realized the increased density necessary to be given to a line of battle to enable it to endure the prolonged nervous strain the new system of tactics entailed. Where formerly 15,000 men to the mile of front had been con- sidered ample for the occupation of a position or the execution of an attack, double that number now often proved insufficient, and their front was broken before reinforcements could arrive. Much had been done to create an efficient staff, but though the idea of the army corps command was now no new thing, the senior generals entrusted with these commands were far from having acquired the independence and initiative of their French opponents. Hence the extraordinary slowness of their man- oeuvres, not because the Austrian infantry were bad marchers, but because the preparation and circulation of orders was still far behind the French standard. The light cavalry had been much improved and the heavy cavalry on the whole proved a fair match for their opponents.

27. The French Army. — After the peace of Tilsit the Grand Army was gradually withdrawn behind the Rhine, leaving only three commands, totalling 63,000 men, under Davout in Prussia, Oudinot in west central Germany, and Lefebvre in Bavaria, to assist the princes of the Confederation of the Rhine in the main- tenance of order and the enforcement of the French law of con- scription, which was rigorously insisted on in all the States comprised in this new federation.

In exchange for the subsistence of the French troops of occupation, a corresponding number of these new levies were moved to the south of France, where they commenced to arrive at the moment when the situation in Spain became acute. The Peninsular War (q.v.) called for large forces of the old Grande Armie and for a brief period Napoleon directed operations in person; and the Austrians took advantage of the dissemination and weakness of the French forces in Germany to push forward their own preparations with renewed energy.

But they reckoned without the resourcefulness of Napoleon. The moment news of their activity reached him, whilst still in pursuit of Sir John Moore, he despatched letters to all the members of the Confederation warning them that their con- tingents might soon be required, and at the same time issued a series of decrees to General

Clarke, his war minister, authorizing him to call up the contingent of 1810 in advance, and directing him in detail to proceed with the formation of 4th and 5th battalions for all the regiments across the Rhine. By these

means Davout's, Oudinot's and Lefebvre's commands were augmented, whilst in February and March new corps were formed and rapidly pushed towards the front.

On his return from Spain, seeing war imminent, he issued a series of march orders (which deserve the closest study in detail) by which on the 15 th of April his whole army was to be con- centrated for manoeuvres between Regensburg, Landshut, Augs- burg and Donauworth, and sending on the Guard in wagons to Strassburg, he despatched Berthier to act as commander-in-chief until his own arrival.

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28. Austrian Ofiensive. — The position of assembly was ex- cellently chosen, but unfortunately the Austrians took the initiative. On the 9th of April their main body of six corps crossed the Inn between Braunau and Passau, and simultane- ously two additional corps moved from Pilsen in Bohemia on Regensburg. At this moment Davout was entering Regens- burg with his leading troops, the remainder still some marches in rear, and it was evident that the whole concentration could no longer be carried out before the Austrians would be in a position to intervene. Berthier received the news while still on his way to the front, and quite failed to grasp the situation. Reaching Donauworth at 8 p.m. on the 13th of April, he ordered Davout and Oudinot to remain at Regensburg, whilst Lefebvre and Wrede (Bavarians) who had fallen back before the Austrians were directed to reoccupy Landshut. This was in direct contra- diction with the instructions Napoleon had given him on the 28th of March in view of this very emergency. Davout obeyed, but remonstrated. On the 16th Berthier went on to Augsburg, where he learnt that Lefebvre's

advanced troops had been driven out of Landshut, thus opening a great gap seventy-six miles wide between the two wings of the French army. Meanwhile Napoleon, who had left Paris at 4 a.m. on the 13th of April, was hastening towards the front, but remained still in ignorance of Berthier's doings until on the 16th at Stutt- gart he received a letter from the Marshal dated the 13th, which threw him into consternation. In reply he immediately wrote : " You do not inform me what has rendered necessary such an extraordinary measure which weakens and divides my troops " — and — " I cannot quite grasp the meaning of your letter yet , I should have preferred to see my army concentrated between Ingolstadt and Augsburg, the Bavarians in the first line, with the duke of Danzig in his old position, until we know what the enemy is going to do. Everything would be excellent if the duke of Auerstadt had been at Ingolstadt and the duke of Rivoli with the Wurttembergers and Oudinot's corps at Augsburg, ... so that just the opposite of what should have been done has been done " (C. N. to Berthier, Ludwigsburg, 16th April).

29. Napoleon takes command. — Having despatched this severe reprimand he hastened on to Donauworth, where he arrived at 4 a.m. on the 17th, hoping to find Berthier, but the latter was at Augsburg. Nevertheless, at 10 a.m. he ordered Davout and Oudinot to withdraw at once to Ingolstadt; and Lefebvre and Wrede on the right to support the movement. About noon

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Berthier returned and after hearing his explanation Massena received orders to move from Augsburg towards Ingolstadt. " To-morrow will be a day of preparation spent in drawing closer together, and I expect to be able by Wednesday to manoeuvre against the enemy's columns accˆdint; to circumstances."

Meanwhile the Atistrians had approached so near that by a single day's march it would have been possible to fall upon and crush by superior numbers either wing of the French army, but though the Austrian light cavalry successfully covered the operations of the following troops they had not yet risen to a conception of their reconnoitring mission, and the archduke, in ignorance of his opportunity and possessed, moreover, with the preconceived idea of uniting at Regensburg with the two corps coming from Bohemia, moved the bulk of his forces in that direction, leaving only a covering body against Davout altogether insufficient to retain him. Davout, however, had left a garrison of 1800 men in Regensburg, who delayed the junction of the Austrian wings until the 20th inst., and on the

same day the emperor, having now reunited his whole right wing and centre, overwhelmed the covering detachments facing him in a long series of disconnected engagements lasting forty-eight hours, and the archduke now found himself in danger of being forced back into the-Danube. But with the Bohemian reinforcements he had still four corps in hand, and Napoleon, whose intelligence service in the difficult and intersected country had lamentably failed him, had weakened his army by detaching a portion of his force in pursuit of the beaten right wing, and against the archduke's communications,

30. Eckmuhl. — When, therefore, the latter, on the 22nd, marched southward to reopen his communications by the defeat of the enemy's army, always the surest means of solving this difficulty, he actually reached the neighbourhood of Eckmuhl with a sufficient numerical superiority had he only been prompt enough to seize his opportunity. But the French had been beforehand with him. Napoleon, who had personally taken part in the fighting of the previous day, and followed the pursuit as far as Landshut, whence he had despatched Massena to follow the retreating Austrians along the Isar, seems to have realized about 3 a.m. in the morning that it was not the main body of the enemy he had had before him, but only its left wing, and that the main body itself must still be northward towards Regensburg. Issuing orders to Davout, Oudinot and his cavalry to concentrate with all speed towards Eckmuhl, he himself rode back along the Regensburg road and reached the battle-field just as the engage- ment between the advance troops had commenced. Had the Austrians possessed mobility equal to that of the French the latter should have been overwhelmed in detail, but whilst the French covered 17 and 19 m. the Austrians only marched 10, and, owing to the defect in their tactical training alluded to above, the troops actually on the ground could not hold out long enough for their reserves to arrive. The retreat of the front lines involved the following ones in confusion, and presently the whole mass was driven back in considerable disorder. It seemed as if nothing could save the Austrians from complete disaster, but at the critical moment the emperor, yielding to the protestations of his corps commanders, who represented the excessive fatigue of their troops, stopped the pursuit, and the archduke made the most of his opportunity to restore order amongst his demoralized men, and crossed to the north bank of the Danube during the night.

31. Austrian Retreat. — On the following morning the French reached Regensburg and at once proceeded to assault its medieval walls, but the Austrian garrison bravely defended it till the last of the stragglers was safely across on the north bank. It was here that for the only time in his career Napoleon was slightly wounded. Then, leaving Davout to

observe the archduke's retreat, the emperor himself rode after Massena, who with the major portion of the French army was following the Austrian weaker wing under Hiller. The latter was not so shaken as Napoleon believed, and turning to bay inflicted a severe check on its pursuers, who at Ebelsberg lost 4000 men in three

fruitless assaults. Thus covered by his rearguard Hiller gained space and time to pass his troops over to the north bank of the Danube and remove all boats on the river. This left the direct road to Vienna open, and Napoleon, hoping to find peace in the enemy's capital, pushed the whole of his army down the right bank, and with Murat's cavalry entered the city on the 12th of May, after somewhat severe resistance lasting three days. Mean- while the archduke and Hiller, both now unmolested, effected their junction in the vicinity of Wagram, picketing the whole line of the Danube with their outposts and collecting all the boats.

32. Aspern and Wagram. — The reconnaissance of the river was at once taken in hand by the French upon their arrival in Vienna, and a point opposite the island of Lobau selected for the crossing. Thanks to the Austrian precautions it took four days to collect the necessary material to span the main branch of the river, here some 2000 yds. across, and though Napoleon personally spurred on all to activity nearly four days more were required for its construction. It was not till the night of the 19th of May that orders for the passage were finally issued, and during the night the troops commenced to occupy the island of Lobau. Surprise, of course, was out of the question, but the Austrians did not attempt to dispute the passage, their object being to allow as many French as they felt they could deal with to pass over and then to fall on them. Thus on the 21st of May the battle of Aspern (q.v.) or Essling began. It ended on the night of the 22nd with the complete defeat of Napoleon, the first ever inflicted upon him. The French retreated into the island of Lobau. By nightfall upwards of 100,000 men, en- cumbered with at least 20,000 wounded, were crowded together on the little island scarcely a mile square, short of provisions and entirely destitute of course of all hospital accessories. The question then arose whether the retreat was to be continued across the main stream or not, and for the second time in his career Napoleon assembled his generals to take their opinion. They counselled retreat, but having heard them all he replied, in substance: " If we leave here at all we may as well retire to Strassburg, for unless

the enemy is held by the threat of further operations he will be free to strike at our communications and has a shorter distance to go. We must remain here and renew operations as soon as possible."

Immediate orders were despatched to summon every available body of troops to concentrate for the decisive stroke. Practically the lines of communication along the Danube were denuded- of combatants, even Bernadotte being called up from Passau, and the viceroy of Italy, who driving the archduke Johann before him (action of Raab) had brought up 56,000 men through Tirol, was disposed towards Pressburg within easy call. The arsenal of Vienna was ransacked for guns, stores and appliances, and preparations in the island pushed on as fast as possible. By the end of June 200,000 troops were stationed within call, and on the 4th July the French began to cross over to the left bank of the Danube. The events which followed are described under Wagram. The great battle at this place, fought on the 5th and 6th of July, ended in the retirement of the Austrians. The only other event which occurred before peace was made was an unimportant action at Znaym on the nth of July.

33. The Russian War of 1812. — Whilst the campaign of 1809 had seriously shaken the faith of the marshals and the higher ranks in the infallibility of the emperor's judgment, and the slaughter of the troops at Aspern and Wagram had still further accentuated the opposition of the French people to conscription, the result on the fighting discipline of the army had, on the whole, been for good. The panics of Wagram had taught men and officers alike a salutary lesson.

Aware of the growing feeling against war in France, Napoleon had determined to make his allies not only bear the expenses of the coming campaign, but find the men as well, and he was so far master of Europe that of the 363,000 who on the 24th of June crossed the Niemen no less than two-thirds were Germans, Austrians, Poles or Italians. But though the battlefield discipline of the men was better, the discipline in camp and on the march was worse, for the troops were no longer eager to reach the

battlefield, and marched because they were compelled, not of their own goodwill. The result was apparent in a sudden diminution in mobility, and a general want of punctuality which in the event very seriously influenced the course of the campaign. On the other hand, the Russians, once their father- land was invaded, became dominated by an ever-growing spirit of fanaticism, and they were by nature too obedient to their natural leaders, and too well inured to the hardships of cam- paigning, to lose their courage in a retreat.

34. The Strategic Deployment. — By the middle of June 181 2 the emperor had assembled his army along the line of the Niemen. On the extreme right stood the Austrian contingent under Schwarzenberg (34,000 men). Next, centring about Warsaw, a group of three corps (19,000 men) under the chief command of Napoleon's brother Jerome. Then the main army under Napoleon in person (220,000 men; with 80,000 more under the viceroy of Italy on his right rear); and on the extreme left at Tilsit a flanking corps, comprising the Prussian auxiliary corps and other Germans (in all 40,000 strong). The whole army was particularly strong in cavalry; out of the 450,000, 80,000 belonged to that arm, and Napoleon, mindful of the lessons of 1807, had issued the most minute and detailed orders for the supply service in all its branches, and the forwarding of reinforce- ments, no less than 100,000 men being destined for that purpose in due course of time.

Information about the Russians was very indifferent; it was only known that Prince Bagration with about 33,000 men lay grouped about Wolkowysk; Barclay de Tolly with 40,000 about Vilna; and on the Austrian frontier lay a small corps under Tormassov in process of formation, while far away on the Turkish frontiers hostilities with the sultan retained Tschitschagov with 50,000 more. Of the enemy's plans Napoleon knew nothing, but, in accordance with his usual practice, the position he had selected met all immediate possible moves.

35. Opening of the Campaign. — On the 24th of June the passage of the Niemen began in torrid heat which lasted for a few days. The main army, with the emperor in person, covered by Murat and the cavalry, moved on Vilna, whilst Jerome on his right rear at once threatened Bagration and covered the emperor's outer flank. From the very first, however, the inherent weakness of the vast army, and the vicious choice of time for the beginning of the advance, began to make itself felt. The crops being still green, and nothing else available as forage for the horses, an epidemic of colic broke out amongst them, and in ten days the mounted arms had lost upwards of one-third of their strength; men died of sunstroke in numbers, and serious straggling began. Still everything pointed to the concentration of the Russians at Vilna, and Jerome, who on the 5th of July had reached Grodno, was ordered to push on. But Jerome proved quite inadequate to his position, listening to the complaints of his subordinates as to want of supplies and even of pay; he spent four whole days in absolute inertia, notwithstanding the emperor's reprimands. Meanwhile the Russians made good their retreat — Barclay to- wards the entrenched camp of Drissa on the Dvina, Bagration towards Mohilev.

The emperor's first great coup thus failed. Jerome was replaced by Davout, and the army resumed its march, this time in the hope of surrounding and overwhelming Barclay, whilst Davout dealt with Bagration. The want of mobility, particularly in the cavalry, now began to tell against the French. With horses only just recovering from an epidemic, they proved quite unequal to the task of catching the Cossacks, who swarmed round them in every direction, never accepting an engagement but compelling a constant watchfulness for which nothing in their previous experience had sufficiently prepared the French.

Before their advance, however, the Russian armies steadily retired, Barclay from Vilna via Drissa to Vitebsk, Bagration from Wolkowysk to Mohilev. Again arrangments were made for a Napoleonic battle; behind Murat's cavalry . came the " general advanced guard " to attack and hold the enemy, whilst the main body and Davout were held available to swing in on his rear. Napoleon, however, failed to allow for the psychology

of his opponents, who, utterly indifferent to the sacrifice of life, refused to be drawn into engagements to support an advance or to extricate a rearguard, and steadily withdrew from every position when the French gained touch with them.

Thus the manoeuvre against Vitebsk again miscarried, and Napoleon found himself in a far worse position, numerically and materially, than at the outset of the campaign. Then he had stood with 420,000 men on a front of 160 m., now he had only 229,000 men on a front of 135; he had missed three great opportunities of destroying hi? enemy in detail, and in five weeks, during which time he had only traversed 200 m., he had seen his troops reduced numerically at least one-third, and, worse still, his army was now far from being the fighting machine it had been at the outset.

36. Smolensk. — Meanwhile the Russians had not lost a single gun and the moral of their men had been improved by the result of the many minor encounters with the enemy; further, the

and then began a series of rearguard actions and nocturnal retreats which completely accomplished their purpose of wearing down the French army. The Russian government, however, failed to see the

matter in its true light, and Marshal Kutusov was sent to the front to assume the chief command. His inten- tion was to occupy a strong position and fight one general action for the possession of Moscow, and to this end he selected the line of the Kalatscha where the stream intersects the great Moscow road. 37. Borodino. — Here»he was overtaken by Murat and Ney, but the French columns had straggled so badly that four whole days elapsed before the emperor was able to concentrate his army for battle and then could only oppose 128,000 men to the Russians' 110,000. About 6 a.m. the battle began, but Napoleon was suffering from one of those attacks of illness and depression which henceforth became such an important factor in his fate. Till about midday he followed the course of the action with his usual alertness; then he appears to have been overcome by a

junction of Bagration and Barclay was now assured in the vicinity of Smolensk. Towards this place the French advance was now resumed, and the Russian generals at the head of a united force of 130,000 men marched forward to meet them. Here, however, the inefficiency of the Russian staff actually saved them from the disaster which must certainly have overtaken them had they realized their intention of fighting the French. The Russians marched in two columns, which lost touch of one another, and as it was quite impossible for either to engage the French single- handed, they both retired again towards Smolensk, where with an advanced guard in the town itself — which possessed an old- fashioned brick enceinte not to be breached by field artillery alone — the two columns reunited and deployed for action behind the unfordable Dnieper.

Murat and Ney as " general advanced guard " attacked the town in the morning of the 16th of August, and whilst they fought the main body was swung round to attack the Russian left and rear. The whole of the 1 7th was required to complete the movement, and as soon as its purpose was sufficiently revealed to the Russians the latter determined to retreat under cover of night. Their manoeuvre was carried out with complete success,

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kind of stupor and allowed his marshals to fight by themselves. There was no final decisive effort as at Wagram and the Guard was not even called on to move. Ultimately the sun went down on an undecided field on which 25,000 French and 38,000 Russians had fallen, but the moral reaction on the former was far greater than on the latter.

38. Moscow. — Kutusov continued his retreat, and Murat with his

now exhausted horsemen followed as best he might. Sebastiani, commanding the advanced guard, overtook the Russians in the act of evacuating Moscow, and agreed with the latter to observe a seven hours' armistice to allow the Russians to clear the town, for experience had shown the French that street fighting in wooden Russian townships always meant fire and the consequent destruction of much-needed shelter and provisions. Towards nightfall Napoleon reached the scene, and the Russians being now clear the troops began to enter, but already fires were observed in the farther part of the city. Napoleon passed the night in a house in the western suburb and next morning rode to the Kremlin, the troops moving to the quarters assigned to them, but in the afternoon a great fire began and, continuing for two days, drove the French out into the country again.

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The emperor was now in the direst perplexity. Kutusov was hovering on the outskirts of the city, his main body at Kaluga, some marches to the S.W., where he was in full communication with the richest portion of the empire; and now news arrived that St. Cyr, who had relieved Macdonald on his extreme left, had only 17,000 men left under arms against upwards of 40,000 Russians under Witgenstein; and to the south Tschitschagov's army, being no longer detained on the Turkish frontier, peace having been made, was marching to £>in Tormassov about Brest-Litewski with forces which would bring the total of the two well over 100,000 men. Meanwhile Schwarzenberg's force opposing these had dwindled to a bare 30,000.

The French army was thus disposed almost in an equilateral triangle with sides of about 570 m., with 95,000 men at the apex at Moscow opposed to 120,000, 30,000 about Brest opposite 100,000, and 17,000 about Drissa confronted by 40,000, whilst in the centre of the base at Smolensk lay Victor's corps, about 30,000. From Moscow to the Niemen was 550 m. In view of this situation Napoleon on the 4th of October sent General Lauriston to the Russian headquarters to treat. Whilst waiting his return Murat was enjoined to skirmish with Kutusov, and the emperor himself worked out a scheme to assume the offensive with his whole army towards St Petersburg, calling in Victor and St Cyr on the way. This project was persisted with, until on the 1 8th Murat was himself attacked and severely handled (action of Tarutino or Vinkovo). On the morning of the 19th the whole army moved out to accept this challenge, and the French were thoroughly worsted on the 24th in the battle of Maloyaroslavetz. 39. The Retreat

from Moscow. — Then began the celebrated retreat. It has generally been forgotten that the utter want of march discipline in the French, and not the climatic condi- tions, was responsible for the appalling disasters which ensued. Actually the frost came later than usual that year, the 27 th of October, and the weather was dry and bracing; not till the 8th of November did the cold at night become sharp. Even when the Beresina was reached on the 26th November, the cold was far from severe, for the slow and sluggish stream was not frozen over, as is proved by the fact that Eble's pioneers worked in the water all through that terrible day. But the French army was already completely out of hand, and the degree to which the panic of a crowd can master even the strongest instinct of the individual is shown by the conduct of the fugitives who crowded over the bridges, treading hundreds under foot, whilst all the time the river was easily fordable and mounted men rode backwards and forwards across it.

To return to the actual sequence of events. Kutusov had been very slow in exploiting his success of the 24th and indeed had begun the pursuit in a false direction; but about the 2nd of November, headquarters of the French being at Vyazma, the Cossacks became so threatening that the emperor ordered the army to march (as in Egypt) in hollow square. This order, however, appears only to have been obeyed by the Guards, with whom henceforward the emperor marched.

Kutusov had now overtaken the French, but fortunately for them he made no effort to close with them, but hung on their flank, molesting them with Cossacks and picking up stragglers. Thus the wreck of the Grande Amite, now not more than fifty thousand strong, reached Smolensk on the 9th and there rested till the 14th. The march was then resumed, the Guard leading and Ney commanding the rearguard. Near Krasnoi on the 16th the Russian advanced guard tried to head the column off. Napoleon halted a whole day to let the army close up; and then attacked with his old vigour and succeeded in clearing the road, but only at the cost of leaving Ney and the rearguard to its fate. By a night march of unexampled daring and difficulty Ney succeeded in breaking through the Russian cordon, but when he regained touch with the main body at Orcha only 800 of his 6000 men were still with him (21st).

40. The Beresina. — From here Napoleon despatched orders to Victor to join him at Borisov on the Beresina. The cold now gave way and thaw set in, leaving the country a morass, and information came that Tschitschagov from the south had reached

Borisov. He now selected Viesselovo as the point of passage and at 1 a.m. on the 23rd sent orders to Oudinot to march thither and construct bridges. In the execution of these orders Oudinot encountered the Russian advanced guard near Borisov and drove the latter back in confusion, though not before they had destroyed the existing bridge there. This sudden reassumption of the offensive threw Tschitschagov into confusion. Thus time was gained for Victor also to come up and for Oudinot to con- struct the bridges at Studienka near the above-mentioned place, but a spot in many respects better suited for the purpose. Thither therefore Napoleon sent his pontonniers under General Ebl6, but on their arrival they found that no preparations had been made and much time was lost. Meanwhile Victor, in doubt as to the real point of passage, had left the road to Studienka open to Wittgenstein, who had followed hard on his heels.

By 4 p.m. on the 26th the bridges were finished and the passage began, but not without resistance by the Russians, who were gradually closing in. The crossing continued all night, though interrupted from time to time by failures of the bridges. All day during the 27 th stragglers continued to cross, covered by such combatants as remained under sufficient discipline to be employed. At 8 a.m. on the 28th, however, Tschitschagov and Wittgenstein moved forward on both banks of the river to the attack, but were held off by, the splendid self-sacrifice of the few remaining troops under Ney, Oudinot and Victor, until about 1 p.m. the last body of regular troops passed over the bridges, and only a few thousand stragglers remained beyond the river.

The number of troops engaged by the French that day cannot be given exactly. Oudinot's and Victor's men were relatively fresh and may have totalled 20,000, whilst Ney can hardly have had more than 6000 of all corps fighting under him. How many were killed can never be known, but three days later the total number of men reported fit for duty had fallen to 8800 only.

41. Final Operations. — Henceforward the retreat of the army became practically a headlong flight, and on the 5th of December, having reached Smorgoni and seeing that nothing further could be done by him at the front, the emperor handed over the command of what remained to Murat, and left for Paris to organize a fresh army for the following year. Travelling at the fullest speed, he reached the Tuileries on the 18th, after a journey of 312 hours.

After the emperor's departure the cold set in with increased severity, the thermometer falling to 23 . On the 8th of December Murat reached

Vilna, whilst Ney with about 400 men and Wrede with 2000 Bavarians still formed the rearguard; but it was quite impossible to carry out Napoleon's instructions to go into winter quarters about the town, so that the retreat was resumed on the 10th and ultimately Konigsberg was attained on the 19th of December by Murat with 400 Guards and 600 Guard cavalry dismounted.

Meanwhile on the extreme French right Schwarzenberg and his Austrians had drifted away towards their own frontier, and the Prussian contingent, which under Yorck (see Yorck von Wartenburg) formed part of Macdonald's command about Riga, had entered into a convention with the Russians at Tauroggen (December 30) which deprived the French of their last support upon their left. Konigsberg thus became untenable, and Murat fell back to Posen, where on the 10th of January he handed over his command to Eugene Beauharnais and returned to Paris.

The Russian pursuit practically ceased at the line of the Niemen, for their troops also had suffered terrible hardships and a period of rest had become an absolute necessity.

42. The War of Liberation. — The Convention of Tauroggen became the starting-point of Prussia's regeneration. As the news of the destruction of the Grande Armie spread, and the appearance of countless stragglers convinced the Prussian people of the reality of the disaster, the spirit generated by years of French domination burst out. For the moment the king and his ministers were placed in a position of the greatest anxiety, for they knew the resources of France and the boundless versatility of their arch-enemy far too well to imagine that the end of their

sufferings was yet in sight. To disavow the acts and desires of the army and of the secret societies for defence with which all north Germany was honeycombed would be to imperil the very existence of the monarchy, whilst an attack on the wreck of the Grand Army meant the certainty of a terrible retribution from the new armies now rapidly forming on the Rhine.

But the Russians and the soldiers were resolved to continue the campaign, and working in collusion they put pressure on the not unwilling representatives of the civil power to facilitate the supply

and equipment of such troops as wene still in the field; they could not refuse food and shelter to their starving country- men or their loyal allies, and thus by degrees the French garrisons scattered about the country either found themselves surrounded or were compelled to retire to avoid that fate. Thus it happened that the viceroy of Italy felt himself compelled to depart from the positive injunctions of the emperor to hold on at all costs to his advanced position at Posen, where about 14,000 men had gradually rallied around him, and to withdraw step by step to Magdeburg, where he met reinforcements and commanded the whole course of the lower Elbe.

43. Napoleon's Preparations. — Meanwhile the emperor in Paris had been organizing a fresh army for the reconquest of Prussia. Thanks to his having compelled his allies to fight his battles for him, he had not as yet drawn very heavily on the fighting resources of France, the actual percentage of men taken by the conscriptions during the years since 1806 being actually lower than that in force in continental armies of to-day. He had also created in 1811-1812 a new National Guard, organized in " cohorts " to distinguish it from the regular army, and for home defence only, and these by a skilful appeal to their patriotism and judicious pressure applied through the prefects, became a useful reservoir of half-trained men for new battalions of the active army. Levies were also made with rigorous severity

• in the states of the Rhine Confederation, and even Italy was called on for fresh sacrifices. In this manner by the end of March upwards of 200,000 men were moving towards the Elbe, 1 and in the first fortnight of April they were duly concentrated in the angle formed by the Elbe and Saale, threatening on the one hand Berlin, on the other Dresden and the east.

44. Spring Campaign of 181 3. — The allies, aware of the gradual strengthening of their enemy's forces but themselves as yet unable to put more than 200,000 in the field, had left a small corps of observation opposite Magdeburg and along the Elbe to give timely notice of an advance towards Berlin; and with the bulk of their forces had taken up a position about Dresden, whence they had determined to march down the course of the Elbe and roll up the French from right to left. Both armies were very indifferently supplied with information, as both were without any reliable regular cavalry capable of piercing the screen of outposts with which each endeavoured to conceal his disposition, and Napoleon, operating in a most unfriendly country, suffered more in this respect than his adversaries.

On the 25th of April Napoleon reached Erfurt and assumed the chief

command. On this day his troops stood in the following positions. Eugene, with Lauriston's, Macdonald's and Regnier's corps, on the lower Saale, Ney in front of Weimar, holding the defile of Kosen; the Guard at Erfurt, Marmont at Gotha, Bertrand at Saalfeld, and Oudinot at Coburg, and during the next few days the whole were set in motion towards Merseburg and Leipzig, in the now stereotyped Napoleonic order, a strong advanced guard of all arms leading, the remainder — about two- thirds of the whole — following as " masse de manoeuvre," this time, owing to the cover afforded by the Elbe on the left, to the right rear of the advanced guard.

Meanwhile the Russians and Prussians had concentrated all available men and were moving on an almost parallel line, but somewhat to the south of the direction taken by the French. On the 1st of May Napoleon and the advanced guard entered Liitzen. Wittgenstein, who now commanded the allies in place of Kutusov, hearing of his approach, had decided to attack

1 Napoleon always gave them out as 300,000, but this number was never attained.

the French advanced guard, which he took to be their whole force, on its right flank, and during the morning had drawn together the bulk of his forces on his right in the vicinity of Gross- Gorschen and Kaya.

45. Battle of Liitzen. — About 9 a.m. on May 2nd he began an attack on the French advance guard in Liitzen, whilst the remainder of his army was directed against Napoleon's right and rear. Just as the latter were moving off the heads of the French main body suddenly appeared, and at n a.m. Napoleon, then standing near the Gustavus Adolphus monument on the field of Liitzen, heard the roar of a heavy cannonade to his right rear. He realized the situation in a moment, galloped to the new scene of action, and at once grouped his forces for decisive action — the gift in which he was supreme. Leaving the leading troops to repulse as best they might the furious attack of both Russians and Prussians, and caring little whether they lost ground, he rapidly organized for his own control a battle-reserve. At length when both sides were exhausted by their efforts he sent forward nearly a hundred guns which tore asunder by their case-shot fire the enemy's line and marched his reserve right through the gap. Had he possessed an adequate cavalry force the victory would have been decisive. As it was, the allies made good their retreat and the French were too exhausted for infantry pursuit.

Perhaps no battle better exemplifies the inherent strength of the

emperor's strategy, and in none was his grasp of the battlefield more brilliantly displayed, for, as he fully recognized, " These Prussians have at last learnt something — they are no longer the wooden toys of Frederick the Great," and, on the other hand, the relative inferiority of his own men as compared with his veterans of Austerlitz called for far more individual effort than on any previous day. He was everywhere, encouraging and compelling his men— it is a legend in the French army that the persuasion even of the imperial boot was used upon some of his reluctant conscripts, and in the result his system was fully justified, as it triumphed even against a great tactical surprise.

46. Bautzen. — As soon as possible the army pressed on in pursuit, Ney being sent across the Elbe to turn the position of the allies at Dresden. This threat forced the latter to evacuate the town and retire over the Elbe, after blowing up the stone bridge across the river. Napoleon entered the town hard on their heels, but the broken bridge caused a delay of four days, there being no pontoon trains with the army. Ultimately on the 18th of May the march was renewed, but the allies had continued their retreat in leisurely fashion, picking up reinforcements by the way. Arrived at the line of the Spree, they took up and fortified a very formid- able position about Bautzen (q.v.). Here, on the 20th, they were attacked, and after a two days' battle dislodged by Napoleon; but the weakness of the French cavalry conditioned both the form of the attack, which was less effective than usual, and the results of the victory, which were extremely meagre.

The allies broke off the action at their own time and retired in such good order that the emperor failed to capture a single trophy as proof of his victory. The enemy's escape annoyed him greatly, the absence of captured guns and prisoners reminded him too much of his Russian experiences, and he redoubled his demands on his corps commanders for greater vigour in the pursuit. This led the latter to push on without due regard to tactical precautions, and Blucher took advantage of their carelessness when at Haynau (May 26), with some twenty squadrons of Landwehr cavalry, he surprised, rode over and almost destroyed Maison's division. The material loss inflicted on the French was not very great, but its effect in Raising the moral of the raw Prussian cavalry and increasing their con- fidence in their old commander was enormous.

Still the allies continued their retreat and the French were unable to bring them to action. In view of the doubtful attitude of Austria, Napoleon became alarmed at the gradual lengthening of his lines of communication and opened negotiations. The enemy, having everything to gain and nothing to lose thereby, agreed finally to a six

weeks' suspension of arms. This was perhaps the gravest military error of Napoleon's whole career,

and his excuse for it, " want of adequate cavalry," is the strongest testimony as to the value of that arm.

47. The Autumn Campaign. — As soon as a suspension of arms (to 15th of August) had been agreed to, Napoleon hastened to withdraw his troops from the dangerous position they occupied with reference to the passes leading over the mountains from Bohemia, for he entertained no doubt now that Austria was also to be considered as an enemy. Finally he decided to group his corps round Gorlitz and Bautzen whence they could either meet the enemy advancing from Breslau or fall on his flank over the mountains if they attempted to force their way into Saxony by the valley of the Elbe. This latter manoeuvre depended, however, on his maintenance of/ Dresden, and to this end he sent the I. Corps up the Elbe to Pirna and Konigstein to cover the fortifications of Dresden itself. His instructions on this point deserve the closest study, for he foresaw the inevitable attraction which a complete entrenched camp would exercise even upon himself, and, therefore, limited his engineers to the construction of a strong bridge head on the right bank and a continuous enceinte, broken only by gaps for counter attack, around the town itself.

Then he turned his attention to the plan for the coming campaign. Seeing clearly that his want of an efficient cavalry precluded all ideas of a resolute offensive in his old style, he determined to limit himself to a defence of the line of the Elbe, making only dashes of a few days' duration at any target the enemy might present.

Reinforcements had been coming up without ceasing and at the beginning of August he calculated that he would have 300,000 men available about Bautzen and 100,000 along the Elbe from Hamburg via Magdeburg to Torgau. With the latter he determined to strike the first blow, by a concentric advance on Berlin (which he calculated he would reach on the 4th or 5th day), the movement being continued thence to extricate the French garrisons in Kiistrin, Stettin and

Danzig. The moral effect, he promised himself, would be prodigious, and there was neither room nor food for these 100,000 elsewhere.

Towards the close of the armistice he learned the general situation of

the allies. The crown prince of Sweden (Bernadotte), with his Swedes and various Prussian levies, 135,000 in all, lay in and around Berlin and Stettin; and knowing his former marshal well, Napoleon considered Oudinot a match for him. Bliicher with about 95,000 Russians and Prussians was about Breslau, and Schwarzenberg, with nearly 180,000 Austrians and Russians, lay in Bohemia. In his position at Bautzen he felt himself equal to all his enemy's combinations.

48. Dresden. — The advance towards Berlin began punctually with the expiration of the armistice, but with the main army he himself waited to see more clearly his adversaries' plans. At length becoming impatient he advanced a portion of his army towards Bliicher, who fell back to draw him into a trap. Then the news reached him that Schwarzenberg was pressing down the valley of the Elbe, and, leaving Macdonald to observe Bliicher, he hurried back to Bautzen to dispose his troops to cross the Bohemian mountains in the general direction of Konigstein, a blow which must have had decisive results. But the news from Dresden was so alarming that at the last moment he changed his mind, and sending Vandamme alone over the mountains, he hurried with his whole army to the threatened point. This march remains one of the most extraordinary in history, for the bulk of his forces moved, mainly in mass and across country, 90 m. in 72 hours, entering Dresden on the morning of the 27th, only a few hours before the attack of the allies commenced. For the events which followed see Dresden {battle).

Dresden was the last great victory of the First Empire. By noon on the 27th August the Austrians and Russians were completely beaten and in full retreat, the French pressing hard behind them, but meanwhile Napoleon himself again succumbed

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to one of his unaccountable attacks of apparent intellectual paralysis. He seemed unaware of the vital importance of the moment, crouched shivering over a bivouac fire, and finally rode back to Dresden, leaving no specific orders for the further pursuit. 49. French Defeats. — The allies, however, continued to retreat, but unfortunately

Vandamme, with his single corps and un- supported, issued out of the mountains on their flank, threw himself across their line of retreat near Kulm, and was completely overwhelmed by sheer weight of numbers (29th). In spite of this misfortune, Napoleon could claim a brilliant success for himself, but almost at the same moment news reached him that Oudinot at Grossbeeren near Berlin, and Macdonald on the Katzbach opposed to Bliicher, had both been severely defeated. ‘ 50. Napoleon’s Movements. — During the next two days the emperor examined his situation and dictated a series of notes which have been a puzzle to every strategical thinker ever since. In these he seems suddenly to have cut adrift from every principle the truth of which he had himself so brilliantly demonstrated, and we find him discussing plans based on hypothesis, not knowledge, and on the importance of geographical points without reference to the enemy’s field army. From these reveries he was at length awakened by news which indicated that the con- sequences of Macdonald’s defeat had been far more serious to the moral of that command than he had imagined. He immedi- ately rode over to establish order, and his manner and violence were so improper that Caulaincourt had the greatest difficulty in concealing the scandal. Bliicher, however, hearing of his arrival, at once retreated and the emperor followed, thus uncovering the passes over the Bohemian mountains, a fact of which Schwarzenberg was quick to take advantage. Learning of his approach, Napoleon again withdrew to Bautzen. Then hearing that the Austrians had counter-marched and were again moving towards Dresden, he hastened back there, concentrated as many men as could conveniently be handled, and advanced beyond Pirna and Konigstein to meet him. But the Austrians had no intention of attacking him, for time was now working on their side and, leaving his men to starve in the exhausted district, the emperor again returned to Dresden, where for the rest of the month he remained in an extraordinary state of vacillation. On the 4th of October he again drew up a review of the situation, in which he apparently contemplated giving up his communications with France and wintering in and around Dresden, though at the same time he is aware of the distress amongst his men for want of food.

51. Campaign of Leipzig. — In the meanwhile Bliicher, Schwarzenberg and Bernadotte were working round bis flanks. Ney, who had joined Oudinot after Grossbeeren, had been defeated at Dennewitz (6th Sept.), the victory, won by Prussian troops solely, giving the greatest encouragement to the enemy. Suddenly Napoleon’s plans are again reviewed and completely changed. Calling up St Cyr, whom he had ˆdready warned to remain at Dresden with his command, he

decides to fall back towards Erfurt, and go into winter quarters between that place and Magdeburg, pointing out that Dresden was of no use to him as a base and that if he does have a battle, he had much better have St Cyr and his men with him than at Dresden. He then on the 7th of October drew up a final plan, in which one again recognizes the old commander, and this he immediately proceeded to put into execution, for he was now quite aware of the danger threatening his line of retreat from both Bliicher and Schwarzen- berg and the North Army; yet only a few hours afterwards the portion of the order relating to St Cyr and Lobau was cancelled and the two were finally left behind at Dresden. From the 10th to the 13th Napoleon lay at Diiben, again a prey to the most extraordinary irresolution, but on that day he thought he saw his opportunity. Bliicher was reported near Wittenberg, and Schwarzenberg was moving slowly round to the south of Leipzig. The North Army under Bernadotte, unknown to Napoleon, lay on Blucher's left around Halle. The emperor decided to throw the bulk of his force on Bliicher, and, having routed him, turn south on Schwarzenberg and sever his com- munications with Bohemia. His concentration was effected

with his usual sureness and celerity, but whilst the French moved on Wittenberg, Bliicher was marching to his right, indifferent to his communications as all Prussia lay behind him.

This move on the 14th brought him into touch with Bernadotte, and now a single march forward of all three armies would have absolutely isolated Napoleon from France; but Bernadotte 's nerve failed him, for on hearing of Napoleon's threat against Wittenberg he decided to retreat northward, and not all the persuasions of Bliicher and Gneisenau could move him. Thus if the French movement momentarily ended in a blow in the air, it was indirectly the cause of their ultimate salvation.

52. The " Battle of the Nations." — On the 15th Napoleon con- centrated his forces to the east of Leipzig, with only a weak detachment to the west, and in the evening the allies were prepared to attack him. Schwarzenberg, with 180,000 men available at once and 60,000 on the following day; Bliicher had about 60,000, but Bernadotte now could not arrive before the 18th.

Napoleon prepared to throw the bulk of his force upon Schwar- zenberg and massed his troops south-east of the town, whilst Schwarzenberg marched concentrically against him down the valley of the Elster and Pleisse, the mass of his troops on the right bank of the latter and a strong column under Giulay on the left working round to

join Bliicher on the north. The fighting which followed was most obstinate, but the Austrians failed to make any impression on the French positions, and indeed Giulay felt himself compelled to withdraw to his former position. On the other hand, Bliicher carried the village of Mockern and came within a mile of the gates of the town. During the 17th there was only indecisive skirmishing, Schwarzenberg waiting for his reinforcements coming up by the Dresden road, Bliicher for Bernadotte to come in on his left, and by some extraordinary oversight Giulay was brought closer in to the Austrian centre, thus opening for the French their line of retreat towards Erfurt, and no imformation of this move- ment appears to have been conveyed to Bliicher. The emperor when he became aware of the movement, sent the IVth Corps to Lindenau to keep the road open.

On the 1 8th the fighting was resumed and by about noon Bernadotte came up arid closed the gap to the N.E. of the town between Bliicher and the Austrians. At 2 p.m. the Saxons, who had remained faithful to Napoleon longer than his other German allies, went over to the enemy. All hope of saving the battle had now to be given up, but the French covered their retreat obstinately and by daybreak next morning one-half of the army was already filing out along the road to Erfurt which had so fortunately been left for them.

53. Retreat of the French and Battle of Hanau.— It took Bliicher time to extricate his troops from the confusion into which the battle had thrown them, and the garrison of Leipzig and the troops left on the right bank of the Elster still resisted obstinately — hence no direct pursuit could be initiated and the French, still upwards of 100,000 strong, marching rapidly, soon gained distance enough to be reformed. Bliicher followed by parallel and inferior roads on their northern flank, but Schwarzenberg knowing that the Bavarians also had forsaken the emperor and were marching under Wrede, 50,000 strong, to intercept his retreat, followed in a most leisurely fashion. Bliicher did not succeed in overtaking the French, but the latter, near Hanau, found their way barred by Wrede with 50,000 men and over 100 guns in a strong position.

To this fresh emergency Napoleon and his army responded in most brilliant fashion. As at Krasnoi in 181 2, they went straight for their enemy and after one of the most brilliant series of artillery movements in history, directed by General Drouot, they marched right over their enemy, practically destroying his whole force. Henceforward their march was unmolested, and they reached Mainz oh the 5th of November.

54. The Defensive Campaign. — When the last of the French troops had crossed to the western bank of the Rhine, divided counsels made their appearance at the headquarters of the allies. Every one was weary of the war, and many felt that it would be unwise to push Napoleon and the French nation to extremes.

Hence a prolonged halt arose, utilized by the troops in renewing their equipment and so forth, but ultimately the Young German party, led by Bliicher and the principal fighting men of the army, triumphed, and on the ist of January 1814 the Silesian army (50,000) began its passage of the Rhine at Kaub. They were to be supported by Schwarzenberg with 200,000 men, who was to advance by Basel and Neu Breisach to the south, and Bernadotte with the Northern army, about 1 20,000, was to move in support on the right flank through the Netherlands and Laon; this force was not yet ready and did not, in fact, reach the latter place till March.

To meet these forces the emperor could not collect 200,000 men in all, of whom upwards of 100,000 were held by Wellington on the Spanish frontier, and 20,000 more were required to watch the debouches from the Alps. Hence less than 80,000 remained available for the east and north-eastern frontier. If, however, he was weak in-numbers, he was now again operating in a friendly country, able to find food almost everywhere and practically indifferent as to his communications.

On the 25th of January, Bliicher entered Nancy, and, moving rapidly up the valley of the Moselle, was in com- munication with the Austrian advanced guard near La Rothiere on the afternoon of the 28th. Here his head- quarters were surprised and he himself nearly captured by a sudden rush of French troops, and he learnt at the same time that the emperor in person was at hand. He accordingly fell back a few miles next morning to a strong position covering the exits from the Bar-sur-Aube defile. There he was joined by the Austrian advance guard, and together they decided to ac- cept battle — indeed they had no alternative, as the roads in rear were so choked with

traffic that retreat was out of the question. About noon the 2nd of February Napoleon attacked them; but the weather was terrible, and the ground so heavy that his favourite artillery, the mainstay of his whole system of warfare, was useless and in the drifts of snow which

at intervals swept across the field, the columns lost their direction and many were severely handled by the Cossacks. At nightfall the fighting ceased and the emperor retired to Lesmont, and thence to Troyes, Marmont being left to observe the enemy.

55. Montmirail. — Owing to the state of the roads, more perhaps to the extraordinary lethargy which always characterized Schwarzenberg's headquarters, no pursuit was attempted. But on the 4th of -February Bliicher, chafing at this inaction, obtained the permission of his own sovereign to transfer his line of operations to the valley of the Marne; Pahlen's corps of Cossacks were assigned to him to cover his left and maintain communication with the Austrians.

Believing himself secure behind this screen, he advanced from Vitry along the roads leading down the valley of the Marne, with his columns widely separated for convenience of subsistence and shelter — the latter being almost essential in the terrible weather prevailing. Bliicher himself on the night of the 7th was at Sezanne, on the exposed flank so as to be nearer to his sources of intelligence, and the rest of his army were distributed in four small corps at or near fipernay, Montmirail and fitoges; reinforcements also were on their way to join him and were then about Vitry.

In the night his headquarters were again surprised, and he learnt that Napoleon himself with his main body was in full march to fall on his scattered detachments. At the same time he heard that Pahlen's Cossacks had been withdrawn forty-eight hours previously, thus completely exposing his flank. He himself retreated towards fitoges endeavouring to rally his scattered detachments, but Napoleon was too quick for him and in three successive days he defeated Sacken at Montmirail, York at Champ Aubert and Bliicher and his main body at fitoges, pursuing the latter towards Vertus. These disasters compelled the retreat of the whole Silesian army, and Napoleon, leaving Mortier and Marmont to deal with them, hurried back to Troyes with his main body to strike the flank of Schwarzenberg's army, which had meanwhile begun its leisurely advance, and again at Mormant on the 17th of February, Montereau the 18th and Mery the 21st, he inflicted such heavy punishment upon his adversaries that they fell back precipitately to Bar-sur-Aube.

Emery Walker sc

56. Laon. — In the meantime Bliicher had rallied his scattered forces and was driving Marmont and Mortier before him. Napoleon, as soon as he had disembarrassed himself of Schwarzen- berg, counter-

marched his main body and moving again by Sezanne, fell upon Bliicher's left and drove him back upon Soissons. This place had been held by a French garrison, but had capitulated only twenty-four hours beforehand, a fact of which Napoleon was naturally unaware. The Silesian army was thus able to escape, and marching northwards combined with Bernadotte at Laon — this reinforcement bringing the forces at Bliicher's disposal up to over 100,000 men.

On the 7th of March Napoleon fell upon the advance guard of this force at Craonne and drove it back upon Laon, where a battle took place on the 9th. Napoleon was here defeated, and with only 30,000 men at his back he was compelled to renounce all ideas of a further offensive, and he retired to rest his troops to Reims. Here he remained unmolested for a few days, for Bliicher was struck down by sickness, and in his absence nothing was done. On the 14th of March, however, Schwarzenberg, becoming aware of Napoleon's withdrawal to Reims, again began his advance and had reached Arcis-sur-Aube when the news of Napoleon's approach again induced him to retreat to Brienne.

57. The Allies March on Paris.— Thus after six weeks' fighting the allies were hardly more advanced than at the beginning. Now, however, they began to realize the weakness of their opponent, and perhaps actuated by the fear that Wellington from Toulouse might, after all, reach Paris first, they determined

to march to Paris (then an open city), and let Napoleon do his worst to their communications. Actually this was exactly what he was preparing to do. He had determined to move eastward to St Dizier, rally what garrisons he could find, and raise the whole country against the invaders, and had actually started on the execution of this plan when his instructions fell into the enemy's hands and his projects were exposed. Regardless of the threat, the allies marched straight for the capital. Marmont and Mortier with what troops they could rally took up a position on Montmartre heights to oppose them, but seeing further resistance to be hopeless they gave way on the 31st of March, just as Napoleon, with the wreck of the Guards and a mere handful of other detachments, was hurrying across the rear of the Austrians towards Fontainebleau to join them.

This was the end of the First Empire. The story of the Water- loo Campaign is told under its own heading.

The Military Character of Napoleon.

No military career has been examined more often and more freely than that of Napoleon. Yet even so the want of complete documentary evidence upon which to base conclusions has vitiated all but the most recent of the countless monographs and histories that have appeared on the subject. Fortunately the industry and ability of the military history section of the French General Staff have rendered available, by the publica- tion of the original orders issued during the course of his campaigns, a mass of information which, taken in conjunction with his own voluminous correspondence, renders it possible to trace the growth of his military genius with a reasonable approach to accuracy. Formerly we could only watch the evolution of his powers of organization and the purely psychic gifts of resolution and command. The actual working of his mind towards that strategic and tactical ascendancy that rendered his presence on the battlefield, according to the testi- mony of his opponents, equal to a reinforcement of 40,000 men, was entirely undiscernible.

The history of his youth reveals no special predilection for the military service — the bent of his mind was political far more than military, but unlike the politicians of his epoch he con- sistently applied scientific and mathematical methods to his theories, and desired above all things a knowledge of facts in their true relation to one another. His early military education was the best and most practical then attainable, primarily because he had the good fortune to come under the influence of men of exceptional ability — Baron du Keile, Bois Roger and others. From them he derived a sound knowledge of artillery and fortification, and particularly of mountain warfare, which latter was destined to prove of inestimable service to him in his first campaigns of 1794-95 and 1796. In these, as well as in his most dramatic success of Marengo in 1800, we can discern no trace of strategical innovation. He was simply a master of the methods of his time. Ceaseless industry, energy and con- spicuous personal gallantry were the principal factors of his brilliant victories, and even in 1805 at Ulm and Austerlitz it was still the excellence of the tactical instrument, the army, which the Revolution had bequeathed to him that essentially produced the results.

Meanwhile the mathematical mind, with its craving for accurate data on which to found its plans (the most difficult of all to obtain under the conditions of warfare), had been searching for ex- pedients which might serve him to better purpose, and in 1805 he had recourse to the cavalry screen in the hope of such results. This proved a palliation of his difficulty, but not a solution. Cavalry can only observe, it cannot

hold. The facts as to the position of an opponent accurately observed and correctly re- ported at a given moment, afford no reliable guarantee of his position 48 hours later, when the orders based on this information enter upon execution. This can only be calculated on the ground of reasonable probability as to what it may be to the best interest of the adversary to attempt. But what may seem to a Napoleon the best course is not necessarily the one that suggests itself to a mediocre mind, and the greater the gulf which separates

the two minds the greater the uncertainty which must prevail on the side of the abler commander.

It was in 1806 that an improved solution was first devised. The general advanced guard of all arms now followed immediately behind the cavalry screen and held the enemy in position, while the remainder of the army followed at a day's march in a " bataillon carree " ready to manoeuvre in any required direc- tion. The full reach of this discovery seems as yet scarcely to have impressed itself upon the emperor with complete con- viction, for in the succeeding campaign in Poland we find that he twice departed from this form — at Pultusk and Heilsberg — and each time his enemy succeeded in escaping him. At Fried- land, however, his success was complete, and henceforth the method recurs on practically every battlefield. When it fails it is because its inventor himself hesitates to push his own concep- tion to its full development (Eckmuhl 1809, Borodino 1812). Yet it would seem that this invention of Napoleon's was intuitive rather than reasoned; he never communicated it in its entirety to his marshals, and seems to have been only capable of exercising it either when in full possession of his health or under the excite- ment of action. Thus we find him after the battle of Dresden— itself a splendid example of its efficacy — suddenly reverting to the terminology of the school in which he had been brought up, which he himself had destroyed, only to revive again in the next few days and handle his forces strategically with all his accustomed brilliancy.

In 1814 and in 1815 in the presence of the enemy he again rises supremely to each occasion, only to lapse in the intervals even below the level of his old opponents; and that this was not the consequence of temporary depression naturally resulting from the accumulated load of his misfortunes, is sufficiently shown by the downright puerility of the arguments by which he seeks to justify his own successes in the St Helena memoirs, which one may search in vain for any indication that Napoleon was himself aware of the magnitude of his own discovery. One is forced to the conclusion that there existed in Napoleon's brain a dual capacity — one the normal and reasoning

one, developing only the ideas and conceptions of his contemporaries, the other intuitive, and capable only of work under abnormal pressure. At such moments of crisis it almost excelled human comprehension; the mind seems to have gathered to itself and summed up the balance of all human passions arranged for and against him, and to have calculated with unerring exacti- tude the consequences of each decision.

A partial explanation of this phenomenon may perhaps be found in the economy of nervous energy his strategical method ensured to him. Marching always ready to fight wherever his enemy might stand or move to meet him, his mind was relieved from all the hesitations which necessarily arise in men less confident in the security of their designs. Hence, when on the battlefield the changing course of events left his antagonists mentally exhausted, he was able to face them with will power neither bound nor broken. But this only explains a portion of the mystery that surrounds him, and which will make the study of his career the most fascinating to the military student of all times.

Amongst all the great captains of history Cromwell alone can be compared to him. Both, in their powers of organization and the mastery of the tactical potentialities of the weapons of their day, were immeasurably ahead of their times, and both also understood to the full the strategic art of binding and restraining the independent will power of their opponents, an art of which Marlborough and Frederick, Wellington, Lee and Moltke do not seem ever even to have grasped the fringe.

(F.N.M.)

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Naval Operations

The French navy came under the direct and exclusive control of Napoleon after the 18th Brumaire. At the close of 1799 (see French Revolutionary Wars) he had three purposes to serve by the help of his fleet: the relief of the French garrison besieged by the British forces in Malta; the reinforcement of the army he had left in Egypt; and the distraction of Great Britain by the threat of invasion of England across the Channel, or of Ireland. The deficiencies both in number and in quality of his naval resources doomed him to fail in all three. Though he had control of what remained of the navies of Holland and Spain, as well as of the French, he was outnumbered at every point, while the efficiency of the British fleet gave it a mobility which doubled its material superiority. Ail Napoleon's efforts to sup- port his troops in Malta and Egypt were necessarily made under the hampering obligation to evade the British forces barring the road. The inevitable result was that only an occasional blockade- runner could succeed in escaping detection and attack. The relief thus brought to Malta and

Egypt was not sufficient. In February 1800, the ” Genereux ” (74), one of the few ships which escaped from the Nile, sailed from Toulon with three corvettes, under Rear-admiral Perree, to relieve Malta. On the 18th she was sighted by the blockading squadron, surrounded and captured. Three other survivors of the Nile were at anchor in Malta — the ” Guillaume Tell ” (80), and two frigates, the ” Diane ” and the ” Justice.” On the 29th of July the ” Guillaume Tell ” en- deavoured to slip out in the night. She was sighted, pursued and overpowered, after a singularly gallant resistance. The frigates made an attempt to get off on the 24th of August, but only the ” Justice,” a solitary survivor of the squadron which fought at the Nile, reached Toulon. Malta, starved out by the British fleet, surrendered on the 5th of September 1800. Very similar was the fate of the efforts to reach and reinforce the army of Egypt. The British squadrons either stopped the re- lieving forces at their point of departure, or baffled, when they did not take them, at their landfall. A squadron of seven sail of the line, under Admiral Ganteaume, succeeded in slipping out of Brest, when a gale had driven the British blockading force off the coast. Ganteaume met with some measure of success in capturing isolated British men-of-war, one of them being a 74, the ” Swiftsure.” But he failed to give effectual help to the Egyptian army. He sailed ov. the 23rd of January 1801, entered the Mediterranean and, his squadron being in .a bad condition, steered for Toulon, which he reached on the 18th of February. On the 19th of March he sailed again for Egypt, but was again driven back by the same causes on the 5th of April. On the 25th he was ordered out once more. Three of his ships had to be sent

back as unfit to keep the sea. With the other four he reached the coast of Egypt, on the 7th of May, only to sight a powerful British force, and to be compelled to escape to Toulon, which he did not reach till the 22nd of July. The French in Egypt were in fact beaten before he reached the coast. At the beginning of 1 801, a British naval force, commanded by Lord Keith, had sailed from Gibraltar, escorting an army of 18,000 men under General Abercromby. It reached Marmorice Bay, in Asia Minor, on the 31st of January, to arrange a co-operation with the Turks, and after some delay the army was transported and landed in Egypt, on the 7th and 8th of March. Before the end of September the French army was reduced to capitulate. In the interval another effort to carry help to it was made from Toulon. On the 13th of June 1801 Rear-admiral Linois left Toulon with three sail of the line, to join a Spanish squadron at Cadiz and go on to Egypt. In the straits he was sighted by the British squadron under Sir J. Saumarez, and driven to seek the protection of the Spanish batteries in Algeciras. On the 6th of July he beat off a British attack, capturing

the ” Hannibal,” 74. On the 9th a Spanish squadron came to his assistance, and the com- bined force steered for Cadiz. During the night of the I2th/i3th of July they were attacked by Sir J. Saumarez. Two Spanish three-deckers blew up, and a 74-gun ship was taken. The others were blockaded in Cadiz. The invasion scheme was vigorously pushed after the 3rd of March 1801. Flat-bottomed boats were gradually collected at Boulogne. Two attempts to destroy them at anchor, though directed by Nelson himself, were repulsed on the 4th and 16th of August. But the invasion was so far little more than a threat made for diplomatic purposes. On the 1st of October 1801 an armistice was signed in London, and the Peace of Amiens followed, on the 27th of March 1802. (For the operations in the Baltic in 1801, see Copenhagen, Battle oe.)

The Peace of Amiens proved to be only an uneasy truce, and it was succeeded by open war, on the 18th of May 1803. From that date till about the middle of August 1805, a space of some two years and two months, the war took the form of a most determined attempt on the part of Napoleon to carry out an invasion of Great Britain, met by the counter measures of the British government. The scheme of invasion was based on the Boulogne flotilla, a device inherited from the old French royal government, through the Republic. Its object was to throw a great army ashore on the coast between Dover and Hastings. The preparations were made on an unprecedented scale. The Republic had collected some two hundred and forty vessels. Under the direction of Napoleon ten times as many were equipped. They were divided into: frames, ship-rigged, of 35 metres long and 8 wide, carrying 1 2 guns ; chaloupes cannonieres, of 24 metres long and 5 wide, carrying 5 guns and brig- rigged; bateaux cannoniers, of 19 metres long by 1-56 wide, carrying 2 guns and mere boats. All were built to be rowed, were flat-bottomed, and of shallow draft so as to be able to navigate close to the shore, and tc take the ground without hurt. They were built in France and the Low Countries, in the coast towns and the rivers — even in Paris — and were collected gradually, shore batteries both fixed and mobile being largely employed to cover the passage. A vast sum of money and the labour of thousands of men were employed to clear harbours for them, at and near Boulogne. The shallow water on the coast made it impossible for the British)ine-of battle ships, or even large frigates, to press the attack on them home. Smaller vessels they were able to beat off and so, in spite of the activity of the British cruisers and of many sharp encounters, the concentration was effected at Boulogne, where an army of 130,000 was encamped and was incessantly practised in embarking and disembarking. Before the invasion was taken in hand as a serious

policy, there had been at least a pro fession of a belief that the flotilla could push across the Channel during a calm. Experience soon showed that when the needful allowance was made for the time required to bring them out of harbour (two tides) and for the influence which the Channel currents must have upon their speed, it would be extremely rash to rely on a calm of sufficient length. Napoleon therefore came

early to the conclusion that he must bring about a concentration of his seagoing fleet in the Channel, which would give him a temporary command of its waters.

He had a squadron at Brest, ships at L'Orient and Rochefort, some of his vessels had taken refuge at Ferrol on their way back from San Domingo when war broke out, one was at Cadiz, and he had a squadron at Toulon. All these forces were watched by British blockading squadrons. The problem was to bring them together before the British fleet could be concentrated to meet them. Napoleon's solution grew, as time went on and circum- stances changed, in scope and complexity. In July 1804 he ordered his admiral commanding at Toulon, Latouche Treville, to seize an opportunity when Nelson, who was in command of the blockade, was driven off by a northerly gale, to put to sea, with 10 sail of the line, pick up the French ship in Cadiz, join Ville- neuve who was in the Aix roads, and then effect a junction with Ganteaume and the 21 sail of the line at Brest. He hoped that if the British ships in the North Sea concentrated with the squadron in the Channel, he would be able to make use of Dutch vessels from the Texel. The death of Latouche Treville, 20th of August 1804, supplied an excuse for delay. He was succeeded by Villeneuve. Napoleon now modified the simple plan prepared for Latouche Treville, and began laying elaborate plans by which French vessels were to slip out and sail for distant seas, to draw the British fleet after them, and then return to concentrate in the Channel. A further modification was introduced by the end of 1804. Spain, which was bound by treaty to join Napoleon, was allowed to preserve a show of neutrality by paying a monthly subvention. The British government, treating this as a hostile action — as it was — seized the Spanish treasure ships on their way from America, near Cape Santa Maria, on the 5th of October 1804, and Spain declared war on the 12th of December. New plans were now made including the co-operation of the Spanish fleet. Amid all the variation in their details, and the apparent confusion introduced by Napoleon's habit of suggesting alter- natives and

discussing probabilities, and in spite of the prepara- tions ostensibly made for an expedition to Ireland, which was to have sailed from Brest and to have carried 30,000 troops commanded by Augereau, the real purpose of Napoleon was neither altered nor concealed. He worked to produce doubt and confusion in the mind of the British government by threats and attacks on its distant possessions, which should lead it to scatter its forces. One of these ventures was actually carried out, without, however, securing the co-operation, or effecting the purpose he had in view. On the nth of January 1805 Admiral Missiessy left Rochefort with 5 sail of the line, un- detected by the British forces on the coast. Missiessy carried out a successful voyage of commerce-destroying, and returned safely to Rochefort on the 20th of May, from the West Indies. But the force sent in pursuit of him was small, and the- British government was not deceived into weakening its hold on the Channel. It was in fact well supplied with information by means of the spy service directed by an exiled French royalist, the count d'Antraigues, who was established at Dresden as a Russian diplomatic agent. Through his correspondents in Paris, some of whom had access to Napoleon's papers, the British government was able to learn the emperor's real intentions. The blockade of Brest was so strictly maintained that Ganteaume was allowed no opportunity to get to sea. Villeneuve, who was to have co-operated with Missiessy, did indeed leave Toulon, at a moment when Nelson, whose policy it was to encourage him to come out by not staying too near the port, was absent, on the 1 7th of January 1805. The British admiral, when informed that the French were at sea, justified Napoleon's estimate of his probable course in such a contingency, by making a useless cruise to Egypt. But Villeneuve's ill-appointed ships, manned by raw crews, suffered loss of spars in a gale, and he returned to Toulon on the 21st. His last start came when he sailed, unseen by Nelson, on the 30th of March. Aided by lucky changes of wind, he reached Cadiz, was joined by 1 French and 6 Spanish ships under Admiral Gravina, which, added to the n he had with him, gave him a force of 18 sail. He left Cadiz on the night

of the oth/ioth of April, and reached Fort de France in Martin- ique on the 14th of May. Here he was to have remained till joined by Ganteaume from Brest. On the 1st of June he was joined by a frigate and two line-of-battle ships sent with orders from Rochefort, and was told to remain in the West Indies till the 5th of July, and if not joined by Ganteaume to steer for Ferrol, pick up the French and Spanish ships in the port, and come on to the Channel. Villeneuve learnt on the 8th of June that Nelson had reached Barbadoes in pursuit of him on the 4th. The British admiral, delayed by contrary winds, had not

been able to start from the entry to the Straits of Gibraltar till the nth of May. An action in the West Indies would have ruined the emperor's plan of concentration, and Villeneuve decided to sail at once for Ferrol. Nelson, misled by false information, ranged the West Indies as far south as the Gulf of Paria, in search of his opponent whom he supposed to be engaged in attacks on British possessions. By the 13th of June he had learnt the truth, and sailed for Gibraltar under the erroneous impression that the French admiral would return to Toulon. He sent a brig home with despatches; on the 19th of June, in lat. 33 12′ N. and long. 58 W., the French were seen by this vessel heading for the Bay of Biscay. Captain Bettesworth who commanded the brig hurried home, and the information he brought was at once acted on by Lord Barham, the First Lord of the Admiralty, who took measures to station a force to intercept Villeneuve outside Ferrol. On the 22nd of July, 35 leagues N.W. of Finis- terre, Villeneuve was met by the British admiral sent to intercept him, Sir Robert Calder. A confused action in a fog ended in the capture of 2 Spanish line-of-battle ships. But Sir R. Calder, who had only 15 ships to his opponent's 20 and was nervous lest he should be overpowered, did not act with energy. He retreated to join the blockading fleet off Brest. Villeneuve was now able to join the vessels at Ferrol. Nelson, who reached Gibraltar on the very day the action off Ferrol was fought, was too far away to interfere with him. But Villeneuve, who was deeply impressed by the inefficiency of the ships of his fleet and especially of the Spaniards, and who was convinced that an overwhelming British force would be united against him in the Channel, lost heart, and on the 15th of August sailed south to Cadiz. By this movement he ruined the emperor's elaborate scheme. Napoleon at once broke up the camp at Boulogne and marched to Germany. The further movements of Villeneuve's fleet are told under Trafalgar, Battle or.

With the collapse of the invasion scheme, the naval war between Napoleon and Great Britain entered on a new phase. It lost at once the unity given to it by the efforts of the emperor to effect, and of the British government to baffle the passage of the Channel by an army. In place of the movements of great fleets to a single end, we have a nine years' story (1805-1814) of cruising for the Drotection of commerce, of convoy, of colonial expeditions to capture French, Dutch or Spanish possessions and of combined naval and military operations in which the British navy was engaged in carrying troops to various countries, and in supporting them on shore. Napoleon continued to build line-of-battle ships in numbers from Venice to Hamburg, but only in order to force the British government to maintain costly and wearing blockades. He never allowed his fleets to go to sea to seek battle. The

operations of the British fleet were therefore divided between the work of patrolling the ocean roads and ancillary services to diplomacy, or to the armies serving in Italy, Denmark and, after 1808, in Spain. The remaining colonial possessions of France, and of Holland, then wholly dependent on her, were conquered by degrees, and the ports in which privateers were fitted out to cruise against British commerce in distant seas were gradually rendered harmless. Though privateering was carried on by the French with daring and a considerable measure of success, it did not put an appreciable check on the growth of British merchant shipping. The function of the British navy in the long conflict with Napoleon was of the first importance, and its services were rendered in every sea, but their very number, extent and complexity render it impossible here to record them in detail.

Bibliography. — Captain Mahan, Influence of Sea Power upon the French Revolution and the Empire (London, 1892) ; Chevalier, Histoire de la marine franchise sous le consulat et I'empire (Paris, 1886). All the operations connected with the successive invasion schemes are recorded, with exhaustive quotations of documentary evidence, in Projets et tenlatives de debarquement aux lies Britanniques, by Captain Desbriere (Paris, 1901). Captain Desbriere's exhaustive work was done for the historical section of the French general staff, and is a fine example of the scholarly and conscientious modern French historical school. (D. H.)

NAPOLEONITE, also called Corsite because the stone is found in the island of Corsica, a variety of diorite which is characterized by orbicular structure. The grey matrix of the stone has the normal appearance of a diorite, but contains many rounded lumps 1 or 2 in. in diameter, which show concentric zones of light and dark colours. In these spheroids also a distinct and well-marked radial arrangement of the crystals is apparent. The centre of the spheroid is usually white or pale grey and consists mainly of felspar; the same mineral makes the pale zones while the dark ones are rich in hornblende and pyroxene. The felspar is a basic variety of plagioclase (anorthite or bytownite). Though mostly rounded, the spheroids may be elliptical or subangular; sometimes they are in contact with one another but usually they are separated by small areas of massive diorite. When cut. and polished the rock makes a beauti- ful and striking ornamental stone. It has been used for making paper-weights and other small

ornamental articles.

Spheroidal structure is found in other diorites and in quite a number of granites in various places, such as Sweden, Russia, America, Sardinia, Ireland. It is by no means common, however, and usually occurs in only a small part of a granitic or dioritic mass, being sometimes restricted to an area of a few square yards. In most cases it is found near the centre of the outcrop, though ex- ceptionally it has been found quite close to the margin. It arises evidently from intermittent and repeated crystallization of the rock- forming minerals in successive stages. Such a process would be favoured by complete rest, which would allow of supersaturation of the magma by one of the components. Rapid crystallization would follow, producing deposits on any suitable nuclei, and the crystals then formed might have a radial disposition on the surfaces oa which they grew. The magma might then be greatly impoverished in this particular substance, and another deposit of a different kind would follow, producing a zone of different colour. The nucleus for the spheroidal growth is sometimes an early porphyritic crystal, sometimes an enclosure of gneiss, &c, and often does not differ essentially in composition from the surrounding rock. When spher- oids are in contact the ; r inner zones may be distinct while the outer ones are common to both individuals having the outlines of a figure of eight. This proves that growth was centrifugal, not centripetal.

Many varieties of spheroids are described presenting great differ- ences in composition and in structure. Some are merely rounded balls consisting of the earliest minerals of the rock, such as apatite, zircon, biotite and hornblende, and possessing no regular arrange- ment. Others have as centres a foreign fragment such as gneiss or hornfels, with one or more zones, pale or dark, around this. Radial arrangement of the crystals, though often very perfect, is by no means universal. The spheroids are sometimes flattened or egg-shaped, apparently by fluxion movements of the magma at a time when they were semi-solid or plastic. As a general rule the spheroids are more basic and richer in the ferromagnesian minerals than the surrounding rock, though some of the zones are often very rich in quartz and felspar. Graphic or perthitic intergrowths between the minerals of a zone are frequent. The spheroids vary in width up to I or 2 ft. In some cases they contain abnormal constituents such as calcite, sillimanite or corundum, (J. S. F.)

NAQUET, ALFRED JOSEPH (1834-), French chemist and politician, was born at Carpentras (Vaucluse), on the 6th of October 1834. He became professor in the faculty of medicine in Paris in 1863, and in

the same year professor of chemistry at Palermo, where he delivered his lectures in Italian. He lost his professorship in 1867 with his civic rights, when he was condemned to fifteen months' imprisonment for his share in a secret society. On a new prosecution in 1869 for his book Religion, propriiti, famille he took refuge in Spain. Returning to France under the government of Emile Ollivier he took an active share in the revolution of the 4th of September 1870, and became secretary of the commission of national defence. In the National Assembly he sat on the extreme Left, consistently opposing the opportunist policy of successive governments. Re-elected to the Chamber of Deputies he began the agitation against the marriage laws with which his name is especially

connected. His proposal for the re-establishment of divorce was discussed in May 1879, and again in 1881 and 1882, and became law two years later. Naquet, although he disapproved in principle of a second chamber, secured his election to the senate in 1883 to pilot his measure through that body. In 1886 by his efforts divorce became legal after three years of definite separa- tion on the demand of one of the parties concerned. In 1890 he resigned from the senate to re-enter the Chamber of Deputies, this time for the 5th arrondissement of Paris, and took his seat with the Boulangist deputies. After Boulanger's suicide his political influence declined, and was further compromised by accusations (of which he was legally cleared) in connexion with the Panama scandals.

The thesis written for his doctorate, Application de V analyse ckimique a la toxicologie (1859), was followed by many papers on chemistry contributed to learned journals, and his Principes de chimie fondes sur les theories modernes (1865) reached its 5th edition in 1890. He is better known by his political works, Socialisme collectiviste et socialisme liberal (1890, Eng. trans., 1891), L'Humanite et la patrieˆ (1901), Loi du divorce (1903), L'Anarchie et le collectivisme (1904), Desarmement ou alliance anglaise (1908).

NARA, an important water channel in Sind, India, probably representing a former bed of the Indus, though now traversing the desert far E. of the river. Its total length is 250 m.; and by means of cross cuts, weirs and embankments, it has been made to irrigate no less than 42*9 sq. m., with a navigable length of 425 m.

NARA, a town of Japan, in the province of Yamato, 255 m. from Osaka by rail. Pop. 32,000. It lies on the slope of a range of picturesque hills, beautifully wooded with cryptomerias, evergreen oaks, &c. This was the first permanent capital of Japan. Up to the

beginning of the 8th century the imperial court changed its location at the accession of each sovereign, and the court's place of residence naturally became the official metropolis. But Nara remained the metropolis during seven consecutive reigns (709 to 784), and its seventy-five years of favoured existence sufficed for the building and furnishing of several imposing shrines and temples, for the laying out of a noble park, for the casting of a colossal image of Buddha, and for the execution of many other beautiful specimens of applied art. Not much is known of the Nara palace in its original form, but many of the articles and ornaments used by its inmates survive in a celebrated collection which, during nearly twelve hundred years, had been preserved in a store-house (Shoso-in) near the temple of Todai-ji. This collection cannot be visited by strangers more than once a year, and even then only by special permission. The vigorous growth of the Buddhist creed through- out the Nara epoch was remarkable, and found outward ex- pression in many striking architectural and artistic works. The ' best of these, namely, those dating from tie first half of the 8th century, show Indo-Grecian affinities, which gradually grow fainter as the end of the epoch approaches. The temple called Todai-ji was completed about 750. At present the buildings enclose a quadrangle 520 ft. by 620, the south side being mainly occupied by the huge, ungainly and no longer perpendicular hall containing the Dai Butsu, or colossal statue of Buddha. The casting of this wonderful piece of work was accomplished after eight failures in 749 by Takusho, an artist from Korea. On two occasions the head was melted during the burning of the temple (1180 and 1567) and from 1567 to 1697 the statue stood exposed to the weather. The height of the figure is 53 ft. On a hill to the east of the temple stands a bell-house with a huge bell, cast in 73 2 > 132 ft. high, 9 ft. across the mouth and weighing 37 tons. The great Buddha is often spoken of as the most remarkable of the Nara relics; but restorations have so marred it that it can no longer be compared with many smaller examples of con- temporaneous and subsequent sculpture. More worthy of close attention are two effigies of Brahma and Indra preserved among the relics of Kobuku-ji, which, with Kasuga-no-Miya, Ni-gwatsu- do and Todai-ji, constitute the chief religious edifices. These figures, sculptured in wood, have suffered much from the ravages of time, but nothing could destroy the grandeur of their propor- tions or the majesty and dignity of their pose. Several other

works of scarcely inferior excellence may be seen among the relics,

and at the shrine of Kasuga is performed a religious dance called Kagura, in which the costumes and gestures of the dancers are doubtless the same as those of twelve centuries back. Kasuga- no-Miya was founded in 767, and its chapels with their rough red- painted log-work afford fine examples of primitive Japanese architecture. In the temple-park are herds of tame deer; and little images of deer and trinkets from deer's horn are the favourite charms purchased by the pilgrims. Within the enclosure stands a curious old trunk of seven plants entwined, including a camellia, cherry and wistaria. Of the great Buddhist temple Kobuku-ji, founded in 710, and burnt for the third time in 1717, there remains little save two lofty pagodas. A railway now gives access to the town, but every effort is made to preserve all the ancient features of Nara. A museum has been formed, where many antique objects of great interest are displayed, as well as works from the hands of comparatively modern artists. Nara in the days of its prosperity is said to have had a population of a quarter of a million.

NARAIN6ANJ, or Narayanganj, a town of India; in the Dacca district of eastern Bengal and Assam, situated near the junction of two rivers with the Meghna, 10 m. by rail S. of Decca city. Pop. (iqoi) 24,472. As the port of Dacca, having steamer communication with both Calcutta and Chittagong, it has become the chief entrepot for the jute trade of eastern Bengal. There are 73 jute-presses, employing 6000 hands, and the annual export of jute exceeds 300,000 tons. It also ranks as the model municipality of Bengal.

NARBONNE, a city of France, capital of an arrondissement in the department of Aude, situated in a vine-growing plain 5 m. from the Mediterranean, on the railway from Toulouse to Cette, 37 m. E. of Carcassonne. Pop. (1906) 23,289. The Robine canal, a branch of the Canal du Midi, divides Narbonne into two distinct portions, the bourg and the cite. The latter is one of the oldest and most interesting of French towns. The former cathedral (St Just), which consists only of a choir 130 ft. high and transept, was begun in 1272, and the transept was still un- finished at the end of the 15th century. The towers (194 ft. high) at each extremity of the transept were built about 1480. Some additions towards the west were made early in the 18th century. An unusual effect is produced by a double row of crenellation taking the place of balustrades on the roof of the choir chapels and connecting the pillars of the flying buttresses. Among the sepulchral monuments, which are the chief feature of the interior, may be noticed the alabaster tomb of Cardinal Guillaume Briconnet, minister of state under Charles VIII. The chapter- house, of the 15th century, has a vaulted roof supported on four free pillars. The treasury

preserves many interesting relics. The apse of the cathedral was formerly joined to the fortifications of the archiepiscopal palace, and the two buildings are still con- nected by a mutilated cloister of the 14th and 15th centuries. On the front of the palace are three square towers of unequal height. Between the Tour des Telegraphes (13 18), crenellated and turreted at the corners, and that of St Martial (1374), machi- colated and pierced by Gothic openings, a new facade was erected in the style of the 13th century after the plans of Viollet-le-Duc. This portion of the building now serves as h&tel de ville, and its upper stories are occupied by the Narbonne museum of art and archaeology, which includes a fine collection of pottery. The palace garden also contains many fragments of Roman work once built into the now dismantled fortifications; and the Musee Lapidaire in the Lamourguier buildings (formerly the church of a Benedictine convent) has a collection of Roman remains derived from the same source. The church of St Paul, though partly Romanesque, is in the main striking, and for the south of France a rare example of a building of the first half of the 13th century in the Gothic style of the north. It possesses some ancient Christian sarcophagi and fine Renaissance wood carving. Narbonne has a sub-prefecture, tribunals of first instance and of commerce, a board of trade arbitration, a chamber of commerce, a communal college for boys and a school of commerce and industry. It has a good trade in wine and

spirituous liquors, and is famous for its honey. The industries include cooperage, sulphur-refining, brandy-distilling and the manufacture of bricks and tiles and verdigris.

Long before the Roman invasion of Gaul Narbonne was a flourish- ing city, being capital of the Volcae Tectosages. It was there that the Romans in 118 B.C. founded their first colony in Gaul, which bore the name of Narbo Martins; they constructed great works to protect the city from inundation and to improve its port, situated on a lake now filled up but at that time communicating with the sea. Capital of Gallia Narbonensis, the seat of a proconsul and a station for the Roman fleet, Narbo Martius became the rival of Massilia. But in a.d. 150 it suffered greatly from a conflagration, and the division of Gallia Narbonensis into two provinces lessened its im- portance as a capital. Alans, Suevi, Vandals, each held the city for a brief space, and at last, in 413, it was occupied by the Visigoths, whose capital it afterwards became. In 719, after a siege of two years, it was captured by the Saracens, and by them its fortifica- tions were restored and extended. Charles Martel, after the battle of Poitiers, and Pippin the Short, in 752, were both repulsed from its walls; but on a new attempt, after an investment of seven years, and by aid of a traitor, the Franks managed

again to force their way into Narbonne. Charlemagne made the city the capital of the duchy of Gothia, and divided it into three lordships — one for the bishop, another for a Frankish lord, and the third for the Jews, who, occupying their own quarter, possessed schools, synagogues and a university famous in the middle ages. The viscounts who succeeded the Frankish lord sometimes acknowledged the authority of the counts of Toulouse, sometimes that of the counts of Barcelona. In the 13th century the crusade against the Albigenses spared the city, but the archbishopric /was seized by the pope's legate, Arnaud Amaury, who took the title of viscount of Narbonne. Simon de Montfort, however, deprived him of this dignity, receiving from Philip Augustus the duchy of Narbonne along with the county of Toulouse. By his expulsion of the Jews Philip the Fair hastened the decay of the city ; and about the same period the Aude, which had formerly been diverted by the Romans, ceased to flow towards Narbonne and the harbour was silted up, to the further disadvantage of the place. In 1642 Henri Marquis de Cinq-Mars was arrested at Narbonne for conspiring against Richelieu. United to the French crown in 1507, Narbonne was enclosed by anew line of walls under Francis I., but having ceased to be a garrison town it had the last portions of its ramparts demolished in 1870. The archbishopric was founded about the middle of the 3rd century, its first holder being Sergius Paulus; it was suppressed in 1790.

NARBONNE-LARA, LOUIS MARIE JACQUES AMALRIC, comte de (1755-1813), French soldier and diplomatist, was. born at Colorno, in the duchy of Parma, on the 24th of August 1755. He was the son of one of the ladies-in-waiting of Elizabeth, duchess of Parma, and his father was either a Spanish nobleman or — as has been alleged — Louis XV. himself. He was brought up at Versailles with the princesses of France, and was made colonel at the age of twenty-five. He became marechal-de- camp in 1791, and, through the influence of Madame de Stael, was appointed minister of war. But he showed incapacity in this post, gave in his resignation, and joined the Army of the North. Incurring suspicion as a Feuillant and also by his policy at the war office, he emigrated after the 10th of August 1792, visited England, Switzerland and Germany, and returned to France in 1801. In 1809 he re-entered the army as general of division, and was subsequently minister plenipotentiary at Munich and aide de camp to Napoleon. In 1813 he was appointed French ambassador at Vienna, where he was engaged in an un- equal diplomatic duel with Metternich (q.v.) during the fateful months that witnessed the defection of Austria from the cause of Napoleon to that of the Allies. He died at Torgau, in Saxony, on the 17th of November 1813.

See A. F. Villemain, Souvenirs contemporains (Paris, 1854).
NARBOROUGH, SIR JOHN (d. 1688), English naval com- mander, was descended from an old Norfolk family. He received his commission in 1664, and in 1666 was promoted lieutenant for gallantry in the action with the Dutch fleet off the Downs in June of that year. After the peace he was chosen to conduct a voyage of exploration in the South Seas. He set sail from Deptford on the 26th of November 1669, and entered the Straits of Magellan in October of the following year, but returned home in June 1671 without accomplishing his original purpose. A narrative of the expedition was published at London in 1694 under the title An Account of several late Voyages and Discoveries to the South and North. During the second Dutch War Nar- borough was second captain of the lord high-admiral's ship the

" Prince," and conducted himself with such conspicuous valour at the battle of Solebay (Southwold Bay) in May 1672 that he won special approbation, and shortly afterwards was made rear- admiral and knighted. In 1675 he was sent to suppress the Tripoline piracies, and by the bold expedient of despatching gun-boats into the harbour of Tripoli at midnight and burning the ships he induced the dey to agree to a treaty. Shortly after his return he undertook a similar expedition against the Algerines. In 1680 he was appointed commissioner of the navy, an office he held till his death in 1688. He was buried at Knowlton church, Kent, where a monument has been erected to his memory. See Charnock, Biog. Nav. i. ; Hist. MSS. Comm. 12th Rept.
NARCISSUS, in Greek mythology, son of the river god Cephissus and the nymph Leiriope, distinguished for his beauty. The seer Teiresias told his mother that he would have a long life, provided he never looked upon his own features. His rejection of the love of the nymph Echo (q.v.) drew upon him the vengeance of the gods. Having fallen in love with his own reflection in the waters of a spring, he pined away (or killed him- self) and the flower that bears his name sprang up on the spot where he died. According to Pausanias, Narcissus, to console himself for the death of a favourite twin-sister, his exact counter- part, sat gazing into the spring to recall her features by his own. Narcissus, representing the early spring-flower, which for a brief space beholds itself mirrored in the water ?nd then fades, is one of the many youths whose premature death is recorded in Greek mythology (cf. Adonis, Linus, Hyacinthus); the flower itself was regarded as a symbol of such death. It was the last flower gathered by Persephone before she was carried off by Hades, and was sacred to Demeter and Core (the cult

name of Perse- phone), the great goddesses of the underworld. From its associations Wieseler takes Narcissus himself to be a spirit of the underworld, of death and rest. It is possible that the story • may have originated in the superstition (alluded to by Arte- mfdorus, Oneirocritica, ii. 7) that it was an omen of death to dream of seeing one's reflection in water.

See Ovid, Metam. iii. 341-510; Pausanias ix. 31; Conon, Narrationes, 24; F. Wieseler, Narkissos (1856) ; Greve in Roscher's LexiBon der Mythologie; J. G. Frazer, The Golden Bough (1900), i.

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NARCISSUS, a genus of bulbous plants belonging to the family Amaryllidaceae, natives of central Europe and the Mediterranean region; one species N. Tazetta, extends through Asia to Japan. From these, or rather from some of these, by

cultivation and hybridization, have arisen the very numerous modern varieties. The plants have long narrow leaves spring- ing from the bulb and a central scape bearing one or more generally large, white or yellow, drooping or inclined flowers, which are enveloped before opening in a membranous spathe. The flowers are regular, with a perianth springing from above the ovary, tubular below, with spreading segments and a central corona; the six stamens are inserted within the tube. The most interesting feature botanically is the " corona " or " cup," which springs from the Fig. 1. — Flowers of Narcissus base of the flower-segments. (Narcissus Tazetta) bursting from This gives the special char- the sheathing bract or spathe, b. acter tQ the flower> and the

members of the genus are classified according to the length of this organ as compared with that of the segments. The most probable supposition is that the cup is simply an excrescence or " enation " from the mouth of the flower-tube, and is connected with the fertilization of the flowers by insect agency.

There are five weli-marked sections.

1. The hoop-petticoat narcissi, sometimes separated as the genus Corbularia, are not more than from 3 to 6 in. in height, and have grassy foliage and yellow or white flowers. These have the coronet in the centre of the flower very large in proportion to the other parts, and much expanded, like the old hooped petticoats. They are now all regarded as varieties or forms of the common hoop-petticoat, N.

Bulbocodium , which has comparatively large bright yellow flowers; N. tenuifolius is smaller and somewhat paler and with slender erect leaves; N. citrinus is pale lemon yellow and larger; while N. monophyllus is white. The small bulbs should be taken up in summer and replanted in autumn and early winter, according to the state of the season. They bloom about March or April in the open air. The soil should be free and open, so that water may pass off readily.

2. A second group is that of the Pseudonarcissi, constituting the genus Ajax of some botanists, of which the daffodil, N. Pseudo- narcissus is the type. The daffodil (fig. 2) is common in woods and

FlG. 2. — Daffodil — (Narcissus Pseudonarcissus). 1 , Flower cut open ; 2, pistil; 3, horizontal plan of flower.

thickets in most parts of the north of Europe, but is rare in Scotland. Its leaves are five or six in number, are about I ft. in length and 1 in. in breadth, and have a blunt keel and flat edges. The stem is about 18 in. long and the spathe single-flowered. The flowers are large, yellow, scented and a little drooping, with a corolla deeply cleft into six lobes and a bell-shaped corona which is crisped at the margin ; they appear in March or April. In this species the corona is also very large and prominent, but is more elongated and trumpet- shaped, while the other members are regarded as subspecies or varieties of this. Of this group the most striking one perhaps is N. bicolor, which has the perianth almost white and the corona deep yellow; it yields a number of varieties, some of the best known being Empress, Horsfieldi, Grandee, Ellen Willmott, Victoria, Weardale Perfection, &c. N. moschatus, a native of the Pyrenees and the Spanish peninsula, is a cream-coloured subspecies of great beauty with several forms. N. cyclamineus is a pretty dwarf sub- species, native of Portugal, with narrow linear leaves and drooping flowers with reflexed lemon-yellow segments and an orange-yellow corona N. major is a robust form with leaves -\ in. broad and bright lemon-yellow flowers 2-2 1 in. long ; maximus is a closely-related but still finer form ; obvallaris (the Tenby daffodil) is an early form with

uniformly yellow flowers. N. minor and minimus are miniature repetitions of the daffodil. All these grow well in good garden soil, and blossom from March onwards, coming in very early in genial seasons.

3. Another group, the mock narcissi or star daffodils, with coronets of medium size, includes the fine and numerous varieties of N. incomparabilis, one of which, with large, double flowers, is known as butter-and-eggs ; N. odorus, known as the campernelle jonquil, has two to four uniform bright yellow flowers, and is considered a hybrid between N. Jonquilla and N. Pseudonarcissus. A form with sweet-scented double flowers is known as Queen Ann's jonquil; N. juncifolius, a graceful little plant from Spain, Portugal and south France, has one to four small bright yellow flowers on each scape. The hardier forms of this set thrive in the open border, but the smaller sorts, like Queen Ann's jonquil, are better taken up in autumn and replanted in February; they bloom freely about April or May. N. Iriandrus — Ganymede's Cup — is a pretty little species with white flowers about I in. long; in several of its varieties the flowers are a pale or deeper yellow ; they make attractive pot plants.

4. The polyanthus or bunch narcissi form another well-marked group, whose peculiarity of producing many flowers on the stem is indicated by the name. In these the corona is small and shallow as compared with the perianth. Some of the hardier forms, as TV. Tazetta itself, the type of the group, succeed in the open borders in light well-drained soil, but the bulbs should be deeply planted, not less than 6 or 8 in. below the surface, to escape risk of injury from frost. Many varieties of this form of narcissus, such as Grand Monarque, Paper white, Soleil d'or, are grown. They admit of being forced into early bloom, like the hyacinth and tulip. They vary with a white, creamy or yellow perianth, and a yellow, lemon, primrose or white cup or coronet; and, being richly fragrant, they are general favourites amongst spring flowers. Many tons of these flowers are exported from the Scilly Isles to the London markets in spring. The " Chinese sacred lily " or " joss flower " is a form of N. Tazetta. The jonquil, TV. Jonquilla, with yellow flowers, a native of south Europe and Algeria, of which there are single and double flowered varieties, is also grown in pots for early flowering, but does well outside in a warm border.

5. There remains another little group, the poet's or pheasant's- eye narcissi (N. poeticus), in which the perianth is large, spreading and conspicuous, and the corona very small and shallow. These pheasant's-eye narcissi, of which there are several well-marked varieties, as radiiflorus, poetarum, recurvus, &c, blossom in succession during April and May, and all do well in the open borders as perma- nent hardy bulbs. N. biflorus, the primrose peerless, a two-flowered whitish yellow-cupped species, equally hardy and easy of culture, is a natural hybrid between N. poeticus and Tazetta. N. gracilis, a yellow-flowered species, has also been regarded as a hybrid between N. Tazetta and N.

juncifolius, and blooms later.

Of late years some remarkably fine hybrids have been raised between the various distinct groups of narcissi, and the prices asked for the bulbs in many cases are exceedingly high. One of the most distinct groups is that known under the name of ” Poetaz ” — a combination of poeticus and Tazetta. The best forms of poeticus ornatus have been crossed with the bunch-flowered Tazettas, and have resulted in producing varieties with large trusses of exquisite flowers more or less resembling the ornatus parents, and varying in colour from the purest white to yellow, the rim of the corona being in most cases conspicuously and charmingly coloured with red or crimson. This is an excellent group for cutting purposes, but it will take a few more years to make the varieties common.

For an account of the history and culture of the narcissus see F. W. Burbidge, The Narcissus (1875); a more recent scientific treatment of the genus will be found in J. G. Baker’s Handbook of Amaryllideae (1888); see also Nicholson, Dictionary of Gardening (1886) ; and J. Weathers, Practical Guide to Garden Plants (1901).

NARCOTICS (Gr. vapwriKos, making numb), a general term for substances having the physiological action, in a healthy animal, of producing lethargy or stupor, which may pass into a state of profound coma or unconsciousness along with complete paralysis, terminating in death. Certain substances of this class are used in medicine for the relief of pain, and are then called anodynes, whilst another group produce profound sleep, and are consequently known as hypnotics. In one sense, anaesthetics, such as chloroform and ether, may be held to be narcotics, but, as they are usually volatile substances causing unconsciousness for a comparatively short time, they are conveniently separated from the true narcotics, the effects of which are much more lasting. These distinctions are to a great extent artificial, as it is evident that a substance capable of producing partial insensibility to pain, or sleep, will inevitably in larger doses cause profound coma ending in death. Hence we find the same substances sometimes classed as anodynes and at other times as hypnotics. For example, small doses of opium, or of one or

other of its preparations, relieve pain, whilst larger doses act as hypnotics, causing deep sleep passing into coma. Cannabis Indica, belladonna and hyoscyamus, are also anodyne in their action. The chief narcotics are mentioned below.

Opium is the inspissated juice of the Papaver somniferum, con- taining 7-5 to 10-5% of anhydrous morphine. Besides morphine some of the other alkaloids contained in it are of a narcotic nature, notably papaverine, narceine, meconine, cryptopine and narcotine, but the principal anodyne and narcotic effects are due to the mor- phine alkaloid. Though seasoned opium takers may take 20 to 30 grs. without noticeable effects, 1 to 3 grs. produces marked symptoms in the western races. Idiosyncrasy is marked in regard to the amount of opium a person can safely take. The medicinal dose is up to 2 grs., and the smallest dose that has been known to cause death in an adult is \ gr. The narcotic properties of Morphine vary as to whether it is taken by the stomach or injected under the skin; 2 grs. by the stomach is dangerous, and a safe medicinal dose by the skin is f to \ gr. The smallest dose that has produced death in an adult was J gr. given hypodermically. The motor centres of the brain and spinal cord are first stimulated by opium and morphine and later depressed; death in fatal cases being from paralysis of the respiratory centre of the medulla. For the treatment of poisoning see under Opium.

Cannabis indica or Indian Hemp (see Hemp). — The part used in medicine is the non-fertilized female spikes of the Cannabis sativa.

The active constituent is the resin containing cannabin with the active principle cannabinol, the alkaloids cannabinene and tetano- canabine. Cannabis indica is sold in the East under various names. A confection of the drug made in Arabia is called hashisch. Churrus is the resin scraped off the leaves, and the dried leaf is called bang, gunga or ganga being the name given to the dried flowering tops sold for smoking. The medicinal dose is \ to 1 gr. of the extract, 2 to 3 grs. is a poisonous dose, but there is no recorded fatal case in man. In Eastern countries the smoking of Cannabis indica produces a form of mania. The effects of smaller doses are intoxication of a pleasant character, exaltation, hallucinations and delirium, later dilatation of the pupils, drowsiness, sleep and coma. Indian hemp is an uncertain anodyne and hypnotic. When large quantities have been taken an emetic should be given or the stomach pump used, and endeavour to allay excitement until the effects have passed off. Belladonna and Atropine. — The leaves of the Atropa Belladonna or deadly nightshade of which the active principle is atropine principally used as a sulphate. A small dose of belladonna or atro- pine causes dryness of the throat and mouth, dilatation of the pupils, dimness of vision except for distant objects and often double vision. The pulse becomes quick, rising, in an adult, from 80 to 120 or 160 beats per minute; and there is often a bright red flush over the skin. The intellectual powers are at first acute and strong, but they soon become confused. There is giddiness, confusion of thought, excite- ment, a peculiar talkative wakeful restiveness, in which the person shows that his mind is occupied by a train of fancies or is haunted by visions and spectres. Often there is violent delirium before sleep comes on. The sleep after a large dose deepens into stupor, with great muscular prostration or paralysis. During all the time the pupils are widely dilated. Death occurs from failure both of the heart's action arid of respiration. The minimum lethal dose is not known, but 80 grs. of the root have caused death ; tS to jV gr. hypodermically have caused dangerous symptoms and § gr. would almost certainly be fatal. For the medicinal preparations and treatment of poisoning see Belladonna.

Stramonium. — The part of the plant used is the leaves and seed of the Datura Stramonium or thorn apple, the alkaloidal constituent being daturine, a variable mixture of hyoscine and atropine. The physiological action is almost identical with belladonna. Poisoning is usually due to children eating the seeds; the lethal dose is un- known. The symptoms produced are divided into three stages — delirium, sleep and deep coma. In case of slight poisoning a rash is one of the toxic symptoms. The treatment of poisoning is to give emetics, wash out the stomach and give stimulants and pilocarpine subcutaneously,

also to apply warmth and to use artificial respiration if necessary.

Hyoscyamus, the leaves of the Hyoscyamus niger or henbane (5.0.). The active principle is hyoscyamine. The physiological action is almost similar to belladonna, with excitement and cardiac stimulation and afterwards depression and stupor, but the action of hyoscyamus on the heart is more powerful. In large doses it is a strong cerebral depressant, and produces dilatation of the pupil ; ˆa gr. of hyoscamine produces marked effects, sleepiness and dryness of the mouth ; f gr. by subcutaneous injection has produced fatal results. The treatment of hyoscyamus poisoning is similar to that of stra- monium.

Hops (the Humulus Lupulus), containing the active principle lupuline, and Lactucarium, the juice of the Lactuca virosa (lettuce), containing an alkaloid lactucine, are very feeble narcotics, causing heaviness and sleep if taken in large doses.

Chloral Hydrate is a pure hypnotic which in larger doses is a powerful narcotic, producing prolonged sleep with depression of the cardiac and motor centres. It is an intrinsic cardiac poison, the

heart being arrested in diastole, with coincident respiratory failure. Chloral hydrate is not uniform in its action, some people manifesting great susceptibility to the drug. It is safe in small doses of 10 to 20 grs. It is difficult to say what is a lethal dose. Cases are recorded of recovery after 336 grs. taken with an equal amount of potassium bromide and even after a dose of 595 grs., but in susceptible persons to to 15 grs. have produced toxic symptoms and death has occurred after doses of from 30 to 45 grs. If seen early, the treatment is an emetic, but if the poison should have been already absorbed, stimulants, hot coffee, strychnine or digitalin hypodermically, with perhaps artificial respiration, may be required.

Alcohol in large quantities is a strong narcotic, producing the typical stages of preliminary excitement followed by drowsiness and profound coma, during which death may occur. The treatment is washing out the stomach to prevent the absorption of the poison and the use of strychnine hypodermically.

NARDI, JACOPO (b. 1476), Florentine historian, occupied various positions in the service of the Florentine republic after the expulsion of the Medici in 1494, and even on their return in 1512 he continued

in the public service. In 1527 he joined in the movement for the expulsion of the family and was instrumental in defeating the Medicean troops under Cardinal Passerini, who were attacking the Palazzo della Signoria. When the Medici again definitely became masters of Florence in 1530, Nardi was exiled from the city and his property confiscated. He spent the rest of his days in various parts of Italy, chiefly in Venice, and wrote a statement of the claims of the Florentine exiles against the Medici, addressed to the emperor Charles V. The exact date of his death is unknown. His chief work is his Istorie della Citla di Firenze, covering the period from 1498 to 1538, in part based on Biagio Buonaccorsi's Diario.

L. Arbib's edition of Nardi's history (Florence, 1842) contains a biography of the author, and so does that of Agenore Gelli (Florence,

1888).

NARES, SIR GEORGE STRONG (1831-), English Arctic explorer, son of a captain in the navy, was educated at the Royal Naval College at New Cross, and entered the navy in 1846. After being employed for some time on the Australian station, in 1852 he became mate of the " Resolute " in the- Arctic expedition which was sent out in that year. Serving in the Crimea upon his return, he was appointed lieutenant in charge of the naval cadets on the inauguration of the " Britannia " training ship, and was then employed in surveying work on the N.E. coast of Australia and in the Mediterranean, attaining the rank of captain in 1869. While in command of the " Challenger " (187 2-1 874), in the famous voyage of deep-sea exploration round the world, he was ordered home to take command of the Arctic expedition which set sail in the spring of 1875 in the ships " Alert " and " Discovery." He published a narrative of the voyage on his return, and for his services was made K.C.B. (1876). Two years later he was sent in command of the " Alert " to survey Magellan Strait. From 1879 to 1896 he was attached to the Harbour Department of the Board of Trade. He retired from active service in 1886, and became a vice-admiral in 1892. (See Polar Regions.)

NARGILE or Nargileh, the Persian and Turkish name for a " hookah," a tobacco pipe with a long flexible tube for stem passing through a vessel containing water, often perfumed. This bowl was originally made of a coco-nut (Persian nUrgil), whence the name, but now glass, metal or porcelain, are also used.

NARNI (anc. Umbrian Nequinum, Rom. Narnia), a town and episcopal see of the province of Perugia, Italy, 65 m. N. of Rome by rail. Pop.

(1901) 5200 (town), 12,773 (commune). It is picturesquely situated on a lofty rock (787 ft. above sea-level), 480 ft. above the Nera valley, at the point where the river traverses a narrow ravine, and commands a fine view. The cathedral and the portico of S. Maria della Pensola are buildings of the nth century with flat arches; the former has some good Renaissance sculptures. There are other interesting churches; S. Francesco has a good doorway of the 14th century. In the town hall is a " Coronation of the Virgin " by D. Ghirlandaio. The town also contains some picturesque Gothic houses and palaces. Near the station, below the town, are factories of india-rubber and calcium carbide.

The Umbrian Nequinum was taken by the Romans after a long siege in 299 B.C., and a colony planted there against the Umbrians, taking its name from the river. It was among the twelve colonies that were punished for refusing help to Rome in 209 B.C. It was considered a suitable point to oppose a threatened march of Has- drubal on Rome. It stood on the Via Flaminia, the great bridge of which over the river lies below the town. The original main road ran to Nuceria by Mevania; a branch by Interamna and Spoletium joined it at Forum Flaminii. According to some authors, the emperor Nerva was born at Narnia. The town is mentioned in the history of the Gothic wars. Procopius (B.G. i. 17) describes the site of the town, the river and the bridge — the latter as built by Augustus, and as having the highest arches that he knew. In the middle ages Narni was under the papal power. It was the birthplace of the well-known condottiere Erasmo Gattamelata.

See G. Eroli, Miscellanea Storica Narnese (2 vols., Narni, 1858- 1862), and other works by the same author.

NARRAGANSETT, a township of Washington county, Rhode Island, U.S.A. on the W. shore of Narragansett Bay, about 25 m. S. of Providence and about 8 m. W.S.W. of Newport. Pop. (1890) 1408; (1900) 1523; (1905) 1469; (1910) 1250. Area about 15 sq. m. It is connected at Kingston Station (about 9 m. N.W.) by the Narragansett Pier railway with the shore line of the New York, New Haven & Hartford railway; an electric line connects with Providence. The southern part of the town- ship is a peninsula, lying between the mouth of Narragansett Bay and an inlet separating this part of the township from South Kingstown. Narragansett Pier, within the township, has a fine bathing beach, which extends along the indented coast between the village and the mouth of the Pattaquamscutt river; the force of the surf is somewhat broken by Point Judith, about 5 m. S. (also in the township), on which there is a lighthouse. On a ridge

overlooking the ocean and commanding a fine view is the Point Judith Country Club, with golf courses, tennis courts and a polo-field, on which is held a horse show at the close of each season. Many of the summer visitors at Narragansett Pier are from New England, New York and Philadelphia, but there is a sufficient number from Baltimore, Washington, Richmond, Louisville and other Southern cities to give to its society a noticeably Southern tone. Narragansett Pier was so-named from the piers that were built here late in the 18th century and early in the 19th to provide a port for the Narragansett Country, or southern Rhode Island, and it still has a coal wharf, and a yacht landing at the Casino. The development of the place as a summer resort was begun about the middle of the 19th century by the erection of a bathing-house and the conversion of some farm houses into boarding houses. The erection of large hotels and private residences soon followed, and the completion of the railway to the pier in 1876 increased its popularity. The District of Narragansett (in the town of South Kingstown) was organized in 1888 and in 1901 was incorporated as a separate township.

The town is named from the Narraganset Indians, a once- powerful Algonquian tribe, which occupied much of the shore of Narragansett Bay. Under their chief Canonicus (d. 1647) they were friendly to the early Rhode Island settlers, and under Miantonomo (q.v.) entered into a tripartite treaty with the Connecticut colonists and the Mohegans; but after the execu- tion of Miantonomo the Narragansets under Miantonomo's son, Canonchet or Nanuntenoo, were less friendly. Their loyalty to the whites was suspected at the time of King Philip's War, and on the 19th of December 1675, at the Great or Cedar Swamp (Narragansett Fort) in the present town of South Kingstown (immediately west of the town of Narragansett), they were decisively defeated by the whites, under Governor Josiah Winslow of the Plymouth Colony. The site of the engagement is marked by a granite monument erected in 1906 by the Rhode Island Society of Colonial Wars. Canonchet escaped, but on the 2nd of August 1676 was captured near Stonington, Connecticut, and on the following day was executed. Most of the survivors of the tribe were later settled among the Niantic, to whom the name Narraganset has been transferred. There are now few survivors of pure Indian blood.

NARSES, Narseh, Narseus, king of Persia, son of Shapur I. He rose as pretender to the throne against his grand-nephew Bahram III. in a.d. 292, and soon became sole king. He attacked

the Romans, but after defeating the emperor Galerius near Callinicum on the Euphrates in 296 was completely defeated in 297, and forced to conclude a peace, by which western Meso- potamia and five provinces on the left bank of the upper Tigris were ceded to the Romans and their sovereignty over the kingdom of Armenia was acknowledged. This peace, concluded in 297, lasted for forty years. Narses died in 303 and was succeeded by his son Hormizd II. (Ed. M.)

NARSES (c. 478-573) an important officer of Justinian, in the 6th century. He was a eunuch, but we are nowhere distinctly informed that he was of servile origin. A native of Persarmenia (that portion of Armenia which was allotted to Persia by the partition of 384), he may have been prepared and educated by his parents for service in an oriental court. If the statement that he died at the age of ninety-five be correct, he was born about 478. He was probably brought young to Constantinople, and attained a footing in the qfficium of the grand chamberlain. He rose to be one of the three (spectabiles) " chartularii," a position implying some literary attainment, and involving the custody of the archives of the household. Hence, probably in middle life, he became " praepositus sacri cubiculi," an "illustris," and entitled along with the praetorian prefects and the generals to the highest rank at the imperial court. In this capacity, in 530, he received into the emperor's obedience another Narses, a fellow-country- man, with his two brothers, Aratius and Isaac. These Pers- armenian generals, having formerly fought under the standard of Persia, now in consequence of the successes of Belisarius trans- ferred their allegiance to the emperor Justinian, came to Con- stantinople, and received costly gifts from the great minister.

In 532 the insurrection known as the Nika broke out in Constantinople, when for some hours the throne of Justinian seemed doomed to overthrow. It was saved partly by the courage of his wife, Theodora, and partly by the timely prodigality of Narses, who stole out into the capital, and with large sums of money bribed the leaders of the " blue " faction, which was aforetime loyal to the emperor, to shout as of old " Justiniane Auguste tu vincas."

The African and Italian wars followed. In the fourth year of the latter war (538) the splendid successes of Belisarius had awakened both joy and fear in the heart of his master. Reinforcements were sent into Italy, and Narses was placed at their head. Belisarius understood that Narses came to serve under him like any other officer of distinguished but subordinate rank, and he received a letter from Justinian which

seemed to support this conclusion. But the friends of Narses continually plied him with suggestions that he, a great officer of the house- hold, in the secrets of the emperor, had been sent to Italy, not to serve as a subaltern, but to hold independent command and win military glory for himself. The truth probably lay between the two. Justinian could not deprive his great general of the supreme command, yet he wished to have a very powerful emissary of the court constantly at his side. He would have him watched but not hampered.

The two generals met (a.d. 538) at Fermo on the Adriatic coast. The first interference of Narses with the plans of Belisarius was beneficial. John, one of the officers highest in rank under Belisarius, had pressed on to Rimini, contrary to the instructions of his chief, leaving in his rear the difficult fortress of Osimo (Auximum) untaken. His daring march had alarmed the Goths for Ravenna, and induced them to raise the siege of Rome; but he himself was now shut up in Rimini, and on the point of being forced by famine to surrender. Belisarius and his followers were prepared to let him pay the penalty of his rashness and disobedience. But his friend Narses so insisted on the blow to the reputation of the imperial arms which would be produced by the surrender of Rimini that he carried the council of war with him, and Belisarius had to plan a brilliant march across the mountains, in conjunction with a movement by the fleet, whereby Rimini was relieved while Osimo was still untaken. When Belisarius and John met, the latter ostentatiously thanked Narses alone for his preservation.

His next use of his authority was less fortunate. Milan,

which was holding out for the Romans, was also hard pressed by famine. The two generals who were sent to relieve it loitered disgracefully over their march, and, when Belisarius wished to despatch further reinforcements, the commanders of these new troops refused to stir till Narses gave them orders. Belisarius wrote to the eunuch pointing out the necessity of unity of purpose in the imperial army. At length, grudgingly, Narses gave his consent, and issued the required orders; but it was too late. Milan had been compelled by extremity of famine to surrender, and with it the whole province of Liguria fell into the hands of the enemy. This event forced Justinian to recognize the dangers of even a partially divided command, and he recalled Narses to Constantinople.

Twelve years elapsed before Narses returned to Italy. Mean- while there had been great vicissitudes of fortune both for the Romans and

the Goths. Italy, which appeared to have been won by the sword of Belisarius, had been lost again by the exactions and misgovernment of Alexander. Totila had raised up a new army, had more than kept Belisarius at bay in five difficult campaigns (544-548) and now held nearly all the country. Belisarius, however, in this his second series of campaigns, had never been properly seconded by his master. In the spring of 552 Narses set sail from Salona on the Dalmatian coast with a large and well-appointed army. It was a Roman army only in name. Lombards, Heruli, Huns, Gepidae and even Persians followed the standard of Narses, men equal in physical strength and valour to the Goths, and inspired by the liberal pay which they received, and by the hope of plunder.

The eunuch seems to have led his army round the head of the Adriatic Gulf. By skilfully co-operating with his fleet, he was able to cross the rivers of Venetia without fighting the Gothic general Teias, who intended to dispute their passage. Having mustered all his forces at Ravenna, he marched south- ward. He refused to be detained before Rimini, being determined to meet the Gothic king as soon as possible with his army un- diminished. The occupation of the pass of Furlo (Petra Pertusa) by the Goths prevented his marching by the Via Flaminia, but, taking a short circuit, he rejoined the great road near Cagli. A little farther on, upon the crest of the Appenines, he was met by Totila, who had advanced as far as Tadini, called by Procopius Tagina. Parleys, messages and harangues by each general followed. At length the line of battle was formed, and the Gothic army, probably greatly inferior in number to the Byzan- tine was hopelessly routed (July 552), the king receiving a mortal wound as he was hurrying from the battlefield.

With Totila fell the last hopes of the Gothic kingdom of Italy. Teias, who was proclaimed his successor, protracted for a few months a desperate resistance in the rocky peninsula of Castella- mare, overlooking the bay of Naples. At length want of provisions forced him into the plain, and there by the river Sarno, almost in sight of Pompeii, was fought (553) a battle which is generally named from the overlooking range of Mons Lactarius (Monte Lettere). The actual site of the battle, however, is about half a mile from the little town of Angri, and its memory is still vaguely preserved by the name Pozzo dei Goti (well of the Goths). In this battle Teias was killed. He was the last king of the Ostrogoths.

The task of Narses, however, was not yet ended. By the invitation of the Goths an army of 75,000 warlike Alamanni and Franks, the subjects of King Theudibald, crossed the Alps under the command of

two Alamannic nobles, the brothers Lothair and Buccelin (553). The great strategic talents of Narses were shown even more conspicuously in this, than in his previous and more brilliant campaigns. Against the small but gallant bands of Totila and Teias he had adopted the policy of rapid marches and imperative challenges to battle. His strategy in dealing with the great host from Gaul was of the Fabian kind. He kept them as long as he could north of the Apennines, while he completed the reduction of the fortresses of Tuscany. At the approach of winter he gathered his troops into the chief cities and declined operations in the field, while the Alamannic brothers marched through Italy, killing and

plundering. When the spring of 554 appeared, Lothaire with his part of the army insisted on marching back to Gaul, there to deposit in safety the plunder which they had reaped. In an unimportant engagement near Pesaro he was worsted by the Roman generals, and this hastened his northward march. At Ceneda in Venetia he died of a raging fever. Pestilence broke out in his army, which was so wasted as to be incapable of further operations in Italy. Meanwhile his brother Buccelin, whose army was also suffering grievously from disease, partly induced by free indulgence in the grapes of Campania, encamped at Casilinum, the site of modern Capua. Here, after a time, Narses accepted the offered battle (554). The barbarians, whose army was in the form of a wedge, pierced the Roman centre. But by a most skilful manoeuvre Narses contrived to draw his lines into a curve, so that his mounted archers on each flank could aim their arrows at the backs of the troops who formed the other side of the Alamannic wedge. They thus fell in whole ranks by the hands of unseen antagonists. Soon the Roman centre, which had been belated in its march, arrived upon the field and completed the work of destruction. Buccelin and his whole army were destroyed, though we need not accept the statement of the Greek historian (Agathias ii. 9) that only five men out of the barbaric host of 30,000 escaped, and only eighty out of the Roman 18,000 perished.

The only other important military operation of Narses which is recorded — and that indistinctly — is his defeat of the Herulian king Sindbal, who had served under him at Capua, but who subsequently revolted, was defeated, taken captive and hanged by the eunuch's order (565). In the main the thirteen years after the battle of Capua (554-567) were years of peace, and during them Narses ruled Italy

from Ravenna with the title of prefect. 1 He rebuilt Milan and other cities destroyed in the Gothic War; and two inscriptions on the Salarian bridge at Rome have preserved to modern times the record of repairs effected by him in the year 564.

His administration, however, was not popular. The effect of the imperial organization was to wring the last solidus out of the emaciated and fever-stricken population of Italy, and the belief of his subjects was that no small portion of their contribu- tions remained in the eunuch's private coffers. At the close of 565 Justinian died, and a deputation of Romans waited upon his successor Justin II., representing that they found " the Greeks " harder taskmasters than the Goths, that Narses the eunuch was determined to reduce them all to slavery, and that unless he were removed they would transfer their allegiance to the barbarians. This deputation led to the recall of Narses in 567, accompanied, according to a somewhat late tradition, by an insulting message from the empress Sophia, who sent him a golden distaff, and bade him, as he was not a man, go and spin wool in the apartments of the women. " I will spin her such a hank," Narses is represented as saying, " that she shall not find the end of it in her lifetime "; and forthwith he sent messengers to the Lombards in Pannonia, bearing some of the fruits of Italy, and inviting them to enter the land which bore such goodly produce. Hence came the invasion of Alboin (568), which wrested the greater part of Italy from the empire, and changed the destinies of the peninsula. 2

1 Gibbon's statement that Narses was " the first and most powerful of the exarchs " is more correct in substance than in form. The title of exarch does not appear to be given to Narses by any con- temporary writer. He is always " Praefectus Italiae," " Patricius " or " Dux Italiae," except when he bears the style of his former offices in the imperial household, " Ex-Praepositus [Cubiculi] " or " Chartularius."

2 This celebrated story seems to be unknown to strictly con- temporary authors. We find no hint of it in Agathias (who wrote between 566 and 582), in Marius (532-596), or in Gregory of Tours (540-594). The possibly contemporary Liber Pontificalis and Isidore of Seville (560-636) hint at the invitation to the Lombards. Frede- garius (so-called), who probably wrote in the middle of the 7th century, and Paul the Deacon, towards the close of the 8th, supply the saga like details, which become more minute the farther the narrators are from the action. On the whole, the transaction, though it is too well vouched for to allow us to dismiss it as entirely fabulous, cannot take its place among the undoubted facts of history.

Narses, who had retired to Naples, was persuaded by the pope (John III.) to return to Rome. He died there about 573, and his body, enclosed in a leaden coffin, was carried to Constantinople and buried there. Several years after his death the secret of the hiding-place of his vast stores of wealth is said to have been revealed by an old man to the emperor Tiberius II., for whose charities to the poor and the captives they furnished an opportune supply.

Narses was short in stature and lean in figure. His freehanded- ness and affability made him very popular with his soldiers. Eva- grius tells us that he was very religious, and paid especial reverence to the Virgin, never engaging in battle till he conceived that she had given him the signal. Our best authorities for his life are his contemporaries Procopius and Agathias. See Gibbon, Decline and Fall, vols. iv. and v., edited by J. B. Bury (1898). (T. H.)

NARSINGHGARH, a native state of Central India, in the Bhopal agency. Area, 741 sq. m.; pop. (1901) 92,093; esti- mated revenue, £33,000; tribute to Holkar, £4000. The chief, whose title is raja, is a Rajput of the Omat clan. The state was founded about 1681 by a minister of Rajgarh, who compelled the ruler of that state to transfer to him half his territory. The town of Narsinghgarh had a population in 1901 of 8778.

NARSINGHPUR, a town and district of British India, in the Nerbudda division of the Central Provinces. The town is on the river Singri, and has a railway station 52 m. E. of Jubbulpore; pop. (1901) 11,233. The district has an area of 1976 sq. m. It forms a portion of the upper part of the Nerbudda valley. The first of those wide alluvial basins which, alternating with rocky gorges, give so varied a character to the river's course, opens out just below the famous marble rocks in Jubbulpore, and extends westward for 225 m., including the whole of Narsinghpur, together with the greater part of Hoshangabad. The Satpura hills to the south are here a generally regular range, nowhere more than 500 ft. above the plain, and running almost parallel to the river, at a distance of 15 or 20 m. In the intervening valley, the rich level of black wheat land is seldom broken, except by occasional mounds of gravel or nodular limestone, which afford serviceable village sites. Along the foot of the boundary hills the alluvium gives way to belts of red gravelly soil, rice and sugar-cane take the place of wheat, and forest trees that of mango groves. The population in 1901 was 315,518, showing a decrease of 14-5% in the decade, due to famine. The principal crops are wheat, millets, rice, pulses, oil-seeds and cotton. There are manufactures of cotton, silk, brass and iron-ware. At Mohpani are coal-mines. The Great Indian Peninsula railway

runs through the district, with a branch to Mohpani.

See Narsinghpur District Gazetteer (Bombay, 1906).

NARTHEX (Gr. vapdr]ˆ, the name of the plant giant-fennel, in Lat. ferula), the name applied in architecture, probably from a supposed resemblance in shape to the reed-like plant, to the long arcaded porch forming the entrance into a Christian church, to which the catechumens and penitents were admitted. Some- times there was a second narthex or vestibule within the church, when the outer one was known as the exonarthex. In Byzantine churches this inner narthex formed part of the main structure of the church, being divided from it by a screen of columns. A narthex is found in some German churches, where, however, it had no ritual meaning but was introduced as a western transept to give more importance to the west end. One of the finest examples to be found in England is that of Ely cathedral, where its northern portion, however, was apparently never completed.

NARVA (Rugodiv of Russian annals, also Ivangorod), a seaport and fortress of Russia, in the government of St Petersburg, 100 m. by rail W.S.W. of the city of St Petersburg. Pop. (1897) 16,577. It stands on the Narova river, which flows from Lake Peipus or Chudskoye, and enters the Gulf of Finland in Narva Bay, 8 m. below this town. The town was founded in 1223 by Danes, and changed hands between the Teutonic knights, Danes, Swedes and Russians until it was taken by Peter the Great in 1704, after the Russians had suffered here a terrible defeat at the hands of Charles XII. of Sweden four years

before. Its fortress, built on the right bank of the river, and known as Ivangorod, has lost its importance, and was abandoned in 1864. The cathedral and the town hall (1683) contain interesting antiquities. There are here an arsenal, a small museum and a school of navigation. Several manufactories utilize the waterfalls of the Narova, e.g. cotton-mills, woollen cloth mills, flax and jute mills, saw-mills and steam flour mills. The total trade falls short of half a million sterling annually. A watering-place has grown up at Ust-Narova, or Hungerburg, at the mouth of the Narova.

NARVACAN, a town of the province of Ilocos Sur, Luzon, Philippine Islands, near the coast and on the main road 13 m. S.S.E. of Vigan, the

capital. Pop. (1903) 19,575. It lies in a level valley surrounded by mountains, and has a cool and healthy climate. The soil, both in the valley and on the neighbouring mountain-sides, is very fertile, and produces rice, vegetables, Indian corn, indigo, cotton, tobacco, maguey and sugar-cane. Cotton fabrics are woven by the women and sold to the mountain tribes. The language of the town is Ilocano.

NARVAEZ, PANFILO DE (c. 1480-1528), Spanish adventurer, was an hidalgo of Castile, born at Valladolid about 1480. He was one of the subordinates of Velazquez in the reduction of Cuba, and, after having held various posts under his governor- ship, was put at the head of the force sent to the Aztec coast to compel Cortes to renounce his command; he was surprised and defeated, however, by his abler and more active compatriot at Cempoalla, and made prisoner with the loss of an eye (1520). After his return to Spain he obtained from Charles V. a grant of Florida as far as the River of Palms; sailing in 1527 with five ships and a force of about 600 men, he landed, probably near Pensacola Bay, in April 1528, and, striking inland with some 300 of his followers, reached ” Apalache ” on June 25. The prospects of fabulous wealth which had sustained them in their difficult and perilous journey having proved illusory a return to the coast was determined, and the Bahia de los Caballos, at or near St Mark’s, was reached in the following month. Having built rude boats, the much-reduced company sailed hence for Mexico on September 22, but the vessel which carried Narvaez was driven to sea in a storm and perished. His lieutenant, Cabeza de Vaca, with three others who ultimately reached land, made his way across Texas to the Gulf of California. (See Florida.)

See Prescott, Conquest of Mexico; H.H.Bancroft, Mexico (1882- 1890); and the Naufragio of Alvaro Nunez Cabeza de Vaca in the Biblioteca of Rivadeneyra, xxii.

NARVAEZ, RAMON MARIA (1800-1868), Spanish soldier and statesman, was born at Loja, Granada, on the 4th of August 1800, entered the army at an early age, and saw active service under Mina in Catalonia in 1822. He was in his sympathies a Con- servative, and could not go all lengths with the Radical opposi- tion to Ferdinand VII., whom he served after his restoration. When the king died, Narvaez became one of the Conservati/e supporters of Isabel II. He achieved great popularity by his victory over Gomez, the Carlist general, near Arcos, in November 1836, and after clearing La Mancha of brigands by a vigorous policy of suppression in 1838 he was appointed captain-general of Old Castile, and commander-in-chief of the army of reserve. In 1840, for the part he had taken at Seville in

the insurrection against Espartero and the Progresista party, he was compelled to take refuge in France, where, in conjunction with Maria Cristina, he planned the expedition of 1843 which led to the overthrow of his adversary. In 1844 he became prime minister, and was created field-marshal and duke of Valencia, but his policy was too reactionary to be tolerated long, and he was compelled to quit office in February 1846. He now held the post of ambassador at Paris, until again called to preside over the council of ministers in 1847; but misunderstandings with Maria Cristina led to his resignation in the following year. His ministry succeeded that of O'Donnell for a short time in 1856-1857, and he again returned to power for a few months in 1864-1865. He once more replaced O'Donnell in July 1866, and was still in office when he died at Madrid on the 23rd of April 1868.

Some very curious notices of Narvaez may be found in the letters of Prosper Merimee to Panizzi (1881). For his general political career see Hermann Baumgarten, Geschichte Spaniens v. Ausbruch d. franzos. Revol. bis auf unsere Tage (1865-1871); and the Historia Contemporanea of Antonio Pirala (1871-1879).

NARVIK or Victoriahavn, a seaport on the Ofoten Fjord of the north-west coast of Norway, in Nordland ami (county), 68° 30′ N. It is wholly modern, developed by the construction and completion (1903) of the Ofoten railway, the most northerly in the world. There are extensive quays, from which is shipped the iron ore from the rich districts traversed by the line. Narvik is 167 m. N.W. of Gellivara, and 982 N. by W. of Stockholm by the railway. In summer express trains cover the whole distance in two days. Narvik is a convenient point from which to visit the beautiful Lofoten Islands.

NARWHAL, the Scandinavian name of a cetacean (Monodon monoceros) , characterized by the presence in the male of a long horn-like tusk. In the adult of both sexes there are only two teeth, both in the upper jaw, which lie horizontally side by side, and in the female remain throughout life concealed in cavities of the bone. In the male the right tooth usually remains similarly concealed, but the left is immensely developed, attaining a length equal to more than half that of the entire animal. In a narwhal 1 2 ft. long, from snout to end of tail, the exserted portion of the tusk may measure 6 or 7 and occasionally 8 ft. in length. It projects horizontally forwards from the head in the form of a cylindrical or slightly tapering, pointed tusk, composed of ivory, with a central cavity reaching almost to the apex, without enamel, and with the surface marked by spiral grooves and ridges, running in a sinistral direction. Occasionally both left and right tusks are developed, in which case the direction of the grooves is the

same in both. No instance has ever been met with of the complete development of the right tusk associated with a rudimentary condition of the left. In young animals several small additional teeth are present, but these usually disappear soon after birth.

The head is rather short and rounded; the fore limbs or paddles are small and broad compared with those of most dolphins; and (as in the beluga) a dorsal fin, found in nearly all other members of the group, is wanting. The general colour of the surface is dark grey above and white below, variously marbled and spotted with shades of grey.

The narwhal is an Arctic whale, frequenting the icy circum- polar seas, and rarely seen south of 65° N. lat. Four instances have, however, been recorded of its occurrence on the British coasts, one on the coast of Norfolk in 1588, one in the Firth of Forth in 1648, one near Boston in Lincolnshire in 1800, while a fourth entangled itself among rocks in the Sound of Weesdale, Shetland, in September 1808. Like most cetaceans it is gregari- ous and usually met with in ” schools ” or herds of fifteen or twenty individuals. Its food appears to be cuttlefishes, small fishes and crustaceans. The purpose served by the tusk — or ” horn ” — is not known; and little is known of the habits of narwhals. Scoresby describes them as ” extremely playful, frequently elevating their horns and crossing them with each other as in fencing.” They have never been known to charge and pierce the bottom of ships with their weapons, as the swordfish does. The name ” sea-unicorn ” is sometimes applied to the narwhal. The ivory of which the tusk is composed is of very good quality, but owing to the central cavity, only fitted for the manufacture of objects of small size. The entire tusks are sometimes used for decorative purposes, and are of considerable, though fluctuating, value. (See Cetacea.) (W. H. F.)

NASCIMENTO, FRANCISCO MANOEL DE (1734-1819), Portuguese poet, better known by the literary name of Filinto Elysio, bestowed on him by the Marqueza de Alorna, was the reputed son of a Lisbon boat-owner. In his early years he acquired a love of national customs and traditions which his humanist education never obliterated, while, in addition, he learnt to know the whole range of popular literature {litter atur a de cordel) — songs, comedies, knightly stories and fairy tales, which were then printed in loose sheets {folhas volantes) and sold by the blind in the streets of the capital. These circumstances

explain the richness of his vocabulary, and joined to an ardent patriotism they fitted him to become the herald of the literary revival known as Romanticism, which was inaugurated by his distinguished follower Almeida Garrett. Nascimento began to write verses at the age of fourteen. He was ordained a priest in 1754, and shortly afterwards became treasurer of the Chagas church in Lisbon. He led a retired life, and devoted his time to the study of the Latin classics, especially Horace, and to the society of literary friends, among whom were numbered some cultivated foreign merchants. These men nourished the common ambition to restore Camoens, then half forgotten, to his rightful place as the king of the Portuguese Parnassus, and they proclaimed the cult of the Quinhentistas, regarding them as the best poetical models, while in philosophy they accepted the teaching of the French Encyclopaedists.

Nascimento's first publication was a version of one of Metastasio's operas, and his early work consisted mainly of translations. Though of small volume and merit, it sufficed to arouse the jealousy of his brother bards. At this time the Arcadia was working to restore good taste and purify the language of gallicisms, but the members of this society forgot the traditions of their own land in their desire to imitate the classics. Nascimento and other writers who did not belong to the Arcadia, formed themselves into a rival group, which met at the Ribeira das Naos, and the two bodies attacked one another in rhyme without restraint, until the " war of the poets," as it was called, ended with the collapse of the Arcadia. Nasci- mento now conceived a strong but platonic affection for D. Maria de Almeida, afterwards Condessa da Ribeira, sister of the famous poetess the Marqueza de Alorna. This lady sang the chansonnettes he wrote for her, and their poetical intercourse drew from him some lyrics of profound emotion. This was the happiest epoch of his life, but it did not last long. The ac.cession of D. Maria I. inaugurated an era of reaction against the spirit and reforms of Pombal, and religious succeeded to political intolerance. In June 1778 Nascimento was denounced to the Inquisition on the charge of having given vent to heterodox opinions and read " the works of modern philosophers who follow natural reason." The tribunal held a secret inquiry, and without giving him an opportunity of defence issued an order for his arrest, which was to take place early in the morning of the 14th of July. He had received a warning, and succeeded in escaping to the house of a French merchant, Verdier, where he lay hid for eleven days, at the end of which his friend the Marquez de Marialva put him on board a French ship which carried him to Havre. Nascimento took up his residence in Paris, and his first years there passed pleasantly enough. Soon, however, his

circumstances changed for the worse. He received the news of the confiscation of his property by the Inquisition; and though he strove to support himself by teaching and writing he could hardly make both ends meet. In 1792 his admirer Antonio de Araujo, afterwards Conde de Barca, then Portuguese minister to Holland, offered the poet the hospitality of his house at the Hague, but neither the country, the people, nor the language were congenial, and when his host went to Paris on a diplomatic mission in 1797 Nascimento accompanied him, and spent the rest of his life in and near the French capital. He retained to the end an intense love of country, which made him wish to die in Portugal, and in 1796 a royal decree permitting his return there and ordering the restoration of his goods was issued, but delays occurred in its execution, and the flight of the court to the Brazils as a result of the French invasion finally dashed his hopes. Before this the Conde de Barca had obtained him a commission from the Portuguese government to translate the De Rebus Emanuelis of Osorio; the assistance of some fellow-countrymen in Paris carried him through his last years, which were cheered by the friendship of his biographer and translator Alexandre Sane and of the Lusophil Ferdinand Denis. Lamartine addressed an ode to him; he enjoyed the esteem of Chateaubriand; and his admirers at home, who imitated him extensively, were called after him Gs Filintistas. Exile and suffering had enlarged his ideas and given him a sense

of reality, making his best poems those he wrote between the ages of seventy and eighty-five, and when he passed away, it was recognized that Portugal had lost her foremost contempo- rary poet.

Garrett declared that Nascimento was worth an academy in himself by his knowledge of the language, adding that no poet since Camoens had rendered it such valuable services; but his truest title to fame is that he brought literature once more into touch with the life of the nation. By his life, as by his works, Nascimento links the 18th and 19th centuries, the Neo-Classical period with Romanticism. Wieland's Oberon and Chateau- briand's Martyrs opened a new world to him, and his contos or scenes of Portuguese life have a real romantic flavour; they are the most natural of his compositions, though his noble patriotic odes — those " To Neptune speaking to the Portuguese " and " To the liberty and independence of the United States " — are the most quoted and admired. On leaving Portugal, he abandoned the use of rhyme as cramping freedom of thought and expression; nevertheless his highly polished verses are generally robust to hardness and overdone with archaisms. His translations from Latin, French and Italian, are accurate though harsh, and his renderings of Racine and the Fables of Lafontaine entirely lack the simplicity and

grace of the originals. But Nascimento's blank verse translation of the Martyrs is in many ways superior to Chateaubriand's prose.

Bibliography. — The 'most useful edition of his collected works is that in 22 vols., Lisbon, 1836-1840. See Innocencio da Silva, Diccionario bibliographico Portuguez, ii. 446-457 and ix. 332-336; also Filinto Elysio e a sua Epoca, by Pereira da Silva (Rio, 1891); and Filinto Elysio, by Dr Theophilo Braga (Oporto, 1891).

(E. PR.) NASEBY, a village of Northamptonshire, England, 7 m. S.S.W. of Market Harborough, famous as the scene of the battle of June 14, 1645, which decided the issue of the first Civil War (see Great Rebellion). The army of King Charles I. was less than 10,000 strong, while the " New Mode] " army of the parliament, commanded by Sir Thomas Fairfax, numbered some 13,000, yet it was not without considerable hopes of victory that the Royalists drew up for battle, for although Lieutenant-General Cromwell had made the New Model cavalry formidable indeed, the Royalist foot had become professionalized in several years of war, whereas the Parliamentarian foot was newly organized, and in part at least but half-trained. Fairfax and Cromwell, however, were still more confident, and with better reason. The battlefield lies between Naseby and Sibbertoft (3 m. N. of Naseby) and is an undulating ridge which, near the centre of England, forms the " divide " between the Avon and the Welland rivers. Across this ridge the two armies were drawn up, the New Model facing north and the king's army south, the horse on the flanks and the foot in the centre in each army. At the first shock the Royal foot asserted its superiority over the opposing infantry, four out of five regiments in the first line were broken, and Skippon, the major-general of the foot, was wounded. But Fairfax's regiment held its ground, until the second line of infantry advanced and re-established the front. Meantime the Royalist right wing of horse, led by Prince Rupert, had completely routed the horse of Colonel Ireton which opposed them. But the victors as usual indulged in a disorderly pursuit, and attempted to overpower the baggage guard of the enemy near Naseby village. Their incoherent attack was repulsed, and when Rupert, gathering as many of his men as he could, returned to the battlefield, the decisive stroke had been delivered by Cromwell and the right wing of Parliamentary horse. In front of him, in somewhat broken ground, was Sir Marmaduke Langdale's cavalry, which the lieutenant-general with his own well-trained regiments scattered after a short, fierce encounter. Cromwell's " godly " troopers did not scatter in pursuit. A few squadrons were ordered to keep the fugitives on the run, and with the rest, and such of Ireton's broken troops as he could gather, Cromwell attacked the Royalist centre in rear while Fairfax and his foot pressed

it in front. Gradually the Royalist infantry, inferior in numbers, was disintegrated into small groups, which surrendered one after the other. But one brigade, called

the ” Bluecoats,” held out to the last, and was finally broken by a combined charge of Fairfax’s regiment of foot, led by Cromwell, and the general’s personal escort, led by Fairfax himself, who captured a colour with his own hand. The remnant of the king’s army, re-formed by Rupert, stood inactive and irresolute while its infantry was being destroyed and then fled. The spoils included 100 standards and colours and the king’s private papers. But more important than trophies was the practical annihilation of the last field army of which the king disposed. Half the Royalists were captured, and about 1000 fell, in the battle and the pursuit which followed it. In addition all the artillery and the. muskets (to the number of 8000) and ammunition without which the king could scarcely create a new army, fell into the hands of the victors.

NASH, RICHARD (1674-1762), English dandy, better known as ” Beau Nash,” was born at Swansea on the 18th of October 1674. He was descended from an old family of good position, but his father from straitened means had become partner in a glass business. Young Nash was educated at Carmarthen grammar school and at Jesus College, Oxford. He obtained a commission in the army, which, however, he soon exchanged for the study of law at the Temple. Here among ” wits and men of pleasure ” he came to be accepted as an authority in regard to dress, manners and style. When the members of the Inns of Court entertained William III. after his accession, Nash was chosen to conduct the pageant at the Middle Temple. This duty he performed so much to the satisfaction of the king that he was offered knighthood, but he declined the honour, unless accompanied by a pension. As the king did not take the hint, Nash found it necessary to turn gamester. The pursuit of his calling led him in 1705 to Bath, where he had the good fortune almost immediately to succeed Captain Webster as master of the ceremonies. His qualifications for such a position were unique, and under his authority reforms were introduced which rapidly secured to Bath a leading position as a fashionable watering-place. He drew up a new code of rules for the regulation of balls and assemblies, abolished the habit of wearing swords in places of public amusement and brought duelling into disrepute, induced gentlemen to adopt shoes and stockings in parades and assemblies instead of boots,

reduced refractory chairmen to submission and civility, and introduced a tariff for lodgings. Through his exertions a handsome assembly-room was also erected, and the streets and public buildings were greatly improved. Nash adopted an outward state corresponding to his nominal dignity. He wore an immense white hat as a sign of office, and a dress adorned with rich embroidery, and drove in a chariot with six greys, laced lackeys and French horns. When the act of parliament against gambling was passed in 1745, he was deprived of an easy though uncertain means of subsistence, but the corporation afterwards granted him a pension of six score guineas a year, which, with the sale of his snuff-boxes and other trinkets, enabled him to support a certain faded splendour till his death on the 3rd of February 1762. He was honoured with a public funeral at the expense of the town. Notwith- standing his vanity and impertinence, the tact, energy and superficial cleverness of Nash won him the patronage and notice of the great, while the success of his ceremonial rule, as shown in the increasing prosperity of the town, secured him the gratitude of the corporation and the people generally. He was a man of strong personality, and considerably more able than Beau Brummell, whose prototype he was.

See Lewis Melville, Bath under Beau Nash (1908), with full list of authorities; Oliver Goldsmith, Life of Richard Nash (1762). See also Gentleman's Magazine (1762); London Magazine, vol. xxxi. ; " The Monarch of Bath " in Blackwood's Magazine, vol. xlviii.

NASHE (or Nash), THOMAS (1567-1601), English poet, playwright and pamphleteer, was born at Lowestoft in 1567. His father belonged to an old Herefordshire family, and is vaguely described as a " minister," Nashe spent nearly seven years, 1582 to 1589, at St John's College, Cambridge, taking his B.A. degree in 1 585-1 586. On leaving the university he tried, like Greene and Marlowe, to make his living in London by

literature. It is probable that his first effort was The Anatomie of Absurditie (1589) which was perhaps written at Cambridge, although he refers to it as a forthcoming publication in his preface to Greene's Menaphon (1589). In this preface, addressed to the gentlemen students of both universities, he makes boister- ous ridicule of the bombast of Thomas Kyd and the English hexameters of Richard Stanihurst, but does not forget the praise of many good books. Nashe was really a journalist born out of due time; he boasts of writing " as fast as his hand could trot "; he had a brilliant and picturesque style which, he was careful to explain, was entirely original; and in addition to his keen sense of the ridiculous he had an abundance of

miscellaneous learning. As there was no market for his gifts he fared no better than the other university wits who were trying to live by letters. But he found an opening for his ready wit and keen sarcasm in the Martin Marprelate controversy. His share in this war of pamphlets cannot now be accurately determined, but he has, with more or less probability, been credited with the following: A Countercuffe given to Martin Junior (1589), Martins Months Minde (1589), The Returne of the renowned Cavaliero Pasquill and his Meeting with Marforius (1589), The First Parte of Pasquils Apologie (1590), and An Almond for a Parr at (1590). He edited an unauthorized edition of Sidney's poems with an enthusiastic preface in 159 1, and A Wonderfull Astrologicall Prognostication, in ridicule of the almanac-makers, by " Adam Fouleweather," which appeared in the same year, has been attributed to him. Pierce Penilesse, His Supplication to the Divell, published in 1592, shows us his power as a humorous critic of national manners, and tells incidentally how hard he found it to live by the pen. It seems to Pierce a monstrous thing that brainless drudges wax fat while " the seven liberal sciences and a good leg will scarce get a scholar bread and cheese." In this pamphlet, too, Nashe began his attacks upon the Harveys by assailing Richard, who had written contemptuously of his preface to Greene's Menaphon. Greene died in September 1592, and Richard's brother, Gabriel Harvey, at once attacked his memory in his Foure Letters, at the same time adversely criticizing Pierce Penilesse. Nashe replied, both for Greene and for himself, in Strange Newes of the intercepting certaine Letters, better known, from the running title, as Foure Letters Confuted (1592), in which all the Harveys are violently attacked. The autumn of 1592 Nashe seems to have spent at or near Croydon, where he wrote his satirical masque of Summers Last Will and Testament at a safe distance from London and the plague. He afterwards lived for some months in the Isle of Wight under the patronage of Sir George Carey, the governor. In 1593 he wrote Christs Teares over Jerusalem, in the first edition of which he made friendly overtures to Gabriel Harvey. These were, however, in a second edition, published in the following year, replaced by a new attack, and two years later appeared the most violent of his tracts against Harvey, Have with you to Saffron-walden, or, Gabriell Harveys Hunt is up (1596). In 1599 the controversy was suppressed by the archbishop of Canterbury. After Marlowe's death Nashe prepared his friend's unfinished tragedy of Dido (1596) for the stage. In the next year he was in trouble for a play, now lost, called The Isle of Dogs, for only part of which, however, he seems to have been responsible. The " seditious and slanderous matter " contained in this play induced the authorities to close for a time the theatre at which it had been performed, and the dramatist was put in the Fleet

prison. Besides his pamphlets and his play-writing, Nashe turned his energies to novel-writing. He may be regarded as the pioneer in the English novel of adventure. He published in 1 594 The Unfortunate Traveller, Or the Life of Jack Wilton, the history of an ingenious page who was present at the siege of Terouenne, and afterwards travelled in Italy with |the earl of Surrey. It tells the story of the earl and Fair Geraldine, describes a tournament held by Surrey at Florence, and relates the adventures of Wilton and his mistress Diamante at Rome after the earl's return to England. .The detailed, realistic manner in which Nashe relates his improbable fiction resembles that of Defoe. His last work is entitled Lenten Stuffe (1599)

and is nominally " in praise of the red herring," but really a description of Yarmouth, to which place he had retired after his imprisonment, written in the best style of a " special corre- spondent." Nashe's death is referred to in Thomas Dekker's Knight's Conjuring (1607), a kind of sequel to Pierce Penilesse. He is there represented as joining his boon companions in the Elysian fields " still haunted with the sharp and satirical spirit that followed him here upon earth." Had his patrons under- stood their duty, he would not, he said, have shortened his days by keeping company with pickled herrings. It may therefore be reasonably supposed that he died from eating bad and in- sufficient food. The date of his death is fixed by an elegy on him printed in Fitzgeffrey's Afaniae (1601).

The works of Thomas Nashe were edited by Dr A. B. Grosart in 1883-1885, and more recently by Ronald B. McKerrow (1904). An account of his work as a novelist may be found in the English Novel in the Time of Shakespeare, by J. J. Jusserand (Eng. trans., 1890). The Unfortunate Traveller was edited with an introduction by Edmund Gosse in 1892. See also " Nash's Unfortunate Traveller und Head's English Rogue, die beiden Hauptvertreter des englischen Schelmenromans," by W. Kollmann in Anglia (Halle, vol. xxh., 1899, pp. 81-140).

NASHUA, a city and one of the county seats of Hillsboro county, New Hampshire, U.S.A., at the confluence of the Nashua and Merrimac rivers, 35 m. S.S.E. of Concord and 40 m. N.W. of Boston by rail. Pop. (1890) 19,311; (1900) 23,898, of whom 8093 were foreign-born; (1910 census) 26,005. Nashua is served by the Boston & Maine railroad, whose several divisions centring here give the city

commercial importance, and by electric fines to Hudson, Litchfield, Pelham, Dracut and Tyngsboro. The area of the city in 1906 was 30-71 sq. m. To the N.,W. and S.W. of the city there are beautiful hills and moun- tains. The church of Saint Francis Xavier and the First Congregational church are architecturally noteworthy. The city has a soldiers' monument, a public library, a court house and two hospitals. There is a United States fish hatchery here, and until after the close of the 18th century fishing was the principal industry of the place, as manufacturing is now. Water-power is furnished by the Nashua river and by Salmon Brook, and the city is extensively engaged in manufactures, notably cotton goods, boots, shoes, and foundry and machine-shop products. The value of the city's factory products increased from $10,096,064 in 1900 to $12,858,382 in 1905, or 27-4%, and in 1905 Nashua ranked second among the manufacturing cities of the state. Nashua is one of the oldest interior settlements of the state. The first settlement here was established about 1665; and in 1673 the township of Dunstable was incorporated by the General Court of Massachusetts. In 1741, when the boundary between Massachusetts and New Hampshire was settled, the jurisdiction of this portion of Dunstable was transferred to New Hampshire; five years later it was incorporated under the laws of that state; and in 1803 the settlement, originally known as Indian Head, was incorporated as a village under the name of Nashua, and in 1836 the township of Dunstable also received the name Nashua. The town of Nashville was set apart from the town of Nashua in 1842, but the two towns were united under a city charter obtained in 1853. In 1795 the first stage coach was run through here from Boston to Amherst, and at about the same time a canal was built around Pawtucket Falls on the Merrimac at Lowell. In 1822 a manufacturing company was formed, which at once began to develop the water-power and in 1825 erected the first cotton mill. Thirteen years later the Nashua & Lowell railroad (now leased to the Boston & Maine) first reached Nashua.

See The History of the City of Nashua, edited by E. E. Parker (Nashua, 1897).

NASHVILLE, the capital of Tennessee, U.S.A., and the county-seat of Davidson county, on the Cumberland river, 186 m. S.S.W. of Louisville, Kentucky. Pop. (1890) 76,168; (1900) 80,865, of whom 3037 were foreign-born and 30,044 were negroes; (1910 census) 110,364. Nashville is served by the Tennessee Central, the Louisville & Nashville, and the Nashville, Chat- tanooga & St Louis railways, and by several steamboat lines. The Cumberland river is crossed here by four foot-bridges. Nashville is situated on and between hills and bluffs in an un-

dulating valley; its streets are paved with brick or granite blocks in the business section and macadamized or paved with asphalt in the residential sections. The city has fine public buildings, many handsome residences, and several beautiful parks. The principal building is the State House, a fine example of pure Greek architecture, on the most prominent hill-top, with a tower 205 ft. in height. On the grounds about it are a bronze equestrian statue of Andrew Jackson, by Clark Mills (1815-1883), and the tomb of President James K. Polk, who lived in Nashville. Other prominent buildings and institutions are the United States Government Building, the County Court House, the City Hall, the Tennessee School for the Blind, the Tennessee Industrial School, the State Library, the Library of the State Historical Society housed in Watkins Institute, a Carnegie library, park buildings, the State Penitentiary, Vendome Theatre, the Board of Trade Building, the City Hospital, the St Thomas Hospital (Roman Catholic), and, near the city, a Confederate Soldiers' Home and a State Hospital for the Insane. Eleven miles east of the city is the " Hermitage," which was the residence of President Andrew Jackson.

The grounds of the Tennessee Centennial Exposition of 1897 (commemorating the admission of Tennessee into the Union) on the west border of the city now constitute Centennial Park, in which still stand the reproduced Parthenon of Athens, the History Building, which in general outline is a reproduction of the Erectheum and contains a museum and an art gallery, and a monument to the memory of James Robertson (1742-1814), the founder of the city. Besides this there are four other parks: Glen- dale Park in the south section, a place of much natural beauty; Shelby Park, in the eastern part of the city, fronting the river; Watkins Park, on the north; and Cumberland Driving Park. In Mount Olivet Cemetery is a beautiful Confederate Soldiers' monument surrounded by the graves of 2000 Confederate soldiers, and a little to the north of the city is a National Cemetery in which 16,643 Federal soldiers are buried, the names of 4711 of them being unknown.

Nashville is one of the foremost educational centres in the Southern states. In the western part of the city is Vanderbilt University. This institution, opened in 1875, is under the patronage of the Methodist Episcopal Church, South, and was named in honour of Cornelius Vanderbilt, who contributed $1,000,000 to its funds, and whose son, W. H. Vanderbilt, and grandsons, W. K. Vanderbilt and Cornelius Vanderbilt, gave to the university about $820,000. It is coeducational and embraces an academic department, a biblical department, and departments of engineering, law, medicine, pharmacy and dentistry; in 1909 it had 125 instructors and 959 students. The University of

Nashville is a non-sectarian institution embracing a college department, a medical department, a preparatory department, and the George Peabody College for Teachers; it was incorporated under the laws of North Carolina as Davidson Academy in 1785 and under the laws of Tennessee as Cumberland College in 1806, and the present name was adopted in 1826. The George Peabody College for Teachers, an important part of the institution, was opened as a normal school in 1875; in 1907-1908 it had an enrolment (including the summer session) of 647 students. In 1909 it received $1,000,000 from the Peabody Fund, later supple- mented by $250,000 from the state, $200,000 from the city and $100,000 from Davidson county. The University of Tennessee, located mainly at Knoxville, has at Nashville its medical and dental departments. Ward Seminary, opened in 1865, Boscobel College, opened in 1889, and Buford, Belmont and Radnor colleges are all non-sectarian institutions of Nashville for the higher educa- tion of women. For the education of negroes the city has Fisk University (opened in 1866, incorporated in 1867), under the auspices of the American Missionary Association and the Western Freedman's Aid Commission of the Congregational Church (noted since 187 1 for its Jubilee Singers, who raised money for Jubilee Ha 11, finished in 1876) ; it embraces a college department, a preparatory department, a normal department and departments of theology, music and physical training; and Walden University, founded as Central Tennessee College in 1866, under the auspices of the

Methodist Episcopal Church, and embracing a college depart- ment, a normal department, an industrial department, and departments of English, commerce, law, medicine, dentistry, pharmacy, music, bible training, nurse training and domestic science. The Baptist, the Methodist Episcopal (South), the Cumberland Presbyterian, and the African Baptist and the African Methodist Episcopal churches have publishing houses in Nashville.

The leading manufactures of the city are flour and grist mill products (valued at $4,242,491 in 1905), lumber and timber products — Nashville is one of the greatest hard wood markets in the United States, and in 1905 the value of lumber and timber products was $1,119,162 and of planing-mill products, $1,299,066 — construction and repair of steam railway cars ($1,724,007 in 1905), tobacco ($1,3 1 1,019 in I 9°S)i fertilizers ($846,511 in 1905), men's clothing ($720,227 in 1905), saddlery, harness, soap and candles. The total

value of the products of the factories increased from $15,301,096 in 1900 to $23,109,601 (16-8% of the entire factory product of the state) in 1905, amounts greater than those of any other city in the state. Nashville has a large trade in grain, cotton, groceries, dry goods, drugs, and boots and shoes. The water-works and the electric lighting plant are owned and operated by the municipality.

Nashville was founded in 1780 as ” the advance guard of western civilization ” by a company of two hundred or more pioneers under the leadership of James Robertson, the nearest settlement being at the time about three hundred miles distant. When first settled it was named Nashborough in honour of Abner Nash (1716-1786), who was at the time governor of North Caro- lina, or more probably in honour of the Revolutionary general, Francis Nash (17 20-1 777), a brother of Abner, killed at German- town; but when, in 1784, it was incorporated as a town by the North Carolina legislature the present name was substituted. In 1806 Nashville was chartered as a city. Although it was not made the capital of the state until 1843, tne legislature met here from 1812 with the exception of the period from 1815 to 1826. Many of the pioneers of Nashville were slain by the Greek and Cherokee Indians, and at times the settlement was saved from destruction only by the heroism of Robertson, but in 1794 the savages were dealt a crushing blow at Nickojack on the lower Tennessee and much more peaceful relations were established. On the 3rd of June 1850 a convention, known as the Southern or Nashville Convention, whose action was generally considered a threat of disunion, met here to consider the questions at issue between the North and the South. Since such a meeting had first been proposed by a state convention of Mississippi, the famous Compromise Measures of 1850 had been introduced in Congress and the support of the movement had been greatly weakened thereby except in South Carolina and Mississippi. Nine states, however, were represented by about 100 delegates, mostly Democrats, and the convention denounced the Wilmot Proviso, and, as ” an extreme concession on the part of the South,” promised to agree that, W. of Missouri, there should be slavery only in the territory S. of 36 30′ N. lat. At an adjourned meeting in November it expressed its dissatisfaction with the Compromise Measures of Congress, and asserted the right of the South to secede.

During the Civil War Nashville was at first held by the Con- federates, but early in 1862 it was occupied by the Federals, who retained possession of it to the end. The battle of Nashville was fought on the 15th and 16th of December 1864 between the Union army under Major-General G. H. Thomas and the Confederates under Geneial J. B. Hood. The Union defences extended in a semicircle round Nashville,

the flanks on the river above and below. Hood's army was to the south-east, lightly entrenched, with its flanks on two creeks which empty into the Cumberland above and below Nashville. This position he desired to maintain as long as possible so as to gather recruits and supplies in safety. If Thomas, whose army was of motley composition, attacked, he hoped to defeat him and to enter Nashville on his heels. Thomas, however, would not strike until he had his army organized. Then, on the 1 5th, he emerged

from the entrenchments and by a vigorous attack on the Con- federate left forced back Hood's line to a second position 15 m. to the south. Hood, having detached a part of his army, desired to gain time to bring in his detachments by holding this line for another day. Thomas, however, gave him no respite. On the 1 6th the Union army deployed in front of him, again over-lap- ping his left flank, and although a frontal attack was repulsed, the extension of the Federal right wing compelled Hood to extend his own lines more and more. Then the Federals broke the attenuated line of defence at its left centre, and Hood's army drifted away in disorder. The pursuit was vigorous, and only a remnant of the Confederate forces reassembled at Columbia, 40 m. to the south, whence they fell back without delay behind the Tennessee.

NASI, JOSEPH (16th century), Jewish statesman and financier, was born in Portugal of a Jewish (Marano) family. Emigrating from his native land, he founded a banking house in Antwerp. Despite his financial and social prosperity there, he felt it irk- some to be compelled to wear the guise of Catholicism, and determined to settle in a Mahommedan land. After two troubled years in Venice, Nasi betook himself to Constantinople. Here he proclaimed his Judaism, and married his beautiful cousin Reyna. .He rapidly rose to favour, the sultans Suleiman and Selim promoting him to high office. He founded a Jewish colony at Tiberias which was to be an asylum for the Jews of the Roman Campagna. In 1566 when Selim ascended the throne, Nasi was made duke of Naxos. He had deserved well of Turkey, for he had conquered Cyprus for the sultan. Nasi's influence was so great that foreign powers often negotiated through him for concessions which they sought from the sultan. Thus the emperor of Germany, Maximilian II., entered into direct corre- spondence with Nasi; William of Orange, Sigismund August II., king of Poland, also conferred with him on political questions of moment. On the death of Selim in 1574, Nasi receded from his political position, but retained his wealth and offices, and passed the five years of life remaining to him in honoured tranquillity at Belvedere (Constantinople). He died in 1579. His career was not productive of direct results, but it was of

great moral importance. It was one of the tokens of the new era that was to dawn for the Jews as trusted public officials and as members of the state. r \

See Graetz, History of the Jews (Eng. trans.), vol. iv. chs. xvi.- xvii. ; Jewish Encyclopedia, ix. 172. (I. A.)

NASIK, a. town and district of British India, in the central division of Bombay. The town is on the Godavari river, con- nected by a tramway (5 m.) with Nasik Road railway station, 107 m. N.E. of Bombay. Pop. (1901) 21,490. It is a very holy place of Hindu pilgrimage, being 30 m. from the source of the Godavari. Shrines and temples line the river banks, and some stand even in the river. In the vicinity there are a number of sacred caves, among which those of Pandu Lena are the most noteworthy. They are ancient Buddhist caves dating from the 3rd century before Christ to the 6th century after. There are numerous inscriptions of the highest historical value. Nasik has manufactures of cotton goods, brass-ware and mineral waters.

The District of Nasik has an area of 5850 sq. m. With the exception of a few villages in the west, the whole district is situated on a tableland from 1300 to 2000 ft. above sea-level. The western portion is hilly, and intersected by ravines, and only the simplest kind of cultivation is possible. The eastern tract is open, fertile and well cultivated. The Sahyadri range stretches from north to south; the watershed is formed by the Chander range, which runs east and west. All the streams to the south of that range are tributaries of the Godavari. To the north of the watershed, the Girna and its tributary the Mosam flow through fertile valleys into the Tapti. The district generally is destitute of trees, and the forests which formerly clothed the Sahyadri hills have nearly disappeared ; efforts are now being made to prevent further destruction, and to reclothe some of the slopes. The district contains several old hill forts, the scenes of many engagements during the Mahratta wars. Nasik district

became British territory in 1818 on the overthrow of the peshwa. The population in 1901 was 816,504, showing a decrease of 3% in the decade. The principal crops are millet, wheat, pulse, oil-seeds, cotton and sugar cane. There are also some vineyards of old date, and much garden cultivation. Yeola is an important centre for weaving silk and cotton goods. There are flour-mills at Malegaon, railway workshops at

Igatpuri, and cantonments at Deolali and Malegaon. At Sharanpur is a Christian village, with an orphanage of the C.M.S., founded in 1854. The district is crossed by the main line and also by the chord line of the Great Indian Peninsula railway.

NASIR KHOSRAU (Nasiri Khusru), Abu Mu'in-ed-din Nasir b. Khosrau (1004-1088), whose nom de plume was Hujjat, the first great didactic poet of Persia, was born, according to his own statement, a.h. 394 (a.d. 1004), at Kubadiyan, near Balkh in Khorasan. The first forty- two years of his life are obscure; we learn from incidental remarks of his that he was a Sunnite, probably according to the Hanifite rite, well versed in all the branches of natural science, in medicine, mathematics, astronomy and astrology, in Greek philosophy, and the interpretation of the Koran; that he was much addicted to worldly pleasures, especially to excessive wine drinking. He had studied Arabic, Turkish, Greek, the vernacular languages of India and Sind, and perhaps even Hebrew; he had visited Multan and Lahore, and the splendid Ghaznavide court under Sultan Mahmud, Firdousi's patron. Later on he chose Merv for his residence, and was the owner of a house and garden there. In a.h. 437 (a.d. 1045) he appears as financial secretary and revenue collector of the Seljuk sultan Toghrul Beg, or rather of his brother Jaghir Beg, the emir of Khorasan, who had conquered Merv in 1037. About this time, inspired by a heavenly voice (which he pretends to have heard in a dream), he abjured all the luxuries of life, and resolved upon a pilgrimage to the holy shrines of Mecca and Medina, hoping to find there the solution of all his religious doubts. The graphic description of this journey is contained in the Safarndma, which possesses a special value among books of travel, since it contains the most authentic account of the state of the Mussulman world in the middle of the nth century. The minute sketches of Jerusalem and its environs are even now of practical value. During the seven years of his journey (a.d. 1045-1052) Nasir visited Mecca four times, and performed all the rites and observances of a zealous pilgrim; but he was far more attracted by Cairo, the capital of Egypt, and the residence of the Fatimite sultan Mostansir billah, the great champion of the Shl'a, and the spiritual as well as political head of the house of ' Ali, which was just then waging a deadly war against the 'Abbaside caliph of Bagdad, and the great defender of the Sunnite creed, Toghrul Beg the Seljuk. At the very time of Nasir's visit to Cairo, the power of the Egyptian Fatimites was in its zenith; Syria, the Hejaz, Africa, and Sicily obeyed Mostansir's sway, and the utmost order, security and prosperity reigned in Egypt. At Cairo he became thoroughly imbued with Shi'a doctrines, and their introduction into his native country was henceforth the sole object of

his life. The hostility he encountered in the propagation of these new religious ideas after his return to Khorasan in 1052 and Sunnite fanaticism compelled him at last to flee, and after many wander- ings he found a refuge in Yumgan (about 1060) in the mountains of Badakshan, where he spent as a hermit the last decades of his life, and gathered round him a considerable number of devoted adherents, who have handed down his doctrines to succeeding generations.

Most of Nasir's lyrical poems were composed in his retirement, and their chief topics are — an enthusiastic praise of 'AH, his de- scendants, and Mostansir in particular; passionate outcries against Khorasan and its rulers, who had driven him from house and home ; the highest satisfaction with the quiet solitude of Yumgan; and utter despondency again in seeing himself despised by his former associates and for ever excluded from participation in the glorious contest of life. But scattered through all these alternate outbursts of hope and despair we find precious lessons of purest morality, and solemn warnings against the tricks and perfidy of the world, the vanity of all earthly splendour and greatness, the folly and injustice of men, and the hypocrisy, frivolity and viciousness of fashionable

society and princely courts in particular. It is the same strain which runs, although in a somewhat lower key, through his two larger mathnawis or double-rhymed poems, the Rushanainama, or " book of enlightenment," and the Sa'adatnama, or " book of feli- city." The former is divided into two sections: the first, of a meta- physical character, contains a sort of practical cosmography, chiefly based on Avicenna's theories, but frequently intermixed both with the freer speculations of the well-known philosophical brotherhood of Basra, the Ikhwan-es-safa'i, and purely Shi'ite or Isma'ilite ideas; the second, or ethical section of the poem, abounds in moral maxims and ingenious thoughts on man's good and bad qualities, on the necessity of shunning the company of fools and double-faced friends, on the deceptive allurements of the world and the secret snares of ambitious craving for rank and wealth. It concludes with an imaginary vision of a beautiful world of spirits who have stripped off the fetters of earthly cares and sorrows and revel in the pure light of divine wisdom and love. ,If we compare this with a similar allegory in Nasir's diwan, which culminates in the praise of Mostansir, we are fairly entitled to look upon it as a covert allusion to the eminent men who revealed to the poet in Cairo the secrets of the Isma'ilitic faith, and showed him what he considered the " heavenly ladder " to superior knowledge and spiritual bliss. The passage, thus interpreted, lends additional weight to the correctness of Dr Ethe's reconstruction of the date of the Rushanainama, viz. A.H. 440 (a.d. 1049), which, notwithstanding M.

Schefcr's objections, is warranted both by the astronomical details and by the metrical requirements of the respective verses. That of course does not exclude the possi- bility of the bulk of the poem having been composed at an earlier period ; it only ascribes its completion or perhaps final revision to Nasir's sojourn in Egypt.

A similar series of excellent teachings on practical wisdom and the blessings of a virtuous life, only of a severer and more uncom- promising character, is contained in the Sa'adatnama; and, judging from the extreme bitterness of tone manifested in the " reproaches of kings and emirs," we should be inclined to consider it a protest against the vile aspersions poured out upon Nasir's moral and religious attitude during those persecutions which drove him at last to Yumgan. Of all the other works of our author mentioned by Oriental writers there has as yet been found only one, the Zdd- elmusafirin or "travelling provisions of pilgrims" (in the private possession of M. Schefer, Paris), a theoretical description of his religious and philosophical principles; and we can very well dismiss the rest as being probably just as apocryphal as Nasir's famous auto- biography (found in several Persian tadhkiras or biographies of poets), a mere forgery of the most extravagant description, which is mainly responsible for the confusion in names and dates in older accounts of our author.

See Sprenger's Catalogue of the Libraries of the King of Oudh (1854); H. Eth6, " Nasir Chusrau's Rushanainama" in Zeitschrift der deutschen morgenldndischen Gesellschaft, xxxiii., xxxiv., 1879-1880; E. Fagnan, " Le Livre de la felicite," in vol. xxxiv. of the same journal, 643-674; Ch. Schefer, Sefer Nameh, publie, traduit el annoie (Paris, 1 881), and by Guy le Strange in Pilgrims' Text Society (1888); H. Eth6, in Gottinger Nachrichten, 1882, pp. 124-152, Z.D.M.G., 1882, pp. 478-508; and Geiger's Grundriss der iranischen Philologie ii. p. 278; Fagnan in Journ. As. 7th ser. vol. xiii. pp. 164 seq., and Rieu, Cat. Pers. MSS. in Br. Mus., concluded that the poet and the pilgrim were different persons. The opposite view was developed by Ethe. (H, E.)

NASIRABAD, or Mymensingh, a town of British India, headquarters of Mymensingh district in Eastern Bengal and Assam, situated on the left bank of the old channel of the Brahma- putra, which is only navigable during the rainy season. Pop. (1901) 14,668. It has a station on the branch of the Eastern Bengal railway from Dacca to Jagannathganj, on the Jamuna or main stream of the Brahmaputra. The earthquake of the 1 2th of June 1897 destroyed the church and the high school, and seriously damaged other public buildings.

Nasirabad is also the name of a town and cantonment in the district of Ajmere, Rajputana. Pop. (1901) 22,494. It forms the headquarters of a brigade in the 5th division of the Southern army.

NASMYTH, ALEXANDER (1758-1840), Scottish portrait and landscape painter, was born in Edinburgh on the 9th of September 1758. He studied at the Trustees' Academy under Runciman, and, having been apprenticed as an heraldic painter to a coach- builder, he, at the age of sixteen, attracted the attention of Allan Ramsay, who took the youth with him to London, and employed him upon the subordinate portions of his works. Nasmyth returned to Edinburgh in 1778, and was soon largely patronized as a portrait painter. He also assisted Mr Miller of Dalswinton, as draughtsman, in his mechanical researches and experiments; and, this gentleman having generously offered the painter a loan to enable him to pursue his studies abroad, he left in 1782 for Italy, where he remained two years. On his return he painted

the excellent portrait of Burns, now in the Scottish National Gallery, well known through Walker's engraving. Political feeling at that time ran high in Edinburgh, and Nasmyth's pronounced Liberal opinions, which he was too outspoken and sincere to disguise, gave offence to many of his aristocratic patrons, and led to the diminution of his practice as a portraitist. In his later years, accordingly, he devoted himself mainly to landscape work, and did not disdain on occasion to set his hand to scene-painting for the theatres. He has been styled, not unjustly, the " father of Scottish landscape art." His subjects are carefully finished and coloured, but are wanting in boldness and freedom. Nasmyth was also largely employed by noblemen throughout the country in the improving and beautifying of their estates, in which his fine taste rendered him especially skilful; and he was known as an architect, having designed the Dean Bridge, Edinburgh, and the graceful circular temple covering St Bernard's Well. Nasmyth died in his native city on the ioth of April 1840. His youngest son, James, was the well-known inventor of the steam-hammer. His six daughters all attained a certain local reputation as artists, but it was in his eldest son, Patrick (iy87-i83i),that the artistic skill of his family was most powerfully developed. Having studied under his father, Patrick went to London at the age of twenty, and soon attracted atten- tion as a clever landscapist. He was a diligent student of the works of Claude and Richard Wilson, and of Ruysdael and Hobbema, upon whom his own practice was mainly founded. His most characteristic paintings are of English domestic scenery, full of quiet tone and colour, and detailed and minute expression of foliage, and with considerable

brilliancy of sky effect. They were executed with his left hand, his right having in early life been injured by an accident.

For an account of the Nasmyth family see James Nasmyth's Autobiography (1883).

NASMYTH, JAMES (1808-1890), Scottish engineer, was born in Edinburgh on the 19th of August 1808, and was the youngest son of Alexander Nasmyth, the "father of Scottish landscape art." He was sent to school in his native city, and then attended classes in chemistry, mathematics and natural philosophy at the university. From an early age he showed great fondness for mechanical pursuits, and the skill he attained in the practical use of tools enabled him to make models of engines, &c, which found a ready sale. In 1829 he obtained a position in Henry Maudslay's works in London, where he stayed two years, and then, in 1834, started business on his own account in Manchester. The beginnings were small, but they quickly developed, and in a few years he was at the head of the prosperous Bridgewater foundry at Patricroft, from which he was able to retire in 1856 with a fortune. The invention of the steam-hammer, with which his name is associated, was actually made in 1839, a drawing of the device appearing in his note-book, or " scheme-book;" as he called it, with the date 24th November of that year. It was designed to meet the difficulty experienced by the builders of the Great Britain steamship in finding a firm that would under- take to forge the large paddle-wheel shaft required for that vessel, but no machine of the kind was constructed till 1842. In that year Nasmyth discovered one in Schneiders' Creuzot works, and he found that the design was his own and had been copied from his " scheme-book." His title, therefore, to be called the inventor of the steam-hammer holds good against the claims sometimes advanced in favour of the Schneiders, though apparently he was anticipated in the idea by James Watt. Nasmyth did much for the improvement of machine-tools, and his inventive genius devised many new appliances — a planing- machine (" Nasmyth steam-arm "), a nut-shaping machine, steam pile-driver, hydraulic machinery for various purposes, &c. In his retirement he lived at Penshurst in Kent, and amused himself with the study of astronomy, and especially of the moon, on which he published a work, The Moon considered as a Planet, a World and a Satellite, in conjunction with James Carpenter in 1874. He died in London on the 7th of May 1890.

His Autobiography, edited by Dr Samuel Smiles, was published in 1883.

NASR-ED-DIN [Nasirtj'd-Din] (1829-1896), shah" of Persia, was born

on the 4th of April 1829. His mother, a capable princess of the Kajar family, persuaded Shah Mahommed, his father, to appoint him heir apparent, in preference to his elder brothers: and he was accordingly made governor of Azerbaijan. His succession to the throne, 13th October 1848, was vigorously disputed, especially by the followers of the reformer El Bab, upon whom he wreaked terrible vengeance. In 1855 he re- established friendly relations with France, and coming under the influence of Russia, signed a treaty of amity on the 17th of December with that power, but remained neutral during the Crimean war. In 1856 he seized Herat, but a British army under Outram landed in the Persian Gulf, defeated his forces and compelled him to evacuate the territory. The treaty of peace was signed at Paris, on the 4th of March 1857, and to the end of his reign he treated Great Britain and Russia with equal friend- ship. In 1866 the shah authorized the passage of the telegraph to India through his dominions and reminted his currency in the European fashion. In 1873, and again in 1889, he visited England in the course of his three sumptuous journeys to Europe, 1873,1878,1889. The only results of his contact with Western civilization appear to have been the proclamation of religious toleration, the institution of a postal service, accession to the postal union and the establishment of a bank. He gave the monopoly of tobacco to a private company, but was soon com- pelled to withdraw it in deference to the resistance of his subjects. Abstemious in habits, and devoted to music and poetry, he was a cultured, able and well-meaning ruler, and his reign, already unusually long for an Eastern potentate, might have lasted still longer had it not been for the unpopular sale of the tobacco monopoly, which was probably a factor in his assassination at Teheran on the istof May 1896 by a member of the Babi faction. He was succeeded by his son Muzaffar-ed-din.

NASRIDES, THE, of Granada, were the last of the Mahom- medan dynasties in Spain. They ruled from 1232 to 1492. They arose at the time when the king of Castile, Fernando the Saint, was conquering Andalusia. The dynasty was of remote Arabic origin, but its immediate source was the mountain range of the Alpujarra, and the founder was Yusuf (or Yahia) l'Nasr, a chief who was engaged in perpetual conflict with rival chiefs and in particular with the family of Beni-Hud, once kings at Saragossa, who held the fortress of Granada. Yusuf's nephew (or son) Mahommed completed the defeat of the Beni-Hud largely by the help of the king of Castile, to whom he did homage and paid tribute. Mahommed I., called el Ghalib, i.e. the Conqueror (1 238-1273), served the Christian king against his own co-religionists at the siege of Seville and contrived to escape in the general wreck of the Mahommedan power. The internal history of the dynasty is largely

made up of civil dissensions, personal rivalries, palace and harem intrigues. The direct male line of Mahommed el Ghalib ended with the fourth sultan, Nasr, in 13 14. Nasr was succeeded by his cousin Imail (1314-1325), who is said to have been connected with the original stock only through women. From Mahommed el-Ghalib to Mahommed XL, called Boabdil, and also the little king ” El Rey Chico ” by the Christians, who lost. Granada in 1492, there are counted twenty-nine reigns of the Nasrides, giving an average of nine years. But there was not the same number of sultans, for several of them were expelled and restored two or three times. Nor did all the members of the house who were allowed to have been sultans reign over all the territory still in Mahommedan hands. There were contemporary reigns in different parts, and tribal or local rivalries between plain and hill, and the chief towns, Granada, Malaga and Guadix. The dissensions of the Nasrides reached their greatest pitch of fury during the very years in which the Catholic sovereigns were conquering their territory piecemeal , 1 48 2- 1 49 2 . Their position imposed a certain consistency of policy on these sultans. They submitted and paid tribute to the kings of Castile when they could not help doing so, but they endeavoured to use the support of Mahommedan rulers of northern Africa whenever it was to be obtained. Granada became the recognized place of refuge for rebellious subjects of the kings of Castile, and on occasion

supported them against rebels. The end came when the weakness of Mahommedan rulers in Morocco coincided with the rule of strong sovereigns in Castile. Frontier wars between Mahom- medan and Christian borderers were incessant, and at long intervals the kings of Castile made invasions on a considerable scale, without, however, following up any successes they might gain. The comparative prosperity of Granada was due to the concentration of a large population driven from other parts of Spain, and the consequent necessity for the intensive cultivation of the rich valleys lying among the ranges of mountains which encircle the kingdom, and the extensive ” Vega ” or plain of Granada. The reputation for civilization which the agitated Mahommedan state enjoys in history is based on the surviving parts of the highly decorated fortress palace of the Alhambra, which was mainly the work of three of the sultans, the founder, Mahommed el Ghalib, and his two successors.

See S. Lane-Poole, The Mahommedan Dynasties (London, 1894); and Historia de Granada, by Don M. Lafuente Alcantara (Granada,

1884).

NASSARAWA, a province of the British protectorate of northern Nigeria, lying approximately between 6° 40′ and 9 E. and between 7 40′ and 9° 40′ N. It is situated on the northern bank of the river Benue, which in its windings forms the southern frontier of the province. Nassarawa is bounded E. by the province of Muri, N.E. by Bauchi, N. by Zaria and W. by Nupe and the trans-Nigerian portion of the province of Kabba. It has an area of 18,000 sq. m. and an estimated population of 1,500,000. The province, like that of Bauchi, is traversed by mountainous regions. It possesses valuable forests and many fertile river valleys. Native products include rubber, palm kernels and beni seed. Cotton is grown extensively.

Until the middle of the 18th century Nassarawa appears to have been peopled by many native tribes of a primitive type. About 1750 an important pagan tribe, the Igbira, came from the south- west across the Niger and established two rival kingdoms in the western portion of the province. Later the native inhabitants of Zaria, driven before the Fula, came from the north and occupied the central portion of Nassarawa. Later still (about 1840) certain Fula of Zaria themselves conquered portions of the province, founded Keffi, spread as far as the Benue in the south-west corner and occupied the town and district of Abuja in the west. Fula also made a settlement at the town of Nassarawa and at Darroro in the N.E. A colony from Bornu entered the province and founded the important town of Lafia Berebere in the eastern district. As a result of these movements the aboriginal tribes were driven into the hilly regions of the S.E. and N.E. The Munshi, a truculent and hardy people, hold a portion of the northern bank of the Benue, and the Kagoro and Attakar tribes hold the hilly country to the N.E., through which the road passes from Keffi and Lafia to the Bauchi high- lands. Before the British occupation the state of Nassarawa had become a partially subdued Fula emirate, exercising doubtful sway over the native pagans and paying a scarcely less doubtful allegiance on its own part to the Fula ruler of Zaria. The riverain tribes of Nassarawa were among the first to break into open aggression against the British administration established at Lokoja. In January 1900 they attacked a telegraph construc- tion party in the Munshi country on the banks of the Benue. The result was the occupation of Keffi by British troops and the gradual subjugation of the province. In 1902 the first British resident, Captain Moloney, was murdered at Keffi by an official of the emir’s court. The emir repudiated all re- sponsibility for the crime, and the murderer fled to Kano, where his reception on friendly terms was among the incidents which determined the Sokoto-Kano campaign of 1903. The British were now recognized as the rulers of

Nigeria, and the emir of Nassarawa threw in his lot with the British government. Slave raiding was abolished and the slave trade made illegal. A British court of justice was established at the provincial head- quarters and native courts in every district. Roads have been opened and trade is steadily increasing. In 1905 an expedition was required against the Kagoro people, who occupy a vast open

plateau having an elevation of about 1800 ft. through which a short road to the Bauchi tin mines passes from the Benue. These people had been raiding the Fula for cattle and murdering traders upon the road. A splendid grazing country, healthy and also rich in rubber, was opened. The road to the tin mines was rendered safe and is now the Bauchi mail route. There is a cart road from Loko on the Benue to Keffi. (F. L. L.)

NASSAU, a territory of Germany, now forming the bulk of the government district of Wiesbaden, in the Prussian province of Hesse-Nassau, but until 1866 an independent and sovereign duchy of Germany. It consists of a compact mass of territory, 1830 sq. m. in area, bounded on the S. and W. by the Main and Rhine, on the N. by Westphalia and on the E. by Hesse. This territory is divided into two nearly equal parts by the river Lahn, which flows from east to west into the Rhine. The southern half is almost entirely occupied by the Taunus Mountains, which attain a height of 2900 ft. in the Great Feldberg, while to the north of the Lahn is the barren Westerwald, culminating in the Salzburgerkopf (2000 ft.). The valleys and low-lying districts, especially the Rheingau, are very fertile, producing abundance of grain, flax, hemp and fruit; but by far the most valuable product of the soil is its wine, which includes several of the choicest Rhenish varieties, such as Johannisberger, Marco- brunner and Assmannshauser. Nassau is one of the most thickly wooded regions in Germany, about 42% of its surface being occupied by forests, which yield good timber and harbour large quantities of game. The rivers abound in fish, the salmon fisheries on the Rhine being especially important. There are upwards of a hundred mineral springs in the district, most of which formerly belonged to the duke, and afforded him a con- siderable part of his revenue. The best known are those of Wiesbaden, Ems, Soden, Schwalbach, Schlangenbad, Geilnau and Fachingen. The other mineral wealth of Nassau includes iron, lead, copper, building stone, coals, slate, a little silver and a bed of malachite. Its manufactures, including cotton and woollen goods, are unimportant, but a brisk trade is carried on by rail and river in wine, timber, grain and fruit. There are few places of importance besides the above-named spas; Hochst is the only manufacturing town. Wiesbaden, with 100,955 inhabitants, is the capital of the government

district as it was of the duchy. In 1864 the duchy contained 468,311 in- habitants, of whom 242,000 were Protestants, 215,000 Roman Catholics and 7000 Jews. The ecclesiastical jurisdiction was in the hands of the Protestant bishop of Wiesbaden and the Roman Catholic bishop of Limburg. Education was amply provided for in numerous higher and lower schools. The annual revenue of the dukedom was about £400,000 and it furnished a contingent of 6000 men to the army of the German Confederation. History. — During the Roman period the district enclosed by the Rhine, the Main and the Lahn was occupied by the Mattiaci and later by the Alamanni. The latter were subdued by the Franks under Clovis at the end of the 5th century, and at the partition of Verdun in 843 the country became part of the East Frankish or German kingdom. Christianity seems to have been introduced in the 4th century. The founder of the house of Nassau is usually regarded as a certain Drutwin (d. 1076), who, with his brother Dudo, count of Laurenburg, built a castle on a hill overlooking the Lahn, near the present town of Nassau. Drutwin's descendant Walram (d. 1 198) took the title of count of Nassau, and placed bis lands under the immediate suzerainty of the German king; previously he had been a vassal of the arch- bishop of Trier. Then in 1255 Walram's grandsons, Walram and Otto, divided between them their paternal inheritance, which had been steadily increasing in size. Walram took the part of Nassau lying on the left bank of the Lahn and made Wiesbaden his residence; Otto took the part on the right bank of the river and his capital was Siegen. The brothers thus founded the two branches of the house of Nassau, which have flourished to the present time.

The fortunes of the Ottonian, or younger line, belong mainly to the history of the Netherlands. The family was soon divided into several branches, and in the 1 5th century one of its members,

Count Engelbert I. (d. 1442), obtained through marriage lands in Holland. Of his two sons one took the Dutch, and the other the German possessions of the house, but these were united again in 1504 under the sway of John, count of Nassau-Dillenburg, the head of a branch of the family which, in consequence of a series of deaths, the last of which took place in 1561, was a few years later the sole representative of the descendants of Count Otto. John's son was Count William the Rich (d. 1559), and his grandson was the hero, William the Silent, who inherited the principality of Orange in 1544 and

surrendered his prospective inheritance in Nassau to his brother John (d. 1606). William and his descendants were called princes of Orange-Nassau, and the line became extinct when the English king William III. died in 1702. Meanwhile the descendants of Count John, the rulers of Nassau, were flourishing. They were divided into several branches, and in 1702 the head of one of these, John William Friso of Nassau-Dietz (d. 171 1), whose ancestor had been made a prince of the Empire in 1654, inherited the title of prince of Orange and the lands of the English king in the Netherlands. A few years later in 1 743 a number of deaths left John William's son, William, the sole representative of his family, and as such he ruled over the ancestral lands both in Nassau and in the Netherlands. In 1806, however, these were taken from a succeeding prince, William VI., because he refused to join the Confederation of the Rhine. Some of them were given in 1815 to the other main line of the family, the one descended from Count Walram (see below). In 181 5 William VI. became king of the Netherlands as William I., and was compensated for this loss by the grant of parts of Luxemburg and the title of grand- duke. When in 1890 William's male line died out Luxemburg, like Nassau, passed to the descendants of Count Walram. In the female line he is now represented by the queen of the Netherlands.

• Adolph of Nassau, a son of Walram, the founder of the elder line "of the house of Nassau, became German king in 1292, but was defeated and slain by his rival, Albert of Austria, in 1298. The territories of his descendants were partitioned several times, but these branch lines did not usually perpetuate them- selves beyond a few generations, and Walram's share of Nassau was again united in 1605 under Louis II. of Nassau- Weilburg (d. 1626). Soon, however, the family was again divided; three branches were formed, those of Saarbriicken, Idstein and Weil- burg, the heads of the first two becoming princes of the Empire in 1688. Other partitions followed, but at the opening of the 19th century only two lines were flourishing, those of Nassau- Usingen and Nassau-Weilburg. In 1801 Charles William, prince of Nassau-Usingen, was deprived by France of his lands on the left bank of the Rhine, but both he and Frederick William of Nassau-Weilburg, who suffered a similar loss, received ample compensation. In 1806 both Frederick William and Frederick Augustus, the brother and successor of Charles William, joined the Confederation of the Rhine and received from Napoleon the title of duke, but after the battle of Leipzig they threw in their lot with the allies, and in 1815 joined the German Con- federation. As a result of the changes of 1815 Frederick Augustus of Nassau-Usingen ceded some of his newly-acquired lands to Prussia, receiving in return the greater part of the German

possessions of the Ottonian branch of the house of Nassau (see above). In March 1816 he died without sons and the whole of Nassau was united under the rule of Frederick William of Nassau-Weilburg as duke of Nassau. Already in 1814 Frederick William had granted a constitution to his subjects, which pro- vided for two representative chambers, and under his son William, who succeeded in 1816, the first landtag met in 1818. At once, however, it came into collision with the duke about the ducal domains, and these dissensions were not settled until 1836. In this year the duchy took an important step in the develop- ment of its material prosperity by joining the German Zollverein. In 1848 Duke Adolph, the son and successor of Duke William, was compelled to yield to the temper of the times and to grant a more liberal constitution to Nassau, but in the following years a series of reactionary measures reduced matters to their former

unsatisfactory condition. The duke adhered stedfastly to his conservative principles, while his people showed their sympathies by electing one liberal landtag after another. In 1866 Adolph espoused the cause of Austria, sent his troops into the field and asked the landtag for money. This was refused, Adolph was soon a fugitive before the Prussian troops, and on the 3rd of October 1866 Nassau was formally incorporated with the kingdom of Prussia. The deposed duke entered in 1867 into a convention with Prussia by which he retained a few castles and received an indemnity of about £1, 500,000 for renouncing his claim to Nassau. In 1890, on the extinction of the collateral line of his house, he became grand-duke of Luxemburg, and he died on the 17 th of November 1905.

The town of Nassau (Lat. Nasonga) on the right bank of the Lahn, 15 m. above Coblenz, is interesting as the birthplace of the Prussian statesman, Freiherr von Stein. Pop. (1905) 2238. It has a Roman Catholic and an Evangelical church, while its main industries are brewing and mining. Near the town are the ruins of the castle of Stein, first mentioned in 1138, with a marble statue of Stein, while the ruins of the ancestral castle of the house of Nassau may also be seen.

For the history of Nassau see Hennes, Geschichte der Grafen von Nassau bis 125$ (Cologne, 1843) ; von Schutz, Geschichte des Herzog- tums Nassau (Wiesbaden, 1853); von Witzleben, Genealogie und Geschichte der Filrstenhauses Nassau (Stuttgart, 1855); F. W. T. Schliephake and K. Menzel, Geschichte von Nassau (Wiesbaden, 1 865-1 889); the Codex diplomaticus nassoicus, edited by K. Menzel and W. Sauer (1885-1887,) ; and the Annalen des Vereins fur nassau- ische Altertumskunde und Geschichtsforschung (1827 fol.).

NAST, THOMAS (1840-1902), American caricaturist, was born on the 27th of September 1840, in the military barracks of Landau, Germany, the son of a musician in the Ninth regiment Bavarian band. His mother took him to New York in 1846. He studied art there for about a year with Theodore Kaufmann and then at the school of the National Academy of Design. At the age of fifteen he became a draughtsman for Frank Leslie's Illustrated Newspaper; three years afterwards for Harper's Weekly. In i860 he went to England for the New York Illustrated News to depict the prize-fight between Heenan and Sayers, and then joined Garibaldi in Italy as artist for The Illustrated London News. His first serious work in caricature was the cartoon " Peace " in 1862, directed against those in the North who opposed the prosecution of the Civil War. This and his other cartoons during the Civil War and Reconstruction days were published in Harper's Weekly; they attracted great attention, and Nast was called by President Lincoln " our best recruiting sergeant." Even more able were Nast's cartoons against the Tweed Ring conspiracy in New York city; his caricature of Tweed being the means of the latter's identifica- tion and arrest at Vigo. In 1873, 1885 and 1887 Nast toured the United States as lecturer and sketch-artist, but with the advent of new methods and younger blood his vogue decreased. He had been an ardent Republican in his earlier years; had bitterly attacked President Johnson and his Reconstruction policy; had ridiculed Greeley's candidature, and had opposed inflation of the currency, notably with his famous " rag-baby " cartoons, but his advocacy of civil service reform and his distrust of Blaine forced him to become a Mugwump and in 1884 an open supporter of the Democratic party, from which in 1892 he re- turned to the Republican party and the support of Harrison. He had lost practically all of his earnings by the failure of Grant and Ward, and in May 1902 was appointed by President Roosevelt consul-general at Guayaquil, Ecuador, where he died on the 7th of December in the same year. He did some painting in oil and some book illustrations, but these were comparatively unimportant, and his fame rests on his caricatures and political cartoons. Nast introduced the donkey to typify the Democratic party, the elephant to typify the Republican party, and the tiger to typify Tammany Hall, and introduced into American cartoons the practice of modernizing scenes from Shakespeare for a political purpose.

See A. B. Paine, Thomas Nast, his Period and his Pictures (New York, 1904).

NASTURTIUM, or Indian cress, Tropaeolum majus, a perennial climber, native of Peru, but in cultivation treated as a hardy annual. It climbs by means of the long stalk of the peltate leaf which is sensitive to contact like a tendril. The irregular flowers have five sepals united at the base, the dorsal one produced into a spurred development of the axis; of the five petals the two upper are slightly different and stand rather apart from the lower three; the eight stamens are unequal and the pistil consists of three carpels which form a fleshy fruit separating into three one-seeded portions. The flowers are sometimes eaten in salads, and the leaves and young green fruits are pickled in vinegar as a substitute for capers. The pungency of the nasturtium officinale, the water-cress, gave it its name nasi-torlium, that which twists the nose. The plant should have a warm situation, and the soil should be light and well enriched; sow thinly early in April, either near a fence or wall, or in an open spot, where it will require stakes 6 to 8 ft. high.

The dwarf form known as Tom Thumb {T. m. nanum), is an excellent bedding or border flower, growing about a foot high. Sow in April in the beds or borders; and again in May for a succession. Other fine annual Tropaeolums are T. Lobbianum with long spurred orange flowers and numerous varieties; and T. minus, a kind of miniature T. majus with yellow, scarlet and crimson varieties.

The genus Tropaeolum, native of South America and Mexico, includes about 35 species of generally climbing annual and perennial herbs with orange, yellow, rarely purple or blue, irregular flowers, T. peregrinum is the well-known canary creeper. The flame nasturtium with brilliant scarlet blossoms is T. speciosum from Chile; it has tuberous roots, as have also such well-known perennials as T. polyphyllum, T. pentaphyllum. Of these T. speciosum should be grown in England in positions facing north; it flourishes in Scotland.

NATAL, a maritime province of the Union of South Africa, situated nearly between 27° and 31° S., 29° and 33° E. It is bounded S.E. by the Indian Ocean, S.W. by the Cape province and Basutoland, N.W. by the Orange Free State province, N. and N.E. by the Transvaal and Portuguese East Africa. It has a coast line of 376 m.; its greatest length N. to S. in a direct line is 247 m.; its greatest breadth E. to W., also in a direct line, 200 m. Natal has an area of 35,371 sq. m., being nearly three- quarters the size of England. (For map see South Africa.) The province consists of two great divisions, namely Natal proper and Zululand (q.v.). Natal proper has a seaboard of 166 m. and an area of 24,910 sq. m., Zululand, in which is included Amatongaland, a seaboard of 210 m. and an area of 10,461 sq. m. It lies north-east of

Natal. In this article the description of the physical features, &c. refers only to Natal proper.

Physical Features. — The terrace formation of the land char- acteristic of other coast regions of South Africa prevails in Natal. The country may be likened to a steep and gigantic staircase leading to a broad and level land lying beyond its borders. The rocky barrier which shuts off this land is part of the Drakens- berg range. From the mountain sides flow many rivers which dash in magnificent waterfalls and through deep gorges to the sea. Falling 8000 or more feet in little over 200 m., these streams are unnavigable. The south-eastern sides of the mountains are in part covered with heavy timber, while the semi-tropical luxuriance of the coast belt has earned for Natal the title of " the garden colony."

The coast trends, in an almost unbroken line, from S.W.to N.E. It extends from the mouth of the Umtamvuna river (31 4′ S., 30° 12′ E.), which separates Natal from the Cape, to the mouth of the Tugela (29 15′ S., 31° 30′ E.), which marks the frontier between Natal and Zululand. The only considerable indentation is at Durban, about two-thirds of the distance from the Umtam- vuna to the Tugela, where there is a wide and shallow bay, covering with its islands nearly 8 sq. m. The coast, though low and sandy in places, is for the most part rocky and dangerous. The warm Mozambique current sweeps down from the N.E., setting up a back drift close in shore. The southern entrance to Durban harbour is marked by a bold bluff, the Bluff of Natal,

which is 250 ft. high and forested to the water's edge. Opposite the Bluff a low sandy spit called the Point forms the northern entrance to the harbour. North of Durban the coast belt, hitherto very narrow, widens out and becomes more flat. But the greater part of the coast region, which has an average depth of 15 m., is broken and rugged. Ranges of hills lead to the first plateau, which has an average elevation of 2000 ft. and is of ill-defined extent. Here the land loses its semi-tropical character and resembles more the plains of the Orange Free State and the Transvaal. The second plateau, reached by a steep ascent, has an elevation of from nearly 4000 to fully 5000 ft. It is an undulating plain, grass-covered, but for the most part without trees or bush. It continues to the foot of the Drakensberg range, the mountains rising towards the S.W., with almost perpendicular sides, 6000 to 7000 ft. above the country at their base. North- west, towards the Transvaal, the mountains are of lower elevation and more rounded contours.

Mountains. — Although the division of the country into terraces separated by ranges of hills is clearly marked in various districts, as for instance between Durban and Colenso, the province is traversed by many secondary chains, as well as by spurs of the Drakensberg. The highest points of that range, and the highest land in Africa south of Kilimanjaro, lie within the borders of Natal. The Drakensberg (q.v.), from Majuba Hill on the N.W. to Bushman's Nek in the S.W., form the frontier of the province, the crest of the range being gener- ally within Natal. This is the case in the Mont-aux-Sources (11,170 ft.) and Cathkin Peak or Champagne Castle (10,357 ft.) ; the top of the third great height, Giant's Castle (9657 ft.), is in Basutoland, but its seaward slopes are in Natal. From Giant's Castle to Mont-aux- Sources, in which, forsaking their general direction, the Drakensberg run S.E. to N.W., the mountains attain an elevation of 10,000 to 1 1 ,000 ft., with few breaks in their face. North of Mont-aux-Sources the mountain ridge sinks to 8000 and less feet, and here are several passes leading into the Orange Free State. Laing's Nek is a pass into the Transvaal. The chief heights in Natal between Mont-aux- Sources and Laing's Nek are Tintwa (7500, ft.), Inkwelo (6808 ft.) and the fiat-topped Majuba (7000 ft.). Spurs from the Drakensberg, at right angles to the main range, cross the plateaus. The most northern, which runs E. from Majuba to the Lebombo Mountains, coincides roughly with the northern frontier of Natal. It is one of the transverse chains connecting the eastern coast range with the higher terraces and goes under a variety of names, such as Elands Berg and Ingome Mountains. A second range, the Biggarsberg, starts from the Drakensberg near Mount Malani and goes E.S.E. to the junction of Mooi, Buffalo and Tugela rivers. This range con- tains, in Indumeni (7200 ft.), the highest mountain in Natal outside the main Drakensberg. A third range runs N.E. from Giant's Castle towards the Biggarsberg. It lies north of the Mooi river, and its most general name is Mooi River Heights. A fourth range also diverges from Giant's Castle and ramifies in various branches over a large tract of country, one branch running by Pietermaritzburg to the Berea hills overlooking Durban. The chief height in this fourth range is Spion Kop (7037 ft.), about 25 m. S.E. of Giant's Castle. This is not the Spion Kop rendered famous during the Anglo-Boer War of 1899-1902. That Spion Kop, with Vaal Kranz and Pieter's Hills, are heights on the northern bank of the upper Tugela.

Secondary ranges with heights of 5000 and more feet are numerous, whilst lofty isolated mountains rise from the plateaus. The greatest of these isolated masses is Mahwaqa (6834 ft.), in the south-west part of the country. Of many flat-topped hills the best known is the Table Mountain east of Pietermaritzburg.

Rivers. — All the rivers of Natal not purely coast streams have their origin in the Drakensberg or its secondary ranges. The largest and longest, the Tugela, with the Buffalo, Mooi, Klip and other tributaries is treated separately. The Tugela basin drains the whole country north of a line drawn in a direct line east from Giant's Castle. The .Umkomaas (" gatherer of waters ") rises in Giant's Castle and flows in a south-easterly course to the sea. Though it makes no large sweeps it has so tortuous a course that its length (some 200 m.) is twice that of the valley through which it flows. Its banks in its upper course are wild and picturesque, with occasional wide deep valleys, with climate and vegetation resembling the coast belt. The Umzimkulu river rises in Bamboo Castle, in the Drakens- berg, and, with bolder curves than the Umkomaas, runs in a course generally parallel with that stream S.E. to the sea, its mouth being about 40 m. south of that of the Umkomaas. The Ingwangwane rises in the Drakensberg south of the Umzimkulu, which it joins after a course of some 50 m. Below the junction the Umzimkulu forms for some distance the frontier between Natal and the Griqua- land East division of the Cape. The scenery along the river valley (120 m. long) is very striking, in turns rugged and desolate, verdant and smiling, with patches of dense forest and heights wooded to their summit. Port Shepstone is situated at the mouth of the river, which, like that of all others in Natal, is obstructed by a bar. As a

result of harbour works, however, a channel has been cleared and steamers can ascend the river for 6 m.

The Pongola rises in the Transvaal in high ground N.E. of Wakker-stroom and flows E., forming, for the greater part of its course, the northern frontier of the province. After piercing the Lebombo Mountains, it turns N. and joins the Maputa, a river emptying into Delagoa Bay. The Umgeni, which rises in the Spion Kop hills some 30 m. S.E. of Giant's Castle, passes through the central part of Natal and reaches the sea 4 m. N. of Durban. It flows alternately through mountainous and pastoral country, and is known for two magnificent waterfalls, both within 12 m. of Pietermaritzburg. The upper fall is close to the village of Howick. Here the Umgeni leaps in a single sheet of water down a precipice over 350 ft. high, more than double the height of Niagara, forming, when the river is swollen by the rains, a spectacle of rare magnificence. Some 12 m. below are the Karkloof or Lower Falls, where in a series of beautiful cascades the water descends

to the plain. Other rivers of Natal which rise in the spurs of the Drakensberg or in the higher terraces are the Umvoti, which runs south of the Tugela and gives its name to a county division, the Umlaas (which gives Durban its main water supply, the Illovo, which traverse the country between the Umgeni and Umkomaas, and the Umtamvuna, noteworthy as forming the boundary between Natal and Pondoland. There are also seventeen distinct coast streams in the colony.

[Geology. 1 — The general geological structure of Natal and Zululand is simple. It consists of a series of plateaus formed of sedimentary rocks which mainly belong to three formations of widely separated ages, and which rest on a platform of granitic and metamorphic rocks.

The geological formations represented include : —

Post-Cretaceous and Recent Cretaceous

U. Karroo

L. Karroo . Cape System Pre-Cape Rocks

Littoral of Zululand. [“Plateau Basalts. -J Cave Sandstone. [Red Beds.

(Stormberg Series. Beaufort Series. Ecca Series. Ecca Glacial Series (Dwyka Conglomerate). Table Mountain Sandstone Series.

{Quartzites, Conglomerates and Shales of Nkandhla, Umfolosi river. Gneisses, Schists, Marbles, Granites (Swazi- land Series).

Pre-Cape Rocks. — The granites and schists occur in close association. The series covers considerable areas in the lowest parts of the valleys and near the coast. The widest areas are in Zululand. In the Umzimkulu river and in the Tugela river below its junction with the Buffalo, metamorphic limestones are associated with schists, gneisses and granites. A group of highly inclined quartzites, altered conglomerates and jasperoid rocks which crop out on the Umhlatuzi river, between Melmoth and Nkandhla and on the White Umfolosi river above Ulundi Plains, is considered by Anderson to represent some portion of the Lower Witwatersrand series. The’conglomerates are true ” banket ” and are auriferous, but the gold has not been met with in payable quantities.

Table Mountain Sandstone Series. — This rests unconformably on the pre-Cape rocks. Traced northwards, the series becomes thinner and finally dies out. As a rule denudation, which has acted on a

magnificent scale, has removed all but a few hundred feet of the basement beds. The maximum thickness of 2000 ft. occurs near Melmoth. The beds are usually thin false-bedded sandstones with an almost complete absence of shales. A conglomerate at the base contains traces of gold. Griesbach mentions the occurrence of some small bivalves in the shales of Greytown, but Anderson failed to find any fossils.

Ecca Glacial Series. — A great unconformity separates the Table Mountain and Ecca series. In the Cape this gap is represented by the Witteberg and Bokkeveld series. The Dwyka conglomerate rarely attains any great thickness though forming wide outcrops. It is usually a hard compact rock containing striated stones. The Umgeni quarries, where the rock is used for road-metal, furnish the best exposures.

Ecca Series. — With the Beaufort series this occupies over two- thirds of the western portion of the province and has wide outcrops in Zululand and in the Vryheid districts. The Ecca shalescontain some of the best coals of South Africa, but the seams contain much unmarketable coal. Around Dundee and Newcastle the coals are bituminous. In Zululand they are chiefly anthracitic. The fossils include several species of Glossopteris among them: Glossopteris

1 See C. L. Griesbach, ” On the Geology of Natal in South Africa,” Quart. Journ. Geol. Soc. vol. xxvii. pp. 53-72 (1871); P. C. Sutherland, ” Notes on an Ancient Boulder Clay of Natal,” Quart. Journ. Geol. Soc. vol. xxvi. pp. 514-517 (1870); W. Anderson, Reports, Geol. Survey, Natal and Zululand (Pietermaritzburg, 1901 ; London, 1904); and ” Science in South Africa,” Handbook, Brit. Assoc, pp. 260-272 (Cape Town, 1905).

browniana var indica; Bunb. Phyllotheca ZeiUeri eth. fit.; Estheria Greyii, Jones, indicating a Permo-Carboniferous age.

Beaufort Series. — The Ecca series graduates upwards into the highly coloured sandstones and shales of the Beaufort series. Fossil reptilian remains, chiefly Dicynodon, are abunaant.

Stormberg Series. — This consists of sandstones and shales with thin seams of coal. The chief outcrops occur around Biggarsberg and along the upper slopes of the Drakensberg. Ine fossil flora — Thinn- feldia odontopteroides, Morr. and a Pterophyllum — indicate a Rhaetic age. No reptilian remains have been found.

Upper Karroo. — The Red beds and Cave sandstones occur along the

eastern flanks of the Drakensberg.

Cretaceous. — Deposits of this age are confined to the littoral. They are exceedingly prolific in fossils which prove them to be of Upper Cretaceous age. A long list of fossils has been obtained from Umkivelane Hill, Zululand. W.G.*]

Climate. — With a rise in level (not reckoning the mountain tops) of 5500 ft. in a distance of 170 m., Natal possesses several varieties of climate but is nowhere unhealthy. The climate is comparable to that of north Italy. The valleys and coast belt, though practically free from malarial fever, are hot and humid, and fires in dwelling houses are seldom required even in the coolest months; the lower plateaus are cool and the air dry; the uplands are bracing and often very cold, with snow on the ground in winter. The year is divided into two seasons, summer, which begins in October and ends in March, and winter, which fills up the rest of the year. Summer is the rainy season, and May, June and July the driest months of the year. The mean temperature at Durban, records taken at 260 ft. above the sea, is 70° F., varying from 42 in winter to 98° in summer. The average summer humidity is 76%, that of winter 74 %. At Pietermaritzburg, 41 m. inland and 2200 ft. above the sea, the temperature is about 64 . In the uplands the heat of summer is often greater than on the coast, but the air is less humid and the nights are generally coot. Both the humidity and the temperature are increased by the great mass of water, the Mozambique current, flowing south from the equatorial regions. At Durban the annual rainfall is about 40 in., at Pietermaritzburg 38. The average for the province is believed to be about 30 in. In 1893, the year of highest recorded rainfall, 70 in. fell on the coast districts. Thunderstorms, averaging nearly one hundred in the year, and violent hailstorms, occur in summer, being most severe in the interior. The storms serve to modify the intense heat, though the lightning and hail cause considerable damage. The prevailing winds on the coast are north-east, warm and humid, and south-west, cool and bracing, though in summer the south-west wind brings rain. Inland, chiefly in early summer, a hot dry wind, often accompanied by a dust storm, blows from the north. These winds, which blow on an average twenty-five days in the year, seldom reach the coast and are generally followed by rain. Inhabitants of Natal are practically exempt from chest diseases.

Flora. — Botanically, Natal is divided into three zones: (1) the coast belt, extending from the sea inland to heights of 1500 ft., and in some cases to 1800 and 2000 ft.; (2) the midland region, which rises to 4000 ft.; (3) the upper regions. In these zones the flora varies from

sub-tropical to sub-alpine. The heaths and pro- teads common at the Cape peninsula, in Basutoland and other parts of South Africa, are rare in Natal, but almost any species of the flora of semi-tropical and temperate countries introduced attains perfection. The trees and plants characteristic of each zone are not always confined to that zone, but in several instances, when common to the coast belt and the midlands, their character alters according co the elevation of the land. The dense bush or jungle of evergreen trees, climbers and flowering shrubs, which up to the middle of the 19th century covered the greater part of the coast belt, has largely dis- appeared. There are still, however, in the coast belt woods of leguminous evergreens bearing bright-coloured flowers. The trees in these woods are generally from 20 to 50 ft. in height and include the knob-thorn, water-boom, kafir-boom (with brilliant scarlet flowers), the Cape chestnut and milkwoods (Mimusops). But the most striking of the coast-belt flora are the tropical forms — the palm, mangrove, wild banana (Strelitzia augusta), tree-ferns, tree euphorbia, candelabra spurge and Caput medusae. Of palms there are two varieties, the ilala {Hyphaene crinita), found only by the sea shore and a mile or two inland, and the isundu {Phoenix reclinata), more widespread and found at heights up to 2000 ft. or even higher. The amatungulu or Natal plum, found chiefly near the sea, is one of the few wild plants'with edible fruit. Its leaves are of a glossy dark green, its] flower white and star-shaped and its fruit resembles the plum. Other wild fruits are the so-called Cape gooseberry (not native to Natal) and the kaw apple or Dingaan apricot, which grows on a species of ebony tree.

The midland region is characterized by grass lands (the Natal grasses are long and coarse) and by considerable areas of flat-topped thorn bush mimosa. The bush is not as a rule dense, nor is it of any great height. A tree peculiar to this zone is the Alberta magna. It has dull pink flowers, succeeded by seed vessels, each of which is crowned by two scarlet-coloured leafy lobes. A grass belt separates the thorn bush from the districts carrying heavy timber, found mainly in the upland zone, along the sides of the mountains ex- posed to the rains and in kloofs. The indigenous timber trees are

principally the yellow wood (Podocarpus), sneezewood (Pleroxylon utile), stinkwood (Oreodaphne bullata), black ironwood (Olea lauri-folia), white ironwood (Vepris lanceolam) , and umtomboti {Exoecaria africana) ; all are very useful woods, and the yellow wood, sneeze-

wood, stinkwood and ironwood when polished have grain and colour equal to maple, walnut and ebony. The ” rooibesje,” red pear and milkwood trees are used for boatbuilding. The Australian Eucalyptus and Casuarina in great variety, and many other imported trees, including syringas, wattles, acacias, willows, pines, cypress, cork and oak all thrive when properly planted and protected from grass fires. The black wattle has been extensively planted arid nourishes at elevations of from iooo to 3000 ft. Its bark forms a valuable article of commerce.

Flowers which bloom in the early spring are abundant, especially on the edges of forests. Among those found throughout the country are the Dierama pendula, the orchid and the ” everlasting.” As a rule flowers common to all zones are on the coast smaller and with paler colours than they are in the midlands. Aloes are common; in part of the midland zone they form when in bloom with abundance of orange and scarlet flowers a most picturesque sight. Of Cyca- daceae the Stangeria paradoxa is peculiar to Natal. There is but one cactus indigenous to Natal; it is found hanging from perpen- dicular rocks in the midlands. There are, however, several species of euphorbia of the miscalled cacti. Climbing plants with gorgeous flowers are common, and there are numerous species of Compositae and about a hundred cinchonaceous plants. Bulbous plants are also very numerous. The most common are the Natal lily with pink and white ribbed bells, the fire-lily, with flame-coloured blos- soms, ixias, gladiolas, the Ifafa lily, with fuchsia-like clusters, and the arum lily. A conspicuous veld plant is the orange and crimson leonotis, growing 6 ft. high. Geraniums are somewhat scarce. Fern life is abundant; 126 species are indigenous, two being tree-ferns. One of these, Cyathea dregei, found in moist places and open land, has a stem 20 ft. high; the stem of the other, Hemitelia capensis, sometimes reaches 30 ft. The ferns are most common in the midland zone and in the heavy timber forests. Sixty different species have been identified in one valley not more than I m. long and about 100 yds. in breadth. Among fruit trees, besides the wild fruits already mentioned, are the pineapple, mango, papua, guava, grena- dilla, rose apple, custard apple, soursop, loquat, naartje, shaddock and citrous fruits.

Fauna. — The larger animals which abounded in Natal in the first half of the 19th century have been exterminated or driven out of the country. This fate has overtaken the elephant, giraffe, the buffalo, quagga, gnu, blesbok, gemsbok and ostrich. If the Vryheid district be excluded, the lion and rhinoceros may be added to this list; and the Vryheid district belongs geographically to Zululand. Hip- popotami are still found in the Umgeni river and crocodiles in several of the

coast streams. Leopards and panthers are found in thickly wooded klcofs. Hyenas, jackals, wild pig, polecats and wild dogs (Cants pictus) of different species are still found in or about bush jungles and forest clumps; elands (Antilope oreas) are preserved on some estates, and there are at least ten distinct species of antelope (hartebeest, bushbok, duiker, rietbok, rhebok, rovibok, blauwbok, &c). In the Vryheid district the kudu, blue wildebeest, waterbuck, reedbuck, impala, steinbok and klipspringer are also found. Several of these species are now preserved. Ant-eaters (Orycteropus capensis) , porcupines, weasels, squirrels, rock rabbits, hares and cane rats are common in different localities. Baboons (Cynocephalus porcarius) and monkeys of different kinds frequent the mountains and rocky kloofs and bush and timber lands. The birds of Natal 1 are of many species; some have beautiful plumage, but none of them, with the exception of the canary, are to be considered as songsters. Among the larger birds are cranes, herons, the ibis, storks, eagles, vultures, falcons, hawks, kites, owls, the secretary birds, pelicans, flamingoes, wild duck and geese, gulls, and of game birds, the paauw, koraan, pheasant, partridge, guinea fowl and quail. The other birds include parrots, toucans, gaudily coloured cuckoos, lories, swallows, shrikes, sun-birds, kingfishers, weavers, finches, wild pigeons and crows. The otter is found in some of the rivers, which are also fre- quented, near their mouths, by turtles. These last are also found in the coast lagoons and sometimes are of great size. Iguanas, 4 and 5 ft. long, are found on the wooded banks of the rivers; small lizards and chameleons are common, and there are several varieties of tortoise.

Of snakes there are about forty distinct species or varieties. The most dreaded by the natives are called ” imamba,” of which there are at least eight different kinds; these snakes elevate and throw themselves forward, and have been known to pursue a horse- man. One sort of imamba, named by the natives indhlondhlo ,” is crested, and its body is of a bright flame colour. The sluggish puff-adder (Clotho arietans) is common and very dangerous. A hooded snake (Naja haemachates) , the imfezi of the natives, is dangerous, and spits or ejects its poison; besides this there are a few other varieties of the cobra species. The largest of the serpent tribe, however, is the python (Horlulia natalensis), called inhlwati by the natives; its usual haunts are by streams amongst rocky boulders and in jungles, and instances are recorded of its strangling

1 See R. B. and J. D. Woodward, Natal Birds (Maritzburg, 1899).

and crushing adult natives. It is common in the coast districts, and is sometimes 20 ft. long. Insects abound in great numbers, the most

troublesome and destructive being the tick (Ixodes natal- ensis), which infests the pasturage, and the white ant (Termes mordax). Occasionally vast armies of locusts or caterpillars advance over large tracts of country, devouring all vegetation in their line of march. The fish moth, a steel-grey slimy active fish-shaped insect, is found in every house and is very destructive. Fish of excellent quality and in great quantities abound on the coast. They include shad, rock cod, mackerel, mullet, bream and soles; sharks, stingrays, cuttlefish and the octopus are also common in the waters off the coast of Natal. Prawns, crayfish and oysters are also ob- tainable, and turtle (Chelonia mydas) are frequently captured. Freshwater scale-fish are mostly full of bones, but fine eels and barbel are plentiful in the rivers. Trout have been introduced into some of the higher reaches of the rivers.

Inhabitants. — At the census of 1904 the population of the province, including Zululand, was i,io8,754. 2 Of this total 8-8%, or 97,109, were Europeans, 9%, or 100,918, Asiatics and the rest natives of South Africa, mainly of Zulu-Kaffir stock. Of the 824,063 natives, 203,373 lived in Zululand. The white and Asiatic population nearly doubled in the thirteen years since the previous census, allowance being made for the Utrecht and Vryheid districts, which in 1891 formed part of the Transvaal. Of the total population 985,167 live in rural areas, the average density for the whole country being 31-34 per sq. m. The white population is divided into 56,758 males and 40,351 females. Of the white inhabitants the great majority are British. Some 12,500 are of Dutch extraction; these live chiefly in the districts of Utrecht and Vryheid. There are also about 4500 Natalians of German extraction, settled mainly in the New Hanover and Umzimkulu districts. The Asiatics at the 1904 census were divided into 63,497 males and 37,421 females. They include a few high caste Indians, Arabs and Chinese, but the great majority are Indian coolies. The Asiatics are mainly congregated in the coast districts between the Umzimkulu and Tugela rivers. In this region (which includes Durban) the Asiatic population was 61,854. In none of the inland districts did the Asiatic inhabitants number 2000. The coolies are employed chiefly on the sugar, coffee, cotton and other plantations, a small proportion being employed in the coal-mines.

The native inhabitants of Natal proper were almost exter- minated by the Zulus in the early years of the 19th century. Before that period the natives of what is now Natal proper were estimated to number about 100,000. In 1838 when the Zulu power was first checked the natives had been reduced to about 10,000. The stoppage of intertribal wars by the British, aided by a great influx of refugees from Zululand, led to a rapid increase of the population. With the exception of a few

Bushmen, who cling to the slopes of the Drakensberg, all the natives are of Bantu stock. Before the Zulu devastations the natives belonged to the Ama-Xosa branch of the Kaffirs and are said to have been divided into ninety-four different tribes; to-day all the tribes have a large admixture of Zulu blood (see Kaffirs, Zululand and Bantu Languages). The Natal natives have preserved their tribal organization to a considerable extent. Nearly 50% live in special reserves or locations, the area set apart for native occupation being about 4000 sq. m. exclusive of Zululand. Most of the remainder are employed on or live upon farms owned by whites, paying annual rents of from £1 to £5 or more. There were, however, in 1904, 69,746 male natives and 10,232 female natives in domestic service. Of the tribes who were in Natal before the Zulu invasion about 181 2, the two largest are the Abatembu (who are in five main divisions and number about 30,000) and the Amakwabe (seven divisions and about 20,000 people). Other large tribes are the Amanyuswa (ten divisions — 38,000 people), the Amakunu (three divisions — 26,000 people), and the Amabomvu (five divisions — 25,000 people). The three last tribes are among those which sought refuge in Natal from Zulu persecution, before the establishment of British rule in 1843. The number of half-castes is remarkably small, at the census of 1904 the number of ” mixed and others,” which

‘The following is the official estimate of the population on the

31st of December 1908: Europeans 91,443, natives 998,264 (in-

I eluding 7386 ” mixed and others “), Asiatics 116,679; total 1,206,386.

includes Griquas and Hottentots and non-aboriginal negroes, was only 6686.

Chief Towns. — The seat of the provincial government is Pieter-maritzburg (q.v.), commonly called Maritzburg (or P.M.B.), with a population (1904) of 31,199. It is 71 m. by rail N.N.W. of Durban (q.v.), the seaport and only large city in Natal, pop. 67,842. Lady-smith (q.v.), pop. 5568, ranks next in size. It is in the north-west of the province, is famous for its investment by the Boers in 1899- 1900 and is an important railway junction. North-east of Lady- smith are Dundee (281 1) and Newcastle (2950). Dundee is the centre of the

coal-mining district. Newcastle is also a mining town, but depends chiefly on its large trade in wool. It is named after the duke of Newcastle who was secretary for the colonies in 1852 and 1859. Vryheid (2287) is in the centre of a highly mineralized district. Utrecht (860) lies between Newcastle and Vryheid, and was one of the first towns founded by the Transvaal Boers. There are coal-mines on the town lands. Greytown (2436), a wool and wattle trading centre, is in central Natal. Verulam (1325), 19 m. along the coast north of Durban, serves as centre for sugar, tobacco and fruit plantations. It was founded by emigrants from St Albans, England — -whence the name. Port Shepstone, at the mouth of the Umzimkulu river, is the natural outlet for south-west Natal. Est- court is a trading centre, 75 m. by rail N.N.W. of Pietermaritzburg and is 29 m. distant from the village of Weenen (" Weeping "), so named by the first Boer settlers in memory of a Zulu raid. Another village, Colenso, on the south bank of the Tugela, 16 m. by rail south of Ladysmith, was the headquarters of Sir Redvers Buller at the battle of Colenso on the 15th of December 1899.

Communications. — Durban (Port Natal) is in regular communication with Europe via Cape Town and via Suez by several lines of steamers, the chief being the boats of the Union-Castle line, which sail from Southampton and follow the west coast route, those of the German East Africa line, which sail from Hamburg and go via the east coast route and those of the Austrian Lloyd from Trieste, also by the east coast route. By the Union-Castle boats there is a weekly mail service to England. There are also two direct lines of steamers between London and Durban (a distance of 6993 nautical miles), average passage about twenty-six days; the mail route taking twenty to twenty-two days. Durban is also in regular and frequent communication by passenger steamers with the other South African ports, as well as Mauritius, Zanzibar, &c, and with India, Australia, the United States and South America. The works which have made Port Natal the finest harbour in South Africa are described under Durban.

The first railway built in South Africa was a 2-m. line from The Point (or harbour) to the town of Durban. It was opened for traffic in i860 and in 1874 was extended some 4 m. to the Umgeni river. This line was of 4 ft. 85 in. gauge and was privately owned, but, when in 1876 the Natal government determined to build and own a railway system which should in time cover the country, the existing line was bought out and the gauge altered to 3 ft. 6 in. On this, the normal South African gauge, all the Natal railways, save a few 2-ft. branch lines, are built. The main line starts from Durban, and passing through Pietermaritzburg (71 m.), Ladysmith (190 m.) and Newcastle (268 m.)

pierces the Drakensberg at Laing's Nek by a tunnel 2213 ft. long, and 3 m. beyond Charlestown reaches the Transvaal frontier at mile 307. Thence the railway is continued to Johannesburg, .&c. The distances from Durban to the places mentioned by this route are: Johannesburg, 483 m.; Pretoria 511 m.; Kimberley, 793 m. ; Bulawayo, 1508 m. ; Delagoa Bay, 860 m.

From Ladysmith a branch line runs north-west into the Orange Free State, crossing the Drakensberg at Van Reenen's Pass. This line is continued via Harrismith and Bethlehem to Kroonstad (393 m. from Durban) on the main Cape Town, Bloemfontein and Johannesburg railway and is the shortest route between Durban and Cape Town (1271 m.). It also affords via Bloemfontein the shortest route (622 m.) between Durban and Kimberley. From Glencoe Junction, 42 m. north of Ladysmith on the direct line to Johannesburg, a branch railway goes N.E. to the Dundee coal- fields, Vryheid (59 m.) and Hlobane (76 m.). Two lines branch off from Pietermaritzburg. One (62 m. long) goes N.E. to Greytown, serving the east-central part of the province; the other line (108 m. long) goes S.W. to Riverside Station, forming a link in the scheme for direct communication between Natal and East London and Port Elizabeth.

Durban is the starting-point of two coast lines. The south coast line, which runs close to the sea, goes to Port Shepstone (79 m.). A 2-ft. gauge railway (102 m.), which leaves the south coast line at Alexandra Junction (44 m. from Durban), runs N.W. by Stuarts- town and joins the Pietermaritzburg-Riverside line. The north coast railway (167 m. long) crosses the Tugela 70 m. from Durban and continued through Zululand to Somkele, the centre of the Santa Lucia coal-fields.

As might be expected in a country possessing the physical features of Natal, the gradients and curves are exceptionally severe. Not less than 43 m. are upon grades of 1 in 30 and I in 35, and curves of 300 to 350 ft. radius, while on over 100 m. more there are grades under 1 in 60 and curves of less than 450 ft. radius. The main trunk

line reaches an altitude of 3054 ft. at a point 58 m. distant from Durban; after falling 1000 ft. in its farther progress to Pieter-maritzburg, it again rises, 12 m. after leaving that city, to a height of 3700 ft. above the sea; at a point 134 m. from Durban it has reached an altitude of 5152 ft., but on reaching Ladysmith, 191 m. from Durban, the altitude has decreased to 3284 ft. The summit of the Biggarsberg chain is crossed at a point 233 m. from the port, at a height of 4800 ft., and at Laing's Nek the altitude is 5399 ft. The Orange Free State line, after leaving Ladysmith, ascends by steep

gradients the whole of its own course in Natal territory, and when it gains the summit at Van Reenen's Pass it is 5500 ft. above the sea. The mileage open in 1910 was 1 173. The cost of construc- tion, to the same year, exceeded £14,000,000, the interest earned per cent since 1895 not being less than £3, 12s. in any one year. In out- lying districts post carts and ox wagons are the usual means of con- veyance. There are about 5000 m. of high roads kept in repair by the government.

There is a well-organized postal and telegraphic service. Land lines connect Natal with every part of South Africa and with Nyasa- land and Ujiji. A submarine cable from Durban goes to Zanzibar and Aden, whence there is communication with every quarter of the globe. The first telegraph line in Natal was opened in 1873; in 1878 communication was established with Cape Town and in the following year with Delagoa Bay.

Agriculture and Allied Industries. — The diversity of soil and climate leads to a great diversity in the agricultural produce. The chief drawback to farming in the midland and upper districts is the con- siderable proportion of stony ground, and, in some cases, the lack of running water. The area of land under tillage is less than a twentieth of the whole surface, the crop most extensively grown being maize or " mealies." This is universally grown by the natives and forms their staple food; it is also grown by the Indians, and by the white farmers for export. Besides maize the crops cultivated by the natives are Kaffir corn or amabele {Sorghum caffrorum) — used in the manufacture of utyuala, native beer — imfi {Sorghum saccharatum) , tobacco, pumpkins and sweet potatoes. The chief wealth of the natives consists, however, in their large herds of cattle (see infra). While maize thrives in every part of the country, wheat, barley and oats — cultivated by the white farmers — flourish only in the midlands and uplands. More important than the cereal crops are the tropical and sub-tropical products of the coast zone. Besides fruits of nearly all kinds there are cultivated in the low moist regions the sugar-cane, the tea, coffee and tobacco plants, arrowroot, cayenne pepper, cotton, &c. The area under sugar in 1905 was 45,840 acres and the produce 532,067 cwt. (a large quantity of sugar-cane is grown for feeding stock). In the same year the production of tea was 1,633,1781b; of coffee, 24,859ft; of maize, 2,101,470 bushels; of potatoes, 419,946 bushels; and of sweet potatoes, 181,195 bushels. The tea plant was first introduced in Natal in 1850, but little attention was paid to it until the failure of the coffee plantations about 1875, since when only small quantities of coffee have been produced. In 1877 renewed efforts were made to induce tea cultivation, and by 1 881 it had become an established

industry. The variety chiefly grown is the Assam indigenous. Most of the tea estates are situated in the coast belt north of Durban. The sugar cane, like tea, was first introduced in 1850, the first canes being brought from Mauritius. The industry is steadily growing, as are the dependent manufactures of molasses and rum. The fruit industry is of considerable importance and by 1905 had reached a turnover of over £100,000 a year.

Extensive areas in the midland and upland districts are devoted to the raising of stock. Horse-breeding is successfully carried on in the upper districts. The higher the altitude the healthier the unimals and the greater their immunity from disease. Horse- sickness, a kind of malarial fever, which takes an epidemic form in very wet seasons, causes considerable loss. The Natal horse is small, wiry, and has great powers of endurance. Cattle-breeding is probably the most lucrative branch of stock-farming, the country being pre-eminently adapted for horned cattle. Rinderpest in 1896-1897 swept through South Africa, and probably carried off in Natal from 30 to 40 % of the stock of Europeans, while the natives' losses were even heavier. Serum and bile inoculation were the means of saving a considerable percentage of the herds. The farmers soon began to recover from their losses, but in 1908-1909 another serious loss of stock resulted from the ravages of East Coast fever. The cattle consist chiefly of the Zulu and Africander breeds, but attention has been given to improving the breed by the introduction of Short- horn, Devon and Holstein (or Friesland) stock. The chief market for cattle is Johannesburg. The principal breed of sheep is the merino, which does well in the higher altitudes. A Scab Act is in force, and is stringently carried out by government inspectors with most satisfactory results. The Angora goat thrives well in certain districts. Ostriches do well in the dry, arid valleys of the Tugela and Mooi rivers. In 1908 Europeans were returned as owning 32,000 horses, 220,000 horned cattle, 765,000 sheep, 68,000 goats, 25,000 pigs, 960 ostriches and 384,000 poultry. Large herds of cattle — over 500,000 in the aggregate — are owned by the natives, who also possess vast flocks of goats and sheep. The dairy industry is well established, and Natal butter commands a ready sale.

Valuable timber is obtained from the forests. Stinkwood is largely employed in the making of wagons, and is also used for making furniture. Black ironwood is likewise used in building wagons, while sneezewood is largely utilized for supports- for piers and other marine

structures, being impervious to the attacks of the Teredo navalis. More important is the cultivation of the black wattle (Acacia mollissima) , which began in 1886, the bark being expQrted for tanning purposes, the wood also commanding a ready sale. This wattle thrives well in most localities, but especially in the highlands of central Natal. In 1905 the production of wattle bark was 13,620 tons, and the area planted with the tree over 60,000 acres. Aloes and ramie are cultivated to some extent for their fibre.

The government maintains experimental farms and forestry plantations and a veterinary department to cope with lung sickness, rinderpest, East Coast fever and such like diseases. It also conducts campaigns against locusts and other pests and helps irrigation settlements. By means of an Agricultural Bank it affords assistance to farmers.

Mining. — There are several highly mineralized areas in the country. The existence of coal in the north-east districts on or near the surface of the ground was reported as early as 1839, but it was not until 1880 that steps were taken to examine the coalfields. This was done by F. W. North, who reported in 1881 that in the Klip river (Dundee) district there was an area of 1350 sq. m. that might be depended upon for the supply of coal, which is of all characters from lignite to anthracite. In 1889 the extension of the railway from Ladysmith through the coal area first made coal- mining profitable. In 1896 the total output of coal was 216,106 tons (valued at £108,053 at the pit's mouth), in 1908 it had increased to 1,669,774 tons (valued at the pit's mouth at £737,169). There is a considerable trade in bunker and export coal at Durban, the coal bunkered having increased from 118,740 tons in 1900 to 710,777 in 1908 In the last-named year 446,915 tons of coal were exported. Besides the mines in the Newcastle and Dundee district there are extensive coal-fields at Hlobane in the Vryheid district and in Zulu- land (q.v.) Iron ore is widely distributed and is found in the neigh- bourhood of all the coal-fields. There are extensive copper and gold- yielding areas, and in some districts these metals are mined. On the lower Umzimkulu, near Port Shepstone, marble is found in great quantities.

Commerce. — The chief exports, not all products of the province, are coal, wool, mohair, hides and skins, wattle bark, tea, sugar, fruits and jams. The import trade is of a most varied character, and a large proportion of the goods brought into the country are in transit to the Transvaal and Orange Free State, Natal affording, next to Delagoa Bay, the shortest route to the Rand. Textiles, largely cotton goods, hardware, mining and agricultural machinery, tobacco and foodstuffs

form the bulk of the imports. In 1896 the value of exports was £1,785,000; in 1908 the value was £9,622,000. In 1896 the imports were valued at £5,437,000, in 1908 at £8,330,000 (a decrease of £2,300,000 compared with 1905). The bulk of these exports are to the Transvaal and neighbouring countries, and previously figure as imports, other exports, largely wool and hides, are first imported from the Transvaal. Over three-fifths of the imports are from Great Britain, and about one-seventh of the exports go to Great Britain. The shipping, which in 1874 was 126,000 tons, was in 1884 1,013,000; in 1894, i,463jOOo; in 1904 4,263,000; and in 1908, 5,028,000. Over six-sevenths of the shipping is British.

Government and Constitution. — Natal was from 1893 to 1910 a self-governing colony. It is now represented in the Union Parliament by eight senators and seventeen members of the House of Assembly. The qualifications for electors and members of the Assembly are the same, namely men of full age owning houses or land worth £50, or who rent such property of the yearly value of £10; or who, having lived three years in the province, have incomes of not less than £96 a year.

Coloured persons are not, by name, excluded from the franchise, but no persons ” subject to special laws and tribunals,” J in which category all natives are included, are entitled to vote. Another law, 2 directed against Indians, excludes from the franchise, natives, or descendants of natives in the male line, of countries not possessing elective representative institutions. Exemption from the scope of these provisions may be granted by the governor-general and under such exemption a few Kaffirs are on the roll of electors.

At the head of the provincial government is an administrator, appointed by the Union Ministry, who holds office for five years. He is assisted by an executive committee of four members elected by the provincial council. This council to which is

1 Act No. 2 (of the Natal Legislature) of 1883.

2 Act No. 8 of 1896. The Indians whose names were “rightly contained ” in the voters’ rolls at the date of the act retain the franchise.

entrusted the management of affairs purely provincial consists of 25 members, elected by the parliamentary voters and each representing a separate constituency. The council sits for a statutory period of three years. For local government purposes the province is divided into counties or magisterial divisions; Zululand being under special

jurisdiction. The chief towns — ■ Durban, Maritzburg, Ladysmith, Newcastle and Dundee — are governed by municipal corporations and minor towns by local boards.

Revenue and Expenditure. — Revenue is derived chiefly from customs and excise, railways, land sales, posts and telegraphs and a capitation tax. The expenditure is largely on reproductive works (railways, harbours, post office, &c), on the judiciary and police, education and military defence. The majority of these services are, since 1910, managed by the Union Government, but the provincial council has power to levy direct taxation, and (with the consent of the Union Government) to raise loans for purely provincial purposes. Its revenues and powers are those pertaining to local government. Some particulars follow as to the financial position of Natal previous to the establishment of the Union."

In 1846, the first year of Natal's separate existence, the revenue was £3073 and the expenditure £6905. In 1852 the revenue was £27,158 and the expenditure £24,296, and in 1862 the conesponding figures were £98,799 and £85,928. In 1872 revenue had risen to £180,499 and expenditure to £132,978. Ten years later the figures were, revenue £657,738, expenditure £659,031. The rise of Johannes- burg and the opening up of the Dundee coal-fields, as well as the development of agriculture, now caused a. rapid increase on both sides of the account. In 1888 the revenue for the first time exceeded a million, the figures for that year being, revenue £1,130,614, ex- penditure £781,326; in 1898-1899 the figures were £2,081,349 and £1,914,725. The Anglo l Boer War (1899-1902) caused both revenue and expenditure to rise abnormally, while the depression in trade which followed the war adversely affected the exchequer. In 1903-1904 there was a slight credit balance, the figures being, revenue £4,160,145, expenditure £4,071,439. For the next four years there were deficits, but in 1908-1909 a surplus was realized, the revenue being £3,569,275 and the expenditure £3,530,576. For 1909-1910, the last year of Natal's existence as a colony, the revenue, £4.035.000, ˆ again exceeded the expenditure. The public debt, £2,101,500 in 1882, had risen at the close of the Boer War in 1902 to £12,519,000, and was in June 1909, £21,420,000.

Defence. — A small garrison of imperial troops is quartered at Maritzburg. The provincial force consists of a militia, fully equipped and armed with modern weapons. It is divided into mounted rifle- men, about 1900 strong, four field batteries of 340 men and two infantry battalions, each of over 800 men. There is also an armed and mounted police force of 870 Europeans. Military training is

compulsory on all lads over ten attending government schools. The boys are organized in cadet corps. A senior cadet corps is formed of youths between sixteen and twenty. There are also many rifle associations, the members of which are liable to be called out for defence. Durban harbour is defended by batteries with heavy modern guns. The batteries are manned by the naval corps (150 strong) of the Natal militia. Natal makes an annual contribution of £35,000 towards the upkeep of the British navy. .

Law and Justice. — The South Africa Act 1909 established a Supreme Court of South Africa, the former supreme court of Natal becoming a provincial division of the new supreme court. The Roman-Dutch law, as accepted and administered by the courts of Cape Colony up to 1845 (the date of the separation of Natal from the Cape), is the law of the land, save as modified by ordinances and laws enacted by the local legislature, mostly founded upon imperial statute law. The law of evidence is the same as that of the courts of England. Natives, however, are not justiceable under the Roman- Dutch law, but by virtue of letters patent passed in 1848 they are judged by native laws and customs, except so far as these may be repugnant to natural equity. The native laws were first codified ip 1878. in 1887 a board was appointed for their revision, and the new code came into operation in 1901. Provision is made whereby a native can obtain relief from the operation of native law and be subject to the colonial law (Law No. 28 of 1865). Special laws have been passed for the benefit of the coolie immigrants. The ad- ministration of justice is conducted by magistrates' courts, circuit courts and the provincial division of the supreme court. The magi- strates have both civil and criminal jurisdiction in minor cases. Appeals can be made from the magistrates' decisions to the pro- vincial or circuit court. The provincial court, consisting of a judge- president and three puisne judges, sits in Pietermaritzburg and ha* jurisdiction over all causes whether affecting natives or Europeans. The judges also hold circuit courts at Durban and other places Appeals from the circuit courts can be made to the provincial court, and from the provincial court appeals lie to the appellate divisio/v of the Supreme Court of South Africa, sitting at Bloemfontein. Criminal cases are tried before a single judge and a jury of nine — of whom not fewer than seven determine the verdict. There is a. vice-admiralty court, of which the judge-president is judge and

commissary. In native cases the chiefs have civil jurisdiction in disputes among their own tribesmen and criminal jurisdiction over natives except in capital cases, offences against the person or property of non-natives, pretended witchcraft, cases arising out of marriages by Christian rites, &c. An appeal lies to a magistrates' court from every judgment of a native chief, and from the magis- trates' judgment on such appeal to a native high court. This native high court consists of a judge-president and two other judges, and sits in full court at Maritzburg not less than three months and at Eshowe not less than once in the year. There is no jury in this tribunal and single judges may hold circuit courts. With certain exceptions reserved for the provincial court (such as insolvency, ownership of immovable property and divorce), the native high court exercises jurisdiction when all parties to the suit are natives; it also has jurisdiction when the complainant is not a native, but all other parties to the suit are natives.

Religion. — The majority of the white inhabitants are Protestants, the bodies with the largest number of adherents being the Anglicans, Dutch Reformed Church, Presbyterians and Wesleyans. The Anglicans are divided' into two parties — those belonging to " the Church of the Province of South Africa," the body in communion with the Church of England, and those who act independently and constitute " the Church of England in Natal." The schism arose out of the alleged heterodox views of Bishop Colenso (q.v.), who had been created bishop of Natal by letters patent in 1853. In 1863 the metropolitan of Cape Town, as head of the Church of the Province of South Africa, excommunicated Dr Colenso and consecrated a rival bishop for Natal, who took the title of bishop of Pietermaritzburg. Dr Colenso, who obtained a decision of the privy council confirming his claim to be bishop of Natal and possessor of the temporalities attached to the bishopric, died in 1883. After his death those members of the Anglican community who objected to the constitu- tion of the provincial church maintained their organization while the temporalities were placed in the hands of curators. Reunion in spiritual matters has, however, been practically effected. Moreover, an act of the Natal parliament passed in 1909 placed the temporalities into commission in the persons of the bishop and other trustees of the Natal diocese of the Provincial Church ; reservations being made in favour of four congregations at that time unwilling to unite with the main body of churchmen. 1 At the census of 1904 the Anglicans numbered 40,880. The Presbyterians numbered 12,184, the Wes- leyan Methodists 11,992, the Dutch Reformed Church 11,340, the Lutherans 4852, and the Baptists 2193. The Roman Catholics, at whose head is a vicar-apostolic, numbered

10,419. All these figures are exclusive of natives, of vhom the churches named — notably the Anglicans and Wesleyans — have many converts. The Jewish com- munity in 1904 numbered 1496. Of the Asiatics, 87,234 were classed as Hindus and 10,111 as Mahommedans.

Education. — Education other than elementary is controlled by the Union government. Public schools, and private schools aided by provincial grants provide elementary education for white children. Education is neither compulsory nor free; but the fees are low (is. to 5s. a month) and few children are kept away from school. There are government secondary and art schools at Durban and Maritzburg, and a Technical Institute at Durban. For higher edu- cation provision was made by the affiliation of Natal to the Cape of Good Hope University and by exhibitions tenable at English universi- ties. An act of the Natal legislature, passed December 1909, provided for the establishment at Maritzburg of the Natal University College, the course of studies to be such as from time to time prescribed by the Cape University. In 1910 £30,000 was voted for the University College buildings. State aid and inspection is given to private schools for natives. In the native schools — almost all maintained by Christian missions — Zulu and English are taught, the subjects taken being usually reading, writing, arithmetic, grammar,_ geography and history. The state provides elementary and higher grade schools for Indian children. In 1908 there were 52 government schools and 472 schools under inspection; 304 European, 21 coloured, 168 native and 31 Indian, with an aggregate attendance of 30,598 scholars. There are in addition many private and denominational schools and colleges not receiving state aid. Of these, two of the best known are Hilton College and Hermansberg College, many prominent Natalians having been educated at one or the other of these establishments. To encourage the instruction of children who by reason of distance cannot attend a government or govern- ment-aided school, grants-in-aid are made for each pupil attending farm schools.

The Press. — The first newspaper in Natal was the Natalier, a Dutch print published at Maritzburg; it was succeeded by the Patriot. The first English paper was the Natal Witness, started in 1845 and still one of the leading organs of public opinion. In 1851 the Natal Times appeared, and is now continued as the Times of Natal. Another leading paper, the Natal Mercury, dates from 1852. It is a morning newspaper and is issued at Durban. The Natal Advertizer is a Durban evening paper. Sir John Robinson, the first premier of Natal under responsible government, was the editor of the Mercury from i860 until he became prime minister in 1893.

1 For a summary of the Natal church controversy see The Guardian (London March 11, 1910).

In 1886 a new Dutch paper, De Afrikaner, was started at Maritzburg. The Kaffirs have their own organ, Ipipa lo Hlunga (the paper of grievances), issued at Maritzburg, and the Asiatics, Indian Opinion a weekly paper started in 1903 and printed in English, Gujarati, Hindi and Tamil. Local papers are published weekly at Ladysmith, Dundee and Greytown. The Agricultural Journal, a government publication issued fortnightly, is of great service in the promotion of agricultural knowledge.

History.

Vasco da Gama on his voyage to India sighted the bluff at the entrance to the bay now forming the harbour of Durban on Christmas Day 1497 and named the country Terra Natalis. Da Gama made no landing here and, like Discovery the rest of South Africa, Natal was neglected by the history.* Portuguese, whose nearest settlement was at Delagoa Bay. In 1576 Manuel de Mesquita Perestrello, commanded by King Sebastian to explore the coast of South Africa and report on suitable harbours, made a rough chart, even then of little use to navigators, which is of value as exhibiting the most that was known of the country by its discoverers before the advent of their Dutch rivals, who established themselves at Cape Town in 1652. Perestrello states that Natal has no ports but otherwise he gives a fairly accurate description of the country — noting particu- larly the abundance of animals and the density of the population. The first detailed accounts of the country were received from shipwrecked mariners. In 1683 the English ship ” Johanna ” went ashore near Delagoa Bay and the crew made a remarkable journey overland to Cape Town, passing through Natal, where they were kindly received by the natives. About the same time (in 1684) an English snip put into Port Natal (as the bay came to be known) and purchased ivory from the natives, who, how- ever, refused to deal in slaves. In May 1685 another English ship the ” Good Hope ” was wrecked in crossing the bar at Port Natal and in February 1686 the ” Stavenisse,” a Dutch East Indiaman, was wrecked a little farther south. Survivors of both vessels lived for nearly a year at Port Natal and there built a boat in which they made the voyage to Cape Town in twelve days. They brought with them 3 tons of ivory. This fact and their reports of the immense herds of elephants which roamed the bush led Simon van der Stell, then governor at Cape Town to despatch (1689) the ship ” Noord ” to Port Natal, with instruc- tions

to her commander to open up a trade in ivory and to acquire possession of the bay. From the chief of the Amatuli tribe, who inhabited the adjacent district, the bay was ” purchased ” for about £50 worth of goods. No settlement was then made and in 1705 the son of the chief repudiated the bargain. In 1 72 1 the Cape government- did form a settlement at the bay, but it was soon afterwards abandoned. Thereafter for nearly a hundred years Natal was again neglected by white men. A ship now and again put into the bay, but the dangerous bar at its entrance militated against its frequent use. When in 1824 the next attempt was made by Europeans to form a settle- ment at the bay, Cape Colony had passed from the Dutch into the possession of Great Britain, while in Natal great changes had come over the land as a result of wars between the natives.

From the records of the 17th and 18th centuries it is apparent that the people then inhabiting Natal were Bantu-negroes of the Kaffir (Ama Xosa) branch. There is no mention of Hotten- tots, and the few Bushmen who dwelt in the upper regions by the Drakensberg did not come into contact with Europeans. The sailors of the ” Stavenisse ” reported the most numerous and most powerful tribe to be the Abambo, while that which came most in contact with the whites was the Amatuli, as it occupied a considerable part of the coast-land. These Kaffirs appear to have been more given to agriculture and more peaceful than their neighbours in Kaffraria and Cape Colony. But the quiet of the country was destroyed by the inroads of Chaka, the chief of the Zulus (see Zululand). Chaka between 1818 and 1820 ravaged the whole of what is now known as Natal, and after beating his foes in battle, butchered the women, children and old men, incorporating the young men in his impis. The popula- tion was greatly reduced and large areas left without a single

inhabitant. By right of conquest Chaka became undisputed master of the country.

Such was the situation when the first British settlement was made in Natal, In 1823 Francis George Farewell, formerly a lieutenant in the British navy, with other merchants of Cape Town, formed a company to trade with the natives of the south- east coast. In the brig ” Salisbury,” commanded by James S. King, who had been a midshipman in the navy, Farewell visited Port Natal, St Lucia and

Delagoa Bays. The voyage was not successful as a trading venture, but Farewell was so impressed with the possibilities of Natal both for trade and colonization that he resolved to establish himself at the port. He went thither with ten companions, among them Henry Francis Fynn. All the rest save Farewell and Fynn speedily repented of their adventure and returned to the Cape, but the two who remained were joined by three sailors, John Cane, Henry Ogle and Thomas Holstead, a lad. Farewell, Fynn and the others went to the royal kraal of Chaka, and, having cured him of a wound and made him various presents, obtained a document, dated the 7th of August 1824, ceding to " F. G. Farewell & Company entire and full possession in perpetuity " of a tract of land including " the port or harbour of Natal." On the 27th of the same month Farewell hoisted the The Hrst Union Jack at the port and declared the territory he British had acquired a British possession. In 1825 he was settle- joined by King, who had meantime visited England meat and had obtained from the government a letter of recommendation to Lord Charles Somerset, governor of the Cape, granting King permission to settle at Natal. Farewell, King and Fynn made independent settlements at various parts of the bay, where a few Amatuli still lingered. They lived, practically, as Kaffir chiefs, trading with Chaka and gathering round them many refugees from that monarch's tyranny. Early in 1828 King, accompanied by two of Chaka's indunas, voyaged in the " Elizabeth and Susan," a small schooner built by the settlers, to Port Elizabeth. He appears to have been coldly received by the authorities, who were even unable to ascertain the nature of Chaka's embassy. Soon after his return to Natal King died, and in the same month (September 1828) Chaka was murdered by his brother Dingaan. In the December following Farewell went in the " Elizabeth and Susan " to Port Elizabeth. On this occasion the authorities were more hostile than before to the Natal pioneers, for they confiscated the schooner on the ground that it was unregistered and that it came from a foreign port. Farewell was not daunted, and in September 1829 set out to return overland to Port Natal. He was, however, murdered in Pondoland by a chief who was at enmity with the Zulus. Fynn thus became leader of the whites at the port, who were much at the mercy of Dingaan. In 1831 that chief raided their settle- ments, the whites all fleeing south of the Umzimkulu; but at Dingaan's invitation they soon returned. Dingaan declared Fynn his representative and " great chief of the Natal Kaffirs." In 1834, however, Fynn accepted a post under the Cape govern- ment and did not return to Natal for many years. It was in this year that a petition from Cape Town merchants asking for the creation of a British colony at Natal was met by the statement that the Cape finances would not permit the establishment of a new dependency.

The merchants, however, despatched an expedition under Dr Andrew Smith to inquire into the possibilities of the country, and the favourable nature of his report induced a party of Dutch farmers under Piet Uys to go thither also. Both Dr Smith and Uys travelled overland through Kaffraria, and were well received by the English living at the bay. The next step was taken by the settlers at the port, who in 1835 resolved to lay out a town, which they named Durban, after Sir Benjamin d'Urban, then governor of Cape Colony. At the same time the settlers, who numbered about 50, sent a memorial to the governor calling attention to the fact that they were acknowledged rulers over a large tract of territory south of the Tugela, and asking that this territory should be proclaimed a British colony under the name of Victoria and that a governor and council be appointed. To all these requests no official answer was returned. The settlers had been joined in the year named (1835) by Captain

Gardiner, a naval officer, whose chief object was the evangeliza- tion of the natives. With the support of the traders he founded a mission station on the hill overlooking the bay. In 1837 Gardiner was given authority by the British government to exercise jurisdiction over the traders. They, however, refused to acknowledge Gardiner's authority, and from the Cape govern- ment he received no support. 1 It was not until their hand was forced by the occupation of the interior by Dutch farmers that the Cape authorities at length intervened.

The British settlers had, characteristically, reached Natal mainly by way of the sea; the new tide of immigration was by land — the voortrekkers streamed through the passes of ˆniyal the Drakensberg, bringing with them their wives and of the children and vast herds of cattle. The reasons which Dutch caused the exodus from the Cape are discussed else- T 0< ?7 where (see South Africa and Cape Colony), here it is only necessary to point out that those emigrants who entered Natal shared with those who settled elsewhere an intense desire to be free from British control. The first emigrant Boers to enter the country were led by Pieter Retief (c. 1 780-1838), a man of Huguenot descent and of marked ability, who had formerly lived on the eastern frontier of Cape Colony and had suffered severely in the Kaffir wars. Passing through the almost deserted upper regions Retief arrived at the bay in October 1837. He went thence to Dingaan's kraal with the object of securing a formal cession of territory to the Dutch farmers. Dingaan consented on condition that the Boers recovered for him certain cattle stolen by another chief; this task Retief accomplished, and with the help of the ReV. F. Owen, a missionary then living at Dingaan's kraal, a deed of cession was drawn up in English and signed by Dingaan and Retief on the 4th of February 1838. Two days after the signature of

the deed Retief and all of his party, 66 whites, besides Hottentot servants, were treacherously murdered by Dingaan's orders. The Zulu king then commanded his impis to kill all the Boers who had entered Natal. The Zulu forces crossed the Tugela the same day, and the most advanced parties of the Boers were massacred, many at a spot near where the town of Weenen now stands, its name (meaning wailing or weeping) commemorating the event. Other of the farmers hastily laagered and were able to repulse the Zulu attacks; the assailants suffering serious loss at a fight near the Bushman's river. Nevertheless in one week after the murder of Retief 600 Boers — men, women and children — had been killed by the Zulus. The English settlers at the bay, hearing of the attack on the Boers, determined to make a diversion in their favour, and some 20 men under the command of R. Biggar and with a following of 700 friendly Zulus crossed the Tugela near its mouth. In a desperate fight (April 17) with a strong force of the enemy the English were overwhelmed and only four Europeans escaped to the bay. Pursued by the Zulus, all the surviving inhabitants of Durban were compelled for a time to take refuge on a ship then in harbour. After the Zulus retired, less than a dozen Englishmen returned to live at the port; the missionaries, hunters and other traders returned to the Cape. Meantime the Boers, who had repelled the Zulu attacks on their laagers, had been joined by others from the Drakensberg, and about 400 men under Hendrik Potgieter and Piet Uys advanced to attack Dingaan. On the nth of April, however, they fell into a trap laid by the Zulus and with difficulty cut their way out. Among those slain were Piet Uys and his son Dirk, aged 15, who rode by his side. The Boer farmers were now in a miserable plight, but towards the end of the year they received reinforcements, and in December 460 men set out under Andries Pretorius to avenge themselves on the Zulus. On Sunday the 16th of December, while laagered near the Umslatos river, they were attacked by over 10,000 Zulus. The Boers had firearms, the Zulus their assegais only, and after a three hours' fight the Zulus were totally defeated, losing thousands killed, while the farmers' casualties were under

1 Captain Allen Francis Gardiner (1794-1851) left Natal in 1838, subsequently devoting himself to missionary work in South America, being known as the missionary to Patagonia. He died of starvation in Tierra del Fuego.

a dozen. (This memorable victory is annually commemorated by the

Boers as Dingaan's Day, while the Umslatos, which ran red with the blood of the slain, was renamed Blood river.) Dingaan fled, the victorious Boers entered the royal kraal, gave decent burial to the skeletons of Retief and his party, and regarded themselves as now undisputed masters of Natal. They had recovered from a leather pouch which Retief carried the deed by which Dingaan ceded " to Retief and his countrymen the place called Port Natal together with all the lands annexed … as far as the land may be useful and in my possession." This was the 5th or 6th cession made by Chaka or Dingaan of the same territory to different individuals. In every case the overlordship of the Zulus was assumed.

Returning south, Pretorius and his commando were surprised to learn that Port Natal had been occupied on the 4th of December by a detachment of the 72nd Highlanders sent thither from the Cape. The emigrant farmers had, with the assent of the few remaining Englishmen at Port Natal, in May 1838 issued a proclamation taking possession of the port. This had been followed by an intimation from the governor of the Cape (Major- General Sir George Napier) inviting the emigrants to return to the colony, and stating that whenever he thought it desirable he should take military possession of the port. In sanctioning the occupation of the port the British government of the day had no intention of making Natal a British colony, but wished to prevent the Boers establishing an independent republic upon the coast with a harbour through which access to the interior could be gained. After remaining at the port just over a year the Highlanders were withdrawn, on Christmas Eve 1839. Mean- time the Boers had founded Pietermaritzburg and made it the seat of their volksraad. They rendered their power in Natal absolute, for the time, in the following month, when they joined with Panda, Dingaan's brother, in another attack on the Zulu king. Dingaan was utterly defeated and soon afterwards perished, Panda becoming king in his stead by favour of the Boers. At this time, had the affairs of the Boer community been managed with prudence and sagacity they might have estab- lished an enduring state. But their impatience of control, reflected in the form of government adopted, led to disastrous consequences. Legislative power was vested, nominally, in the volksraad (consisting of twenty-four members) , while the president and executive were changed every three months. But whenever any measure of importance was to be decided a meeting was called of het publiek, that is, of all who chose to attend, to sanction or reject it. " The result," says Theal, " was utter anarchy. Decisions of one day were frequently reversed the next, and every one held himself free to disobey any law that he did not approve of. . . . Public opinion of the hour in each section of the

community was the only force in the land" {History of South Africa 18 34- 18 54, chap. xliv.). While such was the domestic state of affairs during the period of self-govern- ment, the settlers cherished large territorial views. They were in loose alliance with and in quasi-supremacy over the Boer communities which had left the Cape and settled at Winburg and at Potchefstroom. They had declared themselves a free and independent state under the title of " The Republic of Port Natal and adjacent countries," 1 and sought (September 1840) from Sir George Napier at the Cape an acknowledgment of their independence by Great Britain. Sir George, being without definite instructions from England, could give no decisive answer, but he was friendly disposed to the Natal farmers. This feeling was, however, changed by what Sir George (and many of the Dutch in Natal also) thought a wilful and unjustifiable attack (December 1840) on a tribe of Kaffirs on the southern, or Cape Colony, frontier by a commando under Andries Pretorius, which set out, nominally, to recover stolen cattle. Having at length received an intimation from London that the queen " could not acknowledge the independence of her own subjects, but that the trade of the emigrant farmers would be placed on the same footing as that of any other British settlement, upon their receiving a military force to exclude the interference 1 Commonly called the Republic of Natalia or Natal.

with or possession of the country by any other European power," Sir George communicated this decision to the volksraad in September 1841. Under the arrangement proposed the Boers might easily have secured the benefits of self-government, subject to an acknowledgment of British supremacy, together with the advantage of military protection, for the British govern- ment was then extremely reluctant to extend its colonial re- sponsibilities. The Boers, however, strongly resented the conten- tion of the British that they could not shake off British nationality though beyond the bounds of any recognized British possession, nor were they prepared to see their only port garrisoned by British troops, and they rejected Napier's overtures. Napier, therefore, on the 2nd of December 1841, issued a proclamation in which he stated that in consequence of the emigrant farmers refusing to be treated as British subjects and of their attitude towards the Kaffir tribes he intended resuming military occupation of Port Natal. This proclamation was answered in a lengthy minute, dated the 21st of February 1842, drawn up by J. N. Boshof (afterwards president of the Orange Free State), by far the ablest of the Dutch who had settled in Natal. In this minute the farmers ascribed all their troubles to one cause, British namely, the absence of a representative government, and which had been repeatedly asked

for by them while Datc «, f° still living in Cape Colony and as often denied or c °" delayed, and concluded by a protest against the occupation of any part of their territory by British troops. An incident which happened immediately after these events greatly en- couraged the Boers to persist in their opposition to Great Britain. In March 1842 a Dutch vessel sent out by G. G. Ohrig, an Amsterdam merchant who sympathized warmly with the cause of the emigrant farmers, reached port Natal, and its supercargo, J. A. Smellekamp (a man who subsequently played a part in the early history of the Transvaal and Orange Free State), con- cluded a treaty with the volksraad assuring them of the pro- tection of Holland. The Natal Boers believed the Netherlands to be one of the great powers of Europe, and were firmly persuaded that its government would aid them in resisting England.

On the 1st of April Captain T. C. Smith with a force of 263 men left his canp at the Umgazi,on the eastern frontier of Cape Colony, and marching overland reached Durban without opposition, and encamped, on the 4th of May, at the base of the Berea hills. The Boers, cut off from their port, called out a commando of some 300 to 400 men under Andries Pretorius and gathered at Congella at the head of the bay. On the night of the 23rd of May Smith made an unsuccessful attack on the Boer camp, losing his guns and fifty men killed and wounded. On the 26th the Boers captured the harbour and settlement, and on the 31st blockaded the British camp, the women and children being removed, on the suggestion of Pretorius, to a ship in the harbour of which the Boers had taken possession. Meantime, an old Durban resident, Richard (commonly called Dick) King, had undertaken to convey tidings of the perilous position of the British force to the com- mandant at Graham's Town. He started on the night of the 24th, and escaping the Boer outposts rode through the dense bush and across the bridgeless rivers of Kaffraria at peril of his life from hostile natives and wild beasts, and in nine days reached his destination — a distance of 360 m. in a direct line, and nearly 600 by the route to be followed. This remarkable ride was accomplished with one change of mount, obtained from a mis- sionary in Pondoland. A comparatively strong force under Colonel A. J. Cloete was at once sent by sea to Port Natal, and on the 26th of June Captain Smith was relieved. The besieged had suffered greatly from lack of food. Within a fortnight Colonel Cloete had received the submission of the volksraad at Pieter- maritzburg. The burghers represented that they were under the protection of Holland, but this plea was peremptorily rejected by the commander of the British forces.

The British government was still undecided as to its policy towards Natal. In April 1842 Lord Stanley (afterwards 14th earl of Derby),

then secretary for the colonies in the second Peel Administration, wrote to Sir George Napier that the establishment of a colony in Natal would be attended with little prospect of

by Great Britain.

advantage, but at the same time stated that the pretensions of the emigrants to be regarded as an independent community could not be admitted. Various measures were proposed which would but have aggravated the situation. Finally, in deference to the strongly urged views of Sir George Napier, Lord Stanley, in a despatch of the 13th of December, received in Cape Town on the 23rd of April 1843, consented to Natal becoming a British colony. The institutions adopted were to be as far as possible in accordance with the wishes of the people, but it was a fundamental condition ” that there should not be in the eye of the law any distinction or disqualification whatever, founded on mere difference of colour, origin, language or creed.” Sir George then appointed Mr Henry Cloete (a brother of Colonel Cloete) a special commissioner to explain to the Natal volksraad the decision of the government. There was a considerable party of Natal Boers still strongly opposed to the British, and they were reinforced by numerous bands of Boers who came over the Drakensberg from Winburg and Potchefstroom. Commandant Jan Mocke of Winburg (who had helped to besiege Captain Smith at Durban) and others of the ” war party ” attempted to induce the volksraad not to submit, and a plan was formed to murder Pretorius, Boshof and other leaders, who were now convinced that the only chance of ending the state of complete anarchy into which the country had fallen was by accepting British sovereignty. In these circumstances the task of Mr Henry Cloete was one of great difficulty and delicacy. He behaved with the utmost tact and got rid of the Winburg and Potchefstroom burghers by declaring that he should recommend the Drakensberg as the northern limit of Natal. On the 8th of August 1843 Natal the Natal volksraad unanimously agreed to the terms

annexed proposed by Lord Stanley. Many of the Boers who would not acknowledge British rule trekked once more over the mountains into what are now the Orange Free State and Transvaal provinces. At the end of 1843 there were not more than 500 Dutch families left in Natal. Cloete, before returning to the Cape, visited Panda and obtained from him a valuable concession. Hitherto the Tugela from

source to mouth had been the recognized frontier between Natal and Zululand. Panda gave up to Natal all the territory between the Buffalo and Tugela rivers, now forming Klip River county.

Although proclaimed a British colony in 1843, an d in 1844 declared a part of Cape Colony, it was not until the end of 1845 that an effective administration was installed with Mr Martin West as lieutenant-governor, and the power of the volksraad finally came to an end. In that year the external trade of Natal, almost entirely with Cape Colony, was of the total value of £42,000 — of which £32,000 represented imported goods.

The new administration found it hard to please the Dutch farmers, who among other grievances resented what they con- sidered the undue favour shown to the Kaffirs, whose numbers had been greatly augmented by the flight of refugees from Panda. In 1843, for instance, no fewer than 50,000 Zulus crossed the Tugela seeking the protection of the white man. The natives were settled in 1846 in specially selected locations and placed under the general supervision of Sir (then Mr) Theophilus Shep- stone (q.v.). Sir Harry Smith, newly appointed governor of the Cape, met, on the banks of the upper Tugela, a body of farmers preparing to recross the Drakensberg, and by remedying their grievances induced many of them to remain in Natal. Andries Pretorius and others, however, declined to remain, and from this time Pretorius (q.v.) ceased his connexion with Natal. Although by this migration the white population was again considerably reduced, those who remained were contented and loyal, and through the arrival of 4500 emigrants from England in the years 1848-1851 and by subsequent immigration from oversea the colony became overwhelmingly British in character. From the time of the coming of the first considerable body of British settlers dates the development of trade and agriculture in the colony, followed somewhat later by the exploitation of the mineral resources of the country. At the same time schools were established and various churches began or increased their work in the colony. Dr Colenso, appointed bishop of Natal, arrived in

1854. In 1856 the dependence of the country on Cape Colony was put to an end and Natal constituted a distinct colony with a legislative council of sixteen members, twelve elected by the inhabitants and four nominated by the crown. At the time the white population exceeded 8000. While dependent on the Cape, ordinances had been passed establishing Roman-Dutch law as the law of Natal, and save where modified by legislation it remained in force.

The British settlers soon realized that the coast lands were suited to the cultivation of tropical or semi-tropical products, and from 1852 onward sugar, coffee, cotton and arrow-root Indian were introduced, tea being afterwards substituted for cooiiea coffee. The sugar industry soon became of importance, l a atro l and the planters were compelled to seek for large numbers of labourers. The natives, at ease in their locations, did not volunteer in sufficient numbers, and recourse was had to coolie labour from India. The first coolies reached Natal in 1 860. They came under indentures, but at the expiration of their contract were allowed to settle in the colony. 1 This proved one of the most momentous steps taken in the history of South Africa, for the Indian population rapidly increased, the ” free ” Indians be- coming market gardeners, farmers, hawkers, traders, and in time serious competitors with the whites. But in i860 and for many years afterwards these consequences were not foreseen, and alone among the South Africa states Natal offered a welcome to Asiatics. In 1 866 the borders of the colony were extended on the south- west by the annexation of part of Kaffraria that had formerly been under the sway of the Pondo chief Faku, who found himself unable to maintain his authority in Keate a region occupied by many diverse tribes. The newly awards. acquired territory was named Alfred county in memory of a visit paid to Natal by Prince Alfred (afterwards duke of Saxe-Coburg-Gotha). In 1867 R. W. Keate (1814-1873) became lieutenant-governor, a post which he filled until 1872. His administration is notable, not so much for internal affairs, but from the fact that he twice acted as arbitrator in disputes in which the Boer states were involved. In a dispute between the Transvaal and the Orange Free State he decided (February 1870) that the Klip river and not the upper Vaal was the frontier stream. A more famous decision, that known as the Keate Award, was given in October 187 1. It concerned the south-western frontiers of the Transvaal, and the award, which was against the Transvaal pretensions, had important effects on the history of South Africa (see Transvaal and South Africa).

During all this time little was done to alter the condition of the natives. There was scarcely an attempt to copy the policy, deliberately adopted in Cape Colony, of educating and civilizing the black man. Neither was Natal faced with the Cape problem of a large half-caste population. The Natal natives were left very much in the state in which they were before the advent of the white men. While this opportunity of educating and training a docile people was in the main neglected, savage abuse of power by their chiefs was prevented. Under the superintendence of Shepstone the original refugees were quiet and contented, enjoying security from injustice and considerable freedom.

This ideal lot, from the native point of view, drew such numbers of immigrants from disturbed districts that with the natural increase of population in thirty years the native inhabitants increased from about 100,000 to fully 350,000. New generations grew up almost as ignorant as their fathers, but not with the same sense of dependence upon the white men. In this way was sown the seed of futur? trouble between the two races. The first serious collision between th° natives and the government occurred in 1873. The Amahlubi, one of the highest in rank of the Bantu tribes of South Africa, fleeing from the cruelties of

1 Between i860 and 1866 some 5000 Indians entered the colony. Immigration then ceased, and was not resumed until 1874. By that year the natives from Portuguese territory and elsewhere who had found employment in Natal had been attracted to the Kimberley diamond mines, and the Natal natives not coming forward (save under compulsion), the importation of Indian coolies was again permitted (see the Natal Blue Book, Report of the Indian Immigration Commission, 1000).

Panda, had been located by the Natal government under their chief Langalibalele (i.e. the great sun which shines and burns) in 1848 at the foot of the Drakensberg with the object of prevent- ing the Bushmen who dwelt in the mountains plundering the upland farmers. Here the Amahlubi prospered, and after the diamond fields had been discovered many of the young men who had been to Kimberley brought back firearms. These Langalibalele refused to register, and entered into negotiations with several tribes with the object of organizing a general revolt. Prompt action by Sir Benjamin Pine, then lieutenant-governor of the colony, together with help from the Cape and baMe's Basutoland, prevented the success of Langalibalele's rebellion, plan, and his own tribe, numbering some 10,000 persons, was the only one which rebelled. The chief was captured, and exiled to Cape Colony (August 1874). Permitted to return to Natal in 1886, he died in 1889.

This rebellion drew the attention of the home government to the native question in Natal. The colonists, if mistaken in their general policy of leaving the natives in a condition of mitigated barbarism, had behaved towards them with uniform kindness and justice. They showed indeed in their dealings both with the natives within their borders and with the Zulus beyond the Tugela a disposition to favour

the natives at the expense of their white neighbours in the Transvaal and Orange Free State, and their action against Langalibalele was fully justified and the danger of a widespread native revolt real. But there were those, including Bishop Colenso, who thought the treatment of the Amahlubi wrong, and their agitation induced the British government to recall Sir Benjamin Pine, Sir Garnet Wolseley being sent out as temporary governor. Sir Garnet reported the natives as ” happy and prosperous — well off in every sense.” As a result of consultations with Shepstone certain modifications were made in native policy, chiefly in the direction of more European supervision.

Meantime the colony had weathered a severe commercial crisis brought on in 1865 through over-speculation and the neglect of agriculture, save along the coast belt. But Colenso tne tra de over berg largely developed on the dis- atfair. covery of the Kimberley diamond mines, and the progress of the country was greatly promoted by the substitution of the railway for the ox wagon as a means of transport. There already existed a short line from the Point at Durban to the Umgeni, and on the 1st of January 1876 Sir Henry Bulwer, who had succeeded Wolseley as governor, turned the first sod of a new state-owned railway which was completed as far as Maritzburg in 1880. At this date the white inhabitants numbered about 20,000. But besides a commercial crisis the colony had been the scene of an ecclesiastical dispute which attracted widespread attention. Bishop Colenso (q.v.), condemned in 1863 on a charge of heresy, ignored the authority of the court of South African bishops and was maintained in his position by decision of the Privy Council in England. This led to a division among the Anglican community in the colony and the consecra- tion in 1869 of a rival bishop, who took the title of bishop of Maritzburg. Colenso’s bold advocacy of the cause of the natives — which he maintained with vigour until his death (in 1883) — attracted almost equal attention. His native name was Usobantu (father of the people).

For some years Natal, in common with the other countries of South Africa, had suffered from the absence of anything resem- bling a strong government among the Boers of the Transvaal, neighbours of Natal on the north. The annexation of the Transvaal to Great Britain, effected by Sir Theophilus Shepstone in April 1877, would, it was hoped, put a period to the disorders in that country. But the new administration at Pretoria in- herited many disputes with the Zulus, disputes which were in large measure the cause of the war of 1879. For years the Zulus had lived at amity with the Natalians, from whom they received substantial favours, and in 1872 Cetywayo (q.v.), on succeeding his father Panda, had given assurances of good behaviour. These promises were not kept for long, and by 1878 his attitude had

become so hostile towards both the Natal and

Transvaal governments that Sir Bartle Frere, then High Commissioner for South Africa, determined on his reduction. During the war (see Zululand) Natal was used as the British base, and the Natal volunteers rendered valuable service in the campaign, which, after opening with disasters to the British forces, ended in the breaking of the Zulu' power. (F. R. C.)

Scarcely had the colony recovered from the shock of the Zulu War than it was involved in the revolt of the Transvaal Boers (1880-1881), an event which overshadowed all Natal domestic concerns. The Natalians were intensely and the British in sentiment, and resented deeply the policy T2,n o, adopted by the Gladstone administration. At In- gogo, Majuba and Laing's Nek, all of them situated within the colony, British forces had been defeated by the Boers. And the treaty of retrocession was never regarded in Natal as anything but a surrender. It was clearly understood that the Boers would aim to establish a republican government over the whole of South Africa, and that the terms of peace simply meant greater bloodshed at no distant date. The protest made by the Natalians against the settlement was in vain. The Transvaal Republic was established, but the prediction of the colonists, ignored at the time, was afterwards fulfilled to the letter. In justice, however, to the colonists of Natal it must be recorded that, finding their protest with regard to the Transvaal settle- ment useless, they made up their minds to shape their policy in conformity with that settlement. But it was not long before their worst fears with regard to the Boers began to be realized, and their patience was once more severely taxed. The Zulu power, as has been 'recorded, was broken in 1879. After the war quarrels arose among the petty chiefs set up by Sir Garnet Wolseley, and in 1883 some Transvaal Boers intervened, and subsequently, as a reward for the assistance they had rendered to one of the combatants, demanded and annexed 8000 sq. m. of country, which they styled the " New Republic." As the London Convention had stipulated that there should be no trespassing on the part of the Boers over their specified boundaries, and as Natal had been the basis for those operations against the Zulus on the part of the British in 1879, which alone made such an annexation of territory possible, a strong feeling was once more aroused in Natal. The " New Republic," reduced in area, however, to less than 2000 sq. m., was nevertheless recog- nized by the British government in 1886, and in 1888 its consent was given to the territory (the Vryheid district) being incor- porated with the Transvaal. Meantime, in 1887, the remainder of Zululand had been annexed to Great Britain (see Zululand). In 1884 the discovery of gold in De Kaap Valley, and on Mr Moodie's farm in

the Transvaal, caused a considerable rush of colonists from Natal to that country. Railways were still far from the Transvaal border, and Natal not only sent her own colonists to the new fields, but also offered the nearest route for prospectors from Cape Colony or from Europe. Durban was soon thronged; and Pietermaritzburg, which was then practi- cally the terminus of the Natal railway, was the base from which nearly all the expeditions to the goldfields were fitted out. The journey to De Kaap by bullock-waggon occupied about six weeks. ” Kurveying ” (the conducting of transport by bullock-waggon) in itself constituted a great industry. Two years later, in 1886, the Rand goldfields were proclaimed, and the tide of trade which ‘had already set in with the Transvaal steadily increased. Natal colonists were ™ w not merely the first in the field with the transport industries. traffic to the new goldfields; they became some of the earliest proprietors of mines, and for several years many of the largest mining companies had their chief offices at Pieter- maritzburg or Durban. In this year (1886) the railway reached Ladysmith, and in 1891 it was completed to the Transvaal frontier at Charlestown, the section from Ladysmith northward opening up the Dundee and Newcastle coalfields. Thus a new industry was added to the resources of the colony.

The demand which the growing trade made upon the one port of Natal, Durban, encouraged the colonists to redouble their efforts to improve their harbour. The question of a fairway

from ocean to harbour has been a difficult one at nearly every port on the African coast. A heavy sea from the Indian Ocean is always breaking on the shore, even in the finest weather, and at the mouth of every natural harbour a bar occurs. To deepen the channel over the bar at Durban so that steamers might enter the harbour was the cause of labour and expenditure for many years. Harbour works were begun in 1857, piers and jetties were constructed, dredgers imported, and controversy raged over the various schemes for harbour improvement. In 1 88 1 a harbour board was formed under the chairmanship of Mr Harry Escombe. It controlled the operations for improving the sea entrance until 1893, when on the establishment of re- sponsible government it was abolished. The work of improving the harbour was however continued with vigour, and finally, in 1904, such success was achieved that vessels of the largest class were enabled to enter port (see Durban). At the same time the railway system was continually developing.

For many years there had been an agitation among the colonists for self-government. In 1882 the colony was offered &fll self-government coupled with the obligations of

govern- self-defence. The offer was declined, but in 1883 the meat legislative council was remodelled so as to consist of

granted. 2 ˆ elected and 7 nominated members. In 1890 the elections to the council led to the return of a majority in favour of accepting self-government, and in 1893 a bill in favour of the proposed change was passed and received the sanction of the Imperial government. At the time the white inhabitants numbered about 50,000. The electoral law was framed to prevent more than a very few natives obtaining the franchise. Restrictions in this direction dated as far back as 1865, while in 1896 an act was passed aimed at the exclusion of Indians from the suffrage. The leader of the party which sought responsible government was Sir John Robinson (1839-1903) who had gone to Natal in 1850, was a leading journalist in the colony, had been, a member of the legislative council since 1863, and had filled various official positions. He now became the first premier and colonial secretary with Mr Harry Escombe (q.v.) as attorney- general and Mr F. R. Moor as secretary for Native Affairs. The year that witnessed this change in the constitution was also notable for the death of Sir Theophilus Shepstone, Natal's most prominent citizen. In the same year Sir Walter Hely- Hutchinson became governor. His immediate predecessors had been Sir Charles Mitchell (1889-1893) and Sir Arthur Havelock (1886-1889). Sir John Robinson remained premier until 1897, a year marked by the annexation of Zululand to Natal. In the following year Natal entered the Customs Union already existing between Cape Colony and the Orange Free State. Sir John Robinson had been succeeded as premier by Mr Harry Escombe (February-October 1897) and Escombe by Sir Henry Binns, on whose death in June 1899 Lieut. -Colonel (afterwards Sir) Albert Hime formed a ministry which remained in office until after the conclusion of the Anglo-Boer War. Mean- time (in 1901) Sir Henry McCallum had succeeded Sir Walter Hely-Hutchinson as governor.

For some years Natal had watched with anxiety the attitude of increasing hostility towards the British adopted by the Pretoria administration, and, with bitter remembrance of the events of 1881, gauged with accuracy the intentions of the Boers. So suspicious had the ministry become of the nature of the military preparations that were being made by the Boers, that in May 1899 they communicated their apprehensions to the High Commissioner, Sir Alfred Milner, who telegraphed on the 25th of May to Mr Chamberlain, informing him

that Natal was uneasy. The governor expressed his views to the prime minister that the Natal government ought to give the British government every support, and Colonel Hime replied that their support would be given, but at the same time he feared the T ns99- r conse qu en ces to Natal if, after all, the British govern- 1902. ment should draw back. In July the Natal ministry

learnt that it was not the intention of the Imperial government to endeavour to hold the frontier in case hostilities arose, but that a line of defence considerably south of the frontier

would be taken up. This led to a request on their part that if the Imperial government had any reason to anticipate the breakdown of negotiations, ” such steps may be at once taken as may be necessary for the effectual defence of the whole colony.” Sir William Penn Symons, the general commanding the British forces in Natal in September, decided to hold Glencoe. On the arrival of Lieut. General Sir George White from India, he informed the governor that he considered it dangerous to attempt to hold Glencoe, and urged the advisability of with drawing the troops to Lpdysmith. The governor was strongly opposed to this step, as he was anxious to protect the coal supply, and also feared the moral effect of a withdrawal. Eventually Sir Archibald Hunter, then chief of staff to Sir Redvers Buller, was consulted, and stated that in his opinion, Glencoe being already occupied, ” it was a case of balancing drawbacks, and advised that, under the circumstances, the troops be retained at Glencoe.” This course was then adopted.

On the nth of October 1899 war broke out. The first act was the seizure by the Boers of a Natal train on the Free State border. On the 12th Laing’s Nek was occupied by the Boer forces, who were moved in considerable force over the Natal border. New- castle was next occupied by the Boers unopposed, and on the 20th of October occurred the battle of Talana Hill outside Dundee. In this engagement the advanced body of British troops, 3000 strong, under Symons, held a camp called Craigside which lay between Glencoe and Dundee, and from this position General Symons hoped to be able to hold the northern portion of Natal. There is no doubt that this policy strongly commended itself to the governor and ministers of Natal, and that they exercised considerable pressure to have it adopted. But from a military point of view it was not at all cordially approved by Sir George White, and it was after- wards condemned by Lord Roberts. Fortunately Symons was able to win a complete victory over one of the Boer columns at Talana Hill. He himself received a mortal wound in the action. Brigadier-General Yule then took command, and an

overwhelm- ing force of Boers rendering the further occupation of Dundee dangerous, he decided to retire his force to Ladysmith. On the 2 1 st of October General Sir George White and General (Sir John) French defeated at Elandslaagte a strong force of Boers, who threatened to cut off General Yule's retreat. He again attacked the Boer forces at Rietfontein on the 24th of October, and on the 26th General Yule reached Ladysmith in safety. Ladysmith now became for a time the centre of military interest. The Boers gradually surrounded the town and cut off the communications from the south. Various engagements were fought in the attempt to prevent this movement, including the actions of Farquhar's Farm and Nicholson's Nek on the 30th (see Trans- vaal). The investment of Ladysmith continued till the 28th of February 1900, when, after various attempts to relieve the beleaguered garrison, Sir Redvers Buller's forces at last entered the town. During the six weeks previous to the relief, 200 deaths had occurred from disease alone, and altogether as many as 8424 were reported to have passed through the hospitals. The relief of Ladysmith soon led to the evacuation of Natal by the Boer forces, who trekked northwards.

During the Boer invasion the government and the loyal colonists, constituting the great majority of the inhabitants of the colony, rendered the Imperial forces every assistance. A comparatively small number of the Dutch colonists joined the enemy, but there was no general rebellion among them. As the war progressed the Natal volunteers and other Natal forces took a prominent part. The Imperial Light Horse and other irregular corps were recruited in Natal, although the bulk of the men in the forces were Uitlanders from Johannesburg. As the nearest colony to the Transvaal, Natal was resorted to by a large number of men, women and children, who were compelled to leave the Transvaal on the outbreak of the war. Refugee and Uitlander committees were formed both at Durban and Maritzburg, and, in conjunction with the colonists, they did all in their power to assist in recruiting irregular corps, and also in furnishing relief to the sick and needy.

As one result of the war, an addition was made to the territory comprised in Natal, consisting of a portion of what had previously been included in the Transvaal. The Natal government origin- ally made two proposals for annexing new territory: —

1. It was proposed that the following districts should be trans- ferred to Natal, viz. the district of Vryheid, the district of Utrecht and such portion of the district of Wakkerstroom as was comprised by a line drawn from the north-eastern corner of Natal, east by Volksrust in a northerly direction to the summit of the Drakensberg Range, along that range, passing just north of the town of Wakker- stroom, to the head waters of the Pongola river, and thence follow- ing the Pongola river to the border of the Utrecht district. In consideration of the advantage to Natal from this addition of terri- tory, Natal should take over £700,000 of the Transvaal debt.

2. It was proposed to include in Natal such portions of the Harri- smith and Vrede districts as were comprised by a line following the

Elands river north from its source on the Basutoland Annex a- border to ; ts j unc tion with the Wilge river, and thence °° s ° drawn straight to the point where the boundaries of Natal, .. the Transvaal and the Orange River Colony meet on the

°” er ? Drakensberg. In consideration of this addition to her territories, terr i tor y) N a t a l should take over a portion of the Orange River Colony debt, to be raised at the end of the war, to the amount of £200,000.

The Imperial government decided to sanction only the first of these two proposals. For this course there were many reasons, the Transvaal territory annexed, or the greater part of it (the Vryheid district), having been only separated from the rest of Zululand in 1883 by a raid of armed Boers. ” In handing over this district to the administration which controls the rest of Zululand, His Majesty’s government,” wrote Mr Chamberlain, under date March 1902, ” feel that they are reuniting what ought never to have been separated.”

With regard, however, to the proposed transfer of territory from the Orange River Colony, the circumstances were different. ” There is,” said Mr Chamberlain, ” no such historical reason as exists in the case of Vryheid for making the transfer. On the contrary, the districts in question have invariably formed part of the state from which it is now proposed to sever them, and they are separated from Natal by mountains which form a well- defined natural boundary. In these circumstances, His Majesty’s government have decided to confine the territory to be trans- ferred to the districts in the Transvaal.”

The districts added to Natal contained about 6000 white inhabitants (mostly Dutch), and some 92,000 natives, and had an area of nearly

7000 sq. m., so that this annexation meant an addition to the white population of Natal of about one-tenth, to her native population of about one-tenth also, and to her territory of about one-fourth. An act authorizing the annexation was passed during 1902 and the territories were formally trans- ferred to Natal in January 1903. (A. P. H.; F. R. C.)

The period following the war was succeeded by commercial depression, though in Natal it was not so severely felt as in other states of South Africa. The government met the crisis me”rciai by renewed energy in harbour works, railway construc- depression tions and the development of the natural resources Bod of the country. A railway to the Zululand coalfields

was completed in 1903, and in the same year a line was opened to Vryheid in the newly annexed territories. Natal further built several railway lines in the eastern half of the Orange River Colony, thus opening up new markets for her produce and facilitating her transit trade. Mr Chamberlain on his visit to South Africa came first to Natal, where he landed in the last days of 1902, and conferred with the leading colonists. In August 1903 the Hime ministry resigned and was succeeded by a cabinet under the premiership of Mr (afterwards Sir) George Sutton, the founder of the wattle industry in Natal and one of the pioneers in the coal-mining industry. In May 1905 Sir George Sutton was replaced by a coalition ministry under Mr C. J. Smythe, who had been colonial secretary under Sir Albert Hime. These somewhat frequent changes of ministry, char- acteristic of a country new to responsible government, reflected, chiefly, differences concerning the treatment of commercial questions and the policy to be adopted towards the natives. Towards those Dutch colonists who had joined the enemy during the war leniency was shown, all rebels being pardoned.

native rebellion.

The attitude of the natives both in Natal proper and in Zululand caused much disquiet. As early as July 1903 rumours were current that Dinizulu (a son of Cetywayo) was disaffected and the power he exercised as representative of the former royal house rendered his attitude a matter of great moment. Dinizulu, however, remained at the time quiescent, though the Zulus were in a state of excitement over incidents connected with the war, when they had been subject to raids by Boer commandoes, and on one occasion at least had retaliated in characteristic Zulu fashion. Unrest was also manifested among the natives west of the Tugela, but it was not at first cause for alarm. The

chief concern of the Natal government was to remodel their native policy where it proved inadequate, especially in view of the growth of the movement for the federation of the South African colonies. During 1903-1904 a Native Affairs' Commission, representative of all the states, obtained much evidence on the status and conditions of the natives. Its investigations pointed to the loosening of tribal ties and to the corresponding growth of a spirit of individual independence. Among its recommenda- tions was the direct political representation of natives in the colonial legislatures on the New Zealand model, and the imposi- tion of direct taxation upon natives, which should not be less than £1 a year payable by every adult male. The commission also called attention to the numerical insufficiency of magistrates and native commissioners in certain parts of Natal. With some of the recommendations the Natal commissioners disagreed; in 1905, however, an act was passed by the Natal legislature imposing a poll-tax of £1 on all males over 18 in the colony, except indentured Indians and natives paying hut-tax (which was 14s. a year). Every European was bound to pay the tax. In 1906 a serious rebellion broke out in the colony, attributable ostensibly to the poll-tax, and spread to Zululand. It was suppressed by the colonial forces under Colonel (afterwards Sir) Duncan McKenzie, aided by a detachment of Transvaal volunteers. An incident which marked the beginning of this rebellion brought the Natal ministry into sharp conflict with the Imperial government (the Campbell-Bannerman administra- tion). Early in the year a farmer who had insisted that the Kaffirs on his farm should pay the poll-tax was murdered, and on the 8th of February some forty natives in the Richmond district forcibly resisted the collection of the tax and killed a sub- inspector of police and a trooper at Byrnetown. Two of the natives implicated were court-martialled and shot (February 1 5) ; others were subsequently arrested and tried by court martial. Nineteen were sentenced to death, but in the case of seven of the prisoners the sentence was commuted. On the day before that fixed for the execution Lord Elgin, then Secretary of _ „ .. State for the Colonies, intervened and directed the W j t „ the governor to postpone the execution of the sentence, homj Thereupon the Natal ministry resigned, giving as their sovern- reason the importance of maintaining the authority of the colonial administration at a critical period, and the con- stitutional question involved in the interference by the imperial authorities in the domestic affairs of a self-governing colony. The action of the British cabinet caused both astonishment and indignation throughout South Africa and in the other self- governing states of the empire. After a day's delay, during which Sir Henry McCallum reiterated his concurrence, already made known in London, in the justice of the sentence passed on the natives, Lord Elgin gave

way (March 30). The Natal ministry thereupon remained in office. The guilty natives were shot on the 2nd of April. 1 It was at this time that Bambaata, a chief in the Greytown district who had been deposed for misconduct, kidnapped the regent appointed in his stead. He was pursued and escaped to Zululand, where he received considerable help. He was killed in battle in June, and by the close of July the rebellion was at an end. As has been stated, it was ostensibly attributable to the poll-tax, but the causes were more deep- seated. Though somewhat obscure they may be found in the

1 Subsequently three other natives, after trial by the supreme court, were condemned and executed for their share in the Byrne- town murders.

growing sense of power and solidarity among all the Kaffir tribes of South Africa — a sense which gave force to the ” Ethio- pian movement,” which, ecclesiastical in origin, was political in its development. There were moreover special local causes such as undoubted defects in the Natal administration. 1 Those Africans whose ” nationalism ” was greatest looked to Dinizulu as their leader, and he was accused by many colonists of having incited the rebellion. Dinizulu protested his loyalty to the British, nor was it likely that he viewed with approval the action of Bambaata, a comparatively unimportant and meddlesome chief. As time went on, however, the Natal government, alarmed at a series of murders of whites in Zululand and at the evidences of continued unrest among the natives, became con- vinced that Dinizulu was implicated in the rebellious movement. When a young man, in 1889, he had been convicted of high treason and had been exiled, but afterwards (in 1897) allowed to return. Now a force under Sir Duncan McKenzie entered Zululand. Thereupon Dinizulu surrendered (December 1907) without opposition, and was removed to Maritzburg. His trial was delayed until November 1908, and it was not until March 1909 that judgment was given, the court finding him guilty only on the minor charge of harbouring rebels. Meantime, in February 1908, the governor — Sir Matthew Nathan, who had succeeded Sir Henry McCallum in August 1907 — had made a tour in Zululand, on which occasion some 1500 of the prisoners taken in the rebellion of 1906 were released.

The intercolonial commission had dealt with the native question as it affected South Africa as a whole; it was felt that Native a more local

investigation was needed, and in August Affairs' 1906 a strong commission was appointed to inquire Com- i n t the condition of the Natal natives. The general

m ss on. e i ec ti 0I1 which was held in the following month turned on native policy and on the measures necessary to meet the commercial depression. The election, which witnessed the return of Tour Labour members, resulted in a ministerial majority of a somewhat heterogeneous character, and in November 1906 Mr Smythe resigned, being succeeded by Mr F. R. Moor, who in his election campaign had criticized the Smythe ministry for their financial proposals and for the " theatrical " manner in which they had conducted their conflict with the home govern- ment. Mr Moor remained premier until the office was abolished by the establishment of the Union of South Africa. In August 1907 the report of the Native Affairs' Commission was published. The commission declared that the chasm between the native and white races had been broadening for years and that the efforts of the administration — especially since the grant of responsible government — to reconcile the Kaffirs to the changed conditions of rule and policy and to convert them into an element of strength had been ineffective. It was not sufficient to secure them, as the government had done, peace and ample means of livelihood. The commission among other proposals for a more liberal and sympathetic native policy urged the creation of a native advisory Board entrusted with very wide powers. " Per- sonal rule," they declared, " supplies the keynote of successful native control "—a statement amply borne out by the influence over the natives exercised by Sir T. Shepstone. The unrest in Zululand delayed action being taken on the commission's report. But in 1909 an act- was passed which placed native affairs in the hands of four district commissioners, gave to the minister for native affairs direct executive authority and created a council for native affairs on which non-official members had seats. While the district commissioners were intended to keep in close touch with the natives, the council was to act as a " deliberative, consultative and advisory body."

Concurrently with the efforts made to reorganize their native policy the colony also endeavoured to deal with the Asiatic question. The rapid growth of the Indian population from about 1890 caused much disquiet among the majority of the white inhabitants, who viewed with especial anxiety the activities

1 The causes, both local and general, are set forth in a despatch by the governor of the 21st of June 1906 and printed in the Blue Book, Cd. 3247.

of the ” free,” i.e. unindentured Indians. An act of 1895, which did not become effective until 1901, imposed an annual tax of £3 on time-expired Indians who remained in the colony and did not reindenture. In 1897 an Indian 2^^! Immigration Restriction Act was passed with the Indians. object of protecting European traders; in 1903 another Immigration Restriction Act among other things, per- mitted the exclusion of all would-be immigrants unable to write in the characters of some European language. Under this act thousands of Asiatics were refused permission to land. In 1906 municipal disabilities were imposed upon Asiatics, and in 1907 a Dealers’ Licences Act was passed with the object, and effect, of restricting the trading operations of Indians. In 1908 the government introduced a bill to provide for the cessation of Indian emigration at the end of three years; it was not pro- ceeded with, but a strong commission was appointed to inquire into the whole subject. This commission reported in 1909, its general conclusion being that in the interests of Natal the importation of indentured Indian labour should not be dis- continued. For sugar, tea and wattle growing, farming, coal- mining and other industries indentured Indian labour appeared to be essential. But the evidence was practically unanimous that the Indian was undesirable in Natal other than as a labourer and the commission recommended compulsory repatriation. While desirous that steps should be taken to prevent an increase in the number of free Asiatic colonists, the commission pointed out that there were in Natal over 60,000 ” free ” Indians whose rights could not be interfered with by legislation dealing with the further importation 0/ coolies. But these Indians by reindentur- ing might come under the operation of the repatriation proposal. Nothing further was done in Natal up to the establishment of the Union of South Africa, when all questions specially or differentially affecting Asiatics were withdrawn from the com- petence of the provincial authorities.

Not long after the conclusion of the war of 1899-1902 the close commercial relations between the Transvaal and Natal led to suggestions for a union of the two colonies, but these suggestions were not seriously entertained. The men tf or divergent interests of the various colonies threatened union. indeed a tariff and railway war when the Customs Convention (provisionally renewed in March 1906) should expire in 1908. But at the close of 1906 the Cape ministry formally reopened the question of federation, and at a railway con-

ference held in Pretoria in May 1908 the Natal delegates agreed to a motion affirming the desirability of the early union of the self-governingˆ colonies. The movement for union rapidly gained strength, and a National Convention to consider the matter met in Durban in October 1908. In Natal, especially among the older colonists, who feared that in a united South Africa Natal interests would be overborne, the proposals for union were met with suspicion and opposition, and the Natal ministry felt bound to submit the question to the people. A referendum act was passed in April 1909, and in June following the electors by 1 1,1 21 votes to 3701 decided to join the Union. (See South Africa.)

Natal was concerned not only with the political aspects of union, and with its natives and Indian problems, but had to safeguard its commercial interests and to deal with a revenue insufficient for its needs. In 1908 an Income Tax and a Land Tax Act was passed; the land tax being a halfpenny in the £ ” on the aggregate unimproved value ” — it brought in £30,000 in 1908-1909. Meantime it was agreed by the Cape, Transvaal and Na,tal governments that, subject to Natal entering the Union, its share of the Rand import trade should be 25% before and 30% after the establishment of the Union. Previously Natal had only 22!% of the traffic, and this agreement led to a revival in trade. Moreover, the development of its coal-mines and agriculture was vigorously prosecuted, and in 1910 it was found possible to abolish both the Income Tax and Land Tax and yet have a surplus in revenue. The closing months of Natal’s existence as a separate colony thus found her peaceful and prosperous. The governor, Sir Matthew Nathan, had

returned to England in December 1909, and Lord Methuen was governor from that time until the 31st of May 1010. On that date the Union of South Africa was established, Natal becoming one of the original provinces of the Union.

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For further historical works and for information on flora, fauna, climate, law, church, &c. see the bibliography under South Africa. (See also Zululand: Bibliography.) (F. R. C.)

NATAL, a city and port of Brazil and capital of the state of Rio Grande do Norte, on the right bank of the Rio Potengy, or Rio Grande do Norte, about 2 m. above its mouth. Pop. of the municipality (1890) 13,725. Natal is the starting-point of the Natal and Nova Cruz railway, and is a port of call for coast- wise steamers, which usually anchor outside the bar. It is a stagnant, poorly built town of one-storeyed houses and mud- walled cabins, with few public edifices and business

houses of a better type. The only industry of note is the manufacture of cotton. The exports are chiefly sugar and cotton. Natal was founded in 1597 as a military post to check an illicit trade in Brazil-wood. In 1633 it was occupied by the Dutch, who remained until 1654. It became the capital of a province in 1820. In early works it is sometimes termed Cidade dos Reis (City of the Kings).

NATANZ, a minor province of Persia, situated in the hilly district between Isfahan and Kashan, and held in fief by the family of the Hissam es Saltaneh (Sultan Murad Mirza, d. 1882). It contains eighty-two villages and hamlets, has a revenue of about £4000, and a population of about 23,000. It is divided into four districts: Barzrud, Natanzrud, Tarkrud and Badrud. Natanz pears are famous throughout the country. The western part of the province is traversed from north to south by the old high-road between Kashan and Isfahan, with the well-known stations of Kuhrud (7140 ft.) and So (7560 ft.). This road was practically abandoned when the Indian government telegraph line, which ran along it, was removed to a road farther east in 1906. The capital of the little province is Natanz, a large village with a population of about 3000, situated 69 m. north of Isfahan, at an elevation of 5670 ft. It has an old mosque, with a minaret 123 ft. in height, built in 1315.

NATCHEZ, a city and the county-seat of Adams county, Mississippi, U.S.A., on the Mississippi river, about 100 m. S.W. of Jackson. Pop. (1890) io,ioi, (1900) 12,210, of whom 7090

were negroes, (1910 census) 11,791. It is served by the Yazoo & Mississippi Valley, the St Louis, Iron Mountain & Southern, the New Orleans & North- Western and the Mississippi Central railways, and by steamboats on the Mississippi river. The city, which has an area of 2-19 sq. m., is mostly on a bluff that rises 200 ft. above the river, the wharfs and landings, and a few old buildings being the only reminders of what was before the Civil War the principal business section. Among the city's institutions are the Fisk Public Library, a charity hospital, two sanatoriums, three orphan asylums, Stanton College for girls (non-sectarian; opened in 1894 and lodged in the old Fisk mansion),- St Joseph's College for girls, the Jefferson Military College (1802), 6 m. from the city, and Natchez College for negroes. The city has four public parks, three on the river front, and one, Memorial Park, in honour of Confederate dead, in the heart of the city. On a neighbouring bluff is a national cemetery. Just outside the city limits, at Gloster, the former estate of Winthrop Sargent, first governor of the Territory of Mississippi, are the graves of Sargent and S. S. Prentiss, who lived in Natchez for some years. In and near the city are many

handsome old residences typical of ante-bellum Natchez, among them being: Monmouth, General Quitman's estate; Somerset and Oakland, long in the Chotard family; and The Briars, the home during girlhood of Varina Howell, the wife of Jefferson Davis. A Roman Catholic cathedral (1841), Trinity Protestant Episcopal Church (1825) and a Presbyterian church (1829) are the principal church buildings. The Prentiss and the Elk are the leading clubs. Mardi Gras is annually celebrated. The leading industries are the shipment of cotton (70,000 to 90,000 bales are handled annually) and the manufacture of cottonseed oil and cake — the first cottonseed-oil mill in the country was built here in 1834 — cotton goods, rope and yarns, lumber, brick, drugs and ice. Natchez was the first city in the state to own municipal water- works and sewage system.

The city was named from the Natchez Indians who lived on its site when the country was first settled. In 1716 on the bluff Le Moyne de Bienville built Fort Rosalie for the protection of some French warehouses, and later the French demanded a neighbouring hill for another settlement. This offended the Natchez, and on the 28th of November 1729 they massacred the French and destroyed the fort, which was immediately rebuilt, and in 1764 was handed over to the English in accordance with the treaty of Paris, and became Fort Panmure; in 1779 it was turned over to the Spanish, who held it until 1798, when they withdrew and United States troops occupied the place. Under Spanish rule Natchez was the seat of government of a large district, and from 1798 to 1802 and from 1817 to 1821 it was the capital of Mississippi. It was chartered as a city in 1803. On the 7th of May 1840 a large part of the city was destroyed by a tornado, but it was soon rebuilt, and at the outbreak of the Civil War was a place of considerable wealth and culture. For several years it was the home of General John Anthony Quitman (1799-1858). Natchez surrendered to Union forces during the Vicksburg campaigns, first on the 12th of May i852, and again on the 13th of July 1863. On the 2nd of September 1862 the Union iron-clad " Essex," commanded by William David Porter, bombarded the city and put an end to the commercial importance of the river front section.

NATHANAEL, a character in the New Testament, who appears in John i. 45 sqq. as one of the first disciples of Jesus. In John xxi. 2 he is described as belonging to Cana of Galilee. The account of his call reveals to us a man of a deeply spiritual and sincere nature. Otherwise we know nothing beyond the mention of his name as one of the seven to whom, after the Resurrection, Christ revealed himself at the sea of Tiberias (John xxi. 2). But the interest he has evoked is shown by the attempts to identify him with other New Testament characters. Of

these the one which has found most favour sees in him the apostle Bartholomew (5.”.). The actual identification must however remain a matter of pure conjecture. Still less can be said for the attempts to find in Nathanael another name for the apostle Matthew, or for Matthias, or for Paul ” the

apostle of visions,” or even for the writer of the Fourth Gospel himself.

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NATHUBHOY, SIR MANGALDAS (1832-1890), Seth or head of the Kapol Bania caste, well known for their thrift and keen commercial instincts. He was born on the 15th of October 1832, of a family whose ancestors emigrated from Diu to Bombay soon after Bombay came into British possession. His grandfather, Ramdas Manordas, amassed a considerable fortune, which, owing to the premature death of his father, came into the sole possession of Mangaldas at the age of eleven. He had to take charge of the business in early life, though he gave some time to English studies. On the death of his wife he established a dispensary at Kalyan in her memory and also a special female ward in connexion with the David Sassoon hospital in Poona. As a merchant Mangaldas was upright and successful. In social matters he stood forth as a reformer, and to him the change to election from hereditary succession to the headship of the caste is due. In 1862 he founded a fellowship in Bombay university to allow graduates to spend some years in Europe. A bequest in his will enabled the university to establish seven similar scholarships. He took keen interest in learning, and in such institutions as the Asiatic and geographical societies. In 1866 he was nominated to the legislative council and sat till 1874. In 1867 he revived the Bombay association, a political body, over which he presided for a time. In 1872 he was made C.S.I., and in 1875 the dignity of Knight Bachelor was conferred on him. Besides a large donation to the Indian Famine Fund, Sir Mangaldas is known to have expended £500,000 on charities. He died at Bombay on the 9th of March 1890.

NATICK, a township of S.E. Middlesex county, Massachusetts, U.S.A., on the S.E. end of Cochituate Lake. Pop. (1890) 9118; (1900) 9488, of whom 1788 were foreign-born; (1910 census) 9866. The areaof the

township is 12-375 sq. m. The township's largest village, also named Natick, lying 18 m. W.S.W. of Boston, is served by the Boston & Albany railroad; it has the Walnut Hill preparatory school, the Leonard Morse hospital, and a public library, the Morse institute, which was given by Mary Ann Morse (1825-1862) and was built in 1873. In the village of South Natick is the Bacon Free Library (1880), in which is housed the Historical, Natural History and Library Society. In 1905 the factory product was valued at $3,453,094; the boots and shoes manufactured in 1905 were valued at $2,896,110 or 83-9% of the town's total, the output of brogans being especially important. Other distinctive manufactures are shirts and base-balls. Natick is the Indian name, signifying " our land," or " hilly land," of the site (originally part of Dedham) granted in 1650 to John Eliot, for the " praying " Indians. There was an Indian church in Natick, at what is now called South Natick or " Oldtown," from 1660 to 1716; and for some years the community was governed, in accordance with the eighteenth chapter of Exodus, by " rulers of tens," " rulers of fifties," and " rulers of hundreds." Until 17 19 the Indians held the land in common. In 1735 the few Indians remaining were put under guardianship. The township owns a copy of Eliot's Indian Bible. An Eliot monument was erected in 1847 on the Indian burying-ground near the site of the Indian church, now occupied by a Unitarian church. Of the Eliot oaks, made famous by Longfellow's sonnet, one was cut down in 1842, the other still stands. Henry Wilson learned to make shoes here, and in the presidential campaign in 1840 gained the sobriquet of the " Natick cobbler." By the colonial authorities Natick was considered as a " plantation " until the establishment of the church; in 1762 the parish (erected in 1745) became a district, and in 1 781 this was incorporated as a town.

See " Natick," by S. D. Hosmer, Daniel Wight and Austin Bacon, in vol. 2 of S. A. Drake's History of Middlesex County (Boston, 1880) ; and Oliver N. Bacon, History of the Town of Natick (Boston, 1856).
NATIONAL ANTHEMS OR HYMNS. The selection of some particular songs, words and music, as the formal expression of national patriotism, is a comparatively modern development

of ceremonial usage. In Europe the chief national anthems are: The United Kingdom: " God save the king " (see below); France: " The Marseillaise," by Rouget de Lisle; Germany: " Heil dir im Siegeskranz," words by Balthasar Gerhard Schumacher, music of " God save the King "; Switzerland: " Rufst du, mein Vaterland," music of " God save the King "; Italy: the " Royal March " by G. Gabetti; Austria: " Gott erhalte unsern Kaiser," words by L. L. Haschka, music by Haydn; Hungary: " Isten aid meg a Magyart "; Belgium: " La Brabanconne," by

F. Campenhout; Holland: ” Wien Nierlansch “; Denmark: ” Heil dir, dem Liebenden,” words by H. Harries, music of ” God save the King,” and ” King Kristian stod ved hojen mast,” words by Ewald, music by Hartman; Sweden:- ” Ur Svenska hjertans”; Russia: ” Bozhe Zaria chrany,” words by J. J. Canas, music by D. Jenko; Rumania: ” Traeasca Regale,” words by V. Alexandri, music by E. A. Hiibsch; Spain: ” Himno de Riego,” music by Herta. In the United States, the ” Star Spangled Banner ” (1814; words by F. S. Key, music by J. S. Smith) and “Hail Columbia ” (1798; words by Joseph Hopkinson, music by Fyles) share the duties of a national anthem, while the tune of ” God save the King ” is sung to words beginning ” My country, ‘tis of thee,” by Samuel F. Smith (1808-1895).

The most celebrated of all national anthems is the English ” God save the King.” which is said to have been first sung as his own composition by Henry Carey in 1740; and a version was assigned by W. Chappell (Popular Music) to the Harmonia Anglicana of 1742 or 1743, but no copy exists and this is now doubted. Words and music were printed in the Gentleman’s Magazine for October 1745. There has been much controversy as to the authorship, which is complicated by the fact that earlier forms of the air and the words are recorded. Such are an ” Ayre ” of 1619, attributed to John Bull, who has long been credited with the origin of the anthem; the Scottish carol, ” Remember, O thou man,” in Ravenscroft’s Melismata, 161 1; the ballad ” Franklin is fled away ” (printed 1669; and a piece in Purcell’s Choice Collection for the Harpsichord (1696). The words or part of them are also found in various forms from the 1 6th century. The question was discussed in Richard Clarke’s Account of the National Anthem (1822), and has been reinvestigated by Dr W. H. Cummings in his God save the King (1902). Carey and Bull, in the general opinion of musical historians, divide the credit; but in his Minstrelsy of England (1901) Frank Kidson introduced a new claimant, James Oswald, a Scotsman who settled in London in 1742, and worked for John Simpson, the publisher of the early copies of God save the King, and who became chamber composer to George III. What appears to be certain is that 1745 is the earliest date assignable to the substantial national anthem as we know it, and that both words and music had been evolved out of earlier forms. Bull’s is the earliest form of the air; Carey’s claim to the re- modelling of the anthem rests on an unauthoritative tradition; and, on general probabilities, Oswald is a strong candidate. The tune was adopted by Germany and by Denmark before the end of the 18th century.

NATIONAL DEBT. Details as to the recent figures of the national debts of individual countries are given under the heading of each country,

and the reader is also referred to the article Finance. Here the subject is considered in its technical aspects — including the special character of the institution, the different classes of debt, the various methods of raising loans, interest, funding systems, comparative statistics of national debts and other points.

National debt is so universal that it has been described as the first stage of a nation towards civilization. A nation, so far as its finances are concerned, may be regarded as a corporate body or even as an individual. Like the one or the other it may borrow money at rates of interest, and with securities, general or special, proportionate to its resources, credit and stability. But, while in this respect there are certain points of analogy between a state and an individual, there are important points of difference so far as the question of debt is concerned. A state,

for example, may be regarded as imperishable, and its debt as a permanent institution which it is not bound to liquidate at any definite period, the interest, unless specially stipulated, being thus of the nature of transferable permanent annuities. While an individual who borrows engages to pay interest to the lender personally, and to reimburse the entire debt by a certain date, a state may have an entirely different set of creditors every six months, and may make no stipulation whatever with regard to the principal. A state, moreover, is the sole judge of its own solvency, and is not only at liberty either to repudiate its debts or compound with its creditors, but even when perfectly solvent may materially alter the conditions on which it originally borrowed. These distinctions explain many of the peculiarities of national debts as contrasted with those of individuals — though a nation, like an individual, may by reckless bad faith utterly destroy its credit and exhaust its borrowing powers.

A well-organized state ought to have within itself the means of meeting all its ordinary expenses; where this is not the case, either through insufficiency of resources or maladministration, and where borrowing is resorted to for what may be regarded as current expenses, a state imperils, not only its credit, but, when any crisis occurs, its very existence; in illustration of this we need only refer to the cases of Turkey in Europe and some of the states of Central and South America. Even for meeting emergencies it is not always inevitable that a state should incur debt; its ordinary resources, from

taxation or from state property, may so exceed its ordinary expenses as to enable it to accumulate a fund for extraordinary contingencies. This, it would seem, was a method commonly adopted in ancient states. The Athenians, for example, amassed 10,000 talents in the interval between the Persian and the Peloponnesian wars, and the Lacedaemonians are said to have done the same. At Susa and Ecbatana Alexander found a great treasure which had been accumulated by Cyrus. In the early days of Rome the revenue from certain sources was accumulated as a sacred treasure in the temple of Saturn; and we know that when Pompey left Italy he made the mistake of leaving behind him the public treasury, which fell into the hands of Caesar. In later times, also, the more prudent emperors were in the habit of amassing a hoard. We find that the method of accumulating reserves prevailed among some of the early French kings, even down to the time of Henry IV. This system long prevailed in Prussia. Frederick II., when he ascended the throne, found in the treasury a sum of 8,700,000 thalers, and it is estimated that at his death he left behind him a hoard of from 60 to 70 million thalers. And similarly, in our own time, of the five milliards of indemnity paid by France as a result of the Franco-German War, 150 millions were set apart to reconstitute the traditional war-treasury. The German empire, apart from the individual states which comprise it, had in 1882 a debt of about £24,000,000, while its invested funds amounted to £37,390,000, including a war-treasure of £6,000,000. The majority of economists disapprove of such an accumulation of funds by a state as a bad financial policy, maintaining that the remission of a proportionate amount of taxation would be much more for the real good of the nation. At the same time the possession of a moderate war-fund, it must be admitted, could not but give a state a great advantage in the case of a sudden war. In the case of England, apart from the private hoardings of a few sovereigns, there does not seem to have existed any deliberately accumulated public treasure; before the time of William and Mary English monarchs borrowed money occasion- ally from Jews and from the city of London, but emergencies were generally met by ” benevolences ” and increased imposts.

All modern states, it may be said, have been compelled to have recourse to loans, either to meet war expenses, to carry out great public undertakings or to make up the recurrent deficits of a mismanaged revenue. Resources obtained in this way are what constitute national debt proper. Loans have been divided into forced and voluntary. Forced loans can, of course, only be raised within the bounds of the borrowing country; and, apart from the injustice which is sure to’attend such an impost, it is always economically

mischievous. The loans which the kings

of England were wont to exact from the Jews were really of the character of forced loans, though the method has never been used in England in modern times so extensively as on the continent. There the sum sought to be obtained in this way has never been anything like realized. In 1793, for example, a loan of this class was imposed in France, on the basis of income; and of the milliard (francs) which it was sought to raise only 100 millions were realized. In Austria and Spain, also, recourse has been had at various times to forced loans, but invariably with unsatisfactory results. Other methods of a more or less compulsory character have been and are made use of in various states for obtaining money, which, as they involve the payment of interest, may be regarded as of the nature of loans; but the debt incurred by such methods is comparatively insignificant, and some of the methods adopted are peculiarly irritating and mischievous. On the other hand, it has occasionally been attempted to raise voluntary loans by appeals to a nation's patriotism; the method has been confined almost exclusively to France. After the revolutions of 1830 and 1848 appeals were thus made to the patriotism of French capitalists to buy 5% direct from the government at par, at a time when the French 5 % were selling at 80; but the results were quite insignificant. In short, the only economically sound method of meeting ex- penses which the ordinary resources of a state cannot meet is by borrowing in the open market on the most advantageous terms obtainable. On this normal method of borrowing, loans are divided into different categories, though there are really only two main classes, which may be designated perpetual and terminable. Borrowing in quasi-perpetuity has hitherto been- the mode adopted by most states in the creation of the bulk of their debt. Not that any state ever borrows with the avowed intention of never paying off debts; but either no definite period for reimbursement is fixed, or the limit has been so extended as to be practically perpetual, or in actual practice the debt has been got rid of by the creation of another of equal amount under similar or slightly differing conditions as to interest. Of course a state is not bound to retain any part of its debt as a perpetual burden; it is at liberty to liquidate whenever it suits its convenience. This quasi-perpetuity of debt in the case of a state in a sound financial condition involves no hardship upon its creditors, who may at any moment realize their invested capital by selling their titles as creditors in the open money market, it may be at the price they paid, or it may be a little below or a little above it, according to the state of the market at the time. Loans, again, contracted on the terminable principle are of various classes; the chief of these are (1) life annuities, (2) terminable

annuities, (3) loans repayable by instalments at certain intervals, (4) loans repayable entirely at a fixed date.

From the time of William III. life and terminable annuities have been a favourite mode in England either of borrowing money or of commuting, and thus gradually paying off, the existing funded debt. At first, and indeed until comparatively recent times, the system of life annuities resulted in serious loss to the country, owing to the calculation of the rate of annuity on too high a scale, a result arising from imperfect data on which to base estimates of the average duration of life. The system of life annuities was sometimes combined in England with that of perpetual annuities, or interest on the permanent debt — the life annuity forming a sort of additional inducement to lenders of limited means to invest their money. At one time the form of life annuities known as tontine was much in vogue both in England and France, the principle of the tontine being that the proceeds of the total amount invested by the contributors should be divided among the survivors, the last survivor receiving the whole interest or annuity. The results of this system were not, however, encouraging to the state. In England, at least, the terminable annuity has been a favourite mode of borrowing from the time of William III.; it has been generally conjoined with a low rate of permanent interest on the sum borrowed. Thus in 1700 the interest on the consolidated debt amounted to only £260,000, while the terminable annuities payable amounted to £308,407. In 1780 a loan of 12 millions was raised

at 4% at par, with the additional benefit of an annuity of £i, 1 6s. 3d. % for eighty years. Even so late as the Crimean War in 1855, a loan of 16 millions at 3% at par was contracted, the contributors recerv ing in. addition an annuity of 14s. 6d. % for thirty years.

The third method of contracting terminable loans, that of gradual repayment or amortization within a certain limit of years, has been a favourite one among certain nations, and specially commends itself to those whose credit is at a low ebb. When the final term of repayment is fixed upon, a calculation is easily made as to how much is to be paid half-yearly until the expiry of the term, so that at the end the whole, principal and interest, will have been paid. At first, of course, the amount paid will largely represent interest, but, as at each half-yearly drawing of the numbers of the bonds to be finally paid off the

principal will be gradually reduced, there will be more and more money set free from interest for the reduction of the actual debt. This method, as we have said, has its advantages, and when conjoined with stipulations as to liberty of conversion to debt bearing a lower rate of interest than that originally offered, and when the bonds are not issued at a figure much below par, might be the most satisfactory method of raising money for a state under certain emergencies. What is known as the " Morgan loan " of France in 1870 was contracted on such conditions.

The last form of temporary loan, that repayable in bulk at a fixed date, is one which, when the sum is of considerable amount, is apt to be attended with serious disadvantages. The repayment may have to be made at a time when a state may not be in a position to meet it, and so to keep faith with its creditors may have to borrow at a higher rate in order to pay their claims. It has, however, worked well in the United States, most of the debt of which has been contracted on the principle of optional payment at the end of a short period, say five years, and com- pulsory payment at the end of a longer period, say twenty years. Thus the loan of 515 millions of dollars contracted in 1862 was issued on this principle, at 6 %, and so with other loans between that year and 1868. In European states, however, the risks of embarrassment are too great to permit of the application of this method on an extensive scale; and for loans of great amount the methods most likely to yield satisfactory results are loans bearing quasi-perpetual interest, or those repayable by instalments on the basis of half-yearly drawings within a certain period.

What are known as lottery loans are greatly favoured on the continent, either as an independent means of raising money, or as an adjunct to any of the methods referred to above. These must not be confounded with the lottery pure and simple, in which the contributors run the risk of losing the whole of their investment. The lottery loan has been found to work well for small sums, when the interest is but little below what it would have been in an ordinary loan, and when the percentage thus set aside to form prizes of varying amounts forms but a small fraction of the whole interest payable. The principle is that each contributor of such a loan has a greater or less chance of drawing a prize of varying amount, over and above the repayment of his capital with interest.

What are known in England as exchequer bills and treasury bills may be regarded as loans payable at a fixed period of short duration, from three months upwards, and bearing very in- significant interest, even so low as 5%. They are a useful means of raising money for immediate

wants and for local loans, and form handy investments for capitalists who are reserving their funds for a special purpose. Exchequer bonds are simply a special form of the funded debt, to be paid off generally within a certain period of years.

There are two principal methods of issuing or effecting a loan. Either the state may appeal dii ectly to capitalists and invite sub- scriptions, or it may delegate the negotiation to one or more bankers. The former method has been occasionally followed in France and Russia, but in practice it has been found to be attended with so many disadvantages to the borrowing state or city that the best financial authorities consider it unsound. The great banking- houses have such a command over the money-market that it is

difficult to keep even a direct loan out of their hands. The majority of loans, therefore, are negotiated by one or more of these houses, and the name of Rothschild is familiar to every one in connexion with such transactions. By this method a borrowing state can assure itself of having the proceeds of the loan with the least possible delay and with the minimum of trouble. A loan may be issued at, above, or below par, though generally it is either at or below par — ” par ” being the normal or theoretical price of a single share in the loan, the sum which the borrowing government undertakes to pay back for each share on reimbursement, without discount or premium. Very generally, as an inducement to investors, a loan is offered at a greater or less discount, according to the credit of the borrowing government. Sometimes a state may offer a loan to the highest bidders; for example, the city of Auckland in 1875 invited sub- scriptions through the Bank of New Zealand to a loan of £100,000 at 6%; offers were made of six times the amount, but oniy those were accepted which were at the rate of 98 % or above. The rate of interest offered generally depends on the credit of the state issuing the loan. England, for example, would have no difficulty in raising any amount at 3 % or even less, while less stable states may have to pay 8 or 9 . The nominal percentage is by no means, however, always an index of the cost of a loan to a state, as the history of the debt of England disastrously shows. During the 18th century various expedients were employed, besides that of terminable annuities already referred to, to raise money for the great wars of the period, at an apparently low percentage. For example, from 3 to 5 would be offered for a loan, the actual amount of stock per cent, allotted being sometimes 107 J or even in; so that between 1776 and 1785, for the £91,763,842 actually borrowed by the government, £115,267,993 was to be paid back. In 1797 a loan of £1,620,000 was contracted, for every £100 of which actually subscribed, at 3%, the sum of £219 was allotted to the lender.

In 1793 a 3% loan of 4! millions was offered at the price of £72%, the government thus making itself liable for £6,250,000. Greatly owing to this reckless method the debt of Great Britain in 181 5 amounted to over 900 millions. France in this respect has been quite as extravagant as England; many of her loans during the 19th century were issued at from 52J to 84%, one indeed (1848) so low as 45% — as a rule with 5% interest. The enormous and embarrassing increase of the French debt during the 19th century was doubtless greatly due to this disastrous system. Nearly every European state and most of the Central and South American states have at one time or another aggravated their debts by this method of borrowing, and got themselves into difficulty with their creditors. Financiers almost unanimously maintain that in the long run it is much better for a state to borrow at high interest at or near par, than at an apparently low interest much below par. A state of even the highest rank may find itself in the midst of a crisis that will for a time shake its credit; but when the crisis is past and its credit revives it will be in a much more sound position with a high interest for a debt contracted at par than with a comparatively low interest on a debt much in excess of what it really received. If a state, for example, borrows at par at 6 % when its credit is low, it may easily when again in a flourishing condition reduce the interest on its debt to 4 or even 3%. The United States government actually did so with the debt it had to contract at the time of the Civil War. This method of reducing the burden of a debt is evidently no injustice to the creditors of a government, when used in a legitimate way. A state is at liberty at any time to pay off its debts, and, if it can borrow at 3% to pay off a 6% debt, it may with perfect justice offer its creditors the option of payment of the principal or of holding it at a reduced interest. Government debts are, however, sometimes reduced after a fashion by no means so legitimate as this. Other states have been even more unprincipled, and have got rid of their debts at one sweep by the simple method of repudiation.

When a state has a variety of loans at varying rates of interest, it may consolidate them into a single debt at a uniform interest. For example, in 1751 several descriptions of English debt were con- solidated into one fund bearing a uniform interest of 3 %, an opera- tion which gave origin to the familiar term ” consols ” (” consoli- dated annuities “)• In the early days of the English national debt, a special tax or fund was appropriated to the payment of the interest on each particular loan. This was the original meaning of ” the funds,” a term which has now come to signify the national debt generally. So also the origin of the term ” funded ” as applied to a debt which has been recognized as at least quasi-permanent, and for the payment of the interest on which

regular provision is made. Unfunded or floating debt, on the other hand, means strictly loans for which no permanent provision requires to be made, which have been obtained for temporary purposes with the intention of paying them off within a brief period. Exchequer and treasury bills are included in this category, and such other moneys in the hands of a government as it may be required to reimburse at any moment. Where a government is the recipient of savings banks deposits, these may be included in its floating debt, and so also may the paper- money which has been issued so largely by some governments. A state with an excessive floating debt must be regarded as in a very critical financial condition.

National debt, again, is divided into external and internal, accord- ing as the loans have been raised within or without the country —

some states, generally the smaller ones, having a considerable amount of exclusively internal debt, though it is obvious that the bulk of national debts are both external and internal.

We referred above to various ways of reducing the burden of a debt, and also to methods of contracting loans by which within a certain period they are amortized or extinguished. Most states, however, are burdened with enormous quasi-permanent debts, the reduction or extinction of which gives ample scope for the financial skill of statesmen. A favourite method of accomplishing this is by the establishment of what is known as a sinking fund, formed by the setting aside of a certain amount of national revenue for the reduction of the principal of the debt. (J. S. K.)

The following table shows the general state of the world's public indebtedness at the beginning of the 20th century, divided according to the more important countries, the bracketed figures in black type indicating the position of the country referred to under each heading in the list. The figures are given by preference- for the year 1900, as more representative, in a case like this, than for some later years; for the Boer War, as regards the United Kingdom, and also the Russo-Japanese War, intro- duced new debt and new considerations, hardly fair to the comparison, while this stands at the end of a long period of peace. The figures in every case are not to be supposed to be absolutely accurate; statistics of national debts differ, -often remarkably, and it is practically impossible to give a perfectly

satisfactory comparison, owing partly to difficulties of computing the exchange, partly to inaccurate accounts, and partly to the varieties of debt (reproductive or non-reproductive, &c).

Kingdom (756 millions) stood second to that of France (1000 millions), in 1900 it stood third to France and Russia; whereas in 1883 its weight per head of population was third, in 1900 it was eleventh; whereas in 1883 its annual charge stood second, in 1900 it stood fourth; and whereas the weight of the charge per head of population in 1883 was fifth, in 1900 it was eleventh. The indebtedness of the great British dependencies, on the other hand, had increased from 302 millions to 544 millions sterling, or by 242 millions; and the local (municipal) debt of Great Britain had risen from about 100 millions to upwards of 300 millions.

It is interesting to recall the history of the British national debt during the 19th century. The debt at the close of the Napoleonic war (18 16) was nearly 887 millions sterling, History and at the beginning of 1900 this debt had been of reduced to 621 millions, 1 or a decrease of 266 millions — Brltisl- notwithstanding interim additions of about 367 e millions, which made the gross reduction during that period 633 millions sterling, an amount actually larger than the whole (dead-weight 2) debt at the end of the century. No country (except the United States, to a smaller amount) has ever redeemed its obligations on such a scale, and this was done while all other European countries of similar standing were piling up debt.

This enormous reduction was effected at different rates 0/ speed. Between 1817 and 1830, when what was known as

The Principal Public Debts of the World, iqoo.

Country.

Population.

Total Debt.

Per Head.

Annual Charge.

Per Head.

The United Kingdom

40,909,925

(3)

£628,978,782

(11)

£i5 7

6

(4)

£23,216,657

(11)

£0

II 4

British Dominions over Sea —

India

230,000,000

(9)

210,323,937

(24)

18

6

(11)

6,595,732

(23)

6

Australian States

3-707,905

(10)

195,324,717

(2)

52 13

(9)

7,595,074

(2)

2

1

. New Zealand

815,820

(23)

47,874,452

(1)

58 12

(22)

1,717,910

(1)

2

2

Canada . .

5.338,883

(21)

53,254,689

(14)

10

(21)

2,678,496

(13)

O

10

Cape Colony

i,5 2 7,224

(24)

27,884,078

(8)

18 5

(23)

1,331,737

(6)

O

17 5

Natal

902,365

(25)

9,019,143

(IS)

10

(24)

350,204

(16)

O

7 9

France .

38,517,975

(1)

1,086,215,525

(4)

28 4

(1)

49,844,652

(4)

I

5 11

Russia .

129,211,113

(2)

656,000,000

(19)

5 2

(2)

29,000,000

(18)

O

4 7

Austria .

25,886,000

(6)

358,438,000

(12)

13 16

11

(6)

14,067,000

(10)

O

II 6

Hungary

19,203,531

(11)

184,600,000

(16)

9 14

(8)

11,977,640

(9)

O

12 6

Italy

32,449,754

(4)

586,000,000

(9)

18

(3)

27,000,000

(7)

O

16 7

United States of Amer

ca

76,303,387

(8)

292,216,265

(21)

3 15

6

(10)

6,709,026

(20)

O

1 9

Spain

18,089,500

(S)

433,283,066

(5)

24 1

5

(5)

16,742,285

(5)

O

18 2

Turkey .

23,880,000

(13)

170,000,000

(18)

7

(13)

5,H8,450

(19)

O

4 3

Egypt .

9,734,000

(16)

103,372,000

(13)

10 12

4

(15)

4,222,379

(IS)

8 8

Prussia .

34,472,509

(7)

329,584,000

(17)

9 7

6

(7)

13,923,170

(17)

O

7 5

German Empire .

56,345,ooo

(14)

118,554,789

(22)

2 2

1

(16)

3,794,461

(22)

O

1 4i

Portugal

5,049,729

(12)

177,192,795

(3)

35

(14)

4,434,243

(8)

O

15 10

Holland

5,104,137

(18)

96,561,287

, (7 }

18 18

(20)

2,926,553

(12)

O

11 ii.

Belgium

6,744,000

(IS)

104,551,000

(10)

15 13

6

(17)

3,320,404

(14)

O

9 9

Japan

43,759,577

(22)

52,903,000

(23)

1 4

2

(18)

3,176,759

(21)

O

1 5

China

390,000,000

(20)

55,000,000

(25)

3

(19)

3,000,000

(24)

O

2

Argentina

4,400,000

(17)

103,000,000

(6)

23 12

(12)

6,301,419

(3)

I

8 7

Brazil

17,000,000

(19)

81,710,000

(20)

4 16

The total indebtedness of the countries named in the table amounted to £6,311,017,478, and the total indebtedness of the world {i.e. including countries not here mentioned) for the year 1898 was computed by Lord Avebury (Journ. Roy. Stat. Soc. vol. lxiv. part i.) as £6,432,757,000, as against £5,097,910,000 in 1888. This compares (taking figures compiled by Mr Dudley Baxter in Journ. Roy. Stat. Soc, March 1874) with a total indebted- ness of 4680 millions sterling in 1874 and 1700 millions sterling in 1848. The United Kingdom had diminished its total debt since 1883 by 127 millions, the amount per head by £6, the annual charge by 6 millions, and the charge per head by 5s. 8d. The United States debt was lower by nearly a hundred millions. Japan, Egypt and Brazil had sensibly improved their positions. But the following countries had increased their debts: France (by 86 millions), Russia (by some 240 millions), Italy (by 140 millions), Austria-Hungary (by 70 millions), Spain (by 190 millions), Prussia (by 227 millions), Portugal (by 80 millions), Holland (by 18 millions), Belgium (by 3 2 millions), and Argentina (by 73 millions).

The result is that, whereas in 1883 the total debt of the United

Pitt's sinking fund was in operation (depending upon the devotion of surplus income to the repayment of debt, but much complicated by the raising of fresh loans), a net reduction was made of £29,488,072 — an annual average of £2,268,313. From 1830 to 1876 the system of using surplus revenue — the so-called old sinking fund — for redeeming debt, was steadily applied, together with the creation of terminable annuities, by which definite blocks of debt were cancelled and the whole amount paid off in a term of years. During this period the debt was reduced by £85,175,782, an annual average of £1,851,647. In 1876 Sir Stafford Northcote's (Lord Iddesleigh's) new sinking fund came into operation, in addition to previous methods of redeeming debt. By this system a definite annual sum was set aside for the service of the debt, the difference between it and

1 Leaving out of account 8 millions of unfunded debt raised for the Boer War.

2 The " dead-weight " debt, or national debt proper, excludes what are treated in the public accounts as "other capital liabilities," the interest on which is not included in the fixed charge ; but it is taken to include the new debt of all sorts raised in 1900, 1901 and 1902 for the Boer War.

the amount required for payment of interest forming a (new) sinking fund devoted to repayment of capital. This fixed charge was gradually reduced from about 29 millions to 26 millions in 1888, to 25 millions in 1890, and to 23 millions in 1899. The amount paid off during this period by means of old sinking fund, terminable annuities and new sinking fund, down to March 1900, was £155,238,639, or an annual average of £6,468,276.

It will be observed that the burden of the debt incurred previously to 181 7 has thus been borne very unequally by different ages of " posterity." While the generations immedi- ately succeeding the Napoleonic war paid off about £2,000,000 a year, the taxpayers between 1876 and 1900 paid at three times that rate. They did so largely without knowing it, since a large part of the amount was wrapped up in the terminable annuities; but it is very questionable justice that so large a proportion of the burden should have been

imposed upon them.

The great bulk of the funded national debt consists of what are known as ” consols.” This name dates from 1751, when nine different government annuities at 3% were consolidated into one, amounting to £9,137,821. These ” consolidated annuities ” formed the germ of what has since become the type of British government stock. At the same time some of the annuities at a higher rate of interest were combined and the interest reduced to 3%, and this stock was known as “reduced,” the two 3% stocks remaining side by side, until in 1854 the 31% government stock was also converted into 3%, under the style of “new threes.” “Consols,” “reduced” and “new threes” formed thenceforth a solid body of British 3% stock, until in 1888 the whole amount was converted (see Conversions below) by Mr (after- wards Lord) Goschen into 2f%. “Consols” were added to from time to time when fresh loans were needed: from 39 millions in 1771 they rose to 71 millions in 1781, to 101 millions in 1783, 278 millions in 1801, 334 millions in 1811, and 400 millions in 1858; but in 1888 they had decreased, by redemptions, to £322,681,035. ” Reduced ” were also added to: from 17 millions in 1751 they rose to 164 millions in 1815, and then gradually

amount more was practically locked up by being held by trustees, or by banks, insurance societies, &c. The savings banks deposits, increasing as they did by about £1 ,000,000 per month (owing partly to the raising in 1894 of the maximum limit), had to be invested in government securities; and the compulsory activity of the government as a buyer of consols, both on this account and also for sinking fund purposes (in order to obtain stock to redeem debt on the increased scale already indicated) operated as an abnormal cause for sending the price of consols high above par. Even at that figure (the average prices for consols being ioij^ in 1894, io6J in 1895, 110J in 1896, 112JI in 1897, no|| in 1898 and 106J — having fallen owing to war prospects — in 1899) it was difficult for the govern- ment brokers to obtain consols, and it was principally owing to this state of things that in 1899 Sir Michael Hicks-Beach reduced the fixed annual charge for the debt (and pro tanto the new sinking fund) from £25,000,000 to £23,000,000. It may be useful to give the figures for the British national debt in 1902, after the disturbance due to the South African War. During the years 1900 and 1901 the new sinking fund was suspended, as well as the payments on the terminable annuity debt applicable to repayment of capital (except in so far as annuities to individuals were concerned) ; so that the debt was not reduced, as it would otherwise have been, by £4,547,000 in 1900 and by £4,681,000 in 1901. On the contrary, it was increased by fresh

borrowings. Consols were raised (in 1901 and 1902) to the extent of £92,000,000; a ” War Loan ” of 2j% stock and bonds, redeemable in 1910, was raised (1900) to the amount of £30,000,000; 2§% exchequer bonds were raised (in 1900) to the amount of £24,000,000, and treasury bills (in 1899 and 1900), £13,000,000. The total war borrowing amounted accordingly to £159,000,000, raised at a discount of (£6,585,000) 4-14%. This includes the whole new borrowing in 1902, a portion of which was intended after the peace to be paid back in the current year; but for this no allowance can here be made. The accompanying table shows the totals for the ” dead-weight debt ” in 1900, 1901 and 1902, and, for convenience, also the ” other capital liabilities.”

“Dead- weight Debt.”

Chief Cause of Difference. 1

.” 9t h . er

Liabilities.”

31st March 1900 .

1901 . .

,, 1902 .

July 1902 .

£628,978,782

690,992,621

747,876,000 779,876,000

(+” War Loan,” £30,000,000

1 +Exch. Bonds, 24,000,000

(-j-Treas. Bills, 5,000,000

-[-Consols, 60,000,000

-[-Consols, 32,000,000

£10,186,482

14,731,256 20,532,000

diminished to 102 millions in 1869, and to £68,912,433 in I 1887, when they were converted with ” consols ” into the new consols (or ” Goschens “) at 2f , to be reduced to 2| in 1903.

The lowest price ever quoted for ” consols ” was 47! on 20th September 1797, owing to the mutiny at the Nore; the highest was 114 in 1896 owing to scarcity of stock, the operation of the sinking funds, and the demand for investment of savings bank moneys.

The high premium to which consols rose towards the end of the century may be briefly explained. Pari passu with the re- duction of the debt went a dwindling of the amount of consols open to investors, and hence occurred a continued normal appre- ciation of the stock. In 1817 the amount of British government stock per head of the population was £40, 10s.; in 1896 this figure had decreased to £14, 12s. The ordinary law of supply and demand would therefore in any case tend to increase the price of govern- ment stock. This has always happened. The amount of 3% diminished from 528 millions in 1817 to 498 in 1827, and to 497 in 1837, and the average prices in these years were 73, 83 and 90;’ additions were made to the stock, and in 1847 (the amount being 510 millions) the price was 86|; again the amount decreased, and in 1852 (500 millions) the price was 98 ; then a great conversion raised the amount to 734 millions in 1854, and the price went down to 90 J ; but by 1887 the amount decreased by about 200 millions, and the price rose well above par; and though the reduction in interest in 1888 set back the price, it rose again as the amount of available stock diminished. Many causes, into which it is not necessary to enter, operated no doubt in keeping up the demand for British government credit. Moreover, apart from the fact that in 1882 there were 689 millions of 3% and in 1900 only 501 millions of 2j% in existence, the amount held by government departments and therefore practically locked up from the market, gradually increased, until from this cause alone the amount of available stock was diminished by upwards of 200 millions; and a large

” Other liabilities ” it must be remembered, represent money advanced (generally by terminable annuity) on reproductive objects — telegraphs, barracks, public works, Uganda railway, &c. — and they could not, obviously, be properly included in the national debt unless at the same time a set-off were made for the valuable assets held by the British government, such as the Suez canal shares, which in 1902 were alone worth upwards of £26,000,000. (H. Ch.)

British National Debt Conversions. — The great bulk of the funded debt of the United Kingdom consists of annuities, which are described as perpetual, because the state is under no obliga- tion to pay off at any time the capital debt which they represent. All that the public creditor can claim is to receive payment of the instalments of annuity as they fall due. On the other hand, the government has the right to redeem the annuities ultimately by payment of the capital debt; though it may, and frequently does, bind itself not to exercise that right as regards a particular stock of annuities until after a definite period. So long as a stock is thus guaranteed against redemption, the only way in which the annual charge for that portion of the debt can be reduced is by the government buying back the annuities in the open market at their current price, which may be more or may be less than the nominal debt, according to general financial conditions and to the state of the national credit. The liability of the stock to redemption at par, when the period of guarantee has expired, prevents its market price from rising materially above that level. To enable the right of compulsory redemption to be enforced, it is only necessary that the government should

1 Other causes are redemption of land tax, variation in capital value, of terminable annuities and minor treasury operations.

have command of sufficient funds for the purpose of paying off the stockholders, or should be able to raise those funds by borrowing at a rate of interest lower than that borne by the stock. Any circumstances which might tend to raise the price of the stock above par would also assist the government in raising its redemption money on more favourable terms. When the amount of stock to be dealt with is large, the raising by a fresh loan of the amount required for redemption would occasion great disturbance. A more convenient method is the conversion of the existing stock to a lower rate of interest by agreement with the stockholders, whose reluctance to accept a reduction of income is overborne by their knowledge that the power of redemption exists and will be put in force if necessary. The opportunity for conversion may be looked for when the price of a redeemable stock stands steadily at or barely above par. Observa- tion of the movements in the price of other securities will serve to show whether this stationary price represents the real market value of the stock, or whether that value is subject to depression owing to an expectation of the stock being converted or redeemed. Accordingly,

the course of prices of other government stocks which are free from the liability to redemption, of the stocks of foreign countries and the colonies, and of the large municipalities, must be watched by government in order to determine, first, whether the conversion of a redeemable stock is feasible, and, secondly, to what extent the reduction of the interest in the stock may be carried.

The credit for the first measure of conversion belongs to Walpole, though it was carried through by Stanhope, his successor as chancellor of the exchequer. In 1714 the legal rate of interest for private transactions, which had been fixed at 6 % in the year of the Restoration, was reduced to 5% by the act 12 Anne, stat. 2, c. 16, But the bulk of the national debt still bore interest at 6%, the doubtful security of the throne and the too frequent irregularities in public payment having hitherto precluded any considerable borrowing at lower rates. Walpole saw that the first requirement was to give increased confidence to the public creditors. Three acts were passed dealing respectively with debts due to the general public, to the Bank of England and to the South Sea Company. Three separate funds — the general fund, the aggre- gate fund and the South Sea fund — were assigned to the service of the several classes of debt, each of these funds being credited with the produce of specified taxes, which were made permanent for the purpose; and it was further provided that any surplus of the funds, after payment of the interest of the debts, should be applied in reduction of the principal. Such was the success of this measure that, in spite of the reduction of interest from 6 to 5% which was also enacted, the passing of the acts was followed by a rise in the price of stocks. A curious preliminary to the introduction of these measures was the passing of a resolution by the House of Commons, which invited advances not exceeding £600,000, to be repaid with interest at 4% out of the first supplies of the year. The result showed that the time was not ripe for such a reduction of interest, as only a sum of £45,000 was offered on those terms. A further resolution was then passed, substituting 5% as the rate of interest, and the whole sum was at once subscribed. Besides accept- ing the reduction of interest on their own debts, the Bank of England and the South Sea Company agreed to assist the government by advancing \ millions at the reduced rate, to be employed in paying off any of the general creditors who might refuse assent to the con- version. The assistance was not required, as all the creditors signified assent. The debts thus dealt with amounted altogether to about 25 J millions, and the annual saving of interest effected (including that upon a large quantity of exchequer bills for which the Bank had been receiving over 7 %) was £329,000.

Walpole had a further opportunity of effecting a conversion in 1737.

In the meantime much of the 5% debt had been reduced to 4 % by arrangements with the Bank of England and the l ‘ 4 ‘ South Sea Company, and further borrowings had taken

place at that rate and even at 3%. In 1737 the 3% stood above par, and Sir John Barnard proposed to the House of Commons a scheme for the gradual reduction of the 4 . As a financial measure the scheme would doubtless have succeeded; but Walpole, moved apparently by consideration for his capitalist supporters, opposed and for the time defeated it. A scheme on similar lines was carried through by Pelham as chancellor of the exchequer in 1749 and em- bodied in the act 23 Geo. II. c. 1. By that act holders of the 4 securities, amounting to nearly £58,000,000, were offered a con- tinuance of interest at 4% for one year, followed by 3!% for seven years, during which they were guaranteed against redemption, with a final reduction to 3 % thereafter. It was necessary to continue the rate of 4% for the first year, as any objecting stockholders could not be paid off without a year’s notice. Three months were allowed for signifying assent to the proposal. At first it was viewed

with disfavour, and both the Bank and the East India Company opposed it. But the pens of the government pamphleteers were busily occupied in showing the advantages of the offer, and at the close of the three months acceptances had been received from the holders of nearly £39,000,000 of the stocks, or more than two-thirds of the whole. A further opportunity was afforded to waverers by a second act (23 Geo. II. c. 22), which allowed three months more for consideration; but for holders accepting under this act the inter- mediate period of 35% interest was reduced from seven years to five. These terms brought in an additional £15,600,000 of stock; and the balance left outstanding, amounting to less than 3! millions, was paid off at par by means of a new loan. The annual saving of interest on the stock converted was at first £272,000, increasing to £544,000 after seven years.

For nearly three-quarters of a century no further conversion was attempted. In that period the total debt had been increased tenfold, and the practice of borrowing in times of war by the issue of an inflated capital, bearing nominally a low rate of interest, prevented recourse to conversion as a means of reducing the burden after peace was restored. But in 1822 Mr Vansittart — who four years earlier had effected a conversion in the opposite direction, turning £27,000,000 of stock from 3 imo 3 \ %, in order to obtain from the holders art advance of £3,000,000 without adding to the capital of the debt — was able to deal with the 5 %. These stocks amounted to

£152,000,000 out of a total funded debt of £795,000,000. The prices at which the chief denominations of government stocks stood in the market in the early part of 1822 indicated a normal rate of interest ot more than 4 but considerably less than 4! %. In these circumstances, to propose the conversion of the 5 % stocks to 4§ % would probably have been futile, unless the new stock were guaran- teed for a long period, as holders would have stood in fear of a speedy further reduction. Nor could the government hope to suc- ceed in a reduction to 4%. Mr Vansittart's plan was to offer £105 of stock bearing 4% in exchange for £100 of 5% stock, thus adding slightly to t:he. capital of the debt, but effecting a large annual saving in interest. These terms were highly successful. Holders of nearly £150,000,000 accepted, leaving less than £3,000,000 of the stock to be paid off, and the annual saving obtained was £1,197,000. The new 4% stock was made irredeemable for seven years (act 3, Geo. IV c. 9).

There were, however, other 4 % stocks, amounting to £76,000,000, which were not secured against redemption. Two years later, the conditions being favourable for their conversion, the act ,

5 Geo. IV. c. 24 was passed, offering holders in exchange a 35 % stock, irredeemable for five years. The offer was accepted as regards £70,000,000, and the remaining £6,000,000 paid off, the annual saving on interest being £381,000.

In 1830 the guarantee given to the 4% stock of 1822 had expired, and the stock stood at a price of 1025. Mr Goulburn decided to attempt its conversion without delay, and accordingly by the act 11 Geo. IV. c. 13 holders were offered in exchange for each £100 of the stock, either £100 of a 3! % stock, irredeemable for ten years, or £70 of a 5 % stock, irredeemable for forty-two years, these two options being considered of approximately equal value. No difficulty was found in securing assent. Over £150,000,000 of the stock was converted, almost wholly into the 3 J % stock; the balance of less than £3,000,000 was paid off, and an annual saving of £754,000 in interest was the result.

It was again Mr Goulburn's fortune to carry out a large and successful conversion in 1844. At that date the funded debt was made up of 3 % and 3 J % stocks in the proportions of about two to one, the only other denomination being the 1844,

trifling amount of 5 % stock created in connexion with the conver- sion of 1830. The price of 3% consols ranged about 98, and that of the new 3j%, created in 1830, about 102. A reduction straight- way from

3J to 3 % was not to be looked for, but it was hoped to ensure that reduction ultimately by offering 31 % for the first few years and a guarantee against redemption for a long term. Accord- ingly the holders of the several 3 § % stocks were offered an exchange to a new stock bearing interest at 3i % for ten years and at 3 % for the following twenty years. Practically the whole of the stock, amounting to £249,000.000, was converted on these terms, only £103,000 being left to be paid off at par. The immediate saving of interest was £622,000 a year for ten years, and twice that rate in subsequent years (acts 7 & 8 Vict. cc. 4 and 5).

Mr Gladstone's only attempt at the conversion of the debt was made in his first year as chancellor of the exchequer. His primary purpose was to extinguish some small remnants of 3% stocks which stood outside the main stocks of that de- nomination. The act 16 Vict. c. 23 offered to holders of these minor stocks, amounting altogether to about 95 millions, the option of exchanging every £100 for either £82, 10s. of a 3i % stock guaran- teed for 40 years, or £110 of a 2j% stock guaranteed for the same period, or else for exchequer bonds at par. In the result stock to the amount of only about £1,500,000 was converted, and the remaining £8,000,000 had to be paid off at par, with some apparent loss of capital, as the current market price of the 3 % was less than par. The failure w?s largely owing to the fact that, between the initiation and the execution of the scheme, the train of events leading up to the Crimean War had become manifest, with unfavourable results

to the public credit. Mr Gladstone had also included, as an optional portion of his plan, liberty to holders of the larger 3% stocks to exchange into the new 3 J and 2§%. Very little advantage was taken of this permission, but the small amount of 2|% stock then created has been largely added to in later years by the conversion of stocks of higher denominations held by the national debt com- missioners for the savings banks and other government funds.

Little better was the result of a more ambitious attempt made by Mr Childers in 1884. His offer (act 47 & 48 Vict. c. 23) extended 1884 to tne h°'ders f a U the 3% stocks, amounting to more

than 600 millions, but no attempt was made to compel acceptance. There was offered in exchange for each £100 of 3 % stock either £102

of a stock at 2f % or £108 of a stock at 2f %, both irredeemable for twenty-one years. But the amount exchanged into the new stocks was only 22 millions, of which more than one- half was stock held by government departments.

The most important of all the conversions of the British debt was effected by Mr Goschen in 1888. It applied to the whole of the 3 % 1888 stocks, amounting to a total of £558,000,000, made up as

follows: £323,000,000 of consols, a stock which dated from 1752, when it was formed by the consolidation of a number of minor stocks ; £69,000,000 of reduced 3 , of which the nucleus was the stock reduced from 4 to 3 by Pelham's conversion in 1749; £166,000,000 of new 3% resulting from the conversion of 1844. All the three stocks were, and had been for a considerable time, well over par. But for the past few years they had remained in almost a stationary position, relatively to the upward movement shown in the prices of the government 2! % stock, and of the stocks of foreign governments, of British colonies and of the leading munici- palities. It was clear that the anticipation of a conversion or re- demption scheme was weighing down consols. Direct evidence of this fact was afforded by the course of a new 3% stock, the local loans stock, which Mr Goschen had created in 1887. Though bearing the same interest and resting upon the same ultimate security as consols, this stock, which had been made irredeemable for twenty- five years, rose at once to a higher level of price. The opportunity for a great scheme of conversion had evidently come. The risk to be incurred by government in undertaking the liability to pay off such an enormous body of stock, though less in comparison with the resources of the nation than that which Mr Goulburn had faced in 1844, was still very great, and it was rendered more formidable by the fact that holders of consols and of reduced 3% were entitled at law to a year's notice before their stocks could be redeemed. If that right of notice were to be enforced as regards any large pro portion of the stocks, no precaution could adequately guard against the risk of untoward circumstances arising to affect the operation before the year expired. Mr Goschen proposed to offer to the holders of each of the three stocks an exchange at par into a new stock bearing interest at 3% for the first year, at 2f% for the next fourteen years and at 2 \ % for twenty years thereafter, the stock to be irredeemable for the whole of that period, namely till 1923. Acceptance was made compulsory for holders of the new 3 %, with the alternative of being paid off at par, as they had no claim to receive notice ; but it was made optional for the holders of the other two stocks, and a bonus of 5s. % was offered to them as an induce- ment to forgo their right of notice. These provisions were duly embodied in

the act 51 Vict. c. 2. The terms were accepted by practically all the holders of the new 3 % and by the great majority of the holders in consols and reduced 3's, the amount left outstanding being only £42,000,000. To enable that balance to be dealt with, an act was passed providing for the compulsory redemption or conver- sion of the outstanding stock at the expiry of the statutory notice. The funds required for this further operation were raised by the issue of treasury bills and exchequer bonds, by temporary advances from the bank and from the national debt commissioners, and by the creation of an additional half-million of the new stock. In the result it was only necessary to find cash for paying off dissentients to the amount of £19,000,000. The final outcome of the whole operation was a saving in the annual charge of interest of £1,412,000, increasing to twice that amount after fourteen years.

The conversion of the consols and reduced 3 % was greatly facilitated by the exercise of a power, which the act conferred, to pay to recognized agents, such as stockbrokers, bankers and solicitors, a commission of Is. 6d. % on stocks in respect of which they lodged their clients' assents. These agents were thus afforded an induce- ment to give their clients explanation and advice, without which many of the fundholders would probably not have moved in the matter. The commissions paid amounted to more than £234,000, representing stocks to the amount of over £312,000,000. The government would not again be confronted with this difficulty of having to give long preliminary notice of the intention to convert or redeem a large portion of the debt, as it was provided by the Conversion Act 1888 that the present consols should be redeemable after 1923 on such notice and in such manner as parliament might direct. _ (W. Bl.;E. W. H.*)

See Leroy-Beaulieu, Traite de la Science des Finances; Rau, Finanzwissenschaft; M'Culloch, On Taxation and the Funding System; Hamilton, Inquiry concerning the Rise and Progress of the English Debt; Taylor, History of Taxation in England; Fenn, Compendium of English and Foreign Funds ; Dudley Baxter, National

Debts, and his paper in the Stat. Soc. Jour. (1874). ; Sir E. W. Hamil- ton, Conversion and Redemption (1889). And for statistics of national debts see the Statesman's Yeat-Book and the Stock Exchange Annual.

NATIONALITY, a somewhat vague term, used strictly in international law (see International Law, Private) for the status of membership in a nation or state (for the conditions of which see State, Allegiance, Naturalization, Alien), and in a more extended sense in political

discussion to denote an aggregation of persons claiming to represent a racial, territorial or some other bond of unity, though not necessarily recognized as an independent political entity. In this latter sense the word has often been applied to such people as the Irish, the Armenians and the Czechs. A ” nationality ” in this connexion represents a common feeling and an organized claim rather than distinct attributes which can be comprised in a strict definition.

NATIONAL WORKSHOPS (Fr. Ateliers Nationaux), the term applied to the workshops established to provide work for the unemployed by the French provisional government after the revolution of 1848. 1 The political crisis which resulted in the abdication of Louis Philippe was naturally followed, in Paris,- by an acute industrial crisis, and this, following the general agricultural and commercial distress which had prevailed through- out 1847, rendered the problem of unemployment in Paris very acute. The provisional government under the influence of one of its members, Louis Blanc, and on the demand of a deputation claiming to represent the people passed a decree (Feb. 25, 1848) from which the following is an extract: —

The provisional government of the French Republic undertakes to guarantee the existence of the workmen by work. It undertakes to guarantee work for every citizen.

For the carrying out of this decree, Louis Blanc wanted the formation of a ministry of labour, but this was shelved by his colleagues, who as a compromise appointed a government labour Commission, under the presidency of Louis Blanc, with power of inquiry and consultation only. The carrying out of the decree of Feb. 25th was entrusted to the minister of public works, M. Marie, and various public works 2 were immediately started. The earlier stages of the national works are sufficiently interesting to justify the following detailed account: —

” The workman first of all obtained a certificate from the landlord of his house, or furnished apartments, showing his address, whether in Paris or the department of the Seine. This certificate was vised and stamped by the police commissary of the district. The work- man then repaired to the office of the maire of his ward, and, on delivering this document, received in exchange a note of admission to the national works, bearing his name, residence and calling, and enabling him to be received by the director of the workplaces in which vacancies existed. All went well while the number of the un- employed was less than 6000, but as soon as that number was exceeded the workmen of each arrondissement, after having visited all the open works in succession without result, returned to their maire’s offices tired,

starving and discontented. The workmen had been promised bread when work was not to be had, which was reason- able and charitable ; the great mistake was, however, then committed of giving them money, and distributing it in public at the offices of the maires instead of distributing assistance in kind, which might have been done so easily through the agency of the bureaux de bien- faisance. Each maire's office was authorized to pay every un- employed workman 1-50 frs. per day on production of a ticket showing that there was no vacancy for him in the national works. The fixed sum of 2 francs was paid to any workman engaged on the public excavation work, without regard to his age, the work done or his calling. . . . The workman made the following simple calcu- lation, and he made it aloud : ' The state gives me 30 sous for doing nothing, it pays me 40 sous when I work, so I need only work to the extent of 10 sous.' This was logical. ...

" The works opened by the minister of public works being far distant from each other, and the workmen not being able to visit them all in turn to make certain that there were no vacancies for them, two central bureaux were established, one at the Halle-aux- Veaux under M. Wissocq, the other near the maire's office in the

1 The term is also incorrectly applied to the proposed ateliers sociaux of Louis Blanc (q.v.), state-supported co-operative productive societies.

2 Clearing the trench of Clamart and conveying the earth to Paris for the construction of a railway station on the chemin de fer de l'Ouest; construction of the Paris terminus of the Paris-Chartres railway; improvement of the navigation of the Oise 1 extension of the Sceaux railway to Orsay.

5th arrondissement in the Rue de Bondy, entrusted to M. Higonnet. . . . The workmen went to have their tickets examined at one of these bureaux; and the absence of employment having been proved, they returned to get their 30 sous at their maires' offices." 1

Owing to the increase in the number of those claiming work or relief, disorganization set in, and both the bureaux and the maires became the centres of disturbances, those in charge of the offices being unable to control the crowds. As a consequence M. Marie commissioned Emile Thomas, a chemist connected with the Ecole Centrale to

reorganize the works. When Thomas took the work in hand on the 5 th of March, the number of unemployed had increased to 14,000 in addition to some 4000 or 5000 employed on public works, and it was steadily on the increase. On the 16th of March the daily pay of the workmen who were not working was reduced to 1 franc; work was guaranteed for at least every other day, in which case the pay was to be 2 francs for the day. The possible usefulness of this order was stultified by the near approach of the elections, the moderate and extreme sections both trying to exploit the dissatisfied workmen. Private industry, too, was paralysed, the workpeople for the most part preferring 1 franc a day and idleness, with the possibility of future benefits. Thomas, left practically to his own resources, endeavoured to organize some special workshops where artisans could be employed at their own trades; but it was found almost impossible to persuade them to do serious work, as they knew that many of their fellows were being paid for loafing. On the 19th of May the number enrolled had increased to 87,942. The National Assembly had in the meanwhile been elected, and met on the 4th of May. The Executive Commission was elected a few days later; Louis Blanc was excluded, but all the other members of the provisional government were on it. Blanc renewed his motion for a ministry of labour; this was rejected. On the 15th the mob invaded the Assembly, and from that time the government abated their socialist tendencies, and cast about for means to put an end to what had become a serious danger to the state as well as an exhausting drain on the treasury. On the 24th of May Thomas received instructions to dismiss all unmarried men under 25 years of age who would not enlist in the army, all men who could not prove six months' residence in Paris, and all who refused offers of private employment. Piece-work was to be established instead of time-work, and men were to be prepared to be drafted into the provinces. Thomas foretold trouble as a consequence of the order, and it was for a time withdrawn. On the 26th of May Thomas was superseded by M. Lalanne, and on the 30th the National Assembly decreed the substitution of piece-work for time-work. On the 20th of June the remainder of the proposals were approved, and the sequel was the insurrection of the 23rd of June and following days (see French History). How far the real socialistic scheme of Louis Blanc would have been successful if it had been put in practice must remain a matter of speculation. It was entered upon hastily, without any organiza- tion, was looked upon coldly by those servants of the govern- ment who ought to have assisted it, and, in the circumstances, was foredoomed to failure from the start.

Authorities. — E. Thomas, Histoire des ateliers nationaux (1848) ; L.

Blanc, Histoire de la revolution francaise de 1848 (1870-1880); 1848 Hist, revelations (1858) ; A. de Lamartine, Hist, de la revolution de 1848 (1849); a useful summary is given in the English Board of Trade Report on Agencies and Methods for dealing with the Unemployed (c. 7182, 1893).

NATROLITE, a mineral species belonging to the zeolite group. It is a hydrated sodium and aluminium silicate with the formula Na2AliSi 3 Oio-2H 2 0, and containing sodium (Na20, 16-3%), was named natrolite by M. H. Klaproth in 1803. ” Needle- stone ” or ” needle-zeolite ” are other names, alluding to the common acicular habit of the crystals, which are often very slender and are aggregated in divergent tufts. Larger crystals have the form of a square prism terminated by a low pyramid: the prism angle being nearly a right angle (88° 45ˆ)1 the crystals are tetragonal in appearance, though actually orthorhombic. There are perfect cleavages parallel to the faces of the prism. 1 E. Thomas, Histoire des ateliers nationaux, p. 29.

The mineral also often occurs in compact fibrous aggregates, the fibres having a divergent or radial arrangement (hence the name radiolite for one variety). From other fibrous zeolites natrolite is readily distinguished by its optical characters: between crossed nicols the fibres extinguish parallel to their length, and they do not show an optic figure in convergent polarized light. Natrolite is usually white or colourless, but some- times reddish or yellowish. The lustre is vitreous, or in finely fibrous specimens sometimes silky. The spec. grav. is 2-2, and the hardness 5J. The mineral is readily fusible, melting in a candle-flame, to which it imparts a yellow colour owing to the presence of sodium. It is decomposed by hydrochloric acid with separation of gelatinous silica.

Natrolite occurs with other zeolites in the amygdaloidal cavities of basic igneous rocks. The best specimens are the diverging groups of white prismatic crystals found in compact basalt at the Puy-de-Marman, Puy-de D6me, France. The largest crystals are those from Brevig in Norway. The walls of cavities in the basalt of the Giant’s Causeway, in Co. Antrim, are frequently encrusted with slender needles of natrolite, and similar material is found abundantly in the volcanic rocks (basalt and phonolite) of Salesel, Aussig and several other places in the north of Bohemia.

Several varieties of natrolite have been distinguished by special names. Fargite is a red natrolite from Glenfarg in Perthshire. Bergmannite or Spreustein is an impure variety which has resulted by the alteration of other minerals, chiefly sodalite, in the augite- syenite

of southern Norway.

NATTIER, JEAN MARC (1685-1766), French painter, was born in Paris in 1685, the son of Marc Nattier, a portrait painter, and of Marie Courtois, a miniaturist. He received his first instruction from his father, and having applied himself to copying pictures at the Luxembourg Gallery, he refused to proceed to the French Academy in Rome, though he had taken the first prize at the Paris Academy at the age of fifteen. In 1715 he went to Amsterdam, where Peter the Great was then staying, and painted portraits of the tsar and the empress Catherine, but declined an offer to go to Russia. Between 1715 and 1720 he devoted himself to compositions like the ” Battle of Pultawa,” which he painted for Peter the Great, and the ” Petrification of Phineus and of his Companions,” which bd to his election to the Academy. The financial collapse of 1720 caused by the schemes of Law all but ruined Nattier, who found himself forced to devote his whole energy to portraiture. He became the painter of the artificial ladies of Louis XV.‘s court. The most notable examples of his straightforward portraiture are the ” Marie Leczinska ” at the Dijon Museum, and a group of the artist surrounded by his family, dated 1730. He died in Paris in 1766. Many of his pictures are in the public collections of France. Thus at the Louvre-is his ” Magdalen “; at Nantes the portrait of ” La Camargo ” and ” A Lady of the Court of Louis XV.” At Orleans a ” Head of a Young Girl,” at Marseilles a portrait of ” Mme de Pompadour,” at Perpignan a portrait of ” Louis XV., ” and at Valenciennes a portrait of ” Le Due de Boufflers.” The Versailles Museum owns an important group of two ladies, and the Dresden Gallery a portrait of the ” Marechal de Saxe.” At the Wallace collection Nattier is represented by ” The Comtesse de Dillieres,” ” The Bath (Mdllede Clermont),” ” Portrait of a Lady in Blue,” ” Marie Leczinska ” and ” A Prince of the House of France.” In the collection of Mr Lionel Phillips are the duchess of Flavacourt as ” Le Silence,” and the duchess of CMteauroux as ” Le Point du jour.” A portrait of the ” Comtesse de Neubourg and her Daughter ” formed part of the Vaile Collection, and realized 4500 gs. at the sale of this collection in 1903. Nattier’s works have been engraved by Leroy, Tardieu, Lepicie, Audran, Dupin and many other noted craftsmen.

See ” J. M. Nattier,” by Paul Mantz, in the Gazette des beaux-arts (1894); Life of Nattier, by his daughter, Madame Tocque; Nattier, by Pierre de Nolhac (1904, revised 1910); arid French Painters of the XVIIIih Century, by Lady Dilke (London, 1899).

NATURAL BRIDGE, a small village of Rockbridge county, Virginia, in the western part of the state, 179 m. by rail W. of Richmond, and

about 16 m. S.E. of Lexington, the county-seat. It is served by the Chesapeake & Ohio and the Norfolk & Western railways. In the vicinity of the village, which is about 1500 ft.

above sea-level, is the great natural curiosity from which it derives its name — a bridge of natural rock 90 ft. long and from 50 to 150 ft. wide, which spans Cedar Creek at a height of 215 ft. above that stream. It consists of horizontal limestone strata, and is the remains of the roof of a cave or underground tunnel through which the creek once flowed. It is crossed by a public road. In the village are magnesia and lithia springs and a salt- petre cave, which was worked during the War of 18 12 and the Civil War. A royal grant dated the 5th of July 1 7 74 conveyed to Thomas Jefferson a tract of 157 acres, ” including the Natural Bridge on Cedar Creek,” and it did not pass from his estate until

1833-

NATURAL GAS, the name given to the inflammable gas occur- ring in petroliferous formations. It consists mainly of hydro- carbons of the paraffin series, principally marsh gas, which constitutes from 50 to 90 % of the Pennsylvanian gas. Members of the olefine series are also present, especially in the gas of Baku. Varying amounts of carbon dioxide, sometimes as much as 10% or more, and small quantities of carbon monoxide, nitrogen, hydrogen and oxygen are also found. For particulars of the geological occurrence, and the collection and distribution, of natural gas, see Petroleum.

NATURALISM. ” Nature ” is a term of very uncertain extent, and the ” natural ” has accordingly several antitheses, often more or less conflicting, and only to be learnt from the context in which they occur. Thus, though Man and the World are often opposed as respectively subject and object, yet the word nature is applied to both: hence Naturalism is used in both a subjective and an objective sense. In the subjective sense the natural, as the original or essential, is opposed to what is acquired, artificial, conventional or accidental. On this opposition the casuistry and paradoxes of the Sophists largely turned; it determined also, at least negatively, the conduct of the Cynics in their contempt for the customary duties and decencies; and it led the Stoics to seek positive rules of life in ” conformity to nature.” This deference for the ” natural ” generally, and distrust of traditional

systems of thought and even of traditional institutions, has played a large part in modern philosophy, especially British philosophy. It was perhaps the inevitable outcome of the reaction, which began with the Renaissance, against the medieval domination of mere authority. ” L’homme qui medite est un animal deprave,” said Rousseau; and again, ” Tout est bien sortant des mains de l’auteur des choses,tout degenere entre les mains de l’homme.” 1 In psychology and epistemology, ” no one,” as Green has said, ” is more emphatic than Locke in opposing what is real to what we ‘ make for ourselves ‘ — the work of nature to the work of the mind. Simple ideas or sensations we certainly do not ‘ make for ourselves.’ They therefore, and matter supposed to cause them, are, according to Locke, real. But relations are neither simple ideas nor their material archetypes. They therefore, as Locke explicitly holds, fall under the head of the work of the mind, which is opposed to the real.” 2 This opposition again led Hume, in the first place, to distinguish between natural and philosophical relations — the former determined simply by associa- tion, the latter by an abitrary union of two ideas, which we may think proper tc compare—and then, in the next, to reduce identity and causality, the two chief ” philosophical relations,” to fictions resulting from ” natural relations,” that is to say, from associations of similarity and contiguity. Subjective naturalism thus tended to become, and in the end became, what is more commonly called Sensationalism or Associatianism, thereby approximating towards that objective naturalism which reduces the external world to a mechanism describable in terms of matter and motion — a result already foreshadowed when Hartley connected ideas and their association with brain vibrations and vibratiuncles. In ethics, also, the striving to get back to the natural entailed a similar downward trend. From the Cambridge Platonists, from Locke and Clarke, we hear much of rational

1 Quoted by Eisler, Worterbuch der philosophischen Begriffe (1899), s.v. ” Naturalismus.” 1 T. H. Green, Prolegomena to Ethics (1883), § 20.

principles of conduct, comparable in respect of intelligibility with the truths of mathematics; but already we find that in Shaftesbury the centre of ethical interest is transferred from the Reason, conceived as apprehending either abstract moral dis- tinctions or laws of divine legislation, to the ” natural affections ” that prompt to social duty; 3 and when we reach Bentham, with pleasure and pain as ” sovereign masters,” and the Mills, with love of virtue explained by the laws of association, all seems to be non-rational. 4 There is much resemblance, as well as some historical connexion, between the

naturalism of moralists such as Shaftesbury and Hutcheson and the Common-Sense metaphysics of Reid and his school. 5 Hence Kant, distinguishing between a ” naturalistic ” and ” scientific ” or critical method in metaphysics, styles Reid and his followers ” naturalists of pure reason,” satirically comparing them to people who think they can settle the size and distance of the moon by direct eyesight better than by the roundabout calculations of mathematics.

So far we have seen the natural approximating to the non- rational. But when used in a subjective sense in opposition to the supernatural, it means the rational as opposed to what is above reason, or even contrary to reason. It is in this sense that the term Naturalism most frequently occurs; and it was so applied specially to the doctrines of the English Deists and the German Illuminati of the 17th and 18th centuries: those of them who held that human reason alone was capable of attaining to the knowledge of God were called theological naturalists or rationalists, while those who denied the possibility of revela- tion altogether were called philosophical naturalists or naturalists simply. 6 In these controversies the term Naturalist was also sometimes used in an objective sense for those who identified God and Nature, but they were more frequently styled Spinozists, Pantheists or even Atheists. But it is at once obvious that dispute as to what is natural and what supernatural is vain and hopeless till the meanings of reason and nature are clearly defined. ” The only distinct meaning of the word ” [natural], said Butler, ” is stated, fixed or settled; since what is natural as much requires and presupposes an intelligent agent to render it so, i.e. to effect it continually, or at stated times, as what is supernatural or miraculous does to effect it for once. And from hence it must follow that persons’ notion of what is natural will be enlarged in proportion to their greater knowledge. . . . Nor is there any absurdity in supposing that there may be beings in the universe, whose capacities . . . may be so extensive, as that the whole Christian dispensation may to them appear natural, i.e. analogous or conformable to God’s dealings with other parts of His creation; as natural as the visible known course of things appears to us.” 7 The antithesis of natural to spiritual (or ideal) has mainly determined the use of the term Naturalism in the present day. 8 But current naturalism is not to be called materialism, though these terms are often used synonymously, as by Hegel, Ueberweg and other historians of philosophy; nor yet pan- theism, if by that is meant the immanence of all things in one God. We know only material phenomena, it is said; matter is an abstract conception simply, not a substantial reality. It is therefore meaningless to describe mind as its effect. Moreover, mind also is but an abstract conception; and here again all our knowledge is

confined to the phenomenal. To identify the two classes of phenomena is, however, impossible, and indeed absurd; nevertheless we find a constant concomitance of psychosis and neurosis; and the more sensationalist and associa- tionist our psychology, the easier it becomes to correlate the

3 Cf. Sidgwick, History of Ethics (1886), p. 181.

4 Cf. W. R. Sorley, The Ethics of Naturalism (1885), pp. 16 sqq.

6 Cf. W. R. Scott, Francis Ilutcheson; his Life, Teaching and Position in Philosophy (1900), pp. 121, 265 seq.

6 See Rationalism ; Kant, Religion innerhalb der Grenzen der blossen Vernunft, Hartenstein's edition, vi. 253 ; and Lechler, Ge- schichte des Englischen Deismus (1841), pp. 454 sqq.

1 Analogy, part i. chap. i. end. Cf. also J. S. Mill, Logic, book iii. chap. xxv. § 2, and Essays on Religion.

8 In aesthetics we find Naturalism used in a cognate sense : the Flemish painters, such writers as Flaubert or Zola, for example, being called naturalistic or realistic, in contrast to the Italian painters or writers like George Sand or the Brontes.

psychical and the physical as but " two aspects " of one and the same fact. It is therefore simplest and sufficient to assume an underlying, albeit unknown, unity connecting the two. A monism — so far neutral, neither materialistic nor spiritualistic — is thus a characteristic of the prevailing naturalism. But when the question arises, how best to systematize experience as a whole, it is contended that we must begin from the physical side. Here we have precise conceptions, quantitative exactness and thoroughgoing continuity; every thought that has ever stirred the hearts of men, not less than every breeze that has ever rippled the face of the deep, has meant a perfectly definite re-distribution of matter and motion. To the mechanical principles of this redistribution an ultimate analysis brings us down; and — beginning from these — the nebular hypothesis and the theory of natural selection will enable us to explain all subsequent synthesis. 1 Life and mind now clearly take a secondary place; the cosmical mechanism determines them, while they are powerless to modify it. The spiritual becomes the " epiphenomenal," a merely incidental phosphorescence,

so to say, that regularly accompanies physical processes of a certain type and complexity. (See also Psychology.)

This absolute naturalism, as we may call it, the union, that is, of psychological and cosmolcgical naturalism, is in fact a species of Fatalism, as Kant indeed entitled it. 2 It is the logical outcome of a sensationalist psychology, and of the epistemology which this entails. As long as association of ideas (or sensory residua) is held to explain judgment and conscience, so long may naturalism stand.

The naturalistic work of chief account at the present day is E. Haeckel's Die Weltrdtsel, gemeinverstandliche Studien uber monistische Philosophic (5th ed., 1900), of which an English translation has appeared. Effective refutations will be found in the works of two of Haeckel's colleagues, O. Liebmann, Zur Analysis der Wirklichkeit (3rd ed., 1900) ; R. Eucken, Die Einheit des Geisteslebens in Bewusstsein und That der Menschheit (1888, Eng. trans.); Der Kampf um einen geistigen Lebensinhalt (1898). See also A. J. Balfour, Foundations of Belief (8th ed., 1901); J. Ward, Naturalism and Agnosticism (1899). (J. W.*)

NATURALIZATION, the term given in law to the acquisition by an alien of the national character or citizenship of a certain state, always with the consent of that state and of himself, but not necessarily with the consent of the state to which he previously belonged, which may refuse to its subjects the right of renouncing its nationality, called " expatriation," or may allow the right only on conditions which have not been fulfilled in the particular case. Hence although nationality in strict theory is always single, as liege homage was and allegiance in its proper sense is, it often happens that two states claim the same person as their national or subject. This conflict arises not only from naturalization having been granted without the corre- sponding expatriation having been permitted, but also from the fact that birth on the soil was the leading determinant of nation- ality by feudal law, and still is so by the laws of England and the United States (Jus soli), while the nationality of the father is its leading determinant in those countries which have accepted Roman principles of jurisprudence (jus sanguinis). The conflict is usually solved for practical purposes by an understanding which is approximately general, namely that, in cases not pro- vided for by treaty, no state shall protect those whom it claims as its nationals while residing in the territory of another state which claims them as its own nationals by any title, whether jus soli, jus sanguinis, naturalization, or the refusal to allow expatriation. On this footing the British foreign office, while it grants passports for travel to naturalized persons, will extend no protection to them

against a claim of their former country, if they return to it, to exact military service due to it. The United States, asserting that expatriation is an inalienable right of man, maintains that, to lose his right to American protection, the emigrant who has been naturalized in the United States must have done that for which he might have been tried and punished at the moment of his departure; it claims to protect him against the exaction of what at that moment was merely a future liability

1 Cf. Spencer, First Principles (1867), p. 398.

2 Cf. Prolegomena, § 60.

to military service, and this doctrine has been practically accepted by France in her dealings with America. Germany also accepted it by the treaty of 1868 between the United States and the North German Confederation, now in force for the German empire, subject to provisions that the emigrant's fixing his domicile in the old country shall be deemed a renunciation of his naturalization in the new, and that his living in the old country for more than two years may be deemed to imply the absence of an intention to return to the new. Between the United States and Great Britain the convention of the 13th of May 1870 provides that naturalization in either is to be valid for all purposes immediately on its completion, but that if the resident shall renew his residence in his old country he may be readmitted to his old nationality, on his application and on such conditions as the readmitting government may impose.

The Naturalization Act 1870, which now governs the matter for England, does not say that the person naturalized becomes thereby a British subject, to which, if it had been said, a proviso might have been added saving the above-mentioned policy of the foreign office as to not protecting him in his old country, although even without such a proviso the foreign office would have been free to follow that policy. The act in question (s. 7) gives him the rights and imposes on him the duties of a natural- born British subject in the United Kingdom, and provides that, when within the limits of his old country, he shall not be deemed a British subject unless he has ceased to be a subject of that country, by its laws or in pursuance of a treaty. On this wording it has been maintained that British naturalization is not really naturalization at all; but leaves the naturalized person as he was with the addition of a certain quality within the United Kingdom; and on that ground it has been considered in France that a Frenchman, obtaining naturalization in England, does not fall within the French law (Code Civil, Art. 17) which pronounces the expatriation of citizens

who cause themselves to be naturalized abroad. This is the Bourgoise Case, 41 Ch. D. 310, in which, when it came before the English courts, Mr Justice Kay inclined to the same view, but the court of appeal avoided giving an opinion on the point. Professor Dicey leans to the same view (5 Law Quarterly Review, 438) ; but Sir Thomas Barclay (4 L.Q.R. 226), Sir Malcolm Mcllwraith (6 L.Q.R. 379), and Prof essor West- lake (International Law — Peace, 2nd ed. p. 234; Private International Law, 4th ed. p. 356) adopt the view that the Naturaliza- tion Act 1870 makes the naturalized person a full British subject, only to be treated in his old country in accordance with the international principles recognized by the British executive. And the foreign office, by granting passports to naturalized persons, acts on the same view. The point is important with reference to the question whether the naturalization of the father in the United Kingdom confers the character of British subjects on his children afterwards born abroad. (See Alien.)

An analogous question arises on the provision in the Naturaliza- tion Act 1870, sec. 16, that the legislature of any British posses- sion may make laws ” for imparting to any person the privileges of naturalization, to be enjoyed by such person within the limits of such possession.” This, in accordance with the wider view of the effect of naturalization in the United Kingdom, may mean that naturalization in pursuance of a colonial law confers the full character of a British subject, only without removing disabilities, such as that to hold land, under which the naturalized person may have lain as an alien in any other British possession. On that footing the foreign office grants passports to the holders of colonial certificates of naturalization, and protects them in all foreign countries but that of their origin; and the Merchant Shipping Act 1894, sec. 1, allows persons naturalized in British possessions to be owners of British ships. On the other hand, those who maintain the narrower view of the effect of natural- ization in the United Kingdom naturally hold that colonial naturalization has no effect at all outside the British possession in which it is granted.

Naturalization in India is regulated by the British Indian Naturalization Act, No. 30 of 1852, under which it may be granted to subjects of the several princes and states in India

as well as to those who are entirely aliens to the British empire. The former, however, are treated for several purposes as British subjects

even without being so naturalized.

In most countries a lengthened sojourn is a condition precedent to naturalization. In Belgium, the United Kingdom, North America and Russia the period of such sojourn is fixed at five years, in France, Greece and Sweden at three, in the Argentine Republic two, while in Portugal a residence of one year is sufficient. In Germany, Austria and Italy no period of residence is prescribed, while in Austria a ten years' residence confers per se the rights of citizenship. In the United States an alien desiring to be naturalized must declare on oath his intention to become a citizen of the United States; two years afterwards must declare on oath his intention to support the constitution of the United States and renounce allegiance to every foreign power, including that of which he was before a subject; must prove residence in the United States for five years, and in the state where his application is made for one year, as a good citizen; and must renounce any title of nobility. In France an alien desiring naturalization, if he has not resided continuously in the country for ten years, must obtain permission to establish his domicile in France; three years after (in special cases one year) he is entitled to apply for naturalization, which involves the renunciation of any existing allegiance.

See further, Allegiance, International Law (Private) ; also Bar, Private International Law (Gillespie's translation); Hansard, Law relating to Aliens; Cutler, Law of Naturalization; Cockburn, Nationality; Cogordan, Nationalite; Heffter, Europaisches Volker- recht; Hall, Foreign Jurisdiction of the British Crown; Westlake, International Law — Peace, and Private International Law (4th ed.).

(Jno. W.)

NAUARCHIA (Gr. vavs, ship, apxfi, command), the supreme command of the Spartan navy. The office was an annual one and could not be held more than once by the same man (Xen. Hell. ii. 1. 7). This law might be evaded in special cases; the new admiral might not be sent to take over the command until some time after his election, which took place at midsummer (Beloch in PhUologus, xliii. p. 272 sqq.), and meanwhile his pre decessor remained de facto admiral; or the retiring admiral might, after the expiry of his term, hold an appointment as secretary (ewicToXeus) to one who, though titular admiral, was really placed under his orders or even kept at Sparta alto- gether. Being independent of the kings and hampered by no colleague, the nauarch wielded such power that Aristotle is hardly going too far when he says (Politics, ii. 9. 22), 17 vavapxla ox&bv trkpa fiaoiKda KadkcfTijKev. He was subject only to the ephors, who,

if he proved incompetent, could depose him (Thuc. viii. 39), though they usually preferred to send out an advisory committee (aijUjSoiAoi). An admiral might appoint his ewLCToXtiis to command a portion, or even the whole, of the fleet, and if the former died in office the secretary succeeded to his post.

For a detailed discussion see J. Beloch, ” Die Nauarchie in Sparta,” in the Rheinisches Museum, xxxiv. (1879) 117-130, where a complete list of nauarchs known to us will be found; regarding the time of the election this is corrected by a later article of the same writer {PhUologus, loc. cit.). See also A. Solari, Ricerche Spartane (Livorno, 1907), 1-58; G. Busolt, ” Staats- und Rechtsaltertiimer ” (Iwan Miiller’s Handbuch der klassischen Altertumswissenschaft, iv.), § 96; G. E. Underfill’s edition of Xenophon, Hellenica. i., ii., note on i. 5. 1. (M. N. T.)

NAUCK, JOHANN AUGUST (1822-1892), German classical scholar and critic, was born at Auerstadt in Prussian Saxony on the 18th of September 1822. After having studied at Halle and held educational posts in Berlin, he migrated in 1859 to St Petersburg, where he was professor of Greek at the imperial historico-philological institute (1869-1883). He died on the 3rd of August 1892. Nauck was one of the most distinguished textual critics of his day, although, like P. H. Peerlkamp, he was fond of altering a text in accordance with what he thought the author must, or ought to, have written.

The most important of his writings, all of which deal with Greek language and literature (especially the tragedians) are the following: Euripides, Tragedies and Fragments (1854, 3rd ed., 1871); Studia Euripidea (1859-1862); Tragicorum Graecorum Fragmenta (1856, last ed., 1889), his chief work; Index to the Fragments (1892); text of Sophocles (1867) : revised edition of Schneidewin’s annotated

Sophocles (1856, &c); texts of Homer, Odysse) 1 (1874} and Iliad (1877-1879); the fragments of Aristophanes of Byzantium (1848), still indispensable; Porphyrius of Tyre (i860, 2nd ed., 1886); Iamblichus, De Vita Pythagorica (1884) ; Lexikon Vindobonense (1867), a meagre compilation of the 14th or 15th century. See memoir by T. Zielinski, in Bursian’s Biographisches Jahrbuch (1894), and J. E. Sandys, History of Classical Scholarship, iii. (1908), pp. 149-152.

NAUCRARY, a subdivision of the people of Attica, which was certainly among the most primitive in the Athenian state. The word is derived either (1) from vavs (a ship) and describes the duty imposed upon each naucrary, of providing one ship and two (or, more probably, ten)

horsemen; or (2) from valuv (to dwell), in which case it has to do with a householder census. The former is generally accepted in view of the fact that the naucraries were certainly the units on which the Athenian fleet was based. The view once held (on the strength of a fragment of Aristotle, quoted carelessly by Photius) that the naucrary was invented by Solon may now be regarded as obsolete (see the Aristotelian Constitution, viii. 3). Each of the four Ionian tribes was divided into three trittyes (" thirds "), each of which was subdivided into four naucraries; there were thus 48 naucraries. The ea-rliest mention of them is in Herodotus (v. 71), where it is stated that the Cy Ionian conspiracy was put down by the " Prytaneis (chief men) of the Naucraries." Although it is generally recognized that in this passage we can trace an attempt to shift the responsibility for the murder of the suppliants from the archon Megacles, it is highly improbable that the Prytaneis of the Naucraries did not play a part in the tragedy. Thucydides is probably right, as against Herodotus, in asserting that the nine archons formed the Athenian executive at this period. It may be conjectured, however, that the military forces of Athens were organized on the basis of the naucraries, and that it was the duty of the presidents of these districts to raise the local levies. It is certainly remarkable that the Aristotelian Constitution of Athens does not connect the naucrary with the fleet or the army; from chapter viii. it would appear that its importance was chiefly in connexion with finance (apxv Terayixevr] Tpos re rdj eio-Qopas ko.1 rds 8a.Ta.vas). The naucrary consisted of a number of villages, and was, therefore, a local unit very much in the power of the naucraros, who was selected by reason of wealth. The naucraros superintended the construction of, and afterwards captained, the ship, and also assessed and administered the taxes in his own area. In the reforms of Cleisthenes, the naucraries gave place to the demes as the political unit. In accordance with the new decimal system, their number was increased to fifty. Whether they continued (and if so, how long) to supply one ship and two J (or ten) horsemen each is not certainly known. Cheidemus in Photius asserts that they did, and his statement is to a certain extent corroborated by Herodotus (vi. 89) who records that, in the Aeginetan War before the Persian Invasion, the Athenian fleet numbered only fifty sail.

See Photius (s.v.), who is clearly using the Ath. Pol. (he quotes from it the last part of his article totidem verbis) ; Schomann, Antiq, (p. 326, Eng. trans.) — quoted by J. E. Sandys (Ath. Pol. viii., 13)— "refutes Gilbert, Greek Constitutional Antiquities (Eng. trans., 1895), and in Jahrb. Class. Phil. cxi. (1875) PP 9 seq. ; A. H. J. Greenidge, Handbook of Greek Const. Hist. p. 134; history of Greece in general ;

for derivation of name, G. Meyer, Curtius' Studien (vii. !75). where Wecklein is refuted. (J. M. M.)

NAUCRATIS, an ancient Greek settlement in Egypt. The site was discovered by Professor W. M. Flinders Petrie in 1884, on the eastern bank of a canal, about 10 m. W. of the present Rosetta branch of the Nile. In ancient times it was approached by the Canopic mouth, which was farther to the west. The identification of the site is placed beyond doubt by the discovery of inscriptions, with the name of the town, and of great masses of early Greek pottery, such as could not have existed anywhere else. The site was excavated in 1 884-1 886 by the Egypt Ex- ploration Fund, and a supplementary excavation was made by the British School at Athens in 1899. A list of the temples of Naucratis is given by Herodotus (ii. 178); they were the Hellenion, common to all the colonizing cities, and those dedicated 1 See footnote to Cleisthenes (i), ad fin.

by the Aeginetans to Zeus, by the Samians to Hera, and by the Milesians to Apollo. A temple of Aphrodite is also mentioned by Athenaeus. Traces of all these temples, except that of Zeus, or at least dedications coming from them, have been found in the excavations, and another has been added to them, the temple of the Dioscuri. The two chief sites to be cleared were the temples of Apollo and of Aphrodite, in both of which succes- sive buildings of various date were found. Both were remarkable for the great mass of early painted pottery that was found; in the temple of Apollo this had been buried in a trench; in that of Aphrodite it was scattered over the whole surface in two distinct strata. A great deal of it was local ware, but there were also imported vases from various Greek sites. In addition to these temples, there was also found a great fortified enclosure, about 860 ft. by 750, in the south-eastern part of the town; within it was a square tower or fort; a portico of entrance and an avenue of rows of sphinxes was added in Ptolemaic times, as is shown by the foundation deposits found at the corners of the portico ; these consisted of models of the tools and materials used in the buildings, models of instruments for sacrifice or ceremonies, and cartouches of King Ptolemy Philadelphus. Professor Petrie naturally supposed this great enclosure to be the Hellenion or common sanctuary of the Greeks, but Mr. Hogarth subsequently found traces of another great walled enclosure to the north-east of the town, together with pottery dedicated roh tG > v'EXMivui > 0€oij, and he claims with reason that this enclosure

is more likely than the other to be the Hellenion, since no early Greek antiquities have been found in the southern part of the town, which seems rather to have been a native settlement. The cemetery of the ancient town was found on two low mounds to the north, but was mostly of Ptolemaic date.

Apart from the historic interest of the site, as the only Greek colony in Egypt in early times, the chief importance of the excavations lies in the rich finds of early pottery and in the inscriptions upon them, which throw light on the early history of the alphabet. The most flourishing period of the town was from the accession of Amasis II. in 570 B.c to the Persian invasion of 520 B.C., when the contents of the temples must have been destroyed. The earlier chronology has been much disputed. There are clear traces of a settlement going back to the 7th century, including a scarab factory, which yielded numerous scarabs, not of native Egyptian manufacture, bearing the names of the kings that preceded Amasis. Among these were fragments of early Greek pottery. It seems a fair inference that the makers of these were Greeks, and that they probably represent the early Milesian colony, settled here in the time of Psammetichus I., before the official assignment of the site by Amasis to the Greek colonists of various cities. The most important of the antiquities found are now in the British Museum.

See W. M. F. Petrie, &c, Naukratis I., third Memoir of the Egypt Exploration Fund (1886); E. A. Gardner, &c, Naukratis II., sixth Memoir of same (1889); D. G. Hogarth, &c, Annual of the British School at Athens (1898-1899). (E. Gr.)

NAUD&, GABRIEL (1600-1653), French librarian and scholar, was born in Paris on the 2nd of February 1600. He studied medicine at Paris and Padua, and became physician to Louis XIII. In 1629 he became librarian to Cardinal Bagni at Rome, and on Bagni's death in 1641 librarian to Cardinal Barberini. At the desire of Richelieu he began a wearisome controversy with the Benedictines, denying Gerson's authorship of De Imitalione Christi. Richelieu intended to make Naud6 his librarian, and on his death Naude accepted a similar offer on the part of Mazarin, and for the next ten years devoted himself to bringing together from all parts of Europe the noble assemblage of books known as the Bibliotheque Mazarine. Mazarin's library was sold by the parlement of Paris during the troubles of the Fronde, and Queen Christina invited Naude to Stockholm. He was not happy in Sweden, and on Mazarin's appeal that he should re-form his scattered library Naude returned at once. But his health was broken, and he died on the journey at Abbe- ville on the 30th of July 1653.

The friend of Gui Patin, of Pierre

Gassendi and all the liberal thinkers of his time, Naud6 was no mere bookworm; his books show traces of the critical spirit which made him a worthy colleague of the humorists and scholars who prepared the way for the better known writers of the “siecle de Louis XIV.”

Including works edited by him, a list of ninety-two pieces is given in the Naudaeana. The chief are Le Marfore, ou discours contre les libelles (Paris, 1620), very rare, reprinted 1868; Instruction a la France sur la verite de Vhistoire des Freres\de la Roze-Croix (1623, 1624), displaying their impostures; Apologie pour tous les grands personnages faussement soupconnez de magie (1625, 1652, 1669, 1712), Pythagoras, Socrates, Thomas Aquinas and Solomon are among those defended; Advis pour dresser une bibliotheque (1627, 1644, 1676; translated by J. Evelyn, 1661), full of sound and liberal views on librarianship ; Addition a Vhistoire de Louys XI. (1630), this includes an account of the origin of printing; Bibliographia politica (Venice, 1633, &c. ; in French, 1642), a mere essay of no bibliographical value; De studio liberali syntagma (1632, 1654), a practical treatise found in most collections of directions for studies; De studio militari syntagma (1637), esteemed in its day; Considera- tions politiques sur les coups d’etat (Rome [Paris], 1639; first edition rare, augmented by Dumay, 1752), this contains an apology for the massacre of St Bartholomew; Biblioth. Cordesianae Catalogus (1643), classified; Jugement de tout ce qui a ete imprime contre le Card. Mazarin (164.9), Naude’s best work, and one of the ablest defences of Mazarin; it is written in the form of a dialogue between Saint- Ange and Mascurat, and is usually known under the name of the latter.

Authorities. — L. Jacob, G. Naudaei tumulus (1659); P. Halle, Elogium Naudaei (1661); Niceron, Memoires, vol. ix. ; L. Jacob, Traicte des plus belles bibliotheques (1644) ; Gui Patin, Leltres (1846) ; Naudaeana et Patiniana (1703); Sainte-Beuve, Portraits Litt. vol. ii. ; A. Franklin, Histoire de la Bibl. Mazarine (i860).

NAUGATUCK, a township and borough of New Haven county, Connecticut, U.S.A., on the Naugatuck river, 5 m. S. of Waterbury, with an area of 17 sq. m. in 1906. Pop. (1890) 6218, (1900) 10,541, of whom 3432 were foreign-born, (1910 census) 12,722. It is served by the New York, New Haven & Hartford railroad and by interurban electric railways. Among the principal public buildings are the Whittemore Memorial Public Library (1892), a fine high school and the large Salem school (part of the public school system), all given to the borough by John Howard Whittemore of Naugatuck, who in

addition endowed the library and the high school. The river furnishes water-power. Among the manufactures are rubber goods, chemicals, iron castings, woollen goods, cutlery, &c. The value of the factory products increased from $8,886,676 in 1900 to $11,009,573 in 1905, or 23-9%. The prominence of the rubber industry here is due to Charles Goodyear (q.v.), who in 182 1 entered into partnership with his father Amasa Goodyear for the manufacture of hardware. Vulcanized rubber overshoes were first made in Naugatuck, and in 1843 the Goodyear's Metallic Rubber Shoe Company was established here. The township was formed from parts of Waterbury, Bethany and Oxford, and was incorporated in 1844; the borough was chartered in 1893; and the two were combined in 1895.

NAUHEIM, or Bad-Nauheim, a watering-place of Germany, in the grand-duchy of Hesse-Darmstadt, situated on the north- east slope of the Taunus Mountains, 24 m. by rail N. of Frankfort- on-Main on the main line of railway to Cassel. Pop. (1905) 5054. It has three Evangelical, a Roman Catholic and an English church. Its thermal waters (84 to 95 F.), although known for centuries, were, prior to 1835, only employed for the extraction of salt. They now yield about 2000 tons annually. The town has several parks, the largest being the Kurpark, 125 acres in extent, in which are the Kurhaus and the two chief springs. The waters, which are saline, strongly impregnated with carbonic acid, and to a less extent with iron, are principally used for bathing, and are specific in cases of gout and rheumatism, but especially for heart affections. Three smaller springs, situated outside the Kurpark, supply water for drinking. In 1899-1900 a new spring (saline) was tapped at a depth of 682 ft. Another attraction of the place is the Johannisberg, a hill 773 ft. high, immediately overlooking the town.

Nauheim, which was bestowed by Napoleon upon Marshal Davout, became a town in 1854. From 1815 to 1866 it belonged to the electorate of Hesse-Cassel, but in 1866 it was ceded to

the grand-duchy of Hesse-Darmstadt. It was the scene of fighting between the French and the Germans in 1762 and again in 1792.

See Grodel, Bad Nauheim, seine Kurmittel (gth ed., Friedberg, 1903); Credner, Die Kurmittel in Bad Nauheim (Leipzig, 1894); Bode, Bad Nauheim, seine Kurmittel und Erfolge (Wiesbaden, 1889) ; and Weber,

Die Park- und Waldanlagen vom Bad Nauheim (Nauheim,

1906).

NAULETTE, a large cavern on the left bank of the Lesse, which joins the Meuse above Dinant, Belgium. Here in 1866 Edouard Dupont discovered an imperfect human lower jaw, now in the Brussels Natural History Museum. It is of a very ape-like type in its extreme projection and that of the teeth sockets (teeth themselves lost), with canines very strong and large molars increasing in size backward. It was found associated with the remains of mammoth, rhinoceros and reindeer. The Naulette man is now assigned to the Mousterian Epoch.

See G. de Mortillet, Le Prehistorique (1900); E. Dupont, &ude sur lesfouilles scientifiques executees pendant I'hiver (1865-1866), p. 21.
NAUMACHIA, the Greek word denoting a naval battle (vaCs, ship, and paxy, battle) , used by the Romans as a term for a mimic sea-fight. These entertainments took place in the amphitheatre, which was flooded with water, or in specially constructed basins (also called naumachiae) . The first on record, representing an engagement between a Tyrian and an Egyptian fleet, was given by Julius Caesar (46 B.C.) on a lake which he constructed in the Campus Martius. In 2 B.C. Augustus, at the dedication of the temple of Mars Ultor, exhibited a naumachia between Athenians and Persians, in a basin probably in the horti Caesaris, where subsequently Titus gave a representation of a sea-fight between Corinth and Corcyra. In that given by Claudius (a.d. 52) on the lacus Fucinus, 19,000 men dressed as Rhodians and Sicilians manoeuvred and fought. The crews consisted of gladiators and condemned criminals; in later times, even of volunteers.

See L. Friedlander in J. Marquardt, Romische Staatsverwaltung, iii. (1885) p. 558.

NAUMACHIUS, a Greek gnomic poet. Of his poems 73 hexameters (in three fragments) are preserved by Stobaeus in his Florilegium; they deal mainly with the duty of a good wife. From the remarks on celibacy and the allusion to a mystic marriage it has been conjectured that the author was a Christian. The fragments, translated anonymously into English under the title of Advice to the Fair Sex (1736), are in Gaisford's Poetae minores Graeci, iii. (1823).

NAUMANN, GEORG AMADEUS CARL FRIEDRICH (1707- 1873), German mineralogist and geologist, was born at Dresden on the 30th of May 1797, the son of a distinguished musician and composer. He received his early education at Pforta, studied at Freiberg under

Werner, and afterwards at Leipzig and Jena. He graduated at Jena, and was occupied in 1823 in teaching in that town and in 1824 at Leipzig. In 1826 he succeeded Mohs as professor of crystallography, in 1835 he became professor also of geognosy at Freiberg; and in 1842 he was appointed professor of mineralogy and geognosy in the university of Leipzig. At Freiberg he was charged with the preparation of a geological map of Saxony, which he carried out with the aid of Bernhard von Cotta in 1846. He was a man- of encyclopaedic knowledge, lucid and fluent as a teacher. Early in life (1821-1822) he travelled in Norway, and his observations on that country, and his subsequent publications on crystallography, mineralogy and geology established his reputation. He was awarded the Wollaston Medal by the Geological Society of London in 1868. He died at Leipzig on the 26th of November 1873.

He published Beitrdge zur Kenntniss Norwegens (2 vols., 1824) ; Lehrbuch der Mineralogie (1828); Lehrbuch der reinen und ange- wandten Kryslallographie (2 vols, and atlas, 1830); Elemente der Mineralogie (1846; ed. 9, 1874; the 10th ed. ‘by F. Zirkel, 1877); Lehrbuch der Geognosie (2 vols, and atlas, 1849-1854, ed. 2, 1858-

1872).

NAUMBURG, a town of Germany, in the province of Prussian Saxony, the seat of the provincial law courts and court of appeal for the province and the neighbouring districts. It is situated on the Saale, near its junction with the Unstrut, in the centre of an amphitheatre of vine-clad hills, 29 m. S.W. from Halle, on the railway to Weimar and Erfurt. Pop. (1905) 25,137.

The cathedral, an imposing building in the Romanesque Transi- tion style (1207-1242), has a Gothic choir at each end, and contains some interesting medieval sculptures. It is remarkable for its large crypt and its towers, a fourth having been added in 1894, the gift of the emperor William II. There are also four other Protestant churches (of which the town church, dedicated to St Wenceslaus and restored in 1892-1894, possesses two pictures by Lucas Cranach the elder), a Roman Catholic church, a gymnasium, a modern school, an orphanage and three hospitals. A curious feature of the town is the custom, which has not yet died out, of labelling the houses with signs, such as the ” swan,” the ” leopard ” and the ” lion.” The industries of the place mainly consist in the manufacture of cotton and woollen fabrics, chemicals, combs, beer, vinegar and leather. On the hills to the north of the town, across the Unstrut, lies Schenkel- burg, once the residence of the poet Gellert, and noticeable for the grotesque carvings in the

sandstone rocks.

In the 10th century Naumburg was a stronghold of the mar- graves of Meissen, who in 1029 transferred to it the bishopric of Zeitz. In the history of Saxony it is memorable as the scene of various treaties; and in 1561 an assembly of Protestant princes was held there, which made a futile attempt to cement the doctrinal dissensions of the Protestants. In 1 564 the last bishop died, and the bishopric fell to the elector of Saxony. In 1631 the town was taken by Tilly, and in 1632 by Gustavus Adolphus. It became Prussian in 1814. An annual festival, with a procession of children, which is still held, is referred to an apocryphal siege of the town by the Hussites in 1432, but is probably con- nected with an incident in the brothers' war (1447-51), between the elector Frederick II. of Saxony and his brother Duke William. Karl Peter Lepsius (1775-1853), the antiquary and his more distinguished son Richard the Egyptologist, were born at Naumburg.

See E. Borkowsky, Die Geschichte der Stadt Naumburg an der Saale (Stuttgart, 1897) ; E. Hoffmann, Naumburg an der Saale im Zeitalter der Reformation (Leipzig, 1900); S. Braun, Naumburger Annalen vom Jahre jqq bis 1613 (Naumburg, 1892); Puttrich, Naumburg an der Saale, sein Dom und andre altertiimliche. Bauwerke (Leipzig, 1841-1843); and Wispel, Entwickelungsgeschichte der Stadt Naumburg an der Saale (Naumburg, 1903).

NAUNTON, SIR ROBERT (1563-1635), English politician, the son of Henry Naunton of Alderton, Suffolk, was educated at Trinity College, Cambridge, becoming a fellow of his college in 1585 and public orator of the university in 1594. Walter Devereux, earl of Essex, enabled him to spend some time abroad, sending information about European affairs. Having returned to England, he entered parliament in 1606 as member for Helston, and he sat in the five succeeding parliaments; in 1614 he was knighted, in 1616 he became master of requests and later surveyor of the court of wards. In 1618 his friend Buckingham procured for him the position of secretary of state. Naunton's strong Protestant opinions led him to favour more active inter- vention by England in the interests of Frederick V., and more vigorous application of the laws against Roman Catholics. Gondomar, the Spanish ambassador, complained to James, who censured his secretary. Consequently in 1623 Naunton resigned and was made master of the court of wards. He died at Lether- ingham, Suffolk, on the 27th of March 1635. Naunton's valuable account of Queen Elizabeth's reign was still in manuscript when he died. As Fragmenta regalia, written by Sir Robert Naunton, it was printed in 1641 and again in 1642, a revised edition, Fragmenta Regalia, or Observations

on the late Queen Elizabeth, her Times and Favourites, being issued in 1653. It was again published in 1824, and an edition edited by A. Arber was brought out in 187c. It has also been printed in several collections and has been translated into French and Italian. There are several manuscript copies extant, and some of Naunton's letters are in the British Museum and in other collections.

See Memoirs of Sir Robert Naunton (1814).

NAUPACTUS (Ital. Lepanlo, mod. Gr. Epaklo), a town in the nomarchy of Acarnania and Aetolia, Greece, situated on a bay on the north side of the straits of Lepanto. The harbour, once the best on the northern coast of the Corinthian Gulf, is now

almost entirely choked up, and is accessible only to the smallest craft. Naupactus is an episcopal see; pop. about 2500. In Greek legend it appears as the place where the Heraclidae built a fleet to invade Peloponnesus. In historical times it belonged to the Ozolian Locrians; but about 455 B.C., in spite of a partial resettlement with Locrians of Opus, it fell to the Athenians, who peopled it with Messenian refugees and made it their chief naval station in western Greece during the Peloponnesian war. In 404 it was restored to the Locrians, who subsequently lost it to the Achaeans, but recovered it through Epaminondas. Philip II. of Macedon gave Naupactus to the Aetolians, who held it till 191, when after an obstinate siege it was surrendered to the Romans. It was still flourishing about a.d. 170, but in Justinian's reign was destroyed by an earthquake. In the middle ages it fell into the hands of the Venetians, who fortified it so strongly that in 1477 it successfully resisted a four months' siege by a Turkish army thirty thousand strong; in 1499, however, it was taken by Bayezid II. The mouth of the Gulf of Lepanto was the scene of the great sea fight in which the naval power of Turkey was for the time being destroyed by the united papal, Spanish and Venetian forces (October 7, 1571). See Lepanto, Battle or. In 1678 it was recaptured by the Venetians, but was again restored in 1699, by the treaty of Karlowitz to the Turks; in the war of independence it finally became Greek once more (March 1829).

See Strabo ix. pp. 426-427; Pausanias x. 38. 10-13; Thucydides i.-iii. passim; Livy. bk. xxxvi. passim; E. L. Hicks and G. F. Hill, Creek Historical Inscriptions (Oxford, 1901), No. 25.

NAUPLIA, a town in the Peloponnesus, at the head of the Argolic Gulf. In the classical period it was a place of no import- ance, and when Pausanias lived, about a.d. 150, it was deserted. At a very early time, however, it seems to have been of greater note, being the seaport of the plain in which Argos and Mycenae are situated, and several tombs of the Mycenaean age have been found. A hero Nauplius took part in the Argonautic expedition; another was king of Euboea. The mythic importance of the town revived in the middle ages, when it became one of the chief cities of the Morea. It was captured in 1 2 11 by Godfrey Villehardouin with the help of Venetian ships; a French dynasty ruled in it for some time, and established the feudal system in the country. In 1388 the Venetians bought Argos and Nauplia. In the wars between Venice and the Turks it often changed masters. It was given to the Turks at the peace concluded in 1540; it was recaptured by Venice in 1686, and Palamidhi on the hill overhanging the town was made a great fortress. In 171 5 it was taken by the Turks; in 1770 the Russians occupied it for a short time. The Greeks captured it during the War of Independence on the 1 2th of December 1822, and it was the seat of the Greek administration till 1833, when Athens became the capital of the country. It is the chief town of the department of Argolis (pop. in 1907, 81,943). Pop. about 6000.

NAUSEA (from Gr. vavs, a ship), sea-sickness, or generally any disposition to vomit; also used figuratively to denote feelings of strong aversion or dislike.

NAUSICAA, in Greek legend, daughter of Alcinous, king of the Phaeacians in the island of Scheria (Odyssey, vi. 15-315, viii. 457.) When Odysseus (Ulysses) was swept into the sea from the raft on which he had left the home of Calypso, he swam ashore to Scheria, where he fell asleep on the bank of a river. Here he was found by Nausicaa,' who supplied him with clothes and took him to her father's palace, where he was hospitably entertained. She is said to have become the wife of Telemachus. The incident of Odysseus and Nausicaa formed the subject of a lost play by Sophocles and was frequently represented in ancient art.

NAUTCH (Hindostani nach), an Indian ballet-dance. The nautch is performed by nautch-girls, who move their feet but little, and the dance consists of swaying the body and posturing with the arms.

NAUTILUS. The term nautilus, meaning simply " the sailor," was applied by the ancient Greeks to the genus of eight-armed cuttlefishes or octopods which is now known as the paper nautilus, ancf whose scientific name is Argonauta (see Cephalopoda).

This animal is not uncommon in the Mediterranean, and from its habit of floating at the surface attracted the attention of the fishermen and sailors of the Aegean Sea from the earliest times. The popular belief that the expanded arms are raised above the water to act as sails and that the other arms are used as oars was not based on any actual observation of the living animal, and it is now known that although the animal floats at the surface it does not sail, the expanded arms being applied to the exterior surface of the shell, which is secreted by them. The eggs are carried in the shell, and as this structure is entirely absent in the males, there is good reason to conclude that the habit of carrying the eggs and using one pair of arms for that purpose gave rise to the modification of those arms and the secretion of the shell by them. Huxley once expressed the truth of the matter with characteristic felicity in the remark that if the shell of the Argonaut is to be compared to anything of human invention or construction at all, it should be compared, not to a ship or boat, but to a perambulator.

The shell of Argonauta (see fig. 1) is spirally coiled and sym- metrical, and thus bears a remarkable resemblance to the shell of the pearly nautilus and the extinct ammonites, especially

Fig. 1. — The Argonaut in life. (After Lacaze-Duthiers.)

Tr, Float; Br. a, ventral or posterior arms; Br.p, dorsal or anterior arms; V, the expanded portion of them, once called the sails; B, the beak; C, the shell; En, the funnel.

as it is like that of the pearly nautilus coiled towards the dorsal or anterior surface of the animal. It is ornamented by ridges and furrows which pass in transverse curves from the inner to the outer margin of the coils. The outer margin or keel is some- what flattened and the whole shell is compressed from side to side. It differs entirely from the shell of the pearly nautilus in the absence of internal septa and siphuncle and in the absence of any attachment between it and the body. It is in fact entirely different in origin and relations to the body from the typical molluscan shell secreted by the mantle in other Cephalopods and other types of Mollusca. It is a structure sui generis, unique in the whole phylum of Mollusca.

The only description of the living animal by a competent observer which we have is that of Lacaze Duthiers, made on a single specimen on the Mediterranean coast of France, and pub- lished in 1892, and even this is in some respects incomplete. The specimen after capture was carried in a bucket, and became separated from its shell. When placed with the shell in a large aquarium tank the animal resumed

possession of the shell and assumed the attitude shown in fig. 1. The shell floated at the surface, doubtless in consequence of the inclusion of some air in the cavity of the shell. It is not known with certainty that the animal is able in its natural state to descend below the surface; the specimen here considered never did so of its own accord, and when pushed down always rose again.

The siphon or funnel is unusually large and prominent, and is the chief or only organ of locomotion, the water which is expelled from it driving the animal backwards. The arms are usually turned backwards and carried inside the shell, to the inner surface of which the suckers adhere, but one or two arms are from time to time extended in front. This does not apply to the dorsal arms which are applied to the outside of the shell, and the expanded membrane of these arms covers the greater part of its surface. The dorsal arms are turned backwards, and each is twisted so that the oral surfaces face each other and the suckers are in contact with the shell. The membrane or velum is thin, and is really a great expansion of a dorsal membrane similar to that which is found along the median dorsal line of the two posterior arms. The suckers of the originally posterior series of each dorsal arm lie along the external border of the shell, and the arm with its two rows of suckers extends round the whole border of the membrane, the arm being curved into a complete loop, so that its extremity reaches almost to the origin of the membrane near the base of the arm, the extremity being continued on to the internal surface of the membrane. The external row of suckers, originally the posterior row, are united by membrane which is con- tinuous with the velum. The smaller suckers on the more distal part of the arm, which extends along the edge of the shell-aperture, are quite sessile. In the figure of Lacaze-Duthiers (fig. i) the suckers appear to be turned away from the shell, but this is erroneous. A figure showing the natural position is given in the Monograph of the Cephalopoda in the series of Monographs issued by the Zoological Station of Naples.

The animal described by Lacaze-Duthiers lived a fortnight in captivity, during which time it devoured with avidity small fishes which were presented to it, seizing them, not by throwing out all the ventral arms, but by means of the suckers near the mouth.

Judging from these observations, Argonauta is a pelagic animal which lives and feeds near the surface of the ocean. Several species of

Argonauta are known, distributed in the tropical parts of all the great oceans. The male is much smaller than the female, not exceeding an inch or so in length. It secretes no shell and its dorsal arms are not modified. The third arm on the left side, however, is modified in another way in connexion with reproduction.

Argonauta is one of the Cephalopods in which the process known as - hectocotylization of one arm is developed to its extreme degree, the arm affected becoming ultimately detached and left by the male in the mantle cavity of the female where it retains for some time its life and power of movement. The hectocotylus or copulatory arm in the Argonaut is developed at first in a closed cyst (fig. 2), which

Fig. 2. — a, Male of Argonauta argo, with the hectocotylized arm still contained in its enveloping cyst, four times enlarged (after H. Miiller). b, Hectocotylus of Tremoclopus violaceus (after Kolliker).

afterwards bursts, allowing the arm to uncoil; the remains of the cyst form a sac on the back of the arm which serves to contain the spermatophores.

The animal known as the Pearly Nautilus was unknown to the ancient Greeks, since its habitat is the seas of the far East, but in the middle ages, when its shell became known in Europe, it was called, from its superficial similarity to that of the original nautilus, by the same name. It was Linnaeus who, in order to distinguish the two animals, took the name ” nautilus ” from the animal to which it originally belonged and bestowed it upon the very different East Indian Mollusc, giving to the original nautilus the new name Argonauta. Zoological nomenclature dates from Linnaeus, and thus the nautilus is now the name of the

only living genus of Tetrabranchiate Cephalopods. A detailed description of this animal is given in the article Cephalopoda (q.v.); it is only necessary to add here a brief account of its mode of life and habits.

Four species are known from the Indian and Pacific oceans ; they are gregarious and nocturnal animals living at some depth and apparently always on the bottom. The natural attitude of the animal as represented by Dr Willey is with the oral surface down- wards, the tentacles spread out, and the shell vertical. The chambers of the shell have no communication with one another nor with the siphuncle, they are air-tight cavities and filled, not with water, but with a nitrogenous gas. This necessarily very much reduces the specific gravity of the

animal, but it is still heavier than the water and does not seem capable of rising to the surface any more than an octopus. Nautilus is rather abundant at some localities in the East Indian Archipelago, for example at Amboyna in the Moluccas. In 1901-1902 Dr Arthur Willey of Cambridge University spent some time in that region for the purpose of investigating the reproduction and development of the animal. He stationed himself at New Britain, known to the Germans as Neu Pommern, an island of the Bismarck Archipelago off the coast of Papua. The natives of this island use the nautilus for food, capturing them by means of a large fish-trap similar in construction to the cylindrical lobster-traps used by British fishermen. Fish is used for bait. Dr Willey found the males much more numerous than the females; of fifteen specimens captured on one occasion only two were females. He kept specimens alive both in vessels on shore and in large baskets moored at the bottom of the sea. He found that when they were placed in a vessel of sea water numbers of a small parasitic Crustacea issued from the mantle cavity. Some of the females laid eggs in captivity, but these were found not to be fertilized; they were about 3-5 centi- metres long and attached singly by a broad base to the sides of the cage in which the animals were confined.

Literature. — Lacaze-Duthiers,“Observationd’unargonautedela Mechterranee,” Arch. tool, exper. x. (1902), p. 1892. Cephalopoda, by Jalta ; Fauna und Flora des Golfes von Neapel, monographs issued by the Zoological Station of Naples. Bashford Dean, ” Notes on Living Nautilus,” Amer. Natur. xxxv. (1901). A. Willey, Contribution to the Natural History of the Pearly Nautilus; A. Willey’s Zoological Results, pt. vi. (1902). (J. T. C.)

NAUVOO, a city of Hancock county, Illinois, U.S.A., on the Mississippi river at the head of the lower rapids and about 50 m. aboveQuincy. Pop. (1900) 1321; (1910) 1020. On the opposite bank of the river is Montrose, Iowa (pop. in 1910, 708), served by the Chicago, Burlington & Quincy railway. Nauvoo is the seat of St Mary’s Academy and Spalding Institute (1907), two institutions of the Benedictine Sisters. ” Commerce City ” was laid out here in 1834 by Connecticut speculators; but the first settlement of importance was made by the Mormons (q.v.) in 1839-1840; they named it Nauvoo, 1 in obedience to a ” revelation ” made to Joseph Smith, and secured a city charter in 1840. Four years later its population was about 15,000, and a large Mormon temple had been built, but internal dissensions arose, “gentile ” hostility was aroused, the charter of Nauvoo was revoked in 1845, two of the leaders, Joseph Smith and his brother Hyrum, were killed at Carthage, the county-seat, by a mob, and in 1846 the sect was driven from the state. Traces of Mormonism, however, still

remain in the ruins of the temple and the names of several of the streets. Three years after the expulsion of the Mormons Nauvoo was occupied by the remnant (some 250) of a colony of French communists, the Icarians, who had come out under the leadership of Etienne Cabet (q.v.). For a few years the colony prospered, and by 1855 its membership had doubled. It was governed under a constitution, drafted by Cabet, which vested the legislative authority in a general assembly composed of all the males twenty years of age or over and the administrative authority in a board of six directors, three of whom were elected every six months for a term of one year. Each family occupied its own home, but property was held in common, all ate at the common table, and the children were taught in the community school. In December 1855 Cabet proposed a revision of the constitution to give him greater authority. This resulted in rending the colony into two irrecon- cilable factions, and in October 1856 Cabet with the minority (172) withdrew to St Louis, Mo., where he died on the 8th of November. In May 1858 the surviving members of his faction together with a few fresh arrivals from France established a new

1 The Mormons said the name was of Hebrew origin and meant ” beautiful place “; Hebrew ” naveh ” means ” pleasant.”

Icarian colony at Cheltenham near St Louis, but this survived only for a brief period. Nauvoo was never intended to be more than a temporary home for the Icarians. Soon after the schism of 1856 those who had rebelled against Cabet began to prepare a permanent home in Adams county, Iowa. There too in 1879 the community split into two factions, the Young Party and the Old Party. Some time before this separation a few members of the colony removed to the vicinity of Cloverdale, Sonoma county, California, and here most of the members of the Young Party joined them early in 1884 in forming the Icaria-Speranza Community. This society tried a government quite different from that first adopted at Nauvoo, but k ceased to exist after about three years. The Old Party also adopted a new constitu- tion, but it too was dissolved in 1895.

See Albert Shaw, Icaria: A Chapter in the History of Communism (New York, 1884); Jules Prudhommeaux, Icaria et son fondateur Etienne Cabet (Paris, 1907); and H. Lux, Etienne Cabet und der Ikarische Kornmunismus (Stuttgart, 1894).

NAVAHO, or Navajo, a tribe of North American Indians of Athabascan stock. They inhabit the northern part of Arizona and New Mexico. The majority live by breeding horses, sheep and goats. They are well known for their beautiful blanket weaving. (See Indians, North American.)

NAVAN, a market town of county Meath, Ireland, situated at the confluence of the Blackwater with the Boyne. Pop. (1901) 3839. It is a railway junction of some importance, where the Clonsilla and Kingscourt branch of the Midland Great Western railway crosses the Drogheda and Oldcastle branch of the Great Northern. By the former it is 30 m. N.W of Dublin. Navan is the principal town of county Meath (though Trim is the county town), and has considerable trade in corn and flour, some manu- facture of woollens and of agricultural implements, and a tannery. Navan was a barony of the palatinate of Meath, was walled and fortified, and was incorporated by charter of Edward IV. It suffered in the civil wars of 1641, and returned two members to the Irish parliament until the Union in 1800. It is governed by an urban district council, and is a favourite centre for rod-fishing for trout and salmon.

NAVARINO, BATTLE OF, fought on the 20th of October 1827, the decisive event which established the independence of Greece. By the treaty signed in London on the 6th of July 1827 (see Greece, History), England, France and Russia agreed to demand an armistice, as preliminary to a settlement. Sir Edward Codrington, then commander-in-chief in the Mediterranean, received the treaty and his instructions on the night of the ioth/i ith of August at Smyrna, and proceeded at once to Nauplia to communicate them to the Greeks. His instructions were to demand an armistice, to intercept all supplies coming to the Turkish forces in the Morea from Africa or Turkey in general, and to look for directions to Stratford Canning (Lord Stratford de Redcliffe), the British ambassador at Constantinople. The ambassador's instructions reached Codrington on the 7th of September. He was accompanied to Nauplia by his French colleague, Rear-Admiral de Rigny. The Greek government agreed to accept the armistice. Admiral de Rigny left for a cruise in the Levant, and Sir Edward Codrington, hearing that an Egyptian a mament was on its way from Alexandria, and believing thrt it was bound for Hydra, steered for that island, which he reached on the 3rd of September, but on the 12th of September found the Egyptians at anchor with a Turkish squadron at Navarino. The Turkish government refused to accept the armistice. On the 19th of September, seeing a movement among the Egyptian and Turkish ships in the bay, Codrington informed the Ottoman admiral, Tahir Pasha, that he had orders to prevent hostile movements against

the Greeks. Admiral de Rigny joined him immediately afterwards, and a joint note was sent by them on the 22nd of September to Ibrahim Pasha, who held the superior command for the sultan. On the 25th an interview took place, in which Ibrahim gave a verbal engagement not to act against the Greeks, pending orders from the sultan. The allies, who were in want of stores, now separated, Codrington going to Zante and de Rigny to Cervi, where his store ships were. Frigates

were left to watch Navarino. The British admiral had barely anchored at Zante before he was informed that the sultan's forces were putting to sea. On the 29th of September a Greek naval force, commanded by an English Philhellene, Captain Frank Abney Hastings, had destroyed some Turkish vessels in Salona Bay, on the north side of the Gulf of Corinth. From the 3rd to the 5th of October Codrington, who had with him only his flagship the " Asia " (84) and some smaller vessels, was engaged in turning back the Egyptian and Turkish vessels, a task in which he was aided by a violent gale. He resumed his watch off Navarino, and on the 13th was joined by de Rigny and the Russian rear-admiral Heiden with his squadron- By general agreement among the powers the command was entrusted to Codrington, and the allied force consisted of three British, four French and four Russian sail of the line, if the French admiral's flagship the " Sirene " (60), which was technic- ally " a double banked frigate," be included. There were four British, one French and four Russian frigates, and six British and French brigs and schooners. The Egyptians and Turks had only three line of battleships and fifteen large frigates, together with a swarm of small craft which raised their total number to eighty and upwards. Ibrahim Pasha, though unable to operate at sea, considered himself at liberty to carry on the war by land. His men were actively employed in burning the Greek villages, and reducing the inhabitants to slavery. The flames and smoke of the destroyed villages were clearly seen from the allied fleet. On the 17th of October, a joint letter of expostulation was sent in to Ibrahim Pasha, but was returned with the manifestly false answer that he had left Navarino, and that his officers did not know where he was. The admirals, therefore, decided to stand into the bay and anchor among the Egyptian and Turkish ships. A French officer in the Egyptian service, of the name of Letellier, had anchored the vessels of Ibrahim and the Turkish admiral in a horseshoe formation, of which the points touched the entrance to the bay, and there were forts on the lands at both sides of the entry. The allies entered in two lines — one formed of the French and British led byCodrington in the " Asia," the other of the Russians, — and began to anchor in the free water in the midst of Ibrahim's fleet. The officer commanding the British frigate " Dartmouth " (42), Captain Fellowes,

seeing a Turkish fireship close to windward of him, sent a boat with a demand that she should be removed. The Turks fired, killing Lieutenant G. W. H. Fitzroy, who brought the message, and several of the boat's crew. The " Dartmouth " then opened " a defensive fire," and the action became general at once. The allies, who were all closely engaged, were anchored among their enemies, and the result was obtained by their heavier broadsides and their better gunnery. Three-fourths of the Turkish and Egyptian vessels were sunk by the assailants, or fired by their own crews. On the allied side the British squadron lost 75 killed and 197 wounded; the French 43 killed and 183 wounded; the Russians 59 killed and 139 wounded. In the British squadron Captain Walter Bathurst of the " Genoa " (74) was slain. The loss of the Turks and Egyptians was never accurately reported, but it was certainly very great.

In its effects on the international situation Navarino may be reckoned one of the decisive battles of the world. It not only made the efforts of the Turks to suppress the Greek revolt hope- less, but it made a breach difficult to heal in the traditional friendship between Great Britain and Turkey, which had its effect during the critical period of the struggle between Mehemet Ali and the Porte (1831-1841). It precipitated the Russo- Turkish war of 1828-1829, and, by annihilating the Ottoman navy, weakened the resisting power of Turkey to Russia and later to Mehemet Ali.

See Memoir of Admiral Sir E. Codrington, by his daughter Lady Bourchier (London, 1873); Naval History of Great Britain, by W. James and Captain Chamier, vol. vi. (London, 1837). (D. H.)

NAVARRE (Span. Navarro), an inland province of northern Spain, and formerly a kingdom which included part of France. The province is bounded on the N. by France (Basses Pyrenees) and Guipuzcoa, E. by Huesca and Saragossa, S. by Saragossa

and Logrono and W. by Alava. It is traversed from east to west by the Pyrenees and the Cantabrian Mountains, and almost the whole of the province is overrun by the ramifications of these ranges. From Navarre there are only three practicable roads for carriages into France — those by the Puerta de Vera, the Puerta de Maya and Roncesvalles. The highest summit in the province is the Monte Adi (4931 ft.)- The chief river flowing towards the Atlantic is the Bidasoa, which rises

near the Puerta de Maya, and after flowing southwards through the valley of Baztan takes a north-easterly course, and for a short distance above its outfall at Fuenterrabia constitutes the frontier between France and Spain (Guipuzcoa); by far the larger portion of Navarre is drained to the Mediterranean through the Ebro, which flows along the western frontier and crosses the extreme south of the province. The hilly districts consist almost entirely of forest and pasture, the most common trees being the pine, beech, oak and chestnut. Much of the lower ground is well adapted for agriculture, and yields grain in abundance; the principal fruit grown is the apple, from which cider is made in some districts; hemp, flax and oil are also produced, and mulberries are cultivated for silkworms. The wine trade is active, and the products of the vineyards are in great demand in south-west France and at Passages in Guipuzcoa for mixing with French wines. Navarre is one of the richest provinces of Spain in live stock. Game, both large and small, is plentiful in the mountains, and the streams abound with trout and other fish. Gypsum, limestone, freestone and marble are quarried; there are also mines of copper, lead, iron, zinc and ro v k salt. Mineral and thermal springs are numerous, but none is of more than local fame. The other industries include manufactures of arms, paper, chocolate, candles, alcohol, leather, coarse linens and cloth. The exports both by rail and by the passes in the Pyrenees consist of live stock, oil, wine, wool, leather and paper. The Ebro Valley railway, which traverses southern Navarre and skirts the western frontier, sends out a branch line from Castejon to Pamplona and Alsasua junction, where it connects with the Northern railways from Madrid to France. Narrow- gauge railways convey timber and ore from the mountains to these main lines. Pamplona, the capital (pop., 1900, 28,886), and Tudela (9449) are described in separate articles. The only other towns with more than 5000 inhabitants are Baztan (9234), Corella (6793), Estella (5736) and Tafalla (5494).

History. — The kingdom of Navarre was formed out of a part of the territory occupied by the Vascones, i.e. the Basques and Gascons, who occupied the southern slope of the western Pyrenees and part of the shore of the Bay of Biscay. In the course of the 6th century there was a considerable emigration of Basques to the north of the Pyrenees. The cause is supposed to have been the pressure put upon them by the attacks of the Visigoth kings in Spain. Yet the Basques maintained their independence. The name of Navarre is derived by etymologists from ” nava ” a flat valley surrounded by hills (a commonplace name in Spain ; cf . Navas de Tolosa to the south of the Sierra Morena) and ” erri ” a region or country. It began to appear as the name of part of Vasconia towards the end of the Visigoth epoch in Spain in the 7th

century. Its early history is more than obscure. In recent times ingenious attempts have been made to trace the descent of the first historic king of Navarre from one Semen Lupus, duke of Aquitaine in the 6th century. The reader may consult La Vasconie by Jean de Jaurgain (Paris, 1898) for the latest example of this reconstruction of ancient history from fragmentary and dubious materials. Jaurgain has been subjected to very damag- ing criticism by L. Barrau-Dihigo {Revue Hispanique, t. vii. 141,' The first historic king of Navarre was Sancho Garcia, who ruled at Pamplona in the early years of the 10th century. Under him and his immediate successors Navarre reached the height of its power and its extension (see Spain: History, for the reign of Sancho el Mayor, and the establishment of the Navarrese line as kings of Castile and Leon, and of Aragon). When the kingdom was at its height it included all the modern province of the name; the northern slope of the western Pyrenees called by the Spaniards the " Ultra-puertos " or country beyond

the passes, and now known as French Navarre; the Basque provinces; the Bureba, the valley between the Basque Mountains and the Montes de Oca to the north of Burgos; the Rioja and Tarazona in the upper valley of the Ebro. In the 12th century the kings of Castile gradually annexed the Rioja and Alava. While Navarre was reunited to Aragon — 1076-1134 — (see Spain: History) it was saved from aggression on the east, but did not recover the territory taken by Castile. About the year 1200 Alfonso VIII. of Castile annexed the other two Basque provinces, Biscay (Vizcaya) and Guipuzcoa. Tarazona re- mained in possession of Aragon. After 1234 Navarre, though the crown was claimed by. the kings of Aragon, passed by marriage to a succession of French rulers. In 15 16 Spanish Navarre was finally annexed by Ferdinand the Catholic. French Navarre survived as an independent little kingdom till it was united to the crown of France by Henry IV. founder of the Bourbon dynasty. From 1510 until 1833, when it was'fully incorporated with Spain, Navarre was a viceroyalty.

As originally organized, Navarre was divided into Merindades, or districts, governed by a Merino (mayorino) as representative of the king. They were the Ultrapuertos (French Navarre), Pamplona, Estella, J udela, Sanguesa. In 1407 Olite was added. The Cortes of Navarre began with the king's council of churchmen and nobles. But in the course of the 14th century the burgesses were added. Their presence was due to the fact that the king had need of their co-operation to raise money by grants and aids. When fully con- stituted, the Cortes consisted of the churchmen, the nobles and the representatives of twenty-seven " good towns-' — that is to say, towns which had no feudal lord, and, therefore, held directly of the king. In the later stages

of its history the Cortes of Navarre included the representatives of thirty-eight towns. The independence of the burgesses was better secured in Navarre than in other parliaments of Spain by the constitutional rule which required the consent of a majority of each order to every act of the Cortes. Thus the burgesses could not be outvoted by the nobles and the Church. Even in the 1 8th century the Navarrese successfully resisted the attempt of the kings of the Bourbon dynasty to establish custom houses on the French frontier. Yet they were loyal to their Spanish sovereigns, and no part of the country offered a more determined or more skilful resistance to Napoleon. Navarre was much under clerical influence. This, and the resentment felt at the loss of their autonomy when they were incorporated with the rest of Spain in 1833, account for the strong support given by many Navarrese to the Carlist cause.

See Historic! Compendiada de Navarra by Don J. M. Yanguas, (San Sebastian, 1832).

NAVARRETE, JUAN FERNANDEZ (1526-1579), surnamed El Mudo (The Mute), Spanish painter of the Madrid school, was born at Logrono in 1526. An illness in infancy deprived him of his hearing, but at a very early age he began to express his wants by sketching objects with a piece of charcoal. He received his first instructions in art from Fray Vicente de Santo Domingo, a Hieronymite monk at Estella, and afterwards he visited Naples, Rome, Florence and Milan. According to the ordinary account he was for a considerable time the pupil of Titian at Venice. In 1568 Philip II. summoned him to Madrid with the title of king's painter and a salary, and employed him to execute pictures for the Escorial. The most celebrated of the works he there pro- duced are a "Nativity" (in which, as in the well-known work on the same subject by Correggio, the light emanates from the infant Saviour), a "Baptism of Christ" (now in the Madrid Picture Gallery), and " Abraham Receiving the Three Angels " (one of his last performances, dated 1576). He executed many other altarpieces, all characterized by boldness and freedom in design, and by the rich warm colouring which has acquired for him the surname of " the Spanish Titian." He died at Toledo in February

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NAVARRETE, MARTIN FERNANDEZ DE (1765-1844),

Spanish historian, was born at Abalos on the gth of November 1765, and entered the navy in 1780. He was engaged in the unsuccessful operations against Gibraltar in 1782, and afterwards in the

suppression of Algerine pirates. Ill-health compelled him for a time to withdraw from active service, but he devoted this forced leisure to historical research, and in 1789 he was appointed by the crown to examine the national archives relating to the maritime history of Spain. Rejoining the navy in 1793, he was present at the siege of Toulon, and afterwards received command of a frigate. From 1797 to 1808 he held in succession various

important posts in the ministry of marine. In 1808 the French invasion led to his withdrawal to Andalusia, and the rest of his life was entirely devoted to literature. In 1819 appeared, as an appendix to the Academy's edition of Don Quijote, his Vida de Cervantes, and in 1825 the first two volumes of the Coleccion de los Viajes y Descubrimientos que hicieron par Mar los Espanoles desde fines del Siglo XV. (3rd vol., 1829; 4th vol., 1837). In 1837 he was made a senator and director of the academy of history. At the time of his death, on the 8th of October 1844, he was assisting in the preparation of the Coleccion de Documents Ineditos para la Historia de Espana. His Disertacion sobre la Historia de la Nautica (1846) and Biblioteca Maritima Espanola (1851), were published posthumously.

NAVARRO, PEDRO (c. 1460-1528), Spanish military engineer and general, of obscure parentage, was born probably about 1460. He began life as a sailor; and was employed later as mozo de espuela, or running footman, by the Cardinal Juan de Aragon; on the death of his employer in 1485 he enlisted as a mercenary in a war between Florence and Genoa; and was sub- sequently engaged for some years in the warfare between the Genoese corsairs and the Mahommedans of Northern Africa. Navarro was not more scrupulous than others, for in 1499 he was at Civitavecchia, recovering from a gunshot wound in the hip received in a piratical attack on a Portuguese trading ship. When Gonsalvo de C6rdoba was sent to Sicily, to take part with the French in the partition of Naples, Navarro enlisted under him; and in the expulsion of the Turkish garrison from Cepha- lonia in 1500 he helped by laying mines to breach the walls, though not at first with much success. The Spanish commander gave him a captain's commission. During the campaigns of 1502 and 1503 he came to the front among the Spanish officers by the defence of Canosa and of Taranto, by his activity in partisan warfare on the French lines of communication, and by the part he took in winning the battle of Cerinola. But his great "reputation among the soldiers of the time was founded on the vigour

and success of his mining operations against the castles of Naples, held by French garrisons, in 1503, and he was undoubtedly recognized as the first military engineer of his age. When the French were expelled from Naples he received from Gonsalvo a grant of land and the title of count of Olivetto. In 1506 he was in Spain, and for several years he was employed in wars on the north coast of Africa. In 1508 he took Velez de Gomera, largely by means of a species of floating battery which he invented. In 1509 he accompanied Ximenez in the conquest of Oran, and did excellent service. Till 151 1 he continued in service in Africa, and took Bougie and Tripoli in 1510. The disasters at Gerba and Kerkenna did not materially affect his reputation. There was some talk of appointing him to command the army of the league formed against the French in 151 2; but his humble birth was thought to disqualify him. He was, however, sent as a subordinate general. At the battle of Ravenna he covered the orderly retreat of the Spanish foot, and was struck from his horse by a shot which failed to pierce his armour. Being taken prisoner by the French, he was sent to the Castle of Loches. Ferdinand, whom the soldiers called an Aragonese skinflint, would not pay his ransom, and after three years of imprisonment he entered the service of Francis I. in a pique. The rest of his life was spent as a French officer. He distin- guished himself in the passage of the Alps, at the battle of Marignano, by the taking of the citadel of Milan, and in the long siege of Brescia. He was at the battle of Pa via, and in 1522 was taken prisoner at Genoa by his own countrymen. He was confined at Naples till the peace of 1 526, but beyond the confisca- tion of his estate at Olivetto no punishment was inflicted for his treason. His last service was in the disastrous expedition of Lautrecto Naples in 1527, which was ruined by the plague. He died near the end of 1528.

A life of Navarro by Don Martin de los Heros, is published in the Documentos ineditos para la Historia de Espana, vol. xxv. (Madrid,

1854).

NAVE, ecclesiastically considered, that part of a church appropriated to the laity as distinguished from the chancel,

the choir or the presbytery, reserved for the clergy. In a 14th- century letter (quoted in Gasquet's Parish Life in Medieval England, 1906, p. 45) from a bishop of Coventry and Lichfield to one of his clergy, the reason for this appropriation is given. " Not only the decrees of the holy fathers but the approved existing customs of the Church order that the place in which the clerks sing and serve God according to their offices be divided by screens from that in which the laity

devoutly pray. In this way the nave of the church … is alone to be open to lay people, in order that, in the time of divine service, clerics be not mixed up with lay people, and more especially with women, nor have communication with them, for in this way devotion may be easily diminished.” The word ” nave ” has been generally derived from Lat. navis, ship. Du Cange (Glossariam, s.v. ” Navis “) quotes from the Chronicon Moriniacense, of the 1 2th century, as to the popular origin of the name, Exterius etiam tabernaculum, quod ecclesiae navis a populo vacatur …. Salmasius in his commentary on Solinus (1629) finds the origin in the resemblance of the vaulted roof to the keel of a ship, and refers to Sallust (Jugurtha, 18. 8) where is noticed a similar resemblance in the huts (mapalia) of the Numidians. The use of the word navis may, however, be due to the early adoption of the ” ship ” as a symbol of the church (see Skeat’s note on Piers Plowman, xl. 32). The Greek vabs, Attic ve&s (vaittv, to dwell), the inner shrine of a Greek temple, the cella, has also been suggested as the real origin of the word. This derivative must presume a latinized corruption into navis, for the early application of the word for ship to this part of a church building is undoubted. 1

Architecturally considered the nave is the central and principal part of a church, extending from the main front to the transepts, or to the choir or chancel in the absence of transepts. When the nave is flanked by aisles, light is admitted to the church through clerestory windows, some of the most ancient examples being the basilica at Bethlehem and the church of St Elias, at Thessalonica, both of the 5th century; numerous churches in Rome; and in the 6th century the two great basilicas at Ravenna; in all these cases the sills of the clerestory windows were raised sufficiently to allow of a sloping roof over the side aisles. When, however, a gallery was carried above the side aisles, another division was required, which is known as the triforium, and this subdivision was retained in the nave even when it formed a passage only in the thfckness of the wall. In Late Gothic work in England, the triforium was suppressed altogether to give more space for the clerestory windows, and roofs of low pitch were provided over the side aisles.

The longest nave in England is that of St Albans (300 ft.), in which there are thirteen nave arches or bays on each side; in Winchester (264 ft.) there are twelve bays; in Norwich (250ft.) fourteen; Peterborough (226 ft.) eleven; and Ely (203 ft.) twelve bays. Most of these dimensions are in excess of those of the French cathedrals; Bourges is 300 ft. long, but as there are no transepts this dimension includes nave and choir. Cluny was 230 ft. with eleven bays; Reims is 235 ft. with ten bays; Paris 170 ft. with ten bays; Amiens 160 with ten

bays; and St Ouen, Rouen, 200 ft. with ten bays. In Germany the nave of Cologne cathedral is only 190 ft., including the two bays between the towers. The cathedral at Seville in Spain is 200 ft. long, with only five bays. In Italy the cathedral at Milan is 270 ft. long with nine bays; at Florence, 250 ft. long with only four bays ; and St Peter's in Rome 300 ft. long with four bays. On the other hand, the vaults in the nave of the con- tinental cathedrals are far higher than those in England, that of Westminster Abbey being only 103 ft. high, whilst the choir of Beauvais is 150 ft. The result is that the_ naves of the English cathedrals not only are longer in actual dimensions, but appear much longer in consequence of their inferior height.

1 Vessels resembling boats or ships are familiar in medieval art and later. Thus " Incense-boats " (navettes) somewhat of this shape are found in 12th-century sculptures. By the 16th century they approximated still more closely to a model of a ship. A large vessel, also in the shape of a boat or ship, and known as a nef, was used at the table of princes and great personages to contain the knives, spoons, &c. Some very elaborate examples of these survive, such as the 15th-century nef of St Ursula in the treasure of the cathedral at Reims, and that of Charles V. of France in the Musee Cluny. A 16th-century nef, adapted for use as a cup, is in the Franks Collection at the British Museum. (See Drinking Vessels.)

NAVEL (O. Eng. nafela, a word common to Teutonic languages; cf. Ger. Nabel, Swed. nafvel; the Sanskrit is nabhila; the English root is also seen in " nave," the hub of a wheel), in anatomy, the umbilicus (Gr. 6ˆ0aX6s), the depression in 'the abdomen which indicates the point through which the embryo mammal obtained nourishment from its mother (see Anatomy: section Superficial and Artistic).

NAVIGATION (from Lat. navis, ship, and agere, to movel, the science or art of conducting a ship across the seas. The term is also popularly used by analogy of boats on rivers, &c, and of flying-machines or similar methods of locomotion. Navigation, as an art applied properly to ships, is technically used in the restricted sense dealt with below, and has therefore to be distinguished from " seamanship " (q.v.), or the general methods of rigging a ship (see Rigging), or the management of sails, rudder, &c.

History. The early history of the rise and progress of the art of naviga-

tion is very obscure, and it is more easy to trace the gradual advance of geographical knowledge by its means than the growth of the practical methods by which this advance was attained. Among Western nations before the introduction of the mariner's compass the only practical means of navigating ships was to keep in sight of land, or occasionally, for short distances, to direct the ship's course by referring it to the sun or stars; this very rough mode of procedure failed in cloudy weather, and even in short voyages in the Mediterranean in such circumstances the navigator generally became hopelessly bewildered as to his position.

Over the China Sea and Indian Ocean the steadiness in direc- tion of the monsoons was very soon observed, and by running directly before the wind vessels in those localities were able to traverse long distances out of sight of land in opposite directions at different seasons of the year, aided in some cases by a rough compass (q.v.). But it is surprising when we read of the progress made among the ancients in fixing positions on shore by practical astronomy that so many years should have passed without its application to solving exactly the same problems at sea, but this is probably to be explained by the difficulty of devising instruments for use on the unsteady platform of a ship, coupled with the lack of scientific education among those who would have to use them.

The association of commercial activity and nautical progress shown by the Portuguese in the early part of the 15th century marked an epoch of distinct progress in the methods of practical navigation, and initiated that steady improvement which in the 20th century has raised the art of navigation almost to the position of an exact science. Up to the time of the Portuguese exploring expeditions, sent out by Prince Henry, generally known as the " Navigator," which led to the discovery of the Azores in 1419, the rediscovery of the Cape Verde Islands in 1447 and of Sierra Leone in 1460, navigation had been conducted in the most rude, uncertain and dangerous manner it is possible to conceive. Many years had passed without the least improve- ment being introduced, except the application of the magnetic needle about the beginning of the 14th century (see Compass and Magnetism). Prince Henry did all in his power to bring together and systematize the knowledge then obtainable upon nautical affairs, and also established an observatory at Sagres (near Cape St Vincent) in order tc obtain more accurate tables of the declination of the sun. John II., who ascended the throne of Portugal in 1481, followed up the good work. He employed Roderick and Joseph, his physicians, with Martin de Bohemia, from Fayal, to act as a committee on navigation. They calcu- lated tables of the sun's declination, and

improved the astrolabe, recommending it as more convenient than the cross-staff. The Ordenanzas of the Spanish council of the Indies record the course of instruction prescribed at this time for pilots; it included the De Sphaera Mundi of Sacrobosco, the spherical triangles of Regiomontanus, the Almagest of Ptolemy, the use oi the astrolabe and its mechanism, the adjustments of instruments, cartography and the methods of observing the movements of heavenly bodies.

The then backward state of navigation is best understood from a sketch of the few rude appliances which the mariner had, and even these were only intended for the purpose of ascertaining the latitude. I he mystery of finding the longitude proved unfathomable for many years after the time of the Armada, and the very inaccurate knowledge existing of the positions of the heavenly bodies themselves full" justified the quaintly expressed advice given in a nautical work of repute at the time, where the writer observes, " Now there be some that are very inquisitive to have a way to get the longitude, but that is too tedious for seamen, since it requireth the deep knowledge of astronomy, wherefore I would not have any man think that the longitude is to be found at sea by any instrument ; so let no seamen trouble themselves with any such rule, but (according to their accustomed manner) let them keep a perfect account and reckoning ot the way of their ship." Such record of the " way of the ship " appears to have been then and for many years later recorded in chalk on a wooden board (log board), which folded like a book, and from which each day a position for the ship was deduced, or from which the more careful made abstracts into what was termed the journal."

A compass, a cross-staff or astrolabe, a fairly good table of the sun s declination, a correction for the altitude of the pole star, and occasionally a very incorrect chart formed all the appliances of a "a vigator in the time of Columbus. For a knowledge of the speed of the ship one of the earliest methods of actual measurement in use was by what was known as the " Dutchman's log," which consisted in throwing into the water, from the bows of the ship, something which would float, and noting the interval between its apparently drifting past two observers standing on the deck at a known distance apart. No other method is mentioned until 1577, when a line was attached to a small log of wood, which was thrown overboard, and the length measured which was carried over in a certain interval of time ; this interval of time was, we read, generally obtained by tha repetition of certain sentences, which were repeated twice if the ship were only moving slowly. It is unfortunate that the words of 'this ancient shibboleth are unknown. This is mentioned by Purchas as being in occasional use in 1607, but the more usual method (as we incidentally

see in the voyages of Columbus) was to estimate or guess the rate of progress. It was customary by one or other of these methods to determine the speed of a ship every two hours, ” royal ” ships and those with very careful captains doing so every hour. When a vessel had been on various courses during the two hours a record of the duration on each was usually kept by the helmsman on a traverse board, which consisted of a board having 32 radial lines drawn on it representing the points of the compass, with holes at various distances from the centre, into which pegs were inserted the mean or average course being that entered on the log board.

Some idea of the speed of ordinary ships in those days may be gathered from an observation in 155 1 of a “certain shipp which, without ever striking sail, arrived at Naples from Drepana, in Sicily in 37 hours ‘ (a distance of 200 m.) ; the writer accounting for such switt motion, which to the common sort of man seemeth incredible, by the fact of the occurrence of ” violent floods and outrageous winds.” In 1578 we find in Bourne’s Inventions and Uemces a description of a proposed patent log for recording a vessel’s speed, the idea (as far as we can gather from its vague description) being to register the revolutions of a wheel enclosed in a case towed astern of a ship (see Log).

Whether the property of the lodestone was independently dis- covered in Europe or introduced from the East, it does not appear to have been generally utilized in Europe earlier than about A.n. 1400 (see Compass). In Europe the card or ” flie ” appears to have been attached to the magnet from the first, and the whole suspended as now ingimbal-nngs within the ” bittacle,” or, as we now spell the word binnacle.” The direction of a ship’s head by compass was termed how she capes.” From the accounts extant of the stores supplied to ships in 1588, they appear to have usually had two compasses, costing 3s. 4d. each, which were kept in charge by the boatswain. The fact that the north point of a compass does not, in most places, point to the true pole but eastward or westward of it by an amount which is termed by sailors ” variation,” appears to have been noticed at an early date; but that the amount of variation varied in different localities appears to have been first observed by either Columbus or Cabot about 1490, and we find it used to be the practice to ascertain this error when at sea either from a bearing of the pole star, or by taking a mean of the compass bearings of the sun at both rising and setting, the deviation of the compass in the ships ot those days being too small a quantity to be generally noticed, though there is a very suggestive remark on the effect of moving the position of any iron placed near a compass, by a Captain Sturmy of Bristol in 1679. In order, partially to obviate the

error of the compass (variation), the magnets, which usually consisted of two steel wires joined at both ends and opened out in the middle, were not placed under the north and south line of the compass card, but with the ends about a point eastward of north and westward of south, the variation in London when first observed in 1580 being about 11° E •' the change of the variation year by year at the same base was first noted by Gelhbrand in 1635.

The " cross-staff " appears to have been used by astronomers at a very early period, and subsequently by seamen for measuring

a r .sr.g

),.,a,,,,i,i l 4i

Fig. 1.

altitudes at sea. It was one of the few instruments possessed by Columbus and Vasco da Gama. The old cross-staff, called by the Spaniards " ballestilla," consisted of two light battens. The part we may call the staff was about I J in. square and 36 in. long. The cross was made to fit closely and to slide upon the staff at right angles; its length was a little over 26 in., so as to allow the " pinules " or sights to be placed exactly 26 in. apart. A sight was also fixed on the end of the staff for the eye to look through so as to see both those on the cross and the objects whose distance apart was to be measured. It was made by describing the angles on a table, and laying the staff upon it (fig. 1). The scale of degrees was marked on the upper face. Afterwards shorter crosses were introduced, so that smaller angles

could be taken by the same instrument. These angles were marked on the sides of the staff.

-I" I To observe with

this instrument a meridian altitude of the sun the bearing was taken by com- pass, to ascertain when it was near the meridian ; then the end of the long staff was placed close to the observer's eye, and the transver- sary, or cross, moved until one end exactly touched the horizon, and the other the sun's centre. This was continued until the sun dipped, when the meridian altitude was obtained.

Another primitive instrument in common use at the beginning of the 16th century was the astrolabe (?.».), which was more con- venient than the cross-staff for taking altitudes. Fig. 2 represents an astrolabe as described by Martin Cortes. It was made of copper or tin, about J in. in thickness and 6 or 7 in. in diameter, and was circular except at one place, where a projection was provided for a hole by which it was suspended. Weight was considered desirable in order to keep it steady when in use. The face of the metal having been well polished, a plumb line from the point of suspension marked the vertical line, from which were derived the horizontal line and centre. The upper left quadrant was divided into degrees. The second part was a pointer pt of the same metal and thickness as the circular plate, about ij in. wide, and in length equal to the diameter of the circle. The centre was bored, and a line was drawn across it the full length, which was called the line of confidence. On the ends of that line were fixed plates, s, s, having each a small hole, both exactly over the line of confidence, as sights for the sun or stars. The pointer moved upon a centre the size of a goose quill. When the instrument was sus- pended the pointer was directed by hand to the object, and the angle read on the one quadrant only. Some years later the opposite quadrant was also graduated, to give the benefit of a second reading. The astrolabe was used by Vasco da Gama on his first voyage p IG 2 round the Cape of Good Hope in 1497; but

the movement of a ship rendered accuracy impossible, and the liability to error was increased by the necessity for three observers. One held the instrument by a ring passed over the thumb, the second measured the altitude, and the third read off.

For finding latitude at night by altitude of the pole star taken by cross-staff or astrolabe, use was made of an auxiliary instrument called the ” nocturnal.” From the relative positions of the two stars in the constellation of the ” Little Bear ” farthest from the pole (known as the Fore and Hind guards) the position of the pole star with regard to the pole could be inferred, and tables were drawn up termed the ” Regiment of the Pole Star,” showing for eight positions of the guards how much should be added or subtracted from the altitude of the pole star; thus, ” when the guards are in the N.W. bearing from each other north and south add half a degree,” &c. The bearings of the guards, and also roughly the hour of the night, were found by the nocturnal, first described by M. Coignet in

1581.

The nocturnal (fig. 3) consisted of two concentric circular plates, the

outer being about 3 in. in diameter, and divided into twelve equal parts corresponding to the twelve months, each being again sub-divided into groups of five days. The inner circle was graduated into twenty-four equal parts, corresponding to the hours of the day, and again subdivided into quarters; the handle was fixed to the outer circle in such a way that the middle of it corresponded with the day of the month on which the guards had the same right ascension as the sun — or, in other words, crossed the meridian at noon. From the common centre of the two circles extended a long index bar, which, together with the inner circle, turned freely and independently

Fig. 3.

about this centre, which was pierced with a round hole. To use the instrument, the projection at twelve hours on the inner plate was turned until it coincided with the day of the month of observation, and the instrument held with its plane roughly parallel to the equi-noctial or celestial equator, the observer looking at the pole star through the hole in the centre, and turning the long central index bar until the guards were seen just touching its edge; the hour in line with this edge read off on the inner plate was, roughly, the time. Occasionally the nocturnal was constructed so as to find the time by observations of the pointers in the Great Bear.

The rough charts used by a few of the more expert navigators at the time we refer to will be more fully described later(see also Map andGEOGRAPHY). Nautical maps or charts first appeared in Italy at the end of the 13th century, but it is said that the first seen in England was brought by Bar- tholomew Columbus in 1489.

Among the earliest authors who touched upon navigation was John Werner of Nurem- berg, who in 1514, in his notes upon Ptolemy's geography, de- scribes the cross-staff as a very ancient instrument, but says that it was only then beginning to be generally introduced among seamen. He recommends measuring the distance between the moon and a star as a means of ascertain- ing the longitude; but this (though developed many years after into the method technically known as " lunars ") was at this time of no practical use owing to the then imperfect know- ledge of the true positions of the moon and stars and the non- existence of instrumental means by which such distances could be measured with the necessary accuracy.

Thirty-eight years after the discovery of America, when long voyages had become comparatively common, R. Gemma Frisius wrote upon astronomy and cosmogony, with the use of the globes. His book

comprised much valuable information to mariners of that day, and was translated into French fifty years later (1582) by Claude de Bossiere. The astronomical system adopted is that of Ptolemy. The following are some of the points of interest relating to navigation. There is a good description of the sphere and its circles; the obliquity of the ecliptic is given as 23 30'. The distance between the meridians is to be measured on the equator, allowing 15° to an hour of time; longitude is to be found by eclipses of the moon and conjunctions, and reckoned from the Fortunate Islands (Azores). Latitude should be measured from the equator, not from the ecliptic, " as Clarean says." The use of globes is very thoroughly and correctly explained. The scale for measuring distances was placed on the equator, and 15 German leagues, or 60 Italian leagues, were to be considered equal to one degree. The Italian league was 8 stadia, or 1000 paces, therefore the degree is taken much too small. We are told that, on plane charts, mariners drew lines from various centres (i.e. compass courses), which were very useful since the virtue of the lodestone had become recognized; it must be remembered that parallel rulers were unknown, being invented by Mordente in 1 584. Such a confusion of lines has been continued upon sea charts till comparatively recently. Gemma gives rules for finding the course and distance correctly, except that he treats difference of longitude as departure. For instance, if the difference of latitude and difference of longitude are equal, the course prescribed is between the two principal winds — that is, 45 . He points out that the courses thus followed are not straight lines, but curves, because they do not follow the great circle, and that distances could be more correctly measured on the globe than on charts. The tide is said to rise with the moon, high water being when it is on the meridian and 12 hours later. From a table of latitudes and longitudes a few examples are here selected, by which it appears that even latitude was much in error. The figures in brackets

Alexandria . 31° 0′ N Athens . . 37 15 Babylon . . 35 Dantzic . . 54 30 London . 52 3 Malta . 34 Rome . . 41 50

• (3i° 13’) 6o° 3 o’E. (55° 55’)

(37 58) 52 45 (49 46) (32 32) 79 (70 25) (54 21) 44 15 (44 38)

(51 3i) 19 15 (25 54) (35 43) 38 45 (40 31) ■

(41 54) 36 20 (38 30)

The latitude of Cape Clear is given 34′ in error, and the

ngitude 4J ; the Stilly

Islands are given with an error of

represent the positions according to modern tables, counting the longitude from the western extremity of St Michael. (Flores is 5 8′ farther west.)

Alexandria . 31 ° o’ N. (31 1

Athens . . 37 15 (37 \

Babylon. . 35 o (32 ;

Dantzic . . 54 30 (54 :

London . . 52 3 (51 ;

Malta . . 34 o (35 t

Rome . . 41 50 (41 ;

!lie latitude of Cape Clear is

gitude 4I ; the Stilly Islands one degree in latitude and 1° 10′ in longitude; while Madeira is placed 3° 8′ too far south and 4° 20′ too far west, and Cape St Vincent 1° 25′ too far south and 6° too far west.

In 1534 Gemma produced an ” astronomical ring,” which he dedicated to the secretary of the king of Hungary. He admitted that it was not entirely his own invention, but asserted that it could accomplish all that had been said of quadrants, cylinders and astrolabes — also that it was a pretty ornament, worthy of a prince. As it displayed great ingenuity, and was followed by many similar contrivances during two centuries, a sketch with brief description is here given (fig. 4).

The outer and principal sustaining circle EPQ represents the meridian, and is about 6 in. in diameter; Pit, are the poles. The

upper quadrant is divided into degrees. It is sus- pended by fine cord or wire placed at the sup- posed latitude. The second circle EQ is fixed at right angles to the first, and represents the equinoctial line. The upper side is divided into twenty-four parts, repre- senting the hours from noon or midnight. On tae inner side of that circle are marked the months and weeks. The third ring CC is attached to the first at the poles, and revolves freely within it. On the interior are marked the months, and on another side the cor- responding signs of the zodiac ; another is gradu- ated in degrees. It is fitted with a groove On the fourth side are

Fig.

which carries two movable sights.

twenty-four unequal divisions (tangents) for measuring heights. Its use is illustrated by twenty problems, showing it capable of doing roughly all that any instrument for taking angles can. Thus, to find the latitude, set the sights C, C to the place of the sun in the zodiac, and shut the circle till it corresponds with 12 o'clock. Look through the sights and alter the point of suspension till the greatest elevation is attained; that time will be noon, and the point of sus- pension will be the latitude. The figure is represented as slung at lat. 40 , either north or south. To find the hour of the day, the latitude and declination being known: the sights C, C being set to the declination as before, and the suspension on the latitude, turn the ring CC freely till it points to the sun, when the index opposite the equinoctial circle will indicate the time, while the meridional circle will coincide with the meridian of the place.

There is in the museum attached to the Royal Naval College at Greenwich an instrument described as Sir Francis Drake's astrolabe. It is not an astrolabe, but may be a combination of astronomical rings as invented by Gemma with additions, probably of a later date. It has the appearance of a large gold watch, about 2\ in. in diameter, and contains several parts which fall back on hinges. One is a sun-dial, the gnomon being in connexion with a graduated quadrant, by. which it could be set to the latitude of the place. There are a small compass and an hour circle. It is very neat, but too small for actual use, and may be simply an ornament representing a larger instrument. There is a table of latitudes engraved inside one lid; that given for London is 51° 34', about 3 m. too much.

Though clocks are mentioned in 1484 as recent inventions,

watches were unknown till about 1530, when Gemma seized the idea of utilizing them for the purpose of ascertaining the difference of longitude between two places by a comparison between their local times at the same instant. They were too inaccurate, however, to be of practical use, and their advocate proposed to correct them by water-clockr > cr sand-clocks. For rough purposes of keeping time on boa::d ship sand glasses were em- ployed, and it is curious to note that hour and half-hour glasses were used for this purpose in the British Navy until 1839. The outer margin of the compass card was early divided into twenty- four equal parts numbered as hours until the error of thus determining time by the bearings of the sun was pointed out by Davis in 1607.

In 1537 Pedro Nunez (Nonius), cosmographer to the king of Portugal, published a work on astronomy, charts and some points of navigation. He recognized the errors in plane charts, and tried to rectify them. Among many astronomical problems given is one for finding the latitude of a place by knowing the sun's declination and altitude when on two bearings, not less than 40 apart. Gemma did a similar thing with two stars; therefore the problem now known as a " double altitude " is a very old one. It could be mechanically solved on a large globe within a degree. To Nunez has been erroneously attributed the present mode of reading the exact angle on a sextant, tbi scale of a barometer, &c, the credit of which is due, however. to Vernier nearly a hundred years later. The mode of dividing the scale which Nunez published in 1542 was the following. The arc of a large quadrant was furnished with forty-five con- centric segments, or scales, the outer graduated to 90 , th«s others to 89, 88, 87, &c, divisions. As the fine edge of tbss pointer attached to the sights passed among those numerous divisions it touched one of them, suppose the fifteenth division on the sixth scale, then the angle was -J-f of 90° = 15° 52′ 56*. This was a laborious method; Tycho Brahe tried it, but aban« doned it in favour of the diagonal lines then in common usa and still found on all scales of equal parts.

In 1545 Pedro de Medina published Arte de navigar at Valla.. dolid, dedicated to Don Philippo, prince of Spain. This appears to be the first book ever published professedly entirely on naviga- tion. It was soon translated into French and Italian, and many years after into English by John Frampton. Though this pre- tentious work came out two years after the death of Copernicus, the astronomy is still that of Ptolemy. The general appearance of the chart given of the Mediterranean, Atlantic, and part of the Pacific is in its favour, but examination shows

it to be very incorrect. A scale of equal parts, near the centre of the chart, extends from the equator to what is intended to represent 75° of latitude; by this scale London would be in 55° instead of 515°, Lisbon in 37° instead of 38° 42'. The equator is made to pass along the coast of Guinea, instead of being over four degrees farther south. The Gulf of Guinea extends 14° too far east, and Mexico is much too far west. Though there are many vertical lines on the chart at unequal distances they do not represent meridians; and there is no indication of longitude. A scale of 600 leagues is given (German leagues, fifteen to a degree). By this scale the distance between Lisbon and the city of Mexico is 1740 leagues, or 6960 miles; by the vertical scale of degrees it would be about the same; whereas the actual distance is 4820 miles. Here two great wants become apparent — a knowledge of the actual length of any arc, and the means of representing the surface of the globe on flat paper. There is a table of the sun's declination to minutes; on June 12th and December nth (o.s.) it was given as 23° 33'. The directions for finding the latitude by the pole star and pointers appear good. For general astronomical information the book is inferior to that of Gemma.

In 1556 Martin Cortes published at Seville Arte de navigar. He gives a good drawing of the cross-staff and astrolabe, also a table of the sun's declination for four years (the greatest value being 23 33'), and a calendar of saints' days. The motions of the heavens are described according to the notions then prevalent, the earth being considered as fixed. He recommends

the altitude of the pole being found frequently, as the esti- mated distance run was imperfect. He devised an instrument whereby to tell the hour, the direction of the ship's head, and where the sun would set. A very correct table is given of the distances between the meridians at every degree of latitude, whereby a seaman could easily reduce the difference of longitude to departure. In the rules for finding the latitude by the pole star, that star is supposed to be 3 from the pole. Martin Cortes attributes the tides entirely to the influence of the moon, and gives instructions for finding the time of high water at Cadiz, when by means of a card with the moon's age on it, revolving within a circle showing the hours and minutes, the time of high water at any other place for which it was set would be indicated. Directions are given for making a compass similar to those then in common use, also for ascertaining and allowing for the varia- tion. The east is here

spoken of as the principal point, and marked by a cross.

The third part of Martin Cortes's work is upon charts; he laments that wise men do not produce some that are correct, and that pilots and mariners will use plane charts which are not true. In the Mediterranean and " Channel of Flanders" the want of good charts is (he says) less inconvenient, as they do not navigate by the altitude of the pole.

As some subsequent writers have attributed to Cortes the credit of first thinking of the enlargement of the degrees of latitude on Mercator's principle, his precise words may be cited. In making a chart, it is recommended to choose a well-known place near the centre of the intended chart, such as Cape St Vincent, which call 37°, " and from thence towards the Arctic pole the degrees increase; and from thence to the equinoctial line they go on decreasing, and from the line to the Antarctic pole increasing." It would appear at first sight that this implied that the degrees increased in length as well as being called by a higher number, but a specimen chart in the book does not justify that conclusion. It is from 34 to 40 , and the divisions are unequal, but evidently by accident, as the highest and • lowest are the longest. He states that the Spanish scale was formed by-counting the Great Berling as 3° from Cape St Vincent (it is under 2\°). Twenty English leagues are equal to 17J Spanish or 25 French, and to i° of latitude. Cortes was evidently at a loss to know the length of a degree, and consequently the circumference of the globe. The degrees of longitude are not laid down, but for a first meridian we are told to draw a vertical line " through the Azores, or nearer Spain, where the chart is less occupied." It is impossible in such circumstances to understand or check the longitudes assigned to places at that period. Martin Cortes's work was held in high estima- tion in England for many years, and appeared in several translations. A reprint, with additions, of Richard Eden's (1561), by John Tapp and published in 1609, gives an improved table of the sun's declination from 1609 to 1625 — the maximum vaiue being 2 3° to 30'. The declinations of the principal stars, the times of their passing the meridian, and other improved tables, are given, with a very poor traverse table for eight points. The cross-staff, he said, was in most common use; but he recommends Wright's sea quadrant.

William Cuningham published in 1559 a book called his Astronomical Glass, in which he teaches the making of charts by a central meridional line divided into equal parts, with other meridians on each side, distant at top and bottom in proportion to the departure at the highest and lowest latitude, for which purpose a table of departures is given very correctly to the third place of sexagesimals. The chart

would be excellent were it not that the parallels are drawn straight instead of being curved. In another example, which shows one-fourth of the sphere, the meridians and parallels are all curved; it would be good were it not that the former are too long. The hemisphere is also shown upon a projection approaching the stereographic; but the eighteen meridians cut the equator at equal distances apart instead of being nearer together towards the primitive. He gives the drawing of an instrument like an astrolabe placed horizontally, divided into 32 points and 360 degrees, and carrying a small magnetic needle to be used as a prismatic compass, or even as a theodolite.

In 1581 Michael Coignet of Antwerp published sea charts, and also a small treatise in French, wherein he exposes the errors of Medina, and was probably the first who said that rhumb lines form spirals round the pole. He published also tables of declina- tion of the sun and observed the gradual decrease in the obliquity

of the ecliptic. He described a cross-staff with three transverse pieces, which was then in common use at sea. Coignet died in

1623.

The Dutch published charts made up as atlases as early as 1584, with a treatise on navigation as an introduction.

In 1585 Roderico Zamorano, who was then lecturer at the naval college at Seville, published a concise and clearly-written com- pendium of navigation; he follows Cortes in the desire to obtain better charts. Andres Garcia de Cespedes, the successor of Zamorano at Seville, published a treatise on navigation at Madrid in 1606. In 1592 Petrus Plancius published his universal map, containing the discoveries in the East and West Indies and towards the north pole. It possessed no particular merit; the degrees of latitude are equal, but the distances between the meridians are varied. He made London appear in 51 32′ N. and long. 22 , by which his first meridian should have been more than 3 east of St Michael.

For Mercator's great improvements in charts at about this date see Map; from facsimiles of his early charts in Jomard, Les Monuments de la geographie, the following measurements have been made. A general chart in 1569 of North America, from lat. 25° to lat. 79 , is 2 ft. long north and south, and 20 in. wide. Another of the same date, from the equator to 60° south lat. is 15-8 in. long. The charts agree with each other, a slight allowance being made for remeasuring. As compared with J. Inman's table of meridional parts, the spaces between the

parallels are all too small. Between o° and io° the error is 8'; at 20 it is 5'; at 30 , 16'; at 40°, 39'; at 50°, 61'; at 6o°, 104'; at 70 , 158′ ; and at 79 , 182′ — that is, over three degrees upon the whole chart. As the measures are always less than the truth it is possible that Mercator was afraid to give the whole. In a chart of Sicily by Romoldus Mercator in 1589, on which two equal degrees of latitude, 36 to 38°, extend 93 in., the degree of longitude is quite correct at one-fourth from the top; the lower part is 1 m. too long. One of the north of Scotland, published in 1595, by Romoldus, measures iof in. from 58 20′ to 6i° ; the divisions are quite equal and the lines parallel; it is correct at the centre only. A map of Norway, 1595, lat. 6o° to 70° = 91 in., has the parallels curved and equidistant, the meridians straight converging lines; the spaces between the meridians at 60° and 70 are quite correct.

In 1594 Blundeville published a description of Mercator's charts and globes; he confesses to not having known upon what rule the meridians were separated by Mercator, unless upon such a table as that given by Wright, whose table of meridional parts is published in the same book, also an excellent table of sines, tangents and secants — the former to seven figures, the latter to eight. These are the tables made originally by Regiomontanus and improved by Clavius.

In 1594 the celebrated navigator John Davis published a pamphlet of eighty pages, in black letter, entitled The Seaman's Secrets, in which he proposes to give all that is necessary for sailors — not for scholars on shore. He defines three kinds of sailing: horizontal, paradoxical and great circle. His horizontal sailing consists of short voyages which may be delineated uppn a plain sheet of paper. The paradoxical or cosmographical embraces longitude, latitude and distance — the combining many horizontal courses into one " infallible and true," i.e. what is now called traverse and Mercator's sailings. His " paradoxical course " he describes correctly as a rhumb line which is straight on the chart and a curve on the globe. He points out the errors of the common or plane chart, and promises if spared to publish a " paradoxall chart." It is not known whether such appeared or not, but he assisted Wright in producing his chart on what is known as Mercator's projection a few years later. Great circle sailing on a globe is clearly described by Davis, and to render it more practicable he divides a long distance into several short rhumb lines quite correctly. From the practice of navigators in using globes the principles of such sailing were not unknown at an earlier date; indeed it is said that S. Cabot, projected a voyage across the North Atlantic on the arc of a great circle in 1495.

The list of instruments given by Davis as necessary to a skilful seaman comprises the sea compass, cross-staff, chart, quadrant, astrolabe, an ” instrument magnetical ” for finding the variation of the compass, a horizontal plane sphere, a globe- and a paradoxical compass. The first three are said to be sufficient for use at sea, the astrolabe and quadrant being uncertain for sea observations. The importance of knowing the times of the tides when approaching tidal or barred harbours is clearly pointed out, also the mode of ascertain- ing them by the moon’s age. A table of the sun’s declination is given for noon each day during four years 1593-1597, from the ephemerides of J. Stadius. The greatest given value is 23 28’. Several courses and distances, with the resulting difference of latitude and de- parture, are correctly worked out. A specimen log-book provides one line only for each day, but the columns are arranged similarly to those of a modern log. Under the head of remarks after leaving Brazil, we read, ” the compass varied 9°, the south point westward.” He states that the first meridian passed through St Michael, because there was no variation at that place, and therefore that this meridian passed through the magnetic pole as well as the pole of the earth. He makes no mention of Mercator’s chart by name nor of Cortes or other writers on navigation. Rules are given for finding the latitude by two altitudes of the sun and intermediate azimuth, also by two fixed stars, using a globe. There is a drawing of a quadrant, with a plumb line, for measuring the zenith distance, and one of a modifica- tion of a cross-staff using which the observer stands with his back to the sun, looking at the horizon through a sight on the end of the staff, while the shadow of the top of a movable projection, falls on the sight; this, known as the back-staff, was an improvement on the cross-staff. It was fitted with a reflector, and was thus the first rough idea of the principle of the quadrant and sextant. This remained in common use till superseded in 1731 by Hadley’s quad- rant. The eighth edition of Davis’s work was printed in 1657.

Edward Wright, of Caius College, Cambridge, published in 1599 a valuable work entitled Certain Errors in Navigation Delected and Corrected. One part is a translation from Roderico Zamorano; there is a chapter from Cortes and one from Nunez. A year later appeared his chart of the world, upon which both capes and the recent discoveries in the East Indies and America are laid down truthfully and scientifically, as well as his know- ledge of their latitudes and longitudes would admit. Just the northern extremity of Australia is

shown.

Wright said of himself that he had striven beyond his ability to mend the errors in chart, compass, cross-staff and declination of sun and stars. He considered that the instruments which had then recently come in use ” could hardly be amended,” as they were growing to ” perfection ” — especially the sea chart and the compass, though he expresses a hope that the latter may be ” freed from that rude and gross manner of handling in the making.” He gives a table of magnetic declinations (variation) and explains its geometrical construction. He states that Medina utterly denied the existence of variation, and attributed it to bad construction and bad observa- tions. Wright expresses a hope that a right understanding of the dip of the needle would lead to a knowledge of the latitude, ” as the variation did of the longitude.” He gives a table of declination of the sun for the use of English manners during four years — the greatest given value being 23 ” 31′ 30”. The latitude of London he made 51° 32’. For these determinations a quadrant over 6 ft. in radius was used. He also treats of the ” dip ” of the sea horizon, refraction, parallax and the sun’s motions. With all this knowledge the earth is still considered as stationary — although Wright alludes to Copernicus, and says that he omitted to allow for parallax. Wright ascertained the declinations of thirty-two stars, and made many improvements or additions to the art of navigation, considering that all the problems could be performed trigonometrically, without globe or chart. He devised sea rings for taking observations, and a sea quadrant to be used by two persons, which is in some respects similar to that by Davis. While deploring the neglected state which navigation had been in, he rejoices that the worshipful society at the Trinity House (which had been established in 1514), under the favour of the king (Henry VIII.), had removed ” many gross and dangerous enormities.” He joins the brethren of the Trinity House in the desire that a lectureship should be established on navigation, as at Seville and Cadiz; also that a grand pilot should be appointed, as Sebastian Cabot had been in Spain, to examine pilots (i.e. mates) and navigators. Wright’s desire was partially fulfilled in 1845, when an Act of Parliament paved the way for the compulsory qualification of masters and mates of merchant ships ; but such was the opposition by shipowners that it was even then left voluntary for a few years. England was in this respect more than a century behind Holland. It has been said that Wright accompanied the earl of Cumberland to the Azores in 1589, and that he was allowed £50 a year by the East India Company as lecturer on navigation at Gresham College, Tower Street.

The great mark which Wright made was the discovery of a correct and

uniform method of dividing the meridional line and making charts which are still called after the name of Mercator.

He considered such charts as true as the globe itself; and so they were for all practical purposes. He commenced by dividing a meridional line, in the proportion of the secants of the latitude, for every ten minutes of arc, and in the edition of his work published in 1610 his calculations are for every minute. His method was based upon the fact that the radius bears the same proportion to the secant of the latitude as the difference of longitude does to the meridional difference of latitude — a rule strictly correct for small arcs only. One minute is taken as the unit upon the arc and 10,000 as the corresponding secant, 2′ becomes 20,000, 3′ = 30,000, &c, increasing uniformly till 49', which is equal to 490,001; i c is 600,012. The secant of 20 is 12,251,192, and for 20 1′ it will be 12,251,192 + 10,642 — practically the same as that used in modern tables.

The principle is simply explained by fig. 5, where b is the pole and bf the meridian. At any point a a minute of longitude : a min. of lat. : : ea (the semi-diameter of the parallel) : kf (the radius). Again ea : kf : :kf:ki:\ radius : sec. akf (sec. of lat). To keep this proportion on the chart, the distances between points of latitude must increase in the same proportion as the secants of the arc contained between those points and the equator, which was then to be done by the " canon of triangles."

Wright gave the following excellent popular de- scription of the principle of Mercator's charts: " Suppose a spherical globe (representing the world) inscribed in a concave cylinder to swell like a. bladder equally in every part (that is as much in longitude as in latitude) until it joins itself to the concave surface of the cylinder, each

Fig. 5.

parallel in- creasing successively from the equator towards either pole until it is of equal diameter to the cylinder, and consequently the meridians widening apart until they are everywhere as distant from each other as they are at the equator. Such a spherical surface is thus by extension made cylindrical, and consequently a plane parallelogram surface, since the surface of a cylinder is nothing else but a plane parallelogram surface wound round it. Such a cylinder on being opened into a flat surface will have upon it a representation of a Mercator's chart of the world."

This great improvement in the principle of constructing charts was adopted slowly by seamen, who, putting it as they supposed to a practical test, found good reason to be disappointed. The positions of most places in the world had been originally laid down erroneously, by very rough courses and estimated distances upon the plane chart, and from this they were transferred to the new projection, so that errors in courses and distances, really due to erroneous positions, were wrongly attributed to the new and accurate form of chart.

When Napier's Canon Mirificus appeared in 16 14, Wright at once recognized the value of logarithms as an aid to navigation, and undertook a translation of the book, which he did not live to publish (see Napier). Gunter's tables (1620) made the applica- tion of the new discovery to navigation possible, and this was done by Addison in his Arithmetical Navigation (1625), as well as by Gunter in his tables of 1624 and 1636, which gave logarithmic sines and tangents, to a radius of 1,000,000, with directions for their use and application to astronomy and navigation, and also logarithms of numbers from 1 to 10,000. Several editions followed, and the work retained its reputation over a century. Gunter invented the sector, and introduced the meridional line upon it, in the just proportion of Mercator's projection.

The means of taking observations correctly, either at sea or on shore, was about this time greatly assisted by the invention bearing the name of Pierre Vernier, the description of which was published at Brussels in 1631. As Vernier's quadrant was divided into half degrees only, the sector, as he called it, spread over 14J degrees, and that space carried thirty equal divisions, numbered from o to 30. As each division of the sector contained 29 min. of arc, the vernier could be read to minutes. The verniers now commonly adapted to sextants can be read to 10 sees. Shortly after the invention it was recommended for use by P. Bouguer and Jorge Juan, who describe it in a treatise entitled La Construction, b°c, du quadrant nouveau. About this period Gascoigne applied the telescope to the quadrant as used on shore; and Hevelius invented the tangent screw, to give slow and steady motion when near the desired position. These

practical improvements were not applied to the rougher nautical instruments until the invention of Hadley's sextant in 1731. In 1635 Henry Gellibrand published his discovery of the annual change in

variation of the needle, which was effected by compar- ing the results of his own observations with those of W. Borough and Edmund Gunter. The latter was his predecessor at Gresham College.

In 1637 Richard Norwood, a sailor, and reader in mathematics, published an account of his most laudable exertions to remove one of the greatest stumbling-blocks in the way of correct navigation, that of not knowing the true length of a degree or nautical mile, in a pamphlet styled The Seaman's Practices. Norwood ascertained the latitude of a position near the Tower of London in June 1633, and of a place in the centre of York in June 1635, with a sextant of more than 5 ft. radius, and, having carefully corrected the declination of the sun and allowed for refraction and parallax, made the difference of latitude 2 28'. He then measured the distance with a chain, taking horizontal angles of all windings, and made a special table for correcting elevations and depressions. A few places which he was unable to measure he paced. His conclusion was that a degree contained 367,176 English feet; this gives 2040 yds. to a nautical mile — only about 12 yds. too much. Norwood's work went through numerous editions, and retained its popularity over a hundred years. In a late edition he says that, as there is no means of discovering the longitude, a seaman must trust to his reckoning. He recommends the knots on the log-line to be placed 51 ft. apart, as the just proportion to a mile when used with the half-minute glass. To Norwood is also attributed the discovery of the " dip " of the magnetic needle in 1576.

The progress of the art of navigation was and is still of course inseparably connected with that of map and chart drawing and the correct astronomical determinations of positions on land. ■ While as we have seen at an early period simple practical astro- nomical means of finding the latitude at sea were known and in use, no mode could be devised of finding longitude except by the rough method of estimating the run of the ship, so that the only mode of arriving at a port of destination was to steer so as to get into the latitude of such a port either to the eastward or west- ward of its supposed position, and then approach it on the parallel of its latitude. The success of this method would of course greatly depend upon the accuracy with which the longitude of such port was known. Even with the larger and more accurate instruments used in astronomical observatories on shore the means of ascertaining latitude were far in advance of those by which longitude could be obtained, and this equally applied to the various heavenly bodies themselves upon which the terrestrial positions depended, the astronomical element of declination (corresponding to latitude) being far more accurately determined than that of right ascension (corresponding to longitude).

Almanacs were first published on the continent of Europe in 1457, but the earliest printed work of that kind in England is dated 1497. The only portions of their contents of use to seamen were tables of the declination of the sun, rough elements of the positions of a few stars, and tables for finding latitude by the pole star.

No accurate predictions of the positions of the moon, stars and planets could, however, be made until the laws governing their movements were known, such laws of course involving a knowledge of their actual positions at different widely separated epochs.

In 1699 Edmund Halley (subsequently astronomer royal), in command of the " Paramour," undertook a voyage to improve the knowledge of longitude and of the variation of the compass. The results of his voyage were the construction of the first variation chart, and proposals for finding the longitude by occultations of fixed stars.

The necessity for having more correct charts being equalled by the pressing need of obtaining the longitude by some simple and correct means available to seamen, many plans had already been thought of for this purpose. At one time it was hoped that the longitude might be directly discovered by observing the variation XIX. to

of the compass and comparing it with that laid down on charts. In 1674 Charles II. actually appointed a commission to investigate the pretensions of a scheme of this sort devised by Henry Bond, and the same idea appears as late as 1777 in S. Dunn's Epitome. But the only accurate method of ascertaining the longitude is by knowing the difference of time at the same instant at the meridian of the observer and that of Greenwich; and till the invention and perfecting of chronometers this could only be done by finding at two such places the apparent time of the same celestial phenomenon.

A class of phenomena whose comparative frequency recommended them for longitude observations, viz. the eclipses of Jupiter's satellites, became known through Galileo's discovery of these bodies (1610). Tables for such eclipses were published by Dominic Cassini at Bologna in 1688, and repeated in a more correct form at Paris in 1693 by his son, who was followed by J. Pound, J. Bradley, P. W. Wargentin, and many other astronomers. But this method, though useful on land, is not suited to mariners; when W. VVhiston, for example, in 1737 recommended that the satellites should be ob- served by a reflecting telescope, he did not sufficiently consider the difficulty of using a telescope at sea.

Another method proposed was that of comparing the local time of the moon's crossing the meridian of the observer with the predicted time of the same event at Greenwich, the difference of the two de- pending upon the moon's motion during the time represented by the longitude; thus Heme's Longitude Unveiled (1678), proposes to find the time of the moon's meridian passage at sea by equal altitudes with the cross-staff, and then compare apparent time at ship with London time. The accuracy of this, as in the case of lunar problems, would obviously depend upon a more perfect knowledge of the laws of the moon's motion than then existed.

The celebrated problem of finding longitude by lunars (or by measurement of " lunar distances ") occupied the attention of astronomers and sailors for many years before being superseded by the more simple and accurate modern method by the use of chronometers, and was the principal reason for establishing the Royal Observatory at Greenwich and the subsequent publication of the Nautical Almanac. The principle was simple, depending upon the comparatively rapid movement of the moon with regard to the heavenly bodies lying in her immediate path in the heavens. It is evident that if the theory of this movement were perfectly understood and the positions of such heavenly bodies accurately determined, the distances of the moon from those at any instant of time at Greenwich could be accurately foretold so that if such predictions were published in advance, an observer at any place in the world, by simply measuring such distances, could accurately determine the Greenwich time, a comparison of which with the local time (which in clear weather can be frequently and simply determined) would give the longitude. This, as previously mentioned, was foreseen by J. Werner as early as 1514, but very great difficulties attended its practical application for many years. Until the establishment of national astronomical observatories it was impossible to accumulate the vast number of observations necessary to fulfil the astronomical conditions, and until the invention of the sextant no instrument existed capable of use at sea which would measure the distances required with the necessary accuracy, while even up to the time when the problem had attained its greatest practical accuracy the calculations involved were far too intricate for general use among those for whom it was chiefly intended. The very principles of a theory of the movements of the moon were unknown before Newton's time, when the lunar problem begins to have a chief place in the history of navigation; the places of stars were formerly derived from various and widely discrepant sources.

The study of the lunar problem was stimulated by the reward of 1000

crowns offered by Philip III. of Spain in 1598 for the dis- covery of a method of finding longitude at sea; the States-general followed with an offer of 10,000 florins. But for a long time nothing practical came of this; a proposal by J. B. Morin, submitted to Richelieu in 1633, was pronounced by commissioners appointed to judge of it to be impracticable through the imperfection of the lunar tables, and the same objection applied when the question was raised in England in 1674 by a proposal of St Pierre to find the longitude by using the altitudes of the moon and two stars to find the time each was from the meridian. When the king was pressed by St Pierre, Sir J. Moore and Sir C. Wren to establish an observatory for the benefit of navigation, and especially that the moon's exact position might be calculated a year in advance, Flamsteed gave his judgment that the lunar tables then in use were quite useless, and the positions of the stars erroneous. The result was that the king decided upon establishing an observatory in Greenwich Park, and Flamsteed was appointed astronomical observer on March 4, 1675, upon a salary of £100 a year, for which also he was to instruct two boys from Christ's Hospital. While the small building in the Park was in course of erection he resided in the Queen's House (now the central part of Greenwich Hospital school), and removed to the houseon the hill on the 10th of July 1676, which came to be known as " Flamsteed House." The institution was placed under the surveyor-general of ordnance — perhaps because that office was then held by Sir Jonas Moore, himself an eminent mathematician. Though this was not the first observatory in Europe, it was destined to become the most useful, and has amply fulfilled the important duties for which it was

designed. It was established to meet the exigencies of navigation, as was clearly stated on the appointment of Flamsteed, and on several subsequent occasions; we see now what an excellent foster- mother it has been to the higher branches of that science. This has been accomplished by much labour and patience; for, though originally the most suitable man in the kingdom was placed in charge, it was so starved and neglected as to be almost useless during many years. The government did not provide a single instrument. Flamsteed entered upon his important duties with an iron sextant of 7 ft. radius, a quadrant of 3 ft. radius, two telescopes and two clocks, the last given by Sir Jonas Moore. Tycho Brahe's catalogue of 777 stars, formed in

about 1590, was his only guide. In 168 1 he fitted a mural arc which proved a failure. Seven years after another mural arc was erected at a cost of £120, with which he set to work in earnest to verify the latitude, and to determine the position of the equinoctial point, the obliquity of the ecliptic and the right_ ascen- sions and declinations of the stars; he obtained the positions of 2884 which appeared in the ” British catalogue ” in 1723 (see Flamsteed, and Astronomy).

Flamsteed died in 1719, and was succeeded by Halley, who paid particular attention to the motions of the moon with a view to the longitude problem. A paper which he published in the Phil. Trans. (1731) shows what had been accomplished up to that date, and proves that it was still impossible to find the longitude correctly by any observation depending upon the predicted position of the moon. He repeats what he had published twenty years before in an appendix to Thomas Street’s Caroline tables, which contained observations made by him (Halley) in I 683-1 684 for ascertaining the moon’s motion, which he thought to be the only practical method of” ” attaining ” the longitude at sea. The Caroline tables of Street, though better than those before his time as well as those of Tycho, Kepler, Bullialdus and Horrox, were uncertain; sometimes the errors would compensate one another; at others when they fell the same way the result might lead to a position being 100 leagues in error. He hopes that the tables will be so amended that an error may scarce ever exceed 3 minutes of arc (equal to l|° of longitude). Sir Isaac Newton’s tables, corrected by himself (Halley) and others up to 1713, would admit of errors of 5 minutes, when the moon was in the third and fourth quarters. He blames Flamsteed for neglecting that portion of astronomical work, as he was at the observatory more than two periods of eighteen years. He himself had at this time seen the whole period of the moon’s apogee — less than nine years — during which he observed the right ascensions at her transit, with great exactness, almost fifteen hundred times, or as often as Tycho Brahe, Hevelius and Flamsteed together. He hoped to be able to compute the moon’s position within 2 minutes of arc with certainty, which would reduce errors of position to 20 leagues at the equator and 15 in the Channel; he thought Hadley’s quadrant might be applied to measure lunar distances at sea with the desired accuracy. 1

The rise of modern navigation may be fairly dated from the invention of the sextant in 1731 and of the chronometer in 1735; the former a complete nautical observatory in itself, and the, latter an instrument which in its modern development has become an almost perfect time-keeper. It was a curious co- incidence that these two invaluable instruments were invented at so nearly the same time. Until 1731 all

instruments in use at sea for measuring angles either depended on a plumb line or required the observer to look in two directions at once.

Their imperfections are clearly pointed out in a paper by Pierre Bouguer (1729) which received the prize of the Paris Academy of Sciences for the best method of taking the altitude of stars at sea. Bouguer himself proposes a modification of what he calls the English quadrant, probably the one suggested by Wright and improved by Davis. Fig. 6 represents the instrument as proposed, capable of measuring fully 90° from E to N. A fixed pinule was recommended to be placed at £, through which a ray from the sun would pass to the sight C. The sight F was movable. The observer, standing with his back to the sun would look through F and C at the horizon, shifting the sight F up or down till the ray from the sun coincided with the horizon. The space from E to F would represent the altitude, and the remaining part F to N the zenith distance. The English quad- rant which this was to supersede differed in having about half the arc from E towards N, and, instead of the pinule being fixed at E, it was on a smaller arc represented by the dotted line «B, and movable. It was placed on an even number of degrees, considerably less than the altitude; the remainder was measured on the larger arc, as described.

1 Halley's observations were published posthumously in 1742, and in 1765 the commissioners of longitude paid his daughter £100 for MSS. supposed to be useful to navigation. As the moon passes the stars lying in her course through the heavens at the mean rate of 33″ in one minute of time, it is obvious that an error to that amount in measuring the distance from a star wouldr produce an error of 15 m. in longitude. As the moon's motion with regard to the sun is nearly one degree a day less, a similar error in the distance would produce still more effect.

Fig. 6.

Hadley's instrument, on the other band, described to the Royal Society in May 1731 {Phil. Trans.), embodies Newton's idea of bringing the reflection of one object to coincide with the direct image of the other. He calls it an octant, as the arc is actually 45°, or the eighth part of a circle; but, in consequence of the angles of incidence and reflection both being changed by a movement of the index, it measures an angle of go", and is graduated accordingly; the same instrument has therefore been called a quadrant. It was very slowly adopted, and no doubt there were numerous mechanical difficulties of cen- tring, graduating, &c, to be overcome before it reached per- fection. In August 1732, in pursuance of an order from the Admiralty,

observations were made with Hadley's quadrant on board the " Chatham " yacht of 60 tons, below Sheer- ness, in rough weather, by persons — except the master attendant — unaccustomed to the motion; still the results were very satis- factory. A year later Hadley published (Phil. Trans., 1733) the description of an instrument for taking altitudes when the horizon is not visible. The sketch represents a curved tube or spirit-level, attached to the radius of the quadrant, since which time many attempts have been unsuccessfully made to construct some form of artificial horizon adapted to use at sea on board ship, a discovery which would greatly facilitate observations at night and at the many times when the natural or sea horizon is imperfectly visible.

From the year 17 14 the history of navigation in England is closely associated with that of the " Commissioners for the discovery of longitude at sea," a body constituted in that year with power to grant annually sums not exceeding £2000 to assist experiments and reward minor discoveries, and also to judge on applications for much greater rewards which were from time to time offered to open competition. For a method of determining the longitude within 60 geographical miles, to be tested by a voyage to the West Indies and back, the sum of £10,000 was offered; within 40 m., £15,000;, within 30 m., £20,000. £10,000 was also to be given for a method that would determine longitude within 80 m. near the shores of greatest danger. No action seems to have been taken before 1737; the first grant made was in that year, and the last in 1815, but the board continued to exist till 1828, having disbursed in the course of its existence £101,000 in all. 2 In the interval a number of other acts had been passed either dealing with the powers, constitution and funds of the commissioners or encouraging nautical discovery; thus the act 18 George II. (1745) offered £20,000 for the discovery by a British ship of the North- West Passage, and the act 16 George III. (1776) offered the same reward for a passage to the Pacific either north-west or north- east, and £5000 to any one who should approach by sea within one degree of the North Pole. All these acts were swept away in 1828, when the longitude problem had ceased to attract competitors, and voyages of discovery were nearly over.

The suggestions and applications sent in to the commissioners were naturally very numerous and often very trifling; but they some- times furnish useful illustrations of the state of navigation. Thus, in a memorial by Captain H. Lanoue (1736), he records a number of recent casualties, which shows how carelessly the largest ships were then navigated. Several men-of-war off Plymouth in 1691 were

2 This total comprises the large sums awarded to Harrison and to the widow of Mayer, the cost of surveys and expeditions in various parts of the globe, large outlays on the Nautical Almanac and on subsidiary calculations and tables, rewards for new methods and solutions of problems, and many minor grants to watchmakers or for improvements in instruments. Thus Jesse Ramsden received in 1775 and later about £1600 for his improvements in graduation (q.v.), and E. Massey in 1804 got £200 for his log (see Log).

wrecked through mistaking the Deadman for Berry Head. Admiral Wheeler's squadron in 1694, leaving the Mediterranean, ran on Gibraltar when they thought they had passed the Strait. Sir Cloudesley Shovel's squadron, in 1707, was lost on the rocks off Scilly, by erring in their latitude. Several transports, in 1711, were lost near the river St Lawrence, having erred 15 leagues in the reckoning during twenty-four hours. Lord Belhaven was lost on the Lizard on the 17th of November 1 72 1, the same day on which he sailed from Plymouth.

Many rewards were paid by the commissioners for methods by which the tedious calculations involved in " clearing the lunar distance" could be abbreviated; thus Israel Lyons (1739-1775) received £10 for his solution of this problem from the commissioners in 1769; and in 1772 he and Richard Dunthorne (1711-1775) each obtained £50. George Whichell, master of the Royal Naval Academy, Portsmouth, conceived a plan whereby the correction could be taken from a table by inspection. In October 1765 the commissioners of longitude awarded him £100 to enable him to complete and print 1000 copies of his table. On the following April they gave him £200 more. The work was continued on the same plan by Antony Shepherd, the Plumian professor of astronomy, Cambridge, with some additions by the astronomer-royal. The total cost of the ponderous 4to volume up to the time of publication in June 1772 was £3100, after which £200 more was paid to the Rev. Thomas Parkinson and Israel Lyons for examining the errata. It was a very large and expensive volume — ill-adapted for ship's use. Considerable sums were paid by the commissioners from time to time for other tables to facilitate navigation — not always very judiciously. It is sufficient to mention here the tables of Michael Taylor and those of Mendoza, published in 1815. The proposals submitted to the board to find the longitude by the time of the moon's meridian passage are very numerous.

One of the first points to which the attention of the com- missioners was directed was the survey of the coasts of Great Britain, which was pressed on them by Whiston in 1737. He was appointed surveyor of coasts and headlands, and in 1741 received a grant for instruments. An act passed in 1740 enabled the commissioners to spend money on the survey of the coasts of Great Britain and the " plantations." At a later date they bore part of the expenses of Cook's scientific voyages, and of the publication of their results. Indeed it is to them that we owe all that was done by England for surveys of coasts, both at home and abroad, prior to the establishment of the hydrographic department of the Admiralty in 1795. But their chief work lay in the encouragement they gave on the one hand to the improvement of timepieces, and on the other to the perfecting of astronomical tables and methods, the latter being published from time to time in the Nautical Almanac. Before we pass on to these two important topics we may with advantage take a view of the state of practical navigation in the middle of the 1 8th century as shown in two of the principal treatises then current.

John Robertson's Elements of Navigation passed through six editions between 1755 and 1796. It contains good teaching on arithmetic, geometry, spherical trigonometry, astronomy, geography, winds and tides, also a small useful table for correcting the middle time between the equal altitudes of the sun — all good, as is also the remark that " the greater the moon's meridian altitude the greater generally the tides will be." He states that Lacaille recommends equal altitudes being observed and worked separately, in order to find the time from noon, and the mean of the results taken as the truth. There is a sound article on chronology, the ancient and modern modes of reckoning time. A long list of latitudes, longitudes and times of high water finishes vol. i. The second volume is said by the author to treat of navigation mechanical and theoretical ; by the former he means seamanship. He gives instructions for all kinds of sailings, for marine surveying and making Mercator's chart.. There are two good traverse tables, one to quarter points, the other to every 15 minutes of arc; the distance to each is 120 m. There is a table of meridional parts to minutes, which is more minute than customary. Book ix., upon what is now called " the day's work," or dead-reckoning, appears to embrace all that is necessary. A great many methods, we are told, were then used for measuring a ship's rate of sailing, but among the English the log and line with a half-minute glass were generally used. Bouguer and Lacaille pro- posed a log with a diver to avoid the drift motion (1753 and 1760). Robertson's rule of computing the equation of equal altitudes is as good as any used at the present day. He gives also a

description of an equal- altitude instrument, having three horizontal wires, probably such as was used at Portsmouth for testing Harrison's timekeeper. The mechanical difficulties must have been great in preserving a perpendicular stem and a truly horizontal sweep for the telescope. It gave place to the improved sextant and artificial horizon. The second edition of Robertson's work in 1 764 contains an excellent dissertation ©& the rise and progress of modern navigation

by Dr James Wilson, which has been greatly used by all subsequent writers.

Don Jorge Juan's Compendio de Navegacion, for the use of mid-shipmen, was published at Cadiz in 1757. Chapter i. explains what pilotage is, practical and theoretical. He speaks of the change of variation, " which sailors have not believed and do not believe now." He describes the lead, log and sand-glass, the latter corrected by a pendulum, charts plane and spherical. Supposing his readers to be versed in trigonometry, he explains what latitude and longitude are, and shows a method for finding the latter different from what has been taught. He explains the error of middle latitude sailing, and shows that the longitude found by it is always less than the truth. (It is strange that while reckoning was so rough and imperfect in many respects such a trifle as that is in low latitudes should be noticed.) After speaking of meridional parts, he offers to explain the English method, which was discovered by Edmund Halley, but omits the principles upon which Halley founded his theory, as it was " too embarassing." He gives instructions for allowing for currents and leeway, tables of declination, positions of a few stars, meridional parts, &c. It is worthy of remark that, after giving a form for a log-book, he adds that this had not been previously kept by any one, but he thought it should not be trusted to memory. He only re- quires the knots, fathoms, course, wind and leeway to be marked every two hours. He gives a sketch of Halley's quadrant, but without a clamping screw or tangent screw.

To ascertain local time at sea by astronomical observations by the altitude of suitably-situated heavenly bodies was an old, well-known and frequently practised operation, so that a comparison could thus be easily made between such local time and the Greenwich time if known at the same instant. The introduction of timekeepers by which Greenwich time can be carried to any part of the world, and the longitude found with ease, simplicity and certainty is due to the invention of John Harrison.

The idea of keeping time at sea by watches was no novelty, but the

practical difficulty arose from their very irregular rates owing to changes of temperature and the motion of the ship. Huygens had applied pendulums to the regulation of clocks on shore in 1656, and in 1675 his application of spiral springs as regulators of watches made them available for use at sea. William Derham published a scientific description of various kinds of timekeepers in The Artificial Clock-Maker, in 1700, with a table of equations from Flamsteed to facilitate comparison of mean time with that shown by the sun-dial or apparent time. In 1714 Henry Sully, an Englishman, published a treatise at Vienna, on finding time artificially. He went to France, and spent the rest of his life in trying to make a timekeeper for the discovery of the longitude at sea. In 1 716 he presented a watch of his own make to the Academy of Sciences, which was approved; and ten years later he went to Bordeaux to try his marine watches, but died before embarking. Julien le Roy was his scholar, and perfected many of his inventions in watchmaking.

Harrison's great invention was the principle of compensation through the unequal contraction of two metals, which he first applied in the invention in 1726 of the compensation (gridiron) pendulum, still in use, and then modified so as to fit it to a watch, devising at the same time a means by which the watch retains its motion while being wound up. With regard to the success of the trial journey (see Harrison, John) to Jamaica in 1761-1762, it may be noted that by the journal of the House of Commons we find that the error of the watch was ascertained by equal altitudes at Portsmouth and Barbados, the calculations being made by Short; these errors came greatly within the limits of the act. At Jamaica the watch was only in error five seconds (assuming that the longitude previously found by the transit of Mercury could be closely depended on, which as we now know, was not the case, the observations being too few in number, and taken with an untrustworthy instrument). Short at Portsmouth found the whole unallowed-for error from November 6th, 1761, till April 2nd, 1762, to be I n, 54 a .5 = l8 geographical miles in the latitude of Portsmouth. During the passage home in the " Merlin " sloop-of- war the timekeeper was placed in the after part of the ship, because it was the dryest place, and there it received violent shocks which retarded its motion. It lost on the voyage home i m 49 s = 16 geo- graphical miles.

One might have supposed that Harrison had now secured the prize ; but there were powerful competitors who hoped to gain it by lunars, and a bill was passed through the House in 1763 which left an open chance for a lunarian during four years. A second West Indies trial of the watch took place between November 1 763 and March 1764, in a

voyage to Barbados, which occupied four months; during which time it is said, in the preamble to act 5 Geo. III. 1765, not to have erred 10 geographical miles in longitude. We only find in the public records the equal altitudes taken at Portsmouth and at Bridgetown, Barbados. William Harrison assumed an average rate of I" a-day gaining, and he anticipated that it would go slower by 1″ for every 10° increase in temperature. The longitude of Bridgetown was determined by N. Maskelyne and C. Green by nine emersions of Jupiter's first satellite, against five of Bradley's and

two at Greenwich Observatory, to be 3 b 54 m 20 8 west of Greenwich. In February 1765 the commissioners of longitude expressed an opinion that the trial was satisfactory, but required the principles to be disclosed and other watches made. Half the great reward was paid to Harrison under act of parliament in this year, and he and his son gave full descriptions and drawings, upon oath, to seven persons appointed by the commissioners of longitude. 1 The other half of the great reward was promised to Harrison when he had made other timekeepers to the satisfaction ot the commissioners, and provided he gave up everything to them within six months. The second half was not paid till 1773, after trials had been made with five watches. These trials were partly made at Greenwich by Maskelyne, who, as we shall see, was a great advocate of lunars, and was not ready to admit more than a subsidiary value to the watch. A bitter contro- versy arose, and Harrison in 1767 published a book in which he charges Maskelyne with exposing his watch to unfair treatment. The feud between the astronomer-royal and the watchmakers con- tinued long after this date.

Even after Harrison had received his £20,000, doubts were felt as to the certainty of his achievement, and fresh rewards were offered in 1774 both for timekeepers and for improved lunar tables or other methods. But the tests proposed for timekeepers were very discouraging, and the watchmakers complained that this was due to Maskelyne. A fierce attack on the astronomer's treatment of himself and other watchmakers was made by Thomas Mudge in 1792, in A Narrative of Facts, addressed to the first lord of the Admiralty, and Maskelyne's reply does not convey the conviction that full justice was done to timekeepers. Maskelyne at this date still says that he would prefer an occultation of a bright star by the moon and a number of correspondent observations of transits of the moon compared with

those of fixed stars, made by two astronomers at remote places, to any timekeeper. The details of these controversies, and of subsequent improvements in timekeepers, need not detain us here. In England the names of John Arnold and Thomas Earnshaw as watchmakers are prominent, each of whom received, up to 1 805, £3000 reward from the commissioners of longitude. It was Arnold who introduced the name chronometer. The French emulated the English efforts for the production of good timekeepers, and favour- able trials were made between 1768 and 1772 with watches by Le Roy and F. Berthoud.

The marvellous accuracy with which the modern chronometer is constructed is doubtless greatly stimulated by the annual competition at Greenwich, from which the Admiralty purchase for the British navy. These chronometers are all fitted with secondary compensation balances, and it is therefore unusual in the navy to apply any temperature correction to the rate. The perfection obtainable in compensation may be illustrated by the performance of a chronometer at the Royal Observatory in 1886, which at a mean temperature of 50 F. had a weekly rate of i-6 sees, losing; and on being further tested at a mean temperature of 92° F., it only changed its weekly rate to 2-9 sees, losing. In the mercantile marine cheaper chronometers without secondary compensation are more commonly used, and tempera- ture corrections applied, calculated from a formula originally proposed by Hartnup, formerly of the Liverpool Observatory. Great success attends this mode of procedure, as illustrated by the following facts. From the discussion of the records of per- formance of the chronometers of the Pacific Steam Navigation Company during twenty-six voyages from London to Valparaiso and back, by giving equal weight to each of the three chrono- meters carried by each ship, the mean error of longitude for an average voyage of 101 days was less than three minutes of arc. As a single instance, in the s.s. Orellana, on applying temperature rates during a voyage of 63 days, the mean accumulated error of the three chronometers was only 2-3 sec. of time.

While chronometers were thus rapidly approaching their present perfection the steady progress of astronomy both by the multiplication and increased accuracy of observations, and by corresponding advances in the theory, had made it possible to construct greatly improved tables. In observations of the moon Greenwich still took the lead; and it was here that Halley's successor Bradley made his two grand discoveries of aberration and nutation which have added so much to the precision of modern astronomy. Kepler's Rudolphine tables of 1627 and Street's tables of 1661, which had held their ground for almost

‘The explanations and drawings are at the British Museum; and two of his watches, one of which was used by Captain Cook in the ” Resolution,” are at Greenwich Observatory. In 1767 Harrison estimates that a watch could be made for £100, and ultimately for £70 or £80.

a century, were rendered obsolete by the observations of Halley and his successor. At length, in 1753, in the second volume of the Commentarii of the Academy of Gottingen, Tobias Mayer printed his new solar and lunar tables, which were to have so great an influence on the history of navigation. Mayer after- wards constructed and submitted to the English government in 1755 improved MS. tables. Bradley found that the moon’s place by these tables was generally correct within 1’, so that the error in a longitude found by lunar would not be much more than half a degree if the necessary observations could be taken accurately at sea. Thus the lunar problem seemed to have at length become a practical one for mariners, and in England it was taken up with great energy by Nevil Maskelyne — ” the father,” as he has been called, ” of lunar observations.”

In 1 761 Maskelyne was sent to St Helena to observe the transit of Venus. On his voyage out and home he used Mayer’s printed tables for lunar determinations of the longitude, and from St Helena he wrote a letter to the Royal Society {Phil. Trans., 1762), in which he described his observations made with Hadley’s quadrant of 20 in. radius, constructed by John Bird, and the glasses ground by Dollond. He took the observations both ways to avoid errors. The arc and index were of brass, the frame mahogany; the vernier was subdivided to minutes. The telescope was 6 in. long, magnified four times, and inverted. Very few seamen in that day possessed so good ail instrument. He considered that ship’s time should be ascertained within twelve hours before or after observing the lunar distance, as a good common watch will scarcely vary above a minute in that time. This shows that he must have intended the altitudes to be calculated — which would lead to new errors. He considered that his observations would give the longitude within 1 1 degrees. On the nth of February he took ten observations; the extremes were a little over one degree apart.

On his return to England Maskelyne prepared the British Mariner’s Guide (1763), in which he undertakes to furnish complete and easy instructions for finding the longitude at sea or on shore, within a degree, by observing the distance between the moon and sun, or a star, by Hadley’s quadrant. How far that promise was fulfilled, and the practicability of the instructions, are points worth consideration, as the book took a prominent place for some years. The errors which he

said were inseparable from the dead-reckoning ” even in the hands of the ablest and most skilful navigators,” amounting at times to 15 degrees, appear to be overestimated. On the other hand, the equations to determine the moon’s position at time of observation from Mayer’s tables, would, he believed, always determine the longi- tude within a degree, and generally to half a degree, if applied to careful observations. He recommends the two altitudes and distance being taken simultaneously when practicable. The probable error of observation in a meridian altitude he estimated at one or two minutes, and in a lunar distance at two minutes. He then gave clear rules for finding the moon’s position and distance by ten equations, too laborious for seamen to undertake. Admitting the requisite calculations for finding the moon’s place to be difficult, he desired to see the moon’s longitude and latitude computed for every twelve hours, and hence her distance from the sun and from a proper star on each side of her carefully calculated for every six hours, and published beforehand.

In 1765 Maskelyne became astronomer-royal, and was able to give effect to his own suggestion by organizing the publication of the Nautical Almanac. The same act of 1765 which gave Harrison his first £10,000 gave the commissioners authority and funds for this undertaking. Mayer’s tables, with his MS. improvements up to his death in 1762, were bought from his widow for £3000; £300 was granted to the mathematician L. Euler, on whose theory of the moon Mayer’s later tables were formed; and the first Nautical Almanac, that for 1767, was published in the previous year, at the cost and under the authority of the commissioners of longitude. In 1696 the French nautical almanac for the following year appeared, an improvement on what had been before issued by private persons, but it did not

attempt to give lunar distances. 1 In the English Nautical Almanac for 1767 we find everything necessary to render it worthy of confidence, and to satisfy every requirement at sea. The great achievement was that of giving the distance from the moon’s centre to the sun, when suitable, and to about seven fixed stars, every three hours. The mariner has only to find the apparent time at ship, and clear his own measured lunar distance from the effects of parallax and refraction (for which at the end of the book are given the methods of Lyons and Dunthorne), and then by simple proportions, or proportional logarithms, find the time at Greenwich. The calculations respecting

the sun and moon were made from Mayer's last manuscript tables under the inspection of Maskelyne, and were so continued till 1804. 2 The calculations respecting the planets are from Halley's tables, and those of Jupiter's satellites from tables made by Wargentin and published by Lalande in 1759 (except those for the fourth satellite). The original Nautical Almanac contained all the principal points of information which the seaman required, but the great value of such an authentic publication to the whole astronomical world led soon to a considerable increase to its contents. As much of this was unnecessary for the ordinary requirements of navigation, since 1903 it has been issued in two forms, the larger for observatory purposes, the smaller for the class for whom it was originally intended.

Various useful rules and tables were appended to early volumes of the Almanac. Thus that for 1771 contains a method and table for determining the latitude by two altitudes and the elapsed time (first published by Cornelius Downes of Amsterdam in 1740). At the end of the Almanac for 1772 Maskelyne and Whichell gave three special tables for clearing the lunar distance; still their rule is neither short nor easily remembered. An improvement of Dun- thorne's solution is also given. In the edition for 1773 a new table for equations of equal altitude was given by W. Wales. In those for 1797 and 1800 tables were added by John Brinkley for rendering the calculations for double altitudes easier.

The plan of the Nautical Almanac was soon imitated by other nations. In France the Acad6mie Royale de Marine had all the lunar distances translated from the British Nautical Almanac for 1773 and following years, retaining Greenwich time for the three-hourly distances. The tables were considered excellent, and national pride was satisfied by their having been formed on the plan proposed by Lacaille. They did not imitate the mode given for clearing the lunar distance, considering their own better.

Though the Spaniards were leaders in the art of navigation during the 16th and 17th centuries, it was not till November 4, 1791, that their first nautical almanac was printed at Madrid, having been previously calculated at Cadiz for the year 1792. They acknowledge borrowing from the English and French. The excellent Berlin Astronomisches Jahrbuch began to appear in 1776, the American Ephemeris in 1849. These two ephemerides and the French Con- naissance des temps are independent and valuable works.

A book of Tables Requisite to be Used with the Nautical Ephemeris was published by Maskelyne at the same time as the first Almanac,

and ten thousand copies were quickly sold. A second edition, prepared by Wales, appeared in 1781, an octavo of 237 pages, in the preface of which it is stated that it contains everything necessary for computing the latitude and longitude by observation. There are in all twenty-three tables, the traverse table and table of meridional parts alone being deficient as compared with modern works of the kind ; dead-reckoning Maskelyne did not touch. He gave practical methods for working several problems; that for computing the lunar

1 The French nautical almanac or Connaissance des temps ap- peared under letters patent from the king, dated 24th March 1679 — seventeen years before the first issue. The following is a literal translation of its advertisement: " This little book is a collection of holy days and festivals in each month. The rising and setting of the moon when it is visible, and of the sun every day. The aspects of the planets as with respect to each other, the moon and the fixed stars. The lunations and eclipses. The difference of longitude between the meridian of Paris and the principal towns in France. The time of che sun's entrance into the twelve signs of the zodiac. The true place of the planets every fifth day, and of the moon every day of the year, in longitude and latitude. The moon's meridian passage, for finding the time of high water, ' as well as for the use of dials by moonlight.' A table of refraction. The equation of. time [this table is strangely arranged, as though the clock were to be reset on the first of every month, and the explanation speaks of the ' premier mobile ']. The time of twilight at Paris. The sun's right ascension to hours and minutes. The sun's declination at noon each day to seconds. The whole accompanied by necessary instructions."

2 Mayer's tables were printed at London under Maskelyne's superintendence in 1770.

especially is an improvement on those by Lyons and Dunthorne, and a rule given for clearing the distance, called Dunthorne's improved method, is remarkably short. Maskelyne's rule for finding the latitudes by two altitudes and the elapsed time is also good. The third edition of the Tables was issued in 1802.

The publication of the Requisite Tables met a great want, and the existence of such accurate and conveniently-arranged mathematical tables for the special purposes of nautical calculations led to the more general use of many refinements which had been previously neglected. They formed the original of many subsequent and greatly extended collections, of which those by J. W. Norie are the more generally used in modern times in the mercantile marine, and the very

accurate and comprehensive tables by James Inman (originally published in 1823) are constantly used in the British navy.

Until the middle of the 17th century mariners generally employed small collections of Dutch charts, known as ” waggoners ” from Waghenair, the name of a celebrated Dutch hydrographer in 1584. In 1671 appeared the English Pilot by John Sellers, who is styled the ” Hydrographer Royal.” It forms a collection of rude sketches of the coasts of England, the North Sea, France and Spain, with safling directions, and on its appearance the importation of Dutch charts was prohibited. Private enterprise, for many years after that, supplied both the British navy and the British mercantile marine with constantly improving charts, especially latterly, under the powerful patronage of the East India Company, whose hydrographer (Alexander Dalrymple), in 1795, was selected as the first hydro- grapher of the Admiralty. This post has since been occupied by a succession of distinguished naval officers under whom have grown up a large school of able nautical surveyors, the results of whose labours are now published in the well-known Admiralty charts.

Prior to the issue of charts by the Admiralty, the instructions to masters of vessels in the British navy enjoined them to ” provide such charts and instruments as they considered necessary for the safe navigation of the ship,” while on the completion of a voyage of discovery it was customary for the results to be published for the Admiralty by private firms.

The establishment of the Admiralty Hydrographic Office in 1795 marked a great step in the advancement of the art of naviga- tion. On the 1 2th of August of that year an order in council placed all such nautical documents as were then in the possession of the Admiralty in charge of Dalrymple, whose catalogue, compiled for the use of the East India Company in 1 786, contained 347 charts between England, the Cape, India and China; thus the germ of the present hydrographic department was estab- lished. The expense was then limited to £650 a year. The first official catalogue of Admiralty charts was issued in 1830, the total number being then 962.

After the close of the long devastating war in 181 5 both trade and science revived, and several governments besides that of Great Britain saw the necessity of surveying the coasts in various parts of the globe; the greater portion of the work fell to the English hydrographical department, which took under its charge nearly every place where the inhabitants were not able to do it for themselves. Since that time its career of usefulness has steadily developed, and it not merely

undertakes the constant improvement of the charts of the whole world, but periodically issues for the use of the seafaring community a vast amount of most accurate and practical nautical information on the various closely allied subjects of navigation, tides, compass adjustment and ocean meteorology.

A knowledge of the times and heights of high and low water and the directions of the tidal streams due to those phenomena are in many parts of the world (and especially round our own coasts) of vital importance to navigation. The theory of the tides was first laid down by Newton and Laplace, and in Phil. Trans., 1683, there is an account of Flamsteed's tide table for London Bridge, which gave the times of each high tide on every day in the year. For a long subsequent period empirical tide tables for a few places in England were published by private individuals, but in 1832 the researches of Dr W. Whewell and Sir J. W. Lubbock enabled official tide tables to be issued by the Admiralty. These have steadily advanced in detail and accuracy, being now in many cases based on continuous tidal observations for a whole lunar period of 18J years, and represent the practical epitome of our knowledge of the tides and tidal currents of the whole world. The formulae and tables on which these predictions are based are given in the introduction to each annual volume (see Tide).

Modern Navigation

Having thus sketched the progress of the art of navigation from an early period to the present time, we will now describe the modern methods by which it is brought into practical use

referring our readers for more technical information to the professional text-books enumerated at the end of this article. The great development in both size and speed of modern ships enormously increases the responsibilities of those who command and navigate them, and has led to a careful examination of the existing modes of determining a ship's position at all times by day or night, both when in sight of land and on the open ocean. An examination of the present text-books on the subject of navigation shows how problems and methods which were formerly considered chiefly as theoretical exercises have now, from the altered conditions of the navigation of very fast ships, become methods of frequent practice, while corresponding improvements have been made in the instruments, such

as compasses, charts and chronometers, by the aid of which more satisfactory results are now attained. Much has also been done to advance the ‘ study of this and its numerous allied subjects by the development of the Royal Naval College at Greenwich and the United Service Institution; also by the establishment of shipmasters’ societies (of which the well-known society in London is typical), where during the year valuable papers are read and useful discussions take place among those actually carrying out the practice of navigation.

In planning out in advance a long ocean voyage the experienced navigator would first, by laying down the track from port to port on a great circle chart, ascertain the shortest route between them, remembering that the greatest saving in distance over other routes is when the ports are far apart in longitude and both in high latitudes of the same name. On examining such a track in conjunction with the wind and current charts it will be seen what modifications the intervention of land, unfavourable currents or winds, ice or unduly high latitude render necessary, and such modified route would be finally adopted subject to possible change as the voyage progressed. The judgment formed on the best route to follow would also be largely influenced by the remarks in the volumes of Sailing directions or ” Pilots ” relating to the region about to be traversed,while among the many excellent modern publications of the Hydrographic Office of the Admiralty perhaps the Ocean Passage Book is one of the most generally useful, since, when used in combination with the admirable charts of suggested full-powered and auxiliary tracks, it very greatly assists all navigators in planning out a successful voyage. Finally the intended route would be trans- ferred from the great circle chart to one on Mercator’s projection, which is the more convenient for purposes of navigation since in constructing the former for the sake of simplicity a projection of the coast’s surface is adopted on which great circles are correctly shown as straight lines (gnomonic), while for practical purposes in navigation such a representation on which a ship’s track when steering a continuous course (technically termed a rhumb line) is truly shown as a straight line (Mercator) is the most convenient, although in high latitudes giving a very distorted representation of the surface depicted. It is well to remember that on great circle charts rhumb lines become curves and great circles straight lines, and, vice versa, on Mercator charts, the rhumb line on each projection being that nearer to the equator, all meridians and the equator on both projections are shown as straight lines.

Ships rarely steer on great circles, which would generally theoretically involve continually altering course, but a series of chords of such circles are described of lengths such as involve a practical change of

course of one or two degrees on the com- pletion of each.

Great circle charts are very useful for drawing what is known as a composite track where if the great circle route would lead into too high a latitude the shortest route to and from the highest desirable parallel is readily laid down, the intervening track being pursued on that parallel.

A method of drawing approximate great circles directly on Mercator charts was proposed by Airy in 1858, and is some- times very useful. The excellent idea, originally suggested by M. F. Maury, of establishing steam ” lanes ” in localities where there is much ocean traffic, so as to minimize the risks of

collision between outward and homeward bound ships, has been successfully carried out in the North Atlantic. The leading transatlantic steamship companies now agree to follow great circle routes from the Irish coast to points on the Banks of Newfoundland, which vary somewhat in position with the season of the year, but are published in advance. These ” lanes ” being avoided by sailing vessels, risks of collision are materially lessened.

Having thus planned the most desirable general track to pursue, three methods are employed to ascertain the position of the ship at any time during such voyage: these are (1) pro- jecting the track on charts; (2) simple trigonometrical calcula- tions where the data are the course steered and distance run; and (3) astronomical observations, which form an entirely independent method.

Of these the first is the least trustworthy, owing to the usual difficulties attending accurate graphic methods and the small scales on which ocean charts are necessarily drawn. When near the land the larger scale coast charts are used, and in the approaches to harbours still larger scale plans give increasing accuracy to this record of a ship’s position. Index charts of all parts of the world are provided, by referring to which the navigator ascertains which chart or plan to employ, always preferably using that on the largest scale.

On leaving harbour, and while near the coast, the position is not found by calculation but by frequently observing (when a variety of objects is in sight) (1) simultaneous sextant angles between suitably situated objects subsequently laid down on the chart by a station pointer; (2) simultaneous compass bearings of two or more objects (technically known as cross bearings); or (3) a combination of both methods by employing one bearing and one angle. All such methods

are capable of considerable accuracy if the observations are made simultane- ously. Should only a small number of objects, or sometimes only one, be visible (as frequently occurs at night) other and rougher methods are practised, depending upon the change of bearing of an object while a certain distance in a certain direction is traversed by the ship, such knowledge being based in many cases on an estimate of the action of the tide. When a ship is steaming at the rate of 20 knots the navigator remembers that a mile is passed over in three minutes, and that if in sight of land and fixing positions by objects on shore, it is essential to adopt some rapid method; otherwise when laid down on the chart the position shows where the ship was, and not where she is. This difficulty has led to the more general use of methods of obtaining positions by angles instead of bearings, and laying them down on the chart by the aid of the station pointer. Many advantages accrue from this, as the observer is not restricted in position on board, as is the case when using the compass, and especially if a double sextant (having two index glasses and one horizon glass) is employed two angles can be measured simultaneously, the result on the chart being very rapidly arrived at. An ingenious combination of sextant and station pointer in one has been proposed, and most simply carried out by attaching vertical sights to the legs of a station pointer, which is put on a suitable horizontal stand, and the legs moved until the sights are in line with the objects observed. To assist the navigator in the choice of suitable objects between which to measure the angles, a very useful pamphlet is issued by the Admiralty, from the diagrams in which it can be seen at a glance which combination of objects in sight gives the most favourable result, always remembering as a broad principle that nearer objects are more suitable than distant ones, and that the accuracy of position determined depends on the relative distances of the objects as well as on the magnitude of the angles between them. In these circumstances,. which render these rougher methods those only available, and especially in hazy weather in many known localities (such as the English Channel), a continuous line of deep sea soundings at fairly even distances apart affords an additional verification of position, remembering that only an occasional sounding might prove very misleading. The chronicle of progress in the art of navigation would be very

incomplete without reference to the extended use of Lord Kelvin’s sounding machines, either in the original form, where the increased pressure at different depths is recorded by dis- coloration of chemical

tubes, or in the later form known as the ” depth recorder,” where similar results are obtained by the automatic record of the position of a piston forced upwards in a tube by this increased pressure. Very satisfactory results can be obtained at speeds of 15 or 16 knots, enabling that great safeguard of navigation in many places, viz. a continuous line of soundings, to be accurately and rapidly obtained. In con- nexion with this should be mentioned a most ingenious invention known as the ” submarine sentry,” which on being set for any desired depth and towed overboard remains at that depth what- ever the speed of the ship may be. On striking bottom it at once floats to the surface and rings a warning bell. Such an instru- ment is of obvious value in ships where, owing to the small number of available men, it is difficult to maintain a continuous line of soundings. To avoid an unnecessarily wide detour in rounding points and shoals, extensive use is now made of both horizontal and vertical danger angles ; the former is the angle on the arc of a horizontal circle passing through a point at the required distance from the danger, and through two previously selected, easily recognized, fixed objects. Should circumstances enable the selection to be made of an angle of about 90 , the ship by continually measuring the angle may be steered on the arc of such a circle with great precision, and may even be safely taken through a channel between two dangers. The vertical danger angle enables similar results to be attained by measuring the vertical angle subtended by a known height; but except where the selected object is one whose height is well determined, such as a lighthouse, this method is not so trustworthy as the former.

Before losing sight of land the latitude and longitude of the last well-.determined position found by the methods referred to is taken from the coast chart, transferred to the ocean or small scale chart, and considered to be the ” departure ” or starting-point of the ocean voyage, and from that point the course and distance run by the ship is laid down, being rectified on every occasion when the position is more accurately determined by astronomical means. To obviate the inevitable inaccuracies attending this graphic method and as a corroboration of the ship’s position, the changes of latitude and longitude involved in each alteration of course are daily calculated by plane trigonometry, such calculations being materially abbreviated by the use of the Traverse Table, which is a tabulated expression of the solutions of right-angled plane triangles.

The foregoing modes of keeping account of a ship’s position are technically known as ” dead reckoning.” The general introduc- tion of compasses with short needles and slow periods of vibration has done very much towards improving the accuracy with which a ship’s ” dead

reckoning ” is kept. The original model of these was that patented by Lord Kelvin in 1876, and since adopted in the British navy as the standard. In this instrument we have a compass specially designed to enable the principles of com- pensation or correction proposed by Sir G. B. Airy in 1837 to be accurately carried out, while its slow period of swing renders it in all circumstances extremely steady.

The record of distance run is always obtained from the patent log, usually in the form of the Cherub or Taffrail log introduced in 1878. The common or hand log has ceased to be regarded as anything but the very roughest of guides, and the patent log in its original form, in which it recorded the revolutions of a small screw towed by the ship, does not give satisfactory results at great speeds, nor can anything more favourable be said of those forms where pressure on known areas is employed. The revolu- tions of the engines, with due allowance made for the condition of the ship’s bottom, afford now perhaps the best means of estimating speed (see Log).

Astronomical observations afford the most accurate means of ascertaining positions at sea, other methods (dead reckoning) being only relied upon when the weather does not admit of the practice of these, though by utilizing twilight and night observa-

tions of moon, stars and planets, the navigator in most parts of the world need seldom proceed far without the means of astronomically rectifying his position either in latitude, longitude or both at the same time.

The practical problems involved are precisely those employed at astronomical observatories, but it is not possible to attain similar accuracy of results, for though the sextant (the instru- ment always employed at sea in making such observations) is capable of marvellous accuracy, yet, as practically all such observations depend directly upon altitudes measured above the sea horizon, the uncertainty and variability of the true position of this, due to the changing effects of refraction, much affect observations made at any one time. This error in practice is greatly reduced by methods of combining several observations made at different times and using their mean or average result.

A notable feature of the progress of the art of modern navigation is the greatly increased practice of star navigation, and many of the supposed difficulties of night observations are found to be removed by experience. Determinations of positions at sea by twilight observations, when the brighter stars become visible while the horizon

is still well defined, are probably the most accurate means we possess; and the careful navigator, by combining for latitude stars passing north and south of the zenith, and for longitude those near the prime vertical both east and west, can generally depend upon a good result, especially if suitable stars can be found for each pair at about the same altitudes. For these purposes the armillary sphere is extremely useful: this is a small celestial globe on which are depicted the principal stars visible to the naked eye. On elevating the pole to the approximate latitude of the observer, and turning the sphere until the sidereal time is under the fixed meridian, a correct representation of the heavens at the time of observation is obtained; the stars a r e then easily identified by their bearings and altitudes. This valuable instrument is not merely useful when at twilight, only a few of the brighter stars being visible, the constellations to which they belong are difficult of recognition, but it enables arrangement to be made in advance for such observations as are desired to be taken during the night. By marking in pencil on the globe the positions of the planets in right ascension and declination, the same sphere is also available for their identification. The heavenly bodies commonly observed at sea are: The Sun, Moon, Venus, Mars, Jupiter, Saturn, the Pole star, and the larger (or first magnitude) fixed stars, the positions of all of which in the heavens are given in the Nautical Almanac for fixed epochs at Greenwich, with the requisite data for computing their positions at all other times in all other places.

The chief astronomical observations made at sea are those for ascertaining (1) latitude, (2) time and thence longitude, (3) error of compass, and (4) latitude and longitude simultaneously.

To ascertain latitude by itself altitudes of heavenly bodies are measured above the horizon when they are on or near the meridian and therefore exactly or nearly north or south of the observer; in the case of the sun, of course, this means at or near noon, and in the case of other bodies such local times are previously accurately ascertained by a simple calculation made from the Nautical Almanac or more roughly found from an armillary sphere. The principle involved is the simple one that by subtracting the observed altitude when on the meridian from 90 the distance of the zenith or point overhead north or south of the heavenly body is found; then by combining with this the distance, obtained from the Nautical Almanac, of the body considered north or south of the celestial equator at the same instant, it is found how far the zenith is north or south of the celestial equator, and this is exactly the same as the latitude of the observer since the celestial equator is merely the imaginary extension of that of the earth. Such observations are not necessarily restricted to that which

can be taken at the instant when the body observed is on the meridian (meridian altitude) ; equally accurate and multiplied observations can be made on either or both sides of the meridian if the body is somewhat near it (ex-meridian and circum-meridian altitudes), and a simple calculation or reference to a specially constructed table or graphic curve gives the required result.

Errors arising from uncertainty as to the true position of the horizon are with twilight and night observations largely counter- acted by taking the means of results obtained from observations made of heavenly bodies crossing the meridian both north and south of the observer, taken as nearly at the same time as convenient. In northern latitudes the pole star is so near to the pole that

observations of it can be taken at any time when it is visible, and from a convenient table given in the Nautical Almanac the altitude of the pole itself (which equals the latitude) is readily obtained.

Longitude at sea is in modern navigation always found by com- paring local or ship mean time with Greenwich mean time, the latter being accurately known from the chronometers and the former from astronomical observations of suitably placed heavenly bodies. It may be assumed in all well found modern ships that on applying the known errors and accumulated rates to the times shown by the chronometers the Greenwich time at any instant is practically accurately known, and as the distance east or west of any place is merely the difference between the two local times at any instant ex- pressed in degrees, so also is the distance east or west of Greenwich (longitude) the difference between time at place and Greenwich time at any one instant. The connexion between time and degrees depends upon the complete rotation of the earth in twenty-four hours, causing meridians 15 apart to pass under the same fixed point in the heavens at intervals of one hour, those east of Greenwich passing earlier and those west later, resulting in local time being in advance of Greenwich time in east longitude and vice versa in west longitude.

The errors and rates of gaining or losing of the chronometer re- ferred to are known from observations made on shore prior to the beginning of the voyage with a sextant and artificial horizon, and these observations are capable of almost as great accuracy as those taken at fixed astronomical observatories. As this knowledge is absolutely

essential every opportunity is taken at each principal port visited of either repeating such observations or obtaining the infor- mation from time balls dropped from observatories on shore at the Greenwich times indicated in the Time-ball pamphlet. Local or ship time can only be found with fair accuracy from calculations based on altitudes of heavenly bodies, when they are nearly east or west of the observer or technically on the prime vertical. Such times can be approximately seen from the azimuth diagrams or from tables of true bearings of heavenly bodies, and the error involved by uncertainty as to the position of the horizon can be greatly obviated in twilight or at night by taking the mean of results arising from nearly simultane- ous observations of bodies bearing both east and west. In the usual case of determining time by observations of the sun the results arising from morning observations are compared with those similarly ob- tained in the afternoon. It will of course be remarked that should any unallowed-for error in the chronometer exist it will affect the resulting longitude by its full amount.

In considering the foregoing methods of astronomically fixing a ship's position we notice that always when the two elements of latitude and longitude are determined at different times, and gener- ally, as we shall presently see, when they are determined together (though usually for a shorter time) the navigator has to depend for some time on the accuracy of the course steered and estimated distance run; also when cloudy weather prevails heTias to depend entirely on those elements for a knowledge of the ship's position. The frequent astronomical observation of the error of the compass is therefore a most important and fortunately simple duty. In practice the error is found by a comparison between the compass bearing of a heavenly body and its true bearing, obtained either by calculation, or more generally from a graphic diagram (Weir's azimuth diagram) or tables from which at practically any time when above the horizon the true bearings of the principal heavenly bodies are taken by in- spection. These important observations are most accurately made when the body observed is bearing nearly east or west true, if not too high, but if clouds prevent observations at such times, fairly good results can be obtained by observing the compass bearing when the object is on the meridian (if not too high) and therefore lying north or south true.

The causes of the changing errors of a compass in an iron ship are described elsewhere (see Compass), but by making comparisons as above the navigator can at once ascertain what is termed the " total " error, and if he takes from that the portion of error due to the earth, or what is termed variation (known from a chart of such elements), the remaining error is that caused by the iron of the ship, technically

known as deviation. The latter method of procedure has the great advantage of enabling the navigator to ascertain during a voyage whatever magnetic changes in the ship are taking place other than those he would expect to occur on change of position. The total error is that applied to compass courses.

Deviations greater- than a few degrees are not merely inconvenient but in modern compasses produce unsteadiness or oscillation of the compass card, so that, especially in new ships, the skilful navigator reduces such errors by adjusting the compensating magnets when favourable occasions offer. Recognizing the great value of a sound knowledge of compass adjustment, the British Board of Trade have included this among the compulsory subjects of examination for the rank of master, thus following the example of the navy, where all navigating officers have to attend a practical course of study on the subject.

The practical problem of finding both latitude and longitude at the same time is the most important of all in modern navigation, and is rapidly superseding other modes of ascertaining a ship's position. The principle involved depends upon the fact that every heavenly body is at each particular instant of time directly overhead or in the zenith of some place on the earth. Thus, if we take the sun as an

instance, it is noon at all places on the meridian of 60° W. when it is exactly 4 p.m. at Greenwich, and at the one spot on that meridian where the observer is as far north or sou th of the terrestrial eq uator as the sun is north or south of the celestial equator (declination) it will not only be noon but the sun will be immediately overhead and will have an altitude of 90 . This, therefore, at any instant defines the position where the sun is vertical; its latitude must equal the sun's declination and its longitude in time equal the time since noon at Greenwich. Now at a distance of 60 m. in every direction on the surface of the earth from the point thus defined the sun will have an altitude of 89° and in all directions at a distance of 1200 m. its altitude will be 70 (= 90°— 20°), so that on a globe, by marking the position where at a certain instant the sun is vertical and taking that as a centre, a series of concentric circles may be drawn, on all points of each of which the sun's altitude will be the same. When, therefore, at sea we measure with a sextant at any time the altitude of the sun (say 60° 10') we at once know we are somewhere on the arc of a circle having for its centre the spot where the sun is vertical at that instant, and for radius a distance equal to 1790′ (= 90° — 60 ° io')- Such information, combined with the best and most recent knowledge we have of the ship's latitude at the >"\me, will of itself afford valuable

information as to the position, but by making two such observations, separated by a sufficiently long interval for the position having the sun vertical to have moved considerably (owing to the rotation of the earth), we are able to consider with certainty that we must be at one or other of the widely separated intersections of two such circles, the movement of the ship in the interval between the two observations being duly allowed for. The dead reckoning affords information as to which of these intersections is the true position.

Now even on a large globe it would be practically impossible to obtain very accurate results from this problem by drawing such circles, but on a large scale chart (or ordinary squared paper) much greater accuracy is obtainable. The method commonly used on a Mercator chart involves two suppositions: (1) that the concentric circles we have referred to will be correctly represented as circles on the chart, and (2) that these are of such diameters, that a portion of say 100 m. of arc may be considered to be a straight line coincident with the tangent to the circle and therefore at right angles to the direction of the sun. Except in high latitudes (above 60°) Mercator's projection fulfils the first condition sufficiently well for practical purposes, and, except when the altitude is greater than 70°, the second condition is also approximately true since the radii of such circles will exceed 1200 m.

Premising these conditions, suppose that on a certain day at 9 a.m. when the ship's approximate position, known from previous observations and laid down on the chart, is supposed to be at A (fig. 7), an observation of the sun is made from which the longitude is calculated, the result being that on the sup- position that the latitude of A is correct, the ship's position is probably at B. Now by drawing a straight line ab through B at right angles to the true bearing of the sun at the time of observation (which is most readily known from the azimuth tables) we are obviously right in assum- ing the ship's position to be somewhere on that line if we consider it as approximately an arc of a large circle having the place where the sun is then vertical as a centre, the direction of such place being indicated by an arrow.

If our supposed latitude be right the position will be at B, but if not correct it must still be on the line ab, and if near land or any danger the direction of this line, even if no subsequent observation be available, will often give most valuable information. If, while waiting for the sun to change its bearing, the ship runs from 6 to C, a line cd drawn through C parallel to ab will represent an arc on which the position lies when she is probably at C, which at this instant (10-30 a. m.) is the most probable position of the ship.

If another observation of the sun for longitude is now made and the resulting position is D (lying of course in the same latitude as C), on drawing through D a line ef at right angles to the bearing of the sun (indicated by an arrow) we are right in assuming the position to be somewhere on such an arc as is represented by this line.

Hence E, the intersection of the two arcs on which the position lies at the same instant, must be the true place when the last observation was taken at the supposed position D, the discrepancies being entirely due to the original unknown error in the assumed latitude of A, for had that been accurate the position on the original line ab would have been such that on laying off the course and distance from that position C would have coincided with E.

Errors in the assumed latitude of as much in many cases as 30 m. will often be found to produce no practical difference in the resultant position, but of course the accuracy of the longitude found is entirely dependent upon the chronometer, and in such cases as arise when the intersecting arcs make a small angle with each other great accuracy

is required in the course and distance run between the times of observation.

This method of finding both latitude and longitude at the same time is commonly known as ” Sumner’s ” method from the publicity given to it in 1847 by the publication of an excellent pamphlet on the subject by a master of that name in the American mercantile marine, although in a modified form it was practised at a much earlier date in the British navy under the name of ” cross bearings of the sun.” Prior to the publication of azimuth tables in 1866 the calculation was more lengthy and troublesome, the work being practically doubled.

We have taken an illustration from observations of the sun, but the method is obviously applicable to all heavenly bodies provided they are so situated that the arcs drawn will intersect at a good angle; this in twilight or at night-time is readily done by selecting two heavenly bodies whose bearings differ considerably, and in such cases the small complication of allowing for the run of the ship is often obviated by making the observations simultaneously. The armillary sphere or star globe is useful in selecting objects suitably situated.

The principle of Sumner’s method has of recent years received a very

important and valuable development under the name of the ” new navigation.” In this method, originally proposed by Marc St Hilaire, a comparison is made between the altitude of a heavenly body as actually observed and that calculated from the supposed position of the ship. For instance, the position of an observer at the instant of observing a (true) altitude of the sun of 40 10′ must be somewhere on a portion of the circumference of a circle (usually of such size that the portion considered may be represented on a chart by a straight line) having its centre in latitude equal to the sun’s declination, and in longitude equal to the Greenwich apparent time at the instant, the radius of such a circle being equal to the sun’s zenith distance of 49 50’. If at the same time the true altitude of the sun is from the estimated position of the ship calculated to be 40 ° 5’, it is evident that the greater observed altitude must be owing to the ship being nearer to the centre of the circle than was supposed, and a line of position drawn through the estimated position at right angles to the bearing of the sun must be transferred parallel to itself through a distance of 5′ towards the direction of the sun’s bearing. The second line of position, obtained when the sun’s bearing has altered some 25 , is dealt with in a similar way, and the intersection of the two lines so obtained gives the position of the ship at the time of second observation. This mode of procedure enables all observa- tions, whether near or far from the meridian, to be similarly dealt with ; in all cases the altitude the heavenly body should have is computed and compared with what it actually has. The practice of problems such as the foregoing is greatly facilitated by the extended means of finding at any moment the azimuth or true bearing of a heavenly body. When the azimuth was only required for the de- termination of compass error, the valuable tables from which the computed results could be obtained by inspection were limited to those cases of most practical importance, but from the ingenious and simple graphical form known as Weir’s azimuth diagram azimuths of all heavenly bodies, whose declinations extend from 6o° N. to 60° S., can be obtained during the whole time they are above the horizon, thus greatly facilitating the laying down lines of position.

A careful record of everything pertaining to the navigation of the ship, with the results of all observations and calculated positions, is kept in the ship’s log, an official book of great importance, a rough original of which is kept on deck with entries made in it of all such events at the time of their occurrence. A copy of the headings of a page of this as transferred into the official log is here given:

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may be expected (as known from the Barometer Manual) the barometer is anxiously and frequently watched, and at all times its indication is compared with that normally experienced in the locality traversed as shown on the barometer charts, due allowance being made in the tropics for the ordinary daily movement. All observations relating to ocean meteorology are of great service in the compilation and improvement of wind and current charts, and in many ships more extensive meteorological journals are voluntarily kept on forms supplied by the Meteorological Office. A knowledge of the temperature of the surface of the sea is often of great practical use in navigation as giving warning of change in direction of the surface ocean current, especially in localities where there exist near to each other warm and ccld currents setting in different directions, as, for instance, near the edge of the Gulf Stream. As an indication of the vicinity of ice such observations are usually much less trustworthy. On the completion of the calculations giving the ship's position at noon each day the results are tabulated in the ship's log on the following form :

Course made good.

Distance.

Latitude.

Longitude.

Variation Allowed.

True Bearings and Distance.

Made Good.

Through

the water.

D.R. Obs.

D.R.

Obs.

Current.

The course entered here is that which would be indicated by the “standard” compass, of the ship (placed in the most favourable magnetic position on board) ; that actually steered by is the one most conveniently seen by the helmsman. Comparisons between the latter and the ” standard ” are frequently made, their indications generally varying somewhat owing to the difference of deviation in different positions on the ship. The compass card is usually gradu- ated into points and degrees, but the course is always estimated in degrees. The speed is ascertained from the indication of the patent log, the hand log being generally only used as a rough check on this. Wind direction and force are the result of estimation; as the speed and course of the ship so greatly affect the apparent direction and velocity no practical anemometer for use on board ship exists. Wind force is estimated in terms of what is known as the ” Beaufort ” scale, based on the supposed amount of sail a vessel could carry at the time. The height of the mercurial barometer is carefully read at the end of each watch, as also is the thermometer; the more sensitive aneroid barometer is kept in a very accessible position and more frequently referred to by the officer of the watch. When navigating in localities and during seasons at which circular storms or hurricanes

The course and distance made good each day are calculated by trigonometry between the best determined positions at two successive noons, such positions in fine weather being always those determined astronomically, and the current being considered the difference in the positions at noon as determined astronomically and as calculated by dead reckoning since the previous noon; such differences, however, obviously include the errors of all kinds. The latitude and longitude found by dead reckoning are entered under that heading (D.R.). The astronomical positions of latitude and longitude (entered as ” obs.” or ” by observation “) are very seldom both determined at noon, but are carried up or back to that instant by calculation from the intervening dead reckoning. The variation allowed is taken from the published

variation chart, on which the latest results of such observations are embodied at intervals of about ten years with the annual changes (as far as known) in different localities, thus enabling the navigator to obtain its value at intermediate dates. Finally the course and distance are calculated from the position of the ship at noon to either the port of destination or some prominent position or danger near to which the vessel must pass. This is entered under the heading ” true bearings and distance.”

Authorities. — The following list of some writers of navigation whose works have not been already mentioned may be found useful to refer to: Thomas Addison, Arithmetical Navigation (1625) — he was the first to apply, logarithms; Antonio de Najera (Lisbon, 1628) follows Nunez and Cespedes, but corrects the declination of sun and stars; Sir R. Dudley, L’arcano del mare (1630-1646, 2nd ed., Florence, 1661) — too ponderous for the use of seamen; Sir Jonas Moore (1681) — one of the best books of the period; William Jones (1702) — a useful compendium containing trigonometry applied to the various sailings, the use of the log, and tables of logarithms ; Pierre Jean Bouguer, Traite complet de la navigation (folio, 1698) — good but too large; Manuel Pimental, L ‘Arte de navegar (Lisbon, 1712); Pierre Bouguer, jun., Nouveau traite de navigation (1753) — without tables, published at the request of the minister of marine, improved and shortened in 1769 under the superintendence of the astronomer Lacaille; Nathaniel Colson, The Mariner’s New Calendar (1735)— a good book; Seller, Practical Navigation — a book very popular in its time (there was an edition as late as 1739) ; Samuel Dunn published good star charts and tables of latitude and longitude (1737), and framed concise rules for many problems on navigation (published by the board of longitude) ; John H. Mocre, The Practical Navigator and Seaman’s New Daily Assistant (1772) — very popular, and gener- ally used in the British navy — the 18th and 19th editions (1810,1814) were improved by J. Dessiou; W. Wilson (Edinburgh, 1773) — a treatise of good repute at the time; Samuel Dunn, New Epitome of Practical Navigation, or Guide to the Indian Seas (1777) — for the longitude he depends chiefly on a variation chart from observations by East Indiamen, and he still makes no mention of the Nautical Almanac or of parallel rulers ; Samuel Dunn (probably a son of the last named, 1781) is the last writer who gives instructions for the use of the astrolabe: he also wrote on ” lunars ” (1783, 1793X a name which was generally adopted about this time, arid published an excellent traverse table (1785), and Daily Uses of the Nautical Sciences, (1790) ; Horsburgh, Directory for East India Voyages (1805) ; A Mackay, The Complete Navigator (about 1791); 2nd ed. 1810)— there is no instruction for

finding longitude by the chronometer. Kelly, Spherical Trigonometry and Nautical Astronomy (1796, 4th ed., 1813) — clear and simple; N. Bowditch, Practical Navigator (1800) — passed through many editions and is now (in a revised form) the official text-book of the United States navy; J. W. Norie, Epitome of Navigation (1803, 21st ed. 1878) — still a favourite in the mercantile marine from its simplicity, and because navigation can be learned from it without a teacher; T. Kerigan, The Young Navigator's Guide to Nautical Astronomy (1821); Inman, Epitome of Navigation (1821) — with. an excellent volume of tables, formerly

largely used in the British navy, 9th ed. (1854); E. Riddle, Naviga- tion and Nautical Astronomy (3rd ed. 1824, 9th ed., by Escott, 1871), still worthy of its high reputation; J. T. Towson, Tables for Reduction of Ex-meridian Altitudes (4th ed. 1854), very useful; H. Raper, Practice of Navigation (1840, 10th ed. 1870), an excellent book; H. Evers, Navigation and Great Circle Sailing (1850), other works on the same subject by Merrifield and Evers (1868) and Evers (1875); R. M. Inskip, Navigation and Nautical Astronomy (1865), a useful book, without tables; T. H. Sumner, A Method of finding a Ship's Position by two Observations and Greenwich Time by Chronometer — this is set forth as a novelty, but was published by Captain R. Owen, R.N., early in the century, and practised by many officers; H. W. Jeans, Navigation and Nautical Astronomy (1858) ; Harbord, Glossary of Navigation (1863, enlarged ed. 1883), a very excellent book of reference ; W. C. Bergen, Practice and Theory of Navigation (1872); Sir W. Thomson, Navigation, a Lecture (1876), well worth reading; Lecky, Wrinkles in Navigation (1880); Martin, Navigation and Nautical Astronomy, sanctioned for use in the British navy.

(W. R. M.*)

NAVIGATION LAWS. The laws grouped under this title are a branch rather of municipal law than of the general maritime law. They are based upon the right of a state to regulate the navigation of its own waters and to protect its own commerce. One of the most curious early books on the subject is Captain G. St Lo, England's Safetie or a Bridle to the French King, proposing a sure Method for encouraging Navigation (London, 2nd ed. 1693). Navigation laws may be divided into two classes. The first class includes all laws designed to secure a commercial monopoly to the state which enacted them. In Great

Britain the object was attained by the Navigation Acts, the earliest of which were those of 1381 and 1390, ordaining that no merchandise should be shipped out of the realm except in British ships on pain of forfeiture. The principal Navigation Act was that of 1660 (Scottish, 1661, c. 45). Up to 1854 coasting trade was wholly restricted to British ships, and a British ship must have been navigated by a master who was a British subject, and by a crew of whom a certain proportion must have been British subjects. After 1854 the only relics of such restrictions were found in the provisions of the Customs Consolidation Act 1853, § 324, by which, in order to secure reciprocity, prohibitions or restrictions may by order in council be imposed upon the ships of any country in which British ships are liable to similar pro- hibitions or restrictions. Subject to these exceptions, a foreign ship is in the same position as a British ship with regard to British trade. This right of foreign ships is expressly recognized by the Customs Law Consolidation Act 1876; by § 141 of that act foreign ships engaged in the coasting trade are not to be subject to higher rates than British ships. Any advantages which a British ship has, e.g. the right of claiming protection for her flag, the non-attachment to her of a maritime lien for necessaries supplied in a British port, are not directly connected with the policy under which the Navigation Acts have become obsolete. These advantages are not secured to a British ship until she is registered. United States law agrees with British in this respect. ” The United States have imitated the policy of England and other commercial nations in conferring peculiar privileges upon American-built ships and owned by our own citizens. . . . The object of the Registry Acts is to encourage our own trade, navigation and shipbuilding by granting peculiar or exclusive privileges of trade to the flag of the United States, and by prohibiting the communication of those immunities to the shipping and mariners of other countries ” (Kent, Comm. iii. 139). It may be noticed that an alien is generally incapable of becoming the owner of a ship. This incapacity was specially preserved in the case of British ships by the Naturaliza- tion Act 1870, § 14.

The second class of navigation laws includes those which deal with the navigation of any waters over which a state has any control, and embraces all that is necessary for the due use of such waters, as rules of the road, management of harbours and light- houses, and licensing and control of pilots. Such laws may deal with (1) the high seas, (2) tidal waters other than the high seas, (3) non-tidal waters.

I. The claims of various natiofs to dominion over parts of the high seas have now become matters of merely historical interest. Such claims have been at different times advanced by Great Britain, Holland, Spain

and Portugal, and were once sufficiently important

to evoke the Mare Liberum of Grotius and the Mare Clausum of John Selden. It may be noted that in 1893 the Court of Arbitration on the Bering Sea Fisheries found that Russia had never claimed or exercised exclusive jurisdiction over the Bering Sea outside terri- torial waters and that the United States had no further right than had Russia at the time of the cession of Alaska in 1867. Rules for the navigation of the high seas may still be promulgated by any government. In Great Britain such rules, generally known as the ” Sailing Rules,” have been made by order in council under the powers of the Merchant Shipping Act 1862; the rules at present in force are those contained in the order of the 27th of November 1896, L.G. No. 1082, as amended by subsequent orders in council. The order of 1896 was extended by the order of 1897, L.G. No. 572, to the ships of most foreign countries, with a special provision as to China. In the case of a state which has not assented to them, the only rules enforceable are the general rules of the sea, gradually ascertained by individual cases before courts of admiralty.

2. For the navigation of its tidal waters — as far as they are territorial — a state may legislate without the assent of other states. An example of such legislation is afforded by the Territorial Waters Jurisdiction Act 1878, a measure passed in consequence of the celebrated case of R. v. Keyn, L.R. 2 Ex. D., 126 (the ” Franconia ” case), in 1876. Under the head of territorial waters would fall the ” narrow seas ” (as the Bristol Channel, Great Belt or Straits of Messina), bays and harbours, estuaries and arms of the sea, navigable tidal rivers, and the sea for the distance of a marine league from the shore. Such waters being res publicae though not res communes, as are the high seas, are prima facie subject to the jurisdiction of the state. In England the soil under such waters, or at least under all but the last kind, is prima facie vested in the crown, subject to the public rights of fishery and anchorage. For the distance of a marine league from low-water mark the crown has certainly jurisdiction for police and revenue purposes. This is a rule of general international law. It may be noted that the Institut de Droit International proposed to double this limit. See Hall, International Law (5th ed.), p. 154. In England the navigation of most of the principal tidal waters is governed by rules contained in acts of parliament and orders in council, the latter for the most part promulgated under the authority given by the Merchant Shipping Act 1862. For instance, there are numerous orders relating to the Thames, Mersey, Tees and other important rivers.

3. Non-tidal waters, even though navigable, are in Great Britain prima

facie private waters, in which the right of navigation does not exist as a public franchise, but can only be acquired by prescription founded on a presumed grant by an owner. In Roman law and in the Code Napoleon it is otherwise. Navigable rivers in those systems are always publici juris, whether tidal cr non-tidal. Navigation of non-tidal waters in the United Kingdom, whether natural or artificial, is now almost entirely regulated by various Navigation and Con- servancy Acts, e.g. the Thames Conservancy Acts, the Shannon, Trent, Lee, &c, Navigation Acts, and the various Canal Acts, especially the Manchester Ship Canal Act 1885. It may be noticed that the crown is empowered by the Merchant Shipping Act 1862 to make rules for the navigation of inland waters, even when artificial, on the application of the proprietors. Examples of such rules are the orders in council regulating the Mersey and Irwell navigation and the Bridgewater navigation, 18th May 1870. Such waters being private property, the application for the rules by the proprietors is recited in the order in council.

The distinction drawn in the United States between navigable and boatable rivers seems to be peculiar to that country, unless indeed it is analogous to the ” fleuves et rivieres navigables ou flottables ” of the Code Napoleon, § 538. It is at least unknown in Great Britain.

Remedies for Obstruction and Pollution. — These may be either criminal or civil — the criminal by indictment or information, the civil by action for damages or for an injunction, in addition to the criminal remedy, where special damage has been sustained. Pollu- tion is expressly provided for by the Rivers Pollution Prevention Act 1876, which gives jurisdiction to county courts in cases within the act.

International Law. — The international law as to the navigation of the high seas has been sketched above. Reference should also be made to what is known as the ” Rule of the War of 1756 ” to the effect that where a colonial or coasting trade is prohibited to other nations in time of peace, a neutral by engaging in this trade by permission of a belligerent in time of war is liable to the other belligerent. The leading case is The Immanuel (1799), 2 C. Robinson r s Rep. 186. Regulations for the coasting trade may be made by the government of India under the powers of the Customs Consolidation Act 1853, § 329, and by the legislature of a British possession under the Merchant Shipping Act 1894, § 736. As to territorial waters, it is the general though not the universal opinion of jurists that the state to which the territorial waters belong has a right to forbid their navigation by foreigners. The free navigation of rivers has often been the subject of treaties, almost necessarily so where a river is the boundary between two states. In

such a case, if a state were to maintain the strict letter of its rights, navigation would be almost impossible, as each state is proprietor down to the middle line of the bed of the river, the medium filum aquae or thalweg.

By the treaty of Vienna in 1815 it was provided that the navigation of all rivers separating or traversing the states that were parties thereto should be open for commercial purposes to the vessels of all nations, subject to a uniform system of police and tolls. The treaty of Paris, 1856, extended this principle to the Danube. In America the cases of the Mississippi and the St Lawrence are important. By the treaty of Versailles, 1783, it was provided that ” the navigation of the Mississippi shall for ever remain free and open to the subjects of Great Britain and the citizens of the United States.” But the United States afterwards acquired Louisiana and Florida; and, the stipulation as to British subjects not being renewed in the treaty of Ghent, 1814, the United States maintains that the right of navigat- ing the Mississippi is vested exclusively in its citizens. As to the St Lawrence, after disputes for a long period between Great Britain and the United States, the right of free navigation for purposes of commerce was secured to the United States by the treaty of Washing- ton, 1871. There are some waters, such as the Suez Canal and the Panama Canal, which are subject to peculiar engagements by treaty or convention. The former depends on the Convention of Con- stantinople, 29th of October 1888, the latter — as far as regards the United Kingdom and the United States — on the Hay-Pauncefote Treaty, 18th of November 1901. But as a rule it may be said that in time of peace the territorial waters of a state are open to foreigners for commercial purposes, subject to observance of any rules as to police, pilotage, &c, imposed by the state. Tolls may be imposed by the state upon foreigners. This right is expressly recognized in most commercial treaties. A notable instance was the claim of Denmark to charge what were called the ” Sound dues ” from all vessels passing Elsinore, though the Sound was not strictly her territorial water. The right was not universally recognized, though it had prescription in its favour and was invariably paid. In 1857 the dues were abolished, and compensation paid to Denmark for the loss of her alleged right. (J. W.)

NAVIUS, ATTUS, in Roman legendary history, a famous augur during the reign of Tarquinius Priscus. When the latter desired to double the number of the equestrian centuries, Navius opposed him, declaring

that it must not be done unless the omens were propitious, and, as a proof of his powers of divination, cut through a whetstone with a razor. Navius's statue with veiled head was afterwards shown in the comitium; the whet- stone and razor were buried in the same place, and a puteal placed over them. Hard by was a sacred fig-tree, called after him the Navian fig-tree. It was reported that Navius was subsequently put to death by Tarquinius. According to Schwegier, the puteal originally indicated that the place had been struck by lightning, and the story is a reminiscence of the early struggle between the state and ecclesiasticism.

See Livy i. 36; Dion. Halic. iii. 70; Aurelius Victor,' De viris illustribus, 6; Schwegier, Romische Geschichte, bk. xv. 16.

NAVVY, a labourer employed in the digging and excavating of earth, &c, in the construction of railways, docks, canals or other engineering operations. The word is a shortened form of " navigator," applied during the 18th and early part of the 19th centuries to a labourer at work on canals, to which the name " navigation " is often applied. Power-machines (excavators) for performing such work are consequently known as " steam- navvies."

NAVY and NAVIES. The navy of a country was in its original meaning the total body of its shipping, whether used for war, for oversea and coasting traffic, or for fishing — the total in fact of its ships (Lat. naves). By custom, however, the word has come to be used only of that part of the whole which is set aside for purposes of war and police. Every navy consists of a material part (see Ship), i.e. the vessels, with their means of propulsion and their armament, and of a human organization, namely the crews of all ranks, by which the vessels are handled. Ships and men are combined in divisions, and are ruled by an organ of the government to which they belong (see Admiralty Administration) .

Personnel

The personnel of the British navy is composed of two different bodies of men, the seamen and the marines, each of which has its appropriate officers. The marines are the subject of a separate article.

The officers of the navy are classed as follows in the order of their rank: flag-officers (see Admiral), commodores, captains, staff captains, commanders, staff commanders, lieutenants, navigating lieutenants, sub-lieutenants, chief gunners, chief boatswains, chief carpenters, gunners, boatswains, carpenters, midshipmen, naval cadets.

Flag-officers are divided into three ranks, viz. rear-admiral, vice-

admiral, admiral. There is also the rank of ” admiral of the fleet ” : such an officer, if in command, would carry the union flag at the main. All flag-officers, commanders-in-chief, are considered as responsible for the conduct of the fleet or squadron under their command. They are bound to keep them in perfect condition for service; to exercise them frequently in forming orders of sailing and lines of battle, and in performing all such evolutions as may occur in the presence of an enemy; to direct the commanders of squadrons and divisions to inspect the state of each ship under their command ; to see that the established rules for good order, discipline and cleanliness are ob- served; and occasionally to inquire into these and other matters themselves. They are required to correspond with the secretary of the admiralty, and report to him all their proceedings.

Every flag-officer serving in a fleet, but not commanding it, is required to superintend all the ships of the squadron or division placed under his orders — to see that their crews are properly disciplined, that all orders are punctually attended to, that the stores, provisions and water are kept as complete as circumstances will admit, that the seamen and marines are frequently exercised, and that every precaution is taken for preserving the health of their crews. When at sea, he is to take care that every ship in his division preserves her station in whatever line or order of sailing the fleet may be formed; and in battle he is to observe attentively the conduct of every ship near him, whether of the squadron or division under his immediate command or not ; and at the end of the battle he is to report it to the commander-in-chief, in order that commenda- tion or censure may be passed, as ,he case may appear to merit ; and he is empowered to send an officer to supersede any captain who may misbehave in battle, or whose ship is evidently avoiding the en- gagement. If any flag-officer be killed in battle his flag is to be kept flying, and signals to be repeated, in the same manner as if he were still alive, until the battle shall be ended; but the death of a flag- officer, or his being rendered incapable of attending to his duty, is to be conveyed as expeditiously as possible to the commander-in-chief. The captain of the fleet is a temporary rank, where a commander- in-chief has ten or more ships of the line under his command ; it may be compared with that of adjutant-general in the army. He may either be a flag-officer or one of the senior captains; in the former case, he takes his rank with the flag-officers of the fleet ; in the latter, he ranks next to the junior rear-admiral, and is entitled to the pay and allowance of a rear-admiral. All orders of the commander-in- chief are issued through him, all returns of the fleet are made through him to the commander-in-chief, and he

keeps a journal of the pro- ceedings of the fleet, which he transmits to the admiralty. He is appointed and can be removed from this situation only by the lords commissioners of the admiralty.

A commodore is a temporary rank, and of two kinds — the one having a captain under him in the same ship, and the other without a captain. The former has the rank, pay and allowances of a rear- admiral, the latter the pay and allowances of a captain and special allowance as the lords of the admiralty may direct. They both carry distinguishing pennants.

When a captain is appointed to command a ship of war he commissions the ship by hoisting his pennant; and if fresh out of the dock, and from the hands of the dockyard officers, he proceeds immediately to prepare her for sea, by demanding her stores, provisions, guns and ammunition from the respective departments, according to her establishment. He enters such petty officers, leading seamen, able seamen, ordinary seamen, artificers, stokers, firemen and boys as may be sent to him from the flag or receiving ship. If he be appointed to succeed the captain of a ship already in commission, he passes a receipt to the said captain for the ship's books, papers and stores, and becomes responsible for the whole of the remaining stores and provisions.

The duty of the captain of a ship, with regard to the several books and accounts, pay-books, entry, musters, discharges, &c, is regulated by various acts of parliament; but the state of the internal discipline, the order, regularity, cleanliness and the health of the crews will depend mainly on himself and his officers. In all these respects the general printed orders for his guidance contained in the King's Regulations and Admiralty Instructions are particularly precise and minute. And, for the information of the ship's company, he is directed to cause the articles of war, and abstracts of all acts of parliament for the encouragement of seamen, and all such orders and regulations for discipline as may be established, to be hung up in some public part of the ship, to which the men may at all times have access. He is also to direct that they be read to the ship's company, all the officers being present, once at least in every month. He is desired to be particularly careful that the chaplain have shown to him the attention and respect due to his sacred office by all the officers and men, and that divine service be performed every Sunday. He is not authorized to inflict summary punishment on any com- missioned or warrant-officer, but he may place them under arrest, and suspend any officer who shall misbehave, until an opportunity shall offer of trying such officer by a court-martial. He is enjoined to be very careful not to suffer the

inferior officers or men to be treated with cruelty and oppression by their superiors. He is the authority who can order punishment to be inflicted, which he is never to do without sufficient cause, nor ever with greater severity than the offence may really deserve, nor until twenty-four hours after

the crime has been committed, which must be specified in the warrant ordering the punishment. He may delegate this authority to a limited extent to certain officers. All the officers and the whole ship's company are to be present at every punishment, which must be inserted in the log-book, and an abstract sent to the admiralty every quarter.

The commander has the chief command in small vessels. In larger vessels he is chief of the staff to the captain and assists him in maintaining discipline, and in sailing and fighting the ship.

The lieutenants take the watch by turns, and are at such times entrusted, in the absence of the captain, with the command of the ship. The one on duty is to inform the captain of all important occurrences which take place during his watch. He is to see that the whole of the duties of the ship are carried on with the same punctuality as if the captain himself were present. In the absence of the captain, the commander or senior executive officer is responsible for everything done on board.

The navigating officer receives his orders from the captain or the senior executive officer. He is entrusted, under the command of the captain, with the charge of navigating the ship, bringing her to anchor, ascertaining the latitude and longitude of her place at sea, surveying harbours, and making such nautical remarks and observations as may be useful to navigation in general.

The warrant-officers of the navy may he compared with the non-commissioned officers of the army. They take rank as follows, viz. gunner, boatswain, carpenter; and, compared with other officers, they take rank after sub-lieutenants and before midshipmen.

The midshipmen are the principal subordinate officers, but have no specific duties assigned to them. In the smaller vessels some of the

senior ones are entrusted with the watch; they attend parties of men sent on shore, pass the word of command on board, and see that the orders of their superiors are carried into effect ; in short, they are exercised in all the duties of their profession, so as, after five years' service as cadets and midshipmen, to qualify them to become lieutenants, and are then rated sub-lieutenants provided they have passed the requisite examination.

The duties and relative positions of these officers remain practi- cally unaffected by recent changes; but a profound modification was made in the constitution of the corps of officers at the close of 1902. Up to the end of that year, officers who belonged to the " executive " branch, i.e. from midshipmen to admiral, to the marines and the engineers, had entered at different ages, had been trained in separate schools, and had formed three co-operating but independent lines. For reasons set forth in a memorandum by Lord Selborne (December 16, 1902) — from the desire to give a more scientific character to naval education, and to achieve complete unity among all classes of officers — it was decided to replace the triple by a single system of entry, and to coalesce all classes of officers, apart from the purely civil lines — surgeons and paymasters (formerly " pursers ") — into one. Lads were in future to be entered together, and at one training establishment at Osborne in the Isle of Wight, on the distinct under- standing that it was to be at the discretion of the admiralty to assign them to executive, marine or engineer duties at a later period. After two years' training at Osborne, and at the Naval College at Dart- mouth, all alike were to go through the rank of midshipman and to pass the same examination for lieutenant. When in the intermediate position of sub-lieutenant, they were to be assigned to their respec- tive branches as executive officer, marine or engineer. The engineers under this new system were to cease to be a civil branch, as they had been before, and become known as lieutenant, commander, captain or rear-admiral E. (Engineer).

The crew of a ship of war consists of leading seamen, able seamen, ordinary seamen, engine-room artificers, other artificers, leading stokers, stokers, coal-trimmers, boys and marines. The artificers and stokers and the marines are always entered voluntarily, the latter in the same manner as soldiers, by enlisting into the corps, the former at some rendezvous or on board particular ships. The supply of boys for the navy, from whom the seamen class of men and petty officers is recruited, is also obtained by voluntary entry.

Merchant seamen are admitted into the royal naval reserve, receive an annual payment by way of retainer, perform drill on board His

Majesty's ships, and are engaged to serve in the navy in case of war or emergency.

There are two schemes for forming reserves. The Royal Naval Reserve scheme draws men from the mercantile marine and fishing population of the United Kingdom. The Royal Fleet Reserve scheme, introduced in 1901, while it gave a better system of training to the pensioners, was mainly designed to obtain the services in war of the men who had quitted the navy after the expiration of their twelve years' service.

So far as other countries are concerned, the staff of officers does not differ materially from one navy to another. In all it consists of admirals, captains, lieutenants, midshipmen and cadets receiving their training in special schools. With the exception of the navy of the United States, all the important naval forces of the world are raised by conscription.

The strength and general condition of navies at any given time must be learnt from the official publications of the various powers, and from privately composed books founded on them. The yearly statements of the First Lord of the Admiralty in Great Britain, the

Reports of the Secretary of the Navy in the United States, and the Reports of the Budget Committees of the French-Chamber contain masses of information. The Naval Annual, founded by Lord Brassey in 1886, is the model of publications which appear in nearly every country which possesses a navy. Mr F. T. Jane's All the World's Fighting Ships is a survey of the materiel of navies since 1898.

History or Navies

Every navy was at its beginning formed of the fighting men of the tribe, or city, serving in the ship or large boat, which was used indifferently for fishing, trade, war or piracy. The develop- ment of the warship as a special type, and the formation of organized bodies of men set aside for military service on the sea came later. We can follow the process from its starting-point in the case of the naval powers of the dark and middle ages, the Norsemen, the Venetians, the French, the English fleet and others. But centuries, and indeed millenniums, before the modern world emerged from darkness the nations of antiquity who lived on the shores of the Mediterranean had formed navies and had seen them culminate and decline. The adven- tures of the Argonauts and of Ulysses give a legendary and poetic picture of an " age of the Vikings " which was coming to an end two thousand years before the Norsemen first vexed the west of Europe. At a period

anterior to written history necessity bad dictated the formation of vessels adapted to the purposes of the warrior. Long ships built for speed (nanpai vi\es, naves longae) as distinguished from round ships for burden (orpoyyvkat. vr)ts, naves onerariae) are of extreme antiquity (see Ship). Greek tradition credited the Corinthians with the invention, but it is probable that the Hellenic peoples, in this as in other respects, had a Phoenician model before them. So little is known of the other early navies, whether Hellenic or non-Hellenic, that we must be content to take the Athenian as our example of them all, with a constant recognition of the fact that it was certainly the most highly developed, and that we cannot safely argue from it to the rest.

The Athenian navy began with the provision of warships by the state, because private citizens could not supply them in sufficient numbers. The approach of the Persian attack in 483 B.C. drove Athens to raise its establish- ment from 50 to 100 long ships, which were paid for out of the profits of the mines of Moroneia (see Themistocles). The Persian danger compelled the Greeks to form a league for their common naval defence. The League had its first headquarters at Delos, where its treasury was guarded and administered by the 'EWrivora/jtiai (Hellenotamiai), or trustees of the Hellenic fund. Her superiority in maritime strength gave Athens a predominance over the other members of the League like that which Holland enjoyed for the same reason in the Seven United Provinces. The Hellenotamiai were chosen from among her citizens, and Pericles transferred the fund to Athens, which became the mistress of the League. The allies sank in fact to subjects, and their contributions, aided by the produce of the mines, went to the support of the Athenian navy. The hundred long ships of the Persian War grew to three hundred by the end of the 5th century B.C. (see Peloponnesian War), and at a later period (when, however, the quality of ships and men alike had sunk) to three hundred and sixty. The ancient world did not attain to the formation of a civil service — at least until the time of the Roman Empire — and Athens had no admiralty or navy office. In peace the war-vessels were kept on slips under cover in sheds. In war a strategos was appointed to the general command, and he chose the trierarchs, whose duty it was to commission them partly at their own expense, under supervision of the state exercised by special inspectors (airoaToXels). The hulls, oars, rigging and pay of the crews were provided by the state, but it is certain that heavy charges fell upon the trierarchs, who had to fit the ships for sea and return them in good condi- tion. The burden became so heavy that the trierarchies were divided, first between two citizens in the Peloponnesian War, and then among groups (synteleiai) consisting of from five to sixteen persons. Individual Athenians who

were wealthy and patriotic or ambitious might fit out ships or spend freely on

Athenian.

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their command. But these voluntary gifts were insufficient to maintain a great navy. The necessity which compelled modern nations to form permanent state navies, instead of relying on a levy of ships from the ports, and such vessels as English nobles and gentlemen sent to fight the Armada, prevailed in Athens also. The organization of the crews bore a close resemblance in the general lines to that of the English navy as it was till the 16th and even the 17th century. The trierarch, either the citizen named to discharge the duty, or some one whom he paid to replace him, answered to the captain. There was a sailing master (Kvˆepvf)rr]s) , a body of petty officers, mariners and oarsmen (wnjpecta), with the soldiers or marines (&rijS&r

Until the use of broadside artillery and the sail became universal at the end of the 16th century, all navies were forcibly organized on much the same lines as the Athenian, even in the western seas. In the Mediterranean the differences were in names and in details. The war fleets of the successors of Alexander, of Carthage, of Rome, of Byzantium, of the Italian republics, of the Arabs and of Aragon, were galleys relying on their power to ram or board. Therefore they present the same elements — a chief who is a general, captains who were soldiers, or knights, sailing masters and deck hands who navigate and tend the few sails used, marines and rowers. A few words may, however, be said of Rome, which transmitted the tradition of the ancient world to Constantinople, and of the Constantino- politah or Byzantine navy, which in turn transmitted the tradi- tion to the Italian cities, and had one peculiar point of interest.

As a trading city Rome was early concerned in the struggle for predominance in the western Mediterranean between the Etruscans, the Greek colonies and the Carthaginians. Its care of its naval interests was shown by the appoint- ment of navy commissioners as early as 311 B.C. (Duoviri navales). In the first Punic War it had to raise great fleets from its own resources, or from the dependent Greek colonies of southern Italy. After the fall of Carthage it had no opponent who was

able to force it to the same efforts. The prevalence of piracy in the 1st century B.C. again compelled it to attend to its navy (see Pompey). The obligation to keep the peace on sea as well as on land required the emperors to maintain a navy for police purposes. The organization was very complete. Two main fleets, called the Praetorian, guarded the coasts of Italy at Ravenna and Misenum (classes Praetoriae), other squadrons were stationed at Forum Julii (Frejus), Seleucia at the mouth of the Orontes (Nahr-el-Asy) , called the classis Syriaca, at Alexandria (classis Augusta Alex- andrine), at Carpathos (Scarpanto, between Crete and Rhodes), Aquileia (the classis Venelum at the head of the Adriatic), the Black Sea (classis Pontica), and Britain (classis Britannica) . River flotillas were maintained on the Rhine (classis Germanica), on the Danube (classis Pannonica and Maesica) and in later days at least on the Euphrates. All these squadrons did not exist at the same time. The station at Forum Julii was given up soon after the reign of Augustus, and the classis Venetum was formed later. But an organized navy always existed. A body of soldiers, the classici, was assigned for its service. The commander was the Praefectus Classis.

When Constantine founded his New Rome on the site of Byzantium, the navy of the Eastern Empire may be said to have begun. Its history is obscure and it suffered several yzaa e. ec jjp Ses While the Vandal kingdom of Carthage lasted (428-534), the eastern emperors were compelled to attend to their fleet. After its fall their navy fell into neglect till the rise of the Mahommedan power at the end of the 7th century again compelled them to guard their coasts. The

eastern caliphs had fleets for purposes of conquest, and so had the emirs and caliphs of Cordova. The Byzantine navy reached its highest point under the able sovereigns of the Macedonian dynasty (867-1056). It was divided into the imperial fleet, commanded by the Great Drungarios, the first recorded lord high admiral, and the provincial or thematic squadrons, under their strategoi. Of these there were three, the Cibyrhaeotic (Cyprus and Rhodes), the Samian and the Aegean. The thematic squadrons were maintained permanently for police purposes. The imperial fleet, which was more powerful when in commission than all three, was kept for war. A peculiar feature of the Byzantine navy was the presence in it of a corps answering to the seaman gunners and gunnery officers of modern navies. These were the siphonarioi, who worked the siphons (crujxives) used for discharging the ” Greek fire.” When the Turkish invasions disorganized the Eastern Empire in the 12th century, the Byzantine navy withered, and the emperors were driven to rely on the help of the Venetians.

The Italian republics of the middle ages, and the monarchical states bordering on the Mediterranean, always possessed fleets which did not differ in essential particulars from that of Athens. There is, however, one fact which must not be overlooked. It is that the seamen of some of them, and more especially of Genoa, served the powers of western Europe from a very early date. Diego Gelmirez, the first archbishop of Santiago in Gallicia, employed Genoese to construct a dockyard and build a squadron at Vigo in the 12th century.

Edward III. of England employed Genoese, and others were engaged to create a dockyard for the French kings at Rouen. By them the naval science of the Mediterranean was carried to the nations on the shores of the Atlantic. The Mediterranean navies made their last great appearance in history at the battle of Lepanto (1571). Thenceforth the main scene of naval activity was on the ocean, with very different ships, other armaments and organizations.

The great navies of modern history may best be discussed by taking first certain specially important national navies in their earlier evolution, and then considering those which are of present day interest in their relations to one another.

The British Navy.

The Royal Navy of Great Britain stands at the head of the navies of the modern world, not only by virtue of its strength, but because it has the longest and the most consistent historical development. The Norse invasions of the 9th century forced the English people to provide for their defence against attack from oversea. Though their efforts were but partially successful, and great Norse settlements were made on the eastern side of the island, a national organization was formed. Every shire was called upon to supply ships ” in proportion to the number of hundreds and from the produce of what had been the folkland contained in it ” (Stubbs, Const. Hist. i. 116). Alfred and his successors had also ships of their own, maintained out of the royal revenue of which they had complete control. Before the Conquest the system of contribution by the shires had largely broken down. Yet in its main lines the method of providing a navy adopted by Alfred and his immediate successors remained in existence. There were the people’s ships which represented the naval side of the fyrd — i.e. the general obligation to defend the realm; and there were the king’s own vessels which were his property. By the nth century a third source of supply had been found. This was the feudal array. Towns on the sea coast were endowed with privileges and franchises, and rendered definite services in return.

The Norman Conquest introduced no fundamental difference. In the 1 2th century the kings of the Angevine dynasty made the military resources of their kingdom available in three ways; the feudal array, the national militia and the mercenaries. Dover, Sandwich, Romney, and the other towns on the south- east coast which formed the Cinque Ports represented the naval part of the feudal array. In the reign of Henry III. (1216-1272) their service was fixed at 57 ships, with 1197 men and boys, for

fifteen days in any year, to count from the time when they weighed anchor. During these fifteen days they served at the expense of the towns. Beyond that date they were maintained by the king. The Cinque Ports Squadron has been spoken of as the foundation of the Royal Navy. But a feudal array is wholly alien in character to a national force. The Cinque Ports, after playing a prominent part in the 13th century, sank into in- significance. They were always inclined to piracy at the expense of other English towns. In 1297, during one of the expeditions to Flanders, they attacked and burnt twenty ships belonging to Yarmouth under the eyes of Edward I. (1272-1307). The national militia had a longer life. The obligation of the coast towns and counties to provide ships and men for the defence of the realm was enforced till the 17th century. Nor did the method of enforcing that obligation differ materially. In the reign of King John (1199-1216), when the records began to be regularly kept, but when there was no radical change in system, the reeves and bailiffs of the seaports were bound to ascertain by a jury the number, size and quality of all ships belonging to the port. When the ships were required for the king's service they were embargoed. The local authorities were then bound to see that they were properly equipped and manned. It was the duty of the reeves and bailiffs to arrange that they should reach the place named by the king as rendezvous at the time fixed by him. These embargoes inflicted heavy loss even when they were honestly imposed, and loud complaints were heard in Parliament from the later years of Edward III. (1327-1377) that they afforded the king's officers many openings for oppression and corruption.

The true ancestors of the modern navy must be sought in the third element of the navy of the middle ages — the king's ships and his ”

mercenaries.” Under King John we find the full record of a regular organization of a Royal Navy as apart from the feudal array of the Cinque Ports or the fyrd. In 1 205 he had in all 50 ” galleys ” — long ships for war — distributed in various ports. William of Wrotham, archdeacon of Taunton, one of the king’s ” clerks,” or ecclesiastical persons who formed his civil service, is named, sometimes in combination with others, as ” keeper of the king’s ships,” ” keeper of the king’s galleys ” and ” keeper of the king’s seaports.” The royal vessels cannot have differed from the 57 warships of the Cinque Ports, and at first his navy was preferable to the feudal array, or the levy from the counties, mainly because it was more fully under his own control. They were indeed so wholly his that he could hire them out to the counties, and at a much later period the ships of Henry V. (1413-1422) were sold to pay his personal debts after his death. Yet though the process by which the king’s ships became the national navy was slow, the affilia- tion is direct from them tfJthe fleet of to-day, while the permanent officials at Whitehall are no less the direct descendants of William of Wrotham and the king’s clerks of the 13th century. When on active service the command was exercised by repre- sentatives of the king, who were not required to be bred to the sea or even always to be laymen. In the crusade of 1190 the fleet of Richard the Lion Hearted (1189-1199), drawn partly from England and partly from his continental possessions, was governed by a body of which two of the members were church- men. They and their lay colleagues were described as the ductores et gubernatores totius navigii Regis. The first commanders of squadrons were known as justiciarii navigii Regis, ductores et constabularii Regis.

The crusade of 11 90 doubtless made Englishmen acquainted with the title of ” admiral “; but it was not till much later that the word became, first as ” admiral and captain,” then as ” admiral ” alone, the title of an officer commanding a squadron. The first admiral of all England was Sir John Beauchamp, appointed for a year in 1360. The permanent appointment of a lord admiral dates from 1406, when John Beaufort, natural son of John of Gaunt, and marquess of Somerset and Dorset, was named to the post. The crews consisted of the two elements which, in varying proportions and under different names, have been and are common to all navies — the mariners whose business

it was to navigate the ship, and the soldiers who were put in to fight. Until the vessel had been developed and the epoch of ocean voyages began, the first were few and subordinate. As the seas of Britain were ill adapted for the use of the galley in the proper sense, though the French employed them, English ships relied mainly on the sail. They

used the oar indeed but never as a main resource, and had therefore no use for the ” turma ” (ciurma in Italian, chiourme in French, and chusma in Spanish) of rowers formed in the Mediterranean craft. Crews were obtained partly by free enlistment, but also to a great extent, by the press (see Impressment). The code of naval discipline was the laws of Oleron (see Sea Laws), which embodied the general ” custom of the sea.” By the reign of Edward III, (1327-1377) the duties and jurisdiction of the admiral were fixed. He controlled the returns of the ships made by the reeves, selected them for service, and chose his officers, who had their commission from him. A rudimentary code of signals by lights or flags was in use.

The history of the middle ages bears testimony to the general efficiency and energy of the navy. Under weak kings, and at certain periods, for instance in the latter years of Edward III. and the reign of his grandson Richard II. (1377-1399), it fell into decay, and the coast was ravaged by the French and their allies the Basque seamen, who manned the navy of Castile. Henry IV. (1399-1413), though an astute and vigorous ruler, was driven to make a contract with the merchants, mariners and shipowners, to take over the duty of guarding the coast in 1406-1407. Their admirals Richard Clitherow and Nicholas Blackburne were appointed, and exercised their commands. But the experiment was not a success, and was not renewed. Apart from these periods of eclipse, the navy in all its elements, feudal, national and royal, was more than a match for its enemies. The destruction of the fleet prepared by Philip Augustus, the French king, for the invasion of England in 1213 at Damme, the defeat of Eustace the Monk in 121 7 off Dover, the victory over the French fleet at Sluys in 1340, and the defeat of the Spaniards off Winchelsea in 1350, were triumphs never quite counterbalanced by any equivalent overthrow. Still better proofs of the ability of any navy to discharge its duties were the long retention of Calais, and the constant success of the rulers of England in their invasions of France. The claim to the sovereignty of the seas has been attributed on insufficient evidence to King John, but it was enforced by Edward III.

Under the sovereigns of the Tudor dynasty (1485-1603) the development of the navy was steady. Though Henry VII. (1485-1509) made little use of his fleet in war, he built ships. His son Henry VIII. (1509-154 7) took a keen interest in his navy. Shipbuilding was improved by the importation of Italian workmen. The large resources he obtained by the plunder of the Church enabled Henry VIII. to spend on a scale which had been impossible for his predecessors, and was to be impossible for his successors without the aid of grants from Parliament. But the most vital service which he rendered to the navy

was the formation of, or rather the organization of existing officials into, the navy office. This measure was taken at the very end of his reign, when the board was constituted by letters patent dated 24th of April 1546. It consisted of a lieutenant of the admiralty, a treasurer, a comptroller, a surveyor, a clerk of the ships, and two officials without special title. A master of the ordnance for the ships was also appointed. Henry's board, commonly known as the navy board, continued, with some periods of suspension, and with the addition of different de- partments — the victualling board, the transport board, the pay office, &c, added at various times — to be the administrative machinery of the navy till 1832. They were all theoretically subject to the authority of the lord high admiral, or the com- missioners for discharging his office, who had the military and political control of the navy and issued all commissions to its officers. In practice the boards were very independent. The double government of the navy, though it lasted long, was undoubtedly the cause of much waste — partly by the creation

of superfluous officials, but more by the opening it provided for corruption.

The 1 6th century in England as elsewhere saw a great develop- ment in the size and capacity of ships, in the length of voyages, and consequently in the sciences of navigation and seamanship, which brought with them the predominance of the seaman element hitherto subordinate. In the reign of Henry VIII., when a squadron was commissioned in 1512, out of a total of 3000 men, 1750 were soldiers. By the end of the reign of his daughter Elizabeth (1558-1603) it was calculated that of the 8346 men required to man her fleet 5534 were seamen, 804 were gunners, and only 2008 were soldiers. In the early years of his reign Henry VIII. equipped his squadrons on a system which bears some resemblance to the Athenian trierarchies. He made a contract with his admiral Sir Edward Howard (1477- iSˆ). by which the king supplied ships, guns and a sum of money. The admiral, who had full power to ” press,” named the officers and collected the crews. Among them are named contingents from particular towns — the representatives of the fyrd. With the exception of the captain, who received eighteen pence a day, all were paid at the same rate, 5s. wages and 5s. for rations per month. Extra sums called ” dead shares,” the wages of so many imaginary men, and rewards, were provided for the master and warrant officers. Until the regular returns known as the ” weekly progress of the dockyards” and the ” monthly lists of ships in sea pay ” were established in 1773, no constant strict account of the strength of the navy was kept. The figure must therefore be accepted as subject to correction, but King Henry’s navy is estimated to have consisted of 53 vessels of 11,268 tons, carrying 237 brass guns and 1848 of iron. , It sank somewhat during the agitated reigns of his successors Edward VI. (1547-1553) and Mary (1553-1558). By Elizabeth it was well restored. In mere numbers her navy never equalled her father’s. At the end of her reign it was composed of 42 vessels, but they were of 17,055 tons, and therefore on the average much larger. The military services rendered by the great queen’s fleet were brilliant. No organic change was introduced, and fleets continued to be made up by including vessels belonging to the different ports.

The two most notable advances in organization were the establishment of a graduated scale of pay by rank in 1582, and the

formation of a fund for the relief of sick and wounded seamen. This was not a grant from the state but a species of compulsory insurance. All men employed by the navy, including shipwrights, were subject to a small deduction from their pay. The amount was kept in the chest at Chatham, from which the fund took its name, and was managed by a committee of five, each of whom had a key, and of whom four were elected by the contributors. The commissioner of the dockyard presided.

It was between the accession and the" fall of the House of Stuart (1603-1688) that the navy became a truly national force, maintained out of the revenue voted by parliament, and acting without the co-operation of temporary levies of trading ships. The reign of James I. (1603-1625) is a period of great importance in its history. The policy of the king was peaceful, and he only once sent out a strong fleet — in 1620 when an expedition was despatched against the Barbary pirates. He took, however, a lively interest in shipbuilding, and supported his master ship- wright Phineas Pett (1507-1647) against the rivals whom he offended by disregarding their rules of thumb. Under the lax administration of the lord high admiral Nottingham, better known as Lord Howard of Effingham, many abuses crept into the navy. Though more money was spent on it than in the reign of the queen, it had sunk to a very low level of effective strength in 1618. In 1610 the old lord admiral was persuaded to retire, and was succeeded by George Villiers, duke of Bucking- ham, the king's favourite. Nottingham's retirement was made compulsory by the report of a committee appointed to inquire into the condition of the navy in 1618. They reported that while numbers of new offices had been created at a cost treble the whole expense of the permanent staff of Queen Elizabeth's time, the dockyards had become nests of pilfering and corruption.

Ships were rotting, and money was yearly drawn for vessels which had ceased to exist. The committee undertook to meet the whole ordinary and extraordinary charges of the navy (upkeep and new building) for £30,000 a year. The ships in commission at that time during peace were confined to tht diminutive winter and summer guards, whose duty was to transport ambassadors to and fro across the Channel and to hunt the pirates who still swarmed on the coast. Buckingham left the administration of the navy in the hands of the com- missioners, who by dismissing superfluous officers and paying better salaries had by 1624 fulfilled their promise to restore the fleet. The establishment they proposed was only of 30 ships, but they were larger in aggregate tonnage by 3050 tons than Queen Elizabeth's.

Charles I. (1625-1649) carried on the work of his father as far as his

limited resources allowed. The pay of the sailors, fixed in 1585 at ios., was increased to 15s. A captain received from £4, 6s. 8d. a month of 28 days (the standard of the navy) to £14, according to the size of his ship. Lieutenants, who were only carried in the larger ships, received from £2, 16s. to £3, ios., the sailing-master from £2, 6s. 8d. to £4, 13s. od., and the warrant officers from £1, 3s. to £2, 4s. The rating of ships by the number of men carried was introduced in this reign. Vessels of good quality were built for the king, and he showed a real understanding of the necessity for maintaining a strong fleet.

But the time was coming when the hereditary royal revenue was no longer adequate to meet the expense of a navy. By the middle of the 17th century a costly warship, far larger than the trading-ship in size and much more strongly built, had been developed. The extension of British commerce called for protection which an establishment of 40 to 50 vessels could not give. When the Great Rebellion broke out in 1641 the navy of King Charles consisted of only 42 vessels of 22,411 tons. At the Restoration (1660) it had grown to 154 ships for sea service, of 57,463 tons. Such a force could only be maintained out of taxes granted by the parliament. The efforts of King Charles to obtain funds for his navy had a large influence in provoking the rebellion (see Ship Money). The government of the navy during this reign remained in the hands of the committee of 1618, under the lord high admiral Buckingham, till he was murdered in 1628. It was then entrusted to a special commission, who were to have held it till the king's second son James, duke of York, was of age. In 1638 the king restored the office of lqrd high admiral " during pleasure " in favour of Algernon Percy, 10th earl of Northumberland, by whom the fleet was handed over to the parliament.

During the Great Rebellion and the Protectorate the navy was governed by parliamentary committees, or by a committee named by the Council of State, or by Cromwell. The need, first for cutting the king off from foreign support, and then for conducting successive struggles in Ireland, or with the king's partisans on the sea, with the Dutch and with the Spaniards during the Protectorate, led to a great increase in its size. These, too, were years of much internal development. Blake and the other parliamentary officers found that the pressed or hired merchant ships were untrustworthy in action. The ships were not strong enough, and the officers had no military spirit. Parliament therefore provided its own vessels and its own officers. The staff was strengthened by the appointment of second lieutenants. The Dutch War of 1652-53 may be said to have seen the last of the national militia, fyrd or levy of ships from the ports for warlike purposes. After the war a code of " fighting instructions " was issued.

During it a cede of discipline in 39 articles was established. Both embodied ancient practices rather than new principles, yet it marked a notable advance in the progress of the navy towards complete organization that it should pass from the state of being governed by traditional use and wont, cr by the will of the commander for the time being, to the condition of being ruled by fixed and published codes to which all were subject. The high military command during the interregnum 1 649-1 660 was entrusted, to committees of admirals and generals at sea.

With the restoration of Charles II. (1660-1685) the modern period in the history of the navy began. The first steps were taken to form a corps of officers. Lads of gentle birth were sent on board ships in commission with a letter of service — from which came their popular name of ” king’s letter boys ” — to the captain, instructing him to treat them on the footing of gentlemen and train them to become officers. After the Dutch War of 1664-67 a body of flag-officers were retained by fixed allowances from the crown. This was the beginning of the half- pay list, which was extended by successive steps to include select bodies of captains and lieutenants, and then all com- missioned officers. The process of forming the corps was not complete till the end of the reign of Queen Anne (1702-1714). Special training and a right to permanent payment are the essentials of a state service. The fleet was, at least in the earlier part of the reign, used for the promotion of British interests and the protection of trade in distant seas. One squadron was sent to take possession of Bombay, which formed part of the dower of Queen Catherine. Tangier, which was acquired in the same way, was occupied as a naval station till the cost of maintaining it proved excessive and it was evacuated in 1685. A series of effective attacks was made on the Barbary pirates, and ships were stationed in the West Indies to check piracy and buccaneer- ing. Until 1673, when he was driven out of office by the Test Act, the king’s brother James, duke of York, afterwards James II., held office as lord high admiral. He proved an able admini- strator. The navy office was thoroughly organized on the lines laid down by the earl of Northumberland, and revised ” sailing and fighting instructions,” as well as a code of discipline, were issued. During the latter years of the reign of Charles II. the administrative corruption of the time affected the navy severely. The fixed charge for ordinary and extraordinary

expenses which had risen to £300,000 a year was mostly wasted, under the lax or dishonest supervision of the commission appointed by the king after his brother left office. James II. (1685-1688), who kept the admiralship in his own hands and governed largely through his able secretary, the diarist Samuel Pepys, did much to restore its efficiency. The navy he left was estimated to consist of 173 ships of 101,892 tons carrying when in commission 42,003 men and armed with 6930 guns.

The evolution of the navy was completed by the Revolution of 1688. It now, though still called royal, became a purely national force, supported by the yearly votes of parliament, and governed by parliamentary committees, known as the com- mission for discharging the office of lord high admiral. A lord high admiral has occasionally been appointed, as in the case of Prince George of Denmark, husband of Queen Anne, or the duke of Clarence, afterwards King William IV. But these were formal restorations. As no organic change was made till 1832, it will now be enough to describe the organization as it was during this century and a half.

The discipline of the navy was based on the Navy Discipline Act of 1660 (13th of Charles II.). The act was found to require amending acts, and the whole of them were combined, and revised by the 22nd of George II., passed in 1749. Some scandals of the previous years had caused great popular anger, and the alternative to death was taken from the punishment threatened against officers who failed to show sufficient zeal in the presence of the enemy. It was under this severe code that Admiral Byng was executed. In 1780 an amending act was passed which allowed a court martial to assign a lighter penalty.

The government, political and military, was in the hands of the admiralty. The administration was carried on in subordination to the admiralty by the navy board and the other civil depart- ments, the victualling board, the board of transport, the pay office, the sick and hurt office and some others. At the head were the flag-officers, who were divided as follows: —

Admiral of the Fleet. White. ,, ,, Blue.

Vice- Admiral Red.

White. ,, ,, Blue.

Rear-Admiral Red. White. Blue.

The Red, White and Blue squadrons had been the divisions of the

great fleets of the 17th century, but they became formal terms

indicating only the seniority of the flag-officers. It was the intention of parliament to confine the flag list to these nins officers, but as the navy grew this was found to be impossible. The rank of admiral of the fleet remained a solitary distinction. The captains, commanders and lieutenants were the com- missioned officers and received their commissions from the admiralty. Promotion from them to flag rank was not at first limited by strict rules, but it tended to be by seniority. During the war of the Austrian Succession, in 1747, a regular system was introduced by which when a captain was promoted for active service — to hoist his flag, as the phrase went — he was made rear-admiral of the Blue squadron. Captains senior to him were promoted rear-admiral in general terms, and were placed on the retired list. They were familiarly called ” yellow ” admirals, and to be promoted in this way was to be ” yellowed.” Pro- motion to a lieutenant’s commission could be obtained by any one who had served, or whose name had been on the books of a sea- going ship, for five years. Whether he entered with a king’s letter of service or from the naval academy at Portsmouth, as a sailor or as a ship’s boy, he was equally qualified to hold a commission if he had fulfilled the necessary conditions and could pass an examining board of captains, a test which in the case of lads who had interest was generally a pure formality. He was supposed to show that he knew some navigation, and was a practical sea- man who could hand, reef and steer. As captains were allowed a retinue of servants, a custom arose by which they put the names of absent or imaginary lads on the books as servants and drew the pay allowance for them. It was quite illegal, and constituted the offence known as ” false musters,” punish- able by dismissal from the service. But this regulation was even less punctually observed than the rule which forbade the carry- ing of women. Till the beginning of the 19th century many distinguished officers were borne on a ship’s books for two or three years before they went to sea. The navigation was en- trusted to the sailing-master and his mates. He had often been a merchant captain or sailor. The captains and lieutenants were supposed to understand navigation, but it was notorious that many of them had forgotten the little they had learnt in order to pass their qualifying examination. As the navy was cut down to the quick in peace, the supply of officers was in- sufficient at the beginning of a war, and it was found necessary to give commissions to men who were illiterate but were good practical seamen. Officers who had not begun as gentlemen ” on the quarter deck ” were said to have come in ” through the hawse hole ” — the hole by which the cable runs out at the bow. Some among them rose

to distinction. The accountant's work was done by the purser, who in bad times was said to be often in league with the captain to defraud both the government and the crew. The medical service in the navy during the 1 8th century was bad. The position of the surgeons who were appointed by the navy office was not an enviable one, and the medical staff of the navy was much recruited from licentiates of Edinburgh, or Apothecaries Hall. Finally it is to be observed that when a ship was paid off only the commissioned officers, masters and surgeons were entitled to half-pay, or had any further necessary connexion with the navy.

The crews were formed partly by free enlistment and partly by impressment. When these resources failed, prisoners, criminal and political, were allowed to volunteer or were drafted from the jails. The Patriotic Society, formed at the beginning of the Seven Years' War, educated boys for the navy. During the Revolutionary and Napoleonic Wars the counties were called upon to supply quotas, which they commonly secured from the debtors' prison or the workhouse. A ship was supposed to be well manned when she had one-fifth of her crew of marines, and one-third of men bred to the sea. This proportion of seamen was rarely reached. As the navy did not train its men from boyhood in peace, the genuine sailors, known as " prime seamen " and " sailormen," who were the skilled artificers of the time, had to be sought for among those who had served their apprentice- ship in the merchant service. They never enlisted voluntarily, for they disliked the discipline of the navy, and the pay was

both bad and given in an oppressive way. The pay of a seaman was 22s. 6d. a month for able seamen, the rate fixed in the reign of Charles II., and 19s. for ordinary seamen. This sum was not paid at fixed dates, but at first only at the end of a commission, and after 1758 whenever a ship which had been a year in com- mission returned home — up to six months before the date of her arrival, the balance being kept as a security against desertion, which was then incessant and enormous. As men were often turned over from ship to ship they had a sheaf of pay notes to present on reaching home. The task of making up accounts was slow, and the men were often driven to sell their pay notes to low class speculators at a heavy discount. Discipline was mainly enforced by the lash, and the abuse of their power by

captains was often gross.

These grievances led to a long series of single ship mutinies, which culminated in the great mutiny of 1797. The fleets at Spithead, the Nore, Plymouth, the South of Ireland and Cape of Good Hope mutinied one after another. The government had aggravated the danger by drafting numbers of the United Irish into the fleet, and the quotas from the counties contained many dangerous characters. The crisis which seemed to threaten the country with ruin passed away. Concessions were made to the just claims of the men. When political agitators en- deavoured to make use of the discontent of the sailors for treason- able ends, the government stood firm, and the patriotism of the great bulk of the men enabled it to restore discipline. The ” breeze at Spithead,” as the mutiny was nicknamed in the navy, was the beginning of the reforms which made the service as popular as it was once hateful.

The administration of the navy throughout the 18th century, and in a less degree after 1806 up to 1832, was in many respects slovenly, and was generally corrupt. The different branches, military and civil, were scattered and worked in practical independence, though the board of admiralty was supposed to have absolute authority over all. The admiralty was at White- hall, the navy office in Seething Lane near the Tower, and after 1780 at Somerset House. The victualling office was on Tower Hill, the pay office in Broad Street, where also was the Sick and Hurt office. In 1749, when the state of the navy excited just discontent, the admiralty first established regular visitations of the dockyards which in a time of general laxity had become nests of corruption. These visitations were, however, not regularly made. By the end of the century, and in spite of sporadic efforts at reform, the evil had become so generally recognized that Earl St Vincent, then first lord, persuaded parliament in 1802 to appoint a parliamentary commission of inquiry. Its reports, thirteen in number, were given between 1804 and 1806. They revealed much waste, bad management and corruption. The tenth report showed that money voted for the navy was used by the then treasurer, Henry Dundas (Lord Melville), for purposes which he refused to reveal. In 1806 another commission was appointed to revise and digest the civil affairs of the navy, and a considerable improvement was effected. Much remained to be done. There was no strict appropriation of money. Accounts were kept in complicated, old-fashioned ways which made it impossible to strike a balance. In 1832 Sir James Graham, first lord in Earl Grey’s adminis- tration, obtained the support of parliament for his policy of sweeping away the double administration of the navy, by admiralty and navy office, and combining them into one divided into five departments.

With this great organic change the navy entered on its modern stage.

Subject to the warning that for the reason given above, the figures do not deserve absolute confidence, the material strength of the British navy from the death of Queen Anne to the fall of Napoleon was :— Ships. Tons.

At the death of Queen Anne, 1 714 . 247 167,219 ,, George I., 1727 . 233 170,862

,, ,, George II., 1760 . 412 321,104

In 1783 617 500,781

In 1793 411 402,555

In 1816 776 724,810

The figures for 1783, and for 1816, are swollen by prizes and worn out ships. AH the figures include vessels unfit for service, or useful

only for harbour work, or ordered to be built, but not actually in existence. The number of men varied enormously from a peace to war establishment. Thus in 1755 on the eve of the Seven Years' War parliament voted 12,000 seamen. In 1762 the vote was for 70,000 men, including 19,061 marines — the corps having been created in the interval. In 1775, on the eve of the American War of Independence, the vote was for 18,000 men for the sea service, including 4354 marines. At the close of the war in 1783 the vote was for 1 10,000 men, including 25,291 marines, from which it fell in 1784 to 26,000 (marines 4495 included) and in 1786 to 18,000 men, of whom 3860 were marines. In 1812, when the navy was at the highest level of strength it reached, the vote was for 113,000 seamen and 31,400 marines. From this level it fell in 1816 to 24,000 seamen and 9000 marines. These figures represent paper strength. Owing to the prevalence of desertion, and the difficulty of obtaining men, the actual strength was always appreciably lower.

The French Navy.

Before the French monarchy could possess a fleet, its early kings, whose rule was effective only in the centre of the country, had first to conquer their sea coast from their great vassals. Philip Augustus (1 180-1223) began by expelling King John of England from Normandy and Poitou. The process was not completed until Louis XII. (1498-1515) united the duchy of Brittany to the crown by his

marriage with the duchess Anne. Long before the centralization of authority had been completed the French kings possessed a fleet, or rather two fleets of very distinct character. Her geographical position has always compelled France to draw her navy from two widely different sources — from the Channel and the coast of the Atlantic on the north and west and on the south from the Mediterranean. This separation has imposed on her the difficult task of concentrating her forces at times of crisis, and the concentration has always been hazardous. Like their English rivals, the French kings of the middle ages drew their naval forces from the feudal array, the national levy and their own ships. But the proportion of the elements was not the same. Many of the great vassals owed the service of ships, and their obedience was always less certain than that of the Cinque Ports. The trading towns were less able, and commonly less willing, than the English to supply the king with ships. He was thus driven to trust mainly to his own vessels — and they were drawn at first exclusively, and always to a great extent, from the Mediterranean seaboard. His own territories in the south were insufficiently provided with seamen, and the French king had therefore to seek his captains, his men and his vessels by purchase or by subsidies from Genoa, or in a less degree from Aragon. When Saint Louis (1 226-1 270) sailed on his first crusade in 1249, he formed the first French royal fleet, and created the first French dockyard at Aigues Mortes. Ships and dockyard were bought from, or were built by, the Genoese at the king's expense. His admirals, the first appointed by the French crown, Ugo Lercari and Jacobo di Levante, were Genoese. Saint Lotus created the office of admiral of France. When in later times Aigues Mortes was cut off from the sea by the encroachment of the land, Narbonne and Marseilles were used as ports of war. This fleet was purely Mediterranean in character. It consisted of galleys, and though the sail was used it was dependent on the oar, and therefore on the " turma " (chiourme) of rowers, who in earlier times were hired men, but from the middle of the 15th century began to be composed of galley slaves — prisoners of war, slaves purchased in Africa, criminals and vagabonds condemned by the magistrate to the chain and the oar. Philip IV. le Bel (1285- 13 14) was led by his rivalry with Edward I. of England to create a naval establishment on the Channel. He found his materials in the existing Mediterranean fleet. A dockyard was built for him at Rouen, again by the Genoese Enrico Marchese, Lanfranc Tartaro and Albertino Spinola. It was officially known as the Tersenal or Dorsenal, but was commonly called the dos des galUes or galley yard, and it existed from 1294 to 1419. The French navy has always suffered from alternations of attention and neglect. In times of disastrous wars on land it has fallen into confusion and obscurity. Except when Francis I. (1515-1547)

made a vigorous attempt to revive it at the very close of his reign, the French navy languished till the 17th century. Its very

unity of administration disappeared in the 15th century, when

the jurisdiction of the admiral of France was invaded and defied by the admiralties of Guyenne, Brittany and the Levant. These local admiralties were suppressed by Francis I.

Richelieu, the great minister of Louis XIII., found the navy extinct. He was reduced to seeking the help of English ships against the Huguenots. From him dates the creation of the modern French navy. In 1626 he abolished the office of admiral of France, which had long been no more than a lucrative place held by a noble who was too great a man to obey orders. He himself assumed the title of grand mattre et surintendant de la navigation, and the military command was entrusted to the admirals du Ponant, i.e. of the west or Atlantic and Channel, and du Levant, i. e. of the Mediterranean. But Richelieu's establishment shrivelled after his death. It was raised from its ruins by the pride and policy of Louis XIV. (1643-1715). Under his direc- tion a numerous and strongly organized navy was created. A very full code of laws — the ordonnance — was framed by Colbert and Lyonne with the advice of the ablest officers, and was promulgated on the 5th of April 1689. Though modified by other ordonnances'm 1765, 1772, 1774, 1776 and 1786, in the mainlines it governed the French navy till the Revolution.

By this code the French navy was based on the Inscription maritime, a very severe law of compulsory service, affecting the inhabitants of the coast and of the valleys of rivers as far up as they were capable of floating a lighter. The whole body of officials and officers was divided into the civil branch known as la plume, and the military branch called I'epee. The first had the entire control of the finances, and the dockyards of Toulon, Brest and Rochfort, with an intendant de la marine at the head of each. The general chief was the sous secretaire au dSpartement de la marine, the title of the French minister of marine till the Revolution. Under Louis XIV. a civil officer, the intendant des armies navales, who ranked as an admiral, sat on councils of war and reported on the conduct of the naval officers. He

must not be confused with the intendant de la marine. The military branch had at its head the admiral of France, the office having been re-created in 1669 by Louis XIV. in favour of his natural son the due de Vermandois. In theory the admiral was the administra- tive military and judicial head of the admiralty. In practice the admirals were princes of the blood, who drew pay and fees, but who never went to sea, with the one exception of the count of Toulouse, another natural son of Louis XIV. Two vice- admirals of France du Ponant and du Levant commanded in the Mediterranean and on the ocean. A third office of vice-admiral of France was created for Suffren. The lieutenant giniral (vice- admiral) came next, and below him the chef d'escadre (rear- admiral), capitaine de vaisseau (post captain), capitaine de brulot (fireship) or defregate (commander), and the major, a chief of the staff on board who commanded all landing parties. There was no permanent body of marines in the French navy, the infanterie de la marine being troops for service in the colonies, which were administratively connected with the navy and governed by naval officers. The lieutenant needs no explanation, and the enseigne was a sub-lieutenant. The corps of officers was recruited from les gardes de la marine, answering more or less to the English midshipmen — who received a careful professional education and were required to be of noble birth. Besides the grand corps de la marine there was a fleet of galleys with a general at its head, and a staff of officers also of noble birth. It was suppressed in 1748 as being a useless expense. Officers not belonging to the grand corps were sometimes taken in from the merchant service. They were known as officiers bleus, because their uniform was all blue, and not, as in the case of the noble corps, blue and red.

On paper the organization of the French royal navy was very thorough. In reality it worked ill; the severity of the inscription maritime made it odious, and owing to the prevailing financial embarrassment of the crown after 1692 the sailors were ill-paid, ill-fed and defrauded of the pensions promised them. They fled abroad, or went inland and took up other trades. The military and civil branches were always in a state of hostility to one another, and their pay also was commonly in arrears. The noble corps was tenacious of its privileges, and extremely insolent

towards the officiers bleus. By Louis XV. (17 15-1774) the navy was neglected till the last years of his reign, when it was revived by the due de Choiseul. Under Louis XVI. (1774-1792) when the Revolution broke out the long accumulated hatred felt for the noble officers had free play. Louis XVI. had indeed relaxed the rule imposing the presentation of proofs of nobility on all naval officers, but the change

was made only in 1786 and it came too late. The majority of the noble officers were massacred by the Jacobins or driven into exile.

The Revolution subjected the French navy to a series of disorganizations and reorganizations by which all tradition and discipline were destroyed. Old privileges and the office of Grand Admiral were suppressed. The attempt to revive the navy in the face of the superior power of England was hopeless. Neither the Republic nor the Empire was able to create an effective navy. They had no opportunity to form a new body of officers out of the lads they educated.

The strength of the French Royal Navy is difficult to estimate, since for long periods of the 18th century it was rotting in harbour and its ships were rarely commissioned. Louis XIV. is credited with 95 ships of the line and 29 frigates, together with many smaller vessels, in 1692. At the close of the Seven Years' War it had sunk to 44 ships of the line and 9 frigates. By 1778 the French navy had risen to 78 of the line with frigates and smaller vessels which brought the total to 264. In 1793 on the outbreak of the revolution- ary war, it was estimated to consist of 82 ships of the line, mostly fine vessels, and of frigates with lesser craft which brought it to a total of 250. Under Napoleon the mere number was very much more considerable and included ships built in the annexed territories, but they were largely constructed of green timber, were meant merely to force England to maintain blockades, and were never sent to sea.

Spanish Navy.

The administrative history of the Spanish navy is singularly confused and broken. It might almost be said that the country had no navy in the full sense of the word — that is to say, no organized maritime force provided and governed by the state for warlike purposes only — until one was created on the French model by the sovereigns of the Bourbon dynasty i.e. after 1700. Yet the kings of the Spanish peninsula, whether they wore the crown of Castile and Leon or of Aragon, had fleets, formed, like all the others of the middle ages, partly of ships supplied by the coast towns and populations, partly of the royal vessels. Aragon was a purely Mediterranean power. Its fleets, which were chiefly supported by Barcelona, a flourishing commercial city, were composed of galleys. With the union of the crown in 1479 Aragon fell into the background, and its navy continued to be represented only by a few galleys, for service in the Mediterranean against the pirates. The dominions of Castile stretched from the Bay of Biscay to the Mediterranean. Its kings, therefore, had need both of

ships (naos) and galleys. The first beginnings of the Castilian navy were not due to the king, but to the foresight and enterprise of Diego Gelmirez, bishop and afterwards first archbishop of Santiago in Gallicia. In or about 1 1 20 he employed the Genoese Ogerio to form a dockyard at Iria, and to build vessels. The naval activity of the coast of the Bay of Biscay developed so rapidly that in 1147 a squadron from the northern ports took part in the conquest of Almeria by Alfonso VII. (1120-1157) in alliance with the Pisans. A century later (1248) another squadron constructed at the expense of the king Fernando III. El Santo (1217-1252), and commanded by Count Ramon Bonifaz of Burgos, the first admiral of Castile, took a decisive part in the conquest of Seville. The annexation of Anda- lucia and the necessity for guarding against invasions from Africa called for a great extension of the navy of Castile. Alfonso X. El Sabio (12 52-1 284) founded the great galley dockyards of Seville — the arenal. It was also the work of Genoese builders and administrators. In the course of the 13th century the towns of the northern coast formed one of the associations so common in Spanish history, and known as hermandades (brother- hoods). The first meeting of its delegates took place at Castrourdiales near Bilbao in 1 296, when the towns of Santander, Laredo, Bermeo, Guetaria, San Sebastian and Vitoria were represented. The hermandad de la marisma (of the seafarers)

of Castile supplied the squadrons which took an active part in the wars of the 14th and 15th centuries between France and England as allies of the French. Its history is obscure, and it came to an end with the establishment of the full authority of the crown by the Catholic sovereigns Ferdinand and Isabel.

The discovery of America, the acquisition by marriage or conquest of Sicily, Naples and Flanders, gave the kings of Spain a yet stronger motive for maintaining a powerful navy. The maxim that their ships were the bridges which joined their widely scattered dominions was fully accepted by them and their servants. But neither the Catholic sovereigns nor the Habsburgs who held the throne till 1700, made any attempt to organize a common navy. The sources from which the naval armaments of Spain were drawn during the greatness and decline of the country were these. Galleys were maintained in the Mediterranean, but they were mainly found by Sicily and Naples, or

by the contracts which the kings of Spain made with the Genoese house of Doria. On the ocean the chief object of the Spanish government was to conduct and protect the severely regulated trade with America. Thus it was mainly concerned for long to obtain the lumbering and roomy vessels called ” galleons,” first designed by Alvaro de Bazan, marquess of Santa Cruz, which were rather armed traders than real warships. The crown did not build its own ships, but contracted for them with its admirals. The American convoys sailed from and returned to the Bay of Cadiz. One squadron, the flota, carried the trade, was navigated by the admiral, with whom was associated a general, who commanded the few warships proper, and was answerable for the protection of the whole. Another squadron, called of Cantabria, was maintained on the north coast, and was employed to see the convoy on its way and meet it on its return home. It had its own admiral and general. The ships were always treated as if they were transports for ■carrying soldiers. The seamen element was neglected. The command was divided between the capitan de mar (sea captain) who was responsible for the navigation and the capitan de guerra (soldier captain) who fought the ship. The same division went through all ranks. The soldiers would neither help to work the ship nor fight the guns. They used musketry only, or relied on a chance to board with sword and pike. Properly speaking there was no class of naval officers, and the overworked and depressed seamen could not supply good gunners. No general naval administration existed. The office of admiral of Castile became purely ornamental and hereditary in the family of Henriquez. It was not replaced by a navy office. One of the innumerable juntas or boards, through which the Spanish kings governed, looked after the making of contracts, and co-operated with the council of the Indes which was specially concerned with the American convoys. After the disasters of the later years of Philip II. (see Armada) some efforts at improvement were made. Better ships were built, and something was done to raise the condition of the seamen. But no thorough- going organization was ever created, and in the utter decadence of the 17th century the Spanish navy and seafaring population alike practically disappeared.

Under the Bourbon dynasty which attained the throne in 1 700 the Spanish navy was revived, or rather a navy was created on the French model. Don Jose Patino, a very able man, was named inlendenie de la marina in 1715, and in 1717 he drew up a draft naval organization and code, founded on the French ordonnance of 1689. Patino’s draft was the basis of the ordenanzas generates (general code) issued in 1 748. The Spaniards even set up a squadron of galleys with a separate staff of officers, also on the French model, which was, however,

suppressed in the year of the issue of the ordenanzas generates. Fine arsenals were organized at Ferrol and Carthagena. The navy thus created produced some distinguished officers, and fought some brilliant single ship actions. But the embarrassments of the treasury, the tendency of several of the kings to sacrifice their navy to political schemes requiring mainly the employment of troops and the ruin of the seafaring population during the 17th century, prevented it from ever attaining to a high level

of efficiency. During the Peninsular War the new navy all but disappeared as the old had done. The want of pecuniary resources and internal instability have prevented its revival on any considerable scale.

The navy created by Patino consisted in 1737 of 56 ships in all, of which 28 were of the line, of from 50 to 80 guns, with one of 114 guns. In 1746 the number of ships of the line had increased to 37. In 1759 the list of line of battle ships was 50 — of which > the majority, if not all, had been constructed by English shipbuilders, in the service of the Spanish government. In 1778, when at the height of its power, it contained 62 ships ot the line.

Dutch Navy.

The Dutch fleet arose out of the great struggle with Spain in the 1 6th century. The Netherlanders had been a maritime people from the earliest antiquity. Under their medieval rulers, the counts of Holland and of Flanders and the House of Burgundy, they had rendered service at sea. The freemen owed the service known as the riemtal (riem, an oar). An admiralty office was established in 1397. But during the revolt against Philip II. of Spain, new naval forces were formed which had no connexion with the medieval navy, save in so far as the governments established in the different states which afterwards formed the Seven Provinces took possession of the jurisdiction and the dues of the medieval admiralty. The naval part of the war with Spain was for long conducted by the adventurers known as the ” beggars of the sea,” and was mainly confined to the coasts and rivers. In 1597, when the Confederation was formed and had provided itself with a common government in the states-general, the need for a regularly organized sea- going fleet was felt. In that year the banner of the states- general, the red lion with the arrows in its paw, was first hoisted during the expedition to Cadiz in alliance with England. On the 13th of August 1597 the states-general issued the decree (Instructie) which regulated the naval administration of the Republic until 1795. The attachment of the Netherlanders to their local

franchises was too strong to permit of the establish- ment of a central authority with absolute powers. It was therefore necessary to make a compromise by which some measure of unity was secured while the freedom of the various confederate states was effectually guarded. Five boards of admiralty (Admiraliteits collegien) were recognized. They were: South Holland, or the Maas, sitting at Rotterdam; North Holland, or Amsterdam; Westfriesland (the western side of the Zuyder Zee), at Hoorn or Enkhuizen on alternate years; Zealand at Middleburg; and Friesland at Dokhum, or after 1645 at Harlingen. These bodies enjoyed all the rights of the admiralty and collected the port dues, out of which they provided for the current expenses of their respective squadrons. Extra- ordinary charges for war were met by grants from the province to which each board belonged. Some measure of unity was secured among these five independent authorities by three devices. Each board consisted of seven persons, of whom four were named by the province and required confirmation by the states-general, while three were chosen from other provinces to secure a representation of the commonwealth. The members of the boards took an oath of fealty to the states-general. The stadtholder was admiral-general. He presided at the board, and commanded the squadron. In his absence his place was taken by his lieutenant admiral-general. An oath of fealty was also taken to him, and all armed ships whether men-of-war or privateers sailed with his commission. He chose the captains from two candidates presented to him by the board. Delegates from the boards met twice a year to consult on the general interest. When the stadtholdership was suspended in 1650 the powers of the admiral-general were absorbed by their high mightinesses (Hunne Hogen Mogen) of the states-general. The staff of officers began with the lieutenant admiral-general and descended through the vice-admiral, the quaintly named Schout-bij-nacht, who was and is the rear-admiral, and whose title means ” commander by night.” These flag officers were named by the admiral-general or states-general. The captain (Zeecapitdn) was selected from the provincial list. The lieutenants

were appointed by the local boards. No regular method of recruiting the corps of officers existed.

This compromise was in itself a bad system. With the exception of the

board of North Holland, which was supported by the wealth of Amsterdam, the admiralties were commonly distressed for money. Unity of action was difficult to obtain. Much of the work of convoy which the state squadrons should have performed was thrown in the 17th century on directorates (Direction) of merchants who fitted out privateers at their own expense. When there was no stadtholder, the local governing bodies trenched on the authority of the states-general, and indulged in a great deal of favouritism. In one respect the navy of the Dutch republic might have been taken as a model by its neighbours. The feeding of the crews was contracted for by the captains, who were required to enter into securities for the execution of the contract, and who had a reputation for probity. The Dutch crews, being better fed and looked after than the English, suffered less from disease. The clumsy organization of the Dutch navy put it at a disadvantage in its wars with England, but the seamanship of the crews, their good gunnery, and the great ability of many of their admirals made them at all times formidable enemies. No organic change was made till 1795, when the victories of the French revolutionary armies led to the formation of the Batavian republic. The five admiralties were then swept away and replaced by a committee for the direction of naval affairs, with a unified administration, organized by Pieter Paulus, a former official of the board of the Maas. As Holland was now swept into the general convulsion of the French Revolution, it followed the fortunes of France. Its navy, after belonging to the Batavian republic, passed to the ephemeral kingdom of Holland, created by Napoleon in favour of his brother Louis in 1806 and annexed to France in 1810. The Dutch navy then became absorbed in the French. After the fall of Napoleon a navy was created for the kingdom of the Netherlands out of the Dutch fragments of the Imperial force.

The United Stales.

The American navy came into existence shortly after the Declaration of Independence. As early as October 1775 Congress authorized the construction of two national cruisers, and, at the same time, appointed a marine committee to administer naval affairs. The first force, consisting of purchased vessels, badly fitted and built, and insufficiently equipped and manned, embraced two ships of 24 guns each, six brigs carrying from 10 to 12 guns, two schooners each with 8 guns, and four sloops, three of 10 guns and one of 4 guns. On December 22nd a personnel of officers was selected, one of the lieutenants being the well-known Paul Jones. Esek Hopkins was made com- mander-in-chief, but, having incurred the censure of Congress, he was dismissed early in 1777, and since then the title has never

been revived except in the person of the president. In November 1776 the grades of admiral, vice-admiral, rear-admiral and commodore were assimilated in rank and precedence to relative army titles, but they were never created by law until 1862. During the war a number of spirited engagements occurred, but there was a great lack of efficient material at home, and agents abroad were not able to enlist the active sympathies of nations or rulers. Benjamin Franklin did manage to equip one good squadron, but this was rendered almost useless by internal dissensions, and it required the victory of Paul Jones in the “Bon Homme Richard” over the ” Serapis ” to bring about any tangible result for the risk taken. During the war 800 vessels of all classes were made prizes, but the navy lost by capture 11 vessels of war and a little squadron of gunboats on the lakes; and, with 13 ships destroyed to avoid capture by the British, 5 condemned, and 3 wrecked at sea, the country was practically without a naval force between 1780 and 1785.

Owing to the depredations upon commerce of the Barbary powers, Congress in 1794 ordered the construction of six frigates, prescribing that four of them should be armed with 44 guns and two with 36 guns; but, the Berbers having made peace.

the number of vessels was reduced one-half, and no additions were made until 1797, when the ” Constitution,” ” United States ” and ” Constellation ” were built. The navy was at first placed under the war department, but a navy department with a secretary of its own was created in 1798. From 1815 to 1842 the secretary was aided by a board of commissioners chosen from among the naval officers, but in the latter year the department was reorganized into five bureaus, which were increased to eight in 1862. Each has a naval officer at its head. They deal with navigation, ordnance, equipment, navy yards, medicines, provisions, steam engineering and construction. The excellent naval academy at Annapolis was founded in 1845 by the then secretary of the navy, G. Bancroft. The war college for officers at Coasters Harbor, Newport, R.I., dates from 1884.

The Balance of Navies in History.

The five navies above discussed claim special notice on various grounds: the British, Dutch and French because they have been leaders and models; the Spanish because it has been closely associated with the others; the American because it was the first of the extra-European sea forces. But these great examples by no means exhaust the list of navies, old and new, which have played or now play a part. Every state which has a coast has also desired to possess forces on the sea.

Even the papacy maintained a fighting force of galleys which took part in the naval transactions of the Mediterranean for centuries. The Turkish sultans have fitted out fleets which once were a menace to southern Europe. But in a survey of general naval history it is not necessary to give all these navies special mention, even though some of them have a certain intrinsic interest. Some, the Scandinavian navies for instance, have been confined to narrow limits, and have had no influence either by their organization, nor, save locally, by action. Others again have been the purely artificial creation of governments. Instances of these on a small scale are the navies of the grand duchy of Tuscany, or of the Bourbon kings of Naples.

A much greater instance is the navy of Russia. Founded by Peter the Great (1689-17 25), it has been mainly organized and has been most successfully led by foreigners. When the Russian government has desired for political reasons to make a show of naval strength, it has been numerous. In 1770, during the reign of Catherine II. (1762-1796), a Russian fleet, nominally commanded by the empress's favourite Orloff, but in reality directed by two former officers of the British navy, John Elphinston (1722-1785) and Samuel Greig (1735-1788), gained some successes against the Turks in the Levant. But when opposed to formidable enemies, as in the Crimean War, it has either remained in port, or has, as in the case of th« war with Japan ˆ904-1905), proved that its vitality was not in proportion to its size.

The innumerable navies of South American republics are small copies of older forces.

The 19th century did indeed see the rise of three navies, which are of a very different character — the Italian, which was the result of the unification of Italy, the German, which followed . t . the creation of the German Empire, and the Japanese. Germany, But all three are contemporary in their origin, and Japan, have inevitably been modelled on older forces — the Austrla – British and the French. With them must go the Austrian navy, excellent but unavoidably small.

If we look a-t the relations which the navies of the modern world have had to one another, it will be seen that the great discoveries of the later 15th century shifted the seat of naval power to the ocean for two reasons. In the Influence first place they imposed on all who wished to sail the power. wider seas opened to European enterprise by Vasco de Gama and Columbus the obligation to use a vessel which could carry water and provisions sufficient for a large crew during a long voyage. The Mediterranean states and their seamen were not prepared by resources or habit to meet the call. But there was a second and equally

effective reason. The powers which had an Atlantic coast were incomparably better placed

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than the Italian states, or the cities of the Baltic, tc take advantage of the maritime discoveries of the great epoch which stretches from 1492 to 1526. In the natural course the leadership fell to Portugal and Spain. Both owed much to Italian science and capital, but the profit fell inevitably to them. The reasons why Spain failed to found a permanent naval power have been given, and they apply equally to Portugal. Neither achieved the formation of a solid navy. The claim of both to retain a monopoly of the right to settle in, or trade with, the New World and Asia was in due course contested by neighbouring nations. France was torn by internal dissensions (the Wars of Religion and the Fronde) and could not compete except through a few private adventurers. England and Holland were able to prove the essential weakness of the Spaniards at sea before the end of the 1 6th century. In the 17th century the late allies against Spain now fought against one another. Her insular position, her security against having to bear the immense burden of a war on a land frontier, and the superiority of her naval organization over the divided administration of Holland, gave the victory to Great Britain. She was materially helped by the fact that the French monarch attacked Holland on land, and exhausted its resources. Great Britain and France now became the com- petitors for superiority at sea, and so remained from 1689 till the fall of Napoleon in 1815.

During this period of a century and a quarter Great Britain had again the most material advantage: that her enemy was not only contending with her at sea, but was engaged in endeavouring to establish and maintain a military preponderance over her neighbours on the continent of Europe. Hence the necessity for her to support great and costly armies, which led to the sacrifice of her fleet, and drove Holland into alliance with Great Britain (Wars of the League of Augsburg, of the Spanish Succession, of the Austrian Succession and the Seven Years' War). During the War of American Independence France was in alliance with Spain and Holland, and at peace on land. She and her allies were able to impose terms of peace by which Great

Britain surrendered positions gained in former wars. But the strength of the British navy was not broken, and in quality it was shown to be essentially superior.

The French Revolution undid all that the government of France had gained between 1778 and 1783 by attention to its navy and abstinence from wars on land. The result of the upheaval in France was to launch her into schemes of universal conquest. Other nations were driven to fight for existence with the help of Great Britain. In that long struggle all the navies of Europe disappeared except the French, which was broken by defeat and rendered inept by inaction, and the victorious British navy. When Napoleon fell, the navy of Great Britain was not merely the first in the world; it was the only powerful navy in existence.

The pre-eminent position which the disappearance of possible rivals had given to Great Britain lasted for several years un- challenged. But it was too much the consequence of a com- bination of circumstances which could neither recur nor endure. The French navy was vigorously revived under the Restoration and the government of Louis Philippe (the periods from 1815 to 1830 and 1830 to 1848). The emperor Nicholas I. of Russia (1825-1855) built ships in considerable numbers. As early as 1838 the fear that the naval superiority of Great Britain would be destroyed had already begun to agitate some observers. The ” extremely reduced state ” of the British navy, and the danger that an overwhelming force would be suddenly thrown on the English coast, were vehemently set forth by Commander W. H. Craufurd, and by an anonymous flag-officer. The peril to be feared, it was argued, was an alliance between France and Russia. In 1838 the British navy contained, built and building, 90 ships of the line, 93 frigates and 12 war steamers; the French, 49 of the line, 60 frigates and 37 war steamers, including armed packets; Russia, 50 of the line, 25 frigates and 8 steamers; the United States, 15 of the line, 35 frigates and 16 war steamers. The agitation of 1838 passed away, and the Crimean War, entailing as it did the destruction of a great part of the Russian

arma- ments*

fleet at Sebastopol, and proving the weakness of the Baltic fleet, and having, moreover, been conducted by an alliance of France and Great Britain against Russia, would seem to have shown that the anxieties of 1838 were exaggerated. But the rivalry which is inherent in the very position of states possessing sea coasts and maritime interests could not cease. The French imperial government was anxious to develop its

navy. By the construction of the armoured floating batteries employed in bombardment of Kinburn in October 1855, and by the launch of the first seagoing ironclad ” La Gloire ” in 1859, it began a new race for superiority at sea, which has shown no sign of slackening since. The launch of the ” Gloire ” was followed by political events in Europe which brought forward new com- petitors, while great navies were developed in America and Asia. The year 1871 was the beginning of a vast growth of naval armaments. It saw the completion of the unity of Italy and the formation of the German empire, two powers which could not dispense with strong fleets. But for some mo a era years the Italian and German navies, though already rivalry in in existence, were still in a youthful stage. The rapid growth of the United States navy dates from about 1890, and the Japanese is a few years younger. France, Russia and Great Britain, in answer to them, began the race in which the efforts of each had a stimulating effect on the others. Though the alliance between France and Russia was not formed till later, their common interests' had marked them out as allies from the first, and it will be no less convenient than accurate to treat Great Britain and the partners in the Dual Alliance as for some time opposed to one another.

In the general reorganization of her armaments undertaken by France after the war of 1870-71, her navy was not neglected. Large schemes of construction were taken in hand. _ . . The instability of French ministries, and the differences an d the of principle which divided the authorities who favoured Dual the construction of battleships from those who were Alliance. partisans of cruisers and torpedo-vessels, militated against a coherent policy. Yet the French navy grew in strength, and Russia began to build strong vessels. As early as 1874 the approaching launch of a coast-defence ironclad at Kronstadt (the ” Peter the Great ” designed by the English constructor Sir E. J. Reed) caused one of the successive ” naval scares ” which recurred frequently in the coming years. It was, however, largely fictitious, and passed away without producing much effect. In 1878 the prospect of a war arising out of the Russian and Turkish conflict of that year, again stirred doubts as to the sufficiency of her naval armaments in England. Yet it was not till about 1885 that an agitation for the increase of the British fleet was begun in a consistent and continuous way. The con- troversy of the succeeding years was boundless, and was perhaps the more heated because the controversialists were not con- trolled by the necessity for using terms of definite meaning, and because the lists published for the purpose of making comparisons were inevitably of doubtful value; when ships built, building and ordered to be built, but not begun, were counted together — or as not infrequently happened,

were all added on one side, but not on the other. The belief that the British navy was not so strong as it should be, in view of the dependence of the British empire on strength at sea, spread steadily. Measures were first taken to improve the opportunities for practice allowed to the fleet by the establishment of yearly naval manceuvres in 1885, and the lessons they afforded were utilized to enforce the necessity for an increase of the British fleet. In 1888 a committee of three admirals (Sir W.Dowell, Sir Vesey Hamilton and Sir R. Richards), appointed to report on the manceuvres of that year, gave it as their opinion that ” no, time should be lost in placing the British navy beyond comparison with that of any two powers.” This verdict met a ready acceptance by the nation, and in 1889 Lord George Hamilton, then first lord of the admiralty, intro- duced the Naval Defence Act, which provided for the addition to the navy within four and a half years of 70 vessels of 318,000 tons at a cost of £21,500,000. The object was to obviate the risk of sudden reductions for reasons of economy in the building vote.

Later experience proved that the practice of fixing the amount to be spent for a period of years operated to restrict the freedom of government to make additions, for which the necessity had not been foreseen when the money was voted. But the act of 1889 did effect an immediate addition to the British fleet, while as was inevitable it stimulated other powers to increased efforts.

The rivalry between Great Britain and the states composing the Dual Alliance may be said to have lasted till 1904, when the course of the war in the Far East removed Russia from the field. It must be borne in mind that during the latter part of these twenty years Russia was largely influenced by the desire to arm against the growing navy of Japan. Comparisons between the additions to the fleets made on either side, even when supported by a great display of figures, are of uncertain value. Number is no sufficient test of strength when taken apart from quality, distribution, the, command of coaling stations — which are of extreme value to a modern fleet — and other considerations. But the respective fists of battleships supply a rough and ready standard, and when taken with the number of men employed and the size of the budgets (both subject to qualifications to be mentioned) does enable us to see with some approximation to

accuracy how far the rivals have attained their desired aims. In 1889, before the passing of the Naval Defence Act, the British navy contained 32 battleships of 262,340 tons. The united French and Russian fleets had 22 of 150,653 tons: of these 17 were French, 7 being vessels of wood plated with iron and therefore of no value when exposed to the fire of modern ex- plosives. This is but one of many examples which might be given of the fallacious character of mere lists of figures. In 1894, when the Naval Defence Act had produced its effect, the com- parative figures were: for Great Britain, 46 ironclads (or battle- ships) of 441,640 tons, and for the Dual Alliance 35 of 270,953 — in which, however, the seven wooden vessels were still included. France and Russia had then large schemes of new construction — 60,300 tons of ships over 10,000 tons for France, and 78,000 tons for Russia. The British figure was 70,000 tons. But the French and Russian list included mere names of vessels, of which the plans were not then drafted.

The rivalry in building went on as eagerly after 1894 as before. At the beginning of 1904 Great Britain had 67 battleships of 895,370 tons, as against 57 of 635,500 belonging to the powers of the Dual Alliance. The difference in favour of Great Britain was therefore 10 battleships, and 259,870 tons. Vessels not ready for service were included in the list, which therefore in- cludes potential as well as actual strength. The balance in favour of Great Britain was less in 1904 than it had been in 1885 in mere numbers. During this period the naval budget of Great Britain had risen from £12,000,000 in 1885 to £34,457,500 in 1903-1904. The number of men employed had grown from 57,000 to 127,000. The figures for the Dual Alliance cannot be given with equal confidence. France had transferred the troupes de la marine or colonial troops from the navy to the army, which introduced a confusing element into the comparison, and the figures for Russian expenditure are very questionable. The total credit demanded for the Frerjch navy in 1890, the year after the passing of the British Naval Defence Act, was frs. 217,147,462. By 1903 the sum had risen to frs. 351,471,524. The Russian figures for 1890 are not attainable, but her budget for 1903 was £11,067,889 sterling. A comparison in numbers of men available is wholly misleading, since the British navy contains a large number of voluntarily enlisted men who serve for many years, and a small voluntary reserve, while France and Russia include all who are liable to be called out for compulsory service during a short period. There is no equality between them and the highly trained men of the British navy. The immense increase in its staff represents an addition to real power to which there is nothing to correspond in the case of continental states.

While this vast growth of naval power was going on in Great Britain, France and Russia, other rivals were entering into the lists with various fortunes. Italy may be said to have been the first comer. Her national navy, formed out of the existing squadrons of Sardinia, Tuscany and Naples, had stood the strain

of war in 1866 very ill. The conditions in which the unity of the country had been achieved during the Franco-Prussian War of 1870-71, together with the obvious need for a navy competi- in the case of a nation with a very extended sea coast, t ioa of animated the Italians to great and even excessive new efforts. Their policy was controlled by the knowledge navies: that they could not hope to rival France in numbers, ,ta ly. and they therefore aimed at obtaining individual vessels of a high level of strength. Italy may be said to have set the example of building monster ships, armed with monster guns. But she was unable to maintain her position in the race. The too hopeful finance in which she had indulged in the first enthusiasm of complete political unification led to serious embarrassment in 1894. Her naval budget sank from £4,960,000 in 1891 to £3.776,845 in 1897-1898, and only rose slowly to £5,037,642 in 1905-1906. As a candidate in the race for naval strength she necessarily held a subordinate place, though always to be ranked among the important sea powers. In 1903, when the rivalry of Great Britain and the Dual Alliance was at its height, her strength in battleships was 18, of 226,630 tons. In number, therefore, they did more than cover the balance in favour of Great Britain as against the Dual Alliance, but not in tonnage, in which the difference in favour of Great Britain was 259,870. The history of the German navy is one of foresight, calculation, consistency and therefore steady growth. The small naval force maintained by Prussia became the navy of the North German Federation after the war of 1866, and the er y ‘ Imperial navy after 1871. Until 1853 it had been wholly de- pendent on the war office. In that year an admiralty was created in favour of Prince Albrecht, but this office was abolished in 1861, and the navy was again placed under the war office. The first ministers of the navy under the North German Federation were generals; so was the first imperial minister, General Stosch (1871). Admiral Tirpitz, appointed in 1897, was the first minister who was bred a seaman. His predecessor, General Stosch, had been an excellent organizer and had done much for the efficiency of the service. It has been the rule of the German government, both before and since the foundation of the empire, to advance by carefully framed plans, without adhering to them pedantically when circumstances called for a modification of their lines. As early as 1867 a scheme had been formed for the construction

of a navy of 16 ironclads and 50 smaller vessels, at a cost of £5,395,833. It was not sufficiently advanced in execution to allow Germany to make any efforts at sea in the war of 1870-71. In 1872 a supplementary grant of £3,791,666 was made for construction in view of the increased cost of armour and arma- ments. In 1882 a revised scheme was made which contemplated the construction of 100 vessels, and it was completed in 1888 by another which provided for the construction of 28 vessels, of which 4 should be battleships of the largest size, within the next six years. In 1894 and for some years afterwards the Reich- stag showed itself hostile to a heavy expenditure on the navy, and refused many votes asked for by the government. Under the pressure of ambition and of the real needs of a nation with an extensive and growing maritime commerce, the expenditure grew in spite of the opposition of the Reichstag. Between 1874 and 1889 it rose from £1,950,000 to £2,750,000, and was increased in the following year to £3,600,000, from which figure it advanced by 1898 to £5,756,135. Another building scheme was framed in that year, but it was swept aside in 1900, under the combined influence of the exhortations of the emperor William II., and of the anger caused in Germany through the arrest by a British cruiser of a German steamer (the ” Bundesrath “) on the coast of Africa on a charge of carrying contraband of war to the Boers. The emperor was now able to obtain the consent of the Reichstag to an extended Naval Defence Act. By the terms of this measure it was proposed to spend £74,000,000 on construction, and £20,000,000 on the dockyards. With this money, by the year 191 7 Germany was to be provided with a fleet of 38 battleships, together with a proportionate number of cruisers and other smaller vessels. Rapid progress was made not only with the programme itself but with the equipment of German dockyards

and other establishments for providing the materiel of a great navy. In the spring of 1909 the serious menace to British supremacy at sea, represented by the growth of the new German fleet of battleships, led in England to a ” scare ” which recalled that of 1888, and to an energetic campaign for additional expenditure on the British navy.

During the years following on the American Civil War (1862- 66) the United States paid small attention to the navy. In 1 88 1 a board was appointed to advise on the needs States. °f tne nav yj an d in 1890, the

board recommended the formation of a fleet of 100 vessels of which 20 should be battleships of the largest class. The reviving interest in the navy was greatly stimulated by the diplomatic difference with Great Britain which arose over the frontier question between her and the republic of Venezuela in 1896. Resolutions were passed in congress approving of an increase of the navy. The war with Spain in 1898 completed the revival of American interest in the navy. The acquisition of Porto Rico, and the protectorate of Cuba in the West Indies, together with the annexa- tion of the Philippines, and the visible approach of the time when the relations of the powers interested in the Pacific would call for regulation, confirmed the conviction that a powerful fleet must be maintained. In 1889 the United States possessed no modern battleship. In 1899 there were 4 built and 8 building. At the close of 1903 there were built and building 27 of 353,260 tons, only two of them being of less than 10,000 tons. From £5,119,850 in 1890 the expenditure grew to £16,355,380 in 1903. The navy of Japan, the last comer among the great naval forces of the world, may be said to date from 1895, from, in . fact, the eve of the war with China. As an insular

power with a large seafaring population, Japan is called upon to possess a fleet. Even in the days of its voluntary isolation it had a known capacity for maritime warfare. Its capacity for assimilating the ideas and mastering the mechanical skill- of Europe have been in no respect better shown than in naval matters. From the moment it was compelled to open its ports it began not only to acquire steamers but to apply itself under European guidance to learning how to make and use them. A navy on the western model was already organized by 1895, but it was still of trifling proportions. In 1896 the Japanese navy had become an object of serious attention to the world. A plan was drafted in that year, and confirmed in the next, by which Japan arranged to supply itself, mainly by purchase in Europe, with a fleet containing 4 of the most powerful battleships. The scheme was modified in detail in 1898, when the decision was taken to increase the tonnage of the vessels. A little later additions were arranged for, and vessels building for South America states in English ports were purchased. The British model was carefully followed in naval organization, the alliance with England giving special facilities for this. And by 1904, when the war with Russia began, the unknown Japanese fleet proved its competence by victories at sea which put the seal on her position as a naval power.

Conclusion. — When we look over the whole period from the end of the Napoleonic wars, one great fact is patent to our view. It is that this was an epoch of revival or development in the naval power of the

whole world, in the course of which the position held by Great Britain in 1816 was partially lost simply by the growth of other powers. The situation, in that year was by its very nature temporary, and a quotation of the respective numbers of warships then possessed by the world would have no value. An instructive comparison can, however, be made between the year 1838, when Great Britain began to be seriously concerned with the rise of possible enemies at sea, and the eve of the war between Russia and Japan. Battleships may again be taken as the test of strength, since nothing happened in the Russo-Japanese War to show that they do not still form the most vital element of naval power. We may also leave aside the many small fleets which cannot act collectively, and which individually do not weigh in the balance. The figures for 1838 are given above, but may be repeated for comparison. In that year Great Britain possessed, built and building, 90

ships of the line; France 49; Russia 50; the United States 15. In 1903 the number of vessels recognized as battleships, possessed by the great powers, was for Great Britain 67; for France 39; for Russia 18; for the United States 27; for Germany 27; for Italy 18; for Japan 5. At the first date the British fleet was among great powers as 90 to 114. At the latter it was as 67 to 134.

Such comparisons, however, as these become much more complicated in later years, when the importance of the preponder- ance of ” Dreadnoughts ” — the new type of battleship — (see Ship and Shipbuilding) — was realized. By the invention of this type Great Britain appeared to obtain a new lead; and in 1907, when it was calculated that by 1910 there would be ten British ” Dreadnoughts ” actually in commission while neither in Europe nor America would a single similar ship have been completed by any foreign power, the situation seemed to be entirely in favour of complete suprema

The British Admiralty figures for the state of the principal fleets as on March 31st, 1910, are summarized below. The letters at the heads of the columns have the following significa- tion: E., England; F., France; R., Russia; G., Germany; I., Italy; U., United States; and J., Japan: — Ships Built

E. F. R. G. I. U. J.

Battleships

17

7

33

10

3°

H

Armd. CD. Vessels .

8

2

7

10

Armd. Cruisers

38

20

4

9

8

15

12

Protected Cruisers, I.

18

5

7

3

2

n.

35

9

2

23

3

16

11

HI.

16

8

2

12

11

2

6

Unprotected Cruisers

2

10

5

6

8

3

Torpedo Vessels .

23

10

6

1

5

2

2

T.B. Destroyers .

150

60

97

85

21

25

57

Torpedo Boats

116

246

63

82

96

30

69

Submarines . . .

63

56

30

8

7

18

9

312

NAVY AND NAVIES

[STRATEGY AND TACTICS

Ships Building

Battleships Armd. Cruisers Protected Cruisers, II. Unprotected Cruisers T.B. Destroyers . Submarines

E.

9 3 9

2

37

II

F.

6

2

R.

8

2

G.

8 3 5

I.

2 2

U.

4

17 23

15

10

- Number uncertain. Bibliography. — Ancient and General: — Accounts of the naval organizations of the ancient world, and of the sea fighting of the time are to be found in the historians of Greece and Rome: Signor G. Corazzini has written a Storia delta marina militare antica (Livorno, 1882). Valuable details of the Imperial Roman navy and of the Byzantine navv will be found in Professor Bury's appendices to his edition of Gibbon's Decline and Fall, vol. i. apx. 5, and vol. vi. apx. 5. General histories of the navies of the world have been written, but thev are inevitably apt to be little more than jejune reviews of the dates, and results of battles. This is certainly the case with the great folio of the English writer Josiah Burchett, A Complete History of the most remarkable transactions at Sea, from the earliest accounts of time to the conclusion of the last war with France, wherein is given an account of the most considerable Naval Expeditions, Sea Fights, Stratagems, Discoveries and other Maritime Occurrences that have happened among all nations that have flourished at Sea; and in a more particular manner of Great Britain from the time of the Revolution m 1688 to the aforesaid period (1720). The later part is however valuable, for Burchett, who was secretary to the admiralty, had access to good authorities for his own time, and had served at sea as secretary to Russell, Lord Orford. There is an Histoire de la marine de tous les peuples, by M. A. du Sein (Paris, 1879) which is of no great value.

Medieval : — As regards the medieval navies the first place may be allowed to the Italians. A general bibliography of Italian nautical

literature, Saggio de una bibliografia marittima italiana, occupying fifty-eight pages, drawn up by Signor Enrico Celani, will be found in the Revista marittima, supplement for 1894 (Rome). The histories of the different Republics of the middle ages record their maritime enterprises. An excellent book, which gives far more than its title promises, is the Storia delta marina pontificia of A. Guglielmotti.O.P., in id volumes published at different times, and in two editions, at Florence 1856, &c. The general maritime history of the Mediterranean in the middle ages is well illustrated in the Memorias sobre la marina comercio y artes de Barcelona (1779-1792) by Don A. Capmany. The naval enterprises of the Norsemen are dealt with in a scholarly fashion by M. G. B. Depping, Histoire des expeditions maritimes des Normands (1826) ; and with newer knowledge by Mr C. F. Keary, The Vikings of Western Christendom (1891). The medieval periods of Western navies are treated in their respective naval histories.

Great Britain: — The History of the Royal Navy to the French Revolution, by Sir N. Harris Nicolas (1847), is unfortunately incomplete. It ends at the year 1422, but is the work of a most laborious and exact antiquary, who had been a naval officer in his youth. The administrative history of the British navy until 1660 is the subject of the History of the Administration of the Navy and of Merchant Shipping in relation to the Navy (1896) by Mr M. Oppenheim — a most valuable collection of materials. The campaigns and battles of the navy are told, generally from the public letters of the admirals, and with no great measure of criticism in several compilations. The Naval History of England (1735) by MrT. Lediard, is copious and useful. The Naval Chronology, or an Historical Summary of Naval and Maritime Events from the Time of the Romans to the Treaty of Peace 1802, by Captain Isaac Schomberg (1802), contains a mass of valuable information, lists of ships, dates of construction, &c, and some administrative details. Less comprehensive, but still useful, is such a compilation as The General History of the Late War (that is, the Seven Years' War), by Dr John Entick " and other gentlemen " (1763). A much better book is The Naval and Military Memoirs of Great Britain 1727 to 1783 (1804) by Mr R. Beatson, a very careful and well-informed writer who had seen some service as a marine officer. The Lives of the British Admirals, containing a new and accurate Naval History from the earliest periods, by Dr J. Campbell (1779), may be profitably consulted, with caution, for it by no means justifies its claim to novelty and accuracy in all parts. The Naval History of Great Britain, from 1793 to the accession of George IV., by Mr W. James (1827), republished with a continuation by Captain Chamier in 1837,

is a standard authority. A far less useful work, which, however, is in parts written from first-hand knowledge, is The Naval History of Great Britain by Captain W. P. Brenton, first published in 1823, and republished in 1836. The Field of Mars, a compilation in dictionary form published in 1 78 1, with an enormous title-page, is not without value for some of the naval transactions of the 1 8th century. The History of the British Navy from the Earliest Period to the Present Time (1863) by Dr C. D. Yonge, contains some original matter for the naval transactions of the 19th century. The Royal Navy, in 7 large volumes (1897-1903), edited and partly written by Sir W. L. Clowes, is a compilation of unequal value. Some of

Sir W. L. Clowes's coadjutors, notably Captain Mahan and Sir C. R. Markham, are of high standing and authority. The book is copiously illustrated. The Naval Chronicle, 1799-18 18, a magazine, contains masses of useful matter, for the Revolutionary and Napoleonic Wars. The Royal Naval Biography of Captain John Marshall, giving the lives of all officers on the list in 1823 or promoted later (1823-1835), with a supplement (1827-1830), may be consulted, but is too un- critical and too uniformly laudatory. The Naval Biographical Dictionary; life and services of every living officer (1846) , by Lieutenant W. R. O'Bryne, is a solid book of reference. The publications of the Navy Record Society (1894 and subsequent years) contain large and valuable publications of original matter, with some reprints of old authorities, such as Sir W. Monson's Tracts, which were difficult of access. See also A Short History of the Royal Navy, by David Hannay.

France: — The naval history of France has been much written about since 1840. Not many of the books published have been of considerable value. The Histoire maritime de la France of M. Leon Guerin (1844), was raean t to meet a popular demand and satisfy national vanity. The Histoire de la marine francaise of M. Eugene Sue (1845-1846) is mainly a romance, but it contains some useful evidence. The Histoire de la marine francaise of Le Comte de Bonfils Lablenie (1845), a naval officer, is of more value, but is somewhat wanting in criticism. The Precis historique de la marine francaise of M. Chasseriau (1845); the Histoire generale de la marine (1853); the Histoire de la marine francaise of M. le Saint (1877); and the Histoire nationale de la marine francaise depuis Jean Bart (1878) of M. Trousset are compilations. La Marine de guerre, ses institu- tions militaires depuis son origine jusqu'ci nos jours, by Capne Gougeard (1877); tne Essai sur I'histoire de V administration de la marine francaise of M. Lambert de Sainte Croix (1892); and the excellent little book of M. Loir on La Marine royale, 1789 (n.d.), may be consulted with pleasure and profit. The three books of M. Jal, Archiologie

novate (1840), Glossaire nautique (1848) and Abraham du Quesne et la marine de son temps (1872) are all of high value. Les Batailles novates de la France of Cap™ Troude (1867), is a carefully written account of naval actions. The Histoire de la marine frangaise, pendant la guerre de V independence americaine (1877); Sous la premiere republique (1886); Sous le consulat et V empire (1886) ; De 1815 & 1870 (1900) ; and La Marine frangaise et la marine allemande, 1870-187 1 (1873) of Capne Chevalier,, are thorough and critical. M. G. Lacour-Gayet, Professor at L'Ecole superieure de la Marine, has published two books of serious research, but marked by some national prejudice, La Marine militaire de la France sous le regne de Louis XV, (1902), and La Marine militaire de la France sous le rigne de Louis XVI. (1905). The Recherches sur I'ancien clos des galees de Rouen (1864) of M. C. de Robillard de Beaurepaire, and the life of Jean de Vienne by the Marquis Terrier de Loray (1878), are valuable monographs on passages of early French naval history. The Projets et tentatives de debarquement aux lies britanniques by Capne Desbriere (1900 seq.) is a most valuable authority. A very scholarly Histoire de la marine frangaise was begun in 1899 by M. C. de la Ronciere.

Miscellaneous :— The standard authorities for Spanish naval history are, La Marina de Castilla (1892), and La Armada Espanola desds la union de Castilla y Aragon (1895-1901), of Captain Cesareo Fernandez Duro. The Geschienes van het Nederlandsche Zeewezen of Mr J. C. de Jonghe (1858), is an admirable and exhaustive history of the Dutch navy. The History of the Maritime Wars of the Turks, by Haji Khalfa (or Hugji Chalifa), translated by Mr J. Mitchell for the Oriental Translation Fund (1831), may be read with curiosity and some profit. There are two general histories of the navy of the United States by Fenimore Cooper (1839), and by Mr E. S. Maclay (1894); the second is the fuller, and the more critical. Captain Mahan's Influence of Sea Power onHistory 1660-1783 (1890), and his Influence of Sea Power upon the French Revolution and Empire 1703- 1812 (1892), must be classed apart as studies of the general inter- action of navies on one another and on international relations. The long series of readable monographs by Admiral Jurien de la Graviere, covering the whole field of naval warfare from the Peloponnesian War to his own time, contain much information and sound criticism. (D. H.)

Naval Strategy and Tactics

Historical Evolution. — That the methods of conducting war at sea have been conditioned by the capacity of the ships and their armament, and that capacity and armament have interacted upon one another, may appear to be platitudes. But they are none the less truths

which must always be borne in mind when we are considering the history of naval strategy, that is, of the large movements by which a commander secures the advantage of fighting at a place convenient to himself, or of tactics — which are the movements he makes in battle. Throughout antiquity and the middle ages till the 16th century, the weapons relied on were — (1) the ship itself, used as a ram, (2) the swords of the crew, (3) such missile weapons as bolts from heavy crossbows

fixed on the bulwarks, bows and arrows, weights dropped from a yard or pole rigged out, and the various means of setting an enemy alight; by shooting arrows with burning tow or by Greek fire or wild fire, blown through tubes (cannae, whence ” cannon “). The nature of the ” Greek fire ” is still an unsettled question, and it is believed by some authorities that the Byzan- tines of the middle ages were acquainted with the use of gun- powder. However that may be, it is certain that even after the introduction of artillery in the 14th century, the means of injuring an enemy at a distance were nil, or were very feeble. All actions, therefore, were fought at close quarters, where ramming and boarding were possible. But the use of the ram was only available for a vessel driven by oars. A sailing vessel could not ram unless she were running before a good breeze. In a light wind her charge would be ineffective, and it could not be made at all from leeward. There- fore, while fleets depended on the methods of battle at close quarters, two conditions were imposed on the warship. She must be small and light, so that* her crew could row her with effect, and she must carry a numerous crew to work her oars and board or repel boarders. Sails were used by the triremes and other classes of warship, ancient and medieval, when going from point to point — to relieve the rowers from absolutely exhausting toil. They were lowered in action, and when the combatant had a secure port at hand, they were left ashore before battle. These conditions applied alike to Phormio, the Athenian admiral of the 5th century B.C., to the Norse king Olaf Tryggveson of the 10th century a.d., and to the chiefs of the Christian and Turkish fleets which fought the battle of Lepanto in a.d. 1571. There might be, and were, differences of degree in the use made of oar and sail respectively. Outside the Mediterranean, the sea was unfavourable to

the long, narrow and light galley of 120 ft. long and 20 ft. of beam. But the Norse ship found at Gokstad, though her beam is a third of her length, and she is well adapted for rough seas, is also a light and shallow craft, to be easily rowed or hauled up on a beach. Some medieval vessels were of considerable size, but these were the exception; they were awkward, and were rather transports than warships. Given a warship which is of moderate size and crowded with men, it follows that prolonged cruises, and blockade in the full sense of the word, were beyond the power of the sea commanders of antiquity and the middle ages. There were ships used for trade which with a favourable wind could rely on making six knots an hour — that is to say, twice the average speed attained by Captain Cook in his voyages of exploration. But a war fleet could not provide the cover, or carry the water and food, needed to keep the crews efficient during a long cruise. So long as galleys were used, that is to say, till the middle of the 18th century, they were kept in port as much as possible, and a tent was rigged over the deck to house the rowers. The fleet was compelled to hug the shore in order to find supplies. It always endeavoured to secure a basis on shove to store provisions and rest the crews. Therefore the wider operations were slowly made. Therefore too, when the enemy was to be waited for, or a port watched, some point on shore was secured and the ships were drawn up. It was by holding such a point that the Corinthian allies of the Syracusans were able to pin in the Athenians. The Romans watched Lilybeum in the same way, and Hannibal the Rhodian could run the blockade before they were launched and ready to stop him. The Norsemen hauled their ships on shore, stockaded them and marched inland. The Greeks of Homer had done the same and could do nothing else. Roger di Lauria, in a.d. 1285, waited at the Hormigas with his galleys on the beach till the French were seen to be coming past him. Edward III. in a.d. 1350, stayed at Winchelsea till the Spaniards were sighted. The allies at Lepanto remained at anchor near Dragonera till the last moment.

Given again that the fighting was at close quarters with ram, stroke of sword, crossbow bolt, arrow, pigs of iron or lead and wild fire blown through tubes, it follows that the formations and tactics were equally imposed on the combatants. The formation was inevitably the line abreast — the ships going side

by side — for the object was to bring all the rams, or all the boarders into action at once. It was quite as necessary to strike with the prow when boarding as when ramming. If the vessels were laid side by side the oars would have prevented them from touching. It may be added that this rule prevailed equally with the sailing ship of later times,

since they were built with what is technically called ” a tumble home,” that is to say, their sides sloped inwards from the water line, and the space from the top of the bulwarks of one to the other was too great to be jumped. The extent to which ramming or boarding would be used respectively would depend on the skill of the rowers. The highly trained Athenian crews of the early Pelopon- nesian War relied mainly on the ram. They aimed at qˆI”’ dashing through an enemy’s line, and shaving off the methods. oars from one side of an opponent. When successfully practised, this manoeuvre would be equivalent to the dismasting of a sailing line of battle ship. It was the 5w/orXoi/s, and it enabled the assailant to turn, and ram his crippled enemy in the stern {irepiicKovs) But an attack with the ram might be exceedingly dangerous to the assailant, if he were not very solidly built. His ram might be broken off in the shock. The Athenians found this a very real peril, and were compelled to construct their triremes with stronger bows, to contend with the more heavily built Peloponnesian vessels — whereby they lost much of their mobility. In fact success in ramming depended so much on a combination of skill and good fortune that it played a somewhat subordinate part in most ancient sea fights. The Romans baffled the ramming tactics of the Carthaginians by the invention of the corva or crow, which grappled the prow of the rammer, and provided a gangway for boarders. After the introduction of artillery in the 14th century, when guns were carried in the bows of the galley, it was considered bad management to fire them until the prow was actually touching the enemy. If they were discharged before the shock there was always a risk that they would be fired too soon, and the guns of the time could not be rapidly reloaded. The officer-like course was to keep the fire for the last moment, and use it to clear the way for the boarders. As a defence against boarding, the ships of a weaker fleet were sometimes tied side to one another, in the middle ages, and a barrier made with oars and spars. But this defensive arrangement, which was adopted by Olaf Tryggveson of Norway at Swolder (a.d. iooo), and by the French at Sluys (a.d. 1340), could be turned by an enemy who attacked on the flank. To meet the shock of ramming and to ram, medieval ships were sometimes ” bearded,” i.e. fortified with iron bands across the bows.

The principles of naval warfare known to the ancient world descended through Byzantium to the Italian Republics and from them to the West. With the growth of ships, the development of artillery, and the beginning of the great s hiJˆ sailing fleets capable of keeping the sea for long periods together, came the need for a new adaptation of old principles. A ship which depended on the wind for its motive power could not hope to ram. It could still board, and the Spaniards did for

long make it their main object to run their bow over an enemy's sides, and invade his deck. In order to carry out this kind of attack they would naturally try to get to windward and then bear down before the wind in line abreast ship upon ship. But an opponent to leeward could always baffle this attack by edging away, and in the meantime fire with his broadside to cripple his opponent's spars. Experience soon showed the more intelligent sea officers of all nations, that a ship which relied on broadside fire, must present her broadside to the enemy; it was also soon seen that in order to give full play to the guns of the fleet, the ships must follow one another. Thus there arose the practice of arranging ships in the line ahead, one behind the other. For a time sea-officers were inclined to doubt whether order could be maintained among vessels subject to the forces of wind and tide. But in the very first years of the 16th century, a Spanish writer of the name of Alonso de Chaves argued with force that even an approach to order is superior to none — and that, given the accidents of

"Line of battle. "

wind and tide, the advantage would rest with him who took | his precautions. The truth was so obvious that it could not but be universally accepted. The line ahead then became "the line of battle." This term has a double mean- ing. It may mean the formation, but it may also mean the ships which are fit to form parts of the line in action. The practice of sorting out ships, so as to class those fit to be in a line of battle apart from others, dates from the second half of the 17th century. Its advantages had been seen before, but the classification was not made universal till then. The excessive number of ships collected in those naval wars, their variety in size, and the presence in the fleets of a large proportion of pressed or hired merchant ships had led to much bad execu- tion. But in the final battles of the first war between Erigland and the Dutch Republic (1652-53), the Parliamentary admirals enforced the formation of the line by strong measures. On the conclusion of the war, they drew up the first published code of fighting instructions. These give the basis of the whole tactical system of the 17th and 18th centuries in naval warfare. The treatises of Paul Hoste, Bigot de Morogues and Bourde de Villehuet, which were the text-books of the time, all French in origin but all translated into other languages, are commentaries upon and

developments of this traditional code of practice.

The governing principles were simple and were essentially sound. The ships were arranged in a line, in order that each should have her broadside free to fire into the enemy Tfl'fttf"' w ' tnout running the risk of firing into her own friends. tactics. I n order to remove the danger that they would touch each other, a competent space, to allow for a change of course in case of need, was left between them. It was fixed at two cables — that is, 200 fathoms, or 400 yds. — though less room was occasionally taken. To reduce the number of men required to handle the sails, and leave them free .to fight the guns, the ships fought under reduced canvas. But it was necessary to retain the power to increase the speed of a ship rapidly. This was secured by not sheeting home one of the sails — that is to say, it was left loose, and the wind was "spilt out of it." When the vessel was required to shoot ahead it was easy to sheet the sail home, and " let all draw." The fleets would fight " on the wind " — that is to say, with the wind on the side, because they were then under better control. With the wind blowing from behind they would take the wind out of one another's sails. When the course had to be altered, the ships turned by tacking — that is, head to wind — or by wearing — that is, stern to wind, either together or in succession. To tack or wear a large fleet in succession was a very lengthy operation. The second ship did not tack, or wear, till she had reached the place where the first had turned, and so on, down the whole line. By tacking or wearing together the order of a fleet was reversed, the van becoming the rear, and the rear the van. It must be remembered that a fleet was divided into van, centre and rear, which kept their names even when the order was reversed. Orders were given by signals from the flag-ship, but as they could not be seen by the ships in a line with her, frigates were stationed on the side of the line opposite to that facing the enemy " to repeat signals."

A main object which the admirals who drafted the orders had before them was to obviate the risk that the enemy would double on one end of the line and put it between two fires. It is obvious that if two fleets, A and B, are sailing, both with the wind on the right side, and the leading ship of A comes into action with the seventh or eighth of B, then six or seven leading ships of B's line will be free to turn and surround the head of A's line. This did actually happen at the battle of Beachy Head. Therefore, the orders enjoin on the admiral the strict obligation to come into action in such a way that his leading ship shall steer with the leading ship of the enemy, and his rear with the rear. The familiar expression of the British navy was " to take every man his bird."

The regular method of fighting battles was thus set up. In itself it was founded on sound principles. As it was framed when the enemies kept in view were the Dutch, who in seamanship

and gunnery were fully equal to the British, its authors were justified in prescribing the safe course. Unhappily they added the direction that a British admiral was to keep his fleet, through- out the battle, in the order in which it was begun. Therefore he could take no advantage of any disorder which might occur in the enemy's lines. When therefore the conflict came to be between the British and the French in the 18th century, battles between equal or approximately equal forces were for long inconclusive. The French, who had fewer ships than the British, were anxious to fight at the least possible cost, lest their fleet should be worn out by severe action, leaving Great Britain with an untouched balance. Therefore, they preferred to engage to leeward, a position which left them free to retreat before the wind. They allowed the British fleet to get to windward, and, when it was parallel with them and bore up before the wind to attack, they moved onwards. The attacking fleet had then to advance, not directly before the wind with its ships moving along lines perpendicular to the line attacked, but in slanting or curving lines. The assailants would be thrown into " a bow and quarter line " — that is to say, with the bow of the second level with the after part of the first and so on from end to end. In the case of a number of ships of various powers of sailing, it was a difficult formation to maintain. The result was that the ships of the assailing line which were steering to attack the enemy's van came into action first and were liable to be crippled in the rigging. If the same formation was to be maintained, the others were now limited to the speed of the injured vessels, and the enemy to leeward slipped away. At all times a fleet advancing from windward was liable to injury in spars, even if the leeward fleet did not deliberately aim at them. The leeward ships would be leaning away from the wind, and their shot would always have a tendency to fly high. So long as the assailant remained to windward, the ships to leeward could always slip off.

The inconclusive results of so many battles at sea excited the attentions of a Scottish gentleman, Mr Clerk of Eldin (1728- 181 2), in the middle of the 18th century. He began a series of speculations and calculations, which he em- theories. bodied in pamphlets and distributed among naval officers. They were finally published in book form in 1790 and 1797. The hypothesis which governs all Clerk's demonstrations is that as the British navy was superior in gunnery and seaman- ship to their enemy, it was their interest to produce a melee. He advanced various ingenious suggestions for concentrating superior forces on parts of the enemy's line — by preference on the rear, since

the van must lose time in turning to its support. They are all open to the criticism that an expert opponent could find an answer to each of them. But that must be always the case, and victory is never the fruit of a skilful movement alone, but of that superiority of skill or of moral strength which enables one combatant to forestall or to crush another by more rapid movement or greater force of blow. Clerk's theories had at least this merit that they must infallibly tend to make battles decisive by throwing the combatants into a furious mingled strife.

The unsatisfactory character of the accepted method of fighting battles at sea had begun to be obvious to naval officers, both French and English, who were Clerk's contemporaries. The great French admiral Suffren condemned naval tactics as being little better than so many excuses for avoiding a real fight. He endeavoured to find a better method, by concentrating superior forces on parts of his opponent's line in some of his actions with the British fleet in the East Indies in 1782 and 1783. But his orders were ill obeyed, and the quality of his fleet was not superior to the British. Rodney, in his first battle in the West Indies in 1780, endeavoured to concentrate a superior force on part of his enemy's line by throwing a greater number of British ships on the rear of the French line. But his directions were misunderstood and not properly executed. Moreover he did not then go beyond trying to place a larger number of ships in action to windward against a smaller number to leeward by arranging them at a less distance than two-cables length. But

an enemy who took the simple and obvious course of closing his line could baffle the attack, and while the retreat to leeward remained open could still slip away. On the 12th of April 1782 (battle of Dominica) Rodney was induced, by the disorder in the French line, to break his own formation and pass through the enemy. He took the French flag-ship and five other vessels. The favourable result of this departure from the old practice of keeping the formation intact throughout the battle ruined the moral authority of the orthodox system of tactics. In the French war which began in 1793 Lord Howe (battle of 1st of June) ordered his fleet to steer through the enemy, and to put them- selves on his line only as a means of bringing his fleet into action, and then played to produce a melee in which the individual superiority of his vessels would have free play. Throughout

the war, which lasted, with a brief interval of peace, from 1793 to 181 5, British admirals grew constantly bolder in the method they adopted for producing the desired melee (battles of St Vincent, Camperdo wn, Trafalgar) . It has sometimes been argued that their line of attack was rash and would have proved disastrous if tried against more skilful opponents. But this is one of those criticisms which are of value only against those who think that there can be a magic efficacy in any particular attack, which makes its success infallible. That the tactics of British admirals of the great wars of 1793-1815 had in themselves no such virtue was amply demonstrated at the engagement off Lissa in 181 1. They were justified because the reliance of admirals on the quality of their fleets was well founded. It should be borne in mind that a vessel while bearing down on an enemy's line could not be exposed to the fire of three enemies at once when at a less distance than 750 yds., because the guns could not be trained to converge on a nearer point. The whole range of effective fire was only a thousand yards or a very little over. The chance that a ship would be dismasted and stopped before reaching the enemy's line was small.

The improvements in the construction of ships, which had so much influence on the development of tactics, had its effect also influence on strategy. The great aims of a fleet in war must be otim- to keep the coast of its own country free from attack, proved to secure the freedom of its trade, and to destroy the enemy's fleet or confine it to port. The first and second of these purposes can be attained by the successful achievement of the third — the destruction Or paralysis of the hostile fleet. But till after the end of the 17th century it was thought impossible, or at least very rash, to keep the great ships out of port between September and May or June. Therefore continuous watch on an enemy by blockading his ports was beyond the power of aViy navy. Therefore too, as the opponent might be at sea before he could be stopped, the movements of fleets were much subordinated to the need for providing convoy to the trade. It was not till the middle of the 18th century that the continuous blockade first carried out by Lord Hawke in i758-59> and then brought to perfection by Earl St Vincent and other 3ritish admirals between 1793 and 1815, became possible.

Modern Times. — The interval of ninety years between 181 5 and 1904 (the opening of the Russo-Japanese conflict) was marked by no naval war. There was fighting at sea, and there were prolonged blockades, but there were no encounters between large and well appointed navies. During this period an entire revolution took place in the means of propulsion, armament and material of construction of ships. Steam was applied to war- ships, at first as an auxiliary force, in

the second quarter of the 19th century. The Crimean War gave a great stimulus to the development of the guns. It also brought about the application of iron to ships as a cuirass. Very soon metal was adopted as the material out of which ships were made. The extended use of shells, by immensely increasing the danger of fire, rendered so inflammable a substance as wood too dangerous for employment in a war-ship. France has the honour of having set the example of employing iron as a cuirass, while England was the first to take it as the sole material. Changes so sweeping as these could not take place without affecting all the established ideas as to

ship- building.

the conduct of war at sea. The time of revolution in means of propulsion, armament and construction was also a time of much speculation. Doubts and obscurities remained unsolved because they had never been brought to the test of actual fighting on an adequate scale. As the 19th century drew to a close, another element of uncertainty was introduced by the development of the torpedo. A weapon which is a floating and moving mine, capable up to a certain point of being directed on its course, invisible or very hard to trace, and able to deliver its blow beneath the water-line, was so complete a novelty that its action was hard indeed to foresee and therefore particularly liable to be exaggerated. From the torpedo sprang too the submarine vessel, which aims at striking below the surface, where it itself is, like its weapon, invisible, or nearly so.

How to solve the problems which science has set has been the task of thoughtful naval officers — and of the governments which the military seaman serves. The questions to be solved may be stated in the following order. What would be the effect: 1st, of the employment of steam, or of any substitute for steam other than the wind or the oar; 2nd, of the development of the gun; 3rd, of the use of metal as a material of construction; 4th, of the use of a weapon and a vessel acting below the surface of the water, and if not wholly invisible at least very much hidden?

The belief that steam had given the lesser fleet an advantage over the greater — that it had, in a phrase once popular among Englishmen, ” bridged the Channel,” — need only be touched on for its historical interest. It was an intelligible, perhaps pardonable, example of the confusion produced by a novelty of improved capacity on the minds of those who were not prepared to consider it in all its bearings. A moment’s thought ought to have shown that where both sides had the command of steam, the proportion between them would remain what

it was before. The only exception would be that the fleet which was steering in a direction already laid down would have a somewhat greater advantage than of old, over another which was endeavouring to detect its presence and course. Its movements would be more rapid, and it could steam through a fog by which it would be hidden in a way impossible for a sailing ship. On the other hand, such a fleet could be much more rapidly pursued and interrupted when once its course was known. The influence which the freedom and certainty of movement conferred by steam would have on the powers of fleets and ships presented a problem less easy to dispose of. Against the advantage they conferred was to be set the limitation they imposed. The necessity for replacing indispensable fuel was a restriction unknown to the sailing ship, which needed only to renew its provisions and water — stores more easily obtained all the world over tha.n coal. Hence doubts naturally arose as to how far a state which did not possess coaling stations in all parts of the world could conduct extensive operations over great distances. The events of the recent Russo-Japanese War lead to the con- clusion that the obligation to obtain coal has not materially limited the freedom of movement of fleets. By carrying store vessels with him, by coaling at sea, and taking advantage of the friendly neutrality of certain ports on his route, the Russian admiral, Rojdesvensky, reached the Far East in 1905 in less time and with ‘iss difficulty than he could have done in days when he would have been liable to delay by calms, contrary winds and loss of spars in gales. The amount of skill on the part of the crews required to carry a fleet a long distance would even appear to be less than it was of old. From this it would seem to follow that modern fleets possess no less capacity than the old sailing fleets for the great operations of war at a distance, or for main- taining blockades. Advantage and disadvantage counterbalance one another, and the proportion remains the same. Blockade is only another name for the maintenance of a watch on an enemy’s squadron in port by a force capable of fighting him if he comes out. Admiral Togo blockaded the Russian squadron at Port Arthur in 1904 as effectually as any admiral has done the work in the past. The mobility given to the blockaded fleet by steam has been exactly counterbalanced by the increased mobility of the watch. The proportions remain the same.

” Fleet In being.”

But if the power to undertake far-ranging operations, and to confine an enemy to port by keeping him under observation, and driving him back when he comes out remains the same, the strategy of war at sea cannot have undergone any material altera- tion. The possession of ports where stores can be accumulated and repairs effected is an advantage as it always was. But a powerful fleet when operating far from its own country can supply itself with a store-house (a base) on the enemy's coast, or can be served at sea by store-ships, as of old. If beaten, it will suffer from the want of places of refuge as it always did.

Among the speculations of recent years, a good deal has been heard of the " fleet in being." If this phrase is only used to mean that, so long as any part of an enemy's navy is capable of acting with effect, its existence cannot be ignored with the certainty of safety, then the words convey a truth which applies to all war whether by land or sea. If it means, as it was at least sometimes clearly intended to mean, that no such operation as the transport of troops oversea can be undertaken with success, so long as the naval forces of an opponent are not wholly destroyed, it is con- trary to ancient experience. The Japanese in the beginning of 1904 began transporting troops to Korea before they had beaten the Russians, and they continued to send them in spite of the risk of interruption by the Vladivostok squadron. There was a risk, but risk is inseparable from war. The degree which can be incurred with sanity depends on the stake at issue, the nature of the circumstance and the capacity of the persons, which vary infinitely and must be separately judged.

The war of 1904-05 may also be said to have shown that the vast change in the construction of ships, together with the develop- _ ment of old and the invention of new weapons, has

done far less to alter the course of battles at sea than had been thought likely. Two calculations have been successively made and have been supported with plausibility. The first was that steam would enable the ship herself to be used as a projectile and that the use of the ram would again become common. The sinking of the " Re dTtalia " by the Austrian ironclad Ferdinand Max at the battle of Lissa in 1866 seemed to give force to this supposition. Accidental collisions such as those between the British war-ships " Vanguard " and " Iron Duke," " Victoria " and " Camperdown " have also shown how fatal a wound may be given by the ram of a modern ship. But the sinking of the " Re dTtalia " was largely an accident. As between vessels both under full control, a collision is easily avoided where there is space to move. In a melee, or pell-mell battle, to employ Nelson's phrase, opportunities would occur for the use of the ram. But the activity of science has

developed one weapon to counterbalance another. The torpedo has made it very dangerous for one fleet to rush at another. A vessel cannot fire torpedoes ahead, and when charging home ‘ at an opponent presenting his broadside would be liable to be struck by one. The torpedo may be said therefore to have excluded the pell-mell battle and the use of the ram except on rare occasions. But then arose the question whether the torpedo itself would not become the decisive weapon in naval warfare. It is undoubtedly capable of producing a great effect when its power can be fully exerted. A school arose, having its most convinced partisans in France, which argued that, as a small vessel could with a torpedo destroy a great battle-ship, the first would drive the second off the sea. The battle-ship was to give place to the torpedo-boat or torpedo-boat-destroyer which was itself only a torpedo-boat of a larger growth. But the torpedo is subject to close restrictions. It cannot be used with effect at more than two thousand yards. It passes through a resisting medium, which renders its course uncertain and comparatively slow, so that a moving opponent can avoid it. The vessel built to use it can be easily sunk by gun-fire. By night the risk from gun-fire is less, but science has nullified what she had done. The invention of the search-light has made it possible to keep the waters round a ship under observation all night. In the war between Russia and Japan the torpedo was at first used with success, but the injury it produced fell

Torpedoes.

dun-fire.

below expectations, even when allowance is made for the fact that the Russian squadron at Port Arthur had the means of repair close at hand. In the sea fights of the war it was of subordinate use, and indeed was not employed except to give the final stroke to, or force the surrender of, an already crippled ship. This war (and as much may be said for the war between the United States and Spain) confirmed an old experience. A resolute attempt was made by the Americans to block or blind (in the modern phrase to ” bottle-up “) the entrance to Santiago de Cuba by sinking a ship in it. The Japanese renewed the attempt on a great scale, and with the utmost intrepidity, at Port Arthur; but though a steamer can move with a speed and precision impossible to a sailing ship, and can therefore be sunk more surely at a chosen spot, the experiment failed. Neither Americans nor Japanese succeeded in preventing their enemy from coming out when he wished to come.

Since neither ram nor torpedo has established the claim made for it,

the cannon remains ” the queen of battles at sea.” It can still deliver its blows at the greatest distance, and in the greatest variety of circumstances. The change has been in the method in which its power is applied. Now, as in former times, the aim of a skilful officer is to concentrate a superior force on a part of his opponent’s formation. When the range of effective fire was a thousand or twelve hundred yards, and when guns could only be trained over a small segment of a circle because they were fired out of ports, concentration could only be effected by bringing a larger number of ships into close action with a smaller. To-day when gun-fire is effective even at seven thousand yards, and when guns fired from turrets and barbettes have a far wider sweep, concentration can be effected from a distance. The power to effect it must be sought by a judicious choice of position. It is true that greater rapidity and precision of fire produce concentration in one way. If of two forces engaged one can bring forty guns to bear on a chosen point of its opponent’s formations, while that opponent can bring fifty guns to bear on a part of it, the superiority would seem to be with the larger number. But this is by no means necessarily the case. The smaller number of guns may give the greater number of blows if fired with greater speed and accuracy. Yet no commander has a right to rely on such a superiority as this till it has been demonstrated, as it had been in the case of the British fleet by the time that Trafalgar was fought. Therefore an able chief will always play for position. He will do so all the more because an advantage of position adds to any other which he may possess. He may dispense with it for a particular reason at a given moment and in reliance on other sources of strength, but he will not throw it away.

When position is to be secured the first condition to be thought of is the order in which it is to be sought for. The ” line ahead ” was imposed on the sailing fleets by the peremptory need for bringing, or at least retaining the power to bring, all their broadsides into action. Experiments made during manceuvres by modern navies, together with the experience gained in the war of 1904-05 in the Far East, have combined to show that no material change has taken place in this respect. It is still as necessary as ever that all the guns should be so placed as to be capable of being brought to bear, and it is still a condition imposed by the physical necessities of the case that this freedom can only be obtained when ships follow one another in a line. When in pursuit or flight, or when steaming on the look-out for a still unseen enemy, a fleet may be arranged in the ” line abreast.” A pursuing fleet would have to run the risk of being struck by torpedoes dropped by a retreating enemy. But it would have the advantage of being able to bring all its guns which can fire ahead to bear on the

rear-ship of the enemy. When an opponent is prepared to give battle, and turns his broad- side so as to bring the maximum of his gun-fire to bear, he must be answered by a similar display of force — in other words, the line ahead must be formed to meet the line ahead.

Both fleets being in this formation, how is the concentration of a superior force to be effected? If the opponents are equal in number, speed, armament, gunnery and the leadership of the

Position.

NAWAB— NAWANAGAR

3 1 ?

Speed.

chiefs, accident alone can confer an advantage on either of them. Where equal weights are tried on accurate scales one cannot force up the other, but this evenness of power is rarely met in war by land or sea. The knowledge that it existed would probably prevent an appeal to arms between nations, since no decisive result could be hoped for. It is needless to insist that superior numbers make the task of concentrating com- paratively easy, unless counterbalanced by a great inferiority in speed. Speed is the quality which an admiral will wish his fleet to possess, in order that he may have the power to choose his point of attack. The swifter of two forces, otherwise equal, can always get ahead of its opponent, and then by turning inwards bring the leading ship of the force it is attacking into a curve of fire. The leader of the slower fleet can avoid the danger by also turning inwards. By so doing he will keep the assailant on his beam, opposite his side. Then the two fleets will tend to swing round in two circles having a common centre, the swifter going round the outer circumference and the slower round the inner. As the difference in length of these two lines would be always great and perhaps immense, the less speedy fleet could easily avoid the risk of being headed. On the other hand the outer fleet will be in a concave formation, and therefore able to bring all its guns to bear on the same point, while the inner fleet will be in a convex line, so that it will be unable to bring the guns of both van and rear to bear on the same mark. The advantage is obvious, but it may perhaps be easily exaggerated. The swifter fleet on the larger circle can in theory concentrate all its fire on one point, but all its ships will still be under fire, and in practice it is found very difficult to make men neglect the enemy who is actually hitting them, and apply their attention entirely to another. Moreover the ships on the outer

circle, having the larger line to cover, cannot allow themselves the same margin of steam-power to make good loss of speed by injury from shot. A fleet would not go at its maximum rate of common speed in action. A blow on the water-line might fill part of the ship's watertight compart- ments and reduce her speed. She must be able to make good the loss by putting on a greater pressure of steam, which she would not be able to do if already going at her maximum rate. In actual battle very much will depend on the respective skill of the gunnery. The swifter fleet might well find its superiority neutralised by the crippling of two or three of its leading ships. In such an action as this it will be, if not impossible, at least exceedingly difficult to give orders by signal. An admiral will therefore have to direct by example, which he cannot do except by placing his flag-ship at the head of the line. In that place he will be marked out as a target for the enemy's concentrated fire. He may indeed decide to direct the battle by signal from outside the line. Yet the difficulty he will find in seeing what is happening, as well as the difficulty the captains will find in seeing the signals, will always be so great, that in all probability the admirals of the future, will, like Nelson, be content to lay down the general principles on which the battle is to be fought, and trust the captains to apply them as circumstances arise. A large measure of independence must needs be allowed to the captains in the actual stress of battle. Ships must be placed at such a distance apart as will allow them room to manceuvre so as to avoid collision with their own friends. The interval cannot be less than 800 yds. When the length of the vessels themselves is added, it will be seen that a line of twelve vessels will stretch six miles. Modern powder is nominally smokeless, and it certainly does not create the dense bank of smoke produced by the old explosives. Yet it does create a sufficient haze to obscure the view from the van to the rear of an extended line. The movements must be rapid, and there will be little time indeed in which to take decisions. The torpedo may not be used during the actual battle. Its part will be to complete the destruction or enforce the surrender of a beaten enemy, and to cover retreats.

The submarine and submergible vessel were brought into prominence by France in the hope that by diminishing the value of battleships they would reduce the superiority of the

British navy. The example of France was followed by other powers, and particularly by Great Britain; but their value as weapons of war is necessarily a matter of speculation.

Bibliography. — Naval strategy can hardly be said to have been dealt with at all till Captain Mahan published his Influence of Sea Power on

History. The tactics of the ancient world are only very briefly dealt with in the De re Militari of Vegetius, in book iv. Vegetius was much copied and read in the middle ages, and was translated in 1284 by Jean de Meung, one of the authors of the Roman de la Rose. His translation is printed, together with the verse paraphrase of Priorats, in the Anciens Textes francais. Naval tactics are dealt with in the treatise of Leo VI. the Tactician, and his son Constantine VII., or perhaps Constantine VIII., printed in Meursius' Opera Omnia, vol. vi. They were emperors of the Mace- donian dynasty. The tactics of the medieval galleys are described, with references to authorities, both by A. Guglielmotti in Marine Pontificia, and by Admiral Jurien de la Graviere in Les Derniers jours de la marine & rames (1885). The chief writers on the tactics of the sailing fleets were French. At the head of them, in time and in merit, must be put Paul Hoste, whose folio on Naval Evolutions appeared in 1697. Hoste was a Jesuit who was secretary to the Count of Tourville. Hoste's treatise was translated into English and published in Edinburgh in 1834 with numerous and excellent illustra- tions by Captain J. D. Boswall, A Treatise on Naval Tactics. Captain Boswall also made use of the passages relating to naval tactics in the History of the Art of War by J. G. Hoyer, an officer in the Prussian army (1797-1800). Another excellent French treatise is Le Manasuvrier of Bourde de Villehuet (1765), translated into English in 1788 under the title of The Manceuvrer, or Skilful Seaman. Particular attention is due to the Essay on Naval Tactics by Mr Clerk of Eldin, first published in a collected form in 1804, but known in parts since 1780. Clerk was original in speculation and lucid in exposition. A French treatise, L'Art de la guerre sur mer, by the Vicomte de Grenier (1787), was less famous or influential, but was able and original. An exhaustive collection of " Fighting Instruc- tions " and other material necessary to an intelligent understanding of the naval tactics of sailing fleets is the Fighting Instructions 1530- 1816, edited by Mr Julian S. Corbett for the Navy Record Society (1905). Admiral Ekin's Naval Battles (1824) has some passages of value. It is comparatively easy to give authorities for the warfare of galleys and sailing ships. The case is altered when we have to deal with the tactics of steam fleets. Vast quantities of speculation have been written in every country which possesses a fleet, but, no test having been applied on a sufficient scale till the Russo-Japanese War of 1904, little of it can be said to possess approved authority. The facts of such wars as there have been are collected in Captain Mahan's Life of Farragut (1893) and Lessons of the War with Spain (1899), and in Mr H. W. Wilson's Ironclads in Action, 1855-1895. A standard work on evolutions and formations is Elementary Naval Tactics, by Captain Wm. Bainbridge Hoff of the United States navy, first published in

1894, but reprinted since with enlargements. The Naval Warfare of Admiral P. H. Colomb is a collection of historical examples meant to illustrate the principles of naval strategy for application in modern conditions. The third edition, revised and corrected, with additions, appeared in 1899. (D. H,)

NAWAB, a Mahommedan title for a native ruler in India, answering to the Hindu raja. Nawab originally means a deputy, being the honorific plural of the Arabic naib, and it was applied to a delegate of a supreme chief, the viceroy or governor under the Great Mogul, e.g. the nawab of Oudh. From this use it became a title of rank, without office, and is now sometimes conferred by the British government on Mahommedan gentlemen for distinguished service.

NAWABGANJ, the name of three towns of British India. (1) The most important is the headquarters of Bara Banki district in the United Provinces, on the Oudh and Rohilkhand railway, 17 m. E. of Lucknow; pop. (1901) 14,478. It has a considerable trade in sugar and cotton goods. It was the scene of a victory by Sir Hope Grant during the Mutiny. (2) A town in Malda district, Eastern Bengal and Assam, on the Mahananda near its junction with the Ganges, a centre of river trade; pop. (1901) 17,016. (3) A town in Gonda district, United Provinces, on the Bengal and North- Western railway; pop. Cigoi) 7047.

NAWANAGAR, or Jamnagar, a native state of India, in Kathiawar, within the Gujarat division of Bombay, situated on the south of the Gulf of Cutch. Area, 3791 sq. m. Pop. (1901) 336,779, showing a decrease of 11% in the decade due to famine. Estimated revenue, £170,000; tribute, £8000. The chief, whose title is Jam, is a Tareja Rajput of the same clan as the rao of Cutch. Prince Ranjitsinjhi (b. 1872), well known in England as a cricketer, was educated at the Rajkumar College,

Rajkot, and Trinity College, Cambridge. He had been adopted by his uncle, the Jam Shri Vibhaji, but the adoption was set aside, with British sanction, in favour of a son by a Mahommedan mother. This son succeeded, but died in 1906 aged twenty-four, and Ranjitsinjhi obtained the throne in March 1907. A branch railway, constructed at the expense of the state, was opened in 1898 from Rajkot to Nawanagar town.

The town of Nawanagar is about 5 m. from the seaport of Bedi. Pop. (1901) 53,844. Founded by Jam Rawal in 1540, it is built of stone, and has manufactures of silk and gold embroidery, and perfumed oils and red powder for ceremonial purposes. Its water is supplied from a reservoir covering 600 acres and an aqueduct 8 m. long.

NAWAWl [Abu Zakariyya ibn Sharaf un-Nawawi] (1233- 1278), Arabian writer, was born at Nawa near Damascus. In the latter city he studied from his eighteenth year, and there, after making the pilgrimage in 1253, he settled as a private scholar until 1267, when he succeeded Abu Shama as professor of tradition at the Ashrafiyya school. He died at Nawa from overwork.

His manual of Moslem law according to the Shafi'ite school has been edited with French translation by van den Bergh, 2 vols., Batavia (18S2-1884), and published at Cairo (1888). The Tahdhlb ul-Asma'i has been edited as the Biographical Dictienary of Illustrious Men chiefly at the Beginning of Islam by F. Wustenfeld (Gottingen, 1842-1847). The Taqrib wa Taisir, an introduction to the study of tradition, was published at Cairo, 1890, with Suyuti's commentary. It has been in part translated into French by M. Marcais in the Journal asiatique, series ix., vols. 16-18 (1900-1901). Nawawi's collection of the forty (actually forty-two) chief traditions has been frequently published with commentaries in Cairo. For other works see C. Brockelmann's Gesch. der arabischen Litteratur, vol. i. (Weimar, 1898), pp. 395-397- (G. W. T.)

NAXOS, the largest of the Cyclades (about 22 m. by 16 m.), a fertile island in the Aegean Sea, east of Paros, with which, and adjacent smaller islands, it forms an eparchia. In ancient times it was also called Dia or Strongyle. It was rich in vines and famous for its wine, and a centre of the worship of Bacchus. The god found Ariadne asleep on its shore, when she was deserted by Theseus. The sculptors of Naxos formed an important school of early Greek art; several unfinished colossal statues are still to be seen in the quarries, notably one in Apollona Bay, to the N.E. of the island. A tyrant Lygdamis ruled Naxos in alliance with Peisistratus of Athens during the 6th century B.C. In 501 a Persian fleet unsuccessfully attacked it, but in 490 it was captured and treated with great severity. Four Naxian ships took part in the expedition of Xerxes, but deserted and fought on the Greek side at Salamis in 480. Naxos was a member of the Delian League (q.v.); it revolted in 471, was captured by Athens, and remained in her possession till her empire was destroyed. In later times the most remarkable event was its capture, in a.d. 1207, by the Venetian Marco Sanudo, who founded the duchy of Naxos, which flourished till the

Turks took the island in 1566. Since the War of Independence it has belonged to the Greek kingdom. The only ancient remains of any importance are those of a temple (Palati), supposed to be that of Dionysus, on an island just off the town. Naxos is still rich in fruit trees, and also exports corn, wine and oil, as well as emery, its richest and most important mineral product. Pop. (1907) 25,185 (province), 2064 (commune).

NAXOS, the earliest Greek colony in Sicily, was founded by Theocles from Chalcis in 735 B.C., on the E. coast, S. of Tauro- menium (mod. Taormina), in a low-lying situation just N. of the mouth of the river Alcantara, where the castle of Schiso now stands. The adoption of the name of Naxos, the island in the Aegean Sea, seems to indicate that there were Naxians among Its founders. Within a few years it became strong enough to found Leontini and Catana. Naxos was the warmest ally of Athens in the Sicilian expedition. In 403 B.C. it was destroyed by Dionysius and handed over to the Sicels, but was never rebuilt. Its place was supplied in 358 by Tauromenium. Scanty traces of its walls are to be seen, of irregular blocks of lava, especially on the south, parallel to the river (E. A. Freeman, Hist, of Sic. i. 323). Without the city stood the altar of Apollo

Archegetes, at which all sacred embassies that left Sicily sacrificed before their departure (Thuc. vi. 3).

NAY, or Ney, the long flute of the ancient Egyptians, held obliquely and played by directing the breath, as in the pipes of the syrinx, across the open end, which had no embouchure of any kind. Performers on the nay are represented on many of the frescoes which decorated the tombs at Thebes, their flutes reaching nearly to the ground while they are in the familiar half-kneeling posture. The acoustic principles involved in the production of sound are the same as for the flute. The narrow- ness of the bore in proportion to the length would facilitate the production of harmonics and so give the nay an extended compass. Victor Loret 1 has compiled a list of all the real pipes of ancient Egypt which have survived, having for the most part been preserved in mummy cases. The nay was not restricted to ancient Egypt, but has remained in general use in various parts of the East until the present day. (K. S.)

NAYAGARH, a native state in India, in the Orissa division of Bengal. Area, 588 sq. m.; pop. (1901) 140,779; revenue, £8000. It contains hills rising to 5000 ft.; and exports much agricultural produce. In 1894 a revolt of the hill tribe of Khonds against the raja required the intervention of British military police. Nayagarh village (pop. 3340) is

connected by road with Khurda in Puri district.

NAYAR, or Nair, a caste or tribe on the W. coast of S. India, who form the dominant race in Malabar. Traditionally they are soldiers, but many have taken to professions, and one was in 1910 a judge of the high court at Madras. Their total number in all India in 1901 was just over one million. Their most peculiar customs are: (1) marumakkattayam = ” descent through sister’s children,” or inheritance in the female line; and (2) sambandham, a loose form of union, taking the place of marriage, without any responsibility of the husband towards either wife or children. In 1896 an act of the Madras legislature enabled a sambandham to be registered, and have the force of a legal marriage. Little advantage has been taken of this act, while it is alleged that the sambandham now usually lasts for a lifetime. See Malabar District Gazetteer (Madras, 1908). NAYLER (or Naylor), JAMES (161 8- 1660), English Puritan, was born at Andersloe or Ardsley, in Yorkshire, in 1618. In 1642 he joined the parliamentary army, and served as quarter- master in John Lambert’s horse. In 1651 he adopted Quakerism, and gradually arrived at the conviction that he was a new incarnation of Christ. He gathered round him a small band of disciples, who followed him from place to place. At Appleby in 1653 and again at Exeter in 1655 he suffered terms of imprison- ment. In October 1655, in imitation of Christ’s procession into Jerusalem, he entered Bristol on horseback, riding single — ” a rawboned nude figure, with lank hair reaching below his cheeks ” — attended by seven followers, some on horseback, some on foot, he in- silence and they singing ” Hosanna! Holy, holy! Lord God of Sabaoth!” At the High Cross he and his followers were arrested. His trial occupied the second parliament of Cromwell for several days, and on the 16th of December 1656 he was convicted of blasphemy and sentenced to be whipped from the Palace Yard to the Old Exchange, to be branded in the forehead with ” B” (for blasphemer), to have his tongue bored with a red-hot iron, to be whipped through the streets of Bristol, and to suffer imprisonment with hard labour for two years. On his release he was readmitted into the communion of the Quakers, and spent some time in Westmorland with George Whitehead (i636?-i723). In October 1660 Nayler set out to visit iris long-forsaken family in Yorkshire, but died on the journey in Huntingdonshire.

A collected edition of the Tracts of Nayler appeared in 17 16. See A Relation of the Life, Conversion, Examination, Confession, and Sentence of James Nayler (1657) ; a Memoir of the Life, Ministry, Trial, and Sufferings of James Nayler £1719); and a. Refutation of some of the more Modern Misrepresentations of the Society of Friends commonly called Quakers, with a Life of James Nayler, by Joseph

Gurney Bevan (1800).

‘“Les Flutes egyptiennes antiques,” in Journal asiatique, 84me s6rie, tome xiv. (Paris, 1889).

NAZARENES (Nafcopcuoi), an obscure Jewish-Christian sect, existing at the time of Epiphanius (fi. a.d. 370) in Coele-Syria, Decapolis (Pella) and Basanitis (Cocabe). According to that authority (Panarion, xxix. 7) they dated their settlement in Pella from the time of the flight of the Jewish Christians from Jerusalem, immediately before the siege in a.d. 70; he characterizes them as neither more nor less than Jews pure and simple, but adds that they recognized the new covenant as well as the old, and believed in the resurrection, and in the one God and His Son Jesus Christ. He cannot say whether their christological views were identical with those of Cerinthus and his school, or whether they differed at all from his own. But Jerome (Ep. 79, to Augustine) says that they believed in Christ the Son of God, born of the Virgin Mary, who suffered under Pontius Pilate, and rose again, but adds that, " desiring to be both Jews and Christians, they are neither the one nor the other." They used the Aramaic recension of the Gospel according to Matthew, which they called the Gospel to the Hebrews, but, while adhering as far as possible to the Mosaic economy as regarded circumcision, sabbaths, foods and the like, they did not refuse to recognize the apostolicity of Paul or the rights of heathen Christians (Jer., Comm. in Isa., ix. 1). These facts, taken along with the name (cf. Acts xxiv. 5) and geographical position of the sect, lead to the conclusion that the Nazarenes of the 4th century are, in spite of Epiphanius's distinction, to be identified with the Ebionites (q.v.).

NAZARETH (mod. en-Ndsira), a town in Galilee, in a hollow of the hills on the southern border of the plain of Esdraelon. It first appears as a village (John i. 46) in which Joseph and Mary lived (Luke i. 26) and to which they returned from Egypt (Matt. ii. 23). . Here the unrecorded years of Christ's boyhood were spent. From the name of the town comes nasara (i.e. "Nazarenes"), the ordinary oriental word for "Christians." There was here a synagogue (Matt. xiii. 54) in which Christ preached the sermon that led to his rejection by his fellow towns- men. The growth of legends and traditional identifications can be traced in the writings of the pilgrims who have visited the town from Jerome's time till our own. For none of these can anything be said, save that it is possible that the village spring (called " St Mary's Well ") is the same as that used in the time of Christ. A large basilica stood here about a.d. 600: the crusaders transferred here the bishopric of Scythopolis. It was taken by Saladin in 1187. In 1517 it was captured by the Turks. The population is now estimated at about 3500 Moslems and 6500 Christians; there are numerous schools, hospitals, &c, conducted by Greeks, Latins and Protestants. Visitors are shown the " Church of the Annunciation " with caves (including a fragment of a pillar hanging from the ceiling, and said to be miraculously

supported) which are described as the scene of the annunciation, the ” workshop of Joseph,” the ” synagogue,” and a stone table, said to have been used by Christ.

NAZARITE, or rather Nazirite, the name given by the Hebrews to a peculiar kind of devotee. The characteristic marks of a Nazarite were unshorn locks and abstinence from wine (Judges xiii. 5; 1 Sam. i. n; Amos ii. n seq.); but full regulations for the legal observance of the Nazarite vow are given in Num. vi., where every product of the grape-vine is forbidden, and the Nazarite is enjoined not to approach a dead body, even that of his nearest relative. The lav/ in question is in its present form post-exilic, and is plainly directed to the regulation of a known usage. It contemplates the assumption of the vow for a limited period only, and gives particular details as to the atoning ceremonies at the sanctuary by which the vow must be recommenced if broken by accidental defilement, and the closing sacrifice, at which the Nazarite on the expiry of his vow cuts off his hair and burns it on the altar, thus returning to ordinary life. Among the later Jews the Nazarite vow, of course, corresponded with the legal ordinance, which was further developed by the scribes in their usual manner (Mishna, tractate Nnzir; cf. 1 Mace. iii. 49; Acts xxi. 23 seq.; Joseph. Ant. xix. 6. 1, Wars ii. 15. 1). On the other hand, in the earliest historical case, that of Samson, and in the similar case of Samuel (who,

however, is not called a Nazarite), the head remains unshorn throughout life, and in these times the ceremonial observances as to uncleanness must have been less precise. Samson’s mother is forbidden to eat une’ean things during pregnancy, but Samson himself touches the carcass of c. lion and is often in contact with the slain, nor does he abstain from giving feasts. 1

In the cases of Samuel and Samson the unshorn locks are a mark of consecration to God (Judges xiii. 5) for a particular service — in the fcne case the service of the sanctuary, in the other the deliverance of Israel from the Philistines. Since, moreover, the Hebrew root n-z-r is only dialectically different from n-d-r, ” to vow,” both corresponding to the same original Semitic root (Arab, n-dh-r), it would seem that the peculiar marks of the Nazarite are primarily no more than the usual sign that a man is under a vow of some kind. To leave the locks unshorn during an arduous undertaking in which the divine aid was specially implored, and to consecrate the hair after success, was a practice among various ancient nations, but the closest parallel to the Hebrew custom b found in Arabia. 2 There the vow was generally one of war or revenge, and, till it was accomplished, the man who vowed left his hair unshorn and unkempt, and abstained from wine, women,

ointment and perfume. Such is the figure of Shanfara as described in his Lamlya. The observances of the ihram (period of consecration) belong to the same usage (see Mecca) , and we find that at Taif it was customary to shear the hair at the sanctuary after a journey. The consecration of Samuel has also its Arabic parallel in the dedication of an unborn child by its mother to the service of the Ka'ba (Ibn Hisham, p. 76; AzrakI, p. 128). The spirit of warlike patriotism that characterized the old religion of Israel could scarcely fail to encourage such vows (cf. 2 Sam. xi. 11, and perhaps 1 Sam. xxi. 4 seq.), and from the allusion in Amos we are led to suppose that at one time the Nazarites had an importance — perhaps even an organization — parallel to that of the prophets, but of a very different religious type from the Canaanite nature-worship.

See Rechabites; Encyc. Bibl. col. 3362 seq.; G. B. Gray, Numbers, pp. 56-&1 ; E. Kautzsch (I.e. n. I below) ; W. R. Harper, Amos and Hosea, p. Ii. sq., with references. (W. R. S.; S. A. C.)

NAZARIUS (4th century a.d.), Latin rhetorician and pane- gyrist, was, according to Ausonius, a professor of rhetoric at Burdigala (Bordeaux). The extant speech of which he is un- doubtedly the author (in E. Bahrens, Panegyrici Latini, No. 10) was delivered in 321 to celebrate the fifteenth anniversary of the accession of Constantine the Great, and the fifth of his son Constantine's admission to the rank of Caesar. The preceding speech (No. 9), celebrating the victory of Constantine over Maxentius, delivered in 313 at Augusta Trevirorum (Trier), has often been attributed to Nazarius, but the difference in style and vocabulary, and the more distinctly Christian colouring of Nazarius's speech, are against this.

See M. Schanz, Geschichte der romischen Litteratur, iii. (1896) ; Teuffel-Schwabe, Hist, of Roman Literature (Eng. trans., 1900),

401. 6.

NEAGH, LOUGH, the largest lake (Irish, " lough ") in the British Isles, situated in the north-east of Ireland, in the province of Ulster, its waters being divided between counties Antrim (N. and E.), Down (S.E.), Armagh (S.), Tyrone and Londonderry (W.). Its shape is an irregular oblong, its extreme measurements being 18 m. from N.E. to S.W. 16 from N. to S., and n from E. to W. Its circumference, without including minor indentations, is about 64 m., and its area 98,255 acres or about 153 sq. m. The shores are generally flat and marshy, or very gently sloping, but flat-topped hills rise near the northern shore, where the lake reaches its extreme depth of 102 ft. The mean height

above sea- level is 48 ft. Though the lough receives a large number of

1 The prohibition to Samson's mother to abstain from wine does not appear to belong to the original narrative (see E. Kautzsch ; Hastings's D.B. v. 657 col. b, following Bohme). John the Baptist is a later example of lifelong consecration (Luke i. 15); cf. also the tradition as to James the Just (Euseb. H.E. ii. 23).

2 On consecration of the hair, see Spencer, De Legibus Hebr. iii. 1. 6; I. Goldziher, Rev. Hist. Rel. xiv. 49 sqq. (1886); J. G. Frazer, Golden Bough 2 , i. 368 sqq.; and W. R. Smith, Rd. Sem?, Index s.v. " hair."

streams, the river Bann alone carries off its waters, flowing northward. The principal feeders are the Main on the north, the Crumlin (whose waters have petrifying powers) on the east, the Bann and Blackwater on the south, and the Ballinderry and Moyola on the west. Antrim and Toome, at the N.E. and N.W. respectively, are the only towns immediately on the shores. The islands are few and near the shores; namely, Skady Tower on the north, Ram's Island (with a ruined round tower) on the east, Ready and Coney Islands on the southwest. The lough abounds in fish, including gillaroo trout, char and pullen or fresh-water herring. A tradition that the lough rose suddenly from a fountain, inundating a populous district, and that remains of buildings may be seen below the waters, finds place in Thomas Moore's ballad Let Erin remember.

NEAL, DANIEL (1678-1743), English historian, born in London on the 14th of December 1678, was educated at the Merchant Taylors' School, and at the universities of Utrecht and Leiden. In 1704 he became assistant minister, and in 1706 sole minister, of an independent congregation worshipping in Aldersgate Street, and afterwards in Jewin Street, London, where he remained almost until his death on the 4th of April 1743. He married Elizabeth Lardner (d. 1748), by whom he had one son, Nathanael, and two daughters. In 1720 Neal published his History of New England, which obtained for its author the honorary degree of M.A. from Harvard college. He also undertook to assist Dr John Evans in writing a history of Nonconformity. Evans, however, died in 1730, and, making use of his papers for the period before 1640, Neal wrote the whole of the work himself. This History of the Puritans deals with the time between the Reformation and 1689; the first volume appearing in 1732, and the

fourth and last in 1738. The first volume was attacked in 1733 for unfairness and in- accuracy by Isaac Maddox, afterwards bishop of St Asaph and of Worcester, to whom Neal replied in a pamphlet, A Review of the principal facts objected to in the first volume of the History of the Puritans; and the remaining volumes by Zachary Grey (1688-1766), to whom the author made no reply.

The History of the Puritans was edited, in five volumes, by Dr Joshua Toulmin (1740-1815), who added a life of Neal in 1797. This was reprinted in 1822, and an edition in two volumes was published in New York in 1844.

NEAL, DAVID DALHOFF (1838-), American artist, was born at Lowell, Massachusetts, on the 20th of October 1838. He was a pupil of the Royal Academy, Munich, under Max. E. Ainmiller, whose daughter he subsequently married. Later he entered the studio of Piloty, with whom he remained from 1869 to 1876. His picture, ” The First Meeting of Mary Stuart and Rizzio,” won for him the great medal of the Royal Bavarian Academy of Art. Besides portraits his canvases include ” James Watt,” a large historical composition shown at the Royal Academy, 1874, ” Chapel of the Kings at Westminster ” (collection of F. Cutting, Boston) and ” Cromwell visiting Milton ” (Hurlbut collection, Cleveland, Ohio).

NEALE, EDWARD VANSITTART (1810-1892), English co-operator and Christian Socialist, was born at Bath on the 2nd of April 1810, the son of a Buckinghamshire clergyman. After receiving his earlier education at home he went to Oriel College, Oxford. In 1837 he was called to the bar at Lincoln’s Inn. He became a member of the Christian Socialists in 1850 and also joined the council of the Society for Promoting Working Men’s Associations. His wealth enabled him to carry out experiments in co-operation on a larger scale than had been previously attempted. He founded the first co-operative store in London, and advanced the capital for two builders’ associations, Doth of which failed. In 1851, though strongly opposed by other members of the promoting ” Council,” he started on his own initiative the Central Co-operative Agency, similar in many respects to the Co-operative Wholesale Society of a later day. The failure of this scheme, together with that of the operatives’ cause in the engineering lock-out of 1852 is said to have cost him £40,000. It is certain that until in later life he inherited the estate of Bisham Abbey in Berkshire he was, comparatively

speaking, a poor man. He was closely associated with the movement which resulted in the Industrial and Provident Societies Act of 1876,

and the passing of the Consolidation Act of 1862 was almost entirely due to his efforts. Besides publishing pamphlets on co-operation he served on the executive com- mittee which afterwards developed into the Central Co-operative Board, and took an active part in the formation of the North of England Co-operative Wholesale Society in 1863. One of the founders of the Cobden mills in 1866, and the Agricultural and Horticultural Association in 1867, he also promoted the annual co-operative congress, afterwards becoming general secretary of the Central Board. He was also a director of the Co-operative Insurance Company and a member of the Co-operative News- paper Society for many years. He visited America in 1875 with a deputation whose object was to open up a direct trade between the farmers of the western states and the English co-operative stores. After resigning the post of secretary to the congress board in 1891, he became a member of the Oxford University branch of the Christian Social Union. He died on the 16th of September 1892.

NEALE, JOHN MASON (1818-1866), English divine and scholar, was born in London on the 24th of January 1818, and was educated at Trinity College, Cambridge. Here he was affected by the Oxford movement, and helped to found the Camden (afterwards the Ecclesiological) Society. Though he took orders in 1841, ill-health prevented his settling in England till 1846, when he became warden of Sackville College, an alms- house at East Grinstead, an appointment which he held till his death on the 6th of August 1866.

Neale was strongly high-church in his sympathies, and had to endure a good deal of opposition, including a fourteen years' inhibition by his bishop. In 1855 he founded a nursing sisterhood named St Margaret's. He occupies a high place as a hymn- ologist, but principally as a translator of ancient and medieval hymns, the best known being probably " Brief life is here our portion," "To thee, O dear, dear country," and "Jerusalem, the golden," which are included in the poem of Bernard of Cluny, Be Conlemptu Mundi, translated by him in full. He also published An Introduction to the History of the Holy Eastern Church (1850, 2 vols.); History of the so-called Jansenist Church of Holland (1858); Essays on Liturgiology and Church History (1863); and many other works.

See Life by his daughter, Mrs Charles Towle (1907) ; the Memoir by his friend, R. F. Littledale ; and the Letters of John Mason Neale (1910), selected and edited by his daughter. For a complete list of Neale's works see article in Diet, of Nat. Biog. xl. 145.

NEAMTZU (Neamtu), a town in Rumania, situated among the lower

slopes of the Carpathian Mountains, and on the left bank of the river Neamtzu, an affluent of the Moldova. Pop. (i960) 8578, about half being Jews. Neamtzu gives its name to the Department of which Piatra is the capital. Lying ism. S. by E. of Falticheni, the nearest railway station, it has little trade. Near it is the ruined fortress of Neamtzu, constructed early in the 13th century by the Teutonic knights of Andrew II., king of Hungary, in order to repel the incursions of the Cumanians. An hour's drive to the west of the town is the monastery of Neamtzu, founded in the 14th century, and containing two churches and many ancient and interesting relics. Before the secularization of the monastic lands in 1864, it was one of the richest and most important of the Rumanian monasteries. Baltzatesti, 10 m. W. by S. of Neamtzu, is locally famous for its mineral springs and baths.

NEANDER, JOACHIM (1650-1680), German hymnwriter, was born at Bremen. The family name, originally Neumann, had, according to the prevailing fashion a century earlier, been Graecized as Neander. After studying at Heidelberg and Frankfort, where he formed friendships with Friedrich Spanheim (1632-1701) and Philipp Jakob Spener (1635-1705), he settled at Diisseldorf as rector of the Latin school in connexion with the Reformed Church. In 1676 he incurred church censure for abstaining and inducing others to abstain from joining in the celebration of the communion. It was during the term of

his suspension from his teaching office that many of his hymns were written. He ultimately renounced his connexion with the separatists, and in 1679 returned to Bremen as one of the preachers of St Martin's church. In the same year he published the Bundeslieder and Dankpsalmen, a collection of 71 hymns, of which many are still in use. He died on the 31st of May 1680. The Neanderthal, near Dusseldorf, takes its name from him. For his place in hymnology see Hymns.

See J. F. Iken, Joachim Neander, sein Leben und seine Lieder

(1880).

NEANDER, JOHANN AUGUST WILHELM (1789-1850), German theologian and church historian, was born at Gottingen on the 17th of January 1789. His father, Emmanuel Mendel, is said to have been a Jewish pedlar, but August adopted the name of Neander on his

baptism as a Christian. While still very young, he removed with his mother to Hamburg. There, as throughout life, the simplicity of his personal appearance and the oddity of his manners attracted notice, but still more, his great industry and mental power. From the grammar-school (Johanneum) he passed to the gymnasium, where the study of Plato appears especially to have engrossed him. Considerable interest attaches to his early companionship with Wilhelm Neumann and certain others, among whom were the writer Karl August Varnhagen von Ense and the poet Adelbert von Chamisso.

Baptized on the 25th of February 1806, in the same year Neander went to Halle to study divinity. Here Schleiermacher was then lecturing. Neander found in him the very impulse which he needed, while Schleiermacher found a pupil of thoroughly congenial feeling, and one destined to carry out his views in a higher and more effective Christian form than he himself was capable of imparting to them. But before the year had closed the events of the Franco-Prussian War compelled his removal t6 Gottingen. There he continued his studies with ardour, made himself yet more master of Plato and Plutarch, and became especially advanced in theology under the venerable G. J. Planck (1751-1833). The impulse communicated by Schleiermacher was confirmed by Planck, and he seems now to have realized that the original investigation of Christian history was to form the great work of his life.

Having finished his university course, he returned to Hamburg, and passed his examination for the Christian ministry. After an interval of about eighteen months, however, he definitively betook himself to an academic career, ” habilitating ” in Heidelberg, where two vacancies had occurred in the theological faculty of the university. He entered upon his work here as a theological teacher in 181 1; and in 181 2 he became a professor. In the same year (1812) he first appeared as an author by the publication of his monograph JJber den Kaiser Julianus und sein Zeitalter. The fresh insight into the history of the church evinced by this work at once drew attention to its author, and even before he had terminated the first year of his academical labours at Heidelberg, he was called to Berlin, where he was appointed professor of theology.

In the year following his appointment he published a second monograph Der Heilige Bernhard und sein Zeitalter (Berlin, 1813), and then in 18 18 his work on Gnosticism (Genelische Entwickelung der vornehmsten gnastischen Systeme). A still more extended an elaborate monograph than either of the preceding followed in 1822, Der Heilige Johannes Chrysostomus und die Kirche, besonders des

Orients in dessen Zeitalter, and again, in 1824, another on Tertullian (Antignostikus) . He had in the meantime, however, begun his great work, to which these several efforts were only preparatory studies. The first volume of his Allgemeine Geschichte der christlichen Religion und Kirche embracing the history of the first three centuries, made its appearance in 1825. The others followed at intervals — the fifth, which appeared in 1842, bringing down the narrative to the pontificate of Boniface VIII. A posthumous volume, edited by C. F. T. Schneider in 1852, carried it on to the period of the council of Basel. Besides this great work he published in 1832 his Geschichte der Pflanzung und Leitung der christlichen

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Kirche, and in 1837 his Das Leben Jesu Christi, in seinem geschichtlichen Zusammenhang und seiner geschichtlichen Entwickelung, called forth by the famous Life of David Strauss. In addition to all these he published Denkwiirdigkeiten aus der Geschichte des Christentums (1823-1824, 2 vols., 1825, 3 vols., 1846); Das Eine und Mannichjaltige des christlichen Lebens (1840); papers on Plotinus, Thomas Aquinas, Theobald Thamer, Blaise Pascal, J. H. Newman, Blanco White and T. Arnold, and other occasional pieces (Kleine Gelegenheitsschriften, 1829) , mainly of a practical, exegetical and historical character. He died on the 14th of July 1850, worn out and nearly blind with incessant study. After his death a succession of volumes, representing his various courses of lectures, appeared (1856ˆ 1864), in addition to flie Lectures on the History of Dogma {Theologische V orlesungen) , admirable in spirit and execution, which were edited by J. L. Jacobi in 1857.

Neander's theological position can only be explained in connexion with Schleiermacher, and the manner in which while adopting he modified and carried out the principles of his master. Characteristically meditative, he rested with a secure footing on the great central truths of Christianity, and recognized strongly their essential reasonableness and harmony. Alive to the claims of criticism, he no less strongly asserted the rights of Christian feeling. " Without it," he emphatically says, " there can be no theology; it can only thrive in the calmness of a soul consecrated to God." This explains his favourite motto". " Pectus est quod theologum facit."

His Church History {Allgemeine Geschichte der christlichen Religion und Kirche) remains the greatest monument of his genius. In this " Neander's chief aim was everywhere to understand what was individual in history. In the principal figures of ecclesiastical history

he tried to depict the representative tendencies of each age, and also the types of the essential tendencies of human nature generally. His guiding principle in treating both of the history and of the present condition of the church was — that Christianity has room for the various tendencies of human nature, and aims at per- meating and glorifying them all; that according to the divine plan these various tendencies are to occur successively and simultaneously and to counterbalance each other, so that the freedom and variety of the development of the spiritual life ought not to be forced into a single dogmatic form ” (Otto Pfieiderer, Development of Theology, p. 280). Several of his books have passed into new and revised editions and have been translated into English. Among these English versions may be mentioned General History of the Christian Religion and Church, translated by J. Torrey (1 850-1 858); History of the Planting and Training of the Church by the Apostle, by J. E. Ryland (1851); Julian and his Generation, by G. V. Cox (1850); Life of Jesus, by J. M’Clintock and C. E. Blumenthal (1848); and Memorials of Christian Life in the Early and Middle Ages, by J. E. Ryland (1852).

See O. C. Krabbe, August Neander (1852), and a paper by C. F. Kling (1800-1861) in the Stud. u. Krit. for 1851 ; J. L. Jacobi, Erinnerungen an August Neander (1882); Philipp Schaff, Erinne- rungen an Neander (1886) ; Adolph Harnack, Rede auf August Neander (1889); A. F. J. Wiegand, Neanders Leben (1889); L. T. Schulze, August Neander (1890); and K. T. Schneider, August Neander (1894). Cf. Herzog-Hauck, Realencyklopadie, and P. Schaff, Germany: its Universities and Theology (1857).

NEANDERTHAL, a ravine near the village of Hochdal between Dusseldorf and Elberfeld, Rhenish Prussia. Here in 1856 were discovered in a Quaternary bed in the Feldhofen Cave human remains which have been referred to a type commonly called Neanderthal Man. The bones found were a brain-cap, two femora, two humeri and other fragments, now in the Fuhlrott Collection, Elberfeld. The cranium, pronounced by Huxley to be the most ape-like yet discovered, was remarkable for its enormous superciliary ridges. Professor Virchow and others contended that the remarkable shape was pathological or caused by disease during the lifetime of the individual. The subsequent discovery of two other skulls, almost identical in form, at Spy in Belgium, have helped to prove its typical character. The now generally accepted view is that the Neanderthal skull represents the oldest known dolichocephalic race of Europe.

NEAP, a word only used of tides in which the high- water mark is at its lowest, there being the least difference in level between high and

low water, opposed to “spring tides” (see Tide). The word is obscure in origin. It appears in O. Eng.in nipflOd, and only once alone in the expression forthganges nip, ” without power of advancing.” It may possibly be connected with ” nip,” in the sense of ” pinched,” ” scanty.”

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NEARCHUS, one of the officers in the army of Alexander the Great. A native of Crete, he settled at Amphipolis in Macedonia. In 325, when Alexander descended the Indus to the sea, he ordered Nearchus to conduct the fleet to the head of the Persian Gulf. The success with which Nearchus accomplished this arduous enterprise led to his selection by Alexander for the more difficult task of circumnavigating Arabia from the mouth of the Euphrates to the Isthmus of Suez. But this project “was cut short by the illness and death of the king (323). In the troubles that followed Nearchus attached himself to Antigonus, under whom he held the government of his .old provinces of Lycia and Pamphylia, and probably therefore shared in the downfall (301) of that monarch.

He wrote a detailed narrative of his expedition, of which a full abstract was embodied by Arrian in his Indica — one of the most interesting geographical treatises of antiquity.

The text, with copious geographical notes, is published in C. Miiller’s Geographi Craeci Minores, i. (1856) ; on the topography see \V. Tomaschek, ” Topographische Erlauterung der Kustenfahrt Nearchs \om Indus bis zum Euphrat” in Sitzungsberichte der K. K. Acad, der Wissenschaften, cxxi. (Vienna, 1890). See also E. H. Bunbury, Ancient Geography, i. ch. 13; and Alexander the Great. Ancient authorities. — Arrian, Anab. vi. 19, 21; vii. 4, 19, 20, 25; Plutarch, Alexander, 10, 68, 75; Strabo xv. pp. 721, 725; Diod. Sic. xvii. 104; Justin xiii. 4.

NEATH (Welsh, Castell-Nedd) , a municipal and contributory parliamentary borough, seaport and market-town of Glamorgan- shire, south Wales, prettily situated near the mouth of the Neath or NMd, on the Great Western and the Rhondda and Swansea Bay railways, 75 m. E.N.E. of Swansea and 1831 m. by rail from London, via Badminton. The Neath and Brecon railway has a terminus in the town. Pop. (1901) 13,720. The principal buildings are the parish church of St

Thomas (restored 1874), the church of St David (1866), a Roman Catholic church, and Baptist, Calvinistic, Methodist, Congregational and Wesleyan chapels; the intermediate and technical schools (1895), Davies's endowed (elementary) school (1789), the Gwyn Hall (1888), the town hall, with corn exchange in the basement storey, and the market-house. According to tradition Iestyn- ap-Gwrgan, the last prince of Glamorgan, had a residence somewhere near the present town, but Fitzhamon, on his con- quest of Glamorgan, gave the district between the Neath and the Tawe to Richard de Granaville (ancestor of the Granvilles, marquesses of Bath), who built on the west banks of the Neath first a castle and then in 1 1 29 a Cistercian abbey, to whose monks he later gave all his possessions in the district. All traces of this castle have disappeared. Another castle, built in the same century, on the east bank, was held direct by the lords of Glamorgan, as the westernmost outpost of their lordship. It was frequently attacked by the Welsh, notably in 1231 when it was taken, and the town demolished by Llewelyn ab Iorwerth. The portcullis gate and a tower are all that remain of it; of the abbey which was at one time the finest in Wales, there still exist the external walls, with parts of the chapel, vaulted chapter-house, refectory and abbot's house. This abbey was the spot where Edward II. found shelter after his escape from Caerphilly. At the dissolution the abbey and the manor of Cadoxton (part of its possessions) were sold to Sir Richard Williams or Cromwell. Its cartulary has been lost. Copper smelting has been carried on in or near the town since 1584 when the Mines Royal Society set up works at Neath Abbey; the industry attained huge propor- tions a century later under Sir Humphrey Mackworth, who from 1695 carried on copper and lead smelting at Melincrythan. Besides its copper works the town at present possesses extensive tinplate, steel and galvanized sheet works as well as iron and brass foundries, steam-engine factories, brick and tile works, engineering works, flannel factories and chemical works. In the neighbourhood there are numerous large collieries, and coal is shipped from wharves on the riverside, vessels of 300 or 400 tons being able to reach the quays at high tide. The Neath Canal, from the upper part of the Vale of Neath to Briton Ferry (13 m.) passes through the town, which is also connected with Swansea by another canal. There is a large export trade in coal,

copper, iron and tin, mostly shipped from nieghbouring ports, while the principal imports are timber and general merchandise. Neath is included in the Swansea parliamentary district of boroughs.

The town perhaps occupies the site of the ancient Nidus or Nidum of the Romans on the Julia Maritima from which a vicinal road branched

off here for Brecon. No traces of Roman anti- quities, however, have been found. Neath is a borough by prescription and received its first charter about the middle of the 1 2th century from William, earl of Gloucester, who granted its burgesses the same customs as those of Cardiff. Other charters were granted to it by successive lords of Glamorgan in 1200, 1340, 1359, 1397, 1421 and 1423. By the first of these (1290) the town was granted a fair on St Margaret's Day (July 20) and as the abbey had extensive sheep walks the trade in wool was consider- able. In 1685 James II. granted a charter, which, however, was not acted upon except for a short time.

NEBO, or Nabu (" the proclaimer "), the name of one of the chief gods of the Babylonian pantheon, the main seat of whose worship was at Borsippa — opposite the city of Babylon. It is due to the close association of Borsippa with Babylon after the period when Babylon became the centre of the Babylonian empire that the cult of Nebo retained a prominence only some degrees less than that of Marduk. The amicable relationship between the two was expressed by making Nebo the son of Marduk. In this case the expression of the relationship in this form was intended to symbolize the superiority of Marduk, different, therefore, from the view involved in making Marduk the son of Ea (q.v.),. which meant that the prerogatives of Ea were transferred to Marduk by the priests of Babylon.

Borsippa became in the course of time so completely a mere adjunct to Babylon that one might fairly have expected the Nebo cult to have been entirely absorbed by that of Marduk. Since that did not happen, the legitimate inference is that other deterrent factors were at play. One of these factors was the position that Nebo had acquired as the " god of wisdom " to whom more particularly the introduction of writing was ascribed. He takes his place, therefore, by the side of Ea as a cultural deity. The wisdom associated with him had largely to do with the interpretation of the movements in the heavens, and the priests of Nebo at an early age must have acquired widespread fame as astrologers. Assuming now, for which there is a reasonable amount of confirmatory evidence, that the priestly school of Nebo had acquired a commanding position before Babylon rose to political importance we can understand why the worshippers of Marduk persisted in paying homage to Nebo, and found a means of doing so without lowering the dignity and standing of their own god. If Assur-bani-pal, the king of Assyria (668-626 B.C.), in the subscripts to the copies of Babylonian literary tablets invokes as he invariably does Nebo and his consort Tashmit as the gods of writing to whom all wisdom is traced, it is fair to assume that in so doing he was following ancient tradition and that the priests of Marduk likewise were

dependent upon the school at Borsippa for their knowledge and wisdom.

Nebo is therefore an older god than Marduk in the sense that his specific prerogative as the god of wisdom was too firmly recognized when Marduk became the head of the Babylonian pantheon to be set aside.

The temple school at Borsippa continued to flourish until the end of the neo-Babylonian empire, and school texts of various contents, dated in the reigns of Artaxerxes, Cambyses and Darius, furnish the evidence that the school survived even the conquest of Babylonia by Cyprus (538 B.C.). The original character of Nebo can no longer be determined with any degree of definiteness. He may have been a solar deity, but there are also decided indications which point to his being a water-deity — like Ea. It may be, therefore, that if he shows the traits of a solar deity, this may be due to the influence of the neighbouring Marduk cult, just as in return Marduk takes on attributes that belong of right to Nebo. Thus, as the god of writing, Nebo has charge of the tables of fate on which he inscribes the names

of men and decides what their lot is to be. If in the systematized religious system, Marduk appears as the arbiter of human fates, the conclusion is warranted that Marduk is here imbued with the authority which originally was in the hands of his son. A reconciliation between the rival claims was effected by con- tinuing Nebo in the role of scribe, but as writing at the dictation of the gods, thus recording what the divine assembly, gathered in the ” chamber of fates ” (known as Ubshu Kinakku) within the precincts of E-Saggila — Marduk’s temple at Babylon — under the presidency of Marduk, had decided.

Nebo also does homage to his father by paying him an annual visit during the New Year celebration, when the god was solemnly carried across to Babylon, and in return Marduk accompanied his son part way back to his shrine at Borsippa. Within E- Saggila, Nebo had a sanctuary known, as was his chief temple at Borsippa, as E-Zida, ” the legitimate (or ‘ firm ‘) house,” and the close bond existing between father and son was emphasized by providing for Marduk within theprecinct of E-Zida, a sanctuary which bore the same name, E-Saggila, ” the lofty house,” as Marduk’s temple at Babylon. The kings,

and more particularly those of the neo-Babylonian dynasty, devote themselves assidu- ously to the worship and embellishment of both E-Saggila and E-Zida. In their inscriptions Marduk and Nebo are invoked together and the names of the two temples constantly placed side by side. The symbols of the two gods are similarly combined. On boundary stones and cylinders, when Marduk's symbol — • the lance — is depicted, Nebo's symbol — the stylus — is generally found adjacent. The dragon, though of right belonging to Marduk (q.v.), as the conqueror of Tiamat, also becomes the symbol of Nebo, and similarly in other respects the two form a close partnership. Such is the relation between the two that occasionally, as in the official reports of astrologers and in official letters, Nebo is even mentioned before Marduk without fear of thereby offending the pride of the priests of Marduk.

In Assyria the Nebo cult likewise enjoyed great popularity, and there is a record of one Assyrian ruler who made Nebo his specific deity and called upon his subjects to put their whole trust in him. One may discern, indeed, a tendency in Assyria to take advantage of the almost equal plane on which Nebo stands with Marduk in Babylonia, to play off Nebo as it were against Marduk. The Assyrian kings in this way, by glorifying at times Nebo at the expense of Marduk, paid their debt of homage to the south without any risk of lowering the grade of their own chief deity Assur. Marduk was in a measure Assur's rival. This was not the case, however, with Nebo, and they accordingly showed a desire to regard Nebo rather than Marduk as the characteristic representative of the southern pantheon. In the astral-theological system Nebo was identified with the planet Mercury. His consort, known as Tashmit, plays no independent part, and is rarely invoked except in connexion with Nebo.

See also Babylon, Borsippa, Babylonian and Assyrian Religion. (M. Ja.)

NEBRASKA, a state just N. of the centre of the U.S.A., lying approximately between 40 and 43 N. and between 18 18′ W., and 27° \V. from Washington. It is bounded on the N. by South Dakota, on the E. by Iowa and a corner of Missouri, on the S. by Kansas, on the S. and W. by a corner of Colorado, and on the W. by Wyoming. The Missouri river extends along the eastern and north-eastern border. The extreme length of the state is about 430 m., and extreme breadth about 210 m. The area is 77,520 sq. m., of which 712 are water surface.

Physical Features. — -The state lies partly in the physiographic province of the Great Plains (covering more than four-fifths of its area) and partly in that of the Prairie Plains, and slopes gently from

the N.W. to the S.E. The altitudes of extreme geographical points are as follows : Rulo, in the S.E. corner of the state, 842 ft. ; Dakota city, in the N.E., 1102; Benkelman, in the S.W. in Dundy county, 2968; Kimball, in the S.W. in Kimball county, 4697; Harrison, in the N.W. corner, 4849 ft. There are three physiographic sub- divisions; the foot-hills (and Bad Lands), the sand-hills and the prairie — all three being portions of three great corresponding regions of the Great Plains and Prairie Plains provinces.

The western portion of the state lies in the foot-hills of the Rocky Mountain system, and is much rougher than western Kansas. The surface of western Nebraska is characterized by high, barren table-

lands, broken by canyons, dotted with buttes, and dominated by some bold and lofty ridges. Pine Ridge, a picturesque escarpment of the Great Plains, cuts across the N.W. corner of Nebraska from Wyoming into South Dakota. A ridge of low hills and bluffs, often precipitous, marked by buttes and deeply cut in places by canyons, it is the most striking surface feature of the state. The altitude in this region varies from 3500 to 5000 ft. In the fork of the North and South Platte are the Wild Cat Mountains with contours rising to 5300 ft., in which Wild Cat Mountain, long reported as the highest point in the state, attains 5038 ft., Hogback Mountain 5082 ft., and various other hills — Gabe Rock (5006), Big Horn Mountain (4718), Coliseum Rock (5050), Scotts Bluff (4662) &c. — rise to heights of 4500 to 5000 ft. In the extreme N.W. the White river and Hat Creek have carved canyons in deep lacustrine deposits, creating fantastic cliffs and buttes, bare of vegetation, gashed with drainage channels, and baked by the sun. The buttes — bare, pyramidal or conical, flat-topped, precipitous hills, and often fantastic, towering pinnacles — are rather widely distributed through the foot-hill region. They are never more than 600 to 1000 ft. above the sur- rounding country. Nature is not grand in any part of Nebraska, but the Bad Lands are imposing, and in the wooded foot-hills there is an abundance of bold and attractive scenery, particularly in Sioux county, and in Cherry county around Valentine and on the canyon of the Snake river. East of the Bad Lands is the sand-hill region, which includes an area of possibly 20,000 sq. m. The sand-hills proper are scattered over an area of perhaps 15,000 sq. m., between the meridians of 98 and 103 W. long., lying mainly N. of the Platte; though there are some along the Republican river. In places they rise in tiers, one above another, like miniature mountains, and are 200 to 300 ft. high; but in general they are very low (25-50 ft. high) and are scattered over a plain. Their present contours are wholly the result of wind action. Save in rare instances, however, they have long ceased to be shifting dunes; for, with the cessation of prairie fires and the

increase of settlement, they have become well grassed < ver and stable; although sand-draws, and even occasional " blow-outs" scooped by the winds in the summits or sides of the hills are still characteristic landmarks. All about and inter-penetrating the foot- hill a nd sand-hill regions are the prairies, which include three-fourths of the state. They are sometimes characteristically flat over wide areas, but are usually gently rolling. Stream valleys and bottom lands are the conspicuous modifying feature of the prairie region; but in general, owing to the gentle slope of the streams and the great breadth of the plains, erosion has been slight; and indeed the streams, overloaded in seasonal freshets, are building up their valley floors. The water-partings are characteristically level uplands, often with shallow depressions, once lakes, and some of them still so. The valleys of the greatest streams are huge shallow troughs. The valley floor of the North Platte in the foot-hills, the flood-plain of an older river, is in places 700 ft. or more below the bounding tableland, and 10 to 15 m. wide; the present flood-plain being from I to 4 m. in width. Hundreds of small tributaries to the greater streams (especially along the Republican and the Logan) complicate and beautify the landscape. No farming country is richer in quiet and diversified scenic charm than the prairies of the eastern half of the state. The Missouri is noteworthy for high bluffs cut by ravines, which border it almost continuously or at least one side. In the foot- hills there are typical canyons, as along the Platte forks, and in the northern edge of the sand-hills. Those of the upper Republican are the largest, those of the Bad Lands are the most peculiar; and the Niobrara tributary system is the most developed.

Rivers. — The Missouri skirts the eastern border for perhaps 500 m. It is not navigated, and save at Sioux City and Omaha serves practically no economic purposes, irrigation being unnecessary in the counties on which it borders. Its bluffs, cut for the most part in the loess but at places in the rock, are frequently from 100 to 200 ft. high. At Vermilion, South Dakota, its alluvial plain, 1131 ft. above the sea, is 330 ft. above the mouth of the Nemaha. The current is always rapid and heavily loaded with sediment, 1 and its axis is forever shifting. Large areas of soil are thus shifted back and forth between Nebraska and the bordering states, to the encouragement of border lawlessness and uncertainty of titles ; some portions E. of the thread and apparently well within Iowa remain under the jurisdiction of Nebraska, or vice versa; and Yankton has been seriously threatened with a sudden transfer from the South Dakota to the Nebraska side. The Platte system is also heavily loaded with sediment in Nebraska. The North and South forks both rise in Colorado; each, especially the latter, has a rapid primary descent, and a very gradual fall down the

foot-hills of the Great Plains. 2 Across Nebraska it maintains a remarkably straight course and an extraordinarily even gradient (about 6 ft. per mile). In the spring freshets it is a magnificent stream, but in summer its volume greatly shrinks, and it is normally a broad, shallow, sluggish, stream, flowing through interlacing channels among the sand-bars it heaps athwart its course. The underflow is probably much greater than the summer

1 About 52 grains per gallon at low water, 404 at high.

2 The North Platte falls 3700 ft. in 510 m., the South, 7200 ft. in 427 m., above their junction; the latter falling 2692 ft. in 308 m. after leaving its canyon in the Rockies.

surface flow in volume. The Loup system is remarkable for the even dip of its parallel feeders, which once joined the Platte separately, until the latter banked up its deposits across the mouths of their more sluggish currents. The Republican and South Platte — the former an intermittent stream — suffer in their flow from the drain made upon their waters in Colorado for irrigation. The upper course of the Niobrara above the Keya Paha is in a narrow gorge. Its immediate bluffs and the shores of some of its tributaries, notably the Snake, are modified by canons. This system is also notable among Nebraska streams for a number of pretty water-falls. The White river, heading on Pine Ridge, falls noo ft. in 20 m. Some streams wholly dry up in the dry seasons, and in the foot-hills and sand-hills there are a few that disappear by sinking or evaporation.

Surface Water. — Swamps and bogs, apart from purely temporary weather ponds, are confined to a few restricted regions of the Missouri river bottoms and the prairies of the S.E. There are some cut-offs or oxbow lakes along the Missouri, and many lakelets origin- ally such are scattered along the Platte, Elkhorn, Big Blue and other rivers. Scores of lakes are scattered about the heads of streams rising in the sand-hills, especially in Cherry county. Some of them are fresh and some alkaline. Springs also are numerous in the sand- hills, where they form considerable streams. They often flow with force and are known locally from this peculiarity as ” artesian ” springs, or sometimes, from this and their large size, as ” mound ” springs. The state fish-hatchery is on springs at South Bend; at Long Pine springs of large flow supply the town and railway shops with water, and led to

the establishment here of Chautauqua grounds.

Underground Water. — The so-called blowing-wells are peculiar. They occur over much of the state, but most frequently S. of the Platte, and are evidently sensitive to barometric conditions; alter- nately "blowing" or 'sucking" as these vary; so that, in cold weather water-pipes may be frozen 100 or more feet below the surface of the ground. Atmospheric pressure is probably the principal cause cf their action; they are therefore termed weather wells" in some localities. Nearly all counties have a practically inexhaustible supply of ground water. Well-depths vary from 15 to 20 ft. in the stream valleys and from 30 to 35 ft. on the loess prairies to 100-400 ft. in the western foot-hill region and isolated prairie areas. Artesian water is also available in many parts of the state. At Niobrara, in Knox county, a well 656 ft. deep, drilled in 1896, yielded for a time 2500 gallons per minute at 95-lb pressure (in 1903 1900 gallons at 65-lb pressure), and furnishes power for a flour-mill and municipal water and electric lighting works; the pressure forces the water about 210 ft. above the mouth of the well, i.e. to a height of 145a ft. Another (1430 ft. deep), in the environs of Omaha, supplies a daily flow of 1,100,000 gallons under a pressure of 15 lb. In some small and exceptional regions the water is very alkaline, and in the counties of the south-east it is so generally saline that it is difficult, below 150 ft., to avoid an inflow of salt water. Saline wells at Lincoln (2463, 1050 and 570 ft. deep) and at Beatrice (1260 ft.) are notable in this regard.

Geology. — The eastern part of the state is covered with a thick mantle of Quaternary (Pleistocene), and the greatest part of the western portion with very thick deposits of Miocene and Pliocene (Tertiary). To the Pleistocene belong the alluvium, loess and glacial drift, and in part the sand-hills. The drift covers the eastern fifth of the state. In striking contrast to Iowa, the Nebraska deposit is very thin, seldom thicker than 1 or 2 ft. Above the drift there is usually a heavy covering of loess or " bluff deposit " (particularly typical in the neighbourhood of Omaha and Council Bluffs). Though thin and worn out in places, it averages probably 100 ft., and is often as much as 200 ft. in thickness, and runs diagonally across the state from the N.E. to the Colorado inset. The opinion that it is of aqueous origin (and probably dates from the close of the glacial time) has the weight of authority. It was spread by the rivers: some evidences of wind action may be attributed to a later period. The sand-hills, which overlap the loess N. of the Platte, are probably mainly derived from the Arikaree, but probably also in part from the early Pleistocene. West of 102° long, there are beds several hundred feet thick of late Tertiary sands and clays. The Arikaree (Miocene) and Ogallala (Pliocene) formations

of the North Loup beds are super- ficial over much of the western half of the state, the former to the N., the latter to the S. The buttes are characteristically Arikaree or Gering formations topping Brule clay. The same is true of at least considerable parts of Pine Ridge. In the Bad Lands there are scanty outcrops of the Chadron formation (known also as ” Titano- therium beds “), the oldest of the Tertiary beds. The thick super- ficial coverings over the state make difficult the determination of the underlying strata. There are only very scanty outcrops except along the rivers. No Archean rocks are exposed in Nebraska, and the sedimentary formations are undisturbed in situ. The Palaeozoic era is represented only by the Pennsylvanian series of the Upper Carboniferous and a scanty strip of Kansas- Nebraska Permian, and is confined to the S.E. counties. But, though small in area, the Carboniferous is by far the most important formation as regards mineral resources within the state. It is buried probably 2000 or 3000 ft. in central Nebraska, outcropping again only in the Rocky Mountains. Upon it, in the trough thus formed, rest conformably the basal strata of the Cretaceous; the Jurassic and Triassic being wholly absent (unless in the extreme north-west). The E. limit of

the Cretaceous extends across the state from N. to S. between 98 and 99 W. long. Its groups include the Dakota formation, char- acterized by a very peculiar rusty sandstone, and the Benton, both of which are rather widely accessible and heavy ; the Niobrara ; the Pierre shales, which apparently underlie about three-quarters of the state in a deep and heavy bed; and, in the extreme west, the Laramie. There are almost no Cretaceous outcrops except on the streams, especially the Niobrara, Republican and Platte rivers— and in the Bad Lands. The superficial Miocene and Pliocent deposits in the west, above referred to, are underlaid by the White river groups of the Oligocene, whose outcrops of Brule clay and Chadron formation also have been mentioned. The Bad Lands are essentially nothing but fresh-water mud excessively weathered and eroded. They are often intersected by dikes of chalcedony, formerly mistaken for lava. The Bad Lands and the Arikaree are famous fossil fields, the latter being the source of the Daemonelix, or ” Devil’s cork-screw,” a large spiral fossil, apparently a lacustrine alga. It was once generally supposed that the Pliocene epoch in Nebraska was distinguished by the activity of geysers; but the so-called ” geyserite ” now known commonly and correctly as ” natural pumice ” and ” volcanic ash,” which is found in the Oligocene and later formations, has no connexion whatever with geysers, but is produced by the shattering of volcanic rock. It occurs widely in Nebraska and adjoining states.

Minerals. — Mineral resources are decidedly limited; the total value of

the mineral output (excluding coal) in 1907 was $1,383, 916, of which $953,432 was the value of clay products, $324,239 of stone, and $54,227 of sand and gravel. The state, however, is particularly rich jn good clays, which are probably its greatest mineral resource. Calcite of excellent quality is the commonest mineral. Gravel is widely obtainable, and sand of the finest quality is available in inexhaustible quantities, and is an important article of export. Flint (valuable for railway ballast) occurs in immense quantities about Wymore and Blue Springs. The underground salt water flow promised once to be a resource of value, especially in the vicinity of Lincoln, but has proved of little or no value in comparison with the great salt-beds of Kansas. A native plaster is yielded by the Arikaree and Ogallala rocks, but though otherwise of excellent qualities it is ruined by slight exposure to the water. A diatomaceous earth in central Nebraska, occurring especially in the region of LoUp, is a good polishing powder, and is used for packing steam pipes. Limonite in the form of ochre occurs in considerable quantity. Of building stones limestones are the most abundant and important, the best comes from the Benton beds and when ” green ” can be sawed into blocks. The Dakota formation, though its sand-stones are in general coarse or otherwise inferior, yields some of splendid quality. Its clays, which are of all colours, are the most valuable of the state. The finest building stone is a beautiful green quartzite rock of dense, fine texture and lasting quality. It is related to the Ogallala beds and occurs only in smallareas. The quarries and clay pits of the state are mainly in the Carboniferous region of the S.E. Cretaceous lignite occurs in small quantities in the N.E., and peat more widely. The Carboniferous formations carry only thin seams of coal, never thicker than about 2 ft., and rarely readily accessible, and they can never be of more than small and merely local import- ance.

Flora. — Nebraska lies partly in the arid, or Upper Sonoran, and partly in the humid, or Carolinian, area of the Upper Austral life- zone ; the divisional line being placed by the United States Biological Survey at about 100° W. long. The most marked characteristic of Nebraskan vegetation is its immigrant character, and the state has been called ” one of the finest illustrations of the commingling of contiguous species to be found anywhere in America ” (C. E. Bessey). Immigrant species have even come from Texas and New Mexico, from the Dakotas and the Rockies. From the last-named various species have crept two-thirds of the way across the state, one (the buffalo berry) wholly covers it, and some have barely crossed into the border foot-hills from Wyoming. A very few trees and shrubs, and some grasses, are strictly endemic to the plains and to Nebraska. Four floral regions lying in

north to south belts across the state, and closely corresponding to — though in boundaries by no means coincid- ing with — its great topographic divisions are distinguished in the regions of the Missouri border, the prairies, sand-hills and foot-hills. In 1896 some 3196, and by 1905 fully 3300 species had been listed, “representing every branch and nearly every class of the vegetable kingdom ” (C. E. Bessey). There are at least 64 trees and at least 77 shrubs growing native in the state ; but of their joint number a mere half-dozen or so can be classed as strictly endemic. Small woods of broad-leaf trees (and red cedars) grow very generally along all the water-courses of the state ; and coniferous species grow along Pine Ridge and the Wild Cat Mountains. In the East, various trees are readily grown on the uplands; in the West the honey-locust, the Osage orange and Russian mulberry for windbreaks; the green ash, and red cedar are perhaps the most valuable drought resisting species. The conifers are spreading naturally. In the sand-hills the sand-bar willow of the rivers and the cottonwoo.d growing naturally, evidence the good conditions of moisture; and the forestation of much of the region is undoubtedly possible. Forest reserves were established on the Dismal river in 1902 and millions of seedlings had been grown by 1906 for transplantation in Nebraska and other states

of the Great Plains. Arbor Day (the 10th of April) was instituted by the Nebraska State Board of Agriculture in 1 872 at the instance of J. Sterling Morton, later secretary of agriculture of the United States (see Arbor Day). It has been yearly observed by the public schools of the state, and no state has done more than Nebraska for the forestation of its waste and prairie lands. In such a purely agricultural state a large wooded area is not desired. Plums, grapes and the dwarf ” sand-cherry ” (Prunus demissa) of the sand-hills are prominent among many wild fruits. The flora is decidedly rich in species as compared with other states, but less so in the number of individuals. Grasses are perhaps the most noteworthy vegetable forms. Nebraska claims a greater variety of native hay and forage species than grow in any other state of the Union. No less than 200 grasses, at least 154 being wild or commonly cultivated, had been listed in 1904. Of the total 200 species 150 (130 indigenous) are valu- able for forage, 34 (20 indigenous) are classed economically as weeds, 10 are non-indigenous cereals and 6 are ornamental. The short buffalo-grass was originally everywhere abundant, but it had practi- cally disappeared by 1890 from the eastern half of the state, and since then has steadily become more

restricted in habitat. The native prairie grasses have been in considerable part displaced by grasses introduced from more humid regions. Weeds are very numerous (about 125); and some, notably the sand-bur {Solatium rostratum) cockle-bur, and tumble-weeds among indigenous, and the Russian thistle (Salsola tragus) and purslane among non-indigenous species, are agricultural pests. Nothing can surpass in beauty the rank grasses and bright flowers that grow on the lowlands and rolling uplands of a virgin prairie — now hardly to be found in the state. The common sunflower (the most conspicuous weed of the state) and allied flowers, which spring up in myriads even in the midst of unbroken prairie wherever this is disturbed, line the roads with yellow bands from horizon to horizon, enclose the broken fields and choke waste places.

Fauna. — The fauna of the state is not known with the same thoroughness and detail as the flora, but it too is varied. This is notably true of birds and of insects. Of the latter there are probably 12,000 to 15,000 species, including 140 butterflies, at least 180 grasshoppers, several hundred bees, &c. The so-called ” grass hoppers,” true locusts, have done great damage at times in Nebraska. About a third of all the species known in the United States are found within the state or close to its borders, and of these, 9 or 10 are so common that their increase under conditions favourable to their deyelopment may be a danger Such conditions are found in dry years, unfavourable to their chief parasitic enemies, favourable to their own breeding, and the cause of their migrations. There were locust plagues in 1874, 1876 and 1877. Fungus parasites have been used with some, but on the whole rather slight, success, and mechanical appliances with perhaps greater success, in combating these pests. Birds are more effective. As in the case of plants, western, eastern, northern and southern avian species meet in Nebraska. In 1905 some 415 to 420 species had been found within its borders, and more than half of these were known to nest in the ttate; 120 had been counted in the winter. The lakes of the sand- hills are the breeding-place — less so as settlement increases- — of myriads of water-fowl. Before the advent of the white man Neb- raska was full of wild mammals, the buffalo, elk, black and white tailed deer, antelope, bears, timber wolves, panthers (pumas), lynx, otter and mink being common. Almost all that remain are black bears, foxes, coyotes (prairie wolves), mink, musk-rats, raccoons and prairie dogs (or gophers). Antelope were not uncommon in the west and northwest until after 1890. The coyote is still so common even in the east as to be a nuisance to the farmer; in 1907 a bounty law was in force which provided for the payment of a state bounty of $5, on every grey wolf, $1-25 on every coyote and $1 on

every lynx (wild cat). A few rodents have increased in numbers; the prairie dog especially is a pest in the alfalfa fields of the arid lands (as are pocket-gophers at places in the east).

Climate. — The climate of Nebraska is typically inland or continental; i.e. it is characterized by "winters of considerable severity, summers of unusual warmth, rainfall in limited quantities, marked and sudden changes of temperature, large seasonal and daily temperature ranges, and dry, salubrious atmosphere, with a small percentage of cloudiness, and a large percentage of sunshine." 1 The average wind velocity for the High Plains of Nebraska and adjoining states is about 10 to 12 m. ; 25 m. is not uncommon; and a velocity of 40 m. and over is recorded a half-dozen or more times every year. In spring velocities of 15 to 20 m. are common. The average velocity of winds for the entire state for 1 1 years preceding 1906 was 9-8 m. per hour. The prevailing directions are those common to a large part of the western Mississippi valley. The prevailing wind of the year is N.W. ; but in the spring, the summer and much of the autumn its predominance is greatly reduced or overcome by S. and S.W. winds blowing from the Gulf of Mexico (but deflected by the rotation of the earth). Sometimes these winds blow in the winter — causing the curious phenomenon of melting snows on the coldest days of the year; in the summer in seasons of drought, especially in the western part of the state, this wind from the GuF sometimes reaches Nebraska

'Senate Executive Document 115 (vol. 10), 51 Congress, 1 Session (1890), Climate of Nebraska.

wrung dry of its moisture and so hot that in a day or two it shrivels and ruins the crops in its path. Such calamities are, however, uncommon, and the belief that Nebraska is often visited by tornadoes is erroneous.

The normal mean-annual temperature of the state is about 48-7° F, and the normals for the six approximately equal weather sections into which the state is divided by the National Weather Service are respectively about 48°, 50-5°, 48-6°, 50-4°, 47-9° and 46-6° F. This illustrates the extraordinary homogeneity of climatic conditions. But there is a considerable difference in the averages for different months — the normal means of January and July through 30 years being 20-9° and 74-6° F., and the means of spring, summer, autumn and winter respectively about 48 , 72 °, 53 and 23-5° F. Thus there is for any particular locality a wide range in absolute temperature through the year, which averages for the state probably about 120 (1897-1905). Similarly, the range is large through the day, especially

in the higher altitudes, where the nights are almost invariably cool and refreshing after even the hottest day. The number of continu- ous days with a mean temperature above 50° F., averages probably about 175 for the state. The actual growing-season between frosts is, however, not so great. Temperature is of course lower as one moves to the N. and N.W., the initial planting and harvesting of each crop progressing wave-like across the state in from one to two weeks. Especially in the W. and N.W. there are in some winters occasional anti-cyclonic or high-area storms known as blizzards — wind-storms preceded or accompanied by snow-fall — which are very severe. They continue from one to three days, and are habitually followed by very low temperature. They are the cause of great loss to the cattle owners. Such storms are, however, rare. In the S.E. portion of the state the winters are characteristically mild and open. Temperatures below zero are rare for any locality; and the same may be said of temperatures above 95 ° in summer.

The normal mean-annual precipitation for the whole state is about 23-84 in. in rain and melted snow, the actual yearly fall varying through 30 years between 13-30 and 31-65 in. Such rainfall might seem inadequate for an agricultural country : moreover, the eastern half of the state is more favoured than the western, which belongs, indeed, to the semi-arid Great Plains on which the Reclamation Service of the United States Government is active. But aridity is a. matter of the efficiency rather than of the mere quantity of rainfall, and in this regard Nebraska is very fortunately situated. Rain is most plenteous in the critical months of the year. Seven-tenths of all precipitation falls in the growing season, giving the state, especi- ally in the east, a greater amount at this time than many other states whose aggregate yearly rainfall is greater; so that Nebraska has an abundance for the safest cultivation. Moreover, nine-,tenths of the rainfall is absorbed by the loess and sandy soils, only one-tenth being ” run-off.” It is a widely spread but unfounded belief in Nebraska that the rainfall has been increasing since the settlement of the state. That its storage has very greatly increased as cultivation has been extended (the prairie sod sheds water like a roof) is true ; moreover, the spread of scientific principles of farming has increased the advantage derived from the ground-water stored. Efficient rainfall has thus been greatly increased. Intermittent streamlets may well become perennial, and many are probably, as reported, becoming so. It is even conceivable that the settlement of the state may affect the seasonal distribution of precipitation; and that an advantageous alteration has in fact resulted is believed by many.

The climate of Nebraska is exceptionally healthy. Its beneficial

qualities must be attributed to the state's inland situation, its dry and pure air, constant winds and splendid drainage, to which its even slope and peculiar soil alike contribute. In some people, however, nervousness is induced ; and the winds, in particular, often have this effect. Autumn is perhaps the finest season ; the fields are green into the winter, the air is pure and fresh, though dry arid warm, and the long season is delightfully mild and beautiful. The arid portion, as compared with the eastern portion, of the state has alike the advantages and disadvantages of a climate more sharply characterized.

Soil. — Geologically Nebraska is one of the most typical agricultural states of the Union ; although in the present distribution of industrial interests agriculture is by no means so predominant as in some southern states. The basis of the soils is sands (coarse, fine or silt) ; clay beds, though economically important, are in quantity relatively scant. In the eastern half silt, and in the western fine sand, form the bulk of the soil. There are five well-defined soil regions corresponding to the geologic-topographic divisions already indicated of drift loess, sand-hills, foot-hills and Bad Lands. The loess is a " salt, fine sandy loam with a large percentage of sand or silt, and considerable calcareous matter, and usually a small amount of clay." It contains considerable humic matter, discolouring rapidly in the air (when exposed it is characteristically a bright buff). It is of extraordinary fertility, and its great depth (in Lincoln and Dawson counties bluffs 200 ft. thick are found) is a guarantee of almost inexhaustible resources. The glacial drift is also a useful deposit, coarse ingredients in it being of small amount (rare boulders, and some gravel). The superficial soil over most of the state, and everywhere in the E. except rarely where the loess or drift is bare, is a rich, black vegetable mould, 1 to 5 ft. thick on the uplands. The sand-hills are not inherently infertile; the soil never bakes, is always receptive of moisture,

absorbing water like a sponge and holding it well. There is a great amount of fertile valley land, adequately watered. Alfalfa and other cultivated grasses are encroaching on the whole region, and even the natural arid-land bunch grasses make excellent grazing. The " butte " soil of the W. is a fine sandy soil, characteristically cal- careous, derived from the Arikaree. With it also moisture is a great factor in its productivity. The Bad Lands are by no means infertile (their name, it should be noted, was originally Mauvaises terres a traverser) ; but

they are almost destitute of ground water, though containing many green ” pockets ” where surface water can be stored. They contain much clay and marls, non-absorbent and subject to such excessive wash that vegetation cannot gain a foot- hold. In various parts of the west are small tracts of so-called ” gumbo ” soil; they are due to the Pierre shale, are poorly drained and characteristically alkaline. Small alkaline areas also occur about lakes in the sand-hills. Where surface water is adequate the regions of the Pierre shale make splendid grazing lands ; but in general they are not very useful for agriculture. Salt lands occur about Salt Creek notably around Lincoln. The stream bottoms of alluvium are modi- fied by loess and humic deposits, and are of course very fertile; but hardly more so than the loess of the uplands.

Agriculture. — Agriculture is not only the chief industry but is also the foundation of the commerce and manufactures of the state. In 1900, of the total area 6o-8% was reported as included in farms, ar, d 37‘5% as actually improved. The rank of the state in the Union was 13th in value of farm property, and 10th in value of farm products. The farm value was $747,950,057, an increase since 1890 of 46-1%; while the total product-value was $162,696,386 — an increase (partly factitious) of 143-4 % ‘ n the same period. A greater part of the state was reported improved in 1890 than in 1900; the change was due to the increase of stock-raising in the West. Simi- larly, the size of the average farm increased from 156-9 acres in 1880 to 190-1 in 1890, and 246-1 in 1900, although in eastern Nebraska there was a contrary tendency. Under the Kincaid law, which permits entire sections instead of quarter sections (160 acres) to be homesteaded, this movement has been fostered. In the years 1880- 1900 the number of farms operated by cash tenants rose from 3-1 to 9-6%; of share tenants from 14-9 to 27-3% of the total. There is no appreciable tendency toward management for absentee owners. The census of 1900 showed that not less than two-fifths of the total net income came from live stock or from hay, grain and forage on farms representing together 96% of the farm-value of the state — live stock being a trifle more important; dairying was similarly predominant for 1-6%, and beet-sugar for o-i . Other crops were unimportant sources of revenue. Sugar-beet culture has developed since about 1889; it is localized largely in Lincoln county, near North Platte, though beets are raised over a large part (especially the western part) of the state. In 1907 about 11,000 acres were planted to sugar beets. The principal factory for the slicing of the beets is one built at Grand Island, Hall county, in 1890. The dairy interest is rapidly growing, but is still exceeded in other states. Omaha is a great dairy market. Nebraska ranks very high

in the production of cattle and hogs. A fourth of all animal products are represented by milk, butter and cheese, eggs and poultry; the rest by animals killed on the farm or sold for slaughter, most of them going to supply the meat-packing industry of South Omaha. Wild, salt and prairie grasses make up the bulk of the forage acreage, but the cultivated crops — especially millet and Hungarian grasses and alfalfa — are more important. Holt county in the Elkhorn valley, and Sheridan county in the foot-hills, produce more than half the hay-crop of the state. Alfalfa can be grown with more or less success in every county of the state, not excepting areas where clay or sand form the sub-soil ; but on the uplands of the central part of the state it is produced with the greatest success and in the greatest quantities. In 1908, according to the reports of the state Board of Agriculture, the crop of Custer, Dawson and Buffalo counties was about 15 of the total crop (1,846,703 tons) of the state. The. product was quintupled between 1899 and 1905, and between 1905 and 1908 the increase was about 40 %. It has been a great aid to western Nebraska as to other portions of the Great Plains. Sorghum and kafir corn are also excellent, and broom-corn fairly good, as drought-resistant crops; the last, which is of lessening importance, is localized in Cass, Saunders and Polk counties. Cereals are by far the most important crops, representing in 1899 four-fifths of farmed land and crop values. Allowing for variations in ” off years,” but speaking with as much exactness as is possible, Nebraska has established her position since about 1900 in the third, fourth and fifth rank respec- tively among the states of the Union, in the production of Indian corn, wheat and oats. Of these, Indian corn is by far the most im- portant, representing normally about two-thirds of the total crop value; while wheat and oats each represented in 1906 about one- seventh of the total crop, and rye, barley, kafir-corn and buckwheat make up the small remainder. Indian corn is grown to some extent all over the state, except in the north-west, but the great bulk of the crop is produced east of the 99th meridian. It is rarely cut, but is left to mature and dry on the stalk in the field. The yearly yield in the decade 1895-1904, according to the most conservative state statistics, varied from 298,599,638 to 72,445,227 bushels, and the average was 178,941,084 bushels, or 190,773,957, omitting the failure of 1901 ; the yield per acre being similarly 26-35 or 2 7 – 9 bushels

(12-4 in 1901); 1 in 1906 the crop was 249,782,500 bushels, and the average yield per acre 34-1 bushels; in 1907 the crop was 179,328,000 bushels, and the average yield only 24 bushels per acre. According to the report of the state Board of Agriculture, Custer, Lancaster and Saunders counties produced the largest amounts (each

more than 5,000,000 bushels) of Indian corn in 1908. Since 1900 Nebraska has become one of the foremost winter wheat states, second only to Kansas. Little spring wheat is now sown except in the northern counties, the state being on the northern edge of the winter wheat belt. From 1880 to 1890 the acreage devoted to wheat greatly diminished, because the spring variety was not relatively remunerative, but the acreage trebled in the next decade as autumn planting increased. The winter varieties have the advantages of larger yield, earlier ripening and lesser loss from insects, and afford protection to the soil. The growth of durum (macaroni) wheat is also increasing, but is hampered by the uncertainty of market, which is for the most part foreign. The wheat crops of the decade 1895- 1904 averaged 33,208,805 bushels a year; or ranged from a minimum of 9-8 to a maximum of 20-9, averaging 15-8 bushels to the acre; in 1906 the crop was 52,288,692 bushels, and the average yield 22 bushels per acre; and in 1907 the crop was 45 911,000 bushels, and the average yield 18-1 bushels per acre. In 1908 Clay, Adams and Hamilton were the principal wheat-growing counties in the state. The corresponding figures for oats were: average yield for the decade, 48,145,185 (range, 28,287,707 in 1901 to 66,810,065 in 1904); range of yield per acre, 17-9 to 34-0, and average 27-6 bushels per acre; in 1906 the crop was 72,275,000 bushels and the average yield per acre 29.5 bushels; in 1907 the crop was 51,490,000 bushels, and the average yield 20-4 bushels per acre. In the decade 1890-1900 the state did not rise above the loth rank in the Union; after 1900 her rise was rapid. The same is even more markedly true of rye; in 1907 the crop was 1,502,000 bushels (from 88,400 acres), a yield exceeded in only five states in the country. Apples are raised in the N.E. and S.E. sections of the state, and are much the most im- portant fruit grown. Peaches are next in importance, and horti- cultural enthusiasts believe that the possibilities of this crop are very great. Other fruits are raised with much success, and in 1904 at St Louis the horticultural exhibit of the state led those of all other states in the medals received for excellence; but nevertheless its relative rank in the Union as a fruit-producing state is still low.

In a period of 30 years (i 869-1 898) there were, according to the state Board of Agriculture, four seasons whose crops could reasonably be classed as failures, three more as ” short,” one as fair, eighteen as good, and four as great. Compared with adjoining states — Iowa, Minnesota, South Dakota, Kansas, Missouri — none shows a greater, if indeed any shows sc great an average value per acre in the yield of Indian corn, wheat, oats, barley and rye; and this despite the assumed handicap of the western half of the state. In fact the yield of this

section relatively to cultivated acreage is normally fully equal to that of the eastern section; a result quite consistent with the scientifically proven fertility of semi-arid lands. The real handicap of the western counties would be shown in comparing aggregate yields per given area; for much land is normally inarable. Alfalfa, stock raising and dairying, afforestation, ” dry-farming ” and irrigation are, however, proving that the West can maintain prosperity by not relying upon ordinary agriculture. Alfalfa is not easily started, however, on the uplands of the extreme western part of the state; and dry-farming (the Campbell dust-mulch system) has the expensive- ness in labour of intensive cultivation. The above-mentioned delusion that climate is changing and adapting itself to agriculture, thus relieving the farmer of accommodating his methods to the climate, has considerably handicapped him in progress. Systematic experiments in dry-farming throughout the Great Plains were pro- vided for on a great scale by Congress in 1906. By attention to crop rotation, soil physics and world-wide search for plants adapted to the Great Plains (such as the U.S. Department of Agriculture has long been conducting), a very great deal can be accomplished — no one can say how much; but certainly the Western must long remain at a great disadvantage in comparison with the Eastern portion of the state as regards the growth of cereals.

Irrigation. — Water for the western part of the state is a resource of primary importance, and irrigation therewith a fundamental problem. Very generally, especially in the butte regions, the country fends itself to the impounding of surface water. The lakes are of great importance for the stock ranges of the sand-hills. It is commonly believed that of underground water, and generally of artesian water, even the driest counties have an abundance. This is great exaggeration. Though both in central and western Nebraska there are strata that generally yield a considerable flow, the supply is usually limited and the expense is great. Up to 1906 dependence was mainly upon the streams, which it is estimated might furnish 3 or 4 million acre-feet — enough to irrigate between 10 and 15% of the arid section— were all the water available, and the la nd

1 Data of the State Bureau of Labor and Industrial Statistics, which are lower than those of the state Board of Agriculture, and (in census years) the Federal Census. The yearly average given by the Board of Agriculture for 1895-1904 is 219,196,000 bushels. The statistics for 1906 and 1907 are taken from the Year-books of the Department of Agriculture.

irrigable. As compared with the streams of Colorado, where irrigation is much more advanced, the streams of Nebraska have a very constant flow; the relative supply-capacities of the Arkansas and Poudre in Colorado, and the Loup and North Platte in Nebraska being about as i-ooo, 1-193, 3*347 an d 4-632 respectively, according to the estimates of the state engineer (Nebraska Public Documents 1901-1902, vol. iii. p. 144). An irrigation law was first passed by Nebraska in 1895. One of the greatest improvement projects undertaken by the national Reclamation Service is one on the North Platte, begun in 1903, which contemplates a reservoir in Wyoming of sufficient capacity to store all the surplus waters of that stream, about 600 m. of canals, and the reclamation of 107,000 acres in Nebraska; it was 74% completed in 1909. The work of the national service began in Nebraska in 1902. Some farmers on the uplands between the valleys in western Nebraska irrigate by means of wind-mills, and although the underground water is 175 ft. or more below the surface one wind-mill often supplies sufficient water to irrigate ten acres. The extent of irrigated acreage increased about thirteen-f old from 1 889 to 1 899. In the latter year there were 1 701 m. of ditch costing about $751.00 per m., irrigating 148,538 acres, which yielded crops averaging $6.61 per acre in value. The greatest part of the irrigated acreage is in the valley of the North Platte and the Upper Platte — probably nine-tenths in 1906 — in Scotts Bluff, Lincoln, Cheyenne, Dawson, Keith and Deuel counties. There is, however, a large ditch in Platte county — the farthest E. of any large ditch in the country; and though agriculture is normally quite ” successful ” here without irrigation, nevertheless it is more profit- able with it. In fact, in 1899 about a quarter of the irrigated acreage lay E. of the section classed as arid.

Manufactures. — The rank of Nebraska among the states of the Union in 1900 in population, in value of agricultural products, and in value of manufactured products, was respectively twenty-seventh, tenth and nineteenth. In the decade 1890-1900 the state increased the value of its manufactures somewhat more than half. The per capita product-values for agriculture and manufactures in 1900 were $153 and $135 (as compared with $63 and $88 in 1890). Only 2-3% of the population were engaged in manufacturing in 1900. Of the total factory product (in 1900, $130,302,453; in 1905, $154,918,220), 84-7 % were urban {i.e. were for the three cities which in 1900 had a population of at least 8000) in 1900, and 81-7 in 1905; the percentage for these cities being 53-3 in 1900 and 43-5 in 1905 for South Omaha, 29-2 in 1900 and 34-9 in 1905 for Omaha, and 2-1 in 1900 and 34 in

1905 for Lincoln; Nebraska City, Fremont, Grand Island, Beatrice, Hastings, Plattsmouth and Kearney were the only other manufacturing centres of any importance. In 1907 there was a beet-sugar factory at Grand Island; at Nebraska City there are several distinctive industries; at South Omaha very important meat-packing houses; and the other cities have interests rather extensive or varied than distinctive. As yet manufactures are insignificant except in lines immediately dependent upon agriculture, the combined output of the packing, flour and grist mill, dairy and malt-liquor establishments constituting in 1900 nine-tenths of the total state output. Meat-packing is by far the most important single interest, South Omaha being the third greatest packing centre of the country, employing in 1900 and in 1905 a quarter of all wage- earners and yielding nearly one-half the total product-value of the state ($71,018,339 in 1900; $69,243,468 in 1905). The malt- liquor industry is favoured by the great production of barley in Iowa; the value of malt liquors manufactured in 1900 was $1,433,501, and in 1905 $1,663,788. Nebraska wheat, like that of Kansas, combines for milling the splendid qualities of winter wheat with those characteristic of grain grown on the edge of the semi-arid West; flour and grist-mill products were valued at $7,794,130 in 1900 and at $12,190,303 in 1905. The first creamery in Nebraska was established in 188 1. A creamery at Lincoln is said to be the largest in the United States. Many co-operative dairies have per- sisted since the early days of farmers' granges. The value of cheese, butter and other dairy products was $2,253,893 in 1900 and $3,326,110 in 1905. Of manufactures not dependent upon agri- culture perhaps the most promising is that of brick and tile products (valued at $839,815 in 1900 and at $1,131,913 in 1905), and the largest in 1905 was the manufacture and repair of steam railway cars (valued at $2,624,461 in 1900 and at $4,394,685 in 1905).

Communications. — There is no longer any river navigation. There were 6,101-5 m – °f railway in the state at the end of 1907; the great period of railway building was 1 870-1 890, the mileage in 1870 being 705, in 1880, 1953, and in 1890, 5407. The eastern half of the state is much better covered by railways than the western. Six great east and west trunk-lines connecting the Rocky Mountain region and Chicago enter the state at Omaha (q.v.), and two others, giving rather an outlet southward, enter the same city and serve the eastern part of the state. In 1908 all but 5 counties out of 90 had railway outlets. A marked tendency toward north and south railway lines is of great promise to the state, as outlets towards the Gulf of Mexico are im- portant, especially for local freight. Omaha and Lincoln are Federal ports of entry for customs.

Population. — In 1900 the population of the state was 1,066,300 and in 1910, 1,192,214. In 1900 16-6% were foreign-born,

and 43‘3% natives of other states than Nebraska. The latter came mainly from the north-central states. Of the foreigners, Germans, Scandinavians and British (including English Canadians) made up four-fifths of the total. The most numerous individual races were Germans (65,506), Swedes (24,693), Bohemians (16,138), Danes (12,531), Irish (11,127), English (9757), Russians (8083) and English Canadians (8010). In 1900 three cities had a population above 25,000 — Omaha, 102,555; Lincoln, 40,169; South Omaha, 26,001 — and seven others had a popula- tion between 5000 and 8000 — Beatrice, Grand Island, Nebraska City, Fremont, Hastings, Kearney and York. The population of Nebraska was 28,841 in i860, 122,993 in 1870, 452,402 in 1880 and 1,062,656 in 1890. The increases of population by decades following i860 were 326-5, 267-8, 134-1, 0-3, and n-8%. From 1880-1890 the absolute increase was exceeded in only four states, and was greater than in any state W. of the Mississippi except the enormous state of Texas; from 1 890-1 900 it was less than in any state of the Union except Nevada (whose population decreased). In this decade 35 counties out of 90 in the state showed a decrease: the shrinkage was mainly in the first half of the decade, and was due to the cumulative effects of national hard times, a reaction from an extraordinarily inflated land ” boom ” of the late ‘eighties, and a remarkable succession of drought years, and consequent crop failure in the West. Between 1885 and 1895 Kansas and Colorado went through much the same experience, due to a too rapid settlement of their arid areas before the conditions of successful agriculture were properly understood. Many homes, and even small settlements in Nebraska — though not to the same extent as in Colorado and Kansas — were abandoned. Urban population (the population in places having 4000 or more inhabitants) also fell, constituting 25-8% in 1890, and in 1900 only 20-8% of the total population of the state. In the case of some cities that showed a great decrease (e.g. Lincoln 27-2%, and Omaha 27%) notoriously “padded” censuses in 1890 were in part responsible for the bad showing ten years later.

In 1906 there were in the state 345,803 communicants of various religious denominations; of these 100,763 were Roman Catholics, 64,352 Methodists, 59,485 Lutherans, 23,862 Presby- terians, 19,121 Disciples of Christ, 17,939 Baptists and 15,247 Congregationalists.

In 1890 there were in the state 2893 untaxed and 3538 taxed Indians, the latter being citizens; in 1900 there were 3,322 altogether, all of them taxed; and in 1908 there were 3720, of whom 1270 were

Omaha, 11 16 Santee Sioux, 1060 Winnebago and 274 Ponca.

Among the Indians who occupied Nebraska immediately before the advent of the whites and thereafter, the only families of much importance in the state's history were the Caddoan and the Siouan. The Caddoan family was represented by the Middle or Pawnee Confederacy; the Siouan family by its Dakota, Thegiha, Chi were and Winnebago branches. Included in the Dakota branch were the Santee and Teton tribes, the latter comprising the Brul6, Blackfeet and Oglala Indians; in the Thegiha branch were the Omaha and Ponca tribes; and in the Chiwere branch, the Iowa, Oto and the Missouri tribes. Other tribes were of less importance; and tribes of other families — with the exception of the Cheyennes and Arapahoes of the Algonquian family, whose permanent hunting grounds em- braced the foot-hill country of the West — were of negligible im- portance, being only roamers within the borders of the state. The Pawnees contested the plains against the Sioux with undying enmity. Before the Civil War there were no very general troubles between Indians and whites, despite constant frontier difficulties, except the bloodless " Pawnee War " of 1859-60; but in 1863- 64 the Indians rose rather generally along the frontier, and many- settlers were killed. In 1890-91 there was another war — with the Sioux— marked by the battle of Wounded Knee, just across the line in South Dakota. In dealings with the Indians there have been in Nebraska the usual discreditable features of administration. The maltreatment of the Poncas, a fine and peaceable tribe, was peculiarly and inexcusably harsh. Segregation on reservations was generally accomplished in 1 870-1 880. There were in 1900 small reservations for Omahas and Winnebagces in Thurston county and for the Sioux in Sheridan county, and an agency for the Santees and Poncas near the mouth of the Niobrara ; and at Genoa, where the Pawnee agency and reservation had been located, there was in 1908 an Indian school maintained by the United States government with 350 boarding

pupils. In 1908, however, almost all the tribal lands had been distributed in severalty: the Niobrara Reservation (under the Santee government boarding school for the Santee Sioux and the Ponca) had only 1130-7 acres reserved for agency, school and mission purposes; the Ponca Reservation (under the same school) had only 160 acres reserved for agency and school buildings; the Omaha Reservation (under the Omaha School) had 12,421 acres unallotted; the Sioux

Reservation (under the Pine Ridge Agency) for Oglala Sioux had 640 acres; and the Winnebago Reservation (under the Winnebago School) had 1710-8 acres unallotted and 480 reserved for agency, &c.
Government. — The present constitution, adopted in 1875, replaced one adopted in 1866. In 1871 a convention framed a constitution that was rejected by the people. It provided for compulsory education, and for the taxation of church property; prohibited the grant by counties or cities of financial aid to railway or other corporations, and enjoined that railways should have an easement only in their right of way. The last two provisions were mainly responsible for the defeat of the constitution. The instrument of 1875 presents a few variations from the normal type, and under it a few interesting problems have arisen. The constitution provides two methods for amend- ment. A convention for revising or amending the constitution is to be held in case a recommendation to that effect made by the legislature (a three-fifths vote of all the members of each house being required) is accepted by a majority of the electors voting at the next election for members of the legislature, but no amendment agreed' upon by the convention is to take effect until approved by a majority of electors voting on it. Without calling a convention, however, the legislature may, by a three- fifths vote of all the members of each house, adopt an amendment, which is to come into effect only if approved by a majority of electors voting at the next election of senators and repre- sentatives — the publication of the proposed amendment in some newspaper in each county once a week for three months before the election being required. This has been interpreted by the courts as requiring a majority of the votes actually cast for senators and representatives. As there is less interest in amend- ments than in the election of members of the legislature, only two out of a large number of amendments proposed from time to time by three-fifths of the members elected to each house have been adopted. The first of these, increasing the pay per day to the members of the legislature and providing for longer sessions, 1 was declared lost by the official canvassers, but when (1886) the ballots had been recounted by the legislature it was declared adopted. The second (1906), creating a railway com- mission, was endorsed by a political party in state convention, was printed on the same ballot-paper with the names of the party candidates for office in order to secure for it all " straight " party votes, and by this procedure, which was upheld by the state supreme court in 1007, it was adopted. All male persons who are citizens of the United States or have declared their intention to become such at least thirty days before an election have the right of suffrage provided they have attained the age of twenty-one years, have resided in the state six months, are not of unsound mind, and

have not been convicted of treason or felony. Women who have either children or taxable property may vote on questions relating to schools. The general election of state and local officers is held annually on the first Tuesday succeeding the first Monday in November, but municipal and school district elections may be held at other times. The secret ballot was adopted in 1891; the use of the voting machines was authorized in 1899; and the nomination of candidates by primaries was made mandatory in 1907. By a provision unique in 1875, the constitution authorized the legislature to provide that the electors might express their preferences for United States senators; but this was not treated as mandatory on the legislature, and though votes were at times taken (1886, 1894), they were not officially canvassed, nor were any senatorial

1 The amendment increased the pay of members from three dollars to five dollars a day ” during their sitting,” and provided that sessions should last at least sixty days, and that members should not receive pay ” for more than sixty days at any one sitting “; the original constitution had provided that they should ” not receive pay for more than forty days at any one session ” and had prescribed no minimum length for a session.

elections materially affected by them. In 1907, under a direct primary law, the nomination of candidates for United States senator was transferred from the party convention directly to the people; and in 1909 the ” Oregon plan ” was adopted, whereby each candidate for the legislature must go on record as promising, or not, always to vote for the people’s choice for United States senator; on the ballot which bears the name of each candidate for the legislature there appears a statement that he ” promises,” or that he ” will not promise,” to vote for the ” people’s choice.” In the same year the state enacted a law providing for the non-partisan nomination of all judges, of all superintendents of public instruction and of regents of the state university; nominations are by petition, and there is a separate ” official non-partisan ballot ” bearing the names and addresses of the nominees and the titles of the office for which they are nominated. The legislature of 1909 also provided for open election primaries and for the framing of state party platforms by convention before the time of the primary.

The governor is the chief executive officer of the state, but quite independent of him are a lieutenant-governor, a secretary of state, an auditor of public accounts, a treasurer, a superintendent of public instruction, an attorney-general and a commissioner of public lands and buildings, who, as well as the governor, are elected for a term of

two years. The governor's appointing power is almost entirely limited to officers of state institutions, and for every appointment he makes the approval of the Senate is required ; but he need not ask the consent of that body to remove for incompetency, neglect of duty or malfeasance in office " any officer whom he may appoint." His constitutional power to pardon is regulated by an act of the legislature (1907) which requires that he shall in no instance grant a pardon until the attorney-general shall have investigated the case and conducted a public hearing. His veto power extends to items in appropriation bills, but any bill or item may be passed over his veto by three-fifths of the members elected to each house of the legis- lature. The most important board of which he is chairman is the state board of equalization. As the present constitution was adopted in the year after a grasshopper plague, which had caused great financial loss, it limited the salary of the governor, auditor of public accounts and treasurer, as well as that of the judges of the supreme and district courts, to $2500 each and that of other important officers (including the secretary of state, the attorney-general and the superintendent of public instruction) to $2000. This economy has somewhat hampered the growing state. Salaries have been too low to attract the ablest men; and as the constitution forbade the creation of new offices, and no amendment of this clause could be secured, resort was had to the creation of additional " secretaries " and of boards constituted of existing state officials or their secretaries.

The legislature consists of a Senate of 33 members and a House of Representatives of 100 members, and meets in regular session on the first Tuesday in January of every odd-numbered year at Lincoln, the capital. Bothsenators and representatives are apportioned accord- ing to population, and are elected by districts in November of each even-numbered year for a term of two years. They are paid at the rate of five dollars a day during 60 days of a regular session and not exceeding ioodays during their entire term. No bill or joint resolu- tion may be introduced at a regular session after its fortieth day except at the request of the governor. Special legislation of various kinds is expressly prohibited, and in the bill of rights it is declared that " all powers not herein delegated remain with the people." This clause would seem to leave the state government with no powers not expressly granted, and to make the rule for interpreting the Nebraska constitution similar to that for interpreting the Federal constitution; but in their practice the Nebraska courts have been little influenced by it, and it is chiefly of historical interest. 2

The administration of justice, is vested in a supreme court, 15 district courts, county courts and courts of justices of the peace and police

magistrates. The supreme court consists of three judges elected for a term of six years, one retiring every two years; each district court consists of one to seven judges elected for a term of four years, and each county court consists of one judge elected for a term of two years. The county courts have exclusive original jurisdiction in the probate of wills and the administration of estates, concurrent jurisdiction with the district courts in civil suits for sums not exceeding $1000, and important jurisdiction in criminal cases. Perhaps the most unique provision of the Nebraska constitution is that

2 An almost identical clause was inserted in the Ohio constitution of 1802, and one in exactly the same language" appears in the present (1851) constitution of that state; it appears also in the Kansas constitutions of 1855, 1858 and 1859 (present), in the Nebraska constitution of 1866, in the North Carolina and South Carolina constitutions of 1868, and was retained in the present constitution oi North Carolina as amended in 1876.

relating to appeals; it appears in the bill of rights and reads as follows: " The right to be heard in all civil cases in the court of last resort, by appeal, error or otherwise, shall not be denied." Regard- less of this provision, however, the civil code denies the right of an appeal from an inferior court in cases that have been tried by a jury, and in which the amount claimed does not exceed $20, and the courts have decided that this denial is not in conflict with the constitution ; but in at least one instance an appeal was allowed because of the constitutional guaranty, and that guaranty has doubtless had much influence on judicial legislation.

County government exists under both the district-commissioner system and the township supervisor system, the latter being rare. Cities are governed in classes according to population.

Except in Omaha there is no great field for social economic legislation; bat the record of the state has been normally good in this respect Railways have given rise to the most notable laws. Regulation has been a burning political question since 1876, the constitution making it the duty of the legislature to " correct abuses and prevent unjust discriminations and extortions in all charges of express, telegraph and railroad companies " within the state. The influence of the railways has been very great, and a constant drag on just taxation and other legislative reforms. In 1885, 1887 and 1897 the legislature created a Board of Transportation consisting of existing state executive

officers or their secretaries, but this could do little except gather statistics, investigate alleged abuses, and advise the legislature, upon which the regulation of rates remained man- datory by the constitution. The Board was eventually declared unconstitutional by the state supreme court. In 1893 a maximum freight-rate Act was passed, but the rates thus fixed were declared by the United States Supreme Court to conflict with the Fourteenth Amendment, being ” unreasonable.” The right of the state to fix ” reasonable ” rates remained unquestioned, but American ex- perience has not found such laws efficacious. In 1906 all political parties conducted campaigns on promises of radical legislation on railway rates, passenger and freight; and a constitutional amend- ment creating a railway commission was adopted in the manner above described. A result of this campaign was a remarkable series of enactments in 1907 for the regulation of railways. The legislature framed a stringent anti-pass law, reduced passenger fares and express and freight charges, provided for equitable local taxation of railway terminals, regulated railway labour in the interest of safe travel, fixed upon railways the responsibility for the death or injury of their employes, and gave to the newly-created railway commission complete jurisdiction over all steam-railways in the state, over the street railways of the cities, and over express companies, telegraph companies, telephone companies and all other common carriers. In 1909 provision was made for an annual corporation licence tax and for the physical valuation of railways. In the same year, following the example of Oklahoma, Nebraska passed a law guaranteeing bank deposits from a fund created by an assessment on the basis of total deposits. Useful child-labour and pure-food laws were enacted in 1907. Prohibition of the liquor traffic had been established in the Territory in 1855, but liquor licences were intro- duced in 1858; in 1909 the licence fee was fixed at $1000. A law enacted in 1907 made it illegal for breweries to own retail liquor houses, and one of 1909 required all saloons to close from 8 p.m. to 7 a.m. A homestead law exempts from judgment liens and forced sale a homestead not exceeding $2000 in value and consisting either of a farm not exceeding 160 acres or of property not exceeding two lots in a city or village; the exemption, however, does not extend to mechanics’, labourers’ or vendors’ liens upon said homestead or to a mortgage upon it that has been signed by both husband and wife or by an unmarried claimant. A woman’s rights to her property are not affected by marriage, except that it becomes liable for payment of debts contracted for necessaries to the family when a judgment against the husband for the payment of the same cannot be satisfied. The rights of dower and courtesy have been abolished, and husband and wife have instead equal rights to inherit property from the other;

but the portion of the property of a deceased spouse that descends to the survivor varies from one-fourth to all according to whose and how many are the children concerned. The grounds for a divorce are adultery, incompetency at the time of marriage, sentence to imprisonment for a term of three years or more, abandonment without just cause for two years, habitual drunkenness, extreme cruelty, and refusal or neglect of the husband to provide a suitable maintenance for his wife. The period of residence in the state re- quired to secure a divorce was formerly six months, but in 1909 it was made two years.

Finance. — The constitution limited the debt that the state might contract to meet casual deficits to $100,000, unless in time of war, and required taxes to be laid to maintain interest on such debt (bonds). These provisions were construed to mean that not more than $100,000 of debt could be contracted in addition to appropria- tions made by the legislature. There was from the beginning a constant issue of state ” warrants ” on the general fund, dependent on taxation. These warrants when issued and presented for payment were paid by the state treasurer, were sold to the permanent school “‘i an d drew 4 % interest until cancelled from the general fund. The floating debt of warrants was practically cancelled in 1909, after i one-mill levy for four years for this purpose. Since 1900 there has

been no bonded debt whatever. The constitution also prohibited state aid to railways and other corporations, leaving this to cities and counties under limitations. In 1903 the assessed valuation of property was $188,458,379; in 1905, $304,470,961; in 1906, $313,060,301; in 1907, $328,757,578, and in 1908, $391,529,673. The increase was due largely to a new revenue law of 1903 ordering property to be assessed at one-fifth of its actual value. The average tax-rate in the year 1904 was 6| mills; in 1905, 1906 and 1907, 7 mills; and in 1908, 6J mills.

Education. — The public schools have been endowed by the United States, beginning in 1854, and by the state; in 1909 the permanent school funds derived from the sale of educational lands amounted to $ 8 450,557. invested in state securities, county, school district and municipal bonds. The percentage of illiterate population (i.e. popu- lation unable to write) above 10 years of age was in 1880 and 1890 smaller than that in any other state in the Union, and in 1900, when it was 2-3% (for native whites, foreign whites and negroes re- spectively 0-8, 6-8 and 1 1-8), was smaller than that in any other state except Iowa (whose percentage was also 2-3); the percentage for males of

voting age (2.5 %) being the least in the Union. There are four state normal schools— one at Peru (opened 1867), one at Kearney (1905), one at Wayne (originally private; purchased by the state in 1909) and one, provided for by the legislature of 1909, situated in the north-western part of the state. The university of Nebraska at Lincoln was established in 1869 by an act of the state legislature, and was opened in 1871. The university is governed by a board of six regents, elected by the electors of the state at large, each for six years, two going out of office each year. The revenue of the university is from the income of Congressional land grants under the Morrill Acts and from a one mill per one dollar tax on the current assessment roll of the state. 1 Connected with it and governed by the same regents are the State College of Agriculture (including the School of Agriculture) and the Agricultural Experiment Station, on_the university farm of 320 acres, 2| m. E. of the university, which receive support from the United States government, and an experimental sub-station at North Platte. The botanical and geological surveys of the state are carried on by the university ; the former has been largely under the supervision of Charles Edwin Bessey (b. 1845), professor of botany. The university as reorganized in 1909 embraces a college of arts and sciences, a graduate college, a college cf agriculture, a college of engineering, a teachers' college (1908), a college of law (1891), a college of medicine, a school of pharmacy, a school of fine arts, an affiliated school of music and a summer session. The medical school is in Omaha. The university has no preparatory department. Its library in 1909 had about 85,000 volumes. In 1908-1909 the university had an enrolment of 361 1 students (2077 men and 1534 women). The granting of uni- versity degrees is conditioned by a "credit-hour" system; 125 credit hours are required for a bachelor's degree. Elisha Benjamin Andrews 2 (b. 1844) became chancellor of the university in 1900; in 1909 he was succeeded by Samuel Avery (b. 1865). Most of the educational institutions of the state are coeducational. Among the private educational institutions of the state are : Nebraska Wesleyan University (1888, Methodist Episcopal), at University Place, a suburb of Lincoln ; Union College (1891, Adventist), at College View, suburb of Lincoln; Creighton University (1879, Roman Catholic), at Omaha; York College (1890, United Baptist), at York; Cotner University (1889; legally " The Nebraska Christian University "), at Bethany, a suburb of Lincoln; Grand Island College (1892, Baptist), at Grand Island; Doane College (1872, Congregational), at Crete; Hastings College (1882, Presbyterian), at Hastings; and Bellevue College (1883, Presbyterian), at Bellevue. State penal and charitable institutions include soldiers' and sailors' homes at Grand Island and Milford, an Institute for the Blind at Nebraska City (1875), an Institute for the Deaf and Dumb at

Omaha (1867), an Institute for Feeble Minded Youth at Beatrice (1885), an Industrial School for Juvenile Delinquents (boys) at Kearney (1879), a Girls' Industrial School at Geneva (1881), an Industrial Home at Milford (1887) for unfortunate and homeless girls guilty of a first offence, asylums or hospitals for the insane at Lincoln (1869), Norfolk (1886) and Hastings (1887), an Orthopedic Hospital '(1905) for crippled, ruptured and deformed children and a state penitentiary (1867), both at Lincoln. A Home for the Friendless, at Lincoln, incor- porated in 1876, was taken over by the state in 1897; admission was restricted to children, and in 1909 its name was changed to the State Public School.

1 In 1909 the state legislature refused to accept for the university the Carnegie education pensions.

2 He was born in Hinsdale, New Hampshire, on the 10th of January 1844; served in the Union army during the Civil War; graduated at Brown University in 1870 and at Newton Theological Institution in 1874; taught homiletics at Newton in 1879-1882, history and economics at Brown in 1 882-1 888, and political economy and finance at Cornell in 1888-1889; and was president of Brown University in 1889-1898. He was an ardent bi-metallist, and in 1892 was a member of the International Monetary Conference at Brussels. He wrote on the currency question, and published a History of the United States in our Own Times (1904) and other works on American history and economics.

33°

NEBRASKA

History. — Local pride has prompted some Nebraskans to begin the history of the white race in their state with the march of Ccronado, in 1541, across the buffalo plains to " Quivira," N. of the Arkansas river in Kansas ; but the claim is not warranted by the evidence. Marquette mapped the Platte from hearsay in 1673; French explorers followed it to the Forks in 1739; and, after Nebraska passed to the United States in 1803 as part of the Louisiana Purchase, successive American exploring expeditions left traces in its history. Major Stephen H.Long, in particular, followed the Platte and South Platte across the state in 1819, and his despairing account of the semi-arid buffalo plains — whence arose the myth of the Great American Desert — finely contrasts with the later history and latter-day optimism of dry-farming and irrigation. Meanwhile, fur traders who drew their goods from the country of the Platte had long been active on the Missouri. Trading

posts were probably established in Nebraska in 1795, 1802, 1807 and 1812; the last two near the present towns of Ft. Calhoun (about 20 m. N. by W. from Omaha) and Bellevue. Manuel de Lisa, a noted Cuban trader and plainsman, was probably the first white settler (1807). In 1823 Bellevue became an Indian agency, and in 1849 the first United States post-office in Nebraska. Ft. Atkinson was maintained near the present town of Ft. Calhoun in 1819-1827; in 1825 the government acquired the first Indian lands, and in the 'thirties of the 19th century missionaries began to settle among the tribes; the first Ft., Kearney was maintained where Nebraska City now stands in 184 7-1848, and in the latter year was re-established on the Platte, some 175 m. inland from the Missouri. Meanwhile there had begun the passage of the Mormons across the state (1845-1857), marked by important temporary settlements near Omaha (q.v.) and elsewhere, the travel to Oregon, and to California, for which depots of supplies were established at Bellevue, Plattsmouth, Nebraska City and old Ft. Kearney, or Dobey Town. 1 Thus the country was well and favourably known before Congress organized it as a Territory in 1854.

Movements in Congress for the creation of a new Territory on the Platte began in 1844, several attempts at organization failing in the succeeding decade. In 1852-1853 Iowans and Missourians along the border of what are now Kansas and Nebraska held elections W. of the Missouri and sent delegates to Congress. A provisional Territorial government formed by Wyandot Indians and licensed white residents on Indian lands in Kansas (q.v.) forced Congress to take action. With what followed, the rivalry of the Platte and Kansas river valleys for the Pacific railway route, and the opposing interests of pro-slavery Missouri and anti-slavery Iowa, and possibly the personal ambitions of Stephen A. Douglas and Thomas H. Benton, had important relations. In the outcome Nebraska was one of the two Territories created by the Kansas-Nebraska Bill of 1854. This creative act bore evident traces of the pro- slavery sentiments of the Congress that passed it in the limitation of the suffrage to whites, and the explicit application of the national fugitive-slave laws for the last time in a federal statute. Under the provision of " popular-sovereignty " it was thought that Nebraska, as the more northerly Territory, would become a " free " state, if not a free Territory. There were slaves within its borders' from the beginning, and anti-slavery ideas were embodied in several legislative bills, until a territorial law of 1 86 1 excluded slavery. But the future of slavery was settled in Kansas, and events in Nebraska throw only a small side-light on that struggle. John Brown and James H. Lane spent considerable time in the south-eastern counties, and across these an " underground railroad " ran, by which slaves were conducted from

Kansas to Iowa and freedom.

As organized in 1854 Nebraska extended from 40 N. lat. to British America, and from the Missouri and White Earth rivers to the ” summit ” of the Rockies; but in 1861 and 1863 it was reduced, by the creation of other Territories, to its present boundaries. By i860 settlement had spread 150 m. W. from

1 In 18 months of 1849-1850 it was officially reported that 8000 wagons, with 80,000 draught-animals and 30,000 people, passed Ft. Kearney on the way to Oregon, California or Utah.

the Missouri, following the river valleys and the freighting routes. Many who had migrated to Pike’s Peak in 1859, stopped in Nebraska on their return eastward; and settlement was stimulated by the national Homestead Act of 1862 (one of the first patents granted thereunder, on the 1st of January 1863, was for a claim near Beatrice, Nebraska), and by the building and land-sales of the Union Pacific and Burlington railways following 1863. Thus in 1861 there were probably 30,000 inhabitants in the Territory, and 3300 men were sent into the field for the Union army in the Civil War. Until well into the ‘sixties freighting across the plains was a great business. The “Oregon Trail,” the “Old California Trail,” and the “Old Salt Lake Trail ” — all nearly identical in Nebraska — ran along the Platte across the entire state with various terminal branches near the eastern border, to the Missouri river towns; while branches from St Joseph, Missouri and Leavenworth, Kansas, ran up the valleys of the Big Blue and Little Blue rivers and joined the Nebraska roads near Ft. Kearney. The Oregon and California migration was of large magnitude by 1846. St Joseph, Leavenworth and Nebraska City (q.v.) were the great freighting terminals of the West. Over these roads was run in 1860-1861 the famous ” pony express ” whose service ended with the com- pletion of the overland telegraph in the latter year; it covered the distance from St Joseph, Missouri, to Sacramento, California, in eight days, and even less. Freighting ended when the Union Pacific was extended across Nebraska between 1863 and 1867.

Political interest in the Territorial period centred mainly in a fight for the capital, waged between the towns of the Missouri river front, Bellevue, Brownville, Nebraska City, Plattsmouth, Omaha and Florence, those of the North Platte interior, and of the South Platte. This struggle engendered extraordinary bitterness, skice success might mean continued life, and defeat prompt demise, to competing towns. As popula- tion increased the question of the capital was complicated by the question of statehood. Both were involved in the agitation in

1858-1859 for the annexation of the South Platte to Kansas (q.v.), which gained considerable strength; annexation promising to the former much earlier statehood than continued union with the backward region of the North Platte, and to northern Kansas also promising earlier statehood, and an advantage in the sectional struggle with southern Kansas. As the expenses of Territorial government were partly borne by the United States, statehood was voted against in i860, and again (virtually) in 1864 after Congress had passed an Enabling Act; but in

1866 a constitution framed by the legislature was declared carried by the people by a majority of 100 votes in 7776, and Nebraska was admitted as a state (in spite of President Johnson's veto) in 1867, after her legislature had accepted a fundamental condition imposed by Congress removing the limitation of the suffrage to whites by the new constitution. Fraud was charged in the Territorial election. At any rate the Republican party had worked for admission because it needed senators in Congress, and it got them. During part of 1866-1867 there were two de facto governments, the Territorial and the state.

The capital of the Territory remained always at Omaha, although in 1858 a majority of the legislature removed to Florence leaving the governor and a legislative rump at Omaha. In

1867 the South Platte region, having obtained a predominance in population capable of overcoming a gerrymander that had favoured the North Platte (and incidentally the Democrats), secured the appointment of a legislative committee to locate the state capital S. of the Platte. Several of the old Missouri river contestants had as representatives of their previous claims young towns located at strategic points in the interior. The committee avoided these and selected the site of Lincoln. Just ten years earlier the legislature had considered removal to another site on the Salt, to be called " Douglas " in honour of Stephen A. Douglas, then still in the heyday of his popularity.

The decade 1870-1880 was marked by the work of the two constitutional conventions described above. The first legislature under the constitution of 1875 met in 1877. The following decade was marked by a tremendous growth in population,

by a feverish activity in railway construction (the mileage in the state being increased from 1953 to 5407 m. in the ten years), and by an extraordinary rise in land values, urban and rural. Farm-land prices were raised to a basis of maximum productiveness when the best interests, especially of the western section, demanded steady growth based on average crop results under average conditions. The early ‘nineties were marked by an economic collapse of false values, and succeeding years by a painful recovery of stable conditions.

The Democratic and Republican parties were first effectively organized in opposition, as parts of national bodies, in the territorial campaigns of 1858. Till then there were practically only Democratic factions; after 1861 the Republicans held the state securely until 1890. After about 1890 the national tendencies towards a re-alignment of political parties on social- economic issues were sharply displayed in Nebraska. This was in the main only an indication of the general Farmers’ Movement (q.v.), 1 but this found in Nebraska special stimulus in large losses (almost $900,000) suffered by the state from the negligence and defalcation of certain Republican office- holders. Following 1890 the ” Fusion ” movement — the fusion, that is, of Populists, Democrats and (after 1896) of Silver Republicans — was of great importance. The only year in which these elements carried the state against the Republicans for presidential electors was in 1896, when William J. Bryan of Lincoln was their presidential candidate; although the state delegation of representatives and senators in Congress was for a time divided. The Fusionists practically controlled the state government from 1897-1899; they held the legislature from 1891-1895 and from 1897-1899, the supreme court from 1899- 190 1, and the governorship and executive departments from 1895-1901; they elected a Democratic governor also for 1891- 1893; but he was not of the true Fusion type, and vetoed a maximum railway freight-rate bill, although his Republican successor approved one. The year 1891 was the most feverish political year of this period. Apart from these temporary Fusion successes the Republicans have always controlled the state. The governors of Nebraska have been as follows: — Territorial Period.

Francis Burt II days, Oct. 1854

Thomas B.Cuming (secretary, acting governor) Oct. 1854-Feb. 1855

Mark W. Izard Feb. 1855-Oct. 1857

Thomas B.Cuming (secretary, acting governor) Oct. 1857- Tan. 1858

William A. Richardson Jan. 1858-Dec. 1858

J. Sterling Morton (secretary, acting governor) Dec. I858-Mayl859

Samuel W. Black May 1859-May 1861

Alvin Saunders May 1861-Mar. 1867

Algernon S. Paddock (secretary, several times acting governor, 1861-1867).

State. David Butler (impeached and removed from

office 1871) 1867-1871 Republican

W. H. James (lieut.-governor, succeeding) 1871-1873 ,,

Robert W. Furnas 1873-1875 ,,

Silas Garber 1875-1879 ,,

Albinus Nance 1879-1883 „

James W. Dawes 1883-1887 „

John M. Thayer 1887-1891

James E. Boyd 2 Democrat

John M. Thayer (acting governor) . . 1891-1892 ,,

James E. Boyd 1892-1893 ,,

Lorenzo Crounse 1893-1895 Republican

Silas A. Holcombe 1895-1899 Fusion

William A. Poynter 1899-1901 ,,

Charles H. Dietrich (elected U.S. Senator) 1901 Republican

Ezra P. Savage (lieut.-governor, succeeding) 1901-1903 ,,

John H. Mickey 1903-1907

George L. Sheldon 1907-1909 ,,

A. C. Shaller.berger 1909-1911 Democrat

Chester H. Aldrich 191 1- Republican

1 Nebraska was one of the states in which the collapse of the co-operative enterprises of the Grange was particularly severe. The Farmers' Alliance was organized for the state in 1887, became a secret organization in 1889, and, as in other states, was a power by 1890. The membership of Grange, Alliance and Knights of Labour went over generally speaking into the People's party.

2 Removed by decision of state supreme court on grounds of non-citizenship, 5th of May 1891 ; reinstated by decision of U.S. Supreme Court, 1st of February 1892.

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NEBRASKA CITY, a city and the county-seat of Otoe county, Nebraska,

U.S.A., situated on the high W. bank of the Missouri river, about 40 m. below Omaha. Pop. (1880) 4183; (1890) 11,494; (1900) 7380 (882 foreign-born); (1910) 5488. It is served by the Chicago, Burlington & Quincy, and the Missouri Pacific railway systems. A railway and wagon bridge spans the Missouri. The city is the seat of the state Institute for the Blind (1875), and has three public parks and a public library. The city is a distributing centre for a beautiful farming region, the trade in grain being especially large. In 1900 Nebraska City ranked third among the manufacturing cities of the state, the manufactures including canned fruits and vegetables, packed pork, flour, oatmeal, hominy, grits, meal, starch, cider-vinegar, agricultural implements, windmills, paving bricks, concrete, sewer pipe, beer, over-alls and shirts. It is one of the oldest settlements of the state. The first ” old Fort Kearney ” was established on the site of Nebraska City in 1847, but was abandoned in 1848, and the fort was re-established farther W. on the Platte river (see Kearney). Otoe county was organized in 1855, and the original Nebraska City was incorporated and made the county-seat in the same year. This city, together with Kearney City, incorporated in 1855 — adjacent to the first ” old ” Fort Kearney — and South Nebraska City, were con- solidated by the legislature into the present Nebraska City in 1858. (Twelve other city ” additions ” and so-called ” towns,” all within or closely adjacent to the present city, were in existence in 1857.) Nebraska City was for some years the largest city of the state. In 1858 it became the headquarters of a great freighting-firm that distributed supplies for the United States government among the army posts between the Missouri river and the Rocky Mountains; in seven months in 1859 this one firm employed 602 men, used 517 wagons, 5682 oxen, and 75 mules, and shipped 2,782,258 lb. of freight. Nebraska City was the initial point of several roads, parts at one time or another of the” Oregon,” ” Old California,” and ” Great Salt Lake ” trails. (See Nebraska (State) : History.) Nebraska City became a city of the second class in 1871 and a city of the first class in 1901.

NEBUCHADREZZAR, or Nebuchadnezzar, king of Babylon, the

and continued the restoration of Babylon, which he made one of the wonders of the world. His ” new palace ” there was built in. fifteen days; temples were erected to the gods, the great walls of the city were constructed with a moat surrounding them, the Euphrates was

lined with brick and a strong fortress erected. Canals were dug throughout the country and a great reservoir excavated near the capital. Only a fragment of his annals has been preserved, recording his campaign against Amasis (Ahmosi) of Egypt in his thirty-seventh year (567 B.C.) when he defeated the soldiers of ” Phut of the Ionians.” Tyre revolted in the seventh year of his reign, and was besieged for thirteen years; a contract-tablet dated in his fortieth year shows that at that time it was under Babylonian officials. After the investment of Tyre Nebuchadrezzar marched against Jerusalem, put Jehoiakim to death and placed Jehoiachin on the throne. Three months later Jehoiachin was deposed and Zedekiah made king in his place. Zedekiah’s revolt in 588 B.C. led to another siege of Jerusalem, which was taken and destroyed in 586 B.C. (see Jews and Jerusalem). To this period probably belong an inscription of Nebuchadrezzar on the north bank of the Nahr el-Kelb near Beirut, and another in the Wadi Brissa in the Lebanon. From his inscriptions we gather that Nebuchadrezzar was a man of peculiarly religious character. A younger brother of his is called Nabo-sum-lisir. See Josephus, Cont. Apion, i. 19; Eusebius, Praep. Evangel, x. NEBULA (Lat. for ” cloud,” connected with the Gr; vek\ri, mist or cloud), in astronomy, the name given to certain luminous cloudy patches in the heavens. They resemble the stars in that they retain the same relative positions, and thus may be dis- tinguished from the comets which appear to wander across the stars. When examined with sufficient telescopic power, a great many of these luminous patches are perceived to be composed of clusters of little stars, which in a smaller telescope are invisible separately, but whose rays of light blend together so as to produce a confused luminous appearance. Others, however, cannot be resolved into individual stars even with the best telescopes, and in many cases the spectroscope gives direct evidence that the nebula has a constitution altogether different from that of a star-cluster. We thus distinguish between the nebulae proper and the star-clusters; but owing to the difficulty of deciding the nature in any particular case, and especially owing to the fact that some of the earlier observers believed it probable that all nebulae would with sufficient telescopic power become resolvable into stars, the term nebula is often used to cover both star-clusters and the true nebulae.

An enumeration of nebulae was made by Charles Messier in Paris in 1771, who recorded 103; Sir William Herschel increased the number known to over 2500; whilst Sir John Herschel between 1825 and 1847 catalogued and described 3926 nebulae (including 1700 observed at the Cape of Good Hope). About 1848 the earl of Rosse with his famous six-foot reflector at Parsonstown began his examination of the

nebulae, which added greatly to our knowledge of their forms and structure. In more modern times the development of photography has enabled the features of the nebulae to be ascertained ahd recorded with a certainty, which, unfortunately, the older visual observations and drawings cannot claim to possess. In this con- nexion the photographic work of Isaac Roberts, A. A. Common, E. E. Barnard and J. E. Keeler in particular must be mentioned. The total number of known nebulae has, too, been enormously increased; Perrine estimates that the number within the power of the Crossley reflector at Lick is not less than half a million.

Nebulae may be conveniently classified according to their telescopic appearance; we enumerate below some of the principal forms that have been recognized, but it must be observed that this classification is rather superficial, and that the differentia- tion is often one of appearance only and not of real structure. The types are: (1) Irregular nebulae, examples: the great nebula of Orion (M. 42), 1 the ” key-hole ” nebula near 17 Argus,

1 i.e. No. 42 in Messier’s catalogue. Nebulae not contained in that catalogue are generally known by their number in Dreyer’s New General Catalogue (N.G.C.).

the ” Omega ” nebula (M. 17); (2) Annular nebulae, example: M. 37 in Lyra; (3) Double nebulae, example: the dumb-bell nebula (M. 27) in Vulpecula; (4) Planetary nebulae, examples: the ” owl ” nebula (M. 97) in Ursa Major, M. 1 in Taurus; (5) Elliptical nebulae, example: the great nebula of Andromeda (M. 31); (6) Spiral nebulae, example: M. 51 in Canes Venatici; (7) Nebulous stars; (8) Diffused nebulosities. Most of these names require little explanation. The first class have ill-defined irregular boundaries; their forms often suggest the appearance of curdled liquid or wreaths of smoke. The annular nebulae have a ringed appearance, the centre being much darker than the outer parts, though it is filled with faintly luminous matter. Double nebulae have two principal centres of condensation. The planetary nebulae are nearly uniformly illuminated compact patches of light generally circular or elliptical in shape; they were so called because they appeared to possess disks like planets. Elliptical nebulae are usually nebulae of some flat type (such as annular or spiral) seen rather edgeways, so that the structure is not readily recognizable. The typical spiral nebulae are in the form of a double spiral, the two branches of which proceed from diametrically opposite points of a bright nucleus and wind round it in the same sense; the whole is generally studded with points of condensation. The great majority of the nebulae, including the abundant small nebulae which shine with a white light

(in contrast with the blue-green light of the planetary and irregular nebulae — see below Spectra of nebulae) , are generally classed as spiral nebulae. The spiral structure has been shown to exist in a few of them, but for the remainder it is only inferred. Nebulous stars are true stars surrounded by ah atmosphere or aureole of nebulous light. Diffused nebulosities are very faint nebulae of enormous extent, sometimes forming the back- ground of a whole constellation. We proceed to describe some of the more famous nebulae.

One of the most remarkable nebulae is that which is situated in the sword-handle of Orion and about the multiple star 6 Orionis; it is faintly visible to the naked eye. It seems to have been first noticed by Huygens in 1656, who described and figured it in his System Salurnium. It has now been found that nebulous streamers connected with the bright nucleus wind through the whole constellation of Orion. It is well known that all the brighter stars of the constellation except Betelgeuse appear to be related to one another by their similarity both of spectra and of proper motion; it seems probable that they are actually situated in the nebula and in some way connected with it.

The only other nebula which can be seen with the naked eye is the elliptical nebula in Andromeda. Modern photographs show very clearly that its structure is spiral. The nucleus is large and appears circular, but the spirals proceeding from it lie in a plane inclined at a rather sharp angle to the line of sight, and this gives to the nebula its elliptical appearance. Two small dense nebulae accompany it, and appear to belong to the system.

The finest example of a ring nebula is M. 57 between j3 and 7 Lyrae. The ring is slightly elliptical, its dimensions being 87* by 64”. At the ends of the major axis the ring becomes very faint, so that the form of the bright part may justly be compared to a pair of marks of parenthesis ( ). The centre is marked by a star which appears to be intimately associated with the ring, for the whole space within the ring is filled with a very faint nebulosity. According to Schaeberle, there is evidence of a spiral structure in this nebula also. It must, however, clearly be of an essentially different character from the structure of an ordinary spiral nebula, and the spectroscope reveals a fundamental difference between the annular and spiral nebulae.

The ” dumb-bell ” nebula in Vulpecula consists of two almost separated fan-shaped patches of light. It exhibits a close resem- blance to the annular nebula; for we have only to assume a continuation of the thinning out along the longest diameter and a slight filling in of

the centre of the Lyra nebula to obtain the dumb-bell form.

NEBULA

Plate II.

NEBULA

NEBULAR THEORY

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Of planetary nebulae one of the best known is the “owl nebula ” in the Great Bear about midway between ” the pointers.” As seen with Lord Rosse’s reflector, it presented a startling appear- ance, resembling the face of a goblin; two faint stars shone in the centres of the two dark circles which represented the saucer- eyes of the creature. Some change has certainly taken place since then, for the two stars no longer could be supposed to represent the pupils of the eyes; the cause may, however, be merely the proper motion of the stars or of the nebula.

The discovery of great regions having a faint nebulous back- ground is one of the most remarkable results of modern work. Particularly interesting is the fact that, whilst the large telescopes are unable to render them perceptible to the eye or to photograph them, they are revealed by what at first sight seems an absurdly simple apparatus. For the study of the ordinary nebulae large reflecting telescopes (preferably of short focal length) are used, the great light-gathering power being all important; but for photographing these diffused nebulosities portrait lenses of very small aperture and focal length are most successful. Thus the great extension of the Orion nebula was photographed by VV. H. Pickering in 1890 with a lens 2-6 in. in aperture and of 8-6 in. focal length; the exposure was rather more than six hours. Other extensive nebulous regions of a similar character have been found by Barnard in the constellations Ophiuchus, Scorpio and Taurus.

Spectra of Nebulae. — Owing to the feebleness of their light the study of the spectra of nebulae is one of particular difficulty. Two varieties of spectra are recognized; the one consists of a few narrow bright lines with sometimes a faint continuous spectrum for a background; the other consists of a continuous spectrum crossed by dark lines and is indistinguishable from that of ordinary stars. The former variety unmistakably shows that the light proceeds from diffuse incandescent vapour; nebulae showing this spectrum are accordingly called ”

gaseous.” Irregular, annular and planetary nebulae are of this nature. The visual spectrum is marked by three bright lines in the blue and green of wave-lengths 5007, 4959 and 4861. Of these the last is the line H fi of the hydrogen series; the other two are of unknown origin, and as they are always found together and have always the same relative intensity, they have both been attributed to the same unknown element, which has been named ” nebulium.” Usually there are no other conspicuous lines in the visual spectrum, but in the ultra-violet region numerous lines can be photographed, including most of the hydrogen series. The yellow line (D 3) of helium can be detected in many nebulae. The great majority of the nebulae, however, show the second variety of spectrum, and are thus indistinguish- able spectroscopically from irresolvable star-clusters. The great nebula of Andromeda and the spiral nebulae are of this kind. It is not necessary to conclude that they, therefore, are star-clusters whose components are, owing to their remoteness from us, too faint and close together to be separately distinguish- able. A gaseous mass only gives a bright line spectrum when it is so rarefied as to be transparent through and through. If the density and thickness are such that a ray of light cannot pass through it the spectrum will, in general, be continuous like that of a solid body.

The inquiry into the physical state and constitution of the nebulae raises problems of great difficulty. In the case of ” gaseous ” nebulae it is very hard to understand how such extremely tenuous masses are maintained in a state of incan- descence. Only one theory has been put forward which at all accounts for this fact, and unfortunately, it is not altogether satisfactory in other respects. This is Sir Norman Lockyer’s “Meteoritic Hypothesis,” which attributes the light to’ col- lisions between numbers of small discrete solid particles, these being vaporized and made luminous owing to the heat developed by their impacts. Formidable difficulties, however, prevent the entire acceptance of this suggestion.

The spiral nebulae are not distributed at random over the sky, nor are they condensed along the galactic plane like the clusters which they spectroscopically resemble. There is a

well-marked centre of aggregation of the northern nebulae near the north galactic pole. In the southern hemisphere they are more evenly distributed, but the avoidance of the galactic plane is marked. The remarkable Nubeculae or Magellanic Clouds in the southern hemisphere, which look like detached portions of the Milky Way, are found on telescopic examination to consist, not of stars alone, like the Milky Way, but of stars and nebulae clustering together. In the greater

cloud Sir John Herschel counted 286 nebulae; in the lesser cloud they are rather less numerous.

References. — The characters of nebulae receive treatment in all text-books on descriptive astronomy; mention may be made of Miss A. M. Clerke, The System of the Stars (2nd ed., 1905), which contains a full account of these objects, illustrated by many photo- graphs; the same work is replete with references to original papers. Of recent catalogues of nebula, we notice J. L. E. Dreyer, ” A new general catalogue of nebulae and clusters of stars,” Memoirs R.A.S. (1888), published separately in 1890; and ” Index Catalogue of Nebulae (1888-1894), “Mem. R.A.S. (1895). Excellent photographs of the more famous nebulae are given in Sir R. Ball’s Popular Guide to the Heavens (1905); a more comprehensive collection is given in Isaac Roberts, Photographs of Stars, Star Clusters and Nebulae (2 vols., 1873-1899). (A. S. E.)

NEBULAR THEORY, a theory advanced to account for the origin of the solar system. It is emphatically a speculation; it cannot be demonstrated by observation or established by mathematical calculation. Yet the boldness and the splendour of the nebular theory have always given it a dignity not usually attached to a doctrine which from the very nature of the case can have but little direct evidence in its favour.

There are very remarkable features in the solar system which point unmistakably to some common origin of many of the different bodies which it contains. We may at once put the comets out of view. It does not appear that they bear any testimony on either side of the question. We do not know whether the comets are really indigenous to the solar system or whether they may not be merely imported into the system from the depths of space. Even if the comets be indigenous to the system, they may, as many suppose, be merely ejections from the sun. In any case the orbits of comets are exposed to such tremendous perturbations from the planets that it is unsafe from the present orbit of a comet to conjecture what that orbit may have been in remote antiquity. On these grounds we discuss the nebular theory without much reference to comets. But even after the omission of all cometary objects we can still count in the solar system upwards of five hundred bodies, almost every one of which pronounces distinctly, though with varying emphasis, in favour of the nebular theory.

The first great fact to be noticed is that the planets revolve around the sun in the same direction. This is true not only of the major planets Mercury, Venus, the Earth, Mars, Jupiter, Saturn, Uranus and

Neptune; it is also true of the host of more than five hundred minor planets. It is also remarkable that all the great planets and many of the small ones have their orbits very nearly in the same plane, and nearly circular in form. Viewed as a question in probabilities, we calculate the chance that five hundred bodies revolving round the sun shall all be moving in the same direction. The improbability of such an arrangement is enormously great. It is represented by the ratio of a number containing about a hundred and sixty figures to unity, and so we are at once forced to the conclusion that this remarkable feature of the planetary motions must have some physical explanation. In a minor degree this conclusion is strengthened by observing the satellites. Discarding those- of Uranus, in which the orbits of the satellites are highly inclined: to the ecliptic, and in which manifestly some exceptional in- fluences have been at work, we find that the satellites revolve; around the primaries also in the same direction; 1 while, to make 1 the argument complete, the planets, so far as they can be observed, rotate on their axes in the same manner.

The nebular theory offers an explanation of this most remark- able uniformity. Laplace supposed the existence of a primeval

1 Exceptions are Saturn ix. (Phoebe), Jupiter vii. (?) and viii., and the satellite of Neptune.

nebula which extended so far out as to fill all the space at present occupied by the planets. This gigantic nebulous mass, of which the sun was only the central and somewhat more con- densed portion, is supposed to have a movement of rotation on its axis. There is no difficulty in conceiving how a nebula, quite independently of any internal motion of its parts, shall also have had as a whole a movement of rotation. In fact a little consideration of the theory of probabilities will show it to be infinitely probable that such an object should really have some movement of rotation, no matter by what causes the nebula may have originated. As this vast mass cooled it must by the laws of heat have contracted towards the centre, and as it contracted it must, according to a law of dynamics, rotate more rapidly. The time would then come when the centrifugal force on the outer parts of the mass ‘would more than counterbalance the attraction of the centre, and thus we would have the outer parts left as a ring. The inner portion will still continue to contract, the same process will be repeated, and thus a second ring will be formed. We

have thus grounds for believing that the original nebula will separate into a series of rings all revolving in the same direction with a central nebulous mass in the interior. The materials of each ring would continue to cool and to contract until they passed from the gaseous to the liquid condition. If the consolidation took place with comparative uniformity we might then anticipate the formation of a vast riiultitude of small planets such as those we actually do find in the region between the orbit of Mars and that of Jupiter. More usually, however, the ring might be expected not to be uniform, and, therefore, to condense in some parts more rapidly than in others. The effect of such contraction would be to draw the materials of the ring into a single mass, and thus we would have a planet formed, while the satellites of that planet would be developed from the still nascent planet in the same way as the planet itself originated from the sun. In this way we account most simply for the uniformity in the direction in which the planets revolve, and for the mutual proximity of the planes in which their orbits are contained.

Such was the nebular theory as it was originally sketched. At the present day when the nebulae that are spiral in form have been shown to be so numerous, next to the fixed stars themselves, our view of the nebular theory has been somewhat modified. It now seems probable that the spiral nebula is the fittest illustration of the transformation of a diffused nebula into a system of sun and planets.

The rotation of the planets on their axes is also explained as a consequence of the nebular theory, for at the time of the first formation of the planet it must haˆe participated in the rotation of the whole nebula, and by the subsequent contraction of the planet the speed with which the rotation was performed must have been accelerated.

There is quite a different method of considering the nebular origin of our system, which leads in a very striking manner to conclusions practically identical with those we have just sketched. We may commence by dealing with the sun as we find it at the present moment, and thence inferring what must have been the progress of events in the earlier epochs of the history of our system.

The daily outpour of heat from the sun at the present time suggests a profound argument in support of the nebular theory. The amount of the sun’s heat has been estimated, but we receive on the earth less than one two-thousand-millionth oart of the whole radiation. It would seem that the greater lart of the rest flows away to be lost in space. Now what supplies this heat? We might at first suppose that the sun

•vas really an intensely heated body radiating out its heat as loes white-hot iron, but this explanation cannot be admitted, for there is no historical evidence that the sun is growing colder. We have not the slightest reason to think that the radiation from the sun is measurably weaker now than it was a couple of thousand years ago, yet it can be shown that, if the sun were merely radiating heat as simply a hot body, then it would cool some degrees every year, and must have cooled

many thousands of degrees within the time covered by historical records. We, therefore, conclude that the sun has some other source of heat than that due simply to incandescence. It might. for example, be suggested that the heat of the sun was supplied by chemical combination analogous to combustion. It would take 20 tons of coal a day burned on each square foot of the sun's surface to supply the daily radiation. Even if the sun were made of one mass of fuel as efficient as coal, that mass must be entirely expended in a few thousand years if the present rate of radiation was to be sustained. We cannot, therefore, admit that the source of the heat in the sun is to be found in any chemical combination taking place in its mass. Where then can we find an adequate supply of heat ? Only one external source can be named: the falling of meteors into the sun must yield some heat just as a shooting star yields some heat to our atmo- sphere, but the question is whether the quantity of heat obtainable from the shooting stars is at all adequate for the purpose. It can be shown that unless a quantity of meteors in collective mass equal to our moon were to plunge into the sun every year the supply of heat could not be sustained from this source. Now there is no reason to believe that meteors in anything like this quantity can be supplied to the sun, and, therefore, we must reject this source as also inadequate.

The truth about the sun's heat appears to be that the sun is really an incandescent body losing heat, but that the operation of cooling is immensely retarded owing to a curious circumstance due jointly to the enormous mass of the sun and to a remarkable law of heat. It is well known that if energy disappears in one form it reappears in another, and this principle applied to the sun will explain the famous difficulty.

As the sun loses heat it contracts, and every pair of particles in the sun are nearer to each other after the contraction than they were before. The energy due to their separation is thus less in the contracted state than in the original state, and as that energy cannot be lost it must reappear in heat. The sun is thus slowly contracting; but as it contracts it gains heat by the operation of the law just referred to, and thus the further cooling and further contraction of the sun is protracted until

the additional heat obtained is radiated away. In this way we can reconcile the fact that the sun is certainly losing heat with the fact that the change in temperature has not been large enough to be perceived within historic times.

It has been estimated that the sun is at present contracting so that its diameter diminishes 10 m. every century; there is, however, now reason to think that the rate of contraction is by no means so rapid as this would indicate. This is an inappreciable distance when compared with the diameter of the sun, which is nearly a million of miles, but the significance for our present purpose depends upon the fact that this contraction is always taking place. Assuming the accuracy of the estimate just made, we see that a thousand years ago the sun must have had a diameter ioo m. greater than at present, ten thousand years ago that diameter must have been iooo m. more than it is now, and so on. We cannot perhaps assert that the same rate is to be continued for very many centuries, but it is plain that the further we look back into the past time the greater must the sun have been.

Dealing then simply with the laws of nature as we know them, we can see no limit to the increasing size of the sun as we look back. We must conceive a time when the sun was swollen to such an extent that it filled up the entire space girdled by the orbit of Mercury. Earlier still the sun must have reached to the earth. Earlier still the sun must have reached to where Neptune now revolves on the confines of our system, but the mass of the sun could not undergo an expansion so prodigious, without being made vastly more rarefied than at present, and hence we are led by this mode of reasoning to the conception of the primaeval nebula from which our system has originated.

Considering that our sun is but a star, or but one of the millions of stars, it is of interest to see whether any other systems present indication of a nebulous origin analogous to that which Laplace

proposed for the solar system. In one of his papers, Sir W. Herschel marshals the evidence which can be collected on this point. He arranges a selection from his observations on the nebulae in such a way as to give great plausibility to his view of the gradual transmutation of nebulae into stars. Herschel begins by showing us that there are regions in the heavens where a faint diffused nebulosity is all that can be detected by the telescope. There are other nebulae in

which a nucleus can be just discerned, others again in which the nucleus is easily seen, and still others where the nucleus is a brilliant star-like point. The transition from an object of this kind to a nebulous star is very natural, while the nebulous stars pass into the ordinary stars by a few graduated stages. It is thus possible to exhibit a series of objects beginning at one end with the most diffused nebulosity and ending at the other with an ordinary fixed star or group of stars. Each object in the series differs but slightly from the object just before it and the object just after it. It seemed to Herschel that he was thus able to view the actual changes by which masses of phosphorescent or glowing vapour became actually condensed down into stars. The condensation of a nebula could be followed in the same manner as we can study the growth of the trees in the forest, by comparing the trees of various ages which the forest contains at the same time. In attempting to pronounce on the evidence with regard to Herschel's theory, we must at once admit that the transmutation of a nebula into a star has never been seen. It is indeed very doubtful whether any changes of a nebula have ever been seen which are of the same character as the changes Herschel's theory would require. It seems, however, most likely that the periods of time required for such changes are immense and that the changes accomplished in only a century or two are absolutely inappreciable.

The nebular theory is a noble speculation supported by plausible argument, and the verdict of science on the whole subject cannot be better expressed than in the words of S. Newcomb: "At the present time we can only say that the nebular hypothesis is indicated by the general tendencies of the laws of nature, that it has not been proved to be inconsistent with any fact, that it is almost a necessary consequence of the only theory by which we can account for the origin and conservation of the sun's heat, but that it rests on the assumption that this conserva- tion is to be explained by the laws of nature as we now see them in operation. Should any one be sceptical as to the sufficiency of these laws to account for the present state of things, science can furnish no evidence strong enough to overthrow his doubts until the su-n shall be found growing smaller by actual measure- ment, or the nebulae be actually seen to condense into stars and systems."

Bibliography. — Laplace, Sysleme du monde; Sir William Herschel, Phil. Trans. (1814), pp. 248-284; Kant's Cosmogony, translated by Professor Hastie; Sir John Herschel, Outlines of Astronomy; Professor S. Newcomb, Popular Astronomy; Lick Observatory' publications, ˆphotographs of Nebulae; Sir Robert Ball, The Earth's Beginning. (R. S. B.)

NECESSITAS (Gr. ‘Avaytcrj), in Orphic theology, the personifica- tion of absolute necessity. She appears as the mother of the Moerae (Fates), as the wife of Demiurgus (Fashioner of the World) and mother of Heimarmene (Destiny). Her power is irresistible, even greater than that of the gods; to her was due the strife (battles with Titans, Giants) that raged amongst them of old, before the rule of love began; the world revolves round the spindle, which she holds in her lap. According to the Egyptian theory, she is one of the four deities present at the birth of every human being, her companions being the Daemon (guardian spirit), Tyche (Fortune) and Eros. On the citadel of Corinth there was a temple sacred to her and Bia (Violence), which none were permitted to enter. The Roman Necessitas is represented in the well-known ode of Horace (i. 35) as the fore- runner and companion of Fortuna, holding in her brazen hand huge nails, a clamp and molten lead, symbolical of fixedness and tenacity.

See Plato, Rep. 616 c, Symp. 195 c, 197 b; Macrobius, Saturnalia, i. 19; Pausanias ii. 4. 6.

NECESSITY (Lat. necessitas), a term used technically in philosophy for the quality of inevitable happening; for example, hot air necessarily tends to rise. Thus it corresponds in the sphere of action to certainty in the sphere of knowledge. That the sun will rise to-morrow is a necessary event ; and men anticipate the rising with certainty. In ordinary language the conception of necessity is rendered meaningless by being referred to the present or even to the past. A current definition of necessity is ” the state which cannot be otherwise than it is.” Such a definition tells us nothing. How can any state be otherwise than it is? Necessity can have meaning only in reference to the future: it means absence of spontaneous power in that which acts necessarily. For the origin of the conception we must look to our inward personal experience of constraint. When we are acting under physical or mathematical or logical or moral necessity we are so far precluded from spontaneous action — in common phrase, we can do no otherwise — though the causes of constraint may be of very different kinds. In ethics the term necessitarianism is applied to that view of human action which regards all action as dictated by external causes (cf . Determinism). The sense in which, if at all, the human mind can cognize necessity, i.e. causal connexion between events or states, has been the subject of vigorous discussion among philosophers. By sceptics and empiricists it is held that a law is merely a crystallized summary of observed phenomena. Thus J. S. Mill denies that a general proposition is more than an enumeration of particulars, and hence that syllogistic reasoning cannot amplify knowledge (see Syllogism). It is clear that the senses cannot apprehend causal connexion, and this

impossibility gives rise to a prior conception according to which the conception of necessity is purely intellectual (see Metaphysics).

NECK (O. Eng. hnecca; the word appears in many Teutonic languages; cf. Dutch nek, Ger. Nacken; in O. E. the common word was heals; cf. Ger. Hals), that part of the body which connects the head with the trunk (see Anatomy: Superficial and Artistic). The word is transferred to many objects resembling this part of the body in shape or function; it is thus applied to an isthmus, or to the narrowest portion of a promontory, to the narrow part of a musical stringed instrument connecting the head and body, as in the violin, or to a narrow pass between mountains, which in the Dutch form nek, appears in place-names in South Africa. In architecture, the ” neck ” is that part of the capital just above the ” astragal,” and the term ” necking ” is applied to the annulet or round, or series of horizontal mouldings, which separates the capital of a column from the plain part or a shaft. In Romanesque work this is sometimes corded.

In Geology, the term ” neck ” is given to the denuded stump of an extinct volcano. Beneath every volcano there are passages of conduits up which the volcanic materials were forced, and after the mass has been levelled by denudation there is always a more or less circular pipe which marks the site of the crater. This pipe, which is filled with consolidated ashes or with crystalline lava, is the characteristic of a volcanic neck. Active volcanoes often stand on the sea-bottom and when the eruption comes to an end the volcano is slowly buried under layers of sediment. In tropical seas the coral animals cover over the submarine volcanoes which rise nearly to the surface and form great reefs of limestone around them. Should elevation take place after long ages the removal of the overlying strata will bring the volcanic mass to light, and in the normal course of things this will suffer denudation exactly like a recent volcano. Many instances of this are furnished by the geological history of the British Isles. In Carboniferous times, for example, before the Coal-measures were deposited, a shallow sea occupied the southern part of Scotland and the north of England. Volcanic activity broke out on the sea- bottom, and many volcanic cones, both small and large, were pro- duced. These have long since been uplifted and the superjacent strata denuded away over a large part of the area which they occu- pied. In Derbyshire, Fife, the Lothians and the Glasgow district the remains of Carboniferous volcanoes occur in every state of preservation. Some have the conical hills of lavas and ashes well preserved (e.g. Largo Law in Fifeshire) ; others retain only a small part of the original volcanic pile (e.g. Arthur’s Seat, Edinburgh; the Binn of Burntisland) and of the larger number nothing remains but the ” neck ” which show,s where once

the crater was situated.

In regions of former volcanic activity necks are the most persistent of all volcanic structures, because the active volcanic magma lis located deep within the earth's crust, and the pipe by which it ris"s> to the surface is of great length and traverses a great thickness

strata. Many volcanic necks stand on lines of fault. In other cases there are groups of necks lying in a straight or sinuous line, which may indicate the position of a fracture or at least of a line of least resistance. But in Scotland it is often impossible to adduce any evidence of the connexion between faults or fissures and the position of volcanic necks; and it seems likely that the pressure of the gases in the igneous magma increased till an explosion took place which perforated the rocks above with a clean tubular passage often nearly circular in cross section. This pipe was usually vertical, and nearly uniform in diameter for great depths; the material occupying it, when exposed by denudation, has a circular ground plan, or if shown in vertical section (or elevation) in a cliff is a pillar-shaped mass crossing the bedding planes of the strata nearly at right angles. It terminates upwards in the remains of the volcanic cone and com- municates below with the reservoir from which the lavas were emitted, represented in most cases, where it has been exposed, by a large irregular mass (a batholith or boss) of coarsely crystalline igneous rock. The site of such a neck is generally indicated by a low conical hill consisting of volcanic rock, surrounded by sedi- mentary or igneous strata of a different kind. The low cone is due to the greater hardness and strength of the volcanic materials and is not connected with the original shape of the volcano. Such hills are common in some parts of Scotland and well-known examples are Arthur's Seat and the Castle Rock (Edinburgh), North Berwick Law, the Bass Rock; they occur also in the Peak district of Derbyshire, and the Wolf Rock off the coast of Cornwall is probably a neck. Two splendid sugar-loaf cones known as the Pitons of St Lucia in the West Indies, rising from the sea with almost vertical sides to a height of nearly 3000 ft., are old volcanic necks. In Texas, New Mexico, Arizona, California and many of the western states of North America geologists have observed conical volcanic hills having all the features which belong to necks.

Where the volcanic rocks are soft and easily disintegrated they may be reduced more rapidly than the strata around them and the position of

a neck may be indicated by a cup-shaped hollow; this is the case with some of the diamond-bearing basic pipes of South Africa. Sometimes necks are encountered in underground mining operations; in the coal-field of Fife, for instance, the coals are sometimes replaced by a circular mass of volcanic rock, a quarter of a mile or more in diameter, which rise Vertically to the surface. Better examples are the Kimberley diamond mines. The blue-ground (or serpentine breccia) occupies great pipes or funnels, circular in outline with nearly vertical sides, extending downwards to un- known depths; these are undoubtedly the necks of old volcanoes. If any lavas were poured out from these pipes at the surface they have since been carried away by denudation.

The size of necks varies considerably; the smallest may be only 20 or 30 yds. in diameter, the largest are several miles. In this respect they resemble active craters, but no necks have been met with on the earth's surface with dimensions approaching those of the so-called " craters " of the moon. Small necks are usually simple, i.e. they contain only one or two kinds of igneous rock (ashes and dikes) and have been produced, so far as we can judge, by a single eruption. Not infrequently they contain no volcanic rock but are filled with pieces of slate, sandstone or whatever strata the pipe traverses. Such necks must have been produced by a single eruption with an outburst of steam, not followed by lava; the disrupted fragments of the surrounding rocks and the materials tumbling down from the crater's walls ultimately filled up the cavity. Instances occur in Fifeshire and in Shetland, and among the recent volcanoes of the Eiffel there are some which have thrown out more slate and sandstone than lava.

Large necks, on the other hand, are often of complex structure, contain many kinds of rock and seem to have been produced by repeated eruptions, each of which more or less completely cleared out the material obstructing the orifice, and introduced a series of fresh accumulations. The beds of ashes which line the interior of an active crater have in nearly all cases a slope or dip towards a central point where the base of the depression is situated, and in volcanic necks which have been filled with ash (tuffs and agglomerates) this funnel-like inward dip is very constant. If there has been only a single eruption the beds of ashes have a very conformable or uniform arrangement, but if activity has been resumed after a period of quiescence a large part of the old material may have been projected and a new series of beds laid down, transgressing unconformably the edges of the earlier ones. By these structures we can sometimes trace a neck within a neck, or of a lateral crater on the margin of a principal one.

Where the crater has filled up with very coarse ashes, or agglomerate, the bedding is rarely visible. Sometimes large empty craters were occupied temporarily by lakes, and level sheets of mud and silt have gathered on their floors: hence bedded sediments are not infrequently found in volcanic necks. Mixed with the volcanic ashes and bombs there are often large broken pieces of sedimentary rocks which may have been crystallized and hardened by the heat and vapours emitted by the volcano. Sometimes great fragments of the walls have foundered or collapsed into the crater, and masses of ncn- volcanic rock, an acre or more in extent, may occur in a volcanic neck. In Arran, for example, there is a large neck which contains lumps of Cretaceous rocks nowhere else known to occur on the island ; they

have fallen down from strata once occupying part of the walls of the crater but now removed by denudation.

The lava which rises and flows out from the crater leaves its trace also in the necks. Sometimes it forms thin beds or flows alternating with the tuffs and having the same basin-shaped dip. More commonly it appears as the material filling fissures and pipes, traversing the ashes irregularly or rising as a central plug in the interior of the neck, and sending out branching veins. Occasionally a whole neck is composed of solid crystalline rock representing the last part of the magma which ascended from the underground focus and con- gealed within the crater. In Mont Pelee, for instance, the last stage of the eruptions of 1 902 to 1905 was the protrusion of a great column of solidified lava which rose at one time to a height of 900 ft. above the lip of the crater, but has since crumbled down. The Castle Rock of Edinburgh is a neck occupied by a plug of crystalline basalt. Necks of this kind weather down very slowly and tend to form prominent hills.

After the eruptions terminate gases or hot solutions given out by deep-lying masses of molten rock may find a passage upward through the materials occupying the crater, greatly modifying their mineral nature and laying down fresh deposits. A good example of secondary deposits within a volcanic neck is provided by the Cripple Creek mining district of Colorado. The ore-bearing veins are connected with volcanic rocks and part of these occupy a vertical circular pipe which is a typical volcanic neck. A phonolitic breccia, greatly altered, is the principal rock, and is cut by dikes of phonolite, dolerite, &c. The country rock is mostly granite and gneiss, and blocks of these are common in the breccia. A large volcano was built up in Tertiary times on the granite plateau, and has since been almost entirely removed by denudation. The gold ores were carried upwards by currents of hot water derived from the volcanic magma and were deposited along cracks and

fissures in the materials which occupied the crater, and also in the surrounding rocks (see Volcano).

(J. S. F.) NECKAM, ALEXANDER (1157-1217), English schoolman and man of science, was born at St Albans in September 11 57, on the same night as King Richard I. Neckam's mother nursed the prince with her own son, who thus became Richard's foster- brother. He was educated at St Albans Abbey school, and began to teach as schoolmaster of Dunstable, dependent on St Albans Abbey. Later he resided several years in Paris, where by 1180 he had become a distinguished lecturer of the university. By 1 186 he was back in England, where he again held the place of schoolmaster at Dunstable. He is said to have visited Italy with the bishop of Worcester, but this statement has been doubted; the assertion that he was ever prior of St Nicolas, Exeter, seems a mistake: on the other hand, he was certainly much at court during some part of his life. Having become an Augustinian canon, he was appointed abbot of Cirencester in 1213. He died at Kempsey in Worcestershire in 1217, and was buried at Worcester. Besides theology he was interested in the study of grammar and natural history, but his name is chiefly associated with nautical science. For in his De naturis rerum and De utensilibus (the former of which, at any rate, had become well known at the end of the 1 2th century, and was probably written about 1.180) Neckam has preserved to us the earliest European notices of the magnet as a guide to seamen — outside China, indeed, these seem to be the earliest notices of this mystery of nature that have survived in any country or civilization. It was probably in Paris, the chief intellectual centre of his time, that Neckam heard how a ship, among its other stores, must have a needle placed above a magnet (the De utensilibus assumes a needle mounted on a pivot), which needle would revolve until its point looked north, and thus guide sailors in murky weather or on starless nights. It is noteworthy that Neckam has no air of imparting a startling novelty: he merely records what had apparently become the regular practice of at least many seamen of the Catholic world.

See Thomas Wright's edition of Neckam's De naturis rerum and De laudibus divinae sapientiae in the Rolls Series (1863), and of the De utensilibus in his Volume of Vocabularies. Neckam also wrote Corrogationes Promethei, a scriptural commentary prefaced by a treatise on grammatical criticism ; a translation of Aesop into Latin elegiacs (six fables from this version, as given in a Paris MS., are printed in Robert's Fables inedites); commentaries, still unprinted, on portions of Aristotle, Martianus Capella and Ovid's Meta- morphoses, and other works. Of all these the De nat. rer., a sort of manual of the scientific knowledge of the 12th century, is much the most important:

the magnet passage herein is in book ii. chap, xcviii. (De vi attractiva), p. 183 of Wright's edition. The correspond- ing section in the De utensil, is on p. 114 of the Vol. of Vocabs,

Roger Bacon's reference to Neckam as a grammatical writer (in

multis vera et utilia scripsit: sed . . . inter auctores non potest . . . numerari) may be found in Brewer's (Rolls Series) edition of Bacon's Opera inedita, p. 457. See also Thomas Wright, Biographia Britannica literaria, Anglo-Norman Period, pp. 449-459 (1846: some points in this are modified in the 1863 edition of De nat. rer.) ; C. Raymond Beazley, Dawn of Modern Geography, iii. 508-509.

(C. R. B.)

NECKAR, a river of Germany, and a right-bank tributary of the Rhine, rises between the Black Forest and the Swabian Alb, near Schwenningen, in Wurttemberg, at an altitude of 2287 ft. As far as Rottweil only a mountain stream, it here attains the volume of a river, flows N. as far as Horb, thence in a north-easterly direction, and with rapid current it passes Rottenburg and the university town of Tubingen, taking then a generally northerly course. From Esslingen the Neckar becomes broader and deeper and its valley very picturesque, and after passing Cannstatt, from which point it is navigable for small craft, it flows through vine-clad hills by the pleasant village' of Marbach, Schiller's birthplace, receives at Besigheim the waters of its most considerable tributary, the Enz, swirls down by Lauffen, and enters the beautiful vale of Heilbronn. Hence, between hills crowned by frequent feudal castles, it runs by Wimpfen and by Hornberg, where Gotz von Berlichingen lived, to Eberbach, where it enters the sandstone formation of the Odenwald. It now takes a tortuous westerly course, and the scenery on its banks becomes more romantic. Winding down by Neckarsteinach and Neckargemiind between lofty wooded heights, it sweeps beneath the Konigsstuhl (1900 ft.), washes the walls of Heidelberg, and now quitting the valley enters the plain of the Rhine and falls into that river from the right at Mannheim. Its length is 247 m., and its drainage area 4790 sq. m. Its more important tributaries are the Enz, Eschach and Glatt (left), and the Fils, Rems, Kocher and Jagst (right). It is navigable for small steamboats up to Heilbronn, for boats up to Cannstatt, and for rafts from Rottweil. It is the principal waterway of

Wurttemberg, and is greatly used for floating down timber. From Rottenburg downwards its banks are almost everywhere planted with vineyards. Up to Frankfort it has been deepened and the channel otherwise improved. A com- mittee, chiefly promoted by the Wurttemberg government and the Stuttgart chamber of commerce, reported in 1901 that it was both desirable and practicable to dredge the river and to canalize it, from Esslingen down to Mannheim, and that the cost would probably be between 2 and 2! millions sterling. See T. Eckart, Bilder aus dent Neckartal (1893). NECKARGEMUND, a town and climatic health resort of Germany, in the grand duchy of Baden, situated amid densely wooded hills, on the left bank of the Neckar, 6 m. E. from Heidelberg by the railway to Wurzburg and at the junction of a line to Jagstfeld. Pop. (1905) 2200. It has an important trade in wine. The other industries are quarrying, tanning and shipbuilding, and there are electrical works. Neckargemiind, one of the favourite tourist resorts in the Neckar valley, was founded in the 10th century and became a free town in 1286. In 1395 it passed to the elector palatine and, together with the surrounding district, was apportioned to Baden in 1814.

NECKER, JACQUES (1732-1804), French statesman, finance minister of Louis XVI., was born at Geneva in Switzerland. His father was a native of Ciistrin in Pomerania, and had, after the publication of some works on international law, been elected as professor of public law at Geneva, of which he became a citizen. Jacques Necker had been sent to Paris in 1747 to become a clerk in the bank of a friend of his father, M. Vernet. He soon afterwards established, with another Genevese, the famous bank of Thellusson & Necker. Thellusson superintended the bank in London (his grandson was made a peer as Lord Rendles- ham), while Necker was managing partner in Paris. Both partners became very rich by loans to the treasury and specula- tions in grain. In 1763 Necker fell in love with Madame de Vermenou, the widow of a French officer. But while on a visit to Geneva, Madame de Vermenou met Suzanne Curchod, the daughter of a pastor near Lausanne, to whom Gibbon had been

engaged, and brought her back as her companion to Paris in 1764. There Necker, transferring his love from the widow to the poor Swiss girl, married Suzanne before the end of the year. She encouraged her husband to try and make himself a public position. He accordingly became a syndic or director of the French East India Company, and, after showing his financial ability in its management, defended it in an able memoir against the attacks of A. Morellet in 1769. Meanwhile he had made interest with the French government by lending it money, and was appointed resident at Paris by the republic of Geneva.

Madame Necker entertained the chief leaders of the political, financial and literary worlds of Paris, and her Fridays became as greatly frequented as the Mondays of Madame Geoffrin, or the Tuesdays of Madame Helvetius. In 1773 Necker won the prize of the Academie Francaise for an iloge on Colbert, and in 1775 published his Essai sur la legislation et le commerce des grains, in which he attacked the free-trade policy of Turgot. His wife now believed he could get into office as a great financier, and made him give up his share in the bank, which he transferred to his brother Louis. In October 1776 Necker was made finance minister of France, though with the title only of director of the treasury, which, however, he changed in 1777 for that of director-general of the finances. He did great good in regulating the finances by attempting to divide the taille or poll tax more equally, by abolishing the " vingtieme d'industrie," and establish- ing monts de piste (establishments for loaning money on security). But his greatest financial measures were his attempt to fund the French debt and his establishment of annuities under the guarantee of the state. The operation of funding was too difficult to be suddenly accomplished, and Necker rather pointed out the right line to be followed than completed the operation. In all this he treated French finance rather as a banker than as a profound political economist, and thus fell far short of Turgot, who was the very greatest economist of his day. Politically he did not do much to stave off the coming Revolution, and his establishment of provincial assemblies was only a timid applica- tion of Turgot's great scheme for the administrative reorganiza- tion of France. In 1781 he published his famous Compte rendu, in which he drew the balance sheet of France, and was dismissed from his office. Yet his dismissal was not really due to his book, but to the influence of Marie Antoinette, whose schemes for benefiting the due de Guines he had thwarted. In retirement he occupied himself with literature, and with his only child, his daughter, who in 1786 married the ambassador of Sweden and became Madame de Stael (

by contriving the decree of November 7, by which the ministry might not be chosen from the assembly. Financially he proved equally incapable for a time of crisis, and could not understand the need of such extreme measures as the establishment of assignats in order to keep the country quiet. His popularity Vanished when his only idea was to ask the assembly for new loans, and in September 1790 he resigned his office, unregretted by a single Frenchman. Not without difficulty he reached Coppet, near Geneva, an estate he had bought in

1784. Here he occupied himself with literature, but Madame Necker pined for her Paris salon and died in 1794. He continued to live on at Coppet, ‘under the care of his daughter, Madame de Stael, and his niece, Madame Necker de Saussure, but his time was past, and his books had no political influence. A momentary excitement was caused by the advance of the French armies in 1798, when he burnt most of his political papers. He died at Coppet in April 1804.

Authorities. — Memoires sur la vie privee de M. Necker (Paris and London, 1818), by his daughter, Madame de Stael-Holstein, and the Notice sur la vie de M, Necker (Paris, 1820), by Auguste de Stael-Holstein, his grandson, published in the collection of his works edited by the latter in 1820-182 1 (Paris, 15 vols.). The bibliography of his works is ,as follows: — Reponse au memoire de M. I’ Abbe Morellet (1769); l&loge de J. B. Colbert (1773); Essai sur la legislation et le commerce des grains (1775); Compte rendu au roi (1781); De V administration des finances de la France (3 vols., 1784); Memoire en reponse au discours prononce par M. de Calonne (1787); De V importance des opinions religieuses (1788); Sur I’ administration de M. Necker, par lui-meme (1791); Du pouvoir executif dans les grands Hats (2 vols., 1792); Reflexions sur le prods de Louis XVI. (1792); De la revolution francaise, several editions, the last in 4 vols. (1797); Cours de la morale religieuse (1800); Derniires vues de politique et de finance (1802); Manuscrits de M. Necker, published by his daughter (1804); Suites funestes d’une seule faute, published after his death. See also Le Salon de Madame Necker, by the Vicomte d’Haussonville (2 vols., 1882), compiled from the papers at Coppet; Ch. Gomel, Les Causes financier es de la revolution francaise (Paris, 1 892) ; and for contemporary tracts and pamphlets M. Tourneux, Bibl. de I’histoire de Paris pendant la revolution (vol. iv., 1906); also (for the earlier ones) Collection complete de tous les outrages pour et contre M. Necker, avec des notes critiques . . . (3 vols., Utrecht, 1781).

(H. M.S.; J. T. S.*)

NECROLOGY (from Med. Lat. necrologium, Gr. veicpos, corpse, the termination being formed from Xbyios, \eyei.v to read, in the sense of list, register; cf. ” martyrology “), a register in a monastery or other ecclesiastical establishment of the names of the deceased members of the society, or of those for whom the prayers of the foundation were offered as benefactors; hence any roll or list of deceased persons or collection of obituaries.

NECROMANCY (Gr. veKpoimvrda, or veKvo/xavrela, from veKpos or veKvs, corpse, and ixavreia, divination), properly divination by

communicating with the dead. The latinized form of the Greek word was corrupted into nigromantia, con- necting the word with niger, black, and so was applied to the ” black art,” ” black magic,” in the sense of witchcraft, sorcery. This corrupted form is common in English to the 17 th century (see Magic and Witchcraft).

NECROPOLIS, a cemetery (q.v.) or burying-place, literally a ” city of the dead ” (Gr. vtupos, corpse, and toXis, city). Apart from the occasional application of the word to modern cemeteries outside large towns, the term is chiefly used of burial- grounds near, the sites of the centres of ancient civilizations.

NECROSIS (Gr. vtKpos, corpse), a term restricted in surgery to death of bone. A severe inflammation, caused by a violent blow, by cold, or by the absorption of various poisons, as mercury and phosphorus, is the general precursor of necrosis. The dead part, analogous to the slough in the soft tissues, is called a sequestrum or exfoliation. At first it is firmly attached to the living bone around; gradually, however, the dead portion is separated from the living tissue. The process of separation is a slow one. New bone is formed around the sequestrum, which often renders its removal difficult. As a rule the surgeon waits until the dead part is loose, and then cuts down through the new case and removes the sequestrum. The cavity in which it lay gradually closes, and a useful limb is the result.

NECTAR, in ancient mythology generally coupled with am- brosia, the nourishment of the gods in Homer and in Greek literature generally. Probably the two terms were not originally distinguished; but usually both in Homer and in later writers nectar is the drink and ambrosia the food. On the other hand, in Alcman nectar is the food, and in Sappho and Anaxandrides ambrosia the drink. Each is used in Homer as an unguent (Iliad, xiv. 170; xix. 38). Both are fragrant, and may be used as perfume. According to W. H. Roscher (Nektar und Am- brosia, 1883; see also his article in Roscher’s Lexikon der Mytho- logie) nectar and ambrosia were originally only different forms of the same substance — honey, regarded as a dew, like manna, fallen from heaven, which. was used both as food and drink. (See also Ambrosia.)

NEED-FIRE, or Wild-Fire (Ger. Notfeuer, O. Ger. nodfyr), a term used in folklore to denote a curious superstition which survived in the Highlands of Scotland until a recent date. Like the fire-churning still customary in India for kindling the, sacri- ficial fire, the need- or wild-fire is made by the friction of one piece of wood on another, or of a rope upon a stake. Need-fire is a practice of shepherd peoples to ward off disease from their herds and flocks. It is kindled on occasions of

special distress, particularly at the outbreak of a murrain, and the cattle are driven through it. Its efficacy is believed to depend on all other fires being extinguished. The kindling of the need-fire in a village near Quedlinburg was impeded by a night light burning in the parsonage (Profile, Harz-Btider, Leipzig, 1855). According to one account, in the Highlands of Scotland the rule that all common fires must be previously extinguished applied only to the houses situated between the two nearest running streams (Kelly, Curiosities of Indo-European Tradition and Folklore, p. 53 seq.). In Bulgaria even smoking during need-fire is forbidden. Two naked men produce the fire by rubbing dry branches together in the forest, and with the flame they light two fires, one on each side of a cross-road haunted by wolves. The cattle are then driven between the two fires, from which glowing embers are taken to rekindle the cold hearths in the houses (A. Strausz, Die Bulgaren, p. 198). In Caithness the men who kindled the need-fire had previously to divest themselves of all metal. In some of the Hebrides the men who made the fire had to be eighty-one in number and all married. In the Halberstadt district in Germany, the rope which was wound round the stake, must be pulled by two chaste boys; while at Wolfenbiittel, contrary to usual custom, it is said that the need-fire had to be struck out of the cold anvil by the smith. In England the need-fire is said to have been lit at Birtley within the last half-century. The superstition had its origin in the early ideas of the purifying nature of flame.

See also Grimm, Deutsche Mythologie, i. 501 sqq. ; Kelly, Curio- sities of Indo-European Tradition and Folklore, p. 48 sqq. ; Elton, Origins of English History, p. 293 sqq. ; J. G. Frazer, The Golden Bough, iii. 301.

NEEDLE (0. Eng. ncedi; the word appears in various forms in Teutonic languages, Ger. Nadel, Dutch naal, the root being ne-, to sew, cf. Ger. ndhen, and probably Lat. nere, to spin, Gr. vfjcrt.s, spinning), an instrument adapted for passing a thread through fabrics in sewing, consisting of a thin rod of steel, having a pointed end and pierced with a hole or ” eye ” to carry the thread. The term is also applied to various other objects that more or less resemble a sewing needle in form, though differing in function, such as the magnetized piece of steel that points north and south in the mariner’s compass, the pointer or indicator of certain forms of electric telegraph instruments, the slender tube by which the contents of a hypodermic syringe are injected beneath the skin, a sharp-pointed mountain peak or isolated mass of rock, &c.

Sewing needles have been in use from prehistoric times. Originally they were made of fishbone, bone or ivory, and their first form was

probably a rude bodkin having a hook instead of an eye, though bone needles with an eye, sometimes at the end and sometimes in the middle, have been found in cave de- posits in Great Britain and France and in the Swiss lakes. Bone

needles continue to be used by uncivilized tribes, but since the discovery of bronze metal needles have been employed in civilized communities. Steel needles were introduced into Europe by the Moors, and it is on record that they were being made at Nuremberg in 1370. In England their manufacture was estab- lished about 1650. The centre of the trade in England is Redditch, in Worcestershire, with several other small towns in Warwickshire. Originally the industry was domestic in its character, but it is now carried on in factories where mechanical appliances have to a great extent supplanted handwork. Large quantities of needles are also manufactured on the continent of Europe, Aix-la-Chapelle being an important centre of their production. In the United States ordinary sewing needles are not made, though there is a large output of the special forms used in sewing machines.

The raw material of needle-manufacture consists of Sheffield crucible steel drawn down into wire of suitable gauge. The wire is supplied in coils of definite weight and diameter, and the first operation is to cut the coils into lengths, each sufficient for two needles. These lengths are next straightened. For this purpose a bundle containing several thousand lengths is packed within two strong iron rings, is heated to red heat, and is then pressed on an iron plate having two parallel grooves in which the iron rings run. Over this plate the bundle is worked backward and forward by the pressure of an oblong slightly curved iron tool having two longitudinal slits through which the edges of the rings project. Thus, by combined pressure and rolling the whole of the lengths quickly become perfectly straight and even. The next operation consists in pointing both ends of the wires. This was formerly done by hand by a grinder who, holding several dozen wires against a grindstone with his left hand and slightly revolving them with his right, was able to point about 100,000 needles a day, the number depending, however, to some extent on the size treated. This method, however, is now largely superseded by machinery, which is still more expeditious. The wires are fed out from a hopper to a revolving wheel, on the periphery of which they are held by an india-rubber band. This wheel revolves at .right angles to a revolving

hollow grindstone, and so each wire is brought up to the stone in rapid succession and pointed at one end, the process being repeated for the other end. The next operations are to stamp the grooves which are to be found at the head of a needle and to punch the oval eyes, both being done by automatic machinery. Kach wire now forms two needles attached head to head by a broad thin scarf of steel. The operation of separating them is largely per- formed by machines which pass the double blanks over the face of an emery wheel, but an older method is to spit them on two flattened wires, clamp them tightly in a frame, file away the scarf and break the blanks in halves, so that two lots of single needles are obtained, each spitted on a wire. The next step, after the heads have been filed smooth, is to harden and temper the needles, which are heated to redness, plunged into cold oil, and then gently heated by being placed on a continuous band passing over a series of gas flames. After the tempering comes the process of scouring, and then the eyes are smoothed and polished so that they will not cut the thread. For this purpose the heads used to be softened by blueing, and the needles string loosely on wires covered with a paste of emery and oil. These wires were then suspended between uprights on a frame platform to which a jerking motion was communicated; in this way the needles were made to swing on the wires and the gentle friction effected the desired end. Generally, however, the eyes are cleared by the action of a concave wire brush, before the scouring process, and then subsequent burnishing becomes unnecessary. The bodies are next polished by being passed between revolving leather rollers which have also a lateral motion in the direction of their axes. The heads of the finished needles have now to be brought all in one direction. Formerly this was done by a " header," wearing a cloth cap on one of her fingers; this being pressed against a batch of the needles which had previously been arranged parallel to each other, those whose heads were presented to the cloth stuck in it and thus were with- drawn. A more modern device is to roll them down a smooth in- clined plane, when the pointed ends, owing to their conical form, travel more slowly than the thicker ends, and thus the needles are all brought round so that they point the same way. They are then sorted according to their lengths, and are done up into packets for the market.

Besides ordinary needles for hand sewing, many varieties are made for use in sewing machines, and in their production automatic machinery is largely utilized. Those used for sewing leather have points of various special forms (twist, chisel, wedge, diamond, &c.) instead of the round point of the ordinary needle, and sometimes have a hook in place of an eye. Knitting needles are long slender rods, usually of steel

but sometimes of bone or other material, having neither hooks nor eyes. Crochet needles are provided with a hook.

Hooked needles again are employed in knitting and stockinet machines; having to be periodically closed by the operation of the mechanism the hooks in one type are made flexible so that they can

be pushed down on the shank, while in another the same end is served by providing them with a minute latch. Another special class is constituted by the numerous varieties of .needles used by surgeons for suturing wounds, &c. (see Surgical Instruments).

NEEDLE-GUN (Zundnadelgewehr), a military breech- loading rifle, famous as the arm of the Prussians in 1866 and of the Germans in 1870-1871. It was the invention of the gunsmith Johann Nicholas von Dreyse (1 787-1867), who, beginning in 1824, had made many experiments, and in 1836 produced the complete needle-gun. From 1841 onwards the new arm was gradually introduced into the Prussian service, and later into the military forces of many other German states. Dceyse was ennobled in 1864. The principal details of the arm (pattern 1 841) are as follows: —

Breech Bolt system

Calibre -607 in.

Weight without bayonet . 10 lb 4 oz.

Charge (black powder) . 74-15 grains

Bullet (lead) . . . 478 grains

Muzzle velocity . . 1000 f.s.

Sighted to … . 800 paces (656 yds.)

In practice the needle-gun proved to have numerous defects; its effective range was very short compared to that of the muzzle- loading rifles of the day, and conspicuously so as against the chassepot: the escape of gas at the breech was, moreover, very great. A paper cartridge was used. An improved model, giving greater muzzle velocity and increased speed in loading, was introduced later, but this was soon replaced by the Mauser rifle.

NEEDLEWORK. This subject may be considered under the two headings of (1) Plain Needlework, used for purely utilitarian purposes,

and (2) Art Needlework for decorative purposes. Plain needlework requires no such further explanation as may be given in the case of art needlework, under which title are included (a) embroidery, and (b) other methods of decorative needlework, such as applied or applique work, ornamental quilting, patchwork and couching. In these last-mentioned methods the needlework is subservient to the decorative effect, which depends almost wholly upon the materials selected for the purpose; whereas in embroidery the needlework itself constitutes and is the visible decoration. The aim of this article is to indicate briefly different stitches of plain needlework and then to show that these stitches are also used in the domain of art needlework.

The more necessary stitches in plain needlework for making clothes are tacking, running, hemming, feather-stitching or herring-boning (all of which are practically of the same type), and button-holing in which the thread is looped as each stitch is made. Button-holing is allied to another looped stitch, namely chain-stitching, which though frequently used ia em- broidery is rarely if ever used in plain needlework. For repairs of clothes and household linen, &c, the principal stitch is darning; grafting, however, is a substitute for it, and varies with the character of the stuff to be repaired, e.g. knitted stockings, damask linen, cloth, &c. Darning is allied to running, and graft- ing to patchwork. Patchwork as a form of decorative needle-work is exemplified in sumptuous canopies and seat covers made several centuries B.C. by Egyptians, and rich hangings made by Italian and French workers in the 16th century.

Long and short stitches, kindred in principle to the running stitch in plain needlework, are perhaps the more frequent of any stitches used in embroidery, and are especially appropriate when the blending of tints with a flat even surface is the effect to be aimed at. Much medieval work of this character, as well as that done with chain stitch and its allied split stitch, is re- garded as typical of opus anglicanum. Chain stitch produces a comparatively broken surface in decided contrast with the smooth one of long and short stitch, split stitch and satin stitch embroidery. Satin stitch is well adapted to express, with even flat surface in designs for colour effects, each mass which is to be of one tint. In this respect, therefore, satin stitch serves a purpose in contrast to that of long and short stitch. A charac- teristic oi satin-stitching is the sheeny effect produced, on both

sides of the material embroidered, by parallel stitches taken closely together. Buttonhole stitch in relation to art needle- work prevails to a great extent in cut linen and drawn-thread work (often called Greek lace), and predominates in the making of needlepoint lace (see Lace). In much of the Persian drawn-thread work, however, it is superseded by whipping or tightly and closely twisting a thread round the undrawn threads of the linen. Whip- ping has been put to another use in certain 16th-century art needlework for ecclesiastical purposes, where round the gold threads employed as the ground of a design coloured silks are dexterously whipped, closely and openly, producing gradations of tint suffused with a corresponding variation of golden shimmer. Another important branch of art needlework with gold and silver threads is couching. When the metallic threads, arranged so as to lie closeiy together, are simply stitched flatly to the found- ation material, the work is called flat couching or laying, a kind of treatment more frequent in Chinese and Japanese than in European art needlework. Flat couching is also carried out with floss silks. When a design for couching includes effects in relief, stout strings or cords as required by the design are first fastened to the foundation materials, and over them the metallic threads or in some cases coloured gimps are laid, and so stitched as to have an appearance in miniature of varieties of willow-twisting or basket work.

The principle of relief couching is carried much further in certain English art needlework, having cumbersome and gro- tesque peculiarities, which was done during the reigns of the Stuarts. Crude compositions were wrought in partial relief with padded work, of costumed figures of kings and queens and scriptural persons with a medley of disproportionate animals, insects and trees, &c, in which foliage, wings, &c, wereof coloured silk needlepoint lace — the whole being set as often as not in a background of tent or cross-stitch work on canvas. But tent and cross-stitch work (in French point comptS) was also used by ‘itself for cushion covers and later for upholstery. In its earlier phases it seems to come under the medieval classification of opus pulvinarum. The reticulations of the canvas or those apparent in finer material governed the stitching and imparted a stiff formal effect to the designs so carried out, a characteristic equally strong in the lads work, or darning on square mesh net (see Lace).

Applique or applied work belongs as much as patchwork to the medieval category of opus consutum, or stitching stuffs together according to a decorative design, the greater part of which was cut out of material different in colour, and generally in texture, from that of the ground to which it was applied and stitched. Irish art needlework, called Carrickmacross lace, is for the most part of cambric applied or

applique to net.

Quilting is also a branch of art needlework rather than em- broidery. Indians and Persians using a short running stitch have excelled in it in past times. Some good quilting was done in England in the 18th century with chain-stitching which lay on the inner side of the stuff, the outer displaying the design in short stitches. In the account of his voyage to the East Indies, published in 1655, Edward Terry (1590-1665) writes of the Indians " making excellent quilts of satin lined with taffeta betwixt which they put cotton wool and worked them together with silk." For less bulky quilting, cords have been used; and elaborate designs for quilted linen waistcoats were well done in the 18th century, with fine short stitches that held the cords between the inner and outer materials.

A large number of names have been given to the many modifica- tions of the limited number of essentially different stitches used in plain and art needlework, and on the whole are fanciful rather than really valuable from a technical point of view. Much descriptive information about them, with an abundance of capital illustrations, is given in the Dictionary of Needlework, by J. F. Caulfield and Blanche Saward (London, 1903).

NEEMUCH, or Nimach, a town of Central India, with a British military cantonment, within the state of Gwalior, on the border of Rajputana, with a station on the Rajputana railway, 170 m. N. of Mhow. Pop. (1901) 21,588. In 1857 it was the most southerly place to which the Mutiny extended. The

brigade of native troops of the Bengal army, which was stationed there, mutinied and marched to Delhi, the European officers taking refuge in the fort, where they were besieged by a rebel force from Mandasor, and defended themselves gallantly until relieved by the Malwa field force. Since 1895 it has been the headquarters of the political agent in Malwa.

NEENAH, a city of Winnebago county, Wisconsin, U.S.A., on the N.W. shore of Lake Winnebago, 82 m. N. by E. of Mil- waukee. Pop. (1890) 5083; (1900) 5954, of whom 1559 were foreign-born; (1905) 6047; (1910) 5734- It is served by the Chicago & North- Western, the Chicago, Milwaukee & St Paul, and the Milwaukee, St Paul & Sault Ste Marie railways, by two interurban electric railways, and by steamboat lines on the lake and on the Fox river, which flows out of Lake Winnebago at this point. Several bridges connect it with Menasha, on the opposite side of the river, and the two cities form one industrial

community. Doty Island, at the mouth of the river, belongs partly to Neenah and partly to Menasha. Neenah is a trade centre of the surrounding agricultural region, in which dairying, especially cheese-making, is carried on extensively. The Fox river (with a fall of 12 ft.) furnishes good water-power for the manufactories. There was a trading post at or near the site of Neenah during the French regime in Wisconsin, but there was no actual settlement until well into the 19th century. Neenah was chartered as a city in 1873; its name is derived from an Indian word meaning ” running water ” or ” rapids.”

NEER, VAN DER. Aernout and Eglon van der Neer, father and son, were Dutch painters whose lives filled almost the whole of the 17th century.

1. Aernout van der Neer (1603-1677), commonly called Aert or Artus, was the contemporary of Albert Cuyp and Hobbema, and so far like the latter that he lived and died in comparative obscurity. Aernout was born at Gorkum and died at Amsterdam. Houbraken’s statement that Aernout had been a steward to a Dutch nobleman, and an amateur painter, before he settled in Amsterdam and acquired skill with his brush, would account for the absence of any pictures dating from his early years. He died in abject poverty, and his art was so little esteemed that the pictures left by him were valued at about five shillings apiece. Even as early as 1659 he found it necessary to supplement his income by keeping a wine tavern. The earliest pictures in which Aernout coupled his monogram of A. V. and D. N. interlaced with a date are a winter landscape in the Rijks Museum at Amsterdam (dated 1639), and another in the Martins collection at Kiel (1642) — immature works both, of poor quality. Far better is the ” Winter Landscape ” (1643) in Lady Wantage’s collection, and the ” Moonlight Scene ” (1644) in the d’Arenberg collection in Brussels. In 1652 Aernout witnessed the fire which consumed the old town-hall of Amsterdam. He made this accident the subject for two or three pictures, now in the galleries of Berlin and Copen- hagen. Though Amsterdam appears to have been constantly van der Neer’s domicile, his pictures tell that he was well acquainted with the canals and woods about Haarlem and Leiden, and with the reaches of the Maes and Rhine. Dort, the home of Albert Cuyp, is sometimes found in his pictures, and substantial evidence exists that there was friendship between the two men. At some period of their lives they laid their hands to the same canvases, on each of which they left their joint mark. On some it was the signature of the name, on others the more convincing signature of style. There are landscapes in the collec- tions of the dukes of Bedford and Westminster, in which Cuyp has represented either the frozen Maes with fishermen packing herrings,

or the moon reflecting its light on the river's placid waters. These are models after which van der Neer appears to have worked. The same feeling and similar subjects are found in Cuyp and van der Neer, before and after their partnership. But Cuyp was the leading genius. Van der Neer got assistance from him; Cuyp expected none from van der Neer. He care- fully enlivened his friend's pictures, when asked to do so, with figures and cattle. It is in pictures jointly produced by them that we discover van der Neer's presence at Dort. We are near

Dort in the landscape sunset of the Louvre, in which Cuyp evidently painted the foreground and cows. In the National Gallery picture Cuyp signs his name on the pail of a milkmaid, whose figure and red skirt he has painted with light effectiveness near the edge of van der Neer's landscape. Again, a couple of fishermen with a dog, and a sportsman creeping up to surprise some ducks, are Cuyp's in a capital van der Neer at the Staedel Institute in Frankfort.

Van der Neer's favourite subjects were the rivers and water- courses of his native country either at sunset or after dark. His peculiar skill is shown in realizing transparence which allows objects — even distant — to appear in the darkness with varieties of warm brown and steel greys. Another of his fancies is to paint frozen water, and his daylight icescapes with golfers, sleighers, and fishermen are as numerous as his moonlights. But he always avoids the impression of frostiness, which is one of his great gifts. His pictures are not scarce. They are less valuable in the market than those of Cuyp or Hobbema; but, possessing a charm peculiarly their own, they are much sought after by collectors. Out of about one hundred and fifty pictures accessible to the public, the choicest selection is in the Hermitage at St Petersburg. In England paintings from his brush are to be found at the National Gallery and Wallace Collection, and, amongst others, in the collections of the marquess of Bute and Colonel Holford.

2. Eglon van der Neer (1643-1703) was born at Amsterdam, and died at Diisseldorf on the 3rd of May 1703. He was first taught by his father, and then took lessons from Jacob van Loo, whose chief business then consisted in painting figures in the landscapes of Wynants and Hobbema. When van Loo went to Paris in 1663 to join the school from which Boucher afterwards emerged, he was accompanied or followed by Eglon. But, leaving Paris about 1666, he settled at Rotterdam, where he dwelt for many years. Later on he took up his residence at Brussels, and finally went to Diisseldorf, where he entered the service of the elector-palatine Johann Wilhelm von der Pfalz. In each of the places where he stopped Eglon married, and having had three wives became the father of twenty-five children. A portrait of the princess of Neuberg led to his appointment as painter to the king of Spain.

Eglon van der Neer has painted landscapes imitating those of his father, of Berchem, and of Adam Elsheimer. He frequently put the figures into the town views of Jan van der Heyden in competition with Berchem and Adrian van der Velde. His best works are portraits, in which he occasionally came near Ter Borch or Metsu in delicacy of touch, de Hooch in effective- ness of lighting, or Mieris in polish of surface. One of his earliest pieces in which the influence of Ter Borch is apparent is the " Lady with the Book," of 1665, which was sold with the Bredel collection in 1875. A. young woman in white and red satin at Rotterdam, of 1669, recalls Mieris, whose style also reappears in Eglon's " Cleopatra " at Buckingham Palace. Two land- scapes with " Tobit and the Angel," dated 1685 and 1694, in the museums of Berlin and Amsterdam, illustrate his fashion of setting Scripture scenes in

Dutch backgrounds. The most important of his sacred compositions is the ” Esther and Ahasuerus,” of 1696, in the Uffizi at Florence. But Eglon varied his practice also with arrangements of hunting and hawking parties, pastures and fords, and cavalry skirmishes. The latest of his panels is a mountain landscape of 1702 in the gallery of Augsburg. (J. A. C. ; P. G. K.)

NEERWINDEN, a village of Belgium in the province of Liege, a few miles E. by S. of Tirlemont, which gives its name to two great battles, the first fought in 1693 between the Anglo-Allied army under William III. of England and the French under the duke of Luxemburg, and the second in 1793 between the Austrians under Prince Josias of Coburg and the French under General Dumouriez.

Battle of Neerwinden or Landen, 1693 (see Grand Alliance, War of the). — Luxemburg, having by feints induced William to detach portions of his army, rapidly drew together superior numbers in face of the Allied camps, which lay in a rough

semicircle from Elissem on the right to Neerlanden, and thence along the Landen brook on the left (July 18-28, 1693). William had no mind to retire over the Geete river, and en- trenched a strong line from Laer through Neerwinden to Neer- landen. On the right section of this line (Laer to Neerwinden) the ground was much intersected and gave plenty of cover for both sides, and this section, being regarded as the key of the position, was strongly garrisoned; in the centre the open ground between Neerwinden and Neerlanden was solidly en- trenched, and in front of it Rumsdorp was held as an advanced post. The left at Neerlanden rested upon the Landen brook and was difficult of access. William’s right, as his line of retreat lay over the Geete, was his dangerous flank, and Luxemburg was aware that, the front of the Allies being somewhat long for the numbers defending it, the intervention of troops drawn from one wing to reinforce the other would almost certainly be too late. Under these conditions Luxemburg’s general plan was to throw the weight of his attack on the Laer-Neerwinden section, and specially on Neerwinden itself, and to economize his forces— as ” economy of force ” was understood before Napoleon’s time — elsewhere, delivering holding attacks or demonstrations as might be necessary, and thus preventing

NEERWINDEN

Emery Walier.sc

the Allied centre and left from assisting the right. Luxemburg had

about 80,000 men to William's 50,000. Opposite the entrenchments of the centre he drew up nearly the whole of his cavalry in six lines, with two lines of infantry intercalated. A corps of infantry and dragoons was told off for the attack of Neerlanden and Rumsdorp, and the troops destined for the main attack, 28,000 of all arms, formed up in heavy masses opposite Neerwinden. This proportion of about one-third of the whole force to be employed in the decisive attack in the event proved insufficient. The troops opposite the Allied centre and left had to act with the greatest energy to fulfil their con- taining mission, and at Laer-Neerwinden the eventual success of the attack was bought only at the price of the utter exhaustion of the troops.

After a long cannonade the French columns moved to the attack, converging on Neerwinden; a smaller force assaulted Laer. The edge of the villages was carried, but in the interior a murderous struggle began, every foot of ground being contested, and after a time William himself, leading a heavy counter-attack, expelled the assailants from both villages. A second attack, pushed with the same energy, was met with the same determina- tion, and meanwhile the French in other parts of the field had pressed their demonstrations home. Even the six lines of cavalry in the centre, after enduring the fire of the Allies for many hours, trotted over the open and up to the entrenchments to meet with certain defeat, and at Neerlanden and Rumsdorp there was

severe hand to hand fighting. But, meantime, the two intact lines of infantry in the French centre had been moved to their left and formed the nucleus for the last great assault on Neer- winden, which proved too much for the exhausted defenders. They fell back slowly and steadily, defying pursuit, and the British Coldstream Guards even captured a colour. But at this crisis the initiative of a subordinate general, the famous military writer Feuquieres (q.v.), converted the hard-won local success into a brilliant victory. William had begun to move troops from his centre and left to the right in order to meet the great assault on Neerwinden, and Feuquieres, observing this, led the cavalry of the French centre once again straight at the en- trenchments. This time the French squadrons, surprising the Allies in the act of manoeuvring, rode over every body of troops they met, and nothing remained for the Allies but a hurried retreat over the Geete. A stubborn rearguard of British troops led by William himself alone saved the Allied army, of which all but the left wing was fought out and in disorder. Luxemburg had won his greatest victory, thanks in a

measure to Feuquieres' exploit; but had the assaults on Neerwinden been made — as Napoleon would have made them — with one-half or two- thirds of his forces instead of one-third, the victory would have been decisive, and Feuquieres would have won his laurels, not in forcing the decision at the cost of using up his cavalry, but in annihilating the remnants of the Allied army in the pursuit. The material results of the battle were twelve thousand Allies (as against eight thousand French) killed, wounded and prisoners, and eighty guns and a great number of standards and colours taken by the French.

The battle of the 18th March 1793 marked the end of Dumouriez's attempt to overrun the Low Countries and the beginning of the Allies' invasion of France. The Austrians under Coburg, advancing from Maestricht in the direction of Brussels, encountered the heads of the hurriedly assembling French army at Tirlemont on the {5th of- March, and took up a position between Neerwinden and Neer- landen. On the 18th, however, after a little preliminary fighting Coburg drew back a short distance and rearranged his army on a more extended front between Racour and Dormael, thus parrying the enveloping movement begun by the French from Tirlemont. Dumouriez was consequently compelled to fight after all on parallel fronts, and though in the villages themselves the individuality and enthusiasm of the French soldier compensated for his inadequate training and indiscipline, the greater part of the front of contact was open ground, where the superiority of the veteran Austrian regulars was unchallengeable. In these conditions an attempt to win a second Jemappes with numerical odds of 11 to 10 instead of 2 to I in favour of the attack was foredoomed to disaster, and the repulse of the Revolutionary Army was the signal for its almost complete dis- solution. Neerwinden was a great disaster, but not a great battle. Its details merely show the impossibility of fighting on the 18th- century system with ill-trained troops. The methods by which such troops could compass victory, the way to fight a " sans culotte " battle, were not evolved until later.

NEES VON ESENBECK, CHRISTIAN GOTTFRIED (1776- 1858), German botanist and entomologist, was born at Erbach on the 14th of February 1776, and was educated at Darmstadt and at Jena, where he took the degree of M.D. After spending some time in medical practice he was appointed professor of botany in Erlangen in 1816. Three years later he became professor of natural history in Bonn, and in 183 1 he was appointed to the chair of botany in the university of Breslau. In 1848 he entered political life and made himself so obnoxious to the government that in 1851 he was deprived of his professorship, and in

consequence the latter years of his life were spent in great poverty. He died in Breslau on the 16th of March

1858.

For about forty years he edited the Nova acta of the ” Acad. Leopold-Carolina,” in which several of his own papers were published. His earliest memoirs dealt with the ichneumons, and he published a Monographic der Ichneumone in 2 vols, in 1828, and Hymenopterorum Ichneumonibus affinium monographiae, in 2 vols, in 1834. His other separate works include: Die Algen des siissen Wassers nach ihren Entwickelungsstufen dargestellt (18 14); Das System der Pilze und Schwamme (18 16); Naturgeschichte der europaischen Lebermoose, in 4 vols. (1833-1838); ” Agrostologia Brasiliensis,” in the Flora Brasiliensis; and a Systema Laurinearum (1836). He also wrote numerous monographs in Flora, in Linnaea and in other scientific German magazines, either alone or along with other well-known

botanists. His best-known works are those that deal with the Fungi, the Hepaticae and the Glumiferae, in all which groups he made valuable additions to knowledge.

His brother Theodor Friedrich Ludwig (1787-1837), inspector of the botanic gardens at Leiden, and afterwards professor of pharmacy at Bonn, also wrote numerous papers on botanical sub- jects, dealing more particularly with medicinal plants and their products.

NEFF, FELIX (1798-1829), Swiss Protestant divine and philanthropist, was born at Geneva on the 8th of October 1798. Originally a sergeant of artillery, he decided in 1819 to devote himself entirely to evangelistic work. He was ordained to the ministry in 1822, and soon afterwards settled in the valley of Freissinieres, where he laboured in the manner of J. F. Oberlin, being at one and the same time pastor, schoolmaster, engineer and agriculturist. He was so successful that he changed the character of the district and its inhabitants. In 1827, worn out by his labours, he was obliged to return to his native place, where he died two years later.

NEGAPATAM, a seaport of British India, in the Tanjore district of Madras, forming one municipality with Nagore, a port 3 m. N. at the mouth of the Vettar river. Pop. (1901) 57,190. It carries on a brisk trade with the Straits Settlements and Ceylon, steamers running once a week to Colombo. The chief export is rice. Negapatam is the terminus of a branch of the South Indian railway, and contains large

railway workshops. It is also a depot for coolie emigration. Negapatam was one of the earliest settlements of the Protuguese on the Coromandel coast. It was taken by the Dutch in 1660, becoming their chief possession in India, and by the English in 1781. From 1799 to 1845 it was the headquarters of Tanjore district. There is a large population of Labbais, Mahommedarts of mixed Arab descent, who are keen traders. Jesuit and Wesleyan missions are carried on.

NEGAUNEE, a city of Marquette county, Michigan, U.S.A., about 12 m. W. by S. of Marquette and 3 m. E. of Ishpeming, in the N. part of the upper peninsula. Pop. (1904) 6797; (1910) 8460. It is served by the Chicago & North- Western, the Duluth, South Shore & Atlantic, and the Lake Superior & Ishpeming railways. It is built on a ridge called Iron Mountain, 1564 ft. above sea-level, and under and near it are some of the most productive iron-ore deposits in the state, the mining of which is the principal industry of the city. The settlement of Negaunee began about 1870, and the city was chartered in 1873. The name is a Chippewa word meaning ” first ” or ” he goes before,” and is said to have been chosen at the request of the Pioneer Iron Company as an equivalent for ” Pioneer.”

NEGLIGENCE (Lat. negligentia, from negligere, to neglect, literally ” not to pick up “), a ground of civil law liability, and in criminal law an element in several offences, the most conspicu- ous of which is manslaughter by negligence. In order to establish civil liability on the ground of negligence, three things must be proved — a duty to take care, the absence of due care, and actual damage caused directly by the absence of due care. Mere care- lessness gives no right of action unless the person injured can show that there was a legal duty to take care. The duty may be to the public in general, on the ground that any person who does anything which may involve risk to the public is bound to take due care to avoid the risk. For instance, in the words of Lord Blackburn, ” those who go personally or bring property where they know that they or it may come into collision with the persons or property of others have by law a duty cast upon them to use reasonable care and skill to avoid such a collision.” Where a special duty to an individual is alleged, the duty must rest on a contract or undertaking or some similar specific ground. Thus, where a surveyor has carelessly given incorrect progress certificates, and a mortgagee who has had no contractual relation with the surveyor has advanced money on the faith of the certificate, the surveyor is not liable to the mortgagee in an action of negligence; because he owed no duty to the mortgagee to be careful. When a duty to take care is established, the degree of care required is now determined by a well-ascertained standard. This standard is the amount of care which would be

exercised

in the circumstances by an ” average reasonable man.” This objective standard excludes consideration of the capacity or state of mind of the particular individual. It also gets rid of the old distinctions between ” gross,” ” ordinary ” and ” slight ” negligence, though no doubt the degree of care required varies with the circumstances of the case. The application of such a standard is a task for which a jury is a very appropriate tribunal. In fact the decision of the question whether there has been a want of due care is left almost unreservedly to the jury. There is this amount of control, that if the judge is of opinion that the evidence, if believed, cannot possibly be regarded as showing want of due care, or in technical language that there is ” no evidence of negligence,” it is his duty to withdraw the case from the jury and give judgment for the defendant. Unless the judge decides that there is no duty to take care, or that there is no evidence of want of care, the question of negligence or no negli- gence is wholly for the jury.

Ordinarily a man is responsible only for his own negligence and for that of his servants and agents acting within the scope of their authority. For the acts or defaults of the servants of an independent contractor he is not liable. But in certain cases a stricter obligation is imposed on him by law. The occupier of premises is under a duty to all persons who go there on business which concerns him to see that the premises are in a reasonably safe condition so far as reasonable care and skill can make them so. Thus he cannot release himself by employing an in- dependent contractor to maintain or repair the premises. The effect of this doctrine is that the occupier may be liable if it can be shown that the independent contractor or his servant has been guilty of a want of due care. A similar obligation has been enforced in the case of a wreck stranded in a navigable river, and the owner was held liable for damage caused by the careless- ness of the servant of an independent contractor who had under- taken to light the wreck. So too any person who undertakes a work likely to cause danger if due care is not taken is liable for damage caused by the carelessness of the servant of an inde- pendent contractor, so long as the carelessness is not casual or collateral to the servant’s employment.

In an action of negligence a familiar defence is ” contributory negligence.” This is a rather misleading expression. It is not a

sufficient defence to show that the plaintiff was negligent, and that his negligence contributed to the harm complained of. The plaintiff's negligence will not disentitle him to recover unless it is such that without it the misfortune would not have happened, nor if the defendant might by the exercise of reasonable care on his part have avoided the consequences of the plaintiff's negligence. The shortest and plainest way of expressing this rule is, that the plaintiff's negligence is no defence unless it was the proximate or decisive cause of the injury. There was an attempt in recent times to extend this doctrine so as to make the contributory negligence of a third person a defence, in cases where the plaintiff, though not negligent himself, was travelling in a vehicle or vessel managed by the negligent third person, or was otherwise under his control. In such circumstances it was said that the plaintiff was " identified " with the third person. (Waite v. North-Eastern Ry. Co., 1858, E. B. & E., 719). This case, in the Exchequer Chamber, was an action on behalf of an infant by his next friend. The infant, which was five years of age, was with its grandmother, who took a half-ticket for the child and a ticket for herself to travel by the defendants' line; as they were crossing the railway to be ready for the train the child was injured by a passing train. The jury found that the defendants were guilty of negligence, and that the grandmother was guilty of negligence which contributed to the accident, while there wai no negligence of the infant plaintiff. A verdict was entered for the plaintiff, but in the Queen's Bench the verdict was entered for the defendants, without calling on them to argue, on the ground that the infant was identified with its grandmother. But the case of the "Bernina," decided in 1888, where a passenger and an engineer on board the " Bushire " were killed in a collision between the " Bernina " and the " Bushire " caused by fault in both ships,

but without fault on the part of the deceased, exploded this supposed doctrine, and made it clear that the defence of contributory negligence holds good only when the defendant contends and proves that the plaintiff was injured by his own carelessness.

The American law of negligence is founded on the English common law; but the decisions in different states have occasion- ally contradicted English decisions, and also one another.

See T. Beven, Negligence in Law, 3rd ed., 1908; Shearman and Redfield, The Law of Negligence (New York), Thompson, Commen- taries on Negltgence (Indianapolis). (A. Ll. D.)

NEGOTIABLE INSTRUMENT, in law, a document or other instrument

purporting to represent so much money, and the property in which passes, like money, by mere delivery. Negoti- able instruments arise in either of two ways: (1) by statute, (2) by custom of merchants. The most commonly recognized negotiable instruments are bills of exchange, promissory notes, bills of lading, foreign bonds and debentures payable to bearer. Negotiable instruments constitute an exception to the “general rule that a man cannot give a better title than he has himself (see Bill or Exchange).

NEGRI, ADA (1870-), Italian poet, was born at Lodi, of an artisan family, and became a village school-teacher. Her first book of poems, Tempeste (1891), tells the helpless tragedy of the forsaken poor, in words of vehement beauty. Her second volume of lyrics, Fatalild (1893), confirmed her reputation as a poet, and led to her appointment to the normal school at Milan; but her later verse, while striking in its sincerity, suffered by a tendency to repetition and consequent mannerism.

NEGRITOS (Span, for ” little negroes “), the name originally given by the Spaniards to the aborigines of the Philippine Islands. They are physical weaklings, of low, almost dwarf, stature, with very dark skin, closely curling hair, flat noses, thick lips and large clumsy feet. The term has, however, been more generally applied to one of the great ethnic groups into which the popula- tion of the East Indies is divided, and to an apparently kindred race in Africa (see Negro). A. de Quatrefages suggests that from the parent negroid stem were thrown off two negrito branches to the west and east, the Indo-Oceanic and African, and that the Akkas, Wochuas, Batwas and Bushmen of the Dark Continent are kinsmen of the Andaman Islanders, the Sakais of the Malay Peninsula and the Aetas of the Philippines. This view has found much acceptance among ethnologists. The result of Quatrefages’s theory would be to place the negrito races closest to the primitive human type, a conclusion apparently justified by their physical characteristics. The true negritos are always of little stature (the majority under 5 ft.), have rounded forms and their skull is brachycephalic or subbrachy- cephalic, that is to say, it is relatively short and broad and of little height. Their skin is dark brown or black, sometimes somewhat yellowish, their hair woolly (scanty on face and body), and they have the flat nose and thick lips and other physical features of the negro. Among peoples undoubtedly negrito are those of the Andaman Islands (q.v.), the Malay Peninsula (q.v.) and some of the Philippines (q.v.), the best types being the Sakais (q.v.), Mincopies and Aetas. The question of the so- called negrito races of India, the Oraons, Gonds, &c, is in much dispute, Quatrefages believing the Indian aborigines to have been negritos, while other ethnologists find

the primitive people of Hindustan in the Dravidian races. Some authorities have placed the Veddahs of Ceylon among the negritos, but their straight hair and dolichocephalic skulls are sufficient arguments against their inclusion. The negrito is often confounded with the Papuan; but the latter, though possessing the same woolly hair and being of the same colour, is a large, often muscular man, with a long, high skull.

See A. de Quatrefages, Les PygmSes (Paris, 1887; Eng. trans. 1895); E. H. Man, The Aborigines of the Andaman Islands (London, 1885) ; Giglioli, Nuove notizie sui populi negroidi dell' Asia e special- mente sui Negriti (Florence, 1879); Meyer, Album von Philippinen- Typen (Dresden, 1885) ; Blumentritt, Ethnographie der Philippinen (Gotha, 1892); A. B. Meyer, Die Negritos (Dresden, 1899); A. H. Keane, Ethnology; A. C. Haddon in Nature for September 1899.

NEGRO (from Lat. niger, black), in anthropology, the designa- tion of the distinctly dark-skinned, as opposed to the fair, yellow, and brown variations of mankind. In its widest sense it embraces all the dark races, whose original home is the intertropical and sub-tropical regions of the eastern hemisphere, stretching roughly from Senegambia, West Africa, to the Fijian Islands in the Pacific, between the extreme parallels of the Philippines and Tasmania. It is most convenient, however, to refer to the dark-skinned inhabitants of this zone by the collective term of Negroids, and to reserve the word Negro for the tribes which are considered to exhibit in the highest degree the characteristics taken as typical of the variety.

These tribes are found in Africa; their home, being south of the Sahara and north of a not very well-defined line running roughly from the Gulf of Biafra with a south-easterly trend across the equator to the mouth of the Tana. In this tract are found the true negroes; and their nearest relatives, the Bantu-negroids, are found to the south of the last-mentioned line. The relation of the yellowish-brown Bushman and Hotten- tot peoples of the southern extremity of Africa to the negro is uncertain; they possess certain negroid characters, the tightly curled hair, the broad nose, the tendency towards prognathism; but their colour and a number of psychological and cultural differences would seem to show that the relation is not close. Between the two a certain affinity seems to exist, and the Hottentot is probably the product of an early intermixture of the first Hamito-Bantu immigrants with the

Bushman aborigines (see Africa: Ethnology). The relation of the negroids of Africa to those of Asia (southern India and Malaysia) and Australasia cannot be discussed with profit owing to lack of evidence; still less the theories which have been put forward to account for the wide dispersal from what seems to be a single stock. It will be sufficient to say that the two groups have in common a number of well-defined characteristics of which the following are the chief: A dark skin, varying from dark brown, reddish- brown, or chocolate to nearly black; dark tightly curled hair, flat in transverse section, 1 of the ” woolly ” or the ” frizzly ” type; a greater or less tendency to prognathism; eyes dark brown with yellowish cornea; nose more or less broad and flat; and large teeth.

Sharing these characteristics, but distinguished by short stature and brachycephaly, is a group to which the name Negrito (q.v.) has been given; with this exception the tendency among the negroids appears to be towards tall stature and dolichoce- phaly in proportion as they approach the pure negro type. As the most typical representatives of the variety are found in Africa, the Asiatic and Australasian negroids may be dismissed with this introduction. The negro and negroid population of America, the descendants of the slaves imported from West Africa, and in a less degree, from the Mozambique coast, before the abolition of the. slave-trade, are treated separately below.

In Africa three races have intermingled to a certain extent with the negro; the Libyans (Berbers: q.v.) in the Western Sudan-; and the Hamitic races (q.v.) and Arabs (q.v.) in the east. The identity of the people who have amalgamated with the negro to form the Bantu-speaking peoples in the southern portion of the continent is not certain, but as the latter appear to ap- proach the Hamites in those characteristics in which they differ from the true negroes, it seems probable that they are infused with a proportion of Hamitic blood. The true negroes show great similarity of physical characteristics; besides those already mentioned they are distinguished by length of arm, especially of fore arm, length of leg, smallness of calf and projection of heel; characteristics which frequently fail to appear to the same degree

1 This point has been fully determined by P. A. Browa (Classifica- tion of Mankind by the Hair, &c), who shows conclusively that, unlike true hair and like true wool, the negro hair is flat, issues from the epidermis at a right angle, is spirally twisted or crisped, has no central duct, the colouring matter being disseminated through the cortex and intermediate fibres, while the cortex itself is covered with numerous rough, pointed filaments adhering loosely to the shaft; lastly, the

negro pile will felt, like wool, whereas true hair cannot be felted.

among the Bantu, who are also as a rule less tall, less prognathous, less platyrrhine and less dark. A few tribes in the heart of the negro domain (the Welle district of Belgian Congo) show a tendency to round head, shorter stature and fairer complexion; but there seems reason to suppose that they have received an infusion of Libyan (or less probably Hamitic) or Negrito blood.

The colour of the skin, which is also distinguished by a velvety surface and a characteristic odour, is due not to the presence of any special pigment, but to the greater abundance of the colour- ing matter in the Malpighian mucous membrane between the inner or true skin and the epidermis or scarf skin. 2 This colouring matter is not distributed equally over the body, and does not reach its fullest development until some weeks after birth; so that new-born babies are a reddish chocolate or copper colour. But excess of pigmentation is not confined to the skin; spots of pigment are often found in some of the internal organs, such as the liver, spleen, &c. Other characteristics appear to be a hypertrophy of the organs of excretion, a more developed venous system, and a less voluminous brain, as compared with the white races.

In certain of the characteristics mentioned above the negro would appear to stand on a lower evolutionary plane than the white man, and to be more closely related to the highest anthro- poids. The characteristics are length of arm, prognathism, a heavy massive cranium with large zygomatic arches, flat nose depressed at base, &c. But in one important respect, the character of the hair, the white man stands in closer relation to the higher apes than does the Negro.

Mentally the negro is inferior to the white. The remark* of F. Manetta, made after a long study of the negro in America, may be taken as generally true of the whole race: ” the negro children were sharp, intelligent and full of vivacity, but on approaching the adult period a gradual change set in. The intellect seemed to become clouded, animation giving place to a sort of lethargy, briskness yielding to indolence. We must necessarily suppose that the development of the negro and white proceeds on different lines. While with the latter the volume of the brain grows with the expansion of the brainpan, in the former the growth of the brain is on the contrary arrested by the premature closing of the cranial sutures and lateral pressure of the frontal bone. 3 This explanation is reasonable and even probable as a contributing cause; but evidence is lacking on the subject and the arrest or even deterioration in mental develop- ment is no doubt very

largely due to the fact that after puberty sexual matters take the first place in the negro's life and thoughts. At the same time his environment has not been su;h as would tend to produce in him the restless energy which h,as led to the progress of the white race; and the easy conditions of tropical life and the fertility of the soil have reduced the struggle for existence to a minimum. But though the mental inferiority of the negro to the white or yellow races is a fact, it has often been ex- aggerated; the negro is largely the creature of his environment,

2 It is also noteworthy that the dark colour seems to depend neither on geographical position, the isothermals of greatest heat, nor even altogether on racial purity. The extremes of the chromatic scale are found in juxtaposition throughout the whole negro domain, in Sene-

fambia, the Gabun, upper Nile basin, lower Congo, Shari valley,

3 La Razza Negra nel suo stato selvaggio, &c. (Turin, 1864), p. 20.

and it is not fair to judge of his mental capacity by tests taken directly from the environment of the white man, as for instance tests in mental arithmetic; skill in reckoning is necessary to the white race, and it has cultivated this faculty; but it is not necessary to the negro.

On the other hand negroes far surpass white men in acuteness of vision, hearing, sense of direction and topography. A native who has once visited a particular locality will rarely fail to recognize it again. For the rest, the mental constitution of the negro is very similar to that of a child, normally good-natured and cheerful, but subject to sudden fits of emotion and passion during which he is capable of performing acts of singular atrocity, impressionable, vain, but often exhibiting in the capacity of servant a dog-like fidelity which has stood the supreme test. Given suitable training, the negro is capable of becoming a craftsman of considerable skill, particularly in metal work, carpentry and carving. The bronze castings by the cire perdue process, and the cups and horns of ivory elaborately carved, which were produced by the natives of Guinea after their intercourse with the Portuguese of the 16th century, bear ample witness to this. But the rapid decline and practical evanescence of both industries, when that intercourse was interrupted, shows that the native craftsman was raised for the moment above his normal level by direct foreign

inspiration, and was unable to sustain the high quality of his work when that inspiration failed. In speaking of the form or forms of culture found among negro and negroid tribes, the dependence of the native upon his environment must be kept in mind, particularly in Africa, where interchange of customs is continually taking place among neighbours.

Thus the forest regions are distinguished by a particular form of culture which differs from that prevailing in the more open country (see Africa: Ethnology). But it may be said generally that the negro is first and foremost an agriculturist. The negritcs are on a lower cultural plane; they are nomadic hunters who do no cultivation whatever. Next in importance to agriculture come hunting and fishing and, locally, cattle-keeping. The last is not strictly typical of negro culture at all; nearly all the tribes by whom it is practised are of mixed origin, and their devotion to cattle seems to vary inversely with the purity of race. The most striking exception to this statement is the Dinka of the upper Nile, the whole of whose existence centres round the cattle pen. Of the other tribes where pastoral habits obtain to a greater or less extent, the Masai have a large percentage of Hamitic blood, the eastern and southern Bantu-speaking negroids are also of mixed descent, &c.

The social conditions are usually primitive, especially among the negroes proper, being based on the village community ruled by a chief. Where the country is open, or where the forest is not so thick as to present any great obstacle to communication, it has often happened that a chief has extended his rule over several villages and has ultimately built up a kingdom adminis- tered by sub-chiefs of various grades, and has «ven established a court with a regular hierarchy of officials. Benin and Dahomey are instances of this. But the region where this ” empire- building ” has reached its greatest proportions lies to the south of the forest belt in the territory of the Bantu negroids, where arose the states of Lunda, Cazembe, &c.

The domestic life of the negro is based upon polygyny, and marriage is almost always by purchase. So vital is polygyny to the native social system that the attempts made by missionaries to abolish plurality of wives would, if successful (a contingency unthinkable under present conditions), result in the most serious social disorder. Not only would an enormous section of the population be deprived of all means of support, but the native wife would be infinitely harder worked; agriculture, the task of the women, would be at a standstill; and infanticide would probably assume dangerous proportions.

Descent in the negro world is on the whole more often reckoned

through the female, though many tribes with a patriarchal system are found. Traces of totemism are found sporadically, but are rare.

Of the highest importance socially are the secret societies, which are found in their highest development among the negroes of the west coast, and in a far less significant form among some of the Bantu negroids of the western forest district. In their highest form these societies transcend the tribal divisions, and the tie which binds the individual to the society takes precedence of all others. But the secret society cannot be called a definitely negro institution, since it is found in the west only.

As an agriculturist the negro is principally a vegetarian, but this form of diet is not the result of direct choice; meat is everywhere regarded as a great delicacy, and no opportunity of obtaining it is ever neglected, with one exception — that the cattle-keeping tribes rarely slaughter for food, because cattle are a form of currency. Fish is also an important article of diet in the neighbourhood of large rivers, especially the Nile and Congo. It is worthy of note that the two cultivated plants which form the mainstay of native life, manioc in the west and centre and mealies in the south and east, are neither of African origin.

Cannibalism is found in its simplest form in Africa. In that continent the majority of cannibal tribes eat human flesh because they like it, and not from any magical motive or from lack of other animal food. In fact it is noticeable that the tribes most addicted to this practice inhabit just those districts where game is most plentiful. Among the true negroes it is confined mainly to the Welle and Ubangi districts, though found sporadically (and due to magical motives) on the west coast, and among the Bantu negroids in the south-western part of Belgian Congo and- the Gabun.

With regard to crafts the most important and typical is that of iron smelting and working. No negro tribe has been found of which the culture is typical of the Stone age; or, indeed, which makes any use of stone implements except to crush ore and hammer metal. Even these are rough pieces of stone of convenient size, not shaped in any way by chipping or grinding. Doubtless the richness of the African soil in metal ores rendered the Stone age in Africa a period of very short duration (see Africa: Ethnology). A good deal of aptitude is shown in the forging of iron, considering the primitive nature of the tools. Considerable skill in carving is also found in the west and among the Bantu negroids, especially of Belgian Congo south of the Congo. Weaving is practised to a large extent in the west; the true native

material being palm-leaf fibre. The cultivation of cotton, which has become important in West Africa, deals with an exotic material and has been subjected to foreign influences. Among the Bantu of the Kasai district the art of weaving palm-cloth reaches its highest level, and in the east cotton-weaving is again found. Pottery-making is almost uni- versal, though nowhere has it reached a very advanced stage; the wheel is unknown, though an appliance used on the lower Congo displays the principle in very rudimentary form. The produc- tion of fire by means of friction was universal, the method known as " twirling " being in vogue, i.e. the rapid rotation between the palms of a piece of hard wood upon a piece of soft wood.

Trading is practised either by direct barter or through the medium of rude forms of currency which vary according to locality. Value is reckoned among the tribes with pastoral tendencies in cattle and goats; among the eastern negroes by hoe-and spear-blades and salt blocks; in the west by cowries, brass rods, and bronze armlets (manilas); in Belgian Congo variously by olivella shells, brass rods, salt, goats and fowls, copper ingots and iron spear-blades, &c.

As regards religion, the question of environment is again important; in the western forests where communities are small the negro is a fetishist, though his fetishism is often combined more or less with nature worship. Where communication is easier the nature worship becomes more systematic, and definite supernatural agencies are recognized, presiding over definite spheres of human life. 1 Where feudal kingdoms have been formed, ancestor-worship begins to appear and often assumes paramount

1 The three volumes by Colonel Ellis mentioned in the biblio- graphy form an excellent study of the development of negro religion.

importance. In fact this form of religion is typical of all the eastern and southern portion of the continent (see Africa: Ethnology). With the negro, as with most primitive peoples, it is the malignant powers which receive attention from man, with a view to propitiation or coercion. Beneficent agencies require no attention, since, from their very nature, they must continue to do good. The negro attitude towards the super- natural is based frankly on fear; gratitude plays no part in it. A characteristic feature of the western culture area, among both negro and Bantu negroid tribes, is the belief that any form of

death except by violence must be due to evil magic exercised by, or through the agency of, some human individual; to dis- cover the guilty party the poison ordeal is freely used. A similar form of ordeal is found in British Central Africa, to dis- cover magicians, and the wholesale ” smelling-out ” of ” witches,” often practised for political reasons, is a well-known feature of the culture of the Zulu-Xosa tribes. Everywhere magic, both sympathetic and imitative, is practised, both by the ordinary individual and by professional magicians, and most medical treatment is based on this, although the magician is usually a herbalist of some skill. Where the rainfall is uncertain, the production of rain by magical means is one of the chief duties of the magician, a duty which becomes paramount in the eastern plains among negroes and Bantu negroids alike. But the negroes and negroids have been considerably influenced by exotic religions, chiefly by Mahommedanism along the whole extent of country bordering the Sahara and in the east. Christianity- has made less progress, and the reason is not far to seek. Islam is simple, categorical and easily comprehended; it tends far less to upset the native social system, especially in the matter of polygyny, and at the same time discourages indulgence in strong drink. Moreover the number of native missionaries is considerable. Christianity has none of these advantages, but possesses two great drawbacks as far as the negro is concerned. It is not sufficiently categorical, but leaves too much to the individual, and it discountenances polygyny. The fact that it is divided into sects, more or less competitive among them- selves, is another disadvantage which can hardly be overrated. This division has not, it is true, as yet had much influence upon the evangelization of Africa, since the various missions have mostly restricted themselves each to a particular sphere; still, it is a defect in Christianity, as compared with Islam, which will probably make itself felt in Africa as it has in China.

As regards language, the Bantu negroids all speak dialects of one tongue (see Bantu Languages). Among the negroes the most extraordinary linguistic confusion prevails, half a dozen neighbouring villages in a small area often speaking each a separate language. All are of the agglutinating order. No absolutely indigenous form of script exists; though the Hausa tongue has been reduced to writing without European assistance. 1

Authorities. — J. Deniker, Races of Man (London, 1900) ; A. H. Keane, Ethnology (London, 1896); Man Past and Present (London, 1900); A. B. Ellis, The Tshi-speaking Peoples (1887); The Ewe- speaking Peoples (1890); The Yoruba-speaking Peoples (1894); B. Ankermann, ” Kulturkreise in Afrika,” Zeit.f. Eth. (1905), p. 54. See also Africa, § 3, Ethnology. (T. A. J.)

Negroes in the United States.

After the migration of the European fair-skinned races in large numbers to other parts of the earth occupied by people of darker colour, the adjustment of relations between the diverse races developed a whole series of problems almost unknown to the ancient world or to the life of modern Europe. The wider the diversity of physique and especially of skin colour, the greater the danger of friction. The more serious the effort to secure industrial and social co-operation under representative institu- tions, the graver have become the difficulties. They have been and are perhaps more acute in the United States than elsewhere,

1 ‘ The Vai alphabet, ” invented ” by a native, Doalu Bukere, in the first half of the 19th century, owed its inspiration to European influence, ‘and of the characters ” many . . . are clumsy adaptations of Roman letters or of conventional signs used by Europeans ” (Sir H. H. Johnston, Liberia, p. 1107 foil., London, 1906).

because there the lightest and the darkest races have com- mingled, because of the theory on which the government of the country nominally rests, that each freeman should be given an equal chance to improve his industrial position and an equal voice in deciding political questions, and because of the almost irreconcilable differences in the public opinion of the two great sections to only one of which do the problems come home as everyday matters. They were not solved by the Civil War and emancipation, but their nature was radically altered. Neither the earlier system of slavery nor the governmental theory during the radical reconstruction period that race differences should be ignored has proved workable, and the trend is now towards some modus vivendi between these extremes.

The only definition of negro having any statutory basis in the United States is that given in the legislation of many Southern states prohibiting intermarriage between a white person and ” a person who has one-eighth or more of African blood.” Census enumerators in their counts of the American people since 1790 have distinguished the two main races of whites and negroes, but in so doing they have never been given a definition or criterion of race. Consequently they followed the judgment of the community enumerated, which usually classes as negro all persons known or believed to have in their veins any ad- mixture of negro blood. It is probable that this line, the so-called ” colour line,” which is emphasized in regions where negroes are numerous by many legal, economic and social dis- criminations between the races, is drawn with substantial accuracy. Far different

has been the result of governmental efforts to draw another line within the group of negroes as thus defined, that between the negroes of pure African blood and those of mixed negro and white blood. This distinction has no legal significance, for negroes of pure blood and negroes of mixed blood are subject to the same provisions of law, and at least for the whites it has little social or economic significance. An attempt to draw it was made at each census betweeen 1850 and 1890 inclusive, and the results, so far as they were published, indicate that between one-sixth and one-ninth of the negroes in the United States have some admixture of white blood. The figures were reached through thousands of census enumerators, nearly all of whom were white. Of recent years an effort has been made on the part of negro investigators to get an answer to the same question by the careful study of communities selected as typical. The classification of about 39,000 coloured people, most of them in different parts of Georgia, with a study of the other available data and inferences from a somewhat wide observation, led Dr Dubois to the conclusion that ” at least one- third of the negroes of the United States have recognizable traces of white blood.” Perhaps we may believe with some confidence that the in- formation from white sources understates, and that from negro sources overstates, the proportion, and that the true proportion of mulattoes in the United States is between one-sixth and one- third of all negroes. To infer that the true proportion in 1850, i860, 1870 and 1890, the dates to which the census figures relate, was much less than the true proportion in 1895 to 1900, to which the unofficial figures relate, is contrary to the general trend of the evidence. As the law and the social opinion of the Southern whites make little or nothing of this distinction between negroes of pure blood and mulattoes, it is often regarded as less important than it really is. The recognized leaders of the race are almost invariably persons of mixed blood, and the qualities which have made them leaders are derived certainly in part and perhaps mainly from their white ancestry. Wherever large numbers of full-blooded negroes and of persons of mixed central or north European and negro blood have lived in the same community for some generations, there is a strong and growing tendency to establish a social line between them.

The difficulty of ascertaining the number of mulattoes in the United States and the tendency of the testimony to be modified by the opinion or desire of the race from which it comes are typical. There is hardly any important aspect of the subject upon which the testimony of seemingly competent and impartial witnesses is not materially affected by the influence of the race

to which the witnesses belong. Under these circumstances it seems necessary to assume that the testimony of the official documents of the federal government is correct, unless clear evidence, internal or external, refutes it. The following state- ments of fact rest mainly on those sources.

The number of negroes living in the (continental) United States in 1908 was about nine and three-quarter millions, and if those in Porto Rico and Cuba be included it reached ten and two-thirds millions. This number is greater than the total population of the United States was in 1820, and nearly as great as the population of Norway, Sweden and Denmark.

During the colonial period, and down to the changes initiated by the invention of the cotton gin, negroes were distributed with some evenness along the Atlantic coast. Between the date of that invention and the Civil War, and largely as a result of the changes the cotton gin set in motion, the tendency was to- wards a concentration of the negroes in the great cotton-growing area of the country. In 1700, for example, one-ninth of the population of the colony of New York was negro; in 1900 only one-seventieth of the population of the empire state belonged to that race. The division line between the Northern and Southern states adopted by the Census Office in 1880, and em- ployed since that date in its publications, is Mason and Dixon's line, or the southern boundary of Pennsylvania, the Ohio river from Pennsylvania to its mouth and the southern boundary of Missouri and Kansas. In the states north of that line, the Northern states, in all of which but Missouri negro slavery either never existed or else was abolished before the Civil War, the white population increased tenfold and the negro population only fourfold between 1790 and i860. In the states south of that line, on the contrary, the Southern states, the negro popula- tion in the same period increased sixfold and the white population not so fast. It was a widespread opinion shortly after the Civil War that the emancipated slaves would speedily disperse through the country, and that this process would greatly simplify the problems arising from the contact of the two races. This expec- tation has not been entirely falsified by the result. Between i860 and 1900 the negroes in the Northern states increased somewhat more rapidly than the northern whites, and those in the Southern states much less rapidly than the Southern whites. As a result, one-tenth of the American negroes lived in 1908 in the Northern states, a larger proportion than at any time during the 19th century. But this process of dispersion is so slow as not materially to affect the prospects for the

im- mediate future, and it is still almost as true as at any earlier date that the region in which cotton is a staple crop coincides in the main with the region in which negroes are more than one- half of the total population.

This appears if a comparison is made between the northern boundary of the so-called Austroriparian zone of plant and animal life in the United States, that is ” the zone of the cotton plant, sugar cane, rice, pecan and peanut,” and the northern boundary of the ” black belt ” or region in which the negroes are a majority of the population. The coincidence of the two is very close, and was much closer in 1900 than in i860. It appears yet more clearly by a comparison between a map showing the counties in which at least 5% of the area was planted to cotton in 1899 and another map showing the ” black belt ” counties in 1900. The black belt stretches north through eastern Virginia beyond the cotton belt, and the cotton belt stretches south-west through eastern central Texas beyond the black belt, but between these two extremes there is a close agreement in the boundaries of the two areas.

The question ” Have the American negroes progressed, materi- ally and morally, since emancipation?” is generally answered in the affirmative. But even on this question entire unanimity is lacking. A considerable body of men could still be found in 1910, mainly among Southern whites, who held that the con- dition of the race was worse than it was in the days of slavery. Probably all competent students would admit, however, that the race has differentiated since 1865, that the distance separating the highest tenth from the lowest tenth has become wider, that

the highest tenth is far better and far better off than formerly, and the lowest tenth is worse and perhaps also worse off than in slavery. Under such circumstances there are no adequate objective tests of progress. The pessimist points to the alleged increase of idleness and crime, the meliorist to a demonstrated decrease of illiteracy and to considerable accumulations of property. The large majority of competent students believe that the American negroes have progressed, materially and morally, since emancipation, that the central or average point is higher than in 1865, although such persons differ widely among themselves regarding the amount of that

progress.

It would be generally but not universally held, also, that the negroes in the United States progressed under slavery, that they were far

better qualified for incorporation as a vital and* contributing element of the country's civilization at the time of their emancipation than they were on arrival or than an equal number of their African kindred would have been. But probably the rate of progress has been more rapid under freedom than it was under slavery.

The evidence regarding the progress of the American negro may be grouped under the following heads: numbers, birth-rate, health, wealth, education, occupations, morals, citizenship.

Numbers. — The dictum of Adam Smith, " The most decisive mark of the prosperity of any country is the increase of the number of its inhabitants," may be applied, perhaps after changing the word " decisive " to " obvious," to the negro population of the United States. The negro population of Africa is probably not increasing at all. But during the 19th century the negroes in the United States increased nearly ninefold. They are now much the most thriving offshoot of the race and the most civilized and progressive group of negroes in the world. Under a slavery system not permitting the importation of new supplies a high rate of increase by excess of births over deaths is an advantage to the master class. During the slavery period and until about 1880 the increase of southern whites and of southern negroes proceeded at about the same rate. But during the last score of years in the century the increase of negroes was much less rapid, the rate being only about three-fifths of that prevailing among southern whites.

Birth-rate. — As the increase of negro population is slackening, as the immigration and emigration of negroes are insignificant in amount, and as the death-rate is about stationary, it is reasonable to infer that the birth-rate is dwindling. This cannot be stated with certainty, for there are no registration records giving the number of births for any large and representative group of American negroes. A good index to the birth-rate, however, may be derived from the proportion of children under 5 years of age to women 15 to 49 years of age. In the returns negroes are not distinguished from Indians and Mongolians. To minimize this slight source of error and at the same time to secure a more representative and homogeneous popu- lation group, the following figures are confined to the Southern or former slave states : — ■

Date.

Children under 5 Years of Age to

1000 Women 15 to 49 Years of Age

in the Southern States.

Negroes.

Whites.

1850

i860

1870 1880 1890 1900

705 688 661

737 601

577

695 682 601 656 580 581

These figures indicate that the proportion of children to child- bearing women, and hence probably the birth-rate, changed in the same direction during each decade between 1850 and 1890. Between 1850 and 1870 the proportion of negro children decreased about 6% and that of white children about 14%; between 1870 and 1880 the proportion of negro children increased about 12 % and that of white children about 9%; between 1880 and 1890 the proportion of negro children decreased about 18 % and that of white children about 12 ; between 1890 and 1900 the proportion of negro children decreased about 4 and that of white children remained practically the same. Before the war the proportion of living children to potential mothers was about the same for the two races at the South, for the first three censuses after the war the proportion of negro children was much greater than of white children, but by 1900 that proportion was less, and the movement during the decade suggests that the proportions may have begun to change in opposite directions.

Some light upon the influences at work may be derived from the comparison between city and country at the south.

Date.

Children under 5 Years of Age to 1000 Women 15 to 44 Years of Age in the Southern States.

Cities having at least 25,000 Inhabitants.

Smaller Cities and Country Districts.

Negroes.

Whites.

Negroes.

Whites.

1890 1900

319 271

39i

374

688 668

665 671

The noteworthy inference from these figures is that the proportion of negro children in southern cities was very low and decreasing. In 1890 it was about five-sixths, and in 1900 less than three-fourths of the proportion of children among whites in these cities. The differences in northern cities are equally marked. City life appears to exercise a powerful and increasing influence in reducing the birth-rate among the negroes.

Health. — The prosperity and progress of a population group are indicated, not merely by growth in numbers but also by the longevity of its members. This vitality is roughly measured by the death-rate. Other things being equal, a low and sinking death-rate is evidence of a high and increasing average duration of life. In the United States vital statistics are in charge of the several states and cities, and are often defective or entirely lacking. In 1890 and 1900 the Federal . government compiled such as were of importance, and in 1864 an official compilation was made of death-rates of negroes before the war. The results are worth consideration.

Date.

Negro Deaths.

Negro Death-rate.

White Death-rate at same Time and Places.

Mainly between

1818-1863 1890 1900

106,217

28,579 37,029

35-0 29-9 29-6

27-0 19-1 17-3

These figures indicate that the death-rate of each race decreased during a half century, but that the decrease among negroes was much less rapid than among whites. The negro death-rate at the earliest period exceeded that of the whites by 8-0 per thousand, or three-tenths of the smaller rate. At the latest period the difference was 12-3 per thousand, or seven-tenths of the smaller rate. But these figures speak for negroes living mainly in cities where the proportion of children and elderly persons is small and that of negroes at the healthy ages is large. After making a proper allowance for these differences in sex and age composition, it is found that the true death-rate of negroes in the registration area is about twice as high as that of a white population of like sex and age structure. Whether the difference between negro and white residents of the country districts in the south is equally great, we have no means for judging.

The leading causes of death among negroes in the registration area arranged in the order of importance are stated below. The ratio to the corresponding death-rate among whites is added, but the differ- ences are affected partly by the greater proportion of negroes in the southern cities and the different incidence of diseases in the two regions, and partly by probable differences in the accuracy of diagnosis of disease in the two sections and by physicians attending the two races.

Causes of Death.

Consumption Pneumonia …. Diseases of the nervous

system …. Heart disease and dropsy Diarrheal diseases . Diseases of the urinary

organs Typhoid fever .

Old age

Malarial fever . Cancer and tumour Diphtheria and croup . Influenza . . . Whooping cough Diseases of the liver

Measles

Scarlet fever

Negro Death-rate per 1000.

85 55

08 21 14

57 68

67 63 48

32 32 29 21

15 03

Ratio to White Death-rate = 100.

280 192

144 161 165

157 204

125 969

72

69

136

239 92

“5 25

These figures bring out in a striking way the very high mortality, absolute and relative, of the American negro from consumption.

When one considers both the great number of deaths caused by consumption and pneumonia, 28-4% of the deaths from all causes in 1900 and the very high death-rate of negroes from these diseases, it is no exaggeration to say that the main cause that the death-rate of that race is double that of the white race lies in the ravages oi these two scourges of mankind. The difference between the two races in this respect has apparently increased since 1890, for at that date the death-rate of negroes in the registration area from con- sumption was only 2-37 times that of the whites, and its death-rate from pneumonia only 1-53 times that of the whites. Here as else- where there has been an improvement as measured by an absolute standard, and at the same time an increased divergence from the conditions prevailing among the more numerous race.

Wealth. — An estimate of the property now held by American negroes made in 1904 by a committee of the American Economic Association indicated about $300,000,000, with a probable error of perhaps $50,000,000. This figure indicates a per capita wealth of about $34. We have no means for judging what the possessions of the race were at the time of its emancipation, but in i860 there were nearly half a million free negroes in the country, many of them holding property and some of them wealthy. The per capita wealth of the white population of the United States in 1900 was about $1320 and that of southern whites about $885, indicating that the property of the average negro person or family was about one twenty-fifth that of the average southern white person or family.

Education. — It is often supposed that the American negroes in 1865 were without any accumulated property and without any start in education. Neither assumption is warranted. On the contrary, about two-fifths of the adult free negroes in the country were reported in 1850 and i860 as able to read and write, and there is some reason to believe that not far from one-twelfth of the adult slaves also had learned to write. In 1900 more than half of the negroes at least ten years of age could write, and the proportion was rising at a rate which, if continued, would almost eliminate illiteracy by the middle of the present century.

The problem of providing adequate educational facilities for negro children is made more difficult by the maintenance in all the former slave states of twosets of schools, one for each race. At the present time those states with one-third of their population negro assign about

one-fifth of their public school funds to the support of negro schools. About $155,000,000 or one-sixth of the entire amount spent by southern communities for public schools between 1870 and 1906, has gone to support schools for the negroes. The same cause has been aided by many private gifts from individuals and organi- zations interested in negro education, among which the Peabody Education Fund of about $2,000,000, now in course of dissolution, and the John F, Slater Fund, now of about $1,500,000, may be mentioned. Wide differences of opinion exist regarding the char- acter of education needed for the race, and the present trend ia towards a greater emphasis upon manual and industrial training as of prime importance for the great majority.

Occupations. — The slavery system furnished industrial training to many slaves who seemed likely to turn it to their master's advantage. When this system was abolished the opportunities for such training open to the race were decreased, and it is doubtful whether even yet as large a proportion of skilled negro artizans are being trained in the south as were produced there before the Civil War. The demand for skilled labour in the south is being met more and more by white labour. This derives an advantage from a prejudice in its favour on the part of white employers even when other things are equal, from its greater skill and efficiency in most cases, its better opportunity to accumulate or to borrow the requisite capital, its superior in- dustry, persistence and thrift. In consequence negroes are being more and more excluded from the field of skilled labour in the south.

Morals. — As the death-rate is believed to vary inversely as health and longevity and thus to afford a measure of those characteristics, so the crime-rate is often thought to vary inversely as morality, and thus to measure the self-control, good order and moral health of the community. But the analogy cannot be pushed. The crime-rate is everywhere far more difficult, and in the United States impossible to ascertain. And even if known the connexion between the in- frequency of crime or of specific sorts of crime and the prevalence of good order, obedience to law and morality is far more indirect and subject to far more qualifications than the connexion between the death-rate and health. Still the data regarding crime with all their defects are the best available index of moral progress or retrogression. It must be remembered that the comparative infrequency of crime among slaves, even if it existed, is no proof of the absence of criminal tendencies and actions. Offences on the part of slaves, or at least minor offences which are always far more numerous than serious offences, were dealt with in most cases privately and without in- voking the machinery of the law. An apparent increase of crime since emancipation might be

due merely to the becoming patent of what was before latent. The only statistical measure of crime now possible in the United States is the number of prisoners in confinement at a given date, and these figures are an inadequate and misleading substitute for true judicial statistics. The evidence they afford, however, is far better than any other in existence and

deserves careful attention. Enumerations of prisoners affording comparable results were made in 1880, 1890 and 1904.

Date.

Negro Prisoners.

Number per 100,000 Pop.

1880 1890 1904

16,089 24,277 26,087

244

324

278

These figures show a rapid increase between 1880 and 1890 in the number and proportion of negro prisoners, and between 1890 and 1904 a slow increase in the number and a notable decrease in the proportion.

But in order to make the figures for 1890 and 1904 comparable, it is necessary to exclude from those for the earlier date 4473 negro prisoners mainly belonging to two classes, persons in confinement prior to sentence and persons in prison because of their inability to pay a fine, but all belonging to classes which were excluded from the enumeration for 1904. This gives the following result: —

| Date.

Negro Prisoners.

Number per 100,000 Pop.

Whites.

1880 1890 1904

16,089 19,804 26,087

244

264 •

278

96

84 77

The proportion of negro prisoners to population increased rapidly between 1880 and 1890 and slightly between 1890 and 1904, the increase for the first period being most accurately shown by the first set of figures and that for the second period by the second set of figures. It is noteworthy also that the proportion of white prisoners to population decreased during the same period. Perhaps a more significant comparison is that between the proportion of prisoners of each race to the population of that race in the northern states and the southern states respectively, the distribution of population and the systems cf penal legislation and administration being widely different in the two sections. It is impossible to make the correction just referred to except for the United States as a whole, but it must be remembered that the figures for 1890 are not comparable with those for 1 904, and that the true figures for that year would be decidedly less.

Number of Prisoners to each 100,000 People.

Date.

Southern States.

Northern States.

Negroes.

Whites.

Negroes.

Whites.

1880 1890 1904

157 285 221

58 62 40

495 681

743

99

in

83

These figures indicate that in the southern states in 1890 there were about four and a half times as many negro prisoners to popu- lation as white prisoners, and in 1904 about five and a half times as many; that in the northern states in 1890 there were about six times as many negro prisoners to population as white prisoners, and in 1904 about nine times as many. They throw no light whatever upon a point they are often quoted as establishing, the comparative criminality of the northern and southern negroes. Those residing in the north include an abnormal number of males, of adults, and of city population, influences all tending to increase the proportion of prisoners. It seems likely that if the figures for the south in 1890 could be made strictly comparable with those for the same region in 1904 the apparent decrease of 22% in the proportion of negro prisoners to population would almost but not quite disappear. The evidence regarding crime indicates a continued but slow and slacken- ing increase in the proportion of negro prisoners to negro population in the country as a whole and in its two main sections, an increase in the proportion of white prisoners to white population during the first interval and a decrease during the second, and a growing differ- ence between the two races in the proportion of prisoners.

Citizenship. — When the Fourteenth and Fifteenth Amendments to the Federal Constitution were adopted, the former conferring United States citizenship on all native negroes and the latter pro- viding that the right of such citizens to vote should not be abridged by any state on account of race, colour or previous condition of servitude, it was not the practice in northern states to allow negroes to vote. Proposals to grant them the suffrage were submitted to the voters in 1865 in Connecticut, Wisconsin, Minnesota and Colo- rado, and in each state they were rejected. In all states containing a large proportion of

negroes the results of the Federal policy of reconstruction were disastrous, and those bitter years probably contributed more than the Civil War itself to estrange the two sec- tions. Since the withdrawal of Federal troops in 1877 the prevailing and persistent judgment of southern whites regarding the laws and the policy to be adopted upon this subject has been accorded more and more weight in determining the action of the states and the Federal government. The number of negroes voting or entitled to vote has been reduced at first by intimidation or fraud, later by

legislation or provisions of the state constitutions. If such enact- ments are nominally directed not against any race but against certain characteristics which may appear mainly in the race, such as illiteracy, inability or unwillingness to pay an annual poll tax or to register each year, they have been and are likely to be held within the constitutional authority of the state. On the part of the over- whelming majority of negroes this practical disfranchisement has aroused no protest, while it has tended to improve the government and to open the way for the gradual development and expression in word and vote of differences within the ranks of white voters regarding questions of public policy.

Along with this decrease of pressure from without the southern states and the development of economic competition between the races within them, there has gone an increased demand on the part of the whites for a complete social separation between the races in school, in church, in public conveyances and hotels, all founded upon a fear that any disregard of such separateness will make intermarriage or fruitful illegal unions between the races more frequent. In short, these developments are towards a more and more rigid caste system. The negroes in the United States have played and are playing an important and necessary part in the industrial and economic life of the southern states, in which in 1908 they formed about one-third of the population. But that life was changing with marvellous rapidity, becoming less simple, less agricultural and patriarchal, more manufacturing and commercial, more strenuous and complex. It was too early to say whether the negroes would be given an equal or a fair opportunity to show that they could be as serviceable or more serviceable in such a civilization as they had been in that which was passing away, and whether the race would show itself able to accept and improve such chances as were afforded, and to remain in the future under these changing circumstances, as they had been in the past, a vital and essential part of the life of the nation.

Bibliography. — Writings about the American negro fall naturally into

classes. The official governmental publications include those of the Census Bureau, notably Bulletin 8, ” Negroes in the United States,” reprinted in 1906 in the volume called Supplementary Analysis, those of the Bureau of Labor, especially important articles in the Bulletin of the Bureau, and those of the commissioner of education. The information in these is largely statistical, but in the later publications not a little interpretative matter has been intro- duced. The point of view is usually that of a dispassionate northern man.

Among southern white men who have written wisely on the subject may be mentioned : Dr J. L. M. Curry, for many years general agent of the’ Peabody and Slater funds; H. A. Herbert, Why the Solid South? or Reconstruction and its Results (Baltimore, 1 890); T. N. Page, The Negro — the Southerner’ s Problem (New York, 1904) ; E. G. Murphy, Problems of the Present South (New York, 1904) ; E. R. Corson, Vital Equation of the Colored Race; and A. H. Stone, Studies in the American Race Problem (New York, 1908). F. L. Hoffman’s Race, Traits and Tendencies of the American Negro (New York, 1896) contains the most important collection of statistical data in any private publication and interpretations thoroughly congenial to most southern whites.

Among the southern negroes doubtless the most important writers are the two representatives of somewhat antagonistic views, Booker T. Washington, Up from Slavery (New York, 1901), Future of the American Negro (Boston, 1899), Tuskegee and its People (New York, 1905), &c, and W. E. B. Dubois, The Souls of Black Folk (Chicago, 1903), The Philadelphia Negro (Boston, 1899), Health and Physique of the Negro American (1907), &c. With these should be mentioned Atlanta University annual publications, the Proceedings of the Hampton Negro Conference and the file of the Southern Workman. No northern man since the war has written on the subject with the thoughtfulness and weight of Frederick Law Olmsted, Journey in the Seaboard Slave States (New York, 1856). See also Sir H. H. Johnston, The Negro in the New World (1910). (W. F. W.) NEGUS. (1) The title of a king or ruler (Amharic negus or n’giis), in Abyssinia (q.v.); the full title of the emperor is negus nagasti, ” king of kings.” (2) The name of a drink made of wine, most commonly port, mixed with hot water, spiced and sugared. According to Malone (Life of Dryden, Prose Works, 484) this drink was invented by a Colonel Francis Negus

(d. 1732), who was commissioner for executing the office of master of the horse from 1717 to 1727, when he became mastef of the buckhounds.

NEHAVEND, a small but very fertile and productive province of Persia, situated south-west of Hamadan, west of Malayir, and north-west of Burujird. Pop. about 15,000. The capital is the ancient city of Nehavend, where Yazdegird, the last monarch of the Sassanian dynasty, was finally defeated by the Arabs. (a.d. 641). It has a population of about 5000, including 700 to 800 Jews; there are fine gardens, and an old citadel on a hill. It is situated at an elevation of 5540 ft., 27 m. from Doletabad (Malayir), and 25 m. from Burujird.

35°

NEHEMIAH (Heb. for " Yah[weh] comforts"), governor of Judaea under Artaxerxes (apparently A. Longimanus, 465- 424 B.C.). The book of Nehemiah is really part of the same work with the book of Ezra, though it embodies certain memoirs of Nehemiah in which he writes in the first person. Apart from what is related in this book we possess little information about Nehemiah. The hymn of praise by Ben Sira (Ecclesiasticus xlix. 13) extols his fame for rebuilding the desolate city of Jerusalem and for raising up fresh homes for the downtrodden people. According to other traditions he restored the temple- service and founded a collection of historical documents (2 Mace, i. 18-36, ii. 13). See further Ezra and Nehemiah (Books), Jews: History §§21 seq.

NEIGHBOUR (O. Eag.neahgebUr, from neah, " nigh," " near ") and gebur, "boor," literally "dweller," "husbandman"; cf. Dan. and Swed. nabo, Ger. Nachbar), properly one who lives in a house close to one, hence any one of a number of persons living in the same locality. From Biblical associations (Luke x. 27) the word is used widely of one's fellow-men.

NEILE, RICHARD (1562-1640), English divine, was educated at Westminster school and at St John's College, Cambridge. His first important preferment was as dean of Westminster (1605); afterwards he held successively the bishoprics of Rochester (1608), Lichfield (1610), Lincoln (1614), Durham (1617) and Winchester (1628), and the archbishopric of York (163 1). When at Rochester he appointed William Laud as his chaplain and gave him several valuable preferments. His political activity while bishop of Durham was rewarded with a privy councillorship in 1627. Neile sat regularly in the courts of star-chamber and high commission. His correspondence with Laud and with Sir Dudley Carleton and Sir Francis Winde- bank (Charles I.'s secretaries of state) are valuable sources for the history of the time.

NEILL, JAMES GEORGE SMITH (1810-1857), British soldier, was born near Ayr, Scotland, on the 26th of May 1810, and educated at Glasgow University. Entering the service of the East India Company in 1827, he received his lieutenant's commission a year later. From 1828 to 1852 he was mainly employed in duty with his regiment, the 1st Madras Europeans (of which he wrote a Historical Record), but gained some experience on the general and the personal staffs as D.A.A.G. and as aide-de- camp. In 1850 he received his majority, and two years later set out for the Burmese War with the regiment. He served throughout the war with distinction, became second-in-command to Cheape, and took part in the minor operations which followed, receiving the brevet of lieutenant-colonel. In June 1854 he was appointed second-in-command to Sir Robert Vivian to organize the Turkish contingent for the Crimean War. Early in 1857 he returned to India. Six weeks after his arrival came the news that all northern India was aflame with revolt. Neill acted promptly; he left Madras with his regiment at a moment's notice, and pro- ceeded to Benares. The day after his arrival he completely and ruthlessly crushed the mutineers (4th June 1857). He next turned his attention to Allahabad, where a handful of Europeans still held out in the fort against the rebels. From the 6th to the 1 5th of June his men forced their way under conditions of heat and of opposition that would have appalled any but a real leader of men, and the place, " the most precious in India at that moment," as Lord Canning wrote, was saved. Neill re- ceived his reward in an army colonelcy and appointment of aide-de-camp to the queen. Allahabad was soon made the con- centration of Havelock's column. The two officers, through a misunderstanding in their respective instructions, dis- agreed, and when Havelock went on from Cawnpore (which Neill had reoccupied shortly before) he left his subordinate there to command the lines of communication. At Cawnpore, while the traces of the massacre were yet fresh, Neill inflicted the death penalty on ali his prisoners with the most merciless rigour. Meanwhile, Havelock, in spite of a succession of victories, had been compelled to fall back for lack of men; and Neill criticized his superior's action with a total want of restraint. A second expedition had the same fate, and Neill himself was now

attacked, though by his own exertions and Havelock's victory at Bithor (16th August) the tension on the communications was ended. Havelock's men returned to Cawnpore, and cholera broke out there, whereupon Neill again committed himself to criticisms, this time addressed to the commander-in-chief and tc Outram, who was on the way with reinforcements. In spite of these very grave acts of insubordination, Havelock gave his rival a brigade command in the

final advance. The famous march from Cawnpore to Lucknow began on September 19th; on the 21st there was a sharp fight, on the 22nd incessant rain, on the 23rd intense heat. On the 23rd the fighting opened with the assault on the Alum Bagh, Neill at the head of the leading brigade recklessly exposing himself. Next day he was again heavily engaged, and on the 25th he led the great attack on Lucknow itself. The fury of his assault carried everything before it, and his men were entering the city when a bullet killed their commander. Strict as he was, he was loved not less than feared, and throughout the British dominions he had established a name as a skilful and extraordinarily energetic commander. The rank and precedence of the wife of a K.C.B. was given to his widow, and memorials have been erected in India and at Ayr. See J. W. Kaye, Lives of Indian Officers (1889) ; and J. C. Marsh- man, Life of Havelock (1867).

NEILSON, ADELAIDE (1846-1880), English actress, whose real name was Elizabeth Ann -Brown, was born in Leeds, the daughter of an actress, and her childhood and early youth were passed in poverty and menial work. In 1865 she appeared in Marga'te as Julia in The Hunchback, a character with which her name was long to be associated. For the next few years she played at several London and provincial theatres in various parts, including Rosalind, Amy Robsart and Rebecca (mlvanhoe), Beatrice, Viola and Isabella (in Measure for Measure). In 1872 she visited America, where her beauty and talent made her a great favourite, and she returned year after year. She died on the 15th of August 1880. Miss Neilson was married to Philip Henry Lee, but was divorced in 1877.

NEISSE, three rivers of Germany. (1) The Glatzer Neisse rises on the Schneegebirge, at an altitude of 1400 ft., flows north past Glatz, turns east and pierces the Eulengebirge in the Wartha pass, then continues east as far as the town of Neisse, and after that flows north-east until at an altitude of 453 ft. it joins the Oder between Oppeln and Brieg. Owing to its torrential character the greater part of its course is only used for floating down timber. It abounds in fish, and its total length is 121 m. (2) The Lausitzer or Gorlitzer Neisse rises near Reichenberg in Bohemia, on the south side of the Riesengebirge, at an altitude of 1130 ft., flows north past Reichenberg, Gorlitz, Forst and Guben, and enters the Oder above Fiirstenberg at an altitude of 105 ft. Its length is 140 m., of which less than 40 m. are navigable. (3) The Wiitende Neisse is a tributary of the Katzbach.

NEISSE, a town and fortress of Germany, in the province of Prussian Silesia, at the junction of the Neisse and the Biela, 32 m. by rail S.W. of Oppeln. Pop. (1905) 25,394 (mostly Roman Catholics) including a

garrison of about 5000. It consists of the town proper, on the right bank of the Neisse, and the Friedrichstadt on the left. The Roman Catholic parish church of St James (Jakobikirche) dates mainly from the 13th century, but was finished in 1430. The chief secular buildings are the old episcopal residence, the new town hall, the old Rathaus, with a tower 205 ft. in height (1499), the beautiful Renaissance Kammerei (exchequer) with a high gabled roof ornamented with frescoes, and the theatre. A considerable trade is carried on in agricultural products.

Neisse, one of the oldest towns in Silesia, is said to have been founded in the 10th century, and afterwards became the capital of a principality of its own name, which was incorporated with the bishopric of Breslau about 1200. Its first walls were erected in 1350, and enabled it to repel an attack of the Hussites in 1424. It was thrice besieged during the Thirty Years' War. The end of the first Silesian War left Neisse in the hands of Frederick the Great, who laid the foundations of its modern fortifications.

The town was taken by the French in 1807. Neisse can, at the will of the garrison, be protected by a system of inundation.

See Kastner, Urkundliche Geschichte der Stadt Neisse (Neisse and Breslau, 1854-1867, 3 vols.); Schutte, Beitrage zur Geschichte von Neisse (Neisse, 1881) ; and Ruffert, Aus Neisse 's Vergangenheit (1903).

NEJD, a central province of Arabia, bounded N. by the Nafud desert, E. by El Hasa, S. by the Dahna desert and W. by Asir and Hejaz. It lies between 20 and 28 N. and 41° and 48 E., extends nearly 550 m. from north to south, 450 from east to west, and covers approximately 180,000 sq. m. The name Nejd implies an upland, and this is the distinctive character of the province as compared with the adjoining coastal districts of Hejaz and El Hasa. Its general elevation varies from 5000 ft. on its western border to 2500 in Kasim in the north-east, and somewhat less in Yemama in the south-east. In the north the double range of Jebel Shammar, and in the east the ranges of J. Tuwek and J. 'Arid rise about 1500 ft. above the general level, but on the whole it may be described as an open steppe, sloping very gradually from S.W. to N.E. of which the western and southern portion is desert, or at best pasture land only capable of supporting a nomad population; while in

the north and east, owing to greater abundance of water, numerous fertile oases are found with a large settled population. The principal physical features are described in the article Arabia.

The main divisions of Nejd are the following: Jebel Shammar, Kasim, Suder, Wushm, ‘Arid, Aflaj, Harik, Yemama and Wadi Dawasir. J. Shammar is the most northerly: its principal settlements are situated in the valley some 70 m. long, between the two ranges of J. Aja and J. Selma, though a few lie on their outer flanks. Jauf, Tema and Khaibar, though dependencies of the Shammar principality, lie beyond the limits of Nejd. The capital, Hail, has been visited by several Europeans, by W. G. Palgrave in 1862, when Talal was emir, and by Mr Wilfrid and Lady Anne Blunt, Charles Doughty, C. Huber, T. Euting and Baron E. Nolde during the reign of Mahommed b. Rashid, who from 1892 till his death in 1897 was emir of all Nejd. Its well ordered and thriving appearance is commented on by all these travellers. The town is surrounded by a wall and dominated by the emir’s palace, a stately, if somewhat gloomy building, the walls of which are quite 75 ft. high, with six towers, the whole giving the idea of an old French or Spanish donjon.

Hail lies at the northern end of the valley, 2 m. S.E. of J. Aja, at an altitude of about 3000 ft. The highest point of J. Aja, the western and higher of the twin ranges, is according to Huber 4600 ft. above sea-level. The valley is about 20 m. in width and is intersected with dry ravines and dotted with low ridges generally of volcanic origin. Wells and springs are the only source of water supply, both for drinking and for irrigation. The principal crops are dates, wheat and barley and garden produce; forage and firewood are very scarce. The population was estimated by Nolde in 1893 at 10,000 to 12,000.

Among the other settlements of J. Shammar are Jafefa and Mukak at the northern foot of J. Aja, Kasr and Kafar at its southern foot, Rauda, Mustajidda and Fed at the foot of J. Selma, all large villages of 3000 to 5000 inhabitants. ‘Akda is a small valley in the heart of J. Aja, an hour’s ride from Hail; it was the oldest possession of the Ibn Rashid, since 1835 the ruling family of J. Shammar, and is a place of great natural strength. Kasim lies E. of J. Shammar in the valley of the W. Rumma the great wadi of northern Nejd; the chief towns Bureda and ‘Aneza are situated about 10 m. apart, on the north and south sides of the wadi respectively. Doughty described ‘Aneza in 1879 as clean and well built with walls of sun-dried brick, with well supplied shops. Many inhabitants live in distant houses in gardens outside the town walls. “Aneza and Bureda each contain some 10,000 inhabitants. The dry bed of the Wadi Rumma in lower KasJm is about 2 m. across,

fringed in places with palm plantations; water is found at 6 or 8 ft. in the dry season and in winter the wells overflow. The staple of cultivation is the date-palm, the fruit ripening in August or September. Fruit trees and fields of wheat, maize or millet surround the villages, but the extent of cultivation

is limited by the necessity of artificial irrigation. Kahafa, Kuseba and Kuwara are the principal villages of upper Kasim; and ‘Aneza and Bureda, Madnab, Ayun and Ras of lower Kasim.

Doughty’s and Huber’s explorations did not extend east of Kasim, and for all details regarding eastern and southern Nejd Palgrave is the only authority. According to him, a long desert march leads from Madnab to Zulfa the first settlement in Suder, where the land rises steadily to the high calcareous tableland of J. Tuwek. The entire plateau is intersected by a maze of valleys, generally with steep banks, as if artificially cut out of the limestone. In these countless hollows is concentrated the fertility and population of Nejd; gardens and houses, cultivation and villages lie hidden from view among the depths while one journeys over the dry flats, till one comes suddenly on a mass of emerald green beneath.

Suder forms the northern end of the plateau, ‘Arid the southern, while Wushm appears to lie on its west, and Aflaj and el Harik below it and to the south and south-west respectively. The principal town is Majma the former capital of Suder, a walled town situated on an eminence in a broad shallow valley sur- rounded by luxuriant gardens and trees. Tuwem, Jalajil and Hula are also described by Palgrave as considerable towns.

‘Arid is entered at Sedus, on the W. Hanifa, a broad valley bottom with precipitous sides, here 2 or 3 m. wide, full of trees and brushwood. Along its course lie the villages of Ayana, and Deraiya the former Wahhabi capital, destroyed by Ibrahim Pasha in 181 7; and a few miles farther E. the new capital Riad, built by the emir Fesal after his restoration and visited by Palgrave in 1863, and by Pelly two years later. It was then, and still is, a large town of perhaps 20,000 inhabitants with thirty or more mosques, well-stocked bazars, and like the towns of Kasim, surrounded by well-watered gardens and palm groves. To the south the valley opens out into the great plains of Yemama, dotted with groves and villages, among which Manfuha is scarcely inferior in size to Riad itself. Still farther to the south- east lies the district of Harik, with its capital Hauta, the last in that direction of the settled districts of Nejd, and on the borders of the southern desert.

Palgrave visited El Kharfa the chief place of the Aflaj district some 80 m. S.W. of Riad. This district seems to be scantily peopled as compared with Suder or Yemama, and a large propor- tion of the inhabitants are of mixed negro origin. While there, he made inquiries about the adjoining district of W. Dawasir. Its length was stated to be ten days' journey or 200 m. ; scattered villages consisting of palm-leaf huts lie along the way, which leads in a south or south-westerly direction to the highlands of Asir and Yemen.

The Bedouin who occupy the remainder of Nejd consist in the main of the four great tribes of the Shammar, Harb, 'Ateba and Muter. The first-named represent that part of the great Shammar tribe which has remained in its ancestral home on the southern edge of the Nafud (the northern branch long ago emigrated to Mesopotamia); many of its members have settled down to town life, but the tribe still retains its Bedouin character, and its late chief, the emir Mahommed Ibn Rashid, the most powerful prince in Nejd, used to live a great part of the year in the desert with his tribesmen. The Harb are probably the largest of the Bedouin tribes in the peninsula; they are divided into a number of sections, several of which have settled in the oases of Hejaz, while others remain nomadic. Their territory is the steppe between Kasim and Medina, and across the pilgrim road between Medina and Mecca, for the protection of which they receive considerable subsidies from the Turks. The 'Ateba circuits extend from the Hejaz border near Mecca along the road leading thence to Kasim. The Muter occupy the desert from Kasim northwards towards Kuwet.

Nejd became nominally a dependency of the Turkish empire in 1871 when Midhat Pasha established a small garrison in El Hasa, and created a new civil district under the government of Basra, under the title of Nejd, with headquarters at Hofuf. Its real independence was not, however, affected, and the emirs.

Mahommed Ibn Rashid at Hail, and Abdallah Ibn Sa'ud at Riad, ruled in western and eastern Nejd respectively, until 1892, when the former by his victory at 'Aneza became emir of all Nejd. His successor, Abdul Aziz Ibn Rashid, was, however, unable to maintain his position, and in spite of Turkish support, sustained a severe defeat in 1905 at the hands of Ibn Sa'ud which for the time, at any rate, restored the supremacy to Riad.

No data exist for an accurate estimate of the population; it probably exceeds 1,000,000, of which two-thirds may be settled, and one-third nomad or Bedouin. Palgrave in 1863, perhaps unduly exaggerating the importance of the town population, placed it at nearly double this figure.

The revenue of the emir Mahommed Ibn Rashid of Hail, who died in 1897, was estimated by Blunt in 1879 at £80,000, and his expenditure at little more than half that amount. Nolde who visited Hail in 1893 after the emir's conquest of the Wahhabi state, believed that his surplus income then amounted to £60,000 a year, and his accumulated treasure to £1*500,000.

Authorities.— W. G. Palgrave, Central and Eastern Arabia (London, 1865); Lady Anne Blunt, Pilgrimage to Nejd (London, 1881); C. M. Doughty, Arabia Deserta (Cambridge, 1885); C. Huber, Journal d'un voyage en Arabie (Paris, 1891); J. Euting, Reise in inner Arabien (Leyden, 1896); E. Nolde, Reise nach inner Arabien (Brunswick, 1895). (R. A. W.)

NEJEF, or Meshed 'Ali, a town of Asiatic Turkey, in the pashalik of Bagdad, 50 m. S. of Kerbela and 5 or 6 m. W. of the ruins of ancient Kufa, out of the bricks of which it is chiefly built. It stands on the eastern edge of the Syrian desert, on the north-eastern shore of a deep depression, formerly a sea, the Assyrium Stagnum of the old geographers, but in latter years drained and turned into gardens for the town. It is a fairly prosperous city, supplied with admirable water by an under- ground aqueduct from the Hindieh canal, a few miles to the north, which also serves to water the gardens in the deep dry bed. of the former lake. The town is enclosed by nearly square brick walls, flanked by massive round towers, dating from the time of the caliphs, but now falling into decay. Outside the walls, over the sterile sand plateau, stretch great fields of tombs and graves, for Nejef is so holy that he who is buried here will surely enter paradise. In the centre of the town stands Meshed (strictly Meshhed) 'Ali, the shrine of 'Ali, containing the reputed tomb of that caliph, which is regarded by the Shi'ite Moslems as being no less holy than the Ka'ba itself, although it should be said that it is at least very doubtful whether 'Ali was actually buried there. The dome of the shrine is plated with gold, and within the walls and roof are covered with polished silver, glass and coloured tiles. The resting-place of 'Ali is represented by a silver tomb with windows grated with silver bars and a door with a great silver lock. Inside this is a smaller tomb of damascened ironwork. In the court before the dome rise two minarets, plated, like the dome, with finely beaten gold from the height of a man and upward. While the

population of Nejef is estimated at from 20,000 to 30,000, there is in addition a very large floating population of pilgrims, who are constantly arriving, bringing corpses in all stages of decomposition and accompanied at times by sick and aged persons, who have come to Nejef to die. At special seasons the number of pilgrims exceeds many times the population of the town. Nejef is also the point of departure from which Persian pilgrims start on the journey to Mecca. No Jews or Christians are allowed to reside there. The accumulated treasures of Meshed ‘Ali were carried off by the Wahhabites early in the 19th century, and in 1843 the town was deprived of many of its former liberties and compelled to submit to Turkish law; but it is again enormously wealthy, for what is given to the shrine may ‘never be sold or used for any outside purpose, but constantly accumulates. . Moreover, the hierarchy derives a vast revenue from the fees for burials in the sacred limits.

See W. K. Loftus, Chaldaea and Susiana (1857); J. P. Peters, Nippur (1897); B. Meissner, Hirau Huarnaq (1901). (J. P. Pe.)

NELEUS, in Greek legend, son of Poseidon and Tyro, brother of Pelias. The two children were exposed by their mother, who afterwards married Cretheus, king of Iolcus in Thessaly. After

the death of Cretheus, the boys, who had been brought up by herdsmen, quarrelled for the possession of Iolcus. Pelias expelled Neleus, who migrated to Messenia, where he became king of Pylos (Apollodorus i. 9: Diod. Sic. iv. 68) and the ancestor of a royal family called the Neleidae, who are historically traceable as the old ruling family in some of the Ionic states in Asia Minor. Their presence is explained by the legend that, when the Dorians conquered Peloponnesus, the Neleidae were driven out and took refuge in Attica, whence they led colonies to the eastern shores of the Aegean. By Chloris, daughter of Amphion, Neleus was the father of twelve sons (of whom Nestor was the most famous) and a daughter Pero. Through the contest for his daughter’s hand (see Melampus) he is connected with the legends of the prophetic race of the Melampodidae, who founded the mysteries and expiatory rites and the orgies of Dionysus in Argolis. According to Pausanias (ii. 2. 2, v. 8. 2) Neleus restored the Olympian games and died at Corinth, where he was buried on the isthmus.

NELLORE, a town and district of India, in the Madras pre- sidency. The town is on the right bank of the Pennar river, and has a station on the East Coast railway, 109 m. N. of Madras city. Pop. (1901) 32,040. There are United Free Church, American Baptist and Catholic

missions.

The District of Nellore has an area of 8761 sq. m. It comprises a tract of low-lying land extending from the base of the Eastern Ghats to the sea. Its general aspect is forbidding: the coast-line is a fringe of blown sand through which the waves occasionally break, spreading a salt sterility < over the fields. Farther inland the country begins to rise, but the soil is not naturally fertile, nor are means of irrigation readily at hand. About one-half of the total area is cultivated; the rest is either rocky waste or is covered with low scrub jungle. The chief rivers are the Pennar, Suvarnamukhi and Gundlakamma. They are not navigable, but are utilized for irrigation purposes, the chief irrigation work being the anicut across the Pennar. Nellore, however, is subject both to droughts and to floods. Copper was discovered in the western hills in 1801, but several attempts by European capitalists to work the ore proved unre- murierative, and the enterprise has been abandoned since 1840. Iron ore is smelted by indigenous methods in many places, but the most important mining industry is that of mica. Salt is largely manufactured along the sea-coast. Nellore, with the other districts of the Carnatic, passed under direct British administration in 1801. The population in 1901 was 1,496,987 showing an increase of 2-3% in the decade. In 1904 a portion of the district was transferred to the newly formed district of Guntur, reducing the remaining area to 7965 sq. m., with a population of 1,272,815. The principal crops are millets, rice, other food grains, indigo and oil-seeds. The breed of cattle is celebrated. The East Coast railway, running through the length of the district, was opened throughout for traffic in 1899. The section from Nellore town to Gudur, formerly on the metre gauge, has been converted to the standard gauge. Previously the chief means of communication with Madras was by the Buckingham canal. The sea-borne trade is insignificant.

NELSON, HORATIO NELSON, Viscount (1758-1805), duke of Bronte in Sicily, British naval hero, was born at the parsonage house of Burnham Thorpe, in Norfolk, on the 29th of September 1758. His father, Edmund Nelson (1722-1802), who came of a clerical family, was rector of the parish. His mother, whose maiden name was Catherine Suckling (1725-1767), was a grand- niece of Sir Robert Walpole (1st earl of Orford). This connexion proved of little or no value to the future admiral, who, in a letter to his brother, the Rev. William Nelson, written in 1784, speaks of the Walpoles as ” the merest set of cyphers that ever existed — in public affairs I mean.” His introduction to the navy came from his maternal uncle, Captain Maurice Suckling (1725-1778), an officer of some reputation who at his death held the important post of comptroller of the navy. Horatio,

who had received a summary, and broken, education at Norwich, Downham and North Walsham, was entered on the ” Raisonable ” when Captain Suckling was appointed to her in 1770 on an alarm

of war with Spain. The dispute was settled, and Captain Suckling was transferred to the ” Triumph,” the guardship at Chatham, whither he took his nephew. In order that the lad might have more practice than could be obtained on a harbour ship, his uncle sent him to the West Indies in a merchant vessel, and on his return gave him constant employment in boat work on the river. In a brief sketch of his life, which he drew up in 1799, Nelson says that in this way he became a good pilot for small vessels ” from Chatham to the Tower of London, down the Swin, and the North Foreland; and confident of myself among rocks and sands, which has many times since been of great comfort to me.” Between April and October of 1772 he served with Captain Lutwidge in the ” Carcass,” one of the vessels which went on a not otherwise notable voyage to the Arctic seas with Captain Phipps, better known by his Irish title of Baron Mulgrave. On his return from the north he was sent to the East Indies in the ” Seahorse,” in which vessel he made the acquaintance of his lifelong friend Thomas Troubridge. At the end of two years he was invalided home. In after times he spoke of the depression under which he laboured during the return voyage, till ” after a long and gloomy reverie, in which I almost wished myself overboard, a sudden glow of patrotism was kindled within me, and presented my king and my country as my patron. My mind exulted in the idea. ‘Well then,’ I exclaimed, T will be a hero, and, confiding in Providence, I will brave every danger.’ ” He spoke to friends of the ” radiant orb ” which from that hour hung ever before him, and “urged him onward to renown.” On his return home he served during a short cruise in the ” Worcester ” frigate, passed his examination as lieutenant on the 9th April 1777, and was confirmed in the rank next day. He went to the West Indies with Captain Locker in the ” Lowestoft ” frigate, was transferred to the flagship by the admiral commanding on the station, Sir Peter Parker (i72r- 181 1), and was then by him promoted in rapid succession to the command of the ” Badger ” brig, and the ” Hinchinbrook ” frigate. By this appointment, which he received in 1779, he was placed in the rank of post captain (from which promotion to flag rank was by seniority), at the very early age of twenty. His connexion with Captain Suckling may, no doubt, have been of use to him, but in the main he owed his rapid rise to his power of winning the affection of all those he met,

whether as comrades or superiors. Sir Peter Parker and Lady Parker remained his friends all through his life. In 1780 he saw his first active service in an expedition to San Juan de Nicaragua, which was rendered deadly by the climate. He was brought to death's door by fever, and invalided home once more. In 1781 he was appointed to the "Albemarle" frigate, and after some convoy service in the North Sea and the Sound was sent to Newfoundland and thence to the North American station. " Fair Canada," as he has recorded in one of his letters, gave him the good health he had so far never enjoyed. At Quebec he formed one of those passionate attachments to women which marked his career. He now made the personal acquaintance of Sir Samuel Hood, Lord Hood. In the autobiographical sketch already quoted he mentions the high opinion formed of him by the admiral who presented him to Prince William, duke of Clarence, afterwards King William IV., as an officer well qualified to instruct him in " naval tactics," by which we must perhaps understand seamanship. Prince William has left a brief but singularly vivid account of their first meeting. He appeared, says the Prince, "to be the merest boy of a captain I ever beheld; and his dress was worthy of attention. He had on a full-laced uniform; his lank unpowdered hair was tied in a stiff Hessian tail of an extra- ordinary length; the old-fashioned flaps of his waistcoat added to the general quaintness of his figure, and produced an appear- ance which particularly attracted my notice; for I had never seen anything like it before, nor could I imagine who he was or what he came about. My doubts were, however, removed when Lord Hood introduced me to him. There was something irresistibly pleasing in his address and conversation; and an enthusiasm, when speaking on professional subjects, that showed he was no common being." The slight oddity of appearance,

the power to arouse affection, and the glow indicating the fire within, are noted by all who ever looked Nelson in the face.

In March 1783, at the very end of the American War, he saw his second piece of active service. He was repulsed in an attempt to retake Turk's Island from the French. The peace gave him leisure to pay a visit to France, for which country and all its ways he entertained a dislike and contempt characteristic of his time. In France he formed another attachment, and went so far as to apply to a maternal uncle for an allowance to eke out his half-pay. It came to nothing, presumably by refusal on the lady's part. And now when the navy was cut down to the quick on the peace establishment, and the vast majority of naval officers were condemned to idleness on shore, he

had the extraordinary good fortune to be appointed to the command of the “Boreas” frigate, for service in the West Indies. Nelson found in this commission an opportunity for the display of his readiness to assume responsibility. He signalized his arrival in the West Indies by refusing to obey an order of the admiral which required him to acknowledge a half-pay officer acting as commissioner of the dockyard at Antigua as his superior. He insisted on enforcing the Navigation Laws against the Americans, who by becoming independent had become foreigners. He called the attention of the government to the corruption prevailing in the dockyard of Antigua. His line was in all cases correct, but it impressed the admiralty as somewhat assuming, and his strong measures against the interloping trade brought on him many lawsuits, which, though he was defended at the expense of the government, caused him much trouble for years. In the West Indies on the 12th of March 1787 he married Frances Nisbet (i76i-i83i),the widow of a doctor in Nevis,whose favour he first gained by being found romping on all fours with her little boy under the drawing-room table. The marriage was one of affection and prudence, rather than of love.

Though Nelson had as yet seen little active service, and that little had not been specially distinguished, he had already gained that reputation within his own service which commonly precedes public recognition. His character had been fully developed, and his capacity proved. His horizon was narrow, being strictly confined to his profession. He had all the convictions of the typical John Bull of his generation. The loyalty of a devoted subject was strong in him. He burned to win affection, admira- tion, distinction. He was a man to do whatever there was to be done to the utmost. A more magnificent instrument for use in the great Revolutionary struggle now dose at hand could not have been forged.

War having broken out, he was appointed captain of the “Agamemnon” (64) on the 30th of November 1793; and joined his ship on the 7th of February. From this date till June 1800, rather more than seven years, he was engaged on continual active service, with the exception of a few months when he was invalided home. This period is the most varied, the busiest, the most glorious and the most debated of a very full career. It subdivides naturally into three sections; (1) From the date o> his appointment as captain of the “Agamemnon” till he was disabled by the loss of his arm in the unsuccessful attack on Santa Cruz de Tenerife on the 24th of July 1797 he served as captain, or commodore, under Hood, Hotham and Jervis, successive commanders-in-chief in the Mediterranean. (2) After an interval of nine months spent at home in recovering from his

wound, and from the effects of a badly performed operation, he returned to the Mediterranean, and was at once sent in pursuit of the great French armament which sailed from Toulon under the command of Napoleon for the conquest of Egypt. His victory of the Nile on the 1st of August 1798 placed him at once in the foremost rank among the warriors of a warlike time, and made him a national hero. With his return to Naples on the 22nd of September the second period ends. (3) From now till he landed at Leghorn on the 26th of July 1800, on his return home across Europe, he was entangled at Naples in political transactions and intrigues, which he was ill prepared to deal with either by nature or training, and was plunged into the absorbing passion,

which did increase his popularity with the mob, but cost him many friends.

The first of these three passages in his life is full of events which must, however, be told briefly. In May he sailed for the Mediterranean with Hood, and was engaged under his orders in the occupation of Toulon by the allied British and. Spanish forces. In August 1793 he was despatched to Naples to convoy the troops which the Neapolitan government had undertaken to contribute towards the garrison of Toulon. It was on this occasion that he made the acquaintance of Emma Hamilton (q.v .), the wife of Sir William Hamilton, minister at the Court of Naples. References to Lady Hamilton begin to appear in his letters to his wife, but, as might be expected, -they indicate little beyond respectful admiration, and he makes a good deal of her kindness to his stepson, Josiah Nisbet, whom he had taken to sea. Young Nisbet was afterwards promoted to post captain, and was put in command of a frigate at an improperly early age by Nelson's interest. He proved quite unworthy, and in the end died mad. After the allies had been driven from Toulon by Napoleon, Nelson was employed throughout 1794 in the operations connected with the occupation of Corsica. In April and May he was engaged in the capture of Bastia, and June and July in the taking of Calvi. Both towns really surrendered from want of stores, but the naval brigades under Nelson's personal direction were conspicuously active, and their energy was favourably contrasted with the alleged formality of the troops. During the operations at Calvi, Nelson's right eye was

destroyed by gravel driven into it by a cannon shot which struck the ground close to him. From the date of the occupation of Corsica till the island was evacuated, that is to say, from the end of 1794 till the middle of 1796, he was incessantly active. He served under Hotham, who undertook the command when Hood returned to England, and was engaged in the indecisive actions fought by him in the Gulf of Lyons in March and July 1795. The easy-going ways of the new admiral fretted the eager spirit of Nelson, and Hotham's placid satisfaction with the triiing result of his encounters with the French provoked his subordinate into declaring that, for his part, he would never think that the British fleet had done very well if a single ship of the enemy got off while there was a possibility of taking her. His zeal found more satisfaction when he was detached to the Riviera of Genoa, where, first as captain, and then as commodore, he had an opportunity to prove his qualities for independent command by harassing the communications of the French, and co-operating with the Austrians. In Sir John Jervis, who superseded Hotham, he found a leader after his own heart. When Spain, after first making peace with France at Basel, declared war on England, and the fleet under Jervis withdrew from the Mediterranean, Nelson was despatched to Elba on a hazardous mission to bring off the small garrison and the naval stores. He sailed in the "Minerve" frigate, having another with him. After a smart action with two Spanish frigates which he took off Carthagena on the 20th of December, and a narrow escape from a squadron of Spanish line of battle ships, he ful- filled his mission, and rejoined the flag of Jervis on the eve of the great battle off Cape St Vincent on the 14th of February 1797 (see St Vincent, Battle of). The judgment, independence and promptitude" he showed in this famous engagement, were rewarded by the conspicuous part he had in the victory, and revealed him to the nation as one of the heroes of the navy. Nelson receiving the swords of the Spanish officers on the deck of the " San Josef " became at once a popular figure.

A few days after the victory he became rear-admiral by seniority, but continued with Jervis, who was made a peer under the title of Earl St Vincent. Nelson's own services were recog- nized by the grant of the knighthood of the Bath. During the trying months in which the fleet was menaced by the sedition then rife in the navy, which came to a head in the mutinies at Spithead and the Nore, he remained with the flag, and in the blockade of Cadiz. In July 1797 he was sent on a desperate mission to Santa Cruz de Tenerife. It was believed that a Spanish Manilla ship carrying treasure had anchored at that

place, and Lord St Vincent was desirous of depriving the enemy of this resource. The enterprise was, in fact, rash in the last degree, for the

soldiers from the garrisons of Elba and Corsica having gone home, no troops were available for the service, and a fortified town was to be taken by man-cf-war boats alone. Nelson's well-established character for daring marked him out for a duty which could only succeed by dash and surprise, if it was to succeed at all. But the Spaniards were on the alert, and the attack, made with the utmost daring on the night of the 24th of July, was repulsed with heavy loss. Some of the boats missed the mole in the dark and were stove in by the surf, others which found the mole were shattered by the fire of the Spaniards. Nelson's right elbow was shot through, and he fell back into the boat from which he was directing the attack. The amputation of his arm was badly performed in the hurry and the dark. He was invalided home, and spent months of extreme pain in London and at Bath. On the 10th of April 1798 he came back to the fleet off Cadiz as rear-admiral, with his flag in the " Van- guard " (74).

He was now one of the most distinguished officers in the navy. Within the next six months he was to raise himself far above the heads of all his contemporaries. It was notorious that a great armament was preparing at Toulon for some unknown destina- tion. To discover its purpose, and to defeat it, the British government resolved to send their naval forces again into the Mediterranean, and Nelson was chosen for the command by Jervis, with whom the immediate decision lay, but also by ministers.

Having joined the flag of Lord St Vincent outside of the straits of Gibraltar on the 30th of April, Nelson was detached on the 2nd of May into the Mediterranean, with three line-of- battle ships and five frigates, to discover the aim of the Toulon armament. Napoleon had, however, enforced rigid secrecy, and the British admiral had to confess that the French were better than the British at concealing their plans. Beyond the fact that a powerful combined force was collected in the French port he could learn nothing. On the 20th of May the " Vanguard " was dismasted in a gale. Nelson bore the check in a highly character- istic manner. "I ought not," he wrote, "to call what has happened by the cold name of accident; but I believe firmly that it was the Almighty's goodness to check my consummate vanity." The " Vanguard " was saved from going on shore by the seaman-like skill of Captain Ball of the "Alexander," against whom Nelson had hitherto had a prejudice, but for whom he had henceforth a peculiar regard. The " Vanguard " was refitted by the exertions of her own crew under cover of the little island of San Pietri on the southern coast of Sardinia. In the meantime the frigates attached to his command had returned to Gibraltar, in the erroneous belief that the liners would be taken there to make good the damage suffered in the gale. " I thought

Hope would have known me better," said Nelson. On the 30th of April he was off Toulon again, only to find that the French were gone, and that he could not learn whither they were steering. Racked by anxiety and deprived of his best means of obtaining information by the disappearance of his frigates, he remained cruising till he was joined, on the 7th of June, by Troubridge with ten sail of the line. And now he started on his fierce pursuit of the enemy, seeking him in the dark, for there were no scouts at hand; exasperated at being left without the eyes of his fleet; half maddened at the thought he might, by no fault of his own, miss the renown towards which his pro- phetic imagination had seemed to guide him; knowing that St Vincent would be blamed for choosing so young an admiral; but resolved to follow the enemy to the antipodes if necessary. From the coast of Sardinia to Naples, from Naples to Messina, from Messina to Alexandria, from Alexandria, where he found the roadstead empty, back to Sicily, and then when at last a ray of light came to him, back to Alexandria — he swept the central and eastern Mediterranean. At no time in his life were the noble qualities of his nature displayed more entirely free from all alloy. He was an embodied flame of resolution, and as yet he showed no sign of the vulgar bluster which was to appear

later. In the midst of his anxieties his kindness of heart shone forth without a trace of the tendency of sentimental gush so irritatingly obvious in after days. Unlike most admirals of his time, he did not live apart from his captains, but saw much of them, and freely discussed his plans with them. He had his reward in their devotion and perfect comprehension of what he wished them to do. At the same time he acquired an absolute confidence in the efficiency of his squadron, the magnificent force which had been formed by years of successful war, and by the careful training of his predecessors. The captains were the band of brothers he himself had made them.

The great victory of the ist of August 1798 (see Nile, Battle of) brought Nelson yet another wound. He was struck on the forehead by a langridge shot, and had for a time to go below. It is perhaps to be lamented in the interest of his fame that the wound was not severe enough to compel him to return home. After providing for the blockade of what remained of the French fleet in Alexandria, he sailed for Naples, and arrived there on the 22nd of September. There was no rear-admiral of any standing in the navy who could not have done what remained to be done in the Mediterranean, under the

supervision of St Vincent, as well as he. For him Naples was a pitfall. There awaited him there precisely the influences to folly which he was least able to resist. He loved being loved, and was the man to think the gift a debt. He had an insatiable appetite for praise. With those weaknesses of character which caused Lord Minto, who yet never ceased to regard him with sincere friendship, to say that he was in some respects a ” baby,” he was disarmed in the presence of the two women who now made a determined attempt to capture him. Emma Hamilton, who could not help endeavour- ing to conquer every man she met, was naturally eager to dominate one who had filled Europe with his fame. Behind Emma was the queen of Naples, Maria Carolina, a woman who had a share of the ability of her mother Maria Theresa without any of her fine moral qualities. Maria Carolina was ail her life trying to fight the power of revolutionary France, with no better resources than were afforded her by the insignificant kingdom of Naples, and a husband who was the embodiment of all the faults of the Italian Bourbons. She had made use of the English minister’s wife as an instrument of political intrigue, and now she employed her to manage Nelson. We have the repeated assertions of Nelson himself in all his ample correspondence from September 1798 to July of 1800, and indeed later, to prove that he was, in his own tell-tale phrase, persuaded to “Sicilyfy” his conscience — in other words to turn his squadron into an instrument for the ambition, the revenge and the fears of Maria Carolina, the ” Dear Queen ” of his letters to Emma Hamilton. It is highly probable that he was secretly influenced by annoyance at the pedantry of the British government, which only gave him a barony for the splendid victory of the Nile, on the ridiculous ground that no higher title could be given to an officer who was not a commander-in-chief. All doubt as to the character of his relations with Lady Hamilton has been laid at rest by the Morrison papers. None ought ever to have existed, for, if Nelson did not love this woman in the fullest possible sense of the word, his conduct would be inexplicable on any other hypothesis than that he was an imbecile. He allowed her to waste his money, to lead him about ” like a bear,” and to drag him into gambling, which he naturally hated. For her sake he offended old friends, and quarrelled with his wife in circumstances of vulgar brutality. That he believed she had borne him a child can no longer be disputed, and he carried on with her a correspondence under the name of Thompson which was apparently meant to deceive her husband, but is varied by grotesque explosions which destroy the illusion, such as it was.

In the hands of these two women, and in the intoxication produced on him by flattery, which could not be too copious or gross for his taste,

Nelson speedily became a Neapolitan royalist of far greater sincerity than was to be found among the king's subjects except in the ranks of the Lazzaroni. He gratified the headlong queen by egging her torpid husband into an exceedingly foolish attack on the French garrisons then

occupying the so-called Roman republic. The collapse of the Neapolitan forces was instant and ignominious. The court fled to Palermo in December, under the protection of the British squadron. At Palermo Nelson remained directing the operations of the ships engaged in blockading Malta, then held by the garrison placed in it by JNapoleon when he took it on his way to Egypt, and sinking continually deeper into his slavery to Lady Hamilton, till the spring of the following year. He was then aroused by a double call. A royalist army led by the king's vicar-general, Fabrizio Ruffo (q.v.), had succeeded in recovering the greater part of the kingdom of Naples from the government set up by the French, and called, in the pedantic style of the revolutionary epoch, the Parthenopean republic. A French fleet commanded by Admiral Bruix entered the Mediterranean. News of the appearance of Bruix reached Nelson just as he was about to sail for Naples with the heir apparent to co-operate with Ruffo and his " Christian Army." He immediately took steps to concentrate his ships, which had been reinforced by a small Portuguese squadron, at Marittimo on the western coast of Sicily, where he would be conveniently placed to meet the French, if they came, or to unite with the ships of Lord St Vincent. He was, however, half distraught between his sense of what was required by his duty to his own service and the obligations he had assumed towards the sove- reigns of Naples. In the end he resolved to sail for Naples, this time without the crown prince, in order to carry out a mission entrusted to him by the king.

The story of Nelson's visit to Naples in the June of 1799 will probably remain a subject for perpetual discussion. His reputa- tion for humanity and probity is considered to depend on the view we take of his actions there and at this period. It is true that the relative importance of these episodes has been much diminished by the publication of the Morrison Papers, and that it has at all times been exaggerated. From the Morrison Papers we know that, when his passions were concerned, he was not incapable of stratagems to deceive his old friend Sir William Hamilton. It is the less incredible that he should have been willing to use deceit against persons whom he hated so fiercely as he did the Neapolitan Jacobins, in his double quality of English Tory and Neapolitan Royalist. But apart from his laxity in the course of a double adultery, his letters, written to many

different people during his stay on the coasts of Naples, contain more than sufficient evidence to show that he was utterly unhinged by excitement, and was unable to estimate the real character of many of his own words and deeds. He considered himself as owing an equal allegiance to Ferdinand of Naples and to his own sovereign. His feelings towards the Jacobin subjects of his Italian king are expressed in terms which bear a remarkable likeness to the rhetoric of the Jacobins of France when they were most vigorously engaged in ridding their country of aristocrats. To Troubridge he writes: “Send me word some proper heads are taken off, this alone will comfort me.” To St Vincent he reports that ” Our friend Troubridge had a present made him the other day of the head of a Jacobin, and makes an apology to me, the weather being very hot, for not sending it here.” Some allowance may be made for a rude taste in jocularity, but it is impossible to mistake the scream of fury in Nelson’s letters, imitated from the style of Lady Hamilton, who in these things was the sycophant of the queen. A man who allowed his thoughts to dwell in an atmosphere of hysterical ferocity, and was above all a man of action, was well on the way to interpret his words into deeds. It was while he was in this heated state that he was sent to preside over the fall of the Parthenopean republic at the end of June 1799.

King Ferdinand had not been unwilling to offer terms to those of his subjects who had joined with the French to establish the republic, so long as he was under the influence of fear. But when the French had been defeated in northern Italy and had left the Republicans to their own resources, he became more anxious to make an example. In the early parts of June he heard that Ruffo was inclined to clemency, and grew very eager to prevent any such mistake. No more effectual way of

enforcing rigour could be imagined than to put the control of events entirely in the hands of Nelson, whose sentiments were well known, who was notoriously under the influence of Emma Hamilton, that is to say, of the queen, and who, as a stranger, would have no family or social attachments with the republicans, no changes of fortune nor future revenges to fear. That he asked Nelson to go to Naples, giving him large powers, may be con- sidered certain. A commission in the full sense he could not give without the consent of the king of Great Britain, and that was not even asked for. But Nelson had general instructions from home to support the Neapolitan government, and

though this only meant, and could only mean, as an ally and against the common enemy, he understood it in a much wider sense, while he considered himself as being bound to Ferdinand in the relation of subject to sovereign by the grant of the duchy of Bront6 in Sicily, which he had just received. He therefore sailed to Naples resolved to act in the double capacity of English and Neapolitan admiral, of English opponent of the Jacobins, and of Neapolitan royalist. The general cause of Europe and the particular revenge of the king and queen were of equal importance to him. When he entered the Bay of Naples on the 24th of June he found that a capitulation had been agreed upon some thirty-six hours earlier, between Ruffo, acting as vicar- general, with the consent of Captain Foote (1767-1833) of the "Seahorse," the senior British naval officer present, on the one side, and the Neapolitan republicans on the other. The republicans had been reduced to the possession of the castles of Uovo and Nuovo, and had been glad to secure terms which allowed them to go into exile in France. Nelson denounced an arrangement which would have precluded all cutting off of heads as "infamous." He ordered the white flag to be hauled down on the " Seahorse," and told Ruffo that he would not allow the capitulation to be carried out. The same warning was given to the republicans in the forts. There is a question whether the capitulation had been in part already carried into effect. Sir William Hamilton, who, together with his wife, had accompanied Nelson from Palermo, asserts that it had, in an official despatch to Lord Grenville dated on the 14th July. But this letter, written only a fortnight after the transaction, contains many inaccuracies, and can be held to prove only that Hamilton would have seen nothing discreditable in violating a capitulation, or that he was in his dotage, and did not know what he was doing. Ruffo refused to be a party to a breach of faith. On the afternoon of the 25th he had an interview with Nelson on board the flagship the "Foudroyant," which was con- ducted through the Hamiltons and was of a very heated character. Next morning, as Ruffo showed a determination to stand aside and throw on Nelson the responsibility of provoking a renewal of hostilities, messages were sent to him both by the admiral and by Hamilton that there would be no interference with the "armistice." This assurance put a stop to the dispute between them. The republicans came out of the forts and were trans- ferred to feluccas under the guard of British marines, where they were kept till the king's pleasure was known. As a matter of course it was that they should be mostly hanged or shot. Whether Nelson meant to deceive Ruffo into thinking that he had accepted the capitulation when he named the armistice, — whether the vicar-general was deceived, and then misled the garrisons in good faith — or whether he knew

perfectly well that the capitulation was not included, and took the opportunity afforded him by these two English gentlemen to deceive his own countrymen, are points much discussed. The republicans in the forts did claim that they were covered by the capitulation, and that it had been violated. It is difficult to see in what way the service of King George was forwarded by Nelson's zeal for King Ferdinand. Such discredit as fell on him would have been avoided if he had kept to his duty as British admiral, and had not thought it incumbent on him to prove himself a good Neapolitan royalist. On the 29th of June Francesco Caracciolo (q.v.), a Neapolitan naval officer who had joined the republicans, was brought to Nelson as a prisoner. Out of his desire to make an example of a proper head, and in the full knowledge that Caracciolo's

death would be pleasing to the queen, Nelson, in virtue, seemingly, of his supposed commission as Neapolitan admiral (which he did not possess), ordered a court martial of Italian officers to sit, on an English ship, to try the prisoner. The court could only find him guilty, and Caracciolo was hanged. The sentence was just, but the procedure was indecent, and Nelson's intervention cannot be justified.

At this period of his life it is indeed difficult to represent Nelson's actions in a favourable light. In July he disobeyed the order of Lord Keith to send some of his ships to Minorca, on the ground that they were needed for the defence of Naples. The influence of the queen, exercised through Emma Hamilton was partly responsible for his wilfulness, but a great deal must be put down to his annoyance at finding that Keith, and not he himself, was to succeed St Vincent as commander-in-chief in the Mediterranean. After the victory of the Nile he became, in fact, incapable of acting as a subordinate. Until he left for home in June 1800, except during the short interval when he acted as commander-in-chief in the absence of Keith, he was captious, querulous and avoided leaving Palermo as much as he could, and far more than he ought. When forced out he made his health an excuse for going back. He began a quarrel with Troubridge which ripened into complete estrangement. He wearied out his friends at the Admiralty, and finally extorted leave to return. As Keith would not allow him to take a line of battleship for his journey home with the Hamiltons, and indeed said plainly that Lady Hamilton had commanded the Mediterranean station long enough, he returned across Europe with his friends. Accounts of the figure they cut, and the sensation they created at Vienna and at Dresden, can be found in the Minto correspondence, and in the reminiscences of Mrs St George, afterwards Mrs Trench (1768-1827). He reached home in November.

In England he was received with the utmost popular en- thusiasm, but with coldness by the king, the Admiralty, and by the great official and social world. His erratic and self-willed conduct towards Lord Keith sufficiently explains the distrust shown by My Lords of the Admiralty. Their uneasiness was not diminished by their knowledge that his renown made it quite impossible to lay him aside at a crisis. The king, a man of strict domestic habits and strong religious convictions, was un- doubtedly offended by the scandals of Nelson's life at Naples, and he cannot but have been displeased by the admiral's openly avowed readiness to devote himself to King Ferdinand. English society as represented by the First Lord, Lord Spencer, and his wife, may not have shared the moral indignation of the pious king; but their taste was offended, and so was their self-respect, when Nelson insisted on forcing Lady Hamilton on them, and would go nowhere where she was not received. When ii was discovered that he insisted on making his wife live in the same house as his mistress, he was considered to have infringed the accepted standard of good manners. After enduring insult at once cruel and cowardly, to the verge of poorness of spirit, Lady Nelson rebelled. A complete separation took place, and husband and wife never met again.

On the 1st of January 1801 Nelson became vice-admiral by seniority. The alliance of the Northern powers of which the Tsar Paul was the inspiring spirit, made it necessary for the British government to take vigorous measures in its own defence. A fleet had to be sent on a very difficult and dangerous mission to the Baltic. The Admiralty would have been unpardonable, and would not have been excused by public opinion if, when it had at its disposal such an admirable weapon as the conqueror of the Nile, it had failed to employ him. Nelson was chosen to go as a matter of course, but unfortunately, it was thought proper to put him under the command of Sir Hyde Parker (q.v.) an officer of no experience, and, as the Admiralty ought to hav* known, of commonplace, not to say indolent, character. Nelsob bore the subordination with many bitter complaints, but on the whole with patience and tact. Sir Hyde Parker began by keeping his formidable second in command at arm's length, but Nelson handled him with considerable diplomacy. Knowing

his superior to be fond of good living he caused a turbot to be caught for him on the Dogger Bank, and sent it to him with a complimentary message. Sir Hyde was not insensible to the attention, and thawed

notably. We have the good fortune to possess the notes taken during the campaign by Colonel Stewart (1774-1827), a military officer who did duty with Nelson as a marine. Colonel Stewart has put on record many stories of Nelson which have a high biographical value. He saw the hero when his character was displayed in all its strength and its weak- ness. Nelson was at once burning for honour, ardently desirous to serve his country at a great crisis, and yet longing for rest and for the company of Emma Hamilton. His passion had, if possible, been increased by the birth of the child Horatia, whom he believed to be his own, and his jealousy was excited by fears that Emma would become an object of attention to the prince of Wales (afterwards George IV.). His health, as Colonel Stewart justly observed, was always affected by anxiety, and during the Baltic campaign he complained incessantly of his sufferings. Nervous irritation provoked him into odd explosions of excite- ment, as when, for instance, he suddenly interfered with the work- ing of his flagship while the officer of the watch was tacking her on the south coast of England, and so threw her into disorder. When he saw the consequences of his untimely intrusion he sharply appealed to the officer to tell him what was to be done next, and when the embarrassed lieutenant hesitated to reply, burst out with, ” If you do not know, I am sure I don’t,” and then went into his cabin. His subordinates learnt to take these manifestations as matters of course, knowing that they were wholly without malignity. To them he was always kind, even when they were at fault, taking, as his own phrase has it, a penknife where Lord St Vincent would have taken a hatchet. Colonel Stewart tells how he was wont to invite the midshipmen of the middle watch to breakfast, and romp with them as if he had been the youngest of the party. The playfulness of his nature came out, in combination with his heroism, when he adorned his refusal to obey Sir Hyde’s weak signal of recall in the middle of the battle, which would have been disastrous if it had been acted on, by putting his telescope to his blind eye and declaring that he could not see the order to retire. At such moments all could see his agitation; but, as the surgeon of the ” Elephant,” which bore his flag at Copenhagen, says, they could also see that ” it was not the agitation of indecision, but of ardent animated patriotism panting for glory.” When Sir Hyde Parker was recalled in May, Nelson assumed the command in the Baltic; but the dissolution of the Northern Confederation left him little to do. His health really suffered in the cold air of high latitudes, and in June he obtained leave to come home. His services were grudgingly recognized by the title of viscount. During the brief interval before the peace he was put in command of a flotilla to combat Napoleon’s futile threat of invasion. In the hope of quieting public anxiety rather than in any serious

expectation of success, an attack was made on a French flotilla strongly protected by its position, at Boulogne, which was disastrously repulsed. Nelson was not in command on the spot, and if he had been would in all probability have renewed his experience at Santa Cruz. He could not do the impossible more than other men. He was only more ready to try.

While the brief peace made at Amiens lasted, he remained on shore. His home was with the Hamiltons in the strange house- hold in which Sir William showed that his 18th-century training had taught him to accept a domestic division with a good grace, and had not left him too squeamish to profit by the pecuniary advantages which may attend the relation of complacent husband. His death on the 6th of April 1803 made no change in the life of the admiral. He lived almost wholly at Merton, where he had purchased a small house, which Emma filled with memorials of his glory and of her now passing beauty. She fed him profusely with the flattery which he, in Lord Minto's words, swallowed as a child does pap; and she was in turn adored by him, and treated with profound deference by his family, with the exception of his father.

When the ambition of Napoleon made it impossible to keep

up the fiction of peace, Nelson was at once called from retirement, and this time there could be no question of putting him under the authority of any other admiral. He was appointed to the Mediterranean command, and hoisted his flag in May 1803. Between this date and his death in the hour of full triumph on the 21st of October 1805, he was in the centre and was one of the controlling spirits of the vast military and naval drama which after filling for more than two years the immense stage bounded by Europe and the West Indies, found its closing scene in Trafalgar Bay (see Trafalgar). In spite of the anxieties of an arduous command Nelson was serene and at his best in this last period of his life. Once only did the ill-advised boasting of Latouche Treville provoke him into a scolding mood. The French officer spoke of him as having fled before his French ships, and the vaunt, which had no better foundation than that Nelson had retired before superior numbers when reconnoitring, exasperated him into threatening to make the Frenchman eat his letter if ever they met. Nelson could boast, but his loudest words are not ridiculously out of proportion to his deeds.

The last hours at Trafalgar will never be forgotten by English- men. There is no figure in English history at once so magnificent in battle, and so penetrating in its appeal to the emotions, as was Nelson on that

last day when under his leadership the fleet annihilated the last lingering fear that Napoleon would ever carry his desolating arms into the British Islands. It matters little that the woman of whom he thought to the last was utterly unworthy of him, had perhaps never rendered the services he supposed her to have done for their country, and was about to dis- honour his memory by mercenary immorality. He must be worse than censorious who can think unmoved of Nelson kneeling in prayer by his cabin table as the ” Victory ” rolled slowly down on the enemy on the 21st of October, appealing to God for help, and writing the codicil in which he left his mistress and his child to the gratitude of his country.

It is said that his famous signal was to have been worded ” Nelson confides that every man will do his duty,” and that his own name was replaced by that of England on the suggestion of one of his officers. The use of his name as an inspiration and an appeal would have been perfectly consistent with his tone at all times, but he agreed to the alteration with the indifference of a man to whom self and country were one at that hour. “Expects” replaced “confides that” because the signal lieutenant Pascoe pointed out to him that the verb originally chosen must be spelt out letter by letter in a long string of flags. He parted with Captain Blackwood of the ” Euryalus ” with a prophecy of his approaching fate. The sight of Colling- wood, the friend of his youth, leading the lee line into action in the ” Royal Sovereign ” drew from him a cry of admiration at the noble example his comrade was showing. When the ” Victory ” had passed astern of the French ” Bucentaure,” and was engaged with her and the ” Redoubtable,” he walked up and down the quarter deck of his flagship by the side of his flag-captain, T. M. Hardy, with the brisk short step customary with him. As they turned, a musket shot from the top of the ” Redoubtable ” struck him on the upper breast, and, plunging down, broke the spine. ” They have done for me at last! ” were the words in which he acknowledged the fatal stroke. He lingered for a very few hours of anguish in the fetid cockpit of the ” Victory,” amid the horrors of darkness relieved only by the dim light of lanterns, and surrounded by men groaning, or raving with unbearable pain. The shock of the broadsides made the whole frame of the ” Victory ” tremble, and extorted a moan from the dying admiral. When Captain Hardy came down to report the progress of the battle, his inherent love for full triumph drew from him the declaration that less than twenty prizes would not satisfy him. He clung to his authority to the end. The suggestion that Collingwood would have to decide on the course to be taken was answered with the eager claim, ” Not while I live. ” But the last recorded words were of affection and of duty. He begged Hardy for a kiss, and he ended with the proud and yet humble claim, ” I have done my duty, thank God for that.”

His body was brought home in his flagship and laid to rest in St Paul’s. He is commemorated in London by the monu- ment in Trafalgar Square, completed in 1840 with a colossal statue by E. H. Baily, and surrounded by Landseer’s bronze lions, added in 1867.

In estimating the character of Nelson, and his achievements, there are some elements which must be allowed for more fully than has always been the case. He was, to begin with, the least English of great Englishmen. He had the excitability, the vanity, the desire for approbation without much delicacy as to the quarter from which it came, which the average Eng- lishman of Nelson's time, his judgment obscured by the effects of centuries of racial rivalry culminating in the Napoleonic wars, was wont to attribute to Frenchmen. Where there is vanity there is the capacity for spite and envy. Nor was Nelson altogether free from these unpleasant faults. But in the main his desire to be liked combined with a natural kindness of disposition to make him appeal frankly to the goodwill of those about him. He won to a very great extent the affec- tion he valued, and that from men so widely different in char- acter as Lord Minto and the simple-hearted seamen among whom he passed the best part of his life. He could be cruel when his emotions were aroused by evil influences, with the downright cruelty he displayed at Naples, or the more subtle form of hardness in his conduct to his wife, when his duty to her stood in the way of his love for Emma Hamilton. But they were few to whom the evil side of his nature was shown, while the captains and seamen for whom he did much to make a hard duty more tolerable were to be counted by the thousand. As a commander he belonged to the race of Pyrrhus and the prince of Conde — the fighters of battles. His victories were won at the head of a force which had been brought to a high level of efficiency by three generations of predecessors, against enemies who had been, as in the case of the French, disorganized by a social revolution which had ruined their discipline, who were inexperienced as the Danes were, or who, as in the case of the Spaniards, were sunk in a moral and intellectual decadence. But he estimated the vices of his opponents with full insight. Wielding a fine instrument, and confronted by inferior enemies, he was entitled to dare much, and it is a proof of his sagacity that he saw how far he could dare, caring but little for the bulk of the force in front of him, and looking to the spirit. Above all, he had the power to inspire the enthusiasm he felt, and to make men act above themselves because he was there, and because they found a joy in pleasing him. Among all the warriors of his generation Napoleon alone was a greater master of the souls of men, and Bliicher alone came near him.

Nelson had no children by his wife. His daughter Horatia, by Lady Hamilton, became the wife of the Rev. Philip Ward, and died in 1881. In November 1805, in recognition of Nelson's great services to his country, his brother William (1757-1833) was created Earl Nelson of Trafalgar, an annuity of £5000 being attached to the title. When

William died without sons in February 1835 his only daughter Charlotte Mary (1787-1873), wife of Samuel Hood, 2nd Baron Bridport (1 788-1868), became duchess of Bronte, while, according to the remainder, his English titles passed to his nephew Thomas Bolton (1786-1835), who became 2nd Earl Nelson. Bolton, who took the name of Nelson, was succeeded as 3rd Earl Nelson in November 1835 by his son Horatio (b. 1823). The duchy of Bronte was in 1910 held by Baroness Bridport's grandson, Arthur Wellington Nelson Hood, 2nd Viscount Bridport (b. 1839).

Authorities. — Very much has been written about Nelson. A large part of the total mass consists of hasty work done to meet an immediate demand, or of repetition not justified by the critical faculty or literary skill of the writers. The valuable portion may be divided into original authorities, such as correspondence, and the testimony of eyewitnesses; and the narratives or criticisms of students who tell with original power, and judge with knowledge and insight. Under the heading of original authorities, the first place is taken by The Dispatches and Letters of Vice-Admiral Lord Viscount Nelson, with notes by Sir N. H. Nicolas (7 vols., 1844-1846). Nicolas spared no pains to make his collection complete and to illustrate it from all trustworthy sources. Thus he includes Sir Edward Berry's Account of the Battle of the Nile, Colonel Stewart's Notes on the Copen-

hagen Campaign, Dr Beatey's Narrative of Nelson's Last Hours, and passages from the so-called Reminiscences of the Captain of the Victory, Dr Scott. This last authority is of little value, for the book consists of recollections by Dr Scott's daughter and son-in-law of what he said years after the events he was speaking of. The student of Nelson's life should make it a rule to exhaust Nicolas before consulting any other authority. A collection of Letters from Nelson to Emma Hamilton was published under her direction in 1814, but it is subject to much suspicion. A great mass of correspondence of the Hamiltons and much MS. relating to Nelson came into the hands of Dr Pettigrew, and passed into the possession of Mr A. Morrison, from whose collection they were transferred to the British Museum. A catalogue, in which the text is given, was privately printed and can be consulted in the museum. Isolated .letters have appeared from time to time. Between February and April 1898 some valuable extracts from his correspondence with his wife, previously un- known, and the correct text of parts of his diary, appeared in the extinct weekly, Literature. Among the lives of Nelson's contem- poraries, J. S. Tucker's Earl of St Vincent (1844), Ross's Saumarez, Lady Bourchier's Codrington and the Letters of Sir William Hoste throw light on particular points. The Nelsonian Reminiscences of Parsons give an

interesting picture of the admiral as he appeared to an observant boy. The observations of older and more intelligent witnesses will be found in The Diaries and Correspondence of George Rose, in The Life and Letters of the First Earl of Minto and in a Journal kept during a Visit to Germany, by Mrs St George, afterwards Mrs Trench. Incidental mentions of Nelson are to be found in the Paget Papers, the correspondence of the minister who succeeded Sir W. Hamilton at the court of Naples. Biographies of Nelson are numerous. Emma Hamilton inspired one by a Mr Harrison, an odious book which was in reality an advertisement of herself and which appeared in 1806. The two quartos of Clarke and McArthur (1809), reprinted in three volumes octavo in 1840, were based on papers supplied by the family, but the texts were edited with un- pardonable freedom and the originals have in many cases been lost. Southey's classic Life was based on Clarke and McArthur. All later biographies have been superseded by Captain Mahan'sZt/e of Nelson, first published in two volumes in 1897 and again in one volume, with additions and corrections in 1899. The much-debated Nea- politan episode has given rise to a literature of its own. The con- troversy began with the appearance of Captain Foote's Vindication of his own part in the transaction published in 1810. It drew an immediate Counter Vindication of Nelson by Commander Jeaffreson Miles. Italian versions will be found in Sacchinelli's Fabrizio Ruffo and in the Compendia of Micheroux edited by theMarcheseMaresca. The controversy has been revived in England by Mr F. P. Badham with his Nelson at Naples (1900). and has provoked the publication of a collection of the documents by the Navy Record Society, in vol. xxv. of their publications, under the title Nelson and the Neapolitan Jacobins (1903). Mr C. Jeaffreson's two works, Lady Hamilton and Lord Nelson (1888) and the Queen of Naples and Lord Nelson (1889), are based on the papers collected by Mr Morrison. See also T. Nelson, Genealogical History of the Nelson Family (1908). (D. H.)

NELSON, ROBERT (1656-1715), English philanthropist and religious writer, son of John Nelson, a London merchant, was born on the 22nd of June 1656, and was educated as the private pupil of George Bull, afterwards bishop of St David's. Having inherited a considerable fortune from his father, he followed no profession. About 1680 he went abroad and spent much time on the continent of Europe till 1691, when he settled at Blackheath. For many years he was an intimate friend and correspondent of Archbishop Tillotson, though not in agreement with his views; and he was also on terms of friendship with the astronomer Halley and other men of science. Nelson's sympathies were with the v Jacobites; and after his return to England

he associated himself with the nonjurors, under whose influence he produced several of his writings on religious subjects. He was an active supporter of the Society for Promoting Christian Knowledge, the Society for the Propagation of the Gospel, and similar associations, and he used his influence largely in the establishment of charity schools and the building of churches in London. In 1687 he had published a controversial work against transubstantiation, and in 1704 appeared his Companion for the Festivals and Fasts of the Church of England, which obtained a remarkable popularity lasting till the middle of the 19th century. Within five years of its publication ten thousand copies of the Companion were printed, and thirty-six editions appeared in a hundred and twenty years. After the death of Bishop Bull in 1710 Nelson wrote his biography, which was published three years later; and he was also the author of many other devotional and controversial works. He died in January

17 1 5, in which year was published his Address to Persons of Quality and Estate, containing suggestions for the establishment of special hospitals, schools and theological colleges, many of his proposals being afterwards carried into effect. Nelson married a Roman Catholic, Lady Theophila Lucy, daughter of the earl of Berkeley, and widow of Sir Kingsmill Lucy of Broxbourne.

See Charles F. Secretan, Memdirs of the Life and Times of the Pious Robert Nelson (i860); Thomas Birch, Life of Tillotson (2nd ed., 1753); Thomas Lathbury, History of the Nonjurors (1845).

NELSON, a river of Keewatin district, Canada, discharging the waters of Lake Winnipeg in a north-easterly direction into Hudson Bay. It drains an area of 360,000 sq. m. and, including iis tributary the Saskatchewan, is 1450 m. long. It is navigable for small steamers for a distance of about 80 m., after which it is unnavigable except for canoes. It has a total fall between the lake and sea of 7 10 ft. Here its chief tributary is the Burntwood. Norway House at its source and York Factory at its mouth are important stations of the Hudson's Bay Company.

NELSON, a town of British Columbia, situated on the west arm of Kootenay lake. Pop. (1906) about 5000. It is the com- mercial, administrative and railroad centre of the east and west Kootenay districts. It is the northern terminus of a branch of the Great Northern

railway and is also connected by rail and steamboat with the main line of the Canadian Pacific railway at Revelstoke and with the Crow's Nest line of the same system at Kootenay landing. It has direct railway communication with Rossland, Grand Forks and Greenwood.

NELSON, a municipal borough in the Clitheroe parliamentary division of Lancashire, England, 325 m. N. from Manchester by the Lancashire & Yorkshire railway. Pop. (1891) 22,754, (1001) 32,816. It is of modern growth, possessing a town hall, market hall, free library, technical school, pleasant park and recreation grounds, and an extensive system of electric tramways and light railways, connecting with Burnley and Colne. Its chief manufacture is cotton. It was incorporated in 1890, and the corporation consists of a mayor, 6 aldermen and 18 councillors. Area, 3466 acres.

NELSON, a seaport of New Zealand, the seat of a bishop and capital of a provincial district of the same name; at the head of Blind Bay on the northern coast of the South Island. Pop. (1906) 8164. The woods and fields in the neighbourhood abound with English song-birds, and the streams are stocked with trout ; while the orchards in the town and suburbs are famous for English kinds of fruit, and hops are extensively cultivated. The town possesses a small museum and art gallery, literary institute, government buildings, and boys' and girls' schools of high repute. The cathedral (Christ Church) is finely placed on a mound which was originally intended as a place of refuge from hostile natives. It is built of wood, the various native timbers being happily combined. Railways connect the harbour with the town, and the town with Motupiko, &c. The harbour, with extensive wharves, is protected by the long and remarkable Boulder Bank, whose southern portion forms the natural breakwater to that anchorage. The settlement was planted by the New Zealand Company in 1842. The borough returns one member to the house of representatives, and its local affairs are administered by a mayor and council.

NELSONVILLE, a city of Athens county, Ohio, U.S.A., on the Hocking river, 62 m. S.E. of Columbus. Pop. (1890) 4558,(1900) 5421, including 328 foreign-born and 204 negroes; (1910) 6082. Nelsonville is served by the Hocking Valley railway. The city is in one of the most productive coal sections of the state; there are large quantities of clay in the vicinity; and the principal industries are the mining and shipping of coal and the manu- facture of fire-clay products. Nelsonville was settled in 1818 and was incorporated in 1838; it was named in honour of Elisha Nelson, who built the first house here.

NEMATODA, in zoology, a group of worms. The name Nema- toda

(Gr. vqua, thread, and dbos, form) was first introduced by Rudolphi, but the group had been previously recognized as distinct by Zeder under the name Ascarides. They are now by

many systematists united with the Acanthocephala and the Nematomorpha to form the group Nemathelminthes.

The Nematoda possess an elongated and thread-like form (see fig. 1), varying in length from a few lines up to several feet. The body is covered externally by a chitinous cuticle which is a product of the subjacent epidermic layer in which no cell limits can be detected though nuclei are scattered through it. The cuticle is frequently prolonged into spines and papillae, which are especially developed at the anterior end of the body. The mouth opens at one extremity of the body and the anus at or near the other. Beneath the epidermis is A

a longitudinal layer of muscle-fibres which are separated into four distinct groups by the dorsal, ventral and lateral areas; these are occupied by a continuation of the epidermic layer; in the lateral areas run two thin-walled tubes with clear contents, which unite in the anterior part of the body and open by a pore situated on the ventral surface usually about a quarter or a third of the body length from the anterior end. These vessels are the nitrogen- ous excretory organs. The body-cavity is largely occupied by processes from the large muscle cells of the skin. These processes stretch across the body cavity to be inserted in the dorsal and ventral middle lines.

The body-cavity also* contains the so- called phagocytic organs. These consist of enormous cells with nuclei so large as to be in some cases just visible to the naked eye. These cells are disposed in pairs, though the members of each pair are not always at the same level. The number of cells is not large (some 2 to 8), and as a rule they lie along the lateral lines. In some species (Ascaris decipiens) the giant cell is replaced by an irregular mass of protoplasm containing a number of small nuclei. Such a plasmodium bears, on its periphery, groups of rounded projections of protoplasm termed end-organs. Similarly the giant cells are produced at their peri- phery into a number of branching pro- cesses which bear similar end-organs on their surface and in some cases terminate in them. These end-organs are the active z °°i- Etp., i agents in taking up foreign granules, or F JG> 1 – Oxyuris. bacteria, which may have found their way into the fluid of the body-cavity, the shape and position of the phagocytic organs it is obvious that they form admir- able strainers through which the fluid of the body-cavity filters (figs. 2, 3).

The alimentary tract consists of a straight tube running from the mouth to the anus without any convolutions; it is separable into three divisions:. (1) a mus- cular oesophagus, which is often provided (e< TestesT with cuticular teeth; (2) a cellular kites- cd, Vas deferens, tine; and (3) a short terminal rectum sp. Cloaca, surrounded by muscular fibres. Neither $ a < Pa P lllae – here nor elsewhere are cilia found at any period of develop- ment.

A nervous system has been shown to exist in many species, and consists of a perioesophageal ring giving off usually six nerves which run forwards and backwards along the lateral and median lines; these are connected by numerous fine, circular threads in the sub-cuticle. Some of the free-living forms possess eye specks. The sexes are distinct (with the exception of a few forms that are hermaphrodite), and the male is always smaller than the female. The generative organs consist of one or two tubes, in the upper

After Galeb, Arch, dt

b, Mouth. ‘u’”’ oe, Oesophagus. * rom bd, Enlargement of the oesophagus, armed with

chitinous teeth. i, Intestine. s, Opening of seg- mental tubes (placed by mis- take on the dor- sal instead of the ventral surface).

portion of which the ova or spermatozoa are developed, the lower portion serving as an oviduct or vas deferens; the female gener- ative organs open at the middle of the body, the male close to the posterior extremity into the terminal portion of the ali- mentary canal ; from this cloaca a diverticulum is given off in which are developed one to three chitinous spicules that subserve the function of copulation. The spermatozoa differ from those of other animals in having the form of cells which sometimes perform amoeboid movements. Most remarkable sexual condi- tions are found to occur in the free-living genera Rhabditis and

Fig. 2. — Sclerostomum arma- tum, 5 , X about 35, opened to show the phagocytic organs. (From Nassonov.)

1, Mouth.

2, Anterior end of alimentary

canal.

3, Posterior end of alimentary

canal.

4., Ovary.

5, 6 and 7, Anterior middle and posterior pairs of phago- cytic organs.

Fig. 3. — One of the phagocytic organs of Sc. artnatum, highly magnified. (From Nassonov.)

1, Nucleus of giant-cell.

2, One of the processes and end-

organs of the same.

Diplogasier. While some of the species are bisexual, others are protandrous, self-fertilizing hermaphrodites. In cultures of the latter there occur very rare supplemental males which appear in no sense degenerate but as fit for reproduction as the males of the bisexual species. Though possessing a complete copulatory apparatus and producing large quantities of spermatozoa, they have lost their sexual instinct and play no part in the economy of the species. These ” psychically decadent ” individuals appear to represent the entire male sex of a bisexual species, and become unnecessary owing to the grafting of hermaphrodit- ism on the female sex.

Mode of Life and Metamorphoses. — While the majority of the

Nematodes are parasites, there are many that are never at any period of their life parasitic. These free-living forms are found everywhere — in salt and fresh water, in damp earth and moss, and among decaying substances; they are always minute in size, and like many other lower forms of life, are capable of retaining their vitality for a long period even when dried, which accounts for their wide distribution; this faculty is also possessed by certain of the parasitic Nematodes, especially by those which lead a free existence during a part of their life-cycle. The free- living differ from the majority of the parasitic forms in under going no metamorphosis; they also possess certain structural peculiarities which led Bastian {Trans. Linn. Soc, 1865) to separate them into a distinct family, the Anguittulidae. It is impossible, however, to draw a strict line of demarcation between the free and parasitic species, since — (1) many of the so-called free

Nematoda live in the slime of molluscs (Villot) , and are therefore really parasitic; (2) while certain species belonging to the free- living genus Anguillula are normally parasitic (e.g. A. iritici, which lives encysted in ears of wheat), other species occasionally adopt the parasitic mode of existence, and become encysted in slugs, snails, &c; (3) it has been experimentally proved that many normally parasitic genera are capable of leading a free existence; 1 (4) transitional forms exist which are free at one period of their life and parasitic at another. The parasitic Nematodes include by far the greatest number of the known genera; they are found in nearly all the orders of the animal kingdom, but more especially among the Vertebrata, and of these the Mammalia are infested by a greater variety than any of the other groups. Some two dozen distinct species have been described as occurring in man. The Nematode parasites of the Invertebrata are usually immature forms which attain their full development in the body of some vertebrate; but there are a number of species which in the sexually adult condition are peculiar to the Invertebrata?

The Nematoda contain about as many parasitic species as all the other groups of internal parasites taken together; they are found in almost all the organs of the body, and by their presence, especially when encysted in the tissues and during their migration from one part of the body to another, give rise to various patho- logical conditions. Although some attain their full development in the body of a single host — in this respect differing from all other Entozoa — the majority do not become sexually mature until after their transference from an ” intermediate ” to a ” definitive ” host. This migration is usually accompanied by a more or less complete metamorphosis, which is, however, not so conspicuous as in most other parasites, e.g. the Trem&toda. In some cases (many species of Ascaris) the metamorphosis is reduced to a simple process of growth.

The parasitic and free-living Nematodes are connected by transitional forms which are free at one stage of their existence and parasitic at another; they may be divided into two classes — those that are parasitic in the larval state but free when adult, and those that are free in the larval state but parasitic when adult. . (1) To the first class belong the so-called ” hairworm,” Mermis, not to be confused with the Gordian worms. 3 The adult forms of M. nigrescens live in damp earth and may be seen after storms or early in the morning crawling up the stalks of plants, a fact which causes people to talk about showers of worms. The eggs are laid on

1 Ercolani successfully cultivated Oxyuris curvula, Strongylus armatus and other species in damp earth; the free generation was found to

differ from the parasitic by its small size, and by the females being ovoviviparous instead of oviparous. To this phenomenon he gave the name of dimorphobiosis.

2 The genera Ascaris, Filaria, Trichosoma are found throughout the Vertebrata; Cucullanus (in the adult condition) only in fishes and Amphibia; Ankylostoma, Trichocephalus, Trichina and Pseudalius live only in the Mammalia, the last-mentioned genus being confined to the order Cetacea; Strongylus and Physaloptera are peculiar to mammals, birds and reptiles, while Dispharagus, Syngamus and Hystrichis are confined to birds. Mermis (in the larval state) is confined to the Invertebrata and Sphaerularia to bees. Oxyuris, though chiefly parasitic in the Mammalia, occurs also in reptiles, Amphibia and one or two insects. Dacnitis and lchthyonema are only found in fishes.

8 See Nematomorpha.

the ground and the young larvae make their way into grasshoppers, in whose bodies they pass most of their larval life. (2) To the second class belong Ankylostoma, Strongylus and many species of Ascaris; the embryo on leaving the egg lives free in water or damp earth, and resembles very closely the free-living genus Rhabditis. After a longer or shorter period it enters the alimentary canal of its proper host with drinking-water, or it bores through the skin and reaches the blood-vessels, and is so conveyed through the body, in which it becomes sexually mature. Rhabditis nigrovenosa has a developmental history which is entirely anomalous, passing through two sexual genera- tions which regularly alternate. The worm inhabits the lung of the frog and toad, and is hermaphrodite (Schneider) or partheno- genetic (Leuckart) ; the embryos hatched from the eggs find their way through the lungs into the alimentary canal and thence to the exterior; in a few days they develop into a sexual larva, called a Rhabditiform larva, in which the sexes are distinct; the eggs remain within the uterus, and the young when hatched break through its walls and live free in the perivisceral cavity of the mother, devouring the organs of the body until only the outer cuticle is left; this eventu- ally breaks and sets free the young, which are without teeth, and have therefore lost the typical Rhabditis form. They live for some time in water or mud, occasionally entering the bodies of water snails, but undergo no change until they reach the lung of a frog, when the cycle begins anew. Although several species belonging to the second class

occasionally enter the bodies of water snails and other animals before reaching their definitive host, they undergo no alteration of form in this intermediate host; the case is different, however, in Filaria medinensis and other forms, in which a free larval is followed by a parasitic existence in two distinct hosts, all the changes being accompanied by a metamorphosis. Filaria medi- nensis — the Guinea worm — is parasitic in the subcutaneous connec- tive tissue of man (occasionally also in the horse). It is chiefly found in the tropical parts of Asia and Africa, but has also been met with in South Carolina and several of the West Indian islands. The adult worm in the female sometimes reaches a length of 6 ft. The males have only recently been discovered. The female is vivi- parous, and the young, which, unlike the parent, are provided with a long tail, live free in water; it was formerly believed from the frequency with which the legs and feet were attacked by this parasite that the embryo entered the skin directly from the water, but it has been shown by Fedschenko, and confirmed by Manson, Leiper and others, that the larva bores its way into the body of a Cyclops and there undergoes further development. It is probable that the parasite is then transferred to the alimentary canal of man by means of drinking-water, and thence makes its way to the subcutaneous connective tissue.

The Nematoda which are parasitic during their whole life may similarly be divided into two classes — those which undergo their development in a single host, and those which undergo their development in the bodies of two distinct hosts.

(1) In the former class the eggs are extruded with the faeces, and the young become fully formed within the egg, and when accidentally swallowed by their host are liberated by the solvent action of the gastric juice and complete their development. This simple type of life-history has been experimentally proved by Leuckart to be characteristic of Trichocephalus affinis, Oxyuris ambigua and other species. (2) The life-history of Ollulanus tricuspis is an example of the second class. Ollulanus tricuspis is found in the adult state in the alimentary canal of the cat; the young worms are hatched in the alimentary canal, and often wander into the body of their host and become encysted in the lungs, liver and other organs ; during the encystment the worm degenerates and loses all trace of structure. This wandering appears to be accidental, and to have nothing to do with the further evolution of the animal which takes place in those embryos which are voided with the excrement. Leuckart proved experimentally that these young forms become encysted in the muscles of mice, and the cycle is completed after the mouse is de- voured by a cat. The well-known Trichinella spiralis (fig. 4) has a life-

history closely resembl- ing that of Ollulanus. The adult worm, which
Fig. 4. — Trichin- is of extremely minute size, the male being only ella
encysted jˆth and the female | of an inch in length

among muscular inhabits the alimentary canal of man and many
fibres. (After other carnivorous mammalia; the young bore

Leuckart.) their way into the tissues and become encysted

in the muscles — within the muscle-bundles according to Leuckart, but in the connective tissue between them according to Chatin and others. The co-existence of the asexual encysted form and the sexually mature adult in the same host,' exceptionally found in Ollulanus and other Nematodes, is the rule in Trichinella; many of the embryos, however, are extruded with the faeces, and complete the life cycle by reaching the alimentary canal of rats and swine which frequently devour human ordure

Swine become infested with Trichinella. in this way and also by eating the dead bodies of rats, and the parasite is conveyed to the body of man along with the flesh of " trichinized " swine.

Importance in Pathology. — Among recent advances having medical import in our knowledge of the Nematodes, the chief are those dealing with the parasites of the blood. F. bancrofti is known to live in the lymphatic glands, and its embryos Micro- filaria sanguinis hominis nocturna, passing by the thoracic duct, reach the blood-vessels and circulate in the blood. Manson showed in 1881 that the larvae (Microfilariae) were not at all times present in the blood, but that their appearance had a certain periodicity, and the larvae of F. bancrofti. Microfilaria nocturna swarmed in the blood at night-time and disappeared from the peripheral circulation during the day, hiding away in the large vessels' at the base of the lungs and of the heart. Ten years later Manson discovered a second species, Filaria perstans, whose larvae live in the blood. They, however, show no period- icity, and are found continuously both by day and by night; and their larval forms are termed Microfilaria perstans. The adult stages are found in the sub-peritoneal connective tissue. A third form, Microfilaria diurna, is found in the larval stage in blood, but only in the daytime. • The adult stage of this form is the Filaria loa found in the subcutaneous tissues of the limbs.

The presence of these parasites seems at times to have little effect on the host, and men in whose system it is' calculated there are some 40-50 million larvae have shown no signs of disease. In other cases

very serious disorders of the lymphatic system are brought about, of which the most marked is perhaps Elephantiasis. Manson and Bancroft suggested that the second host of the parasite is the mosquito or gnat, and for a long time it was thought that they were conveyed to man by the mosquito dying after laying her eggs in water, the larval nematodes escaping from her body and being swallowed by man. It is now held that the parasite enters the blood of man through the piercing mouth-parts at the time of biting. When first sucked up by the insect from an infected man it passes into its stomach, and thence makes its way into the thoracic muscles, and there for some time it grows. Next the larvae make their way into the connective tissue in the pro-thorax, and ultimately bore a channel into the base of the piercing apparatus and come to rest between the hypopharynx and the labium. Usually two are found in this position lying side by side; it would be interesting to know if these are male and female. From their position in the proboscis the larvae can easily enter the blood of man the next time the mosquito bites (Low, Brit. Med. Journ., June 1900; James, ibid., Sept. 1900). Shortly after Low had published his results, Grassi and Noe issued a paper dealing with the larvae of F. immitis, which is spread by means of the mosquito Anopheles (Centrbl. Bakter. I. Abth. xxviii., 1900). The larvae of this parasite develop in the Malpighian tubules of the insect; at a certain stage they cast their cuticle and make their way into the space — part of the haemocoel — found in the labium. During the act of biting the labium is bent back, and as the piercing stylets enter the skin of the sufferer this bending becomes more and more acute. Grassi and Noe think that if the cavity of the labium be full of the larval nematodes this bending will burst the tissue, and through the rent the larvae will escape and make their way into the body of the host. Besides Anopheles, two species of Culex, C. penicillaris and C. pipiens, are also accused of trans- mitting the larvae. A paper by Noe (Atti Ace. Lincei, ix., 1900) seems to prove beyond doubt that the larvae of F. immitis are transmitted in the manner indicated. The adult worm is chiefly found in the heart of the dog, and usually in the right side, which may be so packed with the worms as seriously to interfere with the circulation (fig. 5). The females produce thousands of larvae, which circulate in the blood, and show a certain periodicity in their appearance, being much more numerous in the blood at night than during the day.

Importance as Pests. — Agriculturists now pay increased attention to the nematodes that destroy their crops. A good example of a fairly typical case is afforded by Heterodera schachtii, which attacks beetroot and causes great loss to the Continental sugar manufacturers. The young larvae, nourished by the yolk

which remains over from the egg and by the remains of the mother which they have taken into their alimentary canal, make their way through the earth, and ultimately coming across the root of a beet, begin to bore into it. This they do by means of a spine which can be protruded from the mouth. Once within the root, they absorb the cell sap of the parenchyma and begin to swell until their body projects from the surface of the root in

300 embryos, and that half of these are females, the number of descendants would be, after six generations, some 22,781 milliards (A. Strubell, Bill. Zool., 1888-1889). Other species which have been recorded in the United Kingdom are Tylenchus devastatrix (Kuhn), on oats, rye and clover roots; T. tritici, causing the

Fig. 5.

A, View of the heart of a dog infested with Filaria immitis Leidy; the right ventricle and base of the pulmonary artery have been opened: a, aorta; b, pulmonary artery; c, vena cava; d, right ventricle; e, appendix of left auricle; /, appendix of right auricle.

B, Female F. immitis, removed from the heart to show its length.

the form of a tubercle (fig. 6). 1'he reproductive organs do not begin to appear until the larva has twice cast its skin. After this a marked sexual dimorphism sets in. The female, hitherto indistinguishable from the male, continues to swell until she attains the outlines of a lemon. Doing this she bursts the epidermis of the rootlet, and her body projects into the surround- ing earth. The male has a different life-history (fig. 7). After

the second larval moult, he passes through a passive sta ge comparable to the pupa-stadium of an insect, and during this stage, which occurs inside the root, the reproductive organs are perfected. The male next casts his cuticle, and by means of his spine bores through the tissues of the root and escapes into the earth. Here he seeks a female, pairs, and soon after- wards dies. The eggs of the female give rise to embryos with- in the body of the mother; her other organs undergo a retrogressive change and serve as food for the young, until the body-wall only of the mother remains as a brown capsule. From this the young escape and make their way through the earth to new roots. The whole life-history extends over a period of

some 4-5 weeks (fig. 7), so that some 6-7 generations are born during the warmer months. If we assume that each female produces

Fig. 6.

A,a,Female Heterodera schachtii Schmidt, breaking through the epidermis of a root; the head is still embedded in the paren- chyma of the root.

B, a, larvae boring their way into a root; b, larva of the immobile kind surrounded by the old skin, living as an ectoparasite on the outside of the root. (From Strubell.)

Fig

7-

A, Male Heterodera schachtii.

B,

First motile larva.

greatly magnified.

c,

Second immovable parasitic

0, Head lappets.

larva casting its skin.

b, Mouth cavity.

D

A female with one half of the

c, Spine.

body- wall taken away to

d, Muscle of spine.

show the coiling generative

e. Gland.

organs.

/, Oesophagus.

a, Boring apparatus.

b, Oesophageal bulb.

g, Bulb.

h, Nerve-ring.

c, Excretory pore.

i, Excretory pore

d. Alimentary canal.

j, Oesophagus.

e, Anus.

k, Testis.

/, Ovary.

/, Intestine.

E

A male shortly before casting

m, Muscles moving

spicule.

its larval skin.

n, Spicule.

ear-cockle of wheat; Cephalobus rigidus (Schn.), on oats; Heterodera radicicola (Greef) , on the roots of tomatoes, cucumbers, potatoes, turnips, peach-trees, vines and lettuce, and many other plants.

See N. Nassonov, Arch. Mikr. Anat. (1900) ; Arch, parasit. (1898); Rabot, Lab. Warsaw (1898); Zool. Anz. (1898); L. Jagerskiold, Centrbl. Bakter. (1898); J. Spengel, Zool. Anz. (1897); H. Ehlers, Arch. Nature.. (1899); 0. Hamann, Die Nemathelminthen (1895).

(F. E. B.; A. E. S.)

NEMATOMORPHA. This zoological group includes Gordian worms which are found swimming in an undulatory manner or coiling round water-weeds in ponds and puddles, or knotted together in an apparently inextricable coil. They may be several inches in length and are no thicker than a piece of whip-cord.

The male is distinguishable from the female by the presence of a fork at the posterior end of the body. The body is covered by a cuticle which is sculptured and the various markings are of systematic importance: it is secreted by a hypodermis which also includes nerve-cells and some gland-cells. In the adult aquatic stage the alimentary canal shows signs of degeneration, and it seems probable that in this stage Gordian worms take no food. The mouth is terminal or subterminal; there is a weak sucking pharynx situated behind the brain, and a long intestine lying along the medio-ventral body-cavity; it ends in a cloaca which receives the vasa deferentia in the male. There is a single unsegmented nerve-cord which runs along the ventral middle line and enlarges posteriorly into a caudal ganglion and anteriorly in a ganglion, the brain, which is not supra-oesophageal. The peripheral nervous system is minutely described by T. H. Montgomery. There is a median eye on the head.

The Nematomorpha are nearly solid, — quite so at each end,

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Fig. i. — A water plant around which a Gordius is turning and laying eggs. Fig. 2. — Abdomen of female Pterostichus niger with the a, a, clump and string of eggs. terga removed to expose

the Gordius larva within.

Slightly magnified.

and only in the middle region of the body are there any body- cavities, the space within the body being usually filled up with parenchyma. There are four closed spaces of the nature of body-cavities, two lateral and a dorso-median and a ventro- median. Into the former the ovaries project, though the lumen of the lateral body-cavity is quite shut off

from the lumina of the ovaries or uteri. In the adult male the lateral body-cavities are absent. A curious duct with lateral branches termed the supra-intestinal organ lies above the intestine in the female. There are two series of ovaries extending through a large part of the body and accompanied by two uteri; the latter open by two oviducts which debouch into an atrium which also receives the intestine and a single recep- taculum seminis, and is continued back- ward as the cloaca; this opens posteriorly. The ovaries are epithelial sacs which open into the uteri. The paired testes extend through the greater part of the body and end in two vasa deferentia which unite with the intestine to form a cloaca.

The eggs are laid in the spring as a rule, and after about a week *hey give rise to a minute, ringed larva with a protrusible of an Ephemerid larva boring apparatus consisting of three into which two Gordius chitinous rods. By the aid of this the larvae, (<ˆa) have i arva makes its way into the soft body pene ra . agni e . ˆ some i nse ct larva, Ephemerids, Chiro- nomids, or even of Molluscs, and encysts in the muscles or fat body. The insect, which may have become an imago with the Gordian larva still in it, is then eaten by a carnivorous insect or by a fish, and the contained Gordian larva becomes elongate and mature in its second host. After a year or more this larva emerges into the water and commences to reproduce.

The unexpected occurrence of these worms in pools and puddles, often in great numbers, has given rise to myths about showers of worms. They occasionally make their way into the human stomach with the drinking-water and are vomited; but this is a case of pseudo-parasitism — they are no true parasite of man.

There are a considerable number of species divided among the four genera: Gordius, Paragordius, Chordodes and Parachordodes ; the last, a genus of Camerano's, is looked upon with some doubt by Montgomery. A free swimming marine form with longitudinal rows of bristles, known as Neclonema A. E. Verrill, may also come here, but at present its life-history is unknown. The Nematomorpha form an isolated group; at first sight they seem to be connected with the Nematoda, but in reality their only common feature is the tubular genitalia opening into a cloaca, and it seems at present

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Fig. 3. — Tarsal joint

impossible to connect them with the Annelida. Until more is known it seems wisest to look upon them as an isolated assemblage of animals with no' near affinities to any of the great phyla.

Literature. — L. Camerano, " Monografia deiGordii," Mem. Ace. Torino, xlvii. (1897), contains literature; O. von Linstow, Arch. mikr. AnaL, li. (1898); T. H. Montgomery, Bull. Mas. Harvard, xxxii. (1898); Amer. Natural., xxxiii. (1899); Zool. Jahrb. AnaL, xviii. (1903) p. 387; F. Vejdovsky, Zeitschr. wiss. Zool., lvii. (1894); A. Villot, Arch. Zool. exp. ii. (1887); C. R. Ac. Sci., cviii. (1889); H. B. Ward, Bull. Mus. Harvard, xxiii. (1892). (A. E. S.)

NEMERTINA, or Nemerteans (Nemertea), a subdivision of worms, 1 characterized by the ciliation of the skin, the presence of a retractile proboscis, the simple arrangement of the generative apparatus, and in certain cases by a peculiar pelagic larval stage to which the name " pilidium " has been given. Many of them are long thread-shaped or ribbon-shaped animals, more or less cylindrical in transverse section. Even the comparatively shortest species and genera can always be termed elongate, the broadest and shortest of all being the parasitic Malacobdella and the pelagic Pelagonemertes. There are no exterior appendages of any kind. The colours are often very bright and varied. Nemertines live in the sea, some being common amongst the corals and algae, others hiding in the muddy or sandy bottom, and secreting gelatinous tubes which ensheath the body along its whole length. Formerly, they were gener- ally arranged amongst the Platyelminthes as a sub-order in the order of the Turbel- larians, but with the advance of our know- ledge of these lower worms it has been found desirable to separate them from the Turbel- larians and to look upon the Nemertina as a separate phylum.

0. Burger classifies Nemertines into four orders: — –

1. Protonemerturi, in which there are two layers of dermal muscles, ex- ternal circular and in- ternal longitudinal ; the nervous system lies external to the circular muscles ; the mouth lies behind the level of the brain ; the proboscis has no stylet; there is no caecum to the intestine. Families, Carinellidae, Hubrechtiidae.

II. Meson emertini, in which the nervous system has passed into the dermal muscles and lies amongst them; other characters as in Protonemertini. Family, Cephalothricidae.

III. Metanemertini, in which the nervous system lies inside the dermal muscles in the parenchyma; the mouth lies in front of the level of the

brain; the proboscis as a rule bears stylets; the intestine nearly always has a caecum. Families, Eunemertidae, Ototyphlonemertidae, Prosorhocmidae, Amphiporidae, Tetrastemmatidae, Nectonemertidae, Pelagonemertidae, Malacobdellidae.

This order represents the Hoplonemertini of Hubrecht.

IV. Heteronemertini, in which the dermal musculature is in three layers, an external longitudinal, a middle circular, an internal longitudinal ; the nervous system lies between the first and second of these layers; the outer layer of longitudinal muscles is a new development ; there is no intestinal caecum ; no stylets on the proboscis and the mouth is behind the level of the brain. Families,

EUPOLIIDAE, LlNEIDAE.

1 Nemertes was a sea nymph, daughter of Nereus and Doris. One of the genera was named Nemertes by Cuvier.

2 —

Fig. 1. — Lineus geniculatus. (From Burger.) I, Lateral slits on head; 2, anus.

3ˆ4

NEMERTINA

This order represents the Schizonemertini of Hubrecht and the family Eupolidae.

The first three orders, which have a double muscular layer, external circular and internal longitudinal, are sometimes grouped together as the Dimyaria; the Heteronemertini, in which a third coat of longitudinal muscles arises outside the circular layer, are then placed in a second branch, the Trimyaria.

The following families and genera are represented on the British coasts: Carinellidae, Cannella; Cephalothricidae, Cephalo- thrix, Carinoma; Eunemertidae, Eunemertes; Ototyphlone- mertidae, Ototyphlonemertes; Amphiporidae, Amphiporus, Dre- panophorus; Tetrastemmidae, Tetrastemma, Prosorhocmus; Malacobdellidae, Malacobdella; Eupoliidae, Eupolia, Valen- cinia, Oxypolia; Lineidae, Lineus, Euborlasia, Micrura, Cerebratu- lus, Micrella.

Anatomy. — Proboscis and Proboscidian Sheath, — The organ most

characteristic of a Nemertine is without doubt the proboscis. With very few exceptions (Malacobdella, A krostomum, where it has fused

jpo.

Fig. 2. — Diagrams of the organs of a Nemertine. A, From below; B, from above, m, Mouth. Br, Brain-lobes.

div, Intestinal diverticula. In, Longitudinal nerve stems.

a. Anus. pr, Proboscis.

ov, Ovaries. ps, Proboscidian sheath,

n, Nephridia. p.o., Opening for proboscis.

with the mouth into a single exterior opening), there is a terminal opening, the rhynchostome (subterminal in Valencinia), at the foremost tip of the body, out of which the proboscis is seen shooting backwards and forwards, sometimes with so much force that both its interior attachments are severed and it is entirely expelled from the body. It then often retains its vitality for a long time, apparently crawling as if it were itself a worm, a phenomenon which is at least partially explained by the extraordinary development of nervous tissue, equally distributed all through the walls of the proboscis, and either united into numerous longitudinal nerve-stems (Drepanophorus, Amphiporus) or spread out into a uniform and comparatively thick layer (Cerebratulus, sp.). This very effective and elaborate innervation, which has been directly traced to the brain, whence strong nerves (generally two) enter the proboscis, renders it exceedingly probable that the most important functions of the proboscis are of a sensiferous, tactile nature. In Nemertines the everted proboscis is retracted in the same way as the tip of a glove finger would be if it were pulled backwards by a thread situated in the axis and attached to the tip. The comparison may be carried still further. The central thread just alluded to is represented in the Nemertean proboscis by that portion Which is never everted, and the tip of the glove by the boundary between the evertible and non-evertible portion of the proboscis — a boundary which in the Metanemertini is marked by the presence of a pointed or serrated stylet. This stylet is thus situated terminally when the proboscis

has reached its maximum eversion. It adds a decisively aggressive character to an organ the original significance of which, as we have seen, was tactile. This aggressive character has a different aspect in several genera which are destitute of a central stylet, but in which the

surface that is turned outwards upon eversion of the proboscis is largely pro- vided with nematocysts, sending the urticating rods of different sizes in all directions. In others this surface is beˆet with thick, glandular, adhesive papillae. The comparison with the glove-finger is in so far insufficient as the greater portion of the non-evertible half of the proboscis is also hollow and clothed by glandular walls. Only at the very hinder- most end does it pass into the so-called retractor-muscle (fig. 2), which is at- tached to the wall of the space, or rhyn- chocoel, in which the proboscis moves about. This retractor-muscle, indeed, serves to pull back with great rapidity the extruded proboscis, and is aided in its action by the musculature of the head. The extrusion itself depends en- tirely upon contraction of the muscular walls of the space just mentioned, the rhynchocoel. As it is (1) closed on all Br, Brain-lobes, sides, and (2) filled with a corpuscular N, Lateral nerves, fluid, the contractions alluded to send PS, Proboscidian sheath this fluid to impinge against the anterior Pr, Proboscis, portion, where the proboscis, floating in P.O., Exterior opening

Fig. 3. — Anterior portion of the body of a Nemer- tine.

through which the proboscis is everted or rhynchostome. Oesophagus and

mouth shown by dotted lines.

its sheath, is attached with it to the muscular tissue of the head (fig. 3). Partial extrusion lessening the resist- ance in this region inevitably follows, and when further contractions of the walls of the sheath ensue total ex- trusion is the consequence. It is worthy of notice that in those Nemertines which make a very free use of their proboscis, and in which it is seen to be continually protruded and retracted, the walls of the proboscidian sheath are enormously muscular. On the other hand, they are much less con- siderably or even insignificantly so in the genera that are known to make a rather sparing use of their proboscis. The rhyn- chocoel is formed by a split which appears in the meso- blast surrounding the epi- blastic pit which is the fore- runner of the proboscis. It does not seem to be coelomic. The proboscis, which is thus an eminently muscular organ, is composed of two or three, sometimes powerful, layers of muscles — one of longitudinal and one or two of circular fibres. In the posterior re- tractor the longitudinal fibres become united into one bun- dle, which, as noticed above, is inserted in the wall of the sheath. At the circular inser- tion of the proboscis in front

of the brain the muscular fibres of a Hoplonemertine. Fig. belonging to the anterior ex- tracted ; fig. 5 everted. tremity of the body and those

connected with the proboscis are very intimately interwoven, forming a strong attachment. The short tube between this circular insertion and the rhynchostome is called the rhynchodaeum.

The proboscis broken off and expelled is generally reproduced, the posterior ribbon-like end of this reproduced portion again fusing with the walls of the sheath. There is reason to suppose that, when a wound is inflicted by the central stylet, it is envenomed by the fluid secreted in the posterior proboscidian region being at the same time expelled. A re- servoir, a duct and a muscular bulb in the region (fig. 4) where the stylet is attached serve for this purpose. The significance of two or more (in armature from Drepanophorus very numerous) small sacs con- the proboscis of taining so-called ” reserve ” stylets resembling in Drepanophorus. shape that of the central dart is insufficiently known.

The muscular walls of the rhynchocoel, which by their transverse contractions serve to bring about eversion of the proboscis in the way above traced, are attached to the musculature of the head just in front of the ganglionic commissures (fig. 3). In nearly all Nemertines the rhynchocoel extends backwards as far as the posterior extremity, just above the anus; in Carinella it is limited to the anterior body- region. The corpuscles floating in the fluid it contains are of definite

Fig. 4. Fig. 5.

Figs. 4, 5. — Proboscis with stylet, sacs and muscular bulb 4 re-

Fig. 6.— The

shape, and in Cerebratulus urticans they are deep red, possibly from the presence of haemoglobin. They are usually larger than the blood corpuscles. Internally the muscular layers are lined by an epi- thelium. In the posterior portion this epithelium in certain Helero- nemertea has a more glandular appearance, and sometimes the interior cavity is obliterated by cell-proliferation in this region. Superiorly the sheath either closely adheres to the muscular body- wall, with which it may even be partly interwoven, or it hangs freely in the connective tissue

which fills the space between the intestine and the muscular body-wall.

Cutaneous System. — Externally in all species a layer of ciliated cells forms the outer investment. In it are, moreover, enclosed unicellular glands pouring their highly refracting contents, of a more or less rod-like shape, directly to the exterior. They appear to be the principal source of the mucus these animals secrete. In most Heteronemertines these elements are separated by a thin homo- geneous basement membrane (fig. 8) from the following — that is, from a layer in which longitudinal muscular fibres are largely inter- mixed with tortuous glands, which by reason of their deeper situation communicate with the exterior by a much longer and generally very narrow duct. The pigment is also principally localized in this layer, although sometimes it is present even deeper down within the musculature. The passage from this tegumentary layer to the subjacent longitudinal muscular one is gradual, no membrane separating them. In Carinella, Cephalothrix, Polia and the Metane- mertines the two tegumentary layers with their different glandular elements are fused into one; a thick layer of connective tissue is situated beneath them (instead of between them) and keeps the entire cutaneous system more definitely separate from the muscular (figs. 7, 8).

Musculature and Connective Tissue.- — The muscular layers by which the body-wall is constituted have been very differently and to some extent confusingly described by the successive authors on Nemertean anatomy. There is sufficient reason for this confusion. The fact is that not only have the larger subdivisions a different arrangement and even number of the muscular layers, but even within the same genus, nay, in the same species, well-marked differences occur.

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nl

Fig. 7.

Fig. 8.

Fig. 9.

Figs. 7-9. — The layers of the body-wall in Carinella (fig. 7), the Metanemertini (fig. 8) and the Heteronemerlini (fig. 9). c, Cellular tissue of the integument; Bm, basement membrane; cire. 1, outer

circular, and long., longitudinal layer of muscular tissue; circ. 2, long. 1, additional circular and longitudinal layers of the same; nl, nervous layer.

Increase in size appears sometimes to be accompanied by the development of a new layer of fibres, whereas a difference in the method of preparation may give to a layer which appeared homogeneous in one specimen a decidedly fibrous aspect in another. Nevertheless there are three principal types under which the different modifications can be arranged. One of them is found in the two most primitively organized genera, Carinella and Cephalothrix, i.e. an outer circular, a longitudinal and an inner circular layer of muscular fibres (fig. 7). The second is common to all the Heteronemertines, as well as to Polia and Valencinia, and also comprehends three layers, of which, how- ever, two are longitudinal, viz. the external and the internal one, there being a strong circular layer between them (fig. 9;. To the third type all the Metanemertini correspond ; their muscular layers are only two, an external circular and an internal longitudinal one (fig. 8).

The Heteronemerlini thus appear to have developed an extra layer of longitudinal fibres internally to those which they inherited from more primitive ancestors, whereas the Metanemertini are no longer in possession of the internal circular layer, but have on the contrary largely developed the external circular one, which has dwindled away in the Heteronemertini. The situation of the lateral nerve- stems in the different genera with respect to the muscular layers lends definite support to the interpretation of their homologies here given and forms the basis of Burger's classification.

In Carinella, Cephalothrix and Polia, as well as in all Metane- mertines, the basement membrane of the skin already alluded to is particularly strong and immediately applied upon the muscular layers. In the Heteronemertines there is a layer in which the cutaneous elements are largely represented below the thin basement membrane (fig. 8), between it and the bulk of the outer longitudinal muscles. The difference in the appearance of the basement mem- brane — - sometimes wholly homogeneous, sometimes eminently fibrillar — can more especially be observed in differently preserved specimens of the genus Polia.

eo

p.l.

Fig. 10 Figs. 10,

Fig. 11 – Brain and

The connective tissue of the integument and basement membrane imperceptibly merges into that which surrounds the muscular bundles as they are united into denser and definite layers, and this is especially marked in those forms (Akrostomum) where the density of the muscular body-wall has considerably diminished, and the con- nective tissue has thus become much more prominent. It can then at the same time be observed, too, that the compact mass of connective tissue (" reticulum," Barrois) which lies between the muscular body- wall and the intestine is directly continuous with that in which the muscular layers are embedded. Nuclei are everywhere present. The omnipresence of this connective tissue tends to exclude the formation of any perivisceral body cavity in Nemertines.

In Polia the connective tissue enclosed in the external muscular layer is eminently vacuolar — all the intermediate stages between such cells in which the vacuole predominates and the nucleus is peripheral and those in which the granular protoplasm still entirely fills them being moreover present.

In addition to the musculature of the proboscis and proboscidian sheath, longitudinal muscular fibres are found in the walls of the oesophagus, whilst transverse ones are numerous and united into vertical dissepiments between the successive intestinal caeca, thus bringing about a very regular internal metamerization. The genital products develop in intermediate spaces similarly limited by these dissepiments and alternating with the digestive caeca.

Nervous System and Sense Organs. — The nervous system of Nemer- tines presents several interesting peculiarities. As central organs we have to note the brain-lobes and the longitudinal lateral cords which form one continuous unseg- mented mass of fibrous and cellular nerve-tissue. The fibrous nerve- tissue is more dense in the higher differentiated, more loose and spongy in the lower organized forms; the cellular nerve-tissue is similarly less compact in the forms

that are at the base of the scale, lateral organ of a Schizonemer- No ganglionic swellings whatever tine (fig. 10) and a Hoplo- occur in the course of the longi- nemertine (fig. n). eo, Exterior tudinal cords. The brain must be opening ; u.l, superior brain- looked upon as the anterior thick- lobe; p.l., posterior brain-lobe, eningof these cords, and at the same

time as the spot where the two halves of the central nerve system

intercommunicate. This is brought about by a double commissure, of which the ventral portion is considerably thicker than the dorsal, and which, together with the brain-lobes, constitutes a ring through which both proboscis and proboscidian sheath pass. The brain-lobes are generally four in number, a ventral and a dorsal pair, respectively united together by the above-mentioned commissures, and moreover anteriorly interfusing with each other, right and left. In Carinella this separation into lobes of the anterior thickenings of the cords has not yet commenced, the ventral commissure at the same time being extremely bulky. There is great probability that the central stems, together with the brain, must be looked upon as local longitudinal accumulations of ner- /ˆ-~-~_ˆ5Pˆv

vous tissue in what was ya* s ” a ™*&Sif -.OlJN SJf.

in more primitive an- cestors a less highly differentiated nervous plexus, situated in the body-wall in a similar way to that which still is found in the less highly organizedCoelen- terates. Such a nervous plexus indeed occurs in the body-wall of all Heteronemer tines, sometimes even as a comparatively thick layer, situated, as are the nerve stems, be- tween the external longitudinal and the circular muscles (fig. 9). In Carinella, where the longitudinal nerve-stems are situated exteriorly to the mus- cular layers, this plexus, although present, is much less dense, and can more fitly be compared to a network with wide meshes. In both cases it can be shown to be in immediate continuity with the coating of nerve-cells forming part of the longitudinal cords. It stretches forward as far as the brain, and in Carinella is again con- tinued in front of it, whereas in the Heteronemertines the innervation of the anterior extremity of the head, in front of the brain, takes the form of more definite and less numerous branching stems. The presence of this plexus in connexion with the central stems, sending out nervous filaments amongst the muscles, explains the absence, in Pro-, Meso- and Heteronemertines, of separate and distinct peri- pheral nerve stems springing from the central stems innervating the different organs and body-regions, the only exceptions being the

Fig

L.N— L.N.

12. — The brain of a Nemertine, with its lobes and commissures. S.N., Nerves to sensory apparatus. P.N., Nerves for proboscis. vag, Nerves for oesophagus. L.N., Lateral nerve-stems.

nerves for the proboscis, those for the sense organs in the head and the strong nerve pair (»._ vagus) for the oesophagus. At the same time it renders more intelligible the extreme sensitiveness of the body- wall of the Nemertines, a local and instantaneous irritation often resulting in spasmodic rupture of the animal at the point touched.

In the Metanemertini, where the longitudinal stems lie inside the muscular body-wall, definite and metamerically placed nerve branches spring from them and divide dichotomously in the different tissues they innervate. A definite plexus can here no longer be traced. In certain Metanemertines the lateral stems have been noticed to unite posteriorly by a terminal commissure, situated above the anus, the whole of the central nervous system being in this way virtually situated above the intestine. In others there is an approximation of the lateral stems towards the median ventral line (Drepanopfwrus) ; in a genus of Heteronemertines (Langia), on the other hand, an arrangement occurs by which the longitudinal stems are no longer lateral, but have more or less approached each other dorsally.

In addition to the nerves starting from the brain-lobes just now especially mentioned, there is a double apparatus which can hardly be treated of in conjunction with the sense organs, because its sensory functions have not been sufficiently made out, and which will therefore rather be considered along with the brain and central nervous system. This apparatus is usually known under the name of the lateral organs. To it belong (a) superficial grooves or deeper slits situated on the integument near the tip of the head, (b) nerve lobes in immediate connexion with the nervous tissue of the brain, and © ciliated ducts penetrating into the latter and communicating with the.former. Embryology shows that originally these different parts are separately started, and only ultimately become united into one. Two lateral outgrowths of the foremost portion of the oesophagus, afterwards becoming constricted off, as well as two ingrowths from the epiblast, contribute towards its formation, at least as far as both Meta- and Heteronemertines are concerned. As to the Mesonemertini, in the most primitive genus, Carinella, we do not find any lateral organs answering to the description above given. What we do find is a slight transverse furrow on each side of the head, close to the tip, but the most careful examination of sections made through the tissues of the head and brain shows the absence of any further apparatus comparable to that described above. Only in one species, Carinella

inexpectata, a step in advance has been made, in so far as in connexion with the furrow just mentioned, which is here also somewhat more complicated in its arrangement, a ciliated tube leads into the brain, there to end blindly amidst the nerve- cells. No other intermediate stages have as yet been noticed between this arrangement and that of the Heteronemertini, in which a separate posterior brain-lobe receives a similar ciliated canal, and in which the oesophageal outgrowths have made their appearance and are coalesced with the nerve-tissue in the organ of the adult animal. The histological elements of this portion remain distinct both by transmitted light and in actual sections.

These posterior brain-lobes, which in all Heteronemertines are in direct continuity of tissue with the upper pair of principal lobes, cease to have this intimate connexion in the Metanemertini; and, although still constituted of (i) a ciliated duct, opening out exter- nally, (2) nervous tissue surrounding it, and (3) histological elements distinctly different from the nervous, and most probably directly derived from the oesophageal outgrowths, they are nevertheless here no longer constantly situated behind the upper brain-lobes and directly connected with them, but are found sometimes behind, sometimes beside and sometimes before the brain-lobes. Further- more, they are here severed from the principal lobes and connected with them by one or more rather thick strings of nerve-fibres. In some cases, especially when the lobes lie before the brain, their distance from it, as well as the length of these nervous connexions, has considerably increased.

These curious neuro-glandular pits (fig. 1), absent in the Mesone- mertine and one or two aberrant species, have been shown to possess large glandular cells at their base which secrete a mucus. The development of these organs, which in the Protonemertine are but grooves in the epidermis, not far removed from the similar cephalic slits of many Turbellaria, reaches its height in Drepanophorus. Here the pits split into two, one part ending in a sac lined with sensory epithelium, and embedded in nervous tissue, the other projecting backwards as a long, glandular, blind canal. The exit of these organs takes many shapes, of value in systematic work. Their function is still little understood. Two lateral, shallow pits occur on the side of the body about the level of the hinder end of the proboscis in some species of the genus Carinella, which are termed side-organs. These are capable of being everted, and are probably sensory in function (fig. 20, if).

For the Heteronemertines arguments have been adduced to prove that here they have the physiological significance of a special respir- atory

apparatus for the central nervous tissue, which in all these forms is strongly charged with haemoglobin. The haemoglobin would by its pre-eminent properties of fixing oxygen, serve to lurnish the nerve system, which more than any other requires a constant supply, with the necessary oxygen. Such could hardly be obtained in any other way by those worms that have no special respiratory apparatus, and that live in mud and under stones where

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Fig. 13. Fig. 14.

Figs. 13, 14. — Lateral views of head of a Heteronemertine (fig. 13) with longi- tudinal slit, and of a Metanemertine (fig 14)

the natural supply of freshly oxygenated sea-water is practically limited. Whether in the Metanemertines, where the blood fluid is often provided with haemoglobiniferous disks, the chief functions of the side organs may not rather be a sensory one needs further investigation.

The exterior opening of the duct has been several times alluded to. In the Metanemertines it is generally situated towards the middle of a lateral transverse groove on either side of the head, as was noticed for Carinella, and as is also present in Polia. Generally a row of shorter grooves perpendicular to the first, and similarly provided with strong cilia, enlarges the surface of these furrows (fig. 14). In Valencinia there is nothing but a circular opening without furrow. In all Heteronemertines there is on each side of the head a longitudinal slit of varying length but generally considerable depth, in the bottom of which the dark red brain is very plainly visible by transparency. These slits are continued into the ciliated duct, being at the same time themselves very strongly

ciliated. In life they are commonly rhythmi- ˆTransverse groove cally opened and shut by a wavy move- and furrows ; ment. They are the head slits (cephalic

fissures, ” Kopfspalten “) so characteristic of this subdivision (figs. 10 and 13).

With respect to the sense organs of the Nemertines, we find that eyes are of rather constant occurrence, although many Hetero- nemertines living in the mud appear to be blind. The more highly organized species have often very numerous eyes (Amphiporus, Drepanophorus), which are provided with a spherical refracting anterior portion, with a

cellular ” vitreous body,” with a layer of delicate radially arranged rods, with an outer sheath of dark pigment, and with a separate nerve-twig each, springing from a common or double pair of branches which leave the brain as n. optici, for the innervation of the eyes. Besides these more highly differentiated organs of vision, more primitive eyes are present in others down to simple stellate pigment specks without any refracting apparatus.

Organs of hearing in the form of capsules containing otoliths have only been very rarely observed, apparently only in Metane- mertini.

As to the organ of touch, the great sensitiveness of the body has already been noticed, as well as the probable primary significance of the proboscis. Small tufts of tactile hairs or papillae are sometimes observed in small number at the tip of the head; sometimes longer hairs, apparently rather stiff, are seen on the surface, very sparingly distributed between the cilia, and hitherto only in a very limited number of small specimens. They may perhaps be considered as sensory. ‘

Digestive System. — The anterior opening, the mouth, is situated ventrally, close to the tip of the head and in front of the brain in the Metanemertini, somewhat more backward and behind the brain in the other Nemertines. In most Heteronemertines it is found to be an elongated slit with corrugated borders; in the Metanemertines it is smaller and rounded; in Malacobdella and Akrostomum it, moreover, serves for the extrusion of the proboscis, which emerges by a separate dorsal opening just inside the mouth. The oesophagus is the anterior portion of the digestive canal; its walls are folded longitudinally, comparatively thick and provided with longitudinal muscular fibres. Two layers are specially obvious in its walls — the inner layer bordering the lumen being composed of smaller ciliated cells, the outer thicker one containing numerous granular cells and having a more glandular character. Outside the wall of the oeso- phagus a vascular space has been detected which is in direct con- tinuity with the longitudinal blood-vessels. In certain cases, how- ever, the walls of the oesophagus appear to be very closely applied to the muscular body-wall and this vascular space thereby con- siderably reduced.

The posterior portion of the intestine is specially characterized by the appearance of the intestinal diverticula horizontally and symmetrically placed right and left and opposite to each other.

In the Metanemertini there is a curious diverticulum of the intes- tine which stretches forward in the median line, ventral to the so- called

stomach. It is at times sacculated, but its chief interest is that, as Lebedinsky 1 has shown, the tip of the caecum in embryonic life opens to the exterior as the blastopore. This subsequently closes up, and the newly-formed oesophagus and stomach open in the intestine above and behind it. It is a curious feature in Nemertines that the alimentary canal seldom contains traces of food and yet most of these worms are voracious. The food must be digested, absorbed and ex- creted with great rapidity. There is some evidence that in this group the ectoderm of the oesophagus is chiefly concerned with digestion, whereas the endoderm of the intestine is limited to the absorption of the soluble products.

Cases of asymmetry or irregularity in the arrangement of the intestinal caeca, though sometimes occurring, are not normal. At the tip of the tail, where the growth of the animal takes place, the

1 Arch. mikr. Anat. xlix. (1897) p. 503.

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caeca are always eminently regular. So they are throughout the whole body in most of the Metanemertines. In Carinella they are generally deficient and the intestine straight; in young specimens of this species, however, they occur, though less regular and more in the form of incipient foldings by which the digestive surface is, increased. The inner surface of the intestinal caeca is ciliated, the p caeca themselves are some-

Jl' \ / times — especially in the

hindermost portion of the body — of a considerably smaller lumen than the in- termediate genital spaces; sometimes, however, the reverse is the case, and in both cases it is the smaller lumen that appears enclosed between and suspended by the transverse fibres con- stituting the muscular dis- sepiments above mentioned. The anus is situated ter- minally, the muscular body- wall through which the

intestine must find its way outwards probably acting in this region the part of a sphincter. The lateral nerve stems mostly terminate on both sides in closest prox- imity to the anus; in cer- tain species, however, they interfuse by a transverse connexion above the anus. The longitudinal blood- vessels do the same.

Circulatory Apparatus. — The chief vessels are three longitudinal trunks, a median and two lateral ones. They are in direct con- nexion with each other both at the posterior and at the anterior end of the body. At the posterior end they communicate together by a T-shaped connexion in a simple and uniform way. Anteriorly there is a cer- tain amount of difference in the arrangement. Where- as in the Metanemertines an arrangement prevails as re- presented in fig. 18, in the Heteronemertines the lateral stems, while entirely uniform all through the posterior portion of the body, no longer individually exist in the oesophageal region, but here dissolve themselves into a network of vascular spaces surround- ing this portion of the di- gestive tract. The median dorsal vessel, however, re- mains distinct, but instead of continuing its course be- neath the proboscidian sheath it is first enclosed by the ventral musculature of this organ, and still farther forwards it even bulges out longitudinally into the

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Figs. 15-17. — Diagrammatic sec- tions to show disposition of internal organs in Carinella (Protonemertini) , fig. 15, Heteronemertini, fig. 16, and Metanemertini, fig. 17. C, Cellular portion of integument.

Basement membrane.

Circular muscular layer.

Longitudinal muscular layer.

Second circular (in Carinella). , Second longitudinal (in Hetero- nemertini) .

Nervous layer. LN, Lateral nerves. PS, Cavity of proboscidian sheath (the sheath itself of varying thickness). P, Proboscis. I, Intestine. LBv, Lateral blood-vessel. DBv, Dorsal blood-vessel. CT, Connective tissue.

B,

A, A’. A”, A”

N,

. into cavity of the sheath. Anteriorly it finally communicates with the lacunae just mentioned, which surround the oesophagus, bathe the posterior lobes of the brain, pass through the nerve ring together with the proboscidian sheath, and are generally continued in front of the brain as a lacunar space in the muscular tissue, one on each side.

Special mention must be made of the delicate transverse vessels regularly connecting the longitudinal and the lateral ones. They are metamerically placed, and belong to the same metamere as the digestive caeca, thus alternating with the generative sacs. The blood fluid does not flow in any definite direction ; its movements are largely influenced by those of the muscular body-wall. It is colourless and contains definite corpuscles, which are round or elliptical, and in many Metanemertines are coloured red by haemo- globin, being colourless in other species. The circulatory system of Carinella is considerably different, being more lacunar and less restricted to definite vascular channels. Two lateral longitudinal

Fig. 18. — Diagram

lacunae form, so to say, the forerunners of the lateral vessels. A median longitudinal vessel and transverse connecting trunks have not as yet been detected. There are large lacunae in the head in front of the ganglia.

The vascular system js entirely closed. It contains a colourless fluid, with flat, oval nucleated corpuscles, as a rule colourless, but in some cases tinged with yellow or red haemo- globin. Its presence is one of the most dis- tinctive features which separate the Nemer- tines from the Platyhelminthes. In origin the vascular system is due to a fusion of spaces which arise in the mesoblast of the larva. The blood is probably circulated by the general contraction of the whole animal, since it is very doubtful if there are any intrinsic muscles in the vessel-walls. Its function is less that of respiration than of

conveying the digested food-products all over of * ^’ circu i£ tory the body, and the excretory products to the apparatus in the & l nephridia, and doubtless it serves at times to t g r ; or bodv-reeion of assist in the extension and retraction of parts „ M»t-™™Jno ol the body. I he vessels in the more highly- developed genera seem to be partly lacunae and partly, true vessels with definite walls.

Nephridia. — Associated with the lateral blood-vessels are the single pair of nephridia. Each consists of a more or less coiled, ciliated, longitudinal canal, which on its external surface gives origin to one or

more transverse canals, which pass to the exterior and open a little way behind the mouth on the sides of the body. On its inner surface the longitudinal canal is adpressed to the lateral blood- vessel, and gives off a number of small, blind caeca or tags, each of which ends in a small clump of cells. These tags indent the blood- vessel. From their inner ends, projecting into the lumen of the tag, hangs a bunch of cilia, which forms the flickering ” flame ” so well known in the excretory apparatus of the Platyhelminthes and larval Annelids (fig. 19). There is no communication between the nephridia on one side and the other, but in Eupolia there are ducts opening into the alimentary canai as well as to the exterior, a condition of things which recalls what obtains in certain Oligochaetes. As a rule these organs only extend a short way along the anterior end of the body, a concentration which we may associate with the development of a vascular system to bring the products of excretion to a fixed spot. In Stichostemma, however, Montgomery ‘ has described a series of nephridia lying all along the body, and each with a varying number of external pores. The excretory system is epiblastic in its origin.

The two external openings of the nephridia are situated sometimes more towards the ventral, at other times more towards the dorsal side. Even in the larger Heteronemertines these pores are only a few millimetres behind the mouth region. In transverse sections the nephridia can be shown to be generally situated in the region limited by (1) the proboscidian sheath, (2) the upper wall of the intestine, (3) the muscular body-wall. No trace of nephridia is found posterior to the oeso- phagus.

Generative System. — In the Nemertines the sexes are separate, with only very few exceptions (Tetrastemma herma-

phrodilica, Marion). The reproductive on the lateral vessel of system is of the simplest, strongly con- Drepanophorus specta- trasting with the complicated arrange- bilis. (Magnified about ments in the Platyhelminthes. A series 750.) 1 , The longitudinal of sacs lined with an epithelium, the pro- excretory canal; 2, one liferation of which gives rise to the ova of the tags containing the or spermatozoa, alternate between the flame-cells, caeca of the intestine. When mature,

each sac pushes out a process to the exterior, and this forms the genital duct. The line of the genital openings is usually dorsal to the lateral nerve. The whole sac, with its epithelial wall and its contained genital cells, arises ultimately from some of the parenchymatous cells of the body. The walls and con- tents in some forms arise

simultaneously; in others the walls are first formed and their lining then proliferates. It has been pointed out that the cavity of the sacs corresponds in many particulars with the coelom of higher animals, and in Lebidinsky's observations on the development there is some support to the view that a coelom exists. Montgomery has also described certain spaces which may be coelomic lying between the alimentary canal and the inner longitudinal layer of muscles in the Heteronemertini. The ova and

1 Zool. Jahrb. Ana/., x. (1897) p. 265.

Fig. 19. — Part of the excretory system lying

spermatozoa, when mature, present no peculiarities. As the ova are in many species deposited in a gelatinous tube secreted by the body-walls, in which they are arranged (three or more together) in flask-shaped cavities, impregnation must probably take place either before or at the very moment of their being deposited. The exact mode has not yet been noticed.

pharynx, and he sums up their relationship to the Annelids by the statement that to a certain extent the Nemertines represent Turbellaria which in the course of time have copied certain features of an Annelid character.

Literature. — J. Barrois, " Recherches sur l'embryologie des Nemertes," Annates des Sc. Naturelles, vi. (1877); O. Butschli,

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Fig. 20.— Anterior end of a Carinella, partly diagrammatic. Magnified. (From Burger.) 1, Opening of proboscis; 2, cephalit glands running to frontal organ; 3, dorsal commissure of brain; 4, cerebral organ; 5, upper dorsal nerve; 6, under dorsal nerve; 7, rhynchocoehc blood-vessel; 8, fore-gut; 9, rhynchocoel; 10, nerve to proboscis; II, proboscis; 12, genital sac; 13, genital pore; 14, mid-gut; 15, circular nerves; 16, pore of excretory system; 17, lateral organ; 18, excretory canal; 19, lateral vessel; 20, lateral nerve; 21, oesophageal nerve; 22, mouth; 23, ventral ganglion of brain; 24, dorsal ganglion of brain; 25, rhynchodaeum.

Prosorhocmus claparedii is a viviparous foim. Development. — The

embryology of the Nemertines offers some very remarkable peculiarities. Our knowledge of the development of the most primitive forms is scanty. Both Hetero- and Metane- mertini have been more exhaustively studied than the other two groups, the first, as was noticed above, being characterized by peculiar larval forms, the second developing without metamorphosis.

The larva of Cerebratulus is called the pilidium. In exterior shape it resembles a helmet with spike and ear-lobes, the spike being a strong and long flagellum or a tuft of long cilia, the ear-lobes lateral ciliated appendages (fig. 21). It encloses the primitive alimentary

tract. Two pairs of invaginations of the skin, which originally are called the prostomial and metastomial disks, grow round the intestine, finally fuse together, and form the skin and mus- cular body-wall of the future Nemer- tine, which afterwards becomes cili- ated, frees itself from the pilidium in- vestment and develops into the adult worm without further metamorphosis. The eggs of these species are not enveloped by such massive gelatinous strings as are those of the genus Linens. In the latter we find the young Nemertines crawling about after a period of from six to eight weeks, and probably feeding upon a portion of this gelatinous substance, which is found to diminish in bulk. In accordance with these more seden- tary habits during the first phases of life, the characteristic pilidium larva, which is so eminently adapted for a Oesophageal outgrowth pelagic existence, appear to have for lateral organ. been reduced to a close-fitting exterior

am, Amnion. layer of cells, which is stripped off

pr.d., Prostomial disk. after the definite body- wall of the

po.d., Metastomial disk. Nemertine has similarly originated

out of four ingrowths fr~m the primary epiblast. To this reduced and sedentary pilidium the name of ” larva of Desor ” has been given.

In the Metanemertini, as far as they have been investigated, a direct development’ without metamorphosis has been observed. It appears probable that this is only a further simplification of the more complicated metamorphosis described above.

As to the development of the different organs, there is still much that remains doubtful. The hypoblast in some forms originates by invagination, in others by delamination. The proboscis is an in- vagination from the epiblast; the proboscidian sheath appears in the mesoblast, but is perhaps originally derived from the hypoblast. The

origin of the lateral organs has already been noticed ; that of the nerve system is essentially epiblastic.

Affinities. — The position of the Nemertines in the animal king- dom is now looked upon as more isolated than was formerly thought, and recent writers have been inclined to treat them as a separate phylum. Whether this view be adopted or not, and whether the Turbellaria be regarded as nearly related or only remotely connected, there can be little doubt that the Nemertines resemble the Turbel- laria more nearly than they do any other group of animals. Burger even goes so far as to homologize the proboscis with the Turbellanan

Fig. 21. — Pilidium-larva. B, Bunch of cilia or flagel

lum. oe, Oesophagus. st, Stomach

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(A. A. W. H.; A. E. S.)

NEMESIANUS, MARCUS AURELIUS OLYMPIUS, Roman poet, a native of Carthage, flourished about a.d. 283. He was a popular poet at the court of the Roman emperor Cams (Vopiscus, Carus, 11). He wrote poems on the arts of fishing (Halieutica), aquatics (Nautica) and hunting (Cynegetica) , but only a fragment of the last, 325 hexameter lines, has been preserved. It is neatly expressed in good Latin, and was used as a school text-book in the 9th century. Four eclogues, formerly attributed to Titus Calpurnius (q.v.) Siculus, are now generally considered to be by Nemesianus, and the Praise of Hercules, generally printed in Claudian’s works, may be by him.

Comolete edition of the works attributed to him in E. Bahrens,

Poetae Latini Minores, iii. (1881); Cynegetica: ed. M. Haupt (with Ovid’s Halieutica and Grattius Faliscus) 1838, and R. Stern, with Grattius (1832); Italian translation with notes by L. F. Valdrighi (1876). The four eclogues are printed with those of Calpurnius in the editions of H. Schenkl (1885) and E. H. Keene (1887); see L. Cisorio, Studio sulle Egloghe di N. (1895) and Dell’ imitazione nelle Egloghe di N. (1896) ; and M. Haupt, De Carminibus Bucolicis Calpurnii et N. (1853), tne chief treatise on the subject.

NEMESIS, the personification of divine justice. This is the only sense

in which the word is used in Homer, while Hesiod (Tkeog. 223) makes Nemesis a goddess, the daughter of Night (some, however, regard the passage as an interpolation); she appears in a still more concrete form in a fragment of the Cypria, The word Nemesis originally meant the distributor (Gx.vky.av) of fortune, whether good or bad, in due proportion to each man according to his deserts; then, the resentment caused by any disturbance of this proportion, the sense of justice that could not allow it to pass unpunished. Gruppe and others prefer to connect the name with vefieaciv, vtjxealˆeadai. ("to feel just resentment ")• In the tragedians Nemesis appears chiefly as the avenger of crime and the punisher of arrogance, and as such is akin to Ate and the Erinyes. She was sometimes called Adrasteia, probably meaning " one from whom there is no escape " ; the epithet is specially applied to the Phrygian Cybele, with whom, as with Aphrodite and Artemis, her cult shows certain affinities. She was specially honoured in the district of Rhamnus in Attica, where she was perhaps originally an ancient Artemis, partly confused with Aphrodite. A festival called Nemeseia (by some identified with the Genesia) was held at Athens. Its object was to avert the nemesis of the dead, who were supposed to have the power of punishing the living, if their cult had been in any way neglected (Sophocles, Electro,, 792; E. Rohde, Psyche, 1907, i. 236, note 1). At Smyrna there were two divinities of the name, more akin to Aphrodite than to Artemis. The reason for this duality is hard to explain; it is suggested that they represent two aspects of the goddess, the kindly and the malignant, of the goddesses of the old and the new city. Nemesis was also worshipped at Rome by victorious generals, and in imperial times was the patroness of gladiators and venatores (fighters with wild beasts) in the arena and one of the tutelary deities of the drilling-ground (Nemesis campestris). In the 3rd century a.d. there is evidence of the belief in an all-powerful Nemesis-Fortuna. She was worshipped by a society called Nemesiaci. In early times the representations of Nemesis resembled Aphrodite, who herself sometimes bears the epithet Nemesis. Later, as the goddess of proportion and the avenger of crime, she has as attributes a measuring rod, a bridle, a sword and a scourge, and rides in a chariot drawn by griffins.

Sec C. Walz, De Nemesi Graecorum (Tubingen, 1852) ; E. Tournier, Nemesis (1863), and H. Posnansky, " Nemesis und Adrasteia," in Breslauer philologische Abhandlungen, v. heft 2 (1890), both exhaustive monographs; an essay, " Nemesis, or the Divine Envy," by P. E. More, in The New World (N. Y., Dec. 1899) ; L. R. Farnell, Cults of the Greek Slates, ii. ; and A. Legrand in Daremberg and Saglio's Dictionnaire des antiquites. For the Roman Nemesis, see G. Wissowa,

Religion und Kultus der Rbmer (Munich, 1902).

NEMESIUS (fl. c. a.d. 390), a Christian philosopher, author of a treatise irtpi (pvaews avdp&wov (On Human Nature), was, according to the title of his book, bishop of Emesa (in Syria); of his life nothing further is known, and even his date is uncertain, but internal evidence points to a date after the Apollinarian controversy and before the strife connected with the names of Eutyches and Nestorius, i.e. about the end of the 4th century. His book is an interesting attempt to compile a system of anthro- pology from the standpoint of the Christian philosophy. Moses and Paul are put side by side with Aristotle and Menander, and there is a clear inclination to Platonic doctrines of pre- existence and metempsychosis. In physiological matters he is in advance of Aristotle and Galen, though we can hardly assert — as has sometimes be?n thought — that he anticipated Harvey's discovery of the circulation of the blood. The treatise is conclusive evidence as to the mutual influence of Christianity and Hellenism in the 4th century. John of Damascus and the sthoolmen, including Albertus Magnus and Thomas Aquinas,

held Nemesius in high esteem, believing his book to be the work of Gregory of Nyssa, with whom he has much in common.

Editions: Antwerp, 1575; Oxford, 1671; Halle, 1802; Migne's Patrol. Gr. vol. 40. Versions: Latin by Alsanus, ed. Holzinger (1887); by Burgundio, ed. Burkhardt (1891-1896). Literature: Bender, Untersuch. iiber Nemesius (1898). See further Herzog- Ha'uck's Realencyklop, s.v.

NEMORENSIS LACUS (mod. Nemi), a lake in the Alban Hills, in an extinct subsidiary crater in the outer ring of the ancient Alban crater, E. of the Lake of Albano. It is about 3§ m. in diameter and some no ft. deep; the precipitous slopes of its basin are over 300 ft. high, and on the side towards the modern village a good deal more, and are mainly cultivated. It is now remarkable for its picturesque beauty. In ancient times it was included in the territory of Aricia. and bore the name " Mirror of Diana." The worship of Diana here was a very ancient one, and, as among the Scythians, was originally, so it was said, celebrated with human sacrifices; even in imperial times the priest of Diana was a man of low condition, a gladiator or a fugitive slave, who won his position by slaying his pre- decessor in fight, having first plucked a mistletoe bough from the sacred grove, and who, notwithstanding, bore the title of rex (king) . It is curious that in none of the inscriptions that have been found is the priest of Diana mentioned; and it has indeed been believed by Morpurgo and Frazer that the rex was not the priest of Diana at all, but, according to the former, the

priest of Virbius, or, according to the latter, the incarnation of the spirit of the forest. The temple itself was one of the most splendid in Latium; Octavian borrowed money from it in 31 B.C., and it is frequently mentioned by ancient writers. Its remains are situated a little above the level of the lake, and to the N.E. of it. They consist of a large platform, the back of which is formed by a wall of concrete faced with opus reticulatum, with niches, resting against the cliffs which form the sides of the crater. Excavations in the 17th and the last quarter of the 19th centuries (now covered in again), and also in 1905, led to the discovery of the temple itself, a rectangular edifice, 98 by 52 ft., and of various inscriptions, a rich frieze in gilt bronze, many statuettes (ex-votos) from the favissae of the temple in terra-cotta and bronze, a large number of coins, &c. None of the objects seem to go back beyond the 4th century B.C. A road descended to it from the Via Appia from the S.W., passing through the modern village of Genzano. The lake is drained by a tunnel of about 2 m. long of Roman date. On the W. side of the lake remains of two ships (really floating palaces moored to the shore) have been found, one belonging to the time of Caligula (as is indicated by an inscription on a lead pipe), and measuring 210 ft. long by 66 wide, the other even larger, 233 by 80 ft. The first was decorated with marbles and mosaics, and with some very fine bronze beamheads, with heads of wolves and lions having rings for hawsers in their mouths (and one of a Medusa), now in the Museo delle Terme at Rome, with remains of the woodwork, &c, &c. Various attempts have been made to raise the first ship, from the middle of the 15th century onwards, by which much harm has been done. The neighbourhood of the lake was naturally in favour with the Romans as a residence. Caesar had a villa constructed there, but destroyed again almost at once, because it did not satisfy him.

See F. Barnabei, Notizie degli scavi (1895)1361,461; (1896), 188; V. Malfatti, Notizie degli scavi (1895), 471; (1896), 393; Rivista marittima (1896), 379; (1897), 293; J. G. Frazer, The Golaen Bough (London, 1900) ; L. Morpurgo in Monumenti dei Lincei, xiii. (1903), 297 sqq. (T. As.')

NEMOURS, LORDS AND DUKES OF. In the 12th and 13th centuries the lordship of Nemours, in Gatinais, France, was in possession of the house of Villebeon, a member of which, Gautier, was marshal of France in the middle of the 13th century. The lordship was sold to King Philip III. in 1274 and 1276 by Jean and Philippe de Nemours, and was then made a county and given to Jean de Grailly, captal de Buch in 1364. In 1404 Charles VI. of France gave it to Charles III. of Evreux, king of Navarre, and erected it into a duchy in the peerage of

France (duchi-pairie). Charles III.‘s daughter, Beatrix, brought the

duchy to her husband Jacques de Bourbon, count of La Marche, and by the marriage of their daughter, Eleanor, to Bernard of Armagnac, count of Pardiac, it passed to the house of Armagnac. After being confiscated and restored several times, the duchy reverted to the French crown in 1505, after the extinction of the house of Armagnac-Pardiac. In 1507 it was given by Louis XII. to his nephew, Gaston de Foix, who was killed at Ravenna in 1 Si 2. The duchy then returned to the royal domain, and was detached from it successively for Giuliano de Medici and his wife Philiberta of Savoy in 1515, for Louise of Savoy in 1524, and for Philip of Savoy, count of Genevois, in 1528. The descend- ants of the last-mentioned duke possessed the duchy until its sale to Louis XIV. In 1572 Louis gave it to his brother Philip, duke of Orleans, whose descendants possessed it until the Revolution. The title of due de Nemours was afterwards given to Louis Charles, son of King Louis Philippe, who is dealt with separately below.

The following are the most noteworthy of the earlier dukes of Nemours.

James of Armagnac, duke of Nemours (c. 1433-1477), was the son of Bernard d’ Armagnac, count of Pardiac, and Eleanor of Bourbon-La Marche. As comte de Castres, he served under Charles VII. in Normandy in 1449 and 1450; and afterwards in Guienne. On the accession of Louis XL the king loaded him with honours, married him to his god-daughter, Louise of Anjou, and recognized his title to the duchy of Nemours in 1462. Sent by Louis to pacify Roussillon, Nemours felt that he had been insufficiently rewarded for the rapid success of this expedition, and joined the League of the Public Weal in 1465. He subse- quently became reconciled with Louis, but soon resumed his intrigues. After twice pardoning him, the king’s patience became exhausted, and he besieged the duke’s chateau at Carlat and took him prisoner. Nemours was treated with the utmost rigour, being shut up in a cage; and was finally condemned to death by the parlement and beheaded on the 4th of August 1477. See B. de Mandrot, Jacques a” Armagnac, due de Nemours (Paris,

1890).

Philip or Savoy, duke of Nemours (1490-1533), was a son of Philip, duke of Savoy, and brother of Louise of Savoy, mother of Francis I. of France. Originally destined for the priesthood, he was given the bishopric of Geneva at the age of five, but resigned it in 15 10, when he was made count of Genevois. He served under Louis XII., with whom he was present at the battle of Agnadello (1509), under the emperor Charles V. in 1520, and finally under his nephew, Francis I. In 1528 Francis gave him the duchy of Nemours and married him to Charlotte of Orleans- Longueville. He died on the 25th of November 1533.

His son, James (1531-1585), became duke of Nemours in 1533. He distinguished himself at the sieges of Lens and Metz (1 552-1 553), at the battle of Renty (1554) and in the campaign of Piedmont (1555). He was a supporter of the Guises, and had to retire for some time into Savoy in consequence of a plot. On his return to France he fought the Huguenots, and signalized himself by his successes in Dauphine and Lyonnais. In 1567 he induced the court to return from Meaux to Paris, took part in the battle of Saint Denis, protested against the peace of Long- jumeau, and repulsed the invasion of Wolfgang, count palatine of Zweibriicken. He devoted his last years to letters and art, and died at Annecy on the 15th of June 1585.

By his wife Anne of Este, the widow of Francis, duke of Guise, the duke left a son, Charles Emmanuel (1567-1595), who in his youth was called prince of Genevois. Involved in political intrigues by his relationship with the Guises, he was imprisoned after the assassination of Henry, duke of Guise, and his brother the cardinal of Lorraine, in 1 588, but contrived to escape. He fought at Ivry and Arques, and was governor of Paris when it was besieged by Henry IV. After quarrelling with his half-brother Charles of Lorraine, duke of Mayenne, he withdrew to his government of Lyonnais, where he endeavoured to make himself independent. He was imprisoned, however, in the chateau of Pierre-Encise by the archbishop of Lyons. After his escape he attacked Lyons, but was defeated owing

to the intervention of the constable de Montmorency. He died at Annecy in July 1595.

His brother Henry (1572-1632), called originally marquis de Saint-Sorlin, succeeded him as duke. In 1588 he took the marquisate of Saluzzo from the French for his cousin, the duke of Savoy. The princes

of Guise, his half-brothers, induced him to join the League, and in 1591 he was made governor of Dauphine in the name of that faction. He made his submission to Henry IV. in 1596. After quarrelling with the duke of Savoy he withdrew to Burgundy and joined the Spaniards in their war against Savoy. After peace had been proclaimed on the 14th of November 1616, he retired to the French court. He died in 1632, and was succeeded by his eldest son, Louis, and on the death of the latter in 1641 by his second son, Charles Amadeus (1624- 1 652), who served in the army of Flanders in 1645, and in the following year commanded the light cavalry at the siege of Courtrai. In 1652 he took part in the war of the Fronde, and fought at Bleneau and at the Faubourg St Antoine, where he was wounded. On the 30th of July of the same year he was killed in a duel by his brother-in-law, Francois de Venddme, duke of Beaufort. He had two daughters, Marie Jeanne Baptiste (d. 1724), who married Charles Emmanuel of Savoy in 1665; and Marie Francoise Elisabeth, who married Alphonso VI., king of Portugal, in 1666. His brother Henry (1625-1659), who had been archbishop of Reims, but now withdrew from orders, succeeded to the title. In 1657 he married Marie d'Orleans-Longueville (1625-1707), daughter of Henry II. of Orleans, duke of Longueville. This duchess of Nemours is a famous personage. At an early age she was involved in the first Fronde, which was directed by her father and her stepmother. Anne Genevieve de Bourbon-Conde, the cele- brated duchesse de Longueville; and when her husband died in 1659, leaving her childless, the rest of her life was mainly spent in contesting her inheritance with her stepmother. She left some interesting Memoir es, which are published by C. B. Petitot in the Collection complete des memoires (1819-1829).

NEMOURS, LOUIS CHARLES PHILIPPE RAPHAEL, Due de (1814-1896), second son of the duke of Orleans, afterwards King Louis Philippe, was born on the 25th of October 1814. At twelve years of age he was nominated colonel of the first regiment of chasseurs, and in 1830 he became a chevalier of the order of the Saint Esprit and entered the chamber of peers. As early as 1825 his name was mentioned as a possible candidate for the throne of Greece, and in 1831 he was elected king of the Belgians, but international considerations deterred Louis Philippe from accepting the honour for his son. In February 1 83 1 he accompanied the French army which entered Belgium to support the new kingdom against Holland, and took part in the siege of Antwerp. He accompanied the Algerian expedition against the town of Constantine in the autumn of 1836, and in a second expedition (1837) he was entrusted with the command of a brigade and with the direction of the siege operations

before Constantine. General Damremont was killed by his side on the 1 2th of October, and the place was taken by assault on the 13th. He sailed a third time for Algeria in 1841, and served under General Bugeaud, taking part in the expedition to revictual Medea on the 29th of April, and in sharp fighting near Miliana on the 3rd to 5th of May. In the expedition against the fortified town of Takdempt he commanded the 1st infantry division. On his return to France he became commandant of the camp of Compiegne. He had been employed on missions of courtesy to England in 1835, in 1838 and in 1845, and to Berlin and Vienna in 1836. The occasion of his marriage in 1840 with Victoria, daughter of Duke Ferdinand of Saxe-Coburg, was marked by a check to Louis Philippe's government in the form of a refusal to bestow the marriage dowry proposed by Thiers in the chamber of deputies. The death of his elder brother, Ferdinand, duke of Orleans, in 1842 gave him a position of greater importance as the natural regent in the case of the accession of his nephew, the young count of Paris. His reserve, and dislike of public functions, with a certain haughtiness of manner, how- ever, made him unpopular. On the outbreak of the revolution of

1848 he held the Tuileries long enough to cover the king's retreat, but refrained from initiating active measures against the mob. He followed his sister-in-law, the duchess of Orleans, and her two sons to the chamber of deputies, but was separated from them by the rioters, and only escaped finally by disguising himself in the uniform of a national guard. He embarked for England, where he settled with his parents at Claremont. His chief aim during his exile, especially after his father's death, was a re- conciliation between the two branches of the house of Bourbon, as indispensable to the re-establishment of the French monarchy in any form. These wishes were frustrated on the one hand by the attitude of the comte de Chambord, and on the other by the determination of the duchess of Orleans to maintain the pretensions of the count of Paris. Nemours was prepared to go further than the other princes of his family in accepting the principles of the legitimists, but lengthy negotiations ended in 1837 with a letter, written by Nemours, as he subsequently explained, at the dictation of his brother, Francois, prince de Joinville, in which he insisted that Chambord should express his adherence to the tricolour flag and to the principles of con- stitutional government. In 1871 the Orleans princes renewed their professions of allegiance to the senior branch of their house, but they were not consulted when the count of Chambord came to Paris in

1873, and their political differences remained until his death in 1883.

Nemours had lived at Bushey House after the death of Queen Marie Amelie in 1866. In 1871 the exile imposed on the French princes was withdrawn, but he only transferred his establishment to Paris after their disabilities were also removed. In March 1872 he was restored to his rank in the army as general of division, and placed in the first section of the general staff. After his retirement from the active list he continued to act as president of the Red Cross Society until 1881, when new decrees against' the jDrinces of the blood led to his withdrawal from Parisian society. During the presidency of Marshal MacMahon, be had appeared from time to time at the Elysee. He died at Versailles on the 26th of June 1896, the duchess having died at Claremont on the 10th of November 1857. Their children were Louis Philippe Marie Ferdinand Gaston, comte d'Eu (b. 1842), who married Isabella, eldest daughter of Don Pedro II. of Brazil; Ferdinand Philippe Marie, ducd'Alencon (b. 1844), who married Sophie of Bavaria (184 7-1807), sister of the empress Elizabeth of Austria; Margaret (1846-1803), who married Prince Ladislas Czartoryski; and Blanche (b. 1857).

See R. Bazin, Le Due de Nemours (1907) ; Paul Thureau-Dangin, Hisloire de la monarchic de juillet (4 vols., 1884, &c).

NEMOURS, a town of northern France, in the department of Seine-et-Marne, on the Loing and its canal, 26 m. S. of Melun, on the Paris-Lyon railway. Pop. (1906) 4814. The church, which dates mainly from the 16th century, has a handsome wooden spire, and there is a feudal castle. A statue of the mathematician Bezout (d. 1783), a native of the town, was erected in 1885. In the vicinity is a group of fine sandstone rocks, and sand is extensively quarried. Nemours is supposed to derive its name from the woods (nemora) in the midst of which it formerly stood, and discoveries of Gallo-Roman remains indicate its early origin. It was captured by the English in 1420, but derives its historical importance rather from the lordship (afterwards duchy) to which it gave its name. In 1585 a treaty revoking previous concessions to the Protestants was concluded at Nemours between Catherine de Medici and the Guises.

NEKADOVICH, MATEYA (1777-1834), Servian patriot, was born in 1777. He is generally called Prota Mateya, since as a boy of sixteen he was made a priest, and a few years later became archpriest (Prota) of Valyevo. His father, Alexa Nenadovich, Knez (chief magistrate) of the district of Valyevo, was one of the most popular and respected public men among the Servians at the beginning of the 19th century. When

the four leaders of the Janissaries of the Belgrade Pashalic (the so-called Dahis) thought that the only way to prevent a general rising of the Servians was to intimidate them by murdering all their principal men, Alexa Nenadovich was one of the first victims. The

policy of the Dahis, instead of preventing, did actually and immediately provoke a general insurrection of the Servians against the Turks. Prota Mateya became the deputy-commander of the insurgents of the Valyevo district (1804), but did not hold the post for long, as Karageorge sent him in 1805 on a secret mission to St Petersburg, and afterwards employed him almost constantly as Servia's diplomatic envoy to Russia, Austria, Bucharest and Constantinople. After the fall of Karageorge (1813), the new leader of the Servians, Milosh Obrenovich, sent Prota Mateya as representative of Servia to the Congress of Vienna (1814-1815), where he pleaded the Servian cause inde- fatigably. During that mission he often saw Lord Castlereagh, and for the first time the Servian national interests were brought to the knowledge of British statesmen.

Prota Mateya's memoirs are the most valuable authority for the history of the first and second Servian insurrections against the Turks. The best edition of the Memoari Prole Maleve Nenadomrha was published by the Servian Literary Association in Belgrade in

1893.

NENAGH, a market town of Co. Tipperary, Ireland, finely situated in a rich though hilly country near the river Nenagh, 96I m. S.W. from Dublin by the Ballybrophy and Limerick branch of the Great Southern & Western railway. Pop. (1901) 4704. Of the old castle, called Nenagh Round, dating from the time of King John, there still exists the circular donjon or keep. There are no remains of the hospital founded in 1 200 for Austin canons, nor of the Franciscan friary, founded in the reign of Henry III. and one of the richest religious houses in Ireland. The town is governed by an urban district council. It was one of the ancient manors of the Butlers, who received for it the grant of a fair from Henry VIII. In 1550 the town and friary were burned by O'Carroll. In 1641 the town was taken by Owen Roe O'Neill, but shortly afterwards it was recaptured by Lord Inchiquin. It surrendered to Ireton in 1651, and was burned by Sarsfield in

1688.

NENNIUS (fl. 796), a Welsh writer to whom we owe the Historia Britonum, lived and wrote in Brecknock or Radnor. His work is known

to us through thirty manuscripts; but the earliest of these cannot be dated much earlier than the year 1000; and all are defaced by interpolations which give to the work so confused a character that critics were long disposed to treat it as an unskilful forgery. A new turn was given to the controversy by Heinrich Zimmer, who, in his Nennius vindicatus (1893), traced the history of the work and, by a comparison of the manuscripts with the nth-century translation of the Irish scholar, Gilla Coemgim (d. 1072), succeeded in stripping off the later accretions from the original nucleus of the Historia. Zimmer follows previous critics in rejecting the Prologus maior (§§ 1, 2), the Capitula, or table of contents, and part of the Mirabilia which form the concluding section. But he proves that Nennius should be regarded as the compiler of the Historia proper (§§7-65). Zimmer's conclusions are of more interest to literary critics, than to historians. The only part of the Historia which deserves to be treated as a historical document is the section known as the Genealogiae Saxonum (§§ 57-65). This is merely a recension of a work which was composed about 679 by a Briton of Strathclyde. The author's name is unknown; but he is, after Gildas, our earliest authority for the facts of the English conquest of England. Nennius himself gives us the oldest legends relating to the victories of King Arthur; the value of the Historia from this point of view is admitted by the severest critics. The chief authorities whom Nennius followed were Gildas' De excidio Britonum, Eusebius, the Vita Patricii of Murichu Maccu Mach- theni, the Collectanea of Tirechan, the Liber occupationis (an Irish work on the settlement of Ireland), the Liber de sex aetatibus mundi, the chronicle of Prosper of Aquitaine, the Liber beati Germani. The sources from which he derived his notices of King Arthur (§ 56) have not been determined.

See J. Stevenson's edition of the Historia Britonum (English Hist. Soc, 1838), based on a careful study of the MSS. ; A. de la Borderie, L'Hisloria Britonum (Paris and London, 1883), which summarizes the older negative criticism; H. Zimmer, Nennius vindicatus (Berlin, 1893); T. Mommsen in Neues Archiv der Gesellschaft filr dltere deutsche Geschichtskunde, xix. 283. (H. W. C. D.)

NEO-CAESAREA, SYNOD OF, a synod held shortly after that of Ancyra, probably about 314 or 315 (although Hefele inclines to put it somewhat later). Its principal work was the adoption of fifteen disciplinary canons, which were subsequently accepted as ecumenical by the Council of Chalcedon, 451, and of which the most important

are the following: i. degrading priests who marry after ordination; vii. forbidding a priest to be present at the second marriage of any one; viii. refusing ordination to the husband of an adulteress; xi. fixing thirty years as the age below which one might not be ordained (because Christ began His public ministry at the age of thirty) ; xiii. according to city priests the precedence over country priests; xiv. permitting Chorepiscopi to celebrate the sacraments; xv. requiring that there be seven deacons in every city.

See Mansi ii. pp. 539-551; Hardouin i. pp. 282-286; Hefele (2nded.) i. pp. 242-251 (Eng. trans, i. pp. 222-230). (T. F. C.)

NEOCOMIAN, in geology, the name given to the lowest stage of the Cretaceous system. It was introduced by J. Thurmann in 1 83 s on account of the development of these rocks at Neuchatel (Neocomum), Switzerland. It has been employed in more than one sense. In the type area the rocks have been divided into two sub-stages, a lower, Valanginian (from Valengin, E. Desor, 1854) and an upper, Hauterivian (from Hauterive, E. Renevier, 1874); there is also another local sub-stage, the infra- Valanginian or Berriasian (from Berrias, H. Coquand, 1876). These three sub-stages constitute the Neocomian in its restricted sense. A. von Koenen and other German geologists extend the use of the term to include the whole of the Lower Cretaceous up to the top of the Gault or Albian. Renevier divided the Lower Cretaceous into the Neocomian division, embracing the three sub-stages mentioned above, and an Urgonian division, including the Barremian, Rhodanian and Aptian sub-stages. Sir A. Geikie (Text Book of Geology, 4th ed., 1903) regards ” Neocomian” as synonymous with Lower Cretaceous, and he, like Renevier, closes this portion of the system at the top of the Lower Green- sand (Aptian). Other British geologists (A. J. Jukes-Browne, &c.) restrict the Neocomian to the marine beds of Speeton and Tealby, and their estuarine equivalents, the Weald Clay and Hastings Sands (Wealden). Much confusion would be avoided by dropping the term Neocomian entirely and employing instead, for the type area, the sub-divisions given above. This becomes the more obvious when it is pointed out that the Berriasian type is limited to Dauphine; the Valanginian has not a much wider range; and the Hauterivian does not extend north of the Paris basin.

Characteristic fossils of the Berriasian are Hoplites euthymi, H. occitanicus; of the Valanginian, Natica leviathan, Belemnites pistilliformis and B. dilatatus, Oxynoticeras Gevrili; of the Hauterivian, Hoplites radiatus, Crioceras capricornu, Exogyra Couloni and Toxaster complanatus. The marine equivalents of these rocks in England are the lower Speeton Clays of Yorkshire and the Tealby beds of Lincoln-

shire. The Wealden beds of southern England represent approximately an estuarine phase of deposit of the same age. The Hils clay of Germany and Wealden of Hanover; the limestones and shales of Teschen; the Aplychus and Pygope diphyoides marls of Spain, and the Petchorian formation of Russia are equivalents of the Neocomian in its narrower sense.

See Cretaceous, Wealden, Speeton Beds. (J. A. H.)

NEOCORATE, a rank or dignity granted by the Senate under the Roman Empire to certain cities of Asia, which had built temples for the worship of the emperors or had established cults of members of the imperial family. The Greek word VfUKopos meant literally a temple-sweeper (vecos, temple, nopeiv, to sweep), and was thence used both of a temple attendant and of a priestly holder of high rank who was in charge of a temple.

NEOLITHIC, or Later Stone Age (Gr. vkos, new, and \idos, stone), a term employed first by Lord Avebury and since generally accepted, for the period of highly finished and polished stone implements, in contrast with the rude workmanship of those of the earlier Stone Age (Palaeolithic). Knowledge of Neolithic times is derived principally from four sources, Tumuli or ancient burial-mounds, the Lake-dwellings of Switzerland, the Kitchen- middens of Denmark and the Bone-Caves. No trace of metal

is found, except gold, which seems to have been sometimes used for ornaments. Agriculture, pottery, weaving, the domestica- tion of animals, the burying of the dead in dolmens, and the rearing of megalithic monuments are the typical developments of man during this stage.

See Archaeology; also Lord Avebury, Prehistoric Times (1900) ; Sir John Evans, Ancient Stone Implements of Great Britain (1897) ; Sir J. Prestwieh, Geology (1886-1888).

NEOPHYTE (Gr. veocpvros , from veos, new, vr6v, a plant, ” newly planted “), a word used in the Eleusinian and other mysteries to designate the newly initiated, and in the early church applied to newly baptized persons. These usually wore the white garments which they received at their admission to the church (see Baptism) for eight days, from Easter eve till the Sunday after Easter (hence called Dominica in albis), but they were subject to strict supervision for some time longer and, on the authority of 1 Tim. iii. 6, were generally held ineligible for election as bishops, a rule to which, however, history

shows some notable exceptions, as in the cases of St Ambrose at Milan in 374 and Synesius of Cyrene at Ptolemais in 409, who were chosen bishops before they were even baptized. By the council of Nicaea (325) this rule was extended to the priest- hood. The ancient discipline is still maintained in the Roman Church, and applies to converts from Christian sects as well as to those from heathenism. The period, however, is deter- mined by circumstances. The term " neophyte " is also some- times applied in the Roman Church to newly ordained priests, and even — though rarely — to novices of a religious order. In a transferred sense the word is also given to one beginning to learn any new subject.

See Bergier, Diet, de theologie, s.v. ; Martigny, Diet, des antiquites, PP- 433~435! Siegel, Christliche Alterthilmer, iii. 17 seq.; Riddle, Christ. Antiquities, pp. 313, 522 ;'Wa\cott, Sacred Archaeology, s.v.

NEOPLATONISM, the name given specially to the last school of pagan philosophy, which grew up mainly among the Greeks of Alexandria from the 3rd century onwards. The term has also been applied to the Italian humanists of the Renaissance, and in modern times, somewhat vaguely, to thinkers who have based their speculations on the Platonic metaphysics or on Plotinus, and incorporated with it a tendency towards a mystical explanation of ultimate phenomena.

Historical Position and Significance.- — The political history of the ancient world ends with the formation, under Diocletian and Constantine, of a universal state bearing the cast of Oriental as well as Graeco-Roman civilizatipn. The history of ancient philosophy ends in like manner with a universal philosophy which assimilated elements of almost all the earlier systems, and worked up the results of Eastern and Western culture. Just as the Later Roman empire was at once the supreme effort of the old world and the outcome of its exhaustion, so Neo- platonism is in one aspect the consummation, in another the collapse, of ancient philosophy. Never before in Greek or in Roman speculation had the consciousness of man's dignity and superiority to nature found such adequate expression; never before had real science and pure knowledge been so under- valued and despised by the leaders of culture as they were by the Neoplatonists. Judged from the standpoint of empirical science, philosophy passed its meridian in Plato and Aristotle, declined in the post-Aristotelian systems, and set in the darkness of Neoplatonism. But, from the religious and moral point of view, it must be admitted that the ethical " mood " which Neoplatonism endeavoured to create and maintain is the highest and purest ever reached by antiquity.

It is a proof of the strength of the moral instincts of mankind that the only phase of culture which we can survey in all its stages from beginning to end culminated not in materialism, but in the boldest idealism. This idealism, however, is also in its way a mark of intellectual bankruptcy., Contempt for reason and science leads in the end to barbarism—its necessary consequence being the rudest superstition. As a matter of fact, barbarism did break out after the flower had fallen from Neo- platonism. The philosophers themselves, no doubt, still lived

on the knowledge they repudiated; but the masses were trained to a superstition with which the Christian church, as the executor of Neoplatonism, had to reckon and contend. By a fortunate coincidence, at the very moment when this bankruptcy of the old culture must have become apparent, the stage of history was occupied by barbaric peoples. This has obscured the fact that the inner history of antiquity, ending as it did in despair of this world, must in any event have seen a recurrence of barbarism. The present world was a thing that men would neither enjoy nor master nor study. A new world was discovered, for the sake of which everything else was abandoned; to make sure of that world insight and intelligence were freely sacrificed; and, in the light that streamed from beyond, the absurdities of the present became wisdom, and its wisdom became foolishness.

Such is Neoplatonism. The pre-Socratic philosophy took its stand on natural science, to the exclusion of ethics and religion. The systems of Plato and Aristotle sought to adjust the rival claims of physics and ethics (although the supremacy of the latter was already acknowledged); but the popular religions were thrown overboard. The post – Aristotelian philosophy in all its branches makes withdrawal from the objective world its starting-point. It might seem, indeed, that Stoicism indicates a falling off from Plato and Aristotle towards materialism, but the ethical dualism, which was the ruling tendency of the Stoa, could not long endure its materialistic physics, and took refuge in the metaphysical dualism of the Platonists. But this originated no permanent philosophical creation. From one-sided Platonism issued the various forms of scepticism, the attempt to undermine the trustworthiness of empirical knowledge. Neoplatonism, coming last, borrowed something from all the schools. First, it stands in the line of post-Aristotelian systems; it is, in fact, as a subjective philo- sophy, their logical completion. Secondly, it is founded on

scepticism; for it has neither interest in, nor reliance upon, empirical knowledge. Thirdly, it can justly claim the honour of Plato's name, since it expressly goes back to him for its metaphysics, directly combating those of the Stoa. Yet even on this point it learned something from the Stoics; the Neo- platonic conception of the action of the Deity on the world and of the essence and origin of matter can only be explained by reference to the dynamic pantheism of the Stoa. Fourthly, the study of Aristotle also exercised an influence on Neoplatonism. This appears not only in its philosophical method, but also — though less prominently — in its metaphysic. And, fifthly, Neo- platonism adopted the ethics of Stoicism; although it was found necessary to supplement them by a still higher conception of the functions of the spirit.

Thus, with the exception of Epicureanism — which was always treated by Neoplatonism as its mortal enemy — there is no out- standing earlier system which did not contribute something to the new philosophy. And yet Neoplatonism cannot be described as an eclectic system, in the ordinary sense of the word. For, in the first place, it is dominated by one all-pervading interest — the religious; and in the second place, it introduced a new first principle into philosophy, viz. the supra-rational, that which lies beyond reason and beyond reality. This principle is' not to be identified with the "idea" of Plato or with the "form" of Aristotle. Neoplatonism perceived that neither sense perception nor rational cognition is a sufficient basis or justification for religious ethics; consequently it broke away from rationalistic ethics as decidedly as from utilitarian morality. It had therefore to find out a new world and a new spiritual function, in order first to establish the existence of what it desiderated, and then to realize and describe what it had proved to exist. Man, how- ever, cannot transcend his psychological endowment. If he will not allow his thought to be determined by experience, he falls a victim to his imagination. In other words, thought, which will not stop, takes to mythology; and in the place of reason we have superstition. Still, as we cannot allow every fancy of the subjective reason to assert itself, we require some new and potent principle to keep the imagination within bounds. This is found

in the authority of a sound tradition. Such authority must be superhuman, otherwise it can have no claim on our respect; it must, therefore, be divine. The highest sphere of knowledge — the supra-rational— as well as the very possibility of knowledge, must depend on divine communications — that is, on revelations. In short, philosophy as represented by Neoplatonism, its sole interest being a religious interest, and its highest object the supra- rational, must be a

philosophy of revelation.

This is not a prominent feature in Plotinus or his immediate disciples, who still exhibit full confidence in the subjective pre- suppositions of their philosophy. But the later adherents of the school did not possess this confidence 1 ; they based their philo- sophy on revelations of the Deity, and they found these in the religious traditions and rites of all nations. The Stoics had taught them to overstep the political boundaries of states and nationalities, and rise from the Hellenic to a universal human consciousness. Through all history the spirit of God has breathed ; everywhere we discover the traces of His revelation. The older any religious tradition or mode of worship is, the more venerable is it, the richer in divine ideas. Hence the ancient religions of the East had a peculiar interest for the Neoplatonist. In the inter- pretation of myths Neoplatonism followed the allegorical method, as practised especially by the Stoa; but the importance it attached to the spiritualized myths was unknown to the Stoic philosophers. The latter interpreted the myths and were done with them; the later Neoplatonists treated them as the proper material and the secure foundation of philosophy. Neoplatonism claimed to be not merely the absolute philosophy, the keystone of all previous systems, but also the absolute religion, reinvigorat- ing and transforming all previous religions. It contemplated a restoration of all the religions of antiquity, by allowing each to retain its traditional forms, and at the same time making each a vehicle for the religious attitude and the religious truth embraced in Neoplatonism; while every form of ritual was to become a stepping-stone to a high morality worthy of mankind. In short, Neoplatonism seizes on the aspiration of the human soul after a higher life, and treats this psychological fact as the key to the interpretation of the universe. Hence the existing religions, after being refined and spiritualized, were made the basis of philosophy. ‘■#.

Neoplatonism thus represents a stage in the history of religion; indeed this is precisely where its historical importance lies. In the progress of science and enlightenment it has no positive significance, except as a necessary transition which the race had to make in order to get rid of nature-religion, and that under- valuing of the spiritual life which formed an insuperable obstacle to the advance of human knowledge. Neoplatonism, however, failed as signally in its religious enterprise as it did in its phil- osophical. While seeking to perfect ancient philosophy, it really extinguished it; and in like manner its attempted reconstruction of ancient religions only resulted in their destruction. For in requiring these religions to impart certain prescribed religious truths, and to inculcate the highest moral tone, it burdened them with problems to which they were unequal. And further, by inviting them

to loosen, though not exactly to dissolve, their political allegiance — the very thing that gave them stability — it removed the foundation on which they rested. But might it not then have placed them on a broader and firmer foundation? Was not the universal empire of Rome ready at hand, and might not the new religion have stood to it in the same relation of dependence which the earlier religions had held to the smaller nations and states? This was no longer possible. It is true that the political and spiritual histories of the peoples on the Mediterranean run in parallel lines, the one leading up to the universal monarchy of Rome, the other leading up to monotheism and universal human morality. But the spiritual development had shot far ahead of the political; even the Stoa occupied a height far beyond the reach of anything in the political sphere. It is also true that Neoplatonism sought to come to an understanding

1 Porphyry wrote a book, Ttpl rrjs U ~koyiav cj>i\olas, but this was before he became a pupil of Plotinus; as a philosopher he was independent of the \6yi.a.

with the Byzantine Roman empire; Julian perished in the pursuit of this project. But even before his day the shrewder Neoplatonists had seen that their lofty religious philosophy could not stoop to an alliance with the despotic world-empire, because it could not come in contact with the world at all. To Neo- platonism political affairs are at bottom as indifferent as all other earthly things. The idealism of the new philosophy was too heavenly to be naturalized in the Byzantine empire, which stood more in need of police officials than of philosophers. Important and instructive, therefore, as are the attempts made from time to time by the state and by individual philosophers to unite Neoplatonism and the universal monarchy, their failure was a foregone conclusion.

There is one other question which we are called upon to raise here. Why did not Neoplatonism set up an independent religious community? Why did it not provide for its mixed multitude of divinities by founding a universal church, in which all the gods of all nations might be worshipped along with the one ineffable Deity? The answer to this question involves the answer to another — Why was Neoplatonism defeated by Christianity? Three essentials of a permanent religious foundation were want- ing in Neoplatonism; they are admirably indicated in Augustine's Confessions (vii. 18-21). First,

and chiefly, it lacked a religious founder; second, it could not tell how the state of inward peace and blessedness could become permanent; third, it had no means to win those who were not endowed with the speculative faculty. The philosophical discipline which it recommended for the attainment of the highest good was beyond the reach of the masses; and the way by which the masses could attain the highest good was a secret unknown to Neoplatonism. Thus it remained a school for the ” wise and prudent “; and when Julian tried to enlist the sympathies of the common rude man for the doctrines and worship of this school, he was met with scorn and ridicule.

It is not as a philosophy, then, nor as a new religion, that Neoplatonism became a decisive factor in history, but, if one may use the expression, as a ” mood.” The instinctive certainty that there is a supreme good, lying beyond empirical experience, and yet not an intellectual good — this feeling, and the accom- panying conviction of the utter vanity of all earthly things, were produced and sustained by Neoplatonism. Only it could not describe the nature of this highest good; and there- fore it had to abandon itself to imagination and aesthetic im- pressions. It changed thought into an emotional dream; it plunged into the ocean of sentiment ; it treated the old world of fable as the reflection of a higher reality, and transformed reality into poetry; and after all these expedients, to borrow a phrase of Augustine’s, it only saw afar off the land of its desire.

Yet the influence of Neoplatonism on the history of our ethical culture is immeasurable, above all because it begot the consciousness that the only blessedness which can satisfy the heart must be sought higher even than the sphere of reason. That man shall not live by bread alone, the world had learned before Neoplatonism; but Neoplatonism enforced the deeper truth — a truth which the older philosophy had missed — that man shall not live by knowledge alone. And, besides the pro- paedeutic importance which thus belongs to it, another fact has to be taken into account in estimating the influence of Neoplatonism. It is to this day the nursery of that whole type of devotion which affects renunciation of the world, which strives after an ideal, without the strength to rise above aesthetic impressions, and is never able to form a clear conception of the object of its own aspiration.

Origin. — As forerunners of Neoplatonism we may regard, on the one hand, those Stoics who accepted the Platonic dis- tinction between the sensible world and the intelligible, and, on the other hand, the so-called Neopythagoreans and religious philosophers like Plutarch of Chaeronea and especially Numenius of Apamea. But these cannot be

considered the actual pro- genitors of Neoplatonism; their philosophic method is quite elementary as compared with the Neoplatonic, their fundamental

principles are uncertain, and unbounded deference is still paid to the authority of Plato. The Jewish and Christian thinkers of the first two centuries approach considerably nearer than Numenius to the later Neoplatonism. 1 Here we have Philo, to begin with. Philo, who translated the Old Testament religion into the terms of Hellenic thought, holds as an inference from his theory of revelation that the divine Supreme Being is ” supra- rational,” that He can be reached only through ” ecstasy “, and that the oracles of God supply the material of moral and religious knowledge. The religious ethics of Philo — a compound of Stoic, Platonic and Neopythagorean elements — already bear the peculiar stamp which we recognize in Neoplatonism. While his system assigns the supremacy to Greek philosophy over the national religion of Israel, it exacts from the former, as a sort of tribute to the latter, the recognition of the elevation of God above the province of reason. The claim of positive religion to be something more than the intellectual apprehension of the reason in the universe is thus acknowledged. Religious syncretism is also a feature of Philo’s system, but it differs essentially from what we find in later Neoplatonism. For Philo pays no respect to any cultus except the Jewish; and he believed that all the fragments of truth to be found amongst Greeks and Romans had been borrowed from the books of Moses. The earliest Christian philosophers, particularly Justin and Athenagoras, likewise prepared the way for the speculations of the Neoplatonists— partly by their attempts to connect Christianity • with Stoicism and Platonism, partly by their ambition to exhibit Christianity as ” hyperplatonic.” In the introduction to his Dialogue with Trypho, Justin follows a method which bears a striking resemblance to the later method of Neoplatonism: he seeks to base the Christian knowledge of God — that is, the knowledge of the truth — on Platonism, Scepticism and ” Revelation.” A still more remarkable parallel to the later Neoplatonism is afforded by the Christian Gnostics of Alexandria, especially Valentinus and the followers of Basilides. 2 Like the Neoplatonists, the Basilidians believed, not in an emanation from the Godhead, but in a dynamic manifestation of its activity. The same is true of Valentinus, who also placed an unnameable being at the apex of his system, and regarded matter, not as a second principle, but as a product of the one divine principle. It must be added that the dependence of Basilides and Valentinus on Zeno and Plato is beyond dispute. But the method observed by these Gnostics in thinking out the plan and the history of the universe is by no means

thoroughgoing. Ancient myths are admitted without undergoing analysis; the most naive realism alternates with daring efforts at spiritualiz- ing. Philosophically considered, therefore, the Gnostic systems are very unlike the rigorous self-consistency of Neoplatonism; although they certainly contain almost all the elements which enter into the Neoplatonic theory of the universe.

But were the oldest Neoplatonists really acquainted with the speculations of Philo, or Justin, or Valentinus, or Basilides? Did they know the Oriental religions, Judaism and Christianity in particular? And, if so, did they really derive anything from these sources?

To these questions we cannot give decided, still less definite and precise, answers. Since Neoplatonism originated in Alexandria, where Oriental modes of worship were accessible to every one, and since the Jewish philosophy had also taken its place in the literary circles of Alexandria, we may safely assume that even the earliest of the Neoplatonists possessed

1 The resemblance would probably be still more apparent if we thoroughly understood the development of Christianity at Alexandria in the 2nd century; but unfortunately we have only very meagre fragments to guide us here.

2 The dogmas of the Basilidians, as given by Hippolytus, read almost like passages from Neoplatonic works : iird oidiv fiv, ovx v\v, obn obala, oi>K fwobaiov, oix i-trˆoOn, oh abvBerov, obn hviyiyrov, obx &val

an acquaintance with Judaism and Christianity. But if we search Plotinus for evidence of any actual influence of Jewish and Christian philosophy, we search in vain; and the existence of any such influence is all the more unlikely because it is only the later Neoplatonism that offers striking and deep-rooted parallels to Philo and the Gnostics. The Philonic and Gnostic philosophies thus appear to be merely an historical anticipation of the Neoplatonic, without any real connexion. Nor is there anything mysterious in such an anticipation. It simply means that a certain religious and philosophical tendency, which grew up slowly on Greek soil, was already implanted in those who occupied the vantage-ground of a revealed religion of redemp- tion. We have to come down to Iamblichus and his school before we find complete

correspondence with the Christian Gnosticism of the 2nd century; that is to say, it is only in the 4th century that Greek philosophy in its proper development reaches the stage at which certain Greek philosophers who had embraced Christianity had arrived in the 2nd century. The influence of Christianity — whether Gnostic or Catholic — on Neoplatonism was at no time very considerable, although individual Neoplatonists, after Amelius, used Christian texts as oracles, and put on record their admiration for Christ.

History and Doctrines. — The founder of the Neoplatonic school in Alexandria is supposed to have been Ammonius Saccas (g.v.). Plotinus ˆ ut t ˆ le Enneads of his pupil Plotinus are the primary and classical document of Neoplatonism. The doctrine of Plotinus is mysticism, and like all mysticism it consists of two main divisions. The first or theoretical part deals with the high origin of the human soul, and shows how it has departed from its first estate. In the second or practical part the way is pointed out by which the soul may again return to the Eternal and Supreme. Since the soul in its longings reaches forth beyond all sensible things, beyond the world of ideas even, it follows that the highest being must be something supra-rational. The system thus embraces three heads — (1) the primeval Being, (2) the ideal world and the soul, (3) the phenomenal world. We may also, however, in accordance with the views of Plotinus, divide thus: (A) the invisible world — (1) the primeval Being, (2) the ideal world, (3) the soul; (B) the phenomenal world.

The primeval Being is, as opposed to the many, the One; as opposed to the finite, the Infinite, the unlimited. It is the source of all life, and therefore absolute causality and the only real existence. It is, moreover, the Good, in so far as all finite things have their purpose in it, and ought to flow back to it. But one cannot attach moral attributes to the original Being itself, because these would imply limitation. It has no attributes of any kind; it is being without magnitude, without life, without thought; in strict propriety, indeed, we ought not to speak of it as existing; it is “above existence,” “above goodness.” It is also active force without a substratum; as active force the primeval Being is perpetually producing something else, without alteration, or motion, or diminution of itself. This production is not a physical process, but an emission of force; and, since the product has real existence only in virtue of the original existence working in it, Neoplatonism may be described as a species of dynamic pantheism. Directly or indirectly, everything is brought forth by the ” One.” In it all things, so far as they have being, are divine, and God is all in all. Derived existence, however, is not like the original Being itself, but is subject to a law of diminishing completeness. It is indeed an image

and reflection of the first Being; but the further the line of successive projections is prolonged the smaller is its share in the true existence. The totality of being may thus be con- ceived as a series of concentric circles, fading away towards the verge of non-existence, the force of the original Being in the outermost circle being a vanishing quantity. Each lower stage of being is united with the ” One ” by all the higher stages, and receives its share of reality only by transmission through them. All derived existence, however, has a drift towards, a longing for, the higher, and bends towards it so far as its nature will permit.

The original Being first of all throws out the nous, which is a perfect image of the One and the archetype of all existing things. It is at once being and thought, ideal world and idea. As image, the nous corresponds perfectly to the One, but as derived it is entirely different. What Plotinus understands by the nous is the highest sphere acces- sible to the human mind (xotryuos toijt6s), and, along with that, pure thought itself.

The image and product of the motionless nous is the soul, which, according to Plotinus is, like the nous, immaterial. Its relation to the nous is the same as that of the nous to the One. It stands between the nous and the phenomenal world, is permeated and illuminated by the former, but is also in contact with the latter. The nous is indivisible; the soul may preserve its unity and remain in the nous, but at the same time it has the power of uniting with the corporeal world and thus being disintegrated. It therefore occupies an intermediate position. As a single soul (world-soul) it belongs in essence and destination to the intelligible world ; but it also embraces innumerable individual souls; and these can either submit to be ruled Dy the nous, or turn aside to the sensual and lose themselves in the finite.

Then the soul, a moving essence, generates the corporeal or pheno- menal world. This world ought to be so pervaded by the soul that its various parts should remain in perfect harmony. Plotinus is no dualist, like the Christian Gnostics; he admires the beauty and splendour of the world. So long as idea governs matter, or the soul governs the body, the world is fair and good. It is an image — though a shadowy image — of the upper world, and the degrees of better and worse in it are essential to the harmony of the whole. But in the actual phenomenal world unity and harmony are replaced by strife and discord; the result is a conflict, a becoming and vanishing, an illusive existence. And the reason for this state of things is that bodies rest on a substratum of matter. Matter is the basework of each (to /SdSos cKaarov i) v\t)); it is the dark principle, the indeterminate, that which has no qualities, the j*ii 6v. Destitute of form and idea, it is evil ; as

capable of form it is neutral.

The human souls which have descended into corporeality are those which have allowed themselves to be ensnared by sensuality and overpowered by lust. They now seek to cut themselves loose from their true being; and, striving after independence, they assume a false existence. They must turn back from this; and, since they have not lost their freedom, a conversion is still possible.

Here, then, we enter upon the practical philosophy. Along the same road by which it descended the soul must retrace its steps back to the supreme Good. It must first of all return to itself. This is accomplished by the practice of virtue, which aims at likeness to God, and leads up to God. In the ethics of Plotinus all the older schemes of virtue are taken over and arranged in a graduated series. The lowest stage is that of the civil virtues, then follow the purifying, and last of all the divine virtues. The civil virtues merely adorn the life, without elevating the soul. That is the office of the purifying virtues, by which the soul is freed from sensuality and led back to itself, and thence to the nous. By means of ascetic observances the man becomes once more a spiritual and enduring being, free from all sin. But there is still a higher attainment; it is not enough to be sinless, one must become ” God.” This is reached through contem- plation of the primeval Being, the One — in other words, through an ecstatic approach to it. Thought cannot attain to this, for thought reaches only to the nous, and is itself a kind of motion. It is only in a state of perfect passivity and repose that the soul can recognize and touch the primeval Being. Hence the soul must first pass through a spiritual curriculum. Beginning with the contemplation of corporeal things in their multiplicity and harmony, it then retires upon itself and withdraws into the depths of its own being, rising thence to the nous, the world of ideas. But even there it does not find the Highest, the One; it still hears a voice saying, ” not we have made ourselves.” The last stage is reached when, in the highest tension and concentration, beholding in silence and utter forgetful- ness of all things, it is able as it were to lose itself. Then it may see God, the fountain of life, the source of being, the origin of all good, the root of the soul. In that moment it enjoys the highest indescrib- able bliss; it is as it were swallowed up of divinity, bathed in the light of eternity. 1

Such is the religious philosophy of Plotinus, and for himself personally it sufficed, without the aid of the popular religion or worship. Nevertheless he sought for points of support in these. God is certainly in the truest sense nothing but the primeval Being; but He reveals Himself in a variety of emana- tions and manifestations. The nous is a

sort of second god, the X6701 which are wrapped up in it are gods, the stars are gods, and so on. A rigid monotheism appeared to Plotinus a miserable conception. He gave a meaning to the myths of the popular religions, and he had something to say even for magic, sooth-saying and prayer. In support of image-worship he advanced

1 Porphyry tells us that on four occasions during the six years of their intercourse Plotinus attained to this ecstatic union with God.

arguments which were afterwards adopted by the Christian image-worshippers. Still, as compared with the later Neo- platonists, he is Comparatively free from crass superstition and wild fanaticism. He is not to be classed amongst the ” deceived deceivers,” and the restoration of the worship of the old gods was by no means his chief object.

Amongst his pupils, Amelius and Porphyry are the most eminent. Amelius modified the teaching of Plotinus on certain points; and he also put some value on the prologue to the Gospel of John. To Porphyry (q.v.) belongs the credit of having recast and popularized the system of his master Plotinus. He was not an original thinker, but a diligent student, distinguished by great learning, by a turn for historical and philological criticism, and by an earnest purpose to uproot false teaching — especially Christianity, to ennoble men and train them to goodness. The system of Porphyry is more emphatically practical and religious than that of Plotinus. The object of philosophy, according to Porphyry, is the salvation of the soul. The origin and the blame of evil are not in the body, but in the desires of the soul. Hence the strictest asceticism (abstinence from flesh, and wine, and sexual intercourse) is demanded, as well as the knowledge of God. As he advanced in life, Porphyry protested more and more earnestly against the rude faith of the common people and their immoral worships. But, outspoken as he was in his criticism of the popular religions, he had no wish to give them up. He stood up for a pure worship of the many gods, and maintained the cause of every old national religion and the ceremonial duties of its adherents. His work A gainst the Christians was directed, not against Christ, nor even against what he believed to be Christ’s teaching, but against the Christians of his own day and their sacred books, which, according to Porphyry, were the work of

deceivers and ignorant people. In his trenchant criticism of the origin of what passed for Christianity in his time, he spoke bitter and severe truths, which have gained for him the reputation of the most rabid and wicked of all the enemies of Christianity. His work was destroyed, 1 but the copious extracts which we find in Lactantius, Augustine, Jerome, Macarius Magnus and others show how profoundly he had studied the Christian writings, and how great was his talent for real historical research.

Porphyry marks the transition to a new phase of Neoplatonism, in which it becomes completely subservient to polytheism, and seeks before everything else to protect the Greek and Oriental religions from the formidable assault of Christianity. In the hands of Iamblichus (q.v.), the pupil of Porphyry, Neoplatonism is changed ” from a philosophical theory to a theological doctrine.” The distinctive tenets of Iamblichus cannot be accounted for from scientific but only from practical considerations. In order to justify superstition and the ancient forms of worship, philosophy becomes in his hands a theurgy, a knowledge of mysteries, a sort of spiritualism.

To this period also belongs a set of ” philosophers,” with regard to whom it is impossible to say whether they are dupes or impostors — the “decepti deceptores” of whom Augustine speaks. In this philosophy the mystical properties of numbers are a leading feature; absurd and mechanical notions are glossed over with the sheen of sacramental mystery; myths are explained by pious fancies and fine-sounding pietistic reflections ; miracles, even the most ridiculous, are believed in, and miracles are wrought. The ” philosopher ” has become a priest of magic and philosophy a method of incantation. Moreover, in the unbridled exercise of speculation, the number of divine beings was increased indefinitely; and these fantastic accessions to Olympus in the system of Iamblichus show that Greek philosophy is returning to mythology, and that nature-religion is still a power in the world. And yet it is undeniable that the very noblest and choicest minds of the 4th century are to be found in the ranks of the Neoplatonists. So great was the general decline that this Neoplatonic philosophy offered a welcome shelter to many earnest and influential men, in spite of the

1 It was condemned by an edict of the emperors Theodosius II. and Valentinian in the year 448.

charlatans and hypocrites who were gathered under the same roof. On

certain points of doctrine, too, the dogmatic of Iamblichus indicates a real advance. Thus his emphatic asser- tion of the truth that the seat of evil is in the will is noteworthy; and so also is his repudiation of Plotinus's theory of the divinity of the soul.

The numerous followers of Iamblichus — Aedesius, Chrysan- thius, Eusebius, Priscus, Sopater, Sallust, and, most famous of all, Maximus (q.v.)', rendered little service to speculation. Some of them (Themistius in particular) are known as commentators on the older philosophers, and others as the missionaries of mysticism. The work De mysteriis Aegyptiorum is the best sample of the views and aims of these philosophers. Their hopes rose high when Julian ascended the imperial throne (361-363). But the emperor himself lived long enough to see that his romantic policy of restoration was to leave no results; and after his early death all hope of extinguishing Christianity was abandoned.

But undoubtedly the victory of Christianity in the age of Valentinian and Theodosius had a purifying influence on Neo- platonism. During the struggle for supremacy, the philosophers had been driven to make common cause influence with everything that was hostile to Christianity, tianity. ' But now Neoplatonism was thrust from the great stage of history. The church and church theology, to whose guidance the masses now surrendered themselves, took in along with them their superstition, their polytheism, their magic, their myths, and all the machinery of religious witchcraft. The more all this settled and established itself — certainly not without opposi- tion — in the church the purer did Neoplatonism become. While maintaining intact its religious attitude and its theory of know- ledge, it returned with new zest to scientific studies, especially the study of the old philosophers. If Plato still remains the divine philosopher, yet we can perceive that after the year 400 the writings of Aristotle are increasingly read and valued. In the chief cities of the empire Neoplatonic schools flourished till the beginning of the 5th century; during this period, indeed, they were the training-schools of Christian theologians. At Alexandria the noble Hypatia (q.v.) taught, to whose memory her impassioned disciple Synesius, afterwards a bishop, reared a splendid monument. But after the beginning of the 5th century the fanaticism of the church could no longer endure the presence of " heathenism." The murder of Hypatia was the death of philosophy in Alexandria, although the school there maintained a lingering existence till the middle of the 6th century. But there was one city of the East which, lying apart from the crowded highways of the world, had sunk to a mere provincial town, and yet possessed associations which the church of the 5th century felt herself powerless to eradicate. In Athens a Neoplatonic school still

flourished. There, under the monuments of its glorious past, Hellenism found its last retreat. The school of Athens returned to a stricter philosophical method and the cultivation of scholarship. Still holding by a religious philosophy, it under- took to reduce the whole Greek tradition, as seen in the light of Plotinus, to a comprehensive and closely knit system. Hence the philosophy which arose at Athens was what may fairly be termed scholasticism. For every philosophy is scholastic whose subject-matter is imaginative and mystical, and which handles this subject-matter according to established rules in logical categories and distinctions. Now to these Neoplatonists, the books of Plato, along with certain divine oracles, the Orphic poems, and much more which they assigned to a remote antiquity, were documents of canonical authority; they were inspired divine writings. Out of these they drew the material of their philosophy, which they then proceeded to elaborate with the appliances of dialectic.

The most distinguished teachers at Athens were Plutarch (q.v.), his disciple Syrianus (who did important work as a com- mentator on Plato and Aristotle, and further deserves proclus mention for his vigorous defence of the freedom of the will), but above all Proclus (411-485). Proclus is the great schoolman of Neoplatonism. It was he who, combining religious

ardour with formal acuteness, connected the whole mass of traditional lore into a huge system, making good defects, and smoothing away contradictions by means of distinctions and speculations. ” It was reserved for Proclus,” says Zeller, ” to bring the Neoplatonic philosophy to its formal conclusion by the rigorous consistency of his dialectic, and, keeping in view all the modifications which it had undergone in the course of two centuries, to give it that form in which it was transferred to Christianity and Mahommedanism in the middle ages.” Forty- four years after the death of Proclus the school of Athens was closed by Justinian (a.d. 529); but it had already fulfilled its mission in the work of Proclus. The works of Proclus, as the last testament of Hellenism to the church and the middle ages, exerted an incalculable influence on the next thousand years. They not only formed one of the bridges by which the medieval thinkers got back to Plato and Aristotle; they determined the scientific method of thirty generations, and they partly created and partly nourished the Christian mysticism of the middle ages. The disciples of Proclus are not eminent (Marinus, Asclepio- dotus, Ammonius, Zenodotus,

Isidorus, Hegias, Damascius). The last president of the Athenian school was Damascius (q.v.). When Justinian issued the edict for the suppression of the school, Damascius along with Simplicius (the painstaking commentator on Aristotle) and five other Neoplatonists set out to make a home in Persia. They found the conditions were unfavourable and were allowed to return (see Chosroes I.).

At the beginning of the 6th century Neoplatonism had ceased to exist in the East as an independent philosophy. Almost at the same time, however — and the coincidence is not accidental — it made new conquests in the church theology through the writings of the pseudo-Dionysius. It began to bear fruit in Christian mysticism, and to diffuse a new magical leaven through the worship of the church.

. In the West, where philosophical efforts of any kind had been very rare since the 2nd century, and where mystical contempla- tion did not meet with the necessary conditions, Neoplatonism found a congenial soil only in isolated individuals. C. Marius Victorinus (q.v.) translated certain works of Plotinus, and thus had a decisive influence on the spiritual history of Augustine (Confess, vii. 9, viii. 2). It may be said that. Neoplatonism influenced the West only through the medium of the church theology, or, in some instances, under that disguise. Even Boetius (it may now be considered certain) was a catholic Christian, although his whole mode of thought was certainly Neoplatonic (see Boetius). His violent death in the year 525 marks the end of independent philosophy in the West. But indeed this last of the Roman philosophers stood quite alone in his century, and the philosophy for which he lived was neither original, nor well-grounded, nor methodically developed.

Neoplatonism and the Theology of the Church. — The question as to the influence of Neoplatonism on the development of Christianity is not easily answered, because it is scarcely possible to get a com- plete view of their mutual relations. The answer will depend, in the first instance, upon how much is included under the term ” Neo-platonism.” If Neoplatonism is understood in the widest sense, as the highest and fittest expression of the religious movements at work in the Graeco-Roman empire from the 2nd to the 5th century, then it may be regarded as the twin-sister of the church dogmatic which grew up during the same period; the younger sister was brought up by the elder, then rebelled against her and at last tyran- nized over her. The Neoplatonists themselves characterized the theologians of the church as intruders, who had appropriated the Greek philosophy and spoiled it by the admixture of strange fables. Thus Porphyry says of Origen (Euseb. H.E. vi. 19), ” The outer life of Origen was that of a Christian

and contrary to law; but, as far as his views of things and of God are concerned, he thought like the Greeks, whose conceptions he overlaid with foreign myths." This verdict of Porphyry's is at all events more just and apt than that of the theologians on the Greek philosophers, when they accused them of having borrowed all their really valuable doctrines from the ancient Christian books. But the important point is that the rela- tionship was acknowledged on both sides. Now, in so far as both Neoplatonism and the church dogmatic set out from the felt need of redemption, in so far as both sought to deliver the soul from sensu- ality and recognized man's inability without divine aid — without a revelation — to attain salvation and a sure knowledge of the truth, they are at once most intimately related and at the same time

mutually independent. It must be confessed that when Chris- tianity began to project a theology it was already deeply impregnated by Hellenic influences. But the influence is to be traced not so much to philosophy as to the general culture of the time, and the whole set of conditions under which spiritual life was manifested. When Neoplatonism appeared, the Christian church had already laid down the main positions of her theology; or if not, she worked them out alongside of Neoplatonism — that is not a mere accident — but still independently. It was only by identifying itself with the whole history of Greek philosophy, or by figuring as pure Platonism restored, that Neoplatonism could stigmatize the church theology of Alexandria as a plagiarism from itself. These assumptions, how- ever, were fanciful. Although our sources are unfortunately very imperfect, the theology of the church does not appear to have learned much from Neoplatonism in the 3rd century— partly because the latter had not yet reached the form in which its doctrines could be accepted by the church dogmatic, and partly because theology was otherwise occupied. Her first business was to plant herself firmly on her own territory, to make good her position and clear away old and objectionable opinions. Origen was quite as inde- pendent a thinker as Plotinus; only, they both drew on the same tradition. From the 4th century downwards, however, the influence of Neoplatonism on the Oriental theologians was of the utmost im- portance. The church gradually expressed her most peculiar con- victions in dogmas, which were formulated by philosophical methods, but were irreconcilable with Neoplatonism (the Christologicai dogmas) ; and the further this process went the more unrestrainedly did theologians resign themselves to the influence of Neoplatonism on all other questions. The doctrines of the incarnation, the resur- rection of the flesh and the creation of the world in time marked the boundary line between the church's dogmatic and Neoplatonism ; in every other respect,

theologians and Neoplatonists drew so closely together that many of them are completely at one. In fact, there were special cases, like that of Synesius, in which a speculative reconstruction of distinctively Christian doctrines by Christian men was winked at. If a book does not happen to touch on any of the above-mentioned doctrines, it may often be doubtful whether the writer is a Christian or a Neoplatonist. In ethical precepts, in directions for right living (that is, asceticism), the two systems approximate more and more closely. But it was here that Neo- platonism finally celebrated its greatest triumph. It indoctrinated the church with all its mysticism, its mystic exercises and even its magical cultus as taught by Iamblichus. The works of the pseudo- Dionysius contain a gnosis in which, by means of the teaching of Iamblichus and Proclus, the church's theology is turned into a scholastic mysticism with directions on matters of practice and ritual. And as these writings were attributed to Dionysius, the disciple of the apostles, the scholastic mysticism which they unfold was regarded as an apostolic, not to say a divine, science. The influence exercised by these writings, first on the East, and then — ■ after the 9th (or 12th) century- — on the West, cannot be overestima- ted. It is impossible to enlarge upon it here ; suffice it to say that the mystical and pietistic devotion of our own day, even in the Protestant churches, is nourished on works whose ancestry can be traced, through a series of intermediate links, to the writings of the pseudo- Areopagite.

In the ancient world there was only one Western theologian who came directly under the influence of Neoplatonism; but that one is Augustine, the most important of them all. It was through Neo-platonism that Augustine got rid of scepticism and the last dregs of Manichaeism. In the seventh book of his Confessions he has recorded how much he owed to the perusal of Neoplatonic works. On all the cardinal doctrines — God, matter, the relation of God to the world, freedom and evil — Augustine retained the impress of Neoplatonism ; at the same time he is the theologian of antiquity who most clearly perceived and most fully stated wherein Neoplatonism and Chris-tianity differ. The best ever written by any church father on this subject is to be found in chaps, ix.-xxi. of the seventh book of the Confessions.

Why Neoplatonism succumbed in the conflict with Christianity is a question which the historians have never satisfactorily answered. As a rule, the problem is not even stated correctly. We have nothing to do here with our own private ideal of Christianity, but solely with catholic Christianity and catholic theology. These are the forces that conquered Neoplatonism, after assimilating nearly everything that it contained. Further, we must consider the arena in which the victory

was won. The battlefield was the empire of Constantine and Theodosius. It is only when these and all other circumstances of the case are duly realized that we have a right to inquire how much the essential doctrines of Christianity contributed to the vic- tory, and what share must be assigned to the organization of the church.

In medieval theology and philosophy mysticism appears as the powerful opponent of rationalistic dogmatism. The empirical science of the Renaissance and the two following centuries was itself a new development of Platonism and Neoplatonism, as opposed to rationalistic dogmatism, with its contempt for experience. Magic, astrology and alchemy — all the outgrowth of Neoplatonism— gave the first effectual stimulus to the observation of nature, and conse- quently to natural science, and in this way finally extinguished barren

rationalism. Thus in the history of science Neoplatonism has played a part and rendered services of which Plotinus or Iamblichus or Proclus never dreamt. So true is it that sober history is often stranger and more capricious than all the marvels of legend and romance.

Authorities. — On the relation of Neoplatonism to Christianity, and the historical importance of Neoplatonism generally, see the lead- ing church histories, and the Histories of Dogma by fiaur, Nitzsch, Harnack, &c. Compare also Loffler, Der Plalonismus der Kirchen- vater (1782I; Huber, Die Philosophie der Kirchenvater (1859); Tzchirner, Fall des Heidenthums (1829), pp. 574-618; Burckhardt, Die Zeit Constantin's des Grossen (1853); Chastel, Hist, de la destruc- tion du Paganisme dans I'empire d Orient (1850); Beugnot, Hist, de la destruction du Paganisme en Occident (1835); E. von Lasaulx, Der Untergang des HeUenismns (1854); Vogt, Neuplatonismus und Christenthum (1836); Ullmann, " Einfluss des Christenthums auf Porphyrius," in the Stud. u. Kritiken (1832); Jean Reville, La Religion d, Rome sous les Sevbres (1886); C. Bigg, The Christian Platonists of Alexandria (1886) and Neoplatonism (1895); Rufus M. Jones, Studies in Mystical Religion (1909), pp.70 foil. See further, C. Schmidt, Gnostische Schriften in Koptischer Sprache (1892); K. P. Hasse, Von Plotin zu Goethe (1909) ; Thomas Whittaker, The Neo- Platonists (1901); Petrie, Personal Religion in Egypt before Christ (1909) ; M. Heinze, " Neuplatonismus," in Herzog-Hauck, Realencyk. vol. xiii. (1903). On the after-effects of Neoplatonism on the church's dogmatic, see Ritschl, Theologie und Metaphysik (1881). On the relation of

Neoplatonism to Monachism, compare Keim, Aus dem Ur christenthum (1878). On the history of Neoplatonism with special reference to the decline of Roman polytheism, see, e.g., Samuel Dill, Roman Society in the Last Century of the Western Empire (1898), pp. 82 foil. On Plotinus, Porphyry, &c, see separate articles. (A. Ha.; J. M. M.)

NEOPTOLEMUS (also called Pyrrhus), in Greek legend, the son of Achilles and Deidameia. He was brought up by his grandfather Lycomedes in the island of Scyros, and taken to Troy in the last year of the war by Odysseus, since Helenus had declared that the city could not be captured without the aid of a descendant of Aeacus. Neoptolemus was famed for his beauty, eloquence and bravery. He was one of the warriors in the wooden horse and slew Priam at the sack of Troy {Odyssey, xi. 508-526; Aeneid, ii. 527). Apart from these Trojan tales, Neoptolemus is a prominent figure in the legends of Epirus and of Delphi. He was the ancestor of the Molossian kings, who therefore claimed to be of pure Hellenic stock. He was murdered at Delphi, where he was buried, and a festival was held in his honour every eighth year.

NEOPYTHAGOREANISM, a Graeco-Alexandrian school of philosophy, which became prominent in the 1st century a.d. Very little is known about the members of this school, and there has been much discussion as to whether the Pythagorean litera- ture which was widely published at the time in Alexandria was the original work of ist-century writers or merely reproductions of and commentaries on the older Pythagorean writings. The only well-known members of the school were Apollonius of Tyana and Moderatus of Gades. In the previous century Cicero's learned friend P. Nigidius Figulus (d. 45 B.C.) had made an attempt to revive Pythagorean doctrines, but he cannot be described as a member of the school. Further, it is necessary to distinguish from the Neopythagoreans a number of Eclectic Platonists, who, during the 1st century of our era, maintained views which had a similar tendency (e.g. Apuleius of Madaura, Plutarch of Chaeronea and, later, Numenius of Apamea).

Neopythagoreanism was the first product of an age in which abstract philosophy had begun to pall. The Stoics discovered that their " perfect man " was not to be found in the luxurious, often morbid society of the Graeco-Roman world; that some- thing more than dialectic ethics was needed to reawaken a sense of responsibility. A degenerate society cared nothing for syllogisms grown threadbare by repetition. Neopythagoreanism was an attempt to introduce a religious element into pagan philosophy in place of what had come to be

regarded as an arid formalism. The founders of the school sought to invest their doctrines with the halo of tradition by ascribing them to Pytha- goras and Plato, and there is no reason to accuse them of insincerity. They went back to the later period of Plato's thought, the period when Plato endeavoured to combine his doctrine of Ideas with the Pythagorean number-theory, and identified the Good with the One, the source of the duality of the Infinite

and the Measured (to aireipov and irepas) with the resultant scale of realities from the One down to the objects of the material world. They emphasized the fundamental distinction between the Soul and the Body. God must be worshipped spiritually by prayer and the will to be good, not in outward action. The soul must be freed from its material surrounding, the " muddy vesture of decay," by an ascetic habit of life. Bodily pleasures and all sensuous impulses must be abandoned as detrimental to the spiritual purity of the soul. God is the principle of good; Matter (CXtj) the groundwork of Evil. In this system we distinguish not only the asceticism of Pythagoras and the later mysticism of Plato, but also the influence of the Orphic mysteries and of Oriental philosophy. The Ideas of Piato are no longer self-subsistent entities; they are the elements which constitute the content of spiritual activity. The Soul is no longer an appanage of ovcia, it is ovaia itself: the non-material universe is regarded as the sphere of mind or spirit.

Thus Neopythagoreanism is a link in the chain between the old and the new in pagan philosophy. It connects the teaching of Plato with the doctrines of Neoplatonism and brings it into line with the later Stoicism and with the ascetic system of the Essenes. A comparison between the Essenes and the Neo- pythagoreans shows a parallel so striking as to warrant the theory that the Essenes were profoundly influenced by Neopythago- reanism. Lastly Neopythagoreanism furnished Neoplatonism with the weapons with which pagan philosophy made its last stand against Christianity.

See Pythagoras, Neoplatonism, Essenes; and Zeller's Philo- sophie d. Griechen. For members of the school see Apollonius of Tyana and Moderatus of Gades.

NEPAL, Nepaul or Nipal, an independent state, situated on the north-eastern frontier of India, lying between 8o° 15′ and 88° 10′ E., and 26 20′ and 30° 10′ N.; area, 54,000 sq. m. Its extreme length is about 525 m., and its breadth varies from 90 to 140 m. It is bounded on the N. by Tibet; on the E. by Sikkim; on the S. by Bengal and the United Provinces; and on the W. by Kumaon, from which it is separated by the Kali river. Its population is estimated by the natives at about

5,200,000, the common phrase used by the rulers in speaking of popular opinion being, ” but what will the Bawan (i.e. fifty- two) Lakh say to this.”

Nepal consists physically of two distinct territories: (1) the tarai, or strip of level, cultivated and forest land lying along the southern border; and (2) the great mountainous tract stretching northwards to Tibet. Along the northern frontier stand many of the highest peaks of the Himalayan range, such as Dhaulagiri (26,837 ft.), Mutsiputra, Gaurishankar and Yasa (24,000), Gosain Than (26,313), Mount Everest (29,002 according to the survey value), Kinchinjunga (28,146), and numerous peaks varying from 20,000 to 24,000 ft. In clear weather this magnificent snowy range may be seen in an almost continuous line from the top of some of the lower ranges near Katmandu. South of these are numerous parallel lower ranges, varying from 16,000 to 6000 ft. in height, which are broken up at intervals by cross ranges, thus forming a series of glens with a few hill-girt valleys interspersed.

These mountain ranges determine the course of the rivers, which are divided by the cross ranges into four groups. The first of these extends from Kumaon eastward as far as Dhaulagiri, and consists of the affluents of the Kali (Sarda), Sarju, Kurnali, Eastern Sarju, and Rapti, all of which ultimately form the Gogra or Gogari, and flow into the Ganges. The second group, known to the Nepalese as the Sapt Gandaki, rises from the peaks between Dhaulagiri and Gosain Than, and unite at Trebeni Ghat to form the Gandak. The third is a group of smaller rivers draining the great valley of Nepal, the valleys of Chitlong, Benepa, and Panouti, and portions of the tarai around the Churiaghati- range of hills. These are the various branches of the Bara Gandak, the lesser Rapti, the Bagmati and Kumla. East of this again is the fourth group, known to the Nepalese as the Sapt Kosi, rising from the peaks between Gosain Than and Kinchinjunga, and uniting to form the Soon Kosi, which falls into the Ganges.

There is thus a natural division of the country into four portions. The most western is the country of the Baisi (or twenty-two) rajas, and contains the towns of Jumla, Doti and Sulliana. The second is the country of the Chaubisi (or twenty-four) rajas, and contains the towns of Malebum, Palpa, Gurkha and Noakote. The third is the district containing Nepal proper, with the capital and many large towns to be mentioned afterwards. The fourth is the eastern portion of Nepal, comprising the country of the Kiratis, and many small towns, such as Dhankota, Ham and Bijapur.

Route into Nepal — The portion of Nepal, exclusive of the tarai, which is open to Europeans is the ” valley of Nepal,” containing the capital of the country, and a few adjacent smaller valleys. There is only one means of access open to Europeans, and this indeed is in general resorted to by the natives, as the other routes to the capital are longer and far more difficult. The road runs nearly north from Segauli, passing through the tarai and sal forests, to Bhichhkhori ; then through the beds of mountain streams, through a pass in the Churiyaghati range, and through another sal forest, to Hetoura; thence by a wide and good road to Bhimphedi at the foot of the Sisaghari range of hills. So far the route is practicable for carts and baggage animals, but from this point the road is a mere rugged footpath over the Sisaghari Pass, through the Chitlong valley and over the Chandragiri range. The distance from Segauli to Katmandu is 90 m.

The valley in extreme length from east to west is about 26 m., and in breadth from north to south about 15. The surrounding hills vary in height from 6000 to 9720 ft., the level of the valley itself being about 4500 ft. above the sea. Tradition has it that Nepal was once a lake, and appearances are in favour of this view. It is crossed from east to west by a low limestone range, through which the waters have gradually forced a passage, and in like manner the collected rivers have escaped at the south-east corner of the valley.

There are three principal streams, the Bagmati, Vishnumati, and Manohora, besides many small tributaries of these. All the rivers rise within the valley, except the Bagmati, which springs from the northern side of the Shiupuri peak, and enters the valley through a ravine at the north-east corner. They all unite and pass through a long narrow gorge in the limestone range, already mentioned, at Chobhar, and ultimately escape from the valley at Kotwaldar.

Climate. — In and around the Nepal valley, as in India, the year may be divided into the rainy, cold and hot seasons. The rains begin in June and last till October, but the fall is not so heavy or continuous as in the plains of Hindustan. The cold season extends from the middle of October to the middle of April. During these months the climate is delicious. Hoar-frost and thin ice are common in the mornings, and the thermometer sometimes falls as low as 25 s Fahr., but the days are bright and warm. From Christmas to the end of February there are occasional showers of rain; and snow falls on the surrounding low

ranges, but is very rarely seen in the valley itself. From April to the beginning of the rains is the hot season, but the thermometer seldom reaches 85° in the shade. The result of observations extending over many years gives an average mean temperature of 6o° Fahr., and an annual rainfall of about 60 in. Violent thunderstorms are not uncommon, and occasionally severe earthquakes occur, as in 1833 and 1866.

Flora and Fauna. — In a country possessing such a range of altitudes the flora and fauna are of course very varied. For descrip- tive purposes, Nepal may again be divided into three zones. These are — (1) the tarai and lower ranges of hills up to 4000 ft. in height;

(2) the central ranges and high-lying valleys, up to 10,000 ft.; and

(3) the alpine region, from 10,000 to 29,000 ft. in height. These zones are not, however, sharply defined, as the climate varies according to the latitude, the height of intermediate ranges, and the depth of the valleys; so that tropical plants and animals are some- times found far in the interior, and the more northern species descend along the loftier spurs into the southern zones.

The low alluvial land of the tarai is well adapted for cultivation, and is, so to speak, the granary of Nepal; but owing to scantiness of population and other causes the greater portion of it consists of swamps, jungles and forests. Considerable stretches of land are, however, being reclaimed from year to year. The productions here are those of British India — cotton, rice, wheat, pulse, sugar-cane, tobacco, opium, indigo, and the fruits and vegetables familiar in the plains of India. The forests yield a magnificent supply of sal, sisu, and other valuable forest trees; and the jungles abound with acacias, mimosas, cotton tree (Bombax), dak (Butea frondosa) , large bamboos, rattans, palms, and numerous ferns and orchids. On the Churiaghati range the common Finns longifolia grows freely. Tea can be grown at a height of from 2000 to 4000 ft. The middle zone supplies rice, wheat, maize, barley, oats, ginger, turmeric, chillies, potatoes, Cucurbitaceae, pineapples, and many varieties of European fruits, vegetables and flowers. The forests contain tree rhododen- drons, Finns longifolia, oaks, horse-chestnuts, walnuts, maples, hill bamboos, wild cherry, pear, allies of the tea plant, paper plants (Daphne), roses, and many other inhabitants of temperate climes, with various orchids, ferns and wild flowers. In the alpine zone exist Coniferae of many kinds, junipers, yew, box, hollies, birch, dwarf rhododendrons and the usual alpine flora.

The wild animals follow a similar distribution, and the following typical species may be mentioned. In the lowest zone are found the tiger, leopard, wolf, hyena and jackal, the elephant and rhinoceros, the gaur (Gavaeus gaums), gayal (Gavaeus frontalis), wild buffalo or arna, many species of deer, and the black bear (Ursus labiatus). Among the birds are found the pea-fowl, francolins, wild jungle fowl, and the smaller vultures, &c. In the middle zone there are the leopard, the Himalayan black bear (Ursus tibetanus), the wild dog, cats of many sorts, squirrels, hares, porcupines, the pangolin, and some species 61 deer and antelope. Among the birds are the larger

vultures and eagles, pheasants. (Gallophasis) , chukor, hill partridges, &c. In the alpine zone are found the true bear (Ursus isabellinus, or brown bear), the yak, musk deer, wild goats and sheep, marmots, &c. Among the birds are the eagle-vulture (Gypaetus), the blood pheasant (Ithaginis cruentus), snow pheasant (Tetraogallus hima- layensis), snow partridge (Lerwa nivicola), the horned pheasant (Ceriornis saiyra), crested pheasant (Catrens wallichi) . &c. Geese, ducks, waders of all sorts, and other migratory birds are found in abundance in the two lower zones.

Minerals. — The lowest zone in some directions abounds in fossils; and deposits of lignite, and even of true coal, are met with, the latter notably at a spot south of Palpa. The middle zone is rich in limestone and marbles, and abounds with minerals, such as iron, copper, zinc, lead and sulphur. Copper is found near the surface in many places, and there are remains of mines both at Markhu and in the great valley of Nepal. Mineral springs, both hot and cold, are numerous. Traces of silver, and also of gold, have been found in the alpine zone.

People. — The races occupying Nepal are of mixed Mongol origin. To the north, inhabiting the higher mountains and valleys, dwell the Bhutias or Tibetans. To the west lie the Gurungs and Magars. The Murmis, Gurkhalis and Newars occupy the central parts; and the Kiratis, Limbus and Lepchas occupy the eastern districts. There are also Brahmans and Chhatris in the hills. Besides these there are many small tribes residing in the tarai and some other malarious districts, known as Kumhas, Tharus, Manjis, &c, but generally classed together by the Nepalese as Aoulias, or dwellers in the malarious or aoul districts. These are probable descendants of immigrants from the lower castes of Hindus, occupying the borderlands of the tarai. Among the forests of the lower eastern region are also to be found some small savage tribes, known as Chepangs and Kusundas.

All the races except the Aoulias are of a decidedly Mongolian

appearance, being generally short and robust, and having flat faces, oblique eyes, yellow complexions, straight black hair, and comparatively hairless faces. The Newars, according to the Vamcdvali or native history, trace their descent from the races of southern India, but this is rendered more than doubtful by both their appearance and language. The Gurkhalis (Gurkhas or Ghurkhas) are descendants of the Brahmans and Rajputs who were driven out of Hindostan by the Moslems, and took refuge in the western hilly lands, where they ultimately became dominant, and where they have become much mixed with the other races by intermarriage.

Religions. — The Bhutias, Newars, Limbus, Keratis, and Lepchas are all Buddhists, but their religion has become so mixed up with Hinduism that it is now hardly recognizable. The Newars have entirely abandoned the monastic institutions of Buddhism, and have in great measure adopted the rules of caste, though even these sit but lightly upon them. They burn their dead, eat the flesh of buffaloes, goats, sheep, ducks, and' fowls, and drink beer and spirits. The Gurkhalis, Magars, and Gurungs are Hindus, but the last two are by no means strict in the observance of their religion, though there are some peculiarities which they carefully preserve. Thus, for instance, the Magars will eat pork but not buffalo's flesh, whereas the Gurungs eat the buffalo but not the hog.

Priests. — Where temples are so numerous (there are 2733 shrines in the valley) priests naturally abound, both of the Hindu and Buddhist religions. The festivals too are many in number, and in consequence holidays are incessant. The raj guru, or high priest, is an influential person in the state, a member of council, and has a large income from government lands as well as from the fines for offences against caste, &c. Many other priests, gurus and purohits, have lands assigned to them, and most of the temples have been richly endowed by their founders'. Every family of rank has a special priest, whose office is hereditary.

Astrologers are also numerous, and their services are in constant request. One cannot build a house, set out on a journey, com- mence a war, or even take a dose of physic, without having an auspicious moment selected for him.

Languages. — The various races have all separate languages, or at least dialects. The Gurkhalis and western tribes use Khas (see Pahari), which, unlike the other dialects, is of Sanskrit origin. The Newars have a distinct language and alphabets, for there are three known to their pandits, though only one is in use now. Their language, called

Gubhajius, greatly resembles Tibetan, but is now interspersed with many Sanskrit words. The Bhutias use the Tibetan language and alphabet.

Education. — There is a central educational institution at Kat- mandu with sixteen branches, or schools, over the valley of Nepal. This central institution has three departments, English, Sanskrit and Persian — or more correctly perhaps Urdu. Education is provided

free by the state, and is encouraged by grants of scholarships and prizes. Boys passing out well are sent at government expense to the various universities of northern India to complete their education, and some have lately been sent to Japan. The evil effects of higher education, as taught in the Indian colleges, on the youth of Bengal, &c., has, however, given the Gurkha durbar a distinct shock, and it seems not unlikely that education in Nepal may receive a set-back in consequence. Some of the upper classes speak English fluently, but the bulk of the labouring classes is quite illiterate.

Katmandu is a perfect storehouse of ancient Sanskrit literature, and some of the oldest MSS. in that language as yet known to scholars have been found there. There is also a fair English library. Both are lodged in a good building.

Calendar. — There are three principal eras in use in Nepal. The Samvat of Vikramaditya begins fifty-seven years before the Christian era, the Saka era of Salivanhn begins seventy-eight years after the Christian era, and the Nepalese Samvat dates from October a.d. 880. The Sri-Harsha and Kaligat eras are also sometimes used. Day is considered to begin when the tiles on a house can be counted, or when the hairs on the back of a man's hand can be discerned against the sky. Sixty bipalas = l pala; 60 palas = i ghari or 24 minutes; 60 gharis = i day of 24 hours.

Health. — All families of good position have at least one baid, or medical man, in constant attendance, and there are also many general practitioners. There is a large central hospital at Katmandu, and some thirteen other smaller hospitals are distributed over the country, with free beds, and provision for outdoor treatment. There is also a small hospital attached to the British Residency. The diseases most prevalent in the country are rheumatism, chronic dyspepsia, skin diseases,

syphilis, goitre, smallpox, cholera and leprosy. In the rains a number of cases Of mild intermittent fever, diarrhoea, and dysentery are met with. Fever of a severe typhoid type is common in the crowded lanes and dirty villages. Vaccination is being gradually introduced into the country, and the general health of the inhabitants of the principal cities in the valley has greatly improved since the introduction of fresh water, which has been brought in by pipes from mountain springs.

Towns. — There are three large towns in the Nepal valley, Katmandu, the capital, said to contain approximately 50,000 inhabitants, Patan and Bhatgaon about 30,000 each. The houses are from two to four storeys in height, built of brick and tiled. The windows and balconies are of wood, and some are elaborately carved. There are numerous handsome temples in all the towns, the majority of which are pagoda-shaped and built of brick, with roofs of copper, which is sometimes gilt. The streets are narrow, and they, as well as the squares, are all paved with brick or stone. In front of the temples generally stand monoliths surmounted by figures of Garuda, or of the founder, made of brass gilt, or sometimes of black stone. Besides these three large towns, there are at least twenty smaller towns and numerous villages in the valley, all of which possess many temples. Some of these, as for instance those of Pashupati, Bodhnatha and Symbhunatha, are considered of great sanctity. Many thousands of pilgrims come at one festival to worship at Pashupati, and it is there that the dying are brought to be immersed in the Bagmati, and the dead are burned on its banks.

Agriculture. — While the Gurkhalis are occupied in military affairs, the agriculture of the valley is carried on by the Newars. The soil is varied in character, from light micaceous sand to dense ferruginous clay. The whole valley is cultivated and irrigated where practicable, and the slopes of the hills are carefully terraced, so that there is little grazing ground, and few sheep or cattle are kept There are some milch cows and buffaloes, which are either stall-fed or grazed in the jungles at the foot of the hills. Animals for consumption and sacrifice are all imported, and are consumed as fast as they are brought in. In the cold season the Bhutias brine large flocks of sheep and goats laden with bags of borax, salt and saltpetre. These are sold for consumption, except a few that are retained to carry back the bags. These droves are generally accom- panied by ponies and some of the large Tibetan dogs ; the latter are powerful, fierce, shaggy animals, about the size of a small Newfound- land dog. Poultry are kept and used by the Newars, especially ducks, the eggs of which are in great demand even among the orthodox Hindus. The crops grown in the valley consist of rice, both the transplanted and the dry-sown or ghaiya varieties, wheat,

pulse, murwah, maize, buckwheat, chillies, radishes, mustard, garlic, onions, ginger, turmeric, sugar-cane, potatoes, ground nuts, many species of cucumbers and pumpkins, &c. Nothing but articles of food are allowed to be grown in the valley; hence its capabilities for producing tea, cotton and tobacco are unknown. All of these, however, are grown in other parts of the country, both in the hills and the tarai. Large cardamoms are extensively grown in the eastern hills, and form an important article of export. The hemp plant (Cannabis indica) grows wild, and is used both for manu- facturing purposes and for producing the resinous extract and other intoxicating products which are exported. Plants producing dyes, such as madder or maniit, are grown in some places; and drugs, such as chirata, are collected and exported. The better class of soils yields a return of about Rs. 180 per khait, and the poorest about Rs. 90 per khait. From some of the finer soils as many as

three crops of various sorts are obtained annually. The land- measures in use are different in different parts of the Country. Thus, in the eastern tarai a bigha measures 90X90 yds. English, while in the western tarai it is only 15X15 yds. In the hills the unit cf land measurement is called ropni, which is about twice the size of a western tarai bigha, — and twenty-five ropnis make one khait. This measurement applies only to rice lands. Other land measurements for the valley are as follows: One Nepali bigha is 90 yds. X 90 yds. British. (A British Indian bigha is 40 yds. X 40 yds. and 3 Nepali bighas equal about 5 acres.) Sixteen ropnis equal 1 Nepali bigha.

Land Taxes. — The tarai lands pay from two to nine rupees (British) per Nepali bigha according to quality of land. In the hills taxes are charged on the plough, thus: one plough pays 13 annas; one bullock without plough about 10 annas; one spade 6 J annas. These taxes are termed Hal, Patay and Kodaley.

Horticulture. — The Newars are also fond of horticulture. Many European fruits, flowers and vegetables have been introduced and grow freely. The country is famous for its oranges and pine- apples. Flowers are grown and sold for religious purposes, and even wild flowers are brought into the market and much used by the Newar women in adorning their hair, as well as for offerings at the shrines. Many wild fruits are collected and sold in the markets. Apples and pears, of English stock, thrive well; apricots and plums are good; peaches and grapes grow freely and are of large size, but they seldom ripen before the rains begin, when they rot.

Trade. — All the trade and manufactures of the country are in the

hands of the Newars, and a few Kashmiris and natives of Hindu- stan. The trade in European goods is chiefly carried on by the latter, whilst the Newars deal in corn, oil, salt, tobacco and articles of domestic manufacture. The trade with India is carried on at numerous marts along the frontier, at each of which a customs station is established, and the taxes are collected by a thikadar or farmer. The Newars also carry on the trade with Tibet, through a colony which has been for many years established at Lhasa, but this trade has been a shrinking item since the opening of the Lhasa- Darjeeling route. There are two principal routes to Tibet. One of these runs north-east from Katmandu to the frontier-station of Kuti or Nilam, crossing the Himalayan range at a height of 14,000 ft. ; the other passes out of the valley at the north-west corner, and runs at first upwards along the main branch of the Gandak, crossing the Himalayas, near Kerung, at a height of 9000 ft. All goods on these routes are carried on men's backs, except the salt, &c, carried in bags by the Bhutia sheep and goats. The principal imports from Hindustan are raw cotton, cotton goods, woollen goods, silks and velvets, hardware, cutlery, beads, jewels, coral, saddlery, shoes, guns, gunpowder, glassware, vermilion, indigo, lac, tea, betel-nut, spices, paper, sugar, tobacco, oils, sheet copper, goats, cattle, buffaloes; and from Tibet, musk, medicines, yaks' tails, tea, woollen cloth, blankets, borax, salt, saltpetre, paper-plant, honey, wax, sheep, goats, yaks, ponies, silver, gold. The exports to Hindustan include wax, paper-plant, musK, yaks' tails, medicines, cardamoms, borax, sulphate of copper, brass pots, iron pots, ponies, elephants, hawks, hides and horns (buffalo), rice, ghee, oil seeds, red chillies, madder, cobalt, potatoes, orange's: and to Tibet, broad cloth, raw cotton, cotton goods, tobacco, sugar, opium, coral, jewels, pearls, spices, betel-nut, copper pots, iron pots and hardware. The Nepalese are utterly regardless of statistics, but recent estimates value the exports and imports to and from the British provinces at 3 million sterling annually. Duties are levied on exports and imports, which will be noticed under the head of revenue.

Manufactures. — The Newars are skilful workmen. Their bricks are excellent, and so also is their pottery, for which certain towns are famous, such as Themi and Noakote. As carpenters they excel, though the use of the large saw is still unknown, and planks are cut with chisel and mallet. Some of the wood carvings on the temples and large houses are most artistic in design and bold in execution, though unfortunately they are sometimes of a most obscene char- acter. The manufactures are few, consisting chiefly of coarse cotton cloths, paper made of the inner bark of the paper-plants (Daphne), bells, brass and iron utensils, weapons, and ornaments of gold and silver.

Coinage. — At one time Nepal supplied Tibet with its silver coinage, but this was abandoned on account of the adulterations introduced by the Nepalese. The ancient coins, specimens of which are still to be met with, were made by hand. The modern coinage is struck by machinery, a regular mint having been established by Sir Jung Bahadur at Katmandu, and since improved by his successors.

Government. — The Nepalese have relations with China, and occasionally send an embassy with presents to Peking. The British too have considerable influence with the government in regard to their foreign relations, and a British resident is stationed at Katmandu. But in all matters of domestic policy the Nepalese brook no interference, and they are most jealous of anything that has a tendency to encroach on their inde- pendence. Theoretically the government of Nepal is a pure despotism, and the maharajah is paramount. Practically, all

real power has long been in the hands of the prime minister, and much of the modern history of the country consists of accounts of the struggles of the various factions for power. Under the prime minister there is a council, consisting of the relations of the king, the raj guru, the generals, and a few other officials known as kajis and sirdars and bhardars, which is con- sulted on all important business, and which forms a court of appeal for disputed cases from the courts of law. There are separate civil and criminal courts, but the distinction is not always observed, as difficult cases are often transferred from one to the other.

Law and Justice. — The old savage legal code with its ordeals by fire and water, and its punishments by mutilation and torture was abolished by Sir Jung Bahadur after his return from England in 1 85 1. Treason, rebellion and desertion in war-time are punished by death. Bribery and peculation by public servants are punished by dismissal from office, and a fine and imprisonment, the latter of which can be commuted by payments at various rates, according to the nature of the offence. Murder and the killing of cows are capital offences. Manslaughter and maiming cows are punished by imprisonment for life, and other offences against the person or property by imprisonment or fine. Brahmans and women are exempted from capital punishment. Offences against caste are heavily punished by fine and imprisonment. In some cases indeed all the offender's property is confiscated, and he and his family may be sold as slaves.

Bankruptcy laws have been recently introduced. The marriage laws are somewhat peculiar. Among the Gurkhas the laws resemble those of other Hindus as regards the marriage of widows, polygamy, &c, but among the Newars every girl while still an infant is married with much ceremony to a bel fruit, which is then thrown into some sacred stream. As the fate of the fruit is unknown, a Newari is supposed never to become a widow. At the age of puberty a husband is selected, but the woman can at any moment divorce herself by placing a betel : nut under her husband's pillow and taking her departure. Adultery is punished by the im- prisonment and fine bf both the adulteress and her paramour. Sati has been abolished in Nepal by law.

Gaols. — There are three large prisons in the Nepal valley, one ■ for males and two for females; there are also a considerable number of 'gaols throughout the country. The prisoners are kept in irons, and employed in public works of various sorts. They are allowed six pice a day for subsistence at the capital, and five pice in other places. Their relatives are allowed to minister to their creature comforts.

Slavery is an institution of the country, and all families of rank possess many slaves, who are employed in domestic and field work. They are generally treated well, and are carefully protected by law. The price of slaves ranges from Rs. 100 to Rs. 200.

Revenue. — The revenue of Nepal is about one hundred and fifty lakhs of rupees, i.e. £10,000,000. The chief sources of it are the land-tax, customs, mines, forests and monopolies. About 10% of the tarai lands, and 20% of the hill lands, are private property. Some lands were assigned by the Gurkhali rajas to Brahmans, soldiers and others, and these are untaxed. Others, which were the gifts of the old Newar kings, pay from 4 to 8 annas per bigha. All such grants of land, however, are subject to a heavy fine on the coronation of a new raja. Land which does not produce rice is lightly taxed, but in the valley of Nepal, and wherever rice is grown, the government tax or rent is one half of the produce of the land. Waste lands, when brought into cultivation, are rent free for ten years, after which for five years the tax is only 4 annas per bigha, and the cultivator receives one-tenth of the cleared land rent free for his life. A considerable revenue in the shape of royalty is obtained from mines of copper, iron, &c. The taxes on merchandise amount to from 12 to 14% on the value of the goods carried to and from British India, and from 5 to 6 % is charged on goods exported to Tibet.

Army. — Much attention is devoted by the Gurkhalis to military matters, and the bulk of that race may be said to be soldiers. The

standing army consists of about 50,000 men, in a fair state of efficiency. Besides this force there is a reserve, consisting of men who have served for a few years and taken their discharge, but in case of necessity can be called on again to enter the ranks. These would probably raise the strength to between 70,000 and 80,000 men. The regiments are formed on the European system, and similarly drilled and officered. Each man carries in addition to a bayonet a kukri or native knife. There is practically no cavalry, as the country is not suited for horses. The artillery, however, is on a larger scale, and consists nearly entirely of batteries of mountain artillery. There is a large arsenal well provided with supplies of gunpowder and military stores. There are workshops where cannon are cast, and rifles, and ammunition of all sorts turned out in large quantities, but of an indifferent quality.

In addition to its own army, Nepal supplies to the British army in India a large force of splendid soldiers, who were raised under the following circumstances. In 1815 the British'enlisted three battalions

of Gurkhas from amongst the soldiers of that race who were thrown out of employment, owing to the termination of the first phase of the war with Nepal. These regiments were styled the 1st, 2nd and 3rd Gurkhas, and were soon employed on active service. The 1st and 2nd behaved with much gallantry at the siege and storming of Bharatpur, and in the First Sikh War, while the 2nd and 3rd won a great name for loyalty and courage during the Mutiny of 1857- 58, especially at the siege of Delhi. This induced the British to raise, in 1858, two more battalions, which they numbered the 4th and 5th, and the whole Gurkha force has since proved its* usefulness and loyalty on many occasions, particularly during the Afghan War of 1878-80, and on many frontier expeditions. Battalions have also been sent on service to Burma, Egypt, China and Tibet. The Gurkhas in the British service now consist of ten regiments of riflemen of two battalions each, and number about 20,000 men.

History. — Nepal and the somewhat similar country of Kashmir are peculiar among the Hindu states of India in possessing an historical literature. The Nepalese Vamqdvali professes to start from a very early period in the Satya Yuga, when the present valley was still a lake. The earlier portion of it is devoted to the Satya and Treta Yugas, and contains mythological tales and traditions having reference to various sacred localities in the country. During these two Yugas, and also the Dwapur Yuga, the Vamqdvali deals in round numbers of thousands of years.

In the beginning of the Kali Yuga, the Gupta dynasty is said to have been founded by Ne-Muni, from whom the country takes its name of Nepal. Lists are then given of the various dynasties, with the lengths of the reigns of the rajas. The dynasties mentioned are the Gupta, Ahir, Kirati, Somavanshi, Suryavanshi, Thakuri or first Rajput, Vaishya Thakuri, second Rajput and Karnataki dynasties. The country was then invaded by Mukun- dasena, and after his expulsion various Vaishya Thakuri dynasties are said to have held the throne for a period of 225 years. The chronology of the Vamqdvali up to this period is very confused and inaccurate; and, though the accounts of the various invasions and internal struggles, mixed up as they are with grotesque legends and tales, may be interesting and amusing, they can hardly be considered authentic. Some of the names of the rajas, and the dates of their reigns, have been determined by coins, the colophons of old MSS., and certain inscriptions on the temples and ancient buildings. For instance, Anfuvarma, of the Thakuri dynasty, reigned about a.d. 633, as he is men- tioned by the Chinese traveller Hsuan Tsang, who visited Nepal. His name too is found in an inscription still extant. In like manner it is ascertained from MSS. that Rudra-deva-Varma was reigning in 1008; Lakshmikama-deva from 1015 to 1040; Padma-deva, of the Vaishya Thakuri dynasty, in 1065; Mana- deva, of the second Rajput dynasty, in 1139; Ananta-Malla, 1 286-1302; Harisinha-deva, 1324; Jayastithi-Malla, 1385-1391. Much information as to the chronology of the various dynasties can be obtained from the catalogue of the Cambridge MSS. com- piled by Cecil Bendall, and also from his papers on the ancient coins of the country. Inscriptions too have been edited by Professor Buhler in the Indian Antiquary, vol. ix. Detailed lists of the rajas are to be found in Kirkpatrick's Account of Nepal, in Hodgson's Essays, Prinsep's papers in the Asiatic Society's Journal and Wright's History of Nepal.

The records begin to be more accurate from the time of the invasion and conquest of the country by Harisinha-deva, the raja of Simraun, 1324. This raja was driven from Simraun by Tughlak Shah of Delhi, but seems to have found little difficulty in the conquest of Nepal. There were only four rajas of this Ayodhya dynasty, and then the throne was occupied by Jaya- bhadra-Malla, a descendant of Abhaya-Malla, one of the Rajput dynasty, who reigned in the 13th century. There were eight rajas of this dynasty. The seventh, Jayastithi-Malla, who reigned for forty-three years (1386-1429), appears to have done much in forming codes of laws, and introducing caste and its rules among the Newars. In the reign of the eighth raja, Yaksha- Malla, the kingdom was divided into four separate states — namely, Banepa, Bhatgaon or Bhaktapur, Kantipur or Kat- mandu, and Lalitapur or

Patan. There was only one raja of Banepa, who died without issue. The Malla dynasty in the other

three branches continued in power up to the conquest of the country by the Gurkhas in 1768.

The Gurkhas claim descent from the Rajputs of Chitor, in Rajputana. They were driven out of their own country by the victorious Moslems, and took refuge in the hilly districts about Kumaon, whence they gradually pushed their way east- wards to Lamjung, Gurkha, Noakote and ultimately to the valley of Nepal, which under Raja Prithwi Narayana they finally captured. In the struggle which took place at Bhatgaon, Jaya- prakasa (the raja of Katmandu) was wounded, and shortly afterwards he died at Pashupati. Ranjit-Malia, the aged raja of Bhatgaon, was allowed to retire to Benares, where he ended his days. Tej Narsinha, the raja of Patan, was kept in confine- ment till his death. During the latter years of the war Jaya- prakasa applied to the British for assistance, and a small force, under Captain Kinloch, was sent into the tarai in 1765, but it was repulsed by the Gurkhas.

Prithwi Narayana died in 1774. He left two sons, Pratapa- sinha Sah and Bahadur Sah. The former succeeded his father, but died in 1777, leaving an infant son, Rana Bahadur Sah. On the death of Pratapa-sinha, his brother, who had been in exile, returned to Nepal and became regent. The mother of the infant king, however, was opposed to him, and he had again to flee to Bettia, in British territory, where he remained till the death of the rani, when he again became regent, and continued so till 1795. During this time the Gurkhas were busily annexing all the neighbouring petty states, so that in 1790 their territories extended from Bhutan to the Sutlej river, and from Tibet to the British provinces. At length, in 1790, they invaded Tibet, and were at first successful; but they were thus brought into contact with the Chinese, who in 1791 sent a large force to invade Nepal. In 1792 the Chinese advanced as far as Noakote, and there dictated terms to the Nepalese.

In 1 79 1 the Gurkhas had entered into a commercial treaty with the British and hence, when hard pressed, they applied for assistance against the Chinese to Lord Cornwallis. In con- sequence of this Kirkpatrick was despatched to Nepal, and reached Noakote in the spring of 1792, but not till after peace had been concluded. One result

of this embassy was the ratification of another commercial treaty on the 1st of March 1792.

In 1795 Rana Bahadur removed his uncle, Bahadur Sah, from the regency, and two years subsequently put him to death. From this time up to 1799 the king, who seems to have been insane, perpetrated the most barbarous outrages, till at length his conduct became so intolerable that he was forced to abdicate in favour of his son, Girvan-yuddha Vikrama Sah, who was still an infant. Rana Bahadur once again recovered the throne in 1804, but was assassinated in 1805.

In October 1801 another treaty was signed by the British and Nepalese authorities, and a British resident was sent to the Nepalese court, but was withdrawn in 1803, owing to the conduct of the Nepalese. From this time the Nepalese carried on a system of encroachment and outrage on the frontier, which led to a declaration of war by the British in November 1814. At first the British attacks were directed against the western portion of the Nepalese territory, and under Generals Marly, Wood and Gillespie several disasters were met with. General Gillespie himself was killed while leading an assault on a small fort called Kalunga. General Ochterlony was more successful, and the Gurkhas were driven eastward beyond the Kali river, and began to negotiate for peace. Arms, however, were soon taken up again, and Ochterlony, who was put in command, in January 1816, advanced directly on the capital in the line of the route that is now in use. He soon fought hiS way as far as Mukwanpur, and the Nepalese sued for peace. A treaty was concluded in March, by which the Nepalese relinquished much of their newly acquired territory, and agreed to allow a British residency to be estab- lished at Katmandu. In November the raja died, and was succeeded by his infant son, Surendra Bikran Sah, the reins of government being held by General Bhimsena Thapa.

From this time the records for many years furnish little of interest except a history of struggles for office between the Thapa

and Pandry factions, and futile attempts at forming combinations with other states in Hindustan against the British.

In 1839 Bhimsena's enemies succeeded in driving him from power, and he committed suicide, or was murdered, in prison. The Kala Pandry faction then came into power, and there were frequent grave disputes with the British. War, however, was averted by the exertions of the resident, Mr Brian Hodgson.

In 1843 Matabar Singh, the nephew of Bhimsena, returned from exile, soon got into favour at court, and speedily effected the destruction of his old enemies the Kala Pandrys, who were seized and executed in May 1843. At this time mention begins to be made of a nephew of Matabar Singh, Jung Bahadur, the eldest of a band of seven brothers, sons of a kaji or state official. He rose rapidly in the army and in favour at the court, especially with one of the ranis, who was of a most intriguing disposition. In 1844 he was a colonel, and on the 18th of May 1845 killed his uncle, and immediately, with the aid of the rani, took a prominent part in the government. After a short but turbulent interval of intrigue, he got rid of his enemies at one fell swoop, by what is known as the Kot massacre, on the 15th of September 1846. From that time till the day of his death Jung Bahadur was in reality the ruler of Nepal. His old friend, the rani, was banished, and all posts of any consequence in the state were filled by Jung, his brothers and other relatives. In 1850, finding himself securely seated in power, Jung Bahadur paid a visit to England, which made a great impression on his acute intellect, and ever after he professed and proved himself to be a stanch friend of the British. On his return in 1851 he at once devoted himself to reforming the administration of the country, and, whatever may have been the means by which he gained power, it must be allowed that he exercised it so as to prove himself the greatest benefactor his country has ever possessed. In 1853 a treaty for the extradition of criminals was proposed, but it was not ratified till February 1855. In 1854 the Nepalese entered into a war with Tibet, which lasted with varying success till March 1856, when peace was concluded on terms very favourable to Nepal.

In June 1857 intelligence of the mutiny of the native troops in Hindustan reached Nepal, and produced much excitement. Jung Bahadur, in spite of great opposition, stood firm as a friend of the British. On the 26th June 4000 troops were sent off to assist, and these rendered good service in the campaign against the mutineers. Jung himself followed on the 10th of December, with a force of 8000 men, 500 artillerymen and 24 guns, but too late to be of much use. Many of the mutineers and rebels, including the infamous Nana Sahib, took refuge in the Nepalese tarai, and it was not till the end of 1859 that they were finally swept out of the country. The Nana was said to have died of fever in the tarai, and it is probable that this was the case. His wives and a few attendants resided for many years near Katmandu.

In return for the aid afforded to the British, Jung Bahadur was well rewarded. He was created a G.C.B., and in 1873 a G.C.S.I., honours of

which he was not a little proud. The troops employed received food and pay from the day of leaving Katmandu; handsome donations were given to those severely wounded, and to the relatives of the killed; great quantities of muskets and rifles were presented to the Nepalese government; and, to crown all, a large portion of the tarai was restored to Nepal. This ground contains most valuable sal and sisu forests, and yields a revenue of several lakhs of rupees yearly.

From the termination of the mutiny Nepalese history has been uneventful. The country has been prosperous, and the relations with the British have continued to be most friendly. Neverthe- less the restrictions on commerce, and the prohibitions against Europeans entering the country, or travelling beyond certain narrow limits, are as rigidly enforced as they were a hundred years ago. Sir Jung Bahadur died suddenly in th» tarai in 1877. In spite of all the exertions he had made to bring about a better state of things, three of his wives were allowed to immolate themselves on his funeral pyre. His brother, Sir Ranadip Singh Bahadur, G.C.S.I., succeeded him as prime minister. Shortly after his accession to power a plot was formed against him, but nearly forty of the conspirators were seized and executed, while

others escaped into exile. He was, however, murdered in 1885 and was succeeded by his nephew Sir Shamsher Jung, G.C.S.I., who died in 1001 and was succeeded by his brother Deb Shamsher Jung. But in June of that year a palace revolution placed another brother, Chandra Shamsher Jung, in power, whilst Deb Shamsher fled to India. Maharajah Chandra Shamsher has ruled Nepal with much ability. He gave effective aid to the British during the Tibet war of 1904, and the relations with the government of India became more cordial after his accession to power. In 1906 Chandra Shamsher was created a G.C.S.I., and in 1908 he visited England as a guest of the government, when he was in- vested with the G.C.B. by King Edward VII. He was also made a major-general in the British army, and honorary colonel of the 4th Gurkha Rifles.

For authorities see Dr Daniel Wright, History of Nepal (1877) ; Colonel Kirkpatrick, Account of Nepal; Brian Houghton Hodgson's essays; Dr H. A. Oldfield's sketches; Sir C. M. Aitchison, Treaties and Engagements; Sir Joseph Hooker's writings; and Sir Richard Temple, Hyderabad and Nepal (1887). (D. Wr. ; H. Wy.)

NEPENTHES (Gr. vriTrevdk, sc. apfiaKov, a drug that takes away grief, from vr- privative, and -rrevOos, ” grief “), an Egyptian drug spoken of by Homer in the Odyssey (iv. 221). Generally in the form ” nepenthe ” the name is given to any drug having a like property, and also occasionally to the herb or plant from which such a drug is produced. It is also applied to a special genus of plants, chiefly East Indian, known as the ” pitcher-plants,” on account of the formation of the leaves.

NEPHELINE, a rock-forming mineral consisting of sodium, potassium and aluminium silicate, Na6K 2 Al 8 Si9034. Its crystals belong to the hexagonal system, and usually have the form of a short six-sided prism terminated by the basal plane. The unsymmetrical etched figures produced artificially on the prism faces indicate, however, that the crystals are hemimorphic and tetartohedral, the only element of symmetry being a polar hexad axis. The hardness is 55. The specific gravity (2-6), the low index of refraction and the feeble double refraction are nearly the same as in quartz; but since in nepheline the sign of the double refraction is negative, whilst in quartz it is positive, the two minerals are readily distinguished under the microscope. An important determinative character of nepheline is the ease with which it is decomposed by hydrochloric acid, with separa- tion of gelatinous silica (which may be readily stained by colouring matters) and cubes of salt. A clear crystal of nepheline when immersed in acid becomes for this reason cloudy; hence the name nepheline, proposed by R. J. Haiiy in 1801, from Gr. vteh], a cloud.

Although in naturally occurring nepheline sodium and potas- sium are always present in approximately the atomic ratio 3:1, artificially prepared crystals have the composition NaAlSi0 4 ; the corresponding potassium compound, KAlSi04, which is the mineral kaliophilite, has also been prepared artificially. It has therefore been suggested that the orthosilicate formula, (NaK)AlSi04, represents the true composition of nepheline.

The mineral is one specially liable to alteration, and in the laboratory various substitution products of nepheline have been prepared. In nature it is frequently altered to zeolites (especially natrolite), sodalite, kaolin, or compact muscovite. Gieseckite and liebenerite are pseudomorphs.

Two varieties of nepheline are distinguished, differing in their external appearance and in their mode of occurrence, being analogous in these respects to sanidine or glassy orthoclase and common orthoclase respectively. ” Glassy nepheline ” has the form of small, colourless,

transparent crystals and grains with a vitreous lustre. It is characteristic of the later volcanic rocks rich in alkalis, such as phonolite, nepheline-basalt, leucite- basalt, &c, and also of certain dike-rocks, such as tinguaite. The best crystals are those which occur with mica, sanidine, garnet, &c, in the crystal-lined cavities of the ejected blocks of Monte Somma, Vesuvius. The other variety, known as elaeolite, occurs as large, rough crystals, or more often as irregular masses, which have a greasy lustre and are opaque, or at most translucent, with a reddish, greenish, brownish or grey colour. It forms an essential constituent of certain alkaline

plutonic rocks of the nepheline-syenite series, which are typically developed in southern Norway.

The colour and greasy lustre of elaeolite (a name given by M. H. Klaproth in 1809, from Gr. ekaiov, oil, and \idos, stone; Ger. Fettstein) are due to the presence of numerous microscopic enclosures of other minerals, possibly augite or hornblende. These enclosures sometimes give rise to a chatoyant effect like that of cat's-eye and cymophane; and elaeolite when of a good green or red colour and showing a distinct band of light is some- times cut as a gem-stone with a convex surface.

Closely allied to nepheline, and occurring with it in some nepheline-syenites, is the species cancrinite, which has the composition HsNaoCaˆaCOsˆAMSiGi)!). It is frequently of a bright yellow colour, and has sometimes been cut as a gem- stone. (L. J. S.)

NEPHELINE-SYENITE, or Elaeolite-syenite, a noncrystal- line plutonic rock which consists largely of nepheline and alkali felspar. The rocks are mostly pale coloured, grey or pink, and in general appearance they are not unlike granites, but dark green varieties are also known. They do not contain quartz, as that mineral and nepheline are mutually exclusive. From ordinary syenites they are distinguished not only by the presence of nepheline but also by the occurrence of many other minerals rich in alkalis or in rare earths. Orthoclase and albite are the principal felspars; usually they are intergrown to form perthite. In some rocks the potash felspar, in others the soda felspar predominates. Soda-lime felspars such as oligoclase and andesine are rare or entirely absent. Fresh clear microcline is very char- acteristic of some types of nepheline-syenite. Sodalite, colourless and transparent in the slides, but frequently pale blue in the hand specimens, is the principal felspathoid mineral in addition to nepheline. As a rule these two crystallize before felspar, but they may occur in perthitic intergrowth with it. The commonest ferro-magnesian mineral is pale green augite,

which may be surrounded by rims of dark-green, pleochroic soda-augite (aegirine). The latter forms long fiat prisms or bundles of radiating needles. A dark reddish-brown biotite is very common in some of these rocks and a white mica, probably not muscovite but lepidolite, is occasionally present. The hornblende may be brown, brownish-green, blue or blue-black, belonging as a rule to the varieties which contain soda; it is often intergrown with the pyroxene or enclosed in it. The dark-brown triclinic horn- blende aenigmatite occurs also in these rocks. Olivine is rare, but may be found in some basic forms of nepheline-syenite.

The commonest accessories are sphene, zircon, iron ores and apatite. Cancrinite occurs in several nepheline-syenites; in others there is fluor-spar or melanite garnet. A great number of interesting and rare minerals have been recorded from nepheline-syenites and the pegmatite veins which intersect them. Among these we may mention eudialyte, eukolite, mos- andrite, rinkite, johnstrupite, lavenite, hiortdahlite, perofskite and lamprophyllite. Many of these contain fluorine and the rare earths.

Nepheline-syenites are rare rocks; there is only one occurrence in Great Britain and one in France and Portugal. They are known also in Bohemia and in several places in Norway, Sweden and Finland. In America these rocks have been found in Texas, Arkansas and Massachusetts, also in Ontario, British Columbia and Brazil. South Africa, Madagascar, India, Tasmania, Timor and Turkestan are other localities for the rocks of this series. They exhibit also a remarkable individuality as each occurrence has its own special features; moreover a variety of types characterizes each occurrence, as these rocks are very variable. For these reasons, together with the numerous rare minerals they contain, they have attracted a great deal of attention from petrographers.

Many types of nepheline-syenite have received designations derived from the localities in which they were discovered. The laurdalites (from Laurdal in Norway) are grey or pinkish, and in many ways closely resemble the laurvikites of southern Norway, with which they occur. They contain anorthoclase felspars of lozenge-shaped forms, biotite or greenish augite, much apatite and sometimes olivine. . Some of these rocks are porphyritic. The

foyaites include the greater number of known nepheline-syenites and are called after Foya in the Serra de Monchique (southern Portugal), from which they were first described. They are grey, green or reddish, and mostly of massive structure with preponderat- ing potash felspar, some nepheline, and a variable (often small) amount of femic minerals. Pyroxene-, hornblende- and biotite- foyaites have been recognized according to their mineral com- position. Examples of the first-named occur in southern Norway with the laurdalites; they contain aegirine and black mica. At Alno Island in the Gulf of Bothnia (Sweden) similar rocks are found bearing enclosures or altered limestone with wollastonite and scapolite. In Siebenburgen (Hungary) there is a well-known rock of this group, very rich in microcline, blue sodalite and cancriuite. It contains also orthoclase, nepheline, biotite, aegirine, acmite, &c. To this type the name ditroite has been given from the place where it occurs (Ditro). Pyroxene-foyaite has been described also from Pouzac in the Pyrenees (S. France). Mica-foyaite is not very common, but is known at Miask in the Ural Mountains (miaskite), where it is coarse- grained, and contains black mica, sodalite and cancrinite. The hornblende-foyaites are usually brown or “blue, and intensely dichroic, but may contain also biotite or augite. Rocks of this class occur in Brazil (Serra de Tingua) containing sodalite and often much augite, in the western Sahara and Cape Verde Islands; also at Zwarte Koppies in the Transvaal, Madagascar, Sao Paulo (in Brazil), Paisano Pass (West Texas) and Montreal, Canada. The rock of Salem, Mass., U.S.A., is a mica-foyaite rich in albite and aegirine : it accompanies granite and essexite.

Litchfieldite is another well-marked type of nepheline-syenite, in which albite is the dominant felspar. It is named after Litch- field, Maine, U.S.A., where it occurs in scattered blocks. Biotite, cancrinite and sodalite are characteristic of this rock. A similar nepheline-syenite is known from Hastings Co., Ontario, and con- tains hardly any orthoclase, but only albite felspar. Nepheline is very abundant and there is also cancrinite, sodalite, scapolite, calcite, biotite and hornblende. The lujaurites are distinguished from the rocks above described by their dark colour, which is due to the abundance of minerals such as augite, aegirine, arfvedsonite and other kinds of amphibole. Typical examples are known near Lujaur on the White Sea, where they occur with umptekites and other very peculiar rocks. Other localities for this group are at Julianehaab in Greenland (with sodalite-syenite) ; at their margins they contain pseudomorphs after leucite. The lujaurites frequently have a parallel-banding or gneissose s-tructute.

So’dalite-syenites in which sodalite very largely or completely takes

the place of nepheline occur in Greenland, where they contain also microcline-perthite, aegirine, arfvedsonite and eudialyte. Cancrinite-syenite, with a large percentage of cancrinite, has been described from Dalekarlia (Sweden) and from Finland. We may also mention urtite from Lujaur Urt on the White Sea, which con- sists very largely of nepheline, with aegirine and apatite, but no felspar. Jacupirangite (from Jacupiranga in Brazil) is a blackish rock composed of titaniferqus augite, magnetite, ilmenite, perofskite and nepheline, with secondary biotite.

The chemical peculiarities of the nepheline-syenites are well marked, as will be seen from the following analyses. They are exceedingly rich in alkalis and in alumina (hence the abundance of felspathoids and alkali felspars) with silica varying from 50 to 56 %, while lime, magnesia and iron are never present in great quantity, though somewhat more variable than the other components. As a group, also, these rocks have a low specific gravity.

Si0 2 .

Al 2 O s .

FeO.

Fe 2 03-

CaO.

MgO.

K 2 o.

Na 2 0.

Laurdalite . Ditroite Litchfieldite Lujaurite

54‘55 56-30 60-39

54-H

19-07 24-14

22-57 20-61

3-12 2-26

2-08

2-41 1-99 0-42 3-28

3-15 0-69 0-32 1-85

1-98

0-13 0-13 0-83

4-84 6-79 4-77 5-25

7-67 9-28 8-44 9-87

(J- S. F.) NEPHELINITES. The group of effusive rocks which contains nepheline with plagioclase felspar is subdivided into nepheline-tephrites and nepheline-basanites, while those which contain nepheline but not felspar are nephelinites and nepheline-basalts. The tephrites differ from the basanites in the absence of olivine, and the same distinction subsists between the nephelinites and nepheline-basalts.

Lavas with nepheline, plagioclase and augite = nepheline- tephrites.

Lavas with nepheline, plagioclase, augite and olivine = nepheline-basanites.

Lavas with nepheline and augite = nephelinites.

Lavas with nepheline, augite and olivine = nepheline-basalts.

In their essential and accessory minerals, appearance and structure, these rocks have much in common, and they tend to occur in a natural association as basic rocks comparatively rich in alkalis and alumina. The nephelinites and tephrites are rather

closely linked to the phonolites and pass into them by various gradations. They are usually richer in alkalis and silica and contain less iron, lime and magnesia than the basanites and nepheline-basalts, a difference which finds expression in the presence of olivine and the smaller amount of felspars and felspathoids in the latter.

The nepheline is colourless and transparent when fresh, often in six-sided prisms, but also as irregular interstitial masses filling the spaces between the other minerals, and hard to identify owing to its low double refraction and frequent decomposition. Leucite appears in some tephrites; haiiyne is more frequent as small dodecahedra often filled with black inclusions. The augite varies a good deal, being

bright green or dark green (aegirine) and rich in soda in some tephrites and nephelinites, while in basanites arid basalts it is often brown ” basaltic ” augite or purple ” titaniferous ” augite. It has often good crystalline form, and occurs as eight-sided monoclinic prisms, but the soda augites may be of late crystallization and form mossy or irregular growths in the matrix. Brown hornblende is much less common, and a red biotite is very characteristic of certain nephelinites. Of the felspars, labradorite is probably the most common, with more acid varieties of plagioclase. Sanidine is by no means absent, but may be considered as an accessory. The olivine presents no peculiarities. Melilite, perofskite, pseiidobrookite, melanite garnet, iron oxides, apatite and chromite are occasionally met with.

All these rocks are practically confined to lavas of Tertiary and recent age, though some occur as dikes or small intrusive masses. The plutonic facies of these rocks are found among the theralites, shonkmites, essexitt-s and ijolites. In the British Isles they are exceedingly scarce, though nepheline-basanite occurs in a dike which is presumably Tertiary, cutting the Triassic rocks at Butterton in Staffordshire, and nephelirie-basalt has been found in a single neck at John o’ Groat’s in Caithness and at one or two places near North Berwick in Haddingtonshire. They attain a great develop- ment in the Canary Islands (Teneriffe, Grand Canary, &c.) and in the Azores, Cape Verde Islands and Fernando Noronha. In Germany they are represented among the Tertiary eruptive rocks of the Rhine district and Thuringia, at the extinct craters of the Eiffel and at the Kaiserstuhl. In central Bohemia there are many occur- rences of nepheline-tephrites, basanites and basalts which though fine grained contain all their minerals in excellent preservation. The nephelinite of Katzenbuckel in the Odenwald is well known. Contrasted with the phonolites and leucitophyres these rocks are scarce in Italy and the Mediterranean province, but leucite-bearing nepheline-tephrites occur at Monte Vulture and nepheline-basalts in Tripoli. In America these rocks occur in Texas, in the Bearpaw Mountains of Montana and at Cripple Creek, Colorado. From Argentina some members have been described: thay have a great extension in East Africa (Somaliland and Masai-land) and occur also in North Nigeria. A few also have been described from New South Wales, New Zealand (Dunedin) and Tasmania. (J..-.S. F.)

NEPHEW, the son of a brother or sister. The word is adapted from Fr. neveu, Lat. nepos (originally ” grandson ” or ” de- scendant “). The O. Eng. nefa survived in the form neve till the 15th century; this represents the Teutonic branch, cf. Ger. Neffe, Dutch neef; the

ultimate root is seen in the cognate Gr. vtiroSes, ” descendants,” avef/ Los, ” kinsman,” and Sans. napat, napt, ” descendants ” or ” descendant.” The correlative ” niece,” the daughter of a brother or sister, is from Fr. niece, Lat. neptis, the feminine form of nepos; the O. Eng. word was nift, cf. Ger. Nichte. A euphemistic use of ” nephew ” is that of the natural son of a pope, cardinal or other ecclesiastic; and from the practice of granting preferments to such children the word ” nepotism ” is used of any favouritism shown in finding positions for a man’s family.

NEPI (anc. Nepet or Nepete), a town and episcopal see of Italy., in the province of Rome, 75 m. S.W. of the town of Civita Castellana, 738 ft. above sea-level. Pop. (1001) 2973. The site, surrounded by ravines and accessible only on the W., is naturally strong and characteristic of an Etruscan town; on this side there is a considerable fragment of the ancient Etruscan wall, built of rectangular blocks of tufa (whether the rest of the site was protected by walls is uncertain) , and a ruined castle, erected by Antonio da Sangallo the elder in 1499, for Pope Alexander VI., and restored by Pope Paul III. The municipio (town hall) is from the designs of Vignola, and contains some ancient

inscriptions. The cathedral was burnt down by the French in 1 7 89 and restored in 1831. A mile and a half E.N.E. is the Roman- esque church of S Elia, founded about a.d. iooo, with frescoes of the period. It contains a pulpit of the time of Pope Gregory IV. (827-844), the sculptures of which are scattered about the church (F. Mazzanti in Nuovo Bollettino d’ Archaeologia Cristiana,

1806, 34).

Nepet had become Roman before 386 B.C., when Livy speaks of it and Sutrium as the keys of Etruria. In that year it was surrendered to the Etruscans and recovered by the Romans, who beheaded the authors of its surrender. It became a colony in 383 B.C. It was among the twelve Latin colonies that refused further help to Rome in 209 B.C. After the Social War it became a municipium. It is hardly mentioned in imperial times, except as a station on the road (Via Amerina) which diverged from the Via Cassia near the modern Settevene and ran to Ameria and Tuder. In the 8th century a.d. it was for a short while the seat of a dukedom.

See G. Dennis, Cities and Cemeteries of Etruria (London, 1883, i. 82). (T. As.)

NEPOMUK (or Pomuk), JOHN OF, the national saint of Bohemia. It is necessary to distinguish between the John of Nepomuk of history and the legendary one. In 1393 a dispute arose between King Wenceslaus IV. of Bohemia and the arch- bishop of Prague, John of Jenzenstein. Wenceslaus, wishing to found a new bishopric in south-western Bohemia, determined to seize the revenues of the abbey of Kladrub as soon as the aged abbot Racek should die. The archbishop opposed this plan, and by his orders his vicar-general, John of Pomuk— son of a German named Wolfel, a citizen of Pomuk — advised the monks to elect a new abbot immediately after Racek's death. This greatly incensed the king, who summoned the archbishop and some of his clergy — among whom was Pomuk— to appear before him. He ordered them to be immediately arrested, and though the archbishop escaped his four companions — among them Pomuk — were seized and subjected to cruel torture. They were ordered to abandon the archbishop. Three of them consented, but Pomuk, who refused to submit and was already on the point of death, was carried to the bridge of Prague and thrown into the Vltava. It is difficult to connect this historical event with the legend of St John of Nepomuk, who was canonized by the church of Rome in 1729, mainly by the influence of the Jesuits, who hoped that this new cult would obliterate the memory of Hus. The Austrian chronicler Thomas Ebendorfler of Hasel- bach, who lived two generations later, first states that it was reported that King Wenceslaus had ordered that the confessor of his queen — an office that John of Pomuk never held — should be thrown into the Vltava because he would not reveal the secret of confession. The story is afterwards told in greater detail by the untrustworthy Bohemian historian Wenceslaus Hajek. It appears certain that the person canonized in 1729 was not the historical John of Pomuk or Nepomuk.

See A. H. Wratislaw, Life, Legend and Canonization of St John Nepomuk (1873), a valuable work founded on the best Bohemian authorities; also A. Frind, Der geschichtliche Heilige Johann von Nepomuk (1861); O. Abel, Die Legende vom heiligen Johann von Nepomuk (1855); and particularly vol. iii. of W. W. Tomek's History of the Town of Prague (Czech) (12 vols., Prague, 1855-1901). NEPOS, CORNELIUS (c. 99-24 B.C.), Roman historian, friend of Catullus, Cicero and Atticus, was born in Upper Italy (perhaps at Verona or Ticinum). He wrote: Chronica, an epitome of universal history; Exempla, a collection of anecdotes after the style of Valerius Maximus; letters to Cicero; lives of Cato the elder and Cicero; and De viris illustribus, parallel lives of dis- tinguished Romans and foreigners, in

sixteen books. One section of this voluminous work (De excellentibus ducibus exterarum gentium, more commonly known as Vitae excellentium impera- torum) and the biographies of Cato and Atticus from another (De Latinis historicis) have been preserved. Erotic poems and a geographical treatise are also attributed to him. Nepos is not altogether happy in the subjects of his biographies, and he writes rather as a panegyrist than as a biographer, although he can rebuke his own countrymen on occasion. The Lives contain xix. 13

many errors (especially in chronology), but supply information not found elsewhere. The language is as a rule simple and correct. The Lives were formerly attributed to Aemilius Probus of the 4th century a.d.; but the view maintained by Lambinus (in his famous edition, 1569) — that they are all the work of Nepos — is now generally accepted. A dedicatory epigram written by Probus to the emperor Theodosius and inserted after the life of Hannibal, was the origin of the mistake. This dedication, if genuine, would only prove that Probus copied (and perhaps modi- fied and abridged) the work. In modern times G. F. Unger (Der sogenannte C. N., 1881) has attempted to prove that the author was Hyginus, but his theory has not been favourably received.

Editions of the Lives (especially selections) are extremely numer- ous; text by E. O. Winstedt (Oxford, 1904), C. L. Roth (1881), C. G. Cobet (1881), C. Halm and A. Fleckeisen (1889), with lexicon for school use; with notes, O. Browning and W. R. Inge (1888), J. C. Rolfe (U.S. 1894), A. Weidner and J. Schmidt (1902), C. Erbe (1892), C. Nipperdey and B. Lupus (ed. maj., 1879, school ed., ‘895), J. Siebelis and O. Stange (1897).

NEPOS, JULIUS, the last but one of the Roman emperors of the West (474-475). He was a nephew of Marcellinus, prince of Dalmatia, whom he succeeded in his principality. After the death of Olybrius the throne of the West remained vacant for some months, during which Italy was abandoned to bar- barians. Being connected by marriage with Leo I., emperor of the East, he was selected by him to succeed Olybrius on the Western throne, and proclaimed at Ravenna. After capturing his rival Glycerius, who had been nominated by the army in 473, at the mouth of the Tiber, he was recognized as emperor in Rome, Italy and Gˆul. The only event of the reign of Nepos was the inglorious cession to the Visigoths of the province of Auvergne. In 475 Orestes, father of Augustulus, afterwards the last emperor of the West, raised the standard of revolt and marched against Nepos at Ravenna. The emperor fled into Dalmatia, and continued to reside at Salona until his assassina- tion by two of his own officers in 480, possibly at

the instigation of Glycerius, who had been compelled to enter the church and had been appointed bishop of Salona.

See Tillemont, Hist, des empereurs, vi. ; Gibbon, Decline and Fall, ch. 36.

NEPTUNE (Lat. Neptunus), an Italian god, of unknown origin and meaning, paired with Salacia, possibly the goddess of the salt water. At an early date (399 B.C.) he was identified with the Greek Poseidon (q.v .) , when the Sibylline books ordered a lectisternium in his honour (Livy v. 13). His festival, Nep- tunalia, at which tents were made from the branches of trees, was celebrated on the 23rd of July, and his temple, containing a famous marine group by Scopas, stood near the Circus Flaminius. In earlier times it was the god Fortunus who was thanked for naval victories; but Sextus Pompeius called himself son of Neptune, and Agrippa dedicated to Neptune a temple (Basilica Neptuni) in the Campus Martius in honour of the naval victory of Actium.

NEPTUNE, in astronomy, the outermost known planet of our solar system; its symbol is ˆ . Its distance from the sun is a little more than 30 astronomical units, i.e. 30 times the mean distance of the earth from the sun, or about 2,796,000,000 m. It deviates greatly from Bode's law, which would give a distance of nearly 39. Its orbit is more nearly circular than that of any other major planet, Venus excepted. Its time of revolution is 165 years. Being of the 8th stellar magnitude it is invisible to the naked eye. In a small telescope it cannot be distinguished from a fixed star, but in a large one it is seen to have a disk about 2-3″ in diameter, of a pale bluish hue. No features and no change of appearance can be detected upon it, so that observation can give no indication of its rotation. Both its optical aspect and the study of its spectrum seem to show that it resembles Uranus. Its spectrum shows marked absorption-bands in the red and yellow, indicating an atmosphere of great depth of which hydrogen would seem to be a constituent. (See Planet.)

Only a single satellite of Neptune is yet known. This was dis- covered by William Lassell soon after the discovery of the planet. Its period of revolution is 5

“9 •35°-°-i65°(t-i890) 185 -15° + 0-148 (t-1890)

234 -42

61 -25748°

16 -27I 1

planets or satellites of the solar system. The most noteworthy feature connected with the satellite is a secular change which is going on in the position of its orbital plane. Were the planet spherical in form, no such change could occur, except an extremely slow one produced by the action of the sun. The change is therefore attributed to a considerable ellipticity of the planet, which is thus inferred to be in rapid rotation. It will ultimately be possible to determine from this motion the position of the axis of rotation of Neptune with much greater precision than it could possibly be directly observed.

The following elements of the satellite were determined by H. Struve from all the observations available up to 1892:

Varying Elements of Neptune’s Satellite. Inclination to earth’s equator R.A. of node on earth’s equator Distance from node at epoch Mean daily motion Mean distance at logA = 1-47814 Epoch, 1890, Jan. o, Greenwich mean noon The eccentricity, if any, is too small to be certainly determined. From the above mean distance is derived as the mass of Neptune n is!!- The motion of Uranus gives a mass T8 Jyj.

Discovery of Neptune. — The detection of Neptune through its action upon Uranus before its existence had been made known by observation is a striking example of the precision reached by the theory of the celestial motions. So many agencies were concerned in the final discovery that the whole forms one of the most interesting chapters in the history of astronomy. The planet Uranus, before its actual discovery by Sir William Herschel in 1781, had been observed as a fixed star on at least 17 other occasions, beginning with Flamsteed in 1690. In 1820 Alexis Bouvard of Paris constructed tables of the motion of Jupiter, Saturn and Uranus, based upon a discussion of observa- tions up to that year. Using the mutual perturbations of these planets as developed by Laplace in the Mecanique Cileste, he was enabled satisfactorily to represent the observed positions of Jupiter and Saturn; but the case was entirely different with. Uranus. It was found impossible to represent all the observations within admissible limits of error, the outstanding differences between theory and observation exceeding 1’. In these circumstances one of two

courses had to be adopted, either to obtain the best general representation of all the observa- tions, which would result in the tables being certainly erroneous, or to reject the older observations which might be affected with errors, and base the tables only on those made since the discovery by Herschel. A few years of observation showed that Uranus was deviating from the new tables to an extent greater than could be attributed to legitimate errors of theory of observation, and the question of the cause thus became of growing interest. Among the investigators of the question was F. W. Bessel, 1 who tried to reconcile the difficulty by an increase of the mass of Saturn, but found that he could do so only by assigning a mass not otherwise admissible. Although the idea that the deviations were probably due to the action of an ultra-Uranian planet was entertained by Bouvard, Bessel and doubtless others, it would seem that the first clear statement of a con- viction that such was the case, and that it was advisable to reach some conclusion as to the position of the disturbing body, was expressed by the Rev. T. J. Hussey, an English amateur astronomer. In a letter to Sir George B. Airy in 1834 he inquired Airy's views of the subject, and offered to search for the planet with his own equatorial if the required estimate of its position could be supplied. Airy expressed himself as not fully satisfied that the deviation might not arise from errors in the perturba- tions. He therefore was not certain of any extraneous action; but even if there was, he doubted the possibility of determining the place of a planet which might produce it. In 1837 Bouvard, in conjunction with his nephew Eugene, was again working on the problem; but it does not seem that they went farther than to collect observations and to compare the results with Bouvard 's tables.

In 1835 F. B. G. Nicolai, director of the observatory at Mannheim, in discussing the motion of Halley's comet, con- sidered the possibility that it was acted upon by an ultra-

1 Briefwechsel zwischen Olbers u. Bessel, ii. 250 (Oct. 9, 1823).

Uranian planet, the existence of which was made probable by the disagreement between the older and more recent observations. 2

In 1838 Airy showed in a letter to the Astronomische Nach- richten that not only the heliocentric longitude, but the tabulated radius vector of Uranus was largely in error, but made no suggestions as to the cause. 3

In 1843 the Royal Society of Sciences of Gottingen offered a prize of 50 ducats for a satisfactory working up of the whole theory of the

motions of Uranus, assigning September 1846 as the time within which competing papers should be presented.

It is also recorded that Bessel, during a visit to England in 1842, in a conversation with Sir John Herschel, expressed the conviction that Uranus was disturbed by an unknown planet, and announced his intention of taking up the subject. 4 He went so far as to set his assistant Fleming at the work of reducing the observations, but died before more was done.

The question had now reached a stage when it needed only a vigorous effort by an able mathematician to solve the problem. Such a man was found in John Couch Adams, then a student of St John's College, Cambridge, who seriously attacked the problem in 1843, the year in which he took his bachelor's degree. He soon found that the observations of Uranus could be fairly well represented by the action of a planet moving in a radius of twice the mean distance of Uranus, which would closely correspond to Bode's law. During the two following years he investigated the possible eccentricity of the orbit, and in September 1845 communicated his results to Professor James Challis. In 1845, about the 1st of November, Adams also sent his completed elements to Airy, stating that according to his calculations the observed irregularities in the motion of Uranus could be accounted for by the action of an exterior planet, of which the motions and orbital elements, were given. It is worthy of note that the heliocentric longitude of the unknown body as derived from these elements is only between one and two degrees in error, while the planet was within half a degree of the ecliptic. Two or three evenings assiduously devoted to the search could not therefore have failed to make the planet known. Adams's paper was accompanied by a comparison of his theory with the observations of Uranus from 1780, showing an excellent agreement. Airy in replying to this letter inquired whether the assumed perturbation would also explain the error of the radius-vector of Uranus, which he seemed to consider the crucial test of correctness. It does not seem that any categorical reply to this question was made by Adams.

Meanwhile, at the suggestion of Arago, the investigation had been taken up by U. J. J. Leverrier, who had published some excellent work in theoretical astronomy. Leverrier's first published communication on the subject was made to the French Academy on the 10th of November 1845, a few days after Adams's results were in the hands of Airy and Challis. A second memoir was presented by Leverrier in 1846 (June 1). His investigation was more thorough than that of Adams. He first showed that the observations of Uranus could not be accounted

for by the attraction of known bodies. Considering in succession various explanations, he found none admissible except that of a planet exterior to Uranus. Considering the distances to be double that of Uranus he then investigated the other elements of the orbit. He also attempted, but by a faulty method, to determine the limits within which the elements must be contained.

The following are the elements found by Adams and Leverrier:

Leverrier.

Hypothesis I.

Hypothesis II.

Semi-major axis

36-I54

38-38

37-27

Eccentricity

0-1076

0-16103

315 57ˆ

0-12062

Long, of perihelion

284° 45′

299° 11′

Mean longitude .

318° 47′

325° 8′

323° 2′

Epoch

1847, Jan. 1

1846, Oct. 1

1846, Oct. 1

True longitude

326° 32′

328°

329°

2 Astron. Nach. xiii. § 94. » Ibid. xv. § 217.

4 See Astron. Nach., ErgSnzungsheft, p. 6.

The longitude of the actual planet was 327 57′ on the 1st of October 1846.

The close agreement of these elements led Airy to suggest to Challis, on the 9th of July 1846, a search for the planet with the Northumberland telescope. He proposed an examination of a part of the heavens 30 long in the direction of the ecliptic and io° broad, and estimated the number of hours' work likely to be employed in this sweep. The proposed sweeps were commenced by Challis on the 29th of July. The plan required each region to be swept through twice, and the positions of all the known stars found to be compared, in order that the position of the planet might be detected by its motion. On the 31st of August Leverrier's concluding paper was presented to the French Academy, and on the 18th of September he wrote to John G. Galle (1812-1910), then chief assistant at the Berlin observatory, suggesting that he should search for the computed planet, with the hope of detecting it by its disk, which was probably more than 3″ in diameter. This letter, probably received on the 23rd of September, was communicated to J. F. Encke, the director of the observatory, who approved of the search. H. L. d' Arrest, a student living at the observatory, expressed a wish to assist. In the evening the search was commenced, but it was not found possible to detect any planet by its disk. Star charts were at the time being prepared at the observatory under the auspices of the Berlin Academy of Sciences. It was suggested

by d' Arrest that this region might be covered by one of the charts. Referring to the chart, which was lying in a drawer, it was found that such was the case. Comparing the stars on the chart one by one with the heavens it was found that an eighth magnitude star now visible was not on the chart. This object was observed until after midnight, but no certain motion was detected. On the following evening the object was again looked for, and found to have actually moved. The existence of the planet was thus established. It was afterwards found that Challis in his sweeps had observed the planet on the 4th of August, but, not having compared his observations with those made subsequently, had failed to detect it.

The question whether Leverrier should receive the sole credit of the discovery was warmly discussed. Arago took the extreme ground that actual publication alone should be considered, rejecting Adams's communications to Airy and Challis as quite unworthy of consideration. He also suggested that the name of Leverrier should be given to the planet, but this proposal was received with so little favour outside of France that he speedily withdrew it, proposing that of Neptune instead.

The observations at the first opposition showed that the planet was moving in a nearly circular orbit, and was at a mean distance from the sun much less than that set by Leverrier as the smallest possible. The latter had in fact committed the error of deter- mining the limits by considering the variations of the elements one at a time, assuming in the case of each that while it varied the others remained constant. But a simultaneous variation of all the elements would have shown that the representation of the observations of Uranus would be improved by a simul- taneous diminution of both the eccentricity and the mean distance, the orbit becoming more nearly circular and the planet being brought nearer to the sun. But this was not at first clearly seen, and Benjamin Peirce of Harvard University went so far as to maintain that there was a discontinuity between the solution of Adams and Leverrier and the solution offered by the planet itself, and that the coincidence in direction of the actual and computed planet was an accident. But this view was not well founded, and the only explanation needed was to be found in Leverrier's faulty method of determining the limits within which the planet must be situated. As a matter of fact the actual motion of the planet during the century preceding, as derived from Leverrier's elements, was much nearer the truth than the elements themselves were. This arose from the fact that his very elliptic orbit, by its large eccentricity, brought the planet near to the sun, and therefore near to its true position, during the period from 1780 to 1845, when the action on Uranus was at its greatest.

The observations of the first opposition enabled Sears Cook Walker of the National Observatory, Washington, in February 1847 to compute the past positions of the planet, and identify it with a star observed by Lalande at Paris in May 1795. This being communicated to the Paris observatory, an examination of Lalande 's manuscript showed that he had made two observa- tions of the planet, on the 8th and 10th of May, and finding them discordant had rejected one as probably in error, and marked the other as questionable. A mere re-examination of the region to see which observation was in error would have led him to the discovery of the planet more than half a century before it was actually recognized. The identity of Lalande's star with Neptune was also independently shown by Petersen of Altona, before any word of Walker's work had reached him. Bibliography. — The principal sources for the history of the discovery of Neptune are the Astronomische Nachrichten, vols, xxv., xxvi., xxviii., and Lindenau's paper in the Ergdnzungsheft to this publication, pp. 1-31 (Altona, 1849). In the Memoirs of the Royal Astronomical Society, vol. xvi., Airy gave a detailed history of the circumstances connected with the discovery, so far as he was cog- nizant of them. Documents pertaining

to the subject are found in the Monthly Notices of the Royal Astron. Society. B. A. Gould, Report to the Smithsonian Institution on the History of the Discovery of Neptune, published by the Smithsonian Institution (Washington, 1850), is the most complete and detailed history of all the circum- stances connected with the discovery, and with the early investiga- tions on the orbit of the planet, that has been published. Leverrier's investigation was published in extenso as an addition to the Con- naissance des temps, and Adams's as an appendix to the Nautical Almanac for 1851. Peirce's discussions, so far as published at all, are found in the Proceedings of the American Academy of Arts and Sciences. The first computations of the orbit after the discovery were made by Sears Cook Walker, and published by the Smithsonian Institution (1848-1850). General tables of the motion of Neptune are in Kowalski's Tables du mouvement de la planete Neptune; Newcomb's Investigation of the Orbit of Neptune, Washington, Smithsonian In- stitution (1866); Leverrier's Annates de I'Observatoire de Paris; Memoirs, vol. xiv. (1877), and lastly Newcomb's " Tables " in Astron. Papers of the American Ephemeris, vol. vii., part iv. Tables of the satellite are found in Newcomb, The Uranian and Nep- tunian Systems; appendix to the Washington observations for 1873- (S. N.)

NERAC, a town of south-western France, capital of an arron- dissement in the department of Lot-et-Garonne, 16 m. W.S.W. of Agen by road. Pop. (1906) town, 4018; commune, 6318. The town, once the capital of the dukes of Albret, is divided by the Baise into two parts, Grand-Nerac on the left bank and Petit-N6rac on the right bank. The river is spanned by a bridge of the 16th century, called the Pont Vieux, and by the Pont Neuf, of modern construction. Narrow winding streets often bordered by old houses ascend from the narrow quays on both banks. From the left bank a staircase leads to the Rue Henri Quatre, where stands a wing of the castle in which Henry IV. lived. A statue of the king stands in one of the squares. The former palace of the Chambre des Comptes is now occupied by the tribunal of commerce, the library and the museum. The church of Grand-Nerac of the 18th century and the church of Petit-Nerac of the 19th century offer no remarkable features. On the left bank of the Baise, above Grand-Nerac, market gardens have taken the place of the old gardens of the Sires d' Albret, but remains of the Palais des Mariannes and of the Pavilion des Bains du Roi de Navarre, both of Renaissance architecture, are left. The famous promenade of La Garenne laid out by Antoine de Bourbon, king of Navarre, stretches for more than a mile along the opposite bank of the river. The remains of a Roman villa, including a fragment of mosaic, have been found there. A road

leads from the south end of La Garenne to the ruins of the feudal castle of Nazareth. The Chateau du Tasta of the 15th century is within a short distance of Nerac. The town has a sub-prefecture, and the industries include brewing and cork-working.

Nerac appears at the beginning of the nth century as a possession of the monks of St Pierre de Condom. The lords of Albret gradually deprived them of their authority over the town, and at the beginning of the 14th century founded a castle on the left bank of the Baise. In the 16th century the castle was the residence of Henry IV. during much of his youth and of

Marguerite de Valois, sister of Francis I., of Jeanne d'Albret, and of the second Marguerite de Valois, wife of Henry IV., who held a brilliant court there. Nerac, the inhabitants of which had adopted the Reformed religion, was seized by the Catholics in 1562. The conferences, held there at the end of 1578 between the Catholics and Protestants, ended in February 1579 in the peace of Nerac. In 1580 the town was used by Henry IV. as a base for attacks on the Agenais, Armagnac and Guienne. A Chambre de l'Edit for Guienne and a Chambre des Comptes were established there by Henry IV. In 162 1, however, the town took part in the Protestant rising, was taken by the troops of Louis XIII. and its fortifications dismantled. Soon after it was deprived both of the Chambre de l'Edit and of the Chambre des Comptes, and its ruin was completed by the revocation of the Edict of Nantes in 1685.

NERBUDDA, or Narbada, a river of India. It is traditionally regarded as the boundary between Hindustan proper and the Deccan. It rises on the summit of Amarkantak hill in Rewa state, and for the first 200 m. of its course winds among the Mandla hills, which form the head of the Satpura range; then at Jubbulpore, passing through the " Marble Rocks," it enters its proper valley between the Vindhyan and Satpura ranges, and pursues a direct westerly course to the Gulf of Cambay. Its total course through the Central Provinces and Gujarat amounts to about 800 m., and it falls into the sea in the Bombay district of Broach. It receives the drainage of the northern slopes of the Satpuras, but not that of the Vindhyan tableland, the streams from which flow into the Ganges and Jumna. After leaving the Central Provinces, the river widens out in the fertile district of Broach, with an average breadth of J m. to 1 m. Below Broach city it forms an estuary which is

13 m. broad where it enters the Gulf of Cambay. The Nerbudda is nowhere utilized for irrigation, and navigation is confined to the lower section. In the rainy season boats of considerable size sail about 60 m. above Broach city. Sea-going vessels of about 70 tons frequent the port of Broach, but they are entirely dependent on the tide. In sanctity the Nerbudda ranks only second to the Ganges among the rivers of India, and along its whole course are special places of pilgrimage. The most meritorious act that a pilgrim can perform is to walk from the sea to the source of the river and back along the opposite bank. This pilgrimage takes from one to two years to accomplish.

The Nerbudda has given its name to a division of the Central Provinces, comprising the five districts of Narsinghpur, Hoshanga-bad, Nimar, Betul and Chhindwara. Area, 18,382 sq. m. ; pop. (1001) 1, 785,008.

NERCHINSK, a town of Eastern Siberia, in the government of Transbaikalia, 183 m. by rail E. of Chita, on the left bank of the Nercha, 25 m. above its confluence with the Shilka. Pop. (1897) 6713. It is. badly built of wood, and its lower parts frequently suffer from inundations. It has a small museum. The inhabitants support themselves mainly by agriculture, tobacco-growing and cattle-breeding; a few merchants trade in furs and cattle, in brick-tea from China, and manufactured wares from Russia.

The fort of Nerchinsk dates from 1654, and the town was founded in 1658 by Pashkov, who in that year opened direct communication between the Russian settlements in Transbaikalia and those on the Amur which had been founded by Cossacks and fur-traders coming from the Yakutsk region. In 1689 was signed between Russia and China the treaty of Nerchinsk, which stopped for two centuries the farther advance of the Russians into the basin of the Amur. After that Nerchinsk became the chief centre for the trade with China. The opening of the western route through Mongolia, by Urga, and the establishment of a custom-house at Kiakhta in 1728 diverted this trade into a new channel. But Nerchinsk acquired fresh importance from the influx of immigrants, mostly exiles, into eastern Transbaikalia, the discovery of rich mines and the arrival of great numbers of convicts, and ultimately it became the chief town of Trans- baikalia. In 181 2 it was transferred from the banks of the Shilka to its present site, on account of the floods. Since the foundation,

in 185 1, of Chita, the present capital of Transbaikalia, Nerchinsk has been falling into decay.

NERCHINSK (in full Nerchinskiy Zavod), a town and silver- mine of East Siberia, in the government of Transbaikalia, 1 50 m. E.S.E. of another Nerchinsk (q.v.) (with which it is often con- fused), on a small affluent of the Argun. Pop. (1897) 3000. It lies in a narrow valley between barren mountains, and is much better built than any of the district towns of East Siberia. It has a chemical laboratory for mining purposes, and a meteoro- logical observatory (51° 18′ N., 119 37′ E., 2200 ft. above sea-level), where meteorological and magnetical observations have been made every hour since 1842. The average yearly temperature is 25-3° F., with extremes of 97-7° and -52-6°.

Nerchinsk Mining District extends over an area of 29,450 sq. m., and includes all the silver-mines and gold-fields between the Shilka and the Argun, together with a few on the left bank of the Shilka. It is traversed by several parallel chains of moun- tains which rise to 4500 ft., and are intersected by a complicated system of deep, narrow valleys, densely wooded, with a few expansions along the larger rivers, where the inhabitants with difficulty raise some rye and wheat. The population (75,625 in 1897) consists of Russians, Buryats and Tunguses. Included in this number were some 2300 convicts. The mountains, so far as they have been geologically explored, consist of crystalline slates and limestones — probably Upper Silurian and Devonian — interspersed with granite, syenite and diorite; they contain rich ores of silver, lead, tin and iron, while the diluvial and alluvial valley formations contain productive auriferous sands.

The Nerchinsk silver mines began to be worked in 1704, but during the first half of the 18th century their yearly production did not exceed 8400 oz., and the total amount for the first 150 years (1704-1854) amounted to 11,540,000 oz. The lead was mostly neglected on account of the difficulties of transport, but its pro- duction is at present on the increase. Gold was first discovered in 1830, and between 1833 and 1855 260,000 oz. of gold dust were obtained. In 1864 a large number of auriferous deposits were dis- covered. Until 1863 all the labour was performed by serfs, the property of the emperor, and by convicts, numbering usually nearly four thousand.

‘ NEREUS, in Greek mythology, the eldest son of Pontus and Gaea, and father of the fifty Nereids. He is a beneficent and venerable old man of the sea, full of wisdom and skilled in prophecy, but, like Proteus, he will only reveal what he knows under compulsion. Thus Heracles seized him when asleep, and, although he attempted to escape by assuming various forms, compelled him to reveal the whereabouts of the apples of the Hesperides (Apollodorus ii. 5). His favourite

dwelling-place is a cavern in the depths of the Aegean. The fifty daughters of Nereus, the Nereids, are personifications of the smiling, quiet sea. Of these, Thetis and Amphitrite rule the sea according to the legend of different localities; Galatea is a Sicilian figure, who plays with and deludes her rustic lover of the shore, Polyphemus. Nereus is represented with the sceptre and trident; the Nereids are depicted as graceful maidens, lightly clad or naked, riding on tritons and dolphins. The name has nothing to do with the modern Greek vep6 (really veapbv, ” fresh ” [water]) : it is prob- ably a short form of NVwos.

NERGAL, the name of a solar deity in Babylonia, the main seat of whose cult was at Kutha or Cuthah, represented by the mound of Tell-Ibrahim. The importance of Kutha as a religious and at one time also as a political centre led to his surviving the tendency to concentrate the various sun-cults of Babylonia in Shamash (q.v.). He becomes, however, the representative of a certain phase only of the sun and not of the sun as a whole. Portrayed in hymns and myths as a god of war and pestilence, there can be little doubt that Nergal represents the sun of noon- time and of the summer solstice which brings destruction to man- kind. It is a logical consequence that Nergal is pictured also as the deity who presides over the nether-world, and stands at the head of the special pantheon assigned to the government of the dead, who are supposed to be gathered in a large subterranean cave known as Aralu or Irkalla. In this capacity there is associated with him a goddess Allatu, though there are indications that at one time Allatu was regarded as the sole mistress of Aralu, ruling

in her own person. Ordinarily the consort of Nergal is Laz. Nergal was pictured as a lion and on boundary-stone monuments his symbol is a mace surmounted by the head of a lion.

As in the case of Ninib, Nergal appears to have absorbed a number of minor solar deities, which accounts for the various names or designations under which he appears, such as Lugalgira, Sharrapu (” the burner,” perhaps a mere epithet), Ira, Gibil (though this name more properly belongs to Nusku, q.v.) and Sibitti. A certain confusion exists in cuneiform literature between Ninib and Nergal, perhaps due to the traces of two different conceptions regarding these two solar deities. Nergal is called the ” raging king,” the ” furious one,” and the like, and by a play upon his name — separated into three elements Ne-uru- gal ” lord of the great dwelling ” — his position at the head of

the nether-world pantheon is indicated. In the astral-theological system he is the planet Mars, while in ecclesiastical art the great lion-headed colossi serving as guardians to the temples and palaces seem to be a symbol of Nergal, just as the bull-headed colossi are probably intended to typify Ninib.

The name of his chief temple at Kutha was E-shid-lam, from which the god receives the designation of Shidlamtaea, ” the one that rises up from Shidlam.” The cult of Nergal does not appear to have been as widespread as that of Ninib. He is frequently invoked in hymns and in votive and other inscriptions of Babylonian and Assyrian rulers, but we do not learn of many temples to him outside of Kutha. Sennacherib speaks of one at Tarbisu to the north of Nineveh, but it is significant that although Nebuchadrezzar II. (606-586 e.c), the great temple-builder of the neo-Babylonian monarchy, alludes to his opera- tions at E-shid-lam in Kutha, he makes no mention of a sanctuary to Nergal in Babylon. Local associations with his original seat — Kutha — and the conception formed of him as a god of the dead acted in making him feared rather than actively worshipped. (M. Ja.)

NERI, PHILIP (Filippo de) (1515-1595), Italian churchman, was born at Florence on the 21st of July 1515. He was the youngest child of Francesco Neri, a lawyer of that city, and his wife Lucrezia Soldi, a woman of noble birth, whose family had long served the state. He was carefully brought up, and received his early teaching from the friars at San Marco, the famous Dominican monastery in Florence. He was accustomed in after life to ascribe most of his progress to the teaching of two amongst them, Zenobio de’ Medici and Servanzio Mini. When he was about sixteen years old, a fire destroyed nearly all his father’s property. Philip was sent to his father’s childless brother Romolo, a merchant at San Germano, a Neapolitan town near the base of Monte Cassino, to assist him in his business, and with the hope that he might inherit his possessions. So far as gaining Romolo’s confidence and affection, the plan was entirely successful, but it was thwarted by Philip’s own resolve to take holy orders. In 1533 he left San Germano, and went to Rome, where he became tutor in the house of a Florentine gentleman named Galeotto Caccia. Here he was able to pursue his own studies under the guidance of the Augustinians, and to begin those labours amongst the sick and poor which gained him in later life the title of “Apostle of Rome,” besides paying nightly visits for prayer and meditations to the churches of the city and to the catacombs. In 1538 he entered on that course of home mission work which was the distinguishing charac- teristic of his life; somewhat in the manner of Socrates he traversed the city, seiaing opportunities of entering into con- versation with persons of all ranks, and of leading them on, with

playful irony, with searching questions, with words of wise and kindly counsel, to consider the topics he desired to set before them.

In 1548 he founded the celebrated confraternity of the San- tissima Trinita. de' Pellegrini e de' Convalescente, whose primary object is to minister to the needs of the thousands of poor pilgrims who fiock to Rome, especially in years of jubilee, and also to relieve the patients discharged from hospitals, but still too weak for labour. In 1551 he passed through all the minor orders, and was ordained deacon, and finally priest on the 23rd

of May. He had some thought of going to India as a missionary, but was dissuaded by his friends who saw that there was abundant work to be done in Rome, and that he was the man to do it. Accordingly he settled down, with some companions, at the hospital of San Girolamo della Carita, and while there tentatively began, in 1556, the institute with which his name is more especi- ally connected, that of the Oratory. The scheme at first was no more than a series of evening meetings in a hall (the Oratory), at which there were prayers, hymns, readings from Scripture, from the fathers, and from the Marlyrology, followed by a lecture, or by discussion of some religious question proposed for consideration. The musical selections (settings of scenes from sacred history) were called oratorios. The scheme was developed, and the members of the society undertook various kinds of mission work throughout Rome, notably the preaching of sermons in different churches every evening, a wholly novel agency at that time. In 1564 the Florentines requested him to leave San Girolamo, and to take the oversight of their church in Rome, San Giovanni dei Fiorentini, then newly built. He was at first reluctant, but by consent of Pius IV. he accepted, while retaining the charge of San Girolamo, where the exercises of the Oratory were kept up. At this time the new society included amongst its members Caesar Baronius, the ecclesi- astical historian, Francesco Maria Tarugi, afterwards archbishop of Avignon, and Paravicini, all three subsequently cardinals, and also Gallonius, author of a well-known work on the Sufferings of the Martyrs, Ancina, Bordoni, and other men of ability and distinction.

The Florentines, however, built in 1574 a large oratory or mission- room for the society contiguous to San Giovanni, in order to save them the fatigue of the daily journey to and from San Girolamo, and to provide a more convenient place of assembly, and the headquarters were transferred thither. As the community grew, and its mission work extended, the need of having a church entirely its own, and not subject to other claims, as were San Girolamo and San Giovanni, made itself felt, and the offer of the small parish church of Santa Maria in

Vallicella, conveniently situated in the middle of Rome, was made and accepted. The building, however, as not large enough for their purpose, was pulled down, and a splendid church erected on the site. It was immediately after taking possession of their new quarters that Neri formally organized, under permission of a bull dated July 15, 1575, a community of secular priests, entitled the Congregation of the Oratory. The new church was consecrated early in 1577, and the clergy of the new society at once resigned the charge of San Giovanni dei Fiorentini', but Neri himself did not migrate from San Giro- lamo till 1583, and then only in virtue of an injunction of the pope that he, as the superior, should reside at the chief house of his congregation. He was at first elected for a term of three years (as is usual in modern societies), but in 1587 was nominated superior for life. He was, however, entirely free from personal ambition, and had no desire to be general over a number of dependent houses, so that he desired that all congregations formed on his model outside Rome should be autonomous, governing themselves, and without endeavouring to retain control over any new colonies they might themselves send out — a regulation afterwards formally confirmed by a brief of Gregory XV. in 1622. Much as he mingled with society, and with persons of importance in Church and state, his single interference in political matters was in 1593, when his persuasions induced the pope, Clement VIII., to withdraw the excommunication and anathema of Henry IV. of France, and the refusal to receive his ambassador, even though the king had formally abjured Calvinism. Neri saw that the pope's attitude was more than likely to drive Henry to a relapse, and probably to rekindle the civil war in France, and directed Baronius, then the pope's confessor, to refuse him absolution, and to resign his office of confessor, unless he would withdraw the anathema. Clement yielded at once, though the whole college of cardinals had supported his policy; and Henry, who did not learn the facts till several years afterwards, testified- lively gratitude for the

timely and politic intervention. Neri continued in the govern- ment of the Oratory until his death, which took place on the 26th of May 1595 at Rome. He was succeeded byBaronius. There are many anecdotes told of him which attest his possession of a playful humour, united with shrewd mother-wit. He considered a cheerful temper to be more Christian than a melan- choly one, and carried this spirit into his whole life. This is the true secret of his popularity and of his place in the folk-lore of the Roman poor. Many miracles were attributed to him

alive and dead, and it is said that when his body was dissected it was found that two of his ribs had been broken, an event attributed to the expansion of his heart while fervently praying in the catacombs about the year 1545. This phenomenon is in the same category as the stigmata of St Francis of Assisi. Neri was beatified by Paul V. in 1600, and canonized by Gregory XV. in 1622.

" Practical commonplaceness," says Frederick William Faber in his panegyric of Neri, was the special mark which distinguishes his form of ascetic piety from the types accredited before his day. " He looked like other men … he was emphatically a modern gentleman, of scrupulous courtesy, sportive gaiety, acquainted with what was going on in the world, taking a real interest in it, giving and getting information, very neatly dressed, with a shrewd common sense always alive about him, in a modern room with modern furni- ture, plain, it is true, but with no marks of poverty about it — in a word, with all the ease, the gracefulness, the polish of a modern gentleman of good birth, considerable accomplishments, and a very various information." Accordingly, he was ready to meet the needs of his day to an extent and in a manner which even the versatile Jesuits, who much desired to enlist him in their company, did not rival; and, though an Italian priest and head of a new religious order, his genius was entirely unmonastic and unmedieval; he was the active promoter of vernacular services, frequent and popular preaching, unconventional prayer, and unsystematized, albeit fervent, private devotion.

Neri was not a reformer, save in the sense that in the active dis- charge of pastoral work he laboured to reform individuals. He had no difficulties in respect of the teaching and practice of his church, being in truth an ardent Ultramontane in doctrine, as was all but inevitable in his time and circumstances, and his great merit was the instinctive tact which showed him that the system of monasticism could never be the leaven of secular life, but that something more homely, simple, and everyday in character was needed for the new time.

Accordingly, the congregation he founded is of the least con- ventional nature, rather resembling a residential clerical club than a monastery of the older type, and its rules (never written by Neri, but approved by Paul V. in 1612) would have appeared incredibly lax, nay, its religious character almost doubtful, to Bruno, Stephen Harding, Francis or Dominic. It admits only priests aged at least thirty-six, or ecclesiastics who have completed their studies and are ready for ordination The members live in community, and each pays his own expenses, having the usufruct of his private means — a startling innovation on the monastic vow of poverty. They have indeed a common table, but it is

kept up precisely as a regimental mess, by monthly payments from each member. Nothing is pro- vided by the society except the bare lodging, and the fees of a visiting physician. Everything else — clothing, books, furniture, medicines—must be defrayed at the private charges of each member. There are no vows, and every member of the society is at liberty to withdraw when he pleases, and to take his property with him. The government, strikingly unlike the Jesuit autocracy, is of a republican form; and the superior, though first in honour, has to take his turn in discharging all the duties which come to each priest of the society in the order of his seniority, including that of waiting at table, which is not entrusted in the Oratory to lay brothers, according to the practice in most other communities. Four deputies assist the superior in the government, and all public acts are decided by a majority of votes of the whole congregation, in which the superior has no casting voice. To be chosen superior, fifteen years of membership are requisite as a qualification, and the office is tenable, as all the others, for but three years at a time. No one can vote till he has been three years in the society; the deliberative voice is not obtained before the eleventh year. There are thus three classes of members — novices, triennials and decennials. Each house can call its superior to account, can depose, and can restore him, without appeal to any external authority, although the bishop of the diocese in which any house of the Oratory is established is its ordinary and immediate superior, though without power to interfere with the rule. Their churches are non-parochial, and they can perform such rites as baptisms, marriages, &c, only by permission of the parish priest, who is entitled to receive all fees due in respect of these ministrations. The Oratory chiefly spread in Italy and in France, where in 1760 there were 58 houses all under the government of a superior-general. Malebranche, Thomassin, Mascaron and

Massillon were members of the famous branch established in Paris in 161 1 by Berulle (after cardinal), which had a great success and a distinguished history. It fell in the crash of the Revolution, but was revived by Pere Petetot, cur < 5 of St Roch, in 1852, as the " Oratory of Jesus and the Immaculate Mary "; the Church of the Oratory near the Louvre belongs to the Reformed Church. An English house, founded in 1847 at Birmingham, is celebrated as the place at which Cardinal Newman fixed his abode after his sub- mission to the Roman Catholic Church. In 1849 a second congrega- tion was founded in King William Street, Strand, London, with F. W. Faber as superior; in 1854 it was transferred to Brompton. The society has never thriven in Germany, though a few houses have been founded there, in Munich and Vienna.

Authorities. — J. Marciano, Memorie istoriche della Congregazione

dell' Oratorio (5 vols., Naples, 1693-1702); Perraud, LOratoire de France (2nd ed., Paris, 1866); Jourdain de la Passardiere, L'Oratoire de St Ph. de Neri (1880); Ant. Gallonius, Vita Ph. Neri (Rome, 1600) ; Giacomo Bacci, Life of Saint Philip Neri, trans. Faber (2 vols., London, 1847); Crispino, La Scuola di San Filippo Neri (Naples, 1875) ; F. W. Faber, Spirit and Genius of St Philip Neri (London, 1850) ; F. A. Agnelli, Excellencies of the Oratory of St Philip Neri, trans. F. I. Antrobus (London, 1881); articles by F. Theiner and Hilgers in Wetzer und Welte's Kirchenlexicon, and by Reuchlin and Zockler in Herzog's Realencyklopadie. Neri's own writings include Ricordi, or Advice to Youth, Letters (Padua, 1751), and a few sonnets printed in the collection of the Rime Oneste. Other lives by P6sl (Regensburg 1847); P. Guerin (Lyons, 1852); Mrs Hope (London, 1859); Abp. Capecelatro (2 vols., 1879; 2nd ed., 1884; Eng. trans., 1882; 2nd ed. by T. A. Pope, 1894;.

NERO (37-68), Roman emperor 54-68, was born at Antium on the 1 5th of December 37. He was the son of Gnaeus Domitius Ahenobarbus and Agrippina the younger, and his name was originally L. Domitius Ahenobarbus. His father died when Nero was scarcely three years old. In the previous year (39) his mother had been banished by order of her brother Caligula (Gaius) on a charge of treasonable conspiracy, and Nero, thus early deprived of both parents, found shelter in the house of his aunt Domitia, where two slaves, a barber and a dancer, began his training. The emperor Claudius recalled Agrippina, who spent the next thirteen years in the determined struggle to win for Nero the throne which had been predicted for him. Her first decisive success was gained in 48 by the disgrace and execution of Messallina (q.v.), wife of Claudius. In 49 followed her own marriage with Claudius, and her recognition as his consort in the government. 1 The Roman populace already looked with favour on Nero, as the grandson of Germanicus, but in 50 his claims obtained formal recognition from Claudius himself, who adopted him under the title of Nero Claudius Caesar Drusus Germanicus.' Agrippina's next step was to provide a suitable training for her son. The scholar L. Annaeus Seneca was recalled from exile and appointed his tutor. On the 15th of December 51 Nero completed his fourteenth year, and Agrippina, in view of Claudius's failing health, determined to delay no ■ longer his adoption of the toga virilis. The occasion was celebrated in a manner which seemed to place Nero's prospects of succession beyond doubt. He was introduced to the senate by Claudius him- self. The proconsular imperium and the title of princeps juven- tutis were conferred upon him. 3 He was specially admitted as an extraordinary member of the great priestly colleges; his name was included by the

Arval Brethren in their prayers for the safety of the emperor and his house; at the games in the circus his appearance in triumphal dress contrasted significantly with the simple toga praetexta worn by Britannicus. During the next two years Agrippina followed this up with energy. Britannicus's leading partisans were banished or put to death, and the all- important command of the praetorian guard was transferred to Af ranius Burrus, a Gaul by birth, who had been the trusted agent first of Livia and then of Tiberius and Claudius. Nero himself was put prominently forward. The petitions addressed to the senate by the town of Bononia and by the communities of Rhodes and Ilium were gracefully supported by him in Latin and Greek speeches, and during Claudius's absence in 52 at the Latin festival it was Nero who, as praefect of the city, administered justice in the forum. Early in 53 his marriage with

1 Tac. Ann. xii. 26, 36; see also Schiller, Nero, 67.

2 Tac. Ann. xii. 26; Zonaras xi. 10. ' Tac. Ann. xii. 41.

Claudius's daughter Octavia drew still closer the ties which connected him with the imperial house. Agrippina determined to hasten the death of Claudius, and the absence, through illness, of the emperor's trusted freedman Narcissus, favoured her schemes. On the 13th of October 54 Claudius died, poisoned, as all our authorities declare, by her orders, and Nero was presented to the soldiers on guard as their new sovereign. From the steps of the palace he proceeded to the praetorian camp to receive the salutations of the troops, and thence to the senate-house, where he was promptly invested with all the honours, titles and powers of emperor. 1

Agrippina's bold stroke had been completely successful. Only a few voices were raised for Britannicus; nor is there any doubt that Rome was prepared to welcome the new emperor with genuine enthusiasm. His prestige and his good qualities, carefully fostered by Seneca, made him popular, while his childish vanity, ungovernable selfishness and savage temper were as yet unsuspected. His first acts confirmed this favourable impression. He modestly declined the title of pater patriae; the memory of Claudius, and that of his own father Domitius were duly honoured. The senate listened with delight to his promises to rule according to the maxims of Augustus, and to avoid the errors which had rendered unpopular the rule of his predecessor, while his

unfailing clemency, liberality and affa- bility were the talk of Rome. Much no doubt of the credit of all this is due to Seneca and Burrus. Seneca had seen from the first that the real danger with Nero lay in the savage vehemence of his passions, and he made it his chief aim to stave off by every means in his power the dreaded outbreak. The policy of indulging his tastes and helping him to enjoy the sweets of popularity without the actual burdens of government succeeded for the time. During the first five years of his reign, the golden quin- quennium Neronis, little occurred to damp the popular enthusiasm. Nero's promises of constitutional moderation were amply fulfilled, and the senate found itself free to discuss and even to decide important administrative questions. Abuses were remedied, the provincials protected from oppression, and the burdens of taxation lightened. On the frontiers, thanks chiefly to Corbulo's energy and skill, no disaster occurred serious enough to shake the general confidence, and even the murder of Britanni- cus seems to have been accepted as a necessary measure of self- defence. But Seneca's fear lest Nero's sleeping passions should once be roused were fully verified, and he seems to have seen all along where the danger lay, namely in Agrippina's imperious temper and insatiable love of power. The success of Seneca's own management of Nero largely depended on his being able gradually to emancipate the emperor from his mother's control. During the first few months of Nero's reign the chances of such an emancipation seemed remote, for he treated his mother with elaborate respect and consulted her on all affairs of state. In 55, however, Seneca found a powerful ally in Nero's passion for the beautiful freedwoman Acte, a passion which he deliberately encouraged. Agrippina's angry remonstrances served only to irritate Nero, and caresses equally failed. She then rashly tried intimidation and threatened to espouse the cause of Britannicus. Nero retaliated by poisoning Britannicus. Agrippina then tried to win over Nero's neglected wife Octavia, and to form a party of her own. Nero dismissed her guards, and placed her in a sort of honourable confinement (Tac. Ann. xiii. 12-20). During nearly three years she disappears from the history, and with her retirement things again for the time went smoothly. In 58, however, fresh cause for anxiety appeared, when Nero was enslaved by Poppaea Sabina, a woman of a very different stamp from her predecessor. High-born, wealthy and accomplished, she was resolved to be Nero's wife, and set herself to remove the obstacles which stood in her way. Her first object was the final ruin of Agrippina, and by rousing Nero's jealousy and fear she induced him to seek her death, with the aid of a freedman Anicetus, praefect of the fleet of Misenum. Agrippina was invited to Baiae, and after an affectionate reception, was conducted on board a vessel so

constructed as, at a given signal, 1 Tac. Ann. xii. 96; Suet. Nero, 8.

to fall to pieces. But Agrippina saved herself by swimming, and wrote to her son, announcing her escape, and affecting entire ignorance of the plot. A body of soldiers under Anicetus then surrounded her villa, and murdered her in her own chamber. Nero was horrorstruck at the enormity of the crime and terrified at its possible consequences. But a six months' residence in Campania, and the congratulations which poured in upon him from the neighbouring towns, where the report had been officially spread that Agrippina had fallen a victim to her treacherous designs upon the emperor, gradually restored his courage. In September 59 he re-entered Rome amid universal rejoicing. A prolonged carnival followed. Chariot races, musical and dramatic exhibitions, games in the Greek fashion rapidly succeeded each other. In all the emperor was a prominent figure, but these revels at least involved no bloodshed, and were civilized compared with the gladiatorial shows.

A far more serious result of the death of Agrippina was the growing influence over Nero of Poppaea and her friends. In 62 Burrus died, it was said by poison, and Seneca retired from the unequal contest. Their place was filled by Poppaea, and the infamous Tigellinus, whose sympathy with Nero's sensual tastes had gained him the command of the praetorian guards in succession to Burrus. The haunting fear of conspiracy was skil- fully used by them to direct Nero's suspicions against possible opponents. Cornelius Sulla, who had been banished to Massilia in 58, was put to death on the ground that his residence in Gaul was likely to arouse disaffection in that province, and a similar charge proved fatal to Rubellius Plautus, who had for two years been living in retirement in Asia. 2 Nero's taste for blood thus whetted, Octavia was divorced, banished to the island of Panda- „teria and barbarously murdered. Poppaea's triumph was now complete. She was formally married to Nero; her head appeared on the coins side by side with his; and her statues were erected in the public places of Rome.

In the course of the year 61 Rome was startled by the news of a disaster in Britain. At the time of the Claudian invasion of Britain in a.d. 43 Prasutagus, the king of the Iceni, had concluded a treaty with Claudius, by which no doubt he recognized the suzerainty of Rome and was himself enrolled among " the allies and friends of the Roman people." The alliance was of value to Claudius, for the territory of the Iceni (Norfolk, Suffolk, and Cambridgeshire) lay immediately north of the new province and its capital town Col- chester, and Prasutagus had loyally kept faith with Rome. But in A.D. 61 he died, leaving no male heir. His kingdom therefore lapsed to Rome, and Prasutagus,

anxious that the transfer should be effected in an orderly way, divided his accumulated wealth between his two daughters and the emperor. His plan failed, for the local Roman officials acted as though the kingdom had been conquered in war; they seized on the property of the late king and his chiefs and insulted his family. Fearing that worse might follow when the kingdom should be annexed, and encouraged by the absence of the legate and his legions, the Iceni, led by Prasutagus's daughter Boudicca (Boadicea) rose in revolt and were joined by the Trino- bantes in Essex, who had been long subject to Rome and had their own grievances to redress. Colchester, since a.d. 50 a Roman colony, was sacked. The ninth legion which had hurried from Lincoln was cut to pieces, and the insurgents prepared to march on London. The news of the outbreak found the legate Suetonius Paulinus en- gaged in attacking Anglesey. His resolution was at once taken. At the head of such light troops as he could collect, he marched in haste along the Watling Street, leaving orders for the legions to follow. Though the tribes along the road were rising, Suetonius succeeded in reaching London, only however to find himself too weak to hold it. He was obliged to fall back along the road by which he had come. London first, and then Verulam, were abandoned to the Britons. At last at some undefined point on the Watling Street his legions joined him. Thus reinforced he turned to face the enemy. The engagement was severe but the Roman victory was decisive,' and Roman authority was restored throughout central and southern Britain.

The profound impression produced in Rome by the " British disaster " was confirmed two years later in A.D. 63 by the partial destruction of Pompeii by an earthquake, and the news of the evacuation of Armenia by the Roman legions. A far deeper and more lasting impression was produced by the great fire in Rome. The fire broke out on the night of the 18th of July, 64, among the wooden booths at the' south-east end of the Circus Maximus. Thence in one direction it rapidly spread over the Palatine and 2 Tac. Ann. xiv. 59.

Velia up to the low cliffs of the Esquiline, and in another it laid waste the Aventine, the Forum Boarium and Velabrum till it reached the Tiber and the solid barrier of the Servian wall. After burning fiercely for six days it suddenly started afresh in the northern quarter of the city and desolated the regions of the Circus Flaminius and the Via Lata, and by the time that it was finally quenched only four of the

fourteen regiones remained un- touched; three had been utterly destroyed and seven reduced to ruins. The conflagration is said by all authorities later than Tacitus to have been deliberately caused by Nero himself. 1 But Tacitus, though he mentions the rumours, declares that its origin was uncertain, and in spite of such works as Profumo's Le fonti ed i tempi dello incendio Neroniano (1905), there is no proof of his guilt. 2 By Nero's orders, the open spaces in the Campus Martius were utilized to give shelter to the homeless crowds, provisions were brought from Ostia and the price of corn lowered. In rebuilding the city every precaution was taken against the recurrence of such a calamity. Broad regular streets replaced the narrow winding alleys. The new houses were limited in height, built partly of hard stone and protected by open spaces and colonnades. The water-supply, lastly, was carefully regulated.

There is, however, no doubt that this great disaster told against Nero in the popular mind. It was regarded as a direct mani- festation of the wrath of the gods, even by those who did not suspect the emperor. This impression no religious ceremonies, nor even the execution of a number of Christians, as convenient scapegoats, could altogether dispel. But Nero proceeded with the congenial work of repairing the damage. In addition to the rebuilding of the streets, he erected a splendid palace, the " golden house," for himself. The wonders of his Domus aurea were remembered and talked of long after its partial demolition by Vespasian. It stretched from the Palatine across the low ground, afterwards occupied by the Colosseum, to the Esquiline. Gold, precious stones and Greek masterpieces adorned its walls. Most marvellous of all were the grounds in which it stood, with their meadows and lakes, their shady woods and their distant views. To defray the enormous cost, Italy and the provinces, says Tacitus, were ransacked, and in Asia and Achaia especially the rapacity of the imperial commissioners recalled the days of Mummius and of Sulla. 3 It was the first occasion on which the provincials had suffered from Nero's rule, and the discontent it caused helped to weaken his hold over them at the very moment when the growing dissatisfaction in Rome was gathering to a head. Early in 65 Nero was panic-stricken by the discovery of a formidable conspiracy involving such men as Faenius Rufus, Tigellinus's colleague in the prefecture of the praetorian guards, Plautius Lateranus, one of the consuls elect, the poet Lucan, and, lastly, not a few of the tribunes and centurions of the praetorian guard itself. Their chosen leader, whom they destined to succeed Nero, was C. Calpurnius Piso (q.v.), a handsome, wealthy and popular noble, and a boon companion of Nero himself. The plan to murder Nero was frustrated by a freedman Milichus, who, in the hope

of a large reward, disclosed the whole plot. Piso, Faenius Rufus, Lucan and many of their less prominent accomplices, and even Seneca himself (though there seems to have been no evidence of his complicity) were executed.

But, though largesses and thanksgivings celebrated the suppression of the conspiracy, and the round of games and shows was renewed with even increased splendour, the effects of the shock were visible in the long list of victims who during the next few months were sacrificed to his restless fears and resentment. Conspicuous among them was Paetus Thrasea, whose unbending virtue had long made him distasteful to Nero, and who was now suspected, possibly with reason, of sympathy with the conspirators. The death of Poppaea in the autumn of 1 Tac. Ann. xv. 38; Suet. Nero, 38; Dio Cass. lxii. 16; Pliny, N.H. xvii. 5.

- This work is a reply to C. Pascal's V Incendio di Roma e i primi Cristiani (Milan, 1900), which throws the guilt on the Christians.

'Tac. Ann. xv. 42; Suet. Nero, 31; cf. Friedlander, Silten- geschichte, iii. 67-69.

65 \:as probably not lamented by any One but her husband, but the general gloom was deepened by a pestilence, caused, it seems, by the overcrowding at the time of the fire.

Early, however, in the summer of 66, the Parthian prince Tiridates visited Italy. This event was a conspicuous tribute to the ability both as soldier and statesman of Cn. Domitius Corbulo. As long ago as 54 the news reached Rome that the Parthian king Vologaeses had expelled the king recognized by Rome from Armenia and installed in his place his own brother Tiridates. Orders were at once issued to concentrate all available forces on the Cappadocian frontier under Corbulo, the first soldier of his day. After some time spent in making his army efficient, Corbulo invaded Armenia and swept victoriously through the country. Armenia was rescued and Corbulo proposed that Tiridates should become king of Armenia on condition of his receiving his crown as a gift from Nero. But the government in Rome had a plan of its own, and a certain Tigranes, long resident in Rome, but a stranger to the Armenians, was sent out, and Corbulo was obliged reluctantly to seat him on the Armenian throne. Tigranes's position, always insecure, soon became un- tenable, and it became necessary for Rome to intervene once more. A Roman force under Caesennius Paetus was sent to restore Tigranes and re-establish Roman predominance. Paetus, however, was no Corbulo. He was defeated,

and Corbulo, now legate of Syria, was obliged to come to his rescue. The result was the final triumph of Corbulo's policy. Tiridates agreed to accept the crown of Armenia from the hands of Nero. In royal state he travelled to Italy, and the ceremony of investiture was performed at Rome with the utmost splendour. Delighted with this tribute to his greatness, Nero for a moment dreamt of rivalling Alexander. Expeditions were talked of to the Caspian Sea and Ethiopia, but Nero was no soldier and quickly turned to a more congenial field. He had already, in 64, appeared on the stage before the half-Greek public of Naples. But his mind was now set on challenging the applause of the Greeks themselves in the ancient home of art. Towards the end of 66 he arrived in Greece with a retinue of soldiers, courtiers, musicians and dancers. The spectacle presented by Nero's visit was unique. 4 He went professedly as an enthusiastic worshipper of Greek art and a humble candidate for the suffrages of Greek judges. At each of the great festivals, which to please him were for once crowded into a single year, he entered in regular form for the various competitions, scrupulously conformed to the tradition and rules of the arena, and awaited in nervous suspense the verdict of the umpires. The dexterous Greeks humoured him to the top of his bent. Everywhere the imperial competitor was victorious, and crowded audiences importuned him to display his talents. The emperor protested that only the Greeks were fit to hear him, and rewarded them when he left by the bestowal of immunity from the land tax on the whole province, and by the gift of the Roman franchise; he also planned and actually commenced the cutting of a canal through the Isthmus of Corinth. If we may believe report, Nero found time in the intervals of his artistic triumphs for more vicious excesses. The stories of his mock marriage with Sporus, his execution of wealthy Greeks for the sake of their money, and his wholesale plundering of the temples were evidently part of the accepted tradition about him in the time of Suetonius, and are at least credible. Far more certainly true is his ungrateful treatment of Domitius Corbulo, who, when he landed at Cenchreae, fresh from his successes in Armenia, was met by an order for his instant execution and at once put an end to his life.

Meanwhile the general dissatisfaction was coming to a head, as we may infer from the urgency with which the imperial freedman Helius insisted upon Nero's return to Italy. Far more serious was the disaffection which now showed itself in the rich and warlike provinces of the west. In northern Gaul, early in 68, the standard of revolt was raised by Julius Vindex, governor of Gallia Lugdunensis, and himself the head of an ancient and noble Celtic family. South of the Pyrenees, P. Sulpicius Galba, governor of Hispania Tarraconensis, and Poppaea's

former 4 Suet. Nero, 19-24, ■ Dio Cass. Epit. lxiii. 8-16.

husband, Marcus Salvius Otho, governor of Lusitania, followed Vindex's example. At first, however, fortune seemed to favour Nero. It is very probable that Vindex had other aims in view than the deposition of Nero and the substitution of a fresh emperor in his place, and that the liberation of northern Gaul from Roman rule was part of his plan. 1 If this was so, it is easy to understand both the enthusiasm with which the chiefs of northern Gaul rallied to the standard of a leader belonging to their own race, and the opposition which Vindex encountered from the Roman colony of Lugdunum and the legions on the Rhine. For it is certain that the latter at any rate were not animated by loyalty to Nero. Though they defeated Vindex and his Celtic levies at Vesontio (Besancon), their next step was to break the statues of Nero and offer the imperial purple to their own commander Virginius Rufus. He declined their offer, but appealed to them to declare for the senate and people of Rome. Meanwhile in Spain Galba had been saluted imperator by his legions, had accepted the title, and was already on his march towards Italy. On the road the news met him that Vindex had been crushed by the army of the Rhine, and for the moment he resolved to abandon his attempt. Meanwhile, Nero had reluctantly left Greece, but returned to Italy only to renew his revels. When on the 19th of March the news reached him at Naples of the rising in Gaul, he allowed a week to elapse before he could tear himself away from his pleasures, and then contented himself with proscribing Vindex, and setting a price on his head. The revolts in Spain and Germany terrified him too late into something like energy. The senate almost openly intrigued against him, and the populace were silent or hostile. The fidelity of the praetorian sentinels even was more than doubtful. When finally the palace guards forsook their posts, Nero despairingly stole out of Rome to seek shelter in a freed-man's villa some four miles off. There he heard of the senate's proclamation of Galba as emperor, and of the sentence of death passed on himself. On the approach of the horsemen sent to drag him to execution, he collected sufficient courage to save himself by suicide. Nero died on the 9th of June 68, in the thirty-first year of his age and the fourteenth of his reign, and his remains were deposited by the faithful hands of Acte in the family tomb of the Domitii on the Pincian Hill. With his death ended the line of the Caesars, and Roman imperialism entered upon a new phase. His statues were broken, his name every- where erased, and his golden house demolished; yet, in

spite of all, no Roman emperor has left a deeper mark upon subsequent tradition. The Roman populace for a long time reverenced his memory as- that of an open-handed patron, and in Greece the recollections of his magnificence, and his enthusiasm for art, were still fresh when the traveller Pausanias visited the country a century later. The belief that he had not really died, but would return again to confound his foes, was long prevalent, not only in the remoter provinces, but even in Rome itself; and more than one pretender was able to collect a following by assuming the name of the last of the race of Augustus. More lasting still was the implacable hatred of those who had suffered from his cruelties. Roman literature, faithfully reflecting the sentiments of the aristocratic salons of the capital, while it almost canonized those who had been his victims, fully avenged their wrongs by painting Nero as a monster of wickedness. In Christian tradition he even appears as the mystic Antichrist, who was destined to come once again to trouble the saints. Even in the middle ages, Nero was still the very incarnation of splendid iniquity, while the belief lingered obstinately that he had only disappeared for a time, and as late as the nth century his restless spirit was supposed to haunt the slopes of the Pincian Hill.

The chief ancient authorities for Nero's life and reign are Tacitus (Annals, xiii.-xvi., ed. Furneaux), Suetonius, Dio Cassius (Epit. ixi., lxii., lxiii.), and Zonaras (Ann. id.). The most important modern work is that of B. VV. Henderson, The Life and Principate of the Emperor Nero (London, 1903; see an important notice in

'Suet. Nero, 40; Dio Cass. Epit. lxiii. 22; Plut. Galba, 4; cf. also Schiller's Nero, pp. 261 seq. ; Mommsen in Hermes, xiii. 90.

Class. Rev. vol. xviii. p. 57), which contains complete bibliography of ancient and modern writers; see also H. Schiller's Nero, and Geschichle d. Kaiserzeit; Lehmann, Claudius und Nero; histories of Rome in general. (H. F. P.)

NERVA, MARCUS COCCEIUS, Roman emperor from the 1 8th of September 96 to the 25th of January 98, was born at Narnia in Umbria on the 8th of November, probably in the year 35. He belonged to a senatorial family, which had attained considerable distinction under the emperors, his father and grandfather having been well-known jurists. A single inscription (C.I.L. vi. 31,297) gives the name of his mother as Sergia Plautilla, daughter of Laenas. In his early manhood he had been on friendly terms with Nero, by whom he was decorated in 65 (Tacitus, Annals, xv. 72) with the triumphal insignia after the suppression of the Pisonian conspiracy (further valuable

informa- tion as to his career is given in an inscription from Sassoferrato, (C.I.L. xi. 5743).

He was praetor (66) and twice consul, in 71 with the emperor Vespasian for colleague, and again in 90 with Domitian. Towards the close of the latter's reign (93) he is said to have excited sus- picion and to have been banished to Tarentum on a charge of conspiracy (Dio Cass, lxvii. 15; Philostr. Apoll. Tyan. vii. 8). On the murder of Domitian in September 96 Nerva was declared emperor by the people and the soldiers. He is described as a quiet, kindly, dignified man, honest of purpose, but unfitted by his advanced age and temperament, as well as by feeble health, to bear the weight of empire. Nevertheless, his selection, in spite of occasional exhibitions of weakness, justified the choice. His accession brought a welcome relief from the terrible strain of the last few years. The new emperor recalled those who had been exiled by Domitian; what remained of their confiscated property was restored to them, and a stop was put to the vex- atious prosecutions which Domitian had encouraged. But the popular feeling demanded more than this. The countless informers of all classes who had thriven under the previous regime now found themselves swept away, to borrow Pliny's metaphor (Pliny, Paneg. 35), by a hurricane of revengeful fury, which threatened to become as dangerous in its indiscriminate ravages as the system it attacked. It was finally checked by Nerva; who was stung into action by the sarcastic remark of the consul Titus Catius Caesius Fronto that, " bad as it was to have an emperor who allowed no one to do anything, it was worse to have one who allowed every one to- do everything " (Dio Cass, lxviii. 1).

Nerva seems to have followed the custom of announcing the general lines of his future policy. Domitian had been arbitrary and high-handed, and had heaped favours on the soldiery while humiliating the senate; Nerva showed himself anxious to respect the traditional privileges of the senate, and such maxims of constitutional government as still survived. He pledged himself to put no senator to death. His chosen councillors in all affairs of state were senators, and the hearing of claims against the fiscus was taken from the imperial procuratores and entrusted to the more impartial jurisdiction of a praetor and a court of judices (Dio Cass, lxviii. 2; Digest, i. 2, 2; Pliny, Paneg. 36).

No one probably expected from Nerva a vigorous admini- stration either at home or abroad, although during his reign a successful campaign was carried on in Pannonia against the Germans (Suebi), for which he assumed the name Germanicus. He appears, however, to have set himself honestly to carry out reforms. The economical

condition of Italy evidently excited his alarm and sympathy. The last mention of a lex agraria in Roman history is connected with his name, though how far the measure was strictly speaking a law is uncertain. Under the provisions of this lex, large tracts of land were bought up and allotted to poor citizens. The cost was defrayed partly from the imperial treasury, but partly also from Nerva's private resources, and the execution of the scheme was entrusted to commissioners {Dig. xlvii. 21, 3; Dio Cass, lxviii. 2; Pliny, Ep. vii. 31; Corp. Inscr. Lat. vi. 1548). He also founded or restored colonies at Verulae, Scyllacium and Sitifis in Mauretania. The agrarian

law was probably as short-lived in its effects as preceding ones had been, but a more lasting reform was the maintenance at the public cost of the children of poor parents in the towns of Italy (Aur. Vict. Ep. 24), the provision being presumably secured by a yearly charge on state and municipal lands. Private individuals were also encouraged to follow the imperial example. In the hands of Trajan, Hadrian and the Antonines, Nerva's example bore fruit in the institution of the alimentationes, the most genuinely charitable institution of the pagan world. These measures Norva supplemented by others which aimed at lighten- ing the financial burdens on the declining industry of Italy. The cost of maintaining the imperial postal system (vehicultitio) was transferred to the fiscus; from the same source apparently money was found for repairing the public roads and aqueducts; and lastly, the lucrative but unpopular tax of 5 % on all legacies or inheritances {vicesima hereditatum) , was so readjusted as to remove the grosser abuses connected with it (Pliny, Paneg. 37) . At the same time Nerva did his best to reduce the overgrown expendi- ture of the state (Pliny, Ep.ii. 1). A commission was appointed to consider the best modes of retrenchment, and the outlay on shows and games was cut down to the lowest possible point. Nerva seems nevertheless to have soon wearied of the uncongenial task of governing, and his anxiety to be rid of it was quickened by the discovery that not even his blameless life and mild rule protected him against intrigue and disaffection. Early, apparently, in 97 he detected a conspiracy against his life headed by L. (or C.) Calpurnius Crassus, but he contented himself with a hint to the conspirators that their designs were known, and with banishing Crassus to Tarentum. This ill-judged lenity provoked a few months later an intolerable insult to his dignity. The praetorian guards had keenly resented the murder of their patron Domitian, and now, at the instigation of one of their two prefects, Casperius Aelianus, whom

Nerva had retained in office, they imperiously demanded the execution of Domitian's murderers, the chamber- lain Parthenius and Petronius Secundus, Aelianus's colleague. Nerva vainly strove to save, even at the risk of his own life, the men who had raised him to power, but the soldiers brutally murdered the unfortunate men, and forced him to propose a vote of thanks for the deed (Dio Cass. Epit. lxviii. 4; Aur. Vict. Ep. 24). This humiliation convinced Nerva of the necessity of placing the government in stronger hands than his own. Following the precedent set by Augustus, Galba and Vespasian, he resolved to adopt as his colleague and destined successor, M. Ulpius Trajanus, a distinguished soldier, at the time in com- mand of the legions on the Rhine. In October 97, in the temple of Jupiter on the Capitol, Trajan was formally adopted as his son and declared his colleague in the government of the empire (Pliny, Paneg. 8) . For three months Nerva ruled jointly with Trajan (Aur. Vict. Ep. 24); but on the 25th (according to others, the 27th) of January 98 he died somewhat suddenly. He was buried in the sepulchre of Augustus, and divine honours were paid him by his successor. The verdict of history upon his reign is best expressed in his own words — " I have done nothing which should prevent me from laying down my power, and living in safety as a private man." The memory of Nerva is still pre- served by the ruined temple in the Via Alessandrina (il Colonacce) which marks the site oi the Forum begun by Domitian, but which Nerva completed and dedicated (Suet. Dom. 5; Aur. Vict. 12).

Authorities. — Dio Cass, lxviii. 1-4; Aurelius Victor 12, and Epit. 24; Zonaras xi. 20; compare also Pliny, Epistolae and Panegyricus ; Tillemont, Histoire des empereurs romains, ii. ; C. Merivale, History of the Romans under the Empire, ch. 63; H. Schiller, Geschichte der romischen Kaiserzeit, i. pt. 2 (1883), p. 538; J. Asbach, Romisches Kaiserthum und Verfassung bis auf Trajan (Cologne, 1896); A. Stein in Pauly-Wissowa's RealencyclopMie (s.v. Cocceius, 16); J. B. Bury, The Student's Roman Empire, ch. 23 (1893). (H. F. P.)

NERVAL, GERARD DE (1808-1855), the adopted name of Gerard Labrunie, French man of letters, born in Paris on the 22 nd of May 1808. His father was an army doctor, and the child was left with an uncle in the country, while Mme Labrunie accompanied her husband in his campaigns. She died in Silesia. In 181 1 his father returned, and beside Greek and Latin taught

the boy modern languages and the elements of Arabic and Persian. Gerard found his favourite reading in old books on mysticism and the occult sciences. He distinguished himself by his successes at the College Charlemagne, however, and his first work, La France

guerriere, eligies nationales, was published while he was still a student. In 1828 he published a translation of Goethe's Faust, the choruses of which were afterwards used by Berlioz for his legend-symphony, The Damnation of Faust. A number of poetical pieces and three comedies combined to acquire for him, at the age of twenty-one, a considerable literary reputation, and led to his being associated with Theophile Gautier in the preparation of the dramatic feuilleton for the Presse. He conceived a violent passion for the actress Jennie Colon, in whom he thought he recognized a certain Adrienne, who had fired his childish imagination. Her marriage and her death in 1842 were blows from which his nervous temperament never really recovered. He travelled in Germany with Alexandre Dumas, and alone in various parts of Europe, leading a very irregular and eccentric life. In 1843 he visited Constantinople and Syria, where, among other adventures, he nearly married the daughter of a Druse sheikh. He contributed accounts of his travels to the Revue des Deux Mondes and other periodicals. After his return to Paris in 1844 he resumed for a short time his feuilleton for the Presse, but his eccentricities increased and he committed suicide by hanging, on the 25th of January 1855. The literary style of Gerard is simple and unaffected, and he has a peculiar faculty of giving to his imaginative creations an air of naturalness and reality. In a series of novelettes, afterwards published under the name of Les Illumines, ou les precurseurs du socialisme (1852), containing studies on R6tif de la Bretonne, Cagliostro and others, he gave a sort of analysis of the feelings which followed his third attack of insanity. Among his other works the principal are Les Filles du feu (1854), which contains his masterpiece, the semi-autobiographical romance of Sylv)*., Scenes de la vie orientate (1848-1850); Contes et faceties (1852); La Bohtme galante (1856); and U Alchimiste, a drama in five acts, the joint composition of Gerard and Alexandre Dumas. His Poesies completes were published in 1877.

There are many accounts of Gerard de Nerval's unhappy life. Among them may be mentioned notices by his friend Theophile Gautier and by Arsfene Houssaye, prefixed to the posthumous Le Reve et la vie (1855); Maurice Tourneux's sketch in his Age du romantisme (1887) ; and a sympathetic study of temperament in the Nevroses (1898) of Mme ArvMe Barine. See also G. Ferri&res, Gerard de Nerval (1906).

NERVE (Lat. nervus, Gr. vefipov, a bowstring), originally a sinew or tendon (and still so used in the phrase " to strain every nerve "), but now a term practically confined to the fibres of the nervous system in anatomy, though consequentially employed as a general psychical term in the sense of courage or firmness, and sometimes (but more usually "nervousness") in the opposite sense. In the present article the

anatomy of the nerves is dealt with; see also Nervous System, Muscle and Nerve, Neuropathology, &c.

I. Cranial

The cranial nerves are those which rise directly from the brain, and for the most part are concerned with the supply of the head. With one exception they all contain medullated fibres (see Nervous System). Twelve pairs of these nerves are recognized, and they are spoken of as often by their numbers as by their names. The following is a list : —

(1) Olfactory; (2) Optic; (3) Oculo-motor or Motor oculi; (4) Trochlearis or Patheticus; (5) Trigeminal or Trifacial; (6) Abducens; (7) Facial; (8) Auditory; (9) Glossopharyngeal; (10) Vagus or Pneumogastric; (n) Spinal accessory; (12) Hypoglossal.

The first, or olfactory nerve, consists of the olfactory bulb and tract, which are a modified lobe of the brain and lie beneath the sulcus rectus on the frontal lobe of the brain (see fig. 1). At its posterior end the tract divides to become continuous with the two extremities of the limbic lobe (see Brain), while at its anterior end is the bulb from which some twenty small non-medullated nerves pass through the cribriform plate of the ethmoid to supply the sensory organs in the olfactory mucous membrane (see Olfactory Organ).

The second or optic nerve consists of the optic tract, the optic commissure or chiasma, and the optic nerve proper. The optic tract begins at the lower visual centres or internal and external geniculate bodies, the superior quadrigeminal body and the pulvinar (see fig. i), but these again are connected with the higher visual centre in the occipital lobe by the optic radiations (see fig. 2). In the chiasma some of the fibres cross and some do not, so that the right optic tract forms the right half of both the right and left optic nerves. In addition to this the fibres coming from the internal geniculate body of one side cross in the chiasma to the same body of the op- posite side, forming Gudden' s commissure. The optic nerve passes through the optic foramen in the skull into the orbit, where it is penetrated by the central artery of the retina, and eventually pierces the scelerotic just internal to the posterior pole of the eyeball. Its final distribution is treated in the article Eye.

The third or oculomotor nerve rises from a nucleus in the floor of the

aqueduct of Sylvius (see Brain, fig. 8), and comes to the surface

Olfactory bulu

Olfactory tract

Olfactory tubercle

Optic nerve — J t Optic chiasma

Oculo-motor nerve

Trochlear nerve

Trigeminal nerve. Abducent nervi Facial nerve- Pars intermedia' Auditory nervi

Glosso-pharyngeal

Vagus nerve Spinal accessory nerve (accessory)

Spinal accessory nerve (spinal)

Hypoglossal nerve

Hypoglossal nerve Spinal cord Vermis of Cerebellum (cut)

From D. J. Cunningham, in Cunningham's Text-book of Anatomy.

Fig. i. — View of the Under Surface of the Brain, with the lower portion of the temporal and occipital lobes, and the cerebellum on the left side removed, to show the origins of the cranial nerves.

in a groove on the inner side of the crus cerebri (fig. i); it soon pierces the dura mater, and lies in the outer wall of the cavernous sinus, where it divides into an upper and lower branch. Both these enter the orbit through the sphenoidal fissure, the upper branch supplying the superior rectus and levator palpebrae superioris muscles, the lower the inferior and internal rectus and the inferior oblique, so that it supplies five of the seven orbital muscles.

The fourth or trochlear nerve is very small, and comes from a nucleus a little lower than that of the third nerve. It is specially remarkable in that it crosses to the opposite side in the substance of the valve of Vieussens of the fourth ventricle, after which it winds round the outer side of the crus cerebri (fig. i) and enters the outer wall of the cavernous sinus to reach the orbit through the sphenoidal fissure.

Here it enters the superior oblique muscle on its orbital surface.

The fifth or trigeminal nerve consists of motor and sensory roots. The motor root rises trom a nucleus in the upper lateral part of the floor of the fourth ventricle, as well as by a descending (mesence- phalic) tract from the neighbourhood of the Sylvian aqueduct (see fig. 3). The large sensory root goes to a sensory nucleus a little external to the motor one, and also, by a spinal or descending root, to the substantia gelatinosa Rolandi as low as the second spinal nerve (see fig. 3). The superficial origin of the fifth nerve is from the side of the pons (see fig. 1), and the two roots at once

pass into a small compartment of the dura mater, in front of the apex of the petrous bone, known as Meckel's cave; here the large crescentic Casserian ganglion is formed upon the sensory root, and from this the three branches come off, earning the nerve its name of trigeminal. The first of these divisions is the ophthalmic, the second the maxillary, and the third the mandibular, while the motor root only joins the last of these. The first or ophthalmic division of the fifth runs in the outer wall of the cavernous sinus, where it divides into frontal, lachrymal and nasal branches. They all enter the orbit through the sphenoidal fissure. The frontal nerve divides into supraorbital and supratrochlear, which pass out of the upper part of the anterior opening of the orbit and supply the skin of the forehead and upper part of the scalp as well as the inner part of the eyelids. The lachrymal nerve supplies that gland and the outer part of the upper eyelid. The nasal nerve gives off a branch to the ciliary or lenticular ganglion, which lies in the outer part of the orbit, and through which, as well as through its own long ciliary

branches, it supplies the eyeball with sensation. It leaves the orbit through the anterior eth- moidal canal, and lies for a short distance on the cribriform plate of the ethmoid ; it then enters the nasal cavity through the nasal slit and supplies this cavity, as well as the surface of the nose as far as the tip, with ordinary sensation. The second or maxil- lary division of the fifth nerve leaves the skull through the foramen rctundum, and then runs across the roof of the spheno-maxillary fossa; here the spheno-maxillary or Meckel's ganglion hangs from it by two roots. The nerve then runs in the floor of the orbit, giving off superior dental branches, until it emerges on to the face at the infraorbital foramen, where it divides into palpebral, nasal and labial branches, the names of which indicate their distribution. The third or mandibular division of the fifth leaves the skull through the foramen ovale, and at once gives off a set of motor branches for the muscles cf mas- tication; these are derived from the motor root of the

fifth, except that for the buccinator, which really supplies only the skin and mucous membrane in contact with the muscle. After the motor branch is given off, the third division of the fifth divides into* lingual, inferior dental and auriculotemporal. The lingual is joined by the chorda tympani branch of the facial nerve, and then passes to the anterior two- thirds of the tongue. In its course it passes deep to the submaxillary gland, and here the small sub- maxillary ganglion is connected with it by two roots. The i#- ferior dental nerve gives off a small motor branch to the mylohyoid and posterior belly of the digastric muscles, and then enters a canal in the lower jaw, where it gives off twigs to all the lower teeth. A mental branch comes out through the mental foramen to supply the skin of the chin. The auriculo temporal nerve rises by two roots, which embrace the middle men- ingeal artery, and runs backward and then upward close to the lower jaw joint to supply the parotid gland, the skin on the outer side of the ear, and the side of the scalp. At its beginning it com- municates with the otic ganglion, which lies just internal to it below the foramen ovale, and also receives a communication from the nerve to the internal pterygoid muscle.

The sixth or abducent nerve rises from a nucleus in the floor of the fourth ventricle deep to the eminentia teres (see fig. 3). It appears on the surface of the brain just below the pons and close to the middle line (see fig. 1), soon after which it pierces the dura mater and runs in the floor of the cavernous sinus to the sphenoidal fissure. Entering the orbit through this, it quickly supplies the external rectus muscle.

The seventh or facial nerve begins in a nucleus which is about the same level as that for the sixth, but much deeper from the floor of the fourth ventricle as well as farther from the middle line (see fig. 3). The fibres of. the facial loop round the nucleus of the sixth, and then emerge in the triangular interval between the medulla, pons

Olfactory bulb

Olfactory tract Broca’s area Olfactory tubercle Mesial root of olfactory nerve

Lateral root Optic chiasma Ant. perforated spot Temporal lobe (cut) Optic tract •Oculo-motor nerve

.Trochlear nerve

Taenia semicircularis

Trigeminal nerve

Ext. geniculate body

.Abducent nerve

Int. geniculate body

Pulvinar

Facial nerve

Pars intermedia

Auditory nerve

Lateral ventricle

Mid. cerebellar peduncle

Giosso-pharyngeal nerve

Vagus nerve

Spinal accessory nerve

(accessory)

Spinal accessory nerve

(spinal)

Occipital lobe (cut)

and cerebellum, close to the eighth nerve, and having the pars

intermedia between (see fig. i),, Entering the internal auditory meatus with these structures the facial nerve soon passes into a canal in the petrous bone known as the agueductus Fallopii, and in

this it makes a sudden bend and forms the geniculate ganglion, from which the great superficial petrosal branch to Meckel's ganglion is given off. The canal ends at the stylo-mastoid fora- men on the base of the skull, and here the nerve enters the par- otid gland, in which it

forms a plexus called the pes anserinus. From this, branches pass to all the muscles of the face except those of mastication. In the aqueduct the pars intermedia joins the seventh, and, be- yond the geniculate ganglion, leaves it as the chorda tympani, which runs through the tympanum (see Ear) to join the lin- gual branch of the fifth. It is prob- able that the pars intermedia, geni- culate ganglion and chorda tym- pani, represent the sensory root of the facial nerve. Just out- side the stylo-

u t, T n . . . „ . . , _ mastoid foramen

4ˆJ y J Unmngham ‘ mCunnlnghamsr ”’- i5 ” *’ ,/ the facial gives

c-. rv c ,_ r* , r* onC tne posleiior

HG. 2.— Diagram of the Central Connexions auricular branch of the Optic Nerve and Optic Tract. to the occipitalis . and posterior

auricular muscles, as well as a branch of supply to the stylo- hyoid and posterior belly of the digastric muscles.

The eighth or auditory nerve is in two bundles, cochlear and vestibular. The former comes from the cochlear nuclei which lie deep to the acoustic tubercle in the floor of the fourth ventricle (see fig. 3), while the latter rises from the dorsal nucleus, nucleus of Deiters and the nucleus of the descending root, which are more deeply placed. The nucleus of Deiters is connected with the cerebellum, and is concerned in maintaining the equilibrium (q.v.) of the body, while, as is pointed out in the article Brain, the cochlear nuclei are connected with the inferior quadri- geminal body by the lateral fillet as well as with the internal geniculate body, while this body again is connected with the higher auditory centre in the grey cortex of the temporo- spnenoidal lobe by the auditory radiations. The vestibular root passes in front of the restiform body (see fig. 3), and the SSI?’ cochlear behind that body. Together they enter the internal auditory meatus, and, at the end of it, pierce the lamina cnbrosa, the vestibular nerve supplying the utricle and superior v . ri „ and external semicircular canals, the cochlear nerve the posterior canal, the saccule and the cochlea (see Ear).

The ninth or glossopharyngeal nerve is chiefly, if not entirely, sensory, and its deep termination in the brain is the solitary bundle (see fig 3 ; and Brain, fig. 4). It appears on the surface vagus between the olive and restiform body (see fig. 1), and leaves the skull through the posterior lacerated foramen; as it does so two ganglia, the jugular and

petrous, are formed on it, after which it runs downward and forward, between the internal and ex- ternal carotid arteries, and eventually reaches the back of the tongue (see Tongue). On its way it supplies the tympanum, the stylopharyngeus muscle, though there is grave doubt as to whether these fibres are not really derived from the facial nerve, contributions to the pharyngeal plexus, the tonsil and part of the epiglottis.

■ The tenth nerve or vagus has sensory and motor fibres; the former go to the solitary bundle mentioned in the description of the last nerve (see fig. 3), while the latter come from the dorsal nucleus and nucleus ambiguus, both of which are found deep to the lower half ot the fourth ventricle. The nerve appears on the surface between the olive and restiform body and just below the ninth (see fig. 1). It leaves the skull through the posterior lacerated foramen, and, like the glossopharyngeal, has two ganglia developed on it; the

upper of these is the ganglion of the root, and the lower the ganglion of the trunk (see fig. 4). From the former the auricular branch or Arnold s nerve (see Ear) comes off, while from the latter are given off the pharyngeal branches to the pharyngeal plexus (fig. 4, Ph.) and the superior laryngeal branch which is the sensory nerve of the larynx (fig. 4, S.L.). Between the two ganglia the accessory part of the eleventh nerve joins the tenth, and it is from this communication that the motor twigs to the pharynx, larynx, alimentary and re- spiratory tracts are derived, as well as the inhibitory fibres of the heart. In the neck the vagus accompanies the carotid artery and internal jugular vein, and here it gives off superior and inferior cardiac branches. The left inferior cardiac branch passes to the superficial, while the three others go to the deep cardiac plexus. The nerve now enters the thorax, passing between the subclavian artery and vein. On the right side its recurrent laryngeal branch loops under the subclavian artery (fig. 4, R.), and runs up to supply all the muscles of the larynx except one (see Respiratory System). In the thorax the left vagus passes in front of the arch of the aorta, unaer which the left recurrent laryngeal lcops, and on both sides a thoracic cardiac branch is given to the deep cardiac plexus. Both vagi pass behind the root of their own lung, and break up to form the posterior pulmonary plexus after giving off some branches for the much smaller anterior pulmonary plexus; they then reach the oesophagus, where they again break up into an oesophageal plexus or plexus gulae. As the diaphragm is approached the two nerves become distinct again, but the left one now lies in front and the right behind the food tube, so that, when the stomach is reached, the left vagus supplies the front of the organ and communicates with the hepatic plexus, while the right goes to the back and communicates with the

coeliac, splenic and renal plexuses.

_ The eleventh or spinal accessory nerve is entirely motor, and consists of a spinal and an accessory part. The former rises from the

From D. J. Cunningham, in Cunningham's Text-Book of Anatomy. Fig. 3— Deep Origins of Cranial Nerves from the Fourth Ventricle, anterior horn of the grey matter of the spinal cord as low as the fifth cervical nerve. Its fibres come to the surface mid-way between the anterior and posterior nerve-roots, and run up through the foramen magnum to join the accessory part, the deep origin of which is the lower part of the nucleus ambiguus. The accessory part, as has been noticed, joins the vagus, while the spinal part pierces the sterno-mastoid muscle and runs obliquely downward

From A. M. Patcrson, in Cunningham's Text-Book of Anatomy.

Fig. 4. — The Distribution of the Pneumogastric Nerve.

Va.R, Right vagi.

Va.L, Lett vagi.

r, Ganglion of the root and

connexions with

Sy, Sympathetic, superior cer- vical ganglion.

G.Ph, Glosso-pharyngeal.

Ace, Spinal accessory nerve.

m, Meningeal branch.

Aur, Auricular branch.

/, Ganglion of the trunk

and connexions with

By, Hypoglossal nerve.

C\ , C2 Loop • between the first two cervical nerves.

Sy, Sympathetic.

Ace, Spinal accessory nerve.

Ph, Pharyngeal branch.

Ph.Pl, Pharyngeal plexus.

S.L, Superior laryngeal nerve.

I.L, Internal laryngeal branch.

E.L, External laryngeal branch.

I.C, E.C, Cai,

C02, R.L,

Ca\,

Internal, and External carotid arteries. Superior cervical cardiac branch. [branch.

Inferior cervical cardiac Recurrent laryngeal nerve. Cardiac branches from recurrent laryngeal nerves. Thoracic cardiac branch (right vagus). A. P. PI, Anterior, and P.P. PI, Posterior pulmonary

plexuses. Oes.Pl, Oesophageal plexus. Gasi.R, and Gasl.L, Gastric branches of vagus (right and left). Coe.Pl, Coeliac plexus. Hep.Pl, Hepatic plexus. Spl.Pl, Splenic plexus. Ren.Pl, Renal plexus.

and backward across the posterior triangle of the neck to enter the trapezius; both these muscles are in part supplied by the nerve.

The twelfth or hypoglossal nerve is motor, and rises from a nucleus in the floor of the fourth ventricle deep to the trigonum hypoglossi (see Brain, fig. 3). It emerges from the brain between the anterior pyramid and the olive (see fig. 1), and leaves the skull in two bundles through the anterior condylar foramen. Soon after this it is closely bound to the vagus, and, in front of the atlas, receives an important contribution from the loop between the first and second cervical nerves. The nerve then passes downward until it reaches the origin of the occipital artery, round which it loops, and then runs forward on the surface of the hyo-glossus to the muscles of the tongue. As it bends round the occipital artery it gives off its de- scendens hypoglossi

branch, which derives its fibres from the com- munication with the first cervical already mentioned. This branch runs down and forms a loop with the communicans ceroids branch from the second and third cervical nerves, and from this loop (ansa hypoglossi) many of the depressor muscles of the hyoid bone and larynx are supplied. Farther forward special branches are given off to the thyro-hyoid and genio-hyoid muscles, and these, like the descendens hypoglossi, are derived from the first and second cervical loop, thus leaving all the true muscles of the tongue to be supplied by the medullary part of the nerve.

For the embryology and comparative anatomy of the cranial nerves, see Nervous System.

II. Spinal

The spinal nerves are those which arise from each side of the spinal cord and are distributed to the trunk and limbs, though some of the upper ones supply the lower parts of the head and face. As is shown in the article Nervous System, the division between cranial and spinal nerves is rather one of convenience than of any real scientific difference. There are generally thirty-one pairs of these nerves, which are subdivided according to the part of the vertebral column through which they pass out; thus there are eight cervical (abbreviated C), twelve thoracic (Th.) — formerly called dorsal, — five lumbar (L.), five sacral (S.) and one coccygeal (Coc). As the thoracic nerves are the simplest and most generalized in their arrangement, a typical one of these, say the fourth or fifth, will be first described.

The nerve is attached to the spinal cord by two roots, of which the ventral is purely efferent or motor and the dorsal purely afferent or sensory. On the dorsal root is a fusiform ganglion which lies in the foramen be- tween the verte- brae through which the nerve passes. The two roots then join to- gether to form a mixed nerve (see fig. 5), but very soon divide once more into anterior (ventral) and pos- terior (dorsal) primary divisions. These, however, each contain sen- sory and motor fibres. Just before it divides in this way the mixed nerve gives and receives its rami communicantes with the sympa- thetic (see Ner- vous System).

The anterior primary division runs round the trunk, between the ribs, forming an intercostal nerve and giving off a lateral cutaneous branch, when the side of the body is reached, which divides into anterior and posterior secondary branches. The rest of the division runs forward, supplying the intercostal muscles, as far as the edge of the sternum,

when it ends in an anterior cutaneous branch to the front of the chest. The dorsal primary division divides into an external (lateral) and internal

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From A. M. Paterson, in Cunningham's Text-Book of Anatomy. Fig. 5. — Scheme of the Distribution of a Typical Spinal Nerve.

(mesial) branch through which the skin and muscles of the back are supplied.

It will be seen from the foregoing that the thoracic nerves are almost completely segmental in their distribution, in other words,

From A. M. Paterson, in Cunningham's Text-Book of Anatomy.

Fig. 6. — The Distribution of Cutaneous Nerves on the front of the Trunk. On one side the distribution of the several nerves is represented, the letters indicating their nomenclature.

G.A., Great auricular nerve. S.C, Superficial cervical nerve. S.Cl, Supraclavicular nerves. Acr, Acromial. CI, Clavicular. St, Sternal.

T. 2-12, Lateral and anterior branchesof thoracic nerves. I.H, Ilio-hypogastric nerve. /./, IHo-inguinal nerve. Circ, Cutaneous branch of cir- cumflex nerve, [nerve. L.I.C, Lesser internal cutaneous

I.H, Intercostohumeral.

I.C, Internal cutaneous.

M.S, Cutaneous branch of mus- culo-spiral nerve.

E.C, External cutaneous nerve.

G.C, Genito-crural nerve.

M.C 1 – 2 -, Middle cutaneous nerve.

.I.C 1 , Branch of internal cutane- ous nerve.

P, Branches of pudic nerve.

S.Sc, Branches of small sciatic nerve.

each supplies a slice of the body, but in the other regions this segmental character is masked by the development of the branchial skeleton and the limbs. In the cervical region the first cervical or suboccipital nerve comes out between the occiput and atlas and does not always have a posterior root. When it has not, it obviously can

supply no skin. Its anterior primary division joins those of the second, third and fourth cervical nerves to form the cervical plexus, from which the skin of the side of the neck and lower part of the head and face are supplied by means of the small occipital, great auricular, superficial cervical, suprasternal, supraclavicular and supra- acromial nerves (see fig. 7), as well as those muscles of the neck which are not supplied by the cranial nerves. The phrenic nerve, which comes chiefly from the fourth cervical, deserves special notice because it runs down, through the thorax, to supply the greater part of the diaphragm. The explanation of this long course (see Dia- phragm) is that the diaphragm is formed in the neck region of the embryo. The posterior primary division of the second cervical nerve is very large, and its inner (mesial) branch is called the great occipital and supplies most of the back of the scalp (fig. 7). The fifth, sixth, seventh and eighth anterior primary divisions of the cervical nerves as well as a large part of that of the first thoracic are prolonged into the arm, and in the lower part of the neck and armpit communicate with one another to form the brachial plexus. As a general law underlies the composition of the limb plexuses it will be worth while to study the structure and distribution of this one with some little care. It will be seen from the accompanying diagram (fig. 8) that each component nerve with the exception of the “first thoracic divides into an anterior (ventral) and a posterior (dorsal) division which are best spoken of as secondary divisions in order to prevent any confusion with the anterior and posterior primary divisions which all the spinal nerves undergo. In the diagram the anterior secondary divisions are white, while the posterior are shaded. It has been suggested by A. M. Paterson that the posterior secondary branches correspond with the lateral branches of the thoracic nerves already mentioned, but there are still certain difficulties to be explained before altogether accepting this. Later on in the plexus three cords are formed of which the posterior is altogether made up of the posterior secondary divisions, while the anterior secondary divisions of the fifth, sixth and seventh cervical nerves form the

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From Gray's Anatomy, Descriptive and Surgical.

Fig. 9. — Plan of the Lumbar and Sacral Plexuses.

external cord, and those of the eighth cervical and first thoracic the inner. As a general rule the nerves which rise from the ventral secondary divisions of the limb plexuses run only to that surface of the limb which was ventral in the embryo, while the dorsal secondary divisions are confined to the original dorsal area, but, in order to apply this to the human adult, it must be realized that the limbs

are at one time flattened buds coming off at right angles from the side of the body and having dorsal and ventral surfaces, one (pre- axial) border toward the head of the embryo, and one (postaxial) toward the tail. If a person lies prone upon the floor with the arms outstretched and the palms downward the embryological position of the forelimb is to some extent restored, and it will now be easily understood that the more preaxial part of the limb will be supplied by those nerves which enter it from nearer the head, while the postaxial part draws its nerve supply from lower down the spinal cord. To use Herringham's words : " (A) Of two spots on the skin, that nearer the preaxial border tends to be supplied by the higher nerve. (B) Of two spots in the preaxial area the lower tends to be supplied by the lower nerve, and of two spots in the postaxial area the lower tends to be supplied by the higher nerve." Other points of general importance in regard to cutaneous nerve supply are, firstly, that the area of skin supplied by one spinal nerve is not sharply marked off from that of the next, but the two are separated

Mylo-hyoid

From A

Great occ-pital, nerve

Small occipital nerve

Great auricular nerve

Nerves to levator anguli scapulae

Superficial cervical nerve

Spinal accessory

Nerve to trapezius

Acromial”] branches f Clavicular [JZm.

Posterior scapular nerve

Posterior thoracic nerve

outer head of the median nerve (C. 5?, 6, 7), which joins the inner head (C. 8, Th. 1) and supplies most of the flexor muscles of the front of the forearm as well as those of the ball of the thumb, the outer two lumbricals and also the skin of the outer part of the palm including the outer three digits and half the fourth.

From the inner cord come the inner head of the median just mentioned, the ulnar nerve (C. 8, Th. 1), which passes down behind the internal condyle of the humerus, where it is popularly known as the ” funny bone ” and supplies the flexor carpi iilnaris, half the flexor profundus digitorum, and most of the muscles of the hand as well as the inner digit and a half on the palmar and dorsal aspects. Other branches of the inner cord are the internal cutaneous (C. 8, Th. 1) supplying the inner side of the forearm, the lesser internal cutaneous (Th. 1) which often joins the intercosto-humeral or lateral cutaneous branch of the second intercostal nerve to supply the skin on the inner side of the upper arm, and the internal anterior thoracic nerve (C. 8, Th. 1) to the pectoralis minor and major.

From the posterior cord are derived the three subscapular nerves (C. 5, 6, 7, 8) which supply the subscapularis, teres major and latissimus dorsi muscles, the circumflex nerve (C. 5, 6) supplying the deltoid and teres minor muscles, and the skin over the lower part of the deltoid, and the musculo-spiral nerve (C. 5, 6, 7, 8) which is the largest branch of the brachial plexus and gives off cutaneous twigs to the outer side and back of the arm and to the back of the forearm, as well as muscular twigs to the triceps and adjacent muscles’. At the elbow this nerve divides into the radial and posterior interosseous. The radial is entirely sen- sory and supplies the skin of the outer side of the back of the hand, including three digits and a half, while the posterior inter- osseous is wholly muscular, supplying the muscles on the back of the forearm. It will be seen that the posterior cord is derived altogether from posterior second- ary divisions of the plexus, but there are three other nerves derived from these which should be mentioned.

The posterior thoracic or respiratory

nerve of Bell comes off the back of the

fifth, sixth and seventh cervical nerves

Internal laryn- before the anterior and posterior secondary

Hypoglossal nerve

geal nerve Nerve to thyro-hyoid

Descendens hypoglossi

. Paterson, in Cunningham's Text-book 0/ Anatomy.

Fig. 7. — The Triangles of the Neck (Nerves).

by an overlapping region; and, secondly, that the area supplied by any one spinal nerve is liable to variation in different individuals within moderate limits. This variation may affect the whole plexus, and the term " prefixed plexus " has been devised by C.S. Sherring- ton to indicate one in which the spinal nerves entering into its formation are rather higher than usual, while, when the opposite is the case, the plexus is spoken of as " postfixed."

With regard to the muscular supply of a limb the general rule is that each muscle is supplied by fibres derived from more than one spinal nerve; this, of course, is made possible by the redistribution of fibres in the plexuses. Moreover, the muscular supply does not necessarily correspond to that of the overlying skin, because (see Muscular System) some of the primitive muscles have been sup- pressed, others have fused together, while others have shifted their position to a considerable distance. Bearing the foregoing facts in mind, the main distribution of the nerves of the brachial plexus may be surveyed, though the exact details must be sought in the human anatomy text-books. The outer cord of the plexus gives off the external anterior thoracic nerve (C. 5, 6, 7) to the pectoralis major, the musculocutaneous nerve (C. 5, 6) to the muscles on the front of the arm, and to the skin of the outer side of the forearm and the

divisions separate.and runs down to supply the serratus magnus muscle.

The posterior scapular or nerve to the rhomboid muscles runs to those muscles from the fifth cervical.

The suprascapular nerve (C, 5, 6) passes through the suprascapular

notch to supply the supraspinatus and infraspinatus muscles.

The spinal nerves which are distributed to the lower limbs first intercommunicate in the lumbar and sacral plexuses, which, with the perineal nerves, are sometimes spoken of together as the lumbo sacral plexus. The lumbar plexus (see fig. 9) is formed as a rule of the first four lumbar nerves, though the greater part of the first number is segmental in its distribution and resembles one of the thoracic nerves. It early divides into an ilio-hypo gastric and ilio-inguinal branch, which run round the abdominal wall in the sub- stance of the muscles, and of which the former gives off an iliac branch, which is in series with the lateral cutaneous branches of the intercostal nerves and passes over the crest of the ilium to the gluteal region, while the hypogastric branch runs round to the skin of the pubic region. The ilio-inguinal, on the other hand, gives off no lateral cutaneous or iliac branch, but is prolonged down the inguinal canal to supply the skin ot the scrotum as well as that of the thigh which touches it. In all probability the hypogastric branch of the ilio-hypogastric and the whole of the ilio-inguinal represent the anterior secondary division of the first lumbar nerve, while the posterior secondary division is the iliac branch of the ilio- hypogastric.

The other anterior secondary divisions of the lumbar plexus is the obturator (see fig. 8). The obturator nerve (L. 2, 3, 4) supplies the adductor group of muscles on the inner side of the thigh as well as the hip and knee joints; it occasionally has a cutaneous branch on the inner side of the thigh. The posterior secondary branches of the plexus are the genito-crural, the external cutaneous and the anterior crural. The genito-crural nerve (L. 1,2) is partly anterior (ventral) and partly posterior (dorsal). It sends one anterior branch through the inguinal canal to supply the cremaster

muscle, and another (posterior) to the skin of the thigh just below the groin.

The external cutaneous nerve (L.2, 3) supplies the skin of the outer side of the thigh, while the anterior crural (L.2, 3, 4) innervates the muscles on the front of the thigh, the skin on the front and inner

From A. M. Pateraon, in Cunningham's Text-Book of Anatomy,

Fig. 8. — The Nerves of the Brachial Plexus.

Sy. Sympathetic gangliated cord. Cb, Nerve to coraco-brachialis.

Phr, Phrenic nerve. M, Median nerve.

C-4, 5, 6, 7, 8, T.i, 2, 3, Anterior primary divi- Inner Cord.

sions of the lower cervical and upper IAT< T nternal ante rior thoracic nerve.

U, Ulnar nerve.

thoracic nerves. to 1 , m l . Muscular branches to axial muscles. P.T, Long thoracic nerve. Rh, Nerve to rhomboids (posterior scapular). Subcl, Nerve to subclavius muscle. Int. Intercostal nerves.

I.C, Internal cutaneous nerve.

L.I.C, Lesser internal cutaneous nerve.

Posterior Cord. Circ, Circumflex nerve.

S.Sc, Supra-scapular nerve. The intercostal Af.5,ˆ Musculo-spiral nerve part of the first thoracic nerve is omitted.

Outer Cord. E.A . T, External anterior thoracic nerve.

M.C, Muscular-cutaneous nerve.

side of the thigh, through its middle and internal cutaneous branches, and the skin of the inner side of the leg and foot through the internal saphenous branch. At first sight it is difficult to understand how the anterior crural nerve, which supplies the skin of the front of the thigh, is a posterior secondary division of the lumbar plexus, but the explanation is that the front of the human thigh was originally the dorsal surface of the limb bud, and the distribution of the nerve is quite easily understood if the position of the hind limb of a lizard or crocodile is glanced at. The fourth lumbar nerve is sometimes called the nervus furcalis, because, dividing, it partly goes to the lumbar, and partly to the sacral plexus (fig. 8), though, when the plexus is prefixed, the third lumbar may be the nervus furcalis, or, when it is postfixed, the fifth lumbar. Under ordinary conditions the descending branch of the fourth lumbar nerve joins the fifth, and together they make the lumbosacral cord, which, with the first three sacral nerves, forms the sacral plexus. This plexus, like the others, contains anterior and posterior secondary divisions of its spinal nerves, and it resembles the brachial plexus in that the lowest nerve to enter it contributes no

dorsal secondary division.

All the constituent nerves of the plexus run into one huge nerve, the great sciatic, which runs down the back of the thigh and, before reaching the knee, divides into external and internal popliteal nerves. These two nerves are sometimes separate from their first formation in the plexus, and may always be separated easily by the handle of a scalpel, since they are only bound together by loose connective tissue to form the great sciatic nerve. When they are separated in this way it is seen that the external popliteal is made up entirely of posterior (dorsal) secondary divisions (see fig. 9), and is derived from the fourth and fifth lumbar and first and second sacral nerves, while the internal popliteal is formed by the anterior (ventral) secondary divisions of the fourth and fifth lumbar and first, second and third sacral nerves. The external popliteal nerve supplies the short head of the biceps femoris (see Muscular System), and, just below the knee, divides into anterior tibial and musculo-cutaneous branches, which both supply the dorsal surface of the leg and foot. The anterior tibial nerve is chiefly muscular, innervating the muscles in front of the tibia and fibula as well as the extensor brevis digitorum pedis on the dorsum of the foot, though it gives one small cutaneous branch to the cleft between the first and second toes. The musculo-

cutaneous nerve supplies the peroneus longus and brevis muscles, and the rest of the skin of the dorsum, of the foot, and lower part of the leg, while the skin of the upper part of the dorsum of the leg, below the knee, is supplied by the external popliteal before its division. The internal popliteal nerve, after supplying the ham- strings, is continued into the calf of the: leg as the posterior tibial and innervates all the muscles on this, the ventral, surface. Behind the inner ankle it divides into the external and internal plantar nerves, from which the muscles and skin of the sole are supplied. A little above the knee each popliteal nerve gives off' a contribution to help form the external or short saphenous nerve. That from the internal popliteal is called the com- municans tibialis, while that from the • ex- ternal popliteal is the communicans fibularis. These join about the middle of the back of the calf, and the, now formed, short saphenous nerve runs down behind the outer ankle to – supply the outer side of the foot. Some- times it encroaches on the dorsum of the foot, replacing part of the musculo- cutaneous, though, when this is the case, its dorsal con- tribution from the external popliteal (com- municans fibularis) is always larger than usual. To return to the sacral plexus: branches are given off from the anterior secondary divisions to the short external rotator muscles of the hip (pyriformis, quad- ratus femoris, &c), while from the posterior secondary divisions come the superior glu- teal (L. I.S. 4, 5) and the

inferior gluteal (L.5, S. I, 2) to the muscles of the buttocks. In modern descriptions the lower branches of the lumbo-sacral plexus are grouped into a pudendal plexus, and the plan, though open to criticism on morphological grounds, has such descriptive advantages that it is followed here. Contributions from the first, second, third and fourth sacral, and the coccygeal nerve, form it, and these contributions are almost all anterior (ventral) secondary divi- sions. The branches of this plexus are the small sciatic, pudic, visceral, perforating cutaneous, muscular and sacro-coccygeal nerves. The small sciatic (S.I, 2, 3) is partly dorsal and partly ventral in its origin and distribution; it supplies the skin of the perineum, buttock and the back of the thigh. The pudic nerve (S.2, 3, 4) helps and muscles of the perineum and genital branches form the pelvic stream of white

communicantes (see Nervous System) ; they run from

the second and third or third and fourth sacral nerves to the pelvic plexuses of the sympathetic system. The perforating cutaneous nerve (S.2, 3) pierces the great sacro-sciatic ligament and supplies the skin over the lower internal part of the buttock. The muscular branches (S.3, 4) supply the external sphincter, levator ani and

S.Sub, Short subscapular nerve.

M.Sub, Lower subscapular nerve.

L.Sub, Long subscapular nerve.

/.//, Intercosto-humeral nerve.

Lai, Lateral branch of third intercostal nerve.

to supply the skin organs. The visceral

coccygeus.

The sacro-coccygeal nerve (S.4, 5, Coc.i) runs down on each side of the coccyx to supply the adjacent skin, and represents the ventro-lateral nerve of the tail of lower mammals. (F. G. P.)

NERVI, a coast town of Liguria, Italy, in the province of Genoa, from which it is 7§ m. S.E. by rail (also electric tramway), 82 ft. above sea-level. Pop. (1901) 3480 (town); 6317 .(commune). It is much frequented as a winter resort. It is surrounded with groves of olives, oranges and lemons, and its villas have beautiful gardens. It is moister and less dusty than the western Riviera, and is especially in favour

with those who suffer from lung complaints. At Quarto, 2% m. N.W., 1000 Garibaldians (1 mille) embarked for Marsala in i860.

NERVOUS SYSTEM. The nervous system forms an extremely complicated set of links between different parts of the body, and is divided into (A) the central nervous system, composed of (1) the brain, and (2) spinal cord; (B) the peripheral nervous system, consisting of (1) the cranial nerves, (2) the spinal nerves, (3) the various sense organs, such as the eye, ear, olfactory organ, taste organ and tactile organs, and (4) the motor end plates; (C) the sympathetic system. The anatomy and physiology of many of these parts are treated in separate articles (see Brain, Spinal Cord, Nerve, Eye, Ear, Olfactory Organ, Taste, Touch, Muscle and Nerve, Sympathetic Nervous System). The object here is to deal with anatomical points which are

m

Axis

cylinder

Myelin

i

common to the whole system, or for which a place does not conveniently occur elsewhere.

Histology of the Nervous System.

Three kinds of tissue are found in the nervous system, nerve fibres, nerve ceils, and a supporting tissue called neuroglia. Nerve fibres may be medullated or non-medullated, but, whichever they are, they consist of the long process or axon of a nerve cell; in a non-medullated nerve this process is either naked or enclosed in a delicate membrane called the primitive sheath or neurilemma, but in a medullated nerve the process or axis cylinder is encased by a white fatty substance called myelin, and so the term ” myelinated ” is often used instead of ” medullated ” for these nerves (see fig. 1). Outside this white sheath the neurilemma is present in most nerves, but is lost when they are massed to form the white matter of the central nervous system and in

the optic nerve. At regular intervals the myelin is interrupted by some substance which stains deeply with. silver nitrate, and these breaks are known as nodes of Ranvier. They do not, however, affect the axis cylinder. In a large nerve, such as the median, the nerve fibres are collected into small Primitive bundles called funiculi, enclosed in a connective sheath tissue sheath, the perineurium, and separated from it by a lymph space. From this sheath delicate processes penetrate among the fibres, and these are known as the endoneurium. The funiculi are collected into bundles called/ascictt^', and the whole nerve consists of a variable num- ber of fasciculi surrounded by a dense fibrous sheath, the epineurium. The various bundles do not remain distinct, but break up and re- arrange themselves, so that following them up with the scalpel is a difficult and tedious work. The nerve fibres, however, never join one another and are often several feet in length.

Nerve cells are unipolar, bipolar or multi- polar. Unipolar cells are found in the ganglia on the posterior roots of the spinal nerves, and only give off an axon or axis cylinder process; this, however, soon divides in a T-shaped manner, and all these cells were originally bipolar, though the cell has grown away from its two axons (or, as they are often regarded, axon and dendrite), leaving a stalk joining it to them at right angles. Bipolar cells are found as an embryonic stage of unipolar, though in fish they persist in the spinal ganglia throughout life. They are also some- times found in the sympathetic ganglia. Multi- polar cells are found in the brain and cord, and are best studied in the anterior horns of the grey matter of the latter, where they are nearly visible Cunningham's Text- to the naked eye (see fig. 2). Of their many Book of Anatomy. processes only one is an axon, and it becomes

p IG , Nerve- the axial cylinder of a motor spinal nerve. The

fibre from a Frog, other fibres are called dendrites, and break up (After v. Kolliker.) ln ^° delicate branches some of which surround, but, it is generally believed, are not actually continuous with, neighbouring cells or their processes. It is known that the axons are made up of delicate fibrils, and it is thought by some observers that there is actual continuity between some of these and those of an adjacent neuron, as the combination of a nerve' cell, its axon and dendrites, is called. The cells of Purkinje in the cerebellum show a particularly rich arborization of dendrites (see Brain, fig. 7). Nerve cells have generally a large clear nucleus.

The Neuroglia is the delicate connective tissue which supports and

binds together the nervous elements of the central nervous system. One part of it, which lines the central canal of the cord and ventricles of the brain, is formed of columnar cells, and is called ependyma, while the rest consists of small cells with numerous

Erocesses which sometimes branch and sometimes do not. These bres interlace with one another to form a delicate felt-work which is unmixed with nervous elements on the surface of the grey matter of the brain (see Brain, figs. 7 and 15), though elsewhere it is interwoven with them.

Nerve Endings. — Sensory nerves end by breaking up _ into fibrillae or by various tactile organs. In the former case the minute fibrils, of which it has been shown that the axons or nerve fibres consist, separate and end among epithelial cells of the mucous membrane or skin. In the latter case the nerve_ fibres lose their coating of myelin and end in one of the seven following organs : —

1. End bulbs of Krause (fig. 3, A), oval bulbs composed of elongated cells among which the nerve fibrils end in knobs or coils; each is surrounded by a sheath of neurilemma, and the organs are found in the lips, tongue, conjunctiva, epineurium of nerves, synovial membranes of joints, and in the glans penis et clitoridis, where they have a mulberry-like appearance.

2. Pacinian corpuscles (fig. 3, B) are large enough to be seen by the naked eye, and are oval bodies made up of a series of concentric capsules of connective tissue rather resembling the structure of an onion; in the centre of this is a structureless core, at the distal extremity of which the nerve fibre ends in one or more knobs. These

Cunningham's Text-Book of Anatomy.

Fig. 2. — Three Nerve-Cells from the Anterior Horn of Gray Matter of the Human Spinal Cord.

bodies are found in the palm and sole, in the mesentery, the genital organs and in joints.

3. Tactile corpuscles of Meissner and Wagner (fig. 3, C) are Qval bodies found in certain of the skin papillae and mucous membrane, especially of very sensitive parts like the hand and foot, lips, tongue and nipple. They are oval and made of a connective tissue capsule from which septa enter the interior. The nerve fibre generally takes a spiral course through them, loses its myelin sheath, and ends by breaking up into its fibrils, which eventually become bulbous.

4. Tactile corpuscles of Grandry are found in the skin of those parts devoid of hair, and consist of a capsule containing two or more

B C

From Robert Howden, in Cunningham's Text-Book of Anatomy.

Fig. 3. — Tactile Corpuscles. A, End bulb (Krause); B, Corpuscle of Pacini; C, Corpuscle of Meissner. (B, C, after Ranvier.)

largish cells, between which the nerve fibre ends in the so-called tactile discs.

5. kuffini's endings are flattened oval bodies with a thick con- nective tissue capsule, in which the nerve fibre divides into many

branches which have a varicose appearance, form a rich plexus, and end in knobs. These organs are found between the true skin and subcutaneous tissue of the fingers.

6. Organs of Golgi are found in tendons. Nerve fibres penetrate the tendon bundles and divide in a tree-like manner to end in little disks and varicosities.

7. JV 'euro-muscular spindles are small fusiform bundles of embryonic muscle fibres among which the nerve fibres end by encircling them and forming flattened disks. These are sensory endings, and must not be confused with the motor end plates. They are found in most of the striped muscles of the body.

Motor nerves end in striped muscle by motor end plates. These are formed by a nerve fibre approaching a muscle fibre and suddenly losing its myelin sheath while its neurilemma becomes continuous with the sarcolemma of the muscle fibre. The axis cylinder divides, and its ramifications are surrounded by a disk of granular matter containing many clear nuclei. In very long muscle fibres more than one of these end plates are sometimes found. Involuntary motor endings are usually found in sympathetic nerves going to unstriped muscle. The fibres form minute plexuses, at the points of union of which small triangular ganglion cells are found. After this the separate fibrils of the nerve divide, and each ends opposite the nucleus of an unstriped muscle cell.

The Sympathetic System This system is made up of two gangliated cords running down one on each side of the vertebral column and ending below in the median

vertebrae. In addition to these cords there are numerous ganglia and plexuses through which the sympathetic nerves pass on their way to or from the visoera and blood-vessels.

A typical ganglion of the sympathetic chain is connected with its corresponding spinal nerve by two branches called rami communi- cantes, one of which is grey and the other white (see fig. 4). The white consists of medullated fibres belonging to the central nervous system, and these are splanchnic afferent or centripetal, and efferent or centri- fugal. The efferent fibres lie in the anterior roots of the spinal nerves, and, like all the fibres there, are either motor or secre- tory. They are the motor paths for the unstriped muscle of the vessels and viscera, and the secretory paths for the cells of the viscera. In the course of each fibre from the nerve cell in the spinal cord, of which it is an axon, to the vessel or viscus it supplies, there is always a break where it arborizes round a ganglion cell, and this may be in its own ganglion of the sympathetic chain, in a neighbouring ganglion above or below, or in one of the so-called col- lateral ganglia in- terposed between the sympathetic chain and the vis- cera. In addition to these there are a certain number of Anatomy. vaso-dilator and p IG _ viscero-inhibitory fibres, which run without any cell connexions from the spinal or cranial nerve to the viscera The splanchnic afferent or centri- petal fibres are the sensory nerves from the viscera, and have no cell con- nexions until they reach the spinal ganglia on the pos- terior roots of the spinal nerves, which they do by travers- ing the gangliated cord of the sym- pathetic. The fibres of the white rami

communicantes are remarkable for their small diameter, and the efferent fibres, at all events, are only found in two regions, one of which is called the thoracico-lumbar stream and extends from the first or second thoracic to the second or third lumbar nerve, while the pelvic stream is found from the second to the fourth sacral nerves.

The grey rami communicantes are found in connexion with all _ c-. tir- •,. ■ 1ˆ • r,ˆt-t the spinal nerves, though they are irregular in the paths by which

ˆ a /-—Scheme of the Constitution and Connexions of the Gangliated the reach the sympa thetic ganglia from the cells of which they Cord of the Sympathetic. The gangliated cord is indicated on the right, spr ; their fibres are main , non medullated, and pass into with the

arrangement of the fibres arising from the ganglion cells. On both roots of the ina , nerves and also into the ant £ rior and the let t the roots and trunks 01 spinal nerves are shown, with the arrange – *. – - – - –

ment of the white ramus communicans above and of the gray ramus below.

Car.

From A. M. Paterson, in Cunningham's Text~Book of

5. — The Distribution of the Sym- pathetic Gangliated Cord in the Neck. Sy. 1 , Superior cervical ganglion, and con- nexions and branches.

Internal carotid artery.

Glosso-pharyngeal.

Vagus.

Hypoglossal.

3, 4, First four cervical nerves.

Pharyngeal plexus.

Glosso-pharyngeal nerve.

To external carotid artery.

Middle cervical ganglion .connexions and branches.

Fifth and sixth cervical nerves.

Inferior thyroid artery.

Ansa Vieussenii.

Inferior cervical ganglion, con- nexions and branches.

Seventh and eighth cervical nerves.

Vertebral plexus.

Cardiac branches.

I.C,

G.Ph,

Va,

Hy,

C.i, 2,

Plex,

G.Ph,

E.C,

Sy.2,

C.5, 6, I. Thy, A.V, Sy-3,

C.7, 8

Vert,

Car,

From A.

coccygeal ganglion (g. impar). In the neck the cords lie in front of the anterior tubercles of the transverse processes of the cervical vertebrae, in the thorax, in front of the heads of the ribs, while in the abdomen they lie in front of the sides of the bodies of the

posterior primary divisions of those nerves. In this way they reach the body wall and limbs, and are somatic vaso-motor, secretory and pilo-motor fibres, supplying the vessels, glands and hair muscles of the skin and its glands. The sympathetic ganglia, from which these nerves come, contain multipolar nerve cells with one axon and several dendrites as well as a number of medullated fibres passing through, and much connective tissue.

NERVOUS SYSTEM

Some of the axons of these cells pass in the connectives to ganglia above and below, while others pass with the splanchnic efferent nerves to the viscera.

The above sketch will give the general scheme of the sympathetic system, but its exact topographical details in man must be sought in the modern text-books such as those of Gray, Quain or Cunning- ham. Here only the larger and more important details can be given. In the gangliated chain there is a ganglion corresponding to nearly each spinal nerve, except in the neck, where only three are jound ; of these the superior cervical ganglion is more than an inch long, and is connected with the first four spinal nerves as well as

From A. M. Paterson, in Cun- ningham's Text-Book oj Anatomy.

Fig. 6. — The Arrange- ment of the Sympathetic System in the Thorax, Abdomen and Pelvis.

r.l-12, Z.1-5, 5.1-5, Co, Anterior primary divisions of spinal nerves, connected to the gangliated cord of the sym- pathetic by rami communicantes, white (double lines) and gray (single lines).

Oesophagus and oesophageal plexus.

Aorta and aorta plexus.

Vagus nerve joining oesophageal plexus.

Great splanchnic nerve.

Great splanchnic ganglion.

Small splanchnic nerve.

Least splanchnic nerve.

Coronary artery and plexus.

Splenic artery and plexus.

Hepatic artery and plexus.

Semilunar ganglion.

Diaphragm.

S.R, Suprarenal capsule.

Re, Renal artery and plexus.

S.M, Superior mesenteric artery and plexus.

Sp, Spermatic artery and plexus.

I.M, Inferior mesenteric artery and plexus.

Hypogastric nerves and plexus.

Rectal plexus.

Uterine plexus.

Ves, Vesical plexus.

V.V.V, Visceral branches i from sacral nerves.

with the ninth, tenth and twelfth cranial nerves (see fig. 5, Sy.i). Branches of distribution pass from it to the pharyngeal plexus, the heart and the two carotid arteries. Of these the branch accompanying the internal carotid artery passes to the carotid and cavernous plexuses, and through these communicates with the spheno-maxillary, otic and ciliary ganglia, while the branch to the external carotid communicates with the submaxillary ganglion. The middle cervical ganglion (fig. 5, Sy.2), when it is present, gives rami communicantes to the fifth and sixth cervical nerves, as well as branches of distribution to the thyroid body and heart.

The inferior cervical ganglion (fig. 5, Sy.3) lies behind the sub- clavian artery, and, besides the main connective cord, has a loop

Rec,

VI,

(ansa Vieussenii) joining it to the middle cervical ganglion in front of that vessel. It communicates with the seventh and eighth spinal nerves, and gives branches of distribution to the heart and to the subclavian artery and its branches, especially the vertebral. The thoracic part of the sympathetic cord has usually eleven ganglia, which receive both white and grey rami communicantes from the spinal nerves (fig. 6) ; of the former the upper ones run up in the chain and come off from the cervical ganglia as already described, while the lower ones form the three abdominal splanchnics which pass through the diaphragm (q.v.) and join the abdominal plexuses.

The great splanchnic (fig. 6, S.i) comes from the sixth to the ninth

ganglia, and ends in the semi-lunar ganglion of the solar plexus (fig. 6, SL). The small splanchnic (fig. 6, S.2) comes from the ninth and tenth, or tenth and eleventh ganglia, and ends in the aortico- renal ganglion of the solar plexus, while the smallest splanchnic (fig. 6, 5.3) comes from the last thoracic ganglion, whether it be the tenth or eleventh, and ends in the renal plexus.

In the lumbar region the gangliated cord is very irregular; there may be four or more ganglia, and these are often fused. Grey rami communicantes are given to all the lumbar spinal nerves, and white ones are received from the first two. Most of the branches of distribution pass to the aortic plexus. The sacral gangliated cord runs down just internal to the anterior sacral foramina; it usually has four small ganglia, and the two cords end by joining the coccygeal ganglion or ganglion impar, though the two-fourth sacral ganglia are united by transverse interfunicular commissures. The white rami communicantes, already mentioned as the pelvic stream, from the second to the fourth sacral spinal nerves, do not enter the ganglia but pass directly to the pelvic plexuses (fig. 6, V).

Sympathetic Plexuses. — In the thorax are the superficial and deep cardiac plexuses and the coronary plexuses; the former receives the left superior cervical cardiac of the vagus, and lies in the concavity of the arch of the aorta. The deep cardiac plexus is larger, and lies in front of the bifurcation of the trachea; it receives all the other cardiac nerves, and communicates with the anterior pulmonary plexuses of the vagus (see Nerves: Cranial). The right and left coronary plexuses accompany the coronary arteries; the former communicates with both the cardiac plexuses, the latter only with the deep cardiac plexus.

In the abdomen the solar plexus is by far the most important. It lies behind the stomach and surrounds the coeliac axis ; in it are situated the semilunar, aortico-renal and superior mesenteric ganglia, and from it are prolonged subsidiary plexuses along the main arteries, so that diaphragmatic, suprarenal, renal, spermatic, coeliac, superior mesenteric, aortic and inferior mesenteric plexuses, are recognized. The hypogastric plexus is the continuation downward of the aortic, and lies just below the bifurcation of the aorta (see fig. 6, Hy); it divides into two branches, which accompany the internal iliac arteries and are joined by the pelvic stream of white rami communicantes from the sacral spinal nerves and some twigs from the ganglia of the sacral sympathetic to form the pelvic plexuses. These are prolonged to the viscera along the branches of the internal iliac artery, so that haemorrhoidal, vesical, prostatic, vaginal and uterine plexuses are found. By the side of the neck of the uterus in the last-named plexus

several small ganglia are seen. (For the literature of the sympathetic system, see Quain's Anatomy, London, 1895.)

Embryology of Nervous System The development of the brain, spinal cord and organs of special sense (eye, ear, tongue), will be found in separate articles. Here that of the cranial and spinal nerves and the sympathetic system is dealt with. The thoracic spinal nerves are the most typical, and one of them is the best to begin with. In fig. 7, A the ganglion on the dorsal root (DR) is seen growing out from the neural crest, and : the cells or neuroblasts of which it is composed become fusiform and grow in two directions as the ganglion recedes from the cord. Those which run toward the spinal cord are the axons, while those growing into the mesoderm are probably enlarged dendrites. The ventral roots (VR) rise as the aˆons of the large cells in the ventral horn of the grey matter, and meet the fibres of the dorsal root on the distal side of the ganglion (fig. 7, B). As the two roots join each divides >nto an anterior (ventral) and a posterior (dorsal) primary division (fig. 7, D), the latter growing into the dorsal segment of its muscle • plate and the skin of the back. The anterior primary division grows till it reaches the cardinal vein and dorsal limit of the coelom, and there forks into a somatic branch to the body wall (fig. 7, C, So), and a splanchnic or visceral branch (fig. 7, C, Vi) which joins the sympathetic and forms the white ramus communicans. The somatic branch grows round the body wall and gives off lateral and anterior branches (fig. 7, E). In the limb regions the anterior primary divisions of the nerves divide into anterior and posterior secondary divisions, which probably correspond to the anterior and lateral branches of the thoracic nerves (fig. 7, E and F). These unite with neighbouring nerves to form plexuses, and divide again',' but the anterior nerves keep to the ventral side of the limb and the posterior to the dorsal.

The cranial nerves are developed in the same wayas the spinal, so far as concerns the facts that the motor fibres are the axons of. cells situated in the basal lamina of the mesencephalon and

rhombencephalon (see Brain), and the sensory are the axons and dendrites of cells situated in ganglia which have budded off from the brain. The evidence of comparative anatomy, however, shows that

From A. M. Paterson, in Cunningham's Textbook of Anatomy.

Fig. 7. — Development of the Spinal Nerves.

A, Formation of nerve roots. D.J?,' Dorsal root. V.R, Ventral root. N.T, Neural tube. No, Notochord. Al.C, Alimentary canal. Ao, Aorta. V, Cardinal vein. M.P, Muscle plate.

B, Formation of nerve trunk (N) D.G, Dorsal ganglion. Sy, Sympathetic ccrd. W.D, Wolffian duct. Co, Coelom.

there are two ventral roots to one dorsal. In the fishes and higher vertebrates the dorsal and ventral roots unite, though in selachian (shark) embryos F. M. Balfour says that the dorsal and ventral roots alternate (The Development of Elasmobranch Fishes, London, 1878). When limbs are developed, beginning with fishes, limb plexuses are formed. Where the limbs are suppressed rudimentary plexuses may persist, as in the snake, though usually they disappear.

The cranial nerves are only represented by two pairs in Amphioxus. In the Cyclostomata, fishes and Amphibia, ten pairs of nerves are found, which in their distribution do not always agree with those of man. In the Amniota or reptiles, birds and mammals, the eleventh and twelfth nerves have been added. The researches of W. H. Gaskell (" On the structure, distribution and functions of the nerves which innervate the visceral and vascular systems," /. of Phys. vii. 1, 1886), O. S. Strong (" The cranial nerves of Amphibia," J. Morph. x. 101), J. B. Johnston (/. Comp. Neurol, xii. 2 and 87), and others, show that the cranial nerves are formed of at least five components: (1) Ven- tral motor, (2) Lateral motor, (3) Somatic sensory, (4) Visceral sensory, (5) Lateral line nerves.

The ventral motor components are those which rise from cells situated close to the mid line, and probably correspond to the ventral roots of the spinal nerves. The nerves to the eye muscles (motor oculi, trochlearis and abducens) have this origin (see Nerve : Cranial), as also has the hypo- glossal, which doubtless is a cephalized spinal nerve.

The lateral motor components rise from cells situ- ated more laterally, and comprise the motor roots of the fifth (trigeminal), seventh (facial), and ninth, tenth and eleventh (glossopharyngeal, vagus and spinal accessory). These nerves supply muscles belonging to the branchial skeleton, instead of the muscles of the primi- tive cranium, of which the eye muscles are the remnants.

The somatic sensory components supply the

skin, and end in cells which, among the cyclo-

stomes and fishes, form a considerable elevation

D, E, Formation of subordinate branches, in the rhombencephalon, known as the lobus

Lat, Lateral, and trigemini (fie. 8, Nuc. V.). These components,

Ant, Anterior, branches. in the lower forms, are found in the fifth, seventh

and tenth nerves, but in mammals practically F, Formation of nerve trunks in relation only the fifth contains them. They correspond to the limb ; dorsal and ventral to the dorsal roots of the spinal nerves, trunks corresponding to lateral and The splanchnic sensory or viscera sensory cow- anterior trunks in D and E. ponents end in the brain in the medullary cells

known as the fasciculus communis in fishes, and

So, Vi, P,

C, Formation of nerves. Somatic division. Visceral branch. Posterior primary division.

the cranial nerves cannot be directly homologized with the spinal, nor can the fact of there being twelve of them justify us in assuming that the head contains the rudiments of twelve fused or unsegmented somites. To this we will return later. The case of the optic nerve is different to that of any of the others. A. Robinson (Journ. Anat. and Phys., vol. 30, p. 319) has shown that most of its fibres are the axons of ganglion cells in the retina, and, as the retina is part of the optic vesicle and an outgrowth from the brain, the so-called optic nerve is only comparable to a tract of fibres within the brain. The twelfth or hypoglossal nerve is regarded as a fusion of the motor roots of three spinal nerves, and embryology bears this out, for Froriep has described a small and transitory ganglion corre- sponding to the posterior root ganglion of this nerve. Another link in the chain of reasoning is that the first spinal or sub-occipital nerve often has its posterior root suppressed.

The sympathetic system is developed from the posterior root ganglia of the spinal nerves, by cells which in man migrate a few at a time. A. M. Paterson, however, believes that the sympathetic is developed, independently of the cerebro-spinal system, in the mesoderm (Phil.

Trans, clxxxi. pt. B. p. 159). In embryos of 14- 5 m.m. there are found masses of cells on each side of the ab- dominal aorta, permeated with blood vessels, and having the same structure as the carotid and coccygeal bodies. They are known as the organs of Zuckerkandl, and disappear soon after birth.

Comparative Anatomy

The comparative anatomy of the brain and spinal cord is dealt with in the separate articles devoted to them.

Spinal Nerves. — In Amphioxus the dorsal and ventral roots do not unite with one another but alternate, a dorsal root on one side being Opposite a ventral on the other. The dorsal roots are both sensory and motor, the ventral only motor. In the Cyclostomata (Petromyzon) the arrangement is nearly the same, but in some regions

fasciculus solitarius in mammals (see Brain, fig. 4), as well as in the lobus trigemini and lobus vagi (fig. 8, Nuc. X.). They are found in the fifth, seventh, ninth, tenth and eleventh nerves, and supply visceral surfaces. In mammals the lingual and palatine

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From Catalogue of the Museum of the Royal College of Surgeons of England, vol. »;' jnd ed.

Fig. 8. — Brain (A) and Choroid Plexuses (B) of Lamprey.

branches of the fifth, the chorda tympani and great superficial petrosal (?) of the seventh, and all the sensory fibres of the ninth and tenth

except Arnold's nerve, represent these. In fishes and Amphibians the palate is supplied by the seventh nerve instead of

the fifth, but the explanation given for this difference is that in these lower forms the Gasserian and geniculate ganglia are not distinct, and so fibres from the compound ganglion may pass into either nerve. These splanchnic sensory components of the cranial nerves evidently correspond to the branches which have already been mentioned as the splanchnic afferent fibres of the sympathetic.

The system of the lateral line or acustico-lateralis component is sometimes regarded merely as a subdivision of the somatic sensory. It is best developed in the fish, and may be divided into pre- and post-auditory, and auditory. The pre-auditory part comprises the pit and canal end organs supplied by the seventh, and also probable the olfactory organ supplied by the first nerve. The auditory apparatus, supplied by the eighth nerve, is, according to modern opinion, undoubtedly a part of this system, while the tenth nerve sends a large branch along the lateral line supplying the special end organs of the post-auditory part. All these components of the lateral line pass to the tuberculum acusticum in the fourth ventricle, as well as to the cerebellum, which J. B. Johnston (Zool. BuU. I, 5, p. 221, Boston) regards as a derivative of the rostral (anterior) end of the acustic,um. In mammals no doubt the olfactory and auditory apparatus and nerves have the same morphological signi- ficance as in fishes, but the seventh does not supply any cutaneous sense organs on the head or face, and the only vestige of the post- auditory supply of the tenth nerve to the lateral line is the small auricular branch of the vagus, often called Arnold's nerve.

The following table, slightly modified from the one drawn up by J. McMurrich, gives a fair idea of the present state of our knowledge of the nerve components in the Mammalia.

Nerve.

Ventral

Lateral

Somatic

Splanchnic

Lateral

Motor.

Motor.

Sensory.

Sensory.

Line.

I.

+ (?)

II. 1

III.

+

IV.

+

V.

+

+

+

VI.

+

VII.

+

+

VIII.

+

IX.)

X.

+

+

+

+

XI.)

XII.

+

Spinal

+

(?)

+

+

1 A tract of the brain.

For further details and literature of the nervous system see Quain's Anatomy (latest edition); R. VViedersheim's Comp. Anat. of Vertebrates (Lond. 1907) ; Bronn's Classen und Ordnungen des Thier-reichs ; C. S. Minot's Human Embryology (1892) ; McMurrich's Develop- ment of the Human Body (London, 1906). For the theory of nerve components see Onera Merritt, Journ. Anat. and Phys., vol. 39, p. 199. A general discussion on the comparative anatomy and morphology of limb plexuses will be found in Miss C. W. Saberton's paper on the " Nerve Plexuses of Troglodytes Niger " Studies in Anatomy, University of Manchester, vol. iii. (1906), p. 165. She refers to most of the literature on the subject, but the papers of H. Braus, Jena Zeitschr. v. 31 (1898), p. 239 on fish, of M. Davidoff, Morph. Jakrb. v. 5 (1879), p. 450 on the pelvic plexuses of fish, and of M. Fiirbringer, Gegenb. Festschr. v. 3 (1897), on the spino-occipital nerves and brachial plexus of fish, are also very important. (F. G. P.)

NESFIELD, WILLIAM EDEN (1835-1888), British architect, one of the leaders of the Gothic revival in England, was born in Bath on the 2nd of April 1835. His father, Major William Andrew Nesfield, a well-known landscape gardener, laid out Regent's Park and St James's Park, and remodelled Kew. Educated at Eton, Nesfield was articled first to Mr Burn, a classicist, and then to his uncle, Anthony Salvin, who took the Gothic side in the " battle of the styles." Nesfield travelled for study in France, Italy and Greece, afterwards publishing a volume, Sketches from France and Italy (London, 1862), which became one of the text-books of the Gothic revival. In 1859 Nesfield settled down in London. His first important commission was to build a new wing to Combe Abbey for Lord Craven. In 1862 began a nominal partnership with Norman Shaw, the fruits of which have been exaggerated; they shared rooms in Argyle Street for some years, but never col'aborated. It was in Argyle Street that the principal work of Nesfield's life was conceived — Combe Abbey, Cloverly Hall and Kinmel Park. Here he showed a mastery of planning and construction, a conscientious regard for detail, an eye for the picturesque, an unfailing regard for

dignity, which make his achievements landmarks in the history of his art. He built the lodge in Regent's Park (1864) and that in Kew Gardens (1866). Combe Abbey and Cloverly are some- what " early French " in style, but as Nesfield developed he adopted a purely English, manner, and presented his newer ideas in Loughton Hall and Kinmel Park. The gate lodge at Kinmel Park, Abergele, is entirely " English Renaissance "; Cloverly Hall (1864), planned when he was twenty-nine, with its great hall, fine approaches to the staircase, and the staircase itself, is already half English, and Eastlake, in his History of Gothic Revival, praises it on that very ground. The full development of the revived classic taste in Nesfield came with his addition to Kinmel Park — red brick, stone dressings, grey-green slated roofs — which elevated that originally unpretentious 18th-century building into a small Renaissance palace. For contrast in style, harmonious as they are in artistic expression, Cloverly and Kinmel are the typical examples of the artist's style. Other works are Farnham Royal House near Slough, Lea Wood, Loughton Hall and Westcombe Park. His more notable urban works are the bank at Saffron Walden (1873), and the Rose and Crown Hotel; they stand next door to each other and exhibit another contrast, the former being medieval and the latter what is called " Queen Anne." Though he built no new important church, Nesfield rebuilt the Early Decorated St Mary's, Farnham Royal, near Slough, mainly on the old lines. He restored King's Walden church, Herts (1868), and Radwinter church, Essex (1871), and Cora church

near Whitchurch, Salop; but no great public building came from him. Nesfield's career was a com- paratively short one. On the 3rd of September 1885 he married Mary Annetta, eldest daughter of John Sebastian Guilt and granddaughter of Joseph Guilt, and he retired from practice some years before his death at Brighton on the 25th of March 1888. He left behind him a valuable series of sketches and measured drawings, most of which are now in the library of the Royal Institute of British Architects. (J. M. By.)

NESLE, the name of a place in France (dep. of Somme), which gave its name to an old feudal family. This family became extinct at the beginning of the 13th century, and the heiress brought the lordship to the family of Clermont in Beauvaisis. Simon de Clermont, seigneur de Nesle, was regent of the kingdom of France during the second crusade of St Louis. Raoul de Clermont, constable of France, and Guy I. (d. 1302) and Guy II. (d. 1352) de Clermont, both marshals of France, were members of the family. The lordship of Nesle was erected into a countship for Charles de Sainte-Maure in 1467 and into a marquisate for Louis de Sainte-Maure in 1546. It was acquired in 1666 by Louis Charles de Mailly. His grandson, Louis de Mailly, had five daughters, of whom four (the countess of Mailly, the duchess of Lauragais, the countess of Vintimille, and the marquise de la Tournelle, afterwards duchess of Chateauroux) were succes- sively, or simultaneously, mistresses of Louis XV.

NESSELRODE, KARL ROBERT, Count (1780-1862), Russian diplomatist and statesman, was born on the 14th of December 1780 at Lisbon, where his father (d. 1810) was Russian ambassador. In deference to his mother's Protestantism he was baptized in the chapel of the British embassy, thus becoming a member of the Church of England. The Nesselrodes were of Westphalian origin, but had long been settled in Livonia. Nessel- rode's German origin was emphasized by his education in a Berlin gymnasium, his father having been appointed ambassador to the Prussian court about 1787. When he was sixteen he entered the Russian navy, and his fathers influence procured for him the position of naval aide-de-camp to the emperor Paul. He presently exchanged into the army, obtained a further court appointment, and entered the diplomatic service. Nesselrode was attached to the Russian embassy at Berlin, and transferred thence to the Hague. In August 1806 he received a commission to travel in South Germany to report on the French troops; he was then attached as diplomatic secretary to Generals Kamenski, Buxhoewden and Bennigsen in succession. He was present at the battle of Eylau in January 1807, and assisted at the negotiation of the peace of Tilsit. Immediately afterwards

he was' sent to Paris to join the embassy of Count Peter Tolstoy, whom he accompanied in the spring of the next year to the meeting of the two emperors at Erfurt. After his return to Paris he strengthened the understanding between Alexander I. and Talleyrand consequent on the Erfurt meeting, and acted as intermediary between the two. On the appointment of a successor to Count Tolstoy he retired to St Petersburg, but returned to Paris early in 1810 charged with a commission from Speranski to Talleyrand and the marquis de Caulaincourt, formerly ambassador in St Petersburg, both of whom were hostile to Napoleon's policy of aggression. After the breach of diplomatic relations with Russia in 1811, Nesselrode returned to St Petersburg by way of Vienna in order to exchange views with Metternich. He sought to persuade Alexander to open negotiations with Napoleon, if only to throw the onus of breaking the peace entirely on the French side. He joined the tsar's headquarters at Vilna in March 181 2 and, though Rumiantzov was still foreign minister, it was Nesselrode who directed the foreign policy of Russia from this time forward. He was present at the battle of Leipzig, and accompanied the invading army to Paris; he negotiated the capitulation of Marmont and Mortier at Clichy, and signed the treaty of Chaumont on the 1st of March 1814. His former relations with Talleyrand facilitated negotiations in Paris, and his great influence with the emperor was used in favour of the restoration of the Bourbons, and, after Waterloo, against the imposition of a ruinous war indemnity on France. At the congress of Vienna he was associated with Count Capo d'lstria, and when, in August 1816, Alexander made him secretary of state for foreign affairs in succession to Rumiantzov, it was again in conjunction with the Greek statesman, from whom he differed widely in temperament and ideas. The emperor Alexander I., however, was apt to keep the direction of affairs in his own hands and so long as Alexander inclined to Liberalism Capo d'lstria was the interpreter of his will, but as the emperor veered towards Metternich's system Nesselrode became his mouthpiece. After Alexander's final " conversion " to reactionary principles, Capo d'lstria was dis- missed (1822) and Nesselrode definitely took his place. He had consistently advocated Alexander's project of a " universal union," symbolized by the Holy Alliance, in contradistinction to the narrower system of the alliance of the great powers; and, when the Greek insurrection broke out, he did much to determine the tsar to sacrifice his sympathy with the Orthodox Greeks to his dream of the European confederation (see Alexander I., emperor of Russia).

After Alexander's death in 1825 Nesselrode retained office under Nicholas I. He was responsible for the change of policy of Russia towards the Ottoman empire after 1829, viz. that of abandoning the traditional idea of conquering Constantinople in favour of keeping the Ottoman power weak and dependent on the tsar. This was his policy during the revolt of Mehemet Ali (q.v.), and it was Nesselrode who inspired the terms of the famous treaty of Unkiar Skelessi (1833). Nicholas I. was, however, even less inclined than his brother to place himself in the hands of a minister; and Nesselrode showed himself amenable, though when his views differed from those of the emperor he stated them with great frankness. He conducted the negotiations which led to the shelving of the treaty of Unkiar Skelessi and to the alliance between Russia and Great Britain which, issuing ultimately in the Straits Convention of 1841 — to which France also was a party — healed the breach which had so long divided the powers of eastern and western Europe.

In 1849 it was Nesselrode who suggested the intervention of Russia in Hungary in favour of the Austrian government, although he restrained the tsar from active intervention in France then as in 1830. During the crisis of 1853 he prolonged negotiation in the hope of averting war. The last of his im- portant political acts, the signing of the treaty of Paris in 1856, undid the results of his patient efforts to establish Russian preponderance in the Balkan peninsula. He then retired from the foreign office, retaining the chancellorship, which he had

held since 1844. He died at St Petersburg on the 23rd of March

1862.

See Lettres et papier s du chancelier comte de Nesselrode 1760-1850, the first volume of which was issued by his grandson Count Anatole Nesselrode at Paris in 1904. This work includes letters of the chancellor's father, Count William, Nesselrode's correspondence, and important state papers. In vol. ii. is a fragment of an autobio- graphy (to 1814), which Count Nesselrode did not live to complete. See also Correspondance diplomatique du comte Pozzo di Borgo et du comte de Nesselrode, edited by Charles Pozzo di Borgo (Paris, 2 vols.,

1890-1897).

NEST, the place where a bird lays its eggs, hatches them out, and shelters them until they are fledged. The word is used by analogy of other animals than birds, insects, &c. It appears in much the same form in Teutonic languages; related to it are Irish nead, and Lat. nidus,

whence Fr. nid. It has been referred to the Gr. rooros, return home, but it is now established that it represents a form nizdo- for nisido-, from ni-, down; cf. ” nether,” and sed-, to sit. Sanskrit has nlda. The Lat. nidus has given the scientific term for nest-building, nidification (q.v.).

NESTOR, in Greek legend, son of Neleus and Chloris, king of Pylos in Messenia. When all his brothers were slain by Heracles, in consequence of the refusal of Neleus to purify him for the murder of Iphitus, Nestor alone escaped, being absent at Gerenia — hence his epithet Gerenios in Homer (Apollodorus i. 9). He is the old warrior of the Iliad and the wise counsellor of the Greeks before Troy. After the fall of the city he returned to Pylos, where Telemachus visited him to obtain news of his father. In his earlier years he took part in the battle of the Centaurs and Lapithae, the Calydonian boar hunt, and the Argonautic expedition. The name is used in modern times for any old man of ripe experience, or the oldest member of a class or corporation.

NESTOR (c. 1056-c. 1114), the reputed author of the earliest Russian chronicle, was a monk of the Pecherskiy cloister of Kiev from 1073. The only other fact of his life is that he was commissioned with two other monks to find the relics of St Theodosius, a mission which he succeeded in fulfilling. The chronicle begins with the deluge, as those of most chroniclers of the time did. The compiler appears to have been acquainted with the Byzantine historians; he makes use especially of John Malalas and George Hamartolus. He also had in all probability other Slavonic chronicles to compile from, which are now lost. Many legends are mixed up with Nestor’s Chronicle; the style is occasionally so poetical that perhaps he incorporated Mini which are now lost. The early part is rich in these stories, among which are the arrival of the three Varangian brothers, the founding of Kiev, the murder of Askold and Dir, the death of Oleg, who was killed by a serpent concealed in the skeleton of his horse, and the vengeance taken by Olga, the wife of Igor, on the Drevlians, who had murdered her husband. The account of the labours of Cyril and Methodius among the Slavs is also very interesting, and to Nestor we owe the tale of the summary way in which Vladimir suppressed the worship of Perun and other idols at Kiev. As an eyewitness he could only describe the reigns of Vsevolod and Sviatopolk (1078-1112), but he gathered many interesting details from the lips of old men, two of whom were Giurata Rogovich of Novgorod, who gave him information concerning the north of Russia, Petchora, and other places, and Jan, a man ninety years of age, who died in 1 106, and was son of Vishata the voivode of Yaroslavl and grandson of Ostromir the Posadnik, for whom the Codex was written.

Many of the ethnological details given by Nestor of the various races of the Slavs are of the highest value.

The latest theory about Nestor is that the Chronicle is a patchwork of many fragments of chronicles, and that the name of Nestor was attached to it because he wrote the greater part or perhaps because he put the fragments together. The name of a certain Sylvester, an Igumen, is affixed to several of the manuscripts as the author.

The Chronicle has come down to us in several manuscripts, but unfortunately no contemporary ones, the oldest being the so-called Lavrientski of the 14th century (1377). It was named after the monk Lavrentii, who copied it out for Dimitri Constantinovich, the prince of Souzdal. The work, as contained in this manuscript,

has had many additions made to it from previous and contemporary chronicles, such as those of Volinia and Novgorod. Soloviev, the Russian historian, remarks that Nestor cannot be called the earliest Russian chronicler, but he is the first writer who took a national point of view in his history, the others being merely local writers. The language of his work, as shown in the earliest manuscripts just mentioned, is Palaeo-Slavonic with many Russisms. It has formed the subject of a valuable monograph by Professor Miklosich.

The Chronicle has been translated into Polish, Bohemian, German and French. The compiler cannot very well be the author of the lives of Boris and Gleb, the martyrs, and of the life of St Theodosius, because they contradict many passages in the Chronicle. The work is of primary importance for early Russian history, and, although devoid of literary merit, is not without its amusing episodes of an Herodotean character. The reputed body of the ancient chronicler may be seen among the relics preserved in the Pecherskiy monastery at Kiev.

See Louis Leger's Chronique dite de Nestor (Paris, 1884); Bestuzhev Riumin, On the Composition of the Russian Chronicles till the end of the 14th century (in Russian), (St Petersburg, 1869).

(W. R. M.)

NESTOR, the name of a small but remarkable group of parrots peculiar to the New Zealand sub-region, of which the type is the Psitlacus meridionalis of Gmelin, founded on a species described by J.

Latham {Gen. Synopsis i. 264), and subse- quently termed by him P. nestor, in allusion to its hoary head, but now usually known as Nestor meridionalis, the ” Kaka ” of the Maories and English settlers in New Zealand, in some parts of which it was very abundant, though its numbers are fast decreasing. Forster, who accompanied Cook in his second voyage, described it in his MSS. in 1773, naming it P. hypopolius, and found it in both the principal islands. The general colour of the kaka is olive-brown, nearly all the feathers being tipped with a darker shade, so as to give a scaly appearance to the body. The crown is light grey, the ear-coverts and nape purplish- bronze, and the rump and abdomen of a more or less deep crimson-red; but much variation is presented in the extent and tinge of the last colour, which often becomes orange and some- times bright yellow. The kaka is about the size of a crow; but a larger species, generally resembling it, though with plumage mostly dull olive-green, the Nestor notabilis of J. Gould, was discovered in 1856 by Walter Mantell, in the higher mountain ranges of the Middle Island. This is the ” Kea ” of the-Maories, and incurred the enmity of colonists by developing an extra-ordinary habit of assaulting sheep, picking holes with its powerful beak in their side, wounding the intestines, and so causing death. The bird is admittedly an eater of carrion in addition to its ordinary food, which, like that of the kaka, consists of fruits, seeds and the grubs of wood-destroying insects, the last being obtained by stripping the bark from trees infested by them. The amount of injury the kea inflicts on flock-masters has doubtless been much exaggerated, for Dr Menzies states that on one ” run,” where the loss was unusually large, the proportion of sheep attacked was about one in three hundred, and that those pasturing below the elevation of 2000 ft. are seldom disturbed.

On the discovery of Norfolk Island (October 10 1774) a parrot, thought by Forster to be specifically identical with the kaghaa (as he wrote the name) of New Zealand — though his son (Voyage, ii. 446) remarked that it was ” infinitely brighter coloured ” — was found in its hitherto untrodden woods. Among the drawings of Bauer, the artist who accompanied Robert Brown and Flinders, is one of a Nestor marked ” Norfolk Isl. 19 Jan. 1805,” on which Herr von Pelzeln in i860 founded his N. norfolcensis. Meanwhile Latham, in 1822, had described, as distinct species, two specimens evidently of the genus Nestor, one said, but doubtless erroneously, to inhabit New South Wales, and the other from Norfolk Island. In 1836 Gould de- scribed an example, without any locality, in the museum of the Zoological Society, as Plyctolophus produclus, and when some time after he was in Australia, he found that the home of this species, which he then

recognized as a Nestor, was Phillip Island, a very small adjunct of Norfolk Island, and not more than 5 m. distant from it. Whether the birds of the two islands were specifically distinct or not we shall perhaps never know, since they are all extinct, and no specimen undoubtedly from Norfolk

Island seems to have been preserved. The Phillip-Island Nestor may be distinguished from both of the New-Zealand species by its somewhat smaller size, orange throat, straw-coloured breast, and the generally lighter shade of its tints.

The position of the genus Nestor in the order Psittaci must be regarded as uncertain, but it is now usually placed in the sub-family Nestorinae of the Trichoglossidae (see Parrot).

Further knowledge of this very interesting form may be facilitated by the following references to the Transactions and Proceedings of the New Zealand Institute, ii. 64, 65, 387, iii. 45-52, 81-90, v. 207, vi. 114, 128, ix. 340, x. 192, xi. 377; and to Sir W. Buller's Birds of New Zealand. (A. N.)

NESTORIANS. §1. The Early Nestorians. — Among those who had been present at Ephesus in support of Nestorius (q.v.) was Ibas, presbyter and head of the theological school of Edessa. In 435 he became bishop of Edessa and under his influence the Nestorian teaching made considerable progress. On the accusa- tion of the orthodox he was deposed by the " Robber Synod " of Ephesus, but at Chalcedon in 451 was pardoned on condition of anathematizing both Nestorius and Eutyches and accepting the Tome of Leo. He had not, however, changed his views, and this was generally recognized. Meanwhile one of his pupils, Barsumas, had settled at Nisibis in Persian territory where he became bishop in 435 and established a Nestorian school. And when the emperor suppressed the school of Edessa (" the Athens of Syria ") in 489, and expelled its members, they travelled far afield as eager and successful missionaries of the Gospel. In Persia their numbers and their zeal stimulated the old churches into vigour and led to the founding of new ones. And as they were under ban from Rome and out of communion with the Byzantine Church the Persian government welcomed them as a political ally, though the religious opposition of the Magi was still largely retained. In their new environment the Nestorians abandoned some of the rigour of Catholic asceticism, and at a synod held in 499 abolished clerical celibacy even for bishops and went so far as to permit repeated marriages, in striking contrast not only to orthodox custom but to the practice of Aphraates at Edessa who had advocated celibacy as a condition of

baptism. The liberty here granted to bishops was enjoyed as late as the 12th century, but since then the Nestorian Church has assimilated its custom to that of the Greek Church. That the ascetic ideal was by no means wholly extinct is evident from the Book of Governors written by Thomas, bishop of Marga, in 840 which bears witness to a Syrian monasticism founded by one Awgin of Egyptian descent, who settled in Nisibis about 350, and lasting uninterruptedly until the time of Thomas, though it had long been absorbed in the great Nestorian move- ment that had annexed the church in Mesopotamia.

The Nestorian Church in Eastern Syria and Persia was under the jurisdiction of an archbishop (catholikos) , who in 498 assumed the title ” Patriarch of the East ” and had his seat at Seleucia- Ctesiphon on the Tigris, a busy trading city and a fitting centre for the great area over which the evangelizing activity of the Nestorians now extended. The church traced its doctrines to Theodore of Mopsuestia rather than to Nestorius, whose name at first they repudiated, not regarding themselves as having been proselytized to any new teaching.

§ 2. The Later Nestorians. — In 608 Magian influence was so strong in Persia that the Christians were persecuted and the office of catholicus was vacant for 20 years, being filled again by Jesu-Jabus, during whose patriarchate the Mahommedan invasion overran Persia. The patriarch was able to secure from the caliph permission for the Christians to practice their religion in return for tribute money and this was afterwards remitted. Ibn Ali Talib, anxious to perpetuate their severance from the orthodox church and the Byzantine empire, confirmed these privileges by charter and in 762 the patriarchate was removed to Bagdad. For five centuries the Nestorians were a recognized institution within the territory of Islam, though their treatment varied from kindly to harsh. Blrunl, a Mahom- medan writer, who lived at Khiva c. a.d. iooo, speaks of them as comprising the bulk of the population of Syria, Irak and Khorasan, and as superior to the orthodox in intellectual ability.

■ 4 .p8

NESTORIANS

They agreed with Byzantines in observing Lent, Christmas and Epiphany, but differed from them in the observance of all other feasts and fasts. The Latin church tried in vain during the Crusades to secure their adhesion to Rome. The barbaric invasions of the 13th and 14th centuries fell with crushing force on the Nestorians. In 1258 Hulagu Khan took Bagdad, and about 1400 Timur again seized and sacked the

city. Though the Nestorians were numerous, their moral influence and their church life had greatly deteriorated. Those who escaped capture by Timur fled to the mountains of Kurdistan, and the community that had played so large a part in Mesopotamian history for a thousand years was thus shattered. In 1552 they were further weakened by a large secession known as ” the Chaldeans ” arising out of a dispute about the succession to the patriarchate. The discontented appealed to Rome, and the pope (Julius III.) consecrated the Chaldean catholikos. ‘ The Chaldeans are now chiefly found in rural districts east of the Tigris. They have a see at Bagdad, a monastery (Rabban Hormuz) at Elkoosh, and are called by those Syrian Christians who have resisted the papal overtures, Maghlabin (“the conquered”). Other attempts during ihe 16th century to promote union between the Nestorians and Rome proved fruitless, but the Roman Church has never ceased in its efforts to absorb this ancient community. The history of the Jacobites or Syrian Monophysites who, like the Nestorians, diverged from the Byzantine Church, but in an exactly opposite direction, is told elsewhere (see Jacobite Church, &c). Like the Nestorians they were great missionaries, and up to the 7th century, and again in the 12th and 13th, pro- duced the bulk of Syriac literature (q.v-)- The chief Nestorian authors were (a) in the 7th, 8th and 9th centuries, Babbai the elder and Isho-yabh of Gedhala, commentators; Sahdona, who wrote on the monastic life; Abraham the Lame, a devotional and penitential writer; Dionysius of Tell Mahre (see Dionysius Telmaharensis), whose Annals are important; and Thomas (q.v.) of Marga; (b) in the 14th century, Abdh-isho bar Berikha (d. 1318) the author of a theological treatise Marganitha (” the Pearl “), 1298, and the Paradise of Eden, a collection of 50 theological poems.

§ 3. The Nestorian Missionary Enterprise. — The combined hostility of the orthodox church and the Byzantine empire drove the Nestorians into exile, but they went much further than was needed simply to secure immunity from persecution. They showed a zeal for evangelization which resulted in the establishment of their influence throughout Asia, as is seen from the bishoprics founded not only in Syria, Armenia, Arabia and Persia, but at Halavan in Media, Merv in Khorasan, Herat, Tashkent, Samarkand, Baluk, Kashgar, and even at Kambaluk (Pekin) and Singan fu Hsi’en fu in China, and Kaljana and Kranganore in India. In 1265 they numbered 25 Asiatic provinces and over 70 dioceses. Mongolian invasions and Mahommedan tyranny have,’ of course, long since swept away all traces of many of these. The 400,000 Syrian Christians (” Christians of St Thomas,” see Thomas, St) who live in Malabar no doubt owe their origin to Nestorian missionaries, the stories of the evangelization of India by

the Apostles Thomas and Bartholomew having no real historical foundation, and the Indian activity of Pantaenus of Alexandria having proved fruitless, in whatever part of India it may have been exercised. The theology of the Indian Syrian Christians is of a Nestorian type, and Cosmas Indicopleustes (6th century) puts us on the right track when he says that the Christians whom he found in Ceylon and Malabar had come from Persia (probably as refugees from persecution, like the Huguenots in England and the Pilgrim Fathers in America). Pahlavi inscriptions 1 found on crosses at St Thomas's Mount near Madras and at Kottayam in Travancore, are evidence both of the antiquity of Christianity in these places (7th or 8th century), and for the semi-patri- passianism (the apparent identification of all three persons of the Trinity in the sufferer on the cross) which marked the Nestorian teaching. In 745 Thomas of Kana brought a new

1 " In punishment by the cross (was) the suffering of this One; He who is the true Christ, and God alone, and Guide ever pure." ,

band of emigrants from Bagdad and Nineveh, and possibly the name " Christians of St Thomas " arose from confusion between this man and the apostle. Other reinforcements came from Persia in 822, but the Malabar church never developed any intellectual vigour or missionary zeal. They had their own kings, lived as a close caste, and even imitated the Hindus in caste regulations of food and avoidance of pollution. In 1330 Pope John XXII. issued a bull appointing Jordanus, a French Dominican, bishop of Quilon, and inviting the Nestorians to enter " the Christian Church." The invitation was declined, but in the 16th century the Syrian Christians sought the help of the Portuguese settlers against Mussulman oppression, only to find that before long they were subjected to the fiercer perils of Jesuit antagonism and the Inquisition. The Syrians submitted to Rome at the synod of Dam pier in 1599, but it was a forced submission, and in 1653 when the Portuguese arrested the Syrian bishop just sent out by the catholicus of Babylon, the rebellion broke out. The renunciation was not quite thorough, one party adhering to the Roman Church as Romo-Syrians, the Others reverting wholly to Syrian usages and forming to-day about three-fourths of the whole community. In 1665 a curious thing happened. Gregory, the Jacobite metropolitan of Jerusalem, visited Malabar, and, as the people had no consecrated bishop at the time, he consecrated Mar Thomas, who had been filling the office at the people's request, and remained in the country jointly administering the affairs of the Church with Thomas. Thus the Nestorian Church in India, voluntarily and with perfect indifference to theological dogmas, passed under Jacobite rule, and when early .in the 18th century, Mar Gabriel, a Nestorian bishop, came to Malabar, he had a cool reception,

and could only detach a small following of Syrians whom he brought back to the old Nestorianism. The approaches of the Anglican Church through the Church Missionary Society in the first part of the 19th century were politely repelled. On the death of the bishop Mar Athanasius Matthew in 1877, litigation began as to his successor; it lasted ten years, and the decision (since reversed) was given against the party that held by the Nestorian connexion and the habitual autonomy of the Malabar church in favour of the supremacy of the Jacobite patriarch of Antioch. The great need of the Indian Syrian church to-day is an educated ministry. Early evidence of Nestorian missions in China is extant in the tablet found in 1625 at Chang'an in the district of Hsi'en-fu, province of Shensi. It commemorates " the introduction and propagation of the noble law of Ta t'sin in the Middle Kingdom," and beneath an incised cross sets out in Chinese and Syriac an abstract of Christian doctrine and the course of a Syrian mission in China beginning with the favourable reception of Olopan, who came from Judaea in 636. For two generations the little cause prospered, and again after persecutions in 699 and 813. Later on a second mission arrived, many churches were built and several emperors patronized the faith. This evidence is confirmed by (a) the canon of Theodore of Edessa (800) allowing metropolitans of China, India and other distant lands to send their reports to the catholikos every six years; (b) the edict of Wu Tsung destroying Buddhist monasteries and ordering 300 foreign priests to return to the secular life that the customs of the empire might be uniform; (c) two 9th-century Arab travellers, one of whom, Ibn Wahhab, discussed the contents of the Bible with the emperor; (d) the discovery in 1725 of a Syrian MS. containing hymns and a portion of the Old Testament.

In the 10th century the Nestorians introduced Christianity into Tartary proper; in 1274 Marco Polo saw two of their churches. The legend of Prester John is based on the idea of the conversion of a Mongol tribe, the Karith, whose chieftain Ung Khan at baptism received the title Malek Juchana (King John). And there has lately come to light a MS. of the 9th or 10th century in Sogdianese, an Indo-Iranian language spoken in the north-east of Asia,which shows that theNestorians had trans- lated the New Testament into that tongue and had taught the natives the alphabet and the doctrine. Their activity may well be said to have covered the continent. Their campaign was one of deliberate conquest, one of the greatest ever planned by

Christian missionaries. Marco Polo is witness that there were Nestorian churches all along the trade routes from Bagdad to Pekin. (A. J. G.)

§4. The Modern Nestcrians. — The Nestorians or East Syrians (Surayi) of Turkey and Persia now inhabit a district bounded by Lake Urmia, or Urumia, on the east, stretching westwards into Kurdistan, to Mosul on the south, and nearly as far as Van on the north. They are divided into the Persian Nestorians of the plain of Azerbaijan, and the Turkish Nestorians, inhabiting chiefly the sanjak of Hakkiari in the vilayet of Van, who are subdivided into the Rayai or subject, and the Ashiret or tribal, the latter being semi-independent in their mountain fastnesses. Forming at once a church and a nation*, they own allegiance to their hereditary patriarch, Mar Shimun,, Catholicus of the East, who resides at Qudshanis, a village about 7000 ft. above the sea-level, near the Kurdish town of Julamerk. It is only of late years, under the influence of the different missions, that education, ruined by centuries of persecution, has revived amongst the Nestorians; and even now the mountaineers, cut off from the outer world, are as a rule destitute of learning, and greatly resemble their neighbours, the wild and uncivilized Kurds. They are, however, extraordinarily tenacious of their ancient customs, and, almost totally isolated from the rest of Christendom since the 5th century, they afford an interesting study to the eccesiastical student. Their churches are rude buildings, dimly lighted and destitute of pictures or images, save that of the Cross, which is treated with the deepest venera- tion. The qanki, or sanctuary, is divided from the nave, by a solid wall, pierced by a single doorway; it contains the altar, or madhb'kha (literary, the sacrificing place), and may be entered- only by persons in holy orders who are fasting. Here is cele- brated the Eucharist (Qurbana, or the offering; cf. "Corban"), by the priest (qasha), attended by his deacon (shamasha). Vest- ments are worn only at the ministration of the sacraments; incense is used invariably at the Eucharist and frequently at other services. There are three liturgies — of the Holy Apostles, of Theodore and of Nestorius. The first is quite free from Nestorian influence, dates from some remote period, perhaps prior to 431, and is certainly the most ancient of those now in use in Christendom; the other two, though early, are un- doubtedly of later date. The Nestorian canon of Scripture seems never to have been fully determined, nor is the sacra- mental system rigidly defined. Nestorian writers, however, generally reckon the mysteries as seven, i.e. Priesthood, Oil of Unction, the Offering of the Body and Blood of Christ, Absolu- tion, The Holy Leaven, the Signation of the life-giving Cross. The " Holy Leaven " is reputed to be a part of the original bread of the first

Eucharist, brought by Addai and Mari 1 and maintained ever since in the Church; it is used in the confection of the Eucharistic wafers, which are rather thicker than those used in the Western Church. Communion is given in both kinds, as throughout the East; likewise, confirmation is administered directly after baptism. Sacramental confession is enjoined, but has recently become obsolete; prayers for the departed and invocation of saints form part of the services. The bishops are always celibates and are chosen from episcopal families. The service-books were wholly in MS. until the press of the archbishop of Canterbury's mission at Urmia issued the Takhsa (containing the liturgies, baptismal office, &c.) and several other liturgical texts.

The Nestorians commemorate Nestorius as a saint, and invoke his aid and that of his companions. They reject the Third Oecumenical Council, and though showing the greatest devotion tc the Blessed Virgin, deny her the title of Theotokos, i.e. the mother or bearer of God. Their theological teaching is misty and perplexing; their earliest writings contain no error, and the hymns of their great St Ephrem, still sung in their services, are positively antagonistic to " Nestorianism "; their theology dating from the schism is not so satisfactory. They attribute two Kiani, two Qnumi and one Parsopa in

1 The legendary founders of the Syrian Church. Addai was sup- posed to be one of the Seventy of Luke x. 1 , and Mari his disciple.

Christ (see J. F. BethuHe-Baker's Nestorius and his Teaching). To say that the modern Nestorians are not definitely and firmly orthodox is perhaps fairer than to charge them with being distinctly heretical.

§ 5. Missions amongst the Nestorians. — The peculiar circum- stances, both ecclesiastical and temporal, of the Nestorians have attracted much attention in western Christendom, and various missionary enterprises amongst them have resulted.

1. The Roman Catholic Missions. — In Turkey these consist of the Dominican mission, established at Mosul during the 18th century, and in Persia of the French Lazarist mission, which sprang out of some schools established by a French layman and scientific traveller, Eugene Bore, in 1838. At M. Boreas entreaty the Propaganda sent the first Lazarist father to Persia in 1840. The chief stations of the Lazarists are at Khosrova and Urmia. At the latter place there is an orphanage under the superintendence of the Sisters of St Vincent de Paul. The work of these missions is to extend and consolidate that Catholicized and partly Latinized offshoot of the Nestorians known as the Uniat- Chaldean Church (see ante).

2. The American Presbyterian Mission, established in Persia in 1 834-1 835 by the Rev. J ustin Perkins and Dr A. Grant , comprises large buildings near Urmia, a college and a hospital. The influence of this mission does not extend much beyond the Turkish frontier, but it is strong in the Persian plains. The original aim was to influence the old Nestorian Church rather than to set up a new religious body, ■ but the wide difference between Presbyterians and an Oriental Church rendered the attempt abortive, and the result of the labours of the Americans has been the establishment since 1862 of a Syrian Pro-testant community in Persia, with some adherents in Turkey.

3. The Archbishop of Canterbury's Mission to the Assyrian Christians. — This, Anglican mission was promoted by Archbishop Tait, and finally established by Archbishop Benson in 1886. Its aim is thus officially defined: " To aid an existing Church, . . . not to Anglicanize, . . . not to change any doctrines held by them which are not contrary to that faith which the Holy Spirit, speaking through the Oecumenical Councils of the Undivided Church of 'Christ, has taught us as necessary to be believed by all Christians, but … to strengthen an ancient Church, at the earnest request of the Catholicos, and with the knowledge and blessing of the Catholic patriarch of Antioch, one of the four patriarchs of the Holy Orthodox Eastern Church, and occupant of the Apostolic See from which the Church of the East revolted at the time of Nestorius." This mission has its headquarters at Urmia, with a college for candidates for holy orders and a printing-press. Two mission- priests reside in Turkey, one at Qudshanis with Mar Shimun, the Nestorian Catholicus and Patriarch. The Anglican Church in America co-operates with the mission.

4. The Russian Mission. — One of the Nestorian bishops joined the Russian Orthodox Church in 1898, and returned the same year with a small band of missionaries sent by the Holy Synod of Russia. This mission enrolled a very large number of adherents drawn from the old Church, the Protestant Nestorians, and the Uniat- Chaldeans, but it can hardly be said to have commenced any active work, although the Anglican mission withdrew from competition by closing its schools in the dioceses occupied by the Russians.

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NESTORIUS (d. c. 451), Syrian ecclesiastic, patriarch of Constantinople from 428 to 431, was a native of Germanicia at the foot of Mount Taurus, in Syria. The year of his birth is unknown. He received his education at Antioch, probably under ■ Theodore of Mopsuestia. As monk in the neighbouring monastery of Euprepius, and afterwards as presbyter, he became celebrated in the diocese for his asceticism, his orthodoxy and his eloquence; hostile critics, such as the church historian Socrates, allege that his arrogance and vanity were hardly less conspicuous. On the death of Sisinnius, patriarch of Constantinople (December 427), Theodosius II., perplexed by the various claims of the local clergy, appointed the disinguished preacher of Antioch to the vacant see. The consecration took place on the 10th of April 428, and then, almost immediately afterwards, in what is

said to have been his first patriarchal sermon, Nestorius exhorted the emperor in the famous words — " Purge me, O Caesar, the earth of heretics, and I in return will give thee heaven. Stand by me in putting down the heretics and I will stand by thee in putting down the Persians." In the spirit of this utterance, steps were taken within a few days by the new prelate to suppress the assemblies of the Arians; these, by a bold stroke of policy, anticipated his action by themselves setting fire to their meeting- house, Nestorius being forthwith nicknamed " the incendiary." The Novatians and the Quartodecimans were the next objects of his orthodox zeal — a zeal which in the case of the former at least was reinforced, according to Socrates, by his envy of their bishop; and it led to serious and fatal disturbances at Sardis and Miletus. The toleration the followers of Macedonius had long enjoyed was also rudely broken, the recently settled Pela- gians alone finding any respite. While these repressive measures were being carried on outside the pale of the catholic church, equal care was taken to instruct the faithful in such points of orthodoxy as their spiritual head conceived to be the most im- portant or the most in

danger. One of these was that involved in the practice, now grown almost universal, of bestowing the epithet GeoroKos, ” Mother of God,” upon Mary the mother of Jesus. In the school of Antioch the impropriety of the expres- sion had long before been pointed out, by Theodore of Mopsuestia, among others, in terms precisely similar to those afterwards attributed to Nestorius. From Antioch Nestorius had brought along with him to Constantinople a co-presbyter named Anas- tasius, who enjoyed his confidence and is called by Theophanes his ” syncellus.” This Anastasius, in a pulpit oration which the patriarch himself is said to have prepared for him, caused great scandal to the partisans of the Marian cultus then beginning by saying, ” Let no one call Mary the mother of God, for Mary was a human being; and that God should be born of a human being is impossible.” The opposition, which was led by one Eusebius, a”” scholasticus ” or pleader who afterwards became bishop of Dorylaeum, chose to construe this utterance as a denial of the divinity of Christ, and so violent did the dispute upon it become that Nestorius judged it necessary to silence the remonstrants by force. The situation went from bad to worse, and the dispute not only grew in intensity but reached the outer world.

Matters were soon ripe for foreign intervention, and the notorious Cyril (q.v.) of Alexandria, in whom the antagonism between the Alexandrian and Antiochene schools of theology, 1 as well as the jealousy between the patriarchate of St Mark and that of Constantinople, found a determined and unscrupulous exponent, did not fail to make use of the opportunity. He stirred up his own clergy, he wrote to encourage the dissidents at Constantinople, he addressed himself to the sister and wife of the emperor (Theodosius himself being known to be still favour- able to Nestorius), and he beggared the clergy of his own diocese to find bribes for the officials of the court. 2 He also sent to Rome a careful selection of Nestorius’s sayings and sermons. Nestorius himself, on the other hand, having occasion to write to Pope Celestine I. about the Pelagians (whom he was not inclined to regard as heretical), gave from his own point of view an account of the disputes which had recently arisen within his patriarchate. 5 While ordinarily Rome might have been expected to hold the balance between the contrasted schools of thought, as Leo was able later to do, it is not surprising that this implied appeal proved unsuccessful, for Celestine naturally resented any questioning of the Roman decision concerning the Pelagians and was jealous of the growing power of the upstart see of the Nova Roma of the East. He was not slow to use the opportunity of gaining what was at once an official triumph and a personal satisfaction. In a synod which met in 430, he decided in favour of the epithet

1 At Alexandria the mystic and allegorical tendency prevailed, at Antioch the practical and historical, and these tendencies showed themselves in different methods of study, exegesis and presentation of doctrine.

2 Letters of the archdeacon Epiphanius to the patriarch Maxi- mianus (Migne, Patr. Gr. lxxxiv. 826).

‘ The letter is given in F. Loofs, Nestoriana 166-168, partly trans- lated in J. F. Bethune- Baker, Nestorius and his Teaching, p. i6seq.

GeoroKoj, and bade Nestorius retract his erroneous teaching, on pain of instant excommunication, at the same time entrusting the execution of this decision to the patriarch of Alexandria. On hearing from Rome, Cyril at once held a synod and drew up a doctrinal formula for Nestorius to sign, and also twelve ana- themas covering the various points of the Nestorian dogmatic. Nestorius, instead of yielding to the combined pressure of his two great rivals, merely replied by a counter excommunication.

In this situation of affairs the demand for a general council became irresistible, and accordingly Theodosius and Valentinian III. issued letters summoning the metropolitans of the catholic church to meet at Ephesus at Whitsuntide 431, each bringing with him some able suffragans. Nestorius, with sixteen bishops and a large following of armed men, was among the first to arrive; soon afterwards came Cyril with fifty bishops. Juvenal of Jeru- salem and Flavian of Thessalonica were some days late. It was then announced that John of Antioch had been delayed on his journey and could not appear for some days; he, however, is stated to have written politely requesting that the opening of the synod should not be delayed on his account. Cyril and his friends accordingly assembled in the church of the Theotokos on the 22nd of June, and summoned Nestorius before them to give an account of his doctrines. The reply they received was that he would appear as soon as all the bishops were assembled ; and at the same time the imperial commissioner, Candidian, presented himself in person and formally protested against the opening of the synod. Notwithstanding these circumstances, Cyril and the one hundred and fifty-nine bishops who were with him proceeded to read the imperial letter of convocation, and afterwards the letters which had passed between Nestorius and his adversary. Almost immediately the entire assembly with one voice cried out anathema on the impious Nestorius and his impious doctrines, and after various extracts from the writings cf church fathers had been read the decree of his exclusion from the episcopate and from all priestly communion was solemnly read and

signed by all present, whose numbers had by this time swelled to one hundred and ninety-eight. The accused and his friends never had a hearing. As Nestorius himself said, ” the Council was Cyril “; it simply registered the Alexandrian patriarch’s views.

When the decision was known the populace, who had been eagerly waiting from early morning till night to hear the result, accompanied the members with torches and censers to their lodgings, and there was a general illumination of the city. A few days afterwards (June 26th or 27th) John of Antioch arrived, and efforts were made by both parties to gain his ear; whether inclined or not to the cause of his former co-presbyter, he was naturally excited by the precipitancy with which Cyril had acted, and at a conciliabulum of forty-three bishops held in his lodgings shortly after his arrival he was induced by Candidian, the friend of Nestorius, to depose the bishops of Alexandria and Ephesus on the spot. The efforts, however, to give effect to this act on the following Sunday were frustrated by the zeal of the Ephesian mob. Meanwhile a letter was received from the emperor declar- ing invalid the session at which Nestorius had been deposed unheard; numerous sessions and counter-sessions were after- wards held, the conflicting parties at the same time exerting them- selves to the utmost to secure an effective superiority at court. In the end Theodosius decided to confirm the depositions which had been pronounced on both sides, and Cyril and Memnon as well as Nestorius were by his orders laid under arrest. Re- presentatives from each side were now summoned before him to Chalcedon, and at last, yielding to the sense of the evident majority, he gave a decision in favour of the ” orthodox,” and the council of Ephesus was dissolved. Maximian, one of the Constantinopolitan clergy, a native of Rome, was promoted to the vacant see, and Nestorius was henceforward represented in the city of his former patriarchate only by one small con- gregation, which also a short time afterwards became extinct. The commotion which had been thus raised did not so easily subside in the more eastern section of the church; the Antio- chenes continued to maintain for a considerable time an attitude

of antagonism towards Cyril and his creed, and were not pacified until an understanding was reached in 433 on the basis of a new formula involving some material concessions by him. The union even then met with resistance from a number of bishops, who, rather than accede to it, submitted to deposition and expulsion from their sees; and it was

not until these had all died out that, as the result of stringent imperial edicts, Nestorianism may be said to have become extinct throughout the Roman empire. Their school at Edessa was closed by Zeno in 489. As for Nestorius himself, immediately after his deposition he withdrew into private life in his old monastery of Euprepius, Antioch, until 435, when the emperor ordered his banishment to Petra in Arabia. A second decree, it would seem, sent him to Oasis, probably the city of the Great Oasis, in Upper Egypt, where he was still living in 439, at the time when Socrates wrote his Church History. He was taken prisoner by the Blemmyes, a nomad tribe that gave much trouble to the empire in Africa, and when they set him free in the Thebaid near Panopolis (Akhmim) c. 450, they exposed him to further persecution from Schenute the great hero of the Egyptian monks. There is some evidence that he was summoned to the Council of Chalcedon, 1 though he could not attend it, and the concluding portion of his book known as The Bazaar of Heraclides not only gives a full account of the ” Robber Synod ” of Ephesus 449, but knows that Theo- dosius is dead (July 450) and seems aware of the proceedings of Chalcedon and the flight of Dioscurus the unscrupulous successor of Cyril at Alexandria. Nestorius was already old and ailing and must have died very soon after.

The Nestorian Heresy. — What is technically and conventionally meant in dogmatic theology by ” the Nestorian heresy ” must now be noticed. As Eutychianism is the doctrine that the God-man has only one nature, so Nestorianism is the doctrine that He has two complete persons. So far as Nestorius himself is concerned, however, it is certain that he never formulated any such doctrine ; 2 nor does any recorded utterance of his, however casual, come so near the heresy called by his name as Cyril’s deliberately framed third anathema (that regarding the ” physical union ” of the two hypostases or natures) approaches Eutychianism. It must be remembered that Nestorius was as orthodox at all events as Athanasius on the subject of the incarnation, and sincerely, even fanatically, held every article of the Nicene creed. Hefele himself, one of the most learned and acute of Cyril’s partisans, is compelled to admit that Nestorius accurately held the duality of the two natures and the integrity of each, was equally explicitly opposed to Arianism and Apollinarianism, and was perfectly correct in his assertion that the Godhead can neither be born nor suffer; all that he can allege against him is that ” the fear of the communicatio idiomatum pursued him like a spectre.” But in reality the question raised by Nestorius was not one as to the communicatio idiomatum, but simply as to the proprieties of language. ” I cannot speak of God,” he said, ” as being two or three months old,” a remark

which was twisted to his disadvantage. He did not refuse to speak of Mary as being the mother of Christ or as being the mother of Emmanuel, but he thought it improper to speak of her as the mother of God, and Leo in the Letter to Flavian which was endorsed at Chalcedon uses the term ” Mother of the Lord ” which was exactly what Nestorius wished. And there is at least this to be said for him that even the most zealous desire to frustrate the Arian had never made it a part of orthodoxy to speak of David as dtoiri-roip or of James as &5«As. The secret of the enthusiasm of the masses for the analogous expression Theotokos is to be sought not so much in the Nicene doctrine of the incarnation as in the recent growth in the popular mind of notions as to the dignity of the Virgin Mary, which were entirely unheard of (except in heretical circles) for nearly three centuries of the Christian era. That the Virgin should be given a title that was quasi-divine mattered little. The danger was that under cover of such a title an unhistorical con- ception of the facts of the Gospel should grow up, and a false doctrine of the relations between the human and the Divine be encouraged, and this was to Nestorius a double danger that needed to be ex- posed. He was thus forced into the position of one who brings technical objections against a popular term.

The fact that Nestorius was trained at Antioch and inherited the Antiochene zeal for exact biblical exegesis and insistence upon the recognition of the full manhood of Christ, is of the first importance in understanding his position. From the days of Ignatius, down through Paul of Samosata and Lucian to the great controversies of the 5th century which began with the theories of Apollinarius, the theologians of Antioch started from the one sure fact, that

1 Coptic Life of Dioscurus (Rev. Hgyptologique, 1880-1883). ‘ J. F. Bethune-Baker, Nestorius and his Teaching, ch. vi.

Christ lived on earth the life of man, and without questioning the equally genuine Divine element laid stress on this genuine human consciousness. There is no reason to suppose that Nestorius in- tended to introduce any innovations in doctrine, and in any estimate of him his strong religious interest and his fervent pastoral spirit must have due weight. He was a great extempore preacher and exposed to the peril of the unconsidered ” telling ” phrase. That a man of such conspicuous ability, who impressed himself at the outset on the people of Constantinople as an uncompromising opponent of heresy should within a few short years be an excom- municated fugitive, sacrificed to save the face of Cyril and the Alexandrians, is indeed, as Duchesne says, a tragedy. No suc- cessor of Chrysostom was likely to receive

much good-will from the nephew and successor of Theophilus of Alexandria.

It is only within recent years that an attempt has been made to judge Nestorius from some other evidence than that afforded by the accusations of Cyril and the inferences drawn therefrom. This other evidence consists partly of letters from Nestorius, preserved among the works of those to whom they were written, some sermons collected in a Latin translation by Marius Mercator, an African merchant who was doing business in Constantinople at the time of the dispute, and other material gathered from Syriac manuscripts. Since the helpful collection of Nestoriana published by Dr F. Loofs in 1905 there has also come to our knowledge the most valuable evidence of all, Nestorius's own account of the whole difficulty, viz. The Bazaar 3 of Heraclides of Damascus. This pseudonym served to protect the book against the fate that overtook the writings of heretics, and in a Syriac version it was preserved in the Euphrates valley where the followers of Nestorius settled. Ebed Jesu in the 14th century mentions it together with Letters and Homilies, as well as the Tragedy, or a Letters to Cosmas, the Theopaschites (of which some fragments are still extant) and the Liturgy, which is still used by the Nestorian Church. The discovery of The Bazaar, which is the Apologia of Nestorius, was made public by Dr H. Goussen (though members of the Archbishop of Canterbury's Mission to the Assyrian Christians had previously been acquainted with the book). The text has been edited by P. Paul Bedjan (Leipzig, 1910) and a French translation has been made by M. l'abbe F. Nau. A repre- sentative selection of extracts has been given to English readers in J. F. Bethune-Baker's Nestorius and his Teaching (Cambridge, 1908), chapter ii. of which describes the MS. and its accounts. Much of the argument is thrown into the form of a dialogue between (1) Nestorius and an imaginary opponent Superianus, (2) Nestorius and Cyril. The book reveals a strong personality and helps us to know the man and his teaching, even though we have to gather his own views largely from his criticism of his antagonists. He is throughout more concerned for the wrong done to the faith at Ephesus than to himself, saying that if he held the views attributed to him by Cyril he would be the first to condemn himself without mercy. All through the years of conflict he had " but one end in view, that no one should call the Word of God a creature, or the Manhood which was assumed incomplete." In his letters to Celestine he had laid stress on the point that the teaching he attacked was derogatory to the Godhead and so he called its champions Arians. " If the Godhead of the Son had its origin in the womb of the Virgin it was not Godhead as the Father's, and He who was born could not be homoousios with God,

and that was what the Arians denied Him to be." It is thus increasingly difficult to believe that Nestorius was a " Nestorian." Pere J. Mahe has shown (Revue d'Inst. eccUs. July, 1906) that in spite of notable differences of terminology and form the chronologies of Antioch and Alexandria were in essence the same. Personal rather than doctrinal reasons had by far the larger part in determining the fate of Nestorius, who was sacrificed to the agreement between the two great schools. This view is confirmed by the evidence of the Synodicon Orientate (the collection of the canons of Nestorian Councils and Synods), which shows that the Great Syriac Church built up by the adherents of Nestorius and ever memorable for its zeal in carrying the Gospel into Central Asia, China and India cannot, from its inception, be rightly described as other than orthodox. The "attenuated" (i.e. un- " Nestorian ") form which some historians have noted in the early centuries of Persian Nestorianism was really there from the beginning. The Nestorian Church, following its leader, formally recognizes the Letter of Leo to Flavian and the decrees of the Council of Chalcedon. " When I came," said Nestorius (Baz. Herac.), " upon that exposition and read it, I gave thanks to God that the Church of Rome was rightly and blamelessly making confession, even though they happened to be against me personally." His aim, he tells us, had been to maintain the distinct continuance of the two natures of Christ when united through the Incarnation into one Person. " In the Person the natures use their properties mutually. . . . The manhood is the person of the Godhead and the Godhead is the person of the manhood." The ultimate union of these two natures appears to lie in the will — " For there was one and the same will and mind in the union of the natures, so that both should will or not will exactly the same things. The natures have, moreover, a

3 Syriac, tlgurta, lit. " merchandise. " The Greek word may have been invbpiov. Nothing is certainly known of any such Heraclides.

mutual will, since the person of this is the person of that, and the person of that the person of this." The manner in which this union is realized is thus stated by Nestorius: " The Word also passed through Blessed Mary inasmuch as He did not receive a beginning by birth from her, as is the case with the body which was born of her. For this reason I said that God the Word passed and not was born, because He did not receive a beginning from her. But the two natures being united are one Christ. And He who was born of the Father as to the Divinity,

and from the Holy Virgin as to the humanity is and is styled one; for ot the two natures there was a union." It may truly be said that the ideas for which Nestorius and the Antiochene school strove " won the day as regards the doctrinal definitions of the church. The manhood of Christ was safeguarded, as distinct from the Godhead: the union was left an ineffable mystery."

Authorities. — On Nestorius, in addition to the modern literature cited in the article, and the standard histories of dogma (A. Harnack, F. Loofs, R. L. Ottley's Doctrine of the Incarnation, &c) see R. Seeberg, Lehrbuch der Dogmengeschichte, Bd. ii. § 27 (Leipzig, 1910), L. Duchesne, Histoire ancienne de Veglise, vol. iii. chs. x. xi. (Paris, 1910). (J. S. Bl.;A. J. G.)

NESZLER, VICTOR (1841-1890), German musical composer, was born on the 28th of January 1841 at Baldenheim, near Schlettstadt. At Strassburg he began his university career with the study of theology, but he concluded it with the pro- duction of a light opera entitled Fleurette (1864). To complete his knowledge of music Neszler went to Leipzig to study under Hauptmann. His opera Der Trompeter von Sackingen, based on Scheffel's poem, was composed and performed in 1884. Besides a number of other operas, Neszler wrote many songs and choral works; but it is with the Trompeter von Sackingen that his name is associated. He died at Strassburg on the 28th of May 1890. In 1895 a monument to him by Marzolff was erected there.

NET, 1 a fabric of thread, cord or wire, the intersections of which are knotted so as to form a mesh. The art of netting is intimately related to weaving, knitting, plaiting and lace-making, from all of which, however, it is distinguished by the knotting of the intersections of the cord. It is one of the most ancient and universal of arts, having been practised among the most primitive tribes, to whom the net is of great importance in hunting and fishing.

Net-making, as a modern industry, is principally concerned with the manufacture of the numerous forms of net used in fisheries, but netting is also largely employed for many other purposes, as for catching birds, for the temporary division of fields, for protecting fruit in gardens, for screens and other furniture purposes, for ladies' hair, bags, appliances used in various games, &c. Since the early part of the 19th century numerous machines have been invented for netting, and several of these have attained commercial success. Fishing nets were formerly made principally from hemp fibre — technically called " twine "; but since the adaptation of machinery to net-making cotton has been increasingly used, such nets being more flexible and lighter,

and more easily handled and stowed.

The forms of fishing nets vary according to the manner in which they are intended to act. This is either by entangling the fish in their complicated folds, as in the trammel; receiving them into pockets, as in the trawl; suspending them by the body in the meshes, as in the mackerel-net; imprisoning them within their labyrinthrlike chambers, as in the stake-net; or drawing them to shore, as in the seine. The parts of a net are the head or upper margin, along which the corks are strung upon a rope called the head-rope; the foot is the opposite or lower margin, which carries the foot-rope, on which in many cases leaden plummets are made fast. The meshes are the squares composing the net. The width of a net is expressed by the term ” over “; e.g. a day-net is three fathoms long and one over or wide. The lever is the first row of a net. There are also accrues, false meshes or quarterings, .which are loops inserted in any given row, by which the number of meshes is increased. To bread or

‘This is a common Teut. word, of which the origin is unknown; it is not to be connected with ” knit ” or ” knot.” The term ” net,” i.e. remaining after all deductions, charges &c, have been made, as in ” net profit,” is a variant of ” neat,” tidy, clean, Lat. nitidus, shining.

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Fig. 1.

breathe a net is to make a net. Dead netting is a piece without either accrues or stole (stolen) meshes, which last means. that a mesh is taken away by netting into two meshes of the preceding row at once.

Hand-Netting. — The tools used in hand-netting are the needle, an instrument for holding and netting the material ; it is made with an eye E, a tongue T, and a fork F (fig. 1). The twine is wound on it by being passed alternately between the fork and round the tongue, so that the turns of the string lie parallel to the length of the needle; and are kept on by the tongue and fork. A spool or mesh-pin is a piece of round or flat wood on which the loops are formed, the perimeter of the spool determining the size of the loops. Each loop contains two sides of the square mesh; therefore, supposing that it be required to make a mesh 1 in. square — that is, measuring I in. from knot to knot, — a spool 2 in. in circumference must be used. Large meshes may be formed by giving the twine two or more turns round the spool, as occasion may require; or the spool may be made flat, and of a sufficient width. The method of making the hand-knot in nets known

as the fisherman's knot is more easily acquired by example than described in writing. Fig. 2 shows the course of the twine in form- ing a single knot.. From the last-formed knot the twine passes over the front of the mesh-pin h, and is caught behind by the little finger of the left hand, forming the loop s, thence it passes to the front and is caught at d by the left thumb, then through the loops 5 and m as indicated, after which the twine is released by the thumb and the knot is drawn " taut " or tight. Fig. 3 is a bend knot used for uniting two ends of twine.

Machine-Netting. — In 1778 a netting-machine was patented by William Hor- ton, William Ross, Thomas Davies and John Golby. In 1802 the French govern- ment offered a reward of 10,000 francs to the person who should invent an auto- matic machine for net- making. J a c- —

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machine which

was brought under the notice of Napoleon 1. and Carnot, and he was summoned to Paris by the emperor who asked — " Are you the man who pretends to do what God Almighty cannot — tie a knot in a stretched string?" Jac- quard's model, which is incomplete, was de- posited in the Conservatoire des Arts et Metiers; it was awarde" a prize, and he himself received an appointment in the Conservatoire, where he perfected his famous attachment to the com- mon loom. In the United Kingdom, the first to succeed in inventing an efficient machine

and in establishing the industry of machine net-making was James Paterson of Musselburgh. Paterson, originally a cooper, served in the army through the Peninsular War, and was discharged after the battle of Waterloo. He established a net factory in Mussel- burgh about 1820; but the early form of machine was imperfect, the knots it formed slipped readily, and. there being much prejudice against machine nets, the demand was small. Walter Ritchie, native of Musselburgh, devised a method for forming the ordinary hand-knot on the machine nets, and the machine, patented in July 1835, became the foundation of an extensive and flourishing industry.

The Paterson machine is very complex. It consists of an arrangement of hooks, needles and sinkers, one of each being required for every

mesh in the breadth being made. The needles hold the meshes, while the hooks seize the lower part of each and twist it into a loop. Through the series of loops so formed a steel wire is shot, carrying with it twine for the next range of loops. This twine the sinkers successively catch and depress sufficiently to form the two sides and loop of the next mesh to be formed. The knot formed by threading the loops is now tightened up, the last formed mesh is freed from the sinkers and transferred to the hooks, and the process of looping, threading and knotting thus continues.

Another form of net-loom, working on a principle distinct from that of Paterson,' was invented and patented in France by Onesiphore Pecqueur in 1840, and again in France and in the United King- dom in 1849. ■ This machine was improved by many subsequent

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Fig. 2.

Fig. 3.

NETHERLANDS

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Fig. 4.

inventors; especially by Baudouin and Jouannin, patented in the United Kingdom in 1861. In this machine separate threads or

cords running longitudinally for each division of the mesh are em- ployed (fig. 4). It will be observed that the alternate threads a and 6 are differently disposed — the a series being drawn into simple loops over and through which the threads of the b series have to pass. On the machine the a series of threads are arranged vertically, while the b series are placed hori- zontally in thin lenticular spools. Over the horizontal b series is a range of hooks equal in number with the threads, and set so that they seize the 6 threads, raise them, and give them a double twist, thus forming a row of open loops. The loops are then de- pressed, and, seizing the vertical a threads, draw them crotchet-like through the b loops into loops sufficiently long and open to pass right over the spools containing the b threads (fig. 5), after which -r it only remains to tighten the threads and the mesh is complete.

Wire-netting, which is in extensive de- mand for garden use, poultry

coops, and numerous like purposes, is also a twisted structure made principally by machine power. The industry was mainly founded by Charles Barnard in 1844, the first net- ting being made by hand on wooden rollers. The first machine appeared in 1855, and, since that time many devices, generally of extremely complex con- struction, have come into use. The wire chiefly used is common annealed Bessemer or mild steel (see B. Smith, Wire, Its Manufacture and Uses, New Vork, 1891).

NETHERLANDS. The geographical features of the countries formerly known collectively as the Netherlands or Low Countries are- dealt with under the modern English names of Holland and Belgium. Here we are concerned only with their earlier history, which is put for convenience under this heading in order to separate the account of the period when they formed practically a single area for historical purposes from that of the time when Holland and Belgium became distinct administrative units.

The sources of our knowledge of the country down to the 8th century are Caesar's De Bello Gallico, iv., the history of Velleius

Paterculus, ii. 105, the works of Tacitus, the Historia habtouts F rancorum (i.-iii.) of Gregory of Tours, the Fredegar's

Chronica (for the last two of which see D. Bouquet's Recueil de histariens des Gaules et de la France, 1738- 1876). The Netherlands first became known to the Romans through the campaigns of Julius Caesar. He found the country peopled partly by- tribes of Gallo-Celtic, partly by tribes of Germanic stock, the river Rhine forming roughly the line of demarcation between the races. Several of the tribes along the borderland, however, were undoubtedly of mixed blood. The Gallo-Celtic tribes bore the general appellation of Belgae, and among these the Nervii, inhabiting the district between the Scheldt and the Sambre were at the date of Caesar's invasion, 57 B.C., the most warlike and important. To the north of the Meuse, and more especially in the low-lying ground enclosed between the Waal and the Rhine {insula Batavorum) lived the Batavi, a clan of the great Germanic tribe, the Chatti. Beyond these were found the Frisians (q.v.), a people of German origin, who gave their name to the territory between the Rhine and the Ems. Of the other tribes the best known are the Caninefates, Chauci, Usipetes, Sicambri, Eburones, Menapii, Morini and Aduatici.

Julius Caesar, after a severe struggle with the Nervii and their confederates, was successful in bringing the Belgic tribes into Their

subjection to Rome. Under Augustus, 15 B.C., the

relations conquered territory was formed into an imperial with the province, Gallia Belgica, and the frontier line, the Romans. Rhine, was strongly held by a series of fortified camps. With regard to the region north of the Rhine we first obtain information from the accounts of the campaigns of Nero, Claudius,

Drusus and Tiberius. The Batayians were first brought under Roman rule in the governorship of Drusus, a.d. 13. They were not incorporated in the empire, but were ranked as allies, socii or auxilia. Their land became a recruiting ground for the Roman armies, and a base for expeditions across the Rhine. The Batavians served with fidelity and distinction in all parts of the empire, and from the days of Augustus onwards formed a con- siderable part of the Praetorian guard. The Frisians struggled against Roman over-lordship somewhat longer, and it was not until a.d. 47 that they finally submitted to the victorious arms of Domitius Corbulo. The Frisian auxiliaries were likewise regarded as excellent troops.

In the confusion of the disputed succession to the imperial throne after the death of Nero, the Batavians (a.d. 60-70) under the influence of a great leader, known only by his Roman name, Claudius Civilis, rose in revolt. Civilis

The revolt of CIvlUs.

had seen much service in the Roman armies, and was a man of statesmanlike ability. In revenge for his own imprisonment, and the death of his brother by order of Nero, he took advantage of the disorder in the empire not only to stir up his fellow-countrymen to take up arms for independ- ence, but to persuade a large number of German and Belgic tribes to : join forces with them. A narrative of the revolt is given in detail by Tacitus. At first success attended Civilis and the Romans were driven out of the greater part of the Belgic province. Even the great fortress of Castra Vetera (Xanten) was starved into submission and the garrison massacred. But dissensions arose between the German and Celtic elements of Civilis's follow- ing. The Romans, under an able general, Cerealis, took advantage of this, and Civilis, beaten in fight, retired to the island of the Batavians. But both sides were exhausted, and it was arranged that Cerealis and Civilis should meet on a broken bridge over the Nabalia (Yssel) to discuss terms of peace. At this point the narrative of Tacitus breaks off, but it would appear that easy conditions were offered, for the Batavians returned to their position of socii, and were henceforth faithful in their steady

allegiance to Rome. The insula Batavorum, lined with forts, became for a long period the bulwark of the empire against the inroads of the Germans from the north.

Of this period scarcely any record remains, but when at the end of the 3rd century the Franks (q.v.) began to swarm over the Rhine into the Roman lands, the names of the old tribes had disappeared. The peoples within the pnaks frontier had been transformed into Romanized pro- vincials; outside, the various tribes had become merged in the common appellation of Frisians. The branch of the Franks — who were a confederacy, not a people — which gradually over- spread Gallia Belgica, bore the name of the Salian Franks. Nominally they were taken under the protection of the empire, in reality they were its masters and defenders. In the days of their great king Hlbdwig or Clovis (481-51 1) they were in possession of the whole of the southern and central Netherlands. The strip of coast from the mouth of the Scheldt to that of the Ems remained, however, in the hands of the free Frisians (q.v.), in alliance with whom against the Franks were the Saxons (q.v.), who, pressing forward from the east, had occupied a portion of the districts known later as Gelderland, Overyssel and Drente. Saxon was at this period the common title of all the north German tribes; there was but little difference between Frisians and Saxons either in race or language, and they were closely united for some four centuries in common resistance to the encroach- ments of the Prankish power.

The conversion of Clovis and his rude followers to Christianity tended gradually to civilize the Franks, and to facilitate the fusion which soon took place between them and the Gallo-Roman population. It tended also to accentuate cfirtstf- the enmity to the Franks of the heathen Frisians and aa uy. Saxons. In the south (of the Netherlands) Christianity was spread by the labours of devoted missionaries, foremost amongst whom were St Amandus, St Bavon and St Eligius, and bishoprics were set up at Cambrai, Tournai, Arras, Th£rou- anne and Li£ge. In the north progress was much slower, and

though a church was erected at Utrecht by Dagobert I. about a.d. 630, it was destroyed by the Frisians, who remained obstin- ately heathen. The first successful attempt to convert them was made, under the powerful protection of Pippin of Heristal, by Willebrord, a Northumbrian monk, who became, a.d. 695, the first bishop of Utrecht (see Utrecht). His labours were continued with even more striking results by another English- man, Winfred, better known as St Boniface, the Apostle of the Germans, who suffered martyrdom at Dokkum in a.d. 754 at the hands of some heathen Frisians. The complete conversion was, however, in the end due rather to the arms of the Carolingian kings than to the unaided efforts of the missionaries. Towards the end of the century, Charlemagne, himself a Netherlander by descent and ancestral possessions, after a severe struggle, thoroughly subdued the Frisians and Saxons, and compelled them to embrace Christianity.

In the triple partition of the Carolingian empire at Verdun in 843, the central portion was assigned to the emperor Lothaire, separating the kingdoms of East Francia (the later Ifltwer Germany) from West Francia (the later France). Lorraine. This middle kingdom formed a long strip stretching across Europe from the North Sea to Naples, and embraced the whole of the later Netherlands with the exception of the portion on the left bank of the Scheldt, which river was made the boundary of West Francia. On the death of the emperor, his son Lothaire II. received the northern part of his father's domain, known as Lotharii or Hlutharii Regnum, corrupted later into Lotharingia or Lorraine. Lothaire had no heir, and in 870 by the treaty of Meerssen his territory was divided between the kings of East and West Francia. In 879 East Francia acquired the whole; from 912 to 924 it formed part of West Francia. Finally in 924 Lorraine passed in the reign of

Henry the Fowler under German (East Frankish) overlordship. Henry's son, Otto the Great, owing to the disordered state of the country, placed it in 953 in the hands of his able brother, Bruno, archbishop of Cologne, for pacification. Bruno, who kept for himself the title of archduke, divided the territory into the two duchies of Upper and Lower Lorraine. Godfrey of Verdun was invested by him with the government of Lower Lorraine (Nieder-Lothringen). The history of the Netherlands from this time forward— with the exception of Flanders, which continued to be a fief of the French kings — is the history of the various feudal states into which the duchy of Lower Lorraine was gradually broken up.

It is a melancholy history, telling of the invasion of the North- men, and of the dynastic struggles between the petty feudal Growth sovereigns who carved out counties and lordships of the for themselves during the dark centuries which feudal followed the fall of the Carolingian empire. It was a states. time of oppression and cruelty, and of war and devasta- tion, during which the country remained chiefly swamp and tangled woodland, with little communication save up and down the rivers and along the old Roman roads. Its remoteness from the control of the authority of the German and French kings, together with its inaccessibility, gave special facilities in Lower Lorraine to the growth of a number of practically independent feudal states forming a group or system apart. Chief among these states were the duchy of Brabant, the counties of Flanders, Hainault, Holland, Gelderland, Limburg and Luxemburg, and the bishoprics of Utrecht and Liege. For their separate local histories and their dynasties, their wars and political relations with one another and with neighbouring countries, reference must be made to the separate articles Flanders, Holland, Brabant, Gelderland, Limburg, Luxemburg, Utrecht, Liege.

During the 9th and 10th centuries the Netherlands suffered cruelly from the attacks of the Northmen, who ravaged the The la- shores and at times penetrated far inland. In 834 vasions Utrecht and Dorestad were sacked, and a few years »f the later all Holland and Friesland was in their hands. orthmta. year after year the raids went on under a succession of leaders — Heriold, Roruk, Rolf, Godfrey — and far and wide

there was pillaging, burning, murder and slavery. In 873 Rolf seized Walcheren, and became the scourge of the surrounding districts. In 880 the invaders took Nijmwegen, erected a permanent camp at Elsloo and pushed on to the Rhine. Liege, Aix-la-Chapelle, Cologne and Bonn fell into their hands. The emperor, Charles the Fat, was roused to collect a large army, with which he surrounded the main body of the

Northmen under their leader Godfrey in the camp at Elsloo. But Charles pre- ferred negotiation and bribery to fighting. Godfrey received a large sum of money, was confirmed in the possession of Fries- land, and on being converted to Christianity in 882, received in marriage Gisela, daughter of Lothaire II. Three years later, however, Godfrey was murdered, and although the raids of the Northmen did not entirely cease for upwards of another century, no further attempt was made to establish a permanent dynasty in the land.

At the close of the nth century the system of feudal states had been firmly established in the Netherlands under stable dynasties hereditary or episcopal, and, despite the continual wars between them, civilization had begun to crusades. develop, orderly government to be carried on, and the general condition of the people to be less hopeless and miserable. It was at this time that the voice of Peter the Hermit roused the whole of western Europe to enthusiasm by his preaching of the first crusade. Nowhere was the call responded to with greater zeal than in the Netherlands, and nowhere had the spirit of adventure and the stimulus to enterprise, which was one of the chief fruits of the crusades, more permanent effects for good. The foremost heroes of the first crusade were Netherlanders. Godfrey of Bouillon, the leader of the expedition and the first king of Jerusalem, was duke of Lower Lorraine, and the names of his brothers Baldwin of Edessa and Eustace of Boulogne, and of Count Robert II. of Flanders are only less famous. The third crusade numbered among its chiefs Floris III. of Holland, Philip of Flanders, Otto I. of Gelderland and Henry I. of Brabant. The so-called Latin crusade of 1203 placed the imperial crown of Constantinople on the head of Baldwin of Flanders. At the siege and capture of Damietta (12 18) it was the contingent of North-Netherlanders (Hollanders and Frisians under Count William I. of Holland) who bore the brunt of the fighting and specially distinguished themselves. To the Netherlands, as to the rest of western Europe, the result of the crusades was in the main advantageous. They broke down the intense narrowness of the life of those feudal times, enlarged men's conceptions and intro- duced new ideas into their minds. They first brought the products and arts of the Orient into western Europe; and in the Netherlands, by the impulse that they gave to commerce, they were one of the primary causes of the rise of the chartered towns. Little is known about the Netherland towns before the 12th century. The earliest charters date from that period. No place was reckoned to be a town unless it had received a charter from its sovereign or its local lord. The charters were of the nature of a treaty between the city and its feudal lord, and they differed much in character according to the importance of the place and the pressure it

was able to put upon its sovereign. The extent of the rights which the charter conceded determined whether the town was a free town (wye stadt — villa franca) or a commune {gemeente — communia). In the case of a commune the concessions included generally the right of inheritance, justice, taxation, use of wood, water, &c. The lord's representative, entitled " justiciary " (schout) of " bailiff " (baljuw), presided over the administration of justice and took the command of the town levies in war. The gemeente — consisting only of those bound by the communal oath for mutual help and defence — elected their own magistrates. These electors were often a small proportion of the whole body of inhabitants: sometimes a few influential families alone had the right, and it became hereditary. This governing oligarchy was known as " the patricians." The magistrates bore the name of scabini (schepenen or (chevins), and at their head was the seigneurial official — the schout or baljuw. These schepenen appointed in their turn from the

Rise of the cities In the Nether- lands.

citizens to assist them a body of sworn councillors (gezworenen or jures), whose presidents, styled " burgomasters," had the supervision of the communal finances. Thus grew up a number of municipalities — practically self-governing republics — semi- independent feudatories in the feudal state.

The most powerful and flourishing of all were those of Flanders — Ghent, Bruges and Ypres. In the 13th century these towns The had become the seat of large industrial populations

Flemish (varying according to different estimates from 100,000 «"»- to 200,000 inhabitants), employed upon the weaving

muaes. qC cloth ^^ itg dependent i n d us t r ies, and closely bound up by trade interests with England, from whence they obtained the wool for their looms. Bruges, at that time connected with the sea by the river Zwijn and with Sluis as its port, was the central mart and exchange of the world's commerce. In these Flemish cities the early oligarchic form of municipal government speedily gave way to a democratic. The great mass of the townsmen organized in trade gilds — weavers, fullers, dyers, smiths, leather-workers, brewers, butchers, bakers and others, of which by far the most powerful was that of the

weavers — as soon as they became conscious of their strength rebelled against the exclusive privileges of the patricians and succeeded in ousting them from power. The patricians (hence called leliaerts) relied upon the support of the French crown, but the fatal battle of Courtrai (1302), in which the handicraftsmen (clauwaerts) laid low the chivalry of France, secured the triumph of the democracy. The power of the Flemish cities rose to its height during the ascendancy of Jacques van Artevelde (1285-1345), the famous citizen-statesman of Ghent, but after his downfall the mutual jealousies of the cities undermined their strength, and with the crushing defeat of Roosebeke (1382) in which Philip van Artevelde perished, the political greatness of the municipalitieshad entered upon its decline.

In Brabant — Antwerp, Louvain, Brussels, Malines(Mechlin) — and in the episcopal territory of Liege — Liege, Huy, Dinant — Other there was a feebler repetition of the Flemish conditions. Nether Flourishing communities were likewise to be found in land Hainault, Namur, Cambrai and the other southern

“auuel. districts of the Netherlands, but nowhere else the

vigorous independence of Ghent, Bruges and Ypres, nor the splendour of their civic life. In the north also the 13th century was rich in municipal charters. Dordrecht, Leiden, Haarlem, Delft, Vlaardigen, Rotterdam in Holland, and Middle- burg and Zierikzee in Zeeland, repeated with modifications the characteristics of the communes of Flanders and Brabant. But the growth and development of the northern communal movement, though strong and instinct with life, was slower and less tempestuous than the Flemish. In the bishopric of Utrecht, in Gelderland and Friesland, the privileges accorded to Utrecht, Groningen, Zutphen, Stavoren, Leeuwarden followed rather on the model of those of the Rhenish ” free cities ” than of the Franco-Flemish commune. In the northern Netherlands gener- ally up to the end of the 14th century the towns had no great political weight; their importance depended upon their river commerce and their markets. Thus at the close of the 14th century, despite the constant wars between the feudal sovereigns who held sway in the Netherlands, the vigorous municipal life had fostered industry and commerce, and had caused Flanders in particular to become the richest possession in the world.

It was precisely at this time that Flanders, and gradually the other feudal states of the Netherlands, by marriage, purchase,

treachery or force, fell under the dominion of the guadiln ho use of

Burgundy. The foundation of the Burgundian dominion. ru ‘ e in the Netherlands was laid by the succession of

Philip the Bold to the counties of Flanders and Artois in 1384 in right of his wife Margaret de Male. In 1404 Antony, Philip’s second son (killed at Agincourt 141 5), became duke of Brabant by bequest of his great-aunt Joan. The consolidation of the Burgundian power was effected by Philip the Good, grandson of Philip the Bold, in his long and successful reign of 48 years, ˆ10-1467. He inherited Flanders and Artois, purchased the county of Namur (1427) and compelled his cousin Jacqueline,

the heiress of Holland, Zeeland, Hainault and Friesland, to surrender her possessions to him, 1428. On the death in 1430 of his cousin Philip, duke of Brabant, he took possession of Brabant and Limburg; the duchy of Luxemburg he acquired by purchase, 1443- He made his bastard son David bishop of Utrecht, and from 1456 onwards that see continued under Burgundian influence. Two other bastards were placed on the episcopal throne of Liege, an illegitimate brother on that of Cambrai. Philip did not live to see Gelderland and Liege pass definitively under his rule; it was reserved for his son, Charles the Bold, to crush the independence of Liege (1468) and to incorporate Gelderland in his dominions (1473).

This extension of dominion on the part of the dukes of Bur- gundy implied the establishment of a strong monarchical authority. They had united under their sway a number of provinces with different histories and institutions £*”* **” and speaking different languages, and their aim was to centralize the government. The nobility and clergy were on the side of the ducal authority; its opponents were the munici- palities, especially those of Flanders. Their strength had been seriously weakened by the overthrow of Roosebeke, but Philip on his accession found them once more advancing rapidly in power and prosperity. He was quite aware that the industrial wealth of the great Flemish communes was financially the main- stay of his power, but their very prosperity made them the chief obstacle to his schemes of unifying into a solid dominion the loose aggregate of states over which he was the ruler. On this matter Philip would brook no opposition. Bruges was forced after strenuous resistance to submit to the loss of its most cherished privileges in 1438, and the revolt of Ghent was quenched in the ” red sea ” (as it was styled) of Gavre in T453. The splendour and luxury of the court of Philip surpassed that of any contemporary sovereign. A permanent memorial of it remains in the famous Order of the Golden Fleece, which was instituted by the duke at Bruges in 1430 on the occasion of his marriage with Isabel of Portugal, a descendant

of John of Gaunt, and was so named from the English wool, the raw material used in the Flemish looms, for which Bruges was the chief mart. The reign of Philip, though marred by many acts of tyranny and harshness, was politically great. Had his successor been as prudent and able, he might have made a unified Netherlands the nucleus of a mighty middle kingdom, interposing between France and Germany, and a revival of that of the Carolingian Lothaire.

Before the accession of Charles, the only son of Philip, two steps had been taken of great importance in the direction of unification. The first was the appointment of a grand council with supreme judicial and financial functions, Si/lStf whose seat was finally fixed at Malines (Mechlin) in 1473; tne other the summoning of deputies of all the provincial "states " of the Netherlands to a states-general at Brussels in 1465. But Charles, rightly surnamed the Bold or Head- strong, did not possess the qualities of a builder of states. Im- patient of control and hasty in action, he was no match for his crafty and plotting adversary, Louis XI. of France. His ambition, however, was boundless, and he set himself to realize the dream of his father — a Burgundian kingdom stretching from the North Sea to the Mediterranean. At first all went well with him. By his ruthless suppression of revolts at Dinant and Liege he made his authority undisputed throughout the Netherlands. His campaigns against the French king were .conducted with success. His creation of a formidable standing army, the first of its kind in that age of transition from feudal conditions, gave to the Burgundian power all the outward semblance of stability and permanence. But Charles, though a brave soldier and good military organizer, was neither a capable statesman nor a skilful general. He squandered the resources left to him by his father, and made himself hateful to all classes of his subjects by his exactions and tyranny. When at the very height of power, all his schemes of aggrandisement came to sudden ruin through a succession of disastrous defeats at the hands of the Swiss at Grandson (March 2, 1476), at Morat (June 22, 1476)

and at Nancy (January 5, 1477). At Nancy Charles was himself among the slain, leaving his only daughter Mary of Burgundy, then in her twentieth year, sole heiress to his possessions.

The catastrophe of Nancy threatened the loosely-knit Bur- gundian dominion with dissolution. Louis XI. claimed the Mary of reversion of the French fiefs, and seized Burgundy, Burgundy Franche Comte and

Artois. But the Netherland and Maxh provinces, though not loving the Burgundian dynasty, mitton at jˆ n0 (j es i re to have a French master. Deputies us ”’ representing Flanders, Brabant, Hainault and Holland met at Ghent, where Mary was detained almost as a prisoner, and compelled her (February 10, 1477) to sign the ” Great Privilege.” This charter provided that no war could be declared nor marriage concluded by the sovereign, nor taxes raised without the assent of the states, that natives were alone eligible for high office, and that the national language should be used in public documents. The central court of justice at Malines was abolished, but the Grand Council was reorganized and made thoroughly representative. The Great Privilege was supplemented by provincial charters, the Flemish Privilege granted (February 10), the Great Privilege of Holland and Zeeland (February 17), the Great Privilege of Namur and the Joyeuse Entree of Brabant, both in May, thus largely curtailing the sovereign’s power of interference with local liberties. On these conditions Mary obtained, the hearty support of the states against France, but her humiliations were not yet at an end; two of her privy councillors, accused of traitorous intercourse with the enemy, were, despite her entreaties, seized, tried and beheaded (April 3). Her marriage four months later to Maximilian of Austria was the beginning of the long domination of the house of Habsburg. The next fifteen years were for Maximilian a stormy and difficult period. The duchess Mary died from the effects of a fall from her horse (March 1482), and Maximilian became regent (mambourg) for his son. The peace of Arras with France (March 1483) freed him to deal with the dis- cords in the Netherland provinces, and more especially with the turbulent opposition in the Flemish cities. With the submission of Ghent (June 1485) the contest was decided in favour of the archduke, who in 1494, on his election as emperor, Joanna.” was a ˆˆ e to hand over the country to his son Philip in a comparatively tranquil and secure state. Philip, surnamed the Fair, was fifteen years of age, and his accession was welcomed by the Netherlanders with whom Maximilian had never been popular. Gelderland, however, which had revolted after Nancy, had Charles of Egmont for its duke, and the two bishoprics of Liege and Utrecht were no longer subject to Burgundian authority. In 1496 Philip married Joanna of Aragon, who in 1 500 became heiress apparent to Castile and Aragon. That same year she gave birth at Ghent to a son, afterwards the emperor Charles V. Philip’s reign in the Nether- lands was chiefly noteworthy for his efforts for the revival of trade with England. On the death of Queen Isabel, Philip and Joanna succeeded to the crown of Castile and took up their residence in their new kingdom (January 1506). A few months later Philip unexpectedly died at Burgos (September 25th). His Burgundian lands passed without

opposition to his son Charles, then six years of age.

The claim of the emperor Maximilian to be regent during the minority of his grandson was recognized by the states-general. Masimilian nominated his daughter Margaret, widow ofAjistrla. °^ Philibert, duke of Savoy, to act as governor-general, and she filled the difficult post for eight years with great ability, courage and tact; and when Charles at the age of fifteen assumed the government he found the Netherlands thriving and prosperous. In the following year, by the death of Ferdinand of Aragon, his maternal grandfather, and the, incapacity of his mother Joanna, who had become hopelessly insane, he succeeded to the crowns of Castile and Aragon, which carried with them large possessions in Italy and the dominion of the New World of America. In 1519 Maximilian died, and the following year his grandson, now the head of the house

of Austria, was elected emperor. Charles V. had been born and brought up in the Netherlands, and retained a strong predilection for his native country, but necessarily he had to pass a, arles y. the larger part of his life, at that great crisis of the world's history, in other lands. During his frequent absences he entrusted the government of the Netherlands to the tried hands of his aunt, Margaret, who retained his confidence until her death (November 1530), and secured the affection of all Netherlanders. Margaret was assisted by a permanent council of regency, and there was a special minister charged with the administration of the finances, sometimes under the name of superintendent of the finances, sometimes under the title of treasurer-general and controller-general. The duties of this minister were of special importance, for it was to the Netherlands that Charles looked for much of the resources wherewith to carry on his many wars. During this time Charles consolidated his dominion over the Netherlands. In 1524 he became lord of Friesland by purchase, and in 1528 he acquired the tempor- alities of Utrecht. He now ruled over seventeen provinces — i.e. four duchies, Brabant, Gelderland, Limburg and Luxemburg; seven counties, Flanders, Artois, Hainault, Holland, Zeeland, Namur and Zutphen; the margraviate of Antwerp; and five lordships— Friesland, Mechlin, Utrecht, Overyssel, and Groningen with its dependent districts.

After the death of Margaret, Charles appointed his sister Mary, the widowed queen of Hungary, to the regency, and for twenty years she retained her post, until the abdication in fact of Charles V. in 1555. She too governed ably, Hungary. though in entire subservience to her nephew, but was not in such intimate touch with the national peculiarities of the Netherlanders as her predecessor. At the time of

her accession to office Charles changed the form of administration by the creation of three separate councils, those of State, of Finance, and the Privy Council. The regent was president of the council of state, of which the knights of the Golden Fleece were members. The policy of Charles towards the Netherlands was for many years one of studied moderation. He redressed many grievances, regulated the administration of justice, encouraged commerce, reformed the coinage, but as time went on he was compelled to demand larger subsidies and to take severer measures against heretical opinions. Mary was forced to impose taxation which met with violent resistance, especially in 1539 from the stiff-necked town of Ghent. The emperor himself was obliged to intervene. On the 14th of February 1540 he entered Ghent at the head of a large army and visited the city with severe punishment. All its charters were annulled, its privileges and those of its gilds swept away, and a heavy fine imposed. It was a lesson intended to teach the Netherlanders the utter futility of opposition to the will of their lord. The struggle, however, with the Protestant princes of Germany not only led to continual demands of Charles for men and money from his Netherland dominions, but to his determination to prevent the spread of Protestant opinions; and a series of edicts was passed, the most severe of which (that of 1550) wa,s carried put with extreme rigour. Its preamble stated that its object was ” to exterminate the root and ground of this pest.” By its enactments, men holding heretical opinions were condemned to the stake, women to be buried alive. Yet despite the efforts of the government the Reformation made progress in the land. In 1 548 Charles laid before the states a scheme for making the Netherlands an integral part of the empire under the name of the Circle of Burgundy; but the refusal of the German Electors to make his only son Philip king of the Romans led him to abandon the project, which was never renewed. Already the emperor was beginning to feel weary of the heavy burdens which the government of so many realms had imposed upon him, and in 1549 he presented Philip to the states of the Netherlands, that they might take the oath of allegiance to him, and Philip swore to maintain all ancient rights, privileges and customs.

The abdication of Charles V. took place on the 25th of October 1555 in the great hall of the palace at Brussels, and Philip II. entered upon his long and eventful reign. His external policy

was at first successful. Chiefly through the valour of Lamoral, count of

Egmont, two great victories were won over the French Phiu tt at ˆ t Q uen ti Q (August ro, 1557) and at Gravelines

(July 13, 1558)* The terms of the treaty of Cateau- Cambresis (February 1559) were entirely favourable to Philip. Internal difficulties, however, confronted him. His proposal to impose a tax of 1 % on real property and of 2 % on movable property was rejected by all the larger provinces. As a thorough Spaniard who did not even understand the language of his Netherland subjects Philip was from the first distrusted and his acts regarded with suspicion. He himself never felt at home at Brussels, and in August 1559 he set sail for Spain, never again to revisit the Netherlands.

He appointed as regent, Margaret, duchess of Parma, a natural daughter of Charles V. by a Flemish mother, and like the other

women of the House a strong and capable ruler. afparma. ˆ ne was nominally assisted by the members of the

three councils — the Council of State, the Privy Council

and the Council of Finance, but in reality all power had been

placed by Philip in the hands of three confidential councillors

styled the Consulla — Barlaymont, president of the Council

of Finance, Viglius, president of the Privy Council, and Antony

Perrenot, bishop of Arras, better known by his later title as

Cardinal Granvelle. This extremely able man, a Burgundian

by birth, was the son of one of Charles V.‘s most trusted

councillors, and it was largely to him that the government

of the Netherlands was confided. Two burning questions at

the outset confronted Margaret and Granvelle — the question

of the new bishoprics and the question of the presence in the

Netherlands of a number of Spanish troops. The proposal to

reorganize the bishoprics of the Netherlands was not a new one,

but was the carrying out of a long-planned project of Charles V. In 1555 there were but three dioceses in the Netherlands — those of Tournay, Arras and Utrecht, — all of unwieldy size and under the* jurisdiction of foreign metropolitans. It was proposed now to establish a more numerous hierarchy, self-contained within the limits of Burgundian rule, with three archbishops and fifteen diocesans. The primatial see was placed at Malines (Mechlin), having under it Antwerp, Hertogenbosch, Roermond, Ghent, Bruges, and Ypres constituting the Flemish province; the second archbishopric was at Cambray, with Tournay, Arras, St Omer, and Namur, — the Walloon province; the third at Utrecht, with Haarlem, Middleburg, Leeuwarden, Groningen and Deventer, — the northern (Dutch) province. All these with the exception of Cambray and St Omer were within the boundaries of the Netherlands. The scheme aroused almost universal distrust and opposition. It was believed that its object was the introduction of the dreaded form of the Inquisition established in Spain, and in any case more systematic and stringent measures for the stamping out of heresy. It excited also the animosity of the nobles jealous of their privileges, and of the monasteries, which were called upon to furnish the revenues for the new sees. ‘ Granvelle was made first archbishop of Malines, and all the odium attaching to the increase of the episcopate was laid at his door, though he was in reality opposed to it. The continued

presence of the Spanish troops caused also great dissatisfaction. The Netherlanders detested the Spaniards and everything Spanish, and this foreign mercenary force, together with the new bishops, was looked upon as part of a general plan for the gradual overthrow of their rights and liberties. So loud was the outcry that Margaret and Granvelle on their own responsibility sent away the Spanish regiments from the country (January 1561). The most serious difficulty with which Margaret had to deal arose from the attitude of the great nobles, and among these especially of William (the ” Silent “) of Nassau, prince of Orange, Lamoral, count of Egmont, and Philip de Montmorency, count of Hoorn. These great magnates, all of them Knights of the Fleece and men of peculiar weight and authority in the country, were disgusted to find that, though nominally councillors of state, their advice was never asked, and that all power was placed in the hands of the Consulta. They began to be alarmed by the severity with which the edicts against heresy were being

carried out, and by the rising indignation among the populace. William, Egmont, and Hoorn therefore placed themselves at the head of a league of nobles against Granvelle (who had become cardinal in 1561) with the object of undermining his influence and driving him from power. They resigned their positions as councillors of state, and expressed their grievances personally . to Margaret and by letter to the king in Madrid, asking for the dismissal of Granvelle. The duchess, herself aggrieved by the dictatorial manners of the cardinal, likewise urged upon her brother the necessity of the retirement of the unpopular minister. At last Philip, unwillingly gave way,, and he secretly suggested to the cardinal that he should ask per- mission from

the regent to visit his mother at Besancon. Granvelle left Brusselsonthe 13th of March 1564, never to return. But the king was only temporizing; he had no intention of changing his policy. He did but bide his time.

The Council of Trent had recently brought its long labours to a close (December 4, 1563), and Philip resolved to enforce its decrees throughout his dominions. He issued an order to that effect (August 18, 1564), and it was sent £ˆ „ to the duchess of Parma for publication. The nobles decrees. protested, and Egmont was deputed to go to Madrid and try to obtain from the king a mitigation of the edicts and redress of grievances. Philip was inexorable. The activity of the Inquisition was redoubled, and persecution raged throughout the Netherlands. Everywhere intense indignation was aroused by the cruel tortures and executions. In the presence of the rising storm the duchess was bewildered, seeing clearly the folly of the policy she was obliged to carry out no less than its difficulty. Following the example of William of Orange, Hoorn, Berghqn and other governors, the magistrates generally declined to enforce the edicts, and offered to resign rather than he the instruments for burning and maltreating their fellow-countrymen. It was at this time that the lesser nobility, foremost among whom were Louis of Nassau (brother of William), Philip de Marnix, lord of Sainte Aldegonde, and Henry, count of Brederode, began to organize resistance, and in 1 566 a confederacy „rooito™" was formed, all the members of which signed a docu- ment called "The Compromise," by which they bound themselves to help and protect one another against persecution, and to extirpate the Inquisition from the land. The signatories drew up a petition, known as the " Request," which was presented by the confederates to the regent (April 5, 1566) in the council chamber at Brussels. As they approached, Barlaymont had been heard to say to Margaret, "What, Madam, is your Highness afraid of these beggars (gueux)~t" Beggars. The phrase was seized upon and made a party name, and it became the fashion for patriots to wear beggar's garb and a medal round the neck, bearing Philip's image on one side and a wallet on the other, with two hands crossed, and the legend Fideles au roi jusqu'd la besace.

William of Orange, Egmont, and Hoorn were alarmed at ,the violent passions that had been aroused, and held aloof at first from Brederode and his companions. At their instance, and carrying with them instructions from the regent and the council, the marquis of Berghen and Hoorn's brother (the lord of Mon- tigny) were persuaded to go to Spain and lay before Philip the serious character of the crisis. Philip received them courteously, but took care that neither of them should

return home. Mean- while in the Netherlands the sectaries had been making rapid headway in spite of the persecution. Open-air conventicles were held in all parts of the provinces, and the fierce Calvinist preachers raised the religious excitement of their hearers to such a pitch that it found vent in a furious outburst c/ggˆ of iconoclasm. During the month of August bands of fanatical rioters in various parts of the country made havoc in the churches and religious houses, wrecking the altars, smashing the images and pictures, and carrying off the sacred vessels and other treasures on which they could lay their hands. These acts of wild and sacrilegious destruction reached their climax at Antwerp (August 16 and 17), where a small body of rioters forced their way into the cathedral and were permitted without

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any interference on the part of the magistracy to wreak their will upon its spendid and priceless contents.

The effect of the outbreak was in every way disastrous. The regent was alienated from the popular leaders, and was no longer disposed to help William of Orange, Egmont, and Hoorn to secure a mitigation of religious persecution; and the heart of Philip was hardened in its resolve to exterminate heresy in the Nether- lands. He dissembled until such time as he could despatch his greatest general, the duke of Alva, to Brussels at the head of a picked force to crush all opposition.

William of Orange was not deceived by the specious temporiz- ing of the king. He foresaw the coming storm, and he did his utmost to induce Egmont, Hoorn and other prominent Oraaze. members of the patriotic party to unite with him in taking measures for meeting the approaching danger. Egmont and Hoorn refused to do anything that might be con- strued into disloyalty”, in these circumstances William felt that the time had come to provide for his personal safety. He with- drew (April 1567) first to his residence at Breda, and then to the ancestral seat of his family at Dillenburg in Nassau.

Margaret of Parma meanwhile, with the aid of a considerable body of German mercenaries, had inflicted exemplary punish- Pualsh- rnent upon the iconoclasts and Calvinist sectaries. meat of A body of some 2000 men drawn principally from the sect- Antwerp were cut to pieces

at Austruweel (March 13, ■***• 1567), and their leader John de Marnix, lord of Thou-

seule, slain. Valenciennes, the chief centre of disturbance in the south, was besieged and taken by Philip de Noircarmes, governor of Hainault, who inflicted a savage vengeance (April 1567). The regent therefore represented to her brother that the disorders were entirely put down and that the time had come to show mercy. But Philip's preparations were now complete, and Alva set out from Italy at the head of a force of some 10,000 veteran troops, Spaniards and Italians, afterwards increased by a body of Germans, with which, after marching through Bur- gundy, Lorraine and Luxemburg, he reached the Netherlands (August 8), and made his entry into Brussels a fortnight later.

The powers conferred on Alva were those of military dictator.

The title of regent was left to the duchess Margaret, but she

speedily sent in her resignation, which was accepted

V™ »# (October 6). Before this took place events had been

of Blood, moving fast. On the 9th of September Egmont and

Hoorn were arrested as they left a council at the duke's

residence and were confined in the castle of Ghent. At the same

time Orange's friend, the powerful burgomaster of Antwerp,

Anthony van Stralen, was seized. The next step of Alva was

to create a special tribunal which was officially known as the

" Council of Troubles," but was popularly branded with the name

of the " Council of Blood," and as such it has passed down to

history. As a tribunal it had no legal status. The duke himself

was president and all sentences were submitted to him. Two

members only, Vargas and del Rio, both Spaniards, had votes.

A swarm of commissioners ransacked the provinces in search of

delinquents, and the council sat daily for hours, condemning the accused, almost without a hearing, in batches together. The executioners were ceaselessly at work with stake, sword and gibbet. Crowds of fugitives crossed the frontier to ouaimed. see ‘ i re fuge m Germany and England. The prince of Orange was publicly declared an outlaw and his property confiscated (January 24, 1568). A few weeks later his eldest son, Philip William, count of Buren, a student at the university of Louvain, was kidnapped and carried off to Madrid. William had meanwhile succeeded in raising a force in Germany with which his brother Louis invaded Friesland. He gained a victory at Heiligerlee (May 23) over a Spanish force under Count Aremberg. Aremberg himself was killed, as was Adolphus of Nassau, a younger brother of William and Louis. But Alva himself took the field, and at Jemmingen (July 21) completely annihilated the force of Louis, who himself narrowly escaped with his life. One result of the victory of Heiligerlee was the determination of Alva that Egmont and Hoorn

should die before he left Brussels for the campaign in Friesland. They were pronounced by the Council of Blood to be guilty of high treason (June 2, 1568). Bxeoition On the 6th of June they were beheaded before the andHoora. Broodhuis at Brussels.

A few months after the disaster of Jemmingen, Orange, who had now become a Lutheran, himself led a large army into Brabant. He was met by Alva with cautious tactics. The Spaniards skilfully avoided a battle, and in Atva November the invaders were compelled to withdraw an ” mP across the French frontier through lack of resources, and were disbanded. Alva was triumphant; but though Alva’s master had

supplied him with an invincible army, he was unable to furnish him with the funds to pay for it. Money had to be raised by taxation, and at a meeting of the states-general (March 20, 1569) the governor-general proposed (1) an immediate tax of 1% on all property, (2) a tax of 5% on all transfers of real estate, (3) a tax of 10% on the sale of all articles of commerce, the last two taxes to be granted in perpetuity. Everywhere the proposal met with uncompromising resistance. After a pro- longed struggle, Alva succeeded in obtaining a subsidy of 2,000,000 fl. for two years only. All this time the brutal work of the Blood Council went on, as did the exodus of thousands upon thousands of industrious and well-to-do citizens, and with each year the detestation felt for Alva and his rule steadily increased.

All this time William and Louis were indefatigably making

preparations for a new campaign, and striving by their agents

to rouse the people to active resistance. The first

The Sea-

SUCCesses were however to be not on land, but on the

Beggars.

sea. In 1569 William in his capacity as sovereign prince of Orange issued letters-of-marque to a number of vessels to prey upon the Spanish commerce in the narrow seas. These corsairs, for such they were, were known by the name of Sea-Beggars (Gueux-de-Mer). Under the command of the lord of Lumbres, the lord of Treslong, and William de la Marck (lord of Lumey) they spread terror and alarm along the coast, seized much plunder, and in revenge for Alva's cruelty com- mitted acts of terrible barbarity upon the priests and monks and catholic officials, as well as upon the crews of the vessels that fell into their hands. Their difficulty lay in the lack of ports in which to take refuge. At last by a sudden assault the Sea-Beggars seized the town of Brill at the mouth of Ca/rfiwe ot the Maas (April 1, 1572)- Encouraged by this success Fjaˆ nt they next attacked and took Flushing, the port of Zeeland, which commanded the approach to Antwerp; and the inhabitants were compelled to take the oath to the prince of Orange, as stadtholder of the king. They next mastered Delfs-haven and Schiedam. These striking successes caused a wave of revolt to spread through Holland, Zeeland, Gelderland, Q evolt Utrecht and Friesland. The principal towns gave in in the their submission to the prince of Orange, and acknow- northern ledged him as their lawful

stadtholder. Within three P”” to «*’ months of the capture of Brill, Amsterdam was the only town in Holland in the hands of the Spaniards.

This revolt of the northern provinces was facilitated by the fact that Alva had withdrawn many of the garrisons, and was moving to oppose an invasion from the south. Louis of Nassau, with a small force raised in France with the The connivance of Charles IX., made a sudden dash into “StMotvs. Hainault (May 1572) and captured Valenciennes and Mons. Here he was shut in by a superior force of Spaniards, and made preparations to defend himself until relieved by the army which Orange was collecting on the eastern frontier. On the 9th of July William crossed the Rhine, and captured Malines, Termonde and Oudenarde, and was advancing southwards when the news reached him of the massacre of St Bartholomew, which deprived him of the promised aid of Coligny and his army of 12,000 men. He made an attempt, however, to relieve Mons, but his camp at Harmignies was surprised by a night attack, and William himself narrowly escaped capture. The next morning he retreated, and six days later Mons surrendered.

Orange takes up his resi- dence at DeltL

Orange however did not despair, and resolved to throw in his lot for good and all with the rebel province of the north. Already at his summons the states of Holland had met at Dort (July 15) under the presidency of Philip de Marnix, lord of Sainte Aldegonde, and they had unanimously recognized William as their lawful stadt- holder and had voted a large grant of supplies. The prince now took up his permanent residence at Delft, and a regular government was established, in which he exercised almost dictatorial authority.

Alva was now free to deal with rebellion in the north. Malines, which had surrendered to William, was given over for three days to the mercy of a brutal soldiery. Then the army under Alva’s son, Don Frederick of Toledo, marched northwards, and the sack of Zutphen and the inhuman butchery of Naarden are among the blackest records of history. But the very horrors of Don Frederick’s advance roused a spirit of indomitable resistance in Holland.

The famous defence of Haarlem, lasting through the winter of 1572 to

July 1573, cost the besiegers 12,000 lives, and gave . the insurgent provinces time to breathe. The example Haarlem 0I Haarlem was followed by Alkmaar, and with better and success. The assault of the Spaniards was repulsed,

AUaM4r- the dykes were cut, and Don Frederick, fearing for his communications, beat a hasty retreat (August). A few weeks later (Oct. 11) the fleet of Alva on the Zuyder Zee was completely defeated by the Sea-Beggars and its admiral taken prisoner. Disgusted by these reverses, in bad odour with the king, and with his soldiers mutinying for lack of pay, the governor-general resigned. On the 18th of December 1573 Alva, who the end had persisted in his policy of pitiless severity,

Act of

Federation

between

Holland

and

Zeeland.

Alva with- draws from the Nether- lands.

to

left Brussels, carrying with him the curses of the people over

whom he had tyrannized for six terrible years of misery and

oppression.

Philip sent the grand commander, Don Luis Requesens, as governor-general in his place, and after some futile attempts Don Lais at negotiation the war went on. The prince of Orange, Requesens, who had now formally entered the Calvinist communion, governor- was inexorable in laying down three conditions as general. indispensable: (1) Freedom of worship and liberty to preach the gospel according to the Word of God; (2) the restoration and maintenance of all the ancient charters, privileges, and liberties of the land; (3) the removal of all Spaniards and other foreigners from all posts and employments civil and military. In February 1574 the Spaniards by the fall of

Middleburg lost their last hold upon Walcheren and Zeeland. This triumph was however far more than counterbalanced by the complete defeat of the army, led by Count Louis of Nassau, at Mookerheide near Nijmwegen (14th March). The gallant Louis and his younger brother Henry both lost their lives. This was a grievous blow to William, but his courage did not fail. The Spaniards laid siege to Leiden, and though stricken down by a fever at Delft the prince spared no exertion to save the town. The The siege dykes were cut, the land flooded, but again and again of Leiden. a relieving force was baulked in its attempts to reach the place, which for more than four months bravely defended itself. But when at the very last extremity through famine, a tempestuous flood enabled the vessels of Orange to reach Leiden, and the investing force was driven to retreat (October 3, 1574). This was the turning-point of the first stage in the struggle for Dutch independence. In honour of this great deliverance, the state of Holland founded the university, which was speedily to make the name of Leiden illustrious throughout Europe.

In the spring of 1575 conferences with a view to peace were held at Breda, and on their failure Orange, in the face of Spanish successes in Zeeland, was forced to seek foreign Death of succour. He sought at first in vain. The sovereignty sens.” °f Holland and Zeeland was offered to the queen of England, but she, though promising secret support, declined. The situation was, however, relieved through the

sudden death of Requesens (March 1576). The stadtholder summoned a meeting of the states of Holland and Zeeland to Delft, and on the 25th of April an act of federation between the two provinces was executed. By this compact the prince was invested wkh all the pre-rogatives belonging to the sovereign. He was made commander-in-chief of both the military and naval forces with supreme authority, and in his hands was placed the final appointment to all political and judicial posts and to vacant city magistracies. He was required to maintain the Protestant reformed religion and to suppress ” all religion at variance with the gospel.” He also had authority to confer the protectorate of the federated provinces upon a foreign prince.

In June 1576 the long siege of Zierikzee, the capital of Schouwen, ended in its surrender to the Spanish general Mon- dragon, after the failure of a gallant attempt by Admiral Boisot to break the leaguer, in which he lost P* e **?”* his life. Things looked ill for the patriots, and Zeeland M„tin y , would have been at the mercy of the conqueror had not the success been followed by a great mutiny of the Spanish and Walloon troops, to whom long arrears of pay were due. They chose their leader (eletto), marched into Brabant, and established

themselves at Alost, where they were joined by other bands of mutineers. The principal fortresses of the country were in the hands of Spanish garrisons, who refused obedience to the council. William seized his opportunity, and with a body of picked troops advanced into Flanders, occupied Ghent, and entered into negotiations with the leader of the states- general at Brussels, for a union of all the provinces on ” n ” the basis of exclusion of foreigners and non-interference Pmy.” with religious belief. The overtures were favourably received, the council at Brussels was forcibly dissolved, and a congress met at Ghent on the 19th of October to consider what measures must be taken for the pacification of the country. In the midst of their deliberations the news arrived that the mutineers had marched from Alost on Antwerp, overpowered the troops of Champagney, and sacked the town with terrible barbarities (Nov. 3). This tragedy, known as ” the Spanish Fury,” silenced all disputes and differences among the repre- sentatives of the provinces. A treaty establishing a firm alliance between the provinces, represented by the states-general, assembled at Brussels on the one part, and on the other by the prince of Orange, and the states of Holland and Zeeland, was agreed upon and ratified under the title I* e ,f >ac ’” / of the ” Pacification of Ghent.” It was received with ahent. great enthusiasm. The provinces agreed first to eject the foreigner, then to meet in states-general and regulate all matters of religion and defence. It was stipulated that there was to be toleration for both Catholics and Protestants; that the Spanish king should be recognized as de jure sovereign, and the prince of Orange as governor with full powers in Holland and Zeeland.

Meanwhile Philip had appointed his natural brother, Don John of Austria, to be governor-general in the place of Requesens. After many delays he reached Luxemburg on the 4th of November (the date of the Spanish Fury at Ant- werp) and notified his arrival to the council of state. His letter met with a cold reception. On the advice of the* prince of Orange the states-general refused to receive him as governor-general unless he accepted the ” Paci- fication of Ghent.” Negotiations were entered into, but a dead- lock ensued. At this crisis the hands of Orange and the patriotic party were greatly strengthened by a new compact entitled ” The Union of Brussels,” which was extensively signed, especially in the southern Netherlands. This Brussels?” document (Jan. 1577) engaged all its signatories to help in ejecting the foreign soldiery, in carrying out the ” Pacification,” in recognizing Philip’s sovereignty, and at the same time in maintaining the charters and constitutions which that king on his accession had sworn to observe. The popular support given to the Union of Brussels

forced Don John to yield.

Don John of Austria becomes Governor' General

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He promised to accept the " Pacification of Ghent," and finally an agreement was drawn up, styled the " Perpetual Edict," which was signed by Don John (February 12th) and " l £ r ". ratified by Philip a few weeks later. The states- Edict." general undertook to accept Don John as governor- general and to uphold the Catholic religion, while Don John, in the name of the king, agreed to carry out the provisions of the " Pacification." The authority conferred upon Orange as stadtholder by the provinces of Holland and Zeeland was thus ratified, but that astute statesman had no confidence that Philip intended to observe the treaty any longer than it suited his convenience. He therefore refused, with the approval of the representatives of these provinces, to allow the publica- tion of the " Perpetual Edict " in Holland and Zeeland. As events were to prove, he was in the right.

Don John made his state entry into Brussels on the 1st of May, but only to find that he had no real authority. " The prince of n Orange," he informed the king, " has bewitched th*

Brussels, minds of all men. They keep him informed of every- thing, and take no resolution without consulting him." In vain the fiery young soldier strove to break loose from the shackles which hampered him. He was, to quote the words of a contemporary, " like an apprentice defying his master." Irritated and alarmed, the governor suddenly left Brussels in the month of July with some Walloon troops and went to Namur. It was a virtual act of abdication. The eyes of all men turned to the prince of Orange. Through his exertions the Spanish troops had not only been expelled from Holland and Zeeland, but also from the citadels of Antwerp and Ghent, which were now in the hands of the patriots. He was invited to come to Brussels, and after some hesitation, and not without having first obtained the approval of the states of Holland and Zeeland, he assented. William made his triumphal entry into the capital (September 23), which he had quitted as an outlawed fugitive ten years before. In a brief period he was the acclaimed leader of the entire Netherland people.

But it was not to last. The jealousy of Catholic against Protestant, of south against north, was too deeply rooted. Two distinctive

nationalities, Belgian and Dutch, were Matthias, already in course of formation, and not even the tactful and conciliatory policy of the most consummate statesman of his time could unite those whom the whole trend of events was year by year putting farther asunder. On the 6th of October, at the secret invitation of the Catholic nobles headed by the duke of Aerschot, the archduke Matthias, brother of the emperor, arrived in Brussels to assume the sovereignty of the Netherlands. He was but twenty years of age, and his sudden intrusion was as embarrassing to the prince of Orange as to Don John. William, however, whose position had been strengthened by his nomination to the post of ruwaard of Brabant, determined to welcome Matthias and use him for his own purposes. Matthias was to be the nominal ruler, he himself with the title of lieutenant- general to hold the reins of power.

But Philip had now become thoroughly alarmed, and he despatched Alexander Farnese, son of the duchess of Parma, to The Duke J om ms unc ˆ Don John with a veteran force of 20,000 of Anjou troops. Strengthened by this powerful reinforcement, and John Don John fell upon the patriot army at Gemblours Caslmlr. near N amur on the 31st of January 1578, and with scarcely any loss completely routed the Netherlanders. All was now terror and confusion. The ” malcontent ” Catholics now turned for help from Matthias to the duke of Anjou, who had invaded the Netherlands with a French army and seized Mons. At the same time John Casimir, brother of the elector palatine, at the invitation of the Calvinist party and with the secret financial aid of Queen Elizabeth, entered the country at the head of a body of German mercenaries from the east. Never did the diplomatic talents of the prince of Orange shine brighter than at this difficult crisis. The duke of Anjou at his earnest instigation accepted the title of ” Defender of the liberties of the Nether lands,” and promised, if the provinces would raise an army of 10,000- foot and 2000 horse, to come to their assistance with a

like’ force. At the same time negotiations were successfully carried on with John Casimir, with Elizabeth and with Henry of Navarre, and their help secured for the national cause. Mean-, while Don John had aroused the mistrust of his brother, who met his urgent appeal for funds with cold silence. Deeply hurt at this treatment and disappointed at his failure, Don JobB the governor-general fell ill and died on the 1st of October. Philip immediately appointed Alexander Farnese to the vacant post. In him Orange was to find an adversary who was not only a great general but a statesman of insight and ability equal to his own.

Farnese at once set to work with subtle skill to win over to the royalist cause the Catholic nobles of the south. The moment was propitious, and his efforts met with success. Alexander Ghent had fallen into the hands of John Casimir, Farnese and under his armed protection a fierce and intolerant goyernor- Calvinism reigned supreme in that important city. 8 enera • To the ” Malcontents ” (as the Catholic party was styled) the domination of heretical sectaries appeared less tolerable than the evils attendant upon alien rule. This feeling was widespread throughout the Walloon provinces, and found expres- ,

sion in the League of Arras (5th of January 1579). Arras. By this instrument the deputies of Hainault, Artois and Douay formed themselves into a league for the defence of the Catholic religion, and, subject to his observance of the political stipulations of the Union of Brussels, professed loyal allegiance to the king. The Protestant response was not long in coming. The Union of Utrecht was signed on the 29th of January by the representatives of Holland, Zeeland, Utrecht, Gelder- land and Zutphen. By it the northern provinces utrecbu bound themselves together “as if they were one province ” to maintain their rights and liberties ” with life-blood and goods ” against foreign tyranny; and to grant complete freedom of worship and of religious opinion throughout the confederacy. This famous compact was the work of John of Nassau, at that time governor of Gelderland, and did not at first commend itself to his brother. William was still struggling to carry out that larger scheme of a union of all the seventeen provinces, which at the time of the ” Pacification of Ghent ” had seemed a possibility. But his efforts were already doomed to certain failure. The die was cast, which decreed that from 1579 onwards the northern and southern Netherlands were to pursue separate destinies. For their later history see Holland and Belgium.

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NETHERSOLE, OLGA (1863-), English actress, of Spanish descent, was born in London, and made her stage debut at Brighton in 1887. From 1888 she played important parts in London, at first under John Hare at the Garrick, and in 1894 took the Court Theatre on her own account. She also toured in Australia and America, playing leading parts in modern plays, notably Clyde Fitch's Sapho (produced in London in 1962), which was strongly objected to in New York. Her powerful emotional acting, however, made a great effect in some other plays, such as Carmen, in which she again appeared in America in 1906.

NETHINIM, the name given to the Temple assistants in ancient Jerusalem. They are mentioned at the return from the Exile and particularly enumerated in Ezra ii. and Neh. vii. The original form of the name was Nethunim, as in the Khetib (consonantal reading) of Ezra viii. 17 (cf. Numbers iii. 9), and means " given " or " dedicated," i.e. to the temple. The Talmud has also the singular form — Nathin. In all, 612 Nethinim came back from the Exile and were lodged near the " House of the Nethinim " at Ophel, towards the east wall of Jerusalem so as to be near the Temple, where they served under the Levites and were free' of all tolls, from which they must have been supported. It is mentioned that they had been ordered by David and the princes to serve the Levites (Ezra viii. 20).

Notwithstanding their sacred service, the Nethinim were regarded by later Jewish tradition as especially degraded, being placed in tables of precedence below bastards (Talm. Jer. Hor. iii. 5, Jeb. vii. 5) and in the Mishna {Jeb. viii. 3) it is stated that the prohibition against intermarriage with the Moabites, Ammonites, Egyptians and Edomites, though given in the Bible, only applied for a certain number of generations and did not apply at all to their daughters, but, it is added, " Bastards and Nethinim are prohibited (to marry Israelites) , and this prohibition is perpetual and applies both to males and females."

To explain this combination of sacred service and exceptional degradation, it has been suggested by Joseph Jacobs that the Nethinim were the descendants of the Kedishoth, i.e. women dedicated to the worship of Astarte and attached to the Temple before the Exile. There is evidence of these practices from the time of Solomon (1 Kings xi. 5) down to Josiah (2 Kings xiii. 4-6), and even as late as Ezekiel (Ezek. xxiii. 36-48), giving rise to the command of Deuteronomy xxiii. 17.

An examination of the name lists given in duplicate in Ezra ii. 43-58, Neh. vii. 46-59, together with the additional names in the Greek

Esdras (v. 29-35), shows that the Nethinim were in charge of the rings and hooks connected with the temple service; they sheared the sheep offered for sacrifice in the temple and poured the libations. Some of them were derived from the wars with the Meunim; others from the campaign with Rezin of Damascus. One of the names given in 1 Esdras v. 34, viol 2ou/3

A large majority of the names of the parents mentioned seem to be feminine in form or meaning, and suggest that the Nethinim could not trace back to any definite paternity; and this is con- firmed by the fact that the lists are followed by the enumeration

of those who could not' " show their father's house" (Ezra ii. 60; Neh. vii. 62). The Greek versions, as well as Josephus, refer to them as lepbdov'Koi, which can mean one thing only.

The Talmudic authorities have an abstract term, Nethinuth., indicating the status of a Nathin (Tos. Kidd. v. 1) ed. Zucker- mandel, p. 341), and corresponding to the abstract Mamziruth, " bastardy." The existence of this degraded class -up to the Exile throws considerable light upon the phraseology of the prophets in referring to idolatry as adultery and the scenes connected with it as prostitution. Their continued existence as a pariah class after the Exile would be a perpetual reminder of the dangers and degradation of the most popular Syrian creed.

These unfortunate creatures had no alternative but to accept the provisions made for them out of the Temple treasury, but after the fall of the ' Temple they would naturally disappear by intermarriage with similar degraded classes {Mishna Kidd-. ■ viii. 3). In the Code of Khammurabi §§ 191, 192, they could be adopted by outsiders.

The above explanation of the special degradation of the Nethinim, though they were connected with the Temple service, seems to be the only way of explaining the Talmudic reference to their tabooed position, and is an interesting example of the light that can be reflected on Biblical research by the Talmud.

See Joseph Jacobs, Studies in Biblical Archaeology (1894), 104-122 ; W. Baudissin, Geschichte des Alttestamentlichen Priesterthums, 142 seq. This view, however, is not accepted by Cheyne, Encyclopaedia Biblica, s.v. (J. Ja.)

NETLEY, a village in the Fareham parliamentary division of Hampshire, England, 3 m. S.E. of Southampton on the east shore Of

Southampton Water, and on a branch of the London & South Western railway. Here a Cistercian abbey was founded in 1237 by Henry III., and its ruins" are extensive, including a great part of the cruciform church, abbot's house, chapter house and domestic buildings; The style is Early English and Decorated, and many beautiful details are preserved. The gatehouse was transformed into a fort in the time of Henry VIII. Netley Hospital for wounded soldiers (1 m. S.E. of the abbey), was built in 1856 after the Crimean War. It is a vast pile giving accommodation for upwards of a thousand patients, and is the principal military hospital in Great Britain.

NETSCHER, GASPAR (1639-1684), German portrait and genre painter, was born at Heidelberg in 1639. His father died when he was two years of age, and his mother, fleeing from the dangers of a civil war, carried him to Arnheim, where he was adopted by a physician named Tullekens. At first he was destined for the profession of his patron, but owing to his great aptitude for painting he was placed under an artist named de Koster, and, having also studied under Ter Borch, he set out for Italy to complete his education there. Marrying, however, at Liege, he settled at Bordeaux, and toiled hard to earn a livelihood by painting those small cabinet pictures which are now so highly valued on account of their exquisite finish. After removing to The Hague, he turned his attention to portrait-painting, and in this branch of his art was more successful. He was patronized by William III., and his' earnings soon enabled him to gratify his' own taste by depicting musical and conversational pieces. It was in these that Netscher's genius was fully displayed. The choice of these subjects, and the habit of introducing female figures, dressed in glossy satins, were imitated from Ter Borch; they possess easy yet delicate pencilling, brilliant and correct colouring, and pleasing light and shade; but frequently their refinement passes into weakness. The painter was gaining both fame and wealth when he died prematurely in 1684. His sons Constantyn (1668-1722), and Theodorus (1661-1732), were also painters after their father's style, but inferior in merit.

NETTLE (O. Eng. nelele, cf. Ger. Nessel), the English equivalent of Lat. Urtica, a genus of plants which gives its name to the natural order Urticaceae. It contains about thirty species in the temperate parts of both east and west hemispheres. They are herbs covered with stinging hairs, and with unisexual flowers on the same or on different plants. The male flowers consist of a

perianth of four greenish segments enclosing as many stamens, which latter, when freed from the restraint exercised upon them by the perianth-segments while still in the bud, suddenly uncoil themselves, and in so doing liberate the pollen. The female perianth is similar, but encloses only a single seed-vessel with a solitary seed. The stinging hairs consist of a bulbous reservoir filled with, acrid fluid, prolonged into a long slender tube, the extremity of which is finely pointed. By this point the hair penetrates the skin and discharges its irritant contents beneath the surface. Nettle tops, or the very young shoots of the nettle, may be used as a vegetable like spinach; but from the abundance of crystals (cystoliths) they contain they are apt to be gritty, though esteemed for their antiscorbutic properties, which they do not possess in any exceptional degree. The fibre furnished by the stems of several species is used for cordage or paper- making. Three species of nettle are wild in the British Isles: Urtica dioica, the common stinging nettle, which is a hairy perennial with staminate and pistillate flowers in distinct plants; U. urens, which is annual and, except for the stinging hairs, glabrous, and has staminate and pistillate flowers in the same panicle; and U. pilulifera (Roman nettle), an annual with the pistillate flowers in rounded heads, which occurs in waste places in the east of England, chiefly near the sea — the more virulent of the British species. From their general presence in the neigh- bourhood of houses, or in spots where house refuse is deposited, it has been suggested that the nettles are not really natives, a supposition that to some extent receives countenance from the circumstance that the young shoots are very sensitive to frost. In any case they follow man in his migrations, and by their presence usually indicate a soil rich in nitrogen. The trailing subterranean root-stock renders the common nettle somewhat difficult of extirpation.

NETTLERASH, or Urticaria, a disorder of the skin char- acterized by an eruption resembling the effect produced by the sting of a nettle, namely, raised red or red and white patches occurring in parts or over the whole of the surface of the body and attended with great irritation. It may be acute or chronic. In the former variety the attack often comes on after indulgence in certain articles of diet, particularly various kinds of fruit, shell- fish, cheese, pastry, &c, also occasionally from the use of certain drugs, such as henbane, copaiba, cubebs, turpentine, &c. There is at firstconsiderablefeverishnessandconstitutional disturbance, together with sickness and faintness, which either precede or accompany the appearance of the rash. The eruption may appear on any part of the body, but is most common on the face and trunk. The attack may pass off in a few hours, or may last for several days, the eruption

continuing to come out in successive patches. The chronic variety lasts with interruptions for a length of time often extending to months or years. This form of the disease occurs independently of errors in diet, and is not attended with the feverish symptoms characterizing the acute attack. As regards treatment, the acute variety generally yields quickly to a purgative and the use of some antacid, such as mag- nesia or liquor potassae. The local irritation is allayed by sponging with a warm alkaline solution (soda, potash or ammonia) , or a solution of acetate of lead, and a lotion of ichthyol has been found useful. Chronic cases have been known to benefit from the administration of creosote or salol.

NETTLESHIP, HENRY (1830-1893), English classical scholar, was born at Kettering on the 5th of May 1839. He was educated at Lancing, Durham and Charterhouse schools, and Corpus Christi College, Oxford. In 1861 he was elected to a fellowship at Lincoln, which he vacated on his marriage in 1870. In 1868 he became an assistant master at Harrow, but in 1873 he returned to Oxford, and was elected to a fellowship at Corpus. In 1878 he was appointed to succeed Edwin Palmer in the professorship of Latin, which post he held till his death at Oxford on the 10th of July 1893. Nettleship had been from the first attracted to the study of Virgil, and a good deal of his time was devoted to his favourite poet. After Conington's death in 1869, he saw his edition of Virgil through the press, and revised and corrected subsequent editions of the work. In 1875 he had

undertaken to compile a new Latin lexicon for the Clarendon Press, but the work proved more than he could accomplish, and in 1887 he published some of the results of twelve years' labour in a volume entitled Contributions to Latin Lexicography, a genuine piece of original work. In conjunction with J. E. Sandys, Nettleship revised and edited Seyffert's Dictionary of Classical Antiquities, and he contributed to a volume entitled Essays on the Endowment of Research an article on " The Present Relations between Classical Research and Classical Education in England," in which he pointed out the great value of the professorial lecture in Germany. In his views on the research question he was a follower of Mark Pattison, whose essays he edited in 1889 for the Clarendon Press. In Lectures and Essays on Subjects connected with Latin Literature and Scholarship, Nettleship revised and republished some of his previous publica- tions. A second series of these, published in 1895, and edited by F. Haverfield, contains a memoir by Mrs M. Nettleship, with full bibliography.

See obituary notices in The Times (nth of July, 1893); Classical Review (October, 1893) ; Oxford, Magazine (18th of October, 1893).

NETTLESHIP, RICHARD LEWIS (1846-1892), English philosopher, youngest brother of Henry Nettleship, was born on the 17th of December 1846, and educated at Uppingham and Balliol College, Oxford, where he held a scholarship. He won the Hertford scholarship, the Ireland, the Gaisford Greek verse prize, a Craven scholarship and the Arnold prize, but took only a second class in Litterae Humaniores. He became fellow and tutor of his college and succeeded to the work of T. H. Green, whose writings he edited with a memoir (London, 1880). He left an unfinished work on Plato, part of which was published after his death, together with his lectures on logic and some essays. His thought was idealistic and Hegelian. His literary style was excellent; but, though he had considerable personal influence on his generation at Oxford, a certain nebulousness of view prevented his making any permanent contribution to philosophy. He was fond of music and outdoor sports, and rowed in his college boat. He died on the 25th of August 1892, from the effects of exposure on Mont Blanc, and was buried at Chamounix.

NETTLE TREE, the name applied to certain trees of the genus Celtis, belonging to the family or natural order Ulmaceae. The best-known species have usually obliquely ovate, or lanceo- late leaves, serrate at the edge, and marked by three prominent nerves. The flowers are inconspicuous, usually hermaphrodite, with a 4- or 5-parted perianth, as many stamens, a hairy disk and a i-celled ovary with a 2-parted style. The fruit is succulent like a little drupe, a character which serves to separate the genus alike from the nettles and the elms, to both of which it is allied. Celtis australis is a common tree, both wild and planted, through- out the Mediterranean region extending to Afghanistan and the Himalayas; it is also cultivated in Great Britain. It is a rapidly growing tree, from 30 to 40 ft. high, with a remarkably sweet fruit, recalling a small black cherry, and was one of the plants to which the term ” lotus ” was applied by Dioscorides and the older authors. The wood, which is compact and hard and takes a high polish, is used for a variety of purposes. C. occidentalis, a North American species, is the hackberry (q.v.).

NETTUNO, a fishing village of the province of Rome, Italy, 2 m. E.N.E. of Anzio by rail, and 39 m. S.S.E. of Rome, 36 ft. above sea-level. Pop. (1901) 3406 (town), 5072 (commune). It has a picturesque castle built by Alexander VI. from the designs of Antonio da Sangallo the elder in 1496. It is said to have been a Saracen settlement. The picturesque costume of the women is now worn only at festivals. To the E. on the sandy coast on the way to Astura is a military camp and a range for the trial of field artillery.

NETZE, a river of Germany, having a small portion of its upper course in Poland. It is a right-bank tributary of the Warthe, and rises in the lew-lying lake district, through which the Russo- German frontier runs, to the south of Inowrazlaw. The frontier crosses Lake Goplo, which is not far from the source of the Netze, which on leaving it (in Prussian territory), flows

north-west to the Trlonger lake, and continues thereafter in the same general direction, but with wide fluctuations, to Nakel. Here it joins the Bromberg canal, which gives access to the river Brahe and so to the Vistula. The Netze then turns west- south-west and waters the moorland (much of which, however, has been brought under cultivation) known as the Netzebruch. It joins the Warthe at Zantoch, after a course of 273 m. It is navigable for 130 m. up to the Bromberg canal and thereafter for smaller boats for 40 m. up to Pakosch on the Trlonger lake. Its drainage area is 5400 sq. m. From 1772 to 1807 that part of Poland which was given to Prussia at the first partition was known as the Netze District, as it extended along the Netze. It was almost all given back to Russia at the peace of Tilsit, but was restored to Prussia in 1815 under the treaty of Vienna.

NEU-BRANDENBURG, a town of Germany, in the grand duchy of Mecklenburg-Strelitz, is situated on a small lake called the Tollense See, 58 m. N.W. of Stettin by rail. Pop. (1905) 11,443. It is still partly surrounded with walls, and possesses four interesting old Gothic gates, dating from about 1300. The principal buildings are the Marienkirche, a Gothic building of the 13th century, the Johanniskirche, the town-hall and the grand ducal palace. It possesses a bronze statue of Fritz Reuter (1893); a monument to Bismarck (1895); another commemorat- ing the war of 1870-71 (1895); a small museum of antiquities; and an art collection. On the other side of the lake is the grand- ducal palace, Belvedere. Iron-founding, machine-making, wool-spinning and the making of paper, tobacco and musical instru- ments are carried on here, and the trade in wool and agricultural products is considerable. The horse fair is also important. Neu-Brandenburg was founded in 1248, and has belonged to Mecklenburg since 1292.

See Boll, Chronik der Vorderstadt Neubrandenburg (1875).
NEUBREISACH, a town and fortress of Germany in the imperial province of Alsace-Lorraine, situated on the Rhine- Rhone canal, 1 2 m. E. from Colmar by the railway to Freiburg- im-Breisgau. Pop.

(1905 — including a garrison of 2300 men) 3520. It is built in the form of a hectagon, and together with Fort Mortier, which lies on an arm of the Rhine opposite, forms a place of great strategic strength. It contains an Evangelical (garrison) church, a Roman Catholic church and a non-com- missioned officers' school. There are electrical works in the town.

Neubreisach was founded by Louis XIV. in 1699 and fortified by Vauban, the Neubreisacher canal being constructed to transport the necessary materials. In the Franco-German War, it was bombarded by the Germans from the 2nd to the 10th of November 1870, when it capitulated.

See Wolff, Geschichte des Bombardements von Schlettstadt und Neubreisach (Berlin, 1874); and von Neumann, Die Eroberung von Schlettstadt und Neubreisach im Jahre 1870 (Berlin, 1876).

NEUBURG, a town of Germany, in the kingdom of Bavaria, is pleasantly situated on the Danube, 12 m. W. of Ingolstadt, on the railway to Neuoffingen. Pop. (1905) 8532. It is a place of ancient origin, but is chiefly noteworthy because formerly for two centuries it was the capital of the principality of Pfalz- Neuburg. Its most important building is the old residence of its princes, the handsomest part of which is in the Renaissance style of the 1 6th century. The town also contains an Evangelical and seven Roman Catholic churches, a town hall, several schools and convents, a theatre, and an historical museum with a valuable library. It has electrical works and breweries, while fruit and vegetables are cultivated in the neighbourhood, a considerable trade in these products being carried on by the Danube.

Neuburg was originally an episcopal see. In the 10th century it passed to the counts of Scheyern, and through them to Bavaria, being ceded to the Rhenish Palatinate at the close of a war in 1 507. From 1557 to 1742 it was the capital of a small principality ruled by a cadet branch of the family of the elector palatine of the Rhine. This principality of Pfalz-Neuburg had an area of about 1000 sq. m. and about 100,000 inhabitants. In 1742 it was

united again with the Rhenish Palatinate, with which it passed in 1777 to Bavaria.

See Gremmel, Geschichte des Herzogtums Neuburg (Neuburg, 1872); and Fiihrer durch die Stadt Neuburg und deren Umgebung (Neuburg, 1904).

NEUCHATEL (Ger. Neuenburg), one of the cantons of western Switzerland, on the frontier towards France. It is the only Swiss canton that is situated entirely in the Jura, of which it occupies the central portion (its loftiest summit is the Mont Racine, 4731 ft. in the Tete de Rang range). The canton has a total area of 311-8 sq. m.,of which 267-1 sq. m. are reckoned ” productive ” (forests occupying 88-6 sq. m. and vineyards 4-4 sq. m.). It consists, for the most part, of the longitudinal ridges and valleys characteristic of the Jura range, while its drainage is very unequally divided between the Thiele or Zihl, and the Doubs, which forms part of the north-west boundary of the canton, and receives only the streams flowing from the Le Locle and La Chaux de Fonds valley. Three regions make up the territory. That stretching along the shore of the lake is called Le Vignoble (from its vineyards) and extends from about 1500 ft. to 2300 ft. above the sea-level. An intermediate region is named Les Vallees, for it consists of the two principal valleys of the canton(the Val de Ruz, watered by the Seyon, and the Val de Travers, watered by the Areuse) which lie to a height of about 2300 ft. to 3000 ft. above the sea-level. The highest region is known as Les Montagues, and is mainly composed of the long valley in which stand the industrial centres of La Chaux de Fonds (q.v.), and Le Locle {q.v.) to which must be added those of La Sagne, Les Ponts and Les Verrieres, the elevation of these upland valleys varying from 3000 ft. to 3445 ft. The canton is well supplied with railways, the direct line from Bern past Kerzers (Chietres), Neuchatel, the Val de Travers and Les Verrieres to Pontarlier for Paris passing right through it, while La Chaux de Fonds is connected by a line past Le Locle with Morteau in France. Other lines join the capital, Neuchatel, to La Chaux de Fonds, as well as to Yverdon at the south-west extremity of the lake, and to St Blaise at its north-east end, not very far from Bienne.

In 1900 the population numbered 126,279 souls according to the federal census (a cantonal census of 1906 makes the figure at that date 134,014), of whom 104,551 were French-speaking, 1 7,629 German-speaking and 3664 Italian-speaking, while 107,291 were Protestants, 17,731 Romanists or Old Catholics, and 1020 Jews. There are three ” established anc] state-endowed ” churches, the National Evangelical (in 1907 a proposal to disestablish it was rejected by a huge majority), the Roman Catholic, and the Old Catholic (this sect in La Chaux de Fonds only), while the pastors of the Free Evangelical church and of the Jews (mostly in La Chaux de Fonds) are so far recognized as such by the state as to be exempt from military service.

Besides the capital, Neuchatel (q.v.), the chief towns are La Chaux de Fonds (the most populous of all), Le Locle and Fleurier (3746), the

principal village in the Val de Travers.

The most valuable mineral product is asphalt, of which there is a large and rich deposit in the Val de Travers, belonging to the state but worked by an English company. The wine of the Vignoble region (both sparkling and still) is plentiful and has a good reputation, the red wines of Neuchatel, Boudry and Cor- taillod being largely exported, though the petit vin blanc of Neuchatel is all but wholly consumed within the canton. Absinthe is largely manufactured in the Val de Travers, but lace is no longer made there as of old. The well-known manu- factory of Suchard's chocolate is at Serrieres, practically a suburb of the town of Neuchatel, while in the canton there are also cement factories and stone quarries. But the most char- acteristic industry is that of watch-making and the making of gold watch cases, which is chiefly carried on (since the early 18th century) in the highland valleys of La Chaux de Fonds and of Le Locle, as well as at Fleurier in the Val de Travers. At Couvet, also in the Val de Travers, there is a large factory of screws and knitting machines.

The canton is divided into 6 administrative districts, which

comprise 63 communes. The cantonal constitution dates in its main features from 1858, but has been modified in several important respects. The legislature or Grand Conseil consists of members elected (since 1903) in the proportion of one to every 1 200 (or fraction over 600) of the population, and holds office for three years, while since 1906 the principles of proportional repre- sentation and minority representation obtain in these elections. Since 1906 the executive of 5 members (since 1882) or Conseil d'£tat is elected by a popular vote. The 2 members of the federal Conseil des Etats are named by the Grand Conseil, but the 6 members of the federal Conseil National are chosen by a popular vote. Since 1879, 3000 citizens have the right of " facultative referendum " as to all laws and important decrees, while since 1882 the same number have the right of initiative as to all legislative projects, this right as to the partial revision of the cantonal constitution dating as far back as 1848, the number in the case of a total revision having been raised in 1906 to 5000.

We first hear of the novum castellum, regalissimam sedem in the will (ion) of Rudolf III., the last king of Burgundy, on whose death (1032) that kingdom reverted to the empire. About 1034 the emperor Conrad

II. gave this castle to the lord of several neighbouring fiefs, his successors establishing themselves permanently there in the 12th century and then taking the title of ” count.” In 1288 the reigning count resigned his domains to the emperor Rudolf, who gave them to the lord of Chalon-sur- Saone, by whom they were restored to the count of Neuchatel on his doing homage for them. This act decided the future history of Neuchatel, for in 1393 the house of Chalon succeeded to the principality of Orange by virtue of a marriage contracted in 1388. The counts gradually increased their dominions, so that by 1373 they held practically all of the present canton, with the exception of the lordship of Valangin (the Val de Ruz and Les Montagnes, this last region only colonized in the early 14th century), which was held by a cadet line of the house till bought in 1592. In 1395 the first house ended in ail heiress, who brought Neuchatel to the count of Freiburg im Breisgau. As early as 1290 the reigning count had made an alliance with the Swiss Fribourg, in 1308 with Bern, and about 1324 with Soleure, but it was not till 1406 that an ” everlasting alliance ” was made with Bern (later in 1495 with Fribourg, and in 1501 with Lucerne). This alliance resulted in bringing the county into the Swiss confederation four centuries later, while it also led to contingents from Neuchatel helping the Confederates from the battle of St Jakob (1444) onwards right down into the early 18th century. In 1457, through another heiress, the county passed to the house of the marquises of Baden-Hochberg, and in i5°4 similarly to that of Orleans-Longueville (a bastard line of the royal house of France). From ■1512 to 1529 the Swiss occupied it as the count was fighting for France and so against them. In 1532 the title of ” prince ” was taken, while by the treaty of Westphalia (1648) the princi- pality became sovereign and independent of the empire. In 1530 (the very year Farel introduced the Reformation at Neuchatel) the overlordship enjoyed by the house of Chalon-Orange passed, by virtue of a marriage contracted in 1515, to that of Nassau- Orange, the direct line of which ended in 1702 in the person of William III., king of England. In 1707 the Longueville house of Neuchatel also became extinct, and a great struggle arose as to the succession. Finally the parliament (states) of Neuchatel decided in favour of Frederic I., the first king of Prussia, whose mother was the elder paternal aunt of William III., and so heiress of the rights (given in 1288) of the house of Chalon, to which the fief had reverted on the extinction of the line of the counts of Neuchatel. Thus the act of 1288 determined the fate of the principality, partly because Frederic I. was a Protestant, while the other claimants were Romanists. The nominal rule of the Prussian king (for the country enjoyed practical independence) lasted till 1857, with a brief interval from 1806 to 1814, when the principality was held by Marshal Berthier, by virtue of

a grant from Napoleon. In 1814 its admission into the Swiss confedera- tion was proposed and was effected in 1815, the new canton being the only non-republican member, just as the hereditary rulers of Neuchatel were the last to maintain their position in

Switzerland. This anomaly led in 1848 to the establishment (attempted in 1831) of a republican form of government, brought about by a peaceful revolution led by A. M. Piaget. A royalist attempt to regain power in 1856 was defeated, and finally, after long negotiations, the king of Prussia renounced his claims to sovereignty, though retaining the right (no longer exercised) to bear the title of "prince of Neuchatel." Thus in 1857 Neuchatel became a full republican member of the Swiss con- federation.

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NEUCHATEL, capital of the above Swiss canton, situated near the north-east corner of the lake of Neuchatel. It is the meeting-point of several important railway lines, from Bern past Kerzers (27 m.), from Bienne (19 m.), from La Chaux de Fonds (19 m.), from Pontarlier (in France), by the Val de Travers, (33§m.),and from Yverdon (23 m.). The railway station (1575 ft.) at the top of the town is connected by an electric tramway with the shore of the lake some 150 ft. lower. The older portion of the town is built on the steep slope of the Chaumont, and originally the waters of the lake bathed the foot of the hill on which it stood. But the gradual growth of alluvial deposits, and more recently the artificial embankment of the shore of the lake, have

added much dry ground, and on this site the finest modern buildings have been erected. The 16th-century castle and the 13th-century collegiate church of Notre Dame (now Protestant) stand close together and were founded in the 1 2 th century when the counts took up their permanent residence in the town, to which they granted a charter of liberties in 121 4. Among the buildings on the quays are the Musee des Beaux Arts (modern Swiss paintings and also various historical collec- tions, including that of Desor relating to the Lake Dwellings), the Gymnase or College Latin (in which is also the museum of natural history and the town library) , the university (refounded in 1866 and raised from the rank of an academy to that of a university in 1909), the Ecole de Commerce and the post office. The town owes much to the gifts of citizens. Thus David de Purry (1709-1786) founded the town hospital and built the town hall, while James de Purry bequeathed to the town the villa in which the ethnographical museum has been installed (1904). In 1811 J. L. de Pourtales (1722-1814) founded the hospital which bears his name, while in 1844 A. de Meuron (1789-1852) constructed the lunatic asylum at Prefargier, a few miles from the town. Among natives of the town are the theologians J. F. Ostervald (1663-1747) and Frederic Godet (181 2-1900), the geologist E. Desor (1811-1882), the local historian G. A. Matile (1807-1881) and the politicians A. M. Piaget (1802-1870) and Numa Droz (1844-1899). Neuchatel (partly because very good French is spoken there) attracts many foreign students, while the town is a literary centre. In 1900 Neuchatel numbered 20,843 inhabitants (in 1850 only 7727 and in 1870, 12,683), 15,277 being French-speaking and 4553 German-speaking; there were 17,237 Protestants, 3459 Romanists and 80 Jews. (W. A. B. C.)

NEUCHATEL, LAKE OF. This lake, in W. Switzerland, is with the neighbouring lakes of Bienne and Morat (both connected with it by canals) , the modern representative of the large body of water which at one time seems to have filled the whole of the lower valley of the Aar, It is now the most considerable sheet

of water which is wholly within Switzerland (since parts of those of Geneva and Constance belong to foreign countries), though it does not belong entirely to any one Canton — of its total area of 92J sq. m., 36J sq. m. are in the Canton of Neuchatel and rather over 33 sq. m. in that of Vaud, while Fribourg claims 2cf sq. m. and Berne 2 sq. m. It is about 233 m. in length, varies from 35 to 5 m. in width, and has a

maximum depth of 502 ft., while its surface is 1427 ft. above sea-level. It is mainly formed by the Thiele or Zihl river, which enters it at its south- western end and issues from it at its north-eastern extremity, but it also receives, near its north-west end, the Areuse (flowing through the Val de Travers) and the Seyon (which traverses the Val de Ruz), as well as, near its north-east end, the Broye (that flows through a canal from the Lake of Morat). Successive drainages have brought to light the remains of many lake dwell- ings, of which there is a good collection in the natural history museum at Neuchatel. The scenery of the lake, though pleasing, cannot compare with that of the other Swiss lakes, despite the fact that from it the giants of both the Mont Blanc and Bernese Oberland ranges are clearly seen. The first steamer was placed on the lake in 1827. On the south-eastern shore the picturesque and historical little town of Estavayer is the chief place. At the south-western extremity of the lake is Yverdon (the Eburo- dunum of the Romans and the residence of the educationalist Pestalozzi, 1806-1825). Far more populated is the north- western shore, where, from S.W. to N.E., we find Grandson (famous for the battle of 1476 wherein Charles the Bold, duke of Burgundy, was defeated by the Swiss), Cortaillod (producing excellent sparkling wine), Serrieres (with the famous manu- factories of Suchard chocolate) and Neuchatel itself. On the north shore is La Tene, famous for the remarkable relics cf the Iron Age that have been discovered there. (W. A. B. C.)

NEUENAHR, a spa of Germany, in the Prussian Rhine province, situated at the foot of a basalt peak, in the pleasant valley of the Ahr, 10 m. N.W. of Remagen on the Rhine by the railway to Adenau. Pop. (1905) 3388. It is well laid out, has an Evangelical and two Roman Catholic churches, and carries on a considerable trade in the red wines of the district. There are five alkaline springs with temperatures from 69° to 102 F., the waters of which are specific in chronic catarrh of the respiratory organs, gout, rheumatism and diabetes. In the immediate vicinity lies the Apollinaris spring.

See Schmitz, Erfahrungen iiber Bad Neuenahr (5th ed., Ahrweiler, 1887); and Schwenke, Die Kurmittel des Bades Neuenahr (Halle,

1900).

NEUENDORF, a village of Germany, in the province of Brandenburg, 2 m. E. from Potsdam, on the Nuthe, with a station on the railway from Berlin to Potsdam. Pop. (1905) 6877. The place has considerable industries, chief among which are carpet-weaving, jute-spinning and the manufacture of railway plant. Within its area lies the colony of Nowawes laid out by Frederick the Great in 1754.

NEUFCHATEAU, a town of eastern France, in the department of Vosges at the confluence of the Meuse and the Mouzon, 49 m. W.N.W. of £pinal by rail. Pop. (1906) 3924. The churches of St Christopher (13th and 15th centuries) and St Nicholas, the latter combining the Romanesque and Gothic styles and built above a Romanesque crypt, are of interest. A sub-prefecture, a tribunal of first instance and communal colleges are among the public institutions. Neufchateau carries on wool-spinning and the manufacture of embroidery, nails and chains. The town, which is said to occupy the site of the Roman Neomagus, belonged in the middle ages to the dukes of Lorraine, ruins of whose chateau are still to be seen. In 1641 it passed to France.

NEUHALDENSLEBEN, a town of Germany, in the province of Prussian Saxony on the Ohre, situated 18 m. N.W. from Magdeburg by the railway to Obisfelde and at the junction of a line to Eisleben. Pop. (1905) 10,421. It has an Evangelical church, an old equestrian statue of Henry the Lion and a gym- nasium. There are several active industries, notably the manufacture of majolica and terra-cotta wares, machinery,

gloves, beer, malt, cheese and sugar, while large pig markets are held here.

See Behrends, Chronik der Sladt NeuhaUensleben (new ed., 1903).

NEUHOF, THEODORE STEPHEN, Baron von (c. 1690-1756), German adventurer and for a short time nominal king of Corsica, was a son of a Westphalian nobleman and was born at Metz. Educated at the court of France, he served first in the French army and then in that of Sweden. Baron de Goertz, minister to Charles XII., realizing Neuhof's capacity for intrigue, sent him to England and Spain to negotiate with Cardinal Alberoni. Having failed in this mission he returned to Sweden and then went to Spain, where he was made colonel and married one of the queen's ladies-in-waiting. Deserting his wife soon afterwards he repaired to France and became mixed up in Law's financial affairs; then he wandered about Portugal, Holland and It&ly, and at Genoa he made the acquaintance of some Corsican prisoners and exiles, whom he persuaded that he could free their country from Genoese tyranny if they made him king of the island. With their help and that of the bey of Tunis he landed in Corsica in March 1736, where the islanders, believing his statement that he had the support of several of the great powers, proclaimed him king. He assumed the style of Theodore I., issued edicts, instituted an order of knighthood, and waged war on the Genoese, at first with some success. But he was eventually defeated, and civil broils soon broke out in the island; the

Genoese having put a price on his head and published an account of his antecedents, he left Corsica in November 1736, ostensibly to seek foreign assistance. After trying in vain to induce the grand duke of Tuscany to recognize him, he started off on his wanderings once more until he was arrested for debt in Amsterdam. On regaining his freedom he sent his nephew to Corsica with a supply of arms; he himself returned to the island in 1738, 1739 and 1743, but the combined Genoese and French forces and the growing strength of the party opposed to him again drove him to wandering about Europe. Arrested for debt in London he regained his freedom by mortgaging his "kingdom" of Corsica, and subsisted on the charity of Horace Walpole and some other friends until his death in London on the nth of December 1756. His only son, Frederick (c. 1 7 25-1 797), served in the army of Frederick the Great and afterwards acted as agent in London for the grand-duke of Wurttemberg.

Frederick wrote an account of his father's life, Memoires pour servir a Phistoire de la Corse, and also an English translation, both published in London in 1768. In 1795 he published a new edition on Description of Corsica with an account of its union to the crown of Great Britain. See also Fitzgerald, King Theodore of Corsica (London,

1890).

NEUILLY-SUR-SEINE, a town of northern France, in the department of Seine, 3J m. N.W. of the centre of Paris, of which it is a suburb, between the fortifications and the Seine. Pop. (1906) 39,222. A castle at Neuilly, built by the count of Argenson in the 18th century, ultimately became the property and favourite residence of the duke of Orleans (Louis Philippe), the birthplace of nearly all his children, and the scene of the offer of the crown in 1830. The buildings were pillaged and burned by the mob in 1848. The park, which extended from the fortifications to the river, as well as the neighbouring park of Villiers (also belonging to the princes of Orleans), was broken up into building lots, and is occupied by many small middle-class houses and a few fine villas. Within the line of the fortifications, but on Neuilly soil, stands the chapel of St Ferdinand, on the spot where the duke of Orleans died in 1842 from the results of a carriage accident. The stained-glass windows were made at SeVres after designs by Ingres; the ducal cenotaph, designed by Ary Scheffer, was sculptured by de Triqueti; and the chapel also contains a " Descent from the Cross," by the last-named artist, and an angel executed in Carrara marble by the princess Maris d'Orleans, sister of the duke. The fine bridge, designed in the 1 8th century by Perronet, is noteworthy as the first level bridge constructed in France. The Galignani Institution, founded by the

brothers Galignani for aged booksellers, printers and others, has accommodation for 100 residents. The manufactures

include perfumery, chocolate, colours, varnish, automobiles, carpets, &c.

NEUMANN, FRANZ ERNST (1 798-1895), German mineralogist, physicist and mathematician, was born at Joachimstal on the nth of September 1798. In 1815 he interrupted his studies at Berlin to serve as a volunteer in the campaign against Napoleon, and was wounded in the battle of Ligny. Subsequently he entered Berlin University as a student of theology, but soon turned to scientific subjects. His earlier papers were mostly concerned with crystallography, and the reputation they gained him led to his appointment as Privatdozent at Konigsberg, where in 1828 he became extraordinary, and in 1829 ordinary, professor of mineralogy and physics. In 1831, from a study of the specific heats of .compounds, he formulated ” Neumann’s law,” which expressed in modern language runs: ” The mole- cular heat of a compound is equal to the sum of the atomic heats of its constituents.” Devoting himself next to optics, he produced memoirs which entitle him to a high place among the early searchers after a true dynamical theory of light. In 1832, by the aid of a particular hypothesis as to the constitution of the ether, he reached by a rigorous dynamical calculation results agreeing with those obtained by A. L. Cauchy, and succeeded in deducing laws of double refraction closely resembling those of A. J. Fresnel; and in subsequent years he attacked the problem of giving mathematical expression to the conditions holding for a surface separating two crystalline media, and worked out from theory the laws of double refraction in strained crystalline bodies. He also made important contributions to the mathematical theory of electrodynamics, and in papers published in 1845 and 1847 established mathematically the laws of the induction of electric currents. His last publication, which appeared in 1878, was on spherical harmonics (Beilrage zur Theorie der Kugelfunctionen). He took part in founding the Mathe- matisch-Physikalisches Seminar, to give students a practical acquaintance with the methods of original research. He retired from his professorship in 1876, and died at Konigsberg on the 23rd of May 1895. Hisson, Carl Gottfried Neumann (b. 1832), became in 1858 Privatdozent, and in 1863 extraordinary professor of mathematics at Halle. He was then appointed to the ordinary chair of mathematics successively at Basel (1863), Tubingen

(1865) a nd Leipzig (1868).

NEUMANN. KARL FRIEDRICH (1793-1870), German orientalist, was born, under the name of Bamberger, at Reichsmannsdorf, near Bamberg, on the 28th of December 1793. He studied philosophy and philology at Heidelberg, Munich and Gbttingen, became a convert to Protestantism and took the name of Neumann. From 1822 to 1825 he was a teacher at Spires; then he learned Armenian in Venice and visited Paris and London. In 1829 he went to China, where he studied the language and amassed a large library of valuable books and manuscripts. These, about 12,000 in number, he presented to the royal library at Munich. Returning to Germany in 183 1 Neumann was made professor of Armenian and Chinese in the university of Munich. He held this position until 1852, when, owing to his pronounced revolutionary opinions, he was removed from his chair. Ten years later he settled in Berlin, where he died on the r7th of March 1870.

Neumann's leisure time after his enforced retirement was occupied in historical studies, and besides his Geschichte des englischen Reichs in Asien (Leipzig, 1851), he wrote a history of the United States of America, Geschichte der Vereinigten Staaten von Amerika (Berlin, 1863-1866). His other works include Versuch einer Geschichte der armenischen Literatur (Leipzig, 1836); Die V biker des sudlichen Russland (1846, and again 1855); and Geschichte des englisch-chinesischen Kriegsˆ (1846, and again 1855). He also issued some translations from Chinese and Armenian : Catechism of the Shamans (1831); Vahram's Chronicle of the Armenian Kingdom in Cilicia (1831) and History of the Pirates in the China Sea (1831). The journal of the Royal Asiatic Society (London, 1 871) contains a full list of his works.

NEUMAYR, MELCHIOR (1845-1890), German palaeontologist, was born at Munich on the 24th of October 1845, the son of Max von Neumayr, a Bavarian Minister of State. He was educated in the university of Munich, and completed his studies

at Heidelberg, where he graduated Ph.D. After some experience in field-geology under C. W. von Giimbel he joined the Austrian geological survey in 1868. Four years later he returned to Heidelberg, but in 1873 he was appointed professor of palaeon- tology in Vienna, and occupied this post until his death on the 29th of January 1890. His more detailed researches related to the Jurassic and Cretaceous Ammonites and to the Tertiary freshwater mollusca; and in these studies he sought to trace the descent of the species. He dealt also with the zones of climate during the Jurassic and Cretaceous periods,

and en- deavoured to show that the equatorial marine fauna differed from that of the two temperate zones, and the latter from that of the arctic zone, much as the faunas of similar zones differ from each other in the present day; see his “tlber klimatische Zonen wahrend der Jura und Kreidezeit” (Denkschr. K. Akad. Wiss. Wien, 1883); he was author also of Erdgeschichte (2 vols., 1887); and Die Stamme des Thierreiches (vol. 1 only, 1889).

Obituary by Dr W. T. Blanford in Quart. Joum. Geol. Soc.

(1890).

NEUMUNSTER, a town of Germany, in the Prussian province of Schleswig-Holstein, lies on both banks of the small river Schwale, in the basin of the Stor, 40 m. N. of Altona-Hamburg by rail, and at the junction of lines to Kiel, Vamdrup (Denmark) and Tonning. Pop. (1905) 31,347. It has an Evangelical and a Roman Catholic church and several schools. It is, after Altona, the most important industrial town in the province, and contains extensive cloth-factories, besides manufactories of leather, cotton, wadding, carpets, paper, machinery, beer and sweetmeats. Its trade is also brisk. The name, which was originally Wipendorp, is derived from an Augustine monastery, founded in 1130 by Vicelin, the apostle of Holstein, and is mentioned as ” novum monasterium ” in a document of 1136. Its industrial importance began in the 17th century, when the cloth-workers of Segeberg, a town to the south-east, migrated to it. It became a town in 1870.

See Kirmis, Geschichte der Stadt Neumiinster (1900) ; and Dittmann, Aus dem alten. Neumiinster (1879).

NEUNKIRCHEN, or Ober-Neunkirchen, a town of Germany, in the Prussian Rhine province, on the Blies, 12 m. N.W. of Saarbriicken by rail. Pop. (1905) 32,358, consisting almost equally of Protestants and Roman Catholics. It contains two Gothic Evangelical and a Romanesque Roman Catholic church, several schools, and a monument to Freiherr von Stumm (d.1901), a former owner of the iron- works here. The principal industrial establishment is a huge iron-foundry, employing upwards of 4800 hands, and producing about 320,000 tons of pig-iron per annum; and there are also boiler- works, saw-mills, soap manu- factories and a brewery. Around the town are important coal mines from which about 2\ million tons of coal are raised annually. The castle built in 1570 was destroyed in 1797, and is now a ruin. The town is first mentioned in 1280, and became important industrially during the 18th century.

NEUQUEN, an inland territory of Argentina on the Chilean frontier, between the Colorado and Limay rivers, with the province of Mendoza on the N. and the territory of Rio Negro on the E. and S. Area, 42,345 sq. m. Pop. (1895) I4>5i7; (1904, estimate) 18,022. The greater part of the territory is mountainous, with fertile, well- watered valleys and valuable forests. The eastern part, however, contains large barren plains, showing some stunted vegetation, and having numerous saline deposits. Long drouths prevail in this region and there is no inducement for settlement, the nomadic Indians visiting it only on their hunting expeditions. Guanacos and Argentine hares are found in abundance in Neuquen, and to a lesser degree the South American ostrich. The Neuquen, which unites with the Limay near the 68th meridian to form the Rio Negro, is the principal river of the territory. The largest of a group of beauti- ful lakes in the higher Andean valleys is the celebrated Nahuel- Huapi (Lion Grass), which is nearly 50 m. long from E. to W. and about 20 m. from N. to S. at its widest part, and which lies partly in the S.W. angle of the territory, partly in Rio Negro, and partly in the republic of Chile. It is the source of the Rio

Limay and receives the overflow from two smaller neighbouring lakes. The temperature of the Andean region is cold even in summer, but on the lower plains it is hot in summer, and only moderately cold in winter. The principal industry is the raising of stock for the Chilean markets, as there is little cultivation. Cereals, forage crops, vegetables and fruits of the cold temperate zone can be produced easily, but distance from markets and lack of transport have restricted their production to local needs. The territory is reached by a light-draft river steamer which ascends the Rio Negro to Fort Roca at the confluence of the Limay and Neuquen, and by a branch of the Great Southern railway from Bahia Blanca to the same point. The population is concentrated in a few small towns on the rivers and in some colonies, established by the national government to check Chilean invasions, in the fertile districts of the Andes. A majority of the population, however, is of Chilean origin. The capital is Chos Malal, a small town on the upper Neuquen, in the mountainous district in the northern part of the territory.

NEURALGIA (Gr. vtvpov, nerve, and akyos, pain), a term denoting strictly the existence of pain in some portion or through- out the whole of the distribution of a nerve without any distinctly recognizable structural change in the nerve or nerve centres. This

strict definition, if adhered to, however, would not be applicable to a large number of cases of neuralgia; for in not a few instances the pain is connected with some source of irritation, by pressure or otherwise, in the course of the affected nerve; and hence the word is generally used to indicate pain affecting a particular nerve or its branches from any cause. There are few ailments which give rise to greater human suffering. The existence of neuralgia usually betokens a depressed or enfeebled state of health. It is often found to affect the hereditarily rheu- matic or gouty. In weakened conditions of the system from improper or insufficient food, or as a result of any drain upon the body, or in anaemia from any cause, and in such diseases as syphilis or malaria, neuralgia is a frequent concomitant. Any strain upon the nervous system, such as mental overwork or anxiety, is a potent cause; or exposure to cold and damp, which seems to excite irritation in a nerve already predisposed to suffer. But irritation may be produced by numerous other causes besides this — such as a decayed tooth, diseased bone, local inflammations in which nerves are implicated, by some source of pressure upon a nerve trunk, or by swelling of its sheath in its passage through a bony canal or at its exit upon the surface. The pain is generally localized, but may come to extend beyond the immediate area of its first occurrence. It is usually of paroxysmal character, and not unfrequently periodic, occurring at a certain time of the day or night. It varies in intensity, being often of the most agonizing character, or less severe and more of a tingling kind. Various forms of perverted nerve function may be found co-existing with or following neuralgia. Thus there may be hyperaesthesia, anaesthesia, paralysis, or alterations of nutrition, such as wasting of muscles, whitening of the hair, &c.

The forms in which neuralgia most commonly shows itself are facial neuralgia or tic douloureux, migraine (hemicrania or brow ague), intercostal neuralgia and sciatica.

Facial neuralgia, or tic douloureux, affects the great nerve of sensation of the face (fifth nerve) , and may occur in one or more of the three divisions in which the nerve is distributed. It is usually confined to one side. When the first or upper division of the nerve is involved the pain is mostly felt in the forehead and side of the head. It is usually of an intensely sharp, cutting or burning character, either constant or with exacerbations, and often periodic, returning at a certain hour each day while the attack continues. The skin over the affected part is often red and swollen, and, even after the attack has abated, feels stiff and tender to the touch. In this, as in all forms of neuralgia, there are certain localities where the pain is more intense, these ” painful points,” as they are called, being for the most part in those places

where the branches of the nerves emerge from bony canals or pierce the fascia to ramify in the skin. Hence, in this form, the greater severity of the pain above the eyebrow and

along the side of the nose. There is also pain in the eyelid, redness of the eye, and flow of tears. When the second division of the nerve is affected the pain is chiefly in the cheek and upper jaw, the painful points being immediately below the lower eyelid, over the cheek bone, and about the upper lip. When the third division of the nerve suffers the pain affects the lower jaw, and the chief painful points are in front of the ear and about the chin.

Hemicrania, migraine, brow-ague and sick headache are various terms employed to describe what by some is considered to be another form of neuralgia. An attack may come on suddenly, but, in general, begins by a dull aching pain in the brow or temple, which steadily increases in severity and extent, but remains usually limited to one side of the head. It attains at times an extreme degree of violence, and is apt to be aggravated by movement, loud noises or bright light. Accompanying the pain there is more or less of nausea, and when the attack reaches its height vomiting may occur, after which relief comes, especially if sleep supervene. An attack of this kind may last for a few hours or for a whole day, and after it is over the patient feels comparatively well. It may recur periodically, or, as is more common, at irregular intervals. During the paroxysms, or even preceding them, certain sensory disturbances may be experienced, more especially affections of vision, such as ocular spectra, hemiopia, diplopia, &c. Gout, eyestrain and intestinal toxaemia have been put forward as causes of migraine, and Sir W. Gowers regards it as the equivalent of a true epileptic attack.

Intercostal neuralgia is pain affecting the nerves which emerge from the spinal cord and run along the spaces between the ribs to the front of the body. This form of neuralgia affects the left side more than the right, is much more common in women than in men, and occurs generally in enfeebled states of health. It might be mistaken for pleurisy or some inflammatory affection of the lungs; but the absence of any chest symptoms, its occurrence independently of the acts of respiration, and other considerations well establish the distinction. The specially painful points are chiefly at the commencement of the nerve as it issues from the spinal canal, and at the extremities towards the front of the body, where it breaks up into filaments which ramify in the skin. This form of neuralgia is occasionally the precursor of an attack of shingles {Herpes zoster) as well as a result of it.

Sciatica is another of the more common forms of neuralgia. It affects the great sciatic nerve which emerges from the pelvis and runs down ” the leg to the foot. It is in most instances traceable to exposure to cold or damp, to overuse of the limbs ir> walking, &c. Any source of pressure upon the nerve within the pelvis, such as may be produced by a tumour or even by constipation of the bowels, may excite an attack of sciatica. It is often connected with a rheumatic or gouty constitution. In general the nerve of one side only is affected. The pain which is felt at first a little behind the hip-joint steadily increases in severity and extends along the course of the nerve and its branches in many instances as far as the toes. The specially painful points are about the knee and ankle joints; besides which a feeling of numbness is experienced throughout the whole limb. In severe cases all movement of the limb aggravates the pain, and the patient is obliged to remain in bed. In prolonged attacks the limb may waste and be drawn up and fixed in one position. Attacks of sciatica are often attended with great suffering, and are apt to be very intractable to treatment.

In the treatment of all forms of neuralgia it is of first im- portance to ascertain if possible whether any constitutional morbid condition is associated with the malady. When the attack is periodic the administration of a large dose of quinine two or three hours previous to the usual time of the seizure will often mitigate, and may even prevent the paroxysm. Many topical applications are of great efficacy. Liniments containing opium, belladonna or aconite rubbed into the affected part will often soothe the most severe local pain. And antipyrin, phenacetin, aspirin and similar analgetics are commonly taken. The plan at one time resorted to of dividing or excising a portion of the affected nerve is now seldom employed, but the operation

of nerve-stretching in some forms of neuralgia, notably sciatica, is sometimes successful. It consists in cutting down upon and exposing the nerve, and in seizing hold and drawing upon it so as to stretch it. Such an operation is obviously justifiable only in cases where other less severe measures have failed to give relief. The employment of electricity, in long continued and intractable forms of neuralgia, proves in many instances eminently serviceable. In the severest forms of tic doloureux complete relief has followed the extirpation of the Gasserian ganglion. (F. W. Mo.)

NEURASTHENIA (Gr. veupov, nerve, and acrdeveia, weakness), the general medical term for a condition of weakness of the nervous system. The symptoms may present themselves as follows: (i) general feeling of malaise, combined with a mixed state of excitement and depression; (2) headache, sometimes with the addition of vertigo, deafness and a transitory clouding of consciousness simulating petit mal or migraine; (3) disturbed and restless, unrefreshing sleep, often troubled with dreams; (4) weakness of memory, especially for recent events; (5) blurring of sight, noises or ringing in the ears; (6) variable disturbances of sensibility, especially scattered analgesia (partial and symmetrical) affecting the backs of the hands especially, and in women the breasts; (7) various troubles of sympathetic origin, notably localized coldness, particularly in the extremities, morbid heats, flushings and sweats; (8) various phenomena of nervous depression associated with functional disturbances of organs, e.g. muscular weakness, lack of tone, and sense of fatigue upon effort, dyspepsia and gastric atony with dilatation of the stomach and gastralgia; pseudo-anginal attacks and palpitation of the heart; loss of sexual power with nocturnal pollutions and premature ejaculations leading to apprehension of oncoming impotence. Objective signs met with in organic disease are absent, but the knee-jerks are usually exaggerated.

According to the complexity of symptoms, the neurasthenia is more particularly defined as cerebral, spinal, gastric and sexual. The cerebral form is sometimes termed psychasthenic!, and is liable to present morbid fears or phobias, e.g. agoraphobia (fright in crowds), monophobia (fright of being alone), claustro- phobia (fright of being in a confines place), anthropophobia (fright of society), batophobia (frignc of things failing), sidero- dromophobia (fright of railway travelling). There may also be mental ruminations, in which there is a continuous flow of connected ideas from which there is no breaking away, often most insistent at night and leading to insomnia. Sometimes there is arithmomania (an imperative idea to count). Such cases often exhibit a marked emotionalism and readily manifest joy or sorrow; they may be cynical, pessimistic, introspective and self-centred, only able to talk about themselves or matters of personal interest, yet they frequently possess great intellectual ability, and although there may be mental depression, there is an absence of the insane ideas characteristic of melancholia.

Traumatic neurasthenia is the neurasthenia following shock from injury; it is sometimes termed ” railway spine,” ” railway brain,” from the frequency with which it occurs after railway accidents, especially in people of a nervous temperament. The physical injury at the time may be slight, so that the patient is able to resume work, but

symptoms develop later which may simulate serious organic disease. As in all forms of neurasthenia, the subjective symptoms may be numerous and varied, whereas the objective signs are but few and slight. Many difficulties, therefore, present themselves in arriving at a sound opinion as to the future in such cases. It is desirable not only to study the case carefully, but to obtain some knowledge of the previous history of an individual who is claiming damages on account of traumatic neurasthenia. (F. W. Mo.)

NEURI, an ancient tribe placed by Herodotus (iv. 105) to the north-east of Scythia. He says of it that it is not Scythian, but has Scythian customs. Every member of it, being a wizard, becomes a wolf once a year. The position assigned to their district appears to be about the head waters of the Dniester 4nd Bug (Bugh) and the central course of the Dnieper just the legion which, on general grounds, place-names, recorded migra-

tions and modern distribution, appears to be the original location of the Slavs (q.v.). The wolf story again recalls the tales of werewolves so common among Slavonic peoples, and there is much probability in Schafarik's conjecture that the Neuri are nothing but the ancestors of the Slavs. (E. H. M.)

NEURITIS (Gr. vevpov, nerve), a term applied to the in- flammation of one or more bundles of nerve fibres. Two varieties are known, the localized and the multiple. The localized form frequently follows on exposure to cold and may attack a single nerve. Facial paralysis (Bell's palsy) is commonly seen following a neuritis of the facial nerve. Neuritis may follow blows and wounds of a nerve, injuries involving stretching of a nerve or long continued pressure such as may occur in a dislocation of the elbow joint, or the nerve may share in the extension of a neighbouring inflammation. The first symptom of a localized neuritis is pain of a boring character along the course of a nerve and its distribution, the part being sensitive to pressure. There may be slight redness and oedema along the course of the nerve, movement becomes painful in the muscles to which the nerve is distributed, numbness may follow and the tactile sense be impaired, finally the muscles atrophy, and degenerative changes may take place in the nerve or nerve sheath. Slight cases follow- ing cold or injury may pass off in a few days, while severe cases such as those following the pressure of an unreduced dislocation may last for months.

Multiple neuritis or polyneuritis is a disease which may affect many of the peripheral nerves symmetrically and at the same time. For the pathological changes see Neuropathology. The difference in these

changes is due mostly to the difference in the aetiology of the neuritis. The causes may be divided as follows:

(1) The toxins of acute infective diseases, such as diphtheria, influenza, typhoid fever, malaria, scarlet fever and-septicaemia.

(2) Acute or chronic poisoning by lead, arsenic, mercury, copper and phospho r us. (3) General disorders: gout, rheumatism, tubercle, carcinoma. (4) The local action of leprosy and syphilis. (5) Endemic disease: beri-beri. (6) Alcohol, the most common.

Alcoholic neuritis occurs as a result of constant steady drinking, particularly in those who drink beer rather than spirit. The earliest symptom is numbness of the feet and later of the hands, then painful cramps in the legs appear and there is pain on moving the limbs, or the patient complains of deadness, tingling and burning in the hands and feet, and superficial tenderness is occasionally present. In other varieties of the disease the earliest symptoms are weakness of the legs and extreme fatigue, leading to a characteristic ” steppage gait,” or marked inco-ordination of movement may occur and the gait become ataxic. Trophic changes soon appear, in some cases early and rapid muscular wasting occurs, the skin becomes dry and glossy, the nails brittle and the hair thin. In time actual con- tractures takes place, the hip and knee-joints become flexed and the foot dropped at the ankle. In cases that recover there may be permanent deformity. Should the case progress the patient may become bedridden and powerless, and degenerative mental changes may take place, loss of memory, irritability of temper and emotional instability. Various complications such as bronchitis, fatty changes in the heart, albuminuria and a liability to pulmonary tuberculosis, tend to carry off the victim of chronic alcoholic neuritis. Cases seen early in the progress of the disease, who can be placed under supervision, may recover under treatment, but those in whom the attacks have recurred several times and in whom there is much mental impairment rarely make a complete recovery. The treat- ment consists in putting the patient to bed, with the administration of strychnine hypodermically, and attention should be paid to the position of the limbs so as to avoid the development of contractures, cradles being used, the limbs kept in the correct positions by sand- bags, and gentle massage being employed as soon as possible. Should contractures have already formed some mechanical device adapted to stretch the contracted muscle must be resorted to. Biers’ hyper- aemic suction apparatus is very useful in the painless stretching of contracted joints, or old-standing adhesions may have to be broken down under an anaesthetic, extension apparatus being afterwards worn. In the later treatment the galvanic and

faradaic currents combined with massage are useful in helping to restore the wasted muscles, and hot-air baths and warm applications are appreciated.

Arsenical neuritis mostly affects the lower extremities, as con- trasted with lead, which mainly paralyses the fingers and wrists; recovery is even slower than in alcoholic neuritis, the treatment being on the same lines, with the removal of the cause of the disease. In the neuritis of chronic lead poisoning a fine tremor of the hands is an early symptom and sensory symptoms are usually absent; the muscles affected are the extensors of the wrists, thumb and fingers

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(see Lead Poisoning). The course of the disease is long, and an attempt should be made to eliminate the lead from the system by purgatives and the administration of potassium iodide.

The diabetic neuritis paraesthesia is slight, and the legs are chiefly affected; weakness and ataxia may be present. Trophic sores on the feet are of frequent occurrence in this variety. The treatment is that of the disease.

Post-diphtheritic neuritis occurs in about 10% of all cases of diphtheria. In this form paralysis of the soft palate is the earliest symptom, and this may be the only one, or the pharynx may be affected. The limbs are affected much later, usually about the 5th or 6th week. Atrophy of the muscles is frequently rapid. If the respiratory muscles are unaffected the prognosis is good, ‘but the paralysis of the limbs may last for several months. The treatment is complete rest, good food and the administration of strychnine.

Acute polyneuritis with numbness and motor weakness has been noted after influenza, together with slight muscular wasting and electrical degeneration. Later, loss of sensation in the peripheral portion of the limbs is complained of, and the motor weakness may affect the muscles of the trunk and face. Such cases tend towards complete recovery.

NEUROPATHOLOGY, the general name for the science con- cerned with diseases of the nervous system. As regards the anatomy and physiology, see the articles Nerve, Nervous System, Brain, Spinal Cord, and Sympathetic System. The morbid processes affecting the nervous system are numerous and varied, but usually they are clinically divided into two great groups of (1) organic disease, (2) functional disturbance. Such a classification depends upon whether or not symptoms observed during life can be associated with recognizable changes of the nervous system, gross or microscopical, after death. Sometimes this is the morbid process itself, sometimes only the ultimate result of the process. It must be remarked, however, that many diseases which we now look upon as functional may be found due to recognizable changes when suitable methods of investiga- tion shall have been discovered. The paroxysmal neuroses and psychoses may be considered a priori to be due to temporary morbid functional conditions. Our knowledge of the first group is naturally much more advanced than of the latter, for, given certain

symptoms during life, we are able, as a rule, to predict not only the nature of the morbid process, but its particular locality.

The histological elements which make up the nervous system may also be divided into two groups: (1) the nervous units or neurones, (2) the supporting, protecting and nutrient tissues. Organic diseases may start primarily in the nervous units or neurones and cause their degeneration; such are true diseases of the nervous system. But the nervous units may be affected secondarily by diseases starting in the supporting, protecting and nutrient tissues of the nervous system; such are essentially diseases within the nervous system, and include diseases of the blood-vessels, lymphatics, membranes and the special nervous connective tissue, neuroglia (a residue of the embryonal structure from which the nervous system was developed). Tumours and new growths must* also be included.

The modern conception of the ” neurone ” as an independent complex cell with branching processes, in physiological rather than anatomical association with other neurones, has modified our ideas of the morbid processes affecting the nervous system, especially as regards degenerations of systems, communities or collections of neurones subserving special functions. It was formerly believed, and generally taught, that the primary systemic degenerations were due to a sclerosis; thus locomotor ataxy was believed to be caused by an overgrowth of the sup- porting glia tissue of the posterior columns of the spinal cord, which caused a secondary atrophy of the nervous tissue. We now know that this overgrowth of glia tissue is secondary to the atrophy of the nervous elements, and the only .true primary overgrowth of glia tissue is really of the nature of the new growth (gliosis). But even in this case it is doubtful if the mere proliferation of the glia tissue elements could destroy the nervous elements, if it were not for the fact that it leads to changes in the vessel walls and to haemorrhages.

The symptoms manifested during life depend upon the nature of the morbid process and the portion of the nervous system affected. A correct understanding of neuropathology involves

the study of (1) the causes which give rise to morbid conditions, which are often complex and due to various combinations of factors arising from without and within the body, and (2) the changes in the structure and functions of the nervous system brought about by intrinsic and extrinsic causes.

The causes of pathological processes occurring in the nervous units

(neurones) may be divided into internal and external, and it may be remarked that in all cases except direct injury the two groups are generally more or less combined.

A. Internal Causes. — Of all the causes of nervous disease hereditary predisposition stands pre-eminently first; it may be convergent, paternal, (maternal; from grandparents or even more remote ancestors. Moreover, no study of heredity is com- plete that does not take into consideration collaterals. Especially does this statement apply to functional neuroses, e.g. epilepsy, migraine, hysteria and neurasthenia; and to psychoses, e.g. delusional insanity, mania and melancholia, manic-depressive, recurrent or periodic insanity and dementia-praecox or adolescent insanity.

In 70% of 150 cases of idiocy or imbecility in the London county asylums, Dr Tredgold found a family history of insanity in some form or another. Strictly speaking, it is the tendency to nervous disease rather than the disease itself that is inherited, and this is frequently spoken of as a neuropathic or psychopathic taint. There are, besides, a number of inherited diseases, which, although somewhat rare, are of interest inasmuch as they affect members of a family, the same disease frequently commencing in each individual at about the same age. These are termed family diseases, and include hereditary ataxia (Friedreich's disease), myotonia (Thomsen's disease), hereditary (Huntingdon's) chorea, amaurotic idiocy and various forms of idiopathic muscular atrophy. Alcoholism, tubercu- losis and syphilis in the parents, especially if one or both come from a neuropathic or psychopathic stock, frequently engender idiocy, imbecility, epilepsy and general paralysis in the offspring, by the production of defects in the vitality of the germinal plasm, causing arrest, imperfect development or premature decay of groups, com- munities or systems of neurones, especially those which are latest developed — the symptoms manifested depending upon the portions of the nervous system affected. To explain the hereditary neuro- pathic tendency morphologically, we may suppose that there is an inherited defect in the germinal plasm which is concerned in the formation of the neurones. We may regard the neurone as a complex cell, and the nervous system as a community of neurones arranged in systems and groups having special functions. Like all cells, the neurone nourishes itself and is not nourished; certainly it depends for its development, life and functional activity upon a suitable environment, but it must also possess an inherent vital energy by which it can assimilate and store up nutrient material which may be regarded as potential (latent nerve energy), to be converted into nerve force as required. A constant constructive and destructive bio-chemical process occurs in the

neurones of a healthy nervous system, latent nervous energy is high and the sense of fatigue is the natural indication for sleep and repose, whereby it is constantly recuperated. In the neuropathic or psychopathic individual it may be conceived that in some portion of the nervous system, especially the brain, there may exist communities, systems or groups of neu- rones with inherited low potential, readily becoming exhausted, and, under the influence of altered blood states or stress, especially liable to functional depression, from which arise function-paralysis and melancholia. Again, the bio-chemical substance which represents potential in the nervous system may be in a chemically unstable condition, so as readily to fulminate when excited by abnormal conditions {e.g. toxic conditions of the blood), thus acting as a centre of discharge of nervous energy, which may be manifested by mental or bodily symptoms. We know that in strychnia and tetanus poisoning the most localized peripheral excitation will cause general muscular spasm; in both toxic conditions the spread is probably due to a bio-chemical change in the protoplasm of the spinal neurones, whereby the excitability is greatly increased and a slight stimulus is sufficient to fulminate the whole system of motor neurones. In epilepsy and other paroxysmal neuroses and psychoses it is possible that some altered condition of the blood, when associated with an inherited bio-chemical instability of certain groups, systems or communities of neurones, may act as a fulminating agent. In neuralgia and local hyperaesthesia the slightest general or distant local irritation suffices to produce pain; thus coughing, the vibration of a passing train or the slamming of a door may produce pain by the stimulation of the hyper-excitable neurones. Moreover, it must be borne in mind that the symptoms of nervous disease are due as much to normal physiological functional activity improperly applied, as to actual loss of function occasioned by disease. Thus squint, caused by paralysis of one of the muscles of the eyeball, causes less trouble to the patient than the double vision occasioned by the physio- logical activity of the two retinae, upon the corresponding points of which the images are prevented by the paralysis from falling.

B. The external causes producing morbid changes in the nervous elements are: I. Abnormal conditions of the blood and lymph, by which the neurones are poisoned and their metabolism morbidly affected. II. Excess or deficiency of normal stimula- tion, or existence of abnormal stimulation. III. Injury or diseases of supporting, enclosing or vascular tissues.

I. Abnormal Conditions of the Blood and Lymph. — The im- mediate environment of all the cellular elements of the body is lymph, and in the central nervous system there is a special form of lymph, the cerebro-spinal fluid, which is secreted by the choroid plexus in the venticles of the brain. The neurones, like other cellular elements, are bathed in the lymph, and extract from it the materials necessary for their growth and vital activities, casting out the waste products incidental to the bio-chemical changes which are continually taking place. The lymph, there- fore, serves as a medium of exchange between the blood and the tissues, consequently the essential causes of change in environ- ment of the nervous elements (neurones) are: (i) Deficiency or absence of blood-supply to the nervous system in general (as after severe haemorrhage), or to some particular portion, owing to local vascular disturbance or occlusion. (2) Alterations in the normal condition of the blood, due to (a) deficiency or absence of certain essential constituents, (b) excess of certain normal constituents, (c) the presence of certain abnormal constituents produced within the body, or entering it from without.

(1) Quantity of Blood Supply. — Syncope or fainting occurs when the blood supply suddenly fails to reach the higher centres of the brain ; this usually arises from sudden reflex arrest of the heart's action. If a portion of the central nervous system is cut off from its arterial blood supply by embolic plugging or by clotting of the blood in a vessel with diseased walls, the portion of the brain substance thus deprived of blood undergoes softening, the nervous elements are destroyed, and the systems of nerve fibres, which have had their trophic and genetic centres in the area destroyed, undergo secondary defeneration. Clotting of the blood in the veins may also give rise to destructive softening of the brain, and similar secondary degeneration.

(2) Quality of Blood Supply. — (a) Insufficiency of oxygen, due to poverty of the colouring matter or of the number of the red corpuscles, which constitutes the various forms of anaemia, leads to functional depression, lassitude and mental fatigue. Impoverishment of the blood in women by frequent pregnancies and excessive lactation causes neuralgia, nervous exhaustion and, in the neuropath, hysteria, neurasthenia, melancholia and mania. The mental depression, and the tendency that the various neuroses and psychoses have to occur and recur at the time of the menstrual and climacteric periods in women, suggests the possibility of an alteration in the composition of the blood, either in the nature of an auto-intoxication or " sub- minimal deficiency,' 1 as the probable contributory factor of the mental disturbance. It may be remarked that eclampsia, puerperal and lactational mania are relatively common forms of insanity in

women; although sometimes of septic origin, they more frequently are occasioned by some morbid metabolism as yet little understood. The most striking examples we have, however, of the effect of absence or " sub-minimal " deficiency of a normal constituent of the blood upon the development and functions of the nervous system are afforded by cretinous idiots, who are born without thyroid glands, and whose brains never develop in consequence; and by those people who suffer from the disease known as myxoedema, occasioned by the absence of iodothyrin, a product of the internal secretion of the thyroid gland. The proof of this is shown by the disappearance of the nervous phenomena, slowness of thought, slowness of speech, &c, after a preparation of the gland has been continuously ad- ministered by the mouth. Even cretinous idiots when subjected in early life to thyroid treatment improve considerably. The removal of the testicles in the male may produce a profound effect upon the nervous temperament; for probably there is an internal secretion of this gland in the male, as of the ovary in the female, which has some subtle influence upon the functional activity of the nervous system. The seminal fluid contains a large amount of complex phosphorus-containing substances, which, lost to the body by sexual excess or onanism, have to be replaced by the blood; the nervous system, which also needs these complex organic phosphorus compounds, is thereby robbed, and neurasthenia ensues. Brown- Sequard's testicular injection treatment for many nervous com- plaints, based upon this idea, has not, however, met with much success.

(b) Excess of certain Normal Constituents in the Blood. — Excess of carbonic acid causes drowsiness, and probably in asphyxia is one of the causes of the convulsions. All the series of the nitrogenous waste products — the most highly oxidized, most soluble and least harmful of which is urea — are normal constituents of the blood ; but

should the oxidation process be incomplete, owing to functional or organic disease of the liver, or should these substances accumulate in the blood, owing to inadequate function of the kidneys, a toxic condition, called uraemia, may supervene, the nervous manifestations of which are headache, drowsiness, unconsciousness or coma, epilepti- form convulsions and sometimes symptoms of polyneuritis. Again, in Graves's disease, nervous phenomena, in the form of exophthalmos, fine tremors, palpitation and mental excitement, have by some authorities been explained by the excess of thyroid internal secretion, due to the enlargement and increased functional activity of the gland. The successful treatment of Graves's disease by the ad- ministration of the blood serum and milk of animals (goats), which had the thyroid glands removed, supports this theory.

(c) The presence of abnormal constituents in the blood is a most important cause of disease of the nervous elements. We may consider the subject under the following headings : Poisons produced within the body (a) by perverted function of organs or tissues, auto-intoxication ; (p) by the action of micro-organisms, protozoa and bacteria, upon the living fluids and tissues of the body ; (7) poisons introduced into the body from without, in the food and drink, or by inhalation.

(a) Poisons resulting from perverted Function of the Organs. — In the process of digestion a number of poisonous substances, e.g. albumoses, &c, are produced, which, although absorbed in the ali- mentary canal, are prevented by the living epithelium, and possibly by the liver, from entering the systemic circulation. Fatigue pro- ducts, e.g. sarcolactic acid in prolonged muscular spasms, may lead to auto-intoxication. Excess of uric acid in the blood is associated with high arterial pressure, deposits of lithates in the urine, headache and nervous irritability ; it is an indication of imperfect metabolism and auto-intoxication, as shown by the fact that marked improve- ment occurs by suitable diet and treatment. Phosphoruria, oxaluria and glycosuria, tokens of deranged metabolism, may be associated with various nervous phenomena. Bile in the blood, cholaemia, resulting from obstructive jaundice, may be attended by stupor and psychical depression; and the term melancholia, signifying ” black bile,” indicates the importance which has long been attached to the liver as an organ the derangement of which causes nervous depression. The rapidly fatal results attending acute yellow atrophy of the liver, namely, the profound changes in the urine, the jaundice and the nervous phenomena of delirium, motor irritation, delusions, stupor and coma, demonstrate the important part this organ plays in pre-serving the normal quality of the blood. The delirium and coma which sometimes supervene in diabetes, heralded by acetonaemia, is another instance of auto-intoxication. The coma is very possibly due to the saturation of the sodium salts of the blood by aceto-acetic and oxybutyric acids, products of imperfect proteid metabolism. The effect of this would be an interference with the elimination of carbonic acid in the processes of tissue and pulmonary respiration. Again, in pernicious and certain grave anaemias, the degenerative changes in the spinal cord found in some cases is due, not so much to the defect in the red corpuscles, as to some neuro-toxin,which probably arises from imperfect metabolism or absorption from the alimentary canal. In this question of auto-intoxication, it must be remarked that all the tissues of the body are mutually interde- pendent. If one suffers, all suffer, and a disease cf one organ or tissue is thereby apt to establish a

vicious circle which is constantly en- larging; therefore nervous symptoms manifesting themselves in the course of a disease add much to the gravity of the complaint.

(/3) Poisons produced by Infective Micro-organisms. — Some of these poisons have a general devitalizing influence, by an alteration of the blood and the production of fever. In the course of the acute infectious diseases, typhoid, typhus, smallpox, scarlet fever, measles, influenza, also tuberculosis and septicaemia, delirium is a frequent complication ; it may be the result of high fever or prolonged fever, or directly due to the poison, or the two combined. In severe cases stupor and coma may occur, and it has been shown that in this extreme stage the nerve cells undergo an acute morbid bio-chemical change. These particular poisons have no selective toxic action upon a particular part of the nervous system, and symptoms not only during, but after, the acute illness are liable to supervene, especially in a neuropathic individual. Thus many cases of neurasthenia, insanity, neurosis, also neuritis, date their origin from an acute specific fever. In cerebro-spinal meningitis, tubercular meningitis, acute delirious mania and leprous neuritis, the inflammation of the membranes of the brain and spinal cord is due to the growth of the specific organism in the lymph and interstitial tissue elements.

Poisons may have a selective influence upon some part of the nervous system. The syphilitic poison is the most important factor in the production of two progressive degenerations of the nervous system — one affecting especially the afferent conducting tracts of the spinal cord, namely, locomotor ataxy, and the other affecting especially the frontal and central convolutions of the cerebral hemispheres, namely, general paralysis of the insane. A striking instance of the selective action of the syphilitic poison is shown in the fact that only in persons affected with acquired or inherited syphilis is a symptom known as Argyll-Robertson pupil found ; this is the absence of the pupil reflex contraction to light, while that for accommodation persists. Seeing that this is the most common objective phenomenon in the two diseases mentioned, it strengthens the presumption,

|. NEUROPATHOLOGY

Plate I.

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Fig. 2. Brain of a micro-cephalic idiot, which weighed only eight ounces although its possessor was an adult woman. The striking lack of development of the hemispheres is shown in their small size, whereby the cerebellum is almost entirely uncovered ; more- over the convolutional pattern is simpler than that of an an- thropoid ape's brain.

thickened, so that the fore part brain presents the appearance of branous bag; this contained a large of pus.

abscess 3ns and nbranes

of the mem- amount

Fig. 4. Right hemisphere seen from above instead of laterally: a hole corresponding to the middle of the central convolutions is seen, out of which a tumour is displaced towards the middle line.

Fig. 7. Left hemisphere: a case of ad- vanced dementia, showing atrophy of the convolutions, with deep and wide sulci in- tervening.

Wjtˆ ""T""^^^^Bˆ* X <ˆ"^^*" ˆ 1^^ Fig. 6. Brain from a case

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V**Vsˆ_^^ J*^^^ ' j- A """"" Zˆ J *ˆ *5PˆK t ˆ ie hemispheres have been

morrhage (dark patch) in Fig. 8. The brain of an adult congenital imbecile,

the nght centrum ovale, There is a very simple convolutional pattern in com-

which has ruptured the parison with the other brains, shown in the figures.

„· „ , „·‥„ ,_ „ _, fibres proceeding from the The convolutions are small, the secondary gyri are

suffered with Motor aphasia paralysis of the lower half of the Tnotor area of the brain, deficient in numbers. The sylvian fissure turns

right side of the face, deviation of the tongue to the right Sltuat , e « between the basal obliquely upwards and there is an obvious deficiency

and some weakness in the right leg and arm. ganglia. in the superior

and inferior parietal lobes.

Fig. 5. Left hemisphere of a woman who for 11 years

Fig. 9. Right hemisphere of a woman who for many years was the subject of sensory aphasia. The left hemisphere showed a similar lesion to the right but rather more extensive.

Fig. 10. Left hemisphere and cerebellum of a case of porencephaly. A local atrophy of the convolutions, owing to a vascular lesion before birth, is seen in the parietal lobe.

XIX. 430.

PHOTOGRAPHS OF THE BRAIN (about J their Natural Size) ILLUSTRATING VARIOUS PATHOLOGICAL CONDITIONS.

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Plate II.

NEUROPATHOLOGY

Fig. i, —Trypanosoma gambicnse in the blood from a" case of sleeping sickness in a European. The undulatory membrane isciearly seen; the head of the organism with its micronucleus is in contact with a red blood corpuscle. Magnification 2000 diameters.

Fig. 2. — A. and B. The spirochaete pallidum. A shows the organisms seen in a section of mucous tubercle stained by Levaditi's silver method; the lowest with 8 equal spirals and a pointed end is the most typical. Magnification 1200. B. Spirochetes in a smear preparation stained by Leishman. Magnification 2260-

Fig. 3. — Section of the brain of a European who died of sleeping sickness, showing an enormous increase of large branching neuroglia cells around a small vessel of the cortex. Magnification 450.

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Fig. 4. — Very marked syphilitic arter- itis, showing great diminution of the lumen, mainly caused by an inflammatory thickening of the inner coat. Magnifica- tion 5.

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FlG. 7. — Longitudinal section of a small vessel of the cortex from a case of well-marked general paralysis of the insane. Magnification 250.

FlG. 5.— Section of the base of the brain of a monkey that died of experi- mental sleeping sickness caused by in- oculation of the Trypanosoma gambiense. Magnification 250.

Fig. 8. — Transverse section of a small vessel of the cortex from a case of sleep- ing sickness, showing the perivascular cell infiltration of lymphocytes and plasma cells. Magnification 250.

Fig. 6. — Longitudinal section of a perivascular sheath of the cortex of a monkey that died of experimental sleeping sickness. The large branching neuroglia cells are seen undergoing pro- liferation. Magnification 600.

Fig. 9. — Transverse section of a small vessel of the cerebral cortex from a case of syphilitic gummatous meningitis, show- ing the same perivascular cell infiltration of lymphocytes and plasma cells as seen in figs. 7 and 8. Magnification 250.

Based on experience, that the syphilitic poison is the cause of these diseases in the majority of instances. Again, syphilis, when it attacks the supporting, enclosing and nutrient vascular tissues, shows a predilection to affect structures about the base of the brain, and paralyses of the third nerve are almost pathognomonic of thi3 disease. In rabies, although the whole nervous system is charged with the poison, the medulla oblongata (as shown by the symptoms) is

especially affected. Again, in tetanus the bacilli are only found in the wound; they must therefore be comparatively few in number, but they elaborate a virulent poison, which affects particular groups of neurones. The fact that lockjaw nearly always occurs first, shows Chat the poison selects the motor nucleus of the fifth nerve ; but it is remarkable that experiment has shown that the tetanus toxin, if mixed with an emulsion of nervous matter before injection into an animal, loses its toxicity. This fact indicates its affinity for nervous matter, and also a power of absorption of the poison by some chemical substance in the nervous matter. Another example is offered by diphtheria. A neuro-toxin is produced by the local action of the bacilli, for they do not become freely generalized in the blood and tissues. Whether the poison is a direct production of the bacilli themselves, or is an auto-toxin created in the body itself, by an influence exerted on the living fluids and tissues by a ferment-like product of the bacilli, is not determined. But whatever may be the source of the toxin, its effects upon the neurones are constant, as shown by the sufferings of the patients — -paralysis of the soft palate, with nasal speech and regurgitation of fluids through the nose when swallowing is attempted; inability to read, owing to the paralysis of the muscle of accommodation; weakness and inco-ordination of the limbs, which may amount to paralysis; absence of the knee- jerks ; and often skin anaesthesia

The relation of protozoa to the existence of widespread diseases affecting men and animals is becoming yearly of greater importance and interest. Certain hitherto ob- scure diseases in which the nervous system is profoundly affected are now explained by the invasion of the tissues of the body by these lowly organisms, for example, Sleeping Sickness, the cause of which has been definitely proved to be the Trypanosoma gambiense (see Plate II. fig. I).

The discovery by Schaudinn of the presence of the Spirochaete Pallida (see Plate II. fig. 2) in the primary and secondary lesions of seventy successive cases of syphilis, and the general acceptance of this organism as the cause of the disease, taken together with the fact that in many respects it simulates the trypanosome in its mode of division and other characters, tend to prove that syphilis is also a protozoal disease.

The bacterial invasion of tissues is generally characterized by a migration of polymorpho-nuclear leucocytes, but protozoal invasion is characterized by a formative hyperplasia of the fixed cell tissues, endothelial, epithelial and conjunctival, and there is a close similarity in the defensive reaction of the tissues to all forms of protozoal

invasion (see Plate II. with explanatory text).

If the cause of rabies be regarded as proved since the discovery of Negri bodies, we may assume that j ust as in malaria the Haematozoon malariae undergoes its endocellular development in the red blood corpuscle, the protozoon of rabies undergoes its endocellular de- velopment in the nerve cell.

Only a short time has elapsed since Negri showed that in cases of rabies, whether experimental or otherwise, curious bodies measuring from I p. to 20 in could be constantly found in the nerve cells, and that these bodies are not found in the nerve cells in any other disease; so that even if the theory advanced that they are endocellular forms of protozoa prove not true, yet the discovery affords a valuable and expeditious means of determining whether a suspected animal suffered with rabies or not. It is known that the salivary glands and saliva contain the virus, even before the animal shows symptoms. It is known too that the central nervous system contains the virus and that it multiplies there. Experimental inoculation can be made either from the saliva or an emulsion of the central nervous system of an animal suffering with rabies. Moreover, the virus can pass through a Berkfeldt filter; and if the filtrable product be injected into an animal, the animal thus inoculated will die of rabies and exhibit the Negri bodies. There are only two conclusions to be drawn from these observations : (1) If it be a protozoal disease, the organism at one period of its developmental cycle must be so small as to be able to pass through the pores of the Berkfeldt filter. (2) Negri bodies are the result of intra-cellular degenerative changes caused by an elective affinity of the virus for the protoplasm of the nerve cell. The virus, whatever it may be, does not exist in the blood and other organs and tissues. Seeing that the Negri bodies cannot be found in the saliva, although the saliva contains the virus, nor can they be found in the peripheral nerves, although the virus passes by the lymphatics of the nerves to the nerve cells of the spinal ganglia and central nervous system, it must be concluded that the filtrable virus travels to the central nervous system and there increases.

It is a remarkable fact that before the discovery of the Negri bodies, the diagnosis of rabies was made by microscopic examination of the spinal and sympathetic ganglia, particularly the ganglia of the vagus and fifth nerves. Changes were found similar to those met with in other protozoal diseases, namely, sleeping sickness, dourine

and syphilis. These changes were proliferation of the interstitiai connective tissue cells forming the supporting structure of the

ganglion and hyperplasia of the lymphatic endothelial cells forming the capsule containing the nerve cells.

The diagram here given (fig. 1) after Volpino explains the supposed developmental cycle of the protozoon which is presumed to be the cause of rabies. The weak link in the chain is the assumed sporozoit which is so small as to be capable of passing through a Berkfeldt filter. It has taken twenty years to lead to the complete knowledge of the life history of the malarial parasite and its relation to the disease, and all we can say is that there is now a certain amount of evidence forthcoming which tends to show that rabies is due to a protozoon, which Calkins, who discovered a similar body in the epithelial cells of variola, places among the rhizopods,

There are certain chronic trypanosome infections in which the nervous symptoms form a special feature of the disease, notably sleeping sickness (see Plate II. fig. 1) and a disease affecting horses, termed mal de coit or dourine.

The chronic trypanosome affections resemble in many respects syphilis; they are characterized by local infection, enlargement of the nearest lymphatic glands, a general polyadenitis and successive eruptions, accompanied by fever. The tissue changes are the same whether we examine the primary seat of infection, papular eruptions on the mucous membrane or the skin, or the lymphatic glands.

When the nervous system is affected a local or general chronic meningo-encephalitis is set up, characterized by a meningeal and

Ttypano-

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Sladlo del virus filtrabik

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From a coloured plate in Ceniralblaii fiir Bakteriologie, by permission of Gustav Fischer.

Fig. 1.

perivascular infiltration with lymphocytes and plasma cells, occasioned by a chronic irritative process, presumably caused in the case of sleeping sickness by the presence of trypanosomes in the cerebro-spinal fluid (see fig. 8, Plate II.). The same perivascular and meningeal infiltration with plasma cells and lymphocytes is found in syphilitic and parasyphilitic diseases of the nervous system (see Plate II., figs. 7 and 9).

The significance of pathological changes in the cerebro-spinal fluid has recently become of great importance in the diagnosis of nervous diseases, and a short account of the subject in this article will therefore not be out of place. The cerebro-spinal fluid is clear like water; it has a specific gravity of 1006 and resembles in its composition the blood minus its corpuscular and albuminous constituents. It is secreted by the choroid plexus, and if any cause, such as tumour or meningitis, should interfere with its escape from the ventricles it gives rise by pressure to internal hydrocephalus and cerebral anaemia which may occasion epileptic convulsions and various degrees of drowsy stupor, lethargy, unconsciousness and even coma. With- drawal of the fluid by lumbar puncture and by tapping the ventricles of the brain has been employed in treatment, but without very satisfactory results. If, however, lumbar puncture has proved of but little use in treatment, it has proved of inestimable service in the diagnosis of various diseases of the central nervous system. The fluid withdrawn may be examined in various ways which are comple- mentary to one another.

It should be centrifuged and the deposit examined microscopically if necessary after staining by suitable methods ; the existence of cells

Pathology of the cerebro- spinal fluid.

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in a fluid which normally contains no cellular elements indicates disease of the central nervous system. In general paralysis, syphilis of the nervous system and tabes dorsalis even in early stages of these diseases, the deposit is seen to consist almost entirely of lymphocytes. Some evidence of the progress of the disease and the effect of treatment may be obtained by counting the number of cells at different periods. In tubercular meningitis there are also lymphocytes in abundance although usually tubercle bacilli cannot readily be found, yet bacilli are present, for injection of the fluid into a guinea pig is a certain means of determining whether it is tubercular meningitis or not; for if it is, the animal is sure to develop tubercle. In epidemic cerebro-spinal meningitis the cells in the deposit are polymorpho-nuclear leucocytes, and in the leucocytes can be seen the specific organism Diplococcus intracellularis with its characteristic staining and cultural characters. Septic, pneumonic and pyogenic organisms may also invade the central nervous system giving rise to meningitis, and in these cases the deposit will be polymorpho-nuclear leucocytes, and perhaps the specific organisms may be seen in stained preparations; but if not, they can be obtained by cultural methods. In all operations of this kind antiseptic precautions must be adopted both for the safety of the patient and the reliability of the findings, otherwise organisms in the skin may contaminate the fluid withdrawn.

Other formed elements which may be found are large cells, macrophages containing blood pigment; these cells indicate that some haemorrhage has occurred. One of the most important uses of lumbar puncture has been the discovery of the cause of sleeping sickness. The fluid withdrawn and centrifuged contains, as one would expect from the lesions in the brain and spinal cord, large numbers of lymphocytes and plasma cells (see Plate II. fig. 10), but besides, the actively moving organisms {Trypanosoma gambicnse) (see Plate II. fig. i) which are the essential cause of the disease. It has been remarked that the normal cerebro-spinal fluid is devoid of proteins, but in the various forms of disease above described as con- taining cells in the centrifuged deposit, there is also in the fluid an appreciable amount of proteins. If pathological cerebro-spinal fluid be added to an equal quantity of saturated solution of sodium sulphate there will be a distinct turbidity indicating the presence of proteins in appreciable quantity. This appreciable quantity of proteins is especially significant in the case of fluid withdrawn from cases of general paralysis or tabes, for it goes pari passu in amount with a reaction which is known as the Wassermann sero-diagnostic reaction for syphilis; a reaction, however, which is too complicated to explain here, but which is of the greatest importance for the diagnosis of general paralysis and tabes dorsalis.

The finding of the Trypanosoma gambiense in the cerebro-spinal fluid in sleeping sickness led to the belief that the specific organism of syphilis, Spirochoete pallidum might be found in the cerebro-spinal fluid in syphilitic diseases of the nervous system, but although in a few instances successful inoculation of animals with syphilis by injection of the cerebro-spinal fluid has been effected, yet the organism has only once been found in the fluid withdrawn by lumbar puncture. It has long been a puzzle why only certain individuals, about 5 -8 of' those infected with syphilis, should subsequently suffer with diseases of the nervous system. The skin and mucous orifices are the most common sites of secondary and tertiary lesions and after this the nervous system, but no tissue or structure in the body is exempt. It is probable that the virus attacks tissues when in a low state of re sistance in a random metastatic manner. It is necessary to dis- tinguish between these true syphilitic lesions which are the result of the reaction of the tissues to the living virus and the parasyphilitic affections, which own a different cause. The former may be most successfully treated with mercury, which has the power of devitaliz- ing the specific virus and preventing its multiplication, the same as atoxyl prevents the multiplication of the trypanosomes. Iodide of potassium favours the absorption of the degenerative products of the cells, and syphilitic tumours may rapidly resolve and disappear under the influence of these drugs. Nervous symptoms even so severe as to threaten a rapidly fatal termination may disappear with energetic treatment when they are due to the syphilitic virus producing an inflammatory reaction of the tissues; not so, however, when the symptoms are slow, insidious and progressive, due to a primary decay of the neurones, e.g. the parasyphilitic affections tabes dorsalis and general paralysis of the insane, which are really one and the same disease owning the same cause. We can understand that it may be a chance whether a man suffers with true brain or spinal cord syphilis, because it may be a chance whether the virus is carried there by the blood-vessels and lymphatics, and if carried there finds a suitable nidus to develop. But the parasyphilitic affections appear to be due to a premature primary decay of the neural elements owing to bio- chemical changes in the body induced by reaction to the syphilitic virusi There are a good many facts now forthcoming which show that the subjects of parasyphilis present mild symptoms of syphilis, and upon an average it is not until ten years later that they develop nervous symptoms, which are aggravated rather than benefited by mercury. Such subjects are immune to a second attack of syphilis, and the examination of the blood and cerebro-spinal fluid by the Wassermann reaction of the deviation of the Complement reveals the fact that there is a bio-chemical change ; the presence of this reaction

may be correlated with the fact that these fluids contain lipoid substances and a globulin in excess. The cerebro-spinal fluid contains

these lipoid substances and globulin in proportion to the degree of decay of the neural – structure ; they arise from the destructive metabolism of the neural elements. But the same lipoid substances and globulin are found only in the blood of syphilitic individuals, consequently it must be supposed that in general paralysis and tabes certain groups and systems of neurones undergo decay from excessive metabolic activity which is brought about by two factors (1) a bio-chemical stimulus, the syphilitic poison, (2) excessive physiological stress, which in «o»-syphilitic individuals would only lead to cerebral or spinal neurasthenia.

Sleeping Sickness is characterized by a progressive lethargy, paresis, tremors and the signs and symptoms of neural exhaustion without neural destruction; it comes on slowly and insidiously often years after infection and eventually terminates fatally by intercurrent disease or paralysis of the bulbar centres. Examination of the central nervous system explains the fatal lethargy; the perivascular and meningeal lymphatics are filled with lymphocytes and plasma cells (Plate II. fig. 6.) ; moreover, the neuroglia support- ing cells have undergone a rapid formative proliferation (Plate 1 1 . figs. 3 and 5). The effect of this morbid process is to deprive the neural elements of oxygen and nutrition; the neurones in consequence, although not destroyed, are nevertheless unable to function for more than a brief period.

(7) Poisons introduced into the Body. — The most widespread and potent cause of nervous and mental disease is the abuse of alcoholic stimulants. At least 20 % of the inmates of the asylums of London are admitted with a history of alcoholism. In not more than 10 % is alcohol the efficient cause of the mental disease; in many it is only a contributory factor, and in not a few the lapse from moderation to intemperance is the first sign of the mental breakdown. Most of the patients admitted inherit the neuropathic tendency, and it is a rare thing, among such, to find cirrhosis of the liver with ascites, a condition which indicates long persistent spirit-drinking. The writer, from a very large experience as pathologist to the asylums of London, only remembers one such case, and that was in a notorious woman who was convicted nearly four hundred times for drunken- ness before she could be certified as of unsound mind, a fact which indicates that she inherited a very stable nervous constitution. To people with unstable nervous systems a relatively small quantity of alcohol may act as a poison. Thus epileptics, imbeciles, criminals, potential lunatics, hysterics, neurasthenics and the subjects of head injury are

liable to become anti-social and dangerous to themselves and others by indulgence in quantities of alcohol which would have no harmful effect upon the mentally stable and sound individual. Alcohol may produce acute delirium, with fine tremors, and, gener- ally, visual hallucinations of a horrible nature, indicating acute toxic influence upon the brain. This apparently acute form of alcohol poisoning is met with in chronic inebriates especially ; it is much commoner in men than in women, and it is remarkable how a severe injury or illness, such as pneumonia, will bring out delirium tremens in a drunkard. Chronic alcoholism manifests itself in a variety of ways according to the inborn temperament of the individual. The well-fed man with an inborn stable well-balanced mental organization is able to consume daily large quantities of alcohol with no other obvious effect than the lowered moral sense of indulgence in a vicious habit. However, chronic alcoholics form a large proportion of those convicted for crimes of violence, homicide, suicide and sexual offences. Alcohol acts especially upon the higher centres of the brain, and a drunken man may exhibit ” the abstract and brief chronicle of insanity, going through its successive phases in a short period of time ” (Maudsley). The effect on the nervous system of chronic tippling may be dementia, a very characteristic manifesta- tion of the mental degradation being absence of knowledge of time and place, personal illusions and loss of memory of recent events, indicating a failure of receptivity and of the formation of memory- pictures in the higher centres, mental confusion, delusions of persecu- tion, and especially a morbid jealousy with suspicions of fidelity of the husband by the wife or of the wife by the husband. A certain amount of improvement may occur when total abstinence is enforced, which shows the poison has damaged but not destroyed the nervous elements. There is also a form of mental disease characterized especially by hallucinations of hearing and vision, associated with delusions usually of a persecuting nature, unaccompanied by other marked mental disorder. Abstinence and proper control generally ends in recovery, but such cases so frequently relapse that it is fairly certain that alcohol is an exciting factor to a. morbid or insane temperament. Besides mental symptoms of chronic alcoholic poisoning, there is frequently paralysis, affecting especially the lower limbs (structures suffer most where vitality is least), although the upper limbs, and even the respiratory muscles, may be affected in severe cases. The patient, usually of the female sex, becomes help- less and bedridden, and death frequently occurs from heart failure. Characteristic features of this affection are great tenderness on pressure of the muscles, especially of the calves, absence of reflexes, a variable degree of skin anaesthesia, wasting of muscles and altera- tion of the normal electrical reactions, and

frequently pyrexia. There is no loss of control over the bladder and bowels, unless there is very- marked dementia. This ” complex of symptoms ” points to a peripheral polyneuritis, although frequently changes occur also in the ganglion cells, from which the axis cylinders of the nerves have their

Fig. 2.

origin (vide figs. 2, 3, 4, and 5). Alcoholic polyneuritic psychosis affecting women in many ways resembles delirium tremens; the fact that neuritis occurs much more frequently in women is probably associated with a greater liability to the influence of microbial toxins by absorption from the organs of reproduction. Many other

poisons, notably lead and arsenic, the specific fevers before mentioned, syphilis and alterations of the blood due to imperfect meta- bolism, such as occur in diabetes and gout, may produce, or become impor- tant factors in producing, peripheral neuritis. The outbreak of arsenical neuritis from beer contain- ing this poison in Man- chester in 1900 is of in- terest, from the fact that the symptoms closely re- sembled acute alcoholic neuritis. A distinctive feature, however, was the pigmentation of the skin and the severity of the nervous symptoms. A disease which is common in the East, termed Beri- beri, is a form of neuritis, the cause of which is not exactly known (see Beri- beri). Anaesthetic leprosy is an interstitial inflamma- tion of the nerves due to the Lepra bacillus. Among the nervous diseases due to occupation may be cited lead-poisoning. This is peculiar in selecting the nerve which supplies the extensor muscles of the wrist and fingers, so that dropped wrist is almost characteristic of this form of toxic neuritis. Lead also produces a chronic in- flammation of the cerebral cortex, Encephalitis satur- nina, causing a complex of symptoms, namely, de- mentia, loss of memory, weakened intellect, paresis and epileptiform seizures, hallucinations of sight and hearing, and mental exaltation or depression. Mirror-makers suffer with ^^^^ characteristic fine tremors,

l£” ,^- .4jM \ from the slow absorption of

■^ ~”* , *^- :Ni *i?fflHw 8 mercury into the system.

Workmen at indiarubber factories may suffer from severe mental symptoms, owing to the inhalation of the fumes of bisulphide of

carbon. Serious nervous symptoms have followed carbon monoxide poison- ing. Cases which have re- covered from the immedi- . ate effects have suffered

with dementia and symptoms of disseminated sclerosis, the result of multiple haemorrhagic softenings.

There are a certain number of poisons, besides alcohol, which act upon the nervous system when continually entering the body as the result of a habit, namely, absinthe, ether, cocaine, opium, morphia, hashish and tobacco. Each of these poisons produces a train of symptoms denoting a selective influence upon certain parts of the nervous system. In illustration thereof may be mentioned impair- ment of central vision in tobacco amblyopia.

The disease pellagra, an affection of the skin associated with de- generative changes in the brain and spinal cord and characterized by melancholy with suicidal impulses, sometimes mania associated with paresis, was long considered to be due to the eating of bad maize. But in 1910 the recent research on this disease, still in progress, seemed to negative this theory (see Pellagra). Another disease, ergotism, in an epidemic form, has affected poor people in Russia and North Germany when obliged to subsist upon bread made of rye which has been attacked by the ergot fungus. The poison thus intro-

Fig. 5.

Figs. 2, 3, 4and5-— Spinal motor cells in various stages of destruction, from a case of acute alcoholic poly-vacuolation. Compare with the appearances of a nor- mal cell, fig. 12.

Fig. 6. — Cell illustrating swelling of nucleus and chromatolysis in acute tox- aemia produced by poison of bacillus botulinus. Compare with the appear- ances presented by a normal cell, fig. 12.

duced into the system produces progressive degenerative changes in the brain and spinal cord, which are manifested by psychical dis- turbances, such as slowness of thought, weakness of memory, dulness of perception, sometimes delirium and incoherence; V

othersymptomsareblunted sensibility, dilated pupils, muscular spasms, perhaps even epileptiform seizures and ataxy, and, lastly, stupordeepeningintocoma. Sausage disease, due to eat- ing decayed meat and fish infected with Bacillus botu- linus, is associated with symptomswhichfrequently terminate fatally, and it has been shown that the symptoms are due to a poison which has a very destructive

effect upon the nerve cells (fig. 6).

II. Normal and Abnor- mal Stimulation. — The nervous system, in order to develop and manifest functional activity, re- quires suitable stimula- tion from without. Struc- ture and function are mutually reciprocal and interdependent; for a structure which is not used will gradually lose its function, while its nutrition will also suffer, and in time atrophy may occur. Consciously and unconsciously, a continuous stream of impulses is pouring into the nervous system from without by the sensory channels, which are the avenues of experience and intelligence, and our somatic and psychical life depends upon the existence of' such stimuli. The nervous system in the form of systems, groups and communities of neurones, each with special functions, yet all woven together in one harmonious whole, develops in a particular way in consequence of the awakening influence of these stimuli from without. Consequently nervous structures which are not used are liable to undergo regressive metamorphosis and atrophy; thus amputation of a limb in early life causes atrophy of the nervous structures which presided over the sensation and movement of the part. This is seen both in the grey and white matter of the spinal cord; there is also an atrophy of the psycho- motor neurones of the brain presiding over the movements of the limb.

A healthy physical, intellectual and moral environment of the individual is an essential factor in the prevention and cure of psy- choses and neuroses, because it tends to develop and strengthen body and mind, deliberation, judgment and the higher controlling functions of the brain. A function not used will gradually disappear, and become more and more difficult to evoke. This fact is of importance in functional neuroses and psychoses, e.g. hysterical paralysis, melancholia and delusional insanity, because the longer mental or bodily function is left in abeyance, the more likely is the defect to become permanently installed. The converse is also true; the longer a perverted function exists, the more unlikely it is to disappear. Thus auditory hallucinations, a very important and frequent symptom in the insane, commence with indistinct noises: these are followed by " voices," which eventually become so distinct and real that the greater part of the patient's psychical existence is con- centrated upon, and determined by, this abnormal stimulus from within, indicating progressive strengthening and fixation of the perverted functions of the mind, and progressive weakening and dissolution of the normal functions.

Mental pain in the form of grief, worry, anxiety, fright, shock, violent emotions (pleasurable or painful), disappointed love, sexual excesses

or perversions, and excessive brain work, frequently precede and determine, in persons with the insane or neuropathic taint, various forms (a) of psychoses, e.g. mania, melancholia, delusional insanity; (b) of neuroses, e.g. chorea, hysteria, epilepsy, hystero- epilepsy; (c) or organic brain disease, e.g. apoplexy, thrombosis, general paralysis.

Visceral reflex irritation affords many examples of neuroses and psychoses, the symptoms of which are set up by irritation of the viscera, e.g. intestinal worms. Teething and indigestible food are often the exciting cause in infants and young children of convulsions, spasms of the glottis and tetany. Various functional and organic

diseases of the female reproductive organs act as exciting causes in the production of hysteria, hystero-epilepsy, melancholia and mania; moreover, paroxysmal attacks in these diseases are more liable to occur at the menstrual period or menopause. The irritation of a carious tooth may produce spasmodic tic and trigeminal neuralgia. Wax in the ear may occasion vertigo and tinnitus; and errors of refraction in the eyes may be the cause of attacks of migraine, and even tend to excite epileptic fits in a person suffering from epilepsy. Numerous other examples of peripheral disturbance could be mentioned as exciting causes of nervous affection in neurotic individuals. Irritation of the terminals of the vagus in almost any part of its widespread visceral distribution may lead to vomiting. The characteristic pain of angina pectoris, which radiates down the inner side of the left arm, is explained by the fact that the cardiac branches of the sympathetic arise from the same segments of the spinal cord as the sensory branches of the ulnar nerve ; consequently the pain is referred to the corresponding sUn area supplied by this nerve. This is one example of a great number of referred pains.

III. Injury or disease of enclosing or supporting structures may lead to paralytic or irritative lesions of the nervous system, or the two may be combined. Blows or wounds of the head and spine may damage or destroy the nervous structures by shock or direct injury. Concussion of the brain or spinal cord may occur, as a result of injury, without any recognizable serious damage of the enclosing structures or even the central nervous system. Shock, due to concussion, can only be explained by a molecular or bio-chemical change in the nervous structures.

Direct injury or a fall fracturing the skull, driving the frag- ments into the brain, will cause direct destruction of the nervous tissue; but wounds and diseases of the enclosing and supporting structures, if producing simple non-infective inflammation, give rise only to such symptoms as accord with the nerve structure irritated or destroyed. Should, however, the wound or diseased structure become infected with micro-organisms, the disease spreads and becomes generalized likewise the symptoms. Of all the causes of infective inflammation, middle-ear disease, on account of its frequency and insidious onset, is the most im- portant. It is very liable, when neglected, to be followed by a septic meningitis, encephalitis and brain abscess, the most frequent seat of which is in the adjacent temporal lobe, but it may be in other parts of the brain, e.g. the cerebellum and frontal lobe (Plate I. fig. 3). The peripheral nerves may be destroyed or irritated by direct injury, disease or new growth in adjacent tissues, or they may be involved in the callus thrown out round the seat of a fracture.

Diseases of the blood-vessels are among the most frequent causes of organic brain disease. Arteries or veins — more fre- quently the former — may become blocked or ruptured from various causes. The immediate effect is a disturbance or loss of consciousness, and the individual may be ” struck down ” (see Apoplexy) and never regain consciousness (see Coma). Should the individual recover consciousness more or less permanent loss or disturbance of function will be the result. Paralysis of some form, especially hemiplegia, is the commonest result, but the loss or disturbance of function will depend upon the seat of the injury.

The cerebral arteries may be occluded by embolism ; a portion of a clot or vegetation from a diseased valve of the left side of the heart may be detached, and escape into the circulation; and this is carried into one of the arteries of the brain, usually the middle cerebral, more often of the left side than the right. The area of brain tissue supplied by that artery is deprived of blood, and undergoes softening in consequence, resulting in paralysis of the opposite half of the body (hemiplegia) associated with aphasia when the paralysis affects the right side in a right-handed person (Plate I. figs. 5 and 9). When the embolus is infective, as it frequently is in ulcerative endocarditis, its lodgment in an artery of the brain, not only blocks the vessel but leads to an infective inflammation and softening of its coats, with the formation of an aneurism. The aneurism may suddenly rupture into the substance of the brain and produce apoplexy. In fact the majority of cases of apoplexy from cerebral haemorrhage recurring in young people are due to this cause. Softening may also arise from coagulation of the blood (thrombosis) in the arteries or veins. There

are many causes which generally combine or conspire together to produce thrombosis, viz. a weak acting heart and altered conditions of the blood, and sometimes independently of vascular disease spontaneous coagulation in a vessel of the brain may occur. It is sometimes met with in the cachexia of certain grave diseases, viz. in phthisis and cancer, in typhus and pneumonia, after parturition and

in marasmus at all periods of life, but especially in the very young and very old. But thickening, roughening and a degenerated con- dition of the cerebral arteries known as atheroma when associated with a weak acting heart is especially liable to give rise to thrombosis and softening, and this is a very common cause of apoplexy, paralysis and dementia in people who have passed middle life. General disease of the arteries of the body, associated especially with chronic Bright's disease and high arterial pressure, is frequently attended with the formation of minute miliary aneurisms upon the cerebral arteries, which may rupture and cause apoplexy. Haemorrhage into the brain from this cause is especially liable to occur in certain situations; one vessel in particular, supplying the basal ganglia, most frequently gives way, the effused blood tearing through the motor efferent fibres, which, proceeding from the cerebral cortex in the shape of a funnel, become aggregated together to form the neck between the two masses of grey matter — the optic thalamus and the corpus striatum (Plate II. fig. 6). The result is hemiplegia of the opposite side of the body. Disease of the arteries of the central nervous system, occurring in a person under forty, is generally due to syphilis, the virus of which produces an inflammation of the coats of the vessel, especially the inner (see Plate II. figs. 4, 9, 10). The thickening and narrowing of the lumen with loss of elasticity of the arteries of the brain generally, may suddenly or gradually set up conditions of cerebral anaemia and give rise to semi-comatose and comatose or even apoplectic states. Occlusion by the inflammatory proliferation or by the sudden clotting of blood in the diseased vessel may occur, the immediate effect of which may be an epileptic or apoplectic fit; the result is softening; and seeing that any or all the arteries of the brain may be affected successively, simultaneously, or at random, the symptoms may be manifold. They may be general or local, and not uncommonly are associated with inflammation of the membranes. The disease, under treatment, may abate, and the paralytic or mental phenomena partially or completely disappear, indicating the restoration, or partial restoration, of the circulation in the diseased arteries; sometimes with the lapse of treatment and sometimes without, new symptoms, such as paralysis of a fresh group of muscles or of the opposite side of the body, may manifest themselves, showing that the disease has attacked

a fresh set of arteries. Disseminated sclerosis {insular) is another random morbid process, affecting especially the white matter, with certain character- istic symptoms of a progressive character, the pathology of which is not understood fully, but is probably due to some toxic cause. Islands of nervous tissue undergo a morbid change, commencing in

Written Speech -. . Hand Index

Foot & Toes. Hip Knee v

v \ V Great Toe .Shoulder N ‘ „ /

Elbow X

Tactile & Muscular sensation

/

Thumb _

Upper Face

; Lower Pace Motor Speech Tongue Larynx

Movements of — . ! Eye (probable) T ™f

Smell’

Hearing, Auditory word Memory

Half Vision eenln

Fig. 7. — Diagram of left cerebral hemisphere, showing localization of function. The motor region is situated in front of the central sulcus, and is arranged in a series from ” toe to larynx ” downwards, corresponding in an inverse manner to the spinal series. Irritation of any part of this area will cause localized convulsive spasms, which may spread in a definite march to the whole motor area, as in Jacksonian epilepsy. Destructive lesions will cause paralysis. The centre for ” taste and smell ” is represented at the tip of the uncinate convolution. The centre for ” half-vision ” is only in small part represented, for the larger part is on the mesial surface. ” Hearing ” is represented occupying the posterior half of the first temporal convolution, but only a small part of the centre is seen, for the greater

Cart lies above within the fissure of Sylvius. Included in this area, ut

in the left hemisphere only, is the centre for ” auditory word memory”; destruction of this causes inability to understand the meaning of words uttered, although the patient is able to read aloud. Behind this, in the angular gyrus, is the centre for ” visual word memory ” ; destruction of this causes loss of power of understanding of written or printed words — therefore inability to read. In front of the motor area is Broca’s convolution, the centre of ” motor speech ” ; destruction of this produces motor aphasia, or inability to articulate words. Above this is a centre which is connected with written speech. These four centres concerned with verbal ami written language are connected by commissural fibres, and destruction of these connexions leads to various defects in verbal and written language. It will be understood from this diagram that diseases of the left hemisphere in right-handed persons are associated with results of more significance than similar affections of the right hemisphere.

the myelin sheath and ending in an increase of the supporting neuroglia tissue at the expense of the true nervous tissue.

Tumours and new growths in the central and peripheral nervous systems may be primary or secondary: the former arise in the supporting, enclosing or nutrient tissue elements; the latter are metastatic deposits from tumours originating elsewhere. Tumours may be single or multiple, the special symptoms occasioned depending

Fig. 8. — Diagram of section of the spinal cord in the upper cervical region, showing recent degeneration of the crossed pyramidal tract of the right side and direct pyramidal tract of the left side. The black dots indicate the degenerated fibres stained by the Marchi method. This degeneration is secondary to haemorrhage into the internal capsule of the left hemisphere, and it will be observed by the number of degenerated fibres that the greater bulk have crossed over to the right side of the spinal cord, thus agreeing with the fact that the paralysis is of the right half of the body.

£<;> >““v *- — Atsociation Neurons />2Cfv’ * V *■ , »] Cerebral Cortes

P^st*””

Cerebellar Secern

Neuron of Ant Horn.

Motor tna

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Fig. 9. — A diagram to indicate afferent, efferent and association systems of neurones. It will be observed that there are three nervous circles indicated by the arrows — spinal, cerebellar and cerebral. In every perfect co-ordinate movement impulses properly adjusted are flowing along these three systems of neurones. In systemic degenerations one or more of these systems may be affected, and the symptoms will depend partly upon the function which is lost or disturbed, and partly upon the disturbance of equilibrium of the three co-ordinated systems.

upon the seat of the tumour and whether it destroys or only irritates the adjacent nervous tissue. Tumours situated within the cranial cavity cause general symptoms, namely, optic neuritis, severe headache and vomiting; these symptoms, which are caused by increased intracranial pressure, are more severe in rapidly-growing vascular tumours, even though small, than in large slow-growing tumours.

Fig. 10. — Diagram of spinal cord, fifth lumbar segment, from a case of ad vancecl la bes dorsalis. The posterior column is shrunken, and but faintly stained, except in the anterior part; the shrinkage and the loss of stainability are due to the absence of fibres of the posterior roots, which normally form the greater part of this region of the cord. The fibres which are seen in the anterior part of the posterior column are derived from cells within the spinal cord, and belong to spinal association neurones.

Fig. 11. — Diagram illustrating the relative number and wealth of cells and fibres in the cerebral cortex in the normal brain, in amcitia and dementia. The horizontal systems of fibres are association systems, and it will be observed that these are especially diminished in amentia, and still more in dementia, whereas the radial fibres are less affected. In the normal, there are five layers of cells arranged in columns (Meynert's); in the pathological conditions it will be observed that the pyramidal-shaped cells no longer have their apical processes pointing vertically upwards. The processes are broken off, the cells are distorted in shape and diminished in numbers, and the degree of dementia in a wasted brain is proportional to the atrophy and destruction of the small and medium-sized pyramids of the whole cerebral cortex, and the disappearance of the superficial layers of

fibres. This is specially manifested in paralytic dementia and the dementia of chronic insanity.

Some tumours are highly vascular and a large thin-walled vessel may suddenly rupture and cause an apoplectic fit. If the growth is situated in a portion of the cortex having some special localizing function, e.g. the motor area {vide fig. 7), it may give rise to epilepti- form convulsions, starting in a limb or definite group of muscles; but the irritation usually spreads to the whole motor area of the same side, and even extends to the opposite hemisphere, by an overflow of the discharge through the corpus callosum. In such case there is loss of consciousness. If, however, the tumour destroys the cerebral cortex of a particular region, it may give rise to a paralytic lesion, e.g. paralysis of the arm (vide Plate I., fig. 4).

Organic diseases of the blood-vessels, or of supporting and enclosing tissues, produce secondary degenerations of the nervous system. The symptoms, like the lesion, are obvious, coarse and obtrusive; frequently arising suddenly, they may in a short time terminate fatally, or tend towards partial or complete recovery. Various forms of motor and sensory loss and disturbance of function may arise, indicating destruction or disturbance of particular regions of the central nervous system; and degenera- tions in certain tracts and systems of fibres arise, cor- responding in histological character with those ob- served when a nerve fibre is separated from its cell of origin by section (secondary degeneration of Waller and Tiirck) (vide fig. 8, with explanation) . This form of degeneration must be distinguished from primary degeneration, which is due to an inherent nutritional defect of the nerve cell and all its processes (the neurone), in which a regressive metamorphosis occurs; it starts in the structures of the neurones latest developed (namely, the myelin sheath and the fine terminal twigs of the axis cylinder and dendrons), and proceeds back to the main branches and trunk, eventually destroying the trophic and genetic centre itself, the nerve cell. These primary degeneration pro- cesses are insidious in origin, progressive in character, and nearly always fatal in termination; they affect definite systems, groups and communities of neurones in a progressive manner, and, therefore, are associated with a progressive evolution of symptoms, related to the structures affected (vide figs. 9 and’ 10).

To cite some examples: (1) Locomotor ataxy, on the one hand, is a

primary degeneration affecting the afferent system of neurones; it is characterized by muscular inco- ordination without wasting, inability to stand with the eyes shut, lightning pains in the limbs, absent knee-jerks, Argyll-Robertson pupils, and other symptoms pointing to a morbid process affecting especially the afferent sensory system of neurones. (2) Progressive muscular atrophy, on the other hand, is a disease of the efferent motor system of neurones of the brain and spinal cord, characterized by progressive wasting of groups of muscles innervated by groups of neurones which are undergoing degeneration. A fatal termination to this disease frequently arises from affection of the medulla oblongata, causing what is known as bulbar paralysis. Infantile paralysis is an acute inflammation of the anterior horns of the spinal cord, causing destruction of the spinal motor neurones of the anterior horn. It differs from the above chronic disease its sudden onset and non -progressive character; it

of structures connected with the higher functions of the mind, namely, the association neurones in the superficial layers of the cerebral cortex (fig. 11). Conditions of dementia, primary or secondary, are associated with progressive decay and atrophy of the superficial layers of the grey matter of the cortex, and naked- eye evidence thereof is afforded by partial or general wasting of the cerebral hemispheres, accompanied with thickening of the pia-arachnoid membrane, atrophy of the convolutions, and with deepening and widening of the intervening sulci (Plate I., %• 7)-

The cerebro-spinal fluid fills up the space in the cranial cavity caused by the atrophy of the brain; consequently there is a great

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Fig. m.

Fig. 12.

Fig. 14.

Fig. 16.

resembles it in producing paralysis of muscles without- sensory disturbance. (3) General paralysis of the insane is a degeneration which begins in the association system of neurones of the cerebral

cortex, but which may be, and frequently is, associated with degeneration of the afferent or efferent systems (fig. 9).

Neuroses and psychoses have not hitherto been satisfactorily explained by definite morphological changes in the brain (Plate I., fig. 1). We know little or nothing accurately about the morbid histology of insanity, except as regards the morphological changes met with in cases of amentia and dementia. The conditions of amentia, namely, idiocy and imbecility, are associated with arrest of development of the brain, as a whole or in part, the naked-eye evidence of which may be afforded by small size and simplicity of convolutions of the brain as a whole or in part (Plate I., figs. 2, 8 and 10) ; and the microscopical evidence by arrest of development, or imperfect development,

Motor Cells, drawn from Microphotographs of Preparations stained by Nissl method to show Microchemical Changes produced by various diseases.

FlG. 12. — Normal motor cell from cerebral cortex, showing a mosaic pattern of the cytoplasm due to a substance stainable by basic aniline dyes; this stain- able substance exists also on the dendrons. By comparing the appearances of this cell with the other figures a just idea can be obtained of the morbid changes which result in various pathological conditions.

Fig. 13. — Cell from a case of hyper-pyrexia — disappearance of the mosaic pattern, substance uniformly stained; absence of the chromatic elements on the dendrons, due to a precipitation of cell-globulin by the heat.

Fig. 14. — Cell in an advanced stage of coagulation necrosis, complete absence of mosaic pattern; diffuse fine dust-like stain; breaking off of the processes; all caused by softening of the brain from vascular obstruction.

Fig. 15. — Another specimen from the same brain in a still more advanced stage of destruction, and showing a phagocyte attached to the cell and devouring the decayed structure.

Fig. 16. — A cell with enormously swollen nucleus, the result of hydration due to absorption of fluid after ligature of cerebral vessels. Such a cell will probably recover.

excess of this fluid. Before general paralysis was recognized as a disease some of the cases which died suddenly in a fit were doubtless termed serous apoplexy. This wasting so characteristic of general

paralysis is especially due to atrophy of the cells and fibres of the superficial grey matter of the cortex, sections of which, examined microscopically, after suitable methods of staining have been employed, show great poverty, or complete loss, of three sets of delicate myelinated fibres, namely, tangential, super-radial and the inter-radial corresponding to the line of Baillarger. This degeneration

of the superficial association fibres of the cerebral cortex affects especially the frontal and central convolutions, and is the earliest and most constant microscopical change in progressive paralytic dementia ; it is accompanied usually by meningeal and vascular changes, atrophy of the nerve cells, and, proliferation of the neuroglia (fig. Ii); especially characteristic is the perivascular infiltration with lymphocytes and plasma cells (see Plate II., fig. 7). It was indeed thought that this condition of the vessels was pathognomonic of general paralysis; it certainly is not, for it is found throughout the central nervous system in sleeping sickness and cerebro-spinal syphilis (Plate II., figs. S and 9). It sometimes occurs in the neigh- bourhood of cerebral tumours but it is not found in uraemia or lead encephalitis. Possibly new methods may enable us to show changes of structure in diseases such as epilepsy and delusional insanity, in which hitherto no naked eye or microscopical structural defects accounting for the symptoms have been certainly demonstrated.

In conditions of acute mania there is usually considerable vascular engorgement. We should, however, probably be more correct in assuming that insanity (especially those forms in which there is neither amentia or dementia) is due to alterations in the quality

Fig. 17. — Diagram to illustrate various stages in degeneration and regeneration of medullated nerve fibres.

I, Normal medullated nerve with 5, Complete absorption of de-

node of Ranvier

2, Degenerated nerve, ten days after section, showing de- generated myelin stained black; disappearance of axis- cylinder.

3, Central end of cut nerve, show-

ing at the top an axis-cylinder budding out, proliferated neurilemmal

cells, and still some degenerated myelin in sheath.

4, Peripheral cut end of same, showing proliferated neuri- lemmal cells, still some de- generated myelin.

generated myelin, proto-plas- mic basis of new fibre formed out of neurilemmal cells.

6, A new fibre, with axis-cylinder.

7, Central end of cut nerve at

junction, showing an axis- cylinder sprouting and form- ing a number of axis-cylinder processes, which grow into the peripheral end to form new channels of conduction.

8, Is a new regenerated fibre re-

sembling a sympathetic fibre in having as yet no myelin sheath ; as the nerve becomes excitable and stimulus passes, a myelin sheath is formed.

rather than the quantity of blood in the brain. The primary de- mentia of adolescence, which in 80% of the cases occurs before the age of 25, in which hereditary taint is most common, and which frequently is accompanied by, or terminates in, tuberculosis, can be explained by the effect of toxaemic conditions of the blood on cerebral neurones with an inborn low specific energy and metabolic activity. The histological changes found in the brain do not serve to explain the symptoms, and we must look to bio-chemical changes in the body acting upon an innately unstable brain to explain the problems of the disordered mind in this disease.

Microscopical Changes in Degeneration of the Neurone. — About 1850, Waller demonstrated that a nerve fibre underwent degeneration to its termination when separated from its cell of origin; hence the term “Wallerian degeneration.” Embryo- logical researches by Professor His showed that the axis-cylinder process (the essential conducting portion of the nerve fibre) is an outgrowth of the nerve cell. The cell, therefore, is the trophic and genetic centre of the nerve fibre. Acute alterations and death of the nerve cells may occur from toxic conditions of the blood; from high fever (io7°-iio° F.); arrest of the blood supply, as in thrombosis and embolism; or actual destruction by injury, haemorrhage or inflammation. These morbid pro- cesses produce, as a rule, bio-chemical as well as morphological changes in the nerve cell and its processes. Space will not allow of a

full description, but some of these changes are indicated in figs. 18-22, with explanatory text. When a nerve cell dies, the nerve fibre undergoes secondary degeneration and death; that is to say, the whole neurone dies, and regeneration, at any rate in the higher vertebrates, does not take place. Restoration, or partial restoration, of function is due to other structures taking on the function, and the more specialized that function is, the less likely is restoration to take place. If, however, a peripheral nerve is divided, its component fibres are merely severed from their cells of origin. All that portion of the nerve which is in con- nexion with the nerve cells of origin practically undergoes no change. The peripheral portion un- dergoes degeneration, but from the central end of the nerve new axis cylin- ders again grow out and a new nerve is formed. With this regeneration

comes restoration of t>,„ „ tˆ ,

funrUrm m i,,v». ™-,,r k„ tIG – lS – — Lhagram drawn from function, which may be photomicrograph to show different hastened by suturing the forms of neuroglia cells in a patch of ends of the cut nerve, sclerosis secondary to degeneration and A similar regeneration, disappearance of the neurones. Ob- however, does not occur serve the ‘arge branched cells of Deiters. after section of fibres of the white matter of the central ner- vous system, and this may be due to the fact that the nerve fibres of the white matter of the cerebro-spinal axis possess no nucleated sheath of Schwann, which, by the light of recent investigations, is shown to play an important part in regenera- tion; in the writer’s opinion, the neurilemmal sheath of the old fibre forms a new protoplasmic basis, into which the axis- cylinder from above grows, the passage of stimulus determining its function. Fig. -17, Nos. 1-8, with explanatory text, shows the changes which occur in degeneration and regeneration of a peripheral nerve after section, with loss of function; and sub- sequent union, with restoration of function. The writer, in conjunction with Professor Halliburton, has shown that the characteristic microscopical changes in the myelin sheath which occur in the process of degeneration are due to a splitting up Of the complex phosphoretted substance ” protagon ” into glycero-phosphoric acid, choline and- oleic acid by a process of hydration. The Marchi reaction, which has been found so useful for demonstrating degeneration of the central and peripheral nervous systems, is dependent upon the fact that the myelin sheath, after hardening in a solution of bichromate of potash, does not turn black when acted upon by osmic acid, whereas the simpler non- phosphoretted fatty product of degeneration is stained black. When the Marchi reaction of degeneration is fully developed, it has been ascertained that the nerve yields no phosphorus. The degeneration

resulting from section of a nerve is termed secondary, to distinguish it from another, primary, due to slow

and progressive decay of the whole' neurone, beginning usually at the terminal twigs and proceeding back towards the cell body with its contained nucleus. These primary degenerations involve systems of neurones, correlated by function rather than by anatomical situation. Examples are afforded by locomotor ataxy and progressive muscular atrophy, the former being a degeneration of the afferent sensory system of neurones, the latter of the motor efferent system. The cause of primary degenerations is probably a defect inherited or acquired in the " vita propria " of the neurones affected. They slowly atrophy and disappear, and their place is filled up by an overgrowth of the supporting neuroglia tissue (figs. 10 and 18). This over- growth of dense tissue is termed sclerosis, and was erroneously considered to be the cause, instead of the effect, of the atrophy of the nervous tissue.

For further information the reader may consult the Croonian Lectures on the Degeneration of the Neurone, by F. W. Mott, published in the Lancet (1900); and the same writer's " Introduc- tion to Neuropathology," in Albutt's System of Medicine. Also Gower's Handbook of the Nervous System, von Monakow's Gehirn Pathologic, Ford-Robertson's Pathology of Mental Diseases and Mott's Archives of Neurology, vols. 1, 2, 3 and 4. (F. W. Mo.)

NEUROPTERA (Gr. vtvpov, a nerve, and irrfpbv, a wing), a term used in zoological classification for an order of the class Hexapoda (q.v.). No ordinal name used in the class has had so many varying meanings given to it by different authors. As first used by Linnaeus (1735) it included all insects with mandi- bulate jaws and two pairs of net-veined wings — dragon-flies, May-flies, stone-flies, lacewing-flies and caddis-flies — and it has been employed in the same wide sense by D. Sharp (Cambridge Nat. Hist. vol. v., 1895). But detailed study of these various groups of insects shows that beneath their common superficial resemblances lie important distinctions in structure, and essential differences in the course of the life-history. Some of the families — the stone-flies, for example — have the young insect much like the adult, growing its wings visibly outside the thoracic segments, and active at all stages of its life. The dragon-flies and May-flies are also active throughout their lives and possess external wing- rudiments, though the young insects differ rather strikingly from their parents. All such

families — falling into the group Exopterygota as defined in the classification of the Hexapoda — were separated from the Neuroptera by W. E. Erichson (1839) and united with the Orthoptera, with which order some ento- mologists still associate them under the name of ” Pseudo- neuroptera.” The other groups of the old Linnean order (such as lacewing-flies and caddis-flies) — which are hatched as larvae markedly unlike the parent, develop wing-rudiments hidden under the larval cuticle, and only show the wings externally in a resting pupal stage, passing thus through a ” complete ” metamorphosis and falling into the sub-class Endopterygota — were retained in the order Neuroptera, which thus became much restricted in its extent. More recently the subdivision of the Linnean Neuroptera has been carried still further by the separa- tion of the caddis-flies and scorpion-flies as distinct orders (Trichoptera and Mecaptera respectively) , and by the withdrawal of the ” Pseudo-neuroptera ” from the Orthoptera— with whose typical families they have little in common — and their division into a number of .small orders. Altogether, eight orders are recognized in the classification adopted here, the first five of these belonging to the sub-class Exopterygota and the last three to the Endopterygota (see Hexapoda).

The multiplication of orders is attended with practical diffi- culties, and the distinctions between the various groups of the Linnean Neuroptera are without doubt less obvious than those between the Coleoptera (beetles) and the Diptera (two-winged flies) for example. But if classification is to express relationship, it is impossible to associate in the same order families whose kinship to insects of other orders is nearer than their kinship to each other. And no student can doubt that the stone-flies are akin to Orthoptera and the caddis-flies to the Lepidoptera, while dragon-flies and May-flies stand in an isolated position with regard to all other insects. In the present article, for the sake of convenience, all the insects which have been regarded

by Linnaeus and others as “Neuroptera” are included, but they are distributed into the orders agreed upon by the majority of modern observers, and short characters of these orders and their principal families are given. For further details the reader should consult the special articles on these groups, to which cross-references will be found.

Sub-class Exopterygota Order Plecoptera.

This order was founded (1869) by F. Brauer— the name having been long previously suggested by H. Burmeister (1832) — to include the single family of the Perlidae or stone-flies. They resemble the

Orthoptera more nearly than do any other group of the Linnean Neuroptera, having the anal area of the hind-wings folding fanwise beneath the costal area and the whole hind-wing covered by the fore-wing when the insect is at rest, though the forewing is not firmer in texture than the hind-wing, as is the case in the Orthoptera. In the opinion of J. H. Comstock and J. G. Needham the wing-neuration in this order is the most primitive to be found in the Hexapoda. The tenth abdominal segment carries a pair of jointed cerci which are often elongate, and the feelers are always long, while the jaws are usually feeble and membranous, though the typical parts of a mandibulate mouth are present — mandibles, maxillae with inner and outer lobes and palps, and second maxillae (labium) whose lacinae are not fused to form a ligula. Both head and trunk are somewhat flattened dorso-ventrally, giving the insects a very distinct and characteristic aspect. The stone-flies further resemble the Orthoptera in their numerous Malpighian excretory tubes, which vary in number from twenty to sixty. The reproductive organs, both ovaries and testes, become fused together in the middle of the body. A re- markable point in the Plecoptera is the presence in some forms (Pteronarcys) of small branching gills on the three thoracic and the front abdominal segments. These organs appear, however, from the observations of H. A. Hagen not to be functional in the adult insect — they are merely survivals from the aquatic nymphal stage.

Life-history and Habits.— The nymphs of the Perlidae are closely like their parents and breathe dissolved air by means of tracheal gills on the thoracic segments, for they all live in the water of streams. They feed upon weaker aquatic creatures, such as the larvae of May- flies.

The perfect insects, whose flight is feeble, are never found far from the water. A curious feature among them is the frequent reduction of the wings in the males of certain species, contrary to the usual condition among the Hexapoda, where if the sexes differ in the de- velopment of their wings it is the female which has them reduced. The Plecoptera are world-wide in their range and fossils referable to them have been described from rocks of Eocene, Miocene and Jurassic age, while C. Brongniart states that allied forms lived in the Carboniferous Period.

Order Isoptera.

The two families included in this order agree with the Plecoptera in the young insect resembling the parent, but they are all terrestrial

After C. L. Marlatt, EtU. BuU. 4 (N.S.), US. Dipt. Agrie.

Fig. i. — Termes flavipes, N. America. a, Male from above. b and c, Hind segments of male and

female abdomens, showing short d, Male from side. cerci.

«, Abdomen of female from /, End of shin and foot-segments, side.

throughout life. The hind-wings have no folding anal area and the wings of both pairs, when present, are closely alike (see fig. 1) whence the name Isoptera (=equal winged) lately applied to the group by

G. Enderlein. The eleventh abdominal segment which carries the short jointed cerci (fig. I, b, c) may remain in a reduced condition distinct from the tenth. There are only six or eight Malpighian tubes — contrasting with the large number of these excretory organs found in the Orthoptera and Plecoptera.

The Embiidae are feeble, somewhat soft-skinned insects with the prothorax small and the mesothorax and metathorax elongate. The feelers are long and simple, and the wings are very narrow, each with a sub-costal, a radial, a median and a cubital nervure; the branches of the median and the cubital, however, as well as the anal nervures, are vestigial, and there are a few short cross-bars between

After Marlatt, Enl. Bull. 4 (iV.5), 17.5. Depl. Airic.

Fig. 2. — Head of termite, a, Front view. 6, Hind view, showing jaws (note the distinct inner and outer lobes of the second maxillae). Magnified.

the radial and the median. Some Embiidae are entirely wingless in the adult state, and it has been suggested that this is always the condition in the female sex. According to the recent investigations of K. W. Verhoeff, the family contains only thirteen known species.

The Embiidae live in warm countries, and are very retiring in their habits, hiding under stones where they spin webs formed of silk produced by glands in the basal segments of the fore-feet.

The Termitidae (so-called ” white ants “) are the other family of Isoptera. They are relatively shorter and broader insects than the Embiidae with large prothorax and long wings, which have a trans-

verse line of weakness at the base and are usually shed after the nuptial flight. The Termitidae are numerous in species in warm countries. The vast majority of individuals in a community consist of wingless forms — ” workers ” and ” soldiers,” which are unde- veloped members of either sex. Their economy is fully described in a special article on Termites.

Order Corrodentia. The insects included in this order differ from those of the two preceding orders in their more condensed abdomens which bear no cerci, while the number of Malpighian tubes is reduced to four. In the absence of cerci the Corrodentia are more specialized than the Isoptera and Plecoptera, but some of them show a more primitive character in the retention of vestigial maxillulae — the minute pair of jaws that are found behind the mandibles in the Aptera igˆ.v.). A large proportion of the Corrodentia are wingless. When wings are present the front pair are much larger than the hind pair, and the neuration is remarkable for the concresence of the median with the

After Marlatt, BuU. 4 (;V.S.), Div. Enl. US. Depl. Agric.

Fig. 3. — Book-louse (Atropos divinatoria, Fab.), Europe.

o, From below.

b, From above, (eyes, feeler, feet and claws more highly mag- nified).

first

c, Second maxillae.

d, Mandible.

e, Lacinia or ” pick ” of maxilla.

/, Its palp. Highly magnified, cubital trunk, and the zigzag course of many of the branches. All the insects of this order are of small size and the cuticle is im- perfectly chitinized, so that the body as a whole is soft. The name Corrodentia was first used by H. Burmeister (1832) and has reference to the biting habits of the insects. Originally, however, the Corro- dentia included the order which Enderlein has recently separated as Isoptera (see above). As at present restricted, the Corrodentia include two distinct sub-orders.

Copeognatha. — This sub-ordinal name has been applied by Enderlein to the ” book-lice.” These frail insects, the majority of

which have wings of the type described above, are further characterized by the presence of minute but distinct maxillulae, while the inner lobe (lacinia) of the first maxilla is an elongate, hard structure (the ” pick,” fig. 3, e) and the outer lobe is convex and soft. The labial (second maxillary) palps are reduced to small, rounded prominences external to the still smaller prominences that represent the lobes (fig. 3, c). The feelers of these insects are elongate and thread-like, consisting of from a dozen to nearly thirty segments. The prothorax is very small.

The book-lice are familiar wingless insects, often found in houses running about among old papers and neglected biological collections. They belong to the family Psocidae which has a few score species — most of them winged — living out of doors on the bark of trees and among vegetable refuse. In some Psocidae the wings are in a vestigial state, and the fully winged species rarely if ever fly. H. A. Hagen observed that some genera possess wing-like outgrowths on the prothorax, comparable to those seen in certain insects of the Carboniferous Period. The Psocidae themselves have not been traced back beyond the Oligocene, in the amber of which period their remains are fairly numerous.

Mallophaga. — This term was first applied by C. L. Nitzsch (1818) . to the degraded wingless parasites (fig. 4) commonly known as bird- lice or biting-lice, differing from the true lice (see Hemiptera, Louse) by their jaws adapted for biting (not for piercing or sucking). By their structure they are evidently allied to the Copeognatha. They are abundantly distinct, however, through the short feelers with only three to five segments and the conspicuous prothorax. The head is relatively very large, but the eyes are degraded and often absent. A remarkable feature is the frequent con- crescence of mesothorax and metathorax and in some cases, even, their fusion with the anterior abdominal segments. The legs are stout and spiny, and well adapted for clinging to the hair or feathers of the host animal. It is usual to divide the Mal- lophaga into two families — the Liotheidae, possessing labial palps and two foot-claws, being {airly active insects, which are capable, on the death of their host, of seeking another, and the Philopteridae, without labial palps and with a single foot- claw modified for clasping (fig. 4) which never leave the host and perish themselves soon after its death.

Order Ephemeroptera. This order includes the single family of After (febom, Ent. BuU. 7 the Ephemeridae or May-flies. The name, (0 -i°’ VS ‘ De Pˆf” c – although quite recently proposed by A. *\ G ; 4/ — Biting-louse E. Shipley, should be used rather than (.Tnchoder.tes

scalans) of A. S. Packard's older term Plectoptera on cattle. account of the great liability of confusion

between the latter and Plecoptera. The May-flies are remarkably primitive in certain of their characters, notably the elongate cerci, the paired, entirely mesodermal genital ducts, and the occurrence of an ecdysis after the acquisition of functional wings. On the other hand, the reduced feelers, the numerous Malpighian tubes (40), the large complex eyes, the vestigial condition of the jaws, the excessive size of the fore- wings as compared with the hind- wings and their complex neuration with an enormous number of cross- nervules are all specializations. So in some respects is the life- history, with a true larval preparatory stage, unlike the parent form, and living an aquatic life, breathing dissolved air by means of a paired series of abdominal tracheal gills. Except for its aquatic adaptations, however, the ephemerid larva is wonderfully thysanuran in character, and possesses conspicuous and distinct maxillulae. See special article on May-flies. Order Odonata. The distinctness of the dragon-flies from other insects included in Linnaeus's Neuroptera was long ago recognized by J. C. Fabricius, who proposed for them the ordinal name of Odonata (.1 775). They resemble the May-flies in their " hemimetabolous " life-history; the young insects are markedly unlike their parents, in-habiting fresh water and breathing dissolved air, either through tracheal gills at the tip of the abdomen, or by a branching system of air-tubes on the walls of the rectum into which water is periodically admitted. The winged insects resemble the May-flies in their short feelers and in the large number (50 to 60) of their Malpighian tubes, but differ most strikingly from those insects in their strong well-armoured bodies, their powerful jaws adapted for a predaceous manner of life, and the close similarity of the hind-wings to the fore-wings. All the wings are of firm, glassy texture, and very complex in their neuration ; a remarkable and unique feature is that a branch of the radius (the radial sector) crosses the median nervure, while, by the development of multitudinous cross-nervules, the wing-area becomes divided into an immense number of small areolets. The tenth abdominal segment carries strong, unjointed cerci, while the presence of reproductive armature on the second abdominal segment

of the male is a character found in no other order of the Hexapoda. See special Dragon-fly.

Sub-class Endopterygota Order Neuroptera. The insects retained in the order Neuroptera as restricted by modern systematists are distinguished from the preceding orders by the presence of a resting pupal stage in the life-history, so that a ” complete metamorphosis ” is undergone. Structurally the Neuro- ptera are distinguished by elongate feelers, a large, free prothorax, a labium with the inner lobes of the second maxillae fused together to form a median ligula, membranous, net-veined wings without hairy covering, those of the two pairs being usually alike, the absence of abdominal cerci, and the presence of six or eight Malpighian tubes. The larvae are active and well-armoured, upon the whole of the ” campodeiform ” type, but destitute of cerci; they are predaceous in habit, usually with slender, sickle-shaped mandibles, wherewith they pierce various insects so as to suck their juices. The order contains nine families, most of which are wide in their geographical distribution. Fossil Neuroptera occur in the Lias and even in the Trias if the relationships of certain larvae have been correctly surmised.

The Sialidae or alder-flies (q.v.) differ from other Neuroptera in the jaws of the larva— which is aquatic, breathing by paired, jointed abdominal gills — resembling those of the imago, and being adapted for the mastication of solid food. Some American genera (Corydalis) which belong to this family are gigantic among insects and their males possess enormous mandibles. The Raphidiidae or snake-flies (q.v.) are remarkable for the long, narrow, tapering prothorax which gives the appearance of a constricted neck, while the female has a long ovipositor. Both these families are very sparingly represented in our fauna.

The Myrmeleonidae are large insects with short clubbed feelers on their prominent heads, and two pairs of closely similar net-veined wings, with regular oblong areolets at the tips. Their predaceous, suctorial larvae are the well-known ant-lions (q.v.). No members of this family inhabit our islands, though a few species occur in neighbouring parts of the continent. The same is the case with the allied Ascalaphidae, which are distinguished from the Myrmeleonidae by their elongate feelers— as long as the body — and by the irregular apical areolets of the wings. The curious Nemopteridae have slender feelers and very long strap-shaped hind-wings. The Mantispidae are remarkable among the Neuroptera for their elongate prothorax, raptorial fore-legs and hypermetamorphic life-history, the young campodeiform larva becoming transformed into a fat eruciform grub parasitic on young spiders or wasp-larvae (see Mantis-fly). The last-named two families are confined to warm regions of the earth. The lacewing-flies (q.v.), however, of which there are two families, the

Hemerobiidae and Chrysopidae, whose larvae feed on Aphids, sucking their juices, are represented in our fauna. So are the tiny Coniopterygidae, which are covered with a white powdery secretion, and have very small hind-wings. Their larvae resemble those of the lacewings, attacking scale-insects and sucking their juices.

Order Mecaptera. This small order was founded (1869) by F. Brauer — under the name of Panorpata — for the small family of the Panorpidae or scorpion-flies (q.v.). The name Mecaptera is due to Packard. They may be distinguished from the Neuroptera by the elongation of the head into a beak, the small prothorax, the narrow, elongate wings with predominantly longitudinal neuration, the presence of abdominal cerci and the eruciform larva. They are generally but sparingly distributed over the earth's surface and can be traced back in time to the early Jurassic epoch.

Order Trichoptera.

The caddis-flies (q.v.) constitute this order, the name of which (suggested by H. Burmeister) indicates the hairy covering of the wings. They are abundantly distinct from the Neuroptera and Mecaptera, through the absence of mandibles in the imago, the maxillae — both pairs of which possess the typical inner and outer lobes and jointed palps — forming a suctorial apparatus. The feelers are long, slender and many-jointed. While the fore-wings are elongate and narrow, the hind-wings are broad, with a folding anal area. At the base of each wing projects a dorsal lobe— the jugum — and the neuration is predominantly longitudinal, resembling so closely that of the lower Lepidoptera (q.v.) that a nearer relationship of the Trichoptera to that order than to any group of the old Linnean Neuroptera is certain. Fossil Trichoptera occur in rocks of Liassic age.

Frequently the whole of the Trichoptera are included in a single family, but most special students of the order recognize seven families. In all Trichoptera the maxillary palps of the female are five-segmented. The family Phryganeidae have males with four- segmented hairy palps ; the larvae inhabit stagnant water and make cases of vegetable fragments. In the Limnephilidae the maxillary palp is three-segmented in the male, the }arvae are variable in habit, many forming cases of snail-shells. The males of the Sericostomatidae have two or three segmented palps; their larvae inhabit running water and make cases of grains of sand, or of small stones. In the

Leptoceridae, Hydropsychidae, Rhyacophilidae and Hydroptilidae the palps of the males have five segments like those of the females. The

stone-built cases of the carnivorous Hydropsychid larvae arc familiar objects in the water of swift streams.

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NEUSALZ, a town of Germany, in the Prussian province of Silesia, on the Oder, 20 m. by rail N.W. of Glogau. Pop. (1905) 13,002. It has three Evangelical churches, one of which belongs to the Herrnhut brotherhood, a Roman Catholic church and an orphanage. Its largest industry is, perhaps, the manufacture of thread; there are also in the town ironworks, breweries, shipbuilding yards and electrical works. Neusalz became a town

in 1743.

See Bronisch, Geschichte von Neusalz an der Oder (Neusalz, 1893).

NEUSS, a town of Germany, in the Prussian Rhine province, lies 4m. to the W. of Dusseldorf and 15 m. from the W. bank of the Rhine, with

which it is connected by the Erft canal. It lies at the junction of lines to Cologne, Viersen, Zevenaar (Holland), Dusseldorf, Dtiren and Rheydt. Pop. (1905) 30,494, of whom 95% were Catholics. The chief building in the town is the church of St Quirinus, a remarkably fine example of the transition from the Round to the Pointed style; and there are six other Roman Catholic churches, two Protestant churches and a gymnasium, which contains a collection of Roman antiquities. The town hall was built in the 17th and altered in the 18th century. The old fortifications are now laid out as a promenade encircling the town. Neuss produces oil and meal, and also manufactures woollen stuffs, chemicals and paper, bricks and iron-ware. Its markets for cereals are among the most important in Prussia, and it is also the centre of a brisk trade in cattle, coals, building materials and the products of its various manufactories.

Neuss, the Novaesium of the Romans, frequently mentioned by Tacitus, formerly lay close to the Rhine, and was the natural centre of the district of which Dusseldorf has become the chief town. Drusus, brother of the emperor Tiberius, threw a bridge across the Rhine here, and his name is preserved in the Drususstor, the lower half of which is of Roman masonry. In 1474-1475 Charles the Bold of Burgundy besieged the town in vain for eleven months, during which he lost 10,000 men; but it was taken and sacked by Alexander Farnese in 1586. Since 1887 extensive excavations have been made of the foundations of a huge Roman camp, and many valuable Roman treasures have been unearthed.

See C. Tucking. Geschichte der Stadt Neuss (Dusseldorf, 1891); F. Schmitz, Ver l Neusser Krieg, 1474-1475 (Bonn, 1896); W. Effmarfn, Die St Quirinus Kirche zu Neuss (Dusseldorf, 1890); and Band xx. of the Chroniken der deutschen Stadte. ,

NEUSTADT (Polish, Prudnik), a town of Germany, in the Prussian province of Silesia, on the river Prudnik, 60 m. by rail S.E. of Breslau. It has four Roman Catholic churches and one Evangelical. Pop. (1905) 20,187, the greater part of whom are

Roman Catholics. The chief industries are tanning, dyeing and the manufacture of damask, linen, woollen stuffs, leather and beer.

In 1745, 1760 and 1779 engagements between the Austrians and

Prussians took place near Neustadt, which on the last occasion was bombarded and set on fire.

See Weltzel, Geschichte der Stadt Neustadt (Neustadt, 1870).

NEUSTADT-AN-DER-HAARDT, a town of Germany, in the Bavarian Palatinate, picturesquely situated under the eastern slope of the Haardt Mountains and at the mouth of the valley of the Speyerbach, 14 m. W. of Spires, and at the junction of railway lines to Worms, Weissenburg and Monsheim. Pop. (1905) 18,576. It has four churches, two Evangelical and two Roman Catholic. The Protestant abbey church, a fine Gothic edifice dating from the 14th century, contains the tombs of several of the counts palatine of the Rhine. The Roman Catholic Ludwigskirche is a modern Gothic structure. The chief industries of the town are cloth, paper, furniture, soap, starch and hats. It has also breweries and distilleries. A brisk trade is carried on in wood, grain, fruit and wine, all of which are extensively produced in the vicinity. Neustadt, which became a town in 1275, is one of the centres of the Rhenish ” grape-cure,” and thus attracts numerous visitors.

NEU-STETTIN, a town of Germany, in the Prussian province of Pomerania, on the small Streitzig lake, 90 m. by rail N.E. of Stettin, at the junction of railways to Belgard, Posen and Stolpmiinde. Pop. (1905) 10,785. Its industries are iron- founding, dyeing, brewing and the manufacture of machinery, soap and matches. There is a considerable trade in cattle, grain and other agricultural produce, and in timber and spirits. Neu-Stettin was founded in 1313 by Wratislaus, duke of Pomerania, on the model of Stettin,

See Wilcke, Chronik der Stadt Neu-Stettin (Neu-Stettin, 1862); and F. W. Kasiski, Beschreibung der vaterldndischen Alterthiimer in Neu-Stettin (Danzig, 1881).

NEU-STRELITZ, a town of Germany, capital of the grand- duchy of Mecklenburg-Strelitz, situated between two small lakes, the Zierker See and the Glambecker See, 60 m. N. of Berlin, on the railway to Stralsund, at the junction of lines to Warnemunde and Buschhof. Pop. (1905) 11,656. It is built in the form of a star, the eight rays converging on a market-place adorned with a statue of the grand-duke George (d. i860) . The ducal residence is a handsome edifice in a pseudo-classical style, with a library of 75,000 volumes, and collections of coins and antiquities. Other buildings are the churches (two Evangelical and one Roman Catholic), the Carolinum (a large hospital), the town hall, the barracks, the gymnasium and the theatre. Its manufactures are iron-ware, machinery, pottery, beer and mineral

waters. Its trade, chiefly in corn, meal and timber, is facilitated by the Zierker See and by a canal connecting the town with the Havel and the Elde.

About 1 5 m. to the south lies Alt-Strelitz, the former capital of the duchy, a small town the inhabitants of which are employed in the manufacture of tobacco, leather and wax candles. Neu- Streiitz was not founded till 1726. In the vicinity is the chateau of Hohen-Zieritz, where Queen Louise of Prussia died in 1810.

NEUSTRIA, the old name given to the western kingdom of the Franks, as opposed to the eastern kingdom, Austrasia (q.v.) . The most ancient form of the word is Niuster, from niust, which would make the word signify the ” most recent ” con- quests of the Franks. The word Neustria does not appear as early as the Historia Francorum of Gregory of Tours, but is found for the first time in Fredegarius. The kingdom of Chilperic was retrospectively given this name, and in contemporary usage it was given to the kingdom of Clovis II., as opposed to that of Sigebert III., the two sons of Dagobert; and after that, the princes reigning in the West were called kings of Neustria, and those reigning in the East, kings of Austrasia. Under the new Carolingian dynasty, Pippin and Charlemagne restored the unity of the Frankish realm, and then the word Neustria was restricted to the district between the Loire and the Seine, together with part of the diocese of Rouen north of the Seine; while Austrasia

comprised only the Frankish dominions beyond the Rhine, perhaps with the addition of the three cities of Mainz, Worms and Spires on the left bank. The districts between Neustria and Austrasia were called Media Francia or simply Francia. In 843 Brittany took from Neustria the countships of Rennes and Nantes; and gradually the term Neustria came to be restricted to the district which was later called Normandy, Dudo of Saint Quentin, who flourished about the year 1000, gives the name Neustria to the lands ceded to Rollo and his followers during the 10th century. In the year 1663, the Pere de Moustier gave to his work on the churches and abbeys of Normandy the title of Neustria pia.

At the time of Charlemagne, Lombardy was divided into five provinces: Neustria, Austrasia, Aemilia, Littoraria maris and Tuscia. Austrasia was the name given to eastern Lombardy, and Neustria that given to western Lombardy, the part last occupied by the Lombards.

See F. Bourquelet, ” Sens des mots France et Neustrie sous le regime mdrovingien,” in the Bibliotheque de Vecole des chartes, xxvi. 566-574; Longnon, Atlas historique de la France, both atlas and text.

(C. Pf.)

NEUTITSCHEIN (Czech Nov$ Jilin), a town of Austria, in Moravia, 75 m. N.E. of Briinn by rail. Pop. (1900) 11,891, chiefly German. It is situated on a spur of the Carpathians, and on the banks of the Titsch, an affluent of the Oder. It is the chief place in the Kuhlandchen, a fertile valley peopled by German settlers, who rear cattle and cultivate flax. At Neutitschein manufactures of woollen cloth, flannel, hats, carriages and tobacco are carried on; and it is also the centre of a brisk trade. The town was founded in 13 n. Neutitschein was in 1790 the headquarters of the Austrian field-marshal Loudon, who died here in the same year and is buried in the parish church.

NEUTRALITY, the state or condition of being neutral (Lat. neuter, neither of two) , of not being on or inclined to one side or another, particularly, in international law, the condition of a state which abstains from taking part in a dispute between other states. Neutrality is the most progressive branch of modern International Law. It is also that branch of International Law in which the practice of self-restraint takes the place of the direct sanctions of domestic law most effectively. The rapid changes it is undergoing are in fact bringing the state- system of the modern world nearer to the realization of the dream of many great writers and thinkers, of a community of nations just as much governed by legal methods as any community of civilized men. While the right of war was simply the right of the stronger, there was no room for neutral rights, for, without going back to the time of the ancients, the so-called rights of war and conquest are nothing but survivals of the right of brute strength. No nation or community down to comparatively recent times was treated as having a right to what it could not keep. It is the growth of a law of neutrality, through the modern possibility of concerted action among neutral states, which is bringing about improvement, and, though the signs of our times are not always reassuring, we have taken a long stride forward since Molloy, in his De Jure maritimo et navali (1680), wrote: ” As a neuter neither purchases friends nor frees himself from enemies, so commonly he proves a prey to the victor; hence it is held more advantage to hazard in a conquest with a companion than to remain in a state wherein he is in all probability of being ruined by the one or the other.”

It was the great commercial communities, the Hansa in the north and Venice and the Mediterranean maritime republics in the south, which were first able to insist on some sort of regulation of the usages of war for their own protection. With the growth of intercourse among nations a further advance was made, by treaty stipulations entered

into in time of peace, to provide rules for their guidance in the event of war, but it is only in our own time that the idea of a substantive neutral right has obtained recognition. To our own time belongs the final acceptance of the principle that the neutral flag protects an enemy's goods except contraband, the conception of neutralization of territory, the abolition of fictitious blockades, the practice of declarations of

neutrality, the detachment from the high sea and neutralization of the zone called territorial waters, and the Areopagus of nations called the European Concert, in which the right of neutrals is asserted as a brake upon the operation of the still venerated right of conquest. The rights of neutrals have received their most recent affirmation in several of the decisions of the Hague Peace Conferences.

International trade and intercourse have become so intricate that war can no longer be waged without causing the most serious loss to neutral nations, which, moreover, suffer from it without any of the possible contingent benefits it may procure for the immediate parties. So much is it so, that most great powers have found it necessary for their self-protection to enter into defensive alliances with others, the direct object of which is the preservation of European peace by the threat of making war so gigantic a venture that no state will again embark on it " with a light heart." The next step will probably be alliances between states which, by their nature or by their having reached the limit of their expansion, have nothing further to gain by war with each other, for the purpose of securing perpetual peace as between themselves.

Different attempts have been made to define neutrality, but the word defines itself, so far as a succinct definition serves any purpose. The subject covers too wide and varied an area of matter to be condensed into a short state-

Deflnltlon and scope.

ment of any kind. Neutrality entails rights and duties on both the belligerent and the neutral sides. Theoretically, neutrality, to be complete, would require the neutral to abstain from everything which could even remotely be of assistance to either belligerent. To this obligation would theoretically correspond that the belligerent should carry on the war without doing anything which could even remotely disturb or interfere with the neutral state or the free activity of its citizens. Neither the one nor the other is found to be practicable. It is not even easy for the belligerent to observe absolutely the duty of doing no direct injury to neutral territory. A battle may be fought to the very edge of the neutral frontier, and shells may explode in any neutral town within the firing range of modern artillery. The present respect paid by belligerents to territorial waters is a palliative in the case of a seaboard frontier; but even the three-mile limit

acknowledged by most countries would permit belligerent vessels with present range of artillery to fire land- wards far into neutral territory. Compensation — it is true, would be due for any damage done, but this does not alter the fact that acts of war can produce direct consequences on neutral territory which have the character of carrying war into a neutral state. The neutral state, moreover, is obliged to incur heavy ex- penditure to protect its frontier from being traversed by either belligerent, and thus avoid itself being exposed to claims for compensation for an act which it would otherwise be powerless to prevent. In the case of a maritime war, the neutral state is also bound to exercise strict supervision to prevent its ports from being used by either belligerent for the purpose of increasing its military strength. In short, war cannot be carried on without heavy expense and inconvenience to neighbouring neutral states. The inconvenience to the intercourse of neutral citizens is still greater. Their ships are liable to be taken out of their course, and their cargoes to be discharged to the bottom of the hold in search of articles which are contraband according to circum- stances over which they have no control,- and they may be confiscated without recourse by judges appointed by one of the interested parties. Even their whole trade with specific ports of the one belligerent may be stopped by the ships of the other belligerent without indemnity. On the other hand, a great deal of vital assistance can be given by neutral citizens to the one or the other belligerent in money, or by supplies of arms, ammuni- tion, food and other commodities, which it is not at present the duty of neutral states to interfere with.

The respective rights and duties of belligerents and neutrals in current practice may be subdivided as follows: —

i. Belligerent duty to respect neutral territory and neutral territorial waters.

2. Neutral right of official representation and mediation; of intercourse of neutral citizens with citizens of either belligerent; of convoy, &c.

3. Belligerent right of blockade, angary, visit and search, capture and confiscation of contraband of war.

4. Neutral duties: (absolute) of abstention from any direct corporate assistance to either belligerent, of enforcement of respect by both belligerents for neutral territory; (relative) of prevention of any recruiting for either belligerent, or arming or equipping of vessels for their service; and (contingent) of allowing commercial access to the

one or other belligerent without distinction, and of granting impartially to one or the other belligerent any rights, advantages or privileges, which, according to the usages recognized among nations, are not considered as an intervention in the struggle.

This subdivision, we believe, covers the whole ground of neutrality. We shall follow it in this article.

Belligerent Duty. — It is now universally recognized among European states that a belligerent army must make no use of its strength in the field to carry its operations into Duty to neutral territory or into neutral waters. Belligerent respect forces entering neutral territory are by the practice f”^f a ‘ of nations bound to surrender their arms to the neutral * ory ‘ state, and remain hors de combat till the close of the war. (Com- pare arts. 1 1 and 1 2 of the Hague Convention relating to the ” Rights and Duties of Neutral Powers and persons in case of war on land ” 18th of October 1907.)

Through territorial waters belligerent vessels are allowed to pass freely as in time of peace. Nor does the usage of nations forbid a belligerent vessel from entering a neutral port. Access to Motives of humanity have sanctioned this distinction a „d duty between territorial and maritime warfare. The Ad- to respect miralty Instructions (1893) set out the rights of bel- ” Subject to any limit which the neutral authorities may place upon the number of belligerent cruisers to be admitted into any one of their ports at the same time, the captain, by the comity of nations, may enter a neutral port with his ship for the purpose of taking shelter from the enemy or from the weather, or of obtaining provisions or repairs that may be pressingly necessary (I. section 592). He is bound to submit to any regula- tions which the local authorities may make respecting the place of anchorage, the limitation of the length of stay in the port, the interval to elapse after a hostile cruiser has left the port before his ship may leave in pursuit, &c. (I. section 593). He must abstain from any acts of hostility towards the subjects, cruisers, vessels or other property of the enemy which he may find in the neutral port (section 504)- He must also abstain from increasing the number of his guns, from procuring military stores, and from augmenting his crew even by the enrolment of British subjects ” (section 595).

Nor may the commander of a British warship take a capture into a neutral port against the will of the local authorities (Holland) Manual of Naval Prize Law, 1888, section 299). This subject was one of those dealt with at the Hague Conference of 1907. (See art. 18 of the ” Convention relating to the rights and duties of neutral powers in naval

war.”)

Neutral Rights. — Neutral powers have the right to remain, as far as possible, unaffected by the war operations, and, therefore, continue their diplomatic relations with the belligerent states. The immunities and exterritoriality of their ie%tton. diplomatic agents attach to them as in time of peace, subject only to necessity of war, which may entitle a belligerent to place restrictions on this intercourse. , Thus, during the Franco- German War, on the surrounding of Paris, foreign diplomatists in the besieged city were refused by the German’ authorities all possibility of corresponding with their governments, except by letters left open for their inspection. Neutral legations may also undertake the representation of private interests of subjects of the one belligerent on the territory of the other. Thus in the Franco-German War of 187 1 the Germans in France were placed under the protection of the United States legation, and the French in

Germany under that of the British legation; in the war of 1898 between the United States and Spain, American interests in Spain were committed to the care of the British legation, and those of Spaniards in the United States to that of the Austro- Hungarian legation. By legations are understood both diplo- matic and consular authorities. The protection granted is in the nature of mere mediation. It confers no rights on the belli- gerent subjects in question, nor does it give the neutral legation any right to protect a belligerent subject or his property against any ordinary rights of war.

Good offices, properly speaking, are a mild form of mediation or tentative mediation, i.e. mediation before it has been accepted Bhchtot ky the parties. Article 3 of the Hague Convention offering for the pacific settlement of international disputes good of October 18, 1907, however, provides that ” powers,

° f eiu’ii”” 1 stran 8 ers t0 l ˆ e dispute, have the right to offer good offices or mediation, even during the course of hostilities,” and that ” the exercise of this right can never be regarded by one or other of the parties in conflict as an un- friendly act.” The Hague Convention puts an end to the doubt whether a neutral power can mediate without involving itself in some way with the one or the other side in the dispute. Media- tion had already been provided for in several existing treaties, such as the Treaty of Paris (30th March 1856), which

provides that ” if any dissension should arise between the Sublime Porte and one or more of the other signatory powers and threaten the maintenance of their good relations, the Sublime Porte and each of these powers before resorting to force shall give an opportunity to the other contracting parties in order to prevent such extreme measures ” (article 8) ; the Treaty of Yedo between the United States and Japan (29th July 1858) stipulating that in the case of difference between Japan or any other state, ” the president of the United States, at the request of the Japanese government, will act as a friendly mediator in such matters of difference as may arise between the government of Japan and any other European power ” (article 2) ; and the General Act of Berlin relating to West Africa (1885), which provides that ” in the case of a serious dissension having arisen on the subject of, or within the territories” in question, between the signatory powers, they undertake, before taking up arms, to have recourse to the mediation of one or more of the friendly powers (article 12).

In the Venezuela- Guiana boundary question, the mediation of the United States government was declined by Great Britain, but its good offices were accepted. In the difficulty which arose between Germany and Spain in connexion with the hoisting of the German flag on one of the Caroline Islands, Spain did not consider arbitration consistent with the sovereign power she claimed to exercise over the island in question, but she accepted the mediation of the pope, and the matter was settled by pro- tocols, signed at Rome (17th December 1885). These incidents show the uses of variety and gradation in the methods of diplomacy.

Neutral subjects have the right to carry on trade and inter- course with belligerent subjects in so far as they do not interfere Rlihts of w ‘ tn tne operations or necessities of war, and it is no neutral violation of the neutral character that this trade or subjects on intercourse is of benefit to either side. This is subject belligerent a j wa y S to tˆe belligerent right to capture and confiscate contraband of war (see below). On the other hand, the property of subjects and citizens of neutral states follows the fortune of the belligerent state within whose territorial juris- diction it is situated. It is liable to the same charges as that of native subjects and citizens, and in case of military contributions neutral subjects on belligerent soil can claim no protection or exemption (see below, Angary). They have also the same rights to all indemnities for loss as are granted to native subjects and citizens.

The position of neutral public ships and the relative assimila- tion to them of mail steamers has been the subject of some controversy. A

public ship is a ship having an official character. It includes not only warships, but also any ships affected to

any specific and exclusive government purpose. Public ships in this sense are invested with an extra-territorial character, and the state to which they belong is directly responsible for their acts. They are therefore not liable to visit and 0/ ne U f ra / search for contraband of war, and are exempt from terri- public torial jurisdiction even in belligerent waters. As regards s*4> s «nd vessels which are engaged partly in private traffic and ™*g mers partly on public service, such as mail steamers and government packets, the position is necessarily different. Under the Japanese Prize Law, adopted in view of the Chino- Japanese campaign, any vessel carrying contraband of war, whose destina- tion is hostile, may be detained, without exception being made for mail steamers. The United States proclamation of April 1898 in connexion with the Spanish War stated that mail steamers would only be stopped in case of grave suspicion of their carrying contraband or of their violating a blockade.

On the arrest of the German mail steamers ” Bundesrath ” and ” General ” during the South African War, the German govern- ment represented to the British government that “it was highly desirable ” that steamers flying the German mail-flag should not be stopped, and the British government thereupon issued orders not to stop them on suspicion only {Parliamentary Papers, Africa, No. 1, 1900). This was a precedent of the greatest importance. It would have practically assimilated mail steamers to public ships. Yet the mere circumstance of carrying the mails does not manifestly per se change the character cf the ship. Both this subject and the position of packets- under state owner- ship, which may carry on trade and may consequently transport contraband, require deliberate adjustment by treaty. The convention between Great Britain and France respecting postal communications (30th August 1890) provides that ” in the case of war between the two nations the packets of the two adminis- trations shall continue their navigation, without impediment or molestation until a notification is made on the part of either of the two governments of the discontinuance of postal com- munications, in which case they shall be permitted to return freely to their respective ports ” (article 9). The position of either as neutral is not dealt with. The tendency seems to be towards exemption, but in this case there should be official certification that the ships in question carry nothing in the nature of contraband.

Meanwhile the Hague Conference of 1907 has adopted rules under which postal correspondence of neutrals or belligerents is inviolable,

whether it be official or private, or the carrying vessel be neutral or an enemy vessel, but in nv °y-

so far as mail ships are concerned they are not otherwise exempt from the application of the rules of war affecting merchant ships generally (see Convention on restrictions on the exercise of the right of capture in maritime war, October, 1907). Connected with the position of public ships is the question of the right of convoy. Neutral merchant ships travelling under the escort of a warship or warships of their own flag are held by some authorities to be exempt from visit and search. The Japanese Prize Law, which is largely based on English practice, following on this point the recommendations of the Institute of International Law (see Reglement des prises maritimes, Annuaire 1888, p. 221), provides that " when the commander of a neutral convoy declares that there is no contraband of war on board the vessels under convoy, and that all the papers are in order in these vessels; the vessels shall not be visited " (article 23). J The United States,

1 At the outset of the Chino- Japanese War, Vice-Admiral Sir E. R. Fremantle sent a note to the Japanese admiral requesting him to " give orders to the ships under his command not to board, visit or interfere in any way with British merchant vessels, observing that the British admiral had directed all British ships under his orders to afford protection to such merchant vessels, and not to allow them to be molested in any way." Professor Takahashi, in his International Law of the Chino- Japanese War, relates that the Japanese admiral replied that " as the matters demanded by the British admiral belonged to the sphere of international diplomacy, and consequently were outside his official responsibility, they should be communicated directly to the Japanese Department of Foreign Affairs." " The idea of the British admiral," observes Professor Takahashi, " seemed to be not only to claim a right of convoy, which has never been recognized

in treaties with Mexico (5th April 1 831), Venezuela (20th January 1836), Peru (6th Sept. 1870), Salvador (6th December 1870) and Italy (26th February 1871), have agreed to accept the commander's declaration as provided in the Japanese Prize Law. Wharton quotes in his International Law Digest a passage from a despatch of Mr Secretary Forsyth (18th May 1837) in which he states that " it is an ordinary duty of the naval force of a neutral during either civil or foreign wars to convoy merchant vessels of the nation to which it

belongs to the ports of the belligerents. This, however, should not be done in contravention of belligerent rights as defined by the law of nations or by treaty." The Spanish Naval Instructions (24th April 1898) in the war with the United States granted unconditional exemption to convoyed neutral ships (article n). The subject has now been dealt with by the Declaration of London (1 908-1 009), which requires the commander of a convoy to give a statement in writing as to the character of the vessels and cargoes (see Convoy). A neutral merchant ship, travelling under enemy's convoy, places itself, with the assistance of the belligerent force, beyond the application of the belligerent right of visit and search, and thus commits a breach of neutrality.

Belligerent Rights. — Since the declaration of Paris providing that blockades in order to be binding must be effective, that is Blockad to sa ^' mus * ^ e maintained by a force sufficient really to prevent access to the enemy's coast, the tendency has been to give a precise form to all the obligations of the blockading belligerent. Thus it is now generally agreed that notification to the neutral should be sufficiently detailed to enable neutral vessels to estimate, with practical accuracy, the extent of their risks. French writers consider a general notification, though desirable, as insufficient, and hold an individual notification to each neutral ship which presents itself at the line of blockade as requisite. This theory was applied by France in the. Franco-German War, and earlier by the Northern States in the American Civil War. The new Japanese Prize Law (1894) does not attempt to prescribe any such notification to each ship, but sets out that notice of blockade to each ship is either actual or constructive. " Actual " it describes as being when the master is shown to have had knowledge of the blockade, in whatever way he may have acquired such knowledge, whether by direct warning from a Japanese warship or from any other source; " constructive," when a notification of its existence has been made to the proper authorities of the state to which the vessel belongs, and sufficient time has elapsed for such authorities to communicate the notification to the subjects of that nation, whether or not they have in fact communicated it. No blockade, however, was attempted by the Japanese government, and the application of the rules was not put to the test.

In the war with Spain the United States proclamation of the investment of Cuba stated that an efficient force would be posted, so as to prevent the entrance and exit of vessels from the blockaded ports, and that any neutral vessel approaching or attempting to leave any of them, " without notice or know- ledge" of the establishment of the blockade, would be duly warned by the commander of the

blockading forces, who would endorse on her register the fact and date of such warning, and where such endorsement was made. The words ” without notice or knowledge ” were explained fully in the instructions to blockading vessels (20th June 1898). ” Neutral vessels,” said these instructions, ” are entitled to notification of a blockade before they can be made prize for its attempted violation.” ” The character of this notification is not material. It may be actual, as by a vessel of the blockading force, or con- structive, as by a proclamation of the government maintaining the blockade, or by common notoriety. If a neutral vessel can be shown to have notice of the blockade in any way,

by British prize courts, but also to extend it over all waters of the Far East, where British warships were not actually engaging in convoy. Soon afterwards the matter was settled without any diffi- culty. On nth August the under-Secretary of the Japanese Foreign Office received a letter from the British Minister in T6lcy6 stating that there must be some misunderstanding, and that the British government would never try to interfere with belligerent right.”

she is good prize”- and should be sent in for adjudication ; but should the formal notice not have been given, the rule of constructive knowledge arising from notoriety should be construed in a manner liberal to the neutral.” Thus the United States government abandoned the system of individual notifica- tion inserted in the proclamation of 19th April 1861, which was only found practicable in the case of vessels which had presumably sailed without knowledge. In such cases it was provided by the more recent instructions that they should be boarded by an officer, who should enter the notice in the ship’s log, such entry to include the name of the blockading vessel giving notice, the extent of the blockade, and the date and place, verified by his official signature. The vessel was then to be set free, with a warning that, should she again attempt to enter the same or any other blockaded port, she would be good prize. The Declaration of London (1908-1909) exhaustively treats of this subject and has regulated it with a leaning towards continental views (see Blockade).

Angary, or Droit d’ Angarie, is a contingent belligerent right, arising out of necessity of war, to dispose over, use and destroy, if need be, property belonging to neutral states. 1 . During the Franco-German War imminent necessity was pleaded by the German government, as the justification of using force to seize and sink six British coal-ships in the Seine to prevent French gun-boats from running up the river and interfering with the tactics of the German army operating on its banks. The captains of the vessels refused to enter into any agreement

with the commanding German general, and the vessels were then sunk by being fired upon. The British government raised no objection to the exercise of the right, and confined itself to demanding compensation for the owners, which the German government declared itself ready to pay. Count Bismarck evidently felt the use which might be made against Germany, as a neutral power, of such an extreme measure, and took care in the correspondence with the British government to emphasize the pressing character of the danger, which could not be other- wise parried.

A case given in the text-books as another one of angary during the same war was the temporary seizure and conversion to war purposes of Swiss and Austrian rolling-stock in Alsace, without any apparent military necessity. Ordinary private neutral property on belligerent soil, it must be remembered, follows the fate of private property generally. The only distinction between the right of angary and the right of assimilating private neutral property to private property generally on belligerent soil which seems based on reason is that, whereas private property of neutrals generally which has remained on belligerent soil is sedentary, or, so to speak, domi- ciled there, neutral vessels are mere visitors with a distinct external domicile. The writer thinks the assimilation of neutral railway carriages to neutral vessels in this respect not unreason- able. 8 ‘■

A neutral state in its corporate capacity, we have seen, must abstain from acts which can be of assistance to either belligerent, and it is bound to exercise reasonable diligence to prevent its territory being used as a base for belligerent &£&” operations. The duties of a neutral state as a state go no further. Commercial acts of its citizens, even the export of arms and munitions of war to a belligerent country, do not, in the • present state of international usage, so long as both belligerents are free to profit by such acts alike, involve liability on the part of the neutral state. But relief from the obligation of repressing breaches of neutrality by contraband traffic of subjects has its counterpart in the right granted to belligerent warships of visit and search of neutral merchant vessels, and in the possible condemnation, according to circumstances, of the ship and confiscation of goods held to be contraband.

1 Angaria (from ayyapos, a messenger), a post station. The French word hangar or shed is probably of the same origin.

‘Treaties between the Zollverein and Spain (30th March 1868) and between Germany and Portugal (2nd March 1872) contain special provisions for the fixing of indemnities in case of any forced utiliza-

tion by either state of private property of the citizens of the other.

NEUTRALITY

Coal.

Contraband is of two kinds — absolute contraband, such as arms of all kinds, machinery for manufacturing arms, ammuni- tion, and any materials which are of direct application in naval or military armaments; and conditional contraband, consisting of articles which are fit for, but not necessarily of direct, applica- tion to hostile uses. The British Admiralty Manual of Prize Law (1888), following this distinction, enumerates as absolutely contraband: arms of all kinds and machinery for manufacturing arms; ammunition and materials for ammunition, including lead, sulphate of potash, muriate of potash, chlorate of potash and nitrate of soda; gunpowder and its materials, saltpetre and brimstone; also guncotton; military equipments and clothing; military stores, naval stores, such as masts, spars, rudders, and ship-timber, hemp and cordage, sailcloth, pitch and tar, copper fit for sheathing vessels, marine engines and the component parts thereof, including screw propellers, paddle wheels, cylinders, cranks, shafts, boilers, tubes for boilers, boiler plates and fire-bars, marine-cement and the material used in the manufacture thereof, blue lias and Portland cements; iron in any of the following forms — anchors, rivet iron, angle iron, round bars of iron of from £ to § of an inch diameter, rivets, strips of iron, sheets, plate iron exceeding J of an inch, and Low Moor and Bowling plates; — and as conditionally contraband: provisions and liquors fit for the consumption of army or navy, money, telegraphic materials, such as wire, porous cups, platina, sulphuric acid, materials for the construction of a railway, such as iron bars, sleepers and so forth, coal, hay, horses, rosin, tallow, timber. 1

The classing of coal as conditional contraband has given rise to much controversy. Great Britain has consistently held it to be so. During the war of 1870 the French and German warships were only allowed to take at English ports enough to return to a French or German port respectively. In 1885, during the Franco-Chinese campaign, after protest by the Chinese government, Great Britain applied the same rule at Hong-Kong and Singapore. During the Spanish-American War neither belligerent seems to have treated coal as contraband. In the case of the coal-ships which were prevented from landing their cargoes at Cuba, the prevention seems to have been con- nected with the blockade only. At the West African conference of 1884 Russia declared that she would ” categorically refuse her consent to any articles in any treaty, convention or instru- ment whatever which

would imply ” the recognition of coal as contraband of war (Parliamentary Papers, Africa, No. 4, 1885). Coal, however, is so essential to the prosecution of war that it is impossible to avoid classing it as conditional contra- band, so long as such contraband is recognized. The alternative, of course, would be to allow both belligerents freely to supply themselves at neutral ports, and neutral vessels freely to supply belligerent coaling stations.

During the Franco-Chinese campaign of 1885 and the South African War there was controversy as to the legality of treating food-stuffs as conditional contraband. During the former the subject-matter was rice, and the circum- stances were exceptional. The hostilities being at the outset reprisals, and not actual war, France at first exercised no right of search over British merchant ships. Great Britain, on her side, for the same reason did not object to French war vessels coaling, victualling and repairing at British ports. On China protesting against this indulgence to France, Great

1 The Japanese Prize Law (21st August 1894) makes the following distinction: (1) Arms of all kinds, brimstone, dynamite, nitrate of potash, and all goods fit for the purpose of war exclusively: the above-mentioned goods are contraband when they are on board a vessel which either has a hostile destination or calls at any port of the enemy. (2) Provisions and liquors, money, telegraphic materials, such as wire, platinum, sulphuric acid and zinc, porous cups, materials for the construction of a railway, as iron bars, sleepers, &c, coal, timber and so forth : the above-mentioned goods are contraband goods when the destination of the vessel is either the enemy’s fleet at sea or a hostile port, used exclusively or mainly for naval or military equipment. When it is clearly known that, though goods detailed in the above sections 1 and 2 are found on board a vessel, they are merely for her own use, they cannot be deemed contraband goods.

Food- stuffs.

Britain, as above stated, put in force her practice of treating coal as contraband, and thereupon France exercised her corre- sponding belligerent right of searching British vessels. The closing of British coaling stations to French warships was a serious inconvenience to France, and she proclaimed ” that in the circumstances in which war was being carried on ” the cargoes of rice which were being shipped to the northern Chinese ports were contraband. By depriving the Chinese government of part of the annual tribute sent from the southern provinces in the form of rice she hoped to bring pressure on the Peking government. This was a manifest stretching of the sense of

conditional contraband. Besides, no distinction was made as to destination. The British government protested, but no cases were brought into the French prize courts, and the legality of the measure has never been judicially examined.

The controversy during the South African War was confined to theory. In practice no stoppage of food-stuffs seems to have taken place, though the fact that the whole able-bodied popula- tion of the enemy states formed the fighting force opposed to Great Britain made it clear that the free import of food supplies from abroad helped the farmer-soldiers to carry on warfare without the immediate care of raising food crops.

The two cases cited show the great difficulty of fixing the character of conditional contraband in a way to prevent arbitrary seizures. During the Russo-Japanese War (1904-1905) there was a warm controversy between the British and Russian govern- ments on the scope of the belligerent right to declare certain articles contraband. The Conference of London (1 908-9) , by enumerating the articles which are absolute contraband, limiting those which may be declared contraband, and fixing certain articles which can in no case be declared contraband, has endeavoured to meet the difficulties which arise in practice (see Contraband).

Trade between neutrals has a prima facie right to go on, in spite of war, without molestation. But if the ultimate destina- tion of goods, though shipped first to a. neutral port, is enemy's territory, then, according to the " doctrine fj "" of continuous voyages," the goods may be treated as if voyages. they had been shipped to the enemy's territory direct. This doctrine, though Anglo-Saxon in its origin and develop- ment, has been put in force by an Italian court in the case of the Doelwijk, a Dutch vessel which was adjudged good prize on the ground that, although bound for Jibouti, a French colonial port, it was laden with a provision of arms of a model which had gone out of use, and which could only be intended for use by the Abyssinians, with whom Italy was at war. The subject has been fully discussed by the Institute of International Law, by whom the following rule has been adopted: " Destination to the enemy is presumed where the shipment is to one of the enemy's ports, or to a neutral port, if it is unquestionably proved by the facts that the neutral port was only a stage (etape) towards the enemy as the final destination of a single commercial operation." 2

The question of the legality of the doctrine was raised by Chancellor von Billow during the South African War in connexion with the

stopping of German ships bound for Delagoa Bay, a neutral port. He contended that such vessels were quite, 2 The only person in that eminent assemblage who raised an objection to the principle of the doctrine was the distinguished French writer on maritime law, M. Desjardins, who declined to acknowledge that any theory of continuous voyages was, or could be, consistently with the existing law of neutrality, juridically known to International Law. He admitted, at the same time, that penalties of contraband would be incurred if the shipping to a neutral port were effected merely in order " to deceive the belligerent as to the real destination of the cargo." This was the French ruling in the Frau Houwina case (26th May 1855). He proposed to restrict the operation of the doctrine to this condition, but was opposed by three Italian pro- fessors of international law, Professors Fusinato, Catellani and Buzzati, on the ground that it would exclude, as it obviously would do, the contingency of goods shipped to a neutral port, not for the purpose of defrauding the belligerent, but for that of being ultimately delivered to a belligerent not in possession of a seaport. The article as quoted in the text was also supported by the greatest German authority pn International Maritime Law, Director Perels of the 1 German admiralty.

at all times, outside belligerent jurisdiction, and that only the authorities of the neutral port were entitled to stop contraband on its way to a belligerent force. He did not, however, press the point, and only reserved the right of raising it at a future date. 1 It was fully discussed at the London Conference of 1908-1909. In order to effect a compromise between conflicting theories and practice, a distinction was made in the declaration between absolute and conditional contraband, the doctrine of continuous voyages not being applicable to conditional contraband when documented to be discharged at a neutral port, except where the enemy country has no seaboard (Declaration of London, arts. 30 to 36).

Unneutral Service. — Under this heading the London Conference of 1908-1909, concerning the laws of naval war, dealt with analogues of contraband, and neutral vessels assisting or in the service of the enemy. The articles adopted are as follows: —

A neutral vessel will be condemned and will, in a general way, receive the same treatment as a neutral vessel liable to condemnation for carriage of contraband: (1) If she is on a voyage specially under- taken

with a view to the transport of individual passengers who are embodied in the armed forces of the enemy, or with a view to the transmission of intelligence in the interest of the enemy. (2) If, to the knowledge of either the owner, the charterer, or the master, she is transporting a military detachment of the enemy, or one or more persons who, in the course of the voyage, directly assist the operations of the enemy.

In the cases specified under the above heads, goods belonging to the owner of the vessel are likewise liable to condemnation.

The provisions of the present article do not apply if the vessel is encountered at sea while unaware of the outbreak of hostilities, or if the master, after becoming aware of the outbreak of hostilities, has had no opportunity of disembarking the passengers. The vessel is deemed to be aware of the existence of a state of war if she left an enemy port subsequently to the outbreak of hostilities, or a neutral port subsequently to the notification of the outbreak of hostilities to the power to which such port belongs, provided that such notification was made in sufficient time. (Art. 45.)

A neutral vessel will be condemned and, in a general way, receive the 9ame treatment as would be applicable to her if she were an enemy merchant vessel: (1) If she takes a direct part in the hostilities; (2) If she is under the orders or control of an agent placed on board by the enemy government ; (3) If she is in the exclusive employment of the enemy government; (4) If she is exclusively engaged at the time either in the transport of enemy troops or in the transmission of intelligence in the interest of the enemy.

In the cases covered by the present article, goods belonging to the owner of the vessel are likewise liable to condemnation. (Art. 46.)

Any individual embodied in the armed forces of the enemy who is found on board a neutral merchant vessel may be made a prisoner of war, even though there be no ground for the capture of the vessel. (Art. 47.)

The procedure employed to ascertain whether a neutral vessel carries contraband or not is called Visit and Search (see Search), a belligerent right universally recognized * * n and justified by the considerations that merchant ships of the enemy might evade capture by hoisting a neutral flag, if the belligerent had not the right of ascertaining the real character of the ship, and that private neutral vessels might carry contraband goods and generally help the enemy, if the belligerent had

not the right of examining their cargo. All neutral private vessels in time of war are liable to visit by belligerent warships on the high seas and in the territorial waters of the belligerents, but not in the territorial waters of neutral states. Neutral public ships are not liable to visit (see above as to neutral public ships, mail ships, and convoy). Visit and search must be effected at every stage with ” as much considera- tion as possible ” (Herr von Biilow, in Reichstag, 19th January 1900). The visiting officer first examines the ship’s papers. If satisfied that the vessel is not liable to detention, he immedi- ately quits her. If not so satisfied, he proceeds to search her. If in the course of the search he is satisfied that the vessel is not liable to detention, the search is immediately discontinued. The visiting officer has the right to inspect any lockers, stores or boxes, and in case of refusal to open them he is justified in using such coercive measure as the case warrants. If after the visit and search the commander has reason to entertain suspicion he gives the master an opportunity of explanation, and if the 1 Pari. Papers, Africa, No. I (1900), pp. 14, 25.

explanation is unsatisfactory he detains the vessel. If the seizure turns out after all not to have been justified, the ship and cargo are immediately released and compensation is due for the loss through the detention. In the case of the stoppage and search of German vessels during the South African War, the German government proposed the appointment of arbitrators to decide upon the claims for compensation but this was an innovation to which the British government did not assent.

Resistance to search entails consequences which Art. 63 of the Declaration of London (1908-1909) has expressed as follows: —

Forcible resistance to the legitimate exercise of the right of stoppage, search and capture involves in all cases the condemnation of the vessel. The cargo is liable to the same treatment as the cargo of an enemy vessel. Goods belonging to the master or owner of the vessel are treated as enemy goods.

The consequence of carrying contraband are capture, trial by a belligerent prize court, and possible confiscation of the ship and cargo, or of the cargo alone or of a part of the cargo, according to the facts of the case. All are fjjwuno- agreed as to articles which are absolute contraband tioa, prize. being liable to capture. As regards conditional con- traband, British law, 2 in so far, at least, as concerns “naval and victualling stores,” is less severe, the Lords of the Admiralty being entitled to purchase such stores without condemnation in a prize court. In practice such purchases are made at the market value of the

goods, with an additional 10% for loss of profit. This proceeding is known in International Law as the right of pre-emption. It is not, however, as yet officially recognized on the continent of Europe, though the need of some palliative for confiscation, in certain cases, is felt, and some continental jurists, moved by the same desire to distinguish unmistakable from so to speak constructive contraband, and protect trade against the vexation of uncertainty, have tried to argue conditional contraband away altogether.

The tendency, however, among the majority of continental authorities is seen in the rule drawn up in 1895, after several years of discussion, by the Institute of International Law, a body composed exclusively of international jurists of acknow- ledged standing. The majority which adopted it represents authoritative opinion in Germany, Denmark, Italy, Holland and France, showing that the old antagonism between the British and continental views on conditional contraband has ceased to exist. To prevent confusion the Institute declares con- ditional contraband abolished, and then adds that ” neverthe- less, the belligerent has, at his option and on condition of paying an equitable indemnity, a right of sequestration or pre-emption as to articles (objets) which, on their way to a port of the enemy, may serve equally for use in war or in peace.” The proposed rule goes beyond the directions of the British Prize Act, and it could only come into operation under a verbal alteration of the Declaration of Paris, under which ” contraband ” alone is excepted from the protection of the neutral flag, a fact which seems to have escaped the notice of the Institute. British prize law is at present governed by the Prize Act of 1864. This act must be overhauled to meet the requirements of the new international law of the subject; the creation of an International Court of Appeal and the new rules adopted by the conferences of the Hague and London will make many changes necessary.

Absolute Duties of Neutrals.— The very sense of neutrality obviously implies abstention from direct corporate assistance. The duty of neutral states to enforce respect for their Enforce territory has become a very serious one. A belligerent meat of cannot be allowed to cross the neutral frontier or carry re*pect for on war operations in neutral waters, without the same J^^Jr right being granted to the other belligerent. Pursuit of one force by the other would amount to waging war on the neutral territory. It is agreed among nations that the avoidance of such a contingency is in the interest of them all. During the Franco- German War both France and Germany, ‘ The Naval Prize Act 1864, sect. 38.

as belligerents, and Belgium and England, as neutrals, rigorously observed their duties and enforced their rights, and no difficulty occurred. It is, nevertheless, conceivable that, under pressure of military necessity, or on account of an overwhelming interest, a powerful belligerent state would cross the territory of a weak neutral state and leave the consequences to diplomacy. The South African War was exceptional, in that the Portuguese government exposed itself to no international difficulty through allowing a belligerent, whose final victory was certain, and of necessity entailed total suppression of the conquered belligerent, to cross its colonial territory. At the same time it is an unfor- tunate precedent of taking advantage of the practical power- lessness of neighbouring neutral states to commit a violation of the law of nations, respect for which it is a primary duty of every self-respecting state to encourage. 1

If, by inadvertence or otherwise, belligerent soldiers pass the frontier, they have to be turned back. If they claim the Refugees, droit a" asile, they are arrested, disarmed, and kept in such a manner as to render it impossible for them to take any further part in the hostilities. In the case of territorial waters, as has already been pointed out, the neutral state is not in the same position as on land, all ships without distinction having a right of innocent passage through them. Belligerent ships also have the right to enter neutral ports, but the neutral authority is bound to take precautions to prevent any favour being shown to the one party or the other. 2

1 The right of way claimed and acceded to under the Anglo-Portuguese Treaty of Ilth June 1891 was a mere right of transit for merchandise, and could not in any way be construed as diminishing the neutral obligation to a belligerent who was no party to the treaty.

2 The rules laid down on this subject by the British authorities during the Spanish-American War were as follows: —

Rule 1. — During the continuance of the present state of war all ships of war of either belligerent are prohibited from making use of any port or roadstead in the United Kingdom, the Isle of Man or the Channel Islands, or of any of Her Majesty's colonies or foreign possessions or dependencies, or of any waters subject to the territorial jurisdiction of the British crown, as a station or place of resort for any warlike purpose, or for the purpose of obtaining any facilities for warlike equipment ; and no ship of war of either belligerent shall hereafter be permitted to leave such port, roadstead or waters from which any

vessel of the other belligerent (whether the same shall be a ship of war or a merchant ship) shall have previously departed until after the expiration of at least twenty-four hours from the departure of such last-mentioned vessel beyond the territorial jurisdiction of Her Majesty.

Rule 2. — If there is now in any such port, roadstead or waters subject to the territorial jurisdiction of the British crown any ship of war of either belligerent, such ship shall leave such port, roadstead, or waters within such time, not less than twenty-four hours, as shall be reasonable, having regard to all the circumstances and the con- dition of such ship as to repairs, provisions or things necessary for the subsistence ot her crew ; and if after the date hereof any ship of war of either belligerent shall enter any such port, roadstead or waters subject to the territorial jurisdiction of the British crown, such ship shall depart and put to sea within twenty-four hours after her entrance into any such port, roadstead or waters, except in case of stress of weather, or of her requiring provisions or things necessary for the subsistence of her crew, or repairs; in either of such cases the authorities of the port, or the nearest port (as the case may be), shall require her to put to sea as soon as possible after the expiration of such period of twenty-four hours, without permitting her to take in any supplies beyond what may be necessary for her immediate use; and no such vessel which may have been allowed to remain within British waters for the purpose of repair shall continue in any such port, roadstead or waters for a longer period than twenty-four hours after her necessary repairs shall have been completed. Provided, nevertheless, that in all cases in which there shall be any vessels (whether ships of war or merchant ships) of both the said belligerent parties in the same port, roadstead or waters within the territorial jurisdiction of Her Majesty, there shall be an interval of not less than twenty-four hours between the departure therefrom of any such vessel (whether a ship of war or merchant ship) of the one belligerent and the subsequent departure therefrom of any ship of war of the other belligerent; and the time hereby limited for the departure of such ships of war respectively shall always, in case of necessity, be extended so far as may be requisite for giving effect to this proviso, but no further or otherwise.

Rule 3. — No ship of war of either belligerent shall hereafter be per- mitted, while in any such port, roadstead or waters subject to the territorial jurisdiction of Her Majesty, to take in any supplies, except provisions and such other things as may be requisite for the sub-

Relative Duties of Neutrals. — Relative duties embrace those duties

which citizens are bound to observe and for which states incur a relative responsibility. It was the non-observ-

ance of these relative duties that led to difficulties

Foreign

enlist- between Great Britain and the United States at the meat, «c close of the American Civil War and which brought the two countries themselves to the verge of conflict. The Treaty of Washington (8th May 1871) referring these difficulties to arbitration defined the scope of the duties in question for all future purposes between the two peoples (see below, ” Pro- clamations of Neutrality “). Under this treaty the parties bind themselves to use ” due diligence,” where they have ” reasonable ground ” to believe that any acts have a belligerent character, in ” preventing ” them. They are bound to prevent —

(1) Fitting out, arming, or equipping any vessel;

(2) The departure from their jurisdiction of any vessel, having been specially adapted in whole or in part within such jurisdiction to warlike uses;

(3) The making use by a belligerent of their ports or waters as a base of naval operations against the other;

(4) The making use thereof for the purpose of the renewal or augmenting of military supplies or arms;

(5) The making use thereof for the recruitment of men. The contracting states undertook to bring the rules they

adopted on this subject to the knowledge of other maritime powers, and to invite them to adopt them also, but nothing was ever done to get them accepted among other states. Pro- vision had already been made to enable the government to carry them out in the Foreign Enlistment Act(9th August 1870). This act, which repealed the previous one of 1819 on the same subject, is minute in its provisions to prevent enlisting or recruiting men, or the building or the equipping of vessels; for the military service ” of a foreign state at war with a friendly state.” Other states, except the United States (which adopted a similar act), have not followed the example of Great Britain, but leave it to their governments to deal with the cases, when they may arise, as matters of public safety. 3

There was evident reluctance among foreign states to commit

themselves to the obligation of exercising ” due diligence.” It is clear that the duty of a state to forbear from committing any act which may be of assistance to either belligerent can never be formu- lated as an absolute one in regard to the acts of private persons, merely within the neutral jurisdiction. In recent times’ it has certainly become possible for states to exercise a more effective control than formerly over these acts; but at the present moment, though a much greater latitude is left to neutral subjects and citizens than is consistent with the idea of strict neutrality, there is no move- ment to alter the usages to the disadvantage of neutral interests. That the Geneva Arbitral Tribunal found in favour of the United States in the ” Alabama ” case in no way implied that International Law had undergone any change. The tribunal was bound by the ante- cedent fixation of the Washington rules, and laid down no new prin- ciple. On the other hand, the magnitude of the Geneva award was not likely to promote change in the direction of increasing neutral duties, except as part of a genera! regulation of neutral and belligerent rights. The whole subject was laid before the Hague Conference of 1907, which adopted the main principles of the rules enunciated in the Treaty of Washington (see Art. 8 of the Convention relating to the rights and duties of neutral states in maritime war).

sistence of her crew, and except so much coal only as may be sufficient to carry such vessel to the nearest port of her own country or to some nearer destination ; and no coal shall again be supplied to any such ship of war in the same or any other port, roadstead or waters subject to the territorial jurisdiction of Her Majesty, without special permission, until after the expiration of three months from the time when such coal may have been last supplied to her within British waters as aforesaid.

Rule 4. — Armed ships of either belligerent are interdicted from carrying prizes made by them into the ports, harbours, roadsteads or waters of the United Kingdom, the Isle of Man, the Channel Islands, or any of Her Majesty’s colonies or possessions abroad.

3 The French Penal Code, however, contains the following clauses covering the government’s powers in this respect : —

Art. 84. — Whoever shall by hostile acts, not approved by the Government, expose the State to a declaration of war, shall be punished by banishment, and should war follow, by deportation.

Art. 85. — Whoever shall, by acts not approved by the Government, expose Frenchmen to the risk of reprisals, shall be punished by

banishment.

44»

NEUTRALITY

To some extent the difficulty of determining the extent of

relative neutral duty is overcome by the issue of proclamations

of neutrality; but neutrality and its rights and duties

Prociama- are j n n0 re spect dependent on their being proclaimed tloas of . ., . , * „ i

neutrality. ” v tne ne utral power. Germany issues no proclama- tion; at least the German empire has issued none in connexion with the different wars which have taken place since 1870. The Austro-Hungarian government during the same period only in the case of the war of 1870 itself, and in 1877, issued proclamations, and these probably had objects outside the ordinary purposes of proclamations of neutrality, and its usual practice is the same as that of Germany. France usually issues a short general proclamation, and Great Britain a more detailed one, which must be as old as the ” ancient custom ” of its being publicly read from the steps of the Royal Exchange by the sergeant-at-arms and common crier of the City of London. 1 The British proclamation practically recites the Foreign Enlist- ment Act 1870 (an act to regulate the conduct of His Majesty’s subjects during the existence of hostilities between foreign states with which His Majesty is at peace), admonishes all persons entitled to British protection to observe and respect the exercise of those belligerent rights which ” We and Our Royal Predecessors have always claimed to exercise,” and warns them that any such persons ” breaking, or endeavouring to break, any blockade lawfully and actually established ” by either belligerent, ” or carrying officers, soldiers, despatches, arms, ammunition, military stores, or materials, or article or articles, considered and deemed to be contraband of war, according to the law or modern usages of nations, for the use or service ” of either belligerent, ” rightfully incur, and are justly liable to, hostile capture and to the penalties denounced by the law of nations in that behalf.” During the South African War no proclamation of neutrality was issued by any country.

Proclamations of neutrality may be made to serve the twofold purpose of warning the belligerent of the length to which the neutral government considers neutral duty to extend, and neutral subjects of

the exceptional measures to which a foreign war exposes them. They may also be used to give effect to any modification of neutral right or duty which the neutral state may consider warranted by special or altered circumstances.

No purely mercantile transactions are considered a violation of neutrality. Six years before the American Civil War, President Sale of Pierce, in his message to the Thirty-fourth Congress, arms and first session, made the following statement: — “The ammuni- laws of the United States do not forbid their citizens “°” *rf to sell to either of the belligerent powers articles of contraband of war, or to take munitions of war or soldiers on board their private ships for transportation; and although in so doing the individual exposes his person or property to some of the hazards of war, his acts do not involve a breach of the national neutrality, nor of themselves implicate the government.” This statement of international practice has been confirmed by art. 7 of the Hague Convention of October 18, 1907, on the Rights and Duties of Neutral States and Persons on Land (see below).

During the Franco-German War there was correspondence between the Prussian diplomatic representatives in London and at Washington and the British and United States foreign secretaries concerning shipments of arms and ammunition to the French armies, in which the Prussian government contended that it was incompatible with strict neutrality that French agents should be permitted to buy up in the neutral country, under the eyes and with the cognizance of the neutral govern- ment, ” many thousands of breech-loaders, revolvers, and pistols, with the requisite ammunition, in order to arm there- with the French* people, and make the formation of fresh army corps possible after the regular armies of France had been defeated and surrounded.” Nothing, however, was done to prevent the departure of these supplies. Both the British and United States governments claimed entire liberty for the traffic in question.

1 The Times, 28th April 1898.

In the case of loans publicly issued or raised on neutral territory the position is a little different, inasmuch as the neutral state is necessarily cognizant of the fact. No restriction, Ka] slng of however, is imposed by international usage, and loans 00 provided the same rights are granted to both belli- neutral gerents, either or both can raise money ad libitum in territory. neutral countries. Thus neutral states did not prevent the issue on their territory of the Russian war loan of 1876-1877. Nor in the war of 1894 between China and Japan was any opposition made by Japan to the raising of the Chinese loan

in London. Art. 18 of the Hague Convention on the Rights and Duties of Neutral States and Persons on Land (see below) confirms the existing practice.

Neutrality Reforms. — At the Hague Peace Couference 1899 a suggestion was agreed to, without discussion, that a further state conference should be held for the purpose of dealing specially with neutrality. At the Con- General ference of 1907 this was done, with the result that neutrality two fairly exhaustive conventions were adopted. co f “jˆZ iloa The general provisions relating to neutrality are as follow: — ,

Art. 1. — Neutral territory is inviolable.

Art. 2. — Belligerents are forbidden to send troops or convoys either of munitions of war or of provisions through the territory of a neutral state.

Art. 3. — Belligerents are also forbidden : — (a) To instal, on the territory of a neutral state, a radio-telegraphic station or any apparatus intended to serve as a means of communica- tion with the belligerent forces on land or sea ;

(6) To make use of any installation of like nature, erected by them before the war, on the territory of the neutral state, for an ex- clusively military purpose, and which has not been opened to the service of public correspondence.

Art. 4. — Bodies of combatants shall not be formed or recruiting offices opened on territory of a neutral power for the benefit of the belligerents.

Art. 5. — A neutral state shall not allow on its territory any of the acts mentioned in arts. 2 to 4. It is only bound to repress acts contrary to neutrality in case they have been committed on its own territory.

Art. 6. — A neutral state is not responsible where individuals separately pass the frontier to place themselves at the disposal of either belligerent.

Art. 7. — A neutral state is not bound to prevent exportation or transit for the account of either belligerent, of arms, munitions of war, and, in general, of anything which may be useful for an army or a fleet.

Art. 8. — A neutral state is not bound to prohibit or restrict the use, for belligerents, of telegraphic or telephonic cables, or of wireless

telegraphy apparatus, which are its property or that of companies or private individuals.

Art. 9. — Any prohibitive or restrictive measures adopted by a neutral state relative to the matters mentioned in arts. 7 and 8 shall be applied uniformly by it to both belligerents. The neutral state shall see that this obligation is observed by companies or private individuals owning telegraphic or telephonic cables or wireless tele- graphic apparatus.

Art. 10. — The act by a neutral state of resisting any violation of its neutrality, even by force of arms, cannot be regarded as an act of hostility.

Art. 11. — A neutral state receiving, on its territory, troops belonging to the belligerent armies, shall, as far as possible, keep them distant from the area of hostilities.

It may keep them in camps, and even shut them up in fortified places, or in places suitable for this purpose. It shall decide whether officers may be left at liberty or parole not to leave the neutral territory without authorization.

Art. 12. — When there is no special convention a neutral state shall supply internal prisoners with food, clothing, and the aid which humanity calls for. When peace is established, the cost of keeping the prisoners shall be reimbursed.

Art. 13. — A neutral state receiving escaped prisoners of war shall leave them at liberty. If it allows them to stay on its territory, it may appoint a place of residence for them. The same rule is appli- cable to prisoners of war brought by troops taking refuge on neutral territory.

Art. 14. — A neutral state may authorize the passage on its territory of wounded or sick belonging to the belligerent armies, on condition that the trains which carry them shall transport none of the fighting force and no materials of war. In such a case, the neutral state is bound to take the necessary steps to ensure safety and control.

The wounded or sick brought in these circumstances into neutral territory, by one of the belligerents, and belonging to the enemy, shall be detained by the neutral state in such a way that they cannot

again take part in the hostilities. This neutral state shall discharge the same duties if it be entrusted with the wounded or sick of the other army.

Art. 15. — The Geneva Convention applies to sick and wounded interned on neutral territory (see Geneva Convention).

Art. 16. — The natives of a state not taking part in the hostilities are considered as neutrals.

Art. 17. — A neutral person cannot take advantage of his neu- trality : —

(a) If he commits hostile acts against a belligerent;

(6) If he commits acts in favour of a belligerent, for instance, if he voluntarily takes service in the ranks of the army of one of the parties.

In such a case the neutralshall not be treated with more severity by the belligerent against whom he has acted in contravention of his neutrality than a native of the other belligerent state would be for the same act.

Art. 18. — The following shall not be considered as acts committed in favour of one of the belligerents, in the sense of Art. 17 (b) : —

(a) Supplies or loans made to one of the belligerents provided the purveyor or the lender inhabits neither the territory of the other party nor territory occupied by it, and provided the supplies do not come from these territories;

(b) Services rendered in matters of police or civil administration. Art. 19.— Railway property coming from the territory of neutral

states, whether it belongs to these states or to companies or to private persons, and recognizable as such, cannot be requisitioned or utilized by a belligerent, except in such cases and in such a manner as dictated by absolute necessity. Such property shall be returned to its country of origin as soon as possible.

The neutral state can even, in case of necessity, keep and utilize to that extent property coming from the territory of a belligerent state.

An indemnity shall be paid, proportionate to the amount of the property utilized and the duration of utilization.

The clauses of the Convention relating exclusively to neutrality in naval war, which are still fuller, are :— Coavea- Art. I. — Belligerents are bound to respect the sovereign

Hon ot rights of neutral powers and to abstain, either on the terri- 1907 on tory or in neutral waters, from all acts which might con- aeutrallty stitute in the part of the powers permitting them a non- la naval observance of their neutrality.

war. Art. 2. — All acts of hostility, including capture and the

exercise of the right of visit and search, by belligerent ships of war in the territorial waters of a neutral power, constitute a breach of neutrality and are strictly forbidden.

Art. 3. — When a vessel has been captured in the territorial waters of a neutral power, this power shall, if the prize is still within its jurisdiction, use all means in its power to effect the release of the prize and its officers and crew, and that the crew placed on board by the captor shall be interned. If the prize is out of the jurisdiction of the neutral power, the capturing government shall, on the request of the former, release the prize with its officers and crew. Art. 4. — No prize court can be constituted by a belligerent on neutral territory or on a vessel in neutral waters.

Art. 5. — Belligerents are forbidden to make neutral ports and waters the base of naval operations against their adversaries, especially by installing radio-telegraphic stations or any apparatus which may serve as means of communication with belligerent forces on sea or on land.

Art. 6. — The supply, under any ground whatever, either directly or indirectly, by a neutral power to a belligerent power, of ships of war, or of munitions or of material of war of any kind, is forbidden. Art. 7. — A neutral power is not bound to prevent the exportation or transit, for the account of either belligerent, of arms, munitions of war, or, in general, of anything which may be useful to an army or a fleet.

Art. 8. — A neutral government is bound to use the means at its disposal to prevent, within its jurisdiction, the equipping or arming of any vessel, which it has any reasonable suspicion of being destined to act as a cruiser or to join in hostile operations against a power with which it is at peace.

It is also bound to exercise the same surveillance to prevent the departure out of its jurisdiction of any vessel intending to act as a cruiser or take part in hostile operations, and which, within the said

jurisdiction, may have been adapted either wholly or in part for warlike purposes.

Art. 9. — A neutral power must apply equally to the two belligerents the restrictions, conditions and interdictions specified by it relating to admission to its ports, roadsteads, or territorial waters, with respect to ships of war or their prizes.

A neutral power may, however, forbid access to its ports and roadsteads, to any belligerent vessel which may have neglected to comply with the orders and directions issued by it or may have committed a breach of neutrality.

Art. 10. — The neutrality of a power is not compromised by the simple passage through its territorial waters of belligerent ships of war and of their prizes.

Art. 11. — A neutral power may allow shl-ps rf -vat of belligerents to make use of its licensed pilots.

Art. 12. — In default of other special previsions in the laws of a neutral power, ships of war of belligerents a»“e forbidden to remain in the ports or roadsteads or in the territpria’ waters of the said power for more than twenty-four hours, except in the cases provided for by the present Convention.

Art. 13. — If a power which has received notice of the commencement of hostilities learns that a ship of war of a belligerent is in one of its ports and roadsteads or in its territorial waters, it shall notify the said ship that it must leave within twenty-four hours or within the time prescribed by the local law.

Art. 14. — A belligerent ship of war may not prolong its stay in a neutral port beyond the legal period, except for the purpose of repairing damage or by reason of the state of the sea. It must leave as soon as the cause of the delay has ceased.

The rules relating to the limitation of stay in ports, roadsteads, and neutral waters do not apply to ships of war exclusively employed on religious, scientific or philanthropic missions.

Art. 15. — In default of other special provisions in the laws of the neutral power, the maximum number of ships of war of a belligerent which may be at the same time in one of its ports or roadsteads shall

be three.

Art. 16. — When ships of war of two belligerents are at the same time in a neutral port or roadstead, twenty-four hours at least must elapse between the departure of the ship of either belligerent before that of the other.

The order of departure shall be regulated by the order of arrival, unless the vessel arriving first is entitled to a prolongation of the legal period of its stay.

A belligerent ship of war may not leave a neutral port or road- stead until at least twenty-four hours after the departure of a merchant vessel carrying the flag of its adversary.

Art. 17. — In neutral ports and roadsteads, belligerent ships of war may only repair damage to the extent indispensable for their seaworthiness, and may not, in any way, increase their military strength. The neutral authority will ascertain the nature of the repairs to be executed, which shall be carried out as rapidly as possible.

Art. 18. — Belligerent ships of war may not make use of neutral ports, roadsteads and territorial waters for the purpose of renewing or increasing their military equipment or armament or for com- pleting their crews.

Art. 19. — Belligerent ships may not revictual in neutral ports or roadsteads, except to complete their normal supplies as in time of peace. These ships may also only take on board the fuel necessary for the purpose of reaching the nearest port of their own country. They may also take in fuel sufficient to fill up their bunkers properly so called if they are in a neutral country which has adopted this method of fixing the amount of fuel to be supplied.

If, according to the law of the neutral power, ships may only receive coal twenty-four hours after their arrival, the legal period ot their stay is prolonged for twenty-four hours.

Art. 20. — Belligerent ships of war which have taken in fuel in the port of a neutral power cannot renew their supply in a port of the same power within three months.

Art. 21. — A prize may not be brought into a neutral port except by reason of its unseaworthiness, or of the stress of weather or of insufficiency of fuel or provisions. It must leave again as soon as the cause of its entry has ceased. If it does not do so, the neutral power

shall give it notice to leave immediately, and in the event of its riot complying therewith, the neutral power shall use the means at its disposal to release it with its officers and crew and intern tha crew placed on board by the captor.

Art. 22.— The neutral power shall also release any prize which has been brought in not in accordance with the conditions laid down in Art. 21.

Art. 23. — A neutral power may allow access to its ports and roadsteads to prizes, whether escorted or not, when they have been brought there to be left in sequestration pending the decision of a prize court. It may have the prize conducted to any other of its ports. If the prize is escorted by a ship of war, the officers and men placed on board by the captor are allowed to go on board the escorting ship.

If the prize is navigating alone, the personnel placed on board is set at liberty.

Art. 24. — If, in spite of notice from the neutral authority, a belligerent ship of war does not leave a port in which it has no right to remain, the neutral power has the right to take such steps as it may think proper to render the ship incapable of going to sea during the continuance of the war, and the commander of the ship must facilitate the taking of such steps. When a belligerent ship is detained by a neutral power, the officers and crew are also detained.

The officers and crew thus detained may be left on board the ship or lodged on board another vessel or on shore, and they may be subjected to such restrictive measures as may be considered necessary to be imposed on them. In any event, sufficient men must be left on board the ship to keep it in order.

The officers may be released on giving their parole not to leave the neutral territory without permission.

Art. 25. — A neutral power is bound to exercise the surveillance of which the means in its power admit, to prevent within its

ports or roadsteads and In its waters any violation of the preceding

provisions.

Art. 26. — The exercise by a neutral power of the rights defined by the present Convention can never be considered as an unfriendly act by either belligerent who has accepted the articles relating thereto.

Art. 27. — The contracting powers will communicate to each other, as soon as feasible, all the laws, ordinances and other provisions which within their jurisdiction govern belligerent ships of war in their ports and waters, by means of a notification addressed to the government of the Netherlands and immediately transmitted by the latter to the other contracting powers.

Art. 28.— The provisions of the present Convention are only applicable as between contracting powers, and only if the belligerents are all parties thereto.

Other reforms may be expected from the Conference of 1915. Germany in the course of the South African War and Great Britain in that of the Russo-Japanese War showed great irrita- tion at the stoppage of certain of their merchant vessels, and Great Britain in the one case had to consent to and in the other to demand a modification of belligerent right under International Law — a modification which, be it said, is a perfectly justifiable one, viz. that the right of search for contraband of war be restricted to a specified area. It is probable that, in future wars, powerful neutral states will show, in similar cases, quite as much irritation as did Germany and Great Britain. (T. Ba.)

NEUVILLE, ALPHONSE MARIE DE (1836-1885), French painter, was born, the son of wealthy parents, at Saint-Omer, France, on the 31st of May 1836. From school he went to college, where he took his degree of bachelier es leltres. In spite of the opposition of his family he entered the naval school at Lorient, and it was here, in 1856, that his artistic instincts first declared themselves. After being discouraged by several painters of repute, he was admitted to work in Picot's studio. He did not remain there long, and he was painting by himself when he produced his first picture, " The Fifth Battalion of Chasseurs at the Gervais Battery (Malakoff)." In i860 de Neuville painted an " Episode of the taking of Naples by Gari- baldi " for the Artists' Club in the Rue de Provence, and sent to the Salon in 1861 " The Light Horse Guards in the Trenches of the Mamelon Vert." He also illustrated Le Tour du monde and Guizot's History of France. At the same time he painted a number of remarkable pictures: " The Attack in the Streets of Magenta by Zouaves and the Light Horse " (1864), " A Zouave Sentinel " (1865), " The Battle of San Lorenzo " (1867), and " Dismounted

Cavalry crossing the Tchernaia ” (1869). In these he showed peculiar insight into military life, but his full power was not reached till after the war of 1870. He then aimed at depicting in his works the episodes of that war, and began by representing the ” Bivouac before Le Bourget ” (1872). His fame spread rapidly, and was increased by ” The Last Cartridges ” (1873), in which it is easy to discern the vast difference between the conventional treatment of military subjects, as practised by Horace Vernet, and ‘that of a man who had lived through the life he painted. In 1874 the ” Fight on a Railroad ” was not less successful, and was followed by the ” Attack on a House at Villersexel ” (1875) and the ” Railway Bridge at Styring ” (1877). In 1878 the painter exhibited (not at the Great Exhibi- tion) ” Le Bourget,” the ” Surprise at Daybreak,” ” The Inter- cepted Despatch-bearer,” and a considerable number of drawings. He also exhibited in London some episodes of the Zulu War. In 1 88 1 he was made an officer of the Legion of Honour for ” The Cemetery of Saint-Privat ” and ” The Despatch-bearer.” During these years de Neuville was at work with Detaille on an important though less artistic work, ” The Panorama of Rezon- ville.” De Neuville died in Paris on the 18th of May 1885. At the sale of his works the state purchased for the Luxembourg the ” Bourget ” and the ” Attack on a Barricaded House,” with a water-colour ” The Parley,” and a drawing of a ” Turco in Fighting Trim.”

See Montrosier, Les Peintres militaires (Paris,i88i),“De Neuville, ‘ ‘ in Gazette des beaux arts (Paris, 1885).

NEUWEILER, a town of Germany, in the imperial province of Alsace-Lorraine, situated under the Vosges Mountains, 6 m. N. from Zabern by the railway to Rastatt. Pop. (1905) 1906.

It is an interesting medieval town, still surrounded by walls. The Romanesque Evangelical church dates from the 12th century; there are also a Romanesque Roman Catholic church, which was restored in 1852, a synagogue, and an old town-hall. The town has a considerable trade in hops and wine. Above it rise the ruins of the fortress of Herrenstein, and of the castle of Hiineburg.

See Fischer, Geschichte der Abtei und Stadt Neuweiler (Zabern, 1876).

NEUWIED, a town of Germany, in the Prussian Rhine province, the capital of the mediatized countship of Wied, is situated on the right bank of the Rhine, 8 m. below Coblenz, on the railway from Frankfort-on-Main to Cologne. Pop. (1905) 18,177. The principal edifice is the chateau of the princes of Wied. This is situated in a fine park, and contains a collection of Roman antiquities. The town has an

Evangelical and a Roman Catholic church. Its chief products are starch, sugar, tobacco, cigars, chicory, buttons and enamelled goods. There are large rolling-mills, and in the vicinity are several large iron-foundries. The schools of Neuwied enjoy a high reputation.

Neuwied was founded by Count Frederick of Wied in 1602, on the site of the village of Langendorf, which was destroyed during the Thirty Years' War, and it rapidly increased owing to the toleration accorded to all religious sects. Among those who sought refuge here was a colony of Moravian Brethren; they still occupy a separate quarter of the town, where they carry on manufactures of porcelain stoves and deerskin gloves. * Near Neuwied one of the largest Roman castra on the Rhine has been excavated. In April 1797 the French, under General Hoche, defeated the Austrians near Neuwied, this being their first decisive success in the revolutionary wars. Legenhaus, in the neighbour- hood, is one of the residences of the princes of Weid.

See Wirtgen and Blenke, Neuwied und seine Vmgebung (Neuwied,

1901).

NEVA, a river of Russia, which carries off into the Gulf of Finland the waters of Lakes Ladoga, Onega, Ilmen and many smaller basins. It issues from the south-west corner of Lake Ladoga in two channels, which are obstructed by sandstone reefs, so that the better of the two has a depth of only 7 to 16 ft. A little farther down it becomes completely navigable, and attains a breadth of 4200 ft.; but between the village of Ostrovki and that of Ust-Tosna it passes over a limestone bed, which produces a series of rapids," and reduces the width of the river from 1050 to 840 and that of the navigable passage from 350 to 175 ft. Nine or ten miles before reaching its outfall the river enters St Petersburg, and 5 or 6 m. lower down breaks up into the Great Neva (850 to 1700 ft. wide), the Little Neva (945 to 1365), and the Great Nevka (280 to 1205), this last, 2 m.,farther on, sending off the Little Nevka (37c to 1130 ft.). Its total length is only 40 m. In front of the delta are sandbanks and rocks which pre- vent the passage of vessels except by a canal, 18 m. long, 124 to 226 ft. wide, and admitting vessels with a draught of 185 ft., from Kronstadt to St Petersburg. Most of its alluvial burden being' deposited in the lakes, the Neva takes a long time to alter its channels or extend its delta. The ordinary rise and fall of the river is comparatively slight, but when the west wind blows steadily for a long time, or when Lake Ladoga sends down its vast accumulations of block-ice, inundations of a dangerous kind occur, as in 1777, 1824, 1879 and 1903.

According to observations extending from 1706 to 1899, the mean day of the freezing of the Neva is November 25th, the earliest October 28th, the latest January 9th, and the next latest December 26th. The mean day of opening is April 21st, the earliest March 18th, and the latest May 12th. The mean number of days open is 218, the least 172, the greatest 279.

NEVADA (a Spanish word meaning ” snow-clad ” or ” snowy land,” originally applied to a snow-capped mountain range on the Pacific slope), one of the far western states of the American Union, lying between 35 and 42 N. and 114 1′ 34″ and 120 1′ 34″ W. (37° and 43 W. of Washington). It is bounded N. by Oregon and Idaho, E. by Utah and Arizona, the Colorado River separating it in part from the latter state, and S. and W. by California. Nevada ranks sixth in size among the states of the Union. Of its total area of 110,690 sq. m., 869 sq. nr. are

water surface. Its extreme length, N. and S., is 484 m., and its extreme width, E. and W., is 321 m. (For map, see California.) Physiography. — With the exception of its N.E. and S.E. corners, the state lies wholly within the Great Basin, the floor of which is really a vast table-land between 4000 and 5000 ft. above the sea. This plateau, however, is not a plain, but con- tains many buttes and mesas and isolated mountaia ranges rising from 1000 to 8000 ft. above its surface. In the N.E. an unnamed range of highlands, with an E. and W. trend, forms the water-parting between the streams tributary to the Hum- boldt river in Nevada and those that flow into the Snake river through Idaho and Oregon and thence to the Pacific Ocean. This range is very broken and ill-defined, with peaks often reaching altitudes of from 0000 to 12,000 ft., and with numerous spurs diverging N. and S. from the main divide. Between this ridge and the valley of the Colorado river lies all that portion of the Great Basin included within the state. The surface of this table-land is very rugged, and frequently broken by mountain ranges running N. and S. and from 5 to 20 m. wide at their bases. Intersecting the mountains are numerous ravines and passes. Between the ranges lie valleys of about the same width as the bases of the mountains. These valleys are generally level- floored, but at their borders gradually slope upward, and are filled, often to a depth of several thousand feet, with the detritus of gravel, sand and silt from the neighbouring hills. This is a region of innumerable faulted crust blocks, the elevated ones creating the N. and S. mountain ranges, and

the depressed ones the valleys that lie between. It is for this reason that the mountain slopes are generally more abrupt on one side than on the other. Several valleys often unite into a large elevated plain, broken only by scattered buttes and spurs. The combined areas of the valleys and the area occupied by the mountains are about equal.

The mean elevation of the state is 5500 ft. There are 5400 sq. m. between 2000 and 3000 ft. above the sea; 11,100 sq. m. between 3000 and 4000 ft.; 23,700 sq. m. between 4000 and 5000 ft.; 29,800 sq. m. between 5000 and 6000 ft.; 30,100 sq. m. between 6000 and 7000 ft.; 7800 sq. m. between 7000 and 8000 ft. ; and 2800 sq. m. between 8000 and 9000 ft. The highest point within the state is Wheeler Peak, near the centre of the eastern boundary, with an elevation of 13,058 ft.; the lowest points are along the Colorado river, where the altitudes range from 700 to 800 ft. With the exception of this dip in the S.E. corner, the entire state lies above the 2000 ft. line.

The Sierra Nevada range, which forms the western rim of the Basin, sends into the state a single lofty spur, the Washoe Mountains. At the foot of this range there is, relatively speaking, a depression, with an altitude of about 3850 ft. above the sea, which receives the drainage of the eastern slopes of the Sierra and what little drainage there is in the northern half of Nevada. From this depression east- ward the general level of the plateau gradually rises to an elevation of 6000 ft. near the eastern borders of the state. The mountains also increase in height and importance as far as the East Humboldt range, a lofty mass about 60 m. W. of the Utah boundary. This range is the water-parting for nearly all the westward-flowing streams of the state, and is by far the steepest and most rugged within Nevada, a number of its peaks attaining a height of 11,000 or 12,000 ft. On its eastern slope the waters soon disappear within the bed of narrow canyons, but break out again at the foot in ice- cold springs that form the source of the Ruby and Franklin lakes; on its western side the descent is more gentle, and the waters form the South Fork of the Humboldt river. Somewhat S. of the centre of the state lie the Toyabe Mountains, with several peaks from 10,000 to 12,000 ft. in height. The waters on the eastern slopes flow into the Smoky Valley ; those on the other side assist the neighbouring Shoshone Mountains in feeding the Reese river, which flows N. toward the Humboldt, but seldom has sufficient volume to enable it to reach that stream. About 100 m. E. of the California boundary lies a third important range, the Humboldt Mountains, whose highest point (Star Peak) is 9925 ft. above the sea. Owing to their great height these three ranges receive heavier rainfall than the surrounding country and are feeders to the northern valleys, which constitute the chief agricultural region of the state. Many of the

block mountains of the Great Basin are of complicated internal structure, showing rocks of all ages — slate, limestone, quartzites, granite, multi-coloured volcanic rocks, and large areas of lava overflow.

From the valley of the Humboldt river southward the plateau gradually rises until the divide between this stream and the Colorado

river, in the vicinity of the White Pine Mountains, is reached. From this point there is a fall, which is gradual as far S. as the 38th parallel, and then more abrupt. Thus at Pioche the altitude is 6100 ft., at Hiko 3881 ft., at St Thomas 1600 ft., and at the Eldorado Canyon 828 ft. The region of the Colorado river is largely desert, with occasional buttes and spurs.

Rivers and Lakes. — There are three drainage systems within the state. North of the Humboldt Valley an area of about 5000 sq. m. is drained by the Owyhee, the Little Owyhee, the Salmon and Bruneau rivers, whose waters eventually reach the Pacific Ocean. Below this region flow the streams of the Great Basin, none of which reach the sea, but either terminate in lakes having no outlet or else vanish in sloughs or " sinks." Small streams often sink from sight in their beds of gravel, and after flowing some distance underground, reappear farther on. Of the basin streams the Hum- boldt is the most important. Rising in the N.E., it flows in a tortuous channel in a general S.W. direction for 300 m. and drains 7000 or 8000 sq. m. This stream empties into the Humboldt lake, the overflow from which goes into the so-called Carson Sink. At no part of its course is it a large river, and near its mouth its waters are sub-alkaline. The Truckee river flows with more vigour, having its source in Lake Tahoe, in California, at an altitude of 6225 ft., • and entering the Carson river through an irrigation canal com-

Eleted in 1905; before this date it flowed into Pyramid Lake and ake Winnemucca in the depression at the foot of the Sierra Nevada. A short distance to the S. two other streams, the Carson and the Walker rivers, receive their waters from the eastern slope of this range and empty into lakes bearing their names. Of this group of lakes in the western depression, Pyramid Lake is the largest, being 33 m. long and 14 m. wide. Fed by the same stream is its western neighbour, Lake Winnemucca, a much smaller body. The waters of these two lakes are only moderately saline and may be used for live-stock but not for human beings. Next in importance is Walker lake, 33 m. long and 6 or 7 m. wide, whose waters are strongly saline. On the western boundary, and partly included within the limits of Nevada, is Lake

Tahoe, 20 m. long and 10 m. wide, which is 1 645 ft. deep at its centre and whose waters have never been known to freeze, notwithstanding the lake's elevation. The topography and the climate of Nevada have led to the formation of two kinds of lakes, the ephemeral and the perennial. The perennial lakes, such as those just described, hold their waters for years and perhaps centuries; but the ephemeral lakes usually evaporate in the course of the summer. The latter class is formed by waters that fall on the barren mountain-sides and rush down in torrents, forming in the valleys shallow bodies of water yellow with the mud held in suspension. The largest of these occurs in the Black Rock Desert, in the N.W., and at times is from 450 to 500 m. in length and only a few inches deep. Such bodies often become nothing but vast sheets of liquid mud, and are called " mud lakes," a term most frequently applied to the sloughs fed by Quinn's river. When the waters evaporate in the summer they leave a clay bed of remarkable hardness, which is sometimes encrusted with saline matter of a snowy whiteness and dazzles the eyes of the traveller. When such is the case the beds are called " alkali flats." During the glacial period many of the Nevada lakes attained a great size, several of them uniting to form the ancient " Lake Lahontan," in north-western Nevada. As these lakes shrank after the return of an arid climate, they left elevated beaches and deposits of various minerals, which mark their former extent. _ Both hot and cold springs are numerous, with temperatures ranging from 50 to 204 F.

In the S.E. corner of the state is the third drainage system. Here the Virgin river enters the state after crossing the N.W. corner of Arizona and flows S.W. for 60 m. until it joins the Colorado river. The latter stream flows for 150 m. along the S.E. boundary towards the Gulf of California.

Fauna and Flora. — Of native animals the varieties are few and the numbers of individuals small. In the arid valleys coyotes (prairie wolves), rabbits and badgers are found. Large animals, such as the black and the grizzly bear, and deer are found on the slopes of the Sierra Mountains, and antelope, deer and elk visit the northernmost valleys in the winter. At rare intervals antelope appear in the southern deserts. Here also are found the sage thrasher, Le Conte's thrasher, the Texas nighthawk, Baird's woodpecker, and the mourning dove. Certain species of grouse are common high in the timbered mountains. Several varieties of water-fowl, especially curlews, pelicans, gulls, ducks, terns, geese and snipe, are found in the vicinity of the lakes. The Truckee river and the western lakes abound in trout and black bass. Of the reptiles the leopard lizard and gridiron-tailed lizard, the " chuck-walla " (Sauromalus ater), the rattle-snake, and the horned toad

are the most numerous. The ” black mouse ” or Carson field mouse {Microtus montanus) is found throughout Nevada, as well as in Utah, north-eastern California, and eastern Oregon; it multiplies rapidly under favour- able conditions, and at times causes serious injury to crops.

The flora of Nevada, although scanty, varies greatly according to its location. With the exception of the alkali flats, no portion of the desert fe devoid of vegetation, even in the driest seasons. In the Washoe Mountains, as in the rest of the Sierra Nevada range, there is a heavy growth of conifers, extending down to the very valleys; but in many places these mountains have been almost

deforested to provide timbers for the mines. In very limited spaces on other mountains there are scattered trees— the pifion (nut pine) and the juniper at an altitude between 5000 and 7000 ft. on all but the lowest ranges, the trees rarely reaching a height of over 15 ft.; and the stunted mountain mahogany on the principal ranges at an altitude of 6800 ft. Several varieties of poplar are found in the upper canyons, and trees of the willow-leaved species in the Humboldt Mountains often attain a height of 60 ft. But except for these infrequent wooded strips, the mountains are even more bare than the valleys, because their shrubs are dwarfed from ex- posure. The trees, except in the Washoe Mountains, are of very slow growth and therefore knotty and ill-adapted for timber. As a rule, the elevation of the timber line on the mountains increases as the latitude decreases. On the foothills are found phlox and lupine, and in the N. much bunch grass, which is valuable for grazing pur- poses. The valleys are covered with typical desert shrubs; grease- wood (sarcobatus vermiculatus) , creosote bushes (larrea tridentata) , and sage-brush (artemisia tridentata) ; the first-named plant is abundant, chiefly in the N. This vegetation, covering plains, mesas, and even extending up the sides of the mountains, gives the entire landscape the greyish or dull olive colour characteristic of the Great Basin. To the southward, as the valleys become increasingly sandy and saline, even the sage-brush disappears, and little vegetation besides the cactus and the yucca is to be seen. The valleys are treeless, except in the vicinity of the Truckee river, where considerable quantities of the cotton wood and a small amount of willow, birch, and wild cherry are found. The mesquite grows some distance from water, and is especially common near the Colorado river. In January 1910 there were seven national forests in the state,

created since July 1908 and chiefly in 1909, containing 7983-76 sq. m.

Climate. — As the lofty range of mountains on the W. deprives the winds from the Pacific of nearly all their moisture before they reach the Great Basin, the climate of Nevada is characterized by an excessive dryness. The skies are clear nearly every day in the year. The mean annual precipitation varies from 3 in. in the S.W. (Esmer- alda county) to 12 in. in the E. (White Pine county). In the central, north-eastern and north-western sections, embracing the counties of Nye, Elko and Humboldt, the average annual rainfall varies from 7 to 8 in.; in the west-central section, at the foot of the Sierra, the average is about 10 in. A so-called ” rainy season ” lasts from October to April, but the precipitation is chiefly in the form of snow on the mountains. Except at great altitudes snow lies on ‘the ground only a few days each year. The melting of the mountain snow-caps in the spring causes severe freshets, which in turn are followed by long seasons of drought at a time when water is most needed for agricultural purposes. Fogs and hail are rare, but, as in all treeless countries, the rain comes in unequal quantities, and cloudbursts are not unknown. The mean annual temperature for the state is 49° F., but varies from 54° in the S.W. to 46° in the N. The daily and annual variation is very great, and is intensified toward the E., where the altitudes are greater. At Elko, Elko county, in the N.E., the mean temperature for the year is 46° F. ; for the winter (December, January and February) it is 26 , with extremes reported of 73° and 42 °; the mean temperature for the summer (June, July and August) is 69 , with extremes of 108° and 20 . At Hawthorne, Esmeralda county, in the S.W., the mean temperature for the year is 54 ; for the winter it is 36 , with ex tremes of 69° and 6°; the mean temperature for the summer is 72 , with extremes of 102° and 32 . At the head of the Humboldt river frosts are of almost nightly occurrence, and in the Carson Valley damaging frosts often occur in June. In the extreme S. the isothermal lines run almost due E. and W. ; but farther northward they take a N.W. and S.E. direction. The annual range of tempera ture is about 124 ; the highest temperature ever recorded being 119°, and the lowest -42 . In spite of the high temperatures of summer, however, the low humidity prevents the heat from being oppressive, and cases of sunstroke are unknown. While the western mountains keep out the moisture, they do not ward off the winds which pour down the steep slopes in the winter and spring and raise clouds of dust. Early-sown grain is often injured by flying sand and gravel. In the summer and autumn the winds are light.

Agriculture. — Because of this extreme aridity, agriculture in Nevada is dependent on irrigation. The three principal areas in which

irrigation is practicable are along the Humboldt river, in the plains watered by the Carson, Truckee and Walker rivers, and at the foot of the mountains along the western edge of the state. There are various places also near the mouths of desert canyons, where small amounts of water are obtainable for irrigation purposes from intermittent streams. The total number of acres irrigated in 1899 was 504,168, an increase of 124-7% in the decade. In 1902 the total irrigated acreage was 570,001, an increase of 13-1% in three years. In 1902 Congress provided for the beginning of ex- tensive irrigation works in the arid West, and Nevada (where pre- liminary reconnaissances had been made in 1 889-1 890) was the first state to profit from this undertaking. The survey for the Truckee-Carson system was begun in 1902, with, the object of utilizing the waters flowing to waste in western Nevada for the irrigation and reclamation of the adjacent arid regions in Churchill, Lyon and Storey counties. A canal 31m. long, diverting the waters of the Truckee river into the Carson river, was completed in 1905

at a cost of $1,250,000. A system of reservoirs (the main reservoir is Lake Tahoe with an area of 193 sq. m.), distributing canals, and drain ditches was also projected, making it possible to reclaim 231,300 acres of the desert. It was estimated that the works would require nine years for their completion, at a total cost of $9,000,000, although the first 200,000 acres could be reclaimed at a cost of $2,700,000. The works were to be operated by the government for ten years, and the cost assessed against the holders of the land. 1 At the conclusion of this period the system was to pass into the control of the landholders, with no further charge by the government.

The soil when reclaimed is well adapted for forage crops, cereals.- vegetables and deciduous fruits. Nevada is a great ranching state, and stock-raising has shown a rapid extension. In 1900, 88-9% of its farm acreage was devoted to hay and forage crops, being more than doubled in the decade. Fifty-one per cent, of the im- proved lands in 1899 were devoted to the cultivation of these crops. With the growing of grasses as the chief agricultural product, farming in Nevada is necessarily extensive rather than intensive. In 1899 the average size of the farms was 1 174 acres. 2 The value of the different kinds of agricultural products for 1899 was as follows: live stock, $4,373,973; hay and grain, $1,535,914; dairy produce, $385,220; vegetables, $216,600; fruits, $20,900. It thus appears that the live stock industry is one of the most important in the state; the value of its product in 1899 exceeded its output of gold and silver, which had then reached its lowest point, by over one million dollars. 3 About 64% of the value of the live stock was represented by neat cattle; 19% by sheep; 10%

by horses, and the remainder by mules, swine, asses, burros and goats.

In spite of the predominating interest in stock-raising, intensive cultivation of the soil is practicable where the water supply is sufficient. Nevada, for example, ranked third in 1909 in the amount of wheat produced to the acre (28-7 bushels), 4 but in the total amount produced (1,033,000 bushels) ranked only thirty-eighth, and furnished only 0-145% 0I the crop of the United States. In 1909 in the amount of barley per acre (38 bushels) Nevada ranked third, and in the average farm price per bushel ($0-75) ranked first among the barley-producing states of the country, but in the total amount produced (304,000 bushels) held only the twenty-second place; and in the same year the average yield of potatoes per acre in Nevada was 180 bushels, exceeded in two states — the average for the entire country was 106 -8 bushels per acre— but the total crop in Nevada (540,000 bushels) was smaller than in any state or Territory of the Union, except New Mexico.

The prevailing soils are sand and gravel loams, but other varieties are numerous, ranging from rich alluvial beds of extinct lakes, as in parts of Lyon and Esmeralda counties, to the strongly alkaline plains of the southern deserts. The most productive part of the state is the Humboldt Valley and the region near Pyramid Lake, including the counties of Humboldt, Elko and Washoe.

A singular menace to agriculture in Nevada was the plague in 1907-1908 of Carson field mice. These first appeared in large numbers in the lower part of the Humboldt Valley in the summer of 1906, and in October and November 1907 it was estimated that they numbered on certain ranches from 8000 to 12,000 on every acre. The alfalfa crop suffered particularly, the total loss being about $300,000. After unsuccessful attempts to rid themselves of the mice, the farmers appealed to the United States Biological Survey, and alfalfa hay poisoned with strychnia sulphate was used successfully in the Humboldt Valley in January 1908 and in the Carson Valley, where a similar plague threatened, in April 1908. 6

Minerals. — To its mineral wealth Nevada owes its existence as a state ; but for the richness of its veins of gold and silver ore it would be still little more than an arid waste. Extending from central California S.E. along the dividing line between that state and

1 The public lands are open to entry free of charge, but the government withholds the title until all the payments for water have been made. The yearly payments amount to $2-60 per acre under the

present system ; this amount covers the cost of mainten- ance and operation and also of a thorough drainage system, which is as important to the settler as irrigation. Lands already held in private ownership are supplied with • water at the same price as public lands.

2 Compare this figure with that for the neighbouring state of California, where the average size of the farms was 397-4 acres.

3 That conditions are favourable to the animal industry is shown by the fact that in 1897 the valleys of northern Nevada were so overrun with wild horses, to the detriment of the grazing grounds for cattle, that the legislature authorized the killing of such animals. For a time this was a profitable pursuit, as the horse hides brought good prices.

4 This is the yield reported by the United States Department of Agriculture. Between its reports and those of the Census Bureau in census years there are sometimes great discrepancies. According to the Year Book of the Department of Agriculture in 1909 a crop of 165,000 bushels of oats was grown in Nevada on 7000 acres; there was no crop reported of Indian corn or of rye.

5 See Stanley E. Piper, The Nevada Mouse Plague of 1907-1908 (Washington, 1909), Farmers' Bulletin 352, U.S. Department of Agriculture.

NEVADA

Nevada, and thence past the Colorado river into Arizona, is one of the richest mineral belts in the world. Gold was found in Gold Canyon near Dayton, Nevada, as early as July 1849. In 1859 the discovery of the famous Comstock Lode in Western Nevada led to the building of Virginia City, a prosperous community on the side of a mountain where human beings under ordinary conditions would not have lived, and eventually brought a new state into existence. The mines of this one district had produced, up to 1902 $371,248,288, of which $148,145,385 was in gold, $204,653,040 in silver, and the remainder in unclassified tailing!!. For the years 1862-1868 inclusive, the average annual production was over $11,000,000; in the second period of great productivity (1873-1878) after the opening (by John W. Mackay and his partners, Flood! I

In connexion with the operation of the Comstock mines was built (in 1869-1879) the Sutro Tunnel, named in honour of its engineer, Adolph Sutro (1830-1898), piercing the mountain hori- zontally far below the mouth of the mines, and at a distance of nearly 4 m.

striking the shafts of the Comstock Lode, securing ventila- tion and cool air for the miners, draining the mines above its level, and obviating much pumping and hoisting. 1 Two lateral tunnels were also constructed, making the total length 6J m.

Another mining region that attained importance in the early Renod was the Eureka District, in Eureka county, about 90 m. S. of the Southern Pacific railway. Ore was first discovered here in 1864, but it was five years before the mines became productive. B y J. 8 82 they had produced $60,000,000 of precious metals.

With the working out of the deposits in the Comstock region, the mining industry declined, and between 1877 and 1900 there was a period of great depression, in which Nevada fell from first to sixth place among the silver-producing states and Territories. In May 1900 however, very rich deposits of gold and silver were discovered in Nye county, near the summit of the San Antonio Mountains and a new era began in Nevada's mining industry. The village of Tonopah sprang into existence as soon as the rush of newcomers to this region began, and in 1903 it contained 4000 inhabitants. In two years $7,000,000 worth of gold and silver had been taken from the Tonopah mines and it was asserted that they would prove as rich as the mines of the Comstock Lode. The Tonopah ores were richer in silver than in gold, the respective values in 1904 and 1905 being approximately in the proportion of three to one. This dis- covery gave a new impetus to prospecting in south-western Nevada, and it was soon discovered that the district was not an isolated mining region but was in the heart of a great mineral belt. Tonopah is at the outcropping of a number of ledges which continue for several hundred feet below the surface for an unknown distance In 1902, in Esmeralda county, 24 m. S. of Tonopah, rich ores were tound in the Goldfield District, and within three years there were 8000 people in this region. During 1905 the town of Goldfield had a period of mushroom growth, then quieted, and finally revived to a healthy development. The value of the production of the Goldfield District in 1904 amounted to $2,341,979. This discovery was followed in 1904 by that of the Bullfrog District, in Nye county, 60 1 m. S.E. of Goldfield, and within ninety days after its birth the village of Bullfrog, although 100 m. from a railway, had an electric- lighting plant, an ice plant and a hotel. In 1905 gold was dis- covered in Nye county, 29 m. N.E. of Tonopah, in what became k P° wn as the Manhattan District, and by March 1906 the village of Manhattan was a mile in length and contained 3000 inhabitants. After 1902 the production of gold and silver steadily increased, being $4,980,786 in that year, $9,184,996 in 1905, and $16,774,633 in 1907. By far the greater portion of these metals came from the

southern part of the state. In production of gold in 1907 Esmeralda county ranked first with $8,533,617 (nearly 70% of the total); Nye county s output was $1,547,408, Lincoln county's $929,775, 1 Apart from their commercial uses, the Sutro Tunnel and the shafts of the Comstock Lode have been employed for scientific investigations, with the object of classifying igneous rocks, deter- mining the variations of temperature, and the character of electrical manifestations beneath the earth's surface, and the relation between the structure of rocks and their rate of cooling.

and Storey county s a little more than $250,000. In the production of silver Nye county ranked first in 1907 ($3,667,973, of which $3,544,788 was from Tonopah), Churchill county second ($432,617 from Fairview Wonder and Stillwater), and Eureka county (with lead silver ores) and Storey county were third and fourth respectively Copper, lead and zinc are produced in small quantities, being found in fissure veins with gold and silver. In 1907 the production of copper was 1,782,571 K>, valued at $356,514- The output of lead in 1907 was 6,271,341 lb (valued at $322,381). The output of zinc was 2,168,783 lb (valued at $127,958).

Other minerals exist in great variety. Salt deposits are extensive and commercially important in Washoe and Churchill counties Alter 1900 the production of salt rapidly increased up to 1906 when it was 11,249 bbls,; in 1907 it was only 6457 bbls., all graded as common coarse and all obtained by solar evaporation from brine. Borax marshes are numerous in the west and south-west but they are no longer commercially productive. Large beds of mica are found m the east. Gypsum occurs in a number of places, the best known being in the north-west. Veins of antimony are worked in the Battle Mountain District and in Bullion Canyon 15 m. south of Mill City. There are veins of bismuth near Sodaville A little graphite is produced in Humboldt county. A sub-bituminous • lignite is mined in Esmeralda county (800 tons in 1906; 330 tons in 1907). Considerable quantities of the following minerals have been tound: barytes (heavy spar), magnetite (magnetic iron ore), and pyrolusite (manganese dioxide) in Humboldt county; roofing slate in h-smeralda county; cinnabar (ore containing quicksilver) in Washoe county ; haematite in Elko and Churchill counties; cerussite and galena (lead ores) in Eureka county; and wolframite (a source of tungsten) at Round Mountain, White Pine county. In 1903 and 1907 Nevada ranked second among the American states in the

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Manufactures.— The manufacturing interests of Nevada are un important. Of the manufacturing establishments in the state in 1900, 109 or 47-8%, were situated in Reno, Carson City and Virginia City, named in the order of their importance. These places employed 35-9% of the labour engaged in manufacturing, and the value of their products was 38-8 % of the total for the state. Manu- factures based on the products of mines and quarries (chemicals glass, clay, stone and metal works) constituted about one-fifth of the whole product. Car construction and general shop work of steam railways was the leading manufacturing industry in IQ0V next in importance were the flour and grist milling industry and the printing and publishing of newspapers and periodicals. Such statistics of the special census of manufactures (under the factorv system) of 1905 as are comparable with those of 1900 show 00 lactones in 1900 and 115 in 1905, an increase of 16-2%. Their

ofTˆT t’V 9 ™™ 8 f’-ˆoS.and in io o 5 $2,891,997, an increase 01 131-1 /„. ihe value of their products in 1900 was $1,261 005 and in 1905, $3,096,274, an increase of 145-5% JM.z01.005,

Iransportatwn.— In its industrial development Nevada has always been hampered by lack of transportation facilities. There a [e. n V avi S abl f waterways, and the railwav milea ge is small. Until the completion of the trans-continental railway in i860 wagon trains were the only means of transporting the products of the mines across the desert. An unsuccessful attempt was made beginning in 1861, to domesticate the camel for this purpose » The railway mileage m 1880 was 739 m. ; in 1890, 923 m. ; in the following decade railway building was at a standstill. Since 1900, however there has been considerable development, and the total mileage on I™ °} J a , nuar y 1909, was 1,866-92 m. The state is crossed from east and west by three main lines of railway, parts of tire great transcontinental systems, the Southern Pacific and the Western

A™ P £ VqVTˆ 1 ‘? P l rt ° f t t e state and the San Pedro, Los Angeles & Salt Lake in the southern. The oldest of these trunk lines, the Southern Pacific (formerly the Central Pacific), follows the course of the Humboldt and Truckee rivers. It is met at several

rˆhl 3 K y !’£ eS M hlC 5 S >7 e l he ri ? h minin S districts to the south; at Cobre by the Nevada Northern from Ely in White Pine county in the Robinson copper mining district; at Palisade by the Eureka & Falisade, a narrow-gauge railway, connecting with the lead

and fe/TVV , U ? ka District: at Batt ‘ e Mountain by the thl m! S en l ra A’ r S ° ° f ” arrow n g a «ge, from Austin; at Hazen by the Nevada & California (controlled by the Southern Pacific) which runs to the California line, connecting in that state with other parts of the Southern Pacific system, and at Mina, Nevada, with the Tonopah & Goldfield, which runs to Tonopah and thence to Goldfield thus giving these mining regions access to the Southern Pacific’s transcontinental service; and at Reno, close to the western boundary, ;l£~r lrgml a & T ruckee. connecting with Carson City, Minden

and hv th S P ° n N Val H y ‘r ai lv V ‘- gl ?! a Cky ‘ in the Comstock District lˆiu Y . Neyada-California-Oregon, projected to run through

CˆiLn- xt a w rl ! ia m o° °l c Z° n A ln ‘ˆo. in operation to Alturas, California The Western Pacific railway, completed in l 9 io,extend- ing from Salt Lake City to San Francisco, and running entirel y ! It; , ls interesting to note that in 1875 the Nevada legislature passed an act forbidding camels or dromedaries to run It larze Ihis law remained on the statute books until 1898, when it was formally repealed.

across the state of Nevada, is parallel with the Southern Pacific for some distance in the eastern part of the state, and crosses the mountains at Beckwith Pass 20 m. north of Reno. The San Pedro, Los Angeles & Salt Lake railway, also an important factor in east and west transcontinental traffic, opened in May 1905, has been of special value in the development of the southern part of the state. It crosses a section that is mostly desert, but is connected with the Bullfrog District by the Las Vegas & Tonopah, which runs from GoldfieTd through Beatty and Rhyolite, and meets the San Pedro, Los Angeles & Salt Lake at Las Vegas. The Goldfield and Bull- frog districts have a further outlet to the south through a second railway, the Nevada Short Line (Bullfrog-Goldfield and Tonopah & Tidewater railways) which connects with the Atchison, Topeka & Santa Fe at Ludlow in California.

Population. — Nevada is the most sparsely settled state of the Union. Its population in i860 was 6857; in 1870, 42,491; in 1880, 62,266; in 1890, 45,761; in 1900, 42,335; arid in 1910, 81,875 (0-7 per sq. m.). In 1900 10,093 were foreign-born (mostly English, Irish, Germans, Italians and Chinese in almost equal pro- portions); and there were 35,405 white persons, 5216 Indians, 1352 Chinese, 228 Japanese and

134 negroes. There were then only three towns of importance: Reno, Virginia City and Carson City, the capital.

The Indian population consists of Paiute, Shoshoni and the remnants of a few other tribes of Shoshonean stock. On the Duck Valley reservation (488 sq. m.), established in 1877, in Elko county, between the forks of the Owyhee river and lying partly in Nevada and partly in Idaho, and under the western Shoshoni (boarding) school (55 pupils in 1908), there were 252 Paiute, 238 Shoshoni and 1 Hopi in 1908; on the Pyramid Lake reser- vation (503 sq. m.), established in 1874, in Washoe county, on the borders of the lake from which it is named, 486 Paiute; on the Walker river reservation (79-37 sq. m.), established in 1874 (partly opened to settlement in 1906) along Walker river and Walker Lake, 466 Paiute; on the Moapa river reserve (i5‘6 sq. m.), in the south-eastern part of the state, 117 Paiute.

In 1906, of the 14,944 members of religious denominations 9,970 were Roman Catholics, 1,210 Protestant Episcopalians, 1,105 Latter-Day Saints (Mormons), 618 Methodists and 520 Presbyterians.

Administration. — Nevada is governed under the original constitution of 1864, with the amendments adopted in 1880, 1889, 1904 and 1906. The constitution as adopted limited the suffrage to adult white males, but this provision was annulled by the fifteenth amendment to the Federal constitution; and in 1880 amendments to the state constitution were adopted striking out the word ” white ” from the suffrage clause and adding a new article granting rights of suffrage and office holding without regard to race, colour or previous condition of servitude. A residence in the state of six months and in the district or county of thirty days preceding the election is required of all voters. Persons guilty of treason or felony in any state or Territory and not restored to civil rights, idiots and insane persons, are excluded from the suffrage. An unusual provision in the constitution, a result of its adoption in the midst of the Civil War, gives soldiers and sailors in the service of the United States the right to vote; their votes to be applied to the township and county in which they were bona fide residents at the time of enlistment. 1 The legislature has the right to make the payment of the poll tax a requirement -for voting, but no such provision is in force.* A law passed in 1887, requiring all voters to take an oath against polygamy, with the object of disfranchising Mormons, was declared unconstitutional by the State Supreme Court.

A governor, lieutenant-governor, secretary of state, attorney- general, controller, treasurer, superintendent of public instruc-

1 An interesting application of this provision was made in 1898, when Nevada soldiers on their way to Manila were allowed to vote at sea. It was discovered, however, that no statute had ever been passed to carry this provision into effect, and the votes were rejected.

1 In 1897 a law was passed making the right of suffrage dependent on the payment of poll taxes for the preceding two years; but in the following year the State Supreme Court declared this act unconstitutional because the title was not descriptive of the matter.

tion and surveyor-general are chosen by popular vote every four years. Their functions are similar to those of the administrative officials in other states, with the exception that the governor does not possess the usual pardoning power but is ex officio a member of the pardoning board. The governor and lieutenant- governor must each be at least twenty-five years old at the time of election to office. The legislative department consists of a Senate, with members chosen every four years, about half of whom retire every two years; and an Assembly, whose members are chosen biennially. The constitution requires that the number of senators shall be not less than one-third nor more than one- half the number of members of the Assembly, and that the total membership of both houses shall not exceed seventy-five. Bills of any character may originate in either house. The legislative sessions are biennial and are limited to fifty days; special sessions are limited to twenty days. The judicial department consists of a supreme court with a chief justice and two associate justices, chosen for six years, and district courts, with judges chosen for four years.

The state is divided into fifteen counties, each of which is governed in local matters by a board of county commissioners, and is divided for administrative purposes into townships. The constitution re- quires that township and county governments shall be uniform throughout the state. For each township there is a justice of the peace, chosen biennially by its voters. The homestead exemption extends to a dwelling-house, with its land and appurtenances, with a value not exceeding $5000; but no exemption is granted against a process to enforce the payment of purchase-money, or for improve- ments, or for legal taxes, or of a mortgage to which both the husband and wife have consented. The exemption can be claimed by the husband, wife, or other head of the family, by a written declaration duly acknowledged and recorded in the manner prescribed for conveyances ; and the homestead can then be mortgaged or alienated by a husband only with the wife's consent, if the wife is at the time a resident of the state. The exemption is not affected by the death of the husband or

wife, but inures to the benefit of the surviving members of the family. For divorce a residence in the state of six months is necessary; the grounds for divorce are desertion or neglect to provide for one year, conviction of felony, habitual drunkenness, cruelty or physical incapacity.

There are a number of unusual provisions in the constitution of Nevada. The assertion in the ” Declaration of Rights ” that ” no power exists in the people of this or any other state of the Federal Union to dissolve their connexion therewith or perform any act tending to impair, subvert, or resist the supreme authority of the government of the United States,” is a result of the drafting of the instrument during the Civil War. There is also a provision that only three-fourths of the jurors may be required to agree to a verdict in civil cases, although the legislature has the power to require by statute a unanimous agreement. Amendments to the constitution must be passed by a majority of each house of the legislature at two consecutive sessions and submitted to a vote of the people at the next regular election. Under this provision an amendment cannot be adopted until nearly four years after it is first proposed. At the election of 1904 an amendment was adopted which provides that whenever 10% of the voters of the state, as shown by the votes of the last preceding election, express a wish that any law or resolution of the legislature shall be submitted to the people, the Act or Resolve shall be voted on at the next election of the state or county officers, and if a majority of the voters approve the measure it shall stand ; otherwise, it shall become void. Nevada thus became the fourth American state to adopt the referendum.

Institutions. — The state maintains a penitentiary at Carson City and an insane asylum at Reno. The deaf, dumb and blind are cared for at its expense in the California institution for these defectives. The State University, established at Elko in 1874 and removed to Reno in 1887, is supported by the income from a Federal grant of two townships (72 sq. m.) of public land and an additional grant, under the Morrill Act of 1862, of 90,000 acres for the support of a college for agriculture and mechanic arts. An agricultural experi- ment station and a normal school are conducted in connexion with the university. The control of this institution is vested in a board of regents, chosen by popular vote. At Virginia City is a school of mines, established by the state in 1903. The Federal government maintains three boarding schools for Indians in the state.

The public schools are supported by the income from a Federal grant of 2,000,000 acres of public land (given in lieu of the usual sixteenth

and thirty-sixth sections) supplemented by state and local taxation. The constitution provides that a special state tax, at a rate of not over two mills on the dollar, may be levied for school purposes. All fines collected under the penal laws, all escheats and 2 % of the receipts of toll roads and bridges go into the school fund, which is invested in state and Federal securities and the

interest apportioned among the counties according to their school population. The administration of the school system is in the bands of a superintendent of public instruction.

Finance. — The bonded debt of the state on the 31st of December 1908 amounted to $550,000, of which the state held an irredeemable bond for $380,000; the actual redeemable bonded debt of $170,000 was due to the investment of the school and university funds in the bonds of the state. The actual borrowing capacity of the state is limited by its constitution to $300,000, except for the extraordinary purpose of repelling invasion or suppressing insurrection. Practically all the revenue is derived from the taxation of real and personal property. Mines and mining claims are exempt from taxation, but a quarterly tax is levied on the net proceeds of mines, and is not to be paid a second time so long as the products remain in the hands of the original producer. The rate of taxation for state purposes is fixed by the legislature, and for county pur- poses by the board of county commissioners. A poll tax is required of all males between the ages of 21 and 60 years, one half of which goes to the county in which it is collected and the rest to the state. At the close of 1908 the state receipts for the year amounted to $1,004,041, and expenditures to $875,941.

History. — The first recorded person of European descent to enter the limits of Nevada was Francisco Garces (1738-1781), of the Order of St Francis, who set out from Sonora in 1775 and passed through what is now the extreme southern corner of the state on his way to California. Half a century later a party of trappers of the Hudson's Bay Company entered Nevada and plied their trade along the Humboldt river. American trappers came about the same time. Emigrants to California followed the trappers, and many crossed Nevada in the early 'forties of the 19th century. During 1843-1845 John C. Fremont made a series of explorations in this region. By the treaty of Guadalupe Hidalgo, negotiated in 1848, at the close of the war with Mexico, Nevada

became United States territory. It was then a part of California known as the Washoe Country, and remained so until the 9th of September 185c, when most of the present state was included in the newly organized Territory of Utah. In the meantime the discovery of gold in California had swelled the stream of westward migration across the Washoe Country, and had resulted in the settlement of traders, mostly Mormons, along the routes to the gold fields. The first settlement in what is now the state of Nevada was planted in the valley of the Carson river in 1849. The earliest recorded public meeting was held at Mormon Station (now Genoa) on the 12th of November 1851. The object of this gathering was to frame a government for the settlers, as the seat of the Territorial government of Utah was too remote to afford protection for life and property. Con- gress was petitioned to organize a separate Territory. An inde- pendent local government was formed a week later, and this lasted for several months, until the Utah authorities intervened. In 1854 the Utah legislature created the county of Carson, which included all the settlements in western Utah; but the inhabitants sought to rid themselves of all connexion with the people of the Salt Lake region, and petitioned Congress to annex them to California. In 1858 Carson City was laid out, and in the following year the people of Carson county held a mass meeting and chose delegates to a constitutional convention, which met at Genoa on the 18th of July 1859, and in ten days drafted a con- stitution. The instrument was submitted to a vote of the people and was adopted, and a full set of state officers was chosen. This attempt to create a new state proved abortive, however, and it was not till the mineral wealth of the Washoe Country became generally known that Congress took any action. On the 2nd of March 1861 the Territory of Utah was divided at 39° W. (of Washington) and the western portion was called Nevada. As then constituted, the northern boundary of Nevada was the 42nd parallel, its southern the 37th, and its western boundary was made to conform to the eastern limits of the state of California. James W. Nye (1814-1876) of New York was appointed Territorial governor. In December 1862 the Territorial legislature passed an act ” to frame a constitution and state government for the state of Washoe.” This was submitted to the people and adopted at the polls. Delegates to a constitutional convention accordingly drafted a frame of government, which on the 19th of January 1864 was submitted to a popular vote and overwhelmingly defeated. The instrument contained a

very unpopular clause taxing all mining property, unproduc- tive as well as productive. Moreover, as state officers were to be chosen at the same time that the constitution was voted on, disappointed candidates for party nominations fought against ratification. As a

result, the constitution was rejected while officers to act under it were at the same time duly elected.

Early in 1864, when it became evident that two more Republican votes might be needed in the United States Senate for reconstruc- tion purposes, party leaders at Washington urged the people of Nevada to adopt a constitution and enter the Union as a patriotic duty, and on the 21st of March 1864 Congress passed an act to enable the people of the Territory to form a state government. The third constitutional convention in its history now met at Carson City and drew up a constitution which was duly ratified. On the 31st of October President Lincoln issued a proclamation declaring Nevada a state. By the Enabling Act Congress had . extended the eastern boundary to the 38th meridian (W. of Washington), and in 1866 still farther extended it to the 37th and fixed the southern boundary as it exists at present. The additions eastward were made from Utah and those to the south from Arizona.

Being ” battle-born,” Nevada was loyal to the Union throughout the Civil War, and in spite of its scanty population furnished a company of troops in 1861, which were joined to a California regiment. In 1863 the Territory raised six com- panies of infantry and six of cavalry (about 1000 men), which saw no actual service against the Confederates but were useful in subduing hostile Indians. ,

The history of the state since its organization has been largely a history of its mines. The period from i860 to 1864 was one of rapid development accompanied by the wildest speculation. This was followed by a reaction and a general collapse of inflated values until 1873, when the discovery of the Great Bonanza mine brought about a revival of industry and of speculation. A second period of decline followed the working out of this mine and lasted until 1900, when the discovery of a new mineral belt in southern Nevada brought renewed prosperity. Until 1870 the state was regularly Republican, but in this year the Democrats gained most of the offices, including the seat in the national House of Representatives. The Republicans, however, secured the electoral votes of Nevada in 1872 and in 1876, and in 1878 were again in full control, only to suffer defeat in 1880. Not until the silver currency question became a political issue did Nevada take a prominent part in national politics. In 1885 the Nevada Silver Association was formed for the purpose of advocating the free and unlimited coinage of silver. Both parties in the state in 1888 declared in favour of free coinage, and in 1892 instructed their delegates to the national conven- tions to oppose any candidate who did not favour this policy. As a means of asserting their views effectively, the

citizens, irrespective of party, organized local silver clubs, and these eventually led to the formation of the Silver party of Nevada, which drafted a ” platform ” and nominated a state ticket and presidential electors who were instructed to support the Populist national ticket. The Republicans in the state divided, and the majority of them went over to the Silver party. At the national election in this year the Silver ticket received in Nevada 7264 votes; the Republican 281 1; the Democrat 714; and the Prohibitionist 86. In the state election of 1894 the Silver party was again victorious, and not a Democrat was returned “to the legislature. In the election of 1896 all the parties in the state declared in favour of the free and unlimited coinage of silver at the ratio of 16 to 1. The Democratic and Silver parties united, with the result that the state’s electoral vote went to Bryan and Sewall, the Democratic nominees, while the Silver party retained most of the state offices. In the presidential election of 1900 the Nevada Republicans pursued a non-committal policy with regard to the silver question, declaring in favour of ” the largest use of silver as a money metal in all matters compatible with the best interests of our government.” The Democratic and the Silver parties again

united, and subsequently dominated the politics of the state.

Territorial Governor.— James W. Nye, 1 861-1864; State Governors.

H. G. Blasdel, Rep., 1865-1870.

L. R. Bradley, Dem., 1871-1878.

J. H. Kinkhead, Rep., 1879-1882.

Jewett W. Adams, Dem., 1883-1886.

Christopher C. Stephenson, Rep., 1887-1.889. 1

Frank Bell, Rep., 1890.

R. K. Colcord, Rep., 1891-1894.

John E. Jones, Silver, 1895. 2

Reinhold Sadler, Silver, 1895-1902.

John Sparks, Dem. (Silver), 1903-1906.

D. S. Dickerson, Dem., 1907-1910.

T. L. Oddie, Rep., 191 1- Bibliography. — Clarence King, Report of the Geological Explora- tion of the Fortieth Parallel (Professional Papers of the Engineer Department, U.S. Army); George M. Wheeler, Report upon United States Geographical Surveys West of the One Hundredth Meridian (Engineer Department, U.S. Army); Israel C. Russell, Present and Extinct Lakes of Nevada, in National Geographic Monographs, vol. i. No. 4 (June 1895); idem., The Geological History of Lake Lahontan, a Quaternary Lake of North-western Nevada (Washington, 1885), U.S. Geological Survey Monograph, No. 11; idah M. Stro- bridge, In Miners' Mirage Land (Los Angeles, 1904) ; H. Hoffman, Calif ornien, Nevada und Mexico (Basel, 1879); Nevada and her Resources, compiled under the direction of the State Bureau of Immigration (Carson City, 1894) ; U.S. Department of Agriculture, North America Fauna, No. 7, pt. 2 (1893); William Wright, History of the Big Bonanza (Hartford, Conn., 1876); C. H. Shinn, The Story of the Mine as Illustrated by the Great Comstock Lode of Nevada, in 'The Story of the West" series (New York, 1896); The Silver Mines of Nevada (New York, 1864); M. Angel (ed.), History of Nevada (Oakland, Cal., 1881); H. H. Bancroft, History of Nevada, Colorado and Wyoming, in vol. xxv. of his Works (San Francisco, 1890); Elliot Coues, On the Trail of a Spanish Cavalier, Francisco Garces (New York, 1900).

NEVADA, a city and the eounty-seat of Vernon county, Missouri, U.S.A., in the south-western part of the state, about 90 m. S. by E. of Kansas City. Pop. (1900) 7461, of whom 235 were foreign-born and 168 negroes; (1910) 7176. It is served by the Missouri Pacific and the Missouri, Kansas & Texas railway systems. The principal public buildings are the county court house, the federal building and the high school. Nevada is the seat of Cottey College for girls (Methodist-Episcopal, South, 1884) and of a state hospital for the insane, and there is a state camp ground for the National Guard of Missouri. There are three parks, one of which, Lake Park, is a pleasure and health resort, with a lake and chalybeate and sulphur springs. The smelting of lead and zinc and the manufacture of paper, lumber, sheet metal and bricks are among the city's industries. Nevada is a trading centre for the surrounding country, and a fine farming and stock-raising region, in which Indian corn, oats, wheat, clover, timothy and blue-grass are grown; coal is mined in the vicinity. The city's water-supply is drawn from artesian wells. Nevada (" Nevada City " until 1869) was platted in 1853, was burned down in 1863 during the occupancy by the state militia in war time, was incorporated as a town in 1869, was entered by the first railway in 1870, and was chartered as a city in 1880.

NEVADA CITY, a township and the county-seat of Nevada county, California, U.S.A., about 130 m. N.E. of San Francisco. Pop. (1890) 2524; (1900) 3250 (764 foreign-born); (1910) 2689. It is the terminus of the Nevada County Narrow Gauge railway, which connects with the Southern Pacific railway at Colfax, 23 m. S. An electric line extends to Grass Valley (pop. in 1900, 4719), 4 m. S.W. Situated in a hilly and picturesque region, 2580 ft. above the sea, Nevada City is frequented as a health and summer resort (annual mean temperature, about 53-5° F.; mean summer temperature, about 66°). Gold-mining and quartz-mining are its principal industries, and in 1907 Nevada county's output of gold (104,590-76 oz., worth $2,162,083) was second only to that of Butte county (134,813-39 oz., worth $2,786,840) in California; the county is the leading producer

1 Died the 21st of September, 1 890, and Frank Bell became governor by virtue of his office as lieutenant-governor.

1 Died the 10th of April 1895, and R. Sadler became governor by virtue of his office as lieutenant-governor.

from quartz mines. Among the manufactures of the township are carriages and products of planing mills, foundries and machine shops; and grapes and fruits are raised in the surround- ing country. Gold was first discovered within what is now Nevada City, on Deer Creek, in the summer of 1848, by James W. Marshall, who, in January of the same year, had found the metal near what is now Coloma, IJldorado county. The first settlement was made here in 1849; rich deposits of gold were soon afterwards found on or near the surface, and the settlement had the characteristic growth of a western mining town; its output of gold reached its maximum in 1850-1851. Nevada City was first incorporated in 1851 under a special act of the legislature (repealed in 1852); it was reincorporated in 1856 and again in 1878.

NEV£, or Firn, the name given to the partly consolidated masses of snow and ice which form in the hollows on the sides of mountains below the belt of freshly fallen snow and just above the compact glacier-ice. The neve, which generally consists of broad sheets of great beauty, is formed from the freshly fallen snow during a series of alternate thaws and frosts. These processes are accompanied by a gradual descent down the mountain side, during which the neve suffers consolidation, until it becomes compact glacier-ice. The neve is thus the feeding ground of the glacier (q.v.). The word n£v£ (Lat. nix, nivis, snow) is adopted from the French dialect of the French Alps; firn is German, meaning " last year's (snow)."

NEVERS, a town of central France, capital of the department of Nievre, 159 m. S.S.E. of Paris by the Paris-Lyons-Mediter- ranee railway to Nimes. Pop. (1906) 23,561. Nevers is situated on the slope of a hill on the right bank of the Loire at its con- fluence with the Nievre. Narrow winding streets lead from the quay through the town where there are numerous old houses of the 14th to the 17th centuries. Among the ecclesiastical buildings the most important is the cathedral of St Cyr, which is a combination of two buildings, and possesses two apses. The apse and transept at the west end are the remains of a Romanesque church, while the nave and eastern apse are in the Gothic style and belong to the 14th century. There is no transept at the eastern end. The lateral portal on the south side belongs to the late 15th century; the massive and elaborately decorated tower which rises beside it to the early 16th century. The church of St Etienne is a specimen of the Romanesque style of Auvergne of which the disposition of the apse with its three radiating chapels is characteristic. It was consecrated at the close of the nth century, and belonged to a priory affiliated to Cluny. The ducal palace at Nevers (now occupied by the courts of justice and an important ceramic museum) was built in the 15th and 16th centuries and is one of the principal feudal edifices in central France. The facade is flanked at each end by a turret and a round tower. A middle tower containing the great staircase has its windows adorned by sculptures relating to the history of the house of Cleves by the members of which the greater part of the palace was built. In front of the palace lies a wide open space with a fine view over the valley of the Loire. The Porte du Croux, a square tower, with corner turrets, dating from the end of the 14th century, is among the remnants of the old fortifications; it now contains a collection of sculptures and Roman antiquities. A triumphal arch of the 1 8th century, commemorating the victory of Fontenoy and the hotel de ville, a modern building which contains the library, are of some interest. The Loire is crossed by a modern stone bridge, and by an iron railway bridge. Nevers is the seat of a bishopric, of tribunals of first instance and of commerce and of a court of assizes and has a chamber of commerce and a branch of the Bank of France. Its educational institutions include a lycie, a training college for female teachers, ecclesiastical seminaries and a school of art. The town manufactures porcelain, agricultural implements, chemical manures, glue, boilers and iron goods, boots and shoes and fur garments, and has distilleries, tanneries and dye-works. Its trade is in iron and steel, wood, wine, grain, live-stock, &c. Hydraulic lime, kaolin and clay for the manufacture of faience are worked in the vicinity.

Noviodunum, the early name of Nevers was in later times altered to Nebirnum. The quantities of medals and other Roman antiquities found on the site indicate the importance of the place at the time when Caesar chose it as a military depot for corn, money and hostages. In 52 B.C. it was the first place seized by the revolting Aedui. It became the seat of a bishopric at the end of the 5th century. The countship (see below) dates at least from the beginning of the 10th century. The citizens of Nevers obtained charters in 11 94 and in 1231. For a short time in the 14th century the town was the seat of a university, transferred from Orleans, to which it was restored.

Counts and Dukes of Nevers. Having formed part of the duchy of Burgundy, the county of Nevers (Nivernais) was given by Duke Henry I. in 987 to his stepson, Otto William, afterwards count of Macon, who five years later handed it over to his son-in-law Landri. The first house of the hereditary counts of Nevers originated in this Landri, and was brought to an end in 1192 by the death of Agnes, countess of Nevers, wife of Pierre de Courtenay (d. 121 7). The county subsequently passed by successive marriages into the houses of Donzy, Chatillon and Bourbon. Mahaut de Bourbon brought the county of Nevers, together with those of Auxerre and Tonnerre, to her husband Odo (Eudes), son of Hugh IV., duke of Burgundy, in 1248. Her eldest daughter, Yoland, received the county of Nevers as her dowry when in 1265 she married Jean Tristan, son of King Louis IX. She became a widow in 1270, and in 1272 married Robert de Dampierre, who became count of Flanders. Her descendant by her second marriage, Marguerite, daughter and heiress of Louis II. de Male, count of Flanders, married successively two dukes of Burgundy, Philip I. de Rouvre and Philip II. the Bold. Philip (d. 1415), the third son of Philip the Bold, received the counties of Nevers and of Rethel and the barony of Donzy; his last male descendant, John, died in 149 1. The house of Cleves then inherited the Nivernais, which was erected into a duchy by King Francis I. for Francis of Cleves in 1539. In 1565 Louis de Gonzaga (d. 1595), son of Frederick II., duke of Mantua, married Henrietta of Cleves, duchess of Nevers, and one of his descendants, Charles (d. 1665), sold the Nivernais to Cardinal Mazarin in 1659. The cardinal devised it to his nephew Philippe Jules Mancini, whose descendants possessed it until the French Revolution. The last duke of Nivernais, Louis Jules Barbon Mancini Mazarini, died in 1798.

NEVILLE, or Nevill, the family name of a famous English noble house,

descended from Dolfin son of Uchtred, who had a grant from the prior of Durham in 1131 of ” Staindropshire,” co. Durham, a territory which remained in the hands of his descendants for over four centuries, and in which stood Raby castle, their chief seat. His grandson, Robert, son of Meldred, married the heiress of Geoffrey de Neville (d. 11 92-1 193), who inherited from her mother the Bulmer lordship of Brancepeth near Durham. Henceforth Brancepeth castle became the other seat of the house, of which the bull’s head crest com- memorates the Bulmers; but it adopted the Norman surname of Neville {Neuville). Robert’s grandson, another Robert, (d. 1282) held high position in Northumbria, and sided with Henry III. in the Barons’ War, as did his younger brother Geoffrey (d. 1285), ancestor of the Nevills of Hornby. This Robert’s son Robert (d. 1271) extended the great possessions of the family into Yorkshire by his marriage with the heiress of Middle- ham, of which the powerful Norman castle still stands. The summons of their son Ranulf (d. 1331) to parliament as a baron (1294) did but recognize the position of the Nevills as mighty in the north country. Ralph (d. 1367) the second baron— whose elder brother “the Peacock of the North” was slain by the Douglas in 1318 — was employed by Edward III. as a commander against the Scots and had a leading part in the victory of Nevill’s Cross (1346), where David Bruce was captured, and by which Durham was saved. His active career as head of his house (1331-1367) did much to advance its fortunes and to make the name of Nevill a power on the Scottish march. Of his younger sons, Alexander became archbishop of York (1374-1388) and was a prominent supporter of Richard II., attending him closely

and encouraging his absolutist policy; in consequence of which he was one of those ” appealed of treason ” by the opposition in 1388 and being found guilty was outlawed, and died abroad in 1392. His younger brother William, a naval commander, took the opposite side, was a leading Lollard and a friend of Wiclif, and in 1388-1389 acted with the lords appellants

John, the 3rd baron (d. 1388), a warden of the Scottish marches and lieutenant of Aquitaine, a follower of John of Gaunt and a famous soldier in the French wars of Edward III., con- tinued the policy of strengthening the family’s position by marriage; his sisters and daughters became the wives of great northern lords; his first wife was a Percy, and his second Lord Latimer’s heiress; and his younger son, Thomas, became Lord Furnival in right of his wife, while his son by his second wife became Lord Latimer. His eldest son Ralph (1364-1425), 1 st earl of Westmorland (see Westmorland, earls or), carried the policy further, marrying for his second wife a daughter . of

John of Gaunt and securing heiresses for five of his sons, four of the younger ones becoming peers, while a fifth, Robert, was made bishop of Durham (1438-1457). Among his daughters were the duchesses of Norfolk, Buckingham and York (mother of Edward IV. and Richard III.) and an abbess of Barking. The Nevills were thus closely connected with the houses of Lancaster and York, and had themselves become the most im- portant family in the realm. Of the earl's sons by his second marriage, Richard, earl of Salisbury (and three of his sons) and William, earl of Kent, are the subjects of separate notices.

The greatness of the Nevills centred in the " kingmaker " (Richard's son) and the heads of his house, after the 1st earl, were of small account in history, till Charles, the 6th earl, at the instigation of his wife, Surrey's daughter, joined Northumber- land in the fatal northern rising of 1 569 to the ruin of his house. His estates, with the noble castles of Brancepeth and Raby, were forfeited; Middleham, with the Yorkshire lands, had been settled by the 1st earl on the heirs of his second marriage.

Although the senior line became extinct on the earl's death abroad (1601), there were male descendants of the 1st earl remaining, sprung from George and Edward, sons of his second marriage. George, who was Lord Latimer, was father of Sir Henry, slain at Edgcote fight, and grandfather of Richard, 2nd lord (1460-1530), a soldier who distinguished himself in the north, especially at Flodden Field. His grandson (d. 1577) was the last lord, but there were male descendants of his younger sons, one of whom, Edmund, claimed the barony, and after 1601 the earldom of Westmorland, but vainly, owing to its attainder. In this line may still exist a male heir of this mighty house.

The heirs male of Edward, Lord " Bergavenny " (now " Aber- gavenny " co. Monmouth), who died in 1476, have retained their place in the peerage under that style to the present day by a special and anomalous devolution. His wife, the only child of Richard (Beauchamp), earl of Worcester (d. 1422), brought him the great estates which had come to her line with Fitz Alan and Despencer heiresses, and in 1450 he was summoned as Lord Bergavenny, though not seized of that castle. Their grandson, George (c. 1471-1535) the 3rd lord, was in favour with Henry VII. and Henry VIII., and recovered from the latter in 1 512 the castle and lands of Abergavenny. He was prominent in the French campaigns of 1513-14 and 1523. On the death of his son, Henry, the 4th lord, in 1587, a long-famous contest ensued between his daughter, Lady Fane, and his heir-male, Edward Nevill, which was eventually ended by James I., in 1604, assigning the barony of Abergavenny to Edward's son and that of Despencer to Lady Fane. The former subsequently descended (on uncertain grounds) to the heirs-male with the old Beauchamp estates under special entails. In 1784 the then Lord Abergavenny received an earldom, and the next lord erected at Eridge, Sussex, the present seat of the family, 00 which the marquisate of Abergavenny and earldom of Lewes were conferred in 1876. Its Sussex estates are mainly derived through the Beauchamps, from the Fitz Alans, heirs of the Warennes. The Nevills of Billingbear, Berks, were a junior line, of whom

was Sir Henry Nevill (d. 1615), courtier and diplomatist, who | became a leading figure in parliament under James I. His grandson, another Sir Hemy (d. 1694), was an author of some note and a Republican opponent of Cromwell, by whom he was banished from London in 1654. The family became extinct in 1740, and in 1762

Richard Aldworth (1717-1793), on inheriting Billingbear, took the name of Nevill. From him descend the Lords Braybrooke.

Neuville is a common French name, and it is not clear whether all the Nevills who occur in the 12th and 13th centuries were of the same stock as the lords of Raby. The baronial line of Nevill of ” Essex ” was founded by the marriage, temp. Richard I., of a Hugh de Nevill to the heiress of Henry de Cornhill, a wealthy Londoner. He went on crusade with Richard I. and was after- wards an active supporter of John, who names him in the Great Charter (1215). His descendant, Hugh de Nevill, was summoned as a baron in 131 1, as was his son John, who served in the French and Flemish campaigns, and died, the last of his line, in 1358.

See Rowland’s Historical and Genealogical Account of the Family of Nevill (1830) ; Drummond’s Noble British Families (1846) ; Swallow’s De Nova Villa (1885); and Barron’s sketch in The Ancestor, No. 6 (1903). Also Dugdale’s Baronage; G. E. C[okayne]‘s Complete Peerage; J. H. Round’s Feudal England; and for the Nevill castles Mackenzie’s Castles of England. For the Kingmaker, see Oman’s monograph (1891). (J. H. R.)

NEVILLE, GEORGE (c. 143 2-1476), archbishop of York and chancellor of England, was the youngest son of Richard Neville, earl of Salisbury, and brother of Richard Neville, earl of Warwick, known as the ” Kingmaker.” He was educated at Balliol College, Oxford, and was from his childhood destined for the clerical profession, in which through the great influence of his family he obtained rapid advancement, becoming bishop of Exeter in 1458. From this time forward Neville took a prominent part in the troubled politics of the period. He was present with his brother Warwick at the battle of Northampton in July 1460, immediately after which the great seal was committed to his keeping. He took part in the proclamation of Edward of York as king, who confirmed his appointment as chancellor. In 1463 he was employed on a diplomatic mission in France; and in 1464, after taking part in negotiation with the Scots, Neville became archbishop of York. During the next few years he as well as his brothers fell into disfavour with Edward IV. ; and in 1469, after a successful rising in Yorkshire secretly fermented by Warwick, the king fell into the hands of the archbishop, by whom, after a short imprisonment, he was permitted to escape. When Warwick was in turn defeated by the king’s forces at Stamford in 1470, Archbishop Neville took the oath of allegiance to Edward, but during the short Lancastrian restoration which compelled Edward to cross to Holland, Neville acted as chan- cellor to Henry VI.; and when the tide once

more turned he again trimmed his sails to the favouring breeze, making his peace with Edward, now again triumphant, by surrendering Henry into his hands. The archbishop for a short time shared Henry's captivity in the Tower. Having been pardoned in April 147 1, he was re-arrested a year later on a charge of treason and secretly conveyed to France, where he remained a prisoner till 1475, when he returned to England; he died in the following year, on the 8th of June 1476. Archbishop Neville was a respectable scholar; and he was a considerable benefactor of the university of Oxford and especially of Balliol College.

See Thomas Rymer, Foedera, &c. (London, 1 704); John Wark- worth, Chronicle of the first Thirteen Years of the Reign of Edward IV., ed. J. O. Halliwell (Camden Soc, London, 1839); Paston Letters, ed. J. Gairdner (London, 1872-1875); The Historical Collections of a Citizen of London in the 15th century, ed. J. Gairdner (Camden Soc, London, 1876) ; Sir James H. Ramsay, Lancaster and York 1399- 148$ (Oxford, 1892).

NEVILLE, RALPH (d. 1244), bishop of Chichester and chan- cellor of England, was a member of the great Neville family, but of illegitimate birth. In 12 14 he became dean of Lichfield, and obtained several rich livings; and in 1224 he was consecrated bishop of Chichester. In 1226 he was appointed chancellor by the council governing during the minority of Henry HI. ; and when the king in 1236 demanded the return of the great seal,

Neville refused to surrender it, on the ground that only the authority that had appointed him to the office had power to deprive him of it. In 1231 he was chosen archbishop by the monks of Canterbury, but the election was not ratified by the pope. He died in 1244.

Neville's residence in London was a palace in the street opposite the Temple, which from this association obtained the name of Chancery Lane, by which it is still known; while the palace itself, after passing into the hands of Henry de Lacy, earl of Lincoln, was called Lincoln's Inn after that nobleman when it became the abode of students of law. Neville bequeathed this property to the see of Chichester, and the memory of his connexion with the locality is further preserved in the name of a passage leading from Chancery Lane to Lincoln's Inn which still bears the name of Chichester Rents.

NEVIN, JOHN WILLIAMSON (1803-1886), American theo- logian and educationalist, was born on Herron's Branch, near Shippensburg, Franklin county, Pennsylvania, on the 20th of February 1803. He was

a descendant of Hugh Williamson of North Carolina, and was of Scotch blood and Presbyterian training. He graduated at Union College in 182 1; studied theology at Princeton Theological Seminary in 1823-1828, being in 1826-1828 in charge of the classes of Charles Hodge; was licensed to preach by the Carlisle Presbytery in 1828; and in 1830-1840 was professor of Biblical literature in the newly founded Western Theological Seminary of Allegheny, Penn- sylvania. But under the influence of Neander he was gradually breaking away from " Puritanic Presbyterianism," and in 1840, having resigned his chair in Allegheny, he was appointed professor of theology in the (German Reformed) Theological Seminary at Mercersburg, Pa., and thus passed from the Presbyterian Church into the German Reformed. He soon became prominent; first by his contributions to its organ the Messenger; then by The Anxious Bench — A Tract for the Times (1843), attacking the vicious excesses of revivalistic methods; and by his defence of the inauguration address, The Principle of Protestantism, delivered by his colleague Philip Schaff, which aroused a storm of protest by its suggestion that Pauline Protestantism was not the last word in the development of the church but that a Johannean Christianity was to be its out- growth, and by its recognition of Petrine Romanism as a stage in ecclesiastical development. To Dr Schaff 's 122 theses of The Principle of Protestantism Nevin added his own theory of the mystical union between Christ and believers, and both Schaff and Nevin were accused of a " Romanizing tendency." Nevin characterized his critics as pseudo-Protestants, urged (with Dr Charles Hodge, and against the Presbyterian General Assembly) the validity of Roman Catholic baptism, and defended the doctrine of the " spiritual real presence " of Christ in the Lord's Supper, notably in The Mystical Presence: a Vindication of the Reformed or Calvanistic Doctrine of the Holy Eucharist (1846); to this the reply from the point of view of rationalistic Puritanism was made by Charles Hodge in the Princeton Review of 1848. In 1849 the Mercersburg Review was founded as the organ of Nevin and the " Mercersburg Theology"; and to it he contributed from 1849 to 1883. In 1851 he resigned from the Mercersburg Seminary in order that its running expenses might be lightened; and from 1841 to 1853 he was president of Marshall College at Mercersburg. With Dr Schaff and others he was on the committee which prepared the liturgy of the German Re- formed Church, which appeared in provisional form in 1857 and as An Order of Worship in 1866. In 1861-1866 he was instructor of history at Franklin and Marshall College (in which Marshall College had been merged), of whichhe was president in 1866-1876. He died at Lancaster, Tenn., on the 6th of June 1886.

See Theodore Appel, The Life and Work of John Williamson Nevin (Philadelphia, 1889), containing Nevin's more important articles.

NEVIS, an island in the British West Indies, forming with St Kitts one of the five presidencies in the colony of the Leeward Islands. Pop. (1901) 12,774. It lies in 17 14′ N. and 62° 33′ W., and is separated from St Kitts by a shallow channel 2 m. wide at its narrowest point. In form it is almost round, and from the sea has the appearance of a perfect cone, rising gradually to the height of 3200 ft. Its total area is 50 sq. m. Although the

island is subject to severe storms, the climate is healthy, the average temperature being 82° F. Sugar, rum and molasses are exported, and corn, yams, coffee and fruit are grown. There are medicinal springs and large deposits of sulphur. The chief town, Charlestown, lies on a wide bay on the S.W. The legislative council of St Kitts-Nevis meets at Basseterre, the capital of St Kitts. Nevis was discovered by Columbus in 1498 and first colonized in 1628 by the English from St Kitts. During the period of the slave trade it was a leading mart for slaves in the West Indies.

NEVYANSK, Nevyanskiy or Neyvinskiy Zavod, a town of Russia, in the government of Perm, 57 m. by rail N.N.W. of Ekaterinburg, on the eastern slope of the Ural mountians, in the populous mountain valley of the Neyva, in a district very rich in iron and auriferous sands. Pop. (1881) 13,980; (1897) about 16,000, all Great-Russians and mostly Nonconformists, who are employed, partly at the iron-works, partly in various small industries, such as the manufacture of boxes, widely sold in Siberia, iron wares and boots, and partly in agriculture. The iron-works at Nevyansk are the oldest in the Urals, having been founded in 1699. In 1702 Peter the Great presented them to Demidov, with 3,900,000 acres of land. Several other iron- works are situated within a short distance, the chief being Verkhne-Neyvinsk, 18 m. S.; Neyvo-Rudyansk, 8 m. S.; Petrokamensk, 32 m. N.E.; Neyvo-Shaitansk, 20 m. lower down the Neyva; and Neyvo-Alapayevsk, 64 m. N.E. of Nevyansk.

NEW ABBEY, a parish and village of Kirkcudbrightshire, Scotland. Pop. of parish (1901) 957. The hill of Criffel and Loch Kinder are situated within the parish boundaries. The lake contains two islets, of which one was a crannog and the other the site of an ancient, kirk.

The village, which lies 6 J m. S. of Maxwelltown, is famous for the ruin of Sweetheart Abbey, a Cistercian house built in 1275 by Devorguila in memory of her . husband John de Baliol, who had died at Barnard Castle in 1269. His heart, embalmed and enshrined in a coffin of ebony and silver, which she always kept beside her, was, at her death in 1290, buried with her in the precincts of the abbey, which thus acquired its name (Abbacia Dulcis Cordis, or Douxquer). The building afterwards became known as the New Abbey, to distinguish it from the older foundation at Dundrennan, which had been erected in 1142 by Fergus of Galloway. The remains of the abbey chiefly consist of the shell of the beautiful Cruciform church, with a central saddleback tower rising from the t r ansepts to a height of over 90 ft., and a graceful rose window at the west end of the nave. Most of the work is Early English with Decorated additions. The abbot's tower, a stately relic, stands about J m. N.E. of the abbey.

NEW ALBANY, a city and the county-seat of Floyd county, Indiana, U.S.A., on the N. bank of the Ohio river, at the head of low water navigation, nearly opposite Louisville, Kentucky, with which it is connected by three railway bridges, and 156 m. below Cincinnati, Ohio. Pop. (1890) 21,059; (1900) 20,628, of whom 1363 were foreign-born and 1905 negroes; (1910) 20,629. It is served by the Baltimore & Ohio South-western, the Chicago, Indianapolis & Louisville, the Pittsburg, Cincinnati, Chicago & St Louis and the Southern railways, by electric railways to Louisville, Indianapolis, &c, and by steamboats on the Ohio; it is connected by a belt line with the Louisville & Nashville, the Chesapeake & Ohio, the Illinois Central and other railways. The city is situated on an elevated plateau above the river, in an amphitheatre of wooded hills. It has a good public library, a well organized public school system and several private schools and academies. Within the city limits is a national cemetery. The manufactures include leather, iron, foundry and machine shop products, furniture and veneer, lumber, cotton goods and hosiery, distilled liquors and stoves. The value of the factory products in 1905 was $4,110,709, 13% more than in 1900. Originally settled about the beginning of the 19th century, New Albany was platted in 1813 and was chartered as a city in 1839. The city owed much of its early industrial importance to the plate-glass works successfully established here by Washington Charles de Pauw (1822-1887), who endowed

the De Pauw College for Young Women (opened as the Indiana Asbury Female College in 1852). The glass works left the city because of the superior and cheaper fuel supplied by natural gas in central Indiana. The De Pauw College for Young Women was relatively unimportant after the endowment of Indiana Asbury University (now De Pauw

University) by W. C. de Pauw in 1883, but it continued to give instruction until 1903.

NEW AMSTERDAM, a town of British Guiana, situated in 6° 20′ N. and 59° 15′ W. on the east bank of the Berbice river, about 4 m. from the mouth. Formerly the capital of the colony of Berbice, it is now the capital of the county of that name. It is a picturesque little town composed almost entirely of wooden houses, having a population estimated in 1904 at 7459. The Colony House, standing in handsome grounds beside the small but pretty botanical gardens, was formerly the residence of the governor and the seat of the legislature, and now contains the treasury and supreme courts. The town is lighted by municipally owned electric woiks, and contains various government in- stitutions, a town hall and market. The local government is vested in a mayor and town council, the revenue (a little over £12,000 annually) being mainly raised by a direct rate on house property. The expenditure is principally on streets, street lighting, fire brigade, water supply and drainage. New Amster- dam is connected by ferry and rail with Georgetown, to which there is also a bi-weekly steamer service.

NEWARK, DAVID LESLIE, Lord (1601-1682), Scottish general, was born in 1601, the fifth son of Sir Patrick Leslie of Pitcairly, Fifeshire, commendator of Lindores, and Lady Jean Stuart, daughter of the 1st earl of Orkney. In his early life he served in the army of Gustavus Adolphus, where he rose to the rank of colonel of cavalry. In 1640 he returned to his native country to take part in the impending war for the Covenant. In r643, when a Scottish army was formed to intervene in the English Civil War (see Great Rebellion) and placed under the command of Alexander Leslie, earl of Leven, the foremost living Scottish soldier, Leslie was selected as Leven's major-general. This army engaged the Royalists under Prince Rupert at Marston Moor, and Leslie bore a particularly distinguished part in the battle. He was then sent into the north-western counties, and besieged and took Carlisle. When, after the battle of Kilsyth, Scotland was at the mercy of Montrose and his army, Leslie was recalled from England in 1645, and made lieutenant-general of horse. In September he surprised and routed Montrose at Philiphaugh near Selkirk, and was rewarded by the committee of estates with a present of 50,000 merks and a gold chain; but his victory was marred by the butchery of the captured Irish — men, women and children — to whom quarter had been given. He was then declared lieutenant-general of the forces, and, in addition to his pay as colonel, had a pension settled on him. Leslie returned to England and was present at the siege of Newark. On his return to Scotland he reduced several of the Highland clans that supported the cause of the king. In 1648 he refused to take part in the

English expedition of the ” en- gagers,” the enterprise not having the sanction of the Kirk. In 1649 he purchased the lands of Abercrombie and St Monance, Fifeshire. In 1650 he was sent against Montrose, who was defeated and captured by Major Strachan, Leslie’s advanced guard commander; and later in the year, all parties having for the moment combined to support Charles II., Leslie was appointed to the chief command of the new army levied for the purpose on behalf of Charles II. The result, though disastrous, abundantly demonstrated Leslie’s capacity as a soldier, and it might be claimed for him that Cromwell and the English regulars proved no match for him until his movements were interfered with and his army reduced to indiscipline by the representatives of the Kirk party that accompanied his headquarters. After Dunbar Leslie fought a stubborn defensive campaign up to the crossing of the Forth by Cromwell, and then accompanied Charles to Worcester, where he was lieutenant-general under the king, who commanded in person. On the defeat of the royal army Leslie, intercepted in his retreat through Yorkshire, was com- mitted to the Tower, where he remained till the Restoration

in 1660. He was fined £4000 by Cromwell’s ” Act of Grace ” in 1654. In 1 66 1 he was created Lord Newark, and received a pension of £500 per annum. He died in 1682. The title became extinct in 1790.

NEWARK (Newark-upon-Trent), a market town and municipal borough in the Newark parliamentary division of Nottinghamshire, England. Pop. (1001) 14,992. It lies in a flat, fertile lowland near the junction of the river Devon with the Trent, but actually on the Devon. By means of a canal ij m. in length it is connected with the Trent navigation. It is 120 m. N.N.W. from London by the Great Northern railway, and is on the Melton Mowbray joint branch of that company and the London & North- Western, and on the Nottingham & Lincoln branch of the Midland railway. The church of St Mary Magdalene, one of the largest and finest parish churches of England, is specially notable for the beauty of the tower and of the octagonal spire (223 ft. high) by which it is surmounted. The central piers of the old church, dating from the nth or 12th century, remain, and the lower part of the tower is a fine example of Early English when at its best. The upper parts of the tower and spire are Decorated, completed about 1350; the nave dates from between 1384 and 1393, and the chancel from 1489. The sanctuary is bounded on the south and north by two chantry chapels, the former of which has on one of its panels a remarkable

painting from the ” Dance of Death.” There are a few old monuments, and an exceedingly fine brass of the 14th century. The castle, supposed to have been founded by Egbert, king of the West Saxons, was partly rebuilt and greatly extended by Alexander, consecrated bishop of Lincoln in n 23, who estab- lished at it a mint. It rises picturesquely from the river, and from its position and great strength was for a long time known as the ” key of the North.” Of the original Norman stronghold the most important remains are the gate-house, a crypt and the lofty rectangular tower at the south-west angle. The building seems to have been reconstructed in the early part of the 13th century. In the reign of Edward III. it was used as a state prison. During the Great Rebellion it was garrisoned for Charles I., and endured three sieges. Its dismantling was begun in 1646, immediately after the surrender of the king. There is a very beautiful and interesting cross (the ” Beaumond ” cross) of the latter part of the 15th century in good preservation in the town. A grammar and song school was founded in the reign of Henry VIII., and endowed by Archdeacon Magnus, and there are other considerable charities. The other principal public buildings are the town-hall in the Grecian style (erected in 1774), the corn exchange (1848), the Stock library and Middleton newsroom (1828), the mechanics’ institution (1836), a free library and a fine hospital (1881). There is a large trade in malt, coal, corn and cattle. There are iron and brass foundries, boiler-works, agricultural implement manufactories and breweries. Gypsum and limestone are obtained in the neighbourhood, and plaster of Paris is extensively manufactured. The town is governed by a mayor, 6 aldermen and 18 councillors. Area 1931 acres.

Newark (Newerca, Nouwerk) owed its origin, possibly in Roman times, to its position on the great road called the Fosse Way, in the valley of the Trent. In a document which purports to be a charter of 664 Newark is mentioned as having been granted to the abbey of Peterborough by Wulfhere. In the reign of Edward the Confessor it belonged to Godiva, who granted it to the monastery of Stow, and it remained in the hands of the bishops of Lincoln until the reign of Edward VI. The castle was erected by Bishop Alexander in n 23, and the bridge about the same time. Under Stephen a mint was established. There were burgesses in Newark at the time of the Domesday Survey, and in the reign of Edward III. there is evidence that it had long been a borough by prescription. It was incorporated under an alderman and twelve assistants in 1549, and the charter was confirmed and extended by Elizabeth. Charles L, owing to the increasing commercial prosperity of the town, reincorporated it under a mayor and aldermen, and this charter, except for a temporary

surrender under James II., has continued the govern- ing charter of the corporation. Newark returned two repre-

sentatives to parliament from 1673 until 1885. A weekly market on Wednesdays, and a fair on the eve, day and morrow of the Invention of the Holy Cross, granted to the bishop of Lincoln by John, are still held; another fair at St Mary Magdalene and the four preceding days was granted by Henry III., and is probably represented by the fair now held on the 14th of May. A market for corn and cattle is still held on Wednesdays, and another on Tuesdays for fat stock has been added.

NEWARK, the largest city of New Jersey, U.S.A., a port of entry, and the county-seat of Essex county, on the Passaic river and Newark Bay, about 8 m. W. of New York City. Pop. (1890) 181,830; (1900) 246,070, of whom 71,363 were foreign- born, and 6694 were negroes; (1910 census), 347,469. Of the total foreign-born population in 1900 (48,329 of whom had been in the United States at least ten years), 25,139 were from Germany, 12,792 from Ireland, 8537 from Italy, 5874 from England, 5511 from Russia and 4074 from Austria. Of the total population, 143,306 were of foreign parentage on both sides, 56,404 German, 30,261 Irish, 13,068 Italian, 8951 English and 8531 Russian. Newark is served by the Pennsylvania, the Lehigh Valley, the Erie, the Delaware, Lackawanna & Western and the Central of New Jersey railways, and by steamboats engaged in coastwise and river commerce. By electric lines it is connected with most of the cities and towns within a radius of 20 m., including Jersey City, Paterson and the residential suburbs, among which are the Oranges, Montclair, Bloomfield, Glen Ridge, Belleville and Nutley. It has a frontage on the river and bay 1 of 10J m., and a total area of 23-4 sq. m. The site is generally level, but the ground rises toward the western part. Broad Street, 120 ft., and Market Street, 90 ft. wide, the principal thoroughfares, intersect. The most prominent public buildings are the City Hall, completed in 1906; County Court-House, designed by Cass Gilbert (b. 1859), with sculpture by Andrew O'Connor and decorations by Howard Pyle, Will H. Low, Kenyon Cox, H. O. Walker, C. Y. Turner, F. D. Millet, George W. Maynard and Edwin H. Blashfield; United States Government Building; Public Library, finished in 1901, and City Hospital. There is a Roman Catholic Cathedral, and the city is the see of a Roman Catholic and of a Protestant Episcopal bishop. The Prudential Life Insurance Company and the Mutual Benefit Life Insurance Company have fine office buildings. Many of the older buildings are of a brown sandstone, quarried in or near the city. In Military Park is a monument to Major- General Philip Kearny (1815-1862), and in Washington Park is a monument to Seth Boyden (1 785-1870), a Newark inventor of malleable iron, of machinery for

making nails, and of improve- ments in the steam-locomotive. Newark has also a monument to Frederick Theodore Frelinghuysen (1817-1885), secretary of state in the cabinet of President Chester A. Arthur, and to Abraham Coles (1813-1891), a poet and physician, both of whom lived here. On the banks of the Passaic is a house having as a part of its walls the old walls of Cockloft Hall, in which Washing- ton Irving frequently sojourned, and of which he gave a charming description in Salmagundi. In the vicinity are the remains of Peterborough, the home of Colonel Peter Schuyler (1710-1762), who served against the French in 1746-48 and in the French and Indian War. At the corner of Broad and William streets stood until 1835 the parsonage in which Aaron Burr was born.

In 1910 Newark had 658 acres in public parks, of which 637 acres were under the administration of the Essex County Park Commission. To Washington, Military and Lincoln parks, the older ones near the heart of the city, there have been added Branch Brook (277 acres), Weequahic (265-8 acres), West Side (23 acres), and East Side (12-5 acres) parks. The principal ceme- teries are Mount Pleasant, overlooking the Passaic in the northern part of the city, and Fairmount in the western part; about 1894 the remains of the early settlers were removed from the Old

1 The river channel before improvement had a navigable depth of 7 ft. at mean low water; the depth was increased to about 10 ft. by the Federal government before 1902; in 1907 further improve- ment was authorized by Congress, the channel to be made 300 ft. wide and 16 ft. deep.

Burying Ground to Fairmount Cemetery and placed in a large vault marked by a monument.

As parts of its public school system the city maintains twelve summer or vacation schools, evening schools, a normal and training school for the education of teachers, a school of drawing, and a technical school, the last for evening classes. The Newark Academy, founded in 1792, is the leading private school; and there are various Roman Catholic academies. In the township of Verona (pop. in 1905, 2576), about 7 m. N. by W. of Newark, is the City Home for boys, in which farming, printing and other trades are taught. The Public Library (opened in 1889) con- tained about 160,000 volumes in 1910, and the library of

the New Jersey Historical Society about 26,000 books, about 27,000 pamphlets and many manuscripts; the Prudential Insurance Company has a law library of about 20,000 volumes; and the Essex County Lawyers' Club has one of 5000 volumes or more. Among the charitable institutions are the City Hospital, Saint Michael's Hospital, Saint Barnabas Hospital, Saint James Hospital, the German Hospital, a Babies' Hospital, an Eye and Ear Infirmary, a City Dispensary, the Newark Orphan Asylum, a Home for Crippled Children, a Home for Aged Women and three day nurseries. The municipality owns and operates the water-works, and the water is brought from reservoirs in the Pequanac Valley 20-30 m. N.W. of the city.

The city charter (1857) provides for government by a mayor, elected biennially, and a unicameral council, elected by popular vote. By popular vote, also, the board of street and water commissioners is chosen. The council chooses the city clerk, treasurer and tax receiver, and the mayor appoints the city attorney, police justices, the board of education, the trustees of the public library, and the excise and assessment commissioners, and, subject to the ratification of his choice by the council, the comptroller, auditor and the tax, police, health and fire com- missioners.

Newark has long been one of the leading manufacturing cities of the country. The manufacture of shoes and other leather products, particularly patent leather, became an important in- dustry early in the 19th century; in 1770 there was one tannery here; in 1792 there were three; a large one, still in operation, was built in 1827; in 1837 there were 155 curriers and patent leather makers in the city, which then had an annual product of leather valued at $899,200; in 1905 the value of the leather, tanned, curried and finished was $13,577,719. The manufacture of felt hats (product, 1905, $4,586,040, Newark ranking third in this industry among the cities of the United States), carriages, chairs and jewelry (an industry established about 1830; product, 1905, $9,258,095), developed rapidly early in the 19th century, and there are extensive manufactories of malt liquors (product, 1905, $10,917,003), and of clothing (product, 1905, $3,937>i3 8)> foundries and machine shops, (product, 1905, $6,254,153), and large establishments for smelting and refining lead and copper, the product of the lead smelters and refining establish- ments being in 1905 the most valuable in the city. Among the other important manufactures in 1905 were: chemicals, valued at $3,964,726; slaughtering and meat packing, $2,933,877; varnish, $2,893,305; stamped ware, $2,689,766; enamelled goods, $2,361,350; boots and shoes, $2,382,051; reduction of gold and silver, not from ore, $2,361,350; corsets, $2,081,761; paints, $1,812,463; silverware

and silver-smithing, $1,780,906; tobacco, cigars and cigarettes, $1,742,862; hardware, $1,616,755; buttons, $1,281,528, and saddlery hardware, $1,151,789. In 1905 an art pottery was established for making " crystal patina " and " robin's egg blue " wares, in imitation, to a certain extent, of old oriental pottery, and Clifton India ware, in imitation of pottery made by the American Indians. The total value of Newark's factory products increased from $112,728,045 in 1900 to $150,055,227 in 1905, or 33-1%. In 1905 the value of the city's factory product was almost one- fifth of that for the whole state, and Newark ranked tenth among the manufacturing cities of the entire country. In the same year Newark manufactured more than one-half (by value) of all the jewelry, leather and malt liquors produced in the state.

Insurance is another important business, for here are the headquarters of the Prudential, the Mutual Benefit Life and the American Fire, the Firemen's and the Newark Fire Insurance companies. The city's foreign trade is light (the value of its imports was $859,442 in 1907; of its exports $664,525), but its river traffic is heavy, amounting to about 3,000,000 tons annually, and being chiefly in general merchandise (including food-stuffs, machinery and manufactured products), ores and metals, chemicals and colours, stone and sand and brick.

Newark was settled in 1666 by about thirty Puritans from Milford, Connecticut, who were followed in the next year by about the same number of their sect from Branford and Guilford. Because of the union of the towns of the New Haven Jurisdiction with Connecticut, in 1664, and the consequent admission of others than church members to civil rights, these Puritans resolved to remove and found a new town, in which, as originally in the New Haven towns, only church members should have a voice in the government. They bought practically all of what is now Essex county from the Indians for " fifty double hands of powder, one hundred bars of lead, twenty axes, twenty coats, ten guns, twenty pistols, ten kettles, ten swords, four blankets, four barrels of beer, ten pairs of breeches, fifty knives, twenty horses, eighteen hundred and fifty fathoms of wampum, six ankers of liquor (or something equivalent), and three troopers' coats." Their first church was in Broad Street, nearly opposite the present First Presbyterian Church, with cupola and flankers from which " watchers " and " wards " might discover the approach of hostile Indians, and as an honour to their pastor, Rev. Abraham Pierson (1608-1678), who came from Newark-on-Trent, they gave the town its present name, having called it Milford upon their first settlement. The town was governed largely after the Mosaic law and continued essentially Puritan for fifty

years or more; about 1730 Presbyterianism superseded Congregational- ism, and in 1734 Colonel Josiah Ogden, having caused a schism in the preceding year, by saving his wheat one dry Sunday in a wet season, founded with several followers the first Episcopal or Church of England Society in Newark — Trinity Church. Partly because of its Puritanic genesis and partly because of its independent manufacturing interests, Newark has kept, in spite of its nearness to New York City, a distinct character of its own. The College of New Jersey, now Princeton University, was situated here from 1747 to 1756, for all but the first few months under the presidency of the Rev. Aaron Burr, who published in 1752 the well-known Newark Grammar, long used in Princeton and originally prepared for Burr's very successful boys' school in Newark. The city received large additions to its foreign-born population immediately after the revolution of 1848, when many Germans settled here — a German daily newspaper was estab- lished in 1857. Newark was incorporated as a township in 1693, was chartered as a city in 1836 and received another charter in 1857; from it the township of Orange was formed in 1806 and the township of Bloomfield in 1812.

See H. L. Thowless, Historical Sketch of the City of Newark, New Jersey (Newark, 1902); F. J. Urquhart, Newark, The Story of its Early Days (Newark, 1904); and J. Atkinson, The History of Newark, New Jersey (Newark, 1878).

NEWARK, a city and the county-seat of Licking county, Ohio, U.S.A., at the confluence of three forks of the Licking river, on the Ohio Canal, and 33 m. E. by N. of Columbus. Pop. (1890) 14,270; (1900) 18,157, of whom 1342 were foreign-born and 300 were negroes; (1910 census) 25,404. Newark is served by the Baltimore & Ohio, and the Pittsburg, Cincinnati, Chicago & St Louis railways, and by inter-urban electric lines. It lies on a level plain, but is surrounded by hills. Along two of the forks of the Licking are some of the most extensive earthworks of the "mound builders"; they occupy about 3 sq. m., and have a great variety of forms: parallel walls, circles, semicircles, a parallelogram, an octagon, &c. About 10 m. S.W. and connected with Newark by electric line is Buckeye Lake, an artificial body of water about 8 m. long and 1 m. wide, frequented as a summer resort. Among the city's attractive features are Idlewilde Park and a beautiful auditorium, built

as a memorial to the soldiers and sailors of the Civil War. Newark is the trade centre of an agricultural region, which also abounds in natural gas and coal; natural gas is piped as far as Cincinnati. The city has electric car and steam car shops and various manu- factures, including stoves and furnaces (the most important), bottles, table glass-ware, cigars, rope halters, machine furniture and bent wood. The total factory product in 1905 was valued at $5,612,587, an increase of 94-9% over that in 1900. Newark was laid out about 1801 and was incorporated in 1813.

For an account of the earthworks see Gerard Fowke, Archaeological History of Ohio (Columbus, 1902).

NEW BEDFORD, a city and port of entry, and one of the county-seats of Bristol county, Massachusetts, U.S.A., 56 m. S. of Boston, at the mouth of the Acushnet river, and at the head of New Bedford Harbor, an arm of Buzzard's Bay. Pop. (1890) 40,733; (JQ 00) 62,442, of whom 25,529 were foreign-born, including 8559 French Canadians, 5389 English, 4802 Portuguese and 3020 Irish; (1910 census) 96,652. New Bedford is the terminus of two divisions of the New York, New Haven & Hartford railroad, and is connected with Taunton (the other county-seat), Fall River, Brockton and other cities by interurban electric railways. Passenger steamboat lines connect with Martha's Vineyard, Nantucket and Buzzard's Bay points; a freight line and, in summer, daily passenger service to New York are maintained; the Insular Navigation Co. (Empreza Insulana de Navegacao) runs passenger and freight steamers from New Bedford to Lisbon, and to the Azores; and there is a regular sailing packet service between New Bedford and the Cape Verde Islands. Two bridges connect New Bedford with the township of Fairhaven, on the E. side of the harbour; one, a steel bridge, is almost 1 m. in length and cost $1,500,000. New Bedford is attractively situated, and, commercially, occupies a particularly favourable position. It covers about 20 sq. m., and extends along the ,W. side of the river and harbour for several miles. Unusual dockage facilities are thus provided. The harbour was improved by the Federal government, between 1840 and 1906, the channel from Buzzard's Bay through the harbour being 18 ft. deep and 200 ft. wide; under a project of 1007 it was contemplated to increase the depth of the channel to 25 ft. and the width to 300 ft. There is a broad driveway along the shore of the harbour to Clark's Point at the entrance, where during the Civil War the United States government erected a stone fort, Fort Rodman, in which a garrison of artillery is still maintained; New Bedford was one of the 26 places reported by the U.S. Chief of Engineers in 1909 as having " permanent seacoast defences." Among the principal buildings and institutions are the post

office and custom house, the city hall, the county court house, the registry of deeds building, the masonic building, the merchants' national bank, the institution for savings, St Joseph's and St Luke's hospitals, the Swain free school, St Mary's (Roman Catholic) school, the Friends' academy, a state textile school, a state armory and St Mary's home. The public library, established as a private society library in 1802, taken over by the city in 1853, and housed in the refitted old city hall building, was one of the first free public libraries in the United States; it contains about 100,000 volumes, and has notable collections relating to the whaling industry and to the Quakers. The Sailors' Bethel, built in 1831, and containing memorial tablets reminiscent of the whaling days, is of interest. The Old Dartmouth Historical Society was organized in 1903. A fine park system, aggregating 255 acres, includes the Common, and Brook- lawn, Buttonwood, Hazelwood, Grove and Triangle Parks. The city owns and operates a fine water-supply system.

When whale-oil was a widely used illuminant, New Bedford was long the principal port of the world's whaling industry; and in point of tonnage owned it is perhaps still so, as many New Bedford vessels now sail from San Francisco. As early as the middle of the 18th century, vessels sailed on whaling voyages from the mouth of the Acushnet river, but it was not until 1765, when Joseph Rotch, a Nantucket merchant, bought a tract of land on the W. side of the river and constructed wharves and warehouses, that the industry became established here. At

first the whales were obtained principally off the Virginia and Carolina coasts, but by the outbreak of the War of Independence, the New Bedford whalers sought their prey as far as West Indian and even South American waters. The War of Independence temporarily ruined the industry, but it was soon re-established, and the field of operations was much extended, after 1791 many ships regularly rounding Cape Horn into the Pacific Ocean. By 1804 there were 59 whaling vessels registered from New Bedford. The unsettled commercial conditions of the early years of the 19th century and the Embargo combined to ruin the business once more, but the close of the War of 181 2 ushered in the greatest era of prosperity for the industry. By 1845 only New York, Boston and New Orleans of American ports exceeded New Bedford in tonnage. The production was greatest in that year, New Bedford whalers importing 158,000 bbls. of sperm oil, 272,000 bbls. of whale oil and 3,000,000 lb of whalebone. The beginning of Arctic whaling in 1848 marked a new step in the industry, and the tonnage was much increased. The highest point in capital, tonnage and vessels was reached in 1857, when New Bedford possessed 329 registered

whaling ships, representing an invest- ment of $12,000,000 and employing afloat and ashore 10,000 hands. From a succession of causes, of which the introduction of petroleum into general use as an illuminant was the chief, the industry began to decline from this time. The Civil War was a great blow to the whalers; 25 vessels were sunk by Confederate cruisers, entailing a loss of $1,650,000, and many more were bought by the government to be sunk at the entrances of southern harbours, or to be used as colliers or store ships. 1 In 1871 and 1876 many vessels were lost in the Arctic ice, involving losses of several millions. Still the industry survives on a compara- tively small scale; in January 1909 there were 13 steamers and barks, 1 brig and 4 schooners, with an aggregate tonnage of 4710, employed, chiefly in sperm whaling, and the oil and whalebone product of 1908 was valued at about $350,000.

The prosperity that New Bedford lost with the decline of the whaling industry has been more than made up by the growth of the cotton spinning industry. In 1905 New Bedford ranked second among the cities of the United States in the manufacture of cotton goods (including cotton small wares), producing 5% of the total for the country; the speciality of the mills is the finer cotton goods. The first cotton mill, a five-storey stone structure, was built by Joseph Grinnell (1 789-1885) and his associates in 1847, an d began operations in the following year with 15,000 spindles and 200 looms. This was the beginning of the Wamsutta Mills, in 1907 comprising 8 buildings, 228,000 spindles and 4300 looms. In 1909 the city had some 50 mills, with a total of over 2,137,000 spindles. The value of cotton goods manufactured in 1905 was $22,411,936, or 76-1% of all manufactured products of New Bedford (in 1890 the product was $8,185,286; in 1900 $16,748,783). Among the city's other manufactures are tools, cordage and twine, boots and shoes; glass, oils, lubricants (notably black-fish oil, a lubricant for watches and clocks, of which almost the entire supply is manu- factured here), mechanical toys, beer, ale, woollen and silk goods, and paints. The total value of all factory products was $23,397,491 in 1900 and $29,469,349 in 1905. There is an extensive commerce in coal, raw cotton, lumber and fish; the direct foreign trade is comparatively small — in 1909 the imports were valued at $542,995, and the exports at $34,473.

The site of New Bedford was visited in 1602 by the English navigator, Bartholomew Gosnold, who traded with the Indians at the mouth of the Acushnet or Acoosnet. It was originally part of the town of Dartmouth, which was occupied by settlers from Plymouth, who in 1652 purchased the land from Massasoit, Sachem of the Narragansets, and his son Wamsutta (called Alexander by the whites). About 1665

there was a considerable influx of Quakers, and members of this sect have always formed

1 From New Bedford in November and December 1861 sailed the " Stone Fleet," a flotilla of 45 whaling vessels collected by the Federal government and loaded with stone, most of which were sunk off Charleston and other harbours on the South Atlantic coast for the purpose of stopping blockade running. ; .

an important and influential element in the population. There were few settlers on the site of New Bedford until the middle of the 1 8th century, and there was no village, properly speaking, until 1760. The town was first called Bedford after Joseph Russell, one of the founders, whose family name was the same as that of the dukes of Bedford; and it was later called New Bedford to distinguish it from Bedford in Middlesex county. During the War of Independence the harbour became a rendez- vous for American privateers; this led to an attack, on the 5th of September 1778, by a fleet and armed force under Earl Grey, which burned seventy ships and almost destroyed the town. In 1787 New Bedford was set off from Dartmouth and separately incorporated as a township; in 18 12 the township of Fairhaven was separated from it. New Bedford was chartered as a city in 1847. Its first newspaper, the Marine Journal, was established in 1792. The Mercury, founded in 1807, now one of the oldest newspapers in continuous publication in the country, was for some time edited by William Ellery Channing (1818-1901). There are Portuguese and French weekly newspapers.

See Daniel Ricketson, History of New Bedford (New Bedford, 1858); Z. W. Pease and G. W. Hough, New Bedford (New Bedford, 1889); D. H. Hurd, History of Bristol County (Philadelphia, 1883); L. B. Ellis, History of New Bedford and its Vicinity 1602-1892 (Syracuse, N.Y., 1892); W. S. Tower, A History of the American Whale Fishery (Philadelphia, 1907) ; and The Old Dartmouth Historical Sketches (1903 seq.), published by the Old Dartmouth Historical Society.

NEWBERN, a city, port of entry and the county-seat of Craven county, North Carolina, U.S.A., near the head of the estuary of the Neuse river and at the mouth of the Trent river, about 90 m. N.E. of Wilmington. Pop. (1890) 7843; (1900) 9090, of whom 5878 were negroes; (1910 census) 9961. Newbern is served by the Atlantic Coast Line and the

Norfolk & Southern railways. The Federal government has improved both the Neuse and the Trent rivers for navigation; the Neuse has a channel of 8 ft. at low water to Newbern and one of 4 ft. from Newbern to Kinston, and the Trent a channel of 3 ft. from Newbern to Trenton. The Trent and the Neuse are both spanned here by railway and county bridges. The ” Waterway between Newbern and Beaufort,” projected in 1884, had in 1908 a controlling depth at mean low water of only 2 to 2! ft.; it was decided to abandon this waterway on the completion of an inland waterway about 18 m. long with a channel 10 ft. deep at low water and 90-250 ft. wide, projected in 1907, which would give Newbern an outlet to the ocean at Beaufort. The remains of Tryon Palace, the residence of the royal governor and the meeting-place of the legislature, which was built by William Tryon (q.v.) in 1765-1770, and was said to be the finest building of its time in the colonies, are of historic interest, and among the principal buildings are the United States govern- ment building, the county court house, the county jail and the county home. At Newbern is one of the national cemeteries of the Federal government, containing many fine monuments. The most important industries are the manufacture of lumber (especially pine) and trucking. The total value of factory products in 1905 was $1,343,384. In 1907 about 1000 men, mostly negroes, were employed in the saw-mills, whose annual product averages about 1 70,000,000 ft. Among the manufactures are fertilizers, cotton seed oil and carriages; repair shops of the Norfolk & Southern railway are here; the fisheries are of considerable importance; and the city ships quantities of fish, cotton and market-garden produce — much of the last being forced under canvas with steam heat. It is the port of entry of the Pamlico customs district; in 1908 its imports were valued at $71,421. Newbern was settled in 1710 by a company of Swiss and Germans under the leadership of Baron Emanuel de Graffenried (d. 1735) and was named for Bern, Switzerland. It was incorporated as a city in 1723, but its present charter dates from 1899 with amendments adopted in 1907. For several years it was the capital of the province and for a long time was the chief seaport of the state. Although strongly fortified early in the Civil War, Newbern was captured by a Union force under General A. E. Burnside on the 14th of March 1862 after

an engagement near the city in which the loss to the Confederates, who were under the command of General Lawrence O’Brien Branch, was about 578 in killed, wounded, captured and missing, and the loss of the Union force was 90 killed and 380 wounded. Unsuccessful attempts to recapture the city were made by the Confederates on the 14th of March 1863, and on the 1st of February and the 5th of May

1864.

NEWBERRY, JOHN STRONG (1822-1892), American geologist, was born at Windsor, Connecticut, on the 22nd of December 1822, and received a medical education at Cleveland, Ohio, taking the degree of M.D. in 1848. He completed his medical studies in Paris. His attention was early attracted to geology by collecting coal-measure plants from mines that had been opened by his father, and an acquaintance with Professor James Hall established his interest in the science. Hence while in Paris he studied botany under A. T. Brongniart. In 185 1 he settled in practice at Cleveland, but in 1855 he was appointed . surgeon and geologist to an exploring party in northern California and Oregon, and in 1857 his reports on the geology, botany and zoology were published. Between then and 1861 he was employed on similar work in the region of the Colorado river under Lieutenant J. C. Ives, and his researches were extended over a large area of previously unknown country in Utah, Arizona and New Mexico, the further results being published in 1876. During the Civil War he did important work as a member of the U.S. Sanitary Commission, his organizing capacity being specially marked during the operations in the Mississippi Valley. In 1866 he was appointed professor of geology and palaeontology at the Columbia School of Mines, New York, where he commenced the formation of a magnificent collection of specimens; in 1869 he was made state geologist of Ohio and director of the (second) Geological Survey there, and in 1884 palaeontologist to the U.S. Geological Survey. Four volumes on the geology of Ohio were published while he was director of the survey, his own reports being confined to the surface geology and to the coal-measures and their fossil plants. He devoted much labour to the study of Triassic, Cretaceous and Tertiary plants, and in particular to those of the Laramie stage. He also carried on researches among the Palaeozoic and Triassic fishes of North America. Anjpng his other publications may be mentioned The Origin and Classifica- tion of Ore Deposits (1880). His work throughout was char- acterized by great care and conscientious study, and it was recognized by his inclusion in most of the learned societies of America and the Old World. He received the Murchison medal of the Geological Society of London in 1888, and was president of the American Association for the Advancement of Science (1867), of the New York Academy of Sciences (1867- 1891), and of the International Congress of Geologists (1891). He died at New Haven, Conn., on the 7th of December 1892.

Memoir (with portrait) by J. J. Stevenson, American Geologist (July 1893).

NEWBOLT, HENRY JOHN (1862-), English author, was born on the 6th of June 1862, the son of H. F. Newbolt, vicar of St Mary's, Bilston. He was educated at Clifton College, where he was head of the school in 1881 and edited the school magazine, and at Corpus Christi College, Oxford. He was called to the bar at Lincoln's Inn in 1887 and practised until 1899. His first book was a story, Taken from the Enemy (1892), and in 1895 he published a tragedy, Mordred; but it was the publication of his ballads, Admirals All (1897), that created his literary reputation. These were followed by other volumes of stirring verse, The Island Race (1898), The Sailing of the Long-ships (1902), Songs of the Sea (1904). From 1900 to 1905 he was the editor of the Monthly Review. Among his later books his novels The Old Country (1906) and The New June (1909) attracted considerable attention.

NEW BRIGHTON, formerly a village (coextensive with the town of Castleton) of Richmond county, New York, U.S.A., but since the 1st of January 1898 the first ward of the borough of Richmond, New York City. It is at the north-eastern end of Staten Island, about 6 m. S.W. of the borough of Manhattan, with which it is connected by ferry. Pop. (1890) 16,423; (1900)

21,441, of whom 6575 were foreign-born and 259 negroes; (1905 state census) 23,659. At New Brighton is the Sailors' Snug Harbor, founded under the will of Robert Richard Randall {c. 1740-1801), who in 1771 became a member of the Marine Society of New York (an organization for the relief of indigent masters of vessels and their families), and in 1790 bought from Baron Poelnitz the " Minto farm," about 21 acres of land in what is now the Fifteenth Ward of the Borough of Manhattan. This tract, with four lots in what is now the First Ward of Manhattan, and cash and stocks to the value of about $10,000 Randall (who himself seems to have followed the sea for a time, arid was called " Captain ") bequeathed to a board of trustees, directing that the income should be used " for the purpose of maintaining and supporting aged, decrepit and worn-out sailors," who had served at least five years under the American flag, and that the institution established for this purpose should be called " the Sailors' Snug Harbor." The will was bitterly con- tested by relatives, but finally was fully upheld in 1830 by the United States Supreme Court. The Sailors' Snug Harbor was incorporated in 1806, and its charter was amended in 1828 to permit the building of the institution on Staten Island rather than on the Randall estate, which had already

greatly increased in value. In 1833 the institution, with lands covering 160 acres, was opened in New Brighton with about 50 inmates. Randall's body was removed to the grounds in 1834, and buried under a marble monument, and in 1884 a life-size bronze statue of him, by Augustus Saint Gaudens, was placed in front of the main building. In 1909 the institution comprised the main building, a hospital, a chapel, a parsonage, residences for the officials, and several other buildings. The inmates (about 1000 in 1909) employ themselves at simple trades, or at work about the grounds; the use of intoxicating liquors is strictly prohibited, but the men are furnished with plenty of tobacco, and are well cared for. The present immense value of the land bequeathed by Randall makes Snug Harbor one of the most liberally endowed charitable institutions in New York City. At New Brighton are also a Home for Destitute Children of Seamen, founded in 1846 at Stapleton, Staten Island, removed to a new building on the Snug Harbor property in 1852, and maintained by contributions and gifts; and the Samuel R. Smith Infirmary, founded in 186 1 by the Medical Society of Richmond county, aud named in honour of a Scaten Island physician. At New Brighton there are dry docks, paper and plaster mills, and silk-dyeing and printing works. The village as incorporated in 1866 included the northern half of the township of Castleton, and as reincor- porated in 1872 included all of that township.

NEW BRIGHTON, a borough of Beaver county, Pennsylvania, U.S.A., on Beaver river, 2 m. from its confluence with the Ohio and 28 m. N.W. of Pittsburg. Pop. (1890) 5616, (1900) 6820 (487 foreign-born and 179 negroes); (1910) 8329. It is served by the Pennsylvania railway, and is connected by bridge with Beaver Falls. The borough has a public art gallery, a public park and a general hospital. Coal and fireclay abound in the vicinity, the Beaver river furnishes good water power, and the borough has various manufactures. New Brighton was laid out as a town in 1815 and was incorporated as a borough in 1838.

NEW BRITAIN, a city of Hartford county, Connecticut, U.S.A., near the centre of the state, about 9 m. S.W. of the city of Hartford; land area 13-09 sq. m. in 1906. Pop. (1890) of the township, including the city, 19,007; of the city, 16,519; (1900) of the township, including the city, 28,202; of the city, 25,998, of whom 9293 were foreign-born, including 1869 Irish and i8n Swedes, who have a weekly published here; (1910 census) 43,916. It is served by the New York, New Haven & Hartford railway, and by several inter-urban electric railways. The city is the seat of a state normal school, and has a free public library, formerly the New Britain Institute, and a public park of about 100 acres. New Britain is an important manu- facturing centre; its

principal products are hardware, cutlery and edge tools, hosiery, and foundry and machine shop products. In 1905 the capital invested in manufacturing was $19,979,712 (an increase of 45-1% since 1900) and the value of the factory

products was $14,959,543 (an increase of 34-8%). More than one-half of the product-value was in hardware ($7,537,625).

New Britain, which was settled in 1687, was originally a part of the township of Farmington. On account of ecclesiastical difficulties the ” New Britain Society “—a parish — was organized in 1754. New Britain became a part of Berlin when that town- ship was established in 1785. In 1850 the township of New Britain was incorporated, and in 1871 the city was chartered. By act of the state legislature in 1905 the township of New Britain and the city of New Britain were co. wlidated; the first election under the new charter was in April 1906. The city was one of the first in the country to build a municipal subway for electric light, telephone and telegraph wires.

See D. N. Camp’s History of New Britain (New Britain, 1889).

NEW BRUNSWICK, a province of the Dominion of Canada, lying between 45° 2′ and 48° 3′ N. and 63 46′ and 69 3′ W. Its length from N. to S. is 230 m., its greatest breadth 190 m., and it has a seaboard of about 550 m.

Physical Features. — The surface is generally undulating, but in the north and north-west of the province are many ranges of hills from 1000 to 2000 ft. in height, rising in Bald Mountain to 2400 ft. These elevations are an extension of the Appalachian Mountains and traverse the province from the state of Maine. This whole section of the province is densely wooded. The southern region embraces the district along the Bay of Fundy. Its coast is rocky and bold and interrupted by ravines. Inland the numerous rivers, flowing through the soft sandstone and conglomerate rocks, have cut broad valleys, the soil of which is extremely rich and fertile. Along the shores on the east coast, and for some miles inland, the country is flat and composed of mosses and marshes, but beyond that distance it rises into gently sloping hills, which extend as far as St John.

New Brunswick is a network of rivers, bays and lakes, several of which are navigable for vessels of large tonnage. The principal rivers are the St John, Miramichi, Restigouche, Saint Croix, Petitcodiac, Richibucto and Nipisiguit. The St John, which is famous for its scenery, rises in the state of Maine and is over 450 m. in length. It is navigable for

vessels of moderate tonnage from St John on the Bay of Fundy to Fredericton, a distance of about 88 m., but steamers of light draught ply as far as Wood- stock, 65 m. farther, and during the rainy season boats go as far as Grand Falls, a cataract 70 or 80 ft. high, 225 m. from the sea. Among the many lakes which it drains is Grand Lake, 20 m. long, and varying from 3 to 9 m. in breadth. The Miramichi flows N.E. into a bay of the same name. It is 225 m. long, 7 m. wide at its mouth, and navigable as far as Nelson (46 m.). In the spring and autumn small steamers and barges go much farther up. With its branches it drains a fourth of the province. A large lumber trade is dope in this district, and many saw-mills are driven by the river. The Restigouche forms the north-east boundary of the province, is 100 m. in length and flows into the Bay of Chaleur. It is composed of five main branches, its, name signifying in Indian " the river which divides like the hand." Large vessels may safely navigate it 18 m. from the bay. With its tributaries it drains over 4000 sq. m. of fertile and well-wooded country. The St Croix separates New Brunswick from the state of Maine at its south-west angle. Its source is a chain of lakes called the Chiputneticook. The Petitcodiac is navigable for 25 m. for ships, and schooners of 80 tons burden may proceed to the head of the tide, 12 m. farther; it empties into Shepody Bay. The Richibucto discharges into the Gulf of St Lawrence. The Nipisiguit and Tobique (a tributary of the St John) in the N. are in much repute among anglers.

The coast-line of New Brunswick is indented with numerous fine bays and harbours. The Bay of Fundy is an arm of the sea separating New Brunswick from Nova Scotia and terminating in two smaller bays, Chignecto Bay and the Basin of Minas. Its length up to Chignecto Bay is 140 m. and its extreme breadth 45 m. It is noted for its high tides, which rise about 30 ft. at St John and over 50 ft. at the head of Chignecto Bay. At Bay Verte, 14 m. distant, on the opposite side of the Isthmus of Chignecto, the tide rises little more than 4 or 5 ft. The Bay of

Chaleur, which has several excellent harbours, is over go m. in length and from 20 to 25 m. in breadth. The other inlets of consequence on the east coast are Mirarnichi. Richibucto, Buctouche, Cocagne and Shediac Bays; on the south coast are Passamaquoddy Bay, St John Harbour and Chignecto Bay.

At the mouths of the rivers are in nearly every case excellent

harbours. To the province belong the islands of Campobello and Grand Manan, at the entrance of the Bay of Fundy, from both of which important fisheries are carried on.

Geology. — Along the Bay of Fundy, for about 30 m. inland, is a band of hard Cambrian and Cambro-Silurian rocks, with smaller areas of Devonian, Huronian and Laurentian. The city of St John is built upon very hard Cambrian slates, in which interesting fossils are found. North of this belt grey sandstones and con- glomerates of Carboniferous age occupy a triangular area, the apex of which is near Oromocto Lake, the south side extending to Nova Scotia and the north-west side to Bathurst. Along the western border this area is 400 to 600 ft. high, but near the coast it is low and flat. ” The Carboniferous area of New Brunswick is continuous across the isthmus [of Chignecto] with that of Nova Scotia, so that from Miscou on the Bay of Chaleur to Sydney on the Atlantic coast of Cape Breton, the whole coast of the Gulf of St Lawrence is bordered by coal-bearing rocks ” (S. E. Dawson, North America, London, 1897). North-west of the Carboniferous a belt of 40 to 50 m. wide is occupied by Ordovician and pre-Cambrian formations, with large masses of intrusive granite. The Ordovician is composed of schistose, micaceous, and foliated slates and quartzites, in places highly altered and disturbed. The pre-Cambrian rocks consist of very hard crystalline reddish felsite, chloritic quartzites, and fels- pathic and micaceous schists. The whole of this region is rugged and broken into numerous ranges of hills. The remainder of the province to the north-western boundary is occupied by Silurian rocks, mostly calcareous slates and shales associated with beds of limestone. The whole province has been mantled with ice in the Pleistocene period, and boulder-clay and later modified deposits occupy the surface. Marine clay and sand containing fossil shells are found along the coast.

Climate. — The climate, though subject to extremes, is healthy. The average mean temperature in summer is 6o° F., and in winter 10° F. The average rainfall for thirty years (1875 to 1905 in- clusive) was 32-6 in., whereas in the neighbouring province of , „ „„ „ „ . .

Nova Scotia, with its larger coast-line, it was 39-6. The winters are J agriculture is possible, a quiet, equable prosperity is attained by

severe, and snow falls to a great depth, but the harbour of St John is open throughout the year. During the period 1 875-1905 the average yearly snowfall was 97-5 in., 20 in. more than in Nova Scotia. The autumn is delightful, especially during the ” Indian summer,” after the first frost, but before the weather has broken Area and Population. —

Not including the territorial sea, the area of the province is 27,985 sq. m., of which 74 are water. It thus occupies an area rather larger than that of the mainland of Scotland. The population in 1901 was 331,120, and is practically stationary, there being little or no immigration, and a steady exodus to the United States and to the western provinces of the Dominion. The number of males slightly exceeds that of females. The bulk of the people are of English descent, the remainder Irish and French. The Scots, so prominent in nearly all the other provinces of the Dominion, are here less conspicuous. Of the original Indian inhabitants of the province, who were of Algonquian stock and divided into two tribes, the Micmacs and the Malicites, about 1700 remain, many of whom have a greater or less proportion of white blood.

The capital is Fredericton, on the St John (pop. in 1901 7117). The chief shipping ani commercial centre is St John (pop. in 190!, 40,711). Moncton is a large railway centre (pop. in 1901, 9026). None of the other towns exceeds 5000 inhabitants. Owing to the large Irish and French element over one-third of the population belongs to the Roman Catholic Church. Campbellton (pop. 5000), a northern port oil Chaleur Bay, with an important lumber trade, was destroyed by fire in July, 1910.

Administration. — The province sends ten senators and fourteen members of the House of Commons to the federal parliament. Since the abolition of the legislative council in 1892 the provincial legislature has consisted of a lieutenant- governor and a legislative assembly. Though in this the members are nominally divided on party lines, the smallness of the population renders the division rather one of persons than of principles. Both city and county districts have an elective municipal system.

Education. — There is a good system of primary and secondary schools under provincial control. When in 1 87 1 the system of free undenomina- tional primary schools supported by the pro- vince was introduced, feeling rose so high among Emtrywaw •<* the Roman Catholics that rioting broke out and life was lost. In view of the provisions in the British North America Act for protecting the rights of religious minorities, the Roman Catholics sought to have the new system declared unconstitutional, but the case, after being carried to the judicial committee of the imperial privy council, was decided against them. In 1875 a compromise was arranged, by which practical though not theoretic satisfaction is given to that church. Renewed rioting broke out among the French Roman Catholics in 1890, but after some years the compromise of 1875 was confirmed. At

Fredericton an efficient normal school for the training of teachers is maintained, and a school for the deaf and dumb. The lazaretto for lepers at Tracadie and the marine hospital at St John are sup- ported by the Dominion. At Fredericton is a small provincial university, founded in 1800 and re-established in 1859; at Sackville is the university of Mount Allison College under Methodist control, and at Memramcook one, working chiefly among the French, is owned by the Roman Catholics. In all these an adequate training is given in law, theology and the literary subjects, but for science, whether pure or applied, most of the provincial students go either to the United States or to the universities of Upper Canada.

Either owing to the beauty of its scenery or to the excellence of its education New Brunswick has produced a school _ of poetry, headed by Charles Roberts, which is unique in the Dominion.

Agriculture. — The great predominance of the lumber industry has tended to keep agriculture in the background. There is also a steady flow of the most active young men to the greater oppor- tunities offered by the Canadian and American west. Thus the area under crop tends slowly to decrease. Rather more than 6000 sq. m. is now occupied, of which about 1500 is under crop and about 700 used for pasture, the rest being for the most part still covered with forest. In all the river valleys, and especially on the fertile diked lands along the head of the Bay of Fundy, many rich and prosperous farms are found varying in size from 100 to 240 acres, and good crops of wheat, oats, buckwheat and all the staple grains and roots are grown. The raising of sheep and cattle, and the production of cheese and butter, are becoming industries of importance. A dairy school is maintained by the provincial govern- ment at Sussex (King's county). Though no great development of

hundreds of farmers. Much crown land still remains unoccupied, and is sold by the provincial government on easy terms to bona fide settlers.

Forests. — Its great forests, through which flow numerous rivers with excellent harbours at or near their mouths, have long made New Brunswick a centre of lumbering. This industry has affected the whole development of the province, and the wilder and more unsettled life of its woodsmen contrasts with that of the farmer of Ontario or of the

west. The most valuable and most widely-spread tree is the black spruce (Abies nigra), from which is made a yearly increasing quantity of wood-pulp for paper-making. The hemlock (Abies Canadensis), the cedar, birch, beech, oak, ash and many other valuable trees, are also widely spread. The chief ports for shipping are St John,' at the mouth of the St John river, and Chatham, at the mouth of the Miramichi.

Though much remains, much has been destroyed by forest fires. To this day traces may be seen of the fire which in 1825 utterly destroyed hundreds of square miles of timber along the river Miramichi.

The same forests are also a paradise for sportsmen. The game laws are being made increasingly strict, and the province draws a large revenue from the sale of licences, extra fees being imposed on sportsmen from other countries. Moose (Cervus alecs), caribou and deer may only be shot during about two months in the autumn, and the number allowed to each gun is strictly limited. In 1902 the provincial government set aside a large area of the highlands at the sources of the Tobique, Nipisiquit and Miramichi rivers for a national park and game preserve.

Mines and Fisheries. — The mineral wealth of the province is small, though gold, iron, copper, lead, zinc and plumbago have been worked on a small scale at various times. Coal seams are numerous, but are worked solely for local consumption. Albertite, a species of coal found in Albert county and giving a very hot flame, is now exhausted. Limestone and gypsum are extensively quarried near St John and in Albert county.

The fisheries, on the other hand, are extensive, though less so than those of Nova Scotia. This industry centres in the counties of Charlotte and Gloucester, herring, salmon, lobsters, sardines and cod forming the chief catch. The Restigouche and other rivers near the northern border are much frequented by anglers in search of trout and salmon.

Manufactures. — The chief manufactures, apart from the shipping of St John, are connected with lumbering and with agriculture. The making of paper pulp and of furniture is growing steadily in importance. Co-operation in the manufacture of butter and cheese has produced excellent results, and numerous cheese and butter factories are scattered through the province. In no sense, however, does New Brunswick play an important part in the manufactures of the Dominion.

Communications. — The rivers are still the main arteries of the province. The roads, though improving, are as a rule bad. The main

railway system has since 1876 been that of the Intercolonial, owned and operated by the federal government, by which the province is linked to Nova Scotia on the E. and to the rest of Canada on the W. The Canadian Pacific and the Grand Trunk Pacific also run through the province, and by the Canadian Pacific and the Maine Central it has communication with the United States. Various lines of steamers run, chiefly from St John, to American and other Canadian ports.

History. — Until 1784 New Brunswick formed part, first of the French province of Acadia, later of the British province of Nova Scotia. The first settlement within its borders was made in 1604 by Pierre de Guast, sieur de Monts, with whom was Samuel de Champlain. Their colony at the mouth of the St Croix river was soon abandoned, but throughout the French regime the district was frequented by bands of fur-traders. In 1762 the first English settlement was made at Maugerville on the St John river, and in 1764 a body of Scottish farmers and labourers took up land along, the Miramichi. On the 18th of May 1783 a band of American loyalists settled at the mouth of the St John. Thousands more followed, and in 1784 New Brunswick was declared a separate province. At first governed by a repre- sentative assembly and an irresponsible council, it obtained responsible government in 1847-1848, after a constitutional struggle in which no little ability was shown. In 1867 it entered without reluctance but without enthusiasm into the Canadian Federation. Its economic and educational history, both more important than its political, have been indicated in earlier parts of this article. (For the boundary dispute, see Maine.)

Bibliography. — Sir J. W. Dawson, Acadian Geology (edition of 1891), is the most easily accessible work on the geology of the pro- vince. Numerous studies have been published, chiefly by the Geological Survey of Canada, by L. W. Bailey, R. W. Ells, A. P. Low, and G. F. Matthew. Valuable papers on various provincial

subjects have been published in the Transactions of the Royal Society of Canada by W. F. Ganong. The provincial government issues a yearly volume of sessional papers; Acadiensis, a magazine published in St John, should also be consulted. The earliest account of New Brunswick is given by Nicholas Denys, Description gio- graphique (published Paris, 1672; republished by W. F. Ganong with notes and introduction, 1908); there is no good modern history; R. Montgomery Martin, History of New Brunswick (1837); G. E. Fenety, Political Notes (1867); James Hannay, History of Acadia (1879), and Lives of Wil'mot and Tilley (1907) may be consulted. (W. L. G.)

NEW BRUNSWICK, a city and the county-seat of Middlesex county, New Jersey, U.S.A., on the Raritan river, at the terminus of the Delaware & Raritan canal, about 23 m. S.W. of Newark. Pop. (1890) 18,603, (i9°°), 20,006, of whom 3526 were foreign- born and 755 were negroes; (1910 census) 23,388. It is served by the Pennsylvania and the Raritan River railways, and by daily steamboats to New York. There is a fine stone bridge across the Raritan. In the city are the Wells Memorial Hospital, St Peter's General Hospital, a Carnegie library, a Federal building and a Soldiers'" Monument. New Brunswick is the seat of the Theological Seminary of the Reformed Church in America, the oldest theological school in the United States, founded in 1784 in New York City, situated at Flatbush, Long Island, in 1 796-1810, and removed to New Brunswick in 1810, and of Rutgers College (originally Dutch Reformed, now non- sectarian), which was founded in 1766 as Queen's College, was rechartered in 1770 as a college for " the education of youth in the learned languages, liberal and useful arts and sciences and especially in divinity," was first opened for instruction in 1770, was closed during 1795-1807 and 1816-1825, and was renamed in 1823 in honour of Colonel Henry Rutgers (1745-1830), of New York City, a liberal benefactor. The college embraces two schools: the classical school and the scientific school, which in 1864, in pursuance of the Morrill Act of 1862, was constituted by the state legislature as the state college for the benefit of agriculture and the mechanic arts; a preparatory school is also controlled by its trustees. An agricultural experiment station is maintained in connexion with the college. In 1908-1909 there were 306 students. In 1908 the library of Rutgers College contained 57,000 volumes, and that of the Theological Seminary 48,000 volumes. The city has a variety of manufactures, and the total value of factory products in 1905 was $8,916,983, 54% more than in 1900.

A settlement was made here in 1681, and for a time the place was known as Prigmore's Swamp; later, after John Inian had established a ferry across the river, it was called Inian's Ferry; the present name was adopted in honour of the house of Bruns- wick. New Brunswick received a city charter from the royal governor in 1730, and was chartered as a city by the state legis- lature in 1784. During the War of Independence, General Washington and his army entered New Brunswick on the 28th of November 1776, but on the approach of the enemy evacuated it, and from the 3rd of December 1776 to the 13th of April 1777 it was occupied by the British under Lord Howe. Cornelius Vanderbilt was for several years the proprietor of the Bellona Hotel of New Brunswick, now a tenement house.

NEWBURGH, or Newbtjrg, a city of Orange county, New York, U.S.A.,

on the W. bank of the Hudson river, about 57 m. N. of New York City. Pop. (1800) 23,087, (1900) 24,943, 0I whom 4346 were foreign-born and 558 negroes; (1910, census) 27,805. It is served by the Erie* the West Shore, and — by ferries across the Hudson — the Central New England and the New York Central & Hudson River railways. Across New- burgh Bay, as the expansion of the Hudson at this point is called, is the village of Fishkill, and an electric line connects with the village of Walden (pop. in 1910, 4004), about 12 m. N.W., which has various manufactures, the most important being pocket-knives. The city occupies a commanding position on terraces rising abruptly from the river, and on the fiat plateau above, whence a view may be obtained of the Catskill Mountains to the N.W., of the Highlands of the Hudson to the S. and of the Hudson river for many miles in both directions. Orange Lake, between Newburgh and Walden, is known for its ice

yachting and skating races. Washington Park is in the central part of the city. Downing Park, named in honour of the horti- culturist and landscape gardener Andrew Jackson Downing, (1815-1852), a native of Newburgh, lies on a high plateau overlooking the city and the surrounding country. Among Newburgh's institutions are a public library, St Luke's Hospital, a Children's Home, Mount St Mary's Academy (Roman Catholic) and a business college. In Colden Square there is a statue of Governor George Clinton. Cotton, woollen and silk goods, laces, paper, plaster, plush, felt and felt hats, carpets, engines and boilers, and mill and farm machinery are manufactured, and there are ship and brick yards. In 1905 factory products were valued at $7,142,327, an increase of 33-3% over their value for 1900. Newburgh was first settled in 1 709 by a colony of Germans from the Rhenish Palatinate under their minister, Joshua Kockethal (d. 1719), and was known as "the Palatine Parish of Quassaic." Toward the middle of the century many of the Germans removed to Pennsylvania, and Scottish and English settlers took up their abandoned lands. In 1752 the place was renamed Newburgh, after the town of that name in Scotland, whence many of the new settlers had come. From the spring of 1782 until August 1783 Washington made his headquarters here, occupying the Hasbrouck House (built by Jonathan Hasbrouck between 1750 and 1770), which is still standing in Washington Park, and was bought by the state in 1849. It long contained a collection of historical relics, for which the state has erected a brick building in Washington Park. It was here on the 27th of May 1782 that he wrote

his famous letter of rebuke to Colonel Lewis Nicola (1717-c. 1807), who had written to him on behalf of a coterie of army officers, it is said, suggesting that he assume the title of king. Here, also, Washington made his reply to the so-called ” Newburgh Addresses,” written by John Armstrong, and calling for action on the part of the army to force Congress to redress its grievances. Here the arrangements were completed for the disbandment of the Continental Army, and the centenary of the disbandment was celebrated here on the 18th of October 1883. In commemoration of the disbandment also a monu- ment, known as the ” Tower of Victory ” (53 ft. high, with a life-sized statue of Washington), was erected in Washing- ton Park by Federal and state authorities. Newburgh was incorporated as a village in 1800 and chartered as a city in 1865. The U.S. Geographic Board spells the name Newburg, but the spelling Newburgh is adopted locally and by the U.S. Post Office.

See E. M. Ruttenber, History of the Town of Newburgh (Newburgh, 1859) and History of Orange County (Newburgh, 1872).

NEWBURGH, a royal and police burgh of Fifeshire, Scotland. Pop. (1901) 1904. It is situated on the Firth of Tay, 7 m. N.W. of Ladybank Junction by the North British Railway. Its industries chiefly consist of the making of linen and floorcloth, malting and quarrying, and there are fisheries, especially of salmon. The harbour is used for the transhipment of the cargoes of Perth-bound vessels of over 200 tons. On high ground, about 1 m. S.W., stand the remains (only the pedestal) of Macduff’s Cross, which marks the spot where the clan Macduff — in return for the chief’s services against Macbeth — was granted rights of sanctuary and composition for murder done in hot blood. Denmyln castle, about 15 m. S.E. of Newburgh, was the home for more than 250 years of the Balfour family, of which the two brothers, Sir James (1600-1657), the annalist and Lyon King, and Sir Andrew (1630-1694), founder of the Botanic Garden in Edinburgh, were the most distinguished members. Lindores abbey, the gem of the district, is situated on the Tay, close to Newburgh, and ij m. N. of the village of Lindores. Of the Benedictine abbey, founded in n 78 by David, earl of Hunting- don, brother of William the Lion, there only remain the groined arch of the principal entrance, a portion of the west tower and other Early English fragments, but the ground plan of the whole structure can still be traced. The monks were noted agriculturists and their orchards famous. At Blackearnside, a forest of alders, to the east of the village, Wallace defeated the earl of Pembroke in 1298.

NEWBURN, an urban district in the Tyneside parliamentary division of

Northumberland, England, on the Tyne, 55 m. W. of Newcastle by a branch of the North Eastern railway. Pop. (1901) 12,500. It has collieries, and iron, steel, engineering, tool and fire-clay works, and there is a large industrial population. Newburn is of considerable antiquity. Roman remains have been discovered in proximity to Hadrian's Wall. A church here was destroyed by fire in 1072 in the course of a dispute between two claimants of the earldom of Northumberland. Here in 1640 the Scottish Covenanters planted guns to protect them while fording the river, after which they defeated the English on the Durham side at Stellaheugh, and subsequently occupied Newcastle. The name of Scotswood, one of the manufacturing villages between Newburn and the city, commemorates one of their positions. The district has many associations with the famous engineer George Stephenson, born at Wylam, 3 m. W.

NEWBURY, a market town and municipal borough in the Newbury parliamentary division of Berkshire, England, 53 m. W. by S. of Reading by the Great Western railway. Pop. (1901) 11,061. It is beautifully situated in the narrow well-wooded valley of the Kennet, which is followed by the Kennet and Avon canal. The town has north and south communications by the Didcot, Newbury & Southampton railway (worked by the Great Western company), and is the terminus of the Lambourn Valley light railway. The church of St. Nicholas is a large Perpendicular building of the beginning of the 16th century. It is said to have been built mainly at the charge of John Winchcombe or Smalwoode (Jack of Newbury), an eminent clothier, who, according to the brass to his memory, died in February 1519. A few picturesque old buildings remain in the town, including part of Winchcombe's house and the Jacobean cloth hall, now a public museum. The almshouses called King John's Court are supported by a foundation known as St Bartholomew's Hospital, to which in 1215 King John granted by charter (renewed in 1596 to the corporation) the profits of a fair on St Bartholomew's day (24th of August). Shaw House, on the outskirts of the town to the north-east, is an Elizabethan mansion of brick, dating from 1581; to the north is Donnington castle, retaining a Perpendicular gateway and other fragments. The suburb of Speenhamland was formerly an important posting station on the Bath road. At Sandleford Priory, to the south of Newbury, the site and part of the buildings of an Augustinian priory (c. 1200) were utilized in the erection of a mansion, in 1781, for Mrs Elizabeth Montague. The house- holders of Newbury have the right to elect boys and girls to the educational foundation of Christ's Hospital. The cloth industry is long extinct in Newbury, but large wool fairs are held annually; there is considerable agricultural trade, and there are breweries and flour

mills. A racecourse was opened in the vicinity of the town in 1905, and six meetings are held annually. The borough is under a mayor, 6 aldermen and 18 councillors. Area, 1828 acres.

Newbury (Neubiri, Neubiry) possibly owes its origin to the village of Speen on the other side of the Kennet, which probably marks the site of the Roman station Spinae. The name Newbury (new town or borough) is first mentioned by Odericus Vi talis; it is probable, however, that the manor of Uluritone, entered in Domesday as held by Ernulph de Hesdain and containing fifty- one houses, covered a large part of the site of the town. The manor was subsequently held by the Marshalls, and later by the Mortimers, through whom it passed to the house of York and the crown. It formed part of the dowry of several queens- consort, and was held by Elizabeth before her accession. In 1627 it was granted by Charles I. at a fee-farm to the corporation. Newbury was a borough by prescription; in 1187 its inhabitants are called ” burgesses ” and a document of the time of Edward I. speaks of it as ” burgus.” It was incorporated by a charter of Elizabeth (1596) which was confirmed by Charles I. and Charles II.; a doubtfully valid charter of James II. (1683). Newbury sent two representatives to the parliament of 1302 and delegates to a council held in the reign of Edward III. Newbury early became a centre of the wooDen industry,

but at the beginning of the 17th century this was declining. John Kendrick (d. 1624) left a sum of money to benefit the clothing trade and to ” set the poor on work,” but the result was not what was expected. Elias Ashmole (d. 1629) says: ” Newbury had lost most of its clothing trade, which the naviga- tion of the river Kennet hither, now begun, will probably recover”; the trade, however, was already irrevocably lost. The Weavers’ Company, which still exists, was incorporated in 1 601. In the 18th century a considerable trade was done in corn and malt. Newbury castle, of which traces remained until the 17th century, is said to have been besieged by Stephen in 1152. Newbury was the scene of two battles during the Civil War, in the first of which (1643) Lord Falkland was killed. An important woollen market, established in 1862, is held annually on the first Wednesday in July.

See W. Money, History of Newbury (1887) ; Victoria County History, Berks.

NEWBURYPORT, a city and port of entry and one of the county-seats of Essex county, Massachusetts, U.S.A., on the S. bank of the Merrimac river, about 3 m. above its mouth, and about 38 m. N.N.E. of Boston. Pop. (1890) 13,947; (1900) 14,478, of whom 2863 were foreign-born; (1910 census) 14,949. Area, about 12-85 sq. m. The city is served by two divisions of the Boston & Maine railroad, and by coast and river freight steamers. There are many houses dating back to the 17th century; of these the stone “garrison” house (in Newbury), with walls 4 ft. thick and built in the form of a cross, is an interesting example. Other private houses worthy of mention are the former home’s of ” Lord ” Timothy Dexter and Caleb Cushing, the birthplace of William Lloyd Garrison, and (3ˆ m. from Newburyport in the township of West Newbury) Indian Hill Farm, the birthplace of the journalist Ben Perley Poore (1820-1887), author of Perley’s Reminiscences of Sixty Years in the National Metropolis (1886). Among the public buildings and institutions are the Marine Museum, the Public Library (founded in 1854 by Josiah Little and containing about 45,000 volumes), the old Tracy mansion (built in 1771 or 1772), which forms part of the Public Library building, the Anna Jacques and Homoeopathic hospitals, homes for aged women and men, a Home for Destitute Children, Old South Church, in which is the tomb of George Whitefield, and the Young Men’s Christian Association building, which is a memorial to George Henry Corliss (18 17-1888), the inventor, erected by his widow, a native of Newburyport. The General Charity Society is a benevolent association. The city has a good public school system. The Female High School was opened in 1843 and is said to be the first high school for girls to be established in the United States. The Putnam Free School, now part of the public school system, was endowed early in the 19th century by Oliver Putnam of Newburyport and afterwards of Hampstead, New Hampshire. Three parks, Washington, Cushing and Atkinson, are maintained by the city; and there are a statue of George Washington (1879), by J. Q. A. Ward, one of William Lloyd Garrison by D. C. French, and a memorial to the soldiers and sailors of the Civil War — a bronze statue, ” The Volunteer ” — by Mrs Theo (Ruggles) Kitson. A curious chain suspension bridge across the Merrimac, connecting Newburyport with Amesbury, was built in 1827, replacing a similar bridge built in 1810, which was one of the first suspension bridges in America.

Newburyport in the early part of the 18th century was one of the most prosperous commercial centres in New England. At that time fishing, whaling and shipbuilding were its principal industries, the clipper ships built here being among the fastest and best known on the seas. After the Civil War manufacturing became Newburyport’s chief

interest. In 1905 its factory product was valued at $6,809,979, an increase of 32-5% since 1900; 57-6% was in boots and shoes, and the manufactures of combs and silverware, silversmithing products, cotton goods and electrical supplies are also important.

Newbury, including the site of the present Newburyport, was settled in 1635 by a company under the leadership of the

Rev. Thomas Parker (1595-1677I, who had taught in Newbury, England, in his youth. In 1639 a portion of the territory was set off to form the town of Rowley, and in 1764 about 647 acres were set off and incorporated as the town of Newburyport. In 1 81 9 the town of Parsons (now West Newbury) was formed from Newbury. Newburyport, with its area considerably en- larged, became a city in 1851. During the War of Independence and the War of 1812 it sent out many privateers. In 1811 a fire destroyed 250 buildings, including the greater part of the business portion of the town.

See Caleb Cushing, History and Present State of the Town of New-buryport (Newburyport, 1826); Joshua Coffin, History of Newbury, Newburyport, and West Newbury, 1635-1845 (Boston, 1845) ; Mrs E. V. Smith, History of Newburyport (Boston, 1854) ; D. H. Hurd, History of Essex County (Philadelphia, 1888) ; J. J. Currier, History of Newbury from the First Settlement of the Town to the Beginning of the Twentieth Century (Boston, 1902), History of Newburyport, 1764-1905 (Newburyport, 1906), and Ould Newbury, Historical and Biographical Sketches (Boston, 1898).

NEW CALEDONIA (Fr. Nouvelle-CaUdonie), an island in the western Pacific Ocean, belonging to France. (For map, see Pacific Ocean.) It is about 250 m. long, and has an extreme breadth of 35 m. and an area including adjacent islets of 6450 sq. m.; is situated at the southern extremity of Melanesia, between 20 5′ and 22 16′ S., and between 164 and 167° 30′ E., and, like all the chief islands of that chain and the chain itself, lies north-west and south-east. An almost unbroken barrier reef skirts the west shore at about 5 m. distance, enclosing a navigable channel; on the east, which is more abrupt and precipitous, it is much interrupted. To the north the reefs continue, marking the former extension of the land, for about 160 m., ending with the Huon Islands. The Isle of Pines, so called from its araucarias (its native name is Kunie), geologically a continuation of New Caledonia, lies 30 m. from its south- east extremity. It formerly abounded in sandalwood, and consists of a central plateau surrounded by a belt of cultivation. At the two extremities of New Caledonia, parallel longitudinal ranges of mountains enclose valleys; for the rest the island consists essentially

of confused masses and ranges of mountains, rising to an extreme elevation of 5387 ft., the plains being chiefly the deltas of rivers. The landscape is rich and beautiful, varied with grand rock scenery, the coast-line being broken by numerous small bays, into which flow streams rarely navigable even for short distances, but often skilfully utilized by She natives for irrigation; and sometimes flowing in subterranean channels. The larger rivers in the wet season form impassable morasses, especially in the S.E., where the mountains rise in isolated masses from flat plains.

Geology! — Speaking generally, New Caledonia may be described as a band of Palaeozoic and probably Lower Palaeozoic, rocks, associated doubtless with some Archean beds; this band runs from north-west to south-east, through the whole length of the island. The second element in the composition of the island consists of Mesozoic beds, which occur in a broken band along most of the south-western coast. Most of the island is occupied by the band of the old rocks, which include mica, glaucophane and sericite-schists and slates; there are small intrusions of granite, and numerous dikes and masses of basic eruptive rocks. The slates are inter- bedded with limestones containing fossil brachiopods, which have led to their determination as Silurian or Devonian; but L. Peletan classes all these limestones as Triassic. Triassic beds of the Pacific coastal type occur in a band along the south-western coast. They are covered by marine Jurassic beds and they in turn by Cretaceous coal-bearing, terrestrial deposits, resembling those of New Zealand. According to E. Glasser, the basic igneous rocks which are associated with the mineral deposits of New Caledonia were intrusive in Cainozoic times, at the severing of the connexion between New Caledonia and New Zealand. New Caledonia is part of the Australasian Festoon, and in its general characters resembles the geology of New Zealand. The main mineral deposits are the nickel ores, occurring as veins of garnierite, associated with peridotite dikes, in the ancient rocks of the eastern slope of the island.

1 The basis of knowledge of the geology of New Caledonia was laid by Gamier, Ann. des Mines, ser. 6, vol. xii. (1867). Later accounts are by E. Glasser, ” Les Richesses minerales de la Nouvelle Caledonie,” Ann. des Mines, ser. 10, vol. iv. mem. pp. 299-392, pi. xi., and vol. v. mem. pp. 29-54, 503-701, pi. ii. and xii. (1904); and by L. Peletan, Les Richesses minerales des colonies frangaises (Paris, 1902),

Climate, Flora, Fauna.- — The hottest and wettest months are from December to March, but there is usually a fresh trade-wind blowing and the climate is healthy. There is much less moisture, and the flora is of a less tropical character than farther north ; it has some Polynesian and New Zealand affinities, and on the west coast a partially Australian character; on the higher hills it is stunted; on the lower, however, there are fine grass lands, and a scattered growth of niaulis {Melaleuca viridiflora), useful for its timber, bark and cajeput oil. There is a great variety of fine timber trees. The bread-fruit, sago, banana, vanilla, ginger, arrowroot and curcuma grow wild. The cocoa nut, maize, sugar-cane, coffee, cotton, rice and tobacco (which last does not suffer like other crops from the locusts) do well. The orange, indigo, lucerne and European vege- tables are grown. Mammals are very few; they include the rat and Pteropus and other bats. The commonest birds are pigeons (the large notou and other varieties), doves, parrots, kingfishers and ducks. The kagu (Rhinochetus jubatus), a peculiar ” wingless ” bird, is found here only. Turtle abound on the coast, and fish, of which some kinds, as the tetrodons (globe-fish), are poisonous, especially at certain seasons. Land and marine molluscs are numerous, and include various edible kinds.

Population. — At the census of 1901 the population of New Caledonia numbered 51,415, consisting of 12,253 free Europeans (colonists, soldiers, officials), 29,106 natives, 10,056 convicts. In 1898, however, the introduction of convicts into the island ceased. The centres of population are Noum6a (Numea), the capital, on a fine harbour of the west coast near the southern extremity of the island, with 7000 inhabitants; Bourail, an agricultural penitentiary (1800); La Foa, in the centre of the coffee plantations; Moindu, St Louis and St Vincent.

The natives, whom the French call Kanakas (Canaques, a word meaning ” man,” applied indiscriminately to many Pacific peoples), live on reservations. They are Melanesians of mixed blood, of two fairly distinct types, one sub-Papuan and the other Polynesian. Of the first the physical characteristics are a small, thin-limbed body, hair black, short and woolly, projecting jaws, rounded, narrow, retreating forehead, long and narrow head, enormous eyebrow ridges, flat nose and dark skin. The second type is characterized by a lighter skin, some- times of a reddish-yellow, longer, less woolly hair, body taller with better-proportioned limbs, and head broader. This is the prevailing type in the east and south of the island. There is nowhere a real defining line between the two (many New Caledonians having black skins and woolly hair with Polynesian superiority of limb), but the Polynesian type is generally found among the chiefs and their kindred.

Both sexes among the natives pierce the lobes of the ear for ornaments. Tattooing is almost entirely confined to the women. Both sexes go naked, or with the scantiest loin-cloth. Their huts are usually beehive-shaped, with a single apartment, low narrow door, and no chimney. There are various degrees of hereditary chiefships, and a supreme chief recognized by all. As in some other Pacific islands, when a son is born the chiefship passes to him, but the father continues to govern as regent. All property descends to the eldest son by birth or adoption, though custom demands that the younger members of the family should have a share. The people have to work on the chief's plantations and fisheries, and also work in parties for each other, breaking up new land, &c. This often ends in feasting and in dances (pilu pilu), which include allegorical repre- sentations of events or ideas. The supreme chief's authority is limited by the advice of a council of elders, whom he is obliged to summon in certain emergencies. The standard of morality is low; women are practically slaves, and infanticide was formerly common.

The Kanakas are excellent agriculturists, being accounted superior in this matter to every other race of the Pacific. About the middle of the 19th century the indigenous population was 60,000. Returns for 1904 showed that this had fallen to rather less than half.

The languages of the different tribes are mutually unintelligible. They express abstract ideas imperfectly. Thus there are several words for eating, each applied to a particular article of food. Their reckoning shows the same peculiarity. The numbers go up to five, and for living objects the word bird is added, for inanimate yam, for large objects ship. 1 There are other terms for bundles of sugar- canes, rows (planted) of yams, &c. ; and sometimes things are counted by threes. Ten is two fives, 15 three fives, 20 is a " man " (ten fingers and ten toes), 100 is " five men," and so on.

Administration and Industries. — The colony is administered by a governor, who exercises military power through a marine infantry colonel, and civil power with the assistance of a privy

1 A similar usage exists in Malay; see paper by Yule in Jour. Anthrop. Inst. ix. 290.

council, a director of the interior, a judicial head, and a director of the penitentiary administration. There is also an elective general council. Noumea is the seat of a superior tribunal, a tribunal of first instance, and a tribunal of commerce. The island and its dependencies are divided into five arrondissements. Noumea alone has (since 1879) a

municipality, other localities being administered by commissions. There are about 1600 sq. m. of cultivable lands in the alluvial valleys, where coffee, maize, tobacco, sugar-cane, the vine, vegetables, potatoes, and some of the cereals are grown with success. Coffee was introduced about 1870, and has prospered well. Cheap agri- cultural labour is supplied by the convicts, by the liberated convicts, the Kanakas, and (to some extent) labourers from the New Hebrides. The soil is in three domains: that of the state, for the working of which concessions may be granted; that of the penitentiary administration; and that of the native reserve. Many horses, cattle and sheep have been imported, and the meat-preserving industry is prosecuted. Gold is found in the valley of the Diahot, as well as lead and copper at Balade. Iron is found everywhere. The yearly output of nickel and chrome is considerable, and these minerals, with cobalt, constitute the characteristic wealth of the island. Coal has been worked near Noumea, and kaolin is found in places. Gypsum and marble also deserve mention. The chief industrial establish- ments are smelting furnaces for cobalt, meat-preserving works at Ouaco, sugar-works and distilleries at Noumea and La Foa, tobacco, oil and soap factories at Noumea. The commerce in 1888 amounted to £480,000, of which £200,000 represented the trade with France. In 1900 the total had risen to £820,000, of which £480,000 was for imports and £340,000 for exports, the share of France in that year having been 45% of imports and 47 % of exports. The island imports wines, spirits, tissues, clothing and ironmongery; and exports ores, nickel, cobalt and chrome (which represent over three-quarters of the total exports in value), preserved meats and hides, coffee, copra and other colonial produce. There are about 150 m. of carriage roads, and in' the mountainous regions there are many footpaths. A railway running north-westward from Noumea to Dumb6a, &c, is designed to connect the capital with Bourail. The islands annexed to the colony of New Caledonia are the Isle of Pines, used as a place of detention for habitual criminals: the Loyalty Islands (q.v.), E. of New Caledonia; the Huon Islands, a practically barren group ; the Wallis Archipelago (q.v.) ; and Futuna and Alofa, S. of the Wallis group.

History. — New Caledonia was discovered by Captain Cook in 1774. He touched at the haven of Balade (the original name of the island) near the north-western extremity, as did d'Entre- casteaux in 1793, who closely explored the coast and surrounding seas. They subsequently became known to sealers and traders in sandalwood, who, however, established no friendly relations with the natives. In 1843 French missionaries arrived at the island, and it was claimed for France, but on British representa- tions the claim was renounced. In

1851 a landing party from a French vessel lying at Balade was attacked by the natives, and massacred with the exception of a single member. France was now determined on the annexation, and the flag was raised at the same spot in 1853, but simultaneously the commander of a British vessel was in negotiation with the native chief of the Isle of Pines, and the British flag was hoisted there. The chief, however, subsequently sided with the French, and the British claim was finally withdrawn. The capital, Noumea, was founded in 1854 (it was then called Port de France); in i860 New Caledonia became a colony distinct from the French possessions in the Pacific at large; in 1864 the first penal settle- ment was made on Nou Island, off Noumea. In 1878 there was a serious native insurrection, and another in 1881 was only put down after much bloodshed.

See H. Riviere, Souvenirs de la Nouvelle-CaUdonie: V insurrection canaque (Paris, 1881); Gallet, La Nouvelle-Caledonie (Noumea, 1884); Cordeil, Origines et progres de la Nouvelle-Caledonie (Noumea, 1885); C. Lemire, La Colonisation . . . en Nouvelle-Caledonie (Paris, 1878); Ibid. (Noumea, 1893); Voyage a pied en Nouvelle- Caledonie (Paris, 1884); M. A. Legrand, Au pays des Canaques

(Paris, 1893); Moncelon, Le Bagne et la colonisation penale d, la Nouvelle-Caledonie (Paris, 1886); A. Bernard, L'Archipel de la Nouvelle-Caledonie (Paris, 1895) ; Nouvelle-Caledonie, ses richesses, son avenir (Paris Exhibition, 1900) ; G. Griffith, In an unknown Prison Land (London, 1901); Carol, La Nouvelle-CalSdonie miniere et agricole (Paris, 1900) ; Vallet, La Colonisation francaise en Nouvelle-CaUdonie (Paris, 1905).

NEWCASTLE, DUKES OF. Within the space of a century there were no less than four successive creations of dukes of Newcastle in the British peerage. William Cavendish (see below), nephew of the 1st earl of Devonshire, was raised to the dignity of duke of Newcastle-upon-Tyne in 1665. His son and successor Henry (1630-1691) died leaving daughters only, and one of these married John Holies (1662-1711), earl of Clare, who was created duke in 1694. This duke died also without male issue, leaving his estates to his sister's son, Thomas Pelham (see below), who, with other dignities, had the title of duke of Newcastle-upon-Tyne conferred on him in 1715, and a second and similar ducal title (that of Newcastle-under-Lyme) in 1756. The first dukedom became extinct at his death, but the second title was granted

him with remainder to Henry Fiennes Clinton, earl of Lincoln, at once his nephew and nephew-in-law. From his heir, who ranks as the 2nd duke, Henry Fiennes Clinton (1720-1794), the dukedom passed through father and son from Thomas Pelham Clinton (d. 1795), Henry Pelham Fiennes Pelham Clinton (1785-1851), Henry Pelham Fiennes Pelham Clinton (1811-1864), Henry Pelham Alexander (1834-1879), to the 7th duke, Henry Pelham Archibald Douglas Pelham Clinton (b. 1864). The three principal dukes are more fully noticed below.

1. William Cavendish, duke of Newcastle (1592-1676),

eldest surviving son of Sir Charles Cavendish and of Catherine,

daughter of Cuthbert, Lord Ogle, and grandson of Sir William

Cavendish and ” Bess of Hardwick,” was born in 1592 and

educated at St John’s College, Cambridge. On the occasion of

the creation of Prince Henry as prince of Wales in 1610 he was

made a knight of the Bath, subsequently travelled with Sir

Henry Wotton, then ambassador to the duke of Savoy, and on

his return married his first wife, Elizabeth, daughter of William

Basset of Blore, Staffordshire, and widow of Henry Howard,

3rd son of the earl of Suffolk. His fortune was immense, and he

several times entertained James I. and Charles I. with great

magnificence at Welbeck and Bolsover. On the 3rd of November

1620 he was created Viscount Mansfield, on the 7th of March

1628 earl of Newcastle, and in 1629 the barony of Ogle was

restored to his mother, this title, together with an estate of

£3000 per annum, descending to him. In 1638 he was made

governor of the prince of Wales, and in 1639 a privy councillor.

When the Scottish war broke out he assisted the king with a

loan of £10,000 and a troop of volunteer horse, consisting of

120 knights and gentlemen. In 1641 he was implicated in the Army Plot, and in consequence withdrew for a time from the court. He was sent by Charles on the nth of January 1642 to seize Hull, but was refused admittance. When the king declared open war, Newcastle was given the command of the four northern counties, and had the power conferred on him of making knights. He maintained troops at his own expense, and having occupied Newcastle kept open communications with the queen, and despatched to the king his foreign supplies.

In November 1642 he advanced into Yorkshire, raised the siege of York, and compelled Fairfax to retire after attacking him at Tadcaster. Subsequently his plans were checked by the latter's recapture of Leeds in January 1643, and he retired to York.

He escorted the queen, who returned from abroad in February, to York, and subsequently captured Wakefield, Rotherham and Sheffield, though failing at Leeds, but his successes were once more ravished from him by Fairfax. In June he advanced again, defeated the Fairfaxes to Adwalton Moor on the 30th of June, and obtained possession of all Yorkshire except Hull and Wressel Castle. He might now have joined the king against Essex, but continued his campaign in the north, advancing into Lincolnshire to attack the eastern association, and taking Gainsborough and Lincoln. Thence he returned to besiege Hull, and in his absence the force which he had left in Lincolnshire was defeated at Winceby by Cromwell on the nth of October 1643, which caused the loss of the

whole county. On the 27th of October 1643 he was created a marquis. Next year his position was further threatened by the advance of the Scots. Against prevailing numbers he could do little but harass and cut off supplies. He retreated to York, where the three armies of the Scots, Fairfax and Manchester surrounded him. On the 1st of July Rupert raised the siege, but on the next day threw away his success by engaging the three armies in battle, contrary to Newcastle's desire, at Marston Moor. After this disaster, notwithstanding the entreaties of the king and the remonstrances of Rupert, Newcastle immediately announced his intention of abandoning the cause and of quitting England. He sailed from Scarborough accompanied by a considerable following, including his two sons and his brother, resided at Hamburg from July 1644 to February 1645, and removed in April to Paris, where he lived for three years. There he married as his second wife Margaret (see below), daughter of Sir Thomas Lucas of St John's, Colchester. He left in 1648 for Rotterdam with the intention of joining the prince of Wales in command of the revolted navy, and finally took up his abode at Antwerp, where he remained till the Restoration. In April 1650 he was appointed a member of Charles II. 's privy council, and in opposition to Hyde advocated the agreement with the Scots. In Antwerp he established his famous riding-school, exercised " the art of manage," and published his first work on horsemanship, Methode et invention nouvelle de dresser les chevaux (1658, 2nd ed., 1747; translated as A General System of Horse- manship, 1743).

At the Restoration Newcastle returned to England, and succeeded in regaining the greater part of his estates, though burdened with debts, his wife estimating his total losses in the war at the enormous sum of £941,303. He was reinstated in the offices he had filled under Charles I.; was invested in 1661 with the Garter which had been bestowed upon him in 1650, and was advanced to a dukedom on the 16th of March 1665. He retired, however, from public fife and occupied himself with his estate and with his favourite pursuit of training horses. He established a racecourse near Welbeck, and published another work on horse- manship, A New Method and Extraordinary Invention to Dress Horses and Work them according to Nature . . . (1667). He wrote also several comedies, The Country Captain and TheVarietie (1649), The Humorous Lovers and The Triumphant Widow (1677). With Dryden's assistance he translated Moli&re's L'Etourdi as Sir Martin Mar-All (1688). He contributed scenes to his wife's plays, and poems of his composition are to be found among her works; and he was the patron of Jonson, Shirley, Davenant, Dryden, Shadwell and Flecknoe, and of Hobbes, Gassendi and Descartes. He died on the 25th of December 1676, and was buried in Westminster

Abbey. By his first wife he had ten children, of whom one son, Henry, survived him and became 2nd duke of Newcastle, dying in 1691 without male issue; the title then became extinct and the estates passed to his third daughter Margaret, wife of John Holies, earl of Clare, created duke of Newcastle in 1694.

As a commander in the field Clarendon spoke contemptuously of Newcastle as ” a very lamentable man, and as fit to be a general as a bishop.” 1 It can hardly be denied, however, that his achievements in the north were of great military value to the king’s cause. For politics he had no taste, and adhered to the king’s cause merely from motives of personal loyalty, from hatred of ” whatsoever was like to disturb the public peace,” and because the monarchy ” was the foundation and support of his own greatness.” Even Clarendon concedes that he was ” a very fine gentleman,” which is perhaps the best summary of his character.

His second wife, Margaret, duchess of Newcastle (c. 1625- 1673), had been maid of honour to Henrietta Maria, and after she married the duke in 1645 they continued to cherish a mutual admiration of a very exaggerated character, each regarding the other as endowed with transcendent merits both of person 1 Calendar of Clarendon Papers, ii. 63.

and mind. The duchess cultivated literary composition with exuberant fervour, and kept a bevy of maids of honour obliged to be ready at all hours ” to register her Grace’s conceptions.” Walpole speaks of her as a ” fertile pedant ” with an ” unbounded passion for scribbling”; and, although giving evidence of learning, ingenuity and imagination, her writings are fatally marred by a deficiency in judgment and self-restraint. She is best known by the Life she wrote of her husband, originally printed by A. Maxwell at London in 1667. She also published Philosophical Fancies (1653): Poems and Fancies (1653); The World’s Olio (1655) ! Nature’s Picture drawn by Fancie’s Pencil to the Life, which includes an autobiography (1656); Philosophical and Physical Opinions (1655); Orations (1662); Plays (1662); Sociable Letters (1664); Observations upon Experimental Philo- sophy (1666); Letters and Poems (1676).

The Life of William Cavendish, Duke of Newcastle, by Margaret, duchess of Newcastle, has been edited by C. H. Firth (1886); it was

criticized by Pepys as ” the ridiculous history of my Lord Newcastle writ by his wife, which shows her to be a mad, conceited, ridiculous woman, and he an ass to suffer her to write what she writes to him and of him,” but on the other hand eulogized by Charles Lamb as a work for which ” no casket is rich enough, no case sufficiently durable to honour and keep soft such a jewel. See also La Duchesse et le Due de Newcastle, by fimile Montegut (1895). The duchess’s Select Poems were edited by Brydges in 1813, and her Autobiography in 1814. The latter, edited by Lower, was published along with her Life of the Duke of Newcastle in 1872.

2. Thomas Pelham Holles, duke of Newcastle (1693-1768), whose official life extended throughout the Whig supremacy of the 1 8th century, was the elder son of Thomas, first Lord Pelham, by his second wife Lady Grace Holies, younger sister of John Holies, duke of Newcastle-on-Tyne, who died in 171 1, and left the whole of his vast estates to him. In 171 2 he also succeeded his father in his peerage and estates, and in 1714, when he came of age, was one of the greatest landowners in the kingdom. He vigorously sustained the Whig party at Queen Anne’s death, and had much influence in making the Londoners accept King George. His services were too great to be neglected, and in 17 14 he was created earl of Clare, and in 1715 duke of Newcastle-on-Tyne. He also became lord-lieutenant of the counties of Middlesex and Nottingham and a knight of the Garter in 1 7 1 8, in which year he increased his Whig connexion by marry- ing Lady Henrietta Godolphin, granddaughter of the great duke of Marlborough. In 1717 he first held political office as lord chamberlain of the household, and in 1724 was chosen by Sir Robert Walpole to be secretary of state in place of Lord Carteret. This office he held continuously for thirty years (1724-1754), and only changed it for the premiership on his brother’s death. His long tenure of office has been attributed to his great Whig connexions and his wealth, but some praise must be given to his inexhaustible activity and great powers of debate. He was a peculiarly muddle-headed man, and unhappy if he had not more to do than he could possibly manage, but at the same time he was a consummate master of parliamentary tactics, and knew how to manage the Houses of Lords and Commons alike. Lord Hervey {Memoirs) compares him with Walpole in 1735, and says: ” We have one minister that does everything with the same seeming ease and tranquillity as if he were doing nothing; we have another that does nothing in the same hurry and agita- tion as if he did everything.” He continued in office on Walpole’s fall in 1742, and became more powerful on his younger brother Henry becoming prime minister in 1743. On Henry Pelham’s death in March 1754, Newcastle succeeded

him as premier; but people who had been accustomed to him as secretary of state would not stand him as premier, and in November 1756 he gave place to the duke of Devonshire. For his long services he was created duke of Newcastle-under-Lyme, with remainder to Henry Fiennes Clinton, 9th earl of Lincoln, who had married his niece Catherine Pelham. In July 1757 he again became prime minister — for Pitt, though a great statesman, was a bad party leader — on the understanding, according to Horace Walpole, that ” Mr Pitt does everything, the duke gives everything.” Under this ministry England became famous abroad, but it gradually fell before the young king’s affection for Lord Bute,

who, after supplanting Pitt, became prime minister in the room of Newcastle in May 1762. The duke went into strong opposition, and lost his two lord-lieutenancies for opposing the peace of 1763. In 1765 he became lord privy seal for a few months, but his health was fast giving way, and he died in November 1 768. The duke was certainly not a great man, but he was industrious and energetic, and to his credit be it said that the statesman who almost monopolized the patronage of office for half a century twice refused a pension, and finally left office £300,000 poorer than he .entered it.

See Memoirs of the Administration of the Right Hon. H. Pelham, by W. Coxe (1829).

3. Henry Pelham Fiennes Pelham Clinton, 5th duke of Newcastle (1811-1864), the eldest son of Henry, the 4th duke, was educated at Eton and at Christ Church, Oxford, where he’ graduated in 1832. He was member of parliament for South Nottinghamshire from 1832 to 1846, when he became member for the Falkirk Burghs, retaining this seat until he became duke of Newcastle in January 1851. As earl of Lincoln he was first commissioner of woods and forests from 1841 to February 1846, when he was appointed chief secretary to the lord-lieutenant of Ireland, but the ministry fell in June of the same year. In 1852 Newcastle became secretary for war and the colonies under the earl of Aberdeen, and when, after the outbreak of the Crimean War, a separate war department was constituted, he was placed in charge of it. As secretary for war he was regarded as being largely responsible for the terrible hardships which befell the British troops in the Crimea in the winter of 1854, and as the result of a vote of censure he left office with his colleagues in January 1855. He was secretary for the colonies from 1859 to 1864, and died on the 18th of October 1864, being succeeded as 6th duke by his eldest son, Henry Pelham Alexander.

See J. Martineau, The Life of Henry Pelham, 5th Duke of Newcastle

(1908).

NEWCASTLE, a seaport of Northumberland county, New South Wales, Australia, at the mouth of the Hunter river, 102 m. by rail and 62 m. by sea N. by E. of Sydney, in 32 55′ S., 151° 49′ E. Newcastle is the second city in New South Wales, the fourth port of Australia, and the seat of an Anglican bishop. The city rises steeply from the sea, and possesses numerous fine buildings, among which may be mentioned the railway station, post office, custom-house, the cathedral of Christ Church, the school of art with its large library, and the Victoria Theatre. There are also two state-subsidized hospitals, a college, a school of mines, a technological museum, several large and handsome churches, and numerous subsidized charitable institutions. Communication between the different parts is maintained by tramways, and steam ferry-boats ply between the city and its suburbs on the shores of the harbour. The industries include brewing, shipbuilding, copper and iron-founding, carriage- building and fellmongery; there are boot factories, engineering works, biscuit factories and smelting works at Cockle Creek. There is also a large trade in frozen meat. There are numerous coal mines in the vicinity, yielding coal of the finest quality. Newcastle has a fine harbour, with an area of 540 acres, protected by two breakwaters; the breadth of the channel at its entrance is 1 200 f t. , and the depth at the bar is 2 5ˆ ft. Vessels of the largest tonnage can enter and lie alongside of the wharves, which are S m. in extent, equipped with travelling cranes, hydraulic and steam cranes, lighted by electric light and connected with the Great Northern railway by a branch line. There is a floating dock to lift ‘2000 tons, and at Stockton there is a patent slip to take large vessels for repair. The facilities for the shipment of coal are excellent, and Newcastle is the chief coaling port in the southern hemisphere. The harbour is protected by two forts, Fort Scratchley, the strongest in Australia, and Shepherd’s Hill Fort. The city exports coal, wool, coke, horses, cattle, frozen meat, silver, lead, copper, tallow, hides and country produce. Newcastle returns three members to the legislative council and six members to the legislative assembly. Most of the suburbs are separate municipalities, namely, Stockton, Carrington, I Wickham, Hamilton, Merewether, Adamstown, Waratah, New

Lambton, Lambton, Wallsend and Plattsburg. The population of the municipality of Newcastle is 14,250; of the town and suburbs about 70,000.

The mouth of the Hunter river (named after Governor John Hunter), now known as Newcastle Harbour, was discovered in 1 797 by Lieutenant John Shortland, who accompanied Hunter to New South Wales. For many years after its discovery it was used as a convict station. It became a free settlement in 182 1, and in 1859 was erected into a municipality. The centenary of the landing of Shortland was celebrated in 1897, when a monu- ment commemorating the' event was erected.

NEW CASTLE, a city of New Castle county, Delaware, U.S.A., in the northern part of the state, at the head of Delaware Bay, on a high point of land extending into the Delaware river, 6 m. south of Wilmington. Pop. (1890) 4010; (1900) 3380 (315 foreign- born); (1910) 3351. It is served by the Philadelphia, Baltimore & Washington (Pennsylvania System), and (via Wilmington) the Baltimore & Ohio railways, and by steamship lines connecting with Baltimore, Philadelphia and river ports. The " old " county court house, possibly built by the Swedes, is in New Castle; and there are a public Ebrary, the Immanuel Protestant Episcopal Church (partly built in 1689), and several residences of Dutch and colonial types. The city has a good harbour and an excel- lent river front for manufacturing sites and for shipping; it is included in the customs district of Wilmington. Its industrial establishments include shipyards, rolling mills and steel works, flour-mills, and manufactories of cotton and woollen goods. The shad fisheries are of some importance. In 1651 Governor Peter Stuyvesant of New Netherland established near the place Fort Casimir, as the first determined move in his aggressive policy against the Swedes, who had settled in this vicinity about 1640. The Swedes captured the fort in 1654, but this precipitated the crisis in which New Sweden (Delaware) was lost to the Dutch in 1655. Fort Casimir (renamed Fort Amstel) was made the seat of government of the local Dutch possessions, and in 1657 was placed under the jurisdiction of the City of Amsterdam, under which it remained, though prospering little — disease, famine and fears of English attack causing most of the inhabit- ants to leave in 1658 and 1659 — until just before the English seized the settlements in Delaware in 1664. Under the English the name was changed to New Castle, and trade and commerce prospered; and an arc with a radius of 12 m., having the New Castle court house as a centre, became the northern boundary of the " counties on the Delaware." New Castle was frequently the meeting place of the colonial legislature, and after the legislative separation of Delaware

from Pennsylvania in 1704 it was the seat of administration of the colony until 1777. It was chartered as a city in 1875.

NEWCASTLE, a seaside resort of Co. Down, Ireland, finely situated on the western shore of Dundrum Bay, at the foot of Slieve Donard, the highest eminence of the Mourne Mountains. Pop. (1901) 1553. It is the terminus of the Belfast and County Down railway, being 36 m. S. of Belfast; and is also served by a branch of the Great Northern railway. A fort guarded the passage of the river Shimna here in early times, but the town is entirely modern. The sandy shore affords good bathing, there is a small spa, and the scenery of the Mournes is fine. The demesnes of Donard Lodge and Bryansford are of great beauty. The golf links of the County Down Club here are well known.

NEWCASTLE, a city and the county-seat of Lawrence county, Pennsylvania, U.S.A., on the Shenango river, at the mouth of Neshannock Creek, about 50 m. N.N.W. of Pittsburg. Pop. (1890) 11,600; (1900) 28,339, 5324 being foreign-born and 463 negroes; (1910) 36,280. It is served by the Pennsylvania, the Erie, the Baltimore & Ohio, the Buffalo, Rochester & Pittsburgh, and the Pittsburgh & Lake Erie railways. Cascade Park, in the neighbourhood, is a pleasure resort. The surrounding country, with which the city has an extensive trade, is well adapted to agriculture, and abounds in bituminous coal, iron ore, limestone, sandstone and fire-clay. In 1905 the city ranked fifth among the cities of the state in the value of its factory product, and of its products (valued at $29,433,635, an increase of 47-1%

since 1900) iron and steel, and tin and terne-plates were the most important. Newcastle was founded in 1802, became a borough in 1869, and was first chartered as a city in 1875, its charter being revised in 1887.

NEWCASTLE-UNDER-LYME, a market town and municipal and parliamentary borough of Staffordshire, England, 2 m. W. of Stoke-upon-Trent by the North Staffordshire railway. Pop. (1901) 19,914. The parish church of St Giles was rebuilt in 1873-1876 by Sir Gilbert Scott, with the exception of the tower, which dates from the 12th century. The free grammar school, originally founded in 1602, possesses large endowments, increased by the amalgamation of various subsequent bequests for educa- tional purposes, and now consists of high and middle schools for boys and Orme's school for girls. There is also a school of art included with a free library in handsome municipal buildings. The manufacture of hats was once the staple trade, but it has declined. There are cotton and paper mills; and

tanning, brewing, malting and the manufacture of army clothing are carried on. In the neighbourhood there are large collieries, as at Silverdale and elsewhere. Partly included in the parliamentary borough is the populous parish of Wolstanton, of which the fine church, well placed on high ground, has good details of the 13th century, with a massive tower and spire. The mining town of Audley lies 4. m. N.W., with a fine early Decorated church. Newcastle-under-Lyme is governed by a mayor, 6 aldermen and 18 councillors. Area, 671 acres.

Newcastle-under-Lyme (Neofchastell-sur-Lyme, Newcastle- under-Lyme) is not mentioned in Domesday, but it must early have become a place of importance, for a charter, known only through a reference in a charter to Preston, was given to the town by Henry II. The town owes its name to a castle built here in the 12th century to supersede an older fortress at Chester- ton about 2 m. to the north, of which the ruins were to be seen in the 16th century, and to the fact that it was situated under the forest of Lyme. Henry III. (1235) constituted it a free borough, granting a gild merchant and other privileges;" in 1251 he leased it at fee-farm to the burgesses; the governing charter in 1835 was that of 1590 enlarged by that of 1664, under which the title of the corporation was the " mayor, bailiffs and burgesses of Newcastle-under-Lyme." Newcastle, which was originally held by the crown, was granted (1265) to Simon de Montfort, and subsequently to Edmund Crouchback, through whom it passed to Henry IV. In Leland's time the castle had disappeared "save one great Toure"; in the 17th and 18th centuries the town was flourishing and had a manufacture of hats. The market was originally held on Sunday; in the reign of John it was changed to Saturday; by the charter of Elizabeth it was fixed on Monday. Markets are now held on Monday, Wednes- day and Saturday. Grants of fairs were given by Edward I., Edward III. and Henry VI. Up to the time of the passing of the Municipal Reform Act the farce of electing a mock mayor was gone through annually after the election of the real mayor. Newcastle sent two members to parliament from 1355 to 1885, when it lost one representative.

See Victoria County History, Stafford; T. Ingamells, Historical Records and Directory of Newcastle-under-Lyme.

NEWCASTLE-UPON-TYNE, a city and county of a city, municipal, county and parliamentary borough, and port of Northumberland, England, 272 m. N. by W. of London, on the North-Eastern railway. Pop. (1891) 186,300; (1901) 215,328. It stands on the N. bank of the Tyne, which is here high and steeply inclined above the river. The mouth of the river into the North Sea is 8 m. below Newcastle and its

banks are lined with docks and industrial towns, while its narrow waters are crowded with traffic.

Though Newcastle owes its origin to a Roman station at a bridge over the river, its modern growth has largely destroyed traces of antiquity. Of the old walls which, according to Leland, ” for .strength and magnificence far surpassed all the walls of the cities of England and of most of the towns of Europe,” and the circuit of which was 2 m. 239 yds., there are slight remains, although the fortifications were allowed to go into disrepair

after the union of Scotland and England. The castle, from which the town takes its name, stood on a slight elevation rising abruptly from the river, and was erected by Henry II. between 1 172 and 1 1 77 on the site of an older structure built in 1080 by Robert, eldest son of the Conqueror. It was originally the strongest fortress in the north of England, and its keep is now one of the finest specimens of the Norman stronghold remaining in the country. While it was still incomplete, William the Lion was led within its walls after his capture at Alnwick; and within its great hall Baliol, on the 26th of December 1292, did homage for the crown of Scotland to Edward I. The area of the castle within its outer walls and fosse was 3 acres. Fragments of these walls, with the principal entrance or Black Gate (portions of which are, however, of later construction) and the Watergate or southern postern remain, but the inner wall surrounding the keep has been entirely removed. The massive keep, with walls 14 ft. thick, is in a state of good preservation, as is also the chapel, a beautiful specimen of late Norman style. The castle was purchased by the corporation in 1809, and is under the charge of the Newcastle Society of Antiquaries, which uses a portion of it as an antiquarian museum. Near the castle is St Nicholas church, forming the cathedral of the diocese of New- castle, instituted in 1882. The diocese covers practically the whole of Northumberland, with a very small portion of Cumber- land. The church, which is principally Decorated, consists of nave, aisles, chancel and transepts, the total length of the interior from east to west being 245 ft., and the width at the transepts 128 ft. The principal feature of the church is the lantern tower, a later addition and a very fine specimen of early Perpendicular. Among other interesting old churches is St Andrew’s church, erected in the nth century, and retaining Norman characteristics, with a low square tower and a peal of six bells. During the siege by the Parliamentary

army in 1644 it was greatly damaged. St John's church is a building of the 14th century with an ancient front. Of the nine conventual buildings at one time existing in Newcastle or its immediate neighbourhood, a few fragments of the monastery of the Black Friars remain, and the chapel of the hospital of St Mary at Jesmond forms a picturesque ruin. There are a number of quaint Elizabethan houses in the steep street called the Side, and in the Sandhill at its foot.

Some of the modern streets of Newcastle are spacious and handsome. The most noteworthy are Grey Street, in which a complete scheme of Grecian architecture is followed, and Grainger Street. This thoroughfare is named after Richard Grainger (1798-1861), a wealthy local architect who devoted himself to the beautifying of his city with remarkable energy. Of numerous modern churches may be noted that of St George, Jesmond, a landmark for a great distance and finely decorated within, and the Roman Catholic cathedral of the diocese of Hex- ham and Newcastle. The most important public buildings are the corporation buildings, including a large public hall, and a corn exchange; the guildhall, originally a hospital called the Maison de Dieu, and afterwards used as " the stately court of merchant adventurers," re-erected in 1658; the moot-hall (1810) for the meetings of assizes and sessions and the transaction of county business; the exchange (i860); the central newsroom and art gallery (1838); the Wood memorial hall (1870), used for the meetings of the North of England Institute of Engineers; and the custom-house. The Grey monument in Grey Street, an Ionic column surmounted by a statue of Earl Grey, was erected in 1836 to commemorate the passing of the Reform Bill; the Stephenson monument near the railway station was erected in 1862; a marble statue of Queen Victoria in front of the Royal Victoria Infirmary was unveiled in 1906, and a bronze statue of the queen in 1903 in the cathedral square.

Among educational establishments the chief are the colleges of medicine and of physical science of the university of Durham; the first granting degrees in medicine and surgery; the second, with which the school of art is incorporated, degrees in science and literature. The college of science, or Armstrong College as it is called in commemoration of the first Lord Armstrong, was founded in 1871; the north-east wing was opened in 1888;

further parts of the building in 1894, and the west wing by King Edward in 1906. The royal free grammar school, founded in 1525, occupies modern buildings in Jesmond. There should be mentioned also Allan's endowed schools, founded in 1705, and reorganized by the charity commissioners in 1877; and Ruther- ford College and the

Commercial Institute, providing technical and commercial education. The Laing Art Gallery was erected and presented to the city by Alexander Laing, and opened in 1904. Among clubs and similar institutions are the Literary and Philosophical Society, founded in 1793, the Society of Anti- quaries, founded in 1813, with a museum in the castle; the Natural History Society and museum; the Tyneside Geographical Society; the Tyneside Naturalists' Club, established in 1846; the Mechanics' Institution, 1824; the North of England Institute of Mining Engineers, 1852; the Fine Arts Society; the Farmers' Club; the Northern Counties' Club; the Union Club; and the University Club. Several clubs for working men form a note- worthy social feature. There is a public library and newsroom. The Royal Victoria Infirmary on the Castle Leazes is a memorial of the Diamond Jubilee of Queen Victoria, and was opened in 1906. The benevolent institutions also include the dispensary (i777), fever house (1803), lying-in hospital (1760), eye infirmary (1822), children's hospital, Trinity almshouses (1492), hospital of the Holy Jesus (1682), hospital (1701) for keelmen, i.e. coal-bargemen; and institutions for the blind, dumb and orphans.

Newcastle is well supplied with public parks and recreation grounds. To the N. of the city is the Castle Leazes ornamental park of 35 acres, and beyond this the Town Moor and racecourse, an extensive common, the survival of the pasture land of the township. Eastward from Town Moor is Brandling Park, and westward Nun's Moor. The picturesque grounds of Armstrong Park N.E. of the city extend to about 50 acres, the larger half of which was presented by Sir W. G. Armstrong, who also presented the beautifully wooded grounds of Jesmond Dene. Elswick Park in the south-west of the city, extending to 8f acres, includes Elswick Hall. There are several others. Jesmond, N.E. of the city, is the chief residential suburb. It takes name from " Jesus Mount," and was formerly a place of pilgrimage, possessing a hospital dedicated to St Mary the Virgin.

Both the Northumberland and Durham banks of the river are lined with manufacturing towns or suburbs. Of these the most important is Gateshead (q.v.) immediately opposite New- castle; while those adjacent to Newcastle on the same bank are Benwell and Fenham (pop. in 1901, 18,316) on the west, and Walker (13,336) on the east. The last-named two (formerly urban districts), together with part of Kenton, were incorporated with Newcastle in 1904. Newcastle is connected with the south bank of the Tyne by four bridges — two high-level bridges, an hydraulic swing bridge and a suspension bridge. The old high- level bridge carries the North-Eastern railway, with a road and footway beneath it. It was opened by Queen Victoria in

1849. The new high-level bridge, carrying the railway only, was opened by King Edward VII. in 1906; it consists of four steel spans on granite piers. The hydraulic swing bridge, on the low level, was built to replace a stone structure erected in 1781 on the site of a bridge dating from 1250, and destroyed by a flood in 1 77 1. The Roman bridge, the Pons Aelii, is said to have spanned the river at the same point. The hydraulic bridge (1876) consists of one large centre pier, two midstream piers and two abutments; and its foundations are iron cylinders resting on the solid rock, 60 ft. below the bed of the river. Two spans, which open simultaneously by machines impelled by steam, allow 103 ft. of waterway for vessels going up and down the river. About half a mile farther up the stream is the Redheugh bridge (187 1). The central station of the North-Eastern railway is an extensive and handsome structure built on a sharp curve. An underground line connects it with the Blyth and Tyne station. The suburban line of the North-Eastern company from the central station to Jesmond, Gosforth and Benton was the first standard line to carry passengers by electric traction

(1904)-

Newcastle owes its prosperity to its convenient situation on a tidal river, and to the immense stores of coal in the neighbour- hood, which, besides being largely exported, stimulate a great variety of industries which are dependent on their use. It began to export coal about the end of the 13th century, but the trade received a severe check by the act of Edward I. which made the burning of coal in London a capital offence. In the reign of Edward III. licence was granted to the inhabitants ” to dig coals and stones in the common soil of the town without the walls thereof in the place called the Castle Field and the Forth.” The quay in front of the town, extending from the hydraulic bridge to the Ouseburn, forms a fine thoroughfare of about a mile in length; and by means of dredging a depth of water has been obtained at the shore permitting vessels of large tonnage to approach, although the berths of the ocean steamers are a little farther down the river. The quay is supplied with the most improved mechanical appliances, and has direct communication with the North-Eastern railway. There is a large grain warehouse at the E. end of the quay. Exports include coal, chemicals, pig- iron, iron- work, steel, iron bars, plates and castings, machinery, fire-clay goods and copper. The chief imports are fruits, wheat, maize, oats, barley, iron and steel,

petroleum, sulphur ore, timber and wood hoops, iron ore and potatoes. Steamers carrying passengers serve the principal English ports, Cardiff, Leith, &c; also Baltic ports and New York; while Newcastle is one of the chief ports for the extensive Norwegian tourist traffic, the ships of the combined Bergenske and Nordenfjeldske companies regularly serving Stavanger, Bergen, Trondhjem and intermediate ports. To the industries of Newcastle indicated by the exports may be added glass, lead and shot, brick and tile, earthenware, tool, rope and ships'-fitting manufactures, and most important of all, shipbuilding. The celebrated Elswick works, founded by Messrs Armstrong in 1847, and amalgamated with those of Mitchell & Co., are among the most important in the world. The construction of ships of all sorts, including the largest ironclads with all their armour and guns, is carried on. Elswick is the name of the western part of the borough of Newcastle. The borough returns two members to parliament. It is the largest undivided parliamentary constituency in the United Kingdom. The city is governed by a lord mayor (the title was conferred in 1006), 19 aldermen and 57 councillors. Area, 8453 acres.

History. — Newcastle owes its origin to its position on the great Roman wall and on the estuary of the river Tyne. Its Roman occupation is proved by existing remains, most important among which are the foundations of a bridge, attributed to the emperor Hadrian. Before the Conquest little is known of the town except that it was called Monkchester, and that it was destroyed in the 9th century by the Danes. After the defeat of Edgar ˆEtheling and Earl Waltheof on Gateshead Fell, it was again destroyed by William the Conqueror, but Robert of Normandy is said to have raised a castle there in 1080 on his return from an expedition against Malcolm, king of Scotland, and from that time the town was called Newcastle. Shortly afterwards it was fortified by Robert de Mowbray in his rebellion against William Rufus, but it was taken by the king in 1095. In the reign of Stephen it was seized by David, king of Scotland, and after its restoration to the English in 1157 Henry II. rebuilt the castle and established a mint. The walls surrounding the town are attributed to Edward I. During the 14th century Newcastle was three times defended successfully against the Scots, but in 1640 it was occupied for a year by the Scottish Covenanters under Leslie. It was then garrisoned by royalists, but again surrendered to the Scots in 1644 after a siege of about six weeks, and Charles I. was taken there in 1646 when he had yielded himself to the Scottish army. The burgesses are said to have held the borough at a fee-farm rent under a grant from William Rufus. The title of mayor was conferred by Henry III., while Henry IV. in 1400 made

the town a county of itself with a sheriff, and granted the burgesses power to elect 6 aldermen. Queen Elizabeth incorporated the town in 1589 under the title of mayor and burgesses, and Philip and Mary in 1556 granted 4

additional aldermen, while the charter of James I. in 1604 appointed 24 common councilmen. Newcastle has been repre- sented in parliament by two members since 1295. The coal trade, to which the town owes its prosperity, began in the 13th century, but, partly owing to the act of parliament passed in the reign of Edward I. forbidding the use of coal in London, did not become important until the 17th century. Glassmaking was a considerable trade in the 17th century, and in 1823 George Stephenson established iron works at Newcastle, where the first engines used on the Stockton and Darlington, and Manchester and Liverpool lines were made.

See Victoria County History, Northumberland; John Brand, The History and Antiquities of the Town and County of the Town af New-castle-upon-Tyne (1789); Chirographia, or a Survey of Newcastle-upon-Tyne (1818).

NEWCOMB, SIMON (1835-1909), American astronomer, was born in Wallace, Nova Scotia, on the 12th of March 1835. He became a resident of the United States in 1853, and graduated at the Lawrence Scientific School of Harvard University in 1858, having paid special attention to mathematics and astronomy. He assisted in the preparation of the American Nautical Almanac for 1857. In 1861 he became professor of mathematics in the United States navy, and was put in charge of the great 26-in. equatorial erected at Washington Observatory in 1873. In 1877 he was appointed director of the American Nautical Almanac office, a post which he held until March 1897. In 1884 he became professor of mathematics and astronomy at the Johns Hopkins University, continuing, however, to reside at Washing- tion. He was also editor of the American Journal of Mathematics for many years. In view of the wide extent and importance of his labours, the variety of subjects of which he treats, and the unity of purpose which guided him throughout, Simon Newcomb must be considered as one of the most distinguished astronomers of his time. A study of his works reveals an unusual combination of skill and originality in the mathematical treat- ment of many of the most difficult problems of astronomy, an unfailing patience and sagacity in dealing with immense masses of numerical results, and a talent for observation of the highest order. On assuming the directorship of the Nautical Almanac he became very strongly impressed with the diversity existing in the values of the elements and

constants of astronomy adopted by different astronomers, and the injurious effect which it exercised on the precision and symmetiy of much astronomical work. Accordingly he resolved to ” devote all the force which he could spare to the work of deriving improved values of the fundamental elements and embodying them in new tables of the celestial motions.” The formation of the tables of a planet has been described by Cayley as ” the culminating achievement of astronomy.” but the gigantic task which Newcomb laid out for himself, and which he carried on for more than twenty years, was the building up, on an absolutely homogeneous basis, of the theory and tables of the whole planetary system. The results of these investigations have, for the most part, appeared in the Astronomical Papers of the American Ephemeris, and have been more or less completely adopted for use in the nautical almanacs of all countries. A valuable summary of a considerable part of this work, containing an account of the methods adopted, the materials employed, and the resulting values of the various quantities involved, was published in 1895, as a supplement to the American Ephemeris for 1897, entitled The Elements of the Four Inner Planets and the Fundamental Constants of Astronomy. In 1866 Newcomb had published 1 an important memoir on the orbit of Neptune, which was followed in 1873 by a similar investigation of the orbit of Uranus. 2 About twenty- five years later the tables of these planets were revised by him in view of all the observations which had accumulated in the meanwhile at Washington, Greenwich, Paris and Cambridge. In the meantime the theory of Jupiter and Saturn had been thoroughly worked out by G. W. Hill, Newcomb’s distinguished collaborator in the Nautical Almanac office, and thus was

1 Smithsonian Contributions to Knowledge, vol. xv.

2 Ibid. vol. xix.

completed one important section of the work projected by Newcomb in 1877.

Among Newcomb’s most notable achievements are his re- searches in connexion with the theory of the moon’s motion. His first work on this abstruse subject, entitled Thtorie des perturbations de la lune, qui sont dues d I’ action des planeles, 1 is remarkable for the boldness of its conception, and constitutes an important addition to celestial dynamics. For some years after the publication of Hansen’s tables of

the moon in 1857 it was generally believed that the theory of that body was at last complete, and that its motion could be predicted as accurately as that of the other heavenly bodies. Newcomb showed that this belief was unfounded, and that as a matter of fact the moon was falling rapidly behind the tabular positions. With the view of examining this question, he undertook the reduction of every observation made before 1750 which appeared to be worthy of confidence. In an elaborate memoir 2 he showed that the ancient solar eclipses described by Herodotus, Thucydides, and others, which seemed to require an increased value of the secular acceleration of the moon's mean motion to bring them into line with modern results, might safely be neglected, the ambiguity of the accounts in each case rendering uncertain either the totality of the eclipse or the place from which it was visible. In his investigation he employed the eclipses of the moon recorded in the Almagest, the Arabian eclipses between a.d. 800 and 1004, extracted from Caussin's translation of Ibn Junis, the eclipses and occultations of Bullialdus, Gassendi, and Hevelius, of the French astronomers at Paris and St Peters- burg, and of Flamsteed at Greenwich, and deduced a secular acceleration of 8-8", agreeing well with the theoretical value.

On taking charge of the 26-in. equatorial at the United States Naval Observatory, Newcomb devoted it almost exclusively for the first two years to observations of the satellites of Uranus and Neptune, being of opinion that it was better to do one thing well, than many things indifferently. The results of these skil- fully conducted observations were published in a memoir on The Uranian and Neptunian Systems? From this research it appears that the orbits of all four satellites of Uranus are sensibly circular, and although no special search was made, he concludes that none of Sir William Herschel's supposed outer satellites can have any real existence. From the motion of the satellites he finds that the mass of Uranus is TriTnr tn of that of the sun, while for the planet Neptune he finds a mass equal to rriTTT tn of the sun, agreeing with the value previously found by him from the perturbations of Uranus within irVth of its amount. As early as i860 Newcomb communicated an important memoir to the American Academy, 4 On the Secular Variations and Mutual Relation of the Orbits of the Asteroids, in which he dis- cussed the two principal hypotheses to account for the origin of these bodies — one, that they are the shattered fragments of a single planet (Olbers' hypothesis), the other, that they have been formed by the breaking up of a revolving ring of nebulous matter.

In the Astronomical Papers of the American Ephemeris will be found a large number of contributions from Newcomb's pen on some

fundamental and most important questions of astronomy. Among these are papers on The Recurrence of Solar Eclipses, A Transformation of Hansen's Lunar Theory, Development of the Perturbative Function and its Derivatives. His memoir On the Motion of Hyperion, a New Case in Celestial Mechanics, is in some respects one of his most original researches. He discussed the transits of Venus of 1761 and 1769, and those of Mercury from 1677 to 1881. At the international conference, which met at Paris in 1896 for the purpose of elaborating a common system of constants and fundamental stars to be employed in the various national ephemerides, Newcomb took a leading part, and at its suggestion undertook the task of deter- mining a definite value of the constant of precession, and of

1 Liouville, t. xvi. (1871), pp. 1-45.

1 Washington Observations, 1875, Appendix II.

- Ibid., 1873, Appendix I.

4 Memoirs Amer. Acad, of Arts and Sciences, v. 124-152.

compiling a new catalogue of standard stars. The results of these investigations were published in 1899, 6 and have been in use since the beginning of 190 1. In the intervals of these immense labours, on which his reputation as an astronomer rests, he found leisure for works of a lighter character, e.g. his Popular Astronomy (1878) which has been translated into German, Russian, Norwegian, Czech, Dutch and Japanese, his Astronomy for Schools and Colleges (1880), written in conjunction with Professor E. S. Holden, and Astronomy for Everybody (1903). After his retirement from official life he published an excellent popular treatise on The Stars (1901). A more recondite work is his Compendium of Spherical Astronomy (1906). He also wrote on questions of finance and economics.

He received the honorary degrees of D.C.L. Oxford, and Sc. D. Cambridge and Dublin. In 1872 he was elected an associate of the Royal Astronomical Society, receiving its gold medal in 1874. In 1877 he was elected a foreign member of the Royal Society, which in 1890 awarded him the Copley medal. He also received the first Bruce medal of the Astronomical Society of the Pacific, awarded by the directors of the Berlin, Greenwich, Harvard, Lick, Paris and Yerkes observatories. Except Benjamin Franklin he was the only American to become an Associate of the French Institute. He died at Washington on the nth of July 1909, and was given a military funeral, having been made a rear-admiral by Act of Congress in 1906.

An autobiography, Reminiscences of an Astronomer, appeared in 1903; and a bibliography of his writings is given by Mr Archibald in the Trans. Roy. Soc. Canada, XI. iii. 79. See also the obituary notice by H. H. Turner in the Mon. Not. R.A.S. (Feb. 1910), p. 305.

NEWCOMEN, MATTHEW (c. 1610-1669), English non- conformist divine, was born about 16 10 and educated at St John's College, Cambridge (M.A. 1633). In 1636 he became lecturer at Dedham in Essex, and was the leader of the church reform party in that county. He assisted the elder Calamy in writing Smectymnuus (1641), and preached before parliament in 1643. He was a man of many gifts, excelling alike in preaching, in debate and in friendship, and declined many offers of more remunerative service. He protested against the extreme demo- cratic proposals called " The Agreement of the People " (1647), and was one of the commissioners at the Savoy Synod of 1658. On the passing of the Act of Uniformity in 1662, Newcomen lost his living, but was soon invited to the pastorate at Leiden, where he was held in high esteem not only by his own people but by the university professors. He died of the plague in 1669.

NEWCOMEN, THOMAS (1663-1729), English engineer, one of the inventors of the steam-engine, was born at Dartmouth in 1663. While employed as an ironmonger in his native town, he corresponded with Robert Hooke about the previous investiga- tions of Denis Papin and the marquis of Worcester as to the applicability of steam-power for the purpose of driving machinery, and in conjunction with John Calley (or Cawley), said to have been a grazier or glazier in Dartmouth, and Captain Thomas Savery (1650 ?-i7i5), a military engineer, he constructed in 1705 a " fire-engine," now known as the " atmospheric steam-engine." He died in 1729, probably in London. (See Steam-Engine.)

NEWDIGATE, SIR ROGER (1710-1806), English antiquary, was born on the 30th of May 17 19. He was the 5th baronet of Harefield (in Middlesex) and Arbury (in Warwickshire), and grandson of Sir Richard Newdigate, an English chief justice during the time of Richard Cromwell's protectorate. He was educated at University College, Oxford. From 1741 to 1747 he was M.P. for Middlesex, and from 1750 to 1780 M.P. for the university of Oxford. In 1753 he spoke in parliament on behalf of the repeal of the Plantation Act, and during the debates on the land tax in 1767 he opposed the duke of Grafton's administra- tion and the proposed grant to the royal princes. Being the owner of extensive collieries near Bedworth in Warwickshire, he actively promoted the Coventry, Oxford and Grand Junction canal, cutting also a canal from his collieries to Coventry, and interesting

himself in the construction of the turnpike road from

5 Astronomical Papers of the American Ephemeris, vol. viii. I pts. i. and ii.

Coventry to Leicester. But it is as an antiquary and the founder of a prize at the Oxford university that he is chiefly remembered. His interest in old architecture dated from a tour in France and Italy which was undertaken while he was a young man. He filled two folio volumes with sketches of ancient buildings. His collection of antiquities included marbles, casts of statues and vases. Two marble candelabra found in Hadrian's villa at Rome he purchased for £1800 and presented them to the Radcliffe Library at Oxford. Among his other generosities to the university were a chimney piece, for the hall of University College, and the sum of £2000 for the removal by Flaxman of the Arundel collec- tion of marbles to the Radcliffe Library. The " Newdigate " prize of twenty-one guineas for English verse, which is open for competition each year to the undergraduates of Oxford Uni- versity, was founded by him and was first awarded in the year of his death. He died at Arbury on the 23rd of November 1806. His portrait was painted by Kirkby for University College, Oxford, and at the age of sixty-three he also sat to Romney.

NEWEL (O. Fr. nouel or noel, modern noyau, properly a kernel, from Lat. nux, nut; other foreign equivalents are Ital. albero, Ger. Spindel), the term given in architecture to the central shaft of a semicircular or winding staircase, which is built up or consists of the narrow ends of the steps standing one over the other. When in stone, both newel and steps are cut out of the same block; when in wood, the newel becomes a vertical post into which the steps are housed. The term is also given to the vertical post at the foot or the angles of a square staircase, into which the carriage or beam carrying the steps is tenoned.

NEW ENGLAND, a general name for the north-east section of the United States of America, embracing the states of Maine, New Hampshire, Vermont, Massachusetts, Rhode Island and Connecticut. It has an area of 66,424 sq. m. (4448 sq. m. being water) ; and in ioro its population was 6,552,681, more than one- half of which was in Massachusetts, although that state contains less than one-eighth of the total area. The region is traversed by the broken mountain ranges which form the N.E. continuation of the Appalachian system; the soil

is rather sterile, except in the river valleys; and the climate of the long winters is often severe. But the picturesque scenery and delightful summer climate have made New England a favourite resort. When the commerce of New England was interrupted as a consequence of the Napoleonic wars, the abundance of water power afforded by the rivers encouraged manufacturing, and the region rapidly acquired prominence in this industry, especially in the manu- facture of textiles, of boots and shoes, and of paper and wood pulp; in 1905 the value of the textile products of New England (excluding flax, hemp and jute) alone was $522,821,440 (more than 45% of that of the entire country), the value of boots and shoes was $181,023,946 (more than 55% of the total for the entire country), the value of paper and wood pulp was $49,813,133 (more than one-quarter of that of the entire country), and the value of all factory products amounted to $2,025,998,437 (nearly one-seventh of the total for the entire country).

Northmen very probably visited this region at the beginning of the nth century. (See Vinland). To Europeans who visited it in the 16th century it was included in ” Norumbega,” and some of the early explorers searched here for the mythical city of that name. Title to the territory was claimed by the English on the basis of its alleged exploration by the Cabots in 1498, and by the French on the basis of its exploration by Giovanni da Verrazano in 1524. It was made favourably known to the English by the explorations of Bartholomew Gosnold in 1602, of Martin Pring in 1603 and of George Weymouth in 1605, and was at this time called North Virginia. In 1606 King James I. granted it to the Plymouth Company with a view to encouraging settlement, and in the next year a colony was planted at the mouth of the Sagadahoc (now Kennebec) river, but this was abandoned in 1608; the efforts of the French to establish settlements along the Maine coast were likewise unsuccessful. In 1614-1616 Captain John Smith traversed the coast as far east as the mouth of the Penobscot river and as far south as Cape Cod, gathered much information from the Indians, wrote an attractive descrip-

tion of the country, prepared a map of it, suggested its present name, New England, and made another unsuccessful attempt to found a settlement. A new charter of 1620 conveyed to the New England Council, the successor of the Plymouth Company, all the territory in North America between latitudes 40 and 48° N. under the name of New England, and in the same year a permanent settlement was established at Plymouth by a band of Separatists, who, although they had expected to settle in Virginia, were prevailed upon by the captain of their vessel to land in New England. During its existence of fifteen

years the New England Council made numerous grants of territory, and from three of these grew three of the present states : Massachusetts, from a grant to the Massachusetts Bay Company in 1628; Maine, from the grant to Sir Ferdinando Gorges and John Mason (the two most influential members of the council) in 1622 ; and New Hampshire, from the grant to John Mason in 1629. The Council attempted to establish a general government over its entire domain, but the scheme of some of its members for supporting such a government with contributions from each member in return for an allotment of land was a failure, and although Robert Gorges, the second son of Sir Ferdinando Gorges, was sent over as governor-general in 1623, he accom- plished nothing and returned in the next year in disgust. In 1635, when the Dutch were hemming in its domain on the west and the French on the north, the Council made a final allotment of its remaining territory among its members and surrendered its charter. Connecticut was founded in the same year by emi- grants from Massachusetts without any other authority than that given by the mother colony. A separate colony was founded at New Haven in 1638 by emigrants from England who had stayed for a time in Boston and other Massachusetts towns, but this was annexed to Connecticut in 1664 under the Con- necticut charter of 1662. Rhode Island was founded in 1636 by exiles from Massachusetts who had no authority whatever from a superior government. Plymouth was a separate colony until its union with Massachusetts under the charter of 1691. New Hampshire was a part of Massachusetts from 1641-1643 to 1679. Maine, having passed under the jurisdiction of Massachusetts in 1652, did not regain its independence until 1820. Vermont was settled largely by emigrants from New Hampshire, but New York claimed the territory and the dispute was not settled until the new state was erected in 1791.

Massachusetts, Plymouth, Connecticut and New Haven constituted in their early years a group of neighbouring colonies, substantially independent of the mother country, and possessing a unity of purpose and similar institutions but in need of mutual protection from the Indians, the Dutch and the French, and also needing an arbiter to whom they might refer their own disputes, especially those relating to boundaries and trade. To meet these needs they organized, under Articles of Confedera- tion signed in 1643, the first form of colonial union in America; they called it The United Colonies of New England, but it is more commonly known as the New England Confederacy. The confederate authority was vested in a board of eight com- missioners, two from each colony chosen annually by its General Court.

This board was to meet annually in September, two years of every five

at Boston, one year of every five at Hartford, one at New Haven, and one at Plymouth ; special meetings also might be called by three magistrates of any of the four colonies. The commissioners chose their president at each meeting, but this officer had only the powers of a moderator. An agreement of six commissioners was necessary to pass any measure, but if there was an agreement of less than six the measure might be referred to the General Courts and become a law of the Confederacy if all of those courts approved. The most important powers of the Confederacy were those relating to defence, and in case of an invasion its entire force, consisting of 100 men from Massachusetts and 45 men from each of the other colonies (or some other proportion which the commissioners might name), was to march out if so requested by three magistrates of any of the contracting colonies. The expenses of every defensive war which the commissioners declared to be just were to be defrayed by the several colonies in proportion to their number of men and boys between the ages of sixteen and sixty. Other matters within the jurisdiction of the commissioners were such as related to disputes

between two or more colonies and the return of escaped servants, prisoners and fugitives from justice. As the commissioners had no means of enforcing their orders, their function was chiefly advisory, but it was nevertheless of considerable importance on several occasions. Although the number of commissioners from each of the colonies was the same, those from Massachusetts exerted the dominant influence.

The commissioners met regularly until 1684 — annually until New Haven submitted to Connecticut in 1664, and triennially from 1664 to 1684, when Massachusetts lost its first charter. Upon the downfall of the Puritan Commonwealth in the mother country (1660) numerous grievances were presented to King Charles II. against the Puritan governments of New England, among them Massachusetts' extension of its jurisdiction over the towns of Maine and New Hampshire, the persecution of the Quakers, and the denial of the right of appeal to the crown, and in 1664 a royal commission, consisting of Richard Nicolls, Samuel Maverick, Robert Carr and George Cartwright, was sent over to settle disputes and secure some measure of imperial control, but Massachusetts, the chief offender, successfully baffled all attempts at interference, and the mission was almost a complete failure. The grievances of English merchants arising from the violation of the

navigation laws by the colonies continued, however, to receive the attention of the home government.

In 1676 the Lords of Trade and Plantations sent over Edward Randolph to investigate and gather information which would show the justice and expediency of imposing imperial control, and two years later Randolph was appointed Collector and Surveyor of Customs in New England. Randolph sent back many charges, especially against Massachusetts, with the effect that, in 1684, the charter of that colony was annulled by a decree in Chancery on a writ of quo warranto. This done, the home government set to work to organize the royal domain which should be known as New England, or the Dominion of New England, and its plan for this provided for the annulment of the charters of Rhode Island and Connecticut, and the inclusion in the Dominion of these colonies, and New Hampshire, Maine, New York and the Jerseys, thereby restoring to New England all the territory, with the exception of Pennsylvania, that was included in the grant to the New England Council in 1620. A temporary government was established at Boston in May 1686, with Joseph Dudley as president, and in December of the same year Edmund Andros arrived with a commission and instructions which were a copy of those to the governor of New York and made him governor of all New England except Rhode Island and Connecticut. Rhode Island offered no resistance to the writ against its charter and Andros extended his authority over it immediately after his arrival. Connecticut successfully baffled the royal servants for a time, but when threatened with a division of its territory agreed not to resist the royal purpose, and on the last day of October 1687 it passed under the general govern- ment of New England. Finally, a new commission to Andros, issued in April 1688, extended his jurisdiction over New York and the Jerseys, and the whole region over which he was made governor by this instrument was named ” Our Territory and Dominion of New England in America.” But the English Revolution of 1688 inspired a revolt in New England by which Andros was deposed in April 1689. Under William and Mary no attempt was made to preserve the Dominion of New England, but Rhode Island and Connecticut were permitted to resume government under their old charters, Massachusetts received a new one, and New Hampshire again became a separate royal province.

New England is prominent in American colonial history as the ” Land of the Puritans ” and the home of the corporate colony. The chief motive of its founders in coming to the New World was the establishment of a new Christian common- wealth, but subordinate to this there was from the first an economic motive. So long as the

religious motive remained dominant, ” blue laws ” were a prominent feature of the adminis- tration, but by a slow transition the economic motive became the dominant one, and, as a consequence of this transition and of the corporate form of government, European institutions

were transformed into American institutions and new political ideas were generated more rapidly in New England than in either the Middle or the Southern colonies. Owing to its geographical position, nearer to Canada than any other group of colonies, New England had to stand the brunt of the fighting during the wars between the English and the French (aided by their Indian allies) in America, terminating with the conquest of Canada by the English in 1 759-1 760, and a sense of common danger helped to create a certain, solidarity, which made easier the union of the colonies for common action against the mother country at the time of the War of American Independence. After that war, New England was long the most essentially commercial and industrial group of states, and was a stronghold of Federalism; and in the period immediately before and during the War of 181 2, when its commercial interests suffered terribly, first from the restrictive measures of the general government and then from warfare, New England was a centre of that opposition to the policy of the National Administration (then Democratic), which culminated in the famous Hartford Conven- tion of 1814-1815 (see Hartford).

See the articles on the separate New England states and the authorities there given; among good general works are J. G. Palfrey, History of New England (5 vols., Boston, 1858-1890); J. A. Doyle, The Puntan Colonies (2 vols., New York, 1889); B. B. James, The Colonization of New England (Philadelphia, 1904) ; H. L. Osgood, The American Colonies in the Seventeenth Century (3 vols., New York, 1 904-1 907) ; John Fiske, The Beginnings of New England, or the Puritan Theocracy in its Relation to Civil and Religious Liberty (Boston, 1896) ; S. A. Drake, The Making of New England (New York, 1896); W. B. Weeden, Economic and Social History of New England (2 vols., Boston, 1890); and Edward Channing, History of the United States, vols. i. and ii. (New York, 1905, 1908).

NEW FOREST, one of the few woodland regions left in England covering about 93,000 acres in the south-west of Hampshire, between the Solent, Southampton Water and the river Avon. About two-thirds of it is crown property, and is preserved more or less in its natural condition as open woodland interspersed with bogs and heaths. The trees principally represented are oak and beech, with some newer plantations of Scotch fir. The trees were formerly felled for building

the ships of the navy and for feeding the iron furnaces of Sussex and Hampshire. Pigs and a hardy breed of ponies find a good living in the forest; and in spite of an act in 1851 providing for their extermination or removal, a few red deer still survive. Foxes, squirrels, otters, snakes (smooth snake, grass snake and adder), butterflies (some of them peculiar to the district), and an occasional badger range the forest freely. The tract derives its name from the extensive afforestation carried through in this region by William the Conqueror in 1079; and the deaths of two of his sons within its confines — Richard killed by a stag, and William Rufus by an arrow — were regarded in their generation as a judgment of Heaven for the cruelty and injustice perpetrated by their father when appropriating the forest. Rufus's stone, near Lyndhurst, marks the supposed spot where that monarch fell. About one- fourth of the area is under cultivation by private owners and tenants. The principal village within the forest is Lyndhurst (pop. 2167 in 1901); its church contains a fresco by Lord Leighton, and here is held the .verderers' court, which since 1887 has had charge of the crown portion of the forest. On the western outskirts lies the town of Ringwood (q.v.). Brockenhurst and Beaulieu are the villages next in importance. Beaulieu, at the head of the picturesque estuary of the Beaulieu river, which debouches into the Solent, is famous for the ruins of Beaulieu Abbey, founded by King John for Cistercians. The gatehouse is restored as a residence, and the Early English refectory as a church. There are considerable remains of the cloisters, chapter house and domestic buildings. The New Forest gives name to a parliamentary division of the county.

The New Forest is one of the five forests mentioned in Domesday. It was a hunting-ground of the West Saxon kings, but, as already stated, was afforested by the Conqueror, whose cruelty in the matter is probably exaggerated by the traditional account. One of the chief sources of the wealth of the forest in early times was the herds of pigs fed there. The New Forest

being under the forest laws, was affected by the forest clauses of Magna Carta and by the Forest Charter (i 2 1 7) , which mitigated their severity. The chief officer of this, as of other forests, was the justice in eyre who held the justice seat, the highest forest court and the only court of record capable of entering and executing judgments on offenders; the lower courts were the Swainmote and Wodemote, the former of which is still held, in a modified form, in the Verderers'

Hall of the King's House at Lyndhurst. The circuit of the justices in eyre, or their deputies, continued down to 1635; they were virtually ended by the Act for the Limitation of Forests (1640), though Charles II. attempted to revive them, and they were not legally abolished until 1817. The lower officers of the forest, who held merely local appointments, were the verderers, the regarders (one of whose duties was that of seeing to the expeditation of " great dogs "), the foresters, the woodwards and the agisters. There was also a lord warden, who was usually a nobleman and performed no judicial functions. The Deer Removal Act (185 1) resulted in the almost total extinction of the forest deer. Under the act of 1877 the forest is administered rather as a national park than for the growing of timber on commercial principles.

See J. R. Wise, The New Forest (4th ed., 1883), with over sixty engravings by W. J. Linton and a dozen etchings by H. Sumner; and R. D. Blackmore, Cradock Nowell (1866).

NEWFOUNDLAND, a large island, forming a British colony, and occupying an important and commanding position off the eastern coast of the North American continent, not dissimilar to that occupied by Great Britain towards Europe. It stretches directly across the entrance of the Gulf of St Lawrence, to which access is afforded at both the northern and the southern extremities of the island. In the south-west its distance from Cape Breton is less than 60 m., while only 1640 m. separate its most easterly point from the coast of Ireland. It is situated between 46 36′ 50″ and 51° 39′ N., and between 52 37′ and 50 0, 24′ 50″ W. The total area of the island is about 40,200 sq. m. or one-sixth larger than Ireland: its maximum length from Cape Ray to Cape Norman is 317 m., its maximum breadth from Cape Spear to Cape Anguille, 316 m. In shape it is roughly triangular, three extensive peninsulas, which project from the north (Petit Nord) and south-east (Avalon), assisting the con- formation, although the latter, the most populous region of the island, is joined by a very slender isthmus, at one place only 3 m. wide. A further division of the Avalon peninsula is wrought by the two bays of St Mary's and Conception. St John's, the capital, is situated on the eastern side of Avalon.

Physical Features. — Viewed from the ocean the coasts of Newfoundland appear bleak, rocky and barren. The brown wall of rock, 200 to 300 ft. in height, is, however, broken at frequent intervals by deep fjords and large bays running in some instances 80 to 90 m. inland , and throwing out smaller arms in all directions. For this reason the circumference of the island, which, measured from headland to headland, is about 1000 m., is actually doubled. The

fjords resemble those of Norway; islands are numerous, some of them clad with vegetation; and picturesque scenery is not uncommon.

Near the coasts the surface of the country is of a hilly, rugged character. In the interior the elevated undulating plateau is diversified by ranges of low hills, valleys, woods, lakes, ponds and marshes. Much of this is a savanna country, giving sustenance to large herds of caribou. All the principal hill ranges have a N.N.E. and S.S.W. trend, as have also all the other great physical features of the island, such as the bays, larger lakes, rivers and valleys, a conformation doubtless shaped by glacial action during the Ice period. The most important range of mountains is the Long Range, beginning at Cape Ray and extending along the western side of the island for some 200 m., and having peaks more than 2000 ft. high. Parallel to this but nearer the west coast is the Anguille Range, running from Cape Anguille to the highlands of Bay St George. Some of the summits of the Blomidon Range, extending along the south shore of the Humber and Bay of Islands, attain a height of 2084 ft., being the highest on the island. Avalon peninsula is also very hilly, but the greatest altitude is only 1200 ft. — North-East Mountain, from which sixty-seven lakes are visible on a clear day. Over the interior are spread a number of detached sharply-pointed summits, springing abruptly from the great central plateau, bearing the local name of ” tolts,” and serviceable as landmarks.

In comparison with the island’s size large rivers are few, owing

to the broken, uneven character of most of the country, and the fact that the ponds and lakes find a convenient vent in the numerous lengthy inlets and arms of the sea. There are, however, three considerable streams, the Exploits, the Humber and the Gander. The first-named rises in the extreme S.W. angle of the island, close to the southern extremity of the Long Ra«ge, and after a course of 200 m. falls into the Bay of Exploits, Notre Dame Bay. It is a mile wide at its mouth ; its channel is studded with islands, the largest being Thwart Island, 9 m. in length. Fourteen miles from the mouth is a succession of cascades known as Bishop’s Falls, and farther inland are the picturesque Grand Falls. The Exploits drains an area of between 3000 and 4000 m., much of it fertile land, and densely wooded with pine, spruce, birch and poplar. The width of this fertile belt varies at different parts of the river, but it is estimated that some 200,000 acres might be available for agri- culture. The Humber rises 20 m. inland from Bonne Bay, and, after emptying itself by a circuitous course into Deer Lake, falls into the Bay of Islands. It drains an area of 2000 sq. m. Rising near the southern coast, the Gander flows through Gander

Lake into Hamilton Sound, draining an area of nearly 4000 sq. m. Besides these three there is the Codroy, rising in the Long Range and emptying into the Gulf of St Lawrence.

The immense number of lakes and ponds constitutes perhaps the most striking physical feature of the island. More than a third of the whole area is occupied by water. These bodies of water, large and small, are found in the most various positions: in the mountain gorges; in the depressions between the low hills; in the valleys and even in the hollows on the tops of the highest eminences. The largest is Grand Lake, 56 m. long, 5 in breadth, with an area of 192 sq. m. Its surface is but 50 ft. above sea-level, the bottom at its deepest portion being 300 ft. below sea-level. It contains an island 22 m. long. The next, Red Indian Lake, is 37 m. long, with an area of 64 sq. m. Gander Lake is 33 m. in length, and Deer Lake, through which the Humber flows, is 15 m. After these Michel Sandy Lake, Victoria, Hind's, Terra Nova and George IV. lakes rank next in size. Save where the railway and lumbering camps have invaded them the shores of these lakes are still primitive wilderness.

The coasts of the island, intersected by many great bays, have been familiar to fishermen from an early period, but the interior remained almost completely unknown until the geological survey, still in process, was begun in 1864. Chief amongst the inlets are Placentia Bay, 55 m. in width at its mouth and 90 m. long; Notre Dame Bay, 50 m. wide and 70 m. long; Fortune Bay, 23 m. wide and 70 long; and St Mary's Bay, 25 m. wide by 35 m. in length. Opposite Fortune Bay, which has several important arms, are the two islands of St Pierre and Miquelon, ceded by treaty in 1713 to France, as shelter for her fishermen, and now all that remains of French sovereignty in North America. In the neighbourhood of Bay St George, on the west coast (40 m. wide at the mouth and boasting a good harbour) are situated some of the most fertile lands in the island, well-timbered and containing large deposits of coal and other minerals. Three extensive arms run 20 m. inland from Bay of Islands, the seat of a profitable herring fishery. Conception Bay is one of the largest and most important in the island, having in 1901 a population scattered through the settlements on its shores of over 40,000 inhabitants. Another principal inlet is Bonavista Bay, which contains numerous groups of islands.

Geology.— All the great ancient rock systems, between the Lower Laurentian and the Coal-measures, are more or less represented at one part or another of Newfoundland.

The Laurentian system has an immense spread in the island. It constitutes the principal mountain ranges, coming to the surface through the more recent deposits, on the axes of anticlinal lines, or brought up by great dislocations, most of which trend nearly parallel with each other in a general bearing of about north-north-east and south-south-west. The Laurentian gneiss of the Long Range, on the western side, extends in a nearly straight course from Cape Ray to the headwaters of the Castor in the great northern peninsula. On the south-western extremity of the island these rocks occupy the coast from Cape Ray to La Poile. They are largely exhibited on Grand Lake, running in a spur from the Long Range between it and Red Indian Lake, and bearing for the south-eastern shores of Hall's Bay. The central portion of the northern peninsula is Laurentian, which also spreads over a wide expanse of country between Grand Lake and the Humber and Exploits rivers, and shows itself on the coast between Canada Bay and White Bay. Another range of Laurentian comes up in the district of Ferryland, and shows itself occasionally on the coast of Conception Bay. Thus more than half the island is Laurentian.

Three-fourths of the peninsula of Avalon are Huronian, a forma- tion which does not extend west of Fortune Bay. The town of St John's and, in fact, nearly all the settlements between Fortune Bay and Bonavista Bay are built upon it. Signal Hill, overlooking the harbour of St John's, is capped with the sandstone of this formation. The whole Huronian system is not less than 10,000 ft. thick, and has been cut through by denudation to the Laurentian floor. The rocks of the Primordial Silurian age are spread unconformably over the area thus ground down. These evidences of denudation and reconstruction are very clear in Conception Bay, where the rocks

of the intermediary system have been ground down to the Laurentian gneiss, and, subsequently, the submarine valley thus formed has been filled up with a new set of sediments, the remains of which are still to be found skirting the shores of the bay and forming the islands in it.

Rocks of the Silurian age are most extensive on the peninsula of Cape St Mary, and around the head of Trinity Bay. These belong to the Primordial Silurian group. The Lower Silurian rocks have a large development, and in them the metallic ores occur which seem destined to render the island a great mining centre. The Lauzon division of the Quebec group, which is the true metalliferous zone of

North America, has an immense spread in the island. It consists of serpentine rocks associated with dolomites, diorites, &c, and is well known throughout North America to be usually more or less metalliferous. The Newfoundland rocks are no exception, but give evidence of being rich in metallic ores. The Middle Silurian division of rocks is also widely spread ; and the most fertile belts of land and the most valuable forests are nearly all situated on the country occupied by this formation. The great valley of the Exploits and Victoria rivers, the valley of the Gander and several smaller tracts belong to it.

The Carboniferous series occupies a large area on the western •ide of the island, in the neighbourhood of Bay St George and Grand

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Lake. There is also a wider spread of the same series along the valley of the H umber and round the shores of Deer Lake and the eastern half of Grand Lake, and as far as Sandy Lake. ” Coal,” says Mr J. P. Howley, F.R.G.S., head of the survey, ” is known to exist at several places in this series; and seams, apparently of workable thickness, judging from their out-crops, occur on the Middle Barachois and Robinson’s Brook, in St George’s Bay.”

It will thus be seen that the Carboniferous series is confined to the western side, while the middle, eastern and southern portions are occupied by Silurian, Huronian and Laurentian formations. From the extent to which the Lauzon division of the Quebec group, the true metalliferous zone of North America, prevails in the island, its yet undeveloped mineral wealth must be very great.

Climate. — The climate is more temperate than that of most portions of the neighbouring continent. It is but rarely, and then only for a few hours, that the thermometer sinks below zero in winter, while the summer range rarely exceeds 80° F., and for the most part does not rise above 70 . The Arctic current exerts a chilling influence along the eastern coast, but as a compensation it brings with it the enormous wealth of commercial fishes and seals which has rendered the fisheries the most productive in the world. The Gulf Stream, while it creates fogs, modifies the cold. The salubrity of the climate is evidenced by the robust healthy appearance of the inhabitants.

Open fireplaces are sufficient to warm the houses, and free exercise in

the open air is attainable at all seasons. The average mean temperature at St John's is 41-2° F., the maximum being 83 and the minimum 7 ; the average height of the barometer is 29-37 i n – The average rainfall is 58-30 in. Winter sets in, as a rule, in the beginning of December and lasts until the middle of April. Generally the snow lies during this period, and the frost rarely penetrates the ground to a greater depth than a few inches. Spring is sometimes late in arriving, but once vegetation sets in it advances with mar- vellous rapidity. The autumn is usually very fine, and is often pro- longed till November. There is nothing in the climate to interfere with agriculture. Tornadoes are unknown, and thunderstorms are very rare. Fogs, of which so much is said in connexion with the country, are confined to the shores and bays of the south-eastern and southern coasts.

Fauna. — Among the well-known wild animals indigenous to the country the caribou or reindeer hold a conspicuous place. They migrate regularly between the south-eastern and north-western portions of the island. The winter months are passed in the south, where " browse " is plentiful, and the snow is not too deep to prevent them from reaching the lichens on the lower grounds. In March they begin their spring migration to the barrens and mountains of the north-west. In May or June they bring forth their young. As soon as the frosts of October begin to nip the vegetation they turn south. September and October are the best months for stalk- ing. In addition to the caribou, the wolf and black bear are found in the interior; the fox (black, silver, grey and red), beaver, otter, arctic hare, North-American hare, weasel, bat, rat, mouse and musquash or musk-rat are numerous. The famous Newfoundland dog is still to be met with, but good specimens are rare, and he appears to thrive better elsewhere. The common dogs are a degene- rate mongrel race. It is estimated that there are three hundred species of birds in the island, most of them being migratory. Among them may be enumerated the eagle, hawk, owl, woodpecker, swallow, kingfisher, six species of fly-catchers and the same number of thrushes, warblers and swallows in great variety, finches, ravens, jays. The ptarmigan or willow grouse is very abundant, and is the finest game- bird in the island. The rock ptarmigan is found in the highest and barest mountain ridges. The American golden plover, various species of sandpipers and curlews, the brent goose, ducks, petrels, gulls and the great northern diver are met with everywhere. The great auk, now extinct, was once found in myriads around the island. The little auk, guillemot and the razor-billed auk are abundant. No venomous reptiles occur. Frogs have been intro- duced and thrive well. Of molluscous animals the common squid, a cephalopod about 6 or 7 in. in length, visits the coasts in

immense shoals in August and September, and supplies a valuable bait. A gigantic species of cephalopod was discovered in 1873, which excited much interest among naturalists: the body varies'from 7 to 15 ft. in length, with a circumference of 5 or 6 ft. ; from the head ten arms radiate, the two longest (tentacles) being from 24 to 40 ft. in length, and covered with suckers at their extremities; the other eight arms vary from 6 to II ft., and on one side are entirely covered with suckers. Professor Verrill, of Yale College, distinguished two species — one he named Architeuthis Harveyi, after the discoverer, and the other Architeuthis monachus.

Flora.— The pine, spruce, birch, juniper and larch of the forests of the interior furnish ample materials for a large timber trade as well as for shipbuilding purposes. The white pine grows to the height of 70 or 80 ft. in some places, and is 3 or 4 ft. in diameter. There is an abundance of wood suitable for making pulp for paper; and in 1906-1907 a London companv, with Lord Northcliffe (of the Daily Mail) at its head, acquired large tracts for this purpose, and operations were begun in 1910. The mountain ash, balsam poplar and aspen thrive well. Evergreens are in great variety. The berry- bearing plants cover large areas of the island. The maidenhair or capillaire yields a saccharine matter which is lusciously sweet. Flowering plants and ferns are in vast varieties, and wild grasses and clover grow luxuriantly. Garden vegetables of all kinds, and straw- berries, raspberries, gooseberries, currants, &c, thrive well.

Population. — By the earliest computation made in 1654 the number of permanent inhabitants in the island was 1750. Twenty-six years later the resident population was stated to be 2280; in 1763, 7000: in 1804, 20,000. In 1832 the population had risen to 60,000; in 1836 to 75,094; in 1857, 124,288; and in 1874, 161,374. By the census of 1901 the total population of Newfoundland was 217,037, that of Labrador- being 3947. The capital, St John's, which contained a population of 15,000 in 1835, had in 1001 29,594 souls. The rate of increase for the island for the ten years ending in 1901 was 9-37% as compared with the rate of increase 1874-1884, which was 22-30%. Certain districts such as Carbonear, Harbour Grace and Ferryland, as well as Labrador, showed a steady decline, the largest increase being in St George's district and on the west coast, where it is not less than 40%.

Of the various religious denominations the strength in 1901 was as follows: Roman Catholics, 75,989; Chuch of England, 73,008; Methodists, 61,388; Presbyterians, 1168; Congrega- tionalists, 954; Salvationists, 6594; Moravians, Baptists and others, 1554. The system of public education is denominational, each religious body receiving grants from the revenue according to numerical strength. The total sum allotted to education in 1904-1905 was $196,1.92. The aggregate number of pupils under fifteen attending the 783 elementary schools and academies in the island was 35,204. It is estimated that 25 % of the popula- tion, chiefly the older folk, are illiterate.

Fisheries.— These constitute the great staple industry of the island. On the export of its products the trade of the colony still mainly depends. The most important fish in these waters, commercially, is the cod, which is here more abundant .than anywhere else in the world. Although subject to considerable fluctuation the average annual export of dried cod-fish over a term of years is about 1,200,000 quintals. The value of the export varies between five and six million dollars, according to the market price of the dried fish. The cod are taken on the shores of the island, along the Labrador coast and on " the Banks." These Banks, which have played such an important part in the history of the colony, and are the chief source of its wealth, stretch for about 300 m. in a south-east direction towards the centre of the North Atlantic, and probably at one time formed a part of the North American continent. The depths range from 15 to 80 or 90 fathoms. The deposits consist of sand and gravel composed of ancient rocks, and fragments of quartz, mica, hornblende, felspars and magnetite; along with these are many calcareous fragments of echinoderms, polyzoa and many foraminifera. In the deeper parts there is sometimes

a fine mud containing the above-mentioned minerals and calcareous fragments, and in addition numerous frustules of diatoms. The Banks are swept by the cold Labrador current, and icebergs are frequently stranded upon them. The Gulf Stream passes over their southern portions. These two currents bear along many species of pelagic algae and animals, which supply abundant food to the myriads of echinoderms, molluscs, annelids, coelenterates and other invertebrates which live at all depths on the Banks. These invertebrates in turn supply food to the cod and other fishes which are sought for by the fishermen. Sea birds frequent the Banks in great numbers; and, as diving birds are not met with at any great distance from them, the presence of these in the sea gives seamen an indication of the shallower water.

The total annual catch of cod in Newfoundland waters has been estimated at about 2,500,000 quintals (a quintal being one-twentieth of a ton), with a value of about £ 1 ,400,000 sterling. The cod fishery forms four-fifths of the entire industry, in spite of the increase in the herring and lobster catch. No increase in the quantities taken is to be noted, but the market value of dried cod fish is generally enhanced. In 1885 an export of 1,284,710 quintals was only worth $4,061,600. In 1905 1,196,814 quintals were valued at $6,108,614. 1 o this may be added the value of the fish consumed by the people of the colony, estimated at $450,000. According to the census of 1 90 1 there were 41,231 males and 21,443 females engaged in the catching and curing of fish.

The figures have greatly varied in past years: as for instance in I85 7′ 31 /o of the total population were engaged in catching and curing fish: in 1869, 25-4%, in 1884, 30-6%. and in 1901, 28-4%. bmall voyages and low price? have tended to limit fishery operations ; and the opening up of other industries has diverted labour from the fisheries. The total number of vessels engaged is about 1550 with a tonnage of 54,500; over 11,000 fishing rooms are in actual use. 1 he use of traps has followed the decrease in number of nets and seines, but the continued increase of fishing rooms shows that there is no falling off in the Newfoundland cod fishery, which has now been prosecuted for fully four centuries. Notwithstanding the enormous drafts every year, to ail appearance the cod are as abundant as ever They begin to appear on the coasts of the island about the first of June, at which time they move from the deep waters of the coast to the shallower and warmer waters near the shore, for spawn- ing purposes. Their approach is heralded by the caplin, a beautiful httle fish about 7 in. in length, vast shoals of which arrive, filling every bay and harbour. The cod follow in their wake, feasting greedily upon the

caplin, which supply the best bait. In six weeks the caplin disappear, and their place is taken by the squid about the 1st of August. These also supply a valuable bait, and are followed by the herring, which continue till the middle or end of

October, when the cod fishery closes. The cod are taken by the hook-and-line, the seine, the cod-net or gill-net, the cod-trap and the bultow. Newfoundland exports cod to Brazil, Spain, Portugal, Italy, Great Britain, Greece, the West Indies and the United States. Brazil and Spain are the largest consumers.

After the cod the seal fishery is of next importance. The industry was begun about 1740, when the value of the seal oil exports was £1000. In 1904-1905 sealskins and seal oil to the value of $370,261 and $374,974 were exported, the price of a skin varying between $•90 to $1 -25. This shows a considerable falling off. The number of men employed is about 4000. Steamers were first used in 1863. They are from 350 to 500 tons burden, most of them carrying from 200 to 300 men. The larger class can bring in from 30,000 to 40,000 seals. In one instance 41,900 seals were brought in by a single steamer, the ” Neptune,” the weight being 874 tons and the value $103,750. In bad years the catch may not exceed 200,000 — in 1893 it fell to 129,061. By law no steamer may leave port on a sealing voyage until the 12th of March, and no seal may be killed before the 14th of March. The young seals are born on the ice between the 15th and 25th of February, and mature so rapidly that they are in excellent condition in four weeks.

Of more recent origin is the lobster fishery, their packing for export having begun in 1873. By 1888 the value of the lobster export had risen to $385,077. In 1904-1905, while the catch had somewhat diminished as compared with 1895, the value had in- creased to $512,662.

A vigorous effort has been made to establish the herring fishery on a scale commensurate with the abundance of the fish in these waters. In 1855 the total quantity exported was 32,042 barrels, with a value of $91,357. In 1905 there were 176,633 barrels, valued at $379,938. The principal seats of the herring fishery are Fortune Bay, Placentia, Bay St’ George and Bay of Islands, and the whole coast of Labrador, which furnishes the finest kind of herring. Besides the herring exported, at

least $150,000 worth is sold to the French and Americans as bait.

The export of preserved salmon, of which the island has an abundant supply, does not form a large or important item, seldom reaching in value $100,000. Salmon is taken for the most part in nets in the coves and bays and at the mouths of rivers. The season for taking it is brief, six or seven weeks, beginning at the end of May. The proper preservation of the salmon waters has been for generations neglected, and reckless practices bade fair wholly to exterminate the fish. In 1888, however, a fisheries commission was appointed, and river warders were charged with the stringent enforcement of the new laws. The best salmon fisheries are in Bonavista Bay, Gander and Exploits bays, and on the west coast.

Mackerel formerly frequented the Newfoundland coasts, but disappeared about the middle of the 19th century; and few halibut or haddock are caught. Sea trout and brook trout, however, abound, and latterly Loch Leven and Californian rainbow trout have been introduced with success.

The most extraordinary increase concerns the whaling industry. Before 1850 a very successful whale fishery was carried on, but it then suddenly ceased and has only recently been revived. The revival is due to the invention of a harpoon-gun which kills the whale effectually and with despatch. There are now fourteen whale factories in operation for the production of bone and oil. While in 1895 the value of the oil reached only $7300 and the bone $1000, a decade later the values were $384,062 and $34,833 respectively; no fewer than 1275 whales being caught. A patent process manu- factures the carcases into a fine guano, and utilizes the by-products, thus adding $100,000 to the industry.

On the whole the aggregate value of the Newfoundland fisheries for 1906-1907 was nearly £2,000,000 sterling, including the fish consumed in the colony.

Agriculture. — Until recent years little attention has been paid to agriculture, the belief being current that the interior of the island was a desert. The reports of the geological survey dispelled this fiction, it being conclusively shown that out of the 28,000 sq. m. of dry land over one-sixth or 7000 scj. m. is available under suitable conditions for arable and for grazing purposes. The best land is situated in the Codroy valley, which is rich in alluvial soil. That in the Bay St George district is very fertile, and in the Humber valley, Exploits valley and elsewhere many thousands of farmers could work to advantage. In

1874 on ‘ v 36,339 acres were under cultivation. In 1901, 215,579 acres were occupied, of which 85,533 acres were actually under cultivation, producing chiefly hay, oats, potatoes, turnips and cabbages. In the numbers of live stock there has been a notable increase, especially in sheep. Newfoundland seems especially adapted for a sheep-grazing country.

Mining. — Not until a comparatively recent date was Newfound- land known to contain mineral deposits of great value. The first discovery of copper ore took place at a smalt fishing hamlet called Tilt Cove in 1857. Seven years later the mine was opened, and during the following fifteen years Tilt Cove mine yielded about 50,000 tons of copper ore valued at $1,572,154, besides nickel worth $32,740. In 1875 another mine at Bett’s Cove was opened. There are three principal mines, all in Notre Dame Bay, the copper exports in 1905 being 81,491 tons, with a value of $448,400. The copper- bearing deposits are widely distributed. According to the geological

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survey reports, copper-bearing rocks have a development of over 5000 sq. m. throughout the island. Iron-mining, however, has far surpassed copper-mining, the chief centre being at Bell Island in Conception Bay. Hematite iron has been found at Exploits river, Fortune Harbour, New Bay and other parts in Notre Dame Bay. The iron exported in 1905 amounted to 635,350 tons with a value of $635>35°- In 1895 the value of iron exports was nil. Of iron pyrites 68,970 tons were exported in 1905 valued at $410,514. Similarly in 1895 no slate was exported. It has since been worked at Trinity Bay, Bonavista Bay and Bay of Islands, the latter deposit being declared equal to the best Carnarvon slate. In 1905 14,750 tons were shipped. The existence of coal in the island has been known since Captain Cook first reported its discovery in 1763, but until lately little has been done to exploit it. The most important carboniferous region is at Grand Lake, St George’s and the Codroy region directly opposite the Cape Breton coal-fields.

Zinc has been found in many localities, as also antimony, silver and gold. Asbestos is frequently found, and mica of good size has been discovered in the Laurentian rocks in the Long Range Moun- tains and in Labrador. At the mouth of the Humber are large deposits of marble. The valuable non-metallic materials include talc, gypsum, graphite, lithographic stone and manganese.

Shipping. — The total number of vessels sailing under Newfound- land registry on the 31st of December 1905 was 3049, with a net tonnage

of 129,617 tons. Of these 66 were steamers. The statistics of foreign-going tonnage show a remarkable growth in trade. The bounty granted by the legislature has given a considerable impetus to local shipbuilding. Between 1900 and 1905 the average of vessels annually built in the colony was 105, with a total tonnage for the five years of 17,698. In 1904-1905 the total value of exports was $10,669,342, of imports $10,279,293. For the period of seven years preceding the exports exceeded the imports by $7,174,676 or a balance of trade in favour of the colony of over one million dollars annually.

Manufactures. — In 1874 there were only five saw-mills in the colony, producing 21 11 ft. of timber. The census returns of 1901 showed 195 saw-mills valued at $292,790, employing 2408 persons and producing 43,648 ft. of timber, 16,197 of shingle and 2020 of laths, of a total value of $480,555. Paper-making from wood-pulp has been mentioned in connexion with Flora, above. Six tanneries in 1901 produced goods to the value of $98,200. There are boot and shoe, tobacco, nail, soap, furniture and carriage manufactories. The rope- walk in St John's produces rope and line valued at $300,000 annually.

Government. — Newfoundland is a British colony, directly dependent on the crown. Representative government and a constitution were granted to it in 1832, and " responsible govern- ment " in 1855. Two legislative chambers were appointed — the house of assembly, to be elected, and the legislative council, to be nominated by the governor in council. This form of government has worked satisfactorily. It consists of a governor who is appointed by the crown, and whose term of office is usually about six years; an executive council chosen by the party commanding a majority in the house of assembly, and consisting of seven members; a legislative council or upper house, of fifteen members nominated by the governor in council and holding office for life; and a house of assembly elected every four years by the votes of the people on a household suffrage basis. There are seventeen electoral districts sending thirty-six members to the house of assembly, all of whom are paid. The sessional allowances range from $194 to $291. The supreme court, instituted in 1826, is composed of a chief justice and two assistant judges. They are appointed by the crown, and hold their office for life. The jurisdiction of Newfoundland extends over the whole of the Atlantic coast of Labrador.

Finance. — Duties levied on imports form the basis of the revenue. The tariff being intended for the cost of government and not for industrial protection, the duties are not as a rule differential, being partly ad valorem, partly specific.

There is no direct taxation, and there are no city or town corporations. The customs revenue grew from $840,936 in 1885 to $2,295,959 in 1905. The public debt increased from $2,149,597 in 1885 to $22,043,338 in 1905, against which there was a sinking fund of $300,244. The debt of St John's municipal council, $1,187,221, on which full interest is paid to the government, must be credited to the gross public debt. In December 1905 a new loan of $636,903 was floated in England. Based on the value of the exports the earning capacity of the population increased from $29 per head in 1885 to $47 per head in 1905. The postal and telegraph revenue amounted in 1905 to $125,000, having more than doubled in a decade. The crown lands revenue, which in 1895 was $5500, stood in 1905 at $41,357. With the United Kingdom, trade, which in 1888 was 38 % of the whole, steadily diminishedˆ in volume, until it was in 1905 only 22 % of the whole. Trade with

America in this period showed an increase of 128-5% and that with Canada 76-1 %.

Roads and Railways. — Railways play a unique part in the modern history of the island. Not until 1825 was the first road made; it was 9 m. in length, from St John's £*• to Portugal Cove. When representative government

contract was established in 1S32 an annual grant was voted for roads and bridges, and of late years not less than $100,000 per annum has been expended on this head. There are now over 1000 m. of postal roads, and over 2000 of district roads. In 1880 after much agitation the legislature finally agreed to raise a loan of £1,000,000 for the construction of a railway from St John's to Hall's Bay, with branches to Brigus and Harbour Grace, the distance being estimated at 340 m. In November 1884 the line was completed for traffic as far as Harbour Grace. In the following year the construction of a line, 27 m. in length, from Whitbourne to Placentia, the old French capital, was begun and finished in 1888. Shortly after- wards it was decided to resume the line northwards from St John's to Hall's Bay (which, owing to the failure of the con- tractors, had been discontinued) with a view ultimately to a transinsular railway. The tender of a well-known contractor, Mr R.G. Reid of Montreal, was accepted, and the work was

begun in October 1890. But before the contractor had proceeded far with the Hall's Bay line a new survey was made and another route determined for the proposed transinsular railway, west- wards from the valley of the Exploits, which was regarded as much more favourable than the one originally contemplated. It traversed the Exploits and Humber valleys, passing through the most fertile territory in the island, to the Bay of Islands on the west coast; hence it skirted Bay St George and the Codroy valley and terminated at Port-aux-Basques, acommodious harbour 93 m. distant from Sydney, Cape Breton. The new route was chosen, and a contract signed on the 16th of May 1893, whereby the contractor was to be paid $15,600 per mile in Newfoundland bonds, the whole line to be completed in three years. At the same time, in order to provide for the working of the line, it was agreed between the colonial government and Mr Reid that the latter should maintain and work it, as well as construct a system of telegraphs, for a period of ten years from the 1st of September 1893 at his own expense, in consideration of a " grant in fee simple to the contractor of 5000 acres of land for each one mile of mail line or branch railway to be operated." Should the line, therefore, be 500 m. in length the land grant would be 2,500,000 acres, to be situated on each side of the railway in alternate sections of 1 or 2 m. in length with the railway, and 8 m. in depth, the colony also retaining an equal amount of land with the contractor along the route. Much hostile criticism was subsequently directed towards this arrange- ment. In 1898 a new proposal was made by Mr Reid, under the terms of which he undertook to work all the railways in the island for a period of fifty years, free of cost to the government, provided that, at the termination of the said period, the railways should become his own property. He was also to receive a further concession of land to the extent of 2,500,000 acres on terms similar to those contained in the former contract. Mr Reid agreed to build and run seven steamers, one in each of the large bays, and one to ply in Labrador in summer, to provide an electric street railway for St John's, and also to pave a certain portion of the capital. The colony was to part with the telegraph system to the contractor, who was to acquire at a fixed price the government dry-dock at St John's. On the other hand, to complete the bargain, $1,000,000 in cash was to be paid by the contractor to the government within a year after the signing of the contract. This remarkable covenant, which was afterwards characterized by Mr Chamberlain, secretary of state for the colonies, as a transaction " without parallel in the history of any country," was nevertheless ratified by the legislature, and submitted to the governor, Sir Herbert Murray, for his approval. The governor declined to append his signature to the instrument, but upon its being referred to the imperial

secretary of state, it was decided that the arrangement was one relating exclusively

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to the colony, and this being the case, that it would be ” an unwarrantable interference with the rights of a self-governing colony ” to disallow the measure. The Reid contract was therefore signed by Sir Herbert Murray before relinquishing his post early in 1898. Meanwhile considerable feeling had been manifested in the colony; numerous public meetings in support of the governor’s action were held; and several petitions were despatched to England; but it was not until the spring of 1900 that Sir James Winter and his colleagues were forced to resign on account of the opposition which had been engendered. The general election brought a Liberal, Mr (afterwards Sir) Robert Bond, into power; and he had hardly assumed office when the contractor approached the ministry with further proposals to convert his property into a limited liability company with a capital of £5,000,000 sterling, for which proceeding the consent of the legislature was necessary, under the terms of 1898. Mr Bond refused unless a modification of the contract was agreed to. The modifications demanded were — that the telegraphs should revert at once to the govern- ment; that the land grants, which included a large amount Of private property, should be readjusted so as to conserve the rights of those whose holdings had been confiscated; also, that it should be optional for the colony to take over the railways at the end of fifty years by paying back the sum of $1,000,000 with interest, the amount paid by Mr Reid to the colony; and a sum to be arrived at by arbitration for all improvements that may have been made on the property within the fifty years. After considerable dispute these terms were substantially agreed to, and the conversion into a company took place.

History. — Newfoundland, commonly termed the ” senior colony ” of Great Britain, antedates in discovery (though not in continuous settlement) any other British over-sea dominion. John Cabot, sailing from Bristol in 1497, appears to have made landfall at Bonavista and claimed the whole country for Henry VII. Three years later Gaspar Corte-Real, ranging the North American coasts, discovered and named Conception Bay and Portugal Cove, and was appointed Portuguese governor of Terra Nova. The long series of annual trans-Atlantic expeditions followed upon the voyages of Cabot and Corte-Real, and their reports in England, Portugal and France concerning the multitude of fish in Newfoundland. For a long time it was supposed that the English fishermen did not avail themselves to any extent of

these advantages until the middle of the 16th century, but this is now shown to be erroneous. Mr Prowse states that the trade during the first half of the century was both ” extensive and lucrative.” In 1527 the little Devon- shire fishing ships were unable to carry home their large catch, so ” sack ships ” (large merchant vessels) were employed to carry the salt cod to Spain and Portugal. An act cf 1541 classes the Newfoundland trade with the Irish, Shetland and Iceland fisheries. Hakluyt, writing in 1578, mentions that the number of vessels employed in the fishery was 400, of which only one-quarter were English, the rest being French and Spanish Basque. But in the same year, according to Anthony Parkhurst, ” the English are commonly lords of the harbours where they fish and use all help in fishing if need require.” Shortly there- after England awoke to the importance of Cabot’s great discovery, and an attempt was made to plant a colony on the shores of the island. Sir Humphry Gilbert, provided with letters patent from Queen Elizabeth, landed in St B *f y . John’s in August 1583, and formally took possession toJi of the country in the queen’s name. The first attempt at colonizing was frustrated by the loss of Gilbert soon after- wards at sea. In 1610 James I. granted a patent to John Guy, an enterprising Bristol merchant, for a ” plantation ” in New- foundland ; but no marked success attended his efforts to found settlements. In 1615 Captain Richard Whitbourne of Exmouth in Devonshire was despatched to Newfoundland by the British admiralty to establish order and correct abuses which had grown up among the fishermen. On his return in 1622 he wrote a ” Discourse and Discovery of Newfoundland Trade ” which King James, by an order in council, caused to be distributed

among the parishes of the kingdom ” for the encouragement of adventures unto plantation there.” A year after the departure of Whitbourne, Sir George Calvert, afterwards the first Lord Baltimore, obtained a patent conveying to him the lordship of the whole southern peninsula of Newfoundland, and the right of fishing in the surrounding waters. He planted a colony at Ferryland, 40 m. north of Cape Race, where he built a hand- some mansion and resided with his family for many years. The French so harassed his settlement by incessant attacks that he at length abandoned it.

In 1650, or about a century and a half after its discovery, Newfoundland contained only 350 families, or less than 2000 individuals, distributed in fifteen small settlements, policy? chiefly

along the eastern shore. These constituted the resident population; but in addition there was a floating population of several thousands who frequented the shores during the summer for the sake of the fisheries, which had now attained very large dimensions. So early as 1626, 150 vessels were annually despatched from Devonshire alone; and the shipowners and traders residing in the west of England sent out their ships and fishing crews early in summer to prose- cute these lucrative fisheries. The fish caught were salted and dried on the shore; and on the approach of winter the fishermen re-embarked for England, carrying with them the products of their labour. Hence it became the interest of these traders and shipowners to discourage the settlement of the country, in order to retain the exclusive use of the harbours and fishing coves for their servants, and also a monopoly of the fisheries. They were able to enlist the British government of the day in their project, and stringent laws were passed prohibiting settlement within 6 m. of the shore, forbidding fishermen to remain behind at the close of the fishing season, and rendering it illegal to build or repair a house without a special licence. The object of this short-sighted policy, which was persisted in for more than a century, was to preserve the island as a fishing station and the fisheries as nurseries for British seamen.

There was, however, another element which retarded the prosperity of the country. The French had early realized the immense value of the fisheries, and strove long and Utrecht desperately to obtain possession of the island. Their constant attacks and encroachments harassed the few settlers, and rendered life and property insecure during the long wars between England and France. When at length, in 1713, the treaty of Utrecht ended hostilities, it did not deliver New- foundland from the grasp of France, as it yielded to her the right of catching and drying fish on the western and northern sides of the island. Though no territorial rights were conferred on the French, and the sovereignty was secured to England, the practical effect was to exclude the inhabitants from the fairest half of the island.

In spite of the restrictive regulations, the number of the resident population continued to increase. The sturdy settlers clung to the soil, and combated the ” adventurers ” governor. as t ” le merchants were called, and after a lengthened conflict obtained freedom of settlement and relief from oppression. But the contest was severe and prolonged. The merchant-adventurers strenuously opposed the appointment of a governor; but at length, in 1728, the British government appointed Captain Henry Osborne first governor of Newfound- land, with a commission to establish a form of civil government. This constituted a new era in the history of the colony. In 1763 the fixed inhabitants had

increased to 8ooo, while 5000 more were summer residents who returned home each winter. In 1763 the coast of Labrador, from Hudson's Strait to the river St John opposite the west end of the island of Anticosti, was attached to the governorship of Newfoundland. The population in 1785 had increased to 10,000. During the wars between England and France which followed the French Revolution, Newfoundland attained great prosperity, as all competitors in the fisheries were swept from the seas, and the markets of Europe were exclusively in the hands of the merchants of the country. The value of fish trebled, wages rose to a high figure.

and in 1814 no less than 7000 emigrants arrived. The population now numbered 80,000. In 1832 representative government was granted to the colony, and provision was made for education. In 1846 a terrible fire destroyed three-fourths of St John's and with it an enormous amount of property; but the city rose from its ashes improved and beautified. In 1855 the system of responsible government was inaugurated. In 1838 the first Atlantic cable was landed at Bull Arm, Trinity Bay.

Unproductive fisheries, causing a widespread destitution among the working classes, marked the first eight years of the decade between i860 and 1870. A system of able- bodied pauper relief was initiated to meet the neces- history. sities of the case but was attended with the usual demoralizing results. The necessity of extending the cultivation of the soil in order to meet the wants of the growing population was' felt more and more as the pressure arising from the failure of the fisheries showed their precarious nature more sensibly. In 1864 copper ore was discovered in the north, and mining operations were successfully initiated. In 1869 a series of successful fisheries began which enabled the government to terminate the injurious system of able-bodied pauper relief. In 1871 the revenue rose to $831,160. In 1873 direct steam communication with England and America was established.

By the treaty of Utrecht of 17 13 a right was reserved to French subjects to catch fish and to dry them on that part of Newfoundland which stretches from Cape Bonavista to the northern part of the island and from thence claim*. coming down by the western side reaches as far as Pt. Riche. By the treaty of Versailles of 1783 France renounced the fishery from Bonavista to Cape St John on the east coast, receiving in return extended rights upon the west coast as far as Cape Ray. Neither treaty purported to grant exclusive right, but there was annexed to the treaty of Versailles a declaration to the effect that " His Britannic Majesty will take the most positive measures for preventing

his subjects from interrupting in any manner by their competition the fishery of the French during the temporary exercise of it which is granted to them upon the coasts of the island of Newfoundland, and he will for this purpose cause the fixed settlements which shall be formed there to be removed." Upon this declaration the French founded a claim to exclusive fishing rights within the limits named. A convention was entered into with a view to defining these rights in 1854, but it remained inoperative, the consent of the Newfoundland legislature, to which it was made subject, having been refused. Meanwhile the French government granted a bounty to the French fishermen which enabled them to under- sell the colonists.

In 1884 a convention which had been arranged between the British and French governments was submitted to the colonial administration by its promoters Sir Clare Ford and Mr E. B. Pennell, C.M.G.,but without commanding the support of the Newfoundland government. In the year following, on a change of ministry in the colony, the Ford Pennell convention was again offered to the Newfoundland legislature in a slightly amended form, but the joint committee of the colonial house of assembly and the council absolutely refused to ratify the arrangement unless the French government would consent either to annul or to amend the system of bounties paid upon French-caught fish in Newfoundland waters. At the same time, to counteract the effect of these bounties, which pressed very hardly upon the British competition, a Bait Act was framed and carried in 1886, empowering the executive to prohibit the capture in Newfoundland waters for exportation or sale of bait fishes, except under special licence to be issued by the colonial government. The consequence of this measure, were its provisions properly enforced, would be to place an embargo upon the local supply of bait requisite to the French fishermen — the so-called " metropolitan fleet " — on the Grand Banks. Upon being apprised of this enactment, the French government immediately demanded that Great Britain should deny its sanction to this Newfoundland Bait Act, and pressed their objections with such persistence as to induce Lord Salisbury

Bait

Act.

to disallow the measure. Nevertheless, the despatch of the governor,

Sir William des Voeux, to the colonial secretary, Sir H. Holland, was so entirely in favour of the principle of the bill that the Newfoundland authorities became imbued with a fixed determination to urge forward the measure for imperial acceptance. In 1887, therefore, a delegation, consisting of Sir Robert Thorburn, the premier, and Sir Ambrose Shea, visited England at a moment most propitious for obtaining the sympathy and support of the imperial government and the press and people of the mother country, it being the jubilee year of Queen Victoria's accession to the throne. A conference of colonial premiers was one of the notable events distinguishing that happy period, and the subject was argued before the conference at considerable length. The claim set up by the senior colony " to control and legislate for her own fisheries " met with general approval, the single dissentient-being the representative of Canada, who feared that Canadian fishermen would suffer under the bill. When an assurance was tendered that Canada's fishermen would be placed upon the same footing with those of Newfoundland, the British government somewhat reluctantly sanctioned the Bait Act. The stipulation was made, however, that it should not be enforced until the spring following (1888). In the meantime the chagrin of the French Foreign Office at the failure of the Ford-Pennell negotiations, and the hostile attitude taken up by the Newfoundlanders in what they deemed to be the conservation of their interests, induced M. de Freycinet to devise retaliatory measures. Instructions were issued " to seize and confiscate all instruments of fishing belonging to foreigners resident or otherwise, who shall fish on that part of the coast which is reserved to our use." Lord Rosebery, then foreign secretary, protested to the French ambassador against the spirit of these instructions, which he insisted were in direct contravention of the treaty, inasmuch as they ignored the concurrent as well as those sovereign rights of Great Britain which France solemnly undertook by the treaties never to question or dispute. Nor were other opportunities soon wanting to the French to retort severely upon the Newfoundland authorities for their passage of the Bait Act, as well as to repair in large measure the injury which that act promised to inflict upon the French industry. About 1874 a Nova Scotian named Rumkey had established the first factory for the canning of lobsters on the west coast. This concern proved profitable, and others sprang up, until, at the close of the season of 1887, Captain Campbell, R.N., reported that twenty-six factories were at work, employing about 1100 hands. It was at that time understood that this was an industry which, by the very nature of the process and the permanent shore structure it involved, the French were disqualified from pursuing. So clearly was this recognized that in 1886, when Commander Browne of H.M.S. " Mallard " reported the

existence of a French lobster factory at Port-aux-Choix, a substantially-built structure, roofed with corrugated iron, the French authorities conceded that the establishment was in violation of the treaties, and issued orders for its removal. But this conciliatory policy was of brief dura- tion. The year of the Bait Act's first successful application was marked by the stoppage, by order of the French government, of Messrs Murphy and Andrew's lobster factory, and by their contention that the lobster-canning industry formed a part of the privileges conceded under the treaties to the French, whose participation by the British fishermen would be forcibly resisted.

An exchange of notes took place between Lord Salisbury and M. Waddington, the French ambassador, in which the latter expressed an opinion which evoked a spirited protest on the part of the British Foreign Office. " France," it was then declared, " preserved the exclusive right of fishing she always possessed. This right of France to the coast of Newfoundland reserved to her fishermen is only a part of her ancient sovereignty over the island which she retained in ceding the soil to England, and which she has never weakened or alienated." This claim of the French to an exclusive fishery was held to be wholly untenable, and their classification of the lobster catching and

canning industry as amongst the "fishing" privileges granted them by the treaty was denounced as contrary to both letter and spirit of that instrument. Notwithstanding this, the French agents on the treaty shore clamoured for the removal of several of the British factories, which (it was declared) interfered with the exclusive fishing rights of the French. The French govern- ment also voted (1888) a special bounty for the establishment of lobster factories by their subjects on the treaty coast. Pending a settlement, the British foreign office deemed it expedient, in order not to give offence to France, to invest the French claims with a semblance of right by issuing instructions to British naval officers on the North American station to continue to interpret and enforce the treaties with regard to the Newfound- land lobster-canning industry on the same terms as they had done hitherto with regard to the cod-fishery. Acting under a statute passed in the reign of George III., empowering British naval officers to interpret and enforce the treaties, Sir Baldwin Walker and others proceeded to destroy or remove a number of British factories at the request of the French agents. In 1890 the unexpected discovery was made that the act empower- ing British naval officers to enforce the provisions of the treaties with France had expired in 1832 and had never been renewed. Consequently all the proceedings of which the colonists had been the victims were illegal. One of them, Mr James Baird, immediately took proceedings against Sir Baldwin Walker in the supreme court, which

decided in his favour, mulcting the admiral in £1000.

On an appeal to the privy council the decision was upheld. But before this incident had taken place, the controversy between London and Paris culminated in the modus vivendi of 1800, by which the lobster factories, both ‘”” British and French, which were in existence on the. j 890i 1st of July 1889, were to continue for the present. Instantly the colony took alarm, and a deputation consisting of the island’s leading men was sent to England to protest against both the principle and practice of such an arrangement. On their return they learnt that it was the intention of the imperial government to re-enact verbatim et literatim the act for the enforcement of the treaties which had expired fifty-nine years previously. To prevent such an occurrence, delegates from both parties in Newfoundland visited London in April 1891, and, appearing at the bar of the House of Lords, promised that if the measure which was then on the eve of being introduced into that body were withdrawn, a temporary measure would be passed by the Newfoundland legislature which would answer the same purpose of enabling Great Britain to carry out her treaty obligations with France. The hope then generally entertained was that the whole question of French rights in the colony would soon be the subject of definite negotiations looking to their total extinguishment. That hope was, however, not speedily realized. For a number of years the Modus Vivendi Act was annually passed by the legislature, each year under protest, the conviction gaining strength in the colony that the imperial government was averse from renewing negotiations with France.

In 1898 the secretary of state, Mr Chamberlain, yielding to the urgent request of the senior colony, despatched a commission consisting of Sir J. Bramston and Sir James Erskine, with Lord Westmeath as secretary, on a tour of investigation along the treaty shore; and the report which the royal commissioners made (though not published) touched all points of the unhappy dispute. Again, in 1901, on a suggestion put forward by the colony, Mr Chamberlain summoned Sir Robert Bond, the Newfoundland premier, and a colleague, Sir E. P. Morris, to London, for a new conference on the French shore question, in which Lord Lansdowne, the foreign secretary, participated Nothing coming of this, the Modus Vivendi Act continued to be passed annually. In 1901 a fresh attempt was made to effect a settlement, but the negotiations were again unsuccessful, as the colony declined to make concessions in regard to the sale of bait unless the French system of bounties on the sale of fish by their citizens were abandoned or at least modified in important

particulars. Later in the same year negotiations were begun between the British and French governments for a general treaty, in which all outstanding matters of dispute between the two countries should be for ever settled. As regards New- foundland, the discussion of the French fishery question on the basis of arrangement in the matter of bait and bounties having proved unavailing, it was proposed not to persist further in it, but to put before the French government an arrangement which would terminate the rights of French fishermen to land and dry their fish on the shores of the island, but leave a concurrent right of fishery, the regulation and policing of which would be in the manner provided in the North Sea Fishery Convention of 1881 and the convention of 1887.

On the 8th of April 1904 the Lansdowne-Cambon Convention

was signed, which effected a final settlement of the French shore

question. For the total abandonment of the French

Conven- r jght s compensation was clearly not only due to the Hon of . “,. . , , „ 1 . 1 ,. 1 . . ,

1904. individuals actually engaged in the fishing industry,

but to the French nation at large. Territorial conces- sions were therefore made consisting of a modification of the Anglo-French boundary line in the Niger and Lake Chad district, and a re-arrangement of the Gambia-Senegambia frontier, giving Yarbatenda to Senegambia. The Los Islands opposite Konakry Island were likewise ceded to France. Provision was made for the reciprocal recognition, on the convention coming into force, of a British consul at St Pierre and a French consul at St John’s. Claims for indemnity were duly submitted to an arbitral tribunal, composed of an officer of each nation; and at length what is known as the Lyttelton Award, was made as follows: —

General award for French rights . . $255,750

Loss of occupation 226,813

Effects left by the French on treaty coast . . 28,936

So far as concerned the French, an end was thus put to a situation on the treaty shore, which for nearly two hundred years had given rise to difficulties and anxieties.

Scarcely, however, had a year elapsed from the signing of the convention, when another international disagreement connected with the fisheries assumed grave importance. There ˆhhiat?” ˆ at * ˆ on & k een mtense dissatisfaction in the colony rights. over the attitude of the American government and American fishermen towards the colony. The action of the American Senate in rejecting the Bond-Hay treaty negoti- ated in 1902 stirred the colonial government to retaliatory measures. By virtue of the treaty of 1818 American fishermen enjoyed the following rights: (1) to take fish of every kind on that part of the southern coast of Newfoundland which extends from Cape Ray to Ramea Islands; (2) to take fish of every kind on the western and northern coasts of Newfoundland from the said Cape Ray to the Quirpon Islands; and (3) to take fish of every kind on the coasts, bays, harbours and creeks from Mount Joly to the southern coast of Labrador, to and through the straits of Belle Isle, and thence northward indefinitely along the coast. Subject to these limitations American fishermen have a right in common with British fishermen to prosecute their industry within those areas.

The foregoing embraces the whole of their fishing privileges. Every other right that they ever possessed they renounced under the treaty in the following language: ” The United States hereby renounce for ever any liberty heretofore enjoyed or claimed by the inhabitants thereof, to take, dry or cure fish on or within three marine miles of any of the coasts, bays, creeks or harbours of His Britannic Majesty’s dominions in America not included in the above limits.” This renunciation contained but one qualification: ” that American fishermen shall be permitted to enter such bays or harbours for the purpose of shelter and of repairing damages therein, of purchas- ing wood, and of obtaining water and for no other purpose whatever.”

Under the Newfoundland Foreign Fishing Vessels Act of 1893 the governor in council was authorized to issue licences to foreign fishing vessels, enabling them to enter any port on the

coasts of the island to purchase bait, ice, supplies and outfits for the fishery, and to ship crews’. In 1905 this act was repealed and another passed by the colonial legisla- yJrend/ ture imposing certain restrictions on American vessels, /po& and a further more stringent act in 1906, preventing Newfoundlanders from joining American vessels. These acts were resented by the American government, which, through Mr Secretary Root, called upon the British government to disallow such interferences on the part of the Newfoundland legislature. Lord Elgin’s reply was to suggest a modus vivendi pending further discussion of the questions at issue. In spite of the colony’s

energetic protest, a modus vivendi was agreed to in October 1906, whereby the Foreign Fishing Vessels Act of 1906 was held in abeyance, and the act of 1905 was held not to apply to American fishing vessels, and light dues were waived, while on the other hand American vessels were to report at the custom house on entry for clearance, and their fishermen were to comply with colonial fishery regulations. As regards Sunday fishing by the Americans, which was an important colonial grievance, the American government consented to waive it, if the use of purse seines by American fishermen were allowed. Lord Elgin's action was considered to be an interference with the internal affairs of the colony and great public indignation was aroused. Retaliatory measures were resolved upon, Newfoundland fishermen being declared liable to fine and imprisonment for selling bait to the Americans or for joining American vessels. The legislature voted an address to the imperial government, protesting against the modus vivendi, and this was carried to England in 1907 by Sir Robert Bond, the premier of the colony, but without avail. The matter was referred to the Hague tribunal for arbitration, and pending this the modus vivendi (agreed to in 1908) continued in force. The tribunal gave its award in September 1910, the two main points at issue being decided as follows: (a) Great Britain had the right to make regulations as to the fisheries without the consent of the United States, subject to the pro- visions of the treaty of 1818. (b) The " three-mile limit " in bays (subject to special judgment in individual cases) was to be taken from a line across the bay at the point, nearest the entrance, where a width of ten miles is not exceeded. Among other provisions it was decided that American vessels might employ foreign hands (but these received no benefit under the treaty); also that they might be required to report to customs houses if facilities to do so existed.

Commerce received a shock, but derived a salutary lesson from bank failures which occurred in December 1894. The Union and Commercial banks suspended payment, followed by the suspension of the savings bank, a government institution. This at once lowered the credit of the colony abroad, and caused the utmost misfortune amongst all classes. There is little doubt but that a principal cause of the disaster was the vicious and dangerous system of credit which had been followed by the merchants in their dealings with the " planters " and commission merchants. The insolvent institutions were speedily replaced by branches of three prominent Canadian banks, and a loan of $1,000,000 procured in London by Mr Bond soon after the debacle served to tide the senior colony over its financial difficulties. A new era of prosperity has since set in.

In politics, apart from the matters already alluded to, there occurred

in 1893 the filing of petitions under the Corrupt Practices Act to unseat Sir William Whiteway and his colleagues, who had been successful at the general election of that year. The charges created no little interest in England, and the new government was subjected to much unfair criticism, arising largely from a mis- apprehension pf the political and administrative conditions in the colony. They were examined in detail by the supreme court, which finally pronounced them unsustained, and the Whiteway government resumed office after a brief period of abdication. On the whole, it may be said that Newfoundland has passed the critical stage in her history. Between 1863 and 1900 it has been estimated that $12,000,000 worth of copper ore has been exported, and since 1898, when a discovery of iron ore made at Bell Island, Conception Bay, led to important results, the belief in the island's mineral resour- ces, long entertained by geologists, received practical corroboration. In 1900 the British admiralty, acting upon the repeated suggestions of Sir Charles Dilke and others interested in the manning of the navy, decided to initiate a branch of the imperial naval reserve in the colony. In 1901 a difficulty arose as to paying the men, owing to the lack of any provision for that purpose in the Imperial Reserves Act under which they were enlisted. The colony was asked to bear the cost; its refusal was followed (1902) by the enactment of

special legislation rendering the enrolment and maintenance of the reserves in Newfoundland a special imperial undertaking. Pro/ecu Several efforts had been and continued to be made to M* " "duce Newfoundland to confederate with the Dominion !T™ . of Canada, but the project never met with any degree of ˆmnaam. f avour w ith the electorate. Much of the disfavour with which confederation was regarded in the colony was said to be due to Sir John Macdonald's opposition on behalf of Canada to the Bond-Blaine commercial treaty, which was negotiated between an emissary from the government of Newfoundland and Mr Blaine, then secretary of state of the United States of America, in 1890, but was subsequently disallowed at his request by the imperial government. It is, however, probable that the treaty would never have received the sanction of the American Senate. After the insolvency of the colony in 1 894-1 895, a delegation was sent to Ottawa to ascertain if it were possible to arrange terms of confederation; but Sir Mackenzie Bowell's government objected to the assumption by the Dominion of the entire amount of New- foundland's debt ($16,000,000), and the negotiations were abandoned.

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NEW GLARUS, a town and a village of Green county, Wis- consin, U.S.A., about 22 m. S.W. of Madison, on the Little Sugar river, a branch of the Rock river. Pop. of the town (1890) 1 180; (1900) 1245; (1905) 685; (1910) 627; of the village, which was separated from the town in 1901 (1905) 665; (1910) 708. New Glarus is served by a branch of the Chicago, Mil- waukee & St Paul railway. It has agricultural and dairying industries, but little or no manufacturing interests. It had its origin in a colonizing experiment made by the canton of Glarus, Switzerland in 1845. Agents sent by the canton chose the site of New Glarus largely because the rocky slopes of the valley suggested their Alpine home. The advance party then set about constructing houses and sent for the colonists; and some two hundred men, women and children started from Glarus in April 1845 under two leaders chosen by popular vote; misreading their directions the party got by mistake to St Louis, whence they proceeded up the Mississippi to Galena and thence overland to their new home. To all intents and purposes they were an independent people. They expected to be and were self- sustaining, and for a generation or more retained their exclusive- ness to a remarkable degree. They brought with them a " form of government " drawn up by the Cantonal Council of Glarus and providing in great detail for a system of schools, for what was practically a state church (Reformed Lutheran) supported by tithes, for a system of poor relief , for a system of courts, and for a set of town officers elected on a limited property franchise. This " form " was to be amended and new laws were to be added, as circumstances should require, in a town-meeting in which the essential features of the referendum were observed. The original plan provided also for an equitable distribution of land so as to give to each head of a family pasture, timber and farm lands. With such adjustments as were found necessary for co- ordination with the town and county governments of Wisconsin, it remains practically the same to this day. The village and

town still have an Old {World aspect, and the architecture, customs, style of dress and language of the pioneers still persist to a great degree. A famous organization is the New Glarus William Tell Club of sharpshooters. The village owns its water- works and its electric lighting plant.

NEW GLASGOW, a manufacturing and mining town of Pictou county, Nova Scotia, Canada, on the East river, near its entrance into Pictou Harbour, and the Intercolonial railway, 104 m. N.E. of Halifax. Pop. (1901) 4447. Extensive coal mines are in the vicinity, and there are manufactures of iron and steel, mill machinery, door and sash factories, &c, as well as several ship- building yards.

NEW GRANADA (Span. Nueva Granada), the title under Spanish colonial administration of that part of South America now known as the republic of Colombia, which at one time was extended to include Venezuela and Ecuador. It also was for a time the title of the united territories of Panama and Colombia under republican auspices. The Bogota plateau, then inhabited by a partly civilized Indian nation known to the Spaniards as Chibchas, or Muyscas (the second name seems to have been applied to them through a misunderstanding, the word meaning ” men “), was invaded from the Caribbean coast and conquered in 1537 by Gonzalo Jimenez de Quesada, who, in honour of his native province, called it the ” Nuevo Reino de Granada.” The title at first applied only to the plateau regions of Colombia, as the coast provinces had been previously occupied and named. In 1550 an audiencia real under the viceroyalty of Peru was established at Santa Fe (Bogota), but in 1564 this isolated group of Spanish settlements was transformed into a presidency. In 1 7 18, owing to the unmanageable size of the viceroyalty of Peru, it was divided and a new viceroyalty was created from the various provinces lying in the north-western angle of the continent, extending from Tumbez northward to the northern limits of Panama, and eastward to the Orinoco, to which the name of Nueva Granada was given. The first viceroy was Pedroza y Guerrero, but his successor, Jorge Villalonga, resumed the title of president, and it was not until 1739 that the title of viceroy was definitely established. The new viceroyalty included the provinces of Tierra Firma (now the republic of Panama); Maracaibo, Caracas, Cumana and Guyana (now included in Venezuela); Cartagena, Santa Marta, Rio Hacha, Antioquia, Pamplona, Socorro, Tunja, Santa Fe, Neiva, Mari- quita, Popayan and Pasto (now included in Colombia); and Quito, Cuenca and Guayaquil (now included in Ecuador). In 1777 the provinces of Maracaibo, Caracas, Cumana and Guyana were detached from the viceroyalty to form the captaincy- general of Caracas; otherwise it remained as above until

the termination of Spanish rule in South America.

For the republic of Colombia (1819-1830), the republic of New Granada (1831-1861), the United States of Colombia (1861-1886), and the republic of Colombia (1886 to date), see Colombia.

NEW GUINEA, the largest island (excluding Greenland) in the world, lying between the equator and 12° S. and 130° 50′ and 151° 30′ E., separated from Australia by Torres Strait and having the Arafura Sea on the south-west. It is divided politic- ally between Britain (south-east) , Germany (north-east) and Holland (west), the Dutch territory occupying about 48-6% of the whole area, the German 28-3% and the British Territory of Papua 23-1%. The total area is estimated to be 312,329 sq. m.

New Guinea was probably in Miocene times, if not later, united to the northern part of Queensland. The deeply indented shore of the Gulf of Papua forms the boundary of the subsided area between the two countries, and from it the land stretches out for 200 to 300 m. north and west on both sides of the Fly river in vast plains, little elevated above sea-level. From Cape Bum westwards precipitous limestone cliffs, several hundred feet high, face the sea and rise into forest-clad mountains behind. The northern extremity of New Guinea is all but severed from the mainland by the deep MacCluer Inlet, running eastwards towards Geelvink Bay which deeply indents the northern coast. South- wards from Geelvink Bay the north-east coast is more regular than the south-western. Off its coast-line, on the parallel of 6° S., lies the vast Bismarck Archipelago, of which New Pomerania (Neu Pommern) is the most important member; and, on the parallel of io°, the d'Entrecasteaux Islands, with the Marshall Bennett group to their north-east; while stretching out from the south-east promontory of the mainland is the Louisiade Archi- pelago. The Great Barrier Reef of Australia can be traced more or less continuously round the Gulf of Papua and along the south-east coast to the extremity of the Louisiades. In a general way it may be said that on the west coast of New Guinea, from Cape Buru to the Louisiades, the sea is shallow, while on its steeper eastern side the water close in-shore is often too deep

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for safe anchorage. The islands on the southern margin of the Louisiade Archipelago are raised coral reefs, but the majority are mountainous, rarely, however, exceeding 3000 ft.; all of them are richly forested, but of little agricultural value. The volcanic d’Entrecasteaux Islands are mostly larger, more elevated (the highest being 8000 ft.), and stand in deeper water than the Louisiade group. To the east of Kiriwina (Trobriand) lies a small group of uniquely formed islets, each of which is com- pletely surrounded by a steep forest-clad marginal rampart of coral 300 to 400 ft. high, concealing a depressed inhabited central plateau.

Starting in the southern extremity of New Guinea from an abrupt face some 3000 ft. high, and traversing its centre nearly parallel to both coasts, run high ranges of mountains, which, if not continuous, merge into each other in the same general direc- tion. The Owen Stanley range-its highest summit, named by Huxley in 1850 Mount Owen Stanley, 13,120 ft. — the Albert Victor Mountains, the Sir Arthur

Gordon range, and the Bis- marck Mountains form a backbone united probably with the Sneeuw (Snowy) Mts., where perpetual snow was found by Dr. Lorentz in 1909 at 14,635 ft., and the height of Mt. Wilhelmina was fixed at 15,580 ft. This height may be exceeded by Mt. Carstensz. Other ranges, mostly of lower altitude, run parallel mainly to the east and west coasts. The most important and best - known rivers are the Amberno, in the north, discharging by a wide delta at Point d'Urville; the Kaiserin Augusta, which, rising in the Charles Louis range, and entering the Pacific near Cape della Torre, is navigable by ocean steamers for 180 m.; the Ottilien, a river of great length, which discharges into the sea a short distance south of the last named; and the Mambare, navigable by steam-launch for 50 m. which drains the eastern aspect of Wasigororo Mountains and enters the sea near the Anglo-German boundary. Below 8° S. the narrowness of the country precludes the existence of any very important rivers on either coast. The Purari, however, whose delta is 20 m. long by 20 broad, is navigable for 120 m. by steam-launch, while the Fly has been traversed by the same means for 500 and by a whale-boat for over 600 m. The latter drains an enormous tract of country, which is so little elevated above the sea-level that it can never be of any agricultural or commercial value. West of 141 E. the geographical features of the coast, except in the region of MacCluer Inlet and Geelvink Bay, are very little known, and those of the interior even less.

Bmcry Walker sc

Geology. — The geology of British New Guinea is best known from the report of A. Gibb Maitland {Ann. Rep., British New Guinea, 1891-1892; Pari. Papers, Queensland, 1893, C.A. 1. 53-85, with 3 maps and 3 plates; bibliography, p. 85), which shows that the axis of the territory is a high range, composed of slates and schists of undetermined age, with intrusive plutonic rocks. In the district around Port Glasgow, on the south coast of the eastern peninsula, are the Boioro limestones, also of unknown age ; they are lead-coloured, brecciated limestones with interbeddea dolerites. Some Cretaceous or Upper Jurassic rocks occur in the basin of the Fly river. The Port Moresby beds are Cainozoic. They are highly inclined, and occupy a large range of country along the south coast, and include the Macgillivray Range, to the north-east of Beagle Bay. They are marine and probably Miocene; and range up to the height of 800 ft. above the sea, approximately the same limit as in Victoria. The Kevori grits, and the raised coral reefs are upper Cainozoic, and perhaps Pleistocene; but the reefs occur inland up to a height of 2000 ft. and their range back in time has not been fixed. The volcanic series include the

rhyolite of Nell Island, some obsidian, and the sheets of basalts which form the Cloudy Mountains, Mount Dayman and Mount Trafalgar (an active volcano), and also cover wide areas to the south and west of the Owen Stanley Range. Most of western British New Guinea consists of recent superficial deposits, in the basin of the Fly river. The Louisiade and the d'Entrecasteaux Islands consist of the same slates and schists as form the main axis of the eastern peninsula, and they are auriferous. The geology of the rest of New Guinea is imperfectly known. It appears to consist in the main of a continuation of an axis of old schists and slates, with granite intrusions, and flanked by coastal plains with Cretaceous or Jurassic, and Miocene beds, with Pleistocene sands and reefs and volcanic rocks. In the north-west coal deposits occur. Fergusson Island clearly shows remains of extinct craters, and possesses numerous hot springs, saline lakes and solfataras depositing sulphur and alum. In Murua (Woodlark I.) are quarries of the banded quartzite from which the best stone adzes found throughout south-east New Guinea are made. In Rossel Island (Roua or Arova) occur crystalline schistose and volcanic rocks, and in Misima (St Aignan) limestones and lavas in addition. Nearly all the rivers in New Guinea yield " colours " of gold, but only in the Louisiade Archipelago has enough been discovered to constitute the district a goldfield. No auriferous reefs have been found. Black magnetic iron sand covers the shore in Milne Bay. Coal has been observed in the Purari sandstones. In the Gira river the valuable alloy osmiridium has been discovered. Earthquakes are rare on the mainland, but not infrequent in Bismarck and d'Entrecasteaux archipelagos.

Climate. — Since the mountains as a rule traverse the island parallel to its coasts, the eastern shores have far less rain than the western. The amount which falls, chiefly at night, varies from 30 in. on some parts of the coast to 130 at others, and to a far greater but unknown amount in the mountains. Throughout the dry or cool season the wind blows steadily and almost uninterruptedly (except for an hour or so forenoon and afternoon) from the south-east. The temperature

has an extreme range of "from 72 s to 95 ° F., with a mean of about 80 °. At an elevation of 3000 ft. the climate is pleasantly cool; at 13,000 ft. ice forms in the night, but disappears with the heat of the sun. No snow is known certainly to fall, though it is alleged to have been seen from the sea lying on the summits of the Charles Louis range. Fever is

very prevalent on the coasts, and even in the interior at 2000 ft. above the sea. Though generally of a mild character, it is persistently recurrent, and slowly saps and wears out the constitution; too often it is virulent and rapidly fatal.

Fauna. — New Guinea shares in the poverty in mammals of the Australian sub-region. Monotremes (2 species) and marsupials (4 families and 44 species) predominate, but are not abundant. Among the latter two genera, Distaechurus and Dorcopsis, are peculiar. A pig {Sus papuensis), a dingo, several species of mice (of which Chiruromys is a peculiar genus), a few squirrels, and a considerable number of Chiroptera (bats) inhabit the country. The island is specially remarkable for the number and beauty of its birds. The most recent lists record over 500 species as found in the Papuan area, and of these between 50 and 60 genera are peculiar to it. The birds of paradise, which are confined to the sub-region, give special celebrity to its fauna. Between 70 and 80 species have already been described, many of them the most gorgeously adorned, and others, such as the Pteridophora albertisi, the most wonderful of feathered creatures. They are absent from the Louisiades, but species occur in the d'Entrecasteaux Islands which have not been seen on the mainland opposite. The zoology of the Bismarck Archipelago is little known. The species of birds so far described from it number 178 (referable to 38 families), of which 74 are peculiar to it, though closely allied to Papuan forms. It contains, however, no Paradiseidae. The Amphibia, to which the sea is a barrier, are almost exclusively of Australian affinities. Turtles and tortoises are plentiful on the coast. Ceratochelys insculpla of the Fly river, a chelonian peculiar to New Guinea, is remarkable in having its nearest affinities (as have the Papuan tortoises) with South American species. Of the lizards, 3 of the 6 species of Varani- dae, 16 of the 30 Scincidae, 8 Geckonidae, and 8 out of the 1 1 Agamidae are peculiar. Salamanders, toads and frogs are numerous, and crocodiles abound. Only 4 genera and 5 species of snakes are peculiar to New Guinea, many of them poisonous. Butterflies, moths and bees are very abundant, the former being remarkable for their size and splendid coloration; but these groups have not been investigated exhaustively enough to afford a correct idea of their number or their true affinities. Although the list of Coleoplera already known is long, it represents only a fraction of the species remaining to be discovered. The land molluscs show relationship with the Indian and the Malayan sub-regions; but many forms have here their centre, and have spread hence into Australia and the Pacific islands.

Flora. — Most of the foreshores of New Guinea are eucalyptus- dotted

grass lands; in the interior dense forests prevail to a height of many thousand feet. Vast tracts of the country have been, how- ever, deforested by fire, and these are covered by the tall ineradicable grass, Imperata arundinacea. So far the highest altitudes yet botanically investigated are those of the Owen Stanley range and the mountains in Kaiser Wilhelms Land, but of the flora of the highest range of all — the Charles Louis mountains — nothing is known. The vascular plants already described number about 1500 species. In the low and sub-mountainous lands the flora is a mixture of Malayan, Australian and Polynesian forms. There are, according to Muller, twice as many palms known from New Guinea as from Australia. The alpine flora, beginning at 6000 ft., is specially characterized by its rhododendrons, pines (A raucaria and Libocedrus) , and palms, by numerous superb species of Agapetes (Ericaceae), and on the summits by an extraordinary association of species charac- teristically European (Rubus, Ranunculus, Leontodon, Aspidium), Himalayan, New Zealandian {Veronica), Antarctic and South American (Drymus, Libocedrus). Good pasture grasses are numerous, but pasture lands are limited. The usual tropical food-plants are cultivated. Tobacco has been found growing in the interior, and may be indigenous, as is in some districts the Kava pepper {Piper methysticum) . At Dorey a cotton plant (G. vitifolium) grows wild, and is also cultivated.

Natives. — So large an area of New Guinea remains unexplored that it is impossible, except approximately, to state the number of its inhabitants', but probably 600,000 is under rather than over the mark. The people are broken up into numerous isolated tribes differing greatly in feature, colour and language. Ethnically they belong as a whole to the Melanesian division of the Indo-Pacific races. The predominant tribe are the Papuans (q.v.), who are found here in their greatest racial purity and occupy practically the whole island except its eastern extremity. The New Guinea native is usually of a negroid type with fine physique, but in the Arfak mountains in the north-west, and at points on the west and north coasts and adjacent islands, the very degraded and stunted Karons are found, with hardly the elements of social organization (possibly the aboriginal race unmixed with foreign elements), and resembling the Aetas or Negritos of the Philippines, and other kindred tribes in the Malay Archipelago. On the banks of the Fly river d'Albertis observed at least two widely differing types, those on its upper course bearing some resemblance to the tribes of the

eastern coast. Here, wedged in among the ruder Papuans, who reappear at the extremity of the peninsula, a very different-looking people are found, whom competent observers, arguing from appear-

ance, language and customs, assert to be a branch of the fair Polynesian race. But they are obviously of mixed blood. On the west coasts there is a semi-civilization, due to intercourse with Malays and Bugis, who have settled at various points, and carry on the. trade with the neighbouring islands, in some of which, while the coast population is Malay or mixed, that of the interior is identical with the people of the mainland of New Guinea. On the west coasts Mahommedan teaching has also some civilizing effect. Many of; the tribes at the west end of New Guinea are, at all events in war time, head-hunters, and in the mountains cannibals. Cannibalism, in fact, is practised here and there throughout New Guinea. The frequent hostility and mistrust of strangers are partly due to slave-, hunting raids and ill-treatment by traders, but the different tribes vary much in character. Thus in the mountains of the north-westi the Karons live by plunder, or by disposal of slaves or bird skins:'" while their neighbours the Kebars are a peaceful agricultural people.. The mountain tribes are usually despised by their coast neighbours, but in the south of west New Guinea the coast people live in per- petual terror of their inland neighbours.

At Humboldt Bay the people are ready to trade, as are the tribes, at Astrolabe Bay; here the Russian Miklucho Maclay lived for some time, and was favourably impressed by the natives. Still farther east, the plateaus of the Finisterre ranges are highly culti- vated and artificially irrigated by a comparatively fair people. Many tribes in the south-west seem to be migratory. At Princess Marianne Straits tribes much wilder than those farther west, naked, and painted, swarm like monkeys in the trees, the stems of which are- submerged at high tide. But the Torres Straits islanders are em- ployed by Europeans in the pearl shell fishery, and are good labourers ; and in some of the Kei and Aru Islands the Papuan inhabitants form orderly Christian communities. The people of the south-east peninsula are generally far from ferocious. Englishmen, wandering, inland and losing their way, have been found and brought back by them. Their manners are more courteous, their women better treated, than is usual with Papuans, but they show perhaps less ingenuity and artistic taste. Their children, in the mission schools, show much intelligence.

Exploration and Annexation. — Though probably sighted by

Antonio d'Abreu, 1511, New Guinea was apparently first visited

either by the Portuguese Don Jorge de Meneses, driven on hia

way from Goa to Ternate in 1526 to take shelter at " Isla Versija "

(which has been identified with Warsia, a place on the N.W. coast, but may possibly be the island of Waigeu), or by the Spaniard Alvaro de Saavedra two years later. The name of ” New Guinea ” was probably given by Ortiz de Retez, or Roda, who in 1546 first laid down several points along the north coast. In the same and the two following centuries, though the coasts were visited by many illustrious navigators, as Willem Schouten and Jacob Lemaire, Abel Tasman, William Dampier, L. V. de Torres, L. A. de Bougainville and James Cook, little additional knowledge was gained. This was due first to the difficulties of the navigation, next to the exclusiveness of the Dutch, who, holding the Spice Islands, prevented all access to places east of them, and lastly to the stream of enterprise being latterly diverted to the more temperate regions farther south. The Dutch barrier was broken down by the arrival of Dampier and other ” interlopers ” from the east, and of emissaries from the (English) East India Company in search of spice-bearing lands. The voyage of Thomas Forrest (1774) in the ” Tartar galley ” of 10 tons, and his account of New Guinea (Voyage to New Guinea and the Moluccas, London, 1780), are still full of interest. New Guinea was actually annexed in 1793 by two commanders in the East India Company’s service, and the island of Manasvari in Geelvink Bay was held for some months by their troops. After the peace of 1815 Dutch surveying expeditions to the west coasts

became numerous, and in later times scientific explorers penetrated many of the unknown parts of Dutch New Guinea, such as A. R. Wallace (1856-1863), Odoardo Beccari (1871, 1875 and 1876), and Maria d'Albertis (1871-1878). Important expeditions were those of P. van der Crab, J. E. Teysmann, J. G. Coorengel, A. J. Langeveldt van Hemert and P. Swaan, undertaken for the "Netherlands Indian government 1871-1872, 1875-1876 (reports published at The Hague in 1879); and of C. B. H. von Rosenberg in the Geelvink Bay districts in 1860-1870 (report published at The Hague in 1875). Subsequently to the visits of J. A. d'Entrecasteaux (1793) and Dumont d'Urville (1827-1840), the eastern coasts were surveyed by Captains F.P. Blackwood (1835),

Owen Stanley (1848), Charles B. Yule (1864), and other British officers, including J. Moresby (1874). Among other explorers in this period the following may be mentioned: Nicholas von Miklucho Maclay in 1870, 1877 and 1879-1881, in the Astrolabe Bay district, &c; the missionary, Rev. S. Macfarlane (1875, Fly river, &c); about 1876-1880 the north-east coasts and adjacent islands were explored by the Rev. G. Brown and by Wilfred Powell, and in 1882 Dr Otto Finsch, whose name is well known in connexion with scientific work in New Guinea, made valuable explorations in the neighbourhood of Port Moresby and the Loluki river.

The surveys and reports of Captain Moresby in 1874 brought home to Queensland (and Australia generally) the dangers possible to her commerce were the coasts opposite to Torres Strait and the entrance to the splendid waterway inside the Barrier Reef to fall into the possession of a foreign power. By authority, therefore, of Queensland, the mainland of New Guinea, opposite her shores east of the 141st meridian, was annexed to that colony in 1883. But this action was disallowed by the British government as Yule's and Moresby's had

been. Finally, however, in 1884 a British protectorate was authoritatively proclaimed by Commodore Erskine over the region " lying between the 141st meridian eastward as far as East Cape, with the adjacent islands as far as Kosman Island." German New Guinea was annexed on the 16th of November 1884, when the German flag was raised in Friedrich Wilhelmshafen and a trading company was established on the north-east coast, and in 1885 the two countries agreed to fix their boundaries through the then neutral areas of the country. The result of this was the assignation to Great Britain of the portion now known as the Territory of Papua (British New Guinea), lying between the extreme limits of 5 and 12° S. and 141° and 155° E. To Germany were assigned all the territory and islands to the north of the British boundary under the name of Kaiser Wilhelms Land, while all to the west of the 141st meridian remained under its old flag as Dutch New Guinea.

Since this period explorers and investigators have been almost constantly at work. There may be mentioned the work of the Rev. J. Chalmers on the coast of the Gulf of Papua (1893), and of officers of the German New Guinea Company in the ship " Ysabel " on the coasts and among the islands of the German territory; the ex- pedition which crossed the south-eastern peninsula from Huon Gulf of which both the leaders, O. Ehlers and M. Piering, lost their lives (1895), the important German expedition under C. Lauterbach (1896), and the various explorations carried out by or at the instiga- tion of Sir William MacGregor, including a crossing of the island from the mouth of the Mambare river to that of the Vanapa, and a second crossing in the reverse direction (1897). Ethnographical researches have been prosecuted by Messrs C. G. Seligmann and W. Mersh Strong, and others. The reports of travellers and of various missionary societies have thrown a great deal of light on the natural history of the island, on its resources, and the islanders.

British New Guinea

The British Territory of Papua has an area of about 90,540 sq. m. and a population estimated at 400,000, of whom about 600 are Europeans. The Protectorate, as declared in 1884, with its seat of government at Port Moresby, was subsidized by the three Australian colonies of Queensland, New South Wales and Victoria, and lasted, under the administration of two successive special commissioners (Major-General Sir Peter Scratchley and the Hon. John Douglas), till the 4th of September 1888, when it was proclaimed by the first Administrator — afterwards Lieu- tenant-Governor — Sir William MacGregor, a possession of Queen Victoria. Its constitution was that of a crown

colony in associa- tion with Queensland; but in 1901 the federal government took control of the territory and in 1906 a proclamation by the governor-general of the commonwealth gave it the name of the Territory of Papua. The lieutenant-governor is aided by an executive and a legislative council, and advised by a native regulation board. Justice is administered by petty sessions in the six magisterial districts into which the possession is divided, with a central court at Port Moresby (which, however, sits elsewhere as necessary) having the jurisdiction of a supreme court, from which in certain cases an appeal lies to the supreme court of Queensland.

Order is maintained by an armed constabulary force, under a European officer, of about 180, almost all natives from different districts, whose members are found to be very efficient and trustworthy. The expenditure is about £38,000 annually, and the revenue, mainly derived from customs duties, is rapidly increasing. Only £5110 in 1895, it was £11,683 i n J 899 and

£19,197 in 1905-

Commerce and Trade. — The making of mats, fishing-nets, shell ornaments, decorated gourds, and stone implements, and the manufacture of pottery, canoes and sago, constitute the chief native industries, which are the subject of barter between different regions. European industries include gold mining, in which 500 miners, besides natives, are engaged (chiefly in the Louisiade Archi- pelago), and the beche de mer and pearl-shell fisheries, which were formerly more productive than at present. Copra is naturally largely prepared, as coco-nut palms are very numerous, and are extensively planted every year. A small amount of tortoise-shell is collected. The rubber industry is, according to Sir W. MacGregor, ” important and promising.” Species of Palaquium, the genus from which, in the Indian Archipelago, the best gutta-percha is obtained, occur on the hills, and from their cultivation there might in time be obtained a large revenue independently of European labour. Timber of economic value is scarce. Red cedar (Cedrilla) abounds in the riverine flats, but the quality is poor and commercially valueless; and oaks are plentiful, but the wood is coarse. Small quantities of ebony and sandal- wood are exported. ” There can be no reason- able doubt that the sugar-cane, which is native and present in a great many varieties, sago, cotton, probably also indigenous and of exceptionally fine quality, will eventually be valuable ‘ ‘ (MacGregor). The trade of British New Guinea is exclusively with the Australian colonies. Imports were valued at £72,286 in 1899-1900 (an increase of over £20,110 in the year), and exports (including the gold mines) at £56,167, while in

1905 the figures were £67,188 for imports and £731669 for exports, and in 1906 £79,671 and £80,290 respectively.

German New Guinea

The German protectorate of New Guinea, so called after the island which contributes the greatest area, comprehends, besides Kaiser Wilhelms Land, the islands which are now commonly called the Bismarck Archipelago — viz. New Pomerania, New Mecklenburg, with New Hanover and the Admiralty Islands and the Solomon Islands (Bougainville and Buka). There are besides nearly 200 smaller islands and islets scattered among their greater neighbours. In 1884 New Guinea was absolutely wild, not a single white man living on what is now the German part. On the islands New Pomerania and Mioko only two trading firms had their establishments; and on New Lauenburg the Wesleyans had a mission station. After the annexation commercial enterprise set in at once, hand in hand with political administration. Now on the mainland and in the islands plantations have been established and tobacco and cotton have been successfully grown. Three German mission societies formed settlements on New Guinea, with a branch one on the Gazelle peninsula. The protectorate is included in the Universal Postal Union; each harbour has its post office, also a leading official with a number of assistants to control the natives and the revenue. It is divided into two districts with separate adminis- trations, New Guinea and the Bismarck Archipelago; over both presides an imperial governor, the seat of government being Herbertshohe in New Pomerania. A small police force of natives has been formed. In each district there is a registry of deeds and a court of law, and in New Guinea a court of appeal, of which the governor is president. A line of steamers plies between New Guinea, the Bismarck Archipelago and Singapore. A special silver coin of rupee value has been introduced. The area of Kaiser Wilhelms Land is approximately 70,000 sq. m. It is impossible to speak with any precision of the number of the native population, but the white population in 1906 was

The revenue of German New Guinea is derived from taxes, dues and licences, and amounted on the 31st of March 1892 to about £3000; on the same rate, 1901, to £3750. The annual revenue is averaged at £5000, and the expenditure at £4200. The New Guinea Company was to receive £20,000 for transferring proprietorship to government, which took over the administration in 1899. In 1905 imports into Kaiser Wilhelms Land were valued at £33,316, and exports at £7702,

and the estimated expenditure for 1907-1908 of £76,000 included an imperial subvention of £57,696. The chief harbours are Friedrich Wilhelmshafen and Konstantinhafen.

49°

NEW HAMPSHIRE

Dutch New Guinea

Dutch New Guinea comprises all the western portion of the island. The boundary on the east', separating it from British New Guinea and German New Guinea, was finally settled in 1805. Starting from the south coast, it follows 141 1′ 48″ E. up to the Fly river, which is mounts until 141 1′ is reached, when it once more follows the meridian up to the north coast. The area of the territory is 151,789 sq. m., and the inhabitants have been conjectured to number some 200,000. A few missionaries have established themselves, but otherwise the Dutch have scarcely occupied their possession, which at present merely forms part of the residency of Ternate in the Moluccas. Dutch New Guinea, however, has better natural advantages than either the British or German possessions in the island, and should eventually prove of real value to the Netherlands. The claims to superiority over New Guinea on the part of the rulers of some of the small neighbouring islands date at least from the spread of Islam to the Moluccas at the beginning of the 15th century, and were maintained by the Malay rulers both of Bachian and of Gebeh and afterwards by the sultan of Tidore. When the Dutch first came to these seas it was their policy to ally themselves with certain chiefs, and support their claims over various islands, so as to extend their own commercial monopoly; and they therefore supported the claims (admitted by Great Britain in 1814) of the sultan of Tidore over both the Raja Ampat (i.e. the four Papuan kingships, Waigeu, Salawatti, Misol and Waigamma on Misol Island) and certain islands or points on the north-west coast of New Guinea. Nominally the sultan of Tidore is still the suzerain of western New Guinea, but his authority is scarcely recognized, except on some few shores and adjacent islands, and practically Dutch New Guinea used to be administered partly from Ternate and partly from Timor, upon more peaceful lines than was the case when the rule of the Dutch in New Guinea largely consisted of the sending of a warship now and again to some distant island or bay to burn a kampong, to punish rebellious villagers, and thus assert or reassert Dutch authority, or that of the sultan, who is their vassal. In 1901, however, a more serious effort was made to establish some kind of government in the southern province of Dutch New Guinea, at

Merawkay, where a small Dutch-Indian garrison was stationed with the professed object of preventing raids by bands of savages into the British territory near by. Such raids had been rather frequent, the invaders attacking the natives who live under British protection, burning their huts, murdering the men, carrying off the women and children as slaves, and returning to their own haunts laden with booty. There is an assistant Resident at Merawkay, whose immediate chief is the Dutch Resident at Ternate, and who is the civil administrator of the province of southern Dutch New Guinea. Assistant Residencies have also been established at Manokvary in northern Dutch New Guinea, which has been formed into a province, under Ternate, and at Fakfak, in western Dutch New Guinea, likewise erected into a province, also under Ternate. By 1902, therefore, Dutch New Guinea formed a government, with its headquarters at Ternate, divided into the three provinces named. At regular intervals the steamers of the Dutch Royal Steam Packet Company call at Dorey and other points, while administrative posts have been established elsewhere in lieu of others previously attempted but abandoned.

A curious discussion arose in the Dutch states-general when the government was seeking legislative sanction for the above measures, with a provisional credit to cover the first establish- ment expenses. It was seriously contended in one part of the house that, as eminent men of geographical and ethnographical science had settled the question whether New Guinea belongs to Asia or Polynesia in favour of the latter, a New Guinea coloniza- tion scheme could not properly be proposed and decided upon in a section of the Dutch-Indian budget. This budget concerned only the Asiatic possessions of Holland, not the Polynesian ones, and Dutch New Guinea must, consequently, have its own budget. Finally, the majority of the states-general, backed by

government, decided that New” Guinea must still be reckoned to belong to Asia.

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NEW HAMPSHIRE, a North Atlantic state of the United States, one of the New England group, and one of the Original Thirteen, lying between latitudes 42° 4°’ and 45 18′ 23″ N., and between longitudes 70 37′ and 72 37′ W. It is bounded N. by the Canadian province of Quebec; E. by Maine, by the Salmon Falls river, which separates it in part from Maine, and by the Atlantic Ocean; S.E. and S. by Massachusetts; W. and N.W. by Vermont (from which it is separated by the Connecticut river— low water mark on the W. bank of the Connecticut is New Hampshire’s W. boundary), and by Halls Stream which separates it from Quebec. The state has an area of 9341 sq. m., of which 310 sq. m. are water surface.

Physical Features.— -The delightful scenery of mountains, lakes, streams and woodlands gives to the greater part of New Hampshire, which is in the New England physiographic province, the appearance of a vast and beautiful park; and the state is a favourite summer resort. In the N. central portion, the White Mountains, a continuation of the Appalachian system, rise very abruptly in several short ranges and in outlying mountain masses from a base level of 700-1500 ft. to

generally rounded summits, the heights of several of which are nowhere exceeded in the eastern part of the United States except in the Black and the Unaka mountains of North Carolina: seventy-four rise more than 3000 ft. above the sea, twelve more than 5000 ft., and the highest, Mount Washington, attains an elevation of 6293 ft.

The principal ranges, the Presidential, the Franconia and the Carter-Moriah, have a north-eastern and south-western trend. The Presidential, in the north-eastern part of the region, is separated from the Franconia on the south-west by the Crawford, or White Mountain Notch, about 2000 ft. in depth, in which the Ammonoosuc and Saco rivers find a passage, and from the Carter-Moriah, parallel to it on the east, by the Glen-Ellis and Peabody rivers, the former noted for its beautiful falls. On the Presidential range, which is about 20 m. in length, are Mount Washington and nine other peaks exceeding 5000 ft. in height: Mount Adams, 5805 ft.; Mount Jefferson, 5725 ft.; Mount Sam Adams, 5585 ft.; Mount Clay, «54 ft.; Boot Spur, 5520 ft.; Mount Monroe, 5390 *t. ; J. U- Adams Peak, 5384 ft.; Mount Madison, 5380 ft.; and Mount Franklin, 5028 ft. On the Franconia, a much shorter range, are Mount Lafayette, 5269 ft.; Mount Lincoln, 5098 ft.; and four others exceeding 4000 ft. The highest peak on the Carter-Moriah range is Carter Dome, 4860 ft., but seven others exceed 4000 ft. Lottiest of the isolated mountains is Moosilanke noted for its magnificent view-point 4810 ft. above the sea. Separating Franconia and Pemigewasset ranges is the romantic Franconia Notch, overlooking

NEW HAMPSHIRE

and

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Q Longitude West 72 of Greenwich

Emery Walker sc.

which from the upper cliffs of Profile Mountain is a remarkable human profile, The Great Stone Face, immortalized by Nathaniel Hawthorne; here, too, is the Franconia Flume, a narrow upright

fissure, 60 ft. in height, with beautiful waterfalls.

The whole White Mountain region abounds in deep narrow valleys, romantic glens, ravines, flumes, waterfalls, brooks and lakes. The part of the state which lies N. of the White Mountains is occupied by ridges and wide rolling valleys, the ridges rising occa- sionally to heights of 2000 ft. or more. South of the mountains a plateau-like surface — a part of the New England Uplands — broken by residual mountains, or ” monadnocks ” (a term derived from Mount Monadnock, 3186 ft. high, near the S.W. corner of the state) and lenticular hills, or drumlins, but having a general S.E. slope toward the sea, extends from the intervales of the Connecticut river to the E. border of the Merrimac Valley. Between the Merri- mac Valley and the sea is the only low surface in the state; a considerable portion of this region is less than 500 ft. above the sea, but even here are numerous ridges 1000 ft. in height or more, and small drumlins. The seashore, about 18 m. in length, is for the most part a low sandy beach ; here and there, however, especially to the northward, it is somewhat rocky, and to the southward are two bluffs. The only harbour is at Portsmouth near the mouth of the Piscataqua. About 9 m. from the shore are the bleak and nearly barren Isles of Shoals, nine in number, a part of which belong to New Hampshire and a part to Maine.

Extending from Mount Monadnock in Cheshire, the S.W. corner county, to the headwaters of the Connecticut river in the N.E. corner is a water-parting, W. of which the state is drained southward into Long Island Sound by the Connecticut and its tributaries and E. of which it is drained south-eastward into the Atlantic Ocean principally by the Merrimac in the S., the Saco and the headwaters of the Merrimac in the White Mountain region, and the Andro- scoggin in the N. The Piscataqua is a tidal estuary fed chiefly by the Salmon Falls, Lamprey and Exeter rivers. The headwaters of the rivers are for the most part mountain streams or elevated lakes ; farther on their swift and winding currents — flowing sometimes between wide intervales, sometimes between rocky banks — are marked by numerous falls and fed by lakes.

The lakes and ponds, numbering several hundred, were formed by glacial action and the scenery of many of them is scarcely less attractive than that of the mountains. The largest and most widely known is Lake Winnepesaukee on the S. border of the White Mountain region; this is about 20 m. long and from I to 8 m. wide, is dotted by 274 islands, mostly verdant, and has clear water and a rather level shore, back of which hills or mountains rise on all sides. Among the more prominent of many others that are admired for their beauty are

Squam, New Found, Sunapee and Ossipee, all within a radius of a few miles from Winnepesaukee; Massabesic farther S. ; and Diamond Ponds, Umbagog and Connecticut lakes, N. of the White Mountains. The rivers with their numerous falls and the lakes with their high altitudes furnish a vast amount of water power for manufacturing, the Merrimac, in particular, into which many of the larger lakes, including Winnepesaukee, find an outlet, is one of the greatest power-yielding streams of the world.

Flora. — Except on the summits of the higher mountains New Hampshire was originally an unbroken forest cf which the principal trees were the white pine, hemlock, sugar maple, yellow birch, beech, red oak, and white oak in the S., red spruce, balsam, and white birch on the upper mountain slopes, and red spruce, white pine, sugar maple, white spruce and white cedar in the other parts of the N. The primeval forests have nearly disappeared, but much of the N. third of the state and many abandoned farms in the S. have become reforested with much the same trees, except that on the lower levels in the N. yellow birch, sugar maple and beech have to a considerable extent supplanted spruce, white pine and hemlock, and that wherever forest fires have occurred there is much bird cherry, yellow birch and aspen. The butternut, hickory and chestnut are common nut-bearing trees in the S. Among indigenous fruit-bearing trees, shrubs and vines the state has the bird cherry, black cherry, blueberry, cranberry, raspberry, blackberry, goose- berry, strawberry, grape and black currant; and conspicuous among a very great variety of shrubs and flowering plants are the rose, dogwood, laurel, sumac, holly, winterberry, trilliums, anemones, arbutuses, violets, azaleas, eglantine, clematis, blue gentians, orange lilies, orchids, asters and golden rod. The sum- mits of some of the mountains are too high for trees and above belts of dwarf spruce, balsam and birch they are clothed chiefly with sandworts, diapensia, cassiope, rushes, sedges and lichens.

Fauna. — The N. section of the state was originally a favourite hunting-ground of the Indians, for here in abundance were the moose, caribou, deer, wolf, bear, lynx, otter, beaver, fox, sable, mink, musk-rat, porcupine, wood-chuck, ruffed grouse and pigeon. These were rapidly reduced in number by the white man, the wild

Cigeons are extinct, and the moose, caribou, bear, wolf, lynx and eaver have become rare, but, under the protection of laws enacted during the latter part of the 19th century, deer and ruffed grouse are again quite plentiful. Rabbits, squirrels, raccoons, woodcock and quail are also common game. Many of the lakes and rivers have been stocked with trout and salmon or bass; some, with smelt; the fresh

waters of the state also contain pickerel, perch,

pouts, eels, suckers, dace, sunfish and shiners. In the S. half of New Hampshire are many song birds belonging to the Alleghany faunal area; in the N. part many others belonging to the Canadian faunal area. The hermit thrush, veery, song sparrow, red-eyed vireo, bunting, warbler and wren are among the song birds of the forests.

Climate. — The winters are usually long and severe, and the summers cool and salubrious, but the diversity of surface together with unequal distances from the sea cause marked variations for the different regions. The mean annual temperature ranges from about 42° F. at only moderate elevations in the White Mountain region and farther N. to 47 ° F. at low altitudes in the S.E. The greatest extremes of temperature occur in the deep mountain valleys where it sometimes rises to 102 ° F. or above, in summer, and falls to ~38°F. or below in winter; higher up on the mountains it is never so warm and along the sea coast both extremes are considerably less. The highest recorded winter mean is 25 F., at Nashua in the lower valley of the Merrimac, and at Durham near the sea-coast; the lowest recorded winter mean is 18° F., at Bethlehem 1470 ft. above the sea in the White Mountain region; the highest recorded summer mean is 69° F. at Nashua, and the lowest recorded summer mean is 64 F. at Bethlehem. The mean annual precipitation for the entire state is about 40 in. ; it is 43 in. at Nashua, 45-3 in. at Durham, and perhaps still more on the E. slopes of the mountain ranges, but it is only 37-7 in. at Bethlehem in the N.W. part of the mountain region and only 35-5 in. at Stratford in the upper valley of the Connecticut. The distribution is quite even throughout the year, but summer and autumn are slightly more wet than winter and spring. Among the mountains and in the N. part of the state the annual fall of snow is from 7 to 8 ft., but in the S.E. corner it is little more than one-half that amount. The prevailing winds are generally N.W., but in the vicinity of the sea they are S.E. during summer.

Agriculture. — Fertile soil in New Hampshire is confined largely to the bottom-lands of the Merrimac and Connecticut rivers, where on deposits of glacial drift, which are generally quite deep in the southern half of the state, there is considerable alluvium. In the southeastern section is also a moderately productive soil derived largely from the disintegration of slate. Elsewhere south of the mountains the surface soil is mostly hard pan or till, this being deepest on the drumlins. In the mountain region the soil is mostly a sandy loam composed of disintegrated granitic gneiss and organic matter; on the lower and more gentle slopes as well as in the valleys this is generally deep enough for a luxuriant vegetable growth but on the upper and

more precipitous slopes it is thin, or the rocks are entirely bare.

Farms in the more sterile parts of New Hampshire were abandoned when the depleted soil and the old methods of agriculture made it impossible for owners or tenants to compete with western farmers. This abandonment led in 1889 to the adoption by the state Board of Agriculture of measures which promoted the development of the state, especially the central and northern parts, as a summer resort. Abandoned farms were advertised as suitable for country homes, and within fifteen years about two thousand were bought; and the carriage roads were improved, game preserved and the interests of visitors studied. Agriculture on the farms still operated was now greatly modified, and the production of vegetables, fruits, dairy products, poultry and eggs was largely substituted for the production of cereals. The total acreage of all land included in farms increased from 3,459,018 acres in 1890 to 3,609,784 acres in 1900, or from 60% to 62-6% of the total land area of the state, but the improved portion of this decreased during the decade from 1,727,387 acres to 1,076,879 acres, or from 49-9% to 29-8%; in no other state east of the Mississippi river was so small a proportion of the farm land improved at the close of the decade, although in Florida it was only a trifle larger. The total number of farms increased from 29,151 in 1890 to 29,324 in 1900, and the average size increased from 119 acres to 123-1 acres, but as a result of the more intensive form of agriculture, farms containing less than 50 acres increased from 8188 in 1890 to 8764 in 1900, and those containing 50 acres or more decreased during this decade frota 20,963 to 20,560. Of the total number of farms in 1900, 26,344, or 89-8%, were operated by owners or part owners, 1639 by cash tenants and 546 by share tenants.

Hay is the principal crop; in 1909 the acreage was 640,000 acres and the yield was 621,000 tons. The total acreage of cereals decreased from 88,559 acres in 1879 to 61,498 acres in 1889, and to 4 2 >335 acres in 1899; during the latter decade that of Indian corn

increased from 23,746 acres to 25,694 acres (30,000 acres in 1909), but that of oats decreased from 26,618 acres to 12,589 acres (14,000 acres in 1909), that of wheat decreased from 2027 acres to 271 acres (none reported in 1909), that of barley decreased from 4934 acres to 1596 acres (20ooacres in 1909), that of buckwheat decreased from 3117 acres to 1835 acres (2000 acres in 1909), and that of rye

decreased from 1056 acres to 350 acres (none reported in 1909). With the exception of dairy cows and horses there was likewise a corresponding decrease in the number of livestock during these years: the number of hogs decreased from 58,585 in 1890 to 56,970 in 1900 (51,000 in 1910); of sheep, from 211,825 in 1880 to 105,702 in 1900 (74,000 in 1910); and of neat cattle other than dairy cows, from 141,841 in 1880 to 116,835 in 1900 (93,000 in 1910); but the number of horses increased from 52,458 in 1890 to 77,233 in 1900 (59,000 in 1910), and the number of dairy cows from 90,564 in 1890 to 115,036 in 1900 (122,000 in 1910). The value of the poultry and egg product of 1899 was $1,824,399, which was more than twice that of the cereals and nearly one-third of that of the hay and forage. The potato crop of the same year was grown on 19,422 acres and amounted to 2,420,668 bushels valued at $1,090,495; in 1909 the acreage was 21,000, and the crop was 2,730,000 bushels, valued at $1,747,000. The acreage of other vegetables in 1899 was 26,780 and the value of the market garden produce, including small fruits, which was sold, increased from $187,049 in 1889 to $394,283 in 1899 or HO-8%. Although the crop of orchard fruits was no greater in 1899 than in 1889 the number of apple trees increased during the decade from 1,744,779 to 2,034,398, the number of peach trees from 19,057 to 48,819 and the number of plum trees from 10,151 to 18,137; in the number of pear trees and of cherry trees there was a slight decrease. The fruit crop of 1899 included 1,978,797 bushels of apples, 19,341 bushels of pears, 6054 bushels of peaches, 4942 bushels of plums, 1183 bushels of cherries, 487,500 lb of grapes, 568,640 qts. of strawberries, 124,760 qts. of raspberries and 105,290 qts. of blackberries and dewberries. The valley of the Merrimac is the leading section for the production of hay, small fruits and dairy products. In the bottom lands of the Merrimac and of the Connecticut, south of the White Mountains, a large part of the Indian corn and vegetables is grown. Potatoes, however, are grown in large quantities north and west of the White Mountains; and this district leads in the number of cattle and sheep, and in the production of all the cereals except Indian corn. Apples, pears and grapes are successfully grown throughout the central and southern sections, but peaches and cherries chiefly south of Lake Winne- pesaukee. Hillsboro and Rockingham counties, in the south-east, lead in the production of poultry and eggs.

Forests. — The White Mountain region and Coos county to the north of it, embracing in all nearly one-third of the total area of the state, is essentially a forest country. In 1903, however, only about 12% of this was still occupied by a virgin merchantable forest and 69-8% was cut-over or culled land. In the southern part of the state there is in the

aggregate nearly as large an area of young forests on lands, most of which were until about 1850 used for agricultural purposes. The principal merchantable timber of the state is red spruce, and this is found chiefly in the virgin forests which remain in the north, especially in those on the steep mountain slopes between elevations of 1800 ft. and 3500 ft. AH except a few scattered trees of the white pine, which was once abundant in all parts of the state below 1500 ft. in elevation, has been cut; but some of the second growth in the south is already merchantable. The most common hardwood trees are sugar maple, yellow birch, white birch and beech; these are widely distributed throughout the state, but are for the most part too young to be cut for lumber. White cedar is almost wholly confined to the swamps of the north, and white oak is found chiefly on the more fertile lands of the south. Most of the virgin forests of the northern section were cut in the latter half of the 19th century, while abandoned farms in the south were becoming reforested, and the value of the state's lumber and timber products increased from $1,099,492 in 1850 to $4,286,142 in 1870, and to $9,218,310 in 1900 and then decreased to $7,519,431 in 1905; since 1890 large quantities of wood, chiefly spruce, have also been used in the manufacture of paper and wood pulp. In 1909 a forestry commission was established.

Fisheries. — Although the trout and salmon of the fresh waters in the interior are a great attraction to sportsmen, the commercial fisheries, which are confined to Rockingham county, on the coast, are of small and declining importance. The take of 1898 consisted chiefly of cod, haddock, lobsters, mackerel, alewives, pollock and hake, but was valued at only $48,987, which was a decrease of 67 % from that of 1889; in 1905 the total take was valued at $51,944, of which $32,575 was the value of lobsters and $8166 was the value of fresh cod — the only other items valued at more than $1000 were soft clams ($2770), Irish moss ($2400), alewives, fresh and salted ($1220), and haddock ($1048).

Minerals. — The most important of the mineral products of New Hampshire, which has long been known as " the Granite State," is granite, which is quarried in the southern part of the state in the area of " Lake Winnepesaukee gneiss," near Concord, Merrimack county, near Milford, Hillsboro county, and E. of Manchester in Rockingham county; in Sullivan county, near Sunapee; and in the east central part of the state in Carroll county, near Conway

and Madison. In 1908 there were 8 quarries at Concord, all on Rattlesnake Hill, and all within 2 m. of the state house in Concord.

The Concord granite is – a medium bluish-grey coloured muscovite-biotite granite, with mica plates so abundant as to effect the durability of the polish of the stone; it is used for building — the outer walls of the Library of Congress at Washington, D.C., are made of this stone — to a less degree for monuments, for which the output of one quarry is used exclusively, and for paving blocks. The out- put of the Milford quarries, which numbered in 1908 fifteen — twelve south and south-west and three north-west of Milford — consists of fine and mostly even-grained, quartz monzonites {i.e. granites with an unusually large proportion of soda-lime feldspar), of various grey shades, sometimes tinged with blue, pink or buff, arid always marked with black mica; the finer varieties take a high polish and are used for monuments, and the coarser grades are used for con- struction, especially of railway bridges, and for paving and curbing. The output of the Auburn quarry, 7 m. E. of Manchester, is a deep pink quartz monzonite, marked with fine black dots, which has a fine texture, takes a good polish and is used for monuments. The Conway quarries, four in number in 1908, are on either side of the Saco river, south-east and south-west of North Conway; their output is coarse constructional stones, all biotite or biotite-horn- blende, but varying in colour, pinkish (" red ") and dark- yellow greenish-grey (' green ") varieties being found remarkably near each other at Redstone, on the east side of the Saco valley. About 2§ m. E. of Sunapee are quarried two kinds of monumental stone: the " light Sunapee," a light bluish-grey biotite-muscovite, finer than the Concord granite, and capable of a good polish and of fine carving; and the " black pearl " or " dark Sunapee," a dark bluish-grey quartz-diorite, which seems black mottled with white when polished, and which is coarser than the " light Sunapee." New Hampshire granites were used for building as early as 1623. The value of granite quarried in the state increased from $195,000 in 1887 to $1,147,097 in 1902, when building stone was valued at $619,916, monumental stone at $346,735 and paving stone at $101,548. In that year New Hampshire ranked fourth among the states in output of granite, with 6-3 % of the total value of granite quarried in the entire country; in 1908 the value of granite ($867,028) was exceeded by that of each of seven other states but was more than one-half of the total value of all mineral products of the state. Of this total the only other large items were clay and clay products (valued at $371,640), and mineral waters ($259,520; of which $150,512 was the value of table waters) from nine springs, four in Rockingham, three in Hillsboro county and one each in Coos and Carrol counties — and other mineral waters were used in the manufacture of soft drinks. Mica, first mined at Grafton, Grafton county, in 1803, found also in the northern part of Merri- mack county and in the north-western corner of Cheshire

county in such quantities that for sixty years New Hampshire was the largest producer of mica in the United States, is no longer an important product: in 1907 its value ($7227) was less than that of the mica produced in South Dakota, Alabama, North Carolina or Colorado. A quartz schist, suitable for making whetstones and oilstones, was discovered in 1823 by Isaac Pike at Pike Station, Grafton county, and the Pike Manufacturing Company now owns and operates quarries outside this state also; in 1907 New Hampshire was the principal producer of scythe-stones in the United States, and the total value of whetstones made in 1907 (including the value of precious stones 1) was $59,870.

Manufactures. — The heavy precipitation on the elevated central and northern parts, and the hundreds of lakes and ponds which serve as reservoirs, give to the lower southern part of the state on the Merrimac and other rivers such an abundant and constant water-power that southern New Hampshire has become an important manufacturing district, and manufacturing has become the leading industry of the state. During the last two decades of the 19th century the number of inhabitants engaged in agricultural pursuits decreased from 45,122 to 38,782; and the number engaged in manufacturing and mechanical pursuits increased from 57,283 to 75,945. Many farmers abandoned their sterile farms and made new homes in the West, where soil yielded larger returns for labour, and a foreign-born popula- tion, consisting largely of French Canadians, came to the cities in response to the demand for labour in the mills and factories.

From 1850 to i860 the value of the manufactured products increased 62-3%; in the decade of the Civil War they further increased in value 89%; from 1890 to 1900 the increase was from $85,770,549 to $118,709,308, or 38-4%; and from 1900 to 1905 the value of the factory products increased from $107,590,803 to $123,610,904, or 14-9%. Textiles, and boots and shoes represented

1 Gems are not sought for systematically in New Hampshire. Topaz occurs on Baldface Mountain, near North Chatham.

in 1905 more than one-half the total value. Cotton goods, the manufacture of which was introduced in 1804, increased in value only slightly during the last decade of the 19th century, from (21,958,002 to $22,998,249, but from 1900 to 1905 their value increased 28-4%,

or to $29,540,770; except in 1900 the manufacture of cotton goods had long ranked first, measured by the value of the product, among the state's manufacturing industries. Factory- made boots and shoes increased in value from $11,986,003 in 1890 to $23,405,558 in 1900, or 95-3%, the industry ranking first in 1900; but in 1905 there was a decrease to $22,425,700, the industry then ranking second ; in 1900 the value of boots and shoes was 21-8% and in 1905 it was 18-1 % of the total value of all factory products, and in no other state was the degree of specialization in this in- dustry so great as in New Hampshire. Woollen goods, third in rank, decreased in value from $10,963,250 in 1890 to $10,381,056 in 1900, but the factory product increased in value from $7,624,062 in 1900 to $11,013,982, in 1905, or 44-5%. Paper and wood pulp, for the manufacture of which the spruce forests of the state are so largely used, increased in value from $1,282,022 in 1890 to $7,244,733 in 1900, or 465-1 , and to $8,930,291 in 1905; and this industry rose from ninth in rank in 1890 to fifth in 1900 and to fourth in 1905. The manufacture of lumber and timber products, one of the oldest industries of the state, ranked fifth in 1905; these products had increased in value from $5,641,445 in 1890 to $9,218,310 in 1900, or 63-4, but decreased to $7,519,431 in 1905, the decrease being in large measure due to the great demand for spruce at the paper and pulp mills. Foundry and machine shop products, hosiery and knit goods, wooden boxes, flour and grist mill products, and malt liquors are other important manufactures; the value of wooden boxes increased from $979,758 in 1900 to $2,565,612 in 1905, or 161-9%, an d the value of hosiery and knit goods increased during the same period from $2,592,829 to $3,974,290, or 53-3%. As compared with other states of the Union, New Hampshire in 1905 ranked fifth in the manufacture of factory-made boots and shoes, and in woollen goods, sixth in cotton goods, and seventh in paper and wood pulp, in hosiery and knit goods, and in the dyeing and finishing of textiles. In 1905 the value of the products in the eight cities of Manchester, Nashua, Concord, Dover, Rochester, Laconia, Keene, and Portsmouth, all of which are south of Lake Winne- pesaukee, was 59-5 % of that for the entire state. Nearly one-half the cotton goods were manufactured in Manchester. Boots and shoes were manufactured chiefly in cities near the southern border. Dover led in the manufacture of woollens; Laconia in the manu- facture of hosiery and knit goods; and Berlin, the chief manu- facturing centre north of the White Mountains, in the manufacture of paper and wood pulp.

Transportation. — With the exception of a Grand Trunk line in the northern part of the state the several steam railways are owned or

leased by the Boston & Maine. Up the steep slope of Mount Washington runs a cog railway. The first steps in railway build- ing were taken in 1835, when the Boston & Maine, the Concord, and the Nashua & Lowell railways were incorporated. The Boston & Maine was opened from Boston, Mass., to Dover, N.H., in 1842. In 1850 there were in operation 467 m. ; this mileage had increased to 1015 in 1880 and to 1167-14 on the 1st of January 1909. Portsmouth, the only port of entry, has a very small foreign trade, but there is a considerable traffic in coal and building materials here and on the Cocheco, which is navigable to Dover.

Population. — The population of the state was 141,885 in 1790; 183,858 in 1800; 214,460 in 1810; 244,161 in 1820; 269,328 m 1830; 284,574 in 1840; 317,976 in 1850; 326,073 in i860; 318,300 in 1870; 346,991 in 1880; 376,530 in 1890; 411,588 in 1900; and 430,572 in 1910; the per cent of increase was 9-3 from 1890 to 1900 and 4-6 from 1900 to 1910. Of the total in 1900, 88,107 were foreign-born; 58,967, or 66-9%, were natives of Canada (44,420 French and 14,547 English), 13,547 of Ireland, 5100 of England, 2019 of Scotland, 2006 of Germany, and 2032 of Sweden. Of the 323,481 native-born, 80,435, or 24-8%, were natives of other states than New Hampshire; 56,210 of these were natives of other New England states, however, and 7502 were natives of New York. At the same time there were 124,561 natives of New Hampshire numbered among the inhabitants of other states, principally Massachusetts, Vermont, Maine, New York, Illinois, California, Connecticut, Rhode Island, Minnesota, Iowa, Wisconsin, Michigan, Pennsyl- vania, Ohio, New Jersey, Kansas and Nebraska, and to induce these to return for a holiday season to their native state the ” Old Home Week ” festival, now held throughout New England, was planned in 1899 by Frank West Rollins (b. i860), who was then governor of New Hampshire. The Roman Catholic Church in 1906 had more members than any other religious denomination (119,863 out of 190,298 communicants of all denominations); in the same year there were 19,070 Congregationalists, 15,974

Baptists, 12,529 Methodist Episcopalians (North) and 4892 Protestant Episcopalians. Of the total population in 1890 the rural constituted 67-4% and the urban 37-6%, but in 1900 the rural constituted only 53-3% of the total and the urban 46-7%. The eleven cities having a population in 1900 of 5000 or more were: Manchester (56,987); Nashua (23,858); Concord (19,632) ; Dover (13,207) ; Portsmouth (10,637) ; Keene (9165); Berlin (8886); Rochester (8466); Laconia (8042); Somersworth (7023), and Franklin (5846).

Administration. — New Hampshire was the first of the original thirteen states to establish a government wholly independent * of Great Britain. This was designed to be only temporary, 1 but was in operation from the 5th of January 1776 to the 2nd of June 1784. The constitution which then went into effect provided for a General Court consisting of a Senate and a House of Representatives and made the Council a body advisory to the state president; the 1784 instrument was much amended in 1792, when the title of president was changed to governor, but with the amendments adopted in that year it is in large measure the constitution of to-day. For sixty years there was no change whatever, and only three amendments, those of 1852 (removing the property qualifications of representatives, senators and the governor), were adopted until 1877, when twelve amendments were adopted, — the most important being those providing for biennial (instead of annual) state elections in November (instead of March), and those doing away with the previous requirement that representatives, senators and the governor ” be of the Protestant religion.” Five amendments were ratified in 1889 and four in 1902. New Hampshire is the only state in the Union in which amendments to the constitution may be proposed only by a constitutional convention, and once in seven years at the general election a popular vote is taken on the necessity of a revision of the constitution. A radical revision of the con- stitution is rendered especially difficult by a provision that no amendment proposed by a convention shall be adopted without the approval of two-thirds of the electors who vote on the subject when it is referred to them. Prior to 1902 every male inhabitant of a town who was twenty-one years of age or over, a citizen of the United States, and not a pauper or excused from paying taxes at his own request, had a right to vote, but an amendment adopted in this year made ability to read English and to write additional qualifications, except in the case of those physically unable to read or to write, of those then having the franchise, and of persons 60 years of age or more on the 1st of January 1904. Various other amendments have been proposed from time to time, but have been defeated at the polls. By an act approved on the 9th of April 1909 provision was made for direct nominations of candidates at primaries conducted by regular election officers.

There is a governor’s council of five members, one from each councillor district, which has advisory duties and shares with the governor most of his powers. There. is no lieutenant-governor. The governor and the councillors are elected for a term of two years, and a majority of the votes cast is necessary to a choice. Where no candidate receives such a majority the Senate and the House of Representatives

by joint ballot choose one of the two having the greatest number. No person is eligible for either office who shall not at the time of his election be at least thirty years of age and have been an inhabitant of the state for the seven years next pre- ceding; a councillor must be an inhabitant of the district from which he is chosen. The governor and council appoint all judicial

1 The constitution of 1776 provided that the Congress which framed it " assume the name, power and authority of a House of Representatives"; that said house choose twelve persons to be " a distinct and separate branch of the legislature by the name of a Council"; that the Council appoint a president; that civil officers for the colony and for each county (except clerks of court, county treasurers and recorders) should be appointed by the two houses; and that " if the present unhappy dispute with Great Britain should continue longer than this present year, and the Continental Congress give no instruction or direction to the con- trary, the Council be chosen by the people of each respective county in such manner as the Council and House of Representatives shall order." A constitution framed by a Convention which met in Concord on the loth of June 1778 was rejected by the people w

officers, the attorney-general, auditor, important administrative boards, coroners and certain naval and military officers; they have power to pardon offences; and they may exercise some control over expenditure through the constitutional requirement of the governor's warrant for drawing money from the treasury. The governor may veto within five days, besides Sunday, after it has been presented to him, any bill or resolution of which he disapproves, and a two-thirds vote of the members of both houses is required to pass over his veto. A Senateand a House of Representatives, which together constitute the General Court, meet at Concord on the first Wednesday in January of every odd-numbered year, and at such other times as the governor may appoint for a special session, principally for the making of laws and for the election of the secretary of state, the state treasurer, and the commissary-general. The Senate is com- posed of 24 members, one from each senatorial district, and these districts are formed so as to be approximately equal with respect to the amount of direct taxes paid in each; representation in this body is therefore apportioned on the basis

of property. In the House of Representatives, which has the large membership of 390, representation is on the basis of population, but is so arranged as to favour the rural districts; thus every town or ward of a city having 600 inhabitants is allowed one representative, but, although for every additional representative 1200 additional inhabitants are required, any town having less than 600 inhabitants is allowed a representative for such proportionate part of the time the legislature is in session as the number of its inhabitants bears to 600. Senators and representatives are elected for a term of two years. A repre- sentative must have been an inhabitant of the state for at least two years next preceding his election, and must be an inhabitant of the town, parish or ward he is chosen to represent ; a senator must be at least thirty years of age, must have been an inhabitant of the state for at least seven years next preceding his election, and must be an inhabitant of the district by which he is chosen. The con- stitution of New Hampshire places scarcely any restrictions on the powers of the legislature. By an amendment of 1877, however, it is forbidden to authorize any town to lend money or give credit for the benefit of any corporation whose object is profit. Although money bills may originate only in the House of Representatives the Senate may propose amendments. In 1909 the office of state auditor was created.

For the administration of justice the state has a supreme court and a superior court, each county has a probate court, and some to'wns as well as the cities have a police court. The supreme court and the superior court consist each of one justice and four associate justices. The supreme court holds one general term each year at Concord and on the first Tuesday of every month except July and August sits to hear arguments, make orders and render decisions; the superior court holds one or two sessions a year in every county. Both of these courts have extensive jurisdiction. Each probate court, consisting of a single judge, has jurisdiction within its county of the probate of wills, of the granting of administration, in insol- vency proceedings, and in relation to the adoption of children ; it may appoint and remove guardians of minors, insane persons and spendthrifts, and, upon application, may change a person's name. The court of a justice of the peace has jurisdiction in criminal cases only where the punishment is by fine not exceeding twenty dollars, or by imprisonment not exceeding six months, or by both, and in civil cases only where the title to real estate is not involved and the damage demanded does not exceed thirteen dollars and thirty-three cents. A police court has the same jurisdiction as that of a justice of the peace, and, in addition, concurrent jurisdiction with the superior court in certain cases where the title to real estate is not involved and the damage demanded does

not exceed one hundred dollars. Judges and justices are appointed by the governor and council, and with the exception of justices of the peace they hold office during good behaviour or until they have attained the age of seventy years; justices of the peace are appointed for a term of five years only, but they may be reappointed.

Local affairs are administered by counties, towns (townships), vil- lage districts and cities. In each county a convention, composed of representatives from the towns, meets every two years to levy taxes and to authorize expenditures for grounds and buildings whenever more than one thousand dollars are required. For the discharge of other county functions the qualified electors of each county elect every two years three commissioners, a sheriff, a solicitor, a treasurer, a register of deeds and a register of probate ; two auditors also are appointed annually by the supreme court. The county commissioners have the care of county buildings, consisting chiefly of a court house, gaol and house of correction, but are not allowed to expend more than one thousand dollars for repairs, new buildings or grounds, without authority from the county convention; the commissioners have the care also of all other county property, as well as of county paupers; and once every four years they are required to visit each town of their county, inspect the taxable property therein, determine whether it is incorrectly assessed and report to the state board of equalization. In each town a regular annual meeting of the qualified electors is called on the second Tuesday in March for the transaction of miscellaneous business and the election of town officers. These officers always include three selectmen, a clerk, a treasurer and one or more auditors, and they may include any or all of the following :

assessors, who together with the selectmen constitute a board for the assessment of taxes, one or more collectors of taxes, overseers of the poor, constables, surveyors of highways, fence-viewers, sealers of weights and measures, measurers of wood and bark, sur- veyors of lumber, cullers of staves, a chief fireward or engineer and one or more assistants, a clerk of the market and a pound keeper. The moderator of the town meeting is elected at the general election in November for a term of two years, and a board of health, consisting of three members, is appointed by the selectmen, one member each year. The general business of the town, other than that which comes before the town meeting, is managed by the selectmen, and they are specially intrusted with the regulation of the highways, side- walks and commons. A village district is a portion of a town, including a village, which is set apart and organized for protection from fire, for lighting or sprinkling the streets, for providing a water-supply, for the construction and maintenance of sewers, and for police protection; to serve these

interests three commissioners, a moderator, a clerk, a treasurer and such other officers as the voters of the district may deem necessary are chosen, each for a term of one year. The government of cities is in part determined by general laws and in part by individual charters. In accordance with the general laws each city elects a mayor, a board of aldermen, and a common council in whom is vested the administration of its “fiscal, prudential and municipal affairs”; the mayor presides at the meetings of the board of aldermen, and has a veto on any measure of this body, and no measure can be passed over his veto except by an affirmative vote of at least two-thirds of all the alder- men; each ward elects three selectmen, a moderator and a clerk in whom is vested the charge of elections; the city marshal and assistant marshals are appointed by the mayor and aldermen, but the city clerk and city treasurer are elected by the aldermen and common council in joint session.

Under the laws of New Hampshire the property rights of husband and wife are nearly equal. The wife may hold, acquire and manage property the same as if she were single; she is also subject to the same liabilities in relation to her property as a single woman except that no contract or conveyance by her as surety or guarantor for her husband is binding. Rights of dower and courtesy both obtain. Where there is no will or its provisions are waived, the right of a widow, in addition to her dower and homestead rights, in the personal estate of a deceased husband is the same as that of a widower, in addition to his estate by courtesy and homestead right, in the personal estate of a deceased wife, i.e. one-half if there is no sur- viving issue and one-third if there is such issue. By releasing his or her right of dower or courtesy together with the homestead right, if any, the surviving widower or widow is also entitled, in fee, to one-half the real estate, if said deceased leaves no issue surviving; if the husband leaves issue by the widow surviving, she is entitled in fee to one-third of his real estate ; if the wife leaves issue by him surviving, the husband also is entitled in fee to one-third of her estate; but if the wife leaves issue not by him, he is entitled only to a life interest in one-third of her real estate. Among the grounds for a divorce are adultery, impotency, extreme cruelty, conviction of a crime punishable in the state with imprisonment for more than a year and actual imprisonment under such conviction, treatment seriously injuring the health or en- dangering the reason, wilful desertion for three years, or joining a religious sect or society which professes to believe the relation of husband and wife unlawful, and conduct in accordance therewith for six months.

The homestead law of New Hampshire exempts from seizure for debt

five hundred dollars' worth of any person's homestead except for the enforcement of a mortgage upon it, for the collection of debts incurred in making repairs or improvements, or for the col- lection of taxes. The law also provides that except where a mortgage is given to secure payment of the purchase money, the homestead right of a married person shall not be encumbered without the consent of both husband and wife. The surviving wife or husband and the minor children, if any, may occupy the homestead right during the minority ot the children, and the surviving wife or husband is entitled to the right during the remainder of her or his lifetime.

From 1855 to 1903 the liquor law was essentially prohibitory, but in the latter year an act licensing the traffic was passed. However, some option still remains with each town and city. Once every four years in cities and once in two years in towns the question of licence or no-licence must be submitted to a vote . of the electorate, and in a no-licence town or city no bar-room or saloon is to be permitted; in such a town or city, however, malt liquor, cider and light wines may be sold at a railway restaurant and an inn-keeper may serve liquors to his bona-fide registered guests.

Capital punishment for murder in the first degree is inflicted only upon the request of a jury.

The general supervision of railways is vested in a board of three commissioners appointed by the governor and council for a term of three years, one each year. The board is specially directed to prescribe the manner in which the railway corporations shall keep their accounts, to examine these accounts from time to time, to examine the railways at least once a year, to investigate the cause of

all accidents and upon the petition of an interested party to fix rates for the transportation of persons and freight. In 1909 an anti-pass law was enacted.

Education. — New Hampshire formed a part of Massachusetts when, in 164.7, tne General Court of that province passed the famous act requiring every town in which there were fifty householders to maintain a school for teaching reading and writing, and every town in which there were one hundred house- holders to maintain a grammar school with an instructor capable of preparing young men for college.

Although not much en- forced, this, with some slight changes, continued to be the school law until the close of the colonial era. The beginning of the new era was marked by the founding of Phillips Exeter Academy (1781), and later several other similar schools were opened. Their excellence aroused a much greater interest in the common school system, and throughout the 19th century various experiments for improving it were tried; among them were the division of towns into districts, the appointment of county school commissioners, and the establishment of a state board of education. These, however, have been abandoned, and the system is now administered chiefly by towns and a few special districts under the general supervision of a state superintendent. Each town is constituted a school district, and some special districts are organized under special acts of the legislature. Some of the business relating to the schools is transacted at the annual district school meeting in which women as well as men have a vote, but the schools of each district are managed very largely by a school board elected at this meeting, one-third each year; in districts without a high school the board has only three members, but in districts having a high school the board may have three, six or nine members. The superintendent of public instruction is ap- pointed by the governor and council for a term of two years, and it is his duty to prescribe the form of register to be kept in the schools, to investigate the condition of the schools, to make sug- gestions and recommendations for improving them, to lecture upon educational subjects in the towns and cities, to hold at least one teachers' institute each year in each of the counties, and to designate the times and places for holding examinations of those who wish to teach. The free school system now provides free high schools for all children within the state; for an act of 1903 requires any town not maintaining a high school, or school of corresponding grade, or not uniting with adjoining towns in maintaining one, to pay the tuition of any of its children who attend a high school or academy within the state. Evening schools for the instruction of persons over fourteen years of age must be established in any city or town of more than 5000 inhabitants if 5 % of its legal voters petition for them. Any town upon application, and by contract- ing to appropriate annually a certain fixed sum for its mainten- ance, may receive state aid for establishing a library, and in 1904 libraries had been established by this means in 146 towns. Every district is required to keep its schools open at least twenty weeks each year.

All children between the ages of eight and fourteen and those between the ages of fourteen and sixteen who cannot read and write English are required to attend either a public or an approved private school

for the full term unless excused by the school board on account of physical or mental infirmity. The schools are maintained chiefly out of the proceeds of a district school tax, which must not be less in any district than seven hundred and fifty dollars for every dollar of public taxes apportioned to the town or district, a pro- portion which has gradually increased from five to one in 1 789 and from ninety to one in 1817. To this is added a ” Literary Fund ” (designed originally for founding a college) which is derived from the proceeds of a state tax on the deposits, stock, &c. of savings banks, trust companies, loan and trust companies, building and loan associations and other similar corporations not residing in the state, and a portion of the proceeds of a dog tax, both of which are dis- tributed among the several districts in proportion to the number of pupils not less than five years of age who have attended school at least two weeks. The state also makes appropriations for the pay- ment of a portion of the tuition in high schools and academies distributing it among the districts in proportion to the rate of school tax in each, appropriations for paying a portion of the salary of school superintendents where two or more districts unite to form a supervising district, and appropriations for general school pur- poses to be distributed among the districts according to the number of teachers trained in normal schools and to average school attendance.

The plan of 1 82 1 to use the Literary Fund for founding arid main- taining a state college for instruction in the higher branches of science and literature was abandoned in 1828 and the only state institutions of learning are the Plymouth Normal School (1870) at Plymouth, the Keene Normal School (1909) at Keene, and the New Hampshire College of Agriculture and Mechanic Arts, organized as a department of Dartmouth College in 1866, but removed to Durham,

Strafford county, as a separate institution in 1 891. The normal schools are managed by a board of trustees consisting of the governor, the superintendent of public instruction and five other members appointed by the governor and council for a term of five years, one each year, and they are maintained out of annual state appropria- tions. The College of Agriculture and Mechanic Arts is managed by a board of trustees consisting of the governor, the president of the college, one member chosen by the alumni, and ten members ap- pointed by the governor with the advice and consent of the council for a term of four years, and it is maintained out of the proceeds of grants by the United States government, annual state appropria- tions and a private endowment. The principal institutions of higher learning in the state are Dartmouth College (non-sectarian, opened in 1769), at Hanover, and Saint Anselm’s College (Roman Catholic, opened in

1893), at Manchester. Dartmouth College receives some aid from the state.

The state charitable and correctional institutions consist of the New Hampshire School for Feeble-minded Children, at Laconia; the New Hampshire Soldiers' Home, at Tilton ; the New Hampshire Industrial School, at Manchester; the New Hampshire Hospital for the Insane, and the State Prison, at Concord; and the New Hampshire Sanatorium for consumptives (1909) near Warren Summit, about 75 m. north of Concord. The state also makes annual appropriations for the care and education of blind and deaf and dumb persons in institutions outside of the state. Each county has an almshouse and house of correction. Here, too, many of the insane of the state were formerly confined; but by an act of 1903 the counties were entirely relieved of this care, and the insane were removed to the state hospital. Within the state are also sixteen orphan asylums, and though these are private institutions, in all but one of them children are boarded at county or city expense. Each of the state institutions is under the management of an officer or board of trustees appointed by the governor and council. In 1895 the legislature established a State Board of Charities and Correction. This consists of five members appointed by the governor and council for a term of five years, one each year, and its duties are chiefly advisory and supervisory. It is required to inspect both state and county charitable and correctional institutions, except the state prison and the state hospital, to recommend such changes to the state government as may seem desirable, and to have a special care for dependent children whether in institutions or placed in permanent homes.

Finance. — The income of the state, counties and towns is derived mainly from taxes levied on real estate, on male polls between the ages of twenty-one and seventy, on stock in public funds, on stock in corporations that pay a dividend and are not subject to some special form of tax, on surplus capital in banks, on stock in trade, on live-stock, on railways, on telegraph and telephone lines, on savings banks and on the stock of fire insurance companies. Except in the case of railways, telegraph and telephone lines, savings banks, building and loan associations and fire insurance companies, the taxes are assessed and collected by town officers, but every fourth year the county commissioners are required to inspect the taxable property in the towns and report any misappraisal to the state board of equalization whose duty it is to equalize the valuation of property in the several towns. This board, which is composed of five members appointed by the supreme court for a term of two years, also assesses the taxes on the railways, and on telegraph and telephone lines ; for railways the average rate of taxation is assessed on the estimated actual value of

the road beds, rolling stock and equipment, and for the telegraph and telephone lines this rate is assessed on the estimated actual value of the poles, wires, instru- ments, apparatus, office furniture and fixtures. Savings banks pay to the state treasurer a tax of three-fourths of 1 % upon the amount of deposits on which they pay interest ; building and loan associations pay to him a tax of three-fourths of I % upon the whole amount of their capital stock paid in or shares in force, less the value of their real estate and loans secured by mortgages on real estate situated within the state and bearing interest not ex- ceeding 5%; and fire insurance companies pay to the same officer a tax of 1 % upon the amount of their paid-up capital. The railway tax is distributed as follows : one fourth is paid to the towns through which the railways pass; such a portion of the remainder is paid to any town as is equal to the portion of stock owned in that town; and what is left is reserved as a part of the state tax. Such a portion ˚f 75 % ˚f the tax on fire insurance companies is distributed among the several towns, in proportion to the amount of stock owned in each, as the amount of stock owned within the state bears to the whole amount of stock, and the remainder is reserved as a part of the state tax. All taxes on savings banks are distributed to the towns in which the depositors reside, the tax on non-resident depositors constituting a Literary Fund which is distributed to the towns on the basis of the number of pupils in each. The whole tax received by the state treasurer from each building and loan associa- tion is paid by him to the treasurer of the town in which it is located. The state also derives an income from fees charged for chartering banks, railways, insurance companies and other corporations. The financial condition at the close of the War of Independence was alarming, and in September 1785 a mob at Exeter demanded relief through the issue of more paper currency. This was refused them

however, and by the beginning of the Civil War the state was almost free of debt. During that war the state incurred an indebtedness of about $4,236,000; this it reduced to $2,205,695 in 1872, and then assumed the war debt of the towns and cities, making its total indebtedness again $4,138,124. On the 1st of September 1908 the funded debt of the state was $706,700.

History. — Martin Pring was at the mouth of the Piscataqua in 1603 and, returning to England in the same year, gave an account of the New England coast from Casco Bay to Cape Cod Bay. Samuel de

Champlain discovered the Isles of Shoals and sailed along the New Hampshire coast in 1605, and much more information concerning this part of the New World was gathered in 1614 by Captain John Smith, who in his Description of New England refers to the convenient harbour at the mouth of the Piscataqua and praises the country back from the rocky shore. Under the leadership of Sir Ferdinando Gorges there was formed in 1620 the Council for New England, which procured from King James I. a grant of all the country from sea to sea between 40 and 48° N. latitude, and which made the following grants bearing upon the history of New Hampshire by their inducement to settlement, by determining the boundaries or by causing strife through their conflicts with one another: to John Mason, who has been called " the founder of New Hampshire," on the 9th of March 1622, a grant of the region between the Salem and Merrimac rivers, under the name of Mariana; to John Mason and Sir Ferdinando Gorges jointly, on the 10th of August 1622, a grant of the region between the Merrimac and Kennebec rivers for 60 m. inland, under the name of the Province of Maine; to David Thomson and associates, in 1622, a grant of six thousand acres near the mouth of the Piscataqua; to Sir Henry Roswell and associates, on the 19th of March 1628, a grant of the region from 3 m. south of the Charles river, " or to the southward of any and every part thereof " to 3 m. N. of the Merrimac river, "or to the northward of any and every part thereof," and extending west to the South Sea or Pacific Ocean, under the name of Massachusetts; to John Mason alone, on the 7th of November 1629, a grant of that portion of the " Province of Maine " which lay between the Merrimac and the Piscataqua, under the name of New Hampshire; to the Laconia Company, consisting of Gorges, Mason and associates, on the 17th of November 1629, a grant of an extensive territory (which was called Laconia) around the Lake of the Iroquois (Lake Champlain) together with one thousand acres at some place to be selected along the sea coast; to Edward Hilton, on the 12th of March 1630, the grant of a tract on and about the lower part of Dover Neck; to the Laconia Company, in November 1631, a grant of a tract on both sides of the Piscataqua river near its mouth, known as the Pescataway grant; and finally to John Mason, on the 22nd of April 1635, a short time before the Council surrendered its charter, a grant of the region between the Salem river on the south and the Piscataqua and Salmon Falls rivers on the north-east and extending 60 m. inland, under the name of New Hampshire. Mason died in December of this year, and New Hampshire, unlike the other colonies from which the United States originated, New Jersey and Delaware excepted, never received a royal charter.

The first settlement of which there is indisputable evidence was

established in 1623 by David Thomson at Little Harbor, now in the town of Rye. Thomson was the head of a company which was organized for fishing and trading and whose entire stock was to be held jointly for five years. He built a house on Odiorne's Point overlooking Little Harbor, and, although he removed to an island in Boston Harbor in 1626, he may have continued to superintend the business of the company until the expiration of the five-year term. At least there was a settlement here which was assessed in 1628, and it may not have been completely abandoned when colonists sent over by the Laconia Company arrived in 1630. The Laconia Company received its first grant under the erroneous impression that the Piscataqua river had its source in or near Lake Champlain, and its principal object was to establish an extensive fur trade with the Iroquois Indians. Although Lake Champlain could not be reached by boat up the Piscataqua, and although the enterprise was ulti-

mately a failure, the company sent over colonists who occupied the house left standing by Thomson, and, not far away, built " Mason Hall " or the " Great House " in what is now Ports- mouth, a name (for the entire settlement) that replaced " Straw- berry Banke " in 1653. Edward Hilton with a few associates appears to have established a settlement on Dover Point about the time of Thomson's arrival at Little Harbor, and in the Hilton grant of 1630 it is stated that he had already built houses and planted there; as early as 1639 this settlement was named Dover. In 1638 the Rev. John Wheelwright, an Antinomian leader who had been banished] from Massachusetts, founded Exeter on land claimed to have been bought by him from the Indians. In the same year Massachusetts encouraged friendly Puritans to settle Hampton on the same purchase, and about a year later this colony organized Hampton as a town with the right to send a deputy to the General Court. Serious dissensions had already arisen between Puritan and Anglican factions in Dover, and Captain John Underhill, another Antinomian, became for a time a leader of the Puritan faction. Puritan Massachusetts was naturally hostile to the Antinomians at Exeter as well as to the Anglicans at Strawberry Banke. Although Exeter, in 1639, Dover, in 1640, and Strawberry Banke, not later than 1640, adopted a plantation covenant, these settlements were especially weak from lack of a superior tribunal, and appeals had been made to Massachusetts as early as 1633. Moreover, the grants of Massachusetts and Mariana were clearly in conflict. Under these conditions Massachusetts discovered a new claim for its northern boundary. The charter of that colony was drafted under the impression that the Merrimac flowed east for its entire course, but now an investiga- tion was in progress which was to show that its

source in Lake Winnepesaukee was several miles north of any of the four settlements in New Hampshire. Accordingly, Massachusetts resolved to make the most of the clause in the charter which described the northern boundary as three English miles north of the Merrimac river, " or to the northward of any and every part thereof," to ignore the conflicting grants to Mason and to extend its jurisdiction over the offending settlements. Dover submitted in 1641, Strawberry Banke (Portsmouth) soon after- wards and Exeter in 1643.

The heirs of Mason protested, but little was done about the matter during the period of Puritan ascendancy in the mother country. Immediately after the resignation of Richard Cromwell, however, Robert Tufton Mason (a grandson of the original proprietor), who had become sole heir in 1655, began petitioning first parliament and later the king, for relief. The attorney- general, to whom the petition to the king was referred, reported that the petitioner had a " good and legal right and title to the lands." The commission appointed by the king in 1664 to hear and determine complaints in New England decided that Mason's lands were not within the jurisdiction of Massachusetts, and made an attempt to set up a government under which his claims could be tried, but this was a failure. In 1674 Mason offered to surrender his rights to the Crown in return for one-third of the customs, rents, fines, and other profits derived therefrom, but although the offer was at first favourably considered it was finally declined. Mason then petitioned again, and this time Massachusetts was requested to send agents to England to answer his complaints. They arrived in December 1676, and the case was tried before the Lords Chief Justices of the King's Bench and Common Pleas in April 1677. Mason presented no claim to the right of government, and as to the title to the lands claimed by him the court decided that this was a question between him and the several tenants to be determined by the local court having jurisdiction in such matters. Thereupon Mason, in January 1679, petitioned the king to appoint a governor who should have jurisdiction over all the lands which he claimed, and on the 18th of September of this year New Hampshire was constituted a separate province with a govern- ment vested in a president and council appointed by the king and an assembly chosen by the people. This was the principal outcome of Mason's persistent efforts to establish his rights to

the land; for although he succeeded in procuring the appoint- ment of officers who supported his claims, and although decrees were issued

in his favour, the tenants, who contended that they had profited nothing from what his grandfather had done or that they were on lands which Wheelwright had bought from the Indians, resisted the enforcement of those decrees. The contest, however, especially for the waste lands, was continued by Mason, his heirs and assigns until near the close of the 18th century.

From 1686 to 1689 New Hampshire formed a part of the Dominion of New England, which, after the first few months, was under Sir Edmund Andros as governor-general. There being no provincial authority in New Hampshire at the close of this period, a convention of the leading citizens of its four towns attempted to establish one. Upon the failure of this attempt, a temporary nominal union with Massachusetts was formed, but in 1692 Samuel Allen, the assign of Mason, caused a royal government to be established with his son-in-law, John Usher, as lieutenant-governor, and during the remainder of the colonial era New Hampshire was separate from Massachusetts except that from 1699 to 1741 the two had the same governor. The boundary between the two provinces was yet to be deter- mined. Massachusetts proposed to confine New Hampshire to less than one-fourth its present area; that is, on the west to a line drawn 3 m. east of the south course of the Merrimac and on the north-east to a line drawn north-west from the source of the Salmon Falls river. New Hampshire claimed for its southern boundary a line drawn west from a point 3 m. north of the mouth of the Merrimac and for its upper eastern boundary a line running north by slightly west from the source of the Salmon Falls river. Both provinces granted townships within the disputed territory; Massachusetts arrested men there who refused to pay taxes to its officers, and sought to defer the settle- ment of the dispute. New Hampshire, being on the more friendly terms with the home government, finally petitioned the king to decide the matter, and in 1737 a royal order referred it to a commission to be composed of councillors from New York, Nova Scotia and Rhode Island. This body agreed upon the present eastern boundary but evaded deciding the southern one. Both parties then appealed to the king, and in 1741 the king in council confirmed the decision of the commission in regard to the eastern boundary and decided that the southern boundary should be a line corresponding to the course of the Merrimac from 3 m. north of its mouth to 3 m. north of Pawtucket Falls, at its most southerly bend, and thence due west to the next English province. This gave New Hampshire much more territory on the south than it had claimed. But the western boundary was not yet defined, and as early as 1 749 a controversy over that arose with New York. New Hampshire asked for the territory west to within 20 m. of the Hudson

river, or as far as the western boundaries of Massachusetts and Connecticut, while New York claimed east to the Connecticut river. Within a few years the governor of New Hampshire granted in the disputed territory 138 townships which were rapidly settled by those whom it was the duty of the province to protect. But there was a reluctance to incur the expense of a contest with so powerful a neighbour as New York, and in 1764 that province procured from the king in council a royal order declaring the western boundary of New Hampshire to be the western bank of the Connecticut river. The controversy, however, continued for some years thereafter (see Vermont).

From 1676 to 1759 New Hampshire suffered greatly from the Indians, and the fear of them, together with the boundary disputes and Mason's claims, retarded settlement. But where these troubles were removed the population increased rapidly, and at the outbreak of the War of Independence the province had about 80,000 inhabitants, the great majority of whom were with the patriot or Whig party during that struggle. By June 1775 the once popular governor, Sir John Wentworth, was a refugee; on the 5th of January 1776 the fifth Provincial Congress established a provisional government; on the 15th of the following June the first Assembly elected under that

government declared for independence; and on the 16th of August 1777 the important victory at Bennington was won by New Hampshire and Vermont troops under the command of General John Stark, who had a commissiori from New Hampshire. Six states had ratified the Federal constitution when the New Hampshire convention met at Exeter on the 13th of February 1788, to accept or reject that instrument, and so great was the opposition to it among the delegates from the central part of the state that after a discussion of ten days the leaders in favour of ratification dared not risk a decisive vote, but procured an adjournment in order that certain delegates who had been instructed to vote against it might consult their constituents. Eight states had ratified when the convention reassembled at Concord on the 17th of June, and four days later, when a motion to ratify was carried by a vote of 57 to 47, adoption by the necessary nine states was assured. The War of Independence left the state heavily burdened with debt and many of its citizens threatened with a debtor's prison. As a means of relief a number of citizens demanded of the legislature the issue of paper money equal in amount to the state's debt, and as this was refused, an armed mob numbering about 200 surrounded the meeting-house in Exeter in which the legislature was in session, towards evening on the 20th of September 1786. But General John Sullivan (1740-1795) was at that time president of the state, and on

the next day he, with 2000 or more militia and volunteers, captured 39 of the leaders and suppressed the revolt without bloodshed.

National elections in New Hampshire were carried by the Federalists until 1816, except in 1804 when President Thomas Jefferson won by a small majority; but within this period of Federalist supremacy in national politics the Democrat-Repub- licans elected the governor from 1805 to 181 2 inclusive except in 1809. In 1816 the Democrats won both state and national elections; and out of the transition from Federalist to Demo- cratic control, which was effected under the leadership of William Plumer (1759-1850), a prominent politician in New Hampshire for half a century, a United States senator from 1802 to 1807 and governor of the state in 1812-1813 and 1816-1819, arose the famous Dartmouth College Case. As the trustees of this institu- tion were Federalists with the right to fill vacancies in their number, the Democrats attempted to gain control by converting it into a state university and increasing the number of trustees, but when the case reached the Supreme Court of the United States that body pronounced (1819) the charter a contract which the Federal constitution forbade the state to violate. Heretofore the Federalist regime had taxed the people to support the Congregational Church, but now the Baptists, Methodists and Universalists joined the Democrats, and in 1819 this state support was abolished by the ” Toleration Act.” Because of Daniel Webster’s arguments in the Dartmouth College Case, and because his party had favoured the support of the Con- gregational Church by public taxation, he became very unpopular in this his native state. Accordingly, his denunciation of President Andrew Jackson’s bank policy added strength to the Jacksonian Democracy, and, later, his Whig connexions were the greatest source of the Whig party’s weakness in New Hampshire, John Quincy Adams was an intimate friend of William Plumer, the Democratic leader, and carried the state both in 1824 and 1828, but a Jackson man was elected governor in 1827, 1829, 1830 and 1831. The Whigs never won a national or state election, and often their vote was only about one-half that of the Democrats. But the Democrats broke into two factions in 1846 over the question of slavery (see Hale, John Parker); the American or ” Know-Nothing ” party elected a governor in 1855 and 1856; and then control of the state passed to the Republican party which has held it to the present. After 1890 the railway corporations were charged with a corrupt domination of the legislature and the courts, and in 1906 a ” Lincoln Republican ” movement was organized under the leadership of the well-known novelist Winston Churchill (b. 1871), with the ‘object of freeing the state from this influence.

NEW HARMONY

The governors or presidents of the province and state have been: Province. John Cutt, president ….. Richard Waldron, president Edward Cranfield, lieutenant-governor . Walter Barefoot, deputy-governor . Joseph Dudley, president of Council for New

England

♦Edmund Andros, governor-general of New

England

Without a government Nominally united with Massachusetts Samuel Allen, governor …. Richard Coote, earl of Bellamont, governor Joseph Dudley, governor …. Samuel Shute, governor …. John Wentworth, lieutenant-governor William Burnett, governor Jonathan Belcher, governor Benning Wentworth, governor . John Wentworth, governor . . .

Transition from Province to State. Matthew Thornton, president of the Pro- vincial Convention

State Presidents.

Mesheck Weare John Langdon] ohn Sullivan * ohn Langdon] ohn Sullivan josiah Bartlett

State Governors.

Josiah Bartlett

John Taylor Oilman .

John Langdon

Jeremiah Smith .

John Langdon

William Plumer .

John Taylor Gilman .

William Plumer .

Samuel Bell

Levi Woodbury

David Lawrence Morril

Benjamin Pierce

John Bell . .

Benjamin Pierce

Matthew Harvey

Joseph Morrill Harper (act

Samuel Dinsmoor

William Badger .

Isaac Hill

John Page

Henry Hubbard .

John Hardy Steele

Anthony Colby

Tared Warner Williams

Samuel Dinsmoor

Noah Martin

Nathaniel Bradley Baker

Ralph Metcalf

William Haile

Ichabod Goodwin

Nathaniel Springer Berry

Joseph Albree Gilmore

Frederick Smyth

Walter Harriman

Onslow Stearns

James Adams Weston

Ezekiel Albert Straw .

James Adams Weston

Person Colby Cheney Benjamin Franklin Prescott Natt Head . Charles Henry Bell Samuel Whitney Hale Moody Currier Charles Henry Sawyer David Harvey Goodell Hiram Americus Tuttle John Butler Smith Charles Albert Busiel George Allen Ramsdell Frank West Rollins Chester Bradley Jordan Nahum Josiah Bachelder John McLane Charles M. Floyd Henry B. Quinby Robert P. Bass . ,

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NEW HARMONY, a village in Posey county, Indiana, U.S.A., on the Wabash river, about 22 m. N.W. of Evansville. Pop. (1900) 1341; (1910) 1229. It is served by the Illinois Central railway, and has regular steamboat connexion with the river cities. New Harmony had its beginning in 1814-1815, when it became the home of a communistic religious sect known variously as the Harmonists, Harmonites and Rappites, founded in Germany towards the end of the 18th century by George Rapp (1757-1847), a native of Iptingen in Wiirttemberg. Rapp and his followers, who sought to form a community after the manner of the primitive Christian Church, were

persecuted in Germany, and in 1803-1804 emigrated to Butler county, Pennsylvania. There they established in 1805 a community known as Harmony, consisting of some 600 persons, who held their property in common and in 1807 adopted celibacy. In 1814 Rapp sold most of his Pennsylvania land and bought about 2 4>735 acres (in the next ten years more than 14,000 acres in addition) on the Wabash river in Indiana Territory. In 1814- 181 5 Rapp and a thousand of his followers settled on the Indiana tract, their headquarters being established at New Harmony, or Harmonie as they called it. The settlers, mostly Germans, devoted themselves to agriculture, weaving and leather-working so industriously that they prospered from the start. Rapp, however, in 1825 disposed of his lands and property to Robert Owen, having returned with part of his followers to Pennsylvania and founded a new community known as Economy (q.v.), in Beaver county, where he died in 1847. Intent on founding a socialistic community, Owen went to the United States in 1824, and purchased Rapp's lands and live stock for $182,000. He interested several well-known scientists in his settlement, and with them came to New Harmony in the spring of 1826. Within six months the community numbered over 1000. Among its most notable members were Robert Owen's sons, Robert Dale Owen (1801-1877), a political leader and diplomat; David Dale Owen (1807-1860) and Richard Owen (1810-1890), both geo- logists of note; William MaClure (1763-1840), the founder of the Academy of Natural Sciences at Philadelphia; Thomas Say (1787-1834), " the father of American Zoology " ; Charles Lesueur, a scientist and antiquarian; and Gerard Troost (1776-1850), a well-known geologist. The greater part of the settlers, how- ever, were impractical theorists or adventurers. Constitution after constitution was adopted, and with the adoption of each new constitution and with each new religious discussion a group would secede and form a separate community — in 1828 there were ten — the best known and most successful being Macluria (like the others, occupying a part of Owen's land), named after William MaClure, who became its directing power. The whole organization broke up in 1827, and Owen left New Harmony in 1828. New Harmony has a Working Men's Institute Public Library, founded in 1838 by William MaClure,

and having in 1907 18,000 volumes; the collection is rich in works dealing with socialism.

See " The Harmony Society " in German-American Annals

(Philadelphia), vol. 2 (new series), for January 1904; G. B. Lock- wood and C. A. Prosser, The New Harmony Movement (New York, 1907) ; Meredith Nicholson, The Hoosiers (New York, 1901) ; Morris Hillquit, History of Socialism in the United States (New York, 1903) ; and Frank Podraore, Robert Owen (London, 1906).

NEW HAVEN, the largest city of Connecticut, U.S.A., the county-seat of New Haven and the seat of Yale University. It is co-extensive with the township of New Haven (though there is both a township and a city government), and lies in the south-western part of the state, about 4 m. from Long Island Sound, at the head of New Haven Bay, into which empty three small streams, the Quinnipiac, the Mill and the West rivers. Pop. (1890) 81,298; (1900) 108,027, of whom 30,802 were foreign-born, including 10,491 Irish, 5262 Italians, 4743 Germans, 3193 Russians and 1376 Swedes; (1910 census) 133,605. Land area (1906) 17-91 sq. m., of which more than one-half was annexed since 1900. New Haven is served by the main line and five branches of the New York, New Haven & Hartford railway, by three inter-urban electric lines and by two steamship lines connecting with New York. The city is built on a level, sandy plain, in the rear of which is a line of hills terminating in two spurs, East Rock and West Rock, respectively 360 and 400 ft. high and 2 m. and 2j m. distant from the Green. On East Rock is a monument to the Connecticut soldiers who fell in the War of Independence, the War of 1812, the Mexican War and the Civil War; on the West Rock is a cave, ” Judges’ Cave,” in which the regicides William Goffe and Edward Whalley are said to have concealed themselves when sought for by royal officers in 1661. The central and older portion of the city is laid out in squares surrounding a public Green of 16 acres, which was in former days the centre of religious and social life. New Haven is popularly known as the ” City of Elms,” because of the number of these trees. Besides the Green there are 12 other parks, ranging from 6 to 300 acres in area, four of them being on the water front, along the harbour. On the west side of the city is Edgewood Park (120 acres); on the north is Beaver Pond Park (100 acres); and East and West Rocks, mentioned above, have been made into suburban parks.

Among the public buildings and places of interest are the three churches on the Green, built in 1814; Center Church (Con- gregational), in the rear of which is the grave of John Dixwell (1 608-1 689), one of the regicides; United (formerly known as North) Church (Congregational), and Trinity Church, which belongs to one of the oldest Protestant Episcopal congregations in Connecticut. On the north-western side of the Green are the buildings of Yale University (q.v.) ; the ” college ” campus is the square enclosed by College,

Chapel, High and Elm streets, with Battell Chapel at its eastern corner, Farnam, Lawrence, Phelps, Welch and Osborn halls on its south-eastern side, Vanderbilt Hall, Connecticut (or South Middle) Hall, the oldest of the Yale buildings (1750), and the Art School on the southern side, the Library, Dwight Hall and Alumni Hall on the north-western and Durfee Hall on the northern side; farther north of the Green are the Divinity School, the University Campus, on which are the Bicentennial Buildings and Memorial Hall, and, lying between Grove Street and Trumbull Street and Prospect Street and Hillhouse Avenue, the buildings of the Sheffield Scientific School. In the vicinity is the Grove Street Cemetery, in which are the graves of many famous Americans. Besides the University Library, there are a Public Library (1887), containing about 80,000 vols., the library of the Young Men's Institute (1826) and the collection of the New Haven Colony Historical Society. The city contains a State Normal School and a number of hospitals and charitable institutions.

Among the newspapers of New Haven are the Morning Journal and Courier (1832, Republican), whose weekly edition, the Connecticut Herald and Weekly Journal, was established as the New Haven Journal in 1766; the Palladium (Republican; daily, 1840; weekly, 1828); the Evening Register (Independent; daily, 1840; weekly, 1812); and the Union (1873), a Democratic

evening paper. At New Haven also are published several weekly English, German and Italian papers, and a number of periodicals, including the American Journal of Science (18 18), the Yale Law Journal (1890) and the Yale Review (1892), a quarterly.

In 1900 New Haven was the most important manufacturing centre in Connecticut, and in 1905 it was second only to Bridgeport in the value of its factory product. In 1905 its estab- lishments numbered 490. The principal manufactures are hardware, foundry and machine shop products, ammunition and fire-arms (the Winchester Company), carriages and wagons, malt liquors, paper boxes and corsets. Meat packing is also an important industry. In 1905 the total capital invested in manufacturing was $31,412,715 and the total product $39,666,118 (a gain of 13*7% since 1900). Commercially, New Haven is primarily a distributing point for the Atlantic seaboard, but the city is a port of entry, and foreign commerce (almost ex- clusively importing) is carried on to some extent, the imports in 1909 being valued at $404,805. In 1908 the assessed valua- tion of real and personal property was $119,592,508, the net debt was $3,854,498 and the rate of taxation was 14-75 mills on the dollar.

Under a charter of 1899, as amended afterwards, the city government, which has almost entirely superseded the town government, is in the hands of a mayor, who holds office for two years and appoints most of the administrative officers, except a board of aldermen (of whom each has a two-year term, six are chosen from the city at large and the others one each from each ward, the even-numbered wards electing their representatives one year and the odd-numbered the next), a city clerk, con- troller, sheriff, treasurer and tax collector, all chosen by popular vote, and an assistant clerk, appointed by the board of aldermen.

The first settlement in New Haven (called Quinnipiac, its Indian name, until 1640) was made in the autumn of 1637 by a party of explorers in search of a site for colonization for a band of Puritans, led by Theophilus Eaton and the Rev. John Daven- port, who had arrived at Boston, Massachusetts, from England in July 1637. In the following spring a permanent settlement was made. It was governed under a ” plantation covenant ” until the 4th of June 1639, when, at a general meeting, the ” free planters ” adopted the fundamental principles of a new government. They agreed that the Scriptures should be their guide in civil affairs, and that only approved church members should be admitted to the body politic; twelve men were ap- pointed to choose seven men (“seven pillars”) who should found the church and admit to its original membership such planters as they thought properly qualified. This having been done, the first General Court of which there is record met on the 25th of October. At this court the members of the new church, together with six members of other approved churches, were admitted to citizenship; a magistrate, four assistants, a secretary and a constable were chosen as the civil officers; annual elections and an annual session of the General Court in the last week of October were agreed upon; English statute and common law were expressly excluded; and the ” worde of God was adopted as the onely rule to be attended unto in ordering the affayres of govern- ment in this plantation.” As thus founded, New Haven was town and colony combined. In 1 643-1 644 the colony was ex- panded into the New Haven Jurisdiction, embracing the towns of New Haven, Guilford, Milford, Stamford, and Branford in Connecticut, and, on Long Island, Southold; but this ” Juris- diction ” was dissolved in 1664, and all these towns (except Southold) passed under the jurisdiction of Connecticut, according to the Connecticut charter of 1662. The government of the Jurisdiction was of the strictest Puritan type, and although the forty-five ” blue laws ” which the Rev. Samuel Peters, in his General History of Connecticut, ascribed to New Haven were much confused with the laws of the other New England colonies

and some were mere inventions, yet many of them, and others equally ” blue,” were actually in operation as enactments or as court decisions in New Haven.

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NEWHAVEN— NEW HEBRIDES

Among those in the Peters’s list which are wholly or substantially true are the following: ” The judges shall determine controversies without a jury “; ” Married persons must live together or be imprisoned”; “A wife shall be good evidence against her hus- band”; “No minister shall keep school”; “The selectmen, on finding children ignorant, may take them away from their parents and put them into better hands, at the expense of their parents.” Among those in the same list which are wholly or in part spurious are : ” No woman shall kiss her child on the Sabbath or fasting day,” and ” No one shall travel, cook victuals, make beds, sweep house, cut hair or shave on the Sabbath day.”

One of the most important events in the history of New Haven was the removal hither in October 1716 from Saybrook of the Collegiate School of Connecticut, which developed into Yale University. The period of greatest material prosperity of New Haven in the colonial period began about 17.50, when a thriving commerce with other American ports and the West Indies developed. As a port it was notorious for its smuggling and illicit trade. New Haven also had extensive shipbuilding interests. All attempts to enforce the British commercial regula- tions were ineffectual. On the 22nd of February 1763 a town meeting resolved to encourage colonial manufactures and to refrain from importing from England hats, clothing, leather, gold and silver lace, buttons, cheese, liquors, &c. Two years later Jared Ingersoll (1722-1781), who had been sent to England to protest against the Stamp Act, but had acceptedthe office of Stamp Distributor on the advice of Benjamin Franklin, was forced to resign his office. In 1770 most of the merchants agreed not to import goods from England and transferred their trade with New York City, where Loyalist influence was strong, to Boston and Philadelphia. When news of the embargo of the port at Boston arrived at New Haven, a Committee of Correspondence was at once formed; and in the War of Inde- pendence the people enthusiastically supported the American cause. On the 5th of July 1779 the place was invaded by a British force under General William Tryon, who intended to burn the town, but met so strong a resistance that he withdrew before the next day. New Haven’s commerce suffered severely during the war, but by the close of the first decade of the 19th century it had regained its former importance.

When the War of 181 2 opened there were fully 600 seamen in the city, practically all of whom were engaged in privateering or in the regular naval service of the United States. Among them was Captain Isaac Hull. In 181 5 the Fulton, the first steamboat on Long Island Sound, made its first trip from New York to New Haven. The second quarter of the 19th century was the period of develop- ment of railways and manufactures. The period since the Civii War has been marked by a diversification of industries. To that conflict New Haven contributed approximately $30,000,000, and 3000 men, 500 of whom were killed. From 1701 until 1873 New Haven was the joint capital (with Hartford) of Connecticut. New Haven was incorporated as a city in 1784; new charters were secured from the General Assembly of the state in 1869, 1881 and 1899. Fair Haven was annexed to New Haven in 1897. See Leonard Bacon, Thirteen Historical Discourses (New Haven, 1839) ; J. W. Barber, History and Antiquities of New Haven (3rd ed., New Haven, 1870); C. H. Levermore, Town and City Government of New Haven, and The Republic of . New Haven (Baltimore, 1886); E. S. Bartlett, Historical Sketches of New Haven (New Haven, 1897) ; Edward E. Atwater, History of the Colony of New Haven to its Ab- sorption into Connecticut (New Haven, 1881) ; H. T. Blake, Chronicles of New Haven Green (New Haven, 1898); Records of the Colony of New Haven 1638-1665 (2 vols., Hartford, 1857-1858), edited by C. H. Hoadly; and the Papers and other publications (1865 sqq.) of New Haven Colony Historical Society.

NEWHAVEN, a seaport in the Eastbourne parliamentary division of Sussex, England, 56 m. S. from London by the London, Brighton & South Coast railway, on the English Channel at the mouth of the Ouse. Pop. of urban district (1901) 6772. The church of St Michael has a Norman square embattled tower surmounted by a spire, and an apsidal chancel. The port is protected by fortifications. A harbour was first granted to Newhaven in 1713, and during the early part of the 18th century it possessed a large shipping trade. This afterwards declined, but it is now one of the principal points of communication between England and France, the railway company maintaining

a daily service of fast steamers to Dieppe in connexion with the Chemin de fer de 1'Ouest. The tidal harbour, which is owned by a company, is enclosed by two piers and a breakwater, the area being about 30 acres, and the quayage 1400 yds. The roadstead is one of the finest on the coast of England. With France there is a large traffic in wines, spirits, silk, fruit, veget- ables and general provisions. The coasting trade consists chiefly of imports of coal and provisions, the exports being principally timber for shipbuilding and flint for the Staffordshire potteries. Some shipbuilding is carried on.

NEW HEBRIDES, a chain of islands in the western Pacific Ocean, between 166 and 171° E., and 13° and 21 S., included in Melanesia, and under the joint influence of Great Britain and France. (For map, see Pacific Ocean.) From New Caledonia to the S.W. they are separated by a deep channel; but a com- paratively shallow sea indicates their physical connexion with the Santa Cruz group (q.v.) to the N. The chain lies S.E. and N.W., but the main islands are arranged somewhat in the form of the letter Y. The south-easternmost island is Aneiteum; N.W. from this the main islands are Tanna or Aipere, Eromanga, Efate, 1 the Shepherd Islands and Api or Epi. At this point the arms of the Y divide, the western comprising the large islands of Malekula or Mallicollo and Espiritu Santo, 2 the eastern consisting of Ambrym, Arag and Maiwo or Aurora, with Aoba or Leper Island between the two arms. Espiritu Santo, the largest island, has an area of 875 sq. m. Irregularly disposed to the N. of the Y are the lesser islands composing the Banks group — Gaua, Vanua Lava, Mota, Valua, &c, and the Torres Islands.

With their rugged outline and rich vegetation, the islands as seen from the sea are very beautiful. Excepting the small Torres group, which are low-lying and perched on reefs, but without lagoons, all the islands are of volcanic, not coral, formation, the larger ones lying on both sides of the line of volcanic activity. The coasts are almost free from reefs and the shores rise abruptly from deep water. Old coral is sometimes found elevated to a considerable height. The islands are formed chiefly of basalt and recent eruptive material; earthquakes and submarine eruptions are not infrequent; and some of the islands themselves have active craters. All have considerable elevations, the loftiest being the isolated cone of Lopevi, near the junction of the arms of the Y; its height is 4714 ft. The volcanic soil is very rich. Numerous clear streams water the islands, but some debouch upon flat ground towards the sea, and form unhealthy marshes there. Copper, iron and nickel are the most important minerals known in the group, and sulphur is of some commercial importance.

The climate is generally hot and damp, but there is a season (November to April) which is specially distinguished, as such, and is somewhat unhealthy. The trees — Casuarina, candle nut (Aleurites triloba), kauri pine (or Tanna), various species of Ficus, Myrtaceae and many others — are magnificent; the coco-nut is not confined to the coast, but grows high up the valleys on the hill-sides. Sandal-wood is also found. Besides the breadfruit, sago-palm, banana, sugar, yam, taro, arrowroot and several forest fruits, the orange, pine-apple and other imported species flourish; and European vegetables are exported to Sydney. Land mammals are scarce; they include bats, rats and pigs

which have run wild. There are some lizards and turtles; birds include pigeons, parrots, ducks and swallows; locusts, grasshoppers, butterflies and hornets are numerous, and the sea abounds in fish, which, however, are generally inferior as food, and in some cases poisonous.

The native population is estimated at 50,000; in 1904 the British population was 212, the French 401. The island of Efate contains the seat of the joint government, Vila or Port Vila (formerly Franceville), and the majority of the French population. There are several British and French trading companies, and a considerable area is cleared and worked by settlers. The chief exports are copra, coffee, maize, bananas, timber, &c.

1 Efatl, Vate, Fate, Efat or Sandwich island. 1 Abbreviated to Santo ; native Marina.

The natives of the New Hebrides are Melanesians of mixed blood, and vary much in different islands. On Efate and some others Polynesian immigration has produced a taller, fairer and less savage people. In some parts, as on Aoba, isolated Polynesian communities exist. But the general type is Melanesian: black skin, woolly hair, low, receding forehead, broad face, flat nose and thick lips. The natives decorate themselves with nose-rings and ear-rings and bracelets of shells. The men are constantly fighting; their weapons are bows and poisoned arrows, often beautifully designed, clubs of elaborate patterns and spears. Their houses are either round huts, or rectangular with pitched roofs resting on three parallel rows of posts. The villages are scrupulously clean and neat, ornamented with flowering shrubs, crotons and dracaenas, and are often fortified with stone walls. In character the New Hebrideans are ferocious and treacherous, though most of their unhospitality and savagery is to be traced to the misconduct and cruelty of traders and labour agents. The women occupy a de- graded position, and in some islands widows are buried alive with the bodies of their husbands. There is a great belief in sorceries and omens; but prayer and offerings (usually of shell money) are addressed mainly to the spirits of the (recently) dead, and there is another class of spirits, called Vui, who are appealed to when incor- porate in certain stones or animals; of one of two such the divinity is recognized generally. By the villages a space shadowed by a great banyan tree is often set apart for dances and public meetings. A certain sanctity attaches also sometimes to the Casuarina and the

Cycas. An important institution is the club-house, in which there are various grades, whereon a man's rank and influence mainly depend, his grade being recognized even if he goes to another island where his language is unintelligible. In like manner a division into two great exogamous groups prevails, at all events throughout the northern islands. It would therefore seem that the present diversity of languages in the group must be of relatively recent origin. These languages or dialects are numerous, and mutually unintelligible, but alike as to grammatical construction, and belonging to the Melanesian class.

History. — The Portuguese Pedro Fernandez de Quiros, sighting Espiritu Santo in 1606, thought he had discovered the great southern continent then believed to exist, and named it Australia del Espiritu Santo. Louis de Bougainville visited the islands in 1768, and Captain Cook, who gave them the name they bear, in 1774. The subsequent visits of several explorers, the ex ploitation of the sandal-wood and other products by traders and the arrival of missionaries helped to open up the islands and to give them a certain commercial importance by the middle of the 19th century. Trade was mainly with New Caledonia, and France was thus indicated as the dominant power in the New Hebrides; even British planters pressed France to annex the islands in 1876, but in the following year some of the missionaries urged the same course on England. In 1878 the islands were declared neutral by Great Britain and France. The presence of British and French settlers under independent authority led to unsatisfactory administration, especially in regard to the settle- ment of civil actions and jurisdiction over the native population. As to the establishment of commercial supremacy, French interests clashed with Australian, and in 1882 M. John Higginson of New Caledonia (d. 1904) consolidated the former by founding the trading society which afterwards became the SociUi fratiQaise des N ouvelles-H&brides. In 1886 one of the most serious of many native outbreaks occurred, necessitating a French de- monstration of force from New Caledonia. An Anglo-French convention of the 16th of November 1887 provided for the surveillance of the islands (protection of life and property) by a mixed commission of naval officers. The Anglo-French agreement of 1904 had a clause providing for an arrangement as to proper jurisdiction over the natives and for the appointment of a com- mission to settle disputes between British and French landed proprietors. In this and the following year there was much unrest among the natives, and a joint punitive expedition was necessary.

Strong feeling was aroused meanwhile in Australia owing to the disabilities suffered by British settlers in the islands. British annexation, cr at least a division of the group into British and French

spheres, was urged. But on the 20th of October 1906 a convention was signed in London, confirming a protocol of the preceding 27th of February, and providing that " the group of the New Hebrides, including the Banks and Torres Islands," should form " a region of joint influence," in which British and French subjects should have equal rights in all respects, and

each power should retain jurisdiction over its own subjects or citizens. The claim of other powers to share the joint influence was excluded by the provision that their subjects resident on the islands must be under either British or French jurisdiction. A British and a French high commissioner were appointed, each assisted by a resident commissioner; provision was made for two police forces of equal strength, and the joint naval com- mission of 1887 was retained for the purpose of keeping order. The high commissioners were given authority over the native chiefs. A joint court was established, consisting of two judges, appointed respectively by Great Britain and France, and a third, to be president, and not a British subject or French citizen, appointed by the king of Spain. Its jurisdiction covers civil cases (including commercial suits and those respecting landed property), native offences or crimes against non-natives, and all offences against the provisions of the convention. The sale of arms and intoxicants to natives is forbidden; and the • convention regulates the recruitment of native labour. Pro- vision was made for community of interests in regard to public works, finance and the official use of the English and French languages. The creation of municipalities on the application of groups of not less than thirty non-native residents was pro- vided for, municipal votes being given to both sexes. The con- vention provided against the establishment of a penal settlement and the erection of fortifications.

This convention was bitterly criticized in Australia on the ground that many of the provisions which nominally established equality between British and French would operate in practice to the advantage of the French; and there was no little dis- satisfaction on the ground that the Australian government was neither represented at the preliminary conference, nor fully consulted during the negotiations.

See Parliamentary Papers, France, No. 1 (1888 and 1906) ; and " Correspondence relating to the Convention . . ." (Cd.3288), (1907).

NEW IBERIA, a city of Louisiana, U.S.A., capital of Iberia parish, on the Bayou Teche, in the southern part of the state, about 125 m. W. of New Orleans. Pop. (1890) 3447; (1900) 6815 (3309 negroes); (1910)7499. It is served by the Southern Pacific, the Franklin and

Abbeville, and the New Iberia & Northern railways. Lumber, sugar, cotton and rice are pro- duced in the neighbourhood. At the village of Avery Island, about 10 m. S.E., there are deposits of rock salt. The municipality owns and operates the waterworks and the electric lighting plant. New Iberia was laid out in 1835 and was chartered as a city in 1839.

NEW JERSEY, one of the Middle Atlantic states of the American Union, lying between 41 21′ 22-6″ and 38 55′ 40″ N. Iat., and 75 35′ and 73 53′ 39″ W. long. It is bounded, N., by the state of New York; E., by the Hudson river, which separates the state from New York, and by the Atlantic Ocean; and S. and W. by the Delaware Bay and river, which separate New Jersey from Delaware and Pennsylvania. All the boundaries except the northern are natural. New Jersey has an extreme length, N. and S., of 166 m., an extreme width, E. and W., of 57 m., and a total area of 8224 sq. m., of which 710 sq. m. are water-surface.

Physiography. — There are within the state four distinct topo- graphic belts — the Appalachian, the Highlands, the Triassic Low- land and the Coastal Plain. The folded Appalachian belt crosses the N.W. corner of the state, and includes the Kittatinny Mountain and Valley. The mountain has a north-east-south-west trend, crossing the Delaware river at the Delaware Water Gap and con- tinuing S.W. into Pennsylvania. In width the range varies from 4 or 5 m. in the N. to about 2 m. in the S. Its western foot lies along the Delaware river, which for some distance flows parallel with the range, and has an altitude of about 400 ft. above the sea at Port Jervis, where it enters the state, and of about 300 ft. at the Water Gap, where it leaves it. Where the crest of the ridge enters the state its elevation is 1539 ft.; at High Point, l| ra. S.W. the ridge attains a height of 1803 ft., the highest point within the state. A short distance S.W. of this point, in a depression in the mountain crest, is Lake Marcia, at an elevation of 1570 ft. Beyond Culver's Gap the mountain again narrows to a ridge, and for a portion of its length it is double-crested. On the eastern side the slope is so abrupt as to make ascent difficult and at places impossible, but the western slope, on account of a dip of the rock to the N.W., is more

gradual. The eastern foot has a very uniform altitude of from 900 to 1000 ft. above the sea. The crest of the ridge is from 600 to 1200 ft. W. of the foot, and from 450 to 600 ft. above it. At the Water Gap the ridge is cut through to its base, and the Delaware river flows through

the opening. This gap, 900 ft. wide at the base and 4500 ft. wide at the top, with sides rising very abruptly to a height of 1200 ft. and more, is an impressive sight. The Kittatinny Valley, S.E. of and parallel to the Kittatinny Range, is about 40 m. long and 12 m. wide and has an average elevation of 700 ft. Its western margin is from 900 to 1000 ft. above the sea, and its eastern border is from 400 to 500 ft. lower. The floor of the valley is very undulating, and contains numerous small streams, whose divides are from 700 to 900 ft. above the sea. South-east of the Kittatinny Valley, and parallel with it, lies the second topo- graphic belt, the Highlands. This region embraces an area of 900 sq. m., having a length, N.E. and S.W., of 60 m., and a width varying from 9 to 18 m. It consists of an upland plateau now dissected by streams into a series of hills and ridges, and corresponds to the Piedmont Belt farther to the S.W. and to the upland region of southern New England. The average elevation of the Highlands is about 1000 ft.; the highest point, between Canisteer and Vernon, in Sussex county, being 1496 ft. The third belt, called the Triassic Lowland, occupies about one-fifth of the surface of the state. Its N.W. border is marked by a line drawn S.W. across the state through Pompton, Morristown, Lebanon and Highbridge to the Delaware; its S.E. border by a line drawn from Woodbridge to Trenton. The surface is irregular, with altitudes ranging from about sea-level to 900 ft. A noteworthy feature of this area is the series of trap rock ridges, between which the Passaic river makes its irregular way through a region of flat bottom lands. On the N. E. border of the Lowland, one of these trap ridges lines the western bank of the Hudson river for about 25 m., and is known as the Palisade Ridge, or simply the Palisades, because of the scenic effect produced by the columnar jointing and steep eastern wall of the trap sheet. To the W. the slope of the ridge is very gentle. The Palisades extend from a point N. of the New York boundary as far S. as Weehawken, their height gradually decreasing southward. A slope of debris occurs at the E. base of the Palisade Ridge, but the summit is covered with trees. The trap formation extends to the Kill van Kull Channel, and includes, among other ridges, the so-called First and Second Watchung (or Orange) Mountains W. of the group of suburbs known as the ” Oranges,” but S. of Weehawken it has no scenic attractiveness. With the exception of the ridges, the Triassic Low- land N. of the Raritan river is usually below 200 ft. in altitude; S. ofthe Raritan the topography of this belt is similar to the northern portion, but much of the area is over 200 ft. above the sea. South- east of the Triassic Lowland lies the fourth topographic belt, the Coastal Plain, containing an area of 4400 sq. m., or slightly more than one-half the entire surface of the state. This belt, bordered on the E., S. and W. by water, is highest near its centre and lowest along its margins. It is free

from mountainous ridges, but there are a number of isolated hills, such as the Navesink Highlands (259 ft.) in Monmouth county. One-third of the Coastal Plain is below 50 ft. in altitude; two-fifths are between 50 and 100 ft.; and somewhat more than a fourth of the area is over 100 ft. above sea-level. The total area of the belt as high as 200 ft. above the sea does not exceed 15 sq. m. About one-eighth of the area consists of tidal marsh, lying chiefly between the long sandy ridges or barrier beaches of the Atlantic coast and the mainland. The width of the marsh varies from I to 6 m., being least in the extreme N. and S. and greatest near the mouths of streams. There is also a marsh along Delaware Bay, unprotected by a beach. The waters between these beaches and the mainland are gradually filling with sediment and changing into tidal marsh. In addition to the stretches of marsh along the coast, the eastward-flowing rivers of the Coastal Plain are fringed with large areas of swamp land, some of which is well forested.

For the entire state the average elevation is 250 ft., with 4100 sq. m. below 100 ft.; 2100 sq. m. between 100 and 500 ft.; 1400 sq. m. between 500 and 1000 ft.; and 215 sq. m. between 1000 and 1500 ft. The four topographic belts of the state correspond very closely to the outcrops of its geological formations; the rocks of the Appalachian belt being of Palaeozoic age; the formation of the Highlands, Archaean; that of the Triassic Lowland, Triassic; that of the irregular hills of the Coastal Plain, Cretaceous and Tertiary.

The great terminal moraine of the glacial epoch crosses the N.E.- S.W. topographic belts of the state, in an irregular line running W. and N.W., from Staten Island, N.Y. North of the morainic belt the effect of the glaciation is seen in the irregular courses of the streams, the numerous lakes and freshwater marshes and the falls and rapids along those streams displaced by the glaciers from their former courses. The effect of glaciation on the soil is noted in a later paragraph.

The Delaware river, from its junction with the Neversink Creek to the capes, flows along the western and southern borders of the state for a distance of 245 m., and has a total drainage area in New Jersey of 2345 sq. m. Of equal importance is the Hudson, whose lower waters, forming the north-eastern boundary of New Jersey for a distance of 22 m., drain a very small part of the state, but have contributed materially to the state's commercial develop-

ment. The streams lying wholly within the state are relatively

unimportant. Of the tributaries to the Delaware river the northernmost is Flat Brook, 25 m. long, draining an area of 65 sq. m. W. of the Kittatinny Mountain. The Kittatinny Valley is drained by Paulins Kill and the Pequest river in the E. and S.E., and by the Walkill river in the N.E. Of the streams of the Highlands and the Triassic Lowland, the Passaic river is the most important. Rising in the N.E. — in the southern part of Morris county — it pursues a winding north-easterly course, passing through a gap in the trap rock at Little Falls, and by means of a cascade and a mile of rapids descends 40 ft. At Paterson, 3 m. farther, the stream passes through a crevasse in the trap rock and has a sheer fall of 70 ft. (the Great Falls of the Passaic). 1 The stream then makes a sharp bend south- ward and empties* into Newark Bay. 2 The Passaic and its small tributaries — the Whippany, Rockaway, Pequanac, Wanaque, Saddle and Ramapo — drain an area of about 950 sq. m. On account of the rapid fall of its tributaries, the union of so many of them with the main stream near its middle course and the obstructions to the flow of the water in the lower course, the Passaic is subject to disastrous floods. In 1903 a heavy rainfall caused a flood which continued from the 8th to the 19th of October and destroyed not less than $7,000,000 worth of property. Another, which continued from the 25th of February to the 9th of March 1902, destroyed property valued at $1,000,000 or more, and there were less disastrous floods in 1882 and 1896. 3 The Hackensack river enters the state about 5 m. W. of the Hudson river, flows almost parallel with that stream, and empties into Newark Bay, having a length of 34 m. and a drainage area of 201 sq. m. The Raritan river, flowing eastwardly through the centre of the state, is the largest stream lying wholly within New Jersey, and drains 1 105 sq. m. Commercially, however, this stream is less important than the Passaic. In the southern half of the state the drainage is simple, and the streams are unimportant, flowing straight to the Delaware or the Atlantic. The westward streams are only small creeks; the eastward and southward streams, however, on account of the wider slope, have greater length. Among the latter are the Maurice river, 33 m. long, emptying into Delaware Bay; and the Great Egg Harbor river, 38 m. long, and the Mullica, 32 m. long, emptying into the Atlantic. In the northern part of the state, and especially among the Highlands, are numerous lakes, which are popular places of resort during the summer months. Of these the largest and the most frequented are Lake Hopatcong, an irregular body of water in Morris and Sussex counties, and Greenwood Lake, lying partly in New York and partly in New Jersey.

Fauna and Flora. — The fauna of New Jersey does not differ materially from that of the other Middle Atlantic states. Large game

has almost disappeared. The red, or Virginia, deer and the grey fox are still found in circumscribed localities; and of the smaller mammals, the squirrel, chipmunk, rabbit, raccoon and opossum are still numerous. Among game birds are various species of ducks, the quail, or ” Bob White,” and the woodcock. The waters of the coast and bays abound in shad, menhaden, bluefish, weak-fish (squeteague), clams and oysters. The interior streams are stocked with trout, black bass and perch.

The conditions of plant growth are varied. In the northern and north central parts of the state, where the soil consists partly of glacial drift, the species have a wider range than is the case farther S., where the soil is more uniform. New Jersey is a meeting ground for many species which have their principal habitat farther N. or farther S., and its flora therefore may be divided into a northern and a southern. Still another class, and the most clearly marked of all, is the flora of the beaches, salt marshes and meadows. The total woodland area of the state is about 3234 sq. m. Two distinct types of forest are recognized, with the usual transition zone between them. South and east of a line drawn approximately from Seabright to Glassboro, and thence southward to Delaware Bay, is a nearly level, sandy region known as ” The Pines.” This is the great forest area of the state; it contains about 1,200,000 acres of woodland, practically continuous, and portions of it still but sparsely inhabited. The original forest has been entirely removed, but a young growth of the same tree species, chiefly pitch pine with a variety of oaks, replaces it. Within ” The Pines,” immediately north of the Mullica river, lies an area of about 20,000 acres called ” The Plains.” These are sparsely clothed with prostrate pitch pine, scrub oak and laurel. Tree forms are entirely absent. The cause of this condition is still undetermined. Along the streams in this section are many swamps, valuable for the white cedar that they produce, or when cleared, for cranberry bogs. The northern part of the state is much more rugged,

1 As the waters of the stream have been diverted into mill races, the river very seldom makes this leap in its natural channel. The power thus generated has been largely instrumental in creating the city of Paterson {a, v.).

2 The total length of the Passaic is about 100 m., but its course is so irregular that the distance in a straight line from its source to its mouth is only about 15 m.

3 See G. B. Hollister and M. O. Leighton, The Passaic Flood of 1902 (Washington, 1903), and M. O. Leighton, The Passaic Flood of IQ03

(Washington, 1904)., being numbers 88 and 92 of the Water Supply and Irrigation Papers of the U.S. Geological Survey.

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and the forests are chiefly of chestnut and various species of oak. Though much broken by farms and other elements of culture they aggregate about 740,000 acres. New Jersey’s forests have suffered much from fire, but with the exception of ” The Plains ” the soil everywhere is well adapted to tree growth. A comparatively mild climate and good market facilities increase the potential value of the whole woodland area. The state maintains a Forest Com- mission whose chief concern is to control the fires and thereby give value to private holdings. In this effort it is meeting with consider- able success. The state is also acquiring, and maintaining as de- monstration acres and public parks, forest reserves in various parts of the state. The five reserves now held are in Atlantic, Burlington and Sussex counties and aggregate 9899 acres. 1

Chmate. — Between the extreme northern and southern sections of the state there is a greater variation in climate than would natur- ally result from their difference in latitude. This is due to the prox- imity of the ocean in the S. and to the relatively high altitudes in the N. Near Cape May fruit trees bloom two or three weeks earlier than in the Highlands. The mean annual temperature ranges from 49-2° F. at Dover, in the N., to 55-4° at Bridgeton, in the S. The average date of the first killing frost at Dover is the 4th of October, and of the last, the 10th of May; at Atlantic City, on the sea-coast, these dates are respectively the 4th of November and the nth of April. At Dover the mean annual temperature is 49 ; the mean for the winter is 28 , with an extreme minimum recorded of -13 ; and the mean for the summer is 70°, with an extreme maximum recorded of 102 . At Atlantic City the mean annual temperature is 52 ; for the winter it is 34 , with an extreme of -7 ; and for the summer, 70 °, with an extreme of 99 °. At Vineland, a southern interior town, the mean annual temperature is 53 ; for the winter it is 33 , with an extreme of -13 ; and for the summer, 74°, with an extreme of 105°. These records of temperature afford a striking illustration of the moderating influence of the ocean upon the extremes of summer and winter. On account of the proximity to the sea, New Jersey has a more equable climate than have some of the states in the same latitude farther west. During the summer months the general course of the wind along the sea-coast is in- terrupted about midday by an incoming current of air, the ” sea breeze,” which gradually increases until about three o’clock in the afternoon, and then gradually lessens until the offshore wind takes its place. As the heat is thus made less oppressive along the coast, the beaches of New Jersey have rapidly built up with towns and citie6 that have become popular summer resorts — among the best known of these are Long Branch, Asbury Park, Ocean Grove, Atlantic City (also a winter resort) and Cape May. Among the interior resorts are Lakewood, a fashionable winter resort, and Lake Hopatcong, and Greenwood Lake and surrounding regions, much frequented in the summer. In the summer the prevailing winds throughout the state are from the S.W. ; in the winter, from the N.W. The normal annual precipitation is 47-7 in., varying from 46-6 in. on the sea-coast to 49-1 in. in the Highlands and the Kitta- tinny Valley. Precipitation is from I to 3 in. greater in the summer than in the other seasons, which differ among themselves very little in the average amount of rainfall. From December to March, inclusively, part of the precipitation is in the form of snow. In the extreme S. there is more rain than snow in the winter; but no part of the state is free from snow storms. In the summer thunder storms are frequent, but are generally local in extent, and are much more common in the afternoon and early evening than

in the morning.

Soils. — The soils of the state exhibit great variety. Those of the northern and central sections are made up in part of glacial drift; those of the S. are sandy or loamy, and are locally enriched by deposits of marl. The most fertile soils of the state lie in the clay and marl region, a belt from 10 to 20 m. wide extending across the state in a general south-westerly direction from Long Branch to Salem. South of this belt the soils are generallv sandy and are not very fertile except at altitudes of less than 50″ ft., where they are loamy and of alluvial origin.

Agriculture. — In 1900 very little more land was under cultivation than in 1850, the total acreage for these years being respectively 2,840,966 and 2,752,946. The number of farms, however, increased from 23,905 to 34,294, and the average size of the farms decreased from 115-2 acres to 82 acres, an indication that agriculture gradually became more intensive. In 1900, 22% of the farms contained from 20 to 50 acres, 48-3%, 50-175 acres and only 7-8% con- tained over 175 acres. Farms were smallest in Hudson county, where the average size was 7-9 acres, and largest in Sussex county, where the average size was 143-4 acres. The counties with the largest total acreage were Burlington (343,096), Sussex (256,896) and Hunterdon (248,733). Between 1880 and 1900 the percentage of farms operated by owners decreased from 75-4 to 70-1; the per-

1 The amount of timber cut within the state is very small. Before the introduction of coal and coke as fuel in the forges and furnaces the cutting of young trees for the manufacture of charcoal was a profitable industry, and the process of deforestation reached its maximum. Since i860 the forest area has only slightly diminished, and the condition of the timber has improved, but large trees are still scarce.

centage of cash tenants increased from 10-5 to 15-3; and that of share tenants remained about stationary, being 14-1 in 1880 and 14-6 in 1900. In this last year 27-5 % of the farms derived their principal income from live stock, 20-3 % from vegetables, 17-2 % from dairy produce, 7-8 % from fruits and 7-8 % from hay and grain.

In 1907, according to the Year Book of the United States Depart- ment of Agriculture, the principal crops were: hay, 634,000 tons ($10,778,000); potatoes, 8,400,000 bushels ($6,216,000); Indian corn, 8,757,000 bushels ($5,517,000); wheat, 1,998,000 bushels

($1,958,000); rye, 1,372,000 bushels ($1,043,000); oats, 1,770,000 bushels ($991,000). The number and value of each of the various classes of live stock in the state on the 1st of January 1908 were as follows: horses, 102,000 ($11,526,000); mules, 5000 ($675,000); milch cows, 190,000 ($8,170,000); other neat cattle, 82,000 ($1,722,000); sheep, 44,000 ($220,000); swine, 155,000 ($i,555> 00 °)- In 1899, 5959 farms were classified as dairy farms, i.e. they derived at least 40 % of their income from dairy products ; and the total value of dairy products was $8,436,869, the larger items being $6,318,568 for milk sold and $818,624 for butter sold. Poultry raising also is an important agricultural industry: poultry in the state was valued at $1,300,853 on the 1st of June 1900; and for the year 1899 the value of all poultry raised was $2,265,816, and the value of eggs was $1,938,304. In the production of cereals the state has not taken high rank since the development of the wheat fields of the western states; but in 1899 the acreage in cereals was 45 – 4 % of the acreage in all crops, and the value of the yield was 2 5 – 3% of that of all crops. Of the total acreage in cereals in 1907, 278,000 acres were in Indian corn; 108,000 in wheat-; 78,000 in rye; and 60,000 in oats. The chief cereal-producing counties in 1899 were Burlington, Hunterdon, Monmouth and Salem. The most valuable field crop in 1907 was hay and forage, consisting mostly of clover and cultivated grasses; in 1899 the value of this crop was 20-2 % of that of all crops.

Since 1830 market gardening in New Jersey has become in- creasingly important, especially in the vicinity of large cities, and has proved more profitable than the growing of cereals. In the total acreage devoted to the raising of vegetables in marketable quantities New Jersey in 1900 was surpassed by only two other states. The value of the marketable vegetables in 1899 was $4,630,658, and the value of the total vegetable crop, $8,425,596, or 30-7 % o'f that of all crops. Among the vegetables grown the potato is the most im- portant; in 1907 there were 70,000 acres in potatoes, yielding 8,400,000 bushels, valued at $6,216,000. Between 1899 and 1907 the value of the potato crop more than doubled. In 1899 the state also produced 5,304,503 bushels of tomatoes; 2,418,641 bushels of sweet potatoes; 2,052,200 bunches of asparagus; 17,890,980 heads of cabbage; 21,495,940 musk melons; 3,300,330 water melons; and 1,015,111 bushels of sweet corn. Fruit-growing has also attained considerable importance. In 1899 the total value of the crop was $4,082,788; the value of the orchard fruit was $2,594,981; of small fruits, $1,406,049; and of grapes, $81,758. Peaches grow in all parts of the state, but most of the crop comes from Hunterdon, Sussex and Somerset counties. Apples are grown there and also in the western part of Burlington county. In the

decade 1889- 1899 the apple crop increased from 603,890 to 4,640,896 bushels. In Monmouth, Camden and parts of Burlington and Gloucester counties great quantities of pears are grown. Atlantic, Burlington, Camden and Salem counties are the great centres for strawberries; Atlantic, Cumberland and Salem counties lead in grape-growing; and a large huckleberry crop is yearly gathered in " the Pines." In 1899 New Jersey produced nearly a fourth of the cranberry crop of the United States, the chief centre of production being the bogs of Burlington and Ocean counties. Other fruits grown in considerable quantities are cherries, plums, blackberries and raspberries.

ˆMinerals and Mining. — In 1907 the total value of the state's mineral products was $32,800,299. Clays of different degrees of value are found in nearly every section, but the principal clay mining areas are : the Middlesex county area, where the best clays are found along the Raritan river and the coast ; the Trenton area, in which clay is mined chiefly at Dogtown, E. of Trenton; the Delaware river area, in the vicinity of Palmyra; and the Wood- mansie area, in Ocean county. As the clay pits contain only small amounts of any one kind of clay, it has proved more profitable for manufacturers to buy their raw materials from a number of miners than for them to operate the mines themselves, and consequently clay mining and the manufacture of clay products are largely distinct industries. In New Jersey the mining of clays is more important than in any other state, the amount mined and sold in 1902 being a third of the entire output of the United States, and the amount in 1907 (440,138 tons) being more than one-fifth of all clay mined and sold in the United States; and in 1907 in the value of clay products ($16,005,460; brick and tile, $9,019, 834, and pottery, $6,985,626) New Jersey was outranked only by Ohio and Pennsyl- vania. In Warren and Sussex counties are abundant materials for the manufacture of Portland cement, an industry that has attained importance since 1892; in the value of its product in 1907 ($4,738,516) New Jersey was surpassed only by Pennsylvania. Granite is found in Morris and Sussex counties, but is not extensively 1 quarried ; there are extensive quarries of sandstone in the Piedmont

section; and limestone and trap rock are important mineral resources. In 1907 the total value of stone quarried in the state was $1,523,312, of which $995,436 was the value of trap rock, $274,452 of limestone, $177,667 of sandstone and $75,757 of granite. Some roofing slate is

produced in Sussex county; in 1907 the output was valued at $8000. The mining of natural fertilizers — white and greensand marls — is a long established industry; the output in 1907 was 14,091 tons, valued at $8429.

Of mineral ores the most important are iron, zinc and copper. The manufacture of iron in New Jersey dates from 1674, when the metal was reduced from its ores near Shrewsbury, Monmouth county. Magnetic .ores, found chiefly in Morris, Passaic and Warren counties, form the basis of the present industry. Bog ores were mined until about 1840; since that date they have had no market. The product of the iron mines has fluctuated greatly in quantity, being nearly 1,000,000 tons of ore in 1892, 257,235 tons in 1897, and 549,760 tons in 1907, when the output was valued at $1,815,586, and was about nine-tenths magnetite and one-tenth brown ore. The chief places of production are Hibernia (Morris county) and Mt Pleasant (Hunterdon county); in 1907 four mines in the state produced 316,236 tons. In the production of zinc New Jersey once took a prominent part; in 1907 the only producer was The New Jersey Zinc Company's mine at Franklin Furnace, Sussex county, with an output of 13,573 short tons, valued at $1,601,614. The chief deposits consist of red oxide, silicate and franklinite, and the average zinc content is 23 %. The copper deposits of the state were worked to a small extent in colonial days. One of the brass cannon used at Yorktown was made of copper taken from the Watchung Mountains'during the War for Independence. These mountains are still the chief source of copper, but the ores, chiefly cuprite, mala- chite and chrysocolla, are also found in various parts of the Pied- mont region. In the years following 1900 there was renewed interest in copper mining. There are many valuable mineral springs in the state: for 1907 eleven springs (three in Bergen and two each in Morris, Camden and Somerset counties) reported to the U.S. Geological Survey the sale of 982,445 gallons (mostly table water), valued at $103,082. Other minerals, which are not found in com- mercial quantities, are lead in the form of galena, in Sussex county; graphite, in the crystalline schistose rocks of the Highlands ; molyb- denum, in the form of a sulphide, in Sussex county; and barytes in Mercer and Sussex counties. In Bergen, Warren, Sussex and Morris counties are numerous bogs containing peat of a good quality.

Manufactures. — After 1850 New Jersey made rapid progress in manufacturing, which soon became its leading industry. In 1 850 7′ 7 % of the population were employed as wage-earners in manu- facturing establishments; in 1900, 12-8 %. The value of the pro- ducts in 1850 was $39,851,256; in 1890, $354,573,571; in 1900,

$611,748,933. Such figures of the census of 1900 as are comparable with those of the special census of 1905, when only the establishments under the factory system were enumerated, show that between 1900 and 1905 the number of factories increased 9-3 %; the capital, 49-8 %; and the value of the products, 1 40 % (from $353,005,684 to $774,369,025). This rapid development is due to the excellent transportation facilities, and to the proximity of large markets and of great natural resources, such as the clays of New Jersey and the coal and iron of Pennsylvania. The chief manufacturing centres in 1905, as judged by the value of their products, were Newark ($150,055,277), Jersey City ($75,740,934), Bayonne ($60,633,761), Paterson ($54,673,083), Perth Amboy ($34,800,402), Camden ($33,587,273), and Trenton ($32,719,945). In 1905, 67-1 % of the factories were in municipalities having a population of at least 8000 in 1900, and their product was 74-1 % (in value) of the total. There are indications, however, that industries are slowly shifting to the smaller towns.

The textile industries taken together are the most important of the manufacturing industries, having a greater output (in 1900, $81,910,850; in 1905, $96,060,407), employing more labourers and capital, and paying more wages than any other group. Among the various textiles silk takes the first place, the value of the factory product in 1900 being $39,966,662, and in 1905, $42,862,907. In 1900 the value of the silk output was 48-8 % of the total value of the textiles, and silk manufacturing was more important than any other industry (textile or not) ; in 1905, however, owing to the great progress in other industries, silk had dropped to fourth place, but still contributed 44-6 % of the value of the textiles. In 1900 New Jersey furnished 37-3 %, andin 1905, 32-2 % . of the silk products of the United States, and was surpassed by no other state. The silk industry is centred at Paterson, the chief silk manufacturing city of the United States. West Hoboken and Jersey City are also im- portant producers. A second textile industry in which New Jersey in 1900 and in 1905 took first rank was the manufacture of felt hats; the total value of the product in 1905 was $9,540,433, a gain of 32-3 % since 1900, and constituting 26 % of the value of the product of the entire United States. Most of the product comes from the cities of Newark and Orange. From 1900 to 1905 the value of the worsted goods increased from $6,823,721 to $11,925,126, or 74-8 %,

1 The following statistics of the products for 1900 and for 1905 are for factory products, those for 1900 differing, therefore, from the statistics which appear in the reports of the census of 1900.

the greatest gain made by any of the textiles. In this industry New

Jersey was surpassed only by Massachusetts, Rhode Island and Pennsylvania. During this five-year period there was an increase of 31-2 % (from $6,540,289 to $8,518,527) in the value of the cotton goods manufactured in New Jersey; of 12-6 % (from $2,168,570 to $2,441,516) in that of linen goods; of 45-3 % (from $1,748,148 to $2,539,178) in that of hosiery and knit goods, and of -14-8 % (from $1,522,827 to $1,748,831) in that of carpets and rugs. In dyeing and finishing textiles New Jersey was first among the states of the Union in 1900 (value, $10,488,963, being 23-3% of the total for the country) and in 1905 (value, $11,979,947, being 23-6 % of the total for the country) ; Paterson is the centre of this industry in New Jersey.

In the manufacture of clay products, including brick, tiling, terra cotta and pottery, the state takes high rank: the total value of pottery, terra cotta

The leading single industry in the state in 1905, as determined by the value of its products, was the smelting and refining of copper. In 1900 the output was valued at $38,365,131; in 1905, at $62,795,713, an increase of 63-7 %; and in 1905 21-6 % of the product of the United States came from New Jersey. The raw materials for this industry, however, are imported into New Jersey from other states. In the smelting and refining of platinum, nickel, gold and silver (not from the ore) there was a striking development between 1900 and 1905, the value of the product increasing from $469,224 to $7,034,139. The value in 1905 of gold and silver reduced and refined (not from the ore) was $5,281,805. The values of the other leading manufactures in 1905 were as follows: products of foundry and machine shops, $49,425,385 ; iron and steel 2 (in- cluding products of blast furnaces and rolling mills), $23,667,483; wire (exclusive of copper wire), $11,103,959; petroleum refining, $46,608,984; tanned, curried and finished leather, $21,495,329 (5th in the United States in 1900 and 1905); malt liquors, $17,446,447; slaughter-house products and packed meats, $17,238,076; electrical machinery, supplies and apparatus, $ T 3, 803,476 (5th in the United States in 1900 and in 1905) ; chemicals, $t3, 02 3>629; rubber belting and hose, $9,915,742; jewelry, $9.303. 6 46 (4th in the United States in 1900 and in 1905) ; tobacco, cigars and cigarettes, $8,331,611. Other manufactures valued in 1905 at more than $5,000,000 were: boots and shoes, cars and general railway shop work, illuminating and heating gas, lumber and planing mill products, phonographs, fertilizers, flour and grist mill products, iron and steel ships, refined lard and paper and wood pulp.

Fisheries. — The fisheries of the state are of great commercial value.

In 1904 the fisheries and the wholesale fish trade gave employment to 9094 persons. Until 1901 New Jersey's fisheries were more important than those of any other state in the Middle or South Atlantic groups; but after that date, owing to a decrease in the catch of bluefish, shad, clams and oysters, the annual catch of New York and Virginia became more valuable. The great length of river and, sea front, and the easy communication from all parts of the state with the leading urban markets, have brought about the development of this industry. The total catch in 1904 was 90,108,068 ft, valued at $3,385,415. a decline of 28 % in value since 1901. The chief varieties of the product in 1904, with their value, were as follows: oysters, $1,691,953; clams, $430,766; shad, $238,517; squeteague (weak-fish) , $253,200; bluefish, $120,085; menhaden, $109,090; sea bass, $97,903; cod, $53,789. Fishing, as a commercial pursuit, is carried on in seventeen counties, and attains its greatest importance in Cumberland county, where the catch in 1904 was valued at $1,090,157, and the oyster catch alone at $1,046,147. In the other counties along the Delaware shad is the chief product, and these counties furnish nearly nine-tenths of the catch. A small amount of shad is taken also in the Hudson river. The value of the shad fisheries has greatly declined since 1901. Along the coast squeteague is the most abundant edible variety taken. Bluefish are very plentiful from 4 to 10 m. off Seabnght. The shell fisheries (oysters particularly) are centred in Delaware Bay and at Maurice River Cove, in Cumberland county, but are important also in Cape May, Atlantic, Ocean and Monmouth

8 This is one of the oldest of the important industries in New Jersey: at Old Boonton, about 1770, was established a rolling and slitting mill, probably the first in the country.

counties on the Atlantic seaboard. This industry declined for a time, partly on account of the pollution of the streams by sewage and the refuse of manufacturing establishments, but laws have been enacted for its protection and development. Clams are gathered from Perth Amboy to the upper Delaware Bay ; the most important fisheries being at Keyport, Port Monmouth and Belford. In 1909 the State Bureau of Shell Fisheries estimated the annual value of shell fisheries in the state at nearly $6,000,000, of which $500,000 was the value of clams. Monmouth, Ocean and Cape May counties furnish large quantities of menhaden, which are utilized for oil and fertilizer. This industry in 1904 yielded fertilizer valued at $154,360 and oil valued at $33,110.

Transportation. — In 1905, with a total railway mileage of 2274-40, New Jersey possessed an average of 30-22 m. of railway for each 100 sq. m. of territory, an average higher than that of any other American state; in 1909, according to the State Railroad Commissioners, the mileage was 2354-63 (including additional tracks, sidings, &c, 5471-38 m.). Owing to its geographical position the state is crossed by all roads reaching New York City from the S. and W., and all those reaching Philadelphia from the N. and E. The eastern terminals of the southern and western lines running from New York City are situated on the western shore of the Hudson river, in Weehawken, Hoboken or Jersey City; whence passengers and freight are carried by ferry to New York. Jersey City and Hoboken are also connected with New York by tunnels under the Hudson river. Among these lines are the Erie system, extending W. from Jersey City via Buffalo; the New York, Susquehanna & Western (subsidiary to the Erie), from Jersey City to Wilkes- Barre, Pennsylvania ; the Delaware, Lackawanna & Western, from Hoboken to Buffalo; the Lehigh Valley, from Jersey City to Buffalo; the Pennsylvania, from Jersey City to the S. and W. 1 ; the New York, Ontario & Western (controlled by the New York, New Haven & Hartford), from Weehawken to Oswego; the West Shore (leased by the New York Central), from Weehawken to Buffalo; and the Central railway of New Jersey (controlled by the Philadelphia & Reading), with numerous short lines from Jersey City to the S. and W. These roads also operate numerous branch lines and control other short lines built independently. Among the latter class are the Atlantic City railway (controlled by the Philadelphia & Reading) from Philadelphia to various coast resorts in southern New Jersey; and the West Jersey & Seashore (controlled by the Pennsylvania), from Philadelphia to Atlantic City and Cape May. The railways operating independently of the great ” trunk ” systems are few and unimportant. The excellence of the waggon roads of the state is largely due to the plentiful supply of trap rock in New Jersey.

Of New Jersey’s 487 m. of boundary, 319 m. are touched by waters navigable for boats of varying draft. There is tidal water on the E. and S., and also on the W. as far N. as Trenton. The lower Hudson is navigable for the largest ocean-going steamers. From Bergen Point to Perth Amboy, W. of Staten Island, lie the narrow channels of the Kill van Kull and Arthur Kill, with a minimum depth of 9 or 10 ft. at low water. Raritan Bay, to the S., is navigable only for small vessels. There are no good harbours on the Atlantic coast. The lower Delaware is navigable for ocean steamships as far N. as Camden (opposite Philadelphia), and for small vessels as far as Trenton, which is the head of navigation. The only deep water terminals of the state are

Jersey City and Hoboken. Among the rivers the Raritan is navigable to New Brunswick, the Hacken- sack for small boats for 20 m. above its mouth, the Rahway as far as Rahway, the Great Egg Harbor river as far as May's Landing, the Mullica for 20 m. above its mouth, and the Elizabeth river as far as Elizabeth. In 1907 an inland waterway from Cape May to Bay Head was planned: the length of this channel, through and between coastal sounds from the southernmost part of the state to the northern end of Barnegat Bay in the N.E. part of Ocean county, was to be about 116-6 m., and the channel was to be 6 ft. deep and 100 ft. wide. The Delaware and Raritan canal 2 was long a very

1 The Pennsylvania railway has constructed tunnels under the Hudson river, and has erected a large terminal station on Manhattan Island.

s In William Winterbotham's An Historical, Geographical, Commercial and Philosophical View of the American United States, &c. (London, 1795) there was a discussion of the feasibility of a canal between the Delaware and the Raritan. In 1804 a company was chartered to build such a canal; in 1816 a route Was surveyed; in 1823 a commission was appointed which recommended a route and suggested that the state take part in building the canal; in December 1826 a canal company was incorporated with a monopoly of canal and railway privileges within 10 m. of any part of the canal authorized, but Pennsylvania refused permission to use the waters of the Delaware, and the charter lapsed; in 1830 the Delaware and Raritan Canal Company was incorporated by an act which forbade the construction of any other canal within 5 m. of the proposed route of the Delaware and Raritan, and which reserved to the state the right to buy the waterway 30 years (changed in 1 83 1 to 50 years) after its completion. Lieutenant (afterwards Commodore) Robert F. Stockton (1795-1866), president of the Company, con- tributed greatly to its financial success. In 183 1 it was combined with the Camden & Amboy railway.

important artificial waterway. Its main channel (opened for traffic in 1838) extends from Bordentown, Burlington county, on the Delaware to New Brunswick, on the Raritan, 44 m. by the canal route, and thus carries the waters of the Delaware river entirely across the state, discharging them into the Raritan at New Bruns- wick. It is 40 ft. wide at the bottom, 80 ft. at the top and 9 ft. deep; it has a navigable feeder (30 ft. wide at the bottom and 60 ft. wide at the top, with a depth of 9 ft.), which is 22 m. long, extending from the Delaware at Bull's Head to Trenton. The canal passes through Trenton (the highest point — 56-3 ft. above mean tide), Kingston, Griggston, Weston and Bound

Brook, and has one lock (or more) at each of these places. It is used chiefly for the trans- portation of Pennsylvania coal to New York, and is controlled by the Pennsylvania railway. The total cost up to 1906 was $5, 1 13,749. The Morris Canal, 3 opened in 1836, is 50 ft. wide at the surface, 30 ft. wide at the bottom and 5 ft. deep, and (excluding 4-1 m. of feeders) 102-38 m. long, beginning at Jersey City and passing through Newark, Bloomfield, Paterson, Little Falls, Boonton, Rockaway, Dover, Port Oram, Lake Hopatcong, Hackettstown and Washington to Phillipsburg on the Delaware; it is practically in two sections, one east and the other west of Lake Hopatcong (Sussex and Morris counties; about 928 ft. above sea-level; 9 m. long from • N.E. to S.W. ; maximum width, 1 m.), which is a reservoir and feeder for the canal's eastern and western branches, and which was enlarged considerably when the canal was built. There is another feeder, the Pompton, 3-6 m. long, in Passaic county. The canal crosses the Passaic and Pompton rivers on aqueducts. The Canal (the Morris Canal Banking Company) was leased in April 1871 to the Lehigh Valley Railroad Company for 999 years. It is no longer of commercial importance as a waterway. At Phillipsburg it connects with an important coal carrying canal (lying almost entirely in Pennsylvania), the property of the Lehigh Coal and Navigation Co. (leased to the Central Railroad of New Jersey), which follows the Lehigh river to Coalport (Carbon county, Pennsyl- vania), penetrating the coal regions of Pennsylvania.

Population. — The population of the state in 1880 was 1,131,116; in 1890, 1,444,933; in 1900, 1,883,669 (431,884 foreign-born, and 69,844 negroes); in 1905 (state census) 2,144,134; in 1910, 2 >537)i67. Of the native-born white population in 1900, 556,294 were of foreign parentage, and 825,973 were of native parentage. Among the various elements comprising the foreign-born popula- tion were 119,598 Germans; 94,844 Irish; 45,428 English; 41,865 Italians; 19,745 Russians; 14,913 Hungarians; 14,728 Austrians; 14,357 Poles; 14,211 Scotch; and 10,261 Dutch. In 1800 barely 2% of the population was urban; in 1900 80% of the inhabitants either lived in cities or were in daily com- munication with Philadelphia or New York. The rural popula- tion is practically stationary. The chief cities in 19 10 were Newark (pop. 347,469), Jersey City (267,779), Paterson (125,600), Trenton (96,815), Camden (94,538) and Hoboken (70,324). Owing to its milder climate and its larger number of cities New Jersey has a negro population somewhat larger than that of the states of the same latitude farther west. The rate of increase of this element, which is greatest in the cities, is about the same as that for the white inhabitants. Since 1881 colonies of Hebrews have been

established in the southern part of the state, among them being Alliance (1881), Rosenhayn (1882), Carmel (1883), and, most noted of all, Woodbine, which owes its origin to the liberality of Baron de Hirsch, and contains the Baron de Hirsch Agricultural and Industrial School. As regards church affilia- tion, in 1906 Roman Catholics were the most numerous, with 441,432 members out of a total of 857,548 communicants of all denominations; there were 122,511 Methodists, 79,912 Presby- terians, 65,248 Baptists, 53,921 Protestant Episcopalians, 32,290 members of the Reformed (Dutch) Church in America, and 24,147 Lutherans.

8 The Morris Canal & Banking Company was chartered in 1824 to build the Morris Canal, which never proved a financial success, partly because of the competition of the Delaware Raritan. which soon commanded the coal trade, and partly because of physical and mechanical defects. It was exempted from all taxation by the state, which reserved the right to buy it, at a fair price, in 1923 or, without making any payment, to succeed to the actual ownership in 1973 upon the expiration of the charter. The idea of utilizing the waters of Lake Hopatcong was that of George P. MacCulloch of Morristown. A peculiar feature of the canal was a system of inclined planes or railways on which there were cradles, carrying the canal boat up (or down) the incline; these were devised by Pro- fessor James Renwick (1818-1895) of Columbia College; 12 of them in the eastern division raised boats altogether about 720 ft., and 11 of them in the western division lowered the boats about 690 ft. — the remainder of the grade was overcome by locks.

Administration. — The state is governed under the constitution of 1844, with subsequent amendments of 1875 and of 1897. The only other constitution under which the state has been governed was that of 1776 (see History below). The right of suffrage is conferred upon all males, twenty-one years of age and over, who have resided in the state for one year and in the county for five months preceding the election. 1 Paupers, idiots, insane persons and persons who are convicted of crimes which exclude them from being witnesses and who have not been pardoned and restored to civil rights are disfranchised. The executive power is vested in a governor, who is elected for a term of three years and may not serve two successive terms, though he may be re-elected after he has been out of office for a full term. He must be at least thirty years of age, and must have been a citizen of the United

States for a least twenty years, and a resident of the state seven years next preceding his election. He may not be elected by the legislature, during the term for which he is elected as governor, to any office under the state or the United States governments. He receives a salary of $10,000 a year. If the governor die, resign or be removed from office, or if his office be otherwise vacant, he is succeeded by the president of the Senate, who serves until another governor is elected and qualified. The governor's powers under the constitution of 1776 were greatly limited by the constitution of 1844. His appointive power is unusually large. With the advice and consent of the state Senate he selects the secretary of state, attorney-general, superintendent of public instruction, chancellor, chief justice, judges of the supreme, circuit, inferior and district courts, and the so-called " lay " judges of the court of errors and appeals, in addition to the minor administrative officers who are usually appointive in all American states. The governor may make no appointments in the last week of his term. The state treasurer, comptroller and the commissioners of deeds are appointed by the two houses of the legislature in joint session. The governor is ex officio a member of the court of pardons, and his affirmative vote is necessary in all cases of pardon or commuta- tion of sentence (see below).

The legislative department consists of a Senate and a General Assembly. In the Senate each of the 21 counties has one repre- sentative, chosen for a term of three years, and about one-third ef the membership is chosen each year. The members of the General Assembly are elected annually, are limited to sixty (the actual number in 1009), and are apportioned among the counties according to population, with the important proviso, however, that every county shall have at least one member.

The arrangement of senatorial representation is very unequal ; and the densely populated counties are under-represented. A senator must at the time of his election be at least thirty years old, and must have been a citizen and inhabitant of the state for four years and of his county for one year immediately preceding his election; and an assemblyman must at the time of his election be at least twenty-one years old, and must have been a citizen and inhabitant of the state for two years, and of his county for one year, immediately preceding his election. The annual salary of each senator and of each member of the General Assembly is $500. Money bills originate in the lower house, but the Senate may propose amendments. The legislature may not create any debt or liability " which shall, single or in the aggregate with any previous debts or liabilities, at any time exceed $100,000," except for purposes of war, to repel invasion or to suppress

insurrection, without specifying distinctly the purpose or object, providing for the payment of interest, and limiting the liability to thirty-five years; and the measure as thus passed must be ratified by popular vote. The constitution as amended in 1875 forbids the legislature to pass any private or special laws regulating the affairs of towns or counties, or to vote state grants to any municipal or industrial corporations or societies, and prescribes that in imposing taxes the assessment of taxable property shall be according to general laws and by uniform rules; and anti-race-track agitation in 1891-1S97 led to a further amendment prohibiting the legaliz ing of lotteries, of pool-selling

1 The constitution of 1844 limited the suffrage to white males, and although this limitation was annulled by the fifteenth amend- ment to the Federal Constitution, it was not until 1875 that the state by an amendment (adopted on the 7th of September) struck the word " white " from its suffrage clause. At the same time another amendment was adopted providing that sailors and soldiers in the service of the United States in time of war might vote although absent from their election districts.

or of other forms of gambling. The governor may (since 1875) vet o any item in any appropriation bill, but any bill (or item) may be passed over his veto by bare majorities (of all members elected) in both houses. Bills not returned to the legislature in five days become law, unless the legislature adjourns in the meantime. Amendments to the constitution must first be passed by the legis- lature at two consecutive sessions (receiving a majority vote of all members elected to each house), and then be ratified by the voters at a special election, and no amendment or amendments may be submitted by the legislature to the people oftener than once in five years.

The judicial system is complex and is an interesting develop- ment from the English system of the 18th century. At its head is a court of errors and appeals composed of the chancellor, the justices of the supreme court and six additional " lay " judges. The supreme court consists of a chief justice and eight associate justices, but it may be held by the chief justice alone or by any one of the associate justices. The state is divided into nine judicial districts, and each supreme court justice holds circuit courts within each county of a judicial district, besides being associated with the " president " judge of the court of common pleas of each county in holding the court of common pleas, the court of quarter sessions, the court of oyer and terminer and the orphans' court. One of five additional judges may hold a circuit court in the absence of a justice of the supreme court, or the "

president ” judge of a court of common pleas may do so if the supreme court justice requests it. In each township there are from two to five justices of the peace, any one of whom may preside over the ” small cause court,” which has jurisdiction of cases in which the matter in dispute does not exceed $200 and is not an action of replevin, one in which the charge is slander, trespass or assault, battery or imprisonment, or in which the title to real estate is in question.

The court of common pleas, which may be held either by the ” president ” judge or by a justice of the supreme court, may hear appeals from the ” small cause court,” and has original jurisdiction in all civil matters except those in which the title to real estate is in question. The court of quarter sessions, which may likewise be held by either the judge of the court of common pleas or by a justice of the supreme court, has jurisdiction over all criminal cases except those of treason or murder. The court of oyer and terminer is a higher criminal court, and has cognizance of all crimes and offences whatever. Except in counties having a populatisn of 300,000 or more, a justice of the supreme court must preside over it, and the judge of the court of common pleas may or may not sit with him; in a county having a population of 300,000 or more the judge of the court of common pleas may sit alone. Writs of error in cases punishable with death are returnable only to the court of errors and appeals. No appeals are permitted in criminal cases. The orphans’ court may be held either by the judge of the court of common pleas or by a justice of the supreme court; and it has jurisdiction over controversies respecting the existence of wills, the fairness of inventories, the right of administration and guardianship, the allowance of accounts to executors, administrators, guardians or trustees, and over suits for the recovery of legacies and distributive shares, but it may refer any matter coming before it to a master in chancery. The prerogative court, which is presided over by the chancellor as ordinary and surrogate-general, or by a vice-ordinary and vice-surrogate-general, may hear appeals from the orphans’ court, and has the authority to grant probate of wills and letters of administration and guardianship, and to hear and determine disputes arising therein. The court of chancery is administered by a chan- cellor, seven vice-chancellors and numerous masters in chancery. Besides the ordinary chancery jurisdiction it hears all applications for divorce or nullity of marriage. Appeals from the court of chancery as well as writs of error from the supreme court are heard by the court of errors and appeals. New Jersey has a court of pardons composed of the governor, chancellor and the six ” lay ” judges of the court of errors and appeals, and the concurrence of a majority of its members, of whom the governor shall

be one, is necessary to grant a pardon, commute a sentence or remit a fine. This court has, also, the authority to grant to a convict a licence to be at large upon such security, terms, conditions and limitations as it may require. The judges of the several New Jersey courts are appointed by the governor with the consent of the Senate for a term of years, usually five to seven.

For the purposes of local government the state is divided into counties, cities, townships, towns and boroughs. The govern- ment of the towns is administered through a council, clerk, collector, assessor, treasurer, &c, chosen by popular vote; that of the townships is vested in the annual town meeting, at which administrative officers are elected. Any township with more

than 5000 inhabitants may be incorporated as a town, with its government vested in a mayor and council. Any township or part thereof with less than 4 sq. m. of territory, and less than 5000 inhabitants, may be incorporated as a borough, with its government vested in a mayor and council.

In 1903 a law (revised in 1908) was passed providing for the conduct at public cost of primary elections for the nomination of nearly all elective officers, and for the nomination of delegates to party nominating conventions; nominations for primary elections are made by petitions signed by at least ten voters (except in very small election districts) who make affidavit as to their party affilia- tions; the nominee thus indorsed must file a letter of acceptance. Under this act a “political party” is one which polled at least one-twentieth of the total number of votes cast in the next preceding election in the area for which the nomination is made; and in party conventions there must be one delegate from each election district, and one delegate for each 200 votes cast by the party in the next preceding gubernatorial election.

An act approved on the 10th of April 1908 authorized a Civil Service Commission of four members appointed by the governor, who choose a chief examiner and a secretary of the commission. Civil service rules adopted by this commission went into effect in the same year for certain state employes. In 1910 that part of the law permitting municipalities to adopt these rules through their governing bodies was declared unconstitutional; but municipalities may adopt them by

popular vote.

A state Board of Railroad Commissioners (three appointed by the governor), created in 1907, became in 1910 a Board of Public Utility Commissioners with jurisdiction over all public utilities (including telephones and telegraphs) ; its approval is necessary for the issue of stock or bonds, but it has no power to fix rates.

The state acts concurrently with New York in preserving the natural beauties of the Palisades of the Hudson river; and in 1909 the Palisades Interstate Park, with a front of 13 m. on the Hudson, from Fort Lee to Piermont, was dedicated.

The homestead exempt from sale under seizure is limited to the house and lot, not exceeding $1000 in value, of a debtor having a family. To entitle the property to exemption, it must be registered as a homestead in the office of the county clerk, and it may be sold, then, only with the consent of the husband and wife, and the proceeds of the sale, to the amount of $1000, must be applied to the purchase of another homestead. The exemption does not extend to a sale for unpaid taxes, for labour done on the homestead, materials furnished to it, or for a debt contracted in the purchase thereof, or prior to the recording of the notice. The exemption inures to the benefit of the widow and family of the householder until the youngest child becomes twenty-one years of age.

Capital punishment is by electrocution. A law of 1902 provides the death penalty for any murderous assault on the president of the United States, the chief executive of any state, or the heir to any foreign throne.

The grounds for an absolute divorce are only two: adultery and ” wilful, continued and obstinate” desertion for two years; but a decree of limited or permanent separation may be obtained in case of extreme cruelty. Unless the cause of action is adultery or at least one of the parties was a resident of the state at the time the cause of action arose and has continued to reside there, no suit for a divorce can be begun until one of the parties shall have resided in the state for the two years next preceding. Furthermore, the cause of action must have been recognized in the jurisdiction in which the petitioner resided at the time it arose.

No child less than fourteen years old is permitted to work in any factory, workshop or mill; and the penalty for each offence is $50. The employment of children under sixteen years of age in any mercantile

establishment for more than 10 hours a day, or 55 hours a week, or between 6 o'clock in the evening and 6 o'clock in the morning is prohibited, except one evening each week when they may be permitted to work until 9 o'clock, and except in the evenings from the 15th to the 25th of December when they may be permitted to work until 10 o'clock. There are strict provisions for the protection and for the sanitary housing of factory employees, and prohibiting sweat-shops. A state law (1899) requires the payment of wages in lawful money at least every two weeks to its employees on the part of every firm, association or partnership doing business in the state. Education. — During the colonial period there were schools maintained by churches, a few town schools of the New England type, and, in the latter part of the era, a number of private schools. But the schools of colonial New Jersey, especially the private schools, were usually taught by incompetent masters, and many children were permitted to grow up without any schooling whatever. Public interest in education, however, began to awaken soon after the close of the War of Independence. Under the encouragement of an act of the legislature passed in 1 794 several academies were established. A public school fund was established in 181 7. Three years later townships were authorized to levy taxes for maintaining schools for poor children.

The division of townships into school districts and the election of three trustees were provided for in 1829. In 1846 each town- ship was required to raise as much money for school purposes as the state contributed. In 1855 a normal school for training teachers was established at Trenton. And in 1867 a school law was passed which established the main features of the present school system, although it was four years later before a state school tax was imposed and schools were made free to all children in the state. The public school system is administered under the direction of a superintendent of public instruction and a state board of education. The former decides all con-troversies arising under the school law, and exercises a general supervision over the public schools; the latter has the control of a number of special state educational institutions, appoints the county superintendents and supervises the execution of the school laws of the state. In general each city, town and township in the state constitutes a separate school district, although two or more of these may unite to form a single district. Each district is required to furnish free textbooks. All children between the ages of 7 and 1 5 are required to attend school for the full school year, and those who at 15 years of age have not completed the grammar school course must continue to attend until they either complete it or arrive at the age of 17. Furthermore, children past 15 years of age who have completed the

grammar school course but are not regularly and lawfully employed at some useful occupation must attend a high school or a manual training school until 1 7 years of age.

Funds for the support of the public schools are derived from various sources: (1) the interest on the ” surplus revenue ” ($760,670), deposited with New Jersey by the Federal government in 1836; (2) the income from the state school fund, consisting largely of receipts from the sale and rental of riparian lands 1 ; (3) a state school tax; (4) a direct appropriation by the legislature to supplement the school tax, so that the two combined will form a sum equal to a tax of two and three-fourths mills on each dollar of taxable property; and (5) local taxes. At the close of the fiscal year 1908 the school fund of the state was $4,850,602-41; the income for the year was $224,233-56 and the disbursements were $373,095-76. The income from the state school fund is divided among the counties on the basis of the total number of days of attendance of the public school pupils; the legislative appropriation, however, is apportioned among the counties according to their assessed property values. Each county also received 90% of the state school tax it has paid, the remainder forming a reserve fund to be distributed among the counties at the discretion of the state board. The state will duplicate any yearly sum between $250 and $5000 which a school district may raise to maintain a school or courses of manual training. In like manner, any school that raises $20 for a library will receive the same amount from the state, which will also contribute $10 each year thereafter for maintenance, if the school raises a similar sum. The total number of teachers in the public schools in 1908 was 10,279; the total school enrollment was 402,866, with an average daily attendance of 289,167; and the average length of the school term was nine months and two days. For the benefit of veteran and invalid public school teachers there is a ” retirement fund,” which owes its origin to voluntary con- tributions by teachers in active service. The state has taken official recognition of this fund and administers it on behalf of the contributors through a board of trustees appointed by the governor. In addition to the regular public schools, the state maintains a normal and a model school at Trenton, a normal school at Montclair (opened 1908), the Farnum Preparatory School at Beverly, a Manual Training and Industrial School for Colored Youth at Bordentown, and an agricultural college and experiment station, maintained in connexion with Rutgers College, at New Brunswick. There are industrial schools in Newark, Hoboken and Trenton, for which the state made an appropriation of $20,000 in 1908. Among the prominent institutions not receiving state aid are Princeton Uni- versity, at Princeton; Rutgers College (excluding its

agricultural school), at New Brunswick; and the Stevens Institute of Techno- logy, at Hoboken. Among the denominational institutions are the Theological Seminary (Presbyterian) at Princeton; the Drew Theological Seminary (Methodist Episcopal) at Madison; Seton Hall College (Roman Catholic), at South Orange; St Peter's College (Roman Catholic) at Jersey City; St Benedict's College (Roman Catholic) at Newark; the German Theological School of Newark

1 The state's title to its riparian lands was established, after a long controversy, in 1870 in the case of Stevens v. the Paterson & Newark R.R. Co. (5 Vroom's Reports 532). Since that date, with the exception of the period of Governor Abbett's second administra- tion (1890-1893), the proceeds from the sale and rental of these lands have been regularly applied to the school fund,

(Presbyterian) at Bloomfield ; and the Theological Seminary of the (Dutch) Reformed Church in America, at New Brunswick. There are many private academies and secondary schools, sectarian and non-sectarian.

The state supports the following charitable and correctional institutions all under the inspection of a State Department of Charities and Correction (1905); hospitals for the insane at Trenton and Morris Plains; a training-school for feeble-minded children (partly supported by the state) and a home for feeble-minded women at Vineland ; a sanatorium for tuberculous diseases at Glen Gardner ; a village for epileptics, with a farm of 700 acres, near Skillman, Somerset county; a state home (reform school) for boys near Jamesburg, Middlesex county, and for girls in Ewing township, near Trenton ; a state reformatory for criminals sixteen to thirty years of age, near Rahway ; a state prison at Trenton ; a home for disabled soldiers at Kearney, 1 Hudson county; a home for disabled soldiers, sailors and their wives at Vineland 2 ; and a school for the deaf at Trenton. There is no institution for the blind, but the state pays the expenses of blind children who are sent from New Jersey to the New York State School for the Blind. A State Board of Children's Guardians, with an office in Jersey City, cares for destitute children. A convict parole law went into operation in 1 891.

Finance. — The revenues for state and for local purposes are derived from separate sources. The expenses of the state government are met

chiefly by special taxes on railway and canal corporations, a franchise tax on the capital stock of other corporations, a collateral inheritance tax and leases of riparian lands. The counties and municipalities derive their revenues chiefly from taxes on real and personal property. Real and personal property is free from a state tax, except for school purposes. The school tax is apportioned among the counties in proportion to their taxable property.

A large part of the state's revenue comes from the tax on railways and canals, which is levied on the property actually employed in their operation. Any property of railways other than the " main stem " (i.e. the road-bed with the rails and sleepers not over 100 ft. in width), 3 that is employed in operating the road or canal is taxed by the state for local purposes. Counties and municipalities may tax property within their jurisdiction belonging to railways but not actually used for railway purposes. Domestic telegraph, telephone, express, cable, parlour- and sleeping-car, gas- and electric-lighting, oil and pipe line companies, and several classes of insurance com- panies, are taxed on the amount of their gross receipts. Other domestic corporations are taxed on the amount of their capital stock. The rate of this tax decreases as the amount of capital stock increases, thus favouring large corporations. On all capital stock up to $3,000,000, the rate is one-tenth of 1 %; on all amounts between three and five million dollars, the rate is one-twentieth of I %; and on all above five million dollars, thirty dollars per million, or 3/1000 of 1 %. An inheritance tax is levied on all bequests in excess of $500 to persons other than specially excepted classes; and in 1907 the receipts from . the " collateral inheritance tax " were $241,480. County and municipal revenue are derived from the tax on general property. The poll tax is restricted almost entirely to municipalities, which devote the proceeds to roads and schools. The fees received for issuing charters to corporations are another source of revenue to the state. Toward corporations the policy of New Jersey has always been liberal; there is no limit fixed either to capitalization or to bonded indebtedness ; the tax rate, as already indicated, is lower for large than for small corporations; and so many large combinations of capital have been incorporated under the laws of the state that it is sometimes called " the home of the trusts." For the fiscal year 1907 the fees collected from corpora- tions by the secretary of state amounted to $204,454, the receipts from the tax on corporations other than railways amounted to $2,584,363'6o, and the receipts from the tax on railway corporations were $807, 780. 4 It is the revenue from these sources that has enabled New Jersey to dispense almost entirely with the general property tax for state purposes. The legal requirement that

every corporation chartered by the state must maintain its principal office there has given rise to the peculiar institution called the " corporation agency," a single office which serves as the " principal office " of numbers of corporations. At the close of the fiscal year 1907 the state was free from bonded indebtedness, 6 and had a balance on hand of $1,320,038 (much less than in 1906, because of the non-payment of railway taxes, pending litigation). In the state fund, the total

1 Also receives Federal aid. 2 Idem.

3 Passenger stations and depot buildings were included as part of the " main stem " until 1906, when their exclusion gave considerable added revenue to the municipalities.

4 The tax on railway corporations collected by the state for local purposes and oaid over to the local governments in 1907 amounted tc $531,794.

- The onlv state debt is state certificates ror $1 16,000 issueT co the commissioners of the Agricultural College.

.,602,100, and the total disbursements,

receipts for the year were fe.366,813.

History. — Bones and implements have been found in the Quaternary gravels at Trenton, which have been held by some authorities to prove the presence of Palaeolithic man; but the earliest inhabitants of New Jersey of whom there is any certain record were the Lenni-Lennape or Delaware Indians, a branch of the Algonquian family. They were most numerous in the southern and central portions of the state, preferring the river valleys; but their total number, perhaps, never exceeded a thousand. Between them and the European settlers there were seldom any manifestations of acute hostility, though each race feared and distrusted the other. Many Indians were enslaved, and intermarriage between them and negro slaves became common. During the 18th century the Indian title to the soil was rapidly extinguished, and at the same time the vices and diseases of the stronger race were gradually reducing their numbers. In 1758 an Indian reservation, said to have been the first established within the present limits of the United States, was established at Edgepelick, or Brotherton (now called Indian Mills) in Burlington county. The surviving aborigines remained there until 1802, when they joined the Mohegans in New York and migrated to Wisconsin and later to Indian Territory, now part of the

state of Oklahoma. For the extinction of all Indian titles the legislature of New Jersey in 1832 appropriated $2000, and since that date almost every vestige of Indian occupation has disappeared.

The first authenticated visit of a European to what is now New Jersey was made under French authority by Giovanni da Verrazano, a Florentine navigator, who in the spring of 1524 sailed within Sandy Hook and dropped anchor in the waters of upper New York Bay. In the following year Estevan Gomez, a Portuguese sailor in the service of the emperor Charles V., in his reputed voyage southward from Labrador, is said to have made note of the Hudson and Delaware rivers. It is very probable, also, that French traders soon afterward penetrated the region along the lower Hudson. Voyages to this region for exploration, trade and settlement, however, may be said to have really begun with the year 1609, when Henry Hudson explored the region between Sandy Hook and Raritan Bay and sailed up the river which now bears his name. After this voyage came Dutch traders, who established themselves on Manhattan Island and soon spread across the Hudson river into what are now Hudson and Bergen counties. In 1614 Cornells Jacobsen Mey explored the lower Delaware, and two years later Cornells Hendricksen more thoroughly explored this stream. In 1623 the first party of permanent homeseekers arrived at New Amsterdam, and a portion of these formed a settlement on the eastern bank of the Delaware and built Fort Nassau near the site of the present Gloucester City. In 163 1 Samuel Godyn and Samuel Blommaert secured a patent from Peter Minuit, the director of New Nether- land, authorizing them to plant a settlement near Cape May, but the effort was soon abandoned. A trading hut built at Paulus Hook in 1633 was the beginning of the present Jersey City. On the western bank of the Hudson the trading post of Hobocanhackingh, on the site of the present city of Hoboken, was established at an early date. From these places and from New Amsterdam the Dutch spread into the Raritan Valley. During the rule of Governor William Kieft, the Indians, disturbed by the encroachments of the settlers, assumed a hostile attitude. The actual occasion of the Indian outbreak was the massacre of a number of Tappan Indians in 1643 by soldiers acting under Kieft ‘s orders. From the Connecticut to the Raritan the savages rose in arms, laid waste the farms, massacred the settlers and compelled those who escaped to take refuge on Manhattan Island. The Dutch engaged the services of about fifty English- men under Captain John Underhill, a hero of the Pequot War, and in 1644 the Indians were defeated in several engagements, but a general peace with them was not established until the 30th of August 1645.

In the meantime colonists of another nationality had set foot on the

shores of the lower Delaware. To found a colony in

the new world was long the desire of Gustavus Adolphus of Sweden, but incessant European wars prevented the establish- ment of any settlement until after his death. In 1638 fifty colonists landed on the western bank of the Delaware and built Fort Christina on the site of the modern Wilmington. Five years later, on the eastern bank a triangular fort, called Elfsborg, was constructed near the present Salem. But the Swedish rule was short-lived, as in 1655 the settlements surrendered to Peter Stuyvesant and passed under the control of the Dutch. Upon the subsequent history of New Jersey the attempts of Holland and Sweden at colonization had very little influence. The Dutch and Swedes between the Delaware and the Hudson were mostly traders, and therefore did not make many permanent settle- ments or establish forms of government.

By the English of New England and Virginia the Dutch and Swedes were regarded as intruders, and were repeatedly warned against trespassing on English soil. 1 As early as 1634 a patent had been issued to Sir Edmund Plowden, appointing him governor over New Albion, a tract of land including the present states of New Jersey, Delaware, Maryland and Penn- sylvania. In spite of great efforts, however, Sir Edmund failed to plant a colony. 2 In 1634 a party of English from Virginia, having ascended the Delaware and occupied Fort Nassau, which the Dutch had abandoned, were promptly captured by the Dutch, taken to New Amsterdam, and thence sent home, arriving just in time to prevent the departure of a second English expedition up the Delaware. In 1641 English colonists from New Haven migrated southward and planted a settlement on the eastern bank of the Delaware river, declaring it to be a part of the New Haven jurisdiction. In the following year Governor Kieft, with the assistance of the Swedes, arrested the English and sent them back to New Haven.

Many years elapsed before an English sovereign made any effort to oust the Dutch from the dominions he claimed by virtue of the discovery of the Cabots. On the 12th of March 1664 Charles II. bestowed upon his brother James, duke of York, all the lands between the Connecticut river and the eastern side of Delaware Bay, as well as all the islands between Cape Cod and the Hudson river. An expedition was sent from England in May, under the command of Richard

Nicolls, and in the following August the English flag floated over New Amsterdam. In October Sir Robert Carr took possession of the settlements on the Delaware, and terminated the rule of the Dutch. The few inhabitants of what is now New Jersey acquiesced in the new order. While the expedition commanded by Nicolls was still at sea. the duke of York, by deeds of lease and release, transferred to Lord John Berkeley, baron of Stratton, and Sir George Carteret (q.v.), all that part of his new possessions extending eastward from the Delaware Bay and river to the Atlantic Ocean and the Hudson river, and northward from Cape May to a line drawn from the northernmost branch of the Delaware, ” which is 41 40′ lat.,” to the Hudson river in 41 N. lat. To this tract the name of Nova Caesarea, or New Jersey, was given, as the same name had been given in a patent to Carteret issued in 1650, to ” a certain island and adjacent islets” near Virginia, in America, which were never settled — in honour of Carteret, who governed the isle of Jersey in 1 643-1651 and there enter- tained Prince Charles during his exile from England. The

1 As early as 1613, Captain Samuel Argall, on his way to Virginia, after breaking up some Jesuit settlements at Port Royal, and Mount Desert, passed through the Narrows near the mouth of the Hudson, and finding a group of Dutch traders, made them haul down their flag and replace it with that of England. In the spring of 1620 Thomas Dermer, an English ship captain, on his way from Monhegan to Virginia, visited Manhattan Island and told the Dutch traders that they would not be allowed to remain. In 1627 Governor William Bradford of Plymouth protested by letter to the Dutch against their occupancy, and this warning from the Pilgrims was repeated at least twice.

1 As late as 1784, Charles Varlo, an Englishman who had purchased one-third of the grant from the heirs of Sir Edmund Plowden, came to New Jersey and sought to substantiate his claim. Failing in a suit in chancery to obtain redress, he returned to England, and nothing further was heard of the claimants to New Albion.

grant conferred upon Berkeley and Carteret all the territorial rights which the royal charter had conferred upon the duke of York; but whether or not the rights of government went with these soon became a vexed question. In order to attract immi- grants, the proprietors in February 1665 published their ” Con- cession and Agreement,” by which they made provision for a governor, a governor’s council, and an assembly chosen by the freemen and having the power to levy taxes. Special inducements in the way of land grants were offered to persons embarking with the first governor. In the meantime Governor Nicolls of New York, ignorant of the grant to Berkeley and Carteret,

had approved certain Indian sales of land to settlers within New Jersey, and had confirmed their titles to tracts in what later became Elizabethtown, Middletown and Shrewsbury. In this way he unconsciously opened the way for future trouble. Moreover, when he had learned that the duke had parted with New Jersey he convinced him that it was a great loss, and in the effort to save what was possible, Staten Island was taken from the proprietors on the plea that one arm of the Hudson flowed along its western border.

In August 1665 Philip Carteret, a relative of Sir George, arrived in the province as its first governor. In May 1668 he convoked the first assembly at Elizabethtown. At the next session, in the following November, the towns of Shrewsbury and Middle- town declared that they held their grants from Governor Nicolls, and that they were consequently exempt from any quit-rents the proprietors might claim. They refused to pay their share of the public expenses; and their deputies, on refusing to take the oath of allegiance and fidelity, were expelled from the assembly. The disaffection soon spread and led to the so-called ” disorgan- izing” assembly in 1672, which went so far as to choose James Carteret, a landgrave of Carolina and presumably a natural son of Sir George, as ” President.” Philip Carteret returned to England and laid the case before the proprietors; they ordered President Carteret to continue on his way to Carolina and confirmed as governor John Berry, whom Governor Carteret had left behind as deputy. The duke of York declared that the grants made by Nicolls were null and void; the king enjoined obedience to the proprietors, and quiet was restored. Another change was impending, however, and in August 1673, when a Dutch fleet appeared off Staten Island, New Jersey for a second time became a part of New Netherland. The settled region was called “Achter Koll,” or “Back Bay,” after Newark Bay, whose waters, lying behind the bay of New York, had to be crossed in order to reach Elizabethtown. The period of Dutch rule was short, and by the treaty of Westminster, of the 9th of February 1674, the territory was restored to England. The crown lawyers decided that the rights of the proprietors of New York and New Jersey had been extinguished by the conquest, and that by treaty the lands had been reconveyed, not to the proprietors, but to the king. On the 13th of June 1674 Charles II. accordingly wrote a letter confirming the title and power of Carteret in the eastern half of New Jersey. No similar grant was made to Berkeley, as on the 18th of March he had sold his interest in the province to John Fenwicke, sometime major in the Parliamentary army and later a member of the Society ot Friends, and Edward Byllynge (d. 1687), a Quaker merchant.” On the 29th of June the duke of York received a new patent similar to that of 1664, and he

at once (on the 28th and 29th ol July) confirmed Carteret in all his rights in that portion of New Jersey N. of a line drawn from Barnegat Creek to ” Rankokus Kill ” — a stream a little S. of the site of Burlington — which was considerably more than one-half of the province. The duke of York commissioned Sir Edmund Andros as governor of his dominions, including ” all ye land from ye West side of Connecti- cut River to ye East side of Delaware Bay.” Sir George Carteret again sent over his kinsman Philip Carteret to be governor of the eastern part of New Jersey, and the two governors arrived in October 1674 in the same ship. A disagreement arose as to

3 It has been supposed that Fenwicke and Byllynge intended to establish in America a retreat for those who desired religious and political freedom.

the respective interests of Fenwicke and Byllynge in the western portion of the province, and they chose William Penn, a new member of the Society of Friends, as arbitrator. To Byllynge Penn awarded nine-tenths of the territory and to Fenwicke one-tenth. Financial embarrassments a short time afterward caused Byllynge to assign his shares in trust for his creditors to three Quakers, William Penn, Gawen Lawrie and Nicholas Lucas. Later they acquired control of Fenwicke’s share also. In 1675 Fenwicke with his family and a company of settlers reached the Delaware in the ship ” Griffith ” from London, and on the eastern shore they formed a settlement to which they gave the name of Salem. This was the first permanent English settlement in this part of New Jersey. Refusing to recognize Fenwicke’s jurisdiction, Governor Andros of New York attempted to secure his peaceful recognition of the duke’s authority, and, failing in this, he sent a military force into this district in December 1676 and made Fenwicke a prisoner. In January, however, he was released on his promise not to act in a public capacity until he should receive further authority. Meanwhile the trustees of Byllynge were seeking a division of the province more to theif advantage and, Sir George Carteret having been persuaded by the duke of York to surrender his grant of July 1674, the so-called ” quintipartite deed ” was executed on the 1st of July 1676. This instrument defined the interests of Carteret, Penn, Lawrie, Lucas and Byllynge, by fixing a line of partition from Little Egg Harbor to a point on the Delaware river, in 41 40′ N. lat., and by assigning the province east of this line (East Jersey) to Carteret and the province west of this line (West Jersey), about five-eighths of the

whole, to the Quaker associates. The Quakers' title to West Jersey, however, still bore the cloud resulting from the Dutch conquest, and the duke of York had desired to recover all of his original grant to Berkeley and Carteret ever since Governor Nicolls had protested against it. But at this time his own right to the crown of England was threatened with the Exclusion Bill, and under these conditions instead of pressing his case against the Quakers he not only permitted it to be decided against him but in August 1680 confirmed their title by a new deed.

A very liberal frame of government for West Jersey, drafted presumably by William Penn, and entitled " the Concessions and Agreements of the Proprietors, Freeholders and Inhabitants of West Jersey in America," was adopted in March 1677. This vested the principal powers of government in an assembly of one hundred members, who were to be chosen annually and to be subject to instructions from their constituents. In the intervals between sessions of the assembly, affairs were to be managed by ten commissioners chosen by that body. Religious toleration was assured. In August 1677 the ship " Kent " arrived in the Delaware, with 230 Quakers from London and Yorkshire. These founded a settlement, which became the modern Burlington, and in the next few months several hundred more colonists arrived. But the new colony was never actually governed under "the Concessions and Agreements"; for from the beginning until the first assembly was called in November 1681 its affairs were managed by commissioners named by the pro- prietors and when in 1680 the duke of York confirmed the title to the land to Byllynge and his associates he conveyed the right to govern to Byllynge alone. Although he was one of the signers of " the Concessions and Agreements " Byllynge now com- missioned Samuel Jennings as governor of the province, and the other proprietors acquiesced, appointing Byllynge governor and permitting Jennings to serve as his deputy. Jennings immediately called the first assembly, and this body passed a number of fundamental laws which provided for a governor and council, but were in other respects much like the clauses relating to government in " the Concessions and Agreements." When,' as if to test his authority, Byllynge, in 1682-1683, removed Jennings who had been a popular governor, the assembly, by the advice of William Penn, passed a series of resolutions in the form of a protest, and in 1684 two agents were sent to England to negotiate with Byllynge. There the dispute was finally submitted for arbitration to George Fox and other Quakers, and they decided

that, as the government of the province was legally vested in Byllynge by the duke's conveyance to him, he had the right to name the deputy

governor. Fenwicke, after his release by Andros, endeavoured to re-establish a government at Salem with himself as ” Lord and Chief Proprietor ” of West Jersey, but the duke’s officers further contested his claims and in 1682 Penn effected a peaceful settlement with him.

In East Jersey, after the return of Governor Carteret, there was a period of quiet, until the death of Sir George Carteret in 1680 gave the zealous Andros another chance to further the supposed interests of his ducal master. Claiming jurisdiction over New Jersey by the terms of his commission, he issued a proclamation in March 1680 ordering Philip Carteret and his ” pretended ” officers to cease exercising jurisdiction within the duke’s dominions unless he could show warrant. To this Carteret made a spirited reply, and on the 30th of April a detach- ment of soldiers dragged the governor of East Jersey from his bed and carried him prisoner to New York. Here he was confined for four weeks, and was released only on his promise not to exercise any authority until the matter could be referred to England for adjudication. When the assembly of East Jersey met in June, Andros appeared before it as governor and recom- mended such measures as he deemed advisable, but the deputies refused to pass them. In England, too, his conduct was dis- avowed, and he was called home to answer charges that had been preferred against him. Philip Carteret reassumed the duties of his office, but his administration, now that Andros was no longer feared, was again marked by much friction with the assembly. Sir George Carteret had bequeathed his province to eight trustees, who were to administer it for the benefit of his creditors, and for the next two years the government was conducted in the name of his widow and executrix, Lady Elizabeth. Early in 1682, after several unsuccessful attempts to effect a sale by other means, the province was offered for sale at public auction, and was purchased by William Penn and eleven associates for £3400. Later each of these twelve sold one- half of his share to another associate, thus making twenty-four proprietors; and on the 14th of March the duke of York con- firmed the sale, and gave them all the powers necessary for governing the province. Robert Barclay, one of the proprietors, was chosen governor for life, with the privilege of performing his duties by deputy, and as his deputy he sent over Thomas Rudyard. In 1683 Rudyard was succeeded by Gawen Lawrie, who brought over with him a curious frame of government entitled ” the Fundamental Constitutions.” This instrument, which was designed- to replace the Concessions, provided for the government of the province by a governor chosen by the pro- prietors, a common council consisting of the proprietors or their proxies together with 12 freemen, and a great council consisting of the proprietors or their

proxies together with 144 freemen chosen by a mixed system of elections and the casting of lots. But the new system was to apply only to those who, in return for the greater privileges which it was alleged to ensure, would agree to a resurvey of their lands, arrange to pay quit-rents and provide for the permanent support of the government, and as Governor Lawrie found the colonists generally unwilling to make the exchange on the proposed terms, he discreetly refrained from any attempt to put the Fundamental Constitutions in operation and thereby avoided the confusion which must have resulted from two sets of laws. The government of the twenty-four proprietors, however, was liberal. Recognizing the necessity of some one in the province with full power " to do all things that may contribute to the good and advancement of the same," they directed the appointment of the American Board of Pro- prietors — a body of men identified with the province, who with the deputy-governor were to look after the proprietary interests in such matters as the approval of legislation and the granting of lands, and thereby prevent the delay caused by the transmis- sion of such matters to England for approval. In 1686 another effort was made to put the Fundamental Constitutions in force, but when the deputies and the council rejected the instrument, the proprietors did not force the matter. In 1686 Perth Amboy ,

the newly created port of East Jersey, became its seat of govern- ment.

After his accession to the throne in 1685, James II. showed an unyielding determination to annul the privileges of the colonies, and to unite New York, New Jersey and the New England colonies under a single government. In order, therefore, to save their rights in the soil, the proprietors of East and West Jersey offered to surrender their claims to jurisdiction, and to this arrangement the king consented. Andros, previously appointed viceroy of New England, thereupon received a new commission extending his authority over New York and the Jerseys, and in August 1688 he formally annexed these provinces to the Dominion of New England. The seizure of Andros by the people of Boston in April 1689, following the news of the revolt in England against James II., gave the Jersey proprietors an opportunity to resume their rights, but the proprietary govern- ments regained their former footing very slowly. The pro- prietors were widely separated — some being in America, some in England and others in Scotland — and unity of action was impracticable. For three years there was little or no government in the Jerseys, beyond the measures

taken by local officers for preserving the peace.

In 1692 an important change occurred in the administrative system through the appointment of Andrew Hamilton (d. 1703) as governor of both East and West Jersey. In 1697 a faction opposed to Hamilton secured his removal and the appointment of their partisan, Jeremiah Basse. The opposition in the two colonies to Basse became so formidable that he was removed in 1699 and Hamilton was reappointed. Certain disaffected elements thereupon refused to recognize his authority, on the ground that his appointment had not received the required approval of the crown, and for a time the condition of the provinces bordered on anarchy. These disorders, and especially complaints against the Jerseys as centres of illegal trade, were brought to the attention of King William and his lawyers contended that as only the king could convey powers of govern- ment those exercised by the Jersey proprietors, derived as they were from the duke of York, were without sufficient warrant. Moreover, the inhabitants sent petitions to England, praying that they might be placed under the direct control of the crown. The proprietors of East Jersey had already offered to surrender their jurisdiction, in return for certain concessions by the royal government, but no action had been taken. In 1701 the pro- prietors of both provinces made another proposal, which was accepted, and in April 1702 all rights of jurisdiction were trans- ferred to the crown, while the rights to the soil remained in the proprietors. The provinces of East and West Jersey were then united under a government similar to that of the other royal provinces. Until 1738 the governor of New York was also governor of New Jersey; after that date each colony had its own governor. The legislature met alternately at Burlington and Perth Amboy, until 1790, when Trenton was selected as the capital of the state.

The next four decades were years of development disturbed, however, by friction between the assembly and the royal governors, and by bitter disputes, accompanied by much rioting, with the proprietors concerning land-titles (1 744-1 749). Inde- pendence of the absentee landlords was again claimed by virtue of the grants made by Nicolls nearly a century before. Agri- culture at this time was the main pursuit. The climate was more temperate and the soil more fertile than that of New England; but there were similar small farms and no marked tendencies towards the plantation system of the southern colonies. Slavery had been introduced by the Dutch and Swedes, and from the time of the earliest English occupation had been legally recognized. East Jersey had a fugitive slave law as early as 1675. With the exception of laying an import duty no legislative effort was made — nor is it likely that any would have been allowed by the crown —

to restrict the importation of slaves during the colonial period. In addition to African and Indian slaves there was the class known as ” redemptioners,” or term slaves, consisting of indented servants, who bound themselves to their

masters before leaving the mother country, and ” free willers,” who allowed themselves to be sold after reaching America, in order to reimburse the ship captain fox the cost of their passage. Between East and West Jersey certain political and religious differences developed. The former, settled largely by people from New England and Long Island, was dominated by Puritans; the latter by Quakers. In East Jersey, as in New England, the township became a vigorous element of local government; in West Jersey the county became the unit. Important events in the period of royal government were the preaching of George Whitefield in 1739 and the following years, and the chartering of the College of New Jersey (now Princeton University) in 1746, and of Queen’s (now Rutgers) College in 1766. The colony gave many proofs of its loyalty to the mother country: it furnished three companies of troops for Admiral Vernon’s unfortunate expedition against Cartagena in 1741; in King George’s War it raised £2000 for supplies, furnished troops for the capture of Louisburg and sent over six hundred men to Albany; and in the French and Indian (or Seven Years’) War its militia participated in the capture of both Quebec and Havana. Against England the colony had fewer grievances than did some of its more commercial neighbours, but the Stamp Act and the subsequent efforts to tax tea aroused great opposi- tion. In 1774 occurred the “Greenwich Tea Party.” 1

The last colonial assembly of New Jersey met in November 1775. From the 26th of May to the 2nd of July 1776 the second provincial congress met at Burlington, Trenton and New Bruns- wick and for a time became the supreme governing power. By its orders the royal governor, William Franklin (the natural son of Benjamin Franklin) was arrested and deported to Connecticut, where he remained a prisoner for two years, until exchanged and taken to New York under British protection. Following the recommendation of the Continental Congress, that the colonies should create independent governments, the provincial congress also drafted a provincial constitution, which, without being submitted to the people, was published on the 3rd of July 1776; it contained the stipulation that “if a reconciliation between Great Britain and these colonies should take place, and the latter be taken again under the protection of the crown of Britain, this charter shall be null and void — otherwise to remain firm and inviolable.” On the 20th of September 1777 it was amended by the New Jersey legislature, the words “state” and “states” being

substituted for the words ” colony” (or ” province”) and ■” colonies.” The state furnished a full quota for the Continental army, but the divided sentiment of the people is shown by the fact that six battalions of loyalists were also organized. Tories were active in New Jersey throughout the struggle; among them were bands known as ” Pine Robbers,” who hid in the pines or along the dunes by day and made their raids at night. In the state were fought some of the most important engagements of the war. When Washington, in the autumn of 1776, was no longer able to hold the lower Hudson he retreated across New Jersey to the Delaware near Trenton and seizing every boat for miles up the river he placed his dispirited troops on the opposite side and left the pursuing army no means of crossing. With about 2500 men he recrossed the Delaware on the night of the 25th of December, surprised three regiments of Hessians at Trenton the next morning, and took 1000 prisoners and 1000 stands of arms. In a series of movements following up this success he outgeneraled the British commander, Lord Cornwallis, and on the 3rd of January 1776, defeated a detach- ment of his army at Princeton (q.v.). The American army then went into winter quarters at Morristown, while a part of the British army wintered at New Brunswick. To protect ‘ the

1 Greenwich then had some importance as a port on Cohansey Creek on the lower Delaware. In the summer of 1774 the captain of the ship ” Greyhound,” bound for Philadelphia with a cargo of tea, on account of the state of opinion in that city, put in at Greenwich and stored his tea there in a cellar. It remained undisturbed till the night of the 22nd of November, when a band of about 40 men dressed as Indians, in imitation of the Boston party, broke into the cellar and made a bonfire of the tea. All attempts to punish the offenders were futile.

inhabitants of the Raritan Valley from British foraging parties General Benjamin Lincoln with 500 men was by Washington’s orders stationed at Bound Brook, but on the 13th of April 1777 Lincoln was surprised by a force of about 4000 men under Cornwallis, aDd although he escaped with small loss it was only by remarkably rapid movements. When the British had gained possession of Philadelphia, in September 1777, their communica- tion between that city and the ocean through the Lower Delaware was obstructed on the New Jersey side by Fort Mercer, com- manded by Colonel Christopher Greene, at Red Bank; three battalions of Hessians under Colonel Karl Emil Kurt von Donop attacked the fort on the 22nd of October, but they were repulsed with heavy loss. The fort was abandoned later, however. As the British army under General Clinton was retreating, in June 1778, from

Philadelphia to New York, the American army engaged it in the battle of Monmouth (June 28, 1778); the result was indecisive, but that the British were not badly defeated was ascribed, to the conduct of General Charles Lee. Before daylight on the 19th of August 1779 was approaching, Major Henry Lee with a force of about 400 men surprised the British garrison at Paulus Hook, where Jersey City now stands, and, although sustaining a loss of 20 men, killed 50 of the garrison and took about 160 prisoners. In 1779-1780 Morristown was again Washington's headquarters. The Congress of the Confederation met in Princeton, in Nassau Hall, which still stands, from June to November 1783.

After the war New Jersey found its commercial existence threatened by New York and Philadelphia, and it was a feeling of weakness from this cause rather than any lack of state pride that caused the state to join in the movements for a closer Federal Union. In 1786 New Jersey sent delegates to the Annapolis Convention, which was the forerunner of the Federal Convention at Philadelphia in the following year. In the latter body, on the 15th of June, one of the New Jersey delegates, William Paterson (1745-1806), presented what was called the " New Jersey plan " of union, representing the wishes of the smaller states, which objected to representation in a national Congress being based on wealth or on population. This merely federal plan, reported from a Conference attended by the delegates from Connecticut, New York and Delaware, as well as those from New Jersey (and by Luther Martin of Maryland), consisted of nine resolutions; the first was that " the Articles of Confedera- tion ought to be so revised, corrected and enlarged as to render the federal Constitution adequate to the exigencies of govern- ment and the preservation of the Union "; and the actual " plan " was for a single legislative body, in which each state should be represented by one member, and which should elect the supreme court and have 'power to remove the executive (a Council), to lay taxes and import duties, to control commerce, and even, if necessary, to make requisitions for funds from the states. Madison opposed the plan, on the ground that it would not prevent violations by the states of treaties and of laws of nations. On the first resolution only there was a definite vote; on the 19th of June it was voted to postpone the considera : tion of this resolution and to report the resolutions (the Virginia plan) formerly agreed upon by the committee of the whole. The New Jersey plan left its impress in the provision of the Constitution (approved in the Convention on the 7th of July) for equal representation in the national Senate. The Federal Constitution was ratified by a unanimous vote in the state convention which met at Trenton on the 18th of December

1787.

The state's own constitution, which had been adopted in 1776 and amended in 1.777, retained, like other state constitu- tions framed during the War of Independence, many features of colonial government ill-adapted to a state increasingly demo- cratic. The basis of representation, each county electing three members to the assembly and one member to the legislative council, soon became antiquated. The property qualifications were, for members of the council, " one thousand pounds pro- clamation money, of real and personal estate, in the same county." and. for members of the assembly, " five hundred

pounds proclamation money, in real and personal estate, in the same county." These and the property qualifications for suffrage, which was granted to " all inhabitants of this state, of full age, who are worth fifty pounds proclamation money, clear estate in the same," &c, were soon considered undemocratic; and the democratic tendency of certain election officers may be seen from their construing the words " all inhabitants of full age " to in- clude women, and from their permitting women to vote. The governor was chosen by the joint vote of the council and assembly; he was president of the council, with a casting vote; he was chancellor, captain-general and commander-in-chief of the militia; he had three members of the legislature to act as a privy-council; and he, with the council (of which seven formed a quorum), constituted " the Court of Appeals in the last resort in all causes of law, as heretofore," which, in addition, had " the power of granting pardons to criminals, after condemnation, in all cases of treason, felony or other offences."

In 1838 the opposition to the governor's extensive powers under the constitution was greatly increased in the " Broad Seal " or

Great Seal 1″ War. After a closely contested election in which six members of Congresswere chosen on a general ticket, although there was an apparent Democratic majority of about one hundred votes (in a total of 57,000), two county clerks rejected as irregular sufficient returns from townships to elect five Whig candidates to whom the state board of canvassers (mostly Whigs and headed by the Whig governor, William Pennington) gave commissions under the broad seal of the state. Excluding these five members from New Jersey «£• use of Re P res entatives contained 119 Democrats and life Whigs, so that the choice of a Whig speaker could be secured only by the seating of the five Whigs from New Jersey rather than their Democratic rivals. It was

decided that only members whose seats were not contested should vote for speaker, and Robert M T. Hunter, of Virginia, a Democrat and a compromise candidate, was elected to the position; and on the 28th of February 1839 the Democratic candidates were admitted to their seats, to whicn a congressional committee, reporting afterwards, declared tr-~m entitled. 1

Agitation for constitutional reform resulted in a constitutional convention, which met at Trenton from the 14th of May to the 29th of June 1844 and drafted a new frame of government, introducing a number of radical changes. This instrument was ratified at the polls on the 13th of August. The election of the governor was taken from the legislature and given to the people; the powers of government were distributed among legislative, executive and judicial departments; representation in the assembly was based on population; and the property qualifica- tion for membership in the legislature and for the suffrage was abolished.

The constitution of 1844 declared that ” All men are by nature free and independent, and have certain unalienable rights, among which are those of enjoying and defending life and liberty . . . and of pursuing and obtaining safety and happiness.” A similar clause in the constitution of Massachusetts had been interpreted by the courts as an abolition of slavery, and an effort was made to have the same ruling applied in New Jersey, where the institution of slavery still existed. The courts, however, declared that the clause in the constitution of New Jersey was a ” general proposition,” not applying ” to man in his private, industrial or domestic capacity.” An attempt at abolition had previously been made in 1804 by an act declaring that every child born of a slave should be free, but should remain the servant of its mother’s owner until twenty-five years of age if a male or twenty-one years of age if a female. The owner of the mother, however, might abandon the child after a year, and it then became a public charge. This last provision pro- duced such a heavy drain on the treasury for the support of abandoned negro children that in 1811 the statute was repealed. In 1846 an act was passed designating slaves as apprentices bound to service until discharged by their owners, and providing that children of

1 The election to the U.S. Senate in 1865 of John Potter Stockton (1826-1900), a great-grandson of Richard Stockton, a signer of the Declaration of Independence, created hardly less excitement than the Broad Seal War. The state legislature which elected him senator did so by a plurality vote, having previously passed a resolution changing the vote requisite to choose a senator from a majority to a plurality vote.

He took his seat in the Senate and his election was upheld by the Senate committee on the judiciary, whose report was adopted (26 March 1866) by a vote of 22 to 21, his own vote carrying the motion; but, because of the objection of Charles Sumner, he withdrew his vote on the 27th of March, and was thereupon unseated by a vote of 23 to 21.

such apprentices should be free at birth, but were to be supported by the masters of their parents for six years. There were conse- quently a few vestiges of the slavery system in New Jersey until the adoption of the Thirteenth Amendment to the Federal Con- stitution.

Toward the political questions that disturbed the American people immediately before the Civil War the attitude of the state was conservative. In 1852 the Free-soil candidate for the pre- sidency received only 350 votes in New Jersey; and in 1856 the Democratic candidate received a plurality of 18,605 votes, even though William L. Dayton, a citizen of the state, was the Repub- lican nominee for the vice-presidency. In i860 three of the state's electoral votes were given to Douglas and four .to Lincoln. During the Civil War New Jersey furnished 89,305 men for the Union cause and incurred extraordinary expenditures to the amount of $2,894,385. The state readily consented to the Thirteenth and Fourteenth Amendments to the Federal Con- stitution, but in 1868 withdrew its consent to the latter. The Fifteenth Amendment was rejected by one legislature, but was accepted by its successor, in which the Republican party had obtained a majority.

Industrially the early part of the 19th century was marked in New Jersey by the construction of bridges and turnpikes, the utilization of water power for manufactures, and the intro- duction of steam motive power upon the navigable waters. The second war with England interrupted this material progress, and at its beginning was so unpopular, especially with the Quakers, that the Federalists carried the elections in the autumn of 181 2. But the attempt of this party to retain control by a " gerrymandering " process was unsuccessful. The Democrats were triumphant in 1813, and the Federalist as well as the Democratic administration responded with aid for the defence of New York and Philadelphia. The state also contributed several hundred men to the service of the United States. Material progress in New Jersey after the war is indicated by the con- struction of the Morris (1 824-1 836) and the Delaware & Raritan (1826-1838) canals, and the

completion of its first railway, the Camden & Amboy, in 1834.

The years following the Civil War were marked by great in- dustrial development. The numerous projects, good and bad, that were inaugurated in 1866-187 5, and the various kinds of laws and charters conferring special privileges that were secured, led to the constitutional prohibition of special legislation already mentioned. In this same period there was a bitter railway war. The Delaware & Raritan Canal Company and the Camden & Amboy Railroad Company, both chartered in 1830 and both monopolies, 1 had been practically consolidated in 1831; in 1836 these joint companies gained control of the Philadelphia & Trenton railway; in 1867 these ” United New Jersey Railroad & Canal Companies ” consolidated with the New Jersey Railroad & Transportation Company (which was opened in 1836 and controlled the important railway link between New Brunswick and Jersey City), and profits were to be divided equally between the four companies; and in 1871 these entire properties were leased for 999 years to the Pennsylvania Railroad Company. This combination threatened to monopolize traffic, and it was opposed by the Central Railroad of New Jersey, the Delaware, Lackawanna & Western, and a branch of the North Pennsylvania (from Jenkintown to Yardley; sometimes called the ” national ” or ” air-line “), and by the general public; and in 1873 the state passed a general railway law giving other railways than the United New Jersey holdings of the Penn-

1 In 1864 a bill was introduced in ‘the Federal House of Repre- sentatives making the Camden & Atlantic (now the Atlantic City) railway and the Raritan & Delaware Bay (now a part of the Central of New Jersey) a post route between New York and Philadelphia and authorizing these railways to carry passengers and freight between New York and Philadelphia. Thereupon the governor and legislature of New Jersey protested that such a measure was an infringement of the reserved rights of the state, since the state had contracted with the Camden & Amboy not to construct nor to authorize others to construct within a specified time any other railway across the state to be used for carrying passengers or freight between New York and Philadelphia. XIX. 17

sylvania the right to connect New York and Philadelphia. In 1876 the ” national ” line was extended to Bound Brook (as the Delaware & Bound Brook) and this road, the North Penn- sylvania & Central Railroad of New Jersey, were operated under a tripartite agreement as a through line between New York and Philadelphia; but in 1879 these three lines were leased for 990 years to the Philadelphia & Reading

railway. The state itself then became engaged in a struggle with the railways in order to secure from them their full portion of taxes, as the property of individuals was then taxed many times as heavily as that of railways. In 1884 the state gained the victory by securing the passage of a law taxing the franchises of railway corporations.

A reform movement in politics, called the ” New Idea,” and led by Everett Colby (b. 1874), then a Republican member of the Assembly and in 1906-1908 a state senator, began in 1904; it did much to secure the passage of acts limiting public service franchises to 20 years (unless extended to 40 years by the voters of the municipality concerned), the increase of taxes on railways, the increase of franchise tax rates by 1 § % each year up to 5 %, the adoption of direct primary elections, and the modification of the existing promoters’ liability law.

Before 1800 the state was dominated by the Federalist party; from that date until 1896 it was generally controlled by the Demo- crats, and from 1896 to 191 1 by the Republicans.

The governors of New Jersey have been as follows : —

Governors: under the Proprietors

Philip Carteret 1665-1672

John Berry 1 672-1 673

Anthony Colve 2 . 1673-1674

Governors of East Jersey and their Deputies.

Philip Carteret 1674-1682

Robert Barclay 1 682-1 688

Thomas Rudyard . Deputy . . 1682-1683

Gawen Lawrie . – Deputy . . 1683-1686

Lord Neill Campbell . Deputy . . 1686

Andrew Hamilton . Deputy . 1 686-1 688

Edmund Andros 1688-1689

Andrew Hamilton 1 692-1 697

Jeremiah Basse 1697-1699

Andrew Hamilton 1699-1702

Governors of West Jersey and their Deputies.

Edward Byllynge Samuel Jennings Thomas Olive John Skene . Daniel Coxe . Edward Hunloke

Deputy Deputy Deputy

1680-1687 1681-1684 1684-1685 1685-1687 1687-1688 1687

Deputy

Edmund Andros 1688-1689

Andrew Hamilton 1 692-1 697

Jeremiah Basse 1697-1699

Andrew Hamilton 1699-1702

Under the Royal Government Governors of New York and New Jersey.

Edward Hyde, Lord Cornbury …. 1 703-1 708

John, Lord Lovelace 1 708-1 709

Richard Ingoldsby, Lieut. -Governor . . 1709-1710

Robert Hunter 1710-1719

William Burnet 1 720-1 728

John Montgomerie 1728-1731

Lewis Morris, 3 Pres. Council …. 1 731-1732

William Cosby . . ■ . . – . I73 2_I 736

John Anderson, 3 Pres. Council . 1736

John Hamilton, 3 Pres. Council …. 1 736-1738

Governors of New Jersey only.

Lewis Morris ‘ . 1 738-1 746

John Hamilton, Pres. Council …. 1 746-1 747

John Reading, Pres. Council …. 1747

Jonathan Belcher 1 747-1757

Thomas Pownall, Lieut. -Governor . . . 1757

John Reading, Pres. Council . . 1757-1758

Francis Bernard 1 758-1 760

Thomas Boone 1 760-1 761

Josiah Hardy ..:.... 1761-1762

William Franklin 1 762-1 776

2 Governor-general of New Netherland.

3 Jurisdiction only over New Jersey.

5 J 4

NEW JERUSALEM CHURCH

Governors of the State

1776-

1790

federalist

1 790-1 793

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1793-

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1802

Dem.-Repub

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1803

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1812-

I8I3

Federalist

. 1813-

I8I5

Dem.-Repub

. 1815-

I817

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1817-

1829

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1829

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1832

Democrat

. 1832-

1833 Whig

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. 1833-1836

Democrat

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■ 1837-

1843 Whig ‘

• 1843-

1844

Democrat

• 1845-

1848 Whig

. 1848-

1851

Democrat

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1854

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1857

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• 1857-

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Republican

1860-1863

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. 1863-

-1866 Democrat

. 1866-1869 Republican

ph 1869-

-1872

Democrat

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1875

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1890- 1 893

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• 1893-

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1 896-1 898 Republican

1898

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1899- 1 902

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1905

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Democrat

William Livingston

William Paterson

Richard Howell .

Joseph Bloomfield

John Lambert (Acting)

Joseph Bloomfield

Aaron Ogden

William Sandford Pennington

Mahlon Dickerson

Isaac Halsted Williamson .

Garret Dorset Wall (Declined)

Peter Dumont Vroom

Samuel Lewis Southard

Elias P. Seeley

Peter Dumont Vroom

Philemon Dickinson .

William Pennington

Daniel Haines

Charles C. Stratton

Daniel Haines

George Franklin Fort

Rodman McCauley Price .

William Augustus Newell .

Charles Smith Olden .

Joel Parker

Marcus Lawrence Ward

Theodore Frelinghuysen Randolph

Joel Parker ….

Joseph Dorsett Bedle

George Brinton McClellan

•George Craig Ludlow

Leon Abbett

Robert Stockton Green

Leon Abbett

George Theodore Werts

John William Griggs .

Foster MacGowan Voorhees (Acting) . _ .

David O. Watkins

Foster MacGowan Voorhees

Franklin Murphy , Edward Casper Stokes

John Franklin Fort

Woodrow Wilson

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NEW JERUSALEM CHURCH, or New Church, the com- munity founded by the followers of Emmanuel Swedenborg (q.v.). Swedenborg himself took no steps to found a church, but having given a new interpretation of Scripture, it was inevitable that those who accepted his doctrine should separate themselves and organize a society in accordance therewith. Those who received them fully during Swedenborg's lifetime were few and scattered, but courageously undertook the task of dissemina- tion, and gave themselves to translating and distributing their master's writings. Two Anglican clergymen were conspicuous in this work: Thomas Hartley (d. 1784), rector of Winwick, and John Clowes (1743-1831), vicar of St John's, Manchester. Hartley translated Heaven and Hell (1778) and True Christian Religion (1781); Clowes, who taught New Church doctrine in the existing churches and was opposed to the forming of new organizations, translated 17 volumes, including the Arcana Coelestia, and published over 50 volumes of exposition and defence. Through his influence Lancashire became the strong- hold of the Swedenborgians, and to-day includes a third of the congregations and more than half the members of the New Church in the United Kingdom.

In 1782 a society for publishing Swedenborg's writings was formed in Manchester, and in December 1783 a little company of sympathizers with similar aims met in London and founded " The Theosophical Society," among the members of which were John Flaxman the sculptor, William Sharpe the engraver, and F. H. Barthelemon the composer. In the early days most of them worshipped at the Female Orphan Asylum, St George's, whose chaplain, Rev. Jacob Duche, like Clowes at Manchester, preached the doctrines from his own pulpit. In 1785 and 1787 1 J. W. Salmon and R. Mather conducted an open-air missionary tour in the Midlands and the North with some success. Five prominent Wesleyan preachers adopted the new teaching and were cut off from their connexion, a step which led, in spite of remonstrance from Clowes and others, to the formal organization of the New Jerusalem Church on the 7th of May 1787. For some months the members met in private houses, but in January 1788 began worship in a church in Great Eastcheap with a liturgy specially prepared by the Rev. James Hindmarsh and Isaac Hawkins. " The Theosophical Society " was now dissolved. In April 1789 a General Conference of British Swedenborgians was held in Great Eastcheap Church, followed .by another and by the publication of a journal, the

New Jerusalem Magazine, in 1790. Since 1815 conferences have been held every year. A weekly paper, the Morning Light, is published, as well as monthly magazines for adults (the New Church Magazine) and young folk. The liturgy (containing five services for Morning and Evening, together with the order of Baptism, Holy Supper, Marriage, &c.) was prepared in 1828, revised and ex- tended in 1875; the hymn book of 1823 was revised and enlarged in 1880.

In the provinces the first church was at Birmingham (1791), followed by one at Manchester and another at Liverpool (1793). The Accrington church, the largest in Great Britain, was founded in 1802. Many of the early converts to the New Church were among the most fervent advocates of the abolition of slavery, one was the medical officer of the first batch of convicts sent to Botany Bay; from the house of another, William Cookworthy of Plymouth, Captain Cook sailed on his last voyage. Others were pioneers of elementary education, establishing free day schools long before they were thought of by the state.

In 181 5 the conference took up the question of home missionary work, and its agents were able to found many branches of the church. In 1813 the Manchester and Salford (now the North of

England) Missionary Society was founded, chiefly to provide preachers for the smaller churches in its area; in 1857 a National Missionary Institution was founded and endowed, to which most of the local ones have been affiliated. Other denominational agencies have been concerned with the printing and circulation of Swedenborgian literature, a training college for the ministry (founded in 1852), and a Ministers' Aid Fund (1854), and an Orphanage (1881). The centenary of the New Church as a spiritual system was celebrated in 1857, as an external organiza- tion in 1883. A few Swedenborgians still hold to the non- separating policy, but more from force of circumstances than from deliberate principle. The constitution of the New Church is of the Independent [Congregational type; the conference may advise and counsel, but cannot compel the obedience of the societies. The returns for 1909 showed 45 ministers, 8 recog- nized leaders, 10 recognized missionaries, 70 societies, 6665 registered members, 7907 Sunday scholars. There are also five or six small societies not connected with the conference.

The New Church in Europe. — In Sweden the Philanthropic Exegetic Society was formed by C. F. Nordenskiold in 1786 to collect documents about Swedenborg and to publish his writings. The introduction of alchemy and mesmerism led to its dissolution in 1789, but its work was continued by the society " Pro fide et charitate," which existed from 1796 to 1820. For many years the works of Swedenborg and his followers were proscribed, and receivers of his writings fined or deprived of office, but in 1866, when religious liberty had made progress, the cause was again taken up; in 1875 the society of " Confessors of the New Church " was formed in Stockholm, and since 1877 services have been regularly held. There is also a church in Gothenburg, and lectures are given from time to time in most of the towns of Sweden. In Norway there is no New Church organization; in Denmark a church was founded in Copen- hagen in 1871. In Germany Prelate Oetinger of Wurttemberg translated many of Swedenborg's writings between 1765 and 1786, but the great name is that of Immanuel Tafel (d. 1863), librarian of Tubingen, who not only edited, translated and published, but in 1848 founded a " Union of the New Church in Germany and Switzer- land " which held quarterly meetings. There is a church in Berlin, but otherwise activity in Germany has taken shape in the German Swedenborg Society with headquarters at Stuttgart. In Switzerland, on the contrary, there is an organized body of the New Church ; divine service being held in the Society at Zurich and by circles at Berne, Herisau and Nesslau. The Zurich pastor is a member of the American Convention, and has oversight also of the Austrian societies at Vienna and Trieste. In Hungary there are societies at Buda Pesth and Gyorkony. In France there were early Sweden- borgians of rank and learning, and much translation was accomplished before 1800. About 1838 J. F. E. Le Boys de Guays began his masterly translation of all Swedenborg's theological works and instituted public New Church worship, which was carried on at his house for thirty years. Sunday worship is now held in the New Church Temple on the Rue Thouin. In Italy (Rome), Holland (The Hague), Belgium (Antwerp and Bruges), there are small societies, and nearly every European country has some known adherents.

In America. — About 1784 James Glen, a London Scot, delivered lectures " For the Sentimentalists " on the new doctrine in Phila- delphia and Boston and circulated some of Swedenborg's works. Francis Bailey, state printer of Pennsylvania, was attracted by them and became active in their promulgation. During the next ten years a number of prominent men gave their support to the teaching, which gradually spread inland and southward. The first society for worship

was formed in Baltimore in 1792 (reorganized 1798), though a short-lived one had preceded it at Halifax, N.S., in 1791. Other churches grew up in Philadelphia, Cincinnati, Boston and New York, and the General Convention, which meets annually, was formed at Philadelphia in 1817. In 1907 there were 102 ministers and 103 societies with a membership of 6560. Of these, 4 societies and 140 members are in Canada, while the German Synod counts for 1 1 societies and 325 members.

In Australia, &c. — The formation of societies in Australia began at Adelaide in 1844. Melbourne and Sydney followed in 1854, Brisbane in 1865, Rodborough, Vict., in 1878. There is a circle at Perth. New Zealand has a church at Auckland (1883) and scattered members in the south island. An Australasian conference met at Melbourne in 1881 and has continued to meet in alternate years. There is a society at Mauritius, and correspondents in various parts of South and West Africa, India, Japan, the West Indies and South America.

See L. P. Mercer, The New Jerusalem in the World's Religious Congresses of 1893 ; Minutes of the General Conference of the New Church (annual); Journal of the Annual Session of the General Convention of the New Jerusalem in the United States of A merica.

(A. J. G.)

NEW KENSINGTON, a borough of Westmoreland county, Pennsylvania, U.S.A., on the Allegheny river, 18 m. N.E. of Pittsburg. Pop. (1900) 4665 (1042 foreign-born and 86 ne- groes); (1910) 7707. It is served by the Pennsylvania railroad and by electric railways to neighbouring towns. There are a variety of manufactures. The borough was founded in 1891 and was incorporated in the following year,

NEWLANDS, JOHN ALEXANDER REINA (1838-1898), English chemist, was born in 1838. He was one of the first, if not quite the first, to propound the conception of periodicity among the chemical elements. His earliest contribution to the question took the form of a letter published in the Chemical News in February 1863. In the succeeding year he showed, in the same journal, that if the elements be arranged in the order of their atomic weights, those having consecutive numbers frequently either belong to the same group or occupy similar positions in different groups, and he pointed out that each eighth element starting from a given one is in this arrangement a kind of re- petition of the first, like the eighth note of an octave in music. The Law of Octaves thus enunciated was at first ignored or

treated with ridicule as a fantastic notion unworthy of serious consideration, but the idea, subsequently elaborated by D. I. Mendeleeff and other workers into the Periodic Law, has taken its place as one of the most important generalizations in modern chemical theory. Newlands, who was of Italian extraction on his mother's side, and fought as a volunteer in the cause of Italian freedom under Garibaldi in i860, died in London on the 29th of July 1898. He collected his various papers on the atomicity of the elements in a little volume on the Discovery of the Periodic Law published in London in 1884.

NEW LONDON, a city, port of entry, and one of the county- seats of New London county, Connecticut, U.S.A., coextensive with the township of New London, in the S.E. part of the state, on the Thames river, about 3 m. from its entrance into Long Island Sound. Pop. (1890) 13,757; (I 9°°) I7i548, of whom 3743 were foreign-born; (1910 census) 19,659. It is served by the New York, New Haven & Hartford, and the New London Northern (leased by the Central Vermont) railways, by electric railway to Norwich, Westerly, Groton, Stonington and East Lyme, by a daily line of passenger steamboats to New York City, and by two lines of freight steamers, and in the summer months by daily steamboats to Sag Harbor and Greenport, Long Island, and Watch Hill and Block Island, Rhode Island. New London's harbour is the best on the Sound. The city is the headquarters of a United States artillery district, embracing Fort H. G. Wright on Fisher's Island, New York, Fort Michie on Gull Island, New York, Fort Terry on Plum Island, New York, and Fort Mansfield on Napatree Point, Rhode Island — fortifications which command the eastern entrance to Long Island Sound; and it is the head- quarters of the Third District of the U.S. Engineers and of the Third District of the Lighthouse Department. The harbour was formerly defended by two forts, both now obsolete — Fort Trumbull on the right bank of the Thames, and Fort Griswold on the left bank, in the township of Groton (pop. 1900, 5962). The city is built on a declivity facing the south-east; from the higher points there are excellent views of Long Island Sound and the surrounding country. New London is a summer resort, and is a station of the New York Yacht Club; the boat races between Harvard and Yale universities are annually rowed on the river near the city. Among the places of interest are the Town Mill, built in 1650 by John Winthrop, Jr., in co-operation with the town; the Hempstead Mansion, built by John Hemp- stead about 1678; the old cemetery, north-east of the city, laid out in 1653; a school house in which Nathan Hale taught; and a court house built in 1785. There is a public library (about 30,000 volumes), and the New London County

Historical Society (incorporated 1870) has an historical library. There are two endowed high schools, the Bulkeley School for boys and the Williams Memorial Institute (1891) for girls, and an endowed Manual Training and Industrial School (1872), all offering free instruction. In the 18th century New London had a large trade in lumber, flour and food supplies with the West Indies, Gibraltar

and the Barbary States; but this trade declined after the War of 1812, and the whaling and sealing industries, once very lucrative, have also declined in value. The imports in 1906 were valued at $54,873 and the exports at $60,522; in 1909 their respective values were $10,870 and $10,295. Manufacturing is the principal industry; among the products are silk goods, cotton gins, printing presses and foundry and machine shop products. The total value of factory products was $4,709,628 in 1905, an increase of n-6% since 1900.

New London was founded in 1646 by John Winthrop, the younger. It was known by its Indian name ” Nameaug ” until 1658, when the General Court of Connecticut approved the wish of the settlers to adopt its present name from London, England, the river Monhegin at the same time becoming the Thames. During the War of Independence it was a rendezvous for American privateers. In 1776 the first naval expedition authorized by Congress was organized in its harbour, and there in the next three years twenty privateers were fitted out. On the 6th of September 1781, 800 British troops and Loyalists under General Benedict Arnold (who was born in New London county) raided New London, destroyed much private property, and at Fort Griswold killed 84 American soldiers, many of them after their surrender. The massacre is commemorated by an obelisk, 134 ft. high, on Groton Heights. The city was incorporated in 1784. In 1798 there was an epidemic of yellow fever. From the 7th of November 181 2 until the close of the second war with Great Britain the harbour was blockaded by a British fleet.

See F. M. Caulkins’s History of New London (new ed., New London, 1900) ; and the publications of the New London County Historical Society (New London).

NEWLYN, a village in the St Ives parliamentary division of Cornwall, England, on the shore of Mount’s Bay, 1 m. S.W. of Penzance. It is a small fishing port, with narrow paved lanes and old-fashioned

cottages. Near the parish church of St Peter stands an ancient cross of granite, discovered in a field close by. The harbour, one of the safest for small craft in the west country, is sheltered by two long and massive stone piers. A more ancient pier, originally constructed in the reign of Henry VI., was renewed in that of James I. Tin mining and smelting have been largely carried on in the neighbourhood, and several galleries were worked far under the sea. The principal modern industry, however, is fishing, especially for pilchard. The picturesque appearance of the village, with its quays and little harbour, and the grandeur of the cliffs and moorland scenery towards Land's End, make Newlyn an attractive spot. Between 1880 and 1890 an artistic coterie grew up here, the leaders of which were Edwin Harris, Walter Langley, Fred Hall, Frank Bramley, T. C. Gotch, Mr and Mrs Stanhope Forbes, Chevalier Taylor and H. S. Tuke. The earlier artists at Newlyn were said to have selected it as their centre, because a greyness in the atmosphere helped their depiction of subtleties in tone, part of their creed being subordina- tion of colour to tone-gradation. In later times, the element of a common ideal tended to disappear, but the interest of the " Newlyn school " attracted a regular art-colony, who in various ways assimilated and expressed the picturesque influences of the place (see Painting: Recent British). There is a permanent Art Gallery, containing examples of the work of the Newlyn artists. Newlyn ward in the urban district of Paul (pop. 6332) had in 1901 a population of 3749.

NEW MADRID, a city and the county-seat of New Madrid county, Missouri, U.S.A., on the right bank of the Mississippi river, about 35 m. S. by W. of Cairo, 111. Pop. (1900) 1489; (1910) 1882. It is served by the St Louis South-western railway and by river packets. The city is a shipping point for a rich grain, cotton, livestock and lumber region. Among its manu- factures are lumber, staves, and hoops. The municipality owns its water-works. Owing to the encroachments of the Mississippi river, the site of the first permanent settlement of New Madrid is said to lie now about i§ m. from the E. bank of the river, in Kentucky. This settlement was made in 1788, on an elaborately laid out town site, and was named New Madrid by its founder,

Colonel George Morgan (1742-1810), 1 who, late in 1787, had received a grant of a large tract of land on the right bank of the Mississippi river, below the mouth of the Ohio, from Don Diego de Gardoqui, Spanish minister to the United States. The tract lay within the province of " Louisiana," and the grant to Morgan was a part of Gardoqui's plan to annex to that province the western American settlements, Morgan being required to estab- lish thereon a large number of emigrants, whom he secured from New Jersey, Canada and

elsewhere. Governoi Estevan Miro of Louisiana, however, disapproved of the grant, on the ground that it would cause the province to be overrun by Americans; the settlers became restive under the restraints imposed upon them; Morgan himself left; and in December 1811 and January 1 81 2 a series of severe earthquake shocks caused a general emigration. New Madrid was occupied by Confederate troops under General Gideon J. Pillow, on the 28th of July 1861, and after the surrender of Fort Donelson (February 16, 1862) the troops previously at Columbus, forming the Confederate left flank, were withdrawn to New Madrid and Island No. 10 (in the Mississippi about 10 m. S.). There were Confederate batteries on the left bank of the Mississippi opposite Island No. 10, and along the same bank from a point opposite New Madrid to Tiptonville, Tennessee. Behind these batteries were Reelfoot Lake and over- flowed lands. Retreat by land was thus virtually impossible. Early in March, Major-General John Pope and Commodore A.H. Foote proceeded against these positions; New Madrid, then in command of General John P. McGown, was evacuated on the 14th; (Admiral) Henry Walke (1808-1896), commanding the " Carondelct," ran past the batteries of Island No. 10 and the shore batteries on the 4th of April, and Lieut.Commander Egbert Thompson, commanding the " Pittsburgh," on the 7th; meanwhile the Federals under the direction of Colonel Josiah W. Bissell (b. 1818), of the engineer corps, had, with great difficulty, constructed an artificial channel to New Madrid across the peninsula (swamp land) formed by a great loop of the Mississippi ; troops were conveyed by transports through this channel below the island, Federal batteries having been established on the right bank of the river; the retreat of the Confederates down stream was effectually blocked; they evacuated the island on April 7th, and on the 8th the garrison and the forces stationed in the shore batteries, a total of about 7000, under General W. W. Mackall (who had succeeded General McGown on the 31st of March) was surrendered at Tiptonville. The island was sub sequently washed away, a new one being formed in the vicinity. NEWMAN, FRANCIS WILLIAM (1805-1897), English scholar and miscellaneous writer, younger brother of Cardinal Newman, was born in London on the 27th of June 1805. Like his brother, he was educated at Ealing, and subsequently at Oxford, where he had a brilliant career, obtaining a double first class in 1826. He was elected fellow of Balliol in the same year. Conscientious scruples respecting the ceremony of infant baptism led him to resign his fellowship in 1830, and he went to Baghdad as assistant in the mission of the Rev. A. N. Groves. In 1833 he returned to England to procure additional support for the mission, but rumours of unsoundness in his views on the doctrine of eternal punishment had preceded him, and finding himself generally looked

upon with suspicion, he gave up the vocation of missionary to become classical tutor in an unsectarian college at Bristol. His letters written home during the period of his mission were collected and published in 1856, and form an interesting little volume. Newman's views matured rapidly, and in 1840 he became professor of Latin in Manchester New College, the celebrated Unitarian seminary long established at York, and the parent of Manchester College, Oxford. In 1846 he quitted this appointment to become professor in University College, London, where he remained until 1869. During all this period

1 Morgan had been made Indian agent at Fort Pitt (Pittsburg) in 1776, and was commissioned a colonel in the Continental Army in 1777. In 1806 he was visited at his home, near Pittsburg, by Aaron Burr, who told him something about his famous " conspiracy scheme in the West, which Morgan reported to Jefferson — " the very first intimation I had of the plot," Jefferson afterward wrote to I Morgan.

he was assiduously carrying on his studies in mathematics and oriental languages, but wrote little until 1847, when he published anonymously a History of the Hebrew Monarchy, intended to introduce the results of German investigation in this department of Biblical criticism. In 1849 appeared The Soul, her Sorrows and Aspirations, and in 1850, Phases of Faith, or Passages from the History of my Creed — the former a tender but searching analysis of the relations of the spirit of man with the Creator; the latter a religious autobiography detailing the author's passage from Calvinism to pure theism. It is on these two books that Professor Newman's celebrity will principally rest; having in both to describe his personal experience, his intense earnestness has kept him free from the eccentricity which marred most of his other writings, excepting his contributions to mathematical research and oriental philology. There was, indeed, scarcely a crotchet, except " spiritualism," of which he was not at one time or another the advocate. His versatility was amazing: he wrote on logic, political economy, English reforms, Austrian politics, Roman history, diet, grammar, the most abstruse departments of mathematics, Arabic, the emendation of Greek texts, and languages as out of the way as the Berber and as obsolete as the dialect of the Iguvine inscriptions. In treating all these subjects he showed signal ability, but, wherever the theme allowed, an incurable crotchetiness; and in his numerous metrical translations from the classics, especially his version of the Iliad, he betrayed an insensibility to the ridiculous

which would almost have justified the irreverent criticism of Matthew Arnold, had this been conveyed in more seemly fashion. His miscellaneous essays, some of much value, were collected in several volumes before his death: his last publication, Contributions chiefly to the Early History of Cardinal Newman (1891), was generally condemned as deficient in fraternal feeling. He was far from possessing his brother's subtlety of reasoning, but he impresses by a transparent sincerity and singleness of mind not always dis- played by the more celebrated writer; his style is too individual to be taken as a model, but is admirable for its simplicity and clearness. His character is vividly drawn by Carlyle in his life of Sterling, of whose son Newman was guardian: " a man of fine attainments, of the sharpest-cutting and most restlessly advancing intellect and of the mildest pious enthusiasm." It was his great misfortune that this enthusiasm should have been correlated, as is not unfrequently the case, with an entire in- sensibility to the humorous side of things. After his retirement from University College, Professor Newman continued to live for some years in London, subsequently removing to Clifton, and eventually to Weston-super-Mare, where he died on the 7th of October 1897. He had been blind for five years before his death, but retained his faculties to the last. He was twice married.

See T. G. Sieveking, Memoir and Letters of Francis W. Newman (1909). (R. G.)

NEWMAN, JOHN HENRY (1801-1890), English Cardinal, was born in London on the 21st of February 1801, the eldest son of John Newman, bankei, of the firm of Ramsbottom, Newman and Co. The family was understood to be of Dutch extraction, and the name itself, spelt " Newmann " in an earlier generation, further suggests Hebrew origin. His mother, Jemima Fourdrinier, was of a Huguenot family, long established in London as engravers and paper manufacturers. John Henry was the eldest of six children. The second son, Charles Robert, a man of ability but of impracticable temper, a professed atheist and a recluse, died in 1884. The youngest son, Francis William (q.v.), was for many years professor of Latin in University College, London. Two of the three daughters,- Harriett Elizabeth and Jemima Charlotte, married brothers, Thomas and John Mozley; and Anne Mozley, a daughter of the latfcer, edited in 1892 New- man's Anglican Life and Correspondence, having been entrusted by him in 1885 with an autobiography written in the third person to form the basis of a narrative of the first thirty years of his life. The third daughter, Mary Sophia, died unmarried in

1828.

At the age of seven Newman was sent to a private school conducted by Dr Nicholas at Ealing, where he was distinguished

by diligence and good conduct, as also by a certain shyness and aloofness, taking no part in the school games. He speaks of himself as having been ” very superstitious ” in these early years. He took great delight in reading the Bible, and also the novels of Scott, then in course of publication. At the age of fifteen, during his last year at school, he was ” converted,” an incident that throughout life remained to him ” more certain than that he had hands or feet.” It was in the autumn of 1816 that he thus fell under the influence of a definite creed, and received into his intellect impressions of dogma never afterwards effaced. The tone of his mind was at this date evangelical and Calvinistic, and he held that the pope was anti-Christ. Matriculating at Trinity College, Oxford, 14th December 1816, he went into residence there in June the following year, and in 1818 he gained a scholarship of £60, tenable for nine years. But for this he would have been unable to remain at the university, as in 1819 his father’s bank suspended payment. In that year his name was entered at Lincoln’s Inn. Anxiety to do well in the final ‘ schools produced the opposite result; he broke down in the examination, and so graduated with third-class honours in 1821. Desiring to remain in Oxford, he took private pupils and read for a fellowship at Oriel, then ” the acknowledged centre of Oxford intellectualism.” To his intense relief and delight he was elected on the 12th of April 1822. E. B. Pusey was elected a fellow of the same society in 1823.

On Trinity Sunday, 13th June 1824, Newman was ordained, and became, at Pusey’s suggestion, curate of St Clement’s, Oxford. Here for two years he was busily engaged in parochial work, but he found time to write articles on ” Apollonius of Tyana,” on ” Cicero ” and on ” Miracles ” for the Encyclopaedia Metropolitana. In 1825, at Whately’s request, he became vice-principal of St Alban’s Hall, but this post he held for one year only. To his association with Whately at this time he attributed much of his ” mental improvement ” and a partial conquest of his shyness. He assisted Whately in his popular work on logic, and from him he gained his first definite idea of the Christian Church. He broke with him in 1827 on the occasion of the re-election of Peel for the University, Newman opposing this on personal grounds. In 1826 he became tutor of Oriel, and the same year R. H. Froude, described by Newman as ” one of the acutest, cleverest and deepest men ” he ever met, was elected fellow. The two formed a high ideal of the tutorial office as clerical and pastoral rather than secular. In 1827 he was a preacher at Whitehall. The year following Newman supported and secured the election of Hawkins as provost of Oriel in pre- ference

to Keble, a choice which he later defended or apologized for as having in effect produced the Oxford Movement with all its consequences. In the same year he was appointed vicar of St Mary's, to which the chapelry of Littlemore was attached, and Pusey was made regius professor of Hebrew. At this date, though still nominally associated with the Evangelicals, Newman's views were gradually assuming a higher ecclesiastical tone, and while local secretary of the Church Missionary Society he circulated an anonymous letter suggesting a method by which Churchmen might practically oust Nonconformists from all control of the society. This resulted in his being dismissed from the post, 8th March 1830; and three months later he withdrew from the Bible Society, thus completing his severance from the Low Church party. In 1 831-183 2 he was select preacher before the University. In 1832, his difference with Hawkins as to the " substantially religious nature " of a college tutorship becoming acute, he resigned that post, and in December went with R. H. Froude, on account of the latter's health, for a tour in South Europe. On board the mail steamship " Hermes " they visited Gibraltar, Malta and the Ionian Islands, and subsequently Sicily, Naples and Rome, where Newman made the acquaintance of Dr Wiseman. In a letter home he described Rome as " the most wonderful place on earth," but the Roman Catholic religion as " polytheistic, degrading and idolatrous." It was during the course of this tour that he wrote most of the short poems which a year later were printed in the Lyra Apostolica. From Rome Newman returned to Sicily alone, and was dangerously ill with

fever at Leonforte, recovering from it with the conviction that he had a work to do in England.

In June 1833 he left Palermo for Marseilles in an orange boat, which was becalmed in the Strait of Bonifacio, and here he wrote the verses, " Lead, kindly Light," which later became popular as a hymn. He was at home again in Oxford on the 9th of July, and on the 14th Keble preached at St Mary's an assize sermon on " National Apostasy," which Newman afterwards regarded as the inauguration of the Oxford Movement. In the words of Dean Church, it was " Keble who inspired, Froude who gave the impetus and Newman who took up the work " ; but the first organization of it was due to H. J. Rose, editor of the British Magazine, who has been styled " the Cambridge originator of the Oxford Movement." It was in his rectory house at Had- leigh, Suffolk, that a meeting of High Church clergymen was held, 25th to

29th of July (Newman was not present), at which it was resolved to fight for ” the apostolical succession and the integrity of the Prayer-Book.” A few weeks later Newman started, apparently on his own initiative, the Tracts for the Times, from which the movement was subsequently named ” Tractarian.” Its aim was to secure for the Church of England a definite basis of doctrine and discipline, in case either of disestablishment or of a determination of High Churchmen to quit the establishment, an eventuality that was thought not impossible in view of the States’ recent high-handed dealings with the sister established Church of Ireland. The teaching of the tracts was supplemented by Newman’s Sunday afternoon sermons at St Mary’s, the influence of which, especially over the junior members of the university, was increasingly marked during a period of eight years. In 1835 Pusey joined the movement, which, so far as concerned ritual observances, was later called ” Puseyite “; and in 1836 its supporters secured further coherence by their united opposition to the appointment of Hampden as regius professor of divinity. His Bampton Lectures (in the preparation of which Blanco White had assisted him) were suspected of heresy, and this suspicion was accentuated by a pamphlet put forth by Newman, Elucidations of Dr Hampden’s Theological Statements. At this date Newman became editor of the British Critic, and he also gave courses of lectures in a side-chapel of St Mary’s in defence of the via media of the Anglican Church as between Romanism and popular Protestantism. His influence in Oxford was supreme about the year 1839, when, however, his study of the monophysite heresy first raised in his mind a doubt as to whether the Anglican position was really tenable on those prin- ciples of ecclesiastical authority which he had accepted; and this doubt returned when he read, in Wiseman’s article in the Dublin Review on ” The Anglican Claim,” the words of St Augustine against the Donatists, ” securus judical orbis ter- rarum,” words which suggested a simpler authoritative rule than that of the teaching of antiquity. He continued his work, however, as a High Anglican controversialist until he had published, in 1841, Tract go, the last of the series, in which he put forth, as a kind of proof charge, to test the tenability of all Catholic doctrine within the Church of England, a detailed examination of the XXXIX. Articles, suggesting that their negations were not directed against the authorized creed of Roman Catholics, but only against popular errors and exaggera- tions. This theory, though not altogether new, aroused much indignation in Oxford, and A. C. Tait, afterwards archbishop of Canterbury), with three other senior tutors, denounced it as ” suggesting and opening a way by which men might violate their solemn engagements to the university.” The alarm was shared by the heads of houses and by others in

authority; and, at the request of the bishop of Oxford, the publication of the Tracts came to an end. At this date Newman also resigned the editorship of the British Critic, and was thenceforth, as he himself later described it, ” on his deathbed as regards membership with the Anglican Church.” He now recognized that the position of Anglicans was similar to that of the semi-Arians in the Arian controversy; and the arrangement made at this time that an Anglican bishopric should be established in Jerusalem, the appointment to lie alternately with the British and Prussian

governments, was to him further evidence of the non-apostolical character of the Church of England. In 1842 he withdrew to Littlemore, and lived there under monastic conditions with a small band of followers, their life being one of great physical austerity as well as of anxiety and suspense. To his disciples there he assigned the task of writing lives of the English saints, while his own time was largely devoted to the completion of an essay on the development of Christian doctrine, by which principle he sought to reconcile himself to the elaborated creed and the practical system of the Roman Church. In February 1843 he published, as an advertisement in the Oxford Conservative Journal, an anonymous but otherwise formal retractation of all the hard things he had said against Rome; and in September, after the secession of one of the inmates of the house, he preached his last Anglican sermon at Littlemore and resigned the living of St Mary’s. But still an interval of two years elapsed before he was formally received into the Roman Catholic Church (9th October 1845) by Father Dominic, an Italian Passionist. In February 1846 he left Oxford for Oscott, where Bishop Wiseman, then vicar-apostolic of the Midland district, resided; and in October he proceeded to Rome, where he was ordained priest and was given the degree of D.D. by the pope. At the close of 1847 he returned to England as an Oratorian, and resided first at Mary- vale (near Oscott); then at St Wilfrid’s College, Cheadle; then at St Ann’s, Alcester Street, Birmingham; and finally at Edg- baston, where spacious premises were built for the community, and where (except for four years in Ireland) he lived a secluded life for nearly forty years. Before the house at Edgbaston was occupied he had established the London Oratory, with Father Faber as its superior, and there (in King William Street, Strand) he delivered a course of lectures on ” The Present Position of Catholics in England,” in the fifth of which he protested against the anti-Catholic utterances of Dr Achilli, an ex-Dominican friar, whom he accused in detail of numerous acts of immorality. Popular Protestant feeling ran very high at the time, partly in consequence of the recent establishment of a Roman Catholic diocesan hierarchy by Pius IX., and Criminal

proceedings against Newman for libel resulted in an acknowledged gross miscarriage of justice. He was found guilty, and was sentenced to pay a fine of £100, while his expenses as defendant amounted to about £14,000, a sum that was at once raised by public subscription, a surplus being spent on the purchase of Rednall, a small property picturesquely situated on the Lickey Hills, with a chapel and cemetery, where Newman now lies buried. In 1854, at the request of the Irish bishops, Newman went to Dublin as rector of the newly-established Catholic university there. But practical organization was not among his gifts, and the bishops became jealous of his influence, so that after four years he retired, the best outcome of his stay there being a volume of lectures entitled Idea of a University, containing some of his most effective writing. In 1858 he projected a branch house of the Oratory at Oxford; but this was opposed by Manning and others, as likely to induce Catholics to send their sons to that university, and the scheme was abandoned. In 1859 he estab- lished, in connexion with the Birmingham Oratory, a school for the education of the sons of gentlemen on lines similar to those of the English public schools, an important work in which he never ceased to take the greatest interest. But all this time (since 1841) Newman had been under a cloud, so far as concerned the great mass of cultivated Englishmen, and he was now awaiting an opportunity to vindicate his career; and in .1862 he began to prepare autobiographical and other memoranda for the purpose. The occasion came when, in January 1864, Charles Kingsley, reviewing Froude's History of England in Macmillan's Magazine, incidentally asserted that " Father Newman informs us that truth for its own sake need not be, and on the whole ought not to be, a virtue of the Roman clergy." After some preliminary sparring between the two — Newman's pamphlet, " Mr Kingsley and Dr Newman: a Correspondence on the Ques- tion whether Dr Newman teaches that Truth is no Virtue," published in 1864 and not reprinted, is unsurpassed in the English language for the vigour of its satire: the anger displayed was

later, in a letter to Sir William Cope, admitted to have been largely feigned — Newman published in bi-monthly parts his Apologia pro vita sua, a religious autobiography of unsurpassed interest, the simple confidential tone of which " revolutionized the popular estimate of its author," establishing the strength and sincerity of the convictions which had led him into the Roman Catholic Church. Kingsley's accusation indeed, in so far as it concerned the Roman clergy

generally, was not precisely dealt with; only a passing sentence, in an appendix on lying and equivocation, maintained that English Catholic priests are as truthful as English Catholic laymen; but of the author's own personal rectitude no room for doubt was left.

In 1870 he put forth his Grammar of Assent, the most closely reasoned of his works, in which the case for religious belief is maintained by arguments differing somewhat from those com- monly used by Roman Catholic theologians; and in 1877, in the republication of his Anglican works, he added to the two volumes containing his defence of the via media a long preface and numerous notes in which he criticized and replied to sundry anti-Catholic arguments of his own in the original issues. At the time of the Vatican Council (1869-1870) he was known to be opposed to the definition of Papal infallibility, and in a private letter to his bishop (Ullathorne), surreptitiously published, he denounced the " insolent and aggressive faction " that had pushed the matter forward. But he made no sign of disapproval when the doctrine was defined, and subsequently, in a letter nominally addressed to the duke of Norfolk on the occasion of Mr Gladstone's accusing the Roman Church of having " equally repudiated modern thought and ancient history," Newman affirmed that he had always believed the doctrine, and had only feared the deterrent effect of its definition on conversions on account of acknowledged historical difficulties. In this letter, and especially in the postscript to the second edition of it, Newman finally silenced all cavillers as to his not being really at ease within the Roman Church. In 1878 his old college (Trinity), to his great delight, elected him an honorary fellow, and he revisited Oxford after an interval of thirty-two years. At the same date died Pope Pius IX., who had long mistrusted him; and Leo XIII. was encouraged by the duke of Norfolk and other distinguished Roman Catholic laymen to make Newman a cardinal, the distinction being a marked one, because he was a simple priest and not resident in Rome. The offer was made in February 1879, and the announcement of it was received with universal applause throughout the English-speaking world. The " creation " took place on 12th May, with the title of St George in Velabro, Newman taking occasion while in Rome to insist on the lifelong consistency of his opposition to " liberalism in religion." After an illness that excited appre- hension he returned to England, and thenceforward resided at the Oratory until his death, nth August 1890, making occasional visits to London, and chiefly to his old friend, R. W. Church, dean of St Paul's, who as proctor had vetoed the condemnation of Tract go in 1841. As cardinal Newman published nothing beyond a preface to a work by A. W. Hutton on the Anglican Ministry (1879) and an article on Biblical criticism in the Nine- teenth

Century (February 1884).

Newman's influence as controversialist and preacher {i.e. as reader of his written sermons, for he was never a speaker) was very great. For the Roman Church his conversion secured great prestige and the dissipation of many prejudices. Within it his influence was mainly in the direction of a broader spirit and of a recognition of the important part played by development both in doctrine and in Church government. And although he never called himself a mystic, he showed that in his judgment spiritual truth is apprehended by direct intuition, as an ante- cedent necessity to the professedly purely rational basis of the Roman Catholic creed. Within the Anglican Church, and even within the more strictly Protestant Churches, his influence was greater, but in a different direction, viz. in showing the necessity of dogma and the indispensableness of the austere, ascetic, chastened and graver side of the Christian religion. If his teaching ai to the Church was less widely followed, it was because

of doubts as to the thoroughness of his knowledge of history and as to his freedom from bias as a critic. Some hundreds of clergymen, influenced by the movement of which for ten or twelve years he was the acknowledged leader, made their sub- mission to the Church of Rome; but a very much larger number, who also came under its influence, failed to learn from him that belief in the Church involves belief in the pope. The natural tendency of his mind is often (and correctly) spoken of as sceptical. He held that, apart from an interior and unreasoned conviction, there is no cogent proof of the existence of God; and in Tract 85 he dealt with the difficulties of the Creed and of the canon of Scripture, with the apparent implication that they are insur- mountable unless overridden by the authority of an infallible Church. In his own case these views did not lead to scepticism, because he had always possessed the necessary interior con- viction; and in writing Tract 85 his only doubt would have been where the true Church is to be found. But,, so far as the rest of the world is concerned, his teaching amounts to this: that the man who has not this interior conviction has no choice but to remain an agnostic, while the man who has it is bound sooner or later to become a Roman Catholic.

He was a man of magnetic personality, with an intense belief in the significance of his own career; and his character may be described as feminine, both in its strength and in its weakness. As a poet he had inspiration and genuine power. Some of his short and earlier poems, in spite of a characteristic element of fierceness and intolerance in one or two cases, are described by R. H. Hutton as " unequalled for

grandeur of outline, purity of taste and radiance of total effect "; while his latest and longest, " The Dream of Gerontius," is generally recognized as the happiest effort to represent the unseen world that has been made since the time of Dante. His prose style, especially in his Catholic days, is fresh and vigorous, and is attractive to many who do not sympathize with his conclusions, from the apparent candour with which difficulties are admitted and grappled with, while in his private correspondence there is a charm that places it at the head of that branch of English literature. He was too sensitive and self-conscious to be altogether successful as a leader of men, and too impetuous to take part in public affairs; but he had many of the gifts that go to make a first-rate journalist, for, " with all his love for and his profound study of antiquity, there was something about him that was conspicuously modern." Nevertheless, with the scientific and critical literature of the years 1850-1890 he was barely acquainted, and he knew no German. There are a few passages in his writings in which he seems to show some sympathy with a broader theology. Thus he admitted that there was " something true and divinely revealed in every religion." He held that "freedom from symbols and articles is abstractedly the highest state of Christian communion," but was " the peculiar privilege of the primitive Church." And even in 1877 he allowed that " in a religion that embraces large and separate classes of adherents there always is of necessity to a certain extent an exoteric and an esoteric doctrine." These admissions, together with his elucidation of the idea of doctrinal development and his eloquent assertion of the supremacy of conscience, have led some critics to hold that, in spite of all his protests to the contrary, he was himself somewhat of a Liberal. But it is certain that he explained to his own satisfaction and accepted every item of the Roman Catholic creed, even going beyond it, as in holding the pope to be infallible in canonization; and while expressing his preference for English as compared with Italian devotional forms, he was himself one of the first to introduce such into England, together with the ritual peculiarities of the local Roman Church. The motto that he adopted for use with the arms emblazoned for him as cardinal — Cor ad cor loquitur, and that which he directed to be engraved on his memorial tablet at Edgbaston — Ex umbris et imaginibus in verilatem — together seem to disclose as much as can be disclosed of the secret of a life which, both to contemporaries and to later students, has been one of almost fascinating interest, at once devout and inquiring, affectionate and yet sternly self-restrained.

There is at Oxford a bust of Newman by Woolner. His portrait by Ouless is at the Birmingham Oratory, and his portrait by Millais is in the possession of the duke of Norfolk, a replica being at the London Oratory. Outside the latter building, and facing the Brompton Road, there is a marble statue of Newman as cardinal. (A. W. Hu.)

The chief authorities for Newman's life are his Apologia and the Letters and Correspondence, edited by Miss Mozley, above referred to. The letters and memoranda dealing with the years 1 845-1 890 were entrusted by Newman to the Rev. W. Neville as literary executor. Works by R. W. Church, J. B. Mozley, T. Mozley and Wilfrid Ward should also be consulted, as well as an appreciation by R. H. Hutton. Adverse criticism will be found in the writings of Dr E. A. Abbott (e.g. The Anglican Career of Cardinal Newman, 2 vols. London, 1892), while some minor traits and foibles were noted by A. W. Hutton in the Expositor (September, October and November 1890). See also P. Thureau-Dangin, La Renaissance catholique: Newman et le mouvement d'Oxford (Paris, 1899) ; Lucie Felix-Faure, Newman, sa vie et ses asuvres (ib. 1901); MacRae, Die religiose Gewissheit bei John Henry Newman (Jena, 1898); Grappe, John Henry Newman. Essai de psychologie religieuse (Paris, 1902) ; . • William Barry, Newman (London, 1903); Lady Blennerhassett, J. H. Kardinal-Newman (Berlin, 1904) ; Bremond, Newman. Le developpement du dogme Chretien (Paris, 1905; 4th ed., 1906), Psy- chologie de la joi (ib. 1906), and Essai de biographie psychologique (ib. 1906).

NEWMARCH, WILLIAM (1820-1882), English economist and statistician, was born at Thirsk, Yorkshire, on the 28th of January 1820. He settled in London in 1846 as an official of the Agra Bank, but resigned in 1851 on his appointment as secretary of the Globe Insurance Company. This post he held till 1862,. when he became chief officer in the banking-house of Glyn, Mills & Co., in whose employ he remained until 1881. Notwithstanding the continuous pressure of an active business life he found time to contribute largely many valuable articles to the magazines and newspapers, and took an active part in the proceedings of the Royal Statistical Society (of which he was one of the honorary secretaries, editor of its journal, and in 1869-1871 president) and the Political Economy Club. He was also elected a fellow of the Royal Society. His extensive knowledge of banking was displayed in the evidence which he gave before the select com- mittee on the Bank Acts in 1857. He collaborated with Thomas Tooke in the two final volumes of his History of Prices and was responsible for the greater part of the work in those volumes. For nineteen years he wrote an admirable survey, of the com- mercial history of the year in the Economist. He died at Torquay on the 23rd

of March 1882. After his death his friends founded, in perpetuation of his memory, a Newmarch Lectureship in economic science and statistics at University College, London.

NEWMARKET, a market town in the Newmarket parlia- mentary division of Cambridgeshire, England, 13J m. E. by N. of Cambridge on the Bury branch of the Great Eastern railway. Pop. (iqoi) 10,688. A part of the town is in Suffolk, and the urban district is in the administrative county of West Suffolk. Newmarket has been celebrated for its horse-races from the time of James I., though at that time there was more of coursing and hawking than horse-racing. Charles I. instituted the first cup- race here. For the use of Charles II., during his visits to the races, a palace, no longer extant, was built on the site of the lodge of James I. There are numerous residences belonging to patrons of the turf, together with stables, and racing and training establishments. The racecourse, which lies south-west of the town, has a full extent of 4 m., but is divided into various lengths to suit the different races. The course intersects the so-called Devil's Ditch or Dyke (sometimes also known as St Edmund's Dyke) , an earthwork consisting of a ditch and mound stretching almost straight for 5 m. from Reach to Wood Ditton. It is 12 ft. wide at the top, 18 ft. above the level of the country, and 30 ft. above the bottom of the ditch, with a slope of 50 ft. on the south-west side and 26 ft. on the north-east. It formed part of the boundary between the kingdoms of East Anglia and Mercia, but is doubtless of much earlier origin. Roman remains have been found in the neighbourhood.

NEW MECKLENBURG (Ger. Neu-Mecklenburg, formerly New Ireland, native Tombara), an island of the Bismarck Archipelago,

N.E. of New Guinea in the Pacific Ocean, about 3 S., 152° E., in the administration of German New Guinea. It is about 240 m. long but seldom over 15 wide. From St George 's Channel at the south, separating it from New Pomerania, it sweeps north and then north-west, being divided from New Hanover at the other extremity by Byron Strait. It is mountainous throughout, having an extreme elevation of about 6500 ft. in the north, where the prevalent formations are sandstone and limestone, whereas in the south they are granite, porphyry and basalt. There is a white population of about forty; the natives are Papuans of a less fine type than the natives of New Pomerania, and rather resemble the Solomon islanders. Jacob Lemaire and Willem Cornelis Schouten sighted New Mecklenburg in 16 16, but it was only recognized as part of an island separate from New Guinea by William Dampier in 1700, and as separate from New Pomerania in 1767 by Philip Carteret.

NEW MEXICO, a south-western state of the United States, lying between 31 20′ and 37° N. lat., and 103 s and 109 2′ W. long. It is bounded N. by Colorado; E. by Oklahoma and Texas; S. by Texas and Mexico; and W. by Arizona. It has an extreme length N. and S. of 400 m., an extreme width E. and W. of 358 m., and a total area of 122,634 sq. m., of which 131 sq. m. are water-surface.

Physiography. — New Mexico is a region of mountains and high plateaus. Broadly speaking, its surface is a vast tableland tilted toward the S. and E., and broken by parallel ranges of mountains whose trend is most frequently N. and S. About midway between the western boundary and the Rio Grande passes the Continental Divide, which separates the waters entering the Gulf of Mexico from those that flow into the Gulf of California. In the region E. of the Continental Divide, which embraces about three-fourths of the surface of the state, the general south-eastern slope is very marked. Thus, at Santa Fe, in the north central part of the state, the elevation is 7013 ft.; at Raton, in the N.E., 6400 ft.; at Las Cruces, in the extreme S., 3570 ft.; and at Red Bluff, in the extreme S.E., 2876 ft.

The Rocky Mountain system enters New Mexico near the centre of the northern boundary; its main ridge, lying E. of the Rio Grande, extends as far S. as the city of Santa Fe. It forms the water-parting between the upper waters of the Canadian river and the Rio Grande, and contains many of the loftiest peaks in New Mexico, among them being Truchas (13,275 ft.), Costilla (12,634 ‘*•) and Baldy (12,623 ft.). On the E. this ridge is bounded by the region of the Great Plains, the dissected topography of which is character- ized by many broad valleys intervening. W. of the Rio Grande lies a series of lower ranges, also a part of the Rocky Mountain system, whose western slopes merge almost imperceptibly with the Plateau Region. The San Juan, Gallinas and Nacimiento ranges are among the most notable in this group. South of the Rocky Mountains lies the so-called Basin Region, in which isolated, but sometimes lofty and massive, mountains, the result in many instances of a series of numerous parallel faults, rise from level plains like islands from the sea and enclose the valleys with bare walls of grey and brown rock. These valley plains, from 10 m. to 20 m. wide and sometimes 100 m. long, sloping gradually toward their centres, are usually covered with detritus from the neighbouring mountains, and seldom have a distinct drainage outlet. The Spaniards called them “bolsons ” (purses), a term that geologists have retained. In many of these bolsons are ephemeral lakes, in which the waters collect during the rainy season and stand for several months. These waters are fre- quently impregnated with alkali or salt, and on evaporating leave upon the bed of the lake a thin encrustation of

snowy whiteness. Such beds, locally known as ” alkali flats,” are especially numerous in Valencia, Socorro, Dona Ana and Otero counties, and a number of them furnish all the salt needed by the cattle ranges in their vicinity. East of the San Andreas Range, in the south central part of New Mexico, lies the basin of the extinct Lake Otero, in which are found the remarkable ” white sands,” consisting of dunes of almost pure granular gypsum and covering the area of 300 sq. m. In this region many species of reptiles and insects are almost perfectly white — an interesting example of protective coloration. Both E. and W. of the central portion of the Basin Region the bolson plains soon lose their distinctive character, the valleys become wider and broader and the mountains less lofty and more isolated. East of the Pecos and S. of the Canadian rivers lies the great arid tableland known as the Staked Plains (Llano Estacado) , a vast stretch of barren wastes, with almost nothing to break the monotony of its landscape. This is a part of the Great Plains and a continuation of the high plains region of Texas. The Plateau Region includes most of the area N.

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of the Gila river and W. of tne Rio Grande. Here volcanic activity and powerful erosion have combined to produce a series of remarkable scenic effects. The eastern border of this area is formed by the valley of the Rio Grande and the western foot-hills of the Rocky Mountains; the southern boundary overlooks the Gila river; and on the N. and W. the plateau continues into Colorado, Utah and Arizona. Near its southern and eastern borders are many lava flows and extinct volcanic mountains, one of the most imposing of those in New Mexico being the Mt. Taylor volcano (11,389 ft.), which is surrounded by lava tables and some of the most wonderful volcanic buttes in the world. In other portions of New Mexico there is also much evidence of former volcanic activity. A conspicuous feature of the New Mexican landscape is the mesa, a flat-topped hill created by differential erosion and projecting above the surrounding country like a table. A notable example is the mesa of Acoma, in Valencia county, capped with volcanic rocks; upon its summit, about 350 ft. above the plain, is the Indian pueblo of Acoma.

The average elevation of New Mexico is 5700 ft., with 40,200 sq. m. between 3000 and 5000 ft. ; 56,680 sq. m. between 5000 and 7000 ft.; 22,500 sq. m. between 7000 and 9000 ft.; and 2000 sq. m. above

9000 ft.

For a region with such a small amount of rainfall the rivers are numerous, but none of the streams is navigable, and in many of them during the dry season (and in some of them because of broken stratification) the water in places disappears entirely beneath the sandy bed, and after flowing underground for some distance, breaks out afresh farther on as a river, rivulet or spring. The most im- portant stream is the Rio Grande, which, rising in southern Colorado, enters New Mexico through deep canyons near the centre of the northern boundary and continues southward across the entire state. During its course it changes from a mountain stream in the N. to a sluggish river turgid with sand in the S. In the lowlands it loses much of its volume through evaporation and absorption by the sands, and through irrigation, and in its lower course in New Mexico its bed is frequently dry. In the flood season it usually leaves its banks and inundates the lowlands, spreading over the sands a rich deposit of silt; and on account of this characteristic it is sometimes called ” the Nile of New Mexico.” The stream next in importance is the Pecos river, which rises in Mora county and flows southward into Texas, where ; t joins the Rio Grande. It has the same general characteristics as the latter river, being a mountain stream near its source, and after leaving the highlands becoming sluggish and losing much of its water. Along the lower course many underground streams from the mountains break out as springs and empty into the Pecos. The Canadian river drains the eastern slope of the Rocky Mountains and flows in a general south-easterly direction through Texas into Oklahoma, where it empties into the Arkansas. Most of its course in New Mexico lies through a canyon. The westward-flowing streams — the San Juan, Rio Puerco of the West, Zufii, Rio San Francisco and Gila — are of only slight im- portance, though their flow is perennial. In the valleys there are many small streams whose waters never reach the ocean, but disappear by seepage or evaporation.

Fauna and Flora. — Of native animals the species are numerous, but their numbers are small. Bison no longer roam the plains, and the elk has been driven out; but among the larger mammals still to be found in certain districts are the deer, prong-horn (in small numbers), puma, coyote, timber wolf, lynx (Lynx rufus and Lynx Canadensis) and the black and grizzly bear. Badgers, hares and rabbits are found everywhere, and prairie-dogs are so numerous in some places as to be considered a nuisance. There are numerous species of aquatic birds* From time to time upon the Rio Grande may be seen ducks, wild geese, swans, cranes, herons and gulls. Eagles are often seen, and in the arid and elevated regions crows and ravens are numerous.

Gamble's quail, bob-white, grouse, English pheasants and wild turkeys are the most important game birds, and the mocking-bird is common throughout south-western New Mexico. Among the venomous reptiles and insects are the rattlesnake, the Gila monster (Heloderma suspeclum), a poisonous lizard, and the tarantula (Mygale Heinizii), which, however, are common only in certain places and at certain seasons.

New Mexico has such a great range of elevations that all four of the zones of vegetation into which the South-West has been divided according to altitude are found within its limits; namely, the zone of cactus, yucca and agave (3000-3500 ft.), where grass is scanty; the zone of greasewood and sage-brush (3500-4900 ft.), where there is little grass, and the cactus species are less numerous; the zone of the cedar (4900-6800 ft.) ; and the zone of the pine and fir (6800- 10,800 ft.), in which grass is more abundant. The total woodland area has been estimated at 25,700 sq. m., or a little more than 19 % of the land area. Only the higher ranges and plateaus are timbered, and even there the forests are not dense. The lower slopes are usually covered with the scrub oak, juniper and pifion; but some mountains, especially those along the eastern border of the Rio Grande Valtey, are absolutely treeless. The principal forest areas are upon the southern end of the San Juan Range, upon the Sangre de Cristo Range and in Socorro county, W. of the Rio Grande. The chief_ varieties of timber are the red fir, Engelmann's spruce and vellow pine. Up to_ 1910 the Federal government had created eleven forest reservations in New Mexico, embracing an area of

10,971,711 acres. In the valleys the only trees native to the soil are the willow and cottonwood, found along the water Courses, and beyond the range of irrigation vegetation is limited to scanty grass, with sage-brush and greasewood in the N. and cactus and yucca in the S.

Climate. — As the winds that reach New Mexico have been desiccated while crossing the plains of Texas or the mountains of the N.W., the climate is characterized by a lack of humidity. The sandy soil quickly absorbs the sun's heat and also quickly radiates it, so that there is great daily variation in the temperature. The low humidity, high altitudes and southern latitude all combine to make the climate salubrious and especially beneficial to persons suffering with pulmonary disorders. The highest temperature ever recorded was no° F. at Roswell; the lowest, -23° at Aztec. At Santa Fe, where mountain and plain meet, the mean annual temperature is 49 ; the mean for the winter is 31 and for the summer 67°; and the highest and lowest

temperatures ever recorded were respectively 97° and -13°. At Fort Bayard, in the S.W., the mean temperature for the year is 55 ; the mean for the winter is 39°, with an extreme recorded of -i°; the mean for the summer is 72 °, with a maximum recorded of 103 . At Mesilla Park, in the lower Rio Grande Valley, the mean annual temperature is 60°; for the winter it is 43 , with a minimum of i°, and for the summer 77 , with a maximum of 106 . In all parts of New Mexico except the N.W. there is a so-called wet . season, which begins early in July and lasts for a month or six weeks, the rain coming in the form of short afternoon thunderstorms. About a third of the precipitation occurs during July and August, but after August the monthly precipitation is steadily less until March, in which month only about 3 % of the annual rainfall occurs. For all of New Mexico the mean precipitation is about 13 in., ranging from 9 in. in the lower Rio Grande Valley to 25 in. on the mountain ranges at elevations of 10,000 ft. and over. In the valleys there are usually about two snows a year and these quickly disappear ; but on the mountain peaks and in the canyons the snow accumulates to great depths and forms a steady source of water-supply for the rivers. It is the melting of the snows on the Rocky Mountains, and not the rainy season, that produces the floods of the Rio Grande.

Soils. — The prevailing type of soil on the higher lands is a sandy loam, underlaid with clay or clay loam, which stores water and is the typical soil of the basins. Along the river valleys there are limited areas of fine sediment, and here with irrigation good crops can be grown without the use of fertilizers. In the plains where drainage is poor, especially in the S., the soils contain too much alkali; but in the highlands most of this has been dissolved and carried away by the rains, and the soils are well adapted for grazing grounds.

Agriculture. — Because of the small amount of rainfall, agriculture is confined chiefly to the river valleys. In 1900 only 4-2 % of the land surface was included in farms, and less than -27 of I % was classed as improved farm land. The total acreage, however, rose from 787,882 in 1890 to 5,130,878 in 1900, an increase of 551-2%. Between 1850 and 1880 there was very little increase in farm area, The amount of improved land, though showing an absolute increase between 1880 and 1900, declined relatively to the total area in farms from 37-6% in 1880 to 6-4% in 1900. At the same time the average size of farms (not including farms with an area of less than 3 acres, which reported an annual income of less than $500) increased from 124-9 acres in 1880 to 433-6 acres in 1900. This decrease in the pro- portion of improved acreage and increase in the average size of the farms is due to the increased use of lands for grazing purposes. As regards tenure, 90-6 % of the farms in 1900 were operated by owners, 2-2% by cash tenants,

and 7-2% by share tenants. In this year 39-6% of the farms derived their principal income from hay and grain, 33-2 % from live stock, 5‘5 % from dairy produce, 3-5% from vegetables, 2-8% from fruits. The most important crop, as a result of irrigation, is alfalfa, which is grown for forage, requires little attention, and improves the soil. Wheat, Indian corn and oats are the leading cereal crops; and S. of the latitude of Santa Fe vegetables and deciduous fruits flourish where the water- supply is ample. A little cotton has been grown near Carlsbad in the Pecos Valley, and in 1909 sugar beets were introduced south of Albuquerque and cantaloupes in the southern Rio Grande Valley. Fruit, especially the Bartlett pear, is very successful. The total value of farm property in 1900 was $53,767,824, and the value of the live stock, $31,727,400. The value of the farm products in 1879 was $1,897,974, in 1889 $1,784,824, and in 1899 $10,155,215. In 1909 the values of the principal farm products (according to the Year Book of the U.S. Department of Agriculture) were as follows : hay, $5,339,000; wheat, $1,175,000; Indian corn, $1,915,000; oats, $634,000; and potatoes, $86,000. The values of the various classes of live stock on the 1st of January 1910 were as follows: sheep, $13,714,000; milch cows, $1,125,000; other neat cattle, $15,677,000; horses, $6,251,000; mules, $632,000; swine, $272,000. Stock-raising is the most important industry, and the growing of sheep for wool takes a leading place. The hills and mesas covered with the nutritious grama grass form excellent grazing grounds, which are most extensive in Bernalillo, Guadalupe, Rio Arriba, San Miguel, Union and Valencia counties. In April 1907 (according to an estimate of the National Association of Woo! Manufacturers) New Mexico contained 2,600,000 sheep, the largest

number in any state or Territory except Montana and Wyoming; and in April 1909 there were 3,200,000 sheep of shearing age in New Mexico, but this number was less than that in Montana or Wyoming at that time.

Except in a few mountain valleys in the N., agriculture was long entirely dependent upon irrigation, which has been practised in New Mexico by the Pueblo Indians since prehistoric times. In 1899 the total irrigated area outside of Indian reservations amounted to 203,893 acres (67-2% of all improved land)— an increase of 122-2% in the preceding decade. Of the total land in crops in that year 89-2 % was irrigated. After the passage of the Federal Reclamation Act in 1902, a

number of extensive irrigation works in New Mexico were undertaken by the Federal government. The Carlsbad reservoir and diverting dam in Eddy county and the Rio Hondo canals and reservoir in Chaves county were completed in 1907 and are capable of supplying water to tracts of 20,000 and 10,000 acres respectively. In 1908 an irrigation reservoir in McKinley county for the use of the Zufii Indians and the Leasburg project (Dona Ana county; 20,000 acres) were completed. The Rio Grande project was planned in 1907 for the storage of the flood waters of the Rio Grande near Engle, New Mexico, in order to reclaim about 155,000 acres of land in New Mexico and Texas, and to deliver to Mexico above the city of Juarez 60,000 acre-feet of water per year, as provided by a treaty (proclaimed on the 16th of January 1907) between that republic and the United States. Other systems contemplated by the government were the Las Vegas project for reclaiming 10,000 acres near Las Vegas, the Urton Lake project for reclaiming 60,000 acres in the Pecos Valley, and the La Plata Valley project for irrigating about 40,000 acres in the north- western part of New Mexico, 35 m. S.W. of Durango, Colorado. A special irrigation commission was appointed in 1897, and in 1905 the legislature created the office of Territorial irrigation engineer. Irriga- tion by private companies is of some importance, especially in the San Juan Valley, the Rio Grande Valley and the Pecos Valley. In 1909 it was estimated that about 500,000 acres were irrigated. Dry farming has proved a great success in New Mexico, as elsewhere in the South-West, especially since 1900; and in 1907 it was estimated that 2,000,000 acres were cultivated without irrigation.

Manufactures. — As New Mexico is primarily a mining and stock-raising region, its manufacturing industries are of comparatively small importance. The value of the manufactured products in 1880 was $1,284,846; in 1890 $1,516,195; and in 190*0 $5,605,795, an increase in the latter decade of 269-7%. In 1905 there were 199 establishments under the factory system (an increase of 14-4% over the number in 1900); the amount of capital invested was $4,638,248, and the value of ” factory ” products was $5,705,880 (an increase of 40-5% over the value of the ” factory ” products in 1900). The leading industries in 1905 were the construction of cars and general railway shop and repair work by steam railway companies (value of product, $2,509,845), the manufacture of lumber and timber products (value $1,315,364) and of flour and grist mill products (value $388,124), and the printing and publishing of newspapers and periodicals (value $279,858). In 1900 the manufactures of Albu- querque, Santa Fe and Socorro were valued at 39-4% of the total value of New Mexico’s products.

Minerals. — The existence of valuable mineral deposits was early known to the Spaniards. There was some production of gold by the Mexicans, but the silver mining was unimportant until 1881, when the Lake Valley silver mines in Sierra county began to yield. Be- tween that year and 1884 the coining value of the silver product increased from $275,000 to $3,000,000. After 1885 there was a gradual decline in the output, whose bullion value in 1908 was $250,986. The production of gold has shown a somewhat similar movement; the output in 1881 was valued at $185,000; in 1889, at $1,000,000, and in 1908 at $298,757. The leading gold- and silver-producing counties are Socorro, Grant, Sierra and Dona Ana. Only silver is mined in the last-named county. Copper has been mined for many years, and in 1906 and 1908 constituted New Mexico's most valuable metallic product, the value of the yield in these years being $'• 356,533 and $658,858 respectively. Nearly all the product comes from Grant county, and in 1008 nearly 98 % of the output was from Grant and Otero counties. In 1905-1908 the decrease in output was large. In the same years there was an increase in the output of zinc, which in 1906 was valued at $67,710 and in 1908 at $168,096. Most of the zinc comes from Socorro county, where the mines of the Magdalena District in 1908 yielded 93% of the entire product. A small amount of lead is produced incidentally to the mining of zinc, being derived from mixed lead and zinc ores. Far the most important mineral product, however, is coal, which is found in all forms — lignite to anthracite — and in widely distributed areas. The chief centres of production are the Raton field, in Colfax county ; the Durango-Gallup field, in McKinley and Rio Arriba counties; the Whiteoaks field, in Lincoln county; and the Los Cerillos and Tejon areas, in Santa Fe county. Much of the coal is suitable for coke, of which a considerable amount is manufactured. The value of the coal product in 1902 was $1,500,230; in 1904, $1,904,499; and in 1908, $3,368,753. Iron ores are widely distributed, but have not been developed; graphite is mined in Colfax county; mica in Taos county, and to a small extent in Rio Arriba county; marble is quarried in Otero county and sandstone in Bernalillo, Colfax and San Miguel counties. Gypsum beds are widely distributed, and the

supply is inexhaustible, but their great distance from centres of con- sumption has prevented their profitable working. In New Mexico are found turquoises and a few garnets; it seems probable that turquoises were mined by the Aztecs. The largest of the old Spanish turquoise mines in the Cerillos District, 18 m. S. of Santa Fe, furnished a turquoise product between 1890 and 1900 valued at more than $2,000,000. Other mines are in Grant and Otero counties. The New

Mexican garnets are found in McKinley county. The output of precious stones in 1902 was valued at $51,100, in 1908 at $72,100.
Transportation. — The total railway mileage on the 3 1 st of December 1908 was 2,918-02, more than twice as much as that of 1890. The length of railway per inhabitant in New Mexico in 1907 was about five times as great as that for the whole country, but the amount of line per square mile of territory was only about one-third as great as the average for the United States. New Mexico is traversed by two transcontinental lines, the Atchison, Topeka & Santa Fe, from Chicago to San Francisco and the Southern Pacific, from New Orleans to San Francisco. The main line of the former enters New Mexico near Raton, extends S.W. to Albuquerque and thence westward into Arizona. A southward extension taps the Southern Pacific at El Paso, Texas, and Deming, New Mexico, and there are numerous shorter branches. This system also controls the Pecos Valley & North-Eastern railway, which serves the south- western part of New Mexico. The Southern Pacific crosses New Mexico westward from El Paso, Texas. The western division of the El Paso & South-Western system, connecting El Paso and Benson, Arizona, crosses New Mexico just N. of the Mexican boundary. Its eastern division (including the El Paso & North- Eastern, the El Paso & Rock Island, the Alamogordo & Sacramento Mountain and the Dawson railways) connects with the Chicago, Rock Island & Pacific at Tucumcari; thus forming a connecting link between that system and the Southern Pacific. The Santa Fe Central, extending southward from Santa Fe to Torrance, is a con- necting link between the Atchison, Topeka & Santa Fe and the El Paso & South-Western systems. Branches of the Denver & Rio Grande serve the northern parts of New Mexico.

Population. — The population of New Mexico consists of three distinct classes — Indians; Spanish-Americans, loctdly known as ” Mexicans “; and the English-speaking class called, in distinction from the others, ” Americans.” Of the Indians there are two types, both of the Athapascan family; in one are the Pueblos, and in the other the Navahos, in the N.W. part of the state, and their near kinsmen, the Apaches, to the south. The Pueblo Indians live in adobe houses, are quiet and usually self-sustaining, and have been converted to the forms of Christi- anity. They had irrigated farms and dwelt in six-storey com- munal houses long before the advent of the white man. By the treaty of Guadalupe-Hidalgo, in 1848, the United States govern- ment recognized them as citizens. They lived in 19 villages of pueblos, the largest of which, Zuni, is more properly called a reservation, as it has been enlarged from time to time by grants from the Federal government. The 18 pueblos and the Zufii reservation contained in

1900 a population of 8127, and a total area of 1417 sq. m. The pueblos are held under Spanish grants which were confirmed by the United States. The terraced architecture of the villages is very remarkable. Originally the Pueblo Indians lived in many-storeyed communal houses, built sometimes of stone, sometimes of adobe, and occasionally chiselled into the sides of a stone cliff, as best suited the con- venience of the builders. At present there is a tendency among them to copy the one-storey huts of the Mexicans. Taos (pop. in 1900, 419) is one of the most imposing of the pueblos, consisting of two six-storeyed pyramidal tenements, separated by a brook. Zuni (pop. 1525) has a five-storeyed dwelling surrounded by detached huts; Acoma (pop. 492 in 1900; 566 in 1902), standing on a cliff 357 ft. high (Acoma means “people of the white rock ” and Aco, the Indian name for the pueblo, means ” white rock “), contains three blocks of three-storeyed terraced buildings, 1 and Laguna also contains some three-storeyed

- About 3 m. N.E. of Acoma stands the Enchanted Mesa (Mesa Encantada; Katzimo in Keresan), rising 430 ft. above the plain, and being 2050 ft. long and 100 to 350 ft. wide. Upon its summit, according to Indian tradition, once stood the village of Acoma, but while the inhabitants were tending their crops in the plains a powerful earth movement threw down the rocky ladder by which alone the summit could be reached. According to the story, three women had been left in the village and these perished. The Mesa was first climbed by white men in 1896 by Prof. William Libbey (b. 1855), of Princeton University; it was climbed again in 1897 by a party led by F. W. Hodge ; and pottery and stone implements were found here.

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dwellings, but the Laguna tribe, numbering, 1077 in 1900 and 1384 in 1905, now live mostly in their former summer villages on the plain. The other Indians live on reservations, of which there are three: the Mescalero Apache reservation, in Otero county, containing 554 Indians in 1900; the Jicarilla Apache reservation, in Rio Arriba county, with a population of 829; and the Navaho reservation, in Utah, Arizona and New Mexico, which contains in that part of it situated in New Mexico a population of 2480.

The inhabitants of Spanish descent have been only slightly assimilated and cling tenaciously to their racial peculiarities. As a rule, they live in low adobe houses built around a court, and are poor and ignorant, but hospitable. They are more Americanized in the Rio Grande Valley than among the moun- tains, where English is rarely spoken. Many of them have intermarried with the Indians, creating the class of half-breeds known as ” Mestizos.” Although the proportion of Spanish-American and Indian inhabitants is steadily decreasing with the arrival of immigrants from other parts of the United States, it was nevertheless computed by the New Mexican authorities to be about 63 % in 1904. About one-tenth of the Spanish- American and Indian population habitually use the English language.

The total population of New Mexico in 1870 was 91,874; in 1880, 119,565; in 1890, 153,593; in 1900, 195,310, and in 1910, according to the U.S. census, the figure was 327,301. Of the native white population in 1900, 17,917 were of foreign parentage. Of the foreign-born element 6649, or about one-half, were Mexicans, 1360 were Germans and the rest chiefly English, Irish, Canadians, Italians, Scotch and Austrians. The chief cities were Albuquerque (6238), Santa Fe (5603), Las Vegas (3552) and Raton (3540). Far the greater portion of the popula- tion (in 1906, 56-2% of the estimated population) are communi- cants of the Roman Catholic Church, which had in 1906 121,558 members, the total communicants of all denominations in that year numbering 137,009. Among Protestants there were 6560 Methodists, 2935 Presbyterians and 2331 Baptists.

Administration. — The executive officers until 191 1 were a governor and a Territorial secretary appointed by the President of the United States, and a treasurer, auditor, superintendent of public instruction, adjutant-general, commissioner of public lands and other administrative officials appointed by the governor. The legislative department included a council of 12 members and a House of

Representatives of 24 members, chosen by popular vote. The sessions were biennial and limited to 60 days. All laws passed by the Assembly and approved by the governor had to be submitted to the Federal Congress for its ap- proval. The Territory was represented in Congress by a delegate, chosen by popular vote, with the right to speak in the national legislature but not to vote. The judicial department included a supreme court, district courts, probate courts and local justices of the peace. The supreme court consisted of a chief justice and six associate justices appointed by the President. There were seven judicial districts, each with a court presided over by a justice of the supreme court. Each county had a probate court, and each precinct a justice of the peace.

For the purposes of local government New Mexico is divided into 26 counties, each being governed by a board of county commissioners, chosen by the people. Each county is divided by the commissioners into precincts. Municipal corporations with a population of 3000 and over are cities, and are governed through a mayor and board of aldermen; those with a population of between 1500 and 3000 are towns, and are governed through a mayor and trustees.

A rather unusual institution within New Mexico is the mounted police, who numbered 11 in 1907, whose work was almost entirely in the cattle country, and who had authority to patrol the entire Territory and to make arrests or to preserve order wherever their presence was needed, unhampered by the restrictions limiting the jurisdiction of local police.

A homestead not exceeding $1000 in value, and held by a husband and wife or by a widow or widower with an unmarried daughter or an unmarried minor son, may be held exempt from seizure and sale by legal process. The exemption may be claimed by either the husband or the wife, but may not be granted if each owns a home-

stead; and it does not extend to judgments rendered against the debtor on account of a mortgage, non-payment of the purchase money or supplies and labour for building and repairs.

In 1907 the legislature passed a radical measure, mating the pen- alty for operating games of chance six months' imprisonment in the county-jail, and, at the discretion of the court, a fine of not less than $100 and not more than $500; this law went into effect on the 1st of January 1908. Gambling had formerly been licensed — the gambling-house keeper paying $200 per annum for each gaming table or apparatus, this sum going to the district and county school funds.

Revenues for the support of the government are derived chiefly from the general property tax. There are also special corporation taxes on car companies, express companies and foreign corporations producing, refining or selling petroleum or coal oil : and a system of licence-charges or business taxes. A poll tax is levied by the state for school purposes and may also be levied by municipalities. The county and the municipal tax rates are limited respectively to 5 and 10 mills on the dollar. A special tax not exceeding 3 mills on the dollar may be levied on all taxable property for school purposes, and the proceeds apportioned among the school districts according to the number of school children. The proceeds of the poll tax are distributed in the counties in which the tax is collected. Each school district may supplement the aid from the state by laying special taxes, and the Federal government has granted to each township 4 sq. m. of public land to aid in the support of the schools. Land- grants amounting in 1907 to 1,343,080 acres had also been made for the benefit of various educational, charitable and correctional institutions, and for irrigation purposes. At the close of the fiscal year ending on the 31st of May 1908, New Mexico showed ex- penditures of $721,272-81, receipts of $754,080-94 and a balance in the treasury of $378,653:63. The bonded debt, amounting on the 31st of May 1908 to $788,000, was incurred partly in meeting temporary deficits in the treasury and partly in the construction of public buildings.

Education. — At ,the head of the public school system is a Board of Education of seven members, including the governor and the super intendent of public instruction; this Board apportions the school fund among the counties, selects the text-books and prepares the examinations for teachers. The superintendent of public instruction exercises a general supervision over the schools of New Mexico. There is also a superintendent of schools for each county, and the counties are divided into school districts, each having three directors, who disburse the school funds and have the care of the school property. In incorporated cities and towns these functions are dis- charged by local boards of education. The school age is from five to twenty-one years, and for children between the ages of seven and fourteen school attendance for three months in each year is com- pulsory. The total enrollment for the year ending the 1st of August 1906 was 39,377, with an average daily attendance of 25,174; the average length of the school year was 5 months and 19 days. The use of English in the schoolroom is required by law; New Mexico has adopted a uniform system of text-books.

The state supports the University of New Mexico at Albu- querque; a College of Agriculture and Mechanic Arts 1 (established 1889, opened

1890) at Mesilla Park, 40 m. from El Paso; a Normal School at Silver City (pop. 1900, 2735; county-seat of Grant county); a Normal University at Las Vegas; a School of Mines (at Socorro; pop. 1900, 1512; county-seat of Socorro county), which was founded in 1889, was organized and opened in 1895 when it received from Congress 50,000 acres of land, has in its library the private library of John W. Powell, formerly director of the U.S. Geological Survey, and owns the Torrance Mine at the foot of Socorro Mountain, 2 m. from the college campus; and a Military Institute at Roswell (pop. 1900, 2006; county-seat of Chaves county). Indian day schools are maintained by the Federal government at Albuquerque, Jicarilla, Santa F6 and Zuni.

The state maintains an insane asylum at Las Vegas, a deaf and dumb asylum and penitentiary at Santa F6, an institute for the blind at Almagordo, a reform school at El Rito and a miners' hospital at Raton. For many years the legislature has also contri- buted to the support of a number of private hospitals and charitable institutions.

History. — To the existence of an Old- World myth New Mexico owes its early exploration by the Spaniards. Early in the 1 6th century it was believed that in the New World would be found the fabled cities and creatures of which Europeans had heard for centuries. There was a story that in the 8th century a bishop of Lisbon, to escape from the Arabs, had fled to islands in the West, where he and his followers had founded seven cities; and when the Indians in Mexico related to the Spanish explorers a bit of their folk-lore, to the effect that they had issued from seven caves, the imaginative white men soon identified these caves with the famous Seven Cities. In. 1536 came Cabeza x This college also receives Federal aid: 100,000 acres of public land were voted to it in 1898.

de Vaca into Mexico after eight years of wandering across the continent and related to his countrymen the stories he had heard of wonderful cities of stone in the north. He had not seen the cities himself, nor had he, as is frequently asserted, gone as far north as the present New Mexico, but his reports tended to confirm previous rumours and led the viceroy, Don Antonio de Mendoza, to send Fray Marcos de Niza, a Franciscan friar, on a small and inexpensive expedition of discovery.

Fray Marcos (q.v.) was the first European to enter the limits of what is

now New Mexico. A glimpse of the terraced houses of an Indian village — now identified as Zufii — convinced him that he had seen one of the Seven Cities, and he hastened back with the good news. The stories that he told grew in their passage from mouth to mouth until the Spaniards believed that in the north were cities ” very rich, having silversmiths, and that the women wore strings of gold beads and the men girdles of gold.” Full of missionary zeal, and desirous that settlements should be planted in the new region in order that the heathen might be converted, Fray Marcos did little to refute these exaggerations. The con- quest of the Seven Cities was determined upon, and a band of adventurers, led by Francisco Vasquez de Coronado (q.v.), set out in 1539. Following the route of Fray Marcos de Niza, Coronado reached the first of the alleged cities, and to his great disappoint- ment found only an Indian pueblo. An exploring party sent eastward reached Acoma, and then proceeded to Tiguex on the Rio Grande, and finally to the Pecos river. The main body of Coronado’s ‘ expedition remained in New Mexico on the Rio Grande while he pushed on to the fabled land of Quivira, 1 only to meet with another disappointment.

Forty years elapsed before the Spaniards again entered New Mexico. In 1581 Fray Augustin Rodriguez, another Franciscan, explored the valley of the Rio Grande, and in 1582-1583 Antonio Espejo made extended explorations to the E. and W. of this stream. It was about this time, apparently, that the Spaniards in Mexico adopted the term New Mexico to designate the land to the north; Rodriguez had called the country San Felipe, and Espejo had named it Nueva Andalucia. Between 1 583 and 1595 several attempts at the conquest and occupation of New Mexico were made, but for various reasons they were unsuccessful. In the spring of 1598 Don Juan de Onate entered New Mexico with about 400 colonists, and choosing the pueblo of San Juan (30 m. N.W. of the modern Santa Fe) as a temporary dwelling-place, made preparations for building a town at the junction of the Rio Chama and the Rio Grande, to be known as San Francisco. In the following year the new settlement was renamed San Gabriel. Some years later a second settlement was made at Santa Fe, which has ever since been the seat of government of New Mexico. Although the Franciscan missionaries by 1617 had built seven churches and had baptized 14,000 Indians, there were in this year only 48 soldiers and settlers in the province. The zeal of the friars in stamping out the religious rites of the natives, the severe penalties inflicted for non-observance of the rules of the Church, and the heavy tribute in kind demanded by the Spanish authorities, aroused feelings of resentment in the Pueblo Indians and led in 1680 to a general revolt, headed by a

native named Pope. Over 400 Spaniards were massacred, and the remnant, after enduring a siege in Santa Fe, fled southward to a mission near the present El Paso. For a decade the natives enjoyed their independence, destroying nearly all vestiges of Spanish occupation, and venting their wrath particularly upon the churches. After several attempts at reconquest had failed, Don Diego de Vargas marched up the Rio Grande in 1692, and largely by moral suasion secured the surrender of Santa Fe, then held by the Indians. During the next four years the sub- mission of all the pueblos was secured, and the permanency of

1 Although the Quivira story was fabricated by an Indian captive and its fraudulent character was fully exposed by Coronado in 1541, ignorant American treasure-seekers still search for this mythical region. By a strange perversion of names the deserted stone pueblo of Tabira, S. of Albuquerque in the vicinity of the Manzano Moun- tains, has received the appellation of " Gran Quivira," thereby causing many deluded persons to make a vain search among its ruins for treasure.

European occupation was assured. The history of New Mexico in the 18th century was uneventful, being chiefly a story of petty disagreements among the pueblos, and occasional forays of the more warlike tribes, the Navahos, Apaches and Comanches. During the Mexican War of Independence (1811-21) New Mexico was tranquil and little disturbed by events farther south; but when, near the close of the year 1821, the news of independ- ence arrived it was received with enthusiasm. Under the Mexican republic New Mexico was called a province till 1824, when it was united with Chihuahua and Durango to form the Estado Interno del Norte. Several months later, however, it was separated from these two provinces and became a Territory; in 1836 it was officially designated as a department, and remained as such until ceded to the United States by the treaty of Guadalupe-Hidalgo, in 1848. Its government during this period was only slightly changed from what it had been under Spain. ■

Of great importance to New Mexico during the first half of the 19th century was the development of its trade with the United States. American traders had occasionally ventured as far as Santa Fe before the independence of Mexico, but they were frequently expelled and their goods confiscated by the Spanish authorities. After 1822 trading expeditions became larger and more numerous. From Missouri caravans of pack animals, and later wagon trains, set out in May of each year on the 800 m. journey to Santa Fe, along the route later followed in its general lines by the Atchison, Topeka & Santa Fe railway. The value of the products carried by these trains increased

from $15,000 in 1822 to $450,000 in 1843. On their return trip the wagons often brought loads of wool, fur and blankets.

In 1841 the republic of Texas, claiming that its western boundary was the Rio Grande, sent a force of 300 men to New Mexico to enforce these claims. The Texans reached the frontier in a starved and exhausted condition, were made prisoners by the New Mexican militia, and were sent to Mexico, where after a short term of confinement they were released.

In 1846 the Congress of the United States declared that war existed with Mexico, and on the 3rd of June Brigadier-General Stephen W. Kearny was ordered to undertake the conquest of New Mexico and California and to " establish temporary civil governments therein." Kearny reached Las Vegas on the 15th of August, assured the people of protection if they remained peaceable, and three days later entered Santa Fe without opposi- tion. Here he organized a civil government and compiled a code of laws, some of which are still in force, thus exceeding his instructions and ignoring the territorial claims of Texas, out of which had grown the war. After Kearny's departure for California and Col. Alexander William Doniphan's (1808-1887) setting out (Dec. 1846) on his heroic expedition to join Gen. Wool at Chihuahua, some of the inhabitants revolted, and in January 1847 assassinated the governor, Charles Bent, and a number of Americans and Mexicans who had taken office under the new regime. The insurrection was quickly suppressed, but the citizens soon grew tired of a military government, and in 1848 and again in 1849 petitioned Congress for a government " purely civil in character." In 1850 a convention met in Santa Fe and drafted a state constitution prohibiting slavery; this constitution was ratified, and state officials were chosen to act under it. The governor by military appointment, Colonel John Munroe (1 796-1861), refused to surrender his jurisdiction in favour of the state officials until authorized to do so by Congress, and for a time there was much writing of pronuncia- mentos by the military and the quasi-state officials. But finally a regular Territorial form of government, provided by Congress by an act of the 13th of December 1850 (a part of the Compromise of 1850), was formally inaugurated on the 3rd of March 1851.

As originally constituted, the Territory included, besides most of its present area, nearly all of what is now Arizona, and a small portion of the present Colorado. By the terms of the Compromise Measures of 1850 Texas surrendered all claims to the portion of New Mexico E. of the Rio Grande, and was reimbursed for this loss of territory by the Federal Government. The Gadsden Purchase (see Gadsden, James),

.concluded on the 30th of

December 1853, and proclaimed by President Pierce on the 30th of June 1854, added to the Territory an area of 45,535 sq. m., and changed the southern boundary W. of the Rio Grande so that from the Rio Grande the new boundary ran due W. on the parallel of 31 47′ N. lat. for 100 m., then due S. to the parallel of 31° 20′ N. lat., then due W. on that parallel to its intersection with the 1 nth meridian of longitude west of Greenwich, from that point of intersection in a straight line to the Colorado river, 20 m. below its junction with the Gila, and thence up the middle of the Colorado river to the boundary line between Mexico and California. In 1861 a portion of north-eastern New Mexico was taken to form part of Colorado; and in 1863 all of the area W. of the 109th meridian was organized as the separate Territory of Arizona.

By the Compromise of 1850 the question whether New Mexico should have slavery was left to the decision of the inhabitants. Only a few African slaves were ever brought into the Territory, and these were usually the property of civil and military officers. There were two classes of the population, however, whose status was practically that of slaves; namely, Indian captives and peons. Before slavery was prohibited in the Territory by Act of Congress in 1862, Indian captives were regularly bought and sold, a traffic sanctioned by custom and not prohibited by law. Peons were persons held in servitude on account of debt, and the peonage system was sanctioned both by the custom of the Mexican provinces and by the laws of the Territory. An act of 1 851 forbade servants from leaving masters to whom they were indebted, and in 1853 sheriffs were authorized in some instances to dispose of the debtor’s labour to the highest bidder. Peonage remained a legalized in- stitution until 1867, when it was prohibited by an act of Congress.

At the outbreak of the Civil War the inhabitants were generally apathetic; but when the Confederates invaded New Mexico they proved loyal to the Union. 1 In February 1862 General H. H. Sibley, commanding a force of about 3800 Texans, marched into New Mexico, fought a successful engagement at Valverde, on the Rio Grande, against Union forces under Colonel, later General, Edward R. S. Canby, and occupied Albuquerque and Santa Fe. The Union troops were reinforced from Colorado, however, and after a series of

skirmishes the Confederates were compelled to retreat to Texas, leaving behind about half their original number in killed, wounded and missing. New Mexico furnished to the Union army between 5000 and 6000 men.

The period following the American occupation of New Mexico was marked by constant depredations of the Indians, chiefly the Navahos, Apaches and a few Utes, their main object being plunder. While the troops were occupied with the Confederate invaders the Indians had a free hand, but in 1863 an energetic campaign was begun by General James H. Carleton against the Navahos, who were subdued and placed on a reservation on the Pecos river, and later removed to the north-western part of the Territory. There they grew peaceful and prosperous, acquiring large flocks of sheep and gaining a reputation as makers of blankets. The Apache Indians, the most savage of all, were placed on reservations somewhat later, but for many years bands of their warriors would escape and make raids into New Mexico, Arizona and Mexico. The most notable of the later outbreaks were those in 1879-1880 and in 1885-1886 respectively of the Apache chiefs Victorio and Geronimo (c. 1834-1909).

When the United States acquired possession of New Mexico, the best portions of the Territory were held in private ownership under Spanish and Mexican grants, which were confirmed by the treaty of Guadalupe-Hidalgo. To determine the validity of these claims, which had been complicated by transfers and subdivisions, and to fix their boundaries, which were often very vaguely described, proved a very formidable undertaking; and the slow process of confirmation greatly retarded the development of the Territory. There was but little material progress before the advent of the rail- way. The Atchison, Topeka & Santa Fe railway reached Albu- querque in 1880, and the Southern Pacific railway effected a junction with it at Deming in 1 88 1, thus connecting the Territory with the eastern and western coasts of the United States. With the railway came capital and the development of mines, great cattle ranges and modern towns. Immigrants from the states, however, rarely

1 According to the historian H. H. Bancroft, the loyalty to the Union cause resulted ” largely from the fact that the Confederate invasion came from Texas, the old hatred of the Texans being the strongest popular feeling of the natives, far outweighing their de- votion to either the North or the South.”

settled beyond the zone of the railway, and in the remote rural regions the process of Americanization was slow.

After the Civil War numerous attempts were made to secure the admission of New Mexico into the Union as a state. In 1872 a state constitution was drafted, and it was proposed for a time to call the new state Lincoln, but the movement came to nothing. In 1889 another constitution was drafted, but it was rejected when submitted to a popular vote. On the 6th of November 1906 the question of the joint admission of New Mexico and Arizona as a single state bearing the name of the latter Territory was submitted to a vote of their citizens. The vote of New Mexico was favourable (26,195 to I 4)73S)> but the measure was defeated in Arizona. In June 19 10 the President approved an enabling act providing for the admission of Arizona and New Mexico as separate states.

The governors of New Mexico since its independence from Spain have been as follows :

Under the Mexican Republic 2

Francisco Javier Chavez 1822

Antonio Vizcarra 1822-1823

Francisco Javier Chavez (acting) . . . 1823

Bartolome Vaca 1 823-1 825

Antonio Narbona 1825-1827

Manuel Armijo 1827-1828

Antonio Vizcarra (acting) 1828

Jose Antonio Chavez 1828-1831

Santiago Abreu 1831-1833

Francisco Sarracino 1 833-1 835

Juan Rafael Ortiz (acting) 1834

Mariano Chavez (acting) 1835

Albino Perez 1835-1837

Jose Gonzalez, revolutionary governor or pre-

tendant 1837-1838

Manuel Armijo 1838-1846

Antonio Sandoval (acting) 1 841

Mariano Martinez de Lejanza (acting) . . 1844-1845

Jose Chavez (acting) 1845

uan Bautista Vigil y Alarid (acting) . . 1846

Under the United States

Governors by Military Appointment.

Charles Bent 1846-1847′

Donaciano Vigil 1847-1848

John Marshall Washington 1 848-1 849*

John Munroe 1849-1851 4

Governors by Presidential Appointment.

James S. Calhoun 1851-1852

E. V. Sumner (Military Commander, acting) 1852

John Greiner (Secretary, acting) . . . 1852

William Carr Lane 1 852-1 853

David Merriwether 1853-1857

Abraham Rencher 1857-1861

Henry Connelly . 1861-1865

W. E. M. Amy (Secretary, acting) . . . 1865-1866

Robert B. Mitchell 1866-1869

William A. Pile 1869-1871

Marsh Gidding 1871-1875

William G. Ritch (Secretary, acting) . . 1875

Samuel B. Axtell 1875-1878

Lewis Wallace 1878-1881

Lionel A. Sheldon 1881-1885

Edmund G. Ross 1885-1889

L. Bradford Prince 1889-1893

William T. Thornton 1 893-1 897

Miguel A. Otero 1897-1906

Herbert J. Hagerman 1906-1907

J. W. Raynolds (Secretary, acting as governor) 1907

George Curry 1907-1909

William J. Mills 1909-

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2 Under the republic until 1837 the governor was officially desig- nated as jefe pohtico ; after that date as gobernador.

9 Assassinated during the Mexican revolt on the 19th of January

1847.

4 Governor as Commander of the Department,

Francisco, 1889) ; A. F. Bandelier, Contributions to the History of the South-western Portion of the United States, being vol. v., American series, of the Papers of the Archaeological Institute of America (Cambridge, 1890) ; George P. Winship, ” The Coronado Expedi- tion,” in the Fourteenth Annual Report of the Bureau of Ethnology (Washington, 1896); W. H. H. Davis, The Spanish Conquest of New Mexico (Doylestown, Pa., 1869); P. St G. Cooke, The Conquest of New Mexico and California (New York, 1878) ; William E. Connelly, Doniphan’s Expedition and the Conquest of New Mexico and Cali- fornia (Topeka, Kan., 1907); L. Bradford Prince, Historical Sketches of New Mexico (New York, 1883); H. O. Ladd, The Story of New Mexico (Boston, 1891); Helen Haines, History of New Mexico (New York, 1891); Henry Inman, The Old Santa Fe Trail (New York, 1897) ; Publications of the Historical Society of New Mexico, and Caspar de Villagra, Historia de la Nueva Mexico; reimpresa por el Museo Nacional, con un apendice de documentos y opuscules (2 vols., Mexico, 1900), vol. i. being a reprint of the epic poem published in 1610 by Villagra, a companion of Onate in his expedition to New Mexico.

NEW MILLS, an urban district in the High Peak parlia- mentary division of Derbyshire, England, at the confluence of the rivers Goyt and Kinder, on the border of Cheshire, 13 m. S.E. of Manchester, on the Midland and the London & North- Western railways. Pop. (1901) 7773. Its ancient name was Bowden Middle Cale. The name of New Mills was given to it from a corn-mill erected on the Kinder in the hamlet of Ollersett, and is specially applied to the group of factories which have grown up round it. Formerly paper and cloth were the staple industries of the district, but the inhabitants of the various hamlets are now occupied chiefly in iron and brass foundries, cotton mills and print-works. A short branch of the Midland railway leads to the town of Hayfield (pop. 2614).

NEWMILNS, a manufacturing town and police burgh of Ayrshire, Scotland. Pop. (1901) 4467. It is situated “j\ m. E. of Kilmarnock by the Glasgow and South- Western railway. It was made a burgh of barony in 1490 by James IV., the charter being confirmed in 1566 by Sir Matthew Campbell, the laird of Loudoun, in which parish the town is situated. Muslin- and lace-curtain making and the manufacture of mosquito-nets are the chief industries. Nearly 2 m. E. lies Darvel (pep. 3070), a police burgh and manufacturing town, with a station on the Glasgow and South-Western railway; its chief manufactures are those of lace curtains, muslins and carpets. Two miles E. rises Loudoun Hill (1036 ft.) where Robert Bruce defeated the English in 1307, and about a mile farther E. is the cairn raised to commemorate one of Wallace’s

victories.

NEW ORLEANS, a city of Louisiana, U.S.A., situated almost wholly on the left bank of the Mississippi, 107 m. from its mouth, in that portion of the state which constitutes the river's larger delta, and lying between Lake Pontchartrain (to the north and west) and Lake Borgne (to the east and south); its latitude is about 30°, nearly the same as that of Cairo, Egypt. Pop. (1910) 339,075. The city lay originally at the angle of a deep three-sided bend in the river. Into this hollow it gradually spread, the curving river front, some 9 m. long, serving as its harbour; and hence its old appellation, the Crescent City. Long ago, however, the city filled the pocket of the bend, and spreading farther along the river, now has the form of an " S." Directly north, and still about 3 m. distant from the parts of the city proper that have advanced farthest toward it, lies Lake Pontchartrain (about 40 m. long and 20 m. wide). Lake and river are parallel to one another for many miles; the city lies on the narrow alluvial strip between. The total area included within the municipal limits is 196-25 sq. m., but the city proper covers about 40 sq. m. The larger limits are coextensive with those of the parish of Orleans, and include the district of Algiers, on the right bank of the Mississippi.

The river at New Orleans varies from 1500 to 3000 ft. in width, and its broad channel often stretches almost from shore to shore, with a depth varying frequently at short intervals from 40 ft. to more than 200 ft. Around the margins a line of wharves and shipping extends for miles on each shore. Including the suburbs of Westwego, Gretna, &c, on the right bank of the stream, there is a river frontage of more than 20 m. Gretna, the seat of Jefferson parish, McDonoghville, in Jefferson parish,

and Algiers, or West New Orleans, a part of the city, are in- dustrial suburbs on the west bank of the Mississippi, connected with the east bank by a steam ferry and with one another by electric railway. At Algiers are railway terminals and repair shops of the Southern Pacific and the Texas & Pacific; and the United States Naval Station here, which was built in 1894 (though land was bought for it in 1849), and has a large steel floating dry dock, is the only fresh-water station south of Ports- mouth, Virginia, and is equipped to make all repairs.

The city site is almost perfectly level ; there is an exceedingly slight slope from the river toward the tidal morasses that border Lake Pontchartrain. The elevation of the city plain is only 10 ft. above the sea, and its lower parts are as much as 10-12 ft. below the Mississippi at high flood water. About 6 m. of heavy " levees " or dykes — in

some parts rising clear above the city plain, but backed by filled-in areas graded down from the shores where the traffic of the water-front is concentrated — protect it from the waters. The speed of the current reaches, in times of high water, a rate of 5 m. an hour. Along the immediate front of the principal commercial quarter, this current, losing some of its force by change of direction, deposits its alluvium in such quantities as to produce a constant encroachment of the shore upon the harbour. At its widest part this new land or batture, with wharves, streets and warehouses following eagerly after it, has advanced some 1500 ft. beyond the water-line of the middle of the 18th century.

The climate is not marked by extremes of absolute heat or cold. Only once in thirty-seven years (1871-1907) did the thermometer register as high as 102° F., and on only a few days did it register above 96°; in February 1899 the temperature was 7 , but it rarely falls below 22°. The average annual rainfall is about 58 in.

Canal Street, the centre of retail trade and street life, bounds on the south-west near the river the Vieux Carre — the old rect- angle within the walls of the original city, bounded by the river, Canal, Rampart and Esplanade streets — and separates the picturesque, peaceful French (or Latin) Quarter of the north- east from the bustling business and dignified residence districts of the American Quarter, or New City, on the south-west. In the latter St Charles Avenue and Prytania Street have the finest residences, and in the former Esplanade Avenue. Just below Canal Street, in the oldest part of the American Quarter, are many of the most important or imposing buildings of the city, and some of the places most intimately associated with its history. Here are the St Charles Hotel (1894), the third of that name on the present site, all famous hostelries, and the first (1838-1851) one of the earliest of the great hotels of the country ; and Lafayette Square, surrounded by the City Hall (built in 1850 in the style of an Ionic temple), the new Post Office, two handsome churches, St Patrick's and the First Presbyterian, Odd Fellows' Hall and other buildings. In the square are statues of Henry Clay (by Joel T. Hart) and Franklin (by Hiram Powers), and a monument to John McDonogh (1898); and in the vicinity are the Howard Memorial Library (1887; a memorial to Charles T. Howard), which was the last work of H. H. Richardson, a native of Louisiana, and the Confederate Memorial Hall (presented to the city by F. T. Howard) with Confederate relics. Two blocks away in Marguerite Place is a statue erected (1884) by the women of the city to Margaret Haughery (d. 1882) , the " Orphan's Friend," a noble woman of humble birth and circumstances, who devoted a toilful but successful life to charities. In Lee Circle is a monu- ment to Robert E.

Lee, and facing it is the New Orleans Public Library building (1908). Just off Canal Street, at Carondelet end Gravier Street, is the Cotton Exchange (1882-1883), and in Magazine Street the Produce Exchange. The large office buildings are on Canal, Carondelet, Common and Gravier streets; among them may be mentioned the Maison Blanche, the Hennen Building, the Tulane Newcomb Building and the Canal Louisiana Bank and Trust Company Building. On Camp Street, between Gravier and Poydras, are the office buildings of the Picayune and the Times- Democrat; on Carondelet and Gravier are the wholesale cotton houses; on Poydras and Tchoupitoulas are the wholesale

grocery houses ; and on North Peters and Custom House streets the sugar and rice industries are concentrated. Little of history or tradition is associated with the American Quarter, with the exception of the former site (before 1900) of the Clay statue in Canal Street where Royal Street and St Charles Avenue begin, which was the scene of popular meetings in the Italian troubles of 1 891; here, in Liberty Place, a triangle at the intersection of Canal, North Peters and Tchoupitoulas streets, on the scene of the fight of the 14th of September 1874 between conservative citizens and the radical authorities of the state, is a granite memorial called the Liberty Monument. The Customs House, long renowned for its ” marble room,” is in the old city, just off Canal Street. The corner-stone was laid by Henry Clay in ˆ847. The Boston (1845) and Pickwick (1857) are the best known of the general social clubs, and the Harmony (1862) of the Jewish clubs. It is the French Quarter in which the history, poetry and romance of New Orleans are indissolubly united. The memory of French dominion is retained in the titles, and in the foreign aspect as well, of Toulouse, Orleans, Du Maine, Conti, Bourbon, Dauphine and Chartres streets; while even more distinctly the Spaniard has superimposed his impress on stuccoed wall and iron lattice, huge locks and hinges, arches and gratings, balconies, jalousies, inner courts with parterres, urns and basins with fountains, and statues half hid in roses and vines. There are streets named from its Spanish governors: Unzaga, Galvez, Miro, Salcedo, Casa Calvo, Carondelet and the baron Caron- delet’s Baronne. The moated and palisaded boundaries of early days are indicated by the wide, tree-planted and grassy avenues named respectively from the Canal, the Rampart and the Esplanade that once lay along their course; the original ” commons ” outside the walls are commemorated in

Common Street; and the old parade ground in the midst of the early town's river front, now laid off in flower-beds, white-shelled walks and shaven shrubbery, and known as Jackson Square, still retains its older name of the Place d'Armes. With this quaint, sunny and dusty old square is associated nearly every important event in Louisiana's colonial history. This was the place publique, associated with traffic, gossip, military muster and official acts of state. On one side is the cathedral of St Louis, first built in 1718, burned in 1788, rebuilt in 1792-1794, and largely rebuilt again in 1850. Flanking the cathedral on one side stands the calaboose (Calaboza, 18 10), and on the other the Cabildo — so named from the municipal council that sat here under Spanish rule, when it was the government house and palace of justice. Both buildings are to-day used as law courts. The Cabildo is a dignified two-storey structure of adobe and shell- lime, built in 1795; an incongruous mansard roof was added in 1850. On the 30th of November 1803, in the council hall, the city keys were handed back to the representatives of the French government and the people of Louisiana were absolved from their allegiance to the Spanish king; and here, only twenty days afterward, with similar ceremonies, the keys of the city passed from the hands of the French colonial prefect to those of the commissioners for the United States. In the old Place d'Armes a bronze equestrian statue (1846) of Andrew Jackson by Clark Mills is a remembrance of the ceremonies attending Jackson's triumphal entry into the city after the battle of New Orleans in 1815. In 1825 Lafayette was lodged in the Cabildo as the city's guest.

The appearance of the square was greatly changed in 1849, when the Baroness de Pontalba, in whose estate it was then comprised, cut down the ancient elms that shaded it and laid it out in its present style of a French garden. She also is re- sponsible for the low brick " Pontalba Mansions " on the north and south sides of the square. The Babel of Tongues in the French Market (1 8 1 3) , on the site of an older market, immediately below Jackson Square, and at the" Picayune Tier "just adjacent, is an interesting feature of the city. Near the Cathedral, in Orleans Street, is the convent of the Holy Family, a brick building housing a negro sisterhood founded in 1835, and formerly the scene of New Orleans's famous " quadroon balls." The archi- upiscopal Dalace (1730), said to be the oldest building of the

Mississippi Valley, is part of the unchanged original Ursuline convent; it was used as the State Capitol in 1831, and then it was the residence, and since 1899 has been the administrative office of the archbishop, and houses a colonial museum with the ecclesiastical records. The French Opera House (i860) was the successor of various French theatres built after 1808. The carnival balls are given here. New

Orleans was by far the earliest of American cities to have an annual opera season.

The 18th-century fortifications about the old city were destroyed about 1804. The United States Branch Mint (1838) occupies the site of Fort St Charles (destroyed 1826), where Jackson reviewed his troops as they marched to Chalmette. Just outside the Vieitx CarrS is Beauregard Square, formerly known as Congo Square, because in early days the slaves were wont to gather here for their barbaric dances. The Hotel St Louis (1836), rebuilt in 1884 as the Hotel Royal, was the seat of the Republican reconstruction governments of governors Kellogg and Packard, and the prison fortress of both, respectively in 1874 and 1877, when the whites rose against Republican rule; its rotunda was also once a famous slave mart. Many other spots in the Latin Quarter are of scarcely less interest than those mentioned, not excluding those which were made famous by the romances of G. W. Cable, and whose only title to historic consideration is that which his imagination has given them.

City Park (216-6 acres, partly water), lying between the city and the lake, is notable in the local duelling annals of earlier days. Audubon Park (249 acres) was once the sugar plantation of Etienne de Bore, who first successfully made granulated sugar in 1795-1796; earlier experiments had been made in 1791 by Antonio Mendes, from whom de Bore, who established the sugar industry, bought a plantation in St Bernard Parish. The park was bought by the city for $180,000 in 1871, but was little improved until 1884, when the Cotton Centennial Exposition was held here. It contains to-day a state Sugar Experiment Station, in which a part of their work in course is done by the students in the Audubon Sugar School of the State University at Baton Rouge, and Horticultural Hall, the only one of the Exposition buildings now standing, with a display of tropical trees and plants; opposite Audubon Park is the campus of Tulane University. West End is a suburban resort and residential district on Lake Pontchartrain.

A noted feature of New Orleans is its cemeteries. Owing to the undrained condition of the subsoil, burials are made entirely above ground, in tombs of stuccoed brick and of granite and marble. Some of these are very elegant and costly, and many of the burial-grounds, with their long alleys of these tombs of diverse designs, deeply shaded by avenues of cedars and magnolias, possess a severe but emphatic beauty. Jews and the poor bury their dead underground in shallow graves. The oldest cemetery, St Louis No. 1, contains the graves of many persons notable in history. St Roch’s Campo Santo has a wonder-working shrine, and is the most picturesque of the old

burying-grounds. Metairie, on the site of an old race track, is the finest of the new. It con- tains a monument 1 to the Army of the Tennessee and its com- mander, Albert Sidney Johnston, with an equestrian statue of Johnston by Alexander Doyle, and a monument to the Army of Northern Virginia surmounted by a statue of General T, J. Jackson. In Greenwood Cemetery is the first monument erected to Confederate dead, given by the women of New Orleans. At Chalmette (on the Mississippi, about 5 m. E. of Canal Street), where the battle of New Orleans was fought in 1815, there is a National Cemetery, in which some 12,000 Union soldiers in the Civil War are buried.

Population. — The population in 1900 2 was 287,104, New

1 In the burial vault of this tomb, with the bodies of many other soldiers, are the remains of General P. G. T. Beauregard, who was born near New Orleans.

2 At the earlier censuses the population of the city was as follows: 17,242 in 1810 (when it was the sixth city in population in the United States); 27,176 in 1820 (when, as in 1830 and 1850, it was the fifth city); 46,082 in 1830; not reported separately in 1840; IJ 6,375 in 1850; 168,675 in i860; 191,418 in 1870; 216,090 in 1880; and 242,039 in 1890.

Orleans ranking twelfth among the cities of the United States; in 1910 it was 339,075. Of the 1900 total, 256,779 were native- born, and 30,325 were foreign-born, including 8733 Germans, 5866 Italians, 5398 Irish, 4428 French and 1262 English; and there were 77,714 negroes. In 1900 the population of foreign parentage was 108,010, of whom 78,269 had foreign fathers and foreign mothers, 27,259being of German, 15,4650! Irish, 10,6940! Italian, 9317 of French and 1882 of English parentage. The Latin element that came in colonial times included Frenchmen, French- Canadians, colonists from the French and Spanish West Indies, Canary Islanders (whose descendants are still known as Islenos) , and French refugees from Acadia in 1765 and the years following, and from Santo Domingo at the end of the 18th century. The earliest French immigrants were largely Bretons and Normans, and various Creole words in common use (such as banquette for ” side-walk “) still recall these racial beginnings. The Creoles of New Orleans and the surrounding delta are a handsome, graceful, intelligent race, of a decidedly Gallic type, though softened in

features, speech and carriage. Their dialect has been formed from the French entirely by sound, has no established orthography, and is of much philological interest. Until very recent years the Latin races, though fusing somewhat among themselves, mixed little in blood with the Anglo-American. The Spaniards when in power at the end of the 18th century were notably different from the French in their liberalism in this respect. In social life and standards the French Creoles were very conservative; the old styles of dress, e.g. of the late 18th century — wigs, silk stockings and knee-breeches — lingered later among them, probably, than in any other part of the country. But before the pressure of Anglo-American immigration, capital, enterprise and education, this Creole civilization has slowly yielded ground, at last fairly beginning to amalgamate with the social system of the American nation. But the Creole has stamped his influence upon wellnigh every aspect in the life of the city that has broadened out so widely on every side of his antique town. Its cuisine, its speech, its " continental " Latin Sundays, its opera, its carnival, its general fashions and manners, its intolerance of all sorts of rigour, its whole outward tone and bearing, testify to this patent Latin impress. A comparatively recent addition to the Latin element in the city has been through Italian immigration.

The coloured population, notwithstanding the presence among it of that noted quadroon class which enjoyed a certain legal freedom for generations before the Civil War, has not greatly improved since the date of emancipation. Catholicism is naturally extremely strong in New Orleans. So also are the Baptist and Methodist churches.

Carnivals. — The famous carnival displays of New Orleans are participated in very largely by the " Americain," i.e. the Anglo-American; but they mark one of the victories of the Latin-American over North-American tastes, and probably owe mainly to the " Americain " their pretentious dignity and to the Creole their more legitimate harlequin frivolity. Out of the simple idea of masked revelry in the open streets, as borrowed from Italian cities, the American bent for organization appears to have developed, by a natural growth, the costly fashion of gorgeous torch-lighted processions of elaborately equipped masques in tableaux drawn on immense cars by teams of caparisoned mules, and combining to illustrate in a symmetrical whole some theme chosen from the great faiths or literatures or from history. Legends, fairy-tales, mythologies and theologies, literature from Homer to Shakespeare, science and pure fantasy are drawn upon for these ornate representations, which are accompanied by all the picturesque licence of street life characteristic of carnival times in other cities. They have no rival in

America, and for glitter, colour and elaborateness are by many esteemed the most splendid carnival celebrations of the world. The first carnival parade (as distinguished from the Mardi Gras celebration) was held in 1827 by masked students recently returned from Paris. In 1837 and 1839 the first processions with ” floats ” were held in New Orleans. The regular annual pageants, almost uninterrupted save during the Civil War, date

from 1857, when the ” Mystic Krewe of Comus,” the oldest of the carnival organizations, was formed; similar organizations, secret societies or clubs are the ” Twelfth Knight Revelers ” (1870), ” Rex ” and ” Knights of Momus ” (both 1872, when the carnival was reviewed by the Grand Duke Alexis of Russia), the ” Krewe of Proteus ” (1882), and the ” Krewe of Nereus ” (1895). Balls, processions and other festivities are now spread over a considerable period, culminating in those of Shrove Tuesday (Mardi Gras). During this time the festivities quite engross public attention, and many thousands of visitors from all parts of America are yearly attracted to the city.

Charitable Institutions. — The large Charity Hospital (1786) and the Richard Millikcn Memorial Hospital for Children are supported by the State. The Touro Infirmary (1854; controlled by the Hebrew Benevolent Association; founded by Judah Touro (1775-1854; a Jew of Dutch descent, son of Isaac Touro of Newport, Rhode Island), includes a free clinic open to the needy of all faiths. Other hospitals are: the U.S. Marine Hospital (1885); the H6tel Dieu (1859) and the St Joseph’s Maternity Hospital (1863), both under the Sisters of Charity; the Sarah Goodrich Hospital (1896; Methodist Epis- copal) ; and the Eye, Ear, Nose and Throat Hospital (1889; private). The Poydras Asylum, on Magazine Street, was founded in 1817 by Julien Poydras (1746-1824), a successful trader and delegate from Orleans Territory to the Federal Congress in 1809-1811 ; the present building was erected in 1836; the asylum, which is for orphans, is controlled by Presbyterian trustees, although it was, during Poydras’s life, under the charge of Sisters of Charity. St Vincent’s Infant Asylum (1858), or ” Margaret’s Baby House,” is in charge of Sisters of Charity. Other orphanages and children’s homes are: the New Orleans Female Orphan Asylum (1849) and St Elizabeth’s Industrial School (1845), under the Sisters of Charity; an Ursuline Orphanage (1729) ; the Immaculate Conception Girls’ Asylum (1851) and St Mary’s Catholic Orphan Boys’ Asylum (1835, under the Sisters Marianites of the Holy Cross); the St Alphonsus Orphan Asylum (1878) and St Vincent’s Home for Newsboys (1878), under the Sisters of Mercy; the Mount Carmel Orphan Asylum (1869), under the Sisters of Mount Carmel r the Sacred Heart Orphan Asylum (1894) for girls, under the

Missionary Sisters of the Sacred Heart; St Joseph's Orphan Asylum (1863), under the Sisters of Notre Dame; a Protestant Orphans' Home (1853); a Jewish Orphans' Home (t855); the Children's Home of the Protestant Episcopal Church (1859) ; the Evangelical Lutheran Bethlehem Orphan Asylum (1881); the German Protestant Orphan Asylum (1866); the Freedmen's Orphan Asylum (Baptist) ; and, under private and non-sectarian control, the Asylum for Destitute Orphan Boys (1824) and the Colored Industrial Home and School (1902). The J. D. Fink Fund and the Fink Home (1874) or Asylum (for Protestant widows and their children) are the gift of an eccentric, whose offer of marriage had been refused by one preferring not to marry at all, and who forbade that any old maid should enter the asylum. Other homes for adults are: the Soldiers' Home of Louisiana for Con- federate Veterans; two Homes for the Aged (1869 and 1882), both under the Little Sisters of the Poor; the Faith Home (1888; Baptist) for old coloured women; the German Protestant Bethany Home (1889) and the German Protestant Home for the Aged and Infirm (1887) ; the Julius Weis Home for Aged and Infirm (1899), under the Hebrew Benevolent Association; and, all under private corpora- tions, the Maison Hospitaliere (1893) for aged women, the New Orleans Home for Incurables (1893) and St Anna's Asylum (1850) for destitute women and their children. Temporary homes are: the Convent of the Good Shepherd (1859), under the Sisters of the Good Shepherd, and a Memorial Home (1886; both for wayward women) ; a Home for Homeless Women (1888), and the New Orleans Convalescent Home (1885). Kingsley House is modelled after Hull House in Chicago. The Louisiana Retreat, a private asylum for the insane, is in New Orleans, and there also is a state House of Detention. Education. — The public schools give equal opportunities to whites and blacks, but the whites take decidedly greater advantage of them; a large number even of the whites still make practically no use of either public or parochial schools. The races are kept separate: the attempt was made to mix attendance in 1870, but the whites compelled its abandonment. To a bequest of John McDonogh (1778-1850), whose life is one of the romances and the lessons of New Orleans, 1 the city owes already some thirty school buildings. The Home Institute (1883I provides free night schooling for hundreds of students, and similar work is done on a larger scale by public night schools. Of the adult male population in 1900 13-4 % were illiterate (could not write), seven-tenths of the illiterates being negroes, of whom the illiterates constituted 36 %.

There are various higher institutions of learning in the city. Tulane University of Louisiana was named after its benefactor Paul Tulane (1801-1887), a merchant of New Orleans, who gave $1,050,000 in

1882-1887 to a Board of Trustees for the education of ” the white young persons in the city.” The university was established, unde r 1 See William Allan’s Life and Work of John McDonogh (Baltimore,

1886).

its present name, in 1884, the former university of Louisiana (1834) being merged in it ; it gives free tuition in the academic department to one student from each senatorial and each representative district or parish in the state, and its income-producing property, up to $5,000,000, is exempted from taxation by the state. In 1908-1909 Tulane University had 192 instructors and 2236 students; and it included a Graduate Department, a College of Arts and Sciences (1884), a College of Technology with 157 students, Extension Courses with 148 students, the H. Sophie Newcomb Memorial College for Girls (1886; endowed in memory of her only daughter by Josephine Louise, wife of Warren Newcomb, a sugar merchant of the city), with 288 students in the college and 102 in Newcomb High School, a Teachers’ College, a Law Department (1847), a Medical Depart- ment (1834) with 648 students, a Department of Pharmacy and a Summer School with 860 students. The College of the Immaculate Conception (Jesuit, 1847) is an important school. Higher schools for the negroes include Leland University (1870; Baptist), with college courses, preparatory courses (there are several Baptist secondary schools affiliated with the university), normal and manual training departments, a school of music, a theological school, a woman’s Christian Workers’ Class and a night school; Straight University (1870; Congregational), with kindergarten, primary, high school and industrial departments; New Orleans University (1873; Methodist) and Southern University (1883). The last is supported by the state. Libraries. — The public, society and school libraries in the city in 1909, many being very small, aggregated 301,000 volumes, 227,000 being in five collections. A central library building and three branch buildings, costing $275,000, were presented to the city by Andrew Carnegie. The Howard Memorial Library (1887) is an important reference library, peculiarly rich in books on the history of Louisiana. The Louisiana Historical Society (1836) and the Athenee Louisian- naise (1876) may also be mentioned; the latter has for its purpose the conservation and cultivation of the French language. The Union Franchaise (1872) supplements with educational and charitable activities the general bond of fraternity offered by it to the French population. In New

Orleans there is a State Museum, devoted to the history, institutions and resources of the state.

Newspapers. — Among the older newspapers are L'Abeitte (1827) and the Picayune (1837), which is one of the most famous and in- fluential papers of the South, and was founded by George Wilkins Kendall (1809-1867), a native of New Hampshire, who organized a special military correspondence for his paper during the Mexican War, probably the earliest instance of such service in the United States. The Times-Democrat (1863) is counted among the ablest and most energetic papers of the South. De Bow's Commercial Review (published in New Orleans 1846-1864), founded and edited by James D. B. De Bow (1820-1867), was in its day one of the most important periodicals of the country, and remains a valuable re- pository of information on conditions in the South before the war.

Commerce. — It was its potential commercial value, as indicated by its geographical position, that in 1803, when New Orleans was only a small, poor and remote Franco-Spanish-American port, led to it? purchase by the United States. But various causes operated to impede the city's growth: the invention of railway transit, the development of the carrying trade on the Great Lakes, the bars at the mouth of the Mississippi, over which few large ships could pass, the scourge of yellow fever, the pro- vincialism and the lethargy of an isolated and indolent civiliza- tion. Slavery kept away free labour, and the plantation system fostered that " improvidence and that feudal self-com- placency which looked with indolent contempt upon public co-operative measures" (G. W. Cable). However, in i860 the exports, imports and domestic receipts of New Orleans aggre- gated $324,000,000. As a result of the Civil War the commerce of New Orleans experienced an early paralysis; the port was soon blockaded by the United States navy; the city fell into the hands of the Federal forces (1st May 1862); its commerce with the interior was practically annihilated until after 1865, and from the depression of the years following the war the city did not fully recover for a quarter of a century. Only after 1880 did its total commerce again equal that of i860. It was almost solely as the dispenser of the products of the greatest agricultural valley in the world that New Orleans grew from a little frontier town to the dimensions of a great city. This trade is still dominant in the city's commerce. In the season that follows the harvest of the South and West, the levee, the wharves and the contiguous streets are gorged with the raw staples of the regions that lie about the Mississippi and its greater and lesser tributaries — sugar, molasses, rice, tobacco, Indian corn, pork, staves, wheat, oats, flour and, above all else, from one- fourth to one-third the country's entire

supply of cotton. All other movement is subsidiary or insignificant.

By 1 000 the drawbacks which have been enumerated had been practically eliminated, and uncertainty as to the investment of capital had been removed. The southward tendency in railway traffic favours the city. Deep water to the ocean was secured by a system of jetties at the South Pass mouth of the Mississippi, built by James B. Eads in 1875-1879; but in time this ceased to maintain an adequate depth of water, and (after the report in 1900 of a board of engineers) in 1902 Congress began appro- priations for an improvement of the South-west Pass 1 by opening a channel 1000 ft. wide and at least 35 ft. deep. Many lines of steamers give direct connexion with the West Indies, Central America, Europe, New York and also with Japan (for the shipment of raw cotton via Suez). Ocean steamers, loaded in large part by elevators, now bear away the exports for which a swarm of sailing-ships of much lighter draft and average freight-room once made long stays at the city's wharves. Pas- senger traffic on the rivers has practically vanished, and the shrunken fleet of river steamers (only 15 in 1907) are devoted to the carrying of slow freights and the towing of barges on the rivers and bayous of the lower Mississippi Valley. 2

The total value of all merchandise exported in the six customs years 1902-1903 to 1907-1908 averaged $154,757,110 yearly, and the imports $37,319,254. For the ten years 1890-1899 the correspond- ing averages were $95,956,618 and $15,924,594. Bank clearings increased in the ten customs years preceding 1906-1907 from $447,673,946 to $1,027,798,476 (bank clearings were $956,154,504 and $786,067,353 respectively for the calendar years 1907 and 1908). There has been an extraordinary increase of exports since 1900, and imports from Central America have similarly increased. Cotton represents roughly two-thirds of the value of all exports. As a cotton port New Orleans in 1908 was second only to Galveston, which had only recently surpassed it ; and more than half of the raw cotton exports of the country passed through these two ports. The Board of Trade has maintained a cotton-inspection department since 1 884, and its statistics are standard on the cotton crop. Cotton exports in the four seasons 1903-1904 to 1906-1907 averaged 1,001,199,468 lb, valued at $104,108,824. Wheat and flour, Indian corn, lumber and tobacco are especially noteworthy articles of the export, and bananas and coffee of the import, trade. Importations of coffee have more than quintupled since 1900; the coffee comes for the most part from Brazil and grain wholly from American fields. The imports of bananas, for which New Orleans is the leading port of the country, more than doubled in the same period, and increased more than eight-fold in the twenty-five years following 1 882 (1,200,000 to 10,200,000 bunches).

Railway traffic has grown immensely, and port facilities have been vastly improved in recent years. A belt railway owned by the city (built 1905-1907) connects all railway terminals, public wharves and many manufactories and warehouses. Public ownership pro- tects the city's interest in the harbour front, while at the same time all railways are equally and cheaply served; and new railways, which could not enter the city or have access to the water front because of the impossibility of securing individual trackage, can now enter on the municipal belt. Of privately owned railway terminals in 1908 those of the Illinois Central system had nearly 200 m. of track; the Stuyvesant Docks of the railway have 15 m. of track, a wharf almost 1 m. long, immense warehouses and grain elevators. The New Orleans Terminal Company constructed at Chalmette

1 The South-west Pass, originally the usual entrance, could not be entered by vessels drawing more than 16 ft.; the Eads jetties, aided by dredging, provided through the South Pass (500 ft. broad) a channel 180 ft. wide and 25 to 28 ft. deep. South-west Pass has always been the primary outlet of the river, venting half or more of its volume. Active work on its improvement was begun in 1903 and practically completed in 1909. Including the jetties, this Pass is nearly 20 m. long and has an average width of about 2150 ft.; the deep channel through it is more than 1000 ft. wide. The jetties, 4 m. long on one side and 3 m. on the other, are 6000 ft. apart at their head and 3600 ft. at the sea line. They are built on willow mats (foundation mats 200X150X2 ft.) in wooden frames, sunk with stone and surmounted above the water by a concrete wall.

2 The value of the river commerce was about $8,000,000 in 1816 and $82,000,000 in 1849. The first steamboat descended the Missis- sippi to New Orleans (from Pittsburg) in 1811, and the first steam- boat trip up the river was made in 1817. The halcyon period of river steamer traffic was from 1840 to i860. The luxury of the passenger boats then on the Mississippi and the immense volume of the freight- ing traffic are things of the past since the advent of the railway era. The best time ever made (1870) from New Orleans to St Louis (1278 m.) was 3 days, 21 hours and 25 minutes. The races of these river boats were prominent news items in the papers of America and even in those of Europe, and they have been recorded in more than one page of literature. Steam packets replaced sailing vessels in the ocean trade about 1845.

(1908) splendid terminals, including an immense slip in the river (1500X300 ft., excavated to give 30 ft. of water below zero gauge) capable of accommodating nine vessels at dock simultaneously, and arranged with remarkable conveniences for the loading of grain. Steel-concrete warehouses and elevators surround the slip. The greater industrial establishments of the city cluster about the terminals. New Orleans is served by eleven railways, including the Illinois Central, Southern Pacific, Texas & Pacific and Louisville & Nashville systems. The New Orleans & North-eastern crosses Lake Pontchartrain over a trestle bridge 7 m. long (originally 25 m. before end filling).

Within the city are two canals, now of little importance, because too shallow except for local trade: the Carondelet or Old Basin canal, built in 1798, is 2-5 m. long, 55-65 ft. wide and 7 ft. deep, and goes via Bayou St John to Lake Pontchartrain ; and the New Basin Canal, built in 1837 by the New Orleans Canal & Banking Company, and state property since 1866, is 6-7 m. long, 100 ft. wide and 8 ft. deep, and also connects with Lake Pontchartrain. Neither of these canals connects with the Mississippi river as do the following privately owned canals: the Lake Borgne Canal, from a point 10 m. below the city to Lake Borgne, 7 m. long, 80 ft. wide, 7 ft. deep, shortening the water distance between Mobile and New Orleans by 60 m. ; and the Barataria & Lafourche Company Canal (7 m. long, 45 ft. wide and 6 ft. deep) and Harvey's Canal (5-35 m. long, 70 ft. wide and 6 ft. deep), both connecting with the Bayou Teche region. Manufactures. — Manufacturing has greatly developed since 1890. The value of products increased 146-7% from 1880 to 1890, and in the following decade the increase of wages paid, cost of materials used and value of product were respectively 7-6, 53-3 and 31-5%. In 1905 the value of the factory product was $84,604,006, 45-4% of the value of the total factory product of the state, and an increase of 47'3% since 1900 ; during this same period capital increased 366%, the average number of wage-earners 8-9%, the amount of wages 20-5% and the cost of materials used 53 4 3%. The sugar and molasses industry is the most important, with a product value of $34,908,614 in 1905; New Orleans ranked second to Philadelphia among the cities of the country in the value of this product, that of New Orleans being 12-6 % of the total value of the country's product. At New Orleans is a sugar refinery said to be the largest in the world. Of the manufactures from products of the state the most noteworthy are rice (value of product cleaned and polished in 1905, $4,881,954), bags other than paper ($4,076,226), cotton-seed oil and cake ($3,698,509), malt liquors ($2,170,714), tobacco ($1,408,883), lumber and timber products ($1,644,329) and planing mill products ($1,105,497) and cotton goods ($1,081,951).

Other important manufactures are foundry and machine-shop products ($2,085,327), men's clothing ($1,979,308), coffee and spice roasted and ground ($1,638,263) and steam railway cars constructed and repaired ($1,627,435). New Orleans is the chief centre of the country for the manufacture of cotton-seed products and for rice milling. Oyster canning is a recent and rapidly growing industry. There are also furniture establishments, paper mills and cotton cloth mills.

Government. — Municipal government is organized under a charter framed by the state legislature in 1896, and amended by acts of 1898 and 1900. The seven municipal districts corre- spond to seven independent faubourgs successively annexed. A mayor and various other executive officers and a legislative unicameral council are elected for four years. The mayor and the heads of departments consult as a " cabinet." Various boards — of civil service, public debt, education, health, police, fire, drainage, water and sewerage and state commissioners of the port — control many of the most important interests of the city. The mayor, through his office and his appointive powers, exercises great influence in a number of these. In 1896 New Orleans followed the example of New York and Chicago in sub- jecting its civil service to a competitive merit system and to rules of a civil service board. The police board is non-partisan. The board of education is composed of seventeen members, each elected by one of the seventeen wards of the city. In addition to the city board of health, a state board acts with municipal authority, and (since April 1907) the United States government maintains the maritime quarantine of the Mississippi. The commissioners of the port are officials of the state. Owing to the complete dominance of the Democratic party, all reform movements in politics must come from within that organization. Reform organizations have been intermittently powerful since 1888, and among their achievements for good were the beginning of the great drainage and sewerage improvements and the adoption of the charter of 1896. The present government of the city compares very favourably with systems tried in the past. 1

'The charter of 1805 organized the old. cite (the Vieux Carri) and the faubourgs as distinct municipalities with almost wholly

In 1909 the total assessed valuation of property was $221,373,362, of which $154,604,325 was realty and the remainder personalty. The bonded debt on the 30th of June 1909 was $32,521,040 and the floating debt at the end of 1908 was $1,264,030.

From 1890 to 1900 the expenditures for permanent works (includ- ing

sewerage, lighting, paving, levees, improvements in connexion with street and steam railways, docks, &c.) aggregated $30,000,000. Almost all the public services, nevertheless, were in 1909 in private hands. Electric traction was introduced in 1891-1895, and the street railways were consolidated in 1902 under one management. In 1869 the city bought, and nine years later sold again, the water- works; municipal ownership and control, under a sewerage and water board, was again undertaken in 1900. In 1900 arrangements were made to transfer the extensive markets from private lessees to direct municipal control, and in May 1901 the wharves of the city passed from private to municipal control. 2 The municipal belt railway was constructed in 1905-1907.

Until 1900 there were no sewers, open gutters serving their purpose. It is remarkable that the city twice granted franchises to private parties for the construction of a sewerage system, but without result. The low and extremely level character of the city site, of which nearly one-third is at or below the level of the Gulf, the re- currence of back-water floods from Lake Pontchartrain and the tremendous rains of the region have made the engineering problems involved very difficult. In 1896 a Drainage Commission (merged in 1900 in a Sewerage arid Water Board) devised a plan involving the sale of street railway franchises to pay for the installation of drainage canals and pumps, and in 1899 the people voted a 2-mill tax over 42 years assuring a bond issue of $12,000,000 to pay for sewerage, drainage and water works to be owned by the municipality and to be controlled by a Sewerage and Water Board. Work was begun on the sewerage system in 1903 and on the water works in 1905. In 1906 the legislature authorized the issue of municipal bonds for $8,000,000 to be expended on this work. Up to 1909 the drainage system had cost about $6,000,000 and the sewerage system about $5,000,000; and 310 m. of sewers and nine sewerage pumping stations discharged sewage into the Mississippi below the centre of the city. Garbage is used to fill in swamps and abandoned canals. The new water-supply is secured from the river and is filtered by mechanical precipitation and other means. By 1909 about 500 m. of water-mains had been laid, $7,000,000 had been expended for the water-system, and filtering plants had been established with a capacity of 50,000,000 gallons a day. In August 1905 a city ordin- ance required the screening of aerial cisterns, formerly characteristic of the city, which were breeding-places of the yellow fever Stegomyia, and soon afterwards the state legislature authorized the Sewerage and Water Board to require the removal of all such cisterns. About two-thirds of the street surface in 1899 was still unpaved; the first improvements in paving began in

1890.

As regards hygienic conditions much too has been done in reoent years. New Orleans was long notorious for unhealthiness. Yellow fever first appeared in 1769, and there were about thirty epidemics from 1769 to 1878. Though the first board of health and first quarantine system date back to 1821, from 1787 to 1853 the average death-rate was 59-63 per 1000; never did it fall below 25-00, which was the rate in 1827. In 1832, a cholera year, it rose to 148; in 1853-1854-1855,ˆ6 great yellow-fever years, complicated in 1854- 1855 by cholera, it was 102, 72 and 73. During these three years there were more than 25,000 deaths. The millesimal mortality in 1851-1855 and succeeding quinquennial periods to 1880 was as follows: 70, 45, 40, 39, 34-5 and 33-5. The rate reported by the national census of 1900 was 28-9, the highest of any of the large

separate governments: they issued paper money independently, for example. The charter of 1836 was also an extreme statement of local self-government; the municipalities were practically inde- pendent, although there was a common mayor and a general council of the entire city meeting once annually. This organization was in large part due to the hostility of the Creoles to the Americans. The charter of 1852 formed a consolidated city. That of 1856 added to and amended its predecessor. That of 1870 was very notable as an attempt to secure a business-like and simplified administration. A mayor and seven ” administrators,” elected on a general ticket and constituting individually the different administrative depart- ments, formed collectively a council with legislative powers. All sessions of the council were public, and liberties of suggestion were freely accorded to the citizens. Tried in better times, and as a move- ment for reform sprung from the people and not due primarily to an external impulse, this system might have been permanent and might have exercised great influence on other cities. The early ‘seventies were marked by a great widening of the city’s corporate limits. In 1882 another charter went back to the ordinaryˆ American plan of elective district councillors chosen for the legislative branch, and executive officers chosen on a general ticket. The latter held seats in the council and could debate but not vote. This is tne present system.

2 They were leased to a private company in 1891-1901, but the lease was unprofitable and was disadvantageous to trade. From 190 1 to 1908 wharfage and harbour dues were reduced 25 to 85 %.

cities of the United States. 1 This high death-rate is often attri- buted in great part to the large negro population, among whom the mortality in 1900 was 42-1 per 1000; but the negro population largely comprises that labouring element whose faulty provision for health and sickness in every large city swells the death-rate. A light yellow-fever epidemic occurred in 1 897-1 898-1 899, after nine- teen years of immunity, and a more serious one in 1905, when the United States Marine Hospital Service for a time took control of the city's sanitation and attempted to exterminate the Stegomyia mosquito. The city Board of Health has done much to secure pure food for the people, and has exercised efficient oversight of com- municable diseases, including yellow fever. In movements for the betterment of the city — in commerce, sanitation, public works and general enterprise— a leading part has been taken by an organization of citizens known as the New Orleans Progressive Union, whose charter and by-laws prohibit its participation in political and religious issues.

History. — New Orleans was founded in 1718 by Jean Baptiste Lemoyne, Sieur de Bienville,. and was named in honour of the then Regent of France. 2 The priest-chronicler Charlevoix described it in 172 1 as a place of a hundred wretched hovels in a malarious wet thicket of willows and dwarf palmettos, infested by serpents and alligators; he seems to have been the first, however, to predict for it an imperial future. In 1722 New Orleans was made the capital of the vast province of Louisiana (q.v.) . Much of the population in early days was of the wildest and, in part, of the most undesirable character — deported galley-slaves, trappers, gold-hunters and city scourings; and the governors' letters are full of complaints regarding the riff- raff sent as soldiers as late as Kerlerec's administration (1753- 1763). In 1788 a fire destroyed a large part of the city. In 1 795-1 796 the sugar industry was first put upon a firm basis. The last twenty years of the 18th century were especially char- acterized by the growth of commerce on the Mississippi, and the development of those international interests, commercial and political, of which New Orleans was the centre. The year 1803 is. memorable for the actual transfer (at New Orleans) of Louis- iana to France, and the establishment of American dominion. At this time the city had about 10,000 inhabitants, mostly French Creoles and their slaves. The next dozen years were marked by the beginnings of self-government in city and state; by the excitement attending the Aaron Burr conspiracy (in the course of which, in 1806-1807, General James Wilkinson practically put New Orleans under martial law); by the immigration from Cuba of French planters; and by the American War of 181 2.

In 1815 New Orleans was attacked by a conjunct expedition of British naval and military forces from Halifax, N.S., and other points. The American government managed to obtain early information of the enterprise and prepared to meet it with forces (regular and militia) under Maj.-Gen. Andrew Jackson. The British advance was made by way of Lake Borgne, and the troops landed at a fisherman's village on the 23rd of December 1814, Major-General Sir E. Pakenham taking command there on the 25th. An immediate advance on the still insufficiently prepared defences of the Americans might have led to the capture of the city, but this was not attempted, and both sides remained inactive for some time awaiting reinforcements. At last in the early morning of the 8th of January 1815 (after the Treaty of Ghent had been signed) a direct attack was made on the now strongly entrenched line of the defenders at Chalmette, near the Mississippi river. It failed disastrously with a loss of 2000 out of 9000 British troops engaged, among the dead being Pakenham and Major-General Gibbs. The expedition was soon afterwards abandoned and the troops embarked for England.

From this time to the outbreak of the American Civil War the city annals are almost wholly commercial. Hopeful activity

1 But the death-rate of New Orleans was not so high as that of some smaller Southern cities, Richmond (29-7), Savannah (34-3) or Charleston (37-5), for example. According to Mortality Statistics, IQ05 (Washington, 1907), the death-rate in New Orleans in 1905 was 23-7, and the annual average between 1900 and 1904 was 23-1.

2 Two of the lakes in the vicinity commemorate respectively Louis Phelypeaux, Count Pontchartrain, minister and chancellor of France, and Jean Frederic Phelypeaux, Count Maurepas, minister and secretary of state ; a third is really a landlocked inlet of the sea, and its name (Lake Borgne) has reference to its " incomplete " or " defective " character.

and great development characterized especially the decade 1 830- 1 840. The introduction of gas (about 1830); the building of the New Orleans and Pontchartrain railway (1820-1830), one of the earliest in the United States; the introduction of the first steam cotton press (1832), and the beginning of the public school system (1840) marked these years; foreign exports more than doubled in the period 1831-1833. Travellers in this decade have left pictures of the animation of the river trade — more congested in those days of river boats and steamers and ocean-sailing craft than to-day; of the institution of slavery, the quadroon balls, the medley of Latin tongues,

the disorder and carousals of the river-men and adventurers that filled the city. Altogether there was much of the wildness of a frontier town, and a seemingly boundless promise of prosperity. The crisis of 1837, indeed, was severely felt, but did not greatly retard the city's advancement, which continued unchecked until the Civil War. In 1849 Baton Rouge replaced New Orleans as the capital of the state. In 1850 telegraphic communication was established with St Louis and New York; in 1851 the New Orleans & Jackson railway, the first railway outlet northward, now part of the Illinois Central, and in 1854 the western outlet, now the Southern Pacific, were begun.

The political and commercial importance of New Orleans, as well as its strategic position, marked it out as the objective of a Union expedition soon after the opening of the Civil War. Captain D. G. Farragut {q.v.) was selected by the Union govern- ment for the command of the Western Gulf squadron in January 1862. The four heavy ships of the squadron (none of them armoured) were with many difficulties brought up to the head of the passes, and around them assembled nineteen smaller vessels (mostly gunboats) and a flotilla of twenty mortar-boats under Commander D. D. Porter (q.v.). The main defences of the Mississippi consisted of the two permanent forts Jackson and St Philip. These were of masonry and brick construction, armed with heavy rifled guns as well as smooth-bores, and placed on either bank so as to command long reaches of the river and the surrounding flats. In addition, the Confederates had some im- provised ironclads and gunboats, large and small. On the 16th of April, after elaborate reconnaissances, the Union fleet steamed up into position below the forts, and on the 18th the mortar-boats opened fire. Their shells fell with great accuracy, and although one of the boats was sunk and two disabled, fort Jackson was seriously damaged. But the defences were by no means crippled even after a second bombardment on the 19th, and a formidable obstacle to the advance of the Union main fleet was a boom between the forts designed to detain the ships under close fire should they attempt to run past. At that time the eternal duel of ship versus fort seemed to have been settled in favour of the latter, and it was well for the Union government that it had placed its ablest and most resolute officer at the head of the squadron. Gunboats were repeatedly sent up at night to endeavour to destroy the boom, and the bombardment went on, disabling only a few guns but keeping the gunners of fort Jackson under cover. At last the gunboats " Pinola " and " Itasca " ran in and broke a gap in the boom, and at 2 a.m. on the 24th the fleet weighed, Farragut in the corvette " Hartford " leading. After a severe conflict at close quarters, with the forts and with the ironclads and fire rafts of the defence, almost all the Union

fleet (except the mortar-boats) forced its way past. At noon on the 2 5th Farragut anchored in front of New Orleans ; forts Jackson and St Philip, isolated and continuously bombarded by the mortar- boats, surrendered on the 28th; and soon afterwards the military portion of the expedition occupied the city. The commander; General B. F. Butler, subjected New Orleans to a rigorous martial law so tactlessly administered as greatly to intensify the hostility of South and North, but his administration was in many respects beneficial to the city, which was kept both orderly and healthy. Towards the end of the war General N.P. Banks held the command at New Orleans.

Throughout the years of the Civil War and the Reconstruction

period the history of the city is inseparable from that of the state.

I All the constitutional conventions were held here, the seat of

government again was here (in 1864-1882) and New Orleans was the centre of dispute and organization in the struggle between the races for the control of government. Notable events of that struggle in city history were : the street riot of the 30th of July 1866, at the time of the meeting of the radical constitutional convention; and the ” revolution ” of the 14th of September 1874, when the White League worsted the Republican metro- politan police in pitched battle and forced the temporary flight of the Kellogg government. The latter was reinstated in power by the United States troops, and by the same power the Democrats were frustrated in January 1875, after they had wrested from the Republicans the organization of the state legislature. Never- theless, the ” revolution ” of 1874 is generally regarded as the independence day of Reconstruction, although not until President Hayes withdrew the troops in 1877 and the Packard government fell did the Democrats actually hold control of the state and city. The financial condition of the city when the whites gained control was very bad. The tax-rate had risen in 1873 to 3%. The city defaulted in 1874 on the interest of its bonded debt, later re- funding this ($22,000,000 in 1875) at a lower rate, so as to decrease the annual charge from $1,416,000 to $307,500. Among events in the decade 1880-1890 were the World’s Industrial and Cotton Centennial Exposition of 1884-1883 (celebrating the centennial of the cotton industry of the country), and the introduction of electric lighting (1886); in the decade 1890-1900 the intro- duction of electric transit,

the latest charter and the improve- ments in public works already detailed. The lynching of Italian subjects by a mob in 1891 1 caused serious international com- plications.

Among the many floods from which the city has suffered those of 1849 an d 1882 were the most destructive.

Bibliography.- — For description see the Historical Sketch Booh and Guide to New Orleans … compiled by several leading writers of the New Orleans Press (New York, 1885); B. M. Norman, New Orleans and Environs (New Orleans, 1845); Grace King, New Orleans, the Place and the People (New York, 1895); and the novels and magazine writings of G. W. Cable. The Picayune publishes a guide, frequently revised. For administration, Manual of the City of New Orleans (periodical) ; W. W. Howe, ” Municipal History of New Orleans,” in Johns Hopkins University Studies, series vii., No. 4 (Baltimore, 1889); for accounts of the worst of the yellow-fever epidemics, W. L. Robison’s Diary of a Samaritan, by a member of the Howard Association of New Orleans (New York, i860) ; Report of the Sanitary Commission of New Orleans on the Epidemic Yellow Fever of 1853 (New Orleans, 1854) ; and for much miscellaneous information, 10th Census of the United States (1880), Social Statistics of Cities. History and Present Condition of New Orleans . . . by G. E. Waring and G. W. Cable (Washington, 1 881).

NEW PHILADELPHIA, a city and the county-seat of Tuscar- awas county, Ohio, U.S.A., on the Tuscarawas River and near the Ohio canal, about 75 m. S. by E. of Cleveland. Pop. (1890) 4456; (1900) 6213 (554 foreign-born); (1910) 8542. It is served by the Baltimore & Ohio (the Cleveland, Lorain & Wheeling Division), and the Pennsylvania (Cleveland & Pittsburgh Division) railways, and by an inter-urban electric system. The city has a level site in the midst of a good agricultural country, which abounds in coal and fire-clay. In the public square is a soldiers’ monument, and the city has a public library and a park. Its principal manufactures aTe steel, enamelled ware, clay goods, brooms, flour and carriages. The first settlement in the vicinity was made in May 1772, when Moravian Indian converts migrated from Pennsylvania (Friedenshutten, Bradford county, and Frieden- stadt, Lawrence county) to Schoenbrunn, called by the Indians Welhik-Tuppeek, a spring (now dry) a little south of the present New Philadelphia. Under David Zeisberger (1721-1808) and 1 In October 1890 the chief of police was assassinated, and before he died charged the crime to Italians. He had been active in pro- ceedings against certain Italians accused of crime, and his death was popularly attributed to the Mafia. Nineteen Sicilians were indicted, and of nine

put on trial six were acquitted and three escaped convic- tion on the ground of a mis-trial. On the 14th of March 1891 a mob broke into the jail and lynched eleven of the accused. The Italian government demanded that the lynchers should be punished, entered claims for indemnity in the case of the three Sicilians who had been Italian subjects, and, failing to secure as prompt an answer as it desired, withdrew its ambassador from Washington. In 1892 the United States paid an indemnity of $25,000 to Italy.

Johann Gottlieb Ernestus Heckewelder (1743-1823) other missionary villages were planted at Gnadenhutten (October 1772)1 Lichtenau (1776) and Salem (1780), all in the present county of Tuscarawas. After the massacre of Christian Indians at Gnadenhutten in 1782 the Indians removed to Michigan and in 1791 to Fairfield, Ontario; in 1798 some of them returned to Tuscarawas county and settled Goshen, where Zeisberger is buried. New Philadelphia was laid out in 1804 and was named by its founder, John Knisely, after Philadelphia in Pennsylvania; it was incorporated as a village in 181 5, and was first chartered as a city in 1896.

See Ohio Archaeological and Historical Quarterly for April 1909 (Columbus, Ohio) for several articles on the early settlement by Moravian Indians.

NEW PLYMOUTH, a municipality and seaport on the west coast of North Island, New Zealand, capital of the provincial district of Taranaki, 258, m. N.N.W. of Wellington by rail. Pop. (1906) 5 141. The town slopes to the ocean, with a background of forest surmounted by the snow-clad volcanic cone of Mount Egmont (8270 ft.). The district is not unjustly termed ” the garden of New Zealand.” It is highly fertile, cereals and fruits growing well; and dairy products are extensively exported. In the town are leather-works, timber-works and flour-mills, with freezing- works for export dairy produce. The settlement was founded in 1 84 1 by the Plymouth Company under the auspices of the New Zealand Company, and chiefly consisted of emigrants from Devonshire and Cornwall. On the seashore in the neighbourhood are extensive deposits of ironsand.

NEW POMERANIA (Ger. Neu-Pommern, formerly New Britain, native Birara), an island of the Bismarck Archipelago, N.E. of New Guinea in the Pacific Ocean, about 6° S., 150 E., in the administration of German New Guinea. It is crescent- shaped, about 330 m. long, and, except where the Willaumez Peninsula projects northward, nowhere more than 60 m. wide. The north-eastern extremity consists of the broad, irregular Gazelle Peninsula, joined to the main mass by a narrow neck.

The total area is about 9500 sq. m. The island is in great part unexplored. The coasts are in some parts precipitous; in others the mountains recede inland, and the coast is flat and bordered by coral reefs. The formation appears otherwise to be volcanic, and there are some active craters. The greatest elevation occurs towards the west — about 6500 ft. There is a rich tropical vegetation, and a number of considerable streams water the island. The chief centre is Herbertshohe at the north of the Gazelle Peninsula; it is the seat of the governor of German New Guinea (see New Guinea).

The natives are Melanesians, resembling their Papuan kinsmen of eastern New Guinea, and are a powerful well-formed race. Their villages are clean and well kept. Unlike their Papuan relatives, the islanders are unskilled in carving and pottery, but are clever farmers and fishermen, constructing ingenious fishing weirs. They have a fixed monetary system consisting of strings of cowries. They per- form complicated surgical operations with an obsidian knife or a shark's tooth. The common dead are buried or exposed to sharks on the reefs; bodies of chiefs are exposed in the fork of a tree. Justice is executed, and taboos, feasts, taxes, &c, arranged by a mysterious disguised figure, the duk-duk. The population is divided into two exogamous classes. The children belong to the class of the mother, and when the father dies go to her village for support, the land and fruit trees in each district being divided between the two classes. There are several dialects, the construction resembling Fijian, as in the pronominal suffixes in singular, triad and plural ; the numerals, however, are Polynesian in character.

NEWPORT, a market town and municipal borough, the chief town of the Isle of Wight, England. Pop. (1901) 10,911. It is situated near the centre of the island, at the head of the navigation of the Medina River, 5 m. S. from its mouth at Cowes. It is the chief centre of the railway system of the island. The church of St Thomas of Canterbury, rebuilt in 1854 in the Decorated style, contains many interesting old monuments, and one by Marochetti to the princess Elizabeth, daughter of Charles I., erected by Queen Victoria. The guildhall, erected in 1816 from the designs of Nash, includes the town-hall in the upper story with the market-place below. There are a corn exchange and museum. The grammar school (the scene of

negotiations between Charles I. and the parliament) was founded in

1612, and there is a blue-coat school for girls founded in 1761. The Albany barracks and Parkhurst prison lie north of the town. A considerable trade is carried on in timber, malt, wheat and flour. The town is governed by a mayor, 6 aldermen and 18 councillors. Area 504 acres.

It is supposed that Newport (Neuport) was a Roman settle- ment, then known as Medina. There are no traces of Saxon occupation, and no evidence that Newport became a borough before the reign of Henry II., though it was probably used before that time as a port of entrance for the ancient capital of Carisbrooke. The first charter was granted by Richard de Redvers between 1177 and 1184, freeing the burgesses from tolls throughout the island, from hundred suits, and from being impleaded without the walls, and giving them permission to choose their own reeve — privileges for which they paid 18 marks yearly. These grants, repeated and extended by the countess Isabel de Fortibus, were confirmed in 1349 by Edward III. and afterwards by successive kings, Henry VII. in 1489 granting in addition the petty customs within all ports and creeks of the island. The borough was incorporated by James I. in 1607, and a second charter of incorporation granted by Charles I. in 1637 is that by which Newport was governed until 1835. It was represented in parliament in 1295, but no return was made from that time until 1584, from which date it regularly sent two members. In 1867 the number was reduced to one, and in 1885 its representation was merged in that of the island. A fair was formerly held on Whit-Monday and the two following days, and on the three Saturdays nearest Whitsuntide, known as ” Bargain Saturdays,” there was a hiring fair for servants. There is now no fair. The Saturday market dates from 1184, and there is a Wednesday cattle market. Owing to its facilities for trade, Newport early superseded Carisbrooke as the capital of the island. Its prosperity in medieval times’ depended upon its harbour dues and its oyster beds in the river Medina.

NEWPORT, a municipal and county borough, contributory parliamentary borough, seaport and market town in the Mon- mouth parliamentary division of boroughs, Monmouthshire, England, on the Usk, 5 m. from its confluence with the Severn, and 1335 m. W. of London by the Great Western railway. Pop. (1891) 54,707; (1901) 67,270. It lies chiefly on the right (west) bank of the river, and on the E., N. and W. it is sheltered by a line of lofty hills. The old parish church of St Woollos stands finely on Stow Hill. Originally it consisted only of the present nave, a fine specimen of grand though unadorned Norman architecture; but a massive square tower (of the time of Henry III.) and a chancel were subsequently added; a large western

Early English lady-chapel is interposed between the nave and the tower. The old castle, built about 1 130 by Robert, earl of Gloucester, was greatly altered in the late Perpendicular period. The remains include two towers and the river frontage. The old Dominican monastery is entirely rebuilt and occupied as a private residence; but there are a few fragments of a house of White Friars. The principal public buildings are the spacious Victoria Hall, the Albert Hall, the town-hall, county council offices, market-house, custom-house, and museum and art gallery. Newport owes a rapid increase in importance to its situation on a deep and spacious tidal river, which renders it a convenient outlet for the trade of a rich mineral district. It has extensive docks and wharves, to which large steamers have access at all tides. Three docks, the Alexandra, South and Old Docks, had together a water area of about 60 acres, besides the Alexandra graving dock and dry docks. But additional accommodation was found necessary. In 1905 the Alexandra Docks and Railway company let the contract for the extension of the docks by 50 acres of water area, and the scheme was enlarged later so as to afford an additional area of 86 acres in all. The new works, added to the old Alexandra Dock, give a total deep-water area of over 130 acres. The first part to be completed (48 acres) was filled in the autumn of 1907. The river is crossed by a transporter bridge, opened in 1906, and having a span of 645 ft. and a clear headway from high water

of 177 ft., with a travelling truck worked by electricity. Iron ore, pig iron, timber and grain are among the chief imports, while coal and iron goods are exported. Besides the Great Western railway, Newport is served by the London and North- western, the Rhymney, and the Brecon & Merthyr systems. The town possesses large iron foundries and engineering works, and among other industries are the manufacture of wagons and wheels, nails, bolts and wire, shipbuilding and the making of railway plant, chemical manures and agricultural implements. There are also large breweries, glass and pottery works, and an extensive cattle market. Newport gives name to a Roman Catholic bishopric, but the cathedral church is at Belmont near Hereford. With Monmouth and Usk, Newport returns one member to parliament. In 1889 Maindee, a populous suburb on the left bank of the Usk, was incorporated with Newport, and constitutes one of its five wards. The town is governed by a mayor, 10 aldermen and 30 councillors. Area 4431 acres.

Newport, an ancient mesne borough and castle, occupied an important position on the Welsh marches. The town, which is not mentioned in Domesday, grew up round the castle built early in the 1 2th century. Giraldus Cambrensis, writing in 1 187, calls it Novus Burgus, probably

to distinguish it from Caerleon, whose prosperity declined as that of Newport increased. The first lord was Robert Fitz Hamon, who died in 1107, and from him the lordship passed to the earls of Gloucester and Stafford and the dukes of Buckingham. Hugh le Despenser, who held the lordship for a short time, obtained in 1323 a charter of liberties for the burgesses, granting them freedom from toll throughout England, Ireland and Aquitaine. The earl of Stafford granted a further charter in 1385, confirmed by his grandson in 1427, which gave the burgesses the right of self- government and of a merchant gild. On the attainder of the duke of Buckingham in 1483 the lordship lapsed to the crown, of whom it was held in the 16th and 17th centuries by the Pembrokes, and in the 19th by the Beauforts. The town was incorporated by charter of James I. in 1624 under the title of " Mayor and Bailiffs." This charter was confirmed by Charles II. in 1685 and holds force at the present day. By the act of 1535-1536 Newport is entitled as an ancient borough to take part in the election of a member for Monmouth town. The commercial importance of the town dates only from the second half of the 19th century, the Old Dock being partially formed in 1842, while the Alexandra was opened in 1875. In 1801 the population of the town was only 113 5. In 1385 the borough obtained a market lasting fifteen days from the vigil of St Lawrence (August 10). The charter of 1624 granted two fairs, one on the feast of the Ascension, and a second (still held) on St Leonard's day (November 6). Newport was the scene of a serious Chartist riot in 1839.

NEWPORT, a market town in the Newport parliamentary division of Shropshire, England, 145 m. N.W. from London on the Stafford-Shrewsbury joint line of the London & North- western and Great Western railways, and on the Shrewsbury canal. Pop. of urban district (1901) 3241. The church of St Nicholas is Early English and Perpendicular. There is an ancient market cross, greatly decayed. Newport possesses a literary institute, and a free grammar school founded in 1665. Four miles S. are the beautiful ruins of Lilleshall abbey, including a fine Norman west door and part of the front, considerable remains of the church besides, and traces of domestic buildings. The abbey was founded in 1145, under charter from King Stephen, by Richard de Baumes or Belmeis, dean of St Alkmund, Shrewsbury, for Augustinian canons, who were brought from Dorchester Abbey, Oxfordshire. Ironstone, coal and limestone are worked in the parish.

Newport is not mentioned in the Domesday Survey, but at the time of the Conquest formed part of the manor of Edg- mond, which William I. gave with the rest of the county of Shropshire to Roger, earl of

Shrewsbury. Henry I. is supposed to have founded the borough, at first called New Borough, after the manor had come into his hands through the forfeiture of Robert de Belesme. The site was probably chosen partly on

account of the fisheries, which are mentioned in the Domesday Survey, one of the chief services of the burgesses being that of taking fish to the king's court wherever it might be. This custom was continued after Henry III. had granted the borough with the manor of Edgmond, to Henry de Audley, but in the middle of the 13th century James, son of Henry de Audley, granted that the burgesses need not take the fish anywhere except within the county of Shropshire. The burgesses must have received certain privileges from Henry I., since Henry II. in an undated charter granted them all the liberties, rights and customs which they had in the time of Henry I. This probably included a gild merchant which is mentioned in the Quo Warranto Rolls as one of the privileges claimed by the burgesses. Con- firmation charters were granted by Edward I. in 1287 and Edward II. in 1311, while the town was incorporated in 1551 by Edward VI. whose charter was confirmed by James I. in 1604. The governing body consisted of a high steward, deputy steward, two water-bailiffs and 28 burgesses, but the corporation was abolished by the Municipal Corporation Act of 1883, and a Local Board was formed, which, under the Local Government Act, gave place in 1894 to an urban district council.

See Edward Jones, Historical Records of Newport, co. Salop; Shropshire Archaeol. and Natural History Society, vols. viii. and ix. (1885-18S6); Victoria County History, Shropshire.

NEWPORT, a city of Campbell county, Kentucky, U.S.A., on the Ohio River opposite Cincinnati, Ohio, and at the mouth of the Licking River opposite Covington, Ky. Pop. (1900) 28,301, of whom 4081 were foreign-born and 424 were negroes; (1910 census) 30,309. It is served by the Louisville & Nash- ville, and the Chesapeake & Ohio railways, and by electric lines to Covington, Cincinnati, Bellevue, Fort Thomas and Dayton. With Cincinnati and Covington it is connected by bridges. In the highlands, about 3 m. back of the city, is Fort Thomas, a United States military post, established in 1888 to supersede Newport Barracks (1804), in the city, which were abandoned in 1894. Newport is essentially a residential suburb of Cin- cinnati, but it is also

industrially important. In 1905 the value of the factory product was $5,231,084, Newport ranking third among the manufacturing centres of the state. Newport was settled late in the 18th century, was laid out in 1791, was incor- porated as a town in 1795, and was chartered as a city in 1834.

NEWPORT, a city, a port of entry and the county-seat of Newport county, Rhode Island, U.S.A., occupying the southern portion of the island of Rhode Island at the entrance to Narra- gansett Bay, about 30 m. S. by E. of Providence, about 71 m. S. by W. of Boston and about 165 m. E.N.E. of New York. Pop. (1905 state census) 25,039, of whom 61 n were foreign- born, 2590 being born in Ireland; (1910 U.S. census) 27,149. It is served by the Newport & Wickford Railroad and Steam- boat Line, which connects with the New York, New Haven & Hartford railway at Wickford Junction; by ferry to Bristol, and by steamboats to Providence, Fall River and New York.

The broken water-front of the island, about 17 m. long, is partly rocky arid partly made up of sandy beaches. From the harbour on the south-west the land rises to a gently rolling plateau with maximum elevations of about 250 ft. The climate is notably mild and equable throughout the greater part of the year. In the newer parts of the city there are many magnificent estates of summer residents; and in the " Old Town," the greater part of which is close to the harbour, and extending up the hillside, are many 18th-century houses and Thames Street, its principal business thoroughfare, only 20 ft. wide. Near the" northern end of Thames Street, Washington Square or the Parade, connects with Broadway, which extends northward and is the principal thoroughfare through a large residential district of the permanent inhabitants. From the Parade, also, Touro Street extends eastward to the upper end- of Bellevue Avenue, the principal street, which extends southward to the ocean. There Bellevue Avenue connects with the southern end of the Cliff Walk, which for about 3 m. winds along the cliffs on the eastern coast of the island. North of the walk is the smooth, hard Easton's Beach, frequented for sea-bathing.

South of the Cliff Walk is Bailey's Beach, a private bathing- beach; at its western end is the Spouting Rock, through an opening in which the water, during violent south-east gales, has been thrown to a height of about 50 ft. Ocean Drive, about 9 m. long, encircles the south-western peninsula. Beyond Easton's Beach, in the town of Middletown, is Sachuest, or Second, Beach, with a heavier surf, and here is a fissure in the rocks, 150 ft. long and 50 ft. deep, and 8-14 ft. wide, known as Purgatory. North of Sachuest Beach are the picturesque Paradise Rocks and the Hanging Rocks.

At the head of the Parade stands the old State House (used when Newport was one of the capitals of Rhode Island); it was completed about 1743, was used as a hospital during the War of Independence, and is now the seat of the county court. In the vicinity are the City Hall and a monument to Oliver Hazard Perry. Fronting on Touro Street is a synagogue, erected in 1762-1763, and said to be the oldest in the United States; . one of the early rabbis was Isaac Touro, a Jew of Dutch birth, whose name is borne by a street and a park in Newport. Near the corner of Touro Street and Bellevue Avenue is the Hebrew cemetery. Of chief historic interest along Bellevue Avenue are Touro Park and Redwood Library. In the park is the historic old Stone Mill or " Round Tower," which Longfellow, in accordance with the contention of certain members of the Society of Danish Antiquarians, ascribes, in his Skeleton in Armour, to the Norsemen, but which Benedict Arnold (1615- 1678), governor of Rhode Island, repeatedly mentions in his will as " my Stone-built Wind-Mill." Opposite the park stands the William Ellery Channing Memorial Church; and in the park are monuments to Channing and to Matthew Calbraith Perry. The Channing House on Mary Street, built in 1751, is now used for a Children's Home. The Redwood Library grew out of the Philosophical Society, established in 1730, which Bishop (then Dean) Berkeley possibly helped to found' during his residence here in 1729-1731; the Library was incorporated in 1747, being named in honour of Abraham Redwood (c. 1 709-1 788), a wealthy Friend who early contributed £500 toward supplying it with books; the building was completed in 1750. In Berkeley Avenue, north of Paradise Road, is Whitehall, which Berkeley built for his home in 1729 and which was restored in 1900. The first newspaper of Newport was published in 1732 by James Franklin, a brother of Benjamin Franklin, and in 1758 James Franklin's son, also named James, founded the present Newport Mercury.

Newport is best known as a fashionable resort during the summer and autumn; there are annual horse and dog shows, and fox-hunting is one of the amusements. The harbour is a rendezvous for racing- and pleasure-yachts. On Bellevue Avenue is the country club, the Casino. Among the great estates with magnificent " cottages " here are those of Mrs Cornelius Vander- bilt, Wm. B. Leeds, Mrs O. H. P. Belmont (the " Marble Palace," built for W. K. Vanderbilt), Mrs Ogden Goelet, Mrs Robert Goelet, Perry Belmont, and J. J. Astor — all on the Cliff Walk.

Newport has an inner and an outer harbour; the inner is landlocked, 1 m. long and \ m. wide, but is not deep enough to admit vessels drawing more than 15 ft. of water; the outer admits the largest vessels

and is a refuge for foreign and coastwise commerce. The whole harbour is protected at its entrance by Fort Adams, at the mouth of the inner harbour, Fort Wetherill on Conanicut Island, and Fort Greble on Dutch Island. The Lime Rock Lighthouse was for many years in charge of Mrs Ida Lewis Wilson (b. 1841), famous for the many lives she saved. On Goat Island, which partly encloses the inner harbour, is Fort Walcott, with a United States torpedo station and torpedo factory, and on Coasters Harbor Island, farther north, are a United States Naval Training Station and a War College. Along the western border of the outer harbour is Conanicut Island, on which is the town of Jamestown (pop. in 1905, 1337), with the Conanicut Yacht Club and other attractions for summer visitors. Newport has little foreign trade. There is, however, considerable coastwise trade in fish, coal and general merchandise, and in 1905 the total tonnage of the port amounted to 1,770,816 tons.

Fishing is an industry of some importance. The value of the city's factory products decreased from $1,575,192 in 1900 to $1,347,104 in 1905.

Newport is governed under a charter of 1906, which is unique as an instrument for the government of a city, and aims to restore in a measure the salient features of township government. Most of the powers usually vested in a town meeting are here vested in a representative council of 195 members — 39 from each of 5 wards. A candidate for councilman must secure the signature of at least 30 electors in his ward before his name can be placed on the ballot. A mayor, one alderman from each ward, and a school committee are elected in much the same manner: a candidate for mayor must have his election paper signed by at least 250 qualified electors, and an alderman or member of the school committee by at least 100. All other important officers are appointed by the council. The mayor and aldermen are for the most part executive officials corresponding to the selectmen of a town.

Newport was founded by Nicholas Easton (1593-1675), William Coddington (1601-1678), John Coggeshall, John Clarke (1609-1676), William Brenton (d. 1674), William Dyer, Thomas Hazard, Henry Bull (1609-1693) and Jeremy Clerke (d. 1652), who, as Antinomians, were driven from Massachusetts Bay, and in 1638 settled at Pocasset (later Portsmouth, in the northern part of the island of Rhode Island ; pop.

in 1 905, 23 7 1) . As radical tendencies prevailed in Pocasset they removed, and in 1639 settled Newport at the southern end of the island (called Aquidneck until 1644), which they had bought from the Indians. Most of the founders are commemorated by place-names in the city; in the Coddington Burying-Ground are the tombs of Governor William Coddington, Governor Henry Bull, and Governor Nicholas Easton; and in the Coggeshall Burying-Ground John Coggeshall was buried. At the beginning an independent government by judge and elders was established (Newport and Portsmouth being united in 1640), but in 1647^^6 town was united with Providence, Portsmouth and Warwick in the forma- tion of Rhode Island according to the Williams (or, as it is commonly called, the Warwick) charter of 1644. During 1651- 1654 Newport and Portsmouth were temporarily separated from the other two towns. About 1.640 a Baptist Church was founded, which is probably the oldest in the United States except the Baptist congregation in Providence; here, too, at nearly the same time, one of the first free schools in America was opened. In 1656 English Friends settled here. Between 1739 and 1760 great fortunes were amassed by the “Triangular Trade,” which consisted in the exchange in Africa of rum for slaves, the exchange in the Barbadoes of slaves for sugar and molasses, and the exchange in Newport of sugar and molasses for rum. The destruction here on the 17th of May 1769 of the British revenue sloop ” Liberty,” formerly the property of John Hancock, was one of the first acts of violence leading up to the War of American Independence. The foreign trade of Newport, which in 1770 was greater than that of New York, was destroyed by the War of Independence. During the war the town was in the possession of the British from December 1776 to the 25th of October 1779; a plan to recover it in 1778 by a land force under General John Sullivan, co-operating with the French fleet under Count d’Estaing, came to nothing. Soon after the evacuation of the British, French troops, under Comte de Rochambeau, arrived and remained until near the end of the war, and Newport was a station of the French fleet in 1 780-1 781. The Sayer house, which was the headquarters of Richard Prescott (1725-1788), the British general; the Vernon house, which was the head- quarters of Rochambeaj, and the Gibbs house, which was for a short time occupied by Major-General Nathanael Greene, are still standing.

Newport was chartered as a city in 1784, but in 1787 it sur- rendered its charter and returned to government by town meeting. It was rechartered as a city in 1853; the charter of this year was much amended in 1875 and in 1906 was superseded by another. Until 1900, when Providence became the sole capital, Newport was one of the

seats of government of Rhode Island.

See Mrs J. K. Van Rensselaer, Newport, Our Social Capital (Philadelphia, 1905); Susan C. Woolsey, ” Newport, the Isle of Peace,” in L. P. Powell’s Historic Towns of New England (New York, 1898); G. C. Mason, Reminiscences of Newport (Newport, 1884); W. A. Greene and others, The Providence Plantations for Two Hundred and Fifty Years (Providence, 1886); C. T. Brooks, Controversy touching the Old Stone Mill (Newport, 1851); R. M. Bayles (ed.), History of Newport County (New York, 1888); E. Peterson, History of Rhode Island (i.e. Aquidneck) (New York, 1853).

NEWPORT NEWS, a city and port of entry of Warwick county, Virginia, U.S.A., on the James River and Hampton Roads, 14 m. N. by W. of Norfolk and 75 m. S.E. of Richmond; it is situated on what is known as the Virginia Peninsula. Pop. (1890) 4449; (1900) 19,635, of whom 1614 were foreign-born and 6798 were negroes; (1910 census) 20,205. Newport News is served by the Chesapeake & Ohio railway, of which it is a terminus; by river boats to Richmond and Petersburg, Va.; by coastwise steamship lines to Washington, D.C., Baltimore, Philadelphia, New York, Boston and Providence; by foreign steamship lines to London, Glasgow, Liverpool, Dublin, Belfast, Rotterdam, Hamburg and other ports; and by electric lines to Old Point Comfort, Norfolk and Portsmouth. A public park extending from the James to the heart of the city, a deep, spacious and well-protected harbour, a large shipbuilding yard with three immense dry docks, and two large grain elevators of 2,000,000 bushels capacity, are among the most prominent features; at the shipbuilding yard various United States battle- ships, including the ” Kearsarge,” ” Kentucky,” ” Illinois,” ” Missouri,” ” Louisiana,” ” Minnesota,” ” Virginia ” and ” West Virginia,” were constructed, as well as cruisers, gun-boats, merchant vessels, ferry-boats and submarines. The city’s export of grain and its coastwise trade in coal are especially large. Among the manufactures are shoes, tobacco, medicines and knit goods. The value of the factory products in 1905 was $9,0S3,9 o 6, being 52-5% more than in 1900. Both in 1900 and in 1905 Newport News ranked second to Richmond among the cities of the state in the value of factory products. The first settlement on the site of Newport News was made in 162 1 by planters brought from Ireland by Daniel Gookin, the father of Daniel Gookin (1612-1687) of Massachusetts, who selected the site on the advice of Sir William Newce and his brother Captain Newce. The present city dates only from 1882, when it was laid out in consequence of the extension of the Chesapeake & Ohio railway to the coast here; it was incorporated in 1896. The name is said to be in honour of Christopher Newport and Sir William Newce.

NEWPORT PAGNELL, a market town in the Buckingham parliamentary division of Buckinghamshire, England, 56 m. N.W. by N. of London, on a branch of the London & North- western railway, and at the junction of the river Ouzel with the Ouse. Pop. of urban district (1901) 4028. The church of St Paul and St Peter has Early English portions, including fine north and south porches. An inscription on the tomb of Thomas Abbott Hamilton in the churchyard is by the poet Cowper, who lived in the neighbouring town of Olney (q.v.). The almshouse called Queen Anne's Hospital is named from Anne of Denmark, queen of James I., who reconstituted a foundation of the time of Edward I., dedicated to St John the Baptist and St John the Evangelist.

NEWQUAY, a seaport and watering-place, in the St Austell parliamentary division of Cornwall, England, 14 m. N. of Truro, on a branch of the Great Western railway. Pop. of urban district (1901) 2935. It is finely situated on the north coast, on Newquay Bay, which is sheltered to the west by Towan Head. The cliff scenery is grand, and there is a fine sandy beach along the northward sweep of the coast in Watergate Bay. The harbour, artificially constructed, and equipped with a jetty and piers, admits vessels of 250 tons. The chief exports are iron and other ores, china clay, granite, fish and grain. The imports are coal, salt and manures.

NEW ROCHELLE, a city of Westchester county, in southern New York, U.S.A., on Long Island Sound, i6| m. from the Grand

Central Station, New York City. Pop. (1890) 9057, (1900)

14,720, of whom 4425 were foreign-born and 777 negroes; (1010 census) 28,867. It is served by the New York, New Haven & Hartford Railroad, and by electric railways to New York City and neighbouring places. The city is primarily a residential suburb of New York City, and has some fine colonial residences, and several beautiful residential parks, notably Rochelle, Neptune, and Beechmont Parks. Its large foreign-born popula- tion is comparatively recent and comparatively isolated. Among the prominent buildings of the city are a public library, the high school, a theatre (owned by the Knights of Columbus), a Masonic Temple, the City Bank and several churches, of which the most notable, perhaps, are the Baptist, Methodist, and St Gabriel's (Roman Catholic), which is the gift of members of the Iselin

family, to whose interest in yachting is due in part the prominence of the New Rochelle and Larchmont Yacht Clubs. The Ursuline College o(St Angela (1904) and the Merrill School (1906), both for girls, are in New Rochelle. The principal building of the first is Leland Castle, built in 1858-1860 by Simon Leland and finely decorated with frescoes and coloured marbles. A People's Forum, growing out of the work of the People's Institute of New York City, was established here in 1903-1904. In the road between New Rochelle and White Plains is the monument to Thomas Paine, provided for in his will, on the farm which was confiscated from a Tory by the state and was given to him at the end of the American War of Independence. On the Sound, in Hudson Park, is a monument commemorating the landing- place of the first Huguenot settlers. Immediately S. of New Rochelle, in the Sound, is Glen Island, an amusement resort; belonging to the Glen Island group, E. of Pelham ,I/Ianor, is Travers Island, with the out-of-town clubhouse and grounds of the New York Athletic Club. On David's Island, ac| m. S.W. of New Rochelle, is Fort Slocum, a United States Army post. The suburban villages of Larchmont and Pelham (and Pelham Manor) lie respectively N.E. and W. of New Rochelle. The important industries are the manufacture of scales and of other instruments of precision, and printing and publishing — the Knickerbocker Press of G. P. Putnam's Sons, New York, is here. The site of New Rochelle is part of a purchase by Thomas Pell in 1654 and of a grant to him by Richard Nicolls in 1666; it was sold in 1689 to Jacob Leisler. The first settle- ment of importance was made in 1688 by Huguenots, some of whom were natives of La Rochelle. New Rochelle was incor- porated as a village in 1847, and as a city in 1899.

See R. and C. W. Bolton, History of the Several Towns, Manors and Patents of Westchester County (New York, 1881), and J. Thomas Scharf 's History of Westchester County (2 vols., Philadelphia, 1886).

NEW ROSS, a market-town of Co. Wexford, Ireland, on the acclivity of a hill on the E. bank of the Barrow, 2 m. below its junction with the Nore, 102 m. S.S.W. of Dublin by the Dublin & South-Eastern railway. Pop. (1901) 5847. The Barrow is crossed by an iron bridge with a swivel pillar in the centre on which a portion of the bridge is turned to admit the passage of vessels. Vessels of 600 tons can lie alongside the quays. The inland water communications reach to Dublin by means of the Barrow and the Grand Canal. The Nore is navigable to Inistioge. New Ross has breweries and tan-yards, a salmon fishery, and a brisk export trade in agricultural produce. The urban district of New Ross includes Rosbercon, on the opposite side of the Barrow.

It is stated that St Alban built the abbey of Rossmactreoin, which gave

rise to an ancient city formerly called Rossglas. A Dominican foundation of the 13th century has left some remains in Rosbercon. According to Camden, New Ross was founded by Isabella, daughter of Strongbow and wife of William Marshal, afterwards earl of Pembroke. A charter was granted to it by Roger Bigod in the reign of Edward I., which was extended by James I. and James II. From 1374 it returned two members to parliament, but at the Union in 1800 the number was reduced to one, and the town ceased to be a parliamentary borough in 1885. In 1269 it was surrounded by walls. The fortresses were dismantled by Cromwell, but some remains are extant,

NEWRY, a seaport, market town and parliamentary borough (returning one member) of Co. Down, Ireland, on the Newry

water and Newry canal at the extreme head of Carlingford Lough. Pop. (1901) 12,405. It is 73 m. N. of Dublin by the Great Northern railway. A railway owned by the London & North- western company connects Newry with the deep-water harbour at Greenore; and there is an electric railway to Bessbrook in Co. Armagh. The western part, called Ballybot, is con- nected with the eastern part, or old town, by four bridges over the canal and four over the tidal water. The situation of the town is striking, the Newry Mountains and Slieve Gullion on the west, and the Mourne Mountains on the east, enclosing the narrow valley in which it lies. Newry is one of the most important ports of the province of Ulster, and in connexion with several sub-ports farther down the river is the outlet for the trade of a very extensive district. The port admits vessels of 2000 tons to Victoria Docks, 3 m. from the town, but vessels drawing 1 5 ft. can go up the ship canal to the Albert Basin, 3 m. from the sea. The principal exports are grain, eggs, cattle, linen cloth and flax, and the imports include timber, groceries and coal. In the neighbourhood granite of a fine quality is quarried, and the town ■ possesses rope and sail works, breweries, distilleries, flour-mills and tanneries. It is governed by an urban district council. In n 75 an abbey was founded here by Maurice M'Loughlin, king of Ireland. The abbey was converted in 1543 into a collegiate church for secular priests, and was dissolved by Edward VI., who granted it to Sir Nicholas Bagenal, marshal of Ireland. Bagenal made it his private residence, and laid the foundations of its prosperity. In 1689 Newry was set on fire by the duke of Berwick when in retreat before Schomberg. Charters were granted to the town by James I. and James II. By the charter of James I. it sent two members to parliament, but at the Union in 1800 it was restricted to one member. Until 1898 a portion of Newry was situated in Co. Armagh. A mile N.E. of the town is a notable rath or enclosure, taking its name of Crown rath from traditional single encounters between native princes in contention for

the sovereignty.

NEW SIBERIA ARCHIPELAGO, a group of islands situated off the Arctic coast of Siberia, from 73° to 76° 6′ N., and 13 5 20′ to 148 E. The name is loosely applied, covering either the northern group only of these islands, for which the name of New Siberia Archipelago, or of Anjou Islands, ought properly to be reserved, or the southern group as well, which ought to maintain its name of Lyakhov Islands. Some confusion prevails also as to whether the islands Bennett, Henrietta and Jeannette, dis- covered by the ” Jeannette ” expedition, ought to be included in the same archipelago, or described separately as the Jeannette Islands. The first of these three belongs geographically, and probably geologically, to New Siberia Archipelago, from which it is only 97 m. distant. As to Henrietta and Jeannette Islands, situated 200 m. N.E. of New Siberia Island, in 157° to 159 E., they can hardly be included in the New Siberia Archipelago. There seems, moreover, to be land due north of Kotelnyi Island in 78 N., first sighted by Sannikov and described as Sannikov Land. It was also seen by Baron Toll.

The New Siberia or Anjou Islands consist, beginning from the west, of Kotelnyi, the largest (116 m. long, 100 m. wide), having the small island Byelkovskiy near its western shore; Thaddeus (Fad- deevskiy), in the middle; and New Siberia (Novaya Sibir), in the east (90 m. long, 40 m. wide). Kotelnyi is the highest and most massive of the four, reaching a maximum altitude of 1200 ft. in the Malakatyn-tras mountain. Its north-east portion consists of Upper Silurian coral limestones (Llandovery division), containing a rich fossil fauna and representing a series of folds running north-north- west. The same Silurian deposits are widely spread on the mainland as far as Olenek. The western portion of Kotelnyi is built up of Middle Devonian limestones and slates, folded the same way, of which the fossil fauna is similar to that of the Urals. Triassic slates. appear in the south-east. Diabases pierce to Devonian rocks, and olivine rocks appear as dykes amidst the Triassic deposits. The Malakatyn- tras is also made up of volcanic rocks. The eastern portion of the island, named Bunge’s Land, is thickly covered with Post-Tertiary deposits. Thaddeus Island has a long promontory, Anjou, protrud- ing north-westwards. New Siberia Island attains altitudes of 200 to 300 ft. in its western portion. A range of hills, composed of Tertiary deposits, and named Hedenstrom’s Mountains, runs along its south-western coast, and the same rocks form a promontory protruding northwards. Thi so-called Wood Mountains, which

were supposed to be accumulations of floating wood, are denudations of Miocene deposits containing layers of brown coal with full stems of trees. These Tertiary deposits are characterized by a rich fauna ; fully developed leaves of poplars, numerous fruits of the mammoth tree, needles of several conifers, &c, being found in them, thus testifying to a climate once very much warmer. The only repre- sentative of tree vegetation now is a dwarf willow I in. high.

The Lyakhav Islands consist of the Bolshoy (Large), or Blizhniy (Nearest), which is separated by Laptev Strait, 27 m. wide, from Svyatoy Nos of Siberia; Malyi (Small), or Dalniy (Farthest), to the north-west of Blizhniy; and three smaller islands — Stolbovyi (Pillars), Semenovskiy and Vasilevskiy — to the west of Malyi. Dr Bunge found Bolshoy to consist ot granite protruding from be- neath non-fossiliferous deposits; while the promontory of Svyatoy Nos consists of basalt hills, 1400 ft. high. Along the southern coast of Bolshoy Baron Toll found immense layers of fossil ice, 70 ft. thick, evidently relics from the Ice Age, covered by an upper layer of Post-Tertiary deposits containing numbers of perfectly well- preserved mammoth remains, rhinoceros, Ovibos, and bones of the horse, reindeer, American stag, antelope, saiga and even the tiger. The proof that these animals lived and fed in this latitude (73° 20′ N)., at a time when the islands wore not yet separated from the continent, is given by the relics of forest vegetation which are found in the same deposits. A stem of Alnus fruiicosa, 90 ft. high, was found with all its roots and even fruits.

Basalts and Tertiary brown coal deposits enter into the com- position of the southern extremity of Bennett Island, and the mountains of Sannikov Land, seen by Toll, have the aspect of basaltic ” table mountains.”

The climate of these islands is very severe. In 1886 the winter ended only in June, to begin anew in August (21st May, -5-8° F.; 16th October, -34-6°). The highest summer temperature was 50 . Flocks of geese and other birds come to the islands from the north (Bunge and Toll), as also the gull Leslris pomarina, which feeds chiefly on the lemming. The lemmings are very numerous, and in certain years undertake migrations to the mainland and back. Reindeer, followed by wolves, come also every year to the islands; the polar fox and polar bear, both feeding on the lemmings, are numerous. Hunters come in numbers to the Lyakhovs, which must have been long known to Arctic hunters.

A Yakutsk Cossack, named Vaghin, wintered on Bolshoy in 1 71 2, but it was a merchant, Lyakhov, who first described the two greater islands of this group in 1770, and three years later reached on sledges the largest island of the New Siberia group, which he named Kotelnyi. The Lyakhovs were mapped in 1777. J. Sannikov, with a party of hunters, discovered in 1805-1808 Stolbovyi, Thaddeus and New Siberia Islands, and a merchant, Byelkov, the Byelkovskyi Islands. He sighted the land to the north of Kotelnyi and the land to the north of New Siberia (now Bennett Island). A Russian officer named Hedenstrom, accompanied by Sannikov, explored the archi- pelago and published a map of it in 181 1. Lieutenant Anjou visited it in 1821-1823. A scientific expedition under Dr Alexander Bunge (including Baron Eduard Toll) explored it in 1885-1886. Baron Toll revisited it in 1893 with Lieutenant Shileiko, and again in 1900 with F. G. Seeberg. Papers were found on Bennett Island showing that he left it for the south in November 1902, but he never returned home, and two relief parties in 1903 failed to find traces of him.

Authorities. — The works of Hedenstrom, Ferdinand von Wrangell, and Anjou, Bunge and Toll in Beitrdge zur Kenntniss des rnssischen Reichs, 3te Folge, Bd. iii. (1887). Baron Toll in Memoirs (Zapiski) of the St Petersburg Academy ■of Sciences, 7th series, vol. xxxvii. (1889), xliii. (1895), and 8.th series, vol. ix. (1899), with maps. J. Schmalhausen, ” Tertiare Pflanzen,” in same Memoirs, 7th series, vol. xxxvii. (1890); Geographical Journal, passim. (P. A. K.)

NEW SOUTH WALES, a state of the Australian Common- wealth. The name was given by Captain Cook, in his exploratory voyage in 1770, to the southern portion of the eastern coast of Australia, from some imagined resemblance of its coast-line to that of South Wales. The name was afterwards extended to the eastern half of Australia, but now designates a much more restricted area. New South Wales is bounded by the Pacific Ocean on the E., by Queensland on the N., by South Australia on the W. and by Victoria on the S. It lies between 28 and 38 S. lat., and 141 and 154 E. long. The coast-line, which is about 700 m. in length, extends from Cape Howe (37 30’)

at the south-eastern corner of Australia to Point Danger in 28 7′ S. The colony is approximately rectangular in form, with an average depth from the coast of 650 m. and an average width from north to south of 500 m. The superficial area is estimated at 310,700 sq. m., or about one-tenth of the whole of Australia.

Physical Configuration. — The surface of the state is divided naturally into three distinct zones, each widely differing in general character

and physical aspect, and clearly defined by the Great Dividing Range running from north to south. The tableland, which forms the summit of the range, comprises one of the three zones and separates the other zones, viz. the coastal region, and the great plain district of the interior. The main range follows the line of the coast, varying from 30 to 140 m. distant, being nearest at the south and receding the farthest at the sources of the Goulburn river, the main tributary of the Hunter. The crest of this range is, in some places, narrow; in others it spreads out into a wide tableland. The eastern slopes are, as a rule, rugged and precipitous, but the western versant falls gently to plains. The highest part of the Dividing Range is in the south-eastern portions of the state, on the borders of Victoria. Here some of the peaks rise to a height of over 7000 ft. ; one of these, Mount Kosciusco, the highest peak in Australia, attains an elevation of 73 28 ft. The tableland varies greatly in elevation, but nowhere does it fall below 1500 ft., and in places it reaches an average of 5000 ft. The great plain district, lying west of the tableland, is part of a vast basin which comprises portions of Queensland, South Australia and Victoria, as well as of New South Wales. The great plains are traversed by a few rivers, whose long and uncertain courses carry their waters to the river Murray, which empties itself into the Southern Ocean through the state of South Australia, and during 1250 m. of its course forms the boundary between the states of New South Wales and Victoria. The Murray has a very tortuous course, as may be judged from the fact that the measurement along the joint boundary of New South Wales and Victoria is only 460 m. in a straight line, the river cours? being 1250. The chief tributaries of the Murray are the Darling and the Murrumbidgee, which is joined by the Lachlan The Murray and the Murrumbidgee are permanent streams, but the Darling occasionally ceases to run in part of its course, and for a thousand miles above its junction with the Murray it receives no tributary. In its upper course the Darling receives numerous tributaries. Those on the right bank all come from Queensland and bring down enormous volumes of water in flood time; on the left bank the most im- portant tributaries are the Gwydir, Namoi, Castlereagh, Bogan and Macquarie. Here and there along the course of the western rivers are found lagoons, sometimes of considerable dimensions. These are commonly called lakes, but are in reality shallow depressions receiving water from the overflow of the rivers in times of flood, and in return feeding them when the floods have subsided.

The coastal belt differs greatly from the other divisions of the state. The main range gives rise to numerous rivers flowing eastward to the South Pacific. Almost everywhere between the main range and the sea

the country is hilly and serrated, more particularly in the southern portions of the state. In the Illa- warra district, 50 m. south of Sydney, the mountains skirt the very edge of the coast, but farther north there is a wider coast – land, with greater stretches of country available for tillage and pasture.

Along the sea-board are twenty-two well-defined headlands or capes and about a score of bays or inlets, to mark which for navigators there are thirty-four lighthouses. There are four very fine natural harbours, viz. Jervis Bay, Port Jackson, Broken Bay and Port Stephens, and several others of minor Im- portance. Port Jackson, on which is situated the city of Sydney, is one of the six greatest ports of the British empire. The port second of commercial importance to Sydney is Newcastle, at the mouth of the Hunter river, which is the great coal-shipping port of the colony. Secondary harbours, available for coasting steamers, south of Sydney are at Port Hacking, Wollongong,

Kiama, Shoaihaven, Bateman's Bay, Ulladulla, Merimbula, and Twofold Bay. North of Sydney the secondary ports are at the mouths of the Hawkesbury, Manning, Hastings, Macleay, Nambucca, Bellingen, Clarence, Richmond and Tweed rivers. The rivers of the sea-board are as just enumerated, the only other of importance being the Hunter. The Richmond drains an area of 2400 sq. m. and is navigable for 60 m. The Clarence is a fine stream draining an area of 8000 sq. m.; it has a course of 240 m. navigable for 67 m. The Macleay drains an area of 4800 sq. m., and empties at Trial Bay after a course of 200 m., of which 20 m. are navigable. The Hastings and Manning are both important rivers. The Hunter is one of the chief rivers of the state and embouches at Port Hunter or Newcastle Harbour after a course of 200 m. It drains an area of 11,000 sq. m., more than twice the area of the Thames basin. Less commercially important than the Hunter, the Hawkesbury is nevertheless a fine stream; it has a course of 330 m., of which 70 m. are navigable. South of Sydney the rivers are of less importance; the principal is the Shoaihaven, 260 m. long, draining an area of 3300 sq. m.

Climate. — The three geographical regions above described constitute three distinct climatic divisions. The coastal region, 28 to 37 S. lat., shows a difference between the average summer and winter temperatures of only 24 Fahrenheit. Sydney, which is situated midway between the extreme points of the state (33° 5 1 ‘ S.), has a mean

temperature of 63 , the mean summer temperature being 71 and that of winter 54°, showing a mean range of 17 ; the highest temperature in the shade experienced at Sydney in 1896 was 108-5°, an d the lowest 35-9. The coastal district has an area of 38,000 sq. m., over which there is an average rainfall of 42 in. The rainfall is greatest at the sea-board, diminishing inland; the fall also diminishes from north to south. Sydney has an average fall of 50 in., while the Clarence Heads, in the north, has 58 in., and Eden, in the south, 35-5 in. The tableland is a distinct climatic region. On the high southern plateau, at an elevation of 4640 ft., stands the town of Kiaridra, with a mean summer temperature of 56-4° and winter of 32-5°. Cooma, in the centre of the Monaro plains, at an elevation of 2637 ft., has a mean summer temperature of 65-9° and winter, 41-7°; its summers are therefore as mild as those of London or Paris, while its winters are much less severe. On the New England tableland, under latitude 30° S., the yearly average temperature is 56-5°, the mean summer 67-7° and the mean winter 44-3°. The tablelands cover an area of 85,000 sq. m. and have an average rainfall of 32-6 in.; there is, however, a small area in the southern portion where an average fall of 64 in. is experienced. In the western division, or great plains, severe heat is experienced throughout the summer, and on occasional days the thermometer in the shade ranges above ioo° Fahrenheit, but it is a dry heat and more easily borne than a much less degree of temperature at the sea-board. The mean summer temperature ranges between 75° at Deniliquin in the south and 84° at Bourke. The mean range in winter is between 48° and 54-5°, and, accom- panied as this is with clear skies, the season is very refreshing. West of the tableland the amount of rainfall decreases as the distance from the Pacific increases, and in a large area west of the Darling the average annual rainfall does not exceed 10 in. For the whole western division, embracing an area of 188,000 sq. m., the average rainfall is 19-8 in. (T. A. C.)

Geology. — New South Wales consists geologically as well as geographically of three main divisions which traverse the state from north to south. The highlands of eastern Australia form the middle belt of the state, to the east of which are the low coastal districts and to the west the wide western plains. The highlands of New South Wales consist, geographically, of a series of tablelands, now in the condition of dissected peneplains; geologically, they are built of a foundation of Archean and folded Lower Palaeozoic rocks, covered in places by sheets of more horizontal Upper Palaeozoic and Mesozoic rocks; these deposits occur along the edge of the highlands, and are widely distributed on the floor of the coastal districts. They have been lowered to this level by a monoclinal fold, which has brought down

the Mesozoic rocks, so that they extend eastward to the coast, where they dip beneath the sea. The western plains contain isolated ridges of the old Archean and Lower Palaeo- zoic rocks; but in the main, they consist of plains of Cretaceous beds covered by Cainozoic drifts. The stratified rocks in the high- lands strike north and south, as if they had been crumpled into folds,

in Upper Palaeozoic times, by pressure from east to west. The weak areas in the crust caused by the earth movements were invaded by great masses of Devonian granites. They altered the Lower Palaeo-zoic rocks on their edges, and were once thought to have converted wide areas of Lower Palaeozoic rocks into schists and gneisses. Most of these foliated rocks, however, are doubtless of Archean age. The highland rocks no doubt once extended along the whole length of the state from north to south ; but they are now crossed by a band of Upper Palaeozoic sediments, which extend up to the valley of the Hunter river and separate the Blue Mountains and the Southern Highlands of New South Wales from the New England tableland to the north.

The oldest rocks in New South Wales are referrable to the Archean system, and consist of gneisses and schists, including the glauco-phane-schists in the New England tableland, and hornblende- schists of Berthong. The Archean rocks are comparatively sparsely exposed in New South Wales. They enter the state from the south, being continuous with the Archean block of north-eastern Victoria. They occupy a large area in the western districts of New South Wales, where a projection from the Archean plateau of central Australia crosses into the state from South Australia; it is best exposed in the Barrier Ranges around Broken Hill. Cambrian rocks have not yet been discovered in New South Wales; but Pittman has recorded an Agnostus from Mandurama, near Orange. The rocks of the Ordovician system, though widely distributed, have not always been separated from the Silurian rocks, which they often closely resemble lithologically. The occurrence of Ordovician rocks was first established by Dun at Tomingley, 33 m. S.W. of Dubbo, where he discovered graptolites that he identified as Climacograptus and Dicellograptus. Other graptolites have been found near Orange, and at Lyndhurst, near Carcoar. The fossiliferous horizon is of Upper Ordovician age. The extent of the Ordovician will probably be increased by addition of areas, which cannot yet be separated from the Silurian. The Silurian system is the best-known con- stituent of the Lower Palaeozoic foundation of New South Wales. The rocks consist of sandstones, quartzites, slates and shales, asso- ciated with lenticular masses of limestone. The typical Silurian rocks are richly fossiliferous, the shales containing trilobites,

the sand- stones many brachiopods, and the limestones a rich coral and bryo- zoan fauna. There are also beds of chert, which are largely composea of radiolaria. Caves have been dissolved in the limestones by under- ground streams; the Jenolan caves in the Blue Mountains and those of Yarrangobilly and the Goulburn district are the most famous. The slates of the Silurian have been bent into folds, and saddle reefs occur along the axis of the folds, as at Hargraves. Numerous quartz reefs occur both in the Silurian and Ordovician rocks. In these reefs the chief mineral is gold. Some schists, attributed to the Silurian, but possibly older, contain platinum; and associated with the limestones are beds of copper.

The rocks of the Devonian system rest unconformably upon the Silurian; but some beds of which the age is still uncertain are called Devono-Silurian. The Devonian beds are well developed in the Blue Mountains, where the lower Devonian sediments at Mount Lambie are estimated to be 10,000 ft. in thickness. They are ex- tensively developed along the Cox river and along the slopes of Mount Canoblas. They are also developed in the New South Wales highlands, to the south-east of Goulburn. Some of the best-known exposures are in the ranges which rise above the western plains, such as the Rankin Range on the Darling and the Kokopara Range to the north of the Murrumbidgee. The Devonian rocks at Yalwal are sharply folded and are associated with a series of rhyolites and basic lavas. The lower part of this series is probably Lower De- vonian; and it is covered by shales and volcanic rocks belonging to the Upper Devonian. In the extreme south-east of New South Wales, at the head of the Genoa river, are sandstones with Archaeo- pleris howitti, which are an extension of the Lower Devonian beds of Victoria; while farther to the east, at Eden and Twofold Bay, are Upper Devonian sandstones.

The Devonian system is separated from the Carboniferous by an interval, during which there were powerful earth movements; they produced a lofty mountain chain, running north and south across New South Wales. The highlands are the worn down stumps of this mountain line. In Lower Carboniferous times these mountains were snow-capped, and the valleys on their flanks were occupied by glaciers.

The Lower Carboniferous beds are represented by conglomerates and sandstones with some shales and limestones. The sandstones are characterized by Lepidodendron {Bergeria) australe. _ It is asso- ciated with beds of lava and volcanic ash, some of which contain copper ores. Granites and granodiorites were intruded at this period into the older rocks, and altered the adjacent Devonian beds into slates and

quartzites, and formed gold-quartz veins, which have been worked in the Devonian rocks at Yalwal. The Lower Carboni- ferous rocks also occur in the Blue Mountains, along the Cox river and Capertee river ; and a northern continuation occurs along the western slope of the New England tableland, from the Macintyre river to the Queensland border.

The Upper Carboniferous rocks are most important irom their rich seams of coal. They occupy from 24,000 to 28,000 sq. m., which are best exposed in the Hunter river and around Newcastle.

Farther soutfi they &&&** beneath the Mesozoic sandstones, from which they again rise along the coast around Lake Illawarra and near the mouth of the Shoalhaven river. The Coal Measures have been reached under Sydney, by a deep bore at Balmain, which pierced a seam of coal 10 ft. thick, at the depth of 2917 ft. The Coal Measures are classified by Professor T. W. David as follows : —

Ft.

1. Upper or Newcastle Coal Measures, containing

an aggregate of about 100 ft. of coal . . 1,150

2. Dempsey Series; freshwater beds, containing

no productive coal. This series thins out completely in certain directions . . 2,000

3. Middle, or Tomago, or East Maitland Coal

Measures, containing an aggregate of about

40 ft. of coal …... 570

4. Upper Marine Series; specially characterized by

the predominance of Productus brachythaerus 5,000

5. Lower or Greta Coal Measures, containing an

aggregate of about 20 ft. of coal . . . 130

6. Lower Marine Series; specially characterized by

the predominance of Eurydesma cordata . 4,800

13.650

Geologically, perhaps, the most interesting rocks in the Carboniferous are the glacial conglomerates, containing ice-scratched, erratic blocks. Some of the boulders are encrusted by marine organisms and must have been dropped by icebergs in the sea. The northern limit of the glacial beds is in dispute; they have been described as far north as Ashford. The Carboniferous beds contain numerous sheets and flows of basalt and andesite. A syenite massif of this age occurs at Mittagong; and leucite has been discovered in Carboniferous basalts by David.

The Mesozoic rocks of New South Wales begin with the Narrabeen Shales; they are covered by the Hawkesbury Sandstones, which are well exposed around Sydney; and they in turn are covered by the Wianamatta Shales. The Triassic age of the Hawkesbury Sand- stone is supported by the evidence of the fossil fish; though, accord- ing to Dr Smith Woodward, they may perhaps be Rhaetic. But the fossil plants of which the chief are Taeniopteris daintreei and Thinn- feldia odontopteroides are regarded by Seward as Lower Jurassic. At Talbragar there is a bed containing Jurassic fish, which rests in an erosion hollow in the Hawkesbury Sandstone. The Talbragar beds, then, may be representative of the Jurassic; and the underlying Hawkesbury Sandstone may be Upper Triassic. The Cretaceous system is widely developed in the western part of the state, where it is represented by two divisions. The Rolling Downs formation is regarded as Lower Cretaceous. It consists of a thick series of shales containing marine fossils. It is covered in places by tablelands and ridges of the Desert Sandstone, the remnants of a sheet which doubtless once covered the whole of the Western Plains. The chief economic product of the Desert Sandstone is opal, which occurs in it at White Cliffs and Wilcannia. The opal beds contain Cretaceous fossils such as Cimoliosaurus. An occurrence of Upper Cretaceous beds occurs in the coastal district at Nimbin on the Richmond river. The Cainozoic rocks are best developed in the western districts, as the silts of the Darling and Murray plains. They include some Miocene, or perhaps Oligocene marine sands, formed in the northern part of an inland sea, which occupied the basin of the Lower Murray. The most significant point in the distribution of the marine Cainozoic rocks in New South Wales is their complete absence from the coastal districts; this fact indicates that while the Middle Cainozoic marine beds of

Victoria and New Guinea were being deposited, Australia extended far eastward into the Tasman Sea. The Cainozoic series of New South Wales contains many interesting volcanic rocks, including leucite-basalts, nepheline-basalts and sodalite-basalts. In a basic neck of this period at Inverell, there are eclogite boulders, containing diamonds in situ; and it is doubtless from these basic volcanic necks that the diamonds of the New England tableland have been derived. The volcanic rocks occur on the tableland of New South Wales, and contribute much to the fertility of their soils.

The most important mineral in New South Wales is coal, of which the state has probably a larger available supply than any other country in the southern hemisphere. The coal-fields occupy 24,000 sq. m. The coal is present in such vast amount as to offer the possibility of very economical working of the abundant iron ores of Australia. Kerosene shale occurs in the Blue Mountains to the west of Sydney, in the Upper Carboniferous rocks. Gold is widely distributed through the highlands. It was first recorded by James McBrien in 1823, as occurring in grains in the sands of the Fisn river, between Rydal and Bathurst; and though further discoveries were made, they were kept secret as far as possible. The first discovery of gold in mining quantities was made by Hargraves in 1851, at the junction of Lewis Ponds and Summerhill Creek, in what was called the Ophir Diggings, near Bathurst. The gold mines are very numerous and widely scattered, but individually they are mostly small and of no great depth. The total value of the gold raised since 1850 is over £50,000,000. The output of alluvial gold is now increased by the employment of dredges. The gold-quartz veins are mainly in the Ordovician and Silurian rocks; but some also occur in the Devonian,

and there are impregnations of gold in tufas of Devonian age. Deep leads beneath the basalts occur at Kiandra.

The silver-lead mines of New South Wales are famous owing to the importance of Broken Hill. The mines there occur in gneiss and schists, which are probably of Archean age; the lode has in places been worked for a width of over 200 ft. The zinc ores associated with the silver-lead long lay unutilized, as the problem of their separation from the associated rhodonite has only recently been overcome. Tin is worked in the rivers of the New England tableland as at Vegetable Creek. The chief copper field is at Cobar in the north-western plains. Bismuth, platinum, molybdenum and anti- mony are obtained in small quantities.

The geology of New South Wales has been described in the Mono-

graphs, Memoirs and Records of the Geological Survey, which in the fullness and high scientific character form the most valuable contribution to Australasian geology. Pittman's map of the state in two sheets, on the scale of 16 m. to the inch, was issued by the Survey in 1893. The economic geology has been admirably summarized in a work by E. F. Pittman, The Mineral Resources of New South Wales (1901). Numerous geological memoirs have appeared in the Rep. Austral. Assoc, for the Advancement of Science, the Journ. R. Soc. N.S. Wales and the Proc. of the Linnaean Soc. N.S. Wales. A systematic account of the minerals has been published by A. Liversidge, The Minerals of New South Wales (1888), and to him is due a valuable chemical study of the meteorites and gold nuggets. Contributions on the palaeontology of New South Wales are con- tained in the Rec. Austral. Museum, Sydney. A bibliography of the economic geography has been issued by W. S. Dun, Rec. Geol. Surv. N.S. Wales, vol. vi., 1899, and of the Cretaceous geology, also by W.. S. Dun, in Journ. of Proc. Royal Soc. N.S. Wales, 1903, vol. xxxvii. pp. 140-153. (J. W. G.)

Artesian Water. — Before actual boring proved that the belief was well founded, it had long been scientifically demonstrated that water would probably be obtained in the Cretaceous formation which underlies the whole of the north-west of New South Wales; and it is probable that the artesian water-bearing basin extends much farther south than was previously supposed. It may, indeed, be yet found to extend approximately along the course of the Lower Darling. ˆ Artesian water is also obtainable in other than Cretaceous rocks. This is shown by palaeontological evidence ; and some of the most successful bores, such as those at Coonamble, Moree, Gil Gil and Euroka, have pierced rocks of Triassic age, corresponding with the Ipswich Coal Measures.

Population. — The population on the 1st of July 1906 was 1,504,700, viz. 799,260 males and 705,440 females. The total includes 105,000 Chinese and 7500 aborigines and half-castes. Since i860 New South Wales had added more largely to its population than any of the other Australian states. In i860 the population was 348,546; in 1890 the number was 1,121,860. From 1890 to 1901 the population increased 238,083, or at the rate of 21-2%. By far the largest part of the increase is due to excess of births over deaths, for out of the increase of over 1,000,000 since i860, only 350,000 was due to immigration. In

1905 there were 39,572 births and 14,980 deaths; these figures are equal to 26-78 and 10-13 per thousand respectively. The birth-rate has fallen very much, especially since 1899. In 1861- 1865 it was 42-71 per 1000; in 1896-1899 it was 27-92, and in

1906 it had fallen still further to 26-78. The marriage rate for 1905 was 7-40 per thousand, and the persons married 14-80 per thousand. The mean for 20 years was 7-39. The chief cities are Sydney and suburbs, population in 1906, 535,000; Newcastle and suburbs, 56,000; Broken Hill, 30,000; in 1901, Parramatta, 12,568; Goulburn, 10,610; and Maitland (East and West), 10,085. There are nine other towns with between 5000 and 10,000 inhabitants each.

Religion. — The proportions of the leading denominations in 1901 were: — Church of England, 46-6%; Roman Catholic, 26-0; Presbyterian, 9-9; Wesleyan and other Methodists, 10-3; Congregationalist, 1-9; Baptist, 1-2; Jews, 0-5; others, 3-6. Sydney is the seat of Anglican and Roman Catholic archbishoprics; the Anglican archbishop is also primate of Australia and Tasmania.

Education. — The state has in its employ 3135 male and 2424 female teachers, and maintains 2901 schools. The law requires that all children over six years and under fourteen years shall attend school, and in 1904, 220,000 children of these ages, as well as 39,000 others below or beyond the school ages, were receiving instruction, making a total of 259,000. Of this number 2ir,O00 were in state schools and 48,000 in private schools. The majority of the private schools are controlled by one or other of the religious bodies. The Roman Catholic Church has 361 schools, with 1835 teachers and an attendance of 33,000 pupils. The total expenditure of the state on public instruction, science and art during the year ended 30th June 1906 was £91 1 ,000. During the calendar year 1906 a sum of £840,000 was expended on primary instruction. The fees from pupils

amounted to £82,000, making the actual cost of primary instruction £758,000. There are a university and a technical college in Sydney.
Finance. — The revenue of the state is derived from four main sources, viz. taxation; sale and lease of lands; earnings of railways, tramways and other services ; and share of surplus revenue returned by the commonwealth. During 1906 the income derived under each of these heads was: from taxation £1,297,776; from lands £1,729,887; from railways and other services £5,856,826; from commonwealth £2,742,770; these with miscellaneous collections to the amount of £655,823 made up a total revenue of £12,283,082. The direct taxation is represented by a tax of one penny in the pound on the unimproved value of land, sixpence in the pound on the annual income derived in

the state from all sources, except the use and occupation of land and improvements thereon. There are also various stamp duties. The land revenue is derived partly from the alienation of the public estate, either absolutely or under con- ditions, but mainly from the occupation of the public lands. There is also a small revenue from mining lands, timber licences, &c. The state still holds 146 million acres out of a total of 196 million acres, having alienated about 50 million acres. The principal heads of ex- penditure were: interest and charges on public debt, £3,291,059; public instruction, £911,177; working expenses of railways and tramways, £2,954,777; other services working expenses, £208,242; other services, £3,900,726. The public debt in 1906 was £85,641,734, equal to £56, us. per inhabitant; the great proportion of this debt has been incurred for works that are revenue producing, only about £1 1,000,000 was not so expended. Of the total debt in 1903 about £66,ooo,oeo was held in London. The net return from public works in excess of expenditure in 1906 amounted to nearly 3J % on the whole public debt, and the interest paid averages 3‘6%.

Administration. — The political constitution of New South Wales is that of a self-governing British colony, and rests on the provisions of the Constitution Act. The governor is appointed by the crown, the term of office being generally for five years, and the salary £5000. The governor is the official medium of communication between the colonial government and the secretary for the colonies, but at the same time the colony maintains its own agent-general in London, who not only sees to all its commercial business but communicates with the colonial office. The powers of the state parliament have been since 1 90 1 restricted by the transfer of certain powers to the common- wealth of Australia. In the legislative assembly there are 90 members. The principle adopted in distributing the representa- tion is that of equal electoral districts, modified in practice by a preference given to the distant and rural constituencies at the cost of the metropolitan electorates. The suffrage qualification is a residence of twelve months and the attainment of the age of 21 years. Women are entitled to the franchise: there are the usual restrictions in regard to the pauper and criminal classes. An elector has only one vote, which is attached to the district in which he resides. Members of the Legislative Assembly are allowed a salary of £300 a year. There were in 1906 about 700,000 electors. Each electoral district returns one member. The Legislative Council consists of persons nominated for life by the governor, acting on the advice of the Executive Council; the number of members is not fixed by law but in 1906 it was 55. Parliaments are triennial. Local government was extended in 1905 and 1906 to the whole state,

excepting the sparsely popu- lated western division; formerly it was confined to an area of about 2800 sq. m. There are altogether about 55,000 m. of road communications, but not more than 15,000 m. are properly formed. The various local bodies are municipalities or shires, the former is the term applied to closely peopled areas of small extent endowed with complete local government, and the latter is the designation of the more extensive districts, thinly peopled, to which a less complete system of local government has been granted.

Federal Capital. — In 1908 the Seat of Government Act pro- vided that the federal territory and capital of Australia should be in the Yass-Canberra district of New South Wales, and that the territory should have an area of not less than 900 sq. m. and easy access to the sea. In 1909 a Board appointed to consider the several possible sites within this district reported in favour of Canberra, on the Molonglo river, near Queanbeyan, as the site for the new city, and the basins of the Molonglo, Queanbeyan and Cotter rivers were indicated as suitable to form the federal territory. Jervis Bay was recommended as offering a site for a

port for the territory. Bills were passed in 1909 by the legis- lative assembly of New South Wales and by the federal parlia- ment, transferring this territory to the federation.

Agriculture. — New South Wales might be described as essentially a pastoral country, and the cultivation of the soil has always been secondary to stock-raising. But the predominance of the pastoral industry is not by any means so marked as it was even as late as the last decade of the 19th century. The want of progress in agriculture was not to be ascribed to defects of climate or soil, but chiefly to the great distance of Australia from the markets of the world. This difficulty has, for the most part, been removed by the establishment of numerous important lines of steamers trading between Australia and Europe, and recent years have therefore seen considerable expansion in all forms of agriculture.

In 1882 the area of land under cultivation was 733,582 acres, which is slightly less than 1 acre per inhabitant. In 1900 the total area under cultivation was 2,439,639 acres, and in 1906 it had risen to 2,838,081 acres, which is a little short of 2 acres per inhabitant.

The area devoted to each of the principal crops was as follows : —

Acres.

Wheat 1,939,400

Maize 189,000

Oats 38,500

Sugar Cane …. 21,500

Hay 438,000

Vines 8,100

The average yield per acre of crops may be set down as follows : —

Bushels.

Wheat 10-5

Maize 30

Oats 23

Sugar Cane …. 20 tons, cane

Hay 1 ton

Wine 185 gallons

The total value of production in the year 1906 may be set down at £6,543,000, which works out at £2, 6s. id. per acre.

Although the coastal districts are still important, as the crops yielding the largest returns per acre are grown there, as regards the total area under crop these districts are of much less importance compared with the whole state than formerly.

The area under crop on the coast districts is about 320,000 acres ; on the tablelands 375,000 acres; on the western slopes, 1,100,000 acres; the Riverina district, 750,000 acres; the western plains, chiefly in the central portion, 270,000 acres; and less than 20,000 acres in the western division, which comprises nearly half the total area of the state. The soil in that part of the country is, for the most part, suitable for cultivation, and there are large areas of rich land, but the rainfall is to6 light and irregular for the purpose of agriculture.

There were 76,000 occupiers of rural holdings in 1905, and the area occupied by them, exclusive of lands leased from the state, is 48,081,000 acres. The great majority, 80% in 1905, of occupiers are freeholders; the practice of renting farm lands is not followed to any considerable extent, except in the dairying lands on the coast district. New South Wales took up its position amongst wheat- exporting countries in 1900; the bulk of the grain exported goes to the United Kingdom. Hay crops and maize rank next in importance to wheat. The cultivation of fruit is receiving increased attention, but the growing of sugar cane and tobacco and the production of wine, until recently so promising, are, if not declining, at least stationary, in spite of the suitability of the soil of many districts for these crops.

Grazing and Dairying. — The grazing industry still holds a chief place amongst the productive industries of the state. In 1906 the number of horses was 507,000; of sheep, 40,000,000; of cattle, 2,340,000; and swine, 311,000. There were considerable losses of sheep in 1902 owing to the drought of that year, but the flocks in 1906 were of better quality than at any previous period and little short of the number of 1898. The vast majority of the sheep are of the merino breed, but there are about a million long-woolled sheep and between two and three million cross-bred. Dairying made very great strides in the ten years preceding 1906, and ranks as one of the great industries of the state. There were 644,000 dairy cows in 1906, and the numbers are increasing year by year. The production of wool was 300,000,000 lb, as in the grease; tallow, 493,000 cwt. ; butter, 500,000 cwt.; cheese, 42,000 cwt.; and bacon and hams, 110,000 cwt.

Mining. — The mining industry has made great strides. In 1905 there were about 38,000 men engaged in the various mines, besides 3300 employed in smelting. Of these, 10,700 were employed in gold-mining; in coal-mining there were 14,100; silver, 7100; tin, 2750, and copper, 1850. The value of mining machinery may be approxi- mately set down at £2,900,000. The following summary shows the value of the various minerals won in 1905. It is impossible to separate the

values of silver and lead contained in the ore obtainec* at Broken Hill ; the two metals are therefore shown together.

NEW SOUTH WALES

54i

Minerals.

Metallic —

Gold

Silver

Silver, lead and ore

Lead, pig, &c. . . . .

Zinc spelter and concentrates

Tin ingots and ore . . . .

Copper ingots and ore

Antimony and ore . . . .

Bismuth

Wolfram

Scheelite

Molybdenite .

Platinum

Non-metallic —

Coal

Coke

Kerosene shale .

Alunite

Limestone flux .

Ironstone flux ….

Marble ….

Diamonds ….

Opal

Sundry minerals

oz. fine

ton

Quantity.

Value.

carat

Total

274,267 417,520

441,447 210

103,532

i,957

8,592

388

55 86

138

19

398

6,632,138

162,961

38,226

2,702

14,941

6,801

6,354

£1,165,013

52,196

2,441,856

2,657

221,155

226,110

527,403

5,221

20,763

7,36i

10,122

2,507 825

2,003,461 100,306 21,247 6,750 9,519 4,525 2,420

3,745

59,ooo

2,919

£6,897,081

The value of gold won varies from year to year, but from 1894 to 1906 in only two years did it fall below £1,000,000. About one- fourth of the gold won is alluvial. The yield of gold from quartz mines was in 1904 II dwt. 14 grs. per ton, which was somewhat below the average for the previous ten years. The Broken Hill silver lode is the largest as yet discovered; it varies in width from 10 ft. to 200 ft., and may be

traced for several miles. The Broken Hill Proprietary Company owns the principal mine, and at Port Pirie in the neighbouring colony of South Australia erected a com- plete smelting plant; the problem of the recovery of the zinc con- tents of the ore having been satisfactorily solved, the company made extensive additions to the plant already erected, and in 1906 the manufacture of spelter was undertaken. From the commence- ment of mining operations on a large scale in 1885 to the end of 1905 the value of silver and lead ore won was £40,000,000. The pro- duction of tin rapidly declined after 1881, when the value of ore raised was £569,000: the production varies both with the price and the occurrence of rain, but the principal cause of the decreased production was the exhaustion of the shallow deposits of stream tin, from which most of the ore was obtained. The principal deposits of copper are in the central parts between the Macquarie, Bogan and Darling rivers. The copper lodes ot New South Wales contain ores of a much higher grade than those of many well-known mines worked at a profit in other parts of the world, and, with a fair price for copper, the production largely increases. Iron is widely diffused, principally in the form of magnetite, brown haematite, limonite and bog iron. Coal mining is carried on in three districts. In the northern or Hunter river district there were 63 collieries, employing 10,500 men, and the quantity of coal raised was in 1904 about 4,100,000 tons; in the southern district there were fifteen collieries, employing 3100 men and raising 1,600,000 tons of coal. The western or mountain collieries were seventeen in number, employing 540 men and raising about 418,000 tons. About 52% of the coal obtained is exported. Kerosene shale (torbanite) is abundant and is system- atically worked.

Manufacturing. — There are a large and rapidly increasing number of manufactories, but in 1905 only about 250 employed more than 50 hands. The following gives a statement of factory employment for eleven years: —

Year.

No. of Establish- ments.

Hands Employed.

Value of Plant and Machinery.

1895 1900

1905

2723

3077 3700

48,030 60,779 72,175

£5,255,000

5,708,000 7,920,000

the value of goods imported was £29,424,008; and the value of exports was £36,757,002. The average value of imports per inhabitant was £20 and of exports £24, 17s. The bulk of the trade is carried on with the other Australian states; in 1905 the value of such trade was, imports, £14,938,885, and exports, £12,263,472; the British trade is also considerable, the imports direct from Great Britain being valued at £8,602,288 and the exports £10,222,422. With all British countries the trade was, imports, £25,989,399, and exports, £25,994,563. New South Wales maintains a large trade with foreign countries aggregating £3,434,609 imports and £10,762,439 exports. France, Germany, Belgium and the United States are the principal foreign countries with which the state trades.

Wool is the staple export, and represents, in most years, one-third the value of the exports. Gold coin and bullion form one of the principal items in the export list, but only a small portion of the export is of local production, the balance being Queensland and New Zealand gold sent to Sydney for coinage. The course of trade from 1880 to 1905 was as follows: —

About 5-3% of the males and io-6% of the females employed are under sixteen years; the total number of male employees in 1905 was 56,117, and of females, 16,058. About two-thirds of the hands are employed in Sydney and the adjacent district. The total value of the articles produced in manufactories, and the increased value of materials after undergoing treatment, was £30,028,000 in 1905, of which £17,500,000 represented value of materials used and £600,000 the value of fuel: the total wages paid was £5,200,000.

Commerce. — During 1905, 2725 vessels entered New South Wales ports from places outside the state; their tonnage was 4,697,500;

Year.

Imports.

Exports.

1880

£14,176,063

£15,682,802

1885

23,737,46i

16,750,107

1890

22,615,004

22,045,937

1895

15,992,415

21,934,785

1900

27,561,071

28,164,516

1905

29,424,008

36,757,002

The principal articles of export in 1905 were: Wool, £13,446,260; gold, £3,053,331; silver and concentrates, £2,407,142; lead, £1,072,858; butter, £817,820; coal, £1,565,602; copper, £1,280,599; breadstuffs, £1,345,589; leather and skins, £1,559,033; meats, £761,235; tallow, £464,330; timber, £353,265; tin, £466,049.

Banking. — The banks of issue number thirteen; their paid-up capital amounts to £13,918,000 and the capital and reserves to £19,319,000, but of this sum only about £9,000,000 is used in the state. On the 30th of June 1906 the coin and bullion-in reserve amounted to £8,192,000 and the note circulation to £1,462,000. The banks had on

deposit £23,325,730 bearing interest and £15,773,883 not bearing interest, representing a total of £39,100,000. The savings banks had on their books at the close of 1905 about 355,714 depositors, with £13,500,000 to their credit. This repre- sents £9, is. 6d. per inhabitant. The total deposits in all banks therefore amounted to £52,600,000. The progress from i860 to 1905 was as follows : —

Year.

Amount on

Average per

Deposit.

Inhabitant.

£. s. d.

i860

£5,721,208

16 8 3

1870

7,044,464

14 2 6

1880

19,958,880

26 13 8

1890

43,390,141

38 13 6

1900

43,135,000

31 17

1905

52,600,000

34 17 6

Postal and Telegraph Service. — The postal business of 1905 was represented by the carriage of 102,292,888 letters and postcards, 44,599,104 newspapers and 23,077,094 parcels and books; the telegrams despatched numbered 3,837,962. To transact the postal business of the country, mail conveyances travelled 12,000,000 m. The income of the postal and telegraph department in 1905 was £1,065,618 and the expenditure £933,121, but there were some items of expenditure not included in the sum named, such as interest charges, &c, and cost of new buildings. The administration of the post office is under the commonwealth government

Railways. — The railways are almost entirely in the hands of the state, for out of 3471 m. open in 1906 the state owned 3390 m. The capital expended on the state lines open for traffic was £43,626,000, of which sum £7,400,000 was expended on rolling stock and equipment and £36,226,000 on construction of_ roads, stations and permanent ways. The net earnings amounted in 1906 to £1,926,407, which represents a return of 4-41 % upon the capital invested. The state pays, on an average, 3-69% for the money borrowed to construct the lines, and there is therefore a considerable surplus to the advantage of the revenue. The year 1906 was, how- ever, a very excellent one as regards railway working, the operations of the ten previous years showing an average loss of about a quarter ofi%. (T.A. C.)

History

New South Wales was discovered by Captain Cook on board the ” Endeavour,” on 20th April 1770. After he had observed the transit of Venus at Tahiti, he circumnavigated ;

New Zealand and went in search of the eastern coast history. of the great continent whose western shores had long been known to the Dutch. He sighted the Australian coast at

Gippsland, Victoria, near Cape Everard, which he named Point Hicks, and sailed along the east coast of Australia as far north as Botany Bay,

where he landed, and claimed possession of the continent on behalf of King George III. He then continued his voyage along the east coast of Australia, and returned to England by way of Torres Strait and the Indian Ocean. The favourable reports made by Captain Cook of the country around Botany Bay induced the British government to found a penal settlement on the south-eastern part of what was then known as New Holland. An expedition, consisting of H.M.S. ” Sirius” of 20 guns, the armed trader ” Supply,” three store-ships and six transports, left England on 17th May 1787, and after touching at Tenerife, Rio de Janeiro, and the Cape of Good Hope, arrived at Botany Bay on the 20th of January 1788, under the command of Captain Arthur Phillip, R.N., with Captain John Hunter, R.N., as second. The persons on board the fleet included 564 male and 192 female convicts, and a detachment of marines, consisting of Major Ross, commandant, 16 officers, 24 non-commissioned officers, an adjutant and quartermaster, 160 privates and 40 women. There were in addition five medical men and a few mechanics. The live stock consisted of one bull and four cows, a stallion and three mares, some sheep, goats, pigs and a large number of fowls. The expedition was well provided with seeds of all descriptions.

The shores of Botany Bay were found to be unsuitable for residence or cultivation, and Captain Phillip transferred the people under his command to Port Jackson, half a seatemeat dozen miles away, near the site of the present city of regime. Sydney. For some years the history of the infant settlement was that of a large gaol; the attempts made to till the soil at Farm Cove near Sydney and near Parra- matta were only partially successful, and upon several occasions the residents of the encampment suffered much privation. But by degrees the difficulties inseparable from the foundation of a remote colony were surmounted, several additional convict- ships landed their living freight on the shores of Port Jackson, and in 1793 an emigrant-ship arrived with free settlers, who were furnished with provisions and presented with free grants of land. By the end of the 1 8th century the inhabitants of Sydney and its neighbourhood numbered 5000. Immediately after the arrival of the first fleet, surveys of the adjacent coast were made; the existence of a strait between Australia and Tasmania was discovered by Surgeon Bass; and before the retirement of Governor King in 1806 Australia had been circumnavigated and the principal features of its coast-line accurately surveyed by Captain Flinders, R.N. The explorations landward were, however, not so successful, and for many years the Blue Moun- tains, which rise a few miles back from Sydney, formed an im- penetrable barrier to the progress of colonization. Penal establishments were formed at

Newcastle in New South Wales, at Hobart and Launceston in Tasmania, and an unsuccessful attempt was made to colonize Port Phillip. The most note- worthy incident in the first decade of the 19th century was the forcible deportation by the officers of the New South Wales Corps, a regiment raised in England for service in the colony, of the governor, Captain Bligh, R.N., the naval officer identified with the mutiny of the ” Bounty.” For some time the govern- ment was administered by the senior officer of the New South Wales Corps, but in 1809 he was succeeded by Captain Macquarie, who retained the governorship for eleven years.

During the regime of this able administrator New South Wales was transformed from a penal settlement to a colony. Before Captain t ˆ le arr ‘ va l 0I Macquarie schools and churches had Mac- been erected, a newspaper, the Sydney Gazette and

quarie’s]y ew South Wales Advertiser, had been started, and a/ MD™”””” attem P ts na -d been made to acclimatize the drama. But he was the first governor to open up the country. He constructed permanent buildings at Sydney and Parramatta, formed roads and built bridges in the districts along the coast, and commenced a track across the Blue Mountains, which had been crossed in 1813 by Wentworth and others, thus opening up the rich interior to the inhabitants of Sydney. It was during

Captain Macquarie’s administration that the first banking in- stitution, the Bank of New South Wales, was founded. The final fall of Napoleon in 1815 gave the people of the United Kingdom leisure to think about their possessions at the Anti- podes; and in 18 17 free settlers commenced to arrive in con- siderable numbers, attracted by the success of Captain John M’Arthur, an officer in the New South Wales Regiment, who had demonstrated that the soil, grass and climate were well adapted for the growth of merino wool. But although the free settlers prospered, and were enabled to purchase land on very easy terms, they were dissatisfied with the administration of justice, which was in the hands of a judge-advocate assisted by military officers, and with the absence of a free press and representative institutions. They also demanded permission to occupy the vast plains of the interior, without having to obtain by purchase or by grant the fee-simple of the lands upon which their sheep and cattle grazed. These demands were urged during the governorships of Sir Thomas Brisbane and General Darling; but they were not finally conceded, together with perfect religious equality, until the regime of Sir Richard Bourke, which lasted from 1831 to 1837. At the latter date the population had increased to 76,793, 18SL of whom 25,254 males and 2557 females were or had

been convicts. Settlement had progressed at a rapid rate. Parramatta, Richmond and Windsor had indeed been founded within the first decade of the colony's existence; Newcastle, Maitland and Morpeth, near the coast to the north of Sydney, had been begun during the earlier years of the 19th century; but the towns of the interior, Goulburn, Bathurst and others, were not commenced till about 1835, in which year the site of Melbourne was first occupied by Batman and Fawkner. The explorations which followed the passage of the Blue Mountains opened up a large portion of south-eastern Australia. Van Diemen's Land was declared a separate colony in 1825, West Australia in 1829, South Australia in 1836 and New Zealand in 1839; so that before 1840 the original area of New South Wales, which at first included the mainland of Australia and the islands in the South Pacific, had been greatly reduced. In 1840 the press was free in every part of Australia, trial by jury had been introduced, and every colony possessed a legislature, although in none of them except New South Wales had the principle of representation been introduced, and in that colony only to a very limited extent. The policy of granting land without payment, originally in force in New South Wales, had been abandoned in favour of sales of the public lands by auction at the upset price of twenty shillings per acre; and the system of squatting licences, under which colonists were allowed to occupy the waste lands on payment of a small annual licence, had been conceded. In 1851, when separate autonomy was granted to Victoria, New South Wales had a population of 187,243, the annual imports were £2,078,338, the exports £ 2)399)58o, the revenue was £575,794, and the colony contained 132,437 horses, 1,738,965 cattle and 13,059,324 sheep.

Gold was discovered at Summerhill Creek, near Bathurst, in February 1851, by Edward Hammond Hargraves; and at the end of June the first shipment, valued at £3 500, left Sydney. This discovery made an important change in the position of the colony, and transportation, which had been discontinued during the previous year, was finally abolished. The first mail steamer arrived in August 1852, and in 1853 a branch of the Royal Mint was established at Sydney. The New Constitution Bill, passed during the same year by the local legislature, provided for two deliberative chambers, the assembly to be elected and the council nominated, and for the responsibility of the executive to the legislature. The Sydney University, founded in 1850, was enlarged in 1854, and the first railway in R esp ons- New South Wales, from Sydney to Parramatta, com- me menced in 1850, was opened in 1855. In the same govern- year the Imperial parliament passed the New Con- ˆJJJ*' stitution Act; and in June 1856 the first responsible

government in Australia was formed, during the governor- ship of Sir William Denison, by Mr Stuart Alexander Donaldson.

The first administration lasted only for a few weeks, and it was some years before constitutional government worked smoothly. The powers of the new parliament were utilized for extending representative institutions. Vote by ballot was introduced; the number of members in the assembly was increased to 80, and the franchise was granted to every adult male after six months' residence in any electoral area. Mean- while the material progress .of the colony was unchecked. A census taken at the end of 1857 showed that the population of Sydney was, including the suburbs, 81,327. Telegraphic communication was established between Sydney, Melbourne, Adelaide and Tasmania in 1859; and during the same year the Moreton Bay district was separated from New South Wales and was constituted the colony of Queensland.

During the regime of Sir John Young, afterwards Lord Lisgar, who succeeded Sir William Denison in 1861, several important Sit John events occurred. The land policy of previous govern- Youog's ments was entirely revised, and the Land Bill, framed governor- by Sir John Robertson, introduced the principle of sb,p ' deferred payments for the purchase of crown lands,

and made residence and cultivation, rather than a sufficient price, the object to be sought by the crown in alienating the public estate. This measure, passed with great difficulty and by bringing considerable pressure to bear upon the nominated council, was the outcome of a lengthened agitation throughout the Australian colonies, and was followed by similar legislation in all of them. It was during the governorship of Sir John Young that the distinction between the descendants of convicts and the descendants of free settlers, hitherto maintained with great strictness, was finally abandoned. In 1862 the agitation against the Chinese assumed importance, and the attitude of the miners at Lambing Flat was so threatening that a large force, military and police, was despatched to that goldfield in order to protect the Chinamen from ill-treatment by the miners. At this time, the only drawback to the general progress and prosperity of the country was the recrudescence of bushranging, or robbery under arms, in the country districts. This crime, originally confined to runaway convicts, was now committed by young men born in the colony,

familiar with its mountains and forests, who were good horsemen and excellent shots. It was not until a large number of lives had been sacrificed, and many bushrangers brought to the scaffold, that the offence was thoroughly stamped out in New South Wales, only to reappear some years afterwards in Victoria under somewhat similar conditions.

The earl of Belmore became governor in 1868, and it was during his first year of office that H.R.H. the duke of Edinburgh visited the colony in command of the ” Galatea.” An attempt made upon his life, during a picnic at Clontarf, caused great excitement throughout Australia, and his assailant, a man named O’Farrell, was hanged. A measure which virtually made primary education free, compulsory and unsectarian came into operation. A census taken in 1871 showed that the population was 503,981; the revenue, £2,908,155; the expenditure, £3,006,576; the imports, £9,609,508; and the exports, £11,245,032. Sir Hercules Robinson, afterwards Lord Rosmead, was sworn in as governor in 1872. During his rule, which lasted till 1879, the Fiji Islands were annexed; telegraphic communica- tion with England and mail communication with the United States were established ; and the long series of political struggles, which prevented any administration from remaining in office long enough to develop its policy, was brought to an end by a coalition between Sir Henry Parkes and Sir John Robertson. Lord Augustus Loftus became governor in 1879, in time to inaugurate the first International Exhibition ever held in Australia. The census taken during the following year gave the population of the colony as 751,468, of whom 411,149 were males and 340,319 females. The railway to Melbourne was com- pleted in 1880; and in 1883 valuable deposits of silver were discovered at Broken Hill. In 1885 the Hon. W. B. Dalley, who was acting Premier during the absence through ill-health of Sir Alexander Stuart, made to the British government the offer

of a contingent of the armed forces of New South Wales to aid the

Imperial troops in the Sudan. The offer was accepted; the

contingent left Sydney in March 1885, on board the

” Iberia ” and ” Australasian,” and for the first time Sad ‘ a . _ . . , , , . • , • contingent

a British colony sent its armed forces outside its own jsss.

boundaries to fight on behalf of the mother-country. In July of the

same year Dr Moran, the Roman Catholic arch- bishop of Sydney, became the first Australasian cardinal. Lord Carrington, who was appointed governor in 1888, opened the railway to Queensland, and during the same year the centenary of the colony was celebrated. The agitation against the Chinese, always more or less existent, became intense, and the govern- ment forcibly prevented the Chinese passengers of four ships from landing, and passed laws which practically prohibit the immigration of Chinese.

In 1889 the premier, Sir Henry Parkes, gave in his adhesion to the movement for Australasian federation, and New South Wales was represented at the first conference held at Melbourne in the beginning of 1890. Lord Jersey assumed office on the 15th of January 1891, and a few weeks afterwards the conference to consider the question of federating the Australian colonies was held at Sydney, and the great strike, which at one time had threatened to paralyse the trade of the colony, came to an end. A board of arbitration and conciliation to hear and determine labour questions and disputes was formed, and by later legisla- tion its powers have been strengthened. (For the labour legislation of the state, see Australia.) A census taken on the 5th of April 1891 showed that the population was 1,134,207, of whom the aborigines numbered 7705 and the Chinese 12,781. In 1893 a financial crisis resulted in the suspension of ten banks; but with two exceptions they were reconstructed, and by the following year the effects of the depression had passed away. Federation was not so popular in New South Wales as in the neighbouring colonies, and no progress was made between 1891 and 1894, although Sir Henry Parkes, who was at that time in opposition, brought the question before the legislature. The Rt. Hon. Sir William Duff, who followed Lord Jersey as governor, died at Sydney in 1895, and was succeeded by Lord Hampden. In 1896 a conference of Australian premiers was held at Sydney to consider the question of federation. The then Premier, Mr Reid, was rather lukewarm, as he considered that the free- trade policy of New South Wales would be overridden- by its protectionist neighbours and its metropolitan position ˆ tt,ta ˆ s interfered with. But his hand was to a great extent federation. forced by a People's Federation Convention held at Bathurst, and in the early portion of 1897 delegates from New South Wales met those from all the other colonies, except Queensland, at Adelaide, and drafted the constitution, which with some few modifications eventually became law. The visit of the Australian premiers to England on the occasion of Queen Victoria's Diamond Jubilee gave an additional impetus to federation, and in September 1897 the convention reassembled in Sydney and discussed the modifications in the constitution which had

been suggested in the local parliaments. In January 1898 the bill was finally agreed to and submitted to a popular referendum of the inhabitants of each colony. Those of Victoria, South Australia and Tasmania agreed to the measure; but the majority in New South Wales, 5458, was not sufficient to carry the bill. The local parliament subsequently suggested certain amendments, one of them being that Sydney should be the federal capital. The general election returned a majority pledged to federation, and after some opposition to the federal Bill by the legislative council it was again referred to the electors of the colony and agreed to by them, 107,420 votes being recorded in its favour, and 82,741 against it. One of the provisions of the bill as finally carried was that the federal metropolis, although in New South Wales, should be more than 100 m. from Sydney. The Enabling Bill passed through all its stages in the British parliament during the summer of 1900, all the Australian colonies assenting to its provisions; and on the 1st of January 1901 Lord Hopetoun, the governor-general of Australia, and the federal ministry, of which the premier, Mr Barton, and Sir

William Lyne, Home Secretary, represented New South Wales, were sworn in at Sydney amidst great rejoicings. Large con- tingents of troops from New South Wales were sent to South Africa during 1899 and 1900. (G. C. L.),

NEWSPAPERS. The word ” newspaper,” as now employed, covers so wide a field that it is difficult, if not impossible, to give it a precise definition. By the English ” Newspaper Libel and Registration Act ” of 1881 it is defined as ” any paper containing public news, intelligence or occurrences, or any remarks or observations therein printed for sale, and published periodically or in parts or numbers at intervals not exceeding twenty-six days “; and the British Post Office defines a newspaper as ” any publication ” — to summarize the wording — ” printed and pub- lished in numbers at intervals of not more than seven days, consisting wholly or in part of political or other news, or of articles relating thereto or to other current topics, with or without advertisements. 1 ‘ In ordinary practice, the ” newspapers,” as distinguished from other periodicals (q.v.), mean the daily or (at most) weekly publications which are principally concerned with reporting and commenting upon general current events.

For the laws regulating the conduct and contents of newspapers see Press Laws and allied articles. The two real essentials of a ” newspaper ” are that it contains ” news,” and is issued at regular intervals. But the course of history has involved considerable changes both in the mode of issue and in the con- ception of what ” news ” is. For purposes of modern usage we have to distinguish historically between the product of a printing- press which is manifolded by that means, and a mere manuscript sheet which is only capable of being copied by hand. ” News” again varies both according to the appetite and according to its method of collection and presentation. A distinction ought perhaps to be made between literary and pictorial news, but this is almost impossible in practice.

1. General Considerations

So far as very early forms of what we now recognize as corre- sponding to a ” newspaper ” are concerned, involving public reports of news, the Roman Ada Diurna and the Chinese Peking Gazelle may be mentioned here, if only on account of their historical interest. The Acta Diurna (” Daily Events “) in ancient Rome (lasting to the fall of the Western Empire), were short announcements containing official intelligence of battles, elections, games, fires, religious rites, &c, and were compiled by the actuarii officers appointed for the purpose; they were kept as public records, and were also posted up in the forum or other places in Rome, and were sometimes copied for despatch to the provinces. Juvenal speaks of a Roman lady passing her morning in reading the paper, so that it appears that private copies were in vogue. In China the Peking Gazette, as foreigners call it, containing imperial rescripts and official news, has appeared regularly ever since the days of the Tang dynasty (a.d. 618-905). Even older than it, as is alleged, is the monthly Peking News (Tsing-Pao) — now in appearance an octavo book of 24 pages in a yellow cover — which, according to M. Huart, French Consul at Canton, was founded early in the 6th century. But it is not of any real moment to do more than refer to such publications as these, which have little in common with the ideas of Western civilization. The ” newspaper ” in its modern acceptation can only be properly dated from the time when in Western Europe the invention of printing made a multiplication of copies a commercial possibility in any satisfactory sense.

On the point of terminology, Mr J. B. W. Williams, in his History of English Journalism to the Foundation of the Gazette (1908), the first scholarly account of the early evolution of the Tress in England, describes the Oxford Gazette of 1665 (the original of the London Gazette) as the first English ” newspaper ” in the precise sense, i.e. a

“paper “of news; 1 for it was a half- sheet in folio, two pages, and not a ” pamphlet ” as previous periodicals of news had been. A pamphlet (q.v.) was one or more

1 For the earliest known use of the terra ” newspaper ” he cites a letter in 1670 to Charles Perrot, second editor of the Gazette: ” 1 wanted your newes paper Monday last past.”

unbound sheets of paper folded in quarto, and these earlier periodicals were called ” news books.” The term ” news sheet,” again, had implied, up to that time, a written letter of news — a ” newsletter ” as it came afterwards to be called. But it is hardly necessary to insist here on the distinction between a ” news book ” and a ” newspaper,” interesting as it is to note that the English inclusion of newspapers among ” books ” for the purpose of the law of copyright is strictly justified by the original nomenclature. The ” newsbook ” made what is for modern purposes the essential advance upon either the written ” newsletter ” or the isolated printed announcement of some event, in being both printed and also issued in a series at regular and continuous intervals. Yet both these forms of publication were in the direct ancestry of the newspaper. The writing of “letters of news” or “letters of intelligence” was a regular profession before the printed newspaper was introduced, and lasted as such for some time afterwards, having indeed the advantage of being outside the necessity of obtaining a licence, which hampered the printed publication; and the profession of ” scrivener ” naturally suggested that of the later type of journalist. Of what used, again, to be called a ” relation,” i.e. a statement of an isolated piece of news, there are various printed examples as early as during the latter part of the 15th century. For instance, an official manifesto of Archbishop Dietrich of Cologne was printed at Mainz in 1462. A French pamphlet giving an account of the surrender of Granada to Ferdinand and Isabella — ” le premier jour de Janvier dernierement passe ” — appeared in 1492.

Precisely at what point, and in what instance, it can be said that a continuous series of news-pamphlets started, which can therefore be called the earliest newspaper, is hard to decide, upon the materials now available. But it was on the continent of Europe, and not in England; and probably in the Nether- lands. We have, for instance, pamphlets in the British Museum, which contain news-items and suggest periodical publication, though they are not actually known to form copies of a regular series. A Newe Zeytung; Die Schlact des turkischen Keysers, &c, dates from 1526; another Newe Zeytung, still more varied in its contents, contains a letter from Winchester dated July 24, 1554. In Germany alone about 800 examples of such news-

pamphlets dating earlier than 1610 are known. The effect of the Cologne Mercurius Gallobelgicus (1594) on English purveyors of ” relations ” is dealt with below (under United Kingdom) ; but this was rather a book than a newspaper. The earliest plainly periodical publication containing ” news of the day ” was, how- ever, the German Frankfurter Journal, a weekly started by Egenolph Emmel in 1615. The Antwerp Nieuwe Tijdinghen followed in 1616; and in 1622 the history of English newspapers begins with the Weekly Newes published in London by Archer and Bourne. From this point we are on firmer ground, and the evolution of the modern Press in the different countries, as traced below, can be continuously followed. It is worth noting that a link in the history of journalism with the Roman Acta Diurna is provided by the Venetian government written gazetli (from which comes our ” gazette “) of the 16th century, official bulletins or leaflets dealing with public affairs, which were avowedly based on the ancient Roman model. Italy indeed originated not only the title ” gazette ” (probably derived from the Gr. 7afa, i.e. treasury of news), but also that of ” coranto ” (Fr. courant; also early anglicized as ” current,” i.e. a ” running ” relation), both of which are familiar in the history of the English and foreign Press.

The art and business of journalism, as now understood — taking ” journalism ” here in the sense of the production of the literary contents of a newspaper, and not the production and distribution of the printed sheet itself — is a fam- combination of the mere recording or reporting of news and of its presentation in such a way, and with such comment, as to influence the minds of readers in some particular direction. The history of the ” leading article ” as a great factor in the shaping of public opinion begins with Swift, Defoe, Bolingbroke and Pulteney, in the many English newspapers, from the Review and the Examiner to the Craftsman, by which was waged the

keen political strife of the years 1 704-1 740. There is no counter- part to it in France until the Revolution of 1789, nor in Germany until 1796 or 1798. It was a Frenchman who wrote — ” Suffer yourself to be blamed, imprisoned, condemned; suffer yourself even to be hanged; but publish your opinions. It is not a right; it is a duty.” It was in England that the course so pithily described was actually taken, in the face of fine, imprisonment and pillory, at a time when in France the

public had to depend upon foreign journals illicitly circulated, when its own chief writers resorted to clandestine presses, to paltry disguises, and to very poor subterfuges to escape the responsibilities of avowed authorship, and when in Germany there was no political publicity worthy to be named. When the Mercure de France (1672), after a long period of mediocrity, came into the hands of men of large intellectual faculty, they had the most cogent reasons for exerting their powers upon topics of literature rather than upon themes of politics. True political journalism dates in France only from the French Revolution (see, for instance, Mallet du Pan), and it then had a very brief existence. It occupied a cluster of writers, some of whom left an enduring mark upon French literature. A term of high aspiration was followed quickly by a much longer term of frantic licence and of literary infamy. Then came the long rule of a despotic censorship; and cycles of licence followed by cycles of repression. In 1870 indeed the democratic government at Bordeaux issued against journals of high aims and of unspotted integrity, but opposed to its pretensions, edicts as arbitrary as the worst acts in that kind of Napoleon I., and unparalleled in the whole course of the govern- ment of Napoleon III.

In all the other countries of Europe political journalism, in any characteristic sense, was the creation of the 19th century — somewhat earlier in the century in northern Europe, somewhat later in southern. The Ordinarie Post-Tidende of Stockholm dates indeed from 1643, but until recent times it was a mere news-letter. Denmark had no sort of journal worth remark until the foundation in 1749 of the Berlingske Tidende, and that too attained to no political rank. The Gazette (Viedomosti) of St Petersburg — the patriarch of Russian newspapers — dating from the 16th of December 1702, is a government organ, and nearly synchronizes with the Boston News-Letter (1704), the first successful attempt at a newspaper in the British colonies in America. Journalism in Italy begins with the Diario di Roma in 1716, but in politics the Italian press remained a nullity for all practical purposes until nearly the middle of the 19th century, when the newspapers of Sardinia, at the impulse of Cavour, began to foreshadow the approach of the influential Italian press of a later day. In Spain no rudiments of a newspaper press can be found until the 18th century; the Gaceta de Madrid started about 1726. As late as in 1826 an inquisitive American traveller recorded his inability to lay his hands, during his Peninsular tour, upon more than two Spanish newspapers.

While originally the newspaper depended entirely on its own reporters and correspondents for news, and still largely does so, the widening of the field of modern journalism is largely due to collective enterprise, by which outside organizations known as ” news agencies ” send a

common service of news to all papers which arrange to take it. The first of the great collecting and distributing news agencies, Reuter's Agency, was founded by Julius Reuter, a Prussian government-messenger, who was impressed by the common interest roused by the revolutionary movements of 1848. In 1849 he established a news-transmitting agency in Paris, with all the appliances that were then available. Between Brussels and Aix-la-Chapelle he formed a pigeon-service, connecting it with Paris and with Berlin by telegraph. As the wires extended, he quickly followed them with agency- offices in many parts of the continent. He then went to London, where his progress was for a moment held in check. Mr Walter of The Times listened very courteously to his proposals, but (on that first occasion) ended their interview by saying, " We generally find that we can do our own business better than anybody else can." He went to the office of the Morning Advertiser, which had then the next largest circulation to that xix. 18

of The Times, and had better success. He entered into an agree- ment with that and afterwards with other London journals, including The Times, and also with many commercial corporations and firms. The newspapers, of course, continued to employ their own organizations and to extend them, but they found great advantage in the use of Reuter's telegrams as supple- mentary. Within a few years the business is said to have yielded the founder some £25,000 a year, and in 1865 it was transferred to a limited company. In later years this type of news-agency operating all over the world was repeated by others, and also by agencies operating mainly or exclusively only in one country.

It is no longer possible nowadays to confine the meaning of " journalism " merely to the work of those who write for the Press. Properly it may be said to include the whole intellectual work comprised in the production of a newspaper; and although the designation of " journalist " is generally applied only to editors and to writers, and would not be extended at all to the purely mechanical staff — the compositors, foundry-men and machinists — nor even to the proof-readers, whose sphere is analogous rather to the sub-editorial than to the mechanical departments, the modern tendency has nevertheless been, not only to install mere reporting (q.v.) in a place of high importance, but to give increased weight in journalism to those who occupy what may be called the " managerial " offices, the business side of making a paper pay having itself developed into an art on its own account. To be a great " journalist " was once, but ia hardly now, the same as being a great " publicist." The publicist proper is he who delivers his views on public affairs in the Press; but the excellence of his articles may nevertheless be consistent with the

journal being a disastrous failure, and his reputation as a journalist is then but poor. The great journalist is he who makes the paper with which he is connected a success; and in days of competition the elements necessary for obtaining and keeping a hold on the public are so diverse, and the factors bear- ing on the financial success, the business side, of the paper are so many, that the organization of victory frequently depends on other considerations than those of its intrinsic literary excellence or sagacity of opinion, even if it cannot be wholly independent of these. The modern newspaper, moreover, depends for its financial success no longer primarily on its receipts from circulation, but on its receipts from advertisements; and though these can only ultimately be secured on the basis of circulation (the number of people who buy and read the paper), the establish- ment of the paper as the organ of a large body of readers for whose custom it is desirable to advertise often involves other capacities than those of the great publicist; and even in so far as the circulation depends on the attractiveness of its " news," the direction given to the supply of news may be managerial rather than editorial. Thus, in the division of labour, the editorial functions, formerly supreme and all-embracing, because the excellence of the contents of the paper made its success, have gradually, by a fissiparous process, yielded some of their authority to the managerial functions, and these have grown into an in- dependence which — since editorial possibilities ultimately depend on financial resources — has given increased importance in journalism to the business side.

It must suffice here to say therefore that the work of journalism may be broadly divided into its editorial and managerial sides. And apart from exceptional cases of a working proprietor who is both editor and manager, or of a managing-editor, or of a great manager who exercises editorial functions, or a great editor who exercises managerial functions, the ordinary course is to keep them fairly distinct. The managerial side involves the business work of a paper, including the obtaining of advertise- ments and all the operations directly connected with producing it and making it pay as a commercial enterprise. The editorial side is engaged — however much managerial exigencies may dictate its policy — in providing the " reading matter " which forms its contents, other than such as is of the nature of advertis- ing. The editorial staff includes editors and assistant-editors, sub-editors (in Great Britain a term usually restricted in daily journalism to those engaged in the " news. " departments).

leader-writers, critics, ‘reporters (more narrowly considered part of the ” sub-editorial ” staff) , &c. The actual owner of the paper, the proprietor, may or may not take part in either side, but in law his authority is delegated to those who produce it. The older ideas of journalistic management survive in making the editor, publisher and printer, but curiously not the “manager,” liable in a writ for libel, contempt of court, &d, together with the proprietor in English law. But no satisfactory legal definition of ” editor,” still less of ” manager,” is possible, since their positions and powers vary according to circumstances.

So far as the general relations of the staff of a paper with its proprietor are concerned, we may briefly note that engagements are contracts for personal service; they will not therefore be specifically enforced, and the remedy for injury is dismissal or action for damages ; and they must be in writing and stamped, to be evidence in law, if for a year or longer. The editor is the agent of the proprietor, and binds him for acts within the scope of editorial authority (which includes the insertion of any matter in the paper). Being an agent he can have no power as against the proprietor, but unreasonable interference on the latter’s part may entitle an editor to an action for breach of contract or for damage to his professional reputation : while gross misconduct on the part of an editor might similarly entitle the proprietor to damages. Letters, manuscripts, &c, come into the editor’s hands as agent for his proprietor, and are the latter’s property. Uninvited contributors send him articles at their own risk, but the sending to them of a type-set proof has been held to be evidence of acceptance. Apart from special terms, the editor is entitled to ” edit ” such articles, i.e. use them wholly or in part, or alter them ; he has a free hand to do so in the case of anonymous articles; in the case of signed articles it is clearly his duty to kˆep them free from libel or illegality, but the right to edit is limited in so far as his alterations might attribute to the writer anything which would give the latter a claim for damages. Though the highest function of an editor is embodied in the etymology of the word (a ” bringer forth ” or producer), as one who acts as the literary midwife in the literary setting forth of ideas, it is probably his use of the proverbial blue-pencil, altering or deleting, which is generally associated with the word “to edit.” Each aspect, however, of edi- torial work has its own importance — the organization and inspiration on-the one hand, the moulding into shape on the other. And ” good ” editing is necessarily relative, depending to a certain extent on the character of the paper which it is intended to produce.

See Press Laws, Libel, Copyright, &c. ; and generally, for law, Fisher and Strachan, Law of the Press (2nd ed., 1898).

The history of the Newspaper Press is told for various countries of importance under their respective sections below. The practical development of the modern newspaper is indeed due to a union of causes, largely mechanical, that may well be termed marvellous. A machine (see Printing) that, from a web of paper 3 or 4 m. long, can, in one hour, print, fold, cut and deliver many thousand perfected broadsheets, is, however, not so great a marvel as is the organizing skill which collects information by conversation, post or telegraph, from all over the world, and then distributes these communications in cheap printed copies regularly every day to an enormous public, sifted, arranged and commented upon, in the course of a few hours. But for a high ideal of public responsibility and duty, conjoined with high culture and with great " staying-power," in the editorial rooms, all these marvels of ingenuity — which now combine to develop public opinion on great public interests, and to guide it — would be nothing better than a vast mechanism for making money out of man's natural aptitude to spend his time either in telling or in hearing some new thing. A newspaper, after all, is essentially a business, conducted by its proprietors for gain. That the commercial motive is a danger to honest journals is obvious, were it not indeed that here as elsewhere honesty is in the long run the best commercial policy.

The example of American journalism has so greatly affected the developments in England and other countries since about The in flu- ˆyo, that it is important to realize the conditions eaceot under which, in the United States, the newer type American of journalism arose. 1 In substance very much the km"" 1 ' same causes produced very much the same effects, though at a slower rate, in England; but British conservatism operated here as elsewhere. Several circumstances combined in the last quarter of the 19th century to Dromote

1 The account which follows is reproduced from Mr Whitelaw Reid's article in the 10th edition of the Ency. Brit.

great changes in the condition and character of American newspapers. (1) Paper was enormously cheapened. Before and during the Civil War it cost large New York newspapers at times 22 cents per lb for even a poor quality. In 1864 it cost 16 cents in February, and ran up a cent every month till in mid- summer it touched 21 and 22 cents. As late as 1873 it was still sold at from 12 to 13 cents. As new materials were found and machineˆ' was improved, the price slowly declined. When the manufacture from wood-pulp was made commercially successful,

the profits tempted great investments of new capital; bigger mills were built, competition became keen, and new inventions cheapened the various processes. Thus in New York in 1875 the average price for the year for fair" news " paper was 8-53 cents per lb; in 1880, 6-92; in 1885, 5-16; and in 1890, 3-38. At last, about 1897, large contracts for a good average quality, delivered at the press-room, were made in New York at as low a figure as 1-5 cents per lb. Subsequently advances in raw materials, one or two dry seasons which curtailed the water- power, and combinations resulting from over-competition, caused some reaction. Yet it could still be said in 1900 that prudent publishers could buy for $1 as much paper as would have cost them $3 twenty years earlier, or $10 about 1875. (2) Printing machinery for great newspaper offices was transformed. Instead of the old cylinder presses fed by hand, with the product then folded and counted by hand, machines came into common use to print, fold, cut, paste and count and deliver in bundles, ready either for the carrier or the mail, at rates of speed formerly not dreamed of. The size of the paper could be increased or diminished at will, as late news might require, within an hour of the time when it must be in the hands of its readers. Instead of cutting down other news to make room for something late and important, more pages were added, and this steadily increased the tendency to larger papers. Devices were also found for printing the same sheet in different colours at the same rate of speed; and in this way startling headlines were made more startling in red ink, or a piece of news for which special attention was desired was made so glaring that no one could help seeing it. (3) Hand-setting (for great newspapers) was practically abolished. Instead of the slow gathering of single types by hand separate lines were now produced and cast by machines, capable when pushed to their utmost capacity of doing each the work of five average compositors. Thus between 1880 and 1900 there were reductions in the cost — (1) of the raw material for the manufacture of newspapers from two-thirds to three- fourths; (2) of printing, at least as much; and (3) of com- position, at least one-half, while the facilities in each department for a greater product within a given time were enormously increased. The obvious business tendency of these changes was either a reduction in price or an increase of size, or both.

Electricity became the only news-carrier. New ocean cables broke down the high rates charged at the outset. The American news appetite, growing by what it fed on, soon demanded far fuller cablegrams of European news; and the wars in which Great Britain and the United States were involved accelerated the movement. The establishment of a strong telegraph com- pany, capable of efficient

competition with the one which practically controlled the inland service in 1880, likewise cheapened domestic news by telegraph and increased its volume. The companies presently recognized their interest in encouraging rival news associations, and so getting double work for the wires, while promoting the establishment of new papers. Wild competition between news agencies was thus encouraged (even in the cases of some already known to be bankrupt) to the extent of credits of a quarter or half a million dollars on tele- graphic tolls. The rapid spread of long-distance telephone lines further contributed to this tendency to make the whole continent a whispering gallery for the press. Every great paper had both telegraph and telephone wires run directly into its newsroom.

Photography and etching were added to the office equipment, Various ” process ” methods were found, by which the popular desire for a picture to make the news clearer could be gratified. Drawings were reproduced successfully in stereotype plates for

the fastest rotary presses. The field of political caricature had heretofore belonged exclusively to the weekly papers, but the great dailies now seized upon it, and commanded the service of the cleverest caricaturists. Newspapers found a way to put the ” half-tone ” etching of a photograph, such as had heretofore been printed only on slow flat presses, bodily into the stereotype plate for the great quadruple and octuple presses; and there- after portraits and photographs of important groups on notable occasions began to appear, embodied in the text describing the occurrences, a few hours after the camera had been turned on them, in papers printed at the rate of thirty and forty thousand an hour. In this development of illustrated daily journalism America rapidly went far beyond other countries.

News agencies multiplied and gave cheaper service. The New York Associated Press had been the chief agency for the whole country. It admitted new customers with great caution, and its refusal to admit was almost prohibitory, while its with- drawal of news from established papers was practically fatal. It was owned by the leading New York journals. Their dis- agreements led to the success of a rival, the United Press. The New York Associated Press finally dissolved,

most of the New York members became connected with the United Press, and many of their Western and Southern clients organized the Associated Press of Illinois, more nearly on a mutual plan. The United Press finally failed, and most of its New York members went into the Associated Press of Illinois, which in turn was forced into plans for reorganization by decisions of Illinois courts against its rules for confining its services to its own members. One result of these successive changes was to en- courage new papers by making it easy for them to secure a comprehensive news service, and thus to threaten the value of the old papers. Another was the struggle to increase the volume of the service, leading to reports of multitudes of occurrences formerly left without notice in the great news centres, and ex- tension of agencies into the remotest hamlets, and less scrupulous care in the consideration and preparation of the reports filed at many points for transmission. News syndicates for special purposes also developed, as well as small news associations, sometimes with a service sufficient for the wants of many papers. The almost official authenticity which the public formerly attributed to an Associated Press despatch measurably declined; and the dailies found more difficulty in sifting and deciding upon the news that came to them, and incurred more individual responsibility for what they printed.

The great accumulation of private fortunes also changed the newspapers. Millionaires came to think it advantageous to own newspapers, openly or secretly, which could be conducted without reference to direct profits, for the sake primarily of political, social or business considerations. To secure large circulations for such enterprises they were willing to sell the paper for long periods at much below the cost of manufacture, and to spend money for news and writers more lavishly than the legitimate business of established journals would allow. Great business corporations seeking for favourable or fearing adverse legislation sometimes made secret newspaper investments for the same purpose.

These various new conditions, affecting the newspaper press of the United States with ever-increasing force, gradually changed the average character of the papers and their effect upon their readers. A large circulation became the only evidence of success and the only way to make the sale v>f a newspaper below cost ultimately a source of profit. A disposition to lower the character in order to catch the largest audience naturally followed. Criminal news was reported more fully than formerly, with more piquant details. Competitors outdid each other in the effort to treat all news with unprecedented sensationalism. The lowest possible price was regarded as essential to the largest possible circulation, and so a favourite price even for large

newspapers became one cent to the public, and consequently only half a cent to the publishers, whose business was practically all at wholesale with dealers and news companies. The feeling that the most must be given for the money prompted also the

great increase in size, only made possible by the reductions in paper, composition, presswork, &c, already noted. Yet mere quantity and mere sensation after a time palled on the jaded appetite, and the spice of intense personality became necessary. As most people like to see their names in print, and can bear criticism of their neighbours with composure, these two chords of human nature were incessantly played upon.

The principal feature in the development of modern news- papers is the importance attached to obtaining, and prominently displaying, ” news ” of all sorts, and incidentally cf, arac . there has been a considerable change of view as towhat teristics sort of news should be given prominence. Sport and of modem finance are treated at greater length and more popu- ” ews ” larly; and, partly owing to the largely increased number of papers and consequent greater competition; partly to a desire to appeal to the larger public, which is now able to read and ready to buy reading-matter, there has been a tendency to follow the tastes of the vast number of people who can read at all rather than of those to whom reading means a very high standard of literary and intellectual enjoyment. This has involved a more popular form of presenting news, not only in a less literary style and by the presentation of ” tit-bits ” of information with an appeal to cruder sentiments, but also in a more liberal use of headlines and of similar devices for catching the eye of the reader. ” Personal journalism,” i.e. paragraphs about the private life or personal appearance of individuals — either men or women — of note or notoriety in society or public affairs, has become far more marked; and in this respect, as in many others, encouragement has been given to a spirit of inquisitiveness, and also to a widespread inclination either to flatter or be oneself flattered, the latter desire being indeed con- spicuously prevalent in these “democratic days” even among the classes which once affected to despise such publicity.

The modern impulse, culminating in England in the last decade of the 19th century in what was then called the “New Journalism,” was a direct product of American conditions and ways of life, but in Great Britain it was also the result of the democratic movement produced by the Education Act of 1870 and the Reform Act of 1885; and it affected more or less all countries which came within the influence of free institutions. The most generally adopted American innovation (for,

though not known before even in England, it was practically a new thing as carried out in American newspapers) was the ” inter- view ” (the report in dialogue form of a conversation with some prominent person, whose views were thus elicited by a reporter), which during the early ‘nineties was taken up in varying degrees by English newspapers; it was “cheap copy” — the word ” copy ” covering in journalistic slang any matter in the shape of an article — and could easily be made both informing and interesting; and ” interviewing ” caused a large increase in the journalistic profession, notably among women. The rage for the ” interview ” again declined in vogue outside American journalism in proportion as people of importance became less ready to talk for publication — or for nothing.

From the highest class of paper downwards, however, real news — and especially early news — has been more and more sought after, and all the force of organization both within individual newspaper offices and outside them in the shape of news agencies, has been applied to the purpose of obtaining early news and publishing it as quickly as possible. In this matter the Press has certainly been helped most materially not only by the advance in telegraphic facilities (see Reporting) but by all the other new rapid methods of production in Type setting (see Typography) and Press- work (see Printing) which have been the feature of the modern period. The vastly increased amount of telegraphic work now done has perhaps not been all pure gain to the best sort of journalism. It has to some extent weakened the effect of the considered article, and led to hasty conclusions and precipitate publication, with results that sometimes cannot be compensated for by any later contradiction or modification. In some cases a reaction ensued. Take for instance the case of war correspondence. The prestige of the

” war correspondent ” became at one time enormous, and his evolution from the days of H. Crabb Robinson, who wrote to The Times from Spain in 1807-1809, has been traced by busy pens with all the precision of a special interest in history. Certainly nothing finer in active English journalism was ever done than in W. H. Russell’s letters to The Times from the Crimea, or the work of Archibald Forbes and others in the Franco- Prussian War; but more recently, although first-rate abilities have been forthcoming, the news agencies, often

favoured by the military Press censor, have generally been ahead of the ” specials,” and the individual work that might have been done for isolated papers has been much hampered by restrictions. This is due partly to the increased competition, partly to military jealousy and officialism, partly to the vital importance of secrecy in modern warfare: but the result has been to a considerable extent to reduce the value of the ” war correspondent ” as compared with what was done in the Press in the days of Russell and Forbes. A letter arriving weeks after the telegraphic account, however meagre, is largely shorn of its interest. Given a brilliant foreign correspondent, the form of letters sent home from abroad on general subjects is still, no doubt, very effective. But the telegram is necessarily the backbone of the news service of the daily paper. The Press, be it added, is frequently able to acquaint the public with what is going on while a government itself is still uninformed. The work of officials and statesmen is admittedly increased and sometimes embarrassed by the new strain imposed upon them in consequence, but the public are on the whole well served by their emancipation from the obscurity of purely official intelligence and by the obligation of straightforward dealing imposed upon governments, which in their nature are apt to be secretive.

Connected with the increased attention given to news is the greater vogue of the newspaper ” poster ” or contents-bill, which is exhibited in the streets. The poster has acquired commercial importance for indicating the possession of some special news without revealing its whole nature, and the tendency has been to have fewer lines and fewer words in larger type, in order to catch the eye more impressively. Rotary machines for printing these posters enable them to be turned out with greater rapidity; and in the case especially of evening papers it is possible at any time during the afternoon, should important news arrive, to issue a new poster and thus secure a large street sale by the insertion of a few words only in the ” stop press ” or ” fudge ” without the necessity of changes in the plates. The catch-penny style of the poster has transferred itself also to the newspaper itself, in the shape of the ” scare ” headlines. And there has been a tendency for the news to be so ” displayed ” in the headlines as to make any further reading unnecessary.

Apart from the publication of ” news ” and reports, and occasional original articles of a descriptive and miscellaneous character, the chief function of a newspaper is criticism, whether of politics or other topics of the moment, or of the drama, art, music, books, sport or finance. As regards sport, the comments of the various newspapers are mainly descriptive; but a prominent feature in the United Kingdom has been the attention paid to ” tipping ” probable winners on the Turf, and the

insertion of betting news. The publication of the ” odds ” some time before a race, and of starting-prices, undoubtedly helped to foster the increase of this form of gambling, as was pointed out in the report of the Select Committee on Gambling in England in 1902, but the efforts to induce the English newspapers to keep such matter out of their columns have not had much success. The Daily News (London) in 1902 started on a new proprietorship under Mr Cadbury with a declared policy of not referring to horse- racing or betting; but when its principal proprietors in 1909 became largely concerned also in the Star and Morning Leader, they were apparently content to retain the ” tipster ” elements which bulked large in them, and this inconsistency aroused considerable comment. The sporting interest (i.e. the desire to know results of racing and cricket, &c.) largely inflates the circulation of most of the London and provincial halfpenny evening papers.

Between about 1870 and 1880 the English newspapers began to pay increased attention to literary and artistic criticism; and gradually the daily Press, which formerly applied itself mainly to recording news, and to political, social and financial subjects, became a formidable rival in this sphere to the weekly reviews and the monthly and quarterly magazines. Books are “re- viewed ” in the Press partly for literary reasons, partly as a quid pro quo for publishers’ advertisements; and the desire for ” something to quote,” irrespectively of the responsible nature of the criticism, became in the early ‘nineties a mania with publishers, who in general appear to have considered that their sales depended upon their catching a public which would be satisfied by seeing in the advertisement that such and such a book was pronounced by such and such a paper to be ” indispensable to any gentleman’s library.” Unfortunately the enormous output of books made it impossible for editors to have them all reviewed, and equally impossible for them to be certain of discriminating properly between those which were really worth reviewing or not. The result has been that the work of book-reviewing in the newspapers is often hastily and poorly or very spasmodically done. But there have been some honourable exceptions. The ” Literary Supplement ” (since 1901) to The Times is the most ambitious attempt made by any daily paper to deal seriously with literature. The Daily Chronicle started a ” literary page ” in 1891, and it was imitated in varying degrees by other English papers. The Scotsman and some other provincial papers have also for some time devoted much space to excellent literary criticism. The ” literary supplement ” has also been developed to excellent effect in some journals in the United States, such as the New York Times, where this feature was indeed originally started. As a form of serious criticism,

however, the review has, in the general newspapers of later years, taken a lower place than must be desirable, partly owing to the cause named, partly to a tendency among reviewers either to indiscriminate praise or to irresponsible irrelevance, partly to a suspicion of ” log-rolling ” ; and to a large extent it has become the practice merely to treat the appearance of new books as so much news, to be chronicled, with or without extracts, according as the subject makes good ” copy,” like any other event of the day.

The modern tendency, resulting from the enormous amount of newspaper production, has been to make journalism less literary and at the same time literature more journalistic. Either as reviewers, leader-writers or editors, many of the principal ” men of letters ” have worked for longer or shorter periods as writers for some newspaper or other, and much of the published literature of the time has appeared originally in the columns of the newspapers, in the form of essays, poems, short stories or novels (in serial form). Publication in this shape has many advantages for an author besides that of ad- ditional remuneration; it offers an opportunity for a new writer to try his wings, and it helps to introduce him at once to a large public. Moreover, the newspapers read by the educated classes profit by the superior class of journalist represented by writers of a literary turn. But the increased popularity of the news- paper, and the close tie between it and the literary world, have on the whole impressed a journalistic stamp upon much of the literature of the day. However popular at the moment a writer may be, the infection with journalistic methods — while rightly employed by journalists, as such, in dealing with contemporary events and for strictly contemporary purposes — is apt to be responsible for something wanting in his work, the loss of which deprives him of the permanent literary or scientific rank to which he might otherwise aspire.

The new point of departure for the more popular style of English journalism (apart from the influence of American models) is really to be found in the publication of Sir George (then Mr) Newnes’s Tit-Bits in 1881. This penny weekly paper, with its appeal to the masses, who liked to read snippets of information brightly put together, showed what enormous profits were to be made by this style of enterprise; and the multiplication of journals of this description — notably Mr

Alfred Harmsworth's (Lord Northcliffe's) Answers (1888) and Mr C. Arthur Pearson's Pearson's Weekly (1890) — had a further influence on public taste, so that even the classes above that which primarily enjoyed these publications were affected in the same direction. A new note was thus introduced into English daily journalism in England. Whereas before 1885 the chief feature in London journalism, outside The Times and other great morning papers, had been the literary brilliance of the Saturday Review and its evening paper analogues, the Pall Mall and St James's Gazettes, in the early 'nineties came a craze for " actuality." Mr T. P. O'Connor, with his vivid pen (first in the Star, then in the Sunday Sun and elsewhere), set the pace for a crowd of imitators; the successful establish- ment of the Daily Mail in 1896, with its system of compressing the news of the day briefly and pointedly into short paragraphs, while at the same time catering for all tastes and employing first-rate correspondents and reporters to supply it with special information, gave a distinct shake-up to the older traditions of daily journalism. The old tendency had been to rely for success either on writers of exceptional knowledge or capacity, men who were essentially amateurs, or on a class of professional journalists who at all events had a literary tradition behind them. A different sort of amateur now arose, and a different sort of professional. Even when an attempt was made to provide for a literary public, success came to be generally sought by popular rather than by literary methods. The literary public in the proper sense of the word is inevitably a small one, and the greater part of the Press deals with literature on lines more suited to a larger and less refined clientele. It may be claimed, no doubt, that the best sort of journalism shows a high, and sometimes the highest, literary standard, but the fact remains that for the bulk of modern journalism its conductors realize only too well that their business is to appeal to the masses, and to a standard of education and taste which falls far short of anything that can be called intellectual.

It is often said that the leading articles or " editorials," expressing the attitude of the paper towards important subjects of the Jay, have lost their importance, but this is only a half- truth. Allowance being made for changes in literary style, the actual amount of good writing in this department in the great organs of opinion — well-informed, scholarly and incisive — may justly be considered equal to anything done in what are sometimes considered its palmy days. 1 On the other hand, it is undoubtedly the case that in the newer type of newspaper, which appeals rather on the score of its tit-bits of news and rapid readableness to a more casual and less serious public, the whole raison d'Ure of the old-fashioned leading article has disappeared, and its

place is taken by a few brief notes, merely indicating the attitude of the paper, and not seeking to discuss any subject comprehensively at all. The ” leader ” is to some extent a form of newspaper routine, but on the whole it is a routine which has proved its value by experience. The con- tinuous high standard of tone, maintained by so many great journals, depends more largely than is sometimes realized on the regular industry and skill of those whose business it is to discuss the latest developments of affairs every day or every week in a manner which gives reasonable men something fresh to think about, or interprets for them the thoughts which are only vaguely floating in their minds. The liberty of the Press enables every sort of view, right or wrong, to be discussed in this prominent form, and thus every aspect of a question is brought out in public, to be accepted or rejected according to the weight of evidence and of argument.

The same end is assisted by the devotion of so much space to ” letters to the editor.” It is sometimes said that in England the London Times owes its position largely to the fact that if any individual grievance is felt it is generally ventilated by a letter to The Times. Whatever may be the organization of the

1 It must be remembered that the style of public speeches has also altered. Nobody thinks of quoting the classics nowadays in the House of Commons. A more business-like form of speech is adopted in public life, and the Press reflects -this change.

Press for reporting the news of the day, the resources of no newspaper staff are great enough to cover an area of information as large as that represented by its readers; and the value of the outlet for opinion and information afforded by the corre- spondence columns cannot be overstated.

Most people probably read more papers than is compatible with a healthy mental digestion, but the Press, as such, has to-day an enormous — and none the less real because subtle — influence; and this is largely due to the reputation maintained by its higher representatives. While, individually, the great papers wield considerable influence, due partly to real sagacity and authority, partly to the psychological effect produced by mere print or by reiterated statement, collectively the Press now represents the Public, and expresses popular opinion more directly than any representative assembly. The multiplication of ” Press-cutting agencies,” and of such essentially ” newsy ” publications as Who’s Who (the English form of which originated with Mr Douglas Sladen in 1897) and similar biographical reference books — all tending to increase, the publicity

of modern life — has contributed materially to the pervading influence of journalism in everyday life and the constant dependence of society in most of its manifestations on the activity of the ” Fourth Estate.” (H. Ch.)

From the introduction of low rates for telegraphy and from the increase of mechanical methods of production, and of the desire to read and the growth of advertising (see Advertisement), the modern low-priced newspaper ne ^° has resulted. But it is by no means a recent develop- papers. ment merely. In France, Theophrastus Renaudot’s Gazette de Paris (1631) was started at the price of six centimes. In England we find the first mention of inexpensive news-sheets towards the close of the 17th century, when a number of half- penny and farthing Posts sprang into existence, and appeared at more or less irregular intervals. These consisted of small leaflets, containing a few items of news — sometimes accompanied by advertisements — and were commonly sold in the streets by hawkers. The rise in cost was really due to artificial causes. The increase of these newspapers, and especially the growing practice of inserting advertisements, led the legislature to con- template a stamp tax of a penny per sheet on all news publica- tions. As a protest, a curious pamphlet — of which a copy is preserved in the British Museum — was issued in 1701, and it sheds an interesting light upon this early phase of cheap journal- ism. The pamphlet is entitled Reasons humbly offered to the Parliament on behalf of several persons concerned in the paper- making, printing and publishing of the halfpenny newspapers. It states that five master printers were engaged in the trade, which used 20,000 reams of paper per annum. The journals are described in the following terms: ” The said newspapers have been always a whole sheet and a half, and sold for one halfpenny to the poorer sort of people, who are purchasers of it by reason of its cheapness, to divert themselves, and also to allure herewith their young children and entice them to reading; and should a duty of three halfpence be laid on these mean news- papers (which, by reason of the coarseness of the paper, the generality of gentlemen are above conversing with), it would utterly extinguish and suppress the same.”’ The pamphlet goes on to say that hundreds of families, including a considerable number of blind people, were supported by selling the half- penny journals in the streets.

In 171 2 a tax of a halfpenny per sheet was imposed, and the cheap newspapers at once ceased to exist. This tax on the press was increased from time to time, till in 181 5 it stood at fourpence per sheet. The usual price of newspapers was then sevenpence a copy. From these facts it seems highly probable that, had not the stamp tax been imposed, the halfpenny paper would soon have become the

normal type, and would have continued so to this day. In 1724 a committee of the House of Commons sat to consider the action of certain printers who were evading the stamp tax by publishing cheap newspapers under the guise of pamphlets. They found that there were then two Halfpenny Posts published in London, one by Read of Whitefriars. and the

other by Parker of Salisbury Street. There were also three weekly papers issued at a halfpenny a copy. The tax, after several reductions, was finally repealed on 15th June 1855, and a rush of cheap papers immediately followed. A penny became the usual price for London daily papers, with the exception of The Times, and halfpenny papers soon became common.

The growth of the cheap newspaper has since been practically a simultaneous one throughout the civilized world. This has been notably the case in the United States, France and Great Britain. The general tendency in newspaper production, as in all other branches of industry, has in recent times been towards the lowering of prices while maintaining excellence of quality, experience having proved the advantage of large sales with a small margin of profit over a limited circulation with a higher rate of profit. The development — and indeed the possibility — of the cheap daily paper was due to a number of causes operating together during the latter half of the 19th century. Among these, the first place must undoubtedly be given to the cheapening of paper, through the introduction of wood pulp and the perfect- ing of the machinery used in the manufacture. From 1875 to 1885 paper cheapened rapidly, and it has been estimated that the introduction of wood pulp trebled the circulation of news- papers in England. Keen competition in the paper trade also did much to lower prices. At the same time the prime cost of newspaper production was increased by the introduction of improved machinery into the printing office. The growth of advertisements must also be taken into account in considering the evolution of the halfpenny journal. The income from this source alone made it possible to embark upon journalistic enter- prises which would otherwise have been simply to court disaster. The popular journal of the present day does not, however, owe its existence and success merely to questions of diminished cost and improved methods of production. A change has come over the

public mind. The modern reader likes his news in a brief, handy form, so that he can see at a glance the main facts without the task of reading through wordy articles. This is especially the case with the man of business, who desires to master the news of the past twenty-four hours as he travels to his office in the morning. It is to economize time rather than money that the modern reader would often prefer a halfpenny paper; while the man of leisure, who likes to peruse leading articles and full descriptive accounts, finds what he needs in the more highly priced journals. The halfpenny paper in England has not had to contend with the opposition that the penny newspaper met from its threepenny contemporaries in the 'fifties and 'sixties. This is largely due to the fact that in most cases the contributors, paper, printing and general arrangement of the cheaper journal do not leave much room for criticism. Mr G. A. Sala once com- plained that the reporters of the older papers objected to work side by side with him when he represented the first penny London daily (the Daily Telegraph), through fear of losing caste, but this does not now apply, for in the United Kingdom, France and the United States the cheap journals, owing to their vast circula- tion, are able to offer the best rates of remuneration, and can thus command the services of some of the best men in all the various departments of journalism. (N.)

Another aspect of the newspaper which may here be considered is the introduction of pictorial illustrations (see also Illustra- tion). The earliest attempts at popular illustration of news events took the form in England of " broad- sides." One broadside dated 1587 recounted the Valiant Exploits of Sir Francis Brake; another dated 1607 gave an account of A wonderful flood in Somersetshire and Norfolk. The series of murder broadsides which lasted almost to our own time commenced in 1613 with one that gave an account of the murder of Mr William Storre, a clergyman of Market Rasen, in Lincolnshire, by Francis Cartwright. Early in the reign of Charles I. there appeared a broadside which described a fall of meteors in Berkshire. A little later — in 1683 — the Weekly News came out with the picture of an island which was supposed to have risen from the sea on the French coast. The execution of Strafford in 1641 was made the subject of a picture

Illustrated papers.

pamphlet that is to be seen in the British Museum, and in 1642 the first attempt to portray the House of Commons appeared in A Perfect Diurnall of the Passages in Parliament. In 1643 a pamphlet was published, called The Bloody Prince; or a Declaration of the Most Cruel Practices of Prince Rupert and the rest of the Cavaliers infighting against God and the True Ministers of His Church. This

contains a woodcut representation of Prince Rupert on his charger, one of the first attempts at pro- viding the public with a portrait of a contemporary celebrity.

Soon after this there appeared a journal, entitled Mercurius Civicus, which frequently gave illustrations, and, allowing for the Weekly News with its one attempt at an illustration above mentioned, must be counted the first illustrated paper. Mer- curius Civicus, however, only gave portraits; it published Charles I. and his queen, Prince Rupert, Sir Thomas Fairfax and all the leading men on both sides in the Civil War. Perhaps the most interesting illustration of the next four years was that contained in a tract intended to evoke sympathy for the con-‘ quered and captured king. It represented Charles in Carisbrooke Castle in 1648. There were many later attempts to depict the tragedy of Charles I.‘s execution, and several woodcuts present to us also the execution of the regicides after Charles II. came to the throne. A broadside of the reign of the second Charles shows the Frost Fair on the Thames in 1683, and with a broad- side describing Great Britain’s Lamentations, or the ■ Funeral Obsequies of that most incomparable Protestant Princess — Queen Mary, the wife of William III., in 1695 — we close the illustrated journalism of the 1 7th century.

Curiously enough, the 18th century, so rich in journalistic enterprise and initiative so far as the printed page was concerned, did less than the previous century to illustrate news. In 1731, however, in the Grub Street Journal, there appeared the first illustration of the Lord Mayor’s procession. In 1740 another journal, the Daily Post, gave an illustration of Admiral Vernon’s attack on Porto Bello. The narrative was introduced by the editor with the information that the letter that he is printing is from a friend who witnessed the conflict between the English and the Spaniards. The writer of the letter, who must be put on record as the father of war correspondents, signed himself ” William Richardson.”

There were some interesting efforts to illustrate magazines about this time. In the Gentleman’s Magazine for 1746 there was a lengthy account of the famous rising of 1745, and a map was given of the country round Carlisle, showing the route of the Scottish rebels; and in the same volume there was a portrait of the duke of Cumberland. In 1747 the Gentleman’s gave a bird’s-eye view of the city of Genoa, illustrating the account of the insurrection there, and so on year by year there were further pictures. In 1751 an obituary notice was illustrated by a portrait of a certain Edward Bright of Maldon, Essex. Mr Bright died at the age of thirty, and his interest to the public was that he weighed 425 stones. There were a number of maga- zines

besides the Gentleman's that came out about this time and continued well into the next century. In the Thespian Magazine for 1793, for example, there is an illustration of a new theatre at Birmingham. Then there were the English Magazine, the Macaroni Magazine, the Monstrous Magazine. Every one of these contained illustrations on copper, more or less topical.

William Clement, the proprietor of the Observer, the first number of which was published in 1791, was the first real pioneer of illustrated journalism, although his ideals fell short in this particular, that he was never prepared to face the illustra- tion of news systematically; he only attempted to illustrate events when there was a great crisis in public affairs. In 1818 Abraham Thornton, who was tried for murder, appealed to the wager of battle, which after long arguments before judges was proved to be still in accordance with statute law, and he escaped hanging in consequence. Thornton's portrait appeared in the Observer. Clement owned for some time Bell's Life and the Morning Chronicle. All his journals contained occasional topical illustrations. The Observer's illustration of the house where the Cato Street conspirators met is really sufficiently

elaborate for a journal of to-day, and in 1820 it gave its readers " A Faithful Reproduction of the Interior of the House of Lords as prepared for the Trial of Her Most Gracious Majesty Queen Caroline." In 182 1 it published an interior of the House of Commons with the members in their places. The Observer of 22nd July 1821 — the Coronation number — contained four engravings. Of the George IV. Coronation number Mr Clement sold 60,000 copies, but even that was nothing to the popularity that this journal secured by its illustrations of the once famous murder of Mr Weare and the trial of the murderer Thurtell. The Observer in 1838 gave a picture of the Coronation of Queen Victoria. In 1841 there was a fire at the Tower of London, when the armoury was destroyed. The Observer published three illustrations of the fire; it further published an emblematic engraving on the birth of the prince of Wales, and issued a large page engraving of the christening ceremony in the following January. Thus it had in it all the elements of pictorial journalism as we know it to-day.

The weekly Illustrated London News was, however, the first illustrated

newspaper by virtue of its regularity. It was the first illustrated paper, because all the illustrations to which we have referred as appearing in the Observer and other publications were irregular. They came at intervals; they were quite sub- ordinate to the letterpress of the paper; they were given only occasionally in times of excitement, with a view to promoting some little extra sale. That they did not really achieve the result hoped for to any great extent may be gauged by the fact that from 1842 to 1847 the Observer published scarcely any illustrations at all, and in the meantime the Illustrated London News had taken an assured place as a journal devoted mainly to the illustration of news week by week. That is why its first publication marked an epoch in journalism. The casual illustra- tion of other journals still went on: the Weekly Chronicle, for example, still published a number of pictures; the Sunday Times, also a very old paper, illustrated in these early days many topical subjects. In 1834, indeed, it pictured the ruins of the House of Commons, when that building was burned down. A paper started in 1837 called the Magnet gave illustrations, one of them of the removal from St Helena and delivery of the remains of the emperor Napoleon to the prince de Joinville in 1840.

The first number of the Illustrated London News appeared on 14th May 1842. Its founder was Herbert Ingram (1811-1860), who was born in Boston, Lincolnshire, and started life amid the most humble surroundings, what education he ever received having been secured at the free school of his native town. Apprenticed at fourteen to a printer in Hull, he later settled in Nottingham as a printer and newsagent in a small way. It was during his career as a newsvendor at Nottingham that he was seized with the belief that it was possible to produce a paper entirely devoted to illustration of news. In the first number of the Illustrated London News, however, there was not a single picture that was drawn from actual sight, the factor which is the most essential element of the illustrated journalism of to-day. Sir John Gilbert (1817-1897), the artist, has stated that not one of the events depicted by him — a state ball at which the queen and the prince consort appeared, the queen with the young prince of Wales in her arms, and other incidental illustrations — was taken from life.

The Illustrated London News had not been long in existence before there were many imitators, in America Harper's Weekly, in France L' Illustration and in Germany fiber Land und Meer, and from that day there has been constant development, the Illustrated Zeilung of Leipzig being perhaps the most striking. In America the use of illustrations in the daily papers has become a regular feature, culminating in the bulky Sunday editions of the principal journals;

and the practice of presenting the news in pictorial form has increased continuously even in England. In 1910 three London daily newspapers were principally devoted to illustration — the Daily Graphic, the Daily Mirror and the Daily Sketch, while most of the penny and halfpenny journals included some form of pictorial matter. This change was due

to the ever-increasing cheapening and ever-growing celerity of manufacture of what are known as half-tone blocks. It was in 1890 that the application of photography to illustrated journalism began in England, and by 19 10 it had grown to enormous dimensions, but the first newspaper photographs (mainly portraits) had to be engraved on wood, although the use of half- tone came in well-nigh simultaneously. “Up to 1890 illustrated journalism was in the hands of the artists, and the artists were in the hands of the wood engravers, who reproduced their work sometimes effectively — often inefficiently. But in the course of twenty years the wood engraver had been utterly superseded so far as illustrated journalism was concerned. The further develop- ments of journalism seemed likely to be entirely in the direction of coloured reproductions, block-making and machinery for facili- tating their production having made particularly rapid strides.

(C. K. S.) It is almost impossible by any statistical detail to give an idea of the advances made by the newspaper press as a whole; comoara- but an outline of the general results for 1828, 1866 and ˆ,° e ˆ ta . 1882, together with a fourth, as given in the 10th edition tjstlcSt ” of this encyclopaedia for 1900, may have its utility.

The earliest summary is that of Adrien Balbi. It was published in the Revue encyclopedique for 1828 (vol. i. pp. 593-603), along with much matter of more than merely statistical interest. The numbers of newspapers published in different countries at that date are given as follows: France, 490; United Kingdom, 483; Austria, about 80; Prussia, 288; rest of the Germanic Confederation, 305; Nether- lands, 150; Spain, 16; Portugal and the Azores, 17; Denmark, Sweden and Norway, 161 ; Russia and Poland, 84. The respective proportions of journals to populations were — for Prussia 1 to 41,500, German states 1 to 45,300, United Kingdom 1 to 46,000, France 1 to 64,000, Switzerland I to 66,000, Austria I to 400,000, Russia 1 to 565,000. Europe had in all 2142 newspapers, America 978, Asia 27, Africa 12 and Oceania 9; total 3168. Of these, 1378 were published in English-speaking countries (800 of them in the United States), having a population of 154 millions, and 1790 in other countries, with a population of 583 millions.

The second summary (1886) is that given by Eugene Hatin in an appendix to his valuable Bibliotheque de la presse periodique. His enumeration of newspapers is as follows: France, 1640; United Kingdom, 1260; Prussia, 700; Italy, 500; Austria-Hungary, 365; Switzerland, 300; Belgium, 275; Holland, 225; Russia, 200; Spain, 200; Sweden and Norway, 150; Denmark, 100; United States, 4000. Here the proportions of papers to population are — Switzerland and United States I to 7000, Belgium I to 17,000, France and the United Kingdom I to 20,000, Prussia 1 to 30,000, Spain I to 75,000, Austria 1 to 100,000, Russia 1 to 300,000. Hatin assigns to Europe a total of 7000, to America 5000 and to the rest of the world 250, making in all 12,500.

The third summary is taken from that of Henry Hubbard, pub- lished, in his Newspaper Directory of the World (New Haven, Con- necticut, 1882). Its scope embraces a considerable number of serial publications which cannot be classed as newspapers. Still Hubbard's figures, which were collected (chiefly by the American consuls and consular agents in all parts of the world) about 1880, cannot be disregarded. The following are his general results: —

Daily

Other

♦Newspapers.

Publications.

Europe .

2403

10,730

Asia .

154

337

Africa . .

25

125

N. America

1136

9.656

S. America

208

427

Australasia

94

47i

Total .

4020

21,746

The following summary for 1900, given in the 10th edition of the Ency. Brit., and compiled by G. F. Barwick and Dorset Eccles, of the British Museum, included everything in the .nature of a news- paper, as distinct from periodicals.

Totals of Newspapers, igoo.

Great Britain and Ire- land . . . . . 2,902 United States 15,904

France 2,400

Germany 3i 2 78

Austria 393

Hungary 171

Sweden 213

Denmark 145

Iceland and Faroe Islands 3

Norway 132

Belgium . Holland . Luxemburg R ussia Italy . . Spain . Portugal . Switzerland Greece Rumania . Servia

290 312

12 280 251 338

79 600

47 47 24

552

NEWSPAPERS

[BRITISH

Bulgaria …. Montenegro . Turkey …. Persia ….

Syria

India

Ceylon …. China ….

Siam

Straits Settlements . Cochin China. . Japan …. East Indies . South Africa West Africa . Central Africa, &c. . Egypt …. Canada ….

15

2

22

3

6

600

10

40

5 12

4

150

39

109

10

76

21

742

Central and West Indies 129

South American Repub

ics 340

Australasia —

New South Wales .

227

Queensland . .

109

South Australia .

44

Victoria .

310

West Australia .

18

Tasmania .

18

New Zealand —

Otago . Wellington .

28

29

Auckland

17

Hawkes Bay .

11

Canterbury

23

Sundry .

36

Total

31,026

2. British Newspapers

Early news- letters.

United Kingdom. 1 The first regular English journalists may be identified with the writers of manuscript ” news-letters,” originally the depend- ants of great men, each employed in keeping his own master or patron well-informed, during his absence from court, of all that happened there. The duty grew at length into a calling. The writer had his periodical subscription list, and instead of writing a single letter wrote as many letters as he had customers. Then one more enterprising than the rest established an ” in- telligence office,” with a staff of clerks, such as Ben Jonson’s Cymbal depicts from the life in The Staple of News, acted in 1625, which is the best-known dramatic notice of the news-sheets. ” This is the outer room where my clerks sit,

And keep their sides, the register in the midst;

The examiner, he sits private there within;

And here I have my several rolls and files

Of news by the alphabet, and all put up

Under their heads.”

Of the earlier news-letters good examples may be seen in the Paston Letters, and in the Sydney Papers. Of those of later date specimens will be found in Knowler’s Letters and Despatches of Strafford, and other well-known books. Still later examples may be seen amongst the papers collected by the historian Thomas Carte, preserved in the Bodleian Library at Oxford. Of these, several series were addressed to the first duke of Ormond, partly by correspondents in England and

Ireland, partly by correspondents in Paris; others were addressed to successive earls of Huntingdon; others, again,, to various members of the Wharton family. And similar valuable collections are to be seen in the library of the British Museum, and in the Record Office in London. In Edinburgh the Advocates' Library possesses a series of the 16th century, written by Richard Scudamore to Sir Philip Hoby during his embassy to Vienna. The MS. news-letters — some of them proceeding from writers of marked ability who had access to official information, and were able to write with greater freedom and independence of tone than the compilers of the printed news — held their ground, although within narrowing limits, until nearly the middle of the 18th century. The distinction between the news- letter and the newspaper is pointed out in the preceding section. It was at one time believed that the earliest regular English newspaper was an English Mercurie of 1588, to which George Chalmers, the political writer and antiquarian, referred in his Life of Ruddiman (1794) as being (with others of the same date) in the British Museum. The falsehood of this supposition, which was long accepted on Chalmers's authority, was, however, pointed out by Thomas Watts, of the British Museum, in 1839, in a volume with the title Letter to Antonio Panizzi on the Reputed earliest printed Newspaper, and again in 1850, in an article in the Gentleman's Magazine (n.s. xxxiii. 485-491). The documents in question are (1) a MS. unnumbered issue of the English Mercurie, dated " Whitehall, July 26th, 1588 "; (2) a printed copy, No. 50, of

1 In the following account of early British newspapers certain portions of the article by E. Edwards in the 9th ed. of the Ency. Brit. have been incorporated.

July 23, 1588; (3) a printed copy of No. 51; (4) a printed copy of No. 54, of November 24, 1588; (5) and thiee other MS. copies. These were included in a collection bequeathed to the Museum of Dr Birch (1766), and are incontestably 18th-century forgeries. The handwriting of the spurious MSS. was identified by a letter among Dr Birch's correspondence as that of Philip Yorke, afterwards 2nd Lord Hardwicke, and there were trifling correc- tions in Dr Birch's handwriting, showing that he was a party with Yorke, the author, to the mystification. No information is forthcoming as to the object of it, but it is worth mentioning that Yorke and his brother also published a clever jeu d' esprit called The Athenian Letters, purporting to be a transcript from a Spanish translation of letters written by a Persian agent during the Peloponnesian War; so that it may be inferred that this sort of thing recommended itself to Yorke, and not necessarily for

any deception.

Various English pamphlets, as well as French, Italian and German, occur in the 16th century with such titles as Newes from Spaine, and the like. In the early years of the 17th century they became very numerous; the Charles Burney collection in the British Museum is particularly valuable for this early period, the newsbooks and newspapers in it commencing with a ” rela- tion ” of 1603. In 1614 we find Burton (the author of the Anatomy of Melancholy) pointing a sarcasm against the non- reading habits of ” the major part ” by adding, ” if they read a book at any time . . . ‘tis an English chronicle, Sir Huon of Bordeaux, Amadis de Gaul, &c, a play-book, or some pamphlet of news.” But up to 1641, owing to the fact that to print domestic news was barred by the royal prerogative, the English periodicals which are to be considered as strictly the forerunners of the regular newspaper were only translations or adaptations of foreign periodicals containing news of what was going on abroad.

There is in the British Museum a Mercurius Gallobelgicus; Sive rerum in Gallia et Belgio potissimum, Hispania quoque, Italia, Anglia, Germania, Polonia, Vicinisque Locis ab anno 1588 usque ad Martium anni praesentis 1594 gestarum, nuncius. Opusculum in Sex libris qui totidem annos complectuntur , divisum auclore D. M. Jansonio Doccomensi Frisio. Editio altera. Coloniae Agrippinae. A pud Godefridum Kempensem. Anno MDXCI V. This production of Janson’s at Cologne is a fairly thick octavo book, giving a Latin chronicle of events from 1587 to 1 S94, and is really a sort of annual register. It was continued down to 1635. The Mercurius Gallobelgicus is chiefly interesting because, by circulating in England, it started the idea of a periodical supplying foreign news, and apparently became to English contemporaries a type of the newfangled news-sum- maries. 1 In 1614 there was published in London a little square book (45 pp.), by Robert Booth, A Relation of all matters passed . . . since March last to the present 1614, translated according to the originall of Mercurius Gallobelgicus, which has the running title Mercurius Gallobelgicus his relation since March last. From a repetition of such ” relations ” at irregular intervals, to the periodical publication of news-books with a common title in a numbered series, was a natural development. Thus on the 1st of June 1619 Ralph Rounthwaite entered at Stationers’ Hall A Relation of all matters done in Bohemia, Austria, Poland, Sletia, France, &c, that is worthy of relating, since the 2nd of March 1618 (1619 N.S.) until the 4th of May? Again at the beginning of November 1621 Bartholomew Downes and another entered hi like manner The certaine and true newes from all parts of Germany and Poland, to this present 20 of October 1621? No copy of either of these papers is now

known to exist. Nor is any copy known of the Courant or Weekly Newes from foreign parts of October 9, 1621 — ” taken out of the High Dutch,” — men- tioned by John Nichols. 4 But in May 1622 we arrive at a regular weekly newspaper which may still be seen in the British Museum.

1 The title Mercurius or Mercury — as representing the messenger of the gods — thus became a common one for English periodicals.

2 Registers of the Stationers’ Company, as printed by Edward Arber, iii. 302.

I 3 Ibid. iv. 23. 4 Literary Anecdotes, iv. 38.

The Stationers’ Registers contain an entry on May 18th of A Currant of generall newes. Dated in 14th May last; no copy of this issue is preserved, but what is presumably the next number is to be found in the Burney collection. It is entitled ” The 23rd of May — The Weekely Newes from Italy, Germany, &c, London, printed by J. D. for Nicholas Bourne and Thomas Archer.” On many subsequent numbers the name of Nathaniel Butter appears in connexion sometimes with Bourne and some- times with Archer; so that there was probably an eventual partnership in the new undertaking. Archer is known as a publisher of “relations” since 1603; he died in 1634. Butter had published Newes from Spaine in 161 1, and he continued to be a publisher of news until 1641, if not later, 1 and died in 1664.

For details of the history of the development of the news-book down to 1641, and thence to the starting of the London Gazette in 1665, reference should be made to Mr J. B. Williams’s History of English Journalism (1908), already referred to. Mr Williams, by his study of the materials preserved in the British Museum in the Burney and Thomason 2 collections, has considerably modified many of the previously accepted views as to the affiliation and authorship of these early English periodicals. The leading facts can only be summarized here.

The Weekely Newes (1622), though the first English ” Coranto,” had no regular title connecting one number with the rest; it was simply the news of the week, and so described. The first period- ical with a title

was a Mercurius Britannicus published by Archer (1625; the earliest copy in existence being No. 16, April 7th), which probably lasted till the end of 1627. But the activity of the Coranto-makers was checked by the Star Chamber edict in 1632 against the printing of news from foreign parts. The next step in the evolution of the newspaper was due to the abolition of the Star Chamber in 1641, and the consequent freeing of the Press; and at last we come to the English periodical with domestic news. In November 1641 begins The Head of severall proceedings in the present parliament (outside title) or Diurnal Occurrences (inside title), the latter being the title under which it was soon known as a weekly; and on Jan. 31st 1642 appeared A Perfect Diurnal of the Passages in Parliament. These were printed for William Cooke, and were written apparently by Samuel Pecke, ” the first of the patriarchs of English domestic journalism ” (Williams). It is unnecessary here to mention every domestic journal which played its part in the verbal warfare in the Great Rebellion. The weekly Diurnals were soon copied by other booksellers. At first they were naturally on the side of the parliament. In January 1643, however, appeared at Oxford the first Royalist diarnal, named Mercurius Aulicus (continued till September 1645, and soon succeeded by Mercurius Academicus), which struck a higher literary note; its chief writer was Sir John Birkenhead. Mercurius Civicus, the first regularly illustrated periodical in London, was started by the parliamentarian Richard Collings on May nth, 1643 (continued to December 1646); Collings had also started earlier in the year the Kingdome’s Weekly Intelligencer, which lasted till October 1649. I n September 1643 appeared another Puritan opponent of M. Aulicus in the Mercurius Britanicus (sic) of Captain Thomas Audley, which temporarily ceased publication on September 9th, 1644, only to be revived on September 30th by Marchamont (or Marchmont) Nedham, a writer who plays a prominent part in the journalism of this period, and to be continued till May 18th

1646.

In January 1647 was started the Perfect Occurrences by Henry Walker (” Luke Harruney “), who was not only a great journalist

1 It is to him that a passage in Fletcher’s Fair Maid of the Inn (Act iv. Sc. 2) obviously refers (written in 1625) : ” It shall be the ghost of some lying stationer. A spirit shall look as if butter would not melt in his mouth; a new Mercurius Gallo-Belgicus.” The quotation also illustrates the contemporary regard paid to the Mercurius Gallobelgicus.

2 George Thomason (d. 1666) was a London bookseller who in 1641

began collecting contemporary pamphlets, &c. His collection was ultimately bought by George III. and presented to the British Museum in 1762. A catalogue was completed in 1908, with intro- duction by Dr G. K. Fortescue. There is also a catalogue of early English newspapers in the Bibliotheca Lindesiana, Collections and Notes No. 5, of Lord Crawford (1901).

on the parliamentary side but is important as having originated the introduction of advertisements into the news-books. Later in the year a number of new Royalist Mercuries came into the field from which Aulicus and Academicus had now withdrawn: the first was Mercuricus Melancholicus (until 1649), and the most important were Mercurius Pragmaticus (Sept. 1647 to May 1650) and Mercuricus Elencticus (Nov. 1647 to Nov. 1649). M. Pragmaticus was not, as has been stated, originated by Marchamont Nedham (who about this time turned his coat and became Royalist), but in 1648-1649 he was its writer until he again turned parliamentarian; “history,” says Mr Williams, ” has no personage so shamelessly cynical as Marchamont Nedham, with his powerful peri and his political convictions ever ready to be enlisted on the side of the highest bidder; he even wrote for Charles II. in later years.” Against the unlicensed Royalist Mercuries in London, where the people were on the king’s side, the parliament waged active war, but some of them managed to come out, although writer after writer was imprisoned, until the middle of 1650. Meanwhile from October 1649 to June 1650, by a new act of parliament, the licensed press itself was entirely suppressed, and in 1649 two official journals were issued, A Brief Relation (up to October 1650) and Severall Proceedings in Parliament (till September 1655), a third licensed periodical, A Perfect Diumall (till September 1655), being added later in the year, and a fourth, Mercurius Politicus (of which Milton was the editor for a year or so and Marchamont Nedham one of the principal writers), starting on June 13th, 1650 (continuing till April 12th, 1660). After the middle of 1650 there was a revival of some of the older licensed news-books; but the Weekly Intelligence of the Commonwealth (July 1650 to September 1655), by R. Collings, was the only important newcomer up to September 1655, when Cromwell suppressed all such publications with the exception of Mercurius Politicus and the Publick Intelligencer (October 1655 to April 1660), both being official and conducted by Marchamont Nedham.

Till Cromwell’s death (Sept. 3rd. 1658) Nedham reigned alone in the press, but with the Rump he fell into disgrace, and in 1659 a rival appeared in Henry Muddiman (a great writer also of ” news-letters “), whose Parliamentary Intelligencer, renamed the Kingdom’s

Intelligencer (till August 1663), was supported by General Monck. Nedham's journalistic career came finally to an end (he died in 1678) at the hand of Monck's council of state in April 1660. The following announcement was published in the Parliamentary Intelligencer: " Whereas Marchmont Nedham, the author of the weekly news-books called Mercurius Politicus and the Publique Intelligencer is, by order of the council of state, discharged from writing or publishing any publique intelligence; the reader is desired to take notice that, by order of the said council, Giles Dury and Henry Muddiman are authorized henceforth to write and publish the said intelligence, the one upon the Thursday and the other upon the Monday, which they do intend to set out under the titles of the Parlia- mentary Intelligencer and of Mercurius Publicus." This arrange- ment with Muddiman lasted till 1663, when he was supplanted by Sir Roger L'Estrange, who was appointed " surveyor of the Press." On him was conferred by royal grant — and, as it proved, for only a short period — " all the sole privilege of writing, printing, and publishing all narratives, advertisements, mercuries, intelligencers, diurnals and other books of public intelligence; . . . with power to search for and seize the unlicensed and treason able schismatical and scandalous books and papers." L'Estrange discontinued Mercurius Politicus and Kingdom's Intelligencer and substituted two papers, the Intelligencer (Aug. 1st) and the Newes (Sept. 3rd) at a halfpenny, the former on Mondays and the latter on Thursdays; they were continued till January 29th, 1666, but from the beginning of 1664 the Intelligencer was made consecutive with the Newes, numbered and paged as one.

We come now to the origin of the famous London Gazette. Muddiman, obliged to devote himself solely to his news-letters, was associated with Joseph Williamson (under-secretary and afterwards secretary of state), who was for a time L'Estrange's

assistant in the compilation of the Intelligencer. 1 Muddiman organized for himself a far-spread foreign correspondence, and carried on the business of a news-letter writer on a larger scale than had till then been known. Presently L'Estrange, T he . whose monopoly of printing was highly unpopular,

Gazette, found his own sources of information much abridged, while

Williamson, for his own ambitious purposes, entered into a complicated intrigue (analysed in detail by Williams, op. cit. pp. 190 seq.) for getting the whole business into his hands, with Muddiman as his tool and with Muddiman's clients as his customers. To L'Estrange's application for renewed assistance Williamson replied that he could not give it, but would procure for him a salary of £100 a year if he would give up his right in the news-book. 2 The Intelligencer appealed (Oct. 1665) to Lord Arlington, and pathetically assured him that the charge for " entertaining spies for information was £500 in the first year." 3 But L'Estrange boasted that he had " doubled " the size and price of the book, 4 and had brought the profit from £200 to £400 or £500 a year. 5 The appeal was in vain. At that time the great plague had driven the court to Oxford. The first number of the bi-weekly Oxford Gazette, licensed by Arlington and written by Muddiman, was published on the 1 6th November 1665. It was a " paper " of news, of the same size and shape as Muddiman's news-letters. With the publication of the 24th number (Monday, February 5th, 1665- 1666 O.S.) the Oxford Gazette became the London Gazette. After the 25th number Muddiman, who saw that he was not safe in Williamson's hands, seceded. Williamson had the general control of the Gazette, and for a considerable time Charles Perrot, a member of Oriel College, was the acting editor. 6 L'Estrange was soon driven out of the field, being solaced, on his personal appeal to the king, with a charge of £100 a year on the news-books (henceforth " taken into the secretaries' office ") and a further £200 out of secret service money for his place as surveyor of the press. Muddiman, meanwhile, attached himself to the other secretary of state, Sir W. Morice, and he was authorized to issue an opposition official paper, which appeared as Current Intelligence (June 4-Aug. 20, 1666); and though the Great Fire, which burnt out all the London printers, resulted in the reappearance, after a week's interval, of the Gazette alone, Muddiman's unrivalled organization of news-letters remained; and they continued, till his death in 1692, to be the more popular source of information. The Gazette, however, now remained for some time the only " newspaper " in the strict sense already mentioned. For several years it was regularly translated into P>ench by one Moranville. During the Stuart reigns generally its contents were very meagre, although in the reign of Anne some improvement is already visible. More than a century after the establishment of the Gazette, we find Secretary Lord Wey- mouth addressing a circular 7 to the several secretaries of legation and the British consuls abroad, in which he says, " The writer of the Gazette has represented that the reputation of that paper is greatly lessened, and the sale diminished, from the small portion of foreign news with which it is supplied." He desires that

each of them will send regularly all such articles of foreign intelligence as may appear proper for that paper, ” taking particular care — as the Gazette is the only paper of authority printed in this country — never to send anything concerning the authenticity of which there is the smallest doubt.” From such humble beginnings has arisen the great repertory of State Papers, now so valuable to the writers and to the students of English history. . The London Gazette has appeared twice a week (on Tuesday and Friday) in a continuous series ever since 8 The editorship is a government appointment.

1 This help seems to have been given at the request of the secretary of state, Lord Arlington (then Sir H. Bennet), in 1663; State Papers, Domestic, Charles II., lxxix. 112, 113.

2 State Papers, Domestic, Charles II., cxxxiv. 103 (Rolls House).

3 Ibid. 117.

4 In 1664 he had halved them, so that this really only means he had now restored the original size.

5 State Papers, Domestic, Charles II., cxxxv. 24.

- Anthony Wood, Athenae Oxonienses, ” Perrot.”

‘ Calendar of Home-Office Papers, 1766-176Q, p. 483 (1879).

8 A complete set is now of extreme rarity.

We come now to the Revolution. The very day after the departure of James II. was marked by the appearance of three newspapers — The Universal Intelligence, the English Courant and the London Courant. Within a few days more these were followed by the London Mercury, the Orange Gazette, the London Intelligence, the Harlem Currant and others. The Licensing Act, which was in force at the date of the Revolution, expired in 1692, but was continued for a year, after which it finally ceased. On the appearance of a paragraph in the Flying Post of 1st April 1697, which appeared to the House of Commons to attack the credit of the Exchequer Bills, leave was given to bring in a bill ” to prevent writing, printing or publishing of any news without licence “; but the bill was thrown out in an early stage of its progress. That Flying Post which gave occasion to this attempt was also noticeable for a new method of printing, which it thus announced to its customers — ” If any gentleman has a mind to oblige his country friend or correspondent with this account of public affairs, he can have it for twopence … on a sheet of fine paper, half of which being

left blank, he may thereon write his own affairs, or the material news of the day.”

In 1696 Edward Lloyd — the virtual founder of the famous ” Lloyd’s ” of commerce — started a thrice-a-week paper, Lloyd’s News, which had but a brief existence in its first shape, but was the precursor of the Lloyd’s List of the present day. No. 76 of the original paper contained a paragraph referring to the House of Lords, for the appearance of which a public apology must, the publisher was told, be made. He preferred to dis- continue his publication (February 1697). Nearly thirty years afterwards he in part revived it, under the title of Lloyd’s List — published at first weekly, afterwards twice a week. 9 This dates from 1726. It is now published daily.

It was in the reign of Queen Anne that the English newspaper press first became really eminent for the amount of intellectual power and of versatile talent which was employed upon it. It was also in that reign that the press was f /re t first fettered by the newspaper stamp. The accession daily. of Anne was quickly followed by the appearance of the first successful London daily newspaper, the Daily Courant (nth of March 1702-1703). Seven years earlier, in 1695, the Postboy had been started as a daily paper (actually the first in London), but only four numbers appeared. The Courant was published and edited by the learned printer Samuel Buckley, who explained to the public that ” the author has taken care to be duly furnished with all that comes from abroad, in any language. ... At the beginning of each article he will quote the foreign paper from which it is taken, that the public, seeing from what country a piece of news comes, with the allowance of that government, may be better able to judge of the credibility and fairness of the relation. Nor will he take upon himself to give any comments, . . . supposing other people to have sense enough to make reflexions for themselves.” Then came, in rapid succession, a crowd of new competitors for public favour, of less frequent publication. The first number of one of these, the Country Gentleman’s Courant (1706), was given away gratuitously, and made a special claim to public favour on the ground that ” here the reader is not only diverted with a faithful register of the most remarkable and momentary [i.e. momentous] transactions at home and abroad, . . . but also with a geographical description of the most material places mentioned in every article of news, whereby he is freed the trouble of looking into maps.”

On the 19th of February 1704, whilst still imprisoned in Newgate for a political offence, Defoe {q.v.) began his famous paper, the Review. At the outset it was published ,

weekly, afterwards twice, and at length three times Review. a week. It continued substantially in its first form until July 29, 171 2; and a complete set is of extreme rarity. From the first page to the last it is characterized by the manly 9 Frederick Martin, History of Lloyd's, 66-77 and 107-120. The great collection of newspapers in the British Museum contains only one number of Lloyd's News; but sixty-nine numbers may be seen in the Bodleian Library. Of the List, also, no complete series is known to exist; that in the library of Lloyd's begins with 1740.

boldness and persistent tenacity with which the almost unaided author utters and defends his opinions on public affairs against a host of able and bitter assailants. Some of the numbers were written during travel, some in Edinburgh. But the Review appeared regularly. When interrupted by the pressure of the Stamp Act (which came into force on the ist of August I7r2), the writer modified the form of his paper, and began a new series (August 2, 1712, to June n, I7r3). In those early and monthly supplements of his paper which he entitled " Advice from the Scandalous Club," and set apart for the discussion of questions of literature and manners, and sometimes of topics of a graver kind, Defoe to some extent anticipated Richard Steele's Tatler (1709) and Steele and Addison's Spectator (1711). In 1 705 he severed those supplements from his chief newspaper, and published them twice a week as the Little Review. But they soon ceased to appear. It may here be added that in May 1 7 16 Defoe began a new monthly paper under an old title, Mercurius Politicus, ... "by a lover of old England." This journal continued to appear until September 1720. The year 1 7 10 was marked by the appearance of the Examiner, or Remarks upon Papers and Occurrences (No. 1, August 3), of which thirteen numbers appeared by the co-operation of Bolingbroke, Prior, Freind and King before it was placed under the sole control of Swift. The Whig Examiner, avowedly intended " to censure the writings of others, and to give all persons a rehearing who had suffered under any unjust sentence of the Examiner," followed on the ist September, and the Medley three weeks afterwards.

This increasing popularity and influence of the newspaper press could not fail to be distasteful to the government of the day. Prosecutions were multiplied, but with small stamp success. At length some busy

projector hit upon 1712. the expedient of a newspaper tax. The paper which

seems to contain the first germ of the plan is still preserved amongst the treasury papers. It is anonymous and undated, but probably belongs to the year 1711. ” There are published weekly,” says the writer, ” about 44,000 newspapers, viz. Daily Courant, London Post, English Post, London Gazette, Postman, Postboy, Flying Post, Review and Observator.” 1 The duty eventually imposed (171 2) was a halfpenny on papers of half a sheet or less, and a penny on such as ranged from half a sheet to a single sheet (10 Anne, c. xix. § 101). The first results of the tax cannot be more succinctly or more vividly described than in the following characteristic passage of Swift’s Journal to Stella (August 7, 1712): “Do you know that Grub Street is dead and gone last week? No more ghosts or murders now for love or money. I plied it close the last fortnight, and pub- lished at least seven papers of my own, besides some of other people’s; but now every single half-sheet pays a halfpenny to the queen. The Observator is fallen; the Medleys are jumbled together with the Flying Post; the Examiner is deadly sick; the Spectator keeps up, and doubles its price — I know not how long it will hold. Have you seen the red stamp the papers are marked with? Melhinks the stamping is worth a halfpenny.”

Swift’s doubt as to the ability of the Spectator to hold out against the tax was justified by its discontinuance in December 171 2, Steele starting the Guardian in 1713, which only ran for six months. But the impost which was thus fruitful in mischief, by suppressing much good literature, wholly failed in keeping out bad. Some of the worst journals that were already in existence kept their ground, and the number of such ere long increased. 2 An enumeration of the London papers of 1714 comprises the Daily Courant, the Examiner, the British Merchant, the Lover, the Patriot, the Monitor, the Flying Post, the Postboy, Mercator, the Weekly Pacquet and Dunton’s Ghost. Another enumeration in 1733 includes the Daily Courant, the Craftsman, Fog’s Journal, Mist’s Journal, the London Journal, the Free

1 ” A Proposition to Increase the Revenue of the Stamp-Office,” Redington, Calendar of Treasury Papers, 1708-1714, p. 235. The stamp-office dated from 1 694, when the earliest duties on paper and parchment were enacted.

2 See the Burney collection of newspapers in the British Museum; and Nichols, Literary Anecdotes of the Eighteenth Century, iv. 33-97.

Briton, the Grub Street Journal, the Weekly Register, the Uni- versal Spectator, the Auditor, the Weekly Miscellany, the London Crier, Read's Journal,, Oedipus or the Postman Remounted, the St James's Post, the London Evening Post and the London Daily Post, which afterwards became better known as the Public Advertiser. Part of this increase may fairly be ascribed to political corruption. In 1742 the committee of the House of Commons appointed to inquire into the political conduct of the earl of Orford reported to the House that during the last ten years of the Walpole ministry there was paid, out of public money, no " less a sum than £50,077, J 8s. to authors and printers of newspapers, such as the Free Briton, Daily Courant, Gazetteer and other political papers." 3 But some part of the payment may well have been made for advertisements. Towards the middle of the century the provisions and the penalties of the Stamp Act were made more stringent. Yet the number of newspapers continued to rise. Dr Johnson, who in 1750 started his twopenny bi-weekly Rambler, and jˆ hBSO „> in 1758 his weekly Idler, writing in the latter bears time. testimony to the still growing thirst for news: " Jour- nals are daily multiplied, without increase of knowledge. The tale of the morning paper is told in the evening, and the narra- tives of the evening are bought again in the morning. These repetitions, indeed, waste time, but they do not shorten it. The most eager peruser of news is tired before he has completed his labour; and many a man who enters the coffee-house in his nightgown and slippers is called away to his shop or his dinner before he has well considered the state of Europe." Five years before (i.e. in 1753) the aggregate number of copies of news- papers annually sold in England, on an average of three years, amounted to 7,411,757. In 1760 it had risen to 9,464,790, and in 1767 to 11,300,980. In 1776 the number of newspapers published in London alone had increased to fifty-three.

When Johnson wrote his sarcastic strictures on the newspapers that were the contemporaries and, in a sense, the rivals of the Idler, the newswriters had fallen below the standard of an earlier day. A generation before the newspaper was often much more of a political organ than of an industrial venture. All of the many enterprises of Defoe in this field of journalism united indeed both characteristics. But if he was a keen tradesman, he was also a passionate politician. And not a few of his fellow- workers in that field were conspicuous as statesmen no less than as journalists. Even less than twenty years before the appearance of Johnson's remarks, men of the mental calibre of Henry Fielding were still to be found amongst the editors and writers of newspapers. The task had fallen to a different class of men in 1750.

The history of newspapers during the long reign of George III. is a history of the struggle for freedom of speech in the face

Press prosecw

c (repeated criminal prosecutions, in which individual writers and editors were defeated and severely punished, while the Press itself derived new strength from the protracted conflict, and turned ignominious penalties into signal triumphs. From the days of Wilkes's North Briton onwards (see Wilkes, John: it was started in 1761), every conspicuous newspaper prosecution gave tenfold currency to the doctrines that were assailed. In the earlier part of this period men who were mere traders in politics — whose motives were obviously base and their lives contemptible — became for a time powers in the state, able to brave king, legislature and law courts, by virtue of the simple truth that a free people must have a free press. One of the minor incidents of the North Briton excitement (Wilkes's prosecution in 1763) led indirectly to valuable results with reference to the much-vexed question of parliamentary reporting. During the discussions respecting the Middlesex election, Almon, a bookseller, collected from members of the House of Commons some particulars: of the debates, and published them in the London Evening Post. The success which attended these reports induced the proprietors of the St James's Chronicle to employ a reporter to collect notes

3 " Fourth Report of the Committee of Secrecy," &c, in Hansard's

Parliamentary History, xii. 814.

in the lobby and at the coffee-houses. This repeated infraction of the privilege of secret legislation led to the memorable proceed- ings of the House of Commons in 1771, with their fierce debates, angry resolutions and arbitrary imprisonments — all resulting, at length, in that tacit concession of publicity of discussion which in the main, with brief occasional exceptions, has ever since prevailed.

Evening journalism in England started originally with supple- mental editions of the morning papers, giving the latest foreign war news. In July 1695, when William III. was London fighting France in the Netherlands, a ” Postscript to press?* the Pacquet-boat from Holland to Flanders ” was published with special advices from the seat of war; and from that time there were frequent afternoon issues of morning journals, giving war news. In August 1706 a ” Six at Night ” evening paper was started in London. The first London evening paper of any importance, however, was the Courier (1792), which during the latter part of the Napoleonic War, with Mackintosh, Coleridge and Wordsworth among its contributors, became one of the chief papers of the day. It was edited suc- cessively by Daniel Stuart, William Mudford, Eugenius Roche, John Gait, James Stuart and Laman Blanchard. In 1827 a twenty-fourth share in the paper sold for 5000 guineas, but it gradually declined and came to an end in 1842, when it was incorporated by the Globe (still existing).

The principal metropolitan newspapers at different periods of George III.‘s reign were the Public Advertiser, the Morning London P° st > the Morning Chronicle, the Morning Herald press in and finally The Times. Of these the Morning Post aeorge and The Times, still existing, are dealt with later. Of the three which eventually ceased to exist, the first was known in 1726 as the London Daily Post and General Advertiser. In 1738 the first part of this title was dropped, and in 1752 General Advertiser was altered into Public Advertiser, a name which the letters of Junius made so famous. Many of these had appeared before the smallest perceptible effect was produced on the circulation of the paper; but when the “Letter to the King” came out (19th December 1769, almost a year from the beginning of the series) it caused an addition of 1750 copies to the ordinary impression. The effect of subsequent letters was variable; but when Junius ceased to write the monthly sale of the paper had risen to 83,950. This was in December 1771. Seven years earlier the monthly sale had been but 47,515. It now became so valuable a property that shares in it were sold, according to John Nichols, ” as regularly as those of the New River Company.” But the fortunes of the Advertiser declined almost as rapidly as they had risen. It continued to appear until 1798, and then expired, being amalgamated with the commercial paper called the Public Ledger (dating from 1759). Actions for libel were brought against the paper by Edmund Burke in 1784, and by William Pitt in 1785, and in both suits damages were given.

The Morning Chronicle was begun in 1769. William Woodfall was its printer, reporter and editor, and continued to conduct it until 1789. James Perry succeeded him as editor, and so continued, with an

interval during which the editorship was in the hands of Mr Sergeant Spankie, until his death in 182 1. Perry's editorial functions were occasionally discharged in Newgate in consequence of repeated prosecutions for political libel. In 1819 the daily sale reached nearly 4000. It was sold in 1823 to Mr Clement, the purchase-money amounting to £42,000. Mr Clement held it for about eleven years, and then sold it to Sir John Easthope for £16,000. It was then, and until 1843, edited by John Black, who numbered amongst his staff Albany Fonblanque, Charles Dickens and John Payne Collier, the circulation being about 6000. The paper continued to be distinguished by much literary ability, but not by com- mercial prosperity. In 1849 (the circulation having fallen to 3000) it became the joint property of the duke of Newcastle, Mr W. E. Gladstone and some of their political friends; and by them, in 1854, it was sold to Mr Sergeant Glover. From 1848 to 1854 Douglas Cook (afterwards of the Saturday Review) was

editor. At length the Morning Chronicle ended in the Bankruptcy Court, after an existence of more than ninety years. The Morning Herald was founded and first edited by Henry Bate (Sir Henry Bate Dudley) in 1781, and came to an end at the close of 1869; for some time it was a popular Tory paper, and from 1835 to 1845 had a circulation of about 6000.

The development of the Press was enormously assisted by the gradual abolition of the " taxes on knowledge," and also by the introduction of a cheap postal system. In AAo/K ; on 1756 an additional halfpenny was added to the tax of taxes of 1712. In 1765 and in 1773 various restrictive on know* regulations were imposed. In 1789 the three-halfpence led £ e ' was increased to twopence, in 1798 to twopence-halfpenny, in 1804 to threepence-halfpenny, and in 1815 to fourpence, less a discount of 20%. Penalties of all kinds were also increased, and obstructive regulations were multiplied. In the course of the struggle between this constantly enhanced taxation and the irrepressible desire for cheap newspapers, more than seven hundred prosecutions for publishing unstamped journals were instituted, and more than five hundred were imprisoned, sometimes for considerable periods. As the prosecu- tions multiplied, and the penalties became more serious, Poor Man's Guardians, Democrats, Destructives and their congeners multiplied also, and their revolutionary tendencies increased in a still greater ratio. Blasphemy was added to sedition. Penny and halfpenny journals were established which dealt exclusively with narratives of gross vice and crime, and which vied with each other in every kind of artifice to make vice and crime attractive. Between the years 1831 and 1835 many scores of

unstamped newspapers made their appearance. The political tone of most of them was fiercely revolutionary. Prose- cution followed prosecution; but all failed to suppress the obnoxious publications.

To Bulwer Lytton, the novelist and politician (Baron Lytton), and subsequently to Milner Gibson and Richard Cobden, is chiefly due the credit of grappling with this question in the House of Commons in a manner which secured first the reduction of the tax to a penny on the 15th of September 1836, and then its total abolition at last in 1855. The measure for the final abolition of the stamp tax was substantially prepared by W. E. Gladstone during his chancellorship of the exchequer in 1854, but was carried by his successor in 1855. The number of news- papers established from the early part of 1855, when the repeal of the duty had become a certainty, and continuing in existence at the beginning of 1857, amounted to 107; 26 were metropolitan and 81 provincial. Of the latter, the majority belonged to towns which possessed no newspaper whatever under the Stamp Acts, and the price of nearly one-third of them was but a penny. In some cases, however, a portion of these new cheap papers of 1857 was printed in London, usually with pictorial illustrations, and to this was added a local supplement containing the news of the district.

Amongst the earliest results of the change in newspaper law made in 1855 was the establishment in quick succession of a series of penny metropolitan local papers, chiefly suburban, of a kind very different from their unstamped forerunners. They spread rapidly, and attained considerable success, chiefly as advertising sheets, and as sometimes the organs, more often the critics, of the local vestries and other administrations. One of them, the Clerkenwell News and Daily Chronicle, so prospered in the commercial sense, being crowded with advertisements, that it sold for £30,000, and was then transformed into the London Daily Chronicle (28th May 1877). Another conspicuous result of the legislation of 1855 was an enormous increase in the number and influence of what are known as ” class papers ” and professional and trade papers. The duties on paper itself were finally abolished in 1861.

” Taxes on knowledge ” having thus been abolished, the later developments in newspaper history are mainly connected with the increase in number, due largely to the spread of educa- tion, the improvements in machinery and distribution and in collection of news, the constant adaptation to the new demands

of a wider public, and the progress in the art of advertising as applied to the Press. The following sections on the more important newspapers in London and the Provinces fill in the remaining details of the history of the British Press, so far as they are substantially important or interesting. Much that is in its nature ephemeral or trivial is necessarily passed

over.

Modern London Newspapers. The Morning Post (oldest of existing London daily papers) dates from 1772. For some years it was in the hands of Henry Bate “M alnr ‘ r Henry Bate Dudley), and it attained some degree of p ° r „ * temporary popularity, though of no very enviable sort. In 1795 the entire copyright, with house and printing materials, was sold for £600 to Peter and Daniel Stuart, who quickly raised the position of the Post by enlisting Sir James Mackintosh and the poet Coleridge in its service, and also by giving unremitting attention to advertisements and to the copious supply of incidental news and amusing paragraphs. There has been much controversy about the share which Coleridge had in elevating the Post from obscurity to eminence. That he greatly promoted this result there can be no doubt. His famous ” Character of Pitt,” published in 1800, was especially successful, and created a demand for the par- ticular number in which it appeared that lasted for weeks, a thing almost without precedent. Coleridge wrote for this paper from 1795 until 1802, and during that period its circulation in ordinary rose from 350 copies, on the average, to 4500. Whatever the amount of rhetorical hyperbole in Fox’s saying — recorded as spoken in the House of Commons — ” Mr Coleridge’s essays in the Morning Post led to the rupture of the treaty of Amiens,” it is none the less a striking testimony, not only to Coleridge’s powers as a publicist, but to the position which the newspaper press had won, in spite of innumerable obstacles at that time. The list of his fellow-workers in the Post is a most brilliant and varied one. Besides Mackintosh, Southey and Arthur Young, it included a galaxy of poets. Many of the lyrics of Moore, many of the social verses of Mackworth Praed, some of the noblest sonnets of Wordsworth, were first published in the columns of the Post. And the story of the paper, in its early days, had tragic as well as poetic episodes. In consequence of offence taken at some of its articles, the editor and proprietor, Nicholas Byrne (who succeeded Daniel Stuart), was assaulted and murdered whilst sitting in his office.

Up to about 1850 the history of the Morning Post offers little to record; with the Morning Chronicle and Morning Herald, and having a smaller circulation than either of them, it was being rapidly eclipsed in London journalism by The Times (see below), and in 1847 only sold some three thousand copies. Heavily in debt to Messrs J. and T. B. Crompton, the paper manufacturers, it had been taken over by them ; and in that year the management was entrusted to Peter Borthwick (1804-1852), a Scotsman who, after graduation both at Edinburgh and Cambridge, had taken to politics in the Conservative interest and had sat in parliament for Evesham from 1835 to 1838 and from 1841 to 1847, when he was almost ruined by fighting an election petition in which he was unseated. Peter Borthwick took the task of reviving the paper seriously in hand, and in a few years was already improving its position when he fell ill and died ; and he was succeeded in 1852 by his son Algernon Borthwick, afterwards Lord Glenesk (1830-1908). The later history of the paper is prim- arily connected with its practical re-establishment and successful conduct under the latter. Algernon Borthwick had been its Paris correspondent from 1850, and had shown social gifts and journalistic acumen of great promise. When he became managing editor in 1852 he devoted himself with such energy to the work that in seven years the debt on the business had been paid off. He gave the paper a strong political colour, Conservative, Imperialist and Protectionist; and in the ‘fifties and ‘sixties Borthwick was a keen supporter of Lord Palmerston. After the death of Mr Crompton, his nephew, Mr Rideout, the principal surviving partner in the paper manu- facturing firm, was so impressed with Borthwick’s success that he vested the entire control of the paper in him for life; and on Mr Rideout’s death in 1877, Borthwick was enabled, by the help of his friend Andrew Montague, to buy the property and become sole proprietor. The Morning Post had now become, largely through Borthwick’s own social qualities, the principal organ of the fashion- able world; but in 1881 he took what was then considered the hazardous step of reducing its price from threepence to a penny, and appealing no longer to the ” threepenny public ” with The Times but to a wider clientele with the Daily Telegraph and Standard. The result was a ten-fold increase in circulation and a financial success exceeding all anticipations. Borthwick himself, who was knighted in 1880, and was created a baronet in 1887, had entered parliament in 1880 for Evesham, and from 1885 to 1895 sat for South Kensington, being finally raised to the peerage in 1895. His political gifts naturally increased the influence of the paper; he supported the ” Tory democracy ” and was an active worker for the Primrose League, of which he was three times chancellor; and the Morning Post, under his control, became one of

the great organs of opinion on the Conservative side. From 1880 onwards he devolved the

“The Times.’

editorial duties on others, at first Sir William Hardman, and then successively Mr A. K. Moore, Mr Algernon Locker, Mr James Nicol Dunn (from 1897 to 1905; afterwards editor of the Manchester Courier) and Mr Fabian Ware; under them the literary standard of the paper was kept at a high level, and constant improvements were introduced ; and the staff included a number of well-known writers, notably Mr Spencer Wilkinson (b. 1853), who in 1909 was appointed professor of military history at Oxford. From 1897 till his death in 1905, at the age of thirty-two, Lord Glenesk’s son, Oliver Borthwick, had much to do with the managerial side. On Lord Glenesk’s own death on the 24th November 1908, the proprietorship passed to the trustees of his only surviving child, a daughter, who in 1893 had married the 7th Earl Bathurst.

The Times 1 is usually dated from the 1st of January 1788, but was really started by John Walter on the 1st of January 1785, under the title of The London Daily Universal Register, printed logographically . On its reaching its 940th issue its name was changed. The logographic or “word-printing” process had been invented by a printer named Henry Johnson several years before, and found a warm advocate in John Walter, who expounded its peculiarities at great length in No. 510 of his Daily Universal- Register. In a later number he stated, very amusingly, his reasons for adopting the altered title, which the enterprise and ability of his successors (see Walter, John) made world-famous. Within two years John Walter had his share in the Georgian persecutions of the press, by successive sentences to three fines and to three several imprisonments in Newgate, chiefly for having stated that the prince of Wales and the dukes of York and Clarence had so misconducted themselves ” as to incur the just disapprobation of his Majesty. In 1803 the management was transferred (together with the joii»* proprietorship of the journal) to his son, John Walter (2), by whom it was carried on with extraordinary energy and consummate ability, and at the same time with marked independence. To Lord Sidmouth’s government he gave a general but independent support. That of Pitt he opposed, especially on the questions of the Catamaran expedition and the malversations of Lord Melville. This opposition was resented by depriving the elder Walter of the printing for the customs department, by the withdrawal of government advertisements from The Times, and also, it is said, by the systematic detention at the outports of the foreign intelligence addressed to its editor.

John Walter the Second, however, was strong and resolute enough to brave the government. He organized a better system of news transmission than had ever before existed. He introduced steam-printing (1814) and repeatedly improved itsmechanism (see Printing) ; and although modern machines may now seem to thrust into insignificance a press of which it was at first announced as a notable triumph that ” no less than 1 100 sheets are impressed in one hour,” yet the assertion was none the less true that The Times of 29th November 18 14 ” presented to the public the practical result of the greatest improvement connected with printing since the discovery of the art itself.” The effort to secure for The Times the best attain- able literary talent in all departments kept at least an equal pace with those which were directed towards the improvement of its mechanical resources. And thus it came to pass that a circulation which did not, even in 181 5, exceed on the average 5000 copies became, in 1834, 10,000; in 1840, 18,500; in 1844, 23,000; in 1851, 40,000; and in 1854, 51,648. In the year last named the average circulation of the other London dailies was — Morning Advertiser, 7644; Daily News, 4160; Morning Herald, 3712; Morning Chronicle, 2800 ; Morning Post, 2667 ; so that the supremacy of The Times can readily be understood.

Sir John Stoddart, afterwards governor of Malta, edited The Times for several years prior to 1816. He was succeeded by Thomas Barnes, who for many years wrote largely in the paper. When his health began to fail the largest share of the editorial work came into the hands of Captain Edward Sterling — the contributor about a quarter of a century earlier of a noteworthy series of political letters signed ” Vetus,” the Paris correspondent of The Times in 1814 and subsequent eventful years, and afterwards for many years the most conspicuous among its leader-writers. 2 From 1841 to 1877 the chief editor was John Thadeus Delane, who had his brother-in-law G. W. Dasent for assistant-editor, and another brother-in-law, Mowbray Morris, as business manager. By the time of the second John Walter’s death (1847) the substantial monopoly of The Times in London journalism had been established ; and under the proprietor- ship of the third John Walter the result of the labour of Delane as editor, and of the brilliant staff of contributors whom he directed, among whom Henry Reeve was conspicuous as regards foreign affairs,

1 See the centenary number of January 2, 1888; the pamphlet by S. V. Makower, issued by The Times in 1904, ” The History of The Times “; and the article by Hugh Chisholm on ” The Times, 1785- 1908 ” in the National Review (May 1908).

s See Life of John Sterling, by Carlyle, who says of him at this time : ” The emphatic, big-voiced, always influential and often strongly unreasonable Times newspaper was the express emblem of Edward Sterling. He, more than any other man, . . . was The Times, and thundered through it, to the shaking of the spheres.” The nick- name of ” The Thunderer,” for The Times, came in vogue in hisday.

was to turn the ” favourite broadsheet ” of the English public into the ” leading journal of the world.” When Delane retired, he was succeeded as editor by Thomas Chenery, and on his death in 1884 by George Earle Buckle (b. 1854). At the beginning of 1908 considerable changes took place in the proprietorial side of The Times, which was converted into a company, with Mr A. F. Walter (chief proprietor since 1891) as chairman and Mr C. Moberly Bell (b. 1847; manager since 1890) as managing director; the financial control passing into the hands of Lord Northcliffe.

In the history of The Times its influence on the mechanical side of newspaper work was very great. The increasing circulation of The Times between the years 1840 and 1850 made an improvement in the printing-presses necessary, as sometimes the publication could not be completed before the afternoon. To meet this want the Applegath vertical press was introduced in 1848 and the American Hoe ten-feeder press in 1858. Meanwhile the idea of stereotyping from the movable types had been making steady progress. About the year 1856, however, a Swiss named Dellagana introduced to The Times Kroning’s idea of casting from papier-mache instead of plaster, and was allowed to experiment in The Times office. After a time the invention was so much improved that matrices of pages could be taken and the stereotype plates fixed bodily on the printing machine in place of the movable type. This cleared the way for the intro- duction of the famous Walter press. Hitherto only one set of ” formes ” could be used, as the type was set up once only— one side of the paper being worked on one machine and the sheets then taken to another machine to be ” perfected.” Stereotyping enabled the formes to be multiplied to any extent, as several plates could be cast from one matrix. Mr MacDonald, the manager of The Times, had devoted himself for several years to the production of a press which could print papers on both sides in one operation from a large reel of paper, the web of

paper being cut into the required size after print- ing, instead of each sheet being ” laid on ” by a man and then printed. After years of experiment the Walter press was introduced into the Times machine-room in 1869, and the question of printing great numbers in a short time was solved. Each press turned out 12,000 sheets per hour, and it was therefore only a question of multiplying the stereo plates and presses to obtain any number of printed papers by a certain time. Meanwhile Messrs Hoe had set about producing something even quicker and better than the Walter press. They succeeded in accomplishing this by multiplying the reels of paper on each press, and also adding folders and stitchers. The result was the production of over 36,000 sheets per hour from each machine. These presses were adopted by The Times in 1895.

In 1868 the question of composing machines for the quicker setting-up of type was taken up by The Times. A German named Kastenbein had an invention which he brought to the notice of The Times, and arrangements were made for him to continue his ex- periments in The Times office. In a couple of years a machine was made, which was worked and improved until in 1874 several machines were ready to set up a portion of the paper; but it was not until 1879 that the arrangements were sufficiently advanced to make certain that they could do all that was wanted from them. The irtroduction of composing machines, and the necessary alterations in the office arrangements which followed, led to some trouble among the compositors, which in 1880 culminated in a partial strike; but a part of the staff remaining loyal the printer was able by extra effort to produce the paper at the proper time on the morning following the strike. Various improvements were made, until one machine was able to set up as many as 298 lines of The Times in one hour, equal to 16,688 separate types. A system of telephoning the parliamentary report from the House of Commons direct to the com- positor was begun in 1885, and was continued until the House decided to rise at midnight, which enabled the more economical method of composing direct from the ” copy ” to be resumed.

Ever since the introduction of the composing machines the business had been much hampered by the question of ” distribution ” — that is, the breaking-up and sorting of the types after use. Kastenbein had invented a distributing machine to accompany his composing machine, but it proved to be unsatisfactory. Various systems were tried at The Times office, but for many years the work of the composing machines was to some extent crippled by the distribu- tion difficulty. This had been recognized by Mr Frederick Wicks (d. 1910), the inventor of the Wicks Rotary Type-casting Machine, who for many

years had been working at a machine which would cast new type so quickly and so cheaply as to do away with the old system of distribution and substitute new type every day. In 1899 his machine was practically perfect, and The Times entered into a contract with him to supply any quantity of new type every day. The difficult question of distribution was thus surmounted, and composition by machines placed on a satisfactory basis.

Thus during the last half of the 19th century The rimes continued to take the lead in new inventions relating to the printing of a news-paper, just as it had in the fifty years preceding. The three most important advances during the later period were practically worked out at The Times office — namely, fast-printing presses, stereotyping and machine composing, and without the»e it is safe to say that the cheap newspaper of the present day could not exist. Further in-dications of the enterprise of The Times in taking up journalistic novelties may also be seen in its organizing a wireless telegraphy

service, with a special steamer, in the Far East, at the opening of the Russo-Japanese War.

The price at which The Times has been sold has been changed at various dates: in 1796 to 4jd., 1799 to 6d., 1809 to (>\A., 1815 to 7d., 1836 to 5d., 1855 to 4d., 1861 (Oct. 1) to 3d., and in 1904 (still remaining at 3d.) it started a method of payment by subscription which gave subscribers an advantage in one form or another and thus in reality reduced the price further. In 1905 this advantage took the form of the price (3d.)- covering a subscription to The Times Book Club, a circulating library and book-shop on novel lines (see Bookselling and Publishing).

The first number of the paper contained 57 brief advertisements, but as it grew in repute and in size its advertising revenue became very large, and with the growth of this revenue came pari passu the means of spending more money on the contents. As far back as 1861 a single issue had contained 105 columns of advertisements, and another 98. Prior to 1884 the paper had only on two occasions consisted of 24 pages in a single issue. Between that year and 1902 more than 80 separate issues of this size were published, many of them containing over 80 columns of advertisements. Of two issues, one containing the news of the death and the other the account of the funeral of Queen Victoria, 140,000 copies were printed. From that time issues of 20 pages and over became an ordinary matter: and on May 24 ,1909 (Empire Day), The Times signalized the occasion by bringing out a huge supplement of 72 pages full of articles on Imperial topics.

The Times has long stood in a class by itself among newspapers, owing to its abundance of trustworthy news, its high literary standard and its command of the ablest writers, who, however, are generally anonymous in its columns. It has always claimed to be a national rather than a party organ. It was Liberal in its politics in the Reform days, but became more and more Conservative and Im- perialist when the Unionist and anti-Home Rule era set in. On the conversion of Mr Gladstone to Home Rule, The Times was, indeed, largely instrumental in forming the Liberal-Unionist party. In the course of its vigorous campaign against Irish Nationalism it published as part of its case a series of articles on ” Parnellism and Crime,” including what were alleged to be facsimile reproductions of letters from Mr Parnell showing his complicity with the Phoenix Park murders. The history of this episode, and of the appointment of the Special Commission of investigation by the government, is told under Parnell. One of the strongest features of The Times has been always its foreign correspondence.

Among leading incidents in the history of The Times a few may be more particularly mentioned. In 1840 the Paris correspondent of the paper (Mr O’Reilly) obtained information respecting a gigantic scheme of forgery which had been planned in France, together with particulars of the examination at Antwerp of a minor agent in the conspiracy, who had been there, almost by chance, arrested. All that he could collect en the subject, including the names of the chief conspirators, was published by The Times on the 26th of May in that year, under the heading ” Extraordinary and Extensive Forgery and Swindling Conspiracy on the Continent (Private Correspondence).” The project contemplated the almost simultane- ous presentation at the chief banking-houses throughout the Con- tinent of forged letters of credit, purporting to be those of Glyn & Company, to a very large amount ; and its failure appears to have been in a great degree owing to the exertions made, and the re- sponsibility assumed, by The Times. One of the persons implicated brought an action for libel against the paper, which was tried at Croydon in August 1841, with a verdict for the plaintiff, one farthing damages. A subscription towards defraying the heavy expenses (amounting to more than £5000) which The Times had incurred was speedily opened, but the proprietors declined to profit by it; and the sum which had been raised was devoted to the foundation of two ” Times scholarships, ” in connexion with Christ’s Hospital and the City of London School. Three years afterwards The Times rendered noble public service in a different direction. It used its vast power with vigour — at the expense of materially checking the growth of its own advertisement fund — by denouncing the fraudulent

schemes which underlay the ” railway mania ” of 1845. The Parnell affair has already been mentioned. And more recently the ” book war,” arising out of the attack by the combined publishers on The Times Book Club in 1906, was prosecuted by The Times with great vigour, until in 1908 it came quietly to an end.

Various adjuncts to The Times, issued by its proprietors, have still to be mentioned. The Mail, published three times a week at the price of 2d. per number, gives a summary of two days’ issue of The Times. The Times Weekly Edition (begun in 1877) is pub- lished every Friday at 2d., and gives an epitome of The Times for the six days. The Law Reports (begun in 1884) are conducted by a special staff of Times law reporters. Commercial Cases deals with cases of a commercial nature. Issues is a useful half-yearly com- pilation of all the company announcements and demands for new capital, taken from the advertisement columns of The Times.

In 1897 The Times started a weekly literary organ under the title of Literature. In 1901, however, a weekly literary supplement to The Times was issued instead, and Literature passed into the hands of the proprietor of the Academy, with which paper it was incor- porated. The ” Literary Supplement,” which appears each Thursday

(at first on Fridays), is printed in a different form, and separately paged. In 1904 a ” Financial and Commercial Supplement ” (at first on Mondays, and later on Fridays) was added; in 1905 an ” Engineering Supplement ” (Wednesdays), and in 1910 a “Woman’s Supplement.”

The publishing department of The Times also invaded several new fields of enterprise. The Times Atlas was first published in 1895, and this publication was supplemented by that of The Times (previously Longmans’) Gazetteer. A much larger amd more im- portant venture was the issue in 1898 of a reprint of the ninth edition of the Encyclopaedia Britannica at less than half the original price, on a new system of terms (known as The Times system) that enabled the purchaser to receive the whole work at once and to pay for it by a series of equal monthly payments. This was followed by a similar sale of the Century Dictionary and of a reprint of the first fifty years of Punch ; and eleven new volumes of the Encyclopaedia Britannica,

supplementing the ninth edition, and forming with it the tenth edition, were issued by The Times in 1902 on similar terms (see Encyclopaedia) .

In 1895 The Times, through its Vienna correspondent, purchased from Dr Moritz Busch the MS. and entire copyright of his journals, containing a very minute record of his intimate relations with Bismarck. It was stipulated in the contract that these were not to be published until after the death of the prince. That event occurred on the 30th July 1898, and on the 12th September of the same year The Times published through Messrs Macmillan (in 3 vols.) Bismarck: Some Secret Pages of his History, by Dr Moritz Busch.

The Times History of the War in South Africa arose out of a desire to preserve in a more readable form the excellent work done by the numerous Times correspondents in South Africa. When originally projected in the early days of 1900 it was hoped that the war would be of short duration, and that the history of it could be rapidly completed. The length of the war naturally upset all these calculations, and eventually the sixth and last volume was only issued in 1909.

For a long period after the establishment of The Times, no effort to found a new daily London morning newspaper was ever conspicuously successful. Among unfruitful attempts were — (1) the New Times, started by Dr (afterwards Sir John) Stoddart, upon his departure from Printing-House Square; (2) the Representative (1824.), established by John Murray, under circumstances which seemed at the outset exceptionally promising; (3) the Constitutional, begun in 1836 and carried on for eight months by a joint-stock company, exceptionally favoured in having for editor and sub- editor Laman Blanchard and Thornton Hunt, with a staff of con- tributors which included Thackeray, Douglas Jerrold and Bulwer; (4) the Morning Star, founded in 1856, and kept afloat until 1870, when it was merged in the Daily News; (5) in 1867, the Day, for six weeks only; (6) in 1873 the Hour, for three years; (7) in 1878, the Daily Express, which soon failed.

A measure of greater success followed the establishment (1794) of the Morning Advertiser, under special circumstances. It was the “Morn- joint-stock venture of a large society of licensed victuallers, lag Ad- amongst whom subscription to the paper was the condi- vertiser ” t ‘ on membership. For nearly sixty years its circulation lay almost entirely in public-houses and coffee-houses, but amongst them it sold nearly 5000 copies daily, and it yielded a steady profit of about £6000 a year. Then, by the ability and enterprise of an experienced editor,

Janies Grant (1802-1879), it was within four years raised to a circulation of nearly 8000, and to an aggregate profit of £12,000 a year. In 1891 its price was reduced from three- pence to a penny.

The history of the Daily News, founded in 1846, has been told by Mr Justin McCarthy and Sir John R. Robinson in a volume of “Dall “political and social retrospect ” published in 1896 on

N y „ the occasion of its jubilee. It could boast of having e s ‘ continuously been the champion of Liberal ideas and

principles — of what (so long as Mr Gladstone lived) might be called official Liberalism at home and of liberty abroad. It became a penny paper in 1868. Its only rival in the history of Liberal journal- ism in London for many years was the Morning Star, which in 1870 it absorbed. Notably, it led British public opinion in foreign affairs as champion of the North in the American Civil War, of the cause of Italy, of the emancipation of Bulgaria from the Turk and of Armenia. Its early editors were Charles Dickens (21st January- March 1846), John Forster (March-October 1846), E. E. Crowe (1847-1851), F. K. Hunt (1851-1854), W. Weir (1854-1858), T. Walker (1858-1869). In 1868 the price was reduced to a penny, and it came under the management of Mr (afterwards Sir) John R. Robinson (1828-1903), who only retired in 1901. Its later editors included (1868-1886) Mr F. H. Hill (the brilliant author of Political Portraits), and subsequently Sir John Robinson, as managing editor, in conjunction with Mr P. W. Clayden (1827-1902), the author of Life of Samuel Rogers, England under the Coalition and other able works, as political and literary editor, down to 1896, and Mr E.T.Cook from 1896 to 1901. Mr Cook, during the negotia- tions with the Boer government in 1899, strongly supported Sir Alfred Milner; and under him the Daily News, as an exponent of Lord Rosebery’s Liberal Imperialism, gave no countenance to the pro-Boer views of some of the more active members of the Liberal party. In 1901, however, the proprietary changed, and Mr George

Cadbury became chief owner of the paper. Mr E. T. Cook, who had shown brilliant ability as a publicist, but whose views on the Boer War were not shared by the new proprietor, retired, subse- quently joining the staff of the Daily Chronicle; the journal then became an organ of the anti-imperialist section of the Liberal party. Mr A. G. Gardiner became editor in 1902; and in 1904 considerable changes were made in the style of the paper, which was reduced in price to a halfpenny. The influence of Mr Cadbury, and of the group of Quaker families — largely associated with the manufacture of cocoa — who followed his

example in promoting the publication of Liberal and Free Trade newspapers, led in later years to somewhat violent attacks from political opponents on the so-called ” Cocoa Press,” with the Daily News at its head.

The first number of the Daily Telegraph was published on 29th June 1855, as a twopenny newspaper. Its proprietor was Colonel Sleigh. This gentleman soon found himself in pecuniary „ _ straits, and in satisfaction of the debt for the printing Tele- of the paper it was transferred to Mr Joseph Moses Levy “. „

in the following September. On 17th September Mr Levy * ra P°- published it as a. four-paged penny journal, the first penny newspaper produced in London. His son, afterwards Sir Edward Lawson (b. 1833), who was created Baron Burnham in 1904, immediately entered the office, and after a short time became editor, a post which he only abandoned in 1885, when he became managing proprietor and sole director. From the outset Mr Levy gathered round him a staff of high literary skill and reputation. Among the first were Thornton Hunt, Geoffrey Prowse, George Hooper and Sir Edwin Arnold. E. L. Blanchard was among the earliest of the dramatic critics, and Alexander Harper the City editor. Later there came George Augustus Sala (q.v.), then one of Charles Dickens’s young men; Clement Scott (1841-1904), at one time a clerk in the War Office ; and Edward Dicey (b. 1832), then fresh from Cambridge. The Hon. Frank Lawley turned to journalism from official life ; and among the most remarkable of the early contributors to the paper was J. P. Benjamin, the great Anglo-American lawyer. H. D. Traill was a leader-writer for well-nigh a quarter of a century. J. M. Le Sage (b. 1837), for many years the managing editor, began his connexion with the paper under Mr Levy. Others prominently associated with the paper have been W. L. Courtney (b. 1850), a distinguished man of letters who, after several years of work as tutor at New College, Oxford, joined the staff in 1890, and in 1894 also became editor of the Fortnightly Review ; E. B. Iwan-Miiller (d. 1910) and J. L. Garvin (from 1S99), afterwards (1904) editor of the Observer. After 1890 Mr H. W. L. Lawson, Lord Burnham’s eldest son and heir, assisted his father in the general control of the paper.

The Daily Telegraph may be said to have led the way in London journalism in capturing a large and important reading-public from the monopoly of The Times. It became the great organ of the middle classes, and was distinguished for its enterprise in many fields. In June 1873 the Telegraph despatched George Smith to carry out a series of archaeological researches in Nineveh, which resulted in the discovery

of the missing fragments of the cuneiform account of the Deluge, and many other inscriptions. In co-operation with the New York Herald it equipped H. M. Stanley's second great expedition to Central Africa (1875-1877). Another geographical feat with which the name of the Daily Telegraph is associated was the exploration of Kilimanjaro (1884-1885) by Mr (afterwards Sir) Harry Johnston, whose account of his work appeared in the Daily Telegraph during 1885. And Mr Lionel Decle's march from the Cape to Cairo, in 1899 and 1900, was also undertaken under the auspices of the paper. The Telegraph raised many large funds for public purposes. Almost the first was the subset iption for the relief of the sufferers by the cotton famine in Lancashire, in the winter of 1 862-1 863; the fund in aid of the starving and impoverished people of Paris at the close of the siege in 1871 ; the prince of Wales's Hospital Fund in commemoration of the Jubilee of 1897; and the Shilling Fund for the soldiers' widows and orphans in connexion with the Boer War. An undertaking of a more festive kind was the fete given to 30,000 London school children in Hyde Park on the occasion of Queen Victoria's Jubilee in 1887.

In politics the Daily Telegraph was consistently Liberal up to 1878, when it opposed Mr Gladstone's foreign policy as explained in his Midlothian speeches. After 1886 it represented Unionist opinions. Among special feats of which it can boast was the first news brought to England of the conclusion of peace after the Franco- German War.

Prior to 1874 the Daily Telegraph was printed by eight- and ten-feeder machines, through which every sheet had to be passed twice to complete the impression. Under these conditions it was necessary to start printing one side of the paper as early as ten or eleven o'clock. The handicap which this imposed on the satisfactory production of a newspaper was removed by the introduction of Hoe's web machines at the end of 1874. No further change took place until 1891, when they were superseded by others built by the same makers capable of printing a 12-page paper at the rate of about 24,000 an hour, cut, folded, delivered and counted in quires. In 1896 they were modified so as to be suitable for turning out an 8-, 10-, 12-, 14- or 16-page paper. Up to 1894 the setting of type had been done entirely by hand, but in that year the linotype, after an experimental trial, was introduced on a large scale.

The Standard was established as an evening paper in the Tory interest (as the express organ of the opponents of the measure for _- e removing Roman Catholic disabilities) in 1827, its first

Standard editor being Stanley Lees Giffard, father of the first earl of Halsbury, who had Alaric Watts and Dr William Maginn, famous as one of the originators of Fraser's Magazine, as his chief helpers. In the course of two or three years it became a pecuniary, as it had from the first been a political, success, and gradually ousted the Courier, which was for a time conducted by William Mudford, whose son half a century later became the most distinguished editor of the Standard. In course of time the latter became the property of Mr Charles Baldwin, whose father was proprietor of the Morning Herald, and when the father died the son found himself in possession of both a morning and an evening journal. In his hands neither of them prospered, although the Standard retained a large circulation and constantly printed early and accurate political information. At length, midway in the 'fifties, both papers were purchased by Mr James Johnstone, Mr John Maxwell, the pub- lisher, being for a time associated with him in the ownership. Mr Johnstone realized that he had before him a great opportunity, and at once set to work to grasp it. He brought out the Standard as a morning paper (29th June 1857), increased its size from four to eight pages, and reduced the price from fourpence to twopence. One of the most curious features of the early numbers was a novel by William Howard Russell. The evening edition was continued. In February 1858 Mr Johnstone again reduced the price, this time to a penny. When that step was taken the Standard announced that its politics were " enlightened amelioration and progress," but that it was " bound to no party "; and to those independent lines it in the main adhered. In the course of four or five years it became a financial success, and then began to attract to itself many brilliant pens, one of its contributors in the 'sixties, Lord Robert Cecil, being destined to become illustrious as marquess of Salisbury. Lord Robert was an occasional leader-writer, whose contributions were confined almost entirely to political subjects. It was at this time that the Standard laid the foundation of the great reputation for early and detailed foreign news which it has ever since enjoyed. During the American Civil War it obtained the services of a repre- sentative signing himself " Manhattan," whose vivid and forcible letters from the battlefield arrested attention from the beginning. As the campaign progressed, these full, picturesque and accurate accounts of the most terrible struggle of modern times were looked for with eager interest. There were no " special cables " to discount the poignant curiosity of the reader, and the paper reached a circu- lation far beyond anything

hitherto known. The distinction thus acquired was maintained during the Prussian- Austrian War of 1866, and greatly increased by the Tetters and telegrams describing the triumphs and disasters of the campaign of 1870. In the eany ‘sixties the staff had been reinforced by the engagement of Mr William Heseltine Mudford. In the midst of his work as a parliamentary reporter, he was sent as special correspondent to Jamaica in 1865 to report upon the troubles which involved the recall of Governor Eyre; a further period in the gallery of the House of Commons followed, and in 1873 Mr Mudford became business manager. Mr Johnstone’s first editor was Captain Hamber, who afterwards seceded to the short-lived Hour, with whom had been associated Mr David Morier Evans as manager. He was succeeded by the owner’s eldest son, to whom Mr (afterwards Sir) John Gorst was joined in a consultative capacity. In 1876 Mr Mudford became editor, still, however, retaining managerial control. Mr Johnstone, the proprietor to whose energy and perspicacity the paper owed so much, died in 1878, and under his will Mr Mudford was appointed editor and manager for life, or until resignation. Already a great property, the Standard in Mr Mudford’s hands entered upon a very successful period. He had for his first assistant-editor Mr Gilbert Venables, who was succeeded after a short term by Mr George Byron Curtis, previously one of the leader-writers, who thus held the position through nearly the whole of Mr Mudford’s long editorship. The staff at this time comprised many men, and some women, whose names are distinguished in letters as well as in journalism. Mr Alfred Austin, Mr T. H. S. Escott, Miss Frances Power Cobbe and Professor Palmer were all writing for the paper at the same time. To them must be added, among others, Mr E. D. J. Wilson, the brilliant political leader-writer (afterwards of The Times), Mr Percy Greg, son of ” Cassandra ” Greg, Mr T. E. Kebbel and Dr Robert Brown, who wrote copiously upon scientific and miscellaneous subjects. Foremost among the war correspondents were Mr G. A. Henty, who represented the paper on many a stricken field ; Mr John A. Cameron, who was killed at Abu Klea ; and Mr William Maxwell. In January 1900 Mr Mudford retired, and was succeeded in the editor- ship by Mr G. Byron Curtis (d. 1907), Mr S. H. Jeyes, whose con- nexion with the paper had begun in 1891, becoming assistant-editor. In November 1904 the Standard, which had at that time taken rather a strong line in deprecating the tariff reform movement within the Unionist party, was sold to Mr C. Arthur Pearson (proprietor of the Daily Express, see below), who was chairman of the Tariff Reform League, and considerable changes were made in the paper, Mr H. A. Gwynne becoming editor. In 1910 Mr Pearson, owing to ill-health, transferred his interests in the proprietary company he had formed in 1904 to Mr Davison Dalziel.

The Daily Chronicle arose, as already mentioned, out of the local Clerkenwell News, the latter paper having been purchased by Mr Edward Lloyd in 1877, and converted into “an Imperial „ .. morning paper ” on independent Liberal lines. Under rtronlcl the editorship of Mr R. Whelan Boyle the Daily Chronicle e ‘

soon took rank among the other London daily journals, the only traces of its original character being shown in the attention paid to metropolitan affairs and the appearance of numerous small advertisements. The independent tone of the journal was conspicuous in its treatment of the Home Rule question. At first deprecating the system of combined agitation and outrage with which the term was synonymous, the Daily Chronicle, under the editorship of Mr A. E. Fletcher (1890-1895), ceased to be a Unionist journal, and supported Mr Gladstone’s Bill of 1893. Another instance was afforded in the course of the Boer War. During the negotiations and the early stages of the campaign, the Daily Chronicle, which was then edited by Mr H. W. Massingham (b. i860), strove for peace by supporting the Boer side against the diplomacy of Mr Chamberlain Mr Massingham’s policy was, however, not to the liking of the pro- prietors, and he retired from the editorship towards the end of 1899, Mr W. J. Fisher succeeding him as editor. In 1904 Mr Robert Donald became editor, and the price was reduced to a halfpenny. Mr Massingham during his editorship, ably seconded by Mr (after- wards Sir) Henry Norman (b. 1858), had largely increased the interest of the paper, particularly on its literary side. A new impetus had been given in this direction in 1891, when a ” literary page ” was started, conducted at first by Mr J. A. Manson, and after 1892 by Mr Massingham, when he became assistant-editor under Mr Fletcher. The Chronicle had taken a leading part in many public movements since 1 877. It was conspicuous in its advocacy of the cause of the men in the London dock strike of 1889; and in the great mining dispute for a ” living wage,” which was brought to a close by Lord Rosebery in November 1893, raised over £13,000 for the relief com- mittees. Much attention was given to the theosophical discussion of 1891 and to the exposure of the adventurer ” De Rougemont ” after he had appeared before the British Association at Bristol in 1898. The Chronicle took an active part in the negotiations which led to the Venezuelan Arbitration Treaty of 1897; it energetically pleaded the cause of the Armenians and Cretans during the massacres of 1896, and it encouraged the Greeks in the war with Turkey in 1897. Its foreign policy was, however, more distinguished by good- will than by discretion — and notably in the latter instance. The Chronicle also worked strenuously for the Progressive cause in London in regard to the County Council, Borough

Councils and the School Board. Its new successes included the first announcement of the revolution in eastern Rumelia (1885); the first circumstantial account of the death of Prince Rudolph (1889); Nansen's own narrative of his expedition towards the North Pole; Sir Martin Conway's journey across Spitzbergen in 1896; and the first ascent of Aconcagua in 1897.

In 1890 the illustrated morning daily paper, the Daily Graphic, was founded by W. L. Thomas (1830-1901) as an offshoot

from the weekly illustrated Graphic, and soon came into favour.

Dally Graphic.

In 1906 a new Liberal morning daily was started by Mr Franklin Thomason in the shape of the Tribune, edited by Mr W. Hill, who retired after a few months, with Mr L. T. Hobhouse as Tribune political editor. Later Mr Pryor became managing editor, but at the beginning of 1908, after heavy losses, the publication was stopped.

Two morning papers, at the popular price of halfpenny, appeared in the spring of 1892, the Morning and the Morning Leader. They raced for priority of publication, the former winning by nernlnit a day. The Morning Leader, under the same manage- , ea(f er ment as the (evening) Star, continued to flourish, but the Morning had but a brief career.

The halfpenny Daily Mail was originated by Mr Alfred Charles Harmsworth (b. 1865), who was subsequently created a baronet (1904) and in 1905 a peer as Baron Northcliffe ; it appeared Dallv

in 1896, on the same day as Sir G. Newnes's penny Courier m»//

(which only lasted a few weeks). In the evolution of English journalism the foundation of the Daily Mail carried still farther the work begun by the Daily Telegraph in earlier days. It was the first halfpenny morning newspaper to place at the disposal of its readers a news service competing with that of any of the higher-priced newspapers, and soon took an increasingly important place in the Press. At the opening of the 20th century it claimed a regular circulation of about a million copies daily (and had occasionally sold as many as 1,500,000 copies of a single issue), and it was pro- duced simultaneously in London and Manchester, the whole of the contents being telegraphed nightly. In May 1904 it began publish- ing a continental edition in Paris. The sensational success of the Daily Mail, which first made Lord Northcliffe one of the dominant personalities in

English journalism, was due, not to individual writers, but to a consistent policy of catering for a modern public and serving them with lively news and articles, and constant change of interest. Its large circulation, and resulting advertising revenue, gave it an influence which in politics was used on the Unionist side; but the readers of the Daily Mail went to it, not for politics, but for news, brightly and briefly displayed. Its triumph represented the

success of a business organization, in which individual views on affairs played a comparatively minor part.

The half penny Daily Express, founded by Mr Cyril Arthur Pearson (b. 1866) on the lines of the Daily Mail, first appeared in 1900, and _ ,, soon won a large clientele. With R. D. Blumenfeld as

Exams editor (from 1904) it worked strenuously for Tariff Reform. p . -pjˆ jj a jiy Mirror, started by Mr Harmsworth as a women's penny daily in 1904, failed to attract in its original form and was quickly changed into a halfpenny general daily, relying as _.. a novelty on the presentation of news by photographic

mi r pictures of current events. This new feature soon ob- nno * tained for it a large circulation under the enterprising management of Mr Kennedy Jones (b. 1865), who was already known for his successful conduct of the Evening News and his share in the business of the Daily Mail.

The Globe (founded Jan. 1st., 1803), the oldest of existing London evening papers, owed its origin to the desire of the booksellers or Ofobe publishers of the day for an advertising medium, at a

moment when the Morning Post gave them the cold shoulder. A syndicate of publishers started a morning paper, the British Press (which had only a short career), to combat the Post, and the Globe as a rival to the Courier (see above), which, like the Post, was under Daniel Stuart's control. George Lane, previously Stuart's chief assistant, was the editor. From 1815 a prominent member of the staff was Mr (afterwards vice-chancellor Sir James) Bacon. After swallowing up some other journals, in 1823 it absorbed the property and title of the Traveller, controlled by Colonel Torrens, who in the

reorganization became principal proprietor and brought over Walter Coulson as the editor. John Wilson succeeded as editor in 1834, efficiently seconded by Mr Moran; Thomas Love Peacock and R. H. Barham (" Ingoldsby ") being famous contributors during his regime. For some time the Globe was the principal Whig organ, and Mr (afterwards Deputy Judge Advocate Sir James) O'Dowd its political inspirer. Mahony (" Father Prout ") was its Paris correspondent. In 1842 the Courier was incorporated, but a gradual decline in the fortunes of the paper, and Colonel Torrens's death in 1864, brought about a reorganization in 1866, when a small Conservative syndicate, including Sir Stafford Northcote, bought it and converted the Globe into a Conservative organ. In 1868 the pink colour since associated with the paper was started. In 1869 its price (originally sixpence) was lowered to a penny. Mr W. T. Madge (b. 1845), whose vigorous management was afterwards so valuable, and who in 1881 started with Captain Armstrong the People, a popular Sunday journal for the masses, joined the paper in 1866; and after brief periods of editorship by Messrs Westcomb, R. H. Patterson, H. N. Barnett and Marwood Tucker (1868), in 1871 Captain George C. H. Armstrong (1836-1907), who in 1892 was created a baronet, was put in control ; he edited the paper for some years, and then it became his property. The editorial chair was filled in succession by Mr Ponsonby Ogle, Mr Algernon Locker (1891), and the proprietor's son and heir Lieut. G. E. Armstrong, R.N. (1895), until in June 1907, after Sir G. Armstrong's death, the paper was sold to Mr Hildebrand Harmsworth. The Globe " Turn- overs " (miscellaneous articles, turning over from the first to the second page) began in 1871, and became famous for variety and humour. The jocular " By the Way " column, another characteristic feature, was started in 1881, and owed much to Mr Kay Robinson and Mr C. L. Graves. In the history of the Globe one of the best- known incidents is its publication of the Salisbury-Schuvaloff treaty of 1878. It was the first London daily to use the linotype composing-machine (1892).

A new period of evening journalism, characteristic of the later 19th century, opened with the founding of the Pall Mall Gazette. D.H m 11 The first number (at twopence) was issued on 7th February Osteite l86g from Salisbu, 7 Street, Strand. Mr George Smith, of the publishing firm of Smith and Elder, was its first proprietor; Mr Frederick Greenwood (g.fl.), its first editor, took the Anti- Jacobin for his model; the paper was intended to realize Thackeray's picture (in Pcndennis) of one " written by gentlemen for gentlemen." Its political attitude was to be independent, and much space was to be given to literature and non-political matter. It had brilliant supporters, such as

Sir J. Fitzjames Stephen as writer of leading articles (replaced to a certain extent, after 1869, by Sir Henry Maine), R. H. Hutton, Matthew James Higgins (" Jacob Omnium "), James Hannay, and George Henry Lewes, with George Eliot, Anthony Trollope, Charles Reade, and Thomas Hughes as occa- sional contributors; but the paper failed to attract the general public until, in the following year, Mr Greenwood's brother, James, furnished it with three articles on " A Night in a Workhouse: by an Amateur Casual." A morning edition had already been tried and dropped, and so was a distinct morning paper attempted in 1870. In 1867 new premises were taken in Northumberland Street, Strand. Three years later the Pall Mall Gazette was the first to announce the sur- render of Napoleon III. at Sedan. Matthew Arnold contributed his famous " Arminius " letters (" Friendship's Garland ") in 1871, and Richard Jefferies contributed " The Gamekeeper at Home " in 1876 and onwards. Mr Greenwood made the paper unflinchingly Con- servative and strongly adherent to Lord Beaconsfield's foreign policy. In 1880, however, Mr Smith handed over the Pall Mall Gazette to his son-in-law, Mr Henry Yates Thompson, who turned

it into a Liberal journal. Mr Greenwood then retired from the editorship and shortly afterwards started the St James's Gazette ; Mr John (afterwards Viscount) Morley became editor of the Pall Mall, with Mr W. T. Stead (b. 1849) as assistant-editor. The price was reduced in 1882 to one penny. Many of the old contributors remained, and they were reinforced by Robert Louis Stevenson, who wrote some " Letters from Davos," Professor Tyndall, Professor Freeman, James Payn and Mrs Humphry Ward. When Mr Morley exchanged journalism for politics in 1883, he was succeeded by Mr W. T. Stead (a.v.), with Mr Alfred Milner, afterwards Lord Milner, as his assistant. Adopting an adventurous policy, Mr Stead im- ported the " interview " from America, and a report of General Gordon's opinion was believed to have been the cause of his ill-fated mission to Khartum. A series of articles called " The Truth about the Navy " (1884) had considerable influence in causing the Ad- miralty to lay down more ships next year. But Mr Stead's career as the editor came to an end in 1889, in consequence of his publishing a series of articles called " The Maiden Tribute of Modern Babylon," purporting to further the Criminal Law Amendment Bill. Mr Stead had made a feature of reprints called " extras "; and, edited by Mr Charles Morley, the Pall Mail Budget became an illustrated weekly. Mr Stead was replaced in 1889 by E. T. Cook, who had become assistant-editor in succession to Milner. The Pall Mall Gazette was now steadily Liberal and a strong advocate of Irish Home Rule. On its staff were Edmund Garrett (a gifted writer

who became editor of the Cape Times in South Africa, and died prematurely in 1907), F. C. Gould the caricaturist, and J. Alfred Spender (b. 1862). Mr Cook resigned in 1892, on the sale of the paper to Mr William Waldorf Astor, the American millionaire, who turned it again into a Conservative organ, and also changed its shape, abandon- ing the old small pages for a larger sheet ; and he and his assistant Mr Spender continued the Liberalism of the Pall Mall in the West- minster Gazette (see below). Mr Henry Cust, M. P., was appointed editor, with Mr E. B. Iwan-Muller as assistant-editor. Mr Cust (b. 1 86 1) , who was Lord Brownlow's heir, and came fresh to editorship with enthusiasms acquired from his experiences in parliament and in society, made the columns of the Pall Mall very lively for the next couple of years. It became well known for its " booms," and its " smartness " generally. Some papers contributed to it by Sir Charles Dilke and Mr Spenser Wilkinson resulted in the establish- ment of the Navy League in 1894. The paper had, too, the first news of Mr Gladstone's resignation and the appointment of Lord Rosebery to succeed him. But though the Pall Mall under Mr Cust had outshone all its competitors, its independence of those business considerations which ultimately appeal to most proprietors hardly represented a durable state of affairs; and eventually the relations between proprietor and editor became strained. In February 1896 Mr Cust and Mr Iwan-Muller were succeeded respectively by Sir Douglas Straight, and Mr Lloyd Sanders, the latter of whom retired in 1902. Sir Douglas Straight (b. 1844) had been in early days a well-known London barrister, and from 1879 to 1892 was a judge in India. Sir Douglas Straight remained editor till the end of 1908, when he was succeeded by Mr Higginbottom.

Founded in 1880 by Mr H. Hucks Gibbs (afterwards Lord Alden- ham), for Mr Frederick Greenwood to edit when he had left the Pall Mall, the St James's Gazette represented the more _.. „. intellectual and literary side of Tory journalism in op- j,mea't position to the new Liberalism of Mr Greenwood's former gazette organ; it was in fact meant to carry on the idea of the original Poll Mall as Mr Greenwood had conceived it, and was (like it) more of a daily review than a chronicle of news. In 1888 the paper having then been sold to Mr E. Steinkopff, Mr Greenwood retired and was succeeded as editor (1888-1897) by Mr Sidney Low, subsequently author of The Governance of England and other able works, who had as his chief assistant-editors Mr S. H. Jeyes (till 1 891), and Mr Hugh Chisholm(i892-i897),the latter succeeding him as editor (1897-1900). In those days mere news was not considered the important feature ; or rather, original and sagacious views were identified with a sort of

novelty such a paper could best promulgate. The St James's was for many years conspicuous for its literary character, and for the number of distinguished literary men who wrote for it, some of whom first became known to the public by means of its columns. Its interest in newspaper history is really that of a paper which appealed to and influenced a comparatively small circle of cultured readers, a " superior " function more and more difficult to reconcile with business considerations. It was one of the earliest supporters of the Imperialist movement, and between 1895 and 1899 was the chief advocate in the Press of resistance to the foreign bounties on sugar which were ruining the West Indies, thus giving an early impetus to the movement for Tariff Reform and Colonial Preference. During the years immediately following 1892, when the Pall Mall Gazette again became Conservative, the competition between Conservative evening papers became acute, because the Globe and Evening Standard were also penny Conservative journals; and it was increasingly difficult to carry on the St James's on its old lines so as to secure a profit to the proprietor; by degrees modifications were made in the general character of the paper, with a view to its containing more news and less purely literary matter. But it retained its original shape; with sixteen (after 1897, twenty) small pages, a form which the

Pall Mall abandoned in 1892. Gradually these changes took effect. In 1900 Mr Theodore Andrea Cook, who had been assistant-editor since 1898, became editor for a brief period, and subsequently Mr Ronald MacNeill (till 1903) acted in this capacity, with Mr W. D. Ross as manager. Meanwhile the St James's Budget, which up to 1893 had been a weekly edition of the Gazette, was turned into an independent illustrated weekly, edited from the same office by Mr J. Penderel-Brodhurst (afterwards editor of the Guardian), who had been on the editorial staff since 1888; and it continued to be published till 1899. In 1903 the St James's was sold to Mr C. Arthur Pearson, who in 1905, having bought the morning Standard, amal- gamated the St James's with the Evening Standard.

The Evening Standard had been founded in 1827 (see under the Standard above), and when it was amalgamated with

the St James's Gazette in 1905, the two titles covered a new paper, in a new form, as the penny Evening Standard and St James's Gazette.

When the Pall Mall Gazette was sold to Mr Astor in 1892 and converted into a Conservative organ, Mr E. T. Cook, the editor, and most of his staff, resigned, and in 1893 they came together The West- a g am on t he Westminster Gazette, newly started for the minster purpose by Sir G. Newnes (who had made a fortune out Gazette. Q f xit-bits and other popular papers) as a penny Liberal evening paper. It was printed on green paper, but the novelty of this soon wore off. The paper was conducted on the lines of the old Pall Mall, and it had the advantage of a brilliant political cartoonist in F. Carruthers Gould. In 1895 Mr Cook was appointed editor of the Daily News, and his place was ably filled by Mr J . Alfred Spender, who had been his assistant-editor, Mr Gould (who was knighted in 1906) being his chief assistant. Apart from Sir F. C. Gould's cartoons, the Westminster became conspicuous in London evening journalism for its high standard of judicious political and literary criticism. It gradually became the chief organ of Liberal thought in London. One of its early literary successes was the original publication of Mr Anthony Hope's Dolly Dialogues, and it continued to maintain, more than any other evening paper, the older literary and political tradition of the " gentlemanly journalism " out of which it had sprung. In 1908 a change of proprietorship took place, the paper being sold by Sir G* Newnes (d. 1910) to Mr (afterwards Sir) Alfred Mond, but without affecting the personnel or policy of the paper.

The first modern English evening newspaper to be issued at a half-penny was the London Evening News — afterwards known as the Day. ' It was started in 1855, but soon failed to meet expenses

Halfpenny anc j disappeared from the scene. In 1868 appeared the Evening London Echo, published by Henry Cassell. It had for its Papers. nrst e dit r, unt j[jg.,ˆ M r (afterwards Sir) Arthur Arnold (1833-1902), afterwards M.P. for Salford (1880-1886) and chairman of the London County Council (1895-1896), who was well known both as a writer and traveller and as founder of the Free Land League (1885). Baron Albert Grant (1830-1899), the pioneer of modern mammoth company-promoting, 1 afterwards took the Echo in hand and wasted a fortune over it ; and eventually it was owned for some years by Mr Passmore Edwards, coming to an end in 1905. The Evening News was begun at a halfpenny in 188 1 as a Liberal organ, but was shortly afterwards bought by a Conservative syndicate. It saw stormy times, and at the end of thirteen years it had absorbed £298,000 and was heavily in debt. Its shares could then be purchased

for threepence or fourpence each. In August 1894 it was purchased by Messrs Harmsworth for £25,000, and under Mr Kennedy Jones's management developed into a highly successful property. On 17th January 1888 the first number of the Star appeared, under the editor-ship of Mr T. P. O'Connor (b. 1 848) , as a half penny evening newspaper in support of Mr. Gladstone's policy. When Mr O'Connor left the paper, Mr H. W. Massingham became its editor, and subsequently Mr Ernest Parke. In 1909 the Star was acquired by a new proprietor- ship in which Messrs Cadbury and the Daily News had an important share. From the first it was conspicuous for its advanced attitude in politics, and also for excellent literary criticism. In 1893 MrT. P. O'Connor founded the Sun, which eventually passed into the hands of a succession of proprietors and came to an end in October 1906. As regards the purely sporting press in London, Sporting Life, . started in 1859, became a daily in 1883, and in 1886

Sporting i ncor p 0rat ed the old Bell's Life. The daily Sportsman, "" a the leading paper, was founded in 1865. The financial

financial daily press is a modern creation and has taken many dallies. shapes; the Financier was the first regular daily, but in 1884 the Financial News, under Mr H. H. Marks, made its appear-

1 Albert Grant, who took that name though his father's was Gottheimer, was given the title of baron by King Victor Emmanuel of Italy in 1868 for his services in connexion with the Milan picture gallery. He made a large fortune by company-promoting, and in T865 became M.P. for Kidderminster. He became a prominent public character in London. In 1873 he built Kensington House, a vast mansion close to Kensington Palace, which in 1883 was demolished and the site seized by his creditors. In 1874 he bought up Leicester Square, converted it into a public garden, and presented it to the Metropolitan Board of Works. But soon afterwards he failed, and from 1876 to his death he constantly figured in the law-courts at the suit of his creditors.

ance, and in 1888 the Financial Times; and these became the leading papers of their class.

The London weekly press (see also under Periodicals) has always worn a motley garb. Weekly publication facilitates the individuality of a journal, both as respects its editorship and as respects . the class of readers to which it more especially addresses " " n

itself. From the days of Daniel Defoe there have always weekly been

newspapers bearing the unmistakable impress of an ”’” individual and powerful mind. Cobbett’s Weekly Register papers. affords perhaps as striking an illustration of journalism in its great- ness and in its meanness as could be found throughout its entire annals. And Cobbett’s paper has had many successors, some of which, profiting by the marvellous mechanical appli- ances of the present day, have attained a far wider popular influence than was possessed by the Weekly Register in its most prosperous days.

The history of the weekly reviews practically begins with the Examiner, which was founded in 1808 and had a long career as one of the most prominent organs of the Liberals, ending in 1881. That its literary reputation was great resulted naturally from a succession of such editors as Leigh Hunt, Albany Fonblanque, John Forster and Henry Morley. This was succeeded in January 1817 by the foundation of the Literary Gazette, the proprietor of which was Henry Colburn and the first editor William Jerdan. Jerdan succeeded in inducing Crabbe and Campbell to contribute to it, and among those who assisted him were Bulwer Lytton, Barry Cornwall and Mrs Hemans. The Literary Gazette came to an end in 1862. At the end of 1820 Theodore Hook founded John Bull, which for a time had extraordinary popularity; to it he contributed the most brilliant of his jeux d ‘esprit.

Epochs in the development of this form of literature were marked by the foundation of the Athenaeum by James Silk Buckingham in January 1828 and by that of the Spectator by Robert Stephen Rintoul later in the same year. ;

The Spectator was edited for thirty years by Robert Rintoul. In 1858 the latter sold the paper to Mr Scott, who retired, however, from the editorship after a few months ; and for a time the Spectator .Spectator was in low water. In 1861 it passed into the hands aa j of R. H. Hutton (q.v.) and Meredith Townsend, and under Saturday them became a successful exponent of moderate Liberalism p ev iew and thoughtful criticism, particularly in the discussion of religious problems, such as were uppermost in the days of the Meta- physical Society. The high character and literary reputation of the Spectator were already established when, in 1897, it passed into the hands of Mr J. St Loe Strachey (b. i860), but under him it became a more powerful organ, if only because it more than maintained its position while the other weekly papers declined. Unionist in politics since 1886, the Spectator after 1903 was the leading organ of FreeTrade Unionists who opposed tariff reform, until the progress of socialism and the extravagance of Mr Lloyd-George’s budget in 1909 caused it to accept the full policy of

the Unionist party in preference to the dangers of socialistic radicalism. No paper in London, it may well be said, has earned higher respect than the Spectator, or carried more weight in its criticisms, both on politics and on literature. This has not been on account of any special brilliance of the pyrotechnic order, but because of continuous sobriety and good sense and unimpeachable good faith.

The Saturday Review, on the other hand, is important historically rather for the brilliance of its ” palmy days.” First published on the 3rd of November 1855, it was founded by A. J. B. Beresford Hope (1820-1887), a brother-in-law of Lord Salisbury, M.P. for Maidstone and for Cambridge University, and a prominent church- man and art patron; with John Douglas Cook (1808-1868) as editor. Mr Hope was the son of James Hope (1770-1831), author of A nas- tatius; and it was reputed that Douglas Cook was ” Anastatius ” Hope’s natural son. For several years the Saturday maintained an exceptional position in London journalism. On the political side it was at first Peelite, but the strong churchmanship of Mr Beresford Hope and antagonism to Mr Gladstone did much to bring it round to a pronounced Conservative view. Most, though not all, of its early staff had already worked under Mr Cook, when he was editor of the Morning Chronicle (from 1848*0 1854). In its literary com- ment it gave much space to articles of pure criticism and scholarship, and almost every writer of contemporary note on the Tory side contributed to its columns. But the matter which did most to give it its peculiar character was found in its outspoken or even sensational ” middles ” — ” The Frisky Matron,” ” The Girl of the Period ” (by Mrs Lynn Linton), The Birch in the Boudoir,” &c. The editorship remained in the hands of Mr Cook till his death in 1868. In 1861 a secession from the Saturday lasting till 1863, led to the temporary brilliance of the London Review (1 860-1 868), started by Charles Mackay. Douglas Cook was succeeded by Philip Harwood (1809-1887), who had followed him from the Morning Chronicle and under whom Mr Andrew Lang became a contributor, with others of note. Mr Harwood retired in 1883, and was succeeded by his former assistant Mr Walter Herries Pollock, under whom the paper underwent some modifications in form to meet changes in the public taste; Mr G. Saintsbury and Mr H. D. Traill were then prominent members of the staff, and Mr Frederick Greenwood wrote for the paper till he started the Anti-Jacobin. In 1894 the Saturday Review

was sold by the heirs of Mr Beresford Hope to Mr Lewis Edmunds, from whose hands it soon passed to Mr Frank Harris. In 1899 the paper was sold to Lord Hardwicke and came under the editorship of Mr Harold Hodge, who remained in this position when, after Lord Hardwicke's death in 1905, it passed into the hands of Mr Gervase Becket.

The Saturday Review and Spectator, as the exponents of brilliant Toryism and serious Liberalism, had the field practically to themselves for some years; but when in 1886 the Spectator followed the Libera! Unionists in opposing Home Rule for Ireland, and ceased to support Mr Gladstone, the result was the addition to London journalism of the Radical Speaker (1898); and in 1898 the threepenny Outlook (altered in price in 1905 to sixpence) was started, to present more particularly the growing interests of the Colonies and the Empire, a side further developed in 1905 and 1906 under the editorship of Mr J. L. Garvin (b. 1868) in its advocacy of Mr Chamberlain's policy of a preferential tariff, when the Spectator became aggressively Free Trade. In December 1906 the Outlook was sold by its proprietor, Mr C. S. Goldman, to Lord Iveagh, and Mr Garvin resigned the editorship. In 1907 the Speaker was incorporated with the Nation, a new Radical weekly, edited by H. W. Massingham. Several ambitious new weeklies meanwhile started, and some passed away before the end of the century, such as the Realm, the British Review and the Review of the Week. The most brilliant of all these, which also lasted the longest, was the Scots (soon renamed the National) Observer (1888-1897), edited at first by W. E. Henley (q.v.), and subsequently by J. E. Vincent (d. 1909). Mr Henley, assisted by Mr Charles Whibley, collected a band of clever young writers, who formed almost a " school " of literary journalism, and many of whom won their spurs in literature by their contributions to this paper. The Pilot (1900) under Mr D. C. Lathbury was another brilliant attempt, but it failed to pay its way and hardly lasted for three years.

Among purely literary weeklies the Athenaeum found a rival in the Academy, founded in October 1869 by Dr Appleton and edited by him. Later, under the editorship of J. S. Cotton, it was famous for its signed reviews and scholarly character; but the small circle to whom pure literature appealed made financial success difficult. In 1896 the Academy was bought by Mr Morgan Richards, and for some years was edited by Mr Lewis Hind, amalgamating Literature (a weekly which had been started by The Times) in 1901 ; and subsequently under changed proprietors it was successively edited by Mr Teignmouth Shore and Mr Anderson Graham. In April 1907 it was bought from Sir G. Newnes by Sir Edward Tennant, and subsequently passed under the

control of Lord Alfred Douglas, who in 1910 parted with it to a new proprietary.

The publication of Sunday editions of the daily papers has not found the same favour in England as in the United States. In 1899 Sunday a Sunday Daily Mail and a Sunday Daily Telegraph papers. appeared simultaneously; but public opinion was so violent against seven-day journalism that both were withdrawn. The oldest of the Sunday papers, the Observer (1791), was conducted by one editor, Mr Doxat, for more than fifty years. It was one of the first papers to contain illustrations. In later years Mr Edward Dicey was a notable editor. In 1905 the Observer passed into the hands of Lord Northcliffe, his first editor being Mr Austin Harrison, a son of Frederic Harrison. In 1907 Mr J. L. Garvin became editor, and under him the old influence of the Observer revived.

Lloyd's Weekly Newspaper started as an unstamped illustrated journal at a penny in September 1842. In 1843 it was enlarged in size, and the price raised to threepence. Curious ingenuity was shown in advertising it by all sorts of expedients. Amongst others, all the pennies its proprietor could lay his hands on were embossed, by a cleverly constructed machine, with the title and price of the new journal. The Times drew attention to this defacement of the coin of the realm, and so gave it a better advertisement still. From a weekly sale of 33,000 in 1848 it rose to 170,000 in 1861. In antici- pation of the abolition of the paper duty, the price was then reduced to a penny, and its circulation continued to increase. In later years it had an able editor in MrT. Catling. Reynolds's Weekly Newspaper, an extreme Radical paper with a large circulation, dates from May 1850. Other Sunday papers came later into existence — the People (1881), the Sunday (afterwards Weekly) Sun (1891), the Sunday Special (1897) — with which in 1904 was amalgamated the Sunday Times (1822). The Referee (1877), a paper with a strong sporting and theatrical interest, is famous for the humorous contributions by " Dagonet " (G. R. Sims) and the pungency of its miscellaneous articles.

Of the London illustrated weekly papers the oldest, the Illustrated London News, was founded in 1842; the Graphic in 1869; while the in »

weTkly In l891 Black and White was started : and in l8 92 the MDCT £ Sketch, edited by Mr Clement Shorter (also then editor of ' the Illustrated London News), introduced a lighter vein. Mr Shorter gave up the editorship of these two weeklies in 1901, and became editor of a new illustrated weekly, the Sphere, with the proprietorship of which

came also to be associated the Taller. Another new illustrated weekly of a high class, Country Life Illus- trated, began in 1897.

The ” Society ” weeklies, Truth (1877), Vanity Fair (1868) — with

a separate cartoon as a special feature, famous for the artistic work of Pellegrini, Leslie Ward and others — and the World „ Socle{ „ (1874), brought a new ” note ” into regular journalism, . * Mr Edmund Yates’s success with the World largely con ~* .? tributing to the increase of the personal style which he e es- did so much to introduce; and Truth made its proprietor, the politician Mr Henry Labouchere, one of the most prominent men cf the day, not so much for its aggressive Radicalism as for its vigorous exposures of all sorts of public charlatanry.

Among other weeklies, important ones are such ecclesiastical papers as the Guardian (1846), the Record (1828), the Church Times (1863), the Tablet (1840), Christian World (1857), Methodist Times (1885); the medical papers, the Lancet (1823) and British Medical Journal ; the financial papers, the Economist (1843) and Statist (1878); and the great sporting and country-house paper, the Field

(1853)-

Among humorous papers Punch (1840) stands first (see Cari- cature,) of which (1895) Mr M. H. Spielmann published a History ; Fun (1860-1901), Mr Harry Furniss’s Lika Joko (1894, only for a few months), Judy (1867), Moonshine (1879) ” umor ous and Pick-me-up (1888), have also catered for popular W era – gaiety.

The introduction of women into English journalism in any large, degree was one of the new departures of the last quarter of the 19th century. It was indeed no new thing for women to write for the Press. Harriet Martineau was, in her day, one of the Women principal membersof the2?at7;yiV0msstaff,andMissFrances journal- Power Cobbe (l822-i905)the advocate of anti- vivisection- ‘ ste * ism, was an active journalist. Miss Flora Shaw (Lady Lugard), as writer of colonial topics for The Times, or Mrs Crawford, as Paris, correspondent of the Daily News, are other notable instances of the; prominence of women’s work in the same spheres with the ablest; men. But such cases as these were exceptional, in which something in the nature of a personal mission and a peculiar aptitude gave the impulse. Journalism as a profession for women came, however, to be widely resorted to, partly through its obvious recommendation in a day when women’s education required an alternative outlet, for those who had to earn

their living, to that of the teaching pn> fession; partly, and pari passu, through the immense increase in women readers and the immensely increased publicity given in news- papers to matters of primarily feminine interest. In 1880 the only ‘ ladies’ paper ” of any importance was the Queen, a weekly which dates from 1861. But subsequently a considerable number of new weeklies entered the field: notably the Lady’s Pictorial (1880); the Lady (1885); Woman (1889); the Gentlewoman (1890), which owed its success to the vigorous management of Mr J. S. Wood; Madame (1895); and the Ladies’ Field (1898). New monthlies also appeared, in the Englishwoman, the Ladies’ Realm and the Woman at Home. The sphere of action of the lady journalist was soon by no means confined to the ” ladies’ papers, or to the writing of columns on dress or cookery for such general journals as found it useful to cultivate feminine readers; women invaded every other field of journalism, especially the large new field of ” interviewing ” and fashionable gossip. The increase in women-writers generally, novelists, dramatists, poets, reacted on their connexion with journal- ism ; the increased ” respectability ” of journalism made it easier for them to work side by side with men; and gradually nobody thought the introduction of women into this sphere anything out of the common; a lady journalist, in fact, was much less remarkable than a lady doctor.

British Provincial Press. England and Wales. — Though the real development of English provincial journalism, as a power co-ordinate with that of London, only dates from the abolition of the stamp duty in 1855, many country newspapers before that time had been marked by literary ability and originality of character. The history of the provincial press of England begins in 1690 with the weekly Worcester Postman (new Berrow’s Worcester Journal). The Stamford Mercury (1695; earliest known 17 12; long known as Lincoln, Rutland and Stamford Mer- cury); Norwich Postman 1 (1706); Nottingham Courant (1710), afterwards renamed Journal; Newcastle Courant (1711); Liverpool Courar.t (1712; shortlived); Hereford Journal (1713); Salisbury Postman (1715); Bristol Felix Farley’s Journal (1715; merged into the Bristol Times in 1735 2); the Canterbury Kentish Post (17 17; afterwards Kentish Gazette); Leeds Mercury (1717)ˆ Exeter Mercury, Protestant Mercury, and Postmaster or Loyal Mercury (all 1718 3); York Mercury (1718), and Manchester Weekly Journal (1719), came

1 The Norwich Postman, a small quarto of meagre contents, was published at a penny, but its proprietor notified that “a halfpenny is not refused “! Within a few years Norwich also had its Courant (1712) and Weekly Mercury or Protestant’s Packet (1720).

2 Amalgamated with the Bristol Mirror (1773) in 1865 to form the Daily Bristol Times and Mirror.

8 Exeter was then fiercely political. These three newspapers commented so freely on proceedings in parliament that their editors were summoned to appear at bar (Journal of the House of Commons, xix. 30, 43, 1718). The incident is curious as showing that, each represented a rival MS. news-letter writer in London.

quickly afterwards; and other early papers worth mentioning were the Salisbury Journal (1729); Manchester Gazette (1730-1760); Manchester Mercury (1762-1830) ; the earliest Birmingham paper, Aris's Gazette (1741); the Cambridge Chronicle (1744); and the Oxford Journal (1753). Liverpool also boasted of the Liverpool Advertiser (1756) and Gore's General Advertiser (1765- 1870). Of the above the Leeds Mercury (1717) became an in- creasingly important provincial organ. It was originally published weekly, and its price was three-halfpence. In 1729 it was reduced to four pages of larger size, and sold, with a stamp, at twopence. From 1755 to 1766 its publication was suspended, but was resumed in January 1767, under the management of James Bowley, who continued to conduct it for twenty-seven years, and raised it to a circulation of 3000. Its price at this time was fourpence. The increase of the stamp duty in 1797 altered its price to sixpence, and the circulation sank from 3000 to 800. It was purchased in 1801 by Edward Baines, who first began the insertion of " leaders," and whose family left an impress not only on journalism but on literature in the North of England. It took him three years to obtain a circulation of 1500; but the Mercury afterwards made rapid progress. When the Stamp Tax was removed, its price was reduced to a penny, and in 1901 to a halfpenny. For many years it admitted neither racing nor theatrical new to its columns, and it had a powerful moral and political influence in Lancashire and Yorkshire.

The abolition of the duty on advertisements in 1853, of the stamp duty in 1855, and of the paper duty in 1861, opened the way for a cheap press, and within ten years of the abolition of the paper duty penny morning newspapers had taken up commanding posi- tions in Edinburgh, Glasgow, Dundee and Aberdeen; in Liver- pool, Manchester, Leeds, Bradford, Newcastle and Sheffield; in Birmingham

and Nottingham; in Bristol, Cardiff and Plymouth; and across St George's Channel in Dublin, Cork, Belfast and Water- ford. As time went on, and increasingly after the 'seventies, pro- vincial evening papers began to multiply. But any real importance as organs of opinion was still confined to only a few of the great penny provincial dailies, notably the Yorkshire Post, Manchester Guardian, Birmingham Post (1857), Sheffield Telegraph (associated with Sir W. Leng), Liverpool Daily Post, Leeds Mercury and Western Morning News; others too numerous to mention here were at the same time cradling journalists who were to become famous in a larger sphere, such as the Darlington Northern Echo, on which Mr W. T. Stead made his debut, while Mr Joseph Cowen for some years made the Newcastle Daily Chronicle a powerful force.

The provincial journals began as strictly local organs. But even in 1870 it was beginning to be universally perceived that, though the influence of a newspaper depends upon the sagacity, sound judgment and courage of the editor, its success as a business enterprise rests mainly with the business manager. Managers demanded less local- ism, a wider range of news, prompter and fuller reports of all im- portant events, longer parliamentary reports, parliamentary sketches, verbatim reports of speeches by statesmen of the first rank. In the early 'seventies such a thing as a full telegraphic report in a provincial morning newspaper of parliamentary proceedings, or of a speech by a leading statesman, was almost unheard of. The Press Association had been in existence a short time, but had not then covered the country with its organization. Reuter's foreign news service very briefly reported important events. Leading articles were written during the day. Between 1870 and 1880 a complete revolu- tion was effected, as the result of the social and educational changes. Leader-writers began to discuss the latest topics. Newspapers that had been content to fill their columns with local news and clippings from London and distant provincial papers put such matter aside. Telegraphic news crushed it out. In February 1870 the govern- ment took over the telegraph system. The advantage of the change was immediately felt by newspapers and their readers. Leading English and Irish newspapers, following Scotland's lead, began to open offices in London, where Fleet Street soon began to be an open directory to the provincial press — English, Scottish and Irish. The Scottish and the leading Irish newspapers of necessity, the wealthiest and most enterprising English papers for convenience and advantage, engaged special wires. Others that were near enough to London to do so secured London news and advertisements by railway, and completed their news supply by a liberal use of the telegraph. Commercial news, both home and foreign,

especially American, was expanded. The Press Association spread its news-collecting organ- ization over the whole country, and was stimulated to activity by the rising opposition of the Central News. All this energy had its counterpart in the business- side of the press. Rapid ” perfecting ” printing machines were introduced,- and newspaper managers found themselves in possession of newspapers full of the latest news, and procurable in practically unlimited quantities. By the use of special trains and other organizations, circulation increased apace. The development of news agencies, and their universal employment, tended to produce sameness in the provincial press. From this fate the more enterprising journals saved themselves by special London letters, parliamentary sketches and other special contributions. In 1881 the reporters gallery in the House of Commons was opened to some provincial newspapers, and these accordingly enjoyed new facilities for special effort and distinction. A more important matter,

however, was the bombardment of Alexandria and the subsequent Egyptian War. The leading provincial newspapers had already emancipated themselves from localism, and in general news and criticism had risen almost, if not quite, to the average level of the first-class London journals. Now they were to step abroad into the field of war. Singly or in syndicates, or by arrangement with London journals, the leading provincial newspapers sent out war corre- spondents, and were able to record the history of events as promptly and fully as the metropolitan press. The first syndicate to send cut war correspondents was formed by the Glasgow News, the Liverpool Daily Post, Manchester Courier, Birmingham Gazette and Western Morning News, who despatched two correspondents to Egypt, and the new departure was attended with complete success. The Central News also sent out war correspondents to Egypt and the Sudan. During the South African War (1899-1902) the Press Association, in conjunction with Reuter’s Agency, employed corre- spondents, as well as the Central News. The leading provincial newspapers, however, all formed syndicates amongst themselves to secure war telegrams, and in many cases made arrangements for the simultaneous publication of the letters and telegrams of leading London journals. This system of securing simultaneous publication, in provincial newspapers, of special contributions to London morning newspapers was afterwards still further extended, and articles of exceptional interest that have been specially prepared for London journals may now be found on the same day in some of the leading provincial newspapers.

By the beginning of 1880 the country had fallen upon a period of low prices, and extra expenditure upon war telegrams and on an improved

supply of general news was to a considerable extent balanced by the reduced cost of paper. A list compiled at the com- mencement of 1902 gave the names of eighty-seven halfpenny daily newspapers published in English provincial towns, a considerable number of these being morning journals. Of these, sixty-two had been issued since 1870, those bearing earlier dates of origin being in most cases sheets which formerly were issued at a penny or more, but had subsequently reduced their prices. Of the sixty-two that were issued since 1870, twenty-seven appeared between 1 87 1 and 1882, nineteen between 1882 and 1892 and sixteen between 1892 and 1902. Under the stimulus of cheapness the news-sheet was enlarged. More advertisements, more news, more varied contri- butions, filled up the additional space. The cost of composition increased, and, though circulation and revenue increased also, there was some danger to the margin of profit. Again invention came to the rescue. In the 'eighties some of the leading provincial newspapers began to use type-setting machines. In this forward step the provinces were far ahead of the London papers, excepting The Times. The Southport Daily News — since dead — led the way by introducing six Hattersley machines, and soon afterwards type-setting machinery became the rule in the provincial press. In the development of provincial papers, one factor of special importance must be noted, the desire for news about all branches of sport. In 1870 sporting meant horse-racing and little more. By degrees it embraced athleticism in all its branches, and progressive newspapers were looked to for information on football, hockey, golf, cricket, lawn- tennis, yachting, boating, cycling, wrestling, coursing, hunting, polo, running, bowls, billiards, chess, &c, quite as much as for notices of musical and dramatic performances, and of other forms of recreation and amusement. The ordinary provincial press, and its halfpenny evening representatives, largely depend on the attraction of the sporting news; and a number of special local papers have also been started to cater for this public.

Scotland. — The first newspaper purporting by its title to be Scottish (the Scotch Intelligencer, 1 7th September 1643) and the first newspapers actually printed in Scotland {Mercurius Criticus and Mercurius Politicus, published at Leith in 1651 and 1653) were of English manufacture — the first being intended to communicate more particularly the affairs of Scotland to the Londoners, the others to keep Cromwell's army well acquainted with the London news. The reprinting of the Politicus was transferred to Edinburgh in November 1654, and it continued to appear (under the altered title Mercurius Publicus subsequently to April 1660) until the beginning of 1663. Meanwhile an attempt by Thomas Sydserfe to establish a really

Scottish newspaper, Mercurius Caledonius, had failed after the appearance of ten numbers, the first of which had been published at Edinburgh on the 8th of January 1660. It was not until March 1699 that a Scottish newspaper was firmly estab- lished, under the title of the Edinburgh Gazette, by James Watson, a printer of eminent skill in his art. 2 Before the close of the

1 This was followed by the Scotch Dove, the first number of which is dated " September 30 to October 20, 1643," and by the Scottish Mercury (No. 1, October 5, 1643). In 1648 a Mercurius ScoticUs and a Mercurius Caledonius were published in London. The Scotch Dove was the only one of these which attained a lengthened existence.

8 Watson was the printer and editor, but the person licensed was

}ames Donaldson, merchant in Edinburgh (" Act in favors of ames Donaldson for printing the Gazette," March 10,1699, published in Miscellany of the Maitland Club, ii. 232 sq.). Arnot, in his History of Edinburgh, mentions as the second of Edinburgh newspapers — intervening between Mercurius Caledonius and the Gazette — a

year the Gazette was transferred to John Reid, by whose family it long continued to be printed. In February 1705 Watson started the Edinburgh Courant, of which he only published fifty-five numbers. He states it to be his plan to give " most of the remarkable foreign news from their prints, and also the home news from the ports of this kingdom . . . now altogether neglected." The Courant appeared thrice a week. Upon complaint being made to the privy council concerning an advertisement inserted after the transfer of the paper to Adam Boig, the new printer presented a supplication to the council in which he expressed his willingness " that in all time coming no inland news or advertisements shall be put into the Courant, but at the sight and allowance of the clerks of council." In 1710 the town council authorized Mr Daniel Defoe to print the Edinburgh Courant in the place of the deceased Adam Boig. Four years earlier (1706) the indefatigable pioneer of 'the Scottish press, James Watson, had begun the Scots Courant, which he continued to print until after the year 1718. To these papers were added in October 1708 the Edinburgh Flying Post and in August 1709 the Scots Postman. Five years later

this paper appears to have been incorporated with the Edinburgh Gazette. The Caledonian Mercury began April 28, 1720. At one period it was published thrice and afterwards twice a week. Its first proprietor was William Rolland, an advocate, and its first editor Thomas Ruddiman. The property passed to Ruddiman on Rolland's death in 1729, and remained in his family until 1772. It is curious to notice that in his initiatory number of April 1720, Rolland claimed a right to identify his Mercury with that of 1660. This journal, he said in his preface to the public, " is the oldest [existing] in Great Britain." And his successor of the year i860 followed suit by celebrating the " second centenary " of the Caledonian Mercury. He brought out a facsimile of No. 1 of Mercurius Caledonius (January 1660), in its eight pages of small quarto, curiously contrasting with the great double sheet of the day. But sixty years is a long period of suspended animation, and the connexion of the two newspapers cannot be proved to be more than nominal. The Caledonian Mercury was the first of Scottish journals to give conspicuous place to literature — foreign as well as Scottish. In " the '45 " one of its editors, Thomas Ruddiman, junior, virtually sacrificed his life, 1 and the other, James Grant, went into exile, for the expression of conscientious political opinion. Its publication ceased after an existence of more than one hundred and forty years.

Notwithstanding the positive assertion 2 that the Edinburgh Courant and the Edinburgh Evening Courant " were entirely different journals, and never had any connexion whatever with each other," a substantial identity may be asserted upon better grounds than those for which identity used to be claimed for the Caledonian Mercury with Mercurius Caledonius. The grant by the town council of Edinburgh in December 1718 of a licence to James M'Ewan to print an Evening Courant three times a week appears to have been really a revival, in altered form, of the original Courant, repeatedly referred to in earlier, but not much earlier, records of the same corporation. So revived, the Evening Courant was the first Scottish paper to give foreign intelligence from original sources, instead of repeating the advices sent to London. In 1780 David Ramsay became its proprietor. Under his management it is said to have attained the largest Scottish circulation of its day. It was then of neutral politics. Subsequently, returning to its original title, and appearing as a daily morning paper, it ranked for long as the senior organ of the Conservative party in Scotland, but at last the compe- tition of the Scotsman caused its disappearance, and after amalgamat- ing with the Glasgow News or the Scottish News in 1886, it expired in

1888.

The Edinburgh Weekly Journal began in 1744, but it only attained celebrity when, almost seventy years afterwards, it became the joint property of Sir Walter Scott and of James Ballantyne. Scott wrote in its columns many characteristic articles. Ballantyne edited it until his death in 1833, and was succeeded in the editorship by Thomas Moir. The paper was discontinued about 1840. The Edinburgh Evening News started in 1873.

The Scotsman, the leading Scottish newspaper, was established as a twice-a-week paper injanuary 1817 and became a daily in June 1855. It ranked as the chief organ of the Liberal party in Scotland, until the Home Rule split in 1886, when it became Unionist. It was founded by William Ritchie, in conjunction with Charles Maclaren. For a short period it was edited by J. R. M'Culloch, the eminent political economist. He was succeeded by Maclaren, who edited the paper until 1845, and he in turn in 1848 by Alexander Russel (1814- 1876), who (with Mr Law as manager) continued to conduct it with

Kingdom's Intelligencer. But this was a London newspaper, dating from 1662, which may occasionally have been reprinted in Scotland; no such copies, however, are now known to exist. In like manner the Scottish Mercury, No. 1, May 8, 1692, appears to have been a London newspaper based upon Scottish news-letters, although in an article written in 1848, in the Scottish Journal of Topography, vol. ii. P- 303, it is mentioned as an Edinburgh newspaper.

1 During an imprisonment of six weeks in the Tolbooth of Edin- burgh his health suffered so severely that he died very shortly after his release.

- Grant, History of the Newspaper Press (1873), iii. 412.

great ability until 1876. In 1859 the first of Hoe's rotary ffiachhiefe brought into Scotland was erected for the Scotsman. The Scotsm&k soon developed into a great newspaper, strong both on its literary side and also in gathering news; and it was circulated all over Scotland, its publishing offices being opened in Glasgow, which was a better centre for distributing in the west, and in Perth for the north. At last under Charles A. Cooper it succeeded in killing all its rivals in Edinburgh. In 1885 the Scotsman issued an evening paper.

The North British Advertiser was founded in 1826, The Witness began in 1840 as the avowed organ of what speedily became the Free Church party in Scotland. In its first prospectus it calls itself the Old Whig. The paper appeared twice a week, and its editor, Hugh Miller,

very soon made it famous. In the course of less than sixteen years he wrote about a thousand articles and papers, conspicuous for literary ability, still more so for a wide range of acquirement and of original thought, most of all for deep conscientiousness. It survived its first editor's death (1855) only a few years.

In Glasgow the Glasgow Herald was founded in 1782. When the Scotsman extended its activities to Glasgow, the Herald opened an office in Edinburgh ; and it took an active part in breaking down the old localism of Scottish papers. In later years it became a powerful organ. The North British Daily Mail was established in April 1847. George Troup, its first editor, made it specially famous for the organizing skill with which he brought his intelligence at an unprecedented rate of speed from Carlisle, the nearest point then connected with London by railway. 3 The Glasgow Evening News was started in 1870.

The Aberdeen Journal was founded as a weekly paper in 1748 and became a daily in 1876. In 1879 it issued an evening edition. The Aberdeen Daily Free Press, originally a weekly, dates from 1853. In 1 88 1 it issued an evening paper in connexion with itself. The Dundee Advertiser, established in 1801, towards the latter part of the century extended its sphere of influence much on the lines of the Scotsman and Glasgow Herald. It issued the Evening Telegraph in 1877. In 1859 the Dundee Courier, a half penny paper, had begun.

It may be added that a very large number of the men who have distinguished themselves by their labours on the great newspapers of London, and several who rank as founders of these, began their career and have left their mark on the newspapers of Scotland.

Ireland.— In 1641 appeared a sheet called Warranted Tidings from Ireland, but this, with Ireland's True Diurnal (1642), Mercurius Hibernicus (1644), the Irish Courant (1690), were all of them London newspapers containing Irish news. The real newspaper press of Ireland began with the Dublin News-Letter of 1685. Five years later appeared the Dublin Intelligencer (No. 1, September 30, 1690}. Both of these were shortlived. Pue's Occurrences followed in 1700 and lasted for more than fifty years, as the pioneer of the daily press of Ireland. In 1710 or in 171 1 (there is some doubt as to the date of the earliest number) the Dublin Gazette began to appear, the official organ of the vice-regal government. Falkener's Journal was established in 1728. Esdatle's News-Letter began in 1744, took the title of Saunders's News-Letter in 1754 (when it appeared three times a week), and became a daily newspaper in 1777.

In the Nationalist press the famous Freeman's Journal has long been prominent amongst the Dublin papers. It was established as a daily paper by a committee of the first society of "United Irishmen " in 1763, and its first editor was Dr Lucas. Flood and" Grattan were at one time numbered amongst its contributors, although the latter, at a subsequent period, is reported to have exclaimed in his place in the Irish parliament, " The Freeman's Journal is a liar … a public, pitiful liar." In 1870 it brought out the Evening Telegraph. In 1891 the dissensions among the Irish Nationalists led to the establishment of the Parnellite Dublin Daily Independent and Evening Herald. In 1897 the Nation, formerly a weekly, was brought out as a daily. On the Unionist side the principal Irish paper is the Dublin Irish Times (1859).

Waterford possessed a newspaper as early as 1729, entitled the Waterford Flying Post. It professed to contain " the most material news both foreign and domestic," was printed on common writing paper and published twice a week at the price of a halfpenny. The Waterford Chronicle was started in 1766.

The Belfast News-Letter was started in 1737; the Belfast Evening Telegraph in 1870; the Belfast Northern Whig in 1824.

British Dominions beyond the Sea- It is unnecessary here to give all the statistics for the British Colonial press, which has enormously developed in modern times. So far as its early history is concerned, it may be noted that Keimer's Gazette was started in Barbadoes in 1731 and Granada followed with a newspaper of its own in 1742. In Canada the Halifax Gazette was established in 175 1 and the Montreal Gazette in 1765. The first Australasian paper was the Sydney Gazette and New South Wales Advertiser (1 803-1 843), the Derwent Star, in Van Dieman's Land (Tasmania), starting in 1810. In modern days all the British dominions beyond the sea have produced important and well-con- ducted papers. The Canadian press has naturally had certain marked affinities with the American ; but the Globe in Toronto, as

3 See Notes and Queries, 5th series, vii. 45, viii. 205.

the organ of the Liberal party, has played a leading part in Canadian history. In Australia the Sydney Bulletin, the Sydney Morning Herald

(1831— daily since 1840), Sydney Daily Telegraph, Melbourne Argus (1846) and Melbourne Age (1854), with the evening Melbourne Herald, have been the most important. In South Africa the Cape Times (1876) has been the principal paper, but some of the Transvaal English papers have exercised great influence in the disturbed political conditions since about 1895.

India. — For a considerable period under the rule of the East India Company the Indian press was very unimportant both in character and influence. It was permitted to shape its course and to gain a position as it could, under the potent checks of the deportation power and the libel law, without any direct censorship. Nor was it Found difficult to inflict exemplary punishment on the writers of " offensive paragraphs."

Prior to Lord Wellesley's administration the most considerable newspapers published at Calcutta were the World, the Bengal Journal, the Hurkaru, the Calcutta Gazette (the organ of the Bengal government), the Telegraph, the Calcutta Courier, the Asiatic Mirror and the Indian Gazette. Mr Duane, the editor of the World, was sent to Europe in 1794 for " an inflammatory address to the army," as was Mr Charles Maclean, four years afterwards for animadverting in the Telegraph on the official conduct of a local magistrate.

The Calcutta Englishman dates from 1 82 1 . Lord Wellesley was the first governor-general who created a censorship (April 1799). His press-code was abolished by the marquis of Hastings in 181 8. The power of transporting obnoxious editors to Europe of course remained. Perhaps the most conspicuous instance of its exercise was the re- moval of the editor of the Calcutta Journal (Silk Buckingham), which occurred immediately after Lord Hastings's departure from India and during the government of his temporary successor, Mr John Adan. Buckingham's departure was followed closely (14th March 1823) by a new licensing act, far exceeding in stringency that of Lord Wellesley, and (5th April 1823) by an elaborate " Regulation for preventing the Establishment of Printing-Presses without Licence, and for restraining under certain circumstances the Circulation of Printed Books and Papers." The first application of it was to suppress the Calcutta Journal.

In the course of the elaborate inquiry into the administration of India which occupied both Houses of Parliament in 1832, prior to the renewal of the Company's charter, it was stated that there were, besides 5 native journals, 6 European newspapersˆ three daily, the Bengal Hurkaru, John Bull and the Indian Gazette; one published

twice a week, the Government Gazette; and two weekly the Bengal Herald and the Oriental Observer. At this period every paper was published under a licence, revocable at pleasure, with or without previous inquiry or notice. At Madras, on the other hand, the press remained under rigid restriction. The Madras censorship was removed whilst the parliamentary inquiry of 1832 was still pending.

One question only, and that but for a brief interval, disturbed Lord William Bentinck's love of free discussion. The too famous " Half-Batta " measure led him to think that a resolute persistence in an unwise policy by the home government against the known convictions of the men actually at the helm in India and an un- fettered press were two things that could scarcely co-exist. It was on this occasion that Sir Charles Metcalfe recorded his minute • of September 1830, the reasoning of which fully justifies the assertion — " I have, for my own part, always advocated the liberty of the press, believing its benefits to outweigh its mischiefs ; and I continue of the same opinion." This opinion was amply carried out in the memorable law (drafted by Macaulay and enacted by Metcalfe as governor-general in 1835), which totally abrogated the licensing system. It left all men at liberty to express their sentiments on

fmblic affairs, under the legal and moral responsibilities of ordinary ife, and remained in force until the outbreak of the mutiny of

1857.

In 1853 Garcin de Tassy, when opening at Paris his annual course of lectures on the Hindustani language, enumerated and gave some interesting details concerning twenty-seven journals (of all sorts) in Hindustani. In i860 he made mention of seventeen additional ones. Of course the circulation and the literary merits of all of them were relatively small. One, however, he said, had reached a sale of 4000 copies. 1

In 1857 Lord Canning's law, like that of 1823, on which it was closely modelled, absolutely prohibited the keeping or using of printing-presses, types or other materials for printing, in any part of the territories in the possession and under the government of the East Indian Company, except with the previous sanction and licence of government, and also gave full powers for the seizure and prohibition from circulation of all books and papers, whether printed within the Indian territories or elsewhere.

In 1878 an act was passed, which long remained in force, regulating

the vernacular press of India: ” Printers or publishers of journals in Oriental languages must, upon demand by the due officer, give bond not to print or publish in such newspapers anything likely to excite

1 The Hurkaru and the Indian Gazette were long afterwards combined under the new leading title, Indian Daily News (with the old name appended).

feelings of disaffection to the government or antipathy between persons of different castes or religions, or for purposes of extortion. Notification of warning is to be made in the official gazette if these regulations be infringed (whether there be bond or not) ; on repetition, a warrant is to issue for seizure of plant, &c. ; if a deposit have been made, forfeiture is to ensue. Provision is made not to exact a deposit if there be an agreement to submit to a government officer proofs before publication.” After the disturbances of 1908-1909 further and more stringent regulations were made.

The Indian Daily Mirror (1863) was the first Indian daily in English edited by natives. The total number of journals of all kinds pub- lished within all the territories of British India was reported by the American consular staff in 1882 as 373, with an estimated average aggregate circulation per issue of 288,300 copies. Of these, 43, with an aggregate circulation of 56,650 copies, were published in Cal- cutta; 60, with an aggregate circulation of 51,776 copies, at Bombay. In 1900 it appeared from the official tables that there were about 600 newspapers, so Called, published in the Indian empire, of which about one-third, mostly dailies, were in the Indian vernaculars. Calcutta had 15 dailies {Calcutta Englishman, &c.);. Bombay 2 (Bombay Gazette) ; Madras 4 (Madras Mail) ; Rangoon 3 (Rangoon Times); Allahabad 2 (Pioneer); Lahore 2 (Civil and Military. Gazette). |

• Authorities. — For late developments, see Mitchell s, Sell s and Willing's Press Directories. For historical information: J. B. W. Williams, Hist, of British Journalism to the Foundation of the Gazette (1908); H. R. Fox-Bourne, English Newspapers (1877); "The Newspaper Press," Quarterly Review, cl. 498-537 (October, 1880); Hatton, Journalistic London (1882) ; Pebody's English Journalism (1882); Progress of British Newspapers in the 19th Century (1901; published by Simpkin, Marshall & Co.) ; Andrews, History of British Journalism (2 vols., i860); Hunt, The Fourth Estate; Grant, The Newspaper Press (3 vols., 1871-1873); Plummer, "The British Newspaper Press," Companion to the Almanac (1876); Nichols, Literary Anecdotes of the Eighteenth Century, iv. 33-97- (H. Ch.)

3. Newspapers of the United States 2 Massachusetts. — Boston was the first city of America that possessed a local newspaper; but the earliest attempt in that direction, made in 1689, and a second attempt, under the title Publick Occurrences, which followed in September 1690, were both suppressed by the government of Massachusetts. Nearly fourteen years afterwards (April 24, 1704), the first number of the Boston News-Letter was " printed by B. Green, and sold by Nicholas Boone." Its proprietor and editor — so far as it can be said to have had an editor, for extracts from the London papers were its staple contents — was John Campbell, postmaster of the town. In 1 7 19 he enlarged his paper, in order, as he told his readers, " to make the news newer and more acceptable; ... whereby that which seem'd old in the former half-sheets becomes new now by the sheet. . . . This time twelvemonth we were thirteen months behind with the foreign news beyond Great Britain, 3 and now less than five months; so that … we have retrieved about eight months since January last"; and he encourages his subscribers with the assurance that if they will continue steady " until

January next, life permitted, they will be accommodated with all the news of Europe . . . that are needful to be known in these parts." But Campbell's new plans were soon disturbed by the loss of his office, and the commence- ment of a new journal by his successor in the postmastership, William Brooker, entitled the Boston Gazette " published by authority" (No. 1, 21st December 1719). The old journalist had a bitter controversy with his rival, but at the end of the year 1722 relinquished his concern in the paper to Benjamin Green, who carried it on, with higher aims and greater success, until his death, at the close of 1733, being then succeeded by his son-in- law, John Draper, who published it until December 1762. By Richard Draper, who followed his father, the title was altered to Massachusetts Gazette and Boston News-Letter; and the maintenance of the British rule against the rising spirit of independence uniformly characterized his editorship and that of his widow (to whom, at a subsequent period, a pension was

2 For the general conditions producing the modern type of American newspaper, see the first section of this article. In the following account of American and foreign newspapers, the historical material in the 9th and 10th editions of the Ency. Brit, has been utilized and in parts repeated.

3 In other words, the attention of the Bostonian politicians was engrossed on the siege of Belgrade, when their contemporaries in the mother country were intent on the destruction of the Spanish fleet on the coast of Sicily.

granted by the British government). It was the only paper printed in Boston during the siege, and ceased to appear when the British troops were compelled to evacuate the city.

The Boston Gazette, founded in 1719, had James Franklin, elder brother of the celebrated Benjamin Franklin, as its first printer. It lasted until the end of 1754, its editorship usually changing with the change of the postmasters. On the 17 th August 1721 James Franklin started the New England C our ant, the publication of which ceased in 1727; and two years later Benjamin Franklin purchased the Pennsylvania Gazette, which he continued weekly until 1765.

To the Boston Gazette and the Courant succeeded the New England Weekly Journal (20th March 1727; incorporated with the Boston Gazette in 1741), and the Weekly Rehearsal (27th September 1731), which became the Boston Evening Post (August 1735), and under that title was for a time the most popular of the Boston newspapers. It aimed at neutrality in politics, and there- fore did not survive the exciting events of the spring of 1775. Several minor papers followed, which may be passed over without notice. A new Boston Gazette, which began in April 1755 (merged in 1836 in the Centinel), is of more interest. For a long time it was the main organ of the popular party against England, and expounded their policy with great ability, and in a dignified temper. Otis, John Adams, Samuel Adams and Joseph Warren were amongst its writers. It was strongly Republican after the adoption of the constitution, especially opposing its old contributor John Adams.

The Massachusetts Spy (1770), under the indefatigable editor- ship of the American historian of printing, Isaiah Thomas, did yeoman's service in this struggle, although of a different kind from that of the-Boston Gazette. The latter spoke chiefly to the thinkers and natural leaders of the people. The Spy was a light and active skirmisher who engaged his antagonists wherever he met them, and frequently carried the war into the enerny's country. In July 1774, during the operation of the Boston Port Act, and soon after the landing of four British regiments, it adopted Franklin's odd device, representing Great Britain as a dragon, and the colonies as a snake divided into nine parts with the motto, " join or die." But Boston grew too hot for the patriotic printer, and he had to remove to Worcester on the day of the battle of Lexington. Here the paper continued to be published (as the Worcester Spy) until 1786, — the lack of the stirring revolutionary matter being occasionally supplied by the republication in its columns of entire books, such as Robertson's America and Gordon's History of the Revolution. This journal, like so many more, was for a time killed by a tax. The stamp duty imposed in March 1786, though amounting to but two- thirds of a penny, and very speedily repealed, led to its suspension until April 1788, when the weekly Massachusetts Spy was revived, lasting till 1848. A morning edition, the Worcester Spy, was started in 1845 and continued to be published till May 1904.

The Boston Centinel was another memorable newspaper. It was founded in 1784 as the Massachusetts Centinel and the Republican Journal, a semi-weekly; in 1790 becoming the Columbian Centinel. For many years it was edited by Major B. Russell (1 761- 1845), a man who combined real ability with moderation of temper and singular modesty and disinterested- ness. He printed the Acts of Congress for a

very long time without charge, but the government eventually gave him £1400 in recognition of his work. The Centinel had good foreign news, and Russell was intimate with Louis Philippe and Talleyrand when they were in Boston. In 1830 it absorbed the Palladium (founded in 1793 as the Massachusetts Mercury, and renamed in 1 80 1 the Massachusetts Mercury and New England Palladium), and in 1836 the Boston Gazette, but in 1840 was merged in the Boston Advertiser. The Boston Daily Advertiser was founded in 1813, and in 1832 absorbed the Patriot, which in 1819 was started out of a nucleus chiefly composed of the New England Chronicle

(1776).

William Lloyd Garrison's once well-known Liberator was founded at Boston on New Year's Day 183 1. For a time its editor was also writer, compositor and pressman. In December

of that year the legislature of Georgia offered a reward of 5000 dollars to any one who would cause him to be apprehended and brought to trial. He continued the paper till 1865 and lived to witness the abolition of negro slavery. In 1827 Garrison also edited in Boston the National Philanthropist, the first American total abstinence paper.

Among modern Boston papers the most important are the Evening Transcript (1830), Herald (1836), Daily Advertiser (1813). Globe (1872), Boston American (1904) and Post (183 1).

Of Massachusetts papers outside Boston the most important still in existence in 1910 was the morning Springfield Republican (weekly, 1824; daily, 1844), established by Samuel Bowles, father of Samuel Bowles (1826-1878), its most famous editor.

The Evening Salem Gazette, originally a weekly (1768), was a famous paper during the War of Independence and in the period immediately after. The Hampshire Gazette of Northampton, Massachusetts, founded in September 1786 in the interests of the Administration at the time of Shays 's Rebellion, started its daily edition in 1890. The v/etkly Gazette and Courier (1841), was a consolidation of the Greenfield Gazette (1792) and the Courier (1838). The Salem Register and Mercury continues the Salem Register (1800) and the Mercury, which was published in Salem as early as 1768, but not continuously. The Haverhill Evening Gazette dates from 1798. In Pittsfield is published the Berkshire County Eagle, a weekly established in 1789, with an evening edition, the Berkshire Evening Eagle (1892). The Newburyport Herald (evening 1880; morning 1892) continues the title

of an earlier paper (1797) owned by Ephraim W. Allen and William S. Allen.

At the commencement of the struggle for independence in 1775 Massachusetts possessed 7 newspapers, New Hampshire 1 (the New Hampshire Gazette), Rhode Island 2, and Connecticut 3, — making 13 in all for the New England colonies. Pennsylvania had 8, of which the earliest in date was the American Weekly Mercury (No. 1, 22nd December 1719) ; and New York but 3, the oldest of them being the New York Gazette (1725). Up to that period (1725) Boston and Philadelphia were the only towns possessing a newspaper throughout America. In the middle and southern colonies there were, in 1775, in the aggregate, 10 journals, of which Maryland, Virginia and North Carolina possessed each 2, South Carolina 3 and Georgia 1. The tctal number of the Anglo-American papers was 34, and all of them were of weekly publication.

New Hampshire.— -The New Hampshire Gazette (1756; daily edition since 1852), published at Portsmouth, was the ” father ” of the New England press. The Cheshire Republican (1793) and New Hampshire Sentinel (1799; evening edition since 1890) are still published at Keene.

Vermont. — The earliest paper established in Vermont was the Green Mountain Postboy, first published in April 1781. The oldest important paper in Vermont is the Rutland Herald (established in 1794 as a weekly; daily edition since 1 861). The Vermont Journal of Windsor, Vermont, was established in

1783-

Maine. — The first papers of any importance published in Maine were the Portland Advertiser (evening, 1785), of which James G. Blaine was editor in 1857-1860; and the Eastern Argus of Portland (September 1803). The latter was established by Nathaniel Willis (1780-1870), the father of N. P. Willis. Willis was converted in Portland by Edward Payson and about 1808 he left the paper. In 1816-1826 he established in Boston the Recorder, which is supposed to have been the first American religious paper. In 1827 Willis established the Youth’s Com- panion, the most popular American juvenile paper. The Eastern Argus was edited in 1820-1824 by Seba Smith (1818-1868), who established in 1829 the Portland Courier, which he edited until 1837 and to which he contributed the sketches republished in 1833 as Life and Letters of Major Jack Downing.

Connecticut. — The Connecticut Courant of Hartford was established in October 1764 as a weekly; in 1893 there appeared a semi-weekly issue, and its daily issue, the Hartford Courant, first appeared in 1837. The paper was a strong supporter of the administrations of Washington and Adams. Probably the best known of its editors is Joseph R. Hawley. Charles Dudley Warner was long a member of the staff. The Hartford Times (semi-weekly 1817; daily, 1841) has always been a prominent paper. Its principal early editors were Gideon Wells in 1826- 1836 (in 1861-1869 he was United States secretary of the navy), and John Milton Niles (1787-1856), who was United States

senator in 1835-1839 and 1843-1849 and was postmaster-general of the United States in 1840-1841.

Next to the Courant, the oldest paper still published in Con- necticut is the New Haven Journal, established as a weekly in 1766 (the weekly edition is now styled the Connecticut Herald), which first appeared as a daily in 1834 as the Morning Journal and Courier. The New London Gazette (1763), which in 1773 became the Connecticut Gazette, ceased publication in 1844. Another Gazette was established in New London for a time, but is no longer published and was in no way connected with the earlier paper. The Danbury News (weekly, 1870, when The Times and Jejfersonian were consolidated; daily, 1883) is known for the humorous sketches contributed by its proprietor James – Montgomery Bailey (1841-1894). The Republican Farmer (weekly) was established in 1790 in Danbury and in 1810 removed to Bridgeport; the Evening Farmer was first published m 1855. The Norwich Courier (weekly, 1796) has a daily edition, the Bulletin (1858).

Rhode Island. — The oldest paper now published in Rhode Island is the Newport Mercury (weekly; 1758), which, like most of the other New England patriot sheets, was suppressed in 1765; it was established by James Franklin, a nephew of Benjamin Franklin.

Pennsylvania. — The Aurora (1790) was the most notable of the early Philadelphia papers, next to Franklin’s Gazette. It was founded by Franklin’s grandson, Benjamin Franklin Bache, who in 1784 had started the American Daily Advertiser, the first American daily. Bache

and his successor William Duane (who edited the paper till 1822) bitterly attacked Washington, Adams and Hamilton; and the Aurora after 1793 was practically the organ of Jefferson, but ceased to be of importance after the national capital was removed from Philadelphia. From 1791 to 1793 the principal Anti-Federalist paper was the National Gazette, edited by Philip Freneau, whom Jefferson brought to Philadelphia. As opposed to these there was the United States Gazette, founded in New York in 1789, but removed to Phila- delphia in 1790, which represented Alexander Hamilton. This journal afterwards (1826-1847) was an important Whig organ, under the editorship of Joseph Ripley Chandler (1792-1880). In 1847 it was consolidated with the North American (1830), which still survives in Philadelphia, having in its progress also absorbed the Pennsylvania Gazette (1729-1845), for a time owned by Benjamin Franklin, the Pennsylvania Packet (founded 1771) and other papers.

Other important Philadelphia papers still in existence are, the Public Ledger (1836), founded as a one-cent paper, purchased in 1864 by George W. Childs, who increased the price from b\ to 10 cents a week; the Philadelphia Evening Bulletin, which consolidated the American Sentinel (1815) and the Evening Bulletin (1847); and the Press (1857), edited from 1880 to 1908 by Charles Emory Smith (1842-1908), United States Minister to Russia in 1890-1892, and postmaster-general of the United States in 1898-1902.

Benjamin Lundy edited in Philadelphia in 1836-1838 the National Enquirer (anti-slavery), which became the Pennsylvania Freeman and in 1838-1840 was edited by John G. Whittier.

Outside of Philadelphia the oldest papers of importance in Penn- sylvania are the Pittsburgh Gazette, first published in 1786 and probably the first newspaper published west of the Alleghanies, which in 1906 was consolidated with the Times (1879) to form the Gazette Times; and the Pittsburgh Post (1792; daily, 1842), one of the few influential Democratic papers published in Pennsylvania ; the Pittsburgh Dispatch (1846) is a morning paper. Other papers founded before 1801 (and still published) in Pennsylvania are: the Franklin Repository of Chambersburg (weekly, 1ˆ90; daily, 1883), of which A. K. McClure was proprietor and editor in 1 850-1856 ; the Reading Adler (weekly, 1796), the oldest existing German newspaper in the country; the Intelligencer of Lancaster (1799), with which the Journal (1794) was combined in 1839; the Westmoreland Democrat of Greensburg (weekly, 1799) ; the Herald of Norristown (weekly, 1799; daily, 1848).

Maryland. — The earliest journal of Maryland was William Tarks's Maryland Gazette, of Annapolis, begun in 1727, when in all America it had but six existing predecessors. Discontinued in 1736, it was revived in 1739 by Jonas Green and lasted till 1839.

The oldest paper now published in Baltimore is the American, the successor of the Maryland Journal and Baltimore Advertiser founded in August 1773; on the 21st September 1814 it pub- lished " The Star Spangled Banner." The Baltimore Sun was started in 1837.

New Jersey. — New Jersey had no really established newspaper before the Revolution, although the first number of an intended journal was published in 1765, under the title of the Constitu- tional Gazette, containing matters interesting to Liberty, but no wise repugnant to Royalty. The earliest regular paper was the New Jersey Gazette, which began in December 1777 at Burlington (soon removing to Trenton), and ceased publication in 1786. A State Gazette (weekly), now published in Trenton, dates from 1792 (daily, 1846); Trenton's largest paper is the Times (evening; 1882). The Sentinel of Freedom, a Newark weekly, was first published in 1796; its daily edition, the Star, dates from 1832. Newark's largest paper is the Evening News (1883). The New Brunswick Times was first published as a weekly in 1792; a daily edition was added in 1849.

Virginia. — Virginia, notwithstanding its illustrious pre- cedency — the province of Raleigh, the cradle of Washington — possessed neither newspaper nor printing office until 1736, so that (as respects one-half at least of the wish) there was once a prospect that the devout aspiration of Sir William Berkeley might be realized. " Thank God," said this Virginian governor in 167 1, "we have neither free school nor printing press, and I hope may not have for a hundred years to come." The earliest journal established in the state was the Virginia Gazette, commenced in 1736. It was still published at Williamsburg in 1766, when a second paper of the same name was established there. This second paper, backed by Thomas Jefferson, was afterwards called the American Advertiser and then the Com- mercial Advertiser, and stopped in 1822. The Richmond En- quirer, which started in 1808, succeeding the Examiner, early attained a leading position as a Democratic organ; it was discontinued in 1880. The Alexandria Gazette (18 16) is still published.

Washington, D.C. — The first " administration organ " (i.e. expressing the political views of the administration, but not officially a government paper), was the National Intelligencer (1800); this position it held until 1829, when it became an opposition paper. In

Jackson's administration the United States Telegraph, which had been purchased in 1826 by Duff Green, became the "administration organ"; but in 1830 it was supplanted by the Globe. The United States Telegraph, which had supported Calhoun, remained his organ until 1835, strongly favouring slavery and opposing the abolition press. The Globe after December 1830 was conducted by Francis Preston Blair the elder and John C. Rives (1795-1864); it opposed Nullification, Secession, and the Southern wing of the Democratic party. In 1841 the National Intelligencer became the administration organ; it was succeeded in the same year by a new paper, the Daily Madisonian, President Tyler's organ, and in 1845 the Union became the organ of President Polk. To the Union in 1845 the Globe sold out, but only as a party organ. In 1846 to 1871 the Globe was the publisher of the Congressional debates. President Taylor's organ during his administration was the newly established Republican. During President Fillmore's presidency the National Intelligencer , which was a Webster- Whig organ, returned to power, and during Pierce's administration the Union was again the administration organ, with the Evening Star (1852) a close second. In Buchanan's administration the influence of the Union continued. During the Civil War most of these papers died off, except the Star and the National Intelligencer, which in 1870 removed to New York, where it stayed as a semi-weekly for some time. The Washington Post, now the leading paper, was founded in 1877. The National Era, the organ of the American and Foreign Anti-Slavery Society, first published in Washington in 1844 (the Cincinnati Philanthropist was merged with it in 1847) by Gamaliel Bailey, is known principally because Uncle Tom's Cabin ran in its columns as a serial in 1851-1852. A New

National Era (1870), was conducted in Washington by Frederick Douglass and his sons.

New York.— The New York Gazette (which started in New York City on the 16th of October 1725) was followed by the Weekly Journal (No. 1, 5th November 1733), still memorable for the prosecution for sedition which it entailed on its printer, John Peter Zenger, and for the masterly defence of the accused by Andrew Hamilton. " The trial of Zenger," said Gouverneur Morris, " was the germ of American freedom." Gaines's New York Mercury was published from 1752 to 1783. James Riving- ton (1724-1802) in 1773 published the New York Gazetteer as a loyalist sheet, but his press was destroyed in 1775 and

he went to England; in 1777 he returned and published Rivington's New York Loyal Gazette (semi- weekly), renamed first the Royal Gazette and then Rivington's New York Gazette and Universal Advertiser, which came to an end in 1783. The semi-weekly Independent Journal was one of the papers of New York City in which, between October 27th, 1787, and April 2nd, 1788, the Federalist essays were published; in 1788 it became part of the New York Gazette, and then in 1840 was consolidated with the Journal of Commerce. The first daily newspaper published in the city or state of New York was the New York Journal and Register, commenced in 1788. In 1802 the Morning Chronicle, edited by Peter Irving (1771-1838), a brother of Washington Irving, was established as Aaron Burr's organ; in 1805 it was merged in the Poughkeepsie Journal. Another political paper was the Minerva (1793), under Noah Webster, which had a semi- weekly edition, the Herald. These in 1797 became the Com- mercial Advertiser and New York Spectator respectively. The former (surviving as the Globe and Commerical Advertiser) was edited in 1820-1844 by W. L. Stone and in 1867 by Thurlow Weed.

In 1810 the aggregate number of papers published within the state was 66, of which 14 belonged to New York City. Ten years later the city press included 8 daily journals, with an aggregate daily circulation of 10,800 copies. No one paper circulated more than 2000, and but two— the Evening Post (1801) and the Com- mercial Advertiser (1797)— attained that number.

The New York Evening Post was at first strongly Federalist and practically an organ of Alexander Hamilton, who with John Jay assisted in founding it. Its first editor was William Coleman (1766-1829). In the years immediately following 1819 John Rodman Drake contributed to the Post the " Croaker " pieces, in which FitzGreene Halleck joined. William Cullen Bryant began to write for the Post in 1826, and became its editor-in-chief in 1828. John Bigelow, Parke Godwin, Carl Schurz, Horace White, E. L. Godkin, editor from 1881 to 1901, and Henry Villard, are the important names in its history. Rollo Ogden became editor in 1903. Closely connected with the Post is the weekly Nation, long edited by E. L. Godkin (q.v.). The Post was strongly Federalist until the War of 181 2; it opposed the Hartford Convention; until i860 it was consistently Democratic; it supported Lincoln in i860 and in 1864 and Grant in 1868; in later years it was an advocate of free trade and of civil service reform. There were earlier Evening Posts in 1 746-1 747 and in 1794.

The cheap (two-cent) press of America (the previous price having

usually been six cents) began in New York in the shape of the Morning Post (1st January 1833), which only lasted a few weeks; the real pioneer was the Daily Sun (No. 1, 23rd September 1833), written, edited, set up, and worked off by Benjamin Henry Day, a journeyman printer. It sold at one cent till the Civil War, when it charged two cents, the price remaining at that figure. The New York Sun was acquired in 1868 by Charles Anderson Dana (q.v.), who made it a powerful organ, and under his successor William M. Laffan (1848-1909) it remained one of the great dailies.

The New York Herald followed in May 1835, founded and edited by James Gordon Bennett (q.v.), and his efforts and those of his son gave it an enormous commercial success.

The New York Tribune was established in 1841 by Horace Greeley (q.v.), who remained its editor and one of its proprietors

until his death, shortly after his defeat for the presidency in 1872. He was succeeded as editor and proprietor by Whitelaw Reid (b. 1837), who had joined the staff in 1868 and afterwards became U.S. Ambassador in London. Directed by two such men the Tribune became a powerful organ.

The New York Times, which was to rank with the Tribune and Sun among the best modern American daily papers, was established by Henry J. Raymond (q.v.) in September 1851; and, though absent at times in the discharge of his duties as lieut.- governor of New York and member of Congress, he. continued its editor and chief proprietor until his death in June 1869. At the end of the century, under the control of Mr Adolph S. Ochs (b. 1858), it was prominent in American journalism for the excellence of its news service and literary character.

The New York World was founded in i860 as a highly moral and religious sheet, which immediately failed and had to be reorganized. In 1861 the Morning Courier and the Enquirer were merged into it. In 1864 it and the Journal of Commerce were suppressed for several days by the Federal authorities because each had been tricked into publishing a forged presidential proclamation of a draft and of a general fast day. In 1869 it became the sole property of Manton Marble (b. 1834), who retired from its editorship in 1875; in 1876 it was sold' to a syndicate and came under the control of Jay Gould; in 1883 it was purchased by Joseph Pulitzer (b. 1847), and its modern activity began. It worked hard for Grover Cleveland, especially in his

first campaign, and opposed W. J. Bryan and his policies.

The journals owned by W. R. Hearst (b. 1863) all over America represent perhaps more conspicuously than any others the popular developments which at the end of the 19th century were associated with the nickname of the “Yellow Press.” His papers in New York in 19 10 were the American (originally Journal; morning except Sunday); the Evening Journal, the Americanˆ and Journal (Sunday) and Das Morgen Journal. Starting in the ‘nineties as proprietor of the San Francisco Examiner, Mr Hearst had a large fortune to enable him to carry out his ideas of a thoroughgoing democratic journalism, appealing particularly to the less literate masses and supplying all sorts of sensational news. The class prejudice often underlying the policy of his papers was bitterly criticized and resented by sober American opinion, but their passionate appeal to the masses, combined with their audacious and lively presentation of news, gave Mr Hearst nevertheless a position of considerable power; and no secret was made of his ambition to reach the highest political positions, both in New York itself and in the Republic. Dangerous as his social influence was considered by important sections of the community, and unsuccessful as he remained’ up to 1910 in obtaining municipal office or presidential nomination, it remained the fact that, in the type of journalism so indefatigably conducted under him, he represented a serious force in American social and political life, and his journalistic methods were a remarkable outcome of the conditions of a modern free press in a democratic country, where a large public exists for the consumption of the sort of newspaper fare which he was ready to provide.

The New York Press (1887) is a morning Republican paper of the strictest party type.

An important commercial paper of long standing in New York is the Journal of Commerce and Commercial Bulletin, founded in 1827 as the Journal of Commerce by Arthur Tappan (1786- 1865) and his brother Lewis Tappan (1788-1873), and in 1893 consolidated with the Commercial Bulletin (1865). The Journal of Commerce in 1829-1830 was the first American paper to send out news schooners which intercepted packet ships which brought news especially of the French Revolution of 1830. Arthur Tappan, who was one of the founders of Oberlin College, estab- lished in 1833 the Emancipator, an abolitionist paper, of which in 1833-1837 Elizur Wright (1804-1885), and in 1837-1840 Joshua Leavitt (1 794-1873), were editors. Leavitt took the paper to Boston. It was the weekly organ of the American Anti-Slavery Society.

THs New Ysrk Evening Mail (1833), for a time the Mail

And Express, was bought in 1888 and reorganized by Elliott Fitch Shepard (1833-1893). The Express was established in 1836 with the help of Willis Hall (1801-1868), a prominent Whig lawyer and politician, by James Brooks (1810-1873), who had formerly been on the Portland Advertiser and in 1832 had written (for the Advertiser) the first regular Washington correspondence. His brother Erastus (1815-1886) was joint owner of the Express in 1836-1877. James Brooks wrote several books of travel and was involved in the scandal of the Cr6dit Mobilier. .

Of the New York newspapers not in English the most important are the following. The Staats-Zeitung (evening, 1834) is published by a company of which in 1909 Herman Ridder (b. 1851) was president, having since 1890 been treasurer and manager. Ridder, a prominent German Democrat and Roman Catholic, established in 1 886 the Catholic News, a weekly with a large circulation, edited by his son Henry Ridder. The Zeitung (morning, 1845), Herald (even- ing, 1879), and Revue (Sundays) are other German papers published by one company. Mr Hearst's Das Morgen Journal dates from 1890. A Socialist Labour paper — daily Volks Zeitung and weekly Vorwaerts — was established in 1 878. The Jewish Daily News and (weekly) Jewish Gazette (1874) in Yiddish and English have large circulations; so have the Jewish Morning Journal (1901 ; Abend Post, 1899, and weekly, Jewish Journal, 1899); the Jewish Herald (evening) and Volksadvocat (weekly), both editions, 1887; and Forward (evening, 1897). The Courrier des Etats-Unis (1828) publishes small daily, Sunday and weekly editions. There are four Italian dailies, the more important being L'Araldo Italiano (1894) and II Progresso Italo-Americnno (1879). The Atlantis (evening, 1894) is a Greek daily. The Listy (1875) and Hlas Lidu (1886) are Bohemian dailies; the Narodni List (1898) is a Croatian daily; the Gaelic American (1903), Irish Nationalist (1888), Irish-American (1849) and Irish World are Irish weeklies printed in English; the Amerikai Magyar Nepsava (1897) is a Hungarian daily, also pub- lished in Cleveland, Ohio; thedas Naroda (1893) is a small Slavonic daily.

Among the New York weekly publications must be mentioned Harper's Weekly, founded in 1856; George William Curtis was first connected with it in 1857, and after 1864 was its political editor.

Under Curtis it was a powerful advocate of civil service reform, and its campaigns against Tammany were made famous by the cartoons of Thomas Nast. During the Civil War Harper's Weekly published Nast's sketches in the field. Frank Leslie's Illustrated Newspaper (now Leslie's Weekly) was founded in 1855 by Frank Leslie (1821-1880), whose ability as a wood-engraver was the basis of its success. Nast was employed by Leslie in 1854 and subsequent years, and was sent to England to sketch the Heenan- Sayers fight. With Harper's and Leslie's Weeklies ranks Collier's Weekly, established in 1888 by Peter Fenelon Collier (d. 1909).

The following are newspapers of Brooklyn. The Eagle (evening, 1841), of which Walt Whitman was editor in 1846-1847, came in 1885 under the editorship of St Clair McKelway (b. 1845), editor in 1 878-1 885 of the Albany Argus. The Times (evening, 1848), like the Eagle, makes a specialty of the news of Long Island. Brooklyner Freie Presse (evening, 1864). The Standard Union (evening, 1864). The Citizen (evening, 1886).

Outside of New York City the most important papers in the political history of the state have been those of Albany. The Albany Argus, established in 1813 (daily, 1824), was the organ of the famous Albany Regency. The Ever'ng Journal of Albany was established in 1830 by Thurlow Weed, who controlled it for 35 years. After 1865 it became the property of Samuel Wilkeson (1817- 1889), and in 1889 William Barnes, Jr., became its editor. The Argus and the Journal held alternately the valuable state printing. A factional fight in the Democratic party over the printing resulted in the establishment of the Atlas in 1843; in 1858 this was con- solidated with the Argus.

In Buffalo the oldest paper is the Commercial, the successor of the Buffalo Gazette. (1811, weekly), which in 1 81 8 became the Niagara Patriot and in 1820 the Buffalo Patriot, and in 1834 the Buffalo Patriot and Commercial Advertiser. The daily issue began in 1835 as the Commercial Advertiser; the weekly was still called by the earlier name. The weekly ceased publication in 1909. In 1890 the daily became the Commercial. The first daily in Buffalo was the Courier (1828), controlled in 1909 by W. J. Conners. The Evening Times (1885) was in 1909 edited by Norman Mack, who was m 1908 treasurer of the Democratic National Committee.

In Rochester are the Democrat and Chronicle (morning and weekly; Democrat, 1826; Chronicle, 1868); Post-Express (evening, 1858); Herald (morning, 1879); an d Union and Advertiser (evening, 1826). It was in Rochester that Myron Holly (1779-1841), who had formerly

edited the Lyons (N.Y.) Countryman (anti-masonic), edited the Freeman, an anti-slavery paper; and here in 1 847-1 860 Frederick Douglass edited the North Star, called Frederick Douglass's Paper after 1855.

In Syracuse are the Evening Herald (1877) and the Post-Standard (morning, Standard, 1829, and Post, 1894, consolidated in 1899).

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In Troy are the Record (morning and evening, successor to the Post, 1812), the Times (daily, 1851; weekly, 1856), the Evening Standard (1877), and the Northern Budget (weekly only, 1797).

The Utica Herald-Despatch and Daily Gazette is the successor of the Whitestown Gazette (1793); the Daily Gazette first appeared in 1842; the Morning Herald (1847) was consolidated with it in 1867: and in 1900 it was purchased by the owners of the Evening Despatch

(1898).

In Catskill, Greene county, New York, was established in August 1792 by Mackay Croswell the Packet, which in May 1804 was suc- ceeded by the Recorder, which in 1909 was still published as a weekly, the largest in the county. Mackay Croswell's son Edwin Crosweli (1797-1871) left the Recorder in 1823 and in 1824 became editor of the Albany Argus; Croswell was state printer in 1 824-1 840 and

1844-1847.

Other papers (mostly with small circulations) in New York state founded before 1801 are: the Gazette of Hudson (weekly, 1785; daily, Evening Register, 1866); the Register of Newburgh (1796; now a daily only) ; the Washington County Post of Cambridge (weekly only, 1798); the Journal of Ballston Spa (weekly, 1798; Ballston Daily Journal, 1 894; Republican) ; and the Gazette of Owego (weekly only, 1800).

Ohio. — The Repository (weekly, 1815; daily, 1878), formerly the Ohio Repository, of Canton, is one of the oldest papers in Ohio. The Western Hemisphere of Columbus was purchased in 1836 by Samuel Medary (1801-1864), who changed its name to the Ohio Statesman; Medary — the " old wheel horse of Democracy," who is said to have originated the cry of " Fifty- four, forty, or fight! " — was a friend of Stephen A. Douglas and governor of Minnesota in 1857-1858 and of Kansas in 1858— i860; S. S. Cox was editor of the Statesman in

1853-1854.

The Weekly Gazette of Cincinnati (founded in 1793 as the Centinel; in 1804-1815 called the Liberty Hall; in 181 5-1883 the Cincinnati Gazette), and the Commercial Tribune (morning; formed in 1896 by the consolidation of the Commercial Gazette and Tribune), are published by the same firm. In 182 5-1840 Charles Hammond (1779-1841), an anti-slavery leader, Was editor of the Gazette. The Commercial was made by Murat Halstead (1829-1908), a prominent Republican politician, and writer of several ” campaign lives ” of Republican presidential candidates, who was the first editor in the Middle West to get news freely by telegraph. The Cincinnati Enquirer (morning, 1842) became a great power in Ohio politics under the ownership (after 1852) of Washington McLean and his son John R. McLean. The Post (1880), the Times-Star {Times 1836), the Volksblatt (1836), the Volksfreund (daily 1850; weekly 1852), and the Freie Presse (1874) are the other large dailies of Cincinnati. In Cincinnati James G. Birney established in 1835 the Philan- thropist, an anti-slavery paper, which Gamaliel Bailey edited in 1837-1847.

The Cleveland Leader (Republican, 1847) was bought in 1853 by Edwin Cowles (1825-1890) and Joseph Medill (after 1855 of the Chicago Tribune). Cowles became sole owner in 1854; he was an anti-slavery Whig and one of the founders of the Republican party in the state. The Leader of 1853 was a con- solidation of the Cleveland Forest City, a Whig paper founded in 1849 by Joseph Medill and united in 1852 with the Free Democrat. Like the Chicago Tribune it was in 1909 controlled by Medill’s “grandson, Medill McCormick (b. 1877), a son-in-law of M. A. Hanna. The Press of Cleveland (evening, independent) was established in 1878 by James Edmund Scripps (1835-1906); with Milton A. McRae (b. 1858) he formed the Scripps-McRae Press Association of Cleveland and the Scripps-McRae League, which included the Cincinnati Post, the St Louis Star -Chronicle, the Cleveland Press, the Kentucky Post of Covington, the Columbus Citizen, and the Times, the News-Bee and Times- Bee of Toledo. Scripps and McRae organized the Publishers’ Press Association of New York, a rival of the Associated Press. Scripps in, his later years was a benefactor of the city of Detroit, where he had established (1873) the Evening News. The Cleveland Plain-Dealer (morning, 1841) is a well-known paper; in its columns appeared the first ” Artemus Ward ” sketches, contri- buted by Charles Farrar Browne (1834-1867), who in 1861 went to New York to edit the short-lived humorous Vanity Fair. The Waechter und Anzeiger (Waechter 1852; Anzeiger 1872) is published in Cleveland.

The larger papers of Columbus are the Ohio State Journal (morning, 1811), the Press-Post (evening, 1827), the Citizen (evening, 1899), and the Express und Westbote (weekly, 1880; Sunday, 1878; daily, 1890 — the different editions being under different names). The News of Springfield has a weekly edition, the Weekly Republic, which was founded in 1817. The Toledo Blade (daily, 1848; weekly, 1835) before and during the Civil War contained the attacks on slavery and on political abuses written by ” Petroleum V. Nasby,” i.e. David Ross Locke (1833-1888). The first of these letters (signed ” Rev. Petroleum Vesuvious Nasby”) appeared in the Jejfersonian of Findlay, Ohio, in i860, when he was its editor. He had edited small papers in Plymouth and Mansfield (O.) before his connexion with the Blade; in 1871 he became managing editor of the Evening Mail of New York City. Will Carleton (b. 1845) was a member of the Blade’s staff, and contributed to the Blade his first ” ballads.” The News-Bee (evening) of Toledo was formed by the consolidation in 1903 of the Times (1846), News (1888) and Bee (1894), and has a morning edition called the Times and a Sunday edition called the Times-Bee. The Zanesville Courier (Republican; daily, 1846) has a weekly edition dating from 1809 (originally the Muskingum Messenger).

Among the smaller newspapers of Ohio the following are more than 100 years old: the Western Star of Lebanon (weekly, 1806); the Ohio Patriot of Lisbon (weekly, 1808; daily and semi-weekly, 1898) ; and the Journal of Dayton (morning, 1808).

Illinois. — The first newspaper in Illinois was the Illinois Herald (1814; succeeded in 181 5 by the Illinois Intelligencer) of Kaskaskia (then the seat of government); it removed to Vandalia, which then became the capital, in 1820; it became the Vandalia Whig and Illinois Intelligencer in 1832; and it ceased publication about 1839, when Springfield became the capital.

The principal papers in Illinois are naturally those of Chicago. The Chicago Tribune (morning; 1847) succeeded The Gem of the Prairie (1844), and a weekly edition was for a time continued under that name. In August 1848 John Locke Scripps (1818- 1866) bought a third interest in the Tribune and became its managing editor. In 1852 he sold it to a syndicate of Whig politicians. A part (in 1855) and

eventually the whole (in 1874) was bought by Joseph Medill (1823-1899). Horace White (b. 1834) was a reporter on the Tribune in 1856, and was its editor and one of its proprietors in 1864-1874; from 1883 to 1903 he was editor-in-chief of the New York Evening Post. In 1858 the Daily Democratic Press, which J. L. Scripps had established in 1852 with William Bross, was consolidated with the Tribune as the Press and Tribune; in i860 the name became the Tribune again; the Tribune Company was incorporated in 1861, with J. L. Scripps as its president. The first newspaper published in Chicago, the Democrat (November 1833), was merged with the Daily Tribune in 1861. The Inter-Ocean (morning; 1872), under the editorship (from 1897) of George Wheeler Hinman (b. 1863), has made a specialty of foreign affairs. The News (evening; 1875) was founded and developed by Melville E. Stone (b. 1848) as a one-cent evening paper. After 1883 Eugene Field contributed to this paper his column " Sharps and Flats," including much verse. In 1888 Victor Fremont Lawson (b. 1850), -who had been associated with Stone, acquired the paper. The Record (morning; 1881), started by Lawson, was consolidated in 1901 with the Herald (1881) as the Record-Herald.ˆ The Evening Post dates from 1889. In 1900 W. R. Hearst estab- 1 lished in Chicago two papers, Hearst's Evening American and the Examiner (the name assumed in 1902 for his morning American). The Chicago German papers include the Freie Presse (evening and weekly; 1871), the Staals-Zeitung (daily, 1847, weekly — Westen und Daheim — 1845; evening edition, the Abend Presse) and Abendpost (1899). The Skandinaven (semi- weekly, 1866; daily, 1871) is an important Norwegian-Danish paper; and there are large Bohemian and Polish dailies.

In Springfield, the state capital, there are two party journals, the Illinois State Journal (Republican; semi-weekly, 1831; daily, 1848) and the Illinois State Register (Democratic; weekly, 1836; daily, 1848).

Michigan. — The Detroit Free Press (morning, 1835; with a weekly agricultural edition, Farm and Live Stock Journal, 1831/ was particularly known in 1869-1891 for the humorous sketches of Charles Bertrand Lewis (b. 1842), who wrote under the pseudonym " M. Quad." The News (morning, 1873) was established by J. E. Scripps (1835-1906).

Missouri. — The oldest paper is the Republic of St Louis, formerly the Republican, founded as a weekly in July 1808, by Joseph Charless, an Irishman who had worked on the Kentucky Gazette in Lexington; it was called first the Missouri Gazette, then (1809) the Louisiana Gazette, then (1812) the Missouri Gazette again, and then (1822) the

Missouri Republican, and in 1886-1888 the St Louis Republican; the present name was adopted in 1888. Its first daily issue was in September 1836 and the first Sunday issue in 1848. The Republican was originally a Jeffersonian Democratic paper; it opposed Thos. H. Benton; it supported Wm. Henry Harrison in 1840, and became a Whig organ; and from 1856 was a Democratic paper. A cause celebre was the trial in 1830 for the impeachment of Judge James H. Peck of the U.S. District Court for Missouri, who had suspended from practice for 18 months and had imprisoned for 24 hours an attorney, Luke Edward" Lawless, who had criticized in the Republican Judge Peck's decision in a Spanish land grant case, which was adverse to Lawless, attorney for the plaintiff. William Wirt appeared for Peck, and he was acquitted. Since 1837 the paper has been almost continuously the property of the Knapp and Paschall families. In 1871 the Repub- lican purchased a Walter press from The Times of London ; it introduced stereotyping in i860, probably before any other news- paper. The Globe-Democrat (morning; Republican, 1852) of St Louis early became a valuable property: in 1872 it was sold for $456,100. In St Louis in 1833-1836 Elijah P. Lovejoy published the Observer, primarily a religious paper, which because of local opposition to its attacks on slavery he removed in July 1 836 to Alton, 111., where he was killed by a mob.

The Post-Dispatch (evening, 185 1) is a consolidation made in 1878 by its proprietor Joseph Pulitzer. Pulitzer's first newspaper experience was in 1868 as a reporter on the Westliche Post (morning, 1857) of St Louis, which has an evening edition, the Anzeiger, a Sunday edition, Mississippi Blaetter, and a semi-weekly and weekly edition, Anzeiger des Westens. Carl Schurz was editor of the West- liche Post in 1867. Another German newspaper in St Louis is Amerika (morning; 1872).

The two principal dailies of Kansas City are the Star (evening, 1880-1881; with a morning edition, the Times, 1838, and a Weekly Star, 1890), founded by William R. Nelson (b. 1841) ; and the Journal (morning, 1854; with a weekly edition). The News-Press (News, 1878; Press, 1902; evening) is the principal paper of St Joseph.

North Carolina. — The Observer (weekly, 1817; daily, 1896) of Fayetteville. The News and Observer (daily ; News, 1872 ; Observer, 1876) and North Carolinian (weekly, 1892) of Raleigh.

South Carolina. — The News and Courier of Charleston (Courier, established 1803 by Loring Andrews, d. 1805, of Hingham, Mass.; News, 1865; consolidated, 1873). The City Gazette of Charleston (founded in 1783 as the South Carolina Weekly Gazette) was edited by

W. G. Simms in 1828-1833, but then failed, after bravely attempt- ing to oppose Nullification, and was finally purchased by the Courier. The State of Columbia (1891) is one of the most influential papers in the South.

Alabama. — The News (evening, 1887) and Age-Herald (morning, 1887) of Birmingham. The Mercury ot Huntsville(weekly, 1816; daily, 1885). The Register of Mobile (weekly, 1821). The Advertiser of Montgomery (1828). The Morning Times of Selma (weekly edition,

1825).

Georgia. — The Constitution of Atlanta (daily, 1868 ; weekly, 1870) : Henry W. Grady (1 851-1889), the orator, was its editor and pro- prietor-in-part from 1880 until his death ; Joel Chandler Harris was an editor (1890-1901) and contributed the Uncle R emus sketches; Frank Lebby Stanton (b. 1857) is well known as a contributor of humorous paragraphs and excellent verse. The Journal of Atlanta (1883; semi-weekly, 1885); its proprietor in 1887-1898 was Hoke Smith (b. 1855), U.S. Secretary of the Interior in 1893-1896, and governor of Georgia in 1907-1909. The Chronicle of Augusta (1785, semi-weekly; now semi- weekly and, since 1837, daily); originally the Augusta Chronicle and Gazette of the State, in 182 1 it became the Augusta Chronicle and Georgia Gazette (then Advertiser); in 1835, the Augusta Chronicle; in 1837, when it incorporated the State's Rights Sentinel— edited for about a dozen years by Judge Augustus Baldwin Longstreet (1 790-1 870), son of the inventor William Longstreet, and author of Georgia Scenes (1840)— the Daily Chronicle and Sentinel; in 1877, after merging with the Constitutionalist (founded before 1800), the Chronicle and Constitutionalist; James R. Randall (1839-1908), author of "Maryland, my Maryland," was senior editor of the Chronicle for some time, having been connected with the Constitutionalist after 1866. The Enquirer-Sun of Columbus (weekly, 1828; daily, 1858). The Telegraph of Macon (semi-weekly, 1826; now daily also). The Union-Recorder of Milledgeville (the Federal Union, 1829, and the Southern Recorder, 1819, united in 1872). The Tribune of Rome (1843). The Morning News of Savannah (1850).

Louisiana. — The Picayune of New Orleans (daily, 1837; weekly,

1841). The Item (evening, 1877) of New Orleans. The Times-Democrat (daily, 1863; semi-weekly, 1895) of New Orleans. L'Abeille de la Nouvelle-Orleans (1827). The States (1880) of New Orleans. On all these see New Orleans. De Bow's Commercial Review appeared in New Orleans in 1846-1861, in Charleston and Washington in 1861-1864, and in New York in 1866-1870; it was edited by James Dunwoody BrownsonDe Bow (1820-1867), formerly (1844-1845) of the Southern Quarterly Review, professor (1848-1850) of political economy in the University of Louisiana, director of the state census in 1850-1853, and of the Federal census in 1853-1855. The Review was intensely Southern in tone and is a most important " source" for the economic history of the South; from it De Bow extracted Industrial Resources of the Southern and Western States (3 vols. New Orleans, 1852-1853).

Florida. — The Florida Times Union and Citizen (1865), with daily and semi-weekly editions; and the Metropolis (1887), both of Jacksonville. The Morning Tribune (weekly, 1870; daily, 1891) of Tampa.

Texas. — The Statesman of Austin (1871). The Morning News of Dallas, established in 1885 by Alfred H. Belo (1839-1901), who in 1875 bought the Galveston News (established 1842) and built up these two papers. The Post (1880) and the Chronicle and Herald (1901) of Houston.

Tennessee. — The Journal and Tribune (Journal, 1839, and Tribune, 1816, consolidated in 1898) of Knoxville. The Commercial Appeal (Appeal, 1840; Avalanche, 1857; Commercial, 1889; consolidated in 1894); and the News Scimitar (Evening Scimitar, 1880, and News, 1902, consolidated in 1904), both of Memphis. The Banner (1875), and the American (1830), both of Nashville. The first paper published in the state was the Gazette (1791) of Rogersville, which removed in 1818 to Knoxville, where it was published for a few years.

Kentucky. — The Louisville Courier- Journal (Journal, 1830; Courier, 1843; Democrat, 1844; consolidated 1868), edited by Henry Watterson. who began his connexion with the Journal in 1867. The Herald (1869) of Louisville. In Frankfort, the Argus of Western America was established in 1806; in 1816 Amos Kendall (1789- 1869) became part owner and co-editor, and under him the Argus was a political power ; it was succeeded in 1 840 by the Yeoman.

Indiana. — The first paper in Indianapolis was the Gazette (January 1822), which in 1830 was consolidated with (and took the name of)

tlje Indiana Democrat; in 1840 it was reorganized as the Indiana Sentinel; in 185 1 it was first published as a daily; in 1865 its name was changed to the Herald, and in 1868 again to the Indianapolis Sentinel; in February 1905 it was bought by the News (v. infra). The Indianapolis Journal (1823) ceased publication in 1904, but was an important Republican sheet especially after 1878, when John Chalfant New (1831-1906) became its editor and proprietor; New was a wealthy banker who was U.S. treasurer in 1875-1876, assistant secretary of the treasury in 1882-1884, and for many years a member (part of the time, treasurer) of the Republican National Committee. The paper was also owned and edited by his son, Harry Stewart New (b. 1858), who was a member of the executive committee of the Republican National Committee. The Indianapolis News (evening, 1869) and the Star (morning, 1903) are the principal papers in the city. The first paper published in the state was at Vincennes in July 1804 and called the Western Sun; it is still published (daily edition since 1879).

Wisconsin. — The principal papers are those of Milwaukee: the Evening Wisconsin (1847); the Sentinel (morning, 1837), edited in 1845-1861 by Rufus King (1814-1876), who was U.S. minister to the Pontifical States in 1863-1867, and a brigadier of volunteers in the Civil War; the News (evening, 1866); the Free Press (morning, 1901) ; the Germania- Abend-Post (1872, with a large weekly edition), and the Kuryer Polski (evening, 1888).

Minnesota. — The Journal (evening, 1878) ; the Tribune (morning, evening and weekly, 1867); and the Tidende (daily, 1887; weekly, 1851 ; Norwegian-Danish) are the principal papers of Minneapolis. In St Paul the best-known paper is the Pioneer Press (founded in 1849; daily since 1854); the Minnesota Pioneer was the first paper printed in the state, and in 1855 it was consolidated with the Minnesota Democrat under the name of Pioneer and Democrat; in 1862 it became the St Paul Pioneer; and in 1875 after the St Paul Press united with it it took the name of the Pioneer Press. The other dailies are the Dispatch (evening, 1868) ; the News (evening, 1900) and the Volks Zeitung (weekly, 1857; daily, 1877).

Kansas. — The Emporia Gazette (evening, 1890) is one of the notable smaller city papers of the country; its reputation being due to its editor and proprietor William Allen White (b. 1868). Other papers of interest are the Leavenworth Times (morning and weekly, 1857) ; in Topeka, the Capital (daily and semi- weekly, 1879); the State Journal (evening and weekly, 1872), and the Herald (evening, 1901); and in Wichita, the Eagle (morning, 1884, and weekly,

1872).

Nebraska. — The News (evening, 1899), the World-Herald (morning and evening, weekly and semi- weekly, 1865), and the Omaha Bee (morning amL evening, .1871) are all of Omaha. The Bee was established by Edward Rpsewater. (1.841-1906); his son Victor (b. 1871) succeeding him in 1895 as managing editor. The.Rose- waters were prominent in the Republican party and headed the

opposition in the state to William Jennings Bryan, who was in 1894-1896 editor of the World-Herald. Bryan also founded at Lincoln the Commoner, a weekly used by him in spreading his political views and in advancing his candidacy for the presidency. The Lincoln dailies are the Nebraska State Journal (morning, 1870; Evening News, 1880; Weekly State Journal, 1868), the Star (evening, 1902); and the evening Post (1896).

Iowa. — The Des Moines papers are the Capital (evening, 1883), the News (evening, 188 1), and the Register and Leader (morning, Leader, 1849, and Register, 1856, consolidated in 1902). At Burlington is the Hawk Eye (morning, 1839), to which Robert Jones Burdette (b. 1844), associate editor in the ‘seventies, contributed humorous squibs. The Burlington Evening Gazette, originally the Wisconsin Territorial Gazette (1837), is one of the oldest papers in the state.

Arkansas. — The Arkansas ‘Gazette (Democratic; morning and weekly) was first published at Arkansas Post in 1819, then removed to Little Rock.

Colorado. — At Denver are the Republican (morning and weekly, 1866); the Post (evening, 1893; weekly, 1901); and the Rocky Mountain News (morning, 1859; evening, The Times, 1872; and a weekly edition).

Arizona.- — At Tombstone, the county-seat of Cochise county, is the well-known Epitaph (1882), a Sunday edition of the Prospector (daily, 1886).

Utah. — At Salt Lake City are the Deseret Evening News (daily and semi-weekly, 1850), controlled by the Mormons; the Salt Lake Tribune (daily, 1870; semi-weekly, 1894), founded by Godbe and Harrison, opponents of Brigham Young, and always anti-Mormon; and the Salt Lake Herald (daily and semi-weekly, 1870). The last named was the principal — and for a time the only— Democratic paper in Utah ; in 1901 it was purchased by Senator W. A. Clark, who sold it in August

1909 to Republican politicians.

California. — At San Francisco are the Call (morning, 1856), owned by John D. Spreckels (b. 1853), principal owner of the Oceanic Steamship Company, and son of Claus Spreckels the ” sugar-king ” ; the Examiner (morning, 1865), founded by Senator George Hearst (1820-1891), the inheritance of which started his son, William Randolph Hearst, in the newspaper business; the Bulletin (morning, 1855); the Chronicle (morning, 1865; weekly, 1874); the Evening Post (187 1; weekly edition, 1875), and the California Demokrat (morning, 1 853; consolidated in 1902 with the Abend Post; weekly edition, California Staats-Zeitung, 1854). The Argonaut (1877) is an able literary weekly.

In Los Angeles the large dailies are the Times (morning, 1881; weekly edition, Saturday Times and Weekly Mirror, 1873); the Herald (morning, 1873); the Express (evening, 1871); the Record (evening, 1895) • an d w. R. Hearst’s Examiner (morning, 1903).

Oregon. — At Portland are the Morning Oregonian (1861; weekly edition, 1850) which has a great reputation on the Pacific Coast; the Oregon Daily Journal (evening and semi- weekly; 1902); and the Evening Telegram (1868).

Washington. — At Seattle are the Post Intelligencer (morning, IS67), and the Times (evening and weekly, 1861).

4. Newspapers or France

The annals of French journalism begin with the Gazette (afterwards called Gazette de France), established by Th6o- phraste Renaudot in 1631, under the patronage of Richelieu, and with his active co-operation. Its price ?” ette * was six centimes. Much of its earliest foreign news came direct from the minister, and not seldom in his own hand. Louis XIII. took a keen, perhaps a somewhat childish, interest in the progress of the infant Gazette, and was a frequent contributor, now and then taking his little paragraphs to the printing office himself, and seeing them put into type. Renaudot was born at Loudun in 1584, studied medicine in Paris and at Mont- pellier, established himself in the capital in 1612, and soon became conspicuous both within and beyond the limits of his profession. Endowed by nature with great energy and versatility, he seems at an early period of his career to have attracted the attention of the great cardinal, and to have obtained permission to establish a sort of general agency office, under the designation of ” Bureau d’Adresses et

de Rencontre." An enterprise like this would, perhaps, naturally suggest to such a mind as Renaudot's the advantage of following it up by the foundation of a newspaper. According to some French writers, however, the project was formed by Pierre d'Hozier, the genealogist, who carried on an extensive correspondence both at home and abroad, and was thus in a position to give valuable help; according to others by Richelieu himself. Be this as it may, Renaudot put his hand zealously to the work, and brought out his first weekly number in May 1631. So much, at least, may be inferred from the date (4th July 1631) of the sixth number, which was the first dated

publication, the five preceding numbers being marked by " signatures " only — A to E. Each number consists of a single sheet (eight pages) in small quarto, and is divided into two parts — the first simply entitled Gazette, the second Nouvelles ordinaires de divers endroits. For this division the author assigns two reasons — (i) that two persons may thus read his journal at the same time, and (2) that it facilitates a division of the subject-matter, the Nouvelles containing usually intelligence from the northern and western countries, the Gazette from the southern and eastern. He commonly begins with foreign and ends with home news, a method which was long and generally followed, and which still obtains. Once a month he published a supplement, under the title of Relation des nouvelles du tnonde, reques dans tout le tnois. In October 163 1 Renaudot obtained letters patent to himself and his heirs, conferring the exclusive privilege of printing and selling, where and how they might please, " the gazettes, news and narratives Of all that has passed or may pass within and without the kingdom." His assailants were numerous, but he steadily pursued his course, and at his death in October 1653 left the Gazette to his sons in flourishing circumstances. In 1752 the title Gazette de France was first used. Under this designation it continued to appear until the 24th August 1848. During the five days which followed that date it was suspended; on the 30th it was resumed as Le Peuple franqais, journal de I'appel a la nation, and again modi- fied on the 14th September to L'Etoile de la France, journal des droits de tons. On the 25th October it became Gazette de France, journal de I'appel d la nation; and under this title it continued.

Jean Loret's rhymed Gazette (1650 to March 1665) will always have

interest in the eyes of students who care less for the ” dignity ” of history than for the fidelity of its local colour- ing and the animation of its backgrounds. It were vain to look there for any deep appreciation of the events of those stormy times; but it abounds in vivid portraits of the men and “manners of the day. It paints rudely, yet to the life, the Paris of the Fronde, with all its effervescence and depression, its versatility and fickleness, its cowardice and its courage.

Of the Mercure galant, established by Donneau de Viz6 in 1672, with Thomas Corneille for its sub-editor, it may be said that it sought to combine the qualities of the Gazettes, at France b 0,: h grave an d gay. Like the Gazette de France, it contained the permitted state news and court circulars of the day. Like Loret’s Gazette, it amused its readers with satirical verses, and with sketches of men and manners, which, if not always true, were at least well invented. Reviews and sermons, law pleas and street airs, the last reception at the Academy and the last new fashion of the milliners, all found their place. De Vize carried on his enterprise for more than thirty years, and at his death (1710) it was continued by Riviere du Fresny. The next editor, Lefevre de Fontenay, altered the title to Nouveau Mercure, which in 1728 was altered to Mercure de France, a designation retained, with slight modifica- tion, until 1853. The Mercure passed through many hands before it came into those of Panckoucke, at the eve of the Revolu- tion. Amongst its more conspicuous writers, immediately before this change, had been Raynal and Marmontel. The latter, indeed, had for many years been its principal editor, and in his Memoires has left us a very interesting record of the views and aims which governed him in the performance of an arduous task. He there narrates the curious fact that it was Madame de Pompadour who contrived the plan of giving pensions to eminent men of letters out of the profits of the Mercure. To one of Marmontel’s predecessors the ” privilege,” or patent, had been worth more than £1000 sterling annually. This revenue was now to be shared amongst several, and to become a means of extending royal ” patronage ” of literature at a cheap rate. It is to this pension scheme, too, that we owe the Contes Moraux. Marmontel, who had long before lost his ” patent ” by an act of high-minded generosity, continued to share in the composition of the literary articles with Chamfort and La Harpe, whilst Mallet du Pan, a far abler writer than either, became the most prominent of the political writers in

the Mercure. In 1789 he contributed a series of remarkable articles on the well-known book of de Lolme; and in the same year he penned some comments on the ” Declaration of the Rights of Man,” very distasteful to violent men of all parties, but which forcibly illustrate the pregnant truth they begin with: ” The gospel has given the

simplest, the shortest and the most comprehensive ‘ Declaration of the Rights of Man,’ in saying, ‘ Do unto others as you would that they should do unto you.’ All politics hinge upon this.”

In 1790 the sale of the Mercure rose very rapidly. It attained for a time a circulation of 13,000 copies. Mirabeau styled it in debate ” the most able of the newspapers.” Great pains were taken in the collection of statistics and state papers, the absence of which from the French newspaper press had helped to depress its credit as compared with the political journalism of England and to some extent of Germany. But, as the Revo- lution marched on towards a destructive democracy, Mallet du Pan evinced more and more unmistakably his rooted attachment to a constitutional monarchy. And, like so many of his compatriots, he soon found the tide too strong for him. The political part of the Mercure (in 1791 its title was altered to Mercure franqais) changed hands, and after the 10th August 1792 its publication was suspended.

All this time the Moniteur {Gazette nationale, ou le moniteur universel), founded in 1789, was under the same general management. The first idea, indeed, of this famous official journal appears to have been Panckoucke’s, but it U aˆJˆeU did not firmly establish itself until he had purchased the Journal de I’assemblSe nationale, and so secured the best report of the debates. The Moniteur, however, kept step with the majority of the assembly, the Mercure with the minority. So marked a contrast between two journals, with one proprietor, gave too favourable a leverage to the republican wits not to be turned to good account. Camille Desmoulins depicted him as Janus — one face radiant at the blessings of coming liberty, the other plunged in grief for the epoch that was rapidly disappearing.

When resumed, after a very brief interval, the Mercure franqais became again Mercure de France — its political im- portance diminished, whilst its literary worth was enhanced. During the later days of the Revolution, and under the imperial rule, its roll of contributors included the names of Geoffroy, Ginguen6, Morellet, Lacretelle, Fontanes and Chateaubriand. The statesman last named brought upon the Mercure another temporary suppression in June 1807 (at which date he was its sole proprietor), by words in true unison with the noblest deed of his chequered career — his retirement, namely, from the imperial service on the day that the news of the execution of the duke of Enghien reached him, being the day after he had been appointed by Napoleon a minister plenipotentiary.

Thus it chanced that alike under the brilliant despotism of Napoleon and under the crapulous malversation of Louis XV. the management of the Mercure was revolutionized for protests which conferred honour upon the journal no less than upon the individual writers who made them. Resumed by other hands, the Mercure continued to appear until January 1820, when it was again suspended. In the following year it reappeared as Le Mercure de France, au dix-neuvieme siecle, and in February 1853 it finally ceased.

The only other newspaper of a date anterior to the Revolution which needs to be noticed here is the first French daily, the Journal de Paris, which was started on New Year's Day of 1777. It had but a feeble infancy, yet lived aenuL. till 1 8 1 9. Its tameness, however, did not save it from sharing in the " suspensions " of its predecessors. After the Revolution such men as Garat, Condorcet and Regnaud de St Jean d'Angely appear amongst its contributors, but those of earlier date were obscure. Its period of highest prosperity may be dated about 1792, when its circulation is taid to have exceeded 20,000.

The police adventures of the writers of the MS. news-letters, or Nouvelles a la main, were still more numerous, and, if we

may judge from the copious specimens of these epistles which yet survive, must also not unfrequently have arisen from lack of official employment, rather than from substantial pro- Noavettes VGCa tion. Madame Doublet de Persan, the widow of ma y n- a member of the French board of trade, was a con-

spicuous purveyor of news of this sort. For nearly forty years daily meetings were held in her house at which the gossip and table-talk of the town were systematically (and literally) registered; and weekly abstracts or epitomes were sent into the country by post. Piron, Mirabaud, Falconet, D'Argental and, above all, Bachaumont, were prominent members of the " society," and each of them is said to have had his assigned seat beneath his own portrait. The lady's valet-de-chambre appears to have been editor ex officio; and as he occasionally suffered imprisonment, when offensive news- letters had been seized by the police, so responsible a duty was doubtless " considered in the wages." News and anecdotes of all kinds— political and literary,

grave, gay or merely scandal- ous — were all admitted into the Nouvelles a la main; and their contents, during a long series of years, form the staple of those Mimoires secrets pour servir & I'histoire de la ripublique des lettres which extend to thirty-six volumes, have been frequently printed (at first with the false imprint " Londres: John Adam- son, 1777-89 "), and are usually referred to by French writers as the Memoires de Bachaumont.

The journalism of the first Revolution has been the theme of many bulky volumes, and Only a very casual glance at this News- P art 01 our subject can be given to it here. When papers of at least one half of the French people was in a ferment **» «'" °^ no P e or °^ ^ ear at tne approaching convocation of the states-general, most of the existing newspapers were still in a state of torpor. Long paragraphs, for example, about a terrible " wild beast of'the Gevaudan " — whether wolf or bear, or as yet nondescript, was uncertain — were still current in 'the Paris journals at this momentous juncture. Mirabeau was among the foremost to supply the popular want. His Lettres d ses commettants began on the 2nd May 1789, and with the twenty-first number became the Courrier de Provence. Within a week Maret (afterwards duke of Bassano) followed with the Bulletin des sSances de I'assemblie nationale, and Lehodey with the Journal des Mats generaux. In June Brissot de Warville began his Patriote franqais. Gorsas published the first number of his Courrier de Versailles in the following month, from which also dates the famous periodical of Prudhomme, Loustalot and Tournon, entitled Revolutions de Paris, with its characteristic motto — " Les grands ne nous paraissent grands que parce que nous sommes a genoux; levonsnous!" In August 1789 Baudouin began the Journal des dibats (edited Journal in 1792 by Louvet) and Marat the Ami du Peuple desdlbats (which at first was called Le Publiciste parisien). f? rf The Moniteur universel (of which we have spoken

already) was first published on the 24th November, although numbers were afterwards printed bearing date from the 5th May, the day on which the states-general first assembled. Camille Desmoulins also commenced his Revolutions de France et de Brabant in November 1789. The Ami du roi was first published in June 1790, La Quotidienne in September 1792.

The Moniteur and Dibats survived, but most of these papers expired either in the autumn of 1792 or with the fall of the party of the Girbnde in September r 7 93. In some of them the energy for good and for evil of a whole lifetime seems to be compressed into the fugitive writings of a few months. Even the satirical journals which combated

the Revolution with shafts of ridicule and wit, keen enough after their kind, but too light to do much damage to men. terribly in earnest, abound with matter well deserving the attention of all students desirous of a thorough knowledge of the period.

The consular government began its dealings with the press by reducing the number of political papers to thirteen. At this period the number of daily journals had been nineteen, and their aggregate provincial circulation, apart from the Paris sale, 49,313, an average of 2600 each.

Under Napoleon the Moniteur was the only political paper that was really regarded with an eye of favour. Even as respects the nation at large, the monstrous excesses into which the Revolutionary press had plunged left an enduring stigma on the class. When Bertin acquired the Journal des d-ebats from Baudouin, the printer, for 20,000 francs, he had to vanquish popular indifference on the one hand, as well as imperial mistrust on the other. The men he called to his aid were Geoffroy and Fievee; and by the brilliancy of their talents and the keenness of his own judgment he converted the Debats into a paper having 32,000 subscribers, and producing a profit of 200,000 francs a year. When the imposition of a special censorship was threatened in 1805, at the instance of Fouche, a remarkable correspondence took place between Fievee and Napoleon himself, in the course of which the emperor wrote that the only means of preserving a newspaper from suspension was ” to avoid the publication of any news unfavourable to the government, until the truth of it is so well established that the publication becomes needless.” The censorship was avoided, but Fievee had to become the responsible editor, and the title was altered to Journal de I’empire — the imperial critic taking exception to the word Debats as ” inconvenient.” The old title was resumed in August 1815. The revolution of July did but enhance the power and the profit of the paper. It has held its course since with uniform dignity, as well as with splendid ability, and may still be said, in the words which Lamartine applied to it in an earlier day, to have ” made itself part of French history.”

Shortly before the Journal de I’empire became again the Journal des debats (in 1815), a severance occurred amidst both the writers and subscribers. It led to the foundation of the Conslitutionnel, which at first and for a short time bore the title of L’Independant. The former became, for a time, the organ of the royalists par excellence, the latter the leader of the opposition. In 1824, however, both were in conflict with the government of the day. At that date, in a secret report addressed to the ministry, the aggregate circulation of the opposition

press of Paris was stated at 41,33c, 1 while that of the government press amounted only to i4,344. 2

The rapid rise of the Conslitutionnel was due partly to the great ability and influence of Jay, of Etienne, of Beranger and of Saint Albin (who had been secretary to Carnot in his ministry of 1815), all of whom co-operated in tuttonnel. its early editorship, and partly to its sympathy with the popular reverence for the memory of Napoleon, as well as to the vigorous share it took in the literary quarrel between the classicists and romanticists. Its part in bringing about the revolution of 1830 raised it to the zenith of its fortunes. For a brief period it could boast of 23,000 subscribers at 80 francs a year. But the invasion of cheap newspapers, and that temporary lack of enterprise which so often follows a brilliant success, lowered it with still greater rapidity. When the author of the Mimoires d'un bourgeois, Dr Veron, purchased it, the sale had sunk to 3000. Veron gave 100,000 francs for the Juif errant of Sue, and the Sue fever rewarded him for a while with more than the old circulation. Afterwards the paper passed under the editorship of Cesena, Granier de Cassagnac, and La Gueronniere.

The cheap journalism of Paris began in 1836 (1st July) with the journal of Girardin, La Presse, followed instantly by Le Siecle, under the management of Dutacq, to whom, it is said — not incredibly — the original idea was really g* (T f ** ,e due. The first-named journal attained a circulation i, e sihcle. of 10,000 copies within three months of its commence- ment of and soon doubled that number. The Siicle prospered even more strikingly, and in a few years had reached a circula- tion (then without precedent in France) of 38,000 copies. The rapid growth of the newspaper press of Paris under

1 Le Conslitutionnel, 16,250; Journal des debats, 13,000; La Quotidienne, 5800 ; Le Courrier francais, 2975 ; Journal de com- merce, 2380; VAristarquc, 925.

2 Journal de Paris, 4175; VFioile, 2749; Gazette de France, 2370; Le Moniteur, 2250; Le Drapeau blanc, 1900; Le Pilote, 900.

Louis-Philippe will be best appreciated from the fact that, while in 1828 the number of stamps issued was 28 millions, in 1836, 1843, 1845 and 1846 the figures were 42, 61, 65 and 79 millions

respectively. At the last-mentioned date the papers with a circulation of upwards of io,coo were (besides the Moni- teur, of which the circulation was chiefly official and gratuitous) as follows: Le Siecle, 31,000; La Presse and Le Constitutionnel, between 20,000 and 25,000; Journal des Dubois and L'Epoque, between 10,000 and 15,000.

If we cast a retrospective glance at the general characteristics (1) of the newspaper press of France, and (2) of the legislation con- cerning it, between the respective periods of the devastating revolu- tion of 1793-1794 and the scarcely less destructive revolution of 1848, it will be found that the years 1819, 1828, 1830 (July), and 1835 (September) mark epochs full of pregnant teaching upon our subject. We pass over, as already sufhciently indicated, the newspaper licence of the first-named years (1793-1794), carried to a pitch which became a disgrace to civilization, and the stern Napoleonic censor- ship which followed it — also carried to an excess, disgraceful, not, indeed, to civilization, but to the splendid intellect which had once given utterance to the words, " Physical discovery is a grand faculty of the human mind, but literature is the mind itself."

The year 1819 is marked by a virtual cessation of the arbitrary power of suppression lodged till then in the government, and by the substitution of a graduated system of preliminary bonds and surety- ships (" cautionnements ") on the one hand, and of strict penalties for convicted press-offences on the other. This initiatory amelioration of 1819 became, in 1828, a measure of substantial yet regulated freedom, which for two years worked, in the main, alike with equity towards the just claims of journalism as a profession and with steady development towards the public of its capabilities as a great factor in the growth of civilization. Those tv/o years were followed by a widely contrasted period of five years. That was a term of entire liberty often grossly abused, and fitly ending with the just and necessary restrictions of September 1835. But that period of 1830- 1835 was also signalized by some noble attempts to use the powers of the newspaper press for promoting the highest and the enduring interests of France. Not least memorable amongst these was the joint enterprise of Montaletnbert and Lamennais — soon to be aided by Lacordaire, — when, by the establishment (October 1 830) of the newspaper L'Avenir, they claimed for the church of France " her just part in the liberties acquired by the country," and asserted for the sacred symbols of Christianity their lawful place, alike above the tricolor and above the lilies. " Dieu et la liberte " was the motto which Montalembert chose for his newspaper, as he had chosen it long before for the guiding star of his youthful aspirations. L'Avenir existed only for one year and one month. It came to its early end from no lack of energy

and patience in its writers, but in part from that mission of the editors to Rome (November 1831) which, at least for a time, necessitated the discontinuance of their news- paper. Human regrets had higher than human consolations. ” Our labours ” on L’Avenir, wrote Montalembert, with simple truth, ” decided the attitude of Catholics in France and elsewhere, from the time of the July revolution to the time of the second empire.”

There were many other papers, at this time and afterwards, which, like L’Avenir, were, in their degree, organs of ideas, not speculations of trade. But they cannot be even enumerated here. No very notable specially religious paper succeeded L’Avenir until the founda- tion in 1843 — under widely different auspices, although twice at the outset the editorship was offered to Lacordaire — of L’Univers Relieieux. That journal was edited, at first, by De Coux, then by Louis Veuillot; it underwent innumerable lawsuits, ” warn- ings,” suppressions and interdicts, for causes very diverse. Several prelates suppressed V Univers Religieux in their respective dioceses, amongst them the great bishop Dupanloup in that of Orleans (1853). Napoleon III. suppressed it in 1861, permitted it to reappear as Le Monde, and suspended it many times afterwards; but it survived all its misfortunes for a good many years. Le Monde had the curious fate, at one time, of being conducted jointly by the first editor of L’Avenir, Lamennais, and by George Sand, who had previously figured in the newspaper annals of France as co-foundress of L liclaireur de Vlndre, a journal published at Orleans. The account given by that brilliant writer of her adventures in what was then to her a new department of activity is an instructive one. With that breadth of sympathy which was so characteristic of her, she strove to interest all her friends (however varied in character, as in rank) in the enterprise. There is, perhaps, scarcely anything more amusing in French journalistic annals than is her (contemporary) account of the first meeting of the shareholders — at which, she tells us, about five hundred resolutions were moved for the guidance of the editor at his desk.

The impulse given to the growth of advertisements in the days which followed July 1830, became, as the years rolled on, sufficiently developed to induce the formation Of a company — in which one of th e Laffit t es took part— to farm them, 1 at a yearly rent of £ 12,000

1 Or, to speak more precisely, to farm a certain conspicuous page of each newspaper, in perpetuity.

sterling (300,000 francs), so far (at first) as regarded the four leading journals (D&bats, Constitutionnel, Siecle, Presse), to which were after-

wards added two others {Le Pays and La Patrie). The combina- tion greatly embarrassed advertisers, first, since its great aim was to force them either to advertise in all, whether addressing the classes intended to be canvassed or not, or else to pay for each advertisement in a selected newspaper the price of many proffered advertisements in all the papers collectively, and, secondly, because by many repeti- tions in certain newspapers no additional publicity was really gained, two or three of the favoured journals circulating for the main amongst the same class of buyers. La France was then the newspaper of the Conservative aristocracy of the nation; Le Monde and the Union more especially addressed the clergy ; the Debats and the Temps were the journals of the upper mercantile class, the Siecle and L'Opinion of the lower or shopkeeping class. A man who asked to advertise briefly, in the Siecle, for example, alone, was charged 2 francs for each several insertion. If he went the round of the six, his advertisement cost him only 75 centimes per journal, for ten successive insertions in each of them, all round.

To a great extent, the inundation of newspapers which followed the revolution of February 1848 was but a parody on the revolu- tionary press of 1793. Most of them, of course, had very . short lives. When Cavaignac took the helm he suppressed Tlnxuy eleven journals, including La Presse and L'Assemblee . */ Nationale. The former had at this period a circulation of nearly 70,060, and its proprietor, in a petition to the National Assembly, declared that it gave subsistence to more than one thousand persons, and was worth in the market at least 1 ,500,000 francs. In August the system of sureties was restored. On the 13th June 1849 the president of the republic suspended Le Peuple, La Revolution Democratique et Sociale, La Vraie Republique, La Democratie Pacifique, La Rejorme and La Tribune des Peuples. On July 16, 1850, the assembly passed what is called the " Loi Tinguy " (from the name of the otherwise obscure deputy who proposed it), by which the author of every news- paper article on any subject, political, philosophical or religious, was bound to affix his name to it, on penalty of a fine of 500 francs for the first offence, and of 1000 francs for its repetition. Every false or feigned signature was to be punished by a fine of 1000 francs, " together with six months' imprisonment, both for the author and the editor." The practical working of this law lay in the creation of a new functionary in the more important newspaper offices, who was called " secr6taire de la redaction," and was, in fact, the scapegoat ex officio. The " Loi Tinguy," though now long repealed, has had a permanent influence on French journalism in the continued preval- ence of signed articles, and the consequent prominence;of individual writers as compared with the same class of

work in other countries. In February 1852 all the press laws were incorporated, with increased stringency, into a ” Decret organique sur la presse.” The stamp duty for each sheet was fixed at 6 centimes, within certain dimensions, and a proportional increase in case of excess.

In 1858 the order of the six leading Parisian papers in point of circulation was — (1) Sibcle, (2) Presse, (3) Constitutionnel, (4) Patrie, (5) Debats, (6) Assemblee Nationale. The number of provincial papers exceeded five hundred. ” Newspapers, nowadays, wrote a keenly observant publicist in that year, ” are almanacs, bulletins, advertising mediums, rather than the guides and the centres of opinion.” In 1866 the change had become more marked still. The monetary success of Girardin’s many commercial speculations in this branch of commerce greatly increased the number of Parisian journals, whilst lowering the status of those of established rank. The aggregate daily issue of the Parisian ” dailies ” had increased to about 350,000 copies, but the evening paper, Le Petit Moniteur, alone issued nearly 130,000 of these. The average circulation of Le Siecle had fallen from 55,000 to 45,000 copies; that of La Patrie was reduced by one-half (32,000 to 16,000); that of Le Constitu- tionnel from 24,000 to 13,000; of L’Opinion Nationale from 18,000 to 15,000; whilst the chief journal of all — with grand . antecedents and with a brilliant history of public service rendered — -had for a time descended, it is said, from 12,000 copies to 9000. And yet almost over the whole of this very period the brilliant “. Lundis ” of Sainte-Beuve were making their punctual appearance in Le Constitutionnel, to be presently continued in Le Moniteur and in Le Temps; and writers like St Marc Girardin, Cuvillier-Fleury, and Prevost-Paradoi’were constantly writing in the Journal des Debats. Meanwhile, Villemessant and his colleagues were making their fortunes out of Le Figaro (begun 1854, but a daily from 1866), and helping to make frivolous petty ” paragraphs ” on matters of literature almost everywhere take the place of able and well-elabor- ated articles. Well might Albert Sorel say, 2 ” Our trumpery news- papers are the newspapers that pay.” In 1872 the circulation of Le Petit Journal (founded 1863), the pioneer of the French halfpenny press, w;as 212,500, and it went on rapidly increasing.

No incident in the newspaper history of this period made more temporary noise than did the strange charges brought in 1 867 against the Debats, the Sibcle and L’Opinion Nationale, by M. Kerveguen, member for Toulon, in the French assembly. He charged them

‘ When comparing the French newspaper press as it stood in 1873

with that of Germany, in the Revue des deux Monies, article" La Presse Allemande," vol. ii. of 1873, p. 715.

collectively with receiving bribes, both from the government of Prussia and from that of Italy — upon the faith, as it afterwards appeared, of statements made by another newspaper, not of France but of Belgium, La Finance. An elaborate inquiry, presided over by M Berryer, pronounced the accusation to be absolutely ground- less. Yet it was soon revived by Le Pays, in the shape of a specific charge against an individual editor of Le Steele — La Varenne. All that was eventually proved, in due course of law, was merely the agency in Paris of La Varenne for the Italian government, at a time prior to the events of 1866.

In 1874 an elaborate return showed that in thirty-five principal towns of France, comprising a population of 2,566,ooo> their re- spective journals had an aggregate weekly issue of 2,800,000 copies.

In 1878 the total number of journals of all kinds published in France was 2200. Of these 150 were political, strictly speaking, of which Paris published 40. Of Parisian journals other than political there were 1 141 (including 71 religious, 104 legal, 153 commercial, 134 technological, 98 scientific and medical, 59 artistic). At that date Le Figaro had a circulation of about 70,000, Le Petit Journal (at a halfpenny) one of about 650,000.

The principal Parisian newspapers in 1883 may be classified thus —

(a) Organs of the Legitimists and of the Church of France: Gazette de France, Le Monde, L' Union, La Defense, La Civilisation, V Univers.

(b) Orleanist organs: Le Monitew Universel, Le Constitutional, Le Francais (under the auspices of the Due de Broglie), Le Sole'il.

(c) Bonapartist organ: Le Pays (edited at one time by La- martine).

(d) Republican organs: Journal des Debats, Le Temps (founded 1861, with the title of the earlier Temps of 1829-1842), Le Siecle, Le XIX. Siecle, Le Paix, La Justice, Paris, La Ripublique Francaise (founded in 1871 by Gambetta), Le Parlement (founded by Dufaure), the Socialist

La Petite RipuUique (1875).

The law concerning the liberty of the press, of July 29, 1881, abolished suretyship for newspapers, and transferred their registration from the ministry of justice at Paris to the local representative of the attorney-general {le parquet) in each town respectively. It made the establishment of a newspaper virtually free, upon legal deposit of two copies, and upon due registration of each newspaper under the simple guarantee of a registered director, French by birth, responsible in case of libel. And it took away the former discretion- ary power, lodged in the home office, of interdicting the circulation in France of foreign journals. The home minister might still pro- hibit a single number of a newspaper; only the whole council of ministers, duly convened, could prohibit the circulation of a foreign newspaper absolutely. 1

The newspapers of Paris, and similarly of France, practically doubled in number between 1880 and 1900. In 1880 there were about 120 Paris newspapers, in 1890 about ff**T 160, and in 1900 about 240. The total number of

meats!' newspapers, as distinguished from periodicals, pub- lished in France during 1900 was in round numbers 2400. Of these, about 2160 appeared in 540 provincial towns.

The history of the French press during the last twenty years of the 19th century followed very closely that of the country itself, Boulangist and anti-Boulangist, Dreyfusist or anti- Dreyfusist, Republican or Nationalist ; finally it became either Moderate Republican or Radical-Socialist with a sprinkling of Nationalist organs and a small minority of Royalist and Bonapartist sheets.

At the head of the Moderate Republican organs were Le Temps and Le Journal des DSbats among the evening papers, 1 The history of French journals published abroad is interesting. The Annates politiques of Linguet— for a time of Linguet and Mallet du Pan jointly — was, from about 1770 to about 1785, almost a power in Europe, in its way. Mallet du Pan's own Mercure Britan- nique, during the eventful years 1 798-1 800, was brilliant, sagacious and honest. When' the pen literally fell from his dying hand — a hand that had kept its integrity under the pains of exile and of bitter poverty — that pen was taken up (for a short interval) by Malouet. When Napoleon forcibly suppressed, a little later, the Courrier de VEurope of the count of Montlosier, he offered the deprived editor a pension, which was refused, until accompanied by the offer of a post in which the able minister of Louis

XVI. could still work for his country.

English journalism in France was for long associated with Galignani's Messenger, started by Giovanni Antonio Galignani (1757- 1822) in 1814, and turned into a daily just before his death. Its palmy days were between 1814 and 1848. In 1895 it was turned into the Daily Messenger, but proved a failure and was dropped in 1904; it was really killed by the competition of the Paris edition of the New York Herald. It had been preceded by Sampson Perry's Argus (1809), a Napoleonic organ. In May 1905 a new era of English journalism on the continent began by the institution of the Paris edition of the London Daily Mail

and Le Figaro, Le Journal, Le Siecle, Le Petit Parisien and Le Petit Journal among the morning dailies. Le Figaro was until 1901 under the editorship of M. F. de Rodays, and the brilliant articles of M. J. Comely were one of the features of the paper; but a dispute among the proprietors in 1901 resulted in the dismissal of M. Comely and the retirement of M. de Rodays. M. Jean Dupuy (a member of the Waldeck-Rousseau government) was the proprietor and editor of Le Petit Parisien, a popular organ almost rivalling £e Petit Journal; the circula- tion of the latter had, however, reached over one million and a quarter copies daily.

Le Matin and L'£clair, among the Moderate Republican organs, gave less attention to the discussion of political questions from the party point of view than to the collection of news, and they were followed by the £cho de Paris (1884). Le Matin, which also dates from 1884, was from its origin essentially what is called in France a journal d' informations, publishing every morning a mass of telegraphic news from all countries. By an arrangement with the London Times, it gave every day a translation of most of the telegrams published in that newspaper. t l.X 1 > ~

In April 1901 the proprietorship of £e Siecle was changed, in consequence of the lack of support given by Parisian readers to that journal as. edited by M. Yves Guyot (formerly minister of public works). The latter was a staunch free-trader, a courageous defender of Captain Dreyfus, and an eloquent advocate of a good understanding between France and England; he emphatically endorsed the British policy in South Africa, and tried to explain it to his countrymen. The paper was, however, bought in by a number of friends of M. Yves Guyot, who remained as editor. The greatest opponent of Yves Guyot from the economic point of view was Jules Meline, also a former minister, whose paper, La Ripublique, was the recognized organ of

Protectionism. » V,-

The Radical and Socialist ideas which in latter years made such progress in France were very ably advocated by several newspapers whose influence steadily grew, such as L'Aurore, La Lanterne and L'Humanite (the organ of Jean Jaures). Such individual organs of opinion must also be mentioned as L' Intransigent, the organ of Henri Rochefort, and M. Clemenceau's organ, Le Bloc, in which he advocated the practical application of all of the revolutionary republican principles, pure and unadulterated, forming a whole {bloc), no part of which could or ought to be sacrificed to temporary political necessities. As an intermediate link between the Republican organs of all shades and the various Monarchist newspapers, came the so-called Nationalist press; an offshoot of or successor to the Boulangist press of the preceding decade. As were the Boulangists, so were the Nationalists, a sort of syndicat des mtcontents, their chief organs being La Palrie, edited by M. Millevoye, and La Cocarde; these papers represented the views of those who had vague hankerings after a different rigime and a decided hostility towards the republican form of government. There was a considerable diminution of influence in the Monarchist press. Le Soleil, however, had a large circle of readers among the Conservative bourgeoisie with Orleanist leanings. Le Gaulois remained a Royalist paper of somewhat doubtful tendencies, the editor, M. Arthur Meyer, having incurred the displeasure of the Pretender whose cause he defended. Of the old Legitimist press there remained the old Gazette de France, which was founded in 1631 and had still a diminishing band of faithful readers. The organ of the religious (Roman Catholic) associations in France, La Croix, founded in 1880, represented the views of the French religious associations, and' discussed all questions from the point of view of Catholic interests. La Croix was published in Paris, but had in the provinces one hundred and four local weekly supplements to the Paris edition, each one taking its name from the parent journal and adding to it the name of the department or locality in which it was printed, such as La Croix de V Allier, La Croix de Lyon.

The French papers, of whatever party, took an increased interest during this period in foreign matters, and much improved

their organization for collecting news. Some of them, in fact, were almost exclusively news-sheets, and the journal d'informa- tions — Le Matin or L' Eclair, for instance — took its place beside the journal properly so called, more perhaps as a rival than as a complement. The natural result followed, and the more old- type newspapers took steps to provide their readers with news as weE as with leading articles, current and literary topics, society gossip, dramatic criticism and law reports. The most remarkable as well as perhaps the earliest attempt to enlarge the scope of Parisian newspapers was made in 1893 by Georges Patinot, editor of the Journal des Debats. Instead of one edition, that newspaper published two entirely distinct editions, a morning one and an evening one. After some time the plucky attempt had to be given up, and the Journal des Dibats became an evening paper. The bold experiment made by the Journal des Dibats (which celebrated its centenary in 1889) led the other newspapers to find a happy mean between a four-page paper published twice a day and an eight-page paper on the pattern of English newspapers, and the result was that now most great daily papers in Paris came out with six pages, the Figaro giving the lead. As French newspapers increased in size they reduced their price. _ Most six-page newspapers, with the exception of Le Figaro, were by 1902 sold at 5 centimes, and the price of 15 centimes, which used to be the rule, became the exception. In 1902 60 Paris papers (daily and weekly) were sold at 5 centimes and 51 at 10 centimes, whilst only n cost 15 centimes. In 1880 only 23 were 5-centime papers and 24 were 10-centime papers.

The American style of journalism came into vogue in Paris in the 'eighties, and " interviews " were frequent; but the general tendency of Parisian editors was to adopt the English compromise, and to eschew any extreme sensational methods. Most of the important Parisian newspapers had their special correspondents in the great capitals of Europe, London, Berlin, St Petersburg, Vienna and Rome. Nothing perhaps was so striking after 1890 as the demand of the French public for foreign and colonial news, or the readiness of the papers to supply it by means of special representatives independent of the news agencies.

In home matters the French press made greater progress still in the rapid and accurate collection of news, and in this respect the provincial press showed more enterprise and more ability than that of Paris. Its development was remarkable, for whereas in 1880 the inhabitants of the departments had to await the arrival of the Parisian papers for their news, they now had the advantage of being supplied every morning with local newspapers inferior to none of the best organs of Paris. Among the best provincial papers may be mentioned

La Gironde and La Petite Gironde of Bordeaux, La Dipiche of Toulouse, Le Lyon Ri- publicain, L'Fxko du Nord of Lille, Le Journal de Rouen, all having a staff in Paris engaged in collecting news, reporting parliamentary proceedings and law cases, telegraphed or tele- phoned during the night and published early the next morning in their respective localities. Being perfectly independent ol purely Parisian opinion or even bias, the decentralization of the French provincial press became complete. The newspapers of the large towns circulated not only in the city in which they were printed but throughout the region of which it was the centre. Thus the Dep&che of Toulouse, with its twelve editions daily, was read in the whole of the departments extending from the Lot to the Pyrenees, whilst the Petite Gironde was found in all south-western France. The influence of the provincial, as of the Paris, press became so great that, as M. Avenel says in his book on the French press, there came a tendency to resent its omni- potence. The power of the newspaper in France differs from that of the English newspaper, in that.it seems to act more on ths government and the parliament than on public opinion. The French newspapers have taken upon themselves, in many cases, functions which belong more properly to the legislative or to the judicial power than to the press, and the result has not always been successful. The cause of this is that too many men of talent with political ambition look upon journalism as " leading to everything, provided one gets out of it." and use it alternately xix. 19

as an antechamber of parliament or of the cabinet, and a lounge during their parliamentary or ministerial eclipses.

See generally Hatin, Histoire de la Presse en France (8 vols., 1860-1861); Gallois, Histoire des Journaux et Journalistes de la Revolution (2 vols.) ; " Journalism in France," Quarterly Review, lxv. 422-468 (March, 1840); Henri Avenel, La Presse franqaise au vingtieme Steele (Paris, 1901).

5. Newspapers of Germany

Printed newspapers in Germany begin with the Frankfurter

Journal, established in 1615 by Egenolph Emmel, a bookseller

of Frankfort-on-Main. The following year saw the foundation

of the Frankfurter Oberpostamtszeitung — continued until the

year 1 866 as Frankfurter Postzeitung. Fulda appears to have been

the next German town to possess a newspaper, then Hildesheim (1619) and Herford (1630). In the course of the century almost all German cities of the first rank possessed their respective journals. . The earliest in Leipzig bears the date 1660. The Rostocker Zeitung was founded in 1710. The Hamburgischer Correspondent (1714) was originally published under the name of Holsteinische Zeitungs-Correspondenz, two years earlier, and was almost the only German newspaper which really drew its foreign news from ” our own correspondent.” Berlin had in the 1 8th century two papers, those of Voss (the Vossische Zeitung, 1722) and of J. K. P. Spener (1740-1827; the Spener’sche Zeitung, or Berlinische Nachrichlen, 1772). Some half-dozen papers which glimmered in the surrounding darkness were the reservoirs whence the rest replenished their little lamps. On the whole, it may be said that the German newspapers were of very small account until after the outbreak of the French Revolution. Meanwhile the MS. news-letters, as in earlier days, continued to enjoy a large circulation in Germany. Many came from London. The correspondence, for instance, known under the name of ” Mary Pinearis ” — that, apparently, of a French refugee settled in London — had a great German circulation between 1725 and 1735. Another series was edited by the Cologne gazetteer, Jean Ignace de Roderique, also a French refugee, and remembered as the subject of a characteristic despatch from

Frederick II. of Prussia to his envoy in that city, enclosing ic© ducats to be expended in hiring a stout fellow with a cudgel to give a beating to the gazetteer as the punishment of an offensive paragraph. 1 The money, it seems, was earned, for Roderique was well-nigh killed. At Berlin itself, Franz Hermann Ortgies carried on a brisk trade in these news-letters (1 728-1 735), until he too came under displeasure on account of them, was kept in prison several months, and then exiled for life. 2 Nor, indeed, can any journal of a high order be mentioned of prior appearance to the AUgemeine Zeitung, founded at Leipzig by the bookseller Cotta (at first under the title of Neueste Weltkunde) in 1798. Posselt was its first editor, but his want of nerve — and perhaps his weak health — hindered the application of his high powers to political journalism. His articles, too, gave offence to the Austrian court, and the paper had to change both its title and its place of publication. It had been commenced at Tubingen, and removed to Stuttgart; it was now transferred to Ulm, and again to Augsburg. It was Cotta's aim to make this the organ of statesmen and publicists, to reach the public through the thinkers, to hold an even balance between the rival parties of the day, and to provide a trustworthy magazine of materials for the historians to come; and, in the course of time, his plan was so worked out as to raise the AUgemeine Zeitung into European fame. Cotta was also the founder, at various periods, of the

Morgenblatt, which became famous for its critical ability and

tact, of Vesperus, of Das Inland, of Nemesis, of the Oppositions-

blalt of Weimar (for a time edited by Bertuch), and even of the

Archives Parisiennes.

Whilst French influence was dominant in Germany, the German papers were naturally little more than echoes of the Parisian press. But amidst the excitements of the ” war of

1 Fr. Kapp, ” Berliner geschriebene Zeitungen,” in Deutsche Rundschau, xxi. 107-122 (1879), citing Droysen, Zeitschr. f. preuss. Cesch. xiii. 1 1 . The story, as told by Droysen, is an instructive commentary on Carlyle’s praise of Frederick’s ” love of the liberty of the press.

2 Kapp, ut supra.

liberation ” a crowd of new journals appeared. Niebuhr started I a Preussischer Correspondent; Gorres — who in 1798 had founded at Coblentz Das rothe Blatt, soon suppressed by the invading French — undertook the Rheinischer Mercur (January 1814 to January 181 6), which was suppressed by the Prussian govern- ment, under Von Hardenberg. This journal, during its initiatory year, had the honour of being termed by Napoleon — perhaps satirically — ” the fifth power of Europe.” Wetzel, somewhat later, founded the Frdnkischer Mercur, published at Bamberg, and Friedrich Seybold the N eckarzeitung. Some of these journals lasted but two or three years. Most of the survivors fell victims to that resolution of the diet (20th September 1819) which subjected the newspaper press, even of countries where the censorship had been formally abolished, to police superintendence of a very stringent kind.

The aspirations for some measure of freedom which burst forth again under the influences of 1830 led to the establishment of such papers as Siebenpfeiffer’s Westbote, Lohbauer’s Hoch- wachter, Wirth’s Deutsche Tribune, Eisenmann’s Baierisches Volksblatt, Der Freisinnige

of Rotteck and Welcker, and many more of much freer utterance than had been heard before in Germany , This led, in the ordinary course, to new declarations in the diet against the licence and revolutionary tendencies of the press, and to ” regulations ” of a kind which will be sufficiently indicated by the mention of one, in virtue whereof no editor of a suppressed journal could undertake another journal, during the space of five years, within any part of Germany. It need hardly be added that few of the newspapers of 1830 saw the Christmas of 1832. Very gradually some of the older journals — and amongst the number the patriarch of all, the Frank- furter Oberpostamtszeitung — plucked up courage enough to speak out a little; and some additional newspapers were again attempted. Amongst those which acquired deserved influence were Brockhaus’s Deutsche Allgemeine Zeitung, the advocate of free trade and of a moderate liberalism, possessing a large circulation in northern Germany (1837); the Deutsche Zeitung, edited by Gervinus, at Heidelberg (July 1847); and the Dorf- zeitung, published at Hildburghausen. The stirring events of 1848 called forth in Germany, as in so many other countries, a plentiful crop of political instructors of the people, many of whom manifestly lacked even the capacity to learn, and vanished almost as suddenly as they had appeared. But it is undeniable that a marked improvement in the ability and energy of the German political press may be dated from this period.

At the beginning of the 20th century the position and influence of the German press were passing through a period of change. The Germans had become a newspaper-reading people. Indeed, with the remarkable growth of the commercial spirit in Germany there had simultaneously been a change in the intellectual attitude and habits of the mass of the nation. The German of ” the great period ” of 1866 and 1870 derived his knowledge of his own and other countries to a very great extent from the more or less intelligent study of books, pamphlets and magazines. The busy German of the opening years of the 20th century had become almost as much the slave of his newspaper as the average American. Berlin in 1900 had 45 dailies, Leipzig 8, Munich 12, Hamburg n, Stuttgart 8, Strassburg 6. In the domains both of home and of foreign politics the result was often a chaos of crude opinions and impulses, the strata of which were only differentiated by certain permanent tendencies of German political thought based upon tradition, class feeling, material interests, or distinctions of religious creed. In these circum- stances it was still possible for the government, as in the days of Prince Bismarck and Dr Moritz Busch, to bring its superior knowledge to bear upon the anarchy of public sentiment through the medium of the inspired (or as it used to be called, the ”

rep- tile “) press, but this operation had now to be performed with greater delicacy and skill. The press had begun to feel its power. It was at least able to drive a bargain with those who would officially control it, and it was conscious in its relations with the authorities that the advantage no longer rested exclusively on the side of the latter. It would be instructive to compare, with

the aid of Dr Busch’s ” Secret Pages ” of the history of Prince Bismarck, the methods by which the first Chancellor used to create and control a movement of public opinion with the devices by which, for instance, count von Biilow and his subordinates endeavoured to manage the press of a later day. The journalists who placed themselves at the disposal of Prince Bismarck were mostly treated as his menials; as he himself said, ” Decent people do not write for me.” Count von Bulow’s methods, and to a certain extent those of his predecessor, Prince Hohenlohe, moved on somewhat different lines. These methods might be characterized as the psychological treatment of the individual journalist, the endeavour to appeal to his personal vanity or to his legitimate ambition, and only in a minor degree to his fear of the dossier, the public prosecutor, and the official boycott. There was also a further development of Prince Bismarck’s system of acknowledging the existence of political and social movements the origin of which was wholly or partially inde- pendent. As in Bismarck’s time, the tendencies of these move- ments were carefully observed, and they were turned to account where they seemed capable of subserving the main objects of state policy. Thus at the opening of the century the pro-Boer and agrarian movements were both employed in support of German foreign and colonial policy, and of an elaborate scheme of naval construction; while the growth of the commercial spirit on the one hand and the awakening of the lower middle classes on the other, were pressed into the service of Welt-politik and of its auxiliary — a system of protective tariffs. It required no small skill to bring into line and to hold together the various classes and interests from time to time arrayed in the press in support of German foreign policy. The organs of the govern- ment in the press were the sheep-dogs which held the flock together.

The German journals of which foreigners hear most belong with few exceptions to the daily press of Berlin. There are, however, one or two provincial or non-Prussian newspapers which from time to time enjoy more careful inspiration from the government offices than any of their Berlin contemporaries. There is, for example, the •Cologne Gazette (Kblnische Zeitung, 1848), of which Prince Bismarck once said that it was ” worth an army corps on the Rhine.” It is difficult to trace all the channels by which information is conveyed to an organ of this kind,

but there have undoubtedly been times when leading articles and entre-filets in the Rhenish organ were virtually or actually written in the German Foreign Office. Indeed, the methods of the institution which has been called the " Press Bureau," but which in the realm of foreign policy at least represented no concrete organization, have been so numerous and varied that it would be hopeless for any one except the most practised observer to trace their manifestations. The advantage of a semi-official press, if it could be manipulated with unvarying success, is that it can easily be dis- avowed when the suggestions, overtures or menaces of which it has been the exponent have served their turn or have become inexpedient. Thus during the blockade of Manila in 1898 the Cologne Gazette gave all the prominence of its first column and of leaded type to an article taken from the Marine Politische Korrespondenz, which practically warned the United States of the intention of Germany to have a share in the Pacific possessions of Spain if these should eventually change hands. Some ten days later the authority of this menace was explicitly disavowed by the North German Gazette, which announced that the Marine Politische Korrespondenz had never possessed a semi-official character. The Cologne Gazette continued in the west of Germany to serve the German government much as it did in the time of Prince Bismarck, although for prudential reasons its inspira- tion became on the whole more intermittent than it was in the days of the first Chancellor. The Hamburgischer Correspondent, the lead- ing Hamburg journal, played a minor r&le of the same nature in the chief Hanseatic port, while the Hamburger Nachrichien, celebrated especially during the exile of Prince Bismarck and the closing years of his life at Friedrichsruh as the receptacle of indiscreet revelations and violent attacks upon his successors, almost lost all significance except as a local organ of violent Anglophobia. The Allgemeine Zeitung of Munich, once famous throughout Europe as the Augs- burger Allgemeine Zeitung before its transference, to the Bavarian capital, became in the hands of new proprietors practically an organ of the imperial Chancellor. In Prince Bismarck's days the press bureau of the Prussian Ministry of the Interior, and a similar organ- ization in the Imperial Home Office, used to furnish hundreds of petty local newspapers known as Kreis-bldtter with whole articles gratis, so that the policy of the government might be advocated in every nook and corner of the country. The numerous journals in which these communications used to appear simultaneously and in an identical form were the government organs to which the Radical and Socialist

opposition more particularly applied the term ” Reptile Press.” Later this practice of wholesale inspiration was abandoned, but there remained many channels, public and private, through which almost every department of the government could communicate information and guidance to newspapers in all parts of Germany. The Prussian Ministry of the Interior distributed to all and sundry a news-letter known as the Berliner Korrespondenz, professing only to give statistics and information, and to correct erroneous statements, but also frequently containing articles advocating some proposal of the government or combating the arguments of its opponents. The Siid-Deutsclie Reichs-Korrespondenz had a similar character, and in 1902 served as an exponent of the policy and tactics of the imperial Chancellor, count von Billow. Almost every one of the political parties has its Korrespondenz (or news-letter) supplying views rather than news. These circular letters deal, in fact, with the policy of the party with which they are associated, although they occasionally also embody information which the party leaders in the Reichstag or in the Prussian Diet have received from representatives of the government for their own guidance. They form the means of hold- ing the parties together, and of inspiring them with common aims, as they are reproduced throughout the country by all the party organs. It was in the press of Berlin that the greatest changes took place towards the end of the 19th century. During the regime of Prince Bismarck the North German Gazette, and occasionally the Post, used to keep Europe in a state of nervous tension by fulminant com- muniques which the, great Chancellor himself often dictated, or by what he used to call ” jets of cold water ” {Kaltwasserstrahl), which were mostly directed against France or Russia. So far as France and Russia are concerned, a much more pacific tone prevailed in Berlin after the conclusion of the Dual Alliance, and it was upon England that the press mainly concentrated its attacks. The North German Gazette, which was originally established by a private individual, in order ” to place a blank sheet of paper at the disposal of Prince Bismarck,” became on the whole, a mere record of home news and a summary of foreign intelligence bearing the semi-official stamp of Wolff’s Telegraph Agency. It had doubtless been found that the constant employment of an organ so distinctly official as the Norddeutsche Allgemeine as a medium of expression for the views of the government was apt to lead to indiscretions which committed the authorities too deeply. Indeed, immediately before Prince Bismarck’s fall he had actually employed this journal in order to attack the labour policy of the emperor. Official communications still continued to appear in the North

German Gazette, but mostly characterized by a vagueness and awkwardness of style in striking contrast to the force and point of Prince Bismarck's polemics. The Imperial Gazette {Reichsanzeiger) , corresponding to the London Gazette, is purely a record of official intelligence, though on rare occasions it publishes in the section marked Nicht Amtlich (non- official), some dementi, some statement of policy or some official document — a proceeding which always requires the express sanction of the emperor.

The journals which in 1880 were most widely read in Berlin, ana which were best known abroad as the exponents of Berlin opinioi'- were the Liberal or Radical Vossische Zeitung and Berliner Tageblait, and the National Liberal National Zeitung. The Vossische Zeitung, the oldest of all the Berlin newspapers, written with a degree of literary ability which justified its real title, Kbniglich priviligierte Berlinische Zeitung filr Stoats- und Gelehrtensachen, held its place. The National Zeitung, however (founded in 1848 by Bernhard Wolff, the originator of Wolff's news agency), which represented as long as it could those vestiges of old German Liberalism which survived in the National Liberal party, was compelled to come to an end on January 1st, 1905. The Kreuz Zeitung represented the " small but mighty party " of the reactionary Conservatives and Agrarians in the state, and of the orthodox (Lutheran) Protestants in the Church. It was the favourite journal of officers in the army, of the Conservative gentry {Junker), as well as the medium through which people of social standing preferred to announce births, marriages and deaths. The Post continued to be subsidized by a small number of industrial and rural magnates in the interests of the Reichspartei, or Free Conservative party, which for the most part subordinated its views to those of the government. The Berliner Neueste Nachrichten, like the Post, was a consistent advocate of the development of the German navy and of a vigorous Welt-politik. The Boersen Zeitung and the Boersen-Courier were organs of the Berlin Stock Exchange; the first of a National Liberal colour, and the other expressing the views of the Moderate Radicals (Freisinnige Vereinigung) and of opponents of extreme protection. The Vorwarts was the central organ of the German Social- Democrats, who had established a considerable number of other journals throughout Germany. The clericals or Centre party were represented by the Germania, less influential than the other leading organ of the Roman Catholic " governing party," the Kolnische Volks-zeitung. The Deutsche Tageszeitung made itself a name by its advocacy of the agrarian movement, while the Freisinnige Zeitung (founded, and to a great extent edited, by the Radical leader Eugen Richter) represented the Radical point of view. Among the provincial papers the

Frankfurter Zeitung (Radical) was distinguished by the excellence of its news, especially on commercial subjects. The Schlesische Zeitung (1752) a leading Conservative organ, had continued to appear in Breslau since the days of Frederick

the Great. The Magdeburger Zeitung and the Hannoversche Courier gave an independent or National Liberal support to the government, The Weser Zeitung, published at Bremen, was an exponent of the Liberalism of the commercial classes, while the Strassburger Post was one of the journals which enjoyed government inspiration, and helped to maintain die Wacht am Rhein. A considerable number of journals, published in the Polish language, advocated the Polish cause in the eastern provinces of Prussia.

Great success attended a new departure in German journalism, represented by newspapers like the Berlin Lokal-Anzeiger, describing themselves as non-political. The Lokal-Anzeiger, founded by August Scherl, who had gained his journalistic experience in America, had a circulation in Germany comparable with that of the Petit Journal in France, and it exercised a very marked influence upon public opinion in Berlin.

The external form and arrangement of German newspapers is often puzzling at first sight to an English reader. There is an absence of the striking headlines, which in English journals direct attention to news of importance, and which in America almost swamp the text. The outside page generally contains the editorial articles and the news of most importance, while the intelligence received immediately before going to press is placed in the last column of the last sheet. The bulk of the paper can apparently be increased in- definitely in accordance with the supply of news or literary matter, or with the number of advertisements. The Vossische Zeitung on a Sunday morning assumes, with its numerous supplementary sheets, the dimensions of a thick Blue-book. The quantity of extraneous matter, such as articles on literary, social and technical subjects, is enormous, and even the most serious political journals invariably publish a novel in serial form, as well as numerous novelettes and sketches. The local news in Berlin and other large cities is written with the minuteness and the familiarity of style of a village chronicle, and gives the impression that every one is occupied in observing the doings of his neighbour. The signed article is very much in vogue, and most writers and salaried correspondents have at least a cypher or initial by which they are distinguished. The greatest licence prevails in reporting and discussing the affairs of other countries, combined with the keenest sensitiveness to foreign criticism of anything that concerns Germany. The example

of the government is followed in advertising the products of German industry, while those of foreigners are studiously depreciated.

6. Other European Countries Austria-Hungary. — At the beginning of 1840 the whole number of Austro-German and Hungarian periodicals, of all sorts, was less than 100, only 22 being (after a fashion) political newspapers; and of these nearly all drew their materials and their inspiration from the official papers of Vienna {Wiener Zeitung and Oesterreichischer Beobachter). These two were all that appeared in the capital. Agram, Pesth, Pressburg, Lemberg and Prague had also two each; but no other city had more than a single journal. In 1846 the aggregate number of periodicals had grown to 155, of which 46 were political, but political only in the character of mere conduit-pipes for intelligence ” approved of ” by the government. In 1855 the number of political papers published throughout the entire territory under Austrian government, the Italian provinces excepted, was 60. The Neue Freie Presse, the chief Vienna daily, was founded in 1864. In 1873, ten years after the virtual cessation of a very strict censorship, the number of political journals, including all the specifically administrative organs, as well local as general, was 267, and that of mere advertising papers 42; in 1883 the former number had increased to about 280, the latter to about 60. Vienna had in 1883 in all 18 daily newspapers, ten of which ranged in average circulation from 14,000 to 54,000 copies.

In the period from 1880 to 1888 the only notable paper founded in Austria, was the Wiener Allgemeine Zeitung (1880). It appeared three times daily, but in spite of the impetus communicated to its start by the well-known ” Freilands ” Apostle Theodor Hertzka, it soon fell away, and eventually became simply a late evening paper, known as the 6 Uhr Abendblatt. It was with the rise of the anti- Semitic and Socialistic movements of 1888 onwards that the Vienna daily press first began a fresh increase. The Deutsche Volksblatt (anti-Semitic) was founded in 1888, the Ostdeutsche Rundschau (Radical) in 1893, and the Reichspost (the organ of the Catholic section of the Christian Socialist party) in 1894. The Labour movement led to the development of the Arbeiterzeitung from a weekly, when it succeeded the Gleichheit in 1889, to a daily in 1895. It was therefore the first Social Democratic daily of Austria. In 1893 the Neues Wiener Journal was founded as a political neutral, and the old Presse disappeared in 1894, its place being filled by the weekly Reichswehr (military), established in 1888. The French daily paper, Le Petit Journal de Vienne, was founded in May 1899. In 1902 nineteen political dailies were published in Vienna.

In 1883 the Hungarian journals numbered 170; in 1899 they were returned as 764. Budapest, which in 1890 had 14 dailies and 10 weeklies, in 1900 had 21 and 3 respectively. The leading papers are the Budapest Kogtbng, the Pester Lloyd and the Budapeste Hirlap. Of the German provincial press the most highly developed is in the German towns of Bohemia and in Prague, and the foundation of the Deutsche Volkszeitung at Reichenberg in 1885 marks the date of

separation of the Deutschfortschrittliche and Deutschvolkliche parties, while the Radical party, which greatly increased in Bohemia, was first represented by the weekly Deutscher Volksbote at Prague, and also in 1897 by the Unverfalschte deutsche Worte, edited by Iro at. Eger. A peculiar feature in Austrian journalism is the existence of German organs of the Czech national movement, of which the repre- sentative is the Prague daily Politik, founded in 1862. In Silesia the anti-Semitic Freie Schlesische Presse was founded in 188 1 at Troppau, and when it changed sides in 1889 it was speedily replaced, 1891, by the Deutsche Wehr. In Moravia the representative papers of the Czech Conservatives and Radicals were the Mir and the Pozar respectively. The newspapers in Galicia, which increased steadily after 1870, are both numerous and important. The leading ones are the Slovo Polskie in Lemberg and the Glos Naroda in Cracow. In 1900 there were 161 newspapers in Polish, as against 10 in 1848 and 50 in 1873. Of the lesser Slavic nations, the Slovenians advanced the most, the Slovenski List having started at the end of 1896. In Illyrian journalism the chief newspapers founded after 1880 were the Crvena Hrvatska (1891), and the Hrvatska Kruna (1893). An attempt at unity amongst the Ruthenian factions in 1 885 to 1887 produced the Mir, while the Ruslan, a daily founded at Lemberg in 1896, advo- cated joint action by Poles and Ruthenians. The Bukowyna, established in 1885, developed into the organ of ” Young Ruthenia,” and the Bukowinska Widomosty, established in 1895, represented the Old Ruthenians.

The Italian press in Austria was represented in 1900 chiefly by the very popular daily Piccolo, published at Trieste ; it had a formidable rival in the Matlino, from 1885 to 1898. The Fede e Lavoro, published at Roveredo, was the organ of the Catholic Labour party, and L’Awenire del Lavoro, at Bozen, that of the Socialists. In Dalmatia the Corriere Nazionale, founded in 1896 at Zara and afterwards published

at Trieste, was the organ of the autonomist Italians, while II Dalmata continued to represent the National Liberals.

Belgium. — The Nieuwe Tijdinghen of Antwerp, published by Abraham Verhoeven, has been said to date virtually from 1605, in which year a ” licence for the exclusive retailing of news ” was accorded to him by the archduke Albert and the archduchess Isabella. But the claim is conjectural. No copy of any number anterior to 1616 is now known to exist. It seems probable that the Gazette Extraordinaris Posilijdinghen, published by Wilhelm Verdussen between i637and 1644, is a continuation of Verhoeven’s paper. But.bethisas it may, that of Verdussen was certainly the foundation of the well-known Gazette van Antwerpen, which continued to appear until 1827. Bruges had its Nieuwe Tijdinghen uyt verscheyden Quartieren, published (in black letter) by Nicholaes Breyghel. When this paper was commenced is uncertain, but various numbers of it exist with dates between 1637 and 1645. In one of these (26th July 1644) a Brusselsche Gazette of the 24th of that month is quoted, apart from which citation no Brussels paper is known of earlier date than 1649. When the first number of Le Courier veritable des Pays-Bas made its appearance, the publisher (Jean Mommaert) prefaced the first number by an address to the reader, in which he says: ” I have long endeavoured to meet with somebody who would give employ- ment to my presses in defending truth against the falsehoods which malignity and ignorance send daily abroad. I have at length found what I sought, and shall now be able to tell you, weekly, the most important things that are going on in the world.” This paper became afterwards the Gazette de Bruxelles, then Gazette des Pays- Bas; and, under the last-named title, it continued to appear until 1 79 1. The Annates Politiques of Linguet was one of the most re- markable of the political journals of Brussels in the 18th century. For a time the editor won the favour of the emperor Joseph II. by praising his reforms, and the Government subscribed for 1200 copies of his paper at two louis d’ors each a year; but here, as in almost every other place of residence during his chequered career, Linguet at length incurred fine and imprisonment. His journal was re- peatedly suppressed, and as often resumed under many modifications of title. It was continued in France, in Switzerland (at Lausanne), and in England. At one time it was so popular that a printer in Brussels regularly and rapidly published a pirated edition of it. For a brief period the publication was resumed at Brussels. Mallet DuPan was, for a time, a collaborator in the editorship. Linguet died by the guillotine in 1794. Le National was a famous paper for a short period prior to the revolution of 1830. Soon after its cessa- tion — its presses were destroyed by the populace

on the 26th August — the official journal, Le Monileur Beige, was established, — ” the ministry deeming it indispensable to the success of its great political enterprise that a journal should be created which might expound its views, and act daily upon public opinion “; and, on decree of the regency, it was published accordingly.

The first newspaper published at Ghent, Gazette van Gent, appeared in 1667. Den Vaderlander, begun in October 1829, was, for a long period, one of the most widely circulated of the Flemish journals.

In 1890 Brussels published 34 papers of various periodicity, among which the Monileur Beige held the lead with a circulation of 90,000, while Le National (revived in 1885) and L’Etoile (1869) circulated 21,000 and 5000 respectively. In 1900 there were 18 dailies and 14 weeklies, &c. Antwerp had 7 dailies in 1890 and 1900; Ghent 7 dailies in 1890 and 6 in 1900; Liege 6 in 1890 and 5 in 1900. The halfpenny paper is well established.

Holland. — The kingdom of the Netherlands has always been rich in newspapers, but they have usually had more weight commercially than politically. Amsterdam in 1890 had 10 dailies, and in 1900 had 12 dailies (Algemeen Handelsblad, Nieuws van den Dag, &c). In 1900 the Hague had 6 dailies (Dagblad, Vaderland, &c.) ; and Rotter- dam had 5 dailies (Nieuwe Rotterdammer Courant, &c). The oldest Dutch paper, the Haarlemsche Courant, founded in 1656, is still one of the leading journals.

Italy. — The Diario di Roma, although dating only from 1716, may claim to have been the patriarch of the Italian press. It lasted for nearly a century and a half. During its later years it was a daily paper, with a weekly supplement having the somewhat whimsical title Notizie del Giorno. Next to this came the Gazzetta Uffiziale di Napoli. These and their congeners were published under a rigid censorship until far into the 19th century, and exercised little influ- ence of any kind. The first tentative movement towards a free press may, perhaps, be dated from the effort to establish at Milan, in 1818, under the editorship of Silvio Pellico, the Conciliatore, in which Simonde de Sismondi, Gonfalonieri and Romagnosi were fellow- writers. But the new journal was suppressed in 1820. The first really effectual effort had to wait for the lapse of nearly thirty years. L’Opinione was first published in Turin (26th December 1847) after- wards in Rome. It had, amongst its many editors, Giacomo Durando (a soldier of mark, and twice minister of foreign affairs) , Montezenolo, Giovini Bianchi and Giacomo Dina. The Florence Diritto, originally founded at Turin, in 1 851, by Lorenzo Valerio, was edited successively by Macchi,

Bargini and Civinini, and as a radical organ attained £reat influence. Counting journals of all kinds, there were published in Italy in 1836 185 newspapers; in 1845, 200; in 1856, 311; in 1864, 450; in 1875, 479. In 1882 the ” periodicals ” of all kinds numbered 1454, and total number of political dailies was 149. In 1890 Rome published 13 dailies, and in 1900, 10 dailies. The leading Roman papers were the Fanfulla, representing the court and govern- ment; the Tribuna (5 centimes), a Liberal paper founded in 1883; the organ of the Vatican, L’Osservatore Romano; and the popular Messaggiero. II Secolo (1866) and the Corriere delta Sera (1876) are issued from Milan.

Russia, Poland and Finland.— ‘The earliest gazette of Moscow (Moskovskya Viedomosti) was issued by order of Peter the Great on the 16th December 1702, but no copy is known now to exist of earlier date than the 2nd January following. The whole gazette of the year 1703 was reproduced in facsimile by order of Baron de Korff (the imperial librarian at St Petersburg) in 1855, on occasion of the festival for the 3rd century of Moscow university. The existing Viedomosti dates only from 1766. That of St Petersburg dates from 1718. The historian Karamzin established a short-lived Moscow journal {Moskovski Listok), and afterwards at St Petersburg the once widely-known Russian Courrier de F Europe (1802). The profits of the successful Invalide Russe (Russki Invalid), established in 1815 by Persorovius, were devoted to the sufferers by the war with France. Adding to the distinctively political journals those of miscellaneous character, the whole number of newspapers published within the Russian states — Poland and Finland excepted — in the year 1835 was 136; in 1858 that number had grown to 179, of which 82 were published in St Petersburg and 15 in Moscow; 132 were printed in Russian, 3 in Russian and in German, 1 in Russian and in Polish, 28 in German, 8 in French, 3 in English, 1 in Polish, 1 in Lithuanian, 1 in Italian. In 1879, under the more liberal rule of Alexander II., the number of political and miscellaneous journals had grown to 293, and of these 105 were under the direct influence of the Government. But, in truth, the period of relaxation of censorship, if strictly ex- amined, will be found to have lasted only from 1855 to 1864, when repressive measures were again and frequently resorted to. Poland in 1830 had 49 newspapers. Fifty years later the number was still less than 70, of which 54 were in Polish, these numbers including journals of all kinds. Finland in i860 had 24 newspapers, half in Swedish, half in Finnish. In 1863 the number had increased to 32, in spite of the zealous opposition of Count de Berg, the governor-general, to all discussion of political events and ” subjects which do not concern the people.” He was very friendly to journals of gardening and cottage

economy, and to magazines of light literature, and did not regard comic papers with anger provided they kept quite clear of politics. The paper which was long the chief Finnish organ, Suometar (founded at Helsingfors in 1847), owed much of its popularity to the pains its editors took with their correspondence* The Oulun Wukko-Samomat (" Uleaborg Daily News ") was for a considerable period the most northerly newspaper of the world,, with the one exception of the little journal published at Tromso, in Norway.

In 1880 the whole number of newspapers printed within the government of Finland was 46, while the total number of news-papers and journals of all kinds published within the whole Russian empire during the same year was 608. Of these, 417 were printed in the Russian language, 155 of them being official or administrative organs; 54 were printed in Polish, 40 in German, 11 in Lettish, 10 in French, 7 in Esthonian, 3 in Lithuanian.

In 1890 St Petersburg had 6 dailies; and in 1900 there were 16 dailies (the St Petersburgskya Viedomosti, the Novoya Vremja, the Journal de St Pitersbourg, &c). Moscow increased from 5 to 8 dailies (the Moskovskya Viedomosti, &c.). The rest of Russia proper produced about 100 newspapers, of which one-third were dailies.

In Russian Poland about 11 papers, one-half being dailies, were published at Warsaw in 1900 (Kurier Warsawski, Gazeta Polska, &c). Spain and Portugal. — In Spain no newspaper of any kind existed earlier than the 18th century, a Gaceta de Madrid starting about 1726 (an alleged gaceta in 1626 is a myth). Even during the early years of the 19th century the capital contented itself with a single journal, the Diario de Madrid. The Peninsular War and the establishment of the Cortes gave the first impulse towards some- thing which might be called political journalism, but the change from total repression to absolute freedom was too sudden not to be grossly abused. The Diario de las Cortes, the Semanario Patriotico (published at Cadiz from 1808 to 1811,) and the Aurora Mallorquina (published at Palma in 1812-1813) were the first of the new papers that attained importance. In 1814 the circulation or receipt in Spain of English newspapers was prohibited under penalty of ten years' imprison- ment. Most of the native journals fell with the Cortes in 1823. In the following year Ferdinand decreed the suppression of all the journals except the then Diario and Gaceta of Madrid, the Gaceta de Bayona, and certain

provincial papers which dealt exclusively with commercial or scientific subjects. At the close of his reign only three or four papers were published in Madrid. Ten years afterwards there were 40; but the number was far more noticeable than the value. Spanish newspapers have been too often the mere stepping- stones of political adventurers, and not unfrequently the worst of them appear to have served the turn more completely than the best. Gonzales Bravo attained office mainly by the help of a paper of notorious scurrility, — El Guirigay. His press-law of 1867 introduced a sort of indirect censorship, and a system of ” warnings,” rather clandestine than avowed; and his former rivals met craft with craft. The Universal and the Correo were successively the organs of Jose Salamanca. At the end of 1854 the political journals published tn Madrid numbered about 40, the most conspicuous being the now defunct Espafia and El Clamor Publico. In 1890 Madrid published 38 papers, of which 15 were dailies; but by 1900 they declined to 28, of which 19 were dailies. The leading Spanish papers in 1900 were — El Correo (1879), Monarchico-Liberal; La Epoca, Conservative; El Imparcial, Independent Liberal; La Justicia, an evening Re- publican paper; El Liberal, numbering among its contributors the best writers without distinction of party ; and El Pais, the organ of the Progressives.

Portugal in 1882 was credited with 179 journals of all kinds and of various periodicity. Of this number 68 appeared in Lisbon. The strictly political daily papers of Lisbon were 6 in number; those of Oporto 3. In 1890 Lisbon published 11 dailies; and in 1900, 19 dailies.

Sweden. — In Sweden the earliest regular newspaper appears to have been the Ordinarie Post-Tidende of Stockholm, first published in 1645, and continued until 1680, then, after long suspension, re- vived under the title Post- och Inrikes-Tidnine. Stockholm has also its Aftonbladet. The Post-Tidende was followed by the Svensk Mercurius (1675-1683) and the Latin Relationes Curiosae (1682- 1701). In 1742 a Swedish newspaper in French (Gazette Fran{aise de Stockholm) was commenced, and was followed in 1772 by the llercure de Suede. But the press in Sweden had small political influence until 1820, when the Argus was established by Johannsen. The strife between ” classicists ” and ” romanticists ” spread itself in Sweden, as in France, from the field of literature into that of politics.- Crusen- stolpe’s Fdderneslandbladet and Hjerta’s Aftonbladet, founded in 1830, were long the most conspicuous of the Swedish journals, — the former on the side of the royalists, the latter on that of the reformers. Hjerta’s paper, in its best days, could boast of a circulation of 5000 copies; but on the accession of King Oscar it ceased to appear as an opposition organ. Almost every town in the provinces now has its paper. In 1890

Stockholm had 5 dailies and 12 weeklies, &c; in 1900 it had 11 dailies and d weeklies, &c, while 93 provincial towns published 197 papers, mostly weeklies, &c. In the period 1890-1894 a large number of newspapers appeared at Stockholm, but their duration was in general very short, often only a few months (Lundstadt, Sveriges Periodiska Literatur, ii. 1896). A newspaper in Finnish is published at Haparanda.

Denmark. — While Denmark published an Europaische Zeitung as early as 1663 and the Danske Mercurius in 1666, the political influence of the press is a newer thing in that country than even in Sweden. Until 1830 Copenhagen had but two papers, and they filled their columns with mild extracts from foreign journals. Real activity in this direction dates from the establishment of the pro- vincial states in 1834. The Berlingske Tidende dates from 1749, and was at first published in German. The Fddrelandet in 1 848-1 849: was in a glow of zeal for Scandinavianism and ” Young Denmark. ‘ In 1890 Copenhagen produced 8 dailies and 6 weeklies, &c. In 1900 it had 12 dailies and 2 weeklies, while 121 papers appeared in sixty- eight provincial towns.

Reykjavik {Iceland) published two weekly papers in 1890, and the same number in 1900 (Thiodolfr and Isafold).

Norway. — The earliest Norwegian paper was the Christiania Intelligentssedler, founded in 1763. Next to this came the Adresse-contors Efterretninger (1765), published at Bergen. Den Constitutionals absorbed an older paper, called Norske Rigstidende. The Morgenblad was founded in 1819. In 1890 Christiania published 12 papers, of which only three appeared daily; in 1900 only 10 papers

were produced, but 8 of them were dailies. The Morgenbladet still held its rank, and the Aftenposten had a large circulation.

Switzerland. — In 1873 the total number of political and general newspapers in Switzerland was 230. In 1881 they numbered 342; 53 were of daily issue, 166 appeared twice or thrice a week, and 7 only were of weekly issue. A monthly compendium of the news of the day appeared at Rorschach, in the canton of St Gall, as early as January 1597. The editor was a German, one Samuel Dilbaum, of Augsburg. He varied his titles, so that his monthly newsbooks, although really consecutive, do not wear the appearance of serial publications. Sometimes he called his issue Historische Relatio, sometimes Beschreibung, sometimes Historische Erzahlung. Switzer- land has since become remarkable for the number of its newspapers in proportion to its size. Among the more important may be mentioned the Journal de Geneve and the Gazette de Lausanne, both Moderate Liberal, and the Catholic Courrier de Geneve. La Tribune de Gen&ve (1878) is a leading five-centime paper. 1

Greece. — The few newspapers that made their sudden appearance in Greece during the war of liberation departed as hastily when King Otho brought with him a press-law, one of the provisos of which demanded caution-money by actual deposit. The journal Saviour was established, in 1834, as a Government organ, and was soon followed by Athena as the journal of the opposition. Ten years later 7 distinctively political papers had been established, along with 13 journals of miscellaneous nature. In 1877 there were, of all sorts, 81 journals, of which 77 appeared in Greek, 2 in Greek and French, 2 in French only; 37 of these were printed in Athens, 17 in the Ionian Islands. In 1890 Athens published 9 dailies and 4 weeklies, &c, and in 1900, 10 dailies and 2 weeklies. The chief papers, the Asty and the Acropolis, were mainly political and on the Liberal side, as indeed were nearly all the Athenian papers.

Turkey. — During the embassy (1795) of Verninac Saint-Maur, envoy of the French republic, a French journal was established at Pera. This, possibly, is the pioneer of all Turkish newspapers. Thirty years later (1825) the Spectateur de VOrient was founded at Smyrna, also by a Frenchman (Alexander Blacquet?). It was after- wards published under the titles Courrier and Journal de Smyrne. In like manner, the Moniteur Ottoman, first of strictly Constantino- politan journals, was founded by the above-named Blacquet in 1 83 1. It soon changed its language to Turkish, and was edited by Franceschi. The second Smyrna newspaper, Echo de VOrient, established in 1838, was

transferred to Constantinople in 1846. But not one of these papers has survived. In 1876 the total number of

i'ournals of all kinds published in the capital was 72 (namely, 20 in r rench, 16 in Turkish, 13 in Armenian, 12 in Greek, 11 in as many other tongues). In 1890 there were 19 papers, in various languages, published at Constantinople, most of them dailies; and in 1900 the number of papers decreased to 18. They appeared in the following languages: the Stamboul and 4 others in French, 3 in Turkish, 1 in Turkish and Greek, 3 in Greek, 2 in Armenian, I in English and French, and 1 each in Arabic, English, Italian and Persian. Smyrna published 8 papers, mostly weeklies, in 1890, and the same number in 1900. Owing to the number of Mahommedan fasts and feasts Turkish newspapers are somewhat irregular in their appearance.

For the newspapers of other countries (e.g. Japan) or of important towns, see under the separate topographical headings. (H. Ch.)

NEWT (a corrupted form from " an evet " or " an effet," a term of Anglo-Saxon origin, still used in many parts of England), the name usually applied to the aquatic members of the family Salamandridae which constitute the genus Molge, formerly known as Triton. But the name Triton, applied to these Batrachians by N. Laurenti (1768), has already been used by Linnaeus (Systema Naturae) for parts of the barnacle (Lepas analifera). B. Merem (1820) proposed to substitute for it the name Molge, said to be derived from the Gr. M6\yrp or M6X70S, " slow," in allusion to the movements of these animals on land. The similar name Molch designates these Batrachians in Gfcrman.

The newts are very closely related to the true Salamanders, Salamandra, from which they differ principally in the shape of the tail, which is compressed, in relation to their aquatic habits during a considerable part of the active period. Their aquatic progression is effected principally by means of the tail, and during the act of swimming the legs are turned backwards and folded against the body and tail, so as to admit of the smallest possible degree of resistance.

A very marked sexual dimorphism prevails in most species of this genus, the males being more brilliantly coloured than the females and provided with a dorsal crest which attains its greatest development during the breeding season, lasting through the spring and the early summer. Later in the season the males more or less completely lose their crests and other nuptial orna- ments, and the two sexes are more alike; they then retire on

land, concealing themselves under stones, logs of wood, or in holes in damp earth, but leaving their retreat at night or in wet weather to search for earth-worms and slugs which constitute their principal food. In the water they are very destructive of tadpoles, insect larvae and crustaceans.

A remarkable feature of the newts, which they share with the other tailed Batrachians and the larvae of the frogs and toads, is the great facility with which they regenerate lost parts, such as the tail, limbs, and even the eye, a faculty which has given rise to a great variety of experiments, from the days of Charles Bonnet and Spallanzani to those of the present school of Enlwickelungsmechanik.

Extraordinary as it may appear, considering the abundance of these creatures and the attention they have received from naturalists, it was only in 1880 that their mode of fecundation was correctly ascertained, from observation of the common newt by the Italian zoologist F. Gasco. The amorous games of the newts, so graphically represented by M. Rusconi, had been repeatedly described, and Abbd Spallanzani, as early as 1766, had ascertained the impregnation to be internal. The then current belief that the water served as a vehicle to convey the spermatozoa to the female organs had received a blow on Karl Theodor von Siebold's discovery of a receptaculum seminis in the female, but no satisfactory explanation had been given of the manner in which the. spermatozoa reach these pouches. This mystery Gasco succeeded in elucidating in his masterly paper published in 1880, which has since been supplemented by his own investigations on the axolotl, and those of E. Zeller, E. O. Jordan and others on the European and American newts.

All who have kept newts in an aquarium have witnessed the curious antics of the male placing himself before the female and rapidly vibrating his folded tail, or bending his body in a semicircle, as if to prevent her from passing ahead of him. The male then emits, at short intervals, in front of the female, several conical or bell-shaped spermatophores (a gelatinous secretion from the cloaca), adhering to the ground and crowned by a spherical mass of spermatozoa, which the female afterwards gathers in the lips of her cloaca either by mere application or by holding the spermatophore between her hind legs and pressing the mass of spermatozoa into the cloaca, whence they ultimately find their way into the lower part of the oviducts, where

the eggs are fecundated as they descend.

The larvae are provided with three pairs of long, fringed, plume- like external gills, which are not lost until the very last stages of the metamorphosis, and, in exceptional cases are even retained throughout life, the newt breeding in the branchiate condition, as often happens in the axolotl. The fore limbs are developed before the hind limbs.

The genus Molge has a wide distribution, extending over Europe, north-west Africa, south-western Asia, eastern temperate Asia (China and Japan) and North America as far south as southern California and the Rio Grande del Norte. Twenty species are dis- tinguished. The British species are the crested newt (M. cristata), the common newt (M. vulgaris) and the palmated newt (M. palmata). The first is the largest, and measures 4 to 6 in. The skin is more or less rugose, with granular warts, a strong fold extends across the throat, and the male is provided with a very high dentate dorsal crest which is interrupted over the sacral region ; the upper parts are dark, with more or less distinct black spots; the sides are speckled with white, and the lower parts are yellow or orange, spotted or marbled with black ; a silvery stripe adorns the side of the tail in the male. The common and the palmated newts are smaller, 2 \ to 4 in. in length, and have a smooth skin. The dorsal crest of the male is high and festooned in the former, low and straight-edged in the latter ; during the breeding season the feet of the common newt are lobate like a grebe's, whilst they are webbed like a duck's in the palmated newt, which is further distinguished in having the tail truncate and terminating in a filament.

It is a remarkable fact that, although related so closely and occur- ring so frequently together in pools of small extent, the common arfd palmated newts are not known ever to produce hybrids, whilst the crested newt, when coexisting (in some parts of France) with a south-western ally, the beautiful Molge marmorata, to which it is by no means more nearly akin than are the two above-named species to each other, regularly gives rise to the form known as M. Masii, which has been proved to be a cross between M. cristata and M. marmorata.

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NEWTON, ALFRED (1820-1907), English zoologist, was born at Geneva on the nth of June 1829. In 1854 he was elected travelling fellow of Magdalene College, Cambridge, of which he

had been an undergraduate, and subsequently visited many parts of the world, including Lapland, Iceland, Spitsbergen, the West Indies and North America. In 1866 he became the first professor of zoology and comparative anatomy at Cambridge, a position which he retained till his death. His services to ornithology and zoogeography were recognized by the Royal Society in 1900, when it awarded him a Royal medal. He wrote many books, including Zoology of Ancient Europe (1862), Ootheca Wolleyana (begun in 1864), Zoology (1872), and a Dictionary of Birds (1893- 1896). The last, still a standard work, was an amplification of the numerous articles on birds which he contributed to the 9th edition of the Encyclopaedia Britannica, and which with com- paratively slight revision are retained in the present edition. He contributed many memoirs to scientific societies, and edited The Ibis (1865-1870), the Zoological Record (1870-1872), and Yarrell's British Birds (1871-1882). He died at Cambridge on the 7th of June 1907.

NEWTON, SIR CHARLES THOMAS (1816-1894), British archaeologist, was born on the 16th of September 1816, at Bredwardine in Herefordshire, and educated at Shrewsbury School and Christ Church, Oxford. He entered the British Museum in 1840 as an assistant in the Antiquities Department. Antiquities, classical, Oriental and medieval, as well as ethno- graphical objects, were at the time included in one department, which had no classical archaeologist among its officers. In 1852 Newton quitted the Museum to become vice-consul at Mitylene, with the object of exploring the coasts and islands of Asia Minor. Aided by funds supplied by Lord Stratford de Redcliffe, then British ambassador at Constantinople, he made in 1852 and 1855 important discoveries of inscriptions at the island of Calymnos, off the coast of Caria; and in 1856-1857 achieved the great archaeological exploit of his life by the discovery of the remains of the mausoleum of Halicarnassus, one of the " seven wonders " of the ancient world. He was greatly assisted by Murdoch Smith, afterwards celebrated in connexion with Persian telegraphs. The results were described by Newton in his History of Discoveries at Halicarnassus (1862- 1863), written in conjunction with R. P. Pullan, and in his Travels and Discoveries in the Levant (1865). These works included particulars of other important discoveries, especially at. Branchidae, where he disinterred the statues which had anciently lined the Sacred Way, and at Cnidos, where R. P. Pullan, acting under his direction, found the colossal lion now in the British Museum.

In 1855 Newton declined the regius professorship of Greek at Oxford. In i860 he was made British consul at Rome, but had scarcely entered upon the post when an opportunity presented itself of reorganizing the amorphous department of antiquities at the British Museum, which was divided into three and ulti- mately four branches. The Greek and Roman section naturally fell to Newton, who returned as Keeper, and held the office until 1885, declining the offer of the principal librarianship made to him in 1878. The Mausoleum Room, to accommodate the treasures he had found in Asia Minor, was built under his super- vision, but the most brilliant episode of his administration was the acquisition of the Blacas and Castellani gems and sculptures. The Farnese and Pourtales collections were also acquired by him. He took a leading part in the foundation of the Society for the Promotion of Hellenic Studies, the British School at Athens, . and the Egypt Exploration Fund. He was Yates professor of classical archaeology at University College, London, from 1880 to 1888. His collected Essays on Art and Archaeology were published in 1886. When, on his retirement from the Museum, his bust by Boehm, now placed in one of the sculpture galleries, was presented to him as a testimonial, he desired the unexpended balance to be given to the school at Athens. After his retirement he was much occupied with the publication of the Greek inscrip- tions in the British Museum, but his health failed greatly in the latter years of his life. He died at Margate on the 28th of November 1894. He married in 1861 the daughter of his successor in the consulate at Rome, the painter Severn, herself a distinguished artist. She died in 1866. (R. G.)

NEWTON, SIR ISAAC

58.3

NEWTON, SIR ISAAC (1642-1727), English natural philo- sopher, was born on the 25th of December 1642 (o.s.), at Wools- thorpe, a hamlet in the parish of Colsterworth, Lincolnshire, about 6 m. from Grantham. His father (also Isaac Newton) who farmed a small freehold property of his own, died before his son's birth, a few months after his marriage to Hannah Ayscough, a daughter of James Ayscough of Market-Overtqn. When Newton was little more than two years old his mother married Barnabas Smith, rector of North Witham. Of this marriage there was issue, Benjamin, Mary and Hannah Smith, and to their children Sir Isaac Newton subsequently left the greater part of his property. After having acquired the rudiments of educa- tion at two small schools in hamlets close to Woolsthorpe, Newton was sent at the age of twelve to the grammar school of Grantham. While attending Grantham school Newton lived in the house of Mr Clark, an

apothecary of that town. According to his own confession he was far from industrious, and stood very low in his class. An unprovoked attack from the boy next above him led to a fight, in which Newton's pluck gave him the victory. This success seems to have led him to greater exertions, and he rose to be the head boy of the school. He displayed very early a taste and an aptitude for mechanical contrivances. He made windmills, water-clccks, kites and dials, and he is said to have invented a four-wheeled carriage which was to be moved by the rider. In 1656 Mr Smith died, and Newton's mother came back with her three children to Woolsthorpe. Newton was then in his fifteenth year, and, as his mother in all probability intended him to be a farmer, he was taken away from school. He was frequently sent on market days to Grantham with an old and trusty servant, who made all the purchases, while Newton spent his time among the books in Mr Clark's house. It soon became apparent to Newton's relatives that they were making a great mistake in attempting to turn him into a farmer, and he was therefore sent back again to school at Grantham. His mother's brother, William Ayscough, the rector of Burton Coggles, the next parish, was a graduate of Trinity College-, Cambridge, and when he found that Newton's mind was wholly devoted to mechanical and mathematical problems, he urged upon Mrs Smith the desirability of sending her son to his own college. He was accordingly admitted a member of Trinity College on the 5th of June 1661, as a subsizar, and was matricu- lated on the 8th of July. We have scarcely any information as to his attainments when he commenced residence, and very little as to his studies as an undergraduate. It is known that while still at Woolsthorpe Sanderson's Logic had been read by him to such purpose that his tutor at Trinity College excused his attendance at a course of lectures on that subject. Newton tells us himself that, when he had purchased a book on astrology at Stourbridge fair, a fair held close to Cambridge, he was unable, on account of his ignorance of trigonometry, to understand a figure of the heavens which was drawn in this book. He therefore bought an English edition of Euclid with an index of propositions at the end of it, and, having turned to two or three which he thought likely to remove his difficulties, he found them so self- evident that he put aside Euclid " as a trifling book," and applied himself to the study of Descartes's Geometry. It is reported that in his examination for a scholarship at Trinity, to which he was elected on the 28th of April 1664, he was examined in Euclid by Dr Isaac Barrow, who formed a poor opinion of his knowledge, and that in consequence Newton was led to read the Elements again with care, and thereby to form a more favourable estimate of Euclid's merits.

The study of Descartes's Geometry seems to have inspired Newton

with a love of the subject, and to have introduced him to the higher mathematics. In a small commonplace book, bearing on the seventh page the date of January 1663/1664, there are several articles on angular sections, and the squaring of curves and ” crooked lines that may be squared,” several calculations about musical notes, geometrical propositions from Francis Vieta and Frans van Schooten, annotations out of Wallis’s Arithmetic of Infinities, together with observations on refraction, on the grinding of ” spherical optic glasses,” on the errors of lenses

and the method of rectifying them, and on the extraction of all kinds of roots, particularly those “in affected powers.” And in this same commonplace book the following entry made by Newton himself, many years afterwards, gives a further account of the nature of his work during the period when he was an undergraduate: —

“July 4, 1699. — By consulting an account of my expenses at Cambridge, in the years 1663 and 1664, I find that, in the year 1664 a little before Christmas, I, being then Senior Sophister, bought Schooten’s Miscellanies arid Cartes’ Geometry (having read this Geometry and Oughtred’s Clwvis clean over half a year before), and borrowed Wallis’s works, and by consequence made these annotations out of Schooten and Wallis, in winter between the years 1664 and 1665. At such time I found the method of Infinite Series; and in summer 1665, being forced from Cambridge by the plague, I computed the area of the Hyperbola at Boothby, in Lincolnshire, to two and fifty figures by the same method.”

That Newton must have begun early to make careful observa- tions of natural phenomena is sufficiently testified by the follow- . in g remarks about halos, which appear in his Optics, book ii. part iv. obs. 13: —

” The like Crowns appear sometimes about the moon; for in the beginning of the Year 1664, February 19th, at night, I saw two such Crowns about her. The Diameter of the first or innermost was about three Degrees, and that of the second about five Degrees and an half. Next about the moon was a Circle of white, and next about that the inner Crown, which was of a bluish green within next the white, and of a yellow and red without, and next about these Colours were blue and green on the inside of the Outward Crown, and red on the outside of it. At the same time there appear’d a Halo about 22 Degrees 35′ distant from the center of the moon. It was elliptical, and its long Diameter was perpendicular to the Horizon, verging below farthest from the moon.”

In January 1665 Newton took the degree of B.A. The persons appointed (in conjunction with the proctors, John Slade of Catharine Hall, and Benjamin Pulleyn of Trinity College, Newton's tutor) to examine the questionists were John Eachard of Catharine Hall and Thomas Gipps of Trinity College. It is a curious accident that we have no information about the respective merits of the candidates for a degree in this year, as the " ordo senioritatis " of the bachelors of arts for the year is omitted in the " Grace Book."

It is supposed that it was in 1665 that the method of fluxions first occurred to Newton's mind. There are several papers still existing in Newton's handwriting bearing dates 1665 and 1666 in which the method is described, in some of which dotted or dashed letters are used to represent fluxions, and in some of which the method is explained without the use of dotted letters. Both in 1665 and in 1666 Trinity College was dismissed on account of the plague. On each occasion it was agreed, as appears by entries in the " Conclusion Book " of the college, bearing dates August 7th, 1665, an d June 22nd, 1666, and signed by the master of the college, Dr Pearson, that all fellows and scholars who were dismissed on account of the pestilence be allowed one month's commons. Newton must have left college before August 1665, as his name does not appear in the list of those who received extra commons on that occasion, and he tells us himself in the extract from his commonplace book already quoted that he was " forced from Cambridge by the plague " in the summer of that year. He was elected a fellow of his college on the 1st of October 1667. There were nine vacancies, one of which was caused by the death of Abraham Cowley in the previous summer, and the nine successful candidates were all of the same academical standing. A few weeks after his election to a fellowship Newton went to Lincolnshire, and did not return to Cambridge till the February following, On the 16th of March 1668 he took his degree of M.A.

During the years 1666 to 1669 Newton's studies were of a very varied kind. It is known that he purchased prisms and lenses on two or three several occasions, and also chemicals and a furnace, apparently for chemical experiments;, but he also employed part of his time on the theory of fluxions and other branches of pure mathematics. He wrote a paper Analysis per Equationes Numero Terminorum Infinitas, which he put, pro-; bably in June 1669, into the hands of Isaac Barrow (then Lucasian professor of mathematics), at the same time giving him

permission to communicate the contents/to their common friend John Collins (1624-1683), a mathematician of no mean order. Barrow did this on the 31st of July 1669, but kept the name of the author a secret, and merely told Collins that he was a friend staying at Cambridge, who had a powerful genius for such matters. In a subsequent letter on the 20th of August, Barrow expressed his pleasure at hearing the favourable opinion which Collins had formed of the paper, and added, ” the name of the author is Newton, a fellow of our college, and a young man, who is only in his second year since he took the degree of master of arts, and who, with an unparalleled genius (eximio quo est acumine), has made very great progress in this branch of mathematics.” Shortly afterwards Barrow resigned his chair, and was instrumental in securing Newton’s election as his successor. Newton was elected Lucasian professor on the 29th of October 1669. It was his duty as professor to lecture at least once a week in term time on some portion of geometry, arithmetic, astronomy, geography, optics, statics, or some other mathematical subject, , and also for two hours in the week to allow an audience to any student who might come to consult with the professor on any difficulties he had met with. The subject which Newton chose for his lectures was optics. The success which attended his researches in optics must have been great, although the results were known only through his own oral lectures, until he presented an account of them to the Royal Society in the spring of 1672. On the 21st of December 1671 he was proposed as a candidate for admission into the Royal Society by Dr Seth Ward, bishop of Salisbury, and on the nth of January 1672 he was elected a fellow of the Society. At the meeting at which Newton was elected a description of a reflecting telescope which he had in- vented was read, and ” it was ordered that a letter should be written by the secretary to Mr Newton to acquaint him of his election into the Society, and to thank him for the communication of his telescope, and to assure him that the Society would take care that all right should be done him with respect to this invention.”

In his reply to the secretary on the 18th of January 1672, Newton writes: —

” I desire that in your next letter you would inform me for what time the society continue their weekly meetings; because, if they continue’ them for any time, I am purposing them to be considered of and examined an account of a philosophical discovery, which induced me to the making of the said telescope, and which I doubt not but will prove much more grateful than the communication of that instrument being in my judgment the oddest if not the most considerable detection which hath hitherto been made into the operations of

nature.”

The promise here made was fulfilled in a communication which Newton addressed to Henry Oldenburg, the secretary of the Royal Society, on the 6th of February 1672, and which was read before the society two days afterwards. The whole is printed in No. 80 of the Philosophical Transactions.

After explaining his discovery of the composition of white light, he proceeds : —

” When I understood this, I left off my aforesaid Glass works; for I saw, that the perfection of Telescopes was hitherto limited, not so much for want of glasses truly figured according to the prescriptions of Optick Authors (which all men have hitherto imagined), as because that Light itself is a Heterogeneous mixture of differently refrangible Rays. So that, were a glass so exactly figured as to collect any one sort of rays into one point, it could not collect those also into the same point, which having the same Incidence upon the same Medium are apt to suffer a different refraction. Nay, I wondered, that seeing the difference of refrangibility was so great, as I found it, Telescopes should arrive to that perfection they are now at.”

He then points out why ” the object-glass of any Telescope cannot collect all the rays which come from one point of an object, so as to make them convene at its focus in less room than in a circular space, whose diameter is the 50th part of the Diameter of its Aperture: which is an irregularity some hundreds of times greater, than a circularly figured Lens, of so small a section as the Object-glasses of long Telescopes are, would cause by the unfitness of its figure, were Light uniform.” He adds: “This made me take reflections into consideration, and finding them regular, so that the Angle of Reflec- tion of all sorts of Rays was equal to their Angle of Incidence; I understood, that by their mediation Optick instruments might be brought to any degree of perfection imaginable, provided a Re- flecting substance could be found, which would polish as finely as

Glasa, and reflect as much light, as glass transmits, and the art of communicating to it a Parabolich figure be also attained. But these seemed very great difficulties, and I have almost thought them insuperable, when I further considered, that every irregularity in a reflecting superficies makes the rays stray 5 or 6 times more out of their due course, than the like irregularities in a refracting one; so that a much greater curiosity would be here requisite, than in figuring glasses for Refraction.

“Amidst these thoughts I was forced from Cambridge by the Intervening Plague, and it was more than two years before I proceeded further. But then having thought on a tender way of polishing, proper for metall, whereby, as I imagined, the figure also would be corrected to the last; I began to try, what might be effected in this kind, and by degrees so far perfected an Instrument (in the essential parts of it like that I sent to London), by which I could discern Jupiters 4 Concomitants, and shewed them divers times to two others of my acquaintance. I could also discern the Moon-like phase of Venus, but not very distinctly, nor without some niceness in disposing the Instrument.

” From that time I was interrupted till this last Autumn, when I made the other. And as that was sensibly better than the first (especially for Day-Objects), so I doubt not, but they will be still brought to a much greater perfection by their endeavours, who, as you inform me, are taking care about it at London.”

After a remark that microscopes seem as capable of improvement as telescopes, he adds: ” I shall now proceed to acquaint you with another more notable difformity in its Rays, wherein the Origin of Colour is unfolded : Concerning which I shall lay down the Doctrine first, and then, for its examination, give you an instance or two of the Experiments, as a specimen of the rest. The Doctrine you will find comprehended and illustrated in the following propositions :

” I. As the Rays of light differ in degrees of Refrangibility, so they also differ in their disposition to exhibit this or that particular colour. Colours are not Qualifications of Light, derived from Refrac- tions, or Reflections of natural Bodies (as ‘tis generally believed), but original and connate properties, which in divers Rays are divers. Some Rays are disposed to exhibit a red colour and no other ; some a yellow and no other, some a green and no other, and so of the rest. Nor are there only Rays proper and particular to the more eminent colours, but even to all their intermediate gradations.

” 2. To the same degree of Refrangibility ever belongs the same colour, and to the same colour ever belongs the same degree of Refrangibility. The least Refrangible Rays are all disposed to exhibit a Red colour, and contrarily those Rays, which are disposed to exhibit a Red colour, are all the least Refrangible: So the most refrangible Rays are all disposed to exhibit a deep Violet Colour, and contrarily those which are apt to exhibit such a violet colour are all the most Refrangible.

” And so to all the intermediate colours in a continued series belong intermediate degrees of refrangibility. And this Analogy ‘twixt colours, and refrangibility is very precise and strict; the Rays always either exactly agreeing in both, or proportionally disagreeing in both.

” 3. The species of colour, and degree of Refrangibility proper to any particular sort of Rays, is not mutable by Refraction, nor by Reflection from natural bodies, nor by any other cause, that I could yet observe. When any one sort of Rays hath been well parted from those of other kinds, it hath afterwards obstinately retained its colour, notwithstanding my utmost endeavours to change it, I have refracted it with Prismes, and reflected it with Bodies, which in Day-light were of other colours; I have intercepted it with the coloured film of Air interceding two compressed plates of glass, transmitted it through coloured Mediums, and through Mediums irradiated with other sorts of Rays, and diversly terminated it ; and yet could never produce any new colour out of it. It would by contracting or dilating become more brisk, or faint, and by the loss of many Rays, in some cases very obscure and dark; but I could never see it changed in specie.

” Yet seeming transmutations of Colours may be made, where there is any mixture of divers sorts of Rays. For in such mixtures, the component colours appear not, but, by their mutual allaying each other constitute a midling colour.”

Further on, after some remarks on the subject of compound colours, he says: ” I might add more instances of this nature, but I shall conclude with this general one, that the Colours of all natural Bodies have no other origin than this, that they are variously qualified to reflect one sort of light in greater plenty then another. And this I have experimented in a dark Room by illuminating those bodies with uncompounded light of divers colours. For by that means any body may be made to appear of any colour. They have there no appropriate colour, but ever appear of the colour of the light cast upon them, but yet with this difference, that they are most brisk and vivid in the light of their own day-light colour. Minium appeareth there of any colour indifferently, with which ‘tis illustrated, but yet most luminous in red, and so Bise appeareth indifferently of any colour with which ‘tis illustrated, but yet most luminous in blew. And therefore minium reflecteth Rays of any colour, but most copiously those indued with red ; and consequently when illustrated with day-light, that is with all sorts of Rays promiscuously

blended, those qualified with red shall abound most in the reflected light, and by their prevalence cause it to appear of that colour. And for the same reason Bise, reflecting blew most copiously, shall appear blew by the excess of those Rays in its reflected light; and the like of other bodies. And that this is the intire and adequate cause of their colours, is manifest, because they have no power to change or alter the colours of any sort of Rays incident apart, but put on all colours indifferently, with which they are inlightened.

” Reviewing what I have written, I see the discourse it self will lead to divers Experiments sufficient for its examination: And therefore I shall not trouble you further, than to describe one of those, which I have already insinuated.

” In a darkened Room make a hole in the shut of a window whose diameter may conveniently be about a third part of an inch, to admit a convenient quantity of the Suns light: And there place a clear and colourless Prisme, to refract the entring light towards the further part of the Room, which, as I said, will thereby be diffused into an oblong coloured Image. Then place a Lens of about three foot radius (suppose a broad Object-glass of a three foot Telescope), at the distance of about four or five foot from thence, through which all those colours may at once be transmitted, and made by its Refraction to convene at a further distance of about ten or twelve feet. If at that distance you intercept this light with a sheet of white paper, you will see the colours converted into whiteness again by being mingled. ” But it is requisite, that the Prisme and Lens be placed steddy, and that the paper, on which the colours are cast be moved to and fro; for, by such motion, you will not only find, at what distance the whiteness is most perfect but also see, how the colours gradually convene, and vanish into whiteness, and afterwards having crossed one another in that place where they compound Whiteness, are again dissipated and severed, and in an inverted order retain the same colours, which they had before they entered the composition. You may also see, that, if any of the Colours at the Lens be intercepted, the Whiteness will be changed into the other colours. And therefore, that the composition of whiteness be perfect, care must be taken, that none of the colours fall besides the Lens.”

He concludes his communication with the words: “This, I conceive, is enough for an Introduction to Experiments of this kind : which if any of the R. Society shall be so curious as to prosecute, I should be very glad to be informed with what success : That, if any thing seem to be

defective, or to thwart this relation, I may have an opportunity of giving further direction about it, or of acknowledging my errors, if I have committed any.”

The publication of these discoveries led to a series of con- troversies which lasted for several years, in which Newton had to contend with the eminent English natural philosopher Robert Hooke ; Lucas, mathematical professor at Liege; Linus, a physician in Liege, and many others. Some of his opponents denied the truth of his experiments, refusing to believe in the existence of the spectrum. Others criticized the experiments, saying that the length of the spectrum was never more than three and a half times the breadth, whereas Newton found it to be five times the breadth. It appears that Newton made the mistake of supposing that all prisms would give a spectrum of exactly the same length; the objections of his opponents led him to measure carefully the lengths of spectra formed by prisms of different angles and of different refractive indices; and it seems strange that he was not led thereby to the discovery of the different dispersive powers of different refractive substances.

Newton carried on the discussion with the objectors with great courtesy and patience, but the amount of pain which these perpetual discussions gave to his sensitive mind may be estimated from the fact of his writing on the 18th of November 1676 to Oldenburg:—

” I promised to send you an answer to Mr Lucas this next Tuesday, but I find I shall scarce finish what I have designed, so as to get a copy taken of it by that time, and therefore I beg your patience a week longer. I see I nave made myself a slave to philosophy, but if I get free of Mr Lucas’s business, I will resolutely bid adieu to it eternally, excepting what I do for my private satisfaction, or leave to come out after me; for I see a man must either resolve to put out nothing new, or to become a slave to defend it.” ‘

It was a fortunate circumstance that these disputes did not so thoroughly damp Newton’s ardour as he at the time felt they would. He subsequently published many papers in the Philo- sophical Transactions on various parts of the science of optics, and, although some of his views havebeen found to be erroneous, and are now almost universally rejected, his investigations led to discoveries which are of permanent value. He succeeded in explaining the colour of thin and of thkk plates, and the inflexion of light, and he wrote on double refraction, polarization and

binocular vision. He also invented a reflecting sextant for observing

the distance between the moon and the fixed stars, — the same in every essential as the instrument which is still in everyday use at sea under the name of Hadley's quadrant. This discovery was communicated by him to Edmund Halley in 1700, but was not published, or communicated to the Royal Society, till after Newton's death, when a description of it was found among his papers.

In March 1673 Newton took a prominent part in a dispute in the university. The public oratorship fell vacant, and a contest arose between the heads of the colleges and the members of the senate as to the mode of electing to the office. The heads claimed the right of nominating two persons, one of whom was to be elected by the senate. The senate insisted that the proper mode was by an open election. The duke of Buckingham, who was the chancellor of the university, endeavoured to effect a compromise which, he says, " I hope may for the present satisfy both sides. I propose that the heads may for this time nominate and the body comply, yet interposing (if they think fit) a pro- testation concerning their plea that this election may not here-after pass for a decisive precedent in prejudice of their claim," and, " whereas I understand that the whole university has chiefly consideration for Dr Henry Paman of St John's and Mr Craven of Trinity College, I do recommend them both to be nominated." The heads, however, nominated Dr Paman and Ralph Sanderson of St John's, and the next day one hundred and twenty-one members of the senate recorded their votes for Craven and ninety-eight for Paman. On the morning of the election a protest in which Newton's name appeared was read, and entered in the Regent House. But the vice-chancellor admitted Paman the same morning, and so ended the first contest of a non-scientific character in which Newton took part.

On the 8th of March 1673 Newton wrote to Oldenburg, the secretary of the Royal Society:

"Sir, I desire that you will procure that I may be put out from being any longer Fellow of the Royal Society: for though I honour that body, yet since I see I shall neither profit them, nor (by reason of this distance) can partake of the advantage of their assemblies, I desire to withdraw."

Oldenburg must have replied to this by an offer to apply to the Society to excuse Newton the weekly payments, as in a letter of Newton's to Oldenburg, dated the 23rd of June 1673, he says, " For your proffer about my quarterly payments, I thank you, but I would not have you trouble yourself to get them excused, if you have not done it already." Nothing further seems to have been done in the matter until the 28th

of January 1675, when Oldenburg informed ” the Society that Mr Newton is now in such circumstances that he desires to be excused from the weekly payments.” Upon this ” it was agreed to by the council that he be dispensed with, as several others are.” On the 18th of February

1675 Newton was formally admitted into the Society. The most probable explanation of the cause why Newton wished to be excused from these payments is. to be found in the fact that, as he was not in holy orders, his fellowship at Trinity College would lapse in the autumn of 1675. It is true that the loss to his income which this would have caused was obviated by a patent from the crown in April 1675, allowing him as Lucasian professor to retain his fellowship without the obligation of taking holy orders. This must have relieved Newton’s mind from a great deal of anxiety about pecuniary matters, as we find him in November

1676 subscribing £40 towards the building of the new library of Trinity College.

It is supposed that it was at Woolsthorpe in the summer of 1666 that Newton’s thoughts were directed to the subject of gravity. Voltaire is the authority for the well-known anecdote about the apple. He had his information from Newton’s favourite niece Catharine Barton, who married Conduitt, a fellow of the Royal Society, and one of Newton’s intimate friends. How much truth there is in what is a plausible and a favourite story can never be known, but it is certain that tradition marked a tree as that from which the apple fell, till 1820, when, owing to decay, the tree was cut down and its wood carefully preserved.

Johann Kepler had proved by an elaborate series of measure- ments that each planet revolves in an elliptical orbit round the sun, whose centre occupies one of the foci of the orbit, that the radius vector of each planet drawn from the sun describes equal areas in equal times, and that the squares of the periodic times of the planets are in the same proportion as the cubes of their mean distances from the sun. The fact that heavy bodies have always a tendency to fall to the earth, no matter at what height they are placed above the earth’s surface, seems to have led Newton to conjecture that it was possible that the same tendency to fall to the earth was the cause by which the moon

was retained in its orbit round the earth. Newton, by calculating from Kepler's laws, and supposing the orbits of the planets to be circles round the sun in the centre, had already proved that the force of the sun acting upon the different planets must vary as the inverse square of the distances of the planets from the sun. He therefore was led to inquire whether, if the earth's attraction extended to the moon, the force at that distance would be of the exact magnitude necessary to retain the moon in its orbit. He found that the moon by her motion in her orbit was deflected from the tangent in every minute of time through a space of thirteen feet. But by observing the distance through which a body would fall in one second of time at the earth's surface, and by calculating from that on the supposition of the force diminishing in the ratio of the inverse square of the distance, he found that the earth's attraction at the distance of the moon would draw a body through 15 ft. in 1 min. Newton regarded the discrepancy between the results as a proof of the inaccuracy of his conjecture, and " laid aside at that time any further thoughts of this matter." But in 1679 a controversy between Hooke and Newton, about the form of the path of a body falling from a height, taking the motion of the earth round its axis into consideration, led Newton again to revert to his former conjectures on the moon. The. measure of the earth, which had hitherto been accepted by geographers and navigators, was based on the very rough estimate that the length of a degree of latitude of the earth's surface measured along a meridian was 60 m. More accurate estimates had been made by R. Norwood and W. Snell, and more recently by P. Picard. At a meeting of the Royal Society on the nth of January 1672, Oldenburg the secretary read a letter from Paris describing the method followed by Picard in measuring a degree, and specifically stating the precise length that he calculated it to be. It is probable that Newton had become acquainted with this measurement of Picard's, and that he was therefore led to make use of it when his thoughts were redirected to the subject. This estimate of the earth's magnitude, giving 69-1 m. to i°, made the two results, the discrepancy between which Newton had regarded as a disproof of his conjecture, to agree so exactly that he now regarded his conjecture as fully established.

In January 1684 Sir Christopher Wren, Halley and Hooke were led to discuss, the law of gravity, and, although probably they all agreed in the truth of the law of the inverse square, yet this truth was not looked upon as established. It appears that Hooke professed to have a solution of the problem of the path of a body moving round a centre of force attracting as the inverse square of the distance; but Halley, finding, after a delay of some months, that Hooke " had not been so

good as his word ” in showing his solution to Wren, started in the month of August 1684 for Cambridge to consult Newton on the subject. Without mentioning the speculations which had been made, he asked Newton what would be the curve described by a planet round the sun on the assumption that the sun’s force diminished as the square of the distance. Newton replied promptly, “an ellipse,” and on being questioned by Halley as to the reason for his answer he replied, ” Why, I have calculated it.” He couid not, however, put his hand upon his calculation, but he promised to send it to Halley. After the latter had left Camr bridge, Newton set to work to reproduce the calculation. After making a mistake and producing a different result he corrected his work and obtained his former result. In the following November Newton redeemed his promise

to Halley by sending him, by the hand of Mr Paget, one of the fellows of his own college, and at that time mathematical master of Christ’s Hospital, a copy of his demonstration; and very soon afterwards Halley paid another visit to Cambridge to confer with Newton about the problem; and on his return to London on the 10th of December 1684, he informed the Royal Society ” that he had lately seen Mr Newton at Cam- bridge, who had showed him a curious treatise De Motu,” which at Halley’s desire he promised to send to the Society to be entered upon their register. ” Mr Halley was desired to put Mr Newton in mind of his promise for the securing this invention to himself, till such time as he could be at leisure to publish it,” and Paget was desired to join with Halley in urging Newton to do so. By the middle of February Newton had sent his paper to Aston, one of the secretaries of the Society, and in a letter to Aston dated the 23rd of February 1685, we find Newton thank- ing him for ” having entered on the register his notions about motion.” This treatise De Motu was the germ of the Principia, and was obviously meant to be a short account of what that work was intended to embrace. It occupies twenty-four octavo pages, and consists of four theorems and seven problems, some of which are identical with some of the most important pro- positions of the second and third sections of the first book of the Principia.

The years 1685 and 1686 will ever be memorable in the history of science. It was in them that Newton composed almost the whole of his great work. During this period Newton had a very extensive correspondence with John Flamsteed, who was then the astronomer-royal. Many of the letters are lost, but it is clear from one of Newton’s, dated the 19th of September 1685, that he had received many useful communications from Flam- steed, and especially regarding Saturn, ” whose orbit, as defined by Kepler,” Newton ” found too little for the

sesquialterate proportions.” In the other letters written in 1685 and 1686 he applies to Flamsteed for information respecting the orbits of the satellites of Jupiter and Saturn, respecting the rise and fall of the spring and neap tides at the solstices and the equin- oxes, respecting the flattening of Jupiter at the poles (which, if certain, he says, would conduce much to the stating the reasons of the precession of the equinoxes), and respecting the difference between the observed places of Saturn and those computed from Kepler’s tables about the time of his conjunction with Jupiter. On this last point the information supplied by Flam- steed was peculiarly gratifying to Newton; and it is obvious from the language of this part of his letter that he had still doubts of the universal application of the sesquialteral pro- portion. ” Your information,” he says, ” about the errors of Kepler’s tables for Jupiter and Saturn has eased me of several scruples. I was apt to suspect there might be some cause or other unknown to me which might disturb the sesquialteral proportions, for the influences of the planets one upon another seemed not great enough, though I imagined Jupiter’s influence greater than your numbers determine it. It would add to my satisfaction if you would be pleased to let me know the long diameters of the orbits of Jupiter and Saturn, assigned by yourself and Mr Halley in your new tables, that I may see how the sesquialteral proportion fills the heavens, together with another small proportion which must be allowed for.”

Upon Newton’s return from Lincolnshire in the beginning of April 1685, he seems to have devoted himself to the prepara- tion of his work. In the spring he had determined the attrac- tions of masses, and thus completed the law of universal gravi- tation. In the summer he had finished the second book of the Principia, the first book being the treatise De Motu, which he had enlarged and completed. Excepting in the correspond- ence with Flamsteed we hear nothing more of the preparation of the Principia until the 21st of April 1686, when Halley read to the Royal Society his Discourse concerning Gravity and its Properties, in which he states “that his worthy countryman Mr Isaac Newton has an incomparable treatise of motion almost ready for the press,” and that the law of the inverse square ” is the principle on which Mr Newton has made out all the

phenomena of the celestial motions so easily and naturally, that its truth is past dispute.” At the next meeting of the Society, on the 28th of April, ” Dr Vincent presented to the Society a manuscript treatise

entitled Philosophiae Naturalis Principia Mathematica, and dedicated to the Society by Mr Isaac Newton." Although this manuscript contained only the first book, yet such was the confidence the Society placed in the author that an order was given " that a letter of thanks be written to Mr Newton; and that the printing of his book be referred to the consideration of the council; and that in the meantime the book be put into the hands of Mr Halley, to make a report thereof to the council." Although there could be no doubt as to the intention of this report, yet no step was taken towards the publication of the work. At the next meeting of the Society, on the 19th of May, some dissatisfaction seems to have been expressed at the delay, as it was ordered " that Mr Newton's work should be printed forthwith in quarto, and that a letter should be written to him to signify the Society's resolu- tions, and to desire his opinion as to the print, volume, cuts and so forth." Three days afterwards Halley communicated the resolution to Newton, and stated to him that the printing was to be at the charge of the Society. At the next meeting of the council, on the 2nd of June, it was again ordered " that Mr Newton's book be printed," but, instead of sanctioning the resolution of the general meeting to print it at their charge, they added " that Mr Halley undertake the business of looking after it, and printing it at his own charge, which he engaged to do."

In order to explain to Newton the cause of the delay, Halley in his letter of the 22nd of May alleges that it arose from " the president's attendance on the king, and the absence of the vice- presidents, whom the good weather had drawn out of town"; but there is reason to believe that this was not the true cause, and that the unwillingness of the council to undertake the publication arose from the state of the finances of the Society. Halley certainly deserves the gratitude of posterity for undertaking the publication of the work at a very considerable pecuniary risk to himself. In the same letter Halley found it necessary to inform Newton of Hooke's conduct when the manuscript of the Principia was presented to the Society. Sir John Hoskyns was in the chair when Dr Vincent presented the manuscript, and passed a high encomium on the novelty and dignity of the subjc~t. Hooke was offended because Sir John did not mention what he had told him of his own discovery. Halley only communicated to Newton the fact " that Hooke had some pretensions to the invention of the rule for the decrease of gravity being reciprocally as the squares of the distances from the centre," acknowledging at the same time that, though Newton had the notion from him, " yet the demonstration of the curves generated thereby belonged wholly to Newton." " How much of this," Halley adds, " is so, you know best, so likewise what

you have to do in this matter; only Mr Hooke seems to expect you should make some mention of him in the preface, which 'tis possible you may see reason to prefix. I must beg your pardon that 'tis I that send you this ungrateful account; but I thought it my duty to let you know it, so that you might act accordingly, being in myself fully satisfied that nothing but the greatest candour imaginable is to be expected from a person who has of all men the least need to borrow reputation."

In thus appealing to Newton's candour, Halley obviously wished that some acknowledgment of Hooke should be made. He knew indeed that before Newton had announced the inverse law Hooke and Wren and himself had spoken of it and discussed it, and therefore justice demanded that, though none of them had given a demonstration of the law, Hooke especially should receive credit for having maintained it as a truth of which he was seeking the demonstration. On the 20th of June 1686 Newton wrote to Halley the following letter: —

" Sir, — In order to let you know the case between Mr Hooke and me, I give you an account of what passed between us in our letters, so far as I could remember; for 'tis long since they were writ, and I do not know that I have seen them since. I am almost confident by circumstances, that Sir Chr. Wren knew the duplicate proportion

when I gave him a visit; and then Mr Hooke (by his book Cometa written afterwards) will prove the last of us three that knew it. I intended in this letter to let you understand the case fully; but it being a frivolous business, I shall content myself to give you the heads of it in short, viz. that I never extended the duplicate pro- portion lower than to the superficies of the earth, and before a certain demonstration I found the last year, have suspected it did not reach accurately enough down so low; and therefore in the doctrine of projectiles never used it nor considered the motions of the heavens ; and consequently Mr Hooke could not from my letters, which were about projectiles and the regions descending hence to the centre, conclude me ignorant of the theory of the heavens. That what he told me of the duplicate proportion was erroneous, namely, that it reached down from hence to the centre of the earth.

" That it is not candid to require me now to confess myself, in print, then ignorant of the duplicate proportion in the heavens; for no other reason, but because he had told it me in the case of projectiles, and so upon mistaken grounds accused me of that ignor- ance. That in my answer to his first letter I refused his correspond- ence, told him I had laid philosophy aside, sent him t only the experiment of projectiles

(rather shortly hinted than carefully described), in compliment to sweeten my answer, expected to hear no further from him ; could scarce persuade myself to answer his Second letter; did not answer his third, was upon other things; thought no further of philosophical matters than his letters put me upon it, and therefore may be allowed not to have had my thoughts of that kind about me so well at that time. That by the same reason he concludes me then ignorant of the rest of the duplicate proportion, he may as well conclude me ignorant of the rest of that theory I had read before in his books. That in one of my papers writ (I cannot say in what year, but I am sure some time before I had any correspondence with Mr Oldenburg, and that's above fifteen years ago), the proportion of the forces of the planets from the sun, reciprocally duplicate of their distances from him, is expressed, and the proportion of our gravity to the moon's conatus recedendi a centro terrae is calculated, though not accurately enough. That when Hugenius put out his Horol. Oscil., a copy being presented to me, in my letter of thanks to him I gave those rules in the end thereof a particular commendation for their usefulness in Philosophy, and added out of my aforesaid paper an instance of their usefulness, in comparing the forces of the moon from the earth, and earth from the sun; in determining a problem about the moon's phase, and putting a limit to the sun's parallax, which shews that I had then my eye upon comparing the forces of the planets arising from their circular motion, and understood it; so that a while after, when Mr Hooke propounded the problem solemnly, in the end of his attempt to prove the motion of the earth, if I had not known the duplicate proportion before, I could not but have found it now. Between ten and eleven years ago there was an hypothesis of mine registered in your books, wherein I hinted a cause of gravity towards the earth, sun and planets, with the dependence of the celestial motions thereon; in which the proportion of the decrease of gravity from the superficies of the planet (though for brevity's sake not there expressed) can be no other than re- ciprocally duplicate of the distance from the centre. And I hope I shall not be urged to declare, in print, that 1 understood not the obvious mathematical condition of my own hypothesis. But, grant I received it afterwards from Mr Hooke, yet have I as great a right to it as to the ellipsis. For as Kepler knew the orb to be not circular but oval, and guessed it to be elliptical, so Mr Hooke, without knowing what I have found out since his letters to me, can know no mofe, but that the proportion was duplicate quatn proxime at great distances from the centre, and only guessed it to be so accurately, and guessed amiss in extending that proportion down to the very centre, whereas Kepler guessed right at the ellipsis. And so Mr Hooke found less of the proportion than Kepler of the ellipsis.

” There is so strong an objection against the accurateness of this proportion, that without my demonstrations, to which ‘Mr Hooke is yet a stranger, it cannot be believed by a judicious philosopher to be any where accurate. And so, in stating this business, I do pretend to have done as much for the proportion as for’ the ellipsis, and to have as much right to the one from Mr Hooke and all men, as to the other from Kepler; and therefore on this account also he must at least moderate his pretences.

“The proof you sent me I like very well. I designed the whole to consist of three books ; the second was finished last summer being short, and only wants transcribing, and drawing the cuts fairly. Some new propositions I have since thought on, which I can as well let alone. The third wants the theory of comets. In autumn last 1 spent two months in calculations to no purpose for want of a good method, which made me afterwards return to the first book, and enlarge it with divers propositions, some relating to comets, others to other things, found out last winter. The third I now ; design to” sup press. Philosophy is such ah impertinently litigious lady, that a man has as good be engaged in lawsuits, as have to do with her. I found it so formerly, and now I am no sooner come near her again, but she gives me warning. The two first books, without the third, will not so well bear the title of Philosophiae Naturalis Principia Mathematica ; and therefore I had- altered it to this, De Matu Corporum Ubri duo. ‘

” But, upon second thoughts, I retain the former title. ‘Twill help the saie of the book, which I ought not to diminish now ‘tis yours. The articles are, with the largest, to be called by that name; if you please you may change the word to sections, though it be not material. In the first page, I have struck out the words ‘ uii posthac docebitur,’ as referring to the third book; which is all at present, from your affectionate friend, and humble servant,

” Is. Newton.”

On the 29th of June 1686 Halley wrote to Newton: — ” I am heartily sorry that in this matter, wherein all mankind ought to acknowledge their obligations to you, you should meet with anything that should give you unquiet “; and then, after an account of Hooke’s claim to the discovery as made at a meeting of the Royal Society, he concludes: —

” But I found that they were all of opinion that nothing thereof appearing in print, nor on the books of the Society, you ought to be considered as the inventor. And if in truth he knew it before you, he ought not to blame any but himself for having taken no more care to secure a discovery, which he puts so much value on. What application he has made in private, I know not; but I am sure that the Society have a very great satisfaction, in the honour you do them, by the dedication of so worthy a treatise.’ Sir, I must now again beg you, not to let your resentments run so high, as to deprive us of your third book, wherein the application of your mathematical doctrine to the theory of comets and several curious experiments, which, as I guess by what you write, ought to compose it, will undoubtedly render it acceptable to those, who will call themselves Philosophers without Mathematics, which are much the greater number. Now you approve of the character and paper, I will push on the edition vigorously. I have sometimes had thoughts of having the cuts neatly done in wood, so as to stand in the page with the demonstrations. It will be more convenient, and not much more charge. If it please you to have it so, I will try how well it can be done; otherwise I will have them in somewhat a larger size than those you have sent up. — I am, Sir, your most affectionate humble servant, E. Halley.”

On the 30th of June 1686 the president was desired by the council to license Newton’s book, entitled Philosophiae Naturalis Principia Mathematica.

On the 14th of July 1686 Newton wrote to Halley approving of his proposal to introduce woodcuts among the letterpress, stating clearly the different things which he had from Hooke, and adding, ” And now having sincerely told you the case between Mr Hooke and me, I hope I shall be free for the future from the prejudice of his letters. I have considered how best to compose the present dispute, and I think it may be done by the inclosed scholium to the fourth proposition.” This scholium was— ” The inverse law of gravity holds in all the celestial motions, as was discovered also independently by my countrymen Wren, Hooke and Halley.” After this letter of Newton’s the printing of the Principia was begun. The second book, though ready for the press in the autumn of 1686, was not sent to the printers until March 1687. The third book was presented to the Society on the 6th of April 1687, and the whole work published about midsummer in that year. It was dedicated to the Royal Society, and to it was prefixed a set of Latin hexameters addressed by Halley to the author. The work, as might have been expected, caused a great deal of excitement throughout Europe, and the whole of the impression was very soon sold. In 1691 a copy of the Principia was hardly to be procured.

While Newton was writing the second and third books of the Principia, a very important event occurred at Cambridge which had the effect of bringing him before the public in a new light. James II. had already, in 1686, in open violation of the law, conferred the deanery of Christ Church at Oxford on John Massey, a person whose sole qualification was that he was a member of the Church of Rome; and the king had boasted to the pope's legate that " what he had done at Oxford would very soon be done at Cambridge." In accordance with this boast, in February 1687 he issued a mandate directing that Father Alban Francis, a Benedictine monk, should be admitted a master of arts of the university of Cambridge, without taking the oaths of allegiance and supremacy. Upon receiving the mandamus Dr Pechell, the master of Magdalene College, who was vice- chancellor, sent a messenger to the duke of Albemarle, the chancellor, to request him to get the mandamus recalled; and the registrary and the bedells waited upon Francis to offer him

instant admission to the degree if only he would take the necessary oaths. Both the king and the monk were inexorable. The court and the university were thus placed in open collision. A menacing letter was despatched by Sunderland to shake the firmness of the university; but, though humble and respectful explanations were returned, the university showed no sign of compliance, nor even of a desire to suggest a compromise. In consequence the vice-chancellor and deputies from the senate were summoned to appear before the High Commission Court at Westminster. Newton was one of the eight deputies appointed by the senate for this purpose. The deputies, before starting for London, held a meeting to prepare their case for the court. A compromise which was put forward by one of them was stoutly and success- fully resisted by Newton, and on the 21st of April the deputation, with their case carefully prepared, appeared before the court. Lord Jeffreys presided at the board. The deputation appeared as a matter of course before the commissioners, and were dis- missed. On the 27th of April they gave in their plea. On the 7th of May it was discussed, and feebly defended by the vice- chancellor. The deputies maintained that in the late reign several royal mandates had been withdrawn, and that no degree had ever been conferred without the oaths having been previously taken. Jeffreys spoke with his accustomed insolence to the vice- chancellor, silenced the other deputies when they offered to speak, and ordered them out of court. When recalled the deputies were reprimanded, and Pechell was deprived of his office as vice-chancellor, and of his emoluments as master of Magdalene. Newton returned to Trinity College to complete the Principia. While thus occupied he had an extensive

correspondence with Halley, a very great part of which is extant. The following letter from Halley, dated London, July 5th, 1687, announcing the completion of the Principia, is of peculiar interest: —

” I have at length brought your book to an end, and hope it will please you. The last errata came just in time to be inserted. I will present from you the book you desire to the Royal Society, Mr Boyle, Mr Paget, Mr Flamsteed, and if there be any else in town that you design to gratify that way ; and I have sent you to bestow on your friends in the University 20 copies, which I entreat you to accept. In the same parcel you will receive 40 more, which having no acquaintance in Cambridge, I must entreat you to put into the hands of one or more of your ablest booksellers to dispose of them. I intend the price of them, bound in calves’ leather, and lettered, to be 9 shillings here. Those I send you I value in quires at 6 shillings, to take my money as they are sold, or at 5 sh ‘for ready, or else at some short time ; for I am satisfied there is no dealing in books without interesting the booksellers; and I am contented to let them go halves with me, rather than have your excellent work smothered by their combinations. I hope you will not repent you of the pains you have taken in so laudable a piece, so much to your own and the nation’s credit, but rather, after you shall have a little diverted yourself with other studies, that you will resume those contemplations wherein you had so great success, and attempt the perfection of the lunar theory, which will be of prodigious use in navigation, as well as of profound and public speculation. . . . You will receive a box from me on Thursday next by the waggon, that starts from town to-morrow.”

In 1692 and 1693 Newton seems to have had a serious illness, the nature of which has given rise to very considerable dispute. In a letter dated the 13th of September 1693, addressed to Samuel Pepys, he writes: —

” Some time after Mr Millington had delivered your message, ht

Cressed me to see you the next time I went to London. I was averse, ut upon his pressing consented, before I considered what I did, for I am extremely troubled at the embroilment I am in, and have neither ate nOr slept well this twelvemonth, nor have my former consistency o£ mind. I never designed to get any thing by your interest, nor by King James’s favour, but am now sensible that I must withdraw from your acquaintance, and see neither you nor the rest of my friends any more, if I may but have them quietly. I beg your pardon for saying I would see you again, and rest your most humble and obedient servant.”

And in a letter written to John Locke in reply to one of bis about the second edition of his book, and dated the 15th of October 1693, Newton wrote: —

“The last, winter, by sleeping too often by my fire, I got an ill

habit of sleeping; and a distemper, which this summer has been

epidemical, put me farther out of order, so that when I wrote to

you, I had not slept an hour a night for a fortnight together, and

I for five days together not a wink. I remember I wrote to you, but

what I said of your book I remember not. If you please to send me a transcript of that passage, I will give you an account of it if 1 can.”

The loss of sleep to a person of Newton’s temperament, whose mind was never at rest, and at times so wholly engrossed in his scientific pursuits that he even neglected to take food, must necessarily have led to a very great deal of nervous excitability. It is not astonishing that rumours got abroad that there was a danger of his mind giving way, or, according to a report which was believed at the time, that it had actually done so. Pepys must have heard such rumours, as in a letter to his friend Milling- ton, the tutor of Magdalene College at Cambridge, dated the 26th of September 1603, he wrote: —

” I must acknowledge myself not at the ease I would be glad to be at in reference to excellent Mr Newton; concerning whom (methinks) your answer labours under the same kind of restraint which (to tell you the truth) my asking did. For I was loth at first dash to tell you that I had lately received a letter from him so surprising to me for the inconsistency of every part of it, as to be put into great disorder by it, from the concernment I have for him, lest it should arise from that which of all mankind I should least dread from him and most lament for — I mean a discomposure in head, or mind, or both. Let me, therefore, beg you, Sir, having now told you the true ground of the trouble I lately gave you, to let me know the very truth of the matter, as far at least as comes within your knowledge.”

On the 30th of September 1693 Millington wrote to Pepys that he had been to look for Newton some time before, but that ” he was out of

town, and since," he says,

" I have not seen him, till upon the 28th I met him at Huntingdon, where, upon his own accord, and before I had time to ask him any question, he told me that he had writt to you a very odd letter, at which he was much concerned; added, that it was in a distemper that much seized his head,' and that kept him awake for above five nights together, which upon occasion he desired I would represent to you, and beg your pardon, he being very much ashamed he should be so rude to a person for whom he hath so great an honour. He is now very well, and though I fear he is under some small degree of melancholy, yet I think there is no reason to suspect it hath at all touched his understanding, and I hope never will; and so I am sure all ought to wish that love learning or the honour of our nation, which it is a sign how much it is looked after, when such a person as Mr Newton lyes so neglected by those in power."_

The illness of Newton was very much exaggerated by foreign contemporary writers. In a manuscript journal of Huygens is to be found an entry; —

" 29 Maj. 1694. — Narravit mihi D. Colm Scotus virum celeberrimum ac summum geometram Is. Neutonum in phrenesin incidisse abhinc anno et sex mensibus. An ex nimia studii assiduitate, an dolore infortunii, quod incendio laboratorium chymicum et scripta quaedam amiserat ? Cum ad Archiepiscopum Cantabrigiensem venisset, ea locutum, quae alienationem mentis indicarent. Deinde ab amicis curam ejus susceptam, domoque clauso remedia volenti nolenti adhibita, quibus jam sanitatem recuperavit ut jam rursus librum suum Principiorum Philosophiae Mathematicorum intelligere incipiat."

Huygens, in a letter dated the 8th of June 1694, wrote to Leibnitz, " I do not know if you are acquainted with the accident which has happened to the good Mr Newton, namely, that he has had an attack of phrenitis, which lasted eighteen months, and of which they say his friends have cured him by means of remedies, and keeping him shut up." To which Leibnitz, in a letter dated the 22nd of June, replied, " I am very glad that I received information of the cure of Mr Newton at the same time that I first heard of his illness, which doubtless must have been very alarming."

The active part which Newton had taken in defending the legal privileges of the university against the encroachments of the crown had probably at least equal weight with his scientific re- putation when his friends chose him as a candidate for a seat in parliament as

one of the representatives of the university. The other candidates were Sir Robert Sawyer and Mr Finch. Sir Robert stood at the head of the poll with 125 votes, Newton next with 122 and Mr Finch was last with 117 votes. Newton retained his seat only about a year, from January 1689 till the dissolution of the Convention Parliament in February 1690. During this time Newton does not appear to have taken part in any of the debates in the House; but he was not neglectful of his duties as a member. On the 30th of April 1680 he moved

for leave to bring in a bill to settle the charters and privileges of the university of Cambridge, just as Sir Thomas Clarges did for Oxford at the same time, and he wrote a series of letters to Dr Lovel, the vice-chancellor of the university, on points which affected the interests of the university and its members.

Some of the members of the university who had lately sworn allegiance to James had some difficulty in swearing allegiance to his successor. On the 12th of February 1689, the day of the coronation of William and Mary, Newton intimated to the vice- chancellor that he would soon receive an order to proclaim them at Cambridge. He enclosed a form of the proclamation, and expressed a hearty ” wish that the university would so compose themselves as to perform the solemnity with a reasonable decorum.”

During his residence in London Newton had made the acquaint- ance of John Locke. Locke had taken a very great interest in the new theories of the Principia. He was one of a number of Newton’s friends who began to be uneasy and dissatisfied at seeing the most eminent scientific man of his age left to depend upon the meagre emoluments of a college fellowship and a professorship.

At one time Newton’s friends had nearly succeeded in getting him appointed provost of King’s College, Cambridge, but the college offered a successful resistance on the ground that the appointment would be illegal, as the statutes required that the provost should be in priest’s orders. Charles Montague, who was afterwards earl of Halifax, was a fellow of Trinity College, and was a very intimate friend of Newton; and it was on his influence that Newton relied in the main for promotion to some post of honour and emolument. His hopes, however, were blighted by long delay. In one of his letters to Locke at the beginning of 1692, when Montague, Lord Monmouth and Locke were exerting themselves to obtain some appointment for him, Newton wrote that he was ” fully convinced that Mr Montague, upon an old grudge which he thought had been worn out, was false to him.” Newton was now in his fifty-fifth year, and whilst those of his own

standing at the university had been appointed to high posts in church or state, he still remained without any mark of national gratitude. But this blot upon the English name was at last removed by Montague in 1694, when he was appointed chancellor of the exchequer. He had previously con- sulted Newton upon the subject of the recoinage, and on the opportunity occurring he appointed Newton to the post of warden of the mint. In a letter to Newton announcing the news, Montague writes: —

” I am very glad that at last I can give you a good proof of my friendship, and the esteem the king has of your merits. Mr Overton, the warden of the mint, is made one of the Commissioners of Customs, and the king has promised me to make Mr Newton warden of the mint. The office is the most proper for you. ‘Tis the chief office in the mint: ‘tis worth five or six hundred pounds per annum, and has not too much business to require more attendance than you can spare.”

This letter must have convinced Newton of the sincerity of Montague’s good intentions towards him; we find them living as friends on the most intimate terms until Halifax’s death in

Newton’s chemical and mathematical knowledge proved of great use in carrying out the recoinage. This was completed in about two years. In 1697 Newton was appointed to the master- ship of the mint, a post worth between £1200 and £1500 per annum. While he held this office, Newton drew up a very extensive table of assays of foreign coins, and composed an official report on the coinage.

Up to the time of the publication of the Principia in 1687 thf method of fluxions which had been invented by Newton, and had been of great assistance to him in bis mathematical investiga- tions, was still, except to Newton and his friends, a secret. One of the most important rules of the method forms the second lemma of the second book of the Principia. Though this new and powerful method was of great help to Newton in his work, he did not exhibit it in the results. He was aware that the well- known geometrical methods of the ancients would clothe his new

creations in a garb which would appear less strange and uncouth to those not familiar with the new method. The Principia gives no information on the subject of the notation adopted in the new

calculus, and it was not until 1693 that it was com- municated to the scientific world in the second volume of Dr Wallis's works.

Newton's admirers in Holland had informed Dr Wallis that Newton's method of fluxions passed there under the name of Leibnitz's Calculus Differentialis. It was therefore thought necessary that an early opportunity should be taken of asserting Newton's claim to be the inventor of the method of fluxions, and this was the reason for this method first appearing in Wallis's works. A further account of the method was given in the first edition of Newton's Optics, which appeared in 1 704. To this work were added two treatises, entitled Tractatus duo de speciebus et magnitudine figurarum curvilinearum, the one bearing the title Tractatus de Quadratura Curvarum, and the other Enumeratio linearum tertii ordinis. The first contains an explanation of the doctrine of fluxions, and of its application to the quadrature of curves; the second, a classification of seventy-two curves of the third order, with an account of their properties. The reason for publishing these two tracts in his Optics, from the subsequent editions of which they were omitted, is thus stated in the advertisement : —

" In a letter written to M Leibnitz in the year 1679, and published by Dr Wallis, I mentioned a method by which I had found some general theorems about squaring curvilinear figures on comparing them with the conic sections, or other the simplest figures with which they might be compared. And some years ago I lent out a manu- script containing such theorems; and having since met with some things copied out of it, I have on this occasion made it public, pre- fixing to it an introduction, and joining a Scholium concerning that method. And I have joined with it another small tract concerning the curvilineal figures of the second kind, which was also written many years ago, and made known to some friends, who have solicited the. making it public."

In 1707 William Whiston published the algebraical lectures which Newton had delivered at Cambridge, under the title of Arithmetica Universalis, sive de Composilione et Resolutions A rithmetica Liber. We are not accurately informed how Whiston obtained possession of this work; but it is stated by one of the editors of the English edition " that Mr Whiston, thinking it a pity that so noble and useful a work should be doomed to a college confinement, obtained leave to make it public." It was soon afterwards translated into English by Raphson; and a second edition of it, with improvements by the author, was published at London in 171 2, by Dr Machin, secretary to the Royal Society. With the view of stimulating mathematicians to write

annotations on this admirable work, the celebrated ‘s Gravesande published a tract, entitled Specimen Commentarii in Arithmeticam Universalem; and Maclaurin’s Algebra seems to have been drawn up in consequence of this appeal.

Newton’s solution of the celebrated problems proposed by John Bernoulli and Leibnitz deserves mention among his mathe- matical works. In June 1696 Bernoulli addressed a letter to the mathematicians of Europe challenging them to solve two problems — (1) to determine the brachistochrone between two given points not in the same vertical line, (2) to determine a curve such that, if a straight line drawn through a fixed point A meet it in two points Pi, P 2 ,then APi m -f-AP 2 m will be constant. This challenge was first made in the Acta Lipsiensia for June 1696. Six months were allowed by Bernoulli for the solution of the problem, and in the event of none being sent to him he promised to publish his own. The six months elapsed without any solution being produced; but he received a letter from Leibnitz, stating that he had “cut the knot of the most beautiful of these problems,” and requesting that the period for their solution should be extended to Christmas next, that the French and Italian mathematicians might have no reason to complain of the shortness of the period. Bernoulli adopted the suggestion, and publicly announced the prorogation for the information of those who might not see the Ada Lipsiensia.

On the 29th of January 1696/7 Newton received from France two copies of the printed paper containing the problems,

and on the following day he transmitted a solution of them to Montague, then president of the Royal Society. He announced that the curve required in the first problem must be a cycloid, and he gave a method of determining it. He solved also the second problem, and he showed that by the same method other curves might be found which shall cut off three or more segments having the like properties. Solutions were also obtained from Leibnitz and the Marquis de L’Hopital; and, although that of Newton was anonymous, yet Bernoulli recognized the author in his disguise; ” tanquam,” says he, ” ex ungue leonem.”

In 1699 Newton’s position as a mathematician and natural philosopher was recognized by the French Academy of Sciences. In that year the Academy was remodelled, and eight foreign associates were created. Leibnitz, Domenico Guglielmini (1655- 17 10), Hartsoeker, and E. W. Tschirnhausen were appointed on the 4th of February, James Bernoulli and John Bernoulli on the 14th of

February, and Newton and Olaus Roemer on th-e 21st of February.

While Newton held the office of warden of the mint, he retained his chair of mathematics at Cambridge, and discharged the duties of the post, but shortly after he was promoted to be master of the mint he appointed Whiston his deputy with ” the full profits of the place.” Whiston began his astronomical lectures as Newton’s deputy in January 1701. On the 10th of December 1701 Newton resigned his professorship, thereby at the same time resigning his fellowship at Trinity, which he had held with the Lucasian professorship since 1675 by virtue of the royal mandate. Whiston’s claims to succeed Newton in the Lucasian chair were successfully supported by Newton himself.

On the 26th of November 1701 NeTvton was again elected one of the representatives of the university in parliament, but he retained his seat only until the dissolution in the following July. Newton does not seem to have been a candidate at this election, but at the next dissolution in 1705 he was again a candidate for the representation of the university. He was warmly supported by the residents, but being a Whig in politics he was opposed by the non-residents, and beaten by a large majority.

In the autumn of 1 703 Lord Scmers retired from the presidency of the Royal Society, and Newton on the 30th of November 1703 was elected to succeed him. Newton was annually re- elected to tnis honourable post during the remainder of his life. He held the office in all twenty-five years, a period in which he has been exceeded by but one other president of the Royal Society, Sir Joseph Banks. As president Newton was brought into close connexion with Prince George of Denmark, the queen’s husband, who had been elected a fellow of the Royal Society. The prince had offered, on Newton’s recommendation, to be at the expense of printing Flamsteed’s observations, and especi- ally his catalogue of the stars. It was natural that the queen should form a high opinion of one whose merits had made such a deep impression on her husband. In April 1 705, when the queen, the prince and the court were staying at the royal residence at Newmarket, they paid a visit to Cambridge, where they were the guests of Dr Bentley, the master of Trinity. Her Majesty went in state to the Regent House, where a congregation of the senate was held, and a number of honorary degrees conferred. After- wards the queen held a court at Trinity Lodge, where (16th of April 1705) she conferred the order of knighthood upon Sir Isaac Newton.

As soon as the first edition of the Principia was published Newton began to prepare for a second edition. He was anxious to improve the

work by additions to the theory of the motion of the moon and the planets. Dr Edleston, in his preface to Newton's correspondence with Cotes, justly remarks: —

" If Flamsteed the Astronomer-Royal had cordially co-operated with him in the humble capacity of an observer in the way that Newton pointed out and requested of him . . . the lunar theory would, if its creator did not overrate his own powers, have been completely investigated, so far as he could do it, in the first few months of 1695, and a second edition of the Principia'would probably have followed the execution of the task at no long interval."

Newton, however, could not get the information he wanted from Flamsteed, and after the spring of 1696 his time was much

occupied by his duties at the mint. Rumours, however, of his work, and of a new edition, were heard from time to time. In February 1700 Leibnitz writes of Newton, " J'ai appris aussi (je ne scai ou) qu'il donnera encore quelque chose sur le mouve- ment de la lune: et on m'a dit aussi qu'il y aura une nouvelle edition de ses principes de la nature."

Dr Bentley, the master of Trinity College, had for a long time urged Newton to give his consent to the republication of the Principia. In the middle of 1 708 Newton's consent was obtained, but it was not till the spring of 1709 that he was prevailed upon to entrust the superintendence of it to a young mathematician of great promise, Roger Cotes, fellow of Trinity College, who had been recently appointed the first Plumian professor of astronomy and experimental philosophy. On the 21st of May 1709, after having been that day with Newton, Bentley announced this arrangement to Cotes: — " Sir Isaac Newton," he said, "will be glad to see you in June, and then put into your hands one part of his book corrected for the press." About the middle of July Cotes went to London, in the expectation doubtless to bring down with him to Cambridge the corrected portion of the Principia. Although Cotes was impatient to begin his work, it was nearly the end of September before the corrected copy was put into his hands. During the printing of this edition a correspondence went on continuously between Newton and Cotes. On the 31st of March 1 7 13, when the edition was nearly ready for publication, Newton wrote to Cotes: —

” I heare that Mr Bernoulli has sent a Paper of 40 pages to be published in the Acta Leipsica relating to what I have written upon the curve Lines described by Projectiles in resisting Mediums. And therein he partly makes Observations upon what I have written & partly improves it. To prevent being blamed by him or others for any disingenuity in not acknowledging my oversights or slips in the first edition, I believe it will not be amiss to print next after the old Praefaiio ad Lector em, the following account of this new Edition.

” ‘ In hac secunda Principiorum Editione, multa sparsim emen- dantur & nonnulla adjiciuntur. In Libri primi Sect. ii. Inventio viriiim quibus corpora in Orbibus datis revolvi possint, facilior redditur et amplior. In Libri secundi Sect. vii. Theoria resistentiae fluidorum accuratius investigatur & novis experimentis confirmatur. In Libro tertio Theoria Lunae & Praecessio Aequinoctiorum ex Principiis suis plenius deducuntur, et Theoria Cometarum pluribus et accuratius computatis Orbium exemplis confirmatur.

” ‘ 28 Mar. 1713. _ I. N.’

” If you write any further Preface, I must not see it, for I find that I shall be examined about it. The cuts for y e Comet of 1680 & 1 68 1 are printed off and will be sent to Dr Bently this week by the Carrier.”

Newton’s desire to have no hand in writing the preface seems to have proceeded from a knowledge that Cotes was proposing to allude to the dispute about the invention of fluxions. At last, about midsummer 17 13, was published the long and im- patiently expected second edition of the Principia, and; on the 27th of July, Newton waited on the queen to present her with a copy of the new edition.

In 1 7 14 the question of finding the longitude at sea, which had been looked upon as an important one for several years, was brought into prominence by a petition presented to the House of Commons by a number of captains of Her Majesty’s ships and merchant ships and of London merchants. The petition was referred to a committee of the House, who called witnesses. Newton appeared before them and gave evidence. He stated that for determining the longitude at sea there had been several projects, true in theory but difficult to execute. He mentioned four: (1) by a watch to keep time exactly, (2) by the eclipses of Jupiter’s satellites, (3) by the place of the moon, (4) by a new method proposed by Mr Ditton. Newton criticized all the methods, pointing out their weak points, arid it is due mainly to his evidence that the committee brought in the report which was accepted by the House, and shortly afterwards was converted into a Bill, passed

both Houses, and received the royal assent. The report ran ” that it is the opinion of this committee that a reward be settled by parliament upon such person or persons as shall discover a more certain and practicable method of ascertaining the longitude than any yet in practice; and the said reward be proportioned to the degree of exactness to which the said method shall reach.”

Sir Isaac Newton was a very popular visitor at the court of George I. The princess of Wales, afterwards Queen Caroline, wife of George II., took every opportunity of conversing with him. Having one day been told by Sir Isaac that he had com- posed a new system of chronology while he was still resident at Cambridge, she requested him to give her a copy. He accord- ingly drew up an abstract of the system from his papers, and sent it to the princess for her own private use; but he after- wards allowed a copy to be made for the Abbe Conti on the express understanding that it should not be communicated to any other person. The abbe, however, lent his copy to M Freret, an antiquary at Paris, who translated it, and endeavoured to refute it. The translation was printed under the title Abrigi de chronologic de M le Ckevallier Newlon, fait par lui-mtme et traduit sur le manuscrit anglais. Upon receiving a copy of this work, Sir Isaac Newton printed, in the Philosophical Trans- actions for 1725, a paper entitled ” Remarks on the observations made on a Chronological Index of Sir Isaac Newton, translated into French by the observator, and published at Paris.” In these remarks Sir Isaac charged the abbe with a breach of promise, and gave a triumphant answer to the objections which Freret had urged against his system. Father Souciet entered the field in defence of Freret; and in consequence of this controversy Sir Isaac was induced to prepare his larger work, which was published in 1728, after his death, and entitled The Chronology of Ancient Kingdoms amended, to which is prefixed a short Chronicle from the First Memory of Kings in Europe to the Conquest of Persia by Alexander the Great.

From an early period of his life Newton had paid great atten- tion to theological studies, and it is well known that he had begun to study the subject of the prophecies before the year 1690. M Biot, with a view of showing that his theological writings were the productions of his dotage, has fixed their date between 1712 and 1719. That Newton’s mind was even then quite clear and powerful is sufficiently proved by his ability to attack the most difficult mathematical problems with success. For it was in 1716 that Leibnitz, in a letter’to the Abbe Conti, proposed a problem for solution ” for the purpose of feeling the pulse of the English analysts.” The problem was to find the orthogonal trajectories of a series of curves represented by a single

equation. Newton received this problem about 5 o'clock in the afternoon as he was returning from the mint, but, though he was fatigued with business, he solved the problem the same evening.

One of the most remarkable of Sir Isaac's theological pro- ductions is his Historical Account of Two Notable Corruptions of the Scripture, in a letter to a friend. This friend was Locke, who received the letter in November 1690. Sir Isaac seems to have been then anxious for its publication; but, as the effect of his argument was to deprive the Trinitarians of two passages in favour of the Trinity, he became alarmed at the probable consequences of such a step. He therefore requested Locke, who was then going to Holland, to get it translated into French, and published on the continent. Being prevented from going to Holland, Locke copied the manuscript, and sent it, without Newton's name, to Le Clerc, who received it before the nth of April 1691. On the 20th of January 1692 Le Clerc announced to Locke his intention to publish the pamphlet in Latin; and, upon the intimation of this to Sir Isaac, he entreated him " to stop the translation and impression as soon as he could, for he designed to suppress them." This was accordingly done; but Le Clerc sent the manuscript to the library of the Remon- strants, and it was afterwards published at London in 1754, under the title of Two Letters from Sir Isaac Newton to M le Clerc. This edition is imperfect, and in many places erroneous. Dr Horsley therefore published a genuine one, which is in the form of a single letter to a friend, and was taken from a manu- script in Sir Isaac's own hand.

Sir Isaac Newton left behind him in manuscript a work en- titled Observations on the Prophecies of Daniel and the Apocalypse of St John, which was published in London in 1733, in one volume 4toi another work, entitled Lexicon Prophelicum,

with a dissertation on the sacred cubit of the Jews, which was printed in 1737; and four letters addressed to Bentley, con- taining some arguments in proof of a Deity, which were published by Cumberland, a nephew of Bentley, in 1756. Sir Isaac also left a Church History complete, a History of the Creation, Para- doxical Questions regarding Athanasius, and many divinity tracts.

Newton devoted much of his time to the study of chemistry; but the greater number of his experiments still remain in manu- script. His

Tabula Quantitatum et Graduum Caloris contains a comparative scale of temperature from that of melting ice to that of a small kitchen fire. He wrote also another chemical paper De Natura Acidorum, which has been published by Dr Horsley. Sir Isaac spent much time in the study of the works of the alchemists. He had diligently studied the works of Jacob Boehme, and there were found amongst his manuscripts copious abstracts from them in his own handwriting. In the earlier part of his life he and his relation Dr Newton of Grantham had put up furnaces, and had wrought for several months in quest of the philosopher's tincture. Among the manuscripts in the possession of the earl of Portsmouth there are many sheets in Sir Isaac's hand of Flamsteed's Explication of Hiero- glyphic Figures, and in another hand many sheets of William Yworth's Processus Mysterii Magni Philosophicus.

In the last few years of his life Newton was troubled with incontinence of urine, which was supposed to be due to stone; but with care he kept the disease under control. In January 1725 he was seized with a violent cough and inflammation of the lungs, which induced him to reside at Kensington; and in the following month he had a severe attack of gout, which produced a decided improvement in his general health. His duties at the mint were discharged by John Conduitt, and he therefore seldom went from home. On the 28th of February 1727, feeling well, he went to London to preside at a meeting of the Royal Society; but the fatigue which attended this duty brought on a violent return of his former complaint, and he returned to Kensington on the 4th of March, when Dr Mead and Dr Chesselden pronounced his disease to be stone. He endured the sufferings of this complaint with wonderful patience. He seemed a little better on the 15th of March, and on the 18th he read the newspapers and conversed with Dr Mead; but at 6 o'clock in the evening he became insensible, and continued in that state till Monday the 20th of March 1727, when he expired without pain between one and two o'clock in the morning. His body was removed to London, and on Tuesday the 28th of March it lay in state in the Jerusalem Chamber, and was thence conveyed to Westminster Abbey, where it was buried.

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(1850); Sir D. Brewster, Memoirs of the Life, Writings, and Discoveries of Sir Isaac Newton (1855; new ed. 1893); Lord Brougham and Routh's Analytical View of Sir Isaac Newton's Principia (1855); S. P. Rigaud, Correspondence of Scientific Men of the 1 7th Century, &c, from the Originals in the Collection of the Earl of Macclesfield (1841); J. Raphson, History of Fluxions, showing in a compendious manner the First Rise of and Various Improvements made in that Incomparable Method (17 15); W. W. R. Ball, Essay on Newton's Principia (1893). A complete bibliography of Newton's writings has been given by G. J. Gray (Cambridge, 1880). The collected works of Newton were published in 1 779-1 785 by Dr Samuel Horsley, F.R.S., under the title Isaaci Newtoni Opera quae exstant Omnia. (H. M. T.)

NEWTON, JOHN (1725-1807), English divine, was born in London on the 24th of July 1725 (O.S.). His father, who for a long time was master of a ship in the Mediterranean trade, became in 1748 governor of York Fort, Hudson Bay, where he died in 1751. The lad had little education and served on his father's ship from 1737 to 1742; shortly afterwards he was impressed on board a man-of-war, the " Harwich," where he

was made a midshipman. For an attempt to escape while his ship lay off Plymouth he was degraded, and treated with so much severity that he gladly exchanged into an African trader. He made many voyages as mate and then as master on slave- trading ships, devoting his leisure to the improvement of his education. The state of his health and perhaps a growing dis- taste for the slave trade led him to quit the sea in 1755, when he was appointed tide-surveyor at Liverpool. He began to study Greek and Hebrew, and in 1758 applied to the archbishop of York for ordination. This was refused him, but, having had the curacy of Olney offered to him in April 1764 he was ordained by the bishop of Lincoln. In October 1767 William Cowper settled in the parish. An intimate friendship sprang up between the two men, and they published together the Olney Hymns (1779). In 1779 Newton left Olney to become rector of St Mary Woolnoth, London, where he laboured with unceasing diligence and great popularity till his death on the 31st of December 1807.

Like Cowper, Newton held Calvinistic views, although his evangelical fervour allied him closely with the sentiments of Wesley and the Methodists. His fame rests on certain of the Olney Hymns {e.g. " Glorious things of Thee are spoken," " How sweet the name of Jesus sounds," " One there is above all others,") remarkable for vigour, simplicity and directness of devotional utterance.

His prose works include an Authentic Narrative of some Interesting and Remarkable Particulars in the Life of John Newton (1764), a volume of Sermons (1767), Omicron (a series of letters on religion, 1774), Review of Ecclesiastical History (1769) and Cardiphonia (1781). This iast was a further selection of religious correspondence, which did much to help the Evangelical revival. Thomas Scott, William Wilberforce, Charles Simeon, William Jay and Hannah More all came under his direct influence. His Letters to a Wife (1793) and Letters to Rev. W. Bull (posthumous, 1847) illustrate the frankness with which he exposed his most intimate personal experiences. A Life of Newton by Richard Cecil was prefixed to a collected edition of his works (6 vols., 1808; 1 vol. 1827). See also T. Wright, The Town of Cowper.

NEWTON, JOHN (1823-1895), American general and engineer, was born in Norfolk, Virginia, on the 24th of August 1823, and graduated second in his class at the U.S. Military Academy in 1842. From 1842 to 1861 he was engaged in the construction of coast defences and the improvement of waterways; he was assistant professor of engineering in the Military Academy from 1843 to 1846, became a captain in 1856, and took part as chief engineer in the Utah expedition of 1857-1858, He served as an engineer in the Virginian campaign of 1861, and was promoted brigadier-general, U.S.V., in September. He especially distinguished himself in the Seven Days' battle and at Antietam, and after the battle of Fredericksburg was made major-general, U.S.V. In the Chancellorsville campaign Newton took part in the storming of Marye's Heights at Fredericksburg, on the 3rd of May 1863, and at the battle of Gettysburg he was for a time in command of the I. corps. He had already received the brevet of lieutenant-colonel for his services at Antietam,

and he now became brevet colonel for his services at Gettysburg. Later he was transferred to Sherman's army, and as a division commander under General Oliver O. Howard took part in the Atlanta campaign. For gallant conduct at Peach Tree Creek he was made brevet brigadier-general, and at the close of the war was made brevet major-general, U.S.A. Returning to regular engineering duty after the war, he was stationed at New York from 1866 to 1884. His most important work there was the improvement of the Hudson river, and especially the removal of the obstructions to shipping in the dangerous entrance to the East river from Long Island Sound, known as Hell Gate. Under two of the largest obstructions — Hallet's Point and Flood Rock, with a surface of three acres and nine acres respectively — shafts were sunk from the shore, and tunnels were bored in every direction. In these tunnels thousands of pounds of explosives were placed, and the rocks were blown into fragments. In March 1884 he became Chief of Engineers, with the rank of brigadier-general, and held this position until his retirement from the army, at his own request, in August 1886. In 1887-1888

he was commissioner of public works in New York City, and from 1888 until his death, on the 1st of May 1895, he was president of the Panama railway.

NEWTON, a city and the county-seat of Harvey county, Kansas, U.S.A., about 27 m. N. of Wichita. Pop. (1905)6601; (1910) 7862. It is served

by the Atchison, Topeka & Santa Fe (of which it is a division point and which has shops here), and the Missouri Pacific railways. Newton is the centre of the settlements of the German-Russian Mennonites, a thrifty people, who immigrated in 1873 and subsequently; Bethel College (opened 1893) is a Mennonite secondary school, and there is a Mennonite hospital. Newton is a supply and distributing point for the surrounding agricultural and stock-raising region, and has various manufactures. The municipality has natural gas for heating, lighting and manufacturing. Newton was first settled in 1 87 1, was chartered as a city in 1872, and in 19 10 adopted a commission form of government.

NEWTON, a city of Middlesex county, Massachusetts, U.S.A., 10 m. W. of Boston, on the S. bank of the Charles river, which borders it for 16 m. Pop. (1880) 16,995; (1890) 24,379; (1900) 33,587, of whom 10,068 were foreign-born, 19,006 of foreign parentage and 505 were negroes; (1910, census) 39,806. Newton is served by the Boston & Albany railway. The city, with an area of 17-98 sq. m., contains 15 villages. In Newton, the most prominent of these villages, is a stone terrace monu- ment to John Eliot, erected on the site of Waban's wigwam near Nonantum Hill, where Eliot founded the first Indian Church on the 28th of October 1646 — the Nonantum Indians, under their chief Waban, removed to Natick in 165 1. On Institution Hill, Newton Centre, is the first Baptist theological seminary in America, Newton Theological Institution, founded in 1825. Here also is the residence of Samuel Francis Smith (1808-1895), author of " America " and several missionary hymns, and pastor here in 1842-1854. In Newton Upper Falls, Echo Bridge (of the Boston Aqueduct) crosses the Charles near the falls in Hemlock Gorge Reservation of the Metropolitan Park system. Auburndale is the seat of Lasell Seminary for Young Women, founded in 1851 by Edward Lasell (1809-1852). Other of the villages are Newtonville, West Newton and Newton Highlands. The city of Newton is primarily a residential suburb of Boston; along the Charles is a part (191-12 acres) of the Charles River Reservation of the Metropolitan Park system, and the city has several attractive public parks, including Norumbega Park, on the banks of the river, with a large open-air theatre; boating, especially canoeing, on the river is very popular. The city has a public library, a high school and a technical high school. Among its manufactures are foundry and machine shop products, worsted goods and electrical apparatus; the factories utilize the water power of the falls. The value of the manufactured product in 1905 was $4,140,996. The region was settled as a part of Cambridge in 1630 and was called South Side (i.e. of the Charles), Nonantum (the Indian name), Cambridge Village,

Little Cambridge or New Cambridge; in 1688 it was incorporated as a separate town and in 1691 received its present name; it annexed an island in the Charles in 1803; parts of it were annexed to Roxbury (1838) and Waltham (1849); it became a city in 1873; and in 1875 it annexed a part of Boston, with which there have been several more recent boundary adjustments.

NEWTON ABBOT, a market town and seaport in the Ash- burton parliamentary division of Devonshire, England, 20 m. S. by W. of Exeter by the Great Western railway. Pop. of urban district (1901) 12,517. Beautifully situated at the head of the Teign estuary, the town grew rapidly in the 19th century. The two parish churches, St Mary's in Wolborough, and AH Saints' in Highweek, are Perpendicular in style. St Mary's contains a Norman font, an ancient brass lectern, buried during the Civil Wars, and some interesting heraldic ornaments which date from the 15th century. Of the 14th century chapel of St Leonard, only a tower survives. A large nunnery, called St Augustine's Priory, was erected near the town in 1861; while eastward is the Jacobean Forde House, belonging to the earl of Devon, and visited by Charles I. and William of Orange,

who first read his declaration to the people of England at Newton Abbot market-cross. The establishment of large engine works by the Great Western railway has aided the development of local industries, and there is a considerable shipping trade, fine china clay and pipeclay being worked near the towns and exported to the Potteries. Large fairs are held for the sale of agricultural produce and livestock. The portion of Newton Abbot in the parish of Highweek was formerly a separate town, known as Newton Bushel.

Probably both Newton Abbot and Newton Bushel were originally included under the name of Newton. Newton Abbot was given to the abbot of Tor by William Lord Brewer, founder of the monastery (1196). Newton Bushel was so called from Robert Bussell or Bushel, foster-child and kinsman of Theobald de Englishville, who was made lord of the manor by Henry III. in 1246.

NEWTON-IN-MAKERFIELD, or Newton-le- Willows, an urban district in the Newton parliamentary division of Lanca- shire, England, 155 m. W. of Manchester by the London & North- Western railway. Pop. (1891) 12,861; (1901) 16,699. At a short distance from the town is a moated Elizabethan half-timbered house, and also an ancient barrow of great extent. The Liverpool farm reformatory school is in the neighbourhood. The industrial establishments include foundries, printing and stationery works, paper mills, glass works and sugar

refineries. Coal abounds in the neighbourhood.

The township of Newton-in-Makerfield, gave its name in Saxon times and in the reign of William the Conqueror to one of the hundreds of Lancashire. The barony was held by the Banastres from the conquest to 1286 and passed successively to the Langtons, Fleetwoods and Leghs. It does not seem that the barons were ever summoned to parliament, and the title, like all parliamentary titles, has fallen into disuse since the abolition of feudal tenures. The courts-baron and courts-leet are held twice annually. The township returned two members to parliament from 1559 to 183 1, but was disfranchised by the Reform Act of 1832. There was a market here at least as early as 1558 which is now discontinued. Near the town a party of Highlanders were taken prisoners in 1648 by Cromwell's troops, and hanged in an adjoining wood, still called Callow's Cross.

NEWTOWN, a municipality of Cumberland county, New South Wales, Australia, 3ˆ m. S.W. of Sydney. It consists chiefly of the residences of the wealthier citizens of Sydney and is connected with the city by rail and tram. As a municipality it dates from 1862. Pop (1901) 22,598.

NEWTOWN (Welsh Drefnewydd, with the same meaning, formerly Llanfair Cedewain), a market town and contributory parliamentary borough of Montgomeryshire, situated on both sides of the Severn, and on the Cambrian railway, 195 m. from London. Pop. of urban district of Newtown and Llanllwchhaiarn (1901) 6500. It is connected with Shrewsbury (Amwythig) by the Montgomeryshire canal. The old Anglican church, partly Decorated and partly Perpendicular, has been superseded by the modern St Mary's, which contains the font and rood-screen of the old building. In the old churchyard lies Robert Owen, born in 17 71 at Newtown, where he died in 1858, known as " the patriarch of reason," author of New Views of Society, &c, and one of the fathers of communism. Newtown, rather than Welshpool, is the chief seat of Welsh flannel manufacture, together with that of tweeds and shawls. It joins with Welshpool, Llanfyllin, Montgomery (Trefaldwyn) , Llanidloes and Machynl- leth, in returning a member to parliament.

NEWTOWNARDS (pron. Newtondrds), a market town of Co. Down, Ireland, beautifully situated near the northern extremity of Strangford Lough, on a branch of the Belfast and Co. Down railway, 9§ m. E. of Belfast. Pop. (1901) 91 10. The town is sheltered by the Scrabo Hills on the west and north, and possesses a fine square, in which the pedestal of an ancient cross was erected in 1636. Muslin embroidery is the principal industry. There are also mills for flax and hemp yarns, a

weaving factory and a hosiery factory. The remains of the old church, originally erected in 1244, contain good Perpendicular work, and tie

family vault of the Londonderry s; there are also the parish church and Presbyterian church, with lofty spires, and a Roman Catholic chapel. In the neighbourhood there are freestone quarries.

The town owes its origin to a Dominican monastery founded in 1244 by Walter de Burgh. It was forfeited by the O'Neills, and given to the Hamiltons and Montgomeries, from whom it passed to the marquess of Londonderry. It received a charter from James I., and until the Union in 1800 returned two members to parliament. The ruined abbey of Moville, ij m. N.E., is the most notable of the many ecclesiastical remains in the neighbourhood. It is attributed to St Finian (c. 550).

NEW ULM, a city and the county seat of Brown county, Minnesota, U.S.A., on the S. bank of the Minnesota river, 88 m. (by rail) S.W. of Minneapolis, in the south central part of the state. Pop. (190s, state census) 5720 (1287 of German birth); (1910) 5648. New Ulm is served by the Minne- apolis & St Louis, and the Chicago & North Western railways. In the south-western part of the city, on a wooded hill called Hermann Heights, there is a statue of Arminius erected by the Grand Lodge of Hermann's Sons of the United States. New Ulm is an important livestock market. The city is the seat of the Dr Martin Luther College (Lutheran, 1884), a secondary school, with a normal and a collegiate department. St Michael's Academy and St Alexander Hospital are under the charge of Roman Catholic sisters. New Ulm was settled about 1853, and was twice attacked and almost destroyed by the Indians during the Sioux uprising of 1862. There is a monument to those who lost their lives in the Sioux massacres.

NEW WASHINGTON, a town of the province of Capiz, island of Panay, Philippine Islands, on the N. coast about 17 m. W. of Capiz, the capital of the province. The town was formed in 1003 by uniting tho towns of Batan, Jimeno, Balete and the village or barrio of Lagatic in the town of Calibo; the total population at that time was 24,480. There are about sixty-six barrios, but all of these except Lagatic, the seat of the municipal government, had in 1903 less than 1000 inhabitants. The language is Visayan. The cultivation of rice, sugar cane, hemp, and Indian corn and the raising of cattle and horses are the principal industries.

NEW WESTMINSTER, a city on the north bank of the Fraser river, British Columbia, 15 m. from the mouth. Pop. (1906 estimate) 7900. Founded in 1859 it was the capital of British Columbia when the British possessions on the Pacific coast formed two colonies — i.e. British Columbia (the mainland portion) and Vancouver Island. The city is accessible to ocean- going ships of 16 ft. draught. It is the chief centre of the farming country of the lower Fraser and has a small export lumber trade. In 1898 the greater portion of the business part of the city was destroyed by fire, and though much of it was rebuilt, the estab- lishment of the city of Vancouver, only 12 m. distant, seriously affected its growth. It is connected with Vancouver by an electric railway. The Great Northern railway, connecting with Seattle and other points in the state of Washington, here crosses the Fraser river by a fine bridge.

NEW YEAR'S DAY, the first day of the year. In the Gregorian calendar this date occurs twelve days earlier than in the Julian ; thus in Russia, Greece, &c, where the latter is still employed, New Year's Day is celebrated on the English 13th of January. The ancient Egyptians, Phoenicians and Persians began their year at the autumnal equinox (Sept. 21) and the Greeks until the 5th century B.C. at the winter solstice (Dec. 21). In 432 B.C. the latter altered their New Year's Day to the 21st of June. The ancient Romans celebrated the beginning of the year on the 21st of December, but Caesar by the adoption of the Julian calendar postponed it to the 1st of January. The Jews have always reckoned their civil year from the first day of the month of Tishri (Sept. 6-Oct. 5), but their ecclesiastical year begins at the spring equinox (March 21). The 25th of March was the usual date among most Christian peoples in early medieval days. In Anglo-Saxon England, however, the 25th of December was New Year's Day. At the Norman Conquest owing, it is believed,

to the coincidence of his coronation being arranged for that date, William the Conqueror ordered that the year should start on the 1st of January. But later England began her year with the rest of Christendom on the 25th of March. The Gregorian calendar (1582), which restored the 1st of January to its position as New Year's Day, was accepted by all Catholic countries at once; by Germany, Denmark and Sweden about 1700, but not until 1751 by England.

The Romans, after the adoption of the Julian calendar, kept the 1st of January as a general holiday. Sacrifices were made to Janus; gifts and visits were exchanged, and masquerading and feasting were general. Congratulatory presents were made to the magistrates who entered upon office on this day. The emperors at the new year exacted from

their subjects tribute of a pound of gold. This quasi-present was called strata, a term (extended to all New Year's gifts in Rome) traditionally derived from a custom initiated by the. legendary King Tatius, to whom branches of vervain gathered in the sacred Grove of Strenua, the goddess of strength, were presented as a good omen on the first day of the year 747 B.C. The imperial strenae later became so excessive that Claudius found it necessary to limit the amount by formal decree.

Participation in the ordinary New Year's Day observances as well as in the Saturnalia of December was from the first discouraged by the Church. Christians were expected to spend the day in quiet meditation, reading of scripture and acts of charity. When about the 5th century the 25th of December had become a fixed festival commemorative of the Nativity, the 1 st of January assumed a specially sacred character as the octave of Christmas Day and as the anniversary of the Circum- cision. As such it still figures in the calendars of the various branches of the Eastern and Western Church, though only as a feast of subordinate importance. The first mention of it in Christian literature as a feast occurs in Canon 17 of a council which met at Tours in 567.

The custom of giving and receiving strenae for luck at the New Year survives in France (where New Year's Day is known as le jour d'etrennes) and the Continent generally. In England its place has been taken by the Christmas-gift. In Scotland, where New Year's Day is more generally observed than Christmas, the custom is still universal. The Persians celebrated the begin- ning of the year by exchanging presents of eggs. The Druids distributed as New Year's gifts branches of the sacred mistletoe. In Anglo-Saxon and Norman England New Year's gifts were common. According to Matthew Paris, Henry III. followed the Roman precedent by extorting New Year's gifts from his subjects. These in later reigns became voluntary but none the less obli- gatory on those who wished to stand well with the throne. The custom reached its climax in Tudor times. Wolsey one New Year gave Henry VIII. a gold cup valued at £117, 17s. 6d. in the coinage of that time. An MS. account is preserved of money gifts given to King Henry by all classes of his subjects on New Year's Day 1533. The total reached many thousands. Bishop Latimer, however, handed Henry instead of a purse a New Testament with a leaf doubled down at Hebrews xiii. 4, as apposite to the king's then impending marriage with Anne Boleyn. In Edward VI. 's time, if not earlier, it was usual for the sovereign to give " rewards " to those who presented New Year's gifts. Elizabeth is related to have been most conscientious in this regard. The custom of offering New Year's gifts to the sovereign became obsolete during the

Commonwealth and was not revived at the Restoration. ‘

NEW YORK, one of the original thirteen United States of America, situated between 40° 29′ 40″ and 45 o’ 2″ N., and between 71° 51′ and 79 45′ 54-4″ W. Its northern boundary is, for the most part, formed by Lake Ontario and the St Law- rence river, which separate it from the province of Ontario, Canada; but north of the Adirondacks the boundary fine leaves the St Lawrence, extending in a due east direction to the lower end of Lake Champlain. Thus the boundary between New York and the province of Quebec, Canada, is wholly artificial. Vermont, Massachusetts and Connecticut bound New York on

the E. ; the Atlantic Ocean, New Jersey and Pennsylvania, on the S.; and Pennsylvania, Lake Erie and the Niagara river on the W.

The state has a triangular outline, with a breadth from E. to W. of 326-46 m. and from N. to S., on the line of the Hudson, of 300 m. In addition, it includes Long Island and Staten Island on the Atlantic Coast. Its land area is 47,654 sq. m. and the area of the inland waters is 1550 sq. m., giving a total area of 49,204 sq. m. In addition to this, New York includes 3140 sq. m. of water in Lakes Ontario and Erie.

Topography. — The most notable topographic feature is the roughly circular mountain area of north-eastern New York known as the Adirondack mountains (q.v.). This is a very ancient mountain mass of crystalline rocks resembling more the Laurentian mountains of Canada than the Appalachians. Indeed, it is commonly considered to be an extension of the Canadian mountains. ‘Parts of the crystal- line area are worn down to a condition of low relief, but in the main mountain mass, although greatly worn, there are still elevations of truly mountainous proportions. The highest peak is Mount Marcy (5344 ft.), though associated with it are several other peaks with an elevation from 4000 to 5000 ft. Even the higher summits are worn to a rounded condition, and are therefore for the most part forest covered up to the timber line which, on Mount Marcy, is at an elevation of about 4900 ft. From the crest of the dome of the Adirondacks proper the surface slopes in all directions to surround- ing lowlands: to the St Lawrence valley on the N. ; the Champlain- Hudson lowland on the E. ; the Mohawk valley on the S. ; and Lake Ontario on the W. While igneous and metamorphic crystalline rocks form the bulk of the Adirondack

area, it is surrounded by a ring of ancient Palaeozoic sediments in which these peripheral lowlands have been developed. The Adirondack area proper, and much of the surrounding ring of more recent rocks, is either too rugged, or has a soil too thin and rocky for extensive agriculture. It is there- fore a sparsely settled region with lumbering for one of the leading industries, though there is some mining, as of iron. Owing to the varied and beautiful scenery, this is a favourite summer resort ; the game of the forests and the fishing in the streams and in the multitude of lakes serve as further attractions. In the peripheral ring farming increases, especially dairying; and manufacturing industries connected with the products of forests, farms and mines are developed. These and other manufacturing industries are greatly aided by the extensive water power furnished by the mountain streams which flow out radially from the central area.

South of the Adirondack region, and S. of the Mohawk Valley, rises a high-level plateau which extends westward to the Pennsyl- vania boundary. Here the rocks are all essentially horizontal and of Palaeozoic age, mainly Devonian. This plateau province, which includes more than half the state, differs greatly from place to place. Its elevation decreases toward the N. by a series of steps, having its lowest elevation on the Ontario plain which skirts the southern shore of Lake Ontario. Similar to this is a narrow plain along the southern shore of Lake Erie, which, in fact, lies in a shallow depression in this Erie plain. Both of these plains are so level, and have so fertile a soil that they are the seats of extensive agriculture, especially fruit raising, which is further encouraged by the influence of the large bodies of lake water that moderate the heat of summer and the cold of winter, and tend to check the late frosts of spring and the early frosts of autumn.

Elsewhere in the plateau province the land is higher and the surface far more irregular, increasing in ruggedness toward both the S. and the E. Elevations of between 1500 and 2000 ft. are common in this region all the way from Chautauqua county in the extreme W. to the Catskill mountains in the E. ; and in places the surface becomes so rugged as to simulate the features of mountains and locally to win the name mountain. Valleys are deeply sunk in the plateau, the largest with bottom lands of sufficient width to give rise to strips of fertile farm land. The valley walls rise to undulating, and often fairly level uplands, which are, in large part, cleared of forest; but the uplands are remote from markets, and the soil is thin. In the main they are grazing lands — the seat of important dairy and sheep- raising industries. This is the region of abandoned farm houses. Thousands have been deserted and they may be found along all the upland roads.

Since this plateau region is a northward extension of the Alleghany plateau, which skirts the western base of the Appalachian mountains, it rises as the mountains are approached. Thus, in S.E. New York, where the Appalachians enter the state, the plateau becomes much higher than in the W-, reaching its culmination in the Catskills. Here, partly because of elevation, and partly because of the resistant nature of the Catskill sandstones, dissection has so sculptured the plateau as to carve it into a mountainous mass which is generally known as the Catskill mountains. In this part of the plateau, summit elevations of from 3000 to 4000 ft. are common, the highest point being Slide Mountain (4205 ft.). Like the Adirondacks, this region is largely forest covered, and is a favourite summer resort; but it is far less a wilderness than the Adirondacks, and in places is cleared for farming, especially for pasturage.

In the plateau province there are other areas known as mountains, of which the Helderberg mountains are the most conspicuous. This formation is really an escarpment facing the lower Mohawk and the Hudson river S. of Albany; where there is a downward step in the plateau. The steeply rising face of the plateau here is due to the resistance of a durable layer of limestone, known as the Helderberg limestone. There are other lower escarpments in the plateau province, similar in form and cause to the Helderberg escarpment. Of these the most notable is the Niagara escarpment which extends eastward from Canada, past Lewiston and Lockport, — a downward step from the Erie to the Ontario plain, where the Niagara limestone outcrops, and its resistance to denudation accounts for the steeply rising face at the boundary between the two plains.

South and S.E. of the Catskills, although including only a small portion of the state, there are a number of different topographic features, due to the belts of different rock structure which cross the state from S.W. to N.E. First come the low folds of the western Appalachians, which, though well developed in Pennsylvania, die out near the New York boundary. The most pronounced of these upfolded strata in New York form the low Shawangunk mountains, which descend, toward the S.E., to a lowland region of folded strata of limestone, slate and other rocks in Orange and Dutchess counties. This lowland area, due to the non-resistant character of the strata, is a continuation of the Great Valley of the Appalachians, and ex- tends N.E. into Vermont and S.W. across New Jersey, Pennsylvania; Maryland and Virginia. It is bounded on its S.E. side by the Highlands, a belt of ancient crystalline rocks which extends N.E. into Connecticut and Massachusetts, and S.W. into the Highlands of New Jersey and thence to the Blue Ridge. South of the High- lands, in New Jersey, but

extending to the very banks of the Hudson, is a belt of Triassic sandstone with intrusions of trap rock, which, on account of its peculiar columnar jointing, has developed a palisade structure — the famous Palisades of the lower Hudson. On the New York side of the Hudson the rocks are crystalline, the surface a region of low hills, a continuation of the crystalline area of Con- necticut, and comparable with the Piedmont plateau of the Southern states. Long Island, though modified by extensive glacial deposits, may be considered a N.E. extension of the coastal plains which attain a much more perfect development in New Jersey and the states farther S.

The entire surface of New York, with the exception of a very small area in the extreme W., in Chautauqua and Cattaraugus counties, was covered by the continental glacier. With its source in Canada, it overrode even the highest mountains and spread beyond the boundary of New York into Pennsylvania and New Jersey; but farther E. its front rested on Staten Island and Long Island, whose surface features, and a part of whose area, are due to the deposits along the ice front, including terminal moraines and outwash gravel plains. Elsewhere in the state, also, the work of the glacier is very evident. It broadened and deepened many of the valleys; rounded the hills; turned aside many streams, causing changes in drainage and giving rise to in- numerable waterfalls and rapids; and it formed the thousands of lakes, large and small, which dot the surface. As the ice receded, it halted at various points, forming moraines and other glacial deposits. Thus the soil of almost the entire state has been derived by glacial action. After the continental ice sheet entirely disap- peared from the state, local valley glaciers lingered in the Adirondacks and the Catskills.

Drainage. — The drainage of New York finds its way to the sea in various directions. The St Lawrence system receives the most, mainly from short streams from the plateau province and from the Adirondacks. A small part of the state, in the W., drains to the Ohio, and thence, by way of the Mississippi, to the Gulf of Mexico; and a much larger area drains into the Susquehanna, entering the head of Chesapeake Bay. A part of the Catskills, and the region farther S., drains into Delaware Bay through the Delaware river. Thus New York is pre-eminently a divide region, sending its drainage; by various courses, into widely separated parts of the ocean. Only the Hudson and a few streams in the extreme S. have independent courses to the sea within the state itself.

The Hudson (q.v.) is essentially a New York stream, though it receives some drainage from the New England States through its small eastern tributaries. Its entire course is within,New York, from which it

receives most of its water supply. It is by far the most important river in the state, for, owing to the sinking of the land, which has admitted the tide as far as Troy, it is navigable for 151 m. from the sea. Thence westward the Mohawk Valley furnishes a highway which is followed by canal, railway and Waggon road. Thus there is here a gap, easily traversed, across the Appalachian mountains and plateaus to the more level and fertile plains beyond. A tow gap also leads northward from the Hudson to the ChamplainVailey across a pass only 147 ft. above sea-level. This was of much import- ance in early wars ; but it is of only minor importance as a com-i mercial highway since it leads to Canada through a region of little economic importance.

The lower Hudson, below Troy, is really a fiord, the stream valley being drowned by the sea through subsidence of the land. It is ndted for its remarkable scenery, especially where it crosses the Highlands. The other large river valleys are far less useful as highways, though each is paralleled by one or more railways. The action of the

continental glacier in scouring down the passes between the St Lawrence and southern drainage, and in turning streams southward, has facilitated the building of railways across the divides.

There are thousands of lakes and ponds in the state, most of them very small and all, even including Lakes Erie and Ontario, the result of glacial action. The largest lake apart from Erie and Ontario is the beautiful Lake Champlain, which lies on the eastern boundary, partly in Vermont, and with the N. end in Canada. It occupies the lower portion of the trough between the Adirondacks and the Green Mountains. The largest lake entirely within the state is Lake George, famous for its beautiful scenery. In the central part of the state are a series of peculiar elongated lakes, extending in a nearly N.S. direction, known as the Finger Lakes. The largest of these are Cayuga, Seneca, Keuka, Canandaigua, Owasco and Skaneateles. In the extreme western part of the state is Chautauqua Lake, beautifully situated in the plateau of western New York.

New York is noted for its many falls and rapids, some of them of great beauty. Of these the largest is the cataract of Niagara, about I m. wide and 160 ft. high. The American Fall is entirely within the state; but the Canadian boundary-line passes down the centre of the Horseshoe or Canadian Fall. Other notable falls are those of the Genesee at

Portage and at Rochester, Trenton Falls, the Falls of Ticonderoga, and a multitude of falls and rapids in the Adirondack region and along the shores of the upper portions of the Finger Lakes. Here the tributary streams tumble down the sides of the lake valleys, whose bottoms have been deepened by glacial erosion, leaving the tributary valleys hanging. There are scores of picturesque glens here, and hundreds of waterfalls, among the most beautiful being in the Cayuga valley — notably Enfield Falls, a few miles S. of Ithaca, Ithaca Falls in the city, and Taughannock, a few miles N. of Ithaca. The last, the highest waterfall in the state, has a vertical fall of 2 1 5 ft. Similar glens and falls are found in the Seneca Valley, the best known being the widely renowned Watkins Glen, now reserved as a state park- (see Watkins). Many of the waterfalls of New York, but notably Niagara, are used as a source of power.

The Coast-line. — New York has extensive coast-line along the Great Lakes, 75 m. on Lake Erie and over 200 m. on Lake Ontario. Where the lake waters flood the stream mouths, there are excellent harbours, and lake navigation is therefore of high importance. The largest of the lake ports is at Buffalo at the head of Niagara river, where, owing to the Niagara cataract, lake boats from the W. must transfer their goods to rail or canal. Buffalo lies at the lower end of natural lake navigation, though by the building of a ship canal in Canada, lake steamers can proceed into Lake Ontario and thence to the St Lawrence.

The ocean coast-line, though of limited extent, is by far the most important in the United States. The greater part of the sea coast is on Long Island — a low, sandy coast, the seat of numerous summer resorts and of some fishing. The mainland, opposite the western end of Long Island, is traversed by the lower Hudson and other channels — submerged valleys — which form a branching bay with several islands, the largest of which are Staten and Manhattan Islands. The western bank of the lower Hudson is in New Jersey. This branching bay makes an excellent protected harbour, with an immense water front, at the outlet of the chief natural highway from the E. to the interior of the country. Naturally, therefore, a dense population, engaged mainly in manufacturing and commerce, has gathered around the shores of this harbour, the greatest number on Manhattan Island and the contiguous mainland in New York City, but large numbers also on western Long Island, in Brooklyn, on the smaller islands, and on the New Jersey side. The harbour entrance is some- what obstructed by sand bars, so that extensive government work has been necessary to open and maintain a channel for large draft ocean vessels. This sand has not been brought by the Hudson itself, for that

river drops most of its sediment load far up stream, in its long tidal channel. It is supplied by the tidal- and wind-formed currents, which are drifting sand from the Long Island and New Jersey coasts, extending the barrier beaches, such as Sandy Hook, out across the entrance to New York Bay.

Climate. — In general the climate of New York is typical of that of northern United States, a climate of extremes, hot in summer, and cold in winter, and yet healthful, stimulating, and, on the whole, not disagreeable. In the absence of extensive alluvial plains and marshes, there is little malaria. The average mean annual tempera- ture is not far from 45° F., though it varies from over 50 near New York City, and 48 near the Lake Erie shore, to less than 40 in the high Adirondacks. The average maximum summer heat is about 93 , temperature of 100° being rarely reached. In the winter the temperature descends below zero during exceptionally cold spells. A temperature of -20° or lower is never attained in the southern portion, seldom in the central, but is often passed, by 5 or 10 degrees, in the Adirondacks and in the higher parts of the plateau. The rivers and smaller lakes freeze in winter and navigation on the St Lawrence river is closed by ice on the average from about the middle of December until early in April. The average rainfall is between 40 and 45 in., but it is less than 30 in. in the Lake Champlain Valley and over 55 in. N. of New York City. In most of the state frosts begin from September 1st to October 1st, and end from April 1st to May 1st. In the Adirondack region the snowfall is heavy, the winter long and severe. In central New York it is not uncommon for snow. to

accumulate to the depth of 3 or 4 ft., and yet this is not persistent. About New York City, and on Long Island, the snow rarely exceeds 1 ft. in depth. The climate is very variable, owing to the frequent passage of cyclonic storms from the W. and S.W., bringing warmer weather with rain and snow in winter, and causing days of great heat and humidity, with thunderstorms, in summer. Between these cyclonic storms come areas of high pressure, or anticyclones, with dry cool air in summer, and dry cold air in winter, sometimes with such decided changes in temperature as to merit the name cold wave. About New York City, and on Long Island, the ocean softens the rigours of winter, and through the influence of cold surface waters off the coast, tempers the heat of summer. The temperature of the larger valleys is notably higher than that of the uplands; and the temperature along the lake shores is decidedly influenced by the large bodies of water. Lakes Ontario and Erie never freeze com- pletely over in winter.

Although one of the smaller states in the Union, being 30th in area,

New York ranks first in population and in wealth, and has won for itself the name Empire State. The physiography has enabled the state to become a great highway of commerce between the central part of the United States and the sea-coast, by rail and by water, along the Mohawk Gap and by other routes. The Great Lakes waterway naturally finds an outlet in New York City. This has made it easy for the states to the west to con- tribute raw materials, notably coal and iron, adding these to the natural raw products of New York. Thus it happens that from Buffalo to New York City there is. a chain of busy manu- facturing centres along the natural highway followed by the Erie Canal and the Hudson river. Other parts of the state, where connected with the main highway, are influenced by it to some extent; but away from the great natural route of commerce New York is not especially noteworthy either for its density of population or for extensive manufacturing and commerce. (R. S. T.)

Flora. — When first settled by Europeans New York was a wood- land region containing nearly all the varieties of trees, shrubs and plants which were common to the territory lying E. of the Mississippi river, N. of the Ohio, and S. of the St Lawrence. In the Adirondack region the trees were principally white pine, spruce, hemlock and balsam, but mixed with these were some birch, maple, beech and basswood, and smaller numbers of ash and elm ; in the swamps of this region were also larch and cedar. The forests of the W. half of the state contained pine, but here such hardwood trees as oak, chestnut, hickory, maple and beech were more common. The tulip tree was common both in the S.W. and N. ; and the walnut, butternut, poplar, sycamore and locust were widely distributed. The original varieties of trees still abound, though in less numbers, on lands ill- adapted to agriculture, and in the Adirondack and Catskill Mountains, where the state has established forest preserves, and the Forest, Fish and Game Commissioner began reforesting in 1901, principally with pine, spruce and larch. On the summits of the Adirondacks are a few alpine species, such as reindeer moss and other lichens; on the shores of Long Island, Staten Island and Westchester county are a number of maritime species ; and on Long Island are several species especially characteristic of the pine barrens of New Jersey. Laurel, rhododendron, and whortleberry are common shrubs in the mountain districts, and sumac, hazel, sassafras and elder are quite widely distributed elsewhere. Among indigenous fruit-bearing plants the state has the black cherry, red cherry, red plum, yellow plum, grape, black currant, blackberry, dewberry, strawberry and cranberry. Blue flag, snake root, ginseng, lobelia, tansy, wormwood, winter- green, pleurisy root, plantain, burdock, sarsaparilla and horehound are among its

medicinal plants. Cowslips, violets, anemones, buttercups and blood-roots are conspicuous in early spring, the white pond lily and the yellow pond lily in summer, asters and golden-rod in autumn, and besides these there are about 1500 other flowering plants in the state and more than 50 species of ferns.

Fauna. — Of the fur and game animals which were inhabitants of the primeval forests few of the larger species remain except in the Adirondack region. Here the puma (” panther “) has become extinct and the Canada lynx is rare. The moose, the elk and the beaver have been placed under the protection of the Forest, Fish and Game Commissioner. There are many deer in the Adirondacks. The porcupine is common, but the Canada pine marten or American sable, fisher, and red fox are rare, and the black bear and grey wolf are found only in small numbers. Rabbits and squirrels are numerous in nearly all parts of the state; skunks, weasels, muskrats and woodchucks are common; there are some racoons; mink are frequently taken in the Adirondacks; and a few otter remain. In the lower counties are some ” Virginia ” opossums.

Among birds of prey a bald eagle and a golden eagle are occasion- ally seen in secluded places. Game birds include ducks, geese, plovers, snipe, loons, grebes, terns, rails, the woodcock and the ruffed grouse; quails are scarce except on Long Island, where a number Oj young birds are liberated each year, and by the same means a supply

of pheasants is maintained in some parts of the state. There is a state game bird farm (1909) near Sherburne in Chenango county. Herons, the brown pelican, bittern, and mud hen frequent the marshes. The robin, song sparrow, chickadee, thrushes, warblers, vireos, orioles, wrens, blue-bird, cat-bird and phoebe are favourite song birds.

There are about 375 species of fish in New York waters (see below under Fisheries).

Soil. — The soil is mostly glacial drift, but its depth and composi- tion often vary greatly even within small areas. The most widely distributed soil, especially in the W. half of the state, is mainly a clay which was formed by the glacial pulverizing of limestone and shale and is still forming from the decomposition of fragments of these substances. In the larger valleys and along the shores of lakes

considerable alluvium is mixed with this clay. In the E. there is some clay formed mainly by the decomposition of slate. A sandy loam is quite characteristic of some of the N. counties, and gravelly loams containing limestone are not uncommon.

Agriculture and Slock- Raising. — Although New York has lost in the competition with the Western States in the production of most of the grains, especially wheat and barley, and in the production of wool, mutton and pork, it has made steady progress in the dairy business and continues to produce great crops of hay. The state has made great advances, too, in the production of flowers, ornamental plants, nursery products, fruits, vegetables, poultry and eggs. In 1900 a little less than three-fourths of the state's total land area was in- cluded in farms and a little more than two-thirds of this was im- proved. The number of farms gradually increased from 170,621 in 1850 to 226,720 in 1900, and the average size decreased from 112-1 acres in 1850 to 97-1 acres in 1890, but increased to 99-9 acres in 1900. More than two-thirds of the farms (152,956) were operated by owners or part owners, 29,900 were operated by share tenants, and 24,303 by cash tenants. Of the total acreage of all crops, 5,154,965 acres (54-1 %) were of hay and 3,125,077 acres (32-8 %) were of cereals. In 1909 the amount of the hay crop (5,002,000 tons) was greater than that of any other state except Iowa, and its value ($71,028,000) was greater than in any other state. The oat crop in 1909 was 37,365,000 bushels; the Indian corn crop, 1,910,000 bushels; the wheat crop, 24,120,000 bushels; the barley crop, 8,820,000 bushels; the rye crop, 2,720,000 bushels; buckwheat, 7,512,000 bushels.

There were less than one-third as many sheep in 1910 (1,177,000) as in 1850; but in the same period the number of dairy cows (1,771,000 in 1910) steadily increased. The number of cattle other than dairy cows was 946,315 in 1850 and 889,000 in 1910. Horses increased from 447,014 in 1850 to 717,000 in 1910.

New York has a larger acreage of vegetables than any other state. Its crop of potatoes in 1909 was 52,560,000 bushels and that of Maine, the next largest, 29,250,000 bushels; and the state is a large producer of onions, turnips, cabbages, cauliflower, sweet Indian corn, cucumbers, rhubarb, parsnips, carrots, green peas and green beans. During the years 1 850-1 889 New York produced about 70 % of the hop crop of the entire country, but since 1890 hop culture has been rapidly extended in the Pacific Coast states and suffered to de- cline in New York, and the crop from 1899 to 1907 averaged only about one-half that of 1889 (20,063,029 lb). Tobacco culture was introduced in 1845, and in i860 the crop was 5,764,582 lb. During 1860-1880 the

increase was slight, but in 1899 the crop was 13,958,370 lb; in 1909 the crop was only 7,050,000 lb. The value of the fruit crop in 1899 ($15,844,346) was second only to that of California; and the most productive agricultural lands are those devoted to floriculture and nurseries.

The dairy business and the production of hay are especially prominent in the rugged region W. of the Adirondack Mountains and in the rugged portions of the counties in the S. half of the state. A large portion of the Indian corn; wheat and barley is produced on the Ontario plain. There are large crops of oats here, too, but the culture of this cereal is quite extensive in most of the counties W. of the Adirondacks. The lower valley of the Hudson is noted for its crops of rye. The buckwheat belt extends S.W. across the state from Albany and Saratoga counties. The principal hop-producing counties are Otsego, Schoharie and Madison, all of which are between Albany and Syracuse. Those producing most tobacco are in a district ex- tending from the S.E. shore of Lake Ontario southward across the state. The great orchards are in the tier of counties bordering the S. shore of Lake Ontario and in Dutchess and Ulster counties in the Hudson Valley. Chautauqua county alone produced more than one-half of the state's crop of grapes in 1899, but this fruit is grown extensively also in the region W. of Seneca Lake in the vicinity of Lake Keuka, and in parts of the lower valley of the Hudson. The culture of small fruits and vegetables is widely distributed throughout the W. half of the state and in the valley of the Hudson, and the greater part of Long Island under cultivation is devoted to market gardening, floriculture and nurseries. The largest nurseries, however, are in the vicinity of Rochester.

Forest Products. — The principal forest area is jn the Adirondack region where the state has a forest preserve (in Clinton, Essex, Franklin, Fulton, Hamilton, Herkimer, Lewis, Oneida, _ St Law- rence, Saratoga, Warren and Washington counties) containing (1909) 1,530,559 acres, and there is as much or more in private pre- serves and in tracts owned by lumbermen. The state has a forest

preserve also in the Catskill region (in Delaware, Greene, Sullivan and Ulster counties) of 1 10,964 acres, and there are wood-lots on many farms throughout the state that produce commercial timber. Originally white pine was the principal timber of the Adirondacks, but most of the merchantable portion has been cut, and in 1905 nearly one-half of the lumber product of this section was spruce, the other half mainly hemlock, pine and hardwoods (yellow birch, maple, beech and basswood.and smaller amounts of elm, cherry and ash). The state is

reforesting portions of its preserve chiefly with pine, spruce and larch. In the Catskills and In the farming regions the lumber product consists largely of hardwoods (mostly oak, chestnut and hickory) , smaller amounts of hemlock and pine, and a very little spruce. The state's entire timber product in 1905 was 1,212,070,168 ft. (board measure) ; of this about five-eighths was from the Adiron- dack region, a little more than one-fourth was from the farming regions, and a little less than one-eighth was from the Catskill region. Maple sugar is an important by-product of the forests, and in the production of this commodity New York ranks second . only to Vermont ; 3,623,540 lb were made in 1900.

Fisheries. — New York was in 1904 more extensively engaged in oyster culture than any other state, and was making more rapid progress in the cultivation of hard clams. In 1909 there were distributed from state fish hatcheries 1 531,293,721 fishes (mostly smelt, pike-perch, and winter flatfish); a large number of fish and eggs were also placed in New York waters by the United States Bureau of Fisheries. The products of the marine fisheries decreased nearly 30 % in value from 1891 to 1897, but from 1897 to 1904 they increased from $3,391,595 to $6,230,558, or 80-3 %, and a large part of this increase was due to the extension of the successful oyster culture at the E. end of Long Island; the value of oysters alone rising from $2,050,058 to $3,780,352. The value of hard clams rose during the same period from $198,930 to $303,599. Peconic Bay, at the E. end of Long Island, yields more scallops than all the other waters of the United States. Soft clams, lobsters, hard crabs and soft crabs are other shell-fish obtained in small quantities. Menhaden are caught in much larger quantities in New York than any other fish, but being too bony for food they are used only in the manu- facture of oil and fertilizer. The most valuable catches of food fish in 1904 were those of bluefish ($556,527), squeteague ($212,623), flounders ($67,159), eels ($53,832), cod ($52,710), scup ($48,068) and shad ($36,826). The shad fishery is mainly in the lower waters of the Hudson river, and the catch diminished so rapidly from 1901 that in 1904 it was only about one-eighth of the average for the decade from 1890 to 1900. The New York fisheries of Lakes Erie and Ontario and the Niagara and St Lawrence rivers yielded pro- ducts in 1903 valued at $187,798 and consisting largely of pike- perch, herring, catfish, bullheads and sturgeon, and in 1902 there were commercial fisheries in sixteen interior lakes and rivers which yielded muscallonge, smelt, bullheads, pickerel, pike-perch and several other varieties having a total value of $87,897.

Minerals. — More than thirty mineral substances are obtained in

commercial quantities from the mines, quarries and wells of New York, but of the total value of the mineral products in 1908 ($45,669,861), nearly six-sevenths was represented by clay products ($8,929^224), pig iron ($15,879,000), stone ($6,157,279), cement ($2,254,759), salt ($2,136,738), petroleum ($2,071,533), and sandand gravel ($1,349,163). The extensive deposits of clay in the Hudson Valley together with the easy water communications with New York City have made this valley the greatest brick-making region in the world; in 1906 the common bricks made here numbered 1,230,692,000. There are also deposits of clay suitable for making bricks, terra-cotta and tiles in nearly every county outside of this valley, and there are some pottery clays in Albany and Onondaga counties. The common bricks made in New York in 1908 were valued at $5,066,084, an amount in excess of that in any other state; and the total value of brick and tile products was $7,270,981, being less than that of Ohio, Pennsylvania or Illinois. In 1750 the mining of iron ore was begun near Monroe, Orange county. Ore has since been found in most of the eastern counties and as far W. as Wayne county, but the mines in Essex, Clinton and Franklin counties of the Adirondack region are by far the most productive. The ores are principally magnetites (New York is the largest producer of magnetite ore among the states, producing about 45 % of the total for the United States in 1907 and 1908), but red haematites occur in the N. and W. section of the Adirondacks and in the central part of the state, and brown haematites and carbonate ore in the S.E. counties. The total output of the state increased from 651 ,228 long tons in 1884 to 1,253,393 long tons in 1890, decreased to_i79,95l long tons in 1898, again increased to 1,375,020 long tons in 1907, when only three states produced more, and was only 697,473 long tons in 1908 when the state held the same rank as in 1907. Limestone

1 These include: the Adirondack Hatchery at Upper Saranac, Franklin county; the Caledonia Hatchery at Mumford, Monroe county; the Cold Spring Harbor Hatchery, at Cold Spring Harbor, Suffolk county ; the Delaware Hatchery, at Margaretville, Delaware county; the Fulton Chain Hatchery, at Old Forge, Herkimer county; the Linlithgo Hatchery, at Linlithgo, Columbia county; the Oneida Hatchery, at Constantia. Oswego county; and the Pleasant Valley Hatchery, at Taggart, Steuben county.

is widely distributed throughout the state, and great quantities of it

are crushed for road-making, railway ballasts, a n d concrete, but as the prevailing colours are greyish or drab it is little used in the walls of buildings. In 1908 the total value of the output of this stone was $2,584,559. Three distinct varieties of sandstone are quarried extensively. Those popularly known as ” bluestones ” belong to the Hamilton period of the Devonian formation and occur mainly between the Hudson and Delaware rivers. They are dark blue-grey, fine grained and durable, and are much used for flagging and kerbing and for sills, caps and steps. Medina sandstones occur throughout a belt averaging about 10 m. wide along the S. shore of Lake Ontario and are either red or grey; the red are used for building, the grey for street paving. A more durable and more beautiful stone for building is the reddish or reddish-brown Potsdam sandstone of which there are extensive formations on the N.W. border of the Adirondacks. The value of all sandstones quarried in 1908 was $1,774,843, an amount exceeded by no other state. Several choice marbles are obtained in the eastern counties. From Tuckahoe, Westchester county, has been taken white marble, used in some of the finest buildings in New York City, and a similar marble is obtained in Putnam and Dutchess counties. Near Gouverneur, St Lawrence county, is a large quarry of coarsely crystalline magnesian limestone, used as monumental marble. In the Lower Silurian formation at Plattsburg and Chazy, in Clinton county, are two beautiful grey or grey and pink marbles, one of which is a favourite among domestic marbles for mantels, table tops and other interior decoiations. From an extensive deposit of blue-black magnesian limestone at Glens Falls are taken the choicest varieties of black marble quarried in the United States. At Moriah and Port Henry, in Essex county, is a stone known as ophlite marble, a mixture of serpentine, dolomite and calcite interspersed with small flecks of phlogopite. Larger deposits of serpentine occur at several places in St Lawrence county ; and at Warwick, in Orange county, is some beautiful marble of a carmine-red colour occasionally mottled with white or showing white veins. The marble cjuarried in 1908 was valued at $706,858. There are extensive formations of granitic rocks in the Adirondacks, in the lower Hudson Valley, and in the adjacent highlands, but they are not extensively quarried. Rockland county quarries considerable trap rock, used mostly for road-making and concrete, and Ulster county has for more than a century produced most of the domestic mill- stones used in the United States. Extending from Madison county to the W. border of the state in Erie county is a narrow belt con- taining large deposits of gypsum, and in 1908 the value of the state’s output ($760,759) was greater than that of any other state, although Michigan produced a larger quantity. At or near Chittenango, in Madison county, natural-cement rock was first

discovered in the United States, and the first use made of it was in the construction of the Erie Canal. The rock was found in much greater quantities at Rosendale, in Ulster county, in 1823, and the amount of this cement produced by New York rose to 4,689,167 barrels in 1899; the state is still the chief producer but only 947,929 barrels were made in 1908. Limestone and clay suitable for making Portland cement are also found in Ulster county and elsewhere, and the production of this increased from 65,000 barrels in 1890 to 2,290,955 barrels in 1908. Near Talcville, in St Lawrence county, is a large deposit of fibrous talc. In 1908 the total value of the state's talc product was $697,390, almost one-half the total for the entire country.

New York and Michigan are the two principal salt-producing states in the Union. Salt was discovered by the Jesuits in Western New York about the middle of the 17th century, anc was manu- factured by the Indians in the Onondaga region. The state bought the salt reservation in 1788, and soon afterward the manufacture of salt was begun by the whites. From 1880 to 1885 the first brines were obtained in Wyoming and Genesee counties by boring deep wells into beds of rock salt, and in 1885 the mining of the extensive de- posits of rock salt in Livingston county was begun. Salt is also pro- duced in Tompkins and Schuyler counties. In 1908 the total pro- duction of the state, 9,076,743 barrels valued at $2,136,738, was exceeded in quantity, and (for the first time) in value by that of Michigan.

The Appalachian oil field extends northward from West Virginia and Pennsylvania into Cattaraugus, Allegany and Steuben counties. The first oil well in the state was drilled at Limestone in Cattaraugus county in 1865, and the state's output of oil was 1,160,128 barrels, valued at $2,071,533 in 1908. At Olean it is pumped into pipes which extend as far north as Buffalo and as far east as Long Island City. The village of Fredonia, in Chautauqua county, was illuminated by natural gas as early as 1825, and gas has since been discovered in several of the western counties. The value of the flow in 1908 was

$959,280.

There are more than forty mineral springs in New York whose waters are of commercial importance, and in 1908 the waters sold from them amounted to 8,007,092 gals., valued at $877,648; several of the springs, especially those in Saratoga county, attract a large number of summer visitors. Graphite is widely distributed in the Adirondack region, but the mining of it is confined for the most part to Essex and Warren counties; in 1908 the output was 1,932,000 lb. valued at

$116,100. Other mineral substances obtained in small quantities are: pyrite, in St Lawrence county; arsenical ore, in Putnam county; red, green and purple slate, in Washington county;

garnet in Warren, Essex and St Lawrence counties; emery and felspar, in Westchester county; and infusorial earth in Herkimer county..

Manufactures. — The establishment of a great, highway of commerce through the state from New York City to Buffalo by the construction of the Erie Canal, opened in 1825, and later by the building of rail- ways along the line of th; water route, made the state's manufactures quite independent of its own natural resources. The factory manu- facture of clothing was begun in New York City about 1835, and received a great impetus from the invention of the sewing-machine, the demands created by the Civil War, and the immigration of vast numbers of foreign labourers. It is now the leading manufacturing industry of the state. The value of the clothing was $340,715,921 in 1905. New York City ranks first among American cities in printing and publishing, the products being valued at $137,985,751 in 1905. Knitting by machinery was introduced into America in 1831 at Cohoes Falls, on the Mohawk river; the products, consisting largely of underwear, were valued at $46,108,600 in 1905. Of the other textile industries none except the manufacture of carpets and rugs and silk and silk goods has become very promin :nt, and yet the total value of all textile products in 1905 was $123,668,177. The refining of sugar was begun in New York City late in the 18th century, but the growth of the industry to its present magnitude has been com- paratively recent; the value of the sugar and molasses refined in 1905 was $116,438,838. Foundry and machine-shop products were valued at $115,876,193 in 1905, and electrical machinery, apparatus, and supplies at $35,348,276. The manufacture of paper and wood-pulp products ($37,750,605 in 1905) is an industry for which the state still furnishes much of the raw material, and other large industries of which the same is true are the manufacture of flour and grist-mill products, dairy products, canned fruits and vegetables, wines, clay products, and salt. New York state has ranked first in the Union in the value of its manufactures since 1830, and their value rose to $2,488,345,579 in 1905. More than three-fifths of that of 1905 was represented by the manufactures of New York City alone. Buffalo, the second city in manufactures, shares largely with New York City the business of slaughtering and meat packing, the refining and smelting of copper, and the manufacture of foundry and machine- shop products, and with New York City and Rochester the manu- facture of flour and grist-mill products. Rochester ranks first among the cities of the United States in the manufacture of photo- graphic materials and apparatus and optical instruments.

Niagara Falls and New York City manufacture a large part of the chemicals, and the value of the state's output rose to $29,090,484 in 19)05. Gloversville and Johnstown are noted for leather gloves and mittens. Transportation and Commerce. — From the very beginning of the occupation of New York by Europeans, commerce was much encouraged by the natural water-courses. The Western Inland Lock Navigation Company, chartered by the state in 1792, com- pleted three canals within about four years and thereby permitted the continuous passage from Schenectady to Lake Ontario of boats of about 17 tons. The Erie Canal was begun by the state in 1817 and opened to boats of about 75 tons burden in 1825. The Champlain Canal, connecting the Erie with Lake Champlain, was also begun in 1817 and completed in 1823. The Oswego Canal, connecting the Erie with Lake Ontario, was begun in 1825 and completed in 1828. Several other tributary canals were constructed during this period, and between 1836 and 1862 the Erie was sufficiently enlarged to accommodate boats of 240 tons burden.

The first railway in the state and the second in operation in the United States was the Mohawk & Hudson, opened from Albany to Schenectady in 183 1. The railway mileage in the state increased to 1361 m. in 1850, to 3928 m. in 1870, to 7684-41 m. in 1890, and to 8422-14 m. in January 1909. The first great trunk line in the country was that of the Erie railway, opened from Piermont, on the Hudson river, to Dunkirk, on Lake Erie, in 1853. The New York Central & Hudson River railway, nearly parallel with the water route from New York City to Buffalo, was formed by the union, in 1869, of the New York Central with the Hudson River railway. The West Shore railway, which follows closely the route of the New York Central & Hudson River, was also the result of a consolidation, completed in 1881, of several shorter lines. In 1886 the New York Central & Hudson River Railroad Company leased the West Shore for a term of 475 years, and this company operates another parallel line from Syracuse to Buffalo, a line following closely the entire N. border of the state (the Rome, Watertown & Ogdensburg), and several cross lines. Other important railways are the Lehigh Valley, the Delaware, Lackawanna & Western, and the Pennsylvania in the central and W. sections, the Delaware & Hudson, the Rutland, and the New York Ontario & Western in the E., and the Long Island on Long Island. In competition with the railways, traffic on the existing canals suffered a marked decline. As, however, this decline was accompanied with a considerable decrease in the proportion of the country's exports which passed through the port of New York, interest in the canals revived, and in 1903 the electorate of the state authorized the issue of bonds to the amount of $101,000,000

for the purpose of increasing the capacity of the Erie, the Champlain and the Oswego canals, to make each navigable by barges of 1000 tons burden. A project adopted by the state for the enlargement of the Erie provides for a new route up the Hudson from Troy to Waterford

and thence to the Mohawk river above Cohoes Falls. Up the Mohawk to Rome the old route is for the most part to be retained ; but from Rome to Clyde there is to be a diversion so as to utilize Oneida Lake and Oneida and Seneca rivers. Westward from Clyde the new channel, like the old but larger, will pass through Rochester and- Lockport to the Niagara river at Tonawanda. Each of the three canals is to have a minimum depth of 12 ft., a minimum bottom width in rivers and lakes of 200 ft., and in other sections a bottom width generally of 75 ft. Their locks are to be 328 ft. in length and 45 ft. in width.

The imports to the port of New York increased in value from $466,527,631 in 1897 to $891,614,678 in 1909, while the exports increased in value from $404,750,496 to $627,782,767. Other ports of entry are Buffalo and Dunkirk, on Lake Erie, Niagara Falls, on the Niagara river, Ogdensburg and Cape Vincent, on the St Lawrence river, Plattsburg, on Lake Champlain, Oswego, on Lake Ontario, Rochester, on the Genesee river, Albany and Syracuse in the interior, and Sag Harbor at the E. end of Long Island.

Population. — New York outstripped Pennsylvania in popula- tion in the first decade of the 19th century, and Virginia in the second decade, and since 1820 it has been the most populous state in the Union. In 1880 1 the population was 5,082,871; in 1890, 5>997j853; in 1900, 7,268,894; in 1905, according to the state census, 8,067,308; and in 1910, 9,113,614. The foreign-born population in 1900 was 1,900,425, including 480,026 natives of Germany, 425,553 of Ireland, 182,248 of Italy, 165,610 of Russia, 135,685 of England, 117,535 of Canada, 78,491 of Austria, 69,755 oi Poland and 64,055 of Scandinavia. More than two-thirds of the foreign-born were in New York City. The coloured population constituted only 1-5% of the total, and was composed of 99,232 negroes, 7170 Chinese, 5257 Indians and 354 Japanese.

Most of the Indians were on eight reservations: the Allegany Reservation (30,469 acres) in Cattaraugus county; the Cattaraugus Reservation (21,680 acres) in Erie, Cattaraugus and Chautauqua

counties; the St Regis Reservation (14,030 acres) in Franklin county ; the Tonawanda Reservation (7548 acres) in Erie and Genesee counties ; the Onondaga Reservation (7300 acres) in Onondaga county ; the Tuscarora Reservation (624 acres) in Niagara county ; the Oneida Reservation (400 acres) in Madison county; and the Shinnecock Reservation (400 acres) near Southampton, on Long Island.

Of 3)591)974 members of all religious denominations in 1906, 2,285,768 were Roman Catholics, 313,689 Methodist Episco- palians, 199,923 Presbyterians, 193,890 Protestant Episcopalians, 176,981 Baptists, 124,644 Lutherans, 57,351 Congregationalists, 35>34 2 Jews (heads of families only), 26,183 members of the German Evangelical Synod, 19,302 members of Eastern Orthodox churches and 10,761 Universalists. The urban population (i.e. population of places having 4000 inhabitants or more) increased from 3,805,477 in 1890 to 5,176,414 in 1900, or 36%, while the rural population (i.e. population outside of incorporated places) decreased during this decade from 1,834,119 to 1,625,859 or 5-9%.

The cities having a population of 15,000 or more in 1905 were: New York City, 4,013,781; Buffalo, 376,587; Rochester, 181,666; Syracuse, 117,503; Albany, 98,374; Troy, 76,910; Utica, 62,934; Yonkers, 61,716; Schenectady, 58,387; Binghamton, 42,036; Elmira, 34,687; Auburn, 31,422; Niagara Falls, 26,560; Newburgh, 26,498; Jamestown, 26,160; Kingston, 25,556; Watertown, 25,447; Poughkeepsie, 25,379; Mt. Vernon, 25,996; Cohoes, 24,183; Amsterdam, 23,943; Oswego, 22,572; New Rochelle, 20,479; Gloversville, 18,672; Lockport, 17,552; Rome, 16,562; and Dunkirk, 15,250.

Government. — Since becoming a state, New York has been governed under four constitutions, adopted in 1777, 1821, 1846 and 1894 respectively. The first state constitution, adopted by a convention at Kingston, made few changes in the provincial system other than those necessary to establish it on a popular basis, but the powers of the governor were curtailed, especially his powers of appointment and veto. These limitations worked unsatisfactorily, and their removal or modification and the extension of the franchise were the principal changes effected in 1821. Under the first constitution the decentralization of administration, which began early in the colonial era, continued without interruption, and under the second it was checked by a few measures only. The third constitution, besides reorganizing

‘The population at preceding census years was: (1790) 340,120;

(1800) 589,051; (1810) 959,049; (1820) 1,372,812; (1830)

1,918,608; (1840) 2,428,921; (1850) 3,097,394; (i860) 3,880,735; {1870) 4.382,759-

the judiciary, transferred to the people the choice of many officers, state and local, who had been appointed by the governor of the legislature; and placed numerous restrictions on the law-making power of the legislature. Under this constitution the theory of local self-government was more fully realized in New York than at any other time.

Since the middle of the 19th century an attempt has been made to meet the problems arising from a rapid industrial and social development by creating bureaus or commissions to exercise a central control over local officials, corporations and even private individuals, and as most of the heads of these bureaus and the commissions are appointed by the governor the importance of that officer has increased. The constitutional changes since 1846 affect principally the judiciary and cities. A constitutional convention met and proposed a new constitution in 1867, but every article was rejected by the people save one relating to the judiciary, which was adopted separately as an amendment in 1869. The constitution of 1894 made further important changes in the judiciary and in the government of cities. The first constitution made no provision for its amendment or revision. The second provided that whenever a majority of the members elected to each house of the legislature voted for an amendment and two-thirds of those elected to the next legislature approved, it should be submitted to the people for their adoption or re- jection. The third modified this provision by requiring the approval of only a majority of the members elected to each house of the second legislature, and directed that the legislature should call a convention to revise the constitution at least once in twenty years if the people requested it. The present con- stitution contains the same clause as the third for the proposal of amendments by the legislature, and makes the unique pro- vision that if the people vote for a convention when the question is submitted to them — this must be as often as once in twenty years— the delegates shall be elected and shall assemble at an – appointed time and place without the call of the legislature, this being the result of the governor's veto, in 1887, of a bill for calling a convention in response to an overwhelming vote of the people in favour of it. Under the first constitution there were property qualifications for voting which amounted in the election of the governor and senators to a freehold estate worth £100 ($500) and in the election of assemblymen to a freehold estate worth £20. ($100) or the payment of an annual rent of 40s. ($10). But under the second constitution the most that was required of any white voter was the payment to the state or county of taxes on either personal or real property, and by an amendment of 1826 this requirement was abolished. The second con- stitution, however, imposed a property qualification on coloured voters amounting to a freehold estate worth $250, and this re- striction was not removed until 1874. Since 1874 the aim has been to bestow suffrage on all male citizens who shall have attained the age of twenty-one years and shall have been in- habitants of the state for one year, but for the protection of the ballot citizenship for ninety days, 2

residence in the county for four months, and in the election district for thirty days next preceding the election are required. Conviction for bribery ot of an infamous crime disqualifies, and personal identification of voters is required in New York City. A statement of receipts and expenditures of an election campaign, showing the amount received from each contributor and the name of every person or committee to whom more than $5 was paid, must be filed by the treasurer of every political committee within twenty days after the election; each candidate also must file a statement of his contributions. By an Act of 1910 women may vote on financial questions affecting a village in which they hold property.

Executive. — When the state government was first established, the governor and lieutenant-governor were the only state officers elected by the people. The state treasurer was chosen by the legislature, and for the appointment of other state officers as well as county officers and mayors of cities the Assembly chose four senators to constitute a council of appointment, a body 1 Increased irom ten days in 1894.

in which the governor had only a casting vote. But the con- stitution of 1821 abolished the council of appointment and gave the choice of the principal state departmental officers to the legislature, and the constitution of 1846 transferred the choice of these officers from the legislature to the people, where it has since remained. Under the constitution of 1821 a great number of local officers were appointed by the governor with the advice and consent of the Senate. The choice of most of these was given to the people in 1846, but since then many new state departments have been created, the heads of which are usually appointed by the governor, subject to the approval of the Senate. Under the present system, therefore, there is a biennial election (in even-numbered years) of a governor, a lieutenant-governor, a secretary of state, a state comptroller, a state treasurer, an attorney-general and a state engineer and surveyor; and the governor appoints, subject to the approval of the Senate, a superintendent of public works, a superintendent of state prisons, a superintendent of insurance, a superintendent of banks, a commissioner of excise, a commissioner of agri- culture, a forest, fish and game commissioner, a commissioner of health, a commissioner of labour, a state architect, a state historian, a state librarian, two public service commissions, a civil service commission, a board of charities, a commission of prisons, a commission in lunacy, three tax commissioners and several other

boards and commissions. The governor has the power, also, of filling vacancies in certain state offices and on the benches of the supreme court and county courts, and he may remove or suspend certain county and municipal officers on charges.

The first state constitution gave the veto power to a council of revision composed of the governor, the chancellor and the judges of the supreme court, but since 1821 this power has been exercised by the governor alone; and in 1874 it was extended to separate items in appropriation bills. A bill or item of an appropriation bill .that has been vetoed by the governor can become a law only with the approval of two-thirds of the members elected to each house of the legislature. So long as the legislature is in session the governor is allowed ten days, besides Sundays, to consider a bill, and if he does not veto it within that time it becomes a law, but no bill becomes a law after the final adjournment of the legislature unless it is actually approved by the governor within thirty days after the adjourn- ment. The governor's power to grant reprieves, commutations or pardons is unrestricted by any board of pardons, but he is required to report to the legislature each case in which he exercises such power. A candidate for the office of governor or lieutenant-governor must be at least thirty years of age and must have resided within the state for five years next preceding his election. The governor's salary is $10,000 a year, and the lieutenant-governor's is $5000.

Legislature. — The legislative power is vested in a Senate of 50 members elected biennially and an Assembly of 150 members elected annually. Since 1846 both senators and assemblymen have been elected by single districts, and ever since the state government was established they have been apportioned accord- ing to population, but the present constitution limits the repre- sentation of New York City in the Senate by declaring that no county shall have more than one-third of all the senators nor any two adjoining counties more than one-half of them. The first and second state constitutions required that every senator should be a freeholder, but since 1846 no property qualifications have been prescribed for membership in either house; the only persons disqualified are those who at the time of the election or within one hundred days before the election were members of Congress, civil or military officers under the United States, or officers under any city government. The constitution of 1846 limited the pay of members of both houses to three dollars a day and to three hundred dollars for any one session (except in impeachment proceedings) besides an allowance for travelling expenses, but since an amendment of 1874 they have been paid $1500 a year and ten cents a mile for travelling expenses.

The legislature meets in annual sessions, beginning in January. Money bills may originate in either house, but at the final vote on such a bill in either house three-fifths of the members elected to that house must be present and the yeas and nays must be recorded; bills_ entailing appropriations for local or private purposes must receive a two-thirds majority to pass. The legislature appoints the V>ard of regents of the University of the State of New York. To aecrease the evil of lobbying a law was enacted in 1906 which requires

that every person employed to promote or oppose the passage of any bill shall file in the office of the secretary of state a written statement showing who has employed him and describing the legislation in respect of which his services are to be rendered; the law also re- quires the employers of lobbyists to file in the same office within two months after the adjournment of the legislature an itemized state- ment of all their lobbying expenses, and forbids the employment of a lobbyist for a contingent fee.

Judiciary. — At the close of the colonial era there were a court of chancery, a supreme court, circuit courts and courts of oyer and terminer which were held in the several counties by the justices of the supreme court, a court of common pleas and a court of sessions in each county, and courts held by justices of the peace in the several towns. This system, with the addition of the Senate, the chancellor and the justices of the supreme court occasionally sitting as a court for the correction of errors, was retained with only slight changes until 1846. But the new constitution of that year substituted a court of appeals for the court of errors, merged the court of chancery into the supreme court, established in each county a new county court composed of a single judge, and, taking the appointment of judges from the governor, gave the election of them to the people. Some further alterations in the constitution affecting the courts were made in 1869, 1879, 1888, 1894, 1899 and 1909, and the system as at present constituted comprises a supreme court of ninety- seven justices, an appellate division of the same, a court of appeals, a court of claims and local courts. The highest judicial court in the state is not, as in most states of the Union, the supreme court, but the court of appeals. This court consists of a chief judge and six associate judges elected from the state at large for a term of fourteen years. Its jurisdiction is limited, except where judgment is of death, to a review of questions of law. Vacancies are temporarily filled from among the justices of the supreme court by the governor. To expedite business, at the request of the court, the governor may designate not more than four justices of the supreme court to act temporarily as additional associate judges of the court of appeals. The salary of the chief judge

is $14,200, of the associate judges $13,700 a year.

The ninety-seven justices of the supreme court are elected for fourteen years from the nine districts into which the state is divided. Of these thirty are chosen in the first district (New York county) and seventeen in the second district (Long Island and Staten Island). The jurisdiction of each justice extends over the entire state. Vacancies are temporarily filled by the governor. Tne supreme court has general jurisdiction in law and equity, including all actions both civil and criminal. The salary of the justices in the first district and in Kings county of the second district is $17,500 a year; in the remainder of the second district it is $16,300 a year; in the other districts it is $10,000 a year. The state is divided into four depart- ments for each of which there is an Appellate Division consisting of seven justices in the first department (county of New York) and five in each of the others. The justices and presiding justice are desig- nated from among the justices of the supreme court by the governor; the presiding justice and a majority of the other justices of each de- partment must be residents of the department.

The court of claims consists of three judges, one presiding, ap- pointed by the governor for a term of six years. It has jurisdiction to hear and determine private claims against the state.

The local judiciary includes the usual county and city judges, county surrogates and justices of the peace. New York City (q.v.) has an extensive judiciary system of its own.

Local Government. — The state is divided into sixty-one counties, each (unless wholly included in a city) having a county board of supervisors elected for two years, one from every town or city ward. This board has certain administrative and legis- lative powers, such as the care of county property, the borrowing of money for the erection of county buildings, the fixing of the salary of the county treasurer and of other county officers, the levying of county taxes and the division of the county into assembly districts and school commissioners' districts. Other county officers are a county judge and a county surrogate elected for a term of six years, a treasurer, a clerk, a district attorney, a sheriff and from one to four coroners elected for a term of three years. Cities are of three classes: (1) those having a population of 175,000′ or more; (2) those having a population between 50,000 and 175,000; and (3) those whose population is less than 50,000; the classification is according to the latest state enumeration.

Bills for ” special ” city laws, as opposed to ” general,” must be approved (within fifteen days after their passage by both houses of the legislature) by the mayor of the city in first-class cities (in which, however, the state legislature may provide for the concurrence of the municipal legislative body), and in other cities by the mayor and council, before it is laid before the governor: if it is passed by the state legislature over the mayor’s veto it goes direct to the governor. All city elections are held in odd numbered years. The organization of cities and villages is provided by the legislature, which may restrict their powers of taxation and of contracting debts and may fix salaries. Town (or township) government in New York somewhat resembles that of New England; the chief executive officer of the town is a supervisor, who represents his town in the county ” board of supervisors.”

National Guard. — The national guard of the state is commanded under the governor by a major-general. It consists of four brigades each commanded by a brigadier-general. The establishments in 1910 consisted of thirteen regiments and fifty separate companies of infantry, two squadrons and two troops of cavalry, four light batteries, one regiment of engineers, a signal corps of two companies and a naval militia, commanded by a captain and consisting of two battalions and two separate divisions.

Laws. — A married woman has full control of her property whether acquired before or after marriage, and she may carry on any business, trade or occupation in her own right. A husband or a wife may convey real property directly to the other. A widow has a dower right in one-third of the real property to which her husband had absolute title, but a wife may convey or devise her real property free from her husband’s right of tenancy by courtesy. The only ground for divorce is adultery. As soon as a divorce has been granted the plaintiff may marry again, but the defendant is not permitted to marry within the state any one except the plaintiff until five years have elapsed, and then only in case the court permits it because of the petitioner’s uniformly good conduct in the meantime. Since the 1st of January 1908 a marriage licence has been required for every lawful marriage.

A homestead consisting of a lot of land with one or more buildings, and properly designated as such in the office of the county clerk, but not exceeding $1000 in value, is exempt from forced sale so long as it

is owned and occupied as a residence by a householder having a family or by a married woman, except to recover the purchase money, to satisfy a judgment obtained before it was designated as a homestead, or to collect taxes upon it. Personal property consisting of necessary household furniture, working tools and team of horses, professional instruments and a library, not exceeding $250 in value, besides the necessary food for the team for ninety days, provisions for the family, wearing apparel, wages or other income not exceeding $12 a week, and several other things, when owned by a householder or person providing for a family, are also exempt from seizure for debt, unless the debt be for purchase money or for services performed in the family by a domestic.

Eight hours constitute a legal day's work for all employees except those engaged in farm labour or domestic service. The employ- ment of children under fourteen years of age in any factory is for- bidden. Until sixteen years of age no child is to he so employed without an employment certificate issued by a commissioner of health, and showing that the child has completed an eight years' course of study in a public school of the state or has had an equivalent schooling elsewhere. For children under sixteen years of age who are so employed the hours of labour are limited to eight a day and the days to six a week, and such children must not begin work before eight o'clock in the morning or continue after five o'clock in the evening. For children between sixteen and eighteen years of age and for women the hours of labour in a factory are limited to ten a day, unless to prepare for a short day or a holiday, and the days to six a week. The employment of children under fourteen years of age in any mercantile establishment, business office, hotel, restaurant or apartment house is also forbidden, except that in villages and in cities of the second or third class children upwards of twelve years of age may be so employed during the summer vacation of the public schools. For both boys and gins sixteen years of age or upward the restrictions are removed for two weeks at Christmas time. 1 The Employers' Liability Act of 1902 (amended and broadened in 1910) holds an employer liable for damages in any case in which one of his employees sustains a personal injury by reason of the negligence of the employer, of a sub-contractor, of a superintendent, or any other person m the employer's service whose duty it was to see that " the ways, works or machinery connected with or used in the business," were in proper condition, or whose duty it was to " direct . . . any employee," if it is not proved that the employee failed in due care and diligence; by another law of 19 10 in certain dangerous employments the employer is liable unless the injured employee was negligent.

Although the constitution of 1894 expressly declares that ” any lottery or the sale of lottery tickets, pool-selling, book-making, or any other kind of gambling ” shall not ” hereafter be authorized or allowed within the state ” and directs the legislature to pass ap-

1 For further regulations relating to the employment of women and children see the Labour Law enacted in 1909 and the subsequent amendments.

propriate laws prohibiting the same,’ the legislature passed an act in 1895, which in practice permitted pool-selling and book-making at race-tracks, but in 1908 and 1910 bills were enacted prohibiting gambling at race-tracks. License to sell intoxicating liquors is subject to a graduated tax. The sale of liquor on Sunday or between one o’clock and five o’clock in the morning of any other day is unlaw- ful. Any town (but not any city) may at its option wholly forbid the sale of intoxicating liquors, may allow it to be sold only on condition that it be not drunk on the vendor’s premises, or may allow it to be sold only by hotel-keepers and pharmacists, or by pharmacists alone. Administrative Commissions. — The regulation and control of such public service corporations as own or operate steam, electric or street railways, gas or electric plants, and express companies were, in 1907, vested in two public service com- missions (the first for New York City and the second for all other parts of the state), each of five members appointed by the governor with the approval of the Senate; in 1910 the regula- tion of telephone and telegraph companies throughout the state was vested in the second commission.

A state civil service commission (1883) consists of three members (not more than two of the same political party) appointed by the governor with the approval of the Senate. For the classified service of the state and of the minor civil divisions, except cities, the commission makes rules (subject to the governor’s approval and to statutory and constitutional pro- visions) governing the classification of offices, the examination of candidates for office, and the appointment and promotion of employees. In cities the mayor is required to appoint a municipal civil service commission, with similar duties; not more than two- thirds of the members may be of the same political party.

Prisons, Poor Law, Charities, &c. — Penal institutions for sane adults, except reformatories for women, are under the general supervision of a state commission of prisons; hospitals for the insane are under the general supervision of a state commission in lunacy ; and all other charitable and penal institutions, maintained wholly or in part by the state, or by any county, city or town within the state, are under the

general supervision of a state board of charities. This board of charities consists of one member from each of the nine judicial districts and three additional members from the City of New York, all appointed by the governor with the consent of the Senate for a term of eight years. Its existence dates from 1867, but its authority was very limited, chiefly advisory, until 1895. Since then, however, its powers have been greatly increased. In 1910 the state charitable institutions were as follows: State Soldiers' and Sailors' Home, Bath; State School for the Blind, Batavia; the Thomas Indian School, Iroquois; State Woman's Relief Corps Home, Oxford; State Hospital for the care of Crippled and Deformed Children, West Haverstraw; Syracuse State Institution for Feeble-Minded Children, Syracuse; State Hospital for the treatment of Incipient Pulmonary Tuberculosis, Ray Brook; Craig Colony for Epileptics, Sonyea; State Custodial Asylum for Feeble-Minded Women, Newark; Rome State Custodial Asylum for Unteachable Idiots, Rome; State Agri- cultural and Industrial School, Industry; State Training School for Girls, Hudson; Western House of Refuge, Albion; New York State Reformatory for Women, Bedford ; the State Training School for Boys; and Letchworth Village, a custodial asylum for epileptics and feeble-minded. Eight private institutions for the care or the care and instruction of deaf mutes and one for the care of the blind are supported mainly by the state. Many other charitable institu- tions receive public money, mostly from counties, cities and towns.

The poor law of the state defines the town poor as those who have gained a settlement in some town or city, by residing there for one year prior to their application for public relief and who are unable to maintain themselves; the county poor as the poor who have not resided in any one town or city for one year before their application for public relief, but have .been in some one county for sixty days; and the state poor as all other poor persons within the state. Wher- ever cared for, each town, city, county and the state must pay the cost of maintaining its own poor. In some counties there is no distinction between town and county poor, but in 1910 only one county had not a county superintendent for the general supervision and care of the poor; towns and cities not subject to special pro- visions intrusted public relief to one or more overseers of the poor or to commissioners of charities. In counties lacking adequate hospital accommodation a poor person requiring medical or surgical treatment may be sent to the nearest hospital approved by the state board of charities. An Act of 1910 provides that indigent soldiers, sailors or marines of the U.S. and their families be cared for in their homes and not in almshouses.

The first state insane asylum, designed chiefly for recent and curable

cases, was opened at Utica in 1843. Since 1896 every public institution for the insane has been maintained and administered as a part of the state system. A state commissioner in lunacy was first appointed in 1874; this officer was replaced in 1889 by a commission in lunacy, which in 1894 was placed at the head of the

administration of the state's insanity law. This commission consists of three members appointed by the governor with the consent of the Senate. Its president must be a physician and alienist, and another member must be a lawyer. The commission appoints a board of experts to examine all immigrants suspected of insanity or allied mental disorders in order to prevent the admission of the insane into the country. In 1910 there were fourteen state hospitals (corresponding to fourteen state hospital districts) for the poor and indigent insane; these were at Utica, Willard, Poughkeepsie, Buffalo, Middletown (homoeopathic), Binghamton, Rochester, Ogdensburg, Gowanda (homoeopathic), Flatbush, Ward's Island, King's Park, Central Islip and Yorktown. There were also in 1910 two hospitals for the criminal insane, at Matteawan and Dannemora. Each of these is under the immediate control of a superintendent appointed by the superintendent of state prisons.

The state commission of prisons consists of seven members appointed by the governor with the consent of the Senate for a term of four years, and the institutions under its supervision in 1910 were the Sing Sing State Prison, 1 at Ossining, the Auburn State Prison at Auburn, the Clinton State Prison at Dannemora, the New York State Reformatory at Elmira, the Eastern New York Reformatory at Napanoch, five county penitentiaries, and all other institutions for the detention of sane adults charged with or convicted of crime, or retained as witnesses or debtors. The state prisons are under a superintendent of state prisons, appointed by the governor, with the consent of the Senate, for five years ; and the state reformatories are managed by a board of seven managers similarly appointed for seven years. In the state reformatory at Elmira (which, like that at Napanoch, is for men between sixteen and thirty years of age who have been convicted of a state prison offence for the first time only) , the plan of committing adult felons on an indeterminate sentence to be determined by their behaviour was first tested in America in 1877, and it has proved so satisfactory that it has been in part adopted for the state prisons. In order to minimize competition between prison

labour and free labour, articles manufactured in the state prisons, the reformatories and the penitentiaries, are sold only to the institutions and departments of the state and its political divisions. Education. — The first school was established by the Dutch at New Amsterdam (now New York City) as early as 1633, and at the close of the Dutch period there was a free elementary school in nearly every settlement. But from the English conquest to the close of the colonial era the chief purpose of the' government with respect to education was to prepare leaders for the state church ; to this end King's College was founded in 1754, and from 1704 to 1776 the other schools were principally those maintained by the Society for the Propagation of the Gospel in Foreign Parts. Hardly any schools remained in operation throughout the War of Independence. In January 1784 Governor George Clinton recommended legislation for the " revival and encouragement of seminaries of learning," with the result that the legislature passed an act establishing a state university of which Columbia College, formerly King's, was the " mother ' portion. In 1787 a second university act was passed which restored to Columbia College the substance of its original charter and made the University of the State of New York an exclusively executive body with authority to incorporate new colleges and academies and to exercise over them the right of visitation. In 1795 an act was passed which formed the basis of the present elementary-school system. This act appropriated £20,000 annually for five years for the establish- ment and maintenance of elementary schools, required each city and town to raise by taxation a sum for the same purpose equal to one- half of its share from the proceeds of the state fund, and provided for the election of school commissioners in each town and of trustees of each school. The state appropriation was discontinued in 1800; but in 1805 the proceeds of the sale of 500,000 acres of land were set apart for a permanent school fund, and in 1812, when the interest on this fund had become nearly $50,000 a year, the amount required before any of it could be distributed for school purposes, the common- school system was permanently established by an act which restored the main features of that of 1795, except that a superintendent of schools chosen by the council of appointment was now placed at its head. Although the interest on the state" fund had risen to $70,000 in 1819, this together with an equal sum raised by the cities and towns was insufficient, and to meet the deficiency the patrons in each district were required by a " rate bill " to contribute in proportion to the attendance of their children. The schools were made free only after a memorable contest against the " rate bill." The framers of the constitution of 1846 were nearly equally divided on this question. In 1849 the legislature passed a free-school bill subject to the approval of the people. The people approved by a vote of nearly

three to one, but the court of appeals declared the act unconstitutional because of the referendum. In 1 851 a compromise measure was substituted, increasing the state appropriation to $800,000 and exempting indigent parents from the rate bill," which was finally abolished in 1867. The administration of the common school system was in the hands of a state superintendent of schools from 1813 to 1821, of the secretary of state from 1821 to 1854, and of a

1 In 1906 a law was enacted for the establishment of a new state prison in the eastern part of the state to take the place of Sing Sing Prison.

superintendent of public instruction from 1854 to 1904. In the meantime the functions of the university had been extended to include an oversight of the professional, scientific and technical schools, the administration of laws relating to admission to the professions, the charge of the State Library at Albany, the super- vision of local libraries, the custody of the State Museum and the direction of all scientific work prosecuted by the state. This dual system was consolidated by the Educational Unification Act of 1904, in conformity with which the university regents have become a legislative body, subordinate to the state legislature, for determining the general educational policy of the state, and a commissioner of education acts as the chief executive, advisory and supervisory, officer of the whole educational system.

The regents of the University are chosen by the legislature, one retiring each year; and an act of 1909 requires that their number shall at all times be three more than the number of judicial districts. The first commissioner of education was chosen by the legislature for a term of six years, but it was arranged that his successor should be chosen by the regents and continue in office during their pleasure. The commissioner (subject to approval of the regents) appoints three assistant commissioners, for higher, secondary and elementary education respectively. The elementary school is administered by a school commissioner in each of the school commissioner's districts into which a county may be divided, by one trustee or three trustees in each separate school district, and by a board of education in each city, village or union free school district having more than three hundred children. Any two or more adjoining school districts may unite to form a union free school district, and in any village or union free school district having a population of 5000 or more the board of education may appoint a superintendent of schools.

The compulsory education law as amended in 1907 and 1909 requires

the full attendance at a public school, or at a school which is an approximate equivalent, of all children who are between seven and fourteen years of age, are in the proper physical and mental condition, and reside in a city or school district having a population of 5000 or more and employing a superintendent of schools ; in such a city or district children between fourteen and sixteen 'years must attend school unless they obtain an employment certificate and are regularly engaged in some useful employment or service; and outside of such a city or district all children between the ages of eight and fourteen years and those between fourteen and sixteen years who are not regularly employed must attend school on all school days from October to June. In a city of the first or second class every boy between fourteen and sixteen years of age who has an employment certificate, but has not completed the course of study prescribed for the elementary public schools or the equivalent, must attend an evening school not less than six hours each week for a period of not less than sixteen weeks each year, or a trade school not less than eight hours a week for sixteen weeks a year. By a law of 1908 the board of education of any city is authorized to establish industrial schools for children who have completed the elementary school course or have attained the age of fourteen years, and trade schools for children who are more than sixteen years old and have completed the elementary school course or a course offered by any of the industrial schools. For the training of teachers for the ele- mentary schools the state maintains ten normal schools at Oswego (1863), Cortland (1866), Fredonia (1866), Potsdam (1866), Geneseo (1867), Brockport (1867), Buffalo (1867), New Paltz (i88s),Oneonta (1887) and Plattsburg (1890) ; it also appropriates $700 annually for each teachers' training class in about one hundred of the secondary schools. The State Normal College at Albany, founded in 1844 as the first state normal school, is designed principally for the training of teachers for the secondary schools, about 800 high schools and academies, supported wholly or in part by the state.

The state controls professional and technical schools through the regents' examinations of candidates for admission to such schools and to the professions, determines the minimum requirements for admission to college by the regents' academic examinations, main- tains the large State Library and the valuable State Museum, and occasionally makes a gift to a college or a university for the support of courses in practical industries; but it maintains no college or university that is composed of a teaching body. To Cornell Uni- versity (q.v.), a non-sectarian institution opened at Ithaca in 1868, the state turned over the proceeds from the National land-grant act of 1862 on

condition that it should admit free one student annually from each Assembly district, and in 1909 a still closer relation between this institution and the state was established by an act which makes the governor, lieutenant-governor, speaker of the Assembly and commissioner of education ex—officio members of its board of trustees, and authorizes the governor with the approval of the Senate to appoint five other members, one each year.

Among the institutions of higher learning in the state, besides Columbia University (q.v.) and Cornell University (q.v.), are: Union University (1795, non-sectarian), at Schenectady; Hamilton College (1812, non-sectarian), at Clinton; Colgate University (1819, non-sectarian), at Hamilton ; Hobart College (1822, non-sectarian), at Geneva; Rensselaer Polytechnic Institute (1824, non-sectarian), at Troy; New York University (1832, non-sectarian), in New York City; Alfred University (1836, non-sectarian), at Alfred; Fordham University (1841, Roman Catholic), in New York City; College of

St Francis Xavier (1847, Roman Catholic), in New York City; College of the City of New York (1849, city) ; University of Rochester (1850, Baptist), at Rochester; Polytechnic Institute of Brooklyn (1854, non-sectarian), at Brooklyn; Niagara University (1856, Roman Catholic), at Niagara Falls; St Lawrence University (1858, non-sectarian), at Canton; St Bonaventure's College (1859, Roman Catholic), at St Bonaventure; St Stephen's College (i860, Pro- testant Episcopal), at Annandale; Manhattan College (1863, Roman Catholic), at New York City; St John's College (1870, Roman Catholic), at Brooklyn; Canisius College (1870, Roman Catholic), at Buffalo; Syracuse University (1871, Methodist Episcopal), at Syracuse; Adelphi College (1896, non-sectarian), at Brooklyn; and Clarkson School of Technology (1896, non-sectarian), at Potsdam. The United States Military Academy (1802) is at West Point.

Finance. — In New York the direct property tax is levied by and for the benefit of localities. Revenues for state purposes are derived from special taxes collected from the liquor traffic, corporations, transfers of decedents' estates, transfers of shares of stock, recording tax on mortgages, sales of products of state institutions, fees of public officers including fines and penalties, interest on deposits of state funds, refunds from department examinations and revenue from investments of trust funds, the most important of which are the common school

fund and the United States deposit fund. A board of three tax commissioners has supervision of methods of assessment within the state, and with the commissioners of the land office constitutes the state board of equalization. The county super- visors, with or without the aid of three commissioners whom they are authorized to appoint for the purpose, constitute a county board of equalization. The recording tax on mortgages, amounting to one- half of 1 % of the principal sums secured, is collected by the record- ing officers under the supervision of the state board of tax com- missioners. The administration of the liquor tax law is under the supervision of the state commissioner of excise and his deputies. The tax on corporations, originating as a capital stock tax in 1880 and extended through succeeding years, is administered by the state comptroller. The comptroller also has charge of the enforcement of the stock transfer tax act and of the laws imposing taxes upon the transfer of decedents' estates. The aggregate of taxes received by the state treasury through the comptroller's department for the fiscal year ending September 30, 1909, was $23,000,000.

On the 30th of September 1909 the state debt, most of which was created since 1895 for the purpose of canal improvements, amounted to $41,230,660. The surplus in the treasury was $8,435,848, the total amount in trust and sinking funds was $31,301,501. The constitution prohibits the legislature from lending the state's credit or incurring an indebtedness for current expenses in excess of $1,000,000 or incurring any indebtedness whatever, other than for war purposes, unless such indebtedness be authorized by lav/ for " some single work or object," the law to be approved by the people at a general election and providing for a direct annual tax sufficient to pay the interest and to liquidate the debt within eighteen years. That instrument further prohibits each county, city, town and village from lending its credit and from creating an indebtedness in excess of 10% of the assessed valuation of its real estate.

The first state institution to receive a bank charter was the bank of New York, incorporated in 1791. In 1804 free banking was re- stricted to such an extent as to give practically a monopoly of the business to associations receiving special charters, and as these charters were generally awarded as favours to politicians the system was a formidable agency of corruption. Chiefly because of these evils the constitution of 1821 required the assent of two-thirds of the members elected to each house of the legislature to pass an act creating a corporation. In 1829 the Safety-Fund Act was passed, which required each bank thereafter chartered or rechartered to pay into the state treasury 3 % of its capital stock other than that owned by the state,

and from this fund the debts of insolvent banks were to be paid. The fund became exhausted by many failures, and a free banking law was enacted in 1838. The constitution of 1846 pro- hibited the legislature from granting any special charters for bank- ing purposes, and consequently no more safety-fund banks were established. At the same time the free-banking system has been greatly improved. The state banks still have the right to issue currency, but the heavy tax on currency issue imposed by Congress in 1866 (after the introduction of the National banking system in 1863) put a stop to the practice. In 1851 a state banking depart- ment was created, and at the head of this is a superintendent of banks appointed by the governor, with the consent of the Senate, for a term of three years. The superintendent — or examiners appointed by him (from a civil service list) — is required to examine every bank and every trust company at least twice each year, each building and loan association at least once a year, and every savings bank at least once in two years. The law provides specifically as to the in- vestment of deposits made in savings banks with the evident purpose of providing the greatest possible security to depositors. State banks must carry from 15% to 25% reserve and trust companies from 10% to 15% reserve, depending upon location.

The introduction of the National banking system caused a decrease in the number of state banks from 309 in 1863 to 45 in 1868, but their number has increased steadily since 1880 and in 1909 there were 202. In the same year there were 140 savings-banks, 85 trust companies,
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safe deposit companies, 255 building and loan associations and other miscellaneous corporations, with total resources of $3,833,500,000 under the supervision of the banking department of the state. This is over 21 % of the entire banking power of the United States. To correct abuses in the life insurance business which were dis- covered in 1905 by a committee of the state legislature, laws were passed in the next year regulating the election of the directors of the insurance companies, and the investments of the companies and the distribution of dividends, limiting the amount of business of the larger companies and prohibiting rebates on insurance premiums. A state superintendent of insurance, (since i860) appointed by the governor, holds office for three years.

History. — The aboriginal inhabitants of New York had an important influence on its colonial history. Within its limits from the upper Hudson westward to the Genesee river was the home of that powerful confederacy of Indian tribes, the Mohawks, Oneidas, Onondagas, Cayugas and Senecas, known to the French as the Iroquois and to the

English as the Five (later Six) Nations. When supplied with firearms by Europeans they reduced a number of other tribes to subjection and extended their dominion over most of the territory from the St Lawrence to the Tennessee and from the Atlantic to the Mississippi. They were at the height of their power about 1700. Of much less influence in New York were several Algonquian tribes in the lower valley of the Hudson and along the sea coast.

New York Bay and the Hudson river were discovered by Giovanni da Verrazaho in 1524, and were probably seen by Estevan Gomez in 1525; for many years following French vessels occasionally ascended the Hudson to trade with the Indians. The history of New York really begins, however, in 1609. In July of that year Samuel de Champlain discovered the lake which bears his name and on its shores led his Algonquian Indian allies against the Iroquois, thus provoking against his countrymen the hostility of a people who for years were to hold the balance of power between the English and the French in America. On the 3rd of September Henry Hudson, in the employ of the Dutch East India Company, entered New York Bay in the ” Half Moon “.in search of the ” northwest passage.” He conceived that a vast trade with the Iroquois for furs might be established; his report aroused great interest in Holland; and the United Netherlands, whose independence had been acknowledged in the spring, claimed the newly discovered country. In 1610 a vessel was despatched with merchandise suitable for traffic with the Indians, the voyage resulted in profit, and a lucrative trade in peltry sprang up. Early in 1614 Adriaen Block explored Long Island Sound and discovered Block Island. The merchants of Amsterdam and Hoorn soon formed themselves into the New Netherland Company, and on the nth of October 1614 received from the States-General a three years’ monopoly of the Dutch fur trade in New Netherland, i.e. that part of America between New France and Virginia, or between latitudes 40° and 45 N. Late in the same year 01 early in 1615 a stockaded trading post called Fort Nassau was erected on Castle Island, now within the limits of Albany, and a few huts were erected about this time or earlier on the southern extremity of Manhattan Island; but no effort at colonization was as yet made. In 16 17 the Dutch negotiated with the Iroquois a treaty of peace and alliance. Fort Nassau was soon removed to the mouth of Tawasentha Creek. On the expiration of the charter of the New Netherland Company (16 18) the States- General refused to grant a renewal, and only private ventures were authorized until 162 1, when the West India Company (q.v.) was chartered for a term of twenty-four years; to this company was given a monopoly of Dutch trade with the whole American coast from Newfoundland to the

Straits of Magellan. It was authorized to plant colonies and to govern them under a very limited supervision of the States-General, such as the approval of its appointment of a governor and of its instructions to him; and its own government was vested in five chambers of directors and an executive board or college of nineteen delegates from those chambers, eight of the nineteen representing the Chamber of Amsterdam. New Netherland became one of the more important interests of the Company. In June 1623, however, New Netherland was formally erected into a province and the management of its affairs assigned to the Chamber of

Amsterdam, which in March 1624 despatched the ” New Netherland,” with the first permanent colonists (thirty families mostly Walloon), under Cornelis Jacobsen Mey, the first governor or director of the colony. Arriving at Manhattan early in May, a few of the men remained there, another small party established ft temporary post (Fort Nassau) on the Delaware river, and still another began a fortified settlement on the site of the present Hartford, Connecticut. But more than one-half of the families proceeded up the Hudson to Fort Orange, the successor of Fort Nassau, at the mouth of Tawasentha Creek, and there founded what is now Albany. Three more vessels arrived in 1625, and when in that year Mcy was succeeded as director by William Verhulst the colony had a population of 200 or more. The government of the province was fully established in 1626 and was vested mainly in a director-general and council. The director-general was formally appointed by the Company subject to the approval of the States-General, but the Amsterdam Chamber and the College of Nineteen supervised his admini- stration. The members of the council were formally appointed by the Company, but the director-general actually determined who they should be, and as he was not bound by their advice they were no check to an autocratic rule. Peter Minuit, the first director general, arrived with more colonists in May 1626, and soon afterwards Manhattan Island was bought from the Indians, Fort Amsterdam was erected at its lower end, and the settlement here was made the seat of government.

In 1629, chiefly to encourage agriculture, the Company issued its famous Charter of Privileges and Exemptions, which provided that any member might have anywhere in New Netherland except on Manhattan Island his choice of a tract of unoccupied land extending 16 m. along the seacoast or one side of a navigable river, or 8 m.

along the river on both sides ” and so far into the country as the situation of the occupyers will permit ” by purchasing the same from the Indians and planting upon it a colony of fifty persons, upwards of 1 5 years old, within four years from the beginning of the. undertaking, one-fourth part within one year; and that any private person might with the approval of the director-general and council take up as much land as he should be able to improve. The founder of a colony was styled a patroon, and, although the colonists were bound to him only by a voluntary contract for specified terms, the relations between them and the patroon during the continuance of the contract were in several important respects similar to those under the feudal system between the lord of a manor and his serfs. The patroon received his estate in perpetual inheritance and had the exclusive right of hunting and fishing upon it. Each colonist not only paid him a fixed rent, usually in kind, but had to share with him the increase of the stock and to have the grain ground at his mill. The patroon was the legal heir of all his colonists who died intestate. He had civil and criminal jurisdiction within the boundaries of his estate; he could create offices, found cities, and appoint officers and magistrates, and, although the charter permitted an appeal from his court to the director- general and council in any case in which the amount in dispute exceeded fifty guilders ($20), some of the patroons exacted from their colonists a promise not to avail themselves of the privilege. The Company promised to permit the patroons to engage in the fur trade, wherever it had no commissary of its own, subject to a tax of one guilder (40 cents) on each skin, and to engage in other trade along the coast from Newfoundland to Florida subject to a tax of s % on goods shipped to Europe. The colonists of the patroons were exempted from all taxes for a period of ten years, but were forbidden to manufacture any cloth whatever. The charter did not give the encouragement to agriculture that was expected of it because the status created for colonists of a patroon was no attraction to a successful farmer in the Netherlands. Immediately after the issue of the charter a few of the more adroit directors of the Amsterdam Chamber hastened to acquire for themselves, as patroons, the tracts of land most favourably situated for trade. On both sides of the entrance to Delaware Bay Samuel Godyn, Samuel Blomaert and five other directors who were admitted to partner-

ship in the second year (1630) established the manor and colony of Swaanendael; on a tract opposite the lower end of Manhattan Island and including Staten Island, Michael Pauw established the manor and colony of Pavonia; on both sides of the Hudson and extending in all directions from Fort Orange (Albany) Kilian van Rensselaer

established the manor and colony of Rensselaerwyck. The colony of Swaanendael was destroyed by the Indians in 1632. Pauw maintained his colony of Pavonia for about seven years and then sold out to the Company. The colony of Rensselaerwyck was the only one that prospered under the patroon system. In the meantime the patroons had claimed unrestricted rights of trade within the boundaries of their estates. These were stoutly denied by the Company. Director- General Minuit was recalled in 1632 on the ground that he had been partial to the patroons; and Wouter van Twiller, who arrived in 1633, endeavoured to promote only the selfish commercial policy of the Company; at the close of his administration (1637) the affairs of the province were in a ruinous condition.

William Kieft was appointed director-general late in 1637, and in 1638 the Company abandoned its monopoly of trade in New Netherland and gave notice that all inhabitants of the United Provinces, and of friendly countries, might trade there subject to an import duty of 10%, an export duty of 15%, and to the requirement that the goods should be carried in the Company's ships. At the same time the director-general was instructed to issue to any immigrant applying for land a patent for as large a farm as he required for cultivation and pasturage;, to be free of all charges for ten years and thereafter subject only to a quit-rent of one-tenth of the produce. Two years later, by a revision of the Charter of Privileges and Exemptions, the prohibition oh manufactures was abolished, the privileges of the original charter with respect to patroons were extended to " all good inhabitants of the Netherlands," and the estate of a patroon was limited to 4 m. along the coast or a navigable river and 8 m. back into the country. The revised charter also provided that any one who brought over five colonists and established them in a new settlement should receive 200 acres, and if such a settlement grew to be a town or village it should receive a grant of municipal government. These inducements encouraged immigration not only from the Fatherland but from New England and Virginia. But the freedom of trade promoted dangerous relations with the Indians, and an attempt of Kieft to collect a tribute from the Algonquian tribes in the vicinity of Manhattan Island and other indiscretions of this officer pro- voked Indian hostilities (1641-1645), during which most of the outlying settlements were laid waste.

Out of this warfare arose an organized movement for a govern- ment in which the colonists should have a voice. In August 1 64 1 Kieft called an assembly of the heads of families in the neighbourhood of Fort Amsterdam to consider the question of peace or war. The assembly chose a board of Twelve Men to represent it, and a few

months later this board demanded certain reforms, especially that the membership of the director-general's council should be increased from one to five by the popular election of four members. Kieft promised the concessions to gain the board's consent to waging war, but later denied its authority to exact promises from him and dissolved it. At another crisis, in 1643, he was obliged to call a second assembly of the people. This time a board of Eight Men was chosen to confer with him. It denied his right to levy certain war taxes, and when it had in vain protested to him against his arbitrary measures it sent a petition, in 1644, to the States-General for his recall, and this was granted. Peter Stuyvesant (g.v.), his successor, arrived at Fort Amsterdam in May 1647. Under his rule there was a return of prosperity; from 1653 to 1664 the population of the province increased from 2000 to 10,000. Stuyvesant was, however, extremely arbitrary. Although he permitted the exist- ence of a board of Nine Men to act as " tribunes " for the people it was originally composed of his selections from eighteen persons chosen at a popular election, and annually thereafter the places of six retiring members were filled by his selections from twelve persons nominated by the board. He treated it with increasing

contempt, and the most that it could do was to remonstrate to the States-General. That body suggested a representative government, but this the Company refused to grant.

Stuyvesant conducted a successful expedition against the Swedes on the southern border of New Netherland in 1655; but he was powerless against the English. The Dutch had long claimed the whole coast from Delaware Bay to Cape Cod, but by the treaty of Hartford (1650), negotiated between himself and the commissioners of the United Colonies of New England, Stuyvesant agreed to a boundary which on the mainland roughly determined the existing boundary between New York and Connecticut and on Long Island extended southward from the west side of Oyster Bay to the Atlantic Ocean. Not- withstanding the good claim to their province which the Dutch had established by discovery and occupancy, the government of Great Britain, basing its claim to the same territory on Cabot's discovery (1498), the patent to the London and Plymouth companies (1606), and the patent to the Council for New England (1620), contended that the Dutch were intruders. In 1653, during the war between England and Holland, the Dutch, fearing an English attack, built a wall, from which the present Wall Street was named, across Manhattan Island at what was then the

northern limits of New Amsterdam. In the following year Cromwell actually sent out an expedition which, with the aid of New England, was to attempt the conquest, but before an attack was made peace was announced. The Connecticut Charter of 1662 included in that colony some settlements acknowledged by the treaty of Hartford to belong to New Netherland, and strife was renewed. Finally, in March 1664, Charles II. formally erected into a province the whole territory from the west side of the Connecticut river to the east side of Delaware Bay together with all of Long Island and a few other dependencies of minor importance, and granted it to his brother James, the duke of York and Albany, as its lord proprietor. The duke appointed Colonel Richard Nicolls governor and placed him in command of an expedition to effect its conquest. Nicolls won over the burgomaster of New Amster- dam and other prominent citizens by the favourable terms which he offered, and Stuyvesant was forced, without fighting, into a formal surrender on the 8th of September. The duke's authority was proclaimed and New Netherland became New York. The separation from it of what is now New Jersey (q.v.) was begun by the duke's conveyance, in the preceding June, of that portion of his province to Berkeley and Carteret, and among numerous changes from Dutch to English names was that from Fort Orange to Fort Albany. A treaty of alliance with the Mohawks and Senecas procured for the English the same friendly relations with the Iroquois that the Dutch had enjoyed. The transition from Dutch to English institutions was effected gradually and the private rights of the Dutch were carefully preserved. The English executive, consisting of a governor and council, was much like the Dutch, but Nicolls, by his con- ciliatory spirit, made his administration more agreeable than Stuyvesant's. In the administration of local affairs some of the Dutch settlements were little disturbed until ten years or more after the conquest, but the introduction of English institutions into settlements wholly or largely English was begun in 1665 by the erection of Long Island, Staten Island and Westchester into an English county under the name of Yorkshire, and by putting into operation in that county a code of laws known as the " Duke's Laws." This code was based largely on the laws of New England, and, although a source of popular discontent, it gave to the freeholders of each town a voice in the government of their town by permitting them to elect a board of eight over- seers which chose a constable and sat as a court for the trial of small causes. Nicolls resigned the governorship in 1668, but his successor, Francis Lovelace, continued his policy — autocratic government, arbitrary in form but mild in practice, and pro- gressive in the matter of religious toleration. In August 1673, Holland and England being at war, a Dutch fleet surprised New York, captured the

city, and restored Dutch authority and the names of New Netherland and New Amsterdam. But

by the treaty of Westminster, February 1674, the Dutch title to the province was finally extinguished, and in November the English again took possession. A new charter was issued to the duke to perfect his title and Edmund (later Sir Edmund) Andros, the new governor, was instructed to establish English institutions and enforce English law in all sections. In 1675 Andros estab- lished at Albany a commission for Indian affairs which long rendered important service in preserving the English-Iroquois alliance. The imperious manner of Andros made him many enemies. Some of them preferred charges against him relating to his administration of the revenue. He was called to England in 1 68 1 to answer these, and during his absence the demand for a representative assembly was accompanied with a refusal to pay the customs duties and so much other insubordination that the duke appointed Colonel Thomas Dongan to succeed Andros, and instructed him to call the desired assembly. It met at Fort James in the City of New York on the 17th of October 1683, was in session for about three weeks, and passed fifteen acts. The first, styled a charter of liberties and privileges, required that an assembly elected by the freeholders and freemen should be called at least once every three years; vested all legislative authority in the governor, council and assembly; forbade the imposition of any taxes without the consent of the assembly; and provided for religious liberty and trial by jury. Other acts divided the province into counties, established courts of justice, and provided for a revenue. In August 1684 when, by its charter, the western boundary of the province was not definitely extended beyond the Hudson, Dongan laid the basis of New York's claim to the western lands of the Iroquois by a new covenant with them in which they recognized the English as their protectors, and throughout his administration he was busy neutralizing French influence among the Iroquois and in diverting the fur trade of the north-west from the St Lawrence to Albany. 'The charter of liberties and privileges was approved by the duke, but before the news of this reached its authors the duke became King James II., and in 1686, when a frame of government for New York as a royal province was provided, the assembly was dispensed with. About the same time the new king adopted a policy for strengthening the imperial control over New England as well as for the erection of a stronger barrier against the French, and in 1688 New York and New Jersey were consoli- dated with the New England colonies into the Dominion of New England and placed under the viceregal authority of Sir Edmund Andros as governor-general. The news of the English revolution of 1688, however, caused an uprising

in Boston, and in April 1689 Andros was seized and imprisoned. Francis Nicholson as lieutenant-governor was still in quiet possession of the govern- ment of New York, and a majority of the population of the province were satisfied to await the outcome of the revolution in the mother country, but in the southern portion of the province, especially in the City of New York and on Long Island, were a number of restless spirits who were encouraged by the fall of Andros to take matters into their own hands. They found a leader in a German merchant, Jacob Leisler (.q.v.). Leisler refused to pay duties on a cargo of wine on the ground that the collector was a " papist," and on the 31st of May 1689, during a mutiny of the militia, he and other militia captains seized Fort James. In the following month Nicholson deserted his post and sailed for England, and Leisler easily gained possession of the city. To strengthen his position he called an assembly which conferred upon him the powers of a dictator. Some time after a copy of the order of the new monarchs (William and Mary) to continue all Protestants in their offices in the colonies had been received, Leisler falsely announced that he had received a commission as lieutenant-governor. He then attempted to revive the act of 1683 for raising revenue, but met with so much opposition that he issued writs for the election of another assembly. This, however, brought him chiefly petitions for the redress of grievances. Albany successfully defied his usurped authority until his recognition was necessary to a united front against the French and their Indian allies, who, in February 1690, had surprised and burned Schenectady. Two other French

attacks had at the same time been directed against New England, and to meet the dangerous situation Leisler performed the one statesmanlike act of his public career, notable in American history as the first step toward the union of the colonies. At his cali, delegates from Massachusetts, Plymouth, Connecticut and Maryland met in New York City with delegates from New York on the ist of May 1690 to consider concerted action against the enemy, and although the expedition which they sent out was a failure it numbered 855 men, New York furnishing about one-half the men, Massachusetts one of the two commanders and Connecticut the other. Leisler had proclaimed the new monarchs of Great Britain and had declared that it was his purpose only to protect the province and the Protestant religion until the arrival of a governor appointed by them; but he was enraged when he learned that. he had been ignored and that under the new governor, Colonel Henry Sloughter, his enemies, van Cortlandt and

Bayard, had again been appointed to the council. When Major Richard Ingoldsby arrived with two companies of the king's soldiers and demanded possession of the fort, Leisler refused although he still professed his willingness to deliver it to Sloughter. On the 17th of March 1691 Leisler's force fired on the king's soldiers, killing two and wounding several. Governor Sloughter arrived two days later, and the revolt terminated in the arrest of Leisler and his chief followers. Leisler and Jacob Milborne, his son-in-law, were pronounced guilty of treason, and were executed on the 16th of May. The execution was regarded even by many who had been indifferent to Leisler's cause, as an act of revenge. The case was carried to England, where in 1605 parliament reversed the attainders of the victims, and for many years the province was rent by the Leislerian and anti-Leislerian factions.

Governor Sloughter, as his commission directed, re-established in 1691 the assembly which James II. had abolished in 1686, and • throughout the remainder of the colonial era the history of the province relates chiefly to the rise of popular government and the defence of the northern frontier. At its first session the assembly passed an act declaratory of the rights and privileges of the people, and much like the charter of liberties and privileges enacted in 1683, except that annual instead of triennial sessions of the assembly were now requested and, as was also provided in Sloughter's commission and instructions, religious liberty was denied to Roman Catholics. This act was disallowed by the crown in 1697, and until Governor Cornbury's administration (1 702-1 708) both the Leislerians and the anti-Leislerians repeatedly bid for the governor's favour by supporting his measures instead of contending for popular rights. But Corn- bury's embezzlement of £1500, appropriated for fortifying the Narrows connecting Upper and Lower New York Bay, united the factions against him and started the assembly in the im- portant contest which ended in the establishment of its control over the public purse. In 1706 it won the right to appoint its own treasurer to care for money appropriated for extraordinary purposes, and eight years later the governor assented to an act which gave to this officer the custody of practically all public money. Until 1737 it had been the custom to continue the revenue acts from three to five years, but thereafter the assembly insisted on annual appropriations.

The first newspaper of New York, the New York Gazette, was established in 1725 by William Bradford as a semi- official organ of the administration. In 1733 a popular organ, the N.ew York Weekly Journal, was established under John Peter Zenger (1697-1746), and in 1735 both the freedom of the press and a great advance toward the independence of the judiciary were the outcome of a famous libel suit

against Zenger.

Between the administration of Governor Montgomerie (1728- 173 1) and Governor Cosby (1732-1736) there was an interregnum of thirteen months during which Rip van Dam, president of the council, was acting-governor, and upon Cosby's arrival a dispute arose between him and van Dam over the division of the salary and fees. Both appealed to the law, and when the chief-justice, Lewis Morris, refused Cosby's request to have the court proceed in equity jurisdiction, and denied the right of the governor to

establish courts of equity, he was removed from office. Not long afterwards there appeared in the Weekly Journal some severe criticisms of the administration. For printing these Zenger was arrested for libel in November 1734. The case was not brought to trial until August 1735, and in the meantime Zenger was kept in jail. Originally he had for counsel two of the most able lawyers in the province, James Alexander (1690- 1756) and William Smith (1697-1769), but when they excepted to the commissions of the chief-justice, James de Lancey (1 703-1 760) and one of his associates, because by these com- missions the justices had been appointed " during pleasure " instead of " during good behaviour," the chief justice disbarred them. Their places, however, were taken by Andrew Hamilton, speaker of the Assembly of Pennsylvania and a lawyer of great reputation in the English colonies. The jury quickly agreed on a verdict of not guilt}', and the acquittal was greeted by the populace with shouts of triumph. The further independence of judges became a leading issue in 1761 when the assembly insisted that they should be appointed during good behaviour, and refused to pay the salaries of those appointed during pleasure; but the home government met this refusal by ordering that they be paid out of the quit-rents.

The defence of the northern frontier was a heavy burden to New York, but by its problems the growth of the union of the colonies was promoted. From the destruction of Schenectady to the Peace of Ryswick (1697) hostilities between the French and the English in the New World took the form of occasional raids across the frontier, chiefly by the Indian allies. The main effort of the French, however, was, by diplomacy, to destroy the English- Iroquois alliance. This rested on the fear of the Iroquois for the French and their hope of protection from the English. Therefore, in response to their repeated complaints of the weak- ness of the English arising from disunion, Governor Fletcher, in 1694, called another intercolonial conference consisting of delegates from New York, Massachusetts, Connecticut and New Jersey, and urged the necessity of more united feelings.

Open hostilities were interrupted for a few years by the Peace of Ryswick and for a longer period by the Peace of Utrecht (1713), but French priests continued to dwell among the Iroquois, teaching them and distributing presents, and of the success of this diplomacy the English were ever in danger. To counteract it they, in 1701, prevailed upon the chiefs to deed their territory, said to be 800 m. in length and 400 m. in breadth, to the king of England. The English, also, frequently distributed presents. But the success of the French at the close of the 17th century and the early portion of the 18th was prevented only by the ceaseless efforts of Peter Schuyler (1657-1724) whose personal influence was for years dominant among all the Iroquois except the Senecas. When they had assumed a neutral attitude, he persuaded a number of them to join troops from New York, New Jersey and Connecticut in the unsuccessful expeditions of 1 709 and 1 7 1 1 against the French at Montreal. The English had a decided advantage over the French in that they could furnish goods for the Indian trade much cheaper than their rivals, and when Governor Burnet saw that this advantage was being lost by a trade between Albany and Montreal he persuaded the assembly to pass an act (1720) prohibiting it. Pursuing the same wise policy he established a trading post at Oswego in 1722 and fortified it in ˆ27, and thereby placed the Iroquois in the desir- able position of middlemen in a profitable fur trade with the ” Far Indians.” London merchants, in their greed, brought about the repeal of the prohibitory act in 1729, but its effects were only in part destroyed. At another intercolonial conference at Albany, called by Burnet, a line of trading posts along the northern and western frontiers was strongly recommended. But neither the other colonies nor the home government would co-operate, and the French were the first to accomplish it. In King George’s War the co-operation of all the northern colonies was sought, and New York contributed £3000 and some cannon toward New England’s successful expedition against Louisburg. But it was left alone to protect its own frontier against the French, I and while the assembly was wrangling with Governor Clinton

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for the control of expenditures the French and their Indians were burning farm houses, attacking Saratoga (November 16, 1745), and greatly endangering the English-Iroquois alliance. Even after the Peace of Aix-la-Chapelle (1748) the Iroquois complained bitterly of the fraudulent land speculators, and in 1753 the chiefs of the Mohawks threatened to declare the covenant chain broken. A reconciliation was

effected, however, by Colonel William Johnson (17 15-17 74), who had long been superintendent of Indian affairs. Largely to secure the co-operation of the Iroquois the home government itself now called to meet at Albany (q.v.) the most important assembly of colonial deputies that had yet gathered. This body, consisting of twenty-five members and representing seven colonies, met in June 1754, and, besides negotiating successfully with the Iroquois, it adopted, with some modifications, a plan of colonial union prepared by Benjamin Franklin; the plan was not approved, however, either by the home government or by any of the colonies. In the first year of the war (1755) expeditions set out against Fort Duquesne (on the site of Pittsburg) and Fort Niagara and Crown Point, on the New York frontier. None of these was taken but on the 8th of September Major-General William Johnson, in command of the expedition against Crown Point, defeated a French and Indian force under Baron Dieskau in the battle of Lake George. As Johnson thought it unsafe to pursue the routed army his victory had no other effect than the erection here of the useless defences of Fort William Henry, but as it was the only success in a year of gloom parliament rewarded him with a grant of £5000 and the title of a baronet. In August 1756 Montcalm took Oswego from the English and destroyed it, and in 1757 he captured Fort William Henry; but in the latter year the elder Pitt assumed control of affairs in England, and his aggressive, clear-sighted policy turned the tide of war in England's favour. Victory followed victory, Ticonderoga, Crown Point and Niagara were wrested from the French and New York was freed of its foes.

England's attempt to make the colonies pay the expenses of the war by means of the stamp tax thoroughly aroused the opposition of commercial New York, already chafing under the hardships imposed by the Navigation Acts and burdened with a war debt of its own exceeding £300,000. The assembly was almost unanimous in voicing its protest to the governor. It authorized its committee, which had been appointed to corre- spond with the New York agent in London, to correspond also with the committees in the other colonies and this committee represented New York in the Stamp Act Congress, a body which was called at the suggestion of Massachusetts, met in New York City in October 1765, was composed of twenty-seven members representing nine colonies, and drew up a declaration of rights, an address to the king, and a petition to each house of parliament. When the Sons of Liberty, a society composed largely of unfranchised mechanics and artisans of New York City, which began to dominate the movement immediately after the Congress adjourned, resorted to mob violence — destroy- ing property and burning in effigy the

governor and other officers — the propertied classes drew back, and a few years later the popular or patriot party lost its control of the assembly. Since the Zenger trial there had been a court party and a popular party: the former included many wealthy Anglicans and was under the leadership of the De Lanceys, the latter included many wealthy and influential dissenters and was under the leadership of the Livingstons. During the administration of Governor Clinton (1743-1753) a quarrel between the governor and James De Lancey, the chief-justice, had greatly weakened the court party, and nearly all its members supported their rivals in opposition to the Stamp Act. In the series of events which followed the first violence of the Sons of Liberty important changes were made in party lines. Personal rivalry and creed became subordinate to political principles. The court party became the Loyalist party, standing for law as against rebellion, monarchy and the union of the empire as against republicanism; the popular party became the patriot party, determined to stand on its rights at any cost. The Stamp Act was repealed in March

1766, but the Townshend Acts, imposing duties on glass, paper, lead, painters' colours and tea, followed closely. They were met in New York: by fresh outbursts of the Sons of Liberty and, as in the other colonies, by an association of nearly all the merchants, the members pledging themselves not to import any- thing from England until the duties were repealed. New York had also been requested to provide certain supplies for the British troops quartered in the city. This the assembly refused to do but parliament answered (1767) by forbidding it to do any other business until it complied. It was under these conditions that the Loyalists, in the elections of 1768 and 1769, gained control of the assembly and in the latter year passed an act granting the soldiers' supplies. When, in 1770, all the duties except those on tea were repealed, the conservative merchants wished to permit the importation cf all goods from England except tea. The Sons of Liberty strongly opposed this, but the con- servatives won and went over to the Loyalists. The moderate Loyalists joined in the election of delegates to the first Con- tinental Congress; but the great body of Loyalists in New York strongly disapproved of the " dangerous and extravagant " measures adopted by that body, and the assembly, in January 1775, refused to approve its acts or choose delegates to the second Continental Congress. The patriots met this refusal by calling a provincial convention to choose the delegates. Scarcely had they done this when news of the encounter at Lexington produced a strong reaction in their favour, and in May 1775 they called a Provincial Congress which usurped the powers of the Assembly. Still, conditions were such hi New York that a fight for independence was not to be

lightly considered. The failure of Montgomery's expedition against Canada at the close of 1775 left the colony exposed to British attacks from the north. In the south the chief city was exposed to the British fleet. Sir William Johnson died in 1774, but under his influence and that of his son, Sir John Johnson, and his nephew Guy Johnson, the Mohawks and other Iroquois Indians had become firmly attached to the British side and threatened the western frontier. In various sections, too, considerable numbers of Loyalists were determined to aid the British. When, in June 1776, a vote on the Declaration of Independence was pending in the Continental Congress, the New York Provincial Congress refused to instruct its delegates in the matter; but a newly elected Provincial Congress, influenced by a Loyalist plot against the life of Wash- ington, adopted the Declaration when it met, on the 9th of July. The position of New York made it naturally one of the principal theatres of military operations during the War of Independence. It Was a settled point of British military policy throughout the war to hold New York City, and from it, as a base, to establish a line of fortified posts along the Hudson by means of which communication might be maintained with another base on Lake Champlain. Such a scheme, if successfully carried out, would have driven a wedge into the fine of colonial defence and cut off communication between New England and the southern colonies. A few days after the fight at Lexington and Concord, Connecticut authorized an expedition under Ethan Allen which surprised and captured Ticonderoga and Crown Point. In the following year (1776) the British began their offensive opera- tions for the control of the Hudson; an army under Sir William Howe was to capture New York City and get control of the lower Hudson, while another army under Sir Guy Carletpn was to retake Crown Point and Ticonderoga and get control of the upper Hudson. Howe, with a force of British and Loyalists vastly superior in equipment and numbers to Washington's untrained militia, landeˆl in July on Staten Island and late in August defeated Washington at the battle of Long Island within the present limits of Brooklyn borough. In the following month Washington withdrew from New York City which the British entered and held until the close of the war. Washington prepared to withstand the British behind fortifications on Harlem Heights, but discovering that Howe was attempting to outflank him by landing troops in the rear he retreated to the mainland, leaving only a garrison at Fort Washington, and established a line of fortified camps on the hills overlooking

the Bronx river as far as White Plains. This brought on the battle of White Plains late in October, in which Howe gained no advantage; and from here both armies withdrew into New Jersey, the British capturing Fort Washington on the way, the Americans leaving behind garrisons to guard the Highlands of the Hudson. In 1777 General John Burgoyne succeeded in taking Ticonderoga, but in the swampy forests southward from Lake Champlain he fought his way against heavy odds, and in the middle of October his campaign culminated disastrously in his surrender at Saratoga. Colonel Barry St Leger led an auxiliary expedition from Oswego against Fort Stanwix on the upper Mohawk, and on the 6th of August he fought at Oriskany one of the most bloody battles of the war, but a few days later, deserted by his terror-stricken Indian allies, he hastened back to Montreal. The British government intended that Howe should co-operate with Burgoyne by fighting his way up the Hudson, but as the secretary of state for the colonies neglected to send him such instructions this was not undertaken until early in October, and then an expedition for the purpose was placed under the command of Sir Henry Clinton. Clinton met with little difficulty from the principal American defences of the Highlands, consisting of Forts Montgomery and Clinton on the western bank, together with a huge chain and boom stretched across the river to a precipitous mountain (Anthony's Nose) on the opposite bank, and ascended as far as Esopus (now Kingston) which he burned, but he was too late to aid Burgoyne. The year 1778 saw the bloody operations of the Tory Butlers and their Loyalist and Indian allies in the Mohawk and Schoharie valleys and notably the massacre at Cherry Valley. In retaliation a punitive expedition under Generals John Sullivan and James Clinton in 1779 destroyed the Iroquois towns, and dealt the Indian confederacy a blow from which it never recovered. The American cause was strengthened this year' also by several victories along the lower Hudson of which General Anthony Wayne's storming of the British fort at Stony Point was the most important. The closing episode of the war as far as New York was concerned was the discovery of Benedict Arnold's attempt in 1780 to betray West Point and other colonial posts on the Hudson to the British. On the 25th of November 1783 the British forces finally evacuated New York City, but the British posts on Lakes Erie and Ontario were not evacuated until some years later.

New York ratified the Articles of Confederation in 1778, and when Maryland refused to ratify unless those states asserting claims to territory west to the Mississippi agreed to surrender them, New York was the first to do so. But under the leadership of George Clinton, governor in 1777-1795, the state jealously guarded its commercial

interests. The Confederation Congress appealed to it in vain for the right to collect duties at its port; and there was determined opposition to the new Federal con- stitution. In support of the constitution, however, there arose the Federalist party under the able leadership of Alexander Hamilton. When a majority of the constitutional convention of 1787 had approved of the new constitution Hamilton alone of the three New York delegates remained to sign it; and when, after its ratification by eight states, the New York convention met at Poughkeepsie (June 17, 1788) to consider ratification, two-thirds of the members were opposed to it. But others were won over by the news that it had been ratified by New Hampshire and Virginia or by the telling arguments of Hamilton, and on the 26th of July the motion to ratify was carried by a vote of 30 to 27.

The constitution having been ratified, personal rivalry among the great families — the Clintons, the Livingstons and the Schuylers — again became dominant in political affairs. The Clintons were most popular among the independent freeholders; the Livingstons had increased their influence by numerous marriage alliances with landed families; and the Schuylers had General Philip Schuyler and Alexander Hamilton, his son-in-law. Originally, the Livingstons, with whom John Jay was connected by marriage, were united with the Schuylers, and yet both together were unable to defeat the Clintons in an

election for governor. Later, the Livingstons, piqued at Wash- ington's neglect to give them the offices they thought their due, joined the Clintons, but the Federal patronage was used against the anti-Federalists or Republicans with such effect that in 1792 John Jay received more votes for governor than George Clinton, although the latter was counted in on a technicality. Jay was elected in 1795 and re-elected in 1798, but in 1801 the brief Federalist regime in the state came to an end with the election of George Clinton for a seventh term. The Republican leaders straightway quarrelled among themselves, thus starting the long series of factional strifes which have characterized the party politics of New York state; the bitterness of the factions and the irresponsible council of appointment are also responsible for the firm establishment early in the Republican regime of the " spoils system." The leaders of the several Republican groups were Chancellor Robert R. Livingston, Aaron Burr, then vice-president, Governor George Clinton and his nephew, De Witt Clinton, who in 1802 was elected United States senator. The first break came in the spring of 1804 when Burr, who had incurred the enmity of his Republican colleagues in 1800 by seeking Federalist votes in the electoral college at Jefferson's expense, became an independent candidate for governor against Morgan Lewis. Hamilton's action in

counselling Federalists not to vote for Burr for governor just as he had counselled them not to support Burr against Jefferson in 1800, was one of the cOntributary causes of Burr's hostility to Hamilton which ended in the duel (July 1804) in which Burr killed Hamilton. Hamilton's death marked the end of the Federalists as a power in New York. The election as governor in 1804 of Lewis, a relative of the Livingstons, was followed by a bitter quarrel with the Clintons over patronage, and resulted at the state election of 1807 in the choice of a Clintonian, Daniel D. Tompkins, for governor and the virtual elimination of the Livingstons from New York state politics. Tompkins served as governor by successive re-elections until 181 7, his term covering the trying period of the second war with Great Britain. New York, whose growing shipping interests had suffered by the Embargo of 1807, was as a commercial state opposed to the war. Politically this opposition had the effect of temporarily reviving the Federalist party, which secured control of the legislature, and gave the electoral vote of the state in 181 2 to De Witt Clinton, whom the Federalists had accepted as a candidate to oppose Madison for re-election on the war issue. During the war New Yorkers served with the regular troops at Niagara, Plattsburg and other places on the western and northern frontiers of the state. For some years after the war political contests in New York state as in the rest of the country were not on party lines. The opposing groups were known as " Bucktails," whose leaders were Governor Tompkins and Martin Van Buren, and " Clin- tonians " or supporters of De Witt Clinton. In 181 7 an act was passed which ten years later ended for ever slavery in New York state; in the same year De Witt Clinton was elected governor and, largely through his efforts, the Erie Canal was begun.

The election of Martin Van Buren as governor in 1828 marked the beginning of the long ascendancy in the state of the " Albany Regency," a political coterie in which Van Buren, W. L. Marcy, Benjamin Franklin Butler (1 795-1858) and Silas Wright were among the leaders; Thurlow Weed, their bitterest opponent and the man who gave them their name, declared of them that he " had never known a body of men who possessed so much power and used it so well." Thurlow Weed owed his early political advancement to the introduction into state politics of the anti-Masonic issue (see Anti-Masonic Party), which also brought into prominence his co-worker W. H. Seward. In 1826 in Genesee county the disappearance of a printer named William Morgan was attributed to Free-Masons and aroused a strong antipathy to that order; and the anti-Masonic movement, through the fostering care of Weed, Francis Granger (1792-1868) and others, spread to other states and led eventually to the establishment

of a political organization that by uniting various anti-Jacksonian elements, polled in the New York state election of 1832 more than 156,000 votes for Francis Granger, their

candidate for governor against Marcy, who was chosen by about 10,000 plurality. As the anti- Masonic wave subsided its leaders and most of its adherents found a place in the newly organized Whig party, which was powerful enough in New York to elect William H. Seward governor in 1838, and to re-elect him and to carry the state for W. H. Harrison against Van Buren in 1840. It was during the first administration of Governor Seward that the anti-rent agitation in the Hudson river counties began. The greater part of the land in this section was comprised in vast estates such as Rensselaerwyck, Livingston, Scarsdale, Phillipse, Pelham and Van Cortlandt manors, and on these the leasehold system with perpetual leases, leases for 99 years or leases for one to three lives had become general. Besides rent, many of the tenants were required to render certain services to the proprietor, and in case a tenant sold his interest in a farm to another he was required to pay the proprietor one-tenth to one-third of the amount received as an alienation fine. Stephen van Rensselaer, the proprietor of Rensselaerwyck, had suffered the rents, especially those of his poorer tenants, to fall much in arrears, and when after his death (1839) the agents of his heirs attempted to collect them they encountered violent opposition. Governor Seward called out the militia to preserve order but asked the legislature to consider the tenants' grievances. The legislature appointed an arbitration commission, but this was unsuccessful, and the trouble, spreading to other counties, culminated (1845) in the murder of the deputy-sheriff of Delaware county. Politically, the anti-rent associations which were formed often held the balance of power between the Whigs and the Democrats, and in this position they secured the election of Governor John Young (Whig) as well as of several members of the legislature favourable to their cause, and promoted the passage of the bill calling the constitutional convention of 1846. In the new constitution clauses were inserted abolishing feudal tenures and limiting future leases of agricultural land to a period of twelve years. The courts pronounced the alienation fines illegal. The legislature passed several measures for the destruction of the leasehold system, and under the pressure of public opinion the great landlords rapidly sold their farms. 1 Up to the election of Seward as governor, New York had usually been Democratic, largely through the predominating influence of Van

Buren and the ” Albany Regency.” After the defeat of Governor Silas Wright in 1846, however, the Democratic party split into two hostile factions known as the ” Hunkers,” or conservatives, and the ” Barnburners,” or radicals. The factions had their origin In canal politics, the conservatives advocating the use of canal revenues to complete the canals, the radicals insisting that they should be used to pay the state debt. Later when the con- servatives accepted the annexation of Texas and the radicals supported the Wilmot Proviso the split became irrevocable. The split broke up the rule of the ” regency, ‘ ‘ Marcy accepting the ” Hunker ” support and a seat in Polk’s cabinet, while Wright, Butler and Van Buren joined the ” Barnburners,” a step pre- liminary to Van Buren’s acceptance of the ” Free Soil ” nomina- tion for president in the campaign of 1848. Only once between 1846 and the Civil War did the Democratic party regain control of the state — in 1853-1855 Horatio Seymour was governor for a single term. In 1854 the newly organized Republican party, formed largely from the remnants of the Whig party and including most of the Free Soil Democrats, with the aid of the temperance issue elected Myron Holley Clark (1806-1892) governor. Two years later the Republicans carried the state for Fr6mont for president, and a succession of Republican governors held office until 1862 when the discouragement in the North with respect to the Civil War brought a reaction which elected Seymour governor. With the exception of New York City the state was loyal to the Union cause during the war and furnished over a half million troops to the Federal armies. Certain commercial interests of New York City favoured the Confederate cause, but Mayor Wood’s sug- gestion that the city (with Long Island and Staten Island) secede and form a free-city received scant support, and after the san-

1 James Fenimore Cooper’s novels Satanstoe (1845), ^* Chain- bearer (1845) and The Redskins (1846) preach the anti-rent doctrine. xrx. 20

guinary draft riots of July 1863 (see New York City) no further difficulty was experienced. After the Civil War the state began to reassume the pivotal position in national politics which has always made its elections second only in interest and importance to those of the nation, and the high political tension emphasized the evils of the ” spoils system.” In 1868 Tammany Hall (?.».), then under the rule of William M. Tweed, forced the Democratic state convention to nominate its henchman, John T. Hoffman, for governor, and by the issue of false naturalization papers and fraudulent voting in New York City on a gigantic scale Hoffman was chosen governor and the electoral vote was cast for Seymour. Tammany and Hoffman were again victorious in 1870; but in 1871 the New York Times disclosed

the magni- tude of Tammany's thefts, amounting in the erection of the Mew York county court house alone to almost $8,000,000, and Tweed and his " Ring " were crushed in consequence. The Republicans carried the state in 1872, but in 1874 Samuel J. Tilden, a Democrat and the leading prosecutor of Tweed, was elected governor. The Republican legislature had in 1867 appointed a committee to investigate the management of the canal system, but the abuses were allowed to continue until in 1875 Governor Tilden disclosed many frauds of the " Canal Ring," and punished the guilty. In 1876, Tilden having been nominated for the presidency, New York cast its electoral vote forhim. In 1880 it was cast for Garfield, the Republican nominee. Two years later the Republicans, having split over a struggle for patronage into the two factions known as "Halfbreeds," or administration party, and "Stalwarts" of whom the leader was Roscoe Conkling, were defeated, Grover Cleveland being chosen governor. In 1884 Cleveland as the Democratic pre- sidential nominee received the electoral vote of his state. Cleve- land likewise carried the state in 1892, but in 1888 Benjamin Harrison, the Republican candidate, the factional quarrels being settled, carried the state. Hostility to free silver and " Bryanism " in the large financial and industrial centres put the state strongly in the Republican column in the elections of 1896, 1900, 1904 and 1908. It was carried by the Democrats in the gubernatorial campaign of 1910.

Governors of New York Colonial.

Cornelis Jacobsen Mey 1624-1625

William Verhulst 1625-1626

Peter Minuit 1626-1632

Bastiaen Janssen Crol 1632-1633

Wouter Van Twiller 1633-1637

William Kieft " . 1637-1647

Peter Stuyvesant 1647-1664

Richard Nicolls 1664-1668

Francis Lovelace 1668-1673

Anthony Colve 1673-1674

Edmund Andros 1674-1683

Thomas Dongan 1683-1688

Francis Nicholson, Lieutenant-Governor. . 1688- 1689

Jacob Leisler (de facto) ˆ89-1691

Henry Sloughter 1691

Richard Ingoldsby (Acting) 1691-1692

Benjamin Fletcher 1 692-1 698

Richard Coote, earl of Bellomont . . . 1 698-1 701

John Nanfan (Acting) 1701-1702

Edward Hyde, Lord Cornbury .... 1 702 -1708

John, Lord Lovelace 1708-1709

Richard Ingoldsby (Acting) 1709-1710

Gerardus Beekman (Acting) 1710

Robert Hunter . . 1710-1719

Peter Schuyler (Acting) 1719-1720

William Burnet 1720-1728

John Montgomerie 1728-1731

Rip van Dam (Acting) 1 731-1732

William Cosby 1 732-1 736

George Clarke (Acting) 1736-1743

George Clinton 1743-1753

Sir Danvers Osborne 1753

James de Lancey (Acting) I753 _I 755

Sir Charles Hardy I755-J757

James de Lancey (Acting) 1757-1760

Cadwallader Golden (Acting) 1 760-1 761

Robert Monckton 1 76 1

Cadwallader Colden (Acting) 1761-1762

Robert Monckton 1 762-1 763

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NEW YORK (CITY)

Cadwallader Colden (Acting) Sir Henry Moore . Cadwallader Colden (Acting) John Murray, earl of Dunmore William Tryon

Provincial Congress

Transition.

State.

George Clinton

John Jay .

George Clinton

Morgan Lewis

Daniel D. Tompkins

John Taylor (Acting)

De Witt Clinton .

Joseph Christopher Yates

De Witt Clinton .

Nathaniel Pitcher (Acting)

Martin Van Buren

Enos Thompson Throop (Acting)

Enos Thompson Throop

William Learned Marcy

William Henry Seward

William C. Bouck

Silas Wright

John Young

Hamilton Fish

Washington Hunt

Horatio Seymour

Myron Holley Clark

John Alsop King

Edwin Dennison Morgan

Horatio Seymour

Reuben Eaton Fenton

John Thompson Hoffman

John Adams Dix

Samuel Jones Tilden

Lucius Robinson

Alonzo Barton Cornell

Grover Cleveland

• David Bennett Hill (Acting)

David Bennett Hill Roswell Pettibone Flower

Levi Parsons Morton .

Frank Swett Black

Theodore Roosevelt Benjamin Barker Odell Frank Wayland Higgins Charles Evans Hughes Horace White John A. Dix . Bibliography. —

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NEW YORK (CITY), the largest city of New York state, U.S.A., situated at the junction of the Hudson river, here called the North river, with the narrow East river (actually a strait connecting Long Island Sound with the Upper Bay), and between Long Island Sound and the Atlantic Ocean. It is composed of five boroughs: the Borough of the Bronx on the south-easternmost part of the mainland of New York state; the Borough of Man- hattan on Manhattan Island (including also other small islands 1) immediately S. and S.W. of the Bronx, and bounded on the W. by the North river, on the E. by the East river, and on the S. by New York Bay; the Borough of Richmond (Staten Island, q.v.), the southernmost and westernmost part of the city; and on the western end of Long Island, the Borough of Brooklyn (q.v.), and, N. of it, the Borough of Queens. The city hall, in the southern part of Manhattan Island, is in lat. 40 42′ 43″ N. and long. 74° o’ 3″ W. The greatest width of the city E. and W. is 16 m., and the greatest length N. and S. is 32 m.; its area is about 326-97 sq. m. (285-72 sq. m. more than in 1890), of which Manhattan Borough constitutes nearly 21-93 sq. m -> the Borough of the Bronx about 41-7 sq. m., the Borough of Queens about 129-5 S Q- m -> the Borough of Brooklyn 77-6 sq. m., and the Borough of Richmond 55-2 sq. m. 2 The total waterfront of the city is 341-22 m., and much of it, especially on the lower part of Manhattan,

is made ground.

New York harbour is one of the most beautiful, largest and best of the world's great ports. Over the bar (Sandy Hook), about 20 m. S. of the S. end of Manhattan Island, is the " Main Ship Bayside-Gedney channel," 1000 ft. wide and 30 ft. deep.

By 1909 the Federal government had completed 7J m. of the Ambrose channel farther to the E. and 40 ft. deep, and 950-1600 ft. wide (2200 ft. is the projected width). 8 A third 1 The more important of these small islands are: Blackwell's (about 120 acres) in the East river, Ward's N. of Blackwell's, and Randall's N. of Ward's, separated from it by Little Hell Gate, and in the mouth of the Harlem river; in the Upper Bay, Governor's Island (originally 65 acres; enlarged by the addition of 101 acres to the southwest), a U.S. military reservation, about 1000 yds. S. of the Battery, the southernmost point of Manhattan Island; Bedloe's Island (sometimes called Liberty Island from the Bartholdi statue on it of " Liberty Enlightening the World "), with an area of I3j acres, lying 2 m. S.W. of the Battery; and Ellis Island, l| m. W.S.W. of the Battery, occupied by the Federal government as a landing-place for immigrants. In the Lower Bay, and a part of the Borough of Richmond, are the artificial islands, Swinburne (1866- 1870; 8 m.'S. of the Battery) and Hoffman (1868-1873; 7 m. S. of the Battery), constructed for quarantine stations.

2 Manhattan and Bronx boroughs compose New York county; the counties of Queens and Richmond are coterminous respectively with the boroughs of those names; Brooklyn Borough is coextensive with Kings county.

3 The narrowness of the channel makes the tidal scour more effective, and it was little filled in even when sewage and garbage was dumped in the Bay itself. The river carries little silt and leaves most of it well above the harbour. The natural excellence of the harbour may be inferred from the following figures: in 1895-1903 the federal

channel, the South and Swash, is used by coasting vessels drawing about 20 ft. The harbour is divided into three parts:' the Lower Bay, the Upper Bay and the North and East rivers. The Lower Bay (about 88 sq. m.) of which Raritan Bay on the S.W., Sandy Hook Bay on the S.E., and Gravesend Bay on the N.E. form parts, and to which the channels mentioned afford entrance from the ocean, has Staten Island to the W. and N., Brooklyn to the N. and E., and the New Jersey shore to the S. and W. The Upper Bay has an area of 14 sq. m., is the immediate embouchure of the North and the East river, is connected with the Lower Bay by the Narrows (minimum width 1 m.) and with Newark Bay to the W. by Kill Van Rull, immediately N. of Staten Island, and, except for these four narrow water-ways, is enclosed by land. The North river (maximum depth, 60 ft.) is here about 1 m. wide and the East river (maximum depth more than 100 ft.; in Hell Gate channel about 200 ft.) is about f m. wide and, from the Battery to Throg's Neck and Willett's Point, where Long Island Sound proper begins, about 20 m. long. The north-east entrance to the harbour, from Long Island Sound by the East river, used principally by New England coasting vessels (especially coal barges), was made navigable for vessels of 25-27 ft. draft by the Federal government, which in 1870-1876 and in 1885 widened and deepened the formerly dangerous narrows • and removed the reefs of Hell Gate, between Manhattan Island (E. 88th Street), BlackwelFs Island, Astoria (on the Long Island shore), and Ward's Island. The third great entry and commercial feeder to the harbour is the North river, by which the great inland water-borne traffic of the Hudson river and the Erie Canal is brought to the port of New York. On the North river are the piers of the transatlantic steamship companies, part of them on the New Jersey side at Hoboken (q.v.). The coastwise trade with New England, especially through Long Island Sound, is largely from the East river, to which a part of the Hudson river traffic makes its way by the Harlem river. The Harlem is a place of anchorage for small craft.

The narrow approaches to the harbour from the ocean and from Long Island Sound make its fortification easy. On Sandy Hook, less than 8 m. from the nearest points of Rockaway Beach and Coney Island on the other side of the entrance, is Fort Hancock, established as a military reservation (1366 acres) in 1892; it received its present name in 1895, and has an artillery garrison. Between the lower and upper bays, on the Narrows, are Fort Wadsworth (1827; named in honour of

General James S. Wadsworth (1807-1864), killed in the battle of the Wilderness), on the Staten Island side, a reservation of 230 acres, including Fort Tompkins, on higher ground than Fort Wadsworth proper, and, across the Narrows, on the Long Island shore, Fort Hamilton (1831), with a reservation of 167 acres. Older fortifications are Fort Lafayette (1807; called Fort Diamond until 1823), between Forts Hamilton and Wadsworth on an artificial island, now used to store ordnance and supplies, and Fort Columbus (1806), South Battery (1812) and Castle Williams (built in 181 1 by Jonathan Williams (1750-1815), who planned all the earlier forti- fications of New York harbour; it is now a military prison), all on Governor's Island, where are important barracks and the New York arsenal of the Ordnance Department. The north-eastern approach to the harbour, at the entrance to Long Island Sound, is protected by fortifications, Fort Totten, at Willett's Point (1862), and directly across from this battery by Fort Schuyler (1826; post established 1856) with a reservation of 52 acres on Throg's Neck.

Geology. — Manhattan Island 1 (13! m. long; maximum width — at 14th Street — 2\ m.; average width about 2 m.) is a "group of gneissoid islands separated . . . by low levels slightly elevated above tide and filled with drift and alluvium " (L. D. Gale in W. W. Mather's Geology of New York, 1843), with a steep west wall from Manhattan-ville (125th Street W. of 8th Avenue) S. beyond 81st Street, and a much steeper east wall. Upon its first occupation by the Dutch the island was rough and rocky with brooks, ponds, marshes and several

expenses for important harbour improvements, principally dredging, were $1,035,300 for New York, $2,710,000 (exclusive of $1,185,000 for the Delaware Breakwater) for Philadelphia, $1,501,169 for Boston, $1,404,845 for New Orleans, and $470,000 for Baltimore,

1 See Wm. H. Hobbs, Configuration of the Rock Floor of Greater New York (Washington, 1905), Bulletin 270 of the U.S. Geological Survey, with an excellent summary of the earlier literature. The study of the underlying rock of Manhattan Island and its vicinity has been stimulatedby the great engineering and building enter- prises in the city limits.

swamps.' Superficially the island may be divided into: an area of drift, S. of 21st Street on the East river, of 13th street on Broadway and of 31st Street on the North river; a second, narrow area of drift running from Hell Gate N.W.to Manhattanville in a line parallel to the Harlem; a limestone (Inwood limestone) area on the Harlem from its mouth to the sharp turn in its course ; a second and smaller limestone area on

the Spuyten Duyvil in the north-westernmost part of the island ; and the remainder areas of gneiss, the larger part being in two great ” islands,” one between the line of E. 21st Street, 13th Street and W. 31st Street, already mentioned, and a line from Hell Gate to Manhattanville, and_ the other nearly joining the first at Manhattanville and covering all the narrow N.W. part of Manhattan Island except the second limestone area on the Spuyten Duyvil. These two gneiss areas have a southerly tilt ; they are named re- spectively Washington and Morningside Heights. In all these areas, except the limestone, the underlying rock is what is styled Man- hattan schist (see U.S. Geologic Atlas, N.Y. City, folio No. 83). The waterfront of M anhattan does not correspond in direction with lime- stone belts, but is probably due to lines of fracture (see W. H. Hobbs, in Bulletin, Geological Society of America, xvi. 151-182).

The Borough of the Bronx is made of high N.E. and S.W. ridges, sloping E. to the lower shores of Long Island Sound; and the Boroughs of Brooklyn and Queens form part of the great terminal moraine. Low serpentine hills (300-380 ft.), with a N.E. and S.W. trend, occupy the central part of the northern end of Staten Island; W. of this is Jura-Trias formation, crossed in its centre by a narrow strip of igneous dike rock; the E. and S. part of the island is Cretaceous. Yellow gravel is one of the many evidences of glacial drift ; but the S.E. part of the island was not encroached upon by the moraine.

Climate. — A combination of marine and continental influences produces a humid climate subject to sudden changes of temperature. The temperature, however, rises above 90 F. only six days in a year on the average; it rarely falls below zero; and in a period of thirty- eight years, from 1871 to 1908, extremes ranged between ioo”, in September 1881, and -6°, in February 1899. The mean winter temperature (December, January and February) is 32 °; the mean summer temperature (June, July and August) is 72 ; and the mean annual temperature is 52 °. The average monthly rainfall ranges from 3-2 in. in May to 4-5 in. in July and in August, and the mean annual precipitation is 44-8 in. The average annual fall of snow amounts to 37 in., of which n -5 in. falls in February, 8-7 in. in January and 8-2 in. in March. The average number of hours of sunshine ranges from 150 in November to 271 in June. The prevailing winds are N.W., except in June when they are S.W.

Streets. — In the downtown portion of Manhattan Island, a strip about 2 m. long, some streets follow the irregular water-fronts and others cross these; and on the west side this irregularity extends farther N., in the former Greenwich village (W. and N.W. of Washington Square),

where West 4th Street, running N.W., crosses West 12th Street, running S.W. north of Houston Street, then North Street, the northernmost limit of the occupied city, in 1807 a commission laid out the island into streets, which were numbered from S. to N. and were called East and West, as they were E. or W. of Broadway, below 8th Street, and of Fifth Avenue, above 8th, and into avenues, which were numbered 3 from E. to W., Twelfth Avenue being on the North river waterfront. East of First Avenue in a bulge of the Island S. of 23rd Street four additional avenues were named A, B, C, and. D, Avenue A being one block E. of First Avenue. Afterwards Madison Avenue was laid out midway between Fourth and Fifth Avenues, N. from 23rd Street, and Lexington Avenue, midway between Third and Fourth Avenues, N. from 21st Street. The most important of the avenues is Broadway, an unfortunately narrow street in the busy downtown part of its course. From Bowling Green, immediately N. of the Battery, it goes in a straight line (E. of N.) for about 25 m. to 10th Street; then bears off to the W. It is called the Boulevard from 78th Street to 162nd Street in its course between Amsterdam Avenue and West End (or Eleventh) Avenue (to 104th Street), and then as a continuation of West End Avenue; and thence to the Yonkers city line is called Kingsbridge Road. The monotonous regularity of the rectangular street plan of Manhattan above 14th Street is partly redeemed by this westward trend of Broadway, the only

2 See a paper, ” Old Wells and Water-Courses on the Island of Manhattan, by George Everett Hill and George E. Waring, Jr., in Historic New York: the First Series of the Half Moon Papers (New York, 1899).

3 In the Borough of the Bronx the system of numbered avenues no longer holds, but the cross streets are numbered consecutively, W. 262 nd Street being immediately S. of the Yonkers line and E. 242nd and 243rd immediately S. of the Mt. Vernon boundary.

old street in this part of the city. The Bowery, extending N. from Chatham Square to East 4th St. (practically con- tinued by Fourth Avenue), is not now a street of commercial importance, being largely taken up with Yiddish tenements. Broadway, in its southernmost part, is a financial and business street; the financial interests centre particularly about Wall Street, 1 which is about one-third of a mile above the Battery, runs E. from Broadway, and was named from a

redoubt built here by the Dutch in 1653 on news of a threatened attack by the English. The wholesale dry goods district is on Broadway and the side streets between Reade and Prince Streets and the wholesale grocery district immediately W. of this. In Maiden Lane is the wholesale jewelry trade. The leather and hide trade is centred immediately S. of the approaches to the Brooklyn Bridge. A little farther up-town on the East Side is the tenement district, one of the most crowded in the world. The principal shopping districts are on Broadway from 17th Street to 34th Street; on Sixth Avenue from 14th Street to 34th Street; and to an increasing degree on Fifth Avenue from 23rd Street to 42nd Street, and on the cross-streets in this area, especially 23rd, 34th and 42nd Streets. Next to Broadway the best known of the avenues is Fifth Avenue, which extends from Washington Square to the Harlem river (143rd Street) in a straight line. On Fifth Avenue there are a few residences in its lower part and between 34th and 45th Streets; but N. of 50th and on the E. side of Central Park are many fine residences. The cross streets within one block to the W. and two blocks to the E. of Fifth Avenue, Central Park West, and in general the upper West Side and in particular Riverside Drive, high above the North river, are the newer residential parts of the city.

Parks. — The park system in 1908 included property valued at $501,604,188. The principal parks are: Central Park in Man- hattan ; Prospect Park in Brooklyn (q.v.) ; and Bronx Park, Van Cortlandt Park and Pelham Bay Park in the Bronx. The first park (as distinguished from ” square “) of any size in Manhattan was Central Park (840 acres; between 59th and 110th Streets and between 5th and 8th Avenues; about 2j m. long and § m. wide), which was laid out (beginning in 1857) by F. L. Olmsted and Calvert Vaux. Nearly one-half is wooded;, with a variety of native and foreign trees and shrubs. The park contains a large pond, the Mere, in the N.E. corner; the Croton retaining reservoir and the receiving reservoir, and other sheets of water. Near the 65th Street entrance from 5th Avenue is the Arsenal, the executive quarters of the De- partment of Parks, with a meteorological observatory (1869).

Pelham Bay Park (1756 acres), in the north-easternmost corner of the city, lies on Long Island Sound, includes Hunter’s Island and Twin Islands, and has a total shore front of about 9 m. Bordering on the city of Yonkers, S. (from 262nd Street) to 24.2nd Street, is Van Cortlandt Park (1132 acres), in which are the Van Cortlandt Mansion (1748), for a time Washington’s headquarters and now a Revolutionary Museum under the Colonial Dames, a parade-ground (75 acres), and Van Cortlandt Lake, a skating pond. East of Van Cortlandt Park is

WoOdlawn Cemetery. Mosholu Parkway (600 ft. wide and about 6000 ft. long) leads from Van Cortlandt Park to the S.E., and Bronx and Pelham Parkway (400 ft. wide and 12,000 ft. long) from Pelham Bay Park to the S.W. connecting these parks with Bronx Park (719 acres) on either side of the Bronx river, a small stream which here broadens into lakes and ponds and has a fall at the lower end of the park. Bronx Park reaches from 180th Street to 205th Street. The northern part is occupied by the New York Botanical Gardens and the southern part by the Zoological Park.

Battery Park is at the southern end of Manhattan; here are the New York Aquarium (in what was until 1896 Castle Garden, on the site of Fort Clinton) and a children's playground (1903). In City Hall Park are the public buildings mentioned below.

The other down-town open spaces are small; many of them are recreation grounds, some, such as Mulberry Bend Park and Hamilton Fish Park, being on the site of former slums, condemned by the city at great expense. Especially in this part of the city municipal recreation piers and free baths have been constructed. Washington Square (1827), between Waverley Place, Wooster and Macdougal Streets, at the foot of 5th Avenue, became a pauper burial-ground about 1797, and was laid out as a park in 1827 ; on the N. side of the square there are still a few fine old residences. Union Square, between Broadway and 4th Avenue, is a favourite place for work- men's mass meetings. Madison Square is reclaimed swampy ground on which there was an arsenal in 1806-1815, then a parade-ground, and in 1825-1839 a municipal House of Refuge in the old barracks, and which was then laid out as a park and was a fashionable centre in 1850ˆ1875. Bryant Park on Sixth Avenue, between 40th and 42nd Streets, was a Potter's Field in 1813-1823, and in 1853 was the site of

'See F. T. Hill, Story of a Street (New York, 1908): •

a world's fair with Crystal Palace, which was destroyed in 1858. In De Witt Clinton Park between 52nd and 54th Streets on the North river, there was the first children's farm school* in New York. Riverside Park (140 acres; 1872), between 72nd and 129th Streets, on the North river front, is a finely wooded natural terrace with winding paths. Morningside Park (31J acres), between W. I loth and 123rd Streets, beautifully wooded, and Mount Morris Park (20J acres) from 120th to 124th Streets, interrupting Fifth Avenue, are high rough ground, Mount Morris being the highest point on Manhattan Island.

Among the other parks in the north part of Manhattan Island are:

Roger Morris Park, between 160th and 162nd Streets, containing the Roger Morris or Jumel Mansion (1763), Washington's headquarters for five weeks in 1776, then the headquarters of Sir Henry Clinton, and after 1777 of the Hessian officers; High Bridge Park (73 J acres) at the Manhattan end of High Bridge, between W. 170th and 175th Streets; Audubon Park between 155th and 158th Streets, from Broadway to the North river, the home in 1840-1851 of John James Audubon; and Ft. Washington (40! acres) from 171st to 183rd Streets on the North river, the site of Ft. Washington in the War of Independence. Along the W. bank of the Harlem river for about 3 m. N. and N.W. is the Harlem River Driveway (or speedway), about 95 ft. wide. Besides the large parks in the Bronx the more important are Crotona (1 54-6 acres), and Poe Park (2$ acres) on E. 192nd Street, the site of E. A. Poe's Fordham cottage. The great baseball grounds of the National and American leagues furnish amusement to the crowds interested in professional baseball. Coney Island (g.s.), similar resorts on Staten Island, on the shores of the North river and on Long Island on the Sound, and on the Hudson river are popular amusement places.

Buildings. — The city's sky-line is broken by the tall business buildings, known as " sky-scrapers," 8 the construction of which was made necessary by the narrowness of the down-town portion of the island in which the increasing business population had to be accommodated. The ten-storey Tower Building (1889; 21 ft. wide; first 9 then 11 storeys; replaced in 1908-19 10 by a taller and wider building) was the first of these, and was soon followed by much taller ones.

The prominent business buildings include the Singer Sewing- Machine Company's Building 4 (612 ft. high, built in 1905-1908 by Ernest Flagg); the Metropolitan Life Insurance Company's Building (693 ft.; completed in 1909); the Produce Exchange (with a 225-ft. tower) ; the Manhattan Life Building (with a 360-ft. tower); the Empire Building (20 storeys); on Wall Street, the Drexel Building, the Trust Company of America (23 storeys), and the National City Bank; on Broad Street, the white marble Stock Exchange (1903), the Broad Exchange Building (276 ft. high) , and the Commercial Cable Building (317 ft. high) ; in Cedar Street, the New York Clearing House; in Liberty Street, the New York Chamber of Commerce (1903), built of white marble and granite, with Ionic columns, the Trinity Building (with a Gothic facade) and the United States Realty Building (both by F. H. Kimball), the City Investing Building (32 storeys; 486 ft. high) ; in Church Street, the Hudson Terminal Buildings (1909, Clinton &• Russell), 22 storeys high, with four storeys below ground (including the terminal of the down-town Hudson tunnels), office buildings with

a tenant population of 10,000; in Park Row, the Park Row Building (30 storeys; 390 ft. high), and the office building of the World (the Pulitzer Building, with a dome 310 ft. high); the white marble Home Life Insurance Building with its sloping red tiled roof; the Fuller (or ” Flatiron “) Building (290 ft. high); and the New York Times Building (363 ft. high) at 42nd Street and Broadway.

The principal public buildings are: the Custom House (1902- 1907; by Cass Gilbert), on the site of Fort Amsterdam, built of granite in the French Renaissance style; in Wall Street, the United States Sub-Treasury, on the site of Federal Hall, in which George Washington was inaugurated first president of the United States; and in and about City Hall Park, the Post

2 See Jacob A. Riis, ” City Farms and Harvest Dances,” in the Century Magazine for September 1909.

3 On the mechanical equipment of the New York ” skyscraper ” see R. P. Bolton, ” High Office Buildings of New York,” vol. 143 of Minutes of Proceedings of the Institution of Civil Engineers (1901). See also Frank W. Skinner, ” The Foundation of Lofty Buildings,” in the Century Magazine for March 1909.

4 See A History of the Singer Building Construction (New York, 1908), edited by O. F. Semsch. The building’s steel columns are carried on pneumatic caisson piers which reach bed rock 90 ft. below the street-level.

Office, the Italian Renaissance City Hall by John McComb, Jr., 1803-1812 (architecturally the best of the public buildings); the Court House, the Hall of Records (French Renaissance), and a new Municipal Building with a lantern 559 ft. high, the main building of 23 storeys being pierced by an arcade through which Chambers Street runs; a little farther N. and E. of Broadway, the Tombs (1898-1899), the city prison, connected by a flying bridge called ” the Bridge of Sighs ” with the Criminal Courts; at Madison Avenue and 23th Street, the elaborate Appellate Court House (J. B. Lord); and on Fifth Avenue (40th-42nd Sts.) the new Public Library (1911). There are several large armouries of the state militia in the city, the best known being those of the 7th, 69th and 71st regiments.

Churches. — Historically the foremost religious denomination in New

York City is the Dutch Reformed. The consistory of the Collegiate Church, controlling several churches, is the oldest ecclesi- astical organization in the city, dating from 1628, when there was a Dutch church " in the Fort." After the city passed into the hands of the English the Protestant Episcopal Church rapidly increased in power, and in 1705 received the grant of the " Queen's Farm " between Christopher and Vesey streets. This immense wealth is held by the corporation of Trinity Church. Its present building (1839-1846; by R. M. Upjohn) is on the site of a church built in 1696, at the head of Wall Street on Broadway. The bronze doors are a memorial to J. J. Astor, and the altar and reredos, to W. B. Astor. In the churchyard are the graves of Alexander Hamilton, Robert Fulton, Captain James Lawrence, Albert Gallatin, William Bradford, the colonial printer, and General Phil Kearny. Many of the largest Episcopalian churches in the city were founded as its chapels, in- cluding St Paul's (1766), the oldest church building in the city. Trinity has several important chapels dependent on it. The Presby- terian Church is relatively stronger in New York than in any other city in the country with the possible exceptions of Philadelphia and Pittsburg. The first Methodist Episcopal society in the United States was formed in New York in 1766 and still exists as the John Street Church. The varied immigration to the city had brought in the other Protestant sects; the large Irish immigration of the first two-thirds of the 19th century, and the great Hebrew migration of the last "part of the same century, made the Roman Catholic and the Jewish denominations strong. The city became the see of a Roman Catholic bishop in 1808 and of an archbishop in 1850. The Roman Catholic Cathedral, St Patrick's (50th-5ist Streets; Fifth-Madison Avenues) , is the head of the archdiocese of New York ; it is the largest and one of the most elaborately decorated churches in the country, designed by James Renwick and erected in 1850-1879, with a Lady Chapel added in 1903. It is in Decorated style and is built princip- ally of white marble. Behind the Cathedral on Madison Avenue is the archiepiscopal residence. The Protestant Episcopal Cathedral of St John the Divine, on 112th Street near Morningside Park, was begun in 1892; the crypt and St Saviour's Chapel were completed in 1910. Other prominent Episcopalian churches are : Christ Church, organized in 1 794, the second parish in age to Trinity ; St Mark's, an old parish with a colonial church (1829); Grace Church (organized in 1808), since 1844 in a commanding position at Broadway and 10th Street, at the first turn in Broadway, with a building of white limestone in Decorated style with a graceful stone spire ; the Church of the Ascension (1840) with John La Farge's mural painting of the Ascension, a chancel by Stanford White, and Sienese marble walls and pulpit ; and the Church

of the Transfiguration (1849), nicknamed ” The Littie Church around the Corner,” and famous under the charge of Dr George H. Houghton (1820-1897) as the church attended by many actors. It has a memorial window to Edwin Booth by John La Farge. Of Presbyterian churches the First (organized in 1719) long occupied a brick church on Wall Street, near the old City Hall, and since 1845 has been on Fifth Avenue between nth and 1 2th Streets; and the Madison Square Church was organized in 1853, and after 1007 occupied one of the most striking ecclesiastical buildings in the city, in a quasi-Byzantine style, with a golden dome and a facade of six pale green granite Corinthian columns. The First Baptist Church (organized 1762; present building on Broadway and 79th Street) is the oldest and the Fifth Avenue Baptist Church (1 841) is the richest society of that denomination in the city; the Memorial Church (1838) is a memorial to Adoniram Judson. The first Congre- gational Church was built in 1809, but it was soon sold and the congregation disbanded; the Broadway Tabernacle on Broadway, near Worth Street, was a famous church in 1840-1857; the present church is at Broadway and 56th Street. St Peter’s (Roman Catholic ; 1785) is the oldest Catholic organization in the city; St Patrick’s (18 1 5) was formerly the cathedral church, and St Paul the Apostle (Paulist; 1859; rebuilt 1876-1885, with decorations by John La Farge) was established by Isaac Hecker. There are many Jewish synagogues and temples.

Hotels. — The principal hotels, clubs and theatres of New York City have steadily been making their way up-town. Both hotels and clubs had their origin in the taverns of the 17th and 18th centuries, such as Fraunces’s Tavern, on the corner of Pearl and Broad Streets,

built in 1719, used as a residence of the De Lancey family, sold in 1762 to Samuel Fraunces (Washington’s steward after 1789), who opened it as the Queen’s Head or Queen Charlotte, used for a time (1768) as the meeting-place of the Chamber of Commerce, and the scene, in its assembly room, of Washington’s farewell to his officers in 1783; it was restored in 1907 by the New York State Society of The Sons of the Revolution, which owns the building. There are now few first-class hotels in the down-town district, the Astor House being the principal exception to the rule that the hotel district is bounded by 23rd and 59th Streets, and by Fourth and Seventh Avenues. With the rapid increase in the value of New York City real estate many apartment-hotels have been built, especially on the upper west side. The most widely-known restaurants are Delmonico’s and Sherry’s, both at Fifth Avenue and 44th Street.

Clubs. — The clubs of New York are even more important to the social

life than those of London, and most of them are splendidly housed and appointed. The oldest of the social clubs is the Union Club, organized in 1836. The Union League Club (organized 1863, incorporated 1865) was formed by members of the U.S. Sanitary Commission, and is the club of the leaders of the Republican party in the city. The Democratic organizations corresponding to it are the Manhattan Club (organized 1865, reorganized in 1877), and the Democratic Club, more closely allied with the local organization of Tammany Hall. The Metropolitan Club was formed in 1891 by members of the Union Club, with which the Calumet Club (1879) also is closely connected. The Knickerbocker Club was founded in 1 87 1 by descendants of early settlers; and the St Nicholas Club by descendants of residents of the city or state before 1785. The University Club (1865, for college graduates only) has one of the handsomest club-houses in the world. Among the special clubs chiefly for writers, artists, actors and musicians, are the Century Association (1847, membership originally limited to 100, devoted to the advancement of art and literature) ; the Lotos Club (1870, composed of journalists, artists, musicians, actors and ” amateurs ” of literature, science and fine arts); the Salmagundi Club (1871, artists) ; the Lambs' Club (1874, ” for the social intercourse of members of the dramatic and musical professions with men of the world “) ; the Players' (1887, actors and authors, artists and musicians), whose building was the gift of Edwin Booth, its founder and first president ; the Grolier Club (1884, bibliophiles) ; the Cosmos Club (1885, members must have read von Humboldt's Cosmos); and the New York Press Club (1872, journalists). The Sorosis (1868) is a women's club, largely professional. Other clubs are the New York Bar Association (1870), the Engineers' Club (1888), the New York Athletic Club (1868), the Racquet and Tennis Club, the New York Yacht Club (1844, incorporated 1865, the custodian of the ” America's ” cup) ; and the Riding Club (1883) ; the Freundschaft Society (1879) and the Deutscher Verein (1874) for Germans; the Army and Navy Club fi88q); several Hebrew clubs, notably the Harmonie and the Progress (1864) ; the Catholic Club of New York, and the clubs of Harvard (1 865) , Yale, the University of Pennsylvania, Cornell University and Princeton.

Theatres, &c. — The first dramatic performances 1 in New York City were given in September and December 1732 by a company from London which played at Pearl Street and Maiden Lane; the first playhouse was opened on the 5th of March 1750, but in 1758 became a German Reformed Church ; and the second was opened with Rowe's Jane Shore on the 28th of December 1758, but remained a theatre only a little more than six years. What has been called the first New

York theatre, opened on the 7th of December 1767 in John Street near Broadway, was the Royal Theatre during the_ British occupation in the War of Independence, and was destroyed in 1798. In that year was built on Park Row the Park Theatre (burnt 1820; rebuilt 1821; burnt 1848) in which George Frederick Cooke (1810), James W. Wallack (1818) and Junius Brutus Booth (1821) made their American debuts, in which Edmund Kean, Charles Kean, Fanny Kemble and Edwin Forrest played, and in which 11 Barbiere di Siviglia, the first Italian opera given in the United States, was rendered in 1825, and the first ballet was danced by Fanny Ellsler in 1840. Rivals of the Park Theatre were: the Chatham Garden and Theatre in 1 823-1 831, and later the Bowery Theatre (opened in 1826; burnt in 1828, 1836, 1838 and 1845; named the Thalia in 1879, when it became a German theatre; and since 1892 Yiddish"). Among famous theatres of the 19th century the following maybe mentioned: Niblo's Garden (built in 1829; burned in 1846; re- built in 1849; destroyed in 1895) was long owned by A. T. Stewart, and after 1866 was the scene of many spectacular shows. Palmo's Opera House (1 844-1 857) was the home first of Italian opera and after 1848, under the management of William E. Burton (1802-186©), of comedy. In Mechanics' Hall (1847-1868) E. P. Christy's minstrels, George Christy's minstrels and the Bryant Brothers appeared. The Astor Place Opera House (on the present site of the Mercantile Library; 1847-1854) is best known because of the riot at Macready's appearance on the 19th of May 1849, in which many were killed by the police and militia. Tripler Hall (1850-1867) was built for Jenny Lind's debut but not completed in time. Here Rachel played in

1 See T. Allston Brown, A History of the New York Stage (3 vols., New York, 1903). . ' ■

1855, and Patti made her debut in 1859. The hall was managed in 1855 by Laura Keene and in 1856-1858 by William E. Burton, and in it in 1864 the three Booths played Julius Caesar, and Edwin Booth played Hamlet for one hundred nights. It was burned in March 1867. In Booth's Theatre (1869-1882; managed and afterwards leased by Edwin Booth), Sarah Bernhardt made her American debut (November 1880); and in the Park Theatre (Broadway and 21st Street; 1875-1882) Stuart Robson and William H. Crane first played together. Light opera was first introduced in 1864, opera bouffe in 1867, and Gilbert and Sullivan light opera in 1879; and The Pirates of Penzance was produced in New York before it was seen in London. Most of the

older theatres still in existence have become houses of vaudeville, melodrama or moving pictures, as, for example, the Academy of Music (14th Street and Irving Place; opened in 1854), until about 1883 the home of the best opera, in which Christine Nilsson, Parepa-Rosa, Salvini and Emma Nevada made their American debuts. The Broadway (1888) was the scene of Edwin Booth's last performance, as Hamlet, in March 1891. In connexion with the Empire Theatre (1893) is the Empire Dramatic School. The two largest places of amusement are the Madison Square Garden (opened in 1890) and the Hippodrome (Sixth Avenue and 43rd-

t4th Streets). The principal concert halls are Carnegie Music Hall 1 891; built by Andrew Carnegie for the Symphony and Oratorio Societies) and Mendelssohn Hall. The Metropolitan Opera House (1882; burnt 1892; immediately rebuilt) gave in 1884 the first season of German opera in America, under the direction of Leopold Damrosch. The Manhattan Opera House (built in 1903 by Oscar Hammerstein as the Drury Lane) was opened as an opera-house in December 1906. In 1910 grand opera ceased to be given except in the Metropolitan. Grand opera in New York has always been dependent for financial success on season subscriptions, and (like the great museums and the zoological and botanical gardens) has been supported by millionaires. The New Theatre (1909) is practically an endowed house.

Music. — Musical societies were formed in the 18th century, an Apollo Society as early as 1 750, a St Cecilia Society, which lasted less than ten years, in 1791, and the Euterpean Society, which lived a half century, in 1799. A New York Choral Society was established in 1823, a Sacred Music Society in the same year and a Philharmonic Society in 1824, succeeded in 1828 by the Musical Fund Society. The present Philharmonic Society, composed of professional players, was organized in 1842 by a New York violinist, Uriah C. Hill (d. 1875). In 1847 was formed the Deutscher Liederkranz, which has given much classical German music; a secession from the Lieder- kranz in 1854 formed the Arion Society, which has been more modern than the Liederkranz, furnished in 1859 the choruses for Tannhauser, the first Wagner opera performed in America, and brought from Breslau in 1871 Leopold Damrosch (1832-1885) as its conductor. He founded the Oratorio Society in 1873 and the Symphony Society in 1877, and was succeeded as conductor of each of these societies by his son Walter (b. 1862). Musical instruction in the public schools has been under the supervision of Frank Damrosch (b. 1859), another son of Leopold, who formed in 1892 the People's Singing Classes, picked voices from which form the People's Choral Union.

Art.— Many private collections have been given or lent to the public galleries of the city, in which are held from time to time excellent loan collections. The largest public art gallery is the Metropolitan Museum of Art, for which a committee, including art patrons and members of the National Academy of Design, drew up a plan in 1869, and which was chartered in April 1870. General Luigi Palma di Cesnola (q.v.) became its director in 1879 and was suc- ceeded (1905-1910) by Sir Caspar Purdon Clarke, director of the South Kensington Museum, and in 19 10 by Edward Robinson (b. 1858). In April 1871 the legislature appropriated $500,000 for a building for the Museum in Central Park: in 1878 the trustees took possession of the building in a tract of l8j acres in Central Park on Fifth Avenue between 80th and 85th Streets; and in March 1880 this building was opened. Additions were made to the south (1888) and the north (1894). In 1902 the central part of the E. front of a new building was opened, and under an appropriation of $1,250,000 in 1904 the building was again enlarged in 1908. Among the benefactors of the Museum have been : its presidents, John Taylor Johnston (1820-1893), Henry G. Marquand {.q.v.), who gave it his collection (old masters and English school), and J. Pierpont Morgan, and Miss Catharine Lorillard Wolfe, who gave the Museum $200,000 and her collection of paintings, Jacob S. Rogers (1823-1901) who left the Museum about $5,000,000, Frederick T. Hewitt, who gave more than $1,600,000, and John S. Kennedy (1830-1909), who left it $2,500,000. Besides paintings and statuary the Museum has collections of glass, Egyptian antiques, Babylonian and Assyrian seals and cylinders, tapestries, ancient gems, porcelain and pottery, armour, musical instruments, laces and architectural casts. The New York Historical Society since 1 858 has had the collection of the New York Gallery of the Fine Arts ; in its art gallery are several examples of Van Dyck and Velazquez, the best collection in the United States (except the Jarves collection at Yale) of the primitives and the early Renaissance of Italy and the Low Countries, and a good American collection, rich in portraits and in the work of Thomas Cole. There is a small collection of paintings with some statuary in the Lenox Library and there are many private collections of note. The National Academy of Design (organized in

1826; incorporated in 1828) has an art library, and students' classes. The Society of American Artists (1877) was a secession from the .Academy which it rejoined in 1 906. This Society with the Art Students' League (1875), and the Architectural League of New York (1881) formed in 1889 the American Fine Arts Society. In its building on W. 57th Street there are good galleries, it is the headquarters of the American Water Color Society (1866), the New York Water Color

Club, the National Sculpture Society (1893), the National Society of Mural Painters and the New York Chapter of the American Institute of Architects ; and the exhibitions of the National Academy of Design and of the Society of American Artists are held here. The National Arts Club and the Municipal Art Society (1 893)have club houses in Gramercy Park. The Decorative Art Association (1878) has classes and sales-rooms for women artists. There are art classes at Cooper Union (g.v.). Columbia University has a School of Architecture (1881).

Municipal Art, Monuments, Statuary, &c. — The city charter of 1897 established an art commission consisting of the mayor, the president of the Metropolitan Museum of Art, the president of the New York Public Library, the president of the Brooklyn Institute of Arts and Sciences, one painter, one sculptor, one architect and three lay members, the last six to be appointed by the mayor from a list presented by the Fine Arts Federation of New York. Without the approval ot this commission no work of art can become the property of the city either by purchase or by gift. Whenever re- quested by the mayor and board of aldermen it must act in a similar capacity with respect to the design of any municipal building, bridge or other structure, and no municipal structure that is to cost more than one million dollars can be erected until it has approved the design. The City Hall contains a valuable collection of portraits. In front of the Custom House are groups symbolical of the continents by D. C. French. The Hall of Records has historic and allegorical statues by Philip Martiny, H. K. Bush-Brown and Albert Weinert. In the Criminal Courts Building are mural decorations by Edward Simmons. The statuary of the Appellate Court House is by T. S. Clarke, K. F. T. Bitter, M. M. Schwartzott, D. C. French, F. W. Ruckstuhl, C. H. Niehaus and others; and it has excellent mural paintings by E. H. Blashfield, Kenyon Cox, C. Y. Turner, H. S. Mowbray and others. Of the city's great monuments the greatest is the tomb (1897; designed by John H. Duncan) of General U. S. Grant (q.v.) ; this mausoleum is in Riverside Park, commanding the North river, at 122nd Street. In the same park at 90th Street is the Soldiers' and Sailors' Monument (1900; C. W. Stoughton, A. A. Stoughton and P. E. Duboy) , a memorial to those who fought in the Union army during the Civil War; it has marble and granite stair- ways leading up to a pedestal on which are twelve fluted Corinthian pillars arranged in a circle and covered with a white marble canopy. On Bedloe's Island in the harbour is the colossal bronze " Liberty Enlightening the World " (F. Bartholdi; dedicated 1 886 ; presented to the people of the United States by the people of France), which is 151 ft. 5 in. from its base to the top of the torch held in the uplifted hand of the female figure. On the N. side of Washington

Square at the foot of Fifth Avenue is the granite Washington Arch (1889; by Stanford White) commemorating the hundredth anniversary of the inauguration in New York City of George Washington as first president of the United States. Among other public statues and monuments are: Augustus St Gaudens's W. T. Sherman (1903), an equestrian statue in gilt bronze on a polished granite pedestal in Fifth Avenue at the S.E. entrance to Central Park, his D. G. Farragut (1880; with a granite exedra for pedestal, designed by Stanford White) in Madison Square, and his Peter Cooper (1894), a seated figure on a marble pedestal and beneath a marble canopy (designed by Stanford White) immediately below Cooper Union on the Bowery; F. W. MacMonnies's Nathan Hale (1893) in City Hall Park; J. Q. A. Ward's William Shakespeare (1870), Seventh Regiment Memorial (1873), " Indian Hunter " (1868), and " Pilgrim " (1885) in Central Park, his George Washington (1882) on the steps of the sub-treasury, his Greeley in front of the Tribune building, and his William Earl Dodge (1885) at Broadway and 34th Street; E- Plassmann's Benjamin Franklin (1872) in Printing House Square; Alexander Doyle's Horace Greeley (1890) in Greeley Square ; K. F, T. Bitter's Franz Sigel (1907) in Riverside Park at 106th Street, D. C. French's Memorial to R. M. Hunt (1900), a bust with a semicircular granite entablature at Fifth Avenue and 70th Street ; and a Columbus Memorial (1894; by Gaetano Russo; erected by the Italian residents), a tall shaft with a statue of Columbus, at 59th Street and Seventh Avenue. There are many other statues in the city, especially in Brooklyn (q.v.) and in Central Park. In Central Park on a knoll S.W. of the Metropolitan Museum stands the Egyptian obelisk, of rose-red Syene granite, the companion of that on the Thames embankment, London, and like it popularly called " Cleopatra's Needle," but actually erected by Thothmes III.; it was presented to the city by Ismail Pasha, Khedive of Egypt, in 1877, was brought to New York at the expense of W. H. Vanderbilt in 1880, and was erected in the park in 1881.

Scientific Collections and Learned Societies. — The New York Aquarium in Battery Park has excellent exhibits of marine life; since 1902 it has been under the direction of the New York Zoological Society (organized 1895), a private corporation which has relations with the Park Department and the city like those of the corporations in control of the Botanical Gardens, the Natural History Museum

and the Metropolitan Museum of Art. Its Zoological Park (opened

1899) forms the southern part of Bronx Park, in which the animals (5528 individuals, 1146 species — 246 mammals, 644 birds and 256 reptiles in 1910) are almost perfectly housed — in large houses, flying cages, pools, dens and ranges. The Botanical Gardens (incorporated in 1891 and 1894), occupying the N. part of Bronx Park, contains two large conservatories (the largest in America) , the largest botanical museum in the world (1900), with lecture hall and museum of fossil botany in the basement, a collection of economic plants on the main floor, and a library, herbarium, laboratories, type exhibits of vegetation on the upper floors, and a natural hemlock grove and bog garden, pinetum, herbaceous grounds, flower garden, fruticetum and deciduous arboretum. The American Museum of Natural History was incorporated in 1869, and is governed by a board of trustees. On the ground floor of its building (77th -8 1st Streets; Eighth-Ninth Avenues) are a lecture hall, meteorites, the Jesup collections of the woods of North America and of building stones, and anthropological and ethnological collections, particularly rich in specimens from the North Pacific region, collected by an expedition sent out by Morris K. Jesup (q.v.). On the main floor are the mammals, insects and butter- flies ; on the second floor the palaeontological collections, the Cope col- lection of fossils and (presented by J. P. Morgan)the Bement collection of minerals and the Tiffany collection of gems ; and on the top floor are a collection of shells and the library, including that of the New York Academy of Sciences, which was founded in 1817 and incorporated in 1818 as the Lyceum of Natural History, received its present name in 1876, and publishes Annals (1824 sqq.) and Transactions (1881 sqq.). Other learned societies are: the New York Historical Society (founded in 1804 and incorporated in 1809), which has a library rich in Americana, the Lenox collection of Assyrian marbles, and the Abbott collection of Egyptian antiquities; the American Geo- graphical Society (founded in 1852; incorporated in 1854), which issues a Bulletin (1859 sqq.); the American Numismatic Society (1858), with an excellent numismatic library and collection; the American Society of Civil Engineers (1852; with a club house and library); the American Society of Mechanical . Engineers (1880), which occupies with the American Institute of Electrical Engineers and the American Institute of Mining Engineers (1871) a building given by Andrew Carnegie; and the New York Academy of Medicine (1847), with a technical library.

-Literature. — In literature 1 New York’s position in America is largely due to the city’s being the home of the principal publishing houses and, as the American metropolis, the home of many authors. Charles Brockden Brown, the first American professional ” man-of- letters,”

although a Philadelphian by birth, was connected with New York City throughout his literary career; after him came the brilliant Knickerbocker school, including Irving, Cooper, Bryant, James Rodman Drake, Fitz Greene Halleck, Charles Fenno Hoff- man (who in 1833 established the Knickerbocker Magazine), N. P. Willis, Edgar Allan Poe, J. K. Paulding, George P. Morris and Gulian C. Verplanck. In this early period New York literature centred largely about the Knickerbocker and the Mirror; and in the later period the monthlies Harper's (1850), the Century (founded in 1870 as Scribners ; present name l88l),and Scribner's (1887) were great literary influences under the editorship of such men as George William Curtis, Josiah Gilbert Holland, William Dean Howells, Henry Mills Alden (b. 1836) and Richard Watson Gilder. Richard Henry Stoddard, Richard Grant White, Bayard Taylor, Edmund Clarence Stedman, H. C. Bunner and John Bigelow are other literary names connected with New York City and with its periodical press. The success of the older magazines has brought into the field lower- priced monthlies. The oldest religious weekly still published is the New York Observer (1823; Presbyterian); its great editois were Samuel Irenaeus Prime from 1840 to 1885 and afterwards his son-in- law Charles Augustus Stoddard. Others are the Churchman (1844; Protestant Episcopal), the Christian Advocate (1826; Methodist Episcopal), the Examiner (1823; Baptist), the Christian Herald (1878) famous for its various charities under the control (1892-1910) of Dr Louis Klopsch (1852-1910), the Outlook (founded in 187c as the Christian Union by Henry Ward Beecher and, carried on as a household magazine by Lyman Abbott), and the Independent (1846) after 1870 edited by William Hayes Ward.

The city's cosmopolitan character is suggested by the great number of its newspapers published in other languages than English : in 1905 of all the periodical publications in New York City almost one-seventh (127 out of 893) were printed in languages other than English , 20 languages or dialects being represented. German, Yiddish and Italian newspapers have large circulations, and there are Bohemian, Greek, French, Croatian, Hungarian and Slavonic dailies. To a degree the New York press is metropolitan, also; but the American press is not dominated by the newspapers of New York as the English press is by that of London (see Newspapers: United States).

Education.' 1 — The Dutch West India Company was bound by its charter to provide schoolmasters. Its first schoolmaster emigrated

1 See Charles Hemstreet, Literary New York, Its Landmarks and Associations (New York, 1903).

1 See A. Emerson Palmer, The New York Public School (New York, 1905).

in 1633 and his school still exists in the Collegiate School, the property of the Collegiate (Dutch) Reformed Church. Down to the middle of the 17th century the support and control of the schools remained with the Dutch Church. Later the desire of the English to hasten the substitution of the English for the Dutch language in the colony led to an unsuccessful attempt by the colonial government to reserve to itself the appointment of the schoolmasters. An English public school was established in 1705 under an Act of 1702, and in 1710 was first opened in connexion with the Anglican Church. It still exists as the Trinity School. In 1754 King's College, now Columbia University (a.o.)i was established; the Dutch Reformed Church made a vain effort to secure control of it, but it became Anglican in its sympathies and its teachers were mostly Loyalists. Before the War of Independence the English language had practic- ally carried the day, and taken possession of the schools and churches.

In 1787 the Manumission Society established a free school for negroes, which was incorporated in 1794. A Quaker society (1798), the " Association of Female Friends for the Relief of the Poor," opened a school in 1801, which soon became a school for white girls only; until 1824 it shared in the school fund and it carried on an infant school only from 1824 to 1846. An association known in 1 805-1 808 as the Society for Establishing a Free School in the City of New York (afterwards the " Free School Society," and after 1826 the " Public School Society ") opened its first school in May 1806; got an appropriation from the state legislature in 1807; in 1819 brought from England a Lancasterian teacher — for the sake of economy the society's schools had always been conducted under the Lancasterian system with student " monitors " or assistant teachers ; until 1826 was largely under the control of the Friends, giving religious instruction; and was supported in part by voluntary contributions, in part by subscriptions from those who desired to share in its management, and in a small degree after 1815 by a contribution from the school fund of the state. For fifty years it did virtually all that was done for popular education in New York City, and for nearly thirty years caused the exemption of the city from the opera- tion of the common-school system of the state; and about 600,000 children passed through its schools.

The Roman Catholic parochial schools opposed the Protestant character of the text-books usedin these public schools, and in 1840,

followed by Hebrew and Presbyterian schools, attempted in vain to secure a part of the common-school fund. In 1842, as a result of this controversy, the city was brought under the general state system, but the Public School Society retained control of its own schools. The Board of Education opened its first schools in 1843. The right of the Public School Society to put up new buildings was definitely withdrawn in 1848; and in 1853 the Society was voluntarily dissolved, and its seventeen schools and property (valued at $454,422) were handed over to the city authorities ; from its trustees fifteen commissioners were appointed to hold office through 1854, and in each ward where there had been a school of the Society three trustees were chosen. After 1856 the control of the schools was entirely in the hands of the Board of Education. A compulsory education law came into effect in 1875. Since 1874 the Board hascontrolled a Nautical School, a training ship being lent to the city by the Federal Navy Department. The separate schools for negroes were' abolished in 1884; free lecture courses were established in 1888; in 1893 seven kindergarten classes were established, and after 1896 a supervisor of kindergartens was appointed by the Board; and in 1894 a teachers' retirement fund was established, the first in any American city.

In Brooklyn also the early Dutch schools were under the clergy. In 1 81 5 the schools first received a part of the state common-school fund. There were separate district schools until 1843 when a Board of Education was organized.

By the consolidation of 1898 the Boroughs of Manhattan and the Bronx became a unit for school purposes, the former city Board of Education becoming the School Board for these two boroughs; the former Brooklyn Board remained in control in that borough; and there was a Central Board of Education for the entire city consisting of eleven delegates from the Manhattan and Bronx Board, six delegates from the Brooklyn Board, and one each (the president) from the Richmond Board and the Queens Board. The revised charter of 1901 abolished the borough school boards and established a single board with 46 members (22 from Manhattan, 14 from Brooklyn, 4 from the Bronx, 4 from Queens and 2 from Richmond), and 46 local school boards (distributed as above) of seven members each, who took the place of the former inspectors in Manhattan and the Bronx. In the City Board there is an executive committee of 15 members. The borough superintendents were done away with in 1901 ; the powers of the city superintendent were increased, and a board of superintendents (the city superintendent and eight associate super- intendents) was created. A board of examiners, nominated by the city superintendent and appointed by the Board of Education, supervises examinations taken

by candidates for teaching positions, appointments to which are governed by rigid civil service rules. The development of public high schools has been rapid since the consolidation. In 1909-1910 trade schools and schools for the anaemic were established. There is an excellent system of evening and vacation schools.

A Free Academy founded in 1848 for advanced pupils who had left the common schools was empowered to grant degrees in 1 854,

and in 1866 became the College of the City of New York, with the Board of Education as its Board of Trustees. In 1900 a separate Board of Trustees (nine members appointed by the mayor) was created. Before 1882 no one was eligible for entrance unless he had attended the city's public schools for one year. In 1907 the College removed to new buildings on St Nicholas Heights between 138th and 140th Streets, the old buildings at Lexington Avenue and 23rd Street being used for some of the lower classes of the seven years' course. The retention of the secondary school in connexion with college, although there are now well-equipped public high schools, is one of the anomalies of the New York educational system. In 1871 a Normal School for Girls, since 1910 the Woman's College of the City of New York, was established as a part of the public system. Since 1888 public lectures for adults have been given under the auspices of the Board of Education, usually in school-houses; and in 1899 the Board opened evening recreation centres in school-houses, in which literary, debating and athletic clubs meet. For the charitable schools see § Charities.

The oldest institution of higher education is Columbia University (q.v.). New York University was chartered in 1831 as the University of the City of New York, and in 1896 received its present name. The University Council is the corporation ; it consists of 32 members, eight going out of office annually. The University Senate has immediate control ; it is composed of the chancellor, 1 two professors of the University College, and the dean and a professor from each of the following schools — law, medicine, pedagogy, graduate and applied science. The work of the collegiate department was begun in 1832; a university building at Washington Square was erected in 1832-1835; a law school, on a plan submitted by B. F. Butler of New York, was established in 1835, a medical school in 1841, the School of Applied Science in 1862, a graduate school in 1886, a school of pedagogy in

1890, a veterinary college (formed by the union of two previously existing schools) in 1899, and a School of Commerce, Accounts and Finance in 1900. In 1894 the College of Arts and Pure Science and the School of Applied Science were removed to a commanding and beautiful site on Washington Heights (about E. 181 st Street) above the Harlem river, the schools of law and pedagogy remaining at Washington Square where a Collegiate Division was opened in 1903; in 1895 the Metropolis Law School was consolidated with the University; in 1898 the Bellevue Hospital Medical College became a part of the University school of medicine. On the Washington Heights Campus the principal buildings are the library (1900), around a part of which extends an open colonnade, 500 ft. long, which is known as the Hall of Fame for Great Americans, and in which the names of great Americans (chosen at intervals by the ballots of 100 prominent educators, historians, &c.) are inscribed on memorial tablets; and Gould Hall, a dormitory, which like the library and the Hall of Fame was the gift of Miss Helen Miller Gould. In 1909-1910 the University library contained about 65,000 vols, and the law library 22,000, and there were 254 instructors and 4036 students (966 in the School of Commerce and 739 in the Law School). For Fordham University see Fordham. Other Roman Catholic colleges are: the College of St Francis Xavier (Society of Jesus; opened 1847; chartered 1861); and Manhattan College (Brothers of the Christian Schools ; opened 1853 ; chartered 1863) at Broadway and 131st Street, in the district formerly known as Manhattanville. Among the technical and professional schools, excluding those of Columbia University and New York University, are: the General Theological Seminary of the Protestant Episcopal Church (opened 1819; in 1 820-1 822 in New Haven; then re-established in New York City), beautifully situated in “Chelsea Village ” on a block (Ninth-Tenth Avenues and 20th-2ist Streets) given for the purpose by Clement Clarke Moore (1779-1863) 2 in buildings largely the gift of Eugene Augustus Hoffman (1829-1902), dean of the Seminary in 1 879-1 902, and of his family, who put it on a sound financial basis; the Union Theological Seminary (1836; Presbyterian), which is representative of the most liberal tendencies in American Presby- terianism (q.v.), especially in regard to text-criticism; the Jewish Theological Seminary of America (1886), chiefly supported by the synagogues of New York, Philadelphia and Baltimore ; the College of Physicians and Surgeons in the City of New York (1892; see Columbia University) ; the Cornell University Medical College (1897; see Cornell University); the Eclectic Medical College (1865); the New York Post-Graduate Medical School and Hospital (1882) ; the New York Polyclinic Medical School and Hospital (1882) ; the New York Medical College and Hospital for Women (1863) ; the

•The chancellors have been: in 1831-1839 James H. Mathews (d. 1870); in 1839-1850, Theodore Frelinghuysen (d. 1862); in 1852-1870, Isaac Ferris (1798-1873); in 1870-1880, Howard Crosby; in 1881-1891, John Hall; and in 1891-1910, Henry Mitchell MacCracken (b. 1840). Dr Ferris was a minister of the (Dutch) Reformed Church and the three chancellors since his time have been Presbyterian clergymen ; but the University is not sectarian.

- C. C. Moore (1779-1863), son of Benjamin Moore (1748-1816), who was Protestant Episcopal bishop of New York and president of Columbia College in 1801-1811, was professor of Biblical learning in the Seminary in 1821-1850, compiled a Hebrew and English Lexicon (1809) and wrote some poetry including the popular juvenile verses beginning ” ‘Twas the night before Christmas. ‘

New York College of Dentistry (1865); and the College of Dental and Oral Surgery of New York (1892). Among the normal schools are: the Teachers’ College of Columbia University (q.v.); the School of Pedagogy and the kindergarten training school of New York University; the kindergarten training school of Pratt Institute in Brooklyn (q.v.) ; the Kraus Seminary for Kindergarteners ; and the Kindergarten Normal Department of the Ethical Culture School under the Ethical Culture Society. Of the many private secondary schools in New York the oldest are the Collegiate School and Trinity School (see above). The Columbia Grammar School (1764) was originally a preparatory department of Columbia College.

Other educational institutions of a popular character are Cooper Union (q.v.) and the People’s Institute 3 (incorporated in 1897), which holds its meetings and lectures in the Cooper Union Building. Its most active promoter and long its managing director was Charles Sprague Smith (1853-1910), who was professor of modern languages at Columbia University in 1 880-1 891, and in 1896 organized the Comparative Literature Society; he was especially assisted by Richard Heber Newton (b. 1840), a Protestant Episcopal clergyman of broad and radical religious and social views, and by Samuel Gompers. The aim was to supply a ” continuous and ordered education in social science, history, literature and such other subjects as time and demand shall determine ” and ” to afford opportunities for the interchange of thought upon topics of general interest . . . to assist in the solution of present problems.” The Institute is primarily a free evening school of social science and a forum for the discussion of questions of the day. There are, besides, Sunday evening ethical services, ” a people’s church,” which has attracted much attention, and several Institute

Clubs ” of a social nature, some of them for children. The People’s Institute organized a censorship of ” moving pictures ” to which most American manu- facturers of these films voluntarily submit. Cheap concerts are given in Cooper Union by the People’s Symphony Concert Associa- tion in conjunction with the People’s Institute.

For the Brooklyn Institute see Brooklyn. The Young Men’s and Young Women’s Christian Associations have classes, especially for working people.

Libraries. — ” The New York Public Library, Astor, Lenox and Tilden Foundations,” was the result of the consolidation in May 1895 of the Astor Library (founded by the bequest of $400,000 by John Jacob Astor; incorporated in 1849; opened in 1854; further endowed by William B. Astor, who gave it about $550,000 and by John Jacob Astor, the younger, who gave it about $800,000 and built the hall in Lafayette Street in which the library, for general reference, was housed until 191 1), the Lenox Library (originally the private collection, particularly rich in incunabula, Americana, genealogy and music, of James Lenox (1800-1880), a bibliophile and art amateur, given by him to the city in 1870 and until 191 1 housed as a special reference library, in a building, designed by R. M. Hunt, on Fifth Avenue, between 70th and 71st streets), and the Tilden Trust (to which Samuel J. Tilden left his private library and about $4,000,000 (most of his estate) for the establishment of a public library, but which, owing to a contest by the heirs, was unable to secure the entire bequest and received only about $2,000,000 from one of the heirs). In 1902-1911 a new building was erected to house these collections. With the Public Library the New York Free Circulating Library (incorporated in 1880; re-incorporated in 1884) was consolidated in 1901 ; and in the next two years several other free libraries, including one for the blind. In 1901 Andrew Carnegie gave more than $5,000,000 for about 65 branch libraries, the city to furnish sites for them and maintain them. The largest and best equipped of the college libraries is that of Columbia Uni- versity. The library of Cooper Union has a complete set of patent office reports and files of newspapers. The Mercantile Library (1820 ; established by an association of merchants’ clerks) is a subscription library at Astor Place; the New York Society Library 4 (on Uni- versity Place) is a subscription library, the oldest in the city, being the outgrowth of a reading room established in the City Hall in 1700 by the earl of Bellomont; it was incorporated in 1754 as the City Library and in 1772 under its present name. The General Society of Mechanics and Tradesmen (founded in 1785) since 1820 has had a circulating library; which with the DeMilt (reference) and the Slade (architectural collections), contains about 99,000 volumes.

Charities. — The city has a commissioner and two deputy commissioners of public charities, but this municipal department works largely through private organizations, the municipal appropriations to which exceed the amount actually expended through institutions controlled by the city. 6 Municipal institutions include: Bellevue Hospital (opened 1816), which in I869 established the first hospital ambulance service in the world, near which there is an Emergency Hospital (1878) for maternity cases, and in connexion with which

3 See C. S. Smith, Working with the People (New York, 1904), and the A nnual Reports of the Managing Director of the People's I nstitute.

4 See A. B. Keep, History of the New York Society Library (New York, 1909).

6 See H. R. Hurd (ed.) New York Charities Directory (19th ed., 1910), published annually by the Charity Organization Society; and W. H. Tolman and Charles Hemstreet, The Better New York (1904), published by the American Institute of Social Service.

are the Gouverneur Reception Hospital (1885), the Harlem Reception Hospital and Dispensary (1887) ; and the Fordham Reception Hospital and Dispensary (1892); the City Hospital (1853) and the Metropolitan Hospital (1875), both on Blackwell's Island; for contagious diseases Willard Parker Hospital (1866) and Riverside Hospital (1885; on North Brother Island in the East river); and for the sick, crippled and idiotic destitute children, the New York City Children's Hospitals and Schools (1837; on Randall's Island). The Manhattan State Hospital on Ward's Island (1871; now used for patients from New York and Richmond counties only) Central Islip State Hospital, on Long Island, in Suffolk county (for Queens county and outside of New York City, Suffolk county) and the Long Island State Hospital (for the county of Kings) are the state insane asylums for the population of New York City.

The Charity Organization Society (organized and incorporated in 1882) investigates claims for charities and secures employment for applicants, has a bureau of information and a sociological library, has done much effective work through its Tenement House Committee and its Committee on Prevention of Tuberculosis, has a school of philanthropy begun as a summer school in 1898 but with a two-year

course since 1904, and publishes a weekly journal, the Survey. In the United Charities Building (1891-1893; in E. 22nd Street), a gift of John S. Kennedy, there is housed, besides the Charity Organization Society, the Children's Aid Society (1853), which was founded by Charles Loring Brace (1826-1890), its first secretary, has established industrial schools and lodging houses (the earliest 1854, being a Newsboys' Lodging House in New Chambers Street) , vacation schools, kindergartens, evening classes, summer houses at Bath Beach (for crippled girls) and West Coney Island, and a farm school at Kensico, and finds homes for orphans and homeless children. In the same building are the New York City Mission and Tract Society (1822, incorporated in 1867; undenominational), the first American organization to introduce district nursing, whose work is all done below 14th street, and the Association for Improving the Condition of the Poor (1843 ; incorporated in 1848), which has a department of relief, does fresh-air work at West Coney Island, supports people's baths, and has founded the Hartley House (a memorial to Robert M. Hartley, who established the Association), a neighbourhood settlement. The Society of St Vincent de Paul in the City of New York (organized 1 835; chartered 1872) is the local Roman Catholic charitable organization. The United Hebrew Charities was formed in 1874 by the union of four Hebrew societies. The Russell Sage Foundation (1907) has headquarters in New York, but is not merely local in its work; it has a charity organization department, a child helping department, and a school hygiene department. " Insti tutional work " by the churches is well developed.

Trade and domestic schools include the Hebrew Technical Institute and the Hebrew Technical School for Girls; the New York Trade School; Grace Institute, endowed by W- R. Grace (twice Mayor of New York City) for the instruction of women in trades; the Man- hattan Trade School for Girls; the American Female Guardian Society and Home for the Friendless; the Baron de Hirsch Trade Schools, in connexion with which there are day and evening schools for the instruction of immigrants (Russian, Galician and Rumanian) in the English language, and a colony with an agricultural and industrial school at Woodbine, N.J.; the Clara de Hirsch Home and Trade Training School for Working Girls; the New York Cooking School; and the Association of Practical Home Making Centres. The New York Diet Kitchen Association(l873) has established diet kitchens in connexion with many dispensaries. The City and Suburban Home Company (1896) provides good apartments at cheap rentals; the Society for Ethical Culture has promoted the same work; and the Mills Hotels, erected by D. O. Mills (1825-1910), are low-priced but self-supporting

lodging houses.

There are many orphanages and day nurseries and there are about thirty permanent homes for adults in the boroughs of Manhattan and the Bronx. The New York Society for the Prevention of Cruelty to Children was incorporated in 1875, and the children's court movement in the city has been connected with this society ; in its work and in that of the Society for the Prevention of Cruelty to Animals Henry Bergh (1820-1888) was the American pioneer. The Society for the Reformation of Juvenile Delinquents (1824) maintains a House of Refuge on Randall s Island ; and the New York Catholic Protectory (1862), under the Brothers of the Christian Schools and the Sisters of Charity, is of a similar character. An important work has been done by the Society for the Suppression of Vice (1873), and by the Society for the Prevention of Crime, organized in 1877 and re-organized in 189 1 by its president Charles Henry Parkhurst (b. 1842), a Presbyterian clergyman.

The New York Institution for the Blind was incorporated in 1831 and originated the New York point system of tangible writing and printing for the blind; the Society for the Relief of the Destitute Blind (1869) and the New York Association for the Blind (1906) are noteworthy. The New York Institute for the Instruction of the Deaf and Dumb (1817), of which Harvey Prindle Peet (1794-1873) was principal in 1831-1867, is a free state school and the first oral school for the deaf in America ; the Institution for the Improved Instruction of Deaf Mutes (1867) is a free city school; St Joseph's Institute for the Improved Instruction of Deaf Mutes (Roman Catholic; 1869) has a school for boys and one for girls.

Among special hospitals the foremost are : the New York Eye and Ear Infirmary (1820), the New York Ophthalmic Hospital (1852), the Manhattan Eye and Ear and Throat Hospital (1869), the New York Orthopaedic Dispensary and Hospital (1866), the New York Skin and Cancer Hospital (1882), the General Memorial Hospital for the Treatment of Cancer (1884), the New York Bacteriological Institute (1890; maintaining the New York Pasteur Institute), and the Neurological Institute (1909). Important research is undertaken by the richly endowed Rockefeller Institute for Medical Research. The St John s Guild (1866, non-sectarian) maintains floating hospitals for tuberculosis patients and a sea-side hospital at New Dorp, Staten Island. There is a roof camp for tuberculous patients on the Vanderbilt Clinic (1886), a free dispensary , connected with the College of Physicians and Surgeons.

Many of the general hospitals have already been mentioned in the list of medical schools; others are: the New York Hospital (1771), St Luke's (1850), Mt. Sinai (1852), the Roosevelt (opened 1871), the Presbyterian (opened 1872; undenominational), the J. Hood Wright Memorial (1862; called the Manhattan Dispensary until 1895), the Hahnemann (1875), and the Flower (1890; homoeopathic; surgical).

Population. — New York is by far the largest city in the United States in population, the census of 1910 returning its numbers as 4,766,883, and in the whole world is second to London only. Seven-eighths of the present area was annexed in the decade 1 890-1 900; and in those years the population increased from 1,515,301 (for an area of which the population in 1900 was 2,050,600) to 3,437,202. In 1905 the population by the state census was 4,000,403 ; of the separate boroughs: Manhattan, 2,102,928 (in 1900, 1,850,093; in 1890, 1,441,216); Bronx, 271,592 (in 1900, 200,507; in 1890,88,908); Brooklyn, 1,355,106 (in 1900, 1,166,582; in 1890, 838,547); Queens, 197,838 (in 1900, 152,999; in 1890, 87,050); Richmond, 72,939 (in 1900, 67,021; in 1890, 51,693). In 1900 there was a slight preponderance of females (1,731,497 females; 1,705,705 males); the ratio of native born to foreign born was about as 176 to 100 (2,167,122 native born; 1,270,808 foreign born); less than i-8% (60,666) were negroes; and less than 0-19% (6321) were Chinese. Of the native population seven-eighths (1,892,719 out of 2,167,122) were natives of New York state. Of the foreign-born population (1,270,080) in 1900, more than one-fourth (322,343) were Germans; more than one-fifth (275,102) were Irish, nearly one-eighth (i55,2oi)| were Russians, principally Jews; more than one-ninth (145,433) were Italians; and the next largest numbers were: 71,427 from Austria, 68,836 from England, 31,516 from Hungary, 28,320 from Sweden, 25,230 from Russian Poland, 1 19,836 from Scotland, 19,399 English Canadians, 15,055 from Bohemia, 11,387 from Norway, 10,499 from Rumania, 8371 from Switzerland and 5621 from Denmark. In 1 900 more than two- thirds of the entire population was of foreign parentage, 2,643,957 being the number of all the persons of foreign parentage and 2,339,895 the number of persons having both parents foreign-born; of this latter number 658,912 were German, 595,267 were Irish, 257,875 were Russians, 214,799 were Italians and 103,497 were Austrians — these numbers as compared with the figures just given for the foreign-born furnish a hint as to priority of the Irish and German immigration to that of the Russian Jews, who like the southern Europeans and the Slavs came to New York in comparatively few numbers more than a generation before 1900. There are in New York City more Germans than in any city of Germany, save Berlin, and

more Irish than in Dublin. There are many well-defined foreign communities in the city, such as ” Little Italy ” about Mulberry Street, ” Chinatown ” on Mott, Pel! and Doyers Streets, the Hebrew quarter on the Upper Bowery and east of it, a ” German Colony ” east of Second Avenue below 14th Street, French quarters south of Washington Square about Bleecker Street and on the west side between 20th and 34th Streets; a Russian quarter near East Broadway, a ” Greek Colony ” about Sixth Avenue in the 40’s, and negro quarters on Thompson Street and on the west side in the 50’s; and there are equally well-defined Armenian and Arab quarters. In 1900 35% of the total working population were employed in trade and transportation (in Boston 34%, in Chicago 32%, in Philadelphia 24%) and 37 % in manufacturing and mechanical

1 The immigrants from Russian Poland, from Austria Hungary, from Russia and Rumania are largely Jews, and it is estimated that one-fourth of the inhabitants of Manhattan are Jews.

arts (in Philadelphia 41%; in Chicago 35%; in Boston 32%). In 1661 the population of Manhattan Island was about 1000. In 1700 it was probably about 5000, the Dutch and English being about equally divided, and there being a few French, Swedes and Jews. In 1732 the population was 8624. During the War of Independence the city lost heavily; but the recovery at the close of the war was rapid, and although the population probably fell during the war from 20,000 to 10,000, in 1790 it was 33,131, then first being greater than that of Boston. From 60,515 in 1800 the population increased to 123,706 in 1820; to 312,710 in 1840; to 813,669 in i860 and to 1,206,299 in 1880. This rapid growth, the large part which immigration plays in the growth, the marked falling-off in the character of the immigrants, and the fact that it is usually the weaker and less enterprising immigrant who stays in New York while the more capable go West — all these circumstances combine to make a serious social problem. The low scale of living of this poorer class operates with the peculiar physical character of the city, especially on the lower East Side, where so many of the more recent immigrants live, to make the question of housing difficult. In Manhattan and the Bronx 66-7 % of the population in 1890 and 72-6% in 1900 lived in dwellings in which the minimum number of dwellers was 21; for the whole city in 1900 the percentage was 54-4, the corresponding percentage for Chicago in 1900 was 17-9. For the entire Borough of Man- hattan the average

density was 149-0 inhabitants per acre; but in the Eighth Assembly District (98 acres; on the lower East Side, bounded S.E. by Henry Street, E. by Clinton Street, N. by Stanton Street, and W. by Chrystie Street), in which more than two-thirds of the population is foreign-born, the density in 1900 was 735-9 per acre, and in 1905 727-9 per acre. In twelve tenement blocks in Manhattan in 1905 the density was over 1000 per acre, the maximum being 1458 per acre in a block bounded by Cherry, Jefferson, Monroe and Rutgers Streets. A Citizens' Association with a " council of hygiene and public health " in 1865 employed sanitary experts to investigate the city's tenements. In 1879 a prize offered for the best plans for tenements was unfortunately awarded to the so-called " dumb bell " tenement, in which the court for air-space gives little air or light, and many of these tenements, which, however, were a great improvement on the older types, were built. In 1902 the further building of " dumb bell " tenements was forbidden and a new Tenement House Commission was appointed. Model apartments have been built: in 1855 by the Workmen's Home Association, organized by the Association for Improving the Condition of the Poor; by the Improved Dwellings Company of Brooklyn and the Improved Dwellings Association of Man- hattan (1879); by the City and Suburban Homes Company (1896); and by some individuals. The city is comparatively healthy; for the five years 1 001-1905 the average death rate was 18-99 per thousand for the entire city, 20-96 for the Borough of the Bronx, 18-64 f° r the Borough of Brooklyn, 19-49 for the Borough of Manhattan, 16-12 for the Borough of Queens and 18-98 for the Borough of Richmond.

Communications. — The physical limitations of Manhattan Island and particularly the circumstance that the business area of the city is small and that the movement of passengers is almost entirely in one direction at any one time, have hindered the development of a simple and adequate system of local communications. Between Manhattan and Long Island there were in IQIO four bridges, three of them completed in the decade immediately before 1910, three of them to Brooklyn (g.».) and one to Long Island City; the New York and Brooklyn Bridge (1872-1883), with a Manhattan terminus at Park Row, and the Williamsburg Bridge (1897-1903) from Clinton and Delancey Streets, Manhattan, to South 5th and 6th Streets, Brooklyn, are suspension bridges ; for a technical description of them see Bridges, vol. iv. pp. 537-538. The Manhattan Bridge (1901-1909) is a wire cable suspension bridge situated between the two just mentioned; its Manhattan terminal is at Canal Street and the Bowery, and its Brooklyn terminal is at Nassau Street. It is the largest of all suspension bridges with a total roadway length of 6855 ft. (Manhattan approach

2067 ft.; Brooklyn approach 1868 ft.; two land spans of 725 ft.; river span 1470 ft.) and a width of 122-5 ft. It has a double deck, the lower for two surface car tracks and a wagon way, and the upper for footways and four elevated railway tracks. The Queensboro Bridge (1901-1909) is a cantilever from Second Avenue, between 59th and 60th Streets, Manhattan, to Long

Island City, with sustaining towers on Blackwell's Island. Its total length, including a plaza in Queens 1 152 ft. long, is 8601 ft. (Manhattan approach 1052 ft.; Queens approach 2672-5 ft.; west channel span 1 1 82 ft.; island span 630 ft.; east channel span 984 ft.) and its width is 89-5 ft. over all, the roadway being 53 ft. and the two side- walks each 16 ft. All of these bridges are crossed by electric carr. and on the bridges to Brooklyn there run surface cars and elevated trains. In 1909 an average of 4249 trolley cars and 3988 elevated cars crossed the Brooklyn Bridge every week day ; for the Williams- burg-Bridge the corresponding averages were 4473 trolley cars and 918 elevated train cars. The Harlem river is crossed by about a dozen bridges, including High Bridge, which carries the city aque- duct. The ferries to Brooklyn are less important than in the days when there was only one bridge and no subway connexion between Manhattan and Brooklyn; the opening of the Pennsylvania-Long Island railway tube in 1910 in the same way made the ferry from 34th Street, Manhattan, to Long Island City comparatively un- important; and the Pennsylvania and the Hudson river subways have to some degree taken the place of ferryboats on the North river for passenger traffic between Manhattan and railways in New Jersey. Between Manhattan and the various islands (to North Brother Island from E. 16th; to Ward's Island from E. 11 6th; to Randall's Island from E. 125th and E. 120th) of the river and bay including Staten Island the only means of transportation is still by ferryboats; the ferry line to Staten Island is owned and operated by the municipality. In Manhattan the first advance made on the horse car — which was still used to some extent in 1910, especially on streets along the water front — was the elevated railway; on great iron trestles of varying heights the first of these railways was built in 1 867-1 872 on New Church Street,West Broadway and Ninth Avenue, from the Battery to 59th Street; in 1878 a line was built on Sixth Avenue, branching off on 53rd Street to Ninth Avenue, and on 1 10th Street to Eighth Avenue and running on Eighth Avenue to the Harlem river (155th Street), a distance of iof m. ; soon afterwards the Second and Third Avenue lines were built from the Brooklyn Bridge to the Harlem river, and the line now extends to Fordham (190th Street), a distance of 13 m. In 1902 the motive power of these elevated trains was changed from steam to electricity. In 1886 a cable car line was

opened, the cars being operated by a clutch (or ” grip “) seizing a moving endless cable in a slot beneath the road bed; but in 1898 the ” underground trolley ” system began to be substituted. Outside Manhattan the overhead trolley is prevalent. In 1900-1904 another era in ” rapid transit ” in New York was begun: in the latter year was opened the Broadway subway with electric trains from the City Hall, along Broadway (above 42nd Street) to Kingsbridge (230th Street) and by a branch line, turning to the E. from 104th street and running, above lioth Street, on Lenox Avenue to the Harlem river and then through the Bronx to West Farms (180th Street) at the S.E. entrance to Bronx Park. In 1901- 1906 the subway was continued to South Ferry and was carried under the East river to the junction of Atlantic and Flatbush Avenues in Brooklyn. The construction company received a fifty years’ franchise for the operation of this subway. In 1908-1909 two more underground lines were opened connecting Manhattan with Hoboken (the terminus of the Delaware, Lackawanna & Western) and Jersey City (the terminus of the Erie, the Pennsylvania and the Central of New Jersey railways) by tubes under the North river; one of these extends up Sixth Avenue to 33rd Street, near the new terminal of the Pennsylvania railway, from which by 1910 tubes had been carried immediately E. and under the East river to Long Island and immediately W. to the New Jersey side. The municipality in 1910 contracted for the construction in Manhattan of lines on Broadway and Lexington Avenue and -on Canal Street across town and for the continuation in Brooklyn of the subway to Coney Island and Fort Hamilton.

The opening of the Erie Canal made the city the gateway for communication by water from the Atlantic Ocean to the interior of the continent, 1 and when the great railway lines were built westward it became the chief railway terminal on the Atlantic coast. Water communication up the Hudson river and through the canal is still of great importance. The New York Central & Hudson river and West Shore railways f oHow closely this water route to Buffalo. The Erie, the Lehigh Valley, the Pennsylvania and the Delaware, Lackawanna & Western railways reach Buffalo by routes across New Jersey, Pennsylvania and western New York. The New York, New Haven & Hartford railway affords communication with New England ; and the Pennsylvania and the Baltimore & Ohio railways, with the middle western and south-eastern parts of the country. The Central Rail- road of New Jersey and the Long Island railway (belonging to the Pennsylvania) are more local. The New York Central & Hudson river and the New York, New Haven & Hartford railways have a terminal in the borough of Manhattan, and the Pennsylvania has a terminal there

also, since 1910, with tunnels to Long Island and New

1 Between 1840 and 1858 the tonnage cleared at New York nearly quadrupled, the increase being from 408,768 to 1,460,998; at the close of the period of the predominance of the canal as a freight carrier, in the decade 1 850-1 860, New York City had, thanks to the Erie Canal and the canals of Ohio, a monopoly of the trade of the 1 upper Mississippi basin.

Jersey; but the other railways have their terminals on the New ersey bank of the Hudson and are reached either by ferries or by subways under the river. The New York Central tracks are sunken from the Grand Central Station for about 50 blocks and then run on a trestle (like the " elevated " railways) for the rest of their course in Manhattan. Ten steamboat lines afford communication with the cities and towns on the Hudson. The Old Dominion, the Clyde and the Savannah are among the more important coastwise lines connect- ing the city with ports on the South Atlantic coast. The Metropolitan line connects it with Boston, and the Portland line with Portland; and there are several lines to ports on Long Island Sound. Among great trans- Atlantic lines which serve the city are the Cunard and the White Star lines to English, French and Mediterranean ports; the North German Lloyd, and the Hamburg-American lines to English, French and German ports; the Compagnie Generate Transatlantique to French ports; and the Holland-American line to the Dutch port of Rotterdam; the docks of some of these lines are on the New Jersey side of the North river, in Hoboken. There are also lines to the West Indies, Central and South America.

Commerce. — The lack of railway lines direct to wharfs and piers in Manhattan is one of the commercial disadvantages of the city. The value of the imports received at the port of New York, which comprises New York Harbor and the Hudson river, increased from $518,796,561 in 1899 to $891,614,678 (or 60-4% of those of the entire country) in 1909; the value of the exports from $476,609,251 in 1899 to $627,782,767 (or 36-3% of those of the entire country) in 1909. The importations of works of art, furs, laces, diamonds, sugar, coffee, spices, cocoa, india-rubber, cigar wrappers, tin, cheese, hemp, hides of cattle and gloves of kid or other leather at New York are especially large as compared with the other ports of the country ; and so are the exportations of chemicals and medicines, copper,

machinery, illuminating oil and hardware.

The city is the principal centre of the New World for the whole- sale grocery and dry-goods businesses. Here are the country's most important " exchanges," including the Stock Exchange (1792), the Produce Exchange (the New York Commercial Association in 1862-1868), the Cotton Exchange (1871) and the Consolidated Stock Exchange (1885); and here are the richest and most powerful banks and trust companies in the New World and the great New York Clearing House. The Chamber of Commerce of the city was 'first organized and was chartered in 1768, and was reorganized in 1784.

Manufactures. — Many of the manufacturing industries, notably the manufacture of clothing, are favoured by the abundance of immigrant labour. Others, such as the refining of sugar and molasses, derive an advantage from their position with respect to imported raw materials. Still others, e.g. the refining of petroleum, derive an advantage from their position with respect to the exportation of the finished products. The growth of manufactures was promoted by the rapid growth in commerce after the opening of the Erie Canal (1825) and by a great stream of immigration, and New York became the foremost manufacturing city in > the United States about the middle of the 19th century. The va'ue of its manufactured products increased from $1,084,850,236 in 1890 to $1,371,358,468 in 1900, and the total value of factory products 1 from $1,172,870,261 in 1900 to $1,526,523,006 in 1905 (an increase of 30-2%). Clothing ranked first in value in 1905, and its value ($305,523,795) was greater than the total value of all factory products in any other city in the United States except Chicago and Philadelphia. Printing and publishing, with products valued at $116,877,594, ranked second. In 1905 the highest degree of localization of any industry in the country was in lapidary work, of which 96-5 % of the entire output of the country was

Eroduced in New York City, more than 60 % of the total for the city eing produced in Brooklyn. The boroughs of Manhattan and the Bronx produced in that year goods valued at $1,043,251,923, or a little more than two-thirds of that for the entire «ity; and in this part of the city is made more than 95 % of the clothing manufactured in all the city. The Borough of Brooklyn produced nearly three- fourths of the remainder.

Water Supply. — The water supply 2 of the colonial city was derived from wells and from the many'fresh-water streams and ponds which have now almost without exception been filled in. A system, draw- ing water from Collect Pond, was installed in 1 774-1 776 by Christopher

Colles (1738-1821), but this never was in actual opera- tion. In 1799 the Manhattan Company was incorporated ostensibly to supply the city with water, but under an omnibus clause in its charter it devoted itself to the banking business. In 1829 the city built a reservoir on 13th Street. In 1830 De Witt Clinton suggested the Croton river as a source of supply. Between 1837 and 1893 were constructed the first Croton Aqueduct, the Bronx river Conduit and the New Croton Aqueduct (see Aqueduct), with maximum discharges

1 The census of 1905 was confined to establishments under the factory system; the total for all manufactured products in 1900 (the figure given in the 1900 census) is greater than the value of factory products only (the figure given for 1900 in the 1905 census, so that figures for 1900 and 1905 may be comparable).

2 See Edward Wegmann, The Water Supply of the City of New York (New York, 1896).

respectively of 95,000,000 gals., 28,000,000 gals, and 302,000,000 gals, a day. In 1905 a new Water Supply Commission was created and immediately afterwards work was begun on a hew aqueduct 3 to bring water from the Catskills; a great reservoir (the Ashokan) was built more than 85 m. N. of New York, W. of Kingston (on the W. side of the Hudson) ; thence an aqueduct was constructed which crossed under the Hudson river between Storm King and Bear Mountain to the Kensico storage reservoir at White Plains, to a filtration plant near Scarsdale and to the Hill View distributing reservoir in Yonkers, and from this reservoir to the five boroughs of Greater New York (Queens and Richmond boroughs both being supplied from Brooklyn) by tunnels, the supply for Staten Island only being pumped through pipes. One of the largest of the new reser- voirs within the city limits is the Jerome Park. The water supply for the typical New York City ” sky-scraper ” cannot be forced to the higher storeys of these buildings by the pumps of the municipal service, and such buildings must have each its own installation of engines for this purpose. In 1908 a high pressure water supply system was installed for fire-protection of a part of the city below 23rd Street; induction motors driving multi-stage centrifugal pumps give sufficient power to force the water to a fire in the top of the highest buildings. (See Fires and Fire Extinction.)

Administration. — By the close of the Dutch period the city had become practically self-governing. But in the permanent form of English government that was established by the Dongan charter, granted in 1686 when the English crown was attacking the privileges of municipalities in the mother country, the mayor and sheriff were

appointed by the governor and council; the recorder, town clerk and clerk of the market were appointed either by the king or by the governor; and although the alder- men and assistants were elected by the people no ordinances of the common council could remain in force more than three months unless they were confirmed by the governor and council. The Montgomerie charter of 1730 was mainly an enlargement of the Dongan charter. From 1777101821 the mayor was chosen by the state council of appointment, consisting of the governor and four senators; from 1821 to 1834 he was elected by the common council; since 1834 he has been elected by the people. In 1730 the common council was divided into two chambers: the board of aldermen and the board of assistants; and the mayor and recorder were excluded from membership. In 1853 a boar;d of sixty councilmen, in which was vested the sole right to originate acts appropriating money, was substituted for the board of assistants. The latter was restored in 1868, but was abolished in 1873 when the board of estimate and apportionment was created. Until 1849 the common council was an executive as well as a legislative body, and for many years the government was administered chiefly by its committees and by the heads of departments which it created and appointed; and the mayor's veto could be overcome by a bare majority vote of the members elected to each chamber. .In 1849 the choice of the heads of departments was given to the people, and in 1853 a two-thirds vote of the members elected to each chamber was required tc pass an act over the mayor's veto. In 1857 the state legislature began the appointment of boards and com- missions for the performance of various functions, and from this state interference and the popular election of the heads of depart- ments resulted a divided responsibility in the city government. The present state constitution (1894) affords some protection against state interference, and under the Consolidation Act of 1882 and under the present charter of " Greater New York," granted in 1897 and revised in 1901, responsibility centres in the mayor.

The mayor is elected for a term of four years. With the exception of that of finance he appoints the heads of all depart- ments: law, water supply, gas and electricity, fire, street cleaning, bridges, docks and ferries, parks, public charities, tenement house, health, correction, police, education, taxes and assessments. Even in the department of finance he appoints the chamberlain and two commissioners of accounts, who examine the receipts and disbursements in the office of the comptroller and chamberlain and may examine the affairs of such other offices or departments as the mayor may direct. All officers appointed by the mayor may be removed by him, except certain

judicial officers and the members of the board of education. 3 See A. D. Flinn, ” The World’s Greatest Aqueduct ” in the Century Magazine for September 1909.

The aqueduct commissioners, the trustees of the College of the City of New York, and the trustees of Bellevue and allied hospitals, however, are removable only for cause and after a hearing. The mayor’s veto of a franchise passed by the board of aldermen is final; his veto of’an ordinance or resolution of the board which involves the expenditure of money, the creation of a debt or the laying of an assessment can be over- come only by a three-fourths vote; and his veto of any other measure of the board can be overcome only by a two-thirds vote. Special city legislation passed by the state legislature is referred to the mayor for his acceptance; if he does not accept it, it may be repassed by both branches of the legislature but must then be marked, when referred to the governor, ” passed without the acceptance of the city.”

The department of finance is administered under the direction of the comptroller, who, like the mayor, is elected for a term of four years. He prescribes the manner in which the accounts in the other departments shall be kept and rendered, and all such accounts are subject to his inspection. His warrant, drawn on the chamberlain and countersigned by the mayor, is required in making a payment on behalf of the city. He settles claims in favour of or against the city. No real estate can be purchased or leased by the city without his consent. No contract, the expense for the execution of which is not in part covered by assessments on the property benefited, is valid without his signature. Legislation affecting the city’s finances is determined mainly by the board of estimate and apportionment consisting of the mayor, comptroller, president of the board of aldermen, with three votes each ; the presidents of the boroughs of Manhattan and Brooklyn, with two votes each; and the presidents of the boroughs of Queens, the Bronx and Richmond, with one vote each. Every October this board prepares the budget for the ensuing year. It is required to submit the same to the aldermen for approval, but the aldermen are not permitted to increase an appropriation, to insert any new appropriation or to reduce that for the payment of state taxes, that for the payment of the interest on the city debt or any of those the amounts of which are fixed by law; and in case they reduce others their action is subject to the mayor’s veto which they can overcome only by a three-fourths vote.

The city's budget grew from $90,778,972 in 1900 $156,545,148 in 1909 ; the assessed value of its taxable property, real and personal, from $3,654,122,193 in 1900 to $7,250,500,559 ($5,4*3.312,599 for Manhattan and the Bronx) in 1909, when the real estate was valued at $6,807,179,704. The net funded debt in December 1909 was $653,270,379, the gross bonded debt being $946,005,728 ; the floating debt was $60,367,290, and the sinking fund was $232,368,060. Among the large items of the 1909 budget were: $27,470,737 for education; $47,225,078 for redemption and interest of the city debt; $20,235,115 for miscellaneous city and county expenses; $14,160,202 for police; $8,428,596 for borough governments; $8,039,565 for fire protection; $7,418,299 for street cleaning; $6,511,143 for water supply and public lighting; $4,760,651 for charitable institutions; $3,319,065 for parks; $2,512,606 for public charities ; and $2,484,859 for health. The state constitution of 1894 fixed the debt limit of all municipalities at 10% of the assessed valuation of their real estate. An amendment of 1899 (in effect 1900) excepted from the debt limit of New York City the previous debt of the counties now wholly included in the city; another amendment adopted in 1905 excepted from this limit debts incurred by the City of New York after the 1st of January 1904 to provide for the supply of water; and an amendment, adopted in 1909, excepted from the debt limit bonds issued after December 31st 1909 for such public improvements owned or to be owned by the city as yield a revenue in excess of what is required to meet the interest and principal of such bonds; also indebtedness incurred prior to January 1st 1910 for rapid transit or dock properties in proportion to the extent to which the revenue meets the interest and the instalments to be paid for the redemption of the bonds, such increase of the debt limit to be used, however, only for rapid transit or dock improvements. The same amendment (1909) also authorizes the city to issue, during any one year, in excess of its former debt limit, bonds to be redeemed out of the tax levy for the ensuing year to the extent of one-tenth of 1 % of the assessed value of the real estate of the city subject to taxation.

The board of aldermen, whose power is less than formerly, is composed of a president, elected on the city ticket for a term of four years; the five borough presidents, each elected by his borough for a term of four years; and 73 aldermen, elected by districts for a term of two years. Each head Of an administrative department is entitled to a seat in the board but no vote ; he is required to attend the board's meeting whenever it requests him to do so and must answer questions relating to his department. The board is required to meet once each month except in August and September. Each administrative

department has a single head with the exception of the department of parks, the department of health and the department of educa- tion; and each head of a department has full power of appointing and removing subordinates except that a person holding a position

in the classified civil service subject to competitive examination can be removed only for cause. The head of the department of parks is a board of three park commissioners: one for the boroughs of Manhattan and Richmond, one for the boroughs of Brooklyn and Queens and one for the Borough of the Bronx; one of the three is designated by the mayor as president of the board. The head of the department of health is also a board of three members; the com- missioner of health, who is president of the board, the police com- missioner and the health officer of the port. The department of education is described in the paragraph on education. Railway, gas and electric companies doing business within the city are subject to the extensive control of a public service commission of five members who are appointed by the governor of the state (see New York).

In New York county, which comprises the boroughs of Manhattan and the Bronx, there is no county court, but in its place are a city court and a court of general sessions. The city court is a civil court, having jurisdiction over cases in which the amount involved does not exceed 82000, and is composed of seven justices elected for a term of ten years. The court of general session is a criminal court, having jurisdiction of all crimes including murder, and is composed of the city judge, the recorder and three justices of the sessions, each elected for a term of fourteen years. New York county elects a surrogate for a term of fourteen years, and Kings has two county judges; but in Queens and Richmond the county and surrogate courts are the same as in other counties of the state. In ‘each of twenty-eight districts into which the city is divided a muCJcipal- court justice is elected for a term of ten years and sessions oi the municipal court, which has jurisdiction of civil cases in whiclr. the amount involved does not exceed $500, are held. For the adminis- tration of criminal justice by magistrates (justices of the peace) the boroughs of Manhattan and the Bronx constitute the first division and the other three boroughs constitute the second division. In each division there is a board of magistrates appointed by the mayor for a term of ten years, and the magistrates hold the several courts of their division in rotation according to such rules as they themselves establish. There is also in each division a court of special sessions consisting of six justices appointed by the mayor for a term of ten years; it has jurisdiction in all misdemeanour cases except libel and must be held by three justices. In the first division both the magistrates and the justices of

the court of special sessions are re- quired to hold a separate court for hearing charges against children under sixteen years of age.

Each borough has a president with extensive power, and the city is divided into twenty-five local improvement districts, each having a board composed of the president of the borough and the alderman representing the district. The president appoints and removes at pleasure a commissioner of public works, who, subject to his control, directs his administration relating to streets, sewers, public buildings and supplies. The borough president prepares all contracts relating to his borough. In Queens and Richmond he directs the cleaning of the streets. In Manhattan, Brooklyn and the Bronx he is directed by the charter to appoint a superintendent of buildings, who, subject to him and with the aid of inspectors, enforces the ordinances of the aldermen relating to the construction, alteration and removal of buildings; in Queens and Richmond the borough president may appoint such an officer only when authorized to do so by the board of aldermen upon the recommendation of the board of estimate and apportionment. A borough president is chairman of each of the local improvement boards.

History. — The discovery of New York Bay and the Hudson river by Verrazano in 1524 was followed only by occasional visits of trading or exploring vessels until the arrival of Henry Hudson in 1609. Beginning with 1610, Dutch merchants despatched several vessels to engage in the fur trade with the Indians, and ii*i6i4 a ship commander, Adriaen Block, having lost his vessel, built the ” Onrust ” or ” Restless ” on the shore of Upper New York Bay. About the same time a few huts were built at the south end of Manhattan Island. When New Netherland had been erected (1623) into a province of the West India Company (see New York), that body chose the south end of Manhattan Island for a trans-Atlantic shipping station and for the seat of government. In 1626 Peter Minuit, the director-general of the province, bought the entire island from the Indians for goods valued at 60 guilders (about $24) and at what was then its southern extremity began the erection of Fort Amsterdam; and at the close of the year the settlement, New Amsterdam, comprised thirty bark-covered dwellings. For several years it was maintained wholly in the interest of the Company, and to none of the inhabitants, all of whom were its agents or employees, were given any political rights, title to land or right to European trade on his own account. The company divided a large portion of the island into six farms of its own, and when by its Charter of Privileges and Exemption

(1629J it attempted to encourage agriculture in other parts of the province (see New York State) it reserved to itself the whole island. In 1633 New Amsterdam received a grant of ” staple right ” by which it could compel any vessel passing the port either to offer its cargo for sale or pay a duty ; in 1 63 8 the Company extended to all friendly European countries the privilege of trading with the province, and about this time it opened town lots for sale. The town rapidly assumed the cosmopolitan character for which it has ever since been noted, there being, according to a contemporary report, eighteen languages spoken by its 400 or 500 inhabitants in 1643. In 1641, to gain the necessary support to fight the Indians, Kieft had to yield to the demand for a popular voice in the government, and permitted the heads of families to choose a board of Twelve Men to confer with him. In 1643 he permitted the choice of a board of Eight Men, and when he refused its demands it was largely instrumental in effecting his recall. Under his successor, Peter Stuyvesant, a board of Nine Men was chosen, and this body, objecting to the customs duties which he imposed, sent three of its number with a petition to the States-General with the result that in 1653 New Amsterdam was made a city with a government administered by a schout, two burgomasters and five schepens. Chiefly with a view to protection from roving traders the great burgher-right and the small burgher-right were established in 1657; the great burgher-right being conferred on all who had been magistrates as well as on those then in office, on clergymen, on militia officers and on the male descendants of all such persons; and the small burgher-right being conferred on all native-born citizens, on the husbands of native-born women and on all who had been residents of the city for a year and six weeks. Other persons approved by the magistrates were allowed to buy the great burgher-right for 50 guilders ($20) or the small burgher-right for 20 guilders ($8). Only burghers and employees of the West India Company could engage in commerce, work at a trade or practise a profession, and only great burghers could hold the more important offices. Originally Stuyvesant appointed the city officers, but in 1658 he permitted them to nominate their own successors. Besides engaging in the fur trade, the city was now exporting considerable timber and food-stuffs; in the coast trade it was beginning to reap the advantages of its situation on the coast route through Long Island Sound; and its trade with the Dutch West Indies was of some importance. But the city and the Company were always at odds. The duties exacted by the Company were a heavy burden and yet the Company did not keep the fort in good repair. Stuyvesant’s arbitrary rule primarily in the interests of

the Company was another grievance, and when in August 1664 there appeared in the harbour an English fleet sent by the duke of York for the conquest of the province, the city was in a defenceless condition. Richard Nicolls, the representative of the duke, easily won over the burgomasters and other prominent citizens; Stuyvesant, practically deserted, was driven to a formal surrender on the 8th of September; and New Amsterdam became New York.

In June 1665 Nicolls reorganized the government, vesting it in a mayor, aldermen and sheriff, to be appointed by the governor of the province for a term of one year; and extended the city's limits to include the whole of Manhattan Island. In 1666 he granted to New Harlem, founded in 1658, a charter which gave to it the status of a town within the city. Nicolls' successor, Governor Francis Lovelace, established a post-route from New York to Boston in 1673. O n tne 3 otn °f J u ˆ I0 73 the city was surprised and captured by a Dutch fleet under Cornells Evertsen and Jacob Binckes. The captors renamed the city New Amsterdam and in January 1674 Anthony Colve, the newly appointed governor of the province, re-established the Dutch city government, but under the treaty of Westminster the English again took possession in November. In 1678 Governor Edmund Andros gave the city practically a monopoly within the province of commerce " over seas " and ordered that flour should be inspected nowhere else; two years later he required that all flour for export should be bolted and packed

within the city. The duties established by order of the duke of York were still a grievance, and when, in 1681, Governor Andros had sailed for England without renewing the ordinance imposing them, the merchants refused payment and demanded that they should thereafter be imposed by a representative assembly. The duke yielded and the first New York Assembly, called by Governor Thomas Dongan, met in the.city on the 17th of October 1683. Less than three years later, on the 20th of April 1686, Dongan gave the city its first real charter, which is a historic instrument in the city government; it was superseded only to a very small extent as late as 1830 (when there was a revision of the charter) and on it as a basis the later charters have been framed.

New York City with its numerous artisans, small traders, sailors and common labourers, such as usually compose the party of discontent, was the centre of the Leisler uprising (see New York State) incited by the English Revolution of 1688, and it was here that Leisler in the spring of 1690 called the first intercolonial assembly to plan an expedition against Canada. During Leisler's rule, too, the freeholders

of the city were for the first time permitted to elect their own mayor, a privilege not subsequently granted until 1834. Before the close of the 17th century New York had become a favourite haunt of pirates; leading merchants assisted pirates as well as privateersmen in fitting out their vessels and shared in their plunder or at least welcomed them with their rich cargoes, and public officials, including one or more governors, were also implicated. The home government finally appointed Richard Coote, earl of Bellomont (1636-1701), governor with explicit instructions to suppress the evil. Before he received his commission he and Robert Livingston sent out William Kidd (d. 1701) with a frigate to capture the pirates. Kidd himself turned pirate, but was arrested in Boston in July 1699, was sent to England for trial and was hanged in May 1701. Bellomont met determined opposition among New York officers and merchants; but by the close of his brief administration (1698-1701) he had caught a number of the pirates and broken up the corrupt system by which they had been protected. The importation of negro slaves was begun in 1725 or 1726 and was somewhat encouraged by the States- General. Becoming prized as household servants they so increased in number in the city that during the first half of the 18th century they were not greatly outnumbered by the whites; the whites early began to fear a slave insurrec- tion, and ordinances were passed forbidding negroes to gather on the Sabbath in groups of more than four, or to carry guns, swords or clubs; but one night in April 171 2 some slaves met in an orchard near Maiden Lane, set fire to a building and killed nine men besides wounding several others who came to put out the fire. Soldiers then captured all the insurgents except six, who committed suicide, and after trial twenty-one were executed. When early in 1741 nine fires broke out within a few weeks and a negro was seen running from the last, the belief became general that* the negroes had formed a plot to burn the town. A reward of £100 was offered for information exposing the plot, and the testimony of an indentured servant-girl, Mary Burton, that her master, mistress, a few other whites and a number of negroes were implicated in such a plot threw the city into a panic. Other confessions were extorted by threats, and on such worthless testimony four whites were executed, fourteen negroes were burned at the stake, twenty were hanged and seventy-one were transported. The frenzy was checked when Mary Burton began to accuse persons of consequence and above suspicion. The New York Gazette, the first newspaper of New York, established by William Bradford in 1725, was a semi-official organ. For criticizing the government in the New York Weekly Journal, which he established in 1733, John Peter Zenger was charged with libel in 1734, and by securing his acquittal in the following year the popular party established the freedom of the press

(see New York). At the beginning of the Stamp-Act controversy John Holt's New York Gazette and Weekly Post-Boy, the successor of Bradford's Gazette, was the medium through which the popular leaders stirred the

people to resistance. The Stamp-Act Congress, called at the suggestion of Massachusetts, sat in the city from the 7th to the 28th of October 1765, and on the 31st of October the New York merchants started the non-importation movement which spread to the other colonies. Lieut. Governor Cadwallader Golden prepared for the enforcement of the Act by strengthening Fort George (a later name for Fort Amsterdam) and increasing its garrison. The ship with the stamps arrived in the evening of the 23rd of October and on the following night threatening notices were posted on the doors of every public office and at the corners of streets. When the day (1st of November) came for the Act to go into effect Governor Colden had retired within the fort. Major James, the commander of the garrison, had threatened to enforce the Act; but the Sons of Liberty gathered a mob, broke into the governor's coach-house, burned his coach and burned him in effigy, destroyed the furniture and other property of Major James and threatened to storm the fort. On the 5th, the governor delivered the stamps to the mayor and aldermen. No serious attempt was subsequently made to enforce the Act, and its repeal (18th of March 1766) was celebrated on the city common with noisy demonstrations and the erection of a liberty pole. The Assembly also made appropri- ations for the erection of statues of the king and William Pitt. The Sons of Liberty opposed the passage by the Assembly of appropriations for the maintenance of the soldiers, and the latter retaliated by repeatedly cutting down liberty poles erected by the Sons of Liberty. Finally in a skirmish on the 18th of January r77o the soldiers killed one man and severely wounded several others, and this bloodshed is memorable as the first in the struggle which culminated in the independence of the colonies. The tea shipped to New York for testing the right of parliament to tax the colonies did not arrive until four months after that shipped to Boston had been thrown over- board, but when it did arrive (April 1774) the chests in one vessel were destroyed in the same manner as were those in Boston and the other vessel was forced to carry its cargo back to London. The Port Act for punishing Boston stirred the New York merchants as weil as the Sons of Liberty (chiefly mechanics and artisans), and when the latter again threatened violence the merchants resolved to guide the movement, and called a mass meeting and

named a committee of correspondence of fifty-one members. This committee, on the 23rd of May 1774, proposed a Continental Congress chiefly with a view to obtaining an effective regulation of non-importation from England; it also named the New York delegates to that body.

During the greater part of the War of Independence the city was occupied by the British. Its capture was a part of the British plan to get control of the Hudson and separate New England from the southern colonies. Early in 1776 the Americans began to throw up fortifications at several points on both banks of the East river in the hope of closing the east water front to the enemy. Other fortifications were erected on Governor's Island and at some points along the west water front to the upper end of Manhattan Island, where an attempt was made to close the passage of the Hudson by building Fort Washington on the New York bank and Fort Lee on the New Jersey bank and connecting them with a line of sunken ships fastened together with chains. To the north of the city proper, also, defences were constructed along the line of the present Grand Street, and to prepare for a retreat from the north end of the island a redoubt, which the British later called Fort George, was built on the prominence overlooking Kingsbridge from the south, and Fort Independence, in what is now Bronx Borough, was built to command the approach from the mainland. After the battle of Long Island, fought within the present limits of Brooklyn Borough, Wash- ington, on the night of the 29th of August 1776, crossed to Manhattan Island. As the city was no longer tenable, some of the generals proposed burning it, but Congress would not give its consent and Washington, although withdrawing the greater part of his army behind fortifications on Harlem (now Washing- ton) Heights, continued to occupy it with about 5000 men under General Israel Putnam until the British general, Sir William

Howe, began to show signs of attack. Troops also remained behind the batteries along the east water front, and it was On this occasion that Nathan Hale went on his fatal errand to ascertain Howe's intentions, was discovered within the British lines and was hanged as a spy. On the 15th of September several British ships which had some days before passed the American batteries, as far as Montressor's (now Randall's) Island, entered Kipp's Bay, at the foot of the present 34th Street, routed the militia posted behind the low breastworks there, and after landing narrowly missed cutting off the rear of Putnam's retreating army. One portion of Howe's army took possession of the city and another marched toward Harlem Heights along the east side of what is now Central Park while Putnam's men were marching in nearly parallel columns on the west side of the park. On "the i6th, in

the battle of Harlem Heights (on what is now Morningside Heights), about 1800 Americans drove a somewhat smaller number of British troops from the field. In October Howe sailed up the East river, and Washington, to avoid being outflanked, retreated to the main- land, leaving only a garrison at Fort Washington. Howe landed at Pell's Point (now within Pelham Bay Park), and on the 28th, a few miles north of the present city limits, was fought the battle of White Plains. Howe then turned westward and southward and on the 16th of November captured Fort Washington. What is now Bronx Borough was within the " Neutral Grounds " which suffered greatly from the foraging parties of both armies. Six days after the British entered the city proper about one- fourth of it was destroyed by fire, and the desolation was ex- tended by another large fire on the 3rd of August 1778. The British crowded their prisoners (who suffered terrible hardships) into several of the churches, the City Hall, the new gaol (later the Hall of Records), King's College, the Livingston sugar house, and a number of ships moored in the harbour. The city was a refuge for Loyalists, but even they were treated with contempt by the British. The homes of Loyalists and Whigs alike were plundered, and when the British finally evacuated (25th of November 1783) they had robbed the city of its wealth and had destroyed its business.

For the first three or four years after the return of peace recovery in some directions was very slow; but only a few months after the British had gone an American merchantman sailed from the port bound for China and opened trade with that country. Trade was speedily resumed with European ports, and by 1788 it was not uncommon to see 100 or more vessels in the port either loading or unloading. On the question of enlarg- ing the powers of the Federal government in 1787-1788, the city strongly supported Alexander Hamilton and John Jay against a determined opposition in other parts of the state, and the ratifica- tion of the Federal constitution in the state convention at Poughkeepsie was a triumph for New York City. The city was the Federal capital in 1 789-1 790 and under its strong Federalist influence the new government of the nation was organized. During the colonial era New York was always the seat of the provincial government and for twenty years it was at times the seat of the state government, but in 1797 Albany was made the permanent capital. In 1807 the success of steam navigation was assured by the trial trip of Robert Fulton's " Clermont " from New York to Albany and return; but the city did not benefit immediately from this invention. On the contrary, the Embargo Act (1807-1809) threatened its commerce with ruin. It revived under the Non-Intercourse Act, but suffered again from the second war with Great Britain. In the first and second years of this

war some merchants reaped profits from privateering against the enemy, but in December 1813 the British stopped privateering by a closer blockade of the harbour and in 1814 they threatened to attack the city. In preparing to resist, the city erected or assisted in erecting elaborate fortifications, and Robert Fulton was busy in New York building a steam frigate with cannon-proof sides and heavy guns, but the war closed without a test of the fortifications and before the frigate was ready for action.

In 18 1 7 the Erie Canal was begun and the first line of trans- Atlantic packet-ships was established. The canal, opened in

1825, insured the commercial supremacy of New York among American cities. The years immediately following the close of the second war with Great Britain also mark the beginning of a rapid increase in the number of European immigrants, and this stream of immigration, rising to a flood in the fourth decade and continuing high throughout the century, has been a dominant force in determining the city's social and political conditions. Although the city was a stronghold of the Federalists at the time the National government was organized, the Democrats, owing to the dexterous management of Aaron Burr, were victorious in the elections of 1800 and 1801, and the city has continued to be normally Democratic owing largely to the activities of the Tammany Society or Tammany Hall (q.v.). This organization, founded in 1789, early espoused the cause of the unfranchised inhabitants, attended to the wants of the immigrants in various ways, led the movement for universal manhood suffrage and the election of city officers, and, after the office of mayor became elective (1834) and the last property qualifications for city voters were removed (1842), continued strong by reason of the support of the great mass of foreign-born citizens. Fraud and corruption were resorted to by Tammany, and offices were used for the good of the organization rather than for the good of the city. Socially, the immigrants deluged the city with vice, crime, misery and pauperism. The unsanitary conditions had already caused epidemics of yellow fever in 1795, 1798, 1822 and 1823, and the city was visited in 1832, 1834 and 1849 with epidemics of cholera in which several thousand lives were lost. These scourges together with a fire in 1835, which destroyed the East Side below Wall Street, hastened the construction of works for getting a supply of water from the Croton river. The immigrants repre- sented various nationalities and religious

sects, and from 1830 to 1871 the city was frequently disturbed by riots arising usually from national or religious antipathy. During the first mayoralty election (1834) there was rioting; and there were an abolitionist riot in the same year, a flour riot during the financial panic of 1837, and labour riots from time to time which were suppressed by the police. In 1857 the state legislature established a state or ” metropolitan ” police for the better protection of the city. The mayor, Fernando Wood, contending that the act was unconstitutional, resisted with the old municipal police, and another serious riot had begun when the Seventh Regiment of state troops compelled obedience; later, too, the court of appeals decided against the mayor.

Wood was still mayor at the outbreak of the Civil War, and in January 1861 he proposed to the Common Council that Man- hattan Island, Long Island and Staten Island should secede and constitute a free city, to be named Tri-Insula. The Council approved. But when, in April, the city had been aroused by the bombardment- of Fort Sumter the majority of the Democrats joined with the Republicans in discarding the proposal and in support of the Union. The native-born and loyal citizens joined the Union army in such large numbers that the city was left with inadequate protection from such of its inhabitants as had often constituted the mob. In this state of affairs the drafting of men for the army was begun in July 1863 in con- formity with an act of Congress which exempted from its opera- tion all who should make a money payment of $300. The New York proletariat and unscrupulous politicians complained that the measure was peculiarly oppressive to the poor, and the rioting with which it was resisted was protracted and bloody. The rioting began the 13 th of July and continued for nearly five days. More than fifty buildings were burned. The mob was especially furious against negroes, a number of whom were hanged or beaten to death. The police fought bravely but were unequal to the emergency, and order was restored only after several regiments had returned to the city and had killed at least 500 of the rioters. In 1871 Irish Catholics threatened to prevent the Orangemen from parading the streets on the anniversary of the Battle of Boyne (12th of July). The superintendent of police also issued an order on the preceding day prohibiting the parade. Public opinion, however, was so strong in favour of the Orangemen that the order was revoked, and five regiments of

militia were called out to protect the parade before it started; at the first assault the mob was scattered by a volley which killed 51 persons. The militia suffered a loss of three killed and several wounded.

The character of the population did not improve speedily, for while immigrants were coming in great numbers a large portion of the saving middle class was removing to the suburbs; and although Tammany Hall was discredited during the Civil War, it gained control of the state as well as the city government soon after the war. William M. Tweed, its ruler, organized the ” Tweed Ring ” which was plundering the city on a gigantic scale, when in 1871 its operations were exposed by the New York Times. The thefts of the ” Ring ” amounted to many millions of dollars, those in the erection of the county court house alone to $8,000,000. Several of the malefactors were sent to prison and Tweed himself died there. Tammany, however, was victorious again in the second election (1874) after Tweed’s fall, and in 1884, when rival companies were seeking to obtain a franchise for working a street railway on Broadway, this privilege, so valuable that the city could have sold it for millions of dollars, was given away by the aldermen; and it was after- wards proved that a number of them had shared a cash bribe of $500,000. Some of them were subsequently punished, but Tammany’s power was not seriously impaired. In 1874 the city’s corporate limits were extended to include about 13,000 acres across the Harlem river: in 1895 there was a further extension in the same county to the southern borders of Yonkers and Mt. Vernon; and in 1898 all of Kings county, all of Richmond county (Staten Island) and a portion of Queens county were consolidated with it. As Tammany’s stronghold was in Manhattan, the annexation of these districts diminished the difficulty of holding Tammany in check, or of defeating it at the polls whenever the anti-Tammany forces united as a consequence of a notoriously corrupt administration. In 1894 an investigation of the state Senate brought to light some of the facts respecting an elaborate system of blackmail which had grown up under the joint protection of Tammany Hall and the city government. Under this system large sums were paid for appointments to office and promotions, and money was collected regularly from the keepers of gambling houses, houses of ill- fame and other disorderly resorts, and from liquor sellers for permission to violate certain details of the excise laws, such as midnight and Sunday closing. There followed a great outcry against Tammany and it was driven from power for three years. During the reform administration, Colonel George Edward Waring (1833-1898), as head of the street cleaning department, quite revolutionized New York as respects cleanliness. The police service and the school system were also much improved. Tammany was successful in the election of 1897 when the opposi- tion was divided. It again abused its power and was defeated in 1901. In 1903 and 1905 the Tammany ticket was elected, but the mayor, George Brinton McClellan, administered the govern- ment,

especially during his second term (1906-1910), independ- ently of Tammany Hall. With the exception of the mayor the Tammany ticket was defeated in 1909, and the mayor, William Jay Gaynor (b. 1 8 5 1) , was little in sympathy with Tammany Hall, having been nominated apparently for the purpose of insuring the election of loyal Tammany men on the county ticket.

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NEW ZEALAND, a British colonial Dominion (so named in 1907), consisting mainly of a group of islands lying in the south Pacific between 34° 25′ and 47° 17′ S., and between 166 26′ and i78°36′ E. The group is situated eastward of Tasmania and Victoria, and Wellington, its capital and central seaport, is 1204 m. distant from Sydney. Of certain outlying clusters of small islands belonging to the

colony, the Chathams (356 m. E. of Cook Strait), Aucklands and Campbell Island are alone of any value. All these are grassy and the Chathams are inhabited by sheep-farming colonists. The Aucklands contain two of the finest harbours in the Pacific. Six hundred miles north of Auckland, the volcanic Kermadecs, covering 8208 acres, are picturesquely clothed with vegetation. In Polynesia a number of inhabited islands were brought under New Zealand control in 1893. Rarotonga and Mangaia, in the Cook group, and Niue or Savage Island are the largest of these; Penrhyn and Suwarrow, though but small coral atolls, contain excellent harbours. Rarotonga is hilly, well watered, and very beautiful. Apart from these little tropical dependencies New Zealand has an area of 104,471 sq. m., of which its two important islands, called North and South, contain 44,468 and 58,525 respectively, while, divided from South Island by Foveaux Strait, Rakiura or Stewart Island, mountainous and forest-clad, contains 621 sq. m. These three form a broken chain, North and South Islands being cut asunder by Cook Strait, a channel varying in width from 16 to 90 m.

North Island is 515 m. long and varies in breadth from 6 to 200 m. It is almost cleft in twain where the Hauraki Gulf penetrates to within 6 m. of Manukau Harbour. From the isthmus thus formed a narrow, very irregular peninsula reaches out northward for some 200 m., moist and semi-tropical, and beautiful rather than uniformly fertile. Rich strips of alluvial soil, however, seam a cold clay-marl, needing intensive cultivation to become highly productive. Buried in this clay-marl are found large deposits of the fossil resin which becomes the kauri gum of commerce; and on the surface extensive forests are still a great though diminishing source of wealth. Though a species of mangrove fringes much of this peninsula, its presence does not denote malaria, from which the islands are entirely free.

South of the isthmus aforesaid, North Island rapidly broadens out. Its central physical feature is the unbroken mountain chains running N.E. from Cook Strait to East Cape on the Bay of Plenty, ranges seldom under 3000 ft., but never attaining 6000 ft. in height. Ikurangi, their highest summit, though a fine mass, does not compare with the isolated volcanic cones which, rising W. of the main mountain system and quite detached from it, are among the most striking sights in the island. Ruapehu (9100 ft.) is intermittently active, and Ngauruhoe (7515 ft.) emits vapour and steam incessantly. Egmont (8340 ft.) is quiescent, but its symmetrical form and dense clothing of forest make it the most beautiful of the three. North of the two first-mentioned volcanoes Lake Taupo spreads over 238 sq. m. in the centre of a pumice-covered plateau from 1000 to 2000 ft. above the sea; and

round and beyond the great lake the region of the thermal springs covers 5000 sq. m. and stretches from Mount Ruapehu to White Island, an ever-active volcanic cone in the Bay of Plenty. The most uncommon natural feature of the district, the Pink and White Terraces, was blown up in the eruption of Mount Tarawera in 1886, when for great distances the country was buried beneath mud and dust, and a chasm 9 m. long was opened in the earth. Fine lakes and waterfalls, in- numerable pools, in temperature from boiling-point to cold, geysers, solfataras, fumaroles and mud volcanoes still attract tourists in large numbers. The healing virtue of many of the

springs is widely known. The government maintains a sanatorium at Lake Rotorua, and there are private bathing establishments in other places, notably near Lake Taupo. In South Island there are hot pools and a state sanatorium at . Hanmer Plains. Experience shows that the most remarkable cures effected by the hot waters are in cases of gout, rheumatism, diseases of the larynx and in skin disorders. Though, thanks to the overlaying porous pumice, the Taupo plateau is not fertile, it has a good rainfall and is drained by unfailing rivers running through deep terraced ravines. The Waikato and Waihou flow N., the Rangitaiki N.E., and Mokau, Wanganui and Rangitikei W. or S. W. The first named, the longest river in the colony, though obstructed by a bar like all western, — and most eastern, — New Zealand rivers, is navigable for some 70 m. The Mokau and Wanganui run between ferny and forest-clad hills and precipices, often of almost incomparable beauty.

East of the Taupo plateau and south of Opotiki on the Bay of Plenty the steep thickly-timbered ranges held by the Uriwera tribe still show scenery quite unspoiled by white intrusion. On the southern frontier of this mountainous tract Waikare Moana extends its arms, the deepest and most beautiful of the larger lakes of the island.

From the mouth of the Waikato southward to about 25 m. from Cape Terawhiti on Cook Strait, and for a distance of from 20 to 40 m. inland, the western coast skirts fertile country well fitted for grazing and dairy-farming, to which it is being rapidly turned as the timber and fern are cleared away from its low hills, downs and rich valleys. On the east coast the same fertility is seen with less forest, and, round Hawkes Bay, a hotter and drier summer. In the south centre, the upland plain of the Wairarapa, ending in a large but commonplace lake, has a climate adapted for both grazing and cereals. The butt-end of the island, of poor, rough, wind-beaten hills, is redeemed by the fine harbour of Port Nicholson, which vies with the Waitemata in utility to New Zealand commerce. Broken as is the surface, poor as is

the soil of certain tracts, there is but little of the island which will not ultimately be cultivated with profit as pumice and clay-marl yield to labour. Everywhere the settler may count on a sufficient rainfall, and — except on the plateau and the mountain highlands — mild winters and genial summers. The pleasant climate has certain drawbacks; the coastal farmer finds that blights and insect pests thrive in the comparative absence of hard frosts. Fortunately mosquitoes are not a serious plague outside a few marshy localities. To pass Cook Strait and land in the middle province of South Island is to pass from Portugal to Switzerland, a Switzerland, however, with a sea- coast that in the east centre is a dull fringe of monotonous sand dunes or low cliffs. As a rule, nevertheless, the shores of South Island are high and bold enough. They are not too well served with harbours, except along Cook Strait, in Banks Peninsula, and by the grand but commercially useless fjords of the south-west. In the last-named region some fifteen salt-water gulfs penetrate into the very heart of the mountains, winding amid steep, cloud- capped ranges, and tall, richly-clothed cliffs overhanging their calm waters. The dominating features of south New Zealand are not ferny plateaus or volcanic cones, but stern chains of mountains. There the Southern Alps rise range upon range, filling the whole centre, almost or quite touching the western shore, and stretching from end to end of the island. West of the dividing crest they are forest clad; east thereof their stony grimness is but slightly softened by growths of scrub and tussock grass. Nineteen-twentieths of the colonists, however, live east of the dividing range, for to that side settlement was attracted by the open, grassy character of the country. The rivers are many, even on the drier eastern coast. But, as must be expected in an island but 180 m. across at the widest point and yet showing ridges capped with perpetual snows, the rivers, large or small, are mountain torrents, now swollen floods, anon half dry. Almost useless for communication or transport, they can be easily drawn upon for irrigation where, as in the east centre, water-races are useful. The largest river, the Clutha, though but 80 m. long in its course to the south-east coast, discharges a volume of water

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estimated at nearly 1,100,000 cubic ft. a minute. On the west the only

two rivers of importance are the Buller and the Grey, the tormer justly famous for the grandeur of its gorges. Large and deep lakes fill many of the mountain valleys. Te Anau and Wakatipu (54 m. long) are the chief, though Manapouri is the most romantic. Aorangi (Mt. Cook) is easily first among the mountain peaks. Its height, 12,349 ft., is especially impressive when viewed from the sea off the west coast. On the north-east a double range, the Kaikouras, scarcely fall short of the Southern Alps in height and beauty. Apart from the fjords and lakes the chief beauties of the Alps are glaciers and waterfalls. The Tasman glacier is 18 m. long and has an average width of 1 m. 15 chains; the Murchison glacier is 10 m. in length. To the west of Aorangi glaciers crawl into the forest as low as 400 ft. above sea-level. Among waterfalls the Sutherland is 1904 ft. high, but has less volume than the Bowen and others. The finest mountain gorge, the Otira, is also the chief route from the east to the west coast. It begins on the western side of Arthur's Pass, a gap the floor of which is 3100 ft. above the sea. Generally the open and readily available region of South Island extends from the Kaikouras along the east and south-east coast to the river Waiau in Southland. It has a mean breadth of some 30 m. In compensation the coal and gold, which form the chief mineral wealth, are found in the broken and less practicable west and centre, and these portions also furnish the water-power which may in days to come make the island a manufacturing country. _ (W. P. R.)

Geology. — New Zealand is part of the Australasian festoon, on the Pacific edge of the Australasian area. Unlike Australia, its geological structure is unusually varied, and owing to its instability, it includes, for its size, an unusually complete series of marine sedimentary rocks. It has, moreover, been a volcanic area of long-continued activity. The physical geography of New Zealand is closely connected with its geological structure, and is dominated by two intersecting lines of mountains and earth movements. The Southern Alps, the back- bone of the South Island, rest on a foundation of coarse gneisses and schists, that are quite unrepresented in the North Island. The continuation of this line of old rocks is occupied by the basins of the Wanganui river and Taupo. E. Suess therefore suggested that the northern continuation of the Alps had foundered, and its summits been buried beneath the Pliocene marine rocks of the Wanganui basin and the volcanic rocks of the Taupo area.

The oldest rocks are Archean, represented by the band of gneisses and schists exposed along the western foot of the Southern Alps. To the south of the district in southern Westland, where the Alps have passed out to sea, the Archeans become more extensive; for they spread eastward and underlie the whole of the dissected table- land of Otago.

It has been suggested that the jasperoids and diabases of the Tarawera Mountains on the North Island may be of Upper Archean age, from their resemblance to the Heathcotian rocks of Australia. No Cambrian rocks have as yet been discovered, but the Ordovkian system is represented by the Aorere beds in the north-western part of the South Island. Here they contain numerous graptolitcs, including Tetragraptus, Dichograplus and Didymograptus. The Silurian system is represented by the Baton river beds to the west of the Aorere beds, occurring in the basin of the Motueka river, which flows into Tasman Bay. The Devonian system is well ex- posed ir. the Reefton mining field. The Carboniferous system includes either the whole or a large part of the Maitai beds. The Maitai beds include a thick mass of slates and sandstones, which form the bulk of the Southern Alps, whence branches extend south- eastward to the coast. The beds take their name from the Maitai river near Nelson; they are largely developed in the mountains of the Tararua-Ruahine-Raukumara chain, on the eastern side of the North Island; they occur in the Kaikoura Mountains, and an outlier forms Mount Torlesse, near the eastern edge of the Southern Alps, west of Christchurch. The Maitai beds have generally been considered to be Carboniferous from the presence of species of Productus found in the Permo-Carboniferous of New South Wales. But Professor Park has obtained Jurassic fossils in the Maitai series; so that it will probably be ultimately divided between the Carboniferous and Jurassic. The two systems should, however, be separable by an unconformity, unless the Maitai series also includes representatives of the Kaihiku series (the New Zealand Permian), and of the Wairoa series, which is Triassic

New Zealand includes representatives of all the three Mesozoic systems. The Hokanui group comprises the Triassic Wairoa and Otapira beds, and the Jurassic Mataura beds. The Wairoa series includes marine limestones characterized by Monotis salinaria, and the Otapira series is characterized by Spiriferina spalulata. The Mataura beds are largely of estuarine formation; they contain oil 6hales and gas springs. The Cretaceous system includes the Waipara series, a belt of chalky

limestones with some phosphate beds at Clarendon in eastern Otago. Their fossils include belemnites, ammonites, scaphites and marine saurians, such as Cimoliosnurus. These Cretaceous limestones are interbedded with glauconitic greensands, as at Moeraki Point in eastern Otago. The second type, of Cretaceous is a terrestrial formation, and is important as it contains the rich coal seams of Greymouth, Westport and Seddonville, which yield a high quality of steam coal. Cretaceous coals have long been worked in the North

Island, north of Auckland, on the shores of the Bay of Islands, where the age of the coal is shown by its occurrence under the Whangarei or Waimio limestone.

The Cainozoic system is represented by Oligocene, Miocene, Pliocene and Pleistocene beds. The best-known Oligocene rocks are the limestones of Oamaru and the brown-coal measures of Waikato. The Oamaru limestones have been largely used for building stones; they are a pure white limestone, largely made up of f oram inif era, bryozoa and shell fragments, and contain the teeth of sharks (e.g. Carcharodori) and of. toothed whales such as Squalodon serratus. In southern Otago the Oligocene beds are brown coals and lignites with oil shales, which, at Orepuki, contain 47% of oil and gas, with 8% of water. The Miocene Pareora beds occur to

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Devonian and Lower Palaeozoic

Archean

the height of 3000 or 4000 ft. above sea-level, in both the North and South Islands. Some of its fossils also occur in the Oamaru series, but the two series are unconformable. In Westland the Miocene includes the Moutere gravels, which rest on the summit of Mount Greenland, 4900 ft. above sea-level.

Marine beds of the Pliocene are best developed in the Wanganui basin. They consist of fine clays with nodular calcareous concretions rich in fossils. The Pleistocene system in the South Island includes glacial deposits, which prove a great extension of the New Zealand glaciers, especially along the western coast. The glaciers must have reached the

sea at Cascade Point in southern Westland. On the eastern side of the Alps the glaciers appear to have been confined to the mountain valleys. The Pleistocene swamp deposits are rich in the bones of the moa and other gigantic extinct birds, which lived on until they were exterminated by the Maori. The Cainozoic volcanic history of New Zealand begins in the Oligocene, when the high volcanic domes of Dunedin and Banks Peninsula were built up. The Dunedin lavas including tephrites and kenytes correspond to the dacite eruptions in the volcanic history of Victoria. The building up of these domes of lavas of intermediate chemical type was followed by the eruption of sheets of andesites and rhyolites in the Thames

Goldfield and the Taupo volcanic district. The volcanic activity of the Taupo district lasted into the Pleistocene, and the last eruptions contributed many of its chief geographical features. 1 (J. W. G.)

Climate. — Diversity of level and latitude cause many varieties of ciimate in the South Island provinces. The height and regularity of the mountain backbone increase the diversity. Only one pass, the Haast (1716 ft.), crosses from E. to W. at a less height than 3000 ft. Along the whole west coast the climate resembles nothing in the British Islands so much as Cork and Kerry, for there are the same wet gales from a western ocean, the same clouds gathering on the dripping sides of wild mountains, an equal absence of severe frosts and hot sunshine, and a rich and evergreen vegetation. Elsewhere, sheltered Nelson has a more genial air than the Wellington side of Cook Strait. Foveaux Strait is as cold and windy as the Strait of Dover. The Canterbury plain has but 26 ins. of annual rainfall, less than a fourth of that along the western littoral. Very seldom indeed is moisture excessive in the eastern half; there is even a deficiency in unfavourable years, and dry, warm winds do damage to crops. Insect life is relatively not abundant ; the air is brisk and bright with ample sunshine. The snow-line, which is at 3000 ft. on the eastern flank of the Alps, is 3700 ft. on the western.

The healthiness of the New Zealand climate in all parts is attested by the death-rate, which, varying (1896-1906) from 9 to 10-50 per 1000, is the lightest in the world. In 1896 it was as low as 9-10. In 1907, however, it was 10-91, the highest figure since the year 1883. Even in the boroughs the average is below 13. The rainfall in most of the settled districts ranges from 30 to 50 ins. a year. Meteorological

statistics are collected at Auckland, Wellington, Christchurch, and Dunedin and eight other stations; and observations of rainfall, temperature, and wind-directions are received from eighteen stations of the second class. From the data thus obtained an isobaric map and a report are prepared for each day; and weather warnings are telegraphed to any part of the coast when necessary. A system of inter-colonial weather exchanges has been agreed upon, and telegrams are daily exchanged between Sydney and Wellington.

Flora. — There are about one thousand species of flowering plants, of which about three-fourths are endemic. Most of those not peculiar to the country are Australian; others are South American, European, Antarctic; and some have Polynesian affinities. Ferns and other cryptogamic plants are in great variety and abundance. The New Zealand flora, like the fauna, has been cited in support of the theory of the remote continental period. In appearance the more conspicuous flora differs very greatly from that of Australia, Poly- nesia, and temperate South America, and helps to give to the scenery a character of its own.

The early colonists found quite half the surface of the archipelago covered with dense, evergreen lorest, a luxuriant growth of pines and beeches, tangled and intertwined with palms, ferns of all sizes, wild vines and other parasites, and a rank, bushy, mossed undergrowth. Though much of the timber is of commercial value — notably the kauri, totara, puriri, rimu, matai and kahikatea — this has not saved the forests from wholesale, often reckless, destruction. Two-fifths perhaps have already disappeared, and it is probable that in fifty years the only large tracts still standing will be sub-alpine woods and in state reserves. Meanwhile charred and rotting stumps give a melancholy and untidy air to valleys and denuded hillsides, for hard-wood stumps — and most New Zealand trees are hard-wood — take more than a generation to decay utterly. Compelled by the windy climate the colonists are doing something to repair these ravages by planting European, Californian and Australian shelter- trei-s; but it is only in the naturally open and grassy regions of the east and south-east that settlement as yet improves the landscape. There, before the colonists came, wide sweeps of dull green bracken or wiry yellow-green tussocks seemed bleak and monotonous enough. The swamps covered with flax and giant bulrushes were often re- deemed to the eye by sheets of golden-plumed to6-to6, a kind of pampas grass.

Fauna. — The destruction of the forest is telling fatally on the

1 See the geological map of New Zealand by Sir James Hector (1884).

A brief sketch of its geological history is given by Hutton, Trans. New Zealand Inst. (1899), xxxii. pp. 159-183. Fullest inform- ation about the geology of New Zealand is given in the Reports of Geological Explorations issued by the Geological Survey of New Zealand, and the Annual Reports of the mines department. A bibliography of the chief literature has been compiled by A. Hamilton, Trans. New Zealand Inst. (1903), xxxv. 489-546.

native avifauna. In their natural state the islands were without land mammals, and the Polynesian immigrants brought but two in their canoes — a dog, now extinct, and a black rat, now rarely seen. Until recent years the forest birds did much to atone for this de- ficiency, for among them the tui and makomako rank high as songsters, while the apteryxes, kakapo, weka and stitch-bird are of peculiar interest to science. The importation of stoats and weasels, ferrets and cats has resulted in a process of extermination which has already made it necessary to set aside the islets Resolution, Kapiti and Little Barrier as sanctuaries. The place of the vanishing native species is being taken by such European arrivals as sky-larks, finches, blackbirds, sparrows and rooks. Outside the forest country the weka, an almost wingless bird, is numerous, and in the Alps a hawk-like green parrot, the kea, has learned to kill sheep and holds its ground. The pukeko, a handsome rail, abounds in swamps. The native wild ducks are carefully preserved for sportsmen, in whose interests pheasants, red and fallow deer, and brown and rainbow trout have been very successfully acclimatized. Acclimatization, indeed, had played a chief part in the settlement of New Zealand. Coming to a country without useful animals, cereals, rich grasses or fruit trees, the colonists had to bring all these necessaries with them. So far acclimatizers note but few failures; the chief case is that of the salmon. Again and again salmon have been successfully hatched out into rivers, but the young fish hastening down stream to the sea never return thence. This is all the more unfortunate as eels were the only large edible creatures found in the fresh-water lakes and rivers. Tidal waters furnish minute whitebait, and the mud-flats of salt or brackish lagoons and estuaries flounders — both very delicate eating. Oysters, both mud and rock, are good and plentiful. A strange visitor, the frost-fish, never seen at sea, is picked up stranded on sandy beaches in cold weather, and is prized by epicures. The snapper is at once the handsomest and most palatable of a good variety of sea fish. Sharks are found everywhere and are common round the north, though they rarely attack man. The albatross is of course the most conspicuous sea bird. Penguins are found, confined to the islets of the far south. As some com- pensation for its paucity of useful animals and food plants, New Zealand was, of

course, free from wild carnivora, has no snakes, and only one poisonous insect, the katipo, a timid little spider found on certain sea-beaches. Of poisonous plants only the berries of the tutu and the karaka are worth notice. The wild dogs and pigs which now sometimes prey on the sheep-farmers' lambs in outlying districts are the descendants of domestic animals which have escaped into the " bush." Among imported pests the rabbit and sparrow, and a numerous company of European and American thistles and other weeds, have to be systematically contended with. The formidable increase of the rabbit has been arrested, mainly by poison and wire-netting fences.

Population. — In January 1840 there may have been 2000 whites in New Zealand. By 1861 the number was still slightly under 100,000. During the next twenty years the gold dis- coveries, the public works expenditure, and the development of agriculture, multiplied the number of colonists five times to 498,000 in April 1881. Then increase slackened for many years, and was slowest between 1886 and 1891, when the ad- dition was but 48,000 in five years. In 1901 the whites numbered 773,000; and between that year and the census computation in April 1906 the increase, 115,859, was the largest yet recorded in any quinquennium. In the middle of 1908 the official estimate of white inhabitants was 950,000.

The white population, about nine to the square mile, is very unevenly distributed. In the South Island nine-tenths of the colonists live within 40 m. of the east and south-east coasts; in the North Island the eastern and northern parts of Wellington province, and the southern and broadest part of Auckland province are still very scantily peopled. For all that, Auckland and Wellington are the most populous of the larger districts, while Nelson, Westland and Marlborough have for a long time shown the slowest increase.

Males still exceed females in the proportion of nine to eight. About 70% of the population is New Zealand born. The white foreign element is smail; what there is is chiefly Scandinavian, German and Dalmatian. Among the foreigners males greatly outnumber females; even in the case of the German settlers the proportion is two to one.

Between 1880 and 1892 the birth-rate fell by no less than 12-95 points — rather more than 1 a year. It continued to fall for seven years more, though at a much reduced rate, and finally reached 25-12 in the year 1899. In the next eight years there was a slow recovery to 27-30 in 1907. Thanks, however, to the low death-rate, elsewhere referred to, the margin of

increase in New Zealand is over 17. To that, and to the annual gain by immigration, the fairly rapid rate of increase is due. Between 1885 and 1891 the colony lost more than it gained oversea; but from 1892 to 1908 the gain by immigration was 90,000. Probably, at least half of these represent Australians, impelled to emigrate by years of drought. England and Scotland supply the bulk of the remainder. The government has aided immigrant farmers and farm labourers having a certain sum of money, also female domestics, by paying part of their passage money.

The people of colour in 1906 numbered 53,000, including 2300 Chinese and 6500 Maori half-castes. An apparent increase of 7000 in the Maori and half-castes between 1891 and 1906 is, perhaps, partly due to more accurate computation. It seems probable that the number of Maori and half-castes taken together is about the same as it was thirty years ago, though the infusion of white blood is larger. The Public Health Department has exerted itself to improve the sanitation of native villages and combat the mischievous trickery of Maori wizards and

” doctors.”

Wealth. — The increase of wealth went on after 1879 in spite of dull times, and was only checked by the especially severe financial depression of 1893 and 1894, caused by low prices and the Australian bank panic. The estimated private wealth of colonists fell from £236 per head in 1890 to £219 in 1895. It was computed in 1905 to have reached £292. After deducting debts owing abroad the public and private wealth of the colony is calculated to be about £270,000,000.

Of the five banks of issue doing business in the dominion three are Australian and New Zealand institutions. Their deposits exceeded £21,000,000 in 1907, as against £12,250,000 in 1890. At the same date more than £10,000,000 stood to the credit of small depositors in post office and private savings banks, nine-tenths in the former. The gross amount insured by policies in life insurance offices (ordinary and industrial) was over £29,000,000, of which the state office claimed two-fifths.

Trnde. — The growth of sea-trade in recent years is shown by the larger size of the ocean-going vessels trading with the colony. The

number of these only advanced from 589 to 629 between 1896 and 1906. But the increase of tonnage in the eleven years was from 614,000 tons to 1,243,000; while the crews rose from 20,000 to 32,500. The coasting trade and trade with Australia are carried in New Zealand-owned vessels.

External trade has risen from £13,111,000 in 1887 to £37>37 T ,ooo in 1907. Before 1886 exports exceeded imports; but in the twenty subsequent years there was an invariable excess of exports, valued in all at £52,000,000.

The re-export trade is stationary and extremely small. Trade with the United States grew from £877,000 in 1891 to £2,140,000 in 1907. Thanks to the tariff of the United States the balance of trade with North America is heavily against New Zealand. The same dis- parity is shown in her trade with Germany, which is, however, much smaller — less than half a million. Trade with India and Ceylon reached £557,000 in 1 906; that with Fiji and other Pacific islands was £622,000 in 1900. With these exceptions New Zealand trade is almost all done with Australia (£5,348,000 in 1907) and the United Kingdom; the latter's share in 1906 was £26,811,000 of the whole.

Production. — Wool (£4,250,000 to £7,657,000 according to prices) remains at the head of the list of exports. The quantity grown in- creased by 70% in the twenty years 1887-1906. Moreover the export of sheep skins and pelts was valued at £680,000 in the last- mentioned year. But the description changes; there is much less merino, and more of the coarser and longer cross-bred. The number of sheep has increased from 16,564,000 in 1886 to 22,000,000 in 1908, though the increase has been almost all in North Island. The number of the flocks grows, and the average size diminishes even more rapidly. There were 9149 flocks in 1886; in 1906 the number had risen to 18,500 — average size of each flock about 1050. The smaller size of the flocks and the breeding of sheep for meat rather than for wool, the cultivation of English grasses and of extensive crops of turnips and other roots on which to fatten sheep and lambs, all tend to change sheep-farming from the mere grazing of huge mobs on wide, unimproved runs held by pastoral licences. The " squatters " still occupy eleven million acres, but even these are more closely sub- divided than in former days. How much more extensive is grazing — of the more scientific order — than agriculture, is seen at once from the figures of the amount of land broken up, for crops or other purposes, and the amount under sown grasses. There were about 1 ,600,000 acres under crop in 1899. This is exclusive of the vast area of native-grass land. The area now occupied and utilized by whites is

about 38,000,000 acres.

The character of the soil and the moist cool climate enable English grasses to be sown almost everywhere, and 13,000,000 acres are now laid down with these. The result is seen in the price obtained for New Zealand sheep in Smithfield Market, which is from fd. to id.

per lb higher than that given for frozen mutton from other countries. The figures below show the growth of the trade:

Export of Frozen Meat.

Year.

lb.

Year.

ft.

1882 1891

1,707,328 110,199,082

1901

| 1907

208,045,000 263,738,496

In the market for frozen lambs the colony remains at present without a rival. Frozen beef is also sent to England. In 1907 the export of frozen meat was valued at £3,420,000. The export of butter and cheese has risen in value from £207,687 in 1890, till in 1907 that of butter amounted to £1,615,000. In London, New Zealand cheese fetches as high a price as Canadian; the value of the cheese ex- ported was £662,000 in 1907. Though not yet quite equal in im- portance to wool or frozen meat, dairy-farming is almost entirely carried on by small farmers and their families, who supply milk to factories. Most of these are co-operative, their shareholders being the farmers themselves. The profits of the industry are thus widely distributed among the producers. The development of dairy- farming has led to the spread of settlement, especially in the west of North Island, where large tracts of fertile soil formerly covered with forest have now been cleared and converted into dairy-farms. Of 1,850,000 cattle in the colony, two-sevenths are dairy cows.

The importance of hemp as an export — increasing from £26,000 in 1898 to £832,000 in 1907 — has led to improvements in cleaning and grading it. In consequence its price in London nearly approaches that paid for manila.

Mining. — The export of gold, which was £1,220,000 in 1880, did not exceed that figure until 1898, and, indeed, fell below three- quarters of a million in 1887. Then gold-mining, after being long at a standstill, began again to make headway. For many years the surface alluvial mining in South Island became less and less profitable. As in other countries, however, the working of quartz reefs gradually compensated for this. The cyanide process of gold extraction, and the returns obtained by its means from the great Waihi mine in the Upper Thames, caused an outbreak of gold fever, which led to the opening up of a few good and a great many worthless quartz-mines in the Auckland fields. In South Island the river-beds of Otago province have been successfully worked by means of dredges, and good returns secured. In 1907 the gold exported was valued at £2,027,000. The total value of the gold exported from New Zealand from the discovery of the metal in 1857 to 1907 was, roundly, £70,000,000. Kauri gum still holds its place as an export, over £500,000 worth being dug up annually. The number of Istrians and Dalmatians who came from the Adriatic to dig for kauri gum led to the passing of restrictive laws.

The progressive output of coal from 1880 to 1900 is shown below.

Year.

1880 1890 1900 1907

Raised in the Colony.

Tons.

299,923

637,397

1,093,990

1,831,009

Imported.

Tons.

123,298 110,939 124,033

Exported. 1

Tons.

7,021

33,404 36,699

Four-sevenths of the coal is bituminous.

1 Excluding Coal for Fuel by Ocean Steamers.

Excellent as the quality of the best New Zealand coal is, the cost oi mining and shipping it prevents the growth of any considerable export trade. Silver is chiefly extracted in the Thames district, but other mines containing silver ores have been found. There are many other valuable ores — copper, iron, lead, zinc, antimony, chrome and manganese. Petroleum springs have been tapped near New Plymouth. Building stones of various kinds and of excellent quality abound. Marble and cement stones occur in many places. There are extensive deposits of iron-sand on the west coast of the North Island, and of iron ore at Parapara in Nelson.

Manufactures. — Protected by a tariff wall which was repeatedly heightened between 1879 and 1907, manufactures made considerable progress. At the end of 1885 about 22,000 work-people were being employed in 1946 workshops, and the aggregate output was valued at six millions and three-quarters. Twenty years later the number of establishments was 4186; the number of hands 56,000; and the output twenty-three millions and a half. A small deduction should be made from this apparent increase to allow for a changed system of classification. Male factory hands greatly outnumbered female, standing in the ratio of four to one. Between 1879 and 1895 wages fell. Between 1895 and 1906 they rose 15% on the average among males of all ages, and as much as 30% among women and girl workers. The disproportionate rise in the case of females is probably due to the policy of the industrial arbitration court. The chief factory industries come under the following heads: meat-freezing and tallow; tanning and wool-scouring; flax mills, saw-mills and grain- mills; boots and shoes; woollen and clothing; butter and

cheese; breweries; printing houses; foundries; agricultural imple- ment and machine shops; soap and candle works; coach-building and furniture; gas-works. Except in meat-freezing, wool-scouring, butter- and cheese-making, flax-milling and timber-sawing, manufac- turing is almost entirely for consumption within the colony.

Government. — New Zealand was not colonized in the ordinary manner around one centre. There were in its early years six distinct settlements — Auckland, Wellington, Nelson, New Plymouth, Canterbury and Otago — between which communica- tion was for several years irregular and infrequent. To meet their political wants the Constitution Act of 1852 created them into provinces, with elective councils and superintendents respectively, subordinated to one colonial legislature. In 1876 the provincial system was abolished. The general assembly, as it is called, is composed of the governor, the legislative council, and the House of Representatives. The governor is appointed by the crown, but his salary. £7500, is paid by the colony. The legislative council consists of members appointed for seven years by the governor in council; the number of legislative- councillors stays at or near forty-five. The House of Repre- sentatives consists of eighty members chosen by the electors. The members of both houses are paid. The franchise is adult suffrage, conditional on a previous residence in the colony for a year, including six months in the electoral district for which a claim to vote is registered. Every elector is qualified for election. Four members of the house must be Maori elected by their own race. The duration of the house is for three years, but it is subject to re-election whenever the governor dissolves the general assembly. Legislation is subject to disallowance by the crown, but that power is seldom exercised. Executive administration is conducted on the principle of English re- sponsible or parliamentary government. The government is represented in England by a high commissioner. Local ad- ministration is vested in local elective bodies, such as municipal councils, county councils, road boards, harbour boards, charitable aid boards, and others, with power to levy rates. The colonial revenue is chiefly derived from customs, stamp duties, land tax, income tax, beer excise, postal and telegraphic services, railways, and crown land sales and rents. The proceeds of land sales are applied to surveys and public works. Customs duties, railways and stamps are by far the most important sources of revenue. They yielded £3,103,000, £2,765,000 and £1,550,000 respectively out of a total revenue of £9,056,000 in the financial year 1907-1908. The gross public debt had reached £66,500,000 in 1908. The money has chiefly been spent on railways, tele- graphs, roads, bridges, land purchase from the native tribes and private estate owners, on loans to settlers

and on native wars. The state railways (2500 m.) return about £800,000 after paying working expenses. This does not quite defray the interest on the cost of their construction and equipment, inas- much as it barely comes to 3!% thereon, but rates and fares are deliberately kept low to encourage settlement and com- munication. The debts of the local bodies amount to about nine millions. They raise rather more than a million a year by rates, licence fees and dues.

Education. — Under the Education Act of 1877 state schools are established, in which teaching is free, secular and compulsory, with certain exceptions, for children between the ages of seven and thirteen. A capitation grant is given for every child in average daily attendance at the schools. Grants are also made for scholarships from primary to secondary schools, for training institutions for teachers and for school buildings. Large reserves of public lands have been made for primary, secondary and university education. AH primary' and some secondary public schools are controlled by provincial education boards elected by school committees of the parents of pupils. The percentage of attendance has rivalled that in the primary schools of Scotland, and in 1905 attained to 86-9 %. Native village schools are also provided by the state in native districts. There are, moreover, industrial schools, orphanages and institutions for the deaf and dumb and blind. There are about ninety secondary schools, state-supported or aided by public endow- ments. The university of New Zealand is an examining body, and grants honours, degrees and scholarships. It is empowered by royal charter to confer degrees entitled to rank and consideration throughout the British dominions, as fully as if they were granted by any university in the United Kingdom. Colleges in the four chief towns and in Nelson are affiliated to the New Zealand University,

which has about fifteen hundred undergraduates keeping terfns. The state in no way controls or interferes with religious administra- tion. Each denomination attends to the religious instruction of its own adherents, chiefly by means of Sunday schools, which count 108,000 pupils. Roman Catholics support about 150 clerical day schools attended by about 1 1 ,500 scholars. State school buildings can be, and sometimes are, used for religious instruction on days and at hours other than those fixed by law for ordinary school work; but no child can be required to attend, except at the wish of its parent or guardian. The government spends £35,000 a year on manual and technical instruction, a branch of teaching which includes about two hundred cookery classes. A school of engineering and an agri- cultural college are attached to the university college in the province of Canterbury, and there are several schools of mines elsewhere.

About 157,000 white children and 6500 Maori children attend schools of one degree or another. Private schools claim about 10% of these. The annual parliamentary expenditure on education exceeds £700,000. In this connexion it may be claimed that the proportion of policemen to population (1 to 1375) is lower in New Zealand than in any other colony. The fixing of the legal minimum ” factory age ” for children at fourteen undoubtedly favours school attendance.

Land. — Apart from gold-mining, coal-mining and gum-digging, the industries are still mainly the growing of food and raw material; and the occupation of the land is easily the chief of all economic questions. Sixteen million acres were in 1907 already held in free- hold, as against about six million acres rented from the state on permanent leasehold. Crown lands are still alienated, though but little is now sold for cash outright. The number of holdings of one acre and upwards in size rose from 33,332 in 1886 to 58,904 in 1896, and 72,338 in 1906; but the area held in estates of 5000 acres and upwards remains very large and has diminished but slowly despite the severity of the graduated land-tax. Many interesting experi- ments in settling lands have been tried. The best known of these, perhaps, is the repurchase of large pastoral estates for subdivision and lease in perpetuity. In the fourteen years 1 893-1907 about a million and a quarter acres were thus acquired at a cost of somewhat under five millions and a half. Over 13,000 souls had been settled in this area, and the yearly rent received from them, about £220,000, left a substantial balance to the credit of the enterprise in the books of the treasury. The tenants (who had been favoured with good years) were with very few exceptions prospering.

Old Age Pensions. — The Old Age Pensions law, enacted in 1898, provided for the free grant of pensions, not exceeding £18 a year, to persons of sixty-five years and upwards who had lived for twenty- five years in the colony. Pensioners must be British subjects, poor, and not ex-criminals or of notoriously bad character. In 1905 the maximum pension was raised to £26 a year. Official figures show that the total number of applications for pensions up to that date had been 31,271, of which 23,877 had been granted. The number of pensioners then on the books of the Pensions Office was 13,257. In the first three years after enactment of the law the growth of the number of pensioners was very rapid ; in the next five it was remarkably slow — only 481 altogether. The proportion of whites qualified by age and residence who were actually drawing pensions was rather less than one-third (it had been 9% more in 1902). The reduction was due to stricter administration. The total sum paid out in eight and a quarter years had been a million and three quarters. The amount paid in pensions in

the financial year 1906-1907 was £325,000. The money is found by the central government. The administration of the system, which is in the hands of a special department, costs a little over £5000. Frauds and evasions by applicants and pensioners, though they exist, are not believed to be numerous. Public thrift does not, so far, seem to have been diminished. Since the coming of the system the amount spent on outdoor relief in the colony had by 1906 diminished from £51,000 to £36,500, in face of an increase of nearly 23 % in the population.

History. — The date, even the approximate date, of man's arrival in New Zealand is uncertain. All that can be safely asserted is that by the 14th century a.d. Polynesian canoe-men had reached its northern shores in successive voyages. By 1642 they had spread to South Island, for there Abel Jansen Tasman found them when, in the course of his circuitous voyage from Javainthe" Heemskirk," he chanced upon the archipelago, coasted along much of its western side, though without venturing to land, and gave it the name it still bears. One hundred and thirty-seven years later, Cook, in the barque " Endeavour," gained a much fuller knowledge of the coasts, whi h he circum- navigated, visited again and again, and mapped out with fair accuracy. He annexed the country, but the British government disavowed the act. After him came other navigators, French, Spanish, Russian and American; and, as the 18th century neared its end, came sealers, whalers and trading-schooners in quest of flax and timber. English missionaries, headed by Samuel Marsden, landed in 18 14, to make for many years but

slow progress. They were lundered by murderous tribal wars in which imported muskets more than decimated the Maori. Still, cruel experience and the persevering preaching of the missionaries gradually checked the fighting, and by the year 1839 it could be claimed that peace and Christianity w§re in the ascendant. So far the British government had resisted the considerable pressure brought to bear in Downing Street in favour of annexation. In vain Edward Gibbon Wakefield, organizer of colonizing associations, prayed and intrigued for permission to repeat in New Zealand the experiment tried by him in South. Australia. Lord Glenelg, the colonial minister, had the support of the missionaries in withstanding Wakefield's New Zealand Company, which at length resolved in desperation to send an agent to buy land wholesale in New Zealand and despatch a shipload of settlers thither without official permission. Before, however, the "

Tory ” had thus sailed for Cook Strait, it had become known to the English government that a French colonizing company — La Compagnie N anto-Bordelaise — was forming, under the auspices of Louis Philippe, to anticipate or oust Wakefield. Further obstruction was manifestly futile, and the British authorities reluctantly instructed Captain Hobson, R.N., to make his way to northern New Zealand with a dormant commission of lieutenant-governor in his pocket and authority to annex the country to Australia by peaceful arrangement with the natives. Hobson landed in the Bay of Islands on the 22nd of January 1840, hoisted the Union Jack, and had little difficulty in inducing most of the native chiefs to accept the queen’s sovereignty at the price of guaranteeing to the tribes by the treaty of Waitangi possession of their lands, forests and fisheries. Some French settlers, convoyed by a man-of-war, reached Akaroa in South Island in the May following. But Hobson had forestalled them, and those who remained in the country became British subjects. Meanwhile, a week after Hobson’s arrival, Wakefield’s colonists had sailed into Port Nicholson, and proposed to take possession of immense tracts which the New Zealand Company claimed to have bought from the natives, and for which colonists had in good faith paid the company. Other bands of company’s settlers in like manner landed at Nelson, Wanganui and New Plymouth, to be met with the news that the British government would not recognize the company’s purchases. Then followed weary years of ruinous delay and official inquiry, during which Hobson died after founding Auckland. His successor, Fitzroy, drifted into an unsuccessful native war. A strong man, Captain Grey, was at last sent over from Australia to restore peace and rescue the unhappy colony from bankruptcy and despair. Grey, much the best of the absolute governors, held the balance fairly between the white and brown races, and bought large tracts of land for colonization, including the whole South Island, where the Presbyterian settlement of Otago and the Anglican settlement of Canterbury were established by the persevering Wakefield.

In 1852 the mother-country granted self-government, and, after much wrangling and hesitation, a full parliamentary system and a responsible ministry were set going in 1856. For twenty years thereafter the political history of the colony consisted of two long, intermittent struggles — one constitutional between the central government (first seated in Auckland, but after 1864 in Wellington) and the powerful provincial councils, of which there were nine charged with important functions and endowed with the land revenues and certain rating powers. The other prolonged contest was racial — the conflict between settler and Maori. The native tribes,

brave, intelligent and fairly well armed, tried, by means of a league against land-selling and the election of a king, to retain theirhold over at least the central North Island. But their kings were incompetent, their chiefs jealous and their tribes divided. Their style of warfare, too, caused them to throw away the immense advantages which the broken bush-clad island offered to clever guerrilla partisans. They were poor marksmen, and had but little skill in laying ambuscades. During ten years of intermittent marching and fighting between 1861 and 1871 the Maori did no more than prove that they had in them the stuff to stand up against fearful

odds and not always to be worsted. Round Mount Egmont, at Orakau, at Tauranga and in the Wanganui jungles,,they more than once held their own against British regiments and colonial riflemen. The storming of their favourite positions — stockades strengthened with rifle-pits — was often costly; and a strange anti-Christian fanaticism, the Hau-Hau cult, encouraged them to face the white men's bullets and bayonets. But even their fiercest fighting leaders, Rewi and Te Kooti, scarcely deserved the name of generals. Some of the best Maori fighters, such as the chiefs Ropata and Kemp, were enlisted on the white side, and with their tribesmen did much to make unequal odds still more unequal. Had General Pratt or General Cameron, who commanded the imperial forces from i860 to 1865, had the rough vigour of their successor, General Chute, or the cleverness of Sir George Grey, the war might have ended in 1864. Even as it was the resistance of the Maori was utterly worn out at last. After 1871 they fought no more. The colonists too, taught by the sickening delay and the ruinous cost of the war to revert to conciliatory methods, had by this time granted the natives special representation in parliament. A tactful native minister, Sir Donald McLean, did the rest. Disarmament, roads and land-purchasing enabled settlement to make headway again in the North Island after twelve years of stagnation. Grey quarrelled with his masters in Downing Street, and his career in the imperial , service came to an end in 1868. His successors, Sir George Bowen, Sir James Ferguson, the marquess of Normanby and Sir Hercules Robinson, were content to be constitutional governors and to respect strictly the behests of the colonial office. . Meanwhile the industrial story of New Zealand may be summed up in the words wool and gold. Ex- tremely well suited for sheep-farming, the natural pastures of the country were quickly parcelled out into huge pastoral crown leases, held by prosperous licensees, the squatters, who in many cases aspired to become a country gentry by turning their leases into freeholds. So profitable was sheep-farming seen to be that energetic settlers began to burn off the bracken and cut and burn the forest in the North Island

and sow English grasses on the cleared land. In the South artificial grassing went on for a time hand in hand with cereal-growing, which by 1876 seemed likely to develop on a considerable scale, thanks to the importation of American agricultural machinery, which the settlers were quick to utilize. Even more promising appeared the gold-fields. Gold had been discovered in 1853. Not, however, until 1861 was a permanent field found — that lighted upon by Gabriel Read at Tuapeka in Otago. Thereafter large deposits were profitably exploited in the south and west of South Island and in the Thames and Coromandel districts of the Auckland province. Gold-mining went through the usual stages of alluvial washing, deep sinking and quartz-reef working. Perhaps its chief value was that it brought many thousand diggers to the colony, most of whom stayed there. Pastoral and mining enterprise, however, could not save the settlers from severe depression in the years 1867 to 1871. War had brought progress in the north to a standstill; in the south wool-growing and gold-mining showed their customary fluctuations. For a moment it seemed as though the manufacture of hemp from the native Phormium tenax would become a great industry. But that suddenly collapsed, to the ruin of many, and did not revive for a number of years.

In 1870 peace had not yet been quite won; industry was depressed; and the scattered and scanty colonists already owed seven millions sterling. Yet it was at this moment that a political financier, Sir Julius Vogel, at that moment colonial treasurer in the ministry of Sir William Fox, audaciously pro- posed that the central government should borrow ten millions, make roads and railways, buy land from the natives and import British immigrants. The House of Representatives, at first aghast, presently voted four millions as a beginning. Coinciding as the carrying out of Vogel's policy did with a rising wool market, it for a time helped to bring great prosperity, an influx of people and much genuine settlement. Fourteen millions of borrowed money, spent in ten years, were on the whole well

laid out. But prosperity brought on a feverish land speculation; prices of wool and wheat fell in 18.79 and went on falling. Faulty banking ended in a crisis, and 1879 proved to be the first of sixteen years of almost unbroken depression. Still, eight prosperous years had radically changed the colony. Peace, railways, telegraphs (including cable connexion with Europe) , agricultural machinery and a larger

population had carried New Zealand beyond the primitive stage. The provincial councils had been swept away in 1876, and their functions divided between the central authority and small powerless local bodies. Politics, cleared of the cross-issues of provincialism and Maori warfare, took the usual shape of a struggle between wealth and radicalism. Sir George Grey, entering colonial politics as a Radical leader, had appealed eloquently to the work-people as well as to the Radical " intellectuals," and though unable to retain office for very long he had compelled his opponents to pass manhood suffrage and a triennial parliaments act. A national education system, free, non-religious and compulsory, was established in 1877. The socialistic bent of New Zealand was already dis- cernible in a public trustee law and a state life insurance office. But the socialistic labour wave of later years had not yet gathered strength. Grey proved himself a poor financier and a tactless party leader. A land-tax imposed by his government helped to alarm the farmers. The financial collapse of 1879 left the treasury empty. Grey was manoeuvred out of office, and Sir John Hall and Sir Harry Atkinson, able opponents, took the reins with a mission to reinstate the finances and restore confidence. Roughly speaking, both the political and the industrial history of the colony from 1879 to 1908 may be divided into two periods. The dividing line, however, has to be drawn in different years. Sixteen years of depression were followed, from 1895 to 1908, by thirteen years of great prosperity. In politics nearly twelve years of Conservative government, or at least capitalistic predominance in public affairs, were succeeded by more than seventeen years of Radicalism. Up to January 1891 the Conservative forces which overthrew Sir George Grey in 1879 controlled the country in effect though not always in name, and for ten years progressive legislation was confined to a mild experiment in offering crown lands on perpetual lease, with a right of purchase (1882), a still milder instalment of local option (1881) and an inoffensive Factories Act (1886). In September 1889, however, Sir George Grey succeeded in getting parliament to abolish the last remnant of plural voting. Finance otherwise absorbed attention; by 1880 the public debt had reached £25,000,000, against which the chief new asset was 1300 m. of railway, and though the population had increased to nearly half a million, the revenue was stagnant. A severe property-tax and an increase of customs duties in 1879 only for a moment achieved financial equilibrium. Although taxation was seconded by a drastic, indeed harsh, reduction cf public salaries and wages (which were cut down by one-tenth all round) yet the years 1884, 1887 and 1888 were notable for heavy deficits in the treasury. Taxation, direct and indirect, had to be further increased, and as a means of gaining

support for this in 1888 Sir Harry Atkinson, who was responsible for the budget, gave the customs tariff a distinctly protectionist complexion.

During the years 1879-1890 the leading political personage was Sir Harry Atkinson. He, however, withdrew from party politics when, in December 1890, he was overthrown by the Progressives under John Baliance. Atkinson's party never rallied from this defeat, and a striking change came over public life, though Baliance, until his death in April 1893, continued the prudent financial policy of his predecessor. The change was emphasized by the active intervention in politics of the trade unions. These bodies decided in 1889 and 1890 to exert their influence in returning workmen to parliament, and where this was impossible, to secure pledges from middle-class candi- dates. This plan was first put into execution at the general election of 1890, which was held during the industrial excitement aroused by the Australasian maritime strike of that year. It had, however, been fully arranged before the conflict broke out. The number of labour members thus elected to the general

assembly was small, never more than six, and no independent labour party of any size was formed. But the influence of labour in the Progressive or, as it preferred to be called, Liberal party, was considerable, and the legislative results noteworthy. Baliance at onae raised the pay of members from £150 to £240 a year, but otherwise directed his energies to constitutional reforms and social experiments. These did not interfere with the general lines of Atkinson's strong and cautious finance, though the first of them was the abolition of his direct tax upon all property, personal as well as real, and the substitution therefor of a land- tax of id. in the £ on capital value, and also of a graduated tax upon unimproved land values, and an income-tax also graduated, though less elaborately. The graduated land-tax, which has since been stiffened, rises from nothing at all upon the smaller holdings to 3d. in the £ upon the capital value of the largest estates — those worth £210,000 and upwards. Buildings, improve- ments, and live stock are exempted. In the case of mortgaged estates the mortgagor is exempted from ordinary land-tax in proportion to the amount of his mortgage. On that the mortgagee pays at the rate of fd. in the £. In 1896 municipal and rural local bodies were allowed to levy rates upon unimproved land values if authorized to do so by a vote of their electors, and by the end of 1901 some sixty bodies, amongst them the city of Wellington, had made use of this permission. The income-tax is not levied on incomes drawn from land. In 1891 the tenure of members of the legislative council or nominated Upper House, which had hitherto been for life, was altered to seven years. In

1892 a new form of land tenure was introduced, under which large areas of crown lands were leased for 999 years, at an unchanging rent of 4% on the prairie value. Crown tenants under this system had no right of purchase. In the same year a law was also passed authorizing government to repurchase private land for closer settlement.

On Ballance's sudden death in April 1893 his place was taken by Richard Seddon, minister of mines in the Baliance cabinet, whose first task was to pass the electoral bill of his predecessor, which granted the franchise to all adult women. This was adopted in September 1893, though the majority for it in the Upper House was but two votes. In 1893 was enacted the Alcoholic Liquor Control Act, greatly extending local option. In 1894 was passed the Advances to Settlers Act, under v/hich state money-lending to farmers on mortgage of freehold or leasehold land was at once begun. The money is lent by an official board, which deals with applications and manages the finance of the system. In thirteen years the board lent out over five millions and a half, and received repayment of nearly two millions of principal as well as over one million in interest at 5 %. Borrowers must repay 5 % of their principal half-yearly, and may repay as much more as they choose. Profits are paid over to an assurance fund. No losses were incurred during the thirteen years above mentioned. The net profit made by the board in 1906 was £45,000. The same year also saw the climax of a series of laws passed by the Progressives affecting the relations of employers and workmen. These laws deal with truck, employers' liability, contractors' workmen, the recovery of workmen's wages, the hours of closing in shops and merchants' offices, conspiracy amongst trade unionists, and with factories, mines, shipping and seamen. In 1895 a law controlling servants' registry offices was added. In 1897 all shipowners engaging in the coasting trade of the colony were compelled to pay the colonial rate of wages.

Meanwhile the keystone of the regulative system had been laid by the passing of the Industrial Conciliation and Arbitration Act, under which disputes between employers and unions of workers are compulsorily settled by state tribunals ; strikes and lock-outs are virtually prohibited in the case of organized work-people, and the conditions of employment in industries may be, and in many cases are, regulated by public boards and courts. The years 1896,1897 and 1898 were marked by struggles over the Old Age Pensions Bill, which became law in November 1898. In 1898 the divorce law was amended on the lines of the Stephen Act of New South Wales, a change which helped to treble the number of petitions for divorce in the next seven years. In 1898 also the

municipal franchise, hitherto confined to ratepayers, was greatly widened; in 1900 the English system of compensation to work- men for accidents suffered in their trade was adopted with some changes, one of the chief being that contested claims are adjudi- cated upon cheaply and expeditiously by the same arbitration court that decides industrial disputes. In 1895 borrowing on a larger scale was begun, and in twelve years twice as many millions were added to the public debt. Before this the Ballance ministry had organized two new departments, those of labour and agriculture. The former supervises the labour laws and endeavours to deal with unemployment; the latter has done much practical teaching, inspection, &c. Butter, cheese and New Zealand hemp are by law graded and branded by depart- mental inspectors before export. For some years the government has worked two coal-mines profitably, chiefly to supply its railways. In 1907 the net profit on these was over £8000. The continued success of the government life insurance office led in 1899 to the setting up of an accidents insurance office, and, in 1903, of a state fire insurance office.

The outbreak of the Boer War in October 1899 was followed in New Zealand by a prompt display of general and persistent warlike enthusiasm: politics ceased to be the chief topic of interest; the general election of 1899 was the most languid held for fifteen years. The desire of New Zealanders to strike a blow for the mother-country took the practical shape of despatching to South Africa ten successive contingents.

After gaining office at the beginning of 1891 the Ballance- Seddon party had to struggle with the last four years of the period of depression. In 1895 began a marked commercial revival, mainly due to the steady conversion of the colony's waste lands into pasture; the development of frozen meat and dairy exports; the continuous increase of the output of coal; the invention of gold-dredging; the revival and improvement of hemp manufacture; the exploiting of the deposits of kauri gum; the reduction in the rates of interest on mortgage money; a general rise in wages, obtained without strikes, and partially secured by law, which has increased the spending power of the working classes. Undoubtedly also commercial confidence was restored by the reconstruction in 1895 of the Bank of New Zea land, and activity has been stimulated by large public loans, while more cautious banking and the systems of taxation and rating on land

values, adopted in 1891 and 1896, have done something to check land speculation.

Between 1879 and 1908 seven governors represented the crown in New Zealand. Of these Sir Hercules Robinson and Sir Arthur Gordon had but brief reigns; Sir Arthur Gordon quitted the colony in June 1882. His successor, Sir William Drummond Jervois, arrived in January 1883, and held office until March 1889. The earl of Onslow, who followed, landed in June 1889, and resigned in February 1892. The next governor, the earl of Glasgow, remained in the colony from June 1892 to February 1897, and was succeeded in August of the last-mentioned year by the earl of Ranfurly, who did not retire until 1904. His place was then taken by Lord Plunket. The cabinets which adminis- tered the affairs of the colony during these years were those of Sir Frederick VVhitaker, Sir Harry Atkinson (3), Sir Robert Stout (2), Mr Ballance, MrSeddon, Mr Hall-Jones and Sir Joseph Ward. Mr Hall-Jones's short premiership was an interregnum made necessary by the absence of Sir Joseph Ward in England at the moment of Mr Seddon's death. Except in ore disturbed month, August 1884, when there were three changes of ministry in eighteen days, executives were more stable than in the colony's earlier years. The party headed by Ballance, Seddon and Ward held office without a break for more than seventeen years, a result mainly due to the general support given to its agrarian and labour policy by the smaller farmers and the working classes. Sir Arthur Gordon differed from his ministers — Hall and Atkinson — on their native policy. Lords Onslow and Glasgow came into collision with Ballance over a proposal to nominate a large batch of Liberals to the then Conservative legislative council. The dispute was by consent referred to the secretary for the colonies, and the decision from Downing Street was in Ballance's favour.

The governor's salary, reduced in 1887, was restored to £7500 a year in 1900. An Immigrants Exclusion Act voted by the general assembly in 1896 did not receive the royal assent; but, by arrangement with the colonial office, another measure, giving power to impose a reading test on aliens landing in the colony, became law in 1899.

The presence of New Zealand premiers at the imperial con- ferences in London in 1897, 1903 and 1907 helped to bring the colony into conscious touch with imperial public questions. Among the results were the increase of the naval contribution (first to £40,000 and then, in 1908, to £100,000), and the im- position in 1903 and again in 1907 of severe discriminating duties against imports from foreign countries.

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High Alps of New Zealand by W. S. Green (London, 1883).

(W. P. R.)

NEXT FRIEND, in law, the phrase used for a person who represents in an action another person who is under disability to maintain a suit on his own behalf. This disability arises from infancy or mental incapacity, consequently every application to the court on behalf of an infant or a lunatic must be made through a next friend (prochein amy, proximus amicus). Previous to the Married Women's Property Act 1882 it was also usual for a married woman to sue by a next friend, but that act, allowing a married woman to sue in all respects as a feme sole, has rendered a next friend unnecessary in her case. In the case of an infant the father is prima facie the proper person to act as next friend; in the father's absence the testamentary guardian if any; but any person not under disability may act as next friend so long as he has no interest in the action adverse to that of the infant. A married woman cannot, however, act as next friend. An infant defends a suit, not by a next friend, but by a guardian ad litem. In the case of a lunatic, he sues by his committee, but if he has no committee, or if the committee has some interest adverse to the lunatic, he sues by his next friend. A next friend has full power over the proceedings in the action

as if he were an ordinary plaintiff, but he is not entitled to be heard in person.

NEY, MICHEL, duke of Elchingen, prince of the Moskowa (1769-1815), marshal of France, was born at Saarlouis on the 10th of January 1769. His father was a cooper, and he received only a rudimentary education. In 1788 he went to Metz and enlisted in a regiment of hussars; in 1792 he was elected lieutenant; and in 1794 he became captain and was placed by Kleber at the head of a special corps of light troops. He was soon promoted chefdc brigade, and in 1796, after repeatedly distinguish- ing himself in action, general of brigade. He then commanded the right wing of Hoche's army up to the peace of Campo Formio. On the resumption of hostilities he again took the field, and for his surprise of Mannheim in 1799 received the grade of general of division. He distinguished himself and received three wounds in the Swiss campaign of Massena, and when Massena turned against the Russians, who were approaching from Italy, Ney was left in command of the holding detachment opposite the

Austrians. He displayed great vigour and skill in this work, and was completely successful, although his opponent was the famous Archduke Charles. In 1800 he was present at Hohenlinden. In May 1802 he married Mademoiselle Auguie, whom Josephine had chosen for him at Bonaparte's request. This event marks a change in Ney's political opinions which can only be explained by reference to Napoleon's power of captivating men. He was henceforward as ardent and sincere an admirer of Napoleon as hitherto he had been of revolutionary principles, and was one of the very few officers of the Army of the Rhine who became a trusted lieutenant of the emperor. He soon afterwards carried out an important diplomatic mission in Switzerland, and in 1803 he was placed in command of the camp of Montreuil. It was while there that, in the name of the army, he - begged Napoleon to declare himself emperor, and on the establishment of the empire he was made marshal of France, and received the grand eagle of the Legion of Honour. In 1805 heˆcommanded the VI. corps of the Grand Army, and his great victory at Elchingen (for which in 1808 he was made duke of Elchingen) practically secured the surrender of the Austrians at Ulm. He was then ordered to the upper Adige, and missed the battle of Austerlitz, but was present at Jena and Eylau and led the decisive attack at Friedland. His reputation for personal heroism was by now at its height, and after Friedland Napoleon gave him the title by which he is still known, " the bravest of the brave."

In 1808, after the first disaster to the French arms in Spain, Ney accompanied Napoleon thither as -commander of the VI. corps. He took part in the Peninsular War from 1808 to 1811, commanding his corps in Napoleon's own operations of 1808-09, in the irregular operations in Galicia 1809-10, and under Mass6na in the invasion of Portugal in 1810-11. In the last, however, he quarrelled bitterly with his former chief, and although he distinguished himself very greatly in command of the rearguard during the retreat from Torres Vedras — notably at Redinha — he was recalled to France by Napoleon and censured for his indiscipline. Almost immediately, however, he was re-employed with the Grande Arm.ee in central Europe under Napoleon himself. In the 18 1 2 expedition to Russia Ney commanded the centre at Borodino, and was created prince of the Moskowa on the evening of the victory. In the retreat he was a tower of strength, animating the rearguard with his own sublime courage, keeping the harassed and famished soldiers together under the colours and personally standing in the ranks with musket and bayonet. He himself was the last to recross the frontier, and threw the remaining muskets into the Niemen. In 1813 he commanded a corps in the German

campaign, fought at Liitzen, Bautzen, Dennewitz and Leipzig, and in 1814 he shared in the victories and defeats of the campaign in France. At the fall of the Empire Ney was neither the first nor the last of the marshals to give up the struggle, but that he acted in the negotiations in concert with Macdonald and Caulaincourt is sufficient proof of his desire to avert the unreserved abdication that was forced upon Napoleon by other circumstances. Less satisfactory than his conduct at

this crisis was his loud protestation of devotion to the Bourbons, when the Restoration was a fait accompli. But he was soon mortified by the disdain of the returned emigres, and retired to his country seat. While on his way thence to take up a command at Besancon, he learned of the return of Napoleon. He hurried at once to pay his respects to Louis XVIII. and to assure him of his fidelity. With the famous remark that the usurper ought to be brought to Paris in an iron cage, he proceeded to Lons-le-Saulnier to bar Napoleon's progress. But instead of doing so, he deserted with his troops, and Napoleon's march became a triumphal progress. Ney's act was undeniably treason to his sovereign, but it was hardly the calculated treason that his emigre detractors saw fit to imagine. The first violence of his language,' his ineffective efforts to make constitutional guarantees the price of his adhesion to Napoleon, and his final surrender to the dominant personality of his old leader, all show him to have been " out of his depth " in this political crisis. Napoleon received him kindly, but did not give him a command at first. But when the Waterloo campaign was about to begin he summoned Ney to the northern frontier. The marshal gladly obeyed and took up the command of the left wing on June 13. The next day the army moved into Belgium. Ney took part in the campaign successively in the roles of strategist, tactician and soldier (see Waterloo Campaign). Much con- troversy has raged over his actions of the 15th and 16th of June. At Waterloo he was of course subordinated to the personal com- mand of Napoleon, but his advice as to the conduct of the battle was often offered and sometimes accepted, and he personally led several charges of the French up to the British squares. But when all was lost, his courage, instead of burning brightly as in the Moscow retreat, was extinguished. He made no attempt to second Davout and Grouchy in the last days of Napoleon's reign, and in despair advocated the restoration of the Bourbons. Finding that Louis XVIII. and his allies ignored his advances, he resolved to escape from France, but afterwards, believing himself protected by the terms of the convention concluded on the 3rd of. June, he gave up the idea. Soon a fresh order was issued denouncing him by name, and after a half-hearted attempt to conceal himself he was arrested on the 5th of August. King Louis and his minister Decazes

realized to the full the lasting unpopularity that would fall on the monarchy in consequence; they had done their best to facilitate the escape of the ” traitors ” ; and when Louis heard of Ney’s arrest he exclaimed, “By letting himself be caught he has done us more harm than he did on the 13th of March!” But neither king nor ministers were in a position to resist the clamour of the ultra-royalists for blood. Every fresh delay in the process of Ney’s trial raised a new outcry at the court, in the salons and in the Chamber of Deputies; and fiercest of all in demanding immediate execution was the king’s niece, the unhappy duchess of Angouleme, who lived to confess that had she known the record of Ney’s services to France she would never have consented to his death. The king was powerless against this all but unanimous voice of royalist opinion, backed as it was by that of the powers to whom he owed his crown. Ney was placed on trial before a court- martial composed chiefly of his former brothers-in-arms, whose participation in the tragedy, slight as it was, was probably never forgiven them by their countrymen. Others of the marshal’s old comrades refused to serve, and were disgraced in consequence, until public opinion forced” their reinstatement. The court, once assembled, was only too glad to take advantage of the plea of Ney’s counsel that he was entitled to be tried by his equals in the Chamber of Peers. In spite of the courageous and eloquent appeal of the young due de Broglie, the result of the trial before the latter body was a foregone conclusion; as to Ney’s treason there could be no doubt, and de Broglie was alone in voting for his acquittal. In the early morning of the 7th of December 181 5 Ney was shot in the Luxembourg gardens, near the Observatory. He met his death quietly and with a perfect soldierly dignity that effaced the memory of his political extravagances, and made him, next to Napoleon himself, the most heroic figure of the time. Much has been said as to

the share of the duke of Wellington in the trial and execution, and, rightly or wrongly, he has been blamed for allowing the Bourbons, when restored by the foreign bayonets that he con- trolled, to proscribe the soldiers who as soldiers had been included in the military capitulation to the Allies.

Ney left materials for memoirs, but in an incomplete state. The Mcmoires du marechal Ney, published in 1833, were collected from these papers by his brother-in-law Gamot and by General Foy, They cover only the earlier part of his career, and end with the battle of

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NEZ PERCYS (in allusion to their custom of wearing nose- rings, &c), a tribe of North American Indians of Sahaptian stock. They call themselves Shaptin (whence the stock name) but to other tribes were known as Chopunnish. Their former range was a large tract in eastern Washington and Oregon and central Idaho. Until 1877 they had been at peace with the whites. In 1875 a portion of their reservation having been takenfrom them, owing to the allegation that they had not carried out the treaty stipulations, difficulties arose which, two years later, caused the Xez Purees War. The disaffected portion of the tribe, numbering some 400 or 500, held out for several months against all the forces the government could bring up, but were finally captured on the Sweet Grass Hills, northern Montana. They were placed in Indian Territory, but in 1884 transferred, owing to their decrease through disease,to a healthier locality in northern Washington. The main tribe are on a reservation in northern Idaho.

NGAMI, the central point of an inland water system of South Africa, once forming a lake 20 m. long and 10 wide, but now little more than an expanse of reeds growing in a soft treacherous soil, below which brackish water is found. It is cut by 202° S. and 23° E. Ngami is the lowest point of a large depression in the plateau which comprises nine-tenths of Africa south of the Zambezi. The area which drains to it is bounded S. by the basin of the Orange, E. by the Matabele hills, N. by the western affluents of the Zambezi. The greater part of the Ngami water-system lies, however, X. W. of the lake (which for convenience it may still be called) in the tableland of Angola and German South West Africa. On the high plateau of Bihe, in the hinterland of Benguella, rise two large rivers, the Okavango and the Kwito, which uniting discharged their waters into Ngami. From the N.E. end of Ngami issued the Botletle or Zuga, a stream which runsS.E. and drains towards the Makarikari marsh, from which there is no outlet.

Although X r gami has dried up since 1890 the Okavango and its tributary the Kwito remain large rivers. The Okavango is known in its

upper course as the Kubango. Its most remote source lies in about \2\° S. and i6.|° E. and its length is over 900 m. It flows first S. then S.E. and E. In about 18 S. and 20! E. it is joined on the north bank by the Kwito, a large navigable stream rising almost as far north as the Okavango. Its general course is S.E., but between 15° and 17 S. it flows S. and even S.W. Below the Kwito confluence the Okavango, which is also joined by various streams from the S.W. (German territory), is a rapid stream with an average breadth of over too yds., and generally navigable as far as the Popa falls, in 21 50′ E. In the dry season, the water-level is from 4 to 20 ft. below the banks, but these are overflowed during the rains. At this period, April-June, some of the surplus water finds its way (in about io° S.) by the Magwekwana to the Kwando or Linyanti (Zambezi system), to which, it is conjectured, the whole body of water may have once flowed. Below the Magwekwana outlet the Okavango, now called the Taukhe or Tioghe, turns almost due S., enters a swampy reed-covered plain and is broken into several branches. In this region the effects of desiccation are marked. Through the swamps the river formerly entered Ngami.

The last 20 m. of the old channel are now dry and devoted tc grain crops. Above this point the waters of the Okavango arc diverted eastward through a channel called Tamalakane to the Botletle, the river which, as stated above, formerly flowed out of Ngami. The point of confluence is in about 20 S. 235° E., the Botletle above this point being merely a succession of pools. Below the junction the river bed is 150 to 200 yds. wide. The banks are 25 to 30 ft. high, and form steep white walls of sand compacted with lime, behind which the dark green forest rises. The stream is fringed with reeds harbouring countless water- fowl. The Botletle, whose bed is about 100 m. in length, loses itself in a system of salt -pans — round or oval basins of varying size sunk to a depth of 30 to 45 ft. in the sandstone, and often bounded by steep banks. The outer pans are dry for a large part of the year, the whole system being filled only at the height of the flood-season in August. The Botletle, which receives in addition the scanty waters of the northern Kalahari, at this season reaches the Makarikari marsh. This marsh, occupying the N.E. corner of Bechuanaland, has also feeders from the Matabele hills in the direction of Bulawayo. During the rains the marsh is converted into a large lake. Much of the water is lost by evaporation; much of it sinks into some subterranean reservoir.

The evidence ot travellers is conclusive that the country around Ngami is drying up. The desiccation appears to be rapid. In 1849 when David Livingstone visited Ngami the lake though shallow was of

considerable extent. Later travellers reported progressive decrease in the size of the lake and in 1896 Sir F. D. Lugard and Dr Siegfried Passarge found it dry. Dr Passarge was told by the natives that the cessation of the river's flow was caused, about 1 890, by a blocking of the channel by thousands of rafts.

Although the river system below the Magwekwana outlet of the Okavango is drying up, above that point there are long stretches of navigable water both on the Okavango and the Kwito, in all considerably over 1000 m. The Popa falls are the last of a series of six in a distance of 40 m., but none present serious engineering diffi- culties. The Magwekwana connexion with the Zambezi is a little over 100 m. long, and for more than half its course flows through a deep well-defined bed with a minimum width of 100. yards. The fall to the Linyanti affluent of the Zambezi is only a few feet and the country presents no obstacles to the construction of artificial channels.

Ngami is within the (British) Bechuanaland protectorate, about 50 m. E. of the frontier of German South-West Africa. The district is the home of the Batawana tribe of Bechuana, with whom is stationed a European magistrate. The tribes living along the lower Okavango are tributary to the Bechuana, and the blocking of the channel referred to was occasioned by their bringing to Ngami their annual tribute of corn.

See Bechuanaland and Kalahari. An account of the Ngami district is given in Die Kalahari by Dr Siegfried Passarge (Berlin, 1904). Of early books of travel consult C. J. Andersson's Lake Ngami (London, 1856) and The Okavango River (London, 1861).

NGAN-HUI (An-hwei or Gan-hwuy), an eastern province of China, which, together with Kiang-su and Kiang-si, forms the vice-royalty of Kiang-nan. It is bounded N. by Ho-nan, E. by Kiang-su and Cheh-kiang, S. by Kiang-si and W. by Hu-peh and Ho-nan. It covers an area of 48,461 sq. m., and contains a population of 23,600,000. Its principal city is Ngan-k'ing on the Yangtsze Kiang, besides which it numbers seven prefectural cities. One district city, Ho-fei, is noted as having been the birthplace of Li Hungchang (1822-1901). The southern half of the province, that portion south of the Yangtsze Kiang, forms part of the Nan-shan, or hilly belt of the south-eastern provinces, and produces, besides cotton, coal and iron ore, large quantities of green tea. There are also considerable forest areas. Ngan-hui is one of the most productive provinces of China. Over the whole of its southern portion tea is largely grown, notably in the districts of Hui-chow Fu, Tung-liu, Ta-tung and Wu-hu. The Yangtsze Kiang is the

principal river of the province, and is of great importance for foreign commerce, supplying direct water communication between some of the principal tea-growing districts and the neighbourhood of Hang-chow. The only other river of importance is the Hwai-ho (see China: The Country). Wu-hu on the Yangtsze Kiang is the only open port in this province. From this port a railway runs S.E. to Wen-chow — an open seaport in Cheh-kiang province.

NIAGARA, a river of North America, running northward from Lake Erie to Lake Ontario, and carrying the discharge of all the Laurentian or Great Lakes, except Lake Ontario (see St Lawrence River). It constitutes part of the boundary between the United States and Canada, separating the state of New York from the province of Ontario. It is navigable from its head to Chippawa, 16 m., and from Queenston to its mouth, 6 m. The intervening 9 m. include a series of rapids and the Falls of Niagara. On the right bank are Buffalo, Tonawanda, Niagara Falls, Lewiston and Youngstown, of New York; on the left bank, Chippawa, Niagara Falls, Queenston and Niagara-on-the- Lake, of Ontario.

The Falls of Niagara are justly celebrated for their grandeur and beauty, and are viewed every year by from 800,000 to 1,200,000 visitors. They are in two principal parts, separated by an island. The greater division, adjoining the left bank, is called the Horseshoe Fall; its height is 155 ft., and the length of its curving crest line is about 2600 ft. The American Fall, adjoining the right bank, is 162 ft. high and about 1400 ft. broad. The water, being supplied by a lake, is free from sediment, and

Bird’s-eye sketch of Niagara river and gorge, from the north. L.E., Lake Erie. EE, Escarpment.

B, Buffalo. L, Lewiston.

N, Niagara Falls, N.Y. Q, Queenston.

F, Niagara Falls, Ont. D, St Davids.

W, Whirlpool.

its clearness contributes to the beauty of the cataract. In recog- nition of the importance of the waterfall as a great natural spectacle, the

province of Ontario and the state of New York have retained or acquired title to the adjacent lands and con- verted them into parks, which are maintained at public expense for the convenience and pleasure of visitors. The cataract is thus a great aesthetic asset of the people of the world; but its perpetuity has been threatened because it is also a great economic asset of the bordering nations. The flow of water in the river at mean stage is 222,000 cub. ft. per second, at low stage 176,000 cub. ft. The descent of this stream at the Falls, and in the rapids just above them, affords a theoretic water power equal to nearly four million horse power, and it is estimated that three-fourths of this is practically available. The annual value of the power must be reckoned in millions of pounds sterling, at least, and possibly in tens of millions. In the utilization of this natural power a beginning has been made; about 15,000 cub. ft. of water per second are now used for the development of electric power, and much larger appropriations have been authorized. As the full development of the economic value involves the diversion of the river from its channel and the destruction of the cataract as a scenic feature, the economic and aesthetic interests are

antagonistic. An agitation started by the champions of scenic beauty led to negotiations looking to the regulation of economic exploitation by international agreement.

The river has no valley. The belt of land it crosses consists of two plains separated by a high cliff or escarpment facing towards Lake Ontario. The stream runs half its length on the upper plain, drops at the falls into a narrow gorge through which it courses 7 m. to the escarpment, and then traverses the lower plain in a deep channel. Under the lower plain are soft shales. The crest of the escarpment is a bed of limestone, nearly level, and this bed is visible in both walls of the gorge to the falls, where it is 60 ft. thick. From this firm brink the cataract plunges down into a deep pool or basin hollowed from the soft shale, and the resulting agitation causes further wear of the shale and the continual undermining of the limestone, which breaks away in blocks. Thus the site of the cataract retreats up stream and the gorge is lengthened; the average rate, measured from 1842 to 1905 being about 5 ft. a year. It is evident that the whole gorge has been dug out by the river, and many attempts have been made to determine the time consumed in the work.

The problem of the river's age is of much interest to geologists, because its solution would aid in establishing a relation between the periods and ages of geologic time and the centuries of human chronology.' The great Canadian glacier, which in the Glacial period alternately crowded forward over the Great Lakes region and melted back again, so modified the face of the land by erosion and by the deposit of drift that the waters afterwards had to find new courses. The Niagara river came into existence when the waning of the glacier laid bare the western part of the Ontario basin, and the making of the gorge was then begun. If it were supposable that the lengthening of the gorge proceeded at a uniform rate, the computation of the time would be easy, but there are various modifying conditions. (1) The limestone is not equally thick all along the gorge ; in one place it is 90 ft., and in several places as little as 35 ft. (2) The height of the cataract has varied from 155. ft. to more than 300 ft. (3) For a short distance at the whirlpool the limestone and shale were replaced by softer material, sand and clay. The river here touched a more ancient gorge, which had previously been concealed by drift except at the escarpment. The diagram shows the breach in the escarpment at St Davids directed towards the sharp turn of the river gorge at the whirlpool. (4) The size of the river has varied. While the glacier was gradually melting the lakes underwent a complicated series of metamorphoses, and there were two separate epochs when the discharge from all the basins beyond Lake Erie followed other routes, and during these epochs the Niagara drained only one-eighth of its present territory. The variation in the size of the river is the most important of the modifying conditions, and at the same time least amenable to computation.

The parts of the gorge eroded by the full river are now marked by deep pools, the powerful cataract having dug far down into the shale. The parts eroded by the depleted river are comparatively narrow and shallow, the weaker cataract having been unable to clear away the fallen blocks of limestone. The work of the full river is illustrated by the main division of the present cataract, called the Horseshoe Fall, which wore its cliff back 335 ft. in 63 years. The work o f the depleted river is less adequately represented by the narrower and shallower American Fall; where the present rate of recession is about one-twenty-fifth as fast. In making two-thirds of the gorge the full river probably consumed between 5000 and 15,000 years. If the depleted river worked one-tenth as fast, the period required for the remaining third was five times as long; but the relative rate is wholly conjectural. A weighing of the evidence now available indicates 25,000 years as a lower limit for plausible estimates of the age of the river, but yields no

suggestion of an upper limit.

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NIAGARA, FORT, an American fortification, on the E. side and at the mouth of Niagara river, opposite the Canadian village

of Niagara, or Niagara-on-the-Lake. Fort Niagara has a reser- vation of 288 acres, with fairly modern equipments, several historic buildings of the time of French and of British possession, in one of which, the old magazine (1757), William Morgan was imprisoned in 1826. Fort Niagara was long, especially during the French occupation of Canada, one of the most important forts in North America, being the key to the Great Lakes, beyond Lake Ontario. ” This immense extent of inland navigation,” says Parkman, ” was safe in the hands of France so long as she held Niagara. Niagara lost not only the lakes but also the valley of the Ohio was lost with it.” Rene Robert Cavelier, Sieur de La Salle, wintered here in 1678-9, built his ship the “Grif- fon,” and established a trading post and Fort Conti, destroyed not long afterwards. Fort Denonville, built in 1687 by Jacques Rene de Bresay, marquis de Denonville, governor-general of Canada, in his cruel campaign against the Iroquois, was abandoned in 1688, after the garrison, commanded by Pierre de Troyes (d. 1687), had been wiped out by an epidemic. The first Fort Niagara, to be so named, was built in 1725-1727 at the instance of Charles le Moyne, 1st baron of Longueil (1656-1729), and

became a very important military and trading post; the fort was rebuilt by Francois Pouchot (1712-1769) in 1756, but in July 1759, after a siege of about sixteen days, it was surrendered to Sir William Johnson by Pouchot, who wrote a Memoir upon the Late War (translated and edited by F. B. Hough; 2 vols., 1866). On the 14th of September 1763 a British force marching from Fort Schlosser (about 2 m. above the Falls; built 1750) to Fort Niagara was ambushed by Indians, who threw most of their captives into Devil's Hole, along the Niagara river. In July 1764 a treaty with the Indians was signed here, which detached some of them from Pontiac's conspiracy. Joseph Brant, John Butler, and, in general, the Indians of north-western New York favouring the British during the American War of Independence, made Fort Niagara their headquarters, whence they ravaged the frontier, and many loyalists and Indians took refuge here at the time of General Sullivan's expedition into western New York in 1779. The fort was not surrendered to the United States until August 1796. In the War of 181 2 it was bombarded by the guns of Fort George (immediately across the river in the town now called Niagara, then Newark 1) on the 13th and 14th of October 181 2; was the starting-point of the American expedition which took Fort George on the 27th of May 1813; and on the 19th of December 1813 was surprised and taken by assault — most of the garrison being killed or taken prisoners — by British troops under John Murray (1774-1.862), who had previously retaken Fort George. After the close of the war, On f he 27th of March 181 s, Fort Niagara was restored to the United States, and a garrison was kept there until 1826. The fort was regarrisoned about 1836. ■■.*■■-

See F. H. Severance, Old Trails on the Niagara Frontier (Buffalo, 1903), Parkman's works, especially Montcalm and Wolfe (2 vols., Boston, 1884), and The Conspiracy ofPontiac (2 vols., Boston, 1851), and a pamphlet by Peter A. Porter, A Brief History of Old Fort Niagara (Niagara Falls, 1896).

NIAGARA FALLS (formerly Clifton or Suspension Bridge), a town and port of entry of Welland county, Ontario, Canada, 40 m. S.S.E. of Toronto, on the west bank of the Niagara river and opposite the Falls. Pop. (1901) 4244. It is a station on the Grand Trunk, Michigan Central and St Catharines & Niagara Central railways, and has electric railway communication with the chief towns in the neighbourhood. Three large steel bridges connect it with the American town of Niagara Falls on the opposite bank. Its importance is chiefly due to the tourist traffic, but the unrivalled water power is being more and more employed. Factories have sprung up, and power is transmitted to Toronto and other cities. A beautiful park, named after

1 On the night of the 10th of December 1813 the American general George McClure (1771-1851), upon abandoning Fort George, set fire to Newark, almost destroying the town and causing great suffering among the inhabitants. McClure attempted to justify this act by a strained construction of a letter to him from the secretary of war, but it was promptly disavowed by the United States government. The burning of Newark led to severe reprisals on the part of the British.

Queen Victoria, extends along the bank of the river for 2j m. above the Falls.

NIAGARA FALLS, a city of Niagara county, New York, U.S.A., on the E. side of the Niagara river, at the Falls, 22 m. N.N.W. of Buffalo. Pop. (1900) 19,457, of whom 7326 were foreign-born, (1910 census) 30,445. The city is served by the New York Central & Hudson River, the Wabash, the Erie, the Lehigh Valley, the West Shore and the Michigan Central railways, and by the International Electric railway and the Niagara, St Catharines & Toronto (electric) railway. The city extends along the level summit of the cliffs from above the Falls to some 3 m. below. The river is here crossed by three bridges; the (upper) steel arch bridge, built (1895) on the site of the former suspension bridge (built in 1869; blown down in 1889; rebuilt as a suspension bridge) near the Falls, is crossed by double carriage- ways and footpaths and by an electric railway, and is pro- bably the longest bridge of the kind in the world, being 1240 ft. long with an arch span of 840 ft.; and i£ m. farther down the river are two railway bridges, the Michigan Central's cantilever bridge, completed in 1883, and the (lower) single steel arch bridge (completed in 1897, on the site of John A. Roebling's suspension bridge built in 1851-1856) of the Grand Trunk railway, which has a terminus at Niagara Falls (Clifton), Ontario, and connects here with the New York Central & Hudson River and the Lehigh Valley railways.

The principal buildings of the city are the Niagara Falls Memorial Hospital, the Federal Building and the Niagara Falls Power Co. Building. The city has a Carnegie library, De Veaux College (Protestant Episcopal, chartered in 1853), and Niagara University, a Roman Catholic institution, founded in 1856 by the priests of the Congregation of the Mission and incorporated in 1863 as the Seminary of Our Lady of Angels, a name still used for the theological department, but displaced, since the charter of the university in 1883, by the present name. In the extreme S.W. part of the city is Prospect Park, which with Goat Island immediately S., and several smaller islands, has been, since 1885, the " New York State Reservation at Niagara Falls." From the Falls, which gave the city its first importance

as a stopping place for tourists, valuable electric and hydraulic power is derived (by a tunnel 29 ft. deep and 18 ft. wide, passing about 200 ft. under the surface of the city, from the upper steel arch bridge to a point ij m. above the Falls, and by the canal of the Niagara FallsHydraulic Power and Manuf acturingCompany) . Niagara Falls is an important manufacturing city; the value of the factory products increased from $8,540,184 in 1900 to $16,915,786 in 1905, or 98-1%. The city is the shipping centre for the W. part of Niagara county. The village of Niagara Falls was for a time called Manchester. In 1892 the village of Sus- pension Bridge (formerly Niagara City) was joined with it under a city charter, which has been frequently amended.

NIAM-NIAM (Zandeh, A-Zandeh), a people of Central Africa, of mixed Negroid descent. With kindred tribes, they stretch from the While Nile above the Sobat confluence to the Shari affluent of Lake Chad, and from the Bahr-el-Arab, about io°N., nearly to the equator. Their political ascendancy, weakened by the incessant attacks of the Arab-Nubian slave-raiders before the rise of the Sudanese mahdi in 1882, was afterwards broken by the forces of the Congo Free State and the Anglo-Egyptian Sudan.

The term Niam-Niam appears to be of Dinka origin, meaning in that language ” great eaters,” with reference, as is supposed, to their cannibalistic propensities. They are called Babungera by the Mangbettu (Monbuttu), A-Madyaka by the Diur, Mundo or Manyanya by the Bongo, Makaraka or Kakaraka by the Mittu. But Niam-Niam has been adopted and generalized by the Sudan and Nubian Mahommedans. Their native name is Zandeh (pi. A-Zandeh), which is current throughout the eastern Niam-Niam domain, a region estimated by Georg Schweinfurth, who visited the country in 1870, at about 48,000 sq. m., with a population of at least two millions. But these by no means constitute a uniform ethnical group, for within this area is the large Madi nation, differing altogether in speech and even

in some respects physically from the ordinary Niam-Niam type. Apart also from numerous tribal divisions, the eastern Niam- Niam proper form three very distinct branches. The bleak northern highlands bordering east on the Bongo and north on Dar-Fertit are occupied by the Banda Niam-Niam. To the southwards are the more civilized Belanda Niam-Niam, who hold the fertile hilly territory of the Nile-Congo watershed. Very different from either arc the so-called ” White

” Niam- Niam, neighbours of the Madi of the Makua-Welle river basin. Their complexion is of a lighter bronze tint, and they are distinguished from the other branches of the family by their tall stature, symmetrical figure, long kinky hair and beard and higher social culture. They wear cotton garments, obtained by barter for ivory, copper and iron, and have a tendency to political unity under one chief. 1

There is, however, a very distinct Niam-Niam type, one of the most marked in the whole of Africa. ” These beings,” remarks Schweinfurth, on his first introduction to them, ” stood out like creatures of another world … a people of a marked and most distinct nationality, and that in Africa and amongst Africans is saying much.” They are of medium height and powerful build. The great space between the eyes, which are almond-shaped and slightly slanting, gives them a peculiar expression. They have a very short nose, with correspondingly long upper lip; woolly hair; a very round head, agreeing in this respect with the Bongo of the Bahr-ei-Ghazal but differing from the great majority of the other African dark races; features generally round, with less jaw-projection and altogether more regular than the typical Negro; of a ruddy brown or chocolate colour, scarcely ever black, but occasionally bronze and even olive.

The average Niam-Niam is distinguished by some excellent qualities, such as frankness, courage, an instinctive love of art, and above all a genuine and lasting affection for his women, such as is betrayed by no other. African race. By tribal custom the men are all hunters, armed with long knives and spears and carrying oblong shields of wicker-work; the women all tillers of the soil, which with little toil yields abundant crops of cereals, yams, manioc, colocasia and Virginian tobacco. Both sexes wear large pins of ivory, iron, monkey or human bone stuck in their hair, and stain their skin with red camwood and the oil of a wild berry. The Niam-Niam are intelligent, skilful builders, and proficient in many native industries. Prominent among these are their earthenware vessels, which display considerable symmetry; iron smelting and metal work, such as swords, knives and spears; wood carvings, such as stools, benches, bowls and tobacco pipes, of varied and intricate design and often admirable works of art. They are great smokers, and very fond of music. Of the ox, horse, ass or camel they have no knowledge; the only domestic animals are poultry, and a breed of dogs, like small wolf-hounds, with smooth red hair, twisted tail like a porker’s, large ears, pointed nose and four-clawed hind feet. These curious little ” greyhounds ” join in the chase with small wooden bells round the neck, and are thus soon found when lost in the woods.

The Niam-Niam are distinguished by their elaborate head- dresses (they formerly wore a sort of big full-buttomed wig, and

Dr W. Junker actually saw elderly people in these), and peculiar

tattoo markings — square patterns on forehead, temples or cheeks,

1 About the middle of the 19th century, most of the eastern Niam-Niam lands appear to have been subject to Yapaty, son of Mabengeh. But after his death they were distributed amongst his seven sons, Renjy, Balia, Perkye, Tombo, Bazimbey, Manuba; and in 1870 there were already fourteen reigning princes of this dynasty, besides several of doubtful relationship with the line of Mabengeh. In the Niam-Niam districts visited by the traders from the Egyptian Sudan there were at that time altogether as many as thirty-five independent chiefs. But reports were current of a very powerful ” sultan ” named Mono, whose empire lay some 300 m. farther west. Another large state, founded in the Welle region by Kipa (Kifa), brother of Yapaty, also fell to pieces after his death in 1868. The powerful chiefs Bakangoi and Kanna, visited in 188,3 by G. Casati, were sons of this Kipa, whose grave near Kanna’s village was still watched by twenty-five ” vestals,” bound, under penalty of death, to keep a fire constantly burning, and to preserve their chastity inviolate {Esploratore, August 1883).

an X-shaped figure in a cartouche below the chest, and various zigzag, straight or dotted lines on the upper arm and breast. Most of them file the incisors. From the malted grain of a species of eleusine they brew good beer, of a sparkling brown or reddish colour and pleasant bitter taste, derived from the stalk of the same cereal.

In this widespread Negroid family are now provisionally grouped the Makaraka, intermingled with the Mundu, and the Babukur in the north-east (Bahr-el-Ghazal) ; the Krej, Banda and N’Sakkara in the north-west (Dar-Fertit, and thence to the upper Shari); the Banziri, Ndris, Togbo, Languassi, Dakoa, Ngapu, Wia-Wia, Manja, Awaka, Akunga and others about both slopes of the Congo-Chad water-parting. These last, who give such an enormous westward extension to the family, present much the same physical characters as the Zandeh proper, and speak dialects of the widely diffused Ndris language, which is not Bantu, but appears to show affinities with Zandeh.

This great division ethnologists are even disposed to connect with the Fula of west and central Sudan, and to substitute for the now exploded ” Nuba-Fula ” a ” Zandeh-Fula ” family, resulting from various secular interminglings between the true negroes and the Berbers of North

Africa. Such crossings have undoubtedly been in progress since prehistoric times over an enormous area south of the Sahara (Africa: Ethnology), and are almost everywhere marked by certain constant characters, such as long ringlety or kinky black hair, coppery, reddish or bronze shades of complexion, brachycephalic (round) head, often highly pronounced, and indicated outwardly by an unusually wide space between the orbits, and generally by some- what softened negro features. But, owing to the different environ- ments and to the different initial ratios of intermixture, the transi- tional fotms are almost endless, so that it becomes difficult to consti- tute distinct ethnical groups without calling in the aid of language. Where type and speech correspond, as to a large extent is the case with most of the above-mentioned tribes, even strict systematists will be disposed to constitute separate ethnical groups, at least as working hypotheses, always allowing for the somewhat untrust- worthy nature of the linguistic factor. In the case under con- sideration Fula has no kind of connexion with Zandeh speech, but this by no means precludes the possibility of racial connexion.

Beyond a few meagre vocabularies no materials have yet been collected for the study of the Zandeh language, which, except in the Madi country, appears to be everywhere spoken with considerable uniformity in the eastern Niam-Niam lands. Its phonetic system, such as initial mb and vowel auslaut, affiliates it, not to the Libyan, as has been asserted, but to the Negro linguistic type. Within this order of speech its pronominal prefix inflection points to affinity rather with the southern Bantu than with the Sudan group of languages. Thus the personal plural a-, as in A-Zandeh, A-Madi, A-Banga, &c, would appear to be identical in origin and meaning with the Bantu wa-, as in Wa-Ganda, Wa-Swaheli, Wa-Sambara, &c. There is also the same dearth of abstract terms, which renders the translation of Scripture into the Negro tongues such a difficult task. Compare gitmbah, an expression for the Deity, really meaning ” lightning,” with the Chinyanja chuuta = thunder = God (?) and the Zulu Unkulunkulu = great-grandfather, also adopted by the missionaries as the nearest equivalent for the Deity in that language.

Politically the dismembered Zandeh empire and dependent principalities are divided up between France, which claims the ” sultanates ” of Rafai, Dinda, Zemio and Tambura in the Mbomu valley, with all the peoples in Fertit and the Shari basin; Belgium, which administers the eastern section between the Mbomu and the upper Welle; and Great Britain, to whose share have fallen the Makaraka and other Niam-Niam groups of the Bahr-el-Ghazal region.

See John Petherick, Egypt, the Soudan and Central Africa (1861); Carlo Piaggia's " Account of the Niam-Niam," communicated by the Marchese O. Antinori to the Bolletino of the Italian Geographical Society (1868), pp. 91-168; G. A. Schweinfurth, Heart of Africa (English edition, 1873); G. Casati, "Journey to the Niam-Niam Country," in Esploratore for August 1883, and Ten Years in Equatoria (1891); F. R. Bohndorff, Reisen in Central Africa (1885); Dr W. Junker, " Rundreise in dem siidlichen Niamniam-Lande," in Petermann' s Mittheilungen for May 1883, English edition, Travels in Africa (1890).

NIAS, the largest island in the chain off the- west coast of Sumatra, Dutch East Indies, lying about 1° N., 97 30′ E. It is roughly oblong in form, measuring about 80 m. by 28, and appears to be partly of volcanic origin and to consist partly of older rocks corresponding with those of Sumatra. Its extreme elevation is about 2300 ft. A number of islets (Nako, Bunga, &c.) lie off the west and north coasts. The island is thickly populated by a pagan people, who by some authorities, including F. Jung- huhn, have been associated with the Battas, but are probably a distinct branch of the pre-Malayan or Indonesian race. Slavery and head-hunting are universal, despite the efforts of Dutch and German missionary societies. The natives are skilled in

such crafts as weaving and metal-work, as well as in agriculture and road-making. Coco-nut oil is produced on Nias and also more especially on the Nako group. A Dutch commissioner is established at Gunong Sitoli on the east coast, a settlement of Malay and Chinese traders.

NIBELUNGENLIED, or Der Nibeltjnge N6t, an heroic epic written in a Middle High German dialect. The story on which the poem is based belongs to the general stock of Teutonic saga and was very widespread under various forms, some of which are preserved. Thus it is touched upon in Beowulf, and fragments of it form the most important part of the northern Eddas, the poets of which evidently assumed that the tale as a whole was well known and that their hearers would be able to put each piece in its proper place. In the prose Edda, or Volsungasaga, which, though largely primitive in spirit, dates from the 13th century, it is set forth in full. The substance of this Norse version is as follows: —

The three Anses — Odin, Loki and Hornir — saw an otter devouring a salmon beside a waterfall. They killed and skinned the otter and, taking the skin with them, sought shelter for the night with Rodmar the giant. But Rodmar recognized the skin as that of his son, and demanded as iveregild gold enough to cover it completely. Loki thereupon went back to the stream, where Andvari in the form of a pike was guarding a great treasure, caught him in a net, and forced him to surrender his hoard. But the piled-up gold left one hair exposed ; in order to cover it Loki returned to Andvari and forced him to surrender a magic ring which had the virtue of breeding gold. Thereupon Andvari, enraged, laid upon the hoard and all who should possess it a curse. This curse, the Leitmotif of the whole story, began to operate at once. Rodmar, for the sake of the treasure, was slain by his sons Fafnir and Regin; and Fafnir, seizing the whole, retired to a desolate heath and, in the form of a snake or dragon, brooded over the hoard. Regin, cheated of his share, plotted vengeance and the conquest of the treasure.

To Regin, a notable smith, was sent Sigurd — son of the slain hero Sigmundr the Volsung and his wife Hiortis, now wife of the Danish king Alt — to be trained in his craft. To him Regin told of Fafnir and' the hoard, and the young hero offered to go out against the dragon if Regin would weld him a sword. But every brand forged by the smith broke under Sigurd's stroke; till at last he fetched the fragments of the sword Gram, Odin's gift to his father, which Hiortis had carefully treasured. These Sigurd forged into a new sword, so hard that with it he could cleave the t anvil and so sharp that it would sever a flock of wool floating against it down stream ; and, so armed, he sought and slew the dragon. But while roasting Fafnir's heart, whi'h Regin had cut out, Sigurd burned his finger with the boiling fat and, placing it to his lips, found that he could understand the language of birds, and so learned from the chattering of the wood peckers that Regin was planning treachery. Thereupon he slew the smith and loading the treasure on the magic steed Grani, given to him by Odin, set out upon his travels.

On the summit of a fire-girt hill Sigurd found the Valkyrie Brunhild in an enchanted sleep, and ravished by her beauty awakened her; they plighted their troth to each other and, next morning, Sigurd left her to set out once more on his journey. Coming to the court of Giuki, a king in the Rhine country, Sigurd formed a friendship with his three sons, Gunnar, Hogni and Guthorm; and, in order to retain so valuable an ally, it was determined to arrange a match between him and their sister Gudrun. Queen Grimhild, skilled in magic, therefore gave him an enchanted drink, which caused him to forget Brunhild. Gunnar, on

the other hand, wished to make Brunhild his wife, and asked Sigurd to ride with him on this quest, which he con- sented to do on condition of receiving Gudrun to wife. They set out; but Gunnar was unable to pass the circle of fire round Brunhild's abode, the achievement that was the condition of winning her hand. So Sigurd, assuming Gunnar's shape, rode through the flames on his magic horse, and in sign of troth exchanged rings with the Valkyrie, giving her the ring of Andvari. So Gunnar and Brunhild were wedded, and Sigurd, resuming his own form, rode back with them to Giuki's court where the double marriage was celebrated. But Brunhild was moody and suspicious, remembering her troth with Sigurd and believing that he alone could have accomplished the quest. One day the two queens, while bathing in the river, fell to quarrel- ling as to which of their husbands was the greater. Brunhild taunted Gudrun with the fact that Sigurd was Gunnar's vassal, whereupon Gudrun retorted by telling her that it was not Gunnar but Sigurd who rode through the flames, and in proof of this held up Brunhild's ring, which Sigurd had given to her. Then Brunhild " waxed as wan as a dead woman, and spoke no word the day long." Maddened by jealousy and wounded pride, she now incited the three kings to murder Sigurd by exciting their jealousy of his power. The two e'der, as bound to him by blood-brotherhood, refused; but the voungest, Guthorm, who had sworn no oaths, consented to do the deed. Twice he crept into Sigurd's chamber, but fled when he found the hero awake and gazing at him with flashing eyes. The third

time, finding him asleep, he stabbed him ; but Sigurd, before he died, had just strength enough to hurl his sword at the murderer, whom it cut in two. Brunhild, when she heard Gudrun wailing, laughed aloud. But her love for Sigurd was great as ever, and she determined not to survive him; distributing her wealth to her hand-maidens, she mounted Sigurd's funeral pyre, slew herself with his sword, and was burnt with him.

In course of time Gudrun married Atli (Attila), king of the Huns, Brunhild's brother. Atli, intent on getting hold of the hoard, which-Gudrun's brothers had seized, invited them to come to his court. In spite of their sister's warnings they came, after sinking the treasure in the Rhine. On their refusal to surrender the hoard, or to say where it was concealed, a fierce fight broke out, in which all the followers of Gunnar and Hogni fell. Atli then once more offered to spare Gunnar's life if he would reveal his secret ; but Gunnar refused to do so till he should see the heart of Hogni. The heart of a slave was laid before him, but he declared that that could not be Hogni's, since it quaked. Hogni's heart was then cut out, the victim laughing the while ; but when Gunnar saw it he pried out that now he alone knew where the

hoard was and that he would never reveal the secret. His hands were then bound, and he was cast into a den of venomous serpents ; but he played so sweetly on the harp with his toes that he charmed the reptiles, except one adder, by which he was stung to death. Gudrun, however, avenged the death of her brothers by slaying the sons she had borne to Atli and causing him unwittingly to drink their blood and eat their hearts. Finally, in the night, she killed Atli himself and burned his hall ; then, leaping into the sea, she was carried by the waves to new scenes, where she had adventures not connected with those recorded in the Nibelungenlied.

This story, in spite of the late date of the Volsungasaga and of added elements due to the imagination of its author, evidently represents a very primitive version. In the Nibelungen story, on the other hand, though its extant versions are of much earlier date, and though it contains elements equally primitive not found in the other, the spirit and the motives of the earlier story have to a large extent been transmuted by later influences, the setting of the story being — though by no means consistently — medieval rather than primitive. Thus the mysterious hoard is all but lost sight of; no mention is made of the curse attached to it; and it is only as an afterthought that Siegfried (Sifrit) is described as its master. Everywhere the supernatural elements are elimin- ated or subordinated, and the story becomes a drama of human motives, depending for its development on the interplay of human passions and activities.

To us in ancient story wonders great are told

Of heroes rich in glory and of adventures bold,

Of feast and joyous living, of wailing and of woe,

Of gallant warriors striving may ye now many marvels know. 1

That is all he gives by way of preface. The gods have vanished

from the scene; there is nothing of Loki and his theft of Andvari's

hoard, nothing of Odin and his gifts of the sword Gram and

the magic horse Grani; and not till the third Aventiure, when

Siegfried comes to Worms, are we given even a hint that such

things as the sword and treasure exist. On the other hand, in

the very next stanza we are introduced to what is to be the leading motive of the plot: Kriemhild, the Burgundian princess, on whose account ” many a noble knight was doomed to perish.” For, as in the legend of Sigurd the Volsung, the plot had turned upon the love and vengeance of Brunhild, so in the song of the Nibelungs it is the love and vengeance of Kriemhild, the Gudrun of the northern saga, that forms the backbone of the story and gives it from first to last an artistic unity which the Volsungasaga lacks. Of the story itself it is impossible here to give anything but the barest outline, sufficient to show its contrast with tha northern version. We may note at the outset the spirit of pessimism which, like the curse on the hoa*d, pervades the whole. It appears in the very first Aventiure, when Kriemhild, in answer to her mother’s interpretation of her dream, declares that she will never marry, since ” it has been proved by the experience of many women that joy is in the end rewarded by sorrow “; it is repeated in the last stanza but one of the long poem: ” As ever joy in sorrow ends and must end alway.” This tragic contrast is emphasized by the pomp and circumstance that surround the ill-fated hero of the story at the beginning.

1 Uns ist in alten maeren wunders vil geseit Von heleden lobebaeren von gr6zer arebeit Von freude unt hdchgeziten von weinen unde klagen Von kiiener recken strtten muget ir nun wunder hoeren sagen.

The primitive setting of the northern version has vanished utterly. Sigmund is king of the Netherlands; the boy Siegfried is brought up by ” wise men that are his tutors ” (Avent. ii.); and when, attracted by the fame of Kriemhild’s beauty, he rides to Worms to woo her, it is as the typical handsome, accomplished and chivalrous king’s son of medieval romance.

It is at this point (Avent. iv.) that some of the primitive elements of the story are suddenly and awkwardly introduced. As Siegfried approaches Worms, Kriemhild’s brothers, the Burgundian kings Gunther, Giselher and Gemot watch his coming, and to them their faithful retainer, ” the grim Hagen,” explains who he is. This, he exclaims, can be no other than the hero who slew the two kings of the Nibelungs, Schilbunc and Nibelunc, and seized their treasure, together with the sword Balmunc and the tarnkappe, or cape of darkness, which has the virtue of making him who wears it invisible. Another adventure, too, he can tell of him, namely, how he slew a dragon and how by bathing in its blood his skin became horny, so that no weapon could wound him, save in one place, where a linden leaf had fallen upon him as he stooped, so that the blood did not touch this spot. 1 In spite of Hagen’s distrust and misgivings, Siegfried now fights as the ally of the Burgundians against the Saxons (Avent. iv.), and undertakes, on condition of receiving Kriemhild to wife, to help Gunther to woo Queen Brunhild, who can only be won by the man who can overcome her in three trials of strength (Avent. vi.). Siegfried and Gunther accordingly go together to Brunhild’s castle of Isenstein in Iceland, and there the hero, invisible in his tarnkappe, stands beside Gunther, hurling the spear and putting the weight for him, and even leaping, with Gunther in his arms, far beyond the utmost limit that Brunhild can reach (Avent. vii.). Brunhild confesses herself beaten and returns with the others to Worms, where the double marriage is celebrated with great pomp (Avent. x.). But Brunhild is ill content; though she saw Siegfried do homage to Gunther at Isenstein she is not convinced, and believes that Siegfried should have been her husband; and on the bridal night she vents her ill humour on the hapless Gunther by tying him up in a knot and hanging him on the wall. ” I have brought the evil devil to my house!” he complains to Siegfried next morning; and once more the hero has to intervene; invisible in his tarn- kappe he wrestles with Brunhild, and, after a desperate struggle, takes from her her girdle and ring before yielding place to Gunther. The girdle and ring he gives to his wife Kriemhild (Avent. x.).

One day, while Siegfried and his wife were on a visit to the Burgundian court, the two queens fell to quarrelling on the question of

precedence, not in a river but on the steps of the cathedral (Avent. xiv.). Kriemhild was taunted with being the wife of Gunther's vassal; whereupon, in wrath, she showed Brunhild the ring and the golden girdle taken by Siegfried, proof that Siegfried, not Gunther, had won Brunhild. So far the story is essentially the same as that in the Volsungasaga; but now the plot changes. Brunhild drops out, becoming a figure altogether subordinate and shadowy. The death of Siegfried is compassed, not by her, but by the " grim " Hagen, Gunther's faithful henchman, who thinks the glory of his master unduly over- shadowed by that of his vassal. Hagen easily persuades the weak Gunther that the supposed insult to his honour can only be wiped out in Siegfried's blood; he worms the secret of the hero's vulnerable spot out of Kriemhild, on pretence of shielding him from harm (Avent. xv.), and then arranges a great hunt in the forest, so that he may slay him when off his guard.

The 1 6th Avenliure, describing this hunt and the murder of Siegfried, is perhaps the most powerful scene in all medieval epic. To heighten the effect of the tragic climax the poet begins with a description of the hunting, and describes the high spirits of Siegfried, who captures a wild boar, rides back with it to camp, and there lets it loose to the great discomfiture of the cooks.

When the hunters sat down to feast, it was found that the wine had been forgotten. Hagen thereupon proposed that they should 1 Compare the heel of Achilles.

race to a spring of which he knew some way off in the forest. Siegfried readily agreed, and though handicapped by carrying shield, sword and spear, easily reached the goal first, but waited, with his customary courtesy, until the king had arrived and drunk before slaking his own thirst. Then, laying aside his arms, he stooped and drank. Hagen, seizing the spear, thrust it through the spot marked by Kriemhild on Siegfried's surcoat. The hero sprang up and, finding that his sword had been removed, attacked Hagen with his shield.

Though to death he was wounded he struck so strong a stroke That from the shattered shield-rim forthwith out there broke Showers of flashing jewels; the shield in fragments lay. 2

Then reproaching them for their cowardice and treachery, Siegfried fell dying " amid the flowers," while the knights gathered round lamenting. At this point two stanzas may be quoted as well illustrating the poet's power of dramatic characterization : —

The king of the Burgundians he too bewailed his death : Then spake the dying hero: ” Nay, now you waste your breath! You weep for an ill fortune that you yourself have wrought : That is a shameful sorrow: it were better you said nought !” Then out spake the grim Hagen: ” I know not why ye plain: This is for us the ending of sorrow and of pain. Full few are left of foemen that dare withstand us now. Glad am I that the hero was by this hand of mine laid low ! ”

This account of the death of Siegfried, which embodies the ancient German tradition, is far finer than the northern version, according to which Hogni murders the hero in his bed. The whole spirit of this Aventiure, too, is primitive Teutonic rather than medieval. The same is true, indeed, of the whole of the rest of the poem. Siegfried, to be sure, is buried with all the pomp of medieval Catholic rites; but Kriemhild, while praying for his soul like a good Christian, plots horrible vengeance like her pagan prototype. With this significant difference, however: Gudrun revenged upon her husband the death of her brothers; Kriemhild seeks to revenge upon her brothers the death of her husband. The Catholic bond of marriage has become stronger than the primitive Teutonic bond of kinship. Mistress now of the inexhaustible hoard of the Nibelungs, Kriemhild sought to win a following by lavish largesses; but this Hagen frustrated by seizing the treasure, with the consent of the kings, and sinking it in the Rhine, all taking an oath never to reveal its hiding- place, without the consent of the others, so long as they should live (Avent. xix.). At last, however, after thirteen years, Kriemhild’s chance came, with a proposal of marriage from Etzel (Attila) king of the Huns, whom she consented to marry on condition that he would help her to vengeance (Avent. xx.). Then more years passed; old feuds seemed to be forgotten; and the Burgundian kings, in spite of Hagen’s warnings, thought it safe to accept their sister’s invitation to visit her court (Avent. xxiii. xxiv.).

The journey of the Burgundians into Hunland is described by the poet at great length (Avent. xxv.xxvii.). The story is full of picturesque detail and stirring incident, full also of interest ing problems in folk-lore and mythology; and throughout it is dominated by the figure of the grim Hagen, who, twitted with cowardice and his advice spurned, is determined that there shall be no turning back and that they shall go through with it to the bitter end. With his own hands he ferries the host over the Danube and then, when the last detachment has crossed, destroys the boat, so that there may be no return. At Attila’s court (Avent. xxviii.) it is again Hagen who provokes the catastrophe by taunting Kriemhild when she asks him if # he has brought with him the hoard of the Nibelungs:

” The devil’s what I bring you ! ” Hagen then replied, ” What with this heavy harness and my shield beside,

1 had enough to carry: this helmet bright I brought;

My sword is in my right hand, and that, be sure, I bring you not! ”

The sword was Siegfried’s. It is Hagen, too, who after the

2 This last fight with the shield seems to have belonged to the common stock of heroic story. Cf. the account of the death of Hereward ” the Wake ” given by Geoffrey Gaimar in the Chronicon Anglo-Norm, and adopted by Freeman in his Norman Conquest (1871), iv. 486.

first onslaught of the Huns strikes off the head of Ortlieb, the son of Etzel and Kriemhild, and who, amid the smoke and carnage of the burning hall, bids the Burgundians drink blood if they are thirsty.

Besides Hagen, during the ride into Hunland and in the final fight, another figure comes to the front, that of Volker the Fiddler, so far only mentioned as a hero of the Saxon war in Avent. ii. He rides fiddling at the head of the host; he plays to the weary warriors in the intervals of the battle in the court of Etzel’s palace; but he is also expert at performing other music, with ” a strong fiddle-bow, mighty and long, like to a sword, exceeding sharp and broad.” He is the type of the medieval knightly minstrel of the age of the Minnesang.

But for all their prowess, after a prolonged struggle (Avent. xxix.-xxxvii.), the Burgundians were at last overwhelmed. Most of the chief figures of heroic saga had come up against them: Attila, Hildebrand, the Ostrogoth Theodoric (Dietrich von Bern). To the last-named even Hagen armed with Sieg- fried’s sword had to yield (Avent. xxxviii.). Kriemhild came to him as he lay in bonds and demanded the Nibelung treasure. He refused to reveal its hiding-place so long as Gunther, also a prisoner, should live. Gunther was accordingly slain by the queen’s orders and his head was brought to Hagen, who cried out when he saw it that all had been accomplished as he had foretold:

” Now none knows where the hoard is save God and I alone: That to thee, devil-woman, shall nevermore be known ! ”

Whereupon Kriemhild slew him with Siegfried's sv/ord. But Kriemhild was not destined, like Gudrun, to set out on further adventures. Hildebrand, horrified at her deed, sprang forward and cut her to pieces with his sword.

In sorrow now was ended the king's high holiday, As ever joy in sorrow ends and must end alway.

To some MSS. of the Nibelungenlied is added a supplementary poem- called the Klage or Lament, a sequel of 2160 short-line couplets, describing the lament of the survivors — notably Etzel — over the slain, the burying of the dead, and the carrying of the news to the countries of the Burgundians and others. At the end it is stated that the story was written down, at the com- mand of Bishop Pilgrim of Passau, by a writer named Konrad (Kuonrat) in Latin, and that it had since been sung (getichtet) often in the German tongue.

Sources of the Story. — The origin and nature of the various elements that go to make up the story of the Nibelungen- lied have been, and continue to be, the subject of very lively debate. The view at one time most generally accepted was that first propounded by Karl Lachmann in his " Kritik der Sage von den Nibelungen " (Rheinisches Museum fiir Philologie, Num. 249, 250, 1829, republished in his Zu den Nibelungen . . . Anmerkungen in 1836), namely, that the story was originally a myth of the northern gods, modified into a heroic saga after the introduction of Christianity, and intermingled with historical elements. This view is maintained by Richard von Muth in his Einleitung in das Nibelungenlied (Paderborn, 1877), who thus sums up the result of his critical researches: " The basis of all is an old myth of a beneficent divine being (Siegfried), who conquers daemonic powers (the Nibelungen), but is slain by them (the Burgundians turned Nibelungen); with this myth was connected the destruction of the Burgundian kingdom, ascribed to Attila, between 437 and 453, and later the legend of Attila's murder by his wife; in this form, after Attila and Theodoric had been associated in it, the legend penetrated, between 555 and 583, to the North, where its second part was developed in detail on the analogy of older sagas, while in Germany a complete change of the old motif took place." To this theory the objection is raised that it is but a theory; that it is un- supported by any convincing evidence; and that the process which it postulates, that, namely, of the transformation of the gods into heroes by the popular imagination, is contrary to all that we know of the fate of dethroned deities, who are apt to live on in fairy stories in very unheroic guise. So early as 1783 Johannes von Miiller of Gottingen had called attention to the historical figures appearing in the

Nibelungenlied, identifying

Etzel as Attila, Dietrich of Bern as Theodoric of Verona, and the Burgundian kings Gunther, Giselher and Gemot as the Gun- daharius, Gislaharius and Godomar of the Lex Burgundiorum; in 1820 Julius Leichtlen (Neuaufgefundenes Bruchstiick des Nibelungenliedes, Freiburg-im-Breisgau) roundly declared that ” the Nibelungenlied rests entirely on a historical foundation, and that any other attempt to explain it must fail.” This view was, however, overborne by the great authority of Lachmann, whose theory, in complete harmony with the principles popular- ized by the brothers Grimm, was accepted and elaborated by a long series of critics. It is only of late years that criticism has tended to revert to the standpoint of Miiller and Leichtlen and to recognize in the story of the Nibelungen as a whole a misty and confused tradition of real events and people. Mythical elements it certainly contains; and to those figures which — like Siegfried, Brunhild, Hagen and the ” good margrave ” Ruedeger of Bechlaren — cannot be traced definitively to historical originals, a mythical origin is still provisionally ascribed. But criticism is still busy attempting to trace these also to historical originals, and Theodor Abeling (Das Nibelungenlied, 1907) makes out a very plausible case for identifying Siegfried with Segeric, son of the Burgundian king Sigimund, Brunhild with the historical Brunichildis, and Hagen with a certain Hagnericus, who, according to the Life of St Columban, guided the saint (the chaplain of the Nibelungenlied), who had incurred the enmity of Brunichildis, safe to the court of her grandson Theu- derich, king of the West Franks.

Herr Abeling’s theory of the sources of the Nibelungen story is one among many; but, as it is one of the latest and not the least ingenious, it deserves mention. That the Icelandic Eddas contain the oldest versions of the legend, though divided and incomplete, is universally admitted. It is equally well established, however, that Iceland could not have been its original home. This Herr Abeling locates among the Franks of what is now southern France, whence the stories spread, from the 6th century onwards, on the one hand across the Rhine into Franconia, on the other hand westwards and northwards, by way of Ireland — at that time in close intercourse with continental Europe — and the northern islands, to Iceland. Hence the two traditions, the German and the Icelandic, of which the latter alone is preserved in something of its primitive form, 1 though primitive elements survive in the Nibelungenlied.

The basis of the story is then, according to this view, historical, not mythical: a medley of Franco-Burgundian historical traditions,

overlaid with mythical fancies. 2 The historical nucleus is the overthrow of the Burgundian kingdom of Gun- dahar by the Huns in 436; and round this there gathered an accretion of other episodes, equally historical in their origin, however distorted, with a naive disregard of chronological possibility: the murder of Segeric (c. 525), the murder of Sigimund by the sons of Chrothildis, wife of Clovis (identified by Abeling with Kriemhild), the murder of Attila by his Bur- gundian wife Ildico (see Kriemhild) . In the Eddas the identity of the original Franco-Burgundian sagas is fairly preserved. In the Nibelungenlied, on the other hand, the influence of other wholly unconnected stories is felt: thus Hildebrand appears during the final fight at Etzel's court, and Theodoric the Great (Dietrich von Bern; see Theodoric), for no better reason than that the Dietrich legend had sent him into exile there, and that he must have been there when the Burgundians arrived.

Origin of the Poem. — The controversy as to the underlying elements of the Nibelung legend extends to the question of the authorship and construction of the poem itself. Was it from the first — whatever additions and interpolations may have

1 The Eddas were first written down, as is commonly assumed, by Bishop Saemund Sigfusson (1056-1133).

2 The process of this overlaying is easy to realize if we remember how usual it was to transfer characteristics and episodes drawn from immemorial folk-lore to successive historical personages. A good example is the " Swan-maiden " myth connected with the house of Bouillon (see Lohengrin). See also other interesting cases cited in the chapter on the " Geste of John de Courci " in Mr J. H. Round's Peerage and Pedigree (London, 1910).

followed — conceived as a single, coherent story, or is it based on a number of separate stories, popular ballads akin to the Eddas, which the original author of the Nibelungenlied merely collected and strung together? The answer to these questions has been sought by a succession of scholars in a critical com- parison of the medieval MSS. of the poem still surviving. Of these 33 are now known, of which 10 are complete, the rest being more or less fragmentary. The most important are those first discovered, viz. the MSS. lettered C (Hohenems, 1755), B (Schloss Werdenberg, 1769), A (Hohenems,

1779); and round these the others more or less group themselves. They exhibit many differences: put briefly, C is the most perfectly finished in language and rhythm; A is rough, in places barbarous; B stands half-way between the two. Which is nearest to the original? Karl Lachmann (Zu den Nibelungen und zur Klage, Anmerkungen, 1836) decided in favour of A. He applied to the Nibelungenlied the method which Friedrich August Wolf had used to resolve the Iliad and Odyssey into their elements. The poem, according to Lachmann, was based on some twenty popular ballads, originally handed down orally, but written down about 1190 or 1200. This original is lost, and A — as its roughness of form shows — is nearest to it; all other MSS., including B and C, are expansions of A. The great authority of Lachmann made this opinion the prevalent one, and it still has its champions. It was first seriously assailed by Adolf Holtzmann (Untersuchungen ilber das Nib., Stuttgart, 1854), who argued that the original could not have been strophic in form — the fourth lines of the strophes are certainly often of the nature of ” padding” — that it was written by Konrad (Kuonrat of the Klage), writer to Bishop Pilgrim of Passau about 970-984, and that of existing MSS. C is nearest to this original, B the copy of a MS. closely akin to C, and A an abbreviated, corrupt copy of B. This view was adopted by Friedrich Zarncke, who made C the basis of his edition of the Nibelungenlied (Leipzig, 1856). A new hypothesis was developed by Karl Bartsch in his Untersuchungen ilber das Nibelungenlied (Leipzig, 1865). According to this the original was an assonance poem of the 12th century, which was changed between 1190 and 1200 by two separate poets into two versions, in which pure rhymes were substituted for the earlier assonances: the originals of the Nibelungenlied and Der Nibelunge Ndt respectively. Bartsch’s subsequent edition of the Nibelunge Ndt (1st ed., Leipzig, 1870) was founded on B, as the nearest to the original. To this view Zarncke was so far converted that in the 1887 edition of his Nibelungenlied he admitted that C shows signs of recension and that the B group is purer in certain details.

As a result of all this critical study Herr Abeling comes to the following conclusions. The poem was first written down by a wandering minstrel about 971 to 991, was remodelled about 1 140 by Konrad, 1 who introduced interpolations in the spirit of chivalry and was perhaps responsible for the metre; during the wars and miseries of the next fifty years manners and taste became barbarized and the fine traditions of the old popular poetry were obscured, and it was under this influence that, about 1 1 90, a jongleur (Spielmann) revised the poem, this re- cension being represented by group B. After 1190, during the Golden Age of the art poetry (Kunstdichtung) of the

Minnesingers {q.v.), a professional poet (Rudolf von Ems?) again remodelled the poem, introducing further interpolations, and changing the title from Der Nibelunge Ndt into Das Nibelungenliet, this version being the basis of the group C. The MS. A, as proved by its partial excellence, is based directly on Konrad's work, with additions borrowed from B.

1 Bartsch and others ascribe its authorship, with much plausi- bility, to an Austrian knight of the race of Kurenberg, the earliest of the courtly lyric poets, whose lyrics are written in the Nibelung strophe. Thus compare Kiirenberg's lyric (Lachmann and Haupt, Des Minnesangs Fruhling, 4th ed., F. Vogt, Leipzig, 1888) —

" Ich zftch mir einen valken m6re danne ein jar " with the Nibelungen Ndt (Bartsch) Av. i. 13 —

" troumte Kriemhilde. Wie si*?, ziige einen valken, stare scoen' und wilde."

Theodor Abeling (Das Nibelungenlied und seine Literatur (Leipzig, 1907) gives a full bibliography, embracing 1272 references from 1756 to 1905. There are English translations of the poem by A. G. Foster-Barham (1887), Margaret Armour (prose, 1897) and Alice Horton (1898). (W. A. P.)

NICAEA, or Nice [mod. Isnik, i.e. ds NiKaiav] an ancient town of Asia Minor, in Bithynia, on the Lake Ascania. Antigonus built the city (316 B.C. ?) on an old deserted site, and soon after- wards Lysimachus changed its name from Antigonia to Nicaea, calling it after his wife. Under the Roman empire Nicaea and Nicomedia disputed the title of metropolis of Bithynia. Strabo describes the ancient Nicaea as built regularly, in the form of a square, with a gate in the middle of each side. From a. monu- ment in the centre of the city all the four gates were visible at the extremities of great cross-streets. After Constantinople became the capital of the empire Nicaea grew in importance, and after the conquest of Constantinople by the Crusaders became the temporary seat of the Byzantine emperor; the double line of walls with the Roman gates is still well preserved. The possession of the city was long disputed between the Greeks and the Turks. It remained an important city for some time after its final incorporation in the Ottoman empire; but became subsequently an insignificant village.

NICAEA, COUNCIL OF. The Council of Nicaea (a.d. 325) is an event of the highest importance in the history of Christianity. Its convocation

and its course illustrate the radical revolution which the position of this religion, within the confines of the Roman empire, had undergone in consequence of the Edict of Milan. Further, it was the first oecumenical council, and this fact invested it with a peculiar halo in the eyes of subsequent ages; while among its resolutions may be found a series of decisions which acquired a lasting significance for the Christian Church. This applies more especially to the reception of the doctrine of the Trinity; for though, immediately after the close of the synod, it was exposed to a powerful opposition, it gained the day, and, in the form which it received at Nicaea and at the council of Constantinople (381), still enjoys official validity in the principal churches of Christendom. Finally, the council marks an epoch in the history of the conception of the Christian religion, in that it was the first attempt to fix the criteria of Christian orthodoxy by means of definitely formulated pro- nouncements on the content of Christian belief — the acceptance of these criteria being made a sine qua non of membership of the Church. Moreover, it admitted the principle that the state might employ the secular arm to bring the Christian subjects of the Roman world-empire under the newly codified faith. Thus the Nicene Council is an important stage in the develop- ment of the state-church, though the completion of that edifice was delayed till the reign of Theodosius the Great. The relation of the emperor Constantine to the assembly was in itself a step in the direction of that independent treatment of ecclesiastical affairs, which, in the following centuries, created the peculiar type of the Byzantine state-church.

From his accession Constantine had shown himself the friend of the Christians; and, when his victory over Licinius (a.d. 323) gave him undisputed possession of the crown, he adhered to this religious policy, distinguishing and fortifying the Christian cause by gratuities and grants of privilege. This propitiatory attitude originated in the fact that he recognized Christianity — ■ which had successfully braved so many persecutions — as the most vital and vigorous of religions, and as the power of the future. Consequently he directed his energies toward the establishment of a positive relationship between it and the Roman state. But the Church could only maintain its great value for the politician by remaining the same compact organism which it had proved itself to be under the stormy reign of Diocletian. Scarcely, however, did it find itself in the enjoyment of external peace, when violent feuds broke out in its midst, whose extent, and the virulence with which they were waged, threatened to dismember the whole religious body. Donatism in the West was followed by the Arian struggle in the East. The former move- ment had been successfully arrested, though it survived in North Africa till the 5th century. The

conflict kindled by the

Alexandrian presbyter Arius (q.v.) assumed greater dimensions and a more formidable character. Constantine at first attempted to restore quiet in Alexandria by transmission of an epistle by Bishop Hosius of Cordova, but his admonitions were fruitless. Accordingly, since other debatable points were at issue, he had recourse to an institution previously evolved by the Christian Church — the convocation of a synod to pronounce on burning questions — qualifying it, however, to correspond with the altered circumstances. He convened a council, designed to represent the whole Church of the empire, at Nicaea in Bithynia, a town situated no great way from the imperial summer-residence of Nicomedia and within easy reach by sea of the Oriental bishops. Among the various estimates of the number of dele- gates, the statement of Athanasius, who speaks of 318 members, has dominated the tradition. In consequence of the vast dis- tances, the West was but weakly represented. From Spain, Hosius — the above-mentioned bishop of Cordova — made his appearance; from Gaul, Nicasius of Dijon; from Dalmatia, Domnus of Stridon; from Italy, Marcus of Calabria with two presbyters as deputies of the Roman bishop Silvester; and from North Africa, Caecilian of Carthage. Thus an immense majority of the synod hailed from the East. The bishops of the three most important metropolises were present — Alexander of Alexandria, Eustathius of Antioch and Macarius of Jerusalem — while a prominent role was also played by Eusebius, bishop of the imperial city Nicomedia, and his erudite namesake, Eusebius of Caesarea. Of the other prelates not a few had distinguished themselves as confessors in the later persecution, and still bore the honourable traces of their sufferings. Since the bishops were accompanied by priests, Nicaea witnessed an array of clerics such as had never before been mustered in a single place. Among the attendant clergy, the still youthful deacon Athanasius, destined to succeed Alexander in the see of Alexandria, was prominent as the most powerful antagonist of Arianism (see Athanasius). The synod met in the imperial palace from the 20th of May to the 25th of July. What order of procedure obtained, and in whom the presidency was vested, are problems which admit of no certain solution: the one indisputable fact is that Constantine — who, at his appearance, was accorded a ceremonious reception, and himself delivered an address on the occasion — exercised a decided influence on the discussions.

The deliberations on the Arian question passed through several distinct stages before the final condemnation of Arius and his doctrines was reached. A clearly defined standpoint with regard to this problem — the relationship of Christ to God — was held only by the attenuated group of Arians and a far from numerous section of delegates, who adhered with unshaken conviction to the Alexandrian view. The bulk of the members occupied a position between these two extremes. They rejected the formulae of Arius, and declined to accept those of his opponents; that is to say, they were merely competent to establish negations, but lacked the capacity, as yet, to give their attitude of com- promise a positive expression. In the main they perpetuated the line of Origen. That the majority of the council should have adopted this neutral tendency is easily intelligible when we consider the state of theology at that period. True, at Nicaea this majority eventually acquiesced in the ruling of the Alex- andrians; yet this result was due, not to internal conviction, but partly to indifference, partly to the pressure of the imperial will — a fact which is mainly demonstrated by the subsequent history of the Arian conflicts. For if the Nicaean synod had arrived at its final decision by the conscientious agreement of all non-Arians, then the confession of faith there formulated might indeed have evoked the continued antagonism of the Arians, but must necessarily have been championed by all else. This, however, was not the case; in fact, the creed was assailed by those very bodies which had composed the laissez-faire centre at Nicaea; and we are compelled to* the conclusion that, in this point, the voting was no criterion of the inward convictions of the council.

In the synod, an Arian confession of faith was first brought forward and read; but it aroused such a storm of indignation

that obviously, in the interests of a restoration of ecclesiastical peace, there could be no question of its acceptance. On this, Eusebius of Caesarea submitted the baptismal creed of his community; and this met with the imperial approval. Since the creed dated from a period anterior to the outbreak of the Arian struggle, its reception would have been equivalent to a declaration on the part of the council that it declined to define its position with reference to the controversy of the hour. That the greater number of delegates were not disinclined to adopt this subterfuge, so congenial to their standpoint, and to shelve the actual solution of the whole problems by recognition of this or some similar neutral formula, is extremely probable. But the emperor manifestly saw that, if the difficulties were eluded in any such mode,

it was inevitable from the very nature of the case, that they should rise again in an accentuated form, and that consequently no pacification could be expected from this policy. Since the Eastern Church subscribed to the Alex- andrian solution of the question, he drew the natural deduction and concluded that he had here a genuine presentment of the feeling of the Church, which, if it received official sanction, might be justly expected to restore peace to the Christian community. But, in pronouncing for this view, he was careful to dissociate himself from the formulation of a new confession: for it was imperative to avoid even an apparent innovation in the articles of faith. Accordingly he proposed that the Caesarean creed should be modified by the insertion of the Alexandrian passwords — as if for the purpose of more accurate definition — and by the deletion of certain portions. That he appreciated the import of these alterations, or realized that this revision was virtually the proclamation of a new doctrine, is scarcely probable. The creed thus evolved — the expression dfiocvaws is of Western origin — was finally signed by all the deputies with the exception of the bishops Theonas of Marmarica and Secundus of Ptolemais: even the Arians had submitted. The two recalcitrant prelates, with the presbyter Arius, were banished to Illyria; Eusebius of Nicomedia and Theognis of Nicaea were also driven into exile, and at the same time the works of Arius were condemned to be burned under pain of death.

But this artificial unity was no ratification of peace: in fact, it paved the way for a struggle which convulsed the whole empire. For it was the proclamation of the Nicene Creed that first opened the eyes of many bishops to the significance of the problem there treated; and its explanation led the Church to force herself, by the arduous path of theological work, into compliance with those principles, enunciated at Nicaea, to which, in the year 325, she had pledged herself without genuine assent.

In addition to the Arian impasse, there was the schism of Bishop Meletius of Lycopolis in the Thebaid, whose settlement Constantine had added to the programme of the council. He and Peter, bishop of Alexandria, had come into conflict over the treatment of the ” backsliders ” (lapsi) in the Diocletian persecu- tion; and their strife acquired additional bitterness from the fact that it was extended to cover the prerogatives of the Alexandrian bishopric. Peter had composed a treatise advocat- ing moderate principles and censuring the courtship of martyrdom for its own sake, then gone so far as to save himself by flight. Meletius, on the other hand, represented the most rigorous school, and allowed himself high-handed infringements of the law. When this had resulted in his deposition by a synod, a

faction still adhered to him, and the Meletians became a schis- matic community; and such they remained even after the death of Peter (311), who demonstrated by his martyrdom that his counsels of moderation were not prompted by cowardice. This Meletian schism made for disorder in the ecclesiastical life of Egypt all the more because its followers sided with Arius. The Nicene Council broke the strength of the movement by great concessions to the Meletian bishops, and, at the same time, expressly recognized the supreme rights of the Alexandrian see over Egypt, Libya and the Pentapolis. Since, in the resolution dealing with this point (canon vi.), reference was made to the analogous and undisputed suzerainty of the Roman see — over

the ten suburbican provinces, attached to the diocese of Rome and including middle and lower Italy, with the islands of Sicily, Corsica and Sardinia — this decision enshrines an important piece of evidence for the history of the papacy. On this oppor- tunity, his ancient privileges were restored to the bishop of Jerusalem, who, in consequence of the political history of the Holy Land, had been subordinated to the metropolitan of Caesarea (canon vii.). The path was smoothed for the readmittance of the Novatians (Catkari) into the church, by recognizing, in this case, their clergy, with the bare stipulation that the laying-on of hands should follow their written promise to be faithful to the doctrine of the Catholic Church (canon viii.).

With regard to the much-debated question as to the termina- tion of the Easter festival, the synod committed itself so far as to pronounce in favour of the Alexandrian cycle — a settle- ment which entailed such important results in practical life that it was communicated to the Christian churches by Con- stantine in a circular letter. The problem, whether a baptism, performed by heretics in the name of Christ or the Trinity, should rank as a baptism or not, had given rise to an animated controversy between the Roman bishop Stephen, who answered in the affirmative, and Cyprian of Carthage, who gave an equally decided negative. The council followed the Roman practice, merely declaring the nullity of baptisms imparted by the adherents of Paul of Samosata (canon xix.). An important provision, in point of ecclesiastical law, was that the chirotony of a bishop required the

presence of at least three other bishops of his province, while the confirmation of the choice remained at the disposal of the metropolitan (canon iv.). A further regulation was that two provincial synods should be held annually (canon v.) ; but a law enacting the celibacy of the clergy was rejected at Nicaea, since Paphnutius, an aged bishop of Egypt who had been tested in persecution, warned his col- leagues against the danger of imposing too arduous a yoke upon the priesthood, and defended the sanctity of marriage.

As Constantine had convened the synod, so he determined its conclusion. A brilliant banquet in the imperial palace — of which Eusebius of Caesarea gives an enthusiastic account — marked its close, after which the bishops were granted their return. The admonitions to peace with which he dismissed them proved unavailing for the reasons indicated above: but the reputation of the first oecumenical council suffered no abatement in consequence.

See F. v. Hefele, Conciliengeschichte, i. (ed. 2, Freiburg, 1873),

Ep. 282-443. A catalogue of the special literature will be found in oofs's article " Arianismus " in Herzog-Hauck, Realencyklopddie f. prolestantische Theologie, i. (ed. 3, Leipzig, 1897); also Bernoulli, " Nicaenisches Konzil," ib., vol. xiv. (1904), pp. 9 sqq. (C. M.)

NICANDER (2nd cent. B.C.), Greek poet, physician and grammarian, was born at Claros, near Colophon, where his family held the hereditary priesthood of Apollo. He flourished under Attalus III. of Pergamum. He wrote a number of works both in prose and verse, of which two are preserved. The longest, Theriaca, is an hexameter poem (958 lines) on the nature of venomous animals and the wounds which they inflict. The other, Alexipharmaca, consists of 630 hexameters treating of poisons and their antidotes. In his facts Nicander followed the physician Apollodorus. Among his lost works may be mentioned: Aetolica, a prose history of Aetolia; Heteroeumena, a mythological epic, used by Ovid in the Metamorphoses and epitomized by Antoninus Liberalis; Ceorgica and Melissourgica, of which considerable fragments are preserved, said to have been imitated by Virgil (Quintilian x. 1. 56). The works of Nicander were praised by Cicero (De oratore, i. 16), imitated by Ovid, and frequently quoted by Pliny and other writers. His reputation does not seem justified; his works, as Plutarch says {De audiendis poetis, 16), have nothing poetical about them except the metre, and the style is bombastic and obscure; but they contain some interesting information as to ancient belief on the subjects treated.

Editions. — J. G. Schneider (1792, 1816); O. Schneider (1856) (with the Scholia); H. Klauser, ” De Dicendi Genere . . . Nicandri ” {Dissertationes Philologicae Vindobonenses, vi. 1898).

The Scholia (from the Gottingen MS.) have been edited by G. Wentzel in Abhandlungen der k. Gesellschaft der Wiss. zu Gottingen, xxxviii. (1892). See also W. Vollgraff , Nikander und Ovid (Groningen, 1909 foil.).

NICANOR, Greek grammarian, son of Hermeias of Alexandria (or Hierapolis), lived during the reign of Hadrian. He chiefly devoted himself to the study of punctuation and the difference of meaning caused by it. Hence he was nicknamed ” the Punctuator ” (6 any / nemas). He is known to have written on the punctuation of Homer and Callimachus. He was possibly the author of a work Ilepi MerovonaaMV (On the Change of Names of Places), of which some fragments are preserved in C. W. Muller, Fragmenla Hisioricorum Graecorum, iii. 632.

Edition of the Iliad and Odyssey fragments by L. Friedlander (1 850) and O. Carnuth (1875) respectively.

NICARAGUA, a republic of Central America, bounded on the N. by Honduras, E. by the Caribbean Sea, S. by Costa Rica, and W. by the Pacific Ocean (for map, see Central America). Pop. (1905), about 550,000; area, 49,200 sq. m. Nicaragua forms an irregular equilateral triangle with its base stretching for 280 m. along the Caribbean Sea from Cape Gracias a Dios southwards to the San Juan delta, and its apex at the Coseguina volcano, on the Bay of Fonseca, which separates Nicaragua on the Pacific side from Salvador. The frontier which separates the republic from Honduras extends across the continent from east-north-east to west-south-west. It is defined by the river Segovia for about one-third of. the distance, or from Cape Gracias a Dios to 86° W.; it then deflects across the watershed on the east and south of the Hondurian river Choluteca, crosses the main Nicaraguan cordillera (mountain chain), and follows the river Negro to the Bay of Fonseca. In accordance with the treaty of 1858, which was confirmed in 1888 by the United States president, acting as arbitrator, and more fully defined in 1896, the boundary towards Costa Rica is drawn 2 m. S. of the San Juan river and Lake Nicaragua, as far as a point parallel to the centre of the western shore of the lake. It is then continued south-westward for the short distance which intervenes between this point and the northernmost headland of Salinas Bay, on the Pacific.

Physical Features. — The coasts of Nicaragua are strikingly different

in configuration. The low, swampy and monotonous shore of the Caribbean, with its numerous lagoons and estuaries, and its fringe of reefs and islets, contains only three harbours: Gracias a Dios, Bluefields or Blewfields, and Greytown (San Juan del Norte). Its length, from Cape Gracias a Dios to the San Juan delta, is nearly 300 m. The Pacific coast, measuring some 200 m. from the Bay of Fonseca to Salinas Bay, is bold, rocky and unbroken by any great indentation; here, however, are the best harbours of the republic — the southern arm of the Bay of Fonseca (q.v.), Corinto, Brito and San Juan del Sur.

The surface of the country is naturally divided into five clearly distinct zones: (1) the series of volcanic peaks which extend parallel to the Pacific at a little distance inland ; (2) the plains and lakes of the great depression which lies to the east of these mountains and stretches from sea to sea, between the Bay of Fonseca and the mouths of the San Juan; (3) the main cordillera, which skirts the depression on the east, and trends north-west from Monkey Point or Punta Mico on the Caribbean Sea, until it is merged in the ramifica- tions of the Hondurian and Salvadorian highlands ; (4) the plateaus which slope gradually away from the main cordillera towards the Caribbean; (5) the east or Mosquito coast.with its low-lying hinter- land. The last-named region has to a great extent had a separate history ; and it was only in 1894 that the Mosquito Reserve, a central enclave which includes more than half of the littoral and hinterland, was incorporated in the republic and renamed the department of Zelaya. (See Mosquito Coast.)

Though situated almost on the western edge of the country, and greatly inferior, both in continuity and in mean altitude, to the main cordillera, the chain of volcanic cones constitutes a watershed quite equal in importance to the cordillera itself. It consists for the most part of isolated igneous peaks, sometimes connected by low interven- ing ridges. It terminates in th,e extreme north-west with Coseguina (2831 ft.), and in the extreme south-east with the low wooded archi- pelagos of Solentiname and Chichicaste near the head of the San Juan river. Between these two extremes the chief cones, proceeding southwards, are: the Maribios chain, comprising El Viejo (5840 ft.), Santa Clara, Telica, Orota, Las Pilas, Axosco, Momotombo (4127 ft.), all crowded close together between the Bay of Fonesca and Lake

Managua; Masaya or Popocatepac (which was active in 1670, 1782,

1857 and 1902, and attains a height of 2972 ft.), and Mombacho (4593 ft-), near Granada; lastly, in Lake Nicaragua the two islands of Zapatera and Ometepe or Omotepec with its twin peaks Ometepe (5643 ft.) and Madera. On the 20th of January 1835 Coseguina was the scene of one of the most tremendous eruptions on record. The outbreak lasted four days and the volcanic dust and ashes erupted fell over a vast area, which comprised Jamaica, southern Mexico and Bogota. After a long repose Ometepe also burst into renewed activity on the 19th of June 1883, when the lavas from a new crater began to overflow and continued for seven days to spread in various directions over the whole island. In the Maribios district occur several volcanic lakelets, such as that of Masaya, besides numerous infemillos, low craters or peaks still emitting sulphurous vapour and smoke, and at night often lighting up the whole land with bluish flames.

In the great lacustrine depression of Nicaragua is collected all the drainage from the eastern versant of the volcanic mountains, from the sheer western escarpment of the main Cordillera, and from a large area of northern Costa Rica. The only river which flows out of the depression on the north enters the Bay of Fonseca at Tempisque. The accumulated waters which pour down into the depression are gathered into the two basins of Lake Managua and Lake Nicaragua. Both basins have a maximum depth of some 260 ft. Lake Managua, the more northerly, has a length of 30 m. and varies in breadth from 8 to 16 m. Its area is about 575 sq. m. After the rains a portion of its overflow escapes southwards into the lower and larger Lake Nicaragua, through the Panaloya channel. Steamers ply on both lakes, but the channel is rendered impassable by a rapid near the town of Tipitapa, at its northern extremity. Here there is a water- fall of 13 ft. The existence of ancient lacustrine beaches, upheaved between the two basins by volcanic agencies or left dry by some enlargement of the San Juan outfall, and a consequent subsidence of the water-level, seems to indicate that the lakes were formerly united. Now, however, Lake Managua is almost a closed basin in the dry season, when the stream in parts of the Panaloya channel sinks to a mere rivulet. The surface of Lake Nicaragua after the rains is 1 10 ft. above sea-level. The lake is 100 m. long, and has a maximum breadth of 45 m. and an area of 2970 sq. m. It is thus the largest sheet of fresh water between Lake Michigan and Lake Titicaca on the borders of Bolivia and Peru. Towards the San Juan outlet its depth decreases to 6 or 8 ft., owing to the vast accumulation of the silt washed down into the lake by its principal Costa Rican affluent, the Rio Frio. Much of this silt is again carried away by the San Juan. Under the influence of the intermittent trade-winds Lake Nicaragua rises and falls regularly, whence the

popular notion that it was a tidal lake. It is also exposed to the dangerous Papagayos tornadoes, caused by the prevailing north-easterly winds meeting opposite currents from the Pacific, It is drained on the south by the San J uan river, which flows generally east by south to the Caribbean Sea. The distance from the lake to the principal or Colorado mouth of the river is 95 m., and the average width of the channel 1500 ft. Near its mouth the main stream branches out into a wide delta. Navigation is greatly impeded by shifting banks of silt, and especially by five rapids which can only be traversed when the river is in full flood. It is often asserted that these rapids were artificially formed by the Spaniards themselves to prevent the buccaneers from penetrating to Lake Nicaragua. But Herrera (Dec. iii. book 2, chap. 3) speaks of the ” great rocks and falls ” which prevented Cordova, the first circumnavigator of the lake, from descending the San Juan in 1522; and although the English traveller Gage states that in his time (17..1 century) vessels reached Granada direct from Spain, there can be little doubt that the rapids are natural obstructions. The various schemes which have been put forward for the conversion of the San Juan and the lacustrine depression into an interoceanic waterway are fully discussed under Panama Canal.

The main Nicaraguan cordillera, which flanks the depression on the east, has often been called the Cordillera de los Andes, from its supposed continuity with the mountain-chains of Panama and the west coast of South America. There is in fact no such continuity, for the San Juan valley completely separates the mountains of Panama from the main Nicaraguan system: This severance, it is true, may be geologically recent, and some geologists see, in the five rapids rf the San Juan, remnants of a connecting ridge which the river has swept away. But the evidence for past continuity is inconclusive, while there can be no doubt about the present severance of the two mountain systems. The main cordillera bears different names in different parts of Nicaragua. Thus the important section which terminates at Monkey Point is commonly called the Cordillera de Yolaina. The summits of the main cordillera seem nowhere to exceed 7000 ft. in altitude; the mean elevation is probably less than 2000 ft. ; the declivity is sheer towards the lakes, and gradual towards the Caribbean. Along the shores of the lakes the cordillera may be described as a double range, consisting of two series of ridges divided by a great longitudinal valley. The lower series, which adjoins the lakes, rises near Lake Managua, and marches parallel to the main crest of the cordillera as far as the northern base of the Yolaina section ; it then diverges, trending south-east nearly as far as Greytown, while the axis of ihe Yolaina section has a more easterly direction.

On the east, the main cordillera abuts upon the region of plateaus and savannas, which occupies nearly half of the area of Nicaragua. It is likely that this region was once a single uniform tableland, sloping by degrees to the flat Mosquito Coast, in which direction its level still sinks. But the relief of the tableland has been wholly changed by fluvial action. The great rivers which flow eastward to the sea have fissured and moulded the surface into deep ravines alter- nating with high plateaus, ridges and isolated hills. Large tracts of these uplands have never been adequately explored, and consist of virgin forest and prairie. The principal river is the Segovia, which rises in the main cordillera due north of Lake Managua, winds E.N.E. as far as 85 W., and constitutes the frontier until it reaches the sea at Cape Gracias a Dios, after a course of more than 450 m., during which it receives many . tributaries. Its basin is narrow and its volume not remarkable, but in length it surpasses all other Central American rivers. Its nomenclature, like that of many lesser streams in the plateau region, is, somewhat confusing'; for while the Spanish colonists were settling beside its headwaters the mid-stream was hardly known except to the native Indians, and the lower reaches were frequented by buccaneers, often of British or Dutch origin. In addition to the three names of Segovia, Coco or Cocos, and Wanks, which are applicable to the whole river, different parts have from time to time received the names of Cabullal, Cabrugal, Cape River, Encuentro, Gracias, Herbias, Oro, Pantasma, Portillo Liso, Tapacac, Telpaneca, Somoro, Yankes, Yare and Yoro. Other important streams, all flowing to the Caribbean in a direction E. by S., are the Hueso, Wawa, Cuculaia, Prinzapolca, Rio Grande, Bluefields and Rama. The Rio Grande or Amaltara, which receives one large tributary, the Tuma, is navigable for about 100 m. The Bluefields, Blewfields, Escondida, or Rio del Desastre, which derives its best- known name from that of Blieveldt, a Dutch corsair, is navigable for 65 m. The hydrography of Nicaragua is curious in two respects: as in the Amazonian region all the large rivers flow east, none escap- ing to the Pacific ; and the main watershed does not correspond with the main cordillera, which is inferior in this particular both to the volcanic mountains and to the plateau region.

The geology, fauna and flora of Nicaragua may be studied in connexion with those of the neighbouring countries (see Central America).

Climate. — The climate is mild and healthy for Europeans on the uplands, such as those of Segovia and Chontales, which have a mean elevation of 2000 to 3000 ft. above sea-level. But elsewhere it is distinctly tropical, with two seasons — wet from May to November on the Pacific slope, and from June to December on the Caribbean, and

dry throughout the winter months. The mean annual tempera- ture is about 8o° Fahr., falling to 70 at night and rising to 90° at noon in summer. Nicaragua comes within the zone of the wet north- east trade-winds, which sweep inland from the Atlantic. The rain- fall is heavy along the west side of the lacustrine basin, with an annual mean at Rivas of 102 in., but this figure is sometimes greatly exceeded on the east coast, where rain is common even in the dry season. Observations made at Greytown in 1890 showed the extremes of temperature to be 89° Fahr. in September for the maximum and 70 Fahr. in January for the minimum; the rainfall for the whole year amounted to 297 in., the rainiest month having been July (52-5 in.) and the driest, May (4-9 in.). Earthquakes are felt at times on the Pacific slope, but in Nicaragua they are less violent than in the neighbouring countries.

Inhabitants. — Accurate statistics as to the growth and distri- bution of the population cannot be obtained, and the figures given below are based on estimates which can only be approxi- mately correct. The census of 1882 gave the total as 275,816; this appears to have risen in 1890 to 375,000, in 1900 to 500,000, and in 1905 to 550,000, or 11 inhabitants per sq. m. There can thus be no doubt that the population is increasing with extra- ordinary rapidity, although there is hardly any immigration. The number of Europeans and their pure-blooded descendants is about 1200, and tends to increase. Spanish and German elements preponderate in the foreign colonies. The most densely peopled region and the focus of civilization is the lacustrine depression and the surrounding uplands. Here are all the large towns, and hither European settlers were attracted from the first by the temperate climate, rich soil, and natural waterways. The development of Nicaragua, unlike that of most American countries (notably Brazil and the United States), has been from west to east. The great mass of the population is a composite race, descended chiefly from the native ” Indians,” their Spanish conquerors, many of whom were Galicians, and the negro slaves introduced during the colonial period. Intermarriage with British, Dutch, and French with Caribs and Creoles has further complicated the ethnology of the country, producing ” Indians ” with fair hair and blue eyes, and half-castes with European features and Indian or negroid coloration, or with European

coloration and Indian or negroid features. The prevailing language is a degenerate form of Spanish, nearer to Galician than to Castilian. Most

of the native dialects have ceased to exist, but a corrupt form of English is spoken on parts of the east coast. All who speak Spanish are classed as Ladinos; the half-castes generally are termed Mestizos; and the name of Sambos or Zambos is confined to the descendants of Indian and negro parents; these are also incorrectly called Caribs. The number of the uncivilized Indians, whose camps or villages are situated in open glades among the forests of the plateau region, is usually estimated at 30,000; but this would seem to be an exaggeration. Pure-blooded Indians are not numerous, as whole districts were depopulated and whole tribes exterminated by the Spanish colonists and the buccaneers. A few may be descendants of the Aztecs and Mayas, whose temples, sculptures, burial- grounds, &c, have not yet been fully explored. For a general account of this ancient civilization and of the Indian tribes see Central America and Mexico: Archaeology. A collection of Nicaraguan antiquities is preserved in the National Museum at Washington, U.S.A.; and the archaeological collection brought to Europe by Dr W. Lehmann in 1910 was exhibited in the Berlin Museum of Fine Arts.

. Chief Towns and Communications. — The capital is Managua (pop. 1905, about 30,000); other important towns are Leon (45,000), Granada (25,000), Masaya (20,000), Chinandega (12,000), and the seaports of Corinto (3000) and Greytown (2500). These are described in separate articles. At the beginning of the 20th century, Nicaragua had few good roads, and none at all east of the main cordillera. Transport in the plateau region was mainly effected by means of pack mules, over the roughest of tracks. But between 1900 and 1905 contracts were signed for the construction of three highways, leading respectively from Matagalpa, from Nueva Segovia and from the Pis Pis mining district to the head of steam navigation on the Segovia, about 160 m. above Cape Gracias. These highways were to be linked to the western system by 79 m. of road connecting Matagalpa with Momotombo. For the construction and upkeep of roads a tax varying from one to ten pesos is levied on all males over eighteen years old. There are 160 m. of state railways, running from Corinto to Leon, Managua, Granada and Diriamba, with branches to El Viejo and Momotombo. Contracts for additional lines were signed between 1900 and 1905. The steamers which ply on the great lakes and the San Juan, besides other vessels which visit the principal Caribbean and Pacific ports, are national property; but from the 1st of January 1905 all the state railways were leased to a syndicate for fifteen years and the steamers for twenty-five years. There are also 20 m. of private railway near the mouth of the Rio Grande, and private steam tramways on the western shore of Lake Nicaragua. Corinto is

the headquarters of shipping; it is visited by two-thirds of the 2100 vessels of 550,000 tons (including coasters) which annually enter the ports of the republic. The coasting trade is restricted to vessels under the Nicaraguan flag. At the beginning of the 20th century most of the ocean-going steamers were owned in Germany or the United States; British enterprise being chiefly represented by schooners trading from Jamaica to Bluefields and Greytown. Nicaragua joined the postal union in 1882, and the western provinces have a fairly complete telegraphic and telephonic system.

Industries and Commerce. — The principal agricultural product is coffee, the yield of which increased from 4,528,300 lb in 1880 to 11,382,000 ft) in 1890, and 26,400,000 lb in 1900. Coffee is grown principally in the Matagalpa region, on the uplands of the interior. The plantations are chiefly owned and managed by Germans, and the product is of good quality; but coffee-planting, like most Nicaraguan industries, suffers from the scarcity of labour. On the Caribbean coast bananas are cultivated and largely exported to the United States. In 1903 more than 2,000,000 bunches were consigned to New Orleans. The cultivation of cotton has been often attempted, but with little success. Sugar is grown and there are many small sugar factories, but little of the output is exported. The cocoa export is also small; tobacco, rice, beans and other crops are grown for local use. Rubber is collected in the forests, and plantations have been formed. Dye-woods and indigo are exported, but the demand for vegetable dyes has decreased. Cattle-rearing is success- fully pursued, live cattle and hides being important articles of export. Cheese and butter are manufactured in large quantities for home consumption. Horses and pigs are also reared, but not sheep. In 1899 the government sold about 52,000 acres of public land lying about 18 m. E. of Lake Nicaragua for the purpose of colonization. The purchaser undertook to introduce settlers from northern Europe, to import cattle for the improvement of the Nicaraguan breed, to plant rubber and vanilla, and to provide schools for agricultural instruction. The sale of Nicaraguan spirits is 3 state monopoly. From the 1st of January 1904 it was leased to a syndicate of distillers for six years. Gold-mining is carried on along the Caribbean littoral. In 1898 the gold dust and bar exports from

Bluefields were of the value of £25,760; in 1900, £62,000; and in 1907, £65,000. Copper, coal, petroleum, silver and precious stones are also found, and there seems little reason to doubt that the mineral resources of Nicaragua, though undeveloped, are nearly as rich as those of Honduras. Other industries include manufactures of leather, boots and shoes, furniture, bricks and pottery, cigars and cigarettes, beer, wine and spirits, candles and soap. The largest and most

numerous commercial firms are German, but there are also French, British, and even Chinese establishments, although the im- migration of Chinese is prohibited by law. The principal exports are (in order of value) coffee, bananas, gold, rubber, cattle and hides, dye-woods and cabinet woods. The principal imports are cotton and woollen goods, machinery and hardware, flour, beer, wine, spirits and drugs. The United States and Great Britain send respectively 60% and 20% of the imports, receiving 60% and 8 % of the exports. The average yearly value of the foreign trade is about £1,200,000 — exports, £700,000; imports, £500,000.

Money, Weights and Measures. — There is one bank of issue, the Bank of London and Central America, which has a capital of £260,000 (£130,300 paid). The monetary unit is the silver peso or dollar of 100 cents, which weighs 25 grammes, 900 fine. The current coin consists largely of Mexican and Central and South American dollars; but little coin is in circulation. The currency is mostly paper, notes being issued directly by the treasury and by the bank. The notes issued by the bank must be covered to the extent of 40 % by gold and silver; the actual bank reserve is stated to be from 65 to 100 % of the notes issued. The value of the paper peso fluctuates; in 1904 the premium on gold stood at 640 %• The value of the silver peso in fractional silver money is about nineteen pence; in a single coin about twenty pence. The exportation of silver pesos is pro hibited. In 1899 a nickel coinage was introduced. The metric system of weights and measures was legalized in January 1893.

Finance. — The revenue of the republic is derived mainly from customs duties, liquor, tobacco and slaughter taxes, railways and steamers, the postal and telegraph services, and the gunpowder monopoly. The principal spending departments are those of war and marine, internal development, and finance. The published accounts, however, present no continuous or clear view of the national receipts and disbursements. Revenue and expenditure vary considerably, but neither often falls below £300,000 or rises above £500,000. In 1886 the republic contracted a railway loan in London to the amount of £285,000 at 6% interest, and in July 1894 the interest fell into default. In 1895 an arrangement was made for the reduction of interest to 4 %, the beginning of amortization, and the creation of ” coffee warrants ” to be used in the payment of export duties on coffee assigned for the service of the debt. In the four years 1897-1900 the sales of these warrants amounted to 1,028,990 gold pesos or (at 23d., the average rate for this period) £98,610. In July 1905 the outstanding amount of the debt was £253,600. In 1905 a further loan of 12,500,000 francs (£500,000) was raised in Paris at 5 %. The

internal debt amounts to about £400,000.

Constitution and Administration. — The former constitution, proclaimed on the 4th of July 1894 and amended on the 10th of December 1896, was superseded on the 30th of March 1905, when a new constitution was promulgated. By this instrument the legislative power is vested in a single chamber of 36 members (instead of 40, as under the old constitution), elected by universal male suffrage for six years (instead of two). The executive is entrusted to a president similarly chosen for six years (instead of four) and aided by a cabinet representing the five ministries of foreign affairs and education, finance, internal administration and justice, war and marine, and public works. For adminis- trative purposes the republic is divided into 13 departments and 2 comarcas, each under a political head who acts as military commandant and controls education, finance, &c. The ad- ministration of justice is entrusted to numerous courts of first instance, three courts of appeal, and a supreme court. The active army of 4000 men can be increased to 40,000 in war. All able-bodied citizens between the ages of seventeen and fifty- five are compelled to serve one year with the colours and are then enrolled in the reserve. Roman Catholicism is the prevailing creed, but all religions are tolerated, and none receives any en- dowment or other special privilege from the state. The bishop of Leon, whose diocese is included in the archiepiscopal province of Guatemala, is the spiritual head of the Roman Catholics. There are numerous elementary schools, at which the teaching is free and compulsory, besides ten colleges for secondary or technical education, and two universities.

History. — For a general account of the Spanish administration during the colonial period, i.e. up to 1821, and of the subsequent attempts to unite all the Central American republics in a single

federal state, see Central America. The history of the Mosquito Reserve and of the relations between Nicaragua and Great Britain is told in full under Mosquito Coast.

First discovered by Columbus in 1502, Nicaragua was not regularly explored till 1522, when Gil Gonzalez Davila pene- trated from the Gulf of Nicoya to the western provinces and sent his lieutenant Cordova to circumnavigate the great lake. The country is said to take its name from Nicaras or Nicaragua (also written Micaragua), a

powerful Cholutec chief, ruling over most of the land between the lakes and the Pacific, who received Davila in a friendly spirit and accepted baptism at his hands. Nicaragua's capital seems to have occupied the site of the present town of Rivas. The Spaniards overran the country with great rapidity, both from this centre northwards, and southwards from the Honduras coast. The occupation began with sanguinary conflicts between the two contending waves of intrusion. Granada was founded in 1524 on the isthmus between the two lakes as the capital of a separate government, which, however, was soon attached as a special province to the captaincy general of Guatemala, which comprised the whole of Central America and the present Mexican state of Chiapas. Hence, during the Spanish tenure, the history of Nicaragua is merged in that of the surrounding region. Of its five earliest rulers " the first had been a murderer, the second a murderer and rebel, the third murdered the second, the fourth was a forger, the fifth a murderer and rebel " (Boyle). Then came the hopeless revolts of the Indians against intolerable oppression, the abortive rebellions of Hernandez de Contreras and John Bermejo (Bermudez) against the mother country (1550), the foundation of Leon, future rival of Granada, in 1610, its sack by the buccaneers under William Dampier in 1685, and, lastly, the declaration of independence (1821), not definitively acknow- ledged by Spain till 1850.

In 1823 Nicaragua joined the Federal Union of the five Central American states, which was dissolved in 1839. While it lasted Nicaragua was the scene of continual bloodshed, caused partly by its attempts to secede from the confederacy, partly by its wars with Costa Rica for the possession of the disputed territory of Guanacaste between the great lake and the Gulf of Nicoya, partly also by the bitter rivalries of the cities of Leon and Granada, respective headquarters of the Liberal and Conservative parties. During the brief existence of the Federal Union no fewer than three hundred and ninety-six persons exercised the supreme power of the republic and the different states. The independent government of Nicaragua was afterwards dis- tinguished almost beyond all other Spanish-American states by an uninterrupted series of military or popular revolts, by which the whole people was impoverished and debased. One out- standing incident was the filibustering expedition of William Walker (q.v.), who was at first invited by the Liberals of Leon to assist them against the Conservatives of Granada, and who, after seizing the supreme power in 1856, was expelled by the combined forces of the neighbouring states, and on venturing to return was shot at Trujillo in Honduras on the 12th of September i860.

Under the administration of Chamorro, who became president in 1875, a difficulty with Germany occurred. The German government asserted that one of its consuls had been insulted, and demanded an indemnity of $30,000 (about £2800), a demand to which Nicaragua only submitted after all her principal ports had been blockaded. The successor of President Chamorro was General Zavala, whose administration brought Nicaragua to a higher degree of prosperity than she had ever known. He was succeeded in 1883 by Dr Cardenas, during whose presidency the attempt of General Barrios to unite the five Central American states was a cause of war between Guatemala and Honduras on one side, and Salvador, Nicaragua, and Costa Rica on the other. Cardenas had taken command of the united Nicaraguan and Costa Rican army when Barrios died, and on the nth of April 1885 a treaty of peace was signed. Don Evaristo Carazo succeeded Dr Cardenas as president of the republic in 1887, but died when he had served a little over two years, and was succeeded by

Dr Roberto Sacasa. Under Carazo's administration the boundary question between Nicaragua and Costa Rica had been settled by arbitration, the president of the United States acting as arbi- trator. While Dr Sacasa was president of Honduras, Salvador and Guatemala signed a treaty, under which the United States of Central America were to be formed. The president of Nicaragua adhered to this treaty, but the National Congress refused to ratify it.' Sacasa was overthrown by a revolution in 1893, and was succeeded by a provisional government, which in its turn was deposed soon after by another uprising, at the head of which was General Jose Santos Zelaya. His position was regularized by the constitution of 1S94, and he was re-elected president in 1898 for another term of four years. Under his government the incorporation of the Mosquito Reserve into the territory of Nicaragua took place. In 1895 occurred the Hatch incident, which led to the occupation of the port of Corinto by a British fleet. Mr Hatch, British pro-vice-consul at Bluefields, being accused of conspiracy against the Nicaraguan government, was arrested, along with other British subjects, and expelled. For this action Nicaragua was required to pay an indemnity of $15,000. An attempt to overthrow Zelaya was made in February 1896, but it was crushed after several months of severe fighting. There were occasional disturbances subsequently, but none sufficient to overturn President Zelaya, who was again re- elected in 1902 and 1906. In 1907 he carried to a successful issue the war which broke out in that year between Nicaragua and Honduras (q.v.). But he was believed to be planning the conquest of other Central American states, and his policy of granting monopolies and commercial concessions to his own

supporters aroused widespread discontent. In October 1909 an insurrection broke out in the Atlantic departments. The execution (after alleged torture) of two citizens of the United States named Grace and Cannon, who were said to have fought in the revolutionary army under General Estrada, led to the despatch of United States warships to Nicaragua; but in the absence of full evidence President Zelaya's responsibility for the execution could not be proved. 1 On the 1st of December the United States broke off diplomatic relations with Nicaragua, and in an official note Secretary Knox described the Zelayan administration as a " blot on the history " of the republic. Fight- ing at Bluefields was prevented by the U.S. cruiser " Des Moines" (18th December), an example followed at Grey town by the British cruiser "Scylla"; but elsewhere along the Atlantic coast the insurgents gained many victories. In the battle of Rama (23rd December) they captured the greater part of the government troops. On the following day Zelaya took refuge on board a Mexican gunboat, and sailed for Mexico. Dr Madriz, one of his supporters, had already succeeded him as president.

Bibliography. — For a general account of Nicaragua, see F. Boyle, A Ride across a Continent (2 vols., London, 1868); E. G. Squier, Nicaragua, &c. (2nd ed., London, 1871); J. W. Bodham, Whetham, Across Central America (London, 1877); T. Belt, The Naturalist in Nicaragua (London, 1888); A. R. Colquhoun, The Key of the Pacific (London, 1895) ; G. Niederlein, The State of Nicaragua (Philadelphia, 1898); A. P. Davis, Hydrography of Nicaragua (U.S.A. Geological Survey report, No. 20) (1900) ; C. Medina, Le Nicaragua en 1900 (Paris, 1900) ; J. W. G. Walker, Ocean to Ocean: an Account, Personal and Historical, of Nicaragua and its People (Chicago, 1902). For commerce, finance and administration, see the annual Reports of the Committee of the Corporation of Foreign Bondholders (London) ; D. Pector, Etude economique sur la republique de Nicaragua (Neuchatel, 1893) ; Bulletins of the Bureau of American Republics (Washington) ; U.S.A. Consular and British Foreign Office Reports; official reports issued periodically at Managua, in Spanish. For history, M. M. de Peralta, Nicaragua y Panama en el siglo XVI (Madrid, 1883) ; J. D. Gamez, Archivo historico de la RepiMica de Nicaragua (Managua, 1896) ; F. Ortega, Nicaragua en los primeros anos de su emancipacion politica (Paris, 1894); D. B. Lucas, Nicaragua: War of the Fili- busters (Richmond, Va., 1896); C. Bovallius, Nicaraguan Antiquities (Stockholm, 1886).

NICASTRO, a town and episcopal see of Calabria, Italy, in the province of Catanzaro, 17 m. W.N.W. of Catanzaro by rail, and s| m. E. of S. Eufemia, a station on the line along the

1 General Medina and other officers were tried by a Nicaraguan court-martial for the murder of Grace and Cannon, but were acquitted on the 28th of January 1910.

west coast from Naples to Reggio di Calabria. Pop. (1901) 13,671 (town), 18,150 (commune). It is situated on the isthmus between the gulfs of S Eufemia and of Squillace, the narrowest part of Calabria, 970 ft. above sea-level, and commands a fine view. The ruined castle served as the place of imprisonment of Frederick II. ‘s son Henry. The place suffered greatly from the earthquake of 1638, which also destroyed the Benedictine abbey of S Eufemia, founded by Robert Guiscard.

NICCOLI, NICCOLO DE’ (1363-1437), Italian humanist, was born and died at Florence. He was one of the chief figures in the company of learned men which gathered round Cosimo de’ Medici, who played the part of Augustus to Niccoli’s Maecenas. Niccoli’s chief services to classical literature consisted in his work as a copyist and collator of ancient MSS.; he corrected the text, introduced divisions into chapters, and made tables of contents. His lack of critical faculty was compensated by his excellent taste; in Greek (of which he knew very little) he had the assistance of Ambrogio Traversari. Many of the most valuable MSS. in the Laurentian library are by his hand, amongst them those of Lucretius and of twelve comedies of Plautus. Niccoli’s private library was the largest and best in Florence; he also possessed a small but valuable collection of ancient works of art, coins and medals. He regarded himself as an infallible critic, and could not bear the slightest contradiction; his quarrels with Filelfo, Guarino and especially with Traversari created a great sensation in the learned world at the time. His hypercritical spirit (according to his enemies, his ignorance of the language) prevented him from writing or speaking in Latin; his sole literary work was a short tract in Italian on Latin Orthography, which he withdrew from circulation after it had been violently attacked by Guarino.

See the Life in Traversarii Epistolae (ed. L. Mehus, 1759); G. Voigt, Die Wiederbelebung des klassischen Altertums (1893); G. Zippel, Nicolb Niccoli (Florence, 1890).

NICCOLITE, a mineral consisting of nickel arsenide, NiAs, containing 43-9% nickel and 56-1% arsenic. Crystals are hex- agonal, but are rare

and indistinct. It usually occurs as compact masses. A characteristic feature is the pale copper- red colour, with metallic lustre, on the uneven fractured surfaces. It is opaque and brittle, and the streak is brownish-black. The specific gravity is 7-5, and the hardness 5|. Small quantities of sulphur, iron and cobalt are usually present, and sometimes the arsenic is largely replaced by antimony. Antimonial varieties are known as arite, and form a passage to the isomorphous species breithauptite (nickel antimonide). Niccolite occurs with ores of cobalt, silver and copper at Annaberg and Schneeberg in Saxony, at Sangerhausen and Mansfeld in Prussian Saxony and other localities; it has occasionally been found in Cornwall and Scotland. The original arite (aarite) is from Mount Ar (Aar) near Pic du Midi d'Ossau in the Pyrenees.

The names niccolite (J. D. Dana, 1868) and nickeline (F. S. Beudant, 1832) refer to the presence of nickel (Lat. niccolum) . Owing to its copper-red colour the mineral is commonly called " copper-nickel," the German equivalent of which, Kupfernickel, was used as early as 1694. (L. J. S.)

NICE, a city of France, the chief town of the department of the Alpes Maritimes, and previous to i860 the capital of the county of Nice (Nizza) in the kingdom of Sardinia, 739 m. by rail from Paris. Pop. (1901) 127,027, of whom 105,109 were permanent residents; in winter-time there is a large influx of visitors. It occupies a fine position at the mouth of the Paillon (Paglione), a stream (often dried up in summer) which, after a course of 20 m., enters the northern end of the Baie des Anges. A steep isolated limestone hill, 308 ft. in height, running back for some distance from the shore, forms the historical nucleus of the town. Formerly crowned by a castle, which, previous to its destruction by the duke of Berwick in 1706, was one of the strongest fortresses on the coast, it is now laid out as a public pleasure-ground, and planted with aloe, cactus, agave and palm. Towards its south-west corner stands a tower (Tour Bellanda or Clerissy) dating, it is said, from the 5th century. The old town stretches along the western

base of the hill; the " town of the 18th century " occupies the ground farther west, which slopes gently towards the Paillon; and away to the north-east and north and west beyond the stream lie the ever-growing quarters of the modern city. To the east of the hill, and thus out of sight of the more fashionable districts, the commercial quarter surrounds the port. The whole frontage of Nice is composed of fine embankments: the Quai des Ponchettes, constructed in 1770 round the base of the castle hill, is continued westward by the Quai du Midi to

the public gardens and the municipal casino, whence the Promenade des Anglais (so called because it was begun in 1822-1824 at the cost of the English colony), a boulevard 85 ft. wide, extends for more than a mile to the mouth of the Magnan, and in 1904 was prolonged to the Var. A pier projecting into the sea from the promenade contains a ” crystal palace.” The course of the Paillon also is embanked on both sides, and at one part the Place Massena, one of the largest public squares in the city, and the principal resort of foreign visitors, and the Avenue Massena (leading thence to the Promenade des Anglais) have been laid out across the stream. Besides a Roman Catholic cathedral — Ste Reparate, dating from 1650 — Nice possesses two Russian churches, two synagogues and an Anglican chapel. Architecturally the most remarkable church is Notre Dame du Voeu, a modern Gothic building with two towers 213 ft. high, erected by the town in 1835 to commemorate its preserva- tion from cholera. The secular buildings include the town hall, the prefecture, the theatres, the hospitals, the lycee (founded by the Jesuits in the 17th century), the natural history museum, the library (especially rich in theology), and, at some distance from the town, the astronomical and meteorological observatory on Mont Gros (1 220 ft.). The industrial establishments comprise perfumery factories, distilleries, oil-works, furniture and wood- work factories, confectionery works, soap-works, tanneries and a national tobacco factory employing several hundred persons. Besides the vine, the trees principally cultivated in the neighbourhood are the olive, the orange, the mulberry and the carob; and the staple exports are oil, agricultural produce, fruits and flowers.

Nice now joins on the north-east the ancient episcopal town of Cimiez, in which are situated the largest and most elegantly appointed hotels. Reckoning from east to west the town is sur- rounded by a girdle of beautiful towns — Carabacel, St Etienne, St Philippe and Les Beaumettes. On the east of the port lie Montboron, Riquier and St Roch, the last partly occupied by barracks. The entrances to the port of Nice and the outer pier have been improved; that of the outer port is 300 ft. wide, and that of the inner 220 ft. The area of the port is about 15 acres, the length of quayage available 3380 ft., the depth of water 20 ft., its trade, mostly coastal, being shared principally between French and Italian vessels, the arrivals being about 1235 vessels of some 300,000 tons annually. Nice is an episcopal see (first mentioned at the end of the 4th century) which since i860 is in the ecclesiastical province of Aix en Provence. It is the headquarters of a military division forming part of the corps d’armee of Marseilles. Protected towards the north by hills which rise stage behind stage to the main ridge of the Alps, Nice is celebrated for the mildness of its

climate. The mean temperature is 60° Fahr., that of winter being 49 , of spring 56°, of summer 72 and of autumn 63 . For a few nights in winter the mercury sinks below freezing point, but snow is practically unknown, falling, on an average, only half a day in the year. The highest reading of the thermometer is rarely above 90 . There are sixty-seven days with rain in the course of the year; but it usually falls in heavy showers which soon leave the sky clear again, though the whole annual amount exceeds 32 in. Fine days and rainy days are almost equally distributed throughout the different seasons. The winds are very variable, sometimes changing several times a day. Apart from the ordinary land and sea breezes, the most frequent is the east wind, which is especially formidable during autumn. The south-west wind (called Libeccio; or wind of Lybia) is moist and warm; the north-east (or Gregaou, Greek), which is happily

rare, brings storms of hail and even snow in winter. The mistral (from the north-west) and the tramontane (from the north) are generally stopped by the mountains; but when they do reach the city they raise intolerable dust-storms. For two thousand years the climate of Nice has been considered favour- able in chest complaints. Those who are requiring rest, and those suffering from gout, asthma, catarrhs, rachitic affections, scrofula, stone, also experience benefit; but the reverse is the case when heart disease, nervous disorders or ophthalmia are concerned. Autumn is the best season; in spring the sudden changes of temperature demand great care. Means of passing the time pleasantly are fairly abundant. The city is at its liveliest during the carnival festivities, in which, as at Rome, battles are waged with sweetmeats and flowers.

History. — Nice (Nicaea) was founded about two thousand years ago by the Phocaeans of Marseilles, and received its name in honour of a victory (vLkti) over the neighbouring Ligurians. It soon became one of the busiest trading stations on the Ligurian coast; but as a city it had an important rival in the town of Cemenelum, which continued to exist till the time of the Lombard invasions, and has left its ruins at Cimiez, 2\ m. to the north. In the 7th century Nice joined the Genoese league formed by the towns of Liguria. In 729 it repulsed the Saracens; but in 859 and 880 they pillaged and burned it, and for the most of the 10th. century remained masters of the surrounding country. During the middle ages Nice had its share in the wars and disasters of Italy. As an ally of Pisa it was the enemy of Genoa, and

both the king of France and the emperor endeavoured to subjugate it ; but in spite of all it maintained its municipal liberties. In the course of the 13th and 14th centuries it fell more than once into the hands of the counts of Provence; and at length in 1388 it placed itself under the protection of the counts of Savoy. The maritime strength of Nice now rapidly increased till it was able to cope with the Barbary pirates; the fortifications were largely extended and the roads to the city improved. During the struggle between Francis I. and Charles V. great damage was caused by the passage of the armies invading Provence; pestilence and famine raged in the city for several years. It was in Nice that the two monarchs in 1538 concluded, through the mediation of Paul III., a truce of ten years; and a marble cross set up to commemorate the arrival of the pope still gives its name, Croix de Marbre, to part of the town. In 1543 Nice was attacked by the united forces of Francis I. and Barbarossa; and, though the inhabitants, with admirable courage, repulsed the assault which succeeded the terrible bombardment, they were ultimately compelled to surrender, and Barbarossa was allowed to pillage the city and to carry off 2500 captives. Pestilence appeared again in 1550 and 1580. In 1600 Nice was taken by the duke of Guise. By opening the ports of the countship to all nations, and proclaiming full freedom of trade, Charles Emmanuel in 1626 gave a great stimulus to the commerce of the city, whose noble families took part in its mercantile enterprises. Captured by Catinat in 1691, Nice was restored to Savoy in 1696; but it was again besieged by the French in 1705, and in the following year its citadel and ramparts were demolished. The treaty of Utrecht in 1 7 13 once more gave the city back to Savoy; and in the peaceful years which followed the ” new town ” was built. From 1744 till the peace of Aix-la-Chapelle (1748) the French and Spaniards were again in possession. In 1775 the king of Sardinia destroyed all that remained of the ancient liberties of the commune. Conquered in 1792 by the armies of the French Republic, the county of Nice continued to be part of France till 1814; but after that date it reverted to Sardinia. By a treaty concluded in i860 between the Sardinian king and Napoleon III. it was again transferred to France, and the cession was ratified by over 25,000 electors out of a total of 30,700.

See L. Durante, Histoire de Nice (3 vols., Turin, 1823-1824) ; J. N. Fcrvel, Histoire de Nice el des Alpes Maritimes depuis 21 siecles (Paris, 1862); E. Tisserand, Histoire civile et religieuse de la citi de Nice (2 vols., Nice, 1862): Cartulaire de Vancienne cathedrale de Nice (Turin, 1888).

NICE, an adjective which in present usage has two main meanings: (1) fastidious, particular, precise or scrupulous, and

(2) pleasant j kind or agreeable. The first meaning has been common since the 16th century, the second only since the end of the 18th. In O. Fr., from which the English form was adapted, the word is niche or nice, which are derivatives of Lat. nescius, not knowing, ignorant. The development in meaning is doubt- ful; some authorities take it as (i)* foolish, (2) foolishly precise,

(3) delicate, (4) pleasant. Skeat suggests an early confusion with the word ” nesh,” soft, delicate, still surviving dialectically.

NICEPHORUS, the name of three emperors of the East.

Nicephorus I., emperor 802-811, was a native of Seleucia in Pisidia, who was raised by the empress Irene to the office of logotheles or lord high treasurer. With the help of the patricians and eunuchs he contrived to dethrone and exile Irene, and to be elected emperor in her stead. His sovereignty was endangered by Bardanes, one of his ablest generals, who revolted and received support from other commanders, notably the later emperors Leo the Armenian and Michael the Amorian. But Nicephorus gained over the latter two, and by inducing the rebel army to disperse achieved the submission of Bardanes, who was relegated to a monastery. A conspiracy headed by the patrician Arsaber had a similar issue. Nicephorus, who needed large sums to strengthen his military force, set himself with great energy to increase the empire’s revenue. By his rigorous imposts he alienated the favour of his subjects, and especially of the clergy, whom he otherwise sought to control firmly. In 803 and 810 he made a treaty with Charlemagne, by which the limits of the two empires were amicably fixed. Venice, Istria, the Dalmatian coast and South Italy were assigned to the East, while Rome, Ravenna and the Pentapolis were included in the Western realm. By with- holding the tribute which Irene had agreed to pay to Harun al-Rashid, Nicephorus committed himself to a war with the Saracens. Compelled by Bardanes’s disloyalty to take the field himself, he sustained a- severe defeat at Crasus in Phrygia (805), and the subsequent inroads of the enemy into Asia Minor induced him to make peace on condition of paying a yearly contribution of 30,000 gold pieces. By the death of Harun in 809, Nicephorus was left free to deal with the Bulgarian king, Krurh, who was harassing his northern frontiers. In 811 Nicephorus invaded Bulgaria and drove Krum to ask for terms, but in a night attack he allowed himself to be surprised and was slain along with a large portion of his army. Krum is said to have made a drinking- cup of Nicephorus’s skull.

Nicephorus II. (Phocas), emperor 963-969, belonged to a Cappadocian

family which had produced several distinguished generals. He was born about 912, joined the army at an early age, and, under Constantine VII., became commander on the eastern frontier. In the war with the Saracens he began with a severe defeat (956), which he retrieved in the years following by victories in Syria. In 960 he led an expedition to Crete, stormed Candia after a ten months' siege, and wrested the whole island from the Saracens. After receiving the unusual honours of a triumph, he returned to the east with a large and well-equipped army. In the campaigns of 962-63 by brilliant strategy he forced his way through Cilicia into Syria and captured Aleppo, but made no permanent conquests. Upon the death of Romanus II. he returned to Constantinople to defend himself against the intrigues of the minister Bringas. With the help of the regent Theophano and the patriarch, he received supreme command of the eastern forces, and being proclaimed emperor by these marched upon the capital, where meanwhile his partisans had overthrown his enemy Bringas. Thanks to his popularity with the army, Nicephorus was crowned emperor by the side of Romanus's infant sons, and in spite of the patriarch's opposition married their mother Theophano. During his reign he continued to wage numerous wars. In 964-966 he definitely conquered Cilicia and again overran Mesopotamia and Syria, while the patrician Nicetas recovered Cyprus. In 968 he reduced most of the fortresses in Syria, and after the fall of Antioch and Aleppo (969), which were recaptured by his lieutenants, secured his conquests by a peace. On his northern frontier he began a war against the Bulgarians, to whom the Byzantines had of late been paying tribute (967), and by instigating an attack from the

Russians distracted their attention effectively. Nicephorus was less successful in his western wars. After renouncing his tribute to the Fatimite caliphs, he sent an expedition to Sicily under Nicetas (964-65), but was forced by defeats on land and sea to evacuate that island completely. In 967 he made peace with the Saracens of Kairawan and turned to defend himself against their common enemy, Otto I. of Germany, who had attacked the Byzantine possessions in Italy; but after some initial successes his generals were defeated and driven back upon the southern coast. Owing to the care which he lavished upon the proper maintenance of the army, Nicephorus was compelled to exercise rigid economy in other departments. He retrenched the court largesses and curtailed the immunities of the clergy, and although himself of an ascetic disposition forbade the

foundation of new monasteries. By his heavy imposts and the debasement of the coinage he forfeited his popularity with the rest of the community, and gave rise to riots. Last of all, he was forsaken by his wife, and, in consequence of a conspiracy which she headed with his nephew John Zimisces, was assassinated in his sleeping apartment. Nicephorus was the author of an extant treatise on military tactics which contains valuable information concerning the art of war in his time.

Nicephorus III. (Botaniates), emperor 1078-1081, belonged to a family which claimed descent from the Roman Fabii and rose to be commander of the troops in Asia. He revolted in 1078 from Michael VII., and with the connivance of the Turks marched upon Nicaea, where he assumed the purple. In face of another rebellious general, Nicephorus Bryennius, his election was ratified by the aristocracy and clergy. With the help of Alexius Com- nenus he drove out of the field Bryennius and other rivals, but failed to clear the invading Turks out of Asia Minor. Nicephorus ultimately quarrelled with Alexius, who used his influence with the. army to depose the emperor and banish him to a monastery. In the years of his reign he had entirely given himself over to debauchery.

See Gibbon, Decline and Fall (ed. Bury, 1896); Finlay, Hist, of Greece; G. ‘ Schlumberger, Nicephore Phocas (Paris, 1890); K. Leonardt, Kaiser Nicephorus II. (Halle, 1887).

NICEPHORUS CALLISTUS XANTHOPOULOS, of Constan- tinople, the last of the Greek ecclesiastical historians, flourished 1320-1330. His Historia Ecclesiastica, in eighteen books, brings the narrative down to 610; for the first four centuries the author is largely dependent on his predecessors, Eusebius, Socrates, Sozomen, Theodoret and Evagrius, his additions showing very little critical faculty; for the later period his labours, based on documents now no longer extant, to which he had free access, though he used them also with small discrimina- tion, are much more valuable. A table of contents of other five books, continuing the history to the death of Leo the Philosopher in 911, also exists, but whether the books were ever actually written is doubtful. Some modern scholars are of opinion that Nicephorus appropriated and passed off as his own the work of an unknown author of the 10th century. The plan of the work is good and, in spite of its fables and superstitious absurdities, contains important facts which would otherwise have been unknown. The history of the Latin Church receives little attention. Only one MS. of the history is known; it was stolen by a Turkish soldier from the library at Buda during the reign of Matthias Corvinus of Hungary and taken to Constan- tinople, where it

was bought by a Christian and eventually reached the imperial library at Vienna. Nicephorus was also the author of lists of the emperors and patriarchs of Constantinople, of a poem on the capture of Jerusalem, and of a synopsis of the Scriptures, all in iambics; and of commentaries on liturgical poems.

Works in J. P. Migne, Patrologia Graeca, cxlv.-cxlvii. ; see also F. C. Baur, Die Epochen der kirchlichen Geschichtsschreibung (1852); C. Krumbacher, Geschickte der byzantinischen Litteratur (1897); Wetzer and Welte's Kirchenlexikon, ix. (Freiburg im Breisgau, 1895).

NICEPHORUS PATRIARCHA (c. 758-829), Byzantine historian and patriarch of Constantinople (806-815). His father Theodorus, one of the secretaries of the emperor Constantine Copronymus, had been scourged and banished for his zealous

support of image-worship, and the son inherited the religious convictions of the father. He was secretary to the imperial commissaries at the council of Nicaea in 787, which witnessed the triumph of his opinions; but, feeling dissatisfied with court life, he retired into a convent. In 806 he was suddenly raised by the emperor Nicephorus I. to the patriarchate of Constan- tinople, and this office he held until 815, when he accepted deposi- tion rather than assent to the iconoclastic edict promulgated by Leo the Armenian in the previous year. He retired to the cloister of St Theodore, which he himself- had founded, and died there in 829. After his death he was included among the saints of the orthodox church.

Nicephorus is the author of a valuable compendium (Breviarium historicum) of Byzantine history from 602 to 770, of a meagre Chronologia compendiaria from Adam to the year of his own death. The former contains an interesting account of the origin and migra- tions of the Bulgarians. Both will be found, together with some controversial writings and his biography by his pupil Ignatius, also patriarch of Constantinople, in J. P. Migne, Patrologia Graeca, c; edition of the compendia and life by C. de Boor (1880, Teubner series); see also F. Hirsch, Byzantinische Studien (1876); J. Hergenrother, Photius (1867); C. Krumbacher, Geschickte der byzantinischen Litteratur (1897); Wetzer and Welte's Kirchen- lexikon, ix. (Freiburg im Breisgau, 1895).

NICHE (through Fr. niche from Ital. nicchia, nicchio, shell; possibly from Lat. mitulus, a sea-mussel; cf. " napkin " from mappa), in architecture a recess sunk in a wall, generally for the reception of a statue. The niche is sometimes terminated by a simple label, but more

commonly by a canopy, and with a bracket or corbel for the figure, in which case it is often called a ” tabernacle.”

NICHOL, JOHN (1833-1894), Scottish man of letters, son of the astronomer J. P. Nichol (1804-1859), was born on the 8th of September 1833, and educated at Glasgow and Balliol College, Oxford, where he had a brilliant career. After taking his first- class in classics, he remained at Oxford as a coach. With Albert Venn Dicey, Thomas Hill Green, Swinburne and others, he formed the Old Mortality Society for discussions on literary matters. In 1862 he was made professor of English literature at Glasgow. He had already made a reputation as an acute critic and a suc- cessful lecturer, and his influence at Glasgow was very marked. He visited the United States in 1865, and in 1882 he wrote the article on American literature for the ninth edition of the EncyclopcBdia Britannica — an article which is a good example of his pungent (sometimes unduly pungent) style. He left Glasgow for London in 1889, and died on the nth of October 1894. Among his best works were his drama Hannibal (1873)ˆ The Death of Themistocles, and other Poems (1881), his Byron in the ” English Men of Letters ” series (1880), his Robert Burns (1882) and Carlyle (1892). A Memoir by Professor Knight was published in 1896.
NICHOLAS, ST, bishop of Myra, in Lycia, a saint honoured by the Greeks and the Latins on the 6th of December. His cult is as celebrated as his history is obscure. All the accounts that have come down to us are of a purely legendary character, and it is impossible to find any single incident confirmed historic- ally. The main facts of his life are usually given as follows. He was bishop of Myra in the time of the emperor Diocletian, was persecuted, tortured for the faith, and kept in prison until the more tolerant reign of Constantine, and was present at the council of Nicaea. It should be observed that this last circum- stance is ignored by all the historians, and that St Athanasius, who knew all the notable bishops of the period, never mentions Nicholas, bishop of Myra. The oldest known monument of the cult of St Nicholas seems to be the church of SS Priscus and Nicholas built at Constantinople by the emperor Justinian (see Procopius, De aedif. i. 6). In the West, the name of St Nicholas appears in the 9th century martyrologies, and churches dedicated to him are to be found at the beginning of the nth century. It is more especially, however, from the time of the removal of his body to Bari, in Apulia, that his cult became popular. The inhabitants of Bari organized an expedition, seized his remains by means of a ruse, and transported them to Bari, where they were received in triumph on the 9th of May

1087, ana where the foundations were laid of a new basilica in his honour. This was the origin of a famous and still popular pilgrimage. There are nearly 400 churches in England dedicated to St Nicholas. He is the patron saint of Russia; the special protector of children, scholars, merchants and sailors; and is invoked by travellers against robbers. In art St Nicholas is represented with various attributes, being most commonly depicted with three children standing in a tub by his side. Of the various interpretations of this, none is absolutely certain. One explanation has been sought in the legend of St Nicholas miraculously restoring to life three rich youths, who had been murdered, cut up and concealed in a salting tub by a thievish innkeeper or butcher, in whose house they had taken lodging.

A legend of his surreptitious bestowal of dowries upon the three daughters of an impoverished citizen, who, unable to procure fit marriages for them, was on the point of giving them up to a life of shame, is said to have originated the old custom of giving presents in secret on the Eve of St Nicholas, subsequently transferred to Christmas Day. Hence the association of Christmas with ” Santa Claus,” an American corruption of the Dutch form ” San Nicolaas,” the custom being brought to America by the early Dutch colonists. (For the ceremony of the. boy- bishop elected on St Nicholas’s Day see Boy-Bishop.)

See N. C. Falconius, Sancti Nicolai acta primigenia (Naples, 1751) ; Bibliolheca hagiographica Graeca (Brussels, 1895), p. 96; Bibl. hagiogr. Latina (Brussels, 1899), n. 6104-6221; F. Nitti di Vito, Le Pergamene di S. Nicola di Bari (Bari, 1901); Charles Cahier, Caracteristiques des saints (Paris, 1867), p. 354; Frances Amold-Forster, Studies in Church Dedications (London, 1899), i. 495-501 and iii. 21.

NICHOLAS, the name of five popes, and one anti-pope.

Nicholas I., sometimes called The Great, and certainly the most commanding figure in the series of popes between Gregory I. and Gregory VII., succeeded Benedict III. in April 858. According to the annalist Prudentius of Troyes, ” he owed his election less to the choice of the clergy than to the presence and favour of the emperor Louis II. and his nobles” — who can hardly have foreseen with what ability and persistency the rights of the Holy See as supreme arbiter of Christendom were to be asserted even against themselves by the man of their choice. Of the previous history of Nicholas nothing is

recorded. His pontificate of nine years and a half was marked by at least three memorable contests which have left their mark in history. The first was that in which he supported the claims of the unjustly degraded patriarch of Constantinople, Ignatius; the history of the conflict cannot be related here, but two of its incidents, the excommunication of Photius, the rival of Ignatius, by the pope in 863, and the counter-deposition of Nicholas by Photius in 867, were steps of serious moment towards the permanent separation between the Eastern and the Western Church. The second great struggle was that with Lothair, the king of Lorraine (second son of the emperor Lothair I., and brother of the emperor Louis II.), about the divorce of his wife Theutberga or Thietberga. The king, who desired to marry his mistress Waldrada, had brought a grave charge against the life of his queen before her marriage; with the help of Arch-, bishops Gunther of Cologne and Thietgaud of Treves, a confession of guilt had been extorted from Thietberga, and, after the matter had been discussed at more than one synod, that of Aix-la- Chapelle finally authorized Lothair, on the strength of this confession, to marry again. Nicholas ordered a fresh synod to try the cause over again at Metz in 863; but Lothair, who was present with his nobles, anew secured a judgment favourable to himself, whereupon the pope not only quashed the whole proceedings, but excommunicated and deposed Gunther and Thietgaud, who had been audacious enough to bring to Rome in person the ” libellus ” of the synod. The archbishops appealed to Louis II., then at Benevento, to obtain the withdrawal of their sentence by force; but, although he actually occupied the Leonine city (864), he was unsuccessful in obtaining any concession, and had to withdraw to Ravenna. Thietberga herself was now induced to write to the pope a letter in which she declared the invalidity of her own marriage, and urged the cause

of Lothair, but Nicholas, not without reason, refused to accept statements which had too plainly been extorted, and wrote urging her to maintain the truth steadfastly, even to the death if need were, ” for, since Christ is < the truth, whosoever dies for the truth assuredly dies for Christ." The imminent humilia- tion of Lothair was prevented only by the death of Nicholas. The third great ecclesiastical cause which marks this pontificate was that in which the indefeasible right of bishops to appeal to Rome against their metropolitans was successfully maintained in the case of Rothad of Soissons, who had been deposed by Hincmar of Reims. It was in the course of the controversy with the great and powerful Neustrian archbishop that papal recognition was first given (in 865} to the False Decretals, which had probably been brought by Rothad to Rome in the preceding

year (see Decretals). At an early period in his reign it also became necessary for Nicholas to administer discipline to John of Ravenna, who seems to have relied not only on the prestige of his famous see but also on the support of Louis II. After lying under excommunication for some time he made a full submission. Nicholas was the pope to whom Boris, the newly converted king of Bulgaria, addressed himself for practical instruction in some of the difficult moral and social problems which naturally arise during a transition from heathenism to Christianity. The pope's letter in reply to the hundred and six questions and petitions of the barbarian king is perhaps the most interesting literary relic of Nicholas I. now extant. He died on the 13th of November 867, and was succeeded by Adrian II.

The epistolae of Nicholas I. are printed in Migne, Patrologia Lat. vol. 119, p. 769 seq. See F. Gregorovius, Rome in the Middle Ages, vol. iii. (Eng. trans., London, 1900-1902); H. Lammer, Nikolaus I. und die byzantinische Staatskirche seiner Zeit (Berlin, 1857); J. Roy, Saint-Nicolas I. (Paris, 1900); J. Richterich, Papst Nikolaus I. (Bern, 1903); A. Greinacher, Die Anschauungen des Papstes Nikolaus I. iiber das Verhdltnis von Slaat und Kirche (1909). (X.)

Nicholas II., pope from December 1058 to July 1061, was a Burgundian named Gerard, who at the time of his election was bishop of Florence. He was set up by Hildebrand, with the support of the empress-regent Agnes and of the powerful Duke Godfrey of Lorraine, against Benedict X., the nominee of the Roman nobles, and was crowned at Rome, after the expulsion of Benedict, on the 24th of January 1059; His pontificate was signalized by the continuance of the policy of ecclesiastical reform associated with the name of Hildebrand (afterwards Gregory VII.). To secure his position he at once entered into relation with the Normans, now firmly established in southern Italy, and later in the year the new alliance was cemented at Melfi, where Nicholas II., accompanied by Hildebrand, Cardinal Humbert and the abbot Desiderius of Monte Cassino, solemnly invested Robert Guiscard with the duchies of Apulia, Calabria and Sicily, and Richard of Aversa with the principality of Capua, in return for oaths of fealty and the promise of assistance in guarding the rights of the Church. The first fruits of this arrangement, which was based on no firmer foundation than the forged ” Donation of Constantine ” (q.v.), but destined to give to the papacy a position of independence towards both trie Eastern and Western Empires, was the reduction in the autumn, with Norman aid, of Galera, where the anti-pope had taken refuge, and the end of the subordination of the papacy to the Roman nobles.

Meanwhile, Peter Damian and Bishop Anselm of Lucca had been sent by Pope Nicholas to Milan to adjust the difference between the Patarenes and the archbishop and clergy. The result was a fresh triumph for the papacy, Archbishop Wido, in face of the ruinous conflict in the Church of Milan, being forced to submit to the terms proposed by the legates, which involved the principle of the subordination of Milan to Rome; the new relation was advertized by the unwilling attendance of Wido and the other Milanese bishops at the council summoned to the Lateran palace in April 1059. This council not only continued the Hildebrandine reforms by sharpening the discipline of the clergy, but marks an epoch in the history of the papacy by its famous regulation of future elections to the Holy See (see

Lateran Councils, and Conclave). Its most important immediate result was the revival of strained relations with the empire, due to the fact that the emperor's traditional rights in the matter of papal elections had been completely ignored. Stephen, cardinal priest of S. Chrysogonus, was sent to the German court to attempt to allay the consequent ill-feeling, but was not received. Pope Nicholas, moreover, had offended the German bishops by what they regarded as arbitrary interference with their rights: he had refused to send the pallium of Arch- bishop Siegfried of Mainz; he had sent a sharp letter of admonition to Archbishop Anno of Cologne. The resulting opposition culminated in a synod of German bishops, perhaps early in 1061 (its date and place of meeting are unknown), at which the decrees of the pope, including the new electoral law, were annulled, while he himself was deposed and his name ordered to be expunged from the canon of the Mass. That these resolutions were not followed by any further action was due to the war of parties in Germany, which enabled the papacy to ignore a demonstration of opinion to which no effect could be given.

Nicholas II. died at Florence in July 106 1. Personally he was one of the least important of the popes, and the great importance of the events of his pontificate is due to the fact that, as Peter Damian wrote (Epist. i. 7), he possessed in Hilde- brand, Cardinal Humbert and Bishop Boniface of Albano aculissimi et perspicatis oculi.

His Diplomata, epistolae, decreta are in Migne, Patrolog. Lat. 143, pp. 1301-1366. See the article " Nikolaus II." by C. Mirbt in Herzog-

Hauck, Realencyklopddie (3rd ed., Leipzig, 1904), with bibliography. Other lists of authorities are in Potthast, Biblioth. Hist. Med. Aev. (2nd ed., Berlin, 1896), p. 854; and Ulysse Chevalier, Repertoire des sources hist, biobibliogr. (Paris, 1905), vol. 3347, s.v. ” Nicolas II.” (X.)

Nicholas III. (Giovanni Gaetano Orsini), pope from the 25th .of November 1277 to the 22nd of August 1280, was a Roman nobleman who had served under eight popes, been made cardinal-deacon of St Nicola in carcere Tulliano by Innocent IV., protector of the Franciscans by Alexander IV., inquisitor-general by Urban IV., and succeeded John XXI., largely through family influence, after a six-months' vacancy in the Holy See. His brief pontificate was marked by several important events. A born politician, he greatly strengthened the papal position in Italy. He concluded a concordat with Rudolph of Habsburg in May 1278, by which the Romagna and the exarchate of Ravenna were guaranteed to the pope; and in July he issued an epoch-making constitution for the government of Rome, which forbade foreigners taking civil office. Nicholas issued the bull Exiit on the 14th of August 1279 to settle the strife within the Franciscan order between the parties of strict and loose observ- ance. He repaired the Lateran and the Vatican at enormous cost, and erected a beautiful country house at Soriano near Viterbo. Nicholas, though a man of learning and strength of character, brought just reproach on himself for his efforts to found principalities for his nephews and other relations. He died from a stroke of apoplexy and was succeeded by Martin IV.

See ” Les Registres de Nicolas III.,” published by Jules Gay in Bibliotheque des ecoles francaises d'Athenes et de Rome (Paris, 1898-1905) ; A. Potthast, Regesta pontif. Roman, vol. 2 (Berlin, 1875) ; A. Demski, ” Papst Nikolaus III.” in KirchengescMchtliche Studien (Miinster, 1903); F. Gregorovius, Rome in the Middle Ages, vol. 5, trans, by Mrs G. W. Hamilton (London, 1 900-1 902) ; Fr. Wertsch, Die Beziehungen Rudolfs von Habsburg zur rom. Kurie bis zum Tode Nikolaus III. (Bochum, 1880); G. Palmieri, Introiti ed esiti di Papa Niccolb III. (Rome, 1889). (C. H. Ha.)

Nicholas IV. (Girolamo Masci), pope from the 22nd of February 1288 to the 4th of April 1292, a native of Ascoli and a Franciscan monk, had been legate to the Greeks under Gregory X. in 1272, succeeded St Bonaventura as general of his order in 1274, was made cardinal-priest of Sta Prassede and Latin patriarch of Constantinople by Nicholas III., cardinal-bishop of Palestrina by Martin IV., and succeeded Honorius IV. after a ten-months' vacancy in the papacy. He was a pious, peace-loving monk with no ambition save for the church, the crusades and

the extirpation of heresy. He steered a middle course between the factions at Rome, and sought a settlement of the

Sicilian question. In May 1289 he crowned Charles II. king of Naples and Sicily after the latter had expressly recognized papal suzerainty, and in February 1291 concluded a treaty with Alphonso III. of Aragon and Philip IV. of France looking toward the expulsion of James of Aragon from Sicily. The loss of Ptolemais in 1291 stirred the pope to renewed enthusiasm for a crusade. He sent the celebrated Franciscan missionary, John of Monte Corvino, with some companions to labour among the Tatars and Chinese. He issued an important constitution on the 1 8th of July 1289, which granted to the cardinals one-half of all income accruing to the Roman see and a share in the financial management, and thereby paved the way for that independence of the college of cardinals which, in the following century, was to be of detriment to the papacy. Nicholas died in the palace which he had built beside Sta Maria Maggiore, and was succeeded by Celestine V.

See ” Les Registres de Nicolas IV.,” ed. by Ernest Langlois in Bibliotheque des ecoles francaises d’A thenes et de Rome (Paris, 1886-!893); A. Potthast, Regesta pontif. Roman, vol. 2 (Berlin, 1875); F. Gregorovius, Rome in the Middle Ages, vol. 5, trans, by Mrs G. W. Hamilton (London, 1900-1902) ; O. Schiff, ” Studien zur Geschichte Papst Nikolaus iV.” in Historische Studien (1897); W. Norden, Das Papsttum u. Byzanz (Berlin, 1903) ; R. Rohricht, Geschichte des Konigreichs Jerusalem (Innsbruck, 1898); J. B. Sagmuller, Die Thdtigkeit «. Stellung der Kardinale bis Papst Bonifaz VIII. (Freiburg-i.B., 1896); J. P. Kirsch, “Die Finanzverwaltung des Kardinalkollegiums im 13. u. 14. Jahrhunderte ” in Kirchen geschichtliche Studien (1895). (C. H. Ha.)

Nicholas V. (Tomaso Parent ucelli or Tomaso da Sarzana), pope from the 6th of March 1447 to the 24th of March 1455, was born at Sarzana, where his father wai > a physician, in 1398. He early studied at Bologna, where the bishop, Nicholas Albergati, was so much struck with his ardour for learning that he gave him the chance to pursue his studies further, by sending him on a tour through Germany, France and England. He distinguished himself at the council of Ferrara-Florence, and in 1444 was made bishop of Bologna by Pope Eugenius IV., who soon afterwards named him as one of the legates charged to negotiate at the convention of Frankfort an understanding between the Holy See and the Empire with regard to the re- forming decrees of the council of Basel. His successful diplomacy was rewarded, on his return to Rome, with the title of cardinal priest of Sta Susanna (December 1446). He was elected pope in succession to Eugenius IV.

on the 6th of March of the following year, taking the name of Nicholas in honour of his early bene- factor.

The eight years of his pontificate were important in the political, scientific and literary history of the world. With the German king, Frederick III., he made the Concordat of Vienna, or Aschaffenburg (February 17, 1448), by which the decrees of the council of Basel against papal annates and reservations were abrogated so far as Germany was concerned; and in the following year he secured a still greater triumph when the resignation of the anti-pope Felix V. (April 7), and his own recognition by the rump of the council of Basel, assembled at Lausanne, put an end to the papal schism. The next year,. 1450, Nicholas held a jubilee at Rome; and the offerings of the numerous pilgrims who thronged to Rome gave him the means of furthering the cause of culture in Italy, which he had so much at heart. In March 1452 he crowned Frederick III. as emperor in St Peter's, the last occasion of the coronation of an emperor at Rome.

Under the generous patronage of Nicholas humanism made rapid strides. He employed hundreds of copyists and scholars, giving as much as ten thousand gulden for a metrical translation of Homer, and founded a library of nine thousand volumes. Nicholas himself was a man of vast erudition, and his friend Aeneas Silvius (later Pope Pius II.) said of him that " what he does not know is outside the range of human knowledge." He was compelled, however, to add that the lustre of his pontificate would be for ever dulled by the tragic fall of Con- stantinople, which the Turks took in 1453. The pope bitterly felt this catastrophe as a double blow to Christendom and to Greek letters. "It is a second death," wrote Aeneas Silvius,

" to Homer and Plato." Nicholas preached a crusade, and en- deavoured to reconcile the mutual animosities of the Italian states, but without much success.

Nicholas conceived great plans for beautifying and developing Rome. He restored the walls and numerous churches, and began the rebuilding of the Vatican and St Peter's. In under- taking these works Nicholas was moved by no vulgar motives, his idea being " to strengthen the weak faith of the people by the greatness of that which it sees." The Romans, however, appreciated neither his motives nor their results, and in 1452 a formidable conspiracy for the overthrow of

the papal govern- ment, under the leadership of Stefano Porcaro, was discovered and crushed. This revelation of disaffection, together with the fall of Constantinople, darkened the last years of Nicholas; ” As Thomas of Sarzana,” he said, ” I had more happiness in a day than now in a whole year.” He died on the 24th of March

1455.

See Herzog-Hauck, Realencyklopddie fur protestantische Theologie und Kirche, vol. xiv. (1904), with full references; Cambridge Modern History, i. 76-78; and M. Creighton, History of the Papacy (London, 1882), vol. ii.

Nicholas V. (Pietro Rainalducci), antipope in Italy from 1328 to 1330 during the pontificate of John XXII. at Avignon, was a native of Corbara in the Abruzzi. He joined the Franciscan order after separating from his wife in 13 10, and became famous as a preacher. He was elected through the influence of the excommunicated emperor, Louis the Bavarian, by an assembly of priests and laymen, and consecrated at St Peter’s on the 1 2th of May 1328 by the bishop of Venice. After spending four months in Rome, he withdrew with Louis to Viterbo and thence to Pisa, where he was guarded by the imperial vicar. He was excommunicated by John XXII. in April 1329, and sought refuge with Count Boniface of Donoratico near Piombino. Having obtained assurance of pardon, he presented a confession of his sins first to the archbishop of Pisa, and then (25th of August 1330) to the pope at Avignon. He remained in honour- able imprisonment in the papal palace until his death in October

1333.

See F. Gregorovius, Rome in the Middle Ages, vol. 6, trans, by Mrs G.W. Hamilton (London, 1 900-1 902) ; Baluzius, Vitae paparum Avenionensium, vol. 1 (Paris, 1693); J- B. Christophe, Histoi r e de la papaute pendant le XIV iim ‘ siecle, vol. 1 (Paris, 1853); E. Ma.cour, Anteil der Minoriten am Kampfe zwischen Konig Ludwig IV. von Bayern und Papst Johann XXII. (Emmerich, 1874); Eubel, ” Der Gegenpapst Nicolaus V. u. seine Hierarchie,” in Hist. Jahrbuch, vol. 12(1891). (C. H. Ha.)

NICHOLAS (1841-), King of Montenegro and the Berda, was born at the village of Niegush, the ancient home of the reigning family of Petrovitch-Niegush, on the 25th of September 1841. His father, Mirko Petrovitch, a celebrated Montenegrin warrior, was elder brother to Danilo II., who left no male off- spring. After 1696, when the dignity

of vladika, or prince- bishop, became hereditary in the Petrovitch family, the sovereign power had descended from uncle to nephew, the vladikas belong- ing to the order of the ” black clergy ” who are forbidden to marry. A change was introduced by Danilo II., who declined the episcopal office, married and declared the principality hereditary in the direct male line. Mirko Petrovitch having resigned his claim to the throne, his son was nominated heir, and the old system of succession was thus accidentally continued. Prince Nicholas, who had been trained from infancy in martial and athletic exercises, spent a portion of his early boyhood at Trieste in the household of the Kuetitch family, to which his aunt, the princess Darinka, wife of Danilo II., belonged. The princess was an ardent advocate of French culture, and at her suggestion the young heir of the vladikas was sent to the academy of Louis le Grand in Paris. Unlike his contemporary, King Milan of Servia, Prince Nicholas was little influenced in his tastes and habits by his Parisian education; the young mountaineer, whose keen patriotism, capability for leadership and poetic talents early displayed themselves, showed no inclination for the pleasures of the French capital, and eagerly looked forward to returning to his native land. He was still in Paris when, in consequence of the assassination of his uncle, he succeeded

as prince (August 13, i860). In 1862 Montenegro was engaged in an unfortunate struggle with Turkey; the prince distin- guished himself during the campaign, and on one occasion narrowly escaped with his life. In the period of peace which followed he carried out a series of military, administrative and educational reforms. In 1867 he met the emperor Napoleon III. at Paris, and in 1868 he undertook a journey to Russia, where he received an affectionate welcome from the tsar, Alexander II. He afterwards visited the courts of Berlin and Vienna. His efforts to enlist the sympathies of the Russian imperial family were productive of important results for Montenegro; consider- able subventions were granted by the tsar and tsaritsa for educational and other purposes, and supplies of arms and ammunition were sent to Cettigne. In 187 1 Prince Dolgorouki arrived at Montenegro on a special mission from the tsar, and distributed large sums of money among the people. In 1869 Prince Nicholas, whose authority was now firmly established, succeeded in preventing the impetuous mountaineers from aiding the Krivoshians in their revolt against the Austrian government (see Cattaro); similarly in 1897 he checked the martial excitement caused by the outbreak of the Greco-Turkish War. In 1876 he declared war against Turkey; his military reputation was enhanced by the ensuing campaign, and still more by that of 1877-78, during which he captured Nikshitch, Antivari and Dulcigno. The war

resulted in a considerable extension of the Montenegrin frontier and the acquisition of a seaboard on the Adriatic. In 1883 Prince Nicholas visited the sultan, with whom he subsequently maintained the most cordial relations; in 1896 he celebrated the bicentenary of the Petrovitch dynasty, and in the same year he attended the coronation of the tsar Nicholas II.; in May 1898 he visited Queen Victoria at Windsor. In 1900 he assumed the title of " Royal Highness." On the 28th of August 1910, during the celebration of his jubilee, he assumed the title of king, in accordance with a petition from the Skupshtina. He was at the same time gazetted field-marshal in the Russian army, an honour never previously conferred on any foreigner except the great duke of Wellington. The descendant of a long line of warriors, gifted with a fine physique and a commanding presence, a successful military leader and a graceful poet, King Nicholas possessed many characteristics which awoke the enthusiasm of the im- pressionable Servian race, while his merits as a statesman received general recognition. His system of government, which may be described as a benevolent despotism, was perhaps that best suited to the character of his subjects. His historical dramas, poems and ballads hold a recognized place in contem- porary Slavonic literature; among them are — Baikanska Tzaritza and Kniaz Arvanili (dramas); Ha'idana, Potini Abenserage and Pesnik i Vila (poems); Skupliene Pesme and Nova Kola (mis- cellaneous songs). In November i860 Prince Nicholas married Milena, daughter of the wiewde Petar Vukotitch. Of his three sons, the eldest, Prince Danilo, married (July 27, 1899) Duchess Jutta (Militza) of Mecklenburg-Strelitz; of his six daughters, Princess Militza married the Grand Duke Peter Nikolaievitch, Princess Stana, Duke George of Leuchtenberg, Princess Helena, King Victor Emmanuel III. of Italy, and Princess Anka, Prince Francis Joseph of Battenberg. (J. D. B.)

NICHOLAS I. [Nikolai Pavlovich], emperor of Russia (1796- 1855), eighth child of the emperor Paul I. and his wife Maria Feodorovna, was born at Tsarskoe-Selo on the 25th of June (July 6, N.S.) 1796. He was only five years old when his father's murder brought his brother Alexander I. to the throne (1801). In the following year his education was entrusted to M. von Lambsdorff, director of the 1st cadet corps and ex- governor of Courland, a man of character and wide knowledge, who superintended it for the next fifteen years. But Nicholas had as little taste for learning as his brother Constantine. The royal pupils spent their lesson hours, as Nicholas afterwards confessed, " partly in dreaming, partly in drawing all sorts of nonsense," in the end " cramming " just enough to scrape through their examinations without discredit. Their chief bent was in the direction of everything

connected with military

matters. Religious training was confined to instruction in the forms of the Orthodox Church and the repetition of prayers by- rote; dogmatic questions Nicholas neither understood “nor cared about; and, in spite of his reverence for his brother Alexander, the latter’s mysticism had not the faintest influence upon him.

Though a colonel in his cradle and a general since 1808, the grand-duke Nicholas did not see any active service until 1814, when he was allowed to join the Russian head-quarters in France but not to take part in any fighting. It is characteristic of him that from this time onwards he never wore civilian dress. In 181 5 he was with the Allies in Paris, and in the following year set out on the grand tour, visiting Moscow and the western provinces of Russia, Berlin (where his engagement to Princess Charlotte Louise, daughter of Frederick William III., was arranged) and England, where his handsome presence and charming address created a profound impression. 1 On the i/i3th of July 1817 took place at St Petersburg his marriage to Princess Charlotte (Alexandra Feodorovna), the beginning of those intimate relations between the courts of Berlin and St Petersburg which were later to become of great international importance. On the 17/29ˆ of April 1818 their first child, the future emperor Alexander II., was born. In the autumn Nicholas was placed in command of the 2nd brigade of the 1st division of the Guard. In 1810 the emperor Alexander first mentioned his intention to abdicate in favour of Nicholas, Constantine consent- ing to stand aside; but he took no steps to initiate his prospective heir in affairs of state, and the grand-duke continued to be confined to his military duties. In 1820 a further important step in the matter of the succession was taken in the divorce of Constantine from the grand-duchess Anne and his re-marriage to Johanna Grudzinska (see Constantine Pavlovich). In January 1822 it was decided in a family council, with the know- ledge though not in the presence of Nicholas, that Constantine’s petition to be relieved of the burden of the crown, for which he felt himself unfitted, should be granted. It was not, however, until August 1823 that the emperor drew up the necessary papers, in the presence of the metropolitan Philaret and other witnesses, and deposited them in sealed packets, to be opened at his death, with the council of state, the senate and the holy synod. For some reason, which can only be conjectured, Constantine was not made a party to this proceeding.

Alexander I. died at Taganrog on the 1st of December 1825. When, some days later, the news reached St Petersburg, all was confusion and uncertainty. Constantine was at Warsaw; Nicholas, who on the 3rd of May of the same year had become chief of the 2nd division of the infantry of the Guard, was too conscious of his unpopularity in the army — the fruit of his drastic discipline — to dare to assume the crown without a public abdication on the part of the legitimate heir. No steps were taken to open the sealed packets, and he himself took the oath to Constantine, and, with characteristic contempt for constitu- tional forms, usurped the functions of the senate and council of state by himself ordering its imposition on the regiments stationed in St Petersburg. But Constantine refused to come to St Peters- burg, or to do more than himself take the oath to Nicholas as emperor, and write assuring him of Ms loyalty. The result was a three weeks' interregnum, of which the discontented spirits in the army took advantage to bring to a head a plot that had long been hatching in favour of constitutional reform. When on the 14th of December the troops who had already taken the oath to Constantine were ordered to take another to Nicholas, it was easy to persuade them that this was a treasonable plot against the true emperor. The Moscow regiment refused to take the oath, and part of it marched, shouting for Constantine and " Constitution," 2 to the square before the Senate House, where they were joined by a company of the Guard and the sailors from the warships. In this crisis Nicholas showed high personal

1 See Stockmar, Denkwiirdigkeiten (Brunswick, 1872), p. 98 sen.; and, for a later impression, Queen Victoria to the king of the Belgians, 4th of June 1844, in Queen Victoria's Letters.

s They had been told that this was the name of Constantine's wife.

courage, if little decision and initiative. It was entirely uncertain how many, and which, regiments could be trusted. For hours he stood, or sat on horseback, amid the surging crowd, facing the mutinous soldiers — who had loaded their muskets and formed square — while effort after effort was made to bring them to reason, sometimes at the cost of life — as in the case of Count Miloradovich, military governor of St Petersburg, who was mortally wounded by a pistol shot while arguing with the mutineers. Nicholas was saved by the very belief of the con- spirators in the universal sympathy of the army with their aims. Had the mutinous troops early in the day received the order to attack, they would have carried the waverers with them; but they hesitated to fire on comrades whom they expected to see march over to their side; and when at last the emperor had steeled his heart to use force, a few rounds of grape-shot sufficed to quell the mutiny. The

chief conspirators — Prince Shchepin- Rostovski, Suthoff, Ryleyev, Prince Sergius Trubetskoi, Prince Obolenski and others — were arrested the same night and inter- rogated by the emperor in person. A special commission, con- sisting entirely of officers, was then set up; and before this, for five months, the prisoners were subjected to a rigorous inquisition. 3 It was soon clear that the Decabrist 4 rising was but one manifesta- tion of a vast conspiracy permeating the whole army. A military rising on a large scale in the south was only averted by the news of the failure of the mutiny at St Petersburg; and at Moscow there were many arrests, including that of Colonel Paul Pestel, the chief of the revolutionary southern league. The prisoners were finally brought to trial before a supreme criminal court established by imperial ukaz on the 1st of June 1826; there were 121 of them and their trial had concluded by the 12th of June. Some were condemned to death, others to solitary confinement in fortresses, others to the Siberian mines and colonies. Of the latter many were accompanied by their wives, though the Russian law allows divorce in the case of such sentences; the emperor unwillingly allowed the devoted women to go, but decreed that any children born to them in Siberia would be illegitimate.

Firmly seated on his throne, Nicholas proceeded to fill up the gaps in his education by studying the condition of his empire. In spite of his reverence for his brother's memory, he made a clean sweep of " the angel's " Bible Society, 6 and other para- phernalia of official hypocrisy; as for Alexander's projects of reform, the pitiful legacy of a life of unfulfilled purposes, these were reported upon by committees, considered and shelved. Nicholas too saw the need for reform; the Decabrist conspiracy had burnt that into his soul; but he had his own views as to the reform needed. The state was corrupt, disorganized; what was wanted was not more liberty but more discipline, So he put civil servants, professors and students into uniform, and for little offences had them marched to the guard-house; thought was disciplined by the censorship, the army by an unceasing round of parades and inspections. The one great gift of Nicholas I. to Russia, a gift which he really believed would be welcome because it would bring every subject into immediate contact with the throne, was — the secret police, the dreaded Third Section. 6

The crowning fault of Nicholas was, however, that he would not delegate his authority; whom could he trust but himself? In this he resembled his contemporary the emperor Francis I. But Francis would " sleep upon" a difficult problem; Nicholas never slept. His constitution was of iron, his capacity for work prodigious; reviews and parades, receptions of deputations, visits to public institutions, then

eight or nine hours in his

3 The prisoners were kept in solitary confinement in the casemates of the inner fortress of St Peter and St Paul. They were brought blindfolded before the commission, and then suddenly confronted with their interrogators. Many went mad under the ordeal, one died, and one starved himself to death (Schiemann, ii. 73).

4 From Russ. Dekabr, December.

5 ” The Holy Scriptures distributed with an absurd profusion in a country where the clergy itself is hardly able to understand and explain them ” had been the ” prime source of all the secret societies established in the empire.” Piece remise par S.M. I’Empereur Nicolas, in Nesselrode vi. 275.

6 I.e. of the Private Chancery of the emperor.

cabinet reading and deciding on reports and despatches — such was his ordinary day’s work. Yet, in spite of all this, his activity could not but nrove the narrow limits of autocratic power. Under the *’ Iron Tsar ” the outward semblance of authority u-as perfectly maintained; but behind this imposing facade the whole structure of the Russian administrative system con- tinued to rot and crumble. The process was even hastened; for the emperor’s stern discipline crushed out all independence of initiative and silenced all honest criticism. The secret police provided but a poor substitute for the assistance which an argus-eyed and articulate public opinion gives to the efficient working of a constitutional system: for the greatest of autocrats has but two eyes, and it is no difficult task to deceive him. Thus it came about that, as Professor Schiemann puts it, ” Potemkin’s scenery was brought out again,” and Nicholas walked with conscious self-approval through a Russia seemingly well ordered, but in fact merely temporarily prepared for each stage of his progress.

War is the ultimate and sharpest test of the soundness of a state, and to this test Russia was submitted soon after the accession of Nicholas, who could not be blind to the revelations that resulted, though he drew the wrong moral. These re- velations had, indeed, begun before the outbreak of the war with Turkey in 1828. The new tsar had devoted especial attention to the reform and recorstruction of the navy, which under Alexander I. had been suffered to decay. Yet the

newly organized squadron which in 1827 set out on the cruise which ended at Navarino only reached Plymouth with difficulty, and there had to be completely refitted. The disastrous Balkan campaign of 1828 was an even more astounding revelation of corruption, disorganization and folly in high places; and the presence of the emperor did nothing to mitigate the attendant evils. He was indefatigable, in war as in peace, in parading and inspecting; the weary and starving soldiers were forced to turn out amid the marshes of the Dobrudscha as spick and span as on the parade grounds of St Petersburg; but he cculd do nothing to set order in the confusion of the commissariat, which caused the troops to die like flies of dysentery and scurvy; or to remedy the scandals of the hospitals, which inflicted on the wounded unspeakable sufferings. On the other hand, his presence was sufficient to hamper the initiative of Prince Wittgenstein, the nominal commander-in-chief; for Nicholas was constitutionally incapable of leaving him a free hand. This was one reason for the failure of the opening campaign. 1 Another was more creditable to the tsar's heart than to his head; he turned from the sight of wounds and blood, and would not make up his mind to sanction operations which, at the cost of a few hundred lives, would have saved thousands who perished miserably of disease. 2

These then were the leading principles which underlay Nicholas's domestic and foreign policy from first to last: to discipline Russia, and by means of a disciplined Russia to discipline the world. So far as the latter task was concerned, he again sharply divided the issues which Alexander had con- fused. The mission of Russia in the West was, in accordance with the principles of the Holy Alliance as Nicholas interpreted them, to uphold the cause of legitimacy and autocracy against the Revolution; her mission in the East was, with or without the co-operation of " Europe," to advance the cause of Orthodox Christianity, of which she was the natural protector, at the expense of the decaying Ottoman empire. The sympathy of Europe with the. insurgent Greeks gave the tsar his opportunity. The duke of Wellington was sent to St Petersburg in 1826 to

1 Nicholas remained in Russia in 1829, and Diabitsch had a free hand.

2 He once sentenced an unhappy Jew to run the gauntlet of 10,000 strokes, exclaiming as he signed the warrant, " Thank God, we have no capital punishment in Russia! " Yet his nature had its kindly side: " He feels kindness deeply — and his love for his wife and children, and for all children, is very great " (Queen Victoria, loc. cit). He also spent much personal effort in organizing the charitable institutions of the dowager empress Maria, and founded a great number of institutions

for technical education.

congratulate the new tsar on his accession and arrange a concert in the Eastern Question. The upshot proved the diplomatic value of Nicholas's apparent sincerity of purpose and charm of manner; the "Iron Duke" was to the "Iron Tsar" as soft iron to steel; Great Britain, without efficient guarantees for the future, stood committed to the policy which ended in the de- struction of the Ottoman sea-power at Navarino and the march of the Russians on Constantinople. By the treaty of Adrianople in 1829 Turkey seemed to become little better than a vassal state of the tsar, a relation intensified, after the first revolt of Mehemet Ali, by the treaty of Unkiar-Skelessi in 1833 (see Mehemet An). In the West, meanwhile, the revolutions of 1830 had modified the balance of forces. Nicholas himself proposed an armed intervention of the Alliance in order " to restore order" in Belgium and France; 3 and when his allies held back even proposed to intervene alone, a project rendered impossible by the outbreak of the great insurrection in Poland, which tied the hands of all three powers (see Poland: History). In the circumstances, Nicholas was forced to give a grudging recognition to the title of Louis Philippe as king of the French; his recognition of that of Leopold, king of the Belgians, was postponed until King William of the Netherlands had finally resigned his rights. Then, the insurrection in Poland once crushed, and Poland itself scarce surviving even as a geographical expression, 4 he drew the three eastern autocratic powers together in a new " Holy Alliance " by the secret convention of Berlin (3rd Oct. 1833) reaffirming the right and duty of intervention at the request of a legitimate sovereign. The cordial understanding with Austria, cemented at. Miinchengratz and Berlin, "was renewed, after the accession of the emperor Ferdinand, at Prague and Toplitz (1835) ; on the latter occasion it was decided " without difficulty " to suppress the republic of Cracow, as a centre of revolutionary agitation. 5 The Triple Alliance was now, in the tsar's opinion, " the last anchor of safety for the monarchical cause." To its maintenance he had sacrificed "his religious convictions" and " the traditions of Russian policy " in consenting to uphold the integrity of Turkey; a sacrifice perhaps the less hard to make since, as he added, the Ottoman empire no longer existed. 6 He allowed himself to be persuaded by Metternich to support the cause of Don Carlos in Spain, 7 and so early as May 1837, in view of the agitation in Hungary, he announced that " in every case " Austria might count on Russia.

These cordial ties were loosened, however, by the fresh crisis in the Eastern Question after 1838. Metternich was anxious to summon a European conference to Vienna, with a view to placing Turkey under a

collective guarantee. To Nicholas this seemed to be a blow aimed at Russia, and he refused to be a party to it. 8 Moreover, in view of the tendency of Austria to forget the con- ventions of Miinchengratz and Toplitz, and to approach the maritime powers, he determined to checkmate her by himself coming to an agreement with Great Britain, in order to settle the Eastern Question according to his own views: a double gain, if by this means Queen Victoria (a ” legitimate ” sovereign) could be drawn away from her unholy alliance with the Jacobin Louis Philippe. This is the explanation of those concessions in the Eastern Question which ended in the Quadruple Alliance of 1840 and the humiliation of Louis Philippe’s government (see Mehemet Ali).

The new Anglo-Russian entente led in 1844 to a visit of the

3 Martens, Recueil, viii. 164, &c, especially the autograph mem. of the tsar on the situation (p. 168) : ” But apart from honour, is it to our interest to consent to this fresh iniquity? .... Even if France invade Austria., Prussia says she will give her moral support! Is that — Great God! — the alliance created by the immortal emperor? .... Let us preserve the sacred fire for the moment of the struggle with the infernal powers! ”

4 Nicholas himself ascribed his hatred of Poles and Jews to the stories told him by his English nurse, Miss Lyon, of her sufferings during the siege of Warsaw in 1794. — Schiemann, i. 181.

6 This convention was not acted upon till 1846.

6 Conversation with Count Ficquelmont (Feb. 13, 1833) iri Martens Recueil, iv. pt. i. p. 443.

7 lb. p. 475. *Ib p. 481.

tsar to the English court. This visit, in spite of the favourable personal impression made by the emperor, was the starting-point of a fresh and fateful divergence; for it was now that the tsar first openly raised the question of the eventual partition of the inheritance of the ” Sick Man,” as he called Turkey. The whole question, however, was indefinitely postponed by the events culminating in the revolutions of 1848. Nicholas foresaw the troubles brewing, and warned Frederick William IV. of Prussia, in a tone of lofty and paternal remonstrance, of the inevitable results of his constitutional experiments. When the

storm burst, he remained entrenched behind the barriers of his own disciplined empire; sovereigns truckling in a panic to insurgent democracies he would not lift a finger to help ; l it was not till Francis Joseph of Austria in 1849 appealed to him in the name of autocracy, reasserting its rights, that he consented to intervene, and, true to the promise made at Miinchengratz in 1833, crushed the insurgent Hungarians and handed back their country as a free gift to the Habsburg king. Scarcely less valuable to Austria was the tsar's intervention in the quarrel between Austria and Prussia arising out of the Hesse incident and the general question of the hegemony of Germany. In October 1850 he had a meeting with Francis Joseph at Warsaw, at which Count Brandenburg and Prince Schwarzenberg were present. Prussia, he declared, must in the German question return to the basis of the treaties of 1815 and renew her entente with Austria; this was the only way of preserving the old friendship of Prussia and Russia. In face of the threat conveyed in this, the Prussian government decided to maintain peace (Nov. 2), Radowitz resigning as a protest. Thus Nicholas, who refused to believe in the perfidy ascribed by Frederick William to Austria, 2 was the immediate cause of Prussia's humiliation at Olmiitz.

Nicholas was soon to have personal experience of the perfidy of Austria. It was a small matter that Count Prokesch-Osten, the Austrian ambassador, was discovered to be supplying a " foul Jew" editor with copy; more serious was Austria's attitude in the troubles that led up to the Crimean War. Grati- tude, in the tsar's opinion, should have made her neutral if not friendly; the revelation of her ingratitude came upon him with the shock of a painful surprise. The first cause of all the evils that followed was his attitude towards Napoleon III. He was forced to recognize the new French empire, but he would recognize no more than the fact of its existence (du fait en lui- mime); he refused to address the emperor of the French as a brother sovereign. He attempted, moreover, to revive the function of the triple alliance as guardian of Europe against French aggression. The resentment of Napoleon awakened the slumbering Eastern Question by reviving the obsolescent claims of France to the guardianship of the Holy Places, and this aroused the pride of the Orthodox tsar, their guardian by right of faith and in virtue of a clause of the treaty of Kuchuk Kainardji (1774), as interpreted in the light of subsequent events. Nicholas could not believe that Christian powers would resent his claim to protect the Christian subjects of the sultan; he believed he could count on the friendship of Austria and Prussia; as for Great Britain, he would try to come to a frank under- standing with her (hence the famous conversations with Sir Hamilton Seymour on the

9th and 14th of January 1853, reviving the ” Sick Man” arguments of 1844), but in any case he had the assurance of Baron Brunnow, his ambassador in London, that the influence of Cobden and Bright, the eloquent apostles of peace, was enough to prevent her from appealing to arms against him. The disillusionment that followed was profound. In October 1853 Nicholas met his brother monarchs of the triple alliance at Warsaw for the last time. In December, at the conference of Vienna, Austria had already passed over to the enemy. Prussia was wavering, neutral indeed, but joining the other powers in a guarantee of the integrity of Turkey (9th April

1 ” Russia cannot aid a power which has abjured its traditions and is under the empire of revolutionary institutions.” — Nicholas to Frederick William IV., Sept. 26, 1848. Martens, Recueil, viii.

2 See Frederick William’s letter to the tsar (Nov. 4) and the latter’s reply. Martens, viii. 384, 386.

1854), urging the tsar to accept the decisions of the Vienna conference, and on his refusal signing a defensive alliance with Austria (April 20, 1854), which included among the casus belli the incorporation in Russia of the banks of the Danube and a Russian march on Constantinople. Thus Nicholas, the pillar of the European alliance, found himself isolated and at war, or potentially at war, with all Europe. The invasion of the Crimea followed, and with it a fresh revelation of the corruption and demoralization of the Russian system. At the outset Nicholas had grimly remarked that ” Generals January and February ” would prove his best allies. These acted, however, impartially; and if thousands of British and French soldiers perished of cold and disease in the trenches before Sevastopol, the tracks leading from the centre of Russia into the Crimea were marked by the bones of Russian dead. The revelation of his failure broke the spirit of the Iron Tsar, and on the 2nd of March 1855 he threw away the life which a little ordinary care would have saved.

The character of the emperor Nicholas was summed up with great insight by Queen Victoria in a letter to the king of the Belgians, written during the tsar’s visit to England (June n, 1844). “He is stern and severe — with fixed principles of duty which nothing on earth will make him change; very clever I do not think him, and his mind is an uncivilized one; his education has been neglected; politics ard military concerns are the only things he takes great interest in; the arts and all softer occupa- tions he is insensible to, but he is sincere, I

am certain, sincere even in his most despotic acts, from a sense that that is the only way to govern; he is not, I am sure, aware of the dreadful cases of individual misery which he so often causes, for I can see by various instances that he is kept in utter ignorance of many things, which his people carry out in most corrupt ways, while he thinks that he is extremely just . . . and I am sure much never reaches his ears, and (as you observed) how can it? He is, I should say, too frank, for he talks so openly before people, which he should not do, and with difficulty restrains himself. His anxiety to be believed is very great, and I must say his personal promises I am inclined to believe; then his feelings are very strong; he feels kindness deeply. ... He is not happy, and that melancholy which is visible in the countenance made me sad at times; the sternness of the eyes goes very much off when you know him, and changes according to his being put out or not. . . . He is bald now, but in his chevalier Garde uniform he is magnificent still, and very striking."

The emperor was a kind husband and father, and his domestic life was very happy. He had- seven children: (1) the emperor Alexander II. (q.v.); (2) the grand-duchess Maria (1819-1876), duchess of Leuchtenberg; (3) the grand-duchess Olga (1822- 1892), consort of King Charles of Wiirttemberg; (4) the grand- duchess Alexandra (1825-1844), married to Prince Frederick of Hesse-Cassel; (5) the grand-duke Constantine Nikolayevich (1827-1892); (6) the grand-duke Nicholas Nikolayevich (1831- 1891); (7) the grand-duke Michael Nikolayevich (b. 1832). The second son of the latter, the grand-duke Michael Mikhailovich (b. 1861), who was morganatically married, his wife bearing the title of Countess Torby, took up his residence in England.

Authorities. — All other works on Nicholas I. have been more or less superseded by Professor Theodor Schiemann's Geschichte Russlands unter Kaiser Nikolaus I., of which the 1st vol., Kaiser Alexander I. und die Ergebnisse seiner Lebensarbeit, was published at Berlin in 1904; the 2nd, carrying the history of Nicholas's reign down to the revolutions of 1830, in 1908. It is based on a large mass of unpublished material, and considerably modifies, e.g. the account of the accession of Nicholas and of the Decabrist conspiracy given in chapte: xiii. of vol. x. of the Cambridge Modern History, and tells for the first time the secret history of the Russo-Turkish War of 1828- 29. The great Recueil des traites conclus par la Russie of T. T. de Martens (St Petersburg, 1874-1909) contains admirable introductory essays, based on the unpublished Russian archives, and giving much material for the study of Nicholas's character and_ policy. Many documents are published for the first time in Schiemann's work; some, from the

archives of Count Nesselrode, are published in the Lettres et papiers du Chancelier Comte de Nesselrode, t. vi. seq. For other works see bibliographies attached to the chapters on Russia in vol. x. and xi. of the Cambridge Modern History. (W. A. P.)

NICHOLAS II. (1868-), emperor of Russia, eldest son and successor of Alexander III., was born at St Petersburg on the 18th of May 1868. He received the ordinary education of Russian grand-dukes, under the direction of General Danilovitch, assisted by M. Pobedonostsev and other eminent professors. Among these was an Englishman, Mr Charles Heath, for whom he had great respect and affection. By the death of his grand- father, Alexander II., in 1881, he became heir-apparent (cesarevich). Though he received, like all the heirs-apparent to the Russian throne, a certain amount of military training, his personal tastes did not lie in that direction, nor did he show any inclination for the boisterous amusements of the jeunesse doree of St Petersburg. Like his father, he was nowhere happier than in the family circle, and he was particularly attached to his sister, the grand-duchess Xenia, who was seven years younger than himself. In 1890-1891 he made a tour in Greece, Egypt, India, Ceylon and Japan, where he narrowly escaped assassina- tion at the hands of a Japanese fanatic. On the return journey by Siberia, at Vladivostok, he turned the first sod of the eastern section of the Siberian railway, and two years afterwards (1893) he was appointed president of the imperial committee for that great undertaking. By the death of his father on the 1st of November 1894 he became emperor, and on the 26th of that month he married Princess Alix of Hesse (a grand-daughter of Queen Victoria), to whom he had been betrothed in the presence of his father during the latter's last illness. Eighteen months later the coronation took place at Moscow with great pomp, but a gloom was thrown over the festivities by the unfortunate incident of the Khodinskoe Polye, a great open space near the city, where a popular fete had been prepared and where, from defective police arrangements, a large number of men, women and children, roughly estimated at 2000, were crushed and trampled to death. Nicholas II. followed in the footsteps of his father, seeking to preserve peace in foreign relations, and continuing in home affairs, though in a much milder form, the policy of centralization and Russification which had characterized the previous reign. His pacific tendencies were shown by his systematic opposition to all bellicose excitement, by his maintain- ing M. de Giers in the post of minister of foreign affairs, by his offering the post, on

the death of that statesman, to M. de Staal, by his restraining France from dangerous adventures, and by initiating the Peace Conference at the Hague. To these ought perhaps to be added the transformation of the Franco-Russian entente cordials into a formal alliance, since the alliance in question might be regarded as favourable to the preservation of t±ie status quo in Europe. In the internal administration during the first years of his reign he introduced by his personal influence, and without any great change in the laws, a more humane spirit towards those of his subjects who did not belong by language and tradition to the dominant nationality, and who were not members of the Eastern Orthodox Church; but he disappointed the men of liberal views by giving it to be clearly understood soon after his accession that he had no intention of circumscribing and weakening the autocratic power by constitutional guarantees or parliamentary institutions. In spite, however, of his desire for peace he let his country drift into the disastrous war with Japan; and notwithstanding his sincere attachment to the principles of bureaucratic autocracy, it was he who granted the constitutional reforms which altered the whole political outlook in Russia (see Russia).

NICHOLAS OF BASEL (d. 1397), a prominent member of the Beghard community, who travelled widely as a missionary and propagated the teachings of his sect. Though vigorously sought after by the Inquisition he eluded its agents for many years until in 1397 he was seized in Vienna, and burned at the stake as a heretic, together with two of his followers, John and James. A considerable legend has attached itself to Nicholas through the persistent but mistaken identification of him with the mysterious ” Friend of God from the Oberland,” the ” double” of Rulman Merswin, the Strassburg banker who was one of the leaders of the 14th-century German mystics known as the Friends of God. In Merswin’s Story of the First

Four Years of a New Life, he writes: ” Of all the wonderful works which God had wrought in me I was not allowed to tell a single word to anybody until the time when it should please God to reveal to a man in the Oberland to come to me. When he came to me God gave me the power to tell him everything.” The identity and personality of this ” Friend of God,” who bulks so largely in the great collection of mystical literature, and is everywhere treated as a half supernatural character, is one of the most difficult problems in the history of mysticism. The tradition, dating from the 15th century and supported by the weighty authority of the Strassburg historian Karl Schmidt (Nicolaus von Basel, Vienna, 1866), identified him with Nicholas, but is now discredited by all scholars. A. Jundt (Les Amis de Dieu, 1879)

shared Preger's view that the Friend was a great unknown who lived in or near Chur (Coire) in Switzerland. But since Denifle's researches (see especially Der Gottesfreund im Olerlande und Nikolaus von Basel, 1870) the belief has gained ground that the " Friend " is not a historical personage at all. Apart from the collection of literature ascribed to him and Merswin there is no historical evidence of his existence. The accounts of his life say that about 1343 he was forbidden to reveal his identity to anyone save Rulman Merswin. And as all the writings bear the marks of a single authorship it has been assumed, especially by Denifle, that " the Friend of God " is a literary creation of Merswin and that the whole collection of literature is the work of Merswin (and his school), tendency- literature designed to set forth the ideals of the movement to which he had given his life. Thus " the great unknown" from the Oberland is the ideal character, " who illustrates how God does his work for the world and for the church through a divinely trained and spiritually illuminated layman," just as William Langland in England about the same time drew the figure of Piers Plowman.

To rescue Merswin from the charge of deceit involved in this theory, Jundt puts forward the suggestion, more ingenious than convincing, that Merswin was a " double personality," who in his primary state wrote the books ascribed to him, and in his secondary state became " the Friend of God from the Oberland," writing the other treatises. A third hypothesis is that advanced by Karl Rieder (Der Gottesfreund von Oberland, Innsbruck, 1905), who thinks that not even Merswin himself wrote any of the literature, but that his secretary and associate Nicholas of Lowen, head of the House of St John at Griinenworth, the retreat founded by Merswin for the circle, worked over all the writings which emanated from different members of the group but bore no author's names, and to glorify the founder of the house attached Merswin's name to some of them and out of his imagination created " the Friend of God from the Oberland," whom he named as the writer of the others. As his design took shape he expanded the supernatural element and made the narratives autobiographical. There is much in this contention that is sound, but Rieder seems to go unnecessarily far in denying altogether that Merswin wrote any of the mystical books. The conclusion remains that the literature must be treated as tendency-writing and not as genuine biography and history.

See besides the works cited, Rufus M. Jones, Studies in Mystical Religion, ch. xiii. (London, 1909). (A J. G.)

NICHOLAS OF GUILDFORD (fl. 1250), English poet, the supposed author of The Owl and the Nightingale, an English poem of the 13th

century. This work, which displays genuine poetical and imaginative qualities, is written in the south- western dialect, and is one of the few 13th-century English poems not devoted entirely to religious topics. The nightingale sitting on a branch covered with blossom sees the owl perched on a bough overgrown with ivy, and proceeds to abuse him for his general habits and appearance. The birds decide to refer the consequent dispute to Master Nicholas de Guildford, who is skilled in such questions, but they first of all engage in a regular dibat in the French fashion. The owl is the best logician, but the nightingale has a fund of abuse that equalizes matters. Finally, when the argument threatens to become a fight, the wren

interferes, and the two go to the house of Master Nicholas at Por- tisHam in Dorset. He judges, they say, many right judgments, and composes and writes much wisdom, and it is lamentable that so learned and worthy a man should gain no preferment from his bishop. The poet, whoever he was, wrote the octosyllabic couplet with ease and smoothness. He borrows something from Alexander of Neckham's De naturis rerum, and was certainly familiar with contemporary French poetry. The piece is a general allegory of the contest between asceticism and a more cheerful view of religion, and is capable of a particular application to the differences between the regular orders and the secular clergy. The nightingale defends her singing on the ground that heaven is a place of song and mirth, while the owl maintains that much weeping for his many sins is man's best preparation for the future.

There are two MSS. of the Hide ami the Nightingale, MS. Cotton Caligula A ix. (British Museum), dating from the first half of the 13th century, and MS. Arch. I. 29, Jesus College, Oxford, written about half a century later. In the Jesus College MS. the poem is immediately preceded by a religious poem entitled La Passyun Jhu Christ, which, according to a note on it, once possessed an additional quatrain implying that it was written by John of Guildford, perhaps a relation of Nicholas.

The Owl and the Nightingale has been edited from the Cotton MS. chiefly for the Roxburghe Club (1838) by Joseph Stevenson, and for the Percy Society (1843) by T. Wright; the best edition is by F. H. Stratmann (Krefeld, 1868), who collated the two MSS. See also B. Ten Brink, Early English Literature (trans. H. M. Kennedy, pp. 214- 218);

Courthope, History of English Poetry; and J. W. H. Atkins in the Cambridge History of Literature, vol. i. For some textual criticism see A.E. Egge in Modern Language iVote.s(Baltimore,January,

1887).

NICHOLAS, SIR EDWARD (1593-1669), English statesman, eldest son of John Nicholas, a member of an old Wiltshire family, was born on the 4th of April 1 593. He was educated at Salisbury grammar school, Winchester College and Queen's College, Oxford. After studying law at the Middle Temple, Nicholas became secretary to Lord Zouch, warden and admiral of the Cinque ports, in 1618, and continued in a similar employment under the duke of Buckingham. In 1625 he became secretary to the admiralty; shortly afterwards he was appointed an extra clerk of the privy council with duties relating to admiralty business, and from 1635 to 1641 he was one of the clerks in ordinary to the council. In this situation Nicholas had much business to transact in connexion with the levy of ship-money; and in 1641, when Charles I. went to Scotland, a heavy responsi- bility rested on the secretary who remained in London to keep the king informed of the proceedings of the parliament. On the return of Charles to the capital Nicholas was knighted, and appointed a privy councillor and a secretary of state, in which capacity he attended the king while the court was at Oxford, and carried out the business of the treaty of Uxbridge. Through- out this troubled period he was one of Charles's wisest and most loyal advisers; he it was who arranged the details of the king's surrender to the Scots, though he does not appear to have advised or even to have approved of the step; and to him also fell the duty of treating for the capitulation of Oxford, which included permission for Nicholas himself to retire abroad with his family. He went to France, being recommended by the king to the confidence of the prince of Wales. After the king's death Nicholas remained on the continent concerting measures on behalf of the exiled Charles II. with Hyde and other royalists, but the hostility of Queen Henrietta Maria deprived him of any real influence in the counsels of the young sovereign. He lived at the Hague and elsewhere in a state of poverty which hampered his power to serve Charles, but which the latter did nothing to relieve. He returned to England at the Restoration; but although Charles had formally appointed him secretary of state in 1654, this office was now conferred on another, and Nicholas had to content himself with a grant of money and the offer of a peerage, which his poverty compelled him to decline. He retired to a country seat in Surrey which he purchased from a son of Sir Walter Raleigh, and here he lived till his death in 1669. By his wife Jane, a daughter of Henry Jay, an alderman of London, he had several sons and daughters; his younger

brother Matthew Nicholas (1 594-1661) was successively dean of Bristol, canon of Westminster and dean of St Paul's.

See The Nicholas Papers, edited by G. F. Warner (Camden Society, London, 1886ˆ-1897), containing Nicholas's correspondence and some autobiographical memoranda. Private correspondence between Nicholas and Charles I. will be found in the Memoirs of John Evelyn, edited by W. Bray (London, 1827); The Edgerton MSS. and the Ormonde Papers contain many references to Nicholas.

NICHOLAS (or Niclaes), HENRY (or Hendrik) (c. 1501-e. 1 580), founder of the sect called" the Family of Love," was born in 1501 or 1502, at Minister, where he was married and carried on the business of a mercer. As a boy he was subject to visions, and at the age of twenty-seven charges of heresy led to his imprisonment. About 1530 he removed with his family to Amsterdam, where he was again imprisoned on a charge of complicity in the Minister revolution of 1534-153 5. About 1539 he experienced a call to found his " Familia Caritatis." Remov- ing to Embden, he lived there and prospered in business for twenty years, though he travelled with commercial as well as missionary objects into the Netherlands, England and elsewhere. The date of his sojourn in England has been placed as early as 1552 and as late as 1569. In 1579 he was living at Cologne, where probably he died a year or two later. His doctrines seem to have been derived largely from the Dutch Anabaptist David Joris or George, who died in 1556; but they have mainly to be inferred from the jaundiced accounts of hostile writers. The outward trappings of his system were merely Anabaptist; but he anticipated a good many later speculations, and his followers were accused of asserting that all things were ruled by nature and not directly by God, of denying the dogma of the Trinity, and repudiating infant baptism. They held that no man should be put to death for his opinions, and apparently, like the later Quakers, they objected to the carrying of arms and to anything like an oath; and they were quite impartial in their repudiation of all other churches and sects, including Brownists and Barrowists.

Nicholas's principal disciple in England was one Christopher Vitel, and towards 1579 the progress of the sect especially in the eastern counties provoked literary attacks, proclamations and parliamentary bills. But Nicholas's followers escaped the gallows and the stake, for they combined with some success the wisdom of the serpent and the harmlessness of the dove. They would only discuss their doctrines with sympathizers; they showed every respect for authority, and considered outward con- formity a duty. This quietist attitude, while it saved them from molestation, hampered propaganda; and though the " Family " existed until the middle of the 1 7th century, it was then swallowed up by the Quakers, Baptists and Unitarians, all of which de- nominations may have derived some of their ideas through the "

Family ” from the Anabaptists.

The list of Nicholas’s works occupies nearly six columns in the Diet. Nat. Biogr. See also Belfort Bax, Rise and Fall of the Anabaptists, pp. 327-380 (1903); and Strype’s Works, General Index – (A. F. P.)

NICHOLS, JOHN (1745-1826), English printer and author, was born at Islington on the 2nd of February 1745. He edited the Gentleman’s Magazine from 1788 till his death, and in the pages of that periodical, and in his numerous volumes of Anecdotes and Illustrations, he made invaluable contributions to the personal history of English men of letters in the 18th century. He was apprenticed in 1757 to ” the learned printer,” William Bowyer, whom he eventually succeeded. On the death of his friend and master in 1777 he published a brief memoir, which afterwards grew into the Anecdotes of William Bowyer and his Literary Friends (1782). As his materials accumulated he compiled a sort of anecdotical literary history of the century, based on a large collection of important letters. The Literary Anecdotes of the 18th Century (1812-1815), into which the original work was expanded, forms only a small part of Nichols’s production. It was followed by the Illustrations of the Literary History of the 1 8th Century, consisting of Authentic Memoirs and Original Letters of Eminent Persons, which was begun in 1817 and com- pleted by his son John Bowyer Nichols (1779-1863) in 1858.

The A necdotes and the Illustrations are mines of valuable in- formation on the authors, printers and booksellers of the time.

Nichols’s other works include: A Collection of Royal and Noble Wills (178c); Select Collection of Miscellaneous Poems (1782), with subsequent additions, in which he was helped by Joseph Warton and by Bishops Percy and Lowth; Bibliotheca Topographica Brilannica (1780-1700); with Richard Gough, The Progresses and Public Processions of Queen Elizabeth (1788); and the important History and Antiquities of the Town and County of Leicester (1705-1815). Nichols was a fellow of the Society of Antiquaries, a trustee of many city institutions, and in 1804 he was master of the Stationers’ Company. He died on the 26th of November 1826.
JoHNBowvERNiCHOLScontinuedhisfather’s various undertakings, and wrote, with other works, A Brief Account of the Guildhall of the City of London (1819). His eldest son, John* Gough Nichols (1806-1873),

was also a printer and a distinguished antiquary, who edited the Gentleman's Magazine from 1851 to 1856, and the Herald and Genealogist from 1863 to 1874, and was one of the founders of the Camden Society.

A full Memoir of John Nichols by Alexander Chalmers is contained in the Illustrations, and a bibliography in the Anecdotes (vol. vi.) is supplemented in the later work. See also R. C. Nichols, Memoirs of J. G. Nichols (1874).

NICHOLSON, HENRY ALLEYNE (1844-1899), British palaeon- tologist and zoologist, son of Dr John Nicholson, a biblical scholar, was born at Penrith on the nth of September 1844. He was educated at Appleby Grammar School and at the uni- versities of Gottingen (Ph.D., 1866) and Edinburgh (D.Sc, 1S67; M.D., 1869). Geology had early attracted his attention, and his first publication was a thesis for his D.Sc. degree On the Geology of Cumberland and Westmoreland (1868). In 1871 he was appointed professor of natural history in the university of Toronto, in 1874 professor of biology in the Durham College of Science and in 1875 professor of natural history in the university of St Andrews. This last post he held until 1882, when he became rcgius professor of natural history in the university of Aber- deen. He was elected F.R.S. in 1897. His original work was mainly on fossil invertebrata (graptolites, stromatoporoids and corals) ; but he did much field work, especially in the Lake district, where he laboured in company with Professor R. Harkness and afterwards with Dr J. E. Marr. He was awarded the Lyell Medal by the Geological Society in 1888. He died at Aberdeen on the 19th of January 1899.

Publications. — Ancient Life-History of the Earth (1877) ; Manual of Zoology (of which there were 7 editions) and other text-books of Zoology; Manual of Palaeontology (1872, 3rd ed., 2 vols., with R. Lydekker, 1889); Monograph of the Silurian Fossils of the Girvan Dutrict in Ayrshire (with R. Etheridge, jun.) (1878-1880); Mono- graph of the British Stromatoporoids in Palaeontograph. Soc. (1886-

1892).

Obituary, with portrait, by Dr G. J. Hinde, in Geol. Mag. (March 1S99).

NICHOLSON, JOHN (1822-1857), Anglo-Indian soldier and administrator, son of Alexander Nicholson, a north of Ireland physician, was born on the nth of December 1822 and educated at Dungannon College. He was presented with a cadetship in the Bengal

infantry in 1839 by his uncle Sir James Hogg, and served in the first Afghan War of 1839-42; he distinguished himself in the defence of Ghazni, and was one of the prisoners who were carried to Bamian and escaped by bribing the guard upon General Pollock's successful advance. It was in Afghanistan that Nicholson first met Sir Henry Lawrence, who got him the appointment of political officer in Kashmir and subsequently on the Punjab frontier. In 1847 he was given charge of the Sind Sagar district, and did much to pacify the country after the first Sikh War. On the seizure of Multan by Mulraj, he rendered great service in securing the country from Attock, and was wounded in an attack upon a tower in the Margalla Pass, where a monument was subsequently erected to his memory. On the outbreak of the second Sikh War he was appointed political officer to Lord Gough's force, when he rendered great service in the collection of intelligence and in furnishing supplies and boats.

On the annexation of the Punjab he was appointed deputy commissioner of Bannu. There he became a kind of legendary

hero, and many tales are told of his stern justice, his tireless activity and his commanding personality. In the course of five years he reduced the most turbulent district on the frontier to such a state of quietude that no crime was committed or even attempted during his last year of office, a condition of things never known before or since. On one occasion, being attacked by a ghazi, he snatched the musket from the hand of a sentry and shot the man dead; on another occasion he put a price on the head of a notorious outlaw, and finding every one afraid to earn it, rode single-handed to the man's village, met him in the street and cut him down. But besides being a severe ruler, Nicholson was eminently just. A criminal had no chance of escaping him, so able and determined was his investigation ; and a corrupt official could not long evade his vigilance; but he was deliberate in his punishments, and gave offenders a chance to redeem their character. He would go personally to the scene of a crime or a legal dispute and decide the question on the spot. Every man in his district, whether mountain tribesman or policeman, felt that he was controlled by a master hand, and the natives said of him that " the tramp of his war-horse could be heard from Attock to the Khyber." Lord Roberts says of him in Forty -One Years in India: " Nicholson impressed me more profoundly than any man I had ever met before, or have ever met since. I have never seen any one like him. He was the beau idial of a soldier and a gentleman." It is little wonder that the natives worshipped him as a god under the title of Nikalsain. Nicholson, however, had a fiery temper and a contempt for red tape, which made him a somewhat intractable subordinate. He had a serious quarrel

with Sir Neville Chamberlain, and was continually falling out with Sir John Lawrence, who succeeded his brother Henry as ruler of the Punjab.

It was when the Mutiny broke out in May 185 7 that Nicholson was able to show the metal that was in him, and he did more than any other single man to keep the Punjab loyal and to bring about the fall of Delhi. When the news of the rising at Meerut arrived, Nicholson was with Edwardes at Peshawar, and they took immediate steps to disarm the doubtful regiments in that cantonment. Together they opposed Sir John Lawrence's proposal to abandon Peshawar, in order to concentrate all their strength on the siege of Delhi. In June Nicholson was appointed to the command of a movable column, with which he again disarmed two doubtful regiments at Phillaur. In July he made a forced march of 41 m. in a single day in the terrific heat of the Punjab summer, in order to intercept the mutineers from Sialkot, who were marching upon Delhi. He caught them on the banks of the Ravi near Gurdaspur, and utterly destroyed them, thus successfully achieving what hardly any other man would have attempted. In August he had pacified the Punjab and was free to reinforce General Wilson on the Ridge before Delhi. An officer who served in the siege gives the following word picture of him as he appeared at this time: —

" He was a man cast in a giant mould, with massive chest and powerful limbs, and an expression ardent and commanding, with a dash of roughness ; features of stern beauty, a long black beard, and a deep sonorous voice. There was something of immense strength, talent and resolution in his whole frame and manner, and a power of ruling men on high occasions which no one could escape noticing. His imperial air, which never left him, and which would have been thought arrogant in one of less imposing mien, sometimes gave offence to the more unbending of his countrymen, but made him almost worshipped by the pliant Asiatics."

Before Nicholson's arrival the counsels of the commanders before Delhi, like those at Meerut, suffered from irresolution and timidity. As General Wilson's health declined, his caution became excessive, and Nicholson was specially sent by Sir John Lawrence to put more spirit into the attack. His first exploit after his arrival was the victory of Najafgarh, which he won over the rebels who were attempting to intercept the British siege train from Ferozepore. After marching through a flooded country scarcely practicable for his guns, Nicholson, with a force of 2500 troops, defeated 6000 disciplined sepoys after an hour's fighting, and thenceforth put an end to all attempts of the enemy to get in the rear of the British position on the Ridge.

Nicholson grew fiercely impatient of General Wilson's

procrastination, and at one time was thinking of appealing to the army to set Wilson aside and elect a successor; but at last, on the 13th of September, he forced Wilson to make up his mind to the assault, and he himself was chosen to lead the attacking column. On the morning of the 14th he led his column, 1000 strong, in the attack on the Kashmir gate, and successfully entered the streets of Delhi. But in trying to clear the ramparts as far as the Lahore Gate, he undertook a task beyond the powers of his wearied troops. In encouraging them as they hesitated, he turned his back on the enemy and was shot in the back. The wound was mortal, but his magnificent physique allowed him to linger for nine days before finally succumbing on the 23rd of September.

His best epitaph is found in the words of Sir John Lawrence's Mutiny Report: —

" Brigadier-General John Nicholson is now beyond human praise and human reward. But so long as British rule shall endure in India, his fame can never perish. He seems especially to have been raised up for this juncture. He crowned a bright, though brief, career by dying of the wound he received in the moment of victory at Delhi. The Chief Commissioner does not hesitate to affirm that without John Nicholson Delhi could not have fallen."

See J. L. Trotter, Life of John Nicholson (1904) ; Sir John Kaye, Lives of Indian Officers (1889); Bosworth Smith, Life of Lord Lawrence (1883) ; Lady Edwardes, Memorials of Sir Herbert Edwardes (1886); and S. S. Thorburn, Bannu (1876).

NICHOLSON, WILLIAM (1753-1B15), English writer on natural philosophy, was born in London in 1753, and after leaving school made two voyages as midshipman in the East India service. He subsequently entered an attorney's office, but, having become acquainted, in 1775, with Josiah Wedgwood, he lived for some years at Amsterdam as agent for the sale of pottery. On his return to England he was induced by Thomas Holcroft to devote himself to the composition of light literature for periodicals, assisting that writer also with some of his plays and novels. Meanwhile he employed himself on the preparation of An Intro- duction to Natural Philosophy, which was

published in 1781 and was at once successful. A translation of Voltaire's Elements of the Newtonian Philosophy soon followed, and he now entirely devoted himself to scientific pursuits and philosophical journalism. In 1784 he was appointed secretary to the General Chamber of Manufacturers of Great Britain, and he was also connected with the Society for the Encouragement of Naval Architecture, estab- lished in 1 791. He bestowed much attention upon the construc- tion of various machines for comb-cutting, file-making, cylinder printing, &c; he also invented an areometer. In 1800 he began in London a course of public lectures on natural philosophy and chemistry, and about this period he made the discovery of the decomposition of water by the voltaic current. In 1797 the Journal of Natural Philosophy, Chemistry and the Arts, generally known as Nicholson's Journal, the earliest work of the kind in Great Britain, was begun; it was carried on till 1814. During the later years of his life Nicholson's attention was chiefly directed to waterworks engineering at Portsmouth, at Gosport and in Southwark. He died in London on the 21st of May 1815.

Besides considerable contributions to the Philosophical Trans- actions, Nicholson wrote translations of Fourcroy's Chemistry (1787) and Chaptal's Chemistry (1788), First Principles of Chemistry (1788) and a Chemical Dictionary (1795) ; he also edited the British Encyclo- paedia, or Dictionary of Arts and Sciences (6 vols., 8vo, London, 1809). NICHOLSON, WILLIAM (1784-1844), Scottish painter, was born at Newcastle-on-Tyne. Having settled in Edinburgh, he painted portraits both in oil and water-colour; and along with Thomas Hamilton the architect he was one of the founders and most vigorous promoters of the Scottish Academy, of which he became the first secretary (1826-1833). In 1818 he published a series of etchings entitled Portraits of Distinguished Living Characters of Scotland, including Sir Walter Scott, Lord Jeffrey, Robert Burns and Professor Wilson.

NICIAS (d. 414 B.C.), a soldier and statesman in ancient Athens, inherited from his father Niceratus a considerable fortune in- vested mainly in the silver mines of Laurium. Evidence of his wealth is found in the fact that he had no less than 1000 slaves whom he hired out. He gravitated naturally to the aristocratic party, and was several times colleague with Pericles in the

strategia. On the death of Pericles he was left leader of the aristocrats against the advanced party of Cleon (q.v.). He made use of his wealth both to buy off enemies (especially in- formers) and to acquire popularity by the magnificent way in which he discharged various

public services, especially those connected with the state religion, of which he was a strong supporter. In the field he displayed extreme caution, and prior to the great Sicilian expedition achieved a number of minor military successes. In 421 he took a prominent part in the arrangement of the ” Peace of Nicias,” which terminated the first decade of the Peloponnesian War (q.v.). He now entered with varying success upon a period of rivalry with Alcibiades, the details of which are largely matters of conjecture. So bitter was the strife that the ostracism of one seemed inevitable, but by a temporary coalition they secured instead the banishment of the demagogue Hyperbolus (417). In 415 he was appointed with Alcibiades and Lamachus to command the Sicilian ex- pedition, and, after the flight of Alcibiades (q.v.) and the death of Lamachus, was practically the sole commander, the much more capable Demosthenes, who was sent to his aid, being apparently of comparatively little weight. How far it is just to attribute to his excessive caution and his blind faith in omens the disastrous failure it is difficult to say. At all events it is clear that the management of so great an enterprise was a task far beyond his powers. He was a man of conventional respect- ability and mechanical piety, without the originality which was required to meet the crisis which faced him. His popularity with the aristocratic party in Athens is, however, strikingly shown by the lament of Thucydides over his death: ” He assuredly, among all Greeks of my time, least deserved to come to so extreme a pitch of ill-fortune, considering his exact per- formance of established duties to the divinity ” (vii. 86, Grote’s version).

Besides Thucydides see Plutarch’s Nicias and Diod. xii. 83 ; also the general authorities on the history of Greece, and the article Peloponnesian War.

NICIAS, son of Nicomedes, an Attic painter of the 4th century B.C. Pliny (xxxv. 131) gives a list of his works. He was associ- ated with Praxiteles, whose statues he coloured, thus adding to their value.

NICKEL (symbol Ni, atomic weight 58.68 (0=i6)),a metallic element. It has been known from the earliest times, being employed by the Chinese in the form of an alloy called pakfong. It was first isolated in an impure condition in 1751 by A. F. Cronstedt from niccolite, and his results were afterwards con- firmed by T. O. Bergman in 1775 (De niccolo,opusc. 2, p. 231; 3, p. 459; 4, p. 374). It occurs in the uncombined condition and alloyed with iron in meteorites; as sulphide in millerite and nickel blende, as arsenide in niccolite and cloanthite, and frequently in combination with arsenic and antimony in the form of complex sulphides. In recent years it has been found in considerable quantities in New Caledonia in the form of a hydrated silicate of

nickel and magnesia approximating to the constitution (NiO, Mg0)Si0 2 nH 2 (J. Gamier, 1865), and in Canada in the form of nickeliferous pyrrhotines, which consist of sulphides of iron associated with sulphides of nickel and copper, embedded in a matrix of gneiss. At the present time nickel is obtained practically entirely from garnierite and the nickeliferous pyrrhotines. When the former is used it is roasted with calcium sulphate or alkali waste to form a matte which is then blown in a Bessemer converter or heated in a reverberatory furnace with a siliceous flux with the object of forming a rich nickel sulphide. This sulphide is then by further heating con verted into the oxide and finally reduced to the state of metal by ignition with carbon in clay crucibles. The process adopted for the Canadian ores, which are poor in copper and nickel, consists in a preliminary roasting in heaps and smelting in a blast furnace in order to obtain a matte, which is then further smelted with a siliceous flux for a rich matte. This rich matte is then mixed with coke and salt-cake and melted down in an open hearth furnace. The nickel sulphide so obtained is then roasted to oxide and reduced to metal. For a wet method of extraction

of the matte see Christofle and Bouilhet, French Patent 11 1 591 (1876). L. Mond {Jour. Soc. Chem. Ind. 1895, p. 945) has obtained metallic nickel from the Canadian mattes by first roasting them and then eliminating copper by the action of sulphuric acid, the product so obtained being then exposed to the reducing action of producer gas at about 350 C. The reduced metal is then passed into a ” volatilizer ” and exposed to the action of carbon monoxide at about 80° C, the nickel carbonyl so formed being received in a chamber heated to 180-200 C, where it decomposes, the nickel being deposited and the carbon monoxide returned to the volatilizer. For an electro- lytic method of treating mattes, see T. Ulke, Moniteur sclent., 1897, 49, p. 450. The metal as obtained by industrial methods rarely contains more than about 99-99-5% of nickel, the chief impurities being copper, iron, cobalt, silicon and carbon.

The following tables show the output of nickel from Canada and the shipments of nickel ore from New Caledonia in recent years : —

Canada

Production

Export

Production

Export

(lb).

(lb).

(lb).

(lb).

1900

7,080,227

13.493.239

1905

18,876,315

11.970,557

1901

9,189,047

9.537,558

1906

21,490,955

20,653,845

1902

10,693.410

3.883.264

1907

21,189,793

19.376,335

1903

12,505,510

9.032,554

1908

19,143,111

19,419,893

1904

10,547,883

14,229,973

New Caledonia

1900.

1901.

1902.

1903.

1904.

1905.

1906.

1907.

1908.

Metric tons .

100,319

133.676

129.653

77.36o

98,665

125,289

130,688

101,708

120,028

(See Rothwell's Mineral Industry (1908), pp. 666, 670).

The metal may also be obtained on the small scale by the reduction of the oxide by hydrogen or by carbon, by ignition of the oxalate or of nickel ammonium oxalate (J. J. Berzelius), by reduction of the chloride in a current of hydrogen (E. Peligot), by electrolysis of nickel ammonium sulphate (Winkler, Zeit. anorg. Chem. 1894, 8, p. 1), and by reduction of the chloride with calcium carbide.

It is a greyish white metal, and is very malleable and ductile. Its specific gravity varies according to the method employed for its preparation, the extreme values being 8-279 and 9-25. It melts between 1400-1600 C. Its specific heat increases with rise of temperature, the mean value from 15 to ioo° C. being 0-1084 (A. Naccari, Gazz., 1888, 18, p. 13). It is magnetic, but loses its magnetism when heated, the loss being complete at about 340-3 50 C. On the physical constants see H. Copaux, Comptes rendus, 1905, 140, p. 651. Nickel occludes hydrogen readily, is attacked by the halogen elements, and oxidizes easily when heated in air. In the massive state it is unacted upon by dry air, but if moistened with acidified water, oxidation takes place slowly. When obtained by reduction processes at as low a temperature as possible the finely divided metal so formed is pyrophoric, and according to P. Schutzenberger (Comptes rendus, 1891, 113, p. 177) dry hydrochloric acid gas converts this form into nickel chloride and a volatile compound of composition NiHCl. It decomposes water at a red heat. According to E. St Edme (Comptes rendus, 1886, ro6, p. 1079) sheet nickel is passive to nitric acid, and the metal remains passive even when heated to redness in a current of hydrogen. On the reduction of organic compounds by hydrogen in the presence of metallic nickel see P. Sabatier and J. B. Senderens, Ann. Chim. Phys., 1905 [8], 4, pp. 319, 433.

It rapidly oxidizes when fused with caustic soda, but is scarcely acted upon by caustic potash (W. Dittmar, Jour. Soc. Chem. Ind., 1884, 3, p.

103). Hydrochloric and sulphuric acids are almost without action on the metal, but it dissolves readily in dilute nitric acid. Nickel salts are antiseptic; they arrest fermentation and stop the growth of plants. Nickel carbonyl, however, is extremely poisonous. On the toxic properties of

nickel salts see A. Riche and Laborde, Jour. Pharm. Chem., 1888, [5], 17, pp. 1, 59, 97.

Nickel is used for the manufacture of domestic utensils, for crucibles, coinage, plating, and for the preparation of various alloys, such as German silver, nickel steels such as invar (nickel, 35‘7%; steel, 64-3%), which has a negligible coefficient of thermal expansion, and constantan (nickel, 45%; copper, 55%), which has a negligible thermal coefficient of its electrical resist- ance.

Compounds. Nickel Oxides. — Several oxides of nickel are known. A suboxide, Ni 2 (?), described by W. Muller (Pogg. Ann., 1869, 212, p. 59), is not certainly known. The monoxide, NiO, occurs naturally as bunsenite, and is obtained artificially when nickel hydroxide, carbonate, nitrate or sulphate is heated. It may also be prepared by the action of nickel on water, by the reduction of the oxide N12O3 with hydrogen at about 200° C. (H. Moissan, Ann. Chim. Phys., [5], 21, p. 199), or by heating nickel chloride with sodium carbonate and extracting the fused mass with water. It is a green powder which becomes yellow when heated. It dissociates at a red heat, and is readily reduced to the metal when heated with carbon or in a current of hydrogen. It is readily soluble in acids, forming salts, the rate of solution being rapid if the oxide is in the amorphous condition, but slow if the oxide is crystalline. The hydroxide, Ni(OH)2, is obtained in the form of a greenish amorphous powder when nickel salts are precipitated by the caustic alkalis. It is readily soluble in acids and in an aqueous solution of ammonia. Nickel sesquioxide, N12O3, is formed when the nitrate is decomposed by heat at the lowest possible temperature, by a similar decomposition of the chlorate, or by fusing the chloride with potassium chlorate. It is a black powder, the composition of which is never quite definite, but approximates

to the formula given above. When heated with oxy-acids it dissolves, with evolution of oxygen, and with hydrochloric acid it evolves chlorine. Numerous hydrated forms of the oxide have been de- scribed (see W. Wernicke, Pogg. Ann., 1870, 217, p. 122). A peroxide, NiC>2, has been obtained in the form of dinickelite of barium, BaO-2Ni02, by heating the monoxide with anhydrous baryta in the electric furnace (E. Dufau, Comptes rendus, 1896, 123, p. 495). G. Pellini and D.

Meneghini (Zeit. anorg. Chem., 1908, 6o, p. 178) obtained a greyish green powder of composition NiCVxPUO, by adding an alcoholic solution of potassium hydrate to nickel- chloride and hydrogen peroxide at —50'. It has all the reactions of hydrogen peroxide, and S. Tanatar (Ber., 1909, 42, p. 1516) regards it as NiO-H 2 2 . "An oxide, Ni 3 4 , has been obtained by heating nickel chloride in a current of moist oxygen at about 400″ C. (H. Baubigny, Comptes rendus, 1878, 87, p. 1082), or by heating the sesquioxide in hydrogen at 190° C. (H. Moissan, Ann. Chim. Phys., 1890 [5], 21, p. 199). The former method yields greyish, metallic-looking, microscopic crystals, the latter a grey amorphous powder. A hydrated form, Ni 3 04-2H20, is obtained when the monoxide is fused with sodium peroxide at a red heat and the fused mass extracted with water.

Nickel Salts. — Only one series of salts is known, namely those corresponding to the monoxide. In the anhydrous state they are usually of a yellow colour, whilst in the hydrated condition they are green. They may be recognized by the brownish violet colour they impart to a borax bead when heated in an oxidizing flame. The caustic alkalis added to solutions of nickel salts give a pale green precipitate of the hydroxide, insoluble in excess of the precipitant. This latter reaction is hindered by the presence of many organic acids (tartaric acid, citric acid, &c). Potassium cyanide gives a greenish yellow precipitate of nickel cyanide, Ni(CN)2, soluble jn excess of potassium cyanide, forming a double salt, Ni(CN) 2 2KCN, which remains unaltered when boiled with excess of potassium cyanide in presence of air (cf. Cobalt). Ammonium sulphide pre cipitates black nickel sulphide, which is somewhat soluble in excess of the precipitate (especially if yellow ammonium sulphide be used), forming a dark-coloured solution. Ammonium hydroxide gives a green precipitate of the hydroxide, soluble in excess of ammonia, forming a blue solution. Numerous methods have been devised for the separation of nickel and cobalt, the more important of which are : — the cobaltinitrite method by which the cobalt is precipitated in the presence of acetic acid by means of potassium nitrite (the alkaline earth metals must not be present); the cyanide method (J. v. Liebig, A nn. , 1 848 , .65 , p. 244 ; 1 853 , 87 , p. 1 28) , in which the two metals are precipitated by excess of potassium cyanide in alkaline solution, bromine being afterwards added and the solution warmed, when the nickel is precipitated. The latter method has been modified by adding potassium cyanide in slight excess to the solution of the mixed salts, heating for some time and then adding mercuric oxide and water, the whole being then warmed on the water bath, when a precipitate of mercuric oxide and nickel hydroxide is obtained

(Liebig). M. Ilinski and G. v. Knorre (Ber., 1885, 18, p. 169) separate the metals by adding nitroso-/3-naphthol in the presence of 50% acetic acid, a precipitate of cobalti nitroso-/3-naphthol, [CioH 6 0(NO)] 3 Co, insoluble in hydrochloric acid, being formed, whilst the corresponding nickel compound dissolves in hydrochloric acid. E. Pinerua separates the metals by taking advantage of the fact that cobalt chloride is soluble in ether which has been saturated with hydrochloric acid gas at low temperature. For an examination of the above and other methods see E. Hintz, Zeit. anal. Chem., 1 89 1, 30, p. 227.

Nickel fluoride, NiF 2 , obtained by the action of hydrofluoric acid on nickel chloride, crystallizes in yellowish green prisms which volatilise above 1000° C. It is difficultly soluble in water, and com- bines with the alkaline fluorides to form double salts. Nickel chloride, NiCla, is obtained in the anhydrous condition by heating the hydrated salt to 140° C, or by gently heating the finely divided metal in a current of chlorine. It readily sublimes when heated in a current of chlorine, forming golden yellow scales. It is easily reduced when heated in hydrogen. It forms crystalline compounds with ammonia and the organic bases. It is soluble in alcohol and in water. Three hydrated forms are known, viz. a mono-, di-, and hexa-hydrate ; the latter being the form usually obtained by the solution of the oxide or carbonate in hydrochloric acid. Nickel chloride ammonia, NiCl2-6NH 3 , is obtained as a white powder when anhydrous nickel chloride is exposed to the action of ammonia gas (H. Rose, Pogg. Ann., 1830, 96, p. 155), or in the form of blue octahedra by evaporat- ing a solution of nickel chloride in aqueous ammonia. When heated to ioo” C. it loses four molecules of ammonia. Two hydrated forms have been described, one containing three molecules of water and the other half a molecule. Numerous double chlorides of nickel and other metals are known. The bromide and iodide of nickel resemble the chloride and are prepared in a similar fashion.

Several sulphides of the element have been obtained. A sub- sulphide, Ni 2 S(?), results when the sulphate is heated with sulphur or when the precipitated monosulphide is heated in a current of hydrogen. It forms a light yellow amorphous mass which is almost insoluble in acids. The monosulphide, NiS, is obtained by heating nickel with sulphur, by heating the monoxide with sulphuretted hydrogen to a red heat, and by heating potassium sulphide with nickel chloride to

160-180 C. When prepared by dry methods it is an exceedingly stable, yellowish, somewhat crystalline mass. When prepared by the precipitation of nickel salts with alkaline sulphide in neutral solution it is a greyish black amorphous compound which readily oxidizes in moist air, forming a basic nickel sulphate. The freshly precipitated sulphide is soluble in sulphurous acid and some- what soluble in hydrochloric acid and yellow ammonium sulphide (see H. Baubigny, Comptes rendus, 1882, 94, pp. 961, 1183; 95, p. 34). Nickel sulphate, $NiS0_4$, is obtained anhydrous as a yellow powder when any of its hydrates are heated. When heated with carbon it is reduced to the metal. It forms hydrates containing one, two, five, six and seven molecules of water. The heptahydrate is obtained by dissolving the metal or its oxide, hydroxide or carbonate in dilute sulphuric acid (preferably in the presence of a small quantity of nitric acid), and allowing the solution to crystallize between 15 and 20° C. It crystallizes in emerald-green rhombic prisms and is moderately soluble in water. It effloresces gradually on exposure to air and passes into the hexahydrate. It loses four molecules of water of crystallization when heated to ioo° C. and becomes anhydrous at about 300° C. The hexahydrate is dimorphous, a tetragonal form being obtained by crystallization of a solution of the heptahydrate between 20 and 30 C, and a monoclinic form between 50 and 70 C. Nickel sulphate combines with many metallic sulphates to form double salts, and also forms addition compounds with ammonia aniline and hydroxylamine. The nitrate, $Ni(N0_3)_2.6H_20$, is obtained by dissolving the metal in dilute nitric acid and concentrating the solution between 40° and 50 C. It crystallizes in green prisms which deliquesce rapidly on exposure to moist air.

Nickel carbonyl, $Ni(CO)_4$, is obtained as a colourless mobile liquid by passing carbon monoxide over reduced nickel at a temperature of about 6o° C. (L. Mond, Langer and Quincke, Jour. Chem. Soc, 1890, 57. P- 749)- It boils at 43* C. (751 mm.), and sets at 25° C. to a mass of crystalline needles. It is readily soluble in hydrocarbon solvents, in chloroform and in alcohol. Its critical pressure is 30 atmospheres and its critical temperature is in the neighbourhood of 195 C. (J. Dewar, Proc. Roy. Soc, 1903, 71, p. 427). It decom poses with explosive violence when heated rapidly. Dewar and Jones (Journ. Chem. Soc, 1904, p. 203) have made an exhaustive study of its reactions, and find that it is decomposed by the halogens (dissolved in carbon tetrachloride) with liberation of carbon mon- oxide and formation of a nickel halide. Cyanogen iodide and iodine mono- and tri-chloride effect similar decompositions with simultaneous liberation of iodine; sulphuric acid reacts slowly, forming nickel sulphate and liberating

hydrogen and carbon mon- oxide. Hydrochloric and hydrobromic acids are without action; hydriodic acid only reacts slowly. With aromatic hydrocarbons in the presence of anhydrous aluminium chloride, in the cold, there is a large evolution of hydrochloric acid gas, and an aldehyde is formed ; at 100 C, on the other hand, anthracene derivatives are produced. Thus by using benzene, benzaldehyde and anthracene are obtained. Dewar and Jones suggest that in the latter reaction it is the

metallic nickel which is probably the reducing agent effecting the change, since it is only dissolved in any quantity when the anthracene hydrocarbon is produced. When mesitylene is used, the reaction does not proceed beyond the aldehyde stage since hydrocarbon formation is prevented by the presence of a methyl group in the ortho-position to the CHO group. Acids and alkalis are in general without action on nickel carbonyl. The vapour of nickel carbonyl burns with a luminous flame, a cold surface depressed in the flame being covered with a black deposit of nickel. It is an extremely powerful poison. Mond and his assistants have discovered several other carbonyls. For example cobalt gives Co(CO)4, as orange crystals which melt at 51 °, decomposing at a higher temperature, giving Co(CO) 3 and CO at 6o°; Co(CO) 3 forms jet black crystals. For iron carbonyls see Iron; also L. Mond, H. Hirtz and M. D. Cowap, Jour. Chem. Soc, 1910, 97, p. 798. Nickel carbonate, NiC0 3 , is obtained in the anhydrous state by heating nickel chloride with calcium carbonate in a sealed tube to 150° C. (H. de Senarmont, Ann. Chim. Phys., 1850 [3], 30, 138). It crystallizes in microscopic rhombo hedra insoluble in cold acids. By precipitation of nickel salts with solutions of the alkaline carbonates, basic carbonates of variable composition are obtained.

Numerous determinations of the atomic weight of nickel have been published, the values obtained varying from 58-0 to approximately 59-5. The more recent work of T. W. Richards and Cushman (Chem. News, 1899, 79, 163, 174, 185) gives for the atomic weight of the metal the values 58-69 and 58-70.

NICKNAME, a name given to a person in addition to his personal names, Christian and surname, either as a playful or familiar form of address or as a mark of ridicule, contempt or hatred. The Middle English, form of the word, nekename, shows that it is a corruption of ” an ekename ” {i.e. ” added ” name; eke, earlier eche, from the root seen in Lat. augere, Gr. avˆkvuv) , and is therefore equivalent to the Lat. agnomen.

There is an interesting list of national nicknames in Notes and Queries,

9th series, 4, 212-214.

NICOBAR ISLANDS, a British group of twelve inhabited and seven uninhabited islands in the Bay of Bengal, between Sumatra and the Andaman Islands, to which latter they are administra- tively appended. They have an aggregate area of about 635 sq. m., Great Nicobar (Loong), the largest and southernmost of any size, covering 333 sq. m. Six others range in area from about 20 sq. m. to 62 sq. m.; the rest are mere islets. A careful census of the natives, taken by Mr E. H. Man in 1901, gave a total population of some 6700, at about which figure the estimates of the number of inhabitants have always stood. Car Nicobar (Pu), the most northerly island, with an area of 49 sq. m., was by far the most densely populated, and had 3500 inhabitants, Great Nicobar containing only 450. The marine surveys of these islands are still meagre and unsatisfactory, but the whole of the Nicobars and outlying islands were surveyed topographi- cally by the Indian Survey Department in 1886-1887, when a number of maps on the scale of 2 in. to the mile were produced, giving an accurate coast-line. Some of the islands have mere flat, coral-covered surfaces; others, again, are hilly, the Great Nicobar rising .to 2105 ft. On that island there are considerable and beautiful streams, but the others generally are badly off for fresh surface water. There is one good harbour, a magnificent land-locked shelter called Nancowry Harbour, formed by the islands of Camorta and Nancowrv (both known to natives as Nankauri).

Geology. — The Nicobars form part of a great submarine chain, of which the Andamans are a continuation. Elaborate geological reports were issued by a Danish scientific expedition in 1846 and an Austrian expedition in 1858. Dr Rink of the former found no trace of true volcanic rocks, though the chain as a whole is known for its volcanic activity, but features were not wanting to indicate con- siderable upheavals in the most recent periods. He considered that the islands belonged to the Tertiary age. Von Hochstetter of the Austrian expedition classified the most important formations thus: eruptive, serpentine and gabbro; marine deposits, probably late Tertiary, consisting of sandstones, slates, clay, marls, and plastic clay; recent corals. He considered the whole group connected geologically with the great islands of the Malay Archipelago farther south. The vexed question of the presence of coal and tin in the Nicobars has so far received no decided scientific support. The white clay marls of Camorta and Nancowry have become famous as being true polycistinan marls like those of Barbados. Earthquakes of great violence were recorded in 1847 and 1881 (with tidal wave), and mild shocks were experienced in December 1899.

Meteorology. — It has always been held to be important to main- tain a meteorological station on the Nicobars, for the purpose of

supplementing the information obtained from the Andamans regard- ing cyclones in the Bay of Bengal. From 1869 to 1888 an observatory was properly maintained in Nancowry harbour, but after the latter year observations were recorded only in a more or less desultory way until 1897, when the station was removed to Mus in Car Nicobar. The climate is unhealthy for Europeans. The islands are exposed tc both monsoons, and smooth weather is only experienced from February to April, and in October. Rain falls throughout the year, generally in sharp, heavy showers. During the five years ending 1888 the annual rainfall varied from 91 in. to 133 in., and the number of wet days per annum from 148 to 222. The highest temperature in the shade was 98-2° F., and the lowest 64° F.

Flora and Fauna. — Although the vegetation of the Nicobars has received much desultory attention from scientific observers, it has not been subjected to a systematic examination by the Indian Forest Department like that of the Andamans, and indeed the forests are quite inferior in economic value to those of the more northerly group; besides fruit trees — such as the coco-nut {Cocos nucijera), the betel-nut (Areca catechu), and the mellori (Pandanus leerani) — a thatching palm (Nipa fruticans) and various timber trees have some commercial value, but only one timber tree (Myristica irya) would be considered first-class in the Andamans. The palms of the Nicobars are, however, exceedingly graceful. Instances of the introduction of foreign economic plants are frequently mentioned in the old missionary records, and nowadays a number of familiar Asiatic fruit-trees are carefully and successfully cultivated. As with the geology and the flora, certain phases of the fauna of the islands have been extensively reported. The mammals are not numerous. In the southernmost islands are a small monkey, rats and mice, tree- shrews (Cladobaies nic), bats, and flying-foxes, but it is doubtful if the ” wild ” pig is indigenous; cattle, when introduced and left, have speedily become ” wild.” There are many kinds of birds, notably the megapod (Megapodius nic), the edible-nest-building swift (Collocalia nidifica), the hackled and pied pigeons (Calaenas nic. and Carpophaga bicolor), a paroquet (Palaeornis caniceps) and an oriole (Oriolus macrourus). Fowls, snipe and teal thrive after importation or migration. Reptiles — snakes, lizards and chame- leons, crocodiles, turtles and an enormous variant

of the edible Indian crab — are numerous; butterflies and insects, the latter very troublesome, have not yet been systematically collected. The fresh- water fish are reDorted to be of the types found in Sumatra.

Natives. — The Nicobarese may be best described as a Far Eastern race, having generally the characteristics of the less civilized tribes of the Malay Peninsula and the south-eastern portion of the Asiatic continent, and speaking varieties of the Mon-Annam group of languages, though the several dialects that prevail are mutually unintelligible. Their figure is not graceful, and, owing to their habit of dilating the lips by betel- chewing, the adults of both sexes are often repulsive in appear- ance. Though short according to the standard of whites (average height, man, 5 ft. 3! in.; woman, 5 ft.), the Nicobarese are a fine, well-developed race, and live to seventy or eighty years of age. Their mental capacity is considerable, though there is a great difference between the sluggish inhabitant of Great Nicobar and the keen trader of Car Nicobar. The religion is an undisguised animism, and all their frequent and elaborate ceremonies and festivals are aimed at exorcising and scaring spirits. Though for a long time they were callous wreckers and pirates, and cruel, and though they show great want of feeling in the ” devil murders ” — ceremonial murders of one of themselves for grave offences against the community, which are now being gradually put down — still on the whole the Nicobarese are a quiet, inoffen- sive people, friendly to each other, and not quarrelsome, and by inclination friendly and not dangerous to foreigners. The old charge of cannibalism may be generally said to be quite untrue. Tribes can hardly be distinguished, but there are dis- tinctions, chiefly territorial. All the differences observed in the several kinds of Nicobarese may with some confidence be referred to habitat and the physical difficulties of communication. Such government as there is, is by the village; but the village chiefs have not usually much power, though such authority as they have has always been maintained by the foreign Powers who have possessed the islands. The clothing, when not a caricature of European dress, is of the scantiest, and the waggling tags in which the loin-cloths are tied behind early gave rise to fanciful stories that the inhabitants were naked and tailed. The houses are good, and often of considerable size. The natives are skilful with their lands, and though they never cultivate cereals, exercise some care and knowledge over the coco-nut and tobacco, and have had much success with the foreign fruits and vegetables

introduced by the missionaries. The staple article of trade has always been the ubiquitous coco-nut, of which it is computed that 15 million are produced annually, 10 million being taken by the people, and 5 million exported about equally from Car Nicobar and the rest of the

islands. The usual cheap European goods are imported, the foreign trade being carried on with the native traders of the neighbouring Asiatic countries. There is an old-established internal trade, chiefly between the older islands and Chowra, for pots (which are only made there) and racing and other canoes.

History. — The situation of the Nicobars along the line of a very ancient trade route has caused them to be reported by traders and seafarers through all historical times. In the 17th century the islands began to attract the attention of missionaries. At various times France, Denmark, Austria and Great Britain all had more or less shadowy rights to the islands, the Danes being the most persistent in their efforts to occupy the group, until in 1869 they relinquished their claims in favour of the British, who at once began to put down the piracies of the islanders, and established a penal settlement, numbering in all about 350 persons, in Nancowry harbour. The health of the convicts was always bad, though it improved with length of residence and the adoption of better sanitary measures; and an attempt to found a Chinese colony having failed in 1884 through mis-management, the settlement was withdrawn in 1888. There are native agencies at Nancowry harbour and on Car Nicobar, both of which places are gazetted ports. At the latter is a Church of England mission station under a native Indian catechist attached to the diocese of Rangoon.

Authorities. — E. H. Man, Dictionary of the Central Nicobarese Language (London, 1889); F. Maurer, Die Nikobaren (Berlin, 1867); Dr Svoboda, Die Bewohner des Nikobaren-Archipels (Leiden, 1893); F. A. De Roepstorff, Dictionary of the Nancowry Dialect (Calcutta, 1884); Vocabulary of Dialects in the Nicobar and Andaman Islands (2nd ed., Calcutta, 1875) ; Prevost and Heing, Report on Preliminary Tour through the Nicobar Islands (Government, Rangoon, 1897); J. B. Kloss, In the Andamans and Nicobars (London, 1902) ; A. Alcock, A Naturalist in the Indian Seas (London, 1902). (R. C. T.)

NICOL, JAMES (1810-1879), Scottish geologist, was born at Traquair, near Innerleithen, in Peeblesshire, on the 12th of August 1810. His father, the Rev. James Nicol (1769-1819), was minister of Traquair, and acquired some celebrity as a poet. Educated at Edinburgh University (1825), James Nicol attended the lectures of Jameson, and thereby gained a keen interest in geology and mineralogy; and he pursued their study in the universities of Bonn and Berlin. After returning home he worked zealously at the local geology and obtained prizes from the Highland Society for essays on the geology of Peebles-shire and Roxburghshire; he subsequently extended his re- searches

over various parts of Scotland, and in 1844 published his able Guide to the Geology of Scotland. In 1847 he was ap- pointed assistant secretary to the Geological Society of London, in 1849 professor of geology in Queen's College, Cork, and in 1853 professor of natural history in the University of Aberdeen, a post which he retained until a few months before he died, on the 8th of April 1879. During these years he carried out im- portant researches on the southern uplands of Scotland and on the structure of the Highlands. In the former region he gave the first clear account of the succession of the fossiliferous Lower Palaeozoic rocks (1848-1852) ; and when he came to deal with the still older Highland rocks he made out the position of the Torridon sandstone and Durness limestone and their re- lations to the schists and gneisses. His matured views, although contested by Murchison, have subsequently been substantiated by Professor C. Lapworth and others.

The more important of his papers were: " On the Structure of the North-Western Highlands " {Quart. Journ. Geol. Soc, 1861), and "On the Geological Structure of the Southern Grampians " (ib., 1863). He contributed the article " Mineralogy " to the ninth edition of the Encyclopedia Britannica. Among his other works were Manual of Mineralogy (1849); Elements of Mineralogy (1858, 2nd ed., 1873); Geological Map of Scotland (1858); and Geology and Scenery of the North of Scotland (1866).

NICOL, WILLIAM (? 1768-1851), Scottish physicist, was born about 1768, and died at Edinburgh on the 2nd of September

185 1. Nothing is known of his early history beyond the fact that, after amassing a small competence as a popular lecturer on natural philosophy, he settled in Edinburgh to live a very retired life in the society of his apparatus alone. Besides the invention of the prism known by his name (" A method of increasing the divergence of the two rays in calcareous spar, so as to produce a single image," New Edin. Journ., 1828), he devoted himself chiefly to the examination of fluid-filled cavities in crystals, and of the microscopic structure of various kinds of fossil wood. His skill as a working lapidary was very great; and he prepared a number of lenses of garnet and other precious stones, which he preferred to the achromatic microscopes of the time.

NICOLAI, CHRISTOPH FRIEDRICH (1 733-181 1), German author and bookseller, was born on the 18th of March 1733 at Berlin, where his father, Christoph Gottlieb Nicolai (d. 1752), was the founder of the famous Nicolaische Buchhandlung. He received a good education, and in 1 749 went to Frankf ort-on- Oder to learn his father's business, finding time also to become acquainted with English literature. In 1 7 5 2 he returned to Berlin, and began to take part in literary controversy by defending Milton against the attacks of J. C. Gottsched. His Briefe iiber den jelzigen Zusland der schonen Wissenschaften in Deutschland, pub- lished anonymously in 1755 and reprinted by G. Ellinger in 1894, were directed against both Gottsched and Gottsched's Swiss opponents, Johann Jakob Bodmer and Johann Jakob Breitinger; his enthusiasm for English literature won for him the friendship of Lessing and Moses Mendelssohn. In association with Mendels- sohn he established in 1757 the Bibliothek der schonen Wissen- schaften, a periodical which he conducted until 1760. With Lessing and Mendelssohn Nicolai founded in 1759 the famous Briefe, die neueste Literatur betrejfend; and from 1765 to 1792 he edited the Allgemeine deutsche Bibliothek. ■ This latter period- ical served as the organ of the so-called " popular philosophers," who warred against authority in religion and against what they conceived to be extravagance in literature. The new move- ment of ideas represented by Herder, Gotthe, Schiller, Kant and Fichte, Nicolai was incapable of understanding, and he made himself ridiculous by foolish misrepresentation of the aims of these writers. Of Nicolai's independent works, perhaps the only one which has some historical value is his Anekdoten von Friedrich II. (1 788-1792). His romances are forgotten, although Das Leben und die Meinungen des Herrn Magister Sebaldus Nothanker (1 773-1 776), and his satire on Goethe's Werther, Freuden des jungen Werther s (1775), had a certain reputation in their day. Between 1788 and 1796 Nicolai published in 12 vols, a Beschreibung einer Reise durch Deutschland und die Schweiz, which bears witness to the narrow conservatism of his views in later life. He died in Berlin on the nth of January 181 1.

Nicolai's Bildniss und Selbstbiographie was published by M. S. Lowe in the Bildnisse jetzt lebender Berliner Gelehrter, in 1806. See also L. F. G. von Gockingk, F. Nicolai's Leben und literarischer NacUass (1820); J. Minor, Lessings Jugendfreunde,in J. Kiirschner's Deutsche Nationalliteratur, vol. lxxii. (1883) ; O. Hoffmann, Herders Briefwechsel mit Nicolai (1887); E. Friedel, Zur Geschichte der Nicolaischen Buchhandlung (1891); and E. Altenkriiger, F. Nicolais Jugendschriften (1894).

NICOLAI, OTTO (1810-1849), German composer, was born on the 9th

of June in Konigsberg. He studied music in Berlin and in 1833 became organist to the German embassy in Rome. There his operas Enrico II (1839) and II Templario (1840) were produced, besides some church music, a series of songs, and a number of compositions for the pianoforte. He was subse- quently appointed Hof Kapellmeister at the Berlin Opera House; and there, only two days before he died (on the nth of March 1849), was performed his brilliant opera, The Merry Wives of Windsor, the work by which he is now remembered.

NICOLAS, SIR NICHOLAS HARRIS (1799-1848), English antiquary, fourth son of John Harris Nicolas (d. 1844), was born at Dartmouth on the. 10th of March 1799. Having served in the navy from 1812 to 1816, he studied law and was called to the bar at the Inner Temple in 1825. His work as a barrister, however, was confined principally to peerage cases before the House of

Lords, and his time was mainly devoted to genealogical and historical studies. In 1831 he was made a knight of the order of the Guelphs, and in 1832 chancellor and knight-commander of the order of St Michael and St George, being advanced to the grade of the grand cross in 1840. He became a member of the council of the Society of Antiquaries in 1826, but soon began to criticize the management of the society's affairs, and withdrew in 1828. He then criticized the Record Commission, which he regarded as too expensive. These attacks, which brought him into controversy with Sir Francis Palgrave, led in 1836 to the appointment of a select committee to inquire into the public records. He was also responsible for several reforms at the British Museum. In 1822 Nicolas married Sarah (d. 1867), daughter of John Davison of Loughton, Essex, a reputed de- scendant of the Tudor statesman William Davison. By her he left two sons and six daughters. Pecuniary difficulties compelled him to leave England, and he died near Boulogne on the 3rd of August 1848. Although a sharp and eager controversialist Nicolas was a genial and generous man, with a great knowledge of genealogical questions.

The most important of the works of Nicolas is his History of the Orders of Knighthood of the British Empire; of the Order of the Guelphs; and of Medals, Clasps, &c, for Naval and Military Services (London, 1841-1842). Among his numerous other writings are, The Chronology of History (London, 1833) ; Life of William Davison (London, 1823) ; Synopsis of the Peerage of England (London, 1825) ; Life and Times of Sir Christopher Hatton (London, 1847); and an uncompleted History of the Royal Navy (London, 1847). He edited Proceedings and Ordinances of the Privy Council of England, 1386-1542 (London, 1834-1837), and Despatches and Letters ,of Lord

Nelson (London, 1844-1846) ; wrote lives of Chaucer, Burns, Cowper. Thomson, Collins, Kirke White and others for Pickering's Aldine edition of the poets; lives of Izaak Walton and Charles Cotton for an edition of the Compleal Angler; and several elaborate works on genealogical and kindred subjects printed for private circulation only.

NICOLAUS DAMASCENUS, Greek historian and philosopher of Damascus, flourished in the time of Augustus and Herod the Great, with both of whom he was on terms of friendship. He instructed Herod in rhetoric and philosophy, and had attracted the notice of Augustus when he accompanied his patron on a visit to Rome. Later, when Herod's conduct aroused the sus- picions of Augustus, Nicolaus was sent on a mission to bring about a reconciliation. He survived Herod, and it was through his influence that the succession was secured for Archelaus; but the date of his death, like that of his birth, is unknown. Fragments of his universal history ('Ioropia KadoXiK-q), from the time of the Assyrian empire to his own days, his autobiography, and his life of Augustus (Bios ~Ka.iaa.pos) have been preserved, chiefly in the extracts of Constantine Porphyrogenitus. Nicolaus also wrote comedies and tragedies, paraphrased and wrote com- mentaries on parts of Aristotle, and was himself the author of philosophical treatises.

Fragments in C. Miiller, Fragmenta historicorum Graecorum, iii. ; see also F. Navet, Nikolaus von Damascus (1853), containing an account of his life and writings, and translation of the fragments.

NICOLAUS OF LYRA (c. 1265-1349), French commentator, was born in Lire, now Vieille-Lyre, in the department of Eure, Normandy. He entered the Franciscan order at Verneuil about 1300, and studied at Paris, where, becoming a doctor some time before 1309, he taught for many years. From 1319 he was provincial of his order in France, and was present in that capacity at the general chapter at Perouse (1321). In 1325 he was provincial of Burgundy, and as executor of the estate of Jeanne of Burgundy, widow of King Philip VI., he founded the college of Burgundy at Paris, where he died in the autumn of 1349, being buried in the chapter hall of the convent of the Cordeliers. Among the authentic works of Nicolaus of Lyra are: (1) two commentaries on the whole Bible, one {Postilla litter alis, 1322- 1331) following the literal sense, the other {Postilla mystica sen moralis, 1339) following the mystic sense. There are numerous editions (Rome, 1471-1472; Douai, 1617; Antwerp, 1634). (2) Tractatus de differentia nostrae translationis {i.e. Vulgate) ab Hebraica veritate, 1333. (3) Two treatises against the Jews. (4) A theological treatise on the Beatific Vision, directed against pope John XXII. (1334), unpublished. (5)

Contemplatio de vita S. Francisci, a book of devotions. Nicolaus was above all a commentator. His exegesis, which was dominated by his polemics against the Jews, is characterized by a fidelity to the literal sense, the comparison with the Hebrew text, the direct use of Jewish commentators, a very independent attitude towarctt traditional interpretations, and a remarkable historical and critical sense. In all this he resembled Roger Bacon. His works, especially the Postilla lateralis, were very popular in the 14th and 15th centuries, but produced few imitators.

In addition to the notices in Wadding, du Moustier, Sbaraglia and Fabricius, see C. Siegfried, in Archiv. f. wissenschaftliche Erfor schung des A.T., vols, i., ii.; A. Merx, Die Prophetie des Joel und ihre Ausleger (1879, pp. 305-366); M. Fischer in Jahrbucher f. protestantische Theologie, xv. ; F. Maschkowski, in Zeitschrift f. alttestamentliche Wissenschaft, xv. ; Neumann in Revue des etudes juives, vols. 26 and 27; H. Labrosse in Positions des theses de l'£cole des Chartes (1906).

NICOLAY, the name of a French family of Vivarais which came rapidly into legal prominence at the end of the 15th century. Jean Nicolay (d. 1527), son of a bailli of Bourg Saint-Andeol, became councillor at the parlement of Toulouse and afterwards at the Grand Council, chancellor of the kingdom of Naples, Maitre des Requetes, and, finally, first president of the Chambre des ComptesofParis(i5o6). This last post was filled continuously up to the Revolution by his descendants. Antoine Chretien de Nicolay (1712-1777) became marshal of France in 1775. His brother, Aymar Chretien Francois Michel (1721-1769), bishop of Verdun, was first almoner of Marie Josephe of Saxony, wife of the dauphin Louis (d. 1765), and her influential counsellor.

See A. de Boislisle, Pieces justificativeˆ pour servir a Vhistoire des premiers presidents de la Chambre des Comptes (1873), an d Histoire de la maison de Nicolay (1875).

NICOLE, PIERRE (1625-1695), one of the most distinguished of the French Jansenists, was the son of a provincial barrister, and was born at Chartres. Sent to Paris in 1642 to study theology, he soon entered into relations with the Jansenist community at Port Royal {q.v.) through his aunt, Marie des Anges Suireau, who was for a short time abbess of the convent. Some scruple of conscience forbade him to

proceed to the priest- hood, and he remained throughout life a ” clerk in minor orders,” although a profound theological scholar. For some years he was a master in the ” little school ” for boys established at Port Royal, and had the honour of teaching Greek to young Jean Racine, the future poet. But his chief duty was to act, in collaboration with Antoine Arnauld, as general editor of the controversial literature put forth by the Jansenists. He had a large share in collecting the materials for Pascal’s Provincial Letters (1656); in 1658 he translated the Letters into Latin, under the pseudonym of Nicholas Wendrock. In 1664 he himself began a series of letters, Les Imaginaires, intended to show that the heretical opinions commonly ascribed to the Jansenists really existed only in the imagination of the Jesuits. His letters being violently attacked by Desmaretz de Saint-Sorlin, an erratic minor poet who professed great devotion to the Jesuits, Nicole replied to him in another series of letters, Les Visionnaires (1666). In the course of these he observed that poets and dramatists were no better than ” public poisoners.” This remark stung Racine to the quick; he turned not only on his old master, but on all Port Royal, in a scathing reply, which — as Boileau told him — did more honour to his head than to his heart. About the same time Nicole became involved in a controversy about transubstantiation with the Huguenot Claude; out of this grew a massive work, La Perpetuity de la foi de I’eglise catholique touchant I’eucharistie (1669), the joint effort of Nicole and Antoine Arnauld. But Nicole’s most popular production was his Essais de morale, a series of short discussions on practical Christianity. The first volume was published in 1671, and was followed at irregular intervals by others; altogether the series numbers fourteen volumes. In 1679, on the renewal of the persecution of the Jansenists, Nicole was forced to fly to Belgium in company with Arnauld. But the two soon parted. Nicole was elderly and in poor health; the life of a fugitive was not to his taste, and he complained that he wanted rest. ” Rest,” answered Arnauld, ” when you have

eternity to rest in!” In 1683 Nicole made a rather ambiguous peace with the authorities, and was allowed to come back to Paris. There he continued his literary labours up to the last; he was writing a refutation of the new heresy of the Quietists, when death overtook him on the 16th of November 1695.

Nicole was one of the most attractive figures of Port Royal. Many stories are told of his quaint absent-mindedness and unreadi- ness in conversation. His books are distinguished by exactly opposite qualities; they are neat and orderly to excess. Hence they were exceedingly popular with Mme de Sevign6 and readers of her class. No other Jansenist writer, not even Pascal, was so successful in

putting the position of Port Royal before the world. And although a modern appetite quails before fourteen volumes on morality, there is much solid sense and practical knowledge of human nature to be found in the Essais de morale. Several abridgments of the work exist, notably a Choix des essais de morale de Nicole, ed. Silvestre de Saci (Paris, 1857).

Nicole's life is told at length in the 4th volume of Sainte Beuve's Port-Royal. (St. C.)

NICOLL, ROBERT (1814-1837), Scottish poet, was born on the 7th of January, 1814, at the farm of Little Tullybeltane, in the parish of Auchtergaven, Perthshire. When Robert was five years old his father was reduced to poverty. He became a day-labourer, and was only able to give his son a very slight education. At sixteen the boy was apprenticed to a grocer and wine-merchant at Perth. In 1833 he began to contribute to Johnstone's Magazine (afterwards Tait's Magazine), and in the next year his apprenticeship was cancelled. He visited Edinburgh, and was kindly received there, but obtained no employment. He opened a circulating library at Dundee, but in 1836 he became editor of the Leeds Times. He held pronounced Radical opinions, and overtaxed his slender physical resources in electioneering work for Sir William Molesworth in the summer of 1837. He was obliged to resign his editorship, and died at the house of his friend William Tait, at Trinity, near Edinburgh, on the 7 th of December 1837, in his twenty-fourth year. He had published a volume of Poems in 1835; and in 1844 appeared a further volume, Poems and Lyrics, with an anonymous memoir of the author by Mrs C. I. Johnstone. The best of his lyrics are those written in the Scottish dialect. They are simple in feeling and expression, genuine folk-songs.

An eloquent appreciation of his character and his poetry was included in Charles Kingsley's article on " Burns and his School " in the North British Review for November 1851. See also P. R. Drummond, Life of Robert Nicoll, Poet (1884).

NICOLL, SIR WILLIAM ROBERTSON (1851-), Scottish Nonconformist divine and man of letters, was born at Auchindoir, Aberdeenshire, on the 10th of October 1851, the son of a Free Church minister. He graduated M.A. at Aberdeen in 1870, and studied for the ministry at the Free Church College there until 1874, when he was ordained minister of the Free Church at Dufftown. Three years later he moved to Kelso, and in 1884 became editor of the Expositor. In 1886 he founded the British Weekly, a Nonconformist organ which obtained great influence over opinion in the free churches. Robertson Nicoll

secured many writers of exceptional talent for his paper, to which he was himself a considerable contributor, the papers signed ” Claudius Clear ” being among those from his hand. He also founded and edited the Bookman (1891, &c), and acted as chief literary adviser to the publishing firm of Hodder & Stoughton. Among his other enterprises were The Expositor’s Bible and The Theological Educator. He edited The Expositor’s Greek Testament (1897, &c), and a series of Contemporary Writers (1894, &c), and of Literary Lives (1904, &c). He wrote a history of The Victorian Era in English Literature, and edited, with T. J. Wise, Literary Anecdotes of the Nineteenth Century. The knighthood bestowed on him among the birthday honours in 1909 was an apt recognition of his long and able devotion to the ” journeyman work ” of literature.

A list of his publications is included in a monograph on Dr Nicoll by Jane T. Stoddart (” New Century Leaders,” 1903).

NICOLLS, RICHARD (1624-1672), American colonial governor, was born probably at Ampthill, Bedfordshire, England, in 1624. He commanded a royalist troop of horse during the Civil War, and on the defeat of the king went into exile. Soon after the Restoration he became groom of the bedchamber to the duke of

York, through whose influence he was appointed in 1664 on a commission with Sir Robert Carr (d. 1667), George Cartwright and Samuel Maverick, to conquer New Netherland from the Dutch and to regulate the affairs of the New England colonies and settle disputes among them. The expedition set sail from Portsmouth on the 25th of May 1664, and New Amsterdam was surrendered to Nicolls on the 8th of September. Under authority of a commission from the duke of York, Nicolls assumed the position of deputy-governor of New Netherland (New York) . His policy was vigorous but tactful, and the transition to the new regime was made smoothly and with due regard to the interests of the conquered people. They were guaranteed in the possession of their property rights, their laws of inheritance, and the enjoy- ment of religious freedom. The English system of law and administration was at once introduced into Long Island, Staten Island and Westchester, where the English element already predominated, but the change was made much more slowly in the Dutch sections. A code of laws, known as the ” Duke’s Laws,” drafted by the governor with the help of his secretary, Matthias Nicolls 1 (c. 1630-1687), and

dated the 12th of March, was proclaimed at Hempstead, Long Island, on the 1st of March 1665 and continued in force until 1683; the code was compiled from the codes of the New England colonies, and it provided for trial by jury, for proportional taxation on property, for the issuance of new patents for land and for land tenure only by licence from the duke. Nicolls returned to England in the summer of 1668 and continued in the service of the duke of York. He was killed in the naval battle of Southwold Bay on the 28th of May 1672.

See J. R. Brodhead, History of the State of New York (2 vols., rev. c(., 1872). For the " Duke's Laws " see Laws of Colonial New York, i. 6-100.

NICOLSON, WILLIAM (1655-1727), English divine and antiquary, was educated at Queen's College, Oxford (M.A., 1679; fellow, 1679-1682). After visiting Leipzig to learn German he was made prebendary of Carlisle in 1681, archdeacon in 1682. Twenty years later he was appointed bishop of the same diocese, where he remained until his translation to Derry in 1718. In 1727 he was nominated archbishop of Cashel and Emly, but died before he could assume charge. Nicolson is remembered by the impulsiveness of his temperament, which led him into a good deal of strife as a bishop, and more happily by his zeal in collecting and guarding manuscripts and other official documents. For this purpose he had special rooms built at Derry. His chief works were the Historical Library (English, 1696-97-99; Scottish, 1702; Irish, 1724; complete later editions, 1732 and 1776), and Leges Marchiarum or Border Laws (1705, new ed., 1747).

NICOMACHUS, a Neo-pythagorean philosopher and mathe- matician, born at Gerasa in Arabia Petraea, flourished about a.d. 100. In his musical treatise he mentions Thrasyllus (d. 36), the astrologer and confidant of Tiberius, and his Arithmetic was translated by Apuleius, who wrote under Antoninus Pius and Marcus Aurelius. He is the author of two extant treatises: (1) 'kpidjxriTiKT] dcraywyij {Introduction to Arithmetic), a meta- physical account of the theory and properties of numbers, and the first work in which arithmetic was treated quite independently of geometry. It was extremely popular, was the subject of commentaries by Iamblichus (ed. H. Pistelli, 1894) and others, was translated into Latin by Apuleius (according to Cassiodorus, the translation itself being lost) and Boetius, and used as a schoolbook down to the Renaissance. (2) '~EtyxuplJlnov aPMOWKJJs (Manual of Harmony), complete in one book, to which are erroneously appended as a second book some fragments probably belonging to a larger treatise On Music now lost. It is the oldest authority on the Pythagorean theory of music. Photius (cod. 187) also

mentions a work by Nicomachus called ‘A.ptBin\Tuca

1 Matthias may have been a cousin of Richard Nicolls; his family were of Islip, Oxford; he was secretary of the province, held various judicial positions, and was mayor of New York City in 1672. Matthias’s son William (1657-1723), a lawyer, was a member of the New York Assembly from 1702 until his death and was speaker in 1702-1718; he received a royal patent for what is now the town of Islip on Long Island. Descendants of Richard and of Matthias Nicolls spell the name ” Nicoll.”

dtoKoyovntva (The Theology of Arithmetic), written in a spirit of Pythagorean mysticism and Oriental superstition, and setting forth the application of arithmetic, or rather of the first ten numbers, to the origin and attributes of the gods. But the extracts in Photius are now generally attributed to Iamblichus. Other works of Nicomachus were: a Life of Pythagoras and a Collection of Pythagorean Doctrines, the chief source of the life of Pythagoras and the account of his philosophy by Iamblichus.

Editions. — Inlrod. to Arith., by R. Hoche (1866); Manual of Harmony, by C. de Jan in Musici scriptores Graeci (1895), with account of Nicomachus and his works, and French translation, with bibliography and notes, by C. E. Ruelle (1881); Theology of Arithmetic, by F. Ast (1817); see W. Christ, Geschichte der griechischen Literatur (1898); M. Cantor, Vorlesungen ilber Geschichte der Mathematih, i. (1894) p. 400, and J. Gow, A Short History of Greek Mathematics (1884), p. 88, both of whom give summaries of the Arithmetic.

NICOMACHUS, of Thebes, Greek painter, of the early part of the 4th century, was a contemporary of the greatest painters of Greece; Vitruvius observes that if his fame was less than theirs, it was the fault of fortune rather than of demerit. Pliny (xxxv. 108) gives a list of his works; among them a ” Rape of Persephone,” ” Victory in a Quadriga,” a group of Apollo and Artemis, and the ” Mother of the Gods seated on a Lion.” Pliny tells us that he was a very rapid worker and used but four colours (the last seems impossible) . Plutarch mentions his paintings as possessing the Homeric merit of ease and absence of effort.

NICOMEDES I., son of Zipoetes, king of Bithynia (c. 278- 248 B.C.). He made himself master of the whole country and put to death his brother, who had set himself up as an independent ruler. He enlarged and consolidated the kingdom, founded the great city of Nicomedia as the capital, and fought successfully for some time with Antiochus of

Syria. His reign seems to have been prosperous and uneventful; the year of his death is uncertain.

Livy xxxviii. 16; Justin xxv. 2; Memnon in C. Miiller, Frag, hist. Graec. iii. 535.

NICOMEDES II., Epiphanes, king of Bithynia, 149-91 B.C., fourth in descent from Nicomedes I., was the son of Prusias II. He was so popular with the people that his father sent him to Rome. Here he was so much favoured by the senate that Prusias sent an emissary to Rome with secret orders to assassinate him. But the emissary revealed the plot, and persuaded the prince to rebel against his father. Supported by Attalus II., king of Pergamum, he was completely successful, and ordered his father to be put to death at Nicomedia. During his long reign Nico- medes adhered steadily to the Roman alliance, and assisted them against Aristonicus of Pergamum. He made himself for a time master of Paphlagonia, and in order to have a claim on Cappa- docia married Laodice (the widow of Ariarathes VI.), who had fled to him when Mithradates the Great endeavoured to annex the country. When her two sons died, Nicomedes brought forward an impostor as a claimant to the throne; but the plot was detected. The Romans refused to recognize the claim, and required Nicomedes to give up all pretensions to Cappadocia and to abandon Paphlagonia.

Appian, Mithrad. 4-7; Strabo xiii. 624, 646; Diod. Sic. xxxii. 20, 21 ; Justin xxxiv. 4, xxxvii. 4, xxxviii. I, 2.

NICOMEDES III., Philopator, king of Bithynia, 91-74 B.C., was the son and successor of Nicomedes II. His brother Socrates, assisted by Mithradates, drove him out, but he was reinstated by the Romans (90). He was again expelled by Mithradates, who defeated him on the river Amneus (or Amnias) in Paphlagonia. This led to the first Mithradatic War, as the result of which Nicomedes was again restored (84). At his death he bequeathed his kingdom to the Romans, a legacy which subsequently brought about the third Mithradatic War.

Justin xxxvii. 4, xxxviii. I, 2; Appian, Mithrad. 7, 10-20, 57, 60; Memnon in C. Miiller, Frag. hist. Graec. iii. 541; Plutarch, Sulla, 22, 24; Eutropius vi. 6.

NICOMEDIA [mod. Ismid], an ancient town at the head of the Gulf of Astacus, which opens on the Propontis, was built in 264 B.C. by Nicomedes I. of Bithynia, and has ever since been “one of the chief towns in this part of Asia Minor. It was the metro- polis of Bithynia under the Roman empire (see Nicaea), and

Diocletian made it the chief city of the East. Owing to its position at the convergence of the Asiatic roads to the new capital, Nicomedia retained its importance even after the foundation of Constantinople and its own capture by the Turks

(1338).

See C. Texier, Asie mineure (Paris, 1839); V. Cuenet, Turquie d'Asie (Paris, 1894).

NICOPOLIS, or Actia Nicopolis, an ancient city of Epirus, founded 31 B.C. by Octavian (Augustus) in memory of his victory over Antony and Cleopatra at Actium. The colony, composed of settlers from a great many of the towns of the neighbouring countries (Ambracia, Anactorium, Calydon, Argos Amphilo- chicum, Leucas, &c), proved highly successful, and the city was considered the capital of southern Epirus and Acarnania, and obtained the right of sending five representatives to the Amphictyonic council. On the spot where Octavian's own tent had been pitched he erected a sanctuary to Neptune adorned with the beaks of the captured galleys; and in further cele- bration of his victory he instituted the so-called Actian games in honour of Apollo Actius. The city was restored by the emperor Julian, and again after the Gothic invasion by Justinian; but in the course of the middle ages it was supplanted by the town of Prevesa. The ruins of Nicopolis, now known as Palaeo- prevesa (Old Prevesa), lie about 3 m. north of that city, on a small bay of the Gulf of Arta (Sinus Ambracius) at the narrowest part of the isthmus of the peninsula which separates the gulf from the Ionian Sea. Besides the acropolis, the most conspicuous objects are two theatres (the larger with twenty-seven rows of seats) and an aqueduct which brought water to the town from a distance of 27 m.

Nicopolis was also the name of (1) a city in Cappadocia in the valley of the Lycus, founded by Pompey on the spot where he defeated Mithradates; (2) a city in Egypt, founded by Octavian 24 B.C. to commemorate his final victory over Antony; and (3) a city in -Thrace (Nikup) at the junction of the Iatrus with the Danube, founded by Trajan in memory of his victory over the Dacians.

NICOSIA, the capital of Cyprus, situated in the north central part of the island. Pop. (1901) 14,752 (Moslem, 6013; Christian, 8739). Its

earliest name was Ledra, but Leucos, son of Ptolemy Soter (280 B.C.), is said to have restored it and changed'its name to Leuteon, Leucotheon or Levcosia. A mile S.W. of the town lies the very large Bronze Age necropolis known as Hagia Paraskevi, which has been repeatedly explored with valuable results. The circuit of the city was reduced in 1567, under the direction of the Venetian engineer G. Savorgnano, from 9 m. to 3 m.; eighty churches and a number of fine houses were sacrificed. The new walls were given a circular shape, with eleven bastions and three gates. Water is supplied by two aqueducts. Government House, the residence of the high commissioner, the government offices, hospital, central prison and the new English church are without the walls. The fosse has been planted, and part of it used as an experimental garden. Carriage roads have been completed to Kyrenia, Kythraia, Famagusta, Larnaca, Limasol and Morphou. The principal monuments of the Lusignan period are the fine cathedral church of St Sophia, an edifice of French Gothic, at once solid and elegant (the towers were never completed); the church of St Catherine, an excellent example of the last years of the 14th century (both these are now mosques) ; and the church of St Nicolas of the English (now a grain store), built for the order of the Knights of St Thomas of Acre. A gateway of no great importance is nearly all that remains of the palace last used by the Venetian proweditori. It dates from the end of the 15th century. There is a museum, with a valuable catalogue. The chief industries are tanning and hand weaving, both silk and cotton.

NICOSIA, a city and episcopal see (since 1816) of Sicily, in the province of Catania, 21 m. by road N. of the railway station of Leonforte (which is 49 m. W. of Catania) and 42 m. W.N.W. of Catania direct, 2840 ft. above sea-level. Pop. (1901) 16,004. The town retains a thoroughly medieval appearance, with a fine Norman cathedral and some other interesting churches, among them S. Maria Maggiore, with a reredos by Antonio Gagini.

A Lombard dialect is still spoken here, and the town is less modernized in every respect than any other in Sicily. The Sicel town of Herbita is usually placed here, but without sufficient reason, and the origin of Nicosia is unknown. It was destroyed by the Saracens and repopulated by the Normans.

NICOTERA, GIOVANNI (1828-1894), Italian patriot and politician, was born at San Biagio on the 9th of September 1828. Joining the party of young Italy he was among the combatants at Naples in May 1848, and was at San Pancrazio with Garibaldi during the defence of Rome. After the fall of Rome he fled to Piedmont, where he organized

the expedition to Sapri in 1857, but shortly after his arrival there he was defeated and severely wounded by the Bourbon troops. Condemned to death, but reprieved through the intervention of the British minister, he remained a prisoner at Naples and at Favignana until i860, when he joined Garibaldi at Palermo. Sent by Garibaldi to Tuscany, he attempted to invade the Papal States with a volunteer brigade, but his followers were disarmed and disbanded by Ricasoli and Cavour. In 1862 he was with Garibaldi at Aspromonte; in 1866 he commanded a volunteer brigade against Austria; in 1867 he invaded the Papal States from the south, but the defeat of Garibaldi at Mentana put an end to his enterprise. His parliamentary career dates from i860. During the first ten years he engaged in violent opposition, but from 1870 onwards he joined in supporting the military reforms of Ricotti. Upon the advent of the Left in 1876, Nicotera became minister of the interior, and governed with remarkable firmness. He was obliged to resign in December 1877, when he joined Crispi, Cairoli, Zanardelli and Baccarini in forming the ” pentarchy ” in opposition to Depretis, but he only returned to power thirteen years later as minister of the interior in the Rudini cabinet of 1891. On this occasion he restored the system of uninominal constituencies, resisted the socialist agitation, and pressed, though in vain, for the adoption of drastic measures against the false bank-notes put in circulation by the Roman bank. He fell with the Rudini cabinet in May 1892, and died at Vico Equense, near Naples, on the 13th of June 1894.

See V. Giordano, La Vita ed i discorsi di Giovanni Nicotera (Salermo, 1878); Mauro, Biografia di Giovanni Nicotera (Rome, 1886; German trans., Leipzig, 1886); and Mario, In memoria di Giovanni Nicotera (Florence, 1894).

NICOTINE, Ci H 14 N2, an alkaloid, found with small quantities of nicotimine, C, 9 H 14 N2, nicoteine, C10H12N2, and nicotelline, CioH 8 N 2 , in tobacco. The name is taken from Nicotiana, the tobacco plant, so called after Jean Nicot (1 530-1600), French ambassador at Lisbon, who introduced tobacco into France in 1560. These four alkaloids exist in combination in tobacco chiefly as malates and citrates. The alkaloid is obtained from an aqueous extract of tobacco by distillation with slaked lime, the distillate being acidified with oxalic acid, concentrated to a syrup and decomposed by potash. The free base is extracted by ether and fractionated in a current of hydrogen. It is a colourless oil, which boils at 247 C. (745 mm.), and when pure is almost odourless. It has a sharp burning taste, and is very poisonous. It is very hygroscopic, dissolves readily in water, and rapidly undergoes oxidation on exposure to air. The free alkaloid is strongly laevo-rotatory. F. Ratz (Monats., 1905, 26, p. 1241) obtained

the value [o] u = — 169-54° at 20°; its salts are dextro-rotatory. It behaves as a di-acid as well as a di-tertiary base.

On oxidation with chromic or nitric acids, or potassium permanganate, it yields nicotinic acid or /3-pyridine carboxylic acid, C S H4N-C02H; alkaline potassium ferricyanide gives nicotyrine, C10H10N2, and hydrogen peroxide oxy nicotine, C10H14N2O. Oxidation of its isomethylhydroxide with potassium permanganate yields trigonelline, C7H7NO2 (A. Pictet and P. Genequand, Ber., 1897,30, p. 2117). It gives rise to various decomposition products such as pyridine, picoline, &c, when its vapour is passed through a red-hot tube. The hydrochloride on heating with hydrochloric acid gives methyl chloride (B. Blau, Ber., 1893, 26, p. 631). Hydriodic acid and phosphorus at high temperature give a dihydro-compound, whilst sodium and alcohol give hexa- and octo-hydro derivatives. Nicotine may be recognized by the addition of a drop of 30 % formaldehyde, the mixture being allowed to stand for one hour and the solid residue then moistened by a drop of concentrated

sulphruic acid, when an intense rose-red colour is produced (I. Schindelmeiser, Pharm. Zentralhalle , 1899, 40, p. 704).

The constitution of nicotine was established by A. Pinner (see papers in the Berichle, 1891 to 1895). With bromine in acetic acid solution at ordinary temperature, nicotine yields a perbromidc, CioHi(,Br 2 N 2 0-HBr3, which with sulphur dioxide, followed by potash, gives dibromcotinine, CioHi Br 2 N 2 0, from which cotinine, C10H12N2O, is obtained by distillation over zinc dust. By heating nicotine with bromine in hydrobromic acid solution for some hours at 100° C, dibromticonine hydrobromide, CioH 8 N2Br 2 2 HBr, results. Dibromcotinine on hydrolysis yields oxalic acid, methy lamine and /3-methyl pyridyl ketone: Ci HioBr2N 2 0+8H 2 0+0 = H 2 C 2 0,+CH 3 NH2+C 6 H<N-COCH 3 +2HBr; whilst dibromticonine yields methylamine, malonic acid and nicotinic acid : CioH 8 Br 2 NjOs-(- 4H 2 = CH 3 NH 2 +CH 2 (C0 2 H)2+C 6 H < N-C0 2 H+2HBr, or if heated with zinc and caustic potash, methylamine and pyridyl-187-dioxy- butyric acid. Thus the groupings

/X -CC—

[J , — C-C— >N-CH 3 and— C-C-C—

N ■ ,

exist in the molecule, and the alkaloid is to be represented as a-pyridyl-N-methyl-pyrollidine.

This result has been confirmed by its synthesis by A. Pictet and P. Crepieux (Comptes rendus, 1903, 137, p. 860) and Pictet and Rotschy (Ber., 1904, 37, p. 1225) : /3-aminopyridine is converted into its mucate, which by dry distillation gives N-/?-pyridylpyrrol. By passing the vapour of this compound through a red-hot tube, it yields the isomeric a/3-pyridylpyrrol, the potassium salt of which with methyl iodide gives a substance methylated both in the pyridine and pyrrol nuclei. By distillation over lime, the methyl group is removed from the pyridine ring, and the resulting a-pyridyl-N- methylpyrrol gives i-nicotine on reduction. This base is resolved into its active components by (ˆ-tartaric acid, /-nicotine-d-tartrate crystallizing out first. The natural (laevo) base is twice as toxic as the dextro. The following formulae are important : —

/N—N— CH r / \— C =CH /- CH-CH 2

U CH CH \J NH CH \J N CH 2

N V N \/- N -V* CH CH H 3 C CH 2

N-|8-Pyridylpyrrol, o/3-pyridylpyrrol, nicotine.

Acetyl and benzoyl derivatives cf nicotine on hydrolysis do not yield nicotine, but an isomeric, inactive oily liquid (metanicotine). It is a secondary base, and boils at 275°-278° C.

Nicolimine is a colourless liquid which boils at 250°-255° C. Its aqueous solution is alkaline. Nicoteine is a liquid which boils at 267° C. It is separated from the other alkaloids of the group by distilling off the nicotine and nicotimine in steam and then fraction- ating the residue. It is soluble in water and is very poisonous. Nicotelline crystallizes in needles which melt at 147 ° C. and is readily soluble in hot water.

NICTHEROY, or Niteroy, a city of Brazil and capital of the state of Rio de Janeiro, on the E. shore of the Bay of Rio de Janeiro, opposite the city of that ume. Pop. (1890) 34,269, (1900 estimate) 35,000. A railway connects the city with the interior — the old Cantagallo line, now a part of the Leo- poldina system, a branch of which runs north-eastward to Macahe, on the coast, and another northward from Nova Friburgo to a junction with the railway lines of Minas Geraes.

Nictheroy is practically a residential suburb of Rio de Janeiro. It occupies, in great part, the low alluvial plain that skirts the shores of the bay and fills the valleys between numerous low wooded hills. The site is shut off from the sea coast by a range of high rugged mountains. The shore line of the bay is broken by large, deeply indented bays (that of Jurujuba being nearly surrounded by wooded hills), shallow curves and sharp pro- montories. Within these bays are beaches of white sand, called praias, such as the Praia da Icarahy, Praia das Flechas and Praia Grande, upon which face low tile-covered residences surrounded with gardens. The city consists of a number of these partially separated districts — Praia Grande, Sao Domingos, Icarahy, Jurujuba, Santa Rosa, Sao Lourenco, Ponta d'Areia and Barreto — all together covering 8 or 9 m. of the shore. An electric street railway connects all the outlying districts with the ferry stations of Praia Grande and Sao Domingos. The city is characteristically Portuguese in the construc- tion and style of its buildings — low, heavy walls of broken stone and mortar, plastered and coloured outside, with an occasional facing of glazed Lisbon tiles, and covered with red tiles. Among the public buildings are several churches

and hospitals (including the Jurujuba yellow-fever hospital and the Barreto isolation hospital), the government palace, a municipal theatre and a large Salesian college situated in the suburbs of Santa Rosa on an eminence overlooking the lower bay. Several large islands fill the upper bay near the eastern shore; some are used as coal deposits for the great steamship companies, and one (Flores) is used as an immigrants' depot. There is a small, rocky and picturesque island nearer the harbour entrance, which is crowned by a small chapel, dedicated to Nossa Senhora da Boa Viagem. Manufactures include cotton and woollen fabrics, tobacco, spirits, soap and tiles.

The first settlement on the east side of the Bay of Rio de Janeiro dates from 1671, when a chapel was erected at Praia Grande, in the vicinity of an Indian village. The settlement did not become a village until 1819, when it was named Villa Real da Praia Grande. In 1834 the city and municipal district of Rio de Janeiro was separated from the province, and Praia Grande became the capital of the latter in the following year. In 1836 it was raised to the dignity of a city and received the appropriate name of Nictheroy, from the Indian name Nyleroi, " hidden water." In the naval revolt of 1893-94 the older districts of the city suffered much damage from desultory bombardments, but the insurgents were too few to take possession. Soon afterwards the seat of government was removed to Petropolis, where it remained until 1903, when Nictheroy again became the capital of the state.

NIDIFICATION (from Lat. nidus), the process of making a nest {q.v.). Nidification is with most birds the beginning of the breeding season, but with many it is a labour that is scamped if not shirked. Some of the auk tribe place their single egg on a bare ledge of rock, where its peculiar conical shape is but a precarious safeguard when rocked by the wind or stirred by the thronging crowd of its parents' fellows. The stone-curlew and the goatsucker deposit their eggs without the slightest preparation of the soil on which they rest; yet this is not done at haphazard, for no birds can be more constant in selecting, almost to an inch, the very same spot which year after year they choose for their procreant cradle. In marked contrast to such artless care stand the wonderful structures which others, such as the tailor-bird, the bottle-titmouse or the fantail-warbler, build for the comfort or safety of their young. But every variety of disposition may be found in the class. The apteryx seems to entrust its abnormally big egg to an excavation among the roots of a tree-fern; while a band of female ostriches scrape holes in the desert-sand and therein promiscuously drop their eggs and leave the task of incubation to the male. Some megapodes bury their eggs in sand, leaving them to come to maturity by the mere warmth of the ground, while others raise a huge hotbed of dead leaves wherein they deposit theirs, and the young are hatched without further care on the part of either parent. Some of the grebes and rails seem to avail themselves in a less degree of the heat generated by vegetable decay and, dragging from the bottom or sides of the waters they frequent fragments of aquatic plants, form of them a rude half-floating mass which is piled on some growing water-weed — but these birds do not spurn the duties of maternity.

Many of the gulls, sandpipers and plovers lay their eggs in a shallow pit which they hollow out in the soil, and then as incuba- tion proceeds add thereto a low breastwork of haulm. The ringed plover commonly places its eggs on shingle, which they so much resemble in colour, but when breeding on grassy uplands it paves the nest-hole with small stones. Pigeons mostly make an artless platform of sticks so loosely laid together that their pearly treasures may be perceived from beneath by the inquisitive observer. The magpie, as though self-conscious that its own thieving habits may be imitated by its neighbours, surrounds its nest with a hedge of thorns. Very many birds of almost every group bore holes in some sandy cliff, and at the end of their tunnel deposit their eggs with or without bedding. Such bedding, too, is very various in character; thus, while the sheldduck and the sand-martin supply the softest of materials — the one of down from her own body, the other of feathers collected

by dint of diligent search — the kingfisher forms a couch of the undigested spiny fish bones which she ejects in pellets from her own stomach. Other birds, such as the woodpeckers, hew holes in living trees, even when the timber is of considerable hardness, and therein establish their nursery. Some of the swifts secrete from their salivary glands a fluid which rapidly hardens as it dries on exposure to the air into a substance resembling isinglass, and thus furnish the " edible birds' nests " that are the delight of Chinese epicures. In the architecture of nearly all the passerine birds, too, some salivary secretion seems to play an important part. By its aid they are enabled to moisten and bend the otherwise refractory twigs and straws, and glue them to their place. Spiders' webs also are employed with great advantage for the purpose last mentioned, but perhaps chiefly to attach fragments of moss and lichen so as to render the whole structure less obvious to the eye of the spoiler. The tailor-bird deliberately spins a thread of cotton and therewith stitches together the edges of a pair of leaves to make a receptacle for its nest. Beautiful, too, is the felt fabricated of fur or hairs by the various species of titmouse, while many birds ingeniously weave into a compact mass both animal and vegetable fibres, forming an admirable non-conducting medium which guards the eggs from the extremes of temperature outside. Such a structure may be open and cup-shaped, supported from below as that of the chaffinch and goldfinch, domed like that of the wren and bottle-titmouse, slung hammock-wise as in the case of the golden-crested wren and the orioles, or suspended by a single cord as with certain grosbeaks and humming-birds.

Certain warblers (Aedon and Thamnobia) invariably lay a piece of snake's slough in their nests — to repel, it has been suggested, marauding lizards who may thereby fear the neigh- bourhood of a deadly enemy. The clay-built edifices of the swallow and martin are known to everybody, and the nuthatch plasters up the gaping mouth of its nest-hole till only a postern large enough for entrance and exit, but easy of defence, is left. In South America the oven-birds (Fumariidae) construct on the branches of trees globular ovens, so to speak, of mud, wherein the eggs are laid and the young hatched. The flamingo erects in the marshes it frequents a mound of earth sometimes 2 ft. in height, with a cavity atop. The females of the hornbills submit to incarceration during this interesting period, the males im- muring them by a barrier of mud, leaving only a small window to admit air and food.

But though in a general way the dictates of hereditary instinct are

rigidly observed by birds, in many species a remarkable degree of elasticity is exhibited, or the rule of habit is rudely broken. Thus the falcon, whose ordinary eyry is on the beetling cliff, will for the convenience of procuring prey condescend to lay its eggs on the ground in a marsh, or appropriate the nest of some other bird in a tree. The golden eagle, too, remarkably adapts itself to circumstances, now rearing its young on a precipitous ledge, now on the arm of an ancient monarch of the forest and again on a treeless plain, making a humble home amid grass and herbage. Herons will breed according to circum- stances in an open fen, on sea-banks or (as is most usual) on lofty trees. Such changes are easy to understand. The instinct of finding food for the family is predominant, and where most food is there will the feeders be gathered together. This explains, in all likelihood, the associated bands of ospreys or fish-hawks, which in North America breed (or used to breed) in large companies where sustenance is plentiful, though in the Old World the same species brooks not the society of aught but its mate. Birds there are of eminently social predilections. In Europe, apart from sea-fowls — whose congregations are universal and known to all — only the heron, the fieldfare and the rook habitually flock during the breeding season; but in other parts of the world many birds unite in company at that time, and in none possibly is this habit so strongly developed as in the anis of the neotropical region, the republican swallow of North America and the sociable grosbeak of South Africa, which last joins nest to nest until the tree is said to break down under the accumulated weight of the common edifice.

In the strongest contrast to these amiable qualities is the parasitic nature of the cuckoos of the Old World and the cow- birds of the New. The egg of the parasite is introduced into the nest of the dupe, and after the necessary incubation by the fond fool of a foster-mother the interloper successfully counterfeits the heirs, who perish miserably, victims of his superior strength. The wRole process has been often watched, but the reflective naturalist will pause to ask how such a state of things came about, and there is not much to satisfy his inquiry. Certain it is that some birds whether by mistake or stupidity do not infrequently lay their eggs in the nests of others. It is within the knowledge of many that pheasants' eggs and partridges' eggs are often laid in the same nest, and gulls' eggs have been found in the nests of eider-ducks and vice versa; a redstart and a pied flycatcher will lay their eggs in the same convenient hole — the forest being rather deficient in such accommodation; an owl and a duck will resort to the same nest-box, set up by a scheming woodsman for his own advantage; and the starling, which constantly dispossesses the green

woodpecker, sometimes dis- covers that the rightful heir of the domicile has to be brought up by the intruding tenant. In all such cases it is not possible to say which species is so constituted as to obtain the mastery, but it is not difficult to conceive that in the course of ages that which was driven from its home might thrive through the foster- ing of its young by the invader, and thus the abandonment of domestic habits and duties might become a direct gain to the evicted householder. • (A. N.)

Nests and Coloration. — The correlation between nests and the coloration of the birds has been investigated by A. R. Wallace. Accordingly he divides birds into two main groups, first those in which the sexes are alike and of conspicuous or showy colours, and which nidificate in a covered site; secondly, those in which the males are showy and the females sombre, and which use open sites for their nests. The many exceptions to these generalizations caused J. A. Allen (Bull. Nutt. Orn. Club, 1878) to write an adverse criticism. C. Dixon (H. Seebohm's Hist. Brit. Birds, ii., 1884, introduction) has reviewed the question from Wallace's point of view. He established the following categories.

1 . Birds in which the plumage of the male is bright and conspicuous in colour, and that of the female dull and sombre, and which nidificate in open sites. In these very common cases, the female alone in- cubates, and obviously derives protection from its inconspicuous plumage.

2. Birds in which the plumage of both sexes is showy or brilliant in colour, and which nidificate in open nests. This group forms one of those exceptions which at first sight appear seriously to affect the validity of Wallace's theory. In most of the cases, however, the birds, as, for instance, crows, gulls, herons, are either well able to defend themselves and their nests or, as, for instance, the sandpipers, they seek safety for themselves in flight, relying upon the protective tints of their eggs or young.

3. Birds in which the male is less brilliant than the female, and which nidificate in open nests. Such birds are exceedingly few, e.g. the Phalaropes, the common cassowary, the emu, a carrion hawk (Milvago leucurus) horn the Falkland Islands, an Australian tree- creeper (Climacteris erythrops) and an Australian goatsucker (Eury- stopodus albigularis). In all these cases the male performs the duty of incubation. The male tinamous do the same, although they do not differ from their mates, but the conspicuously coloured male ostrich takes this duty upon himself during the night.

4. Birds in which both sexes are brightly coloured, and which rear their young in holes or covered nests. For instance, the gaudy coloured rollers, bee-eaters, kingfishers, the hoopoe, hornbills, toucans, parrotc, tits, the sheldrake and many others.

5. Birds in which both sexes are dull in colour, and which build covered nests from motives of safety other than concealment. For example, the swifts (Cypselus), the sand-martin (Cotyle riparia), wrens, dippers and owls.

6. Birds in which the female is duller in colour than the male, and which nidificate in covered nests; e.g. the redstart (Ruticilla phoenicura), the pied flycatcher (Muscicapa atricapilla), rock-thrushes (Monticola), ehats (Saxicola) and robin-chats (Thamnobia), and birds of the genus Malurus. In some of these cases the showy male bird assists in incubation, the kind of nest allowing him to do so with safety.

Similar difficulties beset the generalizations concerning the correlation of the colour of the eggs and the exposed or hidden condition of the nest. The eggs of most birds which breed in holes, or even in covered nests, are white, but the number of exceptions is so great that no general rule can be laid down to this effect. Con- versely the number of birds which lay purely white eggs in open nests, e.g. pigeons, is also large. The eggs of owls are always white,

whether they be deposited in holes on the bare ground or in open nests in a tree. The eggs of the goshawk are white, but those of its small relation, the sparrowhawk, are always blotched, the nest of both being built precisely in the same kind of position, &c. In regard to the almost countless cases of spotted eggs in holes or covered nests, of which so many groups of birds furnish examples either wholly or in part, it has been suggested that the species in question has taken to hiding its eggs in times comparatively recent, ˆnd has not yet. got rid of the ancestral habit of secreting and despositing pigment.

Length of Time of Incubation. — Most of the smaller Passeres seem to hatch their young in from 13-15 days. The shortest period, only 10 days, is recorded of the small Zosterops coerulescens ; the largest, amounting to about 8 weeks, is that of some of the larger Ratitae, penguins and the condor. The best list, comprising birds of most

groups, is that by W. Evans {Ibis, 1891, pp. 52-93; and 1892, pp. 55-58). Speaking broadly, the largest birds lay the largest eggs and require the longest time for incubation, but there are very many exceptions, and only birds of the same group can be compared with each other. The domestic fowl takes 21 days, but the pheasant, though so very nearly allied, takes 2 or 3 days longer, and even the small partridge requires 24 days. The mallard takes 26, the domestic duck 27, the musk duck 35 days, like most of the swans. The cuckoo, with 13 to 14 days, seems to have adapted itself to the short period of its foster parents.

The whole question still affords ample opportunities of experimental investigation and comparison. The condition of the newly hatched birds also varies extremely. The Nidifugae are born with their eyes open, are thinly clothed with neossoptiles of simple structure, leave the nest on the first day and feed themselves. The Nidicolae are born blind, remain a long time in the nest and have to be fed by their parents. Taken as a whole, the Nidifugae comprise most of the phylogenetically older groups; but many of these may include some closely allied members which have reached the developmental level of the Nidicolae: for instance, some Alcidae, the pigeons, Sphenisci, Ttfibinarcs, Ciconiae. For detail see Birds: Classification. While in the first category the sense organs, tegumentary and locomotory organs are far advanced, these are retarded in the Nidicolae, the development of these structures being shifted on to the postembryonic period. Yet the length of the incubation is by no means always longer in the Nidifugae, when compared with equal-sized Nidicolae. For further information the reader may be referred to: A. R. Wallace, ” A Theory of Birds’ Nests,” Journ. of Travel and Nat. Hist., 1868, p. 73, reprinted in his Contributions to the Theory of Natural Selection (London, 1870); A. McAldowie, ” Observations on the Development and the Decay of the Pigment Layer in Birds’ Eggs,” Journ. An. Phys. xx., 1886, pp. 225-237; W. Hewitson, Coloured Illustrations of the Eggs of British Birds (3rd ed., London, 1856); T. M. Brewer, North American Oology (4to, Washington, 1857); A. Lefevre, Atlas des ceufs des oiseaux d’Europe (8vo, Paris, 1845); F. W. Baedeker, Die Eier der europdischen Vogel (fob, Leipzig, 1863); E. Rev, Eier d. Vogel Mittel-Europa’ s (Gera, 1905); A. Newton, Ootheca Wolleyana (8vo, London, 1864-1907); and articles on ” Eggs ” and ” Nidification ” in Diet. Birds (London, 1893-1896). (H. F. G.)

NIEBUHR, BARTHOLD GEORG (1776-1831), German states- man and historian, son of Karsten Niebuhr (q.v.), was born at Copenhagen on the 27th of August 1776. From the earliest age young Niebuhr manifested extraordinary precocity, and from 1794 to 1796, being

already a finished classical scholar and acquainted with several modern languages, he studied at the university of Kiel. After quitting the university he became private secretary to Count Schimmelmann, Danish minister of finance. But in 1798 he gave up this appointment and travelled in Great Britain, spending a year at Edinburgh studying agri- culture and physical science. In 1799 he returned to Denmark, where he entered the state service; in 1800 he married and settled at Copenhagen. In 1804 he became chief director of the National Bank, but in September 1806 quitted this for a similar appointment in Prussia. He arrived in Prussia on the eve of the catastrophe of Jena. He accompanied the fugitive govern- ment to Konigsberg, where he rendered considerable service in the commissariat, and was afterwards still more useful as commissioner of the national debt and by his opposition to ill- considered schemes of taxation. He was also for a short time Prussian minister in Holland, where he endeavoured without success to contract a loan. The extreme sensitiveness of his temperament, however, disqualified him for politics; he proved impracticable in his relations with Hardenberg and other ministers, and in 1810 retired for a time from public life, accepting the more congenial appointment of royal historiographer and professor at the university of Berlin.

He commenced his lectures with a course on the history of Rome, which formed the basis of his great work Romische Geschichte. The first two volumes, based upon his lectures, were published in 1812, but attracted little attention at the time owing to the absorbing interest of political events. In 18 13 Niebuhr's own attention was diverted from history by the uprising of the German people against Napoleon; he entered the Landwehr and ineffectually sought admission into the regular army. He edited for a short time a patriotic journal, the Prussian Correspondent, joined the headquarters of the allied sovereigns, and witnessed the battle of Bautzen, and was subsequently employed in some minor negotiations. In 181 5 he lost both his father and his wife. He next accepted (18 16) the post of ambassador at Rome, and on his way thither he discovered in the cathedral library of Verona the long-lost Institutes of Gaius, afterwards edited by Savigny, to whom he communicated the discovery under the impression that he had found a portion of Ulpian. During his residence in Rome Niebuhr discovered and published fragments of Cicero and Livy, aided Cardinal Mai in his edition of Cicero Be Republica, and shared in framing the plan of the great work on the topography of ancient Rome by Christian C. J. von Bunsen and Ernst Platner (1773-1855), to which he contributed several chapters. He also, on a journey home from Italy, deciphered in a palimpsest at St Gall the

frag- ments of Flavius Merobaudes, a Roman poet of the 5th century. In 1823 he resigned the embassy and established himself at Bonn, where the remainder of his life was spent, with the exception of some visits to Berlin as councillor of state. He here rewrote and republished (1827-1828) the first two volumes of his Roman History, and composed a third volume, bringing the narrative down to the end of the First Punic War, which, with the help of a fragment written in 181 1, was edited after his death (1832) by Johannes Classen (1805-1891). He also assisted in August Bekker's edition of the Byzantine historians, and delivered courses of lectures on ancient history, ethnography, geo- graphy, and on the French Revolution. In February 1830 his house was burned down, but the greater part of his books and manuscripts were saved. The revolution of July in the same year was a terrible blow to him, and filled him with the most dismal anticipations of the future of Europe. He died on the 2nd of January 1831.

Niebuhr's Roman History counts among epoch-making histories both as marking an era in the study of its special subject and for its momentous influence on the general conception of history. " The main results," says Leonhard Schmitz, " arrived at by the inquiries of Niebuhr, such as his views of the ancient popula- tion of Rome, the origin of the plebs, the relation between the patricians and plebeians, the real nature of the ager publicus, and many other points of interest, have been acknowledged by all his successors." Other alleged discoveries, such as the con- struction of early Roman history out of still earlier ballads, have not been equally fortunate; but if every positive conclusion of Niebuhr's had been refuted, his claim to be considered the first who dealt with the ancient history of Rome in a scientific spirit would remain unimpaired, and the new principles intro- duced by him into historical research would lose nothing of their importance. He suggested, though he did not elaborate, the theory of the myth, so potent an instrument for good and ill in modern historical criticism. He brought in inference to supply the place of discredited tradition, and showed the possibility of writing history in the absence of original records. By his theory of the disputes between the patricians and plebeians arising from original differences of race he drew attention to the immense importance of ethnological distinctions, and contributed to the revival of these divergences as factors in modern history. More than all, perhaps, since his conception of ancient Roman story made laws and manners of more account than shadowy lawgivers, he undesignedly influenced history by popularizing that con- ception of it which lays stress on institutions, tendencies and social traits to the neglect of individuals.

Niebuhr's personal character was in most respects exceedingly

attractive. His heart was kind and his affections were strong;

he was magnanimous and disinterested, simple and honest. He had a kindling sympathy with everything lofty and generous, and framed his own conduct upon the highest principles. His chief defect was an over-sensitiveness, leading to peevish and unreasonable behaviour in his private and official relations, to hasty and unbalanced judgments of persons and things that had given him annoyance, and to a despondency and discouragement which frustrated the great good he might have effected as a philo- sophic critic of public affairs.

The principal authority for Niebuhr's life is the Lebensnachrichten uber B. G. Niebuhr, aus Briefen desselben und aus Erinnerungen einiger seiner ndchsten Freunde, by Dorothea Hensler (3 vols., 1838-1839J. In the English translation by Miss Winkworth (1852) a great deal of the correspondence is omitted, but the narrative is rendered more full, especially as concerns Niebuhr's participation in public affairs. It also contains interesting communications from Bunsen and Professor Loebell, and select translations from the Kieine Schriften. See also J. Classen, Barthold Georg Niebuhr, eine Gedachtnisschrift (1876), and G. Eysscnhardt, B. G. Niebuhr (1886). The first edition of his Roman History was translated into English by F. A. Walter (1827), but was immediately superseded by the translation of the second edition by Julius Hare and Connop Thirwall, completed by William Smith and Leonhard Schmitz (last edition, 1 847-1851). The History has been discussed and criticized in a great number of publications, the most important of which, perhaps, is Sir George Cornwall Lewis's Essay on the Credibility of the Early Roman History. See further J. E. Sandys, History of Classical Scholarship (1908), in., pp. 78-82.

NIEBUHR, KARSTEN (1733-1815), German traveller, was born at Liidingworth, Lauenburg, on the southern border of Holstein, on the 17th of March 1733, the son of a small farmer. He had little education, and for several years of his youth had to do the work of a peasant. His bent was towards mathematics, and he managed to obtain some lessons in surveying. It was while he was working at this subject that one of his teachers, in 1760, proposed to him to join the expedition which was being sent out by Frederick V. of Denmark for the scientific exploration of Egypt, Arabia and Syria. To qualify himself for the work of surveyor and geographer, he studied hard at mathematics for a year and a half before the expedition set out, and

also managed to acquire some knowledge of Arabic. The expedition sailed in January 1761, and, landing at Alexandria, ascended the Nile. Proceeding to Suez, Niebuhr made a visit to Mount Sinai, and in October 1762 the expedition sailed from Suez to Jeddah, journeying thence overland to Mocha. Here in May 1763 the philologist of the expedition, van Haven, died, and was followed shortly after by the naturalist Forska.1. Sana, the capital of Yemen, was visited, but the remaining members of the expedition suffered so much from the climate or from the mode of life that they returned to Mocha. Niebuhr seems to have saved his own life and restored his health by adopting the native habits as to dress and food. From Mocha the ship was taken to Bombay, the artist of the expedition dying on the passage, and the surgeon soon after landing. Niebuhr was now the only surviving member of the expedition. He stayed fourteen months at Bombay, and then returned home by Muscat, Bushire, Shiraz and Persepolis, visited the ruins of Babylon, and thence went to Bagdad, Mosul and Aleppo. After a visit to Cyprus he made a tour through Palestine, crossing Mount Taurus to Brussa, reaching Con- stantinople in February 1767 and Copenhagen in the following November. He married in 1773, and for some years held a post in the Danish military service which enabled him to reside at Copenhagen. In 1778, however, he accepted a position in the civil service of Holstein, and went to reside at Meldorf , where he died on the 26th of April 181 5.

Niebuhr was an accurate and careful observer, had the in- stincts of the scholar, was animated by a high moral purpose, and was rigorously conscientious and anxiously truthful in recording the results of his observation. His works have long been classics on the geography, the people, the antiquities and the archaeology of much of the district of Arabia which he traversed. His first volume, Beschreibung von Arabien, was published at Copenhagen in 1772, the Danish government de- fraying the expenses of the abundant illustrations. This was followed in 1774— 1778 by two other volumes, Reisebeschreibung

von Arabien und anderen umliegenden Landern. The fourth volume was not published till 1837, long after his death, under the editorship of Niebuhr's daughter. He also undertook the task of bringing out the work of his friend Forskal, the naturalist of the expedition, under the titles of Descripliones animalium, Flora Aegyptiaco-Arabica, and Icones rerum naturalium (Copen- hagen, 1775-1776). To a German periodical, the Deulsches Museum, Niebuhr contributed papers on the interior of Africa, the political and military condition of the Turkish empire, and other subjects.

French and Dutch translations of his narratives were published during his lifetime, and a condensed English translation, by Robert Heron, of the first three volumes in Edinburgh (1792). His son Barthold (see above) published a short Life at Kiel in 181 7; an English version was issued in 1838 in the Lives of Eminent Men, published by the Society for the Diffusion of Useful Knowledge. See D. G. Hogarth, The Penetration of Arabia (" Story of Ex- ploration " series) (1904).

NIEDERBRONN, a town of Germany, in the imperial province Alsace-Lorraine, on the Falkensteiner Bach, situated under the eastern slope of the Vosges, 12 m. N.W. from Hagenau by rail. Pop. (1905) 3120. It contains an Evangelical and a Roman Catholic church, a convent of the Sisters of the Divine Redeemer, and a high-grade and other schools. Niederbronn is one of the best-known watering-places in the Vosges. Its brine springs, with a hydropathic establishment attached, are specific in cases of gout, obesity and liver disorders. Here, on the 26th of July 1870, the first engagement between the Germans and the French in the Franco-German war took place. There are several ruined castles in the neighbourhood, the most noteworthy of which is one on the Wesenburg (1415 ft. high) erected in the 14th century. Various Celtic and Roman antiquities have been found around Niederbronn.

See Kuhn, Les Eaux de Niederbronn (3rd ed., Strassburg, i860); Mathis, Aus Niederbronns alten Zeiten (Strassburg, 1901); and Kirstein, Das Wasgaubad Niederbronn (Strassburg, 1902).

NIEDERLAHNSTEIN, a town of Germany, in the Prussian province of Hesse-Nassau, situated on the right bank of the Rhine at the confluence of Lahn, 3 m. S.E. from Coblenz by the railway to Ems, and at the junction of lines to Hochheim and Cologne. Pop. (1905) 4351. It has two Roman Catholic churches. The chief industries are the making of machinery and shipbuilding. Niederlahnstein obtained civic rights in 1332, and was until 1803 on the territory of the electors of Trier. Here on the 1st of January 1814 a part of the Russian army crossed the Rhine. In the vicinity are the Johanniskirche, a Romanesque church restored in 1857, and the Allerheiligenberg, whereon stands a chapel, once a famous place of pilgrimage.

NIEDER-SELTERS, a village of Germany, in the Prussian province of Hesse-Nassau, situated in a well-wooded country on the Ems, 12 m. S.E. from Limburg by the railway to Frankiort- on-Main. Pop. (1900) 1339. Here are the springs of the famous Selters or Seltzer water, employed as specific in cases of catarrh of the respiratory organs, the stomach and bladder. Until 1866 the springs belonged to the duke of Nassau; since this date they have been the property of Prussia. They

became famous in the earlier part of the 19th century, although they had been known many years previously.

See Grossmann, Die Heilquellen des Taunus (Wiesbaden, 1887).

NIEDERWALD, a broad hill in Germany, in the Prussian province of Hesse-Nassau, on the right bank of the Rhine, between that river and the Wisper, opposite Bingen, forming the south-western apex of the Taunus range. Its summit is clothed with dense forests of oak and beech, while its southern and western sides, which descend sharply to Rtidesheim and Assmannshausen on the Rhine, are covered with vineyards, and produce some of the finest wines of the district. At the edge of the forest, on the crest of the hill above Riidesheim, stands the gigantic " Germania " statue, the national monument of the war of 1870-71, which was unveiled on the 28th of September 1883 by the emperor William I., in the presence of all the rulers in Germany or their representatives. It was designed by Johannes I Schilling, and the bronze figure of Germania is 33 ft. high; the

pedestal is adorned with allegorical figures and portraits of German princes and generals. Cogtooth mountain railways run up the hill from Riidesheim and Assmannshausen.

See Spielmann, Niederwald und Nationaldenkmal (Wiesbaden,

1898).

NIEHAUS, CHARLES HENRY (1855-), American sculptor, of German parentage, was born at Cincinnati, Ohio, on the 24th of January 1855. He was a pupil of the McMichen School of Design, Cincinnati, and also studied at the Royal Academy, Munich, returning to America in 1881; in 1885, after several years in Rome, he established his studio in New York City. In 1906 he became a National Academician. His principal works are: a statue of President Garfield, for Cincinnati; the Hahnemann Memorial, in Washington; " Moses " and " Gibbons," for the Congressional Library, and " James A. Garfield," " John J. Ingalls," " William Allen," and " Oliver P. Morton," for Statuary Hall, Capitol, Washington; " Hooker " and " Daven- port," State House, Hartford, Connecticut; the Astor Memorial doors, Trinity Church, New York; " General Forrest," Memphis, Tennessee; Generals Sherman and Lee, and William the Silent; "The Scraper; or Greek Athlete using a Strigil"; statues of Lincoln, Farragut and McKinley, at Muskegon, Michigan; a

statue of McKinley and a lunette for McKinley's tomb, at Canton, Ohio; and " The Driller," at Titusville, Pennsylvania, in memory of Colonel E. L. Drake, who, in 1859, sank the first oil well in Pennsylvania.

NIEL, ADOLPHE (1802-1869), marshal of France, was born at Muret on the 4th of October 1802, and entered the Ecole Poly technique in 1821, whence he passed to the engineer school at Metz, becoming lieutenant in the Engineers in 1827 and captain in 1833. At the storming of Constantine he led the engineer detachment with one of the storming parties, and his conduct gained for him the rank of chef de bataillon (1837). In 1840 he was promoted lieutenant-colonel, and in 1846 colonel, and his next war service was as chief of staff to General Vaillant during the siege of Rome (1849), after which he was made general of brigade and director of engineer services at headquarters. In 1851 he became a member of the Committee of Fortifications, in the following year a member of the council of state, and in 1853 general of division. In the first part of the Crimean War he was employed in the expedition to the Baltic, and directed engineer operations against Bomarsund, but early in 1855 he was sent to the Crimea, where he succeeded General Bizot as chief of engineers. For some years he had been the most trusted military adviser of Napoleon III., and he was now empowered to advise the generals on the spot in accordance with the wishes of the sovereign and the home government. This delicate and difficult task Niel managed to carry out with as much success as could be expected, and he had the credit of directing the siege operations against the Malakoff (see Crimean War). His reward was the grand cross of the Legion of Honour. From 1855 to 1859 he was employed at headquarters, and also served in the senate. In the war against the Austrians in the latter year (see Italian Wars) Niel commanded the IV. corps, and took a brilliant part in the battles of Magenta and Solferino. On the field of battle of Solferino he was made a marshal of France. After service for some years in a home command, he became minister of war (1867). In this capacity he drafted and began to carry out a far-reaching scheme of army reform, based on universal service and the automatic creation of large reserves, which needed only time to mature. He also rearmed the whole of the army with the chassepot rifle. But he did not live to complete the development of his system. He died on the 13th of August 1869 in Paris, and a year later the Franco-German War destroyed the old imperial army upon which the new formations were to have been grafted.

NIELLO (the Italian form of Lat. nigellum, diminutive of niger, "black"; Late Gr. fxe\avov), a method of producing delicate and

minute decoration on a polished metal surface by incised lines filled in with a black metallic amalgam. In some cases it is very difficult to distinguish niello from black enamel; but the black substance differs from true enamel in being metallic,

not vitreous. Our knowledge of the process and materials employed in niello-work is derived mainly from four writers, — Eraclius the Roman (a writer probably of the nth century), Theophilus the monk, who wrote in the 12th or 13th century, 1 and, in the 16th century, Benvenuto Cellini 2 and Giorgio Vasari.' The design was cut with a sharp graving tool on the smooth surface of the metal, which was usually silver, but occasionally gold or even bronze. An alloy was formed of two parts silver, one-third copper and one-sixth lead; to this mixture, while fluid in the crucible, powdered sulphur in excess was added ; and the brittle amalgam, when cold, was finely pounded, and sealed up in large quills for future use. A solution of borax to act as a flux was brushed over the metal plate and thoroughly worked into its incised lines. The powdered amalgam was then shaken out of the quills on to the plate, so as to completely cover all the engraved pattern. The plate was now carefully heated over a charcoal fire, fresh amalgam being added, as the powder fused, upon any defective places. When the powder had become thoroughly liquid, so as to fill all the lines, the plate was allowed to cool, and the whole surface was scraped, so as to remove the superfluous niello, leaving only what had sunk into and filled up the engraved pattern. Last of all the nielloed plate was very highly polished, till it presented the appearance of a smooth metal surface enriched with a delicate design in fine grey-black lines. This process was chiefly used for silver work, on account of the vivid contrast between the whiteness of the silver and the darkness of the niello. As the slightest scratch upon the metal received the niello, and became a distinct black line, ornament of the most minute and refined description could easily be pro- duced.

The earliest specimens of niello belong to the Roman period. Two fine examples are in the British Museum. One is a bronze statuette of a Roman general, nearly 2 ft. high, found at Barking Hall in Suffolk. The dress and armour have patterns partly inlaid in silver and partly in niello. The dark tint of the bronze rather prevents the niello from showing out distinctly. This statuette is apparently a work of the 1st century. 4 The other example is not earlier than the 4th century. It is a silver casket or lady's toilet box, in which were found an ampulla and other small objects, enriched with niello-work. 5

From Roman times till the end of the 16th century the art of working in niello seems to have been constantly practised in some part at least

of Europe, while in Russia and India it has survived to the present day. From the 6th to the 1 2th century a large number of massive and splendid works in the precious metals were produced at Byzantium or under Byzantine influence, many of which were largely decorated with niello; the silver dome of the baldacchino over the high altar of S. Sophia was probably one of the most important of these. Niello is frequently mentioned in the inventories of the treasures belonging to the great basilicas of Rome and Byzantium. The Pala d'Oro at S. Mark's, Venice, 10th century, owes much of its refined beauty to niello patterns in the borders. This art was also practised by Bernward, artist-bishop of Hildesheim (ob. 1023) ; a fine silver paten, decorated with figures in niello, attributed to his hand, still exists among the many rich treasures in the church of Han- over Palace. Other nielli, probably the work of the same bishop, are preserved in the cathedral of Hildesheim. In France, too, judging both from existing specimens of ecclesiastical plate and many records preserved in church inventories, this mode of decoration must have been frequently applied all through the middle ages: especially fine examples once existed at Notre Dame, Paris, and at Cluny, where the columns of the sanctuary were covered with plates of silver in the nth century, each plate being richly ornamented with designs in niello. Among the early Teutonic and Celtic races, especially from the 8th to the nth centuries, both in Britain and other countries, niello was

1 Div. Art. Sched. iii. 27-29 (see Hendrie's edition, 1847).

2 Trattato dell' oreficeria.

s Tre arti del disegno.

1 See Soc. Ant. Vet. Mon. iv. pis. n-15.

6 See Visconti, Und Antica Argentaria (Rome, 1793).

Gold and Niello Ring.

frequently used to decorate the very beautiful personal orna- ments of which so many specimens enrich the museums of Europe. The British Museum possesses a fine fibula of silver decorated with a simple pattern in niello and thin plates of repousse gold. This, though very similar in design to many fibulae from Scandi- navia and Britain, was found in a tomb at Kerch (Panticapaeum). Several interesting gold

rings of Saxon workmanship have been found at different times, on which the owner's name and orna- mental pacterns are formed in gold with a background of niello. One with the name of Ethelwulf, king of Wessex (836-838), is now in the British Museum (see figure). Another in the Victoria and Albert Museum has the name of Alhstan, who was bishop of Sherborne from 823 to 867. The metal-workers of Ireland, whose skill was quite unrivalled, practised largely the art of niello from the 10th to the 12th century, and pos- sibly even earlier. Fine croziers, shrines, fibulae, and other objects of Irish work- manship, most skilfully enriched with elaborate niello-work, exist in considerable numbers. From the 13th to the 16th century but little niello-work appears to have been produced in England. Two specimens have been found, one at Matlask, Norfolk, and the other at Devizes, which from the character of the design appear to be English. They are both of gold, and seem to be the covering plates of small pendant reliquaries about 1 in. long, dating about the end of the 15th century. One has a crucifix between St John the Baptist and a bishop; the other, that found at Devizes, has the two latter figures, but no crucifix. 1 It is, however, in Italy that the art of niello-work was brought to greatest perfection. During the whole medieval period it was much used to decorate church plate, silver altar-frontals, and the like". The magnificent frontals of Pistoia cathedral and the Florence baptistery are notable instances of this. During the 15th century, especially at Florence, the art of niello-work was practised by almost all the great artist-goldsmiths of that period. Apart from the beauty of the works they produced, this art had a special importance and interest from its having led the way to the invention of printing from engravings on metal plates (see Lixe-engraving). Vasari's account of this invention, given in his lives of Pollaiuolo and Maso Finiguerra, is very interesting, but he is wrong in asserting that Maso was the first worker in niello who took proofs or impressions of his plates. An important work of this sort, described at length by Vasari and wrongly ascribed by him to Maso Finiguerra {q.v.), still exists in the Opera del Duomo at Florence. It is a pax with a very rich and delicate niello picture "of the coronation of the Virgin; the composition is very full, and the work almost microscopic in minuteness; it was made in 1452. Impressions from it are preserved in the British Museum, the Louvre and other col- lections. The British Museum possesses the finest existing example of 15th-century German niello. It is a silver beaker, covered with graceful scroll-work, forming medallions, in which are figures of cupids employed in various occupations (see Shaw's Dresses and Decorations of the Middle Ages, 1858, vol. ii.).

Authorities. — The Archaeological Journal of 1862 (vol. xix. p. 323)

has an excellent monograph on the subject, see also vol. xii. p. 79 and vol. iv. p. 247; Archaeologia, xxxi. 404; Merrifield, Ancient Practice of Painting, vol. i. (1849) (gives MSS, of Eraclius and other early writers) ; Catalogue of Museum of Royal Irish Academy; Les Nielles a la cath. d'Aix-la-Chapelle (Paris, 1859); Alvin, Nielles de la bibliotheque roy. de Belgique (1857); Duchesne, Nielles des orfevres florentins (1826); Passavant, Le Peintre-graveur (1860- 1864); Ottley, History of Engraving (1816) and Collection of Fac- similes of Prints (1826); Cicognara, Storia delta scultura, ni. p. 168 (Prato, 1823), and Storia della calcografia (Prato, 1831); Lanzi, Storia pittorica, ep. i. sec. iii. (1809); Baldinucci, Professori del disegno (1681-1728) and L 'Arte di intagliare in rame (1686); Zani, Origine dell' incisione in rame (1802); Labarte, Arts of the Middle Ages (1855); Texier, Dictionnaire de I'orfevrerie p. 1822 (Paris,

1 See Proc. Norfolk Archaeo. Soc. iii. p. 97.

1857); Bartsch, Le Peintre-graveur, xiii. 1-35; Rumohr, Unter- suchung der Griinde fur die Annahme, &c. (Leipzig, 1841); Lessing, Collectaneen zur Literatur (vol. xii. art. " Niellum ") ; C. Davenport, in Journal of Soc. of Arts (1901), vol. xlviii. (J. H. M.)

NIEM [Nyem, or Nieheim], DIETRICH OF (c. 1345-1418), medieval historian, was born at Nieheim, a small town subject to the see of Paderborn. He became a notary of the papal court of the rota at Avignon, and in 1376 went with the Curia to Rome. Urban VI. here took particular notice of him, made him an abbreviator to the papal chancery, and in 1383 took him with him on his visit to King Charles at Naples, an expedition which led to many unpleasant adventures, from which he escaped in 1385 by leaving the Curia. In 1387 he is again found among the abbreviators, and in 1395 Pope Boniface IX. appointed him to the bishopric of Verden. His attempt to take possession of the see, however, met with successful opposition; and he had to resume his work in the chancery, where his name again appears in 1403. In the meantime he had helped to found a German hospice in Rome, which survives as the Instituto dell' Anima, and had begun to write a chronicle, of which only fragments are extant. His chief importance, however, lies in the part he took in the controversies arising out of the Great Schism. He accom- panied Gregory XII. to Lucca in May 1408, and, having in vain tried to make the pope listen to counsels of moderation, he joined the Roman and Avignonese cardinals at Pisa. He adhered to the pope elected by the council of Pisa (Alexander V.) and to his successor John XXIII., resuming his place at the Curia. In view of the increasing confusion in the Church, however, he became one of the most ardent advocates of

the appeal to a general council. He was present at the council of Constance as adviser to the German ” nation.” He died at Maastricht on the 22nd of March 1418.

Niem wrote about events in which he either had an intimate personal share or of which he was in an excellent position to obtain accurate information. His most important works are the Nemus unionis and the De schismate. Of these the fsrst, compiled at Lucca after the breach with Gregory XII., is a collection of documents which had fallen into his hands during the negotiations for union : papal pronouncements, pamphlets, letters written and received by himself, and the like. The De schismate libri III., completed on the 25th of May 1410, describes the history of events since 1376 as Niem himself had seen them. It was continued in the Historia de vita Johannis XXIII. Other works are De bono regimine Rom. ponhficis, dedicated to the new pope (John XXIII.) ; De modis uniendi ac reformandi ecclesiam and De difficultate rsformationis in concilio universali, advocating the convocation of a council, to which the pope is to bow; Contra dampnatos Wiclivitas Pragae, against the Hussites; Jura ac privilegia imperii, a glorification of the empire in view of the convocation of the council of Constance; Avisamenta prlcherrima de unione et reformaiione membrorum et capitis fienda, a programme of church reform based on his experiences of the evils of the papal system.

For bibliography see Potthast, Bibl. hist, medii aevi (2nd ed., Berlin, 1896), p. 1051, s.v. ” Theodoricus de Niem “; and generally see the article on Niem by Theodor Lindner in Allgemeine deutsche Biographie (Leipzig, 1886); and Erler, Dietrich von Nieheim (Leipzig,

1887).

NIEMCEWICZ, JULIAN URSIN (17 58-1 841), Polish scholar, poet and statesman, was born in 1757 in Lithuania. In the earlier part of his life he acted as adjutant to Kosciusko, was taken prisoner with him at the fatal battle of Maciejowice (1794), and shared his captivity at St Petersburg. On his release he travelled for some time in America, where he married. After the Congress of Vienna he was secretary of state and president of the constitutional committee in Poland, but in 1830-1831 he was again driven into exile. He died in Paris on the 21st of April 1 84 1. Niemcewicz tried many styles of composition. His comedy The Return of the Deputy (1790) enjoyed a great reputa- tion, and his novel, John of Tenczyn (1825), in the style of Scott, gives a vigorous picture of old Polish days. He also wrote a History of the Reign of Sigismund III. (3 vols., 1819), and a collection of memoirs for ancient Polish history (6 vols., 1822- 1823). But he is now best

remembered by his Historical Songs of the Poles (Warsaw, 1816), a series of lyrical compositions in which the chief heroes are of the golden age of Sigismund I., and the reigns of Stephen Bathori and Sobieski.

His collected works were published in 12 vols, at Leipzig (1838-

1840).

NIENBURG ON THE SAALE, a town of Germany, in the duchy of Anhalt, situated at the influx of the Bode into the Saale, 6 m. N. of Bernburg on the railway Calbe-Konnern. Pop. (1905) 5748. It contains a beautiful Gothic Evangelical church, an old castle, once a monastery (founded 97s, dissolved 1546), and now devoted to secular uses, and a classical school. The in- dustries embrace iron-founding and machine-making, malting and tanning.

NIENBURG ON THE WESER, a town of Germany, in the Prussian province of Hanover, situated on the Weser, 33 m. N.W. from Hanover by the railway to Bremen. Pop. (1905) 9638. It has an Evangelical and a Roman Catholic church, a classical school and an agricultural college. Its industries consist chiefly in glass-blowing, distilling, biscuit-making and the manufacture of manures. The town is mentioned as early as 1025. It was fortified in the 12th century, obtained municipal rights in 1569, and passed in 1582 to the house of Luneburg. It was occupied by the imperialists from 1627 to 1634, and by the French during the Seven Years' War. The walls were dis- mantled by order of Napoleon I. in 1807.

See Gade, Geschichte der Stadt Nienburg an der Weser (1862).

NIEPCE, JOSEPH NICEPHORE (1765-1833), French physicist, and one of the inventors of photography, was born at Chalon- sur-Saone on the 7th of March 1765. In 1792 he entered the army as a sub-lieutenant, and in the following year he saw active service in Italy. Ill-health and failing eyesight compelled him to resign his commission before he had risen above the rank of lieutenant; but in 1795 he was nominated administrateur of the district of Nice, and he held the post until 1801. Returning in that year to his birthplace, he devoted himself along with his elder brother Claude (1 763-1828) to mechanical and chemical researches; and in 1811 he directed his attention to the rising art of lithography. In 1813 the idea of obtaining sun pictures first- suggested

itself to him in this connexion; and in 1826 he learned that L. J. M. Daguerre was working in the same direc- tion. In 1829 the two united their forces, ” pour cooperer au perfectionnement de la decouverte inventee par M. Niepce et perfectionnee par M. Daguerre ” (see also Photography). Niepce died at Gras, his property near Chalon, on the 3rd of July 1833. A nephew, Claude Felix Abel Niepce de Saint- Victor (1805-1870), served with distinction in the army, and also made important contributions towards the advancement of the art of photography; he published Recherches photo- graphiques (Paris, 1855) and Traitt pratique de gravure Mlio- graphique sur acier et sur verre (Paris, 1866).

NIEREMBERG, JUAN EUSEBIO (1595-1658), Spanish Jesuit and mystic, was born at Madrid in 1595, joined the Society of Jesus in 1614, and subsequently became lecturer on Scripture at the Jesuit seminary in Madrid, where he died on the 7th of April 1658. He was highly esteemed in devout circles as the author of De la aficidn y amor de Jesus (1630), and De la aficidn y amor de Maria (1630), both of which were translated into Arabic, Flemish, French, German, Italian and Latin. These works, together with the Prodigios del amor divino (1641), are now forgotten, but Nieremberg’s version (1656) of the Imitation is still a favourite, and his eloquent treatise, De la hcrmosura de Dios y su amabilidad (1649), is the last classical manifestation of mysticism in Spanish literature. Nieremberg has not the enraptured vision of St Theresa, nor the philosophic significance of Luis de Leon, and the unvarying sweetness of his style is cloying; but he has exaltation, unction, insight, and his book forms no unworthy close to a great literary tradition.

NIERSTEIN, a village of Germany, in the grand duchy of Hesse-Darmstadt, on the left bank of the Rhine, 8 m. S. from Mainz by the railway to Worms. Pop. (1905) 4445. It contains a Roman Catholic and a Protestant church, an old Roman bath — Sironabad — and sulphur springs. It is famous for its wines, in which a large export trade is done. Nierstein was originally a Roman settlement, and was a royal residence under the Carolingian rulers. Later it passed from the emperor to the elector palatine of the Rhine.

NIETZSCHE, FRIEDRICH WILHELM (1844-1900), German philosopher, was the son of the pastor at Rocken, near Leipzig, where he was born on 15 th October 1844. He was educated at Schulpforta, and studied the classics at the universities of Bonn and Leipzig. In 1869, while still an undergraduate, he was, on F. W. Ritschl’s recommendation, appointed to an extra- ordinary professorship of classical philology in the university of Basel, and rapidly promoted to

an ordinary professorship. Here he almost immediately began a brilliant literary activity, which gradually assumed a more and more philosophical char- acter. In 1876 eye (and brain) trouble caused him to obtain sick leave, and finally, jn 1879, to De pensioned. For the next ten years he lived in various health resorts, in considerable suffering (he declares that the year contained for him 200 days of pure pain), but dashing off, at high pressure, the brilliant essays on which his fame rests. Towards the end of 1888, after recovering from an earlier attack, he was pronounced hopelessly insane, and in this condition he remained until he died on the 25th of August 1900. Nietzsche's writings must be understood in their relation to these circumstances of his life, and as the outcome of a violent revolt against them on the part of an intensely emotional and nervous temperament. His philosophy, consequently, is neither systematic in itself nor expounded in systematic form. It is made up of a number of points of view which successively appeared acceptable to a personality whose self-appreciation verges more and more upon the insane, and exhibits neither consecutiveness nor consistency. Its natural form is the aphorism, and to this and to its epigrammatic brilliance, vigour, and uncompromising revolt against all con- ventions in science and conduct it owes its persuasiveness. Revolt against the whole civilized environment iri which he was brought up is the keynote of Nietzsche's literary career. His revolt against Christian faith and morals turns him into a proudly atheistic " free-thinker," and preacher of a new " master " morality, which transposes the current valuations, deposes the "Christian virtues," and incites the "over-man" ruthlessly to trample under foot the servile herd of the weak, degenerate and poor in spirit. His revolt against the theory of state supremacy turns him into an anarchist and individualist; his revolt against modern democracy into an aristocrat. His revolt against conventional culture leads him to attack D. F. Strauss as the typical "Philistine of culture"; his revolt against the fashion of pessimism to demand a new and more robust affirma- tion of life, not merely although, but because, it is painful. Indeed, his very love of life may itself be regarded as an indignant revolt against the toils that were inexorably closing in around him. He directs this spirit of revolt also against the sources of his own inspiration; he turns bitterly against Wagner, whose intimate friend and enthusiastic admirer he had been, and denounces him as the musician of decadent emotionalism; he rejects his " educator " Schopenhauer's pessimism, and transforms his will to live into a " Will to Power." Nevertheless his reaction does not in this case really carry him beyond the ground of Schopenhauerian philosophy, and his own may perhaps be most truly regarded as the paradoxical development of an inverted Schopenhauerism. Other influences which may be

traced in his writings are those of modern naturalism and of a somewhat misinterpreted Darwinism (" strength " is generally interpreted as physical endowment, but it has sometimes to be reluctantly acknowledged that the physically feeble, by their combination and cunning, prove stronger than, the " strong "). His writings in their chronological order are as follows: Die Geburt der Tragodie aus dem Geiste der Musik (1872); Unzeit- gemasse Belrachtungen (1873-1876) (Strauss — Vom Nutzen und Nachteil der Historie filr das Leben — Schopenhauer als Erzieher — Richard Wagner in Bayreuth); Menschliches, Allzumenschliches (1876-1880); Morgenrote (1881); Die frbhliche Wissenschaft (1882); Also sprach Zarathustra (1883-1884); Jenseits von Gut und Bose (1886); Zur Genealogie der Moral (1887); Der Fall Wagner (1888); Gotzendammerung (1888); Nietzsche contra Wagner, Der Antichrist, and Poems first appeared in the complete edition of his works, which also contains the notes for Wille

iur Macht, in which Nietzsche had intended to give a more systematic account of his doctrine (1895-1901). (F. C. S. S.) An edition of Nietzsche's complete works began to appear in 1895 ; there are also two popular editions, 1899 ff. (15 vols, have been pub- lished) and 1906 (10 vols.). In 1900 Nietzsche's Briefe began to be published. An English translation in 18 vols., edited by Oskar Levy, reached the 13th vol. in 1910. His biography, by his sister, Elisabeth Eorster-Nietzsche (Das Leben Friedrich Nietzsch.es, 1895 ff.), reached its third volume in 1907. There are also lives by D. Halevy (1909) and M. A. Mugge (F. Nietzsche: his Life and Work, 1908), the latter of a somewhat popular character. G. Brandes first drew European attention to Nietzsche by his famous essay in 1889; since then an enormous literature has grown up round the subject. See especially L. Andreas Salome, F. Nietzsche in seinen Werken (1894); A. Riehl, F. Nietzsche (1897; 3rd ed., 1901); F. Tonnies, Nietzsche- Kultus (1897); H- E'lis, F. Nietzsche (in Affirmations, 1898); H. Lichtenberger, La Philosophic de Nietzsche (1895; German trans., 1899); E. Horneffer, Vortrage iiber F. Nietzsche ; (1900); T. Ziegler, /•". Nietzsche (1900); J. Zeitler, Nietzsches Asthetik (1900); P. Deussen, Erinnerungen an F. Nietzsche (1901); R. Richter, F. Nietzsche, sein Leben und sein Werk (1903) ; G. Simmel, Schopenhauer und Nietzsche (1907). For an estimate of his moral theory see Ethics, adfi?i.

NIEUPORT (Flem. Nienwpoort) , a town of Belgium in the province of

West Flanders. Pop. (1904) 3780. It was the port of Ypres, and is situated on the Yser about 10 m. S. of Ostend. It was strongly fortified in the middle ages and its siege by the French in 1488-1489 is an episode of its heroic period. Under its walls in 1600 Maurice of Nassau defeated the Archduke Albert and the Spaniards. It contains an ancient cloth market, a fine town-hall and an old church, and outside is a lighthouse dating from 1289. Nieuport Bains, 2 m. from the town, is a fashionable seaside resort dating only from 1869. It has a fine pier extending 1500 yds. out to sea and flanking the entrance to the Yser, which has been canalized. The bathing is excellent, and in the season the place is largely frequented by visitors.

NIEVRE, a department of central France, formed from the old province of Nivernais with a small portion of the Orleanais. It is bounded N.W. by Loiret, N. by Yonne, E. by Cote d'Or, E. and S.E. by Saone-et-Loire, S. by Allier and W. by Cher. Pop. (1906) 313, 972. Area, 2659 sq. m. Nievre falls into three regions differing in elevation and in geological formation. In the east are the granitic mountains of the Morvan, one of the most picturesque portions of France, containing Mont Prenelay (2789 ft.) and several lesser heights. The north and centre are occupied by plateaus of Jurassic limestone with a maximum elevation of 1400 ft. The west and south-western part of the department is a district of plains, composed mainly of tertiary formations with alluvial deposits, and comprising the valleys of the Loire and the Allier. The lowest level of the department is 446 ft., at the exit of the Loire. Nievre belongs partly to the basin of the Loire, partly to that of the Seine. The watershed dividing these two basins follows the general slope of the depart- ment from S.E. to N.W. — from Mont Prenelay to the Puisaye, the district in the extreme north-west. Towards the west the limits of Nievre are marked by the Allier-Loire valley — the Loire striking across the south-west corner of the department by Decize and Nevers and then continuing the line of its great affluent the Allier northwards by Fourchambault, La Charite, Pouilly and Cosne. Secondary feeders of the Loire are the Nievre, which gives its name to the department, and the Aron, whose valley is traversed by the Nivernais Canal. The largest tributary of the Seine in Nievre is the Yonne, which rises in the south-east, passes by Clamecy, and carries along with it the northern part of the Nivernais Canal. The Cure, the principal affluent of the Yonne (with which, however, it does not unite till after it has left the department), is the outlet of a lake, Lac des Settons, which serves as a reservoir for the regulation of the river and the canal. Owing to its greater elevation and the retention of the rain-water on its impermeable surface in the shape of ponds and streams, Morvan shows a mean temperature 6° F. lower

than that of the western district, which, in the valley of the Loire, is almost identical with that of Paris (52° F.). At Nevers the annual rainfall amounts to only 21 in., but in Morvan it is nearly three times as great.

The principal cereals are oats and wheat; potatoes are xix. 22

also largely grown. Much land is given over to pasture and the cultivation of various kinds of forage, and the fattening of cattle is a thriving agricultural industry. The Nivernais and Charolais are the chief breeds. The rearing of sheep and draught-horses is also of importance. Vines are grown in the valley of the Loire and in the neighbourhood of Clamecy. The white wines of Pouilly on the Loire are widely known. Nievre abounds in forests, the chief trees being the oak, beech, hornbeam, elm and chestnut. Coal is mined at Decize, and gypsum, building stone, and kaolin are among the quarry products. The best- known mineral springs are those of Pougues and St Honore. Of the iron-works for which Nievre is famous, the most important are those of Fourchambault. At Imphy there are large steel- works. The government works of La Chaussade at Guerigny make chain-cables, anchors, armour-plates, &c. There are also manufactories of agricultural implements and hardware, potteries, manufactories of porcelain, and faience (at Nevers), tile-works, chemical works, paper-mills and saw-mills, as well as numerous tanneries, boot and shoe factories, cask manufactories and oil works (colza, poppy and hemp). In the Morvan district a large part of the population is engaged in the timber industry; the logs carried down by the streams to Clamecy are then put into boats and conveyed to Paris.

A great deal of the traffic is by water: the canal along the left bank of the Loire runs through the department for 38 m., and the Nivernais canal for 78 m. The chief railway is that of the Paris-Lyons-Mediterranee Company, whose main line to Nimes follows the valley of the Loire and Allier throughout the department. Nievre is divided into 4 arrondissements (Nevers, Chateau-Chinon,Clamecy and Cosne being their capitals), 25 cantons, 313 communes. It forms the diocese of Nevers, and part of the educational district of Dijon and of the region of the VIII. corps d'armee. Its court of appeal is at Bourges. The most noteworthy towns are Nevers, the capital, Clamecy, Fourchambault, Cosne, La Charite and Decize. Varzy and Tannay have fine churches of the 14th, and the 12th, 13th and 1 6th centuries respectively, and there is an interesting church, chiefly Romanesque in style, at St Pierre-le-Moutier.

NIFO, AGOSTINO [Augustinus Niphus] (c. 1473-1538 or 1545),

Italian philosopher and commentator, was born at Japoli in Calabria. He settled for a time at Sezza and subsequently proceeded to Padua, where he studied philosophy. He lectured at Padua, Naples, Rome and Pisa, and won so high a reputation that he was deputed by Leo X. to defend the Catholic doctrine of Immortality against the attack of Pomponazzi and the Alexandrists. In return for this he was made Count Palatine, with the right to call himself by the name Medici. In his early thought he followed Averroes, but afterwards modified his views so far as to make himself acceptable to the orthodox Catholics. In 1495 he produced an edition of the works of Averroes; with a commentary compatible with his acquired orthodoxy. In the great controversy with the Alexandrists he opposed the theory of Pomponazzi that the rational soul is inseparably bound up with the material part of the individual, and hence that the death of the body carries with it the death of the soul. He insisted that the individual soul, as part of absolute intellect, is indestructible, and on the death of the body is merged in the eternal unity.

His principal philosophical works are De immortalitate animi (1518 and 1524); De intellects, et daemonibus ; De infinitate primi motoris quaestio and Opuscida moralia et politica. His numerous commentaries on Aristotle were widely read and frequently reprinted, the best-known edition being one printed at Paris in 1654 in fourteen volumes (including the Opuscida).

NIGDEH (Arab. Nakidah), the chief town of a sanjak of the same name in the Konia vilayet of Asia Minor, situated on the Kaisarieh-Cilician Gates road. It is remarkable for the beauty of its buildings, dating from almost all ages of the Seljuk period. After the fall of the sultanate of Rum (of which it had been one of the principal cities), Nigdeh became independent, and, according to Ibu Batuta, ruinous, and did not pass into Ottoman hands till the time of Mahommed II. It represents no classical town, but, with Bor, has inherited the importance of Tyana,

whose site lies aboutio in. S.W. A Hittite-inscribed monument, , brought perhaps from Tyana, has been found at Nigdeh. The population (20,000) includes a large Greek and a small Armenian community. The Orthodox metropolitan of Iconium resides here.

NIGEL (d. 1 1 69), bishop of Ely, head of the exchequer in the reigns of Henry I. and Henry II., was brought into the exchequer in early life (1130). Soon after his uncle Roger of Salisbury secured him the bishopric of Ely, much to the disgust of the monks. Nigel was at first retained in Stephen's service; but, like his uncle and his brothers, incurred the suspicion of leaning towards the Angevin interest, when Roger of Salisbury and Alexander of Lincoln were arrested by Stephen (January 1130). Nigel attempted to maintain himself in his see by force of arms, but he was forced to fly to the empress at Gloucester He was reconciled to Stephen in 1142 and restored to his see; but he now became involved in a quarrel with the powerful Henry of Winchester. Ranulph, his first treasurer and representative at Ely, had been extortionate and dishonest, and the monks accused Nigel, probably with some justification, of spending the estates and treasures of the see in maintaining knights and gaining court influence. Henry of Winchester, who can have had little sympathy with bishops of Nigel's type, took up their quarrel, and Nigel was forced to go to Rome. Fortunately, both in these quarrels and in all his difficulties with Stephen, he secured the strong and uniform support of the Roman Curia. At the accession of Henry II. (n 54) Nigel was summoned to reorganize the exchequer. He was the only surviving minister of Henry I., and his knowledge of the exchequer business was unrivalled. This was the great work of his life. It is to the work of his son Richard, the

Dialogus de Scaccario, that we are indebted for our knowledge of the procedure of the exchequer as it was left by Nigel. The bishop took little part in politics, except as arj administrator. In 1 1 66 his health was broken by a paralytic seizure. Except for another quarrel with his monks, who accused him of despoiling their church and gained the ear of Pope Adrian, the last part of his life was laborious and uneventful. See Dr Liebermann's Einleitung in den Dialogus de Scaccario; J. H. Round's Geoffrey de Mandeville.

NIGER, GAIUS PESCENNIUS, governor of Syria under the emperor Commodus. On the death of Pertinax (a.d. 193), he was saluted emperor by the troops at Antioch, but unaccount- ably delayed marching on Rome until he learned that Septimius Severus, one of the rival claimants, had assumed the offensive. He then strongly garrisoned Byzantium and the principal towns of Asia Minor, but after his legate Aemilianus had been defeated and slain near Cyzicus he himself was driven from Nicaea and routed near the Cilician Gates. Having failed in an effort to escape towards the Euphrates, he was brought back and put to death in 194.

Aelius Spartianus, Pescennius Niger; Dio Cassius lxxii. 8; lxxiii. 13, H-

NIGER, a great river of West Africa, inferior only to the Congo and Nile among the rivers of the continent, and the only river in Africa which, by means of its tributary the Benue, affords a waterway uninterrupted by rapids, and available for shallow-draught steamers, to the far interior. Rising within 150 m. of the sea in the mountainous zone which marks the N.E. frontiers of Sierra Leone and French Guinea, it traverses the interior plateaus in a vast curve, flowing N.E., E. and S.E., until it finally enters the Gulf of Guinea through an immense delta. Its total length is about 2600 m. About 250 m. from its mouth it is joined by the Benue, coming from the east from the mountainous region of Adamawa. From its mouth to the limit of navigability from the sea the river is in British territory; above that point it flows through French territory.

The source of the Niger lies in 9 5′ N. and io° 47′ W., and the most northerly point of the great bend is about 17° N. The area of the Niger basin, excluding the arid regions with a slope towards the stream, has been calculated by Dr. A. Bludau at 584,000 sq. m. The river is known locally under various names, the most common being Joliba (a Mandigo word meaning

region.

Great River) and Kworra or Quorra. By the last name the Niger was known in its lower reaches before its identity with the upper river was established. The stream considered the chief source of the Niger is called the Tembi. A narrow Thebirth- watershed separates it from the headwaters of the the river. streams flowing south-west through Sierra Leone. The birthplace of the Niger is in a deep ravine 2800 ft. above sea- level. From a moss-covered rock a tiny spring issues and has made a pool below. This little stream is the Tembi, which within a short distance is joined by two other rivulets, the Tamincono and Falico, which have their origin in the same mountainous district. After flowing north for about 100 m., the river turns eastward and receives several tributaries from the south. At its confluence with the Tankisso (a northern tributary), 210 m. from its source, the river has attained dimen- sions sufficient to earn for itself the title Joliba. Taking at this point a decided trend northward, the Niger, 100 m. lower down, at Bamako — the first considerable town on its banks — has a depth of 6 ft. with a breadth of 1300 ft. Seven or eight miles below Bamako the Sotuba rocks mark the end of what may be considered the upper river. From this point the navigable portion of the Niger begins. Thirty miles below Sotuba are the rapids of Tulimandio, but these are navigable when the river is at its highest, namely from July to October. A little lower down is Kulikoro, from which point the bed of the stream for over 1000 m. is fairly free from impediments.

The river here turns more directly to the east and increases in volume and depth. At Sansandig the stream is deep enough to permit of steamers of considerable size plying upon the river. After Sansandig is passed the banks of The the stream become low and the Niger is split up into middle a number of channels. Mopti is at the junction of Niger and the main stream with a large right-hand backwater {£*£ or tributary, the BaniorMahel Balevel, on which is situated the important town of Jenne. The banks of the Niger below Mopti become swampy and treeless, and the first of a series of lakes (Debo) is reached. These lakes are chiefly on the left of the main stream, with which they are connected by channels conveying the water in one direction or the other according to the season. At high water most of these are united into one general inundation. The largest lake, Faguibini, is nearly 70 m. long by 12 m. broad, has high shores and reaches a depth exceeding, in parts, 160 ft. It is not until Kabara, the port of Timbuktu, is reached, a distance of 450 m. from Sansandig, that the labyrinth of lakes, creeks and backwaters ceases. Below Kabara the river reaches its most northerly point. At Bamba it is shut in by steep banks and narrows to 600 to 700 yds., again spreading out some distance down. At Barka (200 m. from Timbuktu) the stream turns

south-east and preserves that direction throughout the remainder of its course. At Tosaye, just before the bend becomes pronounced, the Baror and Chabar rocks reduce the width of the river to less than 500 ft., and at low water the strength of the current is a serious danger to navigation. Below Timbuktu for a con- siderable distance the Niger receives no tributaries; from the north none until the region of the Sahara is passed. In places the desert approaches close to the river on both banks and immense sand dunes fill the horizon.

At Ansongo, 430 m. below Timbuktu, the navigable reach of the middle Niger, in all 1057 m., ends. Four huge flint rocks bar the river at Ansongo and effectually prevent Bussa further navigation except in very small vessels. From rapids Ansongo to Say, some 250 m., the river flows through * > nd several rocky passes, the current attaining great velocity. Throughout this distance the river is a hopeless labyrinth of rocks, islands, reefs and rapids. From Say, where the stream is about 700 yds. in breadth, to Bussa, there is another navigable stretch of water extending 300 m. After the desert region is past the Niger receives the waters of the river Sokoto, a considerable stream flowing from the north- east. Some distance below this confluence are the Bussa rapids, which can only be navigated with considerable difficulty. These

lower river.

rapids — though not such a hindrance to navigation — are of a more dangerous character than any encountered between Ansongo and Say. ” In one pass, some 54 yds. wide, shut in between two large reefs, a good half of the waters of the Niger flings itself over with a tremendous roar ” (Hourst). The rapids extend for 50 m. or more; in a less obstructive form they continue to Rabba, but light-draught steamers ascending the stream during flood season experience little difficulty in reaching Bussa. A little above Rabba the river makes a loop south-west, at the head of the loop being (right bank) Jebba. Here the river is bridged by the railway from Lagos. Sixty miles lower down is the mouth of the (left hand) tributary the Kaduna, a river of some magnitude which gives access to Zungeru, the headquarters of the British administration in Northern Nigeria. The head waters of the Kaduna are not far from Kano. Below the mouth of the Kaduna, on the right bank of the Niger, is Baro, the starting-point of a railway to Kano. In 7 50′ N. 6° 45′ E. the Niger is joined by its great tributary the

Benue. At their confluence the Niger is about three-quarters of a mile broad and the Benue rather more than a mile. The united stream forms a lake-like expansion about 2 m. in width, dotted with islands and sandbanks; the peninsula at the junction is low, swampy, and intersected by numerous channels. On the western bank of the Niger at this point is situated Lokoja (g v.), an important commercial centre. The stream, as far south as Iddah (Ida), a town on the east bank, rushes through a valley cut between the hills, the sandstone cliffs at some places rising 150 ft. high. Between Iddah and Onitsha, 80 m., the banks are lower and the country flatter, and to the south of Onitsha the whole land is laid under water during the annual lh D lta floods- Here may be said to begin the great delta of the Niger, which, extending along the coast for about 120 m., and 14c or 150 m inland, forms one of the most remarkable of al) the swampy regions of Africa. The river breaks up into an intricate network of channels, dividing and subdividing, and intercrossing not only with each other but with the branches of other streams, so that it is exceedingly difficult to say where the Niger delta ends and another river system begins. The Rio Nun is a direct continuation of the line of the undivided river, and is thus the main mouth of the Niger

From the sea the only indication of a river mouth is a break in the dark green mangroves which here universally fringe the coast. The crossing of the bar requires considerable care, and at ebb tide the outward current runs 55 knots per hour. For the first 20 m. (or as far as Sunday Island, the limit of the sea tide in the dry season) dense lines of mangroves 40, 50, or 60 ft in height shut in the channel; then palm and other trees begin to appear, and the widening river has regular banks. East of the Nun the estuaries known as the Brass, Sombrero, New Calabar, Bonny, Opobo (or Imo), &c. (with the exception, perhaps, of the first-named), seem to derive most ot their water from independent streams such as the Orashi, rising in about 6° X., which is, however, linked with the Niger by the Onita Creek in 55° N. Behind the town of Okrika, some 30 m. up the Bonny river, the swampy ground gives place to firm land, partially forest-clad West of the Nun all the estuaries up to the Forcados seem to be true mouths of the great river, while the Benin river, though linked to the others by transverse channels, may be more properly regarded as an independent stream. (See Benin.) In this direction the largest mouth is the Forcados, a noble stream with a safe and relatively deep bar Its banks in its lower course are densely wooded, but the beach is sandy and almost free from marsh and malaria. The mouth is 2 m. wide. It has supplanted the Nun river as the chief channel of communication with the interior. There are 17 to 19 ft of water over the Forcados bar,

as against 13 ft. at the Nun mouth. Moreover the Forcados bar shifts little laterally, and within the bar is a natural harbour with an area of 3 to 4 sq. m. having a depth of 30 ft. at low water spring tides. From the mouth of the Forcados to the main stream is 103 m., with a minimum depth in the dry season of 7 ft. A northern arm affords ocean-going vessels access to Wari and

Sapele. The other western mouths of the Niger have as a ru'e shallow and difficult bars. The delta is the largest in Africa and covers 14.000 sq. m.

The Benue is by far the most important of the affluents of the Niger. The name signifies in the Batta tongue " Mother of Waters." The river rises in Adamawa in about 7 40′ N. and 13° 15′ E., The Benue a little north of the town of Ngaundere, at a height of over 3000 ft. above the sea, being separated by a narrow water parting from one of the headstreams of the Logone, whose waters flow to Lake Chad. In its upper course the Benue is a mountain torrent falling over 2000 ft. in some 150 m. With the Chad system it is connected by the Kebbi or Mayo Kebbi, a right-hand tributary whose confluence is in about 9J° N., 13!° E. The Kebbi, fed by many torrents rising in the eastern versant of the Mandara Hills, issues from the S.W. end of the Tuburi marshes. These marshes occupy an extensive depression in the moderately elevated plateau east of the Mandara Hills, and are cut by io° N., 15 E. _ The central part of the marshes forms a deep lake, whence there is a channel going northward to the Logone and navigable for some months during the year. The Kebbi flows west, and soon after leaving Tuburi passes through a rocky barrier marked by a series of rapids and a fall at Lata of 165 ft. Below these obstructions the Kebbi to its junction with the Benue has a depth of not less than 6 ft. In places, as at Lere and Bifara, it widens into lake-like dimensions.

Below the Kebbi confluence the Benue, now a considerable river, turns from a northerly to a westerly direction and is navigable all the year round by boats drawing not more than 2J ft. For some 40 m. below the confluence the river has an average width of 180 to 200 yds., and flows with a strong steady current, although a broad strip of country on each side is swampy or submerged. It is here joined by the Faro, which, rising in the Adamawa Mountains S.E. of Ngaundere, flows almost due north. About 50 m. below the junction of the Faro is Yola, the capital of Adamawa. It lies on the southern side of the Benue, some 850 m. by river from the sea and at an altitude of 600 ft. Here the width of the stream increases at flood time to 1000 or 1500 yds., and though it narrows at the some- what dangerous rapids of Rumde Gilla to 150 or 180 yds., it soon expands again. About 50 m. below

Yola the Benue receives, on the r'ght bank, the Gongola, which rises in the Bauchi highlands and after a great curve north-east turns southward. It is oyer 300 m. long, and at flood time is navigable for about half of its course. The Benue receives several other tributaries both from the north and the south, but they are not of great importance. It flows onwards to the Niger with comparatively unobstructed current, its valleys marked for the most part by ranges of hills and its banks diversified with forests, villages and cultivated tracts. But though exception- ally free from obstruction by rapids, the river falls very low in the dry season, and for seven to eight months is almost useless for navi- gation. The Benue lies within British territory to a point 3 m. below the mouth of the Faro, in about 13° 8′ E. East of that point the river is in the German colony of Cameroon.

As the Niger and the Benue have different gathering grounds, they are not in flood at the same time. The upper Niger rises in June as the result of the tropical rains, and decreases in pj o0 J and December, i„s breadth at Turella expanding from between fow 2000 and 2500 ft. to not less than if m. The middle seasons- Niger, however, reaches its maximum near Timbuktu only in January; in February and March it sinks slowly above the narrows of Tosaye, and more rapidly below them, the level being kept up by supplies from backwaters and lakes; and by April thc-e is a decrease of about 5 ft. In August the channel near Tim- buktu is again navigable owing to rain in the southern highlands. The Benue reaches its greatest he'ght in August or September, begins to fall in October, falls rapidly in November and slowly in the next three months, and reaches its lowest in March and April, when it is fordable in many places, has no perceptible flow and at the confluence begins to be covered with the water-weed Pistia Stratiotes. The flood rises with great rapidity, and reaches 50, 60, or even 75 ft. above the low-water mark.

The two confluents being so unlike, the united river differs from each under the influence of the other. Here the river is at its lowest in April and May; in June it is subject to great fluctuations; about the middle of August it usually begins to rise; and its maximum is reached in September. In October it sinks, often rapidly. A slight rise in January, known as the yangbe, is occasioned by water from the upper Niger. Between high- and low-water mark the difference is as much as 35 ft.

The geological changes which have taken place in the Niger basin are imperfectly known. The French scientists E._ F. Gautier and R. Chudeau, summing up the evidence available in 1909, set forth the hypothesis that the existing upper Niger Geo/ /ca/ and the existing lower Niger were distinct streams. changes . According to this theory

the upper Niger, somewhat above where Timbuktu now stands, went north and north-west and emptied into the Juf, which in the beginning of the quaternary age was a salt-water lake, the remnant of an arm of the sea which in the tertiary age covered the northern Sudan and southern Sahara as far east as Bilma. Lake Fagubini is regarded as a remnant of the

ancient course of the upper river. When the upper Niger had this direction, the Wadi Taffassassent, now a dried-up river of the central Sahara, which rose in the Ahaggar mountains, is believed to have formed the upper course of the existing lower Niger. While the upper and lower parts of the Niger have all the appearance of ancient streams, the middle Niger is the result of a “recent” capture; ” it has no past, it scarcely has a present ” (see R. Chudeau, Sahara soudanais, Paris, 1909).

Vague ideas of the existence of the river were possessed by the ancients. The great river flowing eastward reached by the

Nasamonians as reported by Herodotus can be no History^ other than the Niger. Pliny mentions a river Nigris, pioratioa. of the same nature with the Nile, separating Africa

and Ethiopia, and forming the boundary of Gaetulia; and it is not improbable that this is the modern Niger. In Ptolemy, too, appears along with Gir (possibly the Shari) a certain Nigir (Nryeip) as one of the largest rivers of the interior; but so vague is his description that it is impossible definitely to identify it with the Niger. 1 Arabian geographers, such as Ibn Batuta. who were acquainted with the middle course of the river, called it the Nile of the Negroes. At the same time contradictory opinions were held as to the course of the stream. It was supposed by some geographers to run west, an opinion probably first stated by Idrisi in the 12th century. Idrisi gave the Nile of Egypt and the Nile of the Negroes a common source in the Mountain of the Moon. Fountains from the mountain formed two lakes, whence issued streams which united in a very large lake. From this third lake issued two rivers — the Nile of Egypt flowing north, and that of the Negroes flowing west (see R. Dozy and M. J. de Goeje’s Edrisi, Leiden, 1866: Premier Climat, 1st 4 sections). From Idrisi’s description it would appear that he regarded the Shari, Lake Chad, the Benue, Niger and Senegal as one great river which emptied into the

Atlantic. 2 That the Niger flowed west and reached the ocean was also stated by Leo Africanus. The belief that a western branch of the Nile emptied itself into the Atlantic was held by Prince Henry of Portugal, who instructed the navigators he despatched to Guinea to look for the mouth of the river, and when in 1445 they entered the estuary of the Senegal the Portuguese were convinced that they had discovered the Nile of the Negroes (see Azurara's Discovery and Conquest of Guinea, Beazley and Prestage's translation, vol. ii., London, 1899, chaps. 1.x. and lxi., and introduction and notes). The Senegal being proved an independent river and the eastward flow of the Niger assumed, the theory that it ran into the Nile was revived, and almost to the very year in which the course of the river was actually demonstrated geographers and travellers, such as J. G. Jackson in his Empire of Morocco, first published in 1800, fought zealously for the identity of the Nile of the Negroes with the river of Egypt. The highest scientific authority of the day, Major James Rennell, believed, however, that the Niger ended, by evaporation, in the country of " Wangara " — a region located by him, through a misreading of Idrisi, far too much

1 Sir Rufane Donkin in a curious and learned work, A Dissertation on . . . the Niger (1829), made the Niger join the Gir, which last stream he calls the Nile of Bornu. The united river ran north, disappeared underground in the Sahara and reached the Mediter- ranean at " the quicksands of the gulph of Sidra." Donkin believed that the desert, advancing eastwards, would overwhelm the Egyptian Nile also in its lower course. " The Delta," he exclaims, " shall become a plashy quicksand, a second Syrtis ! and the Nile shall cease to exist from the Lower Cataract downwards."

2 The hydrography of northern central Africa as now known largely explains the medieval belief in a connexion between the western rivers and the Egyptian Nile. Leaving out of account the Welle-Ubangi (and Idrisi's description of the two Niles may infer a knowledge of that stream, which was supposed by Schweinfurth to form part of the Chad system), there is an almost continuous water- way from the mouth of the Senegal to that of the Nile. The upper waters of the Bakoy branch of the Senegal and those of the navigable Niger are less than 40 m. apart; the Niger communicates directly through the Benue, Lake Tuburi and the Logone with the Shari; the easternmost affluents of the Shari and the most western tribu- taries of the Bahr el Ghazel affluent of the Nile are within 20 m. of one another. With but three short porterages a boat could be navigated the whole of this distance. Moreover, from the confluence of the Ghazel the Nile is navigable (at high water) the entire distance to the Mediterranean. (See also Shari.)

to the east, between 15° and 20° E. (see Rennell ‘s map in Hornemann’s Travels, 1802). To Rennell the Benue was an east- flowing continuation of the Niger. 3 The imagined existence of mountains — called Kong in the west and Komri (Lunar) in the east — stretching in a high and unbroken chain across Africa about 10° N. long prevented geographers from thinking of a possible southern bend to the Niger.

That the vast network of rivers on the Guinea coast, of which the Nun was the chief, known as the Oil Rivers, formed the delta of the Niger does not appear to have been suspected before the beginning of the 19th century. Consequently it was from the direction of its source that the river v/as first explored in modern times. In 1795 Mungo Park (q.v.) was sent out by the African Association, and was the first European to see and describe the upper river. Park landed at the Gambia, and struck the Niger near Segu (a town some distance above Sansandig) on the 20th of July 1796; where he beheld it ” glittering in the morning sun as broad as the Thames at Westminster and flowing slowly to the eastward ” (Travels, 1st ed. p. 194). He descended the river some distance, and on his return journey went up stream as far as Bamako. In 1805 Park returned to Africa for the purpose of descending the Niger to its mouth. He started as before from the Gambia, reached the Niger, sailed down the river past Timbuktu, and on the eve of the successful accomplish- ment of his undertaking lost his life during an attack on his boat by the natives at Bussa (Nov. or Dec. 1805). Park held to the opinion that the Niger and Congo were one river, though in 1802 C. G. Reichard, a German geographer, had suggested that the Rio Nun was the mouth of the Niger. 4 Owing to Park’s death the results of his second journey were lost, and the work had to be begun afresh. In 1822 Major A. G. Laing (who had reached Timbuktu by way of Tripoli) obtained some accurate information concerning the sources of the river, and in 1828 the French explorer Rene Caillie went by boat from Jenne to the port of Timbuktu. In 1826 Bussa was reached from Benin by Hugh Clapperton, and his servant Richard Lander. On Clapperton’s death Richard Lander and his brother John led in 1830 an expedition which went overland from Badagry to the Niger. Canoeing down the river from Yawri — 60 m. above Bussa — to the mouth of the Rio Nun they finally settled the doubt as to the lower course of the stream. In 1832 Macgregor Laird established the African Steamship Company, and Richard Lander and R. A. K. Oldfield (as members of its first expedition) ascended the Niger to Rabba, and the Benue as far as Dagbo (80 m.). In 1841 an expedition, consisting of three steamers of the British navy, under Captain (afterwards Admiral) H. D. Trotter, went up to Egga (Egam), but was forced to return owing to sickness and mortality.

Heinrich Barth (1851-1854) made known to Europe the course of the river from Timbuktu to Say. Barth sailed down from Saraiyamo (situated on a tributary stream south-west of Timbukutu) to Kabara; then skirted the left bank to a small town called Bornu in 16° N., and the right thence to Say. In 1880-1881 the German E. R. Flegel ascended the Niger to Gomba opposite the confluence of the Sokoto river with the main stream, and about 70 m. below Earth's southmost point. Zweifel and Moustier, sent out by M. Verminck, a Marseilles merchant, discovered (1879) the sources of the Falico, &c, and in 1885 the Tembi source was visited by Captain Brouet, a French officer. Indeed the additions to the knowledge pf the Niger during the last two decades of the 19th century were largely the work of French officers engaged in the extension of French influence throughout the western Sudan. From 1880 onwards Colonel (afterward General) Gallieni took a leading part in the operations on the upper river, wherein 1883 a small gunboat, the Niger, was launched for the protection of the newly established French posts. In 1885 a voyage was made by Captain Delanneau

3 In 1 8 16 James McQueen correctly divined that there was a great west-flowing tributary (the Benue) to the Niger, and that after its confluence the river ran south to the Atlantic. See his View of Northern Central Africa (1821) and Geographical Survey of Africa

(1840).

4 See EphSmerides geographiques, vol. xii. (Weimar, Aug. 1803).

past the ruins of Sansandig, as far as Diafarabe. In 1887 the gunboat made a more extended voyage, reaching the port of Timbuktu, and correcting the mapping of the river down to that point. In 1894-1895 attention was directed to the middle and lower Niger, to which several expeditions started from the coast of Guinea. A still more important expedition was that of Lieutenant Hourst, who, starting from Timbuktu in January 1896, navigated the Niger from that point to its mouth, executing a careful survey of the river and the various obstructions to navigation. A voyage made in 1897 by Lieutenant de Chevigne showed that at low water the section between Timbuktu and Ansongo presents great difficulties, but the voyage from Timbuktu to Say was again successfully accomplished in 1899 by Captain Granderye. In 1901 Captain E. Lenfant ascended the river with a

flotilla from its mouth to Say, and he demon- strated the ” normal practicability ” of the route, despite the Bussa rapids. The delta of the Niger has been partially surveyed since it became British territory by various ship captains, officials of the Royal Niger Company and others, including Sir Harry Johnston, sometime British consul for the Oil Rivers.

In addition to the main stream, the Niger basin was made known by exploration during the last quarter of the 19th century and the early years of the 20th. The journeys of the German traveller G. A. Krause (north from the Gold Coast, 1886-18S7) and the French Captain Binger (Senegal to Ivory Coast, 1887- 18S9) first defined its southern limits by revealing the unexpected northward extension of the basins of the Guinea coast streams, especially the Volta and Komoe, a fact which explained the absence of important tributaries within the Niger bend. This was crossed for the first time, in its fullest extent, by Colonel P. L. Monteil (French) in 1 890-1 891. At the eastern end of the basin much light has been thrown on the system of the Benue. In 185 1 Barth crossed the Benue at its junction with the Faro, but the region of its sources was first explored by Flegel (1882-1884), who traversed the whole southern basin of the river and reached Ngaundeie. Other German travellers added to the knowledge of the southern tributaries, the Tarabba, Donga and others, which in the rains bring down a large body of water from the highlands of southern Adamawa. British travellers who have done work in the same region are Sir W. Wallace, L. H. Moseley, W. P. Hewby, P. A. Talbot and Captain Claud Alexander. The last-named two were members of an expedition led by Lieut. Boyd-Alexander, who himself crossed Africa from the Niger to the Nile. Messrs Talbot and Claud Alexander surveyed the country between Ibi on the Benue and Lake Chad, mapping (1004) a considerable part of the Gongola. 1 In 1854 the Benue itself was ascended 400 m. by the ” Pleiad ” expedition, and in 1889 to 135° E., and the Kebbi to Bifara by Major (afterwards Sir Claude) Macdonald, further progress towards the Tuburi marsh being prevented by the shallowness of the water. The upper basin of the Benue was also traversed by the French expeditions of Mizon (1892) and Maistre (1892-1893), the latter passing to the south of the Tuburi marsh without definitely settling the hydrographical question connected with it. This was accomplished by Captain Lenfant in 1903. He ascended the Kebbi and discovered the Lata Fall, continuing up the river to its point of issue from Tuburi. Crossing the marshes he found and navigated the narrow river leading to the Logone. Save for the porterage round the Lata Fall the whole journey from the mouth oi the Niger to Lake Chad was made by water. The Benue in the

neighbourhood of Yola was mapped in 1903-1904 by an Anglo-German boundary commission.

From 1904 onwards the French undertook works on the Niger between Bamako — whence there is railway communication with the Senegal — and Ansongo with a view to deepening the channel and removing obstructions to navigation. In 1910 the British began dredging with the object of obtaining from the mouth of the river to Baro a minimum depth of 6 ft. of water.

1 Captain Claud Alexander died of fever in northern Nigeria on the 30th of November 1904. His brother, Lieut. Boyd Alexander, in a subsequent expedition across Africa was murdered in Wadai on the 2nd of April 1910.

Authorities. — Mungo Park, Travels in the Interior Districts of Africa . . . in the Years 1795, 1796 and, 1797 (London, 1799). A geographical appendix by Major James Rennell summarizes the information then available about the Niger. R. and J. Lander, Journal of an Expedition to explore the Course and Termination of the Niger … (3 vols. London, 1833); H. Barth, Travels and Discoveries in North and Central Africa . . ., vols. iv. and v. (London, 1857-1858); Gen. J. S. Gallieni, Mission d' exploration du Haut Niger . . , (Paris, 1885) ; E. Caron, De Saint Louis au Port de Timbouktou; Voyage d'une cannoniere francaise (Paris, 1891); M. Hourst, Sur le Niger et au pays des Touaregs (Paris, 1898), English translation, French Enterprise in Africa . . . Exploration of the Niger (London, 1898). The political references in this book are marked by jealous hostility to the British. Col. J. K. Trotter, The Niger Sources . . . (London, 1897) ; Sir H. H. Johnston, " The Niger Delta," Proc. R.G.S. (December 1888); Sir F. Lugard, "An Ex- pedition to Borgu on the Niger," Geo. Jnl. (September 1895); E. Lenfant, Le Niger; voie ouverte a notre empire africain (Paris, 1903), chiefly a demonstration that the Bussa rapids are not an absolute bar to navigation.

The foregoing books deal almost entirely with the Niger. For the Benue see, besides Barth's Travels, A. F. Mockler Ferryman, Up the Niger; Narrative of Major Claude Macdonald' s Mission to the Niger and Benue Rivers . . . (London, 1892); L. Mizon, " Itineraire de la source de la Benoue au confluent des rivieres Kadei et Mambere" and other papers in the Bull. Soc. Geog. Paris for 1895 and 1896; C. Maistre, A travers I'Afrique central du Congo au Niger (Paris, 1895) ; E. Lenfant, La Grande Route du Cho,d (Paris, 1905) ; Col. L. Jackson, " The Anglo-German Boundary Expedition in Nigeria," Geo. Jnl. (July 1905) ; P. A. Talbot, " Survey Work by the Alexander Gosling

Expedition: Northern Nigeria 1 904-1 905, ” idem (February 1906); Boyd Alexander, From the Niger to the Nile, vol. i. (London, 1907). The British Blue Books, Correspondence relating to Railway Construction in Nigeria (1905) and Further Correspondence, &c. (1909), contain information about the navigability of the lower Niger and of the Kaduna. The best maps are those published by the French and British War Offices; an Atlas du cours du Niger de Tombouctou aux rapides de Boussa in 50 sheets on the scale of 1 : 50,000, by Lieut. Hourst and others, was published in Paris in 1899. (F. R. C.)

NIGERIA, a British protectorate in West Africa occupying the lower basin of the Niger and the country between that river and Lake Chad, including the Fula empire {i.e. the Hausa States) and the greater part of Bornu. It embraces most of the territory in the square formed by the meridians of 3° and 14 E. and the parallels of 4° and 14° N., and has an area of about 338,000 sq. m. The protectorate is bounded W., N. and N. E. by French possessions (Dahomey, Upper Senegal and Niger colony, and Chad territory), S.E. by the German colony of Cameroon and S. by the Atlantic.

Physical Features. — The country is divisible, broadly, into three zones running parallel with the coast: (1) the delta, (2) forest region, giving place to (3) the plateau region. The coast line, some 500 m. in length, extends along the Gulf of Guinea from 2° 46′ 55″ E. to 8° 45′ E. ending at the Rio del Rey, the point where the great bend eastwards of the continent ceases and the land turns south. The Niger (q.v.), which enters the protectorate at its N.W. corner and flows thence S.E. to the Atlantic, receives, 250 m. from the sea, the Benue, which, rising in the mountains of Adamawa south of Lake Chad, flows west across the plateau. Into the huge delta of the Niger several other rivers (the ” Oil Rivers “) empty themselves; the chief being, on the west, the Benin (q.v.), and on the east the Brass. East of the Niger delta is that formed by the Imo or Opobo, Bonny and other streams, and still farther east is the Calabar estuary, mainly formed by the Cross river (q.v.). West of the Niger delta are several independent streams discharging into lagoons, which here line the coast. The most westerly of these streams, the Ogun, enters the Lagos lagoon, which is connected by navigable waterways with the Niger (see Lagos).

The delta region is swampy, and forms, for a distance of from 40 to 70 m. inland, a network of interlacing creeks and broad sluggish channels fringed with monotonous mangrove forests. The main rivers are navigable for ocean-going steamers for a distance of from 15 to 40 m. from their mouths. Beyond the delta firm ground takes the place of mud and the mangroves disappear. The land rises gradually at first,

becoming, however, in many districts very hilly, and is covered with dense forests. The Niger at its confluence with the Benue is not more than 250 ft. above the sea. North of this point are hills forming the walls of the plateau which extends over the centre of the

protectorate and is part of the great plateau of North Africa. This plateau, broken only by the valleys of the rivers, does not attain an elevation approaching that of the plateaus of the southern half of the continent, the culminating point (apart from particular mountain districts), situated in about io° N., reaching a height of 3000 ft. only. The valleys of the Niger and Benue, especially the latter, are very much lower, the town of Yola on the Benue, some 400 m. inland, lying at an altitude of little over 600 ft. The “surface is generally undulating, with isolated ” table mountains ” of granite and sandstone often rising abruptly from the plain. It is clothed largely with thin forest, but becomes more open to the north until, near the French frontier, the arid steppes bordering the Sahara are reached. Much of the country north of Zaria (11° N.) is covered with heavy loose sand. The most mountainous districts are northern Bauchi (a little north of 10°), where heights of 600c to 7000 ft. occur; parts of Muri, along the north bank of the Benue; and the southern border of the Benue basin, where the hills (consisting of ironstone, quartz and granite) appear rich in minerals. The mountainous area covers some 50,000 sq. m. On the east the plateau sinks to the plains of Bornu (q.v.), which extend to Lake Chad. Tributaries of the Niger traverse the western portion of the country, the most noteworthy being the Gulbin Kebbi or Sokoto river and the Kaduna, which flows

through a valley not more than 500 ft. above the sea. The north-eastern part of the country drains to Lake Chad by the Waube or Yo, an intermittent stream, which in its lower course forms the Anglo-French boundary. The western portion of Lake Chad {q.v.) belongs to the protectorate, which contains no other large lake. The water parting between the Chad and Niger systems runs N.W. and S.E. from about Katsena in 13 N. to the Bauchi hills. Of the tributaries of the Benue the most important is the Gongola. During the dry season most of the small rivers cease running and the water in the larger streams is low. The great rise of the Niger within the pro- tectorate takes place in August and September and there is a second rise about the beginning

of the year.

Geology. — The fundamental formation consists of crystalline rocks. From the edge of the coast belt to near the confluence of the Benue and Niger they are overlain by unfossil.‘iferous sandstones, lying undisturbed and possibly of the age of the sandstones of the Congo basin. Limestones, with fossils indicating a Tertiary age, have been found near Sokoto. Superficial deposits occupy the coast belt. Recent alluvium and a thick deposit of blaˆk earth border the upper reaches of the Benue and cover wide areas around Lake Chad.

Climate.— The country lies wholly within the tropics. The climate of the coast-lands is mo’ist and hot, and extremely unhealthy, malarial fever being prevalent and deadly. The annual rainfall in the delta regions varies between 100 and 140 or more inches ; the mean temperature is over 8o° F. The heat does not vary greatly, rarely

sinking below 70 , and not often exceeding ioo° in the shade. The direction of the prevailing wind is S.W. Though unfavourable for the permanent residence of white men, the interior is much less deadly than the coast-lands. The northern part is a land of tornadoes. At the close of the dry season (end of February) cyclones from the N.E., usually accompanied by rain and thunder, burst over the land. They increase in frequency until they merge in the heavy rains which last from July to October. Then the ” hamattan,” or hot, dry wind from the Sahara, begins and brings with it clouds of impalpable dust. At this period the nights are cold, and in the north January and February are cold even in the day-time, while frosts are ex- perienced in the neighbourhood of Lake Chad. The temperature in the central part of the protectorate is much the same average as at the coast, but the range is far greater, varying from a shade minimum of 59 to a shade maximum of 107 . 1 The rainfall is much scantier on the plateaus than in the maritime regions, averaging in Northern Nigeria about 50 in. a year. There is evidence of the increasing desiccation of the whole country north of the forest belt. This desiccation is partly attributable to the unrestricted felling of wood practised for many centuries by the inhabitants. Along the northern border of the protectorate this has resulted in the encroachment of the Saharan desert over once fertile districts.

The natives of the northern regions do not suffer to any extent from

fever unless they move to a part of the country some distance from their home. Leprosy is common, especially in the inland towns ; while ophthalmia is prevalent in the north, especially among the poorer classes, who are compelled to expose themselves to the blinding dust from the deserts and the excessive glare of the sun reflected from the burning sand.

Fauna and Flora. — The animals of Nigeria include the elephant, lion, leopard, giraffe, hyena, West-African buffalo, many kinds of antelope and gazelle and smaller game. Monkeys are numerous in the forests, and snakes are common. The camel is found in the northern regions bordering the Sahara. In the rivers are rhinoceros, hippopotamus and crocodile. The manatus is also found. The birds include the ostrich, marabout, vultures, kites, hawks, ground horn- bill, great bustard, guinea fowl, partridge, lesser bustard, quail, snipe, duck, widgeon, teal, geese of various kinds, paraquets, doves, blue, bronze and green pigeons, and many others. Domestic animals include the horse and donkey in the plateaus, but baggage animals are rare in the coast-lands, where the tsetse fly is found. Mosquitoes are also abundant throughout the delta. Herds of cattle and flocks of sheep and goats are numerous throughout the country.

The mangrove is the characteristic tree of the swamps. North of the swamps the oil palm (Elaeis guineensis) flourishes abundantly. It is common as far as about 7 N. Rubber vines, mahogany, ebony and many valuable timber trees are found in the forest zone. Other trees, found chiefly on the plateaus, are the baobab, the shea-butter tree, the locust tree, gambier, palms, including the date and dum palm (Hyphaene), the tamarind, and, in the arid regions, the acacia and mimosa.

Inhabitants. — The population of Nigeria is estimated at 15,000,000. The Europeans (mostly British) number about a thousand, and are civil servants, soldiers, traders or missionaries. In the delta district and the forest zone the inhabitants are typical negroes. Besides the people of Benin, the coast tribes include the Jekri, living on the lower part of the Benin river and akin to the Yoruba, the Ijos, living in the delta east of the main mouth of the Niger, and the Ibos, occupying a wide tract of country just above the delta and extending for 100 m. east from the Niger to the Cross river. South of the Ibos live the Aros, a tribe of relatively great intelligence, who dominated many of the surrounding tribes and possessed an oracle or ju-ju of reputed great power. On the middle Cross river live the Akuna-kunas, an agricultural race, and in the Calabar region are the Efiks, Ibibios and Kwas. All these tribes are fetish worshippers, though Christian and Moslem missionaries have

made numerous converts. The Efiks, a coast tribe which has come much into contact with white men, have adopted several European customs, and educated Efiks are employed in government service. The great secret society called Egbo (q.v.) is an Efik institution. Each tribe has a different ju-ju, and each speaks a separate language or dialect, the most widely diffused tongues being the Ibo and Efik, which have been reduced to writing. In general little clothing is worn, but none of the tribes go absolutely nude. In colour the majority are dark chocolate, others are coal-black (a tint much admired by the nativfcj themselves) or dark yellow-brown. Cannibalism, human sacrifices and other revolting practices common to the tribes, are being gradually stamped out under British control.

1 Returns at Zungeru for 1903.

Trial by ordeal and domestic slavery are still among the recog- nized institutions.

In the northern parts of Nigeria the inhabitants are of more mixed blood, the negro substratum having been to a great extent driven out by the northern races of the continent. The most important race in Northern Nigeria is that of the Hausa (q.v.) , among whom the superior classes adopted Mahommedanism in the 13th and 14th centuries. While the lower classes remained pagan, a fairly civilized system of administration, with an efficient judicial and fiscal organization, was established in the Hausa territories. The Hausa are keen traders and make ex- cellent soldiers.

At the beginning of the 19th century the Hausa territories were conquered by another dominant Mahommedan race, the Fula (q.v.), who form a separate caste of cattle-rearers. Arab merchants are settled in some of the larger Hausa towns.

In general the people living in the river valleys have been unaffected by Moslem propaganda either in blood or religion. Thus along the banks of the Niger, Benue and other streams, the inhabitants are negro and pagans, and generally of a purely savage though often rather fine type. Of these the Munshi, who inhabit the district nearest the junction of the Benue with the Niger, were long noted for their intractability and hostility to strangers, whom they attacked with poisoned arrows. The Yoraghums, their neighbours, were cannibals. Nearer Yola live the Battas, who also had a bad reputation. These tribes, under British influence, are turning to trade and agricultural pursuits. In the central hilly region of Kachia are other pagan tribes. They wear no clothes and their bodies are covered with hair. South of

the Benue, near the Niger confluence, dwell the savage and warlike Okpotos, Bassas and other tribes. In the districts of Illorin and Borgu, west of the Niger, the inhabit- ants are also negroes and pagan, but of a more advanced type than the tribes of the river valleys. To attempt any complete list of the tribes inhabiting Northern Nigeria would be vain. In the one province of Bauchi as many as sixty native languages are spoken.

In Bornu (q.v.) the population consists of (1) Berberi or Kanuri, the ruling race, containing a mixture of Berber and negro blood, with many lesser indigenous tribes; (2) so-called Arabs, and (3) Fula. The country to the back of Lagos is largely inhabited by Yorubas (q.v.), and the people of Borgu according to some native traditions claim to have had a Coptic origin.

Towns. — A large proportion of the population dwells in towns. The chief ports are Lagos (q.v.), capital of Southern Nigeria, with a population of about 50,000; Calabar (q.v.), pop. about 15,000, known as Old Calabar and Duke Town, on the Calabar river; Opobo, Bonny Town and Brass Town, all on the rivers of the same name. Brass Town contains a fine church, the gift of a native chief. These places are east of the Nun or main mouth of the Niger, where, on the western bank, is Akassa. Here are important engineering works and a slip for repairing ships. Further west at the Forcados mouth of the Niger is a town of the same name, which is the principal port of entry for the river. Benin (q.v.), about 60 m. inland from the mouth of the Benin river, and Bende, about 50 m. N.W. of Calabar, were noted ju-ju towns and have large populations. Wari and Sapele are towns in the Benin district. Owo, some 50 m. N. of Benin city, is an important trade centre for the Yoruba country, in which are the large cities of Abeokuta, Ibadan and Illorin, all separately noticed. On the Niger at the head of the delta are Asaba (west bank) and Onitsha (east bank); Iddah (Ida), in the palm-oil zone; Lokoja on the west bank opposite the confluence with the Benue, and the headquarters of the protectorate's military force; Baro, on the east bank, 70 m. above Lokoja, the river terminus of the Northern Nigeria railway; Egga, Mureji (at the Kaduna confluence), Jebba and Bussa (q.v.) . The administrative headquarters of Northern Nigeria are at Zungeru, on the Kaduna river, in 6° 09′ 40″ E., 9° 48′ 32″ N.

Apart from the sea and river ports and the towns in Yorubaland, the chief centres of population are in the open plains east of the Niger. They are the capitals of various states founded by the Hausa. Of these cities the most important is Kano (q.v.), the great emporium of trade for the central Sudan, where Tuareg and Arab from the north meet

merchants from the Niger, Lake Chad and the far southern regions. It is situated in 12 N. and 8° 32′ E. Some 220 m. W.N.W. of Kano is Sokoto, on a tributary of the Niger of the same name. Sokoto is the religious and political centre of the Fula. Next in importance among the Hausa towns are Bauchi (or Yakoba), pop. over 50,000, 140 m. S.E. of Kano; Zaria (q.v.), pop.

about 60,000, 82 m. S.SW. of Kano; Katsena {q.v.), 84 m. N.W. of Kano; Hadeija, near the N. eastern frontier; Gando,6o m. S.W. of Sokoto; Bida (q.v.), 25 m. N.W. of Egga on the Niger; and Yola (q.v.) on the Benue near the German frontier. Jegga, 85 m. S.W. of Sokoto, is an important entrepot for tiade from the hinterland of the Guinea coast and the Hausa states. The chief towns of Bornu are Kuka (q.v.) on Lake Chad, and Maidugari, some 70 m. S.W. of that lake. Most of these towns are capitals of provinces and resi- dences of native princes subordinate to the British administration. They are nearly all surrounded by strong mud walls and outer dry moats. Their interior is divided into a series of compounds, each entered through a flat-roofed audience chamber. Inside are the beehive-shaped huts of the household. The gateways are strongly fortified. In addition to the towns mentioned there are many others containing populations of from 10,000 to 20,000, the bulk of the inhabitants of the Hausa countries being town dwellers.

Communications. — The rivers are the great highways of communication, but, in consequence of the lowness of the water between October and May, navigation is then only possible for shallow draught stern-wheel steamers and launches. From the Forcados mouth of the Niger steamers can ascend the main stream as far as Jebba, a distance of 530 m. and, at some risk, to Fort Goldie, 30 m. farther up at the foot of the Bussa rapids. Steamers can also ascend the Benue to Yola, 480 m., above the confluence of that river with the Niger at Lokoja. It is also possible by this route to proceed by small boat via the Shari system to Lake Chad. The Kaduna from its confluence with the Niger can be ascended by steamer 50 m. to Barijuko, which is 22 m. by rail from Zungeru. The Gongola is navigable at high water for 130 m. from its junction with the Benue. In the delta region every place of importance is easily reached by river steamers, and there is a regular service between Forcados and Lagos by the lagoons. The Cross river is navigable 240 m. up to and beyond the frontier of Cameroon.

A 3 ft. 6 in. gauge railway from the port of Lagos to Ibadan was completed in 1900, the distance by rail being 123 m. Onlv about half that distance intervenes between Ibadan and the sea. This line was, during 1906-1910, extended via Oshogbo, Illorin and Jebba to Zungeru, whence it is continued to She, 40 m. E. of Zungeru and about 450 m. from Lagos, where a junction is effected with the Baro-Kano line. A small light surface line 22 m. long, 2 ft. 6 in. gauge was built (1901-1902)111 Northern Nigeria between Barijuko on theKaduna and the capital, Zungeru, and proved most successful and lucrative. In 1907'the construction was begun of a 3 ft. 6 in. railway from Baro on the Niger via Bida and Zaria to Kano — a distance of about 400 m. Good roads connect some of the great Hausa cities, and Kano and Kuka are starting-points for caravans across the Sahara to the Mediterranean. There are also old established caravan routes from Kano to Ashanti and neighbouring countries.

Regular communication is maintained with Europe by steamers running between Liverpool and Forcados, Bonny and Calabar, the steamers calling at other West African ports en route. The time occupied between Liverpool and Forcados is about seventeen days. Other steamers ply between the ports named (and others in the protectorate) and London and Hamburg. There is telegraphic communication between Brass and Bonny and Europe by submarine cable, and land lines from Calabar to Lagos and from Lagos to Jebba, Lokoja, Zungeru, Kano, &c, a connexion being also effected with the telegraph system of French West Africa.

Agriculture. — The natives of the coast region cultivate yams and other food plants, 'but in that district agriculture proper scarcely exists, the fruit of the oil-palm supplyi an easy means of obtaining almost everything that the natives require. In the plains of the north, inhabited by Hausa and by agricultural pagan tribes, and in the fertile river valleys, agriculture is regularly carried on. Rice and wheat are cultivated in many parts, though the staple food is guinea corn. Sweet potatoes, ground nuts, yams, onions and other vege- tables are largely grown. Of fruits, dates, pomegranates, citrons and bananas abound in certain areas. The shea-butter tree supplies an excellent oil for lamps, and also for cooking, though it is only used by the poorer classes. The most important vegetable products are cotton and indigo, which are universally grown. Tobacco and kola nuts are also grown.

Mineral Products. — Tin ore of excellent quality is found in the province of Bauchi, alkali salts are abundant in Kano province, iron ore and red and yellow ochres are found in Kontagora and other provinces, kaolin (china clay) and limestone in the west central

regions. Silver and lead have been found in the Benue area. 1

Trade. — Throughout Nigeria local trade is active and has shown rapid increase under British rule. Its further development will be fostered by the improvement of communications which is taking place. Export trade in the delta and forest regions is almost entirely confined to ” jungle produce,” the most important articles being palm oil and palm kernel. Rubber, ebony and other timber, cocoa and gum copal, come next in importance. Cotton is also grown for export. The quantity of palm oil exported annually exceeds 12.000,000 gallons, and is worth over £600,000. Of palm kernels

1 See Colonial Office Reports, Northern Nigeria Mineral Survey 1906-1907; Southern Nigeria Mineral Survey 1905-1907 (Miscellaneous, Nos. 59, 67, 68).

50,000 to 70,000 tons are shipped yearly, with an average value of £500,000 a year. The principal imports are cotton goods (nearly all from the United Kingdom), and in the southern region spirits — gin and geneva — almost wholly from Holland and Germany, salt, rice and other provisions, tobacco, hardware, cutlery and building material, &c, mostly from the United Kingdom. The value of the trade (imports and exports) of Southern Nigeria (exclusive of Lagos) increased from £1,566,000 in 1894-1895 to £3,464,000 in 1905. In 1906 the total trade, inclusive of Lagos, was valued at £6,299,000 — imports, £3,148,000; exports, £3,151,000.

In Northern Nigeria up to the moment of the British occupation the foreign trade was chiefly in the hands of Tripoli Arabs whose caravans crossed the desert at great risk and expense, and carried to the markets of Kuka and Kano tea, sugar and other European goods, taking away the skins and feathers which constituted the principal articles of export to the Mediterranean coast. There was also a very considerable caravan trade in native goods which the industrious Hausa population carried for great distances through the western and central states of the Sudan. The principal articles of this trade are salt, kola nuts, ivory, leather, sodium carbonates and spices. The centre of the cloth manufacture is Kano. The cloth is made of the cotton grown in the country, woven on small hand- looms and dyed either with indigo or with a magenta dye obtained from the bark of a tree. If the Hausa history, which exists in written form, be correct, the manufacture of this cloth has been carried on in Kano since the 9th century. Kano and the district around it clothes half the population of the Sudan. The kola nut, chewed by almost every native of the country, is brought from west of the Niger, traders, from Ashanti,

Accra and Yorubaland frequenting the markets of Jegga. Salt and " potash " are imported from Absen in the Sahara; and ivory, ostrich feathers and leather goods are exported to Tripoli. The principal exports to Great Britain have come hitherto from the forest regions, and are of the same class as the forest products of the south. Rubber constitutes at present the most important export. The cultivation of cotton is however indigenous to the country. Inquiries made under the auspices of the British Cotton Growing Association have led to the conclusion that Northern Nigeria offers the most promising field contained within the empire for the growth of cotton required to render Lancashire looms independent of foreign supplies. Steps have been taken to stimulate the native industry, and it is hoped that cotton may take the place in Northern Nigeria which palm oil and kernels occupy in the coast zone. Any great expansion in the cotton trade is however dependent on the development of cheap and efficient means of transport — hence the importance, commercially, of the Baro-Kano railway, with its base on the navigable Niger. With the increase of transport facilities it is probable that the trade with the Mediterranean coasts will also be diverted to the south, and profit- able minor branches of trade would be formed in leather, ostrich feathers, gums, fibres, &c. The imports from Great Britain, which come via Forcados, are mostly cotton goods, provisions and hard- ware. The importation of spirits is prohibited north of 7° N.

Currency and Banking. — The legal currency, and that in general use, is British sterling. There is a subsidiary coinage (introduced in 1908) consisting of a nickel penny and a nickel tenth of a penny (the last-named was first coined in aluminium, but this metal proved unsuitable and was withdrawn). Cowries (1000 = 3d.) are still occasionally employed, and on the coast, accounts are sometimes kept in gallons of palm oil. Banking is in the hands of the Bank of British West Africa and the Bank of Nigeria. There is also a government savings bank.

History.

Of the early history of the races inhabiting the coast lands little is known. The Beni appear to have been the most powerful race at the time of the discovery of the coast by the Portuguese in the 15th century, and the kings of Benin in the 17th century ruled a large part of the south-western portion of the existing British protectorate (see Benin). The Benin influence does not seem to have reached east of the Forcados mouth of the Niger. In the greater part of the delta region each town owned a different chief and there was no one dominant tribe. Among these people, who occupied a low position even among

the de- generate coast negroes, and who were constantly raided by the more virile tribes of the interior, trading stations were established by the Portuguese, and later on by other Europeans, British traders appearing as early as the 17th century. There was no assertion of political rights by the white men, who were largely at the mercy of the natives, and who rarely ventured far from their ships or the ” factories ” established on the various rivers and estuaries.

By the end of the 18th century British enterprise had almost entirely displaced that of other nations on the Niger coast. But the principal trade of all Europeans was still in slaves.

After the abolition of the sla.ve-t.rade in the 19th century palm oil formed the staple article of commerce, and the various streams which drain the Niger coast near the mouth of the great river became known as the ” Oil Rivers.” The opening up of the interior was in the meantime promoted, chiefly by the efforts of British travellers and merchants. Mungo Park traced the Niger from Segu to Bussa, where he lost his life in 1805. From Bussa to the sea the course of the river was first made known in 1830 by the brothers Richard and John Lander. Major Dixon Denham and Captain Hugh Clapperton entered the country now known as Northern Nigeria from the north in 1823, crossing the desert from Tripoli. Clapperton in 1826- 1827 made a second journey, approaching the same territory from the Guinea coast. Dr Barth, travelling under the auspices of the British government, entered the country from the north and made the journeys, lasting over two years between 1852 and 1855, of which he has left the record that still remains the principal standard work for the interior. Macgregor Laird first organized in 1832 the navigation of the river Niger from its mouth to a point above the Benue confluence. During the next twenty-five years expeditions were despatched into the interior, and a British consul was posted at Lokoja. Possession was also taken, in 1861, of Lagos island, with the object of checking the slave trade still being carried on in that region. But the deadly climate discouraged the first efforts of the British government, and, after the parliamentary committee of 1865 had recommended a policy which would render possible the ultimate withdrawal of British official influence from the coast, the consulate of Lokoja was abandoned.

It was re-established a few years later to meet the still steadily growing requirements of British trade upon the river. In 1880 the

influence of the international ” scramble for Africa ” made itself felt by the establishment under the recognized protection of the French government of two French firms which opened upwards of thirty trading stations on the Lower Niger. The establishment of these firms was admittedly a political move which coincided with the extension of French influence from Senegal into the interior. Nearly at the same time a young Englishman, George Goldie-Taubman, afterwards better known as Sir George Goldie (q.v.), having some private interests on the Niger, conceived the idea of amalgamating all local British interests and creating a British province on the Niger. To effect this end the United African Company was formed in Formation l ^^’ an(ˆ trade was pushed upon the river with of the an energy which convinced the French firms of the Royal futility of their less united efforts. They yielded

N ‘% er the field and allowed themselves to be bought out

ompany. ˆ ˆ United African Company in 1884. At the Berlin Conference held in 1884-1885 the British representative was able to state that Great Britain alone possessed trading interests on the Lower Niger, and in June 1885 a British pro- tectorate was notified over the coast lands known as the Oil Rivers. Germany had in the meantime established itself in Cameroon, and the new British protectorate extended along the Gulf of Guinea from the British colony of Lagos on the west to the new German colony on the east, where the Rio del Rey marked the frontier. In the following year, 1886, the United African Company received a royal charter under the title of the Royal Niger Company. The territories which were placed by the charter under the control of the company were those immediately bordering the Lower Niger in its course from the confluence at Lokoja to the sea. On the coast they extended from the Forcados to the Nun mouth of the river. Beyond the confluence European trade had not at that time penetrated to the interior.

The interior was held by powerful Mahommedan rulers who had imposed a military domination upon the indigenous races and were not prepared to open their ter-‘tories to European intercourse. To secure British political influence, and to preserve a possible field for future development, the Niger Company had negotiated treaties with some of the most important of these rulers, and the nominal extension of the company’s territories

was carried over the whole sphere of influence thus secured. The movements of Germany from the south-east, and of France from the west and north, were thus held in check, and by securing international

agreements the mutual limits of the three European powers concerned were definitely fixed, The principal treaties relating to the German frontiers were negotiated in 1886 and 1893: the Anglo-French treaties were more numerous, those of 1890 and 1898, which laid down the main lines of division between French and British possessions on the northern and western frontiers of Nigeria, having been supplemented by many lesser rectifications of frontier. (See Africa, § 5.) It was not until 1909 that the whole of the frontier between Nigeria and the French and German possessions had been definitely demarcated. Thus, mainly by the action of the Royal Niger Company, a territory of vast extent, into which the chartered company itself was not able to carry cither administrative or trading operations, was secured for Great Britain. In 1897, at a time when disputes with France upon the western frontier had reached a very active stage, the company entered upon a campaign against the Mahommedan sovereign of Nupe. This campaign would, no doubt, have led to important results had the company retained its administrative powers. In the ex- pedition a force of 500 Hausa, drilled and trained by the company, and led by thirty white officers — of whom some were lent for the occasion by the War Office — decisively defeated a force of some thousands of native troops, led by the emir of Nupe himself. The capital town of Bida was taken and the emir deposed. From Bida the expedition marched to Illorin, where again the whole district submitted to the authority of the company. In Illorin the campaign had some lasting effect. In Nupe, on the northern side of the river, as the company was unable to occupy the territory conquered, things shortly reverted to their previous condition. When the company's troops were withdrawn the deposed emir returned and reoccupied the throne, leaving the situation to be dealt with after the territories of the company had been transferred to the crown.

The complications to which the pressure of foreign nations, and especially of France, on the frontiers of the territories gave rise, became at this period so acute that the j ransterot resources of a private company were manifestly authority inadequate to meet the possible necessities of the to the position Relations with France on the western crown – border became so strained that in 1897 Mr Chamberlain, who was then secretary of state for the colonies, thought it necessary to raise a local force, afterwards known as the West African Frontier Force, for the special defence of the frontiers of the West' African dependencies. In these circumstances it was judged advisable to place the territories Of the Royal Niger Company, to which the general name of Nigeria had been given, under the direct control of the crown. It was therefore arranged that in consideration

of compensation for private rights the company should surrender its charter and transfer all political rights in the territories to the Crown. The transfer took place on the 1st of January 1900, from which date the company, which dropped the name of " royal," became a purely trading corporation. The southern portion of the territories was amalgamated with the Niger Coast Protectorate, the whole district taking the name of the Protectorate of Southern Nigeria, while the northern portion, extending from a line drawn slightly above 7 N. to the frontier of the French possessions on the north and including the confluence of the Niger and the Benue at Lokoja, was proclaimed a protectorate under the name of Northern Nigeria.

• The company, during its tenure of administrative power under the charter, had organized its territories south of the confluence, into trading districts, over each of which there was placed a European agent. The executive powers in Africa were entrusted to an agent general with three provincial and twelve district superintendents. There was a small judicial staff directed by a chief justice, and there was a native con- stabulary of about 1000 men, trained and drilled by white officers. The company kept also upon the river a fleet of about

thirty steamers. The entire direction of the proceedings of the company was, however, in the hands of the council in London, and the administrative control of the territories was practically from first to last vested in the person of Sir George Goldie. The local work of the representatives of the company was mainly commercial. When, on the surrender of the charter, Sir George Goldie withdrew from the company, the administrative element disappeared. No administrative records were handed over, and very little machinery remained. Two enactments, however, bore testimony to the legislation of the company. One, which by force of circumstances remained inoperative, was the abolition of the legal status of slavery, proclaimed in the year of Queen Victoria's jubilee (1897). The other, more practical, which has remained in operation to the present day, confirmed and enforced by the succeeding administration, was the absolute prohibition of the trade in spirits beyond the parallel of 7° N.

While the development of the Royal Niger Company's terri- tories was proceeding in the manner described, the regions Progress un der direct

British control were also being opened up /„ and law and order introduced. In 1893, when the title

Southern Oil Rivers Protectorate was changed to that of Niger Nigeria, Coast Protectorate, a regular administration was established (subject to the Foreign Office in London) under Sir Claude Macdonald, who was succeeded as commissioner and consul-general in 1896 by Sir Ralph Moor (1 860-1 909). Under these officials peace was gradually estab- lished between various tribes, trade routes opened and progress made in civilization. The work was one of extreme difficulty, largely because there was no central native authority with which to deal. Small military expeditions had constantly to be employed to break up slave-raiding gangs or reduce to order tribes which blocked trade routes or made war on other tribes living peaceably under British protection. The most serious military operations were against the Beni, a peaceful mission to the king of Benin having been massacred in the bush in January 1897. The operations were completely successful and the Benin country was added to the protectorate (see Benin). In 1900, as stated, the southern portion of the Niger Company's territories was added to the protectorate, the change in administration being effected without difficulty of any kind. Sir Ralph Moor continued until 1904 to govern the country under the style of high commissioner. The efforts of the administration to better the condition of the natives without undue interference with customary law met with encouraging results, and the sub- mission of the Aros to the government in 1902 brought to an end the system of tribal warfare for the purpose of making slaves, while the enforcement of a proclamation of 1901 prohibit- ing the buying, pawning or selling of slaves had a salutary effect. Trade steadily developed, and owing to the large sums paid as duty on imported spirits, the revenue of the protectorate was sufficient to cover the expenditure.

In Northern Nigeria in 1900 the establishment of British authority remained still to be effected. The man selected for the post of first high commissioner was Colonel — afterwards better known as Sir Frederick — Lugard, who had conducted one of the Royal Niger company's most successful expeditions into the western portion of the interior and had already been employed by the British government to raise and organize the West African Frontier Force.

The transference of influence from the company to the govern- ment was officially effected on the 1st of January 1900, on which N rthern ˆ a ˆ 'he Union Jack was hoisted at Lokoja, and the Ni S eria formation of a local administration was entered upon. brought The number of civilians in the employ of the govern- ment was very small, and the

administrative machinery had to be evolved under the pressure of a somewhat acute military situation. The headquarters of the West African Frontier Force had been at Jebba, not far from the point at which Mungo Park had lost his life uoon the river. Neither Jebba nor Lokoja was considered suitable lor the permanent capital of the protectorate, and survey parties were sent out, with strict orders to avoid conflict with the nominally friendly

under control.

natives, to find a more suitable site. This was selected on a branch of the Kaduna river in the south-western corner of the province of Zaria, at a place of which the native name of Zungeru was retained. The ruler of Zaria, while professing friendliness, was, however, unable or unwilling to restrain the rulers of Konta- gora and Nupe from aggression. These two potentates raided for slaves to the borders of the rivers and openly threatened the British position on the Niger. The Ashanti War of 1900 claimed the despatch of a strong detachment of the West African Frontier Force, and it was not until the return of the troops in February 1 901 that Nupe and Kontagora could be effectively dealt with. In that year both provinces were subdued, their emirs deposed, and letters of appointment given to new emirs, who undertook to rule in accordance with the requirements of humanity, to abolish slave-raiding and slave dealing, and to acknowledge the sovereignty of Great Britain. Illorin and Borgu with a portion of Kabba were already under British rule. The rulers of other neighbouring provinces offered their allegiance, and by the end of the year 1901 nine provinces, Illorin, Kabba, Middle Niger, Lower Benue, Upper Benue, Nupe, Kontagora, Borgu and Zaria had accepted the British occupation. These territories, with the exception of Zaria, were all in the more or less immediate neighbourhood of the valleys of the Niger and the Benue, and Zaria bordered upon the Kaduna. For all these territories an initial system of administration was organized, and British residents were appointed to each province. Seven- teen legislative proclamations were enacted in the first year dealing with the immediate necessities of the position, and providing for the establishment of a supreme and provincial court of justice, for the legalization of native courts of justice, and dealing with questions of slavery, importation of liquor and firearms, land titles, &c. In the autumn of 1901 the emir of Yola, the extreme eastern corner of the territories bordering upon the Benue, was, in consequence of the aggressions upon a trading station established by the Niger Company, dealt with in the same manner as the emirs of Nupe and Kontagora, and a new emir was appointed under British rule. In 1902 Bauchi and Bornu were brought under British rule. In Bauchi the emir was

deposed and a new emir was appointed. In Bdrnu the extension of British authority was very willingly accepted as a guarantee against other European encroachments, and the legitimate Shehu was restored to the throne under British protection. Military stations were established in Bornu and in Bauchi, and both provinces were included in the system of British administration. Later in the same year an act of treachery culminating in the murder of a British resident, Captain Moloney, in the province of Nassarawa, led to the military subjugation of that province. The murderer fled northwards through Zaria to Kano, which was still an independent Mahommedan state. The emir of Zaria was found to be in treasonable correspondence with the emir of Kano. It was thought desirable to arrest and dethrone him, and his prime minister was temporarily appointed to administer the province under British protection. To all these provinces British residents were appointed, and British legislative enact- ments became applicable to them all. By the end of the year 1902 British administration had been extended to the whole of the provinces in the south, east and west of the protectorate. The important Mahommedan states of Sokoto, Gando, Kano and Katsena remained independent. These states were regarded as the stronghold of Fula supremacy. The emir of Sokoto held the position of religious as well as political head of all the lesser states of Northern Nigeria, and in response to friendly overtures on the part of the British administration had declared that between Sokoto and Great Britain there could be nothing but war. Katsena was the centre of local learning, while Kano was at once the commercial and the military centre of power. By the end of 1902 it had become evident that a trial of strength between the Mahommedan powers and the new British admin- istration was inevitable. The Mahommedan rulers were them- selves of comparatively recent date. In fighting them there was no question of fighting the whole country. On the contrary it was presumed with justice that their overthrow would be hailed

with satisfaction by many of the subject peoples. Every attempt was made to settle the question at issue by conciliatory methods, but these having failed, a campaign against Kano and Sokoto was entered upon in January 1903. It was entirely successful. The capital of Kano, a walled and fortified town of great extent and formidable strength, fell to a British assault in February of 1903. Sokoto submitted after a battle which took place on the 17th of May. The sultan fled, and on the 21st of May a new sultan, chosen by the council of elders, was

installed by the British high commissioner, after he had publicly accepted the conditions imposed by the British government. These conditions were that all eights of conquest acquired by the Fulani throughout Northern Nigeria passed to Great Britain, that for the future every sultan and emir and principal officer of state should be appointed by Great Britain, that the emirs and chiefs so appointed should obey the laws of the British government, that they should no longer buy and sell slaves, nor enslave people, that they should import no firearms, except flint-locks, that they should enforce no sentences in their courts of law which were contrary to humanity, and that the British government should in future hold rights in land and taxation. When these con- ditions were accepted by the Fulani chiefs the supremacy of Great Britain was established over the entire country. Katsena and Gando followed the example set to them by Kano and Sokoto. Throughout Northern Nigeria all chiefs, Mahommedan and Pagan, now hold their appointments under the British crown and take the oath of allegiance to the British sovereign.

It remained to organize the territories for British rule, to institute a reformed system of taxation, to establish courts of justice, and to open the country to civilized occupation.

The following account of the legislation carried into force up to 1907 shows in effect what was done in that direction. After the conquest of the Hausa States in 1902-1903 the king's writ ran — with the exception of a few districts inhabited by primitive savages — through the whole area known as Northern Nigeria. The temporary enactments of the earlier days were then super- seded by laws based upon a more accurate knowledge of local conditions and rendered possible by the effective administration which had been set up throughout the country.

Courts of Law and Administration of Justice. — A superior court was set up with jurisdiction over all non-natives and government employes. Its jurisdiction over natives was limited to the two centres of administration named " cantonments," and to such neigh- bouring territories as might be included by regulation within a feasible distance of those centres. It could, however, try any case in any province by special warrant of the high commissioner. The whole country was divided into seventeen provinces, in each of which there was a provincial court presided over by the resident in charge, whose assistants were commissioners of the court. They submitted their lists of criminal trials to the high commissioner, who, advised by the attorney-general, acted as a court of appeal, and no sentence exceeding six months could take effect without his confirmation. Cases

could be referred by him for re-trial in the superior court if he so decided. A criminal code was drawn up, together with a criminal procedure proclamation. Native courts were established by warrant at all the chief native towns with varying powers. They were of two classes, the " Alkalis ' Court," presided over by trained Mahommedan jurists, and " Judicial Councils," under the leading chiefs and natives presided over by the emir or other native ruler. In these courts native law and customs (principally the Mahommedan law) were administered with the proviso that no penalty could be enforced which was contrary to the laws of humanity or opposed to any specific proclamation of the protectorate. With the exception of two or three of the most enlightened courts, the criminal powers of these courts were restricted, but in civil actions they had full scope. No native court could carry a sentence of death into execution without the concurrence of the resident.

Cantonment courts were also set up in the two chief government centres (Zungeru and Lokoja), chiefly for the purpose of enforcing sanitary and municipal regulations. These were affiliated to the superior courts.

Lands and Minerals. — These constitute the main asset of the government. In the first instance, as following upon conquest or potential conquest, the Fulani emirs who were appointed by government to each of the great native states were installed under a letter of appointment in which (in addition to rights of legislation, taxation and other powers inherent in suzerainty) the ultimate title to all land was transferred from the Fulani dynasty and vested in the British. Private ownership was not interfered with, but all waste lands became the property of the crown, and no non-native

could acquire title except as from the government. Similarly the sole title to minerals (subject to the share of profits assigned to the Niger Company by the deed of transfer) was vested in the govern- ment, and the terms upon which licences to prospect or mine could be acquired, together with full regulations regarding mining, were enacted by law. The right of natives to smelt iron and the question of compensation for any other existing mining industry or for surface disturbance was left to the discretion of government.

Slavery. — Practical effect v/as given to the abolition of the legal status of slavery, in so far as all British courts were concerned. This decree had been promulgated before the transfer of the ad- ministration, but had existed merely on paper. Every slave could thereby assert his freedom if he desired to do so, but it was not made

illegal for a native to own a slave, and no penalty attached to mere possession in such a case. Slave-dealing and transactions of every kind in slaves were now made illegal. Civil questions arising from the institution of domestic slavery remained justiciable by the native courts; which in this matter were very carefully supervised by the British administration.

Taxation.— In the earlier years of the administration the tolls upon trade in transit, which had existed from time immemorial and had become the means of much extortion, were made a monopoly of the government, and were reorganized on an equitable and popular basis. To these were added certain licences {e.g. on canoes, &c). In 1905 a complete reorganization of the direct taxation of the country was introduced. The innumerable taxes upon agriculture and in- dustry of all kinds were consolidated into two principal taxes, viz. the land and general tax — in its nature an income tax — and the jangali or cattle tax upon nomad herdsmen. The imposition of this tax involved a rough and ready assessment of every village in the protectorate. Under this system the oppression and extortion practised under native rule gave place to a carefully regulated method of assessment. At its initiation the proceeds were divided in approximately equal shares between the central government and the native administration, and a means was thus found of creating a legitimate revenue for the native chiefs to supersede the proceeds of slave-raiding and slave-dealing, and of oppression and extortion, by which they had hitherto supplied their needs. As in India, the village with its lands and cultivation was constituted the unit of assessment, and the provinces were divided into districts under native headmen responsible for the collection of the tax, and its payment to the paramount chief, who in turn rendered the assigned share to district and village chiefs, to the officers of state recognized by government and to the government itself. The administrative officers were entrusted with the assessment and acted as arbitrators and referees in case of illegal exactions. In the Pagan districts where no native machinery existed and no previous taxation had been in force, a nominal impost was levied and collected by the officers of the government through the agency of the village chiefs. The taxation of the great cities formed a separate and very difficult problem. The law laid down the method to be employed in this case, but pending the completion of the rural taxation this detailed application of the system was allowed to remain in suspense. It was hoped that so soon as the scheme could be effectively put into opera- tion the taxes on trade in transit could be largely if not completely abolished, and the traders and merchants — the wealthiest class of the community— would be assessed in their city domiciles. By these

means a large and rapidly increasing revenue is being secured to government; while the condition of the peasantry and people is being greatly ameliorated, an adequate but not excessive income is being secured to the native rulers; and the class of middlemen who lived by extortion and absorbed a great part of the wealth of the country is being abolished.

Native Rulers. — By the operation of the native courts proclamation, the taxation proclamation, and finally by the enforcement of native authority proclamations, the status of the native rulers, their powers and authority, were defined and legalized. They receive the support of the government within the limits of their recognized sphere of action. The great chiefs are appointed by the government in consultation with the principal men, and in. accordance with native customs and laws of succession. Minor chiefs are nominated by their paramount chiefs, subject to the approval of the high com- missioner.

Military and Police. — The defensive force — the Northern Nigeria Regiment of the West African Frontier Force — is constituted by law, and the proclamation contains a military code based on the Army Act with modifications necessary in local circumstances. A police force is similarly organized and controlled by a second enactment. The military force is divided into three regiments and two batteries of artillery under the supreme command of a commandant. The distribution of the garrisons is under the direc- tion of the high commissioner. The police, on the other hand, are more or less equally divided between the provinces (including the establishment at each cantonment), and while their interior economy and organization rests in the hands of a commissioner, they are for purposes of duty under the control of the resident of the province. A district superintendent is appointed to each province.

Miscellaneous Enactments! — A variety of other enactments deals with minor matters of administration. Commissions of inquiry may be appointed by the high commissioner to investigate the conduct

of an individual or department and take evidence on oath. Discipline en board of steamers is prescribed by the Marine Discipline Act. The preservation of wild animals and birds in accordance with international agreements is enforced by law. The importation or possession of arms of precision is forbidden, except by permits in

conformity with the Brussels Act, and in further application of that act the importation of spirits for sale to natives is wholly prohibited. The cantonments are regulated by a municipal ordinance, establish- ing rates and laying down various regulations for order and sani- tation. In order to prevent hydrophobia dogs may only be kept under certain restrictions. Patents, marriages (of non-natives), &c., &c, form the subject of other laws.

Administrative Divisions. — For administrative purposes the territories were at first divided into seventeen provinces: Sokoto, (iando. Kano, Katsena, Bornu East, Bornu West, Zaria, Bauchi, Borgu, Kontugora, Nassarawa, Muri, Yola, Bassa, Kabba, Illorin, Nupe. Of these Sokoto and Gando, Kano and Katsena, Bornu East and Bornu West have been carried a step further in organization and now form three double provinces, each under the charge of a first-class resident. Illorin, Nupe and Kabba have been formed into one province called the Niger province, and also placed under the charge of a first-class resident, and it is intended to continue this process so as to make finally eight first-class provinces of the whole territory. The first-class residents of the double provinces are assisted by about twelve residents and assistant residents of subordinate rank. In the Mahcmmedan states the native system of administration remains intact, and is carried on under British supervision by native emirs and officials. In the Pagan states there is no organized system of native administration, and the British residents are responsible for good government.

Amalgamation of Lagos and Southern Nigeria. — The political reasons which had resulted in the Nigerian territories being divided into three distinct administrations no longer existing, it was decided to unite them under one government, and as a first step in that direction Sir Wsdter (then Mr) Egerton was in 1904 appointed both governor of Lagos and high commissioner of Southern Nigeria. This was followed in February 1906 by the amalgamation of the two administrations under the style of ” the Colony and Protectorate of Southern Nigeria,” with head- quarters at Lagos town. The former colony and protectorate of Lagos (q.v.) became the western or Lagos province of the new administration. In the year the amalgamation was effected the revenue reached a record figure, the amount collected being £1,088,000, to which Lagos province contributed £424,000. Over 80% of the revenue was derived from customs. In the same year the expenditure from revenue was £1,056,000.

Northern Nigeria Railway. — In Northern Nigeria, which con- tinued for the time to be a separate protectorate, Sir Frederick Lugard was, at

the beginning of 1907, succeeded as high com- missioner by Sir Percy Girouard. In August of that year the British government, on administrative, strategic and commercial grounds, came to a decision to build a railway which should place the important cities of Zaria and Kano in direct communication with the perennially navigable waters of the Lower Niger. In view of the approaching unification of Southern and Northern Nigeria, the money needed, about £1,250,000, was raised as a loan by Southern Nigeria. The route chosen for the line was that advocated by Sir Frederick Lugard. This important work, essential for the welfare of the northern territories, was begun under the superintendence of Sir Percy Girouard, 1 the builder of the Wadi Haifa-Khartum railway. At the same time the decision was taken to continue the Lagos railway till it effected a junction with the Kano line near Zungeru, the Niger being bridged at Jebba.

Land Tenure. — Sir Percy Girouard devoted much attention to land tenure, probably the most important of the questions concerning imperial policy in West Africa. He adopted the land policy of Sir F. D. Lugard, and recommended ” a declaration in favour of the nationalization of the lands of the Protectorate.” This was in accord with native laws — that the land is the pro- perty of the people, held in trust for them by their chiefs, who have not the power of alienation. Thereafter the secretary for the colonies appointed a strong committee, which, after hearing much evidence, issued a report in April 1910 in substantial agreement with the governor’s recommendations. This policy 1 In 1909 Sir Percy Girouard was succeeded by Sir H. H. J. Bell. The title High Commissioner had meantime been changed to that of Governor.

was adopted by the Colonial Office. By this means the natives of Nigeria were secured in the possession of their land — the government imposing land taxes, which are the equivalent of rent. This exclusion of the European land speculator and denial of the right to buy and sell land and of freehold tenure was held by all the authorities to be essential for the moral and material welfare of the inhabitants of a land where the duty of the white man is mainly that of administration and his material advantages lie in trade. (See an article on ” Land Tenure in West Africa ” in The Times, May 24, 1910.)

Authorities. — Of early books dealing with large areas of Nigeria, H. Earth’s Travels and Discoveries in North and Central Africa (London, 1857-1858) is a standard authority. See also Lady Lugard, A Tropical Dependency (London, 1905); Boyd Alexander, Fiom the Niger to the Nile (London, 1907) ; C. Larymore, A Resident’s Wife in Nigeria

(London, 1908) ; the annual Reports on Southern and Northern Nigeria issued by the Colonial Office; E. D. Morel, Affairs of West Africa (London, 1902) ; C. H. Robinson, Hausaland (London, 1 896) ; S. Vandeleur, Campaigning on the Upper Nile and Niger (London, 1898), with introduction by Sir George Goldie; Major A. G. Leonard, The Lower Niger and its Tribes (London, 1906) ; C. Partridge, The Cross River Natives (London, 1905) ; E. Dayrell, Folk Stories from Southern Nigeria (London, 1910). Maps of the country on the scale of t, 000. mo an< i "usoioiifl are published by the War Office. The Blue Books, Cd. 2325 (1904), 2787 (1905) and 45 2 3 (!9 9), deal with railway construction, harbours and river navigation. (F. L. L.)

NIGHT, that part of the natural day of twenty-four hours during which the sun is below the horizon, the dark part of the day from sunset to sunrise (see Day). The word in O. Eng. takes two forms, neaht and night, the latter form apparently being established by about the 10th century. The word is common in varying forms to Indo-European languages. The root is usually taken to be nak~, to perish, the word meaning the time when the light fails (cf. Gr. veKos, Lat. nex, death, nocere, to hurt). It was customary to reckon periods of time by nights, and we still use ” fortnight ” (O. Eng. feowertyne niht, fourteen nights), but ” se’n-night ” (seven nights) has been displaced by ” week ” (q.v.). NIGHTINGALE, FLORENCE (1820-1910), younger daughter of William Edward Nightingale of Ernbley Park, Hampshire, and Lea Hurst, Derbyshire, was born at Florence on the 15th of May 1820, and named after that city, but her childhood was spent in England, chiefly in Derbyshire. From her earliest years her strong love of nature and animals manifested itself. Her games, too, were characteristic, for her great delight was to nurse and bandage her dolls. Her first living patient was a shepherd’s dog. From tending animals she passed to human beings, and wherever there was sorrow or suffering she was sure to be found. Her most ardent desire was to use her talents for the benefit of humanity. She had a natural shrinking from society; and though her social position necessitated her presenta- tion at Court, her first season in town was spent in examining into the working of hospitals, reformatories and other charitable institutions. This was followed by a tour of inspection of foreign hospitals. At that time England was sadly behind-hand in matters of nursing and sanitation, and Miss Nightingale, who desired to obtain the best possible teaching for herself, went through a course of training in the Institute of Protestant Deaconesses at Kaiserswerth. She remained there six months, learning every detail of hospital management with a thoroughness rarely equalled. Miss Nightingale neglected nothing that could make her proficient in her self-chosen task. From Kaiserswerth

she went to Paris, where she studied the system of nursing and management in the hospitals under the charge of the sisters of St Vincent de Paul. After her return to England she devoted herself to reorganizing the Governesses' Sanatorium in Harley Street (now the Home for Gentlewomen during Temporary Illness), which was at that time badly managed and in great need of funds. Miss Nightingale grudged neither time nor money to this work, and she had the satisfaction of placing it on a thoroughly satisfactory basis.

In the year 1854 England was stirred to its depths by the report of the sufferings of the sick and wounded in the Crimea. There was an utter absence of the commonest preparations to carry out the first and simplest demands in a place set apart

to receive the sick and wounded of a large army. The condition of the large barrack-hospital at Scutari was deplorable. A royal commission of inquiry was appointed, a patriotic fund opened, and money flowed in fast. To Miss Nightingale this proved the trumpet-call of duty. She wrote to Sidney Herbert, secretary at war, and offered her services. Her letter crossed with one from him inviting her to proceed to the Crimea. She set out on the 24th October with a staff of thirty-seven nurses, partly volunteers, partly professionals trained in hospitals. They reached Scutari on the 4th of November, in time to receive the Balaklava wounded. A day or two later these were joined by 600 from Inkerman. The story of Miss Nightingale's labours at Scutari is one of the brightest pages in English annals. She gave herself, body and soul, to the work. She would stand fortwenty hours at a stretch to see the wounded accommodated. She regularly took her place in the operation-room, to hearten the sufferers by her presence and sympathy, and at night she would make her solitary round of the wards, lamp in hand, stopping here and there to speak a kindly word to some patient. Soon she had 10,000 men under her charge, and the general superintendence of all the hospitals on the Bosporus. Gradually the effects of the measures adopted were seen in a lowered death-rate. In February 1855 it was as high as 42%, before many months it had sunk to 2. For a time Miss Nightingale was herself prostrated with fever, but she refused to leave her post, and remained at Scutari till Turkey was evacuated by the British in July 1856. The enthusiasm aroused in England by Miss Nightingale's labours was indescribable. A man-of-war was ordered to bring her home, and London prepared to give her a triumphant reception; but she returned

quietly in a French ship, crossed to England, and escaped to her country home before the news of her return could leak out. The experiences of those terrible months permanently affected Miss Nightingale's health, but the quiet life she afterwards led was full of usefulness. With the £50,000 raised in recognition of her services she founded the Nightingale Home for training nurses at St Thomas's and King's College Hospitals. She also turned her attention to the question of army sanitary reform and army hospitals, and to the work of the Army Medical College at Chatham. In 1858 she published her Xotcs on Nursing, which gave an enormous stimulus to the study of this subject in England. According to Miss Nightingale nursing ought to signify the proper use of fresh air, light, warmth, cleanliness, quiet, and the selection and administration of diet — all at the least expense of vital force to the patient.

Miss Nightingale followed with interest all the later improve- ments in sanitation, and was frequently consulted about hospital plans both at home and abroad. With the help of the County Council Technical Instruction Committee she organized in 1892 a health crusade in Buckinghamshire. Teachers were 'sent round among the cottagers to give practical advice on such points as ventilation, drainage, disinfectants, cleanliness, &c, a plan which, if widely carried out, would bring the most valuable knowledge to every home in England. She is understood to have drawn up a confidential report for the government on the working of the Army Medical Corps in the Crimea, and to have been officially consulted during the American Civil War and the Franco-German War. In 1907 she received the Order of Merit from King Edward- VII. She died in London on the 13th of August 1 9 10. She is the subject of a beautiful poem by Longfellow, " Santa Filomena," and the popular estimate of her character and mission was summed up in a particularly felicitous anagram, Flit on, cheering angel.

NIGHTINGALE (O. Eng. Nihtegale, literally "singer of the night "), the bird celebrated beyond ali others by European writers for the admirable vocal powers which, during some weeks after its return from its winter-quarters in the south, it exercises at all hours of the day and night. The song itself is indescribable, chough several attempts, from the time of Aristophanes to the present, have been made to express in syllables the sound of its many notes. Poets have descanted on the bird (which they nearly always make of the feminine gender) leaning its breast against a thorn and pouring forth its melody in anguish. But

the cock alone sings, and there is no reason to suppose that the cause

and intent of his song differ in any respect from those of other birds' songs (see Song). In great contrast to the nightin- gale's pre-eminent voice is the inconspicuous coloration of its plumage, which is alike in both sexes, and is of a reddish -brown above and dull greyish-white beneath, the breast being rather darker, and the rufous tail showing the only bright tint.

The range of the European nightingale, Daulias luscinia, is peculiar. In Great Britain it is abundant in suitable localities to the south-east of a line stretching from the valley of the Exe, in Devonshire, to York, but it does not visit Ireland, its occur- rence in Wales is doubtful or intermittent, and it is extremely improbable that it has ever reached Scotland. On the continent of Europe it does not occur north of a line stretching irregularly from Copenhagen to the northern Urals, and it is absent in Brittany; over south Europe otherwise it is abundant. It reaches Persia, and is a winter visitor to Arabia, Nubia, Abyssinia, Algeria and as far south as the Gold Coast. The larger eastern D. philomela, sometimes called the thrush-nightingale or Sprosser of German bird-catchers, is russet-brown in both sexes, and is a native of eastern Europe. D. hafizi of Persia, a true nightingale, is probably the Perso-Arabic bulbul of poets.

The nightingale reaches its English home about the middle of April, 1 the males (as is usual among migratory birds) arriving some days before the females. On. the cocks being joined by their partners, the work for which the long and hazardous journey of both has been undertaken is speedily begun, and before long the nest is completed. This is of a rather uncommon kind, being placed on or near the ground, the outworks consisting chiefly of a great number of dead leaves ingeniously applied together so that the plane of each is mostly vertical. In the midst of the mass is wrought a deep cup-like hollow, neatly lined with fibrous roots, but the whole is so loosely constructed, and depends for lateral support so much on the stems of the plants, among which it is generally built, that a very slight touch disturbs its beautiful arrangement. Herein from four to six eggs of a deep olive colour are duly laid, and the young hatched. The nestling plumage of the nightingale differs much from that of the adult, the feathers above being tipped with a buff spot, just as in the young of the redbreast, hedge-sparrow and redstart, thereby showing the natural affinity of all these forms. Towards the end of summer the nightingale disappears to its African winter haunts.

The name nightingale has been vaguely applied to several other birds. The so-called " Virginian nightingale " is a species of gros- beak (q.v .) ; the " Pekin nightingale" or "Japanese nightingale" is a small babbler

(Liothrix luteus) inhabiting the Himalayas and China, not Japan at all.

The nightingale holds a place in classical mythology. Procne and Philomela were the daughters of Pandion, king of Attica, who in return for warlike aid rendered him by Tereus, king of Daulis in Thrace, gave him the first-named in marriage. Tereus, however, being enamoured of her sister, feigned that his wife was dead, and induced Philomela to take her place. On her discovering the truth he cut out her tongue to hinder her from revealing his deceit; but she depicted her sad story on a robe which she. sent to Procne; and the two sisters then contrived a horrible revenge for the infidelity of Tereus, by killing and serving to him at table his son Itys. There- upon the gods interposed, changing Tereus into a hoopoe, Procne into a swallow, and Philomela into a nightingale, while Itys was restored to life as a pheasant, and Pandion (who had died of grief at his daughters' dishonour) as a bird of prey (see Osprey). The fable has several variants. Ovid's version may be seen in the 6th book of his Metamorphoses (lines 412-676). (A. N.)

NIGHTSHADE, a general term for the genus of plants known to botanists as Solannm. The species to which the name of nightshade is commonly given in England is Solanum Dulcamara which is also called bittersweet or woody nightshade (see fig. 1). It is a common plant in damp hedgebanks and thickets, scram- bling over underwood and hedges. It has slender slightly woody stems, with alternate lanceolate leaves more or less heart-shaped and auriculate at the base. The flowers are arranged in drooping clusters and resemble those of the potato in shape, although 1 Poets and novelists are apt to command at will the song of this bird, irrespective of season. If the appearance of truth is to be regarded, it is dangerous to introduce a nightingale as singing in England before the T5th of April or after the 15th of June. The " early nightingale " of newspaper paragraphs is generally a thrush.

much smaller. The flower clusters spring from the stems at the side of, or opposite to, the insertion of a leaf. The corolla is rotate, of a lilac blue colour with a green spot at the base of each segment, or sometimes white, and bears the yellow sessile anthers

united at their margins so as to form a cone in the centre of the flower. The flowers are suc- ceeded by ovate scarlet berries, 4 in. long,

which in large doses appear to be poisonous or, to say the least, dangerous to children, cases of poisoning by them having occurred. Sola- rium Dulcamara is subject to the same parasitic fungus (Phy to- phi hora infest- ans) as the potato, and may serve as nat. size. I, Flower; 2, fruits, 3 nat. size; 3, berry, a medium for

Fig. 1. — Bittersweet {Solatium Dulcamara),

cut across, enlarged; 4, seed, much enlarged.

communicating

the spores to the potato if not removed from the hedges of the fields where potatoes are grown. The plant derives its names of ” bittersweet ” and Dulcamara from the fact that its

taste is at first bitter and then sweet. It is a native of Europe, North Africa and temper- ate Asia, and has been introduced into North America. The dried young branches are known in pharmacy under the name dulca- mara.

Dulcamara con- tains a bitter prin- ciple y ieldi n g by decomposition a sugar dextrose and the alkaloid solanine. It also contains another glucoside dulca- marin, which when boiled with dilute acid splits up into sugar and dulcama- retin. Solan ine appears to exert a depressant action on the vagus nerve and

Fig. 2. Deadly Nightshade {Atropa bella an J= xcitan t ,, acti< ? n donna). Flowering branch, i nat. size. 1, ° n the medulla- ob- Flower, after removal of the corolla, f nat. size; lon j?<* ta – 2, corolla, with stamens, cut open and flattened, g° lan ™n nigrum | nat. size; 3, cross section of ovary, much dlflcrs . ˆomS.Dulca- enlarged. mam in having white

6 flowers in small

umbels and globose black berries. It is a common weed in gardens and waste places, growing about 12 or 18 in. high, and has ovate, entire or sinuate or toothed leaves. Two varieties of the plant, one with red and the other with yellow berries, are sometimes met with, but are comparatively rare. The berries have been known

to produce poisonous effects when eaten by children, and owe their properties to the presence of solanine. In Reunion and Mauritius the leaves are eaten like spinach.

Deadly nightshade, dwale or belladonna {Atropa belladonna) is a tall bushy herb of the same natural order (fig. 2). It grows to a height of 4 or 5 ft., having leaves of a dull green colour, with a black shining berry fruit about the size of a cherry, and a large tapering root. The plant is a native of central and south Europe, extending into Asia, and is found locally in England, chiefly on chalk and limestone, from Westmorland and south- wards. The entire plant is highly poisonous, and accidents not infrequently occur through children and unwary persons eating the attractive-looking fruit. Its leaves and roots are largely used in jnedicine, on which account the plant is cultivated, chiefly in south Germany, Switzerland and France (see Belladonna).

The name nightshade is applied to plants of different genera in other countries. American nightshade is Phytolacca decandra (poke- weed, q.v.). The three-leaved nightshade is an American species of Trillium. The Malabar nightshade is Basella, which is widely used as a pot-herb in India. Enchanter's nightshade is Circaea lutstiana, a small, glandular, softly-hairy plant, common in damp woods, with slender, erect or ascending stems, paired ovate leaves with long stalks, and small white flowers in terminal racemes, succeeded by a small fruit covered with hooked bristles; it is a member of the natural order Onagraceae, and is not known to possess any poisonous property; the name seems to have been given to it in the first place in mistake for a species of Mandragora (see Mandrake).

NIGRA, COSTANTINO, Count (1828-1907), Italian diplo- matist, was born'at Villa Castelnuovo, in the province of Turin, on the nth of June 1828. During the war of 1848 he interrupted his ' studies to serve as a volunteer against Austria, and was wounded at the battle of Rivoli. On the conclusion of peace he entered the Piedmontese foreign office; he accompanied Victor Emmanuel and Cavour to Paris and London in 1855, and in the following year he took part in the conference of Paris by which the Crimean War was brought to an end. After the meeting at Plombieres between Cavour and Napoleon III. Nigra was sent to Paris again to popularize a Franco-Piedmontese alliance, Nigra being, as Cavour said, " the only person perhaps who knows all my thoughts, even the most secret." He was instrumental in negotiating the marriage between Victor Emmanuel's daughter Clothilde and Napoleon's nephew, and during the war of 1859 he was always with the emperor. He was recalled from Paris when the occupation of the Marche and Umbria by the Pied- montese caused a breach in Franco-Italian relations, and was appointed secretary of state to the prince of Carignano, viceroy of the Neapolitan provinces. When Napoleon recognized the kingdom of Italy in 1861, Nigra returned to France as minister- resident, and for many years played a most important part in

political affairs. In 1876 he was transferred to St Petersburg with the rank of ambassador, in 1882 to London, and in 1885 to Vienna. In 1899 ne represented Italy at the first Hague Peace Conference. In 1904 he retired, and he died at Rapallo on the 1st of July 1907. He was created count in 1882 and senator in 1890. Nigra was a sound classical scholar, and published translations of many Greek and Latin poems with Valuable comments; he was also a poet and the author of several works of folk-lore and popular poetry, of which the most important is his Canti popolari del Piemonle. *■

NIHILISM, the name commonly given to the Russian form of revolutionary Socialism, which had at first an academical character, and rapidly developed into an anarchist revolutionary movement. It originated in the early years of the reign of Alexander II., and the term was first used by Turgueniev in his celebrated novel, Fathers and Children, published in 1862. Among the students of the universities and the higher technical schools Turgueniev had noticed a new and strikingly original type — young men and women in slovenly attire, who called in question and ridiculed the generally received convictions and respectable conventionalities of social life, and who talked of reorganizing society on strictly scientific principles. They reversed the traditional order of things even in trivial matters of external appearance, the males allowing the hair to grow long and the female adepts cutting it short, and adding sometimes the

additional badge of blue spectacles. Their appearance, manners and conversation were apt to shock ordinary people, but to this they were profoundly indifferent, for they had raised themselves above the level of so-called public opinion, despised Philistine respectability, and rather liked to scandalize people still under the influence of what they considered antiquated prejudices. For aesthetic culture, sentimentalism and refinement of every kind they had a profound and undisguised contempt. Professing extreme utilitarianism and delighting in paradox, they were ready to declare that a shoemaker who distinguished himself in his craft was a greater man than a Shakespeare or a Goethe, because humanity had more need of shoes than of poetry. Thanks to Turgueniev, these young persons came to be known in common parlance as ” Nihilists,” though they never ceased to protest against the term as a caluminous nickname. According to their own account, they were simply earnest students who desired reasonable reforms, and the peculiarities in their appear- ance and

manner arose simply from an excusable neglect of trivialities in view of graver interests. In reality, whatever name we may apply to them, they were the extreme repre- sentatives of a curious moral awakening and an important intellectual movement among the Russian educated classes (see Alexander II., of Russia).

In material and moral progress Russia had remained behind the other European nations, and the educated classes felt, after the humiliation of the Crimean War, that the reactionary regime of the emperor Nicholas must be replaced by a series of drastic reforms. With the impulsiveness of youth and the recklessness of inexperience, the students went in this direction much farther than their elders, and their reforming zeal naturally took an academic, pseudo-scientific form. Having learned the rudiments of positivism, they conceived the idea that Russia had outlived the religious and metaphysical stages of human development, and was ready to enter on the positivist stage. She ought, therefore, to throw aside all religious and metaphysical con- ceptions, and to regulate her intellectual, social and political life by the pure light of natural science. Among the antiquated institutions which had to be abolished as obstructions to real progress, were religion, family life, private property and central- ized administration. Religion was to be replaced by the exact sciences, family life by free love, private property by collectivism, and centralized administration by a federation of independent communes. Such doctrines could not, of course, be preached openly under a paternal, despotic government, but the press censure had become so permeated with the prevailing spirit of enthusiastic liberalism, that they could be artfully disseminated under the disguise of literary criticism and fiction, and the public very soon learned the art of reading between the lines. The work which had perhaps the greatest influence in popularizing the doctrines was a novel called Shto Dyelati? (What is to be done?), written in prison by Tchernishevski, one of the academic leaders of the movement, and published with the sanction of the authorities!

Since the time of Peter tire Great, Russia had been subjected to a wonderful series of administrative and social transformations, and it seemed to many people quite natural that another great transformation might be effected with the consent and co- operation of the autocratic power. The doctrines spread, there- fore, with marvellous rapidity. In the winter of 1861-1862 a high official wrote to a friend who had been absent from Russia for a few months: ” If you returned now you would be astonished at the progress which the opposition — one might say, the revolutionary party — has made. . . . The revolutionary ideas have taken possession of all classes, all ages, all professions, and they are publicly expressed in the streets, in the

barracks, and in the government offices. I believe the police itself is carried away by them." Certainly the governnient was under the influence of the prevailing enthusiasm for reform, for it liberated all the serfs, endowed them liberally with arable land, and made their democratic communal institutions independent of the landed proprietors; and it was preparing other important reforms in a similar spirit, including the extension of self-government in the

rural districts and the towns, and the reorganization of the antiquated judicial system and procedure according to the modern principles adopted in western Europe.

The programme of the government was extensive enough and liberal enough to satisfy, for the moment at least, all reason- able reformers, but the well-intentioned, self-confident young people to whom the term Nihilists was applied were not reason- able. They wanted an immediate, thorough-going transforma- tion of the existing order of things according to the most advanced socialistic principles, and in their youthful, reckless impatience they determined to undertake the work themselves, indepen- dently of and in opposition to the government. As they had no means of seizing the central power, they adopted the method of endeavouring to bring about the desired political, social and economic changes by converting the masses to their views. They began, therefore, a propaganda among the working popula- tion of the towns and the rural population in the villages. The propagandists were recruited chiefly from the faculty of physical science in the universities, from the Technological Institute, and from the medical schools, and a female contingent was supplied by the midwifery classes of the Medico-Surgical Academy. Those of each locality were personally known to each other, but there was no attempt to establish among them hierarchical distinctions or discipline. Each individual had entire freedom as to the kind and means of propaganda to be employed. Some disguised themselves as artisans or ordinary labourers, and sought to convert their uneducated fellow- workmen in the industrial centres, whilst others settled in the villages as school-teachers, and endeavoured to stir up dis- affection among the recently emancipated peasantry by telling them that the tsar intended they should have all the land, and that his benevolent intentions had been frustrated by the selfish landed proprietors and the dishonest officials. Landed pro- prietors and officials, it was suggested, should be got rid of, and then the peasants would have arable, pastoral and forest land in abundance, and would not require to pay any taxes. To persons of a certain education the agitators sought to prove that the general economic situation was desperate, that it was the duty of every conscientious citizen to help the people

in such a dilemma, and that the first step towards the attainment of this devoutly to be wished consummation was the limitation or destruction of the uncontrolled supreme power. On the whole the agitators had very little success, and not a few of them fell into the hands of the police, several of them being denounced to the authorities by the persons in whose interest they professed to be acting; but the great majority were so obstinate and so ready to make any personal sacrifices, that the arrest and punish- ment of some of their number did not deter others from con- tinuing the work. Between 1861 and 1864 there were no less than twenty political trials, with the result that most of the accused were condemned to imprisonment, or to compulsory residence in small provincial towns under police supervision.

The activity of the police naturally produced an ever-increas- ing hostility to the government, and in 1866 this feeling took a practical form in an attempt on the part of an obscure individual called Karakozov to assassinate the emperor. The attempt failed, and the judicial inquiry proved that it was the work of merely a few individuals, but it showed the dangerous character of the movement, and it induced the authorities to take more energetic measures. For the next four years there was an apparent lull, during which only one political trial took place, but it was subsequently proved that the Nihilists during this time were by no means inactive. An energetic agitator called Netchaiev organized, in 1869 a secret association under the title of the Society for the Liberation of the People, and when he suspected of treachery one of the members he caused him to be assassinated. This crime led to the arrest of some members of the society, but their punishment had very little deterrent effect on the Nihilists in general, for during the next few years there was a recrudescence of the propaganda among the labouring classes. Independent circles were created and provided with secret printing-presses, in many of the leading provincial towns — notably in Moscow,

Nijni-Novgorod, Penza, Samara, Saratov, Kharkof, Kiev, Odessa, Rostov-on-the-Don and Taganrog; and closer relations were established with the revolutionary Socialists in western Europe, especially with the followers of Bakunin, who considered that a great popular rising should be brought about in Russia as soon as possible. Bakunin’s views did not, it is true, obtain unanimous acceptance.

Some of the Nihilista maintained that things were not yet ripe for a rising of the masses, that the pacific propaganda must be continued for a considerable time, and that before attempting to overthrow the existing social organization some idea should be formed as to the order of things which should take its place. The majority, however, were too im- patient for action to listen to such counsels of prudence, and when they encountered opposition on the part of the govern- ment they urged the necessity of retaliating by acts of terrorism. In a brochure issued in 1874 one of the most influential leaders (Tkatchcv) explained that the object of the revolutionary party should be, not the preparation of revolution in general, but the realization of it at the earliest possible moment, that it was a mistake to attach great importance to questions of future social organization, and that all the energies of the party should be devoted to " a struggle with the government and the established order of things, a struggle to the last drop of blood and to the last breath." In accordance with the fashionable doctrine of evolu- tion, the reconstruction of society on the tabula rasa might be left, it was thought, to the spontaneous action of natural forces, or, to use a Baconian phrase, to natura naturans.

To this and similar declarations of irreconcilable hostility the government replied by numerous arrests, and in the winter of 1877-1878 no less than 193 agitators, selected from 2000 arrested on suspicion, were tried publicly in St Petersburg by a tribunal specially constituted for the purpose. Nearly all of them were condemned to imprisonment or exile, and the revolutionary organization in the northern provinces was thereby momentarily paralysed, but a few energetic leaders who had escaped arrest reorganized their scattered forces and began the work anew. They constituted themselves into a secret executive committee, which endeavoured to keep in touch with, and partially direct, the independent groups in the provincial towns. Though they never succeeded in creating an efficient centralized administra- tion, they contrived to give to the movement, the appearance of united action by assuming the responsibility for terrorist crimes committed by persons who were in reality not acting under their orders. During the years 1878, 1879 and 1880 these terrorist crimes were of frequent occurrence. General Trepov, prefect of St Petersburg, was shot by Vera Zasulitch under pretence of presenting a petition to him; General Mezentsov, chief of the political police, was assassinated in broad daylight in one of the principal streets of St Petersburg, and an attempt was afterwards made on the life of his successor, General Drenteln; Prince Krapotkin, governor of the province of Kharkof, was assassinated for having introduced

stricter prison discipline with regard to political prisoners; a murderous attack was made on the emperor in front of the Winter Palace by an ex-student called Soloviev; repeated attempts were made to blow up the train conveying the Imperial family from the Crimea to St Petersburg; and a dynamite explosion, by which ten people were killed and thirty-four wounded, took place in the Winter Palace, the Imperial family owing their escape to the accident of not sitting down to dinner punctually at the usual hour. Assassination was used also by the agitators against confederates suspected of giving information to the police, an 1 a number of gendarmes were murdered when effecting arrests. After each of these crimes a proclamation was issued by the executive committee explaining the motives and accepting the responsibility.

When repressive measures and the efforts of the police were found insufficient to cope with the evil, Alexander II. deter- mined to try a new system. Count Loris Melikof was entrusted with semi-dictatorial powers, relaxed the severity of the police regime, and endeavoured to obtain the support of all loyal Liberals by holding out the prospect of a series of reforms in a

liberal sense. His conciliatory methods failed signally, and were repaid by an attack on his life. A semblance of parliamentary institutions was not what the Anarchists wanted. They simply redoubled their activity, and hatched a plot for the assassination of the emperor. In March 1881 the plot was successful. Alex- ander II., when driving in St Petersburg, was mortally wounded by the explosion of small bombs, and died almost as soon as he had reached the Winter Palace. On the following day the executive committee issued a bombastic proclamation, in which it declared triumphantly that the tsar had been condemned to death by a secret tribunal on 26th August 1879, and that two years of effort and painful losses had at last been crowned with success. These facts put an end to the policy of killing Anarchism by kindness, and one of the first acts of the new reign was a manifesto in which Alexander III. announced very plainly that he had no intention of limiting the autocratic power, or making concessions of any kind to the revolutionary party. The subsequent history of the movement presents little that is interesting or original, merely a continual but gradually subsiding effort to provoke local disturbances with a view to bringing about sooner or later a general rising of the masses and the overthrow not only of the government, but also of the existing social and economic regime. A serious manifestation on the part of the terrorists took the shape of a plot to assassinate the emperor by bombs in the streets of St Petersburg in March 1887. It was the work of a very small group, the members of

which were being watched by the police, and were all arrested on the day when the crime was to be perpetrated. The movement afterwards showed occasionally signs of revival. In 1901, for example, there were troubles in the universities, and in 1902 there were serious disturbances among the peasantry in some of the central rural districts; and the assassination of M. Sipiaguine, the minister of the interior, was a disquieting incident; but the illusions and enthusiasm which produced Nihilism in the young generation during the early years of the reign of Alexander II. had been largely shattered and dispelled by experience. The revolutionary propaganda temporarily led to a serious situation in the early years of the reign of Tsar Nicholas II., but a new era opened for Russia with the inauguration of parliamentary government.

The following criminal statistics of the movement during six and a half years of its greatest activity (from 1st July 1881 to 1st January 1888) are taken from unpublished official records: — Number of affairs examined in the police department 1500

Number of persons punished 3046

These 3046 punishments may be divided into the following categories : —

Death 20

Penal servitude 128

Exile in Siberia 681

Exile under police supervision in European Russia . 1500 Lesser punishments 717

3046

From the beginning of the movement up to 1902 the number of Anarchists condemned to death and executed was forty-eight, and the number of persons assassinated by the Anarchists was thirty-nine. There is no reason' to suspect the accuracy of these statistics, for they were not intended for publication. They are taken from a confidential memorandum presented to the emperor.

(D. M. W.)

NIIGATA, the chief town of the province of Echigo, Japan. Pop. (1903) 58,821. It lies on the west coast of the island of Nippon, on a

narrow strip of sandy ground between the left bank of the Shinano and the sea, which though close at hand is shut out from view by a low range of sandhills. It occupies an area of rather more than 1 sq. m., and consists of five long parallel streets intersected by cross-streets, which in most cases have canals running down the middle and communicating with the river, so that the internal traffic of the city is mainly carried on by water. The houses are, usually built with gables to the street, and roofs and verandas project so as to keep the windows and footpaths from being blocked up by the heavy winter snows. Niigata was originally chosen as one of the five open ports-Nagasaki, Kobe, Yokohama, Niigata and Hakodate — but it failed, chiefly owing to a bar which prevents the entry of vessels

of any size. The town has been brought within the railway circuit, and the production of petroleum has been developed in the district. Ebisa, on the island of Sado, was opened as a supplementary harbour of refuge, but not as a trading port. There is a large manufacture of lacquer-ware in the town. The foreign trade is entirely in the hands of Japanese merchants. During winter Niigata suffers from a terribly severe climate; the summers, moreover, are excessively hot.

NIJAR, a town of south-eastern Spain, in the province of Almeria; on the southern slope of the Sierra Alhamilla, and on the small river Artal, which flows into the Mediterranean Sea 6 m. S.W. Pop. (1900) 12,497. Diespite the lack of railway communication, Nijar is a place of some commercial importance. Lead, iron and manganese are mined in the neighbouring moun- tains; the fertile plain watered by the Artal yields an abundance of wheat, fruit, olives and esparto grass; and fine porcelain and woollen and cotton goods are manufactured in the town.

NIJMWEGEN, Nimeguen, Nymegen or Nimwegen, a town in the province of Gelderland, Holland, on the left bank of the Waal, 24! m. by rail E. by S. of Tiel. It has regular steamboat communication with Rotterdam, Cologne and Arnhem, and steam- tramways connect it with the popular resorts of Neerbosch, Beek and Berg – en – Dal in the vicinity. Pop. (1904) 49,342. Nijmwegen is very prettily situated on the slopes of five low hills rising from the river-side. It stands up with a boldness quite unusual in a Dutch town, and steps are even necessary to lead to the higher portions of the town. In 18 7 7-1 884 the old town walls were demolished, a promenade and gardens taking

their place, and since then a new quarter has grown up on the south side with a fine open place called the Emperor Charles's Plain. On the east of the town is the beautiful park called the Valkhof, which marks the site of the old palace of the Carolingian emperors. The palace was still inhabitable in 1787, but was ruined by the Fren.cn bombardment of 1794, and only two portions of it remain. These are a part of the choir of the 1 2th-century palace- church, and a sixteen-sided baptistry originally consecrated by Pope Leo III. in 799 and rebuilt in the 12th or 13th century. Close by is the lofty tower of the Belvedere, dating from 1646. The Groote Kerk of St Stephen forms with its tall square tower one of the most striking features in the general views of the town. Originally built about 1272, it dates in its present condition mainly from the 15th and 16th centuries. In the choir is the fine monument of Catherine of Bourbon (d. 1469), wife of Adolphus of Egmont, duke of Gelderland, with a brass of the duchess, and the heraldic achievements of the house of Bourbon. There is also a fine organ. The interesting Renaissance town- hall was built in 1554 (restored in 1879). It is adorned with the effigies of kings and emperors who were once benefactors of Nijmwegen. Inside are to be found some fine wood-carving, tapestries, pictures and a cumbrous safe in which the town charters were so jealously preserved that the garrison used to be called out and the city gates closed whenever they were con- sulted. There is also an interesting museum of antiquities. Other buildings of note are the theatre (1839), the Protestant hospital, the Roman Catholic or Canisius hospital (1866), and the old weigh-hcuse and Flesher's Hall, probably built in 161 2 and restored in 1885. Between 1656 and 1678 Nijmwegen was the seat of a university. Beer, Prussian blue, leather, tin, pottery, cigars, and gold and silver work are the chief industrial products, and there is a considerable trade by rail and river.

NIKAYA (" collection "), the name of a division of the Bud- dhist canonical books. There are four principal Nikayas, making together the Sutta Pitaka (" Basket of Discourses "), the second of the three baskets into which the canon is divided. The fifth or miscellaneous Nikaya is by some authorities added to this Pitaka, by others to the next. The first two Nikayas, called respectively Digha and Majjhima (Longer and Shorter), form one book, a collection of the dialogues of the Buddha, the longer ones being included in the former, the shorter ones in the latter. The third, called the Anguttara (Progressive Addition), rearranges the doctrinal matter contained in the Dialogues in groups of ethical concepts, beginning with the units, then giving the pairs, then the

groups of three, four, five, &c, up to ten. In the Dialogues the

arrangement in such numbered groups is frequent. In an age when books, in our modern sense, were unknown, it was a practical necessity to invent and use aids to memory. Such were the repetition of memorial tags, of cues (as now used for a pre- cisely similar purpose on the stage), to suggest what is to come. Such were also these numbered lists of technical ethical terms. Religious teachers in the West had similar groups — the seven deadly sins, the ten commandments, the four cardinal virtues, the seven Sacraments, and many others. These are only now, since the gradual increase of books, falling out of use. In the 5th century B.C. in India it was found convenient by the early Buddhists to classify almost the whole of their psychology and ethics in this manner. And the Anguttara Nikaya is based on that classification. In the last Nikaya, the Samyutta (The Clusters), the same doctrines are arranged in a different set of groups, according to subject. All the Logia (usually of the master himself, but also of his principal disciples) on any one point, or in a few cases as addressed to one set of people, are here brought together. That was, of course, a very convenient arrangement then. It saved a teacher or scholar who wanted to find the doctrine on any one subject from the trouble of repeating over, or getting some one else to repeat over for him, the whole of the Dialogues or the Anguttara. To us, now, the Samyutta seems full of repetitions; and we are apt to forget that they are there for a very good reason.

During the time when the canon was being completed there was great activity in learning, repeating to oneself, rehearsing in company and discussing these three collections. But there was also considerable activity in a more literary direction. Hymns were sung, lyrics were composed, tales were told, the results of some exciting or interesting talk were preserved in summaries of exegetical exposition. A number of these have been fortunately preserved for us in twenty-two collections, mostly of very short pieces, in the fifth or miscellaneous Nikaya, the Khuddaka Nikaya.

The text of the Dialogues fills about 2000 pages 8vo in the edition prepared for the Pali Text Society, of which five vols, out of six had been published in 1909, and the first had been translated into English. The Samyutta, of about the same size, and the Anguttara, which is a little smaller, have both been edited. Of the twenty-two miscellaneous books twenty. have been edited (see Rhys Davids, American Lectures (1896), pp. 66-79), fi ve have been translated into English and two more into German.

See Digha Nikaya, ed. Rhys Davids and Carpenter (3 vols.); Samyutta Nikaya (5 vols.) , ed. Leon Feer, vol. vi. by Mrs Rhys Davids,

containing indices; Anguttara Nikaya, ed. R. Morris and E. Hardy (5 vols.) ; all published by the Pali Text Society. Also Rhys Davids, Dialogues of the Buddha, vol. i. (Oxford, 1899); A. J. Edmunds, " Buddhist Bibliography," in Journal of the Pali Text Society (1903), pp. 5-12. (T. W. R. D.)

NIKE, in Greek mythology, the goddess of victory (Gr. vlkti). She does riot appear personified in Homer; in Hesiod (Tkeog. 384) she is the daughter of the giant Pallas and Styx, and is sent to fight on the side of Zeus against the Titans. Nike does not appear to have been the object of a separate cult at Athens. She was at first inseparably 'connected and confounded with Pallas Athena, the dispenser of victory, but gradually separated from her. As an attribute of both Athena and Zeus she is repre- sented as a small figure carried by those divinities in their hand. Athena Nike was always wingless, Nike as a separate goddess winged. In works of art she appears carrying a palm branch or a wreath (sometimes a Hermes staff as the messenger of victory); erecting a trophy or recording a victory on a shield; frequently hovering with outspread wings over the victor in a competition, since her functions referred not only to success in war, but to all other human undertakings. In fact, Nike gradu- ally came to be recognized as a sort of mediator of success between gods and men.

At Rome the goddess of victory (Victoria) was worshipped from the earliest times. Evander was said to have erected a temple in her honour on the Palatine before the foundation of Rome itself (Dion. Halic. i. 32, 33). With the introduction of the Greek gods, Victoria became merged in Nike. She always had a

firm hold over the Roman mind, and her popularity lasted till the end of paganism. Special games were held in her honour in the circus, and generals erected statues of her after a successful campaign. She came to be regarded as the protecting goddess of the senate, and her statue (originally brought from Tarentum and set up by Augustus in memory of the battle of Actium) in the Curia Julia (Dio Cassius li. 22; Suetonius, Aug. 100) was die cause of the final combat between Christianity and paganism towards the end of the 4th century. Victoria had altars in camp, a special set of worshippers and colleges, a festival on the 1st of November, temples at Rome and throughout the empire. The Sabine goddess Vicuna and Vica Pota, one of the dii indigetes (both of them goddesses of victory), are earlier varieties of Vic- toria

(Livy xxix. 14). Representations of Nike- Victoria in Greek and Graeco-Roman art are very numerous. The statue of Nike at Olympia byPaeonius has been in great part recovered.

See A. Baudrillart, Les Divinites de la victoire en Gre.ce et en Italie (1894), whose view that in the 5th century Nike became detached from Athena, although Athena Nike still continued to exist, is supported by Miss J. E. Harrison (Classical Review, April 1895) and L. R. Farnell (Cults of the Greek States, i., 1896), but opposed by E. Sikes (C.R., June 1895), who holds that " while Nike was a late conception, Athena Nike was still later, and that the goddess of victory cannot have originated, either at Athens or elsewhere, from an aspect of Athena " ; F. Studniczka, Die Siegesgottin (Leipzig, 1898); Preller-Robert, Griechische Mythologie (1894) ; O. Benndorf, Uber das Cullusbild der Athena Nike (Vienna, 1879); G. Boissier, La fin du paganisme (1891); Gibbon, Decline and Fall, ch. 28.

In the article Greek Art, fig. 32 represents Nike pouring water over a sacrificial ox; fig. 36 the floating Nike of Paeonius; figs. 61, 62 (PI. iii.), the winged Nike of Samothrace; the running or flying figure (fig. 19) is also possibly a Nike.

NIKISCH, ARTHUR (1855-), Hungarian conductor, became known as a musical prodigy at an early age, making a public performance as a pianist at eight years old. He studied at the Vienna Conservatoire from 1866 to 1873, and while there he composed a symphony and other works. For a time he was engaged as a violinist, but in 1877 he began as assistant conductor at the Leipzig opera and two years later became chief conductor. His success there, and his reputation as the producer of the more modern types of music as well as of classical masterpieces led to his being appointed conductor of the symphony orchestra at Boston, U.S.A., from 1889 to 1893; and subsequently, after having been director at the Budapest opera, he was made conductor at the Leipzig Gewandhaus. His fame was now wide- spread, and he made successful visits to London, Paris and other capitals, his ability as a pianoforte accompanist being recog- nized as no less marked than his brilliance as director of an orchestra.

NIKITIN, ATHANASIUS, of Tver (fl. 1468-1474), Russian merchant, traveller and writer, the earliest known Russian visitor to India. He started in 1468 on his " wanderings beyond the Three Seas " (Caspian, Euxine and Indian Ocean), and descended the Volga, passing by Uglich, Kostroma, Nizhniy Novgorod, Kazan, Sarai and Astrakhan. Near the latter he was attacked and robbed by Tatars; but he succeeded in reaching Derbent, where he joined Vasili Papin, the

envoy of Ivan III. of Moscow to the shah of Shirvan ; from Nizhniy Novgorod he had travelled with Hasan Bey, the Shirvan shah's ambassador, returning to his master with a present of falcons from Ivan. At Derbent Nikitin vainly endeavoured to get means of returning to Russia; failing in this, he went on to Batu, where he notices the " eternal fires," and thence over the Caspian to Bokhara. Here he stayed six months, after which he made his way southward, with several prolonged stoppages, to the Persian Gulf, through Mazandaran province and the towns of Amul, Demavend, Ray (near Tehran), Kashan, Nain, Yezd, Sirjan, Tarun, Lar and Bandar, opposite New (or insular) Hormuz. From Hormuz he sailed by Muscat to Gujarat, Cambay and Chaul in western India. Landing at Chaul, he seems to have travelled to Umrut in Aurangabad province, south-east of Surat, and thence to Beder, the modern Ahmedabad. Here, and in adjacent regions, Nikitin spent nearly four years; from the little he tells us, he appears to have made his living by horse-dealing. From Beder he visited the Hindu sanctuary (" their Jerusalem ") of Perwattum. He returned to Russia by

way of Calicut, Dabul, Muscat, Hormuz, Lar, Shiraz, Yezd, Isfahan, Kashan, Sultanieh, Tabriz, Trebizond and Kaffa (Theodosia) in the Crimea. He has left us descriptions of western Indian manners, customs, religion, court-ceremonies, festivals, warfare and trade, of some value; but the text is corrupt, and the narrative at its best is confused and meagre. His remarks on the trade of Hormuz, Cambay, Calicut, Dabul, Ceylon, Pegu and China; on royal progresses and other functions, both ecclesiastical and civil, at Beder; and on the wonders of the great fair at Perwattum — as well as his comparisons of things Russian and Indian — deserve special notice.

Two MSS. are known: (1) in the library of the cathedral of St Sophia in Novgorod; (2) in the library of the Troi'tsa Monastery (Troitsko-Sergievskaya Lavra) near Moscow. See also the edition by Pavel Mikhailovich Stroev in Sofiiskii Vremennik (a.d. 862-1534), pt. ii. pp. 145-164 (Moscow, 1820-1821); and the English version in India in the 15th Century, pp. lxxiv.-lxxx. ; 1-32 (separately paged, Nikitin's being the third narrative in the volume, translated and edited by Count Wielhorski; London, Hakluyt Society, 1857). ' (C. R. B.)

NIKKO, one of the chief religious centres of Japan. The name belongs properly to the district, but is as commonly applied to the principal village, Hachi-ishi, which is 91 m. N. of Tokyo by rail. The district is high-lying, mountainous and beautiful, and is in favour for summer residence. The chief mountain range is known as Nikko-Zan (Mountains of the Sun's Brightness). A Shinto temple seems to have

existed at Nikko from time immemorial, and in 767 its first Buddhist temple was founded by Shodo Sho-nin (the subject of many strange legendary adventures); but the main celebrity of the place is due to the sepulchres and sanctuaries of Iyeyasu and Iyemitsu, the first and third shoguns of the Tokugawa dynasty. Iyeyasu was buried with amazing pomp in i6i7,and Iyemitsu, his grandson, was slain in 1650 while visiting his tomb. From 1644 to 1868 the " abbots " of Nikko were always princes of the imperial blood; thirteen of them are buried within the sacred grounds. Though the magnificent abbots' residence was destroyed by fire in 187 1, and the temples have lost most of their ritual and much of their material splendour, enough remains to astonish by excellence and bewilder by variety of decorative detail. Of the numerous structures which cluster round the shrine of Iyeyasu, it is sufficient to mention the cylindrical copper column (1643), a guardian against evil influences, 42 ft. high, adorned at the top with a series of lotus flowers, from the petals of which hang small bells; a five-storied pagoda (1659), 104 ft. high, with the signs of the zodiac carved round the base; the gate of the Two Kings, with its figures of unicorns, lions, tigers, elephants, mythical animals and tree-peonies; the vermilion-coloured timber enclosure to which this gate gives entrance, with three great storehouses, a sumptuous stable for the sacred horses, and a finely fashioned granite cistern (1618) for holy water; and the Yo-mei-mon gate, which with the contiguous cloister is covered with the most elaborate carving, and gives access by way of another gate (Kara-Mon) to the court in the midst of which stands the last and most sacred enclosure. This, known as the Tama- gaki, is a quadrangle of gilt trellis- work 50 yds. square; within it stands the " chapel " or oratory (or rather a series of chambers), in the decoration of which gilding and black lacquer have been lavishly employed. The tomb of Iyeyasu lies apart about two hundred steps higher up the hills, in the shadow of tall crypto- merias — a single light-coloured bronze urn or casket standing on a circular base of three steps with a stone table in front on which rest a censer, a lotus-cluster and a stork with a candlestick in its mouth, the whole enclosed by a high stone wall. Somewhat similar are the tomb of Iyemitsu and its surroundings; and though the art displayed is of an inferior character, the profusion of buildings and embellishments is even more remarkable. Hotok6 Iwa, the hill on which the tomb stands, is completely covered to the summit with trees of various tints. There are numerous temples and shrines of minor interest in the locality.

NIKOLAYEV, a town, seaport and chief naval station of Russia on the Black Sea, in the government of Kherson, 40 m. N.W. of the city of Kherson. Pop. (1881) 35,000; (1891) 77,210; (1897) 92,060.

Nikolayev stands a little above the

confluence of the Ingul with the Bug, at the head of the liman, or estuary, of the Bug, and is the natural outlet for the basin of that river. The estuary, which is 25 m. long, enters that of the Dnieper. The entrance to the double estuary is protected by the fortress of Ochakov and by the fort of Kinburn, erected on a narrow headland opposite, while several forts surround Nikolayev on both sides of the Bug and protect it from an attack by land. Over the bar at Ochakov the water has been deepened to 25 ft., and over the bar of the Dnieper to 20 ft. by dredging. The town, which occupies two flat peninsulas between the Bug and the Ingul, extends up the banks of the latter, while its suburbs reach still farther out into the steppe. The streets are wide, and intersect one another at right angles. The bank of the Ingul is taken up with shipbuilding yards, docks, slips and various workshops of the admiralty for the construction of armour-plates, guns, boilers, &c. On the river there is a floating dock for armoured ships. Before the Crimean War the activity of the dockyards was very great; the suburbs — which belong to the admiralty — were bound to supply the necessary hands to the number of 3000 every day, and all the inhabitants had to perform compulsory service. Since 1870 the construction of armoured ships and torpedo-boats has been carried on here. From 1893 Nikolayev was the chief port for the Russian volunteer fleet, which sailed ‘ to and fro between this port and Vladivostok until the Russo- Japanese War of 1904-05. Nikolayev has steam flour-mills, iron and machinery works, saw-mills, soap, tobacco, vinegar, carriage and agricultural machinery works. The foreign exports consist almost entirely of cereals, especially wheat and rye, with a little sugar, iron and manganese ore and oilcake. The total value reaches £7,000,000 to £9,000,000 annually. Navi- gation is maintained during the whole winter by the aid of a powerful ice-breaker. Nikolayev is the chief market for the governments of Kherson, Poltava, Kharkov, Ekaterinoslav and parts of Kiev, Kursk and Podolia. In addition to the naval harbour, there are the harbour of the Russian Steamship Company and the coasting harbour, made in 1893; while large storehouses stand close to the commercial port, 2 m. from the town, at Popovaya-Balka on the Bug. The educational in- stitutions include an artillery school, a school of navigation, two technical schools, an astronomical and meteorological observatory, museums and libraries, and a hydrographical institute. Amongst the public buildings, the cathedral, which contains some good Italian pictures,

the theatre, the artillery arsenal, the admiralty and other state buildings are worthy of mention.

The remains of the Greek colony Olbia have been discovered close to the confluence of the Ingul with the Bug, 10 m. S. of Nikolayev. In medieval times the country was under the Lithuanians, and subsequently under the Zaporogian Cossacks. Russian colonists settled in the locality about the end of the 1 8th century, and after the fall of Ochakov, Prince Potemkin established (1789) a wharf on the Ingul which received the name of Nikolayev. (P. A. K.; J. T. Be.)

NIKOLAYEVSK, a town of East Siberia, in the Maritime province, on the left bank of the Amur, 20 m. above its outflow into the Gulf of Amur, in 53 8′ N. Pop. (1897) 8200. It is defended by a fort and batteries. Founded in 1851, Nikolayevsk was formerly the capital of the Maritime province.

NIKOLAYEVSK, a town of Russia, in the government of Samara, on the right bank of the Irgiz, 40 m. from the Volga and 100 m. S.W. of the town of Samara. Pop. (1897) 12,524. Its inhabitants are mostly Raskolniks {i.e. Nonconformists), who have numerous monasteries along the river, and members of the United Greek Church, with about 2000 Tatars. The chief occupations are agriculture and live stock breeding.

Under the name of Mechetnoye, Nikolayevsk was founded in 1762 by Raskolniks who had fled to Poland and returned when Catherine II. undertook to grant them religious freedom. In 1828 serious persecutions began, with the result that the monasteries Were closed with the exception of three, which were handed over in 1829 and 1836 to the United Greek Church. In 1835 the name of the town was changed to Nikolayevsk.

NIKOLAYEVSKAYA, SLOBODA, a town of Russia in the government of Astrakhan, 3 m. from the left bank of the Volga, opposite Kamyshin, and no m. N. of Tsaritsyn. Pop. (1897) 20,000. It dates from the end of the 18th century, when a number of Little Russians settled there for the transport of salt from Lake Elton. It is one of the chief centres on the lower Volga for the trade in corn and salt.

NIKOLSBURG (Czech, Mikulov), a town of Austria, in Moravia, 53 m. S. of Briinn by rail. Pop. (1900) 8091. It is situated at the foot of the Polau Mountains and near the border of Lower Austria. It possesses a chateau of Prince Dietrichstein-Mens- dorff, which contains an extensive library, with some valuable manuscripts. The Heiliger Berg,

in the immediate vicinity, has sixteen chapels, and a church in the Byzantine style. The principal resources are viticulture, the manufacture of cloth, and trade in lime and limestone. On the 31st of December 162 1 peace was concluded here between the emperor Ferdinand II. and Bethlen Gabor, prince of Transylvania; and on the 26th of July 1866 a preliminary treaty of peace between the Prussians and the Austrians was signed here.

NIKON [Nikita Minin] (1605-1681), 6th patriarch of Moscow, Russian reformer and statesman, son of a peasant farmer named Mina, was born on the 7th of May 1605 in the village of Valmanovo, 90 versts from Nizhny Novgorod. Misery pursued the child from his cradle, and prematurely hardened a character not naturally soft; he ran away from home to save his life from an inhuman stepmother. But he gave promise betimes of the energy and thoroughness which were to distinguish him throughout life, and contrived to teach himself reading and writing. When he was but twenty his learning and talents obtained for him a cure of souls. His eloquence attracted atten- tion, and, through the efforts of some Moscow merchants, he was transferred to a populous parish in the capital. Shortly afterwards, seeing in the loss of his three little children a provi- dential warning to seek the higher life, he first persuaded his wife to take the veil and then withdrew himself first to a desolate hermitage on the isle of Anzersky on the White Sea, and finally to the Kozhuzersky monastery, in the diocese of Novgorod, of which he became abbot in 1643. On becoming a monk he took the name of Nikon. In his official capacity he had frequently to visit Moscow, and in 1646 made the acquaintance of the pious and impressionable Tsar Alexius, who fell entirely under his influence. Alexius appointed Nikon archimandrite, or prior, of the wealthy Novospassky monastery at Moscow, and in 1648 metropolitan of Great Novgorod. Finally (1st of August 1652) he was elected patriarch of Moscow. It was only with the utmost difficulty that Nikon could be persuaded to become the arch- pastor of the Russian Church, and he only yielded after imposing upon the whole assembly a solemn oath of obedience to him in everything concerning the dogmas, canons and observances of the Orthodox Church.

Nikon’s attitude on this occasion was not affectation, but the wise determination of a would-be reformer to secure a free hand. Ecclesiastical reform was already in the air. A number of ecclesiastical dignitaries, known as the party of the protopopes (deans), had accepted the responsibility for the revision of the church service-books inaugurated by the late Patriarch Joasaf, and a few other very trivial rectifications of certain ancient* observances. But they were far too

timid to attempt anything really effectual. Nikon was much bolder and also much more liberal. He consulted the most learned of the Greek prelates abroad; invited them to a consultation at Moscow; and finally the scholars of Constantinople and Kiev opened the eyes of Nikon to the fact that the Muscovite service-books were heterodox, and that the ikons actually in use had very widely departed from the ancient Constantinopolitan models, being for the most part imitations of later Polish and Frankish (West European) models. He at once (1654) summoned a properly qualified synod of experts to re-examine the service-books revised by the Patriarch Joasaf, and the majority of the synod decided that " the Greeks should be followed rather than our own ancients." A second I council, held at Moscow in 1656, sanctioned the revision of the

service-books as suggested by the first council, and anathe- matized the dissentient minority, which included the party of the protopopes and Paul, bishop of Kolomna. Heavily weighted with the fullest ecumenical authority, Nikon's patriarchal staff descended with crushing force upon the heterodox. His scheme of reform included not only service-books and ceremonies but the use of the " new-fangled " ikons, for which he ordered a house-to-house search to be made. His soldiers and servants were charged first to gouge out the eyes of these " heretical counterfeits " and then carry them through the town in derision. He also issued a ukaz threatening with the severest penalties all who dared to make or use such ikons in future. This ruthless- ness goes far to explain the unappeasable hatred with which the " Old Ritualists " and the " Old Believers," as they now began to be called, ever afterwards regarded Nikon and all his works. From 1652 to 1658, Nikon was not so much the minister as the colleague of the tsar. Both in public documents and in private letters he was permitted to use the sovereign title. Such a free use did he make of his vast power, that some Russian historians have suspected him of the design of establishing " a particular national papacy "; and he himself certainly main- tained that the spiritual was superior to the temporal power. He enriched the numerous and splendid monasteries which he built with valuable libraries. His emissaries scoured Muscovy and the Orient for precious Greek and Slavonic MSS., both sacred and profane. But his severity raised up a whole host of enemies against him, and by the summer of 1658 they had convinced Alexius that the sovereign patriarch was eclipsing the sovereign tsar. Alexius suddenly grew cold towards his " own familiar friend." Nikon thereupon publicly divested

himself of the patriarchal vestments and shut himself up in the Voskresensky monastery (19th of July 1658). In February 1660 a synod was held at Moscow to terminate ” the widowhood ” of the Muscovite Church, which had now been without a pastor for nearly two years. The synod decided not only that a new patriarch should be appointed, but that Nikon had forfeited both his archi- episcopal rank and his priest’s orders. Against the second part of this decision, however, the great ecclesiastical expert Epifany Slavenitsky protested energetically, and ultimately the whole inquiry collapsed, the scrupulous tsar shrinking from the enforce- ment of the decrees of the synod for fear of committing mortal sin. For six years longer the Church of Muscovy remained without a patriarch. Every year the question of Nikon’s deposition became more complicated and confusing. Almost every contemporary orthodox scholar was consulted on the sub- ject, and no two authorities agreed. At last the matter was submitted to an ecumenical council, or the nearest approach to it attainable in the circumstances, which opened its sessions on the 18th of November 1666 in the presence of the tsar. On the 1 2th of December the council pronounced Nikon guilty of reviling the tsar and the whole Muscovite Church, of deposing Paul, bishop of Kolomna, contrary to the canons, and of beating and torturing his dependants. His sentence was deprivation of all his sacerdotal functions; henceforth he was to be known simply as the monk Nikon. The same day he was put into a sledge and sent as a prisoner to the Therapontov Byelozersky monastery. Yet the very council which had deposed him confirmed all his ‘ reforms and anathematized all who should refuse to accept them. Nikon survived the tsar (with whom something of the old intimacy was resumed in 167 1) five years, expiring on the 17th of August 1 68 1.

See R. Nisbet Bain, The First Romanovs (London, 1905); S. M. Solovev, History of Russia (Rus.), vol. x. (St Petersburg, 1895, &c.) ; A. K. Borozdin, The Protopope Avvakum (Rus.) (St Petersburg, 1898); V. S. Ikonnikov, New Materials concerning the Patriarch Nikon (Rus.) (Kiev, 1888); William Palmer, The Patriarch and the Tsar (London, 1871-1876). (R. N. B.)

NIKOPOL, a town of Russia, in the government of Ekaterino- slav, on the right bank of the Dnieper, 70 m. S.S.W. of the town of Ekaterinoslav. It was formerly called Nikitin Rog, and occupies an elongated peninsula between two arms of the Dnieper at a point where its banks are low and marshy, and has been for centuries one of the places where the middle Dnieper

can most conveniently be crossed. Its inhabitantSj 21,282 in 1900, are

Little Russians, Jews and Mennonites, who carry on agriculture and shipbuilding. The old secha, or fortified camp of the Zaporogian Cossacks, brilliantly described in N. V. Gogol's novel Taras Bulba (1834), was situated a little higher up the river. Numbers of graves in the vicinity recall the battles which were fought for the possession of this important strategic point. One of them, close to the town, contained, along with other Scythian antiquities, the well-known precious vase representing the capture of wild horses. Even now Nikopol, which is situated on the highway from Ekaterinoslav to Kherson, is the point where the " salt-highway " of the Chumaks (Little Russian salt-carriers) to the Crimea crosses the Dnieper. Nikopol is, further, one of the chief places on the lower Dnieper for the export of corn, linseed, hemp and wool.

NIKOPOLI, or Nicopolis (Turkish, Nighebolu or Nebul), the chief town of a sub-prefecture in the district of Plevna (Pleven), Bulgaria. Pop. (1908) 5236, including 3339. Turks and 161 5 Bulgarians. Nikopoli is picturesquely situated on the south bank of the Danube, where it receives the Osem. Until the creation of a new port at Somovit, in the neighbourhood, Nikopoli served as an outlet for the trade of Plevna, Lovtcha and other towns in the interior, the principal export being cereals. The chief industries are tanning and fishing. As a military post the town has for centuries been important. A ruined castle still dominates the place, and fortifications stretch down to the river. Nikopoli occupies the site of the ancient Asamus, but by some medieval confusion bears the name of Nicopolis ad Istrum, which was founded by Trajan several miles down the river, at the inflow of the Iatrus or Yantra, at the spot still called Nikup. The following are the chief points in the modern history of the place: — capture of the fortress by Sigismund of Hungary in 1392 and 1395; defeat of Sigismund and his hosts in 1396 by Bayezid I.; siege of the town by King Ladislaus I. of Hungary in 1444; defeat of the Turks by Bathori in 1 595 and by Michael of Walachia in 1598; capture of the town by Pasvan-oglu in 1797; occupa- tion of the fortress by the Russians under Kamensky in 1810; destruction of the Turkish flotilla and storming of the Turkish camp by Govarov in 1829; capture and burning of the town by the Russians under Kriidener on the 15th of June 1877.

NIKSHICH (also written Nikshitch and Nikshiti; Croatian, NikHC), a town of Montenegro, lying in a flat plain enclosed by lofty mountains on the north-west, and watered by the river Zeta. Pop. (1900) about 3500. Owing to the prevalence of floods, a long viaduct, a gift from Russia, was raised between the town and the mountain road which leads to Podgoritsa, 60 m. S.E. Nikshich consists of a mass of white

houses, dominated by the belfry and the pale yellow cupola of its cathedral, another gift from Russia. This building is chiefly Byzantine in style, and, though hardly beautiful, is the most impressive and by far the largest of Montenegrin churches. Close by stands a barrack-like royal palace; and a little beyond the town are the ruins of an old castle. As Nikshich possesses a brewery and a clothmill, besides being the chief mart of Western Montenegro for timber, hides, farm-produce and livestock, it ranks second in commercial importance to Podgoritsa. About 12 m. S.E. is the celebrated shrine of Ostrog (see Montenegro). Nikshich was included in the Turkish province of Herzegovina until 1876, in which year it was stormed by the Montenegrins, led by Prince Nicholas in person. In 1878 the Montenegrin possession was ratified by the treaty of Berlin.

NILE, the longest river of Africa, and second in length of all the rivers of the globe, draining a vast area in north-east Africa, from the East African lake plateau to the shores of the Mediter- ranean. Although falling short of the length of the Mississippi- Missouri (4194 m. according to the estimate of General Tillo 1), the Nile is at the head of all rivers as regards the length of its basin, which extends through 35 of latitude or 2450 m. in a direct line, with a waterway of about 4000 m. The Nile proper, i.e. from the outlet at Victoria Nyanza to the sea, is 3473 m. long.

1 General Alexi A. Tillo (1 839-1900), Russian scientist and geographer, author of works on geodesy, meteorology, &c.

NILE

&93

The Name. — The early Egyptians called this river by a name which was probably pronounced Hap. It seems to be con- nected with a root meaning ” concealed,” ” mysterious.” This survived as a religious designation down to the fall of paganism. The ” great river ” was also a frequent name for the main stream, and this became the usual name of the Nile in late times as Ier-‘o and continued in use amongst the Copts. In the Bible the Nile is regularly named Yeor pi*’, “W), from the contemporary Egyptian Yor, ” river.” The origin of the Greek and Roman name NeiXos, Nilus, is quite unknown. Mymros in the Odyssey is the name of the Nile (masc.) as well as of the country (fem.). The Arabs pre- served the classical name of the Nile in

the, proper name En-Nil 3-..ˆ » or NlL-

Misr >*aˆ J.AJ, the Nile of Misr (Egypt).

The same word signifies indigo. 1

The modern Egyptians commonly call the river El-Bahr, ” the sea,” a term also applied to the largest rivers, and the inundation ” the Nile,” En-Nil; and the modern Arabs call the river Bahr-en-Nil, ” the river Nile.”

Basin of the River. — The Nile system is a simple one with three principal divisions: (1) the main stream running south to north, and fed by the great lakes of East Central Africa; (2) the equatorial tributary rivers draining the country north-east of the Congo basin; (3) the Abyssinian affluents. The extent of the basin of the Nile is clearly indicated on the map. Its area is estimated at 1,107,227 sq. m., which com- ■pares with the 1,425,000 sq. m. area of the Congo basin. The smaller basin of the longer river is due to its narrowness when passing through the Sahara. South- ward the basin includes the northern part of the plateau between the two. ” Rift ” valleys which traverse that part of Africa, and also that portion of the Albertine (or western) ” Rift ” valley which lies north of the Mfumbiro mountains. That part of the plateau within the Nile basin is occupied by the Victoria Nyanza and its affluents. These affluents drain a compara- tively small part of this plateau, which stretches south to Lake Nyasa. The most remote feeder of the Nile in this direction does not extend farther than 3 20′ S. West and W.S.W. of Victoria Nyanza, however, the Nile basin reaches 3 50′ S. (264 m. south of the equator) and 29 15′ E., following the crest of the hills which dominate the north-eastern shores of Lake Tanganyika and the eastern shores of Lake Kivu. Turning north-westward from this point the Nile basin crosses the mountainous region of Mfumbiro and in- cludes that of Ruwenzori. Its limit is marked by the western wall of the

1 “En- Nil is the river (lit. the inundation) of Egypt: Es-Saghanl says — ‘ But as to the nil [indigoj with which one dyes, it is an

T — J- — -, n _~J A d-nV.dn!rtnrl ‘ * ‘ / ‘/ T Z*rt tiff J* &J\ftl9 /if

Bmcry Walker sc

Indian word Arabicized ‘ El-Fayumi),

{The Misbdh of

Albertine Rift valley, in which lie the Albert Edward and Albert Nyanzas. For a considerable distance the water-parting between the Congo and the Nile is close to the Albert Nyanza and to the Nile as it flows from that lake, but not far north of Wadelai (2 46′ N.) the hills recede and the Nile basin expands westward, over the wide area drained by the Bahr- el-Ghazal and its tributaries. In this region there is no well- marked watershed between the Congo and Nile systems, which interlace. Farther north the limit of the valley is marked by the hills of Darfur. Below that point the valley of the Nile extends but a mile or two into the desert.

The south-eastern limits of the Nile basin extend nearly to the western escarpment of the eastern Rift valley — the dividing plateau being a narrow one. North of the equator a bend is made westward to Mt. Elgon, which on the north-east sends its water towards Lake Rudolf. From Mt. Elgon the Nile watershed is some distance to the west of that lake, while to its north a turn is made again, the watershed including a great part of the Abyssinian highlands. Beyond 15° N. it follows a line generally parallel to the west shore of the Red Sea, except where diverted to the west by the basin of the Khor Baraka.

Sources of the Nile. — The question of the sources of the Nile opens up a time-honoured controversy (see under Story of Discovery below). Victoria Nyanza (q.v.) is the great reservoir whence issues the Nile on its long journey to the Mediterranean. But if the source of the river be considered to be the most remote headstream (measured by the windings of the stream), the distinction belongs to one of the upper branches of the Kagera. Among the feeders of Victoria Nyanza the Kagera is by far the most important, both for length of course and volume of water carried, draining the region of greatest rainfall round Lake Victoria. Three chief branches unite to form the Kagera, and of these the most important for the volume of water carried is said to be the Nyavarongo. The Nyavarongo is formed by the union of various mountain streams, the Rukarara and the Mhogo being the chief. The Rukarara rises in about 2° 20′ S., 29 20′ E., at an elevation of some 7000 ft., in a picturesque and bracing region immediately east of the Albertine Rift valley. The Nyavarongo first flows north to about 1° 40′ S., then turning in a sharp bend east and south, and on again reaching 2° 20′ S., unites with the Akanyaru just west of 30 E. The Akanyaru, which comes from the south- west, has been sometimes considered the larger stream, but according to Dr Richard Kandt it carries decidedly less water, while its course is shorter than that of the Nyavarongo. The combined stream takes an easterly and southerly direction, flowing in

a swamp valley and joining a little west of 31 ° E. the third branch of the Kagera, the Ruvuvu, coming from the south. The source of the Ruvuvu is in about 2° 55′ S., 295° E., but its most southern tributary, and the most distant stream sending its waters towards the Nile, is the Lavironza. The Lavironza rises in about 3 45′ S., 29 50′ E., and flows north-east, joining the Ruvuvu, which has hitherto had an easterly direction, in about 30° 25′ E., 3 10′ S. From this point the Ruvuvu flows east and north to its junction with the Nyavarongo. From this confluence the combined stream of the Kagera flows north and north-west in a level valley strewn with small lakes until almost 1° S., when it turns east, and finally empties itself into Victoria Nyanza just north of 1° S., the mouth forming a small projecting delta. Its lower course is navigable by shallow draught steamers. The total length of the Kagera, reckoning from the source of the Nyavarongo, is some 430 m. Its volume is stated to vary between 21,000 and 54,000 cub. ft. per second. All the other feeders of Victoria Nyanza are small and often intermittent rivers, the largest being probably the Nzoia, which enters on the north-east from the plateaus south of Mount Elgon. (The rivers which enter Albert Edward and Albert Nyanzas and, with those lakes, form the western sources of the Nile, are dealt with under Albert Nyanza and Albert Edward Nyanza.)

The Victoria or Somerset Nile. — The ridge of high land which forms the northern shore of Victoria Nyanza is broken at its narrowest part, where the pent-up waters of the lake — through which a drift from the Kagera inlet to the Nile outlet is just perceptible — have forced a passage at the northern end of a beautiful bay named Napoleon Gulf. At this spot, 30 m. north of the equator, at an alti tude of 3704 ft., the Nile issues from the lake between cliffs 200 and more ft. high with a breadth of some 500 yds. The scene is one of much grandeur. The escaping water precipitates itself over a rocky ledge with a clear fall of i6J ft. The falls, some 300 yds. across, and divided into three channels by two small wooded islands, are named the Ripon Falls, after Earl de Grey and Ripon (afterwards 1st marquess of Ripon), president of the Royal Geographical Society in 1859. The Victoria or Somerset Nile, as this section is called, has at first the character of a mountain stream, racing swiftly through a rocky channel often walled in by cliffs (at times 180 ft. high) and broken by picturesque islands and countless rapids. It receives the waters of several streams, which, rising within a few miles of the Victoria Nyanza, flow north. For 133 m. its course is N.N.W.,

when, on being joined by the river Kaf u (on which Fort Mruli stands) , about i° 39′ N., 32° 20′ E., it takes the north-east direction of that channel, and it is not till 2° N. that the river again turns westward

towards the Albert Nyanza. Seventy miles below the Ripon Falls the Nile enters a marshy lake of irregular outline, running mainly east and west, and known as Kioga (or Choga). The current of the Nile is clearly discernible along the western shore of this lake, which is 3514 ft. above the sea. Eastwards the lake breaks into several long arms, which receive the waters of other lakes lying on the plain west of Mount Elgon. One of these, named Lake Salisbury, lies in I ° 40′ N. and 34 E. ; east of this lake and connected with it is Lake Gedge. Lake Kioga also receives the Mpologoma, a river which rises in the foothills of Elgon and flows east and north, attaining a width of l| m.; and from the south (west of the Nile) a broad lacustrine river, the Seziwa. The Kioga lake system, lying north of the ridge which separates it from Victoria Nyanza, owes its formation in part to the waters pouring down from the Nyanza, and is in the nature of a huge Nile backwater. The lake itself is rarely more than 20 ft. deep; its greatest length is 85 m.; its greatest width 10 m. Below Mruli, the fall in the bed levels of the Nile, which up to this point has been comparatively gradual, increases considerably. At Karuma, where the western bend to the Albert Nyanza is made, the river falls over a wall-like ledge of rock, 5 ft. high, which extends across its bed. But the great feature of the Victoria Nile are the Murchison Falls (named by Sir Samuel Baker, their discoverer, after Sir Roderick Murchison, the geologist), situated in 2° 18′ N. and 31° 50′ E. At this point the river rages furiously through a rock- bound pass, and, plunging through a cleft less than 18 ft. wide, leaps about 130 ft. into a spray-covered abyss. Downstream from these falls the river flows for some 14 m. between steep forest-covered hills, a wide and noble stream with a current so slow and steady that, at certain seasons, it is only from the scarcely perceptible drifting of the green water-plants called Pistia Straliotes that it can be observed. About 24 m. below the Murchison Falls and 254 m. from the Victoria Nyanza the river enters, through a wide delta, and across a formidable bar, the N.E. end of Albert Nyanza. In its passages from the one lake to the other the Nile falls altogether about 1400 ft. Taking its name from a fort which once existed there, the delta district is known as Magungo.

From Albert Nyanza to the Plains. — Issuing from the north-west corner of Albert Nyanza some 5 m. from the spot where it entered that lake, the Nile, which is now known as the Bahr-el-Jebel, or Mountain river, flows in a generally northerly direction. As far as Dufile, 130 m. below Magungo, it has a gentle slope, a deep channel and a current generally slight. It forms a series of lake-like reaches often studded with reedy islands. Immediately below Dufile the Kuku mountains on the west and the Arju range on the east close in upon the river, which,

from an average width of 700 yds., narrows to 230 yds. Here the hills cause the stream to make a sharp bend from the north-east to the north-west. Four or five miles lower down the river widens to 400 yds., and a large island divides the stream, the eastern channel carrying the main volume of water. This island marks the beginning of the Fola Rapids. At its southern end the water falls some 20 ft., and then, like a gigantic mill-race, rushes through a gorge 330 ft. long and nowhere more than 52 ft. wide, to leap into a deep cavity not more than 40 ft. across. Escaping from this ” cauldron ” the waters thunder on in a succession of rapids, which extend beyond the northern end of the island. In all the Fola Rapids are nearly 2 m. long. For the next 80 m. the Nile, save for the great volume of water, resembles a mountain torrent, its course interrupted by continual rapids. The last of these occurs at Bedden, where the river breaks through a line of low hills running athwart its channel. One of these hills forms an island in mid-stream. Below Bedden various stations are established upon the river. Fort Berkeley, in 4 40′ N. (on the right bank), is the nearest to the rapids. Then follow Rejaf (left bank), Gondokoro (right bank) and Lado (left bank), all within 30 m. of one another. A striking feature of the scenery at Rejaf is a cone-shaped hill, about 370 ft. high, crowned by rocks which have the appearance of the ruins of an ancient castle. At Gondokoro the Nile is clear of the hill country, and enters a vast swamp-like expanse through which it flows with a very low slope and a very tortuous channel.

Between Albert Nyanza and the swamp region the Bahr-el-Jebel is joined by many streams. The most important of these affluents is the Asua (nearly 200 m. long), which enters the main stream from the east in 3 50′ N. (19 m. N. of Dufile), but has little water in the dry season. The Asua and its subsidiary streams rise on the western versant of the Karamojo plateau and among the mountain ranges which run off from that plateau to the north-west, the most remote head-stream running originally due south.

The Region of Swamps. — The wide valley which the Nile enters at Gondokoro slopes so gradually towards the north that the river falls only some 182 ft. in a stretch of 475 m. Through this valley the river winds in an extremely tortuous course. Its channel has no banks, and the overflow has caused extensive swamps which are covered by a mass of papyrus and tall reeds, and are traversed by numerous shallow lagoons or ” mayyas.” The shape of these lagoons is constantly altering, as also is that of the channels connecting them with the river. About 8 m. below Bor, many of the eastern ” spills ” unite and form a stream of considerable breadth, with a strong •

current. This stream, which is known to the Dinkas as the Atem, follows a course generally parallel to the Jebel, being bounded eastward by forest land. Opposite Kanisa (6° 46′ N.), on the main river, the Atem divides into two channels, marshy land extending at this point a great distance to the east. The western branch, or Awai, rejoins the Jebel near Shambe 7 6′ N. The eastern branch or Myding continues through the marshes, eventually joining the Bahr- el-Zeraf (see below) in its lower course.

Except for the Atem divergence the Nile, despite the swamps through which it passes, maintains a fairly definite course, with a considerable depth of water as far as Shambe, where, to the west, is a large lagoon. Five miles lower down the river splits into two great channels. That to the left, the main stream, continues to be known as Bahr-el-Jebel, but is sometimes called by its Dinka name Kir. The right branch, or Bahr-el-Zeraf (Giraffe river), has a more easterlv direction, and does not rejoin the main river until 50 m. below i’ts confluence with the Bahr-el-Ghazal (q.v.). From the point of bifurcation the Bahr-el-Jebel flows for 230 m. in a general north- westerly direction until it is joined by the Bahr-el-Ghazal coming from the south-west. The whole region is a vast expanse of low land- crossed by secondary channels, and flooded for many miles in the rainy season. At the junction of the Bahr-el-Ghazal and the Bahr- el-Jebel in 9° 29′ N. the permanently submerged area is usually named Lake No, but the Arabs call it Moghren-el-Bohur (meeting o£ the rivers). Lake No in the rains covers about 50 sq. m. ˆ In the Bahr-el-Jebel occur the great accumulations of ” sudd ” (q.v.), masses of floating vegetation which obstruct and, if not removed, prevent navigation. The aspect of the river throughout the sudd region is monotonous and depressing. On all sides stretch reaches of the reed known as um sttf or mother of wool (Vossia procera), ambach, Bus and papyrus. These grasses rise 15 to 20 ft. above the water, so as often to close the view like a thick hedge. The level of the flat expanse is broken only at intervals by mounds of earth, erected by the white ants and covered with a clump of brushwood or trees; the moisture in the air is excessive; mosquitoes and other swamp flies swarm in myriads. And yet touches of beauty are not wanting. Water-lilies (Nymphaea stellata and Nymphaea Lotus) — white, blue and crimson — often adorn the surface of the stream. Occasionally the rare and odd-looking whale-headed stork or Balae- niceps rex is met with among the reeds, and at night the scene is lit up by innumerable fire-flies.

Tlie White Nile. — From the confluence with the Bahr-el-Ghazal at Lake No, the main stream, which here takes the name of Bahr-el-Abiad, or White river, adopts the easterly course of the tributary stream. Forty miles below the point where the Bahr-el-Zeraf reunites with the main branch, the Nile receives its first great eastern affluent — the Sobat (q.v.), whose head-streams rise in the mountains of south-west Abyssinia and the region north of Lake Rudolf. Just above the Sobat junction the Nile resumes its northern course. It passes through a great alluvial plain, stretching from the spurs of the Abyssinian highlands in the east, to the hilly districts of Kordofan in the west, and covered with high grass and scattered bush. The swamps still bound it on either bank, but the river again flows in a well-marked channel with defined banks. About 56 m. below the Sobat mouth, in 9 55′ N., lies (on the left bank) Fashoda (re- named in 1904 Kodok), an Egyptian town founded in 1867 on the site of Denab, the old " capital " of the Shilluks, and famous for the crisis between England and France in 1898 through its occupation by the French officer Marchand. For the next 270 m. the scenery is very monotonous. The river flows in a wide channel between broad swamps bordered by a belt of forest on either bank. At Abu Zeid (about 13° 5′ N.) for a distance of nearly 4 m. the river is extremely broad and shallow, being fordable at low water. Fifteen miles lower down, at Goz Abu Goma — which is the northern limit of the sudd vegetation — the river is divided into two channels by Abba Island, wooded, narrow and 28 m. long. On Abba Island_ lived, for some years before r 88 1 , Mahommed Ahmed, the Mahdi.

The Blue Nile. — Five hundred and twentv miles below the Sobat mouth and 1652 m. from Ripon Falls, in 15 s 37′ N., the White Nile is joined by its greatest eastern confluent the Bahr-el-Azrak or Blue Nile. In the fork of the two rivers stands Khartum.‘the capital of the Anglo-Egyptian Sudan, whilst on the western bank of the White Nile is Omdurman, the former Mahdist capital. The Blue Nile, or Abai as it is called in Abyssinia, rises in the Gojam highlands in n° N. and 37 E., and flowing northwards 70 m. enters Lake Tsana (q.v.) near its south-west corner, to issue again at the south-east end. The Abai and its tributaries drain a great part of the Abyssinian plateau. The complicated river system is best understood by a study of the map. The Abai itself on leaving Lake Tsana makes a great semicircular sweep S.E. to N.W., from the highlands of Ethiopia to the plains of Sennar. In this section of its course its swirling waters rush over a long series of cataracts and rapids, descending from a height of 5770 ft. at the outlet to about 1400 ft. at Fazokl or Famaka (u° 17′ N., 35 10′ E.), where it crosses the Abyssinian frontier, and flows through the plains

of Sennar to its confluence with the White Nile at Khartum, 1300 ft. above sea-level. Of the tributaries

1 At Khartum the water of the one river is of a greenish-grey colour, that of the other is clear and blue, except when in flood, when it gains a chocolate brown from its alluvial burden.

of the Abai the majority join it on its left bank. The Bashilo, Jamma and Muger, which reach the Abai in the order named, drain the country east of the main stream between the basins of the Takazze and the Hawash. The Guder, with a south to north course, rises in the mountains which form the watershed between the Nile and the Lake Rudolf basin. Next comes the Didessa, a large stream rising near the head-waters of the Baro (the main upper branch of the Sobat) and flowing N.W. to the Abai, the confluence being in about io° N., 35 40′ E. It has an early rise and a long flood period, being by far the most important tributary of the Blue Nile. The Dabus or Yabus rises about 9 N., 34° 30′ E., and flowing north joins the Abai near the spot where that river breaks through the Abyssinian hills. All these affluents are perennial, as is the Bolassa or Yesien, a right-hand tributary which reaches the Abai below the Yabus. Four miles below Famaka the river is joined on its left bank by the auriferous Tumat, an intermittent stream. In Sennar it receives on its right bank two considerable tributaries from the Abyssinian heights, the Dinder, a very long but not perennial stream, and the Rahad, waterless in the dry season, copious and richly charged with sediment during the rains from June to Sep- tember. At this period the discharge of the Blue Nile rises from less than 200 to over 10,000 cub. metres per second, thus greatly exceeding that of the White Nile itself, which is only about 800 cub. metres during the floods above the confluence. The length of the Blue Nile is about 850 m. The country, El Gezira, enclosed in the triangle formed by the junction of the White and Blue Niles forms the most fertile portion of the Sudan. It only requires irrigation to render it one of the finest grain-producing areas in the world.

The Atbara. — Two hundred miles below Khartum — at Ed-Damer — the Nile is joined by the last of its tributary streams — the Atbara or Bahr-el-Aswad (Black river). The Atbara, some 800 m. long, rises in the tableland north of Lake Tsana, being formed by the junction of the Angreb, Salaam, Aradeb, Goang and other mountain streams. Making its way towards the Nubian plains, the river flows in a north-westerly direction, joining, in 14 10′ N., 36° E., tlte Bahr Setit or Takazze (see Abyssinia), a river coming from the east and having a volume of water as large as, if not larger than, the Atbara. The united stream preserves, however, the name of Atbara, and at its confluence with the Nile has a

breadth in flood time of over 600 yds. The Atbara and its tributaries, like many of those which feed the Blue Nile, rapidly dwindle after the rains into the smallest limits. In its lower course the Atbara runs completely dry, but higher up water may be found in deep pools, hollowed out of the sand bed of the stream by the river when in flood. These pools are full of fish, turtles, crocodiles and hippopotami, which remain im- prisoned until the return of the flood. The country comprised between the Nile proper, the Atbara and the Blue Nile is identified with the island of Meroe of ancient history.

The Cataracts. — Downstream of the Atbara junction the Nile continues its course to the Mediterranean, traversing a distance of over 1600 m. without receiving a single tributary on either bank. Below Khartum the river makes a great S-shaped bend, and leaving behind the cultivable land pierces the Nubian desert. In its progress the volume of water suffers continual diminution from evaporation, owing to the extreme dryness of the air. The valley of the river is here very narrow, and the desert land in places comes right to the water's edge. Elsewhere high and barren cliffs shut in the valley. Between Khartum and Wadi Haifa (the northern end of the great Lend), a distance of over 900 m., occurs a series of cataracts, known as the 2nd, 3rd, 4th, 5th and 6th (the 1st cataract is lower down the river at Assuan). That first met with on descending the river from Khartum is the 6th (or Shabluka) cataract. The river here (53 m. below Khartum) is narrow and picturesque. The rapid is 11 m. in length, in which distance the Nile falls some 20 ft. 2 After 188 m. of smooth water the 5th cataract is reached. It begins 28 m. below Berber (a town on the right bank at the head of a caravan route to the Red Sea), and with three principal rapids extends for 100 m. — the drop in this distance being rather more, than 200 ft. At the foot of this cataract is the town of Abu Hamed, at the eastern end of the middle of the S bend. The 4th cataract begins 60 m. down stream from Abu Hamed. It is 69 m. long and has a drop of 160 ft. Between the 4th and 3rd cataracts there is a stretch of 194 m. on a very gentle slope (jˆiˆ-a). This reach constitutes the province of Dongola, and here the cultivable land on the western side of the river is of greater extent than usual in the desert zone. The 3rd cataract, 45 m. long, has a drop of some 36 ft. After another smooth reach extending 73 m. the 2nd cataract, which ends just above Wadi Haifa, the northern frontier town of the Anglo-Egyptian Sudan, is reached. This cataract is 124 m. long and has a fall of 216 ft. Between the 2nd cataract and Assuan are 214 m. of smooth water with a scarcely perceptible slope, tuhnj- The average breadth of the river here is 1640 ft. It runs through a sandstone bed, and the current is guided in many places by spurs of masonry built by the ancient

Egyptians.

Lower River and Delta. — For some distance above Assuan the river is studded with islands, including those of Philae and Elephantine. The rapids south of the town used to form the 1st cataract, where. 2 The fall in the river-bed, as given in these pages, is an approxi- mation derived from barometric readings only.

in a length of 3 m., the river fell i6J ft. Since the completion of the great dam and locks at the head of these rapids (Dec. 1902) they have to a certain extent disappeared, and a navigable channel has been formed. The dam, pierced by 180 sluices, stretches across the river — a wall 2000 yds. long and 26 ft. wide at the top. Below the water rushes between rocks in many channels (this being the relics of the cataract). Upstream from the dam a lake some 100 m. in length has been formed. The Assuan Dam was opened on the 10th of December 1902 (see under Irrigation). A ladder of four locks on the western side of the dam permits navigation between the upper and lower reaches. At Assuan the banks of the river are bordered by high granite hills. From this point to the apex of the delta the length of the Nile is 605 rri. with a slope (13 Jo) even slighter than that above Assuan. The valley is comparatively narrow, being an almost level depression in a limestone plateau — the area of fertility ends where the land ceases to be irrigated by the river. At Edfu, 68 m. below Assuan, a barrage, known as the Esna barrage, regulates the flow of the water, and at Assiut, 274 m. below Edfu, is another barrage fulfilling the same purpose. Cairo, the capital of Egypt, is built on the eastern bank of the Nile 12 m. north of the apex of the delta.

At the beginning of the delta the Nile separates into two channels, the Rosetta and the Damietta, which join the Mediterranean at its south-east angle. At the bifurcation is a double barrage, by means of which the water can be dammed to the height required for forcing the river into the canals which irrigate the delta. Of the two branches the Damietta is the more easterly. Both are about the same length — 146 m. 1 Behind the coast-line, which is low and sandy, are a number of salt marshes or lagoons. Whilst the Damietta branch is gradually silting up, the Rosetta branch is scouring out a wider channel. In time of full flood the depth of the. water in either branch is about 23 ft.

Hydrography. — The fertility and prosperity of Egypt and the

northern part of the Sudan being entirely dependent on the irrigation of the fend by the waters of the Nile, the variation in the supply at different seasons of the year is of vital importance. (In Egypt the height of the flood has been recorded annually, as the chief event of the year, since at least 3600 B.C.) Above the Sobat confluence the Nile traverses a region of heavy rainfall and the water-supply is super-abundant. It is from Victoria, Albert and Albert Edward Nyanzas and their feeders, and in a lesser degree from the Bahr-el-Ghazal, that this river obtains its constant supply of water throughout the year. The great lakes and the region of swamps, retaining a large propor- tion of the water they receive, act as natural reservoirs and prevent the lower Nile from ever running dry in summer. The Abyssinian affluents are the chief cause of the Nile flood. In the equatorial regions rainfall varies from 30 to 80 in. during the year with a mean of about 50. It is heaviest in the months of January, February, March and April, and again in October and November. The most rainy portions of the lake plateau (where alone occurs a rainfall of 60 in. and over) lie along the eastern edge of the Albertine Rift valley, and west and north of Victoria Nyanza. These rains feed Albert Edward and Albert Nyanzas, and, through the Kagera, supply a great part of the water of Victoria Nyanza. The water in the Victoria Nyanza begins to rise in January, the rise becomes marked in June, is at its height in July, the level of the water reaching its lowest at the end of November. The Bahr-el-Jebel is at its lowest in March and April and at its highest in September. The seasonal supply of the Bahr-el-Ghazal does not vary very greatly, the maxi- mum levels occurring in November and December. The Ghazal has but a slight discharge. The Sobat, from December to March, is at its lowest, and is in flood from June to October, during which period the water (milky coloured) which it pours into the Nile equals in volume that of the main stream. It is the colour of the Sobat water which gives its name to the White Nile. The Blue Nile, at its confluence at Khartum, begins to rise in June and is in flood from July to October; the Atbara is also in flood during the same months. The great difference in the supply of water from the equatorial regions and from Abyssinia arises from the fact that the first-named district is one of heavy rain practically all the year round; whereas in Abyssinia the season of heavy rain is usually limited to the months of June to September. Reduced to its simplest expression, the Nile system may be said to consist of a great steady flowing river fed by the rains of the tropics, controlled by the existence of a vast head reservoir and several areas of repose, and annually flooded by the accession of a great body of water with which its eastern tribu- taries are flushed.

At Khartum the Nile is' lowest in April and May and highest in August and September. Its minimum depth is 18 ft. and its maxi- mum depth 25 ft. At Assuan the Nile is at its lowest at the end of May, then rises slowly until the middle of July, and rapidly through- out August, reaching its maximum at the beginning of September; it then falls slowly through October and November. At Cairo the

1 In ancient times the delta was watered by seven branches; five of these branches are now canals not always navigable. The ancient branches were, beginning at the west, the Canopic, Bolbitine, Sebennytic, Phatnitic, Mendesian, Tanitic and Pelusiac, of which the modern Rosetca and Damietta branches represent the Bolbitine and Phatnitic

lowest level is reached about the middle of June, after which the rise is slow in July and fairly rapid in August, reaching the maximum at the beginning of October. By using the water stored by the Assuan dam in the months following high Nile, the river lower down has been, since 1902, replenished at times of low water to meet the needs of cultivators (see Irrigation: Egypt). At Assuan the average rise of the Nile is 26 ft., at Cairo it is 23 ft. A rise of 21 ft. only at Assuan is a " bad Nile " ; on the other hand, a rise of 30 ft. causes a danger of flood, or rather it used to do so previous to the building of the dam. When the Nile below the swamps is at its lowest, the water acquires a green colour and a putrid taste and smell. This is caused by innumerable microscopic green algae, which are brought into the White Nile from the marshes of the Bahr-el-Jebel and Bahr-el- Ghazal, and descend the river when it is clear of all suspended matter. This " green water " is seen at Cairo about the end of June or beginning of July, and passes away with the first rise in the later month, the algae being unable to live in turbid water. By August the river in lower Egypt is full of dark red-brown sediment brought down by the Blue Nile and the Atbara from the plateaus of Abys- sinia. It is estimated to be then carrying 8 cub. yds. per second; by September this has been reduced to half the amount, and then diminishes rapidly. It has been calculated 2 that the time taken by the water to travel from Khartum to the delta barrage varies from 14 days in September to 42 in May. On the island of Elephantine at Assuan is the famous Nilometer, dating from ancient Egyptian times, altered and extended in Roman times and repaired in 1870 by the Khedive Ismail. It is a well built of hewn stones, marked with scales to record the level of the water, which rises and falls with that of the river. The remains of other ancient Nilometers exist at Philae, Edfu and Esna, together with inscriptions recording about forty high Niles in the XXVth Dynasty, discovered on a quay wall of the temple of Karnak. The data furnished by these give about 41 in. per

century as the rate at which the Nile is silting up its bed north of the 1st cataract. The level of high Nile at the Semna rapids, between the 2nd and 3rd cataracts, is 24 ft. lower than that indicated, by the marks sculptured c. 2500 B.C. This fall is attributed to the erosive action of the water as it passes over the hard gneiss which at Semna forms a barrier across the stream. The vertical extent of such erosion is equal to about two millimetres a year.

It is noteworthy that from the mouth of the Sobat to the Mediterranean the current of the Nile is generally deepest and strongest on its right (eastern) bank; the Nile in this respect resembling other great rivers of the northern hemisphere. The pressure of the water on the right bank is attributed to the prevailing N.W. winds. 3

There are now gauges for registering the rise of the water at Cairo, Assuan, Berber and Khartum on the main river; at Wad Medani, Sennar and Roseires on the Blue Nile; El Duem and Taufikia on the White Nile; Nasser on the Sobat; Gondokoro on the Bahr-el- Jebel ; and Ugowe, Jinja and Entebbe on Victoria Nyanza.

Navigation. — At high Nile there is uninterrupted water-communication from the sea to Fort Berkeley in 4° 40′ N. — a distance of 2900 m. Owing to the cataracts, navigation between Assuan and Khartum is impossible during low Nile, and from the 1st of March to the 1st of August the upper courses of the Damietta and Rosetta branches are closed to navigation; the water being utilized for summer irrigation in the delta. As far as Mansura (60 m.) on the Damietta branch and Kafr-el-Zayat (70 m.) on the Rosetta branch, and between Khartum and Fort Berkeley (1090 m.) the river is navigable all the year round, though between the Sobat confluence and Bor, navigation is dependent on the channel being kept clear of sudd. Above Fort Berkeley navigation is interrupted by the rapids and cataracts which extend to Dufile, but from the last-named town to Fajao at the foot of the Murchison Falls (a distance of 1 50 m.) the river is navigable throughout the year. There is a further navigable stretch between Foweira (just above the Karuma rapids) and the southern' end of Lake Kioga. The Blue Nile is navigable for steamers during flood time from its confluence at Khartum to Roseires at the foot of the Abyssinian hills, a distance of 426 m. At low water small boats only can go up stream. The Atbara is never navigable, the current during flood time being too swift for boats. Including the Sobat and the Bahr-el-Ghazal the navigable waters of the Nile and its affluents exceed 4000 m.

Owing to the cataracts and the partial closing of the Damietta and Rosetta branches for irrigation purposes, the Nile below Khartum is

subsidiary, as a means of communication, to the railways and highroads. 4 Above Khartum the river is

2 By Sir Hanbury Brown, inspector-general of irrigation, Lower Egypt, 1892-1903.

3 Egyptian Irrigation (p. 29), by Sir W. Willcocks (London, 1899).

4 Between Assuan (Shellal) and Wadi Haifa the river is, however, the main highway, there being no railway between the places named.

the chief channel of trade and commerce. Steamers first ascended the Nile above the cataracts (to Korosko) in 1820. It was not till 1846 that a steamboat was placed on the White Nile. (W. E. G.; F. R. C.)

Story of Discovery. — Few problems in geographical research exercised for so long a period so potent an influence over the imaginations of man as that of the origin of the Nile. The ancient Egyptians, as is apparent from the records on their monuments, were acquainted with the main stream as far south as the junction of the White and Blue Niles. They appear also to have known the Blue Nile up to its source and the White Nile as far south as the Bahr-el-Ghazal confluence. Beyond that point the sudd probably barred progress. The knowledge acquired by the Egyptians passed to the Persians and Greeks. Herodotus (about 457 B.C.) ascended the Nile as far as the First Cataract. He was led to believe that the source of the river was far to the west — in the region of Lake Chad. Eratosthenes, superintendent of the Alexandrian library, in a map made about 250 B.C., showed, with fair accuracy, th» course of the river as far as where Khartum now stands. He showed also the Atbara and Blue Nile. Eratos- thenes was the first writer to hint at equatorial lakes as the sources of the river. Juba II., king of Mauretania (who died about a.d. 20), in his Libyca, quoted by Pliny, makes the Nile rise in western Mauretania, not far from the ocean, in a lake presenting characteristic Nile fauna, then pass underground for several days' journey to a similar lake in Mauretania Caesariensis, again continue underground for twenty days' journey to the source called Nigris on the borders of Africa and Ethiopia, and thence flow through Ethiopia as the Astapus. This remarkable story received considerable credence, and may be connected with the theory which made the Niger a branch of the Nile (see below). Strabo (a contemporary of Juba), who ascended the river

as far as Syene, states that very early investigators had connected the inundation of the Lower Nile with summer rains on the far southern mountains, and that their theory had been confirmed by the observations of travellers under the Ptolemies. About the same time Dalion, a Greek, is believed to have ascended the White Nile. Nero despatched two centurions on an ex- pedition for the express purpose of exploring the Nile, and Seneca states that they reached a marshy impassable region, which may be easily identified with the country of the Whfte Nile above the mouth of the Sobat. To what they referred when they reported a great mass of water falling from between two rocks is not so readily determined. During this period more accurate knowledge concerning the Nile sources was obtained from the reports of Greek traders who visited the settlements on what is now called the Zanzibar coast. A merchant named Diogenes returning (about a.d. 50) from the east coast of Africa told a Syrian geographer, Marinus of Tyre, that journeying inland for twenty- five days he reached the neighbourhood of two great lakes and a range of snow mountains whence the Nile drew its sources. Marinus published this report in his geographical works. This book is lost, but the information is incorporated in the writings of Ptolemy, who in his book and map sums up all that was known or surmised of the Nile in the middle of the 2nd century of the Christian era. Ptolemy writes that two streams issuing from two lakes 1 (one in 6° and the other in 7 S.) unite in 2° N. to make the Nile, which, in 12 N., receives the Astapus, a river flowing from Lake Coloe (on the equator). His two southern lakes, he conceived, were fed by the melting of snows on a range of mountains running east and west for upwards of 500 m. — the Mountains of the Moon, t6 rrjs aeKijvris Spos, Lunae Mantes. It will be seen that, save for placing the sources too far to the south, Ptolemy's statements were a near approximation to the facts. The two southern lakes may be identified with Victoria and Albert Nyanzas, and Lake Coloe with Lake Tsana. The snow-capped range of Ruwenzori occupies — at least in part — the position assigned to the Mountains of the Moon, with which chain Kilimanjaro and Kenya may also be plausibly identified. On all the subsequent history of the geography of the Nile

1 The two lakes afterwards received the names Lake of Crocodiles and Lake of Cataracts.

Ptolemy's theory had an enormous influence. Medieval maps and descriptions, both European and Arabian, reproduce the Mountains of the Moon and the equatorial lakes with a variety of probable or impossible modifications. Even Speke (see below) congratulated himself on identifying the old Ptolemian range with the high lands to the north of Tanganyika, and connected the name with that of

Unyamwezi, the ” country of the moon.” In the fourteen centuries after Ptolemy virtually nothing was added to the knowledge of the geography of the Upper Nile. Arab writers of the 12th and 13th centuries make mention of the great lakes, and their reports served to revive the interest of Europe in the problem of the Nile. Idrisi made both the Nile and the Niger issue from a great lake, the Niger flowing west, the Nile north. Hence arose much confusion, th? Senegal estuary being regarded by its discoverers (1445) as the mouth of a western branch of the Nile. Even until the early years of the 19th century the belief persisted in a connexion between the Nile and the Niger (see further Niger). Portuguese explorers and missionaries, who in the 15th and 16th centuries visited the east coast of Africa and Abyssinia, gained some information about the equatorial lake region and the Nile, 2 the extent of the know- ledge thus acquired being shown in the map of Africa of Filippo Pigafetta, Italian traveller and historian (1533-1603) published in 1580. It was not, however, till the 17th century that the sources of the Blue Nile were visited by Europeans. In 1615 Pedro Paez, a Portuguese priest, was shown them by the Abyssinians. Ten years later another Portuguese priest, Jeronimo Lobo, also visited the sources and left a vivid descrip- tion of the rise of the river and its passage through Lake Tsana. An English version of the accounts of Paez and Lobo — written by Sir Peter Wyche — was published in 1669 by order of the Royal Society, of which Sir Peter was an original Fellow. Between 1625 (the date of Lobo’s visit) and 1770, some attempts were made by French and other travellers to explore the Blue Nile, but they ended in failure. In the last-named year James Bruce (q.v.) reached Abyssinia, and in November 1772 he arrived in Egypt, having visited the source of the Blue Nile and followed it, in the main, to its confluence with the White Nile. On returning to Europe Bruce was mortified to find that whilst he was still in Egypt the French geographer D’Anville had (1772) issued a new edition of his map of Africa in which by a careful study of the writings of Paez and Lobo he had anticipated Bruce’s discoveries, D’Anville’s map is singularly accurate, if we remember the scanty information at his disposal. To Bruce, nevertheless, belongs the honour of being the first white man to trace the Blue Nile to its confluence with the White Nile. He himself, considering that the Blue Nile was the main branch of the river, claimed to be the discoverer of the long-sought caput Nili?

From the time of Bruce, interest in the Nile problem grew rapidly. The Englishman W. G. Browne {q.v.) when in Darfur (1794-1796) heard that the Abiad rose far south in the Mountains of the Moon, but he makes no mention of the great lakes, and in Major RennelPs map of

1802 there is no hint of equatorial lakes at the Abiad sources. During the French occupation of Egypt the river from the sea to Assuan was accurately surveyed, the results being embodied in Jacotin's Atlas de I'Egypte (1807). In 1812-1814 J. L. Burckhardt, the Orientalist, went up the Nile to Korosko, travelled thence across the desert to Berber and Shendi, and crossing the Atbara made his way to the Red Sea. It was, however, due to the initiative of Mehemet Ali, Pasha of Egypt, that the While Nile was explored. In 1820- 22 a military expedition under Ismail Pasha, a son of Mehemet Ali, which was joined by the French scientist FrSd6ric Cailliaud (who had visited Meroe in 1819) ascended the river to the

2 Francisco Alvarez, a priest, who was in Abyssinia 1 520-1 526, afterwards wrote (about 1550) an account of Abyssinia in which he refers to the Atbara as the main Nile.

3 Bruce, however, acknowledged in his Travels that the Abiad (White Nile) at its confluence with the Blue Nile was the larger river. The Abiad, he writes, " preserves its stream always undiminished, because rising in latitudes where there are continual rains, it therefore suffers not the decrease the Nile does by the six months' dry weather."

confluence of the White and Blue Niles, founded the city of Khartum, and ascended the Blue Nile to Fazokl. In 1827 Adolphe Linant, a Belgian in the service of the British African Association, ascended the White Nile 132 m. above Khartum, being the first white man to do so since the 1st century a.d. Then followed three Egyptian expeditions sent in 1830-41 and 1842 by Mehemet Ali up the White Nile. The first expedition reached, on the 28th of January 1840, a point 6° 30′ N., the second and third pressed further south, reaching 4 42′ N. — or the foot of the rapids above Gondokoro. A Turkish officer, Selim Bimbashi, commanded the expeditions, and among the members were the Frenchmen Thibaut (a convert to Islam and for nearly forty years French consular agent at Khartum), D'Arnaud and Sabatier, and a German, Ferdinand Werne. The last-named wrote a scientific account of the second expedition and drew a map of the Nile between Khartum and Gondokoro. An Austrian Roman Catholic mission was established in the Sudan, and in 1850 one of its members, Dr Ignatz Knoblecher, sent to Europe reports, gleaned from the natives, of the existence of great lakes to the south. About the same time two Protestant missionaries, Ludwig Krapf and John Rebmann, stationed

on the Zanzibar coast, sent home reports of a vast inland sea in the direction where the Nile sources were believed to be. This sea was supposed to extend from o° 30′ N. to 13 30 ‘ S. These reports revived interest in Ptolemy’s Geography. The exploration of the Bahr-el-Ghazal by John Petherick, Miss Tinne and her companions, and others followed the opening up of the White Nile (see Bahr-el-Ghazai). The general result of the work carried on from the north was that by 1858 the Nile system was known as far south as the rapids at Bedden.

On the 3rd of August 1858 the English explorer J. H. Speke (q.v.) discovered the large nyanza (lake), which he rightly con- ceived to be the head reservoir of the White Nile, and which in honour of the queen of England he named Victoria Nyanza. Captain (Sir Richard) Burton and Speke had gone inland from Zanzibar to investigate the reports concerning the vast lake which Rebmann and Krapf had called the Sea of Unyamwezi. These reports proved to be exaggerated accounts of three dis- tinct lakes — Nyasa, Tanganyika and Victoria Nyanza. In i860 Speke returned to Zanzibar accompanied by J. A. Grant (q.v.), bent on solving the problem of the Nile. In spite of great difficulties he made his way to Uganda, on the north-west of Victoria Nyanza, and (without exploring the lake) succeeded in reaching its outlet. On the 28th of July 1862 Speke stood by the Ripon Falls — the birthplace of the Nile. In his journey he had discovered the Kagera river, now known to be the most remote headstream of the Nile, a fact of which Speke was un- certain, though he recognized that it was the largest river entering the nyanza. Speke and Grant paddled down the Nile a short distance, but before reaching Lake Kioga they were stopped by hostile natives and compelled to go westward to Unyoro. There they heard of another great lake further west, but the king of Unyoro refused them permission to visit it. In the end they descended the Kafu river to its confluence with the Nile and then down the main stream to the Karuma Rapids. Here Speke and Grant left the river, and travelled overland east of the stream, which they did not strike again until just above the Ausa con- fluence. Thence they travelled down the Nile to Gondokoro, reached on the 15th of February 1863.

This remarkable journey virtually solved the Nile problem so far as the source of the main stream was concerned, but there re- mained much to be done before the hydrography of the whole Nile basin was made known. At Gondokoro Speke and Grant met Mr (afterwards Sir Samuel) Baker 1 and his wife — a Hungarian lady — who had journeyed thither to afford the explorers help. To Baker Speke communicated the news he had heard con- cerning the western lake, and this lake Baker determined to find. On the 26th of March 1863 Bak«r and his wife left Gondokoro, and despite much opposition,

especially from slave-dealers, followed, in the reverse direction, the route of Speke and Grant as

1 Baker and his wife had in 1861-1862 explored the Atbara (to its upper waters) and other eastern tributaries of the Nile.

far as Unyoro, whence they journeyed west. On the i4thof March 1864 they struck the lake (Albert Nyanza) on its S.E. side. They paddled up the lake to the point where a large river coming from the east poured its waters into the lake. This stream, which they rightly conjectured to be Speke's Nile, they followed up to the Murchison Falls. Thence they went overland to the Karuma Rapids, and so back to Gondokoro by their old tracks. It fell to the lot of General C. G. Gordon (when that officer administered the Egyptian Equatorial provinces) and his assistants to fill up the gap left by Speke and Baker in the course of the main stream. In 1874-/5 two English engineer officers — Lieut, (afterwards Colonel Sir Charles M.) Watson and Lieut. H. Chippendall — followed the river between Gondokoro and Albert Nyanza; in 1876 an Italian, Romolo Gessi Pasha, circum- navigated that lake, proving Baker's estimate of its size to be vastly exaggerated; Gordon in the same year traced the river between Murchison Falls and Karuma Rapids, and an American, Colonel C. Chaill6-Long followed (1874) the Nile from the Ripon Falls to the Karuma Rapids, discovering in his journey Lake Kioga (which he named Ibrahim). In this manner the identity of the Victoria Nile with the river which issued from the Albert Nyanza was definitely established.

In 1874 H. M. Stanley (q.v.) went to Africa with the object of completing the work left unfinished by David Livingstone, who believed, erroneously, that the ultimate sources of the Nile were far to the south (see Congo). Stanley, in 1875, circum- navigated Victoria Nyanza, setting at rest the doubt thrown on Speke's statement that it was a huge sheet of water, 2 but proving Speke mistaken in believing the nyanza to have more than one outlet. On the same journey Stanley encamped at the foot of the Ruwenzori range, not knowing that they were the " Mountains of the Moon," whose streams are the chief feeders of Albert Nyanza. (At the time of his visit the snow-peaks and glaciers were hidden by heavy clouds.) In 1888, however, Stanley saw the mountains in all their glory of snow and ice, discovered Albert Edward Nyanza, and traced the river (Semliki) which connects it with Albert Nyanza. The Semliki had been discovered, and its lower course followed in 1884 by Emin Pasha. Thus at length the riddle of the Nile was read, though much was still to do in the matter of scientific survey, and in the exploration of the valley of the Sobat (q.v.). The Kagera had been partly ex- plored by Stanley (1875), by whom.it was called the Alexandra Nile, and between 1891-98 its various branches were traced by the German travellers Oscar Baumann, Richard Kandt

and Captain H. Ramsay, and by Lionel Decle, a Frenchman. A British officer, Colonel C. Delme-Radcliffe, made the first accurate survey (1900-1901) of the Nile between Albert Nyanza and Gondokoro. In 1903 an Anglo- German commission under Colonel Delme-Radcliffe and Captain Schlobach made a detailed survey of the Kagera from 30° E. to its mouth. The Kioga system was surveyed in 1907-1908 by Lieut. C. E. Fishbourne. A trigonometrical survey of the upper river was begun by Colonel M. G. Talbot, director of Sudan surveys, in 1900, and other surveys were made by Captain H. G. Lyons, director-general of the Egyptian survey department. A fish-survey of the waters of the Nile was also undertaken.

The Removal of Sudd. — As already stated, the sudd above the Sobat confluence seems to have stopped the Roman centurions sent by the emperor Nero to explore the Nile. When the river above the Sobat was again reached by white men (1840) the stream was clear of sudd, and so continued until 1863-1864, when both the Bahr-el-Jebel and the Bahr-el-Zeraf became blocked by floating masses of vegetation. When Baker proceeded to Gondokoro in 1870 he thus described the increase that neglect had caused in the obstruction: ” The immense number of floating islands that were constantly passing down the stream of the While Nile had no exit; thus they were sucked under the original obstruction by the force of the stream, which passed through some mysterious channel, until the subterranean passage became choked with a wondrous accumulation of vegetable matter. The entire river became a marsh, through which, by the great pressure of water, the stream oozed through innumerable small channels. In fact, the White Nile had disappeared.” Baker, who had to cut through 50 m. of sudd in his passage to Gondokoro, urged to Khedive

2 In the map issued in 1873 to illustrate Schweinfurth’s book, The Heart of Africa, Victoria Nyanza is shown as five small lakes.

Ismail to reopen the Nile. This work was efficiently done by Ismail Ayub Pasha, and the White Nile was clear for large vessels when Gordon reached Khartum in 1874. The river did not long remain free, for in 1878 Emin Pasha was unable to ascend the Bahr-el-Jebel from the south on account of sudd. It was cleared in 1879-1880 by officials in the Egyptian service, but had again accumulated in 1884. In consequence of the Mahdist movement nothing could then be done to clear the river, and the work was not taken in hand again until 1899,

when, by direction of Sir William Garstin, the Egyptian inspector-general of irrigation, an expedition under Major Malcom Peake, R.A., was sent to cut through the sudd, which then extended from the Bahr-el-Ghazal confluence almost to Gondokoro. During 1900 a channel was cut through the northern and heaviest portion of the sudd. The work was one of much difficulty, some of the blocks being I m. long and 20 ft. deep; the water beneath flowed with great velocity. To remove the obstruction the surface was first burnt; then trenches were cut dividing the sudd into blocks 10 ft. square, and each of these was hauled out with wire hawsers and chains by gunboats working from below. For a distance of 172 m. N. of Shambe (i.e. about midway between the Ghazal confluence and Gondokoro) the true bed of the river could not, in many places, be found, but Major Peake forced a passage to Gondokoro through a spill channel or series of shallow lakes lying west of the main stream. In 1901 Lieut. Drury, a British naval officer, removed many of the remaining blocks of sudd, opening to navigation a further 147 m. of the river. Beyond this point for a distance of 25 m. the Bahr-el- Jebel could not be traced, so completely was the channel choked by sudd. In 1902, however, Major G. E. Matthews discovered the true bed of the river, which by 1904 was completely freed from obstruc- tions, and freedom of navigation between Khartum and Gondokoro was permanently secured. The effect of the sudd-cutting operations on the supply of water available for irrigation purposes in the lower river was slight. Nevertheless, Sir William Garstin reported that the removal of the sudd ” undoubtedly checked the fall in the river levels which would otherwise have taken place.”

Political Relations. — Explored in part by Egyptian government expeditions, the upper Nile as far south as Albert Nyanza became subject, between 1840 and 1882, to Egypt. Possession of the greater part of the river above Wadi Haifa then fell to the followers of the Mahdi. In 1896-98 an Anglo-Egyptian army reconquered the country, and from Victoria Nyanza to the Mediterranean the main river came under British or Egyptian administration. The west bank of the Bahr-el-Jebel, as far north as 5 30′ N., was in 1894 taken on lease from Great Britain by the Congo Free State during the sovereignty of Leopold II., the territory leased being known as the Lado enclave (g.v.). The Kagera, the main headstream, lies almost wholly in German East Africa.

Authorities. — For the story of exploration see the works of Bruce, Speke, Grant, Baker and other travellers (whose books are mentioned in the biographical notices). Their achievements, and those of ancient and medieval explorers, are ably summarized in The Story of Africa,

vols. ii. and iii.,by Dr Robert Brown (London, 1893-1894), and The Nile Quest, by Sir Harry Johnston (London, 1903). See also J. Partsch, Des Aristotel's Buck: " Uber das Steigen des Nil " (Leipzig, 1909). For the Kagera region consult Caput Nili, by Richard Kandt (Berlin, 1904). Latest additions to geographical knowledge are recorded in the Geographical Journal (London) and the Cairo Scientific Journal. For the hydrography, geology and climate see : The Physiography of the River Nile and its Basin, by Captain H. G. Lyons, director-general, survey department, Egypt (Cairo, 1906), an authoritative work, and numerous other publications of the Survey and Public Works Departments; " Notes on the History of the Nile and its Valley," by W. F. Hume, in Geog. Jnl. (Jan. 1906); Egyptian Irrigation (2nd ed., London, 1899) and the Nile Reservoir Dam at Assuan and After (London, 1901), both by Sir William Willcocks; the Annual Reports (1899 and after) of the Egyptian Public Works Department, by Sir William Garstin and others, and those on Egypt and the Sudan by Lord Cromer and Sir Eldon Gorst (London; official publications). Of special value is the Blue Book Egypt No. 2, 1904, which is a report by Sir William Garstin on the basin of the upper Nile, dealing at length with the lake area, the Nile affluents and the main river as far south as Khartum, from the topographical as well as the hydrographical aspect. Sir W. Garstin and Captain Lyons give full bibliographical notes.

The study of the zoology of the Nile valley was the special object of a Swedish scientific expedition in 1901, under the direction of Prof. L. A. Jagerskiold. The Results were published at Upsala, pt. iii. appearing in 1909. For the botanical and other aspects of the Nile valley, see the works of Petherick, Heuglin, Schweinfurth, Junker and Emin. An orographical map of the Nile basin was pub- lished by the Survey Department, Cairo, in 1908. It 's in six sheets on a scale of 1 : 2,500,000, with inset maps showing political divisions, distribution of rainfall and of vegetation. (F. R. C.)

NILE, BATTLE OF THE. This was fought between the British and French fleets on the 1st of August 1798 in the roadstead of Aboukir. The peace of Campo Formio, signed on the 17th of October 1797, had left France without an opponent in arms on the continent. War with Great Britain still continued, and for

a time the Directory appeared to be intent on its schemes for an invasion of Ireland. Napoleon, fresh from his Italian vic- tories, was appointed to command, and he made a round of inspection of Brest and the Channel ports. But all this show of activity was designed to cover the preparations for an attack on Great Britain " from behind " — in India and by way of Egypt. The French naval forces at Toulon

were got ready slowly in spite of Napoleon's urging and with the defects inevitable in the impover- ished state of the arsenal. Thirty-six thousand soldiers, including the best of the army of Italy, were to be embarked from the southern French ports, from Italy and from Corsica. Information that a great offensive movement was about to be made by the French reached both Earl St Vincent, the commander-in-chief of the Mediterranean fleet, and the British government. Since Spain had entered into alliances with France in 1796, the British fleet had not cruised in the Mediterranean but had been occupied in blocking the Spanish ships at Cadiz. On the 2nd of May 1798 St Vincent detached Nelson, then the junior rear-admiral, with his flag into the Mediterranean, with three sail of the line and frigates to make a reconnaissance at Toulon. On the 17th of May a small French corvette was captured near Cape Side, and from the crew Nelson learnt that the French were still in the harbour. He could gain no information as to the aim of the armament. Napoleon enforced strict secrecy by not letting even the most important officers of the dockyard know whither he was bound. On the 2nd of May the British government had written to St Vincent stating their wish that a part of his fleet should be sent into the Mediterranean. The first lord of the admiralty, Lord Spencer, told him that he might either go him- self or send a subordinate. If the latter course was followed Nelson was indicated as the officer to be chosen. Reinforcements were sent to him to enable him to provide both for the cruise in the Mediterranean and for the blockade of Cadiz. St Vincent had already selected Nelson, and when the reinforcements arrived he despatched Captain Troubridge with the inshore squadron engaged in watching Cadiz — " the choice fellows," as he described them, of his fleet — to join Nelson at Toulon. The ships were replaced by others similarly painted, so that the Spaniards might see no difference and therefore be unable to send news to their ally. Troubridge left on the 24th of May with as many vessels as would bring Nelson's whole command up to thirteen 74's and one 50-gun ship.

While these measures were being taken to Intercept him, Napoleon had put to sea on the 19th of May with fifteen sail of the line, twelve frigates and some two hundred transports. He sailed down the eastern side of Corsica and Sardinia to pick up the detachments which were to join him from the first-named island and from Civita Vecchia. On the evening of the 20th a gale from the N.W. brought some confusion on his flock of ships, but it also drove Nelson to the S.W. His flagship the "Vanguard" (74) was dismasted and compelled to anchor at San Pietro to refit. His frigates were separated from him by the weather, and the captains made for Gibraltar, concluding that the admiral would go

there to refit. The departure of his frigates left Nelson without vessels for scouting and had a material in- fluence on the campaign. The ” Vanguard ” was made ready by the 27th of May, and resumed her station off Toulon. On the 7th of June Nelson was joined by Troubridge. Calms hampered his pursuit of the French, whom he now knew to be at sea, but on the 14th he was off Civita Vecchia; on the 17th he was at Naples, where he heard that the French had been seen going south, and made arrangements to obtain water and stores in the Neapolitan ports. On the 20th he was at Messina, where he first got definite information of the movements of the enemy. The French had appeared off Malta on the 9th and had occupied the island, which was surrendered to them on the 12th by the treachery of the French and Italian members of the order. Push- ing on in the hope of finding them on the coast of the island, Nelson was off Cape Passaro on the 2 2nd, and there learnt that the French had sailed from the island. His instructions directed him to guard against possible French attacks on Sicily, or even an attempt to pass the Straits of Gibraltar and sail for Ireland.

But Nelson knew that the Neapolitan government had no fears for Sicily and that the westerly winds would prevent the French from going to Gibraltar. On a view of all the circumstances, and after consultation with those of his captains in whose judg- ment he had the most confidence, he came to the just conclusion that they were bound for Egypt. He therefore sailed for Alex- andria on the most direct route eastward along the coast of Africa. The information given him at Cape Passaro was that the French had left Malta on the 16th; the actual date was the 19th. Napoleon, whose frigates had sighted the British squadron, and who knew that he might be pursued, did not take the direct route, but steered to the north-east along the south shore of Crete. Thus it happened that on the night of the 22nd of June the fleets crossed one another’s tracks. Want of look-out vessels prevented Nelson from detecting the neighbourhood of his enemy. The French with their convoy going more slowly on the longer route to the north, and the active British squadron on the direct route to the south, both headed for Egypt, with barely 60 m. of sea between them, but neither aware of the position of the other.

On the 28th of June Nelson reached Alexandria to find the port occupied only by a few Turkish ships. It was from Nelson that the Turkish authorities gained their first knowledge of the impending

invasion. Nelson, misled by the false date given him at Cape Passaro, and being unable to reconnoitre the position of the enemy, came to the erroneous conclusion that he was mistaken in supposing that the French were on the way to Egypt, and that they must be bound for some other part of the eastern Mediterranean. On the 29th of June he sailed from Alexandria, standing to the north-east. His topsails were still in sight to the north-east when the French appeared coming from the north- west. They sighted the coast on the 29th to the west of Alex- andria, and on the 1st of July they occupied the anchorage and town. While Nelson was ranging along the coast of Asia Miner, seeking for news of them and finding none, on his way back to Sicily, the French were landing their army. The British squadron reached Syracuse on the 19th of July. Here Nelson was able to obtain water and stores and clear indications that the French had gone to Egypt. On the 24th he sailed, and on the 1st of August was again off Alexandria. The battle of the Pyramids had been fought on the 21st, and Napoleon was master of Egypt. The fear of the British admiral was that the French fleet had left the coast in the interval of his absence. Brueys, the French admiral, had had a choice of three coursesopen to him — to enter the old harbour of Alexandria, to sail for Corfu then occupied by the French or to take a strong anchorage on the coast and prepare to repel attack. To enter the harbour was difficult for large ships, and to leave it by its one narrow entrance in the presence of even an inferior force would have been impossible. Brueys therefore decided against that course. He did not sail for Corfu, partly because some of the army stores were still in his ships and partly because his squadron, ill fitted from the first, was short of provisions, and no more could as yet be obtained from the shore. He therefore stationed himself with thirteen of his ships of the line in the roadstead of Aboukir, some 15 m. north-east of Alexandria, between the island of Aboukir and the Rosetta mouth of the Nile. Here he was found on the evening of the 1st of August when the British fleet came in sight. The French line of thirteen ships was anchored to the east of Aboukir, now called Nelson's Island, in a curve stretching to the south-east. It consisted of the " Guerrier " (74), the " Conquerant " (74), the "Spartiate " (74), the " Aquilon " (74), " Souverain Peuple " (74), " Franklin " (80), " Orient " (120), Admiral Bruey's flagship " Tonnant " (80), " Heureux " (74), " Timoleon " (74), " Guillaume Tell " (80), " Mercure " (74) and " Genereux " (74), counting from the west end. The French ships had begun the voyage short-handed and many men were absent on shore filling the water-casks. They fought with a half to two-thirds of their complements, which suffered from the bad training and inexperience of the French republican navy. A council of flag officers and captains was being held in the ; ' Orient " when the British squadron appeared.

When the enemy was sighted Nelson at once gave the order to attack. All the possibilities of battle had been fully discussed between him and his captains. Much controversy of a rather idle character has taken place as to assigning the credit for the actual course adopted; it was almost dictated to men so experienced and capable as the British captains and their admiral by the position of the enemy. If the French had been anchored so near the shore that it was not possible to pass between them and it, the British ships, coming from the west with a westerly wind, would have passed outside of them, endeavouring to anchor one on the bow and the next on the quarter of each French ship in succession. Those in the van might have been crushed before the ships in the rear and to leeward could come to their assistance. As it was, the French were so placed that there was room for the British ships to pass between them and the land. Therefore it was possible for the first comers of the British squadron to pass inside the French ships, to anchor there, and to allow the next comers to anchor outside so as to put the enemy's van between two fires. This disposition was not without its drawbacks, for it entailed the risk that the British ships might fire into one another while directing their guns on an object between them. The risk was the greater because the battle began at sundown and was continued in the dark. Yet it had the advantage that it produced an intense concentration of fire. In the circumstances it had the peculiar advantage, of which, however, the British captains may not have been aware, that as the French were very short-handed they were unable to work both broadsides to the full. It is to this fact that we must attribute the comparatively small loss suffered by the British ships in an attack which, if made against a well-appointed enemy, must have been extremely costly. Whether by previous arrangement with Nelson, or because he acted on the facts before him, the first British captain to come into action, Captain Foley of the " Goliath " (74), passed inside the French, and anchored abreast of the second of them, the " Conqu&ant." The " Zealous " (74), under Captain Hood, anchored on the bow of the first Frenchman, the " Guerrier." The " Audacious " (74), under Captain Davidge Gould, anchored between the " Zealous " and " Goliath." The " Theseus " (74), under Captain Miller, anchored inside of the third French ship, the " Spartiate." The " Orion " (74), under Captain Saumarez, anchored abreast of the fifth French vessel, the " Souverain Peuple." Then Nelson, in his flagship the " Vanguard " (74), the sixth British ship to come into action, anchored on the outside of the French line abreast of the " Spartiate " already engaged with the " Theseus." The " Minotaur " (74), under Captain Thomas Louis, and the " Defence " (74). under Captain Peyton, anchored next to the " Vanguard " and opposite the fourth French ship, the " Aquilon," and the " Souverain

Peuple," already engaged with the " Orion." Thus eight British 74's which had only to fight one broadside at a time were thrown on five undermanned French 74's, which had to fight both and were speedily crushed. One British vessel, the " Culloden " (74), under Captain Troubridge, grounded on the shoal at Aboukir, and could not get into action. She served as a beacon to the vessels coming behind her. As the French van was silenced, and the, fresh vessels came up from the British rear, the attack was carried down the French line. About 9.30 p.m. the " Orient " was seen to be in flames, and at 10 p.m. she blew up. The explosion imposed a brief suspension of battle, but the fire was soon renewed. By midnight the battle was over. In the course of the next day the " Guillaume Tell," the " Genereux " and two frigates succeeded in escaping, but they were the only survivors of the fleet attacked in the roadstead of Aboukir.

The destruction of the French fleet, which isolated Napoleon in Egypt, had profound political influence in Europe. The total loss of the British squadron was 218 killed and 678 wounded. The loss of the French was never exactly ascertained, but it was certainly very much greater. Admiral Brueys was killed on the quarter-deck of his flagship, and Nelson received a wound in the head from a langridge shot which disabled him.

See Captain Mahan's Life of Nelson (2nd. ed. . 1 890) . (D. H.)

NILES, a city of Trumbull county, Ohio, U.S.A., on the Mahoning river, at the mouth of the Meander and Mosquito creeks, about 55 m. E.S.E. of Cleveland. Pop. (1890) 4289; (1900) 7468 (2104 foreign-born); (1910) 8361. It is served by the Baltimore & Ohio, the Erie and the Pennsylvania railways, and by an interurban electric system. Coal and iron-ore are abundant in the vicinity, and the city's principal manufactures are sheet steel, sheet iron, tin, metal lath, boilers and railway cars. The municipality owns and operates its waterworks and electric- lighting plant. Niles was settled in 1832, laid out in 1834, incorporated as a village in 1865 and chartered as a city in 1895. It was named (1834) in honour of Hezekiah Niles (1777-1839), the founder and editor of the weekly Niles's Register (1811-1849).
NILGAI, or Nylghau (" blue bull "), the largest antelope (Boselaphus tragocamelus) found in India, where it represents the kudu and eland group of Agrica. Only the bulls have horns, and these are short and insignificant. The general colour of the old bulls is bluish grey, but

younger bulls and cows are browner. The nilgai is about the size of a mule (see Antelope).

NILGIRIS, THE, or Neelgherries (Blue Mountains), a range of hills in southern India, which gives its name to a district of the Madras Presidency. The Nilgiris are really a plateau rather than a range, rising abruptly from the plains on most sides, with a general elevation of about 6500 ft. above the sea.

The District of the Nilgiris is the smallest administrative district in Madras. It formerly consisted exclusively of a moun- tain plateau lying at an average elevation of 6500 ft., with an area of about 725 sq. m. In 1873 this was increased by the addition of the Ochterlony valley in the south-east Wynaad, and again, in 1877, by other portions of the Wynaad, makinga total area of 958 sq. m. The administrative headquarters is at Ootacamund, which is also the summer capital of the government of Madras. The summit of the Nilgiri hills is an undulating plateau, fre- quently breaking into lofty ridges and steep rocky eminences. The descent to the plains is sudden and abrupt, the average fall from the crest to the general level below being about 6000 ft., save on the north, where the base of the mountains rests upon the elevated land of Wynaad and Mysore, standing between 2000 and 3000 ft. above sea-level. The Ochterlony valley and Wynaad country consist of a series of broken valleys, once forest-clad throughout, but now studded with tea and coffee-gardens. The highest mountain peaks are — Dodabetta, 8760 ft.; Kudia- kad, 8502; Bevoibetta, 8488; Makurti, 8402; Davarsolabetta, 8380; Kunda, 8353; Kundamoge,. 7816; Ootacamund, 7361; Tambrabetta, 7292; Hokabetta, 7267. There are six well- known passes or ghats by which the district communicates with the neighbouring plains, three of which are practicable to wheeled traffic. The chief rivers are the Moyar, Paikara and Calicut, none of which are navigable. The forests consist of fine timber trees, such as sdl {Shorea robustd), kino {Pterocarpus Marsupium), jack (Artocarpus integrifolia) , blackwood (Dalbergia latifolia) and teak. Eucalyptus and Australian wattle have been extensively planted in the higher grounds of the Wynaad. The hills were first explored by British officers in 1814, and in 1821 the first English house was built on the plateau. The hill tribes include the Todas, the Badagas, the Kotas, the Kurumbas and the Irulas (q.v.). The total population of the district in 1901 was 111,437, showing an increase of n – 7% in the decade. The commercially important products are coffee, tea and cinchona. Coffee cultivation was introduced about 1844. One of its chief seats is the Ochterlony valley. The Madras govern- ment commenced the experimental cultivation of cinchona on the Nilgiris in i860, and several private cinchona gardens

were laid out, owing to the success of the government experiment. The climate of the Nilgiri hills is almost unrivalled for equability of temperature. The average is 58° F. The approach from the plains is by the branch of the Madras railway from Podanur to Mettapolliem, whence a metre-gauge line on the rack principle has been constructed to Coonoor, with an extension to Ootacamund. The chief educational institution is the Lawrence Asylum at

Ootacamund maintained by government. The military quarters are at Wellington.

See Nilgiris District Gazetteer (Madras, 1908). NILSSON, CHRISTINE (1843-), Swedish singer, was born at Wedersloff, near Wexio, Sweden, on the 20th of August 1843. Her father was a poor working man, and she used as a girl to sing and perform on the violin at popular gatherings. In 1857 a wealthy man, M. Tornerhjelm, perceiving the unusual beauty of her voice while she was performing at a fair in Ljungby, provided the means for giving her a proper musical education, and in i860 she was heard in the concert halls in Stockholm and Upsala, and then went to Paiis, where, after four years' study, she made her debut in the role of Violetta at the Th6atre Lyrique on the 27th of October 1864. Between that date and 1872, when she married M. Auguste Rouzaud, she was the leading prima donna. Her first appearance in London was in 1867. A year later, on the 9th of March, she made her first appearance in the Paris Opera House as Ophelie in Hamlet; and she visited the United States in 1870. She sang in St Petersburg in 1872; in America in 1873-1874 and in 1882; in Germany and Austria between 1876 and 1877; and in the next few years in Spain and Scandinavia; but after her marriage her appearances in public were rare. M. Rouzaud died in 1882, and five years afterwards Madame Nilsson married Count A. de Casa Miranda, and finally retired from the stage.

NIMAR, a district of British India, in the Nerbudda division of the Central Provinces. The administrative headquarters are at Khandwa; but the capital in Mahommedan times was Burhanpur. Area, 4273 sq. m. Pop. (1901) 329,615, showing an increase of 14-2% in the decade. The district consists of two portions of the Nerbudda and Tapti valleys, separated by a section of the Satpura range, about 15 m. in breadth. On the highest peak, about 850 ft. above the plain and 1800 above sea-level, stands the fortress of Asirgarh, commanding a pass which has for centuries been the chief highway between Upper India and the Deccan. The district contains extensive forests, but the only tract reserved by government is the Punasa forest, which extends for about 120 m. along the south bank of the Nerbudda, and contains

young teak, besides sdj (Terminalia tomentosa) and anjan (Hardwickia binata). The staple crops are cotton and millet; ganja or Indian hemp is also allowed to be grown under government supervision. The Great Indian Penin- sula railway runs through the district, and a branch of the Rajputana line from Indore joins it at Khandwa. There are factories for ginning and pressing cotton at Khandwa, and manufacture of gold-embroidered cloth at Burhanpur.

The name Nimar, derived from that of the ancient province, is also applied to a district in the state of Indore, lying W. of the British district on both banks of the Nerbudda. Area, 3871 sq. m.; pop. (1901) 257,110. From 1823 onwards this tract, then belonging to Sindhia, was under British management; in 1861 it was ceded in full sovereignty to the British, but in 1867 it passed to Holkar as the result of an exchange of territory. See Nimar District Gazetteer (Allahabad, 1908). NIMES, a city of southern France, capital of the department of Gard, 174 m. S. by W. of Lyons on the Paris-Lyon railway, between Avignon and Montpellier. Pop. (1906) 70,708. Nimes, important alike for its industries and for its archaeological treasures, lies at the foot of the Garrigues, a range of stony and barren hills which limit it on the north and west. The most prominent of these is the Mont Cavalier, the summit of which is crowned by the Tour Magne, a ruined Roman tower commanding a fine view of the town and its surroundings. To the south and east the town overlooks the monotonous plain traversed by the Vistre, and for the most part given over to the cultivation of the vine. Nimes covers a large area, owing to the fact that its population is housed in low buildings, not in the lofty tenements which are found in most of the industrial towns of France. The central and oldest part is encircled by shady boulevards, which occupy the site of the old fortifications. Here are to be found the majority of the Roman remains for which Nimes is remarkable. The most celebrated is the amphitheatre, the best preserved

though not the largest in France. It dates from the ist or 2nd century a.d., and was used as a fortress for some time during succeeding centuries. Occupied daring the middle ages by a special quarter, with even a church of its own, it was cleared in 1809, and since then has been well kept in repair. It is built of large stones fitted together without mortar. In form it is ellip- tical, measuring approximately 440 by 336 ft. externally; the arena is 227 by 120J ft. The elevation (70 ft. in all) consists of a ground story of 60 arches, an upper story of 60

arches and an attic with consoles pierced with holes for supporting the velarium or awning. The building, which was capable of holding nearly 24,000 persons, has 4 main gates, one at each of the cardinal points; and 124 doorways gave exit from the 35 tiers of the amphitheatre to the inner galleries. Originally designed for gladiatorial shows, naval spectacles, chariot races, wolf or boar hunts, the arena has in recent times been used for bull-fights. The celebrated Maison Carree, a temple in the style of the Parthenon, but on a smaller scale, 82 ft. long by 40 wide, is one of the finest monuments of the Roman period, and according to an inscription is dedicated to Gaius and Lucius Caesar, adopted sons of Augustus, and dates from the beginning of the Christian era. It contains a collection of antique sculptures and coins. The so-called temple of Diana, which adjoins the Fountain Gardens, was probably a building connected with the neighbouring baths of which remains are visible. Two Roman gates, the Porte d'Auguste, consisting of two large archways flanked by two smaller ones and dating from a.d. 16, and the Porte de France are still preserved. The Tour Magne (Turris Magna) is still 92 ft. in height, and was formerly a third higher. Admittedly the oldest monument of Nimes, it has been variously regarded as an old signal tower, a treasure house or a mausoleum. Attached to the ramparts erected by Augustus, and turned into a fortress in the middle ages by the counts of Toulouse, the Tour Magpe was restored about 1840. Near the Tour Magne has been discovered the reservoir from which the water conveyed by the Pont du Gard (see Aqueduct) was distributed throughout the city.

When it still possessed its capitol, the temple of Augustus, the basilica of Plotina erected under Hadrian, the temple of Apollo, the baths, the theatre, the circus, constructed in the reign of Nero, the Campus Martius and the fortifications built by Augustus, Nimes must have been one of the richest of the Roman cities of Gaul. The cathedral (St Castor), occupying, it is believed, the site of the temple of Augustus, is partly Roman- esque and partly Gothic in style. The church of St Paul, a modern Romanesque building, is adorned with frescoes by Hippolyte and Paul Flandrin; St Baudile (modern Gothic) is of note for the two stone spires which adorn its facade; and the court-house has a fine Corinthian colonnade and a pediment. Other buildings of note are the old citadel (dating from 1687, and now used as a central prison), and the former lycee, which contains the public library and the museums of epigraphy, of archaeological models of the Roman and Romanesque periods, and of natural history. The town also has a collection of paint- ings. The esplanade in front of the court-house has in the centre a handsome fountain with five marble statues by James Pradier. The

Fountain Gardens, in the north-west of the town, owe their peculiar character as well as their name to a spring of water which after heavy rains is copious enough not only to fill the ornamental basins (constructed in the 18th century with balustrades and statues on ancient foundations) but also to form a considerable stream. Neither the spring, however, nor the Vistre into which it discharges, is sufficient for the wants of the city, and water has consequently been brought from the Rhone, a distance of 17 m. A beautiful avenue, the Boulevard de la Republique, runs south for nearly 1 m. from the middle walk of the garden. Nimes has erected monuments to the " Children of Gard " (by A. Mercia), to Alphonse Daudet and to the Provencal poet Jean Reboul, natives of the town.

The city is the seat of a bishop, a prefect, a court of appeal and a court of assizes, and has tribunals of first instance and of commerce, a board of trade-arbitrators, an exchange, a chamber

of commerce and a branch of the Bank of France. Its edu- cational establishments include lycees and training colleges for both sexes, and schools of music and art.

At the close of the middle ages the industries of Nimes were raised to a state of great prosperity by a colony from Lombardy and Tuscany; and, though the plague, the Wars of Religion and the revocation of the edict of Nantes were all sufficiently disastrous in their effects, before the Revolution about half of the whole community, or from 10,000 to 12,000 persons, had come to be engaged in manufactures, chiefly that of silk. Upholstery materials, shawls, carpets, handkerchiefs, tapes and braidings, brandy, hosiery, leather, clothes, candles, machinery and boots and shoes are now manufactured, and there are a number of foundries. Nimes is, besides, one of the great southern markers for wine and brandy, and there is a good trade in grain, groceries and colonial wares. Quarries of hard limestone, used as the material for the amphitheatre and other buildings by the Romans, are still worked in the vicinity.

Nimes, the ancient Nemausus, derived its name from the sacred wood in which the Volcae Arecomici (who of their own accord surrendered to the Romans in 121 B.C.) were wont to hold their assemblies. Strabo states that it was the metropolis of a district containing twenty-four dependent towns, and that it was independent of the proconsuls • of Gallia Narbonensis. Constituted a colony of veterans by Augustus, and endowed with numerous privileges, it built a temple and struck a medal in honour of its founder. The medal, which afterwards furnished the type for the coat of arms granted to the town by Francis

I., bears on one side the heads of Caesar Augustus and Vipsanius Agrippa (the former crowned with laurel), while on the other there is a crocodile chained to a palm-tree, with the legend Col. Nem. It was Agrippa who built the public baths at Nimes, the temple of Diana and the aqueduct of the Pont du Gard. The city-walls, erected by Augustus, were nearly 4 m. in circuit, 30 ft. high and 10 ft. broad, flanked by ninety towers and pierced by ten gates. Hadrian on his way back from Britain erected at Nimes two memorials of his benefactress Plotina. In the very height of its prosperity the city was ravaged by the Vandals; the Visigoths followed, and turned the amphitheatre into a stronghold, which at a later date was set on fire along with the gates of the city when Charles Martel drove out the Saracens. Nimes became a republic under the protection of Pippin the Short; and in 1185 it passed to the counts of Toulouse, who restored its prosperity and enclosed it with ramparts whose enceinte, less extensive than that of Augustus, may still be traced in the boulevards of the present day. The city took part in the crusade against the Albigenses in 1207. Under Louis VIII. it received a royal garrison into its amphitheatre; under Louis XI. it was captured by the duke of Burgundy, and in 1420 was recovered by the dauphin (Charles VII.). On a visit to Nimes Francis I. enriched it with a university and a school of arts. By 1558 about three-fourths of the inhabitants had become Protestants, and in 1567 a massacre of Catholics took place on St Michael's day. From the accession of Henry IV. till the revo- cation of the edict of Nantes (1685) the Protestant community devoted itself to active industry; but after that disastrous event great numbers went into exile or joined the Camisards. Louis XIV. built a fortress (1687) to keep in check the disturbances caused by the rival religious parties. Nimes passed unhurt through the storms of the Revolution; but in 1815 Trestaillon and his bandit followers pillaged and burned and plundered and massacred the Bonapartists and Protestants. Since then the city has remained divided into two strongly marked factions — Catholics and Protestants — though with no repetition of such scenes.

See H. Bazin, Nimes Gatto-Romain (Nimes, 1891); L. Menard, Histoire civile, ecclesiastique el litteraire de la ville de Nismes ; R. Peyre, Nimes, Aries et Orange (Nifties, 1903).

NIMES, COUNCILS OF (Concilia Nemausensia). Of the four councils held at Nimes those of 886 and 1284 are relatively unimportant. The synod of 394 adopted seven canons on discipline, which were first printed in 1743 and have not as yet

made their way into the great collections. At the council of | July 1096 Pope Urban II. presided, and sixteen disciplinary canons were adopted, which have many points of contact with the canons of the council of Clermont.

See, for the first council of Nimes, Lauchert, pp. 183-185; for the others, Hardouin vi. 1. 397, vi. 2. 1747 ff., vii. 903 ff. ; full titles under Council. (W. W. R.*)

NIMROD (ni-pJ, -viaj; Septuagint, Ne/3pa)5: various reading in Gen. x. 8, Nefipiiv: Vulg. Nemrod). Nimrod is only mentioned in three passages in the Bible; in Micah v. 6 Assyria is called ” the land of Nimrod,” and 1 Chron. i. 10 quotes a portion of the third, the most important reference, Gen. x. 8-12. The last- named is ascribed to one of the oldest writers of the Pentateuch, the Yah wist ; but not perhaps to the oldest stratum of his work (Ball, Sacred Books of the Old Testament). In Gen. x. 8, as Jabal was the inventor of music, so Nimrod was the first warrior, gibbdr, the first hunter, ” he became a mighty hunter, gibbdr cayidh, before Yahweh, so that it is said, A mighty hunter before Yahweh like Nimrod “; the first builder of cities and ruler of a widespread dominion, ” the beginning of bis kingdom was Babel, Erech, Accad and Calneh in the land of Shinar. Out of that land he went forth into Assyria, 1 and built Nineveh, Rehoboth- Ir, Calah and Resen between Nineveh and Calah (the same is the great city).” The general statement that Assyria was originally an offshoot and dependence of Babylon is substantially in accordance with Assyrian and Babylonian authorities. As the chapter stands, Nimrod is a descendant of Ham, cf. verses 6 and 8; but as Babylon and Assyria were Semitic, cf. verses 21, 22, and as verses 6, 7, on the one hand, and verses 8-12, on the other, come from different documents, we must dissociate the two consecutive paragraphs, and regard the ” Cush ” of verse 8 as the Babylonian Cash or Cassites, a people quite distinct from the Cush of verse 6, which is Ethiopia; the text and interpretation of portions of Ger x. 8-12 are doubtful. 2 The ” mighty hunter before Yahweh ” has been variously explained as ” a divinely great hunter ” (Spurrell); ” a hunter ■U defiance of Yahweh ” (Holzinger); ” a hunter with the help of Yahweh ” or ” of some deity whose name has been replaced by Yahweh ” (Gunkel, Genesis, p. 82).

The name Nimrod has not been found in any ancient (say older than 500 B.C.) non-Israelite document or inscription; and there is no conclusive evidence for identifying Nimrod with any of the names found in such documents. In the absence of evidence, the theories are

naturally endless, especially as both the legendary and the historical heroes of the ancient East were often ” mighty hunters.” Nimrod would suggest to a Jew or Syrian the idea of “rebel,” mrd = rebel; but this is not likely to be the etymology. By regarding the ” N ” as performative, Nimrod has been identified with Merodach, the god of Babylon (Pinches, Hastings’s Bible Diet.). He has also been identified with Gilgamesh, the hero of the epic which contains the Babylonian Deluge story (Jeremias, Das A.T.im Lichle des alten Orients), with various historical kings of Babylonia, with Orion, &c, &c. As the name Nmrt (Petrie, Nemart) frequently occurs in Egyptian documents of the XXIInd Dynasty, c. 972-749 (Petrie, Hist, of Egypt, iii. 242, &c), the story of Nimrod is some- times (E. Meyer ap. Holzinger, Genesis) conjectured to be of Egyptian origin. Some support might be obtained for this view by supposing Cush in verse 8 to be Ethiopia as in verse 6; but it seems impossible to reconcile it with the statements in Genesis and Micah which connect Nimrod with Babylon and Assyria. It is possible that the Nebrod of the Septuagint (similarly Philo and Josephus) is the more ancient form of the name (Cheyne, Ency. Bibl.).

1 So Revised Version text with Kautzsch, Dillmann, Gunkel, Holzinger, &c; Revised Version marg., “Out of that land went forth ‘ Asshur ‘,” less probably following Septuagint, Vulgate, Authorized Version, &c.

2 Dr Cheyne’s reconstructions in Ency. Bibl., article ” Nimrod,” are generally regarded as far too sweeping. Ball, Sacred Books of the Old Testament, marks verse 9, which describes Nimrod as ” a mighty hunter,” as a later addition, giving a mistaken explanation of the gibbdr of verse 8.

Many later legends gathered round Nimrod ; Philo, De gigantibus, § 15, allegorises more suo. Nimrod stands for treachery or desertion, according to the derivation from mrd mentioned above. According to Josephus, Ant. I. iv. 2, vi. 2, Nimrod built the Tower of Babel. According to the Rabbis (Tzeenah u Reenah, Hershon’s tr., p. 59), Nimrod cast Abraham into the fire because he refused to worship idols. God, however, delivered him.

Nimrod, in the form Nimrud or Nimroud, is an element in many modern place-names in western Asia. (W. H. Be.)

NINE MEN’S MORRIS, known also as Morelles and Merelles, an ancient English game played with 9 counters a side on a board marked with four squares, one within the other. The middle points of the three inside squares are connected by straight lines, and, in a variation of the game, the corners also. The players, whose counters are of

different colours, place these alternately one by one upon the intersections of the lines, the object of each being to get three of his own men in line, in which case he has the privilege of pounding, i.e. removing from the board, any one of his opponent's men; although he may not take one of a row of three, unless there are no others. When all 18 counters have been placed on the board they are moved to adjacent unoccupied intersections. When all but three of a player's men have been captured he is allowed to jump or hop to any vacant point he chooses. As soon as a player is reduced to two men he loses. In the time of Shakespeare {Midsummer Night's Dream, Act n. Scene 1) the game was commonly played out of doors.

NINEVEH (Heb. mfi, in classical authors Nicos, Ninus; LXX. ~Nivfvri, Niji/eur;: Assyrian Nina or Ninua), the best known and highly renowned capital of the Assyrian empire. There was a quarter or suburb of the old Babylonian city of Lagash whose name was written in the same way; this may possibly have been the home of those settlers from Babylonia who gave its name to the Assyrian city. The name was carried elsewhere, probably by Assyrian settlers, and we meet with Ninoe in Asia Minor (Th. Noldeke, Hermes, v. 464, n. 2) . Philostratus calls a Hierapolis, ˆ &PXIII. hunted elephants, probably situated on the Euphrates. This, however, may be the origin of Ctesias's statement (ap. Diod. ii. 3) that Nineveh stood on the Euphrates; the Arabic geographer Yaqut places a Nineveh on thelower Euphrates near Babylon, and this may be a colony from the great Nineveh, or possibly the Nina of Lagash.

The derivation of the name is uncertain. The name Nina was borne also by the goddess Ishtar, whose worship was the special cult of Nineveh, and Ninua may well be a hypocoristicon of N ina. T he ideogram for Nineveh, as also for the Lagash city, £ >ˆ?M , is a fish enclosed in the sign for house, possibly indi- cating a fish-pond, sacred to Ishtar. As the Semitic nunu means a fish, a play upon nunu and Nina it suggested, but the name may be pre-Semitic. A derivation from the root '" with a mean- ing like " lowland " is doubtful, unless we are sure that the name is Semitic, and that the Lagash city also lay low.

Nineveh was situated at the N.W. angle of an irregular trapezium of land which lay between the rivers Husur (Khausar, Choser) on the N.W., Gomal on the N.E. and E., Upper Zab on the S.E.' and S. and Tigris on the S. and W. In extent this plain is 25 m. by 15 m., and contains the ruins of Nineveh at Kuyunjik and Nebi Yunus, of Dur Sargon at Khorsabad to the N.E. of Calah at Nimrud to the S. as well as of other towns not yet identified. The whole plain has a gradual slope from the low range of Jebel Maqtub and the hill of Ain-es-safra

on the N.E. to the Tigris on the S.W. This plain was, for those days, amply protected on three sides by the two rapid broad streams of the Tigris and its tributary Zab, by the hills on the N.E. and the river Gomal at their base. The weak N.W. side was partly covered by the Husur, an impassable flood in winter but easily fordable in summer. The floods caused by the Husur were frequent and destructive, on one occasion sweeping away the palace terrace at Nineveh and exposing the tombs of the kings, on another isolating Khorsabad. A great series of dams was therefore constructed (mapped and described in ” Topography

of Nineveh,” J.R.A.S. xiv. 318 ff.) which controlled the floods and filled the ditches and moats of Nineveh. One of these ditches can be traced over 2 m. with a breadth of 200 ft., and was lined with a rampart on the city side.

The city on the river side of the Tigris extended about 25 m., its north wall measured 7000 ft., the eastern wall was nearly 3 m. long and the southern about 1000 ft. The city thus formed a long narrow strip along the Tigris, pierced at right angles by the Husur, the waters of which, by closing the great dam in the eastern wall, could be sent round the moats to the N. and S. The Tigris may have swept the western wall, though now a wide belt of sand has accumulated between the ruins and its present channel which is perpetually shifting. The actual extent of the city may be reckoned at about 1800 acres, or about two-thirds the size of Rome within Aurelian’s Wall. At the rate of 50 sq. yds. to a person, it would have held a population of 175,000; but the extent of the palaces, gardens, &c, forbid us to imagine any such multitude except as refugees during a siege. Outside this city proper lay wide outskirts (kablu) which were divided into quarters each with a separate governor {saknu). Further afield lay the Rebit-Ninua, in which some have recognized the Reho- both-Ir of Gen. x. 1 1 (Niniia is often replaced by ir or alu in the inscriptions), a less closely populated area which extended to and included the site of Khorsabad, before Sargon II. built his city of Dur-Sargon there. Across the Tigris, connected by a bridge, lay an extensive district, probably now replaced by Mosul. As Esarhaddon entered Nineveh, on his triumphal return from Sidon, through Rebit-Ninua, it is probable that this name covered the western suburbs. The walled city formed a sort of Acropolis, and it is difficult to say exactly how far the name of Nineveh should be extended. Few traces of private houses have been

found within the walls, but a? deeds of sale speak of houses in Nineveh, which were bounded on three sides by other houses, there must have been continuous streets within the area denoted by that name. Great emphasis has been laid on the agreement of a tetrapolis, formed by Nineveh, Khorsabad, Calah and Keramlis, with the dimensions given by Diodorus and with the phrase ” an exceeding great city of three days’ journey ” (Jonah iii. 3). Admitting that this whole area was thickly inhabited and might be regarded by those at a distance as one city, and that the district may well have had a common name, which could hardly be Assur, there is yet no native evidence that Nineveh extended so far. There is no trace of a common wall, each city was as strongly fortified towards the interior as on the outside. Each had its own Saknu, and the governor of Nineveh stands below the governors of Assur and Calah in official lists. In deeds of sale ” the road to Calah ” is as often named as the ” king’s highway ” to Arbela or Assur.

The history of Nineveh is, of course, bound up with that of Assyria in general. Later Assyrian writers professed to carry back its foundation to the creation of the world, but we lack any historical evidence of its age or early history. We may conjecture that it was founded by settlers from Babylonia Nina, and the statement that Nimrod founded it from Babylonia, along with Calah, Rehoboth-Ir and Resen, shows that this opinion was early held. We are, however, still without evidence that this was its first occupation. The mention of Gudea’s building a temple for Ishtar in Nina (2800 B.C.) may refer to the Lagash city and an inscription of Dungi, king of Ur (2700 B.C.), said to have been found at Nineveh, might have been carried there by some antiquary king. We reach firm ground with the statement of Khammurabi (2285 B.C.) that he” made the waters of Ishtar to be glorious in Nineveh in E-mes-mes,” the temple of Ishtar there (Code IV. 60-62). As he had just spoken of ” returning the gracious protecting god to Assur,” and spells the name Ni-nu-a, there can be no doubt that Nineveh is meant. Shalmaneser I., in his zik&ti inscriptions (L. W. King, Records of the Reign of Tukulti-Ninib I. p. 131), c. 1300 B.C., records his restoration of the temple of Ishtar of Nineveh, which had been built by Samsi-Hadad (Shamshi-Adad) and restored once before by Assur- uballit. Which Samsi-Hadad (out of six at least) this was, and which Assur-uballit w: are not told ; the first of the former

name known to us was a contemporary of Khammurabi and, if he built, the temple first, Khammurabi may have plundered it and then restored it again; but an even earlier Samsi-Hadad may be meant. Dushratta, king of Mitanni, about 1400 B.C., in the Tell el-Amarna letters offers to send to the king of Egypt an image of Ishtar of

Nineveh; from which it has been inferred that Nineveh was then under foreign rule. The same letters mention Shaushbi as goddess of Nineveh. A statue of a female nude figure found at Nineveh bears an inscription showing it to have been in the palace of Assur-bel-kala (1080 B.C.), who is therefore supposed to have resided in Nineveh. Assur-resh-ishi, Mutakkil Nusku and Tiglath-pileser I. restored a temple of Ishtar, probably in Nineveh. Assur-narsin-apli (885 B.C.) restored the temple E-mas-mas of Ishtar at Nineveh, but removed his resi- dence to Calah. Shalmaneser II. set out on several of his expe- ditions from Nineveh, but in the latter part of his reign resided at Calah, and when rebellion broke out under his son Assur-danin- apli Nineveh sided with the rebel prince. Sennacherib records that several of his royal ancestors had been buried in Nineveh and they presumably had resided there. At the commencement of his reign Sennacherib found Nineveh a poor place. A store- house,the ancient and renowned temple, an armoury or storehouse, were the chief buildings. Two lofty platforms along the Tigris front had served as foundations of the palaces hitherto built, but the platforms had been wrecked and the palaces were in decay. Sennacherib restored and enlarged the northern platform now covered by the Kuyunjik mound and built his palace on the south-western portion of it. It has been only partially excavated, though seventy-one rooms were opened, and it is the grandest architectural effort of Assyria. The bas-reliefs with which the walls are adorned are unrivalled in antiquity, for variety of subject, breadth of composition, truth of presentation and artistic treatment. The accuracy with which building operations are portrayed, and a sense of landscape, are great advances even on the superb work of Sargon's palace at Khorsabad. On the adjoining platform to the south, now Nebi-Yunus, Sennacherib erected an arsenal for military supplies. Nineveh was badly supplied with water for drinking; the inhabitants had to " turn their eyes to heaven for the rain," but Sennacherib conducted water by eighteen canals from the hills into the Husur and distributed its waters round the moats and into store tanks, or ponds, within the city. He laid out a fine park or Paradise, for pleasure and the chase, to the east of his palaces, and built up a magnificent "triumphal way" sixty-two cubits broad and forbade any householder to encroach upon the street. Sennacherib made Nineveh his court residence and, after his destruction of Babylon and the influx of the enormous booty brought back from his con- quests, it must have been the most magnificent and wealthiest city of the East.

Esarhaddon began to rebuild Babylon and so departed from his father's purpose to make Nineveh the metropolis of the empire, but he

did not altogether neglect the city. He rebuilt the temple of Assur at Nineveh, and a palace for himself now covered by the Nebi-Yunus mound and so inefficiently explored. Thither Assur-bani-pal brought the rebel Egyptian vassals Necho and Sharru-ludari, the Elamite kings, the booty and captives of his continual conquests. He rebuilt the temples and a palace for himself north of Sennacherib's on the site of the latter's harem; which was adorned with extraordinary variety and richness. His sculptures are at the highest range of original and effective delineation in antiquity. Especially is his palace famous' for the celebrated library, of which Senna- cherib had made a commencement. Tens of thousands of clay tablets, systematically arranged on shelves, contained the classics of the Babylonian literature for which his scribes ran- sacked and copied the treasures of all then known centres of literary life.

Very little trace is left of the fortunes of Nineveh during the reigns of the sons of Assur-bani-pal. Nineveh, according to Herodotus, was besieged by Cyaxares and the Medes but saved by Madyes and the Scythians some twenty or more years before the Medes in alliance with Nabopolassar, king of Babylon,

finally took it, c. 606 B.C. Much conjecture has been lavished upon the varying accounts which have reached us of the capture, but it seems probable that a heavy flood or the besiegers burst the great dam and while thus emptying the moats launched a flood against the west wall on the inside and thus breached the defences.

It may be of interest to record the names of the governors of Nineveh : Nergal-mudammik. 835 B.C. ; Ninib-mukin-ahi, 790-761 B.C.; Mahde, 725 B.C.; Nabu-dini-epush, 704 B.C.; Ahi-ilai, 649 B.C., officiated as Eponyms for the year.

If, as generally admitted, the ruins of Mespila and Larissa " described " by Xenophon, Anab. iii. 4, 7 sq. were those of Kuyunjik and Nimrud, we may conclude that there was no inhabited city on the spot at the time of the march of the Greeks with Cyrus (cf. Strabo xvi. p. 245). The name of Nineveh (Syriac Nlnwe; Arabic Nlnawa, Nunawa) continued, even in the middle ages, to be applied to a site opposite Mosul on the east bank of the Tigris, where huge mounds and the traces of an ancient city wall bore witness of former greatness. Copious references to these mentions are collected in Tuch, De Nino

Urbe (Leipzig, 1845). Ibn Jubair, p. 237 sq., followed by Ibn Batuta, ii. 137, gives a good description of the ruins and the great shrine of Jonah as existing in the 1 2th century. The name of Nlnawa applied, not to the ruins, but to the Rustak (fields and hamlets) on the site (Baladhuri, p. 331; Ibn Haukal, p. 145; Yaqut, ii. 694).

A very complete summary of the traditions will be found in Lincke, ” Assyrien und Nineveh,” in Geschichte und Sage der Mittelmeervolker nach 607-606.

The explorations of Sir A. H. Layard at Kuyunjik (1845- 1847 and 1849-1851) definitely located the city, in confirmation of ancient tradition and the identifications of Rich and others. Excavations were carried on by Rawlinson, 1853-1855; H. Rassam, 1854; G. Smith, 1873-1874 and 1876; Rassam again, 1877-1883; E. A. Wallis Budge, 1888-1889; and King, 1902. The enormous mound of Kuyunjik now separated from that of Nebi-Yunus by the deep and rapid Khausar, marks the site of the palace of Sennacherib and Assur-bani-pal. The mound of Nebi-Yunus is crowned by the ” Tomb of Jonah,” a sacred shrine to the modern inhabitants, and could not be explored; but by sinking a shaft within the walls of a private house, some sculptured slabs were recovered, and the Turkish government later opened out part of a palace of Esarhaddon. Excavations at two of the great city gates showed them to have been erected by Sennacherib.

Bibliography. — The architecture of these palaces is exhaustively treated in Ferguson’s Palaces of Nineveh and Persepolis Restored, and in Perrot and Chipiez, Art in Chaldea and Assyria. Each palace was in itself a fort, and the external walls are still 80 ft. high in places. The many topographical details furnished by exploration when compared with the building inscriptions and the indications given by deeds of sale will doubtless enable us ultimately to map out the principal features of the ancient city, but much more sys- tematic exploration is needed, as well as further publication of exist- ing documents. (C. H. W. J.)

NING-PO (Ning-Po-Fu, i.e. City of the Peaceful Waves), a great city of China, the principal emporium of trade in the province of Chehkiang, standing in a fine plain bounded by mountains towards the west, on the left bank of the Ning-po river, about 16 m. fromits mouth, in 29 49′ N., 121 35′ E. It was visited by Portuguese traders as early as 1522, and is one of the five seaports which were thrown open to foreign trade in 1842 by the treaty of Nanking. The population of the city and suburbs is estimated from 400,000 to 500,000. Ning-po is surrounded by a fine old wall, 25 ft. high and 16 ft. broad, pierced by

six gates and two passages for ships in its circuit of 4 to 5 m. Just within the walls there is a considerable belt of open ground, *nd in many places the ramparts are thickly covered with jasmine and honeysuckle. In ascending the river a stranger's eye is first caught by the numerous huge ice-houses with high thatched roofs and by a tall white tower — the T'ien-feng-t'a or Ning-po pagoda or obelisk — which rises to a height of 160 ft. and has fourteen stories and seven tiers of windows, but has unfortunately been stripped of its galleries and otherwise damaged. Another striking structure in the heart of the city xix. 23

is the Drum Tower, dating from before the 15th century. As > 9 natural in a place long celebrated for its religious and edu- cational pre-eminence, there is no lack of temples, monasteries and colleges, but few of these are of any architectural significance. Brick is the ordinary building material, and the dwelling-houses are mostly of one storey. Silks, cottons, carpets, furniture, white- wood carvings and straw hats are the chief products of the local industry. Large salt-works are carried on in the vicinity, and thousands of fishermen are engaged, mainly between April and July, in catching cuttle-fish. In spite of the powerful competition of Shanghai, Ning-po has a valuable foreign trade. It is regularly visited by the vessels of the China Navigation Company and the Chinese Merchants' Steam Navigation Com- pany. From 216,191 register tons in 1873 the tonnage of the port had increased to 303,109 in 1880, and in 1904 the figures rose to 532,869 tons. The value of the trade passing through the custom house in 1904 was £3,052,629, as compared with £2,3 12,000 in 1900 and £3,405,000 in 1880. Straw or grass hats, straw mats, samshu (from the Shao-sing district), Chinese drugs, vegetable tallow and fish are among the chief exports; in 1904 the hats numbered 2,125,566, though in 1863 they had only amounted to 40,000, and the mats, mainly despatched to south China, average from 1,000,000, to 2,000,000. Missions are maintained in Ning-po by the Roman Catholic church, by the Church Missionary Society (1848), the American Presbyterians, the Reformed Wesleyans, the China Inland Mission (1857), &c. A mission hospital was instituted in 1843. After the storming of Chenhai — the fortified town at the mouth of the river — on the 10th of October 1841, the British forces quietly took possession of Ning-po on the 12th. In 1864 the T'aip'ings held the town for six months.

NINIAN, ST, a Briton, probably from Strathclyde, who was trained at Rome and founded a church at Whithorn on the west side of Wigtown Bay. Whithorn has been identified with the Leukopibia of Ptolemy, but this is uncertain. Bede, writing three centuries after Ninian,

ascribes the name Ad Candidam Casam to the fact that the church of Ninian was built of stone. We are told by Bede that St Ninian dedicated his church to St Martin of Tours, who died between 397 and 400, but Ailred of Rievaulx is our only authority for the statement that St Martin supplied him with masons. The population of the north shore of the Solway Firth at the beginning of the 5th century were probably either Picts or Goidels or a blend of both, and naturally hostile to the Romanized Britons. Bede records that Ninian preached among the Picts within the Mounth, which indicates that he was acquainted with the Pictish language. The legends of his work in Ireland probably arise from the influence exercised in that country by the church of Whithorn. The date of Ninian ‘s death is given by Archbishop Ussher as 432, but there 13 no authority for this statement.

See Bede, Hist. Keel. (ed. C. Plummer, Oxford, 1896), iii., iv. ; Ailred of Rievaulx, ” Life of St Ninian,” in the Historians of Scotland vol. v. (Edinburgh, 1874); W. F. Skene, Celtic Scotland (Edinburgh, 1877), ii. 2 ff. ; and J. Rhys, Celtic Britain (London, 1904), p. 173.

NINIB, the ideographic designation of a solar deity of Baby- lonia. The phonetic designation is uncertain — perhaps Annshit. The cult of Ninib can be traced back to the oldest period of Babylonian history. In the inscriptions found at Shirgulla (or Shirpurla, also known as Lagash), he appears as Nin-girsu, that is, ” the lord of Girsu,” which appears to have been a quarter of Shirgulla. He is closely associated with Bel (q.v.), or En-lil of Nippur, as whose son he is commonly designated. The com- bination points to the amalgamation of the district in which Ninib was worshipped with the one in which Bel was the chief deity. This district may have been Shirgulla and surrounding places, which, as we know, fell at one time under the control of the rulers of Nippur.

Ninib appears in a double capacity in the epithets bestowed on him, and in the hymns and incantations addressed to him. On the one hand he is the healing god who releases from sickness and the ban of the demons in general, and on the other he is the god of war and of the chase, armed with terrible weapons. It is not easy to reconcile these two phases, except on the assumption

that he has absorbed in his person various minor solar deities,

representing different phases of the sun, just as subsequently Shamash absorbed the attributes of practically all the minor sun-deities. ,

In the systematized pantheon, Ninib survives the tendency towards centralizing all sun cults in Shamash by being made the symbol of a certain phase of the sun. Whether this phase is that of the morning sun or of the springtime with which bene- ficent qualities are associated, or that of the noonday sun or of the summer solstice, bringing suffering and destruction in its wake, is still a matter of dispute, with the evidence on the whole in favour of the former proposition. At the same time, the possibility of a confusion between Ninib and Nergal (q.v.) must be admitted, and perhaps we are to see the solution of the problem in the recognition of two diverse schools of theological speculation, the one assigning to Ninib the role of the spring-tide solar deity, the other identifying him with the sun of the summer solstice. In the astral-theological system Ninib becomes the planet Saturn. The swine seems to have been the animal sacred to him, or to have been one of the symbols under which he is represented. The consort of Ninib was Gula(q.v.). (M. Ja.)

NINUS, in Greek mythology, the eponymous founder of Nineveh (q.v.), and thus the city itself personified. He was said to have been the son of Belos or Bel, to have conquered in seventeen years the whole of western Asia with the help of Ariaeus, king of Arabia, and to have founded the first empire. During the siege of Bactra he met Semiramis, the wife of one of his officers, Onnes, whom he took from her husband and married. The fruit of the marriage was Ninyas, i.e. ” The Ninevite.” After the death of Ninus, Semiramis, who was accused of causing it, erected to him a temple-tomb, nine stades high and ten stades broad, near Babylon. According to Castor (ap. Syncell. p. 167) his reign lasted fifty-two years, its commence- ment falling 2189 B.C. according to Ctesias. Another Ninus is described by some authorities as the last king of Nineveh, successor of Sardanapalus.

See J. Gilmore, Fragments of the Persika of Ktesias (1888).

NIOBE, in Greek mythology, daughter of Tantalus and Dione, wife of Amphion, king of Thebes. Proud of her numerous family, six daughters and six sons, she boasted of her superiority to her friend Leto, the mother of only two children, Apollo and Artemis. As a punishment, Apollo slew her sons and Artemis her daughters. Their bodies lay for nine days unburied, for Zeus had changed the people to stone; on the tenth day they were buried by the gods. Out of pity for her grief, the gods changed Niobe herself into a rock on Mount Sipylus in Phrygia, in which form she continued to weep (Homer, Iliad, xxiv.

602-617; Apollodorus iii. 5; Ovid, Metam. vi. 146-312). The names and number of her children, and the time and place of their death, are variously given. This ” Niobe,” described by Pausanias (i. 21) and Quintus Smyrnaeus” 5 (i. 293-306), both natives of the district, was the appearance assumed by a cliff on Sipylus when seen from a distance and from the proper point of view (see Jebb on Sophocles, Antigone, 831). It is to be distinguished from an archaic figure still visible, carved in the northern side of the mountain near Magnesia, towhich tradition has given the name of Niobe, but which is really intended for Cybele.

According to some, Niobe is the goddess of snow and winter, whose children, slain by Apollo and Artemis, symbolize the ice and snow melted by the sun in spring; according to others, she is an earth-goddess, whose progeny — vegetation and the fruits of the soil — is dried up and slain every summer by the shafts of the sun-god. Burmeister regards the legend as an incident in the struggle between the followers of Dionysus and Apollo in Thebes, in which the former were defeated and driven back to Lydia. Heffter builds up the story round the dripping rock in Lydia, really representing an Asiatic goddess, but taken by the Greeks for an ordinary woman. Enmann, who interprets the name as ” she who prevents increase ” (in contrast to Leto, who made women prolific), considers the main point of the myth to be Niobe’s loss of her children. He compares her story with

that of Lamia, who, after her children had been slain by Zeus, retired to a lonely cave and carried off and killed the children of others. The appearance of the rock on Sipylus gave rise to the story of Niobe having been turned to stone. The tragedians used her story to point the moral of the instability of human happiness; Niobe became the representative of human nature, liable to pride in prosperity and forgetfulness of the respect and submission due to the gods.

The tragic story of Niobe was a favourite subject in literature and art. Aeschylus and Sophocles wrote tragedies upon it; Ovid has described it at length in his Metamorphoses. In art, the most famous representation was a marble group of Niobe and her children, taken by Sosius to Rome and set up in the temple of Apollo Sosianus (Pliny, Nat. Hist, xxxvi. 4). What is probably a Roman imitation of this work was found in 1583 near the Lateran, and is now in the Uffizi gallery at Florence. In ancient times it was disputed whether the original was the work of Praxiteles or Scopas, and modern authorities are riot agreed as to its identity with the group mentioned by Fliny.

On the whole subject see C.E. Burmeister, De fabula quae de Niobe

ejusque liberis agit (Wismar, 1836); L. Curtze, Tabula Niobes Thebanae (Corbach, 1836); W. Heffter in Zeitschrift fur Gymnasial-ivesen, ix. (1855); C. B. Stark, Niobe und die Niobiden (1863), the standard work; E. Thramer, Pergamos (1888); C. Friedetichs, Praxiteles und die Niobegruppe (1865); A. Mayerhofer and H. Ohlrich, Die Florentiner Niobegruppe (1881 and 1888) ; for the Niobe on Mount Sipylus, see C. B. Stark, Nach dent griechischen Orient (1874) ; G. Weber, Le Sipylos et ses monuments (1880) ; W. Ramsay, " Sipylos and Cybele," in Journal of Hellenic Studies, iii. (1882); Frazer's Pausanias, iii. 555; for vase-paintings, see H. Heyde- mann, Niobe und Niobiden auf griechischen Vasenbildern (1875). For further literature on the subject, see A. Preuner's mythological bibliography in C. Bursian's Jahresbericht iiber die Fortschrilte der klassischen Altertumswissenschaft, vol. xxv. (1891); the various derivations of the name and interpretations of the legend are given in Enmann's article in Roscher's Lexikon der Mythologie.

In Greek Art, fig. 29 (from an Orvieto vase) represents the slaying of the children of Niobe by Apollo and Artemis; fig. 78 (PI. VI.), Niobe shielding her youngest daughter.

NIORT, a city of western France, chief town of the department of Deux-Sevres, 42 m. E.N.E. of La Rochelle on the railway to Saumur. Pop. (1906) 20,538. Niort is situated on the left bank of the Sevre Niortaise, partly in the valley and partly on the slopes of the enclosing hills. The tower of the church of Notre-Dame (15th and 16th centuries) has a spire 246 ft. high, with bell-turrets adorned with statues of the evangelists, and at the base a richly decorated dais in the Renaissance style; and the north doorway shows a balustrade, of which the balusters form the inscription O Mater Dei, memento mei. St Andre, with a fine window in the apse, and St Hilaire, which contains some beautiful frescoes, both date from the 19th century. Of the old castle, whose site is partly occupied by the prefecture, there remains the donjon — two large square towers united by a central building, flanked by turrets, built, it is said, by Henry II. of England or Richard Cceur de Lion. The platform on the top affords a fine view of the public garden (one of the most picturesque in France) and the valley of the Sevre. The old town-hall, Renaissance in style, is wrongly known as the Alienor palace, after Eleanor of Guienne; it contains a collection of antiquities. The house is still shown in which Madame de Maintenon is erroneously stated to have been born. Near Niort are the fine feudal ruins of the fortress of Coudray-Salbart.

Niort is the seat of a prefect and a court of assizes, and has tribunals of first instance and of commerce, a board of trade- arbitration, lycees

for both sexes, a school of drawing, a chamber of commerce and a branch of the Bank of France. Tanning, currying, shammy-dressing, glove-making and the manufacture of brushes and boots and shoes are the staple industries.

Up to the 7th century the Niort plain formed part of the Gulf of Poitou; and the mouth of the Sevre lay at the foot of the hills now occupied by the town which grew up round the castle erected by Henry Plantagenet in 1155. The place was captured by Louis VIII. in 1224. By the peace of Bretigny it was ceded to the English; but its inhabitants revolted against the Black Prince, and most of them were massacred when his troops recovered the town by assault. In 1373 Duguesclin regained

possession of the town for the French. Protestantism made numerous proselytes at Niort, and Gaspard de Coligny made himself master of the town, which successfully resisted the Catholic forces after the Battle of Jarnac, but surrendered without striking a blow after that of Moncontour. Henry IV. rescued it from the League. It suffered severely by the revocation of the edict of Nantes.

NIPIGON [Neepigon, or NEPiGON],a lake and river of Thunder Bay district, Ontario, Canada. The lake is 30 m. N. of the bay of the same name on Lake Superior, at an altitude of 852 ft. above the sea. It is 70 m. long and 50 m. wide; contains over 1000 islands, is very deep, and has a much-indented shore-line measuring upwards of .580 m. The river, which drains the lake, descends several hundred feet in the 40 m. of its course and is the largest stream flowing into Lake Superior. It is widely known for the excellence of its trout fishing.

NIPISSING, a lake of the district of the same name in Ontario, Canada, situated nearly midway between Lake Huron and the Ottawa river, at an altitude of 644 ft. above the sea. It is of irregular shape, with bold shores, and contains many islands; from the north it receives the waters of Sturgeon river. It is 50 m. in length and 20 in breadth; discharges its waters by French river into Lake Huron, and is separated by a low water- shed from the Mattawa river, a tributary of the Ottawa. It has been proposed as the summit level of the projected Ottawa and Georgian Bay canal, an important project rendered difficult by the numerous rapids both on French river and on the Ottawa. With the Ottawa, Mattawa and French, it formed the old

voyageur route from Montreal to the Great Lakes.

NIPPUR, one of the most ancient of all the Babylonian cities of which we have any knowledge, the special seat of the worship of the Sumerian god, En-li!, lord of the storm demons. It was situated on both sides of the Shatt-en-Nil canal, one of the earliest courses of the Euphrates, between the present bed of that river and the Tigris, almost 100 m. S.E. of Bagdad, in 32 7′ N. 45 10′ E. It is represented by the great complex of ruin mounds known to the Arabs as Nuffar, written by the earlier explorers Niffer, divided into two main parts by the dry bed of the old Shatt-en-Nil (Arakhat). The highest point of these ruins, a conical hill rising about 100 ft. above the level of the surrounding plain, N.E. of the canal bed, is called by the Arabs Bint el-Amir or ” prince’s daughter.” Here very brief and unsatisfactory excavations were conducted by Sir A. H. Layard in 185 1, which served, however, by means of the inscribed bricks discovered, to identify the site. The university of Pennsylvania began systematic excavations in 1889 under the directorship of Dr John P. Peters. With some intermissions these excavations were continued until 1 900 under the original director and his successors, Dr John Henry Haynes and Dr H. V. Hilprecht. The result of their work is a fairly continuous history of Nippur, and especially of its great temple, E-kur, from the earliest period.

Originally a village of reed huts in the marshes, similar to many of those which can be seen in that region to-day, Nippur under- went the usual vicissitudes of such villages — floods and conflagra- tions. For some reason habitation persisted at the same spot, and gradually the site rose above the marshes, partly as a result of the mere accumulation of debris, consequent on continuous habitation, partly through the efforts of the inhabitants. As these began to develop in civilization, they substituted, at least so far as their shrine was concerned, buildings of mud-brick for reed huts. The earliest age of civilization, which we may designate as the clay age, is marked by rude, hand-made pottery and thumb-marked bricks, flat on one side, concave on the other, gradually developing through several fairly marked stages. The exact form of the sanctuary at that period cannot be determined, but it seems to have been in some way connected with the burning of the dead, and extensive remains of such cremation are found in all the earlier, pre-Sargonic strata. There is evidence of the succession on this site of different peoples, varying somewhat in their degrees of civilization. One stratum is marked by painted pottery of good make, similar to that found in a corresponding stratum in Susa, and resembling the early pottery of the Aegean

region more closely than any later pottery found in Babylonia. This people gave way in time to another, markedly inferior in the manufacture of pottery, but superior, apparently, as builders. In one of these earlier strata, of very great antiquity, there was discovered, in connexion with the shrine, a conduit built of bricks, in the form of an arch. Somewhere, apparently, in the 4th millennium B.C., we begin to find inscriptions written on clay, in an almost linear script, in the Sumerian tongue. The shrine at this rime stood on a raised platform and apparently contained, as a characteristic feature, an artificial mountain or peak, a so-called ziggurat, the precise shape and size of which we are, however, unable to determine. So far as we can judge from the inscriptions, Nippur did not enjoy at this time, or at any later period for that matter, political hegemony, but was distinctively a sacred city, important from the possession of the famous shrine of En-lil. Inscriptions of Lugal-zaggisi and Lugal-kigub-nidudu, kings of Erech and Ur respectively, and of other early pre-Semitic rulers, on door-sockets and stone vases, show the veneration in which the ancient shrine was then held and the importance attached to its possession, as giving a certain stamp of legitimacy. So on their votive offerings some of these rulers designate them- selves as patesis, or over-priests, of En-lil. Early in the 3rd millennium B.C. the city was conquered and occupied by the Semitic rulers of Akkad, or Agade, and numerous votive objects of Alu-usharsid (Urumush or Rimush), Sargon and Naram-Sin testify to the veneration in which they also held this sanctuary. En-lil was in fact adopted as the Bel or great lord of the Semitic pantheon. The last monarch of this dynasty, Naram-Sin, rebuilt both the temple and the city walls, and in the accumula- tion of debris now marking the ancient site his remains are found about half way from the top to the bottom. To this Akkadian occupation succeeded an occupation by the first Semitic dynasty of Ur, and the constructions of Ur-Gur or Ur-Engur, the great builder of Babylonian temples, are superimposed immediately upon the constructions of Naram-Sin. Ur-Gur gave to the temple its final characteristic form. Partly razing the constructions of his predecessors, he erected a terrace of unbaked bricks, some 40 ft. high, covering a space of about 8 acres, near the north- western edge of which, towards the western corner, he built a ziggurat, or stage-tower, of three stages of unburned brick, faced with kiln-burned bricks laid in bitumen. On the summit of this artificial mountain stood, apparently, as at Ur and Eridu, a small chamber, the special shrine or abode of the god. Access to the stages of the ziggurat, from the court beneath, was had by an inclined plane on the south-east side. To the north-east of the ziggurat stood, apparently, the House of Bel, and in the courts below the ziggurat stood various other buildings, shrines, treasure chambers and the like.

The whole structure was roughly orientated, with the corners towards the cardinal points of the compass. Ur-Gur also rebuilt the walls of the city in general on the line of Naram-Sin's walls.

The restoration of the general features of the temple of this and the immediately succeeding periods has been greatly facilitated by the discovery of a sketch map on a fragment of a clay tablet. This sketch map represents a quarter of the city to the eastward of the Shatt-en-Nil canal, which was enclosed within its own walls, a city within a city, forming an irregular square, with sides roughly 2700 ft. long, separated from the other quarters of the city, as from the surrounding country to the – north and east, by canals on all sides, with broad quays along the walls. A smaller canal divided this quarter of the city itself into two parts, in the south-eastern part of which, in the middle of its S.E. side, stood the temple, while in the N.W. part, along the Shatt-en-Nil, two great storehouses are indicated. The temple proper, according to this plan, consisted of an outer and inner court (each covering approximately 8 acres), surrounded by double walls, with ziggurat on the north-western edge of the latter.

The temple continued to be built upon or rebuilt by kings of various succeeding dynasties, as shown by bricks and votive objects bearing the inscriptions of the kings of various dynasties of Ur and Isin. It seems to have suffered severely in some

manner at or about the time of the Elamite invasions, as shown by broken fragments of statuary, votive vases and the like, from that period, but at the same time to have won recognition from the Elamite conquerors, so that Eriaku (Sem. Rim-Sin, biblical Arioch), the Elamite king of Larsa, styles himself " shep- herd of the land of Nippur." With the establishment of the Babylonian empire, under Khammurabi, early in the 2nd pre- Christian millennium, the religious as well as the political centre of influence was transferred to Babylon, Marduk became the Bel or lord of the pantheon, many of En-lil's attributes and myths were transferred to him, and E-kur was to some extent neglected. Under the succeeding Cossaean dynasty, however, shortly after the middle of the 2nd millennium, E-kur was restored once more to its former splendour, several monarchs of that dynasty built upon and adorned it, and thousands of in- scriptions, dating from the time of those rulers, have been discovered in its archives. After the middle of the 1 2th century follows another long period of comparative

neglect, but with the conquest of Babylonia by the Assyrian Sargon, at the close of the 8th century B.C., we meet again with building inscriptions, and under Assur-bani-pal, about the middle of the 7th century, we find E-kur restored with a splendour greater than ever before, the ziggurat of that period being 190 ft. by 128 ft. After that E-kur appears to have gradually fallen into decay, until finally, in the Seleucid period, the ancient temple was turned into a fortress. Huge walls were erected at the edges of the ancient terrace, the courts of the temple were filled with houses and streets, and the ziggurat itself was curiously built over in a cruciform shape, and converted into an acropolis for the fortress. This fortress was occupied and further built upon until the close of the Parthian period, about a.d. 250; but under the succeeding rule of the Sassanids it in its turn fell into decay, and the ancient sanctuary became, to a considerable extent, a mere place of sepulture, only a little village of mud huts huddled about the ancient ziggurat continuing to be inhabited. The store-house quarter of the temple town had not been explored as late as 1909. As at Tello, so at Nippur, the clay archives of the temple were found not in the temple proper, but on an outlying mound. South-eastward of the temple quarter, without the walls above described, and separated from it by a large basin connected with the Shatt-en-Nil, lay a triangular mound, about 25 ft. in average height and 13 acres in extent. In this were found large numbers of inscribed clay tablets (it is estimated that upward of 40,000 tablets and fragments have been excavated in this mound alone), dating from the middle of the 3rd millennium B.C. onward into the Persian period, partly temple archives, partly school exer- cises and text-books, partly mathematical tables, with a consider- able number of documents of a more distinctly literary character. For an account of one of the most interesting fragments of a literary or religious character, found at Nippur, see below.

The great complex of ruin mounds lying S.W. of the Shatt-en- Nil canal, larger in extent and mass than the N.E. complex, had not up to 1909 been so fully explored as the mounds to the N.E. Almost directly opposite the temple, however, a large palace was excavated, apparently of the Cossaean period, and in this neighbourhood and further southward on these mounds large numbers of inscribed tablets of various periods, including temple archives of the Cossaean and commercial archives of the Persian period, were excavated. The latter, the ” books and papers ” of the house of Murashu, commercial agents of the government, throw light on the condition of the city and the administration of the country in the Persian period, the 5th century B.C. The former give us a very good idea of the admini- stration of an ancient temple. The whole city of Nippur appears to have been at that

time merely an appanage of the temple. The temple itself was a great landowner, possessed of both farms and pasture land. Its tenants were obliged to render careful accounts of their administration of the property entrusted to their care, which were preserved in the archives of the temple. We have also from these archives lists of goods contained in the temple treasuries and salary lists of temple officials, on tablet forms specially prepared and marked off for periods of a year or less.

On the upper surface of these mounds was found a considerable Jewish town, dating from about the beginning of the Arabic period onward to the 10th century a.d., in the houses of which were large numbers of incantation bowls. Jewish names, appearing in the Persian documents discovered at Nippur, show, however, that Jewish settlement at that city dates in fact from a much earlier period, and the discovery on some of the tablets found there of the name of the canal Kabari suggests that the Jewish settlement of the exile, on the canal Chebar, to which Ezekiel belonged, may have been somewhere in this neighbour- hood, if not at Nippur itself. Hilprecht indeed believes that the Kabari was the Shatt-en-Nil. Of the history and conditions of Nippur in the Arabic period we learn little from the excavations, but from outside sources it appears that the city was the seat of a Christian bishopric as late as the 12th century a.d.

The excavations at Nippur were the first to reveal to us the extreme antiquity of Babylonian civilization, and, as already stated, they give us the best consecutive record of the develop- ment of that civilization, with a continuous occupancy from a period of unknown antiquity, long ante-dating 5000 B.C., onward to the middle ages. But while Nippur has been more fully ex- plored than any other old Babylonian city, except Babylon and Lagash, still only a small part of the great ruins of the ancient site had been examined in 1909. These ruins have been particularly fruitful in inscribed material, especially clay tablets, many of them from the very earliest periods; but little of artistic or architectural importance has been discovered. Excavation at Nippur is particularly difficult and costly by reason of the in- accessibility of the site, and the dangerous and unsettled con- dition of the surrounding country, and still more by reason of the immense mass of later debris under which the earlier and more important Babylonian remains are buried.

See A. H. Layard, Nineveh and Babylon (1853); John P. Peters, Nippur (1897); H. V. Hilprecht, Excavations in Assyria and Baby- lonia (1904); Clarence S. Fisher, Excavations at Nippur (1st part 1905, 2nd part 1906); Babylonian Expedition of the University of Pennsylvania, a

monumental edition of the cuneiform texts found at Nippur, with brief introductions and notes of a more general character (1893 foil.). For a plan of the Parthian palace see Architecture, vol. ii. p. 381. (J. P. Pe.)

The Nippur Deluge Fragment. — From among the many tablets and fragments of tablets discovered at Nippur one of more than ordinary interest was published in 1910. Though mutilated portions of only a few of its lines have been preserved, and the text contains no proper name, it is clear that the tablet represents part of a Babylonian version of the Deluge Legend. 1 The portion of the story covered by the text relates to the warning given by Ea to Ut-napishtim, the Babylonian equivalent of the Hebrew Noah. The god here states that he is about to send a deluge, which will cause destruction to all mankind, and he gives directions for the building of a great ship in which ” the beasts of the field and the birds of heaven ” may be saved, along with Ut-napishtim and his family; he fixes the size of the ship and directs that it should be covered with a strong roof or deck. The text bears a general resemblance to the two well-known Assyrian versions on tablets in the British Museum, but it has been claimed that its phraseology presents a closer parallel to the biblical version of the Deluge story in the ” Priestly Code.” For several years the existence of Babylonian versions of the legend had been detected among collections of tablets dating from the earlier historical periods. A fragment of one such version belongs to the period of the First Dynasty of Babylon, 2 and part of a still earlier Semitic version of another portion of the Gilgamesh Epic has also been recovered. 3 The new fragment from Nippur has given rise to considerable discussion, in view of the light it

1 See Hilprecht, The Babylonian Expedition of the University of Pennsylvania, ser. D, vol. v. fasc. 1.

2 It is dated in the reign of Ammizaduga; cf. Scheil, Recueil de travaux, xx. 55 ff. For another fragment of the Atar-khasis legend of the same period, see Cuneiform Texts in the British Museum, pt. vi., and cf. Zimmern, Zeits. fur Assyr. xiv. 278 f.

3 See Meissner, Mitleil. der Vorderas. Gesellschaft (1902), i. For other Semitic legends of this early period, see Cuneiform Texts in the British Museum, pt. xv. (1902), Pis. I. -VI., and cf. King, The Seven Tablets of Creation, p. lxxvii. f.

is said to throw upon a disputed problem of biblical criticism. According to its discoverer it represents the oldest account of the Babylonian Deluge story extant; and he considers it of funda- mental importance for determining the age of Israel's earliest traditions, since he would regard it as having been written " before Abraham had left his Babylonian home in Ur of the Chaldees."

Beyond the fact that it was found at Nippur during the fourth of the American expeditions, there does not appear to be any exact record of its provenance; and, in order to determine its date, it is necessary to rely on the external and internal evidence furnished by the tablet itself. A number of hymns and prayers addressed to the chief Babylonian gods, and written throughout in the Sumerian language, have been found at Nippur, and these may be dated in the era. of the kings of Ur and Isin, since some of them are mentioned by name in the petitions. To the latter part of this period Professor Hilprecht would assign the new Deluge fragment. It is natural that under the Sumerian revival, which characterized the united kingdom of Sumer and Akkad, the ancient ritual should have been revived and the Sumerian service-books adapted for the use of the reigning monarch. Sumerian, in fact, predominated, not only on the historical monuments, but also throughout the religious literature, a fact which militates against assigning the newly discovered Semitic legend to the period of these early Sumerian texts. It has already been noted that the earliest deluge-fragment previously recovered dates from the latter half of the First Dynasty of Babylon, when the Western Semites had succeeded in establishing their authority through- out the greater part of the country. But, to judge from the photographic reproduction of the Nippur tablet, the characters upon it do not appear to resemble those in use at the time of the First Dynasty, nor those of the period of the Dynasties of Ur and Isin. On purely epigraphic grounds the suggestion has indeed been made that it should be assigned to the Kassite period (not earlier than 1700 B.C.), during which a very large number of the tablets found at Nippur were inscribed. 1

But, even so, the fragment is one of the most interesting that has been recovered on the site of Nippur. For it strikingly illustrates the fact that the temple of En-lil, like that of the Sun-god at Sippar and the other great temples in Babylonia, possessed a body of mythological and religious texts, which formed subjects for study and comment among the priestly scribes. It was by the collection and reproduction of such documents, preserved in the ancient religious centres, that Assur- bani-pal was enabled to form his unique library of tablets at Nineveh. The temple of E-kur thus formed no exception to the rule that the great temples of Babylonia were centres of literary, as well as

of religious, activity.

The text of this Deluge fragment also furnishes one more proof of the existence of parallel versions of the same legend. In some in- stances, as in the great Creation Series of Babylon, the later scribes subjected the different versions to processes of editing, with the result that the earlier forms gave place to the redactions of a militant priesthood. But where no theological nor local prejudices were involved, the tendency to a faithful reproduction of the earlier texts prevailed. Thus the resemblances which have been claimed between the Nippur Deluge fragment and the version of the ” Priestly Code ” in Genesis, in themselves furnish no significant evidence as to the latter’s date. The possibility that Hebrew traditions were subject to Babylonian influence from the period of the Canaanite conquest has long been recognized, and to the Exilic and post-Exilic Jew the mythology of Babylon may well have presented many familiar features. (L. W. K.)

NlRlZ, or NairIz, a district and town in the province of Fars, Persia. The district has 24 villages and extends from near Istahbamat, south of the Bakhtegan lake, to about 50 m. E. Water is scarce and the plain is not much cultivated in con- sequence. The produce consists of some grain, cotton, tobacco, &c, but fruit is more abundant. Here, as in the neighbouring Darab district, villages situated in the hills are called madan (mine), and some travellers have in their itineraries indicated a mine in localities where there is none.

1 It has also been pointed out that the employment of the sign PI for wa and the use of z for s, cited in support of the earlier date, survived in the Kassite period.

The town of NIriz is situated in a plain 7 m. from the south- eastern point of the lake, and about 130 m. from Shiraz, and has a population of about 9000. The people of NIriz were stanch followers of the Bab (see Babiism), and rose against the govern- ment in 1850 and in 1852, with disastrous results. Niriz was formerly known for its manufactureof steel from iron ore brought from Parpa, 40 m. E.

NIRVANA, the term in Buddhist theology, meaning literally ” blowing out “or” dying out,” Skt. nirva, ” to blow, “for a calm or sinless state or condition of the mind reached by a dying out or extinction of sin (see Buddhism).

NISARD, JEAN MARIE NAPOLEON DESIRE (1806-1888), French author and critic, was born at Chatillon-sur-Seine on the 20th of March 1806. In 1826 he joined the staff of the Journal des Dibats, but

subsequently transferred his pen to the National. Under the empire he was inspector-general of education (1852) and director of the Ecole normale (1857-1867). His literary reputation was effectually established by his Histoire de la litterature franqaise (1844-1861), which secured his election to the Academy (1850). His other works include £ludes d'histoire et de litterature (1859-1864), and Les Quatres grands historiens latins (1875). In all his books he vigorously supported the claims of classicism against romanticism. He died at San Remo on the 27th of March 1888.

NISBETT, LOUISA CRANSTOUN (1812-1858), English actress, was the daughter of Frederick Hayes Macnamara, an actor, whose stage name was Mordaunt. As Miss Mordaunt she had con- siderable experience, especially in Shakesperean leading parts, before her first London appearance in 1829 at Drury Lane as Widow Cheerly in Andrew Cherry's (1762-1812) Soldier's Daughter. Her beauty and high spirits made her at once a popular favourite in a large number of comedy parts, until in 1 83 1 she was married to Captain John Alexander Nisbett and retired. Her husband, however, was killed the same year by a fall from his horse, and she was compelled to reappear on the stage in 1 83 2 . She was the original Lady Gay Spanker of London Assurance (1841). In 1844 she withdrew again from the stage to marry Sir William Boothby, Bart., but on his death (1846),, returned to play Lady Teazle, Portia, Constantine in the Love Chase, Helen and Julia in the Hunchback. It was in the first of these parts that she made her final appearance in 1851. She died on the 15th of January 1858.

NISH (also written Nisch and Nis), the capital of the Nish department of Servia, lying in a plain among the southern mountains, on the left shore of the Nishava, a tributary of the Morava. Pop. (1900) 24,451. Among Servian cities, Nish is only surpassed by Belgrade in commercial and strategic import- ance; for it lies at the point where several of the chief Balkan highroads converge, and where the branch railway to Salonica leaves the main line between Belgrade and Constantinople. The administration of the Servian railways has its factory for repairing engines and principal store of materials in the city, which also possesses an iron foundry. The king and the govern- ment reside for at least three months in the year in Nish, where also the national assembly, before the constitution of 1901, was regularly held. It is the see of a bishop, the seat of the district prefecture and a tribunal, and the headquarters of the territorial militia corps, having besides a large number of regular troops in garrison. There is a small obsolete fortress on the right bank of the Nishava, believed to have been erected on the site of the Roman Naissus. The surrounding hills (Vinik, Goritsa, Kamenitsa) were, after 1886, fortified by modern

earthworks.

After the Turks were driven from the city in 1878, it was in many respects modernized; but something of its former character is preserved in the ancient Turkish palace, mosque and fountain, the maze of winding alleys and picturesque houses in the older quarters, and, on market days, by the medley of peasant costumes — Bulgarian, Albanian and Rumanian, as well as Servian.

The ancient Roman city Naissus was mentioned as an im- portant place by Ptolemy of Alexandria. Under its walls was fought in a.d. 269 the great battle in which Emperor Claudius destroyed the army of the Goths. It was at Naissus that

Constantine the Great was born in a.d. 274. Though the emperor Julian improved its defences, the town was destroyed by the Huns under Attila, in the 5th century, but Justinian did his best to restore it. In the 9th century the Bulgarians became masters of Naissus, but had to cede it to the Hungarians in the nth century, from whom the Byzantine emperor Manuel I. reconquered it in 1173. Towards the end of the 12th century the town was in the hands of the Servian prince Stephen Nemanya, who there received hospitably the German emperor Frederic Barbarossa and his Crusaders. In 1 3 7 5 the Turks captured Naissus for the first time from the Servians. In 1443 the allied armies of the Hungarians under Hunyady and the Servians under George Brankovich, retook it from the Turks, but in 1456 it again came under Turkish dominion, and remained for more than 300 years the most important Turkish military station on the road between Hungary and Constantinople. In the frequent wars between Austria and Turkey during the 1 7th and 18th centuries the Austrians captured Naissus twice (in 1689 and 1737), but were not able to retain it long. The Servians having, in the beginning of the 1 9th century, successfully cleared Servia of Turks, were emboldened to attack Nish in 1 809, but were repulsed with great loss. The Turks raised as a monument of their victory a high tower composed entirely of the heads of the Servians slain in the battle of Nish. The remnants of this monument are still kept up. It stands half a mile to the east from Nish, and is called to this day by the Turkish name ” Tyele-Koula,” ” the Tower of Skulls.” In the Russo- Turkish War the Servian army, under the personal command of King Milan, besieged Nish, and forced it to capitulate on the 10th January 1878. The Berlin congress

decided that it should remain with Servia. (C. Mi.)

NISHAPUR, a province of Persia, situated between Meshed and Sabzevar, in northern Khorasan. The older name of the district was Abarshehr. It has a population of from 130,000 to 140,000, is divided into twelve districts, and pays a yearly revenue of about £12,000. It produces much grain and cotton, and is considered one of the most fertile districts of Persia. One of its subdivisions is that of Bar-i-Madan, with chief place Madan (situated 32 m. N.W. of the city of Nishapur, at an elevation of 5100 ft., in 36 28′ N., 58° 20′ E.), where the famous mines are which have supplied the world with turquoises for at least 2000 years. The province used to be one of the administrative divisions of Khorasan, but is now a separate province, with a governor appointed by the shah.

NISHAPUR (Old Pers. Nev-shapur-nev, New Pers. niv, ink — good; Arab. Naisabur), the capital of the province of Nishapur, Persia, situated at an elevation of 3920 ft., in 36 12′ N., and 58° 40′ E., about 49 m. west of Meshed. The second element of the name is that of the traditional founder Shapur, or Sapor of the Western historians. Some accounts name the first (241-272), others the second Shapur (309-379). It was once one of the four great cities of Khorasan, rivalling Rai (Rhages), ” the mother of cities,” in importance and population, but is now a small and comparatively unimportant place with a population of barely 1 5 ,000. It has post and telegraph offices and a lively trade in wool, cotton and dry fruits (almonds, pistachios).

Eastward of the present city, amongst the mounds and ruins of the old town, in a dilapidated chamber adjoining a blue- domed building over the grave of an imamzadeh, is the tomb of the astronomer-poet Omar Khayyam, an unsightly heap of plaster without inscription, and probably fictitious. Near it is the grave of the celebrated poet and mystic Farld ud din Attar, who was killed by the Mongols when they captured the city c. 1229.

Nishapur was an important place during the 5th century, for Yazdegerd II. (438-457) mostly resided there. During the latter Sassanids it is seldom mentioned, and when the Arabs came to Khorasan (641-642) it was of so little importance that, as Tabari relates, it did not even have a garrison. Under the Tahirids (820-872) it became a flourishing town and rose to great importance during the Samanids (874-999). Toghrul, the first ruler of the Seljuk dynasty, made Nishapur his residence in 1037. In JI 53 tne Ghuzz Turkomans overran the country

and partly destroyed town and suburbs. In 1208 most of the town was destroyed by an earthquake. The town was hardly rebuilt when it was again destroyed, this time by the Mongols (April 1 221) and so effectually that, completely levelled to the ground, it was turned into a vast barley field. The city was again rebuilt, suffered again at the hands of the Mongols (1269) and from another great earthquake (1280), and never again rose to its former greatness. (A. H.-S.)

NISIBIS (Nasibina in the Assyrian inscriptions) , an ancient city and fortress in the north of Mesopotamia, near the point where the Mygdonius (mod. Jaghjagha) leaves the mountains by a narrow defile. The modern Nezib or Nasibin consists of some 4000 inhabitants, largely Jews, who pay tribute to the Shammar Bedouins. The neighbourhood, we are informed by Arab writers, was at one time richly wooded, but is now somewhat marshy and unhealthy. According to the Arabian geographer, Yaqut, Persian scorpions were thrown into the place when it was besieged by Anushirwan; hence their number to-day. The church of St James, belonging to a small community of Jacobite Christians, and a few pillars and blocks of masonry are the only remains of the former greatness of the town.

The site of Nisibis, on the great road between the Tigris and the Mediterranean, and commanding alike the mountain country to the north and the then fertile plain to the south, gave it an importance which began during the Assyrian period and continued under the Seleucid empire. From 149 B.C. to a.d. 14 Nisibis was the residence of the kings of Armenia, and there Tigranes had his treasure-houses. The place figured frequently as a frontier fortress in the wars of the Romans and the Parthians, its brick walls being unusually thick and its citadel very strong. Ceded to the Parthians by Hadrian, it became a Roman colony (Septimia Colonia Nisibis) under Septimius Severus. It was heroically defended against Shapur (Sapor) II., who unsuccessfully besieged it thrice. In the peace made by Jovian, however, it passed into the hands of the Persians, who established a strong colony there (a.d. 364). Nisibis early became the seat of a Jacobite bishop and of a Nestorian metropolitan, and under the Arabs (when it continued to flourish and became the centre of the district of Diya'r Rebi'a) the population of the town and neighbourhood was still mostly Christian, and included numerous monasteries. Arab geographers and travellers of the middle ages speak in high terms of the gardens of Nisibis, and the magnificent returns obtained by the agriculturist. According to Mokaddasi (ob. 1024), acorns, preserved fruits and manufactured articles such as carnages and inkstands were exported. The town was so heavily taxed by the Hamdanid princes at Mosul that the Arab tribe of the Banu Habib, although blood relations

of the Hamdanids, migrated into Byzantine territory, where they were well received, accepted Christianity, attracted other emigrants from Nisibis, and at last began to avenge themselves by yearly raids upon their old home. Ibn Haukal goes on to say that finally the Hamdanids took possession of the town, confiscated the estates of those who had emigrated, and compelled those who remained to substitute corn for their profitable fruit crops. This destroyed the prosperity of Nisibis, and the dis- trict, no longer protected against nomad tribes, became a wilderness. Nisibis (Nezib) appeared for the last time in history in 1839, when the Egyptians under Ibrahim Pasha defeated the Turkish army under Hafiz Pasha on the 24th of June in a battle at which von Moltke was present.

NISI PRIUS, in English law, a term used to denote generally all actions tried before judges of the king's bench division. For the history and meaning of this term see Assize. As a rule actions only are tried at nisi prius, and a judge is said to sit at nisi prius when he sits, usually in the king's bench division, for the trial of actions. By a resolution passed by the judges of the king's bench division in 1894 it was declared of the utmost importance that there should be at least three courts of nisi prius sitting continuously throughout the legal year — one for special jury causes, one for common jury causes, and one for causes with- out juries (see the Annual Practice).

Nisi Prius Record was before the Judicature Acts the name of the formal copy of proceedings showing the history of the case up to the time of trial. After the trial it was endorsed with the postea, show- ing the result of the trial, and delivered by the officer of the court to the successful party, whose possession of the postea was his title to judgment. Since the Judicature Acts there is no nisi prius record in civil actions, the nearest approach to it being the deposit of copies of the' pleadings for the use of the judge, and there is no postea, the certificate of the associate or master as to the result of the trial superseding it.

NISUS, in Greek mythology, king of Megara, brother of Aegeus, king of Athens. When Minos, king of Crete, was on his way t"»

attack Athens to avenge the murder of his son Androgeus, for which Aegeus was directly or indirectly responsible, he laid siege to Megara. He finally gained possession of the city through the treachery of the

king's daughter Scylla, who, enamoured of Minos, pulled out the golden (or purple) lock from her father's head, on which his life and the safety of the city depended (for similar stories, see Frazer, Golden Bough, iii. 1900, p. 358). Megara was captured, and Nisus, who died fighting (or slew himself), was changed into a sea-eagle. Minos, disgusted at Scylla's treachery, tied her to the rudder of his' ship, and after- wards cast her body ashore on the promontory called after her Scyllaeum; or she threw herself into the sea and swam after Minos, constantly pursued by her father, until at last she was changed into a ciris (a bird or a fish). In Virgil, Scylla, the daughter of Nisus, is confused with the sea-monster, the daughter of Phorcys. Nisus was the eponymous hero of the harbour of Nisaea, and local tradition makes no mention of his betrayal by his daughter. According to Roscher (in his Lexikon der Mytho- logie), who identifies the ciris with the heron, the story of Nisus and Scylla (like these of Aedon, Procne, Philomela and Tereus) was invented to give an aetiological explanation of the char- acteristics of certain birds. The birds were regarded as originally human beings, whose acts and characters were supposed to account for certain habits of the birds into which they had been changed. E. Siecke, De Niso et Scylla in aves mutatis (progr. Berlin, 1884), holds that the purple or golden hair of Nisus is the sun, and Scylla the moon, and that the origin of the legend is to be looked for in a very ancient myth of the relations between the two, which he endeavours to explain with the aid of Indian and German parallels.

NITHARD (d. 844), Frankish historian, was the illegitimate son of Angilbert, the friend of Charlemagne, by Bertha, a daughter of the great emperor. He was educated at the imperial court and became abbot of St Riquier in commendam, never taking the vows. Little else is known about his life, but he appears to have served his cousin, Charles the Bald, on peaceful errands and also on the field of battle. He fought for Charles at Fontenoy in June 841, and died as the result of wounds received whilst fighting for him against the Northmen near Angouleme. The date of his death was probably the 14th of June 844. In the nth century his body, with the fatal wound still visible, was found in the grave of his father, Angilbert. Nithard's historical work consists of four books on the history of the Carolingian empire under the turbulent sons of the emperor Louis I., especi- ally during the troubled period between 840 and 843. This Historiae or De dissensionibus filiorum Ludovici pii is valuable for the light which it throws upon the causes which led to the disintegration of the Carolingian empire. Although rough in style, partisan in character and sometimes incorrect in detail, the books are the work of a man who had an intimate knowledge of the events which he relates, who

possessed a clear and virile mind, and who above all was not a recluse but a man of action. They are dedicated to Charles the Bald, at whose request they were written.

The Historiae has been printed several times. Perhaps the best edition is in Band ii. of the Monumenta Germaniae historica. Scrip- tores; it has also been edited by A. Holder (Freiburg, 1882). It has been translated into German by J. yon Jasmund (Berlin, 1851; new edition by W. Wattenbach, Leipzig, 1889); and into French in tome iii. of Guizot's Collection des memoires (Paris, 1824).

See O. Kuntzemiiller, Nithard und sein Geschichtswerk (Jena, 1873); G. Meyer von Knonau, Uber Nithards vier Biicher Geschichten (Leipzig, 1866); and W. Wattenbach, Deutschlands Geschichtsquellen, Band i. (Berlin, 1904).

NITHSDALE, WILLIAM MAXWELL. 5TH Earl of (1676- 1744), Jacobite leader, was a member of the family of Maxwell (q.v.), being a son of Robert the 4th earl (d. 1696) and a collateral relation of Robert Maxwell (d. 1646) who was created earl of Nithsdale in 1620. He became famous by his loyalty to the royalist tradition of his family, and by the heroism of his wife Winifred, daughter of William Herbert, 1st marquess of Powis. After becoming earl in 1698 he served the exiled house of Stuart in secret, was suspected as a Jacobite conspirator, and was much

molested on that account. In 17 12 he resigned his estate to his son William (d. 1776), reserving a life rent to himself. When the Jacobite rising took place in 171 5 he joined his friends in the north of England and was taken prisoner at Preston, being sent to London for trial. The countess of Nithsdale, who was at Terregles when she heard of the capture of her husband, followed him to London, making part of the journey on horseback in bitter winter weather. The earl and the other Jacobites were brought to trial in Westminster Hall on the 19th of January 1716, and condemned to death on the 9th of February. The execution was fixed for the 24th. The countess presented a petition to George I. which he refused to receive, and when she knelt before him and took hold of the skirts of his coat he dragged her half across the room before he could break away. Finding that no pardon could be obtained the countess laid a plan to rescue her husband from the Tower of London. With the help of two Jacobite ladies, Mrs Morgan and Mrs Mills, she very cleverly extricated her husband from his cell on the night before the day fixed for the execution by disguising him as a woman. The earl escaped from England and was followed by the countess, but not till she had gone back to Scotland to rescue

important legal papers which proved the transfer of the estate to their son. The earl and countess went to Rome after a short stay in France. In Rome they were attached to the court of the Pretender and lived in poverty and obscurity. The earl died on the 20th of March 1744, and the countess in 1749. Their son, William Maxwell, regained the possession of the family property after his father's death in 1744, since the government could only confiscate his father's life-interest; but the title was forfeited, and he died childless.

See Sir A. Fraser, The Book of Carlaverock (Edinburgh, 1 873).

NITRE, the name given to naturally occurring potassium nitrate; " cubic nitre " is sodium nitrate. The word is adapted from Lat. nitrum, which is itself adapted from Gr. virpov. These words were originally applied to the naturally occurring sodium carbonate; the connexion with potassium nitrate (sal petrae or sal petrosum) may be traced to Raimon Lull's name sal nitri, which substance, however, he distinguished from nitrum. In the 16th Century the ancient nitrum became altered to natron, a term still used for native sodium carbonate, while nitrum, and its adaptation nitre, were retained for potassium nitrate or salt- petre (q.v.).

NITRIC ACID (aqua fortis), HN0 3 , an important mineral acid. It is mentioned in the De invenlione veritatis ascribed to Geber, wherein it is obtained by calcining a mixture of nitre, alum and blue vitriol. It was again described by Albert le Grand in the 13 th century and by Raimon Lull, who prepared it by heating nitre and clay and called it " eau forte." Glauber devised the process in common use to-day, viz. by heating nitre with strong sulphuric acid. Its true nature was not determined until the 18th century, when A. L. Lavoisier (1776) showed that it con- tained oxygen, whilst in 1785 H. Cavendish determined its constitution and showed that it could be synthesized by passing a stream of electric sparks through moist air. The acid is found to exist to a slight extent in the free condition in some waters, but chiefly occurs in combination with various metals, as nitrates,. principally as nitre or saltpetre, KN0 3 , and Chile saltpetre, NaNOs. It is formed when a stream of electric sparks. is passed through moist air, and in the oxidation of nitrogenous matter in the presence of water.

For experimental purposes it is usually obtained by distilling potassium or sodium nitrate with concentrated sulphuric acid. The acid so obtained usually contains more or less water and some dissolved nitrogen peroxide which gives it a yellowish red colour. It may be purified by redistillation over barium and silver nitrates,

followed by treatment of the distillate with a stream of ozonized air. The product so obtained is then redistilled under diminished pressure and finally distilled again from a sealed and evacuated apparatus (V. Veley and Manley, Phil. Trans., 1898, A. 291, p. 365). On the large scale it is obtained by distil- ling Chile saltpetre with concentrated sulphuric acid in horizontal cast iron stills, the vapours being condensed in a series of

stoneware Woulfe's bottles. In practice the theoretical quantity of acid and Chile saltpetre is not used, but the charge is so regulated that the mixture of acid and neutral sodium sulphate formed in the retort remains liquid at the temperature employed, and consequently can be readily removed. Various modifica- tions have been made in the form of the condensing apparatus, the Guttmann condenser {Jour. Soc. Chem. Ind., 1893, p. 203) being now frequently employed. This consists of a series of vertical earthenware condensing tubes through which compressed air is passed in order to reduce the quantity of nitrogen peroxide to a minimum. The temperature of the condenser is so regulated as to bring about the condensation of the nitric acid only, which runs out at the bottom of the pipe, whilst any uncondensed steam, nitrogen peroxide and other impurities pass into a Lunge tower, where they meet a descending stream of water and are condensed, giving rise to an impure acid. F. Valentiner [Eng. Pat. 610 (1892), 19192 (1895)] recommends distillation and condensation of nitric acid in a partial vacuum. For the production of nitric acid from air see Nitrogen. Fuming nitric acid consists of a solution of nitrogen peroxide in concentrated nitric acid and is prepared by distilling dry sodium nitrate with concentrated sulphuric acid.

Nitric acid is a colourless strongly fuming liquid, having a specific gravity of 1-50394 (24-2° C.) (V. Veley, Proc. Roy. Soc. ,62, p. 223). It is exceedingly hygroscopic and corrosive. On dis- tillation, the pure acid begins to boil at 78-2° C. (W. Ramsay), partial decomposition into water, oxygen and nitrogen peroxide taking place. The acid solidifies when strongly cooled, the solid melting at – 47° C. Concentrated nitric acid forms with water a constant boiling mixture which boils at 120-5° C-> contains 68% of acid and possesses a specific gravity of 1-414 (15-5° C). If a more dilute acid than this be distilled, water passes over in excess and the residue in the retort reaches the above composition and "boiling point; on distillation of a stronger acid, excess of acid passes into the distillate and the boiling point rises until the values of

the constant boiling mixture are reached. On the hydrates of nitric acid see V. Veley, Jour. Chem. Soc, 1903, 83, p. 1015, and F. W. Kuster, Zeit. anorg. Chem. 1904, 41, p. 1. On mixing nitric acid with water there is a rise of temperature and a contraction in volume. The acid is a powerful oxidizing agent. It attacks most metals readily, usually with production of a nitrate or hydrated oxide of the metal and one or other of the oxides of nitrogen, or occasionally with the production of ammonium salts; magnesium, however, liberates hydrogen from the very dilute acid. Its action on metals depends in most cases on the temperature, strength of the acid, and the nature of the products of reaction Thus in the case of copper, it is found that the diluted acid acts very slowly upon the metal at first, but as the reaction proceeds the copper dissolves more rapidly up to a certain point and then the rate of solution again diminishes. This is possibly due to the accelerating action of the nitrous acid which is produced in the direct action of the copper on the nitric acid and which, when a certain amount has been formed in the system, begins to decompose, thus 3HN02 = HN03-|- 2NO + H 2 (V. Veley, Phil. Trans., 1891, 182, p. 279; G. 0. Higley, Amer. Chem. Jour., 1893, 15, p. 71, 1895, 17, p. 18, 1896, 18, p. 587). Iron when brought into contact with nitric acid under certain conditions, remains passive to the acid. Thus at 55° C. it is passive to an acid of specific gravity 1-42, and at 31° C. to an acid of specific gravity 1-38. No satis- factory explanation of this passivity has been given (see J. B. Senderens, Bull. Soc. Chem., 1896 [3], 15, p. 691; A. Finkelstein, Zeit. phys. Chem., 1901, 39, p. 91; W. J. Midler, ibid. 1904, 48, P- 577)- Nitric acid is without action on gold, platinum, iridium and rhodium.

The salts of nitric acid, known as nitrates, are mostly readily soluble in water and crystallize well. They are all decomposed when heated to a sufficiently high temperature, with evolution for the most part of oxygen and nitrogen peroxide, leaving a residue of oxide of the metal. They may be recognized by the fact that on the addition of a solution of ferrous sulphate, followed by that of con- centrated sulphuric acid (the mixture being kept quite cold), the ferrous sulphate solution becomes of a deep brown colour, owing

to the reducing action of the ferrous sulphate on the nitric acid which is liberated by the action of the sulphuric acid on the nitrate. As an alternative method the nitrate may be warmed with some fragments of copper and sulphuric acid which has been diluted with its own volume of water, when characteristic brown vapours will be seen.

Nitric acid finds extensive application in the manufacture of sulphuric acid, certain coal-tar colouring matters, explosives, and in the

production of various nitrates.

In medicine, nitric acid is used externally in a pure state as a caustic to destroy chancres, warts and phagadenic ulcers; and diluted preparations are employed in the treatment of dyspepsia, &c. Poisoning by strong nitric acid produces a widespread gastro-enteritis, burning pain in the oesophagus and abdomen and bloody diarrhoea. There may also be blood in the urine. Death occurs from collapse or from secondary destructive changes in the intestinal canal. Characteristic yellow staining of the skin round the mouth from the formation of xanthoproteic acid serves to distinguish it from poisoning by other acids. The antidotes are mild alkalis, together with the use of opium to relieve pain.

NITROBENZENE, C 6 H 5 N0 2 , the simplest aromatic nitro compound. It was first isolated in 1834 by E. Mitscherlich (Pogg. Ann., 1834, 31, p. 625), and is prepared commercially by the gradual addition of benzene to a well-cooled mixture of concentrated nitric and sulphuric acids, the oily product being separated, washed with alkali, and then distilled. It also results in the oxfdation of aniline by monopersulphuric acid (H. Caro, Zeit. angew. Chem., 1898, p. 845) or by potassium permanganate (E. Bamberger, Ber., 1893. 26, p. 496); by the oxidation of nitrosobenzene (below) with atmospheric oxygen; or by the decomposition of benzene diazonium nitrate mercury nitrite, Hg(N02)2-2C6H 5 N 2 -N0 3 , with copper powder (A. Hantzsch, Ber., 1900, ˆ}, p. 2551). It is a yellowish liquid possessing a strong smell of oil of bitter almonds. It boils at 209°C, and melts at 3-6° C. (C.E. Linebarger, Amer. Chem. Jour., 1896, 18, p. 437). The products of its electrolytic reduction vary with the con- ditions: in sulphuric acid solution it yields para-aminophenol (L. Gattermann, Ber., 1893, 26, p. 1844); in alcoholic alkaline solution it yields azoxy benzene; in acid alcoholic solution, benzidine; in ammoniacal alcoholic solution, phenylhydrazine. With chlorine, in the presence of iodine or antimony chloride, it yields meta-chlornitrobenzene. Hydrobromic acid at i85°-i9o°C. converts it into di- and tri-bromaniline. It occasionally acts as an oxidizing agent, as in thepreparation of quinoline and fuchsine. It is used commercially for the preparation of aniline and of benzidine; and in perfumery (oil of mirbane).

Dinitrobenzenes, CcHˆNOzˆ. — Ortho-dinitrobenzene is formed in small quantity in the preparation of meta-dinitrobenzene, and also results from the action of nitro-sulphuric acid on bismuth triphenyl (A. Gillmeister, Ber., 1897, 30, p. 2844). It forms colourless crystals which melt at 116-5° C. and boil at 319° C. (773 mm.). On boiling with aqueous caustic soda, it yields ortho-nitrophenol. Meta-diriitro-

benzene is formed by the direct nitration of nitrobenzene with fuming nitric acid, the product being poured into water and re- crystallized from dilute alcohol. It forms practically colourless needles which melt at 89-7° C, and boil at 302-8° C. It is used for the preparation of meta-phenylene diamine. Para-dinitrobenzene results from the action of nitrogen peroxide on an ethereal solution of quinone dioxime (R. Oliveri-Tortorici, Gazz., 1900, 30, i. p. 533). It crystallizes in colourless needles, which melt at 171 -172 C. It is only slightly soluble in cold water and cold alcohol.

Trinitrobenzenes, C6H 3 (N0 2)3. — Asymmetrical (1.2.4) trinitro-benzene results from the action of fuming nitric and sulphuric acids on para-dinitrobenzene. It forms yellow crystals, which melt at 57-5° C. When boiled with dilute aqueous caustic soda it yields 2-4 dinitrophenol. Symmetrical (1.3.5) trinitrobenzene is formed by the further nitration of meta-dinitrobenzene with fuming sulphuric and nitric acids; by the action of hydrochloric acid on sodium malonyl aldehyde (H. B. Hill and J. Torray, Ber., 1895, 28, p. 2598), or by the action of water on 2.4.6-trinitrobenzoic acid (German patent 77353). It crystallizes in prisms which melt at 121° C. It yields addition compounds with aniline and naphthalene, and combines directly with potassium methylate, sodio-malonic ester and hydrocyanic ester. Alkaline potassium ferricyanide oxidizes it to picric acid.

Nitrosobenzene, C 6 HsN0, was first obtained by the action of nitrosyl bromide or chloride on mercury diphenyl (A. Baeyer, Ber., 1874, 7, p. 1638). It results, with other products, in the oxidation of phenyl diazonium chloride with alkaline potassium ferricyanide; of 0-phenylhydroxylamine with chromic acid mixture (E. Bamberger, Ber., 1893, 26, pp. 473, 483, 1894, 27, p. 1349), or of aniline by monopersulphuric acid (German patent 1 10575). It exists in two crystalline forms. Nitric acid passed into its chloroform solution

gives phenyl diazonium nitrate. With aniline and acetic acid it yields azobenzene. It combines with aromatic amines to form azo-compounds, with arylhydroxylamines to form azoxy compounds, and with hydroxylamine it gives isodiazobenzene.

NITRO COMPOUNDS, in organic chemistry, compounds containing the monovalent radical -NO2 directly combined with carbon.

Aiphatic Nitro Compounds. — The nitroparaffins may be obtained by the action of the alkyl iodides on silver nitrite (V. Meyer, Ann. 1874, 171, p. 1 et seq.). When methyl iodide is used, nitromethane is the sole product, but the higher homo- logues give more or less of the isomeric nitrous esters. Nitro- paraffins may also be obtained by the action of sodium nitrite on the a-halogen fatty acids, the a-nitro fatty acids first formed readily eliminating carbon dioxide (H. Kolbe,/o«r. prak. Chem.,. 1872 [2] 5, p. 427). Tertiary nitro compounds may also be obtained by the oxidation of the corresponding amino-, hydroxyl-amino-, and nitroso-hydrocarbons with monopersulphuric acid (E. Bamberger, Ber., 1903, 36, p. 385):

->C-NH 2 ˆ *C-NHOH-> *C-NO-> ˆC-N0 2 . The nitro compounds of the lower members of the paraffin series cannot be prepared by the direct action of nitric acid on the hydrocarbons themselves, but, in the case of some of the higher members of the series direct nitration is possible (M. Konowalow, Comples rendus, 1892, 114, p. 26; Ber., 1895, 28, p. 1852; R. A. Worstall, Amer. Chem. Jour., 1898, 20, p. 202).

The nitro compounds are colourless, somewhat pleasant smell- ing liquids, which distil without decomposition and possess boiling points much higher than those of the isomeric nitrous esters. Reduction with acid-reducing agents gives amines. The primary and secondary nitro compounds {i.e. those con- taining the groupings -CH 2 N02 and >CH-N02) form metallic derivatives; for example, sodium salts, which according to A. Hantzsch (Ber., 1899, 32, pp. 577 et seq.) are probably derived from the isomeric iso-nitro compounds R : NO(OH), and thus the nitro derivatives are to be looked upon as pseudo-acids. These sodium salts are crystalline solids which are readily soluble in water and are very explosive. Stannous chloride and hydro- chloric acid reduce the nitroparaffins to /3-alkyl hydroxylamines, amines and some ammonia being simultaneously produced (V. Meyer, Ber., 1891, 24, p. 3530), whilst the primary nitro com- pounds on heating with hydrochloric acid yield hydroxylamine and an acid:

CH 3 -CH 2 -N0 2 +H20 = CH 3 -C0 2 H+NH 2 OH (V. Meyer, Ann., 1876, 180, p. 163). When reduced by the Sabatier and Senderens' method (Comptes rendus, 1902, 135, p. 225) they are converted into amines, provided the temperature be kept at i5o°-2oo° C, a higher temperature leading to the formation of paraffins and ammonia. The hydrogen in the primary and secondary nitro compounds which is attached to the same carbon atom as the nitro group is readily replaced by bromine in alkaline solution. The reactions of the nitroparaffins with nitrous acid are very characteristic and have been

used as a method for discriminating between the primary, secondary and tertiary alcohols (q.v.) (V. Meyer, Ann., 1875, 175, p. 93). The primary compounds form nitrolic acids of the type R-C(:NOH)NO, the secondary yield pseudo-nitrols of the type RR 1 : C(NO)(N0 2), whilst the tertiary nitro compounds are not acted upon by nitrous acid. The primary nitroparaffins combine with nitric oxide in the presence of sodium ethylate, to form nitroalkylisonitramines, R-CH(N0 2)-N 2 2 H (W. Traube, Ann., 1898, 300, p. 95).

Nitromethane, CH 3 N0 2 , is a colourless oil which boils at 101° C. Fuming sulphuric acid decomposes it into carbon monoxide and hydroxylamine. It combines with aromatic aldehydes in the pres- ence of alcoholic potash to form addition products which are con- verted by acids into styrol derivatives (J. Thiele, Ber., 1899, 32, p. 1293). Nitroethane, C 2 H s N0 2 , is a colourless liquid which boils at 114° C. Nitroform (trinitromethane), CH(N0 3) 3 , is obtained in the form of its ammonium salt by the decomposition of trinitro- acetonitrile with water (L. Schischkoff, Ann., 1857, 103, p. 364). It is a colourless crystalline solid which melts at 15 C. and has the properties of a strong acid. The potassium salt is formed by the action of potassium ethylate on tetranitromethane (A. Hantzsch, Ber., 1899, 32, p. 631). It is a deep yellow coloured solid, which

is readily soluble in water. It explodes when heated. The silver salt, obtained by shaking an ether solution of nitroform with freshly prepared, slightly moist silver oxide, reacts with methyl iodide to form trinitroethane, a crystalline solid which melts at 56 C. Concen- trated caustic potash decomposes the latter compound, forming the potassium salt of dinitroethane, CH s > C(N0 2) 2 K. Tetranitromethane, C(N0 2 >4, obtained by adding nitroform to a hot mixture of nitric and sulphuric acids, is a crystalline solid which melts at 13° C. Chtorpicrin, CC1 3 N0 2 , is a liquid of suffocating odour obtained by the action of nitric acid and chloride of lime on many organic com- pounds. It boils at 112°.

Aromatic Nitro Compounds. — The aromatic nitro compounds are generally obtained by the direct action of nitric acid. Substitution takes place usually in the nucleus and only rarely in the side chain, and according to the conditions of the experiment and the nature of the compound acted upon, one or more nitro groups enter the molecule. The reaction is gener- ally carried out in the presence of sulphuric acid, which is used to absorb the water formed during the process of nitration. Nitro compounds have also been prepared by the action of cuprous oxide on diazonium salts (T. Sandmeyer, Ber., 1887, 20, p. 1494) ; by the action of copper powder on the double salt

formed by the addition of potassium mercuric nitrite to diazonium nitrites; and by the oxidation of primary aromatic amines (E. Bamberger, Ber., 1893, 26, p. 496). The mono-nitro compounds are stable and distil without decomposition; they have a pale yellow colour and possess an agreeable odour. Most of the poly- nitro compounds are not volatile, but undergo decomposition on heating. The nitro group in the aromatic series is bound very firmly in the molecule and is not readily exchanged for othei groups. Several different products may be obtained by the reduction of the aromatic nitro compounds, the substances formed in any particular case depending on the conditions oi experiment. In acid solution, amines are obtained, in alkaline solution, azoxy, azo and hydrazo compounds, and in neutral solution hydroxylamino compounds. The electrolytic reduction of the aromatic nitro compounds gives rise to substituted hydroxylamines which are immediately transformed into aminophenols or amines.

For the nitrobenzenes see Nitrobenzene. Nitrotoluenes, CeH4(CH) 3 (NO) 2 . Three isomers exist, the ortho- and para-com- pounds being the chief products of the direct nitration of toluene. They may be separated by fractional distillation. The ortho- compound melts at 10-5° C. and boils at 218 C, the para-compound melts at 54° C. and boils at 230 C. Meta-nitrotoluene (melting at 16° C.) is obtained by nitrating acetparatoluidide and then replacing the amino group by hydrogen.

Phenylnitromethane, C 6 H5 – CH 2 N0 2 , isomeric with the nitro toluenes, is prepared by the action of benzyl chloride on silver nitrite. It is a colourless oily liquid which boils at 225°-227° C., is somewhat soluble in water, and does not give a coloration with ferric chloride. It readily forms a sodium salt, from the aqueous solution of which on the addition of a mineral acid an isomeric' solid form of the nitro compound (melting at 84° C.) is precipitated. This solid form gradually passes, on standing, into the oily variety. It is probably a hydroxy-compound, since it gives a red-brown colour with ferric chloride, reacts with phenyl isocyanate and with phosphorus penta-chloride, and with benzoyl chloride yields dibenzhydroxamic acid, C 6 H 6 CO-NH-0-COC 6 H 5 . Thus the solid form is probably to be

represented as C 6 H 6 CH: NO-OH or C6H 6 -CH<ˆ• (see further,

A. Hantzsch on Pseudo-acids, Ber., 1899, 32, p. 575, 1902, 35, pp. 210, 226, iooi, 1906, 39, pp. 139, 1073 et seq.).

The nitrolic acids, R-C(:NOH)N02, may be prepared by the action of

nitrous acid on the primary nitroparaffins; by the action of hydroxylamine on the dibromnitroparaffins; and by the action of nitrogen peroxide on the a-isonitroso fatty acids (G. Ponzio, Gazz., 1903, 33 (1), p. 508). They are colourless solids which are readily soluble in water and possess the character of weak acids. They are characterized by the deep red colour of their solutions in alkalis. When strongly heated they decom- pose, forming fatty acids, nitrogen peroxide and nitrogen. By passing hydrochloric acid gas into an ethereal solution of the acids, the nitro group is eliminated and the hydrochloride of an oximido-acid is obtained (A. Werner and H. Buss, Ber., 1895, 28, p.i282):CH,-C(:NOH)N0 2 +2HCl=HN0 2 +CH 3 -C(:NOH)Cl-Ha.

When heated with water and mineral acids, the nitrolic acids are completely decomposed, yielding fatty acids and nitrous oxide.

leuco-salt.

A. Hantzsch and O. Graul (Ber. 1898, 31, p. 2854) described several series of salts of the nitrolic acids, with particular refer- ence to ethylnitrolic acid. They discriminate between the red or erythro-salts, which are well crystallized, very explosive and unstable compounds, and which regenerate the colourless nitrolic acid on the addition of dilute mineral acids, and the leuco-saits, which are colourless salts obtained by warming the erythro-salts or by exposing them to direct sunlight. These salts cannot be converted either into the red salts or into the free acid. An intensely yellow acid salt is described, as is also a very unstable colourless salt which could not be examined further owing to its very labile nature. The following structural formulae are assigned to these compounds: —

pp^N-OH Rr/ N(OK) Nn t>^^N0 2 K ^NO, ^N(: 0) ^

nitrolic acid ; erythro-salt ;

The acid salts are obtained by the addition of one molecule of alkali to two molecules of the acid in concentrated alcoholic solution at a low temperature. They are unstable compounds which readily split into the red salt and the free acid on standing.

The pseudo-nilrols, RR':C(NO)(N0 2), may be obtained by the action of nitrous acid on the secondary nitroparaffins; by the action of silver

nitrite on such bromnitrosoparaffms as contain the bromine and the nitroso group united to the same carbon atom (O. Piloty, Ber., 1902, 35, p. 3093); and by the action of nitrogen peroxide on ethereal solutions of ketoximes (R. Scholl, Ber., 1888, 21, p. 508; G. Born, Ber. 1896, 29, p. 93). They exhibit an intense blue colour when in the liquid condition or dissolved in alkali and possess a very sharp smell. On oxidation with chromic acid they yield dinitrohydrocarbons, and on reduction with hydroxylamine (in alkaline solution) or with potassium sulphydrate give ketoximes, RR':C:NOH (R. Scholl and K. Landsteiner, .Ber., 1896, 29, p. 87). RR > :C(NO)-N0 2 ->RR':C(NH-OH) 2 ->RR':C:N-OH + NH i OH.

Nitrosohydrocarbons have been prepared in the aliphatic series by the oxidation of the corresponding hydroxylamino compounds. Nitroso-tertiary butane, (CH 3) 3 C-NO, is formed when the corre- sponding hydroxylamine is oxidized by sulphuric monoper acid (E. Bamberger, Ber., 1903, 36, p. 686). A nitrosooctane (CH 3)2C(NO)-[CH 2] 2 -CH(CH 3) 2 , has been obtained by O. Piloty and O. Ruff (Ber., 1898, 31, p. 457) from nitro-di-isobutyl by reducing it to the corresponding hydroxylamino compound with aluminium amalgam and oxidizing this with chromic acid mixture. It is a colourless solid which melts at 54° C. to a deep blue liquid. Numerous nitroso compounds are met with in the aromatic series.

NITROGEN [symbol N., atomic weight 14-01, = i6]. A non-metallic chemical element, first isolated in 1772 by D. Rutherford, who showed that on removing oxygen from air a gas remained, which was incapable of supporting combustion or respiration. Nitrogen forms approximately 79% by volume (or 77% by weight) of the atmosphere; actual values are: % by volume — 79-07 (Regnault), 79-20 (Dumas); % by weight — 76-87 (Regnault), 77-00 (Dumas), 77-002 (Lewy), 76-900 (Stas), 77-010 (Marignac). No absolutely accurate determinations appear to have been made recently. Free nitrogen is also found in some natural waters and has been recognized in certain nebulae. In the combined state nitrogen is fairly widely dis- tributed, being found in nitre, Chile saltpetre, ammonium salts and in various animal and vegetable tissues and liquids. It is invariably present in soils, where compounds are formed by nitrifying bacteria.

Nitrogen may be obtained from the atmosphere by the removal of the oxygen with which it is there mixed. This may be effected by burning phosphorus in a confined volume of air, by the action of an alkaline solution of pyrogallol on air, by passing air over heated copper, or by the action of copper on air in the presence of ammoniacal solutions.

It is also prepared by heating ammonium nitrite (or a mixture of sodium nitrite and ammonium chloride): $NH_4NO_2 = 2H_2O + N_2$; by heating a mixture of ammonium nitrate and chloride (the chlorine which is simultaneously produced being absorbed by milk of lime or

by a solution of sodium hydroxide): $4NH_4NO_3 + 2NH_4Cl = 5N_2 + Cl_2 + 12H_2O$; by heating ammonium dichromate (or a mixture of ammonium chloride and potassium dichromate) : $(NH_4)_2Cr_2O_7 = Cr_2O_3 + 4H_2O + N_2$; bypassing chlorine into a concentrated solution of ammonia (which should be present in considerable excess) : $8NH_3 + 3Cl_2 = 6NH_4Cl + N_2$; by the action of hypochlorites or hypo- bromites on ammonia: $3NaOBr + 2NH_3 = 3NaBr + 3H_2O + N_2$; and by the action of manganese dioxide on ammonium nitrate at 180-200° C. It is also formed by the reduction of nitric and nitrous oxides with hydrogen in the presence of platinized asbestos at a red heat (G. v. Knorre and K. Arndt, Ber., 1899, 32, p. 2136); by the oxidation of hydroxylamine {ibid., 1900, 33, p. 30) ; and by the electro- lysis of hydrazine and its salts (E. Ch. Szarvasy, Jour. Chem. Soc, 1900, 77, p. 603).

The chief importance of nitrogenous compounds depends upon their assimilation by living plants, which, in their develop- ment, absorb these compounds from the soil, wherein they are formed mainly by the action of nitrifying bacteria. Since these compounds are essential to plant life, it becomes necessary to replace the amount abstracted from the soil, and hence a demand for nitrogenous manures was created. This was met in a very large measure by deposits of natural nitre and the products of artificial nitrieres, whilst additional supplies are available in the ammoniacal liquors of the gas-manufacturer, &c. The possible failure of the nitre deposits led to attempts to convert atmospheric nitrogen into manures by processes permitting economic success. Combination can be made in five directions, viz. to form (1) oxides and nitric acids, (2) ammonia, (3) readily decomposable nitrides, (4) cyanides, (5) cyanamides. The first three will be treated here; for the others see Prussic Acid and Cyanamide.

The combination of nitrogen with oxygen was first effected by Cavendish in 1785, who employed a spark discharge. The process was developed by Madame Lefebre in 1859; by Meissner in 1863, who found that moist gases gave a better result; and by Prim in 1882, who sparked the gases under pressure; it was also used by Lord Rayleigh in his isolation of argon (g.v.).- It was not, however, a commercial success, and the same result attended Siemens and Halske's application of the silent discharge. More effective was the* electric arc. In 1892 Sir W. Crookes showed that the arc brought about

combination; and in 1897 Lord Rayleigh went into the process more fully. But the first careful working-out of the conditions was made in 1900 by A. McDougall and F. Howies, who, employing a high tension alternating arc, showed that the effectiveness depended upon the temperature. The commercial manufacture of nitric acid was attempted by C. S. Bradley and D. R. Lovejoy at Niagara Falls, who passed atmospheric air, or air enriched with oxygen, about a high tension arc made as long as possible; but the company (the Atmospheric Products Company) was a failure. Better results have attended the process of K. Birkeland and S. Eyde, which is being worked on a large scale at Notodden, Norway. The arc is produced by leading a current of about 5000 volts equatorially between the poles of an electromagnet; this produces what is practically a disk of flame, 6| ft. in diameter and having a temperature of about 3000 . The disk really consists of a series of successive arcs which increase in size until they burst. The first product of the reaction is nitric oxide, which on cooling with the residual gases produces nitrogen peroxide. The cooled gases are then led into towers where they meet a stream of water coming in the contrary direction. Nitric acid (up to 50%) is formed in the first tower, and weaker acids in the successive ones; the last tower contains milk of lime which combines with the gases to form calcium nitrite and nitrate (this product, being unsuitable as a manure, is decomposed with the acid, and the evolved gases sent back). It was found advantageous not to work for acid but for a basic calcium nitrate (normal calcium nitrate being very deliquescent); for this purpose the acid is treated with the requisite amount of milk of lime. In the process of the Badische Anilin- und Soda-Fabrik, the arc, which is said to be 30 to 50 ft. long or more, is formed in a long tube, and the gases are sent round the arc by obliquely injecting them. A 30% acid is said to be formed. I. Moscicki and J. von Kowalski have patented a process wherein the arc is formed at two vertical

concentric copper electrodes and rotated by an electromagnet; it is worked at Vevey, Switzerland. The Rankin process, of which very little is known, produces the arc with much lower current.

The conversion of nitrogen into ammonia by electricity has received much attention, but the commercial aspect appears to have been first worked out by de Hemptinne in 1900, who used both the spark and silent discharge on mixtures of hydrogen and nitrogen, and found that the pressure and temperature must be kept low and the spark gap

narrow. J. Schlutius in 1903 em- ployed Dowson gas as a source of hydrogen, and induced com- bination by means of platinum and the silent discharge. Several non-electrical processes have been devised. In 1862 Fleck passed a mixture of steam, nitrogen and carbon monoxide over red-hot lime, whilst in 1904 Woltereck induced combination by passing steam and air over red-hot iron oxide (peat is used in practice). In de Lambilly's process air and steam is led over white-hot coke, and carbon dioxide or monoxide removed from the escaping gases according as ammonium formate or carbonate is wanted. The residual gas is then passed through a tube containing porous materials, such as wood- or bone-charcoal, platinized pumice or spongy platinum, then mixed with steam and again forced through the tube. The reactions are represented as

(1) $N_2 + 3H_2 + 2CO + 2H_2 = 2H\text{-}CO_2NH_4$ (Ammonium formate).

(2) $N_2 + 3H_2 + 2CO_2 + 2H_2 = 2HO\text{-}CO_2NH_4$ (Ammoniumcarbonate). The best temperature for the first reaction is between 8o°C. and i30°C. and for the second between 40° C. and 6o° C. In another process, which originated with C. Kaiser (Abst. J.C.S., 1907, ii. p. 862), calcium is heated in a current of hydrogen, and nitrogen passed over the hydride so formed ; this gives ammonia and calcium nitride, the latter of which gives up its nitrogen as ammonia and reforms the hydride when heated in a current of hydrogen.

The fixation of nitrogen as a nitride has not been attended with commercial success. H. Mehner patented heating the oxides of silicon, boron or magnesium" with coal or coke in an electric furnace, and then passing in nitrogen, which forms, with the metal liberated by the action of the carbon, a readily decom- posable nitride.

For an extended bibliography see Bulletin No. 63 of the Bureau of Soils, U.S. Department of Agriculture (Washington, 1910).

Nitrogen is a colourless, tasteless and odourless gas, which is only very slightly soluble in water. It is slightly lighter than air. Lord Rayleigh in 1894 found that the density of atmospheric nitrogen was about 5 % higher than that of chemically prepared nitrogen, a discovery which led to the isolation of the rare gases of the atmosphere (see Argon). The values obtained are shown below. .

Atmospheric Chemical

Nitrogen. Nitrogen.

097209 0-96727 Lord Rayleigh, Chetn. News, 1897, 76,

P- 3i5-

09720 0-9671 A. Leduc, Comptes rendus, 1896, 123,

805.

Nitrogen is a very inert gas: it will neither burn nor support the combustion of ordinary combustibles. It combines directly with lithium, calcium and magnesium when heated, whilst nitrides of the rare earth metals are also produced when their oxides are mixed with magnesium and heated in a current of nitrogen (C. Matignon, Comptes rendus, 1900, 131, p. 837). Nitrogen has been liquefied, the critical temperature being — 149° C. and the critical pressure 27-54 atmospheres. The liquefied gas boils at —195-5° C, and its specific gravity at its boiling point is 0-8103 (E. C. C. Baly and F. G. Donnan, Jour. Chem. Soc, 1902, 81, p. 912).

Compounds.

Nitrogen combines with hydrogen to form ammonia, NH 3 , hydrazine, N2H4, and azoimide, N3H (qq.v.) ; the other known hydrides, N 4 H 4 and N5H5, are salts of azoimide, viz. NH 4 -N 3 and N 2 H 4 -N 3 H.

Nitrogen trichloride, NC1 3 , discovered by P. L. Dulong in 181 1 {Schweigg. Journ., 1811, 8, p. 302), and obtained by the action of chlorine or sodium hypochlorite on ammonium chloride, or by the electrolysis of ammonium chloride solution, is a very volatile yellow oil. It possesses an extremely pungent smell, and its vapour is extremely irritating to the eyes. It is a most dangerous explosive

(see D. L. Chapman and L. Vodden, Jour. Chem. Soc, 1909, 95, p. 138). Chlorine azide, Cl-N 3 , was discovered by F. Raschig in 1908 (see Azoimide) ; the corresponding iodine compound had been obtained in 1900 by A. Hantzsch {Ber., 33, p. 522). For the so-called nitrogen iodide see Ammonia.

Nitrogen forms five oxides, viz. nitrous oxide, N 2 0, nitric oxide, NO, nitrogen trioxide, N 2 3 , nitrogen peroxide, N0 2 , and nitrogen

Eentoxide, N 2 05, whilst three oxyacids of nitrogen are known; yponitrous acid, H 2 N 2 2 , nitrous acid, HN0 2 , and nitric acid, HN0 3 {q.v.). The first four oxides are gases, the fifth is a solid. Nitrous oxide, N 2 0, isolated in 1776 by J. Priestley, \vho obtained it by

reducing nitrogen peroxide with iron, may be prepared by heating ammonium nitrate at 170-260° C, or by reducing a mixture of nitric and sulphuric acid with zinc. It is a colourless gas, which is practically odourless, but possesses a sweetish taste. It is some- what soluble in water. When liquefied it boils at -89-8° C, and by further cooling may be solidified, the solid melting at -102-3° C. (W. Ramsay, Chem. News, 1893, 67, p. 140). It does not burn, but supports the combustion of heated substances almost as well as oxygen. It is used as an anaesthetic, principally in dentistry, producing when inhaled a condition of hysterical excitement often accompanied by loud laughter, whence it is sometimes called ” laughing gas.”

Nitric oxide, NO, first obtained by Van Helmont, is usually pre- pared by the action of dilute nitric acid (sp. gr. 1-2) on copper. This method does not give a pure gas, varying amounts of nitrous oxide and nitrogen being present (see Nitric Acid). In a purer con- dition it may be obtained by the action of sulphuric acid on a mixture of potassium nitrate and ferrous sulphate, or of hydrochloric acid on a mixture of potassium nitrate and ferric chloride. It is also formed by the action of concentrated sulphuric acid on sodium nitrite in the presence of mercury. It is a colourless gas which is only sparingly soluble in water. It may be liquefied, its critical temperature being -93-5°, and the liquid boils at -153-6° C. It is not a supporter of combustion, unless the sustance introduced is at a sufficiently high temperature to decompose the gas, when combustion will continue at the expense of the liberated oxygen. If the gas be mixed with the vapour of carbon disulphide, the mixture burns with a vivid lavender-coloured flame. Nitric oxide is soluble in solutions of ferrous salts, a dark brown solution being formed, which is readily decomposed by heat, with evolution of nitric oxide. It combines with oxygen to form nitrogen peroxide. Nascent hydrogen reduces it to hydroxylamine (q-V.), whilst solutions of hypochlorites oxidize it to nitric acid. In some instances it reacts as a reducing agent, e.g. silver oxide is reduced to metallic silver at 170° C, lead dioxide to the monoxide and manganese dioxide to sesquioxide.

Nitrogen trioxide, N 2 3 , was first mentioned by J. R. Glauber in 1648 as a product of the reaction between nitric acid and arsenious oxide. Sir W. Ramsay {Jour. Chem. Soc, 1890, 5, p. 590), by distil- ling arseniou oxide with nitric acid and cooling the distillate, obtained a gteen liquid which consisted of nitrogen trioxide and peroxide in varying proportions, and concluded that the trioxide could not be obtained pure. He then tried the direct combination of nitric oxide with liquid nitrogen peroxide. A dark blue liquid is produced, and the first portions of gas boiling off from the mixture correspond fairly closely in composition with nitrogen trioxide. H. B. Baker {Jour.

Chem. Soc, 1907, 91, p. 1862) obtained nitrogen trioxide in the gaseous form by volatilizing the liquid under special conditions. L. Francesconi and N. Sciacca {Gazz., 1904, 34 (i.), p. 447) have shown that liquid nitric oxide and oxygen, or gaseous nitric oxide and liquid oxygen, mixed in all proportions and yielded nitrogen trioxide, whilst gaseous nitric oxide mixed with excess of oxygen always gave the trioxide if the mixture was kept below -I io° C. They also state that nitrogen trioxide is stable at ordinary pressure up to -21° C. N. M. v. Wittorf {Zeit. anorg. Chem., 1904, 41, p. 85) obtained blue crystals of the trioxide (melting at -103° C.) on saturating liquid nitrogen peroxide with nitric oxide and cooling the mixture. The liquid prepared by Baker is green in colour, and has a specific gravity i-ii at ordinary temperature, but below -2° C. becomes of a deep indigo blue colour. It forms a mass of deep blue crystals at the temperature of liquid air. It is exceedingly soluble in concentrated sulphuric acid.

Nitrogen peroxide, N0 2 or N 2 4 , may be obtained by mixing oxygen with nitric oxide and passing the red gas so obtained through a freezing mixture. The production of this red gas when air is mixed with nitric oxide was mentioned by R. Boyle in 1671. Nitrogen peroxide is also prepared by heating lead nitrate and passing the products of decomposition through a tube surrounded by a freezing mixture, when the gas liquefies. At low temperatures it is a colour- less crystalline solid which melts at -10-14° C. (W. Ramsay, Chem. News, 1900, 61, p. 91). As the temperature increases the liquid becomes yellowish, the colour deepening with rise of temperature until at +15° C. it has a deep orange tint. The liquid boils at about 22° C. This change of colour is accompanied by a change in the vapour density, and is explained by the fact that nitrogen peroxide consists of a mixture of a colourless compound N 2 4 , and a red- brown gas NOj, the latter increasing in amount at the expense of the former as the temperature is raised (G. Salet, Comptes rendus, 1868, 67, p. 488; see also E. and L. Natanson, Wied. Ann., 1885, 24,

454; 1886, 27, p. 606). M. Berthelot and J. Ogier (Bull. Soc. Chim., 1882 [2], 37, p. 434; 38, p. 60) have also shown that the specific heat of the gas decreases with increase of temperature until it reaches a minimum at about 198-253 C. Cryoscopic determina- tions of the molecular weight of nitrogen peroxide dissolved in glacial acetic acid show that it corresponds to the molecular formula N a 0< at low temperatures (W. Ramsay, Jour. Chem. Soc, 1888, 53, p. 621).

Nitrogen peroxide is the most stable oxide of nitrogen. It is decomposed by water, giving at o° C. a mixture of nitric and nitrous acids: 2N0 2 +H 2 = HN0 3 -t-HN0 2 . It combines with sulphuric acid to form nitro-sulphonic acid, S0 2 (OH)(N0 2). It does not support the combustion of a taper, but burning phosphorus and red-hot carbon will continue to burn in the gas. It converts many metallic oxides into mixtures of nitrates and nitrites, and attacks many metals, forming nitrates and being itself reduced to nitric oxide. It is an energetic oxidizing agent.

Nitrogen pentoxide, N 2 6 , was first obtained in 1849 by H. Sainte-Claire-Deville (Ann. Chim. Phys., 1850 [3], 28, p. 241) by the action of dry chlorine on silver nitrate: 4AgN0 3 -f2Cl 2 =4AgCl+2N 2 6 +0 2 . It may also be obtained by distilling nitric acid over phosphorus pentoxide. It crystallizes in large prisms which melt at 29-30 C. to a yellowish liquid, which boils at 45-50 C. with rapid decomposi- tion. It is very unstable, decomposing slowly even at ordinary temperatures. It dissolves in water, forming nitric acid.

Hyponitrous acid, H 2 N 2 2 , was first obtained in the form of its salts by E. Divers in 1871 (Chem. News, 23, p. 206) by reducing a solution of potassium nitrite with sodium amalgam, and subsequent precipitation as silver salt. Hyponitrites also result when hydroxy-amido-sulphonates, e.g. HO-NH-SOsNa, are hydrolysed by caustic alkalis (E. Divers and T. Haga, Jour. Chem. Soc, 1889, 55, p. 760), or when benzsulphohydroxamic acid, C 6 HeS0 2 -NH-OH, is treated in the same manner (O. Piloty, Ber., 1896, 29, p. 1560). They may also be prepared by the action of mercuric or cupric oxides on alkaline solutions of hydroxylamine (A. Hantzsch, Ann., 1896, 292, p. 317); by the action of hydroxylamine sulphate on alkaline nitrites in the presence of lime or calcium carbonate, the mixture being rapidly heated to 6o° C. ; or by the hydrolysis of dimethyl nitroso-oxyurea, (CH,) 2 N-CO-N(NO)-OH (A. Hantzsch, Ber., 1897, 30, p. 2356). The free acid, which crystallizes in brilliant scales, is best prepared by decomposing the silver salt with an ethereal solution of hydro- chloric acid. It is very explosive, dissolves readily in water and behaves as a dibasic acid. It does not liberate iodine from potassium iodide, neither does it decolorize iodine solution. Bromine oxidizes it to nitric acid, but the reaction is not quantitative. In acid solution, potassium permanganate oxidizes it to nitric acid, but in alkaline solution only to nitrous acid. It decomposes slowly on standing, yielding water and nitrous oxide. The silver salt is a bright yellow solid, soluble in dilute sulphuric and nitric acids, and may be crystallized from concentrated solutions of ammonia. It slowly decomposes on exposure or on heating. The calcium salt, CaN 2 2 -4H 2 0, formed by the action of

calcium chloride on the silver salt in the presence of a small quantity of nitric acid, is a lustrous crystalline powder, almost insoluble in water but readily soluble in dilute acids. It is decomposed by sulphuric acid, with evolution of nitrous oxide.

Nitrous acid, HN0 2 , is found to some extent in the form of its salts in the atmosphere and in rain water. The pure acid has not yet been obtained, since in the presence of water it decomposes with formation of nitric acid and liberation of nitric oxide: 3HN0 2 = HN0 3 +2NO-t-H 2 0. Its salts may be obtained in some cases by heating the corresponding nitrates, but the method does not give good results. Sodium nitrite, the most commonly used salt of the acid, is generally obtained by heating the nitrate with metallic lead; by heating sodium nitrate with sulphur and sodium hydroxide, the product then being fractionally crystallized (Read, Holliday & Sons): 3NaN0 3 +S +2NaOH = Na 2 S0 4 +3NaNq 2 +H 2 0; by oxidiz- ing atmospheric nitrogen in an electric arc, keeping the gases above 300 C, until absorption in alkaline hydroxide solution is effected (German Pat. 188188); or by passing air, or a mixture of oxygen and ammonia, over heated metallic oxides (ibid., 168272). The salts of the acid are colourless or faintly yellow. In aqueous solution the free' acid acts as an oxidizing agent, bleaching indigo and liberating iodine from potassium iodide, or it may act as a reducing agent since it readily tends to pass into nitric acid: consequently it discharges the colour of acid solutions of permanganates and chromates. The acid finds considerable use in organic chemistry, being employed to discriminate between the different types of alcohols and of amines, and also in the production of diazo, azo and diazo-amino compounds. It may be recognized by the blue colour it gives with diphenylamine sulphate and by its reaction with potassium iodide-starch paper.

Nitrosyl chloride, NOC1, is obtained by the direct union of nitric oxide with chlorine; or by distilling a mixture of concentrated nitric and hydrochloric acids, passing the resulting gases into concentrated sulphuric acid and heating the so-formed nitrosyl hydrogen sulphate with dry salt: HN0 3 +3HC1 = N0C1+C1 2 +H 2 0; NOC1 + H 2 S0 4 = HC1 + NO-SO,H; NO-S0 4 H+NaCl = NOC14-NaHS0 4 (W. A. Tilden, Jour. Chem. Soc, i860, p. 630). It is also prepared by the action of phosphorus pentachloride on potassium nitrite or on nitrogen peroxide. It is an orange-coloured gas which may be readily liquefied and by further cooling mav be

solidified. The liquid boils at — 5 C. and the solid melts at — 65 C. It forms double compounds with many metallic chlorides, and finds considerable application as a means of separating various members of

the terpene group of compounds. It is readily decomposed by water and alkaline hydroxides, yielding a mixture of nitrite and chloride. On treatment with silver fluoride it yields nitrosyl fluoride, NOF (0. Ruff, Zeit. anorg. Chem., 1905, 47, p. 190). Nitroxyl fluoride, N0 2 F, is formed by the action of fluorine on nitric oxide at the temperature of liquid oxygen (H. Moissan and P. Lebeau, Comptes rendus, 1905, 140, pp. 1573, 1621). It is a gas at ordinary tempera- ture; when liquefied it boils at —63-5° C. and on solidification melts at — 139 ° C. Water decomposes it into nitric and hydrofluoric acids. Nitramide, NH 2 N0 2 , is obtained by the action of sulphuric and nitric acids on potassium imidosulphonate, or by the action of ice-cold sulphuric acid on potassium nitro-carbamate (J.Thieleand A. Lachmann, Ann., 1895, 288, p. 297): N0 2 -NK-C0 2 K+H 2 S0 4 = NH 2 N0 2 + K 2 S0 4 -f-C0 2 . It crystallizes in prisms or leaflets which melt at 72-75°C. and are readily soluble in water and in all organic solvents except ligroin. It is somewhat volatile at ordinary tempera- ture, and its aqueous solution possesses a strongly acid reaction. It is very unstable, decomposing .into nitrous oxide and water when mixed with copper oxide, lead chromate or even powdered glass. On reduction it gives a strongly reducing substance, probably hydrazine. According to A. Hantzsch (Ann., 1896, 292, pp. 340 et seq.) hyponitrous acid and nitramide are to be regarded as stereo- isomers, being the anti- and syn- forms of the same compound. Thiele, however, regards nitramide as imidonitric acid, HN :N0(OH). Nitrogen sulphide, N4S4, first obtained by W. Gregory (Jour, pharm., 1835, 21, p. 315) by the action of ammonia on sulphur chloride, has been investigated by O. Ruff and E. Geisel (Ber., 1904, 37, p. 1573; 1905, 38, p. 2659), who also obtained it by dis- solving sulphur in liquid ammonia. It is a reddish-yellow crystalline solid, insoluble in water and melting at 178″ C. It explodes readily when melted or subjected to shock. Dry hydrochloric acid gives ammonia but no nitrogen; with ammonia it gives N:SNH 2 and S :S(NH 2) 2 ; and with secondary amines it forms thiodiamines, S(NR 2) 2 , nitrogen and ammonia being liberated. When heated with CS 2 to 100″ C. under pressure, it forms liquid nitrogen sulphide, N 2 S 6 , a mobile red liquid which solidifies to an iodine-like mass of crystals which melt at I0-n°C. Water, alkalis and acids decompose it into sulphur and ammonia (W. Muthmann, Zeit. anorg. Chem., 1897, 13, p. 200).

For sulphonic acids containing nitrogen see Ammonia. Numerous determinations of the atomic weight of nitrogen have been made by different observers, the values obtained varying some- what according to the methods used. These methods have been purely chemical (either gravimetric or volumetric), physical (deter- minations of the

density of nitrogen, nitric oxide, &c.) or physico- chemical. P. A. Guye has given a critical discussion of the relative accuracy of the gravimetric and physico-chemical methods, and favours the latter, giving for the atomic weight a value less than 14-01. The more important papers dealing with the subject are: J. Stas, CEuvres completes, i. pp. 342 et seq.; Lord Rayleigh, Proc. Roy. Soc. (1894), 55, p. 340; (1904) 73, p. 153; G. Dean, Jour. Chem. Soc. (1901), 79, p. 147; R. W. Gray, Jour. Chem. Soc. (1906), 88, p. 1174; A. Scott, Proc. Chem. Soc. (1905), 21, p. 309; P. A. Guye, Chem. News (1905), 92, pp. 261 et seq.; (1906) 93, p. 13 et seq.; D. Berthelot, Comptes rendus (1907), 144, p. 269.

NITROGLYCERIN, C 3 H 6 (N0 3)3 or CH 2 N0 3 • CHNO3 • CH 2 N0 3 glyceryl trinitrate, an explosive first obtained in 1846 by Ascanio Sobrero {Mem. Acad. Torino, 1847) by acting with a mixture of strong nitric and sulphuric acids on glycerin at the ordinary temperature. The reaction proceeds in several stages, mono-, di- and finally tri-nitrate being produced, the final stage requiring sulphuric acid as a dehydrator. When pure it is a very pale yellow oil of sp. gr. 1-614 at 4° C. and i-6o at 15° C. One gram requires for solution between 800 and 1000 c.c. of water, 4 c.c. of absolute alcohol or 18 c.c. of wood spirit, and it is scarcely at all soluble in glycerin itself, but mixes in all proportions with ether, acetone, ethyl acetate and benzene.

In the manufacture glycerin is dropped in a very thin stream into a mixture of 3 parts of nitric (sp. gr. 1 -5) and 5 parts of sulphuric acid (sp. gr. 1-84), the containing vessel being cooled by a water jacket and the acid mixture agitated by a stream of cooled air, the tempera- ture being kept at about 15 C. A considerable excess of acids is necessary for the completion and safety of the reaction, usually about 8 parts of the acid mixture to 1 of glycerin. The higher the strength of the acids the higher the yield of nitroglycerin and the smaller the loss by solution in the waste acids. In recent practice some sulphin trioxide, or fuming sulphuric acid, is added, so that the mixture of acids contains less than 1 % of water. The action is very rapid, and the product, which rises to the top of the acids, is separated and washed successively with cold and then tepid water, and finally with water made slightly alkaline with sodium carbonate or hydroxide, to remove all adhering or dissolved acids which would otherwise render the product very unstable. Nitroglycerin dissolves a little water and then appears thick or milkv. Generallv it is either

dried, after being separated from the wash water, by means of common salt, upon a layer of which the moist nitroglycerin is gently run and allowed to drain or filter through, or it is filtered through a mass of dry sponge or similar dry and porous material.

Under ordinary pressure it boils at above 200° C. (L. de Bruyn). If gradually heated it begins to vaporize and decompose at about 130°, and as a rule it detonates when heated slightly above this temperature, previously giving off some red fumes. A little vapour is given off at ordinary temperatures and pressures, and when under a few millimetres pressure only it rapidly vaporizes below 100° C. The freezing-point is uncertain, owing perhaps to the existence of two modifications, as suggested by Kast (Zeits. f. ges. Schiess- u. Sprengstoff, 1-225; see also S. Nauckhoff, Zeits. f. ang. Chem., 18, Heft I and 2). It is frequently given as 43° to 46° F. (about 6° to 8° C), and it is stated to be more sensitive to percussion when frozen (Beilstein). It crystallizes (in long needles) more easily when gently agitated during the cooling, or when mixed with such substances as kieselguhr. At one time it was transported all over America in a frozen condition without serious accidents, and according to Sir F. Nathan (Jour. Soc. Chem. Ind., 1908, 27, p. 5) it is safer to export in the frozen state. To prevent the freezing of nitroglycerin in dynamite it has been proposed to add various substances, such as chlordinitroglycerin, nitrated diglycerin or tetranitrodiglycerol, and also mono-and di-nitroglycerin. The latter two have been studied by C. W. Will (Ber., 1908, 7, p. 407), who obtained two isomeric dinitroglycerins, one of which is eminently crystallizable and the other fluid. Both are sensitive to percussion, but a little less so than nitroglycerin. The mononitroglycerin also exists in two forms, neither of which is strictly speaking explosive. It appears that an addition of dinitroglycerin to nitroglycerin would materially retard its freezing or lessen its sensitiveness (see also C Claessen, Ger. Pat. 210990 (1909)).

Specific gravity Melting-point .

Boiling-point 18 mm. Solubility

Mono.

Di.

Tri.

1-40

a 58°

54°

155-160°

70%

1-47

a hydrate, 26 /3 hydrate (fluid) 145° about

7-7%

1-6

labile, 2-2° stable, 12-2°

160°

•16%

. The liquid when soaked into a porous combustible substance like blotting-paper burns rapidly and quietly, and when struck with a hammer on a hard surface violently detonates; when a little of the liquid is spread on an anvil and struck, the portion immediately under the hammer only will, as a rule, detonate, the remainder being scattered. Some solutions of nitroglycerin (in ether, acetone, &c.) burn quietly, and the same is the case when it is held in solution or suspension in a colloid substance, as gelatinized guncotton, &c.

Strong sulphuric acid dissolves nitroglycerin, and this solution on being poured into water yields dinitroglycerin (see Will, loc. cit.) and also some mononitroglycerin. When the solution in the strong acid is allowed to stand, some nitric acid is first evolved, and as the temperature rises this is followed by a general decomposition of the substance, though not necessarily an explosive one. Shaken with mercury and sulphuric acid, nitroglycerin yields its nitrogen as nitric oxide; the measurement of the volume of this gas is a convenient mode of estimating nitroglycerin. Ammonium hydroxide has no appreciable action at ordinary temperatures, but strong solutions of sodium or potassium hydroxides start a decomposition, with rise of temperature, in which some nitrate and always some nitrite is produced. Some glycerin may be re-formed, but with very strong alkaline solutions little of the glycerin molecule escapes destruction, oxalic acid and several other products resulting. Alcoholic solutions of the alkalis also produce much nitrite along with some formate and acetate. Calcium or potassium sulphides and potassium hydro-

sulphides completely reduce nitroglycerin to glycerin, some of the sulphur being oxidized and some precipitated. Hydriodic acid reduces it to glycerin and nitric oxide. Aniline and similar bases are oxidized and partially nitrated by nitroglycerin, with the production of non-explosive compounds.

The first attempts to utilize the explosive power of nitro- glycerin were made by Nobel in 1863; they were only partially successful until the plan, first applied by General Pictot in 1854, of developing the force of gunpowder in the most rapid manner and to the maximum extent, through initiative detonation, was applied by Nobel to nitroglycerin. Even then, however, the liquid nature of the substance, though advantageous in one or two directions, constituted a serious obstacle to its safe transport and storage and to its efficient employment; it was therefore not until Nobel produced plastic solid preparations by mixing the liquid with porous substances, such as gunpowder, or carbon and sulphur, and finally kieselguhr in a fine state of division, capable of absorbing and retaining considerable quantities of it, that it could be employed as a blasting agent (see Explosives, Dyna- mite, Cordite). (W. R. E. H.)

Therapeutics. — Nitroglycerin has a sweet burning taste and is decidedly poisonous. Its vapour produces violent headache, and the same effect is often caused by handling compositions con- taining it. Prior to its use as an explosive, its alcoholic solution found application in medicine under the name of glonoin. Although a nitrate, its pharmacological actions resemble those of nitrites such as amyl nitrite, taken internally. The explana- tion is that in an alkaline medium at body heat nitroglycerin yields a nitrite, probably as a preliminary stage of resolution. Nitroglycerin shaken up with warm very dilute alkaline solutions, as sodium carbonate, for a few minutes only, always yields sufficient nitrite to give the diazoreaction; and, as stated, strong alkaline solutions always produce some nitrite as one of the decomposition products. This gradual conversion in the tissues is a valuable property of nitroglycerin, as its effects take longer to manifest themselves than is the case with amyl and other nitrites. Nitroglycerin is valuable as a preventive in cases of cardiac pain, such as angina pectoris, and it is also used in other condi- tions where it is desirable to reduce the arterial tension. The British Pharmacopoeia contains a liquor trinilrini (1%), and tablets made up with chocolate, each containing one-hundredth of a grain.

NITZSCH, GREGOR WILHELM (1790-1861), German classical scholar, brother of Karl Immanuel Nitzsch, was born at Wittenberg on the 22nd of November 1790. In 1827 he was appointed professor of

ancient literature at Kiel, but in 1852 was dismissed by the Danish government for his German sym- pathies. In the same year he accepted a similar post at Leipzig, which he held till his death on the 22nd of July 1861. Nitzsch is chiefly known for his writings on the Homeric epic. In opposition to Wolf and Lachmann, he maintained that the Iliad and Odyssey were not an aggregate of single short poems, but long complete poems, composed by one and the same author according to a uniform plan with a central dramatic idea.

His son,KARL Wilhelm Nitzsch (i8i8-i88o),became professor of history at Konigsberg in 1862, and at Berlin in 1872.

The most important of his works were: Erklarende Anmerkungen zu Homer's Odyssee, i.-xii. (1 826-1 840); Die Sagenpoesie der Griechen (1852); Beitrdge zur Geschichte der epischen Poesie der Griechen (pub. 1862, ed. C. W. Nitzsch). See memoir by F. Liibker (1864); C. Bursian, Geschichte der klassischen Philologie in Deutschland (1883) and J. E. Sandys, Hist, of Glass. Schol. iii. (1908), p. 105.

NITZSCH, KARL IMMANUEL (1787-1868), Lutheran divine, was born at the small Saxon town of Borna near Leipzig on the 21st of September 1787. His father, Karl Ludwig Nitzsch (1751-1831), who at that time was pastor and superintendent in Borna, and afterwards (1790) became professor at Wittenberg and director (181 7) of the seminary for preachers, has also left a name of some distinction in the theological world by a number of writings, among which may be mentioned a work entitled De discrimine revelationis imperatoriae et didaclicae prolusiones academicae (2 vols., 1830). Theologically, he represented a combination of supernaturalism and rationalism (supernatural rationalism or a Kantian rational supernaturalism). Karl Immanuel was sent to study at Schulpforta in 1803, whence he proceeded to the university of Wittenberg in 1806. In 1809 he graduated, and in 1810 he became a Privatdozent at the university. Having become diaconus at the Schlosskirche in 181 1, he showed remarkable energy and zeal during the bombard- ment and siege of the city in 1813. In 181 7 he was appointed one of the preceptors in the preachers' seminary which had been established at Wittenberg after the suppression of the university. From 1820 to 1822 he was superintendent in Kemberg, and in the latter year he was appointed professor ordinarius pf systematic and practical theology at Bonn. Here he remained until called to succeed Marheineke at Berlin in 1847 ; subsequently he became university preacher, rector of the university, provost of St Nicolai (in 1854) and member of the supreme council of the church, in which last capacity he was one of the ablest and most active promoters of the Evangelical Union. He died on the 21st of

August 1868. He represented the Vermittelungstheologie of the school of Schleiermacher.

His son, Friedrich August Nitzsch (b. 1832), was made professor ordinarius of theology at Giessen in 1868 and at Kiel in 1872. He was the author of Grundriss der christl. Dogmcn- geschichte (1870, incomplete) and Das System des Boethius (i860), amongst other works.

Karl Nitzsch ‘s principal works are: System der christlichen Lehre (1829; 6th ed., 1851; Eng. trans., 1849), Praktische Theologie (1847-1860; 2nd ed., 1863-1868), Akademische Vortrdge liber chrisl-liche Claubenslehre (1858) and several series of Predigten. ” He took as his starting-point the fundamental thought of Schleiermacher, that religion is not doctrine but life, direct consciousness, feeling. At the same time he sought to bring religious feeling into closer connexion with knowledge and volition than Schleiermacher had done; he laid special stress — and justly — on the recognition of a necessary and radical union of religion with morality, treating both dogmatics and ethics together accordingly in his System der christ- lichen Lehre ” (Otto Pfleiderer, Development of Theology, p. 123). His Protesianlische Beantwortung, a reply to the Symbolik of Johann Adam Mohler (1796- 1 838), which originally appeared in the Studien u. Kritiken, of which he was one of the founders, may also be mentioned.

See Herzog-Hauck, Realencyklopddie, and the Allgemeine deutsche Biographie; F. Lichtenberger, History of German Theology in the Nineteenth Century, pp. 185-196.

NIU-CHWANG, a city of China, in the Manchurian province of Sheng-king (Liao-tung), jn 40 ” 53′ N. and 122 7′ E., about 35 m. (90 m. by water) from the coast of the Gulf of Liao-tung, on what is now a small branch of the main eastern affluent of the Liao-ho. The population is estimated at 80,000. The city proper is a comparatively unimportant place with broken-down walls, but it is surrounded by a number of large and flourishing suburbs. About the beginning of the Ta-ts’ing dynasty (1644) Niu-chwang was the chief port on the river, but in the reign of K’ien-lung, owing mainly to physical changes, it was supplanted by T’ien-chwang-tai farther down the stream, and towards the close of the 18th century this had in turn to give place to Ying-tsze

still nearer the mouth. In ignorance of these facts Niu-chwang (now scarcely to be reached by a flat-bottomed river boat) was chosen as one of the ports to be opened to foreign trade by the treaty of Tien-tsin; and, though Ying-tsze had of necessity to be adopted as the site of the foreign settlements, Europeans still continue to speak of it as the port of Niu-chwang. Ying-tsze (otherwise known as Ying-k'ou, Niu-k'ou and in Mandarin as Muh-k'ou-ying) lies on the left bank of the Liao-ho on the lowest dry portion of the plain, not much above high-water mark. The British settlement immediately above the town. has a river frontage of 1000 yds. opposite the deepest of the reaches, and runs back to the highway leading to Niu-chwang. Off the mouth of the river there is an extensive bar of hard mud which can only be crossed by certain channels at high tide, when it is covered by from 18 to 20 ft. of water; and the port is altogether closed by ice for four or five months of the year, between November and May. Niu-chwang has shown considerable vigour as a port of trade, sharing in the general prosperity of the provinces of Manchuria, of which it is the outlet. It was opened to foreign trade in 1858. In 1864 the total value of trade was £934,374, in 1878 £2,606,134, in 1898 £4,634,470, while in 1904 the figures reached £5,950,895. The principal exports (29%) are beans, bean-cake, bean-oil and wild silk. The bean-cake is a popular article of food with the natives of Kwang-tung and Fuh-kien, and is also largely employed for manuring the rice and sugar fields in the neighbourhood of Shanghai, Amoy, Swatow, &c. Of imports (71 %) the principal are cotton yarn and cotton cloth, most of the latter being drawn from the United States in prefer- ence to English-made goods. The number of resident foreigners is about 150. Railways connect the port with Tientsin and Peking on the one hand, and with the Russian territories lying to the north on the other. In 1895 Niu-chwang was occupied by Japanese troops, and the town was included in the cession of territory originally granted by the treaty of peace. By a supple- mentary convention it was retroceded by the Japanese under pressure of France and Russia. Niu-chwang suffered considerably from the disturbances of 1900 and again during the Russo- Japanese war. In 1900 the Russians defeated the Chinese troops who attacked the town, and took possession of the port,

and administered affairs until they in their turn were driven out by Japanese. At the conclusion of the war the Japanese restored the port to China.

NIUE (Savage Island or Niue-Fekai, as the natives call it), an island in the South Pacific Ocean, 14 m. long by 10 m. wide, in 19 10′ S., 169 47′ W. The entire island is an old coral reef upheaved 200 ft., honeycombed with caves and seamed with fissures. The soil, though

thin, is, as in other limestone islands, very rich, and coco-nuts, tara, yams and bananas thrive. There is an abundant rainfall, but owing to the porous nature of the soil the water percolates into deep caves which have communica- tion with the sea, and becomes brackish. The natives, a mixed Polynesian and Melanesian people of Samoan speech, are the most industrious in the Pacific, and many of the young men go as labourers to other islands. The consequent minority of men has been destructive of the sexual morality of the women, which formerly stood high. The natives are keen traders, and though uncouth in manners when compared with their nearest neigh- bours, the Tongans and Samoans, are friendly to Europeans. Their hostility to Captain Cook in 1774, which earned from him the name of Savage for the island, was due to their fear of foreign disease, a fear that has since been justified. The population (4079 in 1901) is slightly decreasing. The natives are all Chris- tians, and the majority have learned to read and write, and to speak a little English, under the tuition of the London Missionary Society. They wear European clothes. The island became a British protectorate on the 20th of April 1900, and was made a dependency of New Zealand in October 1900, the native government, of an elected ” king ” and a council of headmen, being maintained. In 1900 there were thirteen Europeans on the island. The exports are copra, fungus and straw hats, which the women plait very cleverly.

See T. H. Hood, Notes of a Cruise in H.M.S. “Fawn “(Edinburgh, J 8o3); J. L. Brenchley, Jottings during the Cruise of the ” Curacpa” (London, 1873); B. H. Thomson, Savage Island (London, 1902).

NIVELLES (Flem. Nyvel), a town of Belgium in the province of Brabant, situated on the Thines 19 m. S. of Brussels. Pop. (1904) 12,109. It is a busy little place with many industries, notably the manufacture of parchment. The town is supposed to owe its origin to the foundation of a convent on the spot by Itta or Iduberge, wife of Pippin of Landen. The Romanesque church of St Gertrude, named after Itta’s daughter, dates from the nth century, but has been badly restored and is dis- figured by a heavy tower. On the top of the tower is the effigy of a man in iron who strikes the hours with a hammer. He is called by the townspeople Jean de Nivelles, a celebrated baron of the 15th century whose title eventually became merged in that of the count de Homes (Horn). The church is supposed to occupy the site of Itta’s convent. Close to Nivelles is Seneffe, where Conde defeated William of Orange in 1674, and at Nivelies itself the French under Marceau defeated the Austrians in

1794-

NIVERNAIS, LOUIS CHARLES BARBON MANCINI MAZ- ARINI, Due de (17 16-1798), French diplomatist and writer, was born in Paris on the 16th of December 1716, son of Philippe Jules Francois, due de Nevers, and Maria Anne Spinola, and great- nephew of Cardinal Mazarin. He was educated at the College Louis le Grand, and married at the age of fourteen. He served in the campaigns in Italy (1733) and Bohemia (1740), but had to give up soldiering on account of his weak health. He was subsequently ambassador at Rome (1748-1752), Berlin (i755 _ 1756) and London, where he negotiated the treaty of Paris (10th of February 1763). From 1787 to 1789 he was a member of the Council of State. He did not emigrate during the Revolution, but lost all his money and was imprisoned in 1 793. He recovered his liberty after the fall of Robespierre, and died in Paris on the 25th of February 1798. In 1743 he was elected to the. Academy for a poemientitled Delie, and from 1763 he devoted the greater part of his time to the administration of the duchy of Nevers and to belles-lettres. He wrote much and with great facility; but his writings are of little value, his Fables being his best pro-

ductions. His (Euwes computes were published in Paris in 1796; an edition of his (Euvresposthum.es was brought out in Paris by Francois de Neufchateau in 1807, and his Correspondance secrete was published in Paris by de Lescure in 1866.

See L. Perey (pseud, for Mile. Luce Herpin), Un Petil-Neveu de Mazarin (Paris, 1890); La Fin du XVIII' siecle: le ducde Nivernais (Paris, 1891), by the,same writer; Sainte-Beuve, Causeries du lundi (vol. xiii.) ; Dupin, Eloge du due de Nivernais (1840); Abbe Blampignon, Le Due de Nivernais, d'apres sa correspondance inedite (1888).

NIXIE, or Nixy, a female water-sprite. The word is adapted from Ger. Nixe, the male water-sprite being Nix. The general term covering both the male and female is " nicker," a kelpie. This also appears in Dutch nikker. The Old Teutonic nikus may be connected with the root which appears in Gr. vi£av or virrav, " to wash."

NIXON, JOHN (1815-1899), English mining engineer and colliery proprietor, was born at Barlow, Durham, on the 10th of May 181 5, the son of a farmer. He was educated at the village school, and at an academy in Newcastle-on-Tyne, where he distinguished himself in

mathematics. Leaving school at fourteen, he worked on his father's farm for two years, and then apprenticed himself to Mr Joseph Gray, one of the leading mining engineers in the north of England, and agent to the second marquis of Bute; subsequently he obtained employment as " overman " at one of the Bute collieries in Durham. In 1839 an advertisement drew him to the South Wales coalfield, where he was engaged in mine-surveying, and whence he pro- ceeded to France as engineer to a coal and iron company. Returning to England, he noticed while travelling on one of the Thames steamers that the Welsh coal in use gave off no smoke and was preferred to north country coal both on this ground and because of its greater power-producing efficiency. His experience in France now suggested to him that a profitable market for this coal might be established among the French iron-founders and manufacturers generally who had hitherto imported English north country coal. For some time he was unable to procure any of this special Welsh coal. Eventually, however, by expending all his small savings he secured a cargo, freighted a small craft, and sent it across to Nantes, where with some difficulty he persuaded the local manufacturers to try it on the understanding that he bore the expense of the experiments. These tests, carried out under Nixon's personal directions, proved highly successful, and in due course the French govern- ment gave him a contract for Welsh coal for the French navy. Nixon's visit to Nantes laid the foundations of the Welsh steam- coal trade, English manufacturers and shipowners imitating the example of their French rivals. At first Nixon only sold the coal on commission, but eventually acquired what appeared to him a prospective field for steam-coal in the Aberdare valley, and after seven years' working at last struck a rich seam. This property is now known as Nixon's Navigation Collieries. Nixon subsequently acquired or developed other South Wales steam collieries, which yielded him a considerable fortune. He was also the inventor of many mechanical improvements in colliery working. He died in London on the 3rd of June 1899.

See J. E. Vincent, John Nixon, Pioneer of the Steam Coal Trade in South Wales (London, 1900).

NIZAM, the hereditary title of the reigning prince of Hyderabad (q.v.) in India, derived from an Arabic word meaning order, or administration. The same word is found in Nazim, applied to the Nawab of Bengal, and in Nizamat, the old term for criminal jurisdiction. Nizam-ul-Mulk (= " administrator of the kingdom") was the title of Asaf Jah, the founder of the dynasty, a very able soldier and minister of the court of Aurangzeb, who was appointed governor of the Deccan in 1713, and established his independence before his

death in 1748.

NIZAMI (1141-1203). Nizam-uddln Abu Mahommed Ilyas bin Yusuf, Persian poet, was born 535 a.h. (1141 a.d.). His native place, or at any rate the abode of his father, was in the hills of Kum, but as he spent almost all his days in Ganja in Arran (the present Elizavettpol) he is generally known as NizamI of Ganja or Ganjawi. The early death of his parents,

which illustrated to him in the most forcible manner the unstable-ness of all human existence, threw a gloom over his whole life, and fostered in him that earnest piety and fervent love for solitude and meditation which have left numerous traces in his poetical writings, and served him throughout his literary career as a powerful antidote against the enticing favours of princely courts, for which he, unlike most of his contemporaries, never sacrificed a tittle of his self-esteem. The religious atmosphere of Ganja, besides, was most favourable to such a state of mind; the inhabitants, being zealous Sunnites, allowed nobody to dwell among them who did not come up to their standard of orthodoxy, and it is therefore not surprising to find that NizamI abandoned himself at an early age to a stern ascetic life, as full of intolerance to others as dry and unprofitable to himself. He was rescued at last from this monkish idleness by his inborn genius, which, not being able to give free vent to its poetical inspirations under the crushing weight of bigotry, claimed a greater share in the legitimate enjoyments of life and the appreciation of the beauties of nature, as well as a more enlightened faith of tolerance, benevolence, and liberality. The first poetical work in which NizamI embodied his thoughts on God and man, and all the experiences he had gained, was neces- sarily of a didactic character, and very appropriately styled Makhzanul Asrdr, or ” Storehouse of Mysteries,” as it bears the unmistakable stamp of Sufic speculations. It shows, moreover, a strong resemblance to Nasir Khosrau’s ethical poems and Sana’I’s Hadikat-ulhakikat, or ” Garden of Truth.” The date of composition, which varies in the different copies from 552 to 582 a.h., must be fixed in 574 or 575 (1178-1179 a.d.). Although the Makhzan is mainly devoted to philosophic meditations, the propensity of Nizaml’s genius to purely epic poetry, which was soon to assert itself in a more independent form, makes itself felt even here, all the twenty chapters being interspersed with short tales illustrative of the maxims set forth in each. His claim to the title of the foremost Persian romanticist he fully established only a year or two after the Makhzan by the publication of his first epic masterpiece Khosrau and Shirin, composed, according to the oldest copies, in 576 a.h. (1180 a.d.). As in all his following epopees the subject was taken from what pious

Moslems call the time of ” heathendom ” — here, for instance, from the old Sassanian story of Shah Khosrau Parwiz (Chosroes Parvez), his love affairs with the princess Shirin of Armenia, his jealousy against the architect Ferhad, for some time his successful rival, of whom he got rid at last by a very ingenious trick, and his final reconciliation and marriage with Shirin; and it is a noteworthy fact that the once so devout NizamI never chose a strictly Mahommedan legend for his works of fiction. Nothing could prove better the complete revolution in his views, not only on religion, but also on art. He felt, no doubt, that the object of epic poetry was not to teach moral lessons or doctrines of faith, but to depict the good and bad tendencies of the human mind, the struggles and passions of men; and indeed in the whole range of Persian literature only FirdusI and Fakhr-uddln As’ ad JorjanI, the author of the older epopee Wis u. Ramin (about the middle of the nth century), can compete with NizamI in the wonderful delineation of character and the brilliant painting of human affections, especially of the joys and sorrows of a loving and beloved heart.

Khosrau and Shirin was inscribed to the reigning atabeg of Azerbaijan, Abu Ja’far Mahommed Pahlavan, and his brother Kizil Arslan, who, soon after his accession to the throne in 582 a.h., showed his gratitude to the poet by summoning him to his court, loading him with honours, and bestowing upon him the revenue of two villages, Hamd and Nijan. NizamI accepted the royal gift, but his resolve to keep aloof from a servile court- life was not shaken by it, and he forthwith returned to his quiet retreat. Meanwhile his genius had not been dormant, and two years after his reception at court, in 584 a.h. (1188 a.d.), he completed his Diwdn, or collection of kasidas and ghazals (mostly of an ethical and parenetic character), which are said to have numbered 20,000 distichs, although the few copies which have come to us contain only a very small number of

verses. About the same time he commenced, at the desire of the ruler of the neighbouring Shirvan, his second romantic poem, the famous Bedouin love-story of Laila and, Majnun, which has so many points in common with Ariosto’s Orlando Furioso, and finished it in the short space of four months. A more heroic subject, and the only one in which he made a certain attempt to rival Firdousi, was selected by our poet for his third epopee, the Iskandarnama, or ” Book of Alexander,” also called Sharafnama or Iqbdlndma-i-Iskandari (” The Fortunes of Alexander “), which is split into two divisions. The first or semi-

historical part shows us Alexander the Great as the con- queror of the world, while the second, of a more ethical tendency, describes him in the character of a prophet and philosopher, and narrates his second tour through the world and his adven- tures in the west, south, east and north. There are frequent Sufic allegories, just as in the Makhzan; and quite imbued with pantheistic ideas is, for instance, the final episode of the first part, the mysterious expedition of Alexander to the fountain of life in the land of darkness. As for the date of composition, it is evident, from the conflicting statements in the different MSS., that there must have been an earlier and a later recension, the former belonging to 587-589 a.h., and dedicated to the prince of Mosul, Tzz-uddin Mas'ud, the latter made for the atabeg Nusrat-uddin Abu Bakr of Azerbaijan after 593 a.h., since we find in it a mention of Nizaml's last romance Haft Paikar, or the " Seven Beauties," which comprises seven tales related by the seven favourite wives of the Sassanian king Bahramgur. In this poem, which was written 593 a.h., at the request of Nur-uddln Arslan of Mosul, the son and successor of the above-mentioned Tzz-uddin, Nizaml returned once more from his excursion into the field of heroic deeds to his old favourite domain of romantic fiction, and added a fresh leaf to the laurel crown of immortal fame with which the unanimous consent of Eastern and Western critics has adorned his venerable head. The most interesting of the seven tales is the fourth, the story of the Russian princess, in which we recognize at once the prototype of Gozzi's well-known Turandot, which was afterwards adapted by Schiller for the German stage. The five mathnawis, from the Makhzan to the Haft Paikar, form Nizaml's so-called " Quintuple " (Khamsa) or " Five Treasures " {Panj Ganj), and have been taken as pattern by all the later epic poets in the Persian, Turkish, Chaghatai and Hindustani languages. Nizaml died at Ganja in his sixty-fourth year, 599 a.h. (1203 a.d.).

The fullest account of Nizaml is given in Dr W. Bacher's Nizaml's Leben und Werke (Leipzig, J 871; English translation byS. Robinson, London, 1873; reprinted in the same author's Persian Poetry for English Readers, 1883, pp. 103-244). All the errors of detail in Bacher's work have been corrected by Dr Rieu in his Catalogue of the Persian MSS. in the British Museum (1881), ii. 563 sqq.

Principal Editions. — The whole Khamsa (lithographed, Bombay, 1834 and 1838; Teheran, 1845); Makhzan-ul Asrar (edited by N. Bland, London, 1844; lithographed, Cawnpore, i860; English translation in MS. by Hatton Hindley, in the British Museum Add. 6961); Khosrau and Shirfn (lithographed, Lahore, 1871; German translation by Hammer in Shirin, ein persisches romantisches Gedicht, Leipzig, 1809); Laila and Majnun (lithographed, Lucknow, 1879;

English translation by J. Atkinson, London, 1836); Haft Paikar (lithographed, Bombay, 1849; Lucknow, 1873; the fourth tale in German by F. von Erdmann, Behramgur und die russische Furslentochter, Kasan, 1844); Iskandarnama, first part, with commentary (Calcutta, 1 8 12 and 1825; text alone, Calcutta, 1853; lithographed with marginal notes, Lucknow, 1865; Bombay, 1861 and 1875; English translation by H. Wilberforce Clarke, London, 1 881; compare also Erdmann, De expeditione Russorum Berdaam versus, Kasan, 1826, and Charmoy, Expedition A' Alexandre contre les Russes, St Petersburg, 1829); Iskandarnama-i-Bahrl, second part, edited by Dr Sprenger (Calcutta, 1852 and 1869). (H. E.)

NIZHNE-TAGILSK, popularly known as Tagil, a town and ironworks of Russia, in the government of Perm, stands in a longitudinal valley on the eastern slope of the Ural Mountains, within a few miles of the place where the Tagil, cutting through the eastern wall of the valley, escapes to the lowlands to join the Tura, a tributary of the Tobol. The southern part of this valley is occupied by the upper Tagil, and its northern portion by the upper Tura, from which the Tagil is separated by a low watershed. Pop. (1897) 30,000, all Great-Russians and

chiefly Nonconformists. The town is connected by railway (the first in Siberia) with Perm and Ekaterinburg, the latter distant 88 m. to the S.S.E. It was founded in 1725 by the Russian mine-owner Demidov, and is still the property of his family. Nizhne-Tagilsk is a central foundry for a number of iron-mines and other works scattered in the valley of the Tagil and its tributary the Salda. Gold, platinum and copper are also mined at Nizhne-Tagilsk. The town carries on a brisk corn trade. The inhabitants make wooden boxes and trays, which are sent to the fairs of Irbit and Nizhniy-Novgorod.

NIZHNE-UDINSK, a town of East Siberia, in the government of Irkutsk, 315 m. by rail W.N.W. of Irkutsk, on the Siberian railway, and on the Uda river. It is a centre for the Biryusa gold mines, and in winter the head of a line of communication with the Lena and Bratsky Ostrog, on the Angara. Pop. (1897)

NIZHNIY-NOVGOROD or Nijni-Novgorod, abbreviated into Nizhegorod, a government of Central Russia, bounded by the governments of Vladimir on the W., Kostroma and Vyatka on the N. and N.E., Kazan and Simbirsk on the E., and Penza and Tambov on the S., with an area of 19,792 sq. m., two-thirds being on the right and the rest on the left bank of. the Volga. The smaller portion, with the exception of the better-drained lands close to the river, is a low, flat, marshy region, covered with thick forests and sandy hills, and thinly peopled. The space between the Oka and the Volga, in the west, is also flat and forest-grown. The best part of the government is that to the east of the Oka; it is hilly, trenched by deep ravines and better drained, and has patches of fertile black earth in the south. The government is drained by the Volga with its tributaries, the Kerzhenets and the Vetluga on the left, and the Sura (with the Pyana) and the Oka on the right. These and their numerous tributaries offer great facilities both for navigation and for the transportation of timber. Numerous small lakes dot the govern- ment, especially in the north, and close upon two-fifths of its entire surface is still covered with forests, which occupy nearly the whole of the Zavolyi (to the north of the Volga) , and extend without a break for 50 and 80 m. to the west and south-west respectively. The climate is severe, especially in the Zavolyi, where the average yearly temperature is 5-6° Fahr. lower than at Nizhniy. Besides the Carboniferous, Permian and Triassic deposits (" variegated marls "), Jurassic deposits are found in patches, chiefly in the south-east, as also in the south-west and north. They are overlain with Cretaceous black clays and sandstones. Thick strata of Tertiary sands, containing petrified wood, are found in the Ardatov district, and over the whole lie Glacial deposits, sandy gravels and clays.

Black earth, known as the " black earth of the plateau," prevails on the high plains between the river valleys in the south-east; the " valley black earth," even more fertile than the former, covers the gently-sloping portions of the territory, also in the south-east. More or less sandy clays are met with elsewhere, and there are large patches of sand. Iron ores (brown and spherosideritic), alabaster, limestone, sand (used for glass), salt and phosphorites are the chief useful minerals. There are also extensive deposits of peat.

The population increased from 1,376,000 in 1880 to 1,602,292 in 1897; of these 841,245 were women, and 140,347 lived in towns. The estimated pop. in 1906 was 1,823,600. They consist of Russians, to the extent of 88%; Mordvinians, to the number of 53,100; Cheremisses, 6700; with Tatars and Chuvashes. Of the total number in

1897 1,525,735 were Orthodox and Old Believers, 75,848 Raskolniks (Nonconformists), 51,236 Mussul- mans and 3388 Jews. Both the birth-rate (53 in 1000) and the death-rate (42 in 1000) are high. A little over 53 % of the area is available for agriculture, and of this 59% is owned by noblemen and 16% only by the peasantry, the remainder being owned by merchants and others. Of the cultivable land owned by the peasantry 55% is under crops, but of similar land owned by noblemen only 30 % is cultivated. The principal crops are wheat, rye, oats, barley, pease and potatoes. In some years the yield is quite insufficient for the population, and every year over 100,000

persons quit their villages in quest of temporary work in neighbouring governments. The zemstvo or district council of Nizhniy-Novgorod supports an agricultural school, an experimental farm and an agency for the purchase of improved seeds and machinery. The live-stock industry is inferior, as many as 41 % of the peasant families having no horses, and 24% no cows. The domestic trades, such as the making of cutlery, felts, woollens, leather goods, wooden wares (sledges, spoons, boxes, window-frames, &c), gloves, wirework, hardware, mats and sacks, are widely practised; 70% of the male working population among the peasants earn their livelihood in this way, as well as by shipping. This last is an industry of considerable magnitude, goods being shipped and unshipped to the annual value of over £5,000,000. Many of the villages and towns have each its own speciality, those in the district of Semenov being famous for wooden spoons, in Gorbatov for cutlery and locks, in Balakhna for spindles, in Makaryev for fancy boxes, in Arzamas, Knyaginin and Sergach for furs and leather goods. The Mordvinians and Cheremisseskeep bees. Fruit and vegetables are cultivated along the Oka and the Volga. The factories are steadily developing, iron and machinery works, flour-mills, potteries, tanneries, shipbuilding yards, saw- mills and distilleries are the more important. Education, owing to the efforts of the zemstvo, is in a better condition than in many other governments of Russia. (P. A. K.; J. T. Be.)

NIZHNIY-NOVGOROD, or simply Nizhniy, a town of Russia, capital of the above government, situated at the confluence of the Oka and the Volga, 272 m. by rail E. of Moscow. It occupies an advantageous position on the great artery of Russian trade, at a place where the manufactured and agricultural products of the basin of the Oka meet the metal wares from that of the Kama, the corn and salt brought from

the south-eastern governments, the produce of the Caspian fisheries, and the various wares imported from Siberia, Central Asia, Caucasia and Persia. It has. thus become the seat of the great Makaryevskaya fair (see below), and one of the chief commercial centres of Russia. Its importance was still further increased during the latter part of the 1 oth century in consequence of the growth of manufactur- ing industry in the Oka basin, the rapid development of steam- boat traffic on the Volga and its tributaries, the extension of the Russian railway system and the opening of Central Asia for trade.

Nizhniy- Novgorod consists of three parts: the upper city, including the Kremlin; the lower town, or Nizhniy Bazaar; and ” the Fair,” with the suburb of Kunavino. The upper city is built on three hills, which rise as steep crags 400 ft. (490 ft. above sea-level) above the right bank of both the Oka and the Volga. The Kremlin, or old fort, occupies one of these hills facing the Volga. It was begun in the second half of the 14th century, but was erected chiefly in the beginning of the 16th, on the site of the old palisaded fort, and has a wall 2300 yds. long, and 65 to 95 ft. high, with eleven towers; it contains the law- courts, the governor’s residence, the arsenal, barracks, the military gymnasium of Count Arakcheev (transferred from old Novgorod), a small museum and two cathedrals, Preobrazhenski and Arkhangelski. These last were erected in 1225 and 1222 respectively, and have been rebuilt more than once; the present structures, in somewhat poor taste, date from 1820-1834 and 1732 respectively. The Preobrazhenski cathedral retains several relics of the past, such as holy pictures of the 14th and 17th centuries and a Bible of 1408; Minin, the hero of Nizhniy (see below) lies buried there. The Kremlin is adorned with a square, containing a monument to Minin and Pozharsky erected in 1826, and pretty boulevards have been laid out along its lower wall. The view from the Kremlin of the broad Volga, with its low- lying and far-spreading left bank, is very striking. The Pechersky monastery, close by, is archaeologically interesting; it was built in the first half of the 16th century — instead of the old monastery founded in 1330 and destroyed by a land-slip in 1596 — and has several antiquities and a library which formerly contained very valuable MSS., now at St Petersburg. Another monastery, that of Blagovyeshchensk (1370, rebuilt 1647), is situated on the right bank of the Oka. Its old churches have been destroyed by

fire, but it has a very ancient holy picture — probably the oldest in Russia, dating from 993, which attracts many pilgrims. In 1904 a town-house and a monument to Tsar Alexander II. were built in the principal square of the upper town. • Besides the Kremlin, the upper town contains the best streets and public buildings. Five descents lead

from it to the lower town, planted on the alluvial terrace, 30 to 35 ft. above the banks of the Oka and the Volga, and in the centre of a very lively traffic. Piles of salt line the salt wharves on the Oka; farther down are the extensive storehouses and heaps of grain of the corn wharves; then comes the steamboat quay on the Volga, opposite the Kremlin, and still farther east the timber wharves. The fair is held on the flat sandy tongue of land between the Oka and the Volga, connected with the town by only a bridge of boats, 1500 yds. long, which is taken to pieces in winter. The shops of the fair, 4000 in number, built of stone in regular rows, are surrounded by a canal, and cover half a square mile. Outside this inner fair are nearly 4000 more shops. Several buildings have been erected, and institutions established, in connexion with the fair, e.g. the house of the committee (1890), banks, a theatre, a circus, a new semicircular canal and a second floating bridge, under- ground galleries, a water-supply, an electrical tramway, temper- ance tea-shops and restaurants kept by the Society of Tradesmen. The Siberian harbour is conspicuous during the fair on account of its accumulations of tea boxes and temporary shelters, in which the different kinds of tea are tried and appraised by tasters. The point of the peninsula is occupied by the store- houses of the steamboat companies, while metal wares and corn are discharged on a long island of the Oka, at the iron harbour and in Grebnovskaya harbour. An island in the Volga is the place where various kinds of rough wares are landed. The rail- way from Moscow has its terminus close to the fair buildings, to the south of which is the suburb of Kunavino, widely known throughout the East as a place for amusements of the lowest kind during the fair. On the fair side the Alexander Nevski cathedral was erected in 1881, and there too is the older ” Fair ” cathedral of 1822.

The climate of Nizhniy is harsh and continental, the yearly average temperature being 39° Fahr. (iO‘6° in January and 64 in July), and the extreme thermometric readings -40 and 104 Fahr. The town has a settled population of (1897) 90,053 inhabitants, who are nearly all Great-Russians, and many of them Nonconformists. The mortality exceeds the birth-rate. The educational institutions include a military school, a technical school, a theological seminary, and two schools for sons and daughters of the clergy.

The manufactures include steam flour-mills, iron and machinery works, manufactories of ropes and candles, distil- leries and potteries. Shipbuilding, especially for the transport of petroleum on the Caspian Sea, and steamboat building, have recently advanced considerably. Nizhniy is the chief station of the Volga steamboat traffic. The first steamer made its appear- ance on the Volga in 1821, but it was not till

1845 that steam navigation began to assume large proportions. The merchants carry on a brisk trade, valued (apart from that of the fair) at. more than £2,000,000 of purchases and £1,800,000 of sales; the principal items are corn (£200,000 to £5005000), salt, iron, tea, fish, groceries and manufactured goods.

The chief importance of the city is due to its fair, which is held from the 29th of July to the 10th of September. From remote antiquity Russian merchants were wont to meet in summer with those from the East at different places on the Volga, between the mouths of the Oka and the Kama — the fair changing its site with the increasing or decreasing power of the nation- alities which struggled for the possession of the middle Volga. Bolgari, Nizhniy-Novgorod, Kazan and Vasilsursk have succes- sively been its seat since the 10th century. From 1641 its seat was at a monastery 55 m. below Nizhniy and close to Makaryev (whence its present name). The situation, however, being in many ways inconvenient, and a conflagration having destroyed the shops at Makaryev, the fair was transferred in 181 7 to its present locality at Nizhniy-Novgorod.

The goods mostly dealt in are cotton, woollen, linen and silk stuffs (35 to 38 % of the whole), iron and iron wares, furs and skins, pottery, salt, corn, fish, wine and all kinds of manufactured goods. The Russian goods constitute four-fifths of the whole trade; those brought from Asia — tea (imported via Kiakhta and via Canton and Suez), raw cotton and silk, leather wares, madder and various manufactured wares — do not exceed 10 or 11%. Manufactured wares, groceries and wines are the goods principally imported from western Europe. The total turnover of goods sold and ” ordered ” amounts to nearly 36ˆ millions sterling annually. The former category dropped, however, from 26 millions in 1 88 1 to 14 millions in 1905.

In 1880, the Russian manufacturers depending chiefly on the barter-trade in tea at Kiakhta, their production was regulated principally by the prices of tea established at the fair; but now cotton takes the lead, and the prospective output for the year of the mills of central Russia is determined at the fair by the price of raw cotton imported from Asia, by that of madder, and by the results of the year’s crop, which became known during the fair. The same holds good with regard to all other stuffs, the prices of wool (pro- visionally established at the earlier fairs of south-western Russia) being ultimately settled at Nizhniy, as well as

those of raw silk. The whole of the iron production of the Urals depends also on the same fair. The ” caravans ” of boats laden with iron- ware, starting from the Urals works in the spring, reach Nizhniy in August, after a stay at the fair of Laishev, which supplies the lower Volga; and the purchases of iron made at Nizhniy for Asia and middle Russia deter- mine the amount of credit that will be granted for the next year’s business to the owners of the ironworks, on which credit most of them entirely depend. The fair thus influences directly all the leading branches of Russian manufacture. It exercises a yet greater influence on the corn and ‘salt trades throughout Russia, and still more on the whole of the trade in Siberia and Turkestan, both de- pending entirely on the conditions of credit which the Siberian and Turkestan merchants obtain at the fair.

The Makaryevskaya fair attracts no fewer than 400,000 people from all parts of Russia, and partly from Asia.

Two other fairs of some importance are held at Nizhniy — one for wooden wares on the ice of the Oka, and another, in June, for horses.

History. — The confluence of the Oka and the Volga, inhabited in the 10th century by Mordvinian tribes, began to be coveted by “the Russians as soon as they had occupied the upper Volga, and as early as the nth century they established a fort, Gorodets, 20 m. above the mouth of the Oka. In 1221, the people of Suzdal, under Yuri Vsevolodovich, prince of Vladimir, erected a fort on the hill now occupied by the Kremlin of Nizhniy. Until the beginning of the 14th century Nizhniy-Novgorod, which grew rapidly as the Russians colonized the banks of the Oka, remained subject to Suzdal; it enjoyed, however, almost complete independence, being ruled by its popular assembly. In the 14th century, until 1390, it elected its own princes. Ill- protected by its palisaded walls, it was plundered in 1377 and 1378 by the Tatars, supported by the Mordvinians. In 1390 Prince Vasili of Moscow, in alliance with Toktamish, khan of the Golden Horde of the Mongols, took Nizhniy and established his own governors there; in 1417 it was definitely annexed to Moscow, becoming a stronghold for the further advance of that principality towards the east. It was fortified in 1508-1511, and was able to repel the Tatars in 1513, 1520 and 1536. The second half of the 16th century was for the city a period of peaceful and rapid development. It became a depot for all merchandize brought from the south-east, and even English merchants established warehouses there. With the fall of Kazan, and the opening of free navigation on the Volga, it became the starting-place for the ” caravan ” of boats yearly sent to the lower Volga under the protection of a military force, whilst the thick forests

of the neighbourhood favoured the development of shipbuilding. In 1606-1611 the trading classes of Nizhniy took an active part in the expeditions against the revolted serfs, and it was a Nizhniy dealer in cattle, Kozma Minin Sukhorukov, who took the initiative in sending an army for the delivery of Moscow from the Poles in. 1612. In 1667 the robber chieftain, Stenka Razin, made an unsuccessful attempt to capture the city. During the 1 7th century the country around Nizhniy became the seat of a vigorous religious agitation, and in its forests the Raskolniks established hundreds of their monasteries and communities, those of the Kerzhenets playing an important part in the history of Russian Nonconformity even to the present time.

Nizhniy-Novgorod had at one time two academies, Greek and Slav, and took some part in the literary movement of the end of the 1 8th century; its theatre also was of some importance in the history of the Russian stage. (P. A. K; J. T. Be.)

NOAH (ni, rest; Septuagint, New Testament, Philo, Josephus, N<3e, Ncoxos, Nweos: Vulg. Noe). According to Gen. v.x. the tenth patriarch in direct descent from Adam, counting Adam as the first; the son of Lamech; the father of Shem, Ham and Japheth; and the builder of the Ark, in which he and his family, &c. &c, were saved from a universal flood (see Deluge). After the flood subsided God made a covenant with Noah per mitting the use of animal food, on condition that the flesh is not eaten with the blood; and forbidding homicide (ix. 1-7, cf. i. 29 f., both P.). Noah was the first to cultivate the vine and to experience the consequences of over-indulgence in its products, an occasion which called forth the filial respect of two of his sons and the irreverence of the third. Through his sons he became the ancestor of the whole human race. The name is mentioned in the genealogy in 1 Chron. i. 4; the ” waters of Noah ” occur in Isaiah liv. 9; and Noah is mentioned with Daniel and Job as an ancient worthy in Ezek. xiv. 14, 20. The story is referred to in the New Testament in Matt. xxiv. 37 f.; Luke iii. 36, xvii. 26 f.; Heb. xi. 7; 1 Pet. iii. 20; 2 Pet. ii. 5.

The name Noah is explained in Gen. V-. 29 as connected with the root nhm ” comfort,” but this is etymologically impossible. As a Hebrew word it might connect with nuah, ” rest “; and the Septuagint has, ” he will give us rest,” instead of ” he will comfort us”; and this is sometimes accepted as the original reading.

As the tenth patriarch Noah corresponds to the tenth pre- historic Babylonian king, Xisuthros in Berossus, Ut-napistim or Atrahasis in the cuneiform tablets, the hero of the Babylonian flood story.

Gen. ix. 20-27 is a distinct episode, and has no necessary con- nexion with the narrative of the Deluge. Probably, as Gunkel, Dillmann and others suggest, it came originally from a cycle of stories different from that which contained the account of the Flood. There are some apparent inconsistencies. Noah is called ” the husbandman.” The proper rendering of verse 20 is ” and Noah, the husbandman, was the first to plant a vineyard,” the E.V.: ” And Noah began to be an husbandman, and he planted a vineyard,” is incorrect. It seems, therefore, that in the original context Noah had been described as ” the husbandman,” a title in no way suggested by Gen. vi. 9-ix. 19. Moreover, even after making allowance for lack of experience as to the effect of the new product, drunkenness and exposure hardly tally with the statement that ” Noah was a just man and perfect in his genera- tions, and Noah walked with God,” vi. 9. This indeed comes from the late Priestly Code; but we are also told in the earlier story that ” Noah found favour in the eyes of the Lord,” vi. 8.

The name also occurs in the Bible (nˆi, Noua, Noa) for the daughter of Zelophehad, of the tribe of Manasseh. Zelophehad having only daughters, the case is made the occasion of laying down the law that where there are no sons daughters inherit, but must marry within their own tribe (Num. xxvi. 33, xxvii. 1, xxxvi. n; Josh. xvii. 3, all Priestly Code). (W. H. Be.)

NOAILLES, the name of a great French family, derived from the castle of Noailles in the territory of Ayen, between Brive and Turenne in the Limousin, and claiming to date back to the nth century. It did not obtain fame until the 16th century, when its head, Antoine de Noailles (1 504-1562), became admiral of France, and was ambassador in England during three im- portant years, 1553-1556, maintaining a gallant but unsuccessful rivalry with the Spanish ambassador, Simon Renard. Henri (1 554-1623), son of Antoine, was a commander in the religious wars, and was made comte d’Ayen by Henry IV. in 1593. Anne (d. 1678), the grandson of the first count, played an important part in the Fronde and the early years of the reign of Louis XIV., became captain-general of the newly won province of Roussillon, and in 1663 was made due d’Ayen, and peer of France. The sons of the first duke raised the family to its greatest fame. The eldest son, Anne Jules (1650-1708), was one of the chief generals

of France towards the end of the reign of Louis XIV., and, after raising

the regiment of Noailles in 1689, he commanded in Spain during the war of the Spanish succession, and was made marshal of France in 1693. A younger son, Louis Antoine (1651-1720), was made archbishop of Paris in 1695, holding this high dignity until his death; he was made a cardinal in 1699. The name of Noailles occurs with almost confusing reiteration throughout the 18th century. Adrien Maurice (1678-1766), the third duke, served in all the most important wars of the reign of Louis XV. in Italy and Germany, and became a marshal in 1734. His last command was in the war of the Austrian succession, when he was beaten by the English at the battle of Dettingen in 1743. He married Francoise d'Aubigne, a niece of Madame de Maintenon and two of his sons also attained the rank of marshal of France. The elder, Louis (1713-1793), who bore the title of due d'Ayen till his father's death in 1766, when he became due de Noailles, served in most of the wars of the 1 8th century without particular distinction, but was nevertheless made a marshal in 1 77 5. He refused to emigrate during the Revolution, but escaped the guillotine by dying in August 1793, before the Terror reached its height. On the 4th Thermidor (July 22) the aged duchesse de Noailles was executed with her daughter-in- law, the duchesse d'Ayen, and her granddaughter, the vicomtesse de Noailles. Jean Paul Francois (1739-1824), the fifth duke, was in the army, but his tastes were scientific, and for his emin- ence as a chemist he was elected a member of the Academy of Sciences in 1777. He became due d'Ayen in 1766 on his grand- father's death, and due de Noailles on his father's in 1793. Having emigrated in 1792, he lived in Switzerland until the Restoration in 1814, when he took his seat as a peer of France. He had no son, and was succeeded as due de Noailles by his grand-nephew, Paul (1802-1885), who won some reputation as an author, and who became a member of the French Academy in the place of Chateaubriand in 1849. The grandfather of Paul de Noailles, and brother of the fifth duke, Emmanuel Marie Louis (1743-1822), marquis de Noailles, was ambassador at Amsterdam from 17ˆ0-1776, at London 1776-1783, and at Vienna 1 783-1 792.

One other branch of the family deserves notice. Philippe (171 5—1794), comte de Noailles, afterwards due de Mouchy, was a younger brother of the fourth duke, and a more distinguished soldier than his brother. He served at Minden and in other campaigns, and was made a marshal on the same day as his brother. He was long in great favour at court, and his wife was first lady of honour to Marie Antoinette, and was nicknamed by her Madame Etiquette. This court favour brought down punishment in the days of the Revolution, and the old marshal and his wife were guillotined on the 27th of June 1794. His

two sons, the prince de Poix and the vicomte de Noailles, were members of the Constituent Assembly.

Philippe Louis Marc Antoine, duke of Noailles and prince of Poix (1752-1819), was born on the 21st of November 1752. In 1789 he was elected deputy of the States-General by the nobility of the bailliages of Amiens and Ham, but was compelled to resign in consequence of a duel with the commander of the Garde Nationale at Versailles. He left the country for some time, but returned to France and took part in the revolution of the 10th of August 1792. He was, however, forced to quit the country once more to evade the fate of his father and mother. Returning to France in 1800, he lived quietly at his residence at Mouchy during the empire. At the Restoration he was brought again into favour and became a peer of France. He died at Paris on the 17th of February 1819.

Louis Marie (1756-1804), vicomte de Noailles, was the second son of the marshal. He served brilliantly under La Fayette in America, and was the officer who concluded the capitulation of York- town. He was elected to the States-General in 1789. He began the famous ” orgie,” as Mirabeau called it, on the 4th of August, when all privileges were abolished, and with d’Aiguilion proposed the abolition of titles and liveries in June 1790. When the revolution became more pronounced he emigrated to America, and became a partner in Bingham’s bank at Philadelphia. He was very successful, and might have lived happily had he not accepted a command against the English in San Domingo, under Rochambeau. He made a brilliant defence of the mole St Nicholas, and escaped with the garrison to Cuba; but in making for Havana his ship was attacked by an English frigate, and after a long engagement he was severely wounded, and died of his wounds on the 9th of January 1804.

NOAKHALI, a town and district of British India, in the Chittagong division of eastern Bengal and Assam. The town, also known as Sudharam, is on a small river channel 10 m. from

the sea. Pop (1901) 6520. The District of Noakhali has an area of 1644 sq. m.; pop. (1901) 1,141,728. The district consists of an alluvial tract of mainland, together with several islands at the mouth of the Meghna. In general, each home- stead is surrounded by a thick grove of betel- and coco-nut palms, and in the north-western tracts dense forests of betel-nut palms extend for miles. Rice is the great staple of cultivation. The district is very fertile; and, with the exception of some sandbanks and recent accretions, every part of it is under con- tinuous cultivation. The process of alluvion is gradually but steadily going on,

the mainland extending seawards. Noakhali is peculiarly liable to destructive floods from the sea, generally caused by southerly gales or cyclones occurring at the time when the Meghna is swollen by heavy rains, and at flood-tides — the tidal bore being sometimes 20 ft. high, and moving at the rate of 15 m. an hour. The cyclone and storm- wave of the 31st of October 1876 was terribly disastrous, sweeping over the whole delta of the Meghna. The loss of human life was estimated at 100,000. The east of the district is served by the Assam-Bengal railway.

The Mahommedan population of the islands at the mouth of the Meghna practised piracy up to a comparatively recent date, and at the beginning of the 17th century Portuguese pirates, under Sebastian Gonzales, occupied Sandwip. They were ultimately reduced to subjection by Shaista Khan, the governor of Bengal, about the middle of the century; and their descendants have sunk to the level of the natives surrounding them, whose dress, customs and language they have, for the most part, adopted. They are Christians, and retain the old Portuguese names. About 1756 the East India Company established factories in Noakhali and Tippera, the ruins of some of which still remain.

NOBEL, ALFRED BERNHARD (1833-1896), Swedish chemist and engineer, was the third son of Emmanuel Nobel (1801-1872), and was born at Stockholm on the 21st of October 1833. At an early age he went with his family to St Petersburg, where his father started torpedo works. In 1859 these were left to the care of the second son, Ludvig Emmanuel (1831-1888), by whom they were greatly enlarged, and Alfred, returning to Sweden with his father, devoted himself to the study of ex- plosives, and especially to the manufacture and utilization of nitroglycerin. Ete found that when that body was incorporated with an absorbent, inert substance like kieselguhr it became safer and more convenient to manipulate, and this mixture he patented in 1867 as dynamite. He next combined nitro- glycerin with another high explosive, gun-cotton, and obtained a transparent, jelly-like substance, which was a still more powerful explosive than dynamite. Blasting gelatin, as it was called, was patented in 1876, and was followed by a host of similar combinations, modified by the addition of potassium nitrate, wood-pulp and various other substances. Some thirteen years later Nobel produced ballistite, one of the earliest of the nitroglycerin smokeless powders, containing in its latest forms about equal parts of gun-cotton and nitroglycerin. This powder was a precursor of cordite, and Nobel’s claim that his patent covered the latter was the occasion of vigorously contested law-suits between him and the British Government in 1894 and 1895. Cordite also consists of nitroglycerin

and gun-cotton, but the form of the latter which its inventors wished to use was the most highly nitrated variety, which is not soluble in mixtures of ether and alcohol, whereas Nobel contemplated using a less nitrated form, which is soluble in such mixtures. The question was complicated by the fact that it is in practice impossible to prepare either of these two forms without ad- mixture of the other; but eventually the courts decided against Nobel. From the manufacture of dynamite and other explosives, and from the exploitation of the Baku oil-fields, in the develop- ment of which he and his brothers, Ludvig and Robert Hjalmar (1820-1896), took a leading part, he amassed an immense fortune; and at his death, which occurred on the ioth of December 1896 at San Remo, he left the bulk of it in trust for the establishment of five prizes, each worth several thousand pounds, to be awarded annually without distinction of nationality.

The first three of these prizes are for eminence in physical science, in chemistry and in medical science or physiology; the fourth is for the most remarkable literary work dans le sens d'idialisme; and the fifth is to be given to the person or society that renders the greatest service to the cause of international brotherhood, in the suppression or reduction of standing armies, or in the establishment or furtherance of peace congresses. See Les Prix Nobel en igoi (Stockholm, 1904).

NOBILI, LEOPOLDO (1784-1835T, Italian physicist, born at Reggio nelT Emilia in 1784, was in youth an officer of artillery, but afterwards became professor of physics in the archducal museum at Florence, the old habitat of the Accademia del Cimento. His most valuable contributions to science consist in the suggestion of the astatic combination of two needles for galvanometers, and in the invention of the so-called thermo- multiplier used by him and M. Melloni. In 1826 he described the prismatically-coloured films of metal, known as Nobili's rings, deposited electrolytically from solutions of lead and other salts when the anode is a polished iron plate and the cathode is a fine wire placed vertically above it. His papers were mostly published in the Bibliolhbque universdh of Geneva. He died at Florence in August 1835.

NOBILIOR, MARCUS FULVIUS, Roman general, a member of one of the most important families of the plebeian Fulvian gens. When praetor (193 B.C.) he served with distinction in Spain, and as consul in 189 he completely broke the power of the Aetolian league. On his

return to Rome, Nobilior celebrated a triumph (of which full details are given by Livy) remarkable for the magnificence of the spoils exhibited. On his Aetolian campaign he was accompanied by the poet Ennius, who made the capture of Ambracia, at which he was present, the. subject of one of his plays. For this Nobilior was bitterly attacked by Cato the Censor, on the ground that he had compromised his dignity as a Roman general. He restored the temple of Hercules and the Muses in the Circus Flaminius, placed in it a fist of Fasti drawn up by himself, and endeavoured to make the Roman calendar more generally known. He was a great en- thusiast for Greek art and culture, and introduced many of its masterpieces into Rome, amongst them the picture of the Muses by Zeuxis from Ambracia.

NOBILITY. To form a true understanding of what is strictly implied in the word ” nobility,” in its social as opposed to a purely moral sense, it is needful to distinguish its meaning from that of several words with which it is likely to be confounded. In England nobility is apt to be confounded with the peculiar institution of the British peerage. Yet nobility, in some shape or another, has existed in most places and times of the world’s history, while the British peerage is an institution purely local, and one which has actually hindered the existence of a nobility in the sense which the word bears in most other countries. Nor is nobility the same thing as aristocracy. This last is a word which is often greatly abused; but, whenever it is used with any regard to its true meaning, it is a word strictly political, implying a particular form of government. But nobility is not necessarily a political term; the distinction which it implies may be accompanied by political privileges or it may not. Again, it is sometimes thought that both nobility and aristocracy are

in some special way connected with kingly government. To not a few it would seem a contradiction to speak of nobility or aristocracy in a republic. Yet, though many republics have eschewed nobility, there is nothing in a republican, or even in a democratic, form of government inconsistent with the existence of nobility; and it is only in a republic that aristocracy, in the strict sense of the word, can exist. Aristocracy implies the existence of nobility; but nobility does not imply aristocracy; it may exist under any form of government. The peerage, as it exists in the three British kingdoms, is something which is altogether peculiar to the three British kingdoms, and which has nothing in the least degree like it elsewhere.

Nobility, then, in the strict sense of the word, is the hereditary handing on from generation to generation of some acknow- ledged pre-eminence, a pre-eminence founded on hereditary

succession, and on nothing else. Such nobility may be imme- morial or it may not. There may or there may not be a power vested somewhere of conferring nobility; but it is . _ ˆ essential to the true idea of nobility that, when once acquired, it shall go on for ever to all the descendants — or, more commonly, only to all the descendants in the male line — of the person first ennobled or first recorded as noble. The pre-eminence so handed on may be of any kind, from substantial political power to mere social respect and precedence. It does not seem necessary that it should be formally enacted by law if it is universally acknowledged by usage. It may be marked by titles or it may not. It is hardly needful to prove that nobility does not imply wealth, though nobility without wealth runs some risk of being forgotten. This definition seems to take in all the kinds of nobility which have existed in different times and places. They have differed widely in the origin of the noble class and in the amount of privilege implied in member- ship of it; but they all agree in the transmission of some privilege or other to all the descendants, or to all the male descendants, of the first noble.

In strictness nobility and gentry are the same thing. This fact is overshadowed in England, partly by the habitual use of the word ” gentleman ” (g.v.) in various secondary uses, partly by the prevalent confusion between nadgeatry. nobility and peerage. But that they are the same is proved by the use of the French word gentttthotnme, a word which has pretty well passed out of modern use, but which, as long as it remained in use, never lost its true meaning. There were very wide distinctions within the French noblesse, but they all formed one privileged class as distinguished from the roturier. Here, then, is a nobility in the strictest sense. If there is no such class in England, it is simply because the class which answers to it has never been able to keep any universally acknowledged privileges. The word ” gentleman ” has lost its original meaning in a variety of other uses, while the word ” nobleman ” has come to be confined to members of the peerage and a few of their immediate descendants.

That the English peerage does not answer to the true idea of a nobility will be seen with a very little thought. There is no handing on of privilege or pre-eminence to perpetual generations. The peer holds a great position, endowed with substantial powers and privileges, and those powers and privileges are handed on by hereditary succession. But they are handed on only to one member of the family at a time. The peer’s children, in some cases his grandchildren, have titles and precedence, but they have no substantial privileges. His remoter descendants have no advantage of any kind over other people, except their chance of succeeding to the peerage. The remote descendant of a duke, even though he may chance to be heir presumptive to the duke-dom, is in no way distinguished from any other gentleman; it is even possible that he may not hold the social rank of gentle- man. This is not nobility in the true sense; it is not nobility as nobility was understood either in the French kingdom or in the Venetian commonwealth.

Nobility thus implies the vesting of some hereditary privilege or advantage in certain families, without deciding in what such privilege or advantage consists. Its nature may differ widely according to the causes which have led to ‘the establishment of the distinction between family and family in each particular case.

The way in which nobility has arisen in different times and places is very various, and there are several nations whose history will supply us with examples of a nobility of one kind giving way to a nobility of another kind. tZpuka. The history of the Roman commonwealth illustrates this perhaps better than any other. 1 What we may call the nobility of earlier occupation makes way for the nobility of office. Our

first glimpses of authentic Roman history set before us two orders in the same state, one of which is distinguished from the other by many exclusive privileges. The privileged

1 For the ethnological problems raised by the relations of populus and plebs,see Rome: History, §1.; also Patricians,

order — the populus, patres, patricians — has all the characteristics which we commonly expect to find in a privileged order. It is a minority, a minority strictly marked out by birth from other members of the commonwealth, a minority which seems further, though this point is less clearly marked, to have had on the whole the advantage in point of wealth. When we are first entitled to speak with any kind of certainty, the non-privileged class possess a certain share in the election of magistrates and the making of laws. But the privileged class alone are eligible to the greatest offices of the state; they have in their hands the ex- clusive control of the national religion; they have the exclusive enjoyment of the common land of the state — in Teutonic phrase, the folkland. A little research shows that the origin of these privileges was a very simple one. Those who appear in later times as a privileged order among the people had once been the whole people. The patricians, patres, housefathers, goodmen — so lowly is the origin of that proud name — were once the whole Roman people, the original inhabitants of the Roman hills. They were the true populus Romanus, alongside of whom grew up a secondary Roman people, the plebs or commons. As new settlers came, as the people of conquered towns were moved to> Rome, as the character of Romans was granted to some allies and forced upon some enemies, this plebs, sharing some but not all of the rights of citizens, became a non-privileged order alongside of a privileged order. As the non-privileged order increased in numbers, while the privileged order, as every exclusive hereditary body must do, lessened, the larger body gradually put on the character of the nation at large, while the smaller body put on the character of a nobility. But their position as a nobility or privileged class arose solely because a class with inferior rights to their own grew up around them. They were not a nobility or a privileged class as long as there was no less privileged class to distinguish them from. Their exclusive possession of power made the commonwealth in which they bore rule an aristocracy; but they were a democracy among themselves. We see indeed faint traces of distinction among the patricians themselves, which may lead us to

guess that the equality of all patricians may have been won by struggles of unrecorded days, not unlike those which in recorded days brought about the equality of patrician and plebeian. But at this we can only guess. The Roman patricians, the true Roman populus, appear at our first sight of them as a body democratic in its own constitution, but standing out as an order marked by very substantial privileges indeed from the other body, the plebs, also democratic in its own con- stitution, but in every point of honour and power the marked inferior of the populus.

The old people of Rome thus grew, or rather shrank up, into a nobility by the growth of a new people by their side which they p trician declined to admit to a share in their rights, powers and possessions. A series of struggles raised this new people, the plebs, to a level with the old people, the populus. The gradual character of the process is not the least instructive part of it. There are two marked stages in the struggle. In the first the plebeians strive to obtain relief from laws and customs which were actually oppressive to them, while they were profitable to the patricians. When this relief has been gained by a series of enactments, a second struggle follows, in which the plebeians win political equality with the patricians. In this second struggle, too, the ground is won bit by bit. No general law was ever passed to abolish the privileges of the patricians; still less was any law ever passed to abolish the dis- tinction between patrician and plebeian. All that was done was done step by step. First, marriage between the two orders was legalized. Then one law admitted plebeians to one office, another law to another. Admission to military command was won first, then admission to civil jurisdiction; a share in religious functions was won last of all. And some offices, chiefly those religious offices which carried no political power with them, always remained the exclusive property of the patricians, because no special law was ever passed to throw them open to plebeians. In this gradual way every practical advantage on the part of the patricians was taken away. But the result did not lead to the

abolition of all distinctions between the orders. Patricians and plebeians went on as orders defined by law, till the distinction died out in the confusion of things under the empire, till at last the word ” patrician ” took quite a new meaning. The distinc- tion, in truth, went on till the advantage turned to the side of the plebeians. Both consuls might be plebeians, both could not be patricians; a patrician could not wield the great powers vested in the tribunes of the commons. These were greater advantages than the exclusive patrician possession of the offices of interrex, rex sacrorum and the higher flamens. And, as the old distinction survived in law and religion after all substantial

privileges were abolished, so presently a new distinction arose of which law and religion knew nothing, but which became in practice nearly as marked and quite as important as the older one.

This was the growth of the new nobility of Rome, that body, partly patrician, partly plebeian, to whom the name nobUitas strictly belongs in Roman history. This new nobility gradually became as well marked and as exclusive as the old patriciate. But if differed from the old patriciate in this, that, while the privileges of the old patriciate rested on law, or perhaps rather on immemorial custom, the privileges of the new nobility rested wholly on a sentiment of which men could remember the beginning. Or it would be more accurate to say that the new nobility had really no privileges at all. Its members had no legal advantages over other citizens. They were a social caste, which strove to keep, and which largely succeeded in keeping, all high offices and political power in its own hands. Such privileges, even of an honorary kind, as the nobles did enjoy by law belonged to them, not as nobles, but as senators and senators' sons. Yet practically the new nobility was a privileged class; it felt itself to be so, and it was felt to be so by others. This nobility consisted of all those who, as descendants of curule magistrates, had the jus imaginum — that is, who could point to forefathers ennobled by office. That is to say, it consisted of the remains of the old patriciate, together with those plebeian families any members of which had been chosen to curule offices. These were naturally those families which had been patrician in some other Italian city, but which were plebeian at Rome. Many of them equalled the patricians ir wealth and antiquity of descent, and as soon as inter marriage was allowed they became in all things their social equals. The practical result of the Licinian reform was that the great plebeian families became, for all practical purposes, patrician. They separated themselves from the mass of the plebeians to form a single body with the surviving patricians, just as the old patricians had striven to keep plebeians out of high offices, so now the new nobles, patrician and plebeian alike, strove to keep " new men," men who had not the jus imaginum, out of high office. But there was still the difference that in die old state of things the plebeian was shut out by law, while in the new state of things no law shut out the new man. It needed a change in the constitution to give the consulship to Lucius Sextius; it needed only union and energy in the electors to give it to Gaius Marius.

The Roman case is often misunderstood, because the later Roman writers did not fully understand the case themselves. Livy could never get rid of the idea that the old struggle between patrician and plebeian was something like the struggle between the nobility and the people at large in the later days of the commonwealth. In a certain sense he

knew better; at any rate, he often repeats the words of those who knew better; but the general impression given by his story is that the plebeians were a low mob and their leaders factious and interested ringleaders of a mob. The case is again often misunderstood because the words ” patrician ” and ” plebeian,” like so many other technical Roman and Greek words, have come in modern language to be used in a way quite unlike their original sense. The word ” plebeian,” in its strict sense, is no more contemptuous than the word commoner in England. The plebs, like the English commons, contained families differing widely in rank and social position, among them those families which, as soon as an artificial barrier broke down, joined with the patricians to form the new

nobility. The whole lesson is lost if the words “patrician” and ” plebeian ” are used in any but their strict sense. The Catuli and Metelli, among the proudest nobles of Rome, were plebeians, and as such could not have been chosen to the purely patrician office of interrex, or flamen of Jupiter. Yet even in good writers on Roman history the words ” patrician ” and ” plebeian ” are often misapplied by being transferred to the later disputes at Rome, in which they are quite out of place.

We may now compare the history of nobility at Rome with its history in some other of the most famous city-commonwealths.

Thus at Athens 1 its history is in its main outlines partson verv muc h the same as its history at Rome up to a between certain point, while there is nothing at Athens which Roman and at a u answers to the later course of things at Rome.

At Athens, as at Rome, an old patriciate, a nobility of

older settlement, a nobility which had once been the whole people, was gradually shorn of ail exclusive privilege, and driven to share equal rights with a new people which had grown up around it. The reform of Cleisthenes (q.v.) answers in a general way to the reform of Licinius, though the different circumstances of the two cities hinder us from carrying out the parallel into detail. But both at Rome and at Athens we see, at a stage earlier than the final reform, an attempt to set up a standard of wealth, either instead of or alongside of the older

standard of birth. This same general idea comes out both in the constitution of Servius and in the constitution of Solon, though the application of the principle is different in the two cases. Servius made voting power depend on income; by Solon the same rule was applied to qualification for office. By this change power is not granted to every citizen, but it is put within the reach of every citizen. No man can change his forefathers, but the poor man may haply become richer. The Athenian finraTpiSat., who were thus gradually brought down from their privileged position, seem to have been quite as proud and exclusive as the Roman patricians; but when they lost their privileges they lost them far more thoroughly, and they did not, as at Rome, practically hand on many of them to a new nobility, of which they formed part, though not the whole. While at Rome the distinction of patrician and plebeian was never wiped out, while it remained to the last a legal distinction even when practical privilege had turned the other way, at Athens, after the democracy had reached its full growth, the distinction seems to have had no legal existence whatever. At Rome down to the last it made a difference whether the candidate for office was patrician or plebeian, though the difference was in later times commonly to the advantage of the plebeian. At Athens, at any rate after Aristides, the eupatrid was neither better nor worse off than another man.

But, what is of far greater importance, there never arose at Athens any body of men which at all answered to the nobilitas of Rome. We see at Athens strong signs of social distinctions, even at a late period of the democracy; we see that, though the people might be led by the low-born demagogue — using that word in its strict and not necessarily dishonourable meaning — their votes most commonly fell on men of ancient descent. We see that men of birth and wealth often allowed themselves a strange licence in dealing with their low-born fellow-citizens. But we see no sign of the growth of a body made up of patricians and leading plebeians who contrived to keep office to themselves by a social tradition only less strong than positive law. We have at Athens the exact parallel to the state of things when Appius Claudius shrank from the thought of the consulship of Gaius Licinius; we have no exact parallel to the state of things when Quintus Metellus shrank from the thought of the consulship of Gaius Marius. The cause of the difference seems to be that, while the origin of the patriciate was exactly the same at Rome and at Athens, the origin of the commons was different. The four Ionic tribes at Athens seem to have answered very closely to the three patrician tribes at Rome; but the Athenian demos grew up in a different way from the Roman plebs. If we could believe that the Athenian demos arose out of the union of

the

1 See further Athens: History, and Eupatridae.

other Attic towns with Athens, this would be an exact analogy to the origin of the Roman plebs; the evraTpidai. would be the Athenians and the demos the Atticans (‘AttlkoI). But from such glimpses of early Attic history as we can get the union of the Attic towns would seem to have been completed before the constitutional struggle began. That union would answer rather to the union of the three patrician tribes of Rome. Such hints as we have, while they set before us, just as at Rome, a state of things in which small landed proprietors are burthened with debt, also set before us the Attic demos as, largely at least, a body of various origins which had grown up in the city. Cleis- thenes, for instance, enfranchised many slaves and strangers, a course which certainly formed no part of the platform of Licinius, and which reminds us rather of Gnaeus Flavius some- what later. On the whole it seems most likely that, while the kernel of the Roman plebs was rural or belonged to the small towns admitted to the Roman franchise, the Attic demos, largely at least, though doubtless not wholly, arose out of the mixed settlers who had come together in the city, answering to the neroiicoi of later times. If so, there would be no place in Athens for those great plebeian houses, once patrician in some other commonwealth, out of which the later Roman nobilitas was so largely formed.

Thus the history of nobility at Athens supplies a close analogy to the earlier stages of its history at Rome, but it has nothing answering to its later stages. At Sparta we have a third instance of a people shrinking up into a nobility, but it is a people whose position differs altogether from anything either at Rome or at Athens. Sparta is the best case of a nobility of conquest. This is true, whether we look on the irepioiKoi as Achaeans or as Dorians, or as belonging some to one race and some to the other (see Perioeci). In any case the Spartans form a ruling body, and a body whose privileged position in the land is owing to conquest. The Spartans answer to the patricians, the ireploiKoi to the plebs; the helots are below the position of plebs or demos. The only difference is that, probably owing to the fact that the distinction was due to conquest, the local character of the dis- tinction lived on much longer than it did at Rome. We hardly look on the Spartans as a nobility among the other Lacedae- monians; Sparta rather is a ruling city bearing sway over the other Lacedaemonian towns. But this is exactly what the original Roman patricians, the settlers on the three oldest hills, were in the beginning. The so-called cities (xoXeis) of the irepLotKoi answered pretty well to the local

plebeian tribes; the difference is that the irepioiKoi never became a united corporate body like the Roman plebs. Sparta to the last remained what Rome was at the beginning, a city with a populus (5ijp.os) but no plebs. And, as at Rome in early times, there were at Sparta distinctions within the populus; there were ofiotot and vrrop.eioves, like the majores and minores gentes at Rome. Only at Rome, where there was a plebs to be striven against, these distinctions seem to have had a tendency to die out, while at Sparta they seem to have had a tendency to widen. The Spartan patriciate could afford to disfranchise some of its own members.

The other old Greek cities, as well as those of medieval Italy and Germany, would supply us with endless examples of the various ways in which privileged orders arose. Venice, a city not exactly belonging to any of these classes, essentially a city of the Eastern empire and not of the Western, gives us an example than which none is more instructive. The renowned patriciate of Venice was as far removed as might be from the character either of a nobility of conquest or of a nobility of older settlement. Nor was it strictly a nobility of office, though it had more in common with that than with either of the other two. As Athens supplies us with a parallel to the older nobility of Rome without any parallel to the later, so Venice supplies us with a parallel to the later nobility of Rome without any parallel to the earlier. Athens has Fabii and Claudii, but no Catuli or Metelli; Venice has Catuli and Metelli, but no Fabii or Claudii.

In one point, however, the Venetian nobility differed from either the older or the newer nobility of Rome, and also from the older nobilities of the medieval Italian cjties. Nowhere else did nobility so distinctly rise out of wealth, and that wealth gained

by commerce. In the original island territory of Venice there could be no such thing as landed property. The agricultural plebeian of old Rome and the feudal noble of contemporary Europe were both of them at Venice impossible characters. The Venetian nobility is an example of a nobility which gradually arose out of the mass of the people as certain families step by step drew all political power into their own hands. The plebs did not gather round the patres, neither were they conquered by the patres; the patres were developed by natural selection out of the plebs, or, more strictly, out of the ancient populus. The commune of Venice, the ancient style of the common-

wealth, changed into the seigniory of Venice. Political power was gradually confined to those whose forefathers had held political power. This was what the later nobility of Rome was always striving at, and what they did to a great extent practically establish. But, as the exclusive privileges of the nobility were never recognized by any legal or formal act, men like Gaius Marius would ever and anon thrust themselves in. The privileges which the Venetian nobility took to themselves were established by acts which, if not legal, were at least formal. The Roman nobility, resting wholly on sufferance, was overthrown by the ambition of one of its own members. The Venetian nobility, resting also in its beginnings on sufferance, but on sufferance which silently obtained the force of law, lasted as long as Venice remained a separate state.

The hereditary oligarchy of Venice was established by a series of changes which took place between the years 1297 and 1319. All of them together really go to make up the " Shutting of the Great Council," a name which is formally given to the act of the first of those years. In 117 2 the Great Council began as an elective body; it gradually ousted the popular assembly from all practical power. It was, as might be looked for, commonly filled by members of distinguished families, descendants of ancient magistrates, who were already beginning to be looked on as noble. The series of revolutions already spoken of first made descent from former councillors a necessary qualification for election to the council; then election was abolished, and the council consisted of all descendants of its existing members who had reached the age of twenty-five. Thus the optimates of Venice did what the optimates of Rome strove to do: they established a nobility whose one qualification was descent from those who had held office in past times' This is what the nobility of office, if left unchecked, naturally grows into. But the particular way in which oligarchy was finally established at Venice had some singular results. Some of the great families which were already looked on as noble were not represented in the council at the time of the shutting; of others some branches were represented and others not. These families and branches of families, however noble they might be in descent, were thus shut out from all the political privileges of nobility. When one branch of Curiae and a fa-mily was admitted and one shut out we have an the Great analogy to the patrician and plebeian Claudii, though Council ot th e distinction had come about in quite another way. en ce. ˆ n(j j n t k e Great Council itself we have the lively image of the aristocratic popular assembly of Rome, the assembly of the populus, that of the curiae, where every man of patrician birth had his place. The two institutions are the same, only the way in which they

came about is exactly opposite. The assembly of curiae at Rome, originally the democratic assembly of the original people, first grew into an aristocratic assembly, and then died out altogether as a new Roman people, with its own assembly, grew up by its side. It was a primitive institution which gradually changed its character by force of circumstances. It died out, supplanted by other and newer powers, when it became altogether unsuited to the times. The Great Council of Venice was anything but a primitive institution; it was the artificial institution of a late age, which grew at the expense of earlier institutions, of the prince on the one side and of the people on the other. But the two different roads led to the same result. The Great Council of Venice, the curiae of Rome, were each of them the assembly of a privileged class, an assembly in which every member of that class

had a right to a place, an assembly which might be called popular as far as the privileged class was concerned, though rigidly oligarchic as regarded the excluded classes. But, close as the likeness is, it is merely a superficial likeness, because it is the result of opposite causes working in opposite directions. It is like two men who are both for a moment in the same place, though their faces are turned in opposite ways. If the later nobilitas of Rome had established an assembly in which every one who had the jus imaginum had a vote and none other, that would have been a real parallel to the shutting of the Venetian Great Council; for it would have come about through the working of causes which are essentially the same.

The nobility which was thus formed at Venice is the very model of a civic nobility, a nobility which is also an aristocracy. In a monarchy, despotic or constitutional, there _,. cannot in strictness be an aristocracy, because the no biuty ot whole political power cannot be vested in the noble Venice class. But in the Venetian commonwealth the nobility **"d** "**»• was a real aristocracy. All political power was vested cracy ' in the noble class; the prince sank to a magistrate, keeping only some of the outward forms of sovereignty; the mass of the people were shut out altogether. And, if no government on earth ever fully carried out the literal meaning of aristocracy as the rule of the best, these civic nobilities come nearer to it than any other form of government. They do really seem to engender a kind of hereditary capacity in their members. Less favourable than either monarchy or democracy to the growth of occasional great men, they are more favourable than either to the constant supply of a succession of able men, qualified to carry on the work of government. Their weak point lies in their necessary conservatism; they cannot advance and adapt themselves to changed circumstances, as either monarchy or

democracy can. When, therefore, their goodness is gone, their corruption becomes worse than the corruption of either of the other forms of government.

All this is signally shown in the history both of Venice and of other aristocratic cities. But we are concerned with them now only as instances of one form of nobility. The civic aristocracies did not all arise in the same way. Venice c,vlc is the best type of one way in which they rose; but crade's. it is by no means the only way. In not a few of the Italian cities nobility had an origin and ran a course quite unlike the origin and the course which were its lot at Venice. The nobles of many cities were simply the nobles of the surrounding country changed, sometimes greatly against their will, into citizens. Such a nobility differed far more widely from either the Roman or the Venetian patriciate than they differed from one another. It wanted the element of legality, or at least of formality, which distinguished both these bodies. The privileges of the Roman patriciate, whatever we may caE them, were not usurpations; and, if we call the privileges of the Venetian nobility usurpations, they were stealthy and peaceful usurpa- tions, founded on something other than mere violence. But in many Italian cities the position of the nobles, if it did not begin irf violence, was maintained by violence, and was often over- thrown by violence. They remained, in short, as unruly and isolated within the walls of the cities as they had ever been without. A nobility of this kind often gave way to a democracy which either proved as turbulent as itself, or else grew into an oligarchy ruling under democratic forms. Thus at Florence the old nobles became the opposite to a privileged class. The process which at Rome gradually gave the plebeian a political advantage over the patrician was carried at Florence to a far greater length at a single blow. The whole noble order was disfranchised; to be noble was equivalent to being shut out from public office. But something like a new nobility presently grew up among the commons themselves; there were popolani grossi at Florence just as there were noble plebeians at Rome. Only the Roman commons, great and small, never shut out the patricians from office; they were satisfied to share office with them. In short, the shutting out of the old nobility was, if not the formation of a new nobility, at least the formation of a

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new privileged class. For a certain class of citizens to be con- demned, by virtue of their birth, to political disfranchisement is as flatly against every principle of democracy as for a certain class of citizens to enjoy exclusive rights by reason of birth. The Florentine democracy was, in truth, rather to be called an oligarchy, if we accept the best definition of democracy (see Thucydides vi. 39), namely, that it is the rule of the whole, while oligarchy is the rule of a part only.

It is in these aristocractic cities, of which Venice was the most fully developed model, that we can best see what nobility really is. It is in these only that we can see nobility in its purest form — nobility to which no man can rise and from which no man can come down except by the will of the noble class itself. In a monarchy, where the king can ennoble, this ideal cannot be kept. Nor could it be kept in the later nobility of Rome. The new man had much to strive against, but he could some- times thrust himself through, and when he did his descendants had their jus imaginum. But at Venice neither prince nor people could open the door of the Great Council; only the Great Council itself could do that. That in the better times of the aristocracy nobility was not uncommonly granted to worthy persons, that in its worse times it was more commonly sold to unworthy persons, was the affair of the aristocratic body itself. That body, at all events, could not be degraded save by its own act. But these grants and sales led to distinctions within the ranks of the noble order, like those of which we get faint glimpses among the Roman patricians. The ducal dignity rarely passed out of a circle of specially old and distinguished families. But this has often been the case with the high magistracies of commonwealths whose constitutions were purely democratic.

From this purest type of nobility, as seen in the aristocratic commonwealths, we may pass to nobility as seen in states of greater extent — that is, for the most part in monarchies. There are two marked differences between the two. They are differences which seem to be inherent in the difference between a republic and a monarchy, but which it would be truer to say are inherent in the difference between a body of men packed close together within the walls of a city and a body of men — if we can call them a body — scattered over a wide territory. The member of a civic nobility is more than a member of an order; he is a member of a corpora- tion; he has no powers, he has hardly any being, apart from the body of which he is a member. He has a vote in making the laws or in choosing those who make them; but when they are made he is, if anything, more strictly bound by them than the citizen of the non-privileged order. To be a fraction of the corporate sovereign, if it had its gains, had also its disadvantages; the Venetian noble was fettered by burthens,

restrictions and suspicions from which the Venetian citizen was free. The noble of the large country, on the other hand, the rural noble, as he commonly will be, is a member of an order, but he is hardly a member of a corporation; he is isolated; he acts apart from the rest of the body and wins powers for himself apart from the rest of the body. He shows a tendency — a tendency whose growth will be more or less checked according to the strength of the central power — to grow into something of a lord or even a prince on his own account, a growth which may advance to the scale of a German elector or stop at that of an English lord of a manor. Now many of these tendencies were carried into those Italian cities where the civic nobility was a half-tamed country nobility; but they have no place in the true civic aristocracies. Let us take one typical example. In many parts of western Europe the right of private war- long remained the privilege of every noble, as it had once been the privilege of every freeman. And in some Italian cities, the right, or at least the privilege, of private war was continued within the city walls. But no power of imagination can conceive an acknow- ledged right of private war in Rome, Venice or Bern.

The other point of difference is that, whatever we take for the origin and the definition of nobility, in most countries it became something that could be given from outside, without the need of any consent on the part of the noble class itself.

In other words, the king or other prince can ennoble. We have seen how much this takes away from the true notion of nobility as understood in the aristocratic commonwealths. The nobility is no longer all-powerful; it may be constrained to admit within its own body members for whose presence it has no wish. Where this power exists the nobility is no longer in any strictness an aristocracy; it may have great privileges, great influence, even great legal powers, but it is not the real ruling body, like the true aristocracy of Venice.

In the modern states of western Europe the existing nobility seems to have for the most part had its origin in personal service to the prince. And this nobility by personal service Nobilities seems commonly to have supplanted an older nobility, i a early the origin of which was, in some cases at least, strictly Western immemorial. In this way the later nobility of the Buro t >e ‘ thegns was in England substituted for the older nobility of the eorls. Now the analogy between this change and the change from the Roman patriciate to the later Roman nobilitas is obvious. In both cases the older nobility gives way to a newer; and in both cases the newer nobility was a nobility of office. Under a kingly government office bestowed by the sovereign holds the same place

which office bestowed by the people holds in a popular government. This new nobility of office supplanted, or perhaps rather absorbed, the older nobility, just as the later nobilitas of Rome supplanted or absorbed the old patriciate. In our first glimpse of Teutonic institutions, as given us by Tacitus, this older nobility appears as strictly immemorial (see Waitz, Deutsche Verfassungsgeschichle, i. 185 sq.), and its immemorial character appears also in the well-known legend in the Rigsmal-saga of the separate creation of jarl, karl and thrall. These represent the three classes of mankind according to old Teutonic ideas — the noble, the simple freeman and the bondman. The kingly house, where there is one, is not a distinct class; it is simply the noblest of the noble. For, as almost everywhere else, this Teutonic nobility admits of degrees, though it is yet harder to say in what the degrees of nobility consisted than to say in what nobility consisted itself. The older nobility is independent of the possession of land; it is independent of office about the sovereign; it is hard to say what were the powers and privileges attached to it ; but of its existence there is no doubt. But in no part of Europe can the existing nobility trace itself to this immemorial nobility of primitive days; the nobility of medieval and modern days springs from the later nobility of office. The nobles of modern Europe are rather thegnas than eorlas. The eorl of the old system would doubtless commonly become a thegn under the new, as the Roman patrician took his place in the new nobilitas-. but others could take their place there also. The Old-English laws point out ways by which the churl might rise to thegn's rank, and in the centuries during which the change went on we find mention — complaining mention — both in England and elsewhere, at the court of Charles the Simple and at the court of ˆEthelred, of the rise of new men to posts of authority. The story that Earl Godwine himself was of churlish birth, whether true or false, marks the possibility of such a rise. A still wilder tale spoke of Hugh Capet as the son of a butcher of Paris. Stories like these prove even more than the real rise of Hagano and Eadric. In England the nobility of the thegns was to a great extent personally displaced, so to speak, by the results of the Norman Conquest. But the idea of nobility did not greatly change. The English thegn sometimes yielded to, sometimes changed into, the Norman baron, using that word in its widest sense, without any violent alteration in his position. The notion of holding land of the king became more prominent than the notion of personal service done to the king; but, as the land was held by the tenure of personal service, the actual relation hardly changed. But the connexion between nobility and the holding of land comes out in the practice by which the lord so constantly took the name of his lordship. It is in this way that the prefixes de and von, descriptions in themselves essentially

local, have become in other lands badges of nobility. This notion has died, out in England by the dropping of the

England.

preposition; but it long lived on wherever Latin or French was used. And before long nobility won for itself a distinguishing outward badge. The device of hereditary coat-armour, a growth of the 1 2 th century, did much to define and mark out the noble class throughout Europe. As it could be acquired by grant of the sovereign, and as, when once acquired, it went on from generation to generation, it answers exactly to the jus imaginum at Rome, the hereditary badge of nobility conferred by the election of the people. Those who possessed the right of coat- armour by immemorial use, or by grant in regular form, formed the class of nobility or gentry, words which, it must again be remembered, are strictly of the same meaning. They held whatever privileges or advantages have attached in different times and places to the rank of nobility or gentry. In England indeed a variety of causes hindered nobility or gentry from ever obtaining the importance which they obtained, for instance, in France: But perhaps no cause was more important than the growth of the peerage. That institution at once set up a new standard of nobility, a new form of the nobility of office. The peer — in strictness, the peer in his own person only, not even his children— became the only noble ; the ideas of nobility and gentry thus became divorced in a way in which they are not in any other country. Those who would elsewhere have been counted as the nobility, the bearers of coat-armour by good right, were hindered from forming a class holding any substantial privilege. In a word, the growth of the peerage hindered the existence in England of any nobility in the continental sense of the word. The esquires, knights, lesser barons, even the remote descendants of peers, that is, the noblesse of other countries, in England remained gentlemen, but not noblemen — simple commoners, that is, without legal advantage over their fellow- commoners who had no jus imaginum to boast of. There can be no doubt that the class in England which answers to the noblesse of other lands is the class that bears coat-armour, the gentry strictly so called. 1 Had they been able to establish and to maintain any kind of privilege, even that of mere honorary precedence, they would exactly answer to continental nobility. That coat-armour has been lavishly granted and often assumed without right, that the word ” gentleman ” has acquired

various secondary senses, proves nothing; that is the natural result of a state of things in which the status of gentry carries with it no legal advantage, and yet is eagerly sought after on social grounds. If coat-armour, and thereby the rank of gentry, has been lavishly granted, some may think that the rank of peerage has often been lavishly granted also. In short, there is no real nobility in England; for the class which answers to foreign nobility has so long ceased to have any practical privileges that it has long ceased to be looked on as a nobility, and the word nobility has been transferred to another class which has nothing answering to it out of the three British kingdoms. 2 This last

1 This statement is mainly interesting as expressing the late Professor Freeman's view; it is, however, open to serious criticism. Coat-armour was in itself not necessarily a badge of nobility at all ; it could be, and was, worn by people having no pretensions to be " gentlemen," and this is true both of England and the continent. In its origin it was a mere personal mark of distinction, in the primary sense of this word. No " grant " was necessary; it was assumed by all and sundry who had occasion to use it, though a reasonable convention forbade one man to assume the device of another. Later arose the custom of granting arms as a mark of personal favour or gratitude. This again was not at the outset an exclusive right of the crown; it was common for a leader in battle to grant to some one not of his family, who had specially distinguished himself, the right to bear the whole or part of his coat of arms, differenced or undifferenced. On the other hand, many undoubted " gentlemen " never assumed arms at all. The claim of the heralds to make " gentry " depend on the bearing of coat-armour, and the right to this depend on grant or recognition by themselves as officers of the crown, is of comparatively late growth. See further the article Gentleman. — W. A. P.

2 Compare e.g. the social conditions of Great Britain and Germany. In Germany there are two classes of nobility: (1) the hoher Adel, members of the mediatized, formerly sovereign families, who rank as the equals in blood (ebenbiirtig) of the royal houses of Europe; (2) the niederer Adel, to which every one having the nobiliary prefix von belongs. In England " presentation at court " is the privilege of no particular class as such; and the wives of ministers of the

France.

class in strictness takes in only the peers personally; at the outside it cannot be stretched beyond those of their children and grandchildren who bear the courtesy titles of lord and lady. No attempt has been

here made to trace out the history of nobility in the various countries and, we must add, cities of Europe. All that has been attempted has been to point out some general truths, and to refer to some specially striking instances. Once more, it must be borne in mind that, while it is essential to the idea of nobility that it should carry with it some hereditary privilege, the nature and extent of that privilege may vary endlessly. In the 18th century the nobility of France and the nobility of Poland alike answered to the very strictest definition of nobility; but the political positions of the two were as broadly contrasted as the positions of any two classes of men could be. The nobility of France, keeping the most oppressive social and personal privileges, had been shorn of all political and even administrative power; the tyrants of the people were the slaves of the king. In Poland sixty thousand gentlemen, rich and poor, famous and obscure, but all alike gentlemen, rode out to choose a king by a unanimous vote, and to bind him when chosen by such conditions as they thought good. Those sixty thousand, like the populus of Rome, formed a narrow oligarchy as regarded the rest of the nation, but a wild democracy among themselves. Poland, in short, came nearer than any kingdom or country of large extent to the nature of an aristocracy, as we have seen aristocracy in the aristocratic cities. The chief power of the state was placed neither in the prince nor in the nation at large; it was held by a noble class. The kingly power in Poland, like the ducal power at Venice, had been so narrowed that Poland, though she still kept a king, called herself a republic no less than Venice. And whatever was taken from the king went to the gain of the noble order. But the nobility of a large country, even though used to act politically as an order, could never put on that orderly and legal character which distinguishes the true civic patriciates. It never could come so nearly as a civic patriciate could to being something like the rule of the best in any sense of those words.

The tendency of modern times has been towards the breaking down of formal hereditary privileges. In modern common- wealths, above all, they have been thought to be essentially inconsistent with republican institutions. The truth of the matter is rather that the circumstances of most modern common- wealths have been unfavourable to the preservation, and still more to the growth, of privileged bodies. Where they existed, as in Switzerland, they have been overthrown. Where they did not exist, as in America, everything has made it more and more impossible that they should arise. And, as modern changes have commonly attacked the power both of kings and of nobles, the common notion has come that kingship and nobility have some necessary connexion. It has seemed as if any form of nobility was

inconsistent with a republican form of government, while nobility, in some shape or other, has come to be looked on as a natural, if not a necessaiy, appendage to a monarchy. And as far as regards the social side of kingship this is true. A court seems more natural where a chain of degrees leads gradually up from the lowest subject to the throne than when all beneath the throne are nearly on a level. And from one point of view, that from which the kingly house is but the noblest of the noble, kingship and nobility are closely allied. But in the more strictly

crown, even if of quite humble origin, are ” commanded ” to court functions with their husbands. The strictness of the principle of admission or exclusion differs at the various German courts, and has tended to be modified by the growth of a new aristocracy of wealth ; but a single instance known to the present writer may serve to illustrate the fundamental divergence, of German (a fortiori Austrian) ideas from English in this matter. A wealthy publisher of European reputation attended the court of his native town, the capital of a small grand-duchy, in virtue of the honorary title Hofrat; his wife, not being noble, did not accompany him. His elder daughter married a cabinet minister, but, as he was not a noble, this did not confer on her the right to go to court. His younger daughter married a sub- altern in a line regiment, belonging to the lesser nobility; as en- nobled by marriage (according to the liberal rule of this particular court), she was duly ” presented.” — W. A. P.

political view monarchy and nobility are strongly opposed. Even the modified form of absolute monarchy which has existed in some Western countries, while it preserves, perhaps even strengthens, the social position of a nobility, destroys its political power. Under the fully-developed despotisms of the East a real nobility is impossible; the prince raises and thrusts down as he pleases. It is only in a commonwealth that a nobility can really rule; that is, it is only in a commonwealth that the nobility can really be an aristocracy. And even in a democratic common- wealth the sentiment of nobility may exist, though all legal privilege has been abolished or has never existed. That is to say, traditional feeling may give the members of certain families a strong preference, to say the least, in election to office. We have seen that this was the case at Athens; it was largely the case in the democratic cantons of Switzerland; indeed the nobility of Rome itself, after the privileges of the patricians were abolished,

rested on no other foundation. (E. A. F.)

Authorities. — Selden's Titles of Honor (London, 1672) remains the best comparative account in the English language of the nobility of various countries up to his date. For England see E. P. Shirley, Noble and Gentle Men (i860) ; Gneist, Adel und Ritterschafi in England (Berlin, 1853); Sir George Sitwell, "The English Gentleman," in the Ancestor (No. I, April 1902); and J. H. Round's works, passim. A. C. Fox-Davies's Armorial Families (Edinburgh, 1895, and subse- quent editions) represents an unhistorical attempt to create the idea of a noblesse in the United Kingdom. For -the origin and growth of the nobility in France, see A. Luchaire, Manuel des institutions francaises (Paris, 1892), and P. Guilhiermoz, Essai sur Vorigine de la noblesse en France au moyen dee (1902); for their later status and privileges, A. de Tocqueville, L Ancien Regime et la Revolution (l8§6 ff.), and H. A. Taine, Les Origines de la France contemporaine, pt. 1., V Ancien Regime (1875 ff.). For the German and Austrian nobility, see v. Strantz, Gesch. des deutschen Adels (2nd ed., Waldenburg, 1851); von Maurer, Vber das Wesen des altesten Adels der deutschen Stdmme (Munich, 1846); Rose, Der Adel Deutschlands und seine Stellung im deutschen Reich (Berlin, 1883); G. Meyer. Lehrbuch des deutschen Staatsrechts (5th ed., Leipzig, 1899), and the Gotha Genealogische Taschenbilcher . For the Italian nobility see the eight magnificent folio volumes of Count Pompeo Litta, Celebri famiglie italiane, continued by various editors (Milan, 1819-1907); for Spanish, Fernandez de Bethencourt, Hist, genealogica, t. i.vii. (1897 1907). The authoritative manual for the royal houses and the " higher nobility " of Europe is the Almanach de Gotha, published yearly. See also the articles Titles of Honour, Peerage, Feudal- ism, Gentleman, Duke, Count, &c.

NOBLE, SIR ANDREW (1832-), British physicist and artillerist, was born at Greenock on the 15th of September 1832, and was educated at Edinburgh Academy and at the Royal Military Academy, Woolwich. In 1849 he entered the Royal Artillery, attaining the rank of captain in 1855, and in 1857 he became secretary to the Royal Artillery Institution. About this time the question of the supersession of the old smooth-bores by rifled guns was coming to the fore, and on the appcintment of the Select Committee on Rifled Cannon in 1858 to report on the matter, he was chosen its secretary, a capacity in which he devised an ingenious method for comparing the probable accuracy of the shooting attainable with each type of gun. In 1859 he was appointed Assistant-Inspector of Artillery, and in the following year he became a member of the Ordnance Select Committee and of the Committee on Explosives, serving on the latter for twenty years, until its dissolution. About the same time he was prevailed upon by Sir

William, afterwards Lord, Armstrong to leave the public service and take up a post at Elswick. Here, in the first instance, he was put in charge of the ordnance department, but it was not long before his organiz- ing and administrative ability and scientific attainments enlarged the sphere of his influence, until finally he became chairman of the company. Immediately on his appointment he began a systematic investigation of the phenomena which occur when a gun is fired, some of his first experiments being designed to discover with accuracy the pressures attained in the largest guns of that time. About 1862 he invented his chronoscope for the measurement of exceedingly small intervals of time, and began to apply it in ballistic experiments for ascertaining the velocity with which the shot moves along the barrel of a gun with different powders and different charges. Then he joined Sir Frederick Abel in a classical research on " Fired Gunpowder,"

the experimental work being largely carried on at Elswick, and the conclusions they arrived at had a great effect on the progress of gunnery, for they showed how increased muzzle velocities were to be attained without increased pressures in the gun. These inquiries, in fact, enabled Elswick in 1877 to turn out the 6-in. and 8-in. guns, with velocities of over 2000 ft. per second, that obliged the British government finally to give up the antiquated muzzle-loaders to which it had so obstinately adhered. Later, when the era of nitro or " smokeless " powders had begun, Captain Noble was an early advocate of their advantages, and when at length the British government awoke to the necessity of selecting a powder of that character for the naval and military services of Great Britain, Elswick extended its hospitality to the committee that invented cordite, and gave the members facilities, which were not offered by the government, for the necessary experimental work. Even after the powder was in- vented and the committee dissolved, inquiries' — which it was nobody's official business to make, and which therefore were not made officially — were continued at Elswick to ascertain how by suitable modifications in form, composition, &c, cordite might the better perform the varied duties required of it. Noble became a member of the committee appointed in 1900 by Lord Lansdowne to consider, among other things, the excessive erosion alleged by some of the powder's critics to be produced by it in the barrels of the guns in which it is used. He was made C.B. in 1881, promoted to be K.C.B. in 1893, and was created a baronet among the Coronation honours in 1002; he was also the recipient of many foreign decorations and scientific honours, including a Royal medal from the Royal Society in 1880, and the Albert medal of the Society of Arts in 1909. He published a number of

his scientific papers in a collected form as Artillery and Explosives in 1906.

NOBLESVILLE, a city and the county-seat of Hamilton county, Indiana, U.S.A., on the White river, about 20 m. N. by E. of Indianapolis. Pop. (1890) 3054; (1900) 4792 (226 ne- groes); (1910) 5073. It is served by the Lake Erie & Western, the Central Indiana and the Indiana Union (electric) Traction railways. It is in the natural gas region of the state, and has various manufactures. It was settled about 1825 and incor- porated as a town in 1851.

NOCERA INFERIORE, formerly Nocera dei Pagani (anc. Nuceria Alfaterna, q.v.), a town and episcopal see of Campania, Italy, in the province of Salerno, at the foot of Monte Albino, 23 m. E.S.E. of Naples by rail, 135 ft. above sea-level. Pop. (1901) 11,933 (town); 20,064 (commune). Nocera is connected with Codola on the line from Naples to Avellino by a branch railway (3 m.). In the old castle Helena, the widow of Manfred, died after the battle of Benevento, and here Urban VI. imprisoned the cardinals who favoured the antipope Clement VII. Two miles to the E. near the village of Nocera Superiore is the circular church of Sta Maria Maggiore, dating from the 4th century. Its chief feature is its dome, ceiled with stone internally, but covered externally with a false roof. It is supported by 40 ancient columns, and in its construction resembles S Stefano Rotondo in Rome. The walls are covered with frescoes of the 14th century, At an early date the city became an episcopal see, and in the 1 2th century it sided with Innocent II. against Roger of Sicily, and suffered severely for its choice. A colony of Saracens introduced by Frederick II. probably gave rise to the epithet (" of the pagans ") by which it was so long distinguished, as well as to the town of Pagani, which lies about 1 m. to the west. In 1385 Pope Urban VI. was besieged in the castle of Charles of Durazzo. Nocera was the birthplace of Solimena the painter and of Hugo de' Pagani, the founder of the Templars; and in the list of its bishops appears the name of Paulus Jovius.

NOCERA UMBRA (anc. Nuceria Camellaria), a town and episcopal see in the province of Perugia, Italy, 12 m. by rail N. by E. of Foligno, 1706 ft. above sea-level. Pop. (1901) 5685 (town), 7848 (commune). It has some old churches, containing pictures and frescoes; in the cathedral is a large altarpiece by Nicolo Alunno. Three miles to the south-east of the town are mineral springs.

NOCTURN, or Nocturne (Lat. nocturnus, of or belonging to the night, nox), in the Roman Church, one of the three divisions of the office of matins, corresponding with the vigils, beginning at 9 p.m. midnight and 3 a.m. respectively. The service consists of psalms, lessons and antiphons (see Breviary). The term ” nocturne ” is applied to a musical composition, answering to the earlier ” serenade, ” of a quiet, dreamy and romantic character. The name and style are said to have originated with John Field (1 782-1837). The best-known compositions of this kind are the pianoforte pieces of Chopin. J. McNeill Whistler also introduced the term into painting by using the name for some of his night-pieces. A ” nocturnal ” is an instrument for finding the hour of the night by observation of the relative positions of the pole-star and other stars, generally the pointers of Ursa Major. The British Museum contains a fine nocturnal made about 1560 by Humfray Cole (see Navigation).

NODDY, the name applied, originally by sailors, to a sea-bird, from its showing so little fear of man as to be accounted stupid. It is the Sterna stolida of Linnaeus, and the Anous stolidus of modern ornithology, having the figure of a Tern (q.v.), and belonging to the sub-family Sterninae, but is heavier in flight, with shorter wings and the tail less deeply forked. The plumage is of a uniform sooty hue, excepting the crown of the head, which is light grey. The Noddy is very generally distributed throughout the tropical or nearly tropical oceans, but occasionally wanders into colder climates, and has been met with even in the Irish Sea. It breeds, often in astounding numbers, on low cays and coral- islets, commonly making a shallow nest of sea-weed or small twigs. Howard Saunders (Proc. Zool. Society, 1876, pp. 669-672) admits four other species of the genus: Anous tenuirostris, supposed to be confined to the southern part of the Indian Ocean, from Madagascar to West Australia; A. melanogenys, often con-founded with the last, but having nearly as wide a range as the first; and A. leucocapillus, hitherto known only from Torres Strait and the Southern Pacific. These three have much resemblance to A. stolidus, but are smaller in size, and the two latter have the crown white instead of grey. The fourth species, A. caeruleus (with which he includes the A. cinereus of some authors), differs not inconsiderably, being of a dove-colour, lighter on the head and darker on the back, the wings bearing a narrow white bar, with their quill-feathers blackish-brown, while the feet are reddish and the webs yellow. Three more species — A. superciliosus from the Caribbean Sea and Gulf of Mexico, A. plumbeigularis from the Red Sea, and A. galapagensis from the Galapagos — have been added by R. Bowdler Sharpe (Philos. Transactions, clxviii. pp. 468, 469), according to whom (Proc. Zool.

Society, 1878, p. 272) A. cinereus of the Eastern Pacific is distinct from A. caeruleus of Australia and the Western Pacific. (A. N.)

NODE (Lat. nodus, a loop), ih astronomy, one of two opposite points at which a heavenly body passes through the principal co-ordinate plane to which its motion is referred. In the case of the heavenly bodies this plane is commonly that of the ecliptic, but, in special cases, the plane through the origin parallel to the earth's equator or the plane of a planet's orbit is used. The ascending node is that at which the body moves from the south or negative towards the north or positive side of the plane. The moon's nodes are the points in which its path intercepts the plane of the ecliptic. In the geometry of curves, a node is the name given to the loop formed by a continuous curve crossing itself, the point of crossing is termed a " double point," and at it there are two non-coincident tangents to the curve; the remaining species of double points, termed " acnode," " spinode " or " cusp," admits of two coincident tangents (see Curve).

NODIER, CHARLES (1780-1844), French author, was born on the 29th of April 1780 at Besancon. His father, on the out- break of the Revolution, was appointed mayor of Besancon and consequently chief police magistrate; he seems to have rather lent himself as an instrument to the tyranny of the Jacobins than to have shared their principles; but his son was for a time an ardent citizen, and is said to have been a club member when he could at the most have been twelve years old. In 1793 Charles

saved the life of a lady guilty of sending money to an emigre, by declaring to his father that if she were condemned he would take his own life. He was sent to Strassburg, where he lived in the house of Eulogius Schneider, the notorious Jacobin governor of Alsace, but a good Greek scholar. During the Terror his father put him under the care of Girod de Chautrans, with whom he studied English and German. His love of books began very early, and he combined with it a strong interest in natural science. He became librarian in his native town, but his exertions in the cause of suspected persons brought him under suspicion. An inspection of his papers by the police, however, revealed nothing more dangerous than a dissertation on the antennae of insects. Entomology continued to be a favourite study with him, but he varied it with philology and pure literature and even political writing. For a skit on Napoleon, in 1803, he was im- prisoned for some months. He then quitted Paris, whither he had gone after losing his position at Besancon, and for some years lived a very unsettled life at Besancon, D61e, where he married, and in other places in the Jura. During these wander- ings he wrote Le Peintre de Salzbourg, journal

des Amotions d'un cmur souffrant, suivi des Meditations du clottre (1803). The hero, Charles, who is a variation of the Werther type, desires the restoration of the monasteries, to afford a refuge from the woes of the world. In 181 1 Nodier appears at Laibach as editor of a polyglot journal, the Illyrian Telegraph, published in French, German, Italian and Slav. On the evacuation of the Illyrian provinces he returned to Paris, and the restoration found him a royalist, though he retained something of republican sentiment. In 1824 he was appointed to the librarianship of the Bibliotheque de 1′ Arsenal. He was elected a member of the Academy in 1833, and made a member of the Legion of Honour in 1843, a year before his death on the 27th of January 1844. These twenty years at the arsenal were by far the most important and fruitful of Nodier's life. He had much of the Bohemian in his composition. But he had the advantage of a settled home in which to collect and study rare books; and he was able to supply a centre and rallying place to a knot of young literary men of greater individual talent than himself — the so-called Romanticists of 1830 — and to colour their tastes and work very decidedly with his own predilections. Victor Hugo, Alfred de. Musset and Sainte-Beuve all acknowledged their obligations to him. He was a passionate admirer of Goethe and of Shakespeare, and had himself con- tributed to the personal literature that was one of the leading traits of the Romantic school.

His best and most characteristic work, some of which is exquisite in its kind, consists partly of short tales of a more or less fantastic character, partly of nondescript articles, half bibliographic, half narrative, the nearest analogue to which in English is to be found in some of the papers of De Quincey. The best examples of the latter are to be found in the volume entitled Melanges tires d'une petite bibliotheque, published in 1829 and afterwards continued. Of his tales the best are Smarra, ou les demons de la nuit (1821); Trilby, ou le lutin d'Argail (1822); Histoire du roi de Bohime et de ses sept chdteaux (1830); La F&e aux miettes (1832);' Ines de las Sierras (1838); Legende se Soeur Beatrix (1838), together with some fairy stories published in the year of his death, and Franciscus Columna, which appeared after it. The Souvenirs de jeunesse (1832) are interesting but untrustworthy, and the Dictionnaire universel de la langue francaise (1823), which, in the days before Littrfi, was one of the most useful of its kind, is said to have been not wholly or mainly Nodier's. There is a so-called collection of CEuvres completes, in 12 vols. (1832), but at that time much of the author's best work had not appeared, and it included but a part of what was actually published. Nodier found an indulgent biographer in Prosper Merimee on the occasion of the younger man's

admission to the academy.

An account of his share in the Romantic movement is to be found in Georg Brandes's Main Currents in Nineteenth Century Literature. His Description raisonnee d'une jolie collection de livres (1844), which is a catalogue of the books in his library, contains a life by Francis Wey and a complete bibliography of his numerous works. See also Sainte-Beuve, Portraits litte'raires , vol. ii.; Prosper Merimee, Portraits historiques et litteraires (1874); and A. Estignard, Correspondance inHite de Charles Nodier, 1796-1844 (1876), containing his letters to Charles Weiss.

NOEGGERATH, JOHANN JACOB (1788-1877), German mineralogist and geologist, was born at Bonn on the 10th of

October 1788. In 1814-1815 he became commissioner of mines for some of the Rhine Provinces, and in 1818 professor of minera- logy and afterwards professor of geology, director of the Museum of Natural History and chief of the mining department in the university at Bonn. He obtained a very fine collection of minerals for the museum, was eminently successful as a teacher, and achieved a wide reputation among mining engineers. The following are his more important publications: Uber aufrecht im Gebirgsgestein eingeschlossene fossile Baumstdmme und andere Vegetabilien (1819-1821); Das Gebirge in Rheinland-Westphalen, nach mineralogischem und chetnischem Bezuge (4 vols., 1822-1826) ; Die Entstehung der Erde (1843); and Der Laacher See und seine vulkanischen Umgebungen (1870). The Carboniferous plant Noeggerathia, allied to the Zamias and Cycads, was named after him. He died at Bonn on the 13th of September 1877.

NOEL, RODEN BERKELEY WRIOTHESLEY (1834-1894), English poet, son of Noel, Lord Barham, afterwards earl of Gainsborough, was born on the 27th of August 1834. He was educated at Trinity College, Cambridge, where he graduated M.A. in 1858. He then spent two years travelling in the East. He married in 1863 Alice de Broe, daughter of the director of the Ottoman Bank in Beirout. The third child of this marriage, Eric, who died at the age of five, is commemorated in Roden Noel's best-known book of verse, A Little Child's Monument (1881). His other volumes are Behind the Veil, and other Poems (1863), not included in his collected works, Beatrice, and

other Poems (1868), The Red Flag (1872), Livingstone in Africa (1874), Songs of the Heights and Deeps (1885), A Modern Faust, and other Poems (1888), Poor People's Christmas (1890) and My Sea, and other Poems (1896). Roden Noel's versification was unequal and sometimes harsh, but he has a genuine feeling for nature, and the work is permeated by philosophic thought. The latter part of his life was spent at Brighton, but he died at Mainz, on the 26th of May 1894. His other works include a drama in verse, The House of Ravensburg (1877), a Life of Byron (1890, " Great Writers " series), a selection of Thomas Otway's plays (1888) for the " Mermaid " series, and critical papers on literature and philosophy.

His Collected Poems were edited (1902) by his sister, Victoria Buxton, with a notice by J. Addington Symonds, which had origin- ally appeared in the Academy (19th of Jan. 1899) as a review of The Modern Faust. The selection (1892) in the series of Canterbury Poets has an introduction by Robert Buchanan.

NOETUS, a presbyter of the church of Asia Minor about a.d. 230, was a native of Smyrna, where (or perhaps in Ephesus) he became a prominent representative of the particular type of Christology now called modalistic monarchianism or patri- passianism. His views, which led to his excommunication from the Asiatic Church, are known chiefly through the writings of Hippolytus, his contemporary at Rome, where he settled andhad a large following. He accepted the fourth Gospel, but regarded its statements about the Logos as allegorical. His disciple Cleomenes held that God is both invisible and visible; as visible He is the Son.

NOGARET, GUILLAUME DE (d. 1313), councillor and keeper of the seal to Philip IV. of France, was born between 1260 and 1270. His father was a citizen of Toulouse, and was, so it was claimed, condemned as a heretic during the Albigensian crusade. The family held a small ancestral property of servile origin at Nogaret, near Saint Felix de Caramon, from which it took its name. In 1291 Guillaume was professor of jurisprudence at the university of Montpellier, and in 1296 he became a member of the Curia Regis at Paris. His name is mainly connected with the quarrel of Philip IV. with Pope Boniface VIII. In 1300 he was sent with an embassy to Boniface, of which he has left a pic- turesque but highly coloured account. His real ascendancy over the king dates from February 1303, when he persuaded Philip to consent to the bold plan of seizing Boniface and bringing him forcibly from Italy to a council in France which should depose him. On the 7th of March he received, with three others, a secret commission from the royal chancery to " go to certain places . .

. and make such treaties with such persons as seemed good to them," On the 1 2th of March a solemn royal assembly

was held in the Louvre, at which Guillaume de Nogaret read a long series of accusations against Boniface and demanded the calling of a general council to try him. Soon afterwards he went to Italy. By the aid of a Florentine spy, Nogaret gathered a band of adventurers and of enemies of the Gaetani (Boniface's family) in the Apennines. The great Colonna house, at bitter feud with the Gaetani, was his strongest ally, and Sciarra Colonna accompanied Nogaret to Anagni, Boniface's birthplace. On the 7th of September, with their band of some sixteen hundred men, Nogaret and Colonna surprised the little town. Boniface was taken prisoner. Sciarra wished to kill him, but Nogaret 's policy was to take him to France and compel him to summon a general council. The tide soon turned, however. On the 9th a concerted rising of the townsmen in Boniface's favour put Nogaret and his allies to flight, and the pope was free. His death at Rome on the nth of October saved Nogaret. The election of the timid Benedict XL was the beginning of that triumph of France which lasted through the Avignon captivity. Early in 1304 Nogaret went to Languedoc to report to Philip IV., and was rewarded by gifts of land and money. Then he was sent back with an embassy to Benedict XL to demand absolution for all concerned in the struggle with Boniface VIII. Benedict refused to meet Nogaret, and excepted him from the general absolution which he granted on the 13th of May 1304, and on the 7th of June issued against him and his associates at Anagni the bull Flagitiosum scelus. Nogaret replied by apologies for his conduct based upon attacks upon the memory of Boniface, and when Benedict died on the 7th of July 1304 he pointed to his death as a witness to the justice of his cause. French influence was successful in getting a Frenchman, Bertrand de Got (Clement V.) elected as Benedict's successor. The threat of proceedings against the memory of Boniface was renewed to force Clement to absolve Nogaret, and Clement had given way on this point when the further question of an inquiry into the condition of the Templars was brought forward by Philip as a preliminary to their arrest and the seizure of their property in October 1307. Nogaret was active in getting the renegade members of the order to give evidence against their fellows, and the whole proceedings against them bear traces of his unscrupulous and merciless pen. Clement's weak and ineffective resistance to this still further delayed the agreement between him and Philip. Nogaret had become keeper of the seal this year in succession to Pierre de Belleperche. His talents as an adweatus diaboli were given still further employment in the trial of Guichard, bishop of Troyes, charged with various crimes, including witchcraft

and incon- tinence, which was begun in 1308 and lasted till 1313. The trial was a hint to Clement as to what might happen if the oft repeated threat of a trial of Boniface were fulfilled. Absolution was obtained from Clement on the 27th of April 13 n. Guillaume de Nogaret was to go on the next crusade and visit certain places of pilgrimage in France and Spain as a penance, but never did so. He died in 1313 ” with his tongue horribly thrust out,” according to the chronicler Jean Desnouelles. He retained the seals till his death and was occupied with the king’s affairs concerning Flanders as late as the end of March 13 13.

See E. Renan in Histoire litteraire de la France, xxvii. 233; R. Holzmann, Wilhelm von Nogaret (Freiburg, 1898). For the sources consult Dom Bouquet, Recueil de historiens des Gaules et de la France, vols, xx.-xxiii. ; Annates regis Edwardi primi in Rishanger (” Rolls ” series), pp. 483-491, which gives the fullest account of the affair at Anagni.

NOGENT-LE-ROTROU, a town of northern France, formerly capital of the district of Perche and now capital of an arrondisse- ment in the department of Eure-et-Loir on the Huisne, 38 m. W.S.W. of Chartres by rail. Pop. (1906) 6884. In the early part of the 17th century the overlordship was acquired by the duke of Sully, financial minister of Henry IV. In the courtyard of the hospital, originally founded at the end of the 12th century, there is a small building containing the tomb of Sully and his wife. On the hill overlooking the town stands the chateau of the counts of Perche, of which the donjon dating from the first half of the nth century is the oldest portion. To Rotrou I., founder of the chateau, the town owes the second part of its name.

Nogent preserves three Gothic churches and the remains of the old priory of St Denis, and there are statues of General St Pol, killed at Sevastopol, and of the poet Rimy Belleau (16th century), a native of the town. The town has a sub-prefecture, a tribunal of first instance, a communal college and institution for deaf mutes.

NOGENT-SUR-MARNE, a town of northern France, in the department of Seine, on a hill on the right bank of the Marne, 6 m. E. of Paris by rail. Pop. (1906) 11,463. The Eastern railway here crosses the Marne valley by a viaduct 875 yds. in length. Nogent has a Gothic church, with a tower of the Roman- esque period, in front of which there is a

monument to Watteau, who died here in 1721. Chemical products are manufactured. The fine situation of the town gained it the name of Beaute, and Charles V. built a chateau here (demolished in the 18th century) which was presented by Charles VII. to Agnes Sorel with the title of Dame de Beaute. An island in the Marne to the south of the town is still known as the lie de Beaute.

NOGENT-SUR-SEINE, a town of north-central France, capital of an arrondissement in the department of Aube, on the left bank of the Seine, 35 m. N.W. of Troyes on the Paris-Belfort line. Pop. (1906) 3791. The river at this point forms an island, which supports a stone bridge of the 17th century. The chief building is the church of St Laurent (1421-1554). A lateral portal in the flamboyant style and the Renaissance tower at the west end are of great beauty. The town is the seat of a sub- prefect and has a tribunal of first instance. There is trade in grain, flour, fodder, wood and cattle. Nogen-sur-Seine was in 1814 the scene of fighting between the French and Austrians.

NOGI, KITEN, Count (1849-), Japanese general, was born in Choshu. He commanded a brigade at the battle of Kinchow (1894) and the subsequent capture of Port Arthur from the Chinese; but the most memorable events of his career were the siege of Port Arthur by the third army corps of Japan under his command in the Russo-Japanese War (1904-5), and the great flanking march made by the same army in the battle of Mukden.

NOIRMOUTIER, an island of western France, belonging to the department of Vendee, and protecting the Bay of Bourgneuf on the south-west. Pop. (1906) 8388. The area amounts to 22 sq. m., one-sixth dunes. Between the island and the mainland is a sandbank laid bare at low water, and crossed by an embank- ment and carriage road some 23 m. long. It was not till about 1766 that it was found possible to walk across to the island, which lies from N.N.W. to S.S.E., and is 12 m. long, its breadth varying from 1 m. in the south part to 3 or 4 m. in the north. It appears to be formed of alluvial deposits gradually accumu- lated round a rock of no great size situated at the meeting-place of the Gascony and Brittany currents. Fishing, agriculture, oyster-breeding and work in the salt marshes also occupy the inhabitants. There are two communes, Noirmoutier and Barbatre. Noirmoutier, which has a small port, has about 2165 of its 6644 inhabitants gathered together in a little town with narrow and winding streets. Its castle was once the residence of the abbot of Her. In the church (12th, 14th and 19th centuries) there is a crypt of the nth century. A mile to the north of the town lies a pleasant watering-place, rendered picturesque by the La Chaise woods (evergreen oaks

and pines), and a grand confusion of rocks, among which lie charming beaches. A dolmen, several menhirs, and the ruins of a Gallo- Roman villa with its hot baths show that the island must have been occupied at an early date ; but the first fact in its recorded history is the foundation of the Benedictine monastery of Her by St Philibert about 680. From this monastery the name Noirmoutier (Heri monasterium, Hermoutier) is derived. It had already attained to great prosperity when it was pillaged by the Normans in 825 and 843. In 1205 the abbey of Notre Dame la Blanche was built at the north extremity of the island to take the place of a Cistercian convent established in the lie du Pilier, at that time attached to Noirmoutier by a dike. This abbey was ruined by the Protestants in 1562. In the 15th, 16th and 17th centuries the island belonged to the family of La Tremoille, and

in 1650 the territory was made a duchy. In 1676 the island was captured by the Dutch. Having been seized by Charette during the war of Vendee, it was recovered by the Republican general, Haxo, who caused the Vendean leader, d'Elbee, to be shot.

NOISE (a word of doubtful origin; O. Fr. nogse or nose; Prov. nausa, which points to Lat. nausea, sickness, as the origin; others take Lat. noxia, harm, as the source), an excessive, offen- sive, persistent or startling sound. By the common law of England freedom from noise is essential to the full enjoyment of a dwelling house, and acts which affect that enjoyment may be actionable as nuisances. But it has been laid down that a nuisance by noise, supposing malice to be out of the question, is emphatically a question of degree {Gaunt v. Finney, 1872, 8 Ch. Ap. 8). The noise must be exceptional and unreasonable. The ringing of bells, building operations, vibration of machinery, fireworks, bands, a circus, merry-go-rounds, collecting disorderly crowds, dancing, singing, &c, have been held under certain circumstances to constitute nuisances so as to- interfere with quiet and comfort, and have been restrained by injunction. Noise occasioned by the frequent repetition of street cries is frequently the subject of local by-laws, which impose penalties for infringement.

NOISOME, harmful, offensive, especially of that which causes physical disgust. The word is formed from the obsolete " noy," trouble, a shortened form of " annoy," now only used as a verb, to cause trouble, the usual substantive being " annoyance." The O. Fr. anoi, anui (modern ennui) is an adaptation of Lat. in odio esse, venire or habere, to be sick, tired of anything (odium, disgust, hatred). The word has no connexion with Lat. nocere, to hurt.

NOKES (Noke, Noak, Noakes), JAMES (d. 1692), an English actor,

whose laughter-arousing genius is attested by Cibber and other contemporaries. Sir Martin Mar-all, Sir Davy Dunce and Sir Credulous Easy were among his favourite parts. His success as the Nurse in Nevil Payne's Fatal Jealousy was so great that he was thereafter nicknamed " Nurse Nokes."

NOLA, a city and episcopal see of Campania, Italy, in the province of Caserta, pleasantly situated in the plain between Mount Vesuvius and the Apennines, 16J m. E.N.E. of Naples, 121 ft. above sea-level. Pop. (1901) 11,927 (town); 14,511 (commune). It is served by the local railway from Naples to Baiano, and is 22 m. from Naples by the main line via Cancello. The more conspicuous buildings are the ancient Gothic cathedral (restored in 1866, and again in 1870 after the interior was destroyed by fire), with its lofty tower, the cavalry barracks, the ex-convent of the Capuchins at a little distance from the city, and the seminary in which are preserved the famous Oscan inscription known as the Cippus Abellanus (from Abella, the modern Avella, q.v.) and some Latin inscriptions relating to a treaty with Nola regarding a joint temple of Hercules. Two fairs are held in Nola, on the 14th of June and the 12th of November; and the 26th of July is devoted to a great festival in honour of St Paulinus, one of the early bishops of the city, who invented the church bell (campana, taking its name from Campania). The church erected by him in honour of St Felix in the 4th century is extant in part. There is a monument (restored in 1887) to Giordano Bruno, the free-thinker, who was born at Nola in 1548.

Nola (NcoXa) was one of the oldest cities of Campania, variously said to have been founded by the Ausones, the Chalcidians and the Etruscans. The last-named were certainly in Nola about 500 B.C. At the time when it sent assistance to Neapolis against the Roman invasion (328 B.C.) it was probably occupied by Oscans in alliance with the Samnites. The Romans made themselves masters of Nola in 313 B.C., and it was thenceforth faithful to Rome. In the Second Punic War it thrice bade defiance to Hannibal; but in the Social War it was betrayed into the hands of the Samnites, who kept possession till Marius, with whom they had sided, was defeated by Sulla, who in 80 B.C. subjected it with the rest of Samnium. Seven years later it was stormed by Spartacus. Whatever punishment Sulla may have inflicted, Nola, though it lost much of its importance, remained a

municipium with its own institutions and the use of the Oscan language. It became a Roman colony under Augustus, who died at Nola. Sacked by Genseric in 455, and by the Saracens in 806 and 904, captured by Manfred in the 13 th century, and damaged by earthquakes in the 15th and 16th, Nola lost much of its importance. The revolution of 1820 under General Pepe began at Nola. The sculptor Giovanni Marliano was a native of the city; and some of his works are preserved in the cathedral.

Nola lay on the Via Popillia from Capua to Nuceria and the south, and a branch road ran from it to Abella and Abellinum. Mommsen (Corp. inscr. Lat. x. 142) further states that roads must have run direct from Nola to Neapolis and Pompeii, but Kiepert's map annexed to the volume does not indicate them. In the days of its independence it issued an important series of coins, and in luxury it vied with Capua. Its territory was very fertile, and this was the principal source of its wealth. A large number of vases of Greek style were manufactured here and have been found in the neighbourhood. Their material is of pale yellow clay with shining black glaze, and they are decorated with skilfully drawn red figures. Of the ancient city, which occupied the same site as the modern town, hardly any- thing is now visible, and the discoveries of the ancient street pavement have not been noted with sufficient care to enable us to recover the plan. Numerous ruins, an amphitheatre, still recognizable, a theatre, a temple of Augustus, &c, existed in the 16th century, and have been since used for building material. They are described by A. Leone, De Nola (Venice, 1 514). A few tombs of the Roman period are preserved. The neighbourhood was divided into pagi, the names of some of which are preserved to us (Pagus Agrifanus, Capriculanus, Lanitanus). (T. As.)

NOLDEKE, THEODOR (1836-), German Semitic scholar, was born at Harburg on the 2nd of March 1836, and studied at Gottingen, Vienna, Leiden and Berlin. In 1859 his history of the Koran won for him the prize of the French Academie des Inscriptions, and in the following year he rewrote it in German (Geschichle des Korans) and published it with additions at Gottingen. In 1861 he began to lecture at the university of this town, where three years later he was appointed extraordinary professor. In 1868 he became ordinary professor at Kiel, and in 1872 was appointed to the chair of Oriental languages at Strassburg, whichhe resigned in 1906. Noldeke's range of studies has been wide and varied, but in the main his work has followed the two lines already indicated by his prize essay, Semitic languages, and the history and civilization of Islam. While a great deal of his work (e.g. his Grammatik der neusyrischen Sprache, 1868, his Mandaische Grammatik, 1874, and his transla- tions from the Arabian of Tabari,

1881-1882) is meant for specialists, many of his books are of interest to the general reader. Several of his essays first appeared in the Encyclopedia Britannica, and his article on the Koran, with some others, was republished in a volume called Oriental Sketches. The articles dealing with Persia were republished in a German volume, Aufsatze zur persischen Geschichte (Leipzig, 1887). Among his best known works are: Das Leben Mohammeds (1863); Beitrdge zur Kenntnis der Poesie der alten Araber (1864); Die alttestament licke Literotur (1868); Untersuchungen zur Kritik des Alten Testa- ments (1869); Zur Grammatik des klassischen Arabisch (1896); Fiinf Mo'allaqat, ubersetzt und erkldrt (1899-1901); and Beitrdge zur semitischen Sprachwissenschaft (1904). He has contributed frequently to the Zeitschrift der deutschen morgenldndischen Gesellschafl, the Gbttingische gelehrte Anzeigen and the Expositor. NOLI, a coast village of Liguria, Italy, in the province of Genoa, from which it is 36 m. S.W. by rail, 13 ft. above sea-level. Pop. (1901) 1985. It is a town of considerable antiquity, now decayed, and has an ancient church of S. Paragorio, once the cathedral, a Romanesque basilica dating from the nth century, with interesting works of art. The diocese has been united with that of Savona.

See A. d'Andrade, Relatione dell' Ufficio Regionale per la conser- vazione dei monumenti del Piemonte e delta Liguria (Turin, 1899), 100 seq.

NOLLEKENS, JOSEPH -(1737-1823) British sculptor, was born on the nth of August 1737 in Dean Street, Soho, London, where his father, a native of Antwerp, the " old Nollekens " of Horace Walpole, was a painter of some repute. In his thirteenth year he entered the studio of the sculptor Peter Scheemakers, and practised drawing and modelling with great assiduity, ultimately gaining various prizes offered by the Society of Arts. In 1760 he went to Rome, and he executed a marble bas-relief, " Timoclea before Alexander," which obtained a prize of fifty guineas from that society in 1762. Garrick and Sterne were among the first English visitors who sat to him for busts; among his larger pieces belonging to this early period perhaps the most important is the " Mercury and Venus chiding Cupid." Having returned to England in 1770, he was admitted an associate of the Royal Academy in 1 771, and elected a member in 1772, the year in which he married Mary, the second daughter of Saunders Welch. By this time he had become known to George III., whose bust he shortly afterwards executed, and henceforward, until about 1816, he was the most fashionable portrait sculptor of his day. He himself thought highly of his early portrait of Sterne. Among many others may be specially named those of Pitt, Fox, the prince of Wales (afterwards

George IV.), Canning, Perceval, Benjamin West and Lords Castlereagh, Aberdeen, Erskine, Egremont and Liverpool. He elaborated a number of marble groups and statues, amongst which may be mentioned those of ” Bacchus,” ” Venus taking off her Sandal,” ” Hope leaning on an Urn,” ” Juno,” ” Paetus and Arria,” ” Cupid and Psyche ” and (his own favourite performance) ” Venus anointing Herself”; all, however, although remarkable for delicacy of workmanship, are deficient in vigour and originality, and the drapery is peculiarly weak. The most prominent personal characteristic of Nollekens seems to have been his frugality, which ultimately developed into absolute miserliness. Mrs Nollekens died in 181 7, and the sculptor himself died in London on the 23rd of April 1823, leaving a large fortune.

NOLLE PROSEQUI (sometimes shortened into nol. pros.), a technical term of English law, the meaning of which varies as it is used with reference to civil or criminal cases. In civil cases it applied only to actions in the king’s bench division, and there signified a formal undertaking by the plaintiff that he intended to proceed no further with the action (se ulterius nolle prosequi). The more modern practice in such cases is to proceed by way of discontinuance. In proceedings either by indictment or by information, a nolle prosequi or stay of proceedings may be entered by the attorney-general. The nolle prosequi is a matter purely for his discretion, and will not be granted unless very good ground be shown for his interference. The object of it generally is to obtain a stay of proceedings against an accomplice in order to procure his evidence. This object is, however, more usually effected by the prosecution offering no evidence and the judge directing an acquittal.

In the United States the term bears the same meaning as in England, with one exception. The attorney-general has not the same discretion with which English law invests him. Although in some states the prosecuting officer may enter a nolle prosequi at his discretion, in others the leave of the court must be obtained.

NOLLET, JEAN ANTOINE (1700-1770), French physicist, of peasant origin, was born near Noyon (Oise) on the 19th of November 1700. He entered holy orders and ultimately attained the rank of abbe; but his tastes all lay in the direction of experimental research, especially on the subject of electricity. In 1734 he was admitted a member of the London Royal Society, four years later he entered the Academy of Sciences at Paris, and in 1753 he was appointed to the newly-instituted chair of experi- mental physics in the College de Navarre. In addition to many memoirs he wrote Lecons de physique experimental (1743), Essai sur V tlectricitt des corps (1747), Recherches sur les

causes particu- lieres des ph&nomenes Slectriques (1749 and 1754), Recueil de lettres sur Velectricitt (1753), V Art de faire les chapeaux (1764) and L' Art des experiences (1770). He died at Paris on the 24th of April 1770,

NOMAD (Gr. vonas, PojudSes, wandering), a wanderer. The word is particularly used of tribes who shift continually from place to place in search of pasture (Gr. vkimv). The vonaSes of ancient Greek writers meant particularly the pastoral tribes of North Africa; hence the Latin name of the Numidians (see Numidia).

NOME, a mining town about 12 m. W. of Cape Nome, on the S. shore of Seward Peninsula, Alaska, in 1900 the largest settlement in the district. Pop. (1900) 12,488; (1910) 2600. Gulch gold was found near Nome on Anvil Creek in September 1898, and diggings in the ocean beach were first worked in July 1899. The rush to Nome in 1900 was one of the most remarkable stampedes in American mining history; the town soon had hotels, banks, stores, several newspapers and weekly mails from the States, and for part of the year there were, it was estimated, 20,000 inhabitants. This rapidity of growth and the isolation of the settlement raised prices to extraordinary heights, and in other respects created economic conditions remarkable even among Alaskan mining camps. By 1903 the population had greatly decreased, and in subsequent years the winter population averaged about 3500, the summer population from 7000 to 8000. In 1905 the gold output of the Nome region amounted to about $2,500,000, nearly all from placers, though some quartz mining was done. A municipal government and local police force were early organized after the fashion of American mining communities, and United States soldiers from the St Michael reservation aided in the preservation of order. The greatest drawback to the town's prosperity is the lack of any good harbour nearer than Point Clarence, 80 m. W. The winter ice-floes, sometimes 30 ft. high on the beach, render harbour improvements at Nome almost impossible. There is connexion with Seattle by steamer (since 1904) in about 85 days. Inigoithe town was incorporated under the laws of the United States. It is the north-western terminus of the United States military telegraph. It was first called 'Anvil City; the name " Nome " is derived from Cape Nome, first so called on a chart dated 1849, and said to have been a draughtsman's mistake for the query " ? Name " on the original chart.

NOMENOE, or Nominoe (d. 851), duke of Brittany. The date of his birth is not known, and his origin is obscure; all that is known is that he was of Breton race. In the hope of pacifying Brittany, Louis the Debonair named him count of Vannes in 819 and governor or duke of Brittany in 826. Throughout the reign of Louis, Nomenoe's fidelity to the emperor never flagged; he put down several attempted insurrections, and maintained peace in Brittany for fifteen years. But in 841 he resolved to make himself independent of Charles the Bald. In 843 Charles made a vain attempt to subdue Brittany. In 844 Nomenoe invaded Maine, and in 845 the emperor was completely defeated at Ballon near Bain-de-Bretagne. In the following year Charles recognized the independence of Brittany. Having resolved to detach the duchy from the ecclesiastical province of Tours, Nomenoe accused the Frankish bishops of Vannes, Quimper, Dol and Leon of simony at the council of Coetlouh in 848, replaced them by Bretons, and erected Dol into a metropolitan see. In 849 Nomenoe attacked the Frankish county of Anjou. Charles retaliated by establishing a garrison at Rennes; but Nomenoe seized Rennes, Nantes and, finally, the whole of Upper Brittany, and ravaged Maine. In 851 he seized Anjou and invaded Beauce; but he died suddenly, leaving as his successor his son Erispoe.

See A. de la Borderie, Histoire de Bretagne, vol. ii. (1898) ; R. Merlet, " Guerres d'independance de la Bretagne," in the Revue de Bretagne, de Vendee et d' Anjou (1891).

NOMENTANA, VIA, an ancient road of Italy, leading N.E. from Rome to Nomentum (q.v.), a distance of 14 m. It originally bore the name Via Ficulensis, from the old Latin village of Ficulea, about 8 m. from Rome. It was subsequently prolonged to Nomentum, but never became an important highroad, and merged in the Via Salaria (see Salaeia, Via) a few miles beyond Nomentum. It is followed as far as Nomentum by the modern highroad, but some traces of its pavement still exist.

See T. Ashby in Papers of Brit. School at Rome, iii. 38 sqq. (T. As.)

NOMENTUM (mod. Menlana), an ancient town of Italy, 14 m. N.E. of Rome by the Via Nomentana. It was a Latin town, but was by some considered to be Sabine, and, like Fidenae and Ficulea, was excluded from the first region by Augustus, who made the Anio its northern boundary. Nomentum received the civitas sine suffragio after the last war of the Latins against Rome (338 B.C.) ; in its municipal constitution the chief magistrate even in imperial times bore the title of dictator. Pliny and Martial often praise the fertility of its

neighbourhood. The site of the town is well protected by ravines except on the east; no ancient remains exist in situ, but inscriptions and other relics have been found.

See T. Ashby in Papers of the British School at Rome, iii. 68 sqq. , (T. As.)

NOMINALISM (from Lat. notnen, name), the name of one of the two main tendencies of medieval philosophy, the other being Realism. The controversy between nominalists and realists arose from a passage in Boethius' translation of Porphyry's Introduction to the Categories of Aristotle, which propounded the problem of genera and species, (1) as to whether they subsist in themselves or only in the mind; (2) whether, if subsistent, they are corporeal or incorporeal; and (3) whether separated from sensible things or placed in them. The Realists held that universals alone have substantial reality, existing ante res; the Nominalists that universals are mere names invented to express the qualities of particular things and existing post res ; while the Conceptualists, mediating between the two extremes, held that universals are concepts which exist in our minds and express real similarities in things themselves. Though a strong realist tendency is evident in the system of Erigena (9th century), the controversy was not definitely started till the nth century: it lasted till the middle of the 12th, when the first period of scholastic philosophy ends. Under an appearance of much vain subtlety the controversy about universals involved issues of the greatest speculative and practical importance: realism repre- sented a spiritual, nominalism an anti-spiritual, view of the world; while realism was evidently favourable, and nominalism unfavour- able, to the teaching of the Church on the dogmas of the Trinity and the Eucharist. Nominalism was a doctrine of sceptics and suspected heretics, such as Berengar of Tours and Roscellinus. Even Abelard's mediating doctrine of conceptualism (q.v.) was sufficiently near to obnoxious ideas to involve him in lifelong persecution. The principles of the great orthodox philosophers of the later scholastic period which begins in the 13th century, Albertus Magnus and Thomas Aquinas, were those of moderate realism. When nominalism was revived in the 14th century by the English Franciscan, William of Occam, it gave evidence of a new tendency in thought, a distrust of abstractions and an impulse towards direct observation and inductive research, a tendency which had its fulfilment in the scientific movement of the Renaissance. Occam's dictum " Entia non multiplicanda sunt praeter necessitatem " was inspired by a spirit similar to that of Bacon. Though nominalism is properly a medieval theory, the tendency has passed over into modern philosophy: the term " nominalist " is often applied to thinkers of the empirical,

sensationalist school, of whom J. S. Mill may be taken as the chief representative. (H. St.)

NONCONFORMIST, a term denoting historically (a) those persons who at the beginning of the 17th century refused to conform to certain practices, e.g. the wearing of the surplice, kneeling at the reception of the Sacrament, &c, of the Church of England; (6) those who, after the passing of the Act of Uniformity 1662, refused to conform to that act and ceased to be members of the church. In current usage the term " non- conformist " is applied in Great Britain to any member of a church not conforming to the ceremonies, worship and doctrines ("forms") of the Church of England, but is generally used of a member of the so-called Free Churches, or Protestant Dissenters, and is not usually applied to Roman Catholics. The name can also be applied, in other countries, to those who do not belong to the established religion. Strictly a " dissenter " is one who dissents from the church as an " established " body, or who

dissents from the establishment of a state church, while conform- ing or not to its forms, ceremonies or practice.

NONCONFORMITY, LAW RELATING TO. For the history of the gradual relief of nonconformists in England from their disabilities see English History, Baptists, Congregational- ism, Methodism, Friends, Society of, &c. ; also Oath. It is proposed here to note simply the present legal aspects of non- conformity apart from its history, that is, the matters in which the law as to nonconformists still differs from that applicable to members of the Church of England. The differences may be conveniently grouped under six heads.

(i) Judicial Notice. — The courts, both temporal and spiritual, take judicial notice of the tenets and authorities of the Church of England, the crown being head of the law and of the church. Where the tenets and authorities of a nonconformist body come in question, they must be proved by evidence. By Lord Lyndhurst's act, the Nonconformist Chapels Act 1844, where no particular religious doctrine or mode of worship has been prescribed by the deed or instrument of trust the usage of the congregation for twenty-five years is to be taken as conclusive evidence of the doctrine and worship which may be properly observed in such meeting-houses. (2) Tribunal— Offences against the law ecclesiastical (not being crimes) committed by clergy

ofthe Church of England as a rule come by letters of request from the bishop of the diocese before the arches court of Canterbury or the chancery court of York (of both of which the same person is judge). Similar matters arising in nonconformist bodies can only be tried by the ordinary secular courts, and generally depend upon the question whether a minister has done any act which is not in accordance with the rules governing the particular body of which he is a minister. A nonconformist body is in law nothing more than a voluntary association, whose members may enforce discipline by any tribunal assented to by them, but must be subject in the last degree to the courts of the realm. Brawling in a church was an offence which formerly fell solely under the cogniz ance of the spiritual courts, but by the Ecclesiastical Courts Juris- diction Act i860 any person guilty of brawling in churches or chapels of the Church of England or Ireland, or in any chapel of any religious denomination, is liable on conviction to a fine or imprisonment (see Brawling), while clergymen of the Church of England may also be dealt with under the Clergy Discipline Act 1892. (3) Status of Ministers. — A nonconformist minister is not in holy orders, and his chapel is not a consecrated building. His status is, however, recog- nized to a limited extent. By the Toleration Act, 1 Will. & Mar., c. 18, a minister, preacher or teacher of a nonconformist congregation is exempt from certain parochial offices, as that of churchwarden. He is also exempt from serving in the reserve forces or on a jury. These privileges only attach where the place of worship of which he is a minister has been duly registered (the Places of Worship Registration Act 1855), unless in the case of bodies subject to special legislation, as Quakers. Registration is not required in th'e case of consecrated buildings. By the Municipal Corporations Act 1882, s. 12, a noncon- formist minister (as is a clerk in holy orders) is disqualified from being elected an alderman or councillor of a town council, but under the Local Government Act 1888 a clerk in holy orders, or other minister of religion, may be a councillor or alderman of a county council, and, under the London Government Act 1899, of a metropolitan borough. He cannot take a degree in divinity at Oxford, Cambridge or Durham (Universities Tests Act 1871), and so is debarred from holding any professorship of divinity in those universities. (4) Marriage. — Marriage by a person in holy orders was probably necessary at common law, at any rate from the Reformation up to 1836. (See Marriage.) And from the date of Lord Hardwicke's Marriage Act, '753> U P to 1836 the ceremony must have been performed in a consecrated building. The first act of parliament that relieved dissenters (other than Jews and Quakers) from these restrictions was the Marriage Act of 1836. By that act the ceremony of marriage might be performed in a nonconformist place of worship, but

it must be after due notice to the superintendent registrar and in his presence or in that of a registrar, and the building must be one that is duly certified for marriages. The Marriage Act 1898 dispensed with the necessity of the attendance of a registrar at marriages celebrated at a nonconformist place of worship, substituting in place thereof a person duly authorized by the trustees of the place of worship, if the persons intending to be married so desire; but the parties may, if they wish, still require the presence of the registrar. Marriage by banns, licence or special licence cannot take place except in a church. (5) Burial. — By the Burial Laws Amendment Act 1880 burial may take place in a churchyard without the rites of the Church of England. But in such a case notice must be given in a specified form, which is unnecessary where the burial service is conducted by a clergyman of the Church of England. (6) Parish Offices.— By 1 Will. & Mar. c. 18, s. 5, a dissenter chosen churchwarden and scrupling to take the oaths may execute his office by deputy. His acceptance of office is made optional by the act; there is nothing to prevent his dis- charging it if he see fit to do so. This seems to be still the law, although a declaration was substituted for the oath by the Statutory Declara- tions Act 1835, s. 9.

British Colonies. — In crown colonies ecclesiastical jurisdiction may be conferred by the sole authority of the crown. In colonies which have parliamentary representation the crown cannot give to a metropolitan bishop jurisdiction or coercive legal authority over suffragan bishops or over any other person. In colonies of the former kind the Church of England may still preserve the privileges which attach to her in the mother country ; in colonies of the latter kind she is in the same position as any other religious body, simply a voluntary association. Since the Irish Church Act 1869 the Church of Ireland has been practically in the same position as the Church of England in colonies which have representative government.

NONFEASANCE, Misfeasance, Malfeasance. The ex- pressions “nonfeasance” and “misfeasance,” and occasionally ” malfeasance,” are used in English law with reference to the discharge of public obligations existing by common law, custom or statute. The rule of law laid down is that no action lies for nonfeasance, i.e. for failure or refusal to perform the obligation, but that an action does lie for misfeasance or malfeasance, i.e. for negligently and improperly performing the obligation. The doctrine was formerly applied to certain callings carried on publicly (see R. v. Kilderby, 1669, 1 Will. Saund. 311, 312 c). At present the terms misfeasance and nonfeasance are oftenest used with reference to the conduct of municipal authorities with reference to the discharge of their statutory

obligations; and it is an established rule that an action lies in favour of persons injured by misfeasance, i.e. by negligence in discharge of the duty; but that in the case of nonfeasance the remedy is not by action but by indictment or mandamus or by the particular procedure prescribed by the statutes. This rule is fully established in the case of failure to repair public highways ; but in other cases the courts are astute to find evidence of carelessness in the discharge of public duties and on that basis to award damages to individuals who have suffered thereby. Misfeasance is also used with reference to the conduct of directors and officers of joint-stock companies. The word malfeasance is sometimes used as equivalent to mala praxis by a medical practitioner. (W. F. C.)

NONIUS MARCELLUS, Latin grammarian and lexicographer, flourished at the end of the 3rd or the beginning of the 4th century a.d. He is often called the ” Peripatetic of Thubur- sicum ” (in Numidia, probably his birth-place). He is the author of a sort of lexicon called De compendiosa doctrina, in 20 sections or chapters, the first twelve of which deal with language and grammar, the remaining eight with special subjects (navigation, costume, food, arms). The work is a compilation from commentaries on the authors quoted (whom Nonius only knows at second hand) and from existing dictionaries and grammars. Nonius is especially indebted to Verrius Flaccus and Aulus Gellius. The Doctrina is valuable as preserving fragments from old dramatists, annalists, satirists and anti- quarian writers. It is remarkable that in the quotations from the authors cited Nonius always follows the same order, beginning with Plautus and ending with Varro and Cato. The grammarians Priscian and Fulgentius borrowed largely from his book; and in the 5th century a certain Julius Tryphonianus Sabinus brought out a revised and annotated edition.

Editions by L. Miiller (1888); J. H. Onions, bks. i.-iii. (1895); W. M. Lindsay (1903) (reviewed in Classical Review, October 1904). See also articles in the Classical Review (Dec. 1888, June and July 1889); J. H. Onions (Oct. 1890, Oct. 1895, Feb. 1896, Feb. 1902); W. M. Lindsay; Journal of Philology, xvi. (1888), xviii. (1890), (J. H. Onions), xxi. (1893). (” The Printed Editions of Nonius,” by H. Nettleship) ; P. Monceaux, Les Africains. Etude sur la litterature latine d’Afrique (1894); Teuffel, Hist, of Roman Literature (Eng. trans.), 404A; M. Schanz, Geschichte der romischen Literatur, iv. 1

(1904).

NONJURORS, the name given to those beneficed clergy of the Church

of England who refused to take the oaths of allegiance to William and Mary in 1689. They were about four hundred in number, and included William Sancroft, archbishop of Canter- bury, and four others of the ” Seven Bishops,” Thomas Ken of Bath and Wells, John Lake of Chichester, Thomas White of Peterborough and Francis Turner of Ely, together with three other bishops, Robert Frampton of Gloucester, William Thomas of Worcester and William Lloyd of Norwich (who is sometimes confused with his namesake, the bishop of St Asaph, one of the

” Seven Bishops “). Other distinguished nonjurors among the clergy were’: William Sherlock, master of the Temple, Jeremy Collier, the ecclesiastical historian, Charles Leslie, the contro- versialist, George Hickes, dean of Worcester, Nathanael Spinckes, John Fitzwilliam, canon of Windsor, and John Kettlewell, the devotional writer. The most famous nonjurors among the laity were Henry Dodwell, Camden professor of history at Oxford, Robert Nelson, Henry Hyde, second earl of Clarendon, and Roger North, the lawyer. Afterwards their number was aug- mented by the refusal of William Law, author of The Serious Call, Thomas Carte, the historian, Thomas Hearne, the antiquary, and others, to take the oaths of allegiance to George I. Ken, the most eminent of the nonjurors, disapproved of their sub- sequent proceedings, and Sherlock and Dodwell afterwards took the required oaths, the former becoming dean of St Paul’s.

Believing in the doctrine of non-resistance to established authority, the nonjurors argued that James II. was still the rightful king, and likened the position of William to that of Cromwell. Taking examples from the Old Testament and from the practice of the early church, their antagonists traversed these arguments, and a long and voluminous controversy followed. Many have thought that the position of the nonjurors was inconsistent, and Dr Johnson said, ” I never knew a non- juror who could reason,” although he appears to have excepted Leslie from this general condemnation. The government did not treat the nonjurors harshly. With the approval of William III., Gilbert Burnet, bishop of Salisbury, attempted to reconcile them to the new order; and it was only when the generous terms offered by Burnet had been refused, that, in February 1690, they were deprived of their sees and other benefices. Although they had only a small following among the mass of the people, who were not required to take the oaths of allegiance, Sancroft and his colleagues claimed to represent

the true Church of England, and requested James II. in his exile to nominate two new bishops to. carry on the episcopal succession. James chose Hickes and Thomas Wagstaffe (1645-1712), who were consecrated in 1694 as bishops of Thetford and Ipswich respectively. A further consecration took place in 17 13 when Collier, Spinckes and Samuel Hawes (d. 1722), were consecrated “bishops at large.” In 17 18 the introduction of a new communion office with some ” usages ” taken partly from primitive liturgies, and partly from the first prayer-book of Edward VI. caused a schism among the nonjurors, dividing them into ” Usagers ” and ” Non- Usagers.” The four ” usages ” were: The mixed chalice, prayers for the faithful departed, prayer for the descent of the Holy Ghost on the consecrated elements, and the Oblatory Prayer, offering the elements to the Father as symbols of His Son’s Body and Blood. Accepting the ” usages ” the two bodies united in 1731, but other dissensions followed, although the episcopal succession was maintained until the death of a bishop named Charles Booth in 1805. The last nonjuror is supposed to have been James Yeowell, who died in 1875. Public worship was conducted in chapels or ” oratories,” and sometimes in private houses.

In Scotland the nonjurors included the greater part of the clergy of the Episcopal Church, which ceased to be the state church in 1689. Many of these men and some of their English colleagues were ardent Jacobites, and were punished for sharing in the risings of 1715 and 1745, and in other Jacobite movements. The Scottish clergy maintained their attitude of resistance to the government until the death of Prince Charles Edward Stuart in 1788, when the bishops met at Aberdeen, and unanimously agreed to submit to the government of King George III. A large number of the Presbyterians in Scotland, principally found among the Cameronians, also refused to take the oaths of allegi- ance to William and Mary; but as their reasons for this refusal were quite different from those of the episcopalian nonjurors, they are not usually referred to by this name (see Cameronians).

For the history of the nonjurors, see Macaulay, History of England vol. ii. (London, 1895) ; T. Lathbury, History of the Nonjurors (London, 1845); and especially J. H. Overton, The Nonjurors (London, 1902), a defence of the sect. (A. W. H.*)

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NONNUS (Egyptian for ” saint “), Greek epic poet, a native of Panopolis (Akhmim) in the Egyptian Thebaid, probably lived at the end of the 4th or the beginning of the 5th century a.d. His principal work is the Dionysiaca, an epic in forty-eight books, the main subject

of which is the expedition of Dionysus to India and his return. The earlier portions treat of the rape of Europa, the battle of the giants, the mythical history of Thebes, and it is not until the eighth book that the birth of the god is described. Other poets had already treated the subject, and since the time of Alexander it had gained popularity from the favourite com- parison of the king with the god and of his enemies with the giants. In its vast and formless luxuriance, its beautiful but artificial versification, its delineation of action and passion to the entire neglect of character, the poem resembles the epics of India. Like his countryman Claudian, Nonnus is a writer of copious learning and still more copious fancy, whose faults are those of the age in which he lived. His chief merit consists in the syste- matic perfection to which he brought the Homeric hexameter. But the very correctness of the versification renders it monoton- ous. His influence on the vocabulary of his successors was likewise very considerable.

We also possess under his name a paraphrase Gtierct/3oXi}) of the Gospel of St John, which is chiefly interesting as apparently indicating that Nonnus in his later years was a convert to Christianity. The style is not inferior to that of his epic, but, employed in embellishing the simple narrative of the evangelist, it produces an impression of extreme bombast and want of taste. According to an epigram in the Palatine Anthology (ix. 198), Nonnus was also the author of a Battle of the Giants, and four lines of the Bassarica (also on the subject of Dionysus) have been preserved in Stephanus of Byzantium.

Editio princeps (1569) ; H. KSchly (" Teubner " series, with critical introduction and full index of names, 1858) ; the most generally useful edition is that by the comte de Marcellus (1856), with notes and prolegomena, and a French prose translation. On the metre, see J. G. Hermann, Orphica (1805), p. 690; A. Ludwich, Beitrdee zur Kritik des Nonnus (1873), critical, grammatical and metrical; C. Lehrs, Quaestiones epicae (1837), pp. 255-302, chiefly on metrical questions; on the sources, R. Kohler, Uber die Dionysiaka des Nonnus (1853), a short and connected analysis of the poem, with a comparison of the earlier and later myths; see also I. Negrisoli, Studio critico . . . Nonnus Panopolita, with short bibliography (1903). The paraphrase on St John (editio princeps, c. 1505) is edited by F. Passow (1834) and A. Scheindler (1881), with complete index.

NONPAREIL, the name under which, from its supposed match- less beauty, a little cage-bird, chiefly imported from New Orleans, has long been known to English dealers (cf. Edwards, Gleanings, i. 132). It is the Emberiza ciris of Linnaeus, and the Cyano- spiza ciris of most recent ornithologists, belonging to a small group, now included with

the buntings and finches, although some authors have regarded it as a tanager (q.v.). The cock has the head, neck and lesser wing-coverts bright blue, the upper part of the back yellow, deepening into green, and the lower parts generally, together with the rump, bright scarlet, tinged on the latter with purple. This gorgeous colouring is not assumed until the bird is at least two years old. The hen is green above and yellow beneath; and the younger cocks present an appearance intermediate between the adults of both sexes. The species, which is often also called the painted bunting, after wintering in Central America or Mexico, arrives in the Southern states of the American Union in April, but does not ordinarily proceed to the northward of South Carolina. In Louisiana, where it is generally known to the French-speaking inhabitants as the Pape — as it was to the Spaniards of Florida as the Mariposa pinlada (painted butterfly) — it is said to bo very abundant; and on its appearance in spring advantage is, or was, taken of the pugnacious disposition of the males to capture them alive in great numbers by means of the stuffed skin of one so placed in connexion with a cage-trap that they instantly fall into the latter on attacking what they conceive to be a rival. Belonging to the same genus as the nonpareil is the indigo-bird, Cyano- spiza cyanea, which, as a summer visitant, is widely diffused from the Missouri to the Atlantic, and extends into the provinces of

Ontario and New Brunswick, being everywhere regarded with favour. Though wanting most of the bright hues of its Congener, the indigo-bird has yet much beauty, the adult cock being nearly all over of a deep blue, changing, according to the light, to green. The hen is brown above and ochreous-white beneath. ‘ The ” pintailed nonpareil ” of aviculture {Erythrura prasina) is a somewhat similarly coloured but really very different bird; the male has a long sharp tail, and the species belongs to the Ploceidae (see Weaver-Bird).

NONPAREIL (Fr. non, and pareil, like, Lat. par), having no equal, unrivalled. Apart from its uses as a descriptive name for particularly fine kinds of fruit, &c, and of certain birds, moths and butterflies, the chief application of the word in English is, in printing, to a size of type between ” emerald ” and ” ruby,” in the United States of America between ” minion ” and ” agate ” (see Typography).

NONSUIT (Fr. non suit, he does not pursue), in law the name given to a judgment whereby an issue is determined against the plaintiff. It was

a term peculiar to the English common-law courts before the Judicature Acts, and was simply the expression of the opinion of the court that, apart from the merits, the plaintiff's case was incomplete. It did not in any way act as a bar to his bringing another action for the same cause. It might be entered either at the wish of the plaintiff himself (to whom it was of course much more beneficial than judgment for the defendant) or by direction of the court against the will of the plaintiff. Although judgment of nonsuit still exists, it has, since the Judicature Acts, the same effect as a judgment on the merits, unless the court otherwise directs. This effect of a nonsuit was specially provided for by the rules of the Supreme Court of 1875.

NOODT, GERHARD (1647-1725), Dutch jurist, was born at Nijmwegen in 1647. Educated at Leiden, Utrecht and Franeker, he became a professor of law at Leiden. As a writer on juris- prudence he acquired a wide reputation. His Latin style was modelled after the best writers, and his numerous works soon rose to the rank of standard authorities. Two of his political treatises were translated into French by Jean Barbeyrac, and appeared at Amsterdam in 1707 and 1714, under the respective titles of Pouvoir des souverains and Liberie de conscience.

The first edition of his collected works was published at Leiden in 1724 and the last in 1767. That of 1735 and those subsequent contain a life of the author by Barbeyrac.

NOON, midday, twelve o'clock. The O. Eng. ndn,. Nor, non, Dutch noen, are all from Lat. nona sc. hora, the ninth hour, i.e. according to the Roman system, three o'clock p.m. (see Day). The early uses of noon till the 13th and 14th centuries are either as translating the Latin, especially with reference to the Cruci- fixion, or as equivalent to the canonical hour of " nones " (see Breviary). The ordinary word for twelve o'clock was middceg, midday, also the equivalent of the canonical hour " sext." Both the office and the meal taken about that time were shifted to an earlier hour, and by the 14th century the ordinary use of •' noon " is that current to-day.

For " nones " (i.e. nonae, sc. dies) in the Roman calendar, see Calendar.

NORA, an ancient town of Sardinia, 22 m. by road S.S.W. of Carales. It was founded, according to Pausanias (x. 17. 5), by the Iberians under Norax, son of Hermes, and was the most ancient town in the island. The discoveries made on the site have, however, shown that it was certainly of Phoenician origin. In Roman times too, we find the

milestones on the road from Nora to Bitia and even on that from Nora to Carales reckoned from Nora {Corp. inscr. Lat. x. 831; Ephemcris epigraphica, viii. 180); but the authors and the sepulchral inscriptions found here give us no information as to its juridical condition. The town occupies a characteristically Phoenician site, a small peninsula joined to the mainland by an isthmus,, low, narrow and sandy. Excavations have led to the discovery of a few Phoenician buildings, the foundations of a temple of Tanit, of a road, of quay walls at the water's edge and of a watch-tower, on the extremity of the peninsula, which rises to some 150 ft. above the sea. Two cemeteries were found, one of the 7th-6th

century B.C., consisting of tombs cut in the rock for inhumation, while in the other, going down to the 4th century B.C., cremation is the rule; there are ossuaries placed in holes in the sand, with a sculptured stele over each. A quantity of small objects, gems, ivories, glass, vases, terra-cottas, &c, were found; in some of them Egyptian, in others Greek, influence and importa- tion are apparent. To the Roman period belong an aqueduct, bringing the water from the neighbouring hills — one pier of it rests upon a destroyed nuraghe — scanty remains of an amphi- theatre, a theatre, considerable ruins of concrete foundations (perhaps of villas by the sea) and a watch-tower on the promon- tory close to the Phoenician tower. A full description of the site and the excavations is given by G. Patroni in Monumenli dei Lincei, xiv. (1905), in. On the isthmus is the curious small old church of S Efisio, with a nave and two aisles divided by heavy square pillars. At the festival of the saint (May 1-4), his body is brought in procession from the cathedral at Cagliari; the festival is much frequented by people from all parts of Sardinia. (T.As.)

NORBA, an ancient town of Latium (Adjectum) , Italy. It is situated 1 m. N.W. of the modern Norma, 1575 ft. above sea-level, on the west edge of the Vclscian Mountains or Monti Lepini, above a precipitous cliff, with a splendid view over the Pomptine Marshes. It was a member of the Latin League of 499 B.C., and became a Latin colony in 492 B.C., as an important fortress guarding the Pomptine Marshes. It served in 199 as a place of detention for the Carthaginian hostages, and was captured and destroyed by Sulla's troops during the civil wars at the end of 82 B.C. Some revival in prosperity took place later. From excavations begun in 1901 it seems clear that the remains ndw visible on the site are entirely Roman. The well-preserved walls are in the polygonal style, ij m. in circuit, and are entirely embankment walls, not standing free above the internal ground level. Remains of a massive tower, and of several gateways (notably the Porta Grande, defended by a tower) exist. Within, the remains of several buildings,

including the substructions of two temples, one dedicated to Juno Lucina, have been examined. At the foot of the cliff are the picturesque ruins of the medieval town of Nainfa (i2th-i3th centuries) abandoned owing to the malaria. The remains of a primitive settlement, on the other hand, have been discovered on the mountain-side to the S. E., above the 13th-century abbey of Valvisciolo, where there is a succession of terraces supported by walls of polygonal work, and approached by a road similarly supported. Here a quantity of primitive Latin pottery has been found, The necropolis of this settlement "was probably the extensive one situated at Caracupa (8th-6th century B.C.), near the railway station of Sermoneta, which belongs also to the 8th-6th century B.C., terminating thus at the precise date at which the Roman city of Norba began to exist.

See L. Savignioni and R. Mengarelli in Notizie degli scavi (1901), 514; (1903) 299, 289; (1904) 407; and Atti del Congresso Storico (Rome, 1903), vol. v. (Archaeologia) 255. (T. As.)

NORBANUS, GAIUS, surnamed Bulbus (or Balbus), Roman politician, was a seditious and turbulent democrat. In 103′ B.C., when tribune of the people, he accused Q. Servilius Caepio of having brought about the defeat of his army by the Cirtlbri through rashness, and also of having plundered the temple of Tolosa. Caepio was condemned and went into exile. About ten years later Norbanus himself was accused of treason on account of the disturbances that had taken place at the trial of Caepio, but the eloquence of M. Antonius, grandfather of the triumvir, procured his acquittal. In 89 Norbanus as praetor successfully defended Sicily against the Italian Socii. During the civil war between Marius and Sulla he sided with the former, but was defeated by Sulla at mount Tifata near Capua, and again by Metellus at Faventia in Cisalpine Gaul (82). He fled to Rhodes, where he committed suicide, while the Rhodians were debating whether to hand him over to Sulla.

See Mommsen, Hist, of Rome, bk. iv. ch. v. ; Greenidge, Hist, of Rome.

NORCIA (anc. Nursia), a town and episcopal see of the province of Perugia, Italy, 29 m. E.N.E. of Spoleto by road, and 40 m. W,

of Ascoli Piceno, 1980 ft. above sea-level, on the south-west foot-slopes of the Monti Sibillini, still surrounded by old walls.' Pep. (iqoi)

4261 (town), 9584 (commune). There are a cathedral, the church of St Benedict and other churches, with Romanesque 14th-century facades; the town-hall; and the prefecture, with Romanesque arcades. Much injury was done by earth- quakes in 1730 and 1859. The ancient Nursia was a Sabine city, though close to the Umbrian border. Its inhabitants fought in 43-41 B.C. against Octavian, and were punished by him for erecting a monument in honour of those who fell. It was governed by octoviri like other Sabine towns and became a municipium under the empire. At Ancarano near Norcia was situated a small pagus; remains of a temple were found there in 1880, which from the character of the objects seems to have been destroyed in the 5th century B.C. The tombs of the district have also produced interesting early bronzes, &c, some of which go back to the 7th century B.C., and a fine funeral couch decorated with sculptured pieces of bone. M. Guardabassi in Notizie degli scavi, 1878, 13 sqq.; 1880, 6 sqq.; A. Pasqui in Monumenti dei Lincei, i. (1891) 239. The town was the birthplace of Q. Sertorius (d. 72 B.C.), of Vespasia, mother of the emperor Vespasian of Plotina, wife of the emperor Trajan, and of St. Benedict, founder of the Benedictine order, and of his sister Scholastica. The town is famous for its pork and its cloth (the term norcineria for a pork butcher's shop is indeed used in Rome) and produces bricks and earthenware.

See F. Patrici Forti, Memorie storiche di Norcia (Norcia, 1869).

NORD, the most northern of the departments of France, formed chiefly out of Flanders, French Hainault and the district of Cambrai (Cambresis). Area 2229 sq. m. Its population (1,895,861 in 1906), which includes a large proportion of Belgians, ranks next to that of Seine among French departments. Its length from south-east to north-west is 112 m.; its breadth nowhere exceeds 40 m., and contracts to 4 where it is crossed by the Lys. Bounded N.W. and N. for 21 m. by the North Sea, it has Belgian territory on the N.E. and E., the departments of Aisne and Somme on the S. and Pas-de-Calais on the W. The Flanders portion west of the Scheldt is very flat, the isolated hill at Cassel, only 535 ft. high, looking north towards Dunkirk over a stretch of fertile lowlands, the Wateringues and the Moeres, separated by a line of sand-dunes from the sea, by which about a thousand years ago they were still covered. The reclamation of this district, now covered by a network of canals, was begun as early as the 12th century. South-east of the Scheldt the country resembles the neighbouring Ardennes, is better wooded, and contains the highest point in the depart- ment (873 ft.). The greater part of Nord is in the Scheldt basin, but certain portions belong to those of the Sambre (Meuse), the Oise (Seine) and the little coast-streams the Aa and the Yser. The Scheldt, flowing by

Cambrai, Bouchain, Valenciennes and Conde, receives the Scarpe, which touches Douai, Marchiennes and St Amand. The Lys, which does not join the Scheldt till it has entered Belgium, passes Armentieres, and receives the Deule, on which Lille, the capital, is situated. The Sambre passes Landrecies and Maubeuge. The Aa falls into the port at Gravelines. The climate of Nord is colder than that of France in general, the mean temperature being 49° or 50 F. The average annual rainfall is about 28 in.

In agricultural and industrial importance Nord is the first of French departments. In the hilly region of the south-east stock- raising flourishes; in the central zone beetroot is the character- istic crop, while mixed farming prevails in the north-west. Cereals (especially wheat and oats) and potatoes are grown in abundance. Among minor crops, flax, tobacco, chicory and hops may be mentioned. Market-gardening and horticulture are practised on a considerable scale in some localities. The mineral wealth of the department lies principally in its coal mines forming part of the Valenciennes basin, the most important in France, which extends into Belgium and Pas de-Calais. The textile industry is particularly active around Lille, Roubaix and Tourcoing which spin and weave cotton and wool, as also around Fourmies which is especially a weaving town. Other

important centres are Armentieres (cloth- weaving), Dunkirk (flax, jute and hemp-spinning), Cambrai (batiste and other delicate fabrics), Douai, Avesnes, le Cateau and Caudry. Other great industries are brewing, frur-milling, glass, brick, pottery and sugar manufacture, alcohol-distilling, dyeing, iron-founding and steel production and other branches of the metallurgical industry carried on at Denain, Hautrnont, Maubeuge, Valen- ciennes, Douai, Raismes, &c. Dunkirk and Gravelines equip fleets for the cod and herring fisheries. Dunkirk is the chief port of the department, which is served by the Northern railway. Its system of inland navigation is highly developed and attains a length of 320 m., comprising a line of waterways from the Scheldt to the North Sea at Dunkirk, with which the coal basin of Valenciennes is linked up by way of the canalized. Scheldt and the textile region of Lille by means of the Deule canal and the canalized Lys. To these must be added the canalized Sambre and other less important waterways.

The department is divided into seven arrondissements (Avesnes, Cambrai, Douai, Dunkirk, Hazebrouck, Lille, Valenciennes) with 67 cantons and 667 communes. It forms the archiepiscopal diocese of Cambrai and part of the region of the I. army corps (headquarters at Lille) and of the educational division of Lille. Its court of appeal is at

Douai. The most noteworthy places are Lille, Cambrai, Douai, Dunkirk, Valenciennes and Anzin, Tourcoing, Roubaix, Avesnes, Halluin, Armentieres, Maubeuge, Cond6-sur-Escaut, Fourmies, Hazebrouck, Gravelines, St Amand- les-Eaux, Bergues, Le Cateau, Comines, Denain, Cassel and Bavai, which are separately noticed. Other populous industrial towns not mentioned above are Loos (pop. 9294) and Haubourdin (7897) near Lille, Caudry (10,947), near Cambrai, and Aniche (7 8 5 5) , a coal mining centre, near Douai. Other places of interest are Bailleul (pop. in 1906, 7128), Bavai and Bergues, which have fine belfries of the 16th century, structures characteristic of the architecture of the department; Hondschoote, scene of a victory of the French over the allies in 1793, which has a church of the 15th and 16th centuries with a fine tower and spire; and Famars which preserves a curious ruined stronghold of the period of the Roman occupation.

NORDAU, MAX SIMON (1840-), German author and philosopher, was born of Jewish parents at Budapest on the 29th of July 1849. He studied medicine and travelled widely through Europe until 1878, when he settled down as a practitioner in his native town. In 1880 he removed to Paris, and in addition to his professional work took up the study of art, literature and social questions. His investigations were marked by a critical accuracy which endeavoured to weigh data and deduce results with a fearless disregard of conventional ideas. In his Entartung he applied the theory of physical degeneration to the intellectual side of civilized man, and endeavoured to show that in art, literature and social evolution there is decadence and hysteria; confused aesthetic theory, mysticism in thought, so-called ” realism ” in art, all alike indicate the vain spasmodic struggling of an effete civilization. In Die konvcntionellen Liigen der Kulturmenschheit (1884), the same destructive method is applied to politics and to social science. Yet Nordau was not a pessimist. In the Paradoxes psychologiques (1885) he expressed his profound and reasoned conviction that the ” Degeneration ” of the time was only temporary. This optimism was seen in his enthusiastic support of Dr Herzl’s Zionist .movement. In connexion with the British government’s offer of land for a Jewish settlement in East Africa, there was a fundamental difference of opinion among the various Jewish societies. Herzl and Nordau were accused of giving up the idea of returning to Palestine, and substituting the African scheme. This idea provoked great hostility, and at a Zionist Ball in Paris (19th of December 1903) a Jew named Louban Chain Selik fired two shots at Nordau unsuccessfully. The outrage drew from Herzl a letter (The Times, 22nd of December) which clearly set forth the view held by himself and Nordau as to the

ultimate destiny of the Zionist Movement.

Works. — Novels and Stories: Seifenbldsen, Federzeiclinungen und Geschichten (1879); Die Krankheit des Jahrhunderts (1889)'

Gefuhlskomodie (1892); Die Drohnenschlacht (1897); Morganatisch (1904). Dramas: Die neuen Journalislen (in collaboration with F. Gross, 1880) ; Der Krieg der Millionen (1882) ; Das Recht zu lieben (2nd ed., 1894); Die Kugel (1894); and Doktor Kohn (1898). He published also Vom Kreml zur Alhambra (1880), an account of his travels, and three works descriptive of Paris and the Parisians— Pariser Studien aus dem wahren MUliardenlande (1878) ; Paris unler der dntten Republik (1881); Ausgewahlte Pariser Briefe (1887); two further volumes of criticism, Zeitgenossische Franzosen, literatur-geschichtliche essays (Berlin, 1901); and Von Kunst und Kunstlem (Leipzig, 1905).

NORDEN, JOHN (1548-1625?), English topographer, was the first Englishman who designed a complete series of county histories and geographies. His earliest known work of import- ance was the Speculum Britanniae, first part . . . Middlesex (1593); the MS. of this in the British Museum (Harl. 570) has corrections, &c, in Lord Burleigh's handwriting. In 1595 he wrote a Choro graphical Description of . . . Middlesex, Essex, Surrey, Sussex, Hampshire, Wight, Guernsey and Jersey, dedicated to Queen Elizabeth; the MS. of this is in the British Museum, Addit. MSS. 31,853- In 1596 he published his Preparative to . . . Speculum Britanniae, dedicated to Burleigh, and in 1598 his Hertfordshire (Lambeth Libr. MSS. 521). Before his death he had completed in manuscript his account of five other counties; three of these studies were printed long after his death, viz! Essex, edited for the Camden Society in 1840 by Sir Henry Ellis from a MS. at Hatfield (see also British Museum Addit. MSS. 33, 769); Northamptonshire, known to have been finished in 1610, but only published in 1720; Cornwall, likewise finished in 1610, published in 1728 (see Harl. MSS. 6252). Of Kent and Surrey even the MSS. are now lost; parts of the latter are perhaps identical with sections of the Chorographical Description of 1595. In 1600 Norden was appointed surveyor of the crown woods and forests in Berkshire, Devon, Surrey, &c; in 1605 he obtained the survivorship of the duchy of Cornwall; in 1607, after a careful survey, he composed his valuable Description of the Honour of Windsor, with fine maps and plans in colour, dedicated

to James I. (see Harl. MSS. 3749). In 1608 he was mainly occupied with the surveying of crown woods, especially in Surrey, Berkshire and Devon, and with the writing of his works on forest culture — Considerations touching . . . raising . . . of Coppices, and . . . Relation of . . . Proceedings upon . . . Commission concerning new forests, to which he added in 1613 his Observations concerning Crown Lands and Woods (see Egerton MSS. 806; Ashmole MSS. 1148; and Lansdowne MSS. 165). In 1612 he was made surveyor of the royal castles in Kent, Surrey, Sussex, .Hampshire, Berkshire, Dorset, Wiltshire, Somerset! Devon and Cornwall; in 1616 and 1617 he appears surveying the soke of Kirketon in Lindsey, as well as various manors and lands belonging to Prince Charles, afterwards Charles I. (see Cambridge University Library, Ff. iv. 30; London, British Museum Addit. MSS. 6027); his last works were a survey of Sheriff Hutton manor, Yorks, in 1624 (Harl. MSS. 6288), and England, an intended guide for English travellers, a series of tables to accompany Speed's county maps, executed in 1625, shortly before his death.

Norden's maps of London and Westminster (in his Speculum Britanniae of 1593) are the best representations known of the English metropolis under the Tudors; his maps of Middlesex (also from the Spec Brit, of 1593). of Essex (1594, 1840), of Hertfordshire (1598, 1723) and of Cornwall (published in 1728; see above) are also note-worthy; in the last-named the roads are indicated for the first time in English topography. Norden also executed maps of Hampshire Hertfordshire, Kent, Middlesex, Surrey and Sussex, for the fifth edition (1607) of Camden's Britannia, also maps of Middlesex Essex, Sussex, Surrey and Cornwall for J. Speed (1610). Several important cartographical works of his are lost: e.g. his Map of

" – - £?■ Ue ? f, ou . ght in En S land from . . . William the Conqueror to . . .Elizabeth, in 16 sheets, formerly in the Bodleian Gallery, Oxford ot which some part is probably preserved in the Invasions of England' an appendix to the Prospect of the most Famous Parts of the World

xLl" ,£^ (!> 63 $: an r r hls Y iem °f Lond ™< in 8 sheets, made c. 1604-1606, and View of London Bridge, published in 1624; in the (Trace collection at the British Museum is an earlier View of London by Norden (1600), and an 1804 reprint of the View of London Bridge-a map of Surrey by Norden, said to have been copied by Speed and Kip in Camden s Britannia of 1607, has also disappeared.

Besides the works noticed above, see the accounts of Norden by r- J $. at " na n „. ln . Speculum Britanniae, pars Cornwall (1728), and

Y L i > liM ln ? pec – BrU -‘ f ars Essex (Camden Society, 1840); also H. H. Wheatley in Harrison’s Description of England (New bhakspere Society, 1877), and C. H. Coote’s article in the Diet. Nat. Bwg. (c R B)

NORDEN, a town of Germany, in the Prussian province of Hanover, 4 m. from the North Sea and 20 m. by rail N. of Emden. Pop. (1905) 6717. It has a 16th-century town hall and its parish church was built in 1445. Gin, sugar, chocolate, yeast, beer, tobacco and machinery are manufactured. Nord- deich, a small port 4 m. N.W., is the shipping place for passengers bound for Norderney. Norden was first mentioned in 842

NORDENSKIOLD, NILS ADOLF ERIK, Baron (1832-1901), geographer and Arctic explorer, was born at Helsingfors, 18th November 1832. His ancestors came originally from Sweden, but for some generations had been settled in Finland. His father, Nils Gustav Nordenskiold, was both a mineralogist and a traveller. Nordenskiold entered the university of Helsingfors in 1849, and applied himself specially to chemistry and miner- alogy. In 1 853 he accompanied his father to the Ural Mountains and studied the iron and copper mines at Tagilsk. On his return he received minor appointments both at the university and the mining office, but an unguarded speech at a convivial entertain- ment in 1855 drew the attention of the Russian authorities to his political views, and led to his dismissal. He then visited Berlin, continuing his mineralogical studies, and in 1856 obtained the Alexander travelling stipend at the university of Helsingfors and planned to expend it in geological research in Siberia and Kamchatka. Before starting he took his master’s and doctor’s degrees (1857), but he again aroused the suspicion of the authorities, so that he was forced to leave the country and was deprived of the right of ever holding office in the univer- sity. Settling at Stockholm he thenceforward became practically a Swedish citizen. He soon received an offer from Otto Torell, the geologist, to accompany him on an expedition to Spitsbergen! To the observations of Torell on glacial phenomena Norden- skiold added the discovery at Bell Sound of remains of Tertiary plants, and on the return of the expedition he received the appointment of professor and curator of the mineralogical department of the Swedish State Museum. In 1861 he took part m T6rell’s second Spitsbergen expedition, which yielded even more important geological results. Of the further expedi- tion to the same quarter promoted by the Swedish academy of science in 1864, Nordenskiold was the leader. Three years later, chiefly through the support of the Swedish government and Oscar Dickson, who contributed largely towards the later expeditions of 1872 and 1875, he headed a well-organized expedition in the iron steamer ” Sofia,”

and reached the highest northern latitude (8i° 42’) then attained in the eastern hemi- sphere. Arctic exploration had now become his all-absorbing object in life, and in 1870, with three young naturalists, he visited the vast inland ice-sheet of Greenland. His next expedi- tion m 1872 did not answer expectation, for the tenders were caught in the ice, and the crews of the three vessels were forced to winter in Spitsbergen. In 1875-1876, however, a successful voyage eastwards, including the ascent of the Yenisei, led him to attempt the discovery of the long-sought North-East Passage. This he accomplished in the voyage of the ” Vega,” navigating for the first time the northern coasts of Europe and Asia. Starting from Karlskrona on the 22nd of June 1878, the ” Vega ” doubled Cape Chelyuskin in the following August, and after being frozen in at the end of September near Bering Strait, completed the voyage successfully in the following summer. He edited a monumental record of the expedition in five octavo volumes, and himself wrote a more popular summary in two volumes.

On his return to Sweden he received an enthusiastic welcome, and in April 1880 was made a baron and a commander of the Order of the Nordstjerna. In 1883 he again visited the east coast of Greenland, and succeeded in taking his ship through the great ice barrier, a feat attempted in vain during more than three centuries. Baron Nordenskiold also made a notable reputation

in the field of historical geography by his Facsimile Atlas (1889) and Periplus (1897). The former contains reproductions of the most important geographical documents printed during the 15th and 16th centuries, and the latter, a work of far greater research, deals with the history of early cartography and the sailing charts in use among mariners during the middle ages. He died at Stockholm on the 12th of August 1901.

NORDERNEY (i.e. ” northern island “), an island of Germany, in the North Sea, the largest of the East Friesland group, belonging to the Prussian province of Hanover. Pop. (1905) 3888. It is 8 m. long and about 15 m. broad, and supports a seafaring and fishing population. It is reached by steamer from Geestemiinde, Emden, Bremen or Hamburg, and at low tide by road from the mainland. The village at the S.W. end of the island is one of the most popular sea-bathing places in Germany, and is visited annually by some 26,000 visitors. On the S. side rises a lighthouse 175 ft. high, while the E. end of the

island is filled with sand dunes ranging in height from 50 to 75 ft. Norderney is immortalized by its association with Heinrich Heine's Nordseebilder.

See Berenberg, Das Nordseebad Norderney (Norden, 1895) ; C. Herquet, Geschichte der Insel Norderney 1398-1711 (1890); and the article Frisian Islands.

NORDFJORD, an inlet of the west coast of Norway, penetrat- ing the land for 50 m, in an easterly direction, its mouth being 115 m. by sea N. of Bergen (6i° 50′ N.). No part of Norway affords finer scenery than the inner ramifications of this fjord among the snowy mountains of the northern Jostedalsbrae. Driving-roads penetrate the mountains from Visnaes eastward to the Gudbrandsdal, from Utvik southward to Vadheim on the Sogne Fjord, and from Faleide northward to Hellesylt (Geiranger Fjord) and Oje (Jorundsfjord). Nordfjordeid is a large village on the outer fjord, at the mouth of Hornindalen. Qlden and Loen are other favourite centres on the inner part of the fjord. A small but powerful breed of horses is peculiar to the Nordfjord district.

NORDHAUSEN, a town of Germany, in the province of Prussian Saxony. It is situated on the Zorge at the south base of the Harz Mountains, and at the west end of the Goldene Aue (Golden Plain), a fruitful valley watered by the Helme, 60 m. by rail W. of Halle, on the main line to Frankfort-on-Main and Cassel, and at the junction of railways to Erfurt and Blankenheim. Pop. (1885) 27,083; (1905) 29,882. It is built partly on the slope of the mountains and partly on the plain, and the upper and lower parts of the town are connected by flights of steps. Among its eight churches the most noteworthy are the Roman Catholic cathedral, late Gothic with a Romanesque crypt, and the Protestant church of St Blasius, containing two pictures by Lucas Cranach. Near the medieval town hall stands a Roland's column, the ancient symbol of free commercial inter- course and civic liberty. The town has a museum of antiquities and various public monuments, notably a fountain by Ernst Rietschel in the corn market, and another to Luther in the market square. There are statues of the emperor Frederick III. and of Prince Bismarck. The chief importance of the place arises from its distilleries, which annually yield about 10,000,000 gallons of " Korn Schnapps," a spirit somewhat akin to whisky. The breweries are also important and there are manufactures of leather, tobacco and cigars, cotton, linen goods, carpets, chicory, malt and chemicals. Nordhausen is sometimes called the Cincinnati of Germany on account of its extensive export trade in pork, corned beef, ham and sausages. There is also a large trade in corn.

Nordhausen is one of the oldest towns in North Germany. It possessed a royal palace in 874 and a convent was founded here in 962. It was destroyed by Henry the Lion, duke of Saxony, in 1 1 80, but was soon rebuilt and was made a free imperial town in 1 2 53 . In this and the following century several diets and other assemblies were held here. The protector (Vogt) of the town was the elector of Saxony and later for a few years (1702-1715) the elector of Brandenburg. Nordhausen accepted the reformed doctrines in 1522. It was annexed by Prussia in 1803 and again

in 1815, having in the meantime belonged to the kingdom of Westphalia.

See Forstemann; Urkundliche Geschichte der Stadt Nordhausen bis 1250 (Nordhausen, 1828-1840) and Kleine Schriften zur Geschichte der Stadt Nordhausen (Nordhausen, 1855); Lesser, Historische Nachrichten von Nordhausen, edited by Forstemann (Nordhausen i860); J. Schmidt, Bau- und Kunstdenkmaler der Stadt Nordhausen (Halle, 1886) ; T. Eckart, Gedenkblatter aus der Geschichte der ehemaligen freien Reichsstadt Nordhausen (Leipzig, 1895) ; Heine, Nordhausen und Preussen (Nordhausen, 1902); and Girschner, Lokalfuhrer fur Nordhausen und Umgebung (1891).

NORDICA, LILIAN (1859-), American operatic soprano, ne'e Norton, was born at Farmington, Maine, and trained as a singer at Boston, and later at Milan. As Madame Nordica she made her operatic debut at Brescia in 1879, and from that time took high rank among the prima donnas, appearing in all the principal capitals in Europe, and also in America.

NORDIN, CARL GUSTAF (1 749-181 2), Swedish statesman, historian and ecclesiastic. In 1774 he was made docent of • Gothic antiquities at Upsala University in consequence of his remarkable treatise, Monumenta svia-gothica vetustioris aevi falso meriloque suspecta. Summoned to Stockholm in 1782 by Gustavus III. to edit a Swedish Corpus diplomaticum, half an hour's private conversation with the young priest convinced Gustavus that Nordin's proper place was by his side in the political arena. But he employed Nordin quite differently from his episcopal colleague Olaf Wallqvist. While the bishop publicly defended the royal measures, Nordin became the king's private adviser. In politics Nordin was a royalist from pure conviction. To him a parliament seemed little better than a mob. He was one of the king's secret managers during the troublesome and dangerous riksdag of 1789, but advised caution and compared the estate of clergy, which at one time held the balance between the jarring orders, to ice which

might be walked upon but could not be driven over. He was appointed a member of an ecclesiastical commission for reforming the church in 1787, in which capacity he was virtually minister of public worship. In 1 791-1792 he became a leading member of the financial and general committees of the riksdag. After the king's death Nordin shared in the general disgrace of the Gustavians and lived in retirement at the little town of Hernosand, where he held the post of lector at the gymnasium. But he reappeared prominently on the political scene during the riksdag of 1800, and in 1805 was consecrated bishop of Hernosand. Though he lacked the brilliant qualities of his rival Wallqvist, Nordin had the same alertness and penetration, and was infinitely more stable and disinterested. One of the most learned men of his day, he devoted his spare time to history, and discovered that many of the oldest and most cherished Scandinavian MSS. were clever forgeries. Like Jean Hardouin he got to believe that a great deal of what is called classical literature was compiled by anonymous authors at a much later date, and he used frequently to startle his colleagues, the Gustavian academicians, by his audacious paradoxes.

He left behind him a colossal collection of MSS., the so-called Nordinskci Samlingarna, which were purchased and presented to Upsala university by Charles XIV. and form the groundwork of the well-known Scriptores rerum Suecicarum medii aevi. Nordin published during his lifetime Handlingar till uplysning af svenska krigshistorien (Stockholm, 1787-1788). His academical addresses came out at Stockholm in 1818 under the title Minnen bfver namnkunniga svenska man. His Dagbok did not appear till 1868.

See Sveriges historia (Stockholm, 1877, &c), vol. v.; C. T. Odhner, Sveriges politiska historia under Gustaf III.'s regering (Stockholm, 1885, &c.) ; R. N. Bain, Gustavus III. vol. 2 (London, 1896).

NORDLINGEN, a town of Germany, in the kingdom of Bavaria, on the Eger, 40 m. N. of Augsburg by rail and at the junction of lines to Buchloe and Dombuhl. Pop. (1905) 8512. It was formerly a free imperial town, owning a territory 35 sq. m. in extent, and is still surrounded with walls and towers. The Evangelical church of St George is a Gothic structure erected in the 15th century and restored in 1880. It has paintings by Hans Schaufelein, who was a native of Nordlingen, and a tower 290 ft. high. The Late Gothic town hall has a collection of picture? and antiquities. The chief manufactures of the town

are linen goods, soap, malt, and agricultural implements, and a brisk trade is carried on in cattle, grain and geese. From 898, when first mentioned, to 121 5 Nordlingen was subject to the bishops of Regensburg, but about 121 5 it became a free city of the Empire. It was annexed to Bavaria in 1803.

Nordlingen was the scene of two great battles in the Thirty Years' War (q.v.). In the first, which was fought on the 5th and 6th of September 1634, the hitherto invincible Swedish army, commanded by Duke Bernhard of Saxe Weimar and Marshal Horn, was defeated with great loss by a somewhat superior army of Imperialists and Spaniards under General Gallas, Horn and 3000 men being made prisoners and 6000 killed or mortally wounded. In the second battle, fought eleven years later (3rd August 1645), Conde (then duke of Erighien) and Turenne were the leaders on the one side, and Mercy and Johann von Weert, the dashing cavalry commander whose onset had decided the battle of 1634, on the other. The Germans were posted some s m. to the east of Nordlingen, about Allerheim, with their right resting on a hill and the left on a castle, the guns with an infantry escort being placed on these points, and the village itself in the centre being also garrisoned and entrenched. In rear of the village the plain was occupied by Mercy's army in the customary two lines, foot in the centre, horse in the wings. The French army, similarly arrayed, but with a few battalions attached to the cavalry wings, was more heterogeneous than the German, being composed of French, Hessian, German mercen- aries, and Liegeois. After a cannonade in which it suffered more severely than its entrenched enemy, the French centre furiously attacked the village of Allerheim; the fighting here was very heavy, and on the whole in favour of the Germans, although Mercy was killed. The right wing of the French cavalry was swept off the field by Johann von Weert's charge, but the German troopers, intoxicated with success, dispersed to plunder. On the French left, meanwhile, Turenne saved the day." Fighting cautiously at first with his leading line to gain time for his second to come up, he then charged and broke up the hostile right wing of cavalry, while some battalions of infantry scaled the hill and captured the Bavarian guns. Unlike Weert the marshal kept his troops in hand, and swung round upon the Bavarian infantry behind Allerheim, who were at the same time cannonaded by their lost guns. A prolonged fight now ensued, in which the Bavarians had the worst of it, and Weert, returning at last to the field, dared not attempt to engage afresh. The armies faced one another all night with their sentries fifty paces apart, but in the morning the Bavarians were found to have retreated. Nothing was gained by the victors but the trophies

and the field of battle, and the losses of both sides had been enormous. Enghien had only 1500 of his foot in hand next day. Nordlingen, therefore, is a classical instance of the unprofitable and costly bataille rangte of the 17th century.

See Beyschlag, Geschichte der Stadt Ndrdlingen (Nordlingen, 1851), and Mayer, Die Stadt Ndrdlingen, ihr Leben und ihre Kunst im Lichte der Vorzeit (Nordlingen, 1856).

NORE, THE, a sandbank at the mouth of the river Thames, England, marked by various buoys and by a lightship, with revolving light. This ship lies 3 m. from the nearest point on the Kent coast, about the same distance from the Essex coast, and 47J m. below London Bridge. The first light was placed here as an experiment by Mr Hamblin, its patentee, in 173 1. In 1797 the neighbouring anchorage was the scene of a mutiny in the British fleet then lying here, well known in history as the Mutiny of the Nore.

NORFOLK, EARLS AND DUKES OF. The 1st earl of Norfolk was Ralph de Guader, a follower of William the Conqueror, who forfeited the earldom when he revolted against William in 1075; the 2nd was Hugh Bigod (d. 1177), one of Stephen's supporters, to whom the earldom was granted by this king before 1141. Hugh's grandson, Hugh (d. 1225), the 3rd earl of this line, married Matilda, daughter of William Marshal, earl of Pembroke, and from the Marshals their son Roger (d. V270), the 4th earl, inherited the office of marshal of England. This powerful family of Bigod retained the

earldom until Roger, the 5th earl, died childless in December

1306.

The next earl of Norfolk was Thomas or Brotherton (1300- 1338), a younger son of Edward I., to whom the earldom was granted in 131 2 by his half-brother, Edward II. In addition to the estates which had formerly belonged to the Bigods Thomas received the office of marshal. He joined Queen Isabella when she landed in England in 1326, and was one of the group of nobles who brought about the deposition of Edward II. He died in August 1338, leaving no son. The survivor of his two daughters, Margaret (c. 1320-1400), who was countess of Norfolk in her own right, married John de Segrave, 3rd Lord Segrave (d. 1353), and their only child Elizabeth (d. c. 1375) became the wife of John de Mowbray, 4th Lord Mowbray (d. 1368), and the mother of two sons John and Thomas. In 1397 the countess Margaret was created duchess of Norfolk, and at the same time her

grandson Thomas Mowbray was made duke of Norfolk.

Thomas , Mowbray, 1st duke of Norfolk (c. 1366-1399), became Baron Mowbray and Baron Segrave when his elder brother John died in February 1382; about the same time Richard II. created him earl of Nottingham, u °™ ray a title held by his dead brother, and in 1385 made him marshal of England for life. For some years he enjoyed the favour and companionship of the king, but differences arose between them, and in 1387 Nottingham began to act with Thomas of Woodstock, duke of Gloucester, his own brother-in- law, Richard Fitzalan, earl of Arundel, and the party of nobles who wished to deprive the king of his power. They routed the royal favourite Robert de Vere, earl' of Oxford, at Radcot Bridge, and Richard was at their mercy. Owing partly to Nottingham's moderate counsels the suggestion to depose him was not carried out, but in the " merciless parliament " of 1388 his favourites were " appealed " of treason and were sentenced to death. For nearly two years the chief power was in the hands of the lords appellant, as Nottingham and his friends were called, but in 1389 the king regained his authority. He detached Nottingham from his colleagues and made him warden of the Scottish marches; later he became captain of Calais and the royal lieutenant in the north-east of France. Richard took him to Ireland in 1394 and soon afterwards sent him to arrange a peace with France and his marriage with Isabella, daughter of King Charles VI. But the earl's supreme service to the king was in 1397 when Richard took a tardy but severe vengeance upon three of the appellants. In their turn these lords were " appealed " of treason before the parliament, and as on the former occasion Nottingham was one of the accusers. He was present when Gloucester was arrested at Pleshey, and Froissart says that he actually beheaded Arundel himself. > Gloucester was entrusted to his keeping at Calais, and in September 1397 he reported that his prisoner was dead. The duke had been murdered, and Nottingham was probably responsible, although the evidence against him is not conclusive. As a reward he received most of Arundel's lands in Surrey and Sussex, and was created duke of Norfolk. He now began to fear for his own safety, and took the duke of Hereford, afterwards King Henry IV., into his confidence. Hereford carried his words to the king, who summoned him to his presence, and at Oswestry Norfolk accused Hereford of speaking falsely. A court of chivalry decided that the dispute should be referred to the arbitrament of single combat and Coventry was the place appointed for the duel; but when on the 16th of September 1398 everything was ready for the fight Richard interposed and ordered both com- batants into banishment. Norfolk was deprived of his offices, but not of his titles; his " heavier doom "

was exile for life, and he was ordered to confine himself to Germany, Hungary and Bohemia. At once he left England for Dordrecht, and after passing some months in wanderings he reached Venice, where he died on the 22nd or 27th of September 1399. The concluding scene of the duke's life in England forms the staple material of act i. of Shakespeare's Richard II. Norfolk left estates in nearly all the English counties. His wife was Elizabeth (c. 1372-1425),

daughter of Richard Fitzalan, earl of Arundel, by whom he had two sons, Thomas and John, and two daughters.

His elder son, Thomas Mowbray (1385-1405), became earl of Nottingham and earl marshal on his father's death, but he was not allowed to assume the title of duke of Norfolk. He quarrelled with Richard Beauchamp, earl of Warwick, over the precedence of their respective earldoms, and left the court in anger when Henry IV. decided in favour of Warwick. At this time (1405) Richard le Scrope, archbishop of York, and other northern potentates were preparing to rise against the king. The earl marshal joined them, was taken prisoner at Shipton Moor, and was beheaded at York on the 8th of June 1405.

John Mowbray (1390-1432), 2nd duke, brother of the last- named, now became earl marshal and earl of Nottingham. He sat in judgment upon Richard, earl of Cambridge, and the other rebels in 141 5, and went to France with Henry V. He took part in the siege of Harfleur, but illness prevented him from fighting at Agincourt. He saw service in France in subsequent years, and after Henry's death he was a member of the English governing council. In 1424 he followed Humphrey, duke of Gloucester, on his campaign in Hainaut, and in 1425 he secured his recognition as duke of Norfolk. He died on the 19th of October 1432 at Epworth, where his father had founded a Cistercian priory. By his wife Catherine, daughter of Ralph Neville; 1st earl of Westmorland, he left an only son, the 3rd duke.

John Mowbray, 3rd duke (1415-1461), became warden of the Scottish marches; he also served as a soldier and an ambassador in France. Upon the outbreak of the fierce rivalry between the houses of York and Lancaster about 1450 he joined Richard, duke of York, to whom he was related; he aided the Yorkist cause in Norfolk and in London, and it was he who in November 1453 demanded an inquiry into the

administration of Edmund Beaufort, duke of Somerset. In 1459 he appeared on the Lancastrian side and took the oath of allegiance to Henry VI. and to his son Edward at Coventry, but soon he was again figuring as an active Yorkist. He was a member of the deputa- tion which in March 1461 asked the duke of York (Edward IV.) to take the crown, and he fought at the second battle of St Albans and also at Towton, where one authority says he saved the day for the Yorkists.

John Mowbray, 4th duke (1444-1476), who had already been created earl of Surrey, a title formerly held by his ancestors, the Fitzalans, was the only son of the preceding. The names both of John and of his father appear frequently in the Paston Letters, as both dukes in turn seized Caister castle, which had been left by Sir John Fastolf to John Paston, and the 4th duke held it against the Pastons for some years. On his death in 1476 the dukedom became extinct, but the earldom passed to his daughter Anne (1472-1481), who married Richard, duke of York, the younger son of Edward IV. Richard was created duke of Norfolk and made earl marshal, but when he was murdered in 1483 the dukedom again became extinct, the earldom having reverted to the crown on the death of Anne. The illustrious family of Howard (q.v.), members of which have been dukes of Norfolk from 1483 to the present H™ day, with the exception of two periods during which

the title was forfeited, was connected with the family of Mowbray.

John Howard, 1st duke of Norfolk (c. 1430-1485), was the son of Sir Robert Howard by his wife Margaret, daughter of Thomas Mowbray, the first duke of that family. In 1455 John Howard was sent to parliament as member for Norfolk, although he ” hadde no lyvelode in the shire “; in 1461 he was knighted; and in 1470, although he appears to have been a consistent Yorkist, he was created a baron by Henry VI. He was treasurer of the royal household from 1467 to 1474, and went to France with Edward IV. in 1475. After Edward’s death, however, he supported Richard III., who created him duke of Norfolk and made him earl marshal of England in June 1483. He was killed at Bosworth whilst fighting for this king on the 22nd of August 1485, and the title thus suffered attainder. He is frequently mentioned in the Paston Letters.

His son, Thomas Howard, afterwards 2nd duke (1443-1524), shared his father’s fortunes; he fought at Barnet for Edward IV. and was made steward of the royal household and created earl of Surrey in 1483. Taken prisoner at Bosworth he was attainted and remained in captivity until January 1489, when he was released and restored to his earldom but not to the dukedom of Norfolk. He was then entrusted

with the maintenance of order in Yorkshire and with the defence of the Scottish borders; he was made lord treasurer and a privy councillor in 1501, and he helped to arrange the marriage between Margaret, the daughter of Henry VII., and James IV- of Scotland. Henry VIII., too, employed him on public business, but the earl grew jealous of Wolsey f and for a short time he absented himself from court. He commanded the army which defeated the Scots at Flodden in September 1513, and was created duke of Norfolk in February of the following year, with precedency as of the creation of 1483. In his later years Norfolk worked more harmoniously with Wolsey. He was guardian of England during Henry's absence in France in 1520, and he acted as lord high steward at the trial of his friend Edward Stafford, duke of Buckingham, in 1521. Among his sons were William, 1st Lord Howard of Effingham, and Sir Edward Howard (c. 1477- 15 13), lord high admiral, who defeated the French fleet off Brest in August 151 2, and lost his life during another engagement in April 1513.

Thomas Howard, 3rd duke (1473-15 54), eldest son of the 2nd duke, married in 1495 Anne (1475-1512), daughter of Edward IV., thus becoming a brother-in-law of Henry VII., who had married Anne's sister Elizabeth. He became lord high admiral in 1 5 13, and led the van of the English army at Flodden in September, being created earl of Surrey in February 15 14. In 1 5 13 he took for his second wife Elizabeth (d. 1558), daughter of Edward Stafford, duke of Buckingham. In 1520 Surrey went to Ireland as lord-deputy, but soon vacated this post to command the troops which sacked Morlaix and ravaged the neighbourhood of Boulogne in 1522; afterwards he raided and devastated the south of Scotland. He succeeded his father in May 1524, and as the most powerful nobleman in England he headed the party hostile to Cardinal Wolsey. He favoured the divorce of Henry VIII. from Catherine of Aragon, and the king's marriage with his niece Anne Boleyn. In 1529 he became president of the council, but in a few years his position was shaken by the fate of Anne Boleyn, at whose trial and execution he presided as lord high steward. But his military abilities rendered him almost indispensable to the king, and in 1536, just after the rising known as the Pilgrimage of Grace had broken out, he was despatched into the north of England; he temporized with the rebels until the danger was past, and then, as the first president of the council of the north, punished them with great severity. Sharing in the general hatred against Thomas Crom- well, Norfolk arrested the minister in June 1540. He led the English army into Scotland in 1542 and into France in 1544; but the execution of Catherine Howard, another of his nieces who had become the wife of the king, had weakened his position. His son Henry Howard, earl of Surrey (q.v.),

was arrested on a charge of treason; Norfolk himself suffered the same fate as accessory to the crime. In January 1547 Surrey was executed; his father was condemned to death by a bill of attainder,, but owing to the death of the king the sentence was not carried out. Norfolk remained in prison throughout the reign of Edward VI., but in August 1553 he was released and restored to his dukedom. Again taking command of the English army he was sent to suppress the rebellion which had broken out under Sir Thomas Wyat, but his men fled before the enemy. He acted as lord high steward at the trial of John Dudley, duke of Northumberland; and he died on the 25th of August 1554. Norfolk was a brutal and licentious man, but was a supporter of the Roman church, being, as he himself admits, ” quick against the sacramentaries.” As a soldier he was serviceable to Henry VIII., but as a diplo- matist he was a failure, being far inferior to Wolsey and to Cromwell. He had two sons, Henry, earl of Surrey, and Thomas (c. 1 528-1 582), who in 1559 was created Viscount Howard of

Bindon, a title which became extinct in 1611. His only daughter Mary (d. 1557) married Henry, duke of Richmond, the natural son of Henry VIII.

Thomas Howard, 4th duke (1536-1572), son of Henry Howard, earl of Surrey, was born on the 10th of March 1536. His tutor was John Foxe, the martyrologist. Soon after Elizabeth became queen in 1558 she sent the young duke to take part in the war against the Scots and their French allies, but the conclu- sion of the treaty of Edinburgh in July 1560 enabled him to return to the court in London. Having married and lost three wives, all ladies of wealth and position, Norfolk was regarded as a suitable husband for Mary queen of Scots, who had just taken refuge in England. He presided over the commission appointed by Elizabeth to inquire into the relations between the Scottish queen and her subjects; and although he appears to have believed in Mary’s guilt he was anxious to marry her. Among the Scots Maitland of Lethington favoured the proposed union; Mary herself consented to it; but Norfolk was unwilling to take up arms, and while he delayed Elizabeth ordered his arrest and he was taken to prison in October 1569. In August 1570, after the suppression of the rising in the north of England, the duke was released; but he entered into communication with Philip II. of Spain regarding the proposed invasion of England by the Spaniards. After some hesitation Norfolk placed himself at the head of the conspirators; and in return for his services he asked the

king of Spain ” to approve of my own marriage with the Queen of Scots.” But the plot failed; Norfolk’s treachery was revealed to Lord Burghley, and in September 1571 he was arrested. He was beheaded on the 2nd of June 1572. It is noteworthy that he always regarded himself as a Protestant. Norfolk’s first wife, Mary (1540-1557), daughter and heiress of Henry Fitzalan, 12th earl of Arundel, bore him a son, Philip, who in consequence of his father’s attainder was not allowed to succeed to the dukedom of Norfolk, but became 13th earl of ArUndel in succession to his maternal grandfather in 1580. Norfolk left two other -sons, Thomas Howard, created earl of Suffolk in 1603, and Lord William Howard (q.v.).

In 1660 the dukedom was restored by act of parliament to Thomas Howard, 4th earl of Arundel (1627-1677), a descendant of the 4th duke. The 5th duke was succeeded by his brother Henry (1628-1684), the friend of John Evelyn, who had been already created earl of Norwich; in 1672 he was made earl marshal, and this dignity was entailed on his male heirs.

Charles Howard, nth duke (1 746-1 81 5), was the son of Charles Howard (1720-1786), who succeeded his cousin, Edward Howard (1686-1777), as 10th duke of Norfolk in 1777, and who wrote Historical Anecdotes of some of the Howard Family (1769 and 1817). Born in March i746,the earl of Surrey, as Charles was called from 1777 until he became duke of Norfolk in 1786, represented Carlisle in the House of Commons, where he acted with the Whigs; unlike his father he was a Protestant. In 1780 he was a lord of the treasury. In 1789 at a dinner held in London the duke gave the toast ” Our sovereign’s health — the majesty of the people “; this greatly offended George III., who deprived him of some of his public offices.

When he died on the 16th of December 181 5 he left no sons, and the dukedom passed to his kinsman, Bernard Edward Howard (1765-1842), a descendant of the 4th duke.

Bernard’s only son, Henry Charles Howard (1791-1856), became 13th duke in 1842. As earl of Surrey he was the first Roman Catholic since the Reformation to sit in the House of Commons, of which he was a member from 1829 to 1841; as duke of Norfolk he was master of the horse from 1846 to 1852 and lord steward from 1853 to 1854. The second of his three sons, Edward George Fitzalan (1818-1883), was a member of the House of Commons from 1848 to 1868, and was created Baron Howard of Glossop in 1869. Lord Howard rendered great service to the cause of Roman Catholic education.

The 13th duke's eldest son, Henry Granville Fitzalan Howard (1815-1860), succeeded to the title. He was a devoted Roman Catholic, left the Liberal party and resigned his seat in parliament rather than support the Ecclesiastical Titles Bill of

1850.- He edited the Lives of Philip Howard, earl of Arundel, and of Anne Dacres, his wife (1857 and 1861). He was suc- ceeded by his son Henry Fitzalan Howard, 15th duke (b. 1847), who was postmaster-general from 1895 to 1900, first Lord Mayor of Sheffield in 1895, went out to the South African War in 1900, and whose position as head of the English Roman Catholics and as premier duke and Earl Marshal made him for many years conspicuous in public life. His only son by his first wife, a daughter of Baron Donington, died in early life; but by his second marriage (1904) to the daughter and heiress of Lord Herries he had a son born in 1908.

NORFOLK, an eastern county of England, bounded N. and E. by the North Sea, S.E. and S. by Suffolk and W. by Cam- bridgeshire and Lincolnshire. The area is 2044-4 sq. m., the county being the fourth in size in England. The surface falls into two divisions. The eastern and central portions consist of an undulating plain with rising ground skirting the river valleys and low chalk downs in the north. For the most part this section is fertile and well wooded, but there are some expanses of heath land. The principal rivers are the Yare and its tribu- taries the Wensum., Bure and Waveney, the last forming a large part of the boundary with Suffolk. In the west the county includes part of the Fen country {q.v.), where the principal rivers are the Great Ouse and its tributaries the Little Ouse or Brandon river, which also forms part of the Suffolk boundary, the Wissey and the Nar. The flat fens are crossed by innumer- able drainage channels. They are comprised within that portion of the whole district known as the Bedford Level, and extend from Welney and Hilgay Fens near the junction of the Great and Little Ouse northward to the Wash.

The watershed is nearly in the centre of the county. The middle eastern portion is a low-lying flat area lifted slightly towards the coast in such a way that some of the tributary streams of the Bure rise very near the sea but flow at first inland or parallel to the coast. Here occur the well-known Norfolk Broads, shallow meres, having their low banks massed with luxuriant reeds and other water-plants, and possessing much quiet beauty of an individual character. Most of them abound with pike, bream and other coarse fish, and harbour innumerable waterfowl, including the water-hen, heron, bittern, king-fisher, mallard, teal and snipe. They. are thus frequented by sports-men, but still more by boating parties, and at Yarmouth, Wroxham Bridge, Acle and elsewhere sailing boats with cabins, and other boats, are hired in large numbers. Annual regattas are held on several Broads. The Broads are generally not widenings of the main river, but are connected with it by short channels. Their formation is probably

due to a slight uprising of the land, whereupon the depressions in the undulated surface continued to carry water. The average depth of the Broads is only some eight feet, and their tendency is to become choked with sedges and bulrushes and to decrease in size. The Bure joins the Yare at Yarmouth, at the seaward end of Breydon Water, which does not rank among the Broads. Following the Bure upwards, a small stream is found uniting it with Filby, Rollesby and Ormsby Broads to the north, which form one sheet of water of irregular shape. The Thurne stream then enters from the same direction, draining Heigham Sound, Hickling Broad, Horsey Mere and Martham Broad. The second of these is the largest of all, measuring some 3 m. in length by one at its widest part. The next tributary, the Ant, drains Barton and Stalham Broads. Closely adjoining the upper Bure itself, there are Ranworth Broad, Homing Broad, and Salhouse, Hoveton and Wroxham Broads almost adjoining. South of Ranworth, on a tributary, is South Walsham Broad. Adjacent to the Yare towards Norwich is Rockland Broad. Between the Waveney and Lowestoft Oulton Broad is formed (in Suffolk; see Lowestoft).

Nearly two-thirds of the boundary of the county is formed by tidal water. There are few bays or inlets, and on the northern coast no river mouths. For the most part the coast-line is flat and low, and has been greatly encroached on by the sea, several villages having been engulfed since the Conquest. From the

mouth of the Yare to Happisburgh the shore is skirted by sand- banks. Thence for 20 m. it is formed of cliffs consisting of clay and masses of embedded rocks, the average height being about 50 ft., although in some cases an altitude of 200 ft. is reached. These cliffs are succeeded by a low shingly or sandy coast stretching as far as St Edmund’s Point. The shores of the Wash are formed of mudbanks, which are left dry at low water. West of Lynn a considerable extent of land has been reclaimed from the sea in modern times, and farther south an old Roman embankment stretches into Lincolnshire. At various points off the coast there are submarine forests, especially in Brancaster Bay and in the neighbourhood of Cromer and Happisburgh. Fossilized remains of large mammals are sometimes dragged up by the nets of fishermen, and mammoth tusks measuring from 6 to 9 ft. have been found at Knole Sand off Happisburgh. The fine sandy beaches and healthy climate have contributed to the growth of such popular watering-places as Cromer, Yarmouth and Hunstanton, while Mundesley and

Wells-next- the-Sea are lesser resorts.

Geology. — The prevailing rock formation in Norfolk is the Chalk, which occupies a broad tract in the central and western portions of the county and underlies the Tertiary deposits in the eastern part, the general dip of the rocks being towards that direction. Pliocene beds predominate in the eastern third of the county; while a narrow belt of Lower Cretaceous and Jurassic rocks lies along the western border. Oxford Clay and Corallian beds have been proved by boring at Lynn, but the oldest formation to appear at the surface is the Kimeridge Clay, which stretches along the coast of the Wash from Hunstanton to King's Lynn and south to Downham, where it has been dug for bricks and tiles. The Lower Greensand, which forms the picturesque escarpment overlooking the Fen-land and the Wash, is represented in its upper part by the brown, iron-stained sandstone, the Carstone (up to 40 ft.), locally known as the " Gingerbread stone," which is quarried at Snettisham and elsewhere as a building stone. Below the Carstone are the Snettisham Clay beds, dug for brick- making at that village and at Dersingham and Heacham; these pass southwards into sandstones and ironstones. The lowest division of the Greensand, the Sandringham beds, highly-coloured sands and sandstones, are exposed at Sandringham Warren, Downham Market and Grimston Common. Overlying the Lower Greensand is the Gault Clay which extends from Shouldham northwards to Dersingham, where it begins to change in character and finally passes into the Red Chalk (4 ft.), so conspicuous in the cliffs at Hunstanton. In the same cliffs the Lower Chalk is exposed resting on the Red Chalk (which does not belong to the Chalk proper but the Gault) ; it is a hard grey or white limestone; at Marham and other places it is quarried for building and for lime. The Middle Chalk (about 300 ft.), with flints in the upper part and occasional marl beds, is exposed at Docking, Hillington and Methwold. The Upper Chalk (about 800 ft.) is much softer, with many flints, including the peculiar forms known as " paramoudras "; it has been largely exploited for lime and whiting, and the flints have been worked from prehistoric times. Dressed flints are still used for facing walls in churches and other buildings. At Trimingham occurs the highest horizon of the Chalk known in England. Eocene strata, Reading Beds (46 ft.) and London Clay (310 ft.) have been proved to lie beneath younger deposits at Yarmouth. Pliocene deposits, sands, gravels and clays are exposed . along the coast from Weybourne and Cromer to Happisburg and in the river valleys over most of the eastern part of the country. The lower subdivision, the Norwich Crag Series (25-100 ft.), exhibits numerous local peculiarities to which distinctive names have been applied, as the " Fluvio-Marine beds " of Bramerton and

Thorpe, the ” mammaliferous crag,” the ” Weybourne Crag ” and the ” Chillesford Clays,” &c. The upper subdivision, the Cromer Forest- Bed (10-30 ft.), contains the bones of the mammoth, rhinoceros, giant beaver, sabre-toothed tiger and many others, as well as the transported stumps of trees. Next in order come the glacial clays, sands and gravels, which cover and obscure so much of the older stratified rocks of the county and hence greatly influence the scenery. There is a lower ” till ” with boulders and an upper chalky boulder clay, sometimes with sands and gravels between; glacial gravels overlie the clays in large sheets as at Norwich, Mousehold Heath, Dereham, Fakenham. The drift is thicker in the east than in the west — very interesting exposures occur on the cliffs about Cromer. Later valley gravels occupy some of the stream courses, and among the more recent deposits are the Fen beds and blown sands.

Climate and Agriculture. — On account of the exposed position of the coast to east and north-east winds, the climate, especially in winter and early spring, is much colder than in the adjacent counties. The air is, however, generally dry, and unhealthy fogs are not common, except in the marshy districts. The cynd is a characteristic mist which sometimes rolls up like smoke from the sea over the eastern parts. Norfolk contains a

greater variety of soil than any other county in England. In the north and west the soil is generally chalky; towards the south- east it is a light sand, assuming occasionally the form of blowing sand, but elsewhere capable of cultivation and of average fertility. In the centre and east the prevailing soil is loam, chiefly light and workable, but sometimes composed of stiff chalky boulder clay. Alluvial clays and loams occur on the borders of Lincolnshire and Cambridgeshire, and stretch along the river valleys. The marsh lands along the coast are subject to inundation, but afford capital pasturage. Farming is in an ad- vanced condition, and, by means of draining, subsoil ploughing, &c, excellent crops are raised. The farms are for the most part large and the farm buildings superior. About four-fifths of the total area is under cultivation. Of this area corn crops occupy some two-fifths and consist mainly of wheat and barley, but in the production of oats also Norfolk is one of the first counties in England. As much attention is paid to the grazing of cattle and to the rearing and fattening of sheep, turnips and swedes are extensively grown. Large numbers of lean cattle, princi- pally Irish shorthorns, are brought into the county mainly for winter grazing. The old Norfolk polled stock is recognized as a distinct breed. Good pasture lands are found in many districts of the county, especially along the river-beds and near the fens. A large acreage is under beans and a fair quantity of small fruit is grown.

Other Industries. — At an early period Norfolk was one of the principal seats of the cloth trade in England, worsted deriving its name from having been first manufactured at Worstead. The weaving of silk and wool is still carried on at Norwich and also shawl weaving, although the staple trade of the town is now boots and shoes. Silk is also manufactured at Yarmouth, Wymondham and North Walsham. Flour-mills are numerous all over the county, and there are agricultural implement works at Norwich, Lynn, Thetford, East Harling, North Walsham, Walsingham, and East Dereham. Lime-burning, brick-making, tanning, malting and brewing are carried on in various districtSi There are extensive mustard and starch works at Norwich. One of the chief hindrances to commercial progress is the danger- ous nature of the sea-coast, and the lack of harbours. A large trade, however, is carried on at Yarmouth. The other principal port is Lynn, and there is a small trade at Cromer and Wells.

Railway communication is provided principally by the Great Eastern railway, the principal lines of which are those from London and Ipswich to Norwich and Yarmouth, from Ely to Norwich and Yarmouth, Ely to Lynn, Lynn to Swaffham and Dereham, Norwich to Dereham and Wells and Norwich to Cromer. There are numerous branch lines. The Midland & Great Northern joint line, from Lynn, serves Cromer, Norwich, North Walsham and Yarmouth. The eastern rivers afford water communication with the port of Yar- mouth and the Great and Little Ouse, with many of the drainage- cuts which are navigable, with Lynn.

Population and Administration. — The area of the ancient county is 1,308,439 acres, with a population in 1891 of 454,516, and in 1901 of 460,120. The area of the administrative county is i,3r4,6i2. The county contains 33 hundreds. The municipal boroughs are — King's Lynn (pop. 20,288); Norwich, a city and county borough and the county town (111,733); Thetford (4613); and Yarmouth, properly Great Yarmouth, a county borough (51,316). The urban districts are Cromer (3781), Diss (3745), Downham Market (2472), East Dereham (5545), Hunstanton (1893), North Walsham (3981), Sheringham (2359), Swaffham (3371), Walsoken (3250), Wells-next-the-Sea (2494). Among other towns may be mentioned Fakenham (2907), Holt (1844), Wymondham (4733). The county is in the south- eastern circuit, and assizes are held at Norwich. There are two courts of quarter sessions, and 25 petty sessional divisions. Each of the four municipal boroughs has a separate commission of the peace and a separate court of quarter sessions. The total number of civil parishes is 700. Norfolk is mainly in the diocese of Norwich, with small parts in those of Ely and Lincoln; it contains 607 ecclesiastical parishes or

districts, wholly or in part. For parliamentary purposes the county is divided into six divisions (North-Western, South-Western, Northern, Eastern, Mid, and Southern), and also includes the parliamentary

boroughs of King's Lynn and Norwich, and part of the parlia- mentary borough of Great Yarmouth; each returning one member, except the city of Norwich, which returns two members. History. — The district which is now Norfolk was invaded in the second half of the 5th century by Angle tribes from north Germany, who, having secured the coast districts, worked their way inland along the river valleys. In the 7th century the land of the North-folk formed the nprthern half of East Anglia which at the time owned the supremacy of Ken*\ and later appears successively as adependency of Mercia and Northumbria, until in 827 the whole land was united under the rule of Ecgbert. In 867 the Danes under Inguar and Ubba defeated and killed King Edmund at Thetford, but, although it formed an integral part of the Danelaw, Norfolk remained thickly settled by an almost exclusively Teutonic population. In the renewed Danish attacks of the nth century Norwich and Thetford were destroyed. At the time of the Norman invasion Norfolk formed part of Harold's earldom, but it offered no active resistance to the Conqueror, who built a castle at Norwich, and bestowed the earldom of East Anglia on Ralf Guader. The forfeited estates of Earl Ralf had passed at the time of the Domesday Survey to Roger Bigod, ancestor of the earls of Norfolk, whose line expired in 1306. The Norfolk fief of Count Alan later formed part of the honour of Richmond; Robert Malet's fief became the honour of Eye; Hermer de Ferriere's fief became the barony of Wormegay, afterwards held by the Bardolfs; Hugh de Mont- fort's fee, as the honour of Haughley, was afterwards attached to the office of constable of Dover. The Howards were settled in the county from the 13th century, Thomas Howard being created duke of Norfolk for his services at Flodden. Castle Acre was a seat of the earls of Warenne; Paston of the Pastons; Attleborough of the Mortimers; Caister of the Fastolfs.

The shire-system was not definitely established in East Anglia before the Conquest, but the Domesday boundaries of Norfolk were practically those of the present day. The thirty-six Domesday hundreds were subdivided into leets, of which no trace remains, and the boroughs of Norwich and Thetford ranked as separate hundreds, while Yarmouth was the chief town of three hundreds. The Domesday hundred of Emneth is now included in Freebridge, and Docking in that

of Smithdon, and the boundary between Brothercross and Gallow hundred has been considerably changed. Norfolk and Suffolk were united under one sheriff until the reign of Elizabeth, the shire court for the former being held at Norwich. The hundred court of Humbleyard hundred was held in the parish of Swardeston; that of Clackclose at Clackclose hill on Stradsett common; Taverham at Frettenham Hill; Grimeshoeat a tumulus bet.veen Brandon and Norwich; Forehoe in the parish of Carleton Forehoe; Greenhoe by the tumuli on the London road to Swaffham; Smithdon in the parish of Bircham Magna; Free- bridge at Flitcham Burgh, afterwards at an oak at Gaywood and still later at an oak at Wiggenhall St German's; Gallow in the 15th century at Fakenham; in the 16th century at Longfield Stone; Brothercross, at the cross by the ford over the Burnham; Eynsford at Reepham; Depwade, at the Deep ford over the Tas; Mitford, in 1639, at " Brokpit "; North Erpingham, at Guneby Gate, near Gunton; South Erpingham, at Cawston Park Gate; Launditch, at the crossing of the Norwich road with the long ditch between Longham and Beeston; Earsham, at an encampment near the church.

Norfolk formed part of the diocese of East Anglia from its foundation in 630, and in 1075 the bishop's see was placed at Thetford, whence it was transferred to Norwich in 1093. In 1 1 21 the Norfolk portion of the diocese included the 12 deaneries of Norwich (or Taverham), Blofield, Ingworth, Sparham, Holt, Walsingham, Toftrees, Brisley, Breckles, Lynn, Thetford and Flegg — all in the archdeaconry of Norwich, and the 12 deaneries of Repps, Humbleyard, Depwade, Waxham, Brooke, Redenhall, P.ockland, Cranwich, Fencham, Hitcham, Burnham and Hengham —in the archdeaconry of Norfolk. From this date the deaneries underwent little change, until the creation of the archdeaconry of Lynn in 1894, when they were entirely reconstituted.

In the wars between John and his barons Roger Bigod garri- soned Norwich castle against the king, who in 12 16 on his retreat from Lynn lost his baggage in the Wash. In the rising of 1381 Norwich was plundered by the insurgents under Sir Roger Bacon of Baconsthorpe, and in the rising of 1549 against en- closures Norwich was again captured by the rebels under Ket. In the Civil War of the 17th century Norfolk as a whole adhered to the parliamentary cause, forming one of the six counties of the Eastern Association. Lynn, however, was held for the king by Sir Hamon Lestrange, and Norwich was one of the first cities to welcome back Charles II.

At the time of the Domesday Survey sheep-farming flourished almost

throughout Norfolk, a flock of 1300 being mentioned at Walton, and horses were extensively bred; numerous bee- hives, nearly 600 water-mills and valuable river-fisheries are mentioned; and salt was made in the hundreds of Freebridge and East Flegg. The worsted trade was introduced by Flemish immigrants as early as the 12th century, and the woollen trade became especially prosperous in the hundreds adjoining the Wash. Linen was manufactured at Aylsham in the 14th century. Fuller, writing in the 1 7th century, describes Norfolk as abound- ing in all good things, and especially rabbits, herrings and worsteds. The leather industry flourished in Norman times.

Norfolk returned members to parliament in 1 290, and in 1 298 the county and the boroughs of Lynn, Norwich and Yarmouth returned each two members. Thetford acquired representation in 1329, and Castle Rising in 1558. Under the Reform Act of 1832 the county returned four members in two divisions, and Castle Rising was disfranchised. Under the act of 1868 the county returned six members in three divisions, and Thetford and Yarmouth were disfranchised, the latter for notorious corruption.

Antiquities. — There are few traces of Saxon architecture in the county, unless the towers of Dunham-Magna and Newton- by-Castleacre be assigned to this period. The round towers which are specially characteristic of the district are probably Norman. Although there are several fine specimens of Norman architecture in the county in addition to Norwich cathedral, and a few good examples of Early English, the majority of the churches are Decorated or Perpendicular, or a mixture of both styles. The most notable features of the churches are the flint and stone panels, the fine rood screens and the numerous brasses. The churches of the marshes in the N.W. are note- worthy, especially those of Tilney Ail Saints and Walsoken (Norman) and West Walton (Early English); the rich Norman church of Castle Rising should also be mentioned. At Northwold remains one of the rare Easter sepulchres. Apart from the churches in the towns, those of Worstead, Hingham, Cawston and Terrington St Clement may be quoted as typical examples of the numerous fine later Gothic village churches. Norfolk possessed an unusually large number of monastic foundations, but of these the remains are few and comparatively unimportant. The cathedral church of Norwich was originally connected with a very richly endowed Benedictine monastery. A foundation of almost equal importance was that of Augustinian canons at Walsingham, where there are remains of an Early English and Decorated church, a Decorated refectory and a Perpendicular gateway. The shrine of Our Lady of Walsingham was the resort of great numbers of pilgrims. Other monastic remains are Bromholm Priory

near North Walsham; slight Early English fragments of Beeston Augustinian priory, W. of Cromer; good Norman and later remains at Binham (Benedictine) N.E. of Walsingham; the Benedictine nunnery of Carrow near Norwich; the fine church (Norman and later) of the Benedictine priory at Wymondham; and the remains at Castle Acre and Thetford.

Of Norman keeps there are remains of the building at Castle Acre; there is a magnificent ruin at Castle Rising N.E. of Lynn; and Norwich Castle is kept in restoration. There are several old mansions of interest, such as the Jacobean brick building of Blickling Hall, Barningham Hall (r6i2), Hunstanton, the moated Oxburgh Hall, and Cressingham Manor, both of the 15th century. The larger mansions, however, such as Sandringham

(a seat of King Edward VII.), ‘Holkham, Rainham, Costessey, Gunton, Houghton and Shadwell, are of more modern date. The Holkham estate was the scene of the agricultural work of Thomas William Coke, earl of Leicester (d. 1842), who success- fully proved that wheat could be profitably grown in this part of the county; and also made great improvements in live stock. Among sites of other various interests are Burnham Thorpe, the birthplace of Nelson; Paston and Oxnead, successive seats of the Paston family whose Letters are famous; and Ket’s Oak near Hethersett, W. of Norwich, where Robert Ket took oath as leader of the agrarian rebellion of 1549.

See Victoria County History; Norfolk; F. Blomefield, Essay towards a Topographical History of . . . Norfolk (London, 1739- 1775 and 1805-1810); W. Rye, History of Norfolk (London, 1885); P. H. Emerson, Pictures of East Anglian Life (London, 1888), and other works; Rev. A. Jessopp, Arcady (London, 1887), and other works; Quarterly Review (London, 1897), where other literature is cited; G. C. Da vies, Norfolk Broads and. Rivers (Edinburgh, 1884).

NORFOLK, a city of Madison county, Nebraska, U.S.A., on the north branch of the Elkhorn river, 2 m. from its mouth, and about 75 m. S.W. of Sioux City. Pop. (1900) 3883 (622 foreign-born) ; (1910) 6025. It is served by the Union Pacific, the Chicago & North Western (of which it is a division headquarters), and the Chicago, St Paul, Minneapolis & Omaha railways. The city is the seat of the Northern Nebraska Insane Asylum. Cereals, alfalfa and fruit are raised in the

surrounding country. The site was first permanently settled in 1S66. Norfolk was incorporated as a village in 1881 and chartered as a city in 1886; it became a city of the first class in 1909.

NORFOLK, a city and port of entry of Norfolk county, Virginia, U.S.A., on the northern side of the Elizabeth river (an arm of the Chesapeake Bay) and at the mouth of its eastern branch, and on the Albemarle and Chesapeake and the Dismal Swamp canals, about 90 m. S.E. of Richmond. Pop. (1890) 34,871; (1900) 46,624, of whom 1705 were foreign-born and 20,230 were negroes; (1910 census) 67,452. It is served by the Atlantic Coast Line, the Seaboard Air line, the Southern, the New York, Philadelphia & Norfolk, the Chesapeake & Ohio, the Norfolk & Western, the Norfolk & Southern and the Virginian railways, by many steamship lines, by ferry to Portsmouth (immediately opposite), Newport News, Old Point Comfort and Hampton, and by electric lines to several neighbouring towns. The Norfolk and Portsmouth Belt Line encircles the two cities, and connects the various trunk lines. Among the prominent buildings and institutions are the Custom House, the Federal Building, Marine Hospital, St Christopher's Hospital, St Vincent's Hospital, Norfolk Protestant Hospital, Sara Leigh Hospital, Norfolk Public Library, Norfolk Academy, Cotton Exchange, City Market, Bank of Commerce Building, Citizens' Bank Building, Board of Trade Building, Law Building, Virginia Bank & Trust Company Building, Norfolk National Bank, Atlantic Hotel, Monticello Hotel, Lynnhaven Hotel, Norfolk Mission College (Presbyterian) for negroes and the historic St Paul's church, which was built in 1737 and was struck by a cannon-ball and partly burned in 1776; in the yard is one of the oldest cemeteries in the country. Norfolk is the see of a Protestant Episcopal bishopric. The city has a public park of 1 10 acres and various smaller ones, and in the vicinity are several summer resorts, notably Virginia Beach, Ocean View, Old Point Comfort, Pine Beach and Willoughby Beach. The " Norfolk " navy yard is in the southern part of the city of Portsmouth. The harbour is deep, easily accessible through a channel 30 ft. in depth, and well protected by forts Monroe and Wool. The city has immense coal piers. It is the largest peanut market in the world, is in a great truck-gardening region, and makes large shipments of cotton (822,930 bales in 1905), oysters, coal, fertilizers, lumber, grain, fruits, wine, vegetables, fish and live stock. Norfolk is combined with Portsmouth in one customs district, the foreign trade of which in 1908 amounted to $11,326,817 in exports and $1,150,044 in imports. One of the most important manufacturing industries is grading, roasting, cleaning and shelling peanuts (in 1905 valued at $791,760). In 1900 the value of the factory products was $4,691,779; in

1905 it was $5,900,129, the city ranking third among the cities of the state in value of factory products.

Norfolk was founded in 1682 in pursuance of an act of the Virginia Assembly passed in 1680 to establish towns for the encouragement of trade; it was incorporated as a borough in 1736 by a royal charter, was chartered as a city in 1845, its charter being revised in 1882 and 1884, and received a new charter in 1906 (amended in 1908), under which there are a mayor (elected fcr four years), a common council, a board of aldermen and a board of control of three members, which has charge of public works, streets, sewers, drains and water supply, the police and fire departments, the work of the board of health, &c. Norfolk is administratively independent of Norfolk county. In 1906 the town of Berkley (incorporated in 1890; pop. in 1900, 4988) was annexed. During the War of Independence Norfolk was bombarded on the 1st of January 1776 by the British under John Murray, 4th earl of Dunmore (1732- 1809); much of the town was burned by the American troops to prevent Dunmore from establishing himself here. In 1855 it suffered severely from yellow fever. At the outbreak of the Civil War the city was abandoned, and the navy yard was burned by the Federals in April 1861 ; Norfolk was then occupied until the 9th of May 1862 by Virginia troops, first under General William Booth Taliaferro (1822-1898) and later under General Benjamin Huger (1806-1877). Five miles from Norfolk and with Norfolk as its headquarters was held from the 26th of April to the 30th of November 1907 the Jamestown Ter-Cen- tennial Exposition, celebrating the first permanent English settlement in America at Jamestown, Virginia.

NORFOLK ISLAND, an island in the Pacific Ocean, about 800 m. E. of the nearest point of New South Wales, in 29 S., 167 56′ E. It stands on a submarine tableland extending about 18 m. to the N. and 25 m. to the S., and has itself an area of 8528 acres or 13-3 sq. m. The islets of Nepean and Philip lie near it. Its high cliff-bound coast is difficult of access. With a general elevation of 400 ft. above the sea the island rises in the N.W. to 1050 ft. in the double summit of Mount Pitt. The soil, of decomposed basalt, is wonderfully fertile. The rich undulating pasture-land with clumps of trees and copses resembles a park. Oranges, lemons, grapes, passion fruit, figs, pine-apples, guavas and other fruits grow abundantly; while potatoes, onions, maize and arrowroot can be cultivated. The Norfolk Island pine {Araucaria excelsa) is a magnificent tree, with a height sometimes exceeding 200 ft. and a girth of 30. A small species of palm is known as the Norfolk Island cabbage. Tree- ferns are abundant. The flora is most closely associated with that of New Zealand, and the avifauna indicates the same connexion rather than one with Australia, as those birds which

belong to Australian genera are apparently immigrants, while those which occur on the island in common with New Zealand would be incapable of such distant migration. The climate is healthy, the thermometer rarely sinking below 65 F. The island is a station of the British Pacific cable. It was discovered in 1774 by Captain Cook, and was taken by Philip King of the ” Stirling ” and twenty-four convicts from New South Wales. This settlement was abandoned in 1805, but in 1826 the island was made a penal settlement from New South Wales. In 1856, 194 Pitcairn islanders took the place of the convicts. Forty of them soon returned to Pitcairn Island, and the remainder deteriorated owing to intermarriage. The administration of justice by an elected magistrate was unsatisfactory. Crime was rarely punished, and debts were not recoverable. A remedy was attempted in 1896 by an improvement in the government. The island was brought under the immediate administration of New South Wales; a chief magistrate, appointed by the governor of New South Wales, took the place of the elected magistrate, and an elected council of twelve elders superseded the general gathering of the adult population. In 1867 a Melan- esian mission station was established at St Barnabas, and in

1882 a church was erected to the memory of Bishop Patteson,

with windows designed by Burne-Jones and executed by William

Morris.

NORICUM {Noricus ager), in ancient geography, a district bounded on the N. by the Danube, on the W. by Raetia and Vindelicia, on the E. by Pannonia, on the S. by Pannonia and Italy, corresponding to the greater part of the modern Styria and Carinthia, and part of Austria, Bavaria and Salzburg. The original population appears to have consisted of Ulyrians, who after the great emigration of the Gauls became subordinate to various Celtic tribes, chief amongst them being the Taurisci, probably called Norici by the Romans from their capital Noreia (Neumarkt). The country is mountainous and the soil poor, but it was rich in iron, and supplied material for the manu- factories of arms in Pannonia, Moesia and northern Italy. The famous Noric steel was largely used for the Roman weapons (” Noricus ensis,” Horace, Odes, i. 16. o). The inhabitants were a brave and warlike people, who paid more attention to cattle-breeding than toj agriculture, although it is probable that the Romans, by draining the marshes and cutting

down timber, increased the fertility of the soil. Gold and salt were also found in considerable quantities; the plant called saliunca (the wild or Celtic nard) grew in abundance, and was used as a perfume (Pliny, Nat. Hist. xxi. 20. 43). Noricum was the southern outpost of the northern or Celtic peoples and the starting-point of their attacks upon Italy. It is in Noricum that we first hear of almost all these Celtic invaders. Archaeological researches, particularly in the cemeteries of Hallstatt (q.v.), less than 40 m. from Noreia, have shown that for centuries before recorded history there was a vigorous civilization. The Hallstatt cemeteries contained weapons and ornaments from the Bronze age, through the period of transition, up to the fully-developed Iron age. Professor Ridgeway (Early Age of Greece, i. ch. 5) has made out a strong case for the theory that in Noricum and the neighbouring districts was the cradle of the Homeric Achaeans. For a long time the Noricans enjoyed independence under princes of their own, and carried on commerce with the Romans. In 48 B.C. they took the side of Caesar in the civil war against Pompey. In 16, having joined with the Pannonians in invading Histria, they were defeated by Publius Silius, proconsul of Illyricum. From this time Noricum is called a province, although not organized as such, but remaining a kingdom with the title regnum Noricum. It was under the control of an imperial procurator. It was not until the reign of Marcus Antoninus that the Legio II. Pia (afterwards called Italica) was stationed at Noricum, and the commander of the legion became the governor of the province. Under Diocletian, Noricum was divided into Noricum ripense (along the Danube) and mediter- ranean (the southern mountainous district). Each division was under a praeses, and both belonged to the diocese of Illyria in the prefecture of Italy. The Roman colonies and chief towns were Virunum (near Mariasaal), Ovilava (Wels), Celeia (Cilli), Juvavum (Salzburg), Lauriacum (Lorch, at the mouth of the Enns, the ancient Anisus).

See A. Muchar, Das romische Norikum (Gratz, 1825) ; T. Mommsen, Corpus inscriptionum Latinarum, iii. 587; J. Marquardt, Romische Staatsverwaltung, i. (2nd ed., 1881) p. 290; Smith's Diet, of Gk. and Roman Geog. (1873) < Mary B. Peaks, The General Civil and Military Administration of Noricum and Raetia (Chicago, 1907) ; full references to ancient authorities in A. Holder, Alt-celtischer Sprachschatz, ii. (1904)- (J- H. F.)

NORMAN, SIR HENRY WYLIE (1826-1904), field-marshal and colonial governor, was born on the 2nd of December 1826, and entered the Indian army at the age of seventeen. In 1840 his father, who had been for many years a merchant in Cuba, became a partner in a mercantile house in Calcutta, where he was joined by his son in 1842. In 1844

the latter obtained a cadetship. He went through the second Sikh campaign and having attracted the favourable notice of Sir Colin Campbell was selected by him to accompany an expedition against the Kohat Pass Afridis in 1850 as officiating brigade-major. The subaltern of twenty-four was given a substantive appointment in this capacity for a splendid deed of gallantry, which is recorded by Sir Charles Napier in the following terms: ” In the pass of Kohat a sepoy picket, descending a precipitous mountain under fire and the rolling of large stones, had some men killed and

wounded. Four of the latte’r, dreadfully hurt, crept under some rocks for shelter. They were not missed until the picket reached the bottom, but were then discovered by our glasses, high up and helpless. Fortunately the enemy did not see them, and some sepoys volunteered a rescue, headed by Norman of the 31st Native Infantry and Ensign Murray of the 70th Native Infantry. These brave men — would that the names of all were known to me for record! — ascended the rocks in defiance of the enemy, and brought the wounded men down.” Norman served in numerous frontier expeditions between 1850 and 1854, and in the suppression of the Sonthal rebellion of 1855-56. In the Mutiny campaign he was constantly engaged, being present at the siege of Delhi, the relief of Lucknow and a number of other affairs. As adjutant-general of the Delhi Field Force, he was one of the leading spirits of the siege, and afterwards became its chief chronicler. Altogether he was mentioned twenty-five times in despatches. He afterwards became assistant military secretary for Indian affairs at the Horse Guards, military secretary to the government of India, military member of the viceroy’s council and member of the secretary of state for India’s council. In 1883 Sir Henry began his colonial career as governor of Jamaica, an appointment from which he was transferred in 1888 to the governorship of Queensland. Here he remained until 1895, when he came home to act as agent-general for the colony in London. In 1893 he was offered the viceroyalty of India, but, after first accepting, declined it. In 1897 he was chairman of the royal commission of inquiry into the condition of the West Indies. In April 1901 he was appointed governor of the Royal Hospital, Chelsea, in succession to Sir Donald Stewart. In 1902 he was made a field-marshal. He died on the 26th of October 1904.

See Sir William Lee Warner, Memoirs of Field-marshal Sir Henry Wylie Norman (1908).

NORMAN, a city and township (coextensive) and the county- seat of Cleveland county, Oklahoma, U.S.A., about 2 m. N. of the Canadian river, and 18 m. S. by E. of Oklahoma City. Pop. (1890) 787; (1900)

2225; (1910) 3724. It is served by the Atchison, Topeka & Santa Fe railway. It is the seat of the university of Oklahoma (chartered, 1892; opened 1894; coeducational), which includes a college of arts and sciences, schools of applied science,medicine, pharmacy, mines and fine arts, and a preparatory school, and in 1908 had 56 instructors and 790 students. The Oklahoma Insane Asylum is in the city. Cotton-seed oil, flour and ice are manufactured, and the neighbouring region produces much cotton, Indian corn, oats, alfalfa and wheat. Hogs, cattle and sheep are raised. The first settlement here was made in 1889, and Norman was chartered as a city in 1902.

NORMANBY, CONSTANTINE HENRY PHIPPS, ist Marquess of (1797-1863), British statesman and author, son of Henry, ist earl of Mulgrave (1 755-1831), was born on the 15th of May 1797. The ist earl (who was created baron in 1794 and earl in 1812), was a distinguished soldier, and Pitt's chief military adviser; and he held the offices of chancellor of the duchy of Lancaster (1804), secretary for foreign affairs (1805), first lord of the admiralty (1807-1810), and master of the ordnance (1810-1818). In 1792 he inherited the earlier Irish barony of Mulgrave — created in 1767 for his father, Constantine (1722- 1775) grandson of Sir Constantine Phipps (1656-1723), the lord chancellor of Ireland — from his elder brother Constantine (1744-1792), a distinguished naval captain. His son, the future marquess, passed through Harrow and Trinity College, Cam- bridge, and sat for the family borough of Scarborough as soon as he attained his majority. But, speaking in favour of Catholic emancipation, and dissenting in other points from the family politics, he resigned his seat, and went to live in Italy for some two years. Returning in 1822, he was elected for Higham Ferrers, and made a considerable reputation by political pamphlets and by his speeches in the house. He was returned for Mai ton at the general election of 1826, becoming a supporter of Canning. He was already known as a writer of romantic tales, The English in Italy (1825); in the same year he made his appearance as a novelist with Matilda, and in 1828 he- produced

another novel, Yes and No. Succeeding his father as earl of Mulgrave in 1831, he was sent out as governor of Jamaica, and was afterwards appointed lord-lieutenant of Ireland (1835- 1839). He was created marquess of Normanby in 1838, and held successively the offices of colonial secretary and home (Secretary in the last years of Lord Melbourne's ministry. From 1846 to 1852 he was ambassador at Paris,

and from 1854 to 1838 minister at Florence. The publication in 1857 of a journal kept in Paris during the stormy times of 1848 (A Year of Revolu- tion), brought him into violent controversy with Louis Blanc, and he came into conflict with Lord Palmerston and Mr Gladstone, after his retirement from the public service, on questions of French and Italian policy. He died in London on the 28th of July 1863. He had married in 1818 the daughter of Lord Ravensworth, and was succeeded as 2nd marquess by his son George (1810-1890), a liberal politican, who became governor of Queensland (1871-1874), New Zealand (1874-1879), and Victoria

(1870-1884).

NORMANDY, a province of old France, bounded on the N.E. by the river Bresle, which falls into the Channel at Treport and separates Normandy from Picardy, and then roughly by the Epte, which divides the Vexin into two parts. From the con- fluence of the Epte and Seine to Ivry, the boundary between Normandy and the Ile-de-France is artificial; it is afterwards practically determined by the course of the Eure and the Sarthe. But from there to the sea Normandy is separated by no natural boundary either from Maine or afterwards from Brittany; it lies fairly regularly in the direction from E. to W. The boundary between the coast of Normandy and that of Brittany is formed by the mouth of the Couesnon. Normandy is washed by the English Channel and lies opposite to England. The northern part of the coast consists of cliffs, which cease at the mouth of the Seine, the estuary of which is 1 2 km. wide from Havre to Trouville; the coast of Calvados consists of rocks and beaches; that of the peninsula of Cotentin is sandy on the eastern side and granite on the west; in the north it forms between the point of Barfleur and the cape of La Hague a kind of concave arc in which lies the harbour of Cherbourg.

Historical Geography.— In the time of Caesar the country which has since gone to form Normandy was inhabited by several tribes of the Gauls, the Caleti, who lived in the district of Caux, the Velio- cassi, in the Vexin, the Lexovii, in the Lieuvin, the Unelli in Cotentin ; these are the only ones whose names have been preserved for us by Caesar. At the beginning of the 5th century, when the Notitia provinciarum was drawn up, Normandy corresponded to the Pro- vincia Lugdunensis Secunda, the chief town of which was Rouen (Civitas Rotomagensium) ; it included seven civilates with that of Rouen: those of Bayeux (C. Bajocassium), Lisieux (C. Lexoviorum), Coutances (C. Constantia), Avranches (C. Abrincatum), Seez (C. Sagiorum) and Evreux (C. Ebroicorum) . For ecclesiastical purposes it formed the ecclesiastical province of Rouen, with six suffragan sees. For civil purposes, the

province was divided into a number of pagi: the civitas of Rouen formed the pagus Rotomagensis (P.ou- mois), the *. Caletus (pays de Caux), the p. Vilcassinus (Vexin), the p. Tellaus (Talou); that of Bayeux the pagus Bajocassinus (Bessin), and the Otlinga Saxonia; that of Lisieux the pagus Lexovinus (Lieuvin) ; that of Coutances the p. Corilensis and p. Constantinus (Cotentin); that of Avranches the p. Abrincatinus (Avranchin) ; that of Seez the p. Oximensis (Hi£mois), the p. Sagensis and p. Corbonensis (Corbonnais) ; and that of Evreux the p. Ebroicinus (Evrecin) and p. Madriacensis (pays de Madrie). It is to the settle- ment of the Normans in the country that Normandy owes its name ; from the 10th century onwards it formed a duchy, roughly coextensive with the ecclesiastical province of Rouen. Under the feudal regime, the energy of the Norman dukes prevented the formation of many powerful lordships, and there are few worthy of note, save the countships of Eu, Harcourt, Le Perche and Mortain.

The duchy of Normandy, which was confiscated in 1204 by King P.hilip Augustus of France, formed in the 16th century the gouverne- ment of Normandy ; the extent of this gouvemement did not, as a matter of fact, correspond exactly to that of the duchy, for Le Perche, which had been part of the duchy, was annexed to the gouvemement of Maine, while the Thimerais, which had belonged to the countship of Blois, was joined to the gouvemement of Normandy. In the 17th century this gouvemement was divided into three ginSralites or intendances : those of Rouen, Caen and Alencon. For judicial pur- poses Normandy was under the jurisdiction of the parlement of Rouen, created in 1499. Since 1791 the territory of the old duchy has composed, roughly speaking, the departments of Seine-Inferieure, Eure, Calvados, Manche and Orne.

History. — The prosperity of Normandy in Roman times is proved by the number and importance of the towns which existed there at that time. The most important was Lillebonne (Juliobona), chief town of the Caletes, the Roman antiquities of which are famous. The evangelization of Normandy did not take place before the 3rd century: the first bishop of Rouen, about 260, seems to have been St. Mallonus; it is possible, however, that before this date there were a few Christian com- munities in Normandy, as seems to be proved by the existence of St Nicasius, who was martyred in the Vexin.

The province of Lugdunensis Secunda, which at the end of the 5th century formed part of the kingdom of Syagrius, was conquered by Clovis before 506, and during the Merovingian times followed the fortunes of Neustria. In the 9th century this country was ravaged by the Northmen, who were constantly going up and down the Seina and

later on it was formally ceded to them. During these incursions Rouen was occupied several times, notably in 876 and 88 5.

The definitive establishment of the Normans, to whom the country owes its name, took place in 911, when by the treaty of Saint-Clair-sur-Epte, concluded between King Charles the Simple of France and Rolf or Rollo, chief of the Normans, the territory comprising the town of Rouen and a few pagi situated on the sea-coast was ceded to the latter; but the terms of the treaty are ill-defined, and it is consequently almost impossible to find out the exact extent of this territory or to know whether Brittany was at this time made a feudal dependency of Normandy. But the chronicler Dudo of Saint-Quentin's statement that Rollo married Gisela, daughter of Charles the Simple, must be considered to be legendary. In 924 Rollo received from the king of France Bessin and Maine. Although baptized, he seems to have preserved certain pagan customs. The history of Normandy under Rollo and his immediate successors is very obscure, for the legendary work of Dudo of Saint-Quentin is practically our only authority.

Rollo died in 927, and was succeeded by his son William " Long Sword," born of his union more danico with Poppa, daughter of count Berenger; he showed some attachment to the Scandinavian language, for he sent his son William to Bayeux to learn Norse. The first two dukes also displayed a certain fidelity to the Carolingian dynasty of France, and in 936 William " Long-Sword " did homage to Louis IV. d'Outremer. He died on the 17th of December 942, assassinated by the count of Flanders.

During the minority of his successor, Duke Richard, King Louis IV., who was making an expedition into Normandy, was captured by the inhabitants of Rouen and handed over to Hugh the Great. From this time onwards the dukes of Normandy began to enter into relations with the dukes of France; and in 958 Duke Richard married Hugh the Great's daughter. He died in 996. At the beginning of the reign of his son, Richard II. (996-1026), there was a rising of the peasants, who formed assemblies with a view to establishing fresh laws for the manage- ment of the forests. This attempt at insurrection, described by William of Jumieges, and treated by many historians, on the authority of the poet Wace, as a sort of democratic move- ment, was put down with a firm hand. Richard III. reigned from 1026-1027; he seems to have been poisoned by his brother, Robert the Magnificent, or the Devil (1027-1035), who succeeded him. In 1031 Robert supported King Henry I. of France against his brother Robert, who was laying claim to the throne, and in return for his services received the French Vexin. The duke died on a pilgrimage to Jerusalem, leaving as his heir

an illegiti- mate son, William, born of his union with the daughter of a tanner of Falaise.

William was very young when his father started for the Holy Land, leaving him under the protection of the king of France. In 1047 Henry I. had to defend the young duke against an army of rebellious nobles, whom he succeeded in beating at Val-e*- dunes. In the following year the king of France was in his turn supported by the duke of Normandy in his struggle against Geoffrey Martel, count of Anjou; the two allies besieged

Mouliherne (1048); and the war was continued between the duke of Normandy and the count of Anjou by the siege of Alencon, which was taken by Geoffrey Martel, then retaken by William, and that of Domfront, which in 1049 had to surrender to Duke William.

In 1054 William the Bastard married Matilda, daughter of Baldwin V., count of Flanders, in spite of the opposition of Pope Leo IX., who only gave his consent on condition that William and Matilda should each build an abbey: under these conditions were built the Abbaye-aux-Hommes and the Abbaye- aux-Dames at Caen. The king of France had at first protected William, but before long became alarmed at his ambitions; the first sign of his feeling of rivalry with the duke was the encouragement he gave to the revolt of William Busas, count of Eu and Montreuil, who claimed the ducal crown. In 1054 he invaded Normandy with his brother Odo and this count, but Odo was beaten at Mortemer. In 1058 the king of France, joined by Geoffrey Martel, count of Anjou, tried to revenge himself, but was beaten at the ford of Varaville (1058).

Towards the same time took place the annexation of Maine to Normandy, for a short period only. Herbert II., the young count of Maine, who was a vassal of the count of Anjou, did homage to William the Bastard between 1055 and 1060, perhaps after the defeat of Geoffrey Martel; he promised to marry one of William's daughters, and betrothed his sister Margaret to the duke's son, Robert Curthose, on the understanding that, if he died leaving no children, the countship was to fall to William. After his death, the people of Maine revolted (1063), choosing as their lord Walter of Mantes, count of Vexin; but William the Bastard, after one campaign, succeeded in imposing the authority of Normandy. Three years later, William took

posses- sion of England, of which he was crowned king in 1066. Normandy now became the scene of William's quarrels with his son, Robert Curthose, who laid claim to Normandy and Maine, and with the aid of King Philip I. of France succeeded in defeating his father at Gerberoi in 1079.

William the Conqueror died on the 7th of September 1087, and was buried in the church of St Etienne at Caen. After his death his eldest son, Robert Curthose, kept Normandy and Maine, and his second son, William Rufus, became king of England. In 1091 William Rufus made a vain attempt to recover Nor- mandy; but in 1096 Robert departed on a crusade and pledged the duchy to his brother for 10,000 livres. When Robert returned, William Rufus had just died, and his youngest brother, Henry Beauclerc, had already taken possession of the crown. Henry was ambitious of uniting Normandy to England; in 1 105, with the aid of Helias, count of Maine, and the son of Geoffrey Martel, count of Anjou, he took and burnt Bayeux, but failed to take Falaise. On the 28th of September 1106, by the help of William, count of Evreux, Robert, count of Meulan, Robert de Varenne, and Helias, count of Maine, he defeated his brother at Tinchebrai, took him prisoner, and seized Nor- mandy. Duke Robert passed the rest of his life in captivity and died in 1134.

From 1 106 to 1204 Normandy remained united to England. According to Ordericus Vitalis, whose Historia ecclesiastica is a chronicle of the greatest interest for the history of Normandy in the nth and- 12th centuries, Henry Beauclerc governed the two kingdoms wisely, checking the nobles, and protecting the Church and the common people. He carried on hostilities against the king of France and William Clito, son of Robert Curthose, whose claim to the duchy of Normandy was upheld by Louis VI.. and won an important victory over his opponents at Bremule in Normandy (11 19). After the disaster of the White Ship (1121), in which the Atheling William lost his life, Henry's only surviving child was a daughter, Matilda, widow of the emperor Henry V. In 1127 Matilda married Geoffrey the Fair, eldest son of Fulk V., count of Anjou. After the death of Henry I. in 1135, a struggle arose between Matilda, who claimed the kingdom of England and the duchy of Normandy in the name of her son Henry Plantagenet, and Theobald, count of Champagne, grandson of William the Conqueror on the side

of his mother Adela, the candidate of the Normans of Normandy, while the Norman party in England supported Stephen, brother of Theobald. In 1144 Theobald, whose position had been much weakened since the taking of the castle of Rouen, gave up his rights in

Normandy to Matilda's husband Geoffrey, count of Anjou, in favour of Henry Plantagenet. Between 1139 and 1145 Geoffrey, with French and Flemish help, gradually subdued Normandy, and on his death, in 1151, his son Henry Plantagenet was master of Normandy as well as count of Anjou. In 1152, by his marriage with Eleanor, duchess of Aquitaine, the divorced wife of Louis VII. of France, Aquitaine also was secured to himself and his descendants. Finally, in n 53, he was recognized by Stephen of Blois as heir to the throne of England. The duchy of Normandy, though nominally in feudal dependence on the king of France, thus became part of the great Angevin empire, of which the power and resources were more than equal to that of the French kings. The perennial struggle, dating from this period, between the kings of England and France is dealt with elsewhere (see France: History, and English History) .

From the first the French kings were fully conscious of the menace of the Angevin power. The reign of Louis VII. was occupied by the struggle against Henry II. In 1158 he com- mitted the blunder of concluding a treaty with Henry, by which he was to give his daughter Margaret in marriage to Henry Short Mantle, eldest son of Henry II., with the French Vexin as her dowry. The Vexin was consequently the scene of hostilities in 1159 and 1165. In 1173 Louis VII., resuming the policy of his grandfather and father, took advantage of the strife which broke out in the family of the king of England, and took the part of Henry II. 's sons who were in revolt against their father. He negotiated with Henry Short Mantle, duke of Normandy, as though he were king of England, but owing to his weakness did not gain any serious advantage. In n 73 he abandoned the siege of Verneuil, in n 74 that of Rouen, and was no more successful in n 76.

Philip Augustus (1 180-1223) pursued the same policy with greater tenacity and success. He began by taking part against Henry II. with his son and successor, Richard Cceur de Lion, who obtained the throne on the death of Henry II. in 1189. From the point of view of Normandy, the most important events of Richard's reign were: the truce of Issoudun, by which Philip Augustus kept the Norman Vexin which he had just conquered (1195), the building by Richard of Chateau-Gaillard (1196), and finally the defeat of Philip Augustus by Richard at Courcelles, near Gisors (1198). On the death of Richard at Chalus in 1199 the position of Philip Augustus was critical. This situation was modified under the reign of John Lackland, Richard's brother, who had himself crowned duke of Normandy at Rouen (April 25, 1199). Philip Augustus set up in opposition to him Arthur of Brittany, son of Geoffrey and grandson of Henry II., and the first phase of the struggle between the kings of France and England continued

until the treaty of Goulet (1200). But in 1202 Philip made a fresh attempt to seize the continental possessions of the kings of England. An excuse for reopening hostilities offered itself in the abduction, by John, of Isabel of Angouleme, the betrothed of Hugh le Brun, son of the count of La Marche. The barons appealed to Philip Augustus, who summoned John to appear before the royal judges; he failed to appear, and was consequently condemned by default, as a disloyal vassal, to have all the fiefs which he held in France confiscated (April 1202). The confiscation, a purely legal and formal operation, was followed by the actual conquest.

In June 1202 Philip Augustus invaded Normandy and besieged the castle of Arques, near Dieppe; at the same time Arthur of Brittany was taken prisoner by John at Mirebeau in Poitou, and imprisoned in the castle of Falaise, from which Le was removed to Rouen and died, probably assassinated by John's orders. The conquest of Normandy began with the occupation of Chateau-Gaillard after an eight months' siege (September 1203-April 1204); the rest of Normandy was taken during the following months, Rouen surrendering in 1204 but

obtaining a guarantee of her privileges. The conquest of Normandy by the French was not, however, recognized officially till the treaty of Paris (1259).

Normandy enjoyed a time of comparative prosperity under French rule, up to the time of the Hundred Years' War. The institution of the Estates of Normandy even assured her a sort of independence. In 1329 the duchy of Normandy was revived in favour of John, son of King Philip VI.

Owing to her geographical position, Normandy suffered heavily during the Hundred Years' War. In 1346 Edward III., at the instance of Godefroi d'Harcourt lord of Saint-Sauveur, invaded Normandy, landing at Saint- Vast-la-Hougue (July 12); and arriving at Caen on the 25th of July, he laid waste the country as far as Poissy. After the accession of John II. (1350), Normandy was again separated from the crown and given as an appanage to the dauphin Charles. The treaty of London (1359) stipulated for its cession to England, but the provisions of the treaty were modified by those of the treaty of Bretigny (1360), and it remained in the possession of France.

John II. died in 1364, and was succeeded by his son Charles V. One of the chief feudatories of Normandy, Charles the Bad, grandson of Louis X. le Hutin, and a claimant to the crown of France, was in 1365, owing to his continued treachery, deprived of the countship of Longueville, and in 1378 of all his other possessions in Upper and Lower Normandy. The most striking event of the war between the French and English which took place in Normandy during the reign of Charles V. was the siege of Saint-Sauveur-le-Vicomte, which was occupied by the English, and only surrendered after a siege of several years.

The opening years of the reign of Charles VI. (1380-1422) were disturbed by a revolt which broke out at Rouen against the aides which the royal government had tried to impose (1381); a cloth-merchant was proclaimed king of Rouen, and Charles was obliged to go in person to Rouen to put down the insurrection. In 1415 the war with England was resumed: an English army of 60,000 men landed on the 14th of August at the mouth of the Seine, took Harfleur on the 16th of September, and finally defeated the army of the king of France at Agincourt. During the following years the whole of Normandy was occupied, Rouen holding out for nearly six months (July 29, 1418-January 13, 14T9), and Henry V. of England entrusted the administration of Normandy to a special council. In spite of the moderation of the duke of Bedford's government, Normandy, ruined by the war, was in a state of great distress, and in the years following the treaty of Troyes (1420) there was a continual resistance offered to the English. This resistance became general after the expeditions of Joan of Arc and the treaty of Arras; at the end of 1435 the whole district of Caux, and in 1436 that of the Val de Vire revolted; Mont-Saint-Michel, which had never been taken by the English, continued to resist, and in order to keep guard over it the English built Granville. But Normandy was not recovered by the French till after the sack of Fougeres (1449). Cotentin was reconquered by Richmond (see Arthur, duke of Brittany) and the duke of Brittany; Rouen surrendered on the 29th of October 1449. In face of these successes of the French, an English army was sent into Normandy under the leadership of Thomas Kyriel; it landed at Cherbourg and marched across Cotentin to Bayeux, but was met at Formigny (April 15, 1450) by the count of Clermont and utterly routed. Shortly after- wards Caen, and finally Cherbourg, capitulated.

After the French conquest, the history of Normandy is less eventful. In 1465 Normandy was given as an appanage to Charles, brother of King Louis XL, who was deprived of it in 1467. The kings of France tried to win the support of Nor- mandy by certain favours, such as

maintaining the provincial Estates and the University of Caen, founded by the kings of England, and transforming the Exchequer of Normandy into a permanent court of justice (1499) which was called the Parle- ment of Normandy and sat at Rouen in the famous Palais de Tv istice. Among the measures which contributed to the increase of the prosperity of Normandy should be noted the construction in 1752 of the Havre de Grace.

During the 16th century the Protestant Reformation met with some success in Normandy, where the Wars of Religion caused a certain amount of disturbance. The Reforming movement began with Pierre Bar in 1528, and the first apostle of the Reformation at Rouen was Frangois Legay, called Bois- normand. In 1562 the town of Rouen was taken by the Calvinists, but retaken in the same year by the Catholics. Caen received the Reformed religion in 1531, and Alenfon in 1582. In the massacre of Saint Bartholomew's day (1572) more than 500 victims were slaughtered by the Catholics.

In spite of the success of Protestant ideas, however, the Catholic party of the League succeeded after 1588 in establishing itself in Normandy, and King Henry IV. had to conquer it by force of arms. The most famous engagements during this expedition were the victories of Henry IV. at Arques and Ivry s but he failed to take Rouen, which was defended by Alexander Farnese, duke of Parma, and only surrendered after the abjura- tion of the king.

The history of Normandy in the 17th and 18th centuries contains few events of note, except for a few attempts at landing made by the English during the Seven Years' War (1756-1763); in 1758 the English admiral Anson attacked Cherbourg, and in 1759 Admiral Rodney bombarded Havre. From 1790 dates the creation of the departments, when Normandy ceased to have a separate political existence, and her history becomes one with that of France.

See G. Depping, Histoire de la Normandie (2 vols., 1835); Fr. Palgrave, The History of Normandy and of England (2 vols., 1851-1857); E. A. Freeman, The History of the Norman Conquest of England (3rd ed., 5 vols., Oxford, 1877); Joh. Steenstrup, Les Normands (1880); Louis du Bois, Itineraire descriptif, historique it monumental des cinq departements composant la Normandie (1828) ; John Cotman, Architectural Antiquities of Normandy (2 vols., 1820); Leopold Delisle, Etude sur la condition des classes agricoles en Normandie (reprinted 1906), La Normandie illustree (2 vols., 1852-1855) ; A. Duchesne, Historiae Normanorum scriptores antiqui (1619) ; E. J. Tardif, Les Coutumiers de Normandie (1881-1896); Edouard Frere,

Manuel de bibliographic normande (1858-1860); Artur du Monstier, Neustria pia (1663); N. Oursel, Nouvelle Biographic normandt (3 vols., 1 886-1 888). Publications of the learned societies of the province analysed in the Bibliographic of Robert de Lasteyrie.

(R. La.)

NORMANS, the softened form of the word ” Northman,” applied first to the people of Scandinavia in general, and after- wards specially to the people of Norway. In the form of ” Nor- man ” {Northmannus, Normannus, Normand) it is the name of those colonists from Scandinavia who settled themselves in Gaul, who founded Normandy, who adopted the French tongue and French manners, and who from their new home set forth on new errands of conquest, chiefly in the British Islands and in southern Italy and Sicily. From one point of view the expedi- tions of the Normans may be looked on as continuations of the expeditions of the Northmen. As the name is etymologically the same, so the people are by descent the same, and they are still led by the old spirit of war and adventure. But in the view of general history Normans and Northmen must be carefully distinguished. The change in the name is the sign of a thorough change, if not in the people themselves, yet in their historical position. Their national character remains largely the same; but they have adopted a new religion, a new language, a new system of law and society, new thoughts and feelings on all matters. Like as the Norman still is to the Northman, the effects of a settlement of Normans are utterly different from the effects of a settlement of Northmen. There can be no doubt that the establishment of the Norman power in England was, like the establishment of the Danish power, greatly helped by the essential kindred of Normans, Danes and English. But it was helped only silently. To all outward appearance the Norman conquest of England was an event of an altogether’ different character from the Danish conquest. The one was a conquest by a people whose tongue and institutions were still palpably akin to those of the English. The other was a conquest by a people whose tongue and institutions were palpably different from those of the English. The Norman settlers in England felt no community with the earlier Danish settlers in England. In

fact the Normans met with the steadiest resistance in a part of England which was largely Danish. But the effect of real, though

unacknowledged, kindred had none the less an important practical effect. There can be no doubt that this hidden working of kindred between conquerors and conquered in England, as compared with the utter lack of all fellowship between conquerors and conquered in Sicily, was one cause out of several which made so wide a difference between the Norman conquest of England and the Norman conquest of Sicily.

These two conquests, wrought in the great island of the Ocean and in the great island of the Mediterranean, were the main works of the Normans after they had fully put on the C f”^ acter character of a Christian and French-speaking people, Normans. in other words, after they had changed from Northmen into Normans. The English and the Sicilian settle- ments form the main Norman history of the nth century. The ioth century is the time of the settlement of the Northmen in Gaul, and of the change in religion and language of which the softening of the name is the outward sign. By the end of it, any traces of heathen faith, and even of Scandinavian speech, must have been mere survivals. The new creed, the new speech, the new social system, had taken such deep root that the descendants of the Scandinavian settlers were better fitted to be the armed missionaries of all these things than the neighbours from whom they had borrowed their new possessions. With the zeal of new converts they set forth on their new errand very much in the spirit of their heathen forefathers. If Britain and Sicily were the greatest fields of their enterprise, they were very far from being the only fields. The same spirit of enterprise which brought the Northmen into Gaul seems to carry the Normans out of Gaul into every corner of the world. Their character is well painted by a contemporary historian of their exploits. 1 He sets the Normans before us as a race specially marked by cunning, despis- ing their own inheritance in the hope of winning a greater, eager after both gain and dominion, given to imitation of all kinds, holding a certain mean between lavishness and greediness — that is, perhaps uniting, as they certainly did, these two seemingly opposite qualities. Their chief men, he adds, were specially lavish through their desire of good report. They were, moreover, a race skilful in flattery, given to the study of eloquence, so that the very boys were orators, a race altogether unbridled unless held firmly down by the yoke of justice. They were enduring of toil, hunger, and cold whenever fortune laid it on them, given to hunting and hawking, delighting in the pleasure of horses, and of all the weapons and garb of war. Several of these features stand out very clearly in Norman history. The cunning of the Normans is plain enough; so is their impatience of restraint, unless held down by a strong master. Love of imitation is also marked. Little

of original invention can be traced to any strictly Norman source; but no people were ever more eager to adopt from other nations, to take into their service and friendship from any quarter men of learning and skill and eminence of every kind. To this quality is perhaps to be attributed the fact that a people who did so much, who settled and conquered in so large a part of Europe, has practically vanished from the face of the earth. If Normans, as Normans, now exist anywhere, it is certainly only in that insular fragment of the ancient duchy which still cleaves to the successor of its ancient dukes. Else- where, as the settlers in Gaul became French, the emigrants from Gaul became English, Irish, Scottish, and whatever we are to call the present inhabitants of Sicily and southern Italy. Every-

1 Geoffrey Malaterra, i. 3 ” Est quippe gens astutissima, in- juriarum ultrix, spe alias plus lucrandi, patrios agros vilipendens, quaestus et dominationis avida, cujuslibet rei simulatrix, inter largitatem et avaritiam quoddam medium habens. Principes vero delectatione bonae famae largissimi, gens adulari sciens, eloquentiis in studiis inserviens in tantum, ut etiam ipsos pueros quasi rhetores attendas, quae quidem, nisi jugo justitiae prematur, effrenatissima est; laboris, inediae, algoris, ibi fortuna expedit, patiens, venationi accipitrum exercitio inserviens. Equorum, caeterorumque militiae instrumentorum, et vestium luxuria delectatur. Ex nomine itaque suo terrae nomen indiderunt. North quippe Anglica lingua aquilo- naris plaga dicitur. Et quia ipsi ab aquilone venerant terram ipsam etiam Normanniam appellarunt.”

where they gradually lost themselves among the people whom they conquered; they adopted the language and the national feelings of the lands in which they settled; but at the same time they often modified, often strengthened the national usages and national life of the various nations in which they were finally merged.

But Geoffrey hardly did justice to the Normans if he meant to imply that they were simple imitators of others. Their position was very like that of the Saracens. Hasty writers who n e lr forget the existence of the eastern Rome are apt to faculty of claim for the Saracens of Bagdad, or more commonly adapta- for those of Cordova, a monopoly of science and art t,on ‘ at some time not very clearly defined by dates. In so doing they slur over the real position and the real merit of the Saracens with regard to science and art. In neither department did any Saracen, strictly speaking, invent anything; but they learned much both from Constantinople and from Persia, and what they learned they largely developed and improved. The Normans did just the same. They adopted the French tongue, and were presently among the first to

practise and spread abroad its literature. They adopted the growing feudal doctrines of France, and worked them,. both in Normandy and in England, into a harmonious system. From northern Italy, as it would seem, they adopted a -style of architecture which grew in their hands, both in Normandy and in England, into a marked and living form of art. Settled in Gaul, the Scandinavian from a seafaring man became a landsman. Even in land-warfare he cast aside the weapons of his forefathers; but he soon learned to handle the weapons of his new land with greater prowess than they had ever been handled before. He welcomed the lore of every stranger. Lanfranc brought law and discipline; Anselm brought theology and philosophy. The gifts of each were adopted and bore fruit on both sides of the Channel. And no people ever better knew how to be all things to all men. The Norman power in England was founded on full and speedy union with the one nation among whom they found themselves. The Norman power in Sicily was founded on a strong distinction between the ruling people and the many nations which they kept in peace and prosperity by not throwing in their lot with any one among them. The quality which Geoffrey Malaterra expresses by the word ” effrenatissima ” is also clearly marked in Norman history. It is, in fact, the groundwork of the historic Norman character. It takes in one case the form of ceaseless enterprise, in another the form of that lawlessness which ever broke out, both in Normandy and in every other country settled by Normans, when the hand of a strong ruler was wanting. But it was balanced by another quality which Geoffrey does not speak of, one which is not really inconsistent with the other, one which is very promi- nent in the Norman character, and which is, no less than the other, a direct heritage from their Scandinavian forefathers. This is the excessive litigiousness, the fondness for law, legal forms, legal processes, which has ever been characteristic of the people. If the Norman was a born soldier, he was also a born lawyer. Ranulf Flambard, working together the detached feudal usages of earlier times into a compact and logical system of feudal law, was as characteristic a type of the people as any warrior in the Conqueror’s following. He was the organizer of an endless official army, of an elaborate technical system of administration, which had nothing like it in England before, but which grew up to perfection under Norman rulers. 2 But nothing so well illustrates this formal side of the Norman char- acter as the whole position of William the Conqueror himself. His claim to the crown of England is something without earlier precedent, something as far as possible removed from the open violence of aggressors who have no pretexts with which to dis- guise their aggression. It rested on a mass of legal assumptions and subtleties, fallacious indeed, but ingenious, and, as the result proved,

effective. His whole system of government, his

2 This view of Ranulf Flambard's work, which on Freeman's authority superseded the older view, which attributed the feudal organization of England to the Conqueror himself, was subjected to a destructive criticism by Mr J. H. Round in his Feudal England. (Ed.)

confiscations, his grants, all that he did, was'a logical deduction from one or two legal principles, arbitrary certainly in their conception, but strictly carried out to their results. Even Norman lawlessness in some sort took a legal shape. In the worst days of anarchy, in the minority of William or under the no-reign of Robert, the robber-baron could commonly give elaborate reasons for every act of wrong that he did.

It is perhaps less wonderful that this characteristic should have been left out in a picture of the Normans in Apulia and Sicily than if it had been left out in a picture of the Normans in Normandy and England. The circumstances of their Apulian and Sicilian conquests certainly did not tend to bring out this feature of their character so strongly as it was brought out by the circumstances of their English conquest. Possibly the same cause may have kept the chronicler from enlarging on their religious character; yet in Sicily at least they might pass for crusaders. Crusaders in fact they were before crusades were preached. Norman warriors had long before helped the Christians of Spain in their warfare with the Saracens of the Peninsula, and in Sicily it was from the same enemy that they won the great Mediterranean island. Others had done a kindred work in a more distant field as helpers of the Eastern emperors against the Turks of Asia. All these might pass for religious wars, and they might really be so; it needed greater ingenuity to set forth the invasion of England as a missionary enterprise designed for the spiritual good of the benighted islanders. The Norman, a strict observer of forms in all matters, attended to aace of the forms of religion with special care. No people Form$ US were more bountiful to ecclesiastical bodies on both sides of the Channel; the foundation of a Benedictine monastery in the nth century, of a Cistercian monastery in the 1 2th seemed almost a matter of course on the part of a Norman baron. The Conqueror beyond doubt sincerely aimed at bejng a religious reformer both in his duchy and in his kingdom, while it is needless to say that his immediate successor was exceptionally ungodly, whether among Normans or among other men. But among their countrymen generally strict attendance to religious

observances, a wide bounty to religious foundations, may be set down as national characteristics. On the other hand, none were less inclined to submit to encroachments on the part of the ecclesiastical power, the Conqueror himself least of all.

We thus see in the Scandinavian settlers in Gaul, after they had put on the outward garb of their adopted country, a people restless and enterprising above all others, adopting The Con- and spreading abroad all that they could make their Vagiaad own in their new land and everywhere else — a people ofstdly in man y wa ys highly gifted, greatly affecting and compared, modifying at the time every land in which they settled, but, wherever they settled, gradually losing themselves among the people of the land. The Norman, as a visible element in the country, has vanished from England, and he has vanished from Sicily. The circumstances of his settle- ment in his two great fields of conquest were widely different; his position when he was fully established in his two insular realms was widely different; but the end has been the same in both cases. Neither island has for ages been in any sense a Norman land, and the tongue which the Norman brought with him into both has not for ages been spoken in either. Norman influence has been far stronger in England than in Sicily, and signs of Norman presence are far more easily recognized. But the Norman, as a distinct people, is as little to be seen in the one island as in the other. His disappearance in both cases is an illustration of one of the features which we have spoken of in the Norman character, the tendency which in fact made Normans out of Northmen, the tendency to adopt the language and manners of the people among whom they found themselves. But, as far as outward circumstances are concerned, we may say that the same effect has been brought about by different and almost opposite causes. The whole circumstances of the conquest of England constrained the conquerors to become Englishmen in order to establish themselves in the conquered land. In William's theory, the forcible conquest of England

by strangers was an untoward accident. The lawful heir of the English crown was driven against his will to win his rights by force from outside. But he none the less held his crown as an English king succeeding according to English law. More- over, every Norman to whom he granted lands and offices held them by English law in a much truer sense than the king held his; he was deemed to step into the exact position of his English predecessor, whatever that might be. This legal theory worked together with other causes to wipe out all practical distinction between the conquerors and the conquered in a wonderfully short time. By the end of the 12th century the Normans

in England might fairly pass as Englishmen, and they had largely adopted the use of the English language. The fashionable use of French for nearly two centuries longer was far more a French fashion than a Norman tradition. When the tradition of speaking French had all but died out, the practice was revived by fashion. Still the tradition had its effect. The fashion could hardly have taken root except in a land where the tradition had gone before it.

The Normans in England therefore became Englishmen, because there was an English nation into which they could be absorbed. The Normans id Sicily could hardly be said to become Sicilians, for there assuredly was no Sicilian nation for them to be absorbed into. While the Normans in England were lost among the people of the land, the Normans in Sicily were lost among their fellow-settlers in the land. The Normans who came into Sicily must have been much less purely Norman than the Normans who came into England. The army of Duke William was undoubtedly very far from being wholly made up of Normans, but it was a Norman army; the element which was not Norman, though considerable, was exceptional. But we may doubt whether the Norman invaders of Sicily were Norman in much more than being commanded by Norman leaders. They were almost as little entitled to be called pure Scandinavians as the Saracens whom they found in the island were entitled to be called pure Arabs. The conquest of England was made directly from Normandy, by the reigning duke, in a comparatively short time, while the conquest of Sicily grew out of the earlier and far more gradual conquest of Apulia and Calabria by private men. The Norman settlements at Aversa and Capua were the work of adventurers, making their own fortunes and gathering round them followers from all quarters. They fought simply for their own hands, and took what they could by the right of the stronger. They started with no such claim as Duke William put forth to justify his invasion of England; their only show of legal right was the papal grant of conquests that were already made. The conquest of Apulia, won bit by bit in many years of what we can only call freebooting, was not a national Norman enterprise like the conquest of England, and the settlement to which it led could not be a national Norman settlement in the same sense. The Sicilian enterprise had in some respects another character. By the time it began the freebooters had grown into princes. Sicily was won by a duke of Apulia and a count of Sicily. 1 Still there was a wide difference between the duke of the Normans and the duke of Apulia, between an hereditary prince of a hundred and fifty years' standing and an adventurer who had carved out his duchy for himself. And, besides this, warfare in Sicily brought in higher motives and objects. Though crusades had not yet been

preached, the strife with the Mussulman at once brought in the crusading element; to the Christian people of the island they were in many cases real deliverers; still, the actual process by which Sicily was won was not so very different from that by which Apulia had been won. Duke William was undisputed master of England at the end of five years; it took Count Roger thirty years to make himself undisputed master of Sicily. The one claimed an existing kingdom, and obtained full possession of it in a comparatively short time; the other formed for himself a dominion bit by bit, which rose to the rank of a kingdom

1 Roger de Hauteville, the conqueror of Sicily, was a brother of the first four dukes or counts of Apulia, and was invested with the countship of Sicily by the pope before starting on his adventure.

in the next generation. When Count Roger at last found himself lord of the whole island, he found himself lord of men of various creeds and tongues, of whom his own Norman followers were but one class out of several. And the circumstances of his conquest were such that the true Normans among his following could not possibly lose themselves among the existing inhabitants of the island, while everything tended to make them lose themselves among their fellow-adventurers of other races, among whom, by the time the conquest was ended, they could hardly have been even a dominant element.

As far then as concerned the .lands in which the settlements were made, the difference lay in this, that, as has been already said, while there was an English nation, there was no Sicilian nation. The characteristic point of Norman rule in Sicily is that it is the rule of princes who were foreign to all the inhabitants of the island, but who were not more foreign to the inhabitants of the island than different classes of them were to one another. The Norman conqueror found in Sicily a Christian and Greek- speaking people and a Mussulman and Arabic-speaking people. The relations between the two differed widely in different parts of the island, according to the way in which the Saracens had become possessed of different towns &nd districts. In one place the Christians were in utter bondage, in another they were simply tributary; still, everywhere the Mussulman Saracen formed the ruling class, the Christian Greek formed the subject class. We speak of the Saracen very much as we speak of the Norman; for of the Mussulman masters of Sicily very many must have been only artificial

Arabs, Africans who had adopted the creed, language and manners of Arabia. In each case the Arab or the Norman was the kernel, the centre round which all other elements gathered and which gave its character to the whole. Besides these two main races, Greek and Saracen, others came in through the Norman invasion itself. There were the conquerors them- selves; there were the Italians, in Sicily known as Lombards, who followed in their wake; there were also the Jews, whom they may have found in the island, or who may have followed the Norman into Sicily, as they certainly followed him into England. The special character of Norman rule in Sicily was that all these various races flourished, each in its own fashion, each keeping its own creed, tongue and manners, under the protection of a common sovereign, who belonged to none of them, but who did impartial justice to all. Such a state of things might seem degradation to the Mussulman, but it was deliverance to the native Christian, while to settlers of every kind from outside It was an opening such as they could hardly find elsewhere. But the growth of a united Sicilian nation was impossible; the usual style to express the inhabitants of the island is" omnes " or " universi Siciliae populi." In the end something like a Sicilian nation did arise; but it arose rather by the dying out of several of the elements in the country, the Norman element among them, than by any such fusion as took place in England. That is, as has been already said, the Norman as such has vanished in two different ways. In England the Norman duke came in as a foreign intruder, without a native supporter to establish his rule over a single nation in its own land. He could not profess to be, as the count of Sicily could honestly profess to be, a deliverer to a large part of the people of the land. But, coming in by a title which professed to be founded on English law, establishing his followers by grants which professed no less to be founded on English law, he planted a dynasty, and estab- lished a dominant order, which could not fail to become English. The Normans in England did not die out; they were merged in the existing nation. The Normans in Sicily, so far as they did not die out, were merged, not in a Sicilian nation, for that did not exist, but in the common mass of settlers of Latin speech and rite, as distinguished from the older inhabitants, Greek and Saracen. The Norman conquest of England was at the moment a curse; the Norman conquest of Sicily was at the moment a blessing. But the gradual and indirect results of the Norman conquest of England are easily to be seen to this day, and they have been largely, though indirectly, results for good. Its chief result has been, not so much to create anything

new as at once to modify and to strengthen what was old, to call up older institutions to a new life under other forms. But whatever it has

done it has done silently; there has not been at any time any violent change of one set of institutions for another. In Sicily and southern Italy there is hardly any visible Norman influence, except the great historic fact which we may call the creation of Sicily and southern Italy in their modern sense. The coming of the Norman ruled that these lands should be neither Saracen nor Greek, nor yet Italian in the same sense as northern Italy, but that they should politically belong to the same group of states as the kingdoms and principalities of feudal Europe. William assuredly did not create the kingdom of England; Roger assuredly did create the kingdom of Sicily. And yet, notwithstanding all this, and partly because of all this, real and distinct Norman influence has been far more extensive and far more abiding in England than it has been in Sicily.

In Sicily then the circumstances of the conquest led the Norman settlers to remain far more distinct from the older races of the land than they did in England, and in the end to lose themselves, not in those older races of the land, but in the settlers of other races who accompanied and followed them. So far as there ever was a Sicilian nation at all, it might be said to be called into being by the emperor-king Frederick II. In his day a Latin element finally triumphed; but it was not a Norman or French-speaking element of any kind. The speech of the Lombards at last got the better of Greek, Arabic and French; how far its ascendancy can have been built on any survival of an earlier Latin speech which had lived on alongside of Greek and Arabic this is not the place to inquire.

The use of language and nomenclature during the time of Norman rule in the two countries forms a remarkable contrast, and illustrates the circumstances of the two as they have just been sketched. The chroniclers of the conquest of Apulia f* e ”’ and Sicily use the Norman name in every page as the name fS”f es a of the followers of the conquerors from Hauteville. It • n ‘^ n S’ an ” was the natural name for a body of men who must, by 2f ‘ ,, ” the time the conquest of Sicily was over, have been ”’ very mixed, but whose kernel was Norman, whose strength and feelings and traditions all came from a Norman source. But if we turn to Hugo Falcandus, the historian of Sicily in the 12th century, the Norman name is hardly found, unless when it is used historically to point out (as in Muratori vii. 260) that the royal house of Sicily was of Norman descent. Of the various ” Siciliae populi,” we hear of Greeks, Saracens, Lombards, sometimes of Franci, for by that time there were many French-speaking settlers in Sicily who were not of Norman descent. There is a distinction between Christians and Saracens; among Christians there seems to be again a distinction between Greeks and Latins, though perhaps without any

distinct use of the Latin name ; there is again a further distinction between ” Lombardi ” and “Franci”; but Normans, as a separate class, do not appear. In England there is no room for such subtleties. The narratives of the conquest of England use both the Norman and the French names to express the followers of William. In the English chronicles ” French ” is the only name used. It appears also in the Bayeux Tapestry, and it is the only word used when any legal distinction had to be drawn between classes of men in the English kingdom. ” Franci ” and ” Angli ” are often opposed in Domesday and other documents, and the formula went on in charters long after all real distinction had passed away. That is to say, there were several purposes for which it was convenient to distinguish “English” and ” French ” — the last name taking in all the followers of the Conqueror ; there were no purposes for which there was any need to distinguish Normans as such, either from the general mass of the people or from others who spoke the French tongue. We can see also that, though several languages were in use in England during the time of Norman rule, yet England was not a land of many languages in the same sense in which Sicily was. In the 1 2th century three languages were certainly spoken in London; yet London could not call itself the ” city of threefold speech,” as Palermo did. English, French, Latin, were all in use in England; but the distinc- tion was rather that they were used for three different purposes than that they were used by three distinct races or even classes. No doubt there was a class that knew only English ; there may have been a much smaller class that knew only French ; any man who pretended to high cultivation would speak all as a matter of course ; Bishop Gilbert Foliot, for instance, was eloquent in all three. But in Sicily we see the quite different phenomenon of three, four, five classes of men living side by side, each keeping its own nationality and speak- ing its own tongue. If a man of one people knew the speech of any of the others, he knew it strictly as a foreign language. Before the Norman Conquest England had two official tongues; documents

were drawn up sometimes in English, sometimes in Latin, now and then in both. And the same usage went on after the Conquest; the use of English becomes gradually rarer, and dies out under the first Angevins, but it is in favour of Latin that it dies out. French, the language which the Normans brought with them, did not become an official language in England till after strictly Norman rule had passed away. French documents are unknown till the days of French fashion

had come in, that is, till deep in the 13th century. So it was in Sicily also; of all the tongues of Sicily French was the most needful in the king's court (" Francorum lingua quae maxime necessaria esset in curia," says Hugo Falcandus, 321); but it was not an official tongue. The three tongues of Palermo are Greek, Arabic and Latin. King Roger's clock is commemorated in all three. Documents were drawn up in such and so many of these tongues as was convenient for the parties concerned; not a few private documents add a fourth tongue, and are drawn up in Greek, Arabic, Latin and Hebrew. In neither case is the actual speech of the conquerors one of the tongues in formal use. French, as a separate tongue from Latin, already existed as a literary speech, and no people had done more than the Normans to spread it as a literary speech, in both prose and verse. But neither in England nor in Sicily did official formalism acknowledge even French, much less Italian, as a fit tongue for solemn documents. In England, English, French, Latin, were the three tongues of a single nation; they were its vulgar, its courtly and its learned speeches, of which three the courtly was fast giving way to the vulgar. In Sicily, Greek, Arabic, Latin and its children were the tongues of distinct nations; French might be the politest speech, but neither Greek nor Arabic could be set down as a vulgar tongue, Arabic even less than Greek.

The different positions then which the conquering Norman took in his two great conquests of England and of Sicily amply illustrate the way in which he could adapt himself Normans tQ an y c i rcums tances in which he found himself, Scotland, the way in which he could adopt whatever suited his purpose in the institutions of any other people, the way in which he commonly lost his national being in that of some other people. From England, moreover, he spread into Scotland, Wales and Ireland, and in each land his settlement put on a somewhat different character, according to the circum- stances of the land. In Scotland he was not a conqueror, but a mete visitor, and oddly enough he came as a visitor along with those whom he had himself overcome in England. Both Normans and English came to Scotland in crowds in the days of Margaret, Edgar and David, and Scottish national feeling sometimes rose up against them. In Scotland again the Norman settlers were lost in the mixed nationality of the country, but not till they had modified many things in the same way in which they modified things in England. They gave Scotland nobles and even kings; Bruce and Balliol were both of the truest Norman descent; the true Norman descent of Comyn might be doubted, but he was of the stock of the Francigenae of the Conquest. In Wales the Norman came as a conqueror, more strictly a conqueror than in England; he could not claim Welsh crowns or Welsh estates under any fiction of Welsh

law. The Norman settler in Wales, therefore, did not to any perceptible extent become a Welshman; the existing relations of England and Wales were such that he in the end became an Englishman, but he seems not unnaturally to have been somewhat slower in so doing in Wales than he was in England. At least Giraldus Cambrensis, the Norman Welshman or Welsh Norman, was certainly more alive to the distinction between Normans and English than any other of his contemporaries. In Ireland the Norman was more purely a conqueror than anywhere else; but in Ireland his power of adaptation caused him to sink in a way in which he sank nowhere else. While some of the Norman settlers in Ireland went to swell the mass of the English of the Pale, others threw in their lot with the native Irish, and became, in the well-known saying, Hibernis ipsis Hibemiores (see e.g. the article Burgh).

There is yet one point in which we may profitably go back to our comparison between England and Sicily. Both countries are rich

in works of architecture raised during the time of Norman !”.?” ruIc – And the buildings of both lands throw an instructive a light on the Norman national character, as we have

described it. Few buildings, at least few buildings raised

in any reasonable style of architecture which makes use Sicily °^ t ‘ le arcnec ‘ construction, can be less like one another

than the buildings of the Norman kings in England and the buildings of the Norman kings in Sicily. In Sicily the Normans

Wales.

Ireland.

ture in England and in

found the two most outwardly civilized of the nations of Europe, the two which had as yet carried the arts to the highest pitch. The Greek had created the column; the Roman had developed it; the Roman Greek or Greek Roman had taught the column to bear the cupola; the Saracen had taught it to bear arches of his own favourite pointed shape. Out of these elements the Saracens of Sicily had formed a noble and beautiful style, grand and simple in its con- struction, rich and graceful in its characteristic detail. With the Saracen and the Greek as his subjects, the Norman had really no need to innovate ; he had simply to bid the men of the land to go on working for him instead of

for any other. The palaces and churches of the Norman kings at Palermo and Monreale and Cef alu and Messina are in style simply Saracenic; they were most likely the work of Saracen builders; they were beyond doubt built after Saracenic models. In these buildings, as in those of Aquitaine, the pointed arch is the surest sign of Saracenic influence ; it must never be looked on as marking the approach of the Gothic of the North. With that form of art the pointed style of Sicily has nothing in common. A Sicilian church has nothing in common with a French or an English church; it is sometimes purely Oriental, sometimes a basilica with pointed arches. But, if the Saracen gave the lines of the building, the Greek gave the mosaic decorations of its walls. In such a case the ruling people, rather the ruling dynasty, had really nothing to add to what they found ready for them. They had simply to make Saracen and Greek work in partnership. In England, on the other hand, the Normans did really bring in a new style of their own, their own form of Romanesque, differing widely indeed from the Saracenic style of Sicily. This Norman form of Romanesque most likely had its origin in the Lombard buildings of northern Italy. But it took firm root on Norman soil ; it made its way to England at an early stage of its growth, and from that time it went on developing and improving on both sides of the Channel till the artistic revolution came by which, throughout northern Europe, the Romanesque styles gave way to the Gothic. Thus the history of architecture in England during the nth and I2th centuries is a very different story from the history of the art in Sicily during the same time. There were no Greeks or Saracens in England; there was no Greek or Saracen skill. England indeed had, possibly in a somewhat ruder form, the earlier style of Romanesque once common to England with Italy, Gaul and Germany. To this style it is no wonder that the Normans preferred their own, and that style therefore supplanted the older one. A comparison of Norman buildings in England and in Nor- mandy will show that the Norman style in England really was affected by the earlier style of England ; but the modification was very slight, and it in no way affected the general character of the style. Thus, while the institutions of England in the 12th century were English with very considerable Norman modifications, the architecture of England in that century was Norman with a very slight English modification. The difference then is plain. Where, as in Sicily, the Normans felt that they could not improve, they simply adopted the style of the country. Where, as in England, they felt that they could improve, they substituted for the style of the country their own style — that is, a style which they had not created but which they had adopted, which they had made thoroughly their own, and which they went on improving in England no less than in Normandy. That is, the discerning Norman, as ever, adapted himself,

but adapted himself in an intelligent way, to the circumstances of each land in which he found himself. And this comes out the more clearly if we compare Norman work in England and in Sicily with Norman work in at least some parts of Apulia. At Bari, Trani and Bitonto we see a style in which Italian and strictly Norman elements are really mingled. The great churches of those cities are wholly unlike those of Sicily; but, while some features show us that we are in Italy, while some features even savour of the Saracen, others dis- tinctly carry us away to Caen and Peterborough. It is plain that the Norman settlers in Apulia were not so deeply impressed with the local style as they were in Sicily, while they thought much more of it than they thought of the local style of England. In each of the three cases there is adaptation, but the amount of adaptation differs in each case according to local circumstances. In Normandy itself, after the separation from England, architecture becomes French, but it is French of a remarkably good type. The buildings of the latest French style keep a certain purity and sobriety in Normandy which they do not keep elsewhere. (E. A. F.)

For a bibliography of the Normans and Northmen see Ulysse Chevalier, Repertoire des sources hist, du moyen-dge. Topobibliogr. (Montbeliard, 1903), ii. 2140; also, for sources for the Norman in- vasion of France, Molinier, Sources de Vhist. de France (Paris, 1901), i. 264. Many sources for the history of the Normans were collected by Andre Du Chesne in his Hist. Normannorum scriptores anliqui . . . 838-1220, &c. (Paris, 1619). Of modern works may be mentioned H. Dondorff, Die Normannen und ihre Bedeutung fur das europdische Kulturleben im Mittelalter (Berlin, 1875); A. H. Johnson, The Normans in Europe (1877); E. A. Freeman, Hist, of the Norman Conquest (Oxford, 1867-1879) and Hist, of Sicily (1891-1894); O. Delarc, Les Normands en Italie, 859-1073 (Paris, 1883); J. W. Barlow, Shori Hist, of the Normans in S. Europe (London, 1886); A. F. von Schack, Gesch. der Normannen in Sicilien (Stuttgart, 1889); L. von Heinemann, Gesch. der Normannen in Unteritalien und Sicilien (Leipzig, 1894) ; W. Vogel, Die Normannen und das

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frankische Reich, ypQ-QH (1906); F. Chalandon, La Dominion normande en Italie et Sicile, 1009-1194 (Paris, 1907) ; F. Lot, ” La Grande Invasion normande, 856-862,” in t. 69 of the Bibliotheque del’Ecoledes Charles (Paris, 1908).

NORMANTON, a town of Normanton county, Queensland, Australia, on the river Norman, 25 m. E. by S. of the Gulf of Carpentaria, and 1382 m. direct N.W. of Brisbane. Pop. (1901) 838. It is the centre of the Carpentaria district, one of the chief sheep and cattle farming districts in the colony. Nor- manton is also the outlet of the Croydon and Etheridge goldfields, and of the Cloncurry copper mines. It is the terminus of the railway to Croydon, and has large meat-packing works.

NORMANTON, an urban district in the Normanton parlia- mentary division of the West Riding of Yorkshire, England, on the river Calder, 3 m. N.E. of Wakefield on the Midland, North Eastern and Lancashire & Yorkshire railways. Pop. (1901) 12,352. The church of All Saints is Norman and Per- pendicular, with a square tower rebuilt in 1717, and contains a number of interesting monuments; the ancient stained glass is good. The grammar-school was founded about the end of the 1 6th century. Traces remain of a moat surrounding the town. A mound in the neighbourhood called Haw Hill is supposed to be a barrow. Altof ts, a neighbouring parish, was the home of Sir Martin Frobisher in the 16th century. There are numerous collieries in the neighbourhood.

NORNS (O. Norse, Nomir), in Northern mythology, the female divinities of fate, somewhat similar to the Gr. Motpcu and the Roman Parcae. Like them they are generally repre- sented as three in number, and they are said to spin, or weave, the destiny of men. Their dwelling is beside the ” Spring of fate,” beneath the ” world-tree,” Yggdrasil’s ash, which they water with draughts from the spring. In some cases the Norns are not easily to be distinguished from the Valkyries (q.v.). Some- times again they appear as prophetesses (volur) at the birth of children, whose destiny they foretell. The most famous of these stories is contained in the Thdltr af Nornagesti, and has a curious resemblance to the Greek legend of Althaea and Meleager. Similar beings seem to have been known among other Teutonic peoples in early times. (See Teutonic Peoples, §7). (H.M. C)

NORRIS, FRANK (1870-1902), American novelist, was born in Chicago, Illinois, on the 5th of March 1870. He studied art in Paris in 1887-1889; studied at the University of California (1890-1894), and at Harvard University (1894-1895); in 1895- 1896 served in South Africa as war correspdndent for the San Francisco Chronicle; in 1896-1897 was associate editor of the San Francisco Wave; and in 1898 was sent to Cuba as war correspondent for McClure’s Magazine. He died in San Francisco on the 25th of October 1902. He wrote A Deal in Wheat, and Other Stories (1903), Responsibilities of the Novelist, and Other Literary Essays (1903), and the following novels: Moran of the Lady

Letty (1898), a story of adventure off the California coast; McTeague (1899), a story of the San Francisco slums; Blix (1899), a love story; A Man's Woman (1900); The Octopus (1901) and The Pit (1903). The last two were powerful stories, which made his reputation. The Octopus deals with wheat-raising in California and with the struggle between the growers and the railroad trust; The Pit with wheat-specula- tion in the Chicago market. His complete works were published in seven volumes in 1903.

NORRIS, HENRY NORRIS or Norreys, Baron (c. 1525-1601), belonged to an old Berkshire family, many members of which had held positions at the English court. His father, Henry Norris, was a grandson of Sir William Norris, who commanded the royal troops against Lambert Simnel at the battle of Stoke in 1487. Like his brother John (d. 1564), the elder Henry Norris obtained a post at the court of Henry VIII. ; he gained the king's favour and was rewarded with many lucrative offices. He belonged to the party which favoured the elevation of Anne Boleyn; but in May 1536 he was arrested on the charge of intriguing with her, and though he was probably innocent of any serious offence he was beheaded on the 17th of May 1536.

His son Henry regained some of his father's lands and entered upon court life, being a member of parliament under Edward VI. During Mary's reign he was one of those who were entrusted with the custody of the princess Elizabeth, and when the princess became queen she amply repaid the kindness which Norris had shown to her when he was her guardian at Woodstock. In 1566 he was knighted and was sent as ambassador to France, where he remained until 1570, and in 1572 he was created Baron Norris of Rycote. He died in June 1601. By his wife Margaret (d. 1599), daughter of John, Lord Williams of Thame, Norris had six sons, all of whom distinguished themselves in the field. The Norris monument, with figures of Lord and Lady Norris and their six sons, is in St Andrew's Chapel in Westminster Abbey.

The eldest son, Sir William Norris, died in Ireland in December 1579, leaving a son Francis (1579-1623), who succeeded to his grandfather's barony and also to the estates of his uncle Sir Edward Norris. In 1621 Francis was created earl of Berkshire. He left no sons and the earldom became extinct, but the barony descended to his daughter Elizabeth (d. 1645), the wife of Edward Wray (d. 1658). Their daughter Bridget (1627-1657) married as his second wife Montagu Bertie, 2nd earl of Lindsey, and their son James Bertie (1654-1699) became Baron Norris (or Norreys) in 1657, and was created earl of Abingdon in 1682. His descendants the Berties, earls of Abingdon, still hold this barony, and are the present representatives of the family of Norris.

Sir Edward Norris (d. 1603), the 1st Lord Norris's third son, served with the English troops in the Netherlands from 1585 to 1588. He is chiefly remembered owing to his fierce quarrel with Philip, count of Hohenlohe (1550-1606), called Hollock by the English, in August 1586 at Gertruydenberg (see J. L. Motley, The United Netherlands, vol. ii.). In 1589 he sailed with his brother Sir John and Sir Francis Drake on the expedi- tion to Spain and Portugal, and from 1590 to 1599 he was governor of Ostend.

Sir Thomas Norris (1556-1599), another son of the first lord, went as a soldier to Ireland in 1579 and acted for a few months as president of Connaught. He fought against the Fitzgeralds and also in Ulster; in 1585 he became vice-president of Munster, and in 1597 he succeeded his brother, Sir John Norris, as presi- dent. The three remaining brothers were: Sir Henry Norris (1554-1599), who fought in the Netherlands and then in Ireland, where he was killed in 1599; Maximilian Norris, who was killed in Brittany in 1593, and Sir John Norris (q.v.).

Two other members of another branch of this family remain to be mentioned, namely, Sir William Norris and his brother Sir John.

Sir William Norris (c. 1657-1702), having been created a baronet, was sent in 1699 to the Mogul emperor in India to secure trading privileges for the new company which had been just formed to compete with the old East India Company. He reached India in September 1699, and after overcoming many difficulties he arrived at the emperor's residence in April 1701. The embassy, however, was a total failure; Norris was unable to make terms, and he died on the voyage to England.

Sir John Norris (c. 1660-1749) entered the navy and saw a good deal of service during the war with France under William III. and Anne. Under George I. he was sent several times with a fleet into the Baltic Sea to forward the policy of this king by giving the northern nations some idea of the strength of England. In 1734 he became an admiral and commander-in-chief. Norris, who was known as " foul-weather Jack," was a member of parliament from 1708 until his death.

NORRIS, JOHN (1657-1711), English philosopher and divine, was born at Collingbourne-Kingston in Wiltshire. He was educated at Winchester and Exeter College, Oxford, being subsequently elected to a fellowship at All Souls'. His first original work was An Idea of Happiness (1683), in which, with Plato, he places the highest happiness or fruition of the soul in the contemplative love of God.

Malebranche's Recherche de la verite, which had appeared in 1674, made a strong impression upon him. Malebranche, he says, " is indeed the great Galileo of the intellectual world." He had also studied the works of Descartes himself, and most of what had been written for and against Cartesianism. Of English thinkers, More and Cudworth,

the so-called Cambridge Platonists, had influenced him most; and in 1685 his study of their works led to a correspondence with the former, published after his death by Norris as an appendix to his Platonically conceived essay on The Theory and Regulation of Love (1688). He also corresponded with Mrs Astell (q.v.) and Lady Masham, the friend of Locke, to whom he addressed his Reflections upon the Conduct of Human Life (1689). Some time before this Norris had taken orders, and in 1689 he was presented to the living of Newton St Loe, in Somer- setshire. In 1690 he published a volume of Discourses upon the Beatitudes, followed by three more volumes of Practical Discourses between 1690 and 1698. The year 1690 is memorable as the year of the publication of Locke's Essay, and the book came into Norris's hands just as his volume of Discourses was passing through the press. He at once appreciated its import- ance, but its whole temper was alien from the modes of thought in which he had been reared, and its main conclusions moved him to keen dissent. He hastened to " review " it in an appendix to his sermons. These Cursory Reflections constitute Norris the first critic of the Essay; and they anticipate some of the arguments that have since been persistently urged against Locke from the transcendental side. Though holding to the " grey-headed, venerable doctrine " of innate ideas as little as Locke himself, Norris finds the criticism in the first book of the Essay entirely inconclusive, and points out its incon- sistency with Locke's own doctrine of evident or intuitively perceived truths. He also suggests the possibility of subconscious ideation, on which Leibnitz laid so much stress in the same connexion. He next complains that Locke neglects to tell us " what kind of things these ideas are which are let in at the gate of the senses." In other words, while giving a metaphorical account of how we come by our ideas, Locke leaves unconsidered the intellectual nature of the ideas or of thought in itself. Unless we come to some conclusion on this point, Norris argues, we have little chance of being right in our theory of how ideas " come to be united to our mind." He also saw the weakness of Locke's doctrine of nominal essences, showing how it ignores the relation of the human mind to objective truth, and instancing mathematical

figures as a case ” where the nominal essence and the real essence are all one.” The last twenty years of Norris’s life were spent at Bemerton, near Salisbury, the former home of George Herbert, to the living of which he had been transferred in 1691. In 1691-1692 he was engaged in con- troversy with his old enemies the ” Separatists,” and with the Quakers, his Malebranchian theory of the divine illumination having been confounded by some with the Quaker doctrine of the light within. In 1697 he wrote An Account of Reason and Faith, one of the best of the many answers to Toland’s Christianity trot Mysterious. Norris adopts the distinction between things contrary to reason and things above reason, and maintains that the human mind is not the measure of truth. Reason, according to him, is nothing but the exact measure of truth, that is to say, divine reason, which differs from human reason only in degree, not in nature. In 1701 appeared the first volume of the systematic philosophical work by which he is remembered, An Essay towards the Theory of the Ideal or Intelligible World. The first volume treats the intelligible world absolutely; the second, which appeared in 1704, considers it in relation to human understanding. It is a complete ex- position of the system of Malebranche, in which Norris refutes the assertions of Locke and the sensualists. In 1708 Norris wrote A Philosophical Discourse concerning the Natural Im- mortality of the Soul, defending that doctrine against the assaults of Dodwell. After this he wrote little. He died at Bemerton, and a monument was erected to his memory in the parish church, with an inscription in which he is spoken of as one who ” bene latuit.”

Norris was neither an original thinker nor a master of style. His philosophy is hardly more than an English version of Malebranche, enriched by wide reading of ” Platonic ‘ thinkers of every age and country. His style is too scholastic and self-involved. His Theory of the Intelligible World is an attempt to explain the objective nature of truth, which he blamed Locke for leaving out of regard. By the

intelligible world Norris understands the system of ideas eternally existent in the mind of God, according to which the material creation was formed. This ideal system he identifies with the Logos — the second person of the Trinity, the light that lighteth every man that cometh into the world. For it is these ideas and their relations that are alone the object-matter of science; whenever we know, it is because they are present to our mind. Material things are wholly dark to us, except so far as the fact of their existence is revealed in sensation. The matter which we say that we know is the idea of matter, and belongs, like other ideas, to the intelligible world. When stripped of its semi-mythical form of statement, Norris’s emphatic assertion of the ideal

nature of thought and its complete distinction from sense as such may be seen to contain an important truth. As the disciple and correspondent of More, he is, in,a sense, the heir of the Cambridge Platonists, while, as the first critic of Locke's Essay, he may be said to open the protest of the church against the implicit tendencies of that work. He occupies a place, therefore, in the succession of churchly and mystical thinkers of whom Coleridge is the last eminent example.

See Wood, Athenae Oxonienses (ed. Bliss), iv. ; Biographia Britannica; Leslie Stephen in Dictionary of National Biography; J. Tulloch, Rational Theology and Christian Philosophy in England in the 17th Century (1874), who calls Norris " as striking and signifi- cant a figure in the history of English philosophy " as another idealist, Berkeley.

NORRIS, SIR JOHN {c. 1547-1597), English soldier, was the second son of Henry Norris, Baron Norris of Rycote, and gained his earliest military experience in the civil wars in France. In 1 573 he went to Ulster with Walter Devereux, earl of Essex, winning fame by his conduct in the guerilla wars against the Irish, and being responsible for the massacre on the island of Rathlin in July 1575; and in July 1577 he crossed over to the Netherlands to assist the Dutch against the Spaniards. Having added to his reputation by his valour at the battle of Rymenant, Norris returned to England in March 1 584, and in the following July he was sent to Ireland as lord president of Munster; he accompanied the lord deputy, Sir John Perrot, on a campaign in Ulster, and spoke eloquently in the Irish parliament; but he disliked his work and soon obtained his recall. In August

1585 he was again in the Netherlands, commanding the English army of 4400 men which Elizabeth had sent to serve against the Spaniards. During his successful relief of Grave in April

1586 he was wounded, and just after this event he was knighted by the governor-general, the earl of Leicester; but he and Leicester were soon at variance, and many complaints of his conduct were sent to England. After taking part in the battle of Zutphen in October 1586 Sir John was recalled to England, but in 1587 he went again to the Netherlands and was soon quarrelling with his new superior, Peregrine Bertie, Lord Wil- loughby de Eresby, and with Sir William Stanley. In 1588, when the Spanish Armada was expected, he was marshal of the camp at Tilbury; later in the same year he served the queen as ambassador to the Dutch states, and in 1589 he and Sir Francis Drake led the fleet which ravaged the coasts of Spain and Portugal. In 1591, and again in 1593, he aided Henry IV. of France in his struggle with the League in Brittany; and in May 1595 he landed

again in Ireland, where he was still lord president of Munster. But this time he was entrusted with more extensive powers and was to assist the lord deputy, Sir William Russell,_ in subjugating Ulster, He did not, however, work harmoniously with Russell; his health was failing and the gigantic task was too much for him. After fighting and negotiating with the O'Neills in Ulster, and warring in Connaught, he asked for his recall. This was not granted, but he was sup- planted in his military command; and he retired to Munster and died at Mallow on the 3rd of July 1597. His monument is in the church of Tattendon, Berkshire.

See J. L. Motley, The United Netherlands, vol. ii. (1904) ; and R. Bagwell, Ireland under the Tudors, vol. iii. (1890).

NORRIS, WILLIAM EDWARD (1847-), English novelist, was born on the 18th of November 1847, the son of Sir W. Norris, chief justice of Ceylon. He was educated at Eton, and called to the bar at the Inner Temple in 1874. His first story, Heaps of Money, appeared in 1877, and was followed by a long series of novels, many of which first appeared in the Temple Bar and Cornhill magazines. The best of his numerous novels are Mademoiselle de Mersac (1880), Matrimony (1881), No New

Thing (1883), My Friend Jim (1886), The Rogue (1888), The Despotic Lady (1895), Matthew Austin (1895), The Widower (1898), Nature's Comedian (1904), Pauline (1908).

NORRISTOWN, a borough and the county-seat of Mont- gomery county, Pennsylvania, U.S.A., on the Schuylkill river, at the mouth of Stony Creek, opposite Bridgeport, and about 18 m. N.W. of Philadelphia. Pop. (1910 census) 27,875. Norristown is served by the Pennsylvania, the Philadelphia & Reading and the Stony Creek railways, by interurban electric railway to Philadelphia and Reading, and by the Schuylkill canal, and is connected by bridge with the borough of Bridge- port (p"bp. in 1910, 3860), where woollen and cotton goods are manufactured. Norristown is a residential suburb of Philadelphia, and commands fine views of the Schuylkill Valley. It has a State Hospital for the Insane (opened 1880), a fine County Court House, a general hospital, a Friends' Home, a home for aged women, St Joseph's Protectory (Roman Catholic) for girls, and the Norristown and McCann public libraries; in Montgomery cemetery are the tombs

of General Winfield Scott Hancock and General John Frederick Hartranft (1 830-1 889), a distinguished Federal officer in the Civil War and governor of Pennsylvania in 1873-1879. Valley Forge is less than 6 m. distant to the W. The borough has a large trade with the surrounding country, which is well adapted to agriculture and abounds in limestone. Among Norristown's manufactures are hosiery and woollen goods; in 1905 its total factory product was valued at $5,925,243, an increase of 44-3% over the value in 1900. Norristown was founded in 1785, and was named in honour of Isaac Norris (c. 1 671-173 5), a friend of William Penn and a member of the Pennsylvania legislature, who had owned the land on which the borough is built. Norristown was incor- porated as a borough in 1812, and its boundaries were extended in 1853.

NORRKOPING, a town and port of Sweden, in the district (Ian) of ' Ostergotland, 113 m. S.W. of Stockholm by the Malmo railway. Pop. (1880) 26,735; (1900) 41,008. It occupies both banks of the Motala,the wide and rapid emissary of lakeVetter, close to its outlet in the Bravik, an inlet of the Baltic. Having been burned by the Russians in 17 19 and visited by further fires in 1812, 1822 and 1826, the whole town has a modern appearance, with wide and regular streets. Among the more conspicuous buildings are St Olaf's church (erected by Gustavus Adolphus in 1616 and rebuilt in 1765-1767); St Hedvig's, built by the German colony in 1670; the town hall, dating fr6m the beginning of the 19th century; the high school (1868), and technical and weaving schools. Norrkoping is the fourth town in population and industrial importance in Sweden. The falls in the river afford motive power to the cloth and cotton mills (spinning and weaving) — the staple industries — and to factories for sugar, paper, lithography, tobacco and carpets, joinery works and breweries. There are also shipbuilding yards and docks. Fine granite is quarried at Grafversfors, 7! m. N. The inlet of Bravik affords excellent harbour accommodation, with from ˆi ft. to 17I ft. of water below the bridges in the town. The town returns two members to the second chamber of the Riksdag (parliament).

A bull of Pope Lucius III. shows that Norrkoping existed in 1 185. At the meeting of the states in 1604 Duke Charles assumed the Swedish crown as Charles IX.; and not long afterwards Duke John of Ostergotland introduced German craftsmen into Norrkoping, and thus originated its industrial activity. Under Charles XII. the town suffered not only from war but from pestilence, 2700 of its inhabitants perishing in 1710-1711. After the Russian invasion of 17 19 the population was only

2600.

NORTH, BARONS. The English title of Lord North of Kirtling was created for Edward North (c. 1496-1564), son of Roger North, a London citizen, in 1554; he was a successful lawyer, clerk of the parliament (1531) and chancellor of the court of augmentations (1545). His second son was Sir Thomas North (q.v.), and he was succeeded as 2nd baron by his son Roger (1530- 1600), a prominent courtier and soldier of Queen Elizabeth's

day, who married the daughter of Lord Chancellor Rich, and whose eldest son, Sir John (c. 1 551-1597), predeceased him.

Dudley North, 3rd Baron North (1581-1666), son of Sir John North and of Dorothy, daughter and heiress of Sir Valentine Dale, was born in 1581 and succeeded his grandfather, the 2nd Baron North, at the age of nineteen. He was educated at Cambridge, and married in 1599 Frances, daughter of Sir John Brockett of Brockett Hall in Hertfordshire. He travelled in Italy, took part in the campaign of 1602 in the Netherlands, and on his return became a conspicuous figure at court, excelling in athletic exercises as well as in poetry and music, and gaining the friendship of Prince Henry. In 1606, while returning from Eridge to London, he discovered the springs of Tunbridge Wells, which cured North himself of a complaint and quickly became famous. He also recommended the Epsom springs to the public. He supported and subscribed to the expedition to Guiana made by his brother Roger North (c. 1582-c. 1652) in 1619, and when Roger departed without leave Dudley was imprisoned for two days in the Fleet. In 1626 he attached himself to the party of Lord Saye and Sele in the Lords, who were in sympathy with the aims of the Commons; and when the civil war broke out he was on the side of the parliament. In 1641 he was a member of the Lords' committee on Religion, and served on the committee to consider Laud's attainder in 1644, finally voting for the ordinance in January 1645. He was placed on the admiralty commission in 1645, and acted as lord lieutenant for Cambridgeshire. He was one of the small group of Lords who continued attendance in the House of Peers, and on the 19th of December 1648, with three others, visited Fairfax, when they " cast down their honours at his Excellency's feet " and protested their desire not to retain any privileges prejudicial to the public interest. ' He passed the rest of his life in retirement at Kirtling in Cambridgeshire, with his sons, daughters and grandchildren, finding " employ- ment with many airy entertainments as poetry, writing essays, building, making mottoes and inscriptions as well as in music." 2 He wrote A Forest of Varieties (1645), a miscellany of essays and poems, another

edition of which was published in 1659 under the title of A Forest promiscuous of various Seasons' Productions. He died on the 16th of January 1666. North is described as " full of spirit and flame," of imperious temper but of well- balanced judgment, Lord Holland declaring that " he knew no man less swayed with passion and sooner carried with reason and justice." He left, besides one daughter, two sons, the elder of whom, Sir Dudley, succeeded him as 4th Baron North.

Dudley North, 4th Baron North (1602-1677), increased the family fortune by marrying the daughter of Sir Charles Montagu, brother of the 1st earl of Manchester. He was an accomplished man, of studious bent, and had fourteen children, of whom the third son, Francis, became lord chancellor as Lord Guilford; the fourth was Sir Dudley North (q.v.), the economist; the fifth, John (1645-1683), master of Trinity, Cambridge, and professor of Greek in the university; and the sixth, Roger (q.v.), the lawyer and historian.

The eldest son, Charles (d. 1691), was created Lord Grey of Rolleston during his father's life, and succeeded his father as 5th Baron North; and on the death of his son, William, 6th Lord North, without issue, in 1734, the barony of North went to a cousin, Francis North, 3rd baron, afterwards 1st earl of Guilford. The title of Lord North is that by which the 2nd earl of Guilford, prime minister from 1770 to 1782, is best known in history (see Guilford, Barons and Earls of).

George Augustus, 3rd earl of Guilford (d. 1802), left three daughters, and the barony of North fell into abeyance till 1841 when it vested in Susan, Baroness North (1797-1884), wife of John Sidney Doyle, who took the name of North; at her death her son William Henry John North (b. 1836) succeeded as nth baron, the title now being separate from that of Guilford.

NORTH, SIR DUDLEY (1641-1691), English economist, was 4th son of Dudley, 4th Lord North, who published, besides other things, Passages relating to the Long Parliament,

1 Gardiner's Civil War, iv. 285.

2 Roger North's Autobiography, ed. by A. Jessopp, 68.

NORTH, MARIANNE-

of which he had himself been a member. He was born on the 1 6th of May 1641. In his early years he was carried off by gipsies and recovered with some difficulty by his family — an incident curiously

similar to that which befell Adam Smith in his infancy. He engaged in foreign trade, especially with Turkey, and spent a number of years at Constantinople and Smyrna. Some notices of the manners and customs of the east were printed from his papers by his brother. Having returned to London with a considerable fortune, he continued to prosecute ‘ trade with the Levant. His ability and knowledge of commerce attracted the attention of the government, and he was further recommended by the influence of his brother Lord Guilford. During the Tory reaction under Charles II. he was one of the sheriffs forced on the city of London with an express view to securing verdicts for the crown in state trials. He was knighted, and was appointed a commissioner of customs, afterwards of the treasury, and again of the customs. Having been elected a member of parliament under James II., ” he took,” says Roger North, ” the place of manager for the crown in all matters of revenue.” After the Revolution he was called to account for his alleged unconstitutional proceedings in his office of sheriff. He died on the 31st of December 1691.

His tract entitled Discourses upon Trade, principally directed to the cases of the interest, coinage, clipping and increase of money, was published anonymously in 1691, and was edited in 1856 by J. R. M’Culloch in the Select Collection of Early English Tracts on Commerce printed by the Political Economy Club of London. In this thorough-going and emphatic assertion of the free-trade doctrine against the system of prohibitions which had gained strength by the Revolution, North shows that wealth may exist independently of gold or silver, its source being human industry, applied either to the cultivation of the soil or to manufactures. It is a mistake to suppose that stagnation of trade arises from want of money; it must arise either from a glut of the home market, or from a disturbance of foreign commerce, or from diminished consumption caused by poverty. The export of money in the course of traffic, instead of diminish- ing, increases the national wealth, trade being only an exchange of superfluities. Nations are related to the world just in the same way as cities to the state or as families to the city. North emphasizes more than his predecessors the value of the home trade. With respect to the interest of capital, he maintains that it depends, like the price of any commodity, on the proportion of demand and supply, and that a low rate is a result of the relative increase of capital, and cannot be brought about by arbitrary regulations, as had been proposed by Sir Josiah Child and others. In arguing the question of free trade, he urges that every advantage given to one interest over another is injurious to the public. No trade is unprofitable to the public; if it were, it would be given up; when trades thrive, so does the public, of which they

form a part. Prices must determine themselves, and cannot be fixed by law; and all forcible inter- ference with them does harm instead of good. No people can become rich by state regulations, — only by peace, industry, freedom and unimpeded economic activity. It will be seen how closely North's view of things approach to that embodied some eighty years, later in Adam Smith's great work. North is named by Wilhelm Roscher as one of that " great triumvirate " which in the 17th century raised the English school of economists to the foremost place in Europe, the other members of the group being Locke and Petty.

NORTH, MARIANNE (1830-1890), English naturalist and flower-painter, was born at Hastings on the 24th of October 1830, the eldest daughter of a Norfolk landowner, descended from Roger North (1653-1734). She trained as a vocalist under Madame Sainton Dolby, but her voice failed, and she then devoted herself to painting flowers. After the death of her mother in 1855 she constantly travelled with her father, who was then member of parliament for Hastings; and on his death in 1869 she resolved to realize her early ambition of painting the flora of distant countries. In 1871-1872 with this object she went to Canada, the United States and Jamaica, and spent a year

in Brazil, where she did much of her work at a hut in the depths of a forest. In 1875, after a few months at Teneriffe, she began a journey round the world, and for two years was occupied fa painting the flora of California, Japan, Borneo, Java and Ceylon. The year 1878 she spent in India, and after her return she exhibited a number of her drawings in London. Her subsequent offer to present the collection to the botanical gardens at Kew, and to erect a gallery for their reception, was accepted, and the new buildings, designed by James Ferguson, were begun in the same year. At Darwin's suggestion she went to Australia in 1880, and for a year painted there and in New Zealand. Her gallery at Kew was opened in 1882. In 1883, after a visit by her to South Africa, an additional room was opened at the Kew gallery, and in 1884-1885 she worked at Seychelles and in Chile. Miss North died at Alderly in Gloucestershire on the 30thof August 1890. The scientific accuracy with which she represented plant life in all parts of the world gives her work a permanent value.

NORTH, ROGER (1653-1734), English lawyer and biographer, was the sixth son of the 4th Baron North. He acquired a good practice at the

bar, being helped by his elder brother Francis, who became lord chancellor and was created Baron Guilford (q.v.), and in 1684 he became solicitor-general. But the Revolu- tion stopped his advancement, and he retired to his estate of Rougham in Norfolk, and increased his fortune by marrying the daughter of Sir Robert Gayer. He collected books, and was constantly occupied in writing. But he is best known for his Lives of the Norths, published after his death, together with his own autobiography (see the edition in Bohn's Standard ' Library, 1890, by Jessopp), a classic authority for the period. He died at Rougham on the 1st of. March 1734, leaving a family from whom the Norths of Rougham are descended.

He is to be distinguished from Roger North (1585-1652), brother of the 3rd baron, one of the cap'tains who sailed with Raleigh in 1617, who projected the plantation of Guiana with an English colony.

NORTH, SIR THOMAS (i535?-i6oi?), English translator of Plutarch, second son of the 1st Baron North, was born about 1535. He is supposed to have been a student of Peterhouse, Cambridge, and was entered at Lincoln's Inn in 1557. In 1574 he accompanied his brother, Lord North, on a visit to the French court. He served as captain in the year of the Armada, and was knighted about three years later. His name is on the roll of justices of the peace for Cambridge in 1592 and again in 1597, and he received a small pension (£40 a year) from the queen in 1601. A third edition of his Plutarch was published, in 1603, with a supplement of other translated biographies. He translated, in 1557, Guevara's Reloj de Principes (commonly known as Libro Aureo), a compendium of moral counsels chiefly compiled from the Meditations of Marcus Aurelius, under the title of Diall of Princes. The English of this work is one of the earliest specimens of the ornate, copious and pointed style for which educated young Englishmen had acquired a taste in their Continental travels and studies. North translated from a French copy of Guevara, but seems to have been well acquainted with the Spanish version. The book had already been translated by Lord Berners, but without reproducing the rhetorical artifices of the original. North's version, with its mannerisms and its constant use of antithesis, set the fashion which was to culminate in Lyly's Euphues. His next work was The Morall Philosophic of Doni (1570), a translation of an Italian collection of eastern fables. The first edition of his translation of Plutarch, from the French of Jacques Amyot, appeared in 1579. The first edition was dedicated to Queen Elizabeth, and was followed by other editions in 1595 and 1603, containing in each case fresh Lives. It is almost impossible to over-estimate the influence of North's vigorous English on contemporary writers, and some critics have called him the first master of English

prose. The book formed the source from which Shakespeare drew the materials for his Julius Caesar, Coriolanus and Antony and Cleopatra. It is in the last-named play that he follows the Lives most closely, whole speeches being taken direct from North.

North's Plutarch was reprinted for the " Tudor Translations " (1895), with an introduction by George Wyndham.

NORTH ADAMS, a city of Berkshire county, Massachusetts, U.S.A., situated at the junction of the N. and S. branches of the Hoosac river, and the Boston & Maine (at the W. terminus of the Hoosac Tunnel) and the Boston & Albany railways, in the extreme N.W. part of the state. Pop. (1905) 22,150; (1910) 22,019. Area, 199 sq. m. In the city are the villages of North Adams, Greylock and Blackinton. Within the city limits are a natural bridge across Hudson Brook, 50-60 ft. high, and ruins of Fort Massachusetts, which was captured in 1746 by French and Indians under the command of Pierre Francois de Rigaud, Chevalier de Vaudreuil (1704-1772). North Adams is the seat of a state Normal School (1897). Among its manufactures are cotton (especially print) and woollen goods, and boots and shoes. In 1900 the factory products of the city were valued at $10,741,495, and in 1905 at $8,035,705. North Adams secured incorporation as an independent township in 1878. Township government was abandoned and city government was organized in 1895; in 1900 part of Williamstown was annexed.

NORTHALLERTON, a market town in the Richmond parlia- mentary division of the North Riding of Yorkshire, England, 30 m. N.N.W. from York by the North Eastern railway, on which it is an important junction. Pop. of urban district (1901) 4009. It lies in a plain west of the Cleveland and Hambleton Hills, on the Sun Beck, a small tributary of the river Wiske. The church of All Saints is a large cruciform structure, Norman, Early English and Perpendicular, with a central tower 80 ft. in height. There is a grammar-school. Among the charities are a hospital founded in 1476 by Richard Moore. There are no traces of the fortified palace of the bishops of Durham, of the White Friars' monastery founded in 1354, or of the Austin priory founded in 1341. The town has a considerable agricultural trade, and there are motor-engineering works. In the neighbour- hood of Northallerton is the priory 6f Mount Grace, a Carthusian foundation of 1397. It consists of an outer court entered through a gatehouse, the church and chapter-

house, with other buildings lying on the north side, partly surrounded by monastic dwelling- houses. These houses, with gardens attached, also surround three sides of the cloister court, which lies north of the outer court. In the vicinity are a monks' well and a ruined chapel of the 16th century.

Northallerton (Alvetune, Allerton) is said to have been a Roman station and afterwards a Saxon " burgh," but nothing is known with certainty about it before the account given in the Domesday Survey, which shows that before the Conquest Earl Edwin had held the manor, but that the Normans had destroyed it so utterly that it was still waste in 1086. Soon after his accession William Rufus gave it to the bishop of Durham, whose successors continued to hold it until it was taken over by the ecclesiastical commissioners in 1865. As a borough by pre- scription Northallerton returned two members to the parliament of 1 298, but was not represented again until 1640, when its ancient privileges were restored. The Municipal Reform Act of 1832 reduced the number of members to one, and in 1885 the town was disfranchised. The first account of the borough and its privileges is contained in an inquisition taken in 1333 after the death of Anthony, bishop of Durham, which shows that the burgesses held the town with the markets and fairs at a fee-farm rent of 40 marks yearly, and that they had two reeves who sat in court with the bishop's bailiff to hear the disputes of the townspeople. This form of government continued until 1851, when a local board was formed, which in 1894 was superseded by an urban district council. A weekly market on Wednesday was granted by King John to the bishop in 1205. A subsequent bishop obtained a grant of a fair on St Bartholomew's day, which according to Camden (circa 1585), had become almost " the most thronged " cattle fair in England, but is no longer held. In 13 17 the town was burnt by the Scots under Robert Bruce, although the bur- gesses paid 3000 marks that it might be spared. In consequence they were exempted from taxes in 13 19.

See Victoria County History, Yorkshire; C. J. D. Ingledew, The History and Antiquities of Northallerton in the County of York (1858) ; J. L. Saywell, The History and Annals of Northallerton (1885).

NORTH AMERICA. In the article America a brief geographi- cal survey is taken of the two continents which bear this name; and their points of similarity and contrast are broadly indicated. When North America is compared with ° n of the northern continents of the Old World, an important North correspondence is found between it and the greater America part of Eurasia; but here the corresponding parts are *" d reversed, right and left, like the two hands. The Lauren- tian highlands

agree with Scandinavia and Finland, both having escaped deformation since very ancient times. A series of water bodies (the Great lakes in North America; the southern Baltic, with Onega, Ladoga, &c. in Europe) occupy depressions that are associated with the boundary between the very ancient lands and their less ancient covering strata. The old worn-down and re-elevated Appalachian mountains of south-eastern North America agree well with the Hercynian mountains of similar history in middle Europe (Ardennes, Slate mountains of the middle Rhine, &c), each range entering the sea at its Atlantic end (in Nova Scotia and Newfoundland; in Brittany, Wales and Ireland), and dipping under younger formations at its inland end. Certain younger ranges — seldom recognized as mountains because they are mostly submerged in the American mediter- raneans (Gulf of Mexico and Caribbean Sea) , but of great absolute relief and with crests rising in the larger West Indian islands — may be compared with the younger ranges of southern Europe (Pyrenees, Alps, Caucasus) bordering the classic Mediterranean and the seas farther east. The central plains of North America correspond well with the plains of Russia and western Siberia; both stretch from great enclosed water bodies on the south to the Arctic Ocean, and both are built of undisturbed Palaeozoic strata toward the axis of symmetry and of younger strata away from it. Finally, the Western highlands of North America may be com- pared with the great mountain complex of central and eastern Asia. In this remarkable succession of resemblances we find one of the best proofs of the continental unity of Eurasia. More- over, the resemblances thus described controvert the idea, prevalent when geology was less advanced than to-day, that the New World of civilized discovery is an ” old world ” geologically, and that the Old World of history is geologically ” new.” Both worlds are so old, and both share so well the effects of successive geological changes from the most ancient to the most modern periods, that neither can regard the other as older or younger than itself.

There are several climatic similarities between North America and Eurasia. The Appalachians and the Hercynian mountains of middle Europe both contain extensive coal deposits of similar geological age, thus indicating a climatic and geographic re- semblance at a time of great antiquity. The Laurentian high- lands and the Scandinavian highlands were both heavily and repeatedly glaciated in recent geological times, and the ice sheets that crept out on all sides from those centres spread far over the lower lands to the south and away from the axis of symmetry towards the continental interior, scouring the high- lands and leaving them rocky and barren, strewing extensive drift deposits over the peripheral areas, and thus significantly

modifying their form and drainage; while the much loftier mountain ranges of western America and central Asia suffered, singularly enough, a far less extensive glaciation. At the present time, the plentiful and well-distributed rainfall of the continental border on either side of the Atlantic is succeeded by an increasing aridity towards the continental interior, until the broad plains that rise towards the distant mountain complexes are com- paratively barren or even desert. Within each greater mountain area extensive interior drainage basins are found holding salt lakes, and the recently determined former extension of these lakes in Central Asia agrees with the well-proved extension of Pleistocene lacustrine conditions in western North America.

The following sketch of the geological development of North America considers the larger physiographic divisions already indicated.

The extensive area of ancient crystalline rocks (Archean), stretching from Labrador past Hudson Bay to the Arctic Ocean, is of greatly disordered structure, and hence must have once had a

mountainous form. Moreover, the crystalline texture and deformed foliation of the rocks prove that the surface now seen was once buried deep beneath the surface of an earlier time, for only at great Lauren- depths can such texture and foliation be acquired. Both ihi a these lines of evidence lead to the conclusion that the highlands. moc j erate re Kef prevalent over theexistingLaurentianregion is the work of persevering erosion during a long continuance of dry land conditions, and hence that trie region must be regarded as a worn-down mountain system. The worn-down old land is gently overlapped, chiefly around the south and west, and south of Hudson Bay, by very early Palaeozoic strata which rest upon the eroded surface of the crystallines, thus proving that the destruction of the ancient mountains had already been accomplished before some of the oldest fossiliferous formations of the world had been deposited. All the evidence goes to prove that from then to now the Laurentian region has been relatively quiescent. In all subsequent time there have been here only moderate oscillations of level, one of which allowed the transgression of the ancient sea in which the overlapping strata were deposited, while another of much more modern date gave the region its present highland altitude (1000 to 2000ft. ; mountains near the Labrador coast, 8000 ft.), again offering it to the forces of erosion.

It is this ancient Laurentian area that the earlier geologists named the ” Continental Nucleus,” as if it had been the first part of North America to rise from the primeval waters of an assumed universal ocean. The ” Archean V,” formed by the two arms of the Lauren- tian oldland stretching from Labrador to the Arctic, between which Hudson Bay is included, has been repeatedly described as the oldest area of the continent, the beginning around which many later additions have built the existing outlines; and as such it has been adduced in favour of the theory of the permanence of continents. But when thus stated, the half of the story in favour of this theory is not told. Hudson Bay is not due to a primitive failure of elevation between the arms of the “Archean V”; it is not a deep basin whose floor has never emerged from the primeval ocean, but an ancient and comparatively shallow depression in a pre-existent land, over which the sea flowed as the surface sank below sea-level. South and west from the” Archean Nucleus,” the Cambrian strata of the medial plains of North America are found to lie, wherever their base is discovered, on a foundation that possesses all the essential features of the Laurentian oldland. This relation is found all around the Adirondack mountains in New York, along the Appalachians southward to Georgia, through the Mississippi basin in Wisconsin and Missouri, and beyond in Texas, and farther west in the Black Hills, as well as certain points in the Rocky Mountains region. Hence the pre-Cambrian land surface of the continent must have had not only a vastly greater area than was formerly attributed to it, but also an earlier origin; for at the time when it was thought by the older geologists to be first rising from the primeval ocean, it is now proved to have been slowly sinking after a prolonged land exist- ence. The crystalline Archaean rocks in the Laurentian region and its scattered fellows cannot possibly be explained as a primitive sea bottom, rising above sea-level to make the beginning of a continent and receiving Cambrian strata upon its still submerged borders, but only as portions of an already old and deeply-denuded land area, which was in pre-Cambrian time much larger than the visible Laurentian area of to-day, and which was reduced to perhaps half its primeval dimensions by a gradual submergence beneath the trans- gressing sea in which the Cambrian sediments were laid down. We are thus led to believe that much of the continent of to-day was a continent in the earliest geological times, and that the seas which partly covered it in Palaeozoic and Mesozoic time were due to partial submergence, not to partial emergence. Furthermore, all the marine strata that now stretch over a large part of what is believed to have been the ancient continental surface are of relatively shallow water origin; none of them bears any close resemblance to the deposits of the deep oceans that have been so well studied of late

years. Hence the Palaeozoic and Mesozoic seas of North America were not deep oceans, and as far as this continent is concerned it is by no means admissible to assume, as some of the earlier geo- logists did, that the position of continents and oceans have repeatedly changed places. The testimony of the rocks is decidedly in favour of Dana's view that continental masses are relatively permanent.

The early history of the Laurentian region has been dwelt upon because of its great importance in the history of the continent, and because its history has so generally been misunderstood. To these reasons may be added a third: through Palaeozoic and Mesozoic time the history of the Laurentian region is for the most part a blank. Records are wanting from the early Palaeozoic to the Pleistocene, when the Laurentian uplands became the centres from which the ice sheets of the Glacial period spread out on all sides. As a result of this late chapter in the history of the region, the weathered soils of earlier periods were swept away along with an unknown amount of firm rock, leaving bare ledges, scattered boulders and gravelly drift to-day upon a rugged upland without mountains (except in north-east Labrador), but diversified by innumerable knobs and hollows. The drainage of the region has thus been thrown into disorder; large and small lakes and marshy hollows abound; the streams are repeatedly interrupted by rapids, and frequently split into two or more channels, enclosing islands many miles

in length. They are the only highways of this thinly inhabited region.

The Appalachian province is a generally hilly and mountainous belt, stretching from Newfoundland to Alabama. It seems for the most part to have belonged in the earliest times to the great pre-Cambrian land area, of which the Laurentian , £f* highland is the more manifest representative; for where- ~! If n rf ever the basal members of the Palaeozoic sedimentary "« n/an < ' s – series are found in the Appalachians, they rest upon a floor of denuded Archean rocks, and the lowest layers are largely composed of Archaean detritus. This province must, however, be set aside from the undisturbed Laurentian region because of the repeated movements of depression, deformation and elevation that it has suffered, generally along a north-east south-west trend, causing the successive alternations of heavy deposition, and almost equally heavy denudation that have prevailed with varying intensity during the whole stretch of geological time covered by the fossiliferous record. The earliest important mountain-making disturbances interrupted the conditions of deposition in Cambrian time, and produced what has been called the Green Mountain system. A later, and probably greater, disturbance, with its climax at the close

of Carboniferous • time, established the Appalachian Mountain system; but, as under- stood to-day, the " Appalachian revolution " of the older geologists should be regarded as a long-lasting process, perhaps intermittently enduring as long as the whole of Carboniferous time. A subordinate period of deposition and deformation occurred early in Mesozoic time, marked by the accumulation and disturbance of several basins of the Newark formation, roughly corresponding to the Triassic of Europe.

The Appalachian mountains of to-day were formerly regarded as the unconsumed remnants of the chief Appalachian uplift; but it is now generally agreed that Mesozoic erosion reduced the greater part of the range to a lowland of moderate or small relief, leaving only isolated groups of subdued mountains in the areas of the most resistant rocks, and that the altitude and form of the mountains of to-day are chiefly the result of the Tertiary elevation and dis- section of the previously worn-down mass — the additional height thus given in Tertiary time to the pre-existent subdued mountain groups making them now the loftiest areas of the range, as in the White Mountains of New Hampshire (Mount Washington, 6293 ft.) and the Black Mountains of North Carolina (Mount Mitchell, 671 1 ft.). It is interesting to note that the axis of Tertiary elevation is nearly parallel to and closely associated with the axes of the earlier disturbances, but it lies somewhat to the north-west of its prede- cessors, and therefore involves considerable areas of flat-lying Palaeozoic strata on the inner side of the previously disturbed belt from New York to Alabama, thus producing what is known as the Alleghany plateau (altitudes, 2000 to 4000 ft.). It should be added that the Ozark plateau of Missouri and the Ouachita mountains on the south, in Arkansas and farther west, are related to one another in much the same way as the Alleghany plateau and the middle ranges of the Appalachians — the two pairs corresponding to a remarkable degree in regard to conditions of ancient accumulation, medieval deformation and denudation, and more modern uplift and dissection; it is, therefore, admissible to classify this western group of uplifts as an annex to the normal Appalachians. Numerous and extensive coal seams occur in the worn-down Appalachians of Nova Scotia, Pennsylvania and Alabama, as well as in the Alleghany plateau from Pennsylvania to Alabama, and in the extension of the same strata through the Ohio and middle Mississippi basins.

The eastern coast of the continent has a rocky and ragged shore line from Maine to Greenland, with numerous submerged lowlands and valleys forming bays, and as many uplands and ridges out- stretching in promontories and islands ; this being the result of the summation of

many movements of the land, whose total gives an increasing measure of depression to the north, where an archipelago at last replaces what was probably once a corner of the continent; but the measure of the depression is uncertain, because of the doubt regarding the depth beneath sea-level to which the Pleistocene glaciers may have worn the pre-Glacial valleys. South of New England, along the Atlantic coast, and around the border of the gulf into Mexico, the dominating movement of the land in late geological periods has been upward with respect to sea-level, whereby a former sea bottom, on which the land waste of Cretaceous and Tertiary times had been outspread, was revealed as a coastal plain, across which the rivers of the former land area now extend their courses, from the old shore line to the new. Part of the same plain, still sub- merged, forms the ” continental shelf ” of the mid-Atlantic border. Florida seems to be a projecting swell of this shelf, around whose extremity coral reefs have been added, but whose greater mass is still under a shallow sea cover. Along the ragged coast in the north a moderate and very modern movement of elevation has laid bare clay-floored lowlands that were lately beneath the sea, as in the plain of the lower St Lawrence valley, while along the coastal plain of the south a slight movement of depression has drowned a number of low valley floors, producing shallow arms of the sea, as Chesapeake Bay, Albemarle and Pamlico Sound and Mobile Bay. All the coast south of New York is low, and a great part of it is fringed with wave-built sand-reefs.

The great complex of mountains in the Western highlands.

sometimes styled the Cordilleras of North America (the Rocky Mountains being the eastern members of the system in the Th C United States and Canada), differ from the Laurentian

.’ . and Appalachian regions in having suffered numerous ”’** ° disorderly movements at dates so recent that the existing relief of the region bears a signifies nt relation to its irregular

America. uplifts ; a relation that doubtless once obtained in the older mountain areas of the east, where it has now been obliterated by erosion. It is not, however, only in modern geological periods that mountain-making disturbances have prevailed in the regions of the Western highlands; their geological history is one of repeated and long-continued movement — the ruins of the more ancient upheavals

supplying materials for the strata of newer ranges. For example, in Canada an axial belt of ancient rocks is bordered on the east and west by stratified formations of enormous thickness (40,000 to 60,000 ft.), those on the west including a large share of contemporaneous volcanic materials; all three belts having been deformed and up- heaved, as well as deeply dissected in the later chapters of geological time. It is, however, important to note that the interval between Palaeozoic and Mesozoic time, in which mountain-making disturb- ances were so general in western Europe and eastern North America that the older geologists thought them to be of world-wide extent, was here generally passed over in relative quiet, so that continuous sedimentation produced in certain districts a conformable series of deposits from Silurian to Cretaceous time. Furthermore, the Carboniferous period, which gained its name from the extensive coal deposits that were then formed in western Europe and eastern North America, was a marine limestone-making period in the Cordilleran region.

There is here exemplified, as might be expected in a region extend- ing over 3000 m. from Alaska to southern Mexico, and measuring over 1000 m. in breadth at its middle, a great variety of plateau and mountain structures. The broad upheaval of adjacent blocks of earth-crust without significant tilting or disturbance has produced the plateaus of Arizona and Utah. Some of the simplest and youngest mountain ridges in the world are to be found in the broken and tilted lava blocks of southern Oregon. Tilted blocks on a larger scale, much more affected by processes of sculpture, are found in the lofty St Elias Alps of Alaska, the site of some of the greatest glaciers in the world. The wall of a huge fracture, now elaborately carved, constitutes the western slope of the Wahsatch range, facing the desert basin of Utah. Ranges of a relatively simple arch structure are seen in the Uinta mountains of Wyoming and Utah. Arched upheavals also characterize the front range of the Rocky Mountains proper in Colorado and Wyoming and in the Black Hills of South Dakota, bending up the strata of the adjacent plains in the simplest fashion, and producing dome-like mountains, now deeply dissected by out- flowing consequent streams. A remarkable change in the structure of the Rocky Mountains occurs north of the Missouri river in Montana and northward into Canada, where the front range is of synclinal or trough structure, with the youngest instead of the oldest rocks along the axis, while the strata of the plains are bent down and over- ridden in the most abnormal manner. Indeed, mountain structure occurs of so great diversity in various parts of the Cordilleran region as to elude general description. The disturbances extend directly to the western coast line,

including not only the coast range of Cali- fornia, but the peninsular area of Lower California (belonging to Mexico) and the detached mountainous islands of British Columbia and Alaska.

Volcanoes of commanding form here and there dominate the plateaus and mountains. Orizaba, Popocatepetl and their neigh- bours, terminating the Cordilleran system in Mexico; Mount San Francisco, bearing snow and Arctic plants above the nearly desert plateau of Arizona; Mount Shasta, with small glaciers in northern California: Mount Rainier, with extensive glaciers surmounting the Cascade range of Washington; Mount Wrangell in Alaska; and farther on the many cones in the curved chain of the Aleutian islands: all these have been heaped up around vents through which their lavas rose from some deep source. Vast lava floods have been poured out at different times. The southern part of the Mexican plateau is built up in large measure of lava sheets, capped with volcanoes. Extensive lava beds, barren and rugged, cover large areas in north-eastern California. The basins of Snake and Columbia rivers in Idaho and Washington are flooded with older and more extensive lava sheets, whose borders lap around promontories and islands of the ” mainland.” Still older lava-flows in British Columbia are now deeply dissected by the branches of Frazer river, and remain only in disconnected upland areas. High plateaus in Utah are pro- tected by a heavy lava capping, the result of great eruptions before the plateaus were uplifted. Here and there rise dome-like mountains, the result of the underground intrusion of lavas in cistern-like spaces, forming “laccoliths,” and blistering up the overlying strata. Thus, by mountain upheaval or volcanic eruption, great altitudes have been gained. Where the uplift has been strong, ranges of truly Alpine form with extensive snow-fields and glaciers occur, as in the Selkirk range of Canada (now traversed by the Canadian Pacific railway), and again in Alaska. Heights of 12,000 and 14,000 ft. are exceeded by numerous summits in the central part of the system; but the dominating peaks are found far in the north-west and in the south. Several mountains in Alaska exceed 1 8,000 ft. (Mount

McKinley, 20,300 ft.; Mount Logan, 19,540 ft.; Mount St Elias, 18,000 ft.); and the great Mexican volcanoes rise nearly as high (Orizaba, 18,250 ft.). Widespread plateaus maintain upland altitudes of more than a mile over vast areas.

As in all regions of great altitude, the erosion of valleys has progressed on a magnificent scale in the Cordilleran region, and the actual form of many of its parts is more the result of sculpturing than of uplifting. The plateaus’ of Arizona are traversed by the deep canons of the

Colorado river and its branches, at places 1 m. deep, and with elaborately carved walls. Upon the plateaus themselves, long and ragged cliffs of recession attest an even greater work of erosion than the canons. In all the mountain ranges except those of youngest uplift, valleys have been actively eroded, sometimes producing steep peaks as in Mount Assiniboine (11,500 ft.) in the Canadian Rockies, rivalling the Swiss Matterhorn in sharpness of form ; but the greater number of summits have been worn to roughly pyramidal form between wide-flaring valleys, and the mountain flanks have thus come to be extensively covered with rock waste lying on slopes of relatively uniform declivity. Some of the ranges are in a second cycle of dissection, having been once worn down to moderate relief and now being elevated for renewed erosion ; the Sierra Nevada of California is believed to be, in part, of this history, having at least in its central and northern parts been well reduced and now again enjoying a mountainous character in virtue of a later slanting uplift en bloc, with rapid descent on its eastern fractured face. Other ranges, almost completely worn down, still remain low, as in south-eastern California, where they are now represented by gently sloping rock floors veneered with gravel and retaining only small remnants of their original mass still unconsumed; thus the end, as well as the beginning, of the cycle of erosion, together with many complications of its progress, are illustrated in different parts of this great and varied mountain system. In the fjorded coast of Alaska, as well as in the higher northern ranges, signs of intense glacial erosion are seen in the cirques at the valley heads and in the discordant junction of the “hanging” lateral valleys and the deep trunk valleys — the floors of the former being cut off on the walls of the latter.

Fitting complements of the deeply-eroded mountains are found in the great accumulations of mpuntain waste now occupying basins of depression between the various ranges, as in Mexico, Utah, Nevada, Montana and elsewhere. Erosion and transportation here combine to build up the floors of the basins with the waste of the surrounding highlands; a result that is peculiarly beneficial in Mexico where the climate of the plateau basins is rendered relatively temperate by reason of its altitude, and where the surface is easily habitable by reason of its small relief. In the larger depressions, as along the boundary of the United States and Mexico, isolated ranges frequently rise like islands over the plain of waste that has been built up on their flanks. Shallow saline lakes or playas (wet-weather lakes) without outlets lie on the lowest parts of the waste-filled basins; their failure to overflow in rivers discharging to the sea being iess the result of enclosure by barriers than of deficiency of rainfall; for it is chiefly in

the arid region that the waste-floored basins are best developed. Indeed, the rainfall is often so scanty that the streams from the mountains — where most of the little precipitation occurs — often fail even to form lakes, withering away on the waste plains. In all these cases, the wash of rock waste from the mountains remains on the continent and builds up the basin plains, instead of being carried away from the land to form stratified sediments on the sea floor. The .habit of gathering mountain waste in interior basins that characterizes so much of the Cordilleran region to-day is only the continuation of an earlier practice, for extensive basin deposits of Tertiary date are found in many parts of the Cordilleran region; some of them are famous for preserving vertebrate fossils, such as those of the many-toed ancestors of the horse.

Between the loftier western highlands and the lower eastern highlands (Laurentian and Appalachian) lies a great extension of medial plains, stretching in moderate altitude from the _ „ ., , Arctic Ocean to the Gulf of Mexico, and having in their ‘f e . Mea ”” middle a breadth of 1500 m. They are composed ™ ams ‘ throughout of nearly horizontal strata and mark a region long exempt from strong disturbance. Although for the most part floored by marine formations, their structure and composition indicate, as has already been said, relatively shallow water. The ancient sea that once occupied the middle belt of the continent therefore had little likeness to the abysmal oceans, but resembled rather the shallow ocean margins that to-day overlap various continental masses — the largest example of this kind now existing being between Asia and Australia. The eastern part of the plains is underlaid by Palaeozoic strata, already mentioned as having been laid down upon the sub- siding Archaean continent or folded in the making of the Appal- achians; coal beds are here included in the Ohio and middle Missis- sippi basins. The area of the western plains remained submerged to a later date, preserving a stretch of marine waters to the end of Mesozoic time, and thus resembling the lowland belt of western Asia, which was similarly covered by a broad and a shallow arm of the ocean extending from the Arctic to the European mediter- raneans until a late geological date. The surface of the medial plains is not always so even as might be inferred from their name. Both

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the eastern and the western areas have been extensively denuded, even to the point of being reduced to peneplains. Their present altitude is not so much the result of their original uplift from the sea as of a later elevatory movement. The great river basins, for which North America is famous, have thus been formed between the eastern and western highlands — the Mississippi receiving the drainage of a vast area (about 1,240,000 sq. m.) for discharge to the south, while the Saskatchewan and Mackenzie gather their waters from somewhat less extensive areas in the north. Pleistocene glaciation covered the plains of the Ohio, upper Mississippi and Winnipeg districts with extensive deposits of ice-laid or water-laid drift, furnishing a generally smooth surface and a fertile soil: here are the true prairies — treeless, but richly grassed.

The traditional continuity of the Cordilleras of North and South America has been broken by investigations in the isthmian portion of the northern continent. The structural peculiarities of the western highlands of North America may be traced only to the east and west belt of great volcanoes by which the plateau of central Mexico is terminated on the south. The ranges of the Andes fail to reach Panama, from which the nearest one is separated by the valley of the Atrato. The two Cordilleras are out of line with each other, and their ends are some 1200 m. apart. Central America, the West Indies and various submarine ridges by which the islands are con- nected with one another and with the mainland to the west, as well as certain ranges along the northern margin of South America, all belong

together in what has been termed the Antillean mountain system, in which east and west trends of late geological date pre- dominate, with abundant volcanic additions on the Pacific border of Central America, and along the eastern end of the system in the Windward islands of the Lesser Antilles. The unity of this system has been until recently overlooked partly because the Antillean ranges are for the most part still under water, and yet further because the volcanoes which form the strongest reliefs of the isthmian region are so arranged along the Pacific coast as to suggest the continuity of the Cordilleran systems on the north and south; but these volcanoes are really only superadded to a foundation of quite another kind. Geological studies on the mainland and on the islands have shown that both fundamental structure and surface form are not Cordilleran; and numerous soundings in the adjacent mediterraneans suggest that the islands are best interpreted as the somewhat denuded crests of great crustal ridges. The warm waters that bathe the West Indies come with a high temperature from the equatorial Atlantic, and favour the growth of corals along the shores. Fringing and elevated reefs are known on many of the islands. The Bahamas are the slightly overtopping parts of a broad platform of coral and other calcareous marine deposits, of which the greater area constitutes extensive shallow banks, which descend by a steep slope on the north-east to great depths in the Atlantic. The lowlands of Yucatan resemble Florida in being the emerged part of a much larger mass, of which an equal portion is still under water in the shelf around the Gulf of Mexico. All this region is luxuriantly productive and is advantageously surrounded by waters which would be barren and desert, like the Sahara, if replaced by lowlands. The active volcanoes on the Pacific slope have built many cones and uplands, some of their historic eruptions having been of terrible violence. Thus Lake Nicaragua, once a bay of the Pacific, has been cut off by volcanic deposits, leaving only the Gulf of Fonseca open to the western ocean, raising the level of the lake behind the barrier and turning its dis- charge eastward to the Caribbean Sea across what was once the inter-oceanic watershed.

The successive crustal movements by which the land area of what we now know as North America has been increased and connected have determined the growth of several great river systems through which the broader part of the continent is drained. The movements that resulted in the emergence of the Plains had the effect of engrafting many ancient rivers of moderate size upon trunks of unusual dimensions. The Mississippi system, some of whose eastern branches probably date from early Mesozoic time, received great reinforcements by the addition of many long western branches in Tertiary time,

roughly contemporaneous with the uplift of the Gulf coastal plain by which the lower trunk of the river was extended to the sea. The present headwaters of that river-trunk to which the name of Mississippi is applied, and which for that reason have gained an undue subjective importance, are of relatively modern date, as they are controlled by the abundant glacial deposits of northern Minnesota. The evolution of the Mackenzie resembles that of the Mississippi in a very general way, although some of its eastern branches may be the descendants of ancestors more ancient than those flowing westward from the Appalachians; but the regime of the great northern river is strikingly unlike that of its still greater southern analogue on account of its course being from a warmer to a colder climate: hence ice-dams, obstructed discharge, and over- flows recur every spring. The Nelson and the St Lawrence systems, draining eastward to Hudson Bay and St Lawrence Gulf, receive drainage from areas that would belong to the Mackenzie and the Mississippi systems under a simpler plan of continental growth; and there is much reason for thinking that this simpler plan obtained until the occurrence of those changes, in association with the Glacial period, whereby sea waters gained access to the depressions that now

hold the bays and sounds of the north-eastern coast. In exemplification of the rule that the larger ocean receives the drainage of the smaller continental area, the rivers that flow into the Pacific rank below those belonging to the Atlantic. The greatest is the Yukon, of farther Canada and inner Alaska, one of the great rivers of the world, little known until the active exploration of its basin for gold- fields. The Frazer drains much of the mountainous area of southern British Columbia, as the Columbia drains that of the north-western United States; the latter is peculiar in that one of its headwaters rises at the eastern base of the Rocky Mountains in northern Montana and flows westward through the ranges. The Colorado discharges a muddy current into the Gulf of California ; but for the aridity of its large drainage area its volume would be much larger. The same is true of the Rio Grande, whose name would be better justified if so much of its basin were not semi-arid.

The most remarkable lacustrine region of the continent, rivalling that of Central Africa, forms a belt around the border of the Lauren- tian highland; here, in addition to ten large lakes, there rates are hundreds of medium size, and many thousand small lakes. They are peculiar in occupying a region of moderate relief, in which no strong dislocations have taken place in recent geological time (unless in the case of Lake

Superior), and thus in contrasting with the great African lakes which occupy rift-valleys or graben of comparatively recent fracture. The Laurentian lakes are further characterized by an intimate association with the ice-sheets of the Glacial period; but while glacial erosion and drift obstruction suffice to account for the smaller lakes, it is very probable that broad crustal warping and drainage reversal have been potent aids to the other processes in producing the great lakes. The northern Cordil- leran region contains many beautiful lakes of moderate size in deep valleys among the crowded ranges of the narrowed mountain belt. Their origin has not been closely studied. The basins among the spaced ranges of the middle and southern Cordilleras, in the United States and Mexico, contain many lakes that occupy shallow depres- sions in desert plains; they are usually without outlet and saline; many of the basins were formerly occupied by lakes of much greater size, some of which overflowed, implying a climate moister than that of to-day, probably correlated with the glacial climate of the regions farther north. Lakes in volcanic craters or behind volcanic barriers occur in Central America, while Florida possesses many small lakes in limestone basins. The following table is taken from Russell's Lakes of North America: —

Lake.

Ontario Erie

Huron . Michigan Superior

Altitude.

Ft.

247

573 582 582 602

Area.

Sq. m.

7,200 (?)

9,900 22,322 21,729 31,000

Depth.

Ft.

The climatic features of North America are best appreciated when considered as exhibiting modifications of those general climatic conditions which prevail in consequence of the globular aimat form of the earth as a whole. In January, when the iso- e ‘

therms of 65° to 75° F. stretch almost directly across land and sea in the north torrid zone, a mean temperature of zero or less invades the region north-west of Hudson Bay, which thus resembles north-eastern Asia in departing greatly from the mean prevailing in similar latitudes on the northern oceans, and in bringing upon the northern lands an extension of frigid conditions that have no analogue in the southern or oceanic hemisphere. In July, when the isotherms of 40° and 50° have a tolerably direct course around the latitude circles that border the continent on the north, a great middle area of North America becomes warmer than the seas on the east and west, having a mean of over 80°, and in part over 90 . In January the Hudson Bay region is 30 colder than the mean of its own latitude, about 6o° colder than the mean of the corresponding southern latitude; while in July the Arizona-Mexican region is 20 above the mean of its own latitude, or about 40 ” above the mean of the corresponding southern latitude. In both winter and summer the isotherms are more closely crowded while crossing the continent than while crossing the adjacent oceans; or, in other words, the poleward temperature gradient is stronger on the land than on the. oceans ; and all these features should be regarded as inherent characteristics of the climate of North America in virtue of its being a continent chiefly in temperate latitudes.

An associated feature of continental climate is found in the strong annual range of temperature of the central land area. The range between the means of January and July exceeds 40 ° for the largest part of the lands, and 70° for much of the northern lands; the range of extreme temperatures is much greater. On corresponding oceanic areas in the northern hemisphere the range is little more than 20°, and in the southern hemisphere it is probably less than 10°. It must appear from this that if the largest part of North America is said to be in the north temperate zone, ” temperate ” must be taken as having little of the meaning originally given to it in southern Europe, for the winter cold is severe and the summer heat is excessive over much of, the North American continent.

The several members of the terrestrial wind system, including

therein the trade winds of a broadened torrid zone, the stormy westerly winds of middle latitudes and the irregular winds of the polar regions, are well exemplified over North America; but, as is usually the case on land, the systematic movement of the atmosphere is better seen in the drift of the clouds than in the movement of the surface winds, which are much modified by the changes from hill to valley, from mountain to plain. Nevertheless the prevalence of the general atmosphere currents has much to do with the control of certain values of annual temperature range, as well as with the distribution of rainfall. The former are small (about 20) along a great stretch of the Pacific coast, even as far north as Alaska, where the moderating influences of the ocean are brought upon the land by the westerly winds; while a range appropriate to a continental interior (30° or 40 °) is experienced over most of the eastern side of the continent in temperate latitudes, and even upon the North Atlantic ocean near the American coast, where strong seasonal changes of temperature are carried forward by the westerly winds. It is particularly in this respect that the general climatic resemblances between North America and Eurasia, above referred to, are broken ; for eastern Canada and western Europe are strikingly unlike in seasonal variations of temperature. Labrador is about io c cooler than northern Germany in July, but nearly 40 colder in January.

The distribution of rainfall is in general controlled by the prevailing course of the winds. The West Indies receive abundant rain from the passing trades. In Mexico and Central America theeastern slopes are for the most part better watered than the western, because the winds there come chiefly from the east (maximum over 100 in. in Guatemala and adjacent parts). Farther north the reverse holds true ; the Pacific slope north of 40 latitude has an abundant rainfall (maxi- mum over 100 in.), and its mountains are clothed with dense forests. There are large areas of deficient rainfall (less than 20 in.) in the interior of the continent, where the intermontane basins and the piedmont plains that slope eastward from the Rocky Mountains in middle lati- tudes are treeless. The areas afflicted with dryness are unsymmetri- cally distributed, being west of the medial meridian (95), because of the ranges near the Pacific by which rain is withheld from the basins and from the plains farther east. The dryness is induced not only by light precipitation, but also by active evaporation in the warm season — a rule that holds true until a high latitude is reached. East of the medial meridian great profit is received from the warm and moist winds that are drawn inland from the water surface of the mediterraneans (Gulf of Mexico and Caribbean Sea) which so advan- tageously occupy the

latitudes that are given up to the Sahara in the Old World. It is largely on this account that the central and eastern parts of the Mississippi basin enjoy a sufficient and well- distributed rainfall, producing forests or fertile prairies over great areas (rainfall over 40 in.). Regions of prevailing snowfall are chiefly in the north-west and north-east; the former includes the higher ranges of the western highlands in Canada and Alaska, where the snowfall from the Pacific winds is heavy, and extensive snowfields and glaciers are formed; the former includes Greenland, where a heavy ice-sheet shrouds the land, the snowfall of moderate measure being probably supplied mostly from the North Atlantic. In the northern continental interior snow covers the ground during the winter season, not that the snowfall is heavy but that the persistent cold weather preserves the moderate amount that falls.

The extension of the continent across the belts of the terrestrial wind system tends to turn branch winds from the westerlies toward the trades on the Pacific border, and from the trades toward the westerlies on the Atlantic border. This effect is strengthened in summer, when the higher temperature prevalent over the continent causes the air to flow away from above the lands, and to accumulate over the neighbouring oceans, on each of which a vast anticyclone is thereby established — the circulation of the atmosphere over the North Atlantic and North Pacific thus coming to simulate the circu- lation of the surface waters of the oceans themselves. It is partly on account of this deflection of the summer winds up the Mississippi valley that the eastern interior of the continent receives a beneficent rainfall as already stated. In winter when the inflow from the south is replaced by an outflow, little rain or snow would fall but for the indraft winds of cyclonic storms by which the outflow appropriate to the cold season of the continent is temporarily reversed. The free play of the cyclonic winds north and south over the great medial plains permits indrafts from torrid and frigid sources, which some- times succeed each other rapidly, producing abrupt and frequent weather changes. Something of the same contrasts is produced by winds drawn in upon the eastern coast alternately from over the moist and warm waters of the Gulf Stream, and from over the moist and cold waters of the Labrador current.

The southerly flow of the branching winds along the Pacific coast gives them a drying quality, and thus still further broadens the western arid region towards the ocean until it reaches the coast in southern California and north-western Mexico (rainfall less than 10 in.), there joining the arid belt of western Mexico and presenting a strong contrast to the rainy forested coast farther north; but although

unfavourably dry, the southern California coast is one of the most truly temperate regions of the world, in respect of mildness and constancy of temperature. The drying winds cover all California in summer, but they migrate southward in the winter, giving place to the stormy westerlies. Thus California has a subtropical CJiroate

of wet winters and dry summers; while north in British Columbia and Alaska there is plentiful rainfall all the year round, and farther south there is persistent aridity.

The fauna of North America (Nearctic) is more closely related to that of Europe-Asia (Palaearctic) than to that of any other zoo-geographical province; the two being united by many „ writers in one faunal province (Holarctic). The reindeer *«««•«•

(caribou), beaver and polar bear are common to both provinces. The moose, wapiti, bison and grizzly bear of North America are closely related to the elk, red deer or stag, aurochs and brown bear of Eurasia; and the following groups are well represented in both provinces: cats, lynxes, weasels, bears, wolves, foxes, seals, hares, squirrels, marmots, lemming, sheep and deer. On the other hand the following forms are characteristic of North America: {rodents) pouched rats or gophers, musk rat, prairie dog, Canadian porcupine; (carnivora) raccoon and skunk; (ungulates) musk ox, bighorn, Rocky Mountains goat, pronghorn; (marsupial) opossum. Among birds there is a close resemblance to those of Eurasia, with some admixture of South American forms, as in the humming birds. The forms especially characteristic of the northern continent are the Baltimore oriole, bobolink, cowbird, flycatchers, wood-warblers, Californian quail, tree grouse, sage grouse, wild turkey and turkey buzzard. The house sparrow of Europe has been introduced, and has become very common, especially in the cities, where it is known as the English sparrow. Reptilian and amphibian groups are well represented; turtles are especially numerous; salamanders are varied and large; rattlesnakes are among the more peculiar forms. Among fish, the characteristic forms are the cyprinoids (carp), sturgeon, salmon, pike and especially the suckers, sunfish, mudfish (Amia) and gar pike (Lepidosteus) . The most characteristic group of invertebrates is the Unionidae or river mussels.

The floral areas of North America, limited by the geographic divisions of the continent, may be divided into five belts: the eastern forested area, the western forested area, the p/ ora

interior unforested area, the northern barren lands and the Gulf coast.

The eastern forested area extends from the Lauren- tian highland in Canada to the Great Lakes, and southward east of the Mississippi to the Gulf coast. In the north and along the moun- tains southward, the forests are largely coniferous, with a mixture of birches, poplars and maples. Southward, especially in the interior and at low altitudes, the conifers largely disappear, and oaks, hickories, plane-trees, tulip-trees, walnuts and other valuable deciduous species abound. The western forested area begins in the eastern Rocky Mountains and extends to the Pacific. Eastward in the mountains the forests are interspersed with arid districts which increase in area southward. Northward, in Canada, the mountains of the middle Cordilleras are densely wooded with continuous forest up to the timber line. Near the middle Pacific coast the forests attain a luxuriant development, the redwood (Sequoia) of California and Oregon sometimes reaching a height of from 300 to 400 ft. The unforested area of the interior consists of two very dissimilar por- tions. The vast fertile prairies extend from the Great Lakes west- ward to the Great Plains, and southward west of the Mississippi, with occasional eastward lobes at low altitudes. On these plains grasses and other herbaceous vegetation abound, and throughout this fertile belt agriculture is largely followed, the grain and hay crops being especially important. Northward in Canada the plains become wooded, the western mountains and the eastern highlands being thus connected by a narrow strip of forest. South-westward and westward the fertile prairie gives way to a vast arid region beginning on the Great Plains and extending as far as south-eastern California, and thence southward into Mexico. On this broad desert few trees are found, although pinons grow on the cliffs and ledges, and cottonwoods occur along the watercourses; but the various ranges that surmount the desert frequently carry forests. The desert vegetation asawhole consists of cacti, agaves, sage-brush (Artemisia) and other plants adapted to arid conditions. North of the eastern forested area and east of the northern Cordilleras are the ” barren lands,” with frozen subsoil, extending to the Arctic coast. The growing season here is short and the climate forbidding, so that trees cannot develop, although birches, poplars, willows and other genera, which southward attain large size, are present as dwarf shrubs. The vegetation of this northern barren district, like that of bleak mountain summits southward, is very similar in character to that of other extreme boreal regions. Blueberries, crowberries and some other small fruits are abundant, but the brief summer will not mature most crops of the temperate zone. The Gulf coast, on the other hand, supports a vegetation decidedly tropical in its nature. Somewhat developed in Florida and the other southern states, this flora becomes the prevailing one on the coast of Mexico and Central America, especially from the

region of Vera Cruz southward, where the forests are largely composed of palms and live oaks, and where giant bamboos often attain a height of 40 ft. In these tropical forests many orchids and other showy plants of northern conservatories are native.

North America, with an area of about 8,000,000 sq. m. (16% of all the lands, or 4-12% of the whole earth's surface), and a mean altitude of about 2000 ft., at present , plays a part in human history that is of greater importance than is warranted

the Con- tinent.

by its size alone, although it has not in this respect the extraordinary importance of Europe. The continent has the „ good fortune to lie chiefly in a temperate rather

Develop- than a torrid zone, and in temperate latitudes to be ment of much nearer to Europe than to Asia. Whatever may have been the first home of the aboriginal inhabitants, the dominating people of to-day are derived from the leading countries of the Old World. Not only so; temperate North America has become the most progressive part of the continent because of receiving its new population chiefly from the most advanced nations of middle western Europe — Great Britain, France and Germany ; while the torrid islands and the narrowing southern mainland of North America have been settled chiefly from the less energetic peoples of southern Europe; and the inhospitable northern lands are hardly entered at all by new- comers, except in the recently discovered goldfields of the far north-west. From the plantation of colonies on the eastern coast, the movement inland has been governed to a remarkable degree by physiographic factors, such as form, climate and products. The cities of the Atlantic harbours and of the adjacent lowlands still take a leading part in industry and commerce, because of their longer establishment and of their relation to Europe. The uplands, ridges and mountains of the Appalachian system — the " Backwoods " of a century ago— remain rather thinly occupied except at certain centres where coal or other earth-product attracts an industrial population. Beyond the Appalachians the middle interior contains a very large proportion of habitable land. It was long ago recognized as a land of great promise, and it is to-day a land of great performance, covered with a network of railways, yielding an enormous product of grain, and developing industries of all kinds.

Indeed, within and closely around an area marked by the St Lawrence system on the north, the Ohio on the south, and stretching from the Atlantic coast between the Gulf of St Lawrence and Chesapeake Bay inland to the middle prairies, there is a remarkable concentration of the population, industry, progress, wealth and power of North America — the focus of attention from all other parts of the continent. The regions of the far north and north-east, including the greater part of the Laurentian highland and the extreme northern stretch of the medial plains and the western highlands, remain and will long remain thinly populated. The furs of wild animals are their characteristic product. Timber is taken from their more accessible forests; but only in mining districts does the population notably increase, as in the iron region around Lake Superior and in the Klondike gold region.

In the south-eastern United States lies a belt of coastal lowlands skirting the Appalachians, still affected by negro slavery and its consequences. The descendants of the early French settlers of Canada stand in political rights as well as in loyalty to the Government on an equal footing with the British citizens of the Dominion. The Italians of the cities, the Hungarians of the mines, the Scandinavians of the northern prairies, the Irish and Germans everywhere are " Americanized " in the second or third generation, rapidly entering local and national politics, and hardly less rapidly attaining an honourable social standing as tested by intermarriage with English and other stocks. But the negro is set aside, even though he has adopted the language and the religion of his former masters: political and social rights are denied him, and intermarriage with whites is practically excluded, although illegitimate mulattos are numerous. Thus has slavery left upon a people, amongst whom political rights and social opportunities should be equal for all, the heavy burden that always retards progress where strongly contrasted races are brought together. Farther south still are the tropical islands and the narrowing mainland, rich in possible productive- ness, but slowly developed because of a prevailing diversity and instability of government and lack of progressive spirit among the people. Here also there is a considerable proportion of negroes, but they live under less unhappy conditions than those now obtaining in the United States. In Mexico and Central America, the proportionate number of aborigines is much greater than farther north.

West of the Mississippi in middle latitudes the population rapidly decreases in density, and over a large extent of the semi- arid plains it must long remain sparse. The settlements bordering the plains on the east for a long time marked the " Frontier " of civilization, for the vast stretch of dry country was a serious barrier to farther advance. But the

plains are now crossed by many railways leading to the Cordilleran region — the ” Far West ” — in large part too rugged or too arid for occupation, but rich in minerals from one end to the other, the seat of many mining camps of unstable population, and containing numerous permanent settlements in the intermontane basins. Great irrigation enterprises, conducted under the National Reclamation Service of the United States, are employing all available water supplies for agriculture; but large areas must remain permanently desert. On nearing the farther ocean the climatic conditions improve, and the population is rapidly increasing in number and wealth; this district not being content to take its name with respect to the east, not considering itself as included in the ” Far West,” but choosing the distinctive designation of the ” Pacific Slope,” and, while maintaining an active intercourse all across the breadth of the continent, already opening relations with the distant Orient by a new approach. Among the earliest results of the latter movement was the arrival of Chinese labourers, a humble, industrious and orderly class of men, but one which stands apart in language, religion and race from the dominant population, lives largely without domestic ties, and gains neither political nor social standing in the New World.

Two centuries ago the aboriginal population of North America would have deserved description before the immigrant population. To-day the aborigines are displaced from nearly all the valuable parts of the continent. Never very numerous, they are now decreas- ing; many tribes are already extinct, many more are almost so. Those which remain less diminished are in the Far North or North- West where nature is rigorous; or in the tropical forests of Central America where nature is over bounteous; or in the more desert parts of the Middle West where nature is arid. The replacement of the native races by the foreign has too often been harsh, cruel and unjust; yet it has resulted in an advance of civilization. Many savage tribes, speaking many different languages, holding little intercourse with each other, and frequently engaged in intertribal wars, have given place in little more than two centuries to a great population of European origin, whose dominant parts speak one language, whose arts are highly advanced, whose home intercourse is most active, and whose foreign commerce had attained unexpected proportions at the opening of the 20th century. (W. M. D.)

NORTHAMPTON, EARLS AND MARQUESSES OF. The

Northampton title has been held in various English families. About 1080 Simon de Senlis (d. 1109), a Norman noble, and the builder of Northampton Castle, was created earl of Northampton as well as earl

of Huntingdon by William the Conqueror; his son Simon (d. 11 53) was also recognized in the title about 1141, though his stepfather, David, king of Scotland (1084-1153), had meanwhile obtained the earldom in right of his wife. The second Simon died childless. In 1337 William de Bohun (c. 1310- 1360), a distinguished soldier, son of Humphrey de Bohun, 4th earl of Hereford and 3rd earl of Essex, was created earl of Northampton; and his son Humphrey, who succeeded, fell heir in 1361 to the earldoms of Hereford and Essex, which thus became united under that of Hereford. The titles, however, became extinct at his death in 1372.

In 1547 William Parr (1513-1571), son of Sir Thomas Parr and brother of Catherine Parr, was created marquess of North- ampton, and though attainted in 1553 was recreated marquess in 1550. He took part in suppressing the rising in the north of England in 1537, and after serving as member of parliament for Northamptonshire was made Baron Parr in 1539. In December 1543, just after his sister had married the king, he was created earl of Essex, a title formerly held by his father-in- law, Henry Bourchier, who had died in March 1540. Under Edward VI., who called him ” his honest uncle,” Parr was equally prominent, being lord-lieutenant of five of the eastern counties, and being great chamberlain from 1550 to 1553. He favoured the claim of Lady Jane Grey to the English throne and consequently the accession of Queen Mary was quickly followed by his attainder. Although sentenced to death he was pardoned

and released from prison at the end of 15 S3- After enjoying the favour of Queen Elizabeth, Northampton died at Warwick on the 28th of October 1571. He left no children and his mar- quessate became extinct. In 1604 Henry Howard (see below) was created earl of Northampton, his title dying with him. It next passed into the Compton family, where it has since remained. The 1st earl of Northampton in this line, William Compton (d. 1630), who received the title in 1618, was a great- grandson of the Sir William Compton (1482-1528) who was with Henry VIII. at the Field of the Cloth of Gold, and his son the 2nd earl is noticed below. The 9th earl, Charles Compton (1760-1828), was created a marquess in 1812, receiving at the same time the titles of Earl Compton and Baron Wilmington. His son Spencer Joshua Alwyne, the 2nd marquess (1790-1851), was president of the Royal Society from 1838 to 1848; the latter’s son Lord Alwyne Compton (1825-1906) was bishop of Ely from 1886 to 1905.

The 5th marquess (b. 1851), |son of the 4th marquess (1818-1897), was, as Earl Compton, a Liberal member of parliament from 1889 to 1897.

Henry Howard, earl of Northampton (1540-1614), was the second son of Henry Howard, earl of Surrey, the poet, and of Lady Frances Vere, daughter of the 15th earl of Oxford, and younger brother of Thomas Howard, 4th duke of Norfolk. He was educated first by Foxe the martyrologist, afterwards by John White, bishop of Lincoln, with whom he acquired Romanist opinions, and finally at the charge of Queen Elizabeth at King's College and Trinity Hall, Cambridge, where he obtained his M. A. degree in 1 564, subsequently in 1 568 being incorporated M.A. at Oxford. The discovery of his brother's plot to marry Mary, Queen of Scots, and of his own correspondence with her, deprived him of Elizabeth's favour, and he was arrested more than once on suspicion of harbouring treasonable designs. In 1583 he published a work entitled A Dcfensative against the Poy.son of supposed Prophecies, an ostensible attack upon astrology, which, being declared to contain heresies and treason, led to his imprisonment. On regaining his liberty he is said to have travelled in Italy. His flattery of the queen in lengthy epistles met with no response, and his offer to take part in the national defence against the Spanish invasion was refused. He attached himself, however, both to Essex and to Robert Cecil, and through the influence of the latter was in 1600 'again received by Elizabeth. At the close of the queen's reign he joined with Cecil in courting the heir to the throne in Scotland, the main object of his long letters of advice, which James termed " Asiatic and endless volumes," being to poison the royal mind against Sir Walter Raleigh and other rivals, whom he at the same time hoped to ensnare into compromising relations and correspondence with Spain. These methods, which could not influence Elizabeth, were completely successful with James, and on the latter's accession Howard received a multitude of favours. In 1603 he was made a privy councillor, on the 1st of January 1604 lord warden of the Cinque Ports, and on the 13th of March earl of Northampton and Baron Howard of Marnhull in Dorset; on the 24th of February 1605 he was given the Garter and on the 29th of April was appointed Lord Privy Seal. In 1609 he was elected high steward of the university of Oxford, and in 161 2 chancellor of Cambridge university. The same year he was appointed one of the commissioners of the treasury.

He was one of the judges at the trials of Raleigh and Lord Cobham in 1603, of Guy Fawkes in 1605, and of Garnet in 1606, in each case pressing for a conviction. In 1604 he was one of the commissioners who composed the treaty of peace with Spain, and from that date he

received from the Spanish Court a pension of £1000. The climax of his career was reached when he assisted nis great-niece, Lady Essex, in obtaining her divorce from her husband in order to marry the favourite Somerset, whose mistress she already was, and whose alliance Northampton was eager to secure for himself. He obtained the divorce by the decree of a special commission, and when Sir Thomas Overbury's influence seemed likely to prevent Somerset completing the marriage project, he caused the former to be imprisoned in the Tower. Shortly afterwards Overbury died from the effects of

poison administered by the direction of Lady Essex; and the close intimacy which existed between the latter and Northampton, together with his appointment of Sir Gervase Elwes or Helwys, a friend of his own, as the keeper of the victim, leaves his name tarnished with the blackest suspicions. The discovery of the crime was not made till some little time after Overbury had succumbed, and meanwhile Northampton's own death antici- pated his fall, together with that of Somerset, from power. He advised against the summoning of parliament in 1614, and then fomented disputes to compel James to dissolve it. He died unmarried on the 15th of June 16T4, when his title became extinct, and was buried in the chapel of Dover Castle, the monument erected above his grave being subsequently removed to the chapel at Greenwich College. His will shows that he died a Roman Catholic.

Northampton, who was one of the most unscrupulous and treacher- ous characters of the age, was nevertheless distinguished for his learning, artistic culture and his public charities. He built North- umberland' House in London and superintended the construction of the fine house of Audley End. He founded and planned several hospitals. Bacon included three of his sayings in his " Apophthegms," and chose him as " the learnedest councillor " in the kingdom to present to the king his Advancement of Learning. He was the author of a Treatise of Natural and Moral Philosophy (1569; MS. in the Bodleian Library) ; of a pamphlet supporting the union between Elizabeth and the duke of Anjou (1580; Harleian MSS. 180); A Defensative against the Poyson of supposed Prophecies (1583); a reply to a pamphlet denouncing female government (1589; Harleian MS. 7021) ; Duello Foiled, printed in T. Hearne's Collection of Curious Discourses (1775), ii. 225, and ascribed there to Sir Edward Coke; Translation of Charles V.'s Last Advice to Philip II., dedicated with a long epistle to the queen (Harl. 836, 1506 and elsewhere in Stowe 95, King's MSS. 106); devotional writings (Arundel MSS. 300); speeches at the trials of Guy Fawkes and Garnet in State Trials, vol. i. In Somers Tracts (ed. 1809), ii. 136, his opinions on the union between England and Scotland are

recorded.

See the life in Surrey's and Wyatt's Poems, ed. by G. F. Nott (1815), and Sidney Lee's article in the Diet. Nat. Biog.

Spencer Compton, 2nd earl of Northampton in the Compton line (1601-1643), was the son of William, 1st earl, lord presi- dent of the marches, whose father had been created Baron Compton by Elizabeth, and of Elizabeth, daughter and heir of Sir John Spencer, lord mayor of London. On the 3rd of November 1616 he was created a Knight of the Bath, and was elected for Ludlow in the parliament of 162 1, the same year being appointed master of the robes to the prince of Wales and attending the latter in the adventure to Spain in 1623. He warmly supported the king in the Scottish expeditions, at the same time giving his advice for the summoning of the parliament, which " word of four syllables " he declared was " like the dew of heaven." 1 On the outbreak of the Civil War he was entrusted with the execution of the commission of array in Warwickshire. After varying success and failure in the Midlands he fought at Edgehill, and after the king's return to Oxford was given, in November 1642, the military supervision of Banbury and the neighbouring country. He was attacked in Banbury by the parliamentary forces on the 22nd of December, but relieved by Prince Rupert the next day. In March 1643 he marched from Banbury to relieve Lichfield, and having failed there proceeded to Stafford, which he occupied. Thence on the 19th of March, accompanied by three of his sons, he marched out with his troops and engaged Sir John Gell and Sir William Brereton at Hopton Heath. He put to flight the enemy's cavalry and took eight guns, but in the moment of victory, while charging too far in advance, he was surrounded by the parliament soldiers. To these who offered him quarter he answered that " he scorned to take quarter from such base rogues and rebels as they were," whereupon he was despatched by a blow on the head. Clarendon describes his loss as a great one to the cause. Northampton married Mary, daughter of Sir Francis Beaumont, by whom besides two daughters he had six sons, of whom the eldest, James (1622-1681), succeeded him as 3rd earl of Northampton, Henry (1632-1713) became bishop of London, and Charles, William and Spencer all dis- tinguished themselves in the king's cause. The 3rd earl's third 1 Hardwicke State Papers, ii. 210.

son Spencer (1673-1743) was a favourite of George II. and in 1728

was created earl of Wilmington, a title which became extinct at his death.

See the article in the Diet, of Nat. Biog. by C. H. Firth; E. B. G. Warburton's Life of Prince Rupert- S. R. Gardiner's Hist, of England and of the Civil War; Thomason Tracts, E 99 (18) [Hopton Heath and Northampton's death], E 103 (11) [elegy], E in (n), E no (8) 1642 [Proceedings at Banbury], E 83 (47) [speech].

NORTHAMPTON, a municipal, county and parliamentary borough and the county town of Northamptonshire, England, 66 m. N.W. by N. from London by the London & North Western railway; served also by a branch of the Midland railway. Pop. (1891) 75,075, (1901) 87,021. It lies in a slightly undulating district mainly on the north bank of the river Nene. The main roads converging upon the town meet near the centre in a spacious market-place, where stands a fountain on the site of the ancient cross destroyed by the fire of 1675 which levelled a great part of the town. There were formerly seven ancient parish churches, but only four remain. Of these All Saints church was rebuilt after the fire of 1675, but retains its Decorated embattled tower, with which the style of the later building scarcely harmonizes, the principal feature being the fine Ionic portico. The church of St Giles was originally a cruciform structure of the beginning of the 12th century, but has been greatly changed, and besides a rich Norman doorway contains specimens of Early English, Decorated and Perpendicular work. St Peter's, near the site of the ancient castle, is supposed to be of the same date with it, and its interior is a fine specimen of Norman architecture. St Sepulchre's, one of the four round churches still remaining in England, may have been built by the Knights Templars at the close of the nth century. There are several modern parish churches. Northampton is the seat of a Roman Catholic bishop, and there is a pro-cathedral, designed by A. W. Pugin (1864). In the neighbourhood of the town there were a Cluniac priory of St Andrew, a house (Delapr6) for nuns of the same order, and one for Augustinian canons dedicated to St James; but the first has disappeared, the site of the second is occupied by a modern mansion, and of the third there are only slight fragments. Some portions of the castle were re-ftrected on a new site after their destruction when the Castle station was built by the London & North Western Railway Company. In the populous parish of Hardingstone, S. of the town, is one of the original Eleanor crosses, of which only three remain out of twelve erected by Edward I. to mark the resting- places of his queen's body on its way from Harby (Nottingham- shire) to burial at Westminster. The chief public buildings of Northampton are a town hall, county hall, county council room, corn exchange, antiquarian and geological museum, free library

and barracks. The free grammar school was founded in 1552; the Northampton and county modern and technical schools were incorporated with it in 1894. There are a Roman Catholic convent with schools, and various charity schools. The charitable foundations include St John's hospital, founded in the 1 2th century; St Thomas's hospital, founded in J450 in honour of Thomas a, Becket, an infirmary, asylum, dispensary, &c. There is a race-course north of the town. The staple trade is the manufacture of boots and shoes, which is very large. There are also considerable currying and tanning works, breweries, iron foundries, and brick and tile works. The cattle market is extensive. The county borough was created in 1888. The municipal borough is under a mayor, 8 aldermen and 24 councillors. Area, 3469 acres.

British and Roman remains have been discovered near Northampton {Hamtune, N orthantone) , and it became the chief settlement of the Angle tribes who pushed their way up the Nen in the early part of the 6th century. It was occupied by the Danes in the reign of Edward the Elder and is said to have been burnt by Sweyn in 1010. In the reign of Edward the Confessor there were 60 burgesses in his demesne, and, although the number had decreased to 47 in 1086, a new borough containing 40 burgesses had been formed. The burgesses rendered yearly to the sheriff £30, 10s. " which belonged to his farm," and

was probably the beginning of the fee farm which they were allowed to pay directly to the king in 118 5 and which was then increased from £100 to £120. Forty marks of this farm were pardoned by Richard III. in 1484 because " the town had come to such ruin " that the bailiffs ha.d to pay more than £53 from their own goods. The mayor was the chief officer in the 13th century, and Henry VI. granted the incorporation charter in 1460 under the title of mayor, bailiffs and burgesses. The town has been represented by two members since 1395. Tanning was an industry of Northampton in the time of Edward I. and in 1675 a law was made by the corporation forbidding strangers to purchase hides in the town except on fair-days. Boots and shoes are known to have been made here in the reigns of John and Edward I., although probably only for the use of the towns- people, and by the 17th century Northampton was one of the most noted places in England for their manufacture.

Northampton has been the meeting-place of several important councils and parliaments. In the wars between John and his barons the castle withstood a siege by the latter, but in 1264 it was occupied by the barons under the earl of Leicester. In the Wars of the Roses it was the scene of the battle in which Henry VI. was defeated and taken

prisoner in 1460. During the Civil Wars of the 17th century it was held for the parliament by Lord Brooke. In 1675 the town suffered severely by fire, 600 houses being destroyed.

See Victoria County History, Northampton; C. H. Hartshorn, Historical Memorials of Northampton (1848).

NORTHAMPTON, ASSIZE OF, a short code of English laws issued in 1176, is drawn up in the form of instructions to six committees of three judges each, which were to visit the six circuits into which England was divided for the purpose. Though purporting to be a reissue of the Assize of Clarendon (1166), it contains in fact many new provisions. As compared with the earlier assize it prescribes greater severity of punishment for criminal offences; arson and forgery were henceforth to be crimes about which the jurors are to enquire; and those who failed at the ordeal were to lose a hand as well as a foot. In what is perhaps the most important section we may probably see the origin of the possessory action of mort d ‘ancestor, an innovation scarcely less striking than the institution of the novel disseisin in the winter of 1166. The justices were also ordered to try proprietary actions commenced by the king’s writ for the recovery of land held by the service of half a knight’s fee or less. In their fiscal capacity they were to enquire into escheats, churches, lands and women in the king’s gift. The royal bailiffs were to answer at the exchequer for rents of assize and all the perquisites which they made in their offices, and apparently the duty of enforcing this provision was entrusted to the justices. As a result of the rebellion of 11 73-1 174 it was provided that an oath of fealty should be taken by all, ” to wit, barons, knights, freeholders and even villeins (rustici)”, and that any one who refused should be arrested as the king’s enemy, and the justices were to see that the castles whose demolition had been ordered were completely razed.

Authorities. — Sir F. Pollock and F. W. Maitland, History of English Law before the Time of Edward I. (Cambridge, 1898); W. Stubbs, Constitutional History of England (Oxford, 1895). The text of the Assize occurs in Cronica Rogeri de Howden (Rolls Series), ii. 89, and Gesta Henrici Regis Secundi (Rolls Series), i. 108. It has been reprinted from the latter by W. Stubbs in Select Charters (Oxford, 1895)- (G. J. T.)

NORTHAMPTON, a city and the county-seat of Hampshire county, Massachusetts, U.S.A., situated on the Connecticut river, about 16 m. N. of Springfield. Pop. (1910 census) 19,431. The city has an area of 35-3 sq. m. The chief village, Northampton, is on the New York, New

Haven & Hartford; and the Boston & Maine railways. It lies on the border of the meadow-land, and with its irregular, semi-rural streets, and venerable trees is considered one of the prettiest villages in New England. About 2 m. S.E. of Northampton is Mount Holyoke (954 ft.), which may be ascended by carriage road and mountain railway, and the summit of which commands a magnificent view. The city is the seat of a state hospital for the insane;

of the Clarke School for the Deaf (1867, founded by John Clarke of Northampton); of Smith College, one of the foremost colleges for women in the country; of the Mary A. Burnham School for Girls (1877), a preparatory school chiefly for Smith College, founded by Miss Mary A. Burnham; and of the Miss Capen School (preparatory) for girls. Besides the college library, there are in Northampton two public libraries, the Clarke (1850) and the Forbes (1894). The Forbes library was established with funds left by Charles E. Forbes (1795-1881), from 1848 to 1S81 a justice of the state supreme court. The People's Institute was started as a Home-Culture Clubs movement by George W. Cable, who became a resident of Northampton in 1886. The Smith Charities is a peculiar institution, endowed by Oliver Smith (1766-1845) of Hatfield, who left an estate valued at $370,000, to be administered by a board of three trustees, chosen by electors representing the towns of Northampton, Hadley, Hatfield, Amherst and Williamsburg in Hampshire county and Greenfield and Whately in Franklin county — the beneficiaries of the will. The will was contested by Smith's heirs, but in 1847 was sustained by the supreme judicial court of Massachusetts. Of the total sum, $200,000 was to accumulate until it became $400,000. Of this $30,000 was to found Smith's Agricultural School at Northampton, which opened for instruction in 1908; an income of $10,000 was to be paid to the American Colonization Society, but this society failed to comply with the restrictions imposed by the will, and the $10,000 was in- corporated with the Agricultural School fund; and $360,000 was devoted to indigent boys and girls, indigent young women and indigent widows. The remainder of Smith's property was constituted a contingent fund to defray expenses and keep the principal funds intact. Florence, a village on the Mill river in the city limits, is a manufacturing village, silk being its principal product, and cutlery and brushes being of minor importance. The value of the city's factory products increased from $4,706,820 in 1900 to $5,756,381 in 1905, or 22-3%. Northampton was first settled in 1654, became a township in 1656,

and was in- corporated as a city in 1883. In September 1786, at the time of the Shays Rebellion, the New Hampshire Gazette (still published; daily edition since 1890) was established here in the interest of the state administration. Jonathan Edwards was pastor here from 1727 to 1750. Caleb Strong (1745-1819), a member of the Federal Constitutional Convention of 1787, and governor of Massachusetts in 1800-1807 and 1812-1816; Joseph Hawley (1 723-1788), one of the most prominent patriots of western Massa- chusetts; Timothy Dwight; Arthur (1786-1865), Benjamin, and Lewis (1 788-1873) Tappan, prominent philanthropists and anti-slavery men; and William D. Whitney were natives of Northampton.

See J. R. Trumbull, History of Northampton (2 vols., Northampton,

1 898- 1 902).

NORTHAMPTONSHIRE, an east midland county of England, bounded N. by Lincolnshire, N.W. by Rutland and Leicester- shire, W. by Warwickshire, S.W. and S. by Oxfordshire, S.E. by Buckinghamshire, and E. by Bedfordshire, Huntingdonshire and Cambridgeshire. The area is 1003-1 sq. m. The surface is undulating and somewhat monotonous, notwithstanding that the country is richly cultivated and in some parts finely wooded. Elevations over 700 ft. are few. The most picturesque scenery is found in the western and south-western districts. For long Northamptonshire has been famed for its ash trees, and there are also some very old oaks, such as that associated with Cowper's posthumous poem " Yardley Oak," in Yardley Chase near Northampton, as well as a few fine avenues of elm. The north-eastern extremity belongs to the great Fen district. The county forms the principal watershed of central England, nearly all the more important rivers of this region having their sources within its boundaries. The Avon, with a westward course, forms for some distance the northern boundary of the county, till near Lilbourne it passes into Warwickshire. The Nene passes southward past Northampton, whence it takes an easterly course, skirting the eastern boundary of the county. The Welland flows in an easterly direction, forming the boundary

of the county with Leicester, Rutland and Lincoln. Th{ Cherwell, rising in a spring at Charwelton, where it is crossec by a very ancient bridge, passes into Oxfordshire, and ther forms for a considerable distance the southernmost portion oi the boundary of Northamptonshire with that county; the Leam forms a portion of the boundary with Warwickshire. The Ouse, which rises near Brackley, soon afterwards leaves the county, but again touches it near Stony

Stratford, separating it for some distance from'Buckinghamshire.

Geology. — With the exception of the superficial glacial and river deposits, all the rocks exposed in the county are of Jurassic age; they all dip in a general way towards the S.E., the strike of the outcrops being from south-west to north-east. The oldest rocks exposed belong to the Liassic formation ; they come to the surface over a large area in the south-west and centre, around Banbury, Daventry and Market Harborough,andby the removal of the over- lying Oolitic strata they are exposed along the rivers and stream courses near Towcester, Northampton, Wellingborough and Ketter- ing. The Lower Lias, blue clay with limestone bands and cement stones, has few exposures; it has been cut through by the railways at Kilsby and Catesby, and at Braunston it is dug for brick-making. The Middle Lias consists of grey micaceous marls, sandstones and clays, often ferruginous ; ironstone appears near King's Sutton ; at the top is the marlstone or " rock bed," used as a building stone and for road metal. The Upper Lias is again a blue argillaceous series of strata, with limestones and cement stones; it is employed for brick-making. Through the middle of the county from north- east to south-west is an elevated tract of Oolitic rocks which contrasts strongly with the low-lying grass-covered Liassic ground. The lowest subdivision cf the Inferior Oolite, sands, sandstone and calcareous beds, is an important source of iron ore, with from 9 to 12 ft. of workable beds at Blisworth, Kettering, Northampton, Thrapstone, Towcester and Wellingborough. The flaggy sandstone of Duston (Duston slate) belongs to this series. The upper part of the North- ampton sands is known as the Lower Estuarine Beds; these are white and reddish clays and sands. In the north-eastern part of the county from about Maidwell, the Lincolnshire Limestone is developed at the expense of the Northampton Sand; the well- known building stone of Barnack (Barnack Rag) and Weldon belong to this horizon ; a hard shelly variety is known as Weldon or Stam- ford marble. Locally at the base is a series of flaggy strata, the Collyweston slates. The Great Oolite series comprise the Upper Estuarine Beds, the Great Oolite Limestone, Great Oolite Clay, Forest Marble and Cornbrash (very fossiliferous at Rushden). On the south-east border a belt of Oxford Clay occupies the surface; good exposures occur in the brick-fields about Peterborough. Glacial sands and gravels, including the great Chalky Boulder Clayˆoccur in patches on the older rocks, as at Hillmorton, and fill up old channels of the rivers sometimes to a considerable depth, as in the old valley of the Ouse at Furtho, where the Boulder Clay is 100 ft. thick, Borings have revealed the existence of Rhaetic and Keuper rocks resting on an ancient quartz-porphyrite beneath the Lias at Orton; and at Gayton and Northampton the

Carboniferous and possibly Old Red Sandstone strata have been proved, but no Coal Measures were en- countered. The water-bearing strata of Northamptonshire include the marlstone of the Lias, the Lincolnshire Limestone, Collyweston beds and ironstone beds of the Inferior Oolite, and the Cornbrash and Great Oolite Limestone.

Climate and Agriculture. — The climate of Northamptonshire is mild and genial, while the absence of lofty hills renders it much drier than many other inland districts. The mean annual rainfall at Wellingborough is 27-2 ins. The prevailing soil is a rich brown but light and crumbling mould, sometimes with a rocky subsoil. The richest soil is the black mould of the fen district, which is specially suited for grass, as are all the heavier soils. Nearly all the land is capable of cultivation, although there is some stiff wet soil on the slopes of the hills. Nearly nine-tenths of the total area, a high proportion, is under cultiva- tion, and of this considerably over three-fifths is in permanent pasture, the acreage devoted to this use increasing steadily. Less than one-fifth is under grain crops, and the area decreases. Wheat and barley are the principal grain crops. The fattening of cattle is the chief occupation of the Northamptonshire farmer. The favourite stock for breeding purposes is the shorthorn, but the most common custom is to buy in Hereford, Scotch, Welsh and Irish cattle in the spring and fatten them on the rich pastures, a few being retained and fed for the Christmas market. In autumn additional cattle are bought in to eat the coarse grass off the pastures, and these are usually retained during winter. The most common breed of sheep on the rich pastures is the improved Leicester, which is preferred on account of its length

of wool; but the Southdown, on account of its superior flesh, is also largely kept.

Manufactures. — The iron industry is of considerable import- ance, though only a small proportion of the metal is smelted in the county. The industry is carried on in the central part of the county, as in the Kettering, Wellingborough and Thrapston districts, and in the north near Stamford. But Northamptonshire is more famous for its manufacture of boots and shoes, which is chiefly prosecuted in the towns and villages of the central and southern districts, and along the eastern border. This trade occupies some three-quarters of the total number of hands employed in factories in the county.

Communications. — The main line of the London & North Western railway passes through the south-western portion of the county, with an alternative route to Northampton, and branches to Peter- borough and elsewhere. With it are connected at Blisworth Junction the East and West Junction railway to Towcester, Woodford and Stratford-on-Avon, and the Northampton and Banbury Junction railway. The Great Central main line, crossing the county in the south, has connexion with the Great Westen railway at Banbury from Woodford. The Midland railway serves Wellingborough, Kettering and Northampton, and an important junction of systems is effected at Peterborough, which is on the main line of the Great Northern railway. Branch lines of this and the Midland system complete the railway communications of the county. The Grand Junction Canal, which is connected with the Oxford Canal, enters the county at Braunston on the borders of Warwickshire, and passes by Daventry and Blisworth into Buckinghamshire, a branch con- necting it with Northampton. The Grand Union Canal unites with the Grand Junction near Daventry, and runs north until it joins the Leicester Canal at Foxton, branches passing to Welford and Market Harborough.

Population and Administration. — The area of the county is 641,992 acres, with a population in 1891 of 302,183 and in 1901 of 338,088. The area of the administrative county of North- ampton is 585,148 acres, and that of the administrative county of the soke of Peterborough 53,464 acres. In Domesday the covin ty is mentioned as containing 30 hundreds, but it then included a considerable part of Rutland. These divisions were first reduced to 28, and in the reign of Henry II. to 20, their present number. The administrative counties include four municipal boroughs, namely, Brackley (pop. 2467), Daventry (3780), Higham Ferrers (2540) and Peterborough (30,872), together with the municipal and county borough of Northampton (87,021). The urban districts are: Desborough (3573), Finedon (4129), Irthlingborough (4314), Kettering (28,653), Oundle (2404), Raunds (381 1), Rothwell (4193), Rushden (12,453), Wellingborough (18,41 2). There are one court of quarter sessions and nine petty sessional divisions. The borough of Northampton and the liberty of the soke of Peterborough have each a separate court of quarter sessions and a separate commission of the peace. The total number of civil parishes is 346, of which 33 are in the soke of Peterborough. The ancient county contains 297 entire ecclesiastical parishes or districts, wholly or in part, most of them being in the diocese of Peterborough; but small parts of the county fall within the dioceses of Oxford, Ely and Worcester. For parliamentary purposes the county is divided into four divisions (Northern, Eastern, Mid and Southern), and includes the

parliamentary borough of Northampton, and part of the parliamentary borough of Peterborough, each returning one member, except the borough of Northampton, which returns two members.

History. — At some time in the 7th century the district which is now Northamptonshire suffered a simultaneous invasion by the West Saxons from the south and the Anglian tribes from the north, and relics discovered in the county testify to a mingling of races, at the same time showing that West Saxon influence never spread farther north than a line from Daventry to Warwick, and with the extension of the Mercian kingdom under Penda and the conversion of the midland districts ceased altogether. The abbey at Medehamstede (now Peterborough) was begun by Peada in 655, and about the same time foundations were established at Peakirk, Weedon Beck, Castor and Oundle. In 870 the district was overrun by the Danes, and Northampton was one of the five Danish boroughs, until in 921 it was recovered by Edward the Elder, who fortified Towcester in that year. xix. 25

In the nth century Northamptonshire was included in Tostig's northern earldom; but in 1065, together with Huntingdonshire it was detached from Northumbria and bestowed on Waltheof The only monastic foundation which survived the Conquesl was Peterborough. Norman castles existed at Rockingham Barnwell, Lilbourne and Northampton.

As a shire Northamptonshire was probably of Danish origin, representing in the 10th century the area which owed allegiance to Northampton as a political and administrative centre. In 921 this area extended to the Welland, the present northern limit of the county, and at the time of the Domesday Survey the boundaries were approximately those of the present day. Northamptonshire is first mentioned by name in the Historia Eliensis, in connexion with events which occurred at the close of the 10th century.

The Geld roll of the time of William I. and the Domesday Survey of 1086 mention 28 hundreds in Northamptonshire, and part of Rutland is assessed under this county. By 13 16 the divisions had undergone considerable changes, both in name and in extent, and had been reduced to their present number, 20, since which date they have remained practically unaltered. The names of the hundreds point to primitive meeting-places gradually superseded by villages and towns, and the court for Fawsley hundred met under a large beech tree in Fawsley Park until the beginning of the 18th century, when it was transferred to Everdon. The shire-court originally met at

Northampton.

Northamptonshire was originally included in the diocese of Lincoln. The archdeaconry of Northampton is mentioned in the 12th century, and in 1291 included the deaneries of Peter- borough, Northampton, Brackley, Oundle, Higham, Daventry, Preston, Weldon, Rothwell and Haddon. The diocese of Peter- borough was created in 1541, and in 1875 the archdeaconry of Oakham was formed and included in this county the first and second deaneries of Peterborough and the deaneries of Oundle, Weldon and Higham Ferrers. Northampton arch-deaconry now includes the first, second and third deaneries of Brackwell and Rothwell; the first and second deaneries of Haddon and Preston, and the deaneries of Daventry, North- ampton and Weldon.

At the time of the Domesday Survey the chief lay-tenant in Northamptonshire was Robert, earl of Mortain, whose fief escheated to the crown in 1106. The estates of William Peverel founder of the abbey of St James at Northampton, also escheated to the crown in the 12th century. Holdenby House was built by Sir Christopher Hatton, privy councillor to Queen Elizabeth, and Yardley Hastings was named from the Hastings, formerly earls of Pembroke. Higham Ferrers was the seat of the Ferrers family; Braybrook Castle was built by Robert de Braybrook, a favourite of King John; and Burghley House gave the title of baron to William Cecil.

Northampton was a favourite meeting-place of the councils and parliaments of the Norman and Plantagenet kings. In 1 2 1 5 John was besieged in Northampton Castle by the barons, and in 1264 Henry III. captured the castle from the younger Simon de Montfort. During the Wars of the Roses Henry VI. was defeated at Northampton in 1460. In the Civil War of the 17th century the county declared almost unanimously for the parliament. A royalist garrison was placed at Towcester by Prince Rupert in 1644, but almost immediately withdrawn.

The iron-mines and stone-quarries of Northamptonshire were worked in Roman times, but the former were entirely neglected from the Plantagenet period until their rediscovery in 1850, while the two most famous quarries, those of Barnack and Stanion, were exhausted about the 16th century. The wool and leather industries flourished in Norman times. In the 17th century the weaving industry declined in the Northampton district, but became very flourishing about Kettering. Other early industries were charcoal-burning, brick and tile manufacture and brewing. The industries of whip-making, pipe-making, silk- weaving and paper-making were introduced in the 17th

and 18th centuries.

In 1290 Northamptonshire returned two members to parlia- ment, and in 1295 Northampton also returned two members.

In 1547 Brackley and Peterborough returned each two members, and in 1557 Higham Ferrers returned one member. Under the act of 1832 the county returned four members in two divisions, and Brackley and Higham Ferrers were disfranchised.

Antiquities. — Although Northamptonshire was rich in monastic foundations, remains, except of the abbey-church of Peter- borough, afterwards the cathedral, are of small importance. At Geddington, and also at Hardingstone, near Northampton, there is an Eleanor cross, erected by Edward I. to the memory of his queen, in good preservation. For the architecture of its churches Northampton holds a place scarcely inferior to any other English county. To the Saxon period belong the tower of Earls Barton church, which stands on an eminence, probably the mound of an old English strong-house; the tower and other portions at Brigstock; the ground plan and other portions at Wittering; the remarkable tower at Barnack; and Brixworth church, constructed in part of Roman materials, and by some believed to include part of a Roman basilica. Of Norman, besides the cathedral of Peterborough, the finest examples are St Peter's and St Sepulchre's, Northampton, and the tower of Castor church. St Mary's church, Higham Ferrers, formerly collegiate, Early English and Decorated, is one of the finest churches in the county, and, as specially noteworthy among many beautiful buildings, there may be mentioned the churches at Irthlingborough and Lowick, with their lantern towers, Warmington, a very fine specimen of Early English work, Rushden, Finedon, Raunds and Fotheringhay. Of the church at Easton Maudit, Percy, author of the Reliques, and afterwards Bishop of Dromore, was rector.

A gateway at Rockingham, and earth-works at Higham Ferrers and Brackley are worthy of mention. Some castellated ruins remain of the castle at Fotheringhay, famous as the scene of the imprisonment, trial and execution of Mary, Queen of Scots. Barnwell Castle, founded by William the Conqueror, an ' interesting example of the defensive construction of the period, is still a fine ruin, which includes four of the round towers and an imposing gateway. Holdenby Manor House,

where Sir Christopher Hatton (1540-1591) was born, and where Charles I. was staying when he was carried away by Cornet Joyce, is largely restored. Among ancient mansions are Castle Ashby, the seat of the Comptons, the oldest portion belonging to the reign of Henry VIII.; Althorp, the seat of the Spencers, of various dates; Drayton House, of the time of Henry VI.; the vast pile of Burghley House, Stamford, founded by Lord Burleigh (iSS3) > but more than once altered and enlarged; and Kirby Hall, a beautiful Elizabethan building once the residence of Sir Christopher Hatton.

See Victoria County History, Northamptonshire ; G. Baker, History and Antiquities of the County of Northampton (2 vols., London, 1822-1841); John Bridges, History and Antiquities of Northamptonshire, compiled by Rev. Peter Whalley (2 vols., Oxford, 1791); John Norden, Speculi Britanniae, pars altera, or A Delineation of North- amptonshire (London, 1720); Francis Whellan, History, Topography and Directory of Northamptonshire (2nd ed., London, 1874).

NORTH BERWICK, a royal and police burgh of Haddington- shire, Scotland. Pop. (1901) 2614. It is situated on the south shore of the entrance to the Firth of Forth, 22J m. E.N.E. of Edinburgh by the North British railway, being the terminus of a branch line from Drem Junction. It was created a royal burgh by Robert III. (d. 1406), and though once a port of some importance it dwindled to a fishing hamlet. In the latter half of the 19th century, however, it gradually became a fashionable watering-place, much frequented for its firm sandy beach and bathing, and especially for its two golf-courses. Near the station are the ruins of the abbey of Cistercian nuns founded by David I. Immediately to the south rises the fine cone of North Berwick Law (612 ft.), which was utilized as a signal point at the period of the Napoleonic scare.

About 3 m. E. stand the strikingly picturesque ruins of Tantallon Castle, which probably dates from the end of the 14th century and was for many generations the stronghold of the Angus Douglases. Though the 6th earl successfully resisted the sieges of James V. in 1528 and 1530, the castle had at last to be surrendered by treaty. It was besieged and captured by General Monk in 1651, and some

time after the restoration became the property of Sir Hew Dalrymple, lord president of session, whose family still own it. It was then dismantled and fell into decay.

About 2 m. S.W. of North Berwick is Dirleton, with a castle dating from the 12th century. Edward I. took it in 1298, and in the reign of

Robert Bruce it was acquired by the Haliburtons, from whom it passed to the family of Ruthven. On the failure of the Gowrie conspiracy (1600) the castle was forfeited and given to Sir Thomas Erskine (1566-1639), who became Baron Dirleton in 1604, two years later Viscount Fenton, and in 1619 earl of Kellie. Monk laid siege to the castle in 1650, and in 1663 it was purchased by Sir John Nisbet (1609-1687), lord advocate, afterwards a lord of session and Lord Dirleton.

NORTHBROOK, THOMAS GEORGE BARING, ist Earl of (1826-1904), English statesman, eldest son of the first baron (long known as Sir Francis Baring; see Baring), was born on the 22nd of January 1826, and educated at Christ Church, Oxford, where he graduated with honours in 1846. He entered upon a political career, and was successively private secretary to Mr Labouchere (Lord Taunton), Sir George Grey, and Sir Charles Wood (Viscount Halifax). In 1857 he was returned to the House of Commons in the Liberal interest for Penryn and Falmouth, which constituency he continued to represent until he became a peer on the death of his father in 1866. He was a lord of the admiralty in 1857-1858; under-secretary for war, 1861; for India, 1861-1864; for the home department, 1864-1866; and secretary to the admiralty, 1866. When Mr Gladstone acceded to power in 1868, Lord Northbrook was again appointed under-secretary for war, and this office he held until February 1872, when he was appointed governor-general of India. In January 1876, however, he resigned. He had recommended the conclusion of arrangements with Shere Ali which, as has since been admitted, would have prevented the second Afghan war; but his policy was overruled by the duke of Argyll, then secretary of state. Lord Northbrook was created Viscount Baring of Lee in the county of Kent and earl of North- brook in the county of Southampton. From 1880 to 1885 he held the post of first lord of the admiralty in Mr Gladstone's second government. During his tenure of office the state of the navy aroused much public anxiety and led to a strong agitation in favour of an extended shipbuilding programme. The agitation called forth Tennyson's poem " The Fleet." In September 1884 Lord Northbrook was sent to Egypt as special commissioner to inquire into its finances and condition. The inquiry was largely unnecessary, all the essential facts being well known, but the mission was a device of Mr Gladstone's to avoid an immediate decision on a perplexing question. Lord Northbrook, after six weeks of inquiry in Egypt, sent in two reports, one general, advising against the withdrawal of the British garrison, one financial. His financial proposals, if accepted, would have substituted the financial control of Great Britain for the international control proposed at the London

Conference of June-August of the same year. A heavy blow would thus have been struck at internationalism in Egypt. Mr Gladstone was not, however, prepared to give a British guarantee of the interest of the loan, and so Lord Northbrook's mission proved abortive. The £9,000,000 loan issued in 1885 bound Egypt even more securely in international fetters (see Cromer's Modern Egypt, 1908, vol. ii. chap. xlv.). When Mr Gladstone formed his third ministry in 1886 Lord Northbrook held aloof, being opposed to the home rule policy of the premier; and he then ceased to take a prominent part in political life. In 1890 he was appointed lord-lieutenant of Hampshire. He died on the 15th of November 1904. He had married in 1848 Elizabeth Sturt, sister of Lord Alington, and was succeeded as 2nd earl by his eldest son, who as Lord Baring had been M.P. for Winchester (1880-1885) and North Bedford (1886-1892). See B. Mallet, Thomas George, Earl of Northbrook (1908). NORTH CAPE {Nordkap), a promontory on the island Magero off the north coast of Norway in 70 10′ 40″ N., 25° 45′ E., 78 m, N.E. of Hammerfest. Knivskjaerodden, an island a little to the west, actually reaches a point a little farther north than the North Cape, and Nordkyn, 45 m. E., is the northern extremity of the mainland (71° 7′ N.). The desolate cape, rising abruptly

over 1000 ft. from the sea, is frequently visited during the summer period of the " midnight sun," but travellers are often prevented from seeing this phenomenon by adverse atmospheric conditions.

NORTH CAROLINA, a South Atlantic state of the United States of America, situated between latitudes 33° 51′ 37″ (the southernmost point of the southern boundary — 35 is the northernmost) andabout36° 34′ 25-5″ N., and between longitudes 75 27′ W. and 84 20′ W. It is bounded N. by Virginia, E. and S.E. by the Atlantic Ocean, S. and S.W. by South Carolina, S. also by Georgia, and W. and N.W. by Tennessee. North Carolina has an extreme length from E. to W. of 5031 m., which is greater than that of any other state east of the Mississippi river. It total area is 52,426 sq. m., of which 3686 sq. m. are water surface.

Physical Features. — The state lies wholly within the three leading topographical regions of the eastern portion of the United States: the Coastal Plain Region, which occupies approximately the eastern half, the Piedmont Plateau Region, which occupies about 20,000 sq. m. in the middle, and the Appalachian Region, which occupies about 6000

sq. m. in the west. At the eastern extremity of the Coastal Plain Region an outer coast line is formed by a chain of long narrow barrier beaches from which project capes Hatteras, Lookout and Fear, whose outlying shoals are known for their dangers to navigation. Between Hatteras and Lookout is Raleigh Bay and between Lookout and Fear is Onslow Bay; and between the chain of islands and the deeply indented mainland Currituck, Albemarle, Pamlico and other sounds form an extensive area, especially to the northward, of shallow, brackish and almost tideless water. Projecting into these sounds and between the estuaries of rivers flowing into them are extensive tracts of swamp land — the best known of these is Dismal Swamp, which lies mostly in Virginia and is about 30 m. long and 10 m. wide. Through most of the Coastal Plain Region, which extends inland from 80 to 150 m., the country continues very level or only slightly undulating, and rises to the westward at the rate of little more than 1 ft. to the mile. Along the W. border of this region, however, the slope becomes greater and there are some hills. The ” Fall Line,” the boundary between the Coastal Plain and the Piedmont Plateau, has a very irregular course across North Carolina, but lies in a general S.W. direction from the Falls of Roanoke between Halifax and Northampton counties to Anson county on the South Carolina border and marks a rapid increase in elevation of about 200 ft. The Piedmont Plateau Region extends from this line to the Blue Ridge Escarpment, toward which its mean elevation increases at the rate of about 35 ft. to the mile. It is traversed from N.E. to S.W. by a series of ridges which in the E. portion produce only a general undulating surface but to the westward become higher and steeper until the country assumes a bold and rugged aspect. The S.E. face of the Blue Ridge Escarpment, which rises precipitously 1 200-1 500 ft. or more above the Piedmont Plateau, forms the S.E. border of North Carolina’s Appalachian Mountain Region, which includes the high Unaka Mountain Range, segments of which’ are known by such local names as Iron Mountains, Bald Mountains and Great Smoky Mountains. These ranges reach their culmination in this state, and with a series of more or less interrupted cross ranges constitute the greatest masses of mountains in the E. half of the United States. Four peaks along the Blue Ridge have an elevation exceeding 5000 ft. — one of these, the Grandfather, rises 5964 ft.; and about thirty peaks in the Unakas and in the several cross ranges exceed 6000 ft., the highest being Mount Mitchell or Mitchell Dome (67 1 1 ft.), of the Black Mountains, a short cross range extending N. from the Blue Ridge through Yancey county. Other note-worthy peaks are Black Brother (6690 ft.) and Hairy Bear (6681 ft.), the next highest mountains. Many of the neighbouring mountain ridges have uniform crests, but a greater number terminate in

numerous peaks, some sharp, rugged and rocky, but more of them rounded domes. Throughout the whole region the slopes vary greatly: the N.W. slope of the Blue Ridge is almost

imperceptible, or confused with the numerous mountain slopes that rise above it. As a rule the mountain slopes are well graded and subdued, but a few are steep and some are rocky and pre- cipitous. The numerous valleys are usually narrow and deep, though few, if any, descend to less than 2000 ft. above the sea. The Blue Ridge is the principal water parting of the state. West of it the Hiwassee, the Little Tennessee and the French Broad rivers flow W. or N.W. into Tennessee. Farther N. are the headwaters of the New river, which flows N.E. and finds its way to the Ohio. On the S.E. slope of the Blue Ridge rise the Broad, the Catawba and the Yadkin, which flow for some distance a little N. of E., then, finding a passage across one of the ridges of the Piedmont Plateau, turn to the S.S.E. and across the boundary line into South Carolina, in which state their waters reach the Atlantic. In the N.W. part of the Piedmont Plateau Region, and a little to the N. of the most N.E. course of the Yadkin rises the Dan, which in its N.E. course crosses the boundary into Virginia, where it becomes a tributary of the Roanoke, in which its waters are returned to North Carolina near the ” Fall Line.” The other principal rivers — the Cape Fear, the Neuse and the Tar — rise in the N.E. part of the Piedmont Plateau Region, have their S.E. courses wholly within the state, and, with the Roanoke, drain the Coastal Plain Region. In the Mountain Region and in the Piedmont Plateau Region the rivers have numerous falls and rapids which afford a total water power unequalled perhaps in any other state than Maine on the Atlantic Coast, the largest being on the Yadkin, Roanoke and Catawba; and in crossing some of the mountains, especially the Unakas, the streams have carved deep narrow gorges that are much admired for their scenery. In contrast with the rivers of these regions those of the Coastal Plain are sluggish, and toward their mouths expand into wide estuaries.

The Coastal Plain Region is the only part of the state that has any lakes, and these are chiefly shallow bodies of water, with sandy bottoms, in the midst of swamps. In all they number only about fifteen, and have an area estimated at 200 sq. m., about one-half of which is contained in Lake Mattamuskeet in Hyde county.

Flora. — In North Carolina’s flora are many species common to sub-tropical regions and many common to temperate regions, and the variety is consequently very great. In the swamps are the bald cypress, the white cedar and the live oak, usually draped in southern long

moss; south of Cape Fear river are palmettos, magnolias, prickly ash, the American olive and mock orange; along streams in the Coastal Plain Region are the sour gum, the sweet bay and several species of oak; but the tree that is most predominant throughout the upland portion of this region is the long-leaf or southern pine. In the Piedmont Plateau Region oaks, hickories and elms are the most common. In the Mountain Region at the bases of the mountains are oaks, hickories, chestnuts and white poplars: above these are hemlocks, beeches, birches, elms, ashes, maples and limes; and still higher up are spruce, white pine and balsam; and all but a comparatively few of the higher mountains are forest-clad to their summits. All of the species of pine and of magnolia, and nearly all of the species of oak, of hickory and of spruce, indigenous to the United States, are found in North Carolina. On the dome-like tops of such mountains as are too high for trees are large clusters of rhododendrons and patches of grasses fringed with flowers. The forests throughout most of the state have a luxuriant undergrowth consisting of a great variety of shrubs, flowering plants, grasses, ferns and mosses, and the display of magnolias, azaleas, kalmias, golden rod, asters, jessamines, smilax, ferns and mosses is often one of unusual beauty. Venus's fly-trap (Dionaea muscipula), a rare plant, is found only south of the Neuse river; and there are several varieties of Sarracenia, carnivorous pitcher plants. Among the fruit- bearing trees, shrubs, vines and plants the grape, the blue-berry, the cherry, the plum and the cranberry are indigenous and more or less common. Aromatic and medicinal herbs, of which the state has several hundred distinct species, have been obtained in larger quantities than from any other state in the Union.

Fauna. — In North Carolina five of the seven life-zones into which North America has been divided are represented, but more of its area belongs to the upper-austral than to any other zone. The species of fauna that are at all characteristic of this part of the United States are found in the Piedmont Plateau Region and the western portion of the Coastal Plain Region. Among the song-birds are the I mocking-bird, the Carolina wren and the cardinal grosbeak (or red bird); there are plenty of quail or " bob white " (called partridge in the South). Among the mammals are the opossum, raccoon, star-nosed mole (Condylura cristata), grey fox and fox squirrel. The mammals of the Mountain Region include the cotton-tail rabbit, red squirrel, lynx and woodchuck; and there is a considerable variety of migratory song-birds, which are common to the more northern states. In the eastern portion of the Coastal Plain Region are the cotton rat, rice-field rat, marsh rabbit, big-eared bat, brown pelican, swallow-tailed kite, black

vulture and some rattlesnakes and cotton-mouth moccasin snakes, all of which are common farther south; and there are some turtles and terrapins, and many geese, swans, ducks, and other water-fowl. Large numbers of shad, blue fish, weak fish (squeteague), alewives, Spanish mackerel, perch, bass, croakers {Micropogon undulatus), mullet, menhaden, oysters and

clams are caught in the sounds, in the lower courses of the rivers flowing into them, or in the neighbouring waters of the sea.

Climate.— North Carolina has a climate which varies from that of the S.E. corner, which approaches the sub-tropical, to that of the Mountain Region, which is like the medium continental type, except that the summers are cooler and the rainfall is greater. The mean annual temperature for the state (below an elevation of 4000 ft.) is about 59 F. For the Coastal Plain Region it is 61 ° F. ; for the Piedmont Plateau Region, 6o° F. ; for" the Mountain Region, 56° F. ; for Southport, in the S.E. corner of the state, 64 ° F. ; and for Highlands, at an elevation of 3817 ft. in the S.W. corner, 50 F. January, the coldest month, has a mean temperature of 38 ° F. in the Mountain Region, of 41 ° F. on the Piedmont Plateau, and of 44 F. on the Coastal Plain; and in July, the warmest month, the mean is about 79° F. on both the Coastal Plain and the Piedmont Plateau and 74° F. in the Mountain Region. Extremes have ranged from – 19 F. at Highlands in 1899 to 107 F. at Chapel Hill, Orange county, in 1900 and again in 1902. The average precipitation for the state is about 52 in. a year, nearly all of it in the form of rain. For the Coastal Plain Region it is 54 in. ; for the Piedmont Plateau Region, 48 in.; and for the Mountain Region, 53 in. On the E. slope of some of the mountains the rainfall is exceeded nowhere in the United States, save in the N. part of the Pacific Slope. At Highlands, Macon county, during 1898 it was 105-24 in., and during 1901 it was 106-17 in., 30-74 in. falling here during the month of August. The winds are variable and seldom violent, except along the coast during the sub-tropical storms of late summer and early autumn.

Soil. — On the Coastal Plain the soil is generally sandy, but in nearly all parts of this region more or less marl abounds; south of the Neuse river the soil is mostly a loose sand, north of it there is more loam on the uplands, and in the lowlands the soil is usually compact with clay, silt or peat; toward the western border of the region the sand becomes

coarser and some gravel is mixed with it. Throughout much of the Piedmont Plateau and Mountain regions the decom- position of felspar and of other aluminous minerals has resulted in a deep soil of clay with which more or less sand is mixed. It is deeper and more sandy where granite is the underlying rock, deeper and more fertile on the north-western than on the south-eastern mountain slopes, and shallower and more clayey where slate is the underlying rock.

Agriculture. — Until the Civil War agriculture was about the only important industry in the state, and at the close of the 19th century it was still the leading one; but from 1880 to 1900 the ratio of agri- culturists to all inhabitants of the state engaged in some gainful occupation decreased from 75-3 to 64-1%. The land included in farms amounted in 1900 to 22,745,356 acres or 73 % of the total land surface of the state, and the percentage of farm land that was improved increased from 26-5 in 1870 to 36-6 in 1900. Throughout the colonial era the establishment of small estates was a part of the territorial policy of the government of North Carolina, 640 acres being the largest normal grant to any one person; as a consequence of this policy land holdings have always been much smaller here than in most of the other parts of the South, and since the Civil War the rise in the percentage of improved land, the development of truck farming, and the growth in number of negro holdings, have been accompanied by a further decrease in the average size of farms from 316 acres in i860 to 101-3 acres in 1900. In the latter year there were in all 224,637 farms: of these 93,097 contained less than 50 acres, 55,028 between 50 and 100 acres, 44,052 between 100 and 175 acres, and 4224 over 500 acres. Of the total number of farms 12ˆ,978 were operated by owners or part owners, of whom 17,434 were coloured (including Indians); 19,916, by cash tenants, of whom 10,331 were coloured; and 73,092 by share tenants,, of whom 26,892 were coloured. After the Civil War there have been several important changes in the crops raised : the development of cotton manufacturing in the South and the utilization of cotton-seed oil and meal gave impetus to cotton culture; and the discovery of the adaptability of much of the cotton land to the culture of tobacco of a superior quality resulted first in the development of a vast tobacco industry and then to a fluctuation in acreage of the crops of tobacco and of cotton, according as the price of either rose or fell. The destruction of pine forests to meet the demands for naval stores, and the introduction and increased use of the refrigerator car, resulted in much attention to the growth of garden produce for Northern markets. Peanut culture, introduced into the state from Virginia soon after the close of the Civil War, spread rapidly. In the meantime the crops of cereals increased

little, and stock raising generally decreased.

The principal crops are cotton, Indian corn, tobacco, hay, wheat, sweet potatoes, apples and peanuts. The yield of cotton increased from 62,901,790 lb in 1869 to 307,500,000 lb in 1909. In 1909 2,898,000 acres were planted to Indian corn, with a crop of 48,686,000 bushels; 570,000 acres to wheat, with a crop of 5,415,000 bushels; and 196,000 acres to oats, with a crop of 3,234,000 bushels. In Caswell county, North Carolina, ” lemon yellow ” tobacco was first produced in 1852, and the demand for this ” bright ” variety became so great that except during the interruption of the Civil War its culture spread rapidly. In 1879 the state’s crop amounted to 26,986,213 lb, in 1889 to 36,375,258 lb, in 1899 to 127,503,400 lb,

and in 1909 to 144,000,006 lb. The hay and forage crop increased from 80,528 tons in 1879 to 246,820 tons in 1899; and in 1909 the hay crop was 242,000 tons In the production of vegetables and fruits the state ranks high. Potatoes, cabbage and lettuce are much grown for the early Northern markets.

Farmers of the Piedmont Plateau formerly kept large numbers of horses and cattle from April to November in ranges in the Moun- tain Region, but with the opening of portions of that country to cultivation the business of pasturage declined, except as the cotton plantations demanded an increased supply of mules; there were 25,259 mules in 1850, 110,011 in 1890, 138,786 in I900,and 181,000 in 1910. The number of horses was 192,000 in 1910; of dairy cows, 297,000; of hogs, 1,356,000; and of sheep, 215,000.

Cotton is grown most largely in the S. portion of the Piedmont Plateau and in a few counties along or near the W. border of the Coastal Plain; tobacco, in the N. portion of the Piedmont Plateau and in the central and N.W. portions of the Coastal Plain; rice, along the banks of rivers near the coast; wheat, in the valley of the Yadkin; orchard fruits, in the W. portion of the Piedmont Plateau and in the Mountain Region; vegetables and small fruits in the middle and S. portion of the Coastal Plain; peanuts, in the N. portion of the Coastal Plain ; sorghum cane, almost wholly in Columbus county in the S. part of the Coastal Plain. The state government, through its Department of Agriculture, takes an active interest in the introduction of modern agricultural methods, and in the promotion of diversified farming; in 1899 it established the Edgecombe and in 1902 the Iredell test farm.

Forests. — North Carolina had in 1900 about 35,300 sq. m. of woodland; great quantities of merchantable timber still remained,

especially in the Mountain Region and on the Coastal Plain. The trees of the greatest commercial value are oak and chestnut at the foot of the mountains and yellow pine on the uplands of the Coastal Plain. But mixed with the oak and chestnut or higher up are considerable hickory, bi'rch and maple; farther up the mountain sides are some hemlock and white pine; and on the swamp lands of the Coastal Plain are much cypress and some cedar, and on the Coastal Plain south of the Neuse there is much long-leaf pine from which resin is obtained. Several other pines are found, and among the less important timber trees are black spruce, Carolina balsam, beeches, ashes, sycamore or button wood, sweet gum and lindens. The value of the lumber and timber products was $1,074,003 in i860; $5,898,742 in 1890; $14,862,593 in 1900; and $15,731,379 in I9°5- Fisheries. — In the sounds along the coast, in the lower courses of the rivers that flow into them, and along the outer shores fishing is an important industry. The fisheries are chiefly of shad, oysters, mullet, alewives, clams, black bass, menhaden, croakers and blue- fish. In 1908 the catch was valued at about $1,750,000. The State Geological and Economic Survey has made a careful study of the fishes of North Carolina, of the shad fisheries, of oyster culture, and of the development of terrapin. At Beaufort the United States Bureau of Fisheries has a marine biological laboratory, established in 1901 for the study of the aquatic fauna of the south-east coast.

Minerals. — At the beginning of the 20th century a great number of minerals were found in the Piedmont Plateau and Mountain regions, but most of them in such small quantities as to be of little or no commercial value, and in 1902 the total value of the products of the mines and quarries was only $927,376; but in 1907 their value was $2,961,381, and in 1908, $2,145,947. During the first half of the 19th century North Carolina was a mining state of the first importance; in 1804 it was the only state in the United States from which gold was obtained. Operations ceased during the Civil War, and although resumed soon after its close, they became somewhat desultory. Probably the earliest large find was a 17-lb nugget on the Reed Plantation in Cabarrus county in 1799; in the same mine a 28-lb nugget, probably the largest found in eastern United States, was discovered in 1803. The production in Rutherford and Burke counties and their vicinity was so great, and transportation to the United States Mint at Philadelphia so difficult, that from 1831 to 1857 gold was privately coined in I, 2\ and 5 dollar pieces bearing the mark of the coiner " C. Bechtler, Rutherford county, N.C." The coins were of standard purity (or higher) ; they are now very rare. A branch mint of the United States was established in 1837 at Charlotte. Silver, which is

rarer in the state than gold, is found chiefly in the W. portion of the Piedmont Plateau. In 1902 the value of the gold and silver product combined was $71,287, and in 1908, when the lola mine 6 m. E. of Troy, Montgomery county, was the most productive, the value of the gold alone was $97,945, that of the silver $668, and that of copper, $2560.

In 1870 North Carolina's mica mines were reopened, and they produce the best grade of sheet mica for glazing and a large percentage of the country's yield of this mineral. Most of it has been found in the N.E. portion of the Mountain Region; and that mica, was mined here before any European settlement of the country seems proved by numerous excavations and by huge heaps on which are large oak and chestnut trees, some fallen and decayed. North Carolina is also the leading state in the Union in the production of monazite. The mining of corundum was begun at Corundum Hill in Macon county in 1871, and from 1880 to 1902 the output was considerable, but with the discovery of the Canadian corundum

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deposits the importance of those of North Carolina greatly declined. It was along the coast of North Carolina that Europeans in 1585 made the first discovery of iron ore within the present limits of the United States. Iron ores are widely distributed within the state, and there have been times since the eve of the War of Independence when the mining of it was an industry of relatively great importance. In 1908 the product amounted to 48,522 long tons (all magnetite), and was valued at $76,877 ; almost the entire product is from the Cranberry mines, near Cranberry, Mitchell county. The state has two small areas in which bituminous coal occurs; one in the basin of the Dan and one in the basin of the Deep. Very little coal was produced in the state until the Civil War, when, in 1862 and again in 1863, 30,000 short tons were obtained for the relief of the Con- federate government, an amount which up to 1905, when the yield was only 1557 short tons (falling off from 7000 short tons in 1904), had not since been equalled; in 1906, in 1907 and in 1908 no coal was mined in the state. The most valuable immediate product of the state's mines and quarries for nearly every year from 1 890 to 1908 was building stones of granite and gneiss, which are found in all parts of the state west of the "Fall Line"; the best grades of granite are quarried chiefly in

Gaston, Iredell, Rowan, Surry and Wilkes counties. The value of the building stone increased from $150,000 in 1892 to $800,177 (°f which $764,272 was the value of granite) in 1908. Talc also is widely distributed in the state; the most extensive beds are in the eouth-western counties, Swain and Cherokee.

Manufactures. — During the quarter of a century between 1880 and 1905 a great change was wrought in the industrial life of the state by a phenomenal growth of cotton manufacturing. A cotton mill was erected in Lincoln county about 1813, and by 1840 about 25 small mills were in operation within the state. When the Civil War was over, the abnormally high price of cotton made cotton raising for more than a decade a great assistance to the people in recovering from ruin, but when the price had steadily declined from 23-98 cents a pound in 1870 to 10-38 cents a pound in 1879, they turned to the erection and operation of cotton mills. In 1880 the total value of the manufactured products of thestate was$20,095,037 ; in 1900 the value of the cotton manufactures alone was $28,372,789, and in 1905 $47,254,054. The rapid extension of tobacco culture was accompanied by a corresponding growth in the manufacture of chewing and smoking tobacco and snuff, and some of the brands have a wide reputation. The product increased in value from $4,783,484 in 1890 to $25,488,721 in 1905. In 1890 the lumber and timber products, valued at $5,898,742, ranked second among the state's manufactures; by 1905 their value had increased to $15,731,379. The value of the state's factory product for 1900 was $85,274,083, and that for 1905, $142,520,776, an advance of 67-1 %. The cotton mills are mostly in the Piedmont Plateau Region ; Durham, Durham county, and Winston. Forsyth county, are leading centres of tobacco manufacture, and High Point (pop. in 1900, 4163) in Randolph is noted for its manufacture of furniture.

Transportation. — Railway building was begun in the state in 1836 with the Raleigh & Gastcn line, opened from Raleigh to Gaston in 1844 and extended to Weldon in 1852. A longer line, that from Wilmington to Weldon, was completed in 1840. But the greatest period of building was from 1880 to 1890; during this decade the mileage was increased from i486 m. to 3128 m., or 1642 m., which was more than one-third of all that had been built up to the year 1909, when the total mileage was 4464-14. The principal systems of railways are the Southern, the Atlantic Coast Line, the Norfolk & Southern and the Seaboard Air Line. By means of its navigable waters and safe harbours the state has an extensive coasting trade. The harbours along the sounds and in the estuaries of the rivers are well protected from the storms of the ocean by the long chain of narrow

islands in front, but navigation by the largest vessels is interrupted by shoals in the sounds, and especially by bars crossing the inlets between islands. The channel leading to the harbour of Wilmington has been cleared to a depth of 20 ft. or more by dredging and by the construction of jetties and an immense dam, works which were begun by the state in 1823 but from 1828 were carried on from time to time by the national government. The Roanoke river is navigable to Weldon and the Cape Fear river to Fayetteville; the Neuse is navigable for small vessels only to Newbern.

Population. — The population 1 of North Carolina increased from I.399.7SO in 1880 to 1,617,949 in 1890, or 15-6%; to 1,893,810 m 1900, a further increase of 17-1%; and to 2,206,287 in 1910, an increase of 16-5% since 1900. Of the total in 1900 only 4492, or less than I of 1 % were foreign-born, nearly half of these being natives of Germany and England, 1,263,664 were whites, 624,469 negroes, 5687 Indians and 51 Chinese. Nearly one- fourth of the Indians are Cherokees, who occupy, for the most part, the Qualla Reservation in Swain and Jackson counties, not far from the south-western extremity of the state. The others,

*The population of the state was 393,751 in 1790; 478,103 in 1800; 555,500 in 1810; 638,829 in 1820; 737,987 in 1830; 753,419 in 1840; 869,039 in 1850; 992,622 in i860; and 1,071,361 in 1870.

numbering in 1907 nearly 5000, living mostly in Robeson county, are of mixed breed and have been named the Croatans, on the assumption (probably baseless) that they are the descend- ants of John White's lost colony of 1587. The Cherokees have no ambition to accumulate property, but both they and the Croatans have been generally peaceable and many of them send their children to school — for the Croatans the state provides separate schools. The Baptist and Methodist churches are the leading religious denominations in the state; but there are also Presbyterians, Lutherans, members of the Christian Connexion (O'Kellyites), Disciples of Christ (Campbellites) Episcopalians, Friends, Roman Catholics, Moravians and members of other denominations. Until nearly a century after the founding of the Carolinas there was not a town in North Carolina that had a population of 1000, and the urban population of the state was exceptionally small at the beginning of the rapid rise of the manufacturing industries about 1880. In 1900 the urban population (in places having 4000 inhabitants or more) was 152,019, or 8% of the total; the semi-urban (in incorporated places having less than 4000 inhabitants) was 186,258 or 9-8% of the total; and the rural (outside of incorporated places) was 1,555,533 or 82-1% of the total.

But between 1890 and 1900 the urban population increased 56-6% and the semi- urban 61 -6%, while the rural increased only io-6%. The principal cities are Wilmington, Charlotte, Asheville, Raleigh (the capital), Greensboro, Winston and Newbern.

Administration. — North Carolina has been governed under the charters of 1663 and 1665 (1663-1729), under commissions and instructions from the crown (1729-1776), and under the state constitutions of the 18th of December 1776 (amended in 1835, in 1856, and in the Secession Convention of 1861) and of Apr 1868 (amended in 1872-1873, 1875, 2 1879, 1888 and 1899), The present constitution, as amended, prescribes that no con> vention of the people of the state may be called by the legis- lature unless by the concurrence of two-thirds of all the members of each house followed by an affirmative vote of a majority of the electors voting on the question; and that an amendment to the constitution may be adopted only by a three-fifths vote of each house followed by an affirmative vote of the majority of electors voting on the question. The suffrage provisions con- taining the famous ” grandfather clause ” (in Art vi. section 4), were adopted in the form of a constitutional amendment, ratified in August 1900, and in effect on the 1st day of July 1902. All persons otherwise qualified may place their names on the voting register, provided they can read and write any section of the constitution in the English language and have paid on or before the 1st of May the poll tax for the previous year. An exception to the educational requirement is made in favour of any male person who was, on the 1st day of January 1867, or at any time prior thereto, entitled to vote under the laws of any state in the United States wherein he then resided, and in favour of lineal descendants of such persons. This exception remained in force until the 1st of December 1908, after which time all who were on the list became (unless disqualified because con- victed of felony) life voters, but new applicants had to stand the ‘ educational test.

Perhaps the most notable feature about the administration is the weakness of the governor’s position. He is elected by popular vote 3 for four years, and cannot succeed himself in office. His power is limited by a council of state, a relic of colonial days. This body is not, however, a special board, as in Maine, New Hampshire, and Massachusetts, but a kind of administrative cabinet as in Iowa, consisting of the secretary of state, the auditor, the treasurer, and the superintendent of

2 The changes made in 1875 were adopted in a convention, were ratified in 1876, and were so numerous that the amended constitution

is frequently referred to as the Constitution of 1876.

3 Up to 1835 he was elected annually by the two houses of the legislature, and no man could serve as governor for more than three years in any six successive years. Under an amendment of 1835 he was elected for two years by popular vote of electors for members of the House of Commons, and no man was eligible to serve for more than four years in any term of six years.

public instruction, and advising the governor in the administra- tion of his office. Judges, heads of departments, and executive boards are elected, and even in the few instances in which the governor appoints to office the confirmation of the Senate is necessary. Furthermore, in North Carolina the governor has no veto power. In addition to the executive officials mentioned above there are a lieutenant-governor, an attorney-general, a Bureau of Labor Statistics, established in 1887, and a Corporation Commission, which in 1899 superseded the Railroad Commission, established in 1891. The governor and the lieutenant-governor must at the time of their election be at least thirty years of age, and must have been citizens of the United States for five years and residents of the state for two years.

Sessions of the General Assembly are held biennially, beginning on the Wednesday after the first Monday in January. The Senate is composed of fifty members elected biennially by senatorial districts as nearly as possible equal to one another in population, and the House of Representatives (in the Constitution of 1776 called the House of Commons) of one hundred and twenty, elected biennially and chosen by counties 1 according to their population, each county having at least one representative, no matter how small its population. A senator must at the time of his election be at least 25 years of age, and must have been a resident and citizen of the state for at least two years, and a resident in his district for one year immediately preceding his election; and a representative must be a qualified elector of the state and must have resided in his county for at least one year immediately preceding his election. The pay for both senators and representatives is four dollars per day for a period not exceeding sixty days; should the session be prolonged the extra service is without compensation. Extra sessions, called by the governor on the advice of the council of state, are limited to twenty days, but may be extended under the same limitations in regard to compensation. The Senate may sit as a court of

impeachment to try cases presented by the House, and a two- thirds vote is necessary for conviction.

There is a supreme court consisting of a chief justice and four associates, elected by popular vote for eight years, and a superior or circuit court, composed of sixteen judges elected by the people in each of sixteen districts for a term of eight years.

The county officials are the sheriff, a coroner, a treasurer, a register of deeds, a surveyor and five commissioners, elected for two years. The commissioners supervise the penal and charitable institutions, schools, roads, bridges and finances of the county. Subordinate to them are the township boards of trustees, composed of a clerk, and two justices of the peace.

By the constitution personal property to the value of $500 and any homestead to the value of $1000 is exempt from sale for debt, except for taxes on the homestead, or for obligations contracted for the purchase of said premises. Under the revised code (1905) a wife may hold property which she had acquired before marriage free from any obligation of her husband, but in general she is not per- mitted to make contracts affecting either her personal or real estate without the written consent of her husband. Neither can the husband convey real estate without the wife's consent, and a widow may dissent from her husband's will at any time within six months after the probate of the same, the effect of such dissent being to allow her the right of one-third of her deceased husband's property, including the dwelling house in which they usually resided. The constitution prescribes that " all marriages between a white person and a negro, or between a white person and a white person of negro descent to the third generation inclusive, are hereby forever pro- hibited." Until 1905 the only grounds for an absolute divorce were

1 Under the Constitution of 1776 senators were elected by counties, one for each county, and representatives also by counties, two for each county — in addition, the towns of Edenton, Newbern, Wilmington, Salisbury, Hillsboro and Halifax each elected one representative; and a property qualification — a freehold of 50 acres held for six months before an election — was imposed on electors of senators. Under amendments of 1835 senators were chosen by districts formed on the basis of public taxes paid into the state treasury, representatives were still chosen by counties, and were apportioned among them on the same basis as their Federal repre- sentation (i.e. counting three-fifths of the slaves), and free negroes or mulattoes " descended from negro ancestors to the fourth generation inclusive "

were excluded from the suffrage. In 1856 the property qualification for electors of senators was removed.

adultery, natural impotence, and pregnancy of the wife at the time of marriage; but an amendment of 1907 allows a divorce whenever there has been a separation of husband and wife for ten successive years, provided the parties have lived in the state for that period and no children have been born of the marriage. The working of children under twelve years of age in any factory or manufacturing establishment is unlawful, the working of children between the ages of twelve and thirteen in such places is allowed only on condition that they be employed as apprentices and have attended school for at least four months during the preceding year; and no boy or girl under fourteen is to work in such places during night time. An anti- trust law of 1907 makes it unlawful for any corporation controlling within the state the sale of 50% of an article to raise or lower the price of that article with the intention of injuring a competitor. On the 26th of May 1908 the people of the state voted ” against the manufacture and sale of intoxicating liquors ” in the state; the prohibition act thus approved went into effect on the 1st of January 1909. State prohibition had been defeated in 1881 by a vote of 100,000; in 1902 the Anti-Saloon League organized in the state; in 1903 the Watts Law enacted rural prohibition, giving towns local option, under which many of the towns voted ” no licence “; and in 1905 severe police regulations were provided for towns in which saloons were licensed.

Charitable and Penal Institutions. — In the systematic care of the dependent and defective classes North Carolina was one of the pioneer states of the South. An institute for the deaf and dumb and blind was opened at Raleigh in 1845, and another for the deaf and dumb at Morganton in 1894; by a law of 1907 every deaf child of sound mind must attend, between the ages of eight and fifteen, a school for the deaf at least five terms of nine months each; and by a law of 1908 every blind-child (between seven and seventeen), if of sound mind and body, must attend some school for the blind for nine months of each year. The North Carolina State Hospital (for the insane) at Raleigh was opened in 1856 as a result of the labours of Miss Dorothea Lynde Dix (1805-1887); in connexion with it there is an epileptic colony. The State Hospital at Morgan- ton, opened in 1883, completed in 1886, and intended for the use of the western part of the state, is perhaps the best equipped institu- tion of its kind south of the Potomac. In 1901 a department for criminal insane was opened in a wing of the state prison at Raleigh. The Oxford Orphan Asylum at Oxford (1872) is supported partly by the Masonic Order and partly by the state. A movement begun by the Confederate Veterans Association

in October 1889 resulted in the establishment in 1890 of a home for disabled veterans at Raleigh; this became a state institution in 1891. In 1908 a state tuberculosis sanatorium was opened near Aberdeen, Moore county. The state also takes good care of the unfortunates among the negro race. The Institute for the Colored Deaf, Dumb and Blind (1867) at Raleigh and the Eastern Insane Hospital (1880) near Goldsboro are the oldest institutions of the kind for negroes in the world ; in connexion with the last there is an epileptic colony for negroes. There is also (at Oxford) an Orphanage for the Colored (1883), which was established by the ” Wake and Shiloh Associations of the Colored Baptist Church,” first received state aid in 1891 , and is now supported chiefly by the state. The state prison is at Raleigh, although most of the convicts are distributed upon farms owned and operated by the state. The lease system does not prevail, but the farming out of convict labour is permitted by the constitution; such labour is used chiefly for the building of railways, the convicts so employed being at all times cared for and guarded by state officials. A re- formatory for white youth between the ages of seven and sixteen, under the name of the Stonewall Jackson Manual Training and Industrial School, was opened at Concord in 1909, and in March 1909 the Foulk Reformatory and Manual Training School for negro youth was provided for. Charitable and penal institutions are under the supervision of a Board of Public Charities, appointed by the governor for a period of six years, the terms of the different members expiring in different years. Private institutions for the care of the insane, idiots, feeble-minded and inebriates may be established, but must be licensed and regulated by the state board and become legally a part of the system of public charities.

Education. — The public school system was established in 1839, being based on the programme for state education prepared in 1816- 1817 by Archibald Debow Murphey (1777-1832), whose educational ideas were far in advance of his day. Calvin Henderson Wiley (1819-1887), the author of several romances dealing with life in North Carolina, such as Roanoke: or. Where is Utopia? (1866), and of Life in the South: a Companion to Uncle Tom’s Cabin (1852), was superintendent of common schools in 1 853-1 865 (the executive head of the state’s educational department having previously been a ” literary board “), and won the name of the ” Horace Mann of the South ” by his wise reforms. He kept the public schools going through the Civil War, having advised against the disturbance of the school funds and their reinvestment in Confederate securities. The present school system is supervised by a state board of education consisting of the governor, lieutenant-governor, secretary of state, treasurer, auditor, attorney-

general, and superintendent of public instruction. In the counties there is a board of education and there is also a local school committee of three in each township. The compulsory attendance at school of children between the ages

of eight and fourteen for sixteen weeks each year by a state law is optional with each county. A state library commission was established in 1909.

At the head of the state system of education is the university of North Carolina at Chapel Hill, chartered in 1789 and opened in 1795, one of the oldest state universities in the country and one of the oldest universities in the South; it consists of the college, the graduate department, the law department, the department of medicine (1890, part of whose work is done at Raleigh) and the department of pharmacy (1897). In 1907-1908 it had 75 instructors and 775 students. Other state educational institutions are the College of Agriculture and Mechanic Arts (1889) at West Raleigh, which in 1907-1908 had 42 instructors and 436 students; the State Normal and Industrial College (1892) for women, at Greensboro; and the East Carolina Teachers' Training School (1907), at Greenville. For the higher education of the negroes the state supports an Agri- cultural and Mechanical College (1 891) at Greensboro, and normal and industrial schools at Fayetteville, Elizabeth City and Winston. The more important sectarian schools are Wake Forest College (Baptist, opened 1 834 as a " manual labour and classical institute " ; as a college, 1838) at Wake Forest, 16 m. north of Raleigh, with 371 students in 1907-1908; Davidson College (Presbyterian, 1837) at Davidson, with 308 students (1907-1908); Biddle University (Presbyterian) at Charlotte, for negroes; Greensboro Female College (Methodist Episcopal, South; 1846); Guilford College (coeducational; Society of Friends, 1837) near Greensboro; Trinity College (coeducational; M3thodist, 1852) at Durham; Lenoir College (Lutheran, 1890) at. Hickory; Catawba College (Reformed, 1851) at Newton; Weaver- ville College (Methodist Episcopal, 1873) at Weaverville; Elon College (Christian, 1 890) at Elon ; St Mary's College (Roman Catholic, 1877), under the charge of Benedictines, at Belmont; Shaw Uni- versity (Baptist, 1865), for negroes, at Raleigh; and Livingston College (Methodist, 1879), for negroes, at Salisbury.

Finance. — The revenues of the state come from two sources; about

two-thirds from taxation and about one-third in all from the earnings of the penitentiary, from the fees collected by state officials, from the proceeds from the sale of state publications, and from the dividends from stock and bonds. The state owned, in 1909, 30,002 shares of stock in the North Carolina Railroad Company, 1 with a market value (1907) of $5,580,372 (the stock being quoted at 186), and an annual income of 8210,014 and 12,666 shares of stock in the Atlantic & North Carolina Railroad Company, from which the annual income is 831,665. In addition to the ordinary general property tax, licences and polls, there are a tax on corporations and an income tax. North Carolina is one of the few states to experiment with the inheritance tax, but the last law dealing with that subject was repealed in 1899. The total receipts of the general fund for the fiscal year 1907 were $2,603,293, and the total disburse- ments for the same year were $2,655,282.

The state debt at the close of the fiscal year 1907 amounted to $6,880,950. It may be divided into three parts: that contracted between 1848 and 1861 for the construction of roads, railways and canals; that contracted during the Civil War for other than war purposes; and that contracted during the Reconstruction era, nominally in the form of loans to railway companies. In their im- poverished condition it was impossible for the people to bear the burden, so an act was passed in 1879 scaling part of the debt 60%, part of it 75% and part of it 85%. The remainder, $12,805,000, and all arrears of interest were repudiated outright. This of course impaired the obligation of a contract, but under the Eleventh Amend- ment to the Constitution of the United States the bondholders could not bring suit against the state in the Federal courts. Another state could do so, however, and in 1904, certain creditors having given ten of their bonds to South Dakota, the case of South Dakota versus North Carolina came before the Supreme Court. The court decided, four judges dissenting, that North Carolina must pay the amount due or suffer her railway bonds to be seized and sold to satisfy the judgment (192 U.S. Reports, 286. See also 108 U.S. 76).

1 The North Carolina Railroad from Goldsboro, via Raleigh, Greensboro and Salisbury, to Charlotte, was an extension of the Raleigh & Gaston, which had come into the hands of the state; it was chartered in 1849, the act being passed by the casting vote of the speaker, whose action was the cause of his failure to be re-elected to that, or to be elected to any other office afterwards, since the poverty of the state did not warrant such an expenditure. The original stock of $3,000,000, of which the state was to subscribe $2,000,000, was increased in 1855 to $4,000,000, the state subscribing the added

million. The road was leased in 187 1 to the Richmond & Danville for thirty years at 6%; and in 1905 to the Southern Rail- way Company for ninety-nine years at 6£ % for the first six years and at 7 % for the remainder of the term. The Atlantic & North Carolina, the second great internal improvement undertaken by the state, was chartered in 1853, and was opened from Goldsboro to Morehead City (95 m.) in 1858; it was in 1910 a part of the Norfolk & Southern system. Although the state of North Carolina owns 7°‘3 _% of the stock (besides this Craven county holds 7-7%; Lenoir, 2-8%; and Pamlico county, 1-13 %)■ the state casts only 350 votes to the 700 of the private stockholders.

History. — The history of North Carolina may be divided into four main periods : the period of discovery and early colonization (1520-1663); the period of proprietary rule (1663-1729); the period of royal rule (1729-1776); and the period of statehood (from 1776).

It is possible that some of the early French and Spanish explorers visited the coast of North Carolina, but no serious attempt was made by Europeans to establish a settlement until near the close of the 16th century. After receiving from Queen Elizabeth a patent for colonization in the New World, Sir Walter Raleigh, in April 1584, sent Philip Amadas, or Amidas (1550- 1618), and Arthur Barlowe (c. 1550- c. 1620) to discover in the region bordering on Florida a suitable location for a colony. They returned in September with a glowing account of what is now the coast of North Carolina, and on the 9th of April 1585 a colony of about 108 men under Ralph Lane (c. 1530-1603) sailed from Plymouth in a fleet of seven small vessels commanded by Sir Richard Grenville. The colony was established at the north end of Roanoke Island on the 17th of August, and about a week later Grenville returned to England. Threatened with famine and with destruction from hostile Indians, the entire colony left for England on the 19th of June 1586 on Sir Francis Drake’s fleet. Only a few days after their departure Sir Richard Grenville arrived with supplies and more colonists, fifteen of whom remained when he sailed away. Although greatly dis- appointed at the return of the first colony, Raleigh despatched another company, consisting of 121 persons under John White, with instructions to remove the plantation to the shore of Chesapeake Bay. They arrived at Roanoke Island on the 22nd of July 1587 and were forced to remain there by the refusal of the sailors to carry them farther. Of the fifteen persons left by Grenville not one was found alive. White’s grand-daughter, Virginia Dare (b. 18th August 1587), was the first English child born in America. White soon returned to England for supplies, and having been detained there until 1591 he found upon his return no trace of the colony except the word

” Croatan ” carved on a tree; hence the colony was supposed to have gone away with some friendly Indians, possibly the Hatteras tribe, and proof of the assumption that these whites mingled with Indians is sought in the presence in Robeson county of a mixed people with Indian habits and occasional English names, calling them- selves Croatans. In 1629 Charles I. granted to his attorney- general, Sir Robert Heath, all the territory lying between the 31st and 36th parallels and extending through from sea to sea, but the patent was in time vacated, and in 1663 the same territory was granted to the earl of Clarendon (1609-1674), the duke of Albemarle (1608-1670), and six other favourites of Charles II. By a second charter issued in 1665 the limits were extended to 29° and 36 30’.

The proprietors had all the powers of a county palatine and proposed to establish a feudal and aristocratic form of govern- ment. To this end John Locke drafted for them in 1669 the famous Fundamental Constitutions providing for the division of the province into eight counties and each county into seigniories, baronies, precincts and colonies, and the division of the land among hereditary nobles who were to grant three-fifths of it to their freemen and govern through an elaborate system of feudal courts. But these constitutions, several times revised, actually served only as a theoretical standard for the proprietors and were abrogated altogether in 1693, and the colonists were governed by instructions which granted them much greater privileges. From the very beginning the territory tended to divide into two distinct sections, a northern and a southern. The northern section was first called Albemarle, then ” that part of our province of Carolina that lies north and east of Cape Fear,” and about 1689 North Carolina. Settled largely by people from Pennsylvania, this section came to be closely associated with the continental colonies. The southern section, influenced by its location, by the early settlers from Barbados, and by its trade connexions, was brought into rather more intimate relations with the island colonies and with the mother country. The pro- prietors struggled in vain to bring about a closer union. In 1691

one governor was placed over both settlements, but it was found necessary to appoint a deputy for North Carolina, and finally in 1712 again to allow her a governor of her own. So long as the intervening territory was a wilderness no effort was made to define the boundary line. The first steps were taken in that direction just after the close of the proprietary period in 1729, but the work was not completed until

The first permanent English colony in North Carolina was established at Albemarle on the Chowan river about 1660 by people from Virginia. The colony grew rapidly, and at the close of the colonial period (1776) the population numbered approxi- mately 300,000, including English, Scotch, Scotch-Irish, Swiss, French Protestants, Moravians, and about 40,000 negroes. According to Dr Weeks ” the earliest settlers . . . were not religious refugees, . . . they came to the province not from religious but economic motives.”

The proprietary period (1663-1729) was a turbulent one, in spite of the supposedly peaceful influence of the Quakers. Six out of sixteen governors or deputy-governors were driven from office between 1674 and 1712, and there were two uprisings which have been deemed worthy of the term rebellion. The first under John Culpeper in 1677 was primarily economic in character, the chief grievance being the payment of an export duty on tobacco. It was evidently influenced by the recent uprising in Virginia under Nathaniel Bacon. The insurrection of dissenters (1708-1711), which was headed by Thomas Carey, who was deputy-governor while the trouble was brewing, was in opposition to the establishment of the Church of England; it was ultimately unsuccessful, the Church was established in 1 7 1 1 , a law was passed which deprived Quakers Of the privilege of serving on juries or holding public office, and the establish- ment was continued until the War of Independence. A war with the Tuscarora Indians, in 1711-1713, resulted in the defeat of the Indians and the removal of the greater part of the tribe to New York, where they became the sixth nation of the Iroquois confederacy.

North Carolina did not join South Carolina in the revolution of 1 7 19 (see South Carolina), but remained under proprietary rule until 1729. In that year an act was passed by parliament establishing an agreement with seven of the Lords Proprietors for the surrender of their claims to both provinces. They were allowed £17,500 for their rights and £5000 for arrears of quit rents. Lord Carteret refused to sell and continued to hold a one-eighth undivided share until 1744, when he gave up his claim in return for a large strip of land in North Carolina lying between latitude 35 34′ and the Virginia line (36 30’). So that while the king was governmental head of the whole of North Carolina from 1729 to 1776 he was, after 1744, territorial lord of only the southern half. The political history during the royal period is, like that of the other colonies, the story of a constant struggle between the representatives of the people and the representatives of the crown. The struggle was especially bitter during the administrations of the

last three royal governors, Arthur Dobbs (1684-1765), William Tryon (1729-1788) and Josiah Martin (1737-1786). There were disputes over questions of government, of commerce, of finance and of religion. The ship which brought stamps and stamped paper to Wilmington in 1766 was not permitted to land, and the stampmaster was compelled by the people to take an oath that he would not exercise the functions of his office. Through the vigilance of Governor Tryon, however, the Assembly was prevented from sending delegates to the Stamp Act Congress. The colonists were also angered by the attempt to

1 Between 1735 and 1746 the southern boundary was first definitely established by a joint commission of North Carolina, South Carolina and Georgia. The line was resurveyed in 1764, and in 1772 was extended; parts of the line were resurveyed under acts of the assembly of 1803, 1804, 1806, 1813, 1814 and 1815, and by an act of 1819 the last extension, to the Tennessee line, was confirmed and established. According to the charter the northern boundary was to be the line of 36° 30', but the surveys (of 1728, 1749 and 1779) were not strictly accurate, and the actual line runs irregularly from 36° 33′ 15* at its eastern to 36 34′ 25-5″ at its western end. The boundary between North Carolina and Tennessee was surveyed in 1799 ana 1821.

enforce the acts of trade and navigation and by the parliamentary statute of 1764 forbidding the issue of bills of credit; and the Scotch-Irish among them in particular were aroused by the repeal of an act of 1771 allowing Presbyterian ministers to per- form the marriage ceremony and of another act of the same year for the establishment of Queen's College in Mecklenburg county for Presbyterians. In the " back country " extortionate fees, excessive taxes, and the oppressive manner of collecting them brought about a popular uprising, known as the Regulation, which centred in Orange and Anson counties, but was strong also in Brown, Edgecombe, Johnson, Granville and Halifax counties. Hermon Husband (c. 17 24-1 795) was the chief agitator of measures for relief, but, since, as a Quaker, he discouraged violence, the cause was left without a recognized leader. Governor Tryon manifested no sympathy for the oppressed and sought only the thorough suppression of the disturbance, which was organized in the spring of 1768 by Regulators, " for regulating public grievances and abuses of power." The Regu- lators agreed to pay no more taxes until satisfied that they were in accordance with law, and to pay nothing in excess of the legal fees. Violence speedily followed; the local militia was called out, but since only a few would serve the only means found to quiet the people was an alleged promise from the governor that if they would petition him for redress and go to their homes he would

see that justice was done. In reply to their petition the governor denied that he had made any promise in their behalf; and in September he had at his command a military force of 1153, about one-fourth of whom were officers. Although the Regulators assembled to the number of about 3700 they were not prepared to withstand the governor's force and again submitted without bloodshed, there being only a few arrests made. In the following year the Regulators attempted to elect new members to the assembly and petitioned the newly-elected house. But as little had been accomplished when the superior court met at Hillsboro, Orange county, in September 1770, the Regulators became desperate again, whipped the chief offender, Colonel Edmund Fanning, and demolished his residence. These riotous proceed- ings provoked the second military expedition of the governor, and on the 16th of May 1771, with a force of about 1000 men and officers, he met about twice that number of Regulators on the banks of the Alamance, where, after two hours of fighting, with losses on each side nearly equal, the ammunition of the Regulators was exhausted and they were routed. About fifteen were taken prisoners, and of these seven were executed. This insurrection was in no sense a beginning of the War of Independence; on the contrary, during that war most of Tryon's militia who fought at Alamance were Patriots and the majority of the Regulators, who remained in the province, were Loyalists. In August 1 771 Governor Tryon was succeeded by Governor Josiah Martin, who was soon engaged in spirited controversies with the assembly on questions pertaining to taxes, the southern boundary, and the attachment of property belonging to non- residents. So complete became the breach between them that in 1773 the royal government had nearly ceased to operate, and in 1774 the governor was deserted by his hitherto subservient council. The first Provincial Congress met at Newbern on the 25th of August 1774 and elected delegates to the Continental Congress. When the governor learned that a second Pro- vincial Congress was called to meet in April 1775 he resolved to convene the assembly on the same day. But the assembly, the members of which were nearly the same as those of the congress, refused to interrupt the meeting of the congress, and in the next month the governor sought safety in flight, first to Fort Johnson on the Cape Fear below Wilmington and then to a man-of-war along the coast. On the 31st of May 1775 a com- mittee representing the militia companies of Mecklenburg county passed a series of resolutions which declared that the royal commissions in the several colonies were null and void, that the constitution of each colony was wholly suspended, and that the legislative and executive powers of each colony were vested in its provincial congress subject to the direction of the Continental Congress; and the resolutions

requested the

inhabitants of the county to form a military and civil organiza- tion independent of the crown of Great Britain which should operate until the Provincial Congress should otherwise provide or the British parliament should ” resign its unjust and arbitrary pretensions with respect to America.” The ” Mecklenburg Declaration,” which it is alleged was passed on the 20th of the same month by the same committee, ” dissolves the political bonds ” which hav.e connected the county with the mother country, ” absolves ” the citizens of that county ” from all allegiance to the British Crown,” declares them ” a free and independent people,” and abounds mother phrases which closely resemble phrases in the great Declaration of the 4th of July 1776.

The Resolutions were published in at least two newspapers only a few days after they were passed. As for the ” Declaration,” the original records of the transactions of Mecklenburg county were destroyed by fire in 1800, but it is claimed that a copy of the ” Declaration ” was made from memory in the same year, and when, in 1819, a controversy had arisen as to where the movement for independence originated, this copy was published, first in the Raleigh Register and North Carolina Gazette and then in many other news- papers. Several aged men also testified that they had heard a declaration of independence read at Charlotte, the county-seat, in May 1775; and one of them stated that he had carried it to the Continental Congress. Thomas Jefferson and John Adams, however, declared that they had never heard of it before, and both believed it spurious. But Jefferson was charged with plagiarism by those who believed in the authenticity of the ” Declaration,” and in 1833 there was discovered a proclamation of Governor Martin, dated the 8th of August 1775, in which he mentioned a publication in the Cape Fear Mercury of a series of resolves by a committee of Mecklenburg county which declared ” the entire dissolution of the laws, govern- ment and constitution of the country.” Another stage of the controversy was reached in 1 838-1 847 when the Mecklenburg Resolutions of the 31st of May 1775 were discovered either in part or in full in newspaper files. There seems practically no basis for the contention that a declaration of independence was adopted on the 20th other than the tradition that independence was declared by the Mecklenburg Committee on that date, and the occasional references in print, even

before 1819, to a declaration of independence in the county in 1775. Those who believe the ” Declaration ” to be spurious argue that survivors remembered only one such document, that the Resolutions might easily be thought of as a declaration of independence, that Governor Martin in all probability had knowledge only of these and not of the alleged ” Declaration,” and that the dates of publication in the Raleigh and Charleston newspapers, and the politics of those papers, show that the Resolutions are authentic. In July 1905 there appeared in Collier’s Weekly (New York) what purported to be a facsimile reproduction of a copy of the Cape Fear Mercury which was referred to by Governor Martin and which contained the ” Declaration ” ; but this was proved a forgery. 1

The first and the second provincial congress did little except choose delegates to the Continental Congress and the manage- ment of affairs passed in large measure from the royal govern- ment to the several county committees. The third provincial congress, which met on the 21st of August 177s, still required its members to sign an oath of allegiance to King George III. but formed a provisional government consisting of a provincial council and six District Committees of Safety. The first sanction of independence by any body representing the whole province was given by the fourth Provincial Congress on the 12th of April 1776, and the same body immediately proceeded to the con- sideration of a new and permanent form of government. Their labours ended, however, in another provincial government by a Council of Safety, and the drafting of North Carolina’s first state constitution was left to a constitutional convention which assembled at Halifax on the 12th of November.

North Carolinians fought under Washington at Brandywine and Monmouth and played a still more important part in the Southern campaigns of 17 7 8-1 7 81. The state was twice invaded, in 1776 and in 1 780-1 781, and two important battles were fought upon her soil, Moore’s Creek on the 27th of February 1776 and Guilford Court House on the 15th of March 1781.

The territory now comprising the state of Tennessee belonged to Carolina under the charters of 1663 and 1665, and fell to North Carolina when the original province was divided. To this

1 The 20th of May has been made a holiday in North Carolina, and the date appears en the state frag and the state seal; and a statue has been erected at Charlotte in memory of the signers of the ” Declaration.”

territory settlers, many of them from North Carolina, had gone immediately before and during the War of Independence, and had'organized a practically independent government. In 1776 this was formally annexed to North Carolina, but in- 1784 the state ceded this district to the national government on condition that it should be accepted within two years. The inhabitants of the district, however, objected to the cession, especially to the terms, which, they contended, threatened them with two years of anarchy; declared their independence of North Carolina and organized for themselves the state of Franklin. But the new state was weakened by factions, and after a brief and precarious existence it was forced into submission to North Carolina by which in 1790 the territory was again ceded to the national government with the proviso that no regulation made or to be made by Con- gress should tend to the emancipation of slaves (see Tennessee) . North Carolina sent delegates to the Philadelphia Constitu- tional Convention of 1787, but the state convention, at Hillsboro, called to pass upon the constitution for North Carolina, did not meet until the 21st of July 1788, when ten states had already ratified. On the first day of this convention the opponents to the constitution, among whom were most of the delegates from the western counties, were ready to reject it without debate, but yielded to a proposal for discussing it clause by clause. In this discussion, which was continued for nine days, the document was most strongly opposed because it contained no bill of rights and on the ground that it would provide for such a strong central govern- ment that the state governments would ultimately be sacrificed. At the conclusion of the debate the convention by a vote of 184 to 84 declared itself unwilling to ratify the constitution until a bill of rights had been added and it had been amended in several other particulars so as to guarantee certain powers to the states. By reason of this rejection the relations of North Carolina with the other states were severed upon the dissolution of the Confederation, and it took no part in the first election or in the organization of the new government. However, there was a speedy reaction against the oppositon which had in no small measure been inspired by fear of a requirement that debts be paid in gold and silver. A second convention met at Fayetteville in November 1789 and the constitution was speedily ratified (on the 13th) by a vote of 195 to 77.

The period from 1790 to 1835 was marked by a prolonged contest between the eastern and the western counties. When the state constitution of 1776 was adopted the counties were so nearly equal in population that they were given equal representa- tion in the General Assembly, but the equality in population disappeared in the general westward movement, and in 1790 the West began to urge a new

division of the state into repre- sentative districts according to population and taxation. This was stubbornly resisted, and the West assumed a threatenk H attitude as the East opposed its projects for internal improve- ments for which the West had the greater need. In 1823 the West called an extra-legal convention to meet at Raleigh, and delegates from 24 of the 28 western counties responded, but those from the far West, in which there were practically no slaves, wished free white population to be made the basis of representa- tion, while those from the Middle West demanded the adoption of the basis for the national House of Representatives and the convention made only a divided appeal to the people. Ten years later, however, at the election of assemblymen, 33 of the western counties polled an extra-legal vote on the question of calling a constitutional convention, and 30,000 votes were cast for it to only 1000 against it. The effect of this was that in January 1835 the legislature passed a bill for submitting the question legally to all the voters of the state, although this bill itself limited the proposed convention's power relating to re- presentation by providing that it should so amend the constitu- tion that senators be chosen by districts according to public taxes, and that commoners be apportioned by districts according to Federal representation, i.e. five slaves to be counted equal to three whites. When the popular vote was taken, in the following April, every eastern county gave a majority against the conven- tion, but the West, even with the limitation which was decidedly

favourable to the East, voted strongly for it and carried the election with a total majority in the state of 5856 votes. Again, however, the advantage was with the East, for the delegates were chosen by counties, two from each; but in the convention, which was in session at Raleigh from the 4th of June to the nth of July, the East made some concessions: such as the popular election of the governor (who had previously been elected by the two houses of the legislature), the disfranchisement of free negroes, and the abolition of representation from 6 boroughs, 4 of which were in the East. The number of senators was reduced to 50, the number of commoners to 1 20, and the manner of choosing senators and commoners was changed as directed in the act providing for the convention. The electorate gave its approval to the revision by a vote of 26,771 to 21,606, and with this the agitation over representation ceased.

The fundamental points of difference between North Carolina and

South Carolina were exemplified in the slavery conflict. South Carolina led the extreme radical element in the South and was the first state to secede. North Carolina held back, worked for a compromise, sent delegates to the Washington Peace Convention in February 1861, and did not secede until the 20th of May 1861, after President Lincoln's call for troops to preserve the Union. Liberal support was given to the Con- federacy, both in men and supplies, but Governor Vance, one of the ablest of the Southern war governors, engaged in acrimonious controversies with President Jefferson Davis, contending that the general government of the Confederacy was encroaching upon the prerogatives of the separate states. Owing to its distance from the border, the state escaped serious invasion until near the close of the war. Wilmington was captured by the Federals in February 1865; General Sherman's army crossed the southern boundary in March; a battle was fought at Bentonville, March 19-21; Raleigh was entered on April 13; and the Confederates under General Joseph E. Johnston surrendered near Durham Station, in Durham county, on the 26th.

Reconstruction was a costly experience here as in other Southern states. Jonathan Worth (1802-1869), elected governor under the presidential plan in 1865, was an honest and capable official, but the government established in accordance with the views of Congress in 1868 was corrupt, inefficient and tyrannical. Carpet-baggers, negroes and unscrupulous native whites, known as scalawags, were in control of affairs, while the people of wealth, refinement and education were disfranchised. Governor William Woods Holden (1818-1892; governor 1868-1870) was so weak and tyrannical that he was impeached by the legislature in December 1870. Under his successor, Tod R. Caldwell (1818- 1874), there was some improvement in the condition of affairs, and in 1875 a constitutional convention, in session at Raleigh, with the Democrats slightly in the majority, amended the constitution, their work being ratified by the people at the state election in 1876. The native white element completely regained possession of the government in the following year, when the Democrats came into office under Governor Zebulon B. Vance. Since that time the most interesting feature in the political history has been the rise and fall of the People's party. The hard times which followed the financial panic of 1893 made it possible for them, in alliance with the Republicans, to carry the state in the election of 1894. Afterwards their strength declined, because the people became more prosperous, because the national Democratic party in 1896 and 1900 adopted their views on the money question, and because of the unpopularity of a coalition with Republicans, which made it necessary to give the coloured

people a share of the offices. The race question was the chief issue in the election of 1898, the Democrats were successful, and what amounted to a negro-disfranchising amend- ment to the constitution was adopted in August 1900. In 1907 there was a serious clash between the state authorities and the Federal judiciary, arising from an act of the legislature of that year which fixed the maximum railway fare at 2J cents a mile and imposed enormous fines for its violation. The two principal railway corporations, the Southern and the Seaboard

Air Line, contended that the act was clearly contrary to the 14th Amendment to the Federal Constitution in that it de- nied the equal protection of law. The promise of the rail- ways to give to every purchaser of a ticket a rebate check until the question of the validity of the act should be decided by the courts was not satisfactory to the state authorities, who arrested a ticket agent of the Southern railway, convicted him of violating the law, and sentenced him to the chain-gang for thirty days. Thereupon the attorneys tor the railway applied to Judge Jeter Connelly Pritchard (b. 1857) of the United States Circuit Court for a writ of habeas corpus; this was granted and the prisoner was released. The governor of the state, Robert Brodnax Glenn (b. 1854), nevertheless urged the state courts and attorneys to proceed with the prosecution of other ticket agents, and threatened to resist with the force of the state any further interference of Federal judiciary; but in March 1908 the Supreme Court of the United States declared the North Carolina rate law unconstitutional on the ground that it was confiscatory.

Governors of North Carolina

Proprietary Period (1663-1729).

William Drummond

Samuel Stephens

Peter Carteret

John Jenkins, president of the council

Thomas Eastchurch

Thomas Miller, president of the council . John Harvey, president of the council

John Jenkins

Henry Wilkinson

Seth Sothel

Philip Ludwell

Alexander Lillington, deputy-governor . Thomas Harvey, deputy-governor . Henderson Walker, president of the council . Robert Daniel, deputy-governor Thomas Carey, deputy-governor William Glover, president of the council

WiUiam Glover | contestants (Carey's rebellion) Edward Hyde, deputy-governor Thomas Pollock, president of the council.

Charles Eden

Thomas Pollock, president of the council William Reid, president of the council

George Burrington

Edward Mosely, president of the council. Sir Richard Everard

Royal Period (1 729-1 776).

George Burrington 1

Nathaniel Rice, president of the council .

Gabriel Johnston

Nathaniel Rice, president of the council . Matthew Rowan, president of the council

Arthur Dobbs

William Tryon

James Hasell, president of the council osiah Martin

Statehood Period (1776-).

Richard Caswell

Abner Nash

Thomas Burke

Alexander Martin

Richard Caswell

Samuel Johnston . . . ...

Alexander Martin . . . Federalist Richard Dobbs Spaight, Sr. . Dem.-Repub.

Samuel Ashe ,,

William Richardson Davie. . ,,

Benjamin Williams … „

James Turner …. „

Nathaniel Alexander … .„

Benjamin Williams … ,,

David Stone ,,

Benjamin Smith …. „

William Hawkins …. ,,

William Miller ……

John Branch ,,

I 663-1 667 I 667-1 669

1669-1673 1673-1676 1 676-1 677 1677-1678 1678-1679

I 679-1 68 I

1681-1683 1683-1689 1 689-1 69 1 1691-1694

I 694- I 699

1699-1704 1704-1705

I 705-1 706

1706-1707

1707-1710

1710-1712

1712-1714

1714-1722

1722

1722-1724

1724-1725

1725

1725-1729

1 731-1734

1734

1 734-1 752

1 752-1 753

1 753-1 754

1 754-1 765

1765-1771

1771

I77I-I775

1777-1779 1779-1781 1781-1782 1 782-1 784 1 784-1 787 1787-1789 1 789-1 792

I79I-I795

1 795-1 798 1 798-1 799 1 799-1 802 1 802-1 805 1 805-1 807 1 807-1 808 1808-1810 1810-1811 1811-1814 1814-1817 1 81 7-1820

1 Burrington was appointed in 1730, but did not arrive in the province until February 1 73 1. Either Everard held over or the president of the council was acting-governor from 1 729-1 731.

Jesse Franklin

Gabriel Holmes …

Hutchings G. Burton” .

James Iredell

John Owen ….

Montford Stokes .

David Lowry Swain

Richard Dobbs Spaight, Jr.

Edward Bishop Dudley

John Motley Morehead

William Alexander Graham

Charles Manly

David Settle Reid

Warren Winslow (ex-officio)

Thomas Bragg

John Willis Ellis .

Henry Toole Clark (ex-officio)

Zebulon Baird Vance .

William Woods Holden

Jonathan Worth .

Gen. Daniel Edgar Sickles .

Gen. Ed. Richard Sprigg Canby

William Woods Holden

Tod R. Caldwell .

Curtis Hooks Brogden .

Zebulon Baird Vance .

Thomas Jordan Jarvis

Alfred Moore Scales

Daniel Gould Fowle .

Thomas Michael Holt .

Elias Carr ….

Daniel Lindsay Russell

Charles Brantley Aycock .

Robert Brodnax Glenn

William Walton Kitchin

Dem.-Repub.

Democrat

Whig

Democrat

Provisional Conservative Military

Republican

Democrat

Republican Democrat

1 820-1821 1821-1824 1824-1827 1827-1828

I 828-1 830 I 830-1 832

1832-1835

I835-I837

1837-1841

1841-1845

1 845-1 849

1849-1851

1 851-1854

1 854-1 855

1855-1859

1 859-I 861

I 861-1862

1862-1865

1865

1865-1867

1867

1 867-1 868

1 868-1 870

1 870-1 874

1 874-1 877 1 877-1 879 1879-1885 1 885-1 889 1889-1891
1891-1893 1893-1897 1897-1901 1901-1905 1905-1909 1909-

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NORTHCOTE, JAMES (1746-1831), English painter, was born at Plymouth on the 22nd of October 1746. He was apprenticed to his father, a poor watchmaker of the town, and during his spare hours was diligent with brush and pencil. In 1769 he left his father and started as a portrait-painter. Four years later he went to London and was admitted as a pupil into the studio and house of Reynolds. At the same time he attended the Academy schools. In 1775 he left Reynolds, and about two years later, having acquired the requisite funds by portrait-painting in Devonshire, he went to study in Italy. On his return to England, three years later, he revisited his native county, and then settled in London, where Opie and Fuseli were his rivals. He was elected associate of the Academy in 1786, and full academician in the following spring. The ” Young Princes murdered in the Tower,” his first important historical work, dates from 1786, and it was followed by the ” Burial of the Princes in the Tower,” both paintings, along with seven others, being executed for BoydelPs Shakespeare gallery, The ” Death of Wat Tyler,” now in the Guildhall, was exhibited in 1787; and shortly afterwards Northcote began a set of ten subjects, entitled ” The Modest Girl and the Wanton,” which were completed and engraved in 1796. Among the productions of Northcote’s later years are the ” Entombment ” and the ” Agony in the Garden,” besides many portraits, and several animal subjects, like the ” Leopards,” the ” Dog and Heron,” and the ” Lion “; these latter were more successful than the artist’s efforts in the higher departments of art, as was indicated by Fuseli’s caustic remark on examining the ” Angel opposing Balaam “— ” Northcote, you are an angel at an ass, but an ass at an angel.” The works of the artist number about two thousand, and he made a fortune of £40,000. He died on the 13 th of July 1831.

Northcote was emulous of fame as an author, and his first essays in literature were contributions to the Artist, edited by Prince Hoare. In 1813 he embodied his recollections of his old master in a Life of Reynolds. His Fables — the first series published in 1828, the second

posthumously in 1833 — were illustrated with woodcuts by Harvey from Northcote's own designs. In the production of his Life of Titian, his last work, which appeared in 1830, he was assisted by William Hazlitt, who previously, in 1826, had given to the public in the New Monthly Magazine his recollections of Northcote's pungent and cynical " conversations," the bitter personalities of which caused much trouble to the painter and his friends.

NORTH DAKOTA, one of the North Central states of the American Union, between 45° 55′ and 49 N., and 96 25′ and 104 3′ W. It is bounded N. by the Canadian provinces of Saskatchewan and Manitoba, S. by South Dakota, W. by Montana and E. by Minnesota, from which it is separated by the Red river (or Red river of the North). North Dakota has an extreme length, E. and W., of 360 m., an extreme width, N. and S., of 210 m., and a total area of 70,837 sq. m., of which 654 sq. m. are water surface.

Topography. — North Dakota lies in the Prairie Plains and Great Plains physiographic provinces. The escarpment o#the Coteau du Missouri is the dividing line, that portion to the N. and E. lying in the Prairie Plains, that to the S.W. in the Great Plains. The surface presents few striking topographic features, and may be subdivided into three vast plains or prairie table- lands rising one above the other from E. to W., the two eastern- most together constituting the Prairie Plains portion of the state. The lowest of these plains is the valley of the Red river, and this valley extends along the eastern edge of the state and varies in width from 25 to 70 m. Its elevation is 965 ft. at

Wahpeton, in the extreme S.E.; 903 ft. at Fargo; 836 ft. at Grand Forks; and 798 ft. at Pembina, in the extreme N.E., which is the lowest point within the state. To the W. of this valley lies a second plain, ranging in height from 1200 to 1600 ft. above sea level, and in width from 75 m. in the S. to 200 m. in the N. This plain is separated from the Red river valley in the N. by an abrupt slope rising to a height of from 300 to j;oo ft, above the surrounding country, and called the Manitoba escarpment, because the greater part of it lies in the province of Manitoba. The Pembina Mountains, low hills near the inter- national boundary and about 30 m. W. of the Red river, form a portion of this escarpment. From these hills southward the ridge gradually becomes less abrupt until in Walsh county it vanishes into prairie. The ascent to the upper plain then becomes very gentle,

though there is a rise of 400 or 500 ft., until it reaches the south-eastern portion of Sargent county and changes into the more abrupt Coteau des Prairies, a plateau about 2000 ft. above the sea. The second plain, while not so level as the Red river valley, contains but one group of hills, the Turtle Mountains; these rise from 300 to 400 ft. above the general level, near the centre of the northern boundary. The prairies in this second table-land are gently rolling, and are covered with drift from the continental ice-sheet of the glacial period. They are bounded on the W. by a ridge from 300 to 400 ft. in height and from 20 to 50 m. in width, which roughly marks the dividing line between the farming lands of the E. and the grazing lands of the W. The northern portion of this ridge forms the water-parting between the streams that empty into Hudson Bay and those that flow into the Gulf of Mexico. To the W. of this ridge lies the third and highest plain within the state, the so-called Coteau du Missouri. It occupies nearly one half of the state, and rises gradually westward until it attains a general level of about 2700 ft. East of the Missouri river this region is covered with glacial drift, and is noticeably different from the more level lands of the lower plains. The ice-sheet wore down from the hills and filled the valleys with debris until the surface has a billowy appearance. As the Missouri river marks approximately the lower edge of the ice-sheet, the region W. of this stream is almost free from glacial deposits and presents a strong contrast to the rest of the state. The billowy plains still remain in places, but in the vicinity of streams the billows give way to deep ravines. The sands and clays found here are fine and soft, and as there is scant vegetation to protect the hillsides they are easily eroded by the rains. As a result, the surface has been carved into fantastic forms. The early French explorers called the region les terres mauvaises, on account of the difficulties that here met the traveller, and in its English equivalent, ” the Bad Lands,” this appellation still remains. High winds and seams of burning lignite coal have aided the rains in giving the Bad Lands their peculiar configuration. Prairie fires or spontaneous combustion have ignited many coal seams. Some have already burnt out; others still emit smoke and sulphurous fumes from the crevices in the hillsides, and through the fissures may be seen the glowing coal and rock. The earth surface above these natural furnaces has been hardened, cracked and sometimes melted into a reddish slag, called scoria, which, on account of its resemblance to lava, has given rise to an incorrect impression that the region was once the centre of volcanic disturbances. The picturesque effect of this sculpturing by water, wind and fire is greatly enhanced by the brilliant colours along the faces of the hills and ravines— grey, yellow, black and every shade of red and brown. Here too are found petrified forests and other evidences of a vegetable

growth that has long ago disappeared. The lands are bad for the traveller and the farmer, but not for the ranchman. A few miles from the streams the country is less broken, and there are deep grassy valleys, in which the animals may find shelter in winter. Cattle sometimes congregate in cold weather around a burning coal seam and enjoy the warmth. The lignite in this region also warms the ranchman's cabin, being easily mined where a seam is exposed in the walls of a ravine or on the side of a hill.

North Dakota has a mean elevation of 1900 ft. The highest

point in the state, about 3500 ft., is in the southern part of Bowman county, east of the Little Missouri river.

Rivers. — There are three drainage systems within the state: the Red river (of the North) and its tributaries, the Mouse, or Souris, river and its tributaries, and the Missouri river and its tribu- taries. The Red river flows in a winding channel along the eastern boundary and empties into Lake Winnipeg in Canada, thence reaching Hudson Bay through the Nelson river. Its tributaries are small, and are remarkable chiefly for the fact that they at first flow in a direction almost opposite to that of the main stream, and make a great bend to the N.E. before joining it. 1 The Sheyenne, the Goose, the Park and the Pembina rivers are the most important of these streams. The Mouse, or Souris, river rises in Canada, crosses the international boundary near the meridian of 102 W. long., flows S.E. for about 70 m., then turns to the N. and near the 101st meridian re-enters British territory, after receiving the waters of the Riviere des Lacs and other small streams. The Missouri river, the most important stream within the state, crosses the western boundary near the 48th parallel, and after pursuing a winding course in a general south-easterly direction, leaves the state near the centre of its southern boundary. The James river, flowing southward into South Dakota, is the Missouri's only important eastern tributary within the state. From the W. the Missouri receives the waters of the Little Missouri, Cannon Ball, Heart and Knife rivers. All that portion of the state lying W. of the Pembina Mountains and E. of the Mouse river valley is practically without river drainage, and for its surface and sub-surface drainage, Devils Lake, an irregular body of water about 40 m. in length and with an area of 400 sq. m., forms a natural reservoir. The waters of this lake are strongly saline. The entire region W. of the Red river valley and E. of the valleys of the Mouse and Missouri rivers is dotted with small lakes. The morainic belts and other obstructions in the drift plains hem in the waters in the intervening basins and create what are called " glacial lakes," varying in diameter from a few yards to several miles. All the lakes of the state are of this character,

and many are strong with salt and alkali. The drift plains also contain numerous shallow hollows, locally termed ” pots and kettles,” which receive the drainage of their vicinity and form sloughs.

Fauna and Flora. — Before the advent of the white man, herds of bison roamed the prairies, but these have disappeared, 2 and, with the exception of deer and bears, large game is to be found only in the Bad Lands. Here are found the lynx, the ” mountain lion ” or puma, the prairie and timber wolves, the jack rabbit, the prairie dog (gopher), the black, the brown and, occasionally, the grizzly bear. A few fur-bearing animals, the mink, beaver and raccoon, still remain. The prairie dog is found everywhere. Among the lakes, sloughs and stubble-fields of the prairies, teal, ducks, coots and geese are found in abundance. Other prairie birds are the prairie chicken, and there are a great many birds that sing while flying; among them are the horned lark, bobolink, Smith’s longspur and chestnut collared longspur, lark-sparrow, lark-bunting and Sprague’s pipit.

The flora of North Dakota is typical of a semi-arid country. The prevailing plant-colour is a greyish green, due to a hard dry outer covering which serves as a protection from desiccation. All plant life has a remarkably large proportion of subterranean growth, because of the necessity of getting moisture from the earth and not from the air; hence roots and tubers are unusually well developed. The Red river valley is a meeting ground for many species of plants whose principal habitat lies in some other quarter. Many trees of the eastern forest, such as basswood, sugar, river and red maple, red, white and black ash, red and rock elm, black and bur oak, white and red pine and red cedar find their western limit here. Some species characteristic of the more northerly regions — for example, the mountain ash, balsam fir, tamarack and black and white spruce — find here their southern or south-western limits, The same is true of shrubs and herbaceous plants. The prickly ash, Virginian creeper and staff-tree find here their northern limit ; and the mountain maple, Canada blueberry, dwarf birch and ground hemlock their southern limit. Of 1500 species of herbaceous plants in the Red river basin, it is estimated that fully half reach here their geographical limit or limit of frequent occurrence. Trees are found

1 The peculiar bow shape of these western tributaries of the Red river is due to the fact that these streams originally flowed S.E. into Lake Agassiz, now extinct. As the waters of the lake gradually receded, the rivers reached it by pushing their channels eastward through what was once its bed. The southern part of the lake bottom was finally uplifted by a movement of the earth crust, and the outlet was changed

from the S. to the N.E. The waters continued to recede, and the tributaries, in cutting their way through the sediment, followed the slope of the land and gradually turned northward. .

2 The early settlers found the bones of the bison scattered oyer the prairies, and after the construction of railways the gathering and shipping of these for use in sugar refining and in the manufacture of superphosphate became temporarily a profitable industry. Between January and August 1889 a single dealer at Minot shipped 1200 tons, which sold at $8 the ton.

only on Turtle Mountains, in the vicinity of streams, and in a few other places sheltered from wind and sun. North Dakota's total woodland area is estimated at 600 sq. m., or less than 1 % of its entire surface. No other state in the Union has such a relatively small area of forest. By an executive proclamation, which came into effect on the 24th of November 1908, a Federal forest reservation of 218 sq. m. was created. The prairies of the more humid regions are covered with valuable grasses, and with masses of showy native flowers, which bloom from spring to autumn. The pasque flower is found on all the prairies and is the earliest to appear. The Bad Lands exhibit a vegetation typical of semi-arid regions. Cottonwoods flourish along the Little Missouri river, and in sheltered ravines grow stunted junipers and cedars, which seldom rise above the crest of some protecting bluff. Poplars grow in the valleys, and the cactus and sage brush are common. The faces of buttes and ravines that are turned toward the sun are usually devoid of vegetation.

Climate. — There are no mountains, forests or large bodies of water to moderate the extremes of summer and winter, and the uniformity of topography makes the ranges of temperature for different parts of the state very nearly the same. Between the extreme northern and southern sections there is a range of only 6° F. The mean annual temperature for the state is 39 F., with an extreme of no° recorded for the summer and a minimum of – 54 for the winter. As a general rule, temperatures are highest in the W. and lowest in the E. In the central region of the state (at Jamestown, Stutsman county) the mean annual temperature is 40 ; the mean for the winter, 10°, with a minimum of – 40 recorded in February; the mean for the summer is 67 , with an extreme of 103 recorded in July. The winters are long and severe. The season, however, on account of the dryness of the climate, is not so

harsh as the low temperatures would seem to indicate. The seasons are sharply demarked; both winter and summer come suddenly. The summers are short, but as there are sixteen hours of sunlight per day in midsummer, vege- tation grows rapidly. Killing frosts often occur in June and return again early in September. High winds are frequent, and prairie houses are often protected by rows of trees called ” wind breaks.” During the growing season the winds are usually light, but in the late summer and autumn occasional dry, hot, southerly winds (” hot southers “) prove very destructive to vegetation. Tornadoes are not unknown, and local hail storms are frequent in the summer, but do little damage. The total precipitation for the state is 17 or 18 in. , the heaviest, about 20 in., occurring in the Red river valley, and the lightest, about 14 in., in the extreme W. While the rainfall is always below the normal amount for humid regions, by far the greater part of it occurs in the spring and summer, and growing crops receive the full benefit. The precipitation rarely amounts to 2 in. for the entire winter. The snows are therefore very light, and are quickly swept from the prairies by the high winds, so that cattle may graze in the open plains throughout the year. There are, however, during every winter from one to four severe blizzards, which inflict great damage upon unprotected flocks and herds.

Soils. — As the Red river valley is the bed of the extinct Lake Agassiz, its soil is composed of the fine detritus and silty deposits carried into the lake by its tributaries. Over the whole basin this deposit, to a depth of 1 or 2 ft., is coloured black by decayed vegetation, and constitutes one of the most fertile tracts on the continent. Being remarkably free from trees, rocks and streams, the soil can be turned in furrows that run perfectly straight for miles, and favours the development of ” bonanza farms,” where thousands of acres are cultivated in a single field. The soils W. of the valley consist of glacial drift, and are well suited to the growing of grain. The drift becomes thinner toward the W., and finally disappears in the semi-arid regions of the Missouri river valley. In this region the soils of sand and clay are much finer than the drift, and are very productive where the water-supply is sufficient.

Irrigation. — Irrigation is confined to the western half of the state, and more especially to the north-west, being employed chiefly in the drainage basin of the Missouri river. The bed of the river is too far below the surrounding country to permit the use of its waters for irrigation purposes by the usual gravity methods. The ordinary process before 1906 was to dam small streams and ” coulees “(deep gulches in which water flows intermittently) and flood the surround- ing country. The total irrigated area in 1902 was 10,384 acres. The so-called

Reclamation Act passed by Congress in 1902 provided for the construction of a system of irrigation works in this and other states by the Federal government. In 1908 the Federal Reclamation Service had five projects in North Dakota. The Buford-Trenton, Williston and Nesson projects are situated in Williams county, on the left bank of the Missouri river. The abundant lignite coal in the region was to operate pumps for raising water from the river into canals crossing the valley. The Washburn project was to irrigate 5000 acres in McLean county with water pumped from the Missouri river. It was estimated that the fourth project, the lower Yellow- stone, on the western bank of the river of that name, would furnish water for 66,000 acres of land, of which 20,000 lie in Dawson county, North Dakota, and the rest in Montana. The fifth project, the Bowman, was to irrigate 10,000 acres in North Dakota and the north- western part of South Dakota by storing the waters of the North Fork of Grand river. Water for irrigation purposes is often derived

from artesian wells, which are very numerous in the S. and E., particularly in the James river valley.

Agriculture. — Agriculture is by far the most important industry of the state, and, owing to climatic conditions, it is rigidly limited to a few staple crops. The growing season is too short for maize or Indian corn, which constituted only 1-2 % of the acreage of cereals in 1905. No winter wheat can be grown, and the climate is too harsh for the larger fruits, such as apples, pears, peaches, plums and grapes ; but such hardy small fruits as currants, gooseberries, raspberries, blackberries and strawberries may be grown in abundance.

The total farm acreage in 1890 was 7,660,333; in 1900, 15,542,640. The value of the farm property in the same decade rose from $100,745,779 to $255,266,751, and the value of farm products from 1889 to 1899 from $21,264,938 to $64,252,494.

The average size of the farms (excluding farms under 3 acres with products valued at less than $500) was 277-4 acres in 1890 and 343-8 acres in 1900. With regard to tenure, 74-7 % of the farms were operated by their owners, 15-2% by part owners and 7-2% by share tenants. Hay and grain formed the principal source of income of 88-4 % of the farms, live-stock of 6-7 % and dairy produce of 2-6%. Wheat is the state's most important product. In the acreage of this cereal in 1909 (according to the Year-book of the U.S. Department of Agriculture), North Dakota ranked first, and in the crop second among the states of the Union, its total yield being 90,762,000 bushels, valued at $83,501,000. Next in importance to wheat in 1909 was

flaxseed, amounting to 14,229,000 bushels, valued at $22,340,000. In the production of this commodity the state ranked first, and produced about 55% of the entire crop of the United States. The flax is cultivated for the seed, and only slightly for the fibre. Other important crops are oats ($16,368,000 in 1906) barley ($8,913,000), hay, potatoes, rye and Indian corn. The value of the various classes of live-stock on the 1st of January 1910 was as follows: horses, $81,168,000; mules, $1,040,000; cattle, $21,001,000; sheep, $2,484,000; swine, $2,266,000. Very little attention is paid to fruit and vegetable growing.

Minerals. — With the exception of lignite, which underlies a large portion of the western half of the state, North Dakota has few mineral deposits of commercial value. Sandstone occurs in large quantities, and W. of the Red river valley granite and gneiss are found, but these materials are not quarried. The coal is all in the form of brown lignite and is not very valuable as a fuel, as it soon crumbles into a fine powder on being exposed to air. The total area of the coal beds is estimated at 35,000 sq. m. A law enacted in 1896 required the use of lignite in all state buildings and institutions. Mining is carried on along the Northern Pacific railway W. of the Missouri river, in the Mouse river valley along the line of the Minneapolis, St Paul & Sault Ste Marie railway, and at a few places in the same region along the line of the Great Northern railway. Good clays for the manufacture of tile and brick are found at numerous places. The total value of the mineral products (except stone) in 1909 was $738,818, of which $522,116 was the value of coal and $206,222 of clay products.

Manufactures. — Manufacturing in North Dakota is of small im-portance, being largely confined, with the exception of flour and grist milling, to the supply of local needs. Under the factory system there were 337 establishments in 1900 and 507 in 1905: the capital in-vested in 1900 was $3,511,968 and in 1905 $5,703,837; and the value of products was $6,259,840 in 1900 and $10,217,914 (or 63-2% more) in 1905. The products of the flour and grist mills increased in value from $4,134,023 in 1900 to $6,463,228 in 1905, and in this last year constituted in value 63-3 % of the total factory products of the state. Printing and publishing was next in import- ance, with products valued at $719,950 in 1900 and at $1,110,439 in 1905. Butter, cheese and condensed milk manufactured were valued at $122,128 in 1900 and at $562,481 in 1905. The chief manufacturing centres are Fargo and Grand Forks.

Transportation. — The total railway mileage within the state on the 31st of December 1908 was 4135-67 m. The main line of the Northern

Pacific, from St Paul to Portland, Oregon, enters the state at Fargo and runs almost due W. throughout its length for about 380 m. Parallel with this road, but farther to the N., is the main line of the Great Northern system, running from St Paul to Seattle. The length of its route within the state, from Wahpeton to Buford via Larimore, is about 460 m. Both of these systems have numerous branch lines. The main line of the Minneapolis, St Paul & Sault Ste Marie enters the S.E. corner of the state at Fairmount and ends in the N.W. at Portal, on the international boundary, having in 1909 a length within the state of 361 m. Among its many branches are the ” Wheat Line,” running from Kenmare, North Dakota, to Thief River Falls, Minnesota, and having a length of 251 m. in the state; and the ” Missouri River Line,” penetrating the southern and central portions of the state from Hankinson to Garrison, with a length of 282 m. In 1909 the Northern Pacific was building about 140 m. of new track. The Chicago, Milwaukee & St Paul railway, running E. and W. through South Dakota, sends four short branches into the southern part of North Dakota. The Chicago & North- western also sends a short branch line northward into the state, form- ing a junction with other lines at Oakes. The Red river is navigable as far S. as Belmont, and the Missouri river is navigable throughout its course within the state, although it requires a skilful pilot.

Population. — In 1870 the population of that portion of Dakota Territory included within the present limits of North Dakota was 2405; in 1880, 36,909. The population of the state in 1890 was 182,719; in 1900, 319,146; in 1905, 437,070; in 1910, 583,888. The number of the foreign-born population in 1900 was 113,091, or 35-4%, the highest proportion to be found in any state of the Union. The principal elements com- posing the white foreign population were as follows: Norwegians 30,206, English Canadians 25,004, Russians 14,979, Germans 11,546, Swedes 8419. The coloured population consisted of 4692 Indians not taxed, 2276 Indians taxed, 286 negroes, 148 Japanese and 32 Chinese. Most of the Indians not taxed live on reservations, of which there are four: Devils Lake Reserva- tion in 1909 had a total area of 143-97 sq. m., a population of 980, consisting of Sisseton, Wahpeton, and Cut Head (or Pabaksa) Sioux; Turtle Mountain 1 Reservation, in Rolette county, established in 1882, and now allotted (excepting 186 acres for church and school purposes), had a population in 1909 of 2588, being for the most part a mixture of Pembina (or Turtle ‘Mountain) Chippewa with French Canadians; Fort

Berthold Reservation in the west central part of the state, on the Missouri river, established in 1870, had in 1909 an area of 1382-4 sq. m., and a population of 399 Ankara (Caddoan), and, of Siouan stock, 453 Hidatsa (or Grosventre) and 252 Mandan Indians; and Standing Rock Reservation, on the western bank of the Missouri river, was established in 1875, an d in 1909 contained 2887-2 sq. m. (about three-fifths of which lies in South Dakota and much of which was opened to settlement in 1908-1909) and a population of 3399 Sioux. The population of the state is largely rural. The larger municipalities with the population of each in 1905 were: Fargo (12,512), Grand Forks (10,127), Jamestown (5093), Bismarck, the capital, (4913), Minot (4125), Valley City (4059), Dickinson (3188), Wahpeton (2741), Mandan (2714), Grafton (2423) and Devils Lake (2367) ; in 1905 there were fifteen othe"r municipalities each with a population of more than 1000. In 1906 the Roman Catholic Church had the largest number of communicants (61,261 out of a total of 159,053 members of all denominations), and there were 59,923 Lutherans.

Administration. — The state is governed under its constitution of 1889, as subsequently amended. The governor is chosen biennially, and has a limited pardoning power. He may veto appropriation bills by items, but any of his vetoes may be overruled by a two-thirds vote of each house. The governor and lieutenant-governor must be at least thirty years old. The other administrative officers are a secretary of state, auditor, treasurer, superintendent of public instruction, commissioner of insurance, three commissioners of railways, attorney general and commissioner of agriculture and labour; each of these officers is chosen biennially and must be at least twenty-five years of age. The legislative department consists of a Senate, with members chosen every four years, and about half chosen at each biennial election; and a House of Repre- sentatives, with members chosen biennially. The sessions of the legislature are biennial, and are limited to sixty days. The minimum age for senators is twenty-five years and for repre- sentatives twenty-one years. Bills may originate in either house. A lieutenant-governor, chosen biennially , presides over the Senate. In 1907 the legislature proposed an amendment providing for the application of initiative and referendum to statutory laws and constitutional amendments; two years later the legis- lature passed a substitute resolution, which omits the clause regarding amendments of the constitution, and which, if passed by the legislature of 191 1 will be put to popular vote at the general election of 191 2. The judicial department consists of the supreme court, district courts, county courts, municipal courts, and justices of the peace. The supreme court consists of three judges (minimum age thirty years), chosen by

popular vote for six years. Their number may be increased to five whenever the population of the state shall amount to 600,000.

1 The Devils Lake Reservation and the Turtle Mountain Chippewa are both under the Fort Totten School, which is on the Devils Lake Reservation. .

For each judicial district (the tenth district was created in 1907) there is one district judge, elected for four years; the district courts have original jurisdiction (except in probate matters) and certain appellate jurisdiction. The judge of the county court is chosen for two years. This court has exclusive original jurisdiction in probate matters, and in counties with over 2000 inhabitants its jurisdiction may be extended by popular vote to include concurrent jurisdiction with the district courts in civil matters involving amounts less than $1000, and in criminal actions below the grade of felony. Justices of the peace have jurisdiction in civil cases involving no land titles and sums of money not exceeding $200. They may also try misdemeanours in counties without other criminal jurisdiction.

For the administration of local government, the state is divided into counties (46 in 1910). In those counties that have not adopted a township organization county affairs are ad- ministered by a board of county commissioners; where the township organization has been adopted the county government is administered by the chairmen of the several township boards. For each county there are a judge, clerk, register of deeds, auditor, treasurer, sheriff and state's attorney.

All citizens of the United States residing in North Dakota are declared to be citizens of the state. The right of suffrage is confined by the constitution to males twenty-one years of age, who are citizens of the United States or have declared their intention of becoming citizens, and who have resided in the state one year, in the county six months, and in the voting precinct ninety days preceding the election. Civilized Indians who have severed their tribal relations two years before an election are entitled to vote. Women may vote for all school officers and upon all questions relating solely to school matters, and are eligible to any school office. * ■. • ■

Amendments to the constitution must be passed by both houses of the legislature at two consecutive sessions, and must then be ratified by popular vote. By this arrangement a period of nearly four years usually elapses between the proposal and the final ratification of an amendment.

The amount of homestead exempt from seizure for debt is limited in value to $5000, and may not include more than two acres in a town plot or more than 160 acres elsewhere. The exemption is not valid against a debt created for the purchase money, or against taxes levied on the property, or against mechanics' or labourers' liens for work done or material furnished for improvements, or against a mortgage acknowledged by both husband and wife. The grounds for absolute divorce are adultery, cruelty, desertion (one year), neglect (one year), habitual drunkenness (one year) and conviction for felony; residence in the state for one year is required before application for divorce. North Dakota is one of the few American states whose constitu- tion forbids the manufacture, importation 2 or sale of intoxicating liquors. Attempts to secure the repeal of this provision have been unsuccessful. Apothecaries may secure a licence to sell liquors for purely medicinal purposes upon a petition signed by twenty- five reputable free-holders and twenty-five reputable women. In 1909 the advertisement of liquors, solicitation of orders for liquors, and the sale of cigarettes to minors were prohibited.

Education. — At the head of the public school system is a superintendent of public instruction, chosen for two years. He, with the governor and the president of the state university, constitutes a high-school board, having supervision of the secondary schools. In each county there is a county superintendent, elected biennially, and in each school district a board of directors. The proceeds of the sale of public lands donated to the state for educational purposes, and all escheats to the state, constitute a trust fund, the interest from which, with the proceeds of all fines for the violation of state laws, is annually apportioned among the school districts according to the school population; the total apportionment from the State Tuition Fund in 1908 was $357,238. This income is supplemented by local taxation. The minimum school term allowed by law is six

2 Before the law passed by the first Legislative Assembly of the state: to carry out this provision could come into effect, it was partially annulled by the decision of the United States Supreme Court in the case of Leisy v. Hardin (1890), in which the court held that liquors might be imported into any state and sold in the original package^ {a.v.) without reference to local prohibitory or restrictive laws.

In politics the state has been Republican, except

the Democrats and Populists combined; in 1906,

a Democratic governor was elected.

,,,.,,. T Territorial Governors. 1 William Jayne

Newton Edmunds . . .

Andrew J. Faulk

John A. Burbank

John L. Pennington

William A. Howard 2 . . . .

Nehemiah G. Ordway . . . .

Gilbert A. Pierce

Louis K. Church

Arthur C. Melette

in 1892, when 1908 and 1910

1861-1863 1863-1866 1 866-1 869 1869-1874 1874-1878 1 878-1 880 1880-1884 1 884-1 887 1 887-1 889 1889

State Governors.

Republican

Democratic Republican

Democratic

1889-1891 1891-1893 1 893-1 895 1895-1897 1897-1898 1898-1899 1 899-1 90 1 1901-1905 1905-1907 1907-

John Miller .

Andrew H. Burke

Eli C. D. Shortridge

Roger Allin .

Frank A. Briggs 8 .

Joseph M. Devine 4

Frederick B. Fancher

Frank White

Elmore Y. Sarles .

John Burke .

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Thompson, 1799-1814, edited by Elliot Coues (3 vols., New York, 1897).

NORTHEIM, a town of Germany, in the Prussian province of Hanover, on the Ruhme, 12 m. by rail N. of Gottingen and at the junction of railways to Cassel and Nordhausen. Pop. (1905) 7984. It has an interesting Evangelical church, containing some old wood-carving and stained glass, a Roman Catholic church, several schools and a training college for schoolmasters. There are manufactures of tobacco, sugar and boots; other industries are flour-milling, tanning and brewing. The place is said to date from the 9th century; it obtained civic rights in 1208, and later became a member of the Hanseatic League. It was stormed by the imperial troops in June 1627. The Benedictine abbey of St Blasius was founded in 1363 and dis- solved at the Reformation.

See Wennigerholz, Beschreibung und Geschichte der Stadt Northeim (Northeim, 1896).

NORTHER, a winter wind accompanying the “cold wave” that follows the passage of a cyclone across the United States of America. A warm S.E. or S.W. wind on the east of such a cyclone materially slackens or entirely dies away, and is followed, ofteri suddenly, by the piercingly cold norther. The passage

1 The Territorial government embraced both the present states of North and South Dakota.

1 Died in office on the 10th of April 1880.

“Died in office, July 1898.

4 Succeeded Frank A. Briggs, deceased, by virtue of his office of lieutenant-governor.

of a cyclone acros$ America is usually from W. to E., and the cyclonic system of circulation would produce these results; but as the North American cyclones usually originate east of the Rocky Mountains, the warm air drawn from the Gulf of Mexico is not only followed by the cold air drawn from the Arctic regions, but the body of cold air slides down the eastern slopes of the Rockies and advances as a solid wedge (the ” cold wave “) under the cyclone itself. ” Uncomfortably warm in the lightest clothing,” a traveller upon the prairies of Texas may become ” uncomfortably cold before he can wrap his blanket around him ” (W. Ferrel, A Popular Treatise on the Winds). The temperature may fall 50 F. in twenty-four hours.

NORTHFIELD, a city of Rice county, Minnesota, U.S.A., on the Cannon river, about 35 m. S. of St Paul. Pop. (1905) 3438; (1910) 3265. It is served by the Chicago Great-Western, the Chicago, Milwaukee & St Paul, and the Chicago, Rock Island & Pacific railways. It is a shipping centre for the products of the farming and dairying region in which it lies, but it is most widely known for its educational institutions. It is the seat of the Baker School for Nervous and Backward Children, a private institution; of St Olaf College (Norwegian Lutheran), founded in 1874; and of Carleton College (founded in 1866 by Congregationalists but now non-sectarian, opened in 1870), one of the highest grade small colleges in the West, and the first in the North-west to abolish its preparatory academy. Carleton College has the Goodsell Observatory, which gives the time to the railways of the North-west, and publishes a magazine, Popular Astronomy. The Scoville Memorial Library (1896) of the College had 23,000 volumes in 1909. Northfield has a public library and the Minnesota Odd Fellows' Widows and Orphans Asylum. Named in honour of John W. North, who laid out Northfield and several other western towns, it was settled about 1851, incorporated as a village in 1868, and chartered as a city in 1875.

NORTHFIELD, a village of Washington county, Vermont, U.S.A., in Northfield township, about 35 m. S.E. of Burlington, in the Green Mountains region. Pop. (1910) of the village 1918; of the township 3226. Northfield is served by the Central Vermont railway. It is the seat of Norwich University, founded in 1819 as the American Literary, Scientific and Military Academy at Norwich, Windsor county, Vermont, by Captain Alden Partridge (1785-1854). Captain Partridge was a pro- fessor in the U.S. Military Academy in 1813-1816 and acting superintendent of the Academy in 1816-1817, and was president of Norwich University until 1843, he founded various other military schools besides the one at Norwich. Norwich Univer- sity was incorporated in 1834 under its present name, and in 1866, when the buildings at Norwich were burned, was removed to Northfield. The charter requires " a course of military instruction, both theoretical and practical," and the discipline of the institution is military in form and principle. In 1898 the university was recognized by the General Assembly of Ver- mont as the military college of the state. It offers courses leading to the degrees of Bachelor of Arts and Bachelor of Science in civil engineering, in electrical engineering and in chemistry. In 1908 it had 13 instructors and 168 students. Dewey Hall (1902), the administration building, was named in honour of Admiral George Dewey, a former student in the university. In the township there are outcrops of good granite and of verde antique, and along a

range of hills E. of the village there is a deposit of very fine black slate. The hills furnish excellent grazing for cattle, and much milk is shipped to New England cities. The township of Northfield was incorporated in 1781; the original settlement on the site of the present village was made in 1785, and the village was incorporated in 1855.

NORTHFLEET, an urban district of Kent, England, within the parliamentary borough of Gravesend, on the Thames, 22 m. E. by S. of London by the South Eastern' and Chatham railway. Pop. (1901) 12,906. The church of St Botolph is of Norman foundation, but the nave is principally Decorated and the chancel Perpendicular, and the tower, having fallen down, was rebuilt in 1628. The church contains a brass of the 14th

months, and the schools are open to all pupils between the ages of six and twenty-one years. For children between the ages of eight anil fourteen attendance for twelve weeks, six being consecutive, is compulsory. The total enrolment in the public schools in 1908 was 131,582, with an average daily attendance of 90,419.' Educational facilities are also furnished by the state through university and school of mines at University, near Grand Forks, normal schools (opened in 1890) at Valley City and Mayville, an agricultural college and experiment station (1890) at Fargo, a normal and industrial school (opened in 1899) at Ellendale, a school for the deaf (1890) at Devils Lake, a scientific school (opened in 1903) at Wahpeton, and a school of forestry at Bottineau. Fargo College at Fargo, founded in 1887 by Congregationalists, is now non-sectarian. The Methodist Episcopal Church maintains Wesley College near Grand Forks (formerly the Red River Valley University at Wahpeton), affiliated with the state university. There is a state library commission. The state supports a hospital for the insane at Jamestown, an institu- tion for the feeble-minded at Grafton, a home for old soldiers at Lisbon, a blind asylum at Bathgate, a reform school (opened 1902) at Mandan and a penitentiary at Bismarck. There is a state sana- torium for tuberculosis (1909).

Finance. — The chief source of revenue for the state, counties and municipalities is the general property tax. There are no special corporation taxes, but licence-charges are levied upon express and sleeping-car companies, and a tax is laid on the premiums of insurance companies. No poll tax is levied for state purposes, but counties are

authorized to levy such a tax for school purposes. There are boards of equalization and review for the state, counties and muni- cipalities. The state board fixes the rate of the state tax. For defraying the expenses of the state government, exclusive of the interest on the bonded debt, the tax rate is limited by the con- stitution to four mills on the dollar of assessed valuation. The state debt, excluding the amount of Territorial indebtedness assumed when Dakota Territory was divided, may not exceed $200,000. Local indebtedness is limited to 5 % of the assessed value of the local property, but incorporated cities may by special vote increase this limit. The total bonded debt of the state on the 31st of October 1908 was $642,300 and was incurred for the most part for the construction of public buildings during the Territorial period. At the close of the fiscal year ending on the 31st of October 1908, the receipts for the year amounted to $3,259,668, the expenditures to $3,476,073 and the balance in the treasury to $582,905.

History. — The first attempts to establish permanent settle- ments in what is now North Dakota were made by traders of the Hudson's Bay Company, who began their operations in the Red river valley about 1793. 1 In 1797 C. J. B. Chaboillez, a French trader in the service of the North- West Fur Company, built a trading post on the southern bank of the Pembina river, near its mouth, but this was soon abandoned. Three years later Alexander Henry, the younger (d. 1814), built two trading posts in the present limits of the state for this company, one on the western bank of the Red river near the Park river, where he lived until 1808. David Thompson (1770-1857), an employee at different times of the Hudson's Bay and North-West Fur companies, explored the region of the Missouri river in 1797-1798, and thus anticipated the work of Lewis and Clark, who entered the present limits of the state in 1804 and wintered among the Mandans,constructingFortMandan in what isnowMcLean county. In 1801 John Cameron (d. 1804) erected a trading post for the North-West Fur Company on the site of the present Grand Forks.

The first real homeseekers to enter the state of whom there is any record were a colony of Scottish Highlanders who had first settled at Kildonan (Winnipeg) in 181 2 under a grant from the Hudson's Bay Company to Thomas Douglas, 5th earl of Selkirk. A part of the Winnipeg colony soon migrated south- ward and settled on the site of the present city of Pembina, at the mouth of the Pembina river, which they thought to be in British territory, and named the settlement Fort Daer. When Major Stephen H. Long, commanding an exploring expedition to the Minnesota and Red rivers, reached Fort Daer in 1823, he found there about six hundred persons, a few being Scotch,

but the greater part being half-breeds.

North Dakota formed part of the region ceded by France to the United States by the Louisiana Purchase in 1803. From 1803 to 1805 it was included in the District of Louisiana, and from 1805 to 181 2 it was a part of the Louisiana Territory, the name of which was changed to Missouri Territory in 181 2. In 1834

1 There seems to be no good authority for the statement often made that the first settlement in North Dakota was made by French Canadians in 1780.

that part of the present state E. of the Missouri river was included in the newly organized Territory of Michigan, and became successively a part of Wisconsin Territory in 1836, of Iowa Territory in 1838, and of Minnesota Territory in 1849. In 1854 the Territory of Nebraska was organized from a portion of the Missouri Territory, and the part of the Dakotas W. of the Missouri, then locally called ” Mandan Territory,” was included in its limits. After Minnesota entered the Union, in 1858, the country between the Red arid the Missouri rivers had no Territorial government for three years, but the inhabitants formed a provisional government, On the 2nd of March 1861 the Territory of Dakota was created, including the present Dakotas and portions of Wyoming and Montana. The seat of the Territorial government was fixed at Yankton, and remained there until 1883, when it -was removed to Bismarck. The name of the Territory was derived from the Dakota Indians; the word ” Dah-ko-ta ” (signifying ” allied ” or ” confederated “), being originally applied to the Sioux Confederation. In 1863 when Idaho Territory was formed, the boundaries of the Dakotas were fixed at practically their present limits. The boundary between Dakota Territory and Nebraska was slightly altered in 1870 and 1882. The Territory had hardly been organized before its settlement was impeded by the Civil War without and by Indian troubles within. In 1862 the Indians began a series of bloody massacres along the frontiers of Minnesota and Dakota. In the following year General Alfred Sully (1821-1879), command- ing United States troops, marched up the Missouri river as far as Bismarck, and thence to the valley of the James river. On the 3rd of September 1863 with 1200 men he routed 2000 Sioux near the present town of Ellendale, in Dickey county, in an engagement called the battle of White Stone Hills. Four hundred warriors were slain, and a great number were captured. In 1864 Sully defeated the Sioux at the battle of Takaakwta, or Deer Woods, on the Knife river, and a few days later he again encountered them, and after a desperate struggle of three days administered a crushing defeat; the warriors abandoned

their provisions and escaped into the Bad Lands. The Indians still remained hostile, however, and in 1865 Sully found it necessary to conduct his troops N. as far as Devils Lake, and thence W. to the Cannon Ball river. By these opera- tions the Indian frontier was fixed W. of the Missouri river, and forts and garrisons were placed along this stream. The worst of the Indian troubles in northern Dakota were then at an end, though for many years there were occasional outbreaks.

A period of rapid development in the Red river basin followed the entrance of the Northern Pacific railway into this region in 1 87 2. At the election in November 1887 the question of the division of the Territory into two states at the ” seventh standard parallel ” was submitted to the people, and was carried at the polls. In accordance with the Enabling Act, which received the president’s approval on the 22nd of February 1889, a constitutional con- vention met at Bismarck on the 4th of July following, and drafted a frame of government for the state of North Dakota. In October this was ratified at the polls. The chief interest in the election turned on the prohibition clause in the constitution, which was submitted separately, and received a majority of only 1159 votes. On the 2nd of November 1889 President Harrison issued a proclamation declaring North Dakota a state. By an agreement between North and South Dakota, embodied in their constitutions, each state assumed the debt created for the erection of public buildings within its limits during the Territorial period.

In the development of the state since its admission into the Union the railways have been an important factor. In 1894 they inaugurated the so-called ” concentration movement,” and began to conduct annual excursions into North Dakota, thus bringing into the state thousands of immigrants. They have also adopted the policy of selecting favourable town-sites on the uninhabited prairie, erecting grain elevators at such points, and furnishing transportation facilities by means of branch roads tapping the main lines of travel. Under this system I prosperous towns and villages, have sprung up among the prairies

century and other interesting monuments. The nave and chancel have undergone modern restoration. Huggens College, with residences for impoverished ladies, was established in 1847 by John Huggens of Sittingbourne. Besides chemical manufactures, there are chalk, lime,

cement and brick works and a ship- building yard. Swanscombe almost adjoins Northfleet on the south-west. Its name is said to be derived from a camp formed here by the Danish king, Sweyn, and tradition fixes at this spot the meeting between William the Conqueror and the men of Kent, to whom was confirmed the possession of all their ancient laws and privileges.

NORTH HOLLAND, a province of the kingdom of Holland, lying between the North Sea and the Zuider Zee, and on the landward side bounded by the provinces of South Holland and Utrecht. Pop. (1904) 1,053,083; area, 1070 sq. m. The province also includes the islands of Texel, Vlieland and Terschel- ling, belonging to the group of the Frisian Islands, as well as Wieringen, Marken and Urk in the Zuider Zee. There are three natural divisions — foreshore and sand-dunes, inner dunes and the geest grounds, and low fens and clay lands.

The dunes form the great natural barrier against the sea behind which the province lies secure. But the fact of there being no inlets of the sea is the reason of the absence of commercial towns along the sea-board, the only exception being Ymuiden, which has arisen at the mouth of the North Sea canal from Amsterdam. On the other hand the broad, gently-sloping, sandy beach is peculiarly fitted for sea-bathing, and in the absence of harbours permits the beaching of the characteristic flat-bottomed fishing boats. Petten, Egmond-on-Sea, Wyk-on-Sea and Zandvoort are fishing villages and watering-places.

In the depressions of the dunes and on the geest grounds at their foot, small woods have been planted in places, and in this sheltered strip market-gardening and horticulture are practised. Horticulture flourishes, especially along the margin of the geest grounds from about 5 m. north of Haarlem to twice that distance south, hyacinths, tulips, narcissus and crocuses being the flowers chiefly cultivated. The sight of these flowers in spring, with mile after mile of brilliant and varied colours, attracts visitors even from foreign countries. This region of the province was one of the earliest inhabited and includes the oldest towns and villages, such as Schagen, which was flourishing in the 12th century and was created into a lordship in the beginning of the 15th century for the benefit of a natural son of Count Albrecht of Holland. The castle was demolished in the 19th century, but two towers (restored in 1879) are standing. Among interest- ing places may be mentioned Alkmaar, Heilo, Egmond, Kastrikum and Beverwyk, which, like Velzen a few miles south, was granted by Charles Martel to Willebrord, the apostle of the Frisians, in the first half of the 8th century. The name is a corruption of Bedevaartswyk, ” the village on the pilgrims’ road,” and refers to the pilgrimages once made to the

church of St Agatha in the neighbourhood. Brederode, another ancient village, was the seat of the illustrious family of the same name. The remains of the castle are extensive. Other ancient towns are Zandpoort, Bakenes, Haarlem and Bennebroek, once the seat of a nunnery removed hither from Egmond by Dirk II. in the 10th century.

The third division of the province comprises by far the largest area, that, namely, which lies at or below sea-level. The reclama- tion of land which has been effected here is noteworthy. The whole of the lakes to the north of the former Y, including the famous Purmer and Beemster lakes, and the Wieringerwaard and Zype sea-polders, were drained in the beginning of the 17th century; but the Waard-en-Groet, the Anna Paulowna and the Koegras sea-polders to the north of these, were only added to the mainland in the first half of the 19th century. This region is traversed by the North Holland canal (1819-1825), between Amsterdam and the naval station of den H elder. The Y, which was formerly an inlet of the Zuider Zee, was drained, and the North Sea ship canal was formed in its stead (1865-1876), and carried through the dunes to Ymuiden. Of the drained lakes south of the former Y, the most important is the Haarlem Lake. The landscape in this division of the province is the most typical

of Holland; green meadows stretching as far as the eye can see, dotted with windmills and cattle, and slashed by the regular lines of the drainage canals, bordered with pollarded willows.

As in Friesland, cattle-rearing and the making of cheese, chiefly of the Edam description, are the main industries, but agriculture and even a little market-gardening are also practised in the heavier clay lands, such as the Y and Anna Paulowna polders. Purmerend, Alkmaar and Enkhuizen are the chief market centres. Though the country is naturally poor in minerals, springs containing iron have been discovered, such as the Wilhelminabron at Haarlem. The security of the Zuider Zee for trade and fishing purposes was the first factor in the com- mercial development of North Holland, and the cities of Medemblik, Enkhuizen, Hoorn, Edam and Monnikendam, though now little more than market centres for the surrounding district, possessed a large foreign commerce in the 16th and 17th centuries. This prosperity finally concentrated itself upon the Y (that is, upon Amsterdam) and the series of industrial villages situated on its offshoot the Zaam, of which Zaandam and Wormerveer are the most important.

NORTHINGTON, ROBERT HENLEY, ist Earl of (c. 1708- 1772), lord chancellor of England, was the second son of Anthony Henley, a

member of a well-to-do family in Hampshire, who was a Whig member of parliament, and a well-known wit and writer. Robert was educated at Westminster school and St John's College, Oxford; and after gaining a fellowship at All Souls he was called to the bar in 1732. In 1747 he was elected member of parliament for Bath, of which borough he became recorder in 1 7 51. He acquired a lucrative practice at the bar, and in 1756 was appointed attorney-general. In the following year he was promoted to the office of lord keeper of the great seal, being the last person so designated. For three years Henley, though still a commoner, presided over the House of Lords in virtue of his office; but in 1760 he was created Baron Henley of Grainge in the county of Southampton. The delay in raising him to the peerage was due to the hostility of George II., who resented Henley's former support of the prince of Wales's faction, known as the Leicester House party ; and it was in order that he might preside as lord high steward at the trial of Earl Ferrers for murder in 1 760 that he then received his patent. On the accession of George III. the office of lord chancellor was conferred on Henley, and in 1764 he was created Viscount Henley and ear] of Northington. In 1765 he presided at the trial of Lord Byron for killing William Chaworth in a duel. Northington, who was a member of the group known as " the king's friends," was instrumental in procuring the dismissal of the marquess of Rockingham and the recall of Pitt to office in 1766, and he himself joined the government as lord president of the council, Lord Camden becoming chancellor. He resigned office in 1767, and died at his residence in Hampshire on the 14th of January 1772. He married, in 1743, Jane, daughter of Sir John Huband of Ipsley, Warwickshire, by whom he had three sons and five daughters. His youngest daughter, Elizabeth, married Morton Eden, who in 1799 was created Baron Henley in the peerage of Ireland; and her grandson, the 3rd Baron Henley of this creation, was in 1885 created earl of Northington.

Lord Chancellor Northington was in his youth a man of convivial and boisterous manners, much addicted to swearing. Horace Walpole commented on his undignified bearing at the trial of Lord Ferrers; but Lord Eldon considered him " a great lawyer, "and his integrity was unquestioned. His notes of cases tried by himself in the Court of Chancery were published in two volumes in 1818.

Robert Henley, 2nd earl of Northington (1 747-1 786), only surviving son of the lord chancellor, was appointed a teller of the exchequer in 1763, and lord lieutenant of Ireland in 1783, an office which he administered in a spirit of concession to popular claims in Ireland, encouraging native industries and public economy, by which he made himself beloved by the Irish people. He resigned in 1784, and died

unmarried on the 5th of July 1786, when the titles granted to his father became extinct.

See Lord Henley, Memoir of Robert Henley, Earl of Northington (London, 1831); Campbell's Lives of the Chancellors; Foss's Judges of England; Horace Walpole's Memoirs. ,.-

NORTH SEA, a sea bounded E. by the continent of Europe and W. by Great Britain. At its southern end it communicates by the narrow Strait of Dover with the English Channel, and so with the Atlantic, and towards the north it widens out gradually to 345 m. between St Abb's Head and the coast of Denmark, and narrows again to 270 m. between Duncansby Head and the coast of Norway. To the north of Scotland it communicates with the Atlantic westwards by the Pentland Firth and the channel between the Orkney and Shetland Islands, and northwards with the Norwegian Sea.

Its total area is given by Murray as 162,600 sq. m., and by Kriimmel as 571,910 sq. km., or 220,820 sq. statute m. Murray estimates the volume of the North Sea at 11,200 cub. relief m > anc ˆ Krummel at 53,730 cub. km. or 12,890 cub. m., giving mean depths of 61 and 48 fathoms respect ively. The North Sea is thus on the whole shallow; its bed is part of the continental shelf on which the British Isles stand, and it slopes upwards with fair regularity from north to south. In the south and east there is a broad coastal strip over which the depth nowhere exceeds 20 fathoms, and the whole south-eastern part of the area is less than 30 fathoms deep. In about its middle latitude the Dogger Bank crosses the North Sea from east to west, extending for about one-third of the whole distance; near the English coast the depth here is under 10 fathoms and it increases eastwards to about 20 fathoms. South of the Dogger there are local depressions, mostly of small area, in which the depth is as much as 45 fathoms, as in the "Silver Pit." Krummel points out that a line drawn from the northern edge of the Dogger to the middle of the Skagerrack constitutes a rough boundary of the shallow southern basin, the depth increasing very slowly beyond this line to the " Norwegian Channel " — a deep gully closely following the Scandinavian coast, and extending into the Skagerrack, in which the depth increases to as much as 400 fathoms.

According to Jukes-Browne, the North Sea, in its present form, first took shape as a result of the tectonic movements indicated „. by the

break between the older and newer Pliocene

deposits. The southern end of the North Sea was probably little affected by the general subsidence which occurred during the Glacial period; its boundary in this direction was apparently within the present land area of France and Belgium, while a narrow inlet may have run westwards between France and England in the present position of the Strait of Dover. Meanwhile immense quantities of ice detritus from Scotland and Scandinavia were deposited in the North Sea, to a thickness of perhaps 600 ft., and the whole region was subsequently raised above sea-level, constituting the ” structural surface ” upon which the present river system was developed as a series of tributaries to a great river which formed a continuation of the Rhine. Finally the land subsided again, the plain of the North Sea was again submerged, and the western inlet of Pleistocene times became the Strait of Dover.

For reasons which will be sufficiently obvious from the historical sketch just given, the coasts of the southern part of the North Sea are of no great height. In England they consist of low cliffs with sandy beaches, while on the con- tinental side are immense flats and marshes, with parts below sea-level protected by sand-dunes and artificial dykes. Suess has shown that no evidence is forthcoming of tectonic movement since the Bronze Age, and the rapid changes of coast-line now taking place in many parts are therefore wholly due to the action of the sea, which is probably specially effective on account of the relatively recent opening of the Strait of Dover. The erosion of the North Sea coasts has been made a subject of minute study (in England especially by the British Association and a committee of the Royal Geographical Society), and Harmer has obtained interesting results by comparing the British and Continental coasts as characteristic ” weather ” and ” lee ” shores.

The physical conditions of the waters of the North Sea have been extensively studied by expeditions sent out by the Swedish, Norwegian, Danish, German and British governments; and since

Coasts.

1902 by the International Council for the Study of the Sea, which owes its origin mainly to the work of the earlier expedi- tions. Professor Pettersson of Stockholm, to whose initiative much of this work is due, classifies the t/0D> waters found in the North Sea as follows: (1) oceanic water of 35 pro mille salinity or more; (2) water of salinity 34 to 35 pro mille, called ” North Sea ” water; (3) water of

salinity 32 to 34 pro mille, found along the coasts of Holland, Germany, Denmark, and Norway, and called ” bank- water “; (4) water of 32 pro mille salinity or less, belonging to the stream flowing out from the Baltic. Of these (1) and (4) are to be regarded as ” in-flowing ” waters, while the others arc due to mixture, which may or may not take place in the North Sea itself. The oceanic water consists of a mixture of waters of Atlantic and Polar origin; it enters the North Sea from the north- west partly from the Norwegian sea, and partly from the Faewe channel by the passage between the Orkney and Shetland islands, and makes its way southwards along the coast of Scotland, especially during the early summer months.

The International Council, and more particularly the North Sea Fisheries Investigation Committee of the Fishery Board for Scotland, have studied the periodic and irregular variations in the distribution of these waters in minute detail; and the results, extending and confirming the observations of the earlier observers, have established the conclusion that the supply of fresher coastal waters from the land on both sides of the North Sea is greatest in late summer, after the occurrence of the maximum inflow of oceanic water. The autumn and early winter months accordingly represent a period of mixing rather than of inflow, and this mixing is clearly an extremely complicated process, depending on the relative amounts of the mixing waters (which are themselves liable to great variation), on their tempera- ture and salinity, and also on the action of winds and tides. In the southern part of the North Sea area tidal action alone is sufficiently vigorous to ensure complete mixing of the waters from surface to bottom at all times.

The tides of the North Sea are of great complexity, and have not been fully investigated. The tidal wave of the Atlantic enters by the Strait of Dover and by the channels in the north. In the latter place a division into two parts takes place, one wave travelling southwards along the coast of Scotland in comparatively shallow water, while another moves with greater speed across the deeper water to the Norwegian Channel, and thence southwards to the Skagerrack and the Danish coast. The southwards-moving waves are greatly retarded in the shallow water over the Dogger Bank; the trough of the ” Silver Pit ” accordingly gives the Scottish wave a strong easterly component, and the three systems — the Scottish, Norwegian and Channel waves — meet to the east of the Dogger; producing complicated interference phenomena. Along the English coasts the tidal streams are for the most part normal, the flood stream running south to south-east and the ebb north to north-west, but on the Continental coast the movements become very complex on account of the varying influence

of the waves from different sources.

The North Sea is particularly rich in organisms of all kinds, and the abundance of food attracts fish in such quantities that the North Sea fisheries are the most productive in Fauna. the world. Flat fishes, and those feeding at the bottom on smooth ground, are chiefly caught by means of the trawl. The favourite trawling-grounds are the Dogger Bank in winter, and the shallow waters off the Continental coasts in summer; these yield halibut, soles, turbot, brill, plaice, cod, haddock, whiting, &c. In rough ground where the trawl cannot be used, hook- and line-fishing are carried on most success- fully, and ” mid- water “fish are also taken in this way, although the trawl and line-fishing overlap considerably. Herring and mackerel are caught by means of drift-nets. The herring fishing off the British coasts exhibits a remarkable variation during summer and autumn, beginning in Shetland in June, and becoming progressively later southwards, until it ends off the Norfolk coast in November. Various attempts have

been made to connect this succession with the physical changes already described, especially with the periodic influx of Atlantic water, but no very definite relation has been established.

Authorities. — Kriimmel and Boguslawski, Ozeano graphic; O Pettersson, various papers in the Svenska Vetenskaps-Akademie Handlingar, also in Scottish Geographical Magazine (1894) an d the Geographical Journal; H. N. Dickson, Journal of the Scottish Meteorological Society, third series, vol. viii. p. 332; Twelfth Report of the Fishery Board for Scotland, pt. iii. p. 336; Fifteenth Report of the Fishery Board for Scotland, pt. iii. p. 280; Geographical Journal (March 1896); and Quarterly Journal of the Royal Meteorological Society, No. 112 (1899); T. Wemyss Fulton, Fifteenth Report of the Fishery Board for Scotland, pt. iii. p. 334; papers by J. T. Cunningham, W. Garstang and others in the Journal of the Marine Biological Association, various years; International Council for the Study of the Sea, and North Sea Fisheries Investigation Committee of the Fishery Boards for Scotland, Reports and occasional papers.

(H. N. D.)

NORTH SEA FISHERIES CONVENTION. This convention, dated May

6th, 1882, was the result of a conference which was held for the purpose of regulating the police of the fisheries in the North Sea. It was entered into by Great Britain, Germany, Denmark, Holland, Belgium and France for a period of five years and was thereafter to run on until notice of intention to terminate it, such notice to affect only the power giving it. The convention is operative only outside the thtee-mile limit from land. This limit is defined as follows: —

” The fishermen of each country shall enjoy the exclusive right of fishery within the distance of 3 m. from low-water mark along the whole extent of the coasts of their respective countries, as well as of the dependent islands and banks. As regards bays, the distance of 3 m. shall be measured from a straight line drawn across the bay, in the part nearest the entrance, at the first point where the width docs not exceed 10 m. The present article shall not in any way prejudice the freedom of navigation and anchorage in territorial waters accorded to fishing boats, provided they conform to the special police regulations enacted by the powers to whom the shore belongs.”

Under the Herring Fishery (Scotland) Act 1889, the Scottish Fishery Board was empowered by by-law to forbid beam- trawling and otter-trawling within a line drawn from Duncansby Head to Rattras Point. Acting under this power, it forbade these methods of trawling. This gave rise to litigation on the question of whether the prohibition applied to non-British ships beyond the three-mile limit (see Mortensen v. Peters, July 20th, 1906). The high Court of Justiciary in Edinburgh held that ii was not incumbent on the court to draw a distinction between foreigners and British subjects which had not been made by the legislature, and that therefore any infringements of general restrictions imposed, although outside the three-mile limit, were binding, whatever the nationality of the persons committing them. Outside the limits of territorial waters British law, however, does not apply. Thus a later act, the Sea Fisheries Regulation (Scotland) Act 1895, though it provided for the imposition of restrictions on certain methods of sea-fishing outside the limits of territorial waters (s. 8), constructively admitted that no power could be given to apply it to non-British fishermen fishing beyond British territorial waters. A provision of the act empowered the Scottish Fishery Board by by-laws to forbid these methods of fishing within 13 m. of the Scottish coast, but added that ” no area of sea within the said limit of 13 m. shall be deemed to be under the jurisdiction of her majesty for the purposes of this section unless the powers conferred thereby shall have been accepted as binding upon their own subjects with respect to such area by all the States signatories of the North Sea Convention 1882.”

A supplementary convention was signed at the Hague, November 16th, 1887, among the same High Contracting Parties, relating to the liquor traffic in the North Sea. It applies to the area set out in art. 4 of the Convention of May 6th, 1882, and forbids the sale of spirituous liquors within it to persons on board fishing vessels. A reciprocal right of visit and search is granted under this convention to the cruisers entrusted with the carrying out of its provisions. (T. Ba.)

NORTH SHIELDS, a seaport of Northumberland, England, within the municipal and parliamentary borough of Tynemouth (q.v. for history, &c). The town of that name adjoins it on the E.

It lies on the N. bank of the Tyne, immediately above its mouth, and opposite to South Shields in Durham, -j\ m. E. of Newcastle by a branch of the North Eastern railway. It is a town of modern growth, and contains the municipal offices of the borough, a custom-house and various benevolent institutions for seamen. The harbour is enclosed by north and south piers, and there is a depth of 29 ft. at spring-tides besides the quays. Coal and coke are largely exported, and corn, timber and esparto grass are imported. There is an extensive fish quay, and about 14,000 tons of fish are landed annually. There are engineering, iron, salt and earthenware works, and some shipbuilding is carried on.

NORTH SYDNEY, a municipality in the county of Cumberland, New South Wales, Australia, on the N. shore of Port Jackson. Pop. (1901) 22,050. It is a rapidly growing town, immediately opposite and suburban to the city of Sydney, with which, however, the only connexion is by steam ferry. It is the terminus of a railway system serving the district N. of the town.

NORTH TONA WANDA, a city of Niagara county, New York, U.S.A., on the N. side and at the mouth of Tonawanda Creek (opposite Tonawanda), and on the Niagara river, about 14 m. N. of Buffalo. Pop. (1910 census) 11,955. It is served by the Erie, the Wabash, the Lehigh Valley, the West Shore, and the New York Central & Hudson River railways, by three interurban electric lines and by the Erie Canal. Electric power for its factories is furnished by Niagara Falls. In 1905 the value of its factory product was $6,499,312. The water-supply comes from the Niagara river. North Tonawanda was first settled as a part of Tonawanda in 1809; it became a part of Wheatfield township in 1857; was incorporated as a village in 1865, and chartered as a city in 1897. In 1825 Major Mordecai Manuel Noah (1 785-1851), a New York journalist and politician of Portuguese Jewish descent, attempted unsuccessfully to found on Grand Island (area 27 sq. m.; pop. (1910)

914), Erie county, W. of North Tonawanda, the city of Ararat, a temporary refuge for Jews, who should return thence to the Holy Land.

See L. F. Allen in Publications of the Buffalo Historical Society, vol. i. (1879), pp. 305 sqq.

NORTHUMBERLAND, EARLS AND DUKES OF. The

earldom, and later the dukedom, of Northumberland, famous in English history by its connexion with the noble house of Percy (q.v.) is to be traced from an origin anterior to a strictly regu- lated system of peerage. The Saxon kingdom of Northumbria embraced a far more extensive territory than the modern county of Northumberland; and for at least a century after the Norman Conquest Northumberland, as the name imports, comprised a great portion of the country north of the Humber, including the cities of Durham and of York. The geographical position of this territory, contiguous with the kingdom of Scotland, conferred vast responsibility as well as power on the earl or governor to whom its administration was entrusted; and it appears to have been the policy of William the Conqueror and his immediate successors to acknowledge the rights of the men who, though sometimes spoken of as earls, were in no strict sense members of the feudal nobility created by the Norman monarchy. William the Conqueror found Northumberland in the possession of Morcar, a younger son of Algar, the Saxon earl of Mercia, who on giving in his submission was confirmed in the government of the district, but was soon afterwards imprisoned for rebellion, and was replaced by Copsi, an uncle of Morcar's predecessor, Tostig. Copsi was murdered a few weeks after receiving the dignity, and the same fate befell several of his successors; those who escaped it being not infrequently deprived of the post for rebellion or incapacity. Henry, earl of Huntingdon, only son of David I., king of Scotland, was made governor of Northumber- land in 1 139, and was styled " earl of Northumberland " by the contemporary chronicler Roger of Hoveden. It was not for a long period, however, that the earldom of Northumberland came into existence as a title of honour heritable according to peerage law. Ever since the Conquest the house of Percy (q.v.) had been growing in power and importance, and at the coronation of Richard II. in 1377 Henry de Percy, 4th Baron Percy, who had distinguished himself in the French wars, officiated as marshal of England, and

was then created earl of Northumberland. With his son Sir Henry Percy, the celebrated ” Hotspur, ” the earl played a leading part in the turbulent history of the period, especially in bringing About the deposition of Richard II. and the accession of Henry IV. The quarrel of Northumberland and his son with King Henry over the ransom of their Scottish prisoners taken at Homildon Hill on the 14th of September 1402 has been im- mortalized by Shakespeare; and in consequence of their re- bellion all the earl’s honours were forfeited in 1406. He was not himself present at the battle of Shrewsbury in July 1403, when Hotspur was killed, but he was slain, heading a fresh rebellion, at Bramham Moor on the 19th of February 1408.

The 1st earl of Northumberland was succeeded by his grandson, Hotspur’s son, Henry (c. 1394-1455), who was restored to the earldom and the estates of the Perries in 1414 and was killed at the battle of St Albans in May 1455. The title then descended in the male line till the death of the 6th earl in 1537. During the Wars of the Roses the Perries took the Lancastrian side, which led to the attainder of Henry the 3rd earl (1421-1461) during the time of the Yorkist triumph, his forfeited title being conferred in 1464 by Edward IV. on John Neville, Lord Montagu (see the separate article below), by a patent which was cancelled a few years later. The earldom, together with the barony of Poynings which his father had obtained by marriage, was restored in 1473 to Henry Percy, son of the 3rd earl, who attached himself to Edward IV., acquiesced in the accession of Richard III., and submitted to Henry VII., by whom he was received into favour. His grandson Henry, the 6th earl (c. 1502-1537), left no direct heir, and the latter’s nephew, Thomas Percy, was debarred from the succession by an attainder passed on his father for his participation in the Pilgrimage of Grace. In 1549, however, Thomas was restored in blood, and in 1557 he became by a new creation earl of Northumberland, 7th of his line. Meantime, in 1551, John Dudley, earl of Warwick, was created duke of Northumberland (see the separate article below), his title being, however, forfeited by attainder in 1553.

The earldom restored to the house of Percy by the creation of 1557 continued without interruption in the male line till 1670. The 7th earl was beheaded in 1572 for sharing in a conspiracy in which he was joined by the earl of Westmorland with the object of securing the release of Mary Queen of Scots and the free exercise of the Catholic religion. By the earl’s attainder the baronies of Percy and of Poynings and the earldom of Northumberland of the older creation were forfeited, but owing to a clause in the patent the newer earldom of Northumber- land and the other honours conferred in 1557 passed to his brother Henry (c. 1532-1585), who, however, is usually known as

the 8th and not the 2nd earl.

Henry's grandson, Algernon Percy, 10th earl of Northumber- land (1602-1668), son of Henry the 9th earl (1564-1632), became a peer in his father's lifetime as Baron Percy in 1626. During the years immediately preceding the Civil War he served as an admiral, making earnest but unsuccessful efforts to reform the navy, and in 1637 he was made lord high admiral of England. In 1639 Charles I. appointed him general of the forces north of the Trent, and a member of the council of regency. North- umberland played a distinguished and honourable part in the troubled times of the Civil War. He was a friend of Strafford, and gave evidence at his trial which, though favourable on the important point of bringing the Irish army to England, was on the whole damaging; and he afterwards leaned more and more towards the popular party, of which he soon became leader in the House of Lords. He was a member of the committee of safety, and later of the committee of both kingdoms; and he took an active part in the attempts to come to terms with the king, whom he visited at Oxford for that purpose in 1643 and at Uxbridge two years later. Northumberland helped to organize the new model army; and in 1646 he was entrusted by parliament with the charge of the king's younger children. He led the opposition in the House of Lords to the proposal to bring Charles I. to trial, and during the Commonwealth he took no part in public affairs. At the Restoration he was called

to the privy council by Charles II., and with his habitual modera- tion he deprecated harsh proceedings against the regicides. His second wife, Elizabeth (d. 1705), daughter of Theophilus Howard, 2nd earl of Suffolk, brought him Northumberland House in the Strand, London, which was demolished in 1874 to make room for Northumberland Avenue. On the death of his son Joceline, the nth earl, in 1670, the male line became extinct.

George Fitzroy (1665-1716), third son of Barbara, duchess of Cleveland, the wife of Roger Palmer, earl of Castlemaine, by King Charles II., was created by his father earl of Northumber- land in 1674, and duke in 1683. This second dukedom of Northumberland became extinct on his death at Epsom on the 3rd of July 1716.

Meanwhile Elizabeth Percy, daughter of Joceline, the nth earl, had married Charles Seymour, 6th duke of Somerset; and her son Algernon, the 7th duke, was in 1749 created Baron Warkworth and earl of Northumberland, with remainder to his son-in-law, Sir Hugh Smithson, Bart., son of Langdale Smithson of Langdale, Yorkshire. Sir Hugh Smithson (c. 1714- 1786) took the name and arms of Percy on

inheriting the earldom in 1750; in 1766 he was created Earl Percy and duke of North- umberland, and in 1784 he was further created Baron Lovaine of Alnwick, with special remainder to his second son, Lord Algernon Percy. He took a somewhat prominent part in politics as a follower of Lord Bute, and was one of George III.'s confi- dential advisers, holding the office of lord-lieutenant of Ireland from 1763 to 1765, and that of master of the horse from 1778 to 1780. He was a man of cultivated tastes, and spent large sums of money in repairing and improving Alnwick Castle and his other residences. His wife, Elizabeth (1716-1776), who was a prominent figure in society, inherited in her own right her father's barony of Percy. The duke was succeeded by his eldest son Hugh; and his second son Algernon, Lord Lovaine, was created earl of Beverley in 1790.

Hugh, 2nd duke of this line (1742-1817), first inherited his mother's barony of Percy. He was present at the battle of Minden, and although in parliament, where he was member for Westminster from 1763 to 1776, he had opposed the policy that led to the American war, he proceeded to Boston in 1774 as colonel commanding the 5th Fusiliers, a regiment that has since then been known as the Northumberland Fusiliers. His generosity to his men made him exceedingly popular in the army; he became a general in 1 793 , and after succeeding to the dukedom in 1786 he exercised considerable influence in politics, though he never obtained office. His son Hugh, 3rd duke (1785-1847), was lord-lieutenant of Ireland in 1829-1830, when the Catholic Emancipation Act was passed, and was pronounced by Sir Robert Peel " the best chief governor that ever presided over the affairs of Ireland." Both he and his brother Algernon, 4th duke (1792-1865), who was created Baron Prudhoe in 1816, died without issue; the barony of Percy devolved on their great-nephew, the duke of Atholl, and the dukedom passed to George (1778-1867), eldest son of Algernon, 1st earl of Beverley, and so to his son, the 6th duke (1810-1899), and grandson, the 7th duke (b. 1846), who married the daughter of the 8th duke of Argyll. The 7th duke's eldest son, Earl Percy (1871-1910), seemed destined to take a great place in public life when he was prematurely cut off; he had a distinguished career at Oxford and from 1895 in the House of Commons, being under-secretary for India in 1 902-1 903 and under-secretary for foreign affairs in 1903-1905.

See Edward Barrington de Fonblanque, The House of Percy (2 vols., London, 1887); G. E- C(okayne), Complete Peerage, vol. vi. (London, 1895).

NORTHUMBERLAND, JOHN DUDLEY, Viscount Lisle, Earl of

Warwick, and Duke of (c. 1502-1553), was the eldest son of Henry VII. ‘s extortionate minister, Edmund Dudley (q.v.), by his second wife Elizabeth, daughter of Edward Grey, Viscount Lisle, and co-heiress of her brother John, Viscount Lisle. He was probably descended from the old baronial house of Sutton alias Dudley; but his father’s attainder and execution

in 1509 clouded his prospects. His mother, however, married as her second husband in 1511 Arthur Plantagenet, the illegiti- mate son of Edward IV., who in 1523 was created Viscount Lisle in his wife’s right; and Lisle’s rise in Henry VIII. ‘s favour brought young Dudley into prominence. In 15T2 he was restored in blood and in 1538 he was made deputy to his step- father, who was governor of Calais, and he does not appear to have suffered by Lisle’s temporary disgrace and imprisonment in the Tower. Lisle died early in 1542 and Dudley was created Viscount Lisle on the 12th of March and was made warden of the Scottish marches in November, and lord high admiral of England in 1543 in succession to his future rival, Edward Seymour, earl of Hertford. He was also created a knight of the garter and sworn of the privy council on the 23rd of April 1543. In 1544 he accompanied Hertford to the capture and burning of Edinburgh. On the capture of Boulogne in September Lisle was given command of the town and of the Boulonnais; in 1545 he directed the operations of the fleet in the Solent which foiled the French attack on Portsmouth and the Isle of Wight; and he was sent to Paris to ratify the peace con- cluded in 1546.

Lisle had thrown in his lot with the reforming party, and he took an active share in the struggle at Henry VIII. ‘s court for control of affairs when Henry should die. Hertford and he were described by the Spanish ambassador as holding the highest places in Henry VIII. ‘s affections and as being the only noblemen of fit age and ability to carry on the government, ‘/he Howards were infuriated by the prospect, and Surrey’s hasty temper ruined their prospects. Lisle quarrelled bitterly with Bishop Gardiner, served as commissioner at Surrey’s trial, and was nominated one of the body of executors to Henry’s will from which Norfolk and Gardiner were excluded. On Henry’s death Lisle was raised to the earldom of Warwick and promoted to be lord great chamberlain of England, again in succession to Hertford, who became duke of Somerset and Protector. But he was not long content with Somerset’s superiority, though he concealed his

resentment and ambition for the time. He accompanied Somerset on his Pinkie cam- paign, and materially contributed to the winning of that victory. Nor did he exhibit any sympathy with the intrigues of the Protector's brother, Thomas Seymour, the lord high admiral; his subtler policy was to exasperate the brothers and thus weaken the influence of the house of Seymour. He took a leading part in the proceedings which brought the admiral to the block in JSarch 1549; and then used the Protector's social policy to bring about his deposition. Warwick, like most of the privy council, detested Somerset's ideas of liberty and his championship of the peasantry against the inclosure movement ; one of his own parks was ploughed up as a result of a com- mission of inquiry which Somerset appointed; and when the peasants rebelled under Kett, Warwick gladly took the command against them. His victory at Dussindale made him the hero of the landed gentry, and as soon as he had returned to London in September 1549, he organized the general discontent with the Protector's policy into a conspiracy. He played upon the prejudices of Protestants and Catholics alike, holding out to one the prospect of more vigorous reform and to the other hopes of a Catholic restoration, and to all gentry the promise of revenge upon the peasants.

The coalition thus created effected Somerset's deposition and imprisonment in October 1549; and the parliament which met in November carried measures of political coercion and social reaction. But the coalition split upon the religious question. Warwick threw over the Catholics and expelled them from office and from the privy council, and the hopes they entertained were rudely dashed to the ground. But it was difficult to combine coercion of the Catholics with the proscrip- tion of Somerset; the duke was therefore released early in 1550 and restored to the privy council; and his daughter was married to Warwick's son. Warwick himself assumed no position of superiority over his colleagues, and he was never made protector. But he gradually packed the council with his supporters, and

excluded his enemies from office and from access to the king. His plan was to dominate Edward's mind, and then release him from the trammels of royal minority. He abandoned the Tudor designs on Scotland, and made a peace with France in 1550 by which it recovered Boulogne and was left free to pursue its advantage in Scotland. Nor did the betrothal of Edward to Henry's daughter Elizabeth prevent the French king from intriguing to undermine English influence in Ireland. In domestic affairs Warwick pushed on the Reformation with none of the moderation shown by Somerset; and the difference between the two policies is illustrated by the change effected between the first and second Books of Common Prayer. War-

wick, however, was widely distrusted; and the more arbitrary his government grew, the more dangerous became Somerset's rivalry. A parliamentary movement had early been started for Somerset's restoration. Warwick therefore kept parliament from meeting, and the consequent lack of supplies drove him into the seizure of church plate, sale of chantry lands, and other violent financial expedients. At length he resolved to get rid of his opponent; his opposition was magnified into conspiracy, and in October 1551, after Warwick had made himself duke of Northumberland and his ally Dorset, duke of Suffolk, and had scattered other rewards among his humbler followers, Somerset was arrested, condemned by the peers on a charge of felony, and executed on the 22nd of January 1552.

Parliament was permitted, to meet on the following day, but for the next eighteen months Northumberland grew more and more unpopular. He saw that his life vˆas safe only so long as he controlled the government and prevented the administration of justice. But Edward VI. was slowly dying, and Northumber land's plot to alter the succession was his last desperate bid for life and power. Its folly was almost delirious. Edward had no legal authority to exclude Mary, and the nation was at least nine-tenths in her favour. Northumberland bullied the council and overawed London for a few days; but the rest of England was in an uproar, and as he rode out to take the field against Mary, not a soul cried " God speed." A few days later he returned as Mary's prisoner. He was tried for treason, professed himself a Catholic in the delusive hope of pardon, and was executed on the 22nd of August. He was a competent soldier and one of the subtlest intriguers in English history; but he had no principles. He was, says a contemporary French account, " de parole affable, se composant a gracieusite et doulceur, mais au dedans felon, orgueilleux, vindicatif s'il en fut jamais." The violence of his rule and of his pretended Protestantism was largely responsible for the reaction of Mary's reign. His best- known son was Robert Dudley, earl of Leicester, Queen Elizabeth's favourite.

See Letters and Papers of Henry VIII. ; State Papers, Domestic and Foreign, Edward VI. and Mary; MS. 15,888, Bibliotheque Nationale de France; G. E. C(okayne), Complete Peerage; A. F. Pollard, England under Somerset (1900), Life of Cranmer (1904) and vol. vi. of the Political History of England (1910). (A. F. P.)

NORTHUMBERLAND, JOHN NEVILLE, Earl of (c. 1430- 1471), English soldier, was the third son of Richard Neville, earl of Salisbury, and a brother of Richard Neville, earl of Warwick, the " king-maker." At the battle of Blore Heath in 1459 John Neville was taken prisoner

by the Lancastrians, although the Yorkists under his father had won the victory; he was among those who were attainted in the parliament of Coventry, and he was not released until 1460 when his own party had gained the upper hand. Just afterwards he was created Lord Montagu and was made chamberlain of the royal household. He was not present at the battle of Wakefield, when his father was taken prisoner, but he was again a captive after the second battle of St Albans in 1461. He was speedily released by Edward IV., whom he served in the north of England, being rewarded with lands and honours. In 1463 he became warden of the east marches towards Scotland, and he was responsible for the Yorkist victories at Hedgeley Moor and at Hexham in April and May 1464; after the latter battle he secured the execution of Henry Beaufort, duke of Somerset, and other captives of high station. In this year (1464) he was created earl of Northumberland, the

Perries being now crushed, and their head, Henry Percy, being in prison. Northumberland did not at first join his brother Warwick and the other Nevilles when they revolted against Edward IV., but neither did he help the king. Edward, doubt- less suspecting him, restored the earldom of Northumberland and its vast estates to Henry Percy, while John Neville's only recompense was the barren title of marquess of Montagu. At Pontefract in 1470 he and his men declared for Henry VI., a proceeding which compelled Edward IV. to fly from England, and under the restored king he regained his position as warden, but not the earldom of Northumberland. He did not attempt to resist Edward IV. when this king landed in Yorkshire in March 147 1, but he fought under Warwick at Barnet, where he was slain on the 14th of April 1471. His son George (d. 1483) was betrothed to Elizabeth, daughter of Edward IV., and was created duke of Bedford in 1470, but the marriage did not take place and he was deprived of his dukedom in 1477.

NORTHUMBERLAND, the northernmost county of England, bounded N.W. by the Scottish counties of Berwick and Rox- burgh, W. by Cumberland, S. by Durham, and E. by the North Sea. The area is 2018 sq. m. It has a general inclination eastward from the hill-borders of Scotland and Cumberland. The Cheviot range partly separates Northumberland from Scotland, and reaches in the Cheviot, its culminating point north-eastward, the greatest elevation in the county, 2676 ft. The elevation of the Cheviots rarely falls below 1300

ft. along the Border, and generally exceeds 1600. A line of high ground, bending southward, forms the watershed between the North and Irish Seas. The boundary with Cumberland crosses the low divide between the Irthing and the South Tyne, after coinciding with the former river for a short distance, and giving Northumber- land a small drainage area westward. In the south-west a small area of the Pennine uplands is included in the county, reaching elevations up to 2206 ft. in Kilhope Law. Few eminences break the general eastward incline, which appears as a wide billowing series of confluent hills that for half the year mingle tints of brown, russet, and dun in a rich pattern, and at all times communicate a fine sense of altitude and expanse. The Simonside Hills (1447 ft.) form one not very conspicuous exception. The configuration of much of these uplands has a certain linearity in its details due to groups and ranges of ridges, crags, and terrace-like tiers, termed ” edges” (escarpments) by the country folk, and generally facing the interior, like broad ends of wedges. The line of pillared crags and prow-like head- lands between the North and South Tynes along the verge of which the Romans carried their wall is a fine specimen. Passing eastwards from the uplands the moors are exchanged for enclosed grounds, ” drystone ” walls for hedgerows, and rare sprinklings of birch for a sufficiently varied wooding. The hills and moors sink to a coast generally low, a succession of sands, flat tidal rocks and slight cliffs. Its bays are edged by blown sandhills; its borders are severely wind-swept. Several islands lie over against it. Holy Island, the classic Lindisfarne, 1051 acres in extent, but half ” links ” and sandbanks, is annexed to the mainland and accessible to conveyances every tide. The Fame Islands (q.v.) are a group of rocky islets farther south.

Deep glens and valleys, scoring the uplands, and richly wooded except at their heads, are characteristic of the rivers. Of these the chief are the Tweed, forming the north-eastern part of the Scottish border, its tributary the Till (with its feeders the Glen and College), the Aln and the exquisite Coquet, flowing into Alnmouth Bay, the Wansbeck, with its tributary the Font, the Blyth and the Tyne, forming part of the boundary with Durham, the union of the North and South Tynes. Many of the upland streams attract trout-fishermen.

Geology. — The core of the county, in a geological aspect, is the northern Cheviots from Redesdale head nearly to the Tweed. Its oldest rocks are gritty and slaty beds of Silurian age, about the head of the rivers Rede and Coquet and near the Breamish south of Ingram — a part of the great Silurian mass of the southern uplands of Scotland. Volcanic activity about the period of the Old Red Sandstone resulted in the felspathic porphyrites, passing into the syenites and granites,

that form the mass of the northern Cheviots. Round this core there now lie relays of Carboniferous strata dipping

east and south, much faulted and repeated in places, but passing into Coal Measures and Magnesian Limestone in the south-eastern part of the county. The whole system consists of (1) the Carboni- ferous Limestone series in three divisions ; (2) the Millstone Grit ; and (3) the Coal Measures. Lowest in Northumberland lies Tate's Tuedian group, the first envelope of sinking Cheviot-land. Some reddish shore-like conglomerates lie in places at its base, as at Roddam Dene; its shales are often tinged with distemper greens; its coals are scarcely worthy of the name; its limestones are thin, except near Rothbury ; and its marine fossils are few. The Tuedian group is overlaid by the Carbonaceous group ; its shales are carbo- naceous-grey, its coals, though mostly small, very numerous, its limestones often plant-limestones, and its calcareous matter much diffused. Upon this lies the Calcareous group ; its lime occurs in well-individualized marine beds, cropping up to the surface in green- vested strips; its fossils are found in recurrent cycles, with the limestones and coals forming their extremes. These three groups now range round the northern Cheviots in curved belts broaden- ing southwards, and occupy nearly all the rolling ground between the Tweed and the South Tyne, the sandstones forming the chief eminences. The middle division becomes thinner and more like the Coal Measures in passing northwards, and the upper division, thinning also, loses many of its limestones. The Millstone Grit is a characterless succession of grits and shales. The Coal Measures possess the same zone-like arrangement that prevails in the Lime-stone series, but are without limestones. They also are divided, very artificially, into three groups. The lowest, from the Brockwell seam downwards, has some traces of Gannister beds, and its coal- seams are thin. The famous Hutton collection of plants was made chiefly from the roof-shales of two seams — the Bensham and the Low Main. The unique Atthey collection of fishes and Amphibia comes from the latter. The Coal Measures lie along the coast in a long triangle, of which the base, at the Tyne, is produced westwards on to the moors south of that river, where it is wedged against lower beds on the south by a fault. The strata within the triangle give signs of departing from the easterly dip_ that has brought them where they are, and along a line between its apex (near Amble) and an easterly point in its base (near Jarrow) they turn up north- eastwards, promising coal-crops under the sea.

The top of the Coal Measures is wanting. After a slight tilting of the strata and the denudation that removed it, the Permian rocks were deposited, consisting of Magnesian Limestone, a thin fish-bed below it,

and yellow sands and some red sandstone (with plants of Coal Measure species) at the base. These rocks are now all but removed. They form Tynemouth rock, and lie notched-in against the 90-fathom dyke at Cullercoates, and again are touched (the base only) at Seaton Sluice. No higher strata have been preserved. The chief faults of the county extend across it. Its igneous rocks, other than the Cheviot porphyrites and a few contemporaneous traps in the lowest Carboniferous, are all intrusive. An “irregular sheet of basalt forced between planes of bedding (perhaps at the close of the Carboniferous period) forms the crag-making line of the Great Whinsill, which, with many shifts, breaks and gaps, extends from Greenhead near Gilsland to the Kyloe Hills. Numbers of basalt dykes cross the county, and were probably connected with the plateau of Miocene volcanic rocks in the Hebrides. Every- where the Glacial period has left rocks rounded and scored, and rock- fragments from far and near rubbed up into boulder-clay. The glaciers at first held with the valleys, but as the ice-inundation grew they spread out into one sheet — the Cheviot tops, heavily ice-capped, alone rising above it. Two great currents met in con- fluence around these hills — one from across the western watershed, the other skirting the coast from the north. Boulders from Galloway, Criffel, the Lake District and other places adjacent, and from the Lammermuirs and Berwickshire, lie in their track. Of moraines there are only a few towards the hills. Glaciated shell-fragments have been detected at Tynemouth. Laminated brick clays occur among the boulder-clays. Sheets and mounds of gravel of the nature of kames exist here and there on the low grounds, and stretch in a chain over the low watershed between Haltwhistle and Gilsland, sparsely dotting also some more upland valleys. An upper boulder-clay, containing flints, skirts the coast.

The older valleys are all pre-Glacial, and may date from the Miocene period. They are much choked up with Glacial deposits, and lie so deep below the surface that, if they were cleared-out arms of the sea, one of them, 140 ft. deep at Newcastle, would extend for miles inland. After the departure of the glaciers the streams here and there wandered into new positions, and hence arises a great variety of smooth slope and rocky gorge. In the open country atmospheric waste has hollowed out the shales at their outcrops, leaving the sandstones, &c, as protruding ” edges,” roughened here and there into crags. In the lower grounds, where this surface- dissection first began, the ” edges ” have much run together; on the heights, whose turn came last, they are often prominent and crest-like, but have glacier- rounded brows. Many old tarns are now sheeted over with peat. The sloping peat-fields are often th* sites of straggling birch-woods, now buried.

Climate. — The climate is bracing and healthy, with temperate summers {e.g. the average July temperature at Alnwick is 57-9° F.). In spring east winds prevail over the whole county. The lambing

season in the higher uplands is fixed for the latter half of April, and is even then often too early. In summer and autumn west winds are general. The rainfall gradually increases as the country rises from the coast, thus the mean annual fall at Shields is 26-32 in., at Alnwick 31-04 in., while on the western borders 40 to 60 in. are recorded. East winds in summer bringj rain to the interior. The smell from the coal-field, the lighter grime of which is detected as far as Cumberland, is taken by the shepherd for a sign of wet.

Agriculture, &c. — About five-ninths of the total area is under cultivation, and of this nearly five-sevenths is in permanent pasture. There are also about 470,000 acres under hill pasture. South of the river Coquet there is a broad tract of cultivation towards the coast that sends lessening strips up the valleys into the interior. From the Coquet northwards another breadth of enclosed ground stretches almost continuously along the base of the Cheviot hills. In the basin of the Till it becomes very fertile, and towards the Tweed the two breadths unite. In the porphyritic Cheviots the lower hills show a great extent of sound surface and good grass. The average hill-farms support about one sheep to 2 acres. A coarser pasturage covers the Carboniferous hills, and the proportion of stock to surface is somewhat less. In the highest fells the congeries of bogs, hags and sandstone scars, with many acres dangerous to sheepˆ are worthless to the farmer. The lower uplands are a patchwork of coarse grasses (mown by the ” muirmen ” into ” bent-hay “) and heather, or, in the popular terms, heather and ” white ground,” for it is blanched for eight months in the year. Heather is the natural cover of the sandstones and of the sandy glacier-debris near them. On the uplands they grow bents; lower down they are apt to be cold and strong, but are much relieved by patches and inworkings of gravel, especially north of the Wansbeck. The prevalent stream-alluvium is sandy loam, with a tincture of peat. The arable regions are very variable. Changes of soil are probably as numerous as fields. The bulk of the acreage under corn crops, which has greatly diminished, is under oats and barley, and turnips occupy some five-sixths of the area under green crops. North- umberland is one of the largest sheep-rearing counties in Great Britain. Of these, the half-breds — crosses between the Leicester (or Shropshire) and

Cheviot breeds — occupy the lower enclosed grounds, the pure Cheviots are on the uplands and the hardier black-faced breeds lie out on the exposed heathery heights. The cattle are chiefly shorthorns and Galloways. They are very largely raised, chiefly for fattening purposes.

The practice of paying wages in kind has passed greatly into disuse. Some of the shepherds still receive ” stock-wages,” being allowed to keep forty or fifty sheep and several cows on their em- ployers’ farms in lieu of pay. This arrangement, which makes them really copartners, has probably done much to render them the singularly fine class of men they are.

Other Industries. — The manufactures of the county chiefly come from the Tyne, which is a region of ironworks, blast-furnaces, ship-building yards, ropeworks, coke-ovens, alkali-works and manufactories of glass, pottery and fire-bricks, from above Newcastle to the sea. Machines, appliances, conveyances and tools are the principal articles of manufacture in metal. There is great activity in all trades concerned in pit-sinking and mine-working. In the other parts of the county there are a few small cloth-mills, a manufactory of tan gloves at Hexham, some potteries and numbers of small brick and tile works. There are several sea-fishing stations, of which North Shields is by far the most important. The salmon fisheries are also valuable.

Communications. — Communications are provided almost wholly by the North-Eastern railway, of which the main line enters the county at Newcastle and runs N. by Morpeth, and near the coast, to Berwick, where a junction on the East Coast route from London to Scotland is effected with the North British railway. Numerous branch railways serve the populous south-eastern district, and there are connexions westward to Hexham and Carlisle, up the Tweed valley into Scotland and (by the North British line) up the North Tyne valley from Hexham. The principal ports besides the Tyne ports are Blyth, Amble (Warkworth Harbour), Alnmouth and Berwick. The Tyne is one of the most important centres of the coal-shipping trade in the world.

Population and Administration. — The area of the ancient county is 1,291,530 acres with a population in 1891 of 506,442, and in 1901 of 603,498. In physique the Northumbrian is stalwart and robust, and seldom corpulent. The people have mostly grey eyes, brown hair and good complexions. The inhabitants of the fishing villages appear to be Scandinavian; and parts of the county probably contain some admixture of the old Brit-Celt, and a trace of the Gipsy blood of the Faas of Yetholm. The natives have fine characteristics: they are clean, thrifty and plodding, honest and sincere, shrewd and very

independent. Their virtues lie rather in solidity than in aspiration.

Northumbrian speech is characterized by a ” rough vibration

of the soft palate” or pharynx in pronouncing the letter r, well known as the burr, a peculiarity extending to the town and liberties of Berwick, and absent only in a narrow strip along the north-west. Over the southern part of the county there is the same duplication of vowel-sounds, such as ” peol ” for ” pool,” that is found in the English counties adjacent. Many Old- English forms of speech strike the ear, such as ” to butch a beef,” i.e, to kill a bullock, and curious inversions, such as ” they not can help.” There is the Old-English distinction in the use of ” thou ” to familiars and ” ye ” to superiors.

The area of the administrative county is 1,291,515 acres. The county is divided into nine wards, answering to hundreds. Popula- tion is densest in the south-east, where the mining district and the Tyneside industrial area are situated. The municipal boroughs in this district are: Newcastle-upon-Tyne (city, county of a city and county borough; pop. 215,328), Tynemouth (county borough, 51,366), Morpeth (6158), Wallsend (20,918). In this district the following are urban districts: Amble (4428), Ashington (13,956), Bedlington (18,766), Blyth (5472), Cowpen (17,879), Cramlington (6437)1 Earsdon (9020), Gosforth (10,605), Newbiggin-by-the-Sea (2032), Newbum (12,500), Seghill (2213), Weetslade (5453)i Whitley and Monkseaton (7705), Willington Quay (7941). The remainder of the county contains the municipal borough of Berwick-upon- Tweed (13,437) an d the urban districts of Alnwick (6716), Hexham (7071) and Rothbury (1303). The county is in the north-eastern circuit, and assizes are held at Newcastle-upon-Tyne. The total number of civil parishes is 523. The ancient county, which is in the diocese of Newcastle-upon-Tyne, with the exception of a small portion in that of Durham, contains 173 ecclesiastical parishes or districts, wholly or in part. The parliamentary divisions of the county are Berwick-upon-Tweed, Hexham, Wansbeck and Tyneside, each re- turning one member; while the parliamentary borough of Newcastle- upon-Tyne returns two members, and those of Morpeth and Tynemouth one member each.

History. — The first English settlement in the kingdom of Bernicia, which included what is now Northumberland, was effected in 547 by Ida, who, accompanied by his six sons, pushed through the narrow strip of territory between the Cheviots and the sea, and set up a fortress at Bamburgh, which became the royal seat of the Saxon kings. About the end of the 6th century Bernicia was first united with the rival kingdom of Deira under the rule of ˆEthelfrith, and the district

between the Humber and the Forth became known as the kingdom of Northumbria. In 634 Cadwalla was defeated at Hefenfeld (the site of which lies in the modern parish of St John Lee) by Oswald, under whom Christianity was definitely established in Northumbria, and the bishop's see fixed at Hexham, where Bishop Wilfrid erected the famous Saxon church. Oswald also erected a church of stone at Tynemouth, which was destroyed in 865 in an incursion of the Danes under Hinguar and Hubba. The extent of Danish influence in Northumberland has been much exaggerated, however, for though in 876 Halfden, having conquered the whole of Northumbria, portioned out the lands among his followers, the permanent settlements were confined to the southern portion of the kingdom. In the northern half, which is now Northumber- land, the English princes continued to reign at Bamburgh as vassals of the Danes, and not a single place-name with the Danish suffix " by " or " thorpe " is found north of the Tyne. In 938 ˆEthelstan annexed Northumberland to his dominions, and the Danish authority was annulled until its re-establishment by Canute in 1013. The vigorous resistance of Northumbria to the Conqueror was punished by ruthless harrying. The Normans rebuilt the Saxon monasteries of Lindisfarne, Hexham and Tynemouth; Eustace Fitz John founded Alnwick Abbey, and other Norman abbeys were Brinkburn, Hulne, Blanchland and Newminster. Castles were set up at Alnwick, Warkworth, Prudhoe, Dunstanborough, Morpeth, Ford, Chillingham, Lang- ley, Newcastle, Bamburgh, Wark and Norham, a stronghold of the palatine bishops of Durham.

The term Northumberland is first used in its contracted modern sense in 1065 in an entry in the Saxon Chronicle relating to the northern rebellion. The county is not mentioned in the Domesday Survey, but the account of the issues of the county, as rendered by Odard the sheriff, is entered in the Great Roll of the Exchequer for 1131. In the reign of Edward I. the county of Northumberland was found to comprise the whole district

between the Tees and the Tweed, and to have within it the several liberties of Durham, Sadberg and Bedlington south of the Coquet, and Norham beyond the Coquet, all subject to the bishop of Durham; the liberty of Hexham belonging to the archbishop of York; that of Tynedale to the king of Scotland; that of Emildon to the earl of Lancaster; and that of Redesdale to Gilbert de Umfraville, earl of Angus. These franchises were all held exempt from the ordinary

jurisdiction of the shire. By statute of 1495-1496 the lordship of Tynedjle was annexed to Northumberland on account of flagrant abuses of the liberties of the franchise; the liberty of Hexham was annexed to North- umberland in 1572; Norhamshire, Islandshire and Bedlington- shire continued to form detached portions of Durham until 1844, when they were incorporated with Northumberland. The division into wards existed at least as early as 1295, the Hundred Roll of that year giving the wards of Coquetdale, Bamburgh, Glendale and Tynedale.

The shire-court for Northumberland was held at different times at Newcastle, Alnwick and Morpeth, until by statute of 1549 it was ordered that the court should thenceforth be held in the town and castle of Alnwick, and under the same statute the sheriffs of Northumberland, who had lately been in the habit of appropriating the issues of the county to their private use, were required to hereafter deliver in their accounts to the Exchequer in the same manner as the sheriffs of other counties. The assizes were held at Newcastle, and the itinerant justices, on their approach to the county, were met by the king of Scot- land, the archbishop of York, the bishop of Durham and the prior of Tynemouth, who pleaded their liberties either at a well called Chille near Gateshead, if the justices were proceeding from York, or, if from Cumberland, at Fourstanes. In these franchises the king's writ did not run, and their owners performed the office of sheriff and coroner. Among other Northumbrian landowners claiming privileged jurisdiction in 1293 was Robert de Quonla, who claimed that he and his men were quit of the suits of the shire and wapentake; the prior of St Mary of Carlisle claimed to exclude the king's bailiffs from executing their office in his fee of Corbridge, and that he and his men were quit of the suits of the shire and wapentake. The burgesses of Newcastle claimed return of writs in their borough, and Edmund, the brother of Edward I., claimed return of writs and exemptions from the sheriff's jurisdiction in his manor of Stamford. Newcastle was made a county by itself by Henry IV. in 1400, and has juris- diction in admiralty cases. Ecclesiastically the county was in the diocese of Durham, and in 1291 formed the archdeaconry of Northumberland, comprising the deaneries of Newcastle, Corbridge, Bamburgh and Alnwick. In 1535 the archdeaconry included the additional deanery of Morpeth. The archdeaconry of Lindisfarne was formed in 1845, and subdivided into the rural deaneries of Alnwick, Bamburgh, Morpeth, Norham and Roth- bury; the archdeaconry of Northumberland then including the deaneries of Bellingham, Corbridge, Hexham and Newcastle-upon- Tyne. In 1882 Northumberland was formed into a separate diocese with its see at Newcastle, the archdeaconries and

deaneries being unaltered. In 1885 the additional deaneries of Tynemouth and Bedlington were formed in the archdeaconry of Northumberland, and in 1900 the deanery of Glendale in the archdeaconry of Lindisfarne.

Pre-eminent among the great families connected with North-umberland is that of Percy {q.v.). Ford and Chipchase were seats of the Heron family. The Widdringtons were established at Widdrington in the reign of Henry I. and frequently filled the office of sheriff of the county. The barony of Prudhoe was granted by Henry I. to the Umfravilles, who also held the castles of Otterburn and Harbottle and the franchise of Redesdale. From the Ridleys of Willimoteswyke was descended Bishop Ridley, who was martyred in 1555. Aydon Castle was part of the barony of Hugh Baliol. The Radcliffes, who held Dilston and Cartington in the 15th century and afterwards acquired the extensive barony of Langley, became very powerful in Northumberland after the decline of the Percies, and were devoted adherents of the Stuart cause.

From the Norman Conquest until the union of England and Scotland under James I., Northumberland was the scene of perpetual inroads and devastations by the Scots. Norham, Alnwick and Wark were captured by David of Scotland in the wars of Stephen's reign, and in 1290 it was at Norham Castle that Edward I. decided the question of the Scottish succession in favour of John Baliol. In 1295 Robert de Ros and the earls of Athol and Menteith ravaged Redesdale, Coquetdale and Tynedale. In 13 14 the county was ravaged by Robert Bruce, and in 1382 by special enactment the earl of Northumberland was ordered to remain on his estates in order to protect the county from the Scots. In 1388 Henry Percy was taken prisoner and 1500 of his men slain at the battle of Otterburn, immortalized in the ballad of " Chevy Chase." Alnwick, Bamburgh and Dunstanborough were garrisoned for the Lancastrian cause in 1462, but after the Yorkist victories of Hexham and Hedgley Moor in 1464, Alnwick and Dunstanborough surrendered, and Bamburgh was taken by storm. In 1513 the king of Scotland was slain in the battle of Flodden Field on Branxton Moor. During the Civil War of the 17th century Newcastle was garrisoned for the king by the earl of Newcastle, but in 1644 it was captured by the Scots under the earl of Leven, and in 1646 Charles was led there a captive under the charge of David Leslie. Many of the chief Northumberland families were ruined in the rebellion of 1715.

The early industrial development of Northumberland was much impeded by the constant ravages of internal and border warfare, and in 1376 the commonalty of Northumberland begged consideration for

their sheriff, who, although charged £100 for the profits of the county, through death and devastation by the Scots could only raise £53, 3s. 4.d. Again Aeneas Sylvius Piccolomini (Pope Pius II.), who passed through 'the county disguised as a merchant in 1436, leaves a picture of its barbarous and desolate condition, and as late as the 17 th century, Camden, the antiquarian, describes the lands as rough and unfit for culti- vation. The mineral resources, however, appear to have been exploited to some extent from remote times. It is certain that coal was used by the Romans in Northumberland, and some coal ornaments found at Angerton have been attributed to the 7th century. In a 13th-century grant to Newminster Abbey a road for the conveyance of sea-coal from the shore about Blyth is mentioned, and the Blyth coal-field was worked throughout the 14th and 15th centuries. The coal trade on the Tyne did not exist to any extent before the 13th century, but from that period it developed rapidly, and Newcastle acquired the monopoly of the river shipping and coal-trade. Lead was exported from Newcastle in the 12th century, probably from Hexhamshire, the lead mines of which were very prosperous throughout the 16th and 17th centuries. In a charter from Richard I. to Bishop Pudsey creating him earl of Northumberland, mines of silver and iron are mentioned, and in 1240 the monks of Newminster had an iron forge at Stretton. A salt-pan is mentioned at Wark- worth in the 12th century; in the 13th century the salt industry flourished at the mouth of the river Blyth, and in the 15th century formed the principal occupation of the inhabitants of North and South Shields. In the reign of Elizabeth glass- houses were set up at Newcastle by foreign refugees, and the industry spread rapidly along the Tyne. Tanning, both of leather and of nets, was largely practised in the 13th century, and the salmon fisheries in the Tyne were famous in the reign of Henry I.

The county of Northumberland was represented by two members in the parliament of 1290, and in 1295 Bamburgh, Corbridge and Newcastle-upon-Tyne each returned two members. From 1297, however, Newcastle was the only borough repre- sented, until in 1524 Berwick acquired representation and returned two members. Morpeth returned two members from 1553. Under the Reform Act of 1832 the county returned four . members in two divisions; Berwick and Newcastle were repre- sented by two members each, and Morpeth and Tynemouth by one member each. Under the act of 1885 the county now returns four members in four divisions.

Antiquities. — Of Anglo-Saxon buildings the Danes left almost nothing. The crypt of Wilfrid's abbey of St Andrew at Hexham is one undoubted remnant; portions of several other churches are very doubtfully pre-Norman. Some thousand Saxon stycas found buried at Hexham, the " fridstool " there, and an ornate cross now shared between Rothbury and Newcastle are the other principal vestiges of Saxon times. The Black Dyke, a bank and ditch crossing the line of the Roman wall about 3 m. east of the Irthing, is supposed by some antiquaries to be the continuation of the Catrail at Peel Fell ; the latter was the probable boundary-fence between the Saxon Bernicia and the British Strathclyde.

The ecclesiastical buildings of the county suffered greatly at the hands of the Scots. Not a few of the churches were massive structures, tower-like in strength, and fit to defend on occasion. Lindisfarne Priory, the oldest monastic ruin in the country, dates from 1093. Hexham Abbey Church, raised over the crypt of Wilfrid's cathedral, has been termed a " text-book of Early English architecture." Of Brinkburn Priory the church remains, and has been well restored. Hulne Abbey was the first Carmelite monastery in Britain. Besides these there are fragments of Newminster Abbey (1139), Alnwick Abbey (1147) and others. An exquisitely graceful fragment of Tynemouth church is associated with some remains of the older priory. St Nicholas's church, Newcastle (1350), was the prototype of St Giles's, Edinburgh. There is a massive Norman church at Norham, and other Norman and Early English churches at Mitford, Bamburgh, Warkworth (with its hermitage), Alnwick (St Michael's) &c, most of them with square towers. The stone roof of the little church at Bellingham, with its heavy semicircular girders, is said to be now unique.

" It may be said of the houses of the gentry herein," writes Fuller, " ' quot mansiones, tot munitiones,' as being all castles or castle-like." Except a few dwellings of the 16th century in New- castle, and some mansions built after the Union of England and Scotland, the older houses are all castles. A survey of 1460 mentions thirty-seven castles and seventy-eight towers in Northumberland, not probably including all the bastle-houses or small peels of the yeomen. At the Conquest Bamburgh, the seat of the Saxon kings, was the only fortress north of York. Norham Castle was built in 1 12 1. None of the baronial castles are older than the time of Henry I. A grass mound represents Wark Castle. Alnwick Castle is an array of walls and towers covering about five acres. Warkworth, Prudhoe and Dunstanburgh castles are fine groups of ruins. Dilston Castle has still its romantic memories of the earl of Derwentwater. Bel- say, Haughton, Featherstone and Chipchase castles are joined with modern mansions. The peel-towers of Elsdon,

Whitton (Rothbury) and Embleton were used as fortified rectory-houses. Seaton Delaval was the work of Vanbrugh.

The place-names of the county may be viewed as its etymological antiquities. The Danish test-suffix by is absent. Saxon tons, hams, cleughs (clefts or ravines) and various patronymics are met with in great numbers; and the Gaelic knock (hill) and Cymric caer, dwr (water), cefn (ridge), bryn (brow), &c., mingle with the Saxon. Many curiosities of place-nomenclature exist, some strange, some expressive, e.g. Blink-bonny, Blaw-wearie, Skirl-naked, Pity Me.

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NORTHUMBRIA (regnum Northanhymbrorum), one of the most important of the Anglo-Saxon kingdoms, extended from the Humber to the Forth. Originally it comprised two in- dependent kingdoms, Bernicia and Deira (q.v.). Each of these had a dynasty of its own. The first known king of the former was Ida, who, according to tradition, acquired the throne in 547 and reigned twelve years. To him the foundation of Bam- burgh is attributed. Four of Ida's sons successively occupied his throne: Glappa 559-560, Adda 560-568, Aethelric 568-572, and Theodoric 572-579. Of the first three nothing is known, but Theodoric is said (Historia Britlonum) to have been besieged by the Welsh under Urien in Lindisfarne. Theodoric was succeeded by Frithuwald 579-585 or 586 and Hussa 586-592 or 593. Then.ˆthelfrith (q.v.), son of ˆthelric,came to the throne.

He greatly extended his territories at the expense of the Welsh, and eventually provoked an invasion of Aidan, king of the Scots, whom he

defeated at a place called Daegsastan (603). The first king of Deira of whom we know was Ella, or Aelle, who. according to Bede, was still reigning when Augustine arrived in 597. The Saxon Chronicle, which is a less reliable authority for North- umbrian history, places his death in the year 588. The compiler of this work, however, seems to have used a regnal list of the Bernician kings, which differed considerably from most ©f those found in our early authorities. /Ethelfrith eventually acquired possession of Deira, probably in 604 or 605, perhaps on Ella's death, expelling his son Edwin (q.v.). Thenceforward, with rare intervals, the two kingdoms remained united, ˆthelfrith became involved in war with the Welsh towards the end of his reign and captured Chester, probably about 613. Shortly after- wards, in 616, he was defeated and slain in battle on the river Idle by Edwin, who was assisted by the East Anglian king Raedwald. Edwin now became king over both Northumbrian provinces. By his time the kingdom must have reached the west coast, as he is said to have conquered the islands of Anglesea and Man. Under Edwin the Northumbrian kingdom became the chief power in the country. At his death in 633 the kingdom was again divided, Deira falling to his nephew Osric, while Bernicia was occupied by Eanfrith son of ./ Ethelfrith. Both these kings were slain by Ceadwalla in the following year, but shortly afterwards the Welsh king was overthrown by Oswald (q.v.), brother of Eanfrith, who reunited the whole of North- umbria under his sway and acquired a supremacy analogous to that previously held by Edwin. After Oswald's defeat and death at the hands of Penda in 642 Bernicia fell to his brother Oswio, while Oswine son of Osric became king in Deira, though probably subject to Oswio. Oswine's death was compassed by Oswio in 651, and the throne of Deira was then obtained by .i3£thelwald son of Oswald. He is not mentioned, however, after 655, so it is probable that Deira was incorporated in the Bernician kingdom not long afterwards. After Oswio's victory over Penda in 654-655 he annexed the northern part of Mercia to his kingdom and acquired a supremacy over the rest of England similar to that held by his predecessors. The Mercians, however, recovered their independence in 658, and from this time onward Northumbria played little part in the history of southern England. But Oswio and his son Ecgfrith greatly extended their territories towards the north and north-west, making themselves masters of the kingdoms of Strathclyde and Dalriada, as well as of a large part of the Pictish kingdom. Ecgfrith (q.v.), who succeeded on Oswio's death in 671, expelled the Mercians from Lindsey early in his reign, but was in turn defeated by them in 679, his brother ˆElfwine being slain. From this time onwards the Humber formed the boundary between the two kingdoms. In 684 we hear of the first English

invasion of Ireland, but in the following year Ecgfrith was slain and his army totally destroyed by the Picts at a place called Nech-tansmere (probably Dunnichen Moss in Forfarshire). The Picts and Britons now recovered their independence; for Aldfrith, apparently an illegitimate son of Oswio, who succeeded, made no attempt to reconquer them. He was a learned man and a patron of scholars, and during his reign the Northumbrian kingdom partially recovered its prosperity. He was succeeded in 705 by his son Osred, and under him and his successors Northumbria began rapidly to decline through the vices of its kings and the extravagance of their donations. Osred was slain in 716. He was succeeded by Coenred 716-718, and Coenred by Osric 718-729. The next king was Ceolwulf, to whom Bede dedicated his Historia Ecclesiastica in 73 1 . In the same year he was deposed and forced to become a monk, but was soon restored to the throne. In 737 he voluntarily retired to a monastery and left the kingdom to his cousin Eadberht. The latter appears to have been a vigorous ruler; in the year 740 we hear of his being involved in war with the Picts. ˆEthelbald of Mercia seems to have taken advantage of this campaign to ravage Northumbria. In 750 Eadberht is said to have annexed a large part of Ayrshire to his kingdom. Finally in 756, having now allied himself with

(Engus king of the Picts, he successfully attacked Dumbarton (Alcluith), the chief town of the Britons of Strathclyde. Ead- berht showed considerable independence in his dealings with the church, and his brother Ecgberht, to whom the well-known letter of Bede is addressed, was from 734 to 766 archbishop of York. In 758 Eadberht resigned the kingdom to his son Oswulf, and became a monk. After his abdication Northumbrian history degenerates into a record of dynastic murders. Oswulf was slain by his household at a place called Mechil Wongtun in 759. Moll ˆEthelwald, who may have been a brother of Eadberht, succeeded, and after a victory over a certain Oswine, who fell in the battle, abdicated and became a monk probably under compulsion in 765. His successor Alchred claimed descent from Ida, but Simeon of Durham appears to doubt the- truth of his claim. He sent an embassy to Charlemagne in 768 and was deposed in 774, whereupon he fled to Bamburgh and afterwards to the Picts. His deposition has been ascribed to a formal act of the Witan, but this seems an antedating of constitutional methods and the circumstances point to a palace revolution. The successor of Alchred was ˆEthelred son of Moll -Ethelwald. In 778 three high-reeves were slain at the

instigation of the king. yEthelred was expelled during the next year, perhaps in con- sequence of this event, andˆElfwald son of Oswulf became king. /Elfwald was murdered by Sicga in 789, whereupon Osred his nephew the son of Alchred succeeded. In 790 the banished ˆEthelred returned to the throne and drove out Osred, whom he put to death in 792. ˆEthelred, who had married ˆElflaed the daughter of Offa, also killed GElf and (Elfwine, the sons of (Elfwald and was murdered himself at Corbridge in 796. Oswald, who is called patricius by Simeon of Durham, succeeded, but reigned only twenty-seven days, when he was expelled and eventually became a monk. Eardwulf dux, who had apparently fled abroad to escape the wrath of ˆEthelred, was now recalled and held the crown until 807 or 808. Elfwald then became king, but Eardwulf was restored in 808 or 809 after appealing to the emperor and the pope. Earned, son of Eardwulf, probably came to the throne in 809 and reigned until 841. It was during his reign in 827 that Northumbria acknowledged the supremacy of Ecgberht, king of Wessex. Eanred was succeeded by his son yEthelred, who was slain in 850, when Osberht came to the throne and reigned until 863. On the expulsion of Osberht, Ella or jElle, succeeded. The chroniclers emphasize the fact that this king was not of royal descent. He is said to have slain Ragnarr LoSbrok. In the year 866 LoSbrok's sons Ingwaere (I'varr, q.v.), Hcalfdene, Ubba and others brought a vast army to England to avenge the death of their father. In the following year they obtained possession of York. Ella seems now to have made peace with the exiled king Osberht, and their united forces succeeded in recovering the city. In the great battle which ensued the Northumbrian army was annihilated and both kings slain (the death of Ella, according to Irish tradition, being due to the treachery of one of his followers). The southern part of Northumbria now passed entirely into the hands of the invaders, but they allowed a certain Ecgberht to reign over the portion of the kingdom north of the Tyne. Ecgberht was expelled in 872 and died in the course of the following year. His successor Ricsig died in 876 and was followed by Ecgberht II., who reigned until 878. He was the last English king who reigned in Northumbria. After him the chief power north of the Tyne came into the hands of a certain Eadulf of Bamburgh, who did not take the kingly title, but accepted the overlordship of Alfred the Great perhaps in 886. In the winter of 874-875 Healfdene returned to Northumbria, which he partitioned among his followers. He was probably killed in Ireland in 877. Simeon of Durham makes his death occur about the same time, after he had been expelled from his country and had lost his reason as a punishment for his misdeeds. After an interregnum of a few years a certain Guthred became king in 883. He is said to have been a slave and to have been appointed king at the com- mand of St

Cuthbert, who appeared to Eadred the abbot of Carlisle in a dream. There is some reason for the conjecture that he belonged to the family of LoSbrok. He died in 894,

after which date little is known of Northumbrian history for a number of years. About the year 919 the country was invaded by Raegenald (Rognvaldr grandson of I'varr), a Norwegian king from Ireland, who seized York and occupied the lands of St Cuthbert. Aldred, the son of Eadulf, who now ruled north of the Tyne, appealed to Constantine II., king of the Scots, for help, but the Scottish and Northumbrian armies were defeated at Corbridge. Shortly after this, however, all the northern princes submitted to Edward the Elder. Raegenald was succeeded by Sihtric (Sigtryggr, another grandson of I'varr), who married ˆEthelstan's sister. He died in 926, and his brother and successor Guthfrith was soon afterwards expelled by ˆEthel- stan and fled to Eugenius, king of Strathclyde. The Welsh and Scottish kings, however, both submitted to ˆEthelstan, and Guthfrith was again driven into exile. He died in 934, leaving a son Anlaf (Olafr), Godfredsson or Godfreyson. In 934 ˆEthel- stan invaded Scotland as far as the Tay. In 937 a great fleet and army were brought together by Constantine and Anlaf, the son of Sihtric, another Norwegian chieftain who had allied himself with the Scots, helped by Anlaf Godfreyson from Ireland. jEthelstan, however, won a complete victory over them at a place called Brunanburh, probably Burnswark in Dumfries- shire. Anlaf Godfreyson returned to Ireland and died in 941- 942 in a raiding expedition in the south of Scotland. Anlaf the son of Sihtric again came to England in 940 just after the death of ˆEthelstan. He became king of Northumbria and extended his territories as far as Watling Street. Peace was made with King Edmund by the capture of King Anlaf, and a good deal later by the confirmation of King Raegenald, brother to Anlaf Godfreyson and cousin to Anlaf Sihtricson. About two years later, however, both these kings were expelled by Edmund, and the whole of Northumbria was brought under his power. About the second year of Eadred's reign there was another revolt and Eric Bloodaxe, the exiled king of Norway, obtained the throne. During the next few years the kingdom alternated between Eric and Anlaf until 954, when Eadred finally succeeded in establishing his power. Eric was killed by Maccus, the son of Anlaf, while Anlaf himself withdrew to Ireland, where he died in 980. Eadred placed Northumbria in the hands of a certain Osulf, who is called high-reeve at Bamburgh. In the reign of Edgar, Oslac was appointed earl of southern Northumbria, but he was banished at the beginning of the following reign. The next earl was Waltheof and after him Uhtred, who defeated Malcolm II., king of the Scots, in 1006. Twelve years later, however, the Northumbrians

were completely defeated at Carhan, and Lothian was annexed by the Sects (see Lothian). Uhtred was slain by the orders of Canute, who gave the province to Eric (Eirikr) earl of Lade. Shortly afterwards, however, part of it at least came into the hands first of Eadulf and then Aldred and another Eadulf, the brother and sons respectively of Uhtred. The younger Eadulf was slain by Siward, probably in the reign of Hardacanute. Siward held the earldom till his death in 1055, when it was given to Tostig, son of earl Godwine, and after his banishment to Morkere, son of iElfgar, earl of Mercia. Tostig's banishment led to the invasion of Harold Hardrada, king of Norway, and the battle of Stamford Bridge, in which both perished.

Authorities. — Bede, Historia ecclesiastica, ed. C. Plummer (Oxford, 1896); Anglo-Saxon Chronicle, ed. Earle and Plummer (Oxford, 1899); " Annales Lindesfarnenses," in the Monumenta historica Germani-ca, Band xix. (Hanover, 1866); Simeon of Durham ("Rolls" series), ed. T. Arnold (1882); J. C. H. R. Steenstrup, Normannerne (Copenhagen, 1876-1882). ˆ (F. G. M. B.)

NORTH WALSHAM, a market town in the eastern parlia- mentary division of Norfolk, England; 131 m. N.E. by N. from London by the Great Eastern railway. Pop. of urban district (1901) 3981. It lies in a pastoral district near the river Ant, a tributary of the Bure. The church of St Nicholas is a fine Perpendicular structure exhibiting the flint-work common to the district, and possessing a beautiful south porch and the ruin of a massive western tower which partly collapsed early in the 1 8th century. A grammar school was founded in 1606, and reorganized and moved to new buildings in modern times. There

is a market house of the 16th century. A considerable agri- cultural trade is carried on, and cattle-shows and fairs are held. The river Ant provides a route southward to the Norfolk Broads. The coast village of Mundesley, 5 m. N.E. by a branch railway, is in favour as a watering-place, having fine sands beneath the cliffs. In the district between this and North Walsham are Paston, taking name from the family which is famous through the Paston Letters (q.v.), and the fragments of Bromholm Priory, a Cluniac foundation. These are of various dates from Norman onwards, but are incorporated with farm buildings. The rood of Bromholm was a reputed fragment of the Cross which

attracted many pilgrims. To the south of North Walsham is North Walsham Heath, whither in June 1381 a body of in- surgents in connexion with the Peasants' Revolt were driven from before Norwich by Henry le Despenser, bishop of Norwich, and defeated; after which their leader, Geoffrey Lister, and others were sent to the scaffold.

NORTH-WEST FRONTIER PROVINCE, the most northerly province of British India, created on the 25th of October 1901. Roughly it may be defined as the tract of country N. of Baluch- istan, lying between the Indus and Afghanistan. More exactly it consists of (1) the cis-Indus district of Hazara; (2) the com- paratively narrow strip between the Indus and the hills con- stituting the settled districts of Peshawar, Kohat, Bannu and Dera Ismail Khan; and (3) the rugged mountainous region between these districts and the borders of Afghanistan, which is inhabited by independent tribes. This last region is divided into five agencies: Dir, Swat and Chitral, with headquarters at Malakand; Khyber, Kurram, Tochi and Wana. The province lies between 31 4′ and 36 57′ N., and 69 16′ and 74° 7′ E. The approximate area is 38,665 sq. m., of which 13,193 sq. m. are British territory and the remainder is held by tribes under the political control of the Agent to the Governor-General. On the N. it abuts on the Hindu Kush. To the S. it is bounded by Baluchistan and Dera Ghazi Khan district of the Punjab, on the E. by Kashmir and the Punjab, and on the W. by Afghanistan.

1. Hazara District. — The district of Hazara extends north- eastwards into the outer Himalayan Range, tapering to a narrow point at the head of the Kagan valley. The mountain chains which enclose Kagan sweep southward into the broader portion of the district, throwing off well-wooded spurs which break up the country into numerous isolated glens. Approaching Rawalpindi district the hills open out, and rich plain lands take the place of the terraced hillsides and forests of the more northern uplands. The Babusar Pass at the head of the Kagan valley marks the most direct approach to Chilas and Gilgit from the plains of India. (See Hazara).

2. The Settled Districts. — The tract between the Indus and the hills consists of four open districts, Peshawar, Kohat, Bannu and Dera Ismail Khan, divided one from the other by low hills. The vale of Peshawar is for the most part highly irrigated and well wooded, presenting in the spring and autumn a picture of waving cornfields and smiling orchards framed by rugged hills. It has, however, an evil name for malarial fever. Adjoining Peshawar, and separated from it by the JoWaki hills, lies the district of Kohat, a generally hilly tract intersected by narrow valleys. The largest of these traverses the

district from Kushalgarh on the Indus to Thai on the Kurram, narrowing in places, but usually opening out into wide cornlands and pastures dotted with the dwarf palm. This district affords striking contrasts of scenery, from the sheltered fields of Miranzai to the barren desolation of the salt mines. The southern spurs of the Kohat hills gradually subside into the Bannu plain. Where irrigated from the Kurram river, especially round Bannu itself, this tract is well cultivated and forms a great contrast to the harsh desolation of the Kohat hills. But beyond the sphere of irri- gation, where the land is dependent on the rainfall, there is much rough stony ground broken by great fissures cut by flood-water from the border hills. To the east this gives way to the broad level plain of Marwat, which in favourable years presents a uniform ex- panse of rich cultivation extending from Lakki to the base of the Shekh Budin hills. These hills consist of a broken range of sandstone and conglomerate dividing the Bannu plain from the cultivated fiats of Dera Ismail Khan.

3. The Country of the Independent Tribes. — Turning to the mountainous region between the settled districts and Afghanistan, to the extreme north lies the agency of Dir, Swat and Chitral. Chitral itself consists of a narrow valley enclosed between rugged mountains. Below Chitral are found the thickly timbered forests of Dir and Bajour, and the fertile valleys of the Panjkora and Swat rivers. Between this agency and the Khyber Pass lie the Mohmand hills,

a rough country with but little cultivation, under the political control of Peshawar. West and south-west of the Khyber again is the country of the Afridis and the Orakzais. The boundary of the province here follows the line of the Safed Koh, which overlooks the Afridi Tirah and the upper Kurram valley. Dotted with towered hamlets and stately chinar groves the valley of the Kurram runs south-east from the Peiwar Kotal (below the great peak of Sikaram), past Thai in the Miranzai valley, through the southern Kohat hilla to Bannu. South of the Kurram is the Tochi valley, separating it from Waziristan, an isolated mountainous district bounded on the south by the Gomal and the gorges that lead to the Wana plain. The lower ridges of the frontier mountain system are usually bare and treeless, but here and there, as in the Kaitu valley, in northern Waziristan and round Kaniguram in the south, are forest clad and enclose narrow but fertile and well-irrigated dales. In places, too, as, for instance, round Shawal, the summer grazing ground of the Darwesh Khel Waziris, and on the slopes of Pir Ghol, there is good pasturage and a fair sprinkling of deodars. The valleys of the Tochi and Wana are both fertile, but are very different in character. The former is a long narrow valley, with a rich fringe of cultivation bordering the river; the latter is a wide open

alluvial plain, cultivated only on one side, and for the rest rough stony waste. South of the Gomal the Suliman Range culminates in the famous Takht-i- Suliman in the Largha Sherani country, a political dependency of Dera Ismail Khan district. The Kaisargarh peak of the Takht-i- Suliman is 11,300 ft. above sea-level.

Mountain Systems. — The mountains of the Hindu Kush running from east to west form the northern boundary of the province, and are met at the north-east corner of the Chitral agency by the continuation of an outer chain of the Himalayas after it crosses the Indus above the Kagan valley. From this chain minor ranges run in a south-westerly direction the whole length of Bajour and Swat, till they merge into the Mohmand hills and connect the mid-Hima- layas with the Safed Koh. The range of the Safed Koh flanks the Kurram valley and encloses the Kabul basin, which finds its outlet to the Indus through the Mohmand hills. The Suliman system lies south of the Gomal unconnected with the northern hills. To the east the Safed Koh extends its spurs into the Kohat district. The Salt Range crosses the Indus in the Mianwali tahsil of the Punjab, and forms the boundary between Bannu and Dera Ismail Khan, merging eventually in the Waziri hills. The chief peaks in the province are Kaisargarh (11,300 ft.) and Pir Ghol (11,580 ft.) in Waziristan; Shekh Budin (4516 ft.), in the small range; Sikaram (15,621 ft.) in the Safed Koh; Istragh (18,900 ft.), Kachin (22,641 ft.) and Tirach Mir (25,426 ft.), in the Hindu Kush on the northern border of the Chitral agency; while the Kagan peaks in Hazara district run from 10,000 ft. to 16,700 ft.

Rivers. — With the exception of the Kunhar river, which flows down the Kagan valley to the Jhelum, the whole drainage of the province eventually finds its way into the Indus. The Indus enters the province between tribal territory and Hazara district. After leaving Hazara it flows in a southerly direction between the Punjab and the North-West Frontier Province, till it enters Mianwali district of the Punjab, from which it emerges to form again the eastern boundary of the province. From the east it is fed by three or four rivers of Hazara district (see Indus). At Attock the Kabul river brings down to the Indus the whole drainage of Kafiristan, Chitral, Panjkora, Swat and Peshawar district (see Kabul River). The Kurram river rises in the southern slopes of the Safed Koh, and after leaving the Kurram valley passes through the Kohat hills and enters Bannu district. Three miles below Lakki it is joined by the Tochi or Gambela, which carries the drainage of North Waziristan. The Kurram then empties itself into the Indus. From this point until it leaves the province the Indus receives no tributary of any importance. The Gomal river drains a large area of central Afghan- istan and forms the most important povindah (or Kafila) route on the

frontier.

The Pathan Races. — The North-West Frontier Province as now constituted may be described as the country of the Pathans (q.v.). The true Pathan is possibly of Indian extraction. But around this nucleus have collected many tribes of foreign origin. The whole have now become blended by the adoption of a common language, but remain tribally distinct; all alike have accepted Islam, and have invented traditions of common descent which express their present association. For centuries these tribes maintained their independence in the rugged hills which flank the present kingdom of Afghanistan. In the 15th century they began to settle in the plains. The 16th century saw the Pathan tribes established in their present homes. The spirit of independence which always characterized them soon brought them into collision with the Mogul empire. In the 17th century, after a long struggle, the settlers in the plains wrested from Aurangzeb terms which left them almost as independent as their brothers in the hills. The invasion in 1738 of Nadir Shah, who traversed the province from Peshawar to Dera Ismail Khan,

is a landmark in the history of the frontier. From his death to the rise of Ranjit Singh, the frontier districts remained an appendage of the Durani empire. Little control was exercised by the rulers of Kabul, and the country was administered by local chiefs or Afghan Sirdars very much as they pleased. The Sikh invasions began in 1818, and from that date to the annexa- tion by the British government the Sikhs were steadily making themselves masters of the country. After the Second Sikh War, by the proclamation of the 29th of March 1849, the frontier districts were annexed by the British government. From that time until the creation of the North- West Frontier Province the settled districts formed part of the Punjab, while the independent tribes were controlled at different times by the Punjab govern- ment, and the government of India. Their turbulence still continued, and since 1849 they have been the object of over fifty punitive expeditions. The chief tribes, under the political control of the N.W. Frontier agency, besides Chitralis and Bajouris, are the Utman Khel, Yusafzais, Hassanzais, Mohmands, Afridis, Jowakis, Mullagoris, Orakzais, Zaimukhts, Chamkannis, Khattaks, Bangashes, Turis, Waziris, Battannis (Bhitanis) and Sheranis. These tribes are referred to under separate headings.

Creation of the Province. — The North- West Frontier Province differs

from the older provinces of India in having been artifici- ally built up out of part of a previous province together with new districts for a definite administrative purpose. The proposal to make the frontier districts into a separate province, ad- ministered by an officer of special experience, dates back to the viceroyalty of Lord Lytton, who, in a famous minute of the 22nd of April 1877, said: — ■

" I believe that our North- West Frontier presents at this moment a spectacle unique in the world; at least I know of no other spot where, after 25 years of peaceful occupation, a great civilized power has obtained so little influence over its semi-savage neighbours, and acquired so little knowledge of them, that the country within a da'y 's ride of its most important garrison is an absolute terra incognita, and that there is absolutely no security for British life a mile or two beyond our border."

The result of this minute was that a frontier commissionership, including Sind, was sanctioned by the home government, and Sir Frederick (afterwards Lord) Roberts had been designated as the first Commissioner, when the outbreak of the Second Afghan War caused the project to be postponed. It was after- wards shelved by Lord Ripon. Twenty-three years elapsed before the idea was revived and successfully brought to com- pletion by Lord Curzon, whose scheme was on a more modest scale than Lord Lytton's. It omitted Sind altogether, and con- fined the new province to the Pathan trans-Indus districts north of the Gomal. The purpose of the change was to subject all the independent tribes from Chitral to the Gomal Pass to the control of a single hand, and to ensure a firm and continuous policy in their management. The administration of the province is conducted by a chief Commissioner and Agent to the Governor- General.

Population. — In the census of 1901 the operations were extended for the first time to the Kurram Valley and the Sherani country, trans-frontier territories containing a population of 66,628 souls, which had not been previously enumerated. The military cantonments and posts in Malakand, Dir, Swat and Chitral were also enumerated, as were those in the Tochi Valley (the Northern Waziristan Agency) and in the Gomal (the Southern Waziristan Agency), the former figures being included in the census returns of Bannu district, and those of the latter in the returns of Dera Ismail Khan. The total population of the province was 2,125,480; but this figure omits the great majority of the frontier tribes. The province is almost wholly agricultural. The urban population is only one-eighth of the total, and shows no tendency to increase. There are no large industries to attract the population to the towns; these, except Peshawar and Dera Ismail Khan, are either

expansions of large agricultural villages or bazaars which have grown up round the many cantonments of the province. The great majority of the population are Pathan by race and Mahommedan by religion. The predominant

language is Pushtu (q.v.). The conquered strata of the popu- lation speak servile Indian dialects, called Hindki in the north and Jatki in the south, while Gujari is spoken by the large Gujar population in the hills of Hazara and north of Peshawar.

Crops and Climate. — The area under cultivation represents an average of 1-3 acres per head of the total, and of nearly 1-5 acres per head of the rural population. The limit of profitable cultivation has almost been reached. It is therefore from an improvement in the methods of agriculture rather than to an extension of the area under cultivation that recourse must be had to supply the needs of a rapidly increasing population. The Pathan, however, is a slovenly cultivator and slow to adopt any new methods which involve increased effort. The principal crops are — in the cold weather, maize and bajra; in the spring, wheat, barley and gram. Rice and sugar-cane are largely grown on the irrigated lands of Hazara, Peshawar and Bannu districts, and the well and canal irrigated tracts of Peshawar district produce fine crops of cotton and tobacco. In the trans-border agencies the valleys of the Swat, Kurram and Tochi rivers yield abundant rice crops. The province is mainly a mountainous region, but includes the Peshawar valley and the broad riverain tract of the Indus in Dera Ismail Khan district. The climatic conditions are hence extremely diversified. Dera Ismail Khan district is one of the hottest areas in the Indian continent, while over the mountain region to the north the weather is temperate in the summer and intensely cold in the winter. The air is generally dry, and hence the daily and annual range of temperature is fre- quently very large. There are two seasons of rainfall over the province: the monsoon season, when supplies of moisture are brought up by the ocean winds from the Arabian Sea and the Bay of Bengal ; and the winter season, when storms advancing eastwards from Persia and the Caspian districts occasion winds, widespread rain and snow- fall. Both sources of supply are precarious, and instances are not infrequent of the almost entire failure of either the winter or the summer rainfall.

Irrigation. — Canals are the main source of irrigation in the province , and fall under three heads: (1) Private canals in the various districts, the property of the people and managed on their behalf; (2) the Michni Dilazak and Shabkadar branch in Peshawar, constructed by the district board, which receives water rates; and (3) the Swat and Kabul

river canals, which were constructed by and are the property of government, and are managed by the irrigation depart- ment.

About 20 % of the cultivated area is irrigated by canals, 2 % by wells and 3 % by perennial streams. Throughout the province the area in which well-cultivation is possible is extremely limited, and the field has already been covered. In Kohat and Hazara any considerable extension of canal irrigation is out of the question, but in the remaining districts much can still be done to promote irrigation.

Railways. — The railways of the province are mostly intended ir the first instance for strategic purposes. The main line of the North-western railway runs from Rawalpindi to Peshawar, whence it has been extended 9 m. to Jamrud at the entrance to the Khyber Pass. From Nowshera a frontier light line, involving a break of gauge, is carried to Dargai at the foot of the Malakand Pass. From Rawalpindi again another branch extends to the Indus at Kushalgarh. A bridge has been built at this point, and the railway continued through Kohat to Thai at the entrance of the Kurram valley.

See North-West Frontier Province Gazetteer (Calcutta, 1908); Sir Thomas Holdich, The Indian Borderland (1901); Paget and Mason, Record of Frontier Expeditions (1884). (T. H. H.*)

NORTH-WEST TERRITORIES. The North-West Territory was at first a general name given to all the districts of British North America lying N.W. of the St Lawrence basin. In the British North America Act of 1867 provision was made for the admission to Canada of ” Rupert’s Land and the North-West Territory.” Manitoba was formed out of this district in 1870. The territory remaining was then called the ” North-West Territories,” and until other arrangements were made was to be under the governor of Manitoba. In 1876 the district of Keewatin was established; in 1881 the limits of Manitoba were enlarged; and in 1882 four new districts — Assiniboia, Saskatchewan, Alberta and Athabasca — were organized. In 1905 the two first of these with some modification became the province of Saskatche- wan, and the two last the province of Alberta. The territories of Canada outside of the eight provinces and Yukon district of the mainland are now organized as the North-West Territories, and are under an administrator or acting governor. They include the districts of Keewatin, Ungava, Mackenzie and Franklin. These territories have an Indian population of about 8500, the

Indians throughout the southern part being chiefly Chipewyans, or, as they are sometimes called, Tinne. The northern parts are inhabited by Eskimo. In these territories a short hot summer is followed by a long cold winter with extremely low temperatures, the spirit thermometer at times showing 6o° to 65 F. below zero. The following observations may be quoted: —

the Hon.

Feet

above

Sea-level.

Mean Temperature, F.

Average Precipitation, Inches.

Summer.

Winter.

Norway House, Keewatin . York Factory

Fort Simpson, 41 ° 51′ N. . Fort Franklin, 65 12′ N. .

710

400

500

48-7 ° 59-4° 50-4°

12-6

-io° -17°

With the exception of southern Keewatin and the district south of James Bay the animals of the North-West Territories are chiefly fur-bearing. Great herds of musk-oxen are found in Mackenzie, and vast flocks of ducks, geese and other migratory birds spend summer in the northern wilds. Except in southern Keewatin and the James Bay district the flora is decidedly northern, becoming Arctic in the far north. Forest trees grow small and ill formed. Sedges abound, exceeding grasses; mustards are abundant, and saxifrages plentiful. Mosses and lichens are numerous.

The history of the north-west follows three different branches. (1) The story of Arctic exploration and the search for the North- West Passage, with a concentration of interest upon the name of Sir John Franklin, whose loss was followed by a great development of investigation in the Arctic regions; (2) the story of the fur trade, connected with the Hudson Bay forts, from the establishment of the first Charles Fort in 1669; (3) the story of immigration, the beginning of which is to be found in the coming of the Selkirk colonists, the real founders of Manitoba (q.v.), to Red river by way of Hudson Bay.

NORTHWICH, a market town in the Northwich parliamentary division of Cheshire, England, 1715 m. N.W. of London, on the London and North-Western railway and the Cheshire lines. Pop. of urban district, 17,611. It lies in a low open valley at the confluence of the rivers Weaver and Dane, and is the centre of the principal salt-producing district in the United Kingdom. In its narrow and irregular streets many of the houses are strongly bolted to keep them secure from the subsidences which result not infrequently from the pumping of brine. Despite these precautions many accidents have occurred; some of the houses have sunk or stand at fantastic angles, and in 1892 a portion of the High Street, which had subsided below the level of the Weaver, had to be raised 6 ft. Both rock salt and white salt obtained by evaporation from brine are exported. The amount supplied by the whole district, which includes the neighbouring town of Winsford 6 m. south, is about 1,500,000 tons annually. The white salt is shipped chiefly to America. The principal buildings are the church of St Helen, Witton, noted for its finely carved roof of the 17th century, a museum and free library and market house. The Verdin Park was presented to the town by Robert Verdin, M.P. for Northwich, in 1887. There is a considerable industry in the building of flat boats to convey salt to Liverpool, the river Weaver being navigable, and connected by a hydraulic lift, 1 m. from the town, with the Trent and Mersey Canal

on a higher level. Rope- and brick-making, iron and brass-founding, chemical manu- factures, brewing and tanning, are also carried on.

NORTON, CAROLINE ELIZABETH SARAH (1808-1877), afterwards Lady Stirling-Maxwell, English writer, was born in London in 1808. One of the three beautiful granddaughters of Richard Brinsley Sheridan, daughters of his son Thomas, the ” three Graces ” of London society in the reign of George IV., she began to write before she was out of her teens. Her two sisters Helen and Georgina became respectively Lady Dufferin and duchess of Somerset. Lady Dufferin described the sisters to Disraeli with characteristic modesty. ” Georgey’s the beauty,” she said, ” and Carry’s the wit, and I ought to be the good one, but I am not.” At the age of seventeen, Caroline published a

merry satire, The Dandies’ Rout, illustrated by herself, and full of girlish high spirits and wit. Her first essay

See The Life of Mrs Norton, by Jane G. Perkins (1909).

NORTON, CHARLES BOWYER ADDERLEY, ist Baron

(1814-1905), English politician, eldest son of Charles Clement Adderley (d. 1818), one of an old Staffordshire family, was born on the 2nd of August 1814, and inherited Hams Hall, Warwick- shire and the valuable estates of his great-uncle, Charles Bowyer Adderley, in 1826. He was educated at Christ Church, Oxford, and in 1841 he became one of the members of parliament for Staffordshire, retaining his seat until 1878, when he was created Baron Norton. Adderley’s official career began in 1858, when he served as president of the board of health and vice-president of the committee of the council on education in Lord Derby’s short ministry. Again under Lord Derby he was under-secretary for the colonies from 1866 to 1868, being in charge of the act which called the Dominion of Canada into being, and from 1874 to 1878 he was president of the board of trade. He died on the 28th of March 1905. Norton was a strong churchman and especially interested in education and the colonies. In 1842 he married Julia (1820-1887) daughter of Chandos, ist Lord Leigh, by whom he had several sons. His eldest son Charles Leigh (b. 1846) became 2nd Baron Norton. Another son, James Granville Adderley (b. 1861), vicar of Saltley, Birmingham, became well known as an advocate of Christian socialism.

See W. S. Childe-Pemberton, The Life of Lord Norton (1909).

NORTON, CHARLES ELIOT (1827-1908), American scholar and man of letters, was born at Cambridge, Massachusetts, on the 16th of November 1827. His father, Andrews Norton (1786-1853) was a Unitarian theologian, and Dexter professor of sacred literature at Harvard; his mother was Catherine Eliot, Charles William Eliot, president of Harvard, being his cousin. Charles Eliot Norton graduated from Harvard in 1846, and started in business with an East Indian trading firm in

Boston, for which he travelled to India in 1849. After a tour in Europe, he returned to America in 1851, and thenceforward devoted himself to literature and art.

In 1 88 1 Norton inaugurated the Dante Society, whose first presidents were Longfellow, Lowell and Norton. He translated the Vita Nuova (i860 and 1867) and the Divina Commedia (1891-1892, 2 vols.). . After work as secretary to the Loyal Publication Society during the Civil War, he edited from 1864- 1868 the North American Review, in association with James Russell Lowell. In 1861 he and Lowell helped Longfellow in his translation of Dante and in the starting of the informal Dante Club. In 1875 he was appointed professor of the history of art at Harvard, a chair which was created for him and which he held untd he became emeritus in 1898. The Archaeological Insti- tute of America chose him to be the first president (1879-1890). From 1856 until 1874 Norton spent much time in travel and residence on the continent of Europe and in England, and it was during this period that his friendships began with Carlyle, Ruskin, Edward FitzGerald and Leslie Stephen, an intimacy which did much to bring American and English men of letters into close personal relation. Norton, indeed, had a peculiar genius for friendship, and it is on his personal influence rather than on his literary productions that his claim to remembrance mainly rests. From 1882 onward he confined himself to the study of Dante, his professorial duties, and the editing and publication j)f the literary memorials of many of his friends. In 1883 came the Letters of Carlyle and Emerson; in 1886, 1887 and 1888, Carlyle' s Letters and Reminiscences; in 1894, the Orations and Addresses of George William Curtis and the Letters of Lowell. Norton was also made Ruskin's literary executor, and he wrote various introductions for the American " Brantwood " edition of Ruskin's works. His other publications include Notes of Travel and Study in Italy (1859), and an Historical Study of Church-building in the Middle

Ages: Venice, Siena, Florence (1880). He organized exhibitions of the drawings of Turner (1874) and of Ruskin (1879), for which he compiled the catalogues.

He died on the 21st of October 1908 at ” Shady-hill,” the house where he was born. He bequeathed the more valuable portion of his library to Harvard. In 1862 he had married Miss Susan Sedgwick. He had the degrees of Litt.D. (Cambridge) and D.C.L. (Oxford), as well as the L.H.D. of Columbia and the LL.D. of Harvard and of Yale.

NORTON, THOMAS (1532-1584), English lawyer, politician and writer of verse, was born in London in 1532. He was educated at Cambridge, and early became a secretary to the Protector Somerset. In 1555 he was admitted a student at the Inner Temple, and married Margery Cranmer, the daughter of the archbishop. From his eighteenth year Norton had begun to compose verse. We find him connected with Jasper Hey wood ; as a writer of ” sonnets ” he contributed to Tottel’s Miscellany, and in 1560 he composed, in company with Sackville, the earliest English tragedy, Gorboduc, which was performed before Queen Elizabeth in the Inner Temple on the 18th of January 1561. In 1562 Norton, who had served in an earlier parliament as the representative of Gatton, became M.P. for Berwick, and entered with great activity into politics. In religion he was inspired by the sentiments- of his father-in-law, and was in possession of Cranmer’s MS. code of ecclesiastical law; this he permitted John Foxe to publish in 1 5 7 1 . He went to Rome on legal business in 1579, and from 1580 to 1583 frequently visited the Channel Islands as a commissioner to inquire into the status of these possessions. Norton’s Calvinism grew with years, and towards the end of his career he became a rabid fanatic. His punishment of the Catholics, as their official censor from 1581 onwards, led to his being nicknamed ” Rackmaster-General.” At last his turbulent puritanism made him an object of fear even to the English bishops; he was deprived of bis office and thrown into the Tower. Walsingham presently released him, but Norton’s health was undermined, and on the 10th of March 1584 he died in his bouse at Sharpenhoe, Bedfordshire.

The Tragedie of Gorboduc was first r>nbi;«hprl ™rv mmmtio

in 1565, and, in better form, as The Tragedie of Feerex and Porrex, in 1570. Norton’s early lyrics have in the main dis- appeared. The most interesting of his numerous anti-Catholic pamphlets are those on the rebellion of Northumberland and on the projected marriage of Mary Queen of Scots to the duke of Norfolk. Norton also translated Calvin’s Institutes (1561) and Alexander NowelFs Catechism (1570).

Gorboduc appears in various dramatic collections, and was separately edited by W. D. Cooper (Shakespeare Soc. 1847), and by Miss Toulmin Smith in Volkmoller's Englische Sprach- und Literaturdenkmale (1883). The best account of Norton, and his place in literary history, is that of Sidney Lee in his Dictionary of National Biography. (E. G.)

NORWALK, a city of Fairfield county, Connecticut, U.S.A., on the Norwalk river, in the township of Norwalk, adjoining the city of South Norwalk in the same township, and 13 m. W.S.W. of Bridgeport. Pop. (1900) 6125 (1023 foreign-born and 189 negroes); (1910) 6945; of the township (1900) 19,932; (1910) 24,211. The city is served by the New York, New Haven & Hartford railroad, by interurban electric lines, and by steamboats to New York. The city has a green with several old churches and some fine elms, a public library, a hospital, a state armoury and a county children's home. The Norwalk Chapter of the Daughters of the American Revolution has erected here a drinking fountain in memory of Nathan Hale, who obtained in Norwalk his disguise as a Dutch school teacher and then started on his fatal errand to Long Island. Norwalk has some manu- factures, including woollen goods and typewriting machines; and there is some coasting trade, oysters especially being shipped from Norwalk.

The site of the township was purchased from the Indians in 1640 by Roger Ludlow and Daniel Patrick, Ludlow giving six fathoms of wampum, six coats, ten hatchets, ten boes, ten knives, ten scissors, ten Jew's harps, ten fathoms of tobacco, three kettles of six hands, and about ten looking-glasses for all the land between the Norwalk and Saugatuck rivers and extend- ing one day's walk N. from the Sound. The first settlement in the township was made in 1650 at what is now the village of East Norwalk by a small company from Hartford, and the township was incorporated in the next year. The village was burned by the British under Governor Tryon on the 12th of July 1779, and the chair in which it is alleged Tryon sat, on Grumman's Hill, as he watched the flames, has been kept as a relic. Norwalk was incorporated as a borough in 1836 and was chartered as a city in 1893.

See C. M. Selleck, Norwalk (Norwalk, 1896); and Norwalk after Two Hundred and Fifty Years, an Account of the Celebration of the 250th Anniversary of the Charter of the Town (South Norwalk,,

1901).

NORWALK, a city and the county-seat of Huron county, Ohio, U.S.A.,

about 55 m. W.S.W. of Cleveland. Pop. (1900) 7074, including 762 foreign-born and 101 negroes; (1910) 7858 It is served by the Lake Shore & Michigan Southern, and the Wheeling & Lake Erie railways, and by interurban electric lines. It has a public library in which a small museum is main- tained by the Firelands Historical Society. The city is the centre of a rich agricultural district. Among its manufactures are machine-shop products (the Wheeling & Lake Erie has shops here), iron and steel, pianos and automobile fittings.

Norwalk was settled in 181 7 and was named from Norwalk, Connecticut; it was incorporated as a town in 1829 and chartered as a city in 1881. Huron county and Erie county immediately N. are the westernmost of the counties created from the ” Western Reserve,” and comprise the ” Fire Lands ” grant made in 1792 by the state of Connecticut to the people of Greenwich, Fairfield, Danbury, Ridgefield, Norwalk, New Haven, East Haven and New London to indemnify them for their fire losses during the British expeditions in Connecticut under Governor Tryon in 1779 and Benedict Arnold in 1781. The Connecticut grantees were incorporated in 1803 as ” the proprietors of the half-million acres of land

NORWAY (Norge), a kingdom of northern Europe, occupying the W. and smaller part of the Scandinavian peninsula. Its E. frontier marches with that of Sweden, except in the extreme N., where Norway is bounded by Russian territory. On the N., W., S. and S.E. the boundary is the sea — the Arctic Ocean, that part of the Atlantic which is called the Norwegian Sea, the North Sea and the Skagerrack successively. The S. extremity of the country is the island of Slettingen in 57° 58′ N., and the N. that of Knivskjaerodden, off the North Cape in 71° 11′ N. Of the mainland, the southernmost promontory is Lindesnass, in 57° 59′ N., while the northernmost is Nordkyn, in 71 7′ N. The S. of the country, that is to say, the projection between the Skagerrack and the North Sea proper, lies in the same latitude as the N. of Scotland and Labrador, and the midland of Kam- chatka. The most western island, Utvser, lies off the mouth of the Sogne Fjord (4 30′ E.), and the eastermost point of the country is within the Arctic lands, near Vardo (31 n’ E). The direct length of Norway (S.W. to N.E.) is about 1100 m. The extreme breadth in the S. (about 6i° N.) is 270 m., but in the N. it is much less — about 60 m. on the average, though the Swedish frontier approaches within 6 m. of a head-branch of Ofoten Fjord, and the Russian within 19 m. of Lyngen Fjord. The length of the coast line

is difficult to estimate; measured as an unbroken line it is nearly 1700 m., but including the fjords and greater islands it is set down as 1 2,000. The area is estimated at 124,495 sq. m.

Physical Features. Relief. — The main mountain system of the Scandinavian peninsula hardly deserves its name of Kjolen 1 (the keel). It may rather be described as a plateau deprived of the appearance of a plateau, being on the one hand grooved by deep valleys, while on the other many salient peaks tower above its average level. Such peaks, during the later Glacial period, stood above the ice-field. Peaks and ridges were formed by the action of small glaciers cutting out each its circular hollow (botn) just as they still work on the remaining snow-fields. But where the power of the main ice-mass was at work, the characteristic rounded forms of base rock are seen, close above the sea along the coast, but even as high as 5000 ft. in some inland localities. The high plateau lies along the W. side of the peninsula, so that except in the S.E. Norway is mountainous throughout. Even the part excepted is hilly, but it partakes of the character of the long eastern or Swedish slope of the peninsula. Beyond the coast line their floors sink far below sea-level, and thus are formed the fjords and the belt of rugged islands which characterize almost the entire seaboard of Norway. Where Norway marches with Russia, a few heights exceed 3000 or even 4000 ft., but the land is not generally of great elevation. But from the point of junction with Swedish territory the mountains increase considerably in height. For a short distance, as far south as Lake Torne, the loftiest points lie within Norwegian territory, such as Jaeggevarre (6283 ft.), between Lyngen and Ulfs fjords, and Kiste Fjeld (5653 ft.) farther inland. Thereafter the principal heights lie approxi- mately along the crest-line of the plateau and within Swedish territory. Sulitelma, however (6158 ft.), lies on the frontier. Southward again the higher summits fall to Norway. S. of Bodo, Svartisen (" the black ice "), a magnificent snow-field bordering the coast, and feeding many glaciers, culminates at 5246 ft. Thereafter, Okstinderne or Oxtinderne (6273 ft.), and the Store Borge Fjeld (5387 ft.) are the principal elevations as far as 64° N. A little S. of this latitude the so-called Trondhjem depression is well marked right across the central upland, the height of the mountains not often exceeding 4000 ft., while the peaked form characteristic of the heights which rose clear of the glaciers of the later Glacial period is wanting. It is from this point too that Norwegian territory broadens

1 In Norwegian the definite article (when there is no epithet) is added as a suffix to the substantive (masc. and fem. en, neuter et). Geographical terms are similarly suffixed to names, thus Suldals-vaniet, the lake Suldal. The commonest geographical terms are: elv,

river; vand, lake; fjeld, mountain or highland; 6, island; dal, valley; nces, cape; fos, waterfall; bra, glacier; vik, vig, bay; eide, isthmus ; fjord. Aa is pronounced aw.

so as to include not only the highest land in the peninsulaˆ but a considerable part of the general E. and S.E. slope. The high plateau broadens and follows the S.W. sweep of the coast. Pursuing it S. the Dovre Fjeld is marked off by the valleys of the rivers Driva and Sundal, Laagen (or Laugen) and Rauma, and the fjords of the coastland of Nordmore. Here Snehaetta reaches a height' of 7615 ft., and the Romsdal (the name under which the Rauma valley is famous among tourists) is flanked by many abrupt jagged peaks up to 6000 ft. high. The valley of the Laagen forms the upper part of Gudbrandsdal. East of this and S.E. of the Dovre is another fjeld, Rondane, in which Hogronden rises to 6929 ft. South of the Otta valley is Jotunheim or Jotun Fjeld, a sparsely peopled, in parts almost inaccessible, district, containing the highest mountains in Scandinavia, Galdhopiggen reaching 8399 ft. On the seaward side of Jotunheim is Jostedalsbrae, a great snow-field in which Lodals- kaupen reaches a height of 6795 ft. South of Sogne Fjord (61° N.) mountains between 5000 and 6000 ft. are rare; but in Hallingskarvet there are points about 6500 ft. high, and in the Hardanger Vidda (waste), a broad wild upland E. of Hardanger Fjord, Haarteigen reaches 6063 ft. The highland finally sinks towards the S. extremity of Norway in broken masses and short ranges of hills, separated by valleys radiating S.E., S. and W.

Glaciers.— The largest glacier in continental Europe is Jostedals brae, with an area of 580 sq. m., the snow-cap descending to 4000 or 4500 ft. Several of its branches fall nearly to the sea, as the Boiumsbree above the Fjasrland branch of Sogne Fjord. The largest branch is the Nigardsbrae. Skirting Hardanger Fjord, and nearly isolated by its main channel and two arms, is the great glacier of Folgefond (108 sq. m.). Two branches descending from the main mass are visited by many who penetrate the Hardanger — Buarbrae on the E., falling towards Lake Sandven above Odde, and Bondhusbrae on the W. The extreme elevation of the Folgefond in 5270 ft. Continuing N. other considerable snow-fields are those of Hallingskarvet, the Jotun- heim, Snehaetta in Dovre Fjeld, and Store Borge Fjeld at the head of the Namsen valley. Next follow Svartisen, second in extent to Jostedalsbrae (nearly 400 sq. m.), the Sulitelma snow- field and Jokel Fjeld, between Kvaenang and Oxfjords. One glacier actually reaches the edge of Jokel Fjord, a branch of Kvsenang Fjord, so that detached fragments of ice float away on the water. This is the only instance of the kind in Norway. The Seiland snow-field, on Seiland island near Hammerfest, is the most northerly nevi in Europe. The snow-line in

Norway is estimated at 3080 ft. in Seiland, 5150 ft. on Dovre Fjeld, and from 4100 to 4900 ft. in Jotunheim. The lowness of the snow-line adds to the grandeur of Norwegian mountains.

Coast. — The flanks of the plateau fall abruptly to the sea almost throughout the coast-line, and its isolated fragments appear in the innumerable islands which fringe the skter- mainland. This island fringe, which has its counter- gaardot part in a modified form along the Swedish coast, is island- called in Norwegian the skjcergaard (skerry-fence, eace ‘ pronounced shargoord) . This fringe and the fjord-coast are most fully developed from Stavanger nearly as far as the North Cape. The channels within the islands are of incalculable value to coastwise navigation, which is the principal means of communica- tion in Norway. The voyage northward from Stavanger may be made in quiet waters almost throughout. Only at rare intervals vessels must enter the open sea for a short distance, as off the port of Haugesund, or when rounding the promontory of the Stat or Statland, S. of Aalesund, passing the coast of Hustad- viken, S. of Christiansund, or crossing the mouth of some large fjord. At some points large steamers, following the carefully marked channel, pass in deep water between rocks within a few yards on either hand. Small ships and boats, fishing or trading between the fjord-side villages, navigate the ramifying ” leads ” (leder) in security. In some narrow sounds, however, the tidal current is often exceedingly strong. The largest island of the skjasrgaard is Hindo of the Lofoten and Vesteraalen group. Its area is 860 sq. m. The number of islands is estimated at 150,000 and their area at 8500 sq. m. Many of them are of

great elevation, especially the more northerly; thus the jagged peaks characteristic of Lofoten culminate at about 4000 ft. Hornelen, near the mouth of Nordfjord, 3000 ft. high, rises nearly sheer above the Frojfjord, and vessels pass close under the towering cliff. Torghatten (” the market hat “), N. of Namsos, is pierced through by a vast natural tunnel 400 ft. above the sea; and Hestmando (“horseman island”), on the Arctic circle, is justly named from its form. The dark blue waters of the inner leads and fjords are clouded, and show a milky tinge on the sur- face imparted by the glacier-fed rivers. Bare rock is the dominant feature of the coast and islands, save where a few green fields surround a farmstead. In the N, where the snow-line sinks low, the scenery at all seasons has an Arctic character.

Christiania Fjord, opening from the N. angle of the Cattegat and Skagerrack, differs from the great fjords of the W. Its pi rd shores are neither so high nor so precipitous as theirs;

it is shallower, and contains a great number of little islands. From its mouth, round Lindesnaes, and as far as the Bukken Fjord (Stavanger) there are many small fjords, while the skjaergaard provides an inner lead only intermittently. Immediately S. of Bukken Fjord, from a point N. of Egersund, the flat open coast of Jaederen, dangerous to shipping, fringing a narrow lowland abundant in peat-bogs for some 30 m., forms an unusual feature. Bukken Fjord is broad and island-studded, but throws off several inner arms, of which Lyse Fjord, near Stavanger, is remarkable for its extreme narrowness, and the steepness of its lofty shores. The Hardanger Fjord, penetrating the land for 114 m., is known to more visitors than any other owing to its southerly position; but its beauty is exceeded by that of Sogne Fjord and Nord Fjord farther N, Sogne is the largest and deepest fjord of all; its head is 136 m. from the sea, and its extreme depth approaches 700 fathoms. Stor Fjord opens inland from Aalesund, and one of its head branches, Geiranger Fjord, is among the most celebrated in Norway. Trondhjem Fjord, the next great fjord northward, which broadens inland from a narrow entrance, lacks grandeur, as the elevation of the land is reduced where the Trondhjem depression interrupts the average height of the plateau. The coast N. of Trondhjem, though far from losing its beauty, has not at first the grandeur of that to the south, nor are the fjords so extensive. The principal of these are Namsen, Folden and Vefsen, at the mouth of which is Alsten Island, with the mountains called Syv Sostre (Seven Sisters), and Ranen, not far S. of the Arctic circle. Svartisen sends its glaciers seaward, and the scenery increases in magnifi- cence. Salten Fjord, to the N. of the great snow-field, is con- nected with Skjerstad Fjord by three narrow channels, where the water, at ebb and flow, forms powerful rapids. The scenery N. of Salten is unsurpassed. The Lofoten and Vesteraalen islands are separated from the mainland by the Vest Fjord, which is continued inland by Ofoten Fjord. If these two be considered as one fjord, its length is about 175 m.,but the actual penetration of the mainland is little more than a fifth of this distance. The main fjords N. of Vesteraalen have a general northerly direction; among them is Lyngen Fjord near Tromso, with high flanking cliffs and glaciers falling nearly to the sea. Alten Fjord is re- markable for the vegetation on its shores. From Lofoten N. there is a chain of larger islands, Senjen, Kvalo, Ringvadso, Sorb, Stjerno, Seiland, Ing6 and Magero. These extend to the North Cape, but hereafter the skjaergaard ends abruptly. The coast to the E. is of widely different character; flat mountain wastes descend

precipitously to the sea without any islands beyond, save Vardo, with two low islets at the E. extremity of Norway. The fjords are broader in proportion to their length. The chief are Porsanger, Laxe and Tana, opening N., and Varanger opening E. N. of this fjord the land is low and the landscape monotonous; on the S. a few island and branch fjords break the line of the shore.

Stavanger Fjord has an extreme depth of 380 fathoms; Hardanger Fjord 355, Sogne Fjord 670, Nordfjord 340, Trond- hjem Fjord 300, Ranen Fjord 23s, Vestfjord 340, Alten Fjord 225, and Varanger Fjord 230. Marine terraces are met with in the E. of the country, and near Trondhjem, at 600 ft. above sea- level; and they are also seen at a slighter elevation at the heads

of some western fjords. Moreover, at some points (as on the Jaederen coast) ” giant kettles ” may be observed close to sea- level, even below the level of high tide; and these glacial forma- tions indicate the greater elevation of the land towards the close of the Glacial epoch. Former beach-lines are most commonly to be observed in northern Norway (e.g. in Alten Fjord), and in some cases there are two lines at different altitudes. The land above the raised beach is generally bare and unproductive, and human habitation tends to confine itself in consequence to the lower levels.

Hydrography. — In S.E. Norway there are long valleys, carrying rivers of considerable size, flowing roughly parallel but sometimes uniting as they approach the sea. The Glommen, rising N. of Roros in Aursund Lake, and flowing with a southerly curve parallel with the frontier for 350 m. to the Skagerrack, is the largest river in the Scandinavian peninsula. Its upper middle valley is called Osterdal, 1 the richest timber district in Norway. Its drainage area is 16,000 sq. m. Seven miles above its mouth it forms the fine Sarpsfos, and not far above this it traverses the large lake Oieren. A right bank tributary, the Vormen, has one of its sources (under the name of Laagen) in Lake Lesjekogen, which also drains in the opposite direc- tion by the Rauma. The stream, after watering Gudbrandsdal, enters Mjosen, the largest lake in Norway. It is 60 m. long, but, like most of the greater Norwegian lakes, has no great breadth. It has, however, an extreme depth of 1500 ft. The Drammen river, which enters a western arm of Christiania Fjord below the town of Drammen, is the common outlet of several large rivers. The Hallingdal river drains the valley of that name, and forms Lake Kroderen, which is connected with the Drammen river by the Snarum. A short distance above the junction the Drammen flows out of Lake Tyriijord, 50 sq. m. in area, into which flow the united waters of the Rand, from the valley district of Valdres, and the

Baegna. The whole basin of the Drammen has an area of 6600 sq. m. The rivers between Christiania Fjord and Lindesnaes preserve the characteristics of those of the Glommen and Drammen systems. They rise on the Hardanger Vidda or adjacent uplands. The most important are the Laagen (to be distinguished from the river of that name in Gudbrandsdal), draining the Numedal; the Skien, the Nid and the Otter. Lakes are very numerous, the chief, beyond those already named, being Nordsjo on the Skien river, Tinsjii in the same system, which receives the river Maan, famous as forming the Rjukanfos (smoking fall) of 415 ft., and Nisservand on the Nid. The larger lakes lie, with a certain regularity, at elevations about 400 ft. above the sea, and it is considered that their basins were the heads of fjords when the land lay at a lower level, and were formed during an earlier glacial period than the present fjords. The great Lake Faemund, lying E. of the Glommen valley and drained by the river of the same name, which becomes the Klar in Sweden, to which country it mainly belongs, is similar in type to the lakes of the northern highlands of Sweden. The streams of the coast of Jaederen reach the sea through sluggish channels, brown with peat.

Not only do the valleys of the W. far surpass in beauty those of the S. and E., but they carry streams of much greater volume in proportion, owing to the heavier average rainfall of the W. slope. The first to be noted is that of the Sand or Logen river, a brilliant, rapid stream, famous for its salmon-fishing, which debouches at Sand into Sands fjord. The valley which opens from Odde at the head of a branch (S6r fjord) of Hardanger Fjord, is noted as con- taining two of the finest waterfalls in Norway. The one, Lotefos (which is joined by the smaller Skarsfos), is a powerful cataract following a tortuous cleft. The other, Espelandsfos, is formed by a very small stream; it falls quite sheer and spreads out like a fine veil. The only other considerable river entering Hardanger Fjord is the Bjoreia, with its mouth at Vik in Eidfjord. On this stream is the magnificent Voringsfos. Lesser streams within the basin of the Hardanger form the Skjaeggedal and several other beautiful falls. From Hardanger N. to Romsdal the streams of the W. slope are insignificant, but there are several splendid valleys, such as the sombre Nserodal, which descends to the Naero branch of Sogne Fjord, or the valleys which sink S. and N. from the Jostedalsbrse to the head branches of Sogne Fjord and Nordfjord respectively. Above those of Nordfjord is a series of lakes, Olden, Loen and Stryn, whose milky waters are supplied almost directly from the Jostedal glaciers, while above Eidsfjord a corresponding trough contains Lake Hornindal. The next important valley is the Romsdal, the stream of which, the Rauma, forms the W. outlet of Lake Lesjekogen, as the Laagen forms the E.

This lake, which lies 201 1 ft. above sea-level, is the most remarkable example of an indefinite watershed to be found in S. Norway. N, from Romsdal the Dnva debouches into Sundals Fjord, while the Orkla, draining Orkedal, the Gula draining Guldal, and the Nea or Nid, draining Lake Selbu, and

!The middle and upper parts of many valleys in Norway are known by different names from those of the rivers which water them, and such names may extend in common usage over the district on either side of the valley.

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forming the Lerfos, enter Trondhjem Fjord from the S., and range in length from 70 to 100 m. The Stjordal, a beautiful wooded valley, leads up from the fjord to the lowest pass over the Trondhjem depression (at Storlien), and is followed by the railway from Trondhjem into Sweden.

N. of Trondhjem Fjord, in spite of the close proximity of the mountains to the W. coast, several considerable rivers are found, flowing generally about N.E. or S.W. in valleys nearly parallel to the coast. Such are the Namsen (85 m. in length) and the Vefsen, discharging into Namsen Fjord and Vefsen Fjord respectively, and the Dunderland, flowing into Ranen Fjord. In the basin of the same fjord is the short Ros river, which drains Ros Vand, second in extent of the Norwegian lakes. In the extreme N., where the coastward slope is longer, there are such large rivers as the Alten, 98 m. long, discharging into the fjord of that name, and the Tana, also giving name to the fjord into which it flows, and forming a great part of the Russo- Norwegian frontier. It is 180 m. long, and drains an area of 4000 sq. m.

Though the lakes of Norway are not comparable with those of Sweden as regards either number or size, they are very numerous and are estimated to cover somewhat less than one-fortieth of the total area.

Glacial Action. — While the coast is considered to owe its fjords and islands to the work of former great glaciers, the results are even more patent inland. The actual tracks of the old glaciers are constantly to be traced. Nowhere are the evidences of glacial action better illustrated than in the barren tract behind the low coastal belt ol Jaxleren. Here

are vast expanses of almost naked rock, often riven and piled up in fantastic forms; numerous small lakes or bogs occupy the rock basins, and vast numbers of perched blocks are seen, frequently poised in remarkable positions. The great valleys of Norway are of U-section and exhibit the irregular erosive action of the glaciers, as distinct from the regular action of the rivers. If a main glacier, after working steadily in the formation of its trough for a considerable distance, be imagined to receive an accretion of power at a certain point, it will begin from that point to erode more deeply. The result of such action is seen in the series of ledges over which the main rivers of Norway plunge in falls or rapids.

Geology. — Norway consists almost entirely of Archaean and Lower Palaeozoic rocks, imperfectly covered by glacial and other recent deposits. The whole of the interval between the Devonian and the Glacial periods is represented, so far as is known, only by a small patch- of Jurassic beds upon the island of Ando. An archaean zone stretches along the W. coast from Bergen to Hammerfest, interrupted towards the N., by overlying patches of Palaeozoic deposits. Gneiss predominates, but other crystalline rocks occur subordinately. The Lofoten Islands consist chiefly of eruptive granite, syenite and gabbro. S. of a line drawn from the head of the Hardanger Fjord to Lake Mjosen is another great Archaean area. Here again gneiss and granite form the greater part of the mass, but in Telemarken there are also conglomerates, sandstones and clay-slates which are believed to be Archaean. Between these two Archaean areas the Lower Palae- ozoic rocks form a nearly continuous belt which follows approxi- mately the watershed of the peninsula and extends from Bergen and Stavanger on the S. to the North Cape and Vardo in the N. They occur also as a broad strip inlaid in the Archaean floor, from the Christiania Fjord northward to Lake Mjosen. A line drawn from the Nase to the North Cape coincides roughly with a marked change in j the character and structure of the Palaeozoic beds. East of this line even the Cambrian beds are free from overfolding, overthrusting and regional metamorphism. They lie flat upon the Archaean floor, or have been faulted into it in strips, and they are little altered except in the neighbourhood of igneous intrusions. W. of the line the rocks have been folded and metamorphosed to such an extent that it is often difficult to distinguish the Palaeozoic rocks from the Archaean. They form in fact a mountain chain of ancient date similar in structure to the Alps or the Himalayas. The relations of the two areas have been studied by A. E. Tornebohm in the Trondhjem region, and he has shown that the western mass has been pushed over the eastern upon a great thrust-plane. The relations, in fact, are similar to those between

the Dalradian schists of the Scottish Highlands and the Cambrian beds of the W. coast of Sutherland. In Scotland, however, it is the eastern rocks which have been pushed over the western. Corresponding with the difference in structure between the E. and the W. regions there is a certain difference in the nature of the deposits themselves. In the Christiania district the Cambrian, Ordovician and Silurian beds consist chiefly of shales and limestones. Farther north sandstones predominate, and especially the Sparagmite, a felspathic sandstone or arkose at the base of the Cambrian ; but the deposits are still sedimentary. In the Trondhjem district, on the other hand, belonging to the folded belt, basic tuffs and lavas are interstratified with the normal deposits, showing that in this region there was great volcanic activity during the early part of the Palaeozoic era. In both the E. and the W. region the Devonian is probably represented by a few patches of red sandstone, in which none but obscure remains of fossils have yet been found. It may be noted here that in the extreme N. of Norway, E. of the North Cape, there is a sandstone not unlike the Sparagmite of the S., which is said by Reusch to contain ice-worn pebbles and to rest upon a striated pavement of Archaean rocks.

XIX. 26 ‘

The Mesozoic era is represented only by the sandy deposits with seams of lignite which occur on the island of Andoen in the Vester-aalen. They contain remains of plants and have been correlated with the Lower Oolite of Great Britain. No Tertiary beds have been found, but Pleistocene deposits of various kinds are met with. The evidences of ice action during the Glacial Period are conspicuous over the whole country and are similar to those in other glaciated regions. But the most remarkable features produced in recent geological times are the terraces which appear as if ruled on the sides of the valleys and fjords. They are partly platforms cut in the solid rock and partly accumulations of gravel and sand like a modern beach, and they were evidently formed by the action of waves. Some of them contain marine shells of living species and mark the former position of the sea-level ; but others arc of more doubtful origin and may indicate the shores of lakes formed by the damming

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of the lower part of the fjords by means of glaciers, as in the case of the Parallel Roads of Glen Roy. They occur at various levels. and have been observed as high as 3000 ft. above the sea.

No volcanic rocks of modern date are known in Norway, but great intrusions of igneous rock took place in early geological times. Amongst them may be mentioned the gabbro of the Jotunfjeld, and the elaeolite syenites and associated rocks of the Christiania region. The latter form the subject of a valuable series of memoirs by Brogger, who shows that they have all been derived from a single magma, and that the differentiation of this magma led to the pro- duction of several different types of rock. (P. La.)

Meteorology. — The most powerful influence on the climate of Norway is that of the warm drift across the Atlantic Ocean from the S.W. The highest mean annual temperature in Norway T emBera , is found on the S. and W. coasts, where it ranges from ture 44-5° to 45-5° F., and the lowest is found at Karasjok and _ ” Kautokeino, lying at elevations of 430 and 866 ft. respectively in Finmarken, near the Russian frontier. Here the mean temperature is 26-4°, while at Vardo, on the north coast, it is 33 . At Roros (2067 ft.) at the head of the Glommen valley, and at Fjeldberg (3268 ft.) in the upper Hallingdal, the mean annual temperature is 31°. The longest winter is found in the interior of Finmarken, 243 days with a mean temperature below 32° being recorded at

II

Kautokeino, contrasted with 205 at Vardo. In the S. uplands (as at Fjeldberg) there is an average of 200 such days, and at Christiania about 120. On the S.W. coast there is no day of which the mean temperature falls below 32 °; the most westerly insular stations, however, such as Utsire and Skudeness off Bukken Fjord, record frost during some part of 60 days. The lowest winter average temperature is found in a centre of cold in the N. which extends over Swedish and Russian territory as well as Norwegian. The Norwegian station of Karasjok, within it, records 4° during December, January and February, and in this area there have aiso been observed the extreme minima of temperature in the country, e.g. 60-5° below zero at Karasjok. The contrast with the S.W. coast may be continued. Here at some of the island stations, the coldest month, February, has an average about 35°, and the lowest temperature recorded at Ona near Christiansund is 10-5°. It may be noted here that in several cases the lower-lying inland stations in the south show a distinctly lower winter temperature than the higher in the immediate vicinity. Thus the average for Roros (2067 ft.), 13 , contrasts with n° for Tonset ; at Listad in Gudbrandsdal (909 ft.) it is 16-5°, but at Jerkin in the Dovre Fjeld (3160 ft.) it is i7 – 5°- The summer is hottest in S.E. Norway (Christiania, July, 62-5). On the other hand, the lowest summer average in the interior of Finmarken is not less than 53-5° in July ; but at Vardo it is only 48 in August, usually the warmest month on this coast. In the lofty inland tracts of the S.E. the July temperature ranges, from 59 in the valleys, to as low as 49 at the high station of Jerkin. The interior having a warm summer and a cold winter, and the coast a cool summer and a mild winter, the annual range of temperature is remarkably greater inland than on the coast.

An important result of the warm Atlantic drift is that the fjords are not penetrated by the cold water from the lower depths of the outer ocean, and in consequence are always ice-free, except in winters of exceptional severity in the innermost parts of fjords, and along shallow stretches of coast.

The sun is above the horizon at the North Cape continuously from

the 12th of May to the 29th of July, and at Bodo, not far from the

Arctic circle, from the 3rd of June to the 7th of July.

,, ... Even at Trondhjem there is practically full daylight from ••midnight the 2 ˆ d of May tQ the 20th Q f j u j y g ven j n the extreme

“”” S. of Norway there is no darkness from the end of April

to the middle of August. In winter, on the other hand, the sun does not rise above the horizon at the North Cape from the 18th of November, to the 23rd of January, and at Bodo from the 15th to the 27th of December. There is only a twilight at midday. In the extreme S. the sun is above the horizon for 65 hours at mid-winter.

The prevailing winter winds are from the land seaward, while the ,-,. . system is reversed in summer. The winds in Norway

”” s ‘ may therefore be roughly classified according to locality thus : —

Winter . Summer .

South-east Coast (Skagerrack). N.E. S.W. to W.

West Coast.

S.

N.

North.

S.W.

N.

The force of the wind is greater in winter on the coast ; inland, on the contrary, the winter is normally calm ; and at all seasons, on the average, the periods of calm are longer inland than on the coast. The average annual number of stormy days, however, ranges from ten to twenty on the S. coast, from forty-five to sixty-two on the coast of Finmarken, and sixty to seventy at Ona; whereas in the interior of Finmarken the average number is four, while in the S. inland districts stormy days are rare. December and January are the stormiest months. Hailstones are rare and seldom destructive. Thunderstorms are not frequent. They reach a maximum average of ten annually in the Christiania district.

The number of days on which rain or snow falls is greatest on the coast from Jaederen to Vardo, least in the S.E. districts and the interior of Finmarken. At the North Cape, in Lofoten, and along the W. coast between the Stad and Sogne Fjord, precipitation occurs on about 200 days in the year, although by contrast in the inner part of Sogne

Fjord there is precipitation only on 121 days. On Dovie Fjeld and the S.E. coast the average is about 100 days. Snowfall occurs least frequently in the S. (e.g. at Mandal, 25 snowy days out of 1 16 on which precipitation occurs), increasing to 50 at Christiania, or Dovre Fjeld, and about the mouth of Trondhjem Fjord, to 90 at Vardo, and to 100 at the North Cape. From Vardo to the Dovre Fjeld and in the upland tracts, snow occurs at least as frequently as rain. Snowfall has been recorded in all months on the coast as far S. as Lofoten. The amount of precipitation is greatest on the coast, where, at certain points on the mainland between Bukken Fjord and Nordfjord, an annual average of 83 in. is reached or even exceeded. On the outer islands there is a slight decrease; inland the decrease is rapid and great. In Dovre Fjeld a minimum of 12 in. is found. In the extreme S. of the country the average is 39 in., N. of Trondhjem Fjord 53 in. are recorded, and there is a well-marked maximum of 59 in. at Svolvaer in Lofoten, N. of which there is a diminution along the coast to 26 in. at the North Cape. In the northern interior a minimum of 16 in. is recorded. Strongly marked local variations are observed.

The amount of cloudiness is on the whole great. The coast of

Finmarken has over three cloudy days to one clear day; in the interior of the country clear and cloudy days are about equally divided. Fog is most frequent on the W. and N. W. coasts in summer ; on the S.E. coast in winter. In winter a frosty fog often occurs about the heads of the fjords during severe cold or with a breeze from the land.

Flora. — The forests of Norway consist chiefly of conifers. The principal forest regions are the S.E. and S. Here, in the Trondhjem district, and in Nordland there are extensive forests of pine and fir. In the coastal and fjord region of the W. the pine is the only conifer- ous forest tree, and forests are of insignificant extent. In S. Norway the highest limit of conifers is from 2500 to 3000 ft. above sea- level; in the inland parts of the Trondhjem region it is from 1600 to 2000 ft. (though on the coast only from 600 to 1200) ; farther N. it falls to 700 ft. about 70 N. The birch belt reaches 3000 to 3500 ft. Next follow various species of willows, and the dwarf birch (betula nana), and last of all, before the snow-iine, the lichen belt, in which the reindeer moss (dadonia rangiferina) is always conspicuous. A few trees of the willow belt sometimes extend close up to the snow- line. In the S. and less elevated districts the lowest zone of forests includes the ash, elm, lime, oak, beech and black alder; but the beech is rare, flourishing only in the Laurvik district. The snow ranunculus and the Alpine heather are abundant. The Dovre Fjeld is noted as the district in which the Arctic flora may be studied in greatest variety and within

comparatively narrow limits. On the coastal banks the marine flora is very finely developed.

Fauna. — The great forests are still the haunt of the bear, the lynx, and the wolf. Bears are found chiefly in the uplands N. of Trondhjem, in the Telemark and the W. highlands, but the cutting of forests has limited their range. The wolves decreased very suddenly in S. Norway about the middle of the 19th century, probably owing to disease, but are still abundant in Finmarken, and the worst enemy of the herds of tame reindeer. The elk occurs in the eastern forests, and northward to Namdal and the Vefsen district. The red deer is confined chiefly to the W. coast districts ; its principal haunt is the island of Hitteren, off the Trondhjem Fjord. On the high fjelds are found the wild reindeer, glutton, lemming and the fox (which is of wide distribution). The wild reindeer has decreased, though large tame herds are kept in some parts, especially in the N. The lemming is noted for its curious periodic migrations; at such times vast numbers of these small animals spread over the country from their upland homes, even swimming lakes and fjords in their journeys. They are pursued by beasts and birds of prey, and even the reindeer kill them for the sake of the vegetable matter they contain. Hares are very common all over Norway up to the snow- line. The beaver still occurs in the Christiansand district.

Game birds are fairly abundant in most districts. The most notable are the two sorts of rype, the skov or dal rype (willow grouse, lagopus albus) and the fjeld rype (lagopus alpina). Black A .. grouse are widely distributed; hazel grouse are found VI ” a ‘ mainly in the pine forests of the E. and N., as are capercailzie. Woodcock and snipe are fairly common. The partridge is an immigrant from Sweden, and occurs principally in the E. and S.E. A severe winter occasionally almost exterminates it. A very large proportion of the Norwegian avifauna consists of geese and ducks, various birds of prey, golden plover, &c. These birds, at the autumn migration, leave by three well-defined routes — one from Finmarken into Finland, one by the Christiania valley, and one by the W. coast, where they congregate in large numbers on the lowlands of Jaederen. The Lapland bunting and snow bunting (plectrophanes laponica and nivalis), the snowy owl (mgetea scandiaca) and rough-legged buzzard (archibuteo lagopus) and sea-birds are exceedingly numerous. In some localities such birds as the puffin and kittiwake form great colonies (fugleberge, bird cliffs).

The common seal is very frequent; and arctic seals and occasion- ally the walrus visit the northern coasts ; among these the harp seal (phoca groenlandica) is believed to be particularly de- structive to the

fisheries. These last are of great import- ance; a large number of the best food-fisheries occur along the coasts, including cod, herring, mackerel, coal-fish, &c. The basking shark was formerly of some economic importance ; the Japanese shark, a strictly local variety, also occurs in the neighbour- hood of Vardo. Various small species of whales visit the coast; among these the lesser rorqual may be mentioned, as an antique method of hunting it with bow and arrows is still practised in the neighbourhood of Bergen. In the fjords many invertebrates as well as fish are found. Of fresh-water fish the salmonidae are by far the most important. Next to these, perch, pike, gwyniad and eel are most common.

As regards insect life, Norway may be divided into three areas, the S. being richer than the W., while the N. is distinct from either in the number of peculiarly arctic insects.

Sport. — Norway is much frequented by British anglers. Moderate rod-fishing for trout is to be obtained in many parts. But most of the owners of water rights have a full appreciation of the value of good fishing to sportsmen, especially when netting rights are given up for the sake of rod-fishing. The same applies to good shooting. Foreigners may not shoot without a licence, the cost of which is 100 kroner (£ 5 : 1 1 : o) whether on crown lands or on private properties, whose owners always possess the shooting rights.

Marine fauna.

Population. — The resident population of Norway in 1900 was 2,221,477. The Table shows the area and population of each of the administrative divisions (amt, commonly translated ” county “). Norway is, as a whole, the most thinly populated

Amter.

Population

1900.

Area in sq. m.

Southern —

Smaalenene ….

136,167

1,600

Akershus ….

116,896

2,054

Christiania (city) .

229,101

6-5

Buskerud ….

112,743

5,789

Jarlsberg and Laurvik .

101,003

896

Bratsberg ….

98,298

5,863

Nedenes

75.925

3,608-5

Lister and Mandal .

78.259

2,804

South-eastern (inland) —

Hedemarken

126,703

10,618

Christians ....

116,280

9,790

Western —

Stavanger ....

125,658

3,530-5

South Bergcnhus

132,687

6,024-5

Bergen (city)

72,179

5-5

North Bergenhus .

88,214

7,130

Romsdal ....

136,519

5,786

South Trondhjem .

134.718

7,182

Northern —

North Trondhjem .

83,449

8,788-5

Nordland ….

150,637

I4.5I3

72,966

10,131

Finmarken ….

33,387

18,291

of the political divisions of Europe. It may be noted for the sake of comparison that the density of population in the most sparsely populated English county, Westmorland, is about equalled by that in Smaalenene amt (85 per sq. m.), and con- siderably exceeded in Jarlsberg and Laurvik amt (112-7 per sq. m.), but is not nearly approached in any other Norwegian county. The two counties named are small and lie almost wholly within the coastal strip along the Skagerrack, which, with the coast-lands about Stavanger, Haugesund, Bergen and Trondhjem, the outer Lofoten Islands and the land about Lake Mjdsen, are the most thickly populated portions of the country, the density exceeding 50 persons per sq. m. A vast area practically uninhabited, save in the N. by nomadic Lapps, reaches from the northmost point of the Norwegian frontier as far S. as the middle of Hedemarken, excepting a markedly more populous belt across the Trondhjem depression. Thus of the counties, Finmarken is the least thickly populated (i-8 per sq. m.). In such highland regions as Jotunheim and Hardanger Vidda habitations are hardly less scanty than in the N. About two-thirds of the population, then, dwell by the coast and fjords, and about one-quarter in the inland lowlands,

leaving a very small upland population. The rural and urban populations form respectively about 76 and 24% of the whole. Of the chief towns of Norway, Christiania, the capital, had a population in 1900 of 229,101, Bergen of 72,179, Trondhjem of 38,156, Stavanger of 30,541, Drammen of 23,093. The towns with populations between 15,000 and 10,000 are Christiansand, Fredrikstad, Christiansund, Fredrikshald, Aalesund, Skien, Arendal and Laurvik. All these are ports.

The population of Norway in 1801 was returned as 883,038. A rapid increase obtained from 1815 to 1835, a lesser increase thereafter till 1865, and a very slight increase till 1890. The second half of the 19th century, down to 1890, was the period of heaviest emigration from Norway. The vast majority of Norwegian emigrants go to the United States of America. But emigration slackened in the last decade of the 19th century, during which period the movement from rural districts to towns, which had decreased from about the middle of the century, revived. The number of Norwegians abroad may be taken at 350,000. The Lapps, commonly called Finns by the Norwegians, and confined especially to Finmarken (which is named from them), are estimated at 1% of the population. There are also a few Finns (about half the number of Lapps), whom the Norwegians call Kvmner, a name of early origin. The excess

of births over deaths, about as 1-4 to 1, is much above the European average; the death-rate is also unusually low. The number of marriages is rather low, and the average age of marriage is high. The percentage of illegitimacy has shown some increase, but is not so high as in Sweden or Denmark. The percentage of longevity is high. The preponderance of females over males (about 1073 to 1000) is partly accounted for by the number of males who emigrate. The higher mortality of males is traced in part to the dangers of a seafaring life.

Down to the middle of the 19th century drunkenness was a strongly-marked characteristic of Norwegians. A. strict licensing system was then introduced with success. Local boards were given a wide control over the issue of licences, and in 1871 companies (samlag) were introduced to monopolize and control the retail trade in spirits. Their profits do not, as in the Gothen- burg system, go to the municipal funds, but are applied directly to objects of public utility. In 1894 a general referendum resulted in the entire prohibition of the sale of spirits in some towns for five years. The control of retail trade in beer and wine by the samlag has been introduced to some extent.

In Norway a strongly individual national character is to be expected,

combined with conservatism of ancient customs and practices. The one finds no better illustration than the individuality of modern Norwegian music and painting. The other is still strong. Such customs as the lighting of the mid- summer fires and the attendant celebrations still survive. Peculiar local costumes are still met with, such as those associated with weddings. In the coastwise shipping trade and the fisheries of the north, high-prowed square-sailed boats are frequently employed which are the direct descendants of the vessels of the early vikings. Some examples of the ancient farmstead, composed of a group of wooden buildings each of a single chamber, are preserved, and medieval ornamental woodwork is met with. Wood is the principal building material except in some larger towns where brick and stone have superseded it. Where this is not the case, fires have left few, if any, ancient domestic buildings, but the preservation of ancient models in wooden houses makes Norwegian towns peculiarly picturesque. Norway retains a few highly interesting examples of ecclesiastical architecture. There are the peculiar small wooden churches (stavekirke) dating from the nth to the 14th century, with high-pitched roofs rising in tiers so as to give the building some- thing of the form of a pyramid. The roofs are beautifully shingled in wood. The wall timbers are vertical. To protect them from the weather, the roofs overhang deeply, and the lowest sometimes covers a species of external colonnade. The carving is often very rich. The most famous of these churches is that of Borgund near Laerdalsoren; another fine example is at Hitterdal on the Kongsberg-Telemark road. On the other hand there are a few Romanesque and Gothic stone churches. In some of these the influence of English architecture is clear, as in the metropolitan cathedral of Trondhjem and the nave of Stavanger cathedral. St Mary's Church at Bergen, however, tends towards the French models. A good example of the smaller stone church is at Vossevangen, and there are several of Late Romanesque character in the Trondhjem district. There are ruins of a cathedral at Hamar, and a few monastic remains, as at Utstein, north of Stavanger, and on the island of Selje off Statland. Remains of pure Early English work are occasionally found, as at Ogne in Jaederen, but the later Gothic styles were not developed in Norway.

Tourist Traffic and Communications. — During the later decades of the 19th century Norway was rapidly opened up to British, American and German visitors. Passenger communications from Routes Great Britain are maintained chiefly between Hull and Stavanger, Bergen, Aalesund, Christiansund and Trondhjem; Hull, Christiansand and Christiania; Newcastle and Stavanger, Bergen and the North; London and Christiania, &c, and there are also passenger services from

Grimsby, Grangemouth and other ports. Yachting cruises to the great fjords and the North Cape are also provided. A daily service of mail steamers works between Chris- tiania and all ports to Bergen ; thence the summer service is hardly less frequent to Trondhjem. From each large port small steamers serve the fjords and inner waters in the vicinity, and there are also

steamers on several of the larger lakes. The season lasts from June to the middle of September. The voyage to the North Cape is taken _ . by many in order to see the ” midnight sun ” in June and

July. Among the land-routes connecting the great fjords of the west the following may be mentioned, (i) The road from Sand on Sandsfjord (a branch of Bukken Fjord), which follows the Sand river up to the foot of Lake Suldal, near the head of which is Naes. From here a finely engineered road runs up the Bratlandsdal, crosses the Horrebraekke and descends past Seljestad to Odde at the head of a branch of Hardanger Fjord. (2) From Eide on another branch of the same fjord a road runs to Vossevangen (which is connected by rail with Bergen) and continues N. to Stalheim, where it descends through the Nserodal to Gudvangen on a branch of Sogne Fjord. (3) From Vadheim on this fjord a road runs N. to Sandene and Utvik on Nordfjord. Routes N. from this fjord are (4) that from Faleide by Grodaas on Lake Hornindal to Hellesylt on Sunelv Fjord and Oje on Norangs Fjord, and (5) that from the same station or from Visnaes, by way of Lake Stryn, to Grotlid, and Merok on Geiranger Fjord. All these routes pass through magnificent scenery. For the same reason there should also be mentioned (6) the road through the Telemark, which branches from the Bratlandsdal road at Breifond, mounts the Haukelidsaeter and descends to Dalen, from which the Bandaks canal route gives access to Skien on the S.E. coast, the road continuing from Dalen E. to Kongsberg; also those running E. from the great fiords — from Laerdalsoren on Sogne Fjord, branching (7) through Hallingdal, and (8) through Valdres ; (9) the road from Grotlid to Otta in Gudbrandsdal, running N. of the Jotunheim; (10) the road from Veblungsrtaes on a branch of Molde Fjord, running through the Romsdal and over to Domaas; (11) the N. road across Dovre Fjeld from Domaas to Storen on the railway to Trondhjem. Beyond the districts thus indicated, the Saetersdal, a southern valley, is visited by many, and in the far N. the Lofoten Islands and some of the fjords, as Lyngen and Alten, are very fine. The mountains of Jotunheim have

attracted several well-known mountaineers.

The main roads of Norway, the construction of which has de- manded the highest engineering skill, were not brought into existence until the last half of the 19th century. A Highways Act of 1851 placed the roads under the immediate control of local authorities, but government grants are made for the construction not only of main roads, but in many cases of cross-roads also. In a country where railways are few, posting is of prime importance, and in ‘ Norway the system is well developed and regulated. Along all main roads there aie posting stations (sky >ds stationer, pronounced shiiss- stashoner), hotels, inns or farms, whose owners are bound to have horses always in readiness; at some stations on less frequented roads time is allowed for them to be procured. Posting stations are under strict control and the tariff is fixed. The vehicles are the slolkjarre (pronounced approximately stolcharer) for two passengers, and the kariol or carriole for one. A similar posting system obtains by rowing-boats on lakes and fjords.

The first railway, that between Christiania and Eidsvold, was constructed by agreement between British capitalists and the Norwegian government, and opened in 1854. The total Hallways. jˆgˆ f railways is only about 1600 m., Norway having the lowest railway mileage in proportion to area of any European state, though in proportion to population the length of lines is com- paratively great. Almost the whole are state lines. Railways are most fully developed in the S.E., both N. and S. of Christiania. The principal trunk line connects Christiania with Trondhjem by way of Hamar and the Osterdal, Roros and Storen. Four lines cross the frontier into Sweden — from Christiania by Kongsvinger (Kongs- vinger railway) and by Fredrikshald (Smaalenenes railway), from Trondhjem by Storlien (Meraker railway), and from Narvik on Ofoten Fjord, the most northerly line in the world. Among other important lines may be mentioned that serving Lillehammer, Otta, &c, in Gudbrandsdal, that running S.W. from Christiania to Dram- men, Skien and Laurvik; the Saetersdal line N. from Christian- sand; the Jaederen line from Stavanger to Egersund and Flekkefjord; the Bergen- Vossevangen line; and the branch from Hell on the Meraker railway northward to Levanger. These local lines form links in important schemes for trunk lines. Norwegian railways are divided between the standard gauge and one of 3 ft. 6 in. ; on the N. line a change of gauge is made at Hamar.

Some of the large lakes form important channels for inland _ . navigation; the rivers, however, are not navigable for

Canals. any considerable distance. A canal from Fredrikshald gives

access N. to Skellerud, and the Bandaks canal connects Dalen in the Telemark with Skien.

The post-office is well administered, and both telegraph and telephone systems are exceptionally extensive.

Industries. Agriculture.— About 70 % of the total area of Norway is barren, and about 21 % is forest land, but the small agricultural area employs, directly or indirectly, about 40% of the population. The great majority of the peasantry are freeholders. Legislation has provided for the retention of landed property by families to which it has belonged for any considerable period — thus, under certain conditions, a family which has parted with land can reacquire it at an appraisement — or land alienated by its owner may on his death be acquired by his next of kin. The chief crops are oats barley, potatoes,

mangcorn (a mixed crop of oats and barley), rye and wheat, the last being little cultivated. Cattle and sheep are kept in large numbers. Farmers commonly hold upland summer pastures together with their lowland farms, and in the open season frequently occupy a sceter (upland farmstead) and devote themselves to dairy work. Norwegian horses are small and thick-set, and remarkably sure- footed. In the north large herds of reindeer are kept by Lapps. There is an agricultural college and model farm at Aas near Christiania.

Forestry. — Forest industries are confined chiefly to the S.E. and to the Trondhjem-Namsen district. Lumbering is an important industry. Forestry is controlled by the Department of Agriculture, and its higher branches are taught at the Aas college.

Fisheries. — The sea fisheries are of high economic importance. The principal are the cod fisheries. In March and April the cod shoal on the coastal banks for the purpose of spawning, and this gives rise to the well-known fishery for which the Lofoten Islands are the principal base. In April and May shoals of capelan appear off Finmarken, followed by cod and other fish, small whales, &c, which prey upon them ; this affords a second fishery. For herring there is a spring fishery off Stavanger and Haugesund, and one in November and December off Nordland. Mackerel fisheries are important from Trondhjem Fjord S. to the Skagerrack. Salmon and sea-trout fisheries are important in the rivers and still more off the coast. Fishermen from Tonsberg, Tromso, Hammerfest, Vardo, Vadso, &c, work with the arctic fisheries, sealing, whaling, &c, from Green- land to Spitsbergen and Novaya Zemlya. A fishery board at Bergen administers the Norwegian fisheries. The annual value of the coast fisheries ranges

from £1,000,000 to £1,500,000.

Mining. — Norway is not rich in minerals. Coal occurs only on Ando, an island in Vesteraalen. Silver is mined at Kongsberg; copper at Roros, Sulitelma, and Aamdal in Telemarken; iron at Klodeberg near Arendal and in the Dunderlandsdal (developed early in the 20th century). Granite is quarried near Fredrikstad, Fredrikshald and Sarpsborg, and exported as paving setts and kerb- stones, mostly to Great Britain and Germany. Good marble is found near Fredrikshald, and also in the Salten and Ranen districts.

Manufacturing Industries. — The most important are works connected with the timber trade, foundries and engineering shops, spinning and weaving mills, brick and tile works, breweries, paper-mills, tobacco factories, flour-mills, glass works, and potteries, nail works, shipbuilding yards, rope works, factories for preserved food (especially fish), margarine, matches, fish guano, boots, and hosiery, distilleries and tanneries. The chief industrial centres are Christiania, Bergen, Fredrikstad and Sarpsborg, Drammen, Skien and Porsgrund, Trondhjem, Fredrikshald and Stavanger. Large water-power is available in many districts. A powerful impulse was given to industrial enterprise by the non-renewal of the customs treaty with Sweden in 1897, which established a protective systerr against that country.

Shipping and Commerce. — The Norwegians, in proportion to their numbers, are the first nation in the world in the mercantile marine industry. Actually their mercantile marine is only exceeded by those of Great Britain, Germany and the United States. From 1850 to 1880 the tonnage increased from 289,000 to more than 1,500,000. The tonnage now exceeds the latter figure, but steam has greatly increased the carrying power. In 1880 Norwegian steam vessels had a tonnage of about 52,000; they now exceed 640,000 tons. The annual value of imports is about £16,500,000, and of exports about £10,000,000. The growth of both may be judged from periodic averages —

1851-1855.

1866-1870.

1 886-1 890.

Imports Exports

£2,800,000

2,400,000

£5,600,000

3,000,000

£9,200,000

6,600,000

Great Britain and Germany are the countries principally trading with Norway. Great Britain takes about 40 % (by value) of Norwegian exports, and sends about 26% of the total imports into Norway; Germany takes 14% of the exports, and sends 28% of the imports. The chief articles of export are timber, wooden wares and wood pulp, principally to Great Britain, and fish products, principally to Germany, Sweden and Spain. These make 65% of the exports — others of importance are paper, ships, ice, stone and nails. Of the imports about 58 % by value are for consumption, 42 % material for production. Among the first are cereals (principally from Russia), groceries (from Germany), and clothing (from Germany and Great Britain). Among the second are coal (chiefly from Great Britain), hides and skins, cotton and wool, oil and machinery, steamships, and metal goods (from Great Britain, Germany and Sweden).

Government. — Norway is an independent, constitutional and hereditary monarchy, the union with Sweden having been dis- solved on the 7th of June 1905, after lasting 91 years. The constitution rests on the fundamental law (grundlov) promul- gated at Eidsvold on the 17th of May 1814, and altered in detail at various times. The executive is vested in the king, who

Emery T*lke» at.

comes of age at eighteen. His authority is exercised through, and responsibility for his official acts rests with, a council of state consisting of a minister and councillors, who are the heads of finance, public accounts, church and education, defence, public works, agriculture, commerce, navigation and industry and foreign affairs. The king appoints these councillors and high officials generally in the state, church, army, navy, &c. He can issue provisional ordinances pending a meeting of parliament, can declare war (if a war of offence, only with the consent of parliament) and conclude peace, and has supreme command of the army and navy. The legislative body is the

parliament (storthing), the members of which are elected directly by the people divided into electoral divisions, each returning one member. Until the election of 1906 the members were chosen by electors nominated by the voters. Elections take place every three years. The franchise is extended to every Norwegian male who has passed his twenty-fifth year, has resided five years in the country, and fulfils the legal conditions of citizenship. Under the same conditions, and if they or their husbands have paid taxes for the past year, the franchise is extended to women under a measure adopted by the Storthing in June 1907. Members of parliament must possess the franchise in their con- stituency, and must have resided ten years in the country; their age must not be less than thirty. The Storthing meets at Christiania, normally for two months in each year; it must receive royal assent to the prolongation of a session. After the opening of parliament the assembly divides itself into two sections, the upper (lagthing) consisting of one-quarter of the total number of members, and the lower (odelsthing) of the remainder. Every bill must be introduced in the Odelsthing; if passed there it is sent to the Lagthing, and if carried there also the royal assent gives it the force of law. If a measure is twice passed by the Odelsthing and rejected by the Lagthing, it is decided by a majority of two-thirds of the combined sections. The king has a veto, but if a measure once or twice vetoed is passed by three successive parliaments it becomes law ipso facto. This occurred when in 1899 the Norwegians insisted on removing the sign of union with Sweden from the flag of the mercantile marine. Members of parliament are paid 13s. 4d. a day during session and their travelling expenses. Parliament fixes taxa- tion, and has control of the members of the council of state, who are not allowed to vote in either house, though they may speak.

Finance, &c. — The annual revenue and expenditure are each about 5i millions sterling. Considerable sums, however, have been raised by loans, principally for railways. These amounted, between 1900 and 1906 (the financial year ending the 31st of March) to nearly £4,500,000. The principal sources of revenue are customs, railways, post office and telegraphs, the income tax (which is graduated and not levied on incomes below 1000 kroner or £55, 6s. 8d.), and excise. The principal items of expenditure are railways, defence (principally the army), the post office, interest on debt, the church and education, and justice. The Bank of Norway is a private joint-stock corpora- tion, in which the state has large interests. It is governed by special acts of parliament, and its chief officials are publicly appointed. It alone has the right to issue notes, which are in wide circulation. The Mortgage Bank (Norges Hypothekbank) was established by the state to grant

loans on real estate. The currency of Norway is based on a gold standard; but the monetary unit is the krone (crown), of is. 1 ˆd. value, divided into 100 ore. The metric system is in use. Army and Navy. — The army consists of the line, the militia or reserve (landvcern), and the second reserve (landstorm). All capable men of twenty-two years of age and upwards are liable for con- scription (except the clergy and pilots), and when called they serve 6 years in the line, 6 years with the reserve and 4 years with the second reserve. In war, men are liable to service from the 1 8th to the 50th year of age. Only the line can be sent out of the country. The men only meet for military training from 18 to 102 days in each year. The peace establishment of the line is 12,000 men, with 750 officers; its war footing 26,000, or more, but may not exceed 18,000 without the authority of parliament. Of enlisted troops there are only fortress garrisons, and the Christiania garrison of Norwegian Guards. The principal fortresses are Oscarsborg on Christiania Fjord, Agdenes (Trondhjem Fjord), Bergen, Tonsberg and Christiansand. A number of Norwegian forts along the S. Swedish frontier were dismantled under the convention with Sweden of 1905, when a neutral zone was established on either side of the frontier southward from 61 ° N. The navy consists of about 1200 officers and men on permanent service; but all seafaring men between twenty-two and thirty-eight are liable

for, maritime conscription, and are put through some preliminary training. The war vessels include four battleships of 3500 to 4000 tons each, and about 16 other vessels, besides a torpedo flotilla — intended for coast defence only. The chief naval station is at Karl- johansvaern (Horten).

Justice. — Civil cases are usually brought first before a commission of mediation (forligelseskommission), from which an appeal lies to the local inferior courts, which are also tribunals of first instance, and are worked by judges on circuit and assessors. There are three superior courts of appeal (overretter), at Christiania, Bergen and Trondhjem, and one supreme court (hoiesterei) . Criminal cases are tried either in jury courts (lagmandsret) or courts of assize (meddomsret) . The first is for more serious offences ; the second deals with minor offences and is a court of first instance. Military crimes are dealt with by a military judicial organization. Finally there is a high court of impeachment (rigsret), before which members of parliament, the government, &c, are tried for misdemeanours com- mitted in their public capacity.

Local Government. — The country is divided into twenty counties (amtef) (see population), the cities of Christiania and Bergen being included in these. Other towns are formed into communes, governed

by representatives, from whom a council (formand) is elected by themselves. Rural communes (herreder) are similarly administered, and their chairmen form a county council (amtsthing) for each county. At the head is the amtmand, the county governor. The electoral franchise for local council election is for men the same as the parliamentary franchise, and, like it, is extended in a limited degree to women.

Religion and Education. — The state religion, to which the king must conform, is Evangelical Lutheran. Only about 2-4% of the population are dissenters. All Christian sects except Jesuits are tolerated. The king nominates the clergy of the established church. Norway is divided into six bishoprics (slifter), Christiania, Hamar, Christiansand, Bergen, Trondhjem, Tromso; and these into deaneries (provstier), with subdivisions into clerical districts (pmstegjeld), parishes and sub-parishes. The clergy take a leading part in primary education, which, in spite of the difficulties arising in a sparsely populated country, reaches a high standard. Education is com- pulsory, the school-going age being from 6| to 14 years in towns and 7 to 14 years in the country. About 94% of the children of school- going age attend the primary schools, which are administered by school boards in the municipalities and the counties. Teachers must belong to the established church. Their training colleges include one free public college in each diocese. The municipalities and counties bear the cost of primary education with a state grant. There arecontinuation schools, evening schools, &c, and for secondary education, communal middle schools, and state gymnasier. There is a state-aided university at Christiania.

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(O.J.R.H.)

History. Early History. — Archaeological and geological researches have revealed a fishing and hunting population in Norway, possibly

as far back as c. 6000 B.C. Until lately this aboriginal people, which was certainly non-Aryan, was held to be Lappish, but recent investigations seem to show that the Lapps only entered Norway about a.d. 900-1000, and that the original population was probably of Finnish race, though only distantly allied to the Ugro-Finns now inhabiting Finland. To them belong perhaps certain non-Aryan names for natural features of the country, such as Toten, Vefsen, Bukn.

The time of the immigration of a Teutonic element is far from certain. It did not extend N. beyond the Trondhjem district until about the beginning of our era, but there can be Teutonic little doubt that the immigrants’ advance was ex- tfol7- tremely slow, and it is suggested, on the evidence of

archaeology, that the Teutonic element entered S. Norway towards the end of the (Scandinavian) later Stone age, c. 1700 b.c. (see Scandinavian Civilization). But what- ever were the stages of the process, the language of the older race was superseded by Teutonic, and those aborigines who were not incorporated (probably most often as slaves) were driven into the mountains or the islands that fringe the coast. In the high- lands the ” Finns ” maintained some independence down to historical times. The old English poem Beowulf mentions a ” Finnaland ” which should perhaps be located in S. Norway in about the 6th century, and later on the ancient laws of this region forbid the practice of visiting the* ” Finns ” to obtain knowledge of the future. But only in Finmark, which even in the 13th century stretched far into Sweden and included the Norwegian district of Tromso, could the earlier inhabitants live their old life, and here they finally fell into the utmost want and misery. Their existence is mentioned as a thing of the past by a North Trondhjem writer in 1689.

The new Teutonic element of population seems to have flowed into Norway from two centres; one western, probably from Jutland, the other eastern, from the W. coast of Sweden. The” western stream covered Agder, Rogaland and Hordaland (the modern districts of Christiansand and Sondre Bergenhus), and finally extended N. as far as Sondmore, while the eastern stream flowed across Romerike and Hadeland through the Dales to the Trondhjem district, where it divided, one stream flowing down the W. coast till it met the western settlements, another pene- trating N. into Haalogaland (which included the modern Nord- land as well as Helgeland), and a third E. into the N. Swedish districts of Jamtland and Helsingland. The bodies of immigrants were no doubt more or less independent, and each was probably under a king. It is probable that the Horder, who gave their name to Hordaland and Hardanger, were a branch of the Harudes whom Ptolemy in the 2nd century mentions as living in Jutland, where their name remains in the present Hardesyssel. The Ryger, who gave their name to Rogaland, and the modern Ryfylke, are probably akin to the Rugii, an E. Germanic tribe at one time settled in N.E. Pomerania, where we have a remi- niscence of their name in Rtigenwalde. The first mention of any tribe settled in Norway is by Ptolemy, who speaks of the Chaidenoi or Heiner, inhabiting the W. of his island Scandia. The system of settlement in Norway appears to have been different from that adopted by the same race in other lands. In Denmark, for instance, a group of as many as twenty settlers held land more or- less in common, but this system, which demanded that a considerable extent of land should be readily accessible, was not feasible in the greater part of Norway, and except in one or two flatter

districts each farm was owned, or at least worked, by a single family.

When history first sheds a faint light over Norway we find each small district or ” fylke ” (Old Norse jylkir, from folk, army) settled under its own king, and about twenty-nine kingship, fytker in the country. At times a king would win an overlordship over the neighbouring tribes, but the character of the country hindered permanent assimilation. The king always possessed a hird, or company of warriors sworn to his service, and indeed royal birth and the possession of such a hird, and not land or subjects, were the essential attributes of a king There was no law of primogeniture, and on the death

of a king some of his heirs would take their share of the patri- mony in valuables, gather a hird, and spend their lives in warlike expeditions (see Vikings), while one would settle down and become king of the fylke. There are indications that these conditions were fostered by a matriarchal system, and that it would often occur that a wandering king would marry the daughter of a fylkes-king and become his heir. Probably the king’s power was only absolute over his own hird. He was certainly commander-in-chief and perhaps chief priest of the fylke, but the administrative power was chiefly in the hands of the herser and possibly of an earl. The position of earls is vague, but it is noticeable that both those of whom we hear in Harald Haarfager’s time take the opposite side to their king. The herser (Old Norse her sir), of whom there were several in each fylke, united high birth with wealth and political power, and with the holder, the class of privileged hereditary landowners from which they sprang, formed an aristocracy of which there seems little trace in the other Scandinavian countries at this period. Its rise in Norway is perhaps due to the fact that the nature of the country, as well as the individualistic system of settlement, left more scope for inequalities of wealth than in Denmark or Sweden. Once a family had become wealthy enough to fit out Viking ships, it must have added wealth to wealth, besides enormously raising its prestige. The lands of almost all the most powerful families were on islands, whence it was easy to set forth on roving expeditions. The family property of the earls of Lade, for instance, whose representative in the latter half of the 9th century was the most powerful man of the district, was on the island of Nasro. These islands had been the refuge of the aborigines, and it is possible that, as A. Hansen has suggested, the rise of the aristocracy depends here, as elsewhere, on a subject population. Among the proper names of thralls in a poem in the Elder Edda are several which can only be explained on the hypothesis that they are Finnish, e.g. Klums, Lasmer, Drumba. Harald Haarfager’s decree concerning ” those who clear forests and burn salt, fishermen and hunters ” pro- bably refers to the

Finns as a class apart. There can be no doubt that, in Haalogaland for instance, the aristocracy gained its wealth not only from the tribute extorted from the Finns in Finmark, but also from slave labour.

The eight Trondhjem fylker had a common Thing or assembly very early, but these districts were remote, while the wealthy western districts were too much cut off from each other to unite effectively, though here also a common Thing was early estab- lished. The first successful attempt at unification originated round Vestfold, the modern Jarlsberg and Laurvik Amt on the Christiania fjord. Here also there was a certain degree of union very early, and it is possible that national feeling was fostered by proximity to the Danish and Swedish kingdoms. The district was thickly populated, and a centre of commerce. Tradition made the royal family a branch of the great Yngling dynasty of Upsala, which claimed descent from the god Frey. Through several generations this family- had extended its kingdom by marriage, conquest and inheritance, and by the end of the reign of Halfdan the Black, it included the greater part of Hamar and Oslo Stift, and the fylke of Sogn, the district round the modern Sognefjord.

Halfdan's son, Harald Haarfager, having no brothers, suc- ceeded to the whole kingdom, and was further fortunate in that an uncle helped him to maintain his rights. By 866 his power was so well established in S. Norway h**". that he contemplated the conquest of the whole land. fager. The chief obstacle appears to have been the resistance, not only of the petty kings, but also of the aristocratic families, who dreaded the power of a monarchy established by force, and consequently supported the vaguer authority of their own kinglets. There can be no doubt that Harald introduced a feudal view of obligations towards the king, and landowning families, who had regarded their odel, or inherited property, as absolutely their own, resented being forced to pay dues on it. In each district Harald offered the herser the opportunity of becoming his vassals, answerable to him for the government of

the district. The increased dues and the grants of land made by Harald rendered the position of one of his earls more lucrative than that of king under the older system; and it shows to what a paramount position the old aristocracy must have attained, that numbers of the herser and holder could not reconcile them- selves to the limitation of their independence, but quitted the lands which were their real title to

influence, rather than submit to the new order. But the little kingdoms only made futile attempts at combination, except in the western districts of Agde (comprising the modern Lister and Mandal and Nedenaes), Rogaland and Hordaland. Here was the home of the ” western Vikings ” who for nearly a century had owed wealth and fame to their raids on the British Isles. Attack by land was impossible, and Harald had to gather men and ships for three years before he could meet the fleet of the allied kings at Hafsfjord. The battle (872) resulted in a victory to him, and with it all opposition in Norway was at an end. An expedition to Scotland and the Scottish isles (c. 891) dispersed enemies who could harry the Norwegian coast, many of them taking refuge in Iceland; and the earldom of the Orkneys and Shetlands became an appanage of the Norwegian Crown. For the moment the whole country was under a single king, but Harald himself destroyed his work, in accordance with old custom, by giving about twenty of his sons the title of king, and dividing the country among them, only qualifying this retrograde step by installing his favourite son Erik Blodoxe as over-king (930). Moreover, Harald had estab- lished no common Thing for the whole of his kingdom. Norway is naturally divided into three parts, and each of these remained more or less separate for centuries, even having separate laws until the second half of the 13th century. The Frostathing district (so called from Frosta near Trondhjem) included the eight Trondhjem fylker, and also Naumdal, Nordmore and Raumsdal. The Gulathing district consisted of Sondmore, Firdafylke, Sogn, Valdres, Hallingdal, Hordaland and Agde, and met at Gula in Hordaland. The third, the Eidsivathing, met on the shores of Lake Mjosen, and included the Uplands and also the ” Vik,” i.e. all the districts round Christiania fjord, until St Olaf established the Borgarthing at Sarpsborg as a centre for these latter. The king’s council was composed of the local lendermand, and thus varied with the district he happened to be visiting, an arrangement that had its advantages, since the local chiefs were acquainted with the laws of their dis- trict, though it was another hindrance to unification. It was only in 13 19 that a permanent council was formed, the Rigets Raad.

Harald died in 933. Erik Blodoxe (Bloody-axe) only managed to rid himself of two rival over-kings, Olaf and Sigfred, his half-brothers, for on hearing of his father’s death, another son, Haakon (q.v.), called the Good, who had been brought up at ˆEthelstan’s court, came to Norway with a small force and succeeded in ejecting Erik (934). After Haakon’s death in 961 at the battle of Fitje, where his long struggle against Erik’s sons and their Danish allies ter- minated, these brothers, headed by Harald Graafeld (grey-cloak) became masters of the W.

districts, though the ruling spirit appears to have been their mother Gunhild. Earl Sigurd of Lade ruled the N., and the S. was held by vassal kings whom Haakon had left undisturbed. By 969 the brothers had succeeded in ridding themselves of Sigurd and two other rivals, but the following year Harald Graafeld was lured to Denmark and treacherously killed at the instigation of Earl Haakon, son of Sigurd, who had allied himself with the Danish king Harald Gormsson. With the latter's support Earl Haakon won Norway, but threw off his yoke on defeating Ragnfred Eriksson at Tingenes in 972. The S.E. districts were, however, still held by Harald Grenske, whose father had been slain by the sons of Erik. Haakon ruled ably though tyrannically, and his prestige was greatly increased by his victory over the Jomsvikings, a band of pirates inhabiting the island of Wollin at the mouth of the Oder, who had collected a large fleet to attack Norway. The date of their defeat at Hjorungavaag, now Lidvaag, is uncertain. But finally the earl's disregard of the feelings of the most power-

Introduc- tioa of Christi- anity by Olat.

Haakon the Good.

ful " bonder," or landed proprietors, worked them up to revolt, and, in 995, there landed in Norway Olaf, great- grandson of Harald Haarfager and son of the king Tryggve of the Vik whom Gudrod Eriksson had slain, and whose father Olaf had been slain by Erik Blodoxe.

The earl was treacherously killed by his thrall while in hiding, and Olaf entered unopposed upon his short and brilliant reign. His great work was the enforced conversion to Chris- tianity of Norway, Iceland and Greenland. In this undertaking both Olaf and his successor and namesake looked for help to England, whence they obtained a bishop and priests; hence it comes that the organiza- tion of the early church in Norway resembles that of England. No more than England did Norway escape the struggle between Church and State, but the hierarchical party in Norway only rose to power after the establishment of an archiepiscopal see at Trondhjem in 1132, after which the quarrel raged for over a century. Until the year 1100, when tithes were imposed, the priests depended for their livelihood on their dues, and Adam of Bremen informs us that this made them very avaricious.

In the year 1000 Olaf fell at the battle of Svolder off Riigen, fighting against the combined Danish and Swedish fleets. The allies shared Norway between them, but the real power lay in the hands of Erik and

Svein, sons of wlth Earl Haakon. In 1015, when Erik was absent in Denmark. England, another descendant of Harald Haarfager appeared, Olaf, the son of Harald Grenske, a great-grandson of Harald Haarfager (see Olaf II. Haraldsson) . He defeated Svein at Nesje in 1016, which left him free to work towards a united and Christian Norway. For some years he was successful, but he strained the loyalty of his subjects too far, and on the appearance of Knut the Great in 1029 he fled to Russia. His death at the battle of Stiklestad on his return in 1030 was followed by a few years of Danish rule under Svein Knutsson, which rendered Olaf's memory sweet by contrast, and soon the name of St Olaf came to stand for internal union and freedom from external oppression. In 1035 his young son Magnus, afterwards called the Good, was summoned from Russia, and was readily accepted as king. A treaty was made with Hardeknut which provided that whichever king survived should inherit the other's crown. Hardeknut died in 1042, and Magnus became king of Denmark, but a nephew of Knut the Great, Svein Estridsson, entered into league with Harald Haardraade (see Harald III.), the half-brother of St Olaf, who had just returned from the East. As soon, however, as overtures weie made to him by Magnus, he forsook the cause of Svein, and in 1046 agreed to become joint king of Norway with Magnus. The difficulties arising out of this situation were solved by Magnus's death in 1047.

Harald's attempts to win Denmark were vain, and in 1066 he set about a yet more formidable task in attacking England, which ended with his death at Stamford Bridge in 1066. His son Olaf Kyrre (the Quiet) shared the kingdom with his brother Magnus until the latter's death in 1069, after which the country enjoyed a period of peace. A feature of this reign is the increasing import- ance of the towns, including Bergen, which was founded by Olaf. In 1093 Olaf was succeeded by his turbulent son Magnus Barfod . (barefoot) and by Haakon, son of Magnus the Good. The latter died in 1095. Besides engaging in an unsuccessful war against the Swedish king Inge, in which he was defeated at Foxerne in 1101, Magnus undertook three warlike expeditions to the Scottish isles. It was on the last of these expeditions, in 1 103, that he met his death. He was succeeded by his three sons, Eystein, Sigurd and Olaf. Olaf died young. Sigurd undertook a pilgrimage, from which he gained the name of Jorsalfar (traveller to Jerusalem). He won much booty from the Moors in Spain, from pirates in the Mediterranean, and finally at Sidon, which he and his ally Baldwin I. of Jerusalem took and sacked. Eystein died in 1122. Sigurd lived till 1130, but was subject to fits of insanity in his later years. He was the last undoubted representative of Harald Haarfager's race, for on his death

Bad of Harald Haar- fager's Hoe.

his son Magnus was ousted by Harald Gille, or Gilchrist, who professed to be a natural son of Magnus Barfod.

Harald Gille was slain in 1136 by another pretender, and anarchy ruled during the reign of his sons Eystein, Inge and

Sigurd Mund. At last Inge's party attacked and ™£Z£* killed first si g urd ("55) and then Eystein (1157). sioas. I n ge fell in a fight against Sigurd's son Haakon Herde-

bred in 1161, but a powerful baron, Erling, succeeded in getting his son Magnus made king, on the plea that the boy's maternal grandfather was King Sigurd Jorsalfar. Descent through females was not valid in succession to the throne, and to render his son's position more secure, Erling obtained the support of the Church. In 1164 the archbishop of Trondhjem crowned Magnus, demanding that the crown should be held as a fief of the Norwegian Church. Owing to such concessions the Church was gaining a paramount position, when a new pretender appeared. Sverre (O.N. Sverrir) claimed to be the son of Sigurd Mund, and was adopted as leader by a party known as the Birkebeiner or Birchlegs. He possessed military genius of a rare order, and in spite of help from Denmark, the support of the Church and of the majority of barons, Magnus was defeated time after time, till he met his death at the battle of Nordnes in n 84. The aristocracy could offer little further opposition. In joining hands with the Church against Sverre, the local chiefs had got out of touch with the small landowners, with whose support Sverre was able to build up a powerful monarchy. Sverre's most dangerous opponent was the Church, which offered the most strenuous resistance to his efforts to cut down its prerogatives. The archbishop found support in Denmark, whence he laid his whole see under an interdict, but Sverre's counter-claim of his own divine right as king had much more influence in Norway.

Sverre died in 1202, his last years harassed by the rise of the Baglers, or " crozier-men," with a new claimant at their

Magnus.

to three main sources: commerce, Viking expeditions and slave labour.

Trade had been a favourite means of enrich- ment among the aristocracy up to the middle of the 13 th century, but now it was almost monopolized by Germans, and Viking enterprise was a thing of the past. The third source of wealth had also failed, for it is clear from the laws of Magnus that the class of thralls had practically disappeared. This must have greatly contributed to shatter the power of the class which had once been the chief factor in the government of Norway.

Haakon's daughter Ingeborg had married Duke Erik of Sweden, and on Haakon's death in 1319 their three-year-old son Magnus succeeded to the Norwegian and Swedish thrones, the two countries entering into a union which was not definitely broken till 137 1. It was during this reign that Norway was ravaged by the Black Death. In 1343 Magnus handed over the greater part of Norway to his son Haakon VI., who married Margrete, daughter of King Valdemar III. of Denmark. Their young son Olaf V., already king of Denmark, succeeded to his father's throne on Haakon's death in 1380, but died in 1387, leaving the royal line extinct, and the nearest successor to the throne the hostile King Albrecht of Sweden, of the Mecklenburg family. The difficulty was met by filling the throne by election — an innovation in Norway, though it was the custom in Sweden and Denmark. The choice fell on Kingjy OP . Haakon's widow Margrete, but a couple of years wegian, later, chiefly in order to gain German support m Sw ˆ dlsl " a coming struggle with the Mecklenburgers, theˆˆ,*" 8 Norwegians elected as king the young Erik of Pomerania, great-nephew of the queen, who henceforth acted as regent. Erik had claims on the Swedish and Danish thrones, and in 1397, at Kalmar, he was solemnly crowned king over the three countries, which entered into a union " never to be dissolved."

head. His son Haakon III. died two years later, perhaps of poison, but the Birkebeiner party in 1217 succeeded in placing Haakon's son and namesake on the throne (see Haakon IV.). In 1240 the last of the rival claimants fell, and the country began to regain prosperity. The acquisition of Iceland was at length realized. Haakon's death occurred after the battle of Largs in the Orkneys in 1263. The war with Scotland was soon terminated by his son Magnus, who surrendered the Hebrides and the Isle of Man at the treaty of Perth in 1268. Magnus saw the worthlessness of a doubtful suzerainty over islands which had lost their value to Norway since the decay of Viking enterprise. He gained his title of Law- Mender from the revision of the laws, which had remained very much as in heathen days, and which were still different for the four different districts. By 1 2 74 Magnus had secured the accept- ance of a revised compilation of the older law-

books. The new code repealed all the old wergild laws, and provided that the major part of the fine for manslaughter should be paid to the victim's heir, the remainder to the king. Henceforward the council comes more and more to be composed of the king's court officials, instead of a gathering of the lendermmnd or barons of the district in which the king happened to be. During Magnus's reign we hear of a larger council, occasionally called .pdliment (parliament), which is summoned at the king's wish. The old landed aristocracy had lost its power so completely that even after Magnus's death in 1280 it was unable to reinstate itself during the minority of his son Erik.

Erik was succeeded in 1299 by his brother Haakon V., who in

1308 felt himself strong enough to abolish the dignity of the

lendermcend. This paralysis of the aristocracy is

Paralysis no doubt partly to be ascribed to the civil wars, but at the arts- . , , , , . . , l ˆ,

tocracy. m P art a ' s0 to the gradual impoverishment 01 the country, which told especially upon this class. Russia had long eclipsed Norway as the centre of the fur trade, and other industries must have suffered, not only from the civil wars, but also from the supremacy of the Hanseatic towns, which dominated the North, and could dictate their own terms. In earlier times the aristocratic families had owed their wealth

Reigns of the Kings of Norway.

Harald (I.) Haarfager

Erik Blodoxe.

Haakon (I.) den Gode.

Harald (II.) Graafeld .

(Earl Haakon of Lade 970-995)

Olaf (I.) Tiyggvesson

(Earls Erik and Haakon 1000-1016)

Saint Olaf (II.) .

Svein, son of Knut the Great

Magnus (I.) den Gode

Harald (111.) Haardraade .

Olaf (III.) Kyrre >.

Magnus (II.)).

Magnus (III.) Barfod .

Eystein (I.)

Sigurd (I.) Jorsalfar

Olaf (IV.)

Magnus (IV.)

Harald Gille

Sigurd (II.) Mund

Eystein (II.)

Inge

Haakon (II.) Herdebred

Magnus (V.) .

Sverre ….

Haakon (III.) . .

Haakon (IV.) den gamle

Magnus (VI.)

Erik ….

Haakon (V.) .

Magnus (VII.)

Haakon (VI.)

Olaf (V.) . . .

Margrete

Erik of Pomerania

};

(d. 933)

972-930 930-934 935-961 961-970

995-1000

1016-1029 (k.

1030-1035 1035-1047 1046-1066 1 066-1 093 1066-1069 1093-1103 1 103-1 122 1103-1130

1 103-u 16

1130-1135 1 130-1136

1136-1155 1136-1157 1136-1161 1161-1162 1162-1184 1 184-1202 1202-1204 1217-1263 1 263-1 280 1280-1299 1299-1319 1319-1343 1343-1380 1381-1387 1387-1389 1389-

1030)

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1397-1814. — The history of Norway from 1397 down to the union with Sweden in 1814 falls naturally into four divisions. First, in 1450, the triple bond gave place to a union in which Norway became more firmly joined to Denmark. Next, in 1536, as the result of the Reformation, Norway sank almost to the level of a province. After 1660 she gained something in status from the establishment of autocracy in Denmark, and at the close of the period she became a con- stitutional kingdom on a footing of approximate equality with Sweden. But for the convulsions to which some of these changes gave rise, Norway possesses during this period but little history of her own, and she sank from her former position as a con- siderable and independent nation. The kings dwelt outside her borders, her fleet and army decayed, and her language gradually gave place to Danish. Germans plundered her coasts and monopolized her commerce, and after 1450 Danes began to appropriate the higher posts in her adminis- tration. When in 1448 Karl Knutsson was chosen king by the Swedes, and Christian of Oldenburg by the Danes, it was by force that Norway fell to the latter. On the 24th of November 1449 the Norwegians protested against Christian's assumption of sovereignty over them, and against separation from the Swedes. Next year, however, the Swedes assented to the separation. Christian I. (1450-1481) gave estates and offices in Norway to his Danish subjects and raised money by pawning her ancient possessions, the Orkneys and Shetland islands, to the king of Scotland. His son Hans (1482-1513) purchased the obedience of the Norwegian nobles by concessions to their power. The imposing union continued in name, but the weakness of the nation and its government was strikingly illustrated when the Germans in Bergen besieged a monastery in which their enemy Olaf Nilsson, a high official, had taken refuge.

After the downfall of Christian II. (1513-1524) the position of Norway in relation to Denmark was changed for the worse. She was ruled for a century and a quarter by Danish officials; the churches and

monasteries of Norway were sacked by Danes, and Danes were installed as pastors under the Lutheran system, which the Norwegians were compelled to accept in 1539. Soon Norway was dragged by Denmark into the so-called Seven Years' War of the North (1563-70). However, the power of the Hanse League in Bergen was broken. The rule of the Oldenburg dynasty proved neglect- ful rather than tyrannical, and under it the mass of the peasants was not flagrantly oppressed. Christian IV. (1588-1648), who founded Christiania, may almost be said to have discovered Norway anew. He reformed its government and strove to develop its resources, but his policy involved Norway in the loss of the provinces of Jemtland and Herjedalen, which were ceded to the Swedes by the peace of Bromsebro (1645). The Danish war of revenge against Carl X. of Sweden resulted in further territorial loss by Norway. By the

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16th century.

tlth century.

peace of Roskilde (1658) she was compelled to renounce the counties of Trondhjem and Baahus, and although the former was restored by the peace of Copenhagen, two years later, her population fell below half a million. The Swedes had now acquired the rich provinces in the south and south-west of the Scandinavian peninsula, and their ambition to extend their frontiers to the North Sea became more pronounced and more possible of accomplishment. From the middle of the 17th century, however, the Dutch and English made their influence felt, and the political status of Norway could no longer be regarded as a purely Scandinavian affair. The establishment of hereditary autocracy in Denmark by Frederick III. in 1660 conferred many benefits upon Norway. Personal liberty perhaps suffered, but the Norwegian peasant remained a freeman while his counterpart in Denmark was a serf. Norwegian law was revised and codified under Christian V. (1670-1699), who was well served by the Norwegians in his attempt to regain the lost provinces.

Under the sons of these monarchs, Frederick IV. and Carl XII., Norway was once more compelled to pay for Danish aggression. Her shipping was destroyed, and in 1716, when driven from continental Europe, the Swedish century hosts fell upon her. Two years later, however, the death of Carl XII. at the border fortress of Frederikshald averted the danger. During this war Peter Tordenskjold, the greatest among a long series of Norwegian heroes who served in the Danish fleet, won

undying fame. Before the close of the 18th century something had been done towards dispelling the in- tellectual darkness. Holberg, though he flourished outside Norway, was at least born there, and by stemming the tide of German influence he made the future of Norwegian literature possible. At the close of the century Hans Nielson Hauge, the Wesley of Norway, appeared, while the growth of the timber trade with England gave rise to a great increase in wealth and population. In a century and a half the number of the Norwegian people was doubled, so that by 1814 Norway comprised some 900,000 souls. In 1788 the oppressive law that grain should be imported into Norway only from Denmark was repealed, and thanks to Danish policy Norway actually drew financial profit from the wars of the French Revolution.

The Norwegian national movement was to render a decade at the beginning of the 19th century more memorable in Norwegian history than any century which had passed since the Be gi„„i a g Calmar Union. In 1800 the Danish government com* ofNor- mitted the Norwegians to the second Armed Neutrality, wegian and therefore to a share in the battle of Copenhagen, national by which it was broken up. It was not until 1807, movemea • however, that Norway was fully involved in the Napoleonic wars. Then, after the bombardment of Copenhagen, she was compelled by Danish policy to embrace the cause of Napoleon against both England and Sweden. Commerce was annihilated, and the supply of food failed. The national distress brought into the forefront of politics national leaders, among whom Count Hermann Jasper von Wedel-Jarlsberg was the most conspicuous. As yet, however, patriotism went no further than a demand for an administration distinct from that of Denmark, which was conceded in 1807, and for a university nearer home than Copen- hagen. In 181 1 the government assented to the foundation of the university of Christiania. (W. F. R.)

1814-iQoj. — After a union of nearly 400 years between Norway and Denmark, the Danish king, Frederick VI., without consulting the Norwegians, ceded Norway to Sweden ˆy en t s by the treaty of Kiel (January 14, 1814). Some leadingto time previously Sweden had joined the allies in their the unicn struggle against Napoleon, while Denmark had, un- ˆ** wisely, sided with the French. In 1813 the Swedish crown prince, Bernadotte, afterwards King Carl XIV., 1 pro- ceeded to Germany and took command of one of the armies of the allies. After the power of Napoleon had been broken at 1 In 1810 he was elected heir to the Swedish throne, in succession to the childless king Carl XIIL, who died in 1818

Sweden.

the battle of Leipzig, he advanced against Denmark, and King Frederick soon saw himself compelled to accede to the cession of Norway, which had long been the aspiration of the Swedes, especially after the loss of Finland in 1809. In the treaty of Kiel Frederick VI. absolved the Norwegians from their oath cf allegiance, and called upon them to become the loyal subjects of the Swedish king. But the Norwegians, who had not been consulted in the matter, refused to acknowledge the treaty, declaring that, while the Danish king might renounce his right to the Norwegian crown, it was contrary to international law to dispose of an entire kingdom without the consent of its people. A meeting of delegates was convened at Eidsvold, not far from the Norwegian capital, where, on the 17th of May 18 14, a constitu- tion, framed upon the constitutions of America, of France (1791), and of Spain (1812), was adopted. Among its most important features are that the Storthing, or National Assembly, is a single-chamber institution, and that the king is not given an absolute veto, or the right to dissolve the Storthing. The Danish governor of Norway, Prince Christian Frederick, was unanimously elected king. Soon afterwards the Swedes, under the crown prince, invaded Norway. The hostilities lasted only a fortnight, when Bernadotte opened negotiations with the Norwegians. A convention was held at Moss, where it was proposed that the Norwegians should accept the Swedish king as their sovereign, on the condition that their constitution of the 17th of May should remain intact, except with such alterations as the union might render necessary. An extraordinary Storthing was then summoned at Christiania, and on the 4th of November 1814 Norway was declared to be “a free, independent, and indivisible kingdom, united with Sweden under one king.” A month previously Prince Christian Frederick had laid down his crown and left the country.

The union was more fully defined by the ” Act of Union,” which was accepted by the national assemblies of both countries in the following year. In the preamble to the act it is clearly stated that the union between the two peoples was accomplished ” not by force of arms, but by free conviction,” and the Swedish foreign minister declared to the European Powers, on behalf of Sweden, that the treaty of Kiel had been abandoned, and that it was not to this treaty, but to the confidence of the Norwegian people in the Swedish, that the latter owed the union with Norway. The constitution framed at Eidsvold was

retained, and formed the Grundlov, or fundamental law of the kingdom. The union thus concluded between the two countries was really an offensive and defensive alliance under a common king, each country retaining its own government, parliament, army, navy and customs.

In Sweden the people received only an imperfect and erroneous insight into the nature of the union, and for a long time believed it to be an achievement of the Swedish arms. They had hoped to make Norway a province of Sweden, and now they had entered into a union in which both countries were equally independent. During the first fifteen years the king was represented in Norway by a Swedish viceroy, while the government was, of course, composed only of Norwegians. Count Wedel Jarlsberg was the first to be entrusted with the important office of head of the Norwegian government, while several of Prince Christian Frederick's councillors of state were retained, or replaced by others holding their political views. The Swedish Count von Essen was appointed the first viceroy of Norway, and was succeeded two years afterwards by his countryman Count von Morner, over both of whom Count Wedel exercised considerable influence.

During the first years of the union the country suffered from poverty and depression of trade, and the finances were in a strai ed deplorable condition. The first Storthing was chiefly relations occupied with financial and other practical measures. between In order to improve the finances of the country a bank king and f]\j orwa y was founded, and the army was reduced to

Storthing. , , . ˆ _. . . ‘ . , , , , ,

one half. I he paid-up capital of the bank was pro- cured by an extraordinary tax, and this, together with the grow- ing discontent among the peasantry, brought about a rising in

Hedemarken, the object of which was to dissolve the Storthing and to obtain a reduction in the taxation. The rising, however, soon subsided, and the bountiful harvest of 18 19 brought more prosper- ous times to the peasantry. Meanwhile, however, the financial position of the country had nearly endangered its independence. The settlement with Denmark with regard to Norway's share of the national debt common to both, assumed threatening propor- tions. In the interest of Denmark, the allied powers asked for a speedy settlement, and in order to escape their collective inter- vention, Bernadotte, who had now succeeded to the throne of Sweden and Norway, on the death

(February 5, 1818) of the old king Carl XIII., accepted England's mediation, and was enabled in September 1819 to conclude a convention with Denmark, according to which Norway was held liable for only 3,000,000 specie dollars (nearly £700,000). But the Norwegians considered that this was still too much, and the attitude of the Storthing in 182 1 nearly occasioned a fresh interference of the powers. The Storthing, however, yielded at last, and agreed to raise a loan and pay the amount stipulated in the convention, but the king evidently had his doubts as to whether the Norwegians really intended to fulfil their obligations. As his relations with the Storthing had already become strained, and as he was occupied at that time with plans, which it is now known meant nothing less than a coup d'etat in connexion with the revision of the Norwegian constitution, he decided to adopt military preparations, and in July 1821 he collected a force of 3000 Swedish and 3000 Norwegian troops in the neighbourhood of Christiania, ostensibly for the mere purpose of holding some manoeuvres. In a circular note (June 1) to the European powers, signed by the Swedish foreign minister, Engstrom — but it is not difficult to recognize the hand of the king as the real author — the minister complained bitterly of the treatment the king had met with at the hands of the Storthing, and repre- sented the Norwegians in anything but a favourable light to the powers, the intention being to obtain their sympathy for any attempt that might be made to revise the Norwegian constitution. About this time another important question had to be settled by the Storthing. The Storthings of 18 15 and 181 8 had already passed a bill for the abolition of nobility, but the king had on both occasions refused his sanction. The Norwegians maintained that the few counts and barons still to be found in Norway were all Danish and of very recent origin, while the really true and ancient nobility of the country were the Norwegian peasants, descendants of the old jarls and chieftains. According to the constitution, any bill which has been passed by three successively elected Storthings, elections being held every third year, becomes law without the king's sanction. When the third reading of the bill came on, the king did everything in his power to obstruct it, but in spite of his opposition the bill was eventually carried and became law.

In 1822 Count Wedel Jarlsberg retired from the government. He had become unpopular through his financial policy, and was also at issue with the king on vital matters. In Rovat 1821 he had been impeached before the Rigsret, the proposals supreme court of the realm, for having caused the tor const!- state considerable losses. JonasCollett(i772-i85i) was tutl °'j al appointed as his successor to the post of minister of finance. The king had by this time apparently

abandoned his plan of a coup d'Uat, for in the following August he submitted to the Storthing several proposals for fundamental changes in the constitution, all of which aimed at removing all that was at variance with a monarchical form of government. The changes, in fact, were the same as he had suggested in his circular note to the Powers, and which he knew would be hailed with approval by his Swedish subjects. When the Storthing met again in 1824 the royal proposals for the constitutional changes came on for discussion. The Storthing unanimously rejected not only the king's proposals, but also several others by private members for changes in the constitution. The king submitted his proposals again in the following session of the Storthing, and again later on, but they were always unanimously rejected. In 1830 they were discussed for the last time, with the same result.

The king's insistence was viewed by the people as a sign of absolutist tendencies, and naturally excited fresh alarm. In the eyes of the people the members of the opposition in the Storthing were the true champions of the rights and the independence which Jaey had gained in 1814.

For several years the Norwegians had been celebrating the 1 7th of May as their day of independence, it being the anniversary The king's °f tne adoption of the constitution of 1814; but as the absolutist tension between the Norwegians and the king increased, tend' the latter began to look upon the celebration in the

eacles. j.^. ^ a demonstration directed against himself, and when Collett, the minister of finance, was impeached before the supreme court of the realm for having made certain payments without the sanction of the Storthing, he also con- sidered this as an attack upon his royal prerogatives. His irritation knew no bounds, and although t Collett was acquitted by the supreme court, the king, in order to express his irritation with the Storthing and the action they had taken against one of his ministers, dissolved the national assembly with every sign of displeasure. The Swedish viceroy at the time, Count Sandels, had tried to convince him that his prejudice against the celebra- tion of the 17th of May was groundless, and for some years the king had made no objection to the celebration. In 1827 it was, however, celebrated in a very marked manner, and later in the same year there was a demonstration against a foolish political play called

The Union, and this being privately reported to the king in as bad a light as possible, he thought that Count Sandels, who had not considered it worth while to report the occurrence, was not fitted for his post, and had him replaced by Count Beltzar Bojilaus Platen (1766-1829), an upright but narrow-minded statesman. Count Platen's first act was to issue a proclamation warning the people against celebrating the day of independence; and in April 1828 the king, against the advice of his ministers, summoned an extraordinary Storthing, his intention being to wrest from the Storthing the supremacy it had gained in 1827. He also intended to take steps to prevent the celebration of the 17th of May, and assembled a force of 2000 Norwegian soldiers in the neighbourhood of the capital. The king arrived in Christiania soon after the opening of the extraordinary Storthing. He did not succeed, however, in his attempt to make any constitutional changes, but the Storthing met the king's wishes with regard to the celebration of the 17th of May by deciding not to continue the celebration, and the people all over the country quietly acquiesced. The following year trouble broke out again. The students had decided to celebrate the 17 th of May with a festive gathering, which, however, passed off quietly. But large masses of the people paraded the streets, singing and shouting, and gathered finally in the market-place. There was a little rioting, and the police and the military eventually dispersed " battle the people and drove them to their homes with sword of the and musket. This episode has become known as the market- n Da ule of the market-place," and did much to p ' increase the general ill-feeling against Count Platen.

His health eventually broke down from disappointment and vexation at the indignities and abuse heaped upon him. He died in Christiania at the end of the year, and his post remained vacant for several years, the presidency of the Norwegian government in the meantime being taken by Collett, its oldest member.

By the July Revolution of 1830 the political situation in Europe became completely changed, and the lessons derived Increased ˆ rom triat g reat: movement reached also to Norway. political The representatives of the peasantry, for whom the power constitution had paved the way to become the ruling element in political life, were also beginning to dis- tinguish themselves in the national assembly, where they now had taken up an independent position against the representatives of the official classes, who in 18 14 and afterwards had played the leading and most influential part in politics. This party was now under the leadership of the able and gifted Ole Ueland, who remained a member of every Storthing from 1833 to 1869. The Storthing of 1833 was the first of the so-called

of the peasantry.

” peasant Storthings.” Hitherto the peasantry had never been represented by more than twenty members, but the elections in 1833 brought their number up to forty-five, nearly half of the total representation. The attention of this new party was especially directed to the finances of the country, in the admini- stration of which they demanded the strictest economy. They often went too far in their zeal, and thereby incurred consider- able ridicule.

About this time the peasant party found a champion in the youthful poet Henrik Wergeland, who soon became one of the leaders of the ” Young Norway ” party. He was a \y erge . republican in politics, and the most zealous upholder iand.op- of the national independence of Norway and of her posed by full equality with Sweden in the union. A strong e ayeB ‘ opposition to Wergeland and the peasant party was formed by the upper classes under the leadership of another rising poet and writer, Johan Sebastian Welhaven, and other talented men, who wished to retain the literary and linguistic relationship with Denmark, while Wergeland and his party wished to make the separation from Denmark as complete as possible, and in every way to encourage the growth of the national characteristics and feeling among the people. He devoted much of his time, by writing and other means, to promote the education of the people; but although he was most popular with the working and poorer classes, he was not able to form any political party around him, and at the time of his death he stood almost isolated. He died in 1845, and his opponents became now the leaders in the field of literature, and carried on the work of national reconstruction in a more restrained and quiet manner. The peasant party still continued to exist, but restricted itself principally to the assertion of local interests and the maintenance of strict economy in finance.

The violent agitation that began in 1830 died away. The tension between the king and the legislature, however, still continued, and reached its height during the session of 1836, when all the royal proposals for changes in the constitution were laid aside, without even passing through committee, and when various other steps towards upholding the independence of the country were taken. The king, in his displeasure, decided to dissolve the Storthing; but before it dispersed it proceeded to impeach Lovenskiold, one of the ministers, before the supreme court of the realm, for having advised the king to dissolve the Storthing. He was eventually sentenced to pay a fine of ro,ooo kroner (about £550), but he retained his post. Collett, another minister who had greatly displeased the king by his conduct, was

dismissed; but unity in the government was brought about by the appointment of Count Wedel Jarlsberg as viceroy of Norway. From this time the relations between the king and the Norwegian people began to improve, whereas in Sweden he was, in his later years, not a little disliked.

When the king's anger had subsided, he summoned the Stor- thing to an extraordinary session, during which several important bills were passed. Towards the close of the session an Tlle address to the king was agreed to, in which the Stor- national thing urged that steps should be taken to place Norway tta % in political respects upon an equal footing with Sweden, vuestion. especially in the conduct of diplomatic affairs with foreign countries. The same address contained a petition for the use of the national or merchant flag in all waters. According to the constitution, Norway was to have her own merchant flag, and in 182 1 the Storthing had passed a resolution that the flag should be scarlet, divided into four by a blue cross with white borders. The king, however, refused his sanction to the resolu- tion, but gave permission to use the flag in waters nearer home; but beyond Cape Finisterre the naval flag, which was really the Swedish flag, with a white cross on a red ground in the upper square, must be carried. In reply to the Storthing's address the king in 1838 conceded the right to all merchant ships to carry the national flag in all waters. This was hailed with great rejoicings all over the country; but the question of the national flag for general use had yet to be settled With regard to the question raised in the address of the Storthing about the conduct of

diplomatic affairs, and other matters concerning the equality of

Norway in the union, the king in 1839 appointed a committee of

four Norwegians and four Swedes, who were to consider and

report upon the questions thus raised.

During the sitting of this first " Union Committee " its powers

were extended to consider a comprehensive revision of the Act

„ ,. , of Union, with the limitation that the fundamental Death of . > .
. .

King Carl conditions of the union must in no way be interfered Johan; with. But before the committee had finished their succeeded rep ort the king died (March 8th 1844), and was suc- by Oscar I. cee(jed by his son Oscar I. According to the constitu- tion the Norwegian kings must be crowned in Throndhjem cathedral, but the bishop of Throndhjem was in doubt whether the queen, who was a Roman Catholic, could be crowned, and the king decided to forego the coronation both of himself and his queen. The new king soon showed his desire to meet the wishes of the Norwegian people. Thus he decided that in all documents concerning the internal government of the country Norway should stand first where reference was made to the king as sovereign of the two kingdoms. After having received the report of the committee concerning the flag question, he resolved (June 20th, 1844) that Norway and Sweden should each carry its own national flag as the naval flag, with the mark of union in the upper corner; and it was also decided that the merchant flag of the two kingdoms should bear the same mark of union, and that only ships sailing under these flags could claim the protection of the state.

The financial and material condition of the country had now considerably improved, and King Oscar's reign was marked by the carrying out of important legislative work and reforms, especially in local government. New roads were planned and built all over the country, the first railway was built, steamship routes along the coast were established, lighthouses were erected and trade and shipping made great progress. The king's reign was not disturbed by any serious conflicts between the two countries. No change took place in the ministry under the presidency of the viceroy Lovenskiold upon King Oscar's accession to the throne, but on the death or retirement of some of its members the vacant places were filled by younger and talented men, among whom was Fredrik Stang, who in 1845 took over the newly established ministry of the interior. During the Schleswig-Holstein rebellion (1848-1850) and the Crimean War King Oscar succeeded in maintaining the neutrality of Norway and Sweden, by which Norwegian shipping especially benefited. The abolition of the English navigation acts in 1850 was of great importance to Norway, and opened up a great future for its merchant fleet.

In 1826 a treaty had been concluded with Russia, by which the frontier between that country and the adjoining strip of Norwegian territory in the Polar region was definitely wftf° nS debited; but in spite of this treaty Russia in 1851 Russia. demanded that the Russian Lapps on the Norwegian frontier should have the right to fish on the Norwegian coast, and have a portion of the coast on the Varanger fjord allotted to them to settle upon. The Norwegian government

refused to accede to the Russian demands, and serious complica- tions might have ensued if the attention of Russia had not been turned in another direction. While his father had looked to Russia for support, King Oscar was more inclined to secure western powers as his allies, and during the Crimean War he concluded a treaty with England and France, according to which these countries promised their assistance in the event of any fresh attempts at encroachment on Norwegian or Swedish territory by Russia. In consequence of this treaty the relations between Norway and Sweden and Russia became somewhat strained; but after the peace of Paris in 1856, and the accession of Alexander II., whose government was in favour of a peaceful policy, the Russian ambassador at Stockholm succeeded in bringing about more friendly relations.

Owing to the king's ill-health, his son, the crown prince Carl, was appointed regent in 1857, and two years later, when King Oscar died, he succeeded to the thrones of the two countries as

of Carl XV.

Carl XV. He was a gifted, genial and noble personality, and desired to inaugurate his reign by giving the Nor- Death of wegians a proof of his willingness to acknowledge the Oscar 1.; claims of Norway, but he did not live to see his wishes accession in this respect carried out. According to the constitu- tion, the king had the power to appoint a viceroy for Norway, who might be either a Norwegian or Swede. Since 1829 no Swede had held the post, and since 1859 no appointment of a viceroy had been made. But the paragraph in the constitution still existed, and the Norwegians naturally wished to have this stamp of " provinciality " obliterated. A proposal for the abolishment of the office of viceroy was laid before the Question Storthing in 1859, and passed by it. The king, whose of Nor- sympathies on this question were known, had been wegian appealed to, and had privately promised that he would y ' ce "y' sanction the proposed change in the constitution; but as soon as the resolution of the Storthing became known in Sweden, a violent outcry arose both in the Swedish press and the Swedish estates. Under the pressure that was brought to bear upon the king in Sweden, he eventually refused to sanction the resolution of the Storthing; but he added that he shared the views of his Norwegian counsellors, and would, when " the convenient moment " came, himself propose the abolition of the office of viceroy.

In the following year the Swedish government again pressed the demands of the Swedish estates for a revision of the Act of Union, which this time included the establishment of a Swedish union or

common parliament for the two countries, on proposals the basis that, according to the population, there forre- should be two Swedish members to every Norwegian, vision of The proposal was sent to the Norwegian government, ˆ ot which did not seem at all disposed to entertain it ; but some dissensions arose with regard to the form in which its reply was to be laid before the king. The more obstinate members of the ministry resigned, and others, of a more pliable nature, were appointed under the presidency of Fredrik Stang, who had already been minister of the interior from 1845 to 1856. The reconstructed government was, however, in accord with the retiring one, that no proposal for the revision of the Act of Union could then be entertained. The king, however, advocated the desirability of a revision, but insisted that this would have to be based upon the full equality of both countries. In 1863 the Storthing assented to the appointment by the king of a Union committee, the second time that such a committee had been called upon to consider this vexatious question. It was not until 1867 that its report was made public, but it could not come on for discussion in the Storthing till it met again in 1871. During this period the differences between the two countries were somewhat thrust into the background by the Danish complications in 1 863-1 864, which threatened to draw the two kingdoms into war. King Carl was himself in favour of a defensive alliance with Denmark, but the Norwegian Storthing would only consent to this if an alliance could also be effected with at least one of the western powers.

In 1869 the Storthing passed a resolution by which its sessions were made annual instead of triennial according to the constitu- tion of 1814. The first important question which the first yearly Storthing which met in 1871 had to consider was once more the proposed revision of the Act of Union. The Norwegians had persistently maintained that in any discussion on this question the basis for the negotiations should be (1) the full equality of the two kingdoms, and (2) no extension of the bonds of the union beyond the line originally defined in the act of 181 5. However, the draft of the new act contained terms in which the supremacy of Sweden was presupposed and which introduced important extensions of the bonds of the union; and, strangely enough, the report of the Union committee was adopted by the new Stang ministry, and even supported by some of the most influential newspapers under the plausible garb of ” Scandinavianism.” In these circumstances the ” lawyers’ party,” under the leader- ship of Johan Sverdrup, who was to play such a prominent part in Norwegian politics, and the ” peasant party,” led by Soren

national party.

the Stor- thing.

Jaaboek, a gifted peasant proprietor, who was also destined to become a prominent figure in the political history of the country, Pounds- formed an alliance, with the object of guarding against /ton of the any encroachment upon the liberty and independence Norwegian which the country had secured by the constitution of 1814. This was the foundation of the great national party, which became known as the ” Venstre ” (the left), and which before long became powerful enough to exert the most decisive influence upon the political affairs of the country. When, therefore, the proposed revision of the Act of Union eventually came before the Storthing in 1871, it was re- jected by an overwhelming majority. The position which the government had taken up on this question helped to open the eyes of the Norwegians to some defects in the constitution, which had proved obstacles to the development and strengthening of the parliamentary system.

In 1872 a private bill came before the Storthing, proposing that the ministers should be admitted to the Storthing and take part in its proceedings. After a number of stormy debates, f’dmu- t * ie bi’l was successfully carried under the leadership tance of °f Johan Sverdrup by a large majority, but the govern- ministers ment, evidently jealous of the growing powers and to seats in influence of the new liberal party in the Storthing, advised the king to refuse his sanction, although the government party itself had several times in the preceding half-century introduced a similar bill for admitting the ministers to the Storthing. At that time, however, the opposition had looked with suspicion on the presence of the ministers in the national assembly, lest their superior skill in debate and political experience should turn the scale too readily in favour of govern- ment measures. Now, on the contrary, the opposition had gained more experience and had confidence in its own strength, and no doubt found that the legislative work could better be carried on if the ministers were present to explain and defend their views; but the government saw in the proposed reform the threatened introduction of full parliamentary government, by which the ministry could not remain in office unless supported by a majority in the Storthing. Before the Storthing separated the liberals carried a vote of censure against the government; but the king declared that the ministers enjoyed his confidence and took no further notice of the vote. Two of the ministers, who had advised the ratification of the bill, resigned,

however; and a third minister, who had been in the government since 1848, resigned also, and retired from public life, foreseeing the storm that was brewing on the political horizon. Numerous public meetings were held all over the country in support of the proposed reform, and among the speakers was Johan Sverdrup, now the acknowledged leader of the liberal party, who was hailed with great enthusiasm as the champion of the proposed reform. This was the political situation when King Carl died (18th September 1872). He was succeeded by his brother, who ascended Death of the throne as Oscar II. In the following year he gave his sanction to the bill for the abolition of the office of viceroy, which the Storthing had again passed, and the president of the ministry was after- wards recognized as the prime minister and head of the government in Christiania. Fredrik Stang, who was the pre- sident of the ministry at the time, was the first to fill this office. In the same year Norway celebrated its existence for a thousand years as a kingdom, with great festivities.

In 1874 the government, in order to show the people that they to some extent were willing to meet their wishes with regard to the great question before the country, laid before the Storthing a royal proposition for the admittance of the ministers to the national assembly. But this was to be accompanied by certain other constitutional changes, such as giving the king the right of dissolving the Stor- thing at hispleasure, and providingfixed pensions for ex-ministers, which was regarded as a guarantee against the majority of the assembly misusing its new power. The bill which the government brought in was unanimously rejected by the Stor- thing, the conservatives also voting against it, as they considered

Carl XV. ; ac- cession of Oscar II.

Proposals by the Storthing for fall popular control.

the guarantees insufficient. The same year, and again in 1877, the Storthing passed the bill, but in a somewhat different form from that of 1872. On both occasions the king refused his sanction.

The Storthing then resorted to the procedure provided by the constitution to carry out the people's will. In 1880 the bilj was passed for the third time, and on this occasion by the ,

overwhelming majority of 93 out of 113. Three ve ˆ £S Storthings after three successive elections had now carried the bill, and it was generally expected that the king and his government would at length comply with the wishes of the people, but the king on this occasion

also refused his sanction, declaring at the same time that his right to the absolute veto was ” above all doubt.” Johan Sverdrup, the leader of the liberal party and president of the Storthing, brought the question to a prompt issue by proposing to the Storthing that the bill, which had been passed three times, should be declared to be the law of the land without the king’s sanction. This proposal was carried by a large majority on the 9th of June 1880, but the king a’nd his ministers in reply declared that they would not recognize the validity of the resolution.

From this moment the struggle may be said to have centred itself upon the existence or non-existence of an absolute veto on the part of the crown. The king requested the faculty struggle of law at the Christiania university to give its opinion between on the question at issue, and with one dissentient the the king

learned doctors upheld the king’s right to the absolute a ” d ‘**”

ˆ ■ . • ■ 1 j- .1 Storthing.

veto in questions concerning amendments of the con- stitution, although they could not find that it was expressly stated in the fundamental law of the country. The ministry also advised the king to claim a veto in questions of supply, which still further increased the ill-feeling in the country against the government, and the conflict in consequence grew more and more violent.

In the midst of the struggle between the king and the Storthing, the prime minister, Fredrik Stang, resigned, and Christian August Selmer (1816-1889) became his successor; and this, together with the appointment of another member to the ministry, K. H. Schweigaard, plainly indicated that the conflict with the Storthing was to be continued. In June 1882 the king arrived in Christiania to dissolve the Storthing, and on this occasion delivered a speech from the throne, in which he openly censured the representatives of the people for their attitude in legislative work and on the question of the absolute veto, the speech creating considerable surprise throughout the country. Johan Sverdrup and Bjornstjerne Bjornson, the popular poet and dramatist, called upon the people to support the Storthing in upholding the resolution of the gth of June, and to rouse themselves to a sense of their political rights. The elections resulted in a great victory for the liberal party, which returned stronger than ever to the Storthing, numbering 83 and the conservatives only 31. The ministry, however, showed no sign of yielding, and, when the new Storthing met in February 1883, the Odelsthing (the lower division of the

national assembly) decided upon having the question i mpeac h- finally settled by impeaching the whole of the ministry ment of before the Rigsret or the supreme court of the realm, ministers The jurisdiction of the Rigsret is limited to the trial *£ **f . of offences against the state, and there is no appeal ig83 ˆ against its decisions. The charges against the ministers were for having acted contrary to the interests of the country by advising the king to refuse his sanction — first, to the amendment of the law for admitting the ministers to the Storthing; secondly, to a bill involving a question of supply; and thirdly, to a bill by which the Storthing could appoint additional directors on the state railways.

The trial of the eleven ministers of the Selmer cabinet began in May 1883 and lasted over ten months. In the end the The minis- Rigsret sentenced the prime minister and seven of his try sen- ministers to be deprived of their offices, while three, tencedby

Elections of 1882.

the Rigsret.

the bill for admitting the ministers to the Storthing, or had

who had either recommended the king to sanction

entered the cabinet at a later date, were heavily fined. The excitement in the country rose to feverish anxiety. Rumours of all kinds were afloat, and it was generally believed that the king would attempt a coup d'etat. Fortunately the king after some hesi- tation issued (nth March 1884) an order in council announcing that the judgment of the supreme court would be carried into effect, and Selmer was then called upon to resign his position as prime minister. King Oscar, however, in his declara- Acqules- t j on upheld th e constitutional prerogative of the the kJag. crown, which, he maintained, was not impaired by the judgment of the Rigsret. The following month the king, regardless of the large liberal majority in the Storthing, asked Schweigaard, one of the late ministers, whose punishment consisted in a fine, to form a ministry, and the so-called " April ministry " was then appointed, but sent in its resignation in the following month. Professor Broch, a former minister, next failed to form a ministry, and the king was at last compelled to appoint a ministry in accordance with the majority in the First Storthing. In June 1884 Johan Sverdrup was

asked

Liberal to form one. He selected for his ministers leading ministry men on the liberal side in the Storthing, and the first t884 ‘ liberal ministry that Norway had was at length

appointed. The Storthing, in order to satisfy the king, passed a new resolution admitting the ministers to the national assembly, and this received formal sanction.

During the following years a series of important reforms was carried through. Thus in 1887 the jury system in criminal matters was introduced into the country after violent opposition from the conservatives. A bill intended to give parishioners greater influence in church matters, and introduced by Jakob Sverdrup, the minister of education, and a nephew of the prime minister, met, however, with strong opposition, and was eventu- ally rejected by the Storthing, the result being a break-up of the ministry and a disorganization of the liberal party. In June 1889 the- Sverdrup ministry resigned, and a conservative one was formed by Emil Stang, the leader of the conservatives in the Storthing, and during the next two years the Storthing passed various useful measures; but the ministry was eventually wrecked on the rock of the great national question which about this time came to the front — that of Norway’s share in the transaction of diplomatic affairs. At the time of the union in 181 4 nothing had been settled as to how these were to be con- ducted, but in 1835 a resolution was issued, that when the The aues- Swedish foreign minister was transacting diplomatic tioa of matters with the king which concerned both countries, diplomatic or Norway only, the Norwegian minister of state in re pre sen- at t en dance upon the king at Stockholm should be present. This arrangement did not always prove satisfactory to the Norwegians, especially as the Swedish foreign minister could not be held responsible to the Norwegian government or parliament.

By a change in the Swedish constitution in 1885 the ministerial council, in which diplomatic matters are discussed, came to consist of the Swedish foreign minister and two othei \ he o-j members of the cabinet on behalf of Sweden, and of claim. tne Norwegian minister at Stockholm on behalf of

Norway. The king, wishing to remedy this disparity, proposed that the composition of the council should be determined by an additional paragraph in the Act of Union. The representa- tives of the Norwegian government in Stockholm proposed that three members of the cabinet

of each country should constitute the ministerial council. To this the Swedish government was willing to agree, but on the assumption that the minister of foreign affairs should continue to be a Swede as before, and this the Norwegians, of course, would not accept. At the king's instiga- tion the negotiations with the Swedish government were resumed at the beginning of 1891, but the Swedish Riksdag rejected the proposals, while the Norwegian Storthing insisted upon " Norway's right, as an independent kingdom, to full equality in the union, and therewith her right to watch over her foreign affairs in a constitutional manner." The Stang ministry then resigned, and a liberal ministry, with Steen, the recognized

leader of the liberal party after Sverdrup's withdrawal from politics, as prime minister, was appointed.

The new ministry had placed the question of a separate minister of foreign affairs for Norway prominently in their programme, but little progress was made during the next few years. n uestioa ot Another and more important question for the country, separate as far as its shipping and commerce are concerned, consular now came to the front. The Storthing had in 1891 servlce ' appointed a committee to inquire into the practicability of establishing a separate Norwegian consular service, and in 1892 the Storthing, acting upon the committee's report, determined to establish a consular service. The king, influenced by public opinion in Sweden, refused his sanction, and the Norwegian government in consequence sent in their resignation, whereupon a complete deadlock ensued. This was terminated by a com- promise to the effect that the ministry would return to office on the understanding that the question was postponed by common consent. The following year the Storthing again passed a resolution calling upon the Norwegian government to proceed with the necessary measures for establishing the proposed consular service for Norway, but the king again refused to take any action in the matter. Upon this the liberal ministry resigned (May 1893), and the king appointed a conservative government, with Emil Stang as its chief. Thus matters went on till the end of 1894, when the triennial elections took place, with the result that the majority of the electors declared in favour of national independence on the great question then before the country, The ministry did not at once resign, but waited till the king arrived in Christiania to open the Storthing (January 1895). The king kept the country for over four months without a responsible government, during which time the crisis had become more acute than ever. A coalition ministry was at last formed, with Professor G. F. Hagerup as prime minister. A new committee, consisting of an equal number of Norwegians and Swedes, was

appointed to consider the question of separate diplomatic representation; but after sitting for over two years the com- mittee separated without being able to come to any agreement. The elections in 1897 proved again a great victory for the liberal party, 79 liberals and 35 conservatives being returned, and in February 1898 the Hagerup ministry was replaced by a liberal, once more under the premiership of Steen. Soon afterwards the bill for the general adoption of the national or ” pure ” flag, as it was called, was carried for the third time, and became law without the king’s sanction. In 1898 universal political suffrage for men was passed by a large majority, but the proposal to include women received the support of only ˆt> votes.

In January 1902, on the initiative of the Swedish foreign minister, another committee, consisting of an equal number of leading Norwegians and Swedes, was appointed by Ti)e the king to investigate the consular question. The crisis of unanimous report of the committee was to the effect 1902 ‘ that ” it was possible to appoint separate Norwegian consuls exclusively responsible to Norwegian authority and separate Swedish consuls exclusively responsible to Swedish authority.” The further negotiations between the two govern- ments resulted in the so-called communique of the 24th of March 1903, which announced the conclusion of an agreement between the representatives of the two countries for the establishment of the separate consular service. The terms of the communique were submitted to a combined Norwegian and Swedish council of state on the 21st of December 1903, when they were unani- mously agreed to and were signed by the king, who commissioned the Norwegian and the Swedish governments to proceed with the drafting of the laws and regulations for the separate consular services. In due course the Norwegian government submitted to the Swedish government their draft of the proposed laws and regulations, but no reply was forthcoming for several months. About this time the Swedish foreign minister, Mr Lagerheim, who had zealously worked for a friendly solution of the consular question, resigned, and in November the same year Bostrom, the Swedish prime minister, suddenly submitted to the Norwegian government a number of new conditions under which the Swedish

government was prepared to agree to the establishment of separate consuls. This came as a surprise to the Norwegians in view of the fact

that the basis for the establishment of separate consuls had already been agreed upon and confirmed by the king in December 1903.- According to Bostrom's proposals the Norwegian consuls were to be placed under the control of the Swedish foreign minister, who was to have the power to remove any Norwegian consul. The Norwegians felt it would be beneath the dignity of a self-governing country to agree to the Swedish proposals, and that these new demands were nothing less than a breach of faith with regard to the terms of agreement arrived at two years before by both governments and approved and signed by the king. The Norwegian government would have been perfectly justified if, after this, they had withdrawn from the negotiations, but they did not wish to jeopardize the oppor- tunity of arriving at a friendly settlement, and Hagerup, the Norwegian prime minister, proceeded to Stockholm to confer with Bostrom; but no satisfactory agreement could be arrived at. There was therefore nothing left but for the Norwegians to take matters into their own hands.

On the 8th of February 1905 Hagerup announced to the Norwegian Storthing that the negotiations had fallen through, and on the 17th the Storthing decided unanimously to refer the matter to a special committee. Owing to some difference of opinion between the members of his ministry, Hagerup resigned on the 1st of March and was succeeded by Christian Michelsen, who formed a ministry composed of members of both political parties. The special committee decided that a bill should be immediately submitted to the Storthing for the establishment of a Norwegian consular service and that the measure should come into force net later than the 1st of April 1906. An attempt was made by the Swedish crown prince, acting as Prince Regent during the king's illness, to enter into new negotiations with the Norwegian government, but the proposals were not favourably received in Norway. In April 1905 Bostrom resigned, which was considered to be a move on the part of Sweden to facilitate negotiations with Norway. The bill for the establishment of Norwegian consuls was passed by the Storthing without a dissentient voice on the 23rd of May, and it was generally expected that the king, who again had assumed the reins of government, would sanction the bill, but on the 27th of May, in spite of the earnest entreaties of his Norwegian ministers, the king formally refused to do so. The Norwegian Ministry immediately resigned, but the king informed the ministers that Deciara- ˆ e com d not accept their resignation. They, however, tioa of declined to withdraw it. A few days afterwards the independ- Norwegian government informed the Storthing of the ence. king's refusal, whereupon the assembly unanimously

agreed to refer the matter to the special committee. On the 7th of

June the Storthing met to hear the final decision of the government. Michelsen, the prime minister, informed the Storthing that all the members of the government had resigned in consequence of the king's refusal to sanction the consular law, that the king had declined to accept the resignation, and that, as an alternative government could not be formed, the union with Sweden, based upon a king in common, was con- sequently dissolved. The president of the Storthing submitted a resolution that the resigning ministry should be authorized to exercise the authority vested in the king in accordance with the constitution of the country. The resolution was unanimously adopted.

King Oscar, on receiving the news of the action of the Nor- wegian Storthing, sent a telegraphic protest to the Norwegian prime minister and to the president of the Storthing. from a " The Swedish government immediately decided to Sweden, summon an extraordinary session of the Swedish parliament for the 20th of June, when a special com- mittee was appointed to consider what steps should be taken by Sweden. On the 25th of July the report of the committee was laid before the Riksdag, in which it was stated that Sweden could have no objection to enter into negotiations about the severance of the union, when a vote to that effect had been

given by a newly-elected Storthing or by a national vote in the form of a referendum by the Norwegian people. The report was unanimously adopted by the Swedish Riksdag on the 27 th of July, and on the following day the Norwegian Storthing decided that a general plebiscite should be taken on the 13 th of August, when 368,211 voted in favour of the dissolution and only 184 against it. It was thereupon agreed that representatives of Norway and of Sweden should meet at Karlstad in Sweden on the 31st of August to discuss and arrange for the severance of the union. The negotiations lasted till the 23rd of September, though more than once they were on the point of being broken off. The agreement stipulated a neutral zone on both sides of the southern border between the two countries, the Norwegians undertaking to dismantle some fortifications within that zone. The agreement was to remain in force for ten years, and could be renewed for a similar period, unless one of the countries gave notice to the contrary. The Karlstad agreement was ratified by the Norwegian Storthing on the 9th of ˆaioa ° October and by the Swedish Riksdag on the 1 6th of the vn. same month. On the 27th of October King Oscar issued a proclamation to the Norwegian Storthing, in which he relinquished the crown of Norway. The Norwegian government was thereupon authorized by the Storthing to negotiate with Prince Charles of Denmark and to arrange for a national vote as to whether or no the country would approve of his election for the

Norwegian throne. The plebiscite resulted in 259,563 votes for his election and 69,264 against. On the 18th of November the Storthing unanimously elected Prince Charles as king of Norway, he taking the name of Haakon VII. On the 25th of November the king and his consort, Queen Maud, the youngest daughter of King Edward VII. of England, entered the Norwegian capital. Their coronation took place in the Trondhjem cathedral the following year.

In 1907 parliamentary suffrage was granted to women with the same limitation as in the municipal suffrage granted to them in 1 901, viz. to all unmarried women over 25 years, who pay taxes on an income of 300 kroner (about £16) in the country districts and on 400 kroner (about £22) in the towns, as well as to all married women, whose husbands pay taxes on similar incomes. Norway was thus the first sovereign country in Europe where the parliamentary vote was granted to women. (H. L. B.)

Norwegian Literature

Early Norse literature is inextricably bound up with Icelandic literature. Iceland was colonized from Norway in the 9th century, and the colonists were drawn chiefly from the upper and cultured classes. They took with them their poetry and literary traditions. Old Norse literature is therefore dealt with under Iceland (q.v.). (See also Edda, Saga, Runes.)

The modern literature of Norway bears something of the same relation to that of Denmark that American literature bears to English. In each case the development and separation of a dependency have produced a desire on the part of persons speaking the mother-tongue for a literature that shall express the local emotions and conditions of the new nation. Two notable events led to the foundation of a separate Norwegian literature: the one was the creation of the university of Christiania in 181 1, and the other was the separation of Norway from Denmark in 1814. Before this time Norwegian writers had been content, as a rule, to publish their works at Copenhagen. The first name on the annals of Danish literature, Peder Clausen, is that of a Norwegian; and if all Norse writers were removed from that roll, the list would be poorer by some of its most illustrious names, by Holberg, Tullin, Wessel, Treschow, Steffens and Hauch.

The first book printed in Norway was an almanac, brought out in Christiania in 1643 by a wandering printer named Tyge Nielsen, who brought his types from Copenhagen. But the first press set up definitely in Norway was that of Valentin Kuhn, brought over from

Germany in 1650 by the theologian Christian Stephensen Bang (1 580-1678) to help in the circulation of his numerous tracts. Bang's Christianiae Stads Beskrifuelse (1651), is the first book published in Norway. Christen Jensen (d. 1653)

was a priest who collected a small glossary or glosebog of the local dialects, published in 1636. Gerhard Milzow (1629-1688), the author of a Presbyterologia Norwegica (1679), was also a Norse priest. The earliest Norwegian writer of any original merit was Dorthe Engelbrechtsdatter (1634-1716), afterwards the wife of the pastor Ambrosius Hardenbech. She is the author of several volumes of religious poetry which have enjoyed great popularity. The hymn-writer Johan Brunsmann (1637-1707), though a Norseman by birth, belongs by education and temper entirely to Denmark. Not so Petter Dass (1647-1708) {q.v.), the most original writer whom Norway produced and retained at home during the period of annexation. Another priest, Jonas Ramus (1640-1718), wrote Norriges Kongers Historic (History of the Norse Kings) in 1710, and Norriges Beskrivelse (1735). The celebrated missionary to Greenland, Hans Egede (1686-1758), wrote several works on his experiences in that country. Peder Hersleb (1689-1757) was the compiler of some popular treatises of Lutheran theology. Frederik Nannestad, bishop of Trondh- jem (1693-1774), started a weekly gazette in 1760. The missionary Knud Leem (1697-1774) published a number of works on the Lapps of Finmark, one at least of which, his Beskrivelse over Finmarkens Lapper (1767), still possesses con- siderable interest. The famous Erik Pontoppidan (1698-1764) cannot be regarded as a Norwegian, for he did not leave Denmark until he was made bishop of Bergen, at the age of forty-nine. On the other hand the far more famous Baron Ludvig Holberg (1684-1754), belongs to Denmark by everything but birth, having left Norway in childhood.

A few Norsemen of the beginning of the 18th century dis- tinguished themselves chiefly in science. Of these Johan Ernst Gunnerus (1718-1773), bishop of Trondhjem, was the first man who gave close attention to the Norwegian flora. He founded the Norwegian Royal Society of Sciences in 1760, with Gerhard Schoning (1722-1780) the historian and Hans Strom (1726-1797) the zoologist. Peder Christofer Stenersen (17 23-1 776), a writer of occasional verses, merely led the way for Christian Braumann Tullin (1728-1765), a lyrical poet of exquisite genius, who is claimed by Denmark but who must be

mentioned here, because his poetry was not only mainly composed in Christiania, but breathes a local spirit. Danish literature between the great names of Evald and Baggesen presents us with hardly a single figure which is not that of a Norseman. The director of the Danish national theatre in 1771 was a Norwegian, Niels Krog Bredal (1733-1778), who was the first to write lyrical dramas in Danish. A Norwegian, Johan Nordahl Brun (1745-1816), was the principal tragedian of the time, in the French taste. It was a Norwegian, J. H. Wessel (1742-1785), who laughed this taste out of fashion. In 1772 the Norwegian poets were so strong in Copenhagen that they formed a Norske Selskab (Nor- wegian Society), which exercised a tyranny over contemporary letters which was only shaken when Baggesen appeared. Among the leading writers of this period are Claus Frimann (1746-1829), Peter Harboe Frimann (1752-1839), Claus Fasting (1746-1791), Johan Wibe (1 748-1 782), Edvard Storm (1749-! 794), C. H. Pram (1756-1821), Jonas Rein (1760-1821), Jens Zetlitz (1761-1821), and Lyder Christian Sagen (1771-1850), all of whom, though Norwegians by birth, find their place in the annals of Danish literature. To these poets must be added the philosophers Niels Treschow (1751-1833) and Henrik Steffens (1773-1845), and in later times the poet Johannes Carsten Hauch (1790-1872).

The first form which Norwegian literature took as an inde- pendent thing was what was called ” Syttendemai-Poesi,” or The Poetry of the 1 7th of May, that being the day on which

‘•Trefoil.” Norway obtained her independence and proclaimed her king. Three poets, called the ” Trefoil,” came forward as the inaugurators of Norwegian thought in 1814. Of these Conrad Nicolai Schwach (1793-1860) was the least remarkable. Henrik Anker Bjerregaard (1 792-1842), born in the same hamlet of Ringsaker as Schwach, had a much brighter and more varied talent. His Miscellaneous Poems, collected at Christiania in 1829, contain some charming studies from nature, and admirable patriotic songs. He brought out a tragedy of

Magnus Barfods Sonner (Magnus Barefoot’s Sons) and a lyrical drama, Fjeldeventyrel (The Adventure in the Mountains) (1828). He became judge of the supreme court of the diocese of Chrisr tiania. The third member of the Trefoil, Mauritz Kristoffer Hansen (1794-1842), was a schoolmaster. His novels, of which Oltar de Bretagne (1819) was the earliest, were much esteemed in their day, and after his death were collected and edited (8 vols., 1855-1858), with a memoir by Schwach. Hansen’s Poems, printed at Christiania in 1816, were among the earliest publi- cations of a liberated Norway, but were preceded by a

volume of Smaadigte (Short Poems) by all three poets, edited by Schwach in 181 5, as a semi-political manifesto. These writers, of no great genius in themselves, did much by their industry and patriotism to form a basis for Norwegian literature.

The creator of Norwegian literature, however, was the poet Henrik Arnold Wergeland (1808-1845) (q-i>.), a man of great genius and enthusiasm, who contrived within the limits of a life as short as Byron's to concentrate the labours Wer se- of a dozen ordinary men of letters. He held views in 'wel'havea. most respects similar to those pronounced by Rousseau and Shelley. His obscurity and extravagance stood in the way of his teaching, and his only disciples in poetry were Sylvester Sivertson (1800-1847), a journalist of talent whose verses were collected in 1848, and Christian Monsen (1815-1852).

A far more wholesome and constructive influence was that of Johann Sebastian Cammermeyer Welhaven (1807-1873) (q.v.), who was first brought to the surface by the conservative reaction in 1830 against the extravagance of the radical party. A savage attack on Henrik Wergeland' s Poetry, published in 1832, caused a great sensation, and produced an angry pamphlet in reply from the father, Nikolai Wergeland. The controversy became the main topic of the day, and in 1834 Welhaven pushed it into a wider arena by the publication of his beautiful cycle of satirical sonnets called Norges Dcemring (The Dawn of Norway), in which he preached a full conservative gospel. He was assisted in his controversy with Wergeland by Henrik Hermann Foss (1790- 1853), author of Tidsnornerne (The Norns of the Age) (1835) and other verses.

Andreas Munch (1811-1884) took no part in the feud between Wergeland and Welhaven, but addicted himself to the study of Danish models independently of either. He published a series of poems and dramas, one of which latter, Kcng M " ac h. Sverres Ungdom (1837), attracted some notice. His popularity com- menced with the appearance of his Poems Old and New in 1848. His highest level as a poet was reached by his epic called Konge- datterens Brudefart (The Bridal Journey of the King's Daughter) (1861). Twoof his historical dramas have enjoyed a popularity greatly in excess of their merit; these are Solomon de Cans (1854) and Lord William Russell (1857).

A group of minor poetical writers may now be considered. Magnus Brostrup Landstad (1802-1880) was born on Maaso, an island in the vicinity of the North Cape, and, therefore, in higher lati- „.

tudes than any other man of letters. He was a hymn- writer Minor

of merit, and he was the first to collect, in 1853, the Norske p ‘

Folkeviser or Norwegian folk-songs. Landstad was ordered by the government to prepare an official national hymn-book, which was brought out in 1861: Peter Andreas Jensen (1812-1867) published volumes of lyrical poetry in 1838, 1849, 1855 and 1861, and two dramas. He was also the author of a novel, En Erindring (A Souvenir), in 1857. Aasmund Olafsen Vinje (1818-1870) was a peasant of remarkable talent, who was the principal leader of the movement known as the ” maalstraev,” an effort to distinguish Norwegian from Danish literature by the adoption of a peasant dialect, or rather a new language arbitrarily formed on a collation of the various dialects, Vinje wrote a volume of lyrics, which he published in 1864, and a narrative poem, Storegut (Big Lad) (1866), entirely in this fictitious language, and he even went so far as to issue in it a newspaper, Dolen (The Dalesman), which appeared from 1858 to Vinje’s death in 1870. In these efforts he was supported by Ivar Aasen and by Kristoffer Janson (b. 1 841) the philologist, the author of an historical tragedy, Jon Arason (1867); several novels: Fraa Bygdom (1865); Torgrim (1872); Fra Dansketidi (1875); Han og Ho (1878); and Austanfyre Sol og Vestanfyre Maane (East of the Sun and West of the Moon) (1879); besides a powerful but morbid drama in the ordinary language of Norway, En Kvindeskjebne (A Woman’s Fate) (1879). In 1882 he left Norway for America as a Unitarian minister, and from this exile he sent home in 1885 what is perhaps the best of his books, The Saga of the Prairie. Superior to all the preceding in the quality of his lyrical writing was the bishop of Christiansand, Jorgen Moe (1813-1882). He is,

ao and drama- tists.

History, etc.

however, better known by his labours in comparative mythology, in conjunction with P. C. Asbjornsen (see Asbjornsen and Moe).

The names of the Norwegians Ibsen (q.v.) and Bjornson (q.v.), in the two fields of the drama and the novel, stand out prominently in Modern t ‘ le European literature of the later 19th century; and velista two w ” ters °f novels who owe much to their example are Jonas Lie (q.v.\, and Alexander Kielland (1849-1906). Nicolai Ramm Ostgaard

(1812-1872) to some extent pre- ceded Bjornson in his graceful romance En Fjeldbygd (A Mountain Parish), in 1852. Frithjof Foss (i830-i899),who wrote under the pseudonym of Israel Dehn, attracted notice by seven separate stories published between 1862 and 1864. Jacobine Camilla Collett (1813-1895), sister of the poet Wergeland, wrote Amtmandens Dbttre (The Governor's Daughters) (1855), an excellent novel, and the first in Norwegian literature which attempted the truthful description of ordinary life. She was a pioneer in the movement for the emanci- pation of women in Norway. Anne Magdalene Thoresen (1819- 1903), a Dane by birth, wrote a series of novels of peasant life in the manner of Bjornson, of whom she was no unworthy pupil. One of her best novels is Signes Historie (1864). She also wrote some lyrical poetry and successful dramas. The principal historian of Norway is Peter Andreas Munch (1810-1863), whose multifarious writings include a grammar of Old Norse (1847); a col- lection of Norwegian laws until the year 1387 (1846-1849) ; a study of Runic inscriptions (1848); a history and description of Norway during the middle ages (1849); and a history of the Norwegian people in 8 vols. (1852-1863); Jakob Aall (1 773-1 844) was associated with Munch in this work. Christian Berg (1775- 1852) was another worker in the same field. Jakob Rudolf Keyser (1803-1864) printed and annotated the most important documents dealing with the medieval history of Norway. Carl Richard Unger (b. 1817) took part in the same work and edited Morkinskinna in 1867. His edition of the elder Edda (1867) forms a landmark in the study of Scandinavian antiquities. Oluf Rygh (1833-1899) contri- buted to the archaeological part of history. The modern language of Norway found an admirable grammarian in Jakob Olaus Lokke (1829-1881). A careful historian and ethnographer was Ludvig Kristensen Daa (1809-1877). Ludvig Daae (b. 1834) has written the history of Christiania, and has traced the chronicles of Norway during the Danish possession. Bernt Moe (1814-1850) was a careful biographer of the heroes of Eidsvold. Eilert Lund Sundt (1817- 1&75) published some very curious and valuable works on the condition of the poorer classes in Norway. Professor J. A. Friis (b. 1821) published the folk-lore of the Lapps in a series of valuable volumes. The German orientalist, Christian Lassen (1800-1876) was a Norwegian by birth. Lorentz Dietrichson (b. 1834) wrote voluminously both on Swedish and Norwegian, chiefly on Norwegian art and literature. In jurisprudence the principal Norwegian authorities are Anton Martin Schweigaard (1808-1870) and Frederik Stang (1808-1884). Peter Carl Lasson (1798-1873) and Ulrik Anton Motzfelt (1807-1865) were the lights of an earlier generation. In medical science, the great writer of the beginning of the 19th century was Michael Skjelderup (1769-1852), who was

succeeded by Frederik Hoist (1791-1871). Daniel Cornelius Danielsen (b. 1815) was a prominent dermatologist; but probably the most eminent of modern physiologists in Norway is Carl Wilhelm Boeck (1808-1875). The elder brother of the last-mentioned, Christian Peter Bianco Boeck (1 798-1877), also demands recognition as a medical writer. Christopher Hansteen (1784-1873) was professor of mathematics at the university for nearly sixty years. Michael Sars (1805-1869) obtained a European reputation through his investigations in invertebrate zoology. He was assisted by his son Georg Ossian Sars (b. 1837). Baltazar Matthias Keilhau (1797-1858) and Theodor Kjerulf (1825-1888) have been the leading Norwegian geologists. Mathias Numsen Blytt (1789-1862) represents botany. His Norges Flora, part of which was published in 1861, was left incomplete at his death. Niels Henrik Abel (1802-1829) (q.v.) was a mathe- matician of extraordinary promise; Ole Jakob Broch (1818-1889) must be mentioned in the same connexion. Among theological writers may be mentioned Hans Nielsen Hauge (1771-1824), author of the sect which bears his name; Svend Borchman Hersleb (1784- 1836); Stener Johannes Stenersen (1789-1835); Wilhelm Andreas Wexels (1797-1866); a writer of extraordinary popularity; and Carl Paul Caspari (1814-1892), a German of Jewish birth, who adopted Christianity and became professor of theology in the university of Christiania.

The political crisis of 1884-1885, which produced so remarkable an effect upon the material and social life of Norway, was not

without its influence upon literature. There had moveineat, fouowe d to the great generation of the ‘sixties, led by

Ibsen and Bjornson, a race of entirely prosaic writers, of no great talent, much exercised with ” problems.” The movement which began in 1885 brought back the fine masters of a previous imaginative age, silenced the problem-setters, and encouraged a whole generation of new men, realists of a healthier sort. In 1885 the field was still held by the three main names of

modern Norse literature — Ibsen, Bjornson and Lie. Henrik Ibsen proceeded deliberately with his labours, and his name at the same time grew in reputation and influence. The advance of Bjornstjerne Bjornson was not so regular, because it was dis- turbed by political issues. Moreover, his early peasant tales once more, after having suffered great neglect, grew to be a force, and Bjornson’s example has done much to revive an interest in the art of verse in Norway. Jonas Lie, the most popular novelist of Norway, continued to publish his

pure, fresh and eminently characteristic stories. His style, colloquial almost to a fault, has neither the charm of Bjornson nor the art of some of the latest generation. Ibsen, Bjornson and Lie continued, however, to be the three representative authors of their country. Knstian Elster (1841-1881) showed great talent in his pessimistic novels Tora Trondal (1879) and Dangerous People (1881). Kristian Gloersen (b. 1838) had many affinities with Elster. Arne Garborg (1851) was brought up under sternly pietistic influences in a remote countiy parish, the child of peasant parerts, in the south-west corner of Norway, and the gloom of these early surroundings has tinged all his writings. The early novels of Garborg were written in the peasant dialect, and for that reason, perhaps, attracted little attention. It was not until 1890 that he addressed the public in ordinary language, in his extraordinary novel, Tired Men, which produced a deep sensation. Subsequently Gargorg returned, with violence, to the cultivation of the peasant language, and took a foremost part in the maalstrav. A novelist of considerable crude force was Amalie Skram (1847-1905), wife of the Danish novelist, Erik Skram. Her novels are destitute of literary beauty, but excellent in their local colour, dealing with life in Bergen and the west coast. But the most extravagant product of the prosaic period was Hans Jaeger (b. 1854), a sailor by profession, who left the sea, obtained some instruction and embarked on literature. Jaeger accepted the naturalistic formulas wholesale, and outdid Zola himself in the harshness of his pictures of life. Several of Jaeger's books, and in particular his novel Morbid Love (1893), were immediately suppressed, and can with great difficulty be referred to. Knud Hamsun (b. i860) has been noted for his egotism, and for the bitterness of his attacks upon his fellow- writers and the great names of literature. Hamsun is seen at his best in the powerful romance called Hunger (1888). A writer of a much more pleasing, and in its quiet way of a much more original order, is Hans Aanrud (b. 1863). His humour, applied to the observation of the Ostland peasants— Aanrud himself comes from the Gulbrandsdal — is exquisite; he is by far the most amusing of recent Norwegian writers, a race whose fault it is to take life too seriously. His story, How Our Lord made Hay at Asmund Bergemellum's (1887), is a little masterpiece. Peter Egge (b. 1 869) , a young novelist and playwright from Trondh jem, came to the front with careful studies of types of Norwegian temperament. In his Jacob and Christopher (1900) Egge also proved himself a successful writer of comedy. Gunnar Heiberg (b. 1857), although older than most of the young generation, has but lately come into prominence. His poetical drama, The Balcony, made a sensation in 1894, but ten years earlier his comedy of Aunt Ulrica should have awakened anticipation. His strongest work is Love's Tragedy (1904). Two young

writers of great promise were removed in the very heyday of success, Gabriel Finne (1866-1899) and Sigbjorn Obstfelder (1866-1900). The last mentioned, in The Red Drops and The Cross, published in 1897, gave promise of something new in Norwegian literature. Obstfelder, who died in a hospital in Copenhagen inAugust 1900, left an important book in MS., A Priest's Diary (1901).

Verse was banished from Norwegian literature, during the years that immediately preceded 1885. The credit of restoring it belongs to Sigurd Bodtker, who wrote an extremely naturalistic piece called Love, in the manner of Heine. The earliest real poet of the new generation is, however, Niels Collett Vogt (b. 1864), who published a little volume of Poems in 1887. Arne Dybfest (1868-1892), a young anarchist who committed suicide, was a decadent egotist of the most pronounced type, but a poet of unquestionable talent, and the writer of a remarkably

melodious prose. In 1891 was printed in a magazine Vilhelm Krag's (b. 1871) very remarkable poem called Fandango, and shortly afterwards a collection of his lyrics. Vogt and V. Krag continued to be the leading lyrical writers of the period, and although they have many imitators, they cannot be said to have found any rivals. Vilhelm Krag turned to prose fiction, and his novels Isaac Seehuusen (1900) and Isaac Kapergast (1001) are excellent studies of Westland life. More distinguished as a novelist, however, is his brother, Thomas P. Krag (b. 1868), who published a series of romantic novels, of which Ada Wilde (1897) is the most powerful. His short stories are full of delicate charm. Hans E. Kinck (b. 1865) is an accomplished writer of short stories from peasant life, written in dialect. Bernt Lie (b. 1868) is the author of popular works of fiction, mainly for the young. Sven Nilssen (b. 1864) is the author of a very success- ful novel, The Barque Franciska (1901). With him may be mentioned the popular dramatist and memoir-writer, John Paulsen (b. 185 1), author of The Widow's Son. Johan Bojer (b. 1872) has written satirical romances, of which the most powerful is The Power of Faith (1903). Jakob Hilditch (b. 1864) has written many stories and sketches of a purely national kind, and is the anonymous author of a most diverting parody of banal provincial journalism; Tranviksposten (1900-1901).

The leading critics are Carl Naerup (b. 1864) and Hjalmar Christensen (b. 1869), each of whom has published collections of essays dealing

with the aspects of recent Norwegian literature. The death of the leading bibliographer and lexicographer of Norway, Jens Braage Halvorsen (1845-1900), inflicted a blow upon the literary history of his country; his Dictionary of Norwegian Authors (1885-1900) — left for completion by Halfdan Koht — is one of the most elaborate works of its kind ever undertaken. Among recent historians of Norway much activity has been shown by Ernst Sars (b. 1835) and Yngvar Nielsen (b. 1843). The great historian of northern jurisprudence was L. M. B. Aubert (1838-1896), and in this connexion T. H. Aschehoug (b. 1822) must also be mentioned. The leading philosopher of Norway in those years was the Hegelian Marcus Jakob Monrad (b. 1816), whose Aesthetics of 1889 is his master- piece.

The close of 1899 and the beginning of 1900 were occupied by a discussion, in which every Norwegian author took part, Tbe as to the adoption of the landsmaal, or composite

“maal” dialect of the peasants, in place of the rigsmaal or con- Dano-Norwegian. Political prejudice greatly em-

versy. bjˆtered the controversy, but the proposition that the landsmaal, which dates from the exertions of Ivar Aasen (q.v.) in 1850, should oust the language in which all the classics of Norway are written, was opposed by almost every philologist and writer in the country, particularly by Bjornson and Sophus Bugge (b. 1833). On the other side, Arne Garborg’s was almost the only name which carried any literary weight. The maal has no doubt enriched the literary tongue of the country with many valuable words and turns of expression, but there the advantage of it ends, and it is difficult to feel the slightest sympathy with a movement in favour of suppressing the language in which every one has hitherto expressed himself, in order to adopt an artificial dialect which exists mainly on paper, and which is not the natural speech of any one body of persons throughout the whole of Norway,

Authorities. — La Norvege litteraire, by Paul Botten-Hansen (1 824-1 869), is an admirable piece of bibliography, but comes down no farther than 1866. Jens Braage Halvorsen (1845-1900) left his admirable and exhaustive Norsk Forfatter-Lexikon, 1814-1880 (Norwegian Dictionary of Authors) incomplete; but the work was continued by Halfdan Koht. See also Henrik Jaeger, Illustreret norsk literaturhistorie (Christiania, 1 892-1 896); to which an appendix Siste Tidsrum 1890-1904 was added by Carl Nserup in 1905; Ph. Schweitzer, Geschichte der skandinavischen Literatur (Leipzig, 1889); F. W. Horn, History of the Literature of the Scandinavian North (Eng.

trans., Chicago, 1884); Edmund Gosse, Northern Studies (2nd ed., 1882). (E. G.)

NORWEGIAN SEA, the sea enclosed between Norway, the Shetland and Faeroe Islands, Iceland, Greenland, Spitsbergen and Bear Island. Its basin is bounded on the E. by the Spits-

bergen platform, the continental shelf of the Barents Sea and the Norwegian coast: on the S. and S.W. by the North Sea, the Wyville-Thomson ridge, the Faeroe-Iceland ridge and the Iceland-Greenland ridge; on the W. by the coast of Greenland and on the N., so far as is known, by a ridge extending from Greenland to Spitsbergen. The Norwegian Sea is thus placed between the basins of the Atlantic on the one side and of the Arctic Ocean on the other: the mean depth of the submarine ridge separating it from the former being about 300 fathoms, and from the latter probably about 400 fathoms. The basin itself consists of a series of deeps, separated from one another by transverse ridges. Nansen and Helland-Hansen give the following results of measurements of the area:

2-58 million sq. km.

1-79

1-65

1-05

0-30 „

4- 12 million cubic km.

1600 metres.

Area of surface

Water area at 600 metres

„ ,, 1000 „

„ ,, 2000 ,,

,, „ 3000 ,, Volume …. Mean depth .

The Norwegian Sea forms the meeting-place of waters coming from the Atlantic and Arctic oceans, and it also receives coastal waters from the North Sea and connecting areas, and from the Barents Sea. As

communication with other basins is cut off comparatively near the surface, the inflow and outflow of waters must take place entirely in the upper strata, and the isolated water in the deep basin has typical physical characters of its own.

The distribution and circulation of these waters are of great complexity, and have formed the subject of study by oceanographers since the region was first opened up by the Norwegian North Atlantic Expedition, 1876-1878. Much fresh light has been thrown on the subject by the work of the International Council for the study of the sea, and more particularly by the Norwegian investigators Nansen and Helland-Hansen, whose report on Norwegian Fishery and Marine Investigations (vol. ii. No. 2, 1909) contains a complete survey of present knowledge. (H. N. D.)

NORWICH, GEORGE GORING, Earl of (is83?-i663), English soldier, was the son of George Goring of Hurstpierpoint and Ovingdean, Sussex, and of Anne Denny, sister of Edward Denny, earl of Norwich. He was knighted in 1608, and became a favourite at court, benefiting largely from monopolies granted by Charles I. He became Baron Goring in 1628, and privy councillor in 1639. When the troubles between Charles and his parliament became acute Goring devoted his fortune freely to the royal cause; and the king in November 1644 renewed for him the title of earl of Norwich which had become extinct at his uncle's death. He went with the queen to Holland in 1642 to raise money for the king, and in the autumn of the next year he was seeking arms and money from Mazarin in Paris. His proceedings were revealed to the parliament in January 1644 by an intercepted letter to Henrietta Maria. He was consequently impeached of high treason, and prudently remained abroad until 1647 when he received a pass from the parliament under a pretext of seeking reconciliation. Thus he was able to take a prominent part in the Second Civil War of 1648 (see Great Rebellion). He commanded the Kentish levies, which Fairfax dispersed at Maidstone and elsewhere, and was forced to surrender unconditionally at Colchester. He was condemned to exile in November 1648 by a vote of the House of Commons, but in the next month the vote was annulled. Early in the next year a court was formed under Bradshaw to try Norwich and four others. All five were condemned to death on the 6th of March, but petitions for mercy were presented to parliament, and Norwich's life was spared by the Speaker's casting vote. Shortly after his liberation from prison in May he joined the exiled court of Charles II., by whom he was employed in fruitless negotiations with the duke of Lorraine. He became captain of the king's guard at the Restoration, and in consideration of the fortune he had expended in the king's service a pension of £2000 a year was

granted him. He died at Brentford on the 6th of January 1663. By his wife Mary Nevill (d. 1648) , daughter of the 6th Lord Abergavenny, he had four daughters and two sons: George, Lord Goring (q.v.); and Charles, who fought

in the Civil War, succeeded his father in the earldom, and died without heirs in March 1671.

NORWICH, a city and one of the county-seats of New London county, Connecticut, U.S.A., in the township of Norwich, at the point where the Yantic (which expands here in ” The Cove “) and Shetucket rivers join and form the Thames. Pop. (1900) of the township, 24,637, which included that of the city (17,251, including 4597 foreign-born) ; (1910) of the city, 20,367, and of the township, 28,219. The city area in 1906 was 5 -63 sq.m. Norwich is served by the New York, New Haven & Hartford and the Central Vermont railways, by steamers from New York and New London, and by interurban electric lines connecting with Willimantic, New London and other neighbouring places. The city is at the head of navigation on the Thames river, whose channel is 100-200 ft. wide and 14 ft. deep. The residential and older portion of the city is built on the rising ground between the valleys of the two streams; along their banks lies the business district. In Sachem Street is the grave of Uncas (d. c. 1682), a Mohegan Indian chief and friend of the early settlers; the corner-stone of the granite monument over the grave was laid by President Andrew Jackson in 1833. North-east of the Roman Catholic Cemetery, in the extreme eastern part of the city, is a monument to Miantonomo, a sachem of the Narragan- set tribe of Indians, who was put to death here. Among the principal buildings and institutions are the Congregational Church, organized in 1660; the Norwich Free Academy (1856) and its Slater Memorial Hall, in which are the Peck Library and an Art Museum, and the Converse Art Annex and Art Collection; the Otis Public Library (1848); the William W. Backus Hospital; a state hospital for the insane and a state armoury. In the 18th century, and early in the 19th, Norwich had a lucrative trade with the Atlantic ports and the West Indies, but later manufacturing became the most important industry; the manufactures including textiles, cutlery, fire- arms, paper, electrical supplies, printing presses, &c. In 1905 the factory products were valued at $6,022,391. With the city’s growth in manufacturing there has been a large increase in the foreign element in the population. The muni- cipality owns and operates the waterworks, and

gas and electric- lighting plants.

Norwich was settled in 1659 by colonists from Saybrook under the leadership of Captain John Mason (1600-1672), who had crushed the power of the Pequot Indians in Connecticut in 1637, and the Rev. James Fitch (1622-1702), who became a missionary to the Mohegans. 1 The tract was purchased from the Mohegan chiefs, Uncas, Owaneco and Attawanhood, and the settlement was called Mohegan until 1662, when the present name was adopted. During and preceding the War of Independ- ence the citizens of Norwich were ardent Whigs, various members of the well-known Huntington family being among their leaders. 2 In December 1767, in reply to a message from Boston, a town- meeting forbade the use of tea, wines, liquors and foreign manufactures; in r77o all citizens were forbidden to hold

1 The principal village of the Mohegans was originally, it seems, on the site of Norwich. Subsequently the village of Mohegan (on the W. bank of the Thames, about 3 m. S. of Norwich) became their principal settlement, and' the remnant, numbering about loo indi- viduals of mixed blood in 1904, still live here and in the vicinity.

1 Norwich was the birthplace of Benjamin Huntington (1736- 1800), a member of the Continental Congress in 1 780-1 784 and 1787- 1788, a representative in Congress in 1789-1791, judge of the state superior court in 1793-1798, and first mayor of Norwich in 1784- 1796; of Jabez Huntington (1719-1786), a patriot leader and major- general of Connecticut militia during the War of Independence; of his son, Jedediah Huntington (1743-1818), also a patriot leader, a brigadier-general in the Continental Army (1777-1783), and a founder of the Society of the Cincinnati; of Jedediah's brother, Ebenezer Huntington (1754-1834), a soldier and in 1810-1811 and 1817- 1819 a representative in Congress; and of Jedediah's nephew, Jabez Williams Huntington (1788-1847), a jurist, a representative in Congress in 1829-1834, and a member of the U.S. Senate in 1840- 1847. Samuel Huntington (1731-1796) removed to Norwich about 1758, was a member of the Continental Congress in 1776-1783 and its president in 1779-1781, was a signer of the Declaration of Independ- ence, a justice of the supreme court of Connecticut in 1774-1784, and governor of Connecticut in 1 786-1 796.

intercourse with a schoolmaster who had continued to drink tea, and in 1776 a town-meeting directed the town clerk to proceed with his duties without reference to the Stamp Act. Norwich was chartered as a city in 1784. Among the early settlers in Ohio many were inhabitants of Norwich. Benedict Arnold was a native of Norwich; Mrs Lydia H.

Sigourney was born here in a house still standing; Donald G. Mitchell (” Ik Marvel “) was also born here; and Norwich was the home after 1825 of William Alfred Buckingham (1804-1875), war governor of Connecticut.

See F. M. Caulkins, History of Norwich (Hartford, 1866).

NORWICH, a city and county of a city, municipal, county and parliamentary borough, and the county town of Norfolk, England; 114 m. N.E. by N. from London. Pop. (1901), 111,733. It is served by the Great Eastern railway and also by the Midland and Great Northern joint line. The Great Eastern company owns the Thorpe and Victoria stations, and the joint line the City station. The city lies in the valley of the Wensum, which joins the Yare immediately below. The ancient city lay in a deep bend of the Wensum, and the walls (1294- 1342), with their many towers and twelve gatehouses, of which fragments only remain, were 4 m. in circuit. These narrow limits, however, were long ago outgrown, for Evelyn writes in 1 67 1 that ” the suburbs are large, the prospects sweete, with other amenities, not omitting the flower gardens, in which all the inhabitants excel.” The castle, standing high upon a steep mound, is still partly surrounded by earthworks and a ditch spanned by a very early bridge. Only the early Norman square keep remains, with four tiers of arcading without, and an ornate doorway into the great tower. The building long served as a prison, but, on the erection of a new gaol without the city, was acquired in 1884 by the corporation and in 1894 adapted as a museum and art gallery.

The cathedral church of the Holy Trinity lies between the castle and the river, on low ground. In 1094 the seat of the East Anglian bishopric was removed by Bishop Herbert de Lozinga or Lorraine from Thetford to Norwich, where in 1096 he laid the foundation of the cathedral and dedicated it in not, establishing at the same time a Benedictine monastery. As completed by his successor before the middle of the 12th century the cathedral in style was purely Norman; and it still retains its original Norman plan to a great degree. Changes and additions, however, were made from time to timer-the Early English lady chapel (demolished about 1580) belonging to the middle of the 13th century; the Perpendicular spire, erected after the collapse of two previous spires of wood, to the 15th; the west window and porch and the lierne stone vaulting of the nave, with its elaborate 328 bosses, to the 15th, and to the 1 6th the vaulting of the transepts and Bishop Nix’s chantry, whilst the fine cloisters, 175 ft. square, 12 ft. wide, with 45 windows, in style mainly Decorated, were begun in 1297 and not com- pleted till 1430. The following are the dimensions

in feet of the cathedral: total length, 407; length of nave, 204; length of transepts, 178; breadth of nave and aisles, 72; total height of spire, 315 (in England exceeded by Salisbury only); height of tower, 140ˆ; height of nave, 69ˆ; height of choir, 83 1. The chief entrance on the west is a Perpendicular archway, above which is an immense window filled with poor modern stained glass. The nave within is grand and imposing, of great length, divided by fourteen semicircular arches, whose massive piers are in two instances ornamented with spiral mouldings. The triforium is composed of similar arches. The side aisles are low, their vaultings plain. The choir, extending westward some way beyond the crossing, is of unusual length, and terminates in an apse. The oak stalls and misereres are very richly carved work of the 15th century. A curious quatrefoil, opening on the north side of the presbytery, beneath the confessio or relic chapel, deserves mention. There is a monumental effigy of Bishop Goldwell (c. 1499), and another of Bishop Bathurst

1(1837) by Sir F. Chantrey. Mural monuments are plentiful. Sir William Boleyn, great-grandfather of Queen Elizabeth, is buried on the south side of the presbytery, in the midst of which

stood the tomb of Bishop Herbert, the founder. Of three circular apsidal chapels two remain; and in one — the Jesus chapel — the ancient colouring has been renewed. Two richly sculptured gateways lead to the cathedral — the Erpingham gate (1420) and the Ethelbert gateway (c. 1300). The bishop's palace and the deanery are buildings of high antiquity, but both have undergone many alterations. The latter has a well-restored chapel. A beautiful Early Decorated ruin in the palace garden, known as " Bishop Salmon's gateway," is supposed to have been the porch to the great hall (c. 13 19). The diocese covers nearly all Norfolk, the greater part of Suffolk, and a small part of Cambridgeshire.

Of the remarkable number of churches, over forty in all, St Peter Mancroft is by many esteemed the finest parish church in England. Measuring 212 by 70 ft., it has a richly ornamented tower and fleche, 148 ft. high, with a beautiful peal of twelve bells, a long, light clerestory of thirty-four windows, a fine carved oak roof, a remarkable font cover, and the tomb of Sir Thomas Browne (d. 1682). The majority of the Norwich churches are of Perpendicular flint work, mostly of the 15th century. St Andrew, St Stephen, St Michael

Coslany, with the fine Perpendicular Thorpe chapel, St John Maddermarket, St Lawrence, St Giles, with a tower 126 ft. high, St Gregory, St Helen, St Swithin, and St Michael at Plea (so called from the archdeacon's court held here) are also noticeable. The Roman Catholic church of St John the Baptist, begun in r884 from designs by Sir G. G. Scott, occupies a commanding position outside St Giles's gate. At Carrow, E. of the city, there remain the hall, a decorated doorway, and other fragments of a Benedictine nunnery.

The grammar school is a Decorated edifice, formerly a chapel of St John, of c. 1316, with a " carnary " or crypt below. Among its scholars were Sir Edward Coke, Lord Nelson, Raja Brooke and George Borrow, the traveller and author, in whose work L&vengro (chap, xiv.) occurs a noteworthy description of Norwich. St Andrew's Hall (124 by 64 ft.) is the seven-bayed nave of the Black Friars' church, rebuilt with the aid of the Erpinghams between 1440 and 1470. It is a splendid specimen of Perpen- dicular work, with its twenty-eight clerestory windows and chestnut hammer-beam roof, and has served since the Reforma- tion as a public hall, in which from 1824 have been held the triennial musical festivals. It was restored in 1863. The guild- hall, on the site of an earlier tolbooth, is a fine flint Perpendicular structure of 1408-1413; the mayor's council-chamber, with furniture of the time of Henry VIII., is an interesting specimen of a court of justice of that period. The city regalia, kept here, include several objects of historical interest, amongst them a sword of a Spanish admiral captured by Nelson, with his auto- graph letter presenting it to the city, and a curious figure formerly used in the procession of the mayor elect through the city. Other public buildings include a shire hall, within the castle precincts, corn exchange, agricultural hall, volunteer drill hall, barracks and gaol on Mousehold Heath, the Norfolk and Norwich Library, rebuilt in 1900 after a fire, and a theatre. Educational establishments, besides the grammar school, include the Norwich and Ely Diocesan Training College, and the Municipal Technical Institute. The museum in the castle contains collections of British birds, insects, fossils, antiquities, and MSS. and early books. The chief charitable institutions are the Norfolk and Norwich Hospital, lunatic asylum, blind asylum and schools, Jenny Lind Infirmary for children, a soldiers' and sailors' institute, St Giles's or old men's hospital (an ancient foundation), and Doughty's Hospital (1687).

The principal industries include foundries and engineering works, iron and wire fence works, brewing, brick works, chemical works, tanneries, and the production of mustard, starch, and crfipe, gauze and lace; and there are large boot and shoe factories. The great cattle market lies below the castle. The municipal, county and parliamentary

boroughs are coextensive. The parliamentary borough returns two members. The city is governed by a lord mayor (this title having been conferred in 1910), 16 aldermen and 48 councillors. Area, 7905 acres.

History. — There is no conclusive evidence that Norwich (Northwic, Norwic) was an important settlement before the coming of the Angles. Caistor-by-Nonvich, 4 m. S. of Norwich, is on the site of what was probably a Romano-British country town. A few Roman remains have been discovered in Norwich, itself, but not enough to indicate any real occupation or habita- tion. According to tradition Uffa made a fortification here about 570, but its history as a royal borough cannot be traced before the reign of iEthelstan (924-940), when it possessed a mint. After being destroyed by the Danes Norwich enjoyed a period of prosperity under Danish influence and was one of the largest boroughs in the kingdom at the Conquest. Ralph de Guader, earl of East Anglia under William I., formed the nucleus of a French borough with different customs from the English, and after his forfeiture, which involved the ruin of many of the old burgesses, a masonry castle was built and the centre of burghal life gradually transferred to the new community west of it. By 1158, when Henry II. granted the burgesses a charter confirming their previous liberties, the two boroughs seem to have amalgamated. A fuller charter given by Richard I. in 1 194 and confirmed by later sovereigns made Norwich a city enjoying the same liberties as London. From Henry IV. the citizens obtained a charter (1404), making their city a county with a mayor and two sheriffs instead of four bailiffs, and Henry V. added twenty-four aldermen and sixty common councilmen (1418). The cathedral precinct became parcel of the city at the Dissolution and in 1556 the neighbouring hamlets were incorporated in the county of Norwich. The charter of Charles II. (1683) remained in force till 1835, when one sheriff was removed and the number of aldermen, common councilmen and wards diminished. Since 1298 Norwich has been represented in parlia- ment by two members. Two annual fairs, existing before 1332, were formally granted to the city in 1482. One was then held in Lent, the other began on the feast of the Commemoration of St Paul (the 30th of June). These have been succeeded by the Maunday Thursday horse and cattle fair, and the pleasure fairs of Easter and Christmas. The market, which must have existed before the Conquest, was held daily in the 13th century, when citizens enclosed stalls by royal licence. Edward III. made Norwich a staple town, and the importance of its trade in wool and worsted dates from his reign.

See Victoria County History, Norfolk ; W. Hudson, Records of the City of Norwich (1906).

NORWICH, a village and the county-seat of Chenango county, New York, U.S.A., on the Chenango river, 42 m. N.E. of Binghamton. Pop. (1910 census), 7422. It is served by the Delaware, Lackawanna & Western and the New York, Ontario & Western railways. The village has three parks, two libraries — the Guernsey Memorial Library and the D. L. Follett Memorial Law Library — and the Chenango Valley Home for Aged Women. Norwich is in a dairying and farming region, where bops especially are grown; and there are bluestone quarries in the vicinity. There are a variety of manufactures, and the New York, Ontario & Western has repair shops and division headquarters here. The first settlement was made in 1792, and the village was incorporated in 1857.

NORWOOD, a southern district of London, England, partly in Surrey and partly in the county of London (metropolitan borough of Lambeth). The district is hilly and well wooded, hence the name. It is divided into Upper, Lower and South Norwood, all consisting principally of villa residences and detached houses inhabited by the better classes. Among numerous institutions are almshouses for the poor of St Saviour's, South- wark, opened at South Norwood in 1863, a Jewish convalescent home in 1869, and the Royal Normal College and Academy of Music for the Blind at Upper Norwood in 1872. At Gipsy Hill, Upper Norwood, lived Margaret Finch, queen of the Gipsies, who died in 1740 at the age of 109, and was buried in the church- yard at Beckenham.

NORWOOD, a township in Norfolk county, Massachusetts, about 14 m. S.W. of Boston. Pop. (1900) 5840 (1497 foreign- born); (1910) 8014; area about 10 sq. m. Norwood is served

by the New York, New Haven & Hartford railway. The town- ship is traversed by the Neponset river. It has the Morrill Memorial Library (12,000 volumes in 1909). Norwood's manu- factories include printing-ink and glue factories, tanneries, an iron foundry, and the printing-presses and binderies of J. S. Cushing Co., H. M. Plimpton & Co., and the Norwood Press Co. Originally the South or Second Precinct of Dedham, Norwood was incorporated as a township (with the addition of a part of Walpole) under its present name in 1872.

See D. Hamilton Hurd, History of Norfolk County, Massachusetts (Philadelphia, 1864).

NORWOOD, a city of Hamilton county, Ohio, U.S.A., adjoining Cincinnati on the N. E. Pop. (1900), 6480 (718 foreign-born) ; (1910) 16,185. It is served by the Baltimore & Ohio South Western and the Cincinnati, Lebanon and Northern railways, and by interurban electric railways. Norwood has various manufactures, but as one of the hill suburbs of Cincinnati it is primarily a place of residence. It has a Carnegie library (a branch of the public library of Cincinnati) and a Catholic maternity hospital. Norwood, originally called Sharpsburg, was settled about 1798, laid out as a town in 1873, incorporated as a village in 1888, and chartered as a city in 1903.

NORZAGARAY, a town of the province of Bulacan, Luzon, Philippine Islands, on the Quingua river, about 25 m. N. by E. of Manila. Pop. (1903), 5131. The inhabitants are engaged chiefly in the cultivation of rice and Indian corn, and in lumber- ing; good timber grows on the neighbouring mountains, and some iron and gold have been found in this region. Near the town there is a sulphur spring. The language is Tagalog.

NOSAIRIS (also known as Ansayrii, sometimes Ansariyeh), the people who inhabit the mountainous country of N. Syria, which is bounded on the S. by the north end of the Lebanon at the Nahr el-Keblr (Eleutherus), on the N. by Mt Casius, Antioch and the Nahr el-‘Asi (Orontes). Various settlements of them “are found also in Antioch itself and in Tarsus, Adana, and a few other places, while in harvest time they come down as far as the Biq’a (Buka’a). From the time of Strabo until about two centuries ago, the country was famed for its wine, but now more for its tobacco (especially at Latakia). The total number of Nosairis inhabiting this country is variously estimated at from 120,000 to 150,000.

The origin of the name Nosairi is uncertain. Among the more possible explanations is that the name is derived from that of Mahommed Ibn Nusair, who was an Isma’Ilite follower of the eleventh imam of the Shiites at the end of the 9th century. This view has been accepted by Nosairi writers, but they transfer Ibn Nusair to the 7th century and make him the son of the vizier of Moawiya I., while another tradition (cf. Abulfeda, Geog. vol. ii. p. 11, No. 7) identifies him with Nusair, a freedman of the caliph ‘Ali. It is, however, noteworthy that Pliny {Hist. nat. v. 81) gives the name Nazerini to the inhabitants of this district. In this part of Syria paganism remained even up to the middle ages (cf. Archives de I’Orient latin, vol. ii. 2, p. 375), and there is a complete absence of churches of the 5th to the 7th centuries in these mountains. In the 7th century the Arabs invaded Syria, but do not seem to have got into these mountains. At the end of the 10th century,

however, the Isma'- Ilite propaganda won some success among the people. Their strongholds were taken by Raymond in 1099, and later Tancred secured the very summits. In 113 2-1 140 the Assassins (q.v.) gained possession of their chief towns, but Saladin recovered them in 1188. In 1317 the sultan Bibars endeavoured to con- vert them to orthodox Islam, and built many mosques, but Ibn Batuta (i. 177) says they did not use them. A fatwa of Ibn Taimiyya (d. 1327) of this time shows that the Nosairis were regarded with fear and hatred by the orthodox. For the next 500 years they were given over to their own internal disputes, until they came under the power of Ibrahim Pasha in 1832. At the present time they are under the direct ad- ministration of the Turks.

The religion of the Nosairis seems to have been almost the same in the first years of the 5th century a.h. (nth century a.d.)

as it is to-day, judging by the references in the sacred books of the Druses. As set forth in their own sacred book, the Majmu', it seems to be a syncretism of Isma'Ilite doctrines and the ancient heathenism of Harran. The ages of the world are seven in number, each of these having its own manifestation of deity. But the manifestation of the 7th age is not a Mahdi who is yet to come, but the historical person 'Ali ibn abu Talib. This is stated in the crudest form in Sura n of the Majmu : " I testify that there is no god but 'Ali ibn abu Talib." 'Ali is also called the Ma'na ("Idea"; cf. the Logos of the New Testament), hence the Nosairis are also called the Ma'nawiyya. 'Ali created Mahomet, who is known as the Ism (" Name "), and a trinity is formed by the addition of Salman ul-FarisI, who is the Bab {" Door "), through whom the propaganda is made, and through whom one comes to God. A mysterious symbol much used in their ceremonies of initiation consists of the three letters ' Ain, Mini, Sin, these being, the initials of 'Ali, Mahomet and Salman. Of these three, however, 'Ali is the supreme. In Sura 6 of the' Majmu' the Nosairi says: " I make for the Door, I prostrate myself before the Name, I worship the Idea." Each of the seven manifestations of God in the ages of the world has been opposed by an adversary.

The Nosairis are divided into four sects. (1) The Haidarls (from the name haidari, " lion," given to 'Ali on account of his valour) are the most advanced. (2) The Shamalis or Shamsis preserve many traces of the old nature-worship, 'Ali {i.e. the supreme god) is the heaven, Mahomet is the sun, Salman the moon. (3) On the other hand the Kalazis, so named from a sheik Mahommed ibn Kalazi (cf. E. Salisbury in the Journal of the American Oriental Society, viii. 237), or Qamaris, hold that the supreme god ("Ali) is the moon, not the sun.

Their poetry addressed to the moon is translated by C. Huart in the Journal asiatique, ser. vii. vol. xiv. pp. 190 ff. (4) The Ghaibis are worshippers of the air, for God is invisible. In this they come nearer to the ordinary Isma'Ilite doctrine. Religion is restricted among the Nosairis to the initiated, who must be adults over fifteen years of age and of Nosairi parentage. The initiator, who must not be a relative, becomes a spiritual father, and the relation cannot be broken except by his consent. The initiation consists of three stages. In the first the novice is received and told to meditate on the three mystic letters; in the second, after a period of forty days, he is taught the titles of the 16 suras of the Majmu'; in the third, after seven or nine months (intended to correspond with the ordinary period of gestation) , he is taught Suras 5, 6 and 9, learns the meaning of the three mystic letters and goes through a further period of instruction from his initiator. The initiated are divided into two classes, the sheiks, who are recruited from the families of sheiks only, and the ordinary members.

The Nosairis are believers in metempsychosis. The pious Nosairi takes his rank among the stars, but the body of the impious undergoes many transformations.

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NOSARI, or Navsari, a town in India, in the state of Baroda, on the left bank of the Purna river, 147 m. by rail N. of Bombay. Pop. (1901), 21,451. It is an ancient place, known to Ptolemy as Nasaripa. It was one of the earliest settlements of the Parsees in Gujarat, after their banishment from Persia in the 1 2th century. It is still the home of their mobeds, or sacerdotal class, and contains their most venerated " fire temple." Many small industries are carried on, including the weaving of the kusti, or sacred thread of the Parsees. There is also considerable trade by both rail and water, for the river is navigable. The public buildings and the private houses, especially those in the suburbs, are unusually good.

NOSE (O.Eng. nosu, cf. Dutch neus, Swed. nos, snout; the connexion with O.Eng. nasu is obscure, cf. Ger. Nase, Lat. nares, nostrils, nasus, nose, Fr. nez), the organ of the sense of smell (q.v.) in man and other animals (see Olfactory System). The projecting feature above the mouth, to which the word is usually restricted in man, is, in the case of the lower animals, called snout or muzzle, or, if much prolonged, proboscis or trunk. ” Nostril,” the external opening into the nose, is from O.Eng. nosthyrl {thyrl or thirl, hole or opening).

NOSOLOGY (Gr. vo

NOSSEN, a town of Germany, in the kingdom of Saxony, pleasantly situated on the Freiberger Mulde, 51 m. S.E. from Leipzig by the railway to Dresden via Dobeln, and at the junction of a line to Moldau. Pop. (1905), 4879. It possesses an ancient castle crowning a height above the river, and has extensive manufactures of boots and shoes, leather and paper. In the immediate vicinity are the ruins of the Cistercian monastery of Altenzella, or Altzella, founded in 1145, and a noted school of philosophy during the i3th-i5th centuries. In the chapel, which was built in 1347 and restored in 1787, lie the remains of ten margraves of Meissen, members of the family of Wettin. The foundation was secularized in 1544. The valuable annals, Chronicon vetere Cellense majus and Chronicon minus, giving a history of Saxony during the 13th and 14th centuries, were removed to the university library of Leipzig in 1 544. They are printed in Band xvi. of the Monumenta Germaniae hislorica. scriplores (1859).

See E. Beyer, Das Cistsrcienstift und Klosler Alt-Celle (Dresden,

1855)-

NOSSI-B&, properly N6sy-be, i.e. ” Great island,” an island about- 8 m. off the N.W coast of Madagascar, in 13° 23′ S., 48 15′ E. It is 14 m. long by 10 broad, and has an area of 130 sq. m. Nossi-be is volcanic, the N. and S. parts of older, the central part of more modern date. Besides a number of true volcanic craters (Lokobe, the highest point, is i486 ft. above the sea) there are numerous crater-lakes level with the ground (see Nature, March 1877, p. 417). Theˆiimate is similar to that of Mayotte (see Comoro Islands), and the neighbouring islet of Nossi-komba, about 2000 ft. above the sea, serves for a sana- torium. Pop. (1902), 9291. Hellville, the chief town (so called after De Hell, governor of Reunion at the time of the French annexation), is a port of call for the Messageries Maritimes and a centre for the coasting trade

along the western shores of Madagascar. There is excellent anchorage, and a pier 800 ft. long. The soil is very fertile, and there are forests of palms and bamboos. The chief products are coffee, sesame, the sugar-cane, cocoa, vanilla and tobacco. There are numerous sugar factories and rum distilleries.

In 1837 Tsiomeko, chieftainess of one of the numerous divisions of the western Malagasy known under the common name of Sa.kala.va, was expelled by the Hova and fled to Nossi-be and Nossi-komba. Failing assistance from the imam of Muscat, she accepted French protection in 1840, ceding such rights as she possessed on the N.W. coast of the mainland. The French took possession in 1841, and in 1849 an unsuccessful attempt was made to expel them. The administration was entrusted to a subordinate of the governor of Mayotte until 1896, when Nossi-b6 was placed under the administration of Madagascar (q.v.). (J. Si.*)

NOSTALGIA (Gr. voctos, return home, and a\yos, grief), home-sickness, the desire when away to return home, amounting sometimes to a form of melancholia.

NOSTRADAMUS (1303-1566), the assumed name of Michel de Notredame, a French astrologer, of Jewish origin, who was born at St Remi in Provence on the 13th of December 1503. After studying humanity and philosophy at Avignon, he took the degree of doctor of medicine at Montpellier in 1529. He settled at Agen, and in 1544 established himself at Salon near

Aix in Provence. Both at Aix and at Lyons he acquired great distinction by his labours during outbreaks of the plague. In 1555 he published at Lyons a book of rhymed prophecies under the title of Centuries, which secured him the notice of Catherine de' Medici; and in 1558 he published an enlarged edition with a dedication to the king. The seeming fulfilment of some of his predictions increased his influence, and Charles IX. named him physician in ordinary. He died on the 2nd of July 1566.

The Centuries oi Nostradamus have been frequently reprinted, and have been the subject of many commentaries. In 1781 they were condemned by the papal court, being supposed to contain a prediction of the fall of the papacy. Nostradamus was the author of a number of smaller treatises. See Bareste, Nostradamus (Paris,

1840).

NOSTRUM (neuter of Lat. noster, our), the name given to preparations of which the ingredients are not made publicly known, a patent or ” quack ” medicine; it is taken from the label (:l of our own make “) formerly attached to such medicines. NOTARY, or Notary Public. In Roman law the notarius was originally a slave or freedman who took notes (nolae) of judicial proceedings in shorthand. The modern notary corre- sponds rather to the tabellio or tabularius than to the notarius. In canon law it was a maxim that his evidence was worth that of two unskilled witnesses.

The office of notary in England is a very ancient one. It is mentioned in the Statute of Provisors, 25 Edward III. stat. 4. The English notary is an ecclesiastical officer, nominated, since the Peterpence Dispensations Act 1533-1534, by the archbishop of Canterbury through the master of the faculties (now the judge of the provincial courts of Canterbury and York), in order to secure evidence as to the attestation of important documents. All registrars of ecclesiastical courts must be notaries. A notary’s duties, however, are mainly secular. ” The general functions of a notary consist in receiving all acts and contracts which must or are wished to be clothed with an authentic form; in conferring on such documents the required authenticity; in establishing their date; in preserving originals or minutes of them which, when prepared in the style and with the seal of the notary, obtain the name of original acts; and in giving authentic copies of such acts ” (Brooke, On the Office of a Notary, chap. iii.). The act of a notary in authenticating or certifying a document is technically called a ” notarial act.” In most countries the notarial act is received in evidence as a semi-judicial matter, and the certificate of a notary is probative of the facts certified. But English law does not recognize the notarial act to this extent. An English court will, in certain cases, take judicial notice of the seal of a notary, but not that the facts that he has certified are true, except in the case of a bill of exchange protested abroad.

The most important part of an English notary’s duty is the noting and protest of foreign bills of exchange in case of non- acceptance or non-payment. This must be done by a notary in order that the holder may recover. He also prepares ship pro- tests and protests relating to mercantile matters, and authenti- cates and certifies copies of documents and attests instruments to be sent abroad. The office of notary is now usually held by a solicitor. In London he must be free of the Scriveners’ Company.

In Scotland, before the reign of James III., papal and imperial notaries practised until the 29th of November 1469, when an act was passed

declaring that notaries should be made by the king. It would appear, however, that for some time afterwards there were in Scotland clerical and legal notaries — the instruments taken by the latter bearing faith in civil matters. In 1551 an act was passed directing sheriffs to bring or send both kinds of notaries to the lords of session to be examined; and in a statute, passed in 1555, it was ordained that no notary, " by whatsoever power he be created," should use the office "except he first present himself to the said lords, showing his creation, and be admitted by them thereto." It does not appear that this statute vested the right of making notaries in the court of session; but in 1563 it was by law declared that no person should take on him the office, under the pain of death, unless created by the sovereign's

special letters, and thereafter examined and admitted by the lords of session. Since then the Court of Session has in Scot- land exercised exclusive authority on the admission of notaries in all legal matters, spiritual and temporal. The position of notaries in Scotland is somewhat higher than it is in England.

In the United States, notaries are appointed by the governors of the states, and their authority to act is limited to the state to which they are appointed. They are state officers, and their duties in the main are attesting deeds and other instruments, and taking affidavits and depositions; all such documents which are intended to be used in the federal courts must have the notarial seal affixed. They also protest bills of exchange, and in some states they have the powers of a justice of the peace.

In France, notaries receive all acts and contracts to which the parties thereto must give or desire to give the authenticity attached to the acts of a public authority; they certify the date, preserve the originals and give copies or duplicates. Notaries are nominated by the president of the republic on the recommenda- tion of the keeper of the seals. They cannot act as notaries and practise as advocates, or hold any magisterial office, nor must they engage in business. Notaries are divided into three classes: those of towns which have a court of appeal ; those of towns which have a court of first instance; those of the other towns and com- munes. The first and second classes can practise wherever the jurisdiction of their courts extends; the third class only in their canton. They must obtain the sanction of the minister of justice should they desire to change from one district to another. They

must serve an apprenticeship of six years (with exceptions) to a notary of the class to which they desire to belong. Every notary is bound in a certain sum fixed by the government as security for the due discharge of his duties. Since 1896 the remuneration of the more important classes of notaries has been regulated by law. Each district has a chamber of notaries, which exercises disciplinary powers over its members.

In Germany, notaries are appointed by the president of the courts of law and the minister of justice in their respective states; they carry on their profession for their own benefit, and do not, except in Wurttemberg, receive any fixed salary, but take fees from the parties they represent. They may not refuse their services, save on good and sufficient ground. In some German states, notably Saxe-Weimar and Hesse-Darmstadt, there are no notaries. In Wurttemberg, Baden, Bavaria, Alsace-Lorraine, Rhenish Prussia and Austria, they form a distinct class, while in the other German states they generally combine the notarial office with that of advocate. There is no code of rules for the whole empire, the new Burgerliches Gesetz- buch leaving it to each state to frame its own regulations.

NOTE (Lat. nota, mark, sign, from noscere, to know), a mark, particularly a sign by which a musical sound (also called a note) is indicated in writing (see Musical Notation). The term is also applied to an abstract or memorandum of documents, speeches, &c. This appears to have been first in legal use, especially in the process of the transfer of land by fine and recovery (see Fine). Further extensions of this meaning are to an explanation, comment or addition, added in the margin or at the foot of the page to a passage in a book, &c, or to a com- munication in writing shorter or less formal than a letter.

The ordinary distinction between note and letter is reversed in diplomacy. Diplomatic notes are written communications exchanged between diplomatic agents or between them and the ministers of foreign affairs of the government to which they are accredited; they differ from ordinary letters in having a more formal character and in dealing with matters of more immediate and definite importance: e.g. the notification of adhesion to a treaty, of the re-establishment of diplomatic relations after a war, &c. Sometimes, by agreement, a mere exchange of notes has the force of a convention. Collective notes are those signed by the representatives of several powers acting in concert. Some- times identical notes are substituted for collective, i.e. notes identical as to form and substance, but signed and delivered separately by the representatives of the several powers. Thus in 1822, at the congress of Verona, in order to overcome the

objection of Great Britain to any interference of the European concert in Spain, identical notes were presented to the Spanish government instead of a collective note. Circular notes are those addressed by one power “to the other powers generally, e.g. that addressed by Thiers (November 9, 1870) , on the proposed armistice, to the representatives of the great powers accredited to the government of national defence. Confidential notes are directed to inspiring confidence by giving an explicit account of the views and intentions of the plenipotentiaries and their governments. Such a note was sent, for instance, by the plenipotentiaries of the allied powers at the conference of Poros, on the 8th of December 1828, to Capo dTstria, the Greek presi- dent, to instruct him confidentially as to the results of their deliberations. The so-called notes verbales are unsigned, and are merely of the nature of memoranda (of conversations, &c). Notes ad referendum are addressed by diplomatic agents to their own governments asking for fresh powers to deal with points not covered by their instructions, which they have had to ” refer.” Diplomatic notes are usually written in the third person ; but this rule has not always been observed (see P. Pradier-Fodere, Cours de droit diplomatique, Paris, 1899; vol. ii. p. 524).

For notes of hand or promissory notes see Negotiable Instru- ments and Bill of Exchange, and for notes passing as currency see Banks and Banking, Bank-Note and Post.

NOTHOMB, JEAN BAPTISTE, Baron (1805-1881), Belgian statesman and diplomat, was born at Messancy in Luxemburg on the 3rd of July 1805. He was educated at the Athenaeum of Luxemburg and the university of Liege. He was in Luxemburg when the revolution of August broke out, but was nominated a member of the commission appointed to draw up the con- stitution. He was a member of the national congress, and became secretary-general of the ministry of foreign affairs under Surlet de Chokier. He supported the candidature of the duke of Nemours, and joined in the proposal to offer the crown to Prince Leopold of Saxe-Coburg, being one of the delegates sent to London. When the Eighteen Articles were replaced by the Twenty-four less favourable to Belgium, he insisted on the necessity of compliance, and in 1839 he faced violent opposition to support the territorial cessions in Limburg and Luxemburg, which had remained an open question so long as Holland refused to acknowledge the Twenty-four Articles. His Essai historique et politique sur la revolution beige (1838) won for him the praise of Palmerston and the cross of the Legion of Honour from Louis Philippe. In 1837 he became minister of public works, and to him was largely due the rapid development of the Belgian railway system, and the increase in the mining industry. In

1840 he was sent as Belgian envoy to the Germanic confederation, and in 1841, on the fall of the Lebeau ministry, he organized the new cabinet, reserving for himself the portfolio of minister of the interior. In 1845 he was defeated, and retired from parlia- mentary life, but he held a number of diplomatic appointments before his death at Berlin on the 6th of September 1881. See T. Juste, Souvenirs du baron Nothomb (Brussels, 1882). NOTICE, a term primarily meaning knowledge (Lat. notitia), as in ” judicial notice “; thence it comes to signify the means of bringing to knowledge, as in “notice to quit “; at last it may be used even for the actual writing by which notice is given. The most important legal uses of the word are judicial notice and the equitable doctrine of notice. Judicial notice is the recognition by courts of justice of certain facts or events without proof. Thus in England the courts take judicial notice of the existence of states and sovereigns recognized by the sovereign of England, of the dates of the calendar, the date and place of the sittings of the legislature, &c. The equitable doctrine of notice is that a person who purchases an estate, although for valuable consideration, after notice of a prior equitable right, will not be enabled by getting in the legal estate to defeat that right. On the other hand, a purchaser for valuable consideration without notice of an adverse title is as a rule protected in his enjoyment of the property. Other common uses of the word are notice to quit, t’.e. a notice required to be given by landlord to tenant, or by tenant to landlord in order to terminate a tenancy

(see Landlord and Tenant) ; notice of dishonour, i.e. a notice that a. bill of exchange has been dishonoured; notice of action, i.e. a notice to a person of an action intended to be brought against him, which is required by statute to be given in certain cases; notice of trial, i.e. the notice given by a plaintiff to a defendant that he intends to bring on the cause for trial; notice in lieu of personal service of a writ, i.e. by advertisement or otherwise; notice given by one party in an action to the other, at a trial, to produce certain documents in his possession or power; notice to treat, given under the Land Clauses Acts by public bodies having compulsory powers of purchasing land as a preliminary step to putting their powers in force. Notice may be either express or constructive. The latter is where knowledge of a fact is presumed from the circumstances of the case, e.g. notice to a solicitor is usually constructive notice to the client. Notice in some cases may be either oral or written. It is usually advisable to give written notice even where oral evidence is sufficient in law, as in the case of notice to

quit. The American use of notice is practically the same as in England.

NOTKER, a name of frequent occurrence in the ecclesiastical history of the middle ages. Notker Balbulus (c. 840-912) was a native of northern Switzerland, and for many years magisler in the school of St Gall. He compiled a martyrology and other works, but is famous for his services to church music and for the ” sequences ” of which he was the composer. He was canonized in 1 513. His life is in the Bollandist Acta Sanctorum, April 6th. Notker Labeo (d. June 29th, 1022) was also an instructor at St Gall. His numerous translations, including those of the Old Testament Psalms, the categories of Aristotle, the De nuptiis Mercurii et Philologiae of Martianus Capella, and the De consolatione of Boethius, into Old High German, may possibly have been the work of his pupils. They possess con- siderable philological interest, and have been edited by E. G. Graff (Berlin, 1837-1847), and by P. Piper under the title Notkers und seiner Schule Schriften (1 883-1 884).

See J. Kelle, Die Sankt Galler deutschen Schriften und Notker Labeo (Munich, 1888); G. Meyer von Knonau, ” Lebensbild des heiligen Notker,” in Mitteil. Anliq. Gesellschaft Zurich (1877).

NOTO, a city of Sicily, in the province of Syracuse, and 20 m. S.W. of it by rail, 520 ft. above sea-level. Pop. (1901) 22,564. The present town, rebuilt after the earthquake of 1693, has some fine buildings of the early 18th century. The older town lies 5 m. direct to the north (1378 ft.). It was the ancient Nelum, a city of Sicel origin, left to Hiero II. by the Romans by the treaty of 263 b.c. and mentioned by Cicero as a foederata civilas (Verr. v. 51, 133), and by Pliny as Latinae conditionis (H.N. iii. 8. 14). The remains of this city are almost .entirely hidden beneath the ruins of the medieval town, except three chambers cut in the rock, one of which is shown, by an inscription in the library at Noto, to have belonged to the gymnasium, while the other two were heroa, or shrines of heroes. But explora- tions have brought to light four cemeteries of the third Sicel period, and one of the Greek period, of the 3rd and 2nd centuries b.c. There are also catacombs of the Christian period and some Byzantine tombs. See P. Orsi in Notizie degli scavi, 1897, 69-90. Four miles to the S. of Noto, on the left bank of the Tellaro (Helorus) (E. Pais, Alakta, Pisa, 1891, p. 75 seq.) stands a stone column about 35 ft. in height, which is believed to be a memorial of the surrender of Nicias. This is uncertain; but, in any case, in the 3rd century b.c. a tomb was excavated in the rectangular area which surrounds it, destroying apparently a pre-existing tomb. The later burial belongs to the necropolis of the small town of Heloron, 750 yds. to the S.E., some remains of which have

been discovered. It was a small advanced post of Syracuse, belonging probably to the 6th century B.C. See P. Orsi in Notizie degli scavi, 1899, 241.

NOTT, ELIPHALET (1773-1866), American divine, was born on the 25th of June 1773 at Ashford, Connecticut. He was left an orphan without resources, but graduated in 1795 at Brown University. In 1804 he became president of Union College, Schenectady, New York, a position which he held till his death on the 29th of January 1866. He found the college

financially embarrassed, but succeeded in placing it on a sound footing. He was known also as the inventor of the first stove for anthracite coal. His publications include sermons, Counsels to Young Men (1810), and Lectures on Temperance (1847).

Life by C. van Santvoord (ed. Tayler Lewis, 1876).

NOTT, SIR WILLIAM (1782-1845), English general, was the second son of Charles Nott, a Herefordshire farmer, who in 1794 became an innkeeper at Carmarthen. William Nott was indifferently educated, but he succeeded in obtaining a cadet- ship in the Indian army and proceeded to India in 1800. In 1825 he was promoted to the command of his regiment of native infantry; and in 1838, on- the outbreak of the first Afghan war, he was appointed to the command of a brigade. From April to October 1839 he was in command of the troops left at Quetta, where he rendered valuable service. In November 1840 he captured Khelat, and in the following year compelled Akbar Khan and other tribal chiefs to submit to the British. On receiving the news of the rising of the Afghans at Kabul in November 1841, Nott took energetic measures. On the 23rd of December the British envoy, Sir William Hay Macnaghten, was murdered at Kabul; and in February 1842 the weak and incompetent commander-in-chief, General Elphinstone, sent orders that Kandahar was to be evacuated. Nott at once decided to disobey, on the supposition that Elphinstone was not a free agent at Kabul ; and as soon as he heard the news of the massacre in the Khyber Pass, he urged the government at Calcutta to maintain the garrison of Kandahar with a view to avenging the massacre and the murder of Macnaghten. In March he inflicted a severe defeat on the enemy near Kandahar, and in May drove them with heavy loss out of the Baba Wali Pass. In July he received orders from Lord Ellenborough, the governor- general of India, to evacuate Afghanistan, with permission to retire by Kabul. Nott. arranged with Sir George Pollock, now commander-in-chief, to join him at Kabul. On the 30th of August he

routed the Afghans at Ghazni, and on the 6th of September occupied the fortress, from which he carried away, by the governor-general's express instructions, the gates of the temple of Somnath; on the 17th he joined Pollock at Kabul. The combined army recrossed the Sutlej in December. Nott's services were most warmly commended; he was immediately appointed resident at Lucknow, was presented with a sword of honour, and was made a G.C.B. In 1843 he returned to England, where the directors of the East India Company voted him a pension of £1000 per annum. He died at Carmarthen on the 1st of January 1845.

See Memoirs and Correspondence of Sir William Nott, edited by J. H. Stocqueler (2 vols., London, 1854); Charles R. Low, The Afghan War 1838-1842 (London, 1879), and Life and Correspondence of Sir George Pollock (London, 1873); Sir J. W. Kaye, History of the War in Afghanistan (2 vols., London, 1851).

NOTTINGHAM, EARLS OF.. The English title of earl of Nottingham has been held by different families, notably by the Mowbrays (1377 to 1475; merged in the Norfolk title from 1397), the Howards (1596-1681), and the Finches (1681; since 1729 united with that of Winchilsea). For the Howard line see the separate article below. Here only the ancestors of the Finch line are dealt with.

Heneage Finch (1621-1682), first earl of Nottingham in the Finch line, lord chancellor of England, was descended from an old family (see Finch, Finch-Hatton), many of whose members had attained to high legal eminence, and was the eldest son of Sir Heneage Finch, recorder of London, by his first wife Frances, daughter of Sir Edmund Bell of Beaupre Hall, Norfolk. In the register of Oxford university he is entered as born in Kent on the 23rd of December 162 1, and probably his native place was East well in that county. He was educated at Westminster and at Christ Church, Oxford, where he remained till he became a member of the Inner Temple in 1638. He was called to the bar in 1645, and soon obtained a lucrative practice. He was a member of the convention parliament of April 1660, and shortly afterwards was appointed solicitor-general, being created a baronet the day after he was knighted. In May of the following year he was chosen to represent the university oi

Oxford, and in 1665 the university created him a D.C.L. In 1670 he

became attorney-general, and in 1675 lord chancellor. He was created Baron Finch in 1674, and earl of Nottingham in May 1681. He died in Great Queen Street, London, on the 18th of December 1682, and was buried in the church of Raven- stone in Bucks.

His contemporaries of both sides of politics agree in their high estimate of his integrity, moderation and eloquence, while his abilities as a lawyer are sufficiently attested by the fact that he is still spoken of as ” the father of equity.” His most important contri- bution to the statute book is ” The Statute of Frauds.” While attorney-general he superintended the edition of Sir Henry Hobart’s Reports (1671). He also published Several Speeches and Discourses in the Tryal of the Judges of King Charles I. (1660) ; Speeches to both Houses of Parliament (1679) ; Speech at the Sentence of Viscount Stafford (1680). He left Chancery Reports in MS., and notes on Coke’s Institutes.

Daniel Finch (1647-1730), second earl, son of the preceding, entered parliament for Lichfield in 1679. He was one of the privy councillors who in 1685 signed the order for the proclamation of the duke of York, but during the whole of the reign of James II. he kept away from the court. At the last moment he hesitated to join in the invitation to William of Orange, and after the abdication of James II. he was the leader of the party who were in favour of a regency. He declined the office of lord chancellor under William and Mary, but accepted that of secretary of state, retaining it till December 1693. Under Anne he in 1702 again accepted the same office in the ministry of Godolphin, but finally retired in 1704. On the accession of George I. he was made president of the council, but in 1716 he finally withdrew from office. He succeeded to the earldom of Winchilsea (with which the Nottingham title now became united) on the pth of September 1729, and died on the 1st of January 1730.

NOTTINGHAM, CHARLES HOWARD, ist Earl or 1 (1536- . 1624), English lord high admiral (also known as 2nd Lord Howard of Effingham), was the eldest son of William, ist Baron Howard of Effingham, lord high admiral, by his wife, Margaret, daughter of Sir Thomas Gamage of Co.ity in Glamorganshire, and was born in 1536. He was nearly connected with Queen Eliza- beth, his father’s sister, Elizabeth Howard, being mother of Anne Boleyn. During Mary’s reign he is said to have served at sea with his father, and on the accession of Elizabeth his kinship, together with his good looks and abilities, secured his early advancement. In 1559 he was sent as ambassador to France to congratulate Francis II. on his accession, and in 1569 was general of the horse under the earl of Warwick for suppressing the

Roman Catholic rebellion in the north. The next year he commanded a squadron of ships to watch the Spanish fleet which came to conduct the queen of Spain from Flanders, on which occasion ” His lordship, accompanied with 10 ships only of Her Majestie’s Navy Royal, environed their Fleet in a most strange and warlike sort, enforced them to stoop gallant and to vail their bonnets for the queen of England.” 2 In the parlia- ments of 1563 and 1572 he represented Surrey, and succeeded to his father’s title on the 29th of January 1573. He was installed a knight of the Garter on the 24th of April 1574, and made lord chamberlain of the household, an appointment which he retained till May 1585, when he became lord high admiral of England. He also filled the offices of lord lieutenant of Surrey and high steward of Kingston-upon-Thames. He . was one of the commissioners at the trial of the conspirators in the Babington Plot and of Mary, queen of Scots, in 1586, and, accord- ing to Davison, Elizabeth’s secretary of state, it was owing chiefly to his persuasion and influence that Elizabeth signed the death-warrant. 3

In December 1587 he hoisted his flag on the “Ark.” His letters at this time reflect vividly his sense of the impending danger. ” For the love of Jesus Christ, Madam,” he writes to Elizabeth, ” awake thoroughly and see the villainous treasons round about you, against your Majesty and your realm, and

1 i.e. In the Howard line ; see above.

2 Fuller’s Worthies, ii. 361.

3 Nicolas’s Life of Davison, pp. 232, 258. 281.

draw your forces round about you like a mighty prince to defend you. Truly, Madam, if you do so, there is no cause for fear.” * On the approach of the Armada on the 6th of July 1588, Howard describes thus the disposal of his forces: “I have divided myself here into three parts, and yet we lie within sight of one another, so as if any of us do discover the Spanish fleet we give notice thereof presently the one to the other and thereupon repair and assemble together. I myself do lie in the middle of the channel with the greatest force. Sir Francis Drake hath 20 ships and 4 or 5 pinnaces which lie beyond Ushant and Mr Hawkins with as many more lieth towards Scilly.” 5 He directed the various engagements (see Armada), and stayed himself to conduct the attack on the ” San Lorenzo,” stranded off Calais, arriving in consequence at the great fight off Gravelines some time after the engagement had begun. His tactics have been criticized both by contemporary and by later authorities, but his position was a perilous

one, opposed to an overwhelming force of the enemy, and rendered still more difficult by the queen's untimely economy, Howard himself contributing largely to the naval expenses and to the relief of the numerous seamen poisoned by bad food and landed at Margate. " It were too pitiful to have men starve after such a service." 6 Instead of risking all in a pitched battle with the enemy, a course which probably appealed more to his dashing subordinates, he resolved to pursue the less heroic method of " plucking their feathers little by little " ; 7 and his prudence, while justified by the extraordinary results, was also greatly praised by so good a judge as Raleigh. Shortly afterwards, under Howard's directions, a " Relation of Proceedings " was drawn up (now printed in the Navy Records Society Publications, i. 1-18).

In 1596 Howard and Essex commanded the expedition against Cadiz, when a squadron of the enemy's ships was destroyed and two of the number brought home. Howard's intention was to limit the expedition entirely to naval operations, but Essex insisted on landing, and Howard, who had been specially charged by Elizabeth to protect her favourite, 8 was obliged to follow in his support. The town was sacked and the forts destroyed; the naval prizes, however, but for this diversion would have been more numerous. The council of war then refusing to countenance any further attempts on land, Howard and Essex returned with the expedition to England. On the 22nd of October 1596 Howard was created earl of Nottingham.

In February 1598, on a scare of an intended invasion, he was ordered to take measures for the defence of the country, and again in 1599, when he was appointed "Lord Lieut.general of all England," and exercised full authority both over the army and the navy. He took a leading part in suppressing the rebellion of Essex, and served as a commissioner on his trial in February 1601. In December 1602 he entertained Elizabeth at Arundel House, but made no attempt to rival the gorgeous and expensive entertainments given to the queen by some of his contemporaries. Elizabeth's favour, in his case, required no courting by such methods, and it was to Nottingham that she named James as her successor on her deathbed. He continued to hold his office as lord high admiral under the new king, and in 1605 was despatched as ambassador to Spain, where his great reputation, together with his amiable character, perfect temper and unfailing courtesy, secured the successful negotiation of peace. He served on numerous commissions, including those on the union of the two kingdoms in 1604, for the trial of the conspirators of the Gunpowder Plot and of Henry Garnett in 1606, and for reviewing the articles and rules of the order of the Garter in 1618, and he attended Princess

Elizabeth on her marriage to the elector palatine with a squadron to Flushing in 1613. Nottingham, who, unlike many of the Howards, was

4 Navy Records Society: Papers Relating to the Spanish Armada, June 23rd, i. 225.

6 Howard to Walsingham, July 6. lb. i. 245.

6 lb. ii. 183.

7 lb. i. 341 and Cal. of State P. Dont. 1581-1590, p. 516.

8 See H.'s letter to Essex on this subject, Hist. MSS. Comm. Marquess of Salisbury' a MSS. vi. 239.

a staunch Protestant, 1 was commi<-3ioner in Surrey for inquiring after recusants, 2 and in the di><.ese of Winchester for hearing ecclesiastical causes; he sat on the government commission for discovering and expelling Roman Catholic priests, and was mentioned in 1602 from Douay as one of the three enemies most feared by the recusants. 3

On the report of the commission on the navy in 161 8 and of the abuses then exposed, Lord Nottingham, though no blame was attached to himself, being now an old man over eighty years of age, vacated his office of lord high admiral, receiving the sum of £3000 with a pension of £1000, and being granted a special precedence, limited to his person, as earl of Nottingham of the earUer Mowbray creation, and still keeping the lord-lieutenancy of Surrey. He died at Haling House, near Croydon, on the 14th of December 1614, and was buried at Reigate, a monument being afterwards placed to his memory in St Margaret's church at Westminster. He was a striking and almost heroic figure in the Elizabethan annals, no unworthy leader of such men as Drake, Hawkins and Raleigh, the defender of his country at a time of imminent peril, and by his splendid character and services he was placed beyond the reach of the intrigues and jealousies which troubled the reputation of many of his con- temporaries and above even the suspicion of ill-doing.

Lord Nottingham married (1), in July 1 563, Catherine,daughter of Henry Carey, 1st Lord Hunsdon, cousin to the queen, by whom he had, besides three daughters, two sons — William, who died in his

father's lifetime, and Charles (1 579-1642), who succeeded as second earl of Nottingham; and (2), when in his 68th year, Margaret, daughter of James Stuart, earl of Murray, by whom he had two sons, the youngest of whom, on the death of his half-brother without male issue, succeeded as third earl of Nottingham; on his dying childless in April 1681 the earldom became extinct, the barony of Effingham passing to the descendants of the first earl of Nottingham's younger brother, Sir William Howard, from whom the fourth earl of Effingham (creation of 1837) and 14th baron Howard of Effingham (b. 1866), who succeeded in 1898, was descended.

NOTTINGHAM, a city and county of a city, municipal, county and parliamentary borough, and county town of Nottingham- shire, England. Pop. (1901) 239,743. It stands on the left (north) bank of the Trent and its tributary the Leen. It is 125 m. N.N.W. from London by the Midland railway, and is also served by the Great Central and Great Northern railways. Water communications are afforded by the Grantham canal eastward, by the Nottingham and Erewash canals westward, com- municating with the Cromford canal in Derbyshire, and by the Trent. The plan of the town is irregular, and the main thorough- fares are generally modern in appearance, many of the old narrow streets having been wholly altered or renewed. About the centre of the town is an open market-place some 5j acres in area, said to be the largest of its kind in England. Nottingham Castle occupies a fine site to the S., on an abrupt rocky hill. The ancient remains are not large, including only a restored Norman gateway and fragments of the fortifications. In 1878 the site was acquired on lease by the corporation, and the building was opened as the Nottingham and Midland Counties Art Museum. The church of St Mary is a fine Perpendicular cruciform structure, with a central tower. St Peter's church is mainly Perpendicular, but shows traces of an earlier building. St Nicholas' church, near the castle, is a plain building of brick dating from 1676. There are several handsome modern churches, among which is the Roman Catholic cathedral of St Barnabas, from the designs of A. W. Pugin, erected in 1842-1844. There are a large number of Nonconformist places of worship. The principal secular buildings are the guildhall and city sessions court (1887), the shire hall, the Albert Hall and the Exchange; there are two principal theatres, the Theatre Royal and the Empire Theatre. Among educational establishments the principal is University College, for which a fine range of buildings was opened in 1881,

1 See esp. his letter to Walsingham, Naval Record Soc. Pub. i. 65. 1 Hist. MSS. Comm. Marquess of Salisbury's MSS. iv. 203. ' Col. St Pap. Dom. 1601-1603, p. 181.

containing the free municipal library and the museum of natural history. The free grammar school, founded in 1513, for some time in disuse, was revived in 1807, and on its removal in 1868 to new buildings, became known as the High School. There are also the Nottingham High School for girls; the blue-coat school, founded in 1723; the People's College, founded in 1846; two technical schools; the Congregational Institute; and the Nottingham school of art, for which a fine building was erected in 1865 in the Italian style. The Midland Baptist college was transferred from Chilwell to Nottingham in 1882.

The General Hospital was founded in 1781, and there are the Nottingham and Midland eye infirmary, the county asylum and the Midland institution for the blind. The Arboretum and the Forest are the principal public pleasure-grounds; the county cricket club plays matches on the Trent Bridge ground, and there is a racecourse at Colwick, E. of the city. To the N.W., but within the city boundaries, are the industrial districts of Radford and Basford, beyond which lies Bulwell, with collieries, limestone quarries and earthenware manufactures. Bestwood Park, in the vicinity, contained a hunting lodge of Henry I., being included in Sherwood Forest. To the N., Sherwood is a growing resi- dential district; another extends towards Gedling on the E. Southward, across the Trent, West Bridgford is another large residential suburb. To the W. is Lenton, and Beeston has become a populous suburb mainly owing to the establishment of large cycle and motor works.

Nottingham itself became an important seat of the stocking trade towards the close of the 18th century. It was here that Richard Arkwright in 1769 erected his first spinning frame, and here also James Hargreaves had the year previously removed with his spinning jenny after his machine had been destroyed by a mob at Blackburn. Nottingham has devoted itself chiefly to cotton, silk and merino hosiery. Up to 181 5 point lace was also an important manufacture. In 1808 and 1809 John Heathcoat obtained patents for machines for making bobbin net, which inaugurated a new era in the lace manufacture. The industries also include bleaching, the dyeing, spinning and twisting of silk, the spinning of cotton and woollen yarn, tanning, engineering and brewing, while cycle works and tobacco factories are important, and the industries have the advantage of the close proximity of coal-mines. Besides the general market there is a large cattle market.

Nottingham received its style of a city and county of a city by letters patent of the 7th of August 1897. The parliamentary borough returns

three members to parliament, beirig divided into W., E. and S. divisions. The city is governed by a mayor, 16 aldermen and 48 councillors. Area, 10,935 acres.

History. — The advantageous position of Nottingham (Snoten- gaham, Nolingeham) on the Trent, where it was crossed by an ancient highway, accounts for its origin, whether in Roman or Saxon times. The Saxon form of the name is taken to refer to the caves, anciently used as dwelling-places, which were hollowed out of the soft sandstone. Examples of these occur in the Castle rock, in the Rock Holes W. of the castle, in the suburb of Sneinton and elsewhere. It was chosen by the Danes for their winter quarters in 868, and constituted one of their five burghs. In 922 it was secured and fortified by Edward the Elder, who in 924 built a second ” burgh ” opposite the first and connected with it by a bridge over the river. Ethelstan, the successor of Edward the Elder, established there a royal mint. In 1013 the town submitted to Sweyn. William I. erected a castle, and mention of a new borough occurs in Domesday Book, and this seems to be the first evidence of the existence of the ” French borough ” which grew up in Nottingham under the Normans, and was distinguished from the English borough by the different customs which prevailed in it. Parliaments were held at Nottingham in 1334, 1337 and 1357, and it was the scene of the conference of the judges with Richard II. in August 1387. Several important persons have been imprisoned in the castle, among others David II. of Scotland. Edward IV. assembled his troops at Nottingham in 1 461; and it was the headquarters of Richard III. before the battle of Bosworth in 1485 In 1642 Charles I. finally broke with

the Parliament by setting up his standard at Nottingham, and during the ensuing Civil War the castle was held by each of the two parties more than once. In 1644 it was dismantled by Cromwell’s orders.

Henry II. granted the first extant charter, which confirmed to the burgesses the liberties they had under Henry I., referred to a market on Saturdays, and forbade the working of dyed cloth, except in Nottingham, within ten leagues of the borough. This was confirmed by John, who also granted a gild-merchant. Henry III. allowed the burgesses to hold the town in fee-farm, and Edward I. granted them a mayor and two bailiffs, one to be chosen from each borough. Henry VI. confirmed all preceding privileges, first incorporated the mayor and burgesses, and granted that the town, except the castle and the gaol, should be a county of itself. Two sheriffs were to replace the two bailiffs. This charter remained, except for temporary surrenders under Charles II. and James II., the governing charter of the corpora- tion until the Municipal Act of 1835. Nottingham returned two members to

parliament from 1295 until 1885, when the number was increased to three. Edward I. granted an eight- days' fair in September and a fifteen-days' fair in November, the last altered by Richard II. to a five-days' fair in February. Two other fairs were granted by Anne; one large fair, Goose Fair, is still held. This begins on the first Thursday in October and lasts three days. The markets on Wednesdays and Saturdays are held by prescriptive right. Besides the Reform riots of 1831, Nottingham witnessed in 181 1 the Luddite disturbances. In 1870 Nottingham was made the seat of a suffragan bishop of the diocese of Lincoln, but as it is now in the diocese of Southwell there is no suffragan bishopric.

NOTTINGHAMSHIRE, or Notts, an inland county of England, bounded N.W. by Yorkshire, W. by Derbyshire, S. by Leicester- shire and E. and N.E. by Lincolnshire. The area is 843-4 sc l- m – The N. is included in the great plain of York, and in the extreme N. there is some extent of marshes. The valley of the lower Trent and that of the Idle are also very flat. In the S.W. between Nottingham and Warsop, the undulations swell into considerable elevations, reaching near Mansfield a height over 600 ft. This district includes the ancient Sherwood Forest (q.v.). Some portions of it are still retained in their original condition, and there are many very old oaks, especially in the portion known as the Dukeries {q.v.). The county generally is finely wooded, although to the E. of the valley of the Soar there is a considerable stretch of wolds. The principal rivers are the Trent, the Erewash, the Soar and the Idle. The Trent, which enters the county near Thrumpton in the S.W., where it receives the Erewash from the N. and the Soar from the S., flows N.E. past Nottingham and Newark, where it takes a more northerly direction, forming the N. part of the E. boundary of the county till it reaches the Isle of Axholm (Lincolnshire) . The Soar forms for a short distance the boundary with Leicestershire, and the Erewash the boundary with Derbyshire. The Idle, which is formed of several streams in Sherwood Forest, flows N. to Bawtry, and then turns E. to the Trent.

Geology. — All formations, from Lower and Middle Coal Measures, overlain unconformably by Permian, to Lower Lias, crop out successively eastward across the county, with a general but slight dip away from the Pennine uplift. The strike of the Carboniferous rocks veers from S. to E. in the S. ; that of younger formations bends to S.W. The Coal Measures, about 3000 ft. thick, continue the Derby- shire Coalfield. A boring at Ruddington proved the lowest measures, underlain by Millstone Grit. The remaining Lower and Middle Measures below the important Top Hard Coal, with the Kilburn, Main, Deep Hard and Soft Coals, crop out in the south and along the

Erewash Valley; higher strata farther N. All these consist of shale, clay and little sandstone. They contain Carbonicola acuta, C. robusta, Neuropteris heterophylla, Aletkopteris and Lepidodendron, showing essentially non-marine conditions. But several thin marine beds occur. The highest measures, divisible into red Etruria Marls, Newcastle Sandstones and a red sandy Keele series have been proved underground in eastward succession. A thin basal breccia, a sandy and marly group, the Magnesian Limestone with Produclus horridus and SchAzodus obscurus (granular dolomite typically, its upper part locally a dolomitic sandstone, the Mansfield building- stone), red gypsiferous Middle Marls, an Upper Limestone, and Upper Red Marls, collectively 550 ft. thick in the north of. Notting-

hamshire, terminate a Permian outcrop continuous from Durham, but dying out at Nottingham. Only the lowest divisions persist so far. The more extensive Trias overlaps southward on to the Carbon- iferous. Its lower sandstones (Bunter, 600 ft. thick, consisting of Lower Red Sandstone with breccias, and Pebble Beds; Keuper Waterstones, 200 ft. in the east, mainly brown sandstones, con- glomeratic at the base and containing the fish Semionotus) form an undulating wooded district. Higher red and pale green Keuper Marl (700 ft.), with subordinate sandstones and gypsum, makes a low agricultural tract on the E., traversed longitudinally by the Trent. Black Rhaetic shales succeed with Plena (Avicula) contorta, Proto- cardium rhaelicum and bone-beds, below light-coloured marls and limestones (" White Lias "). Lower Lias, almost up to the Semi- costatus zone, crops out within the county. The basal Planorbis zone contains argillaceous limestones, worked for hydraulic cement at Barnston, and saurian remains. Of two types of Glacial boulder- clay, mainly confined to the Triassic and Jurassic clays on the E. and S.E., one containing Carboniferous and some extraneous boulders probably came with the Pennine ice from the N.W. The other, uppermost where both occur, and full of chalk and flint, belongs to the Chalky Boulder Clay of the North Sea ice. Glacial gravels cap- the higher ground of the Triassic sandstones. Church Hole, one of the Magnesian Limestone caves of Creswell Crags, yielded remains of cave-lion, bear, mammoth, rhinoceros, &c. Older river-gravels flank the pasture land of the Trent alluvium.

Climate and Agriculture. — As the higher regions of Derbyshire and Yorkshire attract the rain clouds, the climate of Nottinghamshire is above the average in dryness; thus, the mean annual rainfall at Bawtry is 23-57 in. and at Nottingham 26-83 in. On this account crops ripen nearly as early as in the S. counties. The soil of about one-half the county is gravel and sand, including Sherwood Forest, where it inclines to sterility, and the valley of the Trent, where there is a rich

vegetable mould on a stratum of sand or gravel. The land along the banks of the Trent is equally suitable for crops and pasture. The farms generally are of moderate size, the great majority being under 300 acres. Most of the immediate occupants are tenants-at- will. Roughly four-fifths of the total area is under cultivation. Apples and pears are grown in considerable quantities, but there are not many orchards of large size. Shorthorns are the favourite breed of cattle, and dairy farming is considerably prosecuted. The old forest breed of sheep is almost extinct, Leicesters and various crosses being common.

Industries. — -Coal is mined chiefly on the S.W. border of the county near Nottingham and near Mansfield; there are also mines near Worksop. Clay, sandstone and limestone are also extensively raised. The lace and hosiery industries are of old establishment in the county, Nottingham being the principal centre. There are silk, worsted and cotton mills. A large number of hands are employed in machinery works, and the cycle and motor manufacture of Beeston is important. The manufacture of tobacco arid cigars is considerable at Nottingham and Hucknall Torkard.

Communications. — The main line of the Midland railway touches the S.W. border of the county, with an alternative route through Nottingham, and branches thence N. through Hucknall and Mansfield to Worksop, to Newark and Lincoln, from Mansfield to Southwell and Newark, &c. The main line of the Great Central railway serves Nottingham and Hucknall. That of the Great Northern railway serves Newark and Retford, with a branch to Nottingham and local lines in that vicinity. A branch of the Great Central railway, formerly (till 1908) the main line of the Lancashire, Derbyshire and East Coast railway, enters the county on the W. from Chesterfield, and crosses the Dukeries by Ollerton to Dukeries Junction (G.N.R.) and Lincoln. The Sheffield-Grimsby line of the Great Central crosses the N. of the county by Worksop and Retford. The Trent is navig- able throughout the county, and the Idle between Bawtry and the Trent. The principal canals centre upon Nottingham.

Population and Administration. — The area of the ancient county is 539,756 acres, with a population in 1901 of 514,578. The area of the administrative county is 540,123. The county contains the city and county and municipal borough of Notting- ham (pop. 239,743), an< i the municipal boroughs of Retford or East Retford (12,340), Mansfield (21,445) an< l Newark (14,992). The urban districts are Arnold (8757), Beeston (8960), Carlton (10,041), Eastwood (4815), Hucknall Torkard (15,250), Hucknall under Huthwaite (4076), Kirkby in Ashfield (10,318), Mansfield Woodhouse (4877), Sutton in Ashfield

(14,862), Warsop (2132), West Bridgford (7018), Worksop (16,112). For parliamentary purposes the ancient county is divided into four divisions (Bassetlaw, Newark, Rushcliffe and Mansfield), each returning one member; and the parliamentary borough of Nottingham returns one member for each of its three divisions. There are one court of quarter sessions and seven petty sessional divisions. The boroughs of Newark and Nottingham have separate com- missions of the peace, also separate courts of quarter sessions;

that of East Retford has a separate commission of the peace. The total number of civil parishes is 266. The ancient county contains 231 ecclesiastical parishes and districts, wholly or in part; it is situated principally in the diocese of Southwell and partly in the diocese of York.

History. — The earliest Teutonic settlers in the district which is now Nottinghamshire were an Anglian tribe who, not later than the 5th century, advanced from Lincolnshire along the Fosseway, and, pushing their way up the Trent valley, settled in the fertile districts of the S. and E., the whole W. region from Nottingham to within a short distance of Southwell being then occupied by the vast forest of Sherwood. At the end of the 6th century Nottinghamshire already existed as organized territory, though its W. limit probably extended no farther than the Saxon relics discovered at Oxton and Tuxford. Nottingham after the treaty of Wedmore became one of the five Danish boroughs. On the break-up of Mercia under Hardicanute, Nottinghamshire was included in the earldom of the Middle English, but in 1049 it again became part of Leof ric's earldom of Mercia, and descended to Edwin and Morkere. The first mention of the shire of Notting- ham occurs in 1016, when it was harried by Canute. The boundaries have remained practically unaltered since the time of the Domesday Survey, and the eight Domesday wapentakes were unchanged in 1610; in 1719 they had been reduced to six, their present number, Oswaldbeck being absorbed in Bassetlaw, of which it forms the North Clay division, and " Side " in Thur- garton. Nottinghamshire was originally included in the diocese and province of York, and in 1201 formed an archdeaconry comprising the deaneries of Nottingham, Newark, Bingham and Retford. By act of parliament of 1836 the county was trans- ferred to the diocese of Lincoln and province of Canterbury, with the additional deanery of Southwell. In 1878 the deaneries of Mansfield, South Bingham, West

Bingham, Collingham, Tuxford and Worksop were created, and in 1884 most of the county was transferred to the newly-created diocese of Southwell, the deaneries being unchanged. The deaneries of Bawtry, Bulwell, Gedling, East Newark and Norwell were created in 1888. Until 1568 Nottinghamshire was united with Derbyshire under one sheriff, the courts and tourns being held at Nottingham until the reign of Henry III., when with the assizes for both counties they were removed to Derby. In the time of Edward I. the assizes were again held at Nottingham, where they are held at the present day. The Peverel Court, founded before 11 13 for the recovery of small debts, had jurisdiction over 127 towns in Nottinghamshire, and was held at Nottingham until 1321, in 1330 at Algarthorpe and in 1790 at Lenton, being finally abolished in 1849. The most interesting historic figure in the Domesday Survey of Nottinghamshire is William Peverel. His fief repre- sents the honour of Nottingham, and in 1068 he was appointed constable of the castle which William the Conqueror had raised at Nottingham. The Cliftons of Clifton and the Byrons of Newstead held lands in Nottinghamshire at the time of the Survey. Holme Pierrepoint belonged to the Pierrepoints from the time of Edward I.; Shelford was the seat of the Stanhopes, and Langer of the Tibetots, afterwards earls of Worcester. Archbishop Cranmer was a descendant of the Cranmers of Aslockton near Bingham.

The political history of Nottinghamshire centres round the town and castle of Nottingham, which was seized by Robert of Gloucester on behalf of Maud in 1140; captured by John in 1 1 91; surrendered to Henry III. by the rebellious barons in 1264; formed an important station of Edward III. in the Scottish wars; and in 1397 was the scene of a council where three of the lords appellant were appealed of treason. In the Wars of the Roses the county as a whole favoured the Yorkist cause, Notting- ham being one of the most useful stations of Edward IV. In the Civil War of the 17th century most of the nobility and gentry favoured the Royalist cause, but Nottingham Castle was garrisoned for the parliament, and in 1651 was ordered to be demolished.

Among the earliest industries of Nottinghamshire were the malting and woollen industries, which flourished in Norman

times. The latter declined in the 16th century, and was super- seded by the hosiery manufacture which sprang up after the invention of the stocking-loom in 1589. The earliest evidence of the working of the Nottinghamshire coalfield is in 1259, when Queen Eleanor was unable to remain in this county on account of the smoke of the sea-coal. Collieries are scarcely heard of in Nottinghamshire in the 17th

century, but in 1620 the justices of the peace for the shire report that there is no fear of scarcity of corn, as the counties which send up the Trent for coal bring corn in exchange, and in 1881 thirty-nine collieries were at work in the county. Hops were formerly extensively grown, and Worksop was famous for its liquorice. Numerous cotton-mills were erected in Nottinghamshire in the 18th century, and there were silk-mills at Nottingham. The manufacture of tambour lace existed in Nottinghamshire in the 18th century, and was facilitated in the 19th century by the manufacture of machine-made net. From 1295 the county and town of Notting- ham each returned two members to parliament. In 1572 East- Retford was represented by two members, and in 1672 Newark- upon-Trent also. Under the Reform Act of 1832 the county returned four members in two divisions. By the act of 1885 it returned four members in four divisions; Newark and East Retford were disfranchised, and Nottingham returned three members in three divisions.

Antiquities. — At the dissolution of the monasteries there were no fewer than forty religious houses in Nottinghamshire. The only important monastic remains, however, are those at New- stead, but the building is partly transformed into a mansion which was formerly the residence of Lord Byron (see Hucknall Torkard). There are also traces of monastic ruins at Beauvale, Mattersey, Radford and Thurgarton. The finest parish church in the county is that of Newark. The churches of St Mary, Nottingham, and of Southwell were collegiate churches; South- well, now a cathedral, is a splendid building, principally Norman. The churches of Balderton, Bawtry, Hoveringham, Mansfield and Worksop are also partly Norman, and those of Coddington, Hawton and Upton St Peter near Southwell, Early English. Of the old castles, the principal remains are those at Newark, but there are several interesting old mansions, as at Kingshaugh, Scrooby, Shelford and Southwell. Wollaton Hall, near Notting- ham, is a fine old building (c.1580). The finest residences of more modern date are Welbeck and others in the Dukeries (q.v.).

See Victoria County History, Nottinghamshire; R. Thoroton, The Antiquities of Nottinghamshire (Loud., 1677; republished with additions by J. Thoresby, 3 vols., Lond., 1797); Thomas Bailey, Annals of Nottinghamshire (4 vols., Lond., 1 852-1 856); J. P. Briscoe, Old Nottinghamshire (1881); J. Ward, Descriptive Catalogue of Books relating to Nottinghamshire (Nottingham, 1892).

N01JMEN0N (Gr. voov/xevov, a thing known, from vohv), a philosophical term put into currency by Kant and not much used except in definite reference to his doctrine. In the Kantian system the

term ” noumena ” means things-in-themselves as opposed to ” phenomena ” or things as they appear to us. According to Kant the human mind is such that it can never penetrate by its speculative powers to things-in-themselves, but can only know phenomena. Thus we have the odd position that noumena, or the contents of the intelligible world, are just the things to which thought can never penetrate. The term, however, is a relic of an early period of Kant’s mental develop- ment. In his fully mature or critical position he held that the noumenal world was inaccessible to the speculative reason, and yet that we are not altogether excluded from it, since the practical reason, i.e. our capacity for acting as moral agents, assures us of the existence of a noumenal world wherein freedom, God and immortality have a real place. The relation of noumena to phenomena in the Kantian system is a most difficult one; and, in view of the fact that the acutest intellects of Europe have been engaged vainly for more than a century in reconciling the various passages on the subject, the safest conclusion is that they are irreconcilable. The course adopted by Kant’s immediate successors in German idealism was to reject the whole conception of noumena, for the reason that what is essentially unknowable has no existence for our intelligence. Kant, however, protested

strongly against this development when it was propounded by Fichte, and held that he had precluded it by his ” refutation of idealism”: he stood unshakably to the belief in an absolutely real world behind phenomena. Kant’s position may be illogical as he himself stated it; but it is the expression of a sound principle: we must connect it with his general tendency to recognize the dynamic side of things. He saw, what so many of his successors failed to see, that the world as we know it is an expression of power; and he could not imagine whence the power could come if not from a world beyond phenomena. (See Kant; Phenomenon.) (H. St.)

NOVALICHES, MANUEL PA VIA Y LACY, ist Marquis de (1 814-1896), Spanish marshal, was born at Granada on the 6th of July 1814. He was the son of Colonel Pavia, and after a few years at the Jesuit school of Valencia he entered the Royal Artillery Academy at Segovia. In 1833 he became a lieutenant in the guards of Queen Isabella II., and during the Carlist War from 1833 to 1840 he became general of division in the latter year at the early age of twenty-six. The Moderate party made him war minister in 1847, and sent him to Catalonia,

where his efforts to put down a Carlist rising were not attended with success. He had been made a senator in 1845, and marquis in 1848. He was sent out to Manila in 1852 as captain-general of the Philippine Islands. In April 1854 he crushed with much sternness a formidable insurrection and carried out many useful reforms. On his return to Spain he married the countess of Santa Isabel, and commanded the reserves in the Peninsula during the war with Morocco. He refused the war portfolio twice offered him by Marshals O'Donnell and Narvaez and undertook to form a cabinet of Moderates in 1864 that lived but a few days. He volunteered to crush the insurrection in Madrid on the 22nd of June 1866, and when the revolution broke out in September 1868 accepted the command of Queen Isabella's troops. He was defeated by Marshal Serrano at the bridge of Alcolea on the 28th of September 1868, and was so badly wounded in the face that he was disfigured for life He kept apart during the revolution and went to meet King Alfonso when he landed at Valencia in January 1875. The Restoration made the marquis de Novaliches a senator, and the new king gave him the Golden Fleece. He died in Madrid on the 22nd of October 1896.

NOVALIS, the pseudonym of Friedrich Leopold, Freiherr von Hardenberg (1 772-1801), German poet and novelist. The name was taken, according to family records, from an ancestral estate. He was born on the 2nd of May 1772 on his father's estate at Oberwiederstedt in Prussian Saxony. His parents were members of the Moravian (Herrnhuter) sect, and the strict religious training of his youth is largely reflected in his literary works. From the gymnasium of Eisleben he passed, in 1790, as a student of philosophy, to the university of Jena, where he was befriended by Schiller. He next studied law at Leipzig, when he formed a friendship with Friedrich Schlegel, and finally at Wittenberg, where, in 1794, he took his degree. His father's cousin, the Prussian minister Hardenberg, now offered him a government post at Berlin; but the father feared the influence upon his son of the loose-living statesman, and sent him to learn the practical duties of his profession under the Kreisamtmann (district administrator) of Tennstedt near Langensalza. In the following year he was appointed auditor to the government saltworks in Weissenfels, of which his father was director. His grief at the death in 1797 of Sophie von Kiihn, to whom he had become betrothed in Tennstedt, found expression in the beautiful Hymr.eti an die Nacht (first published in the Athsndum, 1800). A few months later he entered the Mining Academy of Freiberg in Saxony to study geology under Professor Abraham Gottlob Werner (1 750-181 7), whom in the fragment Die Lehrlinge zu Sais he immortalized as the " Meister."

Here he again became engaged to be married, and the next two years were fruitful in poetical productions. In the autumn of 1799 he read at Jena to the admiring circle of young romantic poets his Geistliche Licder. Several of these, such as ” Wenn alle untreu werden,” ” Wenn ich ihn nur habe,” ” Unter tausend frohen Stunden,” still retain, as church hymns, great popularity. In 1800 he was

appointed Amtshauptmann (local magistrate) in Thuringia, and was preparing to marry and settle, when pulmonary consumption rapidly set in, of which he died at Weissenfels on the 25th of March 1801.

His works were issued in two volumes by his friends Ludwig Tieck and Friedrich Schlegel (2 vols. 1802; a third volume was added in 1846). They are for the most part fragments, of which Heinrich von Ofterdingen, an unfinished romance, is the chief. It was undertaken at the instance of Tieck, and reflects the ideas and tendencies of the older Romantic School, of which Hardenberg was a leading member. Heinrich von Ofterdingen’s search for the mysterious ” blue flower ” is an allegory of the poet’s life set in a romantic medieval world. Novalis, however, did not succeed in blending his mystic and philosophical concep- tions into a harmonious whole. The ” fragments ” contain idealistic though paradoxical views on philosophy, art, natural science, mathematics, &c.

There are editions of his collected works by C. Meisner and B. Wille (1898), by E. Heilborn (3 vols., 1901), and by J. Minor (3 vols., 1907). Heinrich von Ofterdingen was published separately by J. Schmidt in 1876. Novalis’s Correspondence was edited by J. M. Raich in 1880. See R. Haym, Die romantische Schule (Berlin, 1870) ; A. Schubart, Novalis’ Leben, Dichten und Denken (1887); C. Busse, Novalis’ Lyrik (1898); J. Bing, Friedrich von Hardenberg (Hamburg, 1899), E. Heilborn, Friedrich von Hardenberg (Berlin, 1901). Carlyle’s fine essay on Novalis (1829) is well known.

NOVARA, a town and episcopal see, of Piedmont, Italy, capital of the province of Novara, 31 m. by rail W. of Milan, 538 ft. above sea-level. Pop. (1906) 37,962 (town), 48,694 (commune). Railways diverge hence to Varallo Sesia, Orta, Arona (for Domodossola), Busto Arsizio, Milan, Vigevano and Vercelli. Previous to 1839 Novara was still surrounded by its old Spanish ramparts, but it is now an open, modern-looking town. Part of the old citadel is used as a prison. The cathedral dates from the 4th century (?), but (with the exception of the octagonal dome-roofed baptistery belonging to the first part of the 10th century, and separated from the west end by an atrium) was rebuilt between i860 and 1870 after designs by Antonelli; the church of S Gaudenzio, dedicated to Bishop Gaudentius (d. 417), who is buried under the high altar, rebuilt by Pellegrino Tibaldi about 1570, has a baroque campanile and a dome 396 ft. high, the latter added by Antonelli in 1875-1878; and San Pietro del Rosario is the church in which the papal anathema was pronounced against the followers of Fra Dolcino. The two first contain pictures by Gaudenzio Ferrari. The city also contains handsome market-buildings erected in 1817- 1842, a large hospital dating from the 9th century and a court- house constructed in 1346. The town has also a museum of Roman antiquities. The principal industry is the carding and spinning of silk; there are also iron- works and foundries, cotton mills, rice-husking mills, organ factories, dye-works and printing works.

Novara, the ancient Novaria, according to Pliny a place of Celtic origin, according to Cato (but wrongly) of Ligurian origin, was a municipal city, and lay on the road between Vercellae and Mediolanum. Its rectangular plan may well be a survival of Roman days. Dismantled in 386 by Maximus for siding with his rival Valentinian, it was restored by Theodosius; but it was afterwards ravaged by Radagaisus (405) and Attila (452). A dukedom of Novara was constituted by the Lombards, a countship by Charlemagne. In n 10 the city was taken and burned by the emperor Henry V. Before the close of the 12th century it accepted the protection of Milan, and thus passed into the hands, first, of the Visconti, and, secondly, of the Sforzas. In 1706 the city, which had long before been ceded by Maria Visconti to Amadeus VIII. of Savoy, was occupied by the Savoy troops. At the peace of Utrecht it passed to the house of Austria with the duchy of Milan; but, having been occupied by Charles Emmanuel in 1734, it was granted to him in the following year. Under the French it was the chief town of the department of Agogna. Restored to Savoy in 1814, it was in 1821 the scene of the defeat of the Piedmontese by the Austrians, and in 1849 of the more disastrous battle which led to the abdication of

Charles Albert and an Austrian occupation of the city. The painter Gaudenzio Ferrari was a native of Novara; and so was Peter Lombard. (T. As.)

NOVA SCOTIA, a province of the Dominion of Canada, lying between 43° 25′ and 47° N. and 59° 40′ and 66° 25′ W., and composed of the peninsula proper and the adjoining island of Cape Breton (q.v.), which is separated from the mainland by the Strait of Canso. The extreme length from S.W. to N.E. is 374 m. (N.S. 268, C.B. 108); breadth 60 to 100 m.; area 21,428 sq. m. The isthmus of Chignecto, n£ m. wide, connects it with the province of New Brunswick.

Physical Features. — Nova Scotia is intersected by chains of hills. The Cobequid Mountains, stretching from E. to W. and terminating in Cape Chignecto, form the chief ridge. Several of the elevations are as high as 1100 ft., and are cultivable almost to their summits. Lying on each side of this range are two extensive tracts of arable land. A ridge of precipices runs for 130 m. along the Bay of Fundy from Brier Island at the farthest extremity of Digby Neck and culminates in Capes Split and Blomidon. Here and there rocks, from 200 to 600 ft. in height and covered with stunted firs, overhang the coasts. Beyond them lies the garden of Nova Scotia, the valley of the Annapolis. The Atlantic coast from Cape Canso to Cape Sable is high and bold, containing many excellent harbours, of which Halifax (Chebucto Bay) is the chief. The N. shore is, as a rule, low, with hills some distance from the coast. Of its harbours the most important is Pictou. Of the inlets the most remarkable is Minas Basin, the eastern arm of the Bay of Fundy; it pene- trates some 60 m. inland, and terminates in Cobequid Bay, where the tides rise sometimes as high as 53 ft., while on the opposite coast, in Halifax Harbour, the spring tides scarcely exceed 7 or 8 ft. The height of the Fundy tides has, however, been often exaggerated, the average being 42-3 ft. Many islands occur along the coast, particularly on the S.E.; of these the most celebrated is Sable Island (q.v.). The rivers are, with few exceptions, navigable for coasting vessels for from 2 to 20 m. The principal are the Annapolis, Avon, Shubenacadie, the East, Middle and West rivers of Pictou, the Musquodoboit and the Lahave. The largest of the fresh-water lakes is Lake Rossignol, situated in Queen’s county, and more than 20 m. long. Ship Harbour Lake, 15 m. in length, and Grand Lake are in Halifax county.

Geology. — The Lower Cambrian formation forms an almost continuous belt along the Atlantic coast, varying in width from 10 to 75 m. and covering an area estimated at 8500 sq. m. It is interrupted by large masses of intrusive granite, extending from the extreme S.W. of the province as far as Halifax, and cropping out in detached areas as far as Cape Canso. This part of the province is rugged and sterile, and abounds in small lakes and peat bogs. Along the N.E. coast extends a Carboniferous area, including two large and pro- ductive coal-fields in Cumberland and Pictou counties, and continued in the coal-fields of Cape Breton. On the S. coast of the Bay of Fundy, and at Minas Basin and Channel, the Triassic Red Sandstone forma- tion predominates, more or less protected by a narrow rim of trap rock, culminating at its E. end in the basaltic promontory of Blomidon (Blow-me-down). The Cobequid Mountains are a mass of slates, quartzites and intrusive rocks (apparently Siluro-Cambrian). At the Joggins, near Cape Chignecto, occurs a splendid exposure, rich in curious minerals and fossils, and very celebrated among geologists.

Climate; Flora and Fauna. — The climate of Nova Scotia is more temperate than that of New Brunswick, and more equable than that of the inland provinces, though not so dry. Spring and winter begin about a fortnight later than in Ontario. Dense fogs often drift in from the Atlantic, but are not considered unhealthy.

Most of the principal birds of North America are to be found, and the game of the country includes moose, caribou, duck, teal, geese, woodcock, partridge, snipe, plover, &c. The game laws are strict and well enforced. The chief wild animals are bears, foxes and wild-cats. Wolves, once numerous, are now extinct. The natural flora does not differ greatly from that of the New England states. The sweet-smelling may-flower, or trailing arbutus (Epigaea repens), grows extensively, and has long been the provincial emblem.

Population. — The population increases slowly, having risen only from 440,572 in 1881 to 459,574 in 1901, an average of 21-8 to the square mile (total area, 2 1 .428 sq. m.) . The rural population is grouped along the river valleys, and the natural increase is normal, but there is a large emigration to the manufacturing

cities of the E. states and to the Canadian N.W. The great mass of the people are of British descent, but in parts of Cape Breton are found descendants of the early French settlers; in Lunenburg and the S.E. is a large German colony; near Halifax are a number of negroes from the West Indies, and scattered through the province are about 2000 Micmac Indians, who now confine themselves chiefly to the making of

bows and arrows, baskets and trinkets; though they carry on a certain amount of mixed farming. Few are of absolutely pure Indian blood. The settlers of English and Scotch descent are about equal in numbers, but the latter have been more prominent in the development of the province. The Irish are found chiefly in Halifax and in the mining towns of Cape Breton. Roman Catholics, Presbyterians and Baptists predominate, though the Church of England is strong in Halifax, and still retains a certain social prestige.

Administration. — The executive authority is in the hands of a lieutenant-governor appointed for five years by the federal government, and of a council appointed from and responsible to the local legislature. This consists of a lower house of assembly, and of a legislative council of twenty life members, which the assembly has frequently, but in vain, endeavoured to abolish. The municipal system was introduced subsequent to federation, and is modelled on that of Ontario.

The revenue is chiefly made up of the Dominion subsidy (see Ontario), and of royalties on mining concessions, chiefly those on coal. Owing to the great increase of mining in Cape Breton, its payments towards the revenue are larger in pro- portion than those of the mainland.

Education. — Primary education is free and compulsory; secondary education is also free but optional. In each county one high school is raised to the rank of an academy, free to all qualified students in the county, and receives an additional grant. Roman Catholics have not won the right of separate schools, as in Ontario, but in Halifax and other districts where that church is strong, a compromise has been arranged. Thus the two Roman Catholic colleges, St Francis Xavier (English) at Antigonish, and St Anne (French) at Church Point (Digby county), and most of the convents are in affiliation with the public school system. There are also many private schools, chiefly for girls, and under denominational control. But while primary and secondary education is widespread and of good quality, higher education has suffered from denominational bickerings, and the universities are still too many and too small. They are: King's College, Windsor (Anglican), founded in 1790; Acadia University, Wolfville (Baptist, 1839) ; St Francis Xavier, Antigonish (Roman Catholic, 1866) ; and Dalhousie University, Halifax (Undenomina- tional), established by charter in 1818, reorganized in 1863, the largest and the most efficient, possessing faculties of arts, science, medicine and law. The province supports a normal school and schools of agriculture and of horticulture at Truro, and has voted $100,000 for a College of Technology at Halifax.

Commerce and Manufactures. — Nova Scotia is naturally a sea-going province, and till about 1881 had the largest tonnage, in proportion to population, in the world. Since then, her shipping has greatly diminished, though Halifax is still one of the chief winter ports of the Dominion, and Sydney is also a favourite port of call for steamers in need of ” bunker ” coal. The water-power provided by the rivers supports many manufactures. Several sugar-refineries exist, and a large trade is carried on with Bermuda and the West India islands.

Fisheries. — The fisheries of Nova Scotia are the most important in Canada, and the value of their products ($7,841,602 in 1904) is about one-third that of the whole Dominion. Lobsters, cod and mackerel constitute the bulk of the catch. Many boats are also fitted out in Lunenburg, Digby, Yarmouth and other ports for the Grand Banks of Newfoundland. A bounty is paid by the Dominion government, and attempts are being made to introduce more scientific methods among the fishermen. The vessels are manned by over 25,000 men, and many more are employed in the lobster canneries and kindred industries. Trout and salmon abound in the inland lakes and streams.

Lumber. — Lumbering was long the chief industry of the province, and is still very important, though the percentage of forest left uncut is only about 30 %. The network of small lakes and rivers enables the logs to be brought to the mills with great ease, and little rough timber is now exported. The chief export is that of spruce deals, almost entirely from Halifax. The manufacture of wood-pulp for paper is also carried on.

Minerals.— Bituminous coal is mined in various parts of Cape Breton (q.v.) and in the counties of Cumberland and Pictou. The seams dip at a low angle, and are of great thickness, especially in Pictou county. The total product exceeds 5,000,000 tons, annually, more than two-thirds that of the whole Dominion. Of this over half is mined in the neighbourhood of Sydney, Cape Breton. Other

Sable Island

Longitude West62of Greenwich

Emery Walker sc.

important centres are Springhill, Acadia Mines, Stellarton and Glace Bay (C.B.). It is shipped as far west as Montreal, and to the New England states. Iron is largely produced, chiefly in the vicinity of the Cumberland and Pictou coal-fields. The deposits include magne- tite, red haematite, specular, limonite and carbonate ores. Blast furnaces are in operation, especially at New Glasgow, Sydney and North Sydney, though most of the ore used at Sydney is imported from Newfoundland. The quarries of easily worked limestone, the product of which is used as a ” flux ” in the blast furnaces, add to the value of the iron deposits. Gold occurs in workable quantities in the quartz all along the Atlantic coast, and several small but successful mining enterprises are in operation, yielding about $500,000 annually. Large deposits of gypsum occur, especially at Windsor in Hants county. Manganese and copper are also worked on a small scale.

Agriculture. — The attention paid to lumbering, fishingand shipping, and the subsequent emigration westwards have lessened the impor- tance of this industry. Mixed farming is however largely carried on, and of late years dairy farming has been greatly extended and im- proved, and much butter and cheese is exported to England. Both the Dominion and the provincial governments have endeavoured to introduce scientific methods. Nova Scotia ranks second to Ontario in its production of apples and peaches. The centre of this industry is the valley of the Annapolis, where, it is said, one ” may ride for fifty miles under apple-blossoms.” At the head of the Bay of Fundy and on Minas Basin the low-lying meadows produce splendid crops of hay. Owing to high Fundy tides, the air in the neighbourhood is constantly in motion, the result being a cool temperature, even in the height of summer, which is well fitted for stock-raising.

Roads and Railroads. — Road-making machines are employed for the improvement of the ordinary highways, and steel bridges are replacing the wooden structures; but the roads in the country districts still leave much to be desired. The Intercolonial railway, owned and worked by the Dominion government, is the chief means of communication with the other provinces, and for the carriage of local traffic. Besides the main line from Halifax to Amherst, a branch runs from Truro to Sydney, and another from Oxford Junction to Pictou and Stellarton. The Canadian Pacific railway has running rights over it

from St John (N.B.) to Halifax; on its completion, similar rights will be granted from Moncton to Halifax to the Grand Trunk Pacific. The Dominion Atlantic railway extends from Windsor Junction, near Halifax, to Yarmouth; the Nova Scotia

Central railway from Lunenburg to Middleton on the Dominion Atlantic railway. A line along the Atlantic coast connects Halifax and Yarmouth, whence a daily line of steamers sails for Boston. Other lines connect Halifax with a number of the S.W. coast and inland towns, and a line has been projected from New Glasgow to Guysborough and the coast. Several smaller lines are owned by the various coal-mining companies. Telegraph and telephone lines extend all over the province, and there are two cable stations — one at Canso and the other at Sydney. The Marconi Company has stations for wireless telegraphy at Halifax, Cape Sable, Sable Island and Glace Bay.

History. — Nova Scotia may well have been the Markland of early Norse and Icelandic voyages, and Cape Breton was visited by the Cabots in 1407-1498, but not till 1604 was any attempt at permanent colonization made by Europeans. In that year an expedition was headed by a Frenchman, Pierre de Guast, Sieur de Monts (1560-c. 1630), who had received from Henry IV. full powers to explore and take possession of all lands in North America lying between the 40th and 46th parallels of north latitude. De Monts and his friend de Poutrincourt (d. 1615), endeavoured to form settlements at Port Royal (now Annapolis), St Croix (in New Brunswick) and elsewhere, but quarrels broke out with the Jesuits, and in 1613 the English colonists of Virginia made a descent upon them, claimed the territory in right of the discovery by the Cabots, and expelled the greater part of the inhabitants. In 1621 Sir William Alexander obtained from James I. a grant of the whole peninsula, which was named in the patent, Nova Scotia, instead of Acadia, the old name given to the colony by the French. During the reign of Charles I. the still existing order of Baronets of Nova Scotia was instituted, and their patents ratified in parliament. The treaty of St Germain-en-Laye (1632) confirmed France in the possession of Acadia, Cape Breton and New France; but fierce feuds broke out among the French settlers, and in 1654 a force sent out by Cromwell took possession of the country, but by the treaty of Breda (1667) it was restored to France by Charles II. Continual

fighting went on between the French and the British colonists of New

England, the Indians taking part, usually on the side of the French; in 1710 the province was finally captured by Great Britain and ceded to her in 17 13 by the treaty of Utrecht, under the name of ” Acadia or Nova Scotia,” the French remaining masters of Cape Breton. Perpetual quarrels went on concerning the boundaries of the district ceded; the English claim comprised the present Nova Scotia, Prince Edward Island, most of New Brunswick and the Gaspe peninsula, while the French restricted it to the S. half of what is now Nova Scotia. In 1749 Halifax was founded as a counterpoise to Louisbourg in Cape Breton, and over 4000 colonists sent out, but the French opposed the new settlers. In 1755 about 6000 French were suddenly seized by Governor Charles Laurence (d. 1760) and hurried into exile. After undergoing many sufferings, some eventually found their way back, while others settled in Cape Breton, or in distant Louisiana. By the treaty of Paris in 1763, France resigned all claim to the country. In 1769 Prince Edward Island (formerly Isle St Jean) was made a separate government. Meanwhile, immigration from the New England colonies had filled the fertile meadows left vacant by the Acadians. A later influx oi American Loyalists led in 1784 to the erection of New BrunswicK. into a separate colony. In the same year, Cape Breton was also separated from Nova Scotia but reunited in 1820.

During the wars of the American and French revolutions Halifax grew apace. Hither, in June 1813, came the ” Shannon ” with her prize the ” Chesapeake,” captured off Boston harbour. Meanwhile, between 1784 and 1828, a large Scottish emigration, chiefly from the Highlands, had settled in the counties around Pictou, and the lumbering industry rose to great proportions. Agriculture was for some time neglected, but in 1818 the letters of ” Agricola ” (John Young, 1773-1837) gave it an impetus. Representative institutions had been granted as early as 1758, but power long rested mainly in the hands of a Council of Twelve, comprising the chief justice, the Anglican bishop and other high officials. In 1848, after a long struggle, responsible government was won by the legislative assembly, led by Joseph Howe.

In these political struggles, education was often the battle- ground, the fight ending in 1864 in the establishment of free primary and secondary schools by Dr (afterwards Sir Charles) Tupper, and the re-organization on an undenominational basis of Dalhousie University (see Halifax). In 1867 the province entered the new Dominion of Canada. For some years after- wards an agitation in favour of repeal was maintained, but gradually died away. Since then its history is a record of uneventful progress.

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NOVATIANUS, Roman presbyter, and one of the earliest antipopes, founder of the sect of the Novatiani or Novatians, was born about the beginning of the 3rd century. On the authority of Philostorgius (H.E. viii. 15) he has been called a native of Phrygia, but perhaps the historian merely intended to indicate the persistence of Novatianism in Phrygia at the time when he wrote. Little is known of his life, and that only from his opponents. His conversion is said to have taken place after an intense mental struggle; he was baptized by sprinkling, and without episcopal confirmation, when in hourly expectation of death; and on his recovery his Christianity retained all the gloomy character of its earliest stages. He was ordained at Rome by Fabian, or perhaps by an earlier bishop; and during the Decian persecution he maintained the view which excluded from ecclesiastical communion all those (lapsi) who after baptism had sacrificed to idols — a view which had frequently found expression, and had caused the schism of Hippolytus. Bishop Fabian suffered martyrdom in January 250, and, when Cornelius

was elected his successor in March or April 251, Novatian objected on account of his known laxity on the above-mentioned point of discipline, and allowed himself to be consecrated bishop by the minority who shared his views. He and his followers were excommunicated by the synod held at Rome in October of the same year. He is said by Socrates (H.I$. iv. 28) to have suffered martyrdom under Valerian. After his death the Novatians spread rapidly over the empire; they called them- selves Kadapoi, or Puritans, and rebaptized their converts from the Catholic view. The eighth canon of the council of Nice provides in a liberal spirit for the readmission of the clergy of the Kadapoi to the Catholic Church, and the sect finally dis- appeared some two centuries after its origin. Novatian has sometimes been confounded with his contemporary Novatus, a Carthaginian presbyter, who held similar views.

Novatian was the first Roman Christian who wrote to any con- siderable extent in Latin. Of his numerous writings three are extant:

(1) a letter written in the name of the Roman clergy to Cyprian in 250; (2) a treatise in thirty-one chapters, De trinitate; (3) a letter written at the request of the Roman laity, De cibis judaicis. They are well-arranged compositions, written in an elegant and vigorous style. The best editions are by Welchman (Oxford, 1724) and by Jackson (London. 1728) ; they are translated in vol. ii. of Cyprian's works in the Ante-Nicene Theol. Libr. (Edin- burgh, 1869). The Novatian controversy can be advantageously studied in the Epistles of Cyprian.

NOVATION, a legal term derived from the Roman law, in which novatio was of three kinds — substitution of a new debtor {expromissio . or delegatio), of a new creditor (cessio nominum vel actionum), or of a new contract. In English law the term (though it occurs as early as Bracton) is scarcely naturalized, the substitution of a new debtor or creditor being generally called an assignment, and of a new contract a merger. It is doubtful, however, whether merger applies except where the substituted contract is one of a higher nature, as where a contract under seal supersedes a simple contract. Where one contract is replaced by another, it is of course necessary that the new contract should be a valid contract, founded upon sufficient consideration (see Contract). The extinction of the previous contract is sufficient consideration. The question whether there is a novation most frequently arises in the course of dealing between a customer and a new partnership, and on the assignment of the business of a life assurance company with reference to the assent of the policyholders to the transfer of their policies. The points on which novation turns are whether the new firm or company has assumed the liability of the old, and whether the creditor has consented to accept the liability of the new debtors and discharge the old. The question is one of fact in each case. See especially the Life Assurance Companies Act 1872, s. 7, where the word " novations " occurs in the marginal note to the section, and so has quasi-statutory sanction. Scots law seems to be more stringent than English law in the application of the doctrine of novation, and to need stronger evidence of the creditor's consent to the transfer of liability. In American law, as in English, the term is something of a novelty, except in Louisiana, where much of the civil law is retained.

NOVAYA ZEMLYA (Nova Zembla, " new land "), an Arctic land off the coast of European Russia, to which it belongs, consisting of two large islands separated by a narrow winding channel, the Matochkin Shar. It lies between 70° 31′ and 77 6′ N., and between 51 35′ and 69° 2′ E. It forms an elongated crescent, being nearly 600 m. long with a width of 30 to 90 m., and an area of about 36,000 sq. m. It separates the Barents Sea on the W. from the Kara Sea on the E. With Vaygach

Island, between it and the mainland, Novaya Zemlya forms a continuation of the Pae-Khoy hills. Vaygach is separated from it by the Kara Strait, 30 m. wide, and from the continent by the Yugor or Ugrian Strait, only 7 m. across. On the E. coast of Novaya Zemlya, especially between the Matochkin Shar and 75 N., there are a number of fjord-like inlets — such as Chekina, Rasmyslov and Medvizhiy bays. The greater part of the W. coast is fretted into bays and promontories, and a large number of islets lie off it. At the S. extremity there are a number of fjords and the wide bay of Sakhanikha. Then

farther N. is the Kostin Shar, a strait separating Mezhdu- sharskiy Island from the coast, and having at its N. entrance South Goose Cape, which forms the S. extremity of Goose Land (Gusinaya Zemlya) in 72° N. Next follows Moller Bay, between Goose Land and Cape Britvin, with several minor bays affording anchorages. On the W. coast of the N. island are Krestovaya, Mashigin and Nordenskjbld bays, and to the N. are several groups of islands — Gorbovyi, Pankratiev, the Gulf Stream Islands and the Orange Islands. Off the E. coast that called Pakhtusov (actually divided by a strait into two) may be mentioned. Little is known of the interior of Novaya Zemlya. It is mountainous throughout. Transverse chains are thrown off from the main chain, and are separated by deep narrow valleys, some of which are watered by streams of considerable size, which, at the spring thaw, bring down a remarkable bulk of detritus. The general slope of the land is steeper on the E. than on the W., and at the N. and S. extremities there is a descent to a comparatively low plateau. In the S. this plateau is broken by several parallel ridges, with level valleys between them, dotted with numerous small lakes. On either side of the Matochkin Shar the hills reach 4000 ft. and upwards. The more elevated region is covered with snow-fields which feed glaciers in some cases, while the N. seems to be covered with a great ice-sheet. Geology. — The geological structure of the central region is of the most varied description. The primary rocks which appear at Mitushev Kamefi are overlaid with thick beds of quartzites and clay- slates containing sulphide of iron, with subordinate layers of talc or mica slate, and thinner beds of fossiliferous limestone, Silurian or Devonian. More recent clay-slates and marls belonging to the middle Jurassic occur in the western coast-region about Matochkin Shar. About 74 N. the crags of the E. coast are composed of grey sand- stone, while in 76 Barents's Islands, and possibly a much greater part of the N. coast, show Carboniferous strata. Traces of Eocene deposits have not been

discovered on Novaya Zemiya. During the Glacial period its glaciers were much larger than at present, whilst during a later portion of the Quaternary period (to judge by the marine fossils found as high as 300 ft. above the sea) Novaya Zemlya, like the whole of the arctic coast of Russia, was submerged for several hundred feet. At present it appears to partake of the move- ment of upheaval common to the whole of N. Russia.

Climate. — Novaya Zemlya is colder than Spitsbergen (which lies more to the N.) as in some degree it shares in the continental con- ditions of northern Russia and Siberia. The middle and northern parts of the W. coast are not so cold as the E. On the W. coast the temperature appears to decrease S. of the Matochkin Shar, being reduced by a cold current from the Kara Sea through Kara Strait. On the other hand, the climate of the northern part of the W. coast is affected by a relatively warm drift from the W. Under this influence there are years when the islands can be circumnavigated without difficulty. In the Matochkin Shar region the snow-line is estimated at about 1 800 to 2000 ft. Glaciers are rare S. of 72 ° N.

Flora and Fauna. — Grass does not grow to any extent except in Goose Land. Elsewhere even the leaved lichens are precarious, though the leather lichens flourish. Of Phanerogams, only the Dryas octopetala covers small areas of the d6bris, interspersed with isolated Cochlearia, &c, and, where a layer of thinner clay has been deposited in sheltered places, the surface is covered with saxifrages, &c. ; and a carpet of mosses allows the arctic willow {Salix polaris) to develop. Where a thin sheet of humus, fertilized by lemmings, has accumulated, a few flowering plants appear, but even so their brilliant flowers spring direct from the soil, concealing the developed leaflets, while their horizontally spread roots grow out of proportion ; only the Salix lanata rises to 7 or 8 in., sending out roots 1 in. thick and 10 to 12 ft. long. This applies only to the better-known neighbourhoods of Matochkin Shar and Kostin Shar; N. of 74° N. very few species have been found. The phanerogamic flora of Novaya Zemlya and Vaygach numbers about two hundred species. As to the genetic connexions of the Novaya Zemlya flora, it appears, according to M. Kjellmann's researches, to belong to the Asiatic rather than to the European arctic region.

The interior of Novaya Zemlya shows hardly a trace of animal life, save here and there a vagrant bird, a few lemmings, an ice-fox, a brown or white bear, and at times immigrant reindeer. Even insects are few. The sea-coast, however, is occupied by countless birds, which come from the S. for the breeding season, and at certain parts of the

sea-coast the rocks are covered with millions of guillemots, while great flocks of ducks of various sorts, geese and swans swarm every summer on the valleys and lakes of the south. Whales, walruses, various seals and dolphins are frequently met with. Only two species of fish are of any importance — the goltzy (Salmo alpinus) in the western rivers, and the omul (Salmo omul) in the eastern.

The numbers of sea mammals and birds attracted Russian hunters, and even in the 16th century they had extended their huts (stano-vishtcha) to the extreme N. of the island. Many of them wintered for

years on Novaya Zemlya without great loss from scurvy Owing to the ice in the White Sea Russian hunters found Novaya Zemlya less easy of access than did the Norwegians- But about 1877 systematic attempts at settlement were made by the Russian government, several families of Samoyedes being established at stations on the W. coast of the S. island, the chief of which is Karmakuly on Moller Bay, where there is a church. Novaya Zemlya is included in the Russian province of Archangel.

History. — Novaya Zemlya seems to have been known to Novgorod hunters in the nth century; but its geographical discovery dates from the great movement for the discovery of the N.E. passage. In 1553 Sir Hugh Willoughby sighted what was probably Goose Land; Richard Chancellor penetrated into the White Sea. In 1556 Stephen Borough reached the S. extremity of the island, being the first western European to do so. William Barents touched the island (1594) at Sukhoy Nos (73 46'), and followed the coast N. to the Orange Islands and S. to the Kostin Shar. Rumours of silver ore having been found induced the Russian government to send out expeditions* during the second half of the 18th century. In 1760 Savva Loshkin cruised along the E. coast, spent two winters there, and in the next year, after having reached Cape Begehrte (Begheerte), returned along the W. coast, thus accomplishing the first cir- cumnavigation; but the valuable records of his voyage have been lost. In 1768 the Russian Lieutenant Rozmyslov reached Goose Land and penetrated into the Kara Sea by the Matochkin Shar, where he spent the winter; in the following year he pursued the exploration of the Kara Sea, but was compelled to return and abandon his ship. The first real scientific information about the island is due to the expeditions (1821-1824) of Count Feodor Petrovich Liitke (1797-1882), after whom part of the N. island is named Liitke Land. Nearly all the W. coast as far as Cape Nassau, as well as Matochkin Shar, was mapped, and valuable

scientific information obtained. In 1832 Lieutenant Pakhtusov mapped the E. coast as far as Matochkin Shar; and in 1835 Pakhtusov and Tsivolka his pilot, or commander of his second ship, mapped the coast as far as 74° 24'. The next expedition was that of the naturalist Karl von Baer in 1838. A new era of scientific exploration began in 1868, while Norwegian sea- hunters brought in valuable geographical information. In 1870 the Norwegian Captain Johannesen penetrated as far as 79 E., in 76° 13′ N., and afterwards accomplished the second circumnavigation of Novaya Zemlya. These explorations led the way for the famous voyages of Baron Nordenskibld (1875- 1878), which included investigations in Novaya Zemlya. In 1877 the Russian Lieutenant, Tyaghin, attempted to cross the S. island, and in 1878 M. Grinevetskiy succeeded in doing so. Among later expeditions may be mentioned those of C. Nossilov (1887-1892), T. N. Chernychev (1895) who made a. crossing of the S. island, H. J. Pearson (1895 and 1897), Lieutenant Borisov (1899 and 1900) and 0. Ekstam (1900 and 1903).

See accounts of the expeditions above mentioned, and especially, among earlier works, K. E. von Baer, Expedition a Novaia Zemlia et en Lapponie (St Petersburg, 1838, &c.) ; and among later works H.J. Pearson, Beyond Petsora Eastward, with botanical and geological appendices by H. W. Feilden (London, 1899); also J. Sporer, Nowaja Semlja (Gotha, 1867); A. P. Engelhardt, A Russian Province of the North (Archangel, of which the author was governor), translated by H. Cooke (London, 1899).

NOVEL (from novellus, diminutive of Lat. novus, new; through the Italian novella), the name given in literature to a study of manners, founded on an observation of contemporary or recent life, in which the characters, the incidents and the intrigue are imaginary, and, therefore, " new " to the reader, but are founded on lines running parallel with those of actual history.

1. With the word novel is identified a certain adherence to the normal conditions of experience. A novel is a sustained story which is, indeed, not historically true, but might very easily be so. It is essentially a modern form of literature — that is to say, it makes its appearance when the energy of a people has con- siderably subsided or has taken purely civic forms, and is ready to contemplate and to criticize pictures drawn from conventional manners. The novel has been made the vehicle for satire, for instruction, for political or religious exhortation, for technical

information; but these are side issues. The plain and direct purpose of the novel is to amuse by a succession of scenes painted from nature, and by a thread of emotional narrative.

It was not until the 18th century that it began to be a prominent factor in literary life, and not until the 19th that it took a place in it which was absolutely predominant. The novel requires, from those who are content to be only fairly proficient in it, less intellectual apparatus than any other species cf writing. This does not militate against the fact that the greatest novelists, always a small class, produce work which is as admirable in its art as the finest poetry. But the novel adapts itself to so large a range of readers, and covers so vast a ground in the imitation of life, that it is the unique branch of literature which may be cultivated without any real distinction or skill, and yet for the moment may exercise a powerful purpose.

2. Classical Antiquity. — The place held by the novel in an- tiquity ˆoffers interesting analogies with its position in modern times. It was Voltaire, in liis Pyrrhonisme de I'histoire, who set the fashion of calling the Cyropaedeia a novel, but it is probable that Xenophon, in composing this great work on the education of Cyrus, had a purpose that was didactic and historical rather than imaginative. The vogue of the novel really began in Alexandrian times, when social life was so far settled in tradition that the pleasure of reflecting on reality had definitely set in. In the 2nd century B.C. a certain Aristides wrote, in six books, the Milcsiaka, which was probably the beginning of the modern novel. These Tales of Miletus, the town in which Aristides lived, are lost, but from existing imitations of them in Greek and Latin we can gather that they consisted of humorous and sarcastic episodes of contemporary life. There seems to be good evidence that the bulk of these novelettes, and of the tales which followed them, dealt mainly with the adventures of lovers. In the 2nd century a.d. Lucian preserved for us invaluable pictures of the life in which he moved: his Lucius or the Ass and his True History are fantastic and extraordinary fictions in which the nature of the novel is not unfrequently approached. But a Syrian Christian, Heliodorus, bishop of Tricca in the 4th century, may claim to have come much closer to it in his Aethiopica, which has the unique merit of being a perfectly pure love story, in which the marvellous is not absolutely banished, but in which on the whole the solid structure of experience is preserved. In the 6th century, as is supposed, a Greek who is called Longus

(A6770S) , but of whose life nothing is known, wrote the voluptuous pastoral story of Daphnis and Chloe, which is far superior to all other remnants of Greek fiction which have come down to us, and which is the only one of them which can strictly be called a novel. In Latin literature, the Golden Ass of Apuleius is mani- festly a translation of a lost Greek book, to which Lucian also was indebted. It is probable that in the great age of Roman literature prose fiction was cultivated, but we should be limited to pure conjecture as to its scope, if we did not possess a fragment of a work which is absolutely invaluable to the comparative student of literature. If the Salyricon of Petronius was not an isolated phenomenon — and it is highly improbable that this was the case — then the Romans of the Neronian epoch understood to the full the secret of how to produce in prose a satirical, not to say cynical, study of manners in fiction. The Salyricon is not less skilfully managed than such later novels as Gil Bias or Peregrine Pickle, and it is of the same class. From the extent of the principal episode which has been preserved, it is supposed that this novel was not a short tale of intrigue, but was a sus- tained record, drawn up with careful and lengthy observation cf manners, for the single purpose of entertainment. Unfortunately this extraordinary work remains not merely solitary in its class, but itself a fragment. In early Christian times, such books as The Shepherd of Hermas, and the productions of Palladius and of Synesius, indistinctly testified to a certain appetite for prose fiction.

3. Italian.— It was in northern Italy that the novel of modern Europe (both the literary type and the name) came into existence. A collection of tales, called 77 Novellino or Cento novelle antiche (although only 66 of the too survive), was composed at the

end of the 13th century, and started this class of literature in Europe. These anonymous stories are of extraordinary diversity, chivalrous, mythological, moral and scandalous. The medieval view of women and priests and peasants is found in its full development, and there is something of the realistic reflection of customs which was to flourish later in a whole class of fiction. The earliest Italian novelist whose name is connected with his writings is Francesco da Barberino (1264-1348), whose Docu- menli d' Amor were first published in 1640. He was followed by the celebrated Giovanni Boccaccio, who wrote his Filocopo about 1339 and the Decameron some nine years later. Of his disciples the most eminent was Francesco Sacchetti (1335-1400), a Florentine. Sacchetti's Trecente novelle, which remained in MS. until the 18th century (1724), are ironical and realistic studies of the life around him in Tuscany. To Giovanni Fiorentino is attributed a collection of 50 tales, called II Pecorone,

printed first in 1558, but written in 1378. Shakespeare was indebted to one of these stories for the plot of The Merchant of Venice. A great name in the evolution of European fiction is that of Tom- maso Guardato, called Masuccio (i4i5?-i477?); he was a native of Salerno, and was the first of the south Italian novelists. Masuccio imitated no one; his conceptions and his observations are wholly his own. His Novellino, printed at Naples in 1476, is divided into five books, each containing ten stories. These deal satirically with the three favourite subjects of the age — namely, jealous husbands, unfaithful wives and debauched priests. He was followed in this, as well as in his vivacity, by Antonio Cornazzano (i43i?i5oo?), an inhabitant of Piacenza, who wrote Italian with much greater purity than Masuccio, but less vigour. His stories were frequently reprinted, under the title of Proverbii. Of the novels of Giovanni B re vio (1480? 1562?) only five have been preserved, but these are of unusual merit. We then reach Matteo Bandello (1480-1561), long the most famous of all the Italian novelists, whose Novelle, first issued in 1554, were eagerly read in all parts of Europe; they are 214 in number. After Bandello the decline of the Italian novella is evident. Francesco Maria Molza (1489-1544), whose stories appeared in 1547, was a rival to Bandello, and has been preferred to him by several modern critics. The Ragionamenti d'Amor (1548) of Agnolo Firenzuola (1493-1545) was the work of a poet writing in richly embroidered prose. After Firenzuola the great school of Italian story-tellers declined. There was no more novel writing of any importance in Italy until the close of the 18th century, when an admiring study of German literature produced the romances of Alessandro Verri (1741-1816) and Ugo Foscolo (1778-1827). The first Italian novelist of merit in recent times, however, is Alessandro Manzoni (T785-1873), whose I Promessi Sposi (1825) enjoyed an unbounded popularity. Manzoni had a troop of imitators, but no rivals. In the fourth quarter of the 19th century Italy produced some very brilliant and original novelists, in particular Giovanni Verga (b. 1840), Matilda Serao (b. 1856) and Gabriele d'Annunzio (b. 1863).

4. France. — In the 14th century, when Italy was already proceeding in a modern direction, France was satisfied with ancient tales of Fierabras or Les Quatre fils d y Aynon, which were nothing but epics told in rambling prose. It was not until about 1450 that the anonymous Quinze joies du mariage showed the French to be influenced by the Italian discovery of the novelette of manners. The author of this extraordinary work was perhaps Antoine de la Sale who seems certainly to have written the whole of the Cent nouvelles npuvelles, imitated from Boccaccio and Sacchetti. This bud of realistic fiction, however, was immediately nipped by the romances of

chivalry, of Spanish extraction, which were only destroyed by the vogue of Don Quixote. The translation of Montalvo's celebrated Amadis de Gaule enjoyed at this time an extraordinary popularity.

The habit of telling tales freely in prose was not, however, formed in France until after 1500. Bonaventure Desperiers (d. 1544) was the author of the Cymbalum mundi, and of Nouvelles recreations, mordant satires and gay stories. Probably to this age also belongs the semi-fabulous B6roalde de Verville, who is supposed to be the author of a collection of facetious

anecdotes and conversations, Le Moyen de Parvenir. These, and other experiments in fiction, lead us up to Rabelais, whose magnificent genius adopted as its mode of address the chain of burlesque prose narratives which we possess in Gargantua and Pantagruel, recording the family history of a race of giant kings, but his influence on the novel is insignificant. It was half a century later that, in the romantic pastoral of Astree, published in 1610, France may be said to have achieved her first attempt at a novel. This famous book was written by Honore d'Urfe; in spite of its absurdities it is full of talent, and succeeds, for the first time in the history of French narrative, in depicting individual character. D'Urfe was followed, with less originality, by Mari n Le Roy de Gomberville (1 600-1 6 74) , who was the author of a Mexican romance, Polexandre, and by Gombauld (1570?- 1666), the author of Endymion (1624). These were fictions of interminable adventures, broken by an infinite number of episodes; they seem tedious enough to us nowadays, but with their refinement of language, and their elevation of sentiment, they fascinated readers like Madame de Sevigne. To Gomberville, who has been called the Alexandre Dumas of the 17th century, succeeded Mdlle de Scudery (1607-1701), who preserved the romantic framework of the novel, but filled it up with modern and familiar figures disguised under ancient names. Her huge romans a clef, tiresome as they are, form the necessary stepping- stone between Astree, in which the novel was first conceived, and La Princesse de Cleves, where at last it found perfect expression. Meanwhile, the elephantine heroic romances were ridiculed by Charles Sorel in his Francion (1622) and Le Berger extravagant (1628). Later examples of a realistic reaction against the pompous beauty of Gomberville and Scudery were the Roman comique (1651) of Scarron and Le Roman bourgeois (1666) of Furetiere.

All these, however, were mere preparations. The earliest novelist of France is Marguerite de la Vergne, comtesse de La Fayette (1634-1693), and the earliest genuine French novels were her Princesse de Montpensier (1662), and her far more im- portant Princesse de Cleves (1678). Madame de La Fayette was the first writer of prose narrative in Europe who portrayed, as closely to nature as she could, the actual manner and conversa- tions of well-bred people. To show that she was capable of writing in the old style, she published, with the help of Segrais, in 1670, a Zayde, which is in the Spanish manner affected by Mdlle de Scudery. It was long before the peculiar originality of the Princesse de Cleves was appreciated. Meanwhile La Fontaine, in 1669, published a fine romance of PsycM, partly in verse, and Fenelon, in 1699, his celebrated Telemaque. The influence of La Bruyere on the novelists, although he wrote no novels, must not be overlooked. But the Princesse de Cleves remained the solitary novel of moral analysis when its author died and the 17th century closed. The successes of Alain Rene Lesage seemed to be wholly reactionary. His realistic novels, Gil Bias and Le Diable boiteux, depended upon their comic force, their picaresque vivacity, rather than upon the sober study of average human character. But Marivaux (1688-1763) took up the psychological novel again, and produced in Marianne (1731) and Le Paysan parvenu (173s) analytical stories of Parisian manners and character which were wholly modern in form. If Marianne was deliberate, the exquisite Manon Lescaut (1731), by the Abbe Prevost d'Exiles (1697-1763), was almost an accident; but, between them, these simultaneous works started the French novel of the analysis of emotion. The brilliant stories of Voltaire, which began with Zadig and included Candide, hardly belonged to this category; they are rather satires and diversions, in which class must also be placed the fashionable boudoir novels of Crebillon fils, La Morliere and others. But the English taste, exemplified mainly by Richardson, Sterne and Fielding, prevailed, and its effect was seen again in the imperfect novels of Diderot and Rousseau. The Nouvelle Helo'ise and the Emile of the latter are not skilfully constructed as stones, but they mark the starting-point of the novel which aims at familiarising the public mind with great ideas in an attractively romantic form. The moral purpose is equally

evident in the famous Paul et Virginie of Bernardin de St Pierre. It was less didactically present in Mme de Stael's Delphine (1802) and Corinne (1807), where the misinterpreted woman of genius, so often depicted since, is first introduced to French novel-readers. It was not, however, until about 1830 that the novel began to be one of the main channels of imaginative writing in France, and the development of

this kind of fiction was one of the main features of the romantic revival. Stendhal showed that, without any of the charms of style, and relying exclusively upon minute psychological observation, the record of a human life could be made enthrall- ingly interesting. Alexandre Dumas, under the direct influence of Sir Walter Scott, allowed his tropic imagination to revel and riot in brilliant chains of adventure. The imaginative novel was admirably conceived by George Sand. But it was Balzac who filled canvas after canvas with the astounding intensity of life itself, and who insisted with irresistible force that the function of the novel is to draw a consistent and unprejudiced picture of humanity under the strain of a succession of probable passions. This has been clearly comprehended by the host of later French novelists, whose record cannot be traced here, to be the function of the novel, as Mme de La Fayette invented it, as Marivaux and Prev6st developed it, and as George Sand and Balzac finally laid down its laws and settled its borders. Certain dates, however, must be recorded in the briefest record of the evolution of the French novel, and 1856 is one of these; in that year Gustave Flaubert published Madame Bovary, a work in which the rival realistic and romantic tendencies are combined with a mastery that had not been approached and has not since been equalled. Another is 1871, when Zola began to roll out the enormous canvas of Les Rougon-Macquart. Yet another in 1 880, when Boule de suif first revealed in Maupassant a novelist whose creations were not merely amusing and striking, but absolutely convincing and logical.

5. English. — If we take no heed of translations of Latin stories, such as those from the Gesta Romanorum, we may say that the beginning of prose fiction in England is Le Morte d' Arthur, of Sir Thomas Malory, finished in or about 1470, and printed by Caxton in 1485. The great merits of this writer were that he got rid of the medieval burden of allegory, essayed an interpretation of the human heart, and invented a lucid and vigorous style of narrative. But his book became, as Professor W. Raleigh has said, " the feeder of poetry rather than of prose," and it gave no inkling of the methods of the modern novel. The same may be said of such versions of the Charlemagne Amadis and Palmeria cycles of romances as Huon of Bordeaux, published by Lord Berners, perhaps in 1535, and innumerable others. It was the novella of Italy from which the English novel first faintly started. Between 1560 and 1580 versions of the Italian novelists became exceedingly popular in England. Paynter in introducing the tales of Bandello and Straparola struck the true novelist's note by offering them not as works of morality or edification, but " instead of a merry companion to shorten the tedious toil of weary ways." The appreciation of these Italian stories led to the composition of the

Euphues of Lyly (1579), a book of great interest and merit, which has been called ” the first original prose novel written in English.” This is somewhat to exaggerate, since Euphues is rather a work of elegant philosophy than a narrative. Lyly had many imitators, Munday, Greene, Dickenson, Barnabe Rich, Lodge, Nash and others, who formed a school of prose fiction which was not without a certain romantic beauty, but which possessed as little narrative vigour as possible. To compare a story written by Sacchetti in 1385 with one written by Greene in 1585 is to perceive that not merely had no progress been made towards the modern novel, but that a great deal of ground had been lost. The genius of the Elizabethan age lay in the direction of lyrical and dramatic poetry, not of prose fiction. The absence of the comic element in Elizabethan romances is very marked. M. Jusserand has claimed a peculiar merit in this and other respects for the Jack Wilton of Nash (1594), which, as he points out, is the earliest English example of picaresque literature. During

the reign of the heroic romances in France, their vogue violently affected the English book-market. The huge stories of Calprenede and Gomberville were imported, and translated and imitated to the exclusion of every other species of prose fiction, between 1645 and 1670. The long- winded books of Mdlle de Scudery, especially Cassandra and The Great Cyrus, were read so univers- ally in England as to leave their stamp on the national manners. Of original English romances, written in competition with the French masterpieces of tenderness and chivalry, the Parthenissa of Lord Orrery (1654) is the best known. The first definite 5tand against these Gallicized romances was made by two dramatists, Aphara Behn and William Congreve. Congreve’s Incognita (1692) is remarkable for its light raillery and humour, and perhaps deserves as well as any 17th-century composition to be called the earliest novel in English. The stories of Mrs Behn have the merit of a romantic simplicity of narrative, but they are dull and devoid of art. But the novel still lingered, unwilling to make its appearance in England, and its place was taken during the age of Anne by the labours of the essayists. So rich is the character painting, so lively the touches of social colour in the Spectator and Tatler, that these periodicals have, by enthusiastic critics, been styled brilliant examples of prose fiction. But it is obvious that in the delightful essays of Addison and Steele there was no attempt made at construction, that the sustained evolution of characters was not essayed, and that even in the studies of Mr Bickerstaff ‘s Club anything

like a plot was studiously avoided. Yet these are all essential characteristics of the novel, and until they make their appearance in English literature we must not say that the secret has been discovered. Very near to the mystery, if he did not quite grasp it, was Daniel Defoe, who introduced into his narrative a minute and rude system of realistic observation, by way of giving an impression of truth to it. This exactitude he combined with a survival of the old picaresque method, the result being those strange and entertain- ing works Colonel Jack (1722) and Roxana (1724). Still closer he came to positive success in the immortal narrative of Robinson Crusoe, in which the fascination of the desolate island was first worked up in English.

6. Not even yet had the English novel been invented. It came into the world in 1740 from the unconscious hands of Samuel Richardson (1680-1761), who had hit upon the notion that morality might be helped and young persons of inexperience protected by the preparation of a set of letters exchanged between imaginary persons. The result was Pamela: or Virtue Rewarded, a book which is in every strict sense the earliest English novel. It has even a claim to be considered the earliest European novel of the modern kind, for the assumption of French criticism that Richardson borrowed his ideas and his characters from the Marianne of Marivaux is not supported by evidence. There is no reason to suppose that Richardson met with the name of Marivaux earlier than 1749. At all events, it would seem to be certain that, whether in France or England, the fourth decade of the 1 8th century saw the spontaneous conception of this ” new species of writing.” The name of the heroine of Richardson’s book was Miss Pamela Andrews, and the second English novel was Fielding’s Joseph Andrews (1742), which started as a mere burlesque of Pamela, but proceeded upon admirably original lines of its own, in” a study of the humours and manners of con- temporary country life. Fielding rejected the epistolary artifice nf Richardson, and told .his story in a straightforward narrative, broken indeed by arguments and ejaculations which bound the new novel to the old essay of the Spectator type. The creative force of Fielding filled the pages of this book with a crowd of vividly-presented characters, and this marked a step in advance, for Richardson’s practice was to concentrate minute attention upon only one or two figures. It was from Richardson that the next important fiction came, in the shape of the long-drawn tragedy of Clarissa (1748). But a third great novelist was now at work; in 1748 appeared the Roderick Random of Smollett, and here we have neither the sculptural manner of Richardson nor the busy world of Fielding’s realism, but a comic impression founded on an artful

employment of emphasis and exaggeration.

Smollett gives us neither breathing statues nor a crowd of men and women, but a gallery of ” freaks,” arranged with great art, indeed, but exhibited in such a way as to expose not their likeness but their unlikeness to the common stock of humanity. It is very important to note this curious divergency between the three great writers, because they exemplified the three classes into which almost all subsequent novels can with more or less ease be divided. The next move was made by Fielding, who in 1749 published his Tom Jones. Starting with the pungent horror of hypocrisy ever before him, Fielding constructs a fragment of the world in which men and women are seen, without exaggeration, plying their daily trades under the eye of an impartial observer who can penetrate to their secret motives. This was a great advance, and a still greater one was the sustained skill with which the author conducted the plot, the interwoven series of the actions of his characters. It may almost be said that until the publica- tion of Tom Jones no novel with a real plot had been conceived in English. The rivalry of the great novelists of this time was of signal help to them, and there can be no question that the astounding richness of Tom Jones stirred Smollett to the exercise of increased energy in Peregrine Pickle (17 51), a coarse and savage book, illuminated by brilliant flashes of humour. A better, because a tenderer and truer study of life was Amelia, which Fielding published in the same year; yet most readers have found this novel a little languid after Tom Jones. But if the ideal of life depicted in it was quieter and sadder, it was perhaps for that very reason more in harmony with the facts of life. Now Richardson, who had long been silent, reasserted his mastery of epistolary analysis in the huge History of Sir Charles Grandison (I 7S3)> m which, as its admirers claimed, ” all the recesses of the human heart are explored and its whole texture unfolded.” Richardson had scarcely been affected by the experiments of his contemporaries, of the very nature of which he affected to be ignorant, and the result is that in his third and last novel he depends entirely on qualities which he had already developed, and owes nothing to the discoveries of others.

7. With this book, the first great group of English novels comes to a close, and we may observe that in these eight stories everything is to be found, in germ if not in full evolution, which was during the next century and a half to make the abundant out-put of the English novel prominent. New forms, above all new subjects, were to present themselves to the imagination of capable British novelists, but the starting-point of every ex- periment was to be discovered in the ripest work of Richardson, Fielding and Smollett. Their influence was

manifest in the writings of the second school of English novelists, in whom, however, several interesting varieties of subject and treatment were discovered. The Tristram Shandy (1759-1766) of Sterne, is the most masterly example in English of a humour which goes direct to pathos for its most ” sentimental ” effects, and of the kind of loosely-strung, reflective fiction which is hardly a narraˆ tive at all. Neither Tristram Shandy nor A Sentimental Journey (1768) can properly be included among novels. In Rasselas (1759) Dr Johnson showed that the new kind of writing could be used to give entertainment to a sermon and in this he was to have a multitude of followers. In Chrysal (1760) Charles Johnstone (d. 1800) showed that the picaresque romance could still exist, tinctured by the newly-found art of the novelist. In The Castle of Otranto (1764) Horace Walpole adapted the methods of the novelist to a pseudo-historical theme of horror and romance, and prophesied of Walter Scott. In The Vicar of Wakefield (1766) Goldsmith was indebted to most of his immediate pre-decessors, but fused their qualities in an amalgam of gentle wit and delicate sweetness and conversational brevity which has made his one loosely-constructed novel a foremost classic of our literature. Thus, in the one quarter of a century which divides Pamela from The Vicar of Wakefield, English novel-writing was born, grew into full maturity, and adopted its adult and final forms.

8. During the remainder of the 18th century, little or nothing was done to extend the range of prose fiction in England, but one or two of those departments of novel- writing which had already

been invented were developed and adapted to changing taste. In particular, the rapid increase of reticence and refinement in conversation made such a novel in letters as Smollett’s Humphrey Clinker (17 71) repulsively coarse to women of delicacy, who were charmed on the other hand with the Evelina of Frances Burney (1778). These two typical books are composed on the same plan, yet essentially a whole age lies between the former and the latter. What has been called ” the novel of the tea- table ” now came into existence, and the 18th century was about to close in mediocrity, when its credit was partially saved by a development of Horace Walpole’s romance of terror in the vigorous and sensational narratives of Anne Radcliffe (1764- 1823), whose Mysteries of Udolpho appeared in 1794. The same year saw the publication of Caleb Williams, in which William Godwin (1 756-1836) evolved a tragic theory of

politics. A finer study than either of the works just mentioned, although not truly a novel, was the gorgeous and sinister Vathek (1786) of William Beckford, an oriental tale of horror. In all these books there existed an element of grotesque mingled with romantic colour, which announced the coming revival.

9. The two schools here indicated, and they may be roughly de- fined as the school of the Tea-Table and the school of the Skeleton- in-the-Cupboard, did not, however, betray their real significance until the second decade of the 19th century, when after several unimportant efforts, they developed into the novel of psycho- logical satire and the romance of historical imagination. Two writers, the greatest who had yet attempted to address English readers through prose fiction, almost simultaneously came forward as the protagonists in these two spheres of work. Jane Austen published Sense and Sensibility in 181 1, Walter Scott Waverley in 1814. These were epoch-making dates; in each case a new era opened for the countless readers of novels. The first-named writer, all exactitude, conscience and literary art, worked away at her ” little bit (two inches wide) of ivory” ; the other, with bold and flowing brush, covered vast spaces with his stimulating and noble compositions. It is, however, to be noted that the isolation in which we now regard these great writers — a solitude a deux only broken in measure by the presence of Miss Maria Edgeworth — is an optical delusion due to the veils of distance. The bookshops from 1810 to 1820 and onwards were thronged and glutted with novels, many of them infinitely more successful, as far as sales were concerned, than the most popular of Miss Austen’s works. The novels of Miss Austen were written between 1796 and 1810, although published from 1811 to 1818; those of Sir Walter Scott date from 1814 {Waverley) to 1829 {Anne of Geier stein). Practically speaking, no additions were made to the formula of the social novel or of the historical romance, to the study of national manners, that is to say, from the satirical or from the picturesque point of view, until a quarter of a century later.

10. The next artist in prose fiction whose force of invention was sufficient to start the novel on wholly fresh tracks was born forty years later than Scott. This was Charles Dickens, whose Pickwick Papers (1836) marks another epoch in novel writing. His career of prodigal production ceased abruptly in 1870, by which time it had long been obvious that he was the pioneer of a great and diverse school of novelists, all born within the second decade of the century. Of these Thackeray was not really made obvious until Vanity Fair (1849), nor Charlotte Bronte till Jane Eyre (1847), nor Mrs Gaskell till Mary Barton (1848), nor George Eliot till Adam- Bede (1859). The most noticeable point on which the five illustrious novelists of the Early

Victorian age resembled one another and differed from all their predecessors, was the sociological or even humanitarian character of their writings. All of them had projects of moral or social reform close at heart, all desired to mend the existing scheme of things. In several of them, particularly in Dickens and Miss Bronte, ths element of insubordination is extremely marked; it is present in them all; and a determination not to be content to see life beautifully, through coloured glasses, or to be content with a sarcastic travesty of it, but to realize in detail its elements of pain and injustice. The novel, which had already learned to

compete with all the amusing sections of literature, became the successful rival of the serious ones also. The task of the novelist was, therefore, so far as the indication of the scope of his particular kind of art is concerned, now complete. The names of Anthony Trollope, Charles Kingsley, Charles Reade, George Meredith, Thomas Hardy and Robert Louis Stevenson represent, in their least challenged form, different movements in novel-writing during the second half of the 19th century; we must be content here to refer for particulars concerning them to the separate biographical articles.

11. Spain. — Prose narrative in Spain practically begins in the 15th century with chronicles and romances of chivalry, tempered occasionally and faintly by some knowledge of what had been attempted in Italy by Boccaccio. The Spanish version of Amades de Gaula, in which the romance of knight errantry culminated, belongs to 1508; the lost original is supposed to have been Portuguese. This was the only book of its class which is saved from the burning in Don Quixote; it was followed by Palmerin of England. These interminable books, and a hundred worse than they, occupied the leisure of 16th-century readers of both sexes. Without approaching the form of novels, they prepared the ground for novel-reading. The exploration of America led to the composition of monstrous tales of the New World, which generally took the form of continuations of Amadts. A new thing was begun in 1554, when the anonymous picaresque romance of Lazarillo de Tormes started the story of fantastic modern adventure; this highly entertaining book has been called the 16th-century Pickwick, and Mr Fitzmaurice-Kelly remarks that it ” fixed for ever the type of the comic prose epic.” The pastoral romance, in the hands of Jorge de Montem&r (d. 1561), who wrote an insipid Diana which was popular for a while throughout Europe, took readers a step backward, away from the ultimate path of the novel. It is of interest to us, however, to note that it was in one of these ” vain imaginings,” in his pastoral romance of Galatea, that Cervantes approached the field of fiction, in 1585. Few of his peculiar merits are to be found in this

early work; he turned for the present to the composition of plays. It was not until 1604 that he returned to prose fiction by printing his immortal Don Quixote, which made an epoch in the history of the novel. This book was originally intended to ridicule the already fading passion for the romances of chivalry, but it proceeded much further than that, and there is hardly any branch of fiction which may not be traced back to the splendid initiation of some chapter of Don Quixote. In 1613 Cervantes published his twelve Exemplary Novels; these are not so well known as the great romance, and they owed not a little of their form to Italian sources, but they are very brilliant. One of the best anonymous Spanish stories of the period, The Mock Aunt, is a type of excellence in facetious narrative of the sarcastic class; this is now commnonly attributed to Cervantes himself. No other novelist of Spain has moulded , the thought of Europe, but the heroic romance which occupied so much of the attention of France in the 17th century was invented by a little-known Spanish soldier, Perez de Hita, who, about 1600, wrote fantastic stories about Granada and the Moors. The farcical romance of Fray Gerundio de Campazas, 1758, by J. F. de Isla (1703-1718), competed in popularity with Gil Bias. Speaking broadly, however, Spain made no appreci- able progress in novel-writing from the days of Cervantes to those of Walter Scott, when the Waverley Novels began to find such artless imitators as Martinez de la Rosa and Zorrilla. But the first original novelist of Spain was Cecilia Bohl de Faber (Fernan Caballero) (1796-1877), whose La Gaviota, 1848, a study of life in an Andalusian village, was the earliest Spanish novel, in the modern sense. She was followed by Valera (1824-1904), by Alarcon (1833-1891), by Pereda (b. 1834), by Perez Galdos (b. 1845) an d by Palacio ValdSs (b. 1853), m whom the tendencies of recent European fiction have been competently illustrated without any striking contributions to originality.

12. Germany. — The cultivation of the novel in i*.s proper sense began late in Germany. It is usual to consider that H. J. C. von Grimmelshausen (i625?-i675) is the earliest German novelist;

his very curious romance, Abenleuerliche Simpliclus Simplicis- simus, was printed at Mompelgard in 1669. This is an account of the adventures of a simple-minded fellow during the Thirty Years' War, and is a chain of episodes, brilliantly recorded, but hardly a novel. Early in the 18th century, an extraordinary number of imitations of Defoe's great romance were published in Germany, and these are

known to scholars as the Robinsonaden. Later on, Wieland imitated Don Quixote, but the earliest German novel which possesses original value is the celebrated work of Goethe, The Sorrows of Young Werther (1774). The still more cele- brated Wilhelm Meister did not appear until 1796. A third novel, Elective Affinities, was published by Goethe in 1809. Meanwhile, a very characteristic group of picturesque stories had been issued by Johann Paul Richter (Jean Paul) (1763-1825), destined to have a wide influence upon romantic literature throughout Europe. Purely romantic were the stories of Tieck, of Brentano, of Arnim, of Fouque, of Kleist, of Immermann. The German novelists of this period wrote like poets, deprived of the discipline of verse. In later times novels of high merit have been written by Gustav Freytag, Wilibald Alexis (1798-1871), called the German Walter Scott, Laube, Fontane, Ebers, Jeremias Gotthelf, Berthold Auerbach, Spielhagen, Heyse and many others, but the 19th century produced no German novelist of commanding originality.

13. Russia. — In Russia alone, among the countries of central and eastern Europe, the novel has developed with a radical originality. Until the second quarter of the 19th century the prose fiction of Russia was confined to imitators of Sir Walter Scott, but about the year 1834 Gogol (1809-1852) began to revolt against the historico-romantic school and to produce stories in which an almost savage realism was curiously blended with the Slavonic dreaminess and melancholy. Since then the Russian novel has consistently been the novel of resignation and pity, but wholly divorced from sentimentality. Gogol was suc- ceeded by Gontcharor, Tourgeniev, Dostoievski, Pissemski 1820-1881) and Tolstoi, forming the most consistent and, doubtless, the most powerful school of novelists which Europe saw in the 19th century. The influence of these writers on the rest of the world was immense, and even in England, where it was least acutely felt, it was significant. That the Russians have indicated the path to new fields in the somewhat outworn province of novel-writing is abundantly manifest.

14. Oriental. — In a primitive form, the novel has long been cultivated in Asia. It was introduced into China, but whence is unknown, in the 13th century, and Le Kuan-chung was the first Chinese novelist. The productions of this writer and of his followers are tales of bloody warfare, or record the adventures of travellers. The novel called The Twice-Flowering Plum-Trees, belonging to the 16th (or 17th) century, is a typical example of the moral Chinese novel, written with a virtuous purpose. Professor Giles holds that the novel of China reached its highest point of development in The Dream of the Red Chamber, an anonymous story of the end of the 17th century; this is a panorama of Chinese social life, ” worked out with a completeness

worthy of Fielding." Prose stories began to be met with in the literature of Japan early in the 10th century. But the inventor of the Japanese novel was a woman of genius, Murasaki no Shikibu, whose Genji Monogatari has been compared to the writings of Richardson; it was finished in 1004 and may, there- fore, be considered the oldest novel in the world. This book, which is one of the great classics of Japan, was widely imitated. After the classic period novel-writing was long neglected in Japan, but the humours of 17th-century life were successfully translated into popular fiction by Saikaku (1641-1693), and later by Jisho and Kiseki, who collaborated in a great number of remarkable stories.

See Dunlop, The History of Fiction (1816); Borroneo, Catalogo de' novellieri italiani (1805); Em. Gebhart, Conleurs du moyen dge (1901); E. M. de Vogue, Le Roman russe (1886); Forsyth, Novels and Novelists of the iSlh Century (1871); Bever and Sansot-Orland, CEuvres galantes des conteurs italiens (1903) ; Rivadeneyra, Biblio- ieca de autores espanoles (1 846-1 880); Gosse, A Century of French Romance (1900-1902); G. Pellissier, Le Mouvement littiraire au

XIX' siecle (1889); Zola, Les Romanciers naturalistes (1880); Le Roman experimental (1879); Brunetiere, Le Roman naturaliste (1883); W. Raleigh, The English No«el (1894); V. Chauvin, Les Romanciers grecs et latins (1862); Fancan, Le Tombeati des romans (1626). (E. G.)

NOVELDA, a town of E. Spain, in the province of Alicante; on the right bank of the river Vinalopo, and on the railway from Madrid to Alicante. Pop. (1900) 11,388. The country around is flat and fertile, producing much wine, dates, oranges, oil, saffron and aniseed. In the town there are tanneries, and manufactures of alcohol, chocolate and soap. The women make fine lace. In the neighbouring village of Salinetas de Elda there are warm sulphur and saline baths.

NOVELLI, EBMETE (1851-), Italian actor and play- wright, was born in Lucca on the 5th of March 1851, the son of a prompter. He made his first appearance in 1866, and played character and leading comedy parts in the best companies between 1871 and 1884. By 1885 he had his own company, and made a great success in Paris in 1898 and 1902. He estab- lished in Rome in 1900 a new theatre, the Casa di Goldoni, on the lines of the Comedie Francaise. He dramatized Gaboriau's Monsieur Lecoq, and alone or in collaboration wrote several comedies and many monologues.

NOVELLO, VINCENT (1781-1861), English musician, son of an Italian who married an English wife, was born in London on the 6th of

September 1781. As a boy he was a chorister at the Sardinian chapel in Duke Street, Lincoln's Inn Fields, where he learnt the organ; and from 1796 to 1822 he became in succession organist of the Sardinian, Spanish (in Manchester Square) and Portuguese (in South Street, Grosvenor Square) chapels, and from 1840 to 1843 of St Mary's chapel, Moorfields. He was an original member of the Philharmonic Society, of the Classical Harmonists and of the Choral Harmonists, officiating frequently as conductor. In 1849 he went to live at Nice, wnere he died on the 9th of August 1861. He composed an immense quantity of sacred music, much of which is still deservedly popular; but his great work lay in the introduction to England of unknown compositions by the great masters. The Masses of Haydn and Mozart were absolutely unknown in England until he edited them, as were also the works of Palestrina, the treasures of the Fitzwilliam Museum, and innumerable great compositions now well known to every one. His first work, a collection oi Sacred Music, as performed at the Royal Portuguese Chapel, which appeared in 1811, has the additional interest of giving a date to the practical founding of the publishing firm with which his name is associated, as Novello issued it from his own house; and he did the same with succeeding works, till his son Joseph Alfred Novello (1810-1896), who had started as a bass singer, became a regular music publisher in 1829. It was the latter who really created the business, and who has the credit of introducing cheap music, and departing from the method of publishing by subscription. From 1841 Henry Littleton assisted him, becoming a partner in 1861, when the firm became Novello & Co., and, on J. A. Novello's retirement in 1866, sole proprietor. Having incorporated the firm of Ewer & Co. in 1867, the title was changed to Novello, Ewer & Co., and still later back to Novello & Co., and, on Henry Littleton's death in 1888, his two sons carried on the business.

Vincent Novello had several other children besides his son Joseph Alfred. Four of his daughters (of whom the youngest, Mary, married Charles Cowden Clarke) were gifted singers; but the most famous was Clara Novello (1818-1908), whose beautiful high soprano and pure "style made her one of the greatest vocalists, alike in opera, oratorio and on the concert stage, from 1833 onwards. In 1843 she married Count Gigliucci, but after a few years returned to her profession, and only retired in i860. Charles Lamb wrote a poem (To Clara N.) inherpraise, NOVEMBER (Lat. novem, nine), the ninth month of the old Roman year, which began with March. By the Julian arrangement, according to which the year began with the 1st of January, November became the eleventh month and had thirty days assigned to it. The nth of November was held to mark the

beginning of winter; the sacred banquet called epulum Jovis took place on the 13th. It is said that the senate desired to rename the month in honour of Tiberius — his birthday occurring on the 16th, but the emperor declined, saying, ” What will you do, Conscript Fathers, if you have thirteen Caesars ? ” The Anglo-Saxon names for November were Windmonath, ” wind- month ” and Blodmonath ” bloodmonth.” In the calendar of the first French republic November reappeared partly as Brumaire and partly as Frimaire. The principal November festivals in the calendar of the Roman Church are: All Saints’ Day on the 1st, All Souls’ on the 2nd, St Martin’s on the nth, the Presentation of the Virgin on the 21st, St Cecilia’s on the 22nd, St Catherine’s on the 25th and St Andrew’s on the 30th. St Hubert commemorated on the 3rd. In the English calendar All Saints’ and St Andrew’s are the only feasts retained.

NOVERRE, JEAN GEORGES (1727-1810), French dancer and ballet master, was born in Paris on the 29th of March 1727. He first performed at Fontainebleau in 1743, and in 1747 com- posed his first ballet for the Opera Comique. In 1748 he was invited by Prince Henry of Prussia to Berlin, but a year later he returned to Paris, where he mounted the ballets of Gliick and Piccini. In 1755 he was invited by Garrick to London, where he remained two years. Between 1758 and 1760 he produced several ballets at Lyons, and published his Letlres sur la danse el les ballets. From this period may be dated the revolution in the art of the ballet for which Noverre was re- sponsible. (See Pantomime and Ballet.) He was next engaged by the duke of Wurttemburg, and afterwards by the empress Maria Theresa, until, in 1775, he was appointed, at the request of Queen Marie Antoinette, maitre des ballets of the Paris Opera. This post he retained until the Revolution reduced him to poverty. He died at St Germain on the 19th of November 1810. Noverre’s friends included Voltaire, Frederick the Great and David Garrick (who called him ” the Shakespeare of the dance “). The ballets of which he was most proud were his La Toilette de Venus, Les Jalousies du serail, L’ Amour corsaire and Le Jaloux sans rival. Besides the letters, Noverre wrote Observations sur la construction d’une nouvelle salle de V Opera (1781); Lettres sur Garrick ecrites & Voltaire (1801) ; and Lettre d, un artiste sur les fetes publiques (1801). NOVGOROD, a government of N.W. Russia, bounded W. and N. by the governments of St Petersburg and Olonets, S.E. by Vologda, Yaroslav and Tver, and S.W. by Pskov, stretching from S.W. to N.E. 450 m. Area, 47,223 sq. m. Pop. (1906) i,555i7°°-

The S. is occupied by the Valdai plateau, in which are the highest elevations of middle Russia (600 to over 1000 ft.), as well as the sources of nearly all the great rivers of the country. The plateau is deeply furrowed by valleys with abrupt slopes, and descends rapidly towards the basin of Lake Ilmen in the W. (only 60 ft. above the sea-level). The N.E. of the government belongs to the lacustrine region of N.W. Russia. This tract is dotted over with innumerable sheets of water, of which Byelo-ozero (White Lake) and Vozhe are the largest of more than 3000. Immense marshes, overgrown with thin forests of birch and elm, occupy more than one-seventh of the entire area of the government; several of them have an area of 300 to 450 sq. m. each. They admit of being crossed only when frozen. Six centuries ago they were even less accessible, but the slow upheaval of N.W. Russia, going on at the rate of 3 or more feet per century, has exercised a powerful influence upon the drainage of the country. Of recent years artificial drainage has been carried out on a large scale. The forests still occupy 55 % of the total area of the government.

Geologically, Novgorod exhibits in the W. vast beds of Devonian limestones and sandstones; these are elsewhere overlaid with Carboniferous limestone, dolomite, sandstones and marls. The Devonian gives rise to salt-springs, especially at Staraya Russa (S. of Lake Ilmen), and contains iron-ores, while the more recent forma- tion has coal strata of inferior quality. The whole is covered with a thick sheet of boulder-clay, very often arranged in ridges or eskers, the bottom moraine of the N. European ice-sheet of the Glacial period. Numerous remains of the neolithic Stone Age are found, especially round the extinct lakes. The Baltic and Caspian Sea basins are connected by the Mariinsk, Tikhvin and Vyshniy-Volochok canals, while the Alexander-von-Wurttemberg canal connects the tributaries of the White Sea with those of the Baltic. The chief river is the Volkhov, which flows from Lake Ilmen into Lake Ladoga.

Other navigable rivers are the Syas, also flowing into Lake Ladoga, and the Sheksna and the Mologa, tributaries of the Volga. The Msta and the Lovat are the principal streams in the basin of Lake Ilmen. All boats from the Volga to St Petersburg pass through this government.

The yearly average temperature at Novgorod is only 40 Fahr. (14-5° in January, 62-5° in July). The severe climate, the marshy or stony soil, and the want of grazing grounds render agriculture unprofitable, though it is carried on everywhere. The yield of rye and other cereals is insufficient for the wants of the inha- bitants. Fireclay, coal and turf are extracted in commercial quantities. Building, smith-work, fishing, shipbuilding, dis- tilleries, glass and match factories, sawmills and a

variety of domestic industries give occupation to about 40,000 families. Hunting is still profitable. But most of the inhabitants are dependent on the river-boat traffic; and nearly one-fourth of the able-bodied males are annually driven to other parts of Russia . in search of work. The Novgorod carpenters and masons have long been renowned. Trade is chiefly in grain and timber, and in manufactures and grocery wares from St Petersburg. The fairs are numerous, and several of them (Kirilovsk monastery, Staraya Russa and Cherepovets) show considerable returns.

The inhabitants are almost exclusively Great-Russians, but they are discriminated by some historians from the Great- Russians of the basin of the Oka, as showing remote affinities with the Little-Russians. They belong mostly (96!%) to the Orthodox Greek Church, but there are many Nonconformists. There are 10,000 Karelians and 9000 Chudes, with some Jews and some Germans. Novgorod is well provided with educa- tional institutions, and primary education is widely diffused in the villages. (P. A. K.; J. T. Be.)

NOVGOROD (formerly known as Velikiy-Novgorod, Great Novgorod), a town of Russia, capital of the government of the same name, and the seat of an archbishop of the Orthodox Greek Church, situated 119 m. by rail S. of St. Petersburg, on the low flat banks of the Volkhov, 2 m. below the point where it issues from Lake Ilmen. Pop. (1900) 26,972. The present town is but a poor survival of the wealthy city of medieval times. It con- sists of a kremlin (old fortress), and of the city, which stands on both banks of the river, connected by a handsome stone bridge. The kremlin was much enlarged in 1044, and again in 11 16. Its stone walls, originally palisades, were begun in 1302, and much extended in 1490. Formerly a great number of churches and shops, with wide squares, stood within the enclosure. Its his- torical monuments include the cathedral of St Sophia, built in 104 5-1052 by architects from Constantinople to take the place of the original wooden structure (989), destroyed by fire in that year. Some minor changes were made in 1688 and 1692, but otherwise (notwithstanding several fires) the building remained unaltered until its restoration in 1893-1900. It contains many highly-prized relics, including bronze doors of the 12th century, one brought reputedly from Sigtuna, the ancient capital of Sweden. Another ancient building in the kremlin is the Yaroslav Tower, in the square where the Novgorod vyeche (common council) used to meet; it still bears the name of ” the court of Yaroslav ” ; and was the chancellery of the secretaries of the vyeche. Other remarkable monuments of ancient Russian architecture are the church of St. Nicholas erected in 1135, the Snamenski cathedral of the 14th century, and churches of the 14th and 15th

centuries. Within the town itself there are four monasteries and convents, two of them dating from the nth century and two from the 12th century; and the large number in the immediate neighbourhood shows the great extent which the city formerly had. A monument to commemorate the thousandth anniversary of the foundation of Russia (the calling in of the Varangians by Novgorod in 862) was erected in 1862. Another monument commemorates the repulse of the Napoleonic invasion of 181 2.

The date at which the Slavs first erected forts on the Volkhov (where it leaves Lake Ilmen and where it flows into Lake Ladoga) is unknown. That situated on a low terrace close by Lake Ilmen was soon abandoned, and Novgorod or ” New-town ”

(in contradistinction to the Scandinavian Aldegjeborg or Ladoga) was founded by Scandinavian sea-rovers as Holmgard on another terrace which extended a mile lower on both banks of the river. The older fort (Gorodishche) still existed in the 13th century. Even in the 9th century the new city on the Volkhov exercised a kind of supremacy over the other towns of the lake region, when its inhabitants in 862 invited the Varangians, under the leadership of Rurik, to the defence of the Russian towns of the north. Down to the end of the 10th century Novgorod was in some sort depended on Kiev; yet in 997 its inhabitants obtained from their own prince Yaroslav a charter which granted them self-government. For five centuries this charter was the bulwark of the independence of Novgorod. From the end of the 10th century the princes of Novgorod, chosen either from the sons of the great princes of Kiev (until 1136) or from some other branch of the family of Rurik, were always elected by the vyeche; but they were only its military defenders, and their delegates were merely assessors in the courts which levied taxes for the military force raised by the prince. The vyeche invariably expelled the princes as soon as they provoked discontent. Their election was often a subject of dispute between the wealthier merchants and landowners and the poorer classes; and Novgorod, which was dependent for its corn supply upon the land of Suzdal, was sometimes compelled to accept a prince from the Suzdal branch instead of from that of Kiev. After 1270 the city often refused to have princes at all, and the elected mayor was the representative of the executive. Novgorod in its transactions with other cities took the name of ” Sovereign Great Novgorod ” (Gospodin Velikiy Novgorod). The supreme power was in the hands of the

vyeche. The city, which had a population of more than 80,000, was divided into wards, and each ward constituted a distinct commune. The wards were subdivided into streets, which correspended to the prevailing occupations of their inhabitants, each .of these again being quite independent with regard to its own affairs.

Trade was carried on by corporations. By the Volkhov and the Neva, Novgorod — then known also as Naugart and Nov- werden — had direct communication with the Hanseatic and Scandinavian cities, especially with Visby or Wisby on the bland of Gotland. The Dnieper brought it into connexion with the Bosporus, and it was intermediary in the trade of Constan- tinople with northern Europe. The Novgorod traders penetrated at an early date to the shores of the White Sea, hunted on Novaya Zemlya in the nth century, colonized the basins of the northern Dvina, descended the Volga, and as early as the 14th century extended their trading expeditions beyond the Urals into Siberia. Two great colonies, Vyatka and Vologda, organized on the same republican principles as the metropolis, favoured the further colonization of N.E. Russia.

At the same time a number of flourishing minor towns such as Novyi Torg (Torzhok), Novaya Ladoga, Pskov, and many others arose in the lake region. Pskov soon became quite independent, and had a history of its own; the others enjoyed a large measure of independence, still figuring, however, as subordinate towns in all circumstances which necessitated common action. It is said that the population of Novgorod in the 14th century reached 400,000, and that the pestilences of 1467, 1508 and 1533 carried off no fewer than 134,000 persons. These figures, however, seem to relate rather to the whole Ilmen region.

Novgorod's struggle against the Suzdal region (now the govern- ment of Vladimir) began as early as the 12th century. In the following century it had to contend with the Swedes and the Germans, who were animated not only by the desire of territorial acquisition, but also by the spirit of religious proselytism. The advances of both were checked by battles at Ladoga and Pskov in 1240 and 1242 respectively. Protected by its marshes, Novgorod escaped the Mongol invasion of 1 240-42, and was able to repel the attacks of the princes of Moscow by whom the Mongols were supported. It also successfully resisted the attacks of Tver, and aided Moscow in its struggle against this powerful neighbour; but soon the ambition of the growing Moscow state was turned against itself. The first serious invasion, in 1332, was rolled back

with the aid of the Lithuanians. But in 1456 the great prince of

Moscow succeeded in imposing a heavy tribute. Ivan III. of Moscow took possession of the colonies in the northern Dvina and the Perm regions, and began two bloody wars, during which Novgorod fought for its liberty under the leadership of Martha Boretskaya, the mayor. In 1475-1478 Ivan III. entered Novgorod, abolished its charters, and carried away 1000 of the wealthier families, substituting for them families from Moscow; the old free city then recognized his sovereignty. A century later Ivan IV. (the Terrible) abolished the last vestiges of the inde- pendence, of the city. Having learned that a party favourable to Lithuania had been organized in Novgorod, he took the field in 1570, and entered the city (much weakened by the recent pestilences) without opposition. His followers killed the heads of the monasteries, the wealthier of the merchants and clergy, and burned and pillaged the city and villages. No fewer than 15,000 men, women and children were massacred at Novgorod alone (60,000 according to some authorities). A famine ensued, and the district of Novgorod fell into utter desolation. Thousands of families were transported to Moscow, Nizhniy-Novgorod, and other towns of the principality of Moscow. In the beginning of the 17th century Novgorod was taken and held for seven years by the Swedes; and in the 18th century the foundation of St Petersburg ultimately destroyed its trade. Its position, however, on the water highway from the Volga to St Petersburg and on the trunk road from Moscow to the capital, still gave it some commercial importance; but even this was destroyed by the opening of the Vishera canal, connecting the Msta with the Volkhov below the city, and by the construction of the railway from St Petersburg to Moscow, which passes 46 m. to the east of Novgorod. (P. A. K.; J. T. Be).

NOVIBAZAR, Novi-Bazar, or Novipazar (ancient Rassia, Rascia, or Rashka, Turkish Yenipazar, i.e. ” New Market “), a sanjak of European Turkey, in the vilayet of Kossovo. Pop. (1905) about 170,000. Novibazar is a mountainous region, watered by the Lim, which flows north into Bosnia, and by several small tributaries of the Servian Ibar. About three- fourths of the inhabitants are Christian Serbs, and the remainder are chiefly Moslem Albanians, with a few gipsies, Turkish officials and about 3000 Austro-Hungarian soldiers. The local trade is mainly agricultural. The sanjak is of great strategic importance, for it is the N .W. part of the Turkish empire, on the direct route between Bosnia and Salonica, and forms a wedge of Turkish territory between Servia and Montenegro. The union of these powers, combined with the annexation of Novibazar, would have impeded the extension of Austrian influence towards Salonica. But by the treaty of Berlin (1878) Austria-Hungary was empowered to garrison the towns of Byelopolye,

Priyepolye, Plevlye and other strategic points within the sanjak, although the entire civil administration remained in Turkish hands. This decision was enforced in 1879. The chief approaches from Servia and Montenegro have also been strongly fortified by the Turks.

Novibazar, the capital of the sanjak, is a town of about 12,00c inhabitants, on the site of the ancient Servian city of Rassia. Near it there are Roman baths, and the old church of St Peter and St. Paul, the metropolitan church of the bishopric of Rassia, in which Stephen Nemanya, king of Servia, passed from the Roman to the Greek Church in 1143.

NOVICE (through French from Lat. novicius or novitius, one who has newly arrived, novus, new), a person who joins a religious order on probation. He or she is subject to the authority of the superior, wears the dress of the order, and obeys the rules. At the end of the " novitiate," which must last at least one year, the novice is free to leave without taking the vows, and the order is free to refuse to allow him or her to take them. The word was early used of a beginner in any art or science, hence an inex- perienced person.

NOVI LIGURE, a town of Piedmont, Italy, in the province of Alessandria, from which it is 14 m. S.E. by rail, situated among wooded hills, 646 ft. above sea-level. Pop. (1901) 17,868. It was the scene of a victory by the Austrians and Russians under

Suvorov over the French in 1799. It is now an important railway junction, the main lines from Turin and Milan to Genoa con- verging here. Cotton, silk, coal briquettes, &c, are also manu- factured here.

NOVO-BAYAZET, a town of Russian Transcaucasia, in the government of Erivan, 35 m. E.N.E. of the town of Erivan, and 4 m. W. of Gok-chai Lake, 5870 ft. above the sea. Pop. 8507 in 1897, mainly Armenians. An Armenian village which stood here was destroyed by Nadir Shah of Persia in 1736, and it was not till the Turkish War of 1828-29 that the site was again occupied by Armenian refugees from the Turkish town of Bayazet or Bayazid.

NOVOCHERKASSK, a town of Russia, capital of the Don Cossacks territory, situated on a hill 400 ft. above the plain, at the confluence of the Don with the Aksai, 45 m. from the Sea of Azov, and 32 m. by rail N.E. from Rostov. Pop. (1897) 52,005. It was founded in 1805,

when the inhabitants of the Cherkassk stanitsa (now Old Cherkassk) were compelled to leave their abodes on the banks of the Don on account of the frequent inundations. The town is an archiepiscopal see of the Orthodox Greek Church, and possesses a cathedral (1904), a museum, the palace of the ataman (chief) of the Cossacks, and monuments to M. I. Platov (a Cossack chief) and T. Yermak (1904), the con- queror of West Siberia. Wide suburbs extend to the S.W., and the right bank of the Aksai is dotted with the villas of the Cossack officials. Manufactures make slow progress. An active trade is carried on in corn, wine and timber (exports), and manufactures and grocery wares (imports).

NOVOGEORGIEVSK. (1) A town of Russia, usually known under the name of Krylov, in the government of Kherson, at the confluence of the Tyasmin with the Dnieper, 17 m. W.N.W. of Kremenchug. Its fort was erected by the Poles in 1615. The inhabitants carry on a lively trade in timber, grain and .cattle, and have a few flourmills and candle-works. Pop. (1897) 11,214. (2) A ‘first-class fortress of Russian Poland (called Modlin till 1831), at the confluence of the Narev (Bug) with the Vistula, 23 m. by rail N.W. of Warsaw. Modlin was first fortified under the Napoleonic regime in 1807, and in the wars of 1813 and 1830-31 underwent several sieges. Since that time the Russians have made many additions to the works, and the place now forms, with Warsaw, Ivangorod and Brest-Litovsk, the so-called Polish Quadrilateral. The strength of Novo- georgievsk lies mainly in the new circle of eight powerful forts, erected at a mean distance of 10 m. from the enceinte. The importance of the fortress lies in the fact that it prevents Warsaw from being turned by a force on the lower Vistula and commands the railway between Danzig and Warsaw.

NOVOMOSKOVSK, a town of Russia, in the government of Ekaterinoslav, 16 m. N.E. of the town of Ekaterinoslav. Includ- ing several villages which have been incorporated with it, it extends for nearly 7 m. along the right bank of the Samara, a tributary of the Dnieper. In the 17th century the site was occupied by several villages of Zaporogian Cossacks, known under the name of Samarchik. In 1687 Prince Golitsuin founded here the Ust-Samara fort, which was destroyed after the treaty of the Pruth (1711), but rebuilt in 1736, and the settlement of Novoselitsy established. The inhabitants of Novomoskovsk, who numbered 23,381 in 1900, are chiefly engaged in agriculture, though some are employed in tanneries, and there is a trade in horses, cattle, tallow, skins, tar and pitch. In the immediate neighbourhood is the Samarsko-Nikolayevskiy monastery, which is visited by many pilgrims.

NOVO-RADOMSK, or Radomsko, a town of Russian Poland, in the government of Piotrkow, 28 m. by rail S.S.W. of the town of Piotrkow. It has factories for bentwood furniture, woollens and cloth, tanneries, ironworks and sawmills, and is the centre of a very active trade. Pop. (1900) 14,464, many being Jews.

NOVOROSSIYSK, a seaport town of S. Russia, in the Cherno- morsk or Black Sea territory, on a bay of the same name (also named Tsemes), on the N.E. coast of the Black Sea. Pop. (1900) 401384- The bay, nearly 3 m. wide at its entrance on the

E., and 5 m. deep from E. to W., is exposed to the N.E. wind (bora), which sweeps down from the Caucasus Mountains with great violence. There is an artificial harbour (1893) protected by a mole. Novorossiysk is connected by a branch railway to Tikhoryetskaya (169 m.) with the main Caucasian line, which crosses the Volga near Tsaritsyn, and has become an important centre for the export of corn, and since the petroleum wells of Groznyi in northern Caucasia were tapped it has become an entrep6t for the export of petroleum. Cement is manufac- tured. Large grain elevators have been built, and a new com- mercial town has grown up. Besides cereals, which amount to 69% of the whole, the exports consist of petroleum and petroleum waste, oilcake, linseed, timber, bran, millet seed, wool, potash, zinc ore and liquorice, the total annual value ranging between 35 and 5j millions sterling. The imports are small. Some 1500 acres in the vicinity of the town are planted with vines. Novorossiysk has belonged to Russia since 1829.

NOWELL, ALEXANDER (c. 1 507-1602), dean of St Paul's,' London, was the eldest son of John Nowell of Read Hall, Whalley, Lancashire, by his second wife Elizabeth Kay of Rochdale. He was educated at Middleton, Lancashire, and at Brasenose College, Oxford, where he is said to have shared rooms with John Foxe the martyrologist. He was elected fellow of Brasenose in 1526. In 1543 he was appointed master of Westminster school, and in December 1551 prebendary of Westminster. He was elected in September 1553 member of parliament for Looe in Cornwall in Queen Mary's first parliament, but in October 1553 a committee of the house reported that, having as prebendary of Westminster a seat in convocation, he could not sit in the House of Commons. He was also deprived of his prebend, probably as being a married man, before May 1554, and sought refuge at Strassburg and Frankfort, where he developed puritan and almost presbyterian views. He submitted, however, to the Elizabethan settlement of religion, and was rewarded with the archdeaconry of Middlesex, a canonry at Canterbury and in 1560 with the deanery of

St Paul's. His sermons occasionally created some stir, and on one occasion Elizabeth interrupted his sermon, telling him to stick to his text and cease slighting the crucifix. He held the deanery of St Paul's for forty-two years, surviving until the 13th of February 1602. Nowell is believed to have composed the Catechism inserted before the Order of Confirmation in the Prayer Book of 1549, which was supplemented in 1604 and is still in use; but the evidence is not conclusive. Early in Elizabeth's reign, however, he wrote a larger catechism, to serve as a statement of Protestant principles; it was printed in 1570, and in the same year appeared his " middle " catechism, designed it would seem for the instruction of " simple curates." Nowell also established a free school at Middleton and made other benefactions for educational purposes. He was twice married, but left no children.

See Ralph Churton, Life of Alexander Nowell (Oxford, 1809); G. Burnet, History of the Reformation (new ed., Oxford, 1865) ; and R. W. Dixon, History of the Church of England. Also the Works of John Strype; the Publications of the Parker Society; the Calendar of State Papers, Domestic; and the Diet. Nat. Biog., vol. lv.

NOWGONG, a town of India, headquarters of the Bundelkhand agency and a military cantonment, in the native state of Chhatar- pur, on the border of the British district of Jhansi. Pop. (1901) 11,507. It has accommodation for a force of all arms. The college for the education of the sons of chiefs in Central India, opened here in 1872, was abolished in 1898, owing to the small attendance.

NOWGONG, a town and district of British India, in the Brahmaputra valley division of eastern Bengal and Assam. The town is situated on the Kalang river. Pop. (1901) 4430. The district of Nowgong has an area of 3843 sq. m. It consists of a wide plain overgrown with jungle and canebrakes, intersected by numerous tributaries of the Brahmaputra, and dotted ™ifh shallow marshes. The Mikir hills cover an area of about 65 M by 35 in the S. of the district; the highest peak is about 3500 ft. I The slopes are very steep, and are covered with dense for«"ji.

The Kamakhya hills near the bank of the Brahmaputra, are about 1500 ft. high. On the summit of the highest peak is a celebrated temple of Kamakhya, the local goddess of love, where three annual festivals are held. The staple crop is rice. Tea cultivation and manufacture are

carried on by European capital and under European supervision, though the soil and climate are not so favourable'as in Upper Assam. The population in 1901 was 261,160, showing a decrease of 24-8% in the decade, due to the extreme unhealthiness of the climate. In the previous ten years the number of deaths recorded from fever and kala azar was 93,824. The section of the Assam-Bengal railway from Gauhati to the hills passes through part of the district, but not very near Nowgong town; and feeder roads to the stations lead from the main road that runs parallel to the Kalang river.

See Nowgong District Gazetteer (Calcutta, 1905).

NOWSHERA, or Naushahra, a town and cantonment in Peshawar district of the North-West Frontier Province of India, situated on the right bank of the Kabul river 27 m. E. of Peshawar. Pop. (1901) 9518. It is the headquarters of a brigade in the 1st division of the northern army, and also the junction for the frontier railway that runs to the station of Mardan and continues to Dargai and Malakand on the route to Chitral.

NOY, WILLIAM (1577-1634), English jurist, was born on the family estate of Pendrea in Buryan, Cornwall, in 1577, his father belonging to a family whose pedigree is included in the visitation of Cornwall in 1620. He went to Exeter College, Oxford, but left without taking a degree. He entered Lincoln's Inn in 1594. From 1603 until his death he was elected, with one exception, to each parliament, sitting invariably for a constituency of his native county. For several years his sym- pathies were in antagonism to the court party. Every commis- sion that was appointed numbered Noy among its members, and even those who were opposed to him in politics acknowledged his learning. A few years before his death he was drawn over to the side of the court, and in October 1631 he was created attorney-general, but was never knighted. It was through his advice that the impost of ship-money was levied. Noy had long suffered from stone, and died in great agony on the 9th of August 1634; two days later- he was buried at New Brentford church. His principal works are On the Grounds and Maxims of the Laws of this Kingdom (1641) and The Compleat Lawyer (1661). NOYON, a city of N. France, in the department of Oise, 67 m. N.N.E. of Paris by the railway to Brussels. Pop. (1906) 5968. Noyon is built at the foot and on the slopes of a hill, and traversed by a small stream, the Verse, which joins the Oise 1 m. farther down. The old cathedral of Notre-Dame, con- structed on the site of a church burned in 1131, is a fine example of the transition from Romanesque to Gothic architecture. In plan it is a Latin cross, with a total length from E. to W. of about 340 ft. ; the height of the nave vaulting is 75 ft. The

west front has a porch, added in the 14th century, and two unfinished towers, their upper portions dating from the 13th century; its decorations have been greatly mutilated. The nave consists of eleven bays, including those of the W. front, which, in the interior, forms a kind of transept. In the windows of the aisles, the arches of the triforium, and the windows of the clerestory the round type is maintained; but double pointed arches appear in the lower gallery; and the vaults of the roof, originally six-ribbed, were rebuilt after a fire in 1293 in the prevailing Pointed style. The transepts have apsidal terminations. Side chapels were added in the N. aisle in the 14th century and in the S. aisle in the 15th and the 16th, one of the latter (15th) is especi- ally rich in decorations. The flying buttresses of the building were restored in the 19th century in the style of the 12th century. From the N.W. corner of the nave runs the western gallery of a fine cloister erected in 1230; and next to the cloister is the chapter-house of the same date, with its entrance adorned with statues of the bishops and other sculpture. The bishops' tombs within the cathedral were destroyed during the Revolution. The chapel of the bishops' palace is an example of the Early

Pointed style; the canons' library was built of wood early in the 1 6th century; and the town-hall (Gothic and Renaissance) dates from 1485-1523. Among the town manuscripts is the Red Book or communal charter of Noyon. Remains of the Roman walls may be traced. There is a statue to Jacques Sarrazin, the painter (1592-1660), a native of the town. Noyon has good trade in grain and live-stock, and contains chemical and artificial manure works, tanneries and ironfoundries and carries on sawmilling and sugar manufacture.

Noyon, the ancient Noviomagus Veromanduorum, was christianized by St Quentin at the close of the 3rd century; and about 530 St Medard, bishop of the district of Vermandois, transferred his see thither from St Quentin. The episcopate of St Eligius towards the middle of the 7 th century, the burial of Chilperic I., the coronation of Pippin the Short in 752, and on the same occasion the coronation of his infant son Carloman with the title of king of Noyon, the coronation of Charlemagne in 768 and the election of Hugh Capet in 987, the plunder of the town by the Normans in 859 are the chief events in the history of Noyon down to the 10th century. Till the Revolution the bishopric was one of the ecclesiastical peerages of the kingdom. At the beginning of the 12th century Noyon easily obtained a communal charter through the favour of its bishops. The extent of the bishopric was considerably curtailed towards the middle of the 1 2th century by the breaking off of the diocese of Tournai. Noyon was ravaged by the English and the Burgundians during the Hundred Years' War. In 15 16

a truce was signed there by Francis I. and Charles V. The city was captured by the Spaniards in 1552, and afterwards by the Leaguers, who were expelled in 1594 by Henry IV. John Calvin was born at Noyon in 1509.

See A. Lefranc, Histoire de Noyon jusqu'd la fin du XIII" Steele (Paris, 1887).

NOZU, MICHITSURA, Marquess (1840-1908), Japanese field-marshal, was born in Satsuma. He fought against the Satsuma rebels in 1877, became a general in 1894 and led the Hiroshima division at the battle of Pingyang (1894). He succeeded Yamagata in the command-in-chief of the Manchurian army, and fought in that capacity throughout the China- Japan War, being raised to the rank of viscount (1895). He commanded the fourth army in the Russo-Japanese War, and received a marquessate at its close. He died in 1908.

NUBAR PASHA (1825-1899), Egyptian statesman, was born at Smyrna in January 1825, the son of an Armenian merchant named Moghreditch, who had married a relative of Boghos Bey, an influential minister of Mehemet Ali. Boghos had promised to interest himself in the future of his young relative, and at his suggestion he was sent first to Vevey, and then to Toulouse, to be educated by the Jesuits, from whom he acquired a very perfect knowledge of French, and perhaps that singular suppleness and subtlety of character by which he was mainly distinguished. Before he was eighteen he went to Egypt, and after some eighteen months' training as secretary to Boghos, who was then minister of both commerce and foreign affairs, he was made second secretary to Mehemet Ali. In 1845 he became first secretary to Ibrahim Pasha, the heir apparent, and accompanied him on a special mission to Europe. Abbas Pasha, who succeeded Ibrahim in 1848, maintained Nubar in the same capacity, and sent him in 1850 to London as his representative to resist the pretensions of the sultan, who was seeking to evade the conditions of the treaty under which Egypt was secured to the family of Mehemet Ali. Here he was so completely successful that he was made a bey; in 1853 he was sent to Vienna on a similar mission, and remained there until the death of Abbas in July 1854. The new viceroy, Said, at once dismissed him from office, but two years after- wards appointed him his chief secretary, and later gave him charge of the important transport service through Egypt to India. Here Nubar was mainly instrumental in the completion of railway communication between Cairo and Suez, and ex- hibited strong organising ability combined with readiness of resource. After a second time falling a victim to Said's caprice I and being dismissed, he was again sent to Vienna, and returned as

principal secretary to Said, a position he held till Said's death in January 1863.

On the accession of Ismail Pasha, Nubar Bey was in the prime of life. He was already on friendly terms with him; he even claimed to have saved his life — at all events, it was a coincidence that the two had together refused to travel by the train the accident to which caused the death (on the 14th of May 1858) of the prince Ahmed, who would otherwise have succeeded Said. Ismail, himself a more capable man than his immediate pre- decessors, at once recognized the ability of Nubar, and charged him with a mission to Constantinople, not only to notify his accession, but to smooth the way for the many ambitious projects he already entertained, notably the completion of the Suez Canal, the change in title to that of khedive and the change in the order of succession. In the first of these he was completely successful; the sultan, believing as little as every one else that the canal was anything more than a dream, gave his consent at a price the moderation of which he must afterwards have regretted. The gratified Ismail created Nubar a pasha, and the sultan himself, persuaded to visit Cairo, confirmed the title so rarely accorded to a Christian. Half the work was, however, yet to be done, and Nubar was sent to Paris to complete the arrangements, and to settle the differences between Egypt and the Canal Company. In what he used to call " an expensive moment of enthusiasm," he left these differences to the arbitration of the emperor Napoleon III. and cost Egypt four millions sterling. On his return he was made Egypt's first minister of public works, and was distinguished for the energy which he threw into the creation of a new depart- ment; but in 1866 he was made minister of foreign affairs, and at once went on a special mission to Constantinople, where he succeeded in the other two projects that had been left in abeyance since his last visit. In June 1867 Ismail was declared khedive of Egypt, with succession in favour of his eldest son. Nubar now had a harder task to undertake than ever before. The antiquated system of " capitulations " which had existed in the Ottoman empire since the 15th century had grown in Egypt to be a practical creation of seventeen imperia in imperio; seven- teen consulates of seventeen different powers administered seven- teen different codes in courts before which alone their subjects were amenable. A plaintiff could only sue a Frenchman in the French court, with appeal to Aix; an Italian in the Italian court, with appeal to Ancona; a Russian in the Russian court, with appeal to Moscow. Nubar's bold design, for which

alone he deserves the credit, was to induce these seventeen powers to consent to abandon their jurisdiction in civil actions, to sub- stitute mixed International Courts and a uniform code binding on all. That in spite of the jealousies of all the powers, in spite of the opposition of the Porte, he should have succeeded, places him at once in the first rank of statesmen of his period. Nubar made no attempt to get rid of the criminal jurisdiction exer- cised by the consular representatives of the foreign powers — such a proposal would have had, at that time, no chance of success.

The extravagant administration of Ismail, for which perhaps Nubar can hardly be held wholly responsible, had brought Egypt to the verge of bankruptcy, and Ismail's disregard of the judg- ments of the Court at last compelled Great Britain and France to interfere. Under pressure, Ismail, who began to regret the establishment of the International Courts, assented to a mixed ministry under Nubar, with Rivers Wilson as minister of finance and de Blignieres as minister of public works. Nubar, finding himself supported by both Great Britain and France, tried to reduce Ismail to the position of a constitutional monarch, and Ismail, with an astuteness worthy of a better cause, took ad- vantage of a somewhat injudicious disbandment of certain regiments to incite a military rising against the ministry. The governments of Great Britain and France, instead of supporting the ministry against the khedive, weakly con- sented to Nubar's dismissal; but when this was shortly fol- lowed by that of Rivers Wilson and de Blignieres they realized that the situation was a critical one, and they succeeded in obtaining from the sultan the deposition of Ismail and the sub-

stitution of his son Tewfik as khedive (1879). Nubar remained out of office until 1884.

In the interval Great Britain had intervened in Egypt — the battle of Tel-el-Kebir had been fought, Arabi had been banished, and Sir Evelyn Baring (afterwards earl of Cromer) had succeeded Sir Edward ftfalet. The British government, under the advice of Baring, insisted on the evacuation of the Sudan, and Sherif having resigned office, the more pliant Nubar was induced to become premier, and to carry out a policy of which he openly disapproved, but which he considered Egpyt was forced to accept under British dictation. At this period he used to say, " I am not here to govern Egypt, but to administer the British government of Egypt. I am simply the greaser of the official wheels." It might have been well if Nubar had confined himself to this modest programme, but it was perhaps hardly to be expected of a man of his ability and restless energy. It must be admitted, however, that

the characters of Nubar and Lord ■ Cromer were not formed to run in harness, and it was with no surprise that the public learnt in June 1888 that he had been relieved of office, though his dismissal was the direct act of the khedive Tewfik, who did not on this occasion seek the advice of the British agent. Riaz Pasha, who succeeded him, was, with one interval of eight months, prime minister until April 1894, when Nubar returned to office. By that time Lord Cromer had more completely grasped the reins of administration as well as of government, and Nubar had realized more clearly the role which an Egyptian minister was called on to play: Lord Cromer was the real ruler of Egypt, and the death of Tewfik in 1890 had necessitated a more open exercise of ■ British authority. In November 1895 Nubar completed his fifty years of service, and, accepting a pension, retired from office. He lived little more than three years longer, spending his time between Cairo and Paris, where he died in January 1899 at the age of seventy- four. (C. F. M. B.)

NUBIA, a region of north-east Africa, bounded N. by Egypt, E. and W. by the Red Sea and the Libyan Desert respectively, and extending S. indefinitely to about the latitude of Khartum. It may be taken to include the Nile valley from Assuan near the First Cataract southwards to the confluence of the White and Blue Niles, stretching in this direction for about 560 m. between 1 6° and 24 N. Nubia, however, has no strictly defined limits, and is little more than a geographical expression. The term appears to have been unknown to the ancients, by whom every- thing south of Egypt was vaguely called Ethiopia, the land of the dark races. It is first associated historically, not with any definite geographical region, but with the Nobatae, a negro people removed by Diocletian from Kharga oasis to the Nile valley above Egypt (Dodecaschoenus), whence the turbulent Blemmyes had recently been driven eastwards. From Nuba, the Arabic form of the name of this people, comes the modern Nubia, a term about the precise meaning of which no two writers are in accord. Within the limits indicated the country consists mainly of sandy desert and rugged and arid steppes and plateaus through which the Nile forces its way to Upper Egypt. In this section of the river there occurs a continuous series of slight falls and rapids, including all the historical ” six cataracts,” beginning below Khartum and terminating at Philae. Between those places the river makes a great S-shaped bend, the region west of the Nile within the lower bend being called the Bayuda Desert, and that east of the Nile the Nubian Desert. The two districts roughly correspond to the conventional divisions of Upper and Lower Nubia respectively. Except along the narrow valley of the Nile only the southernmost portion of Nubia contains arable land. The greater

part is within the almost rainless zone. An auri- ferous district lies between the Nile and the Red Sea, in 22° N. Politically the whole of Nubia is now included either in Egypt or the Anglo-Egyptian Sudan, and has no administrative existence. Ethnology. — As an ethnical expression the term Nuba or Nubian has little value. Rejected by the presumable descend- ants of Diocletian's Nobatae, who now call themselves Berber or Barabara, it has become synonymous in the Nile valley with " slave," or " negro slave." This is due to the large number of

slaves drawn by Arab dealers from the Nuba negroes of Kordofan, who appear to constitute the original stock of the Nubian races (but see Hamitic Races). On the other hand, the name has never included all the inhabitants of Nubia. Peoples of three distinct stocks inhabit the country — the comparatively recent Semitic Arab intruders, mainly in Upper Nubia, the Beja (? Hamitic) family of tribes (the Ababda, Bisharin, Hadendoa, Beni-Amer, &c), everywhere between the Nile and the Red Sea; and the Nubians (Nuba or Barabira), in Lower Nubia, where they are now almost exclusively confined to the banks of the Nile, from Assuan southwards to Dongola. Ethnologically these modern Nubians are a very mixed people, but their affiliation to negroes or negroids, which is based on physical and linguistic grounds, is confirmed by what is known of the history of the Nilotic peoples.

The first inhabitants of the region beyond Egypt appear to have been the Uaua, whose name occurs in an inscription on a tomb at Memphis of the Vlth Dynasty, and again constantly in subsequent inscriptions down to the time of the Ptolemies, as the chief negro race to the south of Syene. (For the history of the country during this period see Ethiopia). It thus appears that throughout the historic period down to the arrival of the Romans the Nile-country above Egypt was occupied by a negro people. Egyptian monuments are found as far south as Mount Barkal (Napata), but no Egyptian settlements beyond Syene. Hence these Uaua negroes probably remained unaffected, or very slightly affected, by foreign elements until about the 3rd century a.d. Their domain then began to be encroached upon from the east by the Blemmyes, who have been identified with the present Beja of the Nubian desert. It was owing to their incessant raids that Diocletian withdrew the Roman garrisons above the cataracts, and called in the warlike Nobatae to protect the Egyptian frontier from their attacks.

These negro Nobatae, originally from Kordofan, as is now evident, had advanced to the Great Oasis (Kharga) in Upper Egypt, whence they passed into the Nile valley between the cataracts. Here they absorbed the older Uaua of kindred stock, and ultimately came to terms with the Blemmyes. The two races even became intermingled, and, making common cause against the Romans, were defeated by Maximinus in 451.

The Blemmyes, remaining pagan after the Nubas had embraced Christianity (6th century) were soon after driven from the Nile valley eastwards to the kindred Megabares, Memnons and other nomads, who, with the Troglodytes, had from time immemorial held the whole steppe region between the Nile and the Red Sea from Axum to Egypt. Here their most collective name was Bugaitae (BoiryaeiraQ, as appears from the Axumite inscription, whence the forms Buja, Beja, which occur in the oldest Arab records, and by which they are still known.

In the 7th century the Arabs who had conquered Egypt penetrated into Lower Nubia, where the two Jawabareh and Al-Gharblya tribes became powerful, and amalgamated with the Nubas of that district. Their further progress south was barred by the Christian kings of Dongola (q.v.) until the 14th century, when the Arabs became masters of the whole region. Still later another element was added to the population in the intro- duction by the Turkish masters of Egypt of a number of Bosnians. These Bosnians (Kalaji as they called themselves) settled in the country and intermarried with the Arabs and Nubians, their descendants still holding lands between Assuan and Derr. Hence it is that the Nubians of this district, fairest of all the race, still claim Arab and Osmanli (Bosnian) descent.

Nevertheless, the Nubian type remains essentially negro, being characterized by a very dark complexion, varying from a mahogany brown and deep bronze to an almost black shade, with tumid lips, large black animated eyes, doli-chocephalic head (index 73, 72), hair often woolly or strongly frizzled, and scant beard worn under the chin like the figures of the fugitives (Uaua?) in the battle-pieces sculptured on the walls of the Egyptian temples. At the same time the nose is much larger and the zygomatic arches less prominent than in the full-blood negro. The Nilotic Nubians are on the whole a strong muscular people,

essentially agricultural, more warlike and energetic than the Egyptians. Many find employment as artisans, small dealers, porters and soldiers in Egypt, where they are usually noted for their honesty, and frank and cheerful temperament. Since the overthrow of the

native Christian states all have become Mahom- medans, but not of a fanatical type. Although a native of Dongola, the mahdi, Mahommed Ahmed, found his chief support, not among his countrymen, but among the more recently converted Kordofan negroes and the nomad Arabs and Beja. (For ethno- logy see also Hamitic Races, Beja, Ababda, Bisharin, Hadendoa, &c).

Language. — Little is known of the language of the ancient Nubians or of its connexion, if any, with the language, known as Meroitic, of the " Ethiopians " who preceded them. The hieroglyphs and inscriptions in Meroitic belong mostly to the first six centuries a.d. ; the existing Nubian MSS. are medieval and are written chiefly in Greek letters, and in form and character resemble Coptic. They are, with one exception, written on parchment and contain lives of saints, &c, the exception being a legal document. The most noteworthy of these MSS. was found near Edfu, in Upper Egypt, early in the 20th century and purchased for the British Museum in 1908. Euty- chius, patriarch of Alexandria about 930, included " Nubi " among the six kinds of writing which he mentions as current among the Hamitic peoples, and " Nubi " also appears among a list of six writings mentioned in an ancient manuscript now in the Berlin Museum.

The modern Nubian tongue, clearly the descendant of the Nubian of the MSS., is very sonorous and expressive. Its distinctly negro character is betrayed in the complete absence of grammatical gender, in its primitive vowel-system and highly-developed process of consonantal assimilation, softening all harsh combinations, lastly, in the peculiar infix _/ inserted between the verbal root and the plural pronominal object, as in ai tokki-j-ir = 1 shake them. As in Bantu, the verb presents a multiplicity of forms, including one present, three past and future tenses, with personal endings complete, passive, interrogative, conditional, elective, negative and other forms, each with its proper participial inflexions. In Lepsius's grammar the verbal paradigm fills altogether no pages.

Of the Nilotic as distinguished from the Kordofan branch of the Nuba language there are three principal dialects current from Assuan along the Nile southwards to Meroe, as under : —

I. Northern: Dialect of Bant Kenz or Mattokki, from the first cataract to Sebu* and Wadi al-'Arab, probably dating from the Diocletian period. II. Central : The Mahal or Marist, from Korosko to Wadi Haifa, (second cataract). Here the natives are called Saidokki, in contradistinction to the northern Mattokki. III. Southern: Dongolawi, throughout the province of Dongola from the second cataract to J. Deja near Meroe,

on the northern frontier of the Arab district of Dar Shagia. By the Mahasi people it is called Biderin Bannid, ” language of the poor,” or, collectively with the Kenz, Oshkirin Bannid, ” language of slaves.” The northern and southern varieties are closely related to each other, differing considerably from the central, which shows more marked affinities with the Kordofan Nuba, possibly because the Saidokki people are later arrivals from Kordofan. For topography, &c. and archaeology, see Sudan § Anglo-Egyptian and Egypt.

Authorities. — C. R. Lepsius, Nubische Grammatik (Berlin, 1880), and Briefe aus Aegypten, Aethiopien, &c. (Berlin, 1852); D. R. Maclver, Areika (Oxford, 1909); Nubian Texts, edited by E. A. Wallis Budge (British Museum, 1909) ; F. LI Griffith, ” Some old Nubian Christian Texts ” in Journal of Theological Studies (July, 1909) ; E. A. Wallis Budge, The Egyptian Sudan (London, 1907) ; J. Ward, Our Sudan, its Pyramids and Progress (London, 1905); E. Riippell, Reisen in Nubien, Kordofan, &c. (Frankfort a. M., 1829); F. Caillaud, Voyage a Meroe (Paris, 1826); L. Reinisch, Die Nuba-Sprache (Vienna, 1879); Memoirs of the Societe khediviale de Geographic Cairo; J. L. Burckhardt, Travels in Nubia, &c. (London, 1819); G. Waddington and B. Hanbury, Journal of a Visit to some parts of Ethiopia (London, 1822); E. F. Gau, Nubische Denkmdler (Stuttgart, 1821). Consult also the bibliography under Sudan.

RUBLE, a province of central Chile, bounded N. by Linares, E. by the Argentine Republic, S. by Conception and W. by Conception and Maule. Area, 3407 sq. m.; pop. (1895) 152,935. The province lies partly in the great central valley of Chile, noted for its fine climate and fertility, and partly on the western slopes of the Andes. The Itata river, which forms the southern boundary, and its principal tributary, the Nuble, form the drainage system of the province. Agriculture and grazing are the principal industries. Wheat is largely produced, and there are vineyards in some localities. Stock-raising is pursued chiefly in the east, where the pastures are rich and the water

supply unfailing. The state railway from Santiago to the southern provinces passes through Nuble, from N.N.E. to S.S.W., and sends off a branch from Bulnes W. to Jan Tome on the Bay of Con- ception. The capital is Chilian, and the only other important town is Bulnes, a railway junction and active commercial centre. The hot baths of Chilian, in the eastern part of the province on the slope of the volcano

of that name, about 7000 ft. above sea level, are very popular in Chile.

NUCERIA ALFATERNA (mod. Nocera Inferiore, q.v.), an ancient town of Campania, Italy, in the valley of the Sarnus (Sarno), about 10 m. E. of the modern coast line at Torre Annun- ziata, and 8 m. E. of Pompeii. In the period before the Roman supremacy it appears to have been the chief town in the valley of the Sarnus, Herculaneum, Pompeii, Stabiae and Surrentum all being dependent upon it. The coins of the town bear the head of the river god. It maintained its allegiance to Rome till 309 B.C. when it joined the revolted Samnites. In 308 it repulsed a Roman attempt to land at the mouth of the Sarnus, but in 307 it was besieged and surrendered. It obtained favour- able terms, and remained faithful to Rome even after Cannae. Hannibal reduced it in 216 by starvation, and destroyed and plundered the town. The inhabitants returned when peace was restored. Even during the Social War Nuceria remained true to Rome, though the dependent towns joined the revolt; after it they were formed into independent communities, and Nuceria received the territory of Stabiae, which had been destroyed by Sulla in 89 B.C., as a compensation. In 73 B.C. it was plundered by Spartacus. Of the buildings of the ancient city nothing at all is to be seen; but on the hillsides on the S. are remains of villas of the Roman period, and here tombs have been found. (T. As.)

NUCLEUS (Lat. for the kernal of a nut, nux, the stone of fruit), the central portion of things, round which other parts of the same thing or other things collect together. The term is particularly applied to the central mass of protoplasm in a plant or animal cell (see Cytology).

NUER, a Nilotic negro people of the upper Nile, dwelling in the swampy plains south of Fashoda and at the Bahr-el-Ghazal confluence, and having for neighbours the Dinka, whom they resemble. They are long-legged and flat-footed, and live, like the aquatic birds, on fish, roots and river plants. They tattoo tribal marks on the forehead, and the women pierce the upper lips. A few Nuer families live on the floating islets of grass and reeds brought down by the river in flood.

NUEVA SAN SALVADOR, or Santa Tecla, the capital of the department of La Libertad, Salvador; on the railway between San Salvador (10 m. N.) and the Pacific port of La Libertad. Pop. (1905) about 18,000. The town was founded in 1854, and intended to replace the capital, San Salvador, which was ruined by an earthquake in that year but soon afterwards rebuilt. Nueva San Salvador is an attractive town with a large and growing trade.

NUEVO LEON, a northern state of Mexico, bounded N., E. and S.E. by Tamaulipas, S. and S.W. by San Luis Potosi and W. and N. by Coahuila. Pop. (190c) 327,937; area 23,592 sq. m. Nuevo Leon lies partly upon the great Mexican plateau and partly upon its eastern slopes, the Sierra Madre Oriental crossing the state N.W. to S.E. A branch of the Sierra Madre extends northward from the vicinity of Salinas, but its elevations are low. The average elevation of the Sierra Madre within the state is slightly under 5500 ft. The general character of the surface is mountainous, though the western and south-western sides are level and dry as in the adjoining state of Coahuila. In the N. the general elevation is low, the surface sandy and covered with cactus and mesquite growth, and hot, semi-arid conditions prevail. The eastern slopes receive more rain and are well clothed with vegetation, but the lower valleys are sub- tropical in character and are largely devoted to sugar production. The higher elevations have a dry, temperate, healthful climate. There are many rivers and streams, notably the Salado, Pesqueria and Presas, but none is navigable within the state, though many furnish good water power. Agriculture is the principal industry,

the chief products being sugar, barley, Indian corn and wheat. Rum is a by-product of the sugar industry, and ” mescal ” is distilled from the agave. The gathering and preparation of ” ixtle ” fibres from the agave and yucca forms another im- portant industry, the fibre being sent to Tampico for export. Stock-raising receives considerable attention; there are about a score of large cattle ranges, and there is a considerable export of live cattle to Texas and to various Mexican states. Consider- able progress has been made in manufacturing industries, and there are a large number of sugar-mills, cotton factories, woollen mills, smelting works and iron and steel works. The state is well served with railways, the capital, Monterrey, being one of the most important railway centres in northern Mexico. The Mexican National line crosses the northern half of the state and has constructed a branch from Monterrey to Matamoros, and a Belgian line (F. C. de Monterrey al Golfo Mexicano) runs from Tampico N.N.W. to Monterrey, and thence westward to Trevino (formerly Venadito) in Coahuila, a station on the Mexican Inter- national. The other principal towns are: Linares, or San Felipe de Linares (pop. 20,690 in 1900), 112 m. by rail S.E. of the capital in a rich agricultural region; Lampazos, or Lampazos de Naranjo (7704), 96 m. by rail N.W. of the capital; Cadereyta Jiminez, Garcia, Santiago and Doctor Arroyo, the last in the extreme southern part of the state.

NUGENT, ROBERT NUGENT, Earl (1702-1788), Irish politician and poet, son of Michael Nugent, was born at Carlans- town, Co.

Westmeath. He was tersely described by Richard Glover as ” a jovial and voluptuous Irishman who had left popery for the Protestant religion, money and widows.” His change of religion took place at a very early period in life; he married in 1736 Anna (d. 1736), daughter of James Craggs, the secretary of state, a lady who had already been twice given in marriage. His wife’s property comprised the borough of St Mawes in Cornwall, and Nugent sat for that constituency from 1741 to 1754, after which date he represented Bristol until 1774, when he returned to St Mawes. He was a lord of the treasury from 1754 to 1759 and president of the board of trade from 1766 to 1768. He married in 1757 Elizabeth, dowager-countess of Berkeley, who brought him a large fortune. His support of the ministry was so useful that he was created in 1767 Viscount Clare, and in 1776 Earl Nugent, both Irish peerages. He died on the 13th of October 1788. Lord Nugent was the author of some poetical productions, several of which are preserved in the second volume of Dodsley’s Collections (1748). The earldom descended by special remainder to the earl’s son-in-law, George Nugent Temple Grenville, marquess of Buckingham, and so to his successors, the dukes of Buckingham and Chandos.

NUISANCE (through Fr. noisance, nuisance, from Lat. nocere, to hurt), that which gives offence or causes annoyance, trouble or injury. In English law nuisance is either public or private. A public or common nuisance is defined by Sir J. F. Stephen as ” an act not warranted by law, or an omission to discharge a legal duty, which act or omission obstructs or causes incon- venience or damage to the public in the exercise of rights common to allHis Majesty’s subjects ” (Digestof the Criminal Law, ˆ.120). A common nuisance is punishable as a misdemeanour at common law, where no special provision is made by statute. In modern times many of the old common law nuisances have been the subject of legislation. It is no defence for a master or employer that a nuisance is caused by the acts of his servants, if such acts are within the scope of their employment, even though such acts are done without his knowledge and contrary to his orders. Nor is it a defence that the nuisance has been in existence for a great length of time, for no lapse of time will legitimate a public nuisance.

A private nuisance is an act or omission which causes incon- venience or damage to a private person, and is left to be redressed by action. There must be some sensible diminution of these rights affecting the value or convenience of the property. ” The real question in all the cases is the question of fact, whether the annoyance is such as materially to interfere with the ordinary comfort of human existence ” (Lord Romilly in Crump v.

Lambert, 1867, L.R. .3 Eq. 409). A private nuisance, differing in this respect from a public nuisance, may be legalized by un- interrupted use for twenty years. It used to be thought that, if a man knew there was a nuisance and went and lived near it, he could not recover, because, it was said, it is he that goes to the nuisance and not the nuisance to him. But this has long ceased to be law, as regards both the remedy by damages and the remedy by injunction.

The remedy for a public nuisance is by information, indictment, summary procedure or abatement. An information lies in cases of great public importance, such as the obstruction of a navigable river by piers. In some matters the law allows the party to take the remedy into his own hands and to ” abate ” the nuisance. Thus, if a gate be placed across a highway, any person lawfully using the highway may remove the obstruction, provided that no breach of the peace is caused thereby. The remedy for a private nuisance is by injunction, action for damages or abatement. An action lies in every case for a private nuisance; it also lies where the nuisance is public, provided that the plaintiff can prove that he has sustained some special injury. In such a case the civil is in addition to the criminal remedy. In abating a private nuisance, care must be taken not to do more damage than is necessary for the removal of the nuisance.

In Scotland there is no recognized distinction between public a.id private nuisances. The law as to what constitutes a nuisance is substantially the same as in England. A list of statutory nuisances will be found in the Public Health (Scotland) Act 1867, and amend- ing acts. The remedy for nuisance is by interdict or action.

The American law on the subject is practically the same as the English law.

NUKHA, a town of Russian Caucasia, in the government of Elizavetpol, and previous to 1819 the capital of the khanate of Sheki, lying 57 m. N.E. of the town of Elizavetopol, at the S. foot of the main chain of the Caucasus. Pop. (1861) 22,618; (1897) 24,811; mainly Tatars, with some Armenians. The cupola of the church in the fortress is 2455 ft. above the sea-level, in 41 12′ 18″ N. and 47 12′ 7″ E. The fortress, a square enclosure, erected in 1765, contains the palace, built in 1790 in the original Persian style. The leading industry is the breeding of silkworms and the spinning of silk. Nukha was a mere

village down to the middle of the 18th century, when it was chosen by Hajji Chelyabi, the founder of the khanate of Sheki, as his residence. The Russian occupation dates from 1S07, though the annexation was not completed till 1819.

NULLAH (Hindostani for an arm of the sea, stream or water- course), a steep narrow valley. Like the ivadi of the Arabs, the nullah is characteristic of mountainous or hilly country where there is little rainfall. In the drier parts of India, and in many parts of Australia there are small steep-sided valleys penetrating the hills, clothed with rough brushwood or small trees growing in the stony soil. During occasional heavy rains torrents rush down the nullahs and quickly disappear. There is little local action upon the sides, while the bed is lowered, and consequently these valleys are narrow and steep.

NULLIFICATION, the process of making null or of no effect (Lat. nullus, none). In United States history the term is applied to the process by which a state either (a) in fact suspended, or (b) claimed a constitutional right of suspending, the operation of a federal law within its own territory. The doctrine of nullification as a constitutional theory was probably never held by a majority of the states or of the American people at any one time, though before i860 most of the states asserted or practised it. The belief in nullification was based on the theory that the union of the states was a voluntary one, each member retaining its sovereignty, though for purposes of con- venience delegating certain powers of government to an agent — the federal government. The powers of this agent were strictly limited by the Constitution, and should it transcend these powers the states must interpose to protect their rights. This view held that the Supreme Court created by the Constitution was not a proper tribunal to decide causes arising beyond the Constitution or relating to the nature of the Union, but that its jurisdiction was limited to cases arising under the Constitu- tion. If the Federal government usurped a right belonging to the state, the latter, being a sovereignty, must judge for itself. As later perfected by John C. Calhoun (?.».), the theory of

nullification required a practice as follows. A state aggrieved by a law of the Federal congress might, in constituent convention, suspend the operation of the objectionable law, and report its action to the other states. If three-fourths of them should decide that the law in question was not unconstitutional, then in effect it became ratified (see United States Constitution, art. v.). The dissatisfied state must then submit or must draw out of the union by the act of secession (see Secession, and Confederate States). This theory of the right of nullification was considered by those who held it to be in accord with the principles

laid down in the Constitution. It must be distin- guished from secession, which was considered a sovereign right, one above the Constitution; yet nullification presumed the sovereignty of the state.

The earliest assertions of the doctrine of nullification are found in the Kentucky and Virginia Resolutions of 1 798-1 799, written respectively by Thomas Jefferson and James Madison in protest against the Alien and Sedition Acts of Congress. Nullification was first practised in 1S09 by Pennsylvania, the governor ordering out the state troops to resist the execution of a decree of a Federal court. In the New England states, 1809-1815, the United States laws relating to embargo, non- intercourse and army enlistments were nullified by state action. From 1825-1829 the state of Georgia forcibly prevented the execution of Federal laws and court decrees relating to the Indians within her borders and in Alabama, 1832-1835, there was a similar nullification. The only example of nullification in which theory and practice coincided was the nullification in 1832 by South Carolina of the Federal tariff laws. In this the state acted upon the theory outlined above which was perfected by Calhoun. In the last decade before the Civil War fourteen of the Northern states in the so-called ” Personal Liberty laws ” nullified the Federal statutes relating to slaves and slavery by making it a crime for their citizens to obey these laws and by setting the state administration against the Federal officials. Since the Reconstruction the Southern states have in practice effected a nullification of the Fourteenth and Fifteenth Amendments to the Constitution providing for negro suffrage.

See John C. Calhoun, Works, vols. i. and vi. (New York, 1853- !855); D. F. Houston, Critical Study of Nullification in South Carolina (New York, 1897) ; C. W. Loring, Nullification and Secession (New York, 1893) ; E. P. Powell, Nullification and Secession in the United States (New York, 1897); and U. B. Phillips, Georgia and States Rights (Washington, 1902). (W. L. F.)

NUMANTIA, an ancient hill fortress in northern Spain, in the province of Soria (Old Castile), overhanging the village of Garray, near the town of Soria, on the upper Douro. Here, on a small isolated high plateau in the middle of the valley, was the stronghold which played the principal part in a famous struggle between the conquering Romans and the native Spaniards during the years 154-133 B.C. Numantia was especially con- cerned in the latter part of this war from 144 onwards. It was several times unsuccessfully besieged. Once the Roman general Hostilius Mancinus with his whole army was compelled to surrender (137). Finally, Scipio Aemilianus, Rome’s first and only general in that age, with some 60,000 men drew round the

town 6 m. of continuous entrenchments with seven camps at intervals. After 15 months (134-133) he reduced by hunger the 6000-8000 Numantine soldiers, much as Caesar afterwards reduced Alesia in Gaul. The result was regarded as a glorious victory, and in Roman literature the fall of Numantia was placed beside the fall of Carthage (149 B.C.). In truth, the maintenance in effective condition of so large a Roman force in so remote and difficult a region was in itself a real achievement and such as at that time no one but Scipio could have performed. He redeemed by organized strategy the vacillations and follies of statesmen who had sat at home and sent out inadequate expeditions or incompetent commanders. The site was, under the Roman Empire, occupied by a Roman town called Numantia, and the Itinerary tells of a Roman road which ran past it. It is to-day a " Monumento National " of Spain, and has yielded remarkable discoveries to the skilful excavations of Dr Schuiten

(1905-1910), who has traced the Celtiberian town, the lines of Scipio and several other Roman camps dating from the Numantine Wars. (F. J. H.)

NUMA POMPILIUS, second legendary king of Rome (715- 672 B.C.), was a Sabine, a native of Cures, and his wife was the daughter of Titus Tatius, the Sabine colleague of Romulus. He was elected by the Roman people at the close of a year's interregnum, during which the sovereignty had been exercised by the members of the senate-in rotation. Nearly all the early religious institutions of Rome were attributed to him. He set up the worhip of Terminus (the god of landmarks), appointed the festival of Fides (Faith), built the temple of Janus, reorgan- ized the calendar and fixed days of business and holiday. He instituted the flamens (sacred priests) of Jupiter, Mars and Quirinus; the virgins of Vesta, to keep the sacred fire burning on the hearth of the city; the Salii, to guard the shield that fell from heaven; the pontifices and augurs, to arrange the rites and interpret the will of the gods; he also .divided the handicraftsmen into nine gilds. He derived his inspiration from his wife, the nymph Egeria, whom he used to meet by night in her sacred grove. After a long and peaceful reign, during which the gates of Janus were closed, Numa died and was succeeded by the warlike Tullus Hostilius. Livy (xl. 29) tells a curious story of two stone chests, bearing inscriptions in Greek and Latin, which were found at the foot of the Janiculum (181 B.C.), one purporting to contain the body of Numa and the other his books. The

first when opened was found to be empty, but the second contained fourteen books relating to philosophy and pontifical law, which were publicly burned as tending to under- mine the established religion.

No single legislator can really be considered responsible for all the institutions ascribed to Numa; they are essentially Italian, and older than Rome itself. Even Roman tradition itself wavers; e.g. the fetiales are variously attributed to Tullus Hostilius and Ancus Marcius. The supposed law-books, which were to all appearance new when discovered, were clearly forgeries.

See Livy i. 18-21; Plutarch, Numa; Dion. Halic. ii. 58-76; Cicero, De republica, ii. 13-15. For criticism: Schwegler, Romische Geschichte, bk. xi. ; Sir G. Cornewall Lewis, Credibility of early Roman History, ch. xi. ; W. Ihne, Hist, of Rome, i. ; E. Pais, Storia di Roma, i. (1898), where Numa is identified with Titus Tatius and made out to be a river god, Numicius, closely connected with Aeneas; J. B. Carter, The Religion of Numa (1906); O. Gilbert, Geschichte und Topographie der Stadt Rom im Allerlum (1883-1885) ; and Rome : Ancient History.

NUMBER 1 (through Fr. nombre, from Lat. numerus; from a root seen in Gr. vkyxiv to distribute), a word generally ex- pressive of quantity, the fundamental meaning of which leads on analysis to some of the most ‘ difficult problems of higher mathematics.

1. The most elementary process of thought involves a distinc- tion within an identity — the A and the not-A within the sphere throughout which these terms are intelligible. Again A may be a generic quality found in different modes Aa, Ab, Ac, &c; for instance, colour in the modes, red, green, blue and so on. Thus the notions of ” one,” ” two,” and the vague ” many ” are fundamental, and must have impressed themselves on the human mind at a very early period: evidence of this is found in the grammatical distinction of singular, dual and plural which occurs in ancient languages of widely different races. A more definite idea of number seems to have been gradually acquired by realizing the equivalence, as regards plurality, of different concrete groups, such as the fingers of the right hand and those of the left. This led to the invention of a set of names which in the first instance did not suggest a numerical system, but denoted certain recognized forms of plurality, just as blue, red, green, &c, denote recognized forms of colour. Eventually the conception of the series of natural numbers became sufficiently clear to lead to a systematic terminology, and the science of arithmetic was thus rendered possible. But it is only in quite recent times that the notion of number has been submitted to a searching critical 1 See also Numerau

analysis: it is, in fact, one of the most characteristic results of modern mathematical research that the term number has been made at once more precise and more extensive.

2. Aggregates (also called manifolds or sets). — Let us assume the possibility of constructing or contemplating a permanent system of things such that (1) the system includes all objects to which a certain definite quality belongs; (2) no object without this quality belongs to the system; (3) each object of the system is permanently recognizable as the same thing, and as distinct from all other objects of the system. Such a collection is called an aggregate: the separate objects belonging to it are called its elements. An aggregate may consist of a single element.

It is further assumed that we can select, by a definite process, one or more elements of any aggregate A at pleasure: these form another aggregate B. If any element of A remains un- selected, B is said to be a part of A (in symbols, B < A) : if not, B is identical with A. Every element of A is a part of A. If B

When a correspondence can be established between two aggregates A and B in such a way that to every element of A corresponds one and only one element of B, and conversely, A and B are said to be equivalent, or to have the same power (or potency); in symbols, AˆB. If AˆB and BC, then A<*>C. It is possible for an aggregate to be equivalent to a part of itself: the aggregate is then said to be infinite. As an example, the aggregates 2, 4, 6, . . . 2», &c, and 1, 2, 3, ... n, &c, are equivalent, but the first is only a part of the second.

3. Order. — Suppose that when any two elements a, b of an aggregate A are taken there can be established, by a definite criterion, one or other of two alternative relations, symbolized by a**b, subject to the following conditions: — (1) If a>b, then ba; (2) If a>b and b>c, then a>c. In this case the criterion is said to arrange the aggregate in order. An aggregate which can be arranged in order may be called ordinable. An ordinable aggregate may, in general, by the application of different criteria, be arranged in order in a variety of ways. According as ab we shall speak of a as anterior or posterior to b. These terms are chosen merely for convenience, and must not be taken to imply any meaning except what is involved in the definitions of the signs > and < for the particular criterion in question. The consideration of a succession of events in time will help to show that the assumptions made are not self-contradictory. An aggregate arranged in order by a**

definite criterion will be called an ordered aggregate. Let a, b be any two elements of an ordered aggregate, and suppose a

An aggregate A is said to be well-ordered (or normally ordered) when, in addition to being ordered, it has the following properties: (1) A has a first or lowest element a which is anterior to all the rest; (2) if B is any part of A, then B has a first element. It follows from this that every part of a well-ordered aggregate is itself well-ordered. A well-ordered aggregate may or may not have a last element.

Two ordered aggregates A, B are said to be similar (A.2Q.B) when a one-one correspondence can be set up between their elements in such a way that if b, b' are the elements of B which correspond to any two elements a, a' of A, then b > b' or b a' or a

Similar ordered aggregates are said to have 1 he same order-type. Any definite order-type is said to be the ordinal number of every aggregate arranged according to that type. This somewhat vague definition will become clearer as we proceed.

4. The Natural Scale. — Let a be any element of a well-ordered aggregate A. Then all the elements posterior to a form an aggregate A', which is a part of A and, by definition, has a first element a'. This element a' is different from a, and immediately succeeds it in the order of A. (It may happen, of course, that a' does not exist; in this case a is the last element of A.) Thus in a well-ordered aggregate every element except the last (if there be a last element) is succeeded by a definite next element. The ingenuity of man has developed a symbolism by means of which every symbol is associated with a definite next succeeding symbol, and in this way we have a set of visible or audible signs 1, 2, 3, &c. (or their verbal equivalents), representing an aggregate in which (1) there is a definite order, (2) there is a first term, (3) each term has one next following, and consequently there is no last term. Counting a set of objects means associating them in order 'with the first and subsequent members of this conventional aggregate. The process of counting may lead to three different results: (1) the set of objects may be finite in number, so that they are associated with a part of the conventional aggregate which has a last term; (2) the set of objects may have the

same power as the conventional aggregate; (3) the set of objects may have a higher power than the conventional aggregate. Examples of (2) and (3) will be found further on. The order-type of 1, 2, 3, &c, and of similar aggregates will be denoted byco; this is the first and simplest member of a set of transfinite ordinal numbers to be considered later on. Any finite number such as 3 is used ordinally as representing the order-type of 1, 2, 3 or any similar aggregate, and cardinally as representing the power of 1, 2, 3 or any equivalent aggregate. For reasons that will appear, co is only used in an ordinal sense. The aggregate 1, 2, 3, &c, in any of its written or spoken forms, may be called the natural scale, and denoted by N. It has already been shown that N is infinite: this appears in a more elementary way from the fact that (1, 2, 3, 4, . . .)— (2 , 3. 4, S, • • •) > where each element of N is made to correspond with the next following. Any aggregate which is equivalent to the natural scale or a part thereof is said to be countable.

5. Arithmetical Operations. — When the natural scale N has once been obtained it is comparatively easy, although it requires a long process of induction, to define the arithmetical operations of addition, multiplication and involution, as applied to natural numbers. It can be proved that these operations are free from ambiguity and obey certain formal laws of commutation, &c, which will not be discussed here. Each of the three direct operations leads to an inverse problem which cannot be solved except under certain implied conditions. Let a, b denote any two assigned natural numbers: then it is required to find natural numbers, x, y, z such that

a = b+x, a = by, a=£ respectively. The solutions, when they exist, are perfectly definite, and may be denoted by a — b, a/b and fy a; but they are only possible in the first case when a>b, in the second when a is a multiple of b, and in the third when a is a perfect 6th power. It is found to be possible, by the construction of certain elements, called respectively negative, fractional and irrational numbers, and zero, to remove all these restrictions.

6. There are certain properties, common to the aggregates with which we have next to deal, analogous to those possessed by the natural scale, and consequently justifying us in applying the term number to any one of their elements. They are stated here, once for all, to avoid repetition; the verification, in each case, will be, for the most part, left to the reader. Each of the aggregates in question (A, suppose) is an ordered aggregate. If a, (3 are any

two elements of A, they may be combined by two definite operations, represented by + and X, so as to produce two definite elements of A represented by a+/3 and a, and cu = a. Thus A contains the elements 1, 1+1, 1+1+1, &c, or, as we may write them, t, 21, 31,. . .mi. . .such that mi+ni = (m+n)i and miXni=mni;

also t<2t<3t . . . We may express this by saying that A contains an image of the natural scale. The element denoted by 1 may be called the ground element of A.

7. Negative Numbers. — Let any two natural numbers a, b be selected in a definite order a, b (to be distinguished from b, a, in which the order is reversed). In this -way we obtain from N an aggregate of symbols (a, b) which we shall call couples, or more precisely, if necessary, polar couples. This new aggregate may be arranged in order by means of the following rules: —

Two couples (a, b), (a', b') are said to be equal if a--b' = a'--b. In other words (a, b), (a', b') are then taken to be equivalent symbols for the same thing.

If a+b'>a'+b, we write (a, b)>(a', b'); and if a+b'

The rules for the addition and multiplication of couples are:

(a, b)+(a', b') = (a+a', 6 + 6')

(a, 6)X(a', b') = (aa'+bb', ab'+a'b).

The aggregate thus defined will be denoted by N; it may be called the scale of relative integers.

If 1 denotes (2, 1) or any equivalent couple, (a, 6)+t = (0+2, b +i)>(a, b) and (a, 6)Xt=(20+6, a--2b) = (a, b). Hence 1 is the ground element of N. By definition, 21 = 1+1 = (4, 2) = (3, 1): and hence by induction nu=(m--i, 1), where m is any natural integer. Conversely every couple (a, b) in which a>b can be expressed by the symbol (a—b)i. In the same way, every couple (a, b) in which b>a can be expressed in the form (6— a)i' , where i' = (i, 2).

8. It follows as a formal consequence of the definitions that t+t' = (2, i) + (i, 2) = (3, 3) = (i, 1). It is convenient to denote (1, 1) and its equivalent symbols by o, because

{a, 6)+(l, i) = (a + i, 6 + 1) =(0,6) (a, 6)X(i, l)=(a+6, a +Z>)=(i, 1);

hence t+i' = o, and we can represent N by the scheme —

3′ . 24',

O, l, 2l, 31 . .

in which each element is obtained from the next before it by the addition of t. With this notation the rules of operation may be written (m, n, denoting natural numbers) —

mi+ni =(m-n)i mi'-ni' = (m--n)i' mi+m' = (m — ri)iii m>n = (» — m)i' m

with the special rules for zero, that if a is any element of N, a+0 = a, aXO = o.

To each element, a, of N corresponds a definite element o' such that a+a' = o; if a = o, then a' = o, but in every other case a, a' are different and may be denoted by mi, mi'. The natural number m is called the absolute value of mi and mi' .

9. If a, P are any two elements of N, the equation £+/3 = a is satisfied by putting £ = a+/3'. Thus the symbol a— /3 is always interpretable as a+/3', and we may say that within N subtraction is always possible; it is easily proved to be also free from ambiguity. On the other hand, a/fi is intelligible only if the absolute value of a is a multiple of the absolute value of (3.

The aggregate N has no first element and no last element. At the same time it is countable, as we see, for instance, by associating the elements o, ai, bi' with the natural numbers 1, 20, 26+1 respectively, thus —

(N) 1, 2,3,4, 5.6, ...

(N) O, l, l', 2t, 21', 31. . .

It is usual to write +a (or simply a) for ai and —a for at'; that this should be possible without leading to confusion or ambiguity is certainly remarkable.

10. Fractional Numbers. — We will now derive from N a different aggregate of couples [a, b] subject to the following rules:

The symbols [a, b], [a', b'], are equivalent if ab' = a'b. According as ab' is greater or less than a'b we regard [a, b] as being greater or less than [a', b'. The formulae for addition and multiplication are [a, b] + [a', 6'] = [a6'+a'6, 66']

[a, b] X [a', b'] = [aa', 66'].

All the couples [a, a] are equivalent to [1, 1], and if we denote

this by v we have [a, b] + v = [a--b, b] > [a, b], [a, b] Xv = [a, b], so that v is the ground element of the new aggregate.

Again 2v = v + v = (2, 1), and by induction m» = [m, 1]. Moreover, if a is a multiple of b, say mb, we may denote [a, b] by rm >.

11. The new aggregate of couples will be denoted by R. It differs from N and N in one very important respect, namely, that when its elements are arranged in order of magnitude (that is to say, by the rule above given) they are not isolated from each other. In fact if [a, 6] = a, and [a', b'] = a', the element [a--a', b + b'] lies between a and a'; hence it follows that between any two different elements of R we can find as many other elements as we please. This property is expressed by saying that R is in close order when its elements are arranged in order of magnitude. Strange as it appears at first sight, R is a count- able aggregate; a theorem first proved by G. Cantor. To see this, observe that every element of R may be represented by a " reduced " couple [a, b], in which a, b are prime to each other. If [a, b], [c, d] are any two reduced couples, we will agree that [a, b] is anterior to [c, d] if either (1) a + b

[1, 1], [1, 2], [2, 1], [1, 3], [3, 1,], [1, 4], [2, 3], [3, 2], [4, 1] . . . which is similar to the natural scale.

The aggregate R, arranged in order of magnitude, agrees with

N in having no least and no greatest element; for if a denotes any element [a, b], then [20-1, 2b] a.

12. The division of one element of R by another is always possible; for by definition

[c, d] X [ad, be] = [acd, bed] = [a, b], and consequently [a, bi [c, d] is always interpretable as [ad, be]. As a particular case [m, it [n, 1] = [m, n], so that every element of R is expressible in one of the forms mv, mvjnv. It is usual to omit the symbol u altogether, and to represent the element [m, n] by m/n, whether m is a multiple of n or not. Moreover, m/i is written m, which may be done without confusion, because m/i + n/i — (ot + «)/i, and »/iX»/i = »i»/i, by the rules given above.

13. Within the aggregate R subtraction is not always practic- able ; but _this limitation may be removed by constructing an aggregate R related to R in the same way as N to N. This may be done in two ways which lead to equivalent results. We may either form symbols of the type (a, /3), where a, (3 denote elements of R, and apply the rules of § 7 ; or elsejorm symbols of the type [a, /}], where a, (3 denote elements of N, and apply the rules of §10. The final result is that R contains a zero element, o, a ground element v, an element v' such that u + i/ = o, and a set of elements representable by the symbols {mjn)v, {mjn)v'. In this notation the rules of operation are

m 1 m' /mn' + m'n\ m , , m' , (mn' --m'n\ ,

—u-\ — -u = i-j — h), —v A — 7-v = I ? —)v ;

n n \ nn in ' n \ nn J '

m , m' , mn' —m'n m'n—mn' . , ,

n v + 7P" J = nn' v ' or nn' v ' as mn >01

m .,m mm m ,^,m

—V/\—rv = rv — — v X – ri

n n nn n n

m .,m , mm

m , m n ' n'

mn m

- — j—v = — V

m . n n

a-P = a + p', where (3+/3'=o; o+0 = a, 0X0=0.

Here a and /3 denote any two elements of R. If = (m/n)v, then /3′ = (m/w)u', and if |8=(w/»)u', then j3′ = (m/»)i>. If = o, then (3′ = 0. _ _

14. When R is constructed by means of couples taken from N, we must put [mi, w] = [mi' , «<■'] = (mjn)v, [ms_ «"] = [«<•', «'] = (m/n)v', and [o,

[a,0] + [t,i] = [eu,0] = [o,0] ,

which is inconsistent with £+10$.

In the same way, if o denotes the zero element of R, and £ any other element, the symbol 0/0 is indeterminate, and £/o inadmissible, because, by the formal rules of operation, £/o+u=|/o, which conflicts with the definition of the ground element v.

It is usual to write +— (or simply —J for — v, and -— for — v'.

Each of these elements is said to have the_absolute value mjn. The criterion for arranging the elements of R in order of magnitude is that, if £, rj are any two elements of it, £>7/when£—7/ is positive; that is to say, when it can be expressed in the form (m/n)v. _

15. The aggregate R is very important, because it is the simplest type of a field of rationality, or corpus. An algebraic corpus is an aggregate, such that its elements are representable by symbols a, /3, &c, which can be combined according to the laws of ordinary algebra; every algebraic expression obtained by combining a finite number of symbols, by means of a finite chain of rational operations, being capable of interpretation as representing a definite element of the aggregate, with the single exception that division by zero is inadmissible. Since, by the laws of algebra, a-

16. Irrational Numbers.— Let a denote any element of R; then a and all lesser elements form an aggregate, A say; the remaining elements form another aggregate Aˆ, which we shall call complementary to A, and we may write R = A+A'. Now the essence of this separation of R into the parts A and A' may be expressed without any reference to a as follows: —

I. The aggregates A, A' are complementaryˆ that is, their elements, taken together, make up the whole of R.

II. Every element of A is less than every element of A'.

III. The aggregate A' has no least element. (This condition is artificial, but saves adistinction of cases in what follows.)

Every separation R = A + A' which satisfies these conditions is called a cut (or section), and will be denoted by (A, A'). We have seen that every rational number a can be associated with a cut. Conversely, every cut (A, A) in which A has a last element a is perfectly definite, and specifies a without ambiguity. But there are other cuts in which A has no last element. For instance, all the elements (a) of R such that either ar = o, or else a > o and a 2 < 2, form an aggregate A, while those for which a > o and a 2 > 2, form the complementary aggregate A'. This separation is a cut in which A has no last element ; because if p/q is any positive element of A, the element (3p + 4q)l(2p + 3q) exceeds plq, and also belongs to A. Every cut of this kind is said to define an irrational number. The justification of this is contained in the following propositions: —

(1) A cut is a definite concept, and the assemblage of cuts is an aggregate according to definition; the generic quality of the aggregate being the separation of R into two complementary parts, without altering the order of its elements.

(2) The aggregate of cuts may be arranged in order by the rule that (A, A') < (B, B') if A is a part of B.

(3) This criterion of arrangement preserves the order of magnitude of all rational numbers.

(4) Cuts may be combined according to the laws of algebra, and, when the cuts so combined are all rational, the results are in agreement with those derived from the rational theory.

As a partial illustration of proposition (4) let (A, A'), (B, B') be any two cuts; and let C be the aggregate whose elements are obtained by forming all the values of o' +(}', where a' is any element of A' and jS' is any element of B'. Then if C is the complement of C, it can be proved that (C, C) is a cut ; this is said to be the sum of (A, A') and (B, B'). The difference, product and quotient of two cuts may be defined in a similar way. If n denotes the irrational cut chosen above for purposes of illustration, we shall have n 2 = (C, C) where C comprises all the numbers a'@' obtained by multiplying any two elements, a', 0′ which are

rational and positive, and such that a' 2 >2, /3′ 2 >2. Since a' 2 /3′ 2 >4 it follows that a'0′ is positive and greater than 2; it can be proved conversely that every rational number which is greater than 2 can be expressed in the form a'/S'. Hence n 2 = 2, so that the cut n actually gives a real arithmetical meaning to the positive root of the equation x 2 = 2 ; in other words we

may say that n defines the irrational number V 2. The theory of cuts, in fact, provides a logical basis for the treatment of all finite numerical irrationalities, and enables us tc justify all arithmetical operations involving the use of such quantities.

17. Since the aggregate of cuts (XX say) has an order of magnitude, we may construct cuts in this aggregate. Thus if a is any element of XX, and 3 is the aggregate which consists of a and all anterior elements of XX, we may write £1 = 8 + 8-', and (8, 8') is a cut in which 8 has a last element a. It is a remarkable fact that no other kind of cut in XX is possible; in other words, every conceivable cut in XX is defined by one of its own elements. This is expressed by saying that H is a continuous aggregate, and XX itself is referred to as the numerical continuum of real numbers. The property of continuity must be carefully distinguished from that of close order (§ n); a continuous aggregate is necessarily in close order, but the converse is not always true. The aggregate XX is not countable.

18. Another way of treating irrationals is by means of sequences. A sequence is an unlimited succession of rational numbers au fl2i „.,... am , a m + i . . .

(in order-type co) the elements of which can be assigned by a definite rule, such that when any rational number e, however small, has been fixed, it is possible to find an integer m, so that for all positive integral values of n the absolute value of (a m + n — a m) is less than e. Under these conditions the sequence may be taken to represent a definite number, which is, in fact, the limit of a m when m increases without limit. Every rational number a can be expressed as a sequence in the form (a, a,a, . . .), but this is only one of an infinite' variety of such representations, for instance —

/ \ /i 3 7 2″ — 1 \

i = (. 9 , -99, -999. ■ • ■) = (i , *. §, • • ■ p • • •)

and so on. The essential thing is that we have a mode of representation which can be applied to rational and irrational numbers alike, and provides a very convenient symbolism to express the results of arithmetical operations. Thus the rules for the sum and product of two sequences are given by the formulae

(01,02,03. • • .) + (6i, h, 63, . • .) = (oi + 6i. 02 + 62, C3 + 63 . . .)
(01, o 2 , 03, . . .)X(6i, h, 63, . . .) = (0i6i, 0262, o 3 6 3 . . .)

from which the rules for subtraction and division may be at once inferred. It has been proved that the method of sequences is ultimately equivalent to that of cuts. The advantage of the former lies in its convenient notation, that of the latter in giving a clear definition of an irrational number without having recourse to the notion of a limit.

19. Complex Numbers. — If a is an assigned number, rational or irrational, and n a natural number, it can be proved that there is a real number satisfying the equation x n — a, except when n is even and a is negative : in this case the equation is not satisfied by any real number whatever. To remove the difficulty we construct an aggregate of polar couples \x, y\, where x, y are any two real numbers, and define the addition and multiplication of such couples by the rules

\x, y\ + \x', y'} = lx + x', y -y j;

\x, y\X\x', y'\ = \xx'—yy', xy' + x'y}.

We also agree that \x, y) < \x', y'\, if x

Whenever m, n are rational, \m, n\ —ma + nr, and we are thus justified in writing, if we like, xa--yr for \x, y\ in all circumstances. A further simplification is gained by writing ^'instead of xa, and regarding r as a symbol which is such that t 2 = — 1 , but in other respects obeys the ordinary laws of operation. It is usual to write i instead of r; we thus have an aggregate 3 of complex numbers x-yi. In this aggregate, which includes the real continuum as part of itself, not only the four rational operations (excluding division by {o, o), the zero element), but also the extraction of roots, may be effected without any restric- tion. Moreover (as first proved by Gauss and Cauchy), if

0o, Ci, . . . On are any assigned real or complex numbers, the equation ac2 n + ai2 »-i + _ . . 4-a„_ lZ + a„ = 0,

is always satisfied by precisely n real or complex values of z, with a proper convention as to multiple roots. Thus any algebraic function of any finite number of elements of 3 is also contained in 3, which is, in this sense, a closed arithmetical field, just as XX is when we restrict ourselves to rational operations. The power of 3 is the same as that of IX.

20. Transfinite Numbers. — The theory of these numbers is quite

recent, and mainly due to G. Cantor. The simplest of them, w, has been already defined (§ 4) as the order-type of the natural scale. Now there is no logical difficulty in constructing a scheme Uu «,, „,...(Vu

indicating a well-o?dered aggregate of type to immediately followed by a distinct element Vi : for example, we may think of all positive odd integers arranged in ascending order of magnitude and then think of the even number 2. A scheme of this kind is said to be of order-type (w+i); and it will be convenient to speak of (w+i) as the index of the scheme. Similarly we may form arrangements corresponding to the

indices

o> +2, u+3

The scheme I *1, v it z> 3 . .

where n is any positive integer. Ml, %, u 3 . . . is associated with to4-w = 2a>;

«11, «12, «13 ■ • • I «21, U22, #23 . . . I . • . I Mrcl, «n2 . . . | . . .

with co.w or co 2 ; and so on. Thus we may construct arrangements of aggregates corresponding to any index of the form

(a)=au n +ba n – l + . . . +ka+l, where n, a, b, . . . I are all positive integers. We are thus led to the construction of a scheme of symbols — I. 1, 2, 3, . . . n . . .

CO, M+I, . . . cu-j-n, ... 2w, 2W+I, . . . 2u+M, . . .

II.

III.

if, (f + I, co>--2 .

u?--n,

<£(«), <£(w) + i, . . . <£(&))+«, . >, w» + i, . . . w+n, . . .

The symbols <£(co) form a countable aggregate: so that we may, if we like (and in various ways), arrange the rows of block (II.) in a scheme of type to: we thus have each element a suc- ceeded in its row by (a + 1), and the row containing (to) succeeded by a

definite next row. The same process may be applied to (III.), and we can form additional blocks (IV.), (V.), &c, with first elements co 4 = w"" co 5 = a)" 4 ' &c. All the symbols in which to occurs are called transfinite ordinal numbers.

21. The index of a finite set is a definite integer however the set may be arranged; we may take this index as also denoting the power of the set, and call it the number of things in the set. But the index of an infinite ordinable set depends upon the way in which its elements are arranged; for instance, ind. (1, 2, 3, . . .)=to, but ind. (1, 3, s, . . . I 2, 4, 6, . . .) = 2to. Or, to take another example, the scheme —

1, 3, 5, . . . (2n-i) . . .

2, 6, 10, . . .2 (2»— 1) . . .

3. 2″

. 2 m (2n — i) . . .

where each row is supposed to follow the one above it, gives a permutation of (1, 2, 3, . . .), by which its index is changed from w to w 2 . It has been proved that there is a permutation of the natural scale, of which the index is <£(<*>), any assigned element of (II.) ; and that, if the index of any ordered aggregate is <£(&>), the aggregate is countable. Thus the power of all aggregates which can be associated with indices of the class (II.) is the same as that of the natural scale; this power may be denoted by a. Since a is associated with all aggregates of a

particular power, independently of the arrangement of their elements, it is analogous to the integers, i, 2, 3, &c, when used to denote powers of finite aggregates; for this reason it is called the least transfinite cardinal number.

22. There are aggregates which have a power greater than a: for instance, the arithmetical continuum of positive real numbers, the power of which is denoted by c. Another one is the aggregate of all those order-types which (like those in II. above) are the indices of aggregates of power a. The power of this aggregate is denoted by "1. According to Cantor's theory it is the transfinite

cardinal number next superior to a, which for the sake of uniformity is also denoted by N o. It has been con- jectured that M i = c, but this has neither been verified nor disproved. The discussion of the aleph-numbers is still in a controversial stage (November 1907) and the points in debate cannot be entered upon here.

23. Transfinite numbers, both ordinal and cardinal, may be combined by operations which are so far analogous to those of ordinary arithmetic that it is convenient to denote them by the same symbols. But the laws of operation are not entirely the same; for instance, 2to and &12 have different meanings: the first has been explained, the second is the index of the scheme (01 fa \ a 2 fa | o 3 63 | . . . | a n b „ | . . .) or any similar arrangement. Again if n is any positive integer, na — a n — a. It should also be observed that according to Cantor's principles of construction every ordinal number is succeeded by a definite next one; but that there are definite ordinal numbers {e.g. u),co 2) which have no ordinal immediately preceding them.

24. Theory of Numbers. — The theory of numbers is that branch of mathematics which deals with the properties of the natural numbers. As Dirichlet observed long ago, the whole of the subject would be coextensive with mathematical analysis in general; but it is convenient to restrict it to certain fields where the appropriateness of the above definition is fairly obvious. Even so, the domain of the subject is becoming more and more comprehensive, as the methods of analysis become more systematic and more exact.

The first noteworthy classification of the natural numbers is into those which are prime and those which are composite. A prime number is one which is not exactly divisible by any number except itself and 1 ; all others are composite. The number of primes is infinite (Eucl Elem. ix. 20), and consequently, if n is an assigned number, however large, there is an infinite number (a) of primes greater than n.

If m, n are any two numbers, and m > n, we can always find a definite chain of positive integers (gi, n), (g 2 , n), &c, such that

OT = gi»+ri, n = ˆri--ri, ri = q 3 r 2 +r i , &c.

with n > ri > r 2 > r 3 . . .; the process by which they are calculated will be called residuation. Since there is only a finite

number of positive integers less than n, the process must terminate v ; th two equalities of the form

rft-2 = qwh-i +n, n_i = gˆin.

Hence we infer successively that rn is a divisor of n_i, n-2, . . .n, and finally of m and n. Also r* is the greatest common factor of m, n: because any common factor must divide r\, ri, and so on down to r* ; and the highest factor of r» is rh itself. It will be convenient to write rA = dv {m, n). If r* = 1, the numbers m, n are said to be prime to each other, or co-primes.

25. The foregoing theorem of residuation is of the greatest importance; with the help of it we can prove three other fundamental propositions, namely: —

(1) If m, n are any two natural numbers, we can always find two other natural numbers x, y such that

dv(m,n) =xm— yn.

(2) If m, n are prime to each other, and p is a prime factor of mn, then p must be a factor of either m or n.

(3) Every number may be uniquely expressed as a product of prime factors.

Hence if n = p a qPr> ... is the representation of any numbern as the product of powers of different primes, the divisors of n are the terms of the product

(i+p+p*+ . . . +p°) (i+g+ ••• +2 S) (i+r+ . . . +rv) . . . their number is (a+i) (0 + i) (7 + 1) . . .; and their sum is 1 1 (£ a+1 — i)-r-II(/> — 1). This includes 1 and n among the divisors of n.

26. Totients. — By the totient of n, which is denoted, after Euler, by 4>{n), we mean the number of integers prime to n, and not exceeding n. If n = p*-, the numbers not exceeding « and not prime to it are

p, 2p, . . . (p a —p), p°- of which the number is p a ~ l : hence 4>(p a) = pa—pa-i, if m< n are prime to each other, (mn) *=(m)(n) ; and hence for the general case, if n = p°-qfrt . . . ,(n) =llp ar ~ 1 (p — 1), where the product applies to all the different prime factors of n. If di, di, &c, are the different divisors of n,

For example, i5 = 0(i5) +

27. Residues and congruences. — It will now be convenient to include in the term ” number ” both zero and negative integers. Two numbers a, b are said to be congruent with respect to the modulus m, when (a — b) is divisible by m. This is expressed by the notation asib (mod m), which was invented by Gauss. The fundamental theorems relating to congruences are

If o = 5 and c = d (mod ni), then a = c = & =

If ha = hb{mod m) then a = & (mod mid), where d = &v{h, m).

Thus the theory of congruences is very nearly, but not quite, similar to that of algebraic equations. With respect to a given modulus m the scale of relative integers may be distributed into m classes, any two elements of each class being congruent with respect to m. Among these will be (m) classes containing numbers prime to m. By taking any one number from each class we obtain a complete system of residues to the modulus m. Supposing (as we shall always do) that m is positive, the numbers o, I, 2, . . . (m — 1) form a system of least positive residues; according as m is odd or even, o, = i, = ± = 2, ... = * = § (m — i), or o, = t i, = 2, . . . ±J(»i— 2),|w form a system of absolutely least residues.

28. The Theorems of Fermat and Wilson.— Let r it r», . . . rt where t = (j > (m), be a complete set of residues prime to the modulus m. Then if x is any number prime to m, the residues xn, xrz, . . . xrt also form a complete set prime to m (§ 27). Consequently xri-xrj . . . xr t = r,r2 . . .rt, and dividing by nr 2 . . . r 1, which is prime to the modulus, we infer that

rf(m) = l(mod m).

which is the general statement of Fermat’s theorem. If m is a prime p, it becomes j: r ‘ = [(mod p).

For a prime modulus p there will be among the set x, 2x, XX, . . . {p — l)x just one and no more that is congruent to I: let this be xy. If y = x, we must have* 2 — 1 = (x — 1) (x + i) so, and hence x = = = 1: consequently the residues 2, 3, 4, . . . (p — 2) can be arranged in i (P~ 3) pairs (x, y) such that xy = l. Multiplying them all together, we conclude that 2.3.4. • • .(£ > — 2) = i and hence, since l.(p — 1) = — I,

(p — 1)! = — 1 (mod p).

which is Wilson's theorem. It may be generalized, like that of Fermat, but the result is not very interesting. If m is composite (m — i)! + i cannot be a multiple of m: because m will have a prime factor p which is less than m, so that (m — i)\=o (mod p). Hence Wilson's theorem is invertible : but it does not supply any practical test to decide whether a given number is prime.

29. Exponents, Primitive Roots, Indices. — Let p denote an odd prime, and x any number prime to p. Among the powers x, x 2 , **, . . . x rl there is certainly one, namely xˆ 1 , which s 1 (mod p) ; let X s be the lowest power of x such that x' = 1 . Then e is said to be the exponent to which x appertains (mod p) : it is always a factor of (p — i) and can only be I when x=i. The residues x for which e = p — i are said to be primitive roots of p. They always exist, their number is (p — l), and they can be found by a methodical, though tedious, process of exhaustion. If g is any one of them, the complete set may be represented by g, g°, g 6 , . . . &c. where a, b, &c, are the numbers less than (p — 1) and prime to it, other than I. Every number x which is prime to p is congruent, mod p, to g*, where i is one of the numbers I, 2, 3, . . . (p — l); this number i is called the index of x to the base g. Indices are analogous to logarithms: thus

indofcyˆindsX+indo-y. ind !l (x h) = h ind a; (mod p — i).

Consequently tables of primitive roots and indices for different primes are of great value for arithmetical purposes. Jacobi's Canon Arithmeticus gives a primitive root, and a table of numbers and indices for all primes less than 1000.

For moduli of the forms 2p, p m , 2p m there is an analogous theory (and also for 2 and 4) ; but for a composite modulus of other forms there are no primitive roots, and the nearest analogy is the representa- tion of prime residues in the form a 1 (3 s X s • • . 1 where 0, $, 7, . are selected prime residues, and x, y, z, . . . are indices of restricted range. For instance, all residues prime to 48 can be exhibited in the form 5 1 7″ 13 s , where x = o, 1, 2, 3; y = o, 1; z = o, 1; the total number of distinct residues being 4.2.2 = 16 = ˆ(48), as it should be.

30. Linear Congruences. — The congruence o'x=;6′ (mod m') has no solution unless dv(a', m') is a factor of V . If this condition is satisfied, we may replace the given congruence by the equivalent

one ax = b (mod m), where a is prime to b as well as to m. By residua- tion (§§ 24, 25) we can find integers h, k such that ah — mk = \, and thence obtain xssbh (mod m) as the complete solution of the given congruence. To the modulus m' there are m'/m incongruent solutions. For example, 12ˆ = 30 (mod 21) reduces to 2ˆ = 5 (mod 7) whence *i = 6 (mod 7) = 6, 13, 2p(mod 21). There is a theory of simultaneous

linear congruences in any number of variables, first developed with precision by Smith. In any particular case, it is best to replace as many as possible of the given congruences by an equivalent set obtained by successively eliminating the variables x, y, z, . . . in order. An important problem is to find a number which has given residues with respect to a given set of moduli. When possible, the solution is of the form x = a (mod m), where m is the least common multiple ot the moduli. Supposing that p is a prime, and that we have a corresponding table of indices, the solution of ax = = b (mod p) can be found by observing that ind x = ind 6-ind a (mod p-l)'.

31. Quadratic Residues. Law of Reciprocity. — To an odd prime modulus p, the numbers I, 4, 9, ... (p-i)- are congruent to i(p-i) residues only, because (pˆx) 2 = x 2 . Thus for p = 5, we have I, 4, 9, 16 = 1, 4, 4, 1 respectively. There are therefore 5(ˆ-1) quadratic residues and 5 (£-1) quadratic non-residues prime to p; and there is a corresponding division of incongruent classes of integers with respect to p. The product of two residues or of two non- residues is a residue; that of a residue and a non-residue is a non- residue; and taking any primitive root as base the index of any number is even or odd according as the number is a residue or a non- residue. Gauss writes aRp, aNp to denote that a is a residue or non- residue of p respectively.

Given a table of indices, the solution of x 2 = a(mo& p) when possible, is found from 2ind x = ind a (mod p-i), and the result may be written in the form x = ±r (mod p). But it is important to discuss the congruence x- = sa without assuming that we have a table of indices. It is sufficient to consider the case x 2 = = 5 (mod p), where q is a positive prime less than p; and the question arises whether the quadratic character of q with respect to p can be deduced from that of p with respect to q. The answer is

contained in the following theorem, which is called Ike law of quadratic reciprocity (for real positive odd primes): if p, q are each or one of them of the form 4W + 1, then p, g are each of them a residue, or each a non-residue of the other; but if p, q are each of the form 4W + 3, then according as p is a residue or non-residue of q we have q a non-residue or a residue of p.

Legendre introduced a symbol (ˆ which denotes + 1 or 1 ac cording as mRq or mN? (q being a positive odd prime and m any number prime to q) ; with its help we may express the law of re- ciprocity in the form

© (I) –

(-1)

}(jr-i)(«-i)

This theorem was first stated by Legendre, who only partly proved it; the first complete proof, by induction, was published by Gauss, who also discovered five (or six) other more or less inde- pendent proofs of it. Many others have since been invented.

There are two supplementary theorems relating to -I and 2 respectively, which may be expressed in the form

()=(~D. g)=(-,)Kˆ).

where p is any positive odd prime. It follows from the definition that

and that (-J = [~j , if m =m' (mod q). As a simple application of

the law of reciprocity, let it be required to find the quadratic char- acter of II with respect to 1907. We have

I1907/ V 11 / In/ _I

because 6N 1 1 . Hence 1 1 R1907.

Legendre's symbol was extended by Jacobi in the following manner. Let P be any positive odd number, and let p, p', p", &c. be

its (equal or unequal) prime factors, so that P = pp'p" Then

if Q is any number prime to P, we have a generalized symbol

defined

This symbol obeys the law that, if Q is odd and positive,

(|)® = (-i) I(P – l)(Q-^ with the supplementary laws

fr) -c-o”- 1 ‘. (I) “*.

It is found convenient to add the conventions that

when Q and P are both odd ; and that the value of the symbol is o when P, Q are not co-primes.

In order that the congruence x 2 = a (mod m) may have a solution it is necessary and sufficient that a be a residue of each distinct prime factor of m If these conditions are all satisfied, and m — 2 lc p K q* . . ... where p, q, &c, are the distinct odd prime factors of m, being / in all! the number of incongruent solutions of the given congruence is 2’, 2 ! + 1 or 2 , + 2 , according as k < 2, k = 2, or k > 2 respectively. The actual solutions are best found by a process of exhaustion. It should

be observed that I— J = 1 is a necessary but not a sufficient condition

for the possibility of the congruence.

32. Quadratic forms. — It will be observed that the solution of the linear congruence ax = b (mod m) leads to all the representations of b in the form ax + my, where *, y are integers. Many of the earliest researches in the theory of numbers deal with particular cases of the problem : given four numbers m, a, b, c, it is required to find all the integers x, y (if there be any) which satisfy the equation ax 2 bxy cy 2 = m. Fermat, for instance, discovered that every positive prime of the form 4» + i is uniquely expressible as the sum of two squares. There is a corresponding arithmetical theory for forms of any degree and any number of variables ; only those of linear forms and binary quadratics are in any sense complete, as the difficulty of the problem increases very rapidly with the increase of the degree of the form considered or of the number of variables contained in it.

_ The form ax’ + bxy + cy 2 will be denoted by (a, b, c) (x, y) 2 or more simply by (a, b, c) when there is no need of specifying the variables. If k is the greatest common factor of a, b, c, we mav write (a, b, c) = k(a’, V, c’) where (a’, V, c’) is a primitive form,

that is, one for which dv (a', V, c') = l. The other form is then said to be derived from (a', b', c') and to have a divisor k. For the present we shall concern ourselves only with primitive forms. Writing D=i 2 -4ac, the invariant D is called the determinant of (a,b,c), and there is a first classification of forms into definite forms for which D is negative, and indefinite forms for which D is positive. The case D = or a positive square is rejected, because in that case the form breaks up into the product of two linear factors. It will be observed that D = o, 1 (mod 4) according as b is even or odd; and that if k 2 is anv odd square factor of D there wiil be forms of determinant D and divisor k. If we write x' = ax +Py, y' =yx+iy, we have identically (a, b, c){x', y) 2 = (a', &', c'){x, y y where

a' = aa?--bay f oy 2

b' = 2aa0+b(aS+0y)+2cy&

c' = aˆ+b0d+d 2

Hence also

D' = b*-4a'c' = (ad-0y) 2 (b 2 -4ac) = (aS -Py) 1 D. Supposing that a, /3, y, S are integers such that aS— /3y = re, a number different from zero, (a, b, c) is said to be transformed into (a', b', c') by the substitution \^^\ of the nth order. If re 2 = i, the two forms

are said to be equivalent, and the equivalence is said to be proper or improper according as ra = i or »=— 1. In the case of equivalence, not only are x', y' integers wherever x, y are so, but conversely; hence every number representable by {a, b, c) is represen table by (a', b', c') and conversely. For the present we shall deal with proper equivalence only and write /~/' to indicate that the forms /, /' are properly equivalent. Equivalent forms have the same divisor. A complete set of equivalent forms is said to form a class; classes of the samedivisorare said to form an order, and of these the most important is the principal order, which consists of the primitive classes. It is a fundamental theorem that for a given determinant the number of classes is finite; this is proved by showing that every class must contain one at ieast of a certain finite number of so-called reduced forms, which can be found by definite rules of calculation.

33. Method of Reduction. — This differs according as D is

positive or negative, and will require some preliminary lemmas. Suppose that any complex quantity z = x+yi is represented in the usual way by a point (x, y) referred to rectangular axes. Then by plotting off all the points corresponding to (az-f/S) / (yz+S), we obtain a complete set of properly equivalent points. These all lie on the same side of the axis of , and there is precisely one of them and no more which satisfies the conditions: (i.) that it is not outside the area which is bounded by the lines 2X= ±1; (ii.) that it is not inside the circle x 2 + > > 2 = I ; (hi.) that it is not on the line 2x = i, or on the arcs of the circle x 2 +y = i intercepted by 2x = l and x = o. This point will be called the reduced point equiva- lent to z. In the positive half-plane (y>o) the aggregate of all reduced points occupies the interior and half the boundary of an area which will be called the fundamental triangle, because the aieas equivalent to it, and finite, are all triangles bounded by circular arcs, and having angles iw, \ir, o and the fundamental triangle may be considered as a special case when one vertex goes to infinity. The aggregate of equivalent triangles forms a kind of mosaic which fills up the whole of the positive half-plane. It will be convenient to denote the fundamental triangle (with its half-boundary, for which x< o) by V ; for a reason which will appear later, the set of equi valent triangles will be said to make up the modular dissection of the positive half-plane.

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Now let /' = {a', b', c') be any definite form with a' positive and ■determinant — A. The root of a'z 2 --b'z--c' =0 which is represented by a point in the positive half-plane is

-b'+iljA

" ii 7 — '

and this is a reduced point if either

(i.) b'

Cases (ii.) and (iii.) only occur when the representative point is on the boundary of V. A form whose representative point is reduced is said to be a reduced form. It follows from the geometrical theory that every form is equivalent to a reduced form, and that there are as many distinct classes of positive forms of determinant— A as there are reduced forms. The total number

of reduced forms is limited, because in case (i.) we have A=4oc — fr 2 >3& 2 , so that 63a 2 , or else a = 6 = c = V3A; incase (iii.) A=4a 2 — 6 2 >36 2 ,4a 2 = A+6 2 <ˆA,or else o = 6 = c = ViA. With the help of these inequalities a complete set of reduced forms can be found by trial, and the number of classes determined. The latter cannot exceed § A ; it is in general much less.

With an indefinite form (a, b, c) we may associate the representative circle

a{x* +f) + bx + c = o,

which cuts the axis of x in two real points. The form is said to be reduced if this circle cuts V ; the condition for this is a(a =* = J6 + c)

34. Problem of Representation. — It is required to find out whether a given number m' can be represented by the given form (a', b , c'). One condition is clearly that the divisor of the form must be a factor of m'. Suppose this is the case ; and let m, (a, b, c) be the quotients of m [and (a', b', c') be the divisor in question. Then we have now to discover whether m can be represented by the primitive form (a, b, c). First of all we will consider proper representations

m = (a, b, c) (a, y) 1 where a, 7 are co-primes. Determine integers /3, 6 such that aS — f}y = 1 ,

and apply to (a, 6, c) the substitution (a ' A ; the new form will be (m, n, I), where

n 2 — \ml = D = V — \ac.

Consequently w 2 = D (mod \m), and D must be a quadratic residue of m. Unless this condition is satisfied, there is no proper repre- sentation of m by any form of determinant D. Suppose, however, that n 2 = D (mod 4m) is soluble and that n u Mj., &c. are its roots. Taking any one of these, say m, we can find out whether (m, «i, k) and

(a, b, c) are equivalent; if they are, there is a substitution (a A

which converts the latter into the former, and then m = aa? + bay + cy i . As to derived representations, if m = (a, b, c) (tx, ty) 2 , then m must have the square factor P, and m/P = (a, b, c)

(x, y) 2 ; hence every- thing may be made to depend on proper representation by primitive forms.

35. Automorphs. The Pellian Equation. — A primitive form (a, b, c) is, by definition, equivalent to itself; but it may be so in more ways than one In order that (a, b, c) may be transformed into

itself by the substitution (”’ s J , it is necessary and sufficient that

(a, p\ = (h(t+bu), -cu \ \y, 5/ \ au, \{t-bu)) where ((, u) is an integral solution of

£-Dk 2 = 4.

If D is negative and — D>4, the only solutions are t= ±2, w = o; D= — 3 gives (±2, o), (±1, ±1); D = — 4 gives (±2, o), (o, ±1). On the other hand, if D>o the number of solutions is infinite, and if (t u Mi) is the solution for which /, u have their least positive values, all the other positive solutions may be found from

!»+a,VD

(M^VD)V = 2, 3)4 ...).

The substitutions by which (a, 6, c) is transformed into itself are called its automorphs. In the case when D=o (mod 4) we have / = 2T, « = 2U, D =4N, and (T, U) any solution of

■p-NU 2 = l.

This is usually called the Pellian equation, though it should properly be associated with Fermat, who first perceived its importance. The

minimum solution can be found by converting V N into a periodic continued fraction.

The form (a, b, c) may be improperly equivalent to itself; in this case all its improper automorphs can be expressed in the form

/ X , (K +6X)/2o\ \(K-b\)/2c, -X j

where k 2 — DX 2 = 4

36. Characters of a form or class. Genera. — Let (a, b, c) be any primitive form; we have seen above (§ 32) that if a, 0, 7, 8 are

any integers

4(aa 2 + Ja T +C7 2)(aˆ +6/3S+C5 2) = 6′ 2 – (a5 -/37) 2 D

where V = 2aa0+b(a8-{-Py) +2cy§. Now the expressions in brackets on the left hand may denote any two numbers m, n representable by the form (a, b, c) ; the formula shows that i,mn is a residue of D, and hence mn is a residue of every odd prime factor of D, and if p is

-A and l-rj will have the same value.

Putting (a, b, c) =/, this common value is denoted by (

a quadratic character (or simply character) of / with respect to p.

Since a is representable by / (x = 1 , y = o) the value ttj is the same as

hjj . For example, if D = — 140, the scheme of characters for the

six reduced primitive forms, and therefore for the classes they represent, is

©(f)

(1,0,35) + +

(4.ˆ2,9)

(5, o, 7) (3, ±2, 12)

In certain cases there are supplementary characters of the type

l—F) and lj) , and the characters (ˆ j are discriminated according

as an odd or even power of p is contained in D ; but in every case there are certain combinations of characters (in number one-half of all possible combinations) which form the total characters of actually existing classes. Classes which have the same total character are said to belong to the same genus. Each genus of the same order contains the same number of classes.

For any determinant D we have a principal primitive class for which all the characters are + ; this is represented by the principal form (1, o, — n) or (1, I, — ») according as D is of the

form \n or 4» + 1. The corresponding genus is called the principal genus. Thus, when D = — 140, it appears from the table above that in the primitive order there are two genera, each containing three classes; and the non-existent total characters are -| — and — (-•

37. Composition. — Considering X, Y as given lineo-linear functions of (* > y), (x' t y') defined by the equations

X = poxx' +pixy' +p 2 x'y +p 3 yy' Y = g xx' +q t xy' +q 2 x'y +q 3 yy'

we may have identically, in x, y, x', y',

(A, B, C) (X, Y) 2 = (a, b, c) (x, y) 2 X (a', b', c') (x', /) 2 and, this being so, the form (A, B, C) is said to be compounded of the two forms (a, b. c), {a', V, c'), the order of composition being indifferent. In order that two forms may admit of composition into a third, it is necessary and sufficient that their determinants be in the ratio of two squares. The most important case is that of two primitive forms , % of the same determinant; these can be com- pounded into a form denoted byˆx or x which is also primitiye and of the same determinant as 4, or x- If A, B, C are the classes to which , X, x respectively belong, then any form of A compounded with any form of B gives rise to a form belonging to C. For this reason we write C=AB = BA, and speak of the multiplication or composition of classes. The principal class is usually denoted by I , because when compounded with any other class A it gives this same class A.

The total number of primitive classes being finite, h, say, the series A, A 2 , A 3 , &c, must be recurring, and there will be a least exponent e such that A' — 1. This exponent is a factor of h, so that every class satisfies A* = 1. Composition is associative as well as commutative, that is to say, (AB)C=A(BC); hence the symbols A,, A 2 ,. . . A» for the h different classes define an Abelian group (see Groups) of order h, which is representable by one or more base-classes Bi, B 2 , . . . B,- in such a way that each class A is enumerated once and only once by putting

A = Bi x B 2 ». ..B,« (xˆm,yˆn,...zˆp)

with mn...p = h, and B 1 ~ = B 2 "= ... = 3ˆ = 1. Moreover, the bases may be so chosen that m is a multiple of n, n of the next correspond- ing index, and so on. The same thing may be said

with regard

to the symbols for the classes contained in the principal genus, because two forms of that genus compound into one of the same kind. If this latter group is cyclical, that is, if all the classes of the principal genus can be represented in the form I, A, A 2 ,. . .A” -1 , the determinant D is said to be regular; if not, the determinant is irregular. It has been proved that certain specified classes of determinants are always irregular; but no complete criterion has been found, other than working out the whole set of primitive classes, and determining the group of the principal genus, for deciding whether a given determinant is irregular or not.

If A, B are any two classes, the total character of AB is found by compounding the characters of A and B. In particular, the class A 2 , which is called the duplicate of A, always belongs to the principal genus. Gauss proved, conversely, that every class in the principal genus may be expressed as the duplicate of a class. An ambiguous class satisfies A 2 = i, that is, its duplicate is the principal class; and the converse of this is true. Hence if Bi, B 2 , . . . Bi are the base- classes for the whole composition-group, and A = Bi x B2 v . . . Bi* (as above) A 2 = I, if 2* = o or m, 2y =o or re, &c; hence the number of ambiguous classes is 2’. As an example, when D = —1460, there are four ambiguous classes, represented by

(i> o, 365), (2, 2, 183), (5, o, 73), (io, 10, 39); hence the composition-group must be dibasic, and in fact, if we put Bi, B 2 for the classes represented by (11, 6, 34) and (2, 2, 183), we have Bi 10 = B 2 2 = 1 and the 20 primitive classes are given by Bi x B2”(x— i°. V— 2)- In this case the determinant is regular and the classes in the principal genus are 1, Bi 2 ,’ Bi 4 , Bi 6 , Bi 8 .

38. On account of its historical interest, we may briefly consider the form x*--y 2 , for which D = —4. If p is an odd prime of the form 4«-(-l, the congruence w 2 =— 4(mod 4/>) is soluble (§ 31) ; let one of its roots be m, and m 2 +4 = 4/£. Then {p, m, I) is of determinant —4, and, since there is only one primitive class for this determinant, we must have (p, m. l)~ (1, o, 1). By known rules we can actually find

a substitution (a ‘ ˆ) which converts the first form into the second; this being so, (_l _) wu ‘ transform the second into the first, and we

shall have p = y 2 +5 2 , a representation of p as the sum of two squares. This is unique, except that we may put ˆ = (= fc 7) 2 |(± 8) 2 . We also have 2 = i 2 + i 2 while no prime 4»+3 admits of such a representation. The theory of composition for this determinant is expressed by the identity (x 2 +y 2) (x’ 2 +y n) = (xx’ ˆyy’) 2 + {xy’ˆyx’) 2 ; and by re- peated application of this, and the previous theorem, we can show that if l$=2“fPq c . . ., where p, q,... are odd primes of the form 4B-t-i. we can find solutions of N=x 2 +y ! , and indeed distinct solutions. For instance 65 = i 2 +8 2 = 4 2 -f-7 2 , and conversely two distinct representations N=* 2 t:y 2 = tt 2 -r-z’ 2 lead to the conclusion that N is composite. This is a simple example of the application of the theory of forms to the difficult problem of deciding whether a given large number is prime or composite ; an application first indicated by Gauss, though, in the present simple case, probably known to Fermat.

39. Number of classes. Class-number Relations. — It appears from Gauss’s posthumous papers that he solved the very difficult problem of finding a formula for h(D), the number of properly primitive classes for the determinant D. The first published solution, however, was that of P. G. L. Dirichlet; it depends on the consideration of series of the form 2(ax 2 f6x l y|-cy 2)” 1_, where 1 is a positive quantity, ultimately made very small. L. Kronecker has shown the connexion of Dirichlet’s results with the theory of elliptic functions, and ob- tained more comprehensive formulae by taking (a, b, c) as the standard type of a quadratic fcrm, whereas Gauss, Diiichlet, and most of their successors, took (a, 2&, c) as the standard, calling (b 2 — ac) its determinant. As a sample of the kind of formulae that are obtained, let p be a prime of the form 471+3; then

K- 4 />)=Za-Z|8, hUp) log (J-HW£)=log n(tanˆ)

where in the first formula 2a means the sum of all quadratic residues of p contained in the series I, 2, 3,. . -i(p~l) and 2/3 is the sum of the remaining non-residues; while in the second formula (/, u) is the least positive solution of t i —pu 2 = i, and the product extends to all values of b in the set 1, 3, 5,. . .(4ˆ — 1) of which p is a non- residue. The remarkable fact will be noticed that the second formula gives a solution of the Pellian equation

in a trigonometrical form.

Kronecker was the first to discover, in connexion with the complex multiplication of elliptic functions, the simplest instances of a very curious group of arithmetical formulae involving sums of class- numbers and other arithmetical functions; the theory of these re- lations has been greatly extended by A. Hurwitz. The simplest of all these theorems may be stated as follows. Let H (A) represent the number of classes for the determinant —A, with the convention that i and not I is to be reckoned for each class containing a reduced form of the type (a, o, a) and J for each class containing a reduced form (a, a, a) ; then if n is any positive integer,

2 H(4n-K 2) = *(«)+¥(») (-2V»ˆ/cˆ2V»)

K=O t +1,- ■ •

where *(n) means the sum of the divisors of re, and ¥(n) means the excess of the sum of those divisors of n which are greater than V »

over the sum of those divisors which are less than V n. The formula is obtained by calculating in two different ways the number of reduced values of z which satisfy the modular equation J(nz) = J(z), where J(z) is the absolute invariant which, for the elliptic function p(«; ft. £3) is g2 3 i (g2 3 — 27g3 2), and z is the ratio of any two primitive periods taken so that the real part of iz is negative (see below, § 68). It should be added that there is a series of scattered papers by J. Liouville, which implicitly contain Kronecker's class-number relations, obtained by a purely arithmetical process without any use of transcendents.

40. Bilinear Forms. — A bilinear form means an expression of the type "SanXiyk (1 = 1, 2,...m; k — l, 2, ...re); the most important case is when m = n, and only this will be considered here. The invariants of a form are its determinant [a„„] and the elementary factors thereof. Two bilinear forms are equivalent when each can be transformed into the other by linear integral substitutions x' =Xax, y=2j8y. Every bilinear form is equivalent to a reduced

r form 2e,*iyi , and r = re, unless [a an] =0. In order that two forms may

be equivalent it is necessary and sufficient that their invariants should be the same. Moreover, if a~b and c~d, and if the invariants of the forms o-f-Xc, b--\d are the same for all values of X, we shall have a--\c~b+Kd, and the transformation of one form to the other may be effected by a substitution which does not involve X. The theory of bilinear forms practically includes that of quadratic forms, if we suppose Xi, yt to be cogredient variables. Kronecker has de- veloped the case when re = 2, and deduced various class-relations for quadratic forms in a manner resembling that of LiouviHe. So far as the bilinear forms are concerned, the main result is that the number of classes for the positive determinant 011022— Oi 2

41. Higher Quadratic Forms. — The algebraic theory of quadratics is so complete that considerable advance has been made in the much more complicated arithmetical theory. Among the most important results relating to the general case of re variables are the proof that the class-number is finite; the enumeration of the arithmetical invariants of a form; classification according to orders and genera, and proof that genera with specified characters exist; also the de- termination of all the rational transformations of a given form into itself. In connexion with a definite form there is the important conception of its weight; this is defined as the reciprocal of the number of its proper automorphs. Equivalent forms are of the same weight; this is defined to be the weight of their class. The weight of a genus or order is the sum of the weights of the classes contained in it ; and expressions for the weight of a given genus have actually been obtained. For binary forms the sum of the weights of all the genera coincides with the expression denoted by H(A) in § 39. The complete discussion of a form requires the consideration of (re— 2) associated quadratics ; one of these is the contra variant of the given form, each of the others contains more than re variables. For certain quaternary and senary classes there are formulae analogous to the class-relations for binary forms referred to in § 39 (see Smith, Proc. R.S. xvi., or Collected Papers, i. 510).

Among the most interesting special applications of the theory are certain propositions relating to the representation of numbers as the sum of squares. In order that a number may be expressible as the sum of two squares it is necessary and sufficient for it to be of the form PQ 2 , where P has no square factor and no prime factor of the form 4re+3. A number is expressible as the sum of three squares if, and only if, it is of the form m 2 n with re:= 1, ±2 ±3

(mod 8) ; when m = i and n = 3 (mod 8), all the squares are odd, and hence follows Fermat's theorem that every number can be expressed as the sum of three triangular numbers (one or two of which may be o). Another famous theorem of Fermat's is that every number can be expressed as the sum of four squares ; this was first proved by Jacobi, who also proved that the number of solutions of n = x 2 +y 1 +z i +t i is 8*(re), if n is odd, while if re is even it is 24 times the sum of the odd factors of n. Explicit and finite, though more complicated, formulae have been obtained for the number of representations of re as the sum of five, six, seven and eight squares respectively. As an example of the outstanding difficulties of this part of the subject may be mentioned the problem of finding all the integral (not merely rational) auto- morphs of a given form /. When / is ternary, C. Hermite has shown that the solution depends on finding all the integral solutions of ¥(x, y, s)+P = i, where F is the contravariant of f.

Thanks to the researches of Gauss, Eisenstein, Smith, Hermite and others, the theory of ternary quadratics is much less incomplete than that of quadratics with four or more variables. Thus methods of reduction have been found both for definite and for indefinite forms; so that it would be possible to draw up a table of rppre- sentative forms, if the result were worth the labour. One specially important theorem is the solution of ax 1 -- by 2 +cz i =o; this is always possible if —be, —ca, —ab are quadratic residues of a, b, c respectively, and a formula can then be obtained which furnishes all the solutions.

42. Complex Numbers. — One of Gauss's most important and far-reaching contributions to arithmetic was his introduction of complex

integers a+ bi, where a, b are ordinary integers, and, as usual, i 2 = — 1 . In this theory there are four units ±1, ±«; the numbers i h (a+bi) are said to be associated; a—bi is the conjugate of a+bi and we write N(a±6i)=a 2 +i 2 , the norm of a+bi, its conjugate, and asso- ciates. The most fundamental proposition in the theory is that the process of tesiduation (§ 24) is applicable; namely, if m, n are any two complex integers and N(ro)>N(n), we can always find integers q, r such that m = gn J

rr with N(rJˆjN(«). This may be proved analytically, but is obvious if we mark complex integers by points in a plane. Hence immediately follow propositions about resolutions into prime factors, greatest common messuie, &c, analogous to those in the ordinary theory; it will only be necessary to indicate special points of difference.

We have 2 = — i(i+i) 2 , so that 2 is associated with a square; a real prime of the form 471+3 is still a prime, but one of the form 471 + 1 breaks up into two conjugate prime factors, for example. 5 = (1 — 2i)(l +21) An integer is even, semi-even, or odd according as it is divisible by (1 +»')', (l +i) or is prime to (1 +i). Among four associated odd integers there is one and only one which = I (mod 2 + 21); this is said to be primary; the conjugate of a primary number is primary, and the product of any number of primaries is primary. The conditions that a+bi may be primary are 6=0 (mod 2) o+i-iso (mod 4). Every complex integer can be uniquely expressed in the form i" , (i+*)"a»6?ci' ..., where oˆm<4, and a, b, c, . . . are primary primes.

With respect to a complex modulus m, all complex integers may be distributed into N(jtc) incongruous classes. If m = h{a+bi) where o, 6 are co-primes, we may take as representatives of these classes the residues x+yi where * = o, I, 2,.. . {(a 2 +&*)A — 1); y = o, 1, 2, . . .(h — i). Thus when 6=0 we may take x = o, 1, 2, ...(ft — 1); y = o, 1, 2,. . .{h — 1), giving the k? residues of the real number h; while if a+bi is prime, 1, 2, 3,. . .(cˆ+i 2 — 1) form a complete set of residues.

The number of residues of m that are prime to m is given by

«ˆ(m)=N(m)n(i- N ˆ)

where the product extends to all prime factors of m. As an analogue to Fermat s theorem we have, for any integer prime to the modulus,

x*<'"> = 1 (mod m),xN(i»-i= 1 (mod p) according as m is composite or prime. There are <7>(N(£) — ij primitive roots of the prime p; a primitive root in the real theory for a real prime 41 + 1 is also a primitive root in the new theory for each prime factor of (471 + 1), but if £ = 4*1+3 be a prime its primitive roots are necessarily complex.

43. If p, q aie any two odd primes, we shall define the symbols

(“j and (-) by the congruences

#*{*««>‘} (|) 2 , #{N(«>-.|« g) 4 (mod s).

it being understood that the symbols stand for absolutely least

residues. It follows that (–) = 1 or — 1 according as p is a quadratic

residue of q or not; and that (- 1 =1 only if p is a biquadratic

residue of q. If p, q are primary primes, we have two laws of reciprocity, expressed by the equations

To these must be added the supplementary formulae

g) 1 -(-i)*JW*)-M 1 (ˆ.) i -(-i)il«««« l >

a--bi being a primary odd prime. In words, the law of biquadratic reciprocity for two primary odd primes may’be expressed by saying that the biquadratic characters of each prime with respect to the other are identical, unless £ = 3=3+21 (mod 4), in which case they are opposite. The law of biquadratic reciprocity was discovered by Gauss, who does not seem, however, to have obtained a complete proof of it. The first published proof is that of Eiseustein, which is very beautiful and simple, but involves the theory of lemniscate functions. A proof on the lines indicated in Gauss’s posthumous papers has been developed by Busche; this probably admits of simplification. Other demonstrations, for instance Jacobi’s, depend on cyclotomy (see below).

44. Algebraic Numbers. — The first extension of Gauss’s complex theory was made by E. E. Kummer, who considered complex numbers represented by rational integral functions of any roots of unity, thus including the ordinary theory and Gauss’s as special cases. He was soon faced by the difficulty that, in some cases, the law that an integer can be uniquely expressed as the product of prime factors appeared to break down. To see how this happens take the equation 7| 2 +7,+6 = o, the roots of which are expressible as rational

integral functions of 23rd roots of unity, and let ij be either of the roots. If we define 077+6 to be an integer, when a, b are natural numbers, the product of any number of such integers is uniquely expressible in the form lr--m. Conversely every integer can be expressed as the product of a finite number of indecomposable

integers a + 677, that is, integers which cannot be further resolved into factors of the same type. But this resolution is not necessarily unique: for instance 6 = 2.3 = —7,(77 + 1), where 2, 3, 77, 77 + 1 are all indecomposable and essentially distinct. To see the way in which Kummer surmounted the difficulty consider the congruence

M 2 + a + 6 = o(mod£) where p is any prime, except 23. If — 23 Rp this has two distinct roots Ui, : and we say that 01? + 6 is divisible by the ideal prime factor of p corresponding to U\, if = I and there will be two ideal factors of 2, say p\ and pz such that 077 + 6 = 0 (mod pi) if 6 = 0 (mod 2) and 077 + 6 = 0 (mod pi) if a + 6 = o (mod 2). If both these congruences are satisfied, a = 6 = o (mod 2) and ay + b is divisible by 2 in the ordinary sense. Moreover (aij + 6)(ci; + d) < = (bc + ad— ae)7, + (&d — 6ac) and if this product is divisible by pu W = o (mod 2), whence either ajj + 6 or ci\ + d is divisible by pi ; while if the product is divisible by pi we have bc + ad-\-bd — yac = o (mod 2) which is equivalent to (a + 6) (c + d) = o (mod 2), so that again either 077 + 6 or c-q + d is divisible by pi. Hence we may properly speak of pi and £2 as prime divisors. Similarly the congruence « 2 +» + 6 = o (mod 3) defines two ideal prime factors of 3, and aij + 6 is divisible by one or the other of these according as 6 = 0 (mod 3) or 2a + b = o (mod 3); we will call these prime factors p 3 , pi. With this notation we have (neglecting unit factors)

2 = plp2, 3 = p3p4, v—pip3t i + v = p2pi- Real primes of which — 23 is a non-quadratic residue are also primes in the field (ij) ; and the prime factors of any number 077 + 6, as well as the degree of their multiplicity, may be found by factorizing (6a 2 — a6 + 6 2), the norm of (077 + 6). Finally every integer divisible by pi is expressible in the form = * = 2m = (1 +77)71 where m, n are natural numbers (or zero); it is convenient to denote this fact by writing £2 = [2, 1 + 77] , and calling the aggregate 2m + (i + ij)n a compound modulus with the base 2, i + ij. This generalized idea of a modulus is very important and far-reaching ; an aggregate is a modulus when, if o, (S are any two of its elements, a + f) and a —0 also belong to it. For arithmetical purposes those moduli are most useful which can be put into the form [a:, a 2 ,...a„] which means the aggregate of all the quantities Xiai + X2ai + ... + x n a n obtained by assigning to (*i,*j,...w„), independently, the values Oi ± i, ± 2, &c. Compound moduli may be multiplied together, or raised to powers, by rules which will be plain from the following example. We have lV = [4. 2(1 + 7,), (i + r,) 2] = [4, 2 + 2.7,-5 + 71] = [4, 12,-5 + 7,]

= [4.-5+7)1 = [4. 3+1] hence pi' = M£i = [4. 3+1] X[2, 1+77] = [8, 4+477, 6+277, 3+41 4V]

= [8,4+477,6+277, -3+377] = (77 -1M77+2, 77-6, 3] = (t?i) [i,77]. Hence every integer divisible by P2 3 is divisible by the actual integer (77 — 1) and conversely; so that in a certain sense we may regard pi as a cube root. Similarly the cube of any other ideal prime is of the form (a77+6)[l, 77]. According to a principle which will be explained further on, ali primes here considered may be arranged in three classes; one is that of the real primes, the others each contain ideal primes only. As we shall see presently all these results are intimately connected with the fact that for the determinant —23 there are three primitive classes, represented by (1, 1, 6) (2, 1, 3), (2, — 1, 3) re spectively.

45. Kummer's definition of ideal primes sufficed for his particular purpose, and completely restored the validity of the fundamental theorems about factors and divisibility. His complex integers were more general than any previously considered and suggested a defini- tion of an algebraic integer in general, which is as follows: if 01,02,. ..o» are ordinary integers {i.e. elements of N, § 7), and 9 satisfies an equation of the form

e"+aifl"- 1 +a 2 e»- 2 + . . . +a„_ 1 0+a„ =0, 8 is said to be an algebraic integer. We may suppose this equation irreducible; 9 is then said to be of the wth order. The n roots 0, 8', 8",. . .flf- 1 ' are all different, and are said to be conjugate. If the equation began with Oo0 n instead of 0", 8 would still be an algebraic number; every algebraic number can be put into the form 8/m, where m is a natural number and 8 an algebraic integer.

Associated with 9 we have afield (or corpus) Q = R(9) consisting of all rational functions of 8 with real rational coefficients ; and in like manner we have the conjugate fields £2′ = R(9'), &c. The aggregate of integers contained in U is denoted by 0.

Every element of Q can be put into the form u = co+ci9+.. . +c„_i0"- 1 where Co, Ci,...e„_i are real and rational. If these coefficients are all integral, to is an integer; but the converse is not necessarily true. It is possible, however, to find a set of integers &>i, &>2....«„ belong- ing to Q, such that every integer in Q can be uniquely expressed in the form

W=/tlWl+/[2W2+ . . . •-HnOSn

where hi, ht ,. ... h n are elements of N which may be called the co-ordinates of &> with respect to the base on, &>2, . . . u>. Thus o is a modulus (§ 44), and we may write o = [o>i, a> 2 , . . . o> n]. Having found one base, we can construct any number of equivalent bases by means of equations such as at' =2aju', where the rational integral

j coefficients £•' are such that the determinant \c n n\= ˆi. If we write

VA =

G>1, 6)2,

. . Wn

O) 1, Oj'2,

II II 0) 1, U> 2,

. . a',

. . a"

"1 1 <*2 > ■

A is a rational integer called the discriminant of the field. Its value is the same whatever base is chosen.

If o is any integer in fl, the product of a and its conjugates is a rational integer called the norm of a, and written N(a). By consider- ing the equation satisfied by a we see that N(a) =oai where a L is an integer in fl. It follows from the definition that if a, /S are any two integers in fl, then N(a/3) = N(a)N(|8); and that for an ordinary real integer m, we have N(m) =m n .

46. Ideals. — The extension of Kummer's results to algebraic numbers in general was independently made by J. W. R. Dedekind and Kronecker; their methods differ mainly in matters of notation and machinery, each having special advantages of its own for particular purposes. Dedekind's method is based upon the notion of an ideal, which is defined by the following properties: —

(i.) An ideal m is an aggregate of integers in fl.

(ii.) This aggregate is a modulus ; that is to say, if n, n' are any two elements of m (the same or different) m~m' is contained in m. Hence also m contains a zero element, and m+m' is an element of m.

(iii.) If y. is any element of rrt, and a any element of 0, then u/u is an element of m. It is this property that makes the notion of an ideal more specific than that of a modulus.

It is clear that ideals exist; for instance, itself is an ideal. Again, all integers in fl which are divisible by a given integer a (in 0) form an ideal; this is called a principal ideal, and is denoted by oa. Every ideal can be represented by a base (§§ 44, 45), so that we may write m = hji, m, . . . m*] > meaning that every element of m can be uniquely expressed in the form "Zhou, where hi is a rational integer. In other words, every ideal has a base (and therefore, of course, an infinite number of bases). ' If a, b are any two ideals, and if we form the aggregate of all products afi obtained by multiplying each element of the first ideal by each element of the second, then this aggregate, together with all sums of such products, is an ideal which is called the product of a and b and written ab or ba. In particular oa=a, o 2 = o ,00 . o/3 = oa/3. This law of multiplication is associative as well as commutative. It is clear that every element of ab is contained in a : it can be proved that, conversely, if every element of c is contained in a, there exists an ideal b such that ab = c. In particular, if a is any element of a, there is an ideal a' such that oa=aa'. A prime ideal is one which has no divisors except itself and 0. It is a fundamental theorem that every ideal can be resolved into the product of a finite number of prime ideals, and that this resolution is unique. It is the decomposition of a principal ideal into the product of prime ideals that takes the place of the resolution of an integer into its prime factors in the ordinary theory. It may happen that all the ideals in S are principal ideals ; in this case every resolution of an ideal into factors corresponds to the resolution of an integer into actual integral factors, and the introduction of ideals is unnecessary. But in every other case the introduction of ideals or some equivalent notion, is indispensable. When two ideals have ' been resolved into their prime factors, their greatest common measure and least common multiple are determined by the ordinary rules. Every ideal may be expressed (in an infinite number of ways) as the greatest common measure of two principal ideals.

47. There is a theory of congruences with respect to an ideal modulus. Thus a = ff (mod m) means that a — £ is an element of tn. With respect to m, all the integers in fl may be arranged in a finite number of incongruent classes. The number of these classes is called the norm of m, and written N(tn). The norm of a prime ideal p is some power of a real prime p; if N(p) = p f , p is said to be a prime ideal of degree/. If m, n are any two ideals, then N(mti) =N(m)N(u). If N(m) =m, then mso (mod m), and there is an ideal m' such that vm = tntn'. The norm of a principal ideal Pa is equal to the absolute value of N(o) as defined in § 45.

The number of incongruent residues prime to m is —

*(m)=N(m)n(i-^),

where the product extends to all prime factors of m. If &> is any element of r> prime to in,

&><<>(m)==i (mod m).

Associated with a prime modulus p for which N (p) ==p ! we have 4>(pJ — 1) primitive roots, where has the meaning given to it in the ordinary theory. Hence follow the usual results about exponents, indices, solutions of linear congruences, and so on. For any modulus m we have N(m)=2«K&), where the sum extends to all the divisors of m.

48. Every element of t> which is not contained in any other ideal is an algebraic unit. If the conjugate fields fl, fl', . . . fl<" _1 > consist of fi real and 2r2 imaginary fields, there isa system of units 61, £2, . . . t,, where r = ri--ft — l, such that every unit in fl is expressible in the form e=p«i' , «2 6 ...«>■' where p is a root of unity contained in fl and a, b, ... I are natural numbers. This theorem is due to Dirichlet.

The norm of a unit is +1 or -1 ; and the determination of all the units contained in a given field is in fact the same as the solution of a Diophantine equation

F(h, h, ... ») = == 1.

For a quadratic field the equation is of the form h^-nh^=^l, and the theory of this is complete; but except for certain special cubic corpora little has been done towards solving the important problem of assigning a definite process by which, for a given field, a system of fundamental units may be calculated. The

researches of Jacobi, Hermite, and Minkowsky seem to show that a proper exten- sion of the method of continued fractions is necessary.

49. Ideal Classes. — If m is any ideal, another ideal n can always be found such that mrt is a principal ideal; for instance, one such multiplier is m _l N(m). Two ideals m ; tn' are said to be equivalent (m~m') or to belong to the same class, if there is an ideal n such that tnn, tn'n are both principal ideals. It can be proved that two ideals each equivalent to a third are equivalent to each other and that all ideals in fl may be distributed into a finite number, h, of ideal classes. The class which contains all principal ideals is called the principal class and denoted by O.

If m, n are any two ideals belonging to the classes A, B respectively, then mn belongs to a definite class which depends only upon A, B and may be denoted by AB or BA indifferently. Thus the class- symbols form an Abelian group of order h, of which O is the unit element; and, mutatis mutandis, the theorems of § 37 about com- position of classes still hold good.

The principal theorem with regard to the determination of h is the following, which is Dedekind's generalization of the corresponding one for quadratic fields, first obtained by Dirichlet. Let f(s) = 2N(m)-«

(m) where the sum extends to all ideals m contained in fl; this converges so long as the real quantity s is positive and greater than 1. Then k being a certain quantity which can be calculated when a funda- mental system of units is known, we shall have

Kh = Lt{{s-i)S{s).

The expression for k is rather complicated, and very peculiar; it may be written in the form

rl + r2 r2 D _2_7T K

K ~ w – |VA| where [VA| means the absolute value of the square root of the dis- criminant of the field, n, n have the same meaning as in § 48, w is the number of roots of unity in fl, and R is a determinant of the form \fi(e?)\, of order (n + rz-i), with elements which are, in a certain special sense, " logarithms " of the fundamental units ti, «2, . . . e,.

50. The discriminant A enjoys some very remarkable properties.

Its value is always different from =*= I ; there can be only a finite number of fields which have a given discriminant; and the rational prime factors of A(B) are precisely those rational primes which, in fl, are divisible by the square (or some higher power) of a prime ideal. Consequently, every rational prime not contained in A is resolvable, in fl, into the product of distinct primes, each of which occurs only once. The presence of multiple prime factors in the discriminant was the principal difficulty in the way of extending Kummer's method to all fields, and was overcome by the introduction of com- pound moduli — for this is the common characteristic of Dedekind's and Kronecker's procedure.

51. Normal Fields. — The special properties of a particular field K are closely connected with its relations to the conjugate fields fl', fl", . . . flO 1 >. The most important case is when each of the conjugate fields is identical with fl: the field is then said to be Galoisian or normal. The aggregate R(0, 6', . . . 6K n_1 >) of a!l rational functions of and its conjugates is a normal field: hence every arithmetical field of order n is either normal, or contained in a normal field of a higher order. The roots of an equation /(0) =0 which defines a normal field are associated with a group of substitu tions: if this is Abelian, the field is called Abelian; if it is cyclic, the field is called cyclic. A cyclotomic field is one the elements of which are all expressible as rational functions of roots of unity; in particular the complete cyclotomic field C m , of order {m), is the aggregate of all rational functions of a primitive mth root of unity. To Kronecker is due the very remarkable theorem that all Abelian (including cyclic) fields are cyclotomic: the first published proof of this was given by Weber, and another is due to D. Hilbert.

Many important theorems concerning a normal field have been established by Hilbert. He shows that if fl is a given normal field of order m, and p any of its prime ideals, there is a finite series of associated fields fli, O2, &c, of orders mi, m*, &c, such that mi=o (mod. m'+i)i an d that if r i =m/m i , p r *' = Pi, a prime ideal in fl'''. If flj is the last of this series, it is called the field of inertia

(Traghehskbrper) for p : next after this comes a nother field of still lower order called the resolving field (Zerlegungskbrper) for

p, and in this field there is a prime of the first degree, p; + i, such that p; + i = p*, where k = m/mi. In the field of inertia pifi remains a prime, but becomes of higher degree; in S2i_i, which is called the branch-field (Ver- zweigungskorper) it becomes a power of a prime, and by going on in this way from the resolving field to Q, we obtain (I + 2) representations for any prime ideal of the resolving field. By means of these theorems, Hilbert finds an expression for the exact power to which a rational prime p occurs in the discriminant of Q, and in other ways the structure of £2 becomes more evident. It may be observed that whem m is prime the whole series reduces to fi and the rational field, and we conclude that every prime ideal in is of the first or ?nth degree: this is the case, for instance, when m = 2, and is one of the reasons why quadratic fields are comparatively so simple in character. 52. Quadratic Fields. — Let m be an ordinary integer different from + 1 , and not divisible by any square : then if x, y assume all ordinary rational values the expressions x + y-Jm are the elements of a field which may be called $2(Vw). It should be observed that V m means one definite root of x 2 — m = o, it does not matter which: it is con- venient, however, to agree that V rn is positive when m is positive, and j V m is negative when m is negative. The principal results relating to $2 will now be stated, and will serve as illustrations of

§§44-51-

In the notation previously used

o = [i > J(I + V«)Ior [1, V«] according as ot = i (mod 4) or not. In the first case A = m, in the second A = \m. The field Q is normal, and every ideal prime in it is of the first degree.

Let q be any odd prime factor of m; then g = q 2 , where q is the

fjrime ideal [q, i(? + V»0] when wsi (mod 4) and in other cases q, V»«] - An odd prime p of which m is a quadratic residue is the product of two prime ideals p, p', which may be written in the form \p < J(a-rV«)] , \p,l(a — -Jm)] or [p, a + i] m] , [p,a — ˆm] , according as m = i (mod 4) or not: here a is a root of x 2 = w (mod p), taken so as to be odd in the first of the two cases. All other rational odd primes are primes in fi. For the exceptional prime 2 there are four cases to consider: (i.) if m = i (mod 8), then 2 = [2,J(l + Vra)] X [2,§(l — V»i)] . (ii.) If m = 5 (mod 8), then 2 is prime: (iii.) if m = 2 (mod 4), 2 = [2,Vm] 2 : (iv.) if m = 3 (mod = 4), 2 = [2,i + V») 2 . Illustrations will be found in § 44

for the case m = 23.

53. .Normal Residues. Genera. — Hilbert has introduced a very convenient definition, and a corresponding symbol, which is a gene- ralization of Legendre's quadratic character. Let n, m be rational

integers, m not a square, w any rational prime; we write I— —) =4-1 if, to the modulus w, n is congruent to the norm of an integer con- tained in H(Vm) ; in all other cases we put I — — I = — I. This new

symbol obeys a set of laws, among which may be especially noted In. w\ Iw, n\ ln\ , In, m\ , .

\~~w~) = V~bTJ = W \~) = +I ' whenever "• m are P" me

top.

Now let qi, qt, ■ ■ ■ qt be the different rational prime factors of the discriminant of $2(\ tn) ; then with any rational integer a we may associate the t symbols

l a, m \ la, m\ (a m \

\ qi I ' \ qi) ' " ' \ qt)

and call them the total character of a with respect to 12. This definition may be extended so as to give a total character for every ideal a in 12, as follows. First let 12 be an imaginary field (m

I n, m \ I n, m \

V 2i / ' " ' \ Or')

next proposition, which, in its natural order, is easily proved by the method of ideals, whereas Gauss had to employ the theory of ternary quadratics.

Every class of the principal genus is the square of a class.

An ambiguous ideal in 12 is defined as one which is unaltered by the change of V m to — ˆ m (that is, it is the same as its conjugate) and not divisible by any rational integer except =1. The only ambi- guous prime ideals in 12 are those which are factors of its discriminant. Putting A = qi 2 q 2 2 . . -qi 2 , there

are in 12 exactly 2′ ambiguous ideals: namely, those factors of A, including n, which are not divisible by any square. It is a fundamental theorem, first proved by Gauss, that the number of ambiguous classes is equal to the number of genera.

54. Class-Number. — The number of ideal classes in the field 12(V m) may be expressed in the following forms : —

(i.) m < 0:

the total character of a. Secondly, let 12 be a real field; we first determine the t separate characters Of — I , and if they are all positive we put n = +N(a), r = t, and adopt the r characters just written above as those of a. Suppose, however, that one of the characters of — 1 is negative ; without loss of generality we may take it to be that with reference to qt. We then put r — t — 1, » = ±N(a) taken

+ 1, and take as thetotal character

with such a sign that (— '- — 1 = of a the symbols (-r—) for i = i,

.(«-0.

(ii.) m > o:

t „ /A\ 2A \nl

(» = I, 2,

-a);

log e

log

n sin T II sin r

With these definitions it can be proved that all ideals of the same class have the same total character, and hence there is a distribution of classes into genera, each genus containing those classes for which the total character is the same (cf. § 36).

Moreover, we have the fundamental theorem that an assigned set of r units ± I corresponds to an actually existing genus if, and only if, their product is +1, so that the number of actually

existing genera is 2 r ~ l . This is really equivalent to a theorem about quadratic forms first stated and proved by Gauss; the same may be said about the

In the first of these formulae t is the number of units contained in 12; thus t = 6 for A=— 3, r=4 for A = — 4, t — 2 in other cases. In the second formula, e is the fundamental unit, and the products are

taken for all the numbers of the set (1,2,. . .A) for which /-) = +1,

It) = — 1 respectively. In the ideal theory the only way in

which these formulae have been obtained is by a modification of Dirichlet's method; to prove them without the use of transcendental analysis would be a substantial advance in the theory.

55. Suppose that any ideal in 12 is expressed in the form [ai, 02]; then any element of it is expressible as Xwi + yu2, where x, y are rational integers, and We shall have N (xai + yui) = ax 2 + bxy + cy 2 , where a, b, c are rational numbers contained in the ideal. If we put x = ax'--fiy',y = yx'--by', where a, /S, y, S are rational numbers such that aS— 187 = = 1, we shall have simultaneously (a, b, c) (x, y) 2 = (a 1 , b', c') (x' t y') 2 as in § 32 and also

(a', b', c') (*', y) 2 =N{x'(a Wl 7a)2)/o? U i + a W2)! =N(xV 1 + / a y,

where [a'i, a'?] is the same ideal as before. Thus all equivalent forms are associated with the same ideal, and the numbers representable by forms of a particular class are precisely those which are norms of numbers belonging to the associated ideal. Hence the class-number for ideals in fi is also the class-number for a set of quadratic forms; and it can be shown that all these forms have the same determinant A. Conversely, every class of forms of determinant A can be associated with a definite class of ideals in Q{yjm), where m = A or jA as the case may be. Composition of form-classes exactly corresponds to the multiplication of ideals: hence the complete analogy between the two theories, so long as they are really in con- tact. There is a corresponding theory of forms in connexion with a field of order «: the forms are of the order n, but are only very special forms of that order, because they are algebraically resolvable into the product of linear factors.

56. Complex Quadratic Forms. — Dirichlet, Smith and others, have discussed forms (a, b, c) in which the coefficients are complex integers of the form m--ni; and Hermite has considered bilinear forms axx' --bxy' --b'x'y--cyy' , where x' , y', b' are the conjugates of x, y, b and a, c, are real. Ultimately these theories are connected with fields of the fourth order; and of course in the same way we might consider forms (a, b, c) with integral coefficients belonging to any given field of order n : the theory would then be ultimately connected with a field of order 2n.

57. Kronecker's Method. — In practice it is found convenient to combine the method of Dedekind with that of Kronecker, the main principles of which are as follows. Let F(x, y, z, . . .) be a poly- nomial in any number of indeterminates (umbrae, as Sylvester calls them) with ordinary integral coefficients; if n is the greatest common measure of the coefficients, we have F = raE, where E is a primary or unit form. The positive integer n is called the divisor of F; and the divisor of the product of two forms is equal to the product of the divisors of the factors. Next suppose that the coefficients of F are integers in a field fi of order n. Denoting the conjugate forms by F', F", ... Fˆ- 1), the product FF'F" . . . F

product of the contents of two forms is equal to the content of the product of the forms. Every form is associated with a definite ideal m, and we have N(F) =N(m) if m is the content of F, and N(m) has the meaning already assigned to it. On the other hand, to a given ideal correspond an indefinite number of forms of which it is the content; for instance (§ 46, end) we can find forms ax+0y of which any given ideal is the content.

58. Now let mi, W2, . . . Wn be a basis of 0; u u ih, ■ • ■ u„ a set of indeterminates ; and

£ = 0>lKi+a> 2 M2+ . . . +«„«„:

J is called the fundamental form of fi. It satisfies the equation N(x-£)=o, or

F(*) =x»+U 1 x"- 1 + . . . +U„ = o where Ui, U 2 , . . . U„ are rational polynomials in u u « 2 , . . .«„ with rational integral coefficients. This is called the fundamental equation.

Suppose now that p is a rational prime, and that p = fc\h c . . . where p, q, r, . . . &c, are the different ideal prime factors of * then if F(x) is the left-hand side of the fundamental equation there is an identical congruence

FW=iPWMQ(x)|»|RW|'. . .(mod p) where P(x), Q(x), &c, are prime functions with respect to p. The meaning of this is that if we expand the expression on the right-hand side of the congruence, the coefficient of every term x l Ui m . . . u n ' will be

congruent, mod p, to the corresponding coefficient in F(*). If,, g, h, &c, are the degrees of p, a, r, &c. (§ 47), then/, g, h, . . . are the dimensions in x, u u u 2 ,. . . u n of the forms of P, Q, R, respectively. For every prime p, which is not a factor of A, a = b = c = . . . = 1 and F(x) is congruent to the product of a set of different prime factors, as many in number as there are different ideal prime factors ol p In particular, if p is a prime in Q, F(x) is a prime function (mod p) and conversely.

It generally happens that rational integral values 01, a?, . . . a n can be assigned to u u « 2 , . . . u n such that U„, the last term in the fundamental equation, then has a value which is prime to p. Suppos- ing that this condition is satisfied, let aiui+o 2 o; 2 + . . .-fa„w„ = o; and let Fi(a) be the result of putting x = a, m=ai in P(x). Then the ideal p is completely determined as the greatest common divisor of p and Pi (a); and similarly for the other prime factors of p. There are, however, exceptional cases when the condition above stated is not satisfied.

59- Cydolomy. — It follows from de Moivre's theorem that the arithmetical solution of the equation x m — i =0 corresponds to the division of the circumference of a circle into m equal parts. The case when m is composite is easily made to depend on that where m is a power of a prime; if m is a power of 2, the solution is effected by a chain of quadratic equations, and it only remains to consider the case when m = g«, a power of an odd prime. It will be convenient to write p. =<*>(>«) =g*-i (5-1); if we also put r^eimlm, the primitive roots of x m = 1 will be p, in number, and represented by r, r a , r*, &c. where I, o, b, &c, form a complete set of prime residues to the modulus m. These will be the roots of an irreducible equation f(x)=o of degree m; the symbol f(x) denoting (x m — i) + (x m l)*; and the change of r into r g produces a cyclical permutation of the roots. It follows from this that every cyclic polynomial in n, r 2 , . . .»> with rational coefficients is equal to a rational number. Thus if we write l+ag*

+bf + .kg^~ 1 =n, we have, in virtue of r h = r° h ,⁰. . .r v .fy^} = r n , and, if we use S _to denote cyclical summation, SfoW. . . > > ') = r !r n '— r ”'?- 1 .. the sum of the nth powers of all the roots of f{x) =0, and this is a rational integer or zero. Since every cyclic polynomial is the sum of parts similar to S{r i a r i b . . .»><). the theorem is proved. Now let e, f be any two conjugate factors of /, so that «/ = M, and let*

Vi = ri+r> +e +n + 2,+ . . . +r,- + (/_i) e (= i, 2,. . .e) then*

the elementary symmetric functions Zti,-, Ztktj', &c, are cyclical functions of the roots of f(x) =0 and therefore have rational values which can be calculated : consequently ij,, tjj, . . .17., which are called the /-nomial periods, are the roots of an equation

F(rj) =V'+Cir, e ~ l + ■ ■ ■ +C e =0 with rational integral coefficients. This is irreducible, and defines a field of order e contained in the field defined by f(x) =0. Moreover, the change of r into r' alters m into %+i, and we have the theorem that any cyclical function of Vl , tj 2 , . . . n e is rational. Now let h, k be any conjugate factors of / and put

Si^i+n+te+rV^-l-. . .r +u _ h) e (= I, 2, 3,)*

then fi.fn-,, fi +2e . . .fi + (A_i) e will be the roots of an equation

G®=f-m$*-i+c 2 {**+... + C4 «o, the coefficients of which are expressible as rational polynomials in rn. Dividing h into two conjugate factors, we can deduce from G(f) =0 another period equation, the coefficients of which are rational poly- nomials in 7ft, fi, and so on. By choosing for e, h, &c, the successive prime factors of p., ending up with 2, we obtain a set of equations of*

prime degree, each rational in the roots of the preceding equations, and the last having n and n-» for its roots. Thus to take a very interesting historical case, let m = 17, so that p. = 16 = 2 4 , the equations are all quadratics, and if we take 3 as the primitive roct of 17, thev are " '

i?+i?— 4-o, J-2-r,f-I=o*

2X2-2fX + (r,f-r, + f-3)=0, p 2 Ap + I=o. If two quantities (real or complex) a and b are represented in the usual way by points in a plane, the roots of x 2 +ax+b=o will be represented by two points which can be found by a Euclidean con struction, that is to say, one requiring only the use of rule and com- pass. Hence a regular polygon of seventeen sides can be inscribed in a given circle by means of a Euclidean construction; a fact first discovered by Gauss, who also found the general law, which is that a regular polygon of m sides can be inscribed in a circle by Euclidean construction if and only if 0(m) is a power of 2 ; in other words TO = 2«P where P is a product of different odd primes, each of which is 01 the form 2 n +i.

*Returning to the case m = q\ we shall call the chain of equations * VI) = °i, &c – wl } en , e a. c h is of prime degree, a set of Galoisian auxili- aries. We can find different sets, because in forming them we*

can take the prime factors of p in any order we like ; but their number is always the same, and their degrees always form the same aggregate namely, the prime factors of p. No other chain of auxiliaries having similar properties can be formed-containing fewer equations of a given prime degree p ■ a fact first stated by Gauss, to whom this theory is mainly due. Thus if m = ? « we must have at least («- 1) auxiliaries of order q, and if q-i =2«6P . . ., we must also have a quadratics, P equations of order p, and so on. For this reason a set of Galoisian auxiliaries may be regarded as providing the simplest solution of the equation f(x)=o.

60. When m is an odd prime p, there is another very interesting way of solving the equation (x p-i) + (x-i) =0. As before let Vi, r 2 , . . . r„_i) be its roots arranged in a cycle by means of a primitive root of x^ = i (mod p); and let e be a primitive root of «— = 1 . Also let*

*ft =ri+«r 2 «»r, . . . + < *-*r p _ 1*

*0t = r 1 -feV 2 – r – £ 2 V 3 +. . . +e-Vj,_! {k=2, 3,. . .p-2) so that 6k is derived from 0i by changing « into e**

if Tn h f e „ Cy -« Cal i, permU ifL 0n (r – u f2 ‘ \ ■ ■ r “~ l) a PP lied to 0* converts it into e 0t; hence 9i0/0n-i is unaltered, and may be expressed as a rational, and therefore as an integral function of e. It is found by calculation that we may put*

** = 0fclf = ? «indm+Aind(*+i-m) [/fe = 1, 2, . . . (^,-3)] while*

0i0p-2= —p. In the exponents of ^(e) the indices are taken to the base g used to establish the cyclical order (n, r 2 . . . r^i). Multiplying together the (p — 2) preceding equalities, the result is

*0i p_1 = -MtolMO • ■ -lAp-3(e) =R(e) where R(e) is a rational integral function of « the degree of which in its reduced form, is less than (p- 1). Let p be any one definite root of *”- l = R(«), and put 0i=p: then since*

■‘Ph-l

we must take 0 = P*Mf2 . . . ^*_i = R*(e)p*. where R k (e) is a rational function of e, which we may suppose put into its reduced integral form; and finally, by addition of the equations which define 0i, 6 2 , &c,*

_ (-l)n=p-t-R 2 Wp 2 -|-R3(e)p3-|-... +R p _ 2 (e) p r-2. If in this formula we change p into e~ h p, and n into r.,, it still remains true.

It will be observed that this second mode of solution employs a Lagrangian resolvent 0i ; considered merely as a solution it is neither so direct nor so fundamental as that of Gauss. But the form of the solution is very interesting; and the auxiliary numbers i>(t) have many curious properties, which have been investigated by Jacobi Cauchy and Kronecker. '

61. When m = q", the discriminant of the corresponding cyclotomic field is ±g\ where \ = q K ~ I (K q-K-i). The prime q is equal to q", where n = 4>(m) =? K_I (g- 1), and q is a prime ideal of the first degree. If p is any rational prime distinct from g. and / the least exponent such that />' = i (mod. m),f will be a factor of ft, and putting /»//=«, we have £ = pip 2 . . .p„, where pi, p 2 . . . p« are different prime ideals each of the /th degree. There are similar theorems for the case when m is divisible by more than one rational prin.e.

*Kummer has stated and proved laws of reciprocity for quadratic and higher residues in what are called regular fields, the definition of which is as follows. Let the field be R(e 2ri/ *), where * is an odd prime; then this field is regular, and p is said to be a regular prime, when h, the number of ideal classes in the field, is not divisible by p. Kummer proved the very curious fact that p is regular if, and only if, it is not a factor of the denominators of the first §(p— 3) Bernoullian*

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numbers. He also succeeded in showing that in the field R(e 2 "»7) the equation a* 4-/3" +7? =0 has no integral solutions whenever h is not divisible by p*. What is known as the " last " theorem of Fermat is his assertion that if m is any natural number exceeding 2, the equation x m +y m =z m has no rational solutions, except the obvious ones for which xyz = o. It would be sufficient to prove Fermat's theorem for all prime values of m; and whenever Kummer's theorem last quoted applies, Fermat's theorem will hold. Fermat's theorem is true for all values of m such that 2*

Hilbert has studied in considerable detail what he calls Kummer fields, which are obtained by taking x, a primitive pth root of unity, and y any root of y" — a = o, where a is any number in the field R(z) which is not a perfect pth power in that field. The Kummer field is then R (x, y), consisting of all rational functions of x and y. Other

fields that have been discussed more or less are general cubic fields, some special biquadratic and a few Abelian fields not cyclic.

Among the applications of cyclotomy may be mentioned the proof which it affords of the theorem, first proved by Dirichlet, that if m, n are any two rational integers prime to each other, the linear form mx +n is capable of representing an infinite number of primes.

62. Gauss's Sums. — Let m be any positive real integer; then

s

g2j 2 ffj/m ;

I+i

Vm.

This remarkable formula, when m is prime, contains results which were first obtained by Gauss, and thence known as Gauss's sums. The easiest method of proof is Kronecker's, which consists in finding the value o{j{e^^i"dzl(i~e'mz)) t taken round an appropriate contour. It will be noticed that one result of the formula is that the square root of any integer can be expressed as a rational function of roots of unity.

The most important application of the formula is the deduction from it of the law of quadratic reciprocity for real primes : this was done by Gauss.

63. One example may be given of some remarkable formulae giving explicit solutions of representations of numbers by certain quadratic forms. Let p be any odd prime of the form 7»+2; then we shall have p = jn+2 = x 2 +jy 2 , where x is determined by the congruences

2XS (n)f (2n)! (mod P) " X ~ 3 (mod 7)> This formula was obtained by Eisenstein, who proved it by investigat- ing properties of integers in the field generated by 7j 3 -2Itj-7=o, which is a component of the field generated by seventh rootf of unity. The first formula of this kind was given by Gauss, and relates to the case p = ^n + i=x 2 +y 2 ; he conceals its connexion with complex numbers. Probably there are many others which have not yet been stated.

*64. Higher Congruences. Functional Moduli. — Suppose that p is a real prime, and that/(x), (x) are polynomials in * with rational integral coefficient.. The congruence f{x) = (x) (mod p) is identical*

when each coefficient of / is congruent, mod p, to the corresponding coefficient of . It will be convenient to write, under these circumstances, /_0(mod p) and to say that /, are equivalent, mod p. Every polynomial of degree h is equivalent to another of equal or lower degree, which has none of its coefficients negative, and each of them less than p. Such a polynomial, with unity for the coefficient of the highest power of x contained in it, may be called a reduced polynomial with respect to p. There are, in all, p* reduced polynomials of degree h. A polynomial may or may not be equivalent to the product of two others of lower degree than itself ; in the latter case it is said to be prime. In every case, F being any polynomial, there is an equivalence F~c/i/ 2 . . . /; where c is an integer and /i 1/2,-/1 are prime functions; this resolution is unique. Moreover, it follows from Fermat's theorem that IFOˆ—FOc"), JF(*)j p2 _F(x' >2), and so on.

As in the case of equations, it may be proved that, when the modulus is prime, a congruence f(x) = o (mod p) cannot have more incongruent roots than the index of the highest power of * in f{x), and that if x=£is a solution, f(x)~(x-Ofi(x), where fi{x) is another polynomial. The solutions of xp= =x are all the residues of p\ hence x"-x~x(x + i) (x+2) . . .(x+p-i), where the right-hand expression is the product of all the linear functions which are prime to p. A generalization of this is contained in the formula

x(x* , "- 1 -i)_n/(*) (mod p) where the product includes every prime function f(x) of which the degree is a factor of m. By a process similar to that employed in finding the equation satisfied by primitive mth roots of unity, we can find an expression for the product of all prime functions of a given degree m, and prove that their number is (m> 1)

—(p m 2 p m " +2p m "ˆ...)

where a, b, c ... are the different prime factors of m. if F is any given function, we can find a resolution F~cF!F 2 . . . F m (mod p)

Moreover,

where c is numerical, Fi is the product of ali prime linear functions which divide F, F 2 is the product of all the prime quadratic factors, and so on;

65. By the functional congruence $\{x)ˆ(x) (mod p,f(x)) is meant that polynomials U, V can be found such that $\{x) =i(x) +6U + W(x)

identically. We might also write^f.)-^) (mod p, /()) ; but this is not so necessary here as in the preceding case of a simple modulus. Let m be the degree of /() ; without loss of generality we may suppose that the coefficient cf x m is unity, and it will be further assumed that /(*) is a prime function, mod p. Whatever the dimensions of {x), there will be definite functions x (x), <£. (x) such that (x)=f(x) x (x)+i(x) where i(x) is of lower dimension than /(x) ; moreover, we may suppose i(x) replaced by the equivalent reduced function 2 (mod p, /(«)) where %'_ k 2 ' • ■ • 0R»-i w "l a " be different, and we conclude that 0" '=i (mod p, f). Every function therefore satisfies n ~ (mod p, f) ; by putting =x we obtain the principal theorem stated in § 64.

A still more comprehensive theory of compound moduli is due to Kronecker; it will be sufficiently illustrated by a particular case. Let mbea fixed natural number; X, Y, Z, T assigned polynomials, with rational integral coefficients, in the independent variables x, y, 2; and let U be any polynomial of the same nature as X, Y, Z, T. We may write U~o (mod m, X, Y, Z, T) to express the fact that there are integral polynomials M, X', Y', Z', T' such that

U=jreM+X'X+Y'Y+Z'Z-|-T'T identically. In this notation U-V means that U-V~o. The number of independent variables and the number of functions in the modulus are unrestricted; there may be no number m in the modulus, and there need not be more than one. This theory of Kronecker's is admirably adapted for the discussion of all algebraic problems of an arithmetical character, and is certain to attain a high degree of development.

It is worth mentioning that one of Gauss's proofs of the law of quadratic reciprocity (Gott. Nachr. 181 8) involves the principle of a compound modulus.

*66. Forms of Higher Degree.— Except for the case alluded to at the end of § 55, the theory of forms of the third and higher degree is still quite fragmentary. C. Jordan has proved that the class number is finite. H. Poincare has discussed the classification of ternary and quaternary cubics. With regard to the ternary cubic it is known that from any rational solution of / = o we can deduce another by a process which is equivalent to finding the tangential of a point (*i. yu z\) on the curve, that is, the point where the tangent at (*i, Vu 21) meets the curve again. We thus obtain a series of solutions (xi, yi, Zi), (x 2 , y 2 , z 2), &c.,, which may or may not be periodic. E. Lucas and J. I. Sylvester have proved that for certain cubics / = o has no rational solutions; for instance x 3 + y 3 -Az 3 = o has*

rational solutions only if A = ab(a + b)/c a , where a, b, c are rational integers. Waring asserted that every natural number can be expressed as the sum of not more than 9 cubes, and also as the sum of not more than 19 fourth powers; these propositions have been neither proved nor disproved.

*67. Results derived from Elliptic and Thela Functions. — For the sake of reference it will be convenient to give the expressions for the four Jacobian theta functions. Let u be any complex quantity such that the real part of iu is negative ; and let q = e*i<->. Then*

+ °°, 2 600(11) = Zq e s W» = 1 + 23 cos 2irv + 2q i cos 41m + 2qp cos 6ir» + . . .*

- 00 00

= n(i-2 s “)(i + 22 2 ‘- 1 cos 2n + 2 M),

X

0oi M = I -2g cos 2TTV + 2q cos 47111 -20? cos 6irv + ...*

= n(l -2 2 »)(l 22 2 1 COS 27TD + 2‘- 2),

I

Oio(v) = 2q i cos ttv + 2g ! cos $m) + 2q cos S-iro-f . . .*

= 2g cos «/n(l-g 2s)(i-r-2g 2s cos 2in) + q i >),*

1

0n (») = 2g sin to — 23* sin 37111 + 22^ sin 57111 — . . .*

1 00

*22 sin iroll(i— 2**) (1-*

*22** COS 27TO + 2 4s)-*

&c. Clearly 0h = o; we have

Instead of 8«i(o), &c, we write the important identities

fl u ‘ = 7r9oo0io9oi 9oo 4 = 0oi 4 -Hio 4

where B n ‘ means the value of ddu (v)/dv for v = o. If, now, we put

V«’

Coo “00

86o

NUMBER

so that

M«0 .

= Vk • sn«,

9io(p) _ 0oi(»)

\7 0m to V*

and, supposing for simplicity that ia is a real negative quantity,

x9oo 2 =2K, «7r0 m 2 = 2iK’, w=jK’/K, the notation being that which is now usual for the elliptic functions. It is found that

— sn2K« = 22-

kK

K

cn2K« = 22- ii

i I —q q’-l

— l sin(2j-i)ir«,

pjCOS (25 — l) 1TM,

— dn 2Ku = £+22.

g-

-COS2S1TM.

•) 2 .

‘n+S 2 ‘ From the last formula, by putting u =0, we obtain

I +42-r£* = — =0oo 2 (l+2g+2g< +2gP+. 1 1 -rg it

and hence, by expanding both sides in ascending powers of g, and equating the coefficients of g", we arrive at a formula for the number of ways of expressing n as the sum of two squares. If 8 is any odd divisor of n, including 1 and n itself if n is odd, we find as the co-efficient of 2" in the expansion of the left-hand side 42(-i)^; on the right-hand side the coefficient enumerates all the solutions n = (= x) 2 4- (± y) 2 , taking account of the different signs (except for o 2) and of the order in which the terms are written (except when 3c 2 =y 2). Thus if n is an odd prime of the form 4I + 1, 2(-i) 6-l) =2, and the coefficient of g n is 8, which is right, because the one possible com- position ra=a 2 +6 2 may be written ra=(±a) 2 +(±6) 2 =(±6) 2 +(±a) 2 , giving eight representations.

By methods of a similar character formulae can be found for the number of representations of a number as the sum of 4, 6, 8 squares respectively. The four-square theorem has been stated in § 41 ; the eight-square theorem is that the number of representations of a number as the sum of eight squares is sixteen times the sum of the cubes of its factors, if the given number is odd, while for an even nu mber it is sixteen times the excess of the cubes of the even factors above the cubes of the odd factors. The five-square and seven- square theorems have not been derived from g-series, but from the general theory of quadratic forms.

68. Still more remarkable results are deducible from the theory of the transformation of the theta functions. The elementary formulae are

u (m,w + i) = e" i, % i (u,w), flio(«,u + i) = e 1 " l % (u,o>), 0oi(«, w + i) =0oo(m,w), 0oo(tt,«+l) = 0Ol(w, u),

-WaS/u.

"0u

—) = — J'V — iw0n(«, 01),

0)/

e -™v» ei ja t _i\ =v^30io(«,o>),

*e -W«V» fll0 /« _I\ =v~=^0oi(w ,«), *

(-,) =V — i«0oo(w, w),

\<0 «/

— to'w2/wo

where V — ju is to be taken in such a way that its real part is positive. Taking the definition of k given in § 67, and considering k as a function of o>, we find

K (~Z) =9 O' 2 /0oo 2 = k'(o)).

J-

j{g- 2 +744-f-c 1 g 2 -|-c 2 g 4 +

For convenience let k 2 (u)=1) convert o into +f))/(yu> +5)\ can be compounded of («,co + i)and («,— w _1); the effect on a will be the same as if we apply a corresponding substi- tution compounded of [

1 — " ?_

and any symmetrical function of these will have the same value at any two equivalent places in the modular dissection (§ 33). Their sum is constant, but the sum of their squares may be put into the form

2(a 2 – J + l) 3 „.

hence (

, 4!> 2 -

this is a transcendental function of u. which is a special case of a

Fuchsian or automorphic function. It is an analytical function of g 2 , and may be expanded in the form

1

1728 1

where c\, c 2 , &c, are rational integers.

*69. Suppose, now, that a, b, c, d are rational integers, such that dv(a, b, c, d) = 1 and ad — bc = n, a positive integer. Let (aa+b)J {coi--d) =co'; then the equation J(u>') =J(w) is satisfied if and only if u'~w, that is, if there are integers a,/3, ■y, 5 such that 06-/37 = * I, and*

(au + b) (yu + S) — (ca + d) { aw +0) = 0. If we writeiKw)

=»n(i +£ 1), where the product extends to all prime factors (p) of n, it is found that the values of a fall into iˆ(ra) equiva lent sets, so that when « is given there are not more than

/i(J',J)=o symmetrical in J, J', with integral coefficients and of degree ˆ{n). Similarly when dv(o, b, c, d) =r we have an equation / T (J , J) =0 of order ˆ(nJT 2) ; hence the complete modular equation for transforma- tions of the »th order is

. Fa'j)=n/r(j',j)=o,

the degree of which is $(n), the sum of the divisors of n.

Now if in F(J',J) we put J'=J, the result is a polynomial in J alone, which we may call G(J). To every linear factor of G corre- sponds a class of quadratic forms of determinant (k 2 ~4«) where k 2 <4» and k is an integer or zero: conversely from every such form we can derive a linear factor (J — a) of G. Moreover, if with each form we associate its weight (§ 41) we find that with the notation of § 39 the degree of G is precisely 2H(4« — k 2)— e„, where c n = i when n is a square, and is zero in other cases. But this degree may be found in another way as follows. A complete representative set of trans- formations of order n is given by u ={aa-\-b)jd, with ad — n, 0ˆb

GCJ)=n{j(„)-j(22f*)j,

and by substituting for J(«) and J (-ˆr—) their values in terms of

g, we find that the lowest term in the factor expressed above is either g~ 2 /i728or g -2a,d /i728, or a constant, according as ad or a = d. Hence if v is the order of G(j), so that its expansion in q begins with a term in g -2 " we must have

j- = 2(i – V» V* / d>\ na>\ n

d>\ n = 22

2H(4m-k 2) =22d+«„ = +(»), K d>Sn

as stated in § 39.

70. Each of the singular moduli which are the roots of G(J)=o corresponds to exactly one primitive class of definite quadratic forms, and conversely.

Corresponding to every given negative determinant —A there is an

irreducible equation ˆ(j)=0, where J = I728J, the coefficients of which are rational integers, and the degree of which is h (— A)- The coefficient of the highest power of _; is unity, so thatj is an arithmetical integer, and its conjugate values belong one to each primitive class of determinant —A. By adjoining the square roots of the prime factors of A the function \j/{j) may be resolved into the product of as many factors as there are genera of primitive classes, and the degree of each factor is equal to the number of classes in each genus. In particular, if {1, I, i(A+l)} is the only reduced form for the determinant —A, the value of j is a real negative rational cube. At*

the same time its approximate value is exp I —2iti- ‘

744— e”\ A , so that, approximately, e“V a =nt 3 -{-744 where m is a rational integer. For instance e*“V 43 = 88473674ˆ3-9997775 ... = 96o 3 +744 very nearly, and for the class (1, I, 11) the exact value of j is-960 3 . Four and only four other similar determinants are known to exist, namely — 11, —19, —67, — 163, although thousands have been classified. According to Hermite the decimal part of eˆV 163 begins with twelve nines; in this case Weber has shown that the*

-] +744 =

exact value of j is-2 18> 3 3 -5 3 -23 3 -29 3 .

71 . The function j(w) is the most fundamental of a set of quantities called class-invariants. Let (a, b, c) be the represents tive of any class of definite quadratic forms, and let a be the root of ax 2 --bx +c = which has a positive imaginary part ; then F (w) is said to be a class- invariant for (a, b, c) if F \ a ’” ■ A =F(u) for all real integers a \yo>\&/

0, 7, 8 such that 08—07 = 1. This is true for j(a) whatever a may be, and it is for this reason that j is so fundamental. But, as will be seen from the above examples, the value of j soon becomes so large that its calculation is impracticable. Moreover, there is the difficulty of constructing the modular equation /i(J, J’) =0 (§69), which

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has only been done in the cases when » = 2, 3 (the latter by Smith in Proc. Lond. Math. Soc. ix. p. 242).

For moderate values of A the difficulty can generally be removed by constructing algebraic functions of j. Suppose we have an irreducible equation

x m +c,x v >- 1 + . . . +c„=o,

the coefficients of which are rational functions of j(o>). If we apply any modular substitution u' = S(u), this leaves the equation unaltered, and consequently only permutates the roots among themselves: thus if x t (w) is any definite root we shall have i(w') = Xi(u), where i may or may not be equal to I. The group of unitary substitutions which leave all the roots unaltered is a factor of the complete modular group. If we put y = x(nw), y will satisfy an equation similar to that which defines x, with f written for j; hence, since j,j' are connected by the equation/! (j,/) =0, there will bean equation \K. y)=o satisfied by x and y. By suitably choosing x we can in many cases find \l/{x, y) without knowing /i(j, j') ; and then the equation ˆ(x, x) =0 defines a set of singular moduli, each one of which belongs to a certain value of u and all the quantities derived from it by the substitutions which leave x(w) unaltered.

As one of the simplest examples, let n = 2, x 3 -j(oi) =y 3 -j (w ') =0. Then the equation connecting x, y in its complete form is of the ninth degree in each variable; but it can be proved that it has a rational factor, namely

y 3 -xfiy 2 +4()ˆxy+x 3 ~2 i . 3 3 . 5 3 = o, and if in this we put x=y — u, the result is

w 4 -2« 3 -495« 2 +2 4 .3 3 .5 3 =0, the roots of which are 12, 20,-15,-15. It remains to find the values of w, to which they belong. Writing y 2 (co) = -} j, it is found that we may define 72 in such a way that 72(01+1) =e~ 27r »7 3 72(w), 72(-w ') = 72(01), whence it is found that

(a,+fl\ – ˆWya-t-flS-W) HˆTi) =e 7,(»). We shall therefore have 72(201) = 72(01) for all values of such that «.._, l«s o*.. 5 _ (mod 3).*

2oi =

yai-Py = l, 75+7a+/35-ˆ57 2 H

7w+5

Putting (a, /S, y, 5) = (o, -I, I, o) the conditions are satisfied, and

2oj=j'V2. Now j(i) — 1728, so that y 2 (i) = 12; and since j'(«) is positive for a pure imaginary, 72(ˆ2) =20. The remaining case is settled by putting

01 _au>\{3

2 7w-(-5

with a, /3, y, S satisfying the same conditions as before. One solution is (1, 2, 1, 1) and hence oi 2 +3oi+4 = o, so that ~ ' ˆ '

72

,2 *)—> *■

Besides 72, other irrational invariants which have been used with effect are 73 = V (j-1728), the moduli k, k', their square and fourth roots, the functions /, /1, / 2 defined by

/=2i(K /)-A./ 1 = v K './,/ 2 = V K ./, and the function 7j(rcoi)/7|(o>) where 17(01) is defined by +»

7)(a>) =gA 2 (— i) s 2

V3

'"(I'f) =S A * I (I 2 !!l)

72. Another powerful method, developed by C. F. Klein and K. E. R. Fricke, proceeds by discussing the deficiency of fiij, j') =0 considered as representing a curve. If this deficiency is zero, j and j' may be expressed as rational functions of the same parameter, and this replaces the modular equation in the most convenient manner. For instance, when » = 7, we may put

j ˆ + I3r+ 4 oHr 2 + 5r + l)3 = 0(T)J ,ˆ (T ,)>

tt'=49.

The corresponding singular moduli are found by solving {r) — 0(r'). For deficiency 1 we may find in a similar way two auxiliary functions x, y connected by some simple equation 4>{x, y) =0 not ex- ceeding the fourth degree, and such that j, f are each rational functions of .r and y.

Hurwitz has extended this field of research almost indefinitely, not only by generalising the formulae for class-number sums, such as

that in § 69, but also by bringing the modular-function theory into connexion with that of algebraic correspondence and Abelian integrals. A comparatively simple example may help to indicate the nature of these researches. From the formulae given at the beginning of § 67, we can deduce, by actual multiplication of the corresponding series,

1 + M /-i\ +°°

*r9'u0oo = ! oo0oi0H> = 2 -r)\Zk?UX 2 2^*

Li=°.

**2»*

where

°X x (.m)q m l l [» = !, 5. 9.*

x(m

Mt)'

extended over all the representations m = +. In a similar way
-0'u0io = 0oo0io 2 0oi = 22 (— I)i(«-i) x {m) qm/i

-d 11001—0

If, now, we write

i)Km-i) x {m)

*7i(«) =2^*

i 2 = 2(-l)ifm-i) x («)gm/4

**»/», J2(M)=22 (- r) K "" l) xW g »/ 4 ,*

we shall have

where 0io, 0oi

dji : dji :dj 3 = U : 0oi : 0oo », are connected by the relation (§ 67)

0io 4 +0oi 4 -0oo 4 =o

which represents, in homogeneous co-ordinates, a quartic curve of deficiency 3. For this curve, or any equivalent algebraic figure, ./1

(<■>). jsM and j 3 (w) supply an independent set of Abelian integrals of the first kind. If we put x = Vk,j/ = Vk', it is found that

/dx ! . / ,. fdx , . . . fxdx , . , . y = V»H- Jy = i7 2 («). Jy'W.

so that the integrals which the algebraic theory gives in connexion with x l +y 4 i=o are dire ctly identified with ji(u), J2M, J3M, provided that we put * = Vk("))

Other functions occur in this theory analogous to.7'i(u), but such that in the g-series which are the expansions of them the coefficients and exponents depend on representations of numbers by quaternary quadratic forms.

73. In the Berliner Sitzungsberichte for the period 1883-1890, L. Kronecker published a very important series of articles on elliptic functions, which contain many arithmetical results of extreme elegance; some of these Kronecker had announced without proof many years before. A few will be quoted here, without any attempt at demonstration; but in order to understand them, it will be necessary to bear in mind two definitions. The first relates to the

Legendre-Jacobi symbol l-Y. If a, b have a common factor we put l-r) =0; while if a is odd and b = 2 h c, where c is odd, we put

Uj = (— j (-) ■ The other definition relates to the classification of

discriminants of quadratic forms. If D is any number that can be such a discriminant, we must have D=o or 1 (mod. 4), and in every case we can write D = D Q 2 , where Q 2 is a square factor of D, and Do satisfies one of the following conditions, in which P denotes a product of different odd primes : —

Do = P, with P= 1 (mod 4)

D = 4P, P=-i (mod 4)

D = 8P, P=±i (mod 4)

Numbers such as- Do are called fundamental discriminants; every discriminant is uniquely expressible as the product of a fundamental discriminant and a positive integral square.

Now let Di, D 2 be any two discriminants, then DiD 2 is also a discriminant, and we may put DiD 2 = D = D Q 2 , where Do is fundamental : this being done, we shall have

where we are to take h, k = i, 2, 3, ... + < * >; m, rc = o, ±1, = ˆ2,... ±00 except that, if Do, (2am + bn)T 7«U where (T, U) is the least positive solution of T 2 -DU 2 = 4. The sum 2 applies to a system of representative a, b,c

primitive forms (a, b, c) for the determinant D, choser. so that a is prime to Q, and b, c are each divisible by all the prime factors of Q. A is any number prime to 2D and representable by (a, b, c); and finally t = 2, 4, 6, 1 according as D < -4, D = —4, D = —3 or D > o. The function F is quite arbitrary, subject only to the conditions that F(ry) = F(*)F(y), and that the sumt on both sides are convergent. By putting F(x) = x- 1 -p, where p is a real positive quantity, it can be deduced from the foregoing that, if D 2 is not a square, and if Di is different from I,

rH(DiQ 2)H(D 2 Q 2) = Lt S (ˆ) s (£) (anfi + bmn + cn)-*-?

where the function H(i) is defined as follows for any discriminant d : —

d > o

T H(d) = iife(A) „, h(d), T + UVrf

h(d) meaning the number of primitive forms for the determinant d. This is a generalisation of a theorem due to Dirichlet.

Then is another formula which, in a certain sense, is the generalisation of Gauss's sums (§ 62) in cyclotomy. Let \j/{u, v) denote the function 6u (u + v) - ra (w)0oi (») and let Di, D2 be any two funda mental discriminants such that D1D2 is also fundamental and negative : then

r9'u _ /DA /DA , /25, 25 2 \

.,r, e L\A/ \A/-L, n

where, on the left-hand side, we are to sum for .Si = 1, 2, 3 . . fD;[; and on the right we are to take a complete set of lepresentative primitive forms (a, 6, c) for the determinant D1D2, and give to m, n all positive and negative integral values such that anP + bmn + cn* is

odd. The quantity r is 2, if DjDn < — 4, t—± if DiD2 = -4, t = 6 if DiD» = -3. By putting D 2 = i, we obtain, after some easy transformations,

5 = 1 \ S / A T0V? * ‘

2ji KV3 sn 4K.

*• 3

which holds for any fundamental discriminant -A. For instance, taking u = tK’/K, and A = 3, we have 1O 2 = 2kK/jt, and 2gi(m2 + m ‘* + B2) = a verification is afforded by making 2K approach

the value *■, in which case g, k vanish, while the limit of ah/n is J,

whence the limiting value of sni— is that of 6g5/W3, which

= 6/4V3 = V3/2, as it should be.

Several of Kronecker’s formulae connect the solution of the Pellian equation with elliptic modular functions: one example may be given here. Let D be a positive discriminant of the form 8ra + 5, let (T, U) be the least solution of T 2 -DU 2 = I : then, if h(D) is the number of primitive classes for the determinant D, (T-UyD)MD) = n(2K K ‘) s

where the product on the right extends to a certain sixth part ˆof those values of 2kk’ which are singular, and correspond to the field Q(V-D),or in other words are connected with the class invariant j(V ~D). For instance, if D = 5, the equation to find (kk’) 2 is

4.S! 0«’) 2 – i) 3 + (25 + i3V 5) 3 (V) 4 = o one root of which is given by (2kk’) 2 = 9 _ 4V‘5 = T-UV5 which is right, because in this case h(D) = 1.

74. Freqicency of Primes. — The distribution of primes in a finite interval (a, a--b) is very irregular, if we change a and keep b constant. Thus if we put «! = m > the numbers p + 2, ju + 3, . . . (jt + n — 1) are all composite, so that we can form a run of consecutive composite numbers as extensive as we please; on the other hand, there is possibly no limit to the number of cases in which p and p + 2 are both primes. Legendre was the first to find an approximate formula for F(jc)i the number of primes not exceeding x. He found by induction

F (x) = x 5 (log e s — 1-08366) which answers fairly well when x

lies between 100 and 1,000,000, but becomes more and more inaccurate as x increases. Gauss found, by theoretical considerations (which, however, he does not explain), the approximate formula

(where, as in all that follows, log x is taken to the base e). This value is ultimately too large, but when x exceeds a million it is nearer the truth than the value given by Legendre's formula.

By a singularly profound and original analysis, Riemann suc- ceeded in finding a formula, of the same type as Gauss's, but more exact for very large values of x. In its complete form it is very complicated; but, by omitting terms which ultimately vanish (for sufficiently large values of x) in comparison with those retained, the formula reduces to

F(x) =A+2(-i>lL(x 1/m)

(w = i, 2, 3, 5, 6, 7, 11, . . .)

where the summation extends to all positive integral values of m which have no square factor, and p is the number of different prime factors of m, with the convention that when m = l, (—1) = 1. The symbol A denotes a constant, namely*

■2£± >X

l»-f-

dx)

(x 2 -l) log» J

and L is used in the sense given above.

P. L. Tchˆbichev obtained some remarkable results on the frequency of primes by an ingenious application of Stirling's theorem. One of these is that there will certainly be (fe-f-i) primes between a and 6, provided that

a<

ˆ_ 2 V6-i| R log6(log6) 2

-ife<4 +a a-gfc*

where R = J log2+§ log 3 + 1 log 5-ˆ log 30=0-921292 .... From

this may be inferred the truth of Bertrand's conjecture that there is always at least one prime between o and (20-2) if 20 > 7. Tchˆbichev's results were generalized and made more precise by Sylvester.

The actual calculation of the number of primes in a given interval may be effected by a formula constructed and used by D. F. E Meissel. The following table gives the values of F(re) tor various values of n, according to Meissel's determinations : — n F(n)

20,000 2,262

100,000 9,592

500,000 41.538

1,000,000 78,498

Riemann's analysis mainly depends upon the properties of tha function

f(s) = 2n- (» = l, 2, 3, . . .),

n considered as a function of the complex variable s. The above definition is only valid when the real part of s exceeds I ; but it can be

generalized by writing

00

*2sin 1 r 2 r(Z)r(z) = 4 Jˆ!: 1 .4**

*where the integral is taken from x = * + oo along the axis of real quantities to x — t, where e is a very small positive quantity, then round a circle of radius e and centre at the origin, and finally from x = e to x = +«> along the axis of real quantities. This function f (z) is of great importance, and has been recently studied by von Mangoldt Landau and others.*

Reference has already been made to the fact that if /, m are co-primes the linear form Ix + m includes an infinite number of primes. Now let (a, 6, c) be any primitive quadratic form with a total generic character C ; and let Ix + m be a primitive linear form chosen so that all its values have the character C. Then it has been proved by Weber and Meyer that (a, b, c) is capable of representing an infinity of

primes all of the linear form Ix+m.

*75. Arithmetical Functions. — This term is applied to symbols such as (n), *(»), &c, which are associated with n by an intrinsic arithmetical definition. The function *(») was written fn by Euler, who investigated its properties, and by proving the formula*

00 +00

n(i-g") = Sgi^'+s) deduced the result that

1 —00

/«=/(n- 1) +/(«-2) -J(„-5)-...=2(-i)'-iJ(»-3£±£)

where on the right hand we are to take all positive values of s such that n-i(3s 1 ±s) is not negative, and to interpret /o as n, if this term occurs. J. Liouville makes frequent use of this function in his papers, but denotes it by f (n).

If the quantity x is positive and not integral, the symbol E(«) or [x] is used to denote the integer (including zero) which is obtained by omitting the fractional part of x; thus E(V2)=l, E(o-7)=o, and so on. For some purposes it is convenient to extend the definition by putting E(-x)=-E(x), and agreeing that when x is a positive integer, E(x)=-i; it is then possible to find a Fourier sine-series representing x-E{x) for all real values of x. The function E(«) has many curious and important properties, which have been investi- gated by Gauss, Hermite, Hacks, Pringsheim, Stern and others. What is perhaps the simplest proof of the law of quadratic reciprocity depends upon the fact that if p, q are two odd primes, and we put p = 2h--i, q = 2k + i*

*the truth of which is obvious, if we rule a rectangle *"Xg" into unit squares, and draw its diagonal. This formula is Gauss's, but the geometrical proof is due to Eisenstein. Another useful formula is r=m-i / r*

2 Ejx-t—) =E(otx)-E(jc), which is due to Hermite. r =,i V ml

Various other arithmetical functions have been devised for particular purposes ; two that deserve mention (both due to Kronecker) are 8u, which means o or 1 according as h, k are unequal or equal, and sgn x, which means x^|x|.

76. Transcendental Numbers. — It has been proved by Cantor that

the aggregate of all algebraic numbers is countable. Hence im- mediately follows the proposition (first proved by Liouville) that there are numbers, both real and complex, which cannot be de- fined by any combination of a finite number of equations with rational integral coefficients. Such numbers are said to be transcen- dental. Hermite first completely proved the transcendent character of e; and Lindemann, by a similar method, proved the transcendence of ir. Thus it is now finally established that the quadrature of the circle is impossible, not only by rule and compass, but even with the help of any number of algebraic curves of any order when the co- efficients in their equations are rational (see Hermite, C.R. Ixxvii., 1873, an d Lindemann, Math. Ann. xx., 1882). Another number which is almost certainly transcendent is Euler's constant C. It may be convenient to give here the following numerical values: —

«■ =3-14159 26535 89793 23846...

e =2-71828 18284 -59045 23536... C =0-57721 56649 01532 8606065. .. (Gauss-Nicolai) logio = (ir logioe) = 0-13493 41840... (Weber), the last of which is useful in calculating class-invariants.

77. Miscellaneous Investigations. — The foregoing articles (§§ 24-76) 5i vc an outline of what may be called the analytical theory of numbers, which is mainly the work of the 19th century, though many of the researches of Lagrange, Legendre and Gauss, as well as all those of Euler, fall within the 18th. But after all, the germ of this remarkable development is contained in what is only a part of the original Diophantine analysis, of which, beyond question, Fermat was the greatest master. The spirit of this method is still vigorous in Euler; but the appearance of Gauss's Disquisitiones arithmelicae in 1801 transformed the whole subject, and gave it a new tendency which was strengthened by the discoveries of Cauchy, Jacobi, Eisenstein and Dirichlet. In recent times Edouard Lucas revived something of the old doctrine, and it can hardly be denied that the Diophantine method is the one that is really germane to the subject. Even the strange results obtained from elliptic and modular functions must somehow be capable of purely arithmetical proof without the use of infinite series. Besides this, the older arithmeticians have announced various theorems which have not been proved or disproved, and made a beginning of theories which are still in a more or less rudimentary stage. As examples of the latter may be

mentioned the partition of numbers (see Numbers, Partition of, below), and the resolution of large numbers into their prime factors.

The general problem of partitions is to find all the integral solutions of a set of linear equations 'Zc i x i —m i with integral coefficients, and fewer equations than there are variables. The solutions may be further restricted by other conditions — for instance, that all the variables are to be positive. This theory was begun by Euler: Sylvester gave lectures on tlje subject, of which some portions have been preserved; and various results of great generality have been discovered by P. A. MacMahon. The author last named has also considered Diophantine in- equalities, a simple problem in which is " to enumerate all the solutions of 7#-= * i3y in positive integers."*

The resolution of a given large number into its prime factors is still a problem of great difficulty, and tentative methods have to be applied. But a good deal has been done by Seelhoff, Lucas, Landry, A. J. C. Cunningham and Lawrence to shorten the calculation, especially when the number is given in, or can be reduced to, some particular form.

It is well known that Fermat was led to the erroneous con- jecture (he did not affirm it) that 2 m + 1 is a prime whenever m is a power of 2. The first case of failure is when m=$2; in fact 2 32 +i=.o (m od 641). Other known cases of failure are w=2 n , with n = 6, 12, 23, 26 respectively; at the same time, Eisenstein asserted that he had proved that the formula 2 m +i included an infinite number of primes. His proof is not extant; and no other has yet been supplied. Similar difficulties are encountered when we examine Mersenne's numbers, which are those of the form 2 P — 1, with p a prime; the known cases for which a Mersenne number is prime correspond to p = 2, 3, 5, 7, 13, 17, 19, 31, 61.

A perfect number is one which, like 6 or 28, is the sum of its aliquot parts. Euclid proved that 2 p ~ l (2 P — 1) is perfect when (2" — 1) is a prime: and it has been shown that this formula includes all perfect numbers which are even. It is not known whether any odd perfect numbers exist or not.

Friendly numbers (nutneri amicabiles) are pairs such as 220, 284, each of which is the sum of the aliquot parts of the other. No general rules for constructing them appear to be known, but several have been found, in a more or less methodical way.

78. In conclusion it may be remarked that the science of arithmetic

(q.v.) has now reached a stage when all its definitions, processes and results are demonstrably independent of any theory of variable or measurable quantities such as those postulated in geometry and mathematical physics; even the notion of a limit may be dispensed with, although this idea, as well as that of a variable, is often convenient. For the applica- tion of arithmetic to geometry and analysis, see Function.

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NUMBERS, BOOK OF, the fourth book of the Bible, which takes its title from the Latin equivalent of the Septuagint 'Apififtoi. While the English version follows the Septuagint directly in speaking of Genesis, Exodus, Leviticus and Deutero- nomy, it follows the Vulgate in speaking of Numbers. Since this book describes the way in which an elaborate census of Israel was taken on two separate occasions, the first at Sinai at the beginning of the desert wanderings and the second just before their close on the plains of Moab, the title is quite appro- priate. The name given to it in modern Hebrew Bibles from its fourth word Bemidhbar (" In the desert ") is at least equally appropriate. The other title in use among the Jews, Vayyid- habber (" And he said "), is simply the first word of the book and has no reference to its contents.

Numbers is the first part of the second great division of the Hexateuch. In the first three books we are shown how God raised up for Himself a chosen people and how the descendants of Israel on entering at Sinai into a solemn league and covenant with Yahweh (Jehovah) became a separate nation, a peculiar people. In the last three books we are told what happened to Israel between the time it entered into this solemn covenant and its settlement in the Promised

Land under the successor of Moses. Yet, though thus part of a larger whole, the book of Numbers has been so constructed by the Redactor as to form a self-contained division of that whole.

The truth of this statement is seen by comparing the first verse of the book with the last. The first is as evidently meant to serve as an introduction to the book as the last is to serve as its conclusion. This is not to say, however, that the book is all of a piece, or written on a systematic plan. On the contrary, no book in the Hexateuch gives such an impression of incoherence, and in none are the different strata which compose the Hexateuch more distinctly discernible.

It is noteworthy that the problems of Hexateuchal criticism are gradually changing their character, as one after another of the main contentions of Biblical scholars regarding the date and authorship of the Hexateuch passes out of the list of debatable questions into that of acknowledged facts. No competent scholars now question the existence, hardly any one the relative da°s, of J, E, and P. In Numbers one can tell almost at a glance which parts belong to P, the Priestly Code, and which to JE, the narrative resulting from the combination of the Judaic work of the Yahwist with the Ephraimitic work of the Elohist. The main difficulty in Numbers is to determine to which stratum of P certain sections should be assigned.*

The first large section (i. — x. 10) is wholly P, and the last eleven chapters are also P with the exception of two or three paragraphs in chap, xxxii., while the intervening portion is mainly P with the exception of three important episodes and two or three others of less importance. The three main episodes are those of the twelve spies, the rebellion of Korah, Dathan and Abiram, and Balaam's mission to Balak. The last is the only one even of these three in which there is nothing belonging to P. Another passage which we may here mention is one where the elements of JE can be readily separated and assigned to their respective authors, viz. chaps, xi. and xii. It is generally agreed that to E belongs the passage describing the outpouring of the Spirit on Eldad and Medad and the remarkable prayer of Moses in xi. 29, " Would God that all the Lord's people were prophets that the Lord

would put his Spirit upon them," a prayer that closely approaches the New Testament idea that all Christians are " priests unto God."

As usual, the J and E elements possess such a vivid character as to render them familiar to ordinary readers. The legislative and statistical and especially the ritualistic parts belonging to P are so detailed and uninteresting that they make no impression on a reader's memory, and P's diffuseness, always undue, reaches a climax in chap. vii. where the offerings presented by each tribe at the dedication of the Tabernacle are actually described in such full detail that six, in themselves extremely uninteresting, verses are repeated in identical terms no fewer than twelve times. Compare also the very similar repetitions and diffuseness in chap. xxix.

Perhaps, however, the most illuminating example of the difference between traditions as recorded in J or E and traditions as given by P is found in the very first passage that occurs after the first long section of P describing the order of march of the several tribes and the position of the ark in the very centre of the host, both when encamped and on the march. Notwithstanding all this, in x. 30 we find Moses entreating Hobab, the son of Reuel his father-in-law, to come along with the Israelites to be " eyes " unto them; and in x. 3$ it is stated that the ark went before them to seek out a resting-place for them. Whether we ascribe this whole passage simply to JE or consider, as many scholars do, that the first statement is by J and the second by E, it is clear that these statements directly contradict P's elaborate scheme, according to which the people march, tribe by tribe, with the ark in the very centre of the square, and guided by the pillar of cloud by day and the pillar of fire by night. There can be equally little doubt that these statements are much more likely to be in accordance with fact than P's. The latter's elaborate plans go on the supposition that great masses of men, women and children could be moved about over the desert as easily as pawns on a chess-board; but even the greatest military leader the world has seen would have been unable to preserve such complicated formations amid the difficulties inevitable on a desert march; and the more carefully an intelligent reader has studied the details of P's plan, the more astonished will he be to read the statement in x. 33 as to the position of the ark, and to learn that Moses, instead of simply following the pillar of cloud, requests Hobab to determine the line of march and select the sites for encampment. No clearer proof could be desired of the utterly uncritical spirit of the age in which the Hexateuch got its present form than that this detailed account should be immediately followed by two short para- graphs in palpable contradiction of the whole plan of camp and march so elaborately worked out in the preceding narrative.

The fact is that Numbers is the result of a long literary process of

amalgamation both of traditions and of documents, a process that began in the closing decades of the gth century B.C. and did not finally end till the 2nd century B.C., the earliest date being that of J, and the latest probably that of the various addenda to Balaam's prophecies, e.g. xxiii. 106, xxiv. 96, xxiv. 18-24. Balaam's prayer in xxiii. 106 is not only metrically superfluous, but the personal, individual note in it is quite out of keeping with every other reference in this poem, which is purely national. This addition may therefore have been originally the marginal note of a pious scribe which was afterwards transferred to the text. In xxiv. 24 Kittim is a name originally derived from Kitium, a city of Cyprus. The meaning of " Kittim " was then extended to include the inhabitants of all the islands and coast-lands of the Mediterranean. Hence it might mean not only Macedonia or Greece, but even Italy. In Dan. xi. 30 it is certainly applied to Rome, the Vulgate rendering it " Romam " there just as that version translates it here by " Italia." Hence Baentsch would refer this oracle to the time of Antiochus IV. (Epiphanes) and even to the embassy of Popillius Laenas in 168 B.C. when that haughty Roman humiliated the Syrian king by drawing a circle round him with his cane, and daring him to step out of it till he had given him an answer.

The book falls naturally into three sections, chronologically arranged: (1) Chaps, i.-x. 10, Israel's twenty days' sojourn at Sinai during which a census of the people is taken and various laws are

promulgated by Moses. (2) Chaps, x. 11-xxii., incidents that oc- curred during the march of Israel from Sinai to the plains of Moab. These incidents seem to have been chosen for the purpose of casting light on the religious history and character of the people and showing how later generations explained the origin of various place names, cf. Taberah and Kibrothhattaavah, xi. 3, 34, and modes or objects of worship, cf . the worship of the brazen serpent, xxi. 4- 1 1 , which, as we learn from 2 Kings xviii. 4, continued down to the time of Hezekiah. (3) Chaps, xxii. 2-xxxvi., Israel's sojourn in the plains of Moab, their experiences while there, and the taking of a second census, prelimin- ary to the invasion of Canaan.

Two examples of the very miscellaneous contents of the book will suffice to show the different literary strata of which it is composed.

(A) We shall take first the account given in chap. xvi. of the rebellion of Korah, Dathan and Abiram. There would be originally four independent narratives, J, E, and two very distinct strata of P, which we may call P 1 and P 2 or P s , i.e. later supplements to P. The

narratives of J and E can no longer be distinguished except from slight linguistic data, perceptible only to Hebrew scholars; but the three stages of development are quite apparent even in translations.

1. The first narrative is that of JE, which relates how two Reubenites, Dathan and Abiram, rebelled against the civil authority of Moses.andwere punished by being buried alive.they and their house-holds. Read together verses 16, 20, 12-15 an d 25-34, omitting 32ft, i.e. " and all the men that appertained unto Korah and all their goods," a clause due to the Redactor, who put it in to unite the narratives, forgetting that Korah, not being a Reubenite, could not have had his tent with its belongings among the tents of the Reubenites.

2. The second narrative is P 1 , which tells how Korah, himself a Levite, at the head of 250 Israelites rebelled against the religious authority of Moses and Aaron because of the privileges conferred on the tribe of Levi. Korah and his associates maintained that the other tribes, belonging as they did to a holy people, had as much right as the Levites to approach Yahweh directly, without the mediation of any Levite, and offer sacrifices and even incense to Yahweh Read together verses 10, 26-7, 19-24.

3. The third narrative is P 2 , which relates how Korah at the head of 250 Levites protested against the priestly privileges of Aaron, claiming that all the Levites had as much right to sacrifice and offer incense to Yahweh as Aaron and his sons had. P.ead together verses 8-1 1 and 16 and 17. In both P 1 and F 2 the disputants are summoned from their tents and ordered to assemble before the Dwelling of Yahweh; and in both cases the same fate overtook the rebels. Fire descended from heaven and consumed Korah and his confederates. It is to be noticed that in both P 1 and P 2 incense is burned in pans or censers, so that even the author of P 2 knew nothing about an altar of incense. Indeed in xvii. 3 and 4 the altar is spoken of in such a way as to imply that there was only one altar, viz. the altar of burnt-offering, xvi. 2 proves that according to the second account the members of Korah's band, so far from being all Levites, as they are represented to have been in verses 8-1 1 . were probably, with the exception of Korah himself, leading members of the secular tribes. In xxvii. 3 we find a proof, all the more conclusive from being incidental, that Korah's followers were not all Levites; for, had they been so, it could never have occurred to the daughters of Zilpahad to repudiate the idea that their father, a Manassile, had had a share in Korah's conspiracy. Of course none of the narratives is found in its entirety, anything common to two or more of them

being given only once ; and great skill has been shown in weaving them together.

(B) The story of Balaam as we have it in chaps, xxii.xxiv. is an amalgam of J and E with later additions; but xxxi. 8, 16 proves that Balaam was not unknown to P. According to E, Balak sent certain Moabite princes all the way to Pethor on the Euphrates to ask Balaam to come and curse Israel. But Elohim came to Balaam by night and forbade him to go. So the princes returned disap pointed. A second and still more influential embassy having been sent, Elohim again appeared by night, and this time permitted Balaam to go on condition that he said nothing but what Elohim bade him say. The journey being a long one and across a difficult desert, requiring a caravan well equipped with camels, the princes of Moab waited till Balaam was ready to accompany them. When Balaam reached the frontier of Moab Balak was waiting to.welcome him, but could not refrain from asking why he had not come with the first embassy. With equal frankness Balaam replied that, though he had come now, he had no power to say anything but what Elohim might put into his mouth. On being taken to Bamoth-Baal he was met by Elohim. Thereupon, instead of cursing the Israelites, Balaam blessed them. Though bitterly disappointed Balak still attempted to effect his purpose and took Balaam to the top of Pisgah, with the result that Israel received a second blessing. Balak, now utterly disheartened, abandoned his project altogether.

According to J, Balaam was among his own people the Bne- Ammon when Balak sent messengers to him with presents such as soothsayers generally received, asking him to come and curse a people that had come up out of Egypt. Balaam protested that, though he were to receive a houseful of silver and gold, he could not go beyond the word of Yahweh, his God. Nevertheless his scruples were somehow overcome; and, without consulting Yahweh, he

agreed to go. As the journey was not a long or dangerous one, the servants of Balak returned at once to inform their master of their success, leaving Balaam to follow at his own convenience. So Balaam, still without consulting Yahweh, saddled his ass and set out for Moab, attended only by two servants. The land through which he had to pass, so far from being a desert, was a land of oil and wine ; and when Balaam was riding along a narrow path between two vine-

yards, the angel of Yahweh would have slain him, had not his ass swerved and saved him. That this episode belongs to J no one need ever forget, since the only parallel in Scripture to the speaking ass is the serpent that spoke in Eden. Balaam, after being sternly rebuked, was allowed to proceed, but only on condition that " the word that I shall speak to thee, that thou shalt speak." Balak met Balaam at Ar-Moab, whence they went to Kiriath-Huzoth and thence to the top of Peor. There Balaam blessed Israel. Balak angrily taunted Balaam with having lost the honours intended for him, and bade him flee to his own place. Balaam reminded Balak of his declaration that he could not go beyond the word of Yahweh, and then boldly announced the respective destinies of Israel and Moab, xxiv. 15-19.

As seven is the perfect number and as Balaam had ordered seven altars to be built, the Redactor thought it would be well to have seven Meshalim or metrical oracles; and so he added other three which are certainly not pertinent to the situation, as they allude not merely to the Assyrian empire but to the Macedonian, and even, as some maintain, to the Roman empire, cf. xxiv. 24.

The poetical quotations in Numbers are of the utmost im- portance, not only as helping to determine the date of the book but as indicating the value of poetry in its bearing on history. In xxi. 14 we have a poetical quotation from a lost volume of early poetry entitled " The Book of the Wars of Yahweh." It is highly probable that Deborah's song was also originally in this book; and when we compare the statement in that song as to Israel's full fighting strength, viz. 40,000 men, with the statements in the prose of Numbers as to 600,000 men and more, we at once realise how much closer to actual facts we are brought by early poetry than by the later prose of writers like P. Perhaps it is in chap. xxxi. that we have the clearest proof of the non-historical character of the book. There we are told that 12,000 Israelites, without losing a single man, slew every male Midianite, children included, and every Midianite woman that had known a man, and took so much booty that there had to be special legislation as to how is should be divided. But if this were actual fact, how could the Midianites have ever reappeared in history? And yet in Gideon's time they were strong enough to oppress Israel. From this chapter, unhistorical as it must be, we see how the legislation of Israel, whatever its character or origin, was referred back to Moses the great Law giver of Israel. (J. A. P.)*

NUMBERS, PARTITION OF. This mathematical subject, created by Euler, though relating essentially to positive integer numbers, is scarcely regarded as a part of the Theory of Numbers (see Number).

We consider in it a number as made up by the addition of other numbers: thus the partitions of the successive numbers 1, 2, 3, 4, 5, 6, &c, are as follows: —

1;

2 , 11;

3, 21, in;

4, 31, 22, 211, mi ;

5, 41, 32, 311, 221, 2111, iiiii;

6, 51, 42, 411, 33, 321, 3111, 222, 2211, 21111, mm.

These are formed each from the preceding ones; thus, to form the partitions of 6 we take first 6; secondly, 5 prefixed to each of the partitions of 1 (that is, 51); thirdly, 4 prefixed to each of the partitions of 2 (that is, 42, 411); fourthly, 3 prefixed to each of the partitions of 3 (that is, 33, 321, 3111); fifthly, 2 prefixed, not to each of the partitions of 4, but only to those partitions which begin with a number not exceeding 2 (that is, 222, 2211, 21 1 1 1) ; and lastly, 1 prefixed to all the partitions of 5 which begin with a number not exceeding 1 (that is, mm); and so in other cases.

The method gives all the partitions of a number, but we may consider different classes of partitions: the partitions into a given number of parts, or into not more than a given number of parts; or the partitions into given parts, either with repeti- tions or without repetitions, &c. It is possible, for any particular class of partitions, to obtain methods more or less easy for the formation of the partitions either of a given

number or of the successive numbers 1, 2, 3, &c. And of course in any case, having obtained the partitions, we can count them and so obtain the number of partitions.

Another method is by L. F. A. Arbogast's rule of the last and the last but one; in fact, taking the value of a to be unity, and, understanding this letter in each term, the rule gives b; c, b 1 ; d, be, b % ; e, bd, c 2 , Wc, b i , &c, which, if b, c, d, e, &c, denote 1, 2, 3, 4, &c, respectively, are the partitions of 1, 2, 3, 4, &c, respectively.

An important notion is that of conjugate partitions.

Thus a partition of 6 is 42; writing this in the form j JI1 ‘ and

summing the columns instead of the lines, we obtain the conjugate partition 221 1; evidently, starting from 22 11, the conjugate partition is 42. If we form all the partitions of 6 into not more than three parts, these are

6, 51, 42. 33. 411. 321, 222,

and the conjugates are

iimi, 21111, 2211, 222, 3111, 321, 33, where no part is greater than 3; and so in general we have the theorem, the number of partitions of n into not more than k parts is equal to the number of partitions of n with no part greater than k.

We have for the number of partitions an analytical theory depending on generating functions; thus for the partitions of a number n with the parts 1, 2, 3, 4, 5, &c, without repetitions, writing down the product

*i+K.i+ * 2 .i+r , .i+ * 4 .. ., = i+x+x 2 +2× 3 . . .Nx”... , it is clear that, if x< *, xP, x~*, . . . are terms of the series x, x 2 , x 3 , . . . for which a +/S +y + . . =», then we have in the development of the product a term x", and hence that in the term Nx" of the product the coefficient N is equal to the number of partitions of n with the parts I, 2, 3, . . . , without repetitions; or say that the product is the generating function (G. F.) for the number of such partitions. And so in other cases we obtain a generating function.*

Thus for the function

-, = I +x’+2× 2 + . . +Nx n + . . . ,

l—X. 1—X\ I —X

observing that any factor l/l— x l is = I \ x l \ x 2 ‘ {■ . . . , we see that in the term Nx n the coefficient is equal to the number of parti tions of n, with the parts I, 2, 3, . . , with repetitions.

Introducing another letter z, and considering the function i+xz.i+x 2 z.i+x 3 z. . ., = l+z(x+x 2 +. .). . .+Nx”z h +. ., we see that in the term Nx n z’ c of the development the coefficient JV is equal to the number of partitions of n into k parts, with the parts I, 2, 3, 4, . . . , without repetitions.

And similarly, considering the function

\— j , = I +z(x+x 2 + ..)... +Nx n z k + . .

i — xz.i—x 2 z.i—x 3 z.. v ‘ ‘ ‘ ‘

we see that in the term Nx n z h of the development the coefficient N is equal to the number of partitions of n into k parts, with the parts I, 2, 3, 4, ... , with repetitions. We have such analytical formulae as

I —X l—X .

A remarkable

-x 15 + ...

1— xz. 1—xH. i—x 3 z. . ‘ 1 —x ‘ l—x . 1 -a?

which lead to theorems in the partition of numbers, theorem is

1 —x. 1 —x 2 . 1 —x 3 . 1 —x A . = 1 — x — x 2 --x & +x ! — x 1 ‘ where the only terms are those with an exponent i(3» 2 =”=«), and for each such pair of terms the coefficient is (-)“i. The formula shows that except for numbers of the form i(3« 2=fc ») the number of partitions without repetitions into an odd number of parts is equal to the number of partitions without repetitions into an even number of parts, whereas for the excepted numbers these numbers differ by unity. Thus for the number 11, which is not an excepted number, the two sets of partitions are

II, 821, 731, 641, 632, 542

10.1,92, 83, 74, 65, 5321,

in each set 6. We have

i—x.i+x.i+x 2 .i+x i .i+x s ...=i;

or, as this may be written,

1

l+X. 1+X 2 . 1+X 4 .1+X. . . =*

I — X

= 1+X+X 2 +X 3 +..

showing that a number n can always be made up, and in one way only, with the parts I, 2, 4, 8, . . . The product on the 'eft-hand side may be taken to k terms only, thus if £=4, we have

1+X.l+X 2 .l+X i .l+ˆ, =ˆˆ, = 1+X+X 2 . ..+ *»,

that is, any number from I to 15 caa be made up, and in one way only, with the parts I, 2, 4, 8; and similarly any number from I to 2*-i can be made up, and in one way only, with the parts 1, 2, 4, . . 2* -1 . A like formula is

I-3C 81

that is,

x . I —x

l-x»

1-x* 1

l + I+x = x~

x- 3 + i+x 3 .x-* + i+x\x-v+i+x i7 i0 +x- 3 K +i+x... +x z * +x)0 ,

showing that any number from —40 to +40 can be made up, and that in one way only, with the parts 1, 3, 9, 27 taken positively or negatively; and so in general any number from -|(3* _ l) to +i(3*-i) can be made up. and that in one way only, with the parts 1. 3. 9> • • 3* -1 taken positively or negatively. See further Combinatorial Analysis. (A. Ca.)

NUMENIUS, a Greek philosopher, of Apamea in Syria, Neo-Pythagorean and forerunner of the Neo-Platonists, flourished during the latter half of the 2nd century ad. He seems to have taken Pythagoras as his highest authority, while at the same time he chiefly follows Plato. He calls the latter an " Atticizing Moses." His chief divergence from Plato is the distinction between the " first god " and the " demiurge." This is probably due to the influence of the Valentinian Gnostics and the Jewish- Alexandrian philosophers (especially Philo and bis theory of the Logos). According to Proclus

(Comment, in Timaeum, 93) Numenius held that there was a kind of trinity of gods, the members of which he designated as Trarf/p, irotijrˆs, irowjjua (" father," " maker," " that which is made," i.e. the world), or 7rd7rxos, eˆoˆos, awoyovos (which Proclus calls " exaggerated language "). The first is the supreme deity or pure intelligence (vovs), the second the creator of the world (Srjiuovpyos), the third the world (koctjuos). His works w r ere highly esteemed by the Neoplatonists, and Amelius is said to have composed nearly 100 books of commentaries upon them.

Fragments of his treatises on the points of divergence between the Academicians and Plato, on the Good (in which according to Origen, Contra Celsum, iv. 51, he makes allusion to Jesus Christ), and on the mystical sayings in Plato, are preserved in the Praeparatio Evangelica of Eusebius. The fragments are collected in F. G. Mullach, Frag. phil. Graec. iii.; see also F. Thedinga, De Numenio philosopho Platonico (Bonn, 1875); Ritter and Preller, Hist. Phil. Craecae (ed. E. Wellmann, 1898), § 624-7; T. Whittaker, The Neo- Platonists (1901).

NUMERAL (from Lat. numerus, a number), a figure used to represent a number. The use of visible signs to represent numbers and aid reckoning is not only older than writing, but older than the development of numerical language on the denary system; we count by tens because our ancestors counted on their fingers and named numbers accordingly. So used, the fingers are really numerals, that is, visible numerical signs; and in antiquity the practice of counting by these natural signs prevailed in all classes of society. In the later times of antiquity the finger symbols were developed into a system capable of expressing all numbers below 10,000. The left hand was held up flat with the fingers together. The units from 1 to 9 were expressed by various positions of the third, fourth, and fifth fingers alone, one or more of these being either closed on the palm or simply bent at the middle joint, according to the number meant. The thumb and index were thus left free to express the tens by a variety of relative positions, e.g. for 30 their points were brought together and stretched forward; for 50 the thumb was bent like the Greek T and brought against the ball of the index. The same set of signs if executed with the thumb and index of the right hand meant hundreds instead of tens, and the unit signs if performed on the right hand meant thousands. 1

The fingers serve to express numbers, but to make a per- manent note of numbers some kind of mark or tally is needed. A single stroke is the obvious representation of unity; higher numbers are indicated by

groups of strokes. But when the strokes become many they are confusing, and so a new sign

1 The system is described by Nicolaus Rhabda of Smyrna (8th century A.D.), ap. N. Caussinus, De eloquentia sacra el hutnana (Paris, 1636). The Venerable Bede gives essentially the same system, and it long survived in the East; see especially Rodiger, " Cber die im Orient gebrauchliche Fingersprache, &c," D.M.G. (1845), and Palmer in Journ. of Philology, ii. 247 sqq.

must be introduced, perhaps for 5, at any rate for 10, 100, iooo, and so forth. Intermediate numbers are expressed by the addition of symbols, as in the Roman system ccxxxvi = 236. This simplest way of writing numbers is well seen in the Baby- lonian inscriptions, where all numbers from 1 to 99 are got by repetition of the vertical arrowhead T = i| and a barbed sign ˆ = 10. But the most interesting case is the Egyptian, because from its hieratic form sprang the Phoenician numerals, and from them in turn those of Palmyra and the Syrians, as illustrated in table 1 . Two things are to be noted in this table — first, the way in which groups of units come to be joined by a cross line, and then run together into a single symbol, and, further, the substitution in the hundreds of a principle of multiplication for the mere addition of symbols. The same thing appears in Babylonia, where a smaller number put to the right of the sign for 100 (Y-) is to be added to it, but put to the left gives the number of hundreds. Thus ˆT- = iooo, but Y*- < = iio. The Egyptians had hieroglyphics for a thousand, a myriad, 100,000 (a frog), a million (a man with arms stretched out in admiration), and even for ten millions.*

Alphabetic writing did not do away with the use of numerical symbols, which were more perspicuous, and compendious than words written at length. But the letters of the alphabet them- selves came to be used as numerals. One way of doing this was to use the initial letter of the name of a number as its sign. This was the old Greek notation, said to go back to the time of Solon, and usually named after the grammarian Herodian, who described it about a.d. 200. I stood for i, II for 5, A for 10, H for 100, X for 1000, and M for 10,000; n with A in its bosom was 50, with H in its bosom it was 500. Another way common to the Greeks, Hebrews, and Syrians, and which in Greece gradually Syriac. Palmyrene. Phoenician. Hieratic. Hieroglyphic.

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Table I. displaced the Herodian numbers, was to make the first nine letters stand for the units and the rest for the tens anO hundreds.

NUMERAL

867

With the old Semitic alphabet of 22 letters this system broke down at n=4oo, and the higher hundreds had to be got by- juxtaposition; but when the Hebrew square character got the distinct final forms 1, Q, |, 1, f these served for the hundreds from 500 to 900. The Greeks with their larger alphabet required but three supplemental signs, which they got by keeping for this purpose two old Phoenician letters which were not used in writing (F or g= 1 =6, and 9 = P=9°), and by adding sampim for ooo. 1

Among the Greeks the first certain use of this system seems to be on coins of Ptolemy II. The first trace of it on Semitic ground is on Jewish coins of the Hasmoneans. It is the founda- tion of gematria as we find it in Jewish book and in the apoca- lyptic number of the beast ("»P pi: = 666). But we do not know how old gematria is; the name is borrowed from the Greek.

The most familiar case of the use of letters as numerals is the Roman system. Here C is the initial of centum and M of mille; but instead of these signs we find older forms, consisting of a circle divided vertically for 1000 and horizontally, 0, or in the cognate Etruscan system divided into quadrants, ©, for 100. From the sign for 1000, still sometimes roughly shown in print as do, comes D, the half of the symbol for half the number; and the older forms of L, viz. X or X, suggest that this also was once half of the hundred symbol. So V (Etruscan A) is half of X, which itself is not a true Roman letter. The system, therefore, is hardly alphabetic in origin, though the idea has been thrown out that the signs for 10, 50, and 100 were originally the Greek X, SP, <£, which were not used in writing Latin. 2

When high numbers had to be expressed systems such as we have described became very cumbrous, and in alphabetic systems it became inevitable to introduce a principle of periodicity by which, for example, the signs for 1, 2, 3, &c, might be used with a difference to express the same number of thousands. Language itself suggested this principle, and so we find in Hebrew S or in Greek ,a = 1000. So further jSMu, j3M., or simply /3. = 20,000 (2 myriads). If now the larger were always written to the left of the smaller elements of a num ber t he diacritic mark could be dispensed with in such a case as (3w\a (instead of / /3w\a) = 2831, for here it was plain that /3=2C©o, not =2, since otherwise it would not 'have preceded w = 800. We have here the germ of the very important notion that the value of a symbol may be periodic and defined by its position. The same idea had appeared much earlier among the Babylonians, who reckoned by powers of 60, calling 60 a soss and 60 sixties a sar. On the tablets of Senkerah a list of squares and cubes is given on this

principle, and here the square of 59 is written 58-1 — that is, 58X60+1; and the cube of 30 is 7-30 — that is, 7 sar+30 soss = 7X60 +3 0X60. Here again we have value by position; but, as there is no zero, it is left to the judgment of the reader to know which power of 60 is meant in each case. The sexrgesimal system, long specially associated with astronomy, has left a trace in our division of the hour and of the circle, but as language goes by powers of 10 it is practically very inconvenient for most purposes of reckoning. The Greek mathematicians used a sort of decimal system; thus Archimedes was able to solve his problem of stating a number greater than that of the grains of sand which would fill the sphere of the fixed stars by dividing numbers into octades, the unit of the second octade being io 8 and of the third io 16 . So too Apollonius of Perga teaches multiplication by regarding 7 as the irvdyajv or 70, 700 and so forth. One must then find successively the product of the several pythmens of the multiplier and the multiplicand, noticing in each case what are tens, what hundreds, and so on, and adding the results. The want of a sign for zero made it impossible mechanically to distinguish the tens, hundreds, &c, as we now do.*

*1 The Arabs, who quite changed the order of the alphabet and extended it to twenty-eight letters, kept the original values of the old letters (putting &» for and «• for v), while the Hundreds from 500 to 1000 were expressed by the new letters in order from < *» to£— In the time of Caliph Walid (a.d. 705-715) the Arabs had as yet no signs of numeration. 1 See further Fabretti, Paldographische Studien.*

Very early, however, a mechanical contrivance, the abacus, had been introduced for keeping numbers of different denominations apart. This was a table with compartments or columns for counters, each column representing a different value to be given to a counter placed on it. This might be used either for concrete arithmetic — say with columns for pence, shillings and pounds; or for abstract reckoning — say with the Babylonian sexagesimal system. An old Greek abacus found at Salamis has columns which, taken from right to left, give a counter the value of 1, 10, 100, 1000 drachms, and finally of 1 talent (6000 drachms) respectively. An abacus on the decimal system might be ruled on paper or on a board strewed with fine sand, and was then a first step to the decimal system. Two important steps, however, were still lacking: the first was to use instead of counters distinctive marks (ciphers) for the digits from one to nine; the second and more important was to get a sign for zero, so that the columns might be dispensed with, and the denomination of each cipher seen at once by counting the number of Hg"its following it. These two steps taken, we have at once the modern so-called Arabic numerals and

the possibility of modern arithmetic; but the invention of the ciphers and zero came but slowly, and their history is a most obscure problem.

What is quite certain is that our present decimal system, in its complete form, with the zero which enables us to do without the ruled columns of the abacus, is of Indian origin. From the Indians it passed to the Arabians, probably along with the astronomical tables brought to Bagdad by an Indian ambassador in 773 a.d. At all events the system was explained in Arabic in the early part of the 9th century by the famous Abu Ja'far Mohammed b. Musa al-Khwarizml (Hovarezmi), and from that time continued to spread, though at first slowly, through the Arabian world.

In Europe the complete system with the zero was derived from the Arabs in the 12th century, and the arithmetic based on this system was known by the name of algoritmus, algorithm, algorism. This barbarous word is nothing more than a. tran- scription of Al-Khwarizml, as Aas conjectured by Reinaud, and has become plain since the puBˆBfciˆn of a unique Cambridge MS. containing a Latin translation— perhaps by Adelhard of Bath — of the lost arithmetical treatise of the Arabian mathematician. 3 The arithmetical methods of Khwarizml were simplified by later Eastern writers, and these simpler methods were introduced to Europe by Leonardo of Pisa in the West and Maximus Planudes in the East. The term zero appears to come from the Arabic §ifr through the form zephyro used by Leonardo.

Thus far modern inquirers are agreed. The disputed points are — (1) the origin and age of the Indian system, and (2) whether or not a less developed Indian system, without the zero but with the nine other ciphers used on an abacus, entered Europe before the rise of Islam, and prepared the way for a complete decimal notation.

Table II.

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*Nana Ghat (Indian) * — — ~ if. (01 n*

Cave Inscriptions

*(Indian) 5 ~— = %fjl fi ')^^*

Devanagari' . Eastern Arabic 7

Ghobar 8 . Boetius 9

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1. The use of numerals in India can be followed back to the Nana Ghat inscriptions, supposed to date from the early part of the 3rd century B.C. These are signs for units, tens and hundreds, as

*3 Published by Boncompagni in Trattati d' aritmetica (Rome, 1857). * From Sir E. C. Bayley's paper in J.R.A.S. (1882). 6 From Burnell's South Indian Palaeography (1874). 6 Of the 10th century. (From Burnell, op. cit.) 7 Of the 10th century; from a MS. written at Shiraz. (From Woepcke, Memoire sur la propagation des chiffres indiens.}*

8 From a MS. at Paris. (From Woepcke, op. cit.)

9 Erlangen (Altdorf) MS. (From Woepcke, op. cit.)

in the other old systems we have dealt with. Like the Indian alphabet, they are probably derived from abroad, but, as in the case of the alphabet, their origin is obscure. The forms of the later Indian numerals for the nine digits appear to be clearly derived from the earlier system. In table II. the first two lines give forms earlier than the introduction of the system of position, while tne Devanagari in the third line was used with a zero and position value. The " cave " numerals were employed during the first centuries of the Christian era. The earliest known example of a date written on the modern system is of A.D. 738, while the old system is found in use as late as the early part of the 7th century (Bayley). On the other hand, there is some evidence that a system of value by position was known to Sanskrit writers on arithmetic in the 6th Christian century. These writers, however, do not use ciphers, but symbolical words and letters, so that it is not quite clear whether they refer to a system which had a zero, or to a system worked on an abacus, where the zero is represented by a blank column. There is no proof as yet for the use of any system of position in India before dfe 6th century, and nothing beyond conjecture can be offered as to its origin.

2. In Europe, before the introduction of the algorithm or full Indo-Arabic system with the zero, we find a transition system in which calculations were made on the decimal system with an abacus, but

instead of unit counters there were placed in the columns ciphers, with values from one to nine, and of forms that are at bottom the Indian forms and agree most nearly with the numerals used by the Arabs of Africa and Spain. For among the Arabs themselves there were varieties in the forms of the Indian numeral, and in particular an eastern and a western type. The latter is called ghobar (dust), a name which seems to connect it with the use of a sand-spread tablet for calculation. The abacus with ciphers instead of counters was used at Rheims about 970-980 by Gerbert, who after- wards was pope under the title of Sylvester II., and it became well known in the nth century. Where did Gerbert learn the use of the abacus with ciphers ? There is no direct evidence as to this, for the story in William of Malmesbury, that he stole it from an Arab in Spain, is generally given up as fabulous. On the other hand, no evidence is offered for an earlier use of the abacus with ciphers, except a passage describing the system in the Geometria ascribed to Boetius. If this book is genuine the Indian numerals were known in Europe and applied to the abacus in the 5th century, and Gerbert only revived the long-forgotten system. On this view we have to explain how Boetius got the ciphers. The Geometria ascribes the system to the " Pythagorici " — i.e. the Neo-Pythagoreans — and it has been thought possible that the Indian forms for the numerals reached Alexandria, along with the cruder form of value by position involved in the use of the abacus without a zero, before direct communication letween Europe and India ceased, which it did about the 4th century ˆ.D. It is then further conjectured by Woepcke that the ghobar numerals of the western Arabs were by them borrowed from the system of Boetius before the full Indian method with the zero reached them ; and thus the resemblance between these forms and those in MSS. of Boetius, which are essentially the same as in other MSS. of the nth century, would be explained. This view, however, presents great difficulties, of which the total disappearance of all trace of the system between Boetius and Gerbert is only one. We have no proof that the Indians ever used such an abacus, or that they had value by position at so early a date as is required, and the ghobar numerals are too similar to those of the eastern Arabs to make it very credible that the two systems had been separated for centuries. The genuineness of the Geometria is maintained by Moritz Cantor, but it has been attacked on other grounds than that of the passage about the abacus; and on the whole it is still an open question whether the abacus with ciphers is not the outcome of an early imperfect knowledge of the Arabic system, Gerbert or some other having got the signs and a general idea of value by position without having an explanation of the zero.

See M. Cantor, Geschichte der Matkematik, vol. i. (Leipzig, 1880); also M. Chasles, papers in the Comptes rendus (1843); G. Friedlein, Die Zahlzeichen und das elementare Rechnen der Griechen und Romer, &c. (1869); F. Woepcke, Sur V introduction de I'arithmetique indien en Occident (Rome, 1859), and Memoire sur la propagation des chiffres indiens (Paris, 1863). For the palaeography of the Indian numerals see Burnell, Elements of S. Indian Palaeography (1874) \ an & Sir E. C. Bayley in J.R.A.S. (1882, 1883). For Boetius compare Friedlein's edition of his arithmetic and geometry (Leipzig, 1857), and Weissen- born in Zeitsch. Math. Phys. xxiv. Other references to the copious literature will be found in Cantor and Friedlein, who also discuss the subject of the notation for fractions, which cannot be entered on here. For systems passed over here, see Pihan, Expose des signes de numera- tion usites chez les peuples orientaux (Paris, i860). (W. R. S.)

NUMERIANUS, MARCUS AURELIUS, son of the Roman emperor Carus. On the death of his father, whom he accom- panied on his expedition against the Persians, he was proclaimed emperor (December, a.d. 283). Pie resolved to abandon the campaign, and" died mysteriously on his way back to Europe, eight months afterwards- Arrius Aper, praefect of the praetorian

guards, his father-in-law, who was suspected of having murdered him, was slain by Diocletian, whom the soldiers had already proclaimed his successor. Numerianus is represented as having been a man of considerable literary attainments, and of remarkably amiable character.

NUMIDIA, the name given in ancient times to a tract of country in the north of Africa, extending along the Mediterranean from the confines of Mauretania to those of the Roman province to Africa. When the Romans first came into collision with Carthage in the 3rd century B.C., the name was applied to the whole country from the river Mulucha (now the Muluya), about 100 m. W. of Oran, to the frontier of the Carthaginian territory, which nearly coincided with the modern regency of Tunis. It is in this sense that the name Numidia is used by Polybius and all historians down to the close of the Roman republic. The Numidians, as thus defined, were divided into two great tribes, — the Massyli on the east, and the Massaesyli on the west — the limit between the two being the river Ampsaga, which enters the sea to the west of the promontory called Tretum, now known as the Seven Capes. At the time of the second Punic War the eastern tribe was governed by Massinissa, who took the side of the Romans in the contest, while Syphax his rival, king of the

Massaesyli, supported the Carthaginians. At the end of the war the victorious Romans confiscated the dominions of Syphax, and gave them to Massinissa, whose sway extended from the frontier of Mauretania to the boundary of the Carthaginian territory, and also south and east as far as the Cyrenaica (Appian, Punica, 106), so that the Numidian kingdom entirely surrounded Carthage except towards the sea. Massinissa, who reached a great age, retained the whole of these dominions till his death in 148 B.C. and was succeeded in them by his son Micipsa, who died in 118. For the war with Rome which followed the death of Micipsa see Jtjgtjrtha. After the death of Jugurtha as a captive at Rome in 106, the western part of his dominions was added to those of Bocchus, king of Mauretania, while the remainder (excluding perhaps the territory towards Cyrene) continued to be governed by native princes until the civil war between Caesar and Pompey, in which Juba I., then king of Numidia, who had espoused the cause of the Pompeians, was defeated by Caesar, and put an end to his own life (46 B.C.). Numidia, in the more restricted sense which it had now acquired, became for a short time a Roman province under the title of Africa Nova, but in the settlement of affairs after the battle of Actium it was restored to Juba II. (son of Juba I.), who had acquired the favour of Augustus. Soon afterwards, in 25 B.C., Juba was transferred to the throne of Mauretania, including the whole western portion of the ancient Numidian monarchy as far as the river Ampsaga, while the eastern part was added to the province of Africa, i.e. that part which had been called Africa Nova before it was given to Juba. It retained the official title, though it may also have been known as Numidia; together with Africa Vetus it was governed by a proconsul, and was the only senatorial province in which a legion was permanently stationed, under the orders of the senatorial governor. In a.d. 37 the emperor Gaius put an end to this arrangement by sending a legatus of his own to take over the command of the legion, thus separating the military from the civil administration, and practically separating Numidia or Africa Nova from Africa Vetus, though the two were still united in name (Tac. Hist. 4. 48). Under Septimus Severus (a.d. 193- en) Numidia was separated from Africa Vetus, and governed by an imperial procurator {procurator per Numidiam) ; finally, under the new organization of the empire by Diocletian, Numidia became one of the seven provinces of the diocese of Africa, being known as Numidia Cirtensis, and after Constantine as N. Con- stantina, corresponding closely in extent to the modern French province of Constantine. During all this period it reached a high degree of civilization, and was studded with numerous towns, the importance of which is attested by inscriptions (see vol. viii. of the Corpus

inscriptionum), and by the massive remains of public buildings. The invasion of the Vandals in a.d. 428 reduced it to a condition of gradual decay; and the invasion of

the Arabs in the 8th century again brought desolation on the land, which was aggravated by continual misgovernment till the conquest of Algeria by the French in 1833.

The chief towns of Numidia under the Romans were : in the north, Cirta, the capital, which still retains the name Constantine given it by Constantine; Rusicada on the coast, serving as its port, on the site now occupied by Philippeville ; and east of it Hippo Regius, well known as the see of St Augustine, near the modern Bona. To the south in the interior were Theveste (Tebessa) and Lambaesis (Lambessa) with extensive and striking Roman remains, connected by military roads with Cirta and Hippo respectively. Lambaesis was the seat of the legion III. Augusta, and the most important strategic centre, as commanding the passes of the Mons Aurasius, a mountain block which separated Numidia from the Gaetulian tribes of the desert, and which was gradually occupied in its whole extent by the Romans under the Empire. Including these towns there were altogether twenty which are known to have received at one time or another the title and status of Roman colonies; and in the 5th century the Notitia enumerates no less than 123 sees whose bishops assembled at Carthage in 479.

For bibliography and account of Roman remains, see under Africa, Roman.

NUMISMATICS (Lat. numisma, nomisma, a coin; from the Greek, derived from voixiˆav, to use according to law), the science treating of coins (Low Lat. cuneus, a die) and medals (Low Lat. medalla, a small coin).

The earliest known coins were issued by the Greeks in the 7th century before the Christian era. By the 4th century the whole civilized world used money (q.v.), each state generally having its proper coinage. Thisqhas continued to be the case to the present time; so that now tnere are few nations without a metal currency of their own, and of these but a small proportion are wholly unacquainted with the use of coins.

Coins, although they confirm history, rarely correct it, and never very greatly. The earliest belong to a time and to nations as to which we are not otherwise wholly ignorant, and they do not afford us that precise information which, would fill in any important details of the meagre sketch of contemporary history. We gain from them scarcely any direct historical information, except that certain cities or princes issued money. When in later times the devices and inscriptions of the coins give more detailed information, history is far fuller and clearer, so that the numismatic evidence is rarely more than corroborative. There are, indeed, some remarkable exceptions to this rule, as in the case of the Bactrian and Indian coins, which have supplied the outlines of a portion of history which was otherwise almost wholly lost. The value of the corroborative evidence afforded by coins must not, however, be overlooked. It chiefly relates to chronology, although it also adds to our knowledge of the pedigrees of royal houses. But perhaps the most interesting manner in which coins and medals illustrate history is in their bearing contemporary, or nearly contemporary, portraits of the most famous kings and captains, from the time of the first successors of Alexander the Great to the present age, whereas pictures do not afford portraits in any number before the latter part of the middle ages; and works of sculpture, although occupying in this respect the same place as coins in the last- mentioned period and under the Roman empire, are neither so numerous nor so authentic. There is no more delightful com- panion in historical reading than a cabinet of coins and medals. The strength and energy of Alexander, the ferocity of Mith- radatcs, the philosophic calmness of Antoninus, the obstinate ferocity of Nero, and the brutality of Caracalla are as plain on the coins as in the pages of history. The numismatic portraits of the time following the founding of Constantinople have less individuality; but after the revival of art they recover that quality, and maintain it to our own day, although executed in very different styles from those of antiquity. From this last class we can form a series of portraits more complete and not less interesting than that of the ancient period.

While coins and medals thus illustrate the events of history,

they have an equally direct bearing on the belief of the nations

Mythology by wmch tne y were issued; and in this reference lies

‘ no small part of their value in connexion with history.

The mythology of the Greeks, not having been fixed in sacred

writings, nor regulated by a dominant priesthood, but having grown out of the different beliefs of various tribes and isolated settlements, and having been allowed to form itself comparatively without check, can scarcely be learned from ancient books. Their writers give us but a partial or special view of it, and modern authors, in their attempts to systematize, have often but increased the confusion. The Greek coins, whether of kings or cities, until the death of Alexander, do not, with a few negligible exceptions, represent the human form. Afterwards, on the regal coins, the king's head usually occupies the obverse and a subject, usually sacred, is placed on the reverse. The coins of Greek cities under the empire have usually an imperial portrait and a reverse type usually mythological. The whole class thus affords us invaluable evidence for the reconstruction of Greek mytho- logy. We have nowhere else so complete a series of the different types under which the divinities were represented. There are in modern galleries very few statues of Greek divinities, including such as were intended for architectural decoration, which are in good style, fairly preserved, and untouched by modern restorers. If to these we add reliefs of the same class, and the best Graeco- Roman copies, we can scarcely form a complete series of the various representations of these divinities. The coins, however, supply us with the series we desire, and we may select types which are not merely of good work, but of the finest. The mytho- logy of ancient Italy, as distinct from that of the Greek colonies of Italy, is not so fully illustrated by the coins of the country, because these are for the most part of Greek design. There are, however, some remarkable exceptions, especially in the money of the Roman commonwealth, the greater number of the types of which are of a local character, including many that refer to the myths and traditions of the earliest days of the city. The coins of the empire are especially important, as bearing representations of those personifications of an allegorical character to which the influence of philosophy gave great prominence in Roman mythology.

Coins are scarcely less valuable in relation to geography than to history. The position of towns on the sea or on rivers, the race of their inhabitants, and many similar particulars are positively fixed on numismatic evidence. The informa- graphy. tion that coins convey as to the details of the history of towns and countries has a necessary connexion with geography, as has also their illustration of local forms of worship. The representations of natural productions on ancient money are of special importance, and afford assistance to the lexicographer. This is particularly the case with the Greek coins, on which these objects are frequently portrayed with great fidelity.

We must recollect, however, that the nomenclature of the ancients was vague, and frequently comprised very different objects under one appellation, and that therefore we may find very different representations corresponding to the same name.

The art of sculpture, of which coin-engraving is the offspring, receives the greatest illustration from numismatics. Not only is the memory of lost statues preserved to us in the designs .

of ancient coins, but those of Greece afford admirable examples of that skill by which her sculptors attained their great renown. The excellence of the designs of very many Greek coins struck during the period of the best art is indeed so great that, were it not for their smallness, they would form the finest series of art-studies in the world. The Roman coins, though at no time to be compared to the purest Greek, yet represent not unworthily the Graeco-Roman art of the empire. From the accession of Augustus to the death of Commodus they are often fully equal to the best Graeco-Roman statues. This may be said, for instance, of the dupondii struck in honour of Livia by Tiberius and by the younger Drusus, of the sestertii of Agrippina, and of the Flavian emperors, and of the gold coins of Antoninus Pius and the two Faustinas, all which present portraits of remarkable beauty and excellence. The Italian medals of the Renaissance are scarcely less useful as records of the progress and characteristics of art, and, placed by the side of the Greek and Roman coins, complete the most remarkable comparative series of monuments illustrating the history of the great schools of art

that can be brought together. Ancient coins throw some light upon the architecture as well as upon the sculpture of the nations by which they were struck. Under the empire, the Roman coins issued at the city very frequently bear representations of im- portant edifices. The Greek imperial coins struck in the provinces present similar types, representing the most famous temples and other structures of their cities, of the form of some of which we should otherwise have been wholly ignorant. The art of gem- engraving among the ancients is perhaps most nearly connected with their coinage. The subjects of

coins and gems are so similar and so similarly treated that the authenticity of gems, that most difficult of archaeological questions, receives the greatest aid from the study of coins.

After what has been said it is not necessary to do more than mention how greatly the study of coins tends to illustrate the contemporary literature of the nations which issued them. Not only the historians, but the philosophers and the poets, are constantly illustrated by the money of their times. This was perceived at the revival of letters; and during the 17th and 18th centuries coins were very frequently engraved in the larger editions of the classics.

The science of numismatics is of comparatively recent origin.

The ancients do not seem to have formed collections, although

they appear to have occasionally preserved individual

rˆ n specimens for their beauty. Petrarch has the credit

Science. ° having t> een tne fi rst collector of any note; but it is probable that in his time ancient coins were already attracting no little notice. The importance of the study of all coins has since been by degrees more and more recognised, and at present no branch of the pursuit is left wholly unexplored. Besides its bearing upon the history, the religion, the manners, and the arts of the nations which have used money, the science of numismatics has a special modern use in relation to ˆ art. Displaying the various styles of art prevalent in different ages, coins supply us with abundant means for promoting the advancement of art among ourselves. If the study of many schools be at all times of advantage, it is especially so when there is little originality in the world. Its least value is to point out the want of artistic merit and historical commemoration in modern coins, and to suggest that modern medals should be executed after some study of the rules which controlled the great works of former times.*

Definitions. — The following are the most necessary numismatic definitions.

1 . A coin is a piece of metal of a fixed weight, stamped by authority of government, and employed as a circulating medium. 1

2. A medal is a piece, having no place in the currency, struck to commemorate some event or person. Medals are frequently comprised with coins in descriptions that apply to both equally; thus, in the subsequent definitions, by the term coins, coins and medals must generally be understood.

3. The coinage of a country is usually divided into the classes of

gold, silver and bronze (copper), for which the abbreviations N,JR, and M are employed in catalogues. In addition to these metals, and to the modifications of them created by the presence of varying amounts of alloy, certain other compounds were frequently used, notably electrum, billon, brass and potin.

1 This definition excludes, on the one hand, paper currencies and their equivalents among barbarous nations, such as cowries, because they are neither of metal nor of fixed weight, although either stamped or sanctioned by authority, and, on the other hand, modes of keeping metal in weight, like the so-called Celtic " ring-money," because it is not stamped, although perhaps sanctioned by authority. The latter has attracted much attention, but it is by no means made out that the rings were made with the primary intention of serving as money. But it is a very common usage among savage or semi- savage races to wear all their wealth in the form of ornaments (as a woman may even now wear her dowry as ornaments in the form of coins) and to use the ornaments (or cut-off portions of them, " skill- ings ") whenever occasion arises as a medium of exchange. These rings then were doubtless used in this manner, but they were no more money than were any other precious possessions which could be used in exchange. There is no good evidence for the use of the little Gaulish " wheels " as money. On these questions see Blanchet, Monn. gaul. pp. 24-29. On the border of the definition are such prehistoric " dumps " of metal as have been found at Enkomi in Cyprus and at Cnossus in Crete; one of these indeed seems to bear traces of a mark of some kind.

4. Electrum (f:\eKTpov, rjXe/o-pos, Xowds xpvuos) , a compound metallic substance, consisting of gold with a considerable alloy of silver. Pliny makes the proportion to have been four parts of gold to one of silver. 2 The material of early coins of Asia Minor struck in the cities of the western coast is the ancient electrum. The amount of silver varies very considerably with time and place. Gold largely alloyed with silver, not struck by the ancient Greeks or their neighbours, should be termed pale gold, as in the case of some of the late Byzantine coins.

5. Billon, a term applied to the base metal of some Roman coins, and also to that of some medieval and modern coins. It contains about one-fifth silver to four-fifths copper. When the base silver coins are replaced by copper washed with silver the term billon becomes inappropriate.

6. Brass, a mixture of copper and zinc. It may be used as an

equivalent to the orichalcum of the Romans, a fine kind of brass of which the sestertii and dupondii were struck, but it is commonly applied indiscriminately to the whole of their copper currency under the empire.

7. Potin, an alloy of copper and tin (therefore a variety of bronze) used for some late Gaulish coins.

8. Various other metallic substances have been used in coinage, including iron (in Peloponnesus) and an alloy of copper and nickel employed for some Bactrian coins. The so-called " glass coins " of the Arabs are merely coin-weights.

9. The forms of coins have greatly varied in different countries and at different periods. The usual form in both ancient and modern times has been circular, and generally of no great thickness.

10. Coins are usually measured by millimetres, or by inches and tenths, the greatest dimension being taken, or, when they are square or oval, the greatest dimension in two directions.

11. The weight of a coin is of great importance, both in determining its genuineness and in distinguishing its identity. Metric weights are used by most numismatists except in England, where troy weight is still in general use.

12. The specific gravity of a coin may be of use in determining the metals in its composition.

1.3. Whatever representations or characters are borne by a coin constitute its type. The subject of each side is also called a type, and, when there is not only a device but an inscription, the latter may be excluded from the term. This last is the general use. No distinct rule has been laid down as to what makes a difference of type, but it may be considered to be an essential difference, however slight. .

14. A difference too small to constitute a ne.w type makes a variety. , ...

15. A coin is a duplicate of another when it agrees with it in all particulars but those of exact size and weight. Strictly speaking, ancient coins are rarely, if ever, duplicates, except when struck from the same pair of dies.

16. Struck coins are those on which the designs are produced by dies impressed on the blank piece (or flan) of metal by some form of

hammering or pressure; they are distinguished from cast coins made by running metal into a mould.

17. Of the two sides of a coin, that is called the obverse which bears the more important device. In early Greek coins it is the convex side, or the side impressed by the lower die; in Greek and Roman imperial it is the side bearing the head; in medieval and modern that bearing the royal effigy, or the king's name, or the name of the city; and in Oriental that on which the inscription begins. The other side is called the reverse. ■ ■ ,

18. The field of a coin is the space unoccupied by the principal devices or inscriptions. Any detached independent device or character is said to be in the field, except when it occupies the

6X I9. The exergue is that part of the reverse of a coin which is below the main device, and distinctly separated from it; it often bears a secondary inscription. Thus, the well-known inscription CONOB occupies the exergue of the late Roman and early Byzantine gold

20. The edge of a coin is the surface of its thickness.

21. By the inscription or inscriptions of a coin all the letters it bears are intended; an inscription is either principal or

22 In describing coins the terms right and left mean the right and left of the spectator, not the heraldic and military right and left, or those of the coin. . .

23 A bust is the representation of the head and neck; it is commonly used of such as show at least the collar-bone, other busts being called heads. A head properly means the representation of a head alone, without any p art of the neck, but it is also commonly used

**Hist. not. xxxiii. 23; cp. xxxvii. 11. Pliny distinguishes two kinds of " electron,"— amber, and this metallic substance. In Greek poetry the name seems to apply to both, but it is generally difficult to decide which is meant in any particular case. Sophocles, however, where he mentions tAttA SapSeav fiXucrpov, . . . ko.1 rbv 'IxSikcV ypvadv (Ant. 1 037-1 039), can scarcely be doubted to refer to the metallic electrum.*

GREEK COINS]

NUMISMATICS

when any part of the neck above the collar-bone is shown. The present article follows custom in the use of the terms bust and head. When the neck is clothed, the bust is said to be draped.

24. A bust or head is either facing, usually three-quarter face, or in profile, in which latter case it is described as to right or to left. Two busts may be placed in various relative positions, as jugate or confronted.

25. A bust wearing a laurel-wreath is said to be laureate.

26. A bust bound with a regal fillet (diadem) is called diademed.

27. A bust wearing a crown with rays is said to be radiate.

28. An object in the field of a coin which is neither a letter nor a monogram is usually called a symbol. This term is, however, only applicable when such an object is evidently the badge of a town or individual. The term adjunct, which is sometimes employed instead of symbol, is manifestly incorrect.

29. A mint-mark is a difference placed by the authorities of the mint upon all money struck by them, or upon each new die or separate issue.

30. A coin is said to be " over-struck " or " re-struck " when it has been struck on an older coin, of which the types are not altogether obliterated.

31. A double-struck coin is one in which the die or dies have shifted so as to cause a double impression.

32. A coin which presents two obverse types, or two reverse types, or of which the types of the obverse and reverse do not correspond, is called a mule ; it is the result of mistake or caprice.

Arrangement of Coins. — No uniform system has as yet been applied to the arrangement of all coins. It is usual to separate them into the three great classes of ancient coins (comprising Greek and Roman), medieval and modern, and Oriental coins. The details of these classes have been differently treated, both generally and specially. The arrangement of the Greek series has been first geographical, under countries and towns, and then chronological, for a further division; that of the Roman series, chronological, without reference

to geography; that of the medieval and modern, the same as the Greek; and that of the Oriental, like the Greek, but unsystematically — a treatment inadmissible except in the case of a single empire.. Then, again, some numismatists have separated each denomination or each metal, or have separated the denominations of one metal and not of another. There has been no general and comprehensive system, constructed upon reasonable principles, and applicable to every branch of this complicated science. Without laying down a system of rules, or criticizing former modes of arrangement, we offer the following as a classification which is uniform without being servile.

1. Greek Coins. — All coins of Greeks, or barbarians who adopted Greek money, struck before the Roman rule or under it, but without imperial effigies. The countries and their provinces are placed in a geographical order from west to east, according to the system of Eckhel, with the cities in alphabetical order under the provinces, and the kings in chronological order. The civic coins usually precede the regal, as being the more important. The coins are further arranged chronologically, the civic commencing with the oldest and ending with those bearing the effigies of Roman emperors. The gold coins of each period take precedence of the silver and the silver of the copper. The larger denominations in each metal are placed before the smaller. Coins of the same denomination and period are arranged in the alphabetical order of the magistrates' names, or the letters, &c, that they bear.

2. Roman Coins. — All coins issued by the Roman commonwealth and empire, whether struck at Rome or in the provinces. The arrangement is chronological, or, where this is better, under geographical divisions.

*3. Medieval and Modem Coins of Eu*4fk. — All coins issued by Christian European states, their branches and colonies, from the fall of the empire of the West to the present day. This class is arranged in a geographical and chronological order, as similar as possible to that of the Greek class, with the important exception of the Byzantine coins and the coins following Byzantine systems, which occupy the first place. The reason for this deviation is that the Byzantine money may be regarded not only as the principal source of medieval coinage but as the most complete and important medieval series, extending as it does without a break throughout the middle ages. The regal coins usually precede the civic ones, as being the more important. The medals of each nation should be arranged in two series: (1) medals of rulers, according to their dates; (2) medals of private persons, as*

far as possible according to the artists.

4. Oriental Coins. — All coins bearing inscriptions in Eastern languages, excepting those of the Jews, Phoenicians and Carthaginians, which are classed with the Greek coins from their close connexion with them. These coins should be arranged under the following divisions: Ancient Persian, Arab, Modern Persian, Indian, Chinese and coins of the Far East.

This method of arrangement will be found to be as uniform as it can be made, without being absolutely mechanical. It differs in some important particulars from most or all of those which have previously obtained; but these very differences are the result of the consideration of a complete collection, and have therefore an inductive origin. A general uniformity is no slight gain, and may well reconcile us to some partial defects.

I. Greek Coins

There are some matters relating to Greek coins in general which may be properly considered before they are described in geographical order. These are their general character, the chief denominations, with the different talents of which they were the divisions, their devices and inscriptions, their art, and the mode of striking.

The period during which Greek coins were issued was probably not much less than a thousand years, commencing about the beginning of the 7th century B.C. and generally ending at the death of Gallienus (a.d. 268). If classed with reference only to their form, fabric, and general appearance they are of three principal types — the archaic Greek, the ordinary Greek, and the Graeco-Roman. The coins of the first class are of silver, electrum and sometimes gold. They are thick lumps of an irregular round form, bearing on the obverse a device, with in some cases an accompanying inscription, and on the reverse a square or oblong incuse stamp (quadralum incusum), usually divided in a rude manner. The coins of the second class are of gold, electrum, silver and bronze. They are much thinner than those of the preceding class, and usually have a convex obverse and a slightly concave or flat reverse. The obverse ordinarily bears a head in bold relief. The coins of the third class are, with very few exceptions, of bronze. They are flat and broad, but thin, and generally have on the obverse the portrait of a Roman emperor. Many Greek cities, however, during the empire issued quasi- autonomous coins bearing the head of some deity or personifica- tion. Greek coins thus fall mainly into the classes of autono- mous, quasi-autonomous and

imperial. The coinage of Roman colonies in Greek as in other lands is usually distinguished by Latin inscriptions.

Since Greek coinage originated in Asia Minor, the coins were adjusted to the weight-systems there in use, and these go back to a Babylonian origin. But it is possible that some of the standard of Greece proper had a native origin. The unit ™ oa « a O' of weight in the East was the shekel (siglos). This was s ˆ stems – sh) of the manah (mina, mna), and this ˆ of the talent (talanton). This scale the Greeks modified, in that, starting from the siglos as unit, they invented a money-mina of 50 sigli, with a money-talent of 60 miuae or 3000 sigli. The siglos-units (and corresponding standards) chiefly employed in Asia Minor were the following (the relation between gold and silver at the time of the invention of these units seems to have been 13! :i) : —

Gold shekel, 8-40 grammes.

Phoenician silver shekel, 7-44 g. =/ 5 of 111-72 g. of silver, which

was equivalent to 8-4 g. of gold. Babylonian or Persic silver shekel, 11-17 g-—-fo°f 111-72 g- of

silver, which was equivalent to 8-4 g. of gold.

Thus one gold shekel was the equivalent of 15 Phoenician or 10 Babylonian silver shekels. Side by side with this system was another in which the weights were exactly double of those just given; a shekel of the heavier system might be regarded as a double shekel of the lighter. Various Babylonian weights are extant, dating from 2000 B.C. downwards, which prove the existence of minae of the two systems. The gold shekel standard was almost invariably used for gold coins, sometimes also for electrum. The Babylonian and Phoenician standards were also sometimes used for gold or electrum as well as silver. A weight more or less approaching that of the gold shekel or its multiples seems to have been usual all over the civilized world in Greek times; e.g. the Phocaean standard of 16-52 g. was but a modification of it. But for silver in Greece proper, from a very early period, the following standards prevailed : the Aeginetic (unit, didrachm or stater, of 12-6 g.) and the Euboic- Attic (stater of 8-72 g.), with its modification the Corinthian. The Euboic-Attic standard attained enormous importance owing to the spread of Athenian trade and the adoption of the weight by Alexander of Macedon. It was used for both gold and silver. The Corinthian standard differed only in its divisional system, the stater being divided into thirds instead of

halves. From it were derived some of the standards in use among the Greeks of S. Italy. Other standards of more local importance were : the Campanian, used in a large part of S. Italy (didrachm originally of 7-41 g., afterwards reduced), and perhaps derived from

the Phoenician; the Rhodian (instituted about 400 B.C., tetra-drachm about 15 g.) ; and the cistophoric (from about 200 B.C., with a tetradrachm of about 12-73 g-)-

Deaomlna- The following table exhibits the weights in grammes tloas. of the principal denominations of the Greek systems : — ■

Gold Shekel System.

Babylonian or Persic.

Phoenician.

Aeginetic.

Euboic-Attic.

Double shekel, distater or tetradrachm Shekel, stater or didrachm …

| Twelfth or obol

16-80 8-40 4-20

2-80

0-70

22-40

11-20

5-6o

3-73

o-93

14-92 7-46

373 2-49 0-62

25-20

12-60

6-30

4-48

I-I2

17-44 8-72 4-36 2-92

o-73

Classes.

The term stater is usually applied to the didrachm, but also to the tetradrachm, and at Cyrene to the drachm.

The bronze standards have been less fully discussed. Some notice of them will be given under different geographical heads.

In the types of Greek coins (using the term in its restricted sense) the first intention of the designers was to indicate the city or state by which the money was issued. The necessity for distinctive Types. devices was most strongly felt in the earlier days of the art, when the obverse of a coin alone bore a design, and, if any inscription, only the first letter, or the first few letters, of the name of the people by whom it was issued. Whatever may have been the original significance of the type in itself, religious or otherwise, it was adopted for the coinage — at least in the earliest times — because it was the badge by which the issuing authority was recognized. It was only with the increased complexity of the denominations in later times, when new distinguishing types had to be found, that — as in the 4th century B.C. — the religious motive in the choice of types came deliberately into play.

Greek coins, if arranged according to their types, fall into three classes: (1) civic coins, and regal without portraits of sovereigns; (2) regal coins bearing portraits; and (3) Graeco- Roman coins, whether with imperial heads or not. The coins of the first class have either a device on the obverse and the quadratum incusum on the reverse, or

*two devices; and these last are again either independent of each other, though connected by being both local, or — and this is more common — that on the reverse is a kind of complement of that on the obverse. It will be best first to describe the character of the principal kinds of types of the first class, and then to notice their relation. It must be noted that a head or bust is usually an obverse type, and a figure or group a reverse one, and that, when there is a head on both obverse and reverse, that on the former is usually larger than the other, and represents the personage locally considered to be the more important of the'two. We must constantly bear in mind that these types are local if we would understand their meaning. In the following list the types of Greek coins of cˆ S < *' c ˆ es ' an d °f kings, not having regal portraits, are Cola's. " classed in a systematic order, without reference to their relative antiquity.*

1. Head or figure of a divinity worshipped at the town, or by the people, which issued the coin, as the head of Athena on coins of Athens, and the figure of Heracles on coins of Boeotian Thebes. Groups are rare until the period of Graeco-Roman coinage.

2. Natural or artificial objects — (a) animal, often sacred to a divinity of the place, as the owl (Athens) and perhaps the tortoise (Aegina); (b) tree or plant, as the silphium (Cyrene) and the olive-branch (Athens); (c) arms or implements of divinities, as the arms of Heracles (Erythrae), the tongs of Vulcan (Aesernia). It is difficult tc connect many objects com- prised in this class with local divinities. Some of them, as the tunny at Cyzicus, are doubtless only so connected because the chief industry of a place was placed under the tutelage of its chief divinity.

3. Head or figure of a local genius — (a) river-god, as the Gelas (Gela); (b) nymph of a lake, as Camarina (Camarina); (c) nymph of a fountain, as Arethusa (Syracuse).

4. Head or figure of a fabulous personage or half-human monster, as a Gorgon (Neapolis Macedoniae), the Minotaur (Cnossus).

5. Fabulous animal, as Pegasus (Corinth), a griffin (Panti-capaeum), the Chimaera (Sicyon).,

6. Head or figure of a hero or founder, as Ulysses (Ithaca), the

Lesser Ajax (Locri Opuntii), Taras, founder of Tarentum (Tarentum).

7. Objects connected with heroes — animal connected with local

hero, as the Calydonian boar or his jaw-bone (Aetolians) .

8. Celebrated real or traditional sacred localities, as moun- tains on which divini- ties are seated, the labyrinth (Cnossus).

9. Representations connected with the

public religious festivals and contests, as a chariot victorious at the Olympic games (Syracuse).

The relation of the types of the obverse and reverse of a coin is a matter requiring careful consideration, since they frequently . illustrate one another. As we have before observed, this relation is either that of two independent objects, which are connected only by their reference to the same place, or the one is a kind of complement of the other. Among coins illustrating the former class we may instance the beautiful silver didrachms of Camarina, having on the obverse the head of the river-god Hipparis and on the reverse the nymph of the lake carried over its waters by a swan, and those of Sicyon, having on the obverse the Chimaera and on the reverse a dove. The latter class is capable of being separated into several divisions. When the head of a divinity occurs on the obverse of a coin, the reverse is occupied by an object or objects sacred to that divinity. Thus the common Athenian tetra- drachms have on the one side the head of Athene and on the other an owl and an olive-branch; the tetradrachms of the Chalcidians in Macedonia have the head of Apollo and the lyre; and the copper coins of Erythrae have the head of Heracles and his weapons. The same is the case with subjects relating to the heroes: thus there are drachms of the Aetolian League which have on the obverse the head of Atalanta and on the reverse the Calydonian boar, or his jaw-bone and the spear-head with which he was killed. In the same manner the coins of Cnossus, with the Minotaur on the obverse, have on the reverse a plan of the Labyrinth. Besides the two principal devices there are often others of less importance, which, although always sacred, and sometimes symbols of local divinities, are generally indicative of the position of the town, or have some reference to the families of magistrates who used them as badges. Thus, for example, besides such representations as the olive-branch sacred to Athene on the Athenian tetradrachms, as a kind of second device dolphins are frequently seen on coins of maritime places; and almost every series exhibits many symbols which can only be the badges of the magistrates with whose names they occur. Regal coins of this class, except Alexander's, usually bear types of a local character, owing to the small extent of most of the kingdoms, which were rather the territories of a city than

considerable states at the period when these coins were issued.

The second great class — that of coins of kings bearing portraits — is necessarily separate from the first. Religious feeling affords the clue to the long exclusion of regal portraits — the feeling that it would be profane for a mortal to take pof^to. a place always assigned hitherto to the immortals. Were there any doubt of this, it would be removed by the character of the earliest Greek regal portrait, that of Alexander, which occurs on coins of Lysimachus. This is not the representation of a living personage, but of one who was not only dead but had received a kind of apotheosis, and who, having been already called the son of Zeus Ammon while living, had been treated as a divinity after his death. He is therefore portrayed as a young Zeus Ammon. Probably, however, Alexander would not have been able, even when dead, thus to usurp the place of a divinity upon the coins, had not the Greeks become accustomed to the Oriental " worship " of the sovereign, which he did not discourage. This innovation rapidly produced a complete change; every king of the houses which were raised on the ruins of the Greek empire could place his portrait on the

money which he issued, and few neglected to do so, while the sovereigns of Egypt and Syria even assumed divine titles.

The reign of Alexander produced another great change in Greek coinage, very different from that we have noticed. He suppressed the local types almost throughout his empire, and compelled the towns to issue his own money, with some slight difference for mutual distinction. His successors followed the same policy; and thus the coins of this period have a new character. The obverses of regal coins with portraits have the head of the sovereign, which in some few instances gives place to that of his own or his country's tutelary divinity, while figures of the latter sort almost exclusively occupy the reverses. Small symbols, letters, and monograms on the reverses distinguish the towns in this class.

The Graeco-Roman coins begin, at different periods, with the seizure by Rome of the territories of the Greek states. They are almost all bronze; and those in that metal are the Roman. most characteristic

and important. In their types we see a further departure from the religious intention of those of earlier times in the rare admission of representations, not only of eminent persons who had received some kind of apotheosis, such as great poets, but also of others who, although famous, were not, and in some cases probably could not have been, so honoured. We also observe on these coins many types of an allegorical character.

The following principal kinds of types may be specified, in addition to those of the two previous classes. (1) Head or figure of a famous personage who either had received a kind of apotheosis, as Homer (Smyrna), or had not been so honoured, as Herodotus (Halicarnassus) and Lais (Corinth). (2) Pictorial representations, always of a sacred character, although occasion- ally bordering on caricature. We may instance, as of the latter sort, a very remarkable type representing Athene playing on the double pipe and seeing her distorted face reflected in the water, while Marsyas gazes at her from a rock — a subject illustrating the myth of the invention of that instrument (Apamea Phrygiae). (3) Allegorical types, as Hope, &c, on the coins of Alexandria of Egypt, and many other towns. These were of Greek origin, and owed their popularity to the sculpture executed by Greeks under the empire; but the feeling which rendered such subjects prominent was not that of true Greek art, and they are essentially characteristic of the New Attic school which attained its height at Rome under the early emperors.

There is a class of coins which is always considered as part of the Graeco-Roman, although in some respects distinct. This is the colonial series, struck in Roman coloniae, and having almost always Latin inscriptions. As, however, these coloniae were towns in all parts of the empire, from Emerita in Spain (Merida) to Bostra in Arabia, in the midst of a Greek population and often of Greek origin, their coins help to complete the series of civic money, and, as we might expect, do not very markedly differ from the proper Greek imperial coins except in having Latin inscriptions and showing a preference for Roman types.

We have now to speak of the meaning of the inscriptions of Greek coins. These are either principal or secondary ; but the former are always intended when inscriptions are mentioned without qualification, since the secondary ones are non- essential. The inscription of civic money is almost always the name of the people by which it was issued, in the genitive plural, as AOHNAIflN on coins of the Athenians, SYPAKOSION on coins of the Syracusans, or the name of the city in the genitive singular, as AKPATANT02 at

Agrigentum. The inscription of regal money is the name, or name and title, of the sovereign in the genitive, as AAEHANAPOY, or BASIAEfJS AAEgANAPOY, on coins of Alexander the Great. Instead of this genitive an ad- jective is sometimes found, as 'AokoSkSv on early Arcadian coins, 'AXcJdKSpetos on staters of Alexander of Pherae. This genitive or adjectival form implies a nominative understood, which has been generally supposed to be vbiutriia " money," or the name of some denomination.

*There are a few instances in which a nominative of this kind is expressed on coins — *AEN02 EMI 2HMA, "I am the badge of Phaeno (?) or Phanes " on an archaic Ionian coin; rOPTYNQS TO IIAIMA, "the striking, struck piece, or type of Gortys"; *AI2TI0N TO IIAIMA SEY0A APITPION (silver monev), or KOMMA ("striking" or "struck piece"); and KOTYOS*

Inscrip- tions.

XAPAKTHP ("engraving" or "engraved piece"). Seuthes (end of 5th century B.C.) and Cotys (1st century B.C.), semi-barbarian Thra- cians, afford no evidence for Gree'k usage. The other instances (all archaic) point to the nominative understood in early times being in reality some word meaning type, or badge. But, if so, this latent nominative was eventually superseded by one meaning " money " or " coin." Thus the staters of Alexander of Pherae are inscribed 'AXeJdi'Speios, his drachms 'AXeJcu'Speta. Probably from the 4th century onwards " coin " was always understood. Occasionally the name of the issuing authority is found in the nominative, as Kijue (at Cumae), A&wcXe (Zancle-Messana), 'AOe. 6 6?/ios on a late coin probably issued by the Athenians in Delos, Tapas at Tarentum. These are by no means always descriptive of the type, but merely a straightforward way of naming the issuing authority. The simple inscriptions of the early period of Greek coinage are under the kings and the Roman empire replaced by elaborate legends, most of which, however, fall under the description above given. A certain number of inscriptions directly describe the type (not merely giving the name of its owner) as 2a)cu7roXis (the goddess of Gela) or Nka(at Terina). Others, especially in Roman tiroes, indicate the reason of issue, as 'lov&alas eaXionvlas on coins of Judaea under Vespasian, or names of festivals for which the coins were issued. These, however, properly belong to the class of secondary inscriptions which either describe secondary ' types, as A0AA, " rewards," accompanying the representation of the arms given to the victor in the exergues of Syracusan decadrachms, 1 or are the names oi magistrates or other officers, or in regal coins those of cities, or are those of the engravers

of the dies, of whom sometimes two were employed, one for the obverse and the other for the reverse, or are dates. These inscriptions are often but abbreviations or monograms, especially when they indicate cities on the regal coins.

The importance of Greek coins as illustrating the character of contemporary art cannot be easily overrated. They are beyond all other monuments the grammar of Greek art. Their geo- graphical and historical range is only limited by Greek coins

history and the Greek world ; as a series they may be _ '

called complete ; in quality they are usually worthy of a place beside contemporary sculpture, having indeed a more uniform merit ; they are sometimes the work of great artists, and there is no question of their authenticity, nor have they suffered from the injurious hand of the restorer. Thus they tell us what other monuments leave untold, filling up gaps in the sequence of works of art, and revealing local schools known from them alone.

The art of coins belongs to the province of relief, which lies between the domains of sculpture and of painting, partaking of the character of both, but most influenced by that which was dominant in each age. Thus in antiquity relief mainly shows the rule of sculpture; in the Renaissance that of painting.

It may be expected that Greek coins will bear the impress of the sister art of sculpture, filling up the gaps in the sequence of examples of the art of which we have remains, telling us somewhat of that which has but a written tradition. Our first duty is to endeavour to place the documents in the best order, separating the geographical from the historical indications, first examining the evidence of local schools, then those of the succession of styles. It is from coins alone that we can discover the existence of great local schools, reflecting the character of the different branches of the Hellenic race. In tracing the changes in these schools we gain a great addition to our ideas of the successive styles, and can detect new examples of those which owe their fame to the leading masters. But in dealing with works in relief we have the advantage due to their intermediate character. In our larger geographical horizon we can trace the character of the successive styles, not of sculpture only, but also of sculpture and painting.

Greek coins clearly indicate three great schools, each with its subordinate groups. The school of central Greece holds the first

place, including the northern group centred in Thrace and Macedonia, and the southern in the Peloponnesus, schools. with the outlying special schools of Crece and Cyrene. The Ionian school has its northern group, Ionia, Mysia and Aeolis, and its southern, Rhodes and Caria. Beyond these are certain barbarous and semi-barbarous groups, of which the most important is that of eastern Asia Minor, Persia and Phoenicia, with Cyprus. The school of the West comprises the two groups of Italy and Sicily.

The whole duration of the schools is limited, by the repulse of the Persians and the accession of Alexander, from 480 to 332 B.C. Before this age all is archaic, and it is hard to trace local characteristics. After it, the centralizing policy of the sovereigns and the fall of the free cities destroyed local art. In certain cultivated centres under enlightened kings a local art arose, but it speedily became general, and we have thus to think of a succession of styles

1 The arms on the Syracusan decadrachms represent a reward given to the victors in the Assinarian games (see below).

during the rest of the life of Greek art. The century and a half of the local schools is significantly the great age of this art.

In the study of each school we have first to determine its character, and then to look in its successive phases for the influence of the great masters of style. Two dangers must be avoided. We must not too sharply divide the sculptors and the painters as if they always were true to the special functions of their arts. It is well to bear in mind that the earliest great painter, Polygnotus, was a portrayer of character, koAos ridoypatfros, ij#ik6s, as Aristotle calls him, whereas the latest great sculptors represented expression (to. nadr]). Thus since rfios is the special province of sculpture, and to wadi) of painting, sculpture first weighed down the balance, afterwards painting; but it must be remembered that relief can be truer to painting than sculpture in the round, which is more limited by the conditions of the material and mechanical necessities. Our second danger is due to the ease with which local qualities may be ascribed to the influence of a leading style. It is also to be borne in mind that the movement of art in coins was during one period slower than in

sculpture — hence an influence more general than particular. Pheidias and Myron do not make their mark so much as Polyclitus. In all cases the direct influence of great masters is to be looked for later than their age.

The school of central Greece in its southern group, comprehend- ing Attica, is remarkable for its widespread extent. It has its colonies in Magna Graecia at Thurium, an Athenian Greece. foundation, probably at Terina, and in Macedonia at Amphipolis and Chalcidice under Athenian rule. It alone shows instances comparable totheworks of Pheidias, though its most numerous fine works are of the age of Polyclitus and that of Praxiteles and Scopas. Its qualities may be seen by comparison of the same subjects as treated by the other schools and groups. The earliest works are marked more than any Others by the qualities of high promise which characterized the Aeginetan marbles- — the same dignified self-restraint and calm simplicity. Next we perceive a series strong in style, and showing that lofty dignity, that reposeful embodiment of character, which are the stamp of the works of Pheidias and his contemporaries. The subjects are more remarkable for fidelity, breadth and boldness than for delicacy of execution or elabora- tion of ornament. Every subject is ideal, even the portrayal of animal form. Thus the character shows us what divinity is intended and the ideality what is intended by the representation of beast or bird. From these works we pass to those which reflect the style of the time of Praxiteles and Scopas, when the influence of painting began to be felt, and art inclined towards feeling and descended to sentiment. Still, to the last, character rules these coins, and the chief difference we see is in the increased love of beauty for its own sake and the fondness for representing movement, not to the exclusion of repose, but by its side. In other respects there is little change except in the finer execution and more ornamental quality of the work. Even when the greatest achievement of the Sicilian school, the female head on the decadrachms of Syracuse, is copied by the Locrians and the Messenians, the larger quality of the school of Greece asserts itself, and the copy is better than the original: there is less artifice and more breadth. The northern group is at first ruder, in the age of Pheidias severer, and afterwards it merges into the greater softness of its southern rival. If it copies, as Larissa may copy Syracuse and Neapolis in Campania, it again asserts its superior simplicity, and we prefer the copy to the original.

The Ionian school lacks the sequence which the rest of the Greek world affords. It is broken by the baneful influence of the Persian dominion, and consequently the best works belong to the earliest and latest part of the period. The earliest coins, of the Aeginetan age,

present nothing special; the later, of the time of Praxiteles and Scopas, comprise works not inferior to those of central Greece, and remarkable, like the Western and the Cretan, as the sole records of a school otherwise unknown. They are markedly characterized by the qualities of the style of feeling, that of Praxiteles and Scopas; but more than this, they are the expression of that style in pictorial form.

Ionia.

The West.

They represent expression, and they treat it as it could not be treated in sculpture in the round, portraying locks streaming in the air and flowing draperies. It must be remembered that, while Hellas produced the great sculptors, western Asia Minor bred the great painters after Polygnotus, himself a sculptor in painting rather than a painter. In the native land of Zeuxis, Parrhasius and Apelles we see the evidence of the rule of painting. The technical skill is inferior to that of the West, yet the skill in modelling is far greater, and has no parallel in the medallic work of any other time or country.

The school of the West, if we except such outlying examples of the art of Hellas as those of Thurium and Terina, has its highest expression in Italy, its most characteristic in Sicily. It has distinctive qualities throughout the age. Even in the earlier period we trace a striving after beauty and a delicacy of finish, with a weakness of purpose, that mark the school with an influence increasing to a time long after the extinction of its rivals. At the same time there is a knowledge of the capacity of the materials and the form of the coin and a masterly power of finish, on the whole a completeness of technical skill which is unequalled. The result in the lower subjects is splendid, if wanting in variety, but in the higher we miss the noble achievements of the greater schools. So far there is a general agreement in the northern and southern groups. Yet the Italian shows a nobler and simpler style, with some affinity to that of central Greece, which we look for in vain in Sicily, though we are dazzled by the rich beauty of the magni- ficent series of coins which marks her wealthiest age. Sicilian art has this apparent advantage, that the great cities, save Syracuse, perished in the Carthaginian invasion, or under the tyranny of the elder Dionysius. Thus we have no important works save of Syracuse during the second half of our period, and cannot judge fully to what this school would have fallen. The key to this exceptional development of Greek art is found in the absence of sculptors or painters in the West, except only Pythagoras of Rhegium at the very beginning of the age, whose influence is thought to be

traceable on the money of his native town. On the other hand, there can be no doubt that many of the Sicilian die-engravers, as Phrygillos (to mention one whose signature is actually found on an intaglio) were gem-engravers. The Western art is that of engravers accustomed to minute and decorative work, uninfluenced by sculpture or painting. Their designs will not bear enlargement, which only enhances the charm of those of the other leading schools. Those of the great Syracusan decadrachms are small; those of the minute hectae of Cyzicus are large.

The most important of the lesser schools is the Cretan. Crete, retaining the primitive life of older Hellas, was never truly civilized, but to the last enjoyed the privileges and exhibited the faults of an undeveloped condition. Producing in the age of high art neither sculptor nor painter of renown, the Cretans, to judge from their coins, were copyists of nature or art. At first rude, their work acquires excellence in design, but never in execution. While we see their poor reproduc- tions of the designs of the Peloponnesus, we are amazed by their skill in portraying nature. Their gods are seated in trees with a background of foliage. Their bulls are sketched as they wandered in the meadows. All fitness for the mode of relief, as well as for the material and the shape of the coin, is entirely ignored. Hence a delight in foreshortening, and a free choice of subject with no reference to the circle in which it must be figured. In spite, however, of their skill, the Cretans never attempted the three-quarter face, which is at once the best suited to the surface of a coin and the most trying to the skill of the artist. Yet their work is delightfully fresh, as if done in the open air. There is no idealism, but much life and movement. In a word, the school is naturalistic and picturesque. Its works are of the highest value in the study of Greek art, but as examples of the application of that art to coins they are to be used with caution. Nowhere else do we see the artist so freely copying nature and art, nowhere so unshackled by academic rules, nowhere so little aware of the limitation of his province.

Crete.

It is important to study the mode in which Greek money was coined, because the forms of the pieces thus receive explanation, and true

coins are discriminated from such modern falsifi- Mode of C ations as have been struck, and in some degree from those Coining. w hich have been cast. Our direct information on the subject is extremely scanty, but we are enabled by careful inference to obtain a very near approximation to the truth on all the most important points.

Of the dies used by the Greeks exceedingly few have been pre- served. In the museum at Sofia is an iron die for the reverse of a coin of Philip II. of Macedon; and several Gaulish dies exist. Most ancient dies are of bronze, others of hardened iron or steel. The blanks were, as a rule, first cast, sometimes in a spherical form, some- times in a form more resembling that assumed by the finished coin. The blank was placed between two dies, the lower, let into an anvil, producing the obverse, the other, let into the end of a bar, producing the reverse. The bar was struck with a hammer, so that the blank received at the same time the impressions of both dies. This general rule was of course often modified; in some parts of the Greek world the dies were hinged together, in others not ; and this arrangement of hinging the dies came in at different times in different places. The machinery of striking was probably much elaborated under the Roman empire, but a collar seems never to have been used in ancient times. Greek dies must usually have worn out very quickly; hence an enormous number of slightly varying representations of the same type. But the idea that it is uncommon to find two Greek coins from the same die is exaggerated. A great number of early Italian and Roman, and a few Greek coins, of large size, were cast in moulds, not struck; and under the empire many coins, originally struck, were reproduced, not always fraudulently, by casting; but the genuine ancient coin of small size is, as an almost invariable rule, struck and not cast.

We may now pass on to notice the Greek coinage of each country, following Eckhel's arrangement. The series begins Greek w ' tn Spain, Gaul and Britain, constituting the only Coinage of great class of barbarous Greek coinage. It must not the Far be supposed that the money of the whole class is of West. one general character; on the contrary, it has very

many divisions, distinguished by marked peculiarities; it has, however, everywhere one common characteristic — its devices are corrupt copies of those of Greek or Roman coins. The earliest of these barbarous coinages begin with the best imitations of the gold and silver money of Philip II. of Macedon. They probably first appeared to the north of his kingdom, but the gold soon spread as far as Gaul, and even found their way into southern Britain, by which

time the original types had almost disappeared through successive degradations. Next in order of time are the silver imitations of Roman coins, the victoriati and denarii of the commonwealth, which began in Spain and passed into Gaul, being current with the gold money of Greek origin; even in Britain the later coinage shows much Roman influence. The copper money of Spain follows the imitated silver types ; that of Gaul and Britain, though showing Roman influence, is more original.

Side by side with these large coinages we find Greek money of colonies in Gaul and Spain, and a far ampler issue of Phoenician coins by the Carthaginian kings and cities pa ”’ of the Peninsula. The coinage of Hispania, corre- sponding to the modern Spain and Portugal, was issued during a petiod of about four centuries, closing in a.d. 41. There are four classes of money, which in the order of their relative anti- quity, are Greek, of two groups, Carthaginian, Romano-Iberian and Latin. The first or older group of Greek money (from before 350 B.C.) belongs to the widespread currency, which reveals

the maritime power of the lonians of Phocaea. It consists of fractions of the drachm of the Phocaean standard, from the diobol or third downwards. Its later pieces are of the Phocaean colony of Emporiae, founded by the earlier settlement of Massiiia. Next in order and in part contemporary, beginning before the middle of the 3rd century B.C., come the drachms of Emporiae, which betray the influence of Siculo-Punic art. Their standard is probably Carthaginian. Of the neighbouring Rhoda, a Rhodian colony, there is similar money. Carthaginian coins of Spain begin in the same period with the issues of the great colony of Gades, following the same weights as the Emporian drachms. These are followed by the issues of the Barcides from 234 to 210 B.C., with Carthaginian types and of Phoenician weight, struck of six denominations, from the hexadrachm to the hemidrachm.

Sefior Zobel de Zangroniz has classed them to Spain, on the grounds of provenance and the possession of the silver mines by the Barcide kings, against Miiller, who attributes them to Africa. The types are Carthaginian, and present some interesting subjects. The true Iberian currency begins not long after the Punic. The later drachms of Emporiae, ultimately following the weight of the contemporary Roman denarius, have Iberian legends, and form the centre of a group of imitations issued by neighbouring native tribes with their distinctive inscriptions. This coinage ceased when the Roman province was formed in 206 B.C. A little before this date the Romans

had begun to introduce Latin money; about this time, however, they took the backward step of permitting native coinages of Latin weight. Probably they found that native legends and types were more welcome to their subjects than those of Rome. Consequently this coinage of Spain under the republic, which lasted until 133 B.C., may be almost considered national. The two provinces Hispania Citerior and Hispania Ulterior have this marked difference: the coins of the nearer province, of silver and bronze, have always Iberian inscriptions on the reverse, and are clearly under distinct Roman regulation; those of the farther are apparently of independent origin, and consequently bear Iberian, Phoenician, Libyo-Phoenician and Latin legends, but they are of bronze alone. The interest of these coins lies mainly in their historical and geographical information. They bear the names of tribes, often the same as those of the town of mintage. The art is poor, and lacks the quaint originality and decorative quality of that of Gaul. Ultimately the native money was wholly latinized (133 B.C.), silver was no longer issued, and although the Ulterior continued to have its own coinage, in the Citerior only Emporiae and Saguntum were allowed to strike coins. Political circum- stances for a time renewed the coinage under Sertorius (80-72 B.C.) in the modified form of a bilingual currency. The purely Latin issues of the two provinces, and under the empire more largely (from 27 B.C.) of the three, Tarraconensis, Baetica and Lusitania, present little of interest. They closed in the reign of Caligula (a.d. 37-41), though in later times purely Roman money in gold and silver was issued at different times in Hispania down to the establishment of the Visigothic kingdom.

The imperial money of Hispania introduces us to one of the two great classes of provincial coins under the empire; the larger of these was the Greek imperial, bearing Greek inscriptions, the smaller the Roman colonial, with Latin inscriptions, deriving its name from the circumstance that among Greek-speaking nations the coloniae were distinguished by the use of the Latin language on their money. In the coinage of Hispania, issued by a nation adopting Latin for official use, the aspect of the coinage is colonial, though it was not wholly issued by colonies. Many of the Spanish towns belong to the kindred class of municipia; others are neither coloniae nor municipia. In Hispania the obverse of the coin bears, as usual in the colonial class, the head of the emperor or of some imperial personage, the reverse a subject proper to the town. The priest guiding a plough drawn by an ox and a cow is peculiarly proper to a colonia, as portraying the ceremony of describing the walls of the city, so also an ox, with the same reference, the altar of the imperial founder, or, as connected

with his cultus, a temple, probably in some cases that of Roma and Augustus. Other types, however, portray the old temples in restored Roman shapes, or indicate directly by fishes, ears of corn and more rarely bunches of grapes, the pro- ducts of the country. Some original and grotesque types have a markedly local character. The money of Augusta Emerita (Merida) in Lusitania, a colony of pensioners (emiriti), is specially interesting, including as it does the silver issues of P. Carisius, the legatus of Augustus.

The coinage commonly called that of Gaul belongs to the people more properly than to the country, for it comprehends pieces issued by the Gauls or other barbarians from the borders of Macedonia and Illyricum to the English Channel and the Bay of Biscay, through Pannonia, part of Germany, Helvetia and Gaul. It influenced the money of northern Italy, and, crossing the Channel, produced that of

The Gauls.

Massilia,

Qaul.

Britain, which has its own distinctive features. Four classes of coinage are found in these vast limits. Arranging them by date, they are the money of the Greek colony of Massilia and her dependencies, that of the Gauls and other barbarians of central and western Europe, that which can be classed to the tribes and chiefs of Gaul and the imperial coinage of that country. The coins of the Gauls and other barbarians outside Gallia include the gold coins known as " rainbow cups " (Regenbogenschiisselcken) , which seem to have been an original currency of the tribes in- habiting the Bohemian and Bavarian districts, and other gold and silver coins (the later series bearing names in Latin char- acters) which circulated in Noricum, Pannonia, Helvetia, Upper Germany, &c.

The great mart of Massilia (Marseilles), founded about 600 B.C. by the Phocaeans, was the centre of the Greek settlements of Gaul and northern Spain. Emporiae was her colony, with other nearer towns of inferior fame. Yet Massilia always held the first place, as is proved by the abundance of her money. At first it consisted of Phocaean

obols, part of the widespread Western currency already noticed in speaking of Emporiae. These were succeeded by Attic drachms, some of which, about Philip of Macedon's time, are beautiful in style and execution. Their obverse type is the head of Artemis, crowned with olive, at once marking the sacred tree, which had grown from a branch carried by the colonists, so tradition said, with a statue of the goddess, from Ephesus, and proclaiming the value of the olive-groves of Massilia. On the reverse we note the Asiatic lion, common to it and the last colony of Phocaeaj the Italian Velia in Lucania. These coins circulated extensively in southern Gaul, and were much imitated by the barbarians on both sides of the Alps.

The Gauls, on their predatory incursions into Greece, must have seized large quantities of the gold coinage circulating there, but it is probable that the gold staters of Philip (PI. I. fig. 14), from which the chief types of the Gaulish gold are derived (PI. I. fig. 1), had already found their way, inde- pendently of such raids, by means of trade along the Danube valley into the districts then inhabited by the Gauls. This is clear from the fact that the gold coins of Alexander were never, his silver rarely, imitated by the Gauls, yet these were in circula- tion at the time of the incursions. Nor did the influence of Philip's silver travel far west. But his gold money evidently travelled through central Europe to Gallia. The money of Gallia before the complete Roman conquest, to which it may be anterior in its commencement by half a century, belongs in the gold to degraded types of the earlier widespread currency. The un- doubted gold and electrum of this imitative class, identified as bearing regal or geographical names, are extremely limited. By far the most interesting coin of the group is the gold piece which bears the name at full length of the brave and unfortunate Vercingetorix. The 'Silver money is comparatively common. The Gauls were ready to copy any types that came in their way, so that in the coinage of Gaul we find imitations of the coinage of Tarentum, Campania, various Spanish cities such as Rhoda, and Roman coins of the republic and early empire. The effect of the silver of Massilia and other Greek colonies is especially noticeable in S. Gaul, and the Roman denarius naturally exerted a strong influence. The bronze money of Gaul is still more abundant than the silver, and has a special interest from its characteristic types. Some of the later local coins are casts of an alloy of copper and tin called potin, but merely a variety of bronze. The Roman coins recall those of Hispania, but are limited to a few coloniae. They range in date from Antony and Augustus to Claudius. The best-known coins of this time, those struck at the colony of Copia Lugdunum (Lyons) with the " Altar of Roma and Augustus,"

belong, how- ever, strictly speaking, to the Roman series. The coins of Nemausus (Nimes), commemorating the conquest of Egypt in the crocodile chained to a palm-tree, were sometimes made in the shape of the hind-leg of an animal, evidently for dedication in the sacred fountain, from the mud of which all the specimens of this variety are derived.

Britain.

The ancient coinage of Britain is the child of that of GauL retaining the marks of its parentage, yet with characters of its own due to independent growth. Money first came in trade by the easiest sea-passage, and, once established in Kent, gradually spread north and west, until the age of the earlier Roman wars, when it was issued in Yorkshire, probably in Lincolnshire, and in a territory of which the northern limits are marked by the counties of Norfolk, Cambridge, Huntingdon, Bedford, Buckingham, Oxford, Gloucester and Somerset. The oldest coins are gold imitations of Philip's staters, which, whether struck in Gaul or Britain, had a circulation on the British side of the Channel. They are the prototypes of all later money. From a careful comparison of their weights with those of later coins, and from a study of the gradual degradation of the types, Evans places the origin of the coinage between 200 and 150 B.C. Its close may be placed about the middle of the 1st century a.d. The inscribed coins occupy the last century of this period, being ' contemporary with uninscribed ones. The uninscribed coins are of gold, silver, bronze and tin, the gold being by far the most common. There is small variety in the types, -nearly all in gold and silver, and some in copper, presenting in more or less degraded form the original Gaulish type for gold. It may be suspected that all new types and the extremely barbarous descendant of the tin series are of the age of the inscribed coins, or but little earlier. The Channel Islands are remarkable for a peculiar coinage of billon, a very base silver, presenting the usual types modified by Gaulish grotesqueness. The place of this group in the British series is merely accidental; in character as in geography it is Gaulish.

The inscribed coins are evidently in most cases of chiefs, though it is certain that one town (Verulamium) and some tribes had the right of striking money. The most interesting coins are those of known chiefs and their families — of Commius, probably the active prince mentioned by Caesar, of Dubnovellaunus, mentioned in the famous Ancyra inscription, which has been called the will of Augustus, and most of all the large and interest- ing series of Cunobelinus, Shakespeare's Cymbeline (PL I. fig. 2), his brother Epaticcus, and his

father Tasciovanus. It is evident from the coins and historical evidence collected by Evans that Tasciovanus had a long reign. His chief town, as we learn from his money, was Verulamium. His coins are in three metals, repeat the traditional types, and present new ones, some showing a distinctly Roman influence. The money of Epaticcus is scanty, but that of Cunobelinus, with Camulodunum (Colchester) for his chief town, is even more abundant than his father's, indicating a second long reign, and having the same general characteristics. The gold shows a modification of the traditional type, the silver and bronze the free action of Roman influence and a remarkable progress in art. With the death of this prince not long before a.d. 43 the bulk of the British coinage probably ceases, none being known of his sons, Adminius, Togodumnus and the more famous Caractacus, but the coins of the Iceni may have continued as late as a.d. 50, and the Brigantes issued silver coins as late as the time of Cartimandua, whose name is partly preserved on one of them.

The ancient coins of Italy occupy the next place. They appear to have been struck during a period of more than 500 years, the oldest being probably of the beginning of the 6th ltaly-

century B.C. and the latest somewhat anterior to the time of Julius Caesar. The larger number, however, are of the age before the great extension of Roman power, which soon led to the use of Roman money almost throughout Italy. There are two great classes, which may be called the proper Italian and the Graeco-Italian ; but many coins present peculiarities of both. The proper Italian coins are of gold s silver and bronze. Of these, the gold coins are extremely rare, and can never have been struck in any large numbers. The silver are comparatively common, but the bronze are very numerous and characteristic. A few of the earliest gold and silver coins of Etruria have a perfectly plain reverse. The most remarkable bronze coins of this class are of the kind called aes grave, most of which were the early proper coinage of Rome, although others are known to have been

NUMISMATICS

Plate I.

■

GREEK COINS.

issued by other Italian cities. These are very thick coins, some of which are of great size, while most have a rude appearance. They are always cast, and were preceded by formless lumps of bronze, known as aes rude, which were not properly a state- coinage. The designs of the Italian coins are generally, if not always, of Greek origin, although the influence of the native mythology may be sometimes traced. The inscriptions are in Latin, Oscan or Etruscan, and follow a native orthography; sometimes on the earlier coins they are retrograde. The art of this class is generally poor, or even barbarous. The denomina- tions are common to Greek money, except in the case of the bronze, which follows a native system. Of this system the early proper Roman coins afford the best known examples. The Graeco-Italian coins are of gold, silver and bronze. The silver and bronze are very common, and the gold comparatively so, although struck by few states or cities. A number of the cities of S. Italy issued in the 6th century coins with an incuse design, on the reverse repeating with slight modifications the design of the obverse. The designs are of Greek origin, although here, as in the proper Italian coins, but less markedly, native influence can be detected. This influence is evident in the frequent occurrence of types symbolically representing rivers, showing a bias towards the old nature-worship, and still more in the use of Latin in- scriptions, with half-Italian forms of the letters on coins other- wise Greek. Of the best art of ancient Italian money we have already spoken, and we shall have occasion to mention some of its most beautiful examples. The denominations of the gold and silver coins are unquestionably derived from those of Greece, according to the weight of the Attic talent, the heaviest gold piece being the stater or 3000th part of that talent; in silver there are few tetradrachms, the didrachms are extremely common, and smaller denominations are usually not rare. We thus learn that the silver currency was chiefly of didrachms, smaller pieces being less used, and larger ones scarcely used at all. It is important here to notice that the interchange of the native or Italian bronze coinage with the Greek

silver coinage led to a double standard, silver and bronze. The bronze standard, as might be suspected, was of Italian origin, the silver of foreign introduction.

The peculiarity of the Italian bronze is that in its oldest cast form it was of such weight as to show the absence in some parts of the country of silver equivalents. It was long after silver had been introduced everywhere, with struck bronze equivalents, before the heavy coinage (aes grave) went out of circulation. The silver money is at first remarkable for the evidence it affords of its extraneous character in presenting two standards. After- wards it becomes equivalent to the bronze, or supplies equivalent pieces, and is quite regular. The original condition of the Italian currencies is best illustrated by the money of Etruria in the 4th and 3rd centuries B.C. Etruria, be it remembered, was an early goal of oriental commerce by sea. At the great mart of Populonia, and in the country round, we find, besides a few gold coins, not only silver coins of two different foreign standards, the Euboic and the so-called Persic, but also cast aes grave and later struck bronze pieces. Without discussing the origin of these various currencies it is enough to note that they bear witness to the effects of a widely-spread commerce, and show that here was the meeting-point of the native system and of foreign ones.

In Italy the aes grave long ruled. Originally it was libral, the principal coin being the as, nominally of the weight of the Italic pound of 273 grammes; this, at least, is the weight of the earliest Roman coinage. On the other hand, the aes grave of some places in E. Italy, as Hatria and Ariminum, is heavier. The successive reductions of the as belong to Roman numismatics, and it is only necessary here to add that they affected the local bronze coinages as Italy fell under the rule of the republic. The silver coinages, on the other hand, survived for a longer time throughout the Greek cities. Apart from the complicated silver coinage of Etruria, and from the Roman issues, we find in central Italy a few silver coins (the unit of 1-18 grammes being the equivalent, at the rate of 1-250, of a bronze as of n-10 oz.) and a large silver coinage of didrachms and smaller denominations in lower Italy.

This was chiefly issued by the wealthy marts which dotted the coasts of Campania, Calabria, Lucania and the Bruttii. We find Etruscan inscriptions on the coins of Etruria, and Oscan on some of those of middle and lower Italy, where they are eclipsed in number and style by the Greek issues. The chief silver standards of S. Italy are (1) the Campanian (with a didrachm of 7‘4i grammes); (2) the Italic, with a stater of 8-i6 grammes, divided into thirds; and (3) the Tarentine,

with a stater of 8-32 grammes, divided into halves. The Tarentine stater was known as vodftfios. The independent coinage of Italy, with one exception, came to an end in 89 B.C.

Beginning in the north of Italy, the first coins that strike us are those of Populonia in Etruria. The silver money of this place is generally of the peculiar fabric in which the reverse is left perfectly plain. The aes grave of upper and middle Italy was largely dominated by the issues of the Roman mints at Rome and Capua (to be treated later). Samnium shows us a curious revival of native silver money after the local coinage of the Italian towns had been almost abolished by Rome. It was the result of the Social or Marsic War of the confederate tribes, who struck for Italy against the Roman supremacy during the years between 90 and 88 B.C. The coins present the head of Italia, and reverse types, of which the most striking are warriors, varying in number, taking an oath over a sacrificial pig, and a bull for Italy goring the prostrate wolf of Rome. The inscriptions are Oscan or Latin.

Certain of the Greek towns of Italy deserve special mention for the splendour of their coinage — beautiful in style and delicate in execution. In Campania (leaving the Romano-Campanian .

for later notice) the two most interesting currencies are of e .

Cumae and Neapolis, the modern Naples. Cumae presents ownso silver money of the archaic and the early fine style, " a y- in which last we first observe the peculiar naivete of western Greek art before it had attained elaboration. The abundant silver coins of Neapolis are of the early and the late fine periods and of the decline. The types are usually the head of the siren Parthenope, more rarely Athene; the reverse presents the man-headed bull common on Campanian money, and possibly meant for the river-god Acheloiis, father of the Sirens. The bronze money is of good style, and age has beautified it with the rich blue or green patina due to the sulphurous soil. When we reach Calabria the Greek money startles us in astonishing wealth of beauty in the currency of the opulent and luxurious mart of Tarentum, second only to Syracuse in the whole West, of all the main periods of art, and including in the age of its present prosperity and its fall (the time of the contest with Rome) the most abundant gold issues of any Greek city. The gold money of Tarentum (see Plate) is a delight to the eye, with the varied beauty of its gem-like types, which, while they show the gem-engraver's art, prove the medallist's knowledge of the rich but opaque metallic material. Several heads of divinities adorn these coins, and the chief

reverse types relate to the legendary founder, Taras, son of Poseidon. Always a youth, he appears as a charioteer, perhaps as a horseman, and riding on a dolphin — the familiar Tarentine type. The most remarkable subject represents him with outstretched arms praying to Poseidon, probably in allusion to the Tarentines' appeal to Sparta for aid about 346 B.C. (PI. I. fig. 3). The silver coinage is chiefly of didrachms of reduced Corinthian weight. The prevalent type is Taras seated on a dolphin ; in the earliest money the type is single, and repeated incuse on the reverse; afterwards this subject occupies the reverse, and, itself a charming composition, is delightfully varied. On the early fine coins the people or demos, personified generally as a youth, often holding a spindle, occupies the obverse, but gives place in the 4th century to a horseman in various attitudes, affording great scope to the engraver's skill; probably he is Taras himself, save when he is a full-grown warrior. These representations illustrate the famed horsemanship of the Tarentines, and refer to contests and games which were probably local. Heraclea in Lucania shows us didrachms of the fine age, with heads of Athene and subjects con- nected with Heracles: the contest with the Nemean lion is most skilfully treated, and the series is very characteristic of the gem- engraver's art. The powerful city of Metapontum begins with early coins having the incuse reverse, and then displays a long series stretching down to the decline of art. The constant type, which recurs with the heraldic instinct of the West, is the ear of barley, reminding us of the " golden harvest " (xpvaovv 6ipos) which the Metapontines dedicated at Delphi. Like the Tarentine badge, it first occupies the obverse, then the reverse, balanced by a charming series of heads of divinities. Persephone is the most appropriate counterpart ; we also note heads of Concordia ('Onovota) and Hygieia, marked by an ingenuous grace peculiar to the early fine work of the Western school, of Leucippus the founder as a helmeted warrior (occurring on a rare tetradrachm and the usual didrachms), and many other types of unusual variety and originality of conception.

Poseidonia issued coins from the archaic period (beginning with the usual incuse fabric) to its capture by the Lucanians early in the 4th century. Its successor Paestum began to coin about 300, and was allowed to keep its mint open even after 89 B.C., when all other local mints in Italy were closed, until the time of Tiberius.

The ancient Sybaris, famous for her luxury, has left archaic coins;

she was, however, destroyed by Croton in 510 B.C. The Athenian colony of Thurium eventually arose near the site of the old Sybaris in 443, and immediately began to issue a splendid series of coins. Not only is the face of the coin occupied by the head of Athene, and the great currency, as at Athens, of tetradrachms, but the severe beauty of the style points to the direct influence of the art of central Greece (PI. I. fig. 4). The head of Athene is covered by a helmet adorned first with a wreath of olive and then a splendid figure of the sea-monster Scylla. The reverse shows a bull butting (Soipios), in a strikingly ideal form. Probably the obverse type affords the nearest reflection of the masterpiece of Pheidias, or at least the closest following of his style.

Velia, the last colony of Phocaea, whose citizens sailed away to the far west rather than submit to the Persian tyrant (544 B.C.), shows coins from its foundation. The pieces of fine work witness to an Asiatic origin in the types of the lion, devouring the stag or as a single device, while the obverse displays the head of Athene so much in favour in Magna Graecia. ■ The style, which lacks strength but not beauty, is Italian, and we see no trace of the pictorial qualities of Ionian art, which indeed had not taken its mature form when the exiles left the mother country.

The Bruttii are the first native Italians whom we find striking a fair Greek coinage. Their gold and silver is of late style, the gold presenting the head of Poseidon and Thetis on a sea-horse, the silver the head of Thetis and the figure of Poseidon, both with other subjects. Caulonia has early coins running down to the early fine period, mythologically interesting in type, and the later with a beautifully designed stag on the reverse. For Croton the ruling type is the tripod. The eagle occurs on the obverse and the tripod on the reverse. The bird of Zeus is inferior to that at Agrigentum, as this again is inferior to the eagle of Elis. We note also beautiful types of Heracles seated, one of marvellously delicate work, on the reverse of which Apollo aims an arrow at the Python from behind his tripod— a remarkable composition. The other Heracles types form a most interesting series of recollections, " memory sketches," of a famous statue, the pose of which recalls the so-called Theseus of the Parthenon, while the obverse presents the head of the Hera Lacinia worshipped on the promontory close by. The latest coins, like the parallel ones of Metapontum, are weak and pretty. The money of the Locri Epizephyrii affords two curious types of reverse, Eirene seated, of fine style, with the legend EIPHNH AOKPflN, and the later yet more remarkable subject of Roma seated while Pistis crowns her, the legend being PfiMA IIIZTI2 AOKPftN. There are beautiful coins of

the little known town of Pandosia, bearing the head of the nymph Pandosia (?) ; the reverse has the river Crathis, a splendid head of the Lacinian Hera, and Pan.

Rhegium was closely connected with Messene in Sicily opposite, and thus the great Sicilian currency of tetradrachms prevails. Anaxilaus, tyrant of Rhegium from 494 to 476 B.C., early in his rule acquired Messene through Samian adventurers. The coins of both towns at first present Samian types, and then, the Samians having been expelled, Anaxilaus commemorates his Olympic victory in the mule-car. The same type appears at Messene and last longer. In both cases the reverse bears a running hare, an animal which Anaxilaus introduced into Sicily. The later 5th-century coinage of Rhegium shows a seated figure of the Rhegine Demos, and a fine head of Apollo, by the engraver Hippocrates.

The little-known town of Terina is illustrious as having produced a series of silver didrachms which, on the whole, is the most beautiful in Italy (PI. I. fig. 5). The obverse has the head of a goddess, who is portrayed winged on the reverse — a wonderfully fine subject, well conceived and most delicately executed in a variety of different attitudes, some recalling the Victories which adorn the balustrade of the temple of Wingless Victory at Athens. Very curiously, the money of Terina begins with an archaic coin which bears on the reverse the named figure of a Wingless Victoiy, surrounded by the olive- wreath.

The coinage of Sicily is Greek. The Hellenic and Carthaginian colonies of the coast left the barbarous natives undisturbed in the inland country; and both issued Greek money, the y ‘ Funic with a tincture of Phoenician style. The coinage ranges from the 6th century b.c. until the subjugation of the island by the Romans, after which a few cities struck colonial or imperial coins for a short space. The marked periods are those of the preponderance of Syracuse from 480 to 212 B.C., interrupted by the great Carthaginian wars, which were fatal to the cities of the southern coast. The coinage is in gold and electrum, mainly issued at Syracuse, in silver and in bronze. The standard is Attic, except the earliest money of the Chalcidian

colonies Himera, Zancle (Messene), and Naxos, which follows the Aeginetan weight. The metrology of Sicily has a distinct relation to that of Italy. Here also there is a double standard, silver and bronze, and in consequence an intrusive silver coin, differing but little from the obol, weighing 0-87 instead of -73 grammes, the silver equivalent

of the bronze litra, whose name it borrows. The litra in bronze was the Sicilian pound of 218 grammes, equal to half an Attic mina, and to two-thirds of the Roman libra or pound. So important was the litra in Sicily that the silver litra supplanted the obol, and the didrachm was sometimes called a stater of ten litrae, the decadrachm a piece of fifty litrae, pentecontalitron. The leading coin is the tetra-drachm, not, as in Italy, the didrachm.

The Sicilian money is of extremely careful artistic work, not unfrequently even in the case of bronze allowing for a more rapid execution of the die; and the highest technical excellence is attained. The art is that of the southern branch of the great Western school, generally more skilful than the art of southern Italy, but less varied. The earlier fine work has a na'ive beauty peculiar to the West and almost confined to Sicily; all that follows is evidently gem-engravers' work. These coins are remarkable for the frequency of artists' signatures, which for the short period of highest skill are almost universal on the larger silver money of Syracuse, and occur less frequently on that of the other great cities. Among these artists may be mentioned Exacestidas (at Camarina), Eucleidas, Eumenes, Phrygillus (at Syracuse), Euaenetus (Syracuse, Camarina, Catana), Cimon (Messana, Syracuse PI. I. figs. 7, 8), Heracleidas and Choirion (Catana). As in Italy, the decline is more rapid than elsewhere in the Greek world, in consequence of the inherent weakness of the style; but it is in part due to the calamities of the island, as of lower Italy.

The fame won by the tyranni and other leading aristocrats of Sicily in the great national contests of Hellas, in the race with the quadriga, the mule-car and the horse, led to the introduction and supremacy of types commemorating these victories, probably in most cases those achieved at Olympia. It is obvious that no success could be so appropriately figured on the coinage; the charioteer or the horseman, not the city, was the victor, but at the same time the renown of the city was indissolubly connected with the citizen who won it. Hence these types are almost confined to states ruled by tyranni or oligarchies; outside Sicily they are practically only found at Rhegium when it was closely connected with Sicily, at Cyrene, in the money of Philip II. of Macedon and at Olynthus and in Euboea. The horseman is not a frequent type; the mule-car is limited to Messene (and Rhegium); but the quadriga becomes the stereotyped subject for the reverse of the great Sicilian tetradrachms — the bulk of the coinage — and only escapes heraldic sameness by a charming variety in the details. In the age of finest art a divinity of the city takes, in Homeric guise, the place of the charioteer, or Victory

herself so wins the contest; commonly she hovers above, about to crown the charioteer or the horses. Yet more interesting are the types connected with nature-worship, especially those portraying river-gods in the form of a man- headed bull, or a youth with the budding horns of a calf, or in the shape of a dog, and also the subjects of the nymphs of fountains. These types occur on either side of the coin. On nearly all, one side (in early times the reverse, later the obverse) is held by the head of a divinity, Persephone and Athene taking the first place.

The leading position which Syracuse held in the island makes it proper to notice her splendid currency first, the finest for knowledge of the materials, for skill in suitably filling the space, and for delicacy of execution in the whole range of Greek money, though we miss the noble simplicity of Greece, the strong feeling of western Asia Minor, and the simple picturesqueness of Crete. Syracuse, was founded in 734 B.C. by Archias of Corinth, an origin which, remembered on both sides, served her well in later history. In the 6th century, perhaps while still under the oligarchy of the Geomori, she issued her most archaic silver money, .which, primitive as

it is, gives promise of the care of the later coinage, and begins the agonistic types, thus indicating some early victory at a great Hellenic contest. Gelo, tyrant of Gela, won the chariot race at Olympia in 488 B.C., secured Syracuse in 485 B.C., and, when the Carthaginians, probably by agreement with Xerxes, invaded Sicily, utterly routed them at the great battle of Himera (480 B.C.), the Salamis of the West. These events find their record in the issue and subjects of his Syracusan money, which, however, was struck, as usual in that age, in the name of the people. The chariot type is varied, for Victory appears hovering above the charioteer, about to crown the horses, and the coins issued after the great battle show the lion of Libya beneath the car in the exergue (PL I. fig. 6). These last pieces are fixed in date by the famous story how Gelo's wife Demarete, having gained favourable terms for the vanquished Carthaginians, was presented by them with a hundred talents of gold, by means of which were coined the great silver pieces of fifty litrae or ten drachms, which were called after her Demareteia. They bear the head of Victory, crowned with laurel, and the quadriga and lion. The battle

of Himera and the death of Gelo (478 B.C.) fix the date of these remarkable coins, which close the archaic series of Syracuse and give us a fixed point in Greek art, at about 479 B.C.

Hiero I. (478-466 B.C.), the brother and successor of Gelo, continues the same types, alluding, as Head well remarks (loc. tit.), to his great victory over the Etruscans off Cumae (474 B.C.), by the marine monster in the exergue of the reverse which denotes the vanquished maritime power. It is to be noted that as Gelo introduces the Victory in the chariot type, so in the horseman type we now first see Victory crowning the rider. Gelo had won an Olympic victory in the four-horse contest, Hiero in the horse-race, though he also won with the four horses in the Pythian games. With Hiero's money we say farewell to archaic art. The female heads on the obverse now have the eye in profile and show beauty and variety, and the horses are even exceptionally represented in rapid action. With the short rule of Thrasybulus, the last brother of the house, it came to an end, and the age of the democracy (466-406 B.C.) began. The victories by land and sea of Gelo and Hiero had established the power of the city on a sure basis, and fifty years of prosperity followed. To the earlier part of this age belong the beautiful transitional coins in which the female heads are marked by a youthful simplicity of beauty combined with fanciful and even fantastic treatment of the hair; the reverses remain extremely severe. Towards the close of this age, beginning about 430, there are very fine works, the first signed coins, with the old dignity yet with greater freedom of style, the horses of the quadriga in rapid movement.

The victory of Syracuse in the contest with Athens was the occasion for the reissue of ten-drachm pieces, commonly but erroneously called medallions. On the reverses of these are a victorious chariot and a panoply of arms, representing the prizes offered at the games by which the Syracusans com- memorated the defeat of the Athenians on the Assinarus in 413. On the obverses is the head of the local nymph Arethusa. The designs are by the artists Cimon (PL I. fig. 8), Euaenetus, and a third who is nameless. These pieces continued to be issued down to about 360 B.C. through the Dionysian period. Contemporary with them are numerous Splendid tetra- drachms — signed and unsigned — as well as the first gold and bronze issued by Syracuse. The interference of Dion in Syracusan politics (357-353) was marked by the intro- duction of an electrum coinage, and of a silver didrachm of Corinthian type, corresponding in weight to the tridrachm of Corinth, and with the same types, the head of Athena and the Pegasus. The Dionysian dynasty closed in anarchy, until Syracuse appealed to Corinth, and Timoleon was sent

to restore order (344 B.C.). His advent marks an epoch in Sicilian coinage. He restored the gold coinage and issued various silver coins which allude to Corinth and to liberty, and under his influence many small cities in Sicily awoke to political life as members of Timoleon's league and issued a scanty but interesting bronze coinage. The Syracusan democracy was overthrown in 317 B.C.

and the city seized by Agathocles (317-289 B.C.), the worst of the tyrants of Syracuse. In the course of his reign he adopted the royal style, and his coins, a reflection of earlier work, give his name first without and then with the title king — a double innovation. The most interesting of his coins are those which bear allusions to his campaign in Africa.

The tyrant Hicetas (288-280 B.C.) and the next ruler, Pyrrhus, king of Epirus (278-275 B.C.), continue the coinage, Pyrrhus issuing money in the name of the Syracusans and also striking his own pieces. The departure of Pyrrhus led to the establish- ment by Hiero II. (c. 270-216 B.C.) of a dynasty which, so long as he ruled, restored the ancient prosperity and preponderance of the rule of his namesake. At first content with inscribing his name alone, he soon not only takes the title of king, conferred on him in the early years of his reign, but also places his portrait on the money. Of his time is the beautiful portrait of his queen Philistis. The money of the short reign of Hieronymus (215- 214 B.C.) and of the brief democracy which fell before the Romans (214-212 B.C.) close the independent series of this great city. But her name still appears in bronze money issued after the conquest.

Taking the rest of the money of Sicily in alphabetical order, we first note a very fine bronze coin bearing a beautiful female head, perhaps that of Sicilia, crowned with myrtle, and a lyre, ntter which belongs to the time of Timoleon's league. This coin „... . is conjecturally attributed to Adranum. The first great „. f. so town is Agrigentum, represented by archaic, transitional, cty '

and fine coins, the fine series ending with the overthrow of the city by the Carthaginians in 406 B.C. — a blow from which it never re- covered. The usual types are the eagle and the fresh-water crab, but in the age of finest art we see two eagles devouring a hare (cf. Aeschylus, Agam. 109 seq.) and a victorious chariot; these occur in the rare decadrachm (PI. I. fig. 9), on which the river-god Acragas himself drives the car, and the tetradrachms. The eagle is superior to that of Croton, inferior to that of Elis. Many of the bronze coins are of good work. The type most worthy of note is the head of a river-

god, with the name Acragas, which was that of the local stream, and on the reverse an eagle standing on an Ionic capital, the Olympic turning-post. The success of Agrigentum at the games is attested by Pindar, while Virgil (Ae,n. iii. 704), Gratius {Cyneg. 526) and Silius Italicus (xiv. 210) mention its ancient renown for horses.

The money of Camarina is of especial beauty and interest. Camarina struck but few coins before the year of liberation (461), soon after which was issued a didrachm having on the obverse a helmet upon a round shield and on the reverse a pair of greaves, between which is a dwarf palm. This piece is followed by tetradrachms and didrachms of the best period, most beautiful in style, and varying a little from difference of age. The tetradrachms bear on the. obverse the head of Heracles in the lion's skin, and on the reverse Athena as a victor at the Olympic games in a quadriga. It was Athena, protector of the city (a-oXiiox IlaXXaj) , whose sacred grove was made more illustrious by the success of Psaumis. The didrachms have on the obverse the head of a river-god, portrayed as a young man with small horns and with wet hair. Of the two rivers of Camarina, the Oanus and the Hipparis, the Hipparis is here represented, for in one case the name is given on the coin. Pindar seems to show the same preference, for, while he merely mentions the Oanus (woTanbv . . . "Slaviv) , he speaks of the sacred channels by which the Hipparis watered the city (aenvois dxtrovs, IrirapK olcnv ap5« aTparov). On the reverse the nymph Camarina ('Queavov Biiyarep . . . lS.aiia.plva) is seen carried across her lake {iyx u P'i- av ■ ■ ■ Mpvav) by a swan swimming with expanded wings, while she aids it by spreading her veil in the manner of a sail; Some of these didrachms have on either side, around the chief device, fresh-water fishes. The series of Catana comprises fine archaic tetradrachms and others of the time of the best art. The archaic tetradrachms have the types of a river in the form of a man-headed bull and of the figure of Victory, of a type remarkably advanced for the time at which they were struck. From 476 to 461, under the name of Aetna, its coinage is represented especially by a unique tetradrachm (PI. I, fig. 10), with a wonderful headof Silenus, and Zeus as the god of the volcano holding a thunderbolt and a sceptre made of a vine-branch; before him is an eagle perched on one of the Aetnaean pines. The head of Apollo succeeds, with for reverse the victorious quadriga, in one case passing the turning-post, an Ionic column. Historically interesting is a small silver coin issued by Catana and Leontini in alliance between 405 and 403. Eryx towards the end of the 5th century produced some rare tetradrachms on which Eros is represented at the knees of his mother, asking for the dove which she holds.*

Gela is represented by coins of which the archaic tetradrachms must be especially mentioned. They have on the obverse the fore- part of the river-god Gelas, whence the city took its name. The Gelas is represented as a bull, having the face of a bearded man. On the reverse is a victorious quadriga, in some examples represented passing

an Ionic column, as on coins of Catana. A beautiful tetradrachm represents the city goddess (Sosipolis) placing a wreath on the head of the monstrous river-god. A little later is a tetradrachm which has types of the head of the Gelas as a young man horned, surrounded by three fishes, and on the reverse Victory in a biga with a wreath above. Small gold coins, and a didrachm representing a Geloan cavalryman spearing an Athenian hoplite, are among the coins issued shortly before the fall of Gela in 405. The money of Himera is of great interest. The oldest didrachms of Himera, which probably began in the 6th century B.C., bear on the obverse a cock and on the reverse an incuse pattern ; later, a hen. During the time that Thero of Agrigentum held the city (before 480 to 472), the crab of Agrigentum appears on the didrachms. The transitional tetra- drachms bear on the one side a victorious quadriga and on the other a nymph sacrificing, near whom a little Silenus stands under the stream of a fountain issuing from a lion's head in a wall. Leontini is repre- sented by tetradrachms with the head of Apollo and the victorious car, which gives place to a lion's head. The series of Messene begins, when the town was called Zancle, or, as it is written upon the coins, Dancle, with early drachms or smaller pieces of the Aeginetan weight, and of very archaic work. On the obverse is a dolphin, and around it a sickle ; on the reverse the earliest pieces repeat the same design incuse (as in the earliest coinage of S. Italy), but later we find a shell in the midst of an incuse pattern. The place is said to have received its name en account of the resemblance of the harbour to a sickle (fd7K\oc or fdYKXij). Next to these first coins of Zancle may be placed, as the oldest piece of the Attic weight, a tetradrachm with the Samian types, a lion's scalp on one side and on the other the head of a calf, and bearing the inscription ME22ENI0N. This coin was doubtless struck during the rule of the Samians, who took the place about 494 B.C., at the instigation of Anaxilaus, tyrant of Rhegium, by whom they were subsequently expelled (Thucyd. vi. 4).

The next pieces are the earliest of those which have on the obverse the mule-car and on the reverse a running hare, like the contemporary coins of Rhegium, with the same devices and equally of the rule of Anaxilaus. These types cease at Rhegium, though they continue at Messene, some of the tetradrachms bearing them being of the age of fine art. About 450 there must have been a temporary restoration of the Zancleans, who struck a tetradrachm with Poseidon and the dolphin as types. A fine piece of rather later date represents Pan caressing a hare. When the town had been seized (287 B.C.) by the Mamertini, money was struck with their name. Naxos is represented by early Aeginetic drachms with an archaic head of Dionysus. Immediately after the year of liberation (461) it produced a tetradrachm with a head of Dionysus and, on the reverse, a squatting Silenus, remarkable for the study of anatomical detail (see PI. I. fig. 11). These types are repeated in a less severe style some fifty years later, when also an engraver Procles signs some pretty didrachms. Segesta is represented by coins from about 480 B.C. We first notice the head of the nymph Segesta and a hound, probably the river-god Crimisus; then the same type for reverse associated with a young hunter accompanied by two hounds — a charming composition. Another interesting type is a victorious car driven by Persephone, who carries ears of corn.

In the series of the city of Selinus the first coins are didrachms, bearing on the obverse a leaf and on the reverse an incuse square. The city and the river of the same name no doubt derived their name from the plant

The Siculo-Punic coins, that is, those actually struck by the Carthaginians in Sicily, will best be dealt with under Carthage, below.

The islands of Melita, Gaulos and Cossura near Sicily issued late coins which belong to the African scries, showing a curious mixture of Phoenician and Egyptian elements in some of their types. Of Lipara there is heavy bronze money on the Sicilian system, having on the obverse a head of Hephaestus, or sometimes a figure of the same divinity seated, holding a hammer and a vase, which he seems to have just formed.

In the Tauric Chersonese there are interesting coins, in the three metals, of the city of Panticapaeum, the modern Kertch.

Their obverse usually bears the head of Pan and their T' r J' a< "* ; reverse a griffin and other subjects; some are of fine sonese, &c*

Greek style. The gold is of higher weight than usual,

owing to the cheapness of the metal at this place. The money of Sarmatia, of Dacia, and of upper and lower Moesi-a. ;'s chiefly bronze of the Graeco-Roman class. In

Sarmatia we may notice the autonomous and imperial pieces of Olbia, which alone amongst Greek cities produced a series of cast bronze coins, and in Dacia the series bearing the name of the province. The Roman colonia Viminacium in upper Moesia is represented by numerous coins of a late time. Of Istrus, in lower Moesia, there are drachms having a strange type on the obverse, representing two beardless heads, side by side, the one upright and the other upside down; on the reverse is an eagle devouring a fish. The style of these coins is in general fair, though it sometimes approaches to barbarism. Apollonia Pontica produced fine silver coins with a head of Apollc and an anchor. There are abundant Greek imperial coins of Marciano- polis and Nicopolis, while Tomi is represented in this class as well as by autonomous money.

The coins of Thrace are of high interest. Here and in Mace- donia we observe the early efforts of barbarous tribes to coin the produce of their silver mines, and the splendid issues of the Greek colonies ; and we see in the weights the influence of the Asiatic Greeks and the Athenians. The oldest coins are of the early 5th century B.C., and there are others of all subsequent times, both while the country was independent and while it was subject to the Romans, until the cessation of Greek coinage. Some cf the best period are of the highest artistic merit. So long as they maintain any general distinctive peculiarities of fabric and design, that is, from their commencement until the age of Philip, the Thracian coins resemble those of Macedonia. The money of Abdera comprises tetradrachms and smaller coins of the periods of archaic and fine art, all but the latest of the Phoenician standard, ultimately superseded by the Persic. The principal type is a seated griffin, copied from its mother-city, Teos. The reverse type, an incuse square, has at first four divisions, but in the age of the finest art contains a variety of beautiful subjects, the signets of the magistrates. Aenus is remarkable for the great beauty of some of its coins. These are tetradrachms of Attic weight, of the late archaic and best ages. The interesting turning-point from growth to maturity is seen in a vigorous head of Hermes in profile, wearing the petasus. A little later is the splendid series of facing heads, the broad, severe, and sculptural treatment of which is truly admirable, and far superior to the more showy handling of the same subject in later drachms. A goat is the reverse type of the larger coins. The

money of the city of Byzantium begins with coins on the Persic standard of good style, having on the obverse a bull above a dolphin and on the reverse an incuse square of four divisions, and closes with the series of bronze coins issued under the empire. The star and crescent type first appears in the Roman period. Of Maronea, anciently famous for its wine, there is an interesting series, among which we notice fine tetradrachms of Phoenician weight, having on the obverse a prancing horse and on the reverse a vine within a square. The standard changes to Persic, of which there is a beautiful series of didrachms. Then the series is in- terrupted by the rule of the Macedonian kings, and resumed in a barbarous coinage of the native Thracians, issued in the second and first centuries before the Christian era, consisting of spread Attic tetradrachms with the types of the head of beardless Dionysus crowned with ivy and on the other side his figure. The Greek imperial coins of Pautalia and Perinthus are worthy of notice. Among those of the latter town we may mention fine pieces of Antoninus Pius and Severus, and large coins, commonly called medallions, of Caracalla and other emperors. The money of the imperial class issued by Philippopolis, Serdica and Trajanopolis should also be noticed. In the Thracian Chersonese the most important series is one of small autonomous silver pieces, probably of the town of Cardia. There is a limited but highly interesting group of coins of Thracian kings and d-nasts. The earliest are of kings of the Odrysae, including Sparadocus and Seuthes I., who began to reign in 424 B.C., and whose money bears the two remarkable inscriptions 2EY0A KOMMA and 2EY0A APTYPION. It closes with the issues of Roman vassals, such as Cotys IV. (a.d. 12-19). Lysimachus, commonly classed as king of Thrace, belongs to the group of

Mace- donia.

Alexander's western successors (see below). Among the islands | of Thrace, Imbros with its trace of Pelasgic worship, and, equally with Lemnos, showing evidence of Athenian dominion, and Samothrace with the Asiatic worship of Cybele yield in interest to Thasos. Here a long and remarkable currency begins with very early Persic didrachms, the obverse type a Silenus carrying a nymph, the reverse an incuse square of four divisions. Under the Athenian supremacy we

see a decline of weight, and in style the attainment of high excellence. After this we observe coins of Phoenician weight, bearing for their obverse types the head of Dionysus. These are of the best period of art, and some tetradrachms are among the very finest Greek coins. The head of Dionysus is treated in a sculptural style that is remarkably broad and grand. The massive, powerful features, and the formal hair, nearly falling to the neck in regular curls like those of the full beard, are relieved by a broad wreath of ivy-leaves, designed with great delicacy and simplicity. The reverse bears a Heracles kneeling on one knee and discharging his bow — a subject powerfully treated. Of a far later period there are large tetradrachms, much resembling those of Maronea, with the same type of the beardless Dionysus, but on the reverse Heracles.

The money of Macedonia both civic and regal is of great variety and interest. It begins at an early time, probably towards the end of the 6th century B.C. The old pieces are of silver, bronze having come into use a century later, and gold about the middle of the 4th century b.c. The character of the coinage resembles that of Thrace; the earliest pieces are of the Phoenician, Babylonic and Attic standards. The most remarkable denominations are the pieces of eight and twelve Phoenician drachms. The largest coins are of the time of Alexander I. (498-454), and somewhat earlier, and indicate the metallic wealth of the country more than its commercial activity. The chief groups of coins are those of the Pangaean, Bisaltian, Strymonian and Chalcidian districts, of the kings of Macedon and Paeonia, and of Macedon under the Romans. This last series begins with the coins of the " regions " issued by permission of the senate and bearing the name of the Macedonians, from 158 to 150 b.c; these are followed by coins of the Roman generals against Andriscus and of the pretender himself, and, from 146 onwards, of the Roman province. Under the empire a large series of bronze coins was issued in the name of the Koinon, i.e. the provincial diet. As regards the earlier civic coinage: the coinage of Acanthus comprises fine archaic tetradrachms of Attic weight and others of Phoenician weight and very vigorous in style, of the commencement of the period of good art. The type of their obverse is a lion seizing a bull (cf. Herodot. vii. 125 f.). The money of Aeneia is chiefly interest- ing from its bearing the head of the hero Aeneas; and on one extraordinary coin of archaic fabric, an Attic tetradrachm, the subject is the hero carrying Anchises from Troy, preceded by Creusa carrying Ascanius; this is in date before 500 B.C. The town of Amphipolis is represented by a long series. There are Phoenician tetradrachms of about 400 B.C. having on the obverse a head of Apollo, facing, sometimes in a splendid

style, which recalls the art of the immediate successors of Pheidias (PI. I. fig. 1 2). The reverse type is a flaming race-torch in an incuse square. The territory of Chalcidice is eminent for the excellence of some of its silver coins. There is a very early Attic tetradrachm of Olynthus, with a quadriga, and an eagle within a double square, which reminds us of the idea of the great Sicilian currencies, the record of Olympic victory. The Phoenician tetradrachms of the best period struck by the Chalcidian League (392-379 B.C., and later), Olynthus being probably the mint, are of great stylistic interest (PI. I. fig. 13). The obverse bears the head of Apollo in profile crowned with laurel. It is in very high relief and treated with great simplicity, though not with the severity of somewhat earlier pieces. The delicacy of the features is balanced by the simple treatment of the hair and the broad wreath of laurel. On the reverse is a lyre. There is an early series of coins of Lete, none later than about 480. The obverse type is a satyr with a nymph, and on the reverse is an incuse square divided fourfold,

first diagonally and then in squares. Mende has money of Attic weight, the types being connected with Silenus, who on a tetra-drachm of fine style is portrayed reclining, a wine-vase in his hand, on the back of an ass; the reverse bears a vine. Of Neapolis (Datenon) there are early coins with the Gorgon's head and the incuse square, which in the period of fine art gives way to a charming head of the " Virgin Goddess " crowned with olive. The coins of Philippi in the three metals are mainly of the time of Philip II., who, having found a rich gold mine near Crenides, changed its name to Philippi. The gold coins are Attic staters, the silver pieces of the Phoenician or Macedonian weight, like Philip's own money. The earliest bear the name of the " Thasians of the Mainland," who immediately preceded Philip's colony. All bear the head of young Heracles in a lion's skin, and a tripod. Imperial pieces were struck by the city as a colonia. There is a long but late series of Thessalonica which in the time of the regions was the mint of the second region; the numerous bronze coins of the Roman period show a figure of Cabirus among other types. Uranopolis has a few coins with very curious astronomical types, probably issued by the eccentric Alexarchus, brother of Cassander. The issues of the Thraco-Macedonians are extremely interesting. They are all just anterior to, or it may be contemporary with, Alexander I. of Macedon. The leading coins are octadrachms of the Phoenician standard. They have usually but one type, the reverse bearing a quadripartite incuse square. Their sudden appearance and heavy weight are due to the working of the silver mines on the border of Macedonia and Thrace.

The usual types are a warrior leading a horse or a yoke of oxen. The coins bear the names of the Bisaltae, Getas, king of the Edoni, the Orrescii and other tribes. Besides these there are very curious Attic decadrachms of the Derronians of Sithonia, bearing the unusual type of an ox-car, in which is a figure seated, and on the reverse a symbol of three legs.

*The oldest coins of the Macedonian kings are of Alexander I., from 498 to 454 B.C., the contemporary of Xerxes. These are Phoenician octadrachms, having on the obverse a cavalryman by the Klnirs of side of a horse, and coins of a lower denomination with the Mace- same or a similar type. The money of Alexander's aonla. successors illustrates the movement of art, but it is not until the reign of Philip II. that we have an abundant coinage. He first strikes gold pieces, chiefly Attic didrachms, from the produce of his mine near Philippi (PI. I . fig. 1 4) . They are of fair sty le , and bear on the obverse the head of Ares. On the reverse is a victorious Olympic biga. These coins were afterwards known as *iXiirx«ot and the gold money of Alexander as 'A\e£di/8p«oi — appellations which probably did not include larger or smaller pieces. Horace calls the gold coins of Philip " Philips " (" regale nomismaPhilippos," Epist. ii. 1, 232). The silver coinage of Philip is mainly composed of tetradrachms of the Phoenician standard (PI. I. fig. 15). Their type of obverse is a head of Zeus and of reverse either a horseman wearing a causia or a victor in the horse-race with a palm — these last coins being the best of Philip's, although the horse is clumsy.*

The coinage of Alexander the Great, both in the number of the cities where it was issued and in its abundance, excels all other Greek regal money; but its art is, without being despicable, far below excellence. The system of both gold and silver is Attic. The gold coins are distaters or gold tetradrachms, staters or didrachms (see PI. I. fig. !7),hemistatersor drachms, with their half or a smaller denomination. The types of the distaters or staters, which last were the most common pieces, are for the obverse the head of Athena and for the reverse Victory bearing a naval standard. The largest silver piece is the decadrachm, which is of extreme rarity. The types of the tetradrachms and most of the lower coins are on the obverse the head of Heracles in the lion's skin and on the reverse Zeus seated, bear- ing on his hand an eagle (PI. I. fig. 16). The head has been supposed to be that of Alexander, but this is not the case, although there may be some assimilation to his portrait. The great currency was of tetradrachms. The coinage was struck in different cities, dis- tinguished by proper symbols and monograms. The classification of the series is difficult, but is gradually advancing. (For Alexander's

Eastern coinage see § iv. Oriental Coins.)

The coinage of Alexander is followed by that of Philip Arrhidaeus, with the same types in gold and silver. That of Alexander IV. was issued by Ptolemy I. alone. In these coins the types of Alexander were modified, the dead king being represented with the ram's horn of Ammon, and wearing an elephant's skin head-dress and aegis. Meanwhile Seleucus, Lysimachus, Antigonus, king of Asia, struck Alexander's money with their own names, and the tetradrachms of Macedonia were generally of this kind until the time o f Philip V. The same coinage, marked by a large flat form, was reissued later by

various cities, especially of western Asia, when the Romans, after the battle of Magnesia in 190 B.C., restored the liberties which Alexander had granted. The series of Alexandrine money is interrupted by various small coinages and the later issues of Lysimachus, king of Thrace, with a fine portrait — head of Alexander with the ram's horn, as the son of Zeus Amnion, a work sometimes worthy of Lysippus and an excellent indication of his style. The reverse has a figure of Athena holding a little Victory (PI. I. fig. 19). The coins of Demetrius I. (Poliorcetes) comprise fine tetradrachms, some of the types of which have an historic reference. They bear either on the obverse his portrait with a bull's horn and on the reverse a figure of Poseidon, or on the one side a winged female figure (Victory) on the prow of a galley, blowing a trumpet, and on the other Poseidon striking with his trident. The latter types cannot be doubted to relate to the great naval victory which Demetrius gained over Ptolemy in 306; the Victory reproduces the " Victory of Samothrace," dedicated by Demetrius and now in the Louvre. The tetradrachms of Antigonus I. (Gonatas), which are of inferior style and work to those of Demetrius, have types which appear to refer in like manner to the great event of his time. The obverse type is a Macedonian buckler with the head of Pan in the midst, and the reverse type Athene Promachos. The head of Pan is supposed to have been taken as a device in consequence of the panic which led to the discomfiture of the Gauls at Delphi. Another pair of types, the head of Poseidon and Apollo seated on the prow of a warship, probably

refers to the victory of Leucollaabott 258 B.C. The tetradrachms of Philip V. have on the obverse a head in the helmet of Perseus, representing probably Philip's son, Perseus, in the character of that hero. The reverse bears a club. Other tetradrachms and smaller coins have a simple portrait of Philip. The tetradrachms of Perseus are of fair style, considering the time at which they were struck. They bear on one side the king's head and on the other an eagle on a thunder-bolt. Andriscus (Philip VI., 150-149 B.C.) issued tetradrachms some of which represent him as Perseus. The coins of the Paeonian kings (from about 359 to 286 B.C.) show Macedonian influence, but are semi-barbarous.

The coin systems of northern Greece, Thessaly, Epirus, Corcyra, Acarnania and Aetolia present certain difficulties which disappear if we consider them as originally Aeginetan, modified in the west by Corinthian, and laier by Roman, influence. The coinage of Thessaly represents very few specimens of a remote period, while pieces of the best time are numerous. These are in general remarkably like the finest coins of Sicily and Italy, although the style is simpler. The prevalence of the horse and horseman is significant. The money of the Thessalian Confederacy, being of late date (196- 146 B.C.), is of little interest. The commonest types are the head of Zeus crowned with oak and the Thessalian Athena Itonia in a fighting attitude. The coinage is resumed in imperial times. Numerous small places, such as Gomphi, Homolium, Lamia, Phalanna, produced coins of considerable beauty; more exten- sive are the issues of Pharsalus, Pherae (with fine coins of the tyrant Alexander), and especially Larissa. The last series begins with archaic pieces and some of the early period of good art, but sometimes of rather coarse execution. The small silver pieces have very interesting reverse types relating to the nymph of the fountain, and to be compared for mutual illustration with the didrachms of Terina and with some of those of Elis. These are followed by coins of fine work. The usual obverse type is the head of Larissa, the nymph of the fountain, facing, and on the reverse is generally a horse, either free or drinking. The head is treated in a very rich manner, like that of the fountain-nymph Arethusa, facing, on tetradrachms of Syracuse; indeed, the debt to the Sicilian type is obvious. The bronze money is also good. The wine-producing island of Peparethus, off the Thessalian coast, is represented by a remarkable series of Attic tetradrachms (about 500-480 B.C.) with a variety of types, partly Dionysiac.

The coinage of Illyria (strictly Illyris or Illyricum) is usually of inferior or rude art; the pieces are Aeginetic, ultimately changing to Corinthian, and then, in 229 B.C., to the standard of the illyricum. R

oman Victeriatus. Of Apollonla there is a large series. The earliest (early 4th century) have the Corcyraean types of the cow and the calf and the floral pattern; the latest, usually the head of Apollo and three nymphs dancing round a fire, the outer ones holding torches. Dyrrhachium, which never bears on its coins the more famous name of Epidamnus, is represented by an im- portant series. First there are reduced Aeginetan didrachms with Corcyraean types. These are succeeded by tridrachms with Corinthian types, and of Corinthian weight; and then the old types

Acar- nania.

are resumed, but the standard is that of the victoriatus. Dyrrhachium, it must be remembered, was founded partly by Corcyraean and partly by Corinthian colonists. The Illyrio-Epirote mining towns, Damas- tium, &c, struck barbarous silver coins in the 4th century ; on some of the small pieces we see an ingot of metal or a miner's pick.

The coins of Epirus are of higher interest and beauty than those of Illyria. Of the Epirots there are bronze coins of the regal period (342-272 B.C.), and both silver and bronze of the republic .

(238-168 B.C.), with the heads of the Dodonaean Zeus and bpirus. Dione, together or apart. Ambracia is represented by silver pieces, with on the one side a head of Dione, on the other the obelisk of Apollo Agyieus.

The series of Greek imperial money of Nicopolis must also be mentioned. The coinage of the kings begins under Alexander I. His coins have been found in the three metals, but they are rare. It is probable that both gold and silver were struck in Italy while he was in that country. The coins of Pyrrhus in all metals are of high interest, and remarkable for their beauty, though the style is usually florid. There can be little doubt that they were for the most part struck in Italy and Sicily, at Tarentum and Syracuse. The tetra- drachm has for the type of the obverse a head of the Dodonaean Zeus crowned with oak and for that of the reverse Dione seated. A fine didrachm bears on the obverse a head of Achilles helmeted, with for the reverse Thetis on a sea-horse carrying the shield of her son. Among the copper coins of Pyrrhus we must remark the beautiful ones with the portrait of his mother Phthia.

The coinage of the island of Corcyra begins with very early reduced Aeginetic didrachms and drachms of the 6th century. The types are

the cow suckling the calf and the floral pattern, as at Dyrrhachium. These leading subjects are varied in later Corcyra. times by others illustrating the Corinthian origin of the nation, its maritime power, and the fame of its wine. Not the least curious are the bronze pieces with galleys bearing their names, as Freedom, Glory, Orderly Government, Corcyra, Comus, Cypris, Victory, Youth, Preserver, Fame, Light-bearer. The abundant bronze series goes on under the emperors.

The coins of Acarnania are not remarkable for beauty or for variety in their types. The money of several cities in the 4th century B.C. is Corinthian in types and weight. That of the Acarnanian League (229-168 B.C.) bears the head of the Acheloiis as a man-headed bull and the seated Apollo Actius. Of Leucas the silver coins show the archaic cultus-figure of Aphrodite Aeneias.

In Aetolia the gold and silver coins of the Aetolian League have some merit (279-168 B.C.). The gold pieces have on the obverse the head of Athena or that of Heracles in the lion's skin and on the reverse Aetolia personified, seated on Gaulish and Aetolia. Macedonian shields (a figure dedicated after the repulse of the Gauls; Paus. x. 18, 7). These subjects recur, with others indicating the hunter-life of the population, on the silver money; of especial interest are the head of Atalanta and the Calydonian boar, and the spear-head with which he was slain. On some of the copper the spear- head and the jaw-bone of the boar are seen.

The coinage of Locris,Phocis and Boeotia is entirely on theAeginetic standard. The'coins of the Locri Epicnemidii are mainly didrachms, struck at Opus, with the head of Persephone and the figure of the Lesser Ajax in a fighting attitude, sometimes f-ocris. accompanied by his name. These coins were struck between 369 and 338 B.C., and are remarkable for the manner in which a Syracusan head is copied, if indeed the dies were not actually in some cases made in the western city.

The money of Phocis begins at a very early age, some time in the 6th century B.C., and extends in silver down to the conquest by Philip (346 B.C.). The prevalent type is a bull's head. The generals Onymarchus andPhalaecus in the Sacred War Phocis. placed their names on bronze coins. Delphi, geographically included in Phocis, strikes very remarkable money .wholly distinct in types from the Phocian. The principal subjects are heads of rams and goats, the symbols of Apollo as a pastoral divinity, a dolphin (Apollo Delphinius), the omphalos and tripod, and a negro's head, which has

not been satisfactorily explained. The Amphictyonic Council struck beautiful didrachms, probably on the occasion of Philip's presidency (346 B.C.), with the head of Demeter, and the Delphian Apollo seated on the omphalos. Under Hadrian and the Antonines there is an imperial coinage of Delphi, some pieces bearing the representation of the temple of Apollo, on one type the letter E appearing between the columns of the face, representing the mystic Delphic EI, on which Plutarch wrote a treatise.

The coinage of Boeotia is chiefly of a period anterior to the reign of Alexander, under whom the political importance of Thebes and the whole country came to an end. The standard until the end of the 4th century is Aeginetic. The main characteristic of the money is the almost exclusive use of the Boeotian shield as the obverse type, marking the federal character of the issues. These were struck by various cities, or by Thebes as ruling the League. The earliest pieces are drachms, presumably of Thebes, issued between 600 and 550 B.C.

Boeotia.

Athens.

These are followed by didrachms of the same and other cities until the time of the Persian War. The result of the unpatriotic policy of Thebes and most of the towns of Boeotia was the degradation of the leading city, and the coins reveal the curious fact that Tanagra for a time became the centre of the League- coinage. We now notice the abandonment of the old incuse reverse and the adoption of regular types, the wheel at Tanagra and the amphora at Thebes. These types increase, and indicate several cities during the short period of Athenian influence (456-446 B.C.). The democratic institutions were next over- thrown, and Thebes became again the head of Boeotia, and struck alone and in her own name, not in that of the League. To the earlier part of this period belong splendid didrachms with reverse types chiefly representing Heracles, subsequently varied by heads of Dionysus in a series only less fine. With the peace of Antalcidas (387 b.c.) Thebes lost her power, the League was dissolved, and the other Boeotian cities issued a coinage of some merit. In 379 B.C. Thebes

became the chief state in Greece, and the patriotic policy of Pelopidas and Epaminondas is shown in the issue of the Boeotian coins at the great city without any name but that of a magistrate. Among those which occur is EIIAM, or EIIAMI, who can scarcely be any other than the illustrious general (PI. I. fig. 18). After the battle of Chaeronea (338 B.C.), swiftly followed by the destruction of Thebes, the coinage is comparatively unimportant, save only for the appear- ance of new league-money of Attic weight, with the head of Zeus and the figure of Poseidon, between 288 and 244 B.C.

In Attica the great series of Athens is dominant. Eleusis issued a small bronze coinage of good style in the 4th century. Oropus and the island of Salamis also had an unim- portant coinage. The Athenian coinage, apparently introduced by Solon, begins with didrachms on the Eubcic standard, which, owing to the fame of the Athenian money, received the name of Attic. The type is an owl, the reverse having only the incuse square. These didrachms were succeeded under Peisistratus by the well-known Attic tetradrachms with head of Athena on the obverse, and owl and olive-spray on the reverse (PI. I. fig. 20). The change supposed to have been introduced by Hippias (Pseudo-Arist. Oecon. ii. 4) was merely one of nomenclature; by calling in the coinage and reissuing it at double its old nominal value he only paid back half of what he had received. To what had previously been called didrachms he gave the name of tetradrachms, by which they have since been known. An obol bearing the name of Hippias himself, and types similar to those of Athens, was probably issued by him during his exile. From the time of the Persian wars the helmet of Athena is adorned with three olive-leaves. A rare decadrachm corresponds at Athens to the Demareteia at Syracuse, and was probably issued for similar reasons in commemoration of victory over the barbarians. Otherwise historical events seem to have left little record in the coinage and the Athenians deliberately affected archaism in the style of their coins, which bear no mark cf the splendour of Athens as the centre of the sculptor's art. No doubt commercial reasons dictated this conservative policy, which makes the coinage of Athens a disappointment in numismatics. Her money was precious for its purity not only in the Greek world but among distant bar- barians, so that imitations reach us from the Punjab and from southern Arabia, and any change would have injured its wide reception. There are many divisions of silver coinage with the types a little varied, and some different ones; and towards the end of the 5th century (probably in 407 B.C.) gold and bronze were introduced. The gold, of good quality and bad style, was never plentiful. The Macedonian empire put an end to the autonomy of

Athens, and when the money is again issued it is of a wholly new style and the types are modified. The great series of spread tetradrachms maybe dated from about 229 B.C., and lasted probably until the time of Augustus. The obverse type is a head of Athena with a richly-adorned helmet, unquestionably borrowed from the famous statue by Pheidias in ivory and goid, but a poor shadow of that splendid original, and an owl on an amphora within an olive-wreath. The earliest coins

have the monograms of two magistrates, the later the names of two who are annual (although the nature of their offices is not certain — possibly they were Xeirovpylai) , and, during the period 146-86, a third name, of the treasurer of the prytany in which the coin was issued. Among the names are those of Antiochus (175 B.C.), afterwards Antiochus IV. of Syria, and of Mithradates the Great (PL II. fig. 1) and his creature, Aristion (87-86 B.C.); but comparatively few of the coins can be dated exactly. Mithra- dates issued the only gold staters in this series. The symbols in the field often represent local statues of great interest. The abundance of this money shows the great commercial importance of Athens in these later times. Under the empire Athens issued only quasi-autonomous coins, but these are of great archaeo- logical value as they bear representations of the Acropolis, with the grotto of Pan, the statue of Pallas Promachus, the Parthenon, and the Propylaea, with the steps leading up to the latter; of the theatre of Dionysus, above which are caverns in the rock, and higher still the Parthenon and the Propylaea; and of various statues and groups of sculpture. Megara and other places in Megaris issued a small but interesting coinage.

The money of the island of Aegina is of especial interest since with it coinage originated, so far as Greece proper is concerned, probably fairly early in the 7th century B.C. There is no good evidence for connecting the institution of e Sfs- the coinage with Pheidon, king of Argos, who established a system of measures and weights, known as the Pheidonian. The weight of the coins is of course on the Aeginetic standard. The oldest pieces are very primitive didrachms, bearing on the obverse a sea-tortoise and on the reverse a rude incuse stamp (PI. II. fig. 2). Afterwards the stamp becomes less rude, and later has a peculiar shape. The sea-tortoise is also replaced by a land-tortoise. There are some coins of the early part of the fine period of excellent work. The great currency was of didrachms. The bronze coins are not remarkable, but some appear to be of an earlier time than most Greek pieces in this metal.

The scries of Achaea begins under the Achaean League in the time of

Epaminondas, with a fine Aeginetic stater and smaller coins in the name of the Achaeans. The later silver coins are either Attic tetrobols or Aeginetic hemidrachms. On all but the earliest, i.e. after about 280 B.C., monograms or symbols indicate the cities which were members of the league; on the later bronze coins the names are given in full. The type of the silver is the head of Zeus Homagyrius, the reverse bearing the monogram of the Achaeans in a laurel- wreath. The oldest bronze repeats the silver types; the later bear a standing Zeus and a seated Demeter, with the name of the city at full length. About forty-five cities are represented by this coinage.

Corinth is represented by a very large series of coins, the weight of which is always on the Corinthian standard, equivalent to Attic but differently divided, — the Corinthian tridrachm, the chief coin, corresponding to the Attic didrachm. The oldest pieces, of the 6th century B.C. (some perhaps even earlier), bear on the obverse Pegasus with the letter ? , koppa, the initial of the name of Corinth, and on the reverse an incuse pattern. In course of time (about 500 B.C.) the head of Athena in an incuse square occupies the reverse. The incuse square disappears, as generally elsewhere, in the early period of fine art. Of the age of the excellence and decline of art we find beautiful work, though generally wanting in the severity of the highest Greek art (PL II. fig. 3). Pegasus is ordinarily seen galloping, but some- times standing or drinking, the koppa is usually retained, and the helmet of Athena, always Corinthian, is sometimes bound with an olive-wreath. The smaller coins have the same reverse, but on the obverse a charming series of types, principally female heads, mostly representing Aphrodite. There are some drachms with Bellerophon in a combatant attitude mounted on Pegasus on the one side and the Chimaera on the other. The autonomous bronze money is poor, but often of fair work, and interesting, especially when the type relates to the myth of Bellerophon. In 46 B.C. this city was made a colonia; and we have a large and interesting series of the bronze coins struck by it as such,

including the remarkable type of the tomb of Lais. The coins of the ” colonies ” of Corinth form a long and important series, struck by Acarnanian towns with Corcyra, and in the west by Locri Epizephyrii in Italy and Syracuse. Some of these cities were not strictly colonies

of Corinth, but the Pegasus staters struck by them form a homogeneous group. They range from the time of Dion (357 B.C.) to nearly the end of the 3rd century. The coins are distinguished by the absence of the koppa, and bear the names or monograms of the cities.

There are bronze coins of Patrae as an important Roman colonia, and silver and bronze money of Phlius, both of the period of good art. The coinage of Sicyon, on the Aeginetic standard «tt? rae ‘ a dominant in the rest of the Peloponnesus, is disappoint- Skyon,

The money of the Eleans is inferior to none in the Greek world in its art, which reaches the highest level of dignified restraint, and in the ™ variety of its types, which are suggested by a few subjects.

The leading types are connected, as we might expect, with the worship of Zeus and Hera and Victory, the divinities of the great Panhellenic contest at Olympia, and the coinage is rather the money of Olympia than of the Eleans as a civic community. The prevalent representations are the eagle and the winged thunderbolt of Zeus, the head of Hera and the figure of Victory. The series begins early in the 5th century B.C. with coins, some of which are didrachms (Aeginetic), having as subjects an eagle carrying a serpent or a hare, and on the reverse a thunderbolt or Victory bearing a wreath — – archaic types which in their vigour promise the excellence of later days. From 471 to 421 B.C., while Elis was allied with the Spartans, such types continue; the eagle and Victory (sometimes seated) are both treated with great force and beauty, and the subject of seated Zeus is remarkable for its dignity. The Argive alliance (421-400 B.C.) seems marked by the pre-eminence given to Hera, whose head may suggest the famous statue of Polycleitus at Argos. About the same time was issued a didrachm with a noble head of Zeus (PL II. fig. 4), which probably recalls, though it is not a copy of, the Zeus of Pheidias. This alliance broken, the old types recur. Magnificent eagles, some admirably designed on a shield, and eagles’ heads (see PI. II. fig. 5), the seated Victory, and fantastically varied thunderbolts mark this age. Among the artists’ signatures at this time is AA, which may repre- sent the sculptor Daedalus of Sicyon. In 364 B.C. the coinage is interrupted for a year, the Pisatans, who conducted the festival then, issuing small gold coins; these are immediately followed by Elean money with the heads of Zeus and the nymph Olympia. Aristotimus, who was tyrant in 272 B.C., issued coins with his initials. The coinage closes with imperia 1 money, some types of which have a local interest, notably two of Hadrian bearing the head and figure of Zeus, copied from the famous statue

by Pheidias.

Cephallenia gives us the early silver coins of Cranii, the money of Pale, of charming style, with the figure of Cephalus on the reverse, and that of Same, all cities of this island. Of the island of Zacy nthus there are silver pieces, usually of rather coarse work, but sometimes of the style of the best Cephallenian money. Some struck in 357 bear the name of Dion of Syracuse, who collected the forces for his expedition in this island. The coins of Ithaca are of bronze. They are of interest on account of their common obverse type, which is a head of Odysseus.

*Returning to the mainland, we first notice the money of Messene, or the Messenians. The earliest coin is a splendid Aeginetic didrachm, Messene ˆ av ‘ n g on ˆ}e obverse a head of Persephone, and excels in design the’similar subjects on the money of Syracuse, from which it must have been copied, for it is of about the time of Epamin- ondas. It shows the purer style of Greece, which, copying Syracusan work, raised its character. On the reverse is a figure of Zeus, inspired by the work of Hageladas. The other silver coins are of about the period of the Achaean League. The bronze money is plentiful, but Lacoala. not interesting. Lacedaemon, as we might have expected, has no early coins, the silver money being mostly of the age of the Achaean League, but the King Areus (309-265 B.C.) and the tyrant Nabis (207-192 B.C.) are represented by Attic tetra- drachms. On a tetradrachm of the time of the former is a figure of the Apollo of Amyclae. Among the types of the autonomous bronze pieces may be noticed the head of the Spartan lawgiver Lycurgus, with his name. The series of Argos in Argolis begins early in the Anrofls. 5** 1 centurv – The standard is Aeginetic. The first pieces ” are the drachm and smaller denominations with a wolf, half-wolf or wolf’s head on the obverse, and A on the reverse. A rare iron coin was issued with these types. At the end of the 5th century begin the didrachms, which have for the obverse type the head of the Polycleitan Hera — a design which is not equal to that of the coins of Elis, the style being either careless or not so simple. The reverse*

Cephal- lenia, &c

type of the drachm represents Diomedes stealthily advancing with the palladium in his left hand and a short sword in his right. A 4th-century drachm of Epidaurus represents the famous seated figure of Asclepius by Thrasymedes of Paros.

Of the money of Arcadia some pieces are doubtless among the most

ancient struck by the Greeks ; and the types of these and later coins are often connected with the remarkable myths of A ., this primeval part of Hellas, showing particularly the rca a ° remains of its old nature-worship. The first series to be noticed is that of the Arcadian League; it begins about 500 B.C. with hemi- drachms having the type of Zeus Lycaeus seated, the eagle repre- sented as if flying from his hand, and a female head. Of a later time, from the age of Epaminondas, there are very fine coins (issued from Megalopolis) with the head of Zeus, and Pan seated. The coins of Heraea begin deep in the 6th century B.C. The earliest have for obverse type the veiled head of Hera, and on the reverse the beginning of the name of the town. The silver coins of Mantinea (beginning early in the 5th century) have on the obverse a bear, representing Callisto, the mother of Areas, who was worshipped here, and on the reverse the letters MA, or three acorns, in an incuse square. Later coins, especially the bronze, have subjects connected with the worship of Poseidon at this inland town. The silver coins of Pheneus must be noticed as being of fine work. The didrachms of the age of Epaminondas have a head of Persephone, and Hermes carrying the child Areas. The obverse type is interesting as a copy of the Syracusan subject, as in Locris and Messene. As in Locris, the merit is in the greater force and simplicity of the face, here most successful, the hair being treated more after the Syracusan manner than after that of the Messenians, who simplified the whole subject. The finest coin attributed to Stymphalus is a magnificent didrachm of the age of Epaminondas, with a head of the local Artemis laureate, and Heracles striking with his club. The smaller silver coins have on the one side a head of Heracles and on the other the head and neck of a Stymphalian bird. There were representations of these birds in the temple of Artemis. The series of Tegea is not important, but two of the reverse types of its bronze coins are interesting as relating to the myth of Tefephus and to the story that Athena gave a jar containing the hair of Medusa to her priestess Sterope, daughter of Cepheus, in order that she might terrify the Argives should they attack Tegea in the absence of Cepheus, when Heracles desired his aid in an expedition against Sparta. Iron coins were issued by Tegea, and also perhaps by Heraea.

The peculiar position of Crete and her long isolation from the political, artistic and literary movements of Hellas have been already touched on. It is not until the age of Philip V. that Crete appears in the field of history, and then only as the battle-ground of rival powers. The most remarkable influence of this age was when Athens, by the diplomacy of Cephisodorus, succeeded about 200 B.C. in

drawing the Cretans into a great league against Philip V. of Macedon. That this project took actual shape is proved by the issue at all the chief mints of the island of tetradrachms with the well-known types of Athens, to be distinguished from the Atticizing types of other cities at this time.

The oldest coins are probably of about 500 B.C., but few cities seem to have issued many until a hundred years later. Then there is a great outburst of coinage, sometimes beautiful, some- times barbarously careless, which lasts until the age of Alexander, when the local currency was probably in great part replaced by Alexandrine coins. At the end of the 3rd century the local coinages are revived until the Roman conquest (67 or 66 B.C.). The chief issue is of silver; bronze is less abundant; and gold is all but unknown. The Cretan types have a markedly local character, yet they copy in some instances other coinages. The chief divinities on the pieces are Zeus, Hera, Poseidon, Heracles and Britomartis, and the leading myths are those of Minos, the story of the Minotaur and the labyrinth being prominent, and also that of Europa. There is frequent reference to nature- worship as in Sicily, yet with a distinctive preference for trees, the forms of which, however, lend themselves readily to the free representation of Cretan art, which may in part explain their prominence. The peculiarity of Cretan art lies in its realism. At some places, as Aptera, Polyrrhenium and Cydonia, we find engravers' signatures. The weight is at first Aeginetic of reduced form; and in the resumption of the coinage after Alexander's time it is Attic.

Of the island in general there are Romaˆi silver and bronze coins of the earlier emperors, some of which are of fine work for the period. The most interesting types are Dictynna and

Crete.

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Zeus Cretagenes. The autonomous coins are very varied. The obverse of the didrachms of Aptera bears a head of Artemis and the reverse a warrior (Plolioikos) before a sacred tree. Of Chersonesus, the port of Lyctus, there are didrachms of coarse style, with a head of Artemis Britomartis, who had a temple at the place. The head is copied from

Stymphalus, as also is one of the reverse types, Heracles wielding his club. The money of Cnossus is of great interest. The oldest coins may be as early as 480 B.C. They bear the figure of the Minotaur as a bull- headed man, kneeling on one knee, and a maeander-pattern, in one case enclosing a star (the sun), in another a head (Theseus?). Of the period 431-350 there are didrachms with the head of Persephone, and the labyrinthine pattern enclosing the sun or the moon or a bull's head for the Minotaur, and at length be- coming a regular maze. To this time belongs the wonderful coin in the Berlin Museum with Minos seated, his name in the field, and the head of Persephone within the maeander-pattern. In the later 4th century a head of Hera (copied without spirit from the coins of Argos) occupies the obverse of didrachms and drachms, and the reverse has a maze through which the way may be clearly traced. This series closes with Alexander's empire, and the native coinage disappears until the league of Cephisodorus revives it with the Athenian tetradrachm of Attic weight, bearing the name of the Cnossians. It is of inferior style, and is followed by base coins with heads of Minos and Apollo, and the Labyrinth, either square as before or in a new circular form, which is interesting as showing it was a mere matter of tradition.

There are interesting coins of Cydonia, some of them of beauti- ful style and work. One bears an engraver's name, Neuantos. The head is that of a Maenad, and the reverse has a figure of the traditional founder Cydon, stringing his bow, who on other didrachms is seen suckled by a bitch. The style is good, but the execution poor. Gortys, or Gortyna, is represented by most remarkable coins, which generally allude to the myth of Europa. Didrachms of archaic style have on the obverse Europa carried by the bull and on the reverse the lion's scalp. These pieces are followed by a remarkably fine class of spread didrachms; the best are of about 400 B.C. They have on the obverse Europa seated in a pensive attitude on the trunk of a tree, doubtless the sacred plane at Gortyna, mentioned by Pliny, which was said never to shed its leaves, and on the reverse a bull suddenly turning his head as if stung by a fly (PI. II. fig. 6). Nothing in Greek art exceeds the skill and beauty of these designs. The truth with which the tree is sketched, and the graceful position of the forlorn Europa are as much to be admired as the fidelity with which the bull is drawn, even when foreshortened, sharply turning his head, with his tongue out and his tail raised. These designs, beautiful in themselves, are strikingly deficient in fitness, and afford equally strong illustrations of the excellencies and of the one great fault of the art of Cretan coins. Many pieces of the same class are of rude execution. Of Itanus there are remarkable coins, the earlier, some of which are

of good style, with the subject of a Tritonian sea-god (Glaucus ?) and two sea-monsters. Lyctus (Lyttus) is represented by strangely rude pieces, with the types of a flying eagle and a boar's head. The coins of Phaestus form a most interesting series. Among the didrachms are some of admirable work, with on the obverse Heracles slaying the Hydra with his club and on the reverse a bull. Others have on the obverse Heracles seated on the ground, resting. Another noticeable obverse type is the beardless Zeus seated in a tree, with his Cretan name, Velchanos. On his knee is a cock crowing, showing that he was a god of the dawn. We also find Talos, the man of brass, said to have been made by Hephaestus or Daedalus, portrayed as a winged youth naked, bearing in each hand a stone, and in a combatant attitude. Apollonius Rhodius (Argonaut, iv. 1638 sqq.) relates that Talos prevented the Argonauts from landing in Crete by hurling stones at them, until he was destroyed by the artifice of Medea. The important town cf Polyrrhenium is represented by carefully- executed coins with a head of Zeus and a bull's head. A later piece has a whiskered head of Apollo, probably Philip V. in that character. Priansus shows the remarkable type of Persephone

seated beside a date-palm, placing her right hand on the head of a serpent in reference to the myth of the birth of Zagreus. As usual, the figure is foreshortened. The reverse has a standing figure of Poseidon. Rhaucus has Poseidon beside his horse. The rare didrachms of Sybritia, or Sybrita, may fitly close the series; one, among the most exquisite of Greek coins, has heads of Dionysus and Hermes in high relief (see PI. II. fig. 7); another has on the obverse a charming subject, Dionysus seated on a running panther, and on the reverse Hermes drawing on his right buskin, — a delightful figure. Another beautiful type is a seated Dionysus.

The coinage of Euboea is all on the native standard, of which the Attic was a variety. It includes some of the very earliest Greek money. Carystus begins in the time of the Persian War „ . with the type of the cow and calf, as in Corcyra, and its ” oe special badge is the cock. In the period 197-146 it issued gold drachms. Chalcis, the mother of western colonies, has already in the 6th century, or even earlier, a long series with the wheel-type and an . incuse diagonally divided, and later, a nymph's head and an eagle devouring a serpent. Eretria probably begins as early as Chalcis, but the obverse type is the Gorgon's head. This is succeeded by the same type and a panther's or bull's head, and fine late archaic coins bear the cow and the cuttle-fish. Eretria was probably the mint of coins with the head of a nymph and a cow or cow's head struck in the name of Euboeans in the fine period. Of Histiaea the usual type is the head of a Maenad and a female figure seated on the stern of a galley.

Among the other islands classed after Euboea, Amorgos must not be passed by, as a bronze coin of Aegiale, one of its towns, presents the curious type of a cupping-glass. To Andros has been „ clades attributed a group of early coins bearing an amphora. ˆ . The silver money of Carthaea, Coressia and Iulis in Ceos soorades is extremely old, beginning in each case in the 6th century. p The weight is Aeginetic, and there are didrachms and smaller coins. The usual types of Carthaea are an amphora and then a bunch of grapes; that of Coressia is a cuttle-fish and. dolphin. The coinage of Delos is insignificant. Melos coined from the early 5th century to imperial times: its chief type is a canting one, the nv>u>i> (pome- granate). Naxos is represented by early Aeginetic didrachms and coins of the fine period, the latter being chiefly bronze pieces of remarkably delicate and good work. The types are Dionysiac. A 7th-century coin with the head of a satyr (one of the earliest repre- sentations of the human head on a coin) is probably Naxian. Of Paros there are early Aeginetic didrachms with the type of a kneeling goat and beneath a

dolphin. Of the 3rd and 2nd centuries B.C. there are Attic didrachms with a head, possibly of Artemis, at first of a charming style, and a goat on the reverse. There are very archaic Aeginetic didrachms of Siphnos, which was famous for its gold and silver mines. A late tetradrachm of Syros is interesting as repre- senting the Cabiri.

The coinage of Asia begins with that of Asia Minor. It falls into certain great classes — first, the ancient gold and electrum, Lydian and Greek, in time succeeded by electrum or gold and silver, all struck in the west and mainly Minor. on the coast. Then the Persian dominion appears in the silver money of the satraps, circulating with the gold and silver of Persia, and the Greek money is limited to a few cities of the coast, none save the electrum of the great mint of Cyzicus uninterrupted by the barbarian. With the decay of the barbarian empire the renewed life of the Greek cities is witnessed by a beautiful coinage along the coast from the Propontis to Cilicia. On Alexander's conquest autonomy is granted to the much-enduring Hellenic communities, and is . again interrupted, but only partially, by the rule of his successors, for there was no time at which Asia Minor was wholly parcelled out among the kings, Greek or native. The Romans, after the battle of Magnesia (190 B.C.), repeated Alexander's policy so far as the cities of the western coast were concerned, and there is a fresh outburst of coinage, which, in remembrance, follows the well-known types of Alexander. When the province of Asia was constituted and the neighbouring states fell one by one under Roman rule, the autonomy of the great cities was generally reduced to a shadow. Still the abundant issues of imperial coinage, if devoid of high merit, are the best in style of late Greek coins, and for mythology the richest in illustration.

The oldest money is the electrum of Lydia, which spread in very early times along the western coast. This coinage, dating from the 7th century B.C., has an equal claim with the Aeginetic silver to be the oldest of all money.

Probably the two currencies arose at the same period, and by interchange became the recognized currency of the primeval marts; otherwise we can scarcely explain the absence ˚y st of Asiatic silver, though it is easy to explain that of European electrum or gold. The

electrum of the coins is gold — the precious metal washed down by the Pactolus — with a native alloy of a varying part of silver. Its durability recommended it to the Lydians, and it had (by convention) the advantage of exchanging decimally with gold, then in the ratio 13-3 to silver. But this commercial advantage allowed the issue of electrum coins on silver standards, while it was natural to coin them on those of gold; hence a variety of weight-systems perplexing to the metrologist. The classification of the earliest coins is exceedingly obscure; it is hardly possible to say which were struck in Lydia itself, which in the Greek coast cities, such as Miletus; but the majority probably belong to Greek mints. The most primitive in appearance are those in which the obverse is merely marked with lines, corresponding to the original rough surface of the die, while the reverse has three depressions, an oblong one flanked by two squares (PI. II. fig. 8) ; there are also various coins of small denomination with a plain convex obverse, and a single rough depression on the reverse, known from the excavations at Ephesus. Both the Babylonian and the Phoenician standards were in use in early times. This double currency, as Head suggests, was probably intended, so far as the Lydians were concerned, for circulation in the interior and in the coast towns to the west, the Babylonic weight being that of the land trade, the Phoenician that of the commerce by sea. Croesus (PI. II. fig. 9) abandoned electrum, and issued pure gold (on the Eabylonic and goSd-shekel standards) , and pure silver(Babylonic) , the silver stater exchanging as the tenth of the Euboic gold stater. These results are explained by the metrological data given earlier in this article. Of the Greek marts of the western coast we have a series of early electrum staters, for the most part on the Phoenician weight. An interesting homogeneous group was issued by the various cities which took part in the Ionian revolt (500-494 B.C.). The Euboic weight naturally found its way into the currencies, but was as yet limited to Samos. Phocaea, Teos and Cyzicus, with other towns, followed from a very early period the Phocaic standard, which for practical purposes may be called the double of the Euboic. They alone before Croesus issued gold money, which was superseded at Phocaea and Cyzicus by electrum. This is the main outline of the native coinage of Asia Minor before the Persian conquest. Its later history will appear under the several great towns, the money of Persia (which circulated largely in Asia Minor) being treated in a subsequent place.

The first countries of Asia Minor are Bosporus and Colchis, the coins of the cities of which are few and unimportant. The autonomous coinages of the cities of Pontus are more cnjMF < /™ S ' numerous

> but the only place meriting a special Poatus notice is Amisus, which almost alone of the cities of Pontus seems to have issued autonomous silver money. The common subjects of the bronze money of this place relate to the myth of Perseus and Medusa, a favourite one in this country.

The regal coins are of the old kingdoms of Pontus and of the Cimmerian Bosporus, of the two united as the state of Bosporus and Pontus under Mithradates VI. (the Great), and as recon- stituted by the Romans when Polemon I. and II. still held the kingdom of Mithradates, which was afterwards divided into the province of Pontus and the kingdom of Bosporus. The early coinage of the kingdom of Bosporus is of little interest. Of that of Pontus there are tetradrachms, two of which, of Mithradates IV. and Pharnaces I., are remarkable for the unflinching realism with which their barbarian type of features is preserved. Mith- radates VI., king of Bosporus and Pontus, is represented by gold staters, and tetradrachms. The portrait on the best of these (see PI. II. fig. 10) is fine despite its theatrical quality, character- istic of the later schools of Asia Minor. The kings of Bosporus struck a long series of coins for the first three and a half centuries after the Christian era. Their gold money (the only non-imperial

Mysla.

gold allowed under the empire) is gradually depreciated and becomes electrum, and ultimately billon and bronze. They bear the heads of the king and the emperor, and are dated by the Pontic era (297 B.C.).

In Paphlagonia we must specially notice the coins of the cities Amastris and Sinope. The silver pieces of the former place bear a youthful head in a laureate Phrygian cap, probably representing Mithras, Amastris, the p . *’

foundress, being seated on the reverse. The silver pieces of Sinope are plentiful. In the 4th century they bear the names of Persian governors. The types are the head of the nymph Sinope and, as at Istrus, an eagle preying on a dolphin. Bithynia is represented by a more important series. The provincial diet issued Roman silver medallions yn a ‘

of the weight of cistophori (to be presently described), with Latin inscriptions, and bronze pieces with Greek inscriptions. The ordinary silver coins of Chalcedon strikingly resemble on both sides those of

Byzantium, and a monetary convention evidently at times existed between these sister-cities. Of Cius, also called Prusias ad Mare, there are gold staters and smaller imperial silver pieces. Of Heraclea there are silver coins of good style; the most interesting type is a female head wearing a turreted head-dress, one of the earliest representations of a city-goddess (early 4th century). The tyrants of Heraclea, Clearchus, Satyrus, Timotheus and Dionysius are represented by coins. Of the imperial class there is a large series of Nicaea, and many coins of Nicomedia. The series of the Bithynian kings consists of Attic tetradrachms and bronze pieces, issued by Ziaelas, Prusias I. and II., and Nicomedes I.-IV.

The fine Greek coinage of Asia may be considered to begin with Mysia. Cyzicus is in numismatics a most important city. Its coinage begins in the 6th century; and the famous electrum Cyzicene staters were struck here for nearly a century and a half (c. 500-350 B.C.). During that whole period they were not only the leading gold coinage in Asia Minor but the chief currency in that metal for the cities on both shores of the Aegean; the value at which they were rated was doubtless a matter of convention, and varied from time to time. The actual weight is of the Phocaic standard, just over 248 grains. The divisions were the hecta or sixth, and the twelfth. The extraordinary variety of " types " at Cyzicus is due to the fact that these types are really symbols differentiating the issues, the true badge of the city, the tunny-fish, being relegated to a subordinate position (PL II. fig. 11). The reverse invariably has the quadripartite incuse square in four planes of the so-called mill-sail pattern. The coins are very thick and the edges are rude. The art is frequently of great beauty, though sometimes careless. The silver coinage of Cyzicus comprises beautiful tetradrachms of the Rhodian standard, with a head of Perse- phone ZflTEIPA, veiled and wreathed with ears of corn. Both late autonomous and imperial coins in bronze are well executed and full of interest, the two classes running parallel under the earlier emperors.

Lampsacus is represented by a long series of coins. Its distinctive type is the forepart of a Pegasus, which occurs on its coins from the 6th century onwards. In the first half of the 4th century it issued splendid gold staters with various types (really, as at Cyzicus, symbols distinguishing the issues) on the obverse and the half-Pegasus on the reverse. The most remarkable type is a bearded head (probably of a Cabirus) with streaming hair in a conical cap, bound with a wreath, singularly pictorial in treatment as well as in expression (PL II. fig. 12). In contrast to this is a most carefully executed head of a Maenad with goat's ear; and other types of great

interest are the Earth- goddess rising from the earth, and Victory nailing a helmet to a trophy, or sacrificing a ram.

The money of the great city of Pergamum is chiefly of a late time. Apart from some rare pieces of gold, the silver coinage is chiefly supplied by the money of the kings of Pergamum and by cistophori. The bronze pieces of the city are numerous, both autonomous and imperial, the two classes overlapping, and there are medallions of the emperors. The local worship of

*Aesculapius is especially promient under the Roman rule. The chief coins of the kings are Attic tetradrachms, with on the obverse a laureate head of Philetaerus, the founder of the state, and on the reverse a seated Athene, the common type of Lysi- machus, from whom Philetaerus revolted. Variations from these types are rare,the most important being a coin with the name of Eumenes (II.), representing his portrait and the Dioscuri. Otherwise the inscription is always *IAETAIPOY. The cisto- phorus probably originated at Ephesus towards the end of the 3rd century, but was soon adopted for the Pergamene dominions, and down to imperial times was the only important silver currency in Asia Minor. It acquired its name from its obverse type, the cista mystica, a basket from which a serpent issues, the whole enclosed in an ivy-wreath. The reverse type repre- sents two serpents, and between them usually a bow-case (PI. II. fig. 13). The half and the quarter of the cistophorus have on one side a bunch of grapes on a leaf or leaves of the vine, and the club with the lion's skin of Heracles within an ivy-wreath. They were tetradrachms equal in weight to about three Attic drachms or three denarii. These coins became abundant when the kingdom of Pergamum was transformed into the province of Asia, and are struck at its chief cities, as Pergamum, Adra- myttium, the Lydian Stratoniceia, Thyatira, Sardis, Smyrna, Ephesus, Tralles, Nysa, Laodicea and Apamea. They have at first the names of Greek magistrates, afterwards coupled with those of Roman proconsuls or propraetors. The silver medallions of Asia, the successors of the cistophori, range from Mark Antony to Hadrian and Sabina. They bear no names of cities, but some may be attributed by their references to local forms of worship. The obverse bears an imperial head, the reverse a type either Greek or Roman. The art is the best of*

this age, more delicate in design and execution than that of any other pieces, the Roman medallions excepted. One of the most remarkable imperial bronze coins of Pergamum represents the Great Altar (PI. II. fig. 16).

The coinage of the Troad is interesting from its traditional allusions to the Trojan War. Of Abydos there is a fine gold Tnas stater, with the unusual subject of Victo-ry sacrificing a ram, and the eagle, which is the most constant type of the silver money. One of the few imperial coins commemo- rates the legend of Hero and Leander. The late tetradrachms of Alexandria Troas bear the head of Apollo Smintheus, and on the reverse his figure armed with a bow. There is a long series of the town as a colonia, of extremely poor work. Ilium Novum strikes late Attic tetradiachms with a head of Athene, and on the reverse the same goddess carrying spear and distaff, with the inscription A0HNAE LA.IAA02. On the autonomous and imperial bronze we notice incidents of the tale of Troy, as Hector in his car, or slaying Patroclus, or fighting; and again the flight of Aeneas. The island of Tenedos is represented by very early coins, and others of the fine and late periods. The usual obverse type of all the silver pieces is a Janus-like com- bination of two heads, presumably some primitive god and his consort; this double type is balanced on the reverse by the double-axe, which played an important part in the primitive cults of Asia Minor and the Aegaean.

In Aeolis the most noteworthy coins are the late tetradrachms of Cyme and Myrina, both of the time of decline, yet with a certain strength which relieves them from the general weakness of the work of that age. Cyme has the head of the Amazon Cyme, and a horse within a laurel- wreath; Myrina, a head of the Grynean Apollo and his figure with lustral branch and patera. Lesbos is remarkable for having coined in base as well as pure silver, its early billon coins being peculiar to the island. This base coinage, which was probably common to Mytilene and Methymna, ceases about 450 B.C., when the Mytilenaean silver begins. Methymna has very interesting archaic silver coins, with the boar and the head of Athene. But the most important coinage of Lesbos is the beautiful electrum coinage (a unique stater, PI. II. fig. 14, and innumerable sixths)which was issued from about 480 to 350. Phocaea in Ionia issued similar coins, dis- tinguished by a seal (the badge of the city), and a convention regulating the weight and quality of the two coinages, and

Ionia.

arranging for the two mints to work in alternate years, is still extant.

The types vary accordingly, as at Cyzicus and Lamp- sacus. There is a long and important series of Mytilene of the imperial time, including very interesting commemorative coins, some of persons of remote history, as Pittacus and Sappho,, others of benefactors of the city, as Theophanes the friend of Pompey, from whom he obtained for this his native place the privileges of a free city. The usual style for these persons is hero or heroine, but Theophanes is called a god, and Archedamis, probably his wife, a goddess.

*The money of Ionia is abundant and beautiful. For the first century and a half (c. 700-545) the chief coinage is of electrum. To the 7th century belongs the remarkable coin in- scribed *AEN02 EMI 2HMA (" I am the badge of the Bright One " or " of Phanes "), with a stag, which was perhaps issued at Ephesus. From 545 to the Ionic revolt (494) there is considerable diminution in the coinage; silver attains more importance. Thenceforward, the course of the coinage is fairly uniform until the period 301-190, when there is a general cessa- tion of autonomous issues. After the battle of Magnesia there is a great revival, tetradrachms of Alexandrine and also of local types being issued in vast numbers. After the constitution of the Roman province of Asia (133), the cistophori supply the silver coinage. The imperial bronze coinage is numerous, with many interesting local types. Of the coins of the various cities the following demand mention. At Clazomenae in the 4th century there are splendid coins, having for types the head of Apollo, three-quarter face, and a swan. The chief pieces, the gold drachm and a half or octobol, and the silver stater or tetradrachm present two types of the head of Apollo, very grand on the gold and the silver, with the signature of Theodotus, the only known Asiatic engraver, and richly beautiful on the other silver piece. These coins are marked by the intense expression of the school of western Asia Minor. Colophon has fine severe coins of the 5th century with the head of Apollo and the lyre.*

The money of Ephesus is historically interesting, but very disappointing in its art, which is limited by the small range of subjects and their lack of beauty. The leading type Ephesus. is the bee; later the stag and the head of Artemis appear. Thus the subjects relate to the worship of the famous shrine. The oldest coins are electrum and silver, both on the Phoenician standard. The type is a bee and the reverse is incuse. The silver coinage continues with the same types, unbroken by the Persian dominion, until in 394 B.C. a remarkable new coin appears. When Conon and Pharnabazus defeated the Lacedaemonian fleet and liberated the Greek cities of Asia from Spartan tryanny a federal coinage was issued by Rhodes, Cnidus, Samos, Ephesus, Iasus and Byzantium with their proper

types on the reverse, but on the obverse the infant Heracles strangling two serpents; these are Rhodian tridrachms. About this time the Rhodian standard was introduced, and a series of tetradrachms began with the bee, having for reverse the forepart of a stag looking back, and behind him a date- palm. The head of Artemis as a Greek goddess begins to appear in the 3rd century. Other series of coins follow with types associated with Artemis, Rhodian and Attic standards alternat- ing; there are also Alexandrine tetradrachms and of course cistophori. The connexion of the city with Lysimachus, who called it Arsinoe, after his wife, is commemorated by coins inscribed AP2I. The Ephesian form of Artemis, as the cult us figure of a nature-goddess, first appears as a symbol on the cistophori, and then on gold coins struck during the revolt of 87-84, when Ephesus took the side of Mithradates. The imperial money provides many representations of the temples of the city, including that of the famous shrine of Artemis, which shows the Tiands of sculpture on the columns, as well as many other remarkable subjects, particularly the Zeus of rain seated on Mount Pelion, a shower falling from his left hand, while below are seen the temple of Artemis and the river-god Cayster; on another coin the strange Asiatic figure of the goddess, frequent in this series, stands between the personified rivers Cayster and

Cenchrius. The money of the Ionian Magnesia begins with the issue of Themistocles, when he was dynast under Persian pro- tection. The ordinary silver coins (350-190 B.C.) representing a cavalryman and the river-god Maeander as a bull are common. After 190 B.C. we have spread tetradrachms of the decline of art, more delicately executed than those of Cyme and Myrina, with a bust of Artemis and a figure of Apollo standing on a maeander and leaning against a lofty tripod, the whole in a Miktus. laurel-wreath. The great city of Miletus is disappoint- ing in its money. The period of its highest prosperity is too early for an abundant coinage, yet in the oldest electrum issues we see the lion and the sun of Apollo Didymeus. In the early 4th century the Carian dynasts issued coins from Ephesus. To about 350 B.C. belong the beautiful coins bearing the head of Apollo facing and the lion looking back at a sun, with the inscription Er AIAYMflN IEPH (scil. Spaxtii)), showing that this was the " sacred " money of the famous temple at Didyma. The types of the

head of Apollo in profile and the lion with the sun continue through a series of various standards with very rare Attic gold staters of the early 2nd century. Phocaea is represented by two very interesting currencies; an electrum series of hectae, characterized by a seal, the badge of the town, beneath the type, struck in convention with Mytilene (see above); and also a widespread early silver coinage, apparently common to the western colonies of the city. The autonomous money is wholly anterior to the Persian conquest. Smyrna Smyrna i ssue(i m tne 4 tn century a very rare coin with the head of Apollo and a lyre, of Colophonian style. Among the earliest coins of New Smyrna are some showing that Lysimachus named it Eurydicea after his daughter. After 190 B.C. it strikes Attic tetradrachms, with the turreted head of Cybele or the city or the Amazon Smyrna (PI. II. fig. 15), and an oak-wreath sometimes enclosing a lion. A rare silver coin and common bronze coins present on the reverse the seated figure of Homer. A gold coin issued by the Prytaneis of the Smyr- naeans probably belongs to the time of the Mithradatic revolt against Rome (87ˆ84). The imperial coins have numerous types, among others the two Nemeses appearing to Alexander in a vision.

Of Teos there are early Aeginetic didrachms, bearing on the one side a seated griffin and on the other a quadripartite incuse square. _ These ceased at the moment when the population left

leos. t j je town> destroyed by the Persians, and fled to Abdera,

where we recognize their type on the coinage of the time. There are much later coins of less importance.

Chios and Samos, islands of Ionia, are represented by interesting currencies. Chios struck electrum and abundant silver. The type Chios. was a seated sphinx with curled wing, and before it stands an amphora, above which is a bunch of grapes; the reverse has a quadripartite incuse. The coins begin before the Persian conquest (490 B.C.).

The coinage of Samos is artistically disappointing, but as a whole has many claims to interest. The earliest money included electrum. Samos The s ” ver begins before 494 b.c. The types are the well-known lion’s scalp and bull’s head. The Athenian con- quest (439 b.c.) is marked by the introduction of the olive-spray as a constant symbol on the reverse and the occasional occurrence of Attic weight. The Samians, having joined the anti-Laconian alliance after Conon’s victory in 394 B.C., struck the coin with Heracles strangling the

serpents already noticed under Ephesus ; the Rhodian weight is here introduced. The long series of imperial money is not without interesting types. The most remarkable is the figure of the Samian Hera, which clearly associates her with the group of divinities to which the Ephesian Artemis belongs. Very noticeable also are the representations of Pythagoras, seated or standing, touching a globe with a wand.

The money of Caria does not present any one great series. Autonomous silver coins are not numerous except at Cnidus, and rarely of good style. Antiochia and Alabanda have tetradrachms in the 2nd century. The imperial coins of Antiochia and of Aphrodisias are worthy of notice. Cnidus is represented at first by archaic coins of Aeginetic weight, some as early as the first half of the 7th century, with a very rude head of Aphrodite. The head of the famous statue of Aphrodite by Praxiteles is not reproduced, but the whole statue .figures on imperial coins. Among the imperial types of Halicarnassus the head of Herodotus is noteworthy. There is

Carta.

late silver money of Iasus with the head of Apollo, and a youth swimming beside a dolphin around which his arm is thrown. Idyma has silver pieces of fine style on which the head of Apollo is absolutely facing; the reverse type is a fig-leaf . On imperial coins of Mylasa the figure of the Zeus of Labranda holding double- axe and spear is represented. Of Termera we have the rare coin of its tyrant Tymnes, dating about the middle of the 5th century and struck on the Persic system.

The Carian satraps prove their wealth by their series of silver coins, which bear the names of Hecatomnus, Mausolus, Hidrieus and Pixodarus. The weight is Rhodian; the types are the three- quarter face of Apollo, and Zeus Labrandeus standing, holding the labrys or two-headed axe. Pixodarus also strikes gold of Attic weight. His silver is the best in the series, and clearly shows the Ionian style in its quality of expression.

Among the islands of Caria, Calymna begins in the 6th century or earlier with curious archaic Persian didrachms bearing a helmeted male head and on the reverse a lyre. The series of Cos begins with small archaic pieces, the aa dCos. type a crab and the reverse incuse. Next come fine coins of transitional style and Attic weight, with the types of a discobolus before a tripod, and a crab. The break so common in the coinage of this coast then interrupts the issue, and a

new coinage occurs before the time of Alexander. The weight is Rhodian, the types the head of Heracles and the crab. After Alexander there is another currency which ceases about 200 B.C. It is resumed later with the new types of the head of Asclepius and his serpent. This continues in Roman times. The bronze of that age comprises a coin with the head of Hippocrates and on the reverse the staff of Asclepius. Xenophon's head likewise occurs, and the portrait of Nicias tyrant in Cos {c. 50 B.C.) on his bronze. Imperial money ends the series.

The island of Rhodes, great in commerce and art, has a rich series of coins. The want of variety in the types — at the city of Rhodes almost limited to the head of Helios and the Rhodes. rose — is disappointing, but happily the principal subject could not fail to illustrate the movements of art, one of which had here its centre. The city of Rhodes was founded c. 408 B.C. on the abandonment by their inhabitants of the three chief towns of the island, Camirus, Ialysus and Lindus. The money of Camirus seems to begin in the 6th century B.C. The type is the fig-leaf, the weight Aeginetic, later degraded. The coins of Ialysus, of the 5th century, follow the Phoenician standard. Their types are the forepart of a winged boar and an eagle's head. The money of Lindus, apparently before 480 B.C., is of Phoenician weight, with the type of a lion's head. The people of the new city of Rhodes adopted another standard, the Attic, and very shortly abandoned it, except for gold money, using instead that peculiar weight which has been called Rhodian; this they retained until the last years of their independent coinage, when they resumed the Attic. The types are the three- quarter face of Helios and the rose. There is a grandeur and noble outlook in the earlier heads of Helios which well befits his character, but the pictorial style is evident in the form of the hair and the expression, which, with all its reserve, has a dramatic quality (see PI. II. fig. 17). Towards the end of the 4th century the radiate head is introduced; the Alexandrine tetradrachms, which were issued after the battle of Magnesia, find a place in the Rhodian mintage. During the age after Alexander there is an abundant bronze coinage, with some pieces of unusual size. The series closes with a few imperial coins ranging from Nerva to Marcus Aurelius.

The early coinage of Lycia introduces us at once into a region of Asiatic mythology, art and language, raising many questions as yet without an answer. The standard of the oldest Lycia. coins (beginning about 520 B.C.) is low Persic, and it falls perhaps under Athenian influence, until it is often indis- tinguishable from the Attic. The Lycian character belongs to the primitive alphabets of Asia

Minor, which combine with archaic Greek forms others which are unknown to the Greek alphabet, and it expresses a native language as yet but imper- fectly understood. The art is stiff and delights in animal forms,

Pamphy Ua.

sometimes of monstrous types, which recall the designs of Phoenicia and Assyria. The most remarkable symbol is the triskeles or tetraskeles symbol, an object resembling a ring, to which three or four hooks are attached. It is supposed to be a solar symbol like the swastika. The oldest money has a boar or his fore-part and an incuse. This is succeeded by a series with an animal reverse, and then by one in which the hooked ring is the usual reverse type. The fourth series bears Lycian in- scriptions, which give the names of dynasts and places. A fifth series is characterized by the type of a lion's scalp. This coinage reaches as late as Alexander's time. It is followed by silver and bronze money of the Lycian League before Augustus and under his reign, but ceasing in that of Claudius — the usual types of the chief silver piece, a hemidrachm, being the head of Apollo and the lyre. The districts of Cragus and Masicytus have coinages, as well as the individual cities. Besides this general currency there are some special ones of towns not in the League. The imperial money rarely goes beyond the reign of Augustus, and is resumed during that of Gordian III. There is a remarkable coin of Myra of this emperor, showing the goddess of the city, of a type like the Ephesian Artemis, in a tree; two woodcutters, each armed with a double axe, hew at the trunk, from which two serpents rise as if to protect it and aid the goddess. Phaselis is an exceptional town, for it has early Greek coins, the leading type being a galley.

The coinage of Pamphylia offers some examples of good art distinctly marked by the Asiatic formality. Aspendus shows a remarkable series of Persic didrachms, extending from about 500 B.C. to Alexander's time. The oldest coins have the types of a warrior and the triskelion or three tegs, more familiarly associated with Sicily; it is probably a solar symbol. These coins are followed by a long series with the types of two wrestlers engaged and a slinger. The main legend is almost always in the Panphylian character and

language. There are also very curious imperial types. The money of Perga begins in the 2nd century with Greek types of the Artemis of Perga. Her figure in a remarkable Asiatic form occurs in the long impe- rial series. Bronze coins earlier in date than the silver money with the Greek types have the Pamphylian title of the goddess, FANA2SAS HPJEIIAS, "of the Lady of Perga." Side has at first Persic didrachms of about 480 B.C., their types the pome- granate and dolphin and head of Athene; then there are money with an undeciphered Aramaizing inscription of the 4th century and figures of Athene and Apollo, and late Attic tetradrachms, their types being the head of Athene and Victory. These were carried on by Amyntas, king of Galatia, when he made his mint in Side (36 B.C.). The pomegranate (ctiStj) is throughout the badge of the city.

The money of Pisidia is chiefly imperial. There is a long series of this class of the colonia Antiochia. The autonomous coins of Selge have the wrestlers and the slinger of Aspendus in inferior and even barbarous copies. Of Isauria and Lycaonia a few cities, including Derbe and the colonies of Iconium and Lystra, strike coins, chiefly of imperial time.

Cilicia, for the most part a coastland, is numismatically of high interest. To Aphrodisias is assigned an interesting series of archaic coins with a winged figure and a pyramidal fetish-stone; in the 4th century Aphrodite is repre- sented in human form seated between sphinxes; the Parthenos of Pheidias is also represented. Celenderis has a coinage beginning in the 5th century, with a horseman seated sideways on the obverse, and on the reverse a goat kneeling on one knee. Mallus has a most interesting series of silver coins, some with curious Asiatic types. Of Nagidus there are Persic didrachms of good style, one interesting type being Aphrodite seated, before whom Eros flies crowning her, with, on the other side, a standing Dionysus. Soli has silver coins of the same weight, the types being an archer or the head of Athene, one variety imitated from remote Velia, and a bunch of grapes. The coinage of Tarsus begins in the 5th century with Persic staters repre- senting a Cilician king on horseback, and a hoplite kneeling.

PtsUla, Ac.

In the 4th century it was the mint of a large series of satrapal coins, issued by Pharnabazus, Mazaeus and other governors (Issus, Mallus and Soli also sharing the cost of minting). The chief type is the Baal of Tarsus. The autonomous bronze of the Seleucid age shows the remarkable subject of the pyre of Sandan, the local form of Heracles;

and there is a long and curious imperial series. The coinage of Anazarbus (imperial, showing rivalry with Tarsus), Seleucia on the Calycadnus, Mopsus, and the priest-kings of Olba are also full of interest.

*The coinage of the great island of Cyprus is, as we might expect from its monuments, almost exclusively non-Hellenic in character. The weight-system, except of gold, which is Attic, is c Persic, save only in the later coins of some mints, struck vW> *»*« on the reduced Rhodian standard, and a solitary Attic tetradrachm of Paphos. The art is usually very stiff down to about 400 B.C., with types of Egypto-Phoenician or Phoenician or of Greek origin. The inscriptions are in the Cyprian syllabic character and the earliest coins resemble the early Etruscan in being one-sided. The prevalent types are animals or their heads, the chief subjects being the bull, eagle, sheep, lion, the lion seizing the stag, the deer and the mythical sphinx. The divinities we can recognize are Aphrodite, Heracles, Athene, Hermes and Zeus Ammon. But the most curious mytho- logical types are a goddess carried by a bull or by a ram, in both cases probably Astarte, the Phoenician Aphrodite. The most remarkable symbol is the well-known Egyptian sign of life. The coins appear to have been struck by kings until before the age of Alexander, when civic money appears. The mints to which coins are ascribed with certainty are Salamis, Paphos, Marium, Idalium and Citium. The coins of the Salaminian line are in silver and gold. The earlier, beginning with Evelthon about 560 B.C., have Cyprian, the later Greek inscriptions, the types generally being native, though after a time under Hellenic influence. They are of Evagoras I., Nicocles, Evagoras II., Pnytagoras and Nicocreon, and the coinage is closed by Menelaus, brother of Ptolemy I. The Phoenician kings of Citium, from about 500 to 312, strike silver and in one case gold, their general types being Heracles and the lion seizing the stag. Bronze begins soon after 400 B.C., and of the same age there are autonomous pieces in silver and bronze. There is Greek imperial money from Augustus to Caracalla (chiefly issued by the KoivSv). The most remarkable type is the temple at Paphos, represented as a structure of two storeys with wings. Within the central portion is the sacred stone, in front a semicircular court.*

The earliest coinage of Lydia is no doubt that of the kings, already described. The next currency must have been of Persian darics (gold) and drachms (si? ver) , followed by that of Alexander, , the Seleucids, and the Attalids of Pergamum, and then by Lyaui. the cistophori of the province of Asia. There is an abundant bronze coinage of the cities, autonomous from the formation of the province,

and of imperial time, but mostly of the imperial class. The largest currencies are of Philadelphia, Sardis, Thyatira and Tralles. The art is not remarkable, though good for the period, and the types are mostly Greek.

The coinage of Phrygia has the same general characteristics as that of Lydia, but the workmanship is poorer. Among noteworthy

Phrygta.

types must be noticed Men or Lunus, the Phrygian moon- god. There are curious types of Apamea, surnamed

Kibotos or the Ark, and more anciently Celaenae. One of Severus represents the legend of the invention of the double pipe, a type already described. Of the same and later emperors are coins bearing the famous type of the ark of Noah and the name NflE. The town of Cibyra is remarkable for a silver coinage of the 1st century B.C., of which the large pieces have the weight of cistophori.

Galatia has little to offer of interest. Trajan issued bronze imperial coins for the province, and there is imperial money of Ancyra, Pessinus and Tavium. The only remarkable regal issue Qalatla is that of Amyntas, Strabo's contemporary, who struck tetradrachms at Side in Pamphylia.

With the coinage of Cappadocia we bid farewell to Greek art and enter on the domain of Oriental conventionalism, succeeded by inferior Roman design coarsely executed. There is one CaoD „. large imperial series, that of Caesarea, intended for general ˆ ”

circulation in the province. The issues range from oca ‘ ”’ Tiberius to Gordian III., and are in silver and bronze. The most common type is the sacred Mount Argaeus, on which a statue is sometimes seen — a remarkable type curiously varied. There are scanty issues of a few other towns. There is an interesting series of coins of the kings of Cappadocia, beginning with Ariarathes I. (c. 332- 322 B.C.), who struck Persic drachms at Sinope and Gaziura, and continuing with other kings, called usually Ariarathes or Ariobar- zanes, who struck Attic drachms and occasionally tetradrachms. The rare tetradrachms of Orophernes, a successful usurper (158- 157 B.C.), bear a fine portrait. The coins of Archelaus, the last king set up by Antony (36 b.c.-a.d. 17), have a good head on the obverse. Of Armenia there are a few silver and bronze coins of late sovereigns. The great series of Syrian money begins with the coinage of the Seleucid kings, of Syria,

only rivalled for length and

abundance by that of the Ptolemies, which it excels in its series of portraits, though it is far inferior in its gold money Syria. an(ˆ wants the large and well-executed bronze pieces which make the Egyptian currency complete. The gold of the Seleucids is scarce, and their main coinage is a splendid series of tetradrachms bearing the portraits of the successive sovereigns. The reverse types are varied for the class of regal money. The execution of the portraits is good, and forms the best continuous history of portraiture for the third and second centuries before our era. The reverses are far less careful. The weight is Attic, but the cities of Phoenicia were ultimately allowed to strike on their own standard. Many of the coins of the earlier kings were issued in their Bactrian or Indian dominions. Seleucus I. (312-280 B.C.) began by striking gold staters and tetradrachms with the types of Alexander the Great. The same king, like his contemporaries, then took his own types: for gold staters, his head with a bull's horn, and on the reverse a horse's head with bull's horns; for tetradrachms, his own head in a helmet of hide with bull's horn and lion's skin, and Victory crowning a trophy, or the head of Zeus, and Athene fighting in a car drawn by four or two elephants with bull's horns. Antiochus I. (293-261), like his father, first struck tetradrachms with Alexandrine types, and then with his own head, Apollo on the'omphalos occupying the reverse. The portrait of Antiochus has a characteristic realism. Antiochus III. (222-187) is repre- sented by a fine and interesting series with a vigorous portrait. He alone of the Seleucids seems to have struck the great octa- drachm in gold in rivalry of the Ptolemies. Coins dated by the Seleucid era (312 B.C.) first appear in his reign. The portrait of Antiochus IV. Epiphanes (175-164) is extremely character- istic, marked by the mad obstinacy which is the key to the tyrant's history. The most remarkable coin is a tetradrachm with the head of Antiochus in the character of Zeus. In his time mints became numerous in the bronze coinage, and there is a remarkable series in that metal with Ptolemaic types, marking his short-lived usurpation in Egypt. From the time of Demetrius I. (162-150) the silver tetradrachms bear both mints and dates. In one type the heads of Demetrius and Queen Laodice occur side by side. With Alexander I. Balas (152-144), Tyre and Sidon begin to strike royal tetradrachms

on their own Phoenician weight. Tarsus also first strikes coins for him with the type of the pyre of Sandan. The money of young Antiochus VI. pre- sents the most carefully executed portrait in the whole series, which, despite its weakness, has a certain charm of sweetness that marks it as a new type in art. The same artist's hand seems apparent in the fine portrait of the cruel usurper Tryphon, and also in the picturesque spiked Macedonian helmet with a goat's horn and cheek-piece which occupies the reverse. Antiochus VII. (138-129) continues the series with, amongst other coins, the solitary bronze piece of Jerusalem, bearing the lily and the Seleucid anchor. Alexander II. Zebina (1 28-1 23) is represented by a unique gold coin (PI. II. fig. 18), as well as by silver and bronze. The empire closes with the money of the Armenian Tigranes (83-69), bearing his portrait with the lofty native tiara, and for reverse Antioch seated, the Orontes swimming at her Jeet (a copy of the famous group by Eutychides).

*There is a copper coinage of the Syrian koinon under Trajan; also of the cities of Commagene, Samosata and Zeugma, and less important mints. The money of the kings of **"■ Commagene is in bronze (c. 140 B.C. to A.D. 72).*

Cyrrhestica has bronze coins of a few cities, nearly all imperial, Cvrrhes- t ˆ e chief mints being Cyrrhus and Hieropolis. Hieropolis J in the time of Alexander the Great issued some remark-

able silver coins in the name of Abd-Hadad and Alexander himself, with figures of the Syrian goddess Atergatis, who also appears on its imperial coins.

Of Chalcidene there are bronze coins of Chalcis and of the tetrarchs,

Chalci- an d Palmyrene shows only the small bronze pieces of

dene Ac. Palmyra, the money of Zenobia and the family of

Odenathus being found in the series of Alexandria.

In Seleucis and Pieria, the four cities of Antioch, Apamea, Lao-

dicea ad Mare and Seleucia Pieria issued a joint coinage inscribed

*AAEA*I2N AHMflN about the middle of the 2nd*

Antioch. cen tury B.C. But the bulk of the money of this territory

is of the great city of Antioch an the Orontes. The coinage is both

autonomous bronze before-and of Roman times, and imperial silver, base metal and bronze. Other mints (as Tyre and Sidon) in this same province issued silver of the same class as Antioch, with different symbols. A large series of coins was issued bearing on the reverse the letters S.C. (Senatus consulto), showing that the coinage was under the control of the Roman senate. Both Latin and Greek inscriptions are used until the reign of Trajan. The city is first called a colony on the coins of Elagabalus. The earliest coins are dated by various eras (Seleucid, Caesarian, Actian) ; later the emperor's consulships are used to date the silver. The leading types are the figure of Antioch seated, the river Orontes swimming at her feet, from the famous statue by Eutychides, and the eagle on a thunderbolt, a palm in front. Under Hadrian the eagle is represented carrying an ox's leg, a reference to the story of the foundation of the city when an eagle carried off part of the sacrifice and deposited it on the site which was consequently chosen. There are few other types. The series (which, strictly speaking, was not the local coinage of Antioch, but an imperial coinage for the province) is very full and includes money of the Syrian emperor Sulpicius Uranius Antoninus (who also struck bronze at Emesa and gold of the Roman imperial class). It ends with Valerian, though it begins anew in the Roman provincial money of the reform of Diocletian, to be noticed later.

Of the other cities of this district, Emisa presents the type of the sacred stone of Elagabal. The imperial money of Gabala shows the veiled cultus-statue of a goddess flanked by sphinxes. Laodicea has an important series. It begins with bronze g£ m aniea ' money of the later Seleucids. The autonomous tetra- drachms of the 1st century B.C. have a turreted and veiled female bust of the city, a favourite Syrian and Phoenician type. From 47 B.C. its title is Julia Laodicea; from Caracalla downwards it is a colonia; the inscriptions become Latin; then, very strangely, Greek on the obverse of the coins and Latin on the reverse. Seleucia has a similar regal autonomous and imperial currency, but does not become a colonia. A shrine containing the sacred stone of Zeus Casius, and the thunderbolt of Zeus Keraunius resting on a throne, are among the types.

In Coele-Syria, Damascus issues coins from the 3rd century b.c. (beginning with Alexandrine tetradrachms) onwards; the city becomes a colonia under Philip I. The imperial money of Heliopolis (Baalbek), a colonia, shows a great temple (of «JJjj|" & c- the Zeus of Heliopolis) in perspective, another temple containing an ear of corn as the central object of worship, and a view of the Acropolis

with the great temple upon it, and steps leading up the rock.

The coinage of Phoenicia is a large and highly interesting series. The autonomous money is here important, and indicates the ancient wealth of the great marts of the coast. The Pboen]cla earliest coins were struck about the middle of the 5th century and usually bear Phoenician inscriptions. The coinage falls into three main periods; the first pre- Alexandrine; the second, that of Alexandrine, Ptolemaic and Seleucid rule; the third, that of the empire. In the first period Aradus strikes silver, usually on the Babylonian standard, staters with a head of Melkarth and a galley, and smaller denominations. All the other cities use the Phoenician standard. The regal silver coins of Byblus have a galley as obverse type; on the reverse, a vulture standing on a ram, or a lion devouring a bulL Here and at Sidon and Tyre portions of the types are represented incuse. Sidon has a large and important series of silver octa- drachms and smaller denominations; on the obverse is a galley (at first with sails set, then without sails, first lying before a fortress, afterwards alone). On the reverse is the king of Persia in a chariot, or slaying a lion. These coins were issued by the kings such as Strato I. and II. and Tennes, and by the satrap Mazaeus. The early silver of Tyre has as reverse type an owl with a crook and flail over its shoulder; on the obverse a dolphin, or Melkarth riding on a sea-horse; a common symbol is the purple-shell (PL II. fig. 20). In the second period, besides Alexandrine silver and regal coins of the Ptolemies and Seleucidae, there are certain large and important issues of autonomous or semi-autonomous silver tetradrachms and smaller denominations, as at Aradus (head of the City, and Victory; also drachms with types copied from Ephesus: obv., bee, rev., stag and date- palm), Marathus (head of the City, and nude figure at Marathus seated on a pile of shields), Sidon (head of the City, and eagle), Tripolis (busts of the Dioscuri, and figure of the City holding cornucopiae) and Tyre (head of the Tyrian Heracles, Melkarth, and eagle). Tyre also issued a gold decadrachm with the head of the City, and a double cornucopiae. On these and other coins Sidon and Tyre claim the rights of asylum. Berytus first

coins in this period, sometimes under the name of Laodicea in Canaan. Ace-Ptolemais (Acre) was an important mint under the

Ptolemies; for a time, under the Seleucidae, it was called Antiochia in Ptolemais. Besides the Seleucid era autonomous eras are in use at some of the cities, as at Aradus (259 B.C.), Sidon (111 B.C.) and Tyre (126 B.C.). Under the empire there are some very large coinages of bronze, besides a certain amount of silver resembling that of Antioch. The quasi-autonomous silver of Tyre was also issued as late as a,d. 57. Berytus (a colonia) has types relating to the cults of Astarte and Poseidon; Astarte is also prominent at Sidon (a colonia from Elagabalus onwards; a common type represents the wheeled shrine of the goddess) and Tripolis. At Byblus a temple is represented with a conical fetish. Tyre has many interesting types: Dido building Carthage; the Ambrosial Rocks; Cadmus fighting the serpent or founding Thebes, &c. Ptolemais issued coins as a colony from Claudius onwards.

In Trachonitis, the only city of importance is Caesarea Panias, with a famous grotto of Pan, perhaps represented on an imperial coin. Several cities in Decapolis issued imperial coins, among them Gadara and Gerasa. In Galilee the coins struck at Tiberias by its founder, Herod Antipas, may be mentioned. Samaria has money of Caesarea, both autonomous and imperial, the last for the most part colonial, and also imperial of Neapolis, among the types of which occurs the interesting subject of Mount Gerizim surmounted by the Samaritan temple. The coinage of Judaea is an interesting series. The money of Jerusalem is of high interest, and more extensive than appears at first sight. Here was struck the coin of Antiochus VII., with the native lily as a type, the series of the Maccabaean princes, that of the Roman procurators, and the bronze coins countermarked by the tenth legion, quartered by Titus in the ruins of the city. One of these bears the remarkable symbol of a pig. After the reduction of Judaea in the reign of Hadrian, Jerusalem was rebuilt as a colonia with the name Aelia Capitolina. The earliest coin commemorates the foundation. The coinage lasts as late as Valerian. Ascalon strikes autonomous silver and bronze, including remarkable tetradrachms with the portraits of Ptolemy Auletes, of his elder son Ptolemy XIV., and of his daughter Cleopatra (see PL II. fig. 21). There is also money of Gaza of some importance; the earliest coins are Attic drachms, &c, of barbarous style, inspired by Greek, especially Athenian models; on its imperial coins the god Marna, and Minos and Io are named.

The independent Jewish coinage begins with the famous shekels. They have been assigned to various periods, but the preponderance of evidence would class them to Simon coinage Maccabaeus, to whom the right of coining was granted by Antiochus VII. The series is of

shekels and half- shekels, of the weight of Phoenician tetradrachms and di- drachms. The obverse of the shekel bears the inscription " the shekel of Israel," and for type a sacred vessel of the temple, above which (after year 1) is the letter indicating the year of issue and the initial of the word year. The reverse reads " Jeru- salem the Holy," and thetype is a flowering branch (PL II. fig. 19). The half-shekel differs in having the inscription " half-shekel " on the obverse. The types are markedly peculiar; the obverse inscription is equally so, for the regular formula of the neigh- bouring cities would give nothing but the name of the city; but the reverse inscription is like that of Tyre and Sidon, for instance, " of Tyre sacred and inviolable." This agreement is confirmatory of the assignment to Simon Maccabaeus. This coinage bears the dates of years 1, 2, 3, 4 (rare), and 5 (very rare). There has been much discussion as to the date. It is best reckoned from the decree of Antiochus VII. granting the right of coinage to Simon (139-138 B.C.). The coins of the fifth year were then struck by John Hyrcanus. The certain coins of the successors of Simon are small bronze pieces of John Hyrcanus (135-104), of Judas Aristobulus (104-103), of Alexander Jannaeus (103-76), who strikes bilingual Hebrew and Greek and also Hebrew coins, showing his native name to have been Jonathan, and of Antigonus (40-37)., who has the Hebrew, name.

Mattathiah. The types represent only Inanimate objects. The Maccabaean coinage is followed by that of the Herodian family, equally of bronze, the two most important issues being those of Herod the Great and Agrippa II. The silver coinage under the early empire was chiefly supplied by the issues of Antioch and Roman denarii; the " penny " with Caesar's image and super- scription was such a denarius. The money of the procurators of Judaea, in part parallel with the Herodian, is of small bronze coins, struck between a.d. 6-7 and a.d. 58-59, the latest period of their administration being as yet unrepresented. These are followed by two classes, the money of the first revolt (a.d. 66-70) and that of the second (suppressed a.d. 135). Both risings caused the issue of native coinage, some of which may be assigned with certainty to each. Of the first revolt are bronze pieces of years 2, 3 and 4. Of the second revolt are restruck Antiochene tetradrachms and Roman denarii, usually with the name of Simon, which appears to have been that of the leader surnamed Bar Cochebas. The obverse type of the tetradrachms or shekels is the portico of the temple; on the reverse are a bundle of branches and a citron, symbols of the feast of tabernacles. Besides this native currency there are coins struck in Palestine by Vespasian, Titus and Domitian.

Of Roman Arabia there are bronze imperial coins of Bostra and less important mints; the kings of Nabataea also issued silver and bronze coins from. Aretas III. (c. 87-62 B.C.) to Rabbel II. (a.d. 75-101). From S. Arabia comes a remarkable silver Arabla ‘ coinage issued by the Himyarites, beginning in the 4th jMeso ” century B.C., and imitated originally from Attic tetra- P° tamla > drachms (both of the old and new style). In Mesopotamia Babylonia. the colonia of Carrhae deserves notice, and the city of Edessa, which issues imperial money as a colonia, and has a series of coins of its kings, striking with Roman emperors in silver and bronze. Curiously, this and the colonial issue are long contemporary. The colonial coinages of Nisibis and of Resaena, which became a colonia, close the group. Babylon was probably a mint of Alexander the Great and of many of the Seleucid kings, certainly of the usurpers Molon (222-220) and Timarchus (162 B.C.).

Africa.

The coins of Africa are far less numerous then those of the other two continents, as Greek, Phoenician and Roman civiliza- tion never penetrated beyond Egypt and the northern coast to the west. The series of Egypt is first in geographical order. As yet no coins have been here assigned of a date anterior to Alexander. The old Egyptians kept their gold, electrum and silver in rings, and weighed them to ascertain the value. During the Persian rule the Persian money must have been current, and the satrap Aryandes is said to have issued a coinage of silver under Darius I. With Alexander a regular Greek coinage must have begun, and some of his coins are of Egyptian mints. A rare bronze coin was struck at Naucratis, probably during his lifetime. With Ptolemy I. the great Ptole- maic currency begins, which lasted for three centuries. The characteristics of this coinage are its splendid series of gold pieces and the size of the bronze money. The execution of the earlier heads is good; afterwards they become coarse and careless. At first the fine pieces were issued by the Phoenician, Cyprian and other foreign mints, the Egyptian work being usually inferior. While the Seleucids were still striking good coins, the Ptolemies allowed their money to fall into barbarism in Egypt and even in Cyprus. The obverse type is a royal head, that of Ptolemy I. being the ordinary silver type (see PL II. fig. 22), while that of Arsinoe II. was long but not uninterruptedly continued on the gold. The head of Zeus Ammon is most usual en the bronze coinage. A type once adopted was usually retained. Thus Ptolemy I., Arsinoe II., Ptolemy IV., Cleopatra I., have a kind of commemoration in the coinage on the analogy of the priesthoods established in honour of each royal pair. The almost universal type of reverse cf all metals is*

the Ptole- maic badge, the eagle on the thunderbolt, which, in spite of variety, is always heraldic. For art and iconography this series is far inferior to that of the Seleucids. The weight after the earlier part of the reign of Ptolemy I. (who experimented with the Attic and Rhodian standards) is Phoenician for gold and silver; .the… metrology of the bronze is obscure. • The chief

Egypt.

coins are octadrachms in gold and tetradrachms in silver, besides the abundant bronze money. Ptolemy I. appears to have issued his money while regent for Philip Arrhidaeus (323-318); it only differs in the royal name from that of Alexander. He then struck money for Alexander IV. (3 17-3 n) on the Attic standard with the head of Alexander the Great, with the horn of AmmOn in the elephant's skin and Alexander's reverse. He soon adopted a new reverse, that of Athene Promachos. This money he con- tinued to strike after the young king's death until he himself (305) took the royal title, when he issued his own money, his portrait on the one side and the eagle and thunderbolt with his name as king on the other. This type in silver, with the in- scription " Ptolemy the king," is thenceforward the regular currency. He also issued gold staters (reverse, Alexander the Great in an elephant-car). Ptolemy II. (Philadelphus, 285- 247), the richest of the family, continued his father's coinage. Philadelphus also began (after the death and deification of Arsinoe' II., about 271 B.C.), the issue of the gold octadrachms with the busts of Ptolemy I. and Berenice I., Ptolemy II. and Arsinoe II., and certainly struck beautiful octadrachms in gold and decadrachms in silver of Arsinoe II., the gold being long afterwards continued. Philadelphus also began the great bronze issues of the system. Ptolemy III. (Euergetes I. c. 247-222) struck gold octadrachms with his own portrait, wearing a crown of rays. His queen Berenice II., striking in her own right as heiress of the Cyrenaica and also as consort, issued a showy currency with her portrait, both octadrachms and decadrachms like those of Arsinoe, and a coinage for the Cyrenaica of peculiar divisions. Under Ptolemy IV. (Philopator, 222-205) the gold octadrachms are continued with his portrait and that of Arsinoe III. Ptolemy V. (Epiphanes, 205-181) still strikes octadrachms with his portrait and with that of Arsinoe, and begins the con- tinuous series

of the tetradrachms of the three great cities of Cyprus. The coinage henceforward steadily degenerates in style and eventually also in metal. In the latest series, the money of the famous Cleopatra VII., it is interesting to note the Egyptian variety of her head, also occurring on Greek imperial money and on that of Ascalon.

Under the Roman rule the imperial money of Alexandria, the coinage of the imperial province of Egypt, is the most remarkable in its class for its extent and the interest and variety of its types. It begins under Augustus and ends with the usurper or patriot Achilleus, called on his money Domitius Domitianus, overthrown by Diocletian (a.d. 297), thus lasting longer than Greek imperial money elsewhere. In the earlier period there are base silver coins continuing the base tetradrachms struck by Auletes, and bronze money of several sizes. Most of the coins are dated by the regnal years of the emperors, the letter L being used for " year." The types are very various, and may be broadly divided into Greek, Graeco-Roman and Graeco- Egyptian. The Graeco-Roman types have the closest analogy to those of Rome herself; the Graeco-Egyptian are of high interest as a special class illustrative of the latest phase of Egyptian mythology. These native types, at first, uncommon, from the time of Domitian are of great frequency. The money of Trajan, Hadrian and Antoninus Pius is abundant and in- teresting. A coin of Antoninus, dated in his sixth year, records the beginning of a new Sothiac cycle of 1460 years, which happened in the emperor's second year (a.d. 139). The reverse type is a crested crane, the Egyptian bennu or phoenix, with a kind of radiate nimbus round its head, and the inscription AIJiN. Under Claudius II. (Gothicus) and thenceforward there is but a single kind of coin of bronze washed with silver. In this series we note the money of Zenobia, and of her son Vabalathus.

Coins bearing the names and local types of the nomes of Egypt were struck by a few emperors at the Alexandrian mint. Their metal is bronze, and they are of different sizes.

Passing by the unimportant coinage of the Libyans, we reach the interesting series of the Cyrenaica, the only truly Greek currency of Africa. It begins under th,e line of Battus about the middle of the 7th century, and reaches to the Roman rule as

far as the reign of Augustus. The coins were issued at Cyrene, Barca, Euesperides and smaller towns. The weight of the gold always, and of the silver until some date not long after 450 B.C., is Euboic; afterwards it is Phoenician. The ruling types are the silphium plant and its fruit, and the head of Zeus Ammon, first bearded (PI. II. fig.

23) then beardless. The art is vigorous, and in the transitional and fine period has the best Greek qualities. It is clearly an outlying branch of the school of central Greece. The oldest coins are uninscribed, so that it cannot always be said at which mint they were struck. The money with the name of Cyrene comprises a fine series of gold Attic staters and silver tetradrachms. It was an important mint of the Ptolemies. Barca has a smaller coinage then Cyrene. It comprises a wonder- ful tetradrachm (Phoenician), with the head of Ammon bearded, boldly represented, absolutely full face, and three silphiums joined, between their heads an owl, a chameleon and a jerboa. The money of Euesperides is less important.

Syrtica and Byzacena offer little of interest. Their coins are late bronze, first with Punic inscriptions, then in imperial times with Latin and Punic or Latin. Latin and Greek are used in the same coins at Leptis Minor in Byzacena.

In Zeugitana the great currency of Carthage is the last repre- sentative of Greek money, for, despite its Orientalism, its origin is Hellenic, and of this origin it is at first not unworthy. Its range in time is from about 410 B.C., when the Cartha- Cartha S e – ginians invaded Sicily, to the fall of Carthage in 146 B.C. The earliest coins are Attic tetradrachms of the class usually called Siculo- Punic. These, and certain gold coins with similar types, were issued in Sicily down to about 310 B.C. The types owe much to the coinage of Sicilian cities, especially Syracuse; but they show also distinct Punic motives, such as a lion before a palm-tree, or a head of a Punic queen. The Punic inscriptions enable some to be attributed to mints such as Motya, Solus, Eryx; others name " Carthage," " the Camp," " the Paymasters," many, inscribed Ziz, were issued from Panormus. The coinage from about 340 to 242 B.C., perhaps all issued at Carthage itself, is scanty; the types, head of Persephone and a horse, or horse and palm-tree, now come in, and prevail to the end of the independent coinage. The acquisition of the Spanish mines about 241 caused the issue of a large coinage, but the gold and silver soon degenerate into electrum and potin. The metrology of the various series (excepting the Siculo-Punic) is obscure, but the standard seems to be Phoenician. The late silver 12-drachm pieces and some of the bronzes are among the heaviest struck coins of the ancients. The art of the earlier coins is sometimes purely Greek of Sicilian style. There is even in the best class a curious tendency to exaggeration, which gradually develops itself and finally becomes very barbarous. Roman Carthage has a bronze coinage which is in- significant. There are a few other towns which issued money with Roman legends, such as Utica. The denarii of Clodius Macer, who revolted in a.d. 68, are

curiously illustrative of his policy, which was to restore the Roman republic.

The cities of Numidia and Mauretania have a late bronze coinage: but an interesting series of silver and bronze coins is attributed with move or less certainty to the Numidian kings from Massinissa (202-148), to Juba I. (60-46 B.C.), and to the ^”™„. Mauretanian kings from Syphax (213-202 B.C.), to Juba tgala ‘ II. (who also struck coins with his consort Cleopatra, daughter of Mark Antony and the famous Egyptian queen) and Ptolemy their son, the last of the great family of the kings of Egypt (A.d. 23-40).

II. Roman Coins

The Roman coinage is of two great classes, — the republican and the imperial; the first lasted from the origin of money at Rome to the reform of Augustus in 16 B.C., and the second from this date to the fall of the Western empire in a.d. 476. The evidence of the coins themselves as to the origin of the republican coinage is at variance with that of the ancient writers; but the general principles of criticism must be maintained here as in other matters of early Roman story.

The tradition which ascribed the introduction of coins bearing types to Servius Tullius must be unhesitatingly rejected. The style and types of the earliest Roman coins point clearly to a date not earlier than the middle of the 4th century. The native copper which the Italians used from primitive times as a sort of medium of exchange, in amorphous blocks (aes rude) was probably not a state-currency, being produced by private enter- prise. It was not until Rome unified Latium and Campania under her rule that central Italy acquired a true coinage. This must have been about 338 b.c. The history of the republican

coinage from 338 to 16 B.C. falls into two great periods — the second being marked by the introduction of the denarius system in 269. From 338 to 269 three minor periods may be distin- guished, indicating in a striking way the growth of the Roman organization of central Italy. In the period 338-312 Rome consolidated her dominion in Latium and Campania as against her rivals the Samnites. In the

second period (312 to c. 290) she finally subdued the Samnites. The system of her coinage is from the beginning based on a double mint, one in Rome and one in Capua (perhaps also she struck in some other cities in south Italy). The weight-units with which she starts are, for bronze, the Osco-Latin pound of 273 grammes, for silver the didrachm of 7-58 grammes (the latter being fa of the former and more or less coincident with the Phocaic-Campanian didrachm current in Campania). The relation between silver and bronze was as 1 : 120 or 1 : 125. The bronze unit was the as of 1 pound weight, which was divided into 12 unciae. The reverse type of all bronze denominations was a prow, which alluded to the establishment of Roman sea-power (in 348 she concluded her treaty with Carthage, in 338 she subjugated Antium, her chief rival on the Latin coast, and set up the beaks of the Antiate ships in her forum). The denominations are marked by I (the as), S (semis =i as) and for the smaller de- nominations a number of pellets indicating the value in unciae. On the obverses appear the heads of deities: Janus on the as (see Plate), Jupiter on the semis, Minerva on thie triens (4 unciae), Hercules on the quadrans (3 unciae), Mercury on the sextans (2 unciae) and Bellona on the uncia. These heavy coins were all cast at Rome. The Roman mint at Capua, on the other hand, produced a series of silver coins (chiefly didrachms) and small struck bronze change with the inscription ROMANO (see PI. II. fig. 24). In the second period (312 to c. 290) the mint at Rome continues to issue cast bronze of the same weights and types. But at Capua the mint becomes much more active, being opened for cast bronze as well as struck silver. The Osco-Latin silver standard is superseded by the Roman scruple-standard (1 scruple of 1-137 grammes=24o of tne pound of 273 grammes). Silver being to bronze as 1 : 1 20, 2 scruples of silver were equiva- lent to 1 bronze as of 273 grammes. The first issue of silver in this period consisted of didrachms (six-scruple pieces) with a head of Roma in a Phrygian helmet (alluding to her Trojan foundation), the inscription is ROMANO. Parallel with this is a Capuan issue of libral cast bronze (aes grave) for the use of the Latin territory; the 3-asses (tressis), 2-asses (dupondius) and as all have the head of Roma as on the didrachm, and the reverse type of all denominations is a wheel. (This wheel probably alludes to the completion of the internal routes of communication in Roman territory, especially of the via Appia, which was finished in 3 1 2) . Finally, to this first issue is attributed one of the quadrilateral ingots generally known as aes signatum ; its types are the Roman eagle on a thunderbolt, and a Pegasus with the inscription ROMANOM. These ingots, according to a plausible but not quite convincing conjecture, were probably not used as money, but only in sacral and legal

*ceremonies — such as dedication to the gods, venditio per aes et libram, &c. — in which the use of aes rude was traditional. But from this time onward each issue of silver and aes grave from the Capuan mint was, it is supposed, accompanied by a new ingot of this kind. Three further issues of silver from the Capuan mint took place in this period, each accompanied by its corresponding aes grave series and ingot. These heavy bronze pieces are all uninscribed; on the silver and small struck bronze ROMA replaces ROMANO. The evidence of hoards shows that in this period there must have been some sort of convention between Rome and the autonomous mints of her allies, permitting the circulation, throughout the bronze-using district under Roman control, of all the coins issued from Rome and Capua, on the one hand, and, on the other, all the aes grave issued by the autonomous mints. In the third sub-period (c. 290-269) the silver coinage of the Capuan mint becomes thoroughly Romanized; its inscription is, of course, ROMA; its types are the typically R*man ones of the youthful head of Janus and Jupiter in his*

quadriga (these are the numtni quadrigati). There is also a series of struck bronze inscribed ROMA issued from the same mint. The important feature of this period is that bronze is no longer regarded as the most important element in the currency, but is subordinated to silver; the result is that we have what is called the semi-libral reduction, the weight of the as issued from the Roman mint being half the pound. But opinions vary as to whether the pound of which the as represented the half in this period was the old one of 273 grammes or the new Roman pound of 327-45 grammes. As the latter was certainly used for a special series of aes grave issued from the Roman mint for the Latins (see below), we may assume that it was also used for the regular Roman coinage. Now since the 5 lb as (163-72 grammes) was equated to 1 scruple of silver (1137 grammes), we get a forced relation of silver to copper of 1 : 144. The as being regarded merely as representing so much silver (1 scruple), so long as the state guaranteed the cover, there was no reason why the as, being merely token money, should not fall in weight; and that it does, sinking by the end of this or beginning of the next period to the weight of \ of the Oscan or £ (sextans) of the new Roman pound. We may note the occurrence in this series of the decussis or 10-as piece. Of the two series of aes grave issued in this period for the benefit of the Latin district, both are heavier than in the preceding period; the new Roman pound of 327-45 grammes is used for a series issued from the mint of Rome; a still higher weight (perhaps of 341 grammes) for a series issued from Capua. The relation between silver and copper involved in this standard is not quite clear. In this period

also we have ingots corresponding according to the theory above mentioned, to the various series of aes grave; one, with a pair of chickens feeding and a pair of rostra, refers to the augury taken by the Roman imperator before battle. Two other ingots commemorate historical events; one, with a Samnite bull on each side, the subjugation of Rome's great rival ; the other, with an elephant and a pig, the alleged rout of Pyrrhus's elephants by the grunting of swine at Asculum in 278. After the introduction in 269 B.C. of the silver denarius (piece of 10 asses, marked X, PI. II. fig. 25) with its half (the quinarius, V) and its quarter (the sestertius, IIS), no changes of obviously great economic importance take place in the coinage until near the close of the republican period. Although it is not true, as is sometimes stated, that the coinage of silver at all local pints in south Italy, except the Bruttian, came to a close with the introduction of the denarius, yet the new Roman coin entirely dominated the currency from the first. Many mints, however, continued to issue bronze coinage down to 89 B.C., and a Roman coinage in various metals is also attributed to certain local mints, such as Croton and Hatria; not to mention the Roman issues which still continued to be made from Capua, though in a less degree than before. At Rome itself the mint was now localized in the temple of Juno Moneta, who probably received her surname from, rather than gave it to, moiley. The denarius, being equivalent to 10 asses, and weighing 4-55 grammes, would at the rate of 1 : 120 (which was now restored) be equivalent to 546 grammes of bronze. The as of the time must therefore have been the one weighing 54-6 grammes, that is \ of the Oscan pound cf 273 grammes, or \ (sextans) of the Attic-Roman pound of 3 2 7'45 grammes. In other words, the legally recognized as of this period was the as of the sextantal reduction. The bronze coins of this reduction are, like the silver, struck, not cast; the process of striking had already been introduced for the lower denominations of bronze in the previous period. About 241 B.C. the weight of the denarius, having sunk under the stress of the first Punic war, was fixed at 3-90 grammes. Possibly the reduction of the as to the weight of an uncia, which Pliny attributes to the time of the Hannibalian crisis, may really have taken place at the same time. In 228 B.C. (some critics prefer to say nearly forty years earlier) a new silver extra-Roman coin, the victoriatus, was introduced. It replaced the old Cam- panian drachm and, wherever it may have been minted, was meant for circulation outside Rome. The quinarius and sester- tius at the same time disappeared from the regular coinage, but

the sesterce remained the unit of account. Marks of value occur on all the coins from 269 B.C. for some time onward, except on the smallest bronze and the victoriatus. After the reduction of the bronze had been carried far, it became possible to issue large denominations of a circular form; thus circular bronze decusses (equal each to 1 denarius) are known of various periods, weighing from over 1100 to 650 grammes.

Gold was not regularly coined by the Romans until the close of the republic; but certain exceptional issues must be noticed. The earliest (some time during the first Punic War) consisted of pieces of 60 (PI. II. fig. 26), 40 and 20 sestertii; they were issued both from Rome and from some external mint or mints. To the crisis of the second Punic War may be assigned certain electrum coins of ij scruple weight (types: janiform female head, and Jupiter in quadriga). It is to this time that Pliny attributes the fixing of the as at the weight of an uncia, and the valuation of the denarius at 16 instead of 10 asses (although in estimating the pay of soldiers the denarius continued to be given for 10 asses). Finally there is some probability in the attribution to the year 209 of the well-known gold coins of 6 and 3 scruples which have on the obverse a head of the young Janus, and on the reverse two soldiers taking an oath of alliance over the carcass of a pig — in allusion to the loyalty to Rome of her Latin colonies (Livy xxvii. 9, 10).

Without following the fortunes of the various denominations, we may note that in 89 B.C. the lex Papiria suppressed all local mints throughout Italy, ordered the reissue of the silver sester- tius, and introduced the semunciaJ (f ounce) standard for bronze. This was just after the close of the Social War, which had been signalized by the issue, on the part of the revolted allies, of an interesting series of coins (denarii and — most treasonable of all — a gold piece) chiefly from Italia, as they called Corfinium. These coins bear in Oscan letters the names of the Italian military leaders, such as C. Papius Mutilus. In 81 B.C. the regular bronze coinage came to an end, and the denarius remained for a long time the only coin issued by the Roman mint. Roman generals sometimes, however, issued exceptional coins in their own names, such as " bronze sesterces."

We have already dealt with the earliest gold money of the republic. Another exceptional issue was the gold coin bearing the name of T. Quinctius Flamininus, the liberator of Hellas (struck between 198 and 190 B.C.); but it was minted in Greece and conformed to Greek

standards. The earliest Roman aurei proper (those of Sulla) were also struck outside Rome. They weigh j'y or ^'g- of a Roman pound. The aurei of Pompeius were 3V. those of Julius Caesar T \, of the pound. After Caesar's time the weight of the aureus fell to ^j lb, under Augustus.

Of the administrative side of the Roman system of coinage little is known but what the coins reveal. The earliest indication of monetary magistrates is found in symbols, which occur on the coins before the close of the first Punic War. Then the names begin to appear, at first abbreviated, then at length. Probably the right of coinage was in the - beginning vested in the consuls, but it would seem that about the time of the second Punic War it was transferred to a special board of magistrates, the tresviri acre argento auro flando feriundo. Whether they were appointed every year, or only when need arose, we do not know; but it is improbable that there was an annual board until the beginning of the 1st century, if then; and even when annually appointed, they cannot all have exercised their right. On the other hand, there were in some years, as 92 B.C., no less than five moneyers; in c. 86 B.C. there were four, two being aediles exercising a specially conferred right. Exceptional issues of this kind were often authorized by the senate, and bear inscriptions indicating the fact, such as P.E.S.C, (Publice ex Senatus consulto). An issue for the purpose of the Apollinarian games, defrayed out of a special treasury, bears the inscription S.C.D(e) T(hesauro). Julius Caesar added a fourth moneyer to the board. The first issue of gold by such a board took place in 43 B.C. ; all previous issues of gold had been made, so far as we know, in virtue of military imperium (in 44 B.C. by the praetors). Augustus, after the troublous period 41-27 was over, returned to the triumviral system ; after his reform of 15 B.C. the bronze coinage which he introduced in that year is signed by the triumvirs, although the gold and silver bears no such names. Shortly afterwards, however, he organized the system which will be dealt with under the empire.

The types of the Roman republican coins are of great interest, although their art never rises above mediocrity. The chief types

of the period before 269 have already been mentioned. The earliest denarii, quinarii and sestertii bear a head of the goddess Roma, helmeted, and the Dioscuri charging on horseback, as they appeared at Lake Regillus. The victoriatus has a head of Jupiter and a figure of Victory crowning a trophy. The types of the bronze coins are practically the same as in the earlier period. About 190 B.C. the goddess Diana in her chariot begins to appear on the reverses of

some of the denarii. Later, other types gradually encroach on the reverses; first, Victory in a chariot; still later such types as the Juno of Lanuvium in a chariot drawn by goats. This and other types which now begin to relieve the monotony of the series usually have a personal allusion to the moneyer, or to his family history. Thus, on a denarius of Sex. Pompeius Fostlus is seen the shepherd Faustulus discovering Romulus and Remus suckled by the she-wolf. Imaginary or more or less authentic portraits of ancestors, such as Numa, L. Junius Brutus or M. Claudius Marcellus, belong to the same category. An elephant's head on a Macedonian shield, on a coin of M. Caecilius Metellus (c. 94 B.C.), alludes to victories won by Caecilii at Panormus (in 251, over Punic elephants) and in Macedonia (in 148). The cult of Venus by the Julian family is illustrated by a denarius of L. Julius Caesar (c. 90 B.C.) with a head of Mars and a figure of Venus in a car drawn by two Cupids. The surrender of Jugurtha by Bocchus to Sulla is represented on a denarius of Sulla's son Faustus (62 B.C., PI. II. fig. 2?). The type is probably a copy of the design which we know the dictator used for his signet-ring. M. Aemilius Lepidus (TVTOR REGis) crowning Ptolemy Epiphanes, or Paullus Aemilius erecting a trophy, while King Perseus and his two children; stand before him, are other historical types. A contemporary event is commemorated on a special issue in-scribed AD FRV EMV EX S(enatus) C(on- sulto), coined by L. Calpurnius Piso and Q. Servilius Caepio in 100 B.C. Caepio, quaestor in that year, defeated the proposal of Saturninus to sell corn publicly at a nominal price; but the senate voted a special issue of money to meet the strain of the market. On the obverse is a head of Saturn, from whose treasury the funds for the issue were drawn; on the reverse are Caepio and Piso on their official seat, and two ears of corn. Perhaps the most graphic allusion to a contemporary event to be found on any coin is furnished by the cap of liberty with two daggers and the inscription EID MAR on coins of Brutus. Representations of a less obviously historical character, as personifications of countries or places (Hispania, Alexandria) or qualities (Honos and Virtus) or mythological figures (Scylla), are all, it would seem, inspired by some personal interest. Many types will only be explained when more light is thrown on the obscure corners of Roman mythology and ritual; but they will all probably be found to have some personal reference to the moneyer. Roman types of the later republic, therefore, though they may be classified externally as " religious," " histori- cal," " canting," &c, are all inspired by some personal motive. The inevitable outcome of this character was that, when once contemporary portraiture was regarded as legitimate on the coins, it speedily became its most important feature. The portrait

of Flamininus on his gold coin struck in Greece long remained without a Roman analogy. In 44 B.C., by order of the senate, the head of Julius Caesar was placed on the silver coins (PI. III. fig. 1; the gold coin bearing his portrait is of doubtful authenticity). After Caesar's death portraits occur on coins issued by men of all shades of political opinion, showing that portraiture on the coins was not then regarded as the mon- archical prerogative, which it became from a.d. 6 onwards, when it was limited to members of the imperial family.

The history of the imperial coinage is full of metrological difficulties. These arise from the conditions fixed by Augustus (16-15 B.C.), by which the emperor alone coined gold Augustus. and silver, the senate alone bronze. Consequently the senate was wholly at the mercy of the emperor. Augustus struck the aureus at 42 to the pound, equal to 25 denarii at 84 to the pound (PI. III. fig. 3). He introduced a new coinage in two metals, the sestertius of 4 asses and dupondius of 2, both in fine

yellow brass (orichalcum), and the as semis and quadrans in common red copper. This distinction of metals, however, was sometimes ignored, as in the time of Nero,when we have sestertius (PI. III. fig. 2) , dupondius and as, all in brass, and of three different sizes. The as is usually nearly equal in size and weight to the dupondius, but is distinguished by its metal and inferior fabric. All this brass and copper coinage bears the letters S.C., scnatus consullo. Emperors not acknowledged by the senate are without such money; thus we have no specimens of Otho or Pescennius Niger.

Nero reduced the denarius to jth of the pound, and alloyed its silver with from 5 to 10% of base metal. Henceforward the quality Chansres ° t ' le denarius gradually sank, until under Sept. Severus under later t ' ie P ro P or tion of alloy was from 50 to 60%. Caracalla emperors a ' so i ssue d lead plated with silver and, among his aurei, copper plated with gold. He also introduced a new coin, called after him the argenteus Antoninianus. It was struck at g'i.th to eˆth of the pound, and seems to have been originally a double denarius struck on a lower standard. The character- istic of this coin is that the head of the emperor is radiate as Sol (PI. Ill.fig. 4), that of the empress on a

crescent as Luna. Towardsthe end of Caracalla's reign the weight of the aureus had fallen to lˆ lb. Under Elagabalus the taxes were paid in gold alone; this was ruinous, for the treasury paid in debased silver at nominal value, which had to be used to purchase gold by the taxpayer at real value. Under Gordian III. the silver contained 67% of alloy; and eventu- ally under Gallienus the " argenteus " frequently contained no silver whatever. Aurelian (a.d. 270-275) attempted a reform of the coinage by which the previous coin was reduced from its nominal to its intrinsic value. The coins were now of bronze with a wash of silver, and we now find them marked with their value as two denarii. These coins replace at once the base silver and the bronze, which now disappear. The moneying right of the senate had become illusory by the depreciation of silver, which had ceased to have any real value. Aurelian entirely suppressed this right; Tacitus and Florian restored it for a few years, after which the S.C. disappears from the coinage. The reform of Aurelian caused a serious outbreak at Rome, but was maintained by him and by Tacitus. Aurelian also suppressed all local mints but Alexandria. It was the work of Diocletian to restore the issue of relatively pure money in the three metals. He made no less than four unsuccessful attempts to regulate the weight of gold. Not later than 290 he restored a pure silver coinage with a piece of 9ˆ lb. His reformed bronze coins are the follis, marked XX, XXI., K, KA, &c. (all meaning " 2 denarii = the unit ") and the half-denarius of centenionalis.

Constantine, probably in a.d. 312 (though some critics attribute the reform to Constantius Chlorus) desiring to rectify the gold coinage, which had long been quite irregular in weight, reduced the chief gold piece to-jˆof thepound,andissuedthesolidus(Pl. Ill.fig. 5), a piece destined to play a great part in commercial history. It was never lowered in weight, though many centuries later it was debased, long after it had become the parent of the gold coinages of Westerns and Easterns alike throughout the civilized world. The letters OB, which are commonly found in the exergue of gold coins from the 4th century onwards mean Obryzum (refined gold), and the letters FS, found on silver coins Pustulatum (refined silver). Under Constantius II. (a.d. 360) and Julian the silver coin of j'j lb was suppressed, and the siliqua of lijth of the pound (which had already been issued in small quantities before) took its place. From about 360 there was a system of 4 bronze coins (follis, denarius, centenionalis and J centenionalis). The last soon disappeared, and under Honorius (395) only the centenionalis remained. Honorius and his successors issued the silver decargyrus (= 10 denarii) . The bronze coinage of this

time was small and mean. It will be seen that a fuller system of bronze was originated by Anastasius, the Byzantine emperor.

Under Augustus the Roman monetary system became the official standard of the empire, and no local mint could exist without the imperial licence. Thus the Greek imperial money is strictly Roman money coined in the provinces, with the legends and types of the towns. Many cities were allowed to strike bronze, several silver. The kings of the Cimmerian Bosporus enjoyed the exceptional privilege of striking gold, which, however, became rapidly debased. The silver becomes limited about Nero's time, but lasts under the Antonines, and is also found under Caracalla and Macrinus. It is chiefly supplied by the mints of Caesarea in Cappadocia, Antioch and subsidiary mints in Syria, and Alexandria in Egypt. None of these were strictly city-mints, but served the purposes of the provincial govern- ment. The bronze increased in mints and quantity in the 2nd century, but, through the debasement of the Roman silver, one city after another ceased to strike about the middle of the 3rd. The provincial mint of Alexandria, however, continued to strike

until the end of the century. From the coins of the ordinary Greek and other cities under the empire must be distinguished the issues of the Roman colonies. In the west these practically ceased in Nero's time; in the east they lasted as long as the other Greek coinage. Purely Roman gold and silver was coined in certain of the provinces, in Spain and Gaul, and at the cities of Antioch and Ephesus. When the base silver had driven the Greek imperial bronze out of circulation, Gallienus established local mints which struck pure Roman types. Diocletian in- creased the number of these mints, which lasted until the fall of the empire of the West, and in the East longer. These mints were (with others added later), Londinium (or Augusta), Camulodunum, Treviri, Lugdunum, Arelate (or Constantina), Ambianum, Tarraco, Carthago, Roma, Ostia, Ravenna, Aquileia, Mediolanum, Siscia, Serdica," Sirmium, Thessalonica, Constan- tinopolis, Heraclea, Nicomedia, Cyzicus, Antiochia (ultimately Theupolis) and Alexandria. A few were speedily abandoned.

As regards the internal organization of the mints under the empire, we know that, although the names of the triumviri monetales do not occur on the coins after 15 B.C., they continued to exist (with the title Illviri aere argento auro flando feriundo, although their competence was restricted to the first metal) until probably the time of Aurelian, who withdrew the right of coinage from the senate. Officials of the imperial treasury superintended the gold and silver

coinage ; Trajan placed a procurator monetae Augusti of equestrian rank at the head of the whole system, subject to the emperor's rationalis (the chief official of the treasury). The system of procurators was extended and regularized by Diocletian. In the Roman colonies (which were only allowed to issue bronze) the formula D.D. or EX D.D. {ex decurionum decreto) often occurs, corresponding to the S.C. of the Roman mint. At many colonies, especially in the west, the monetary duumviri sign the coins. At Rome the imperial mint itself was situated behind the Colosseum, near the Caelian hill, the senate re- taining its mint on the Capitol probably until the time of Trajan. The three monetae (of the three metals) appear together on medallions for the first time under Hadrian, and probably indicate the organization of the mints for the three metals in one place. From the middle of the 3rd century mint-marks begin to occur on the coins, indicating the various mints, the officinae in each mint, &c. Sometimes these marks form " secret combinations"; thus the letters I, O and BI found on three different coins of Diocletian (struck at three different officinae), and the letters HP, KOY and AI on three corresponding coins of Maximian, combine into Greek words representing the genitives of the Latin titles lovius and Herculius assumed by these two emperors.

The obverse type of the imperial coins is the portrait of an imperial personage, emperor, empress or Caesar. The type only varies in the treatment of the head or bust — if male, laureate, radiate or bare; if female, sometimes i yp ˆ an

ioscrip-

veiled, but usually bare. The reverse types of the tlons. pagan period are mythological of divinities, allegorical of personifications, historical of the acts of the emperors. Thus the coins of Hadrian, besides bearing the figures of the chief divinities of Rome, commemorate by allegorical representations of countries or cities the emperor's progresses, and by actual representations his architectural works. Types often occur purely personal to the emperor, such as the sphinx which Augustus used as his signet, or the Capricorn, his natal sign. The most remarkable feature of imperial types is the increase of personifications, such as Abundantia, Concordia, Liberalitas, Pudicitia — for the most part drearily conventional. The inscriptions are either simply descriptive, such as the emperor's names and titles in the nominative on the obverse, or partly on the obverse and partly on the reverse, and the name of the subject on the reverse; or else they are dedicatory, the imperial names and titles being given on the obverse in the dative and the name of the type on the reverse.

Sometimes the reverse bears a directly dedicatory inscription to the emperor. The inscriptions on the earlier imperial coins from Tiberius to Severus Alexander are generally chronological, usually giving the current or last consulship of the emperor and his tribunitian year. It must be noted that Christian symbols first made their appearance on coins in an unsystematic, almost accidental way. The earliest instance is at the mint of Tarraco in a.d. 314, when a cross occurs as a symbol on the reverse. In a.d. 320 the Christian monogram is found as a detail in the field at several mints. But the types still remain pagan; these symbols are not introduced by order,

although the officials who introduced them doubtless knew they could do so with impurity. As times goes on the Christian emblems become more popular; on a coin of Constantius II. we find Victory crowning the emperor, who holds the standard of the cross; the inscription is HOC SIGNO VICTOR ERIS. Another type of the same reign is the Christian monogram flanked by alpha and omega. Under Julian there is a temporary recrudescence of pagan types; with the revival of Christianity monotony of type sets in.

The art of Roman imperial coins, although far inferior to that of Greek, is well worthy of study in its best ages, for its intrinsic merit, for its illustration of contemporary sculpture, and on account of the influence it exercised on medieval and modern art. On the whole the finest work is produced under Augustus, when the portraits still betray a certain refinement of imagination in the artists. Some of it reflects the beauty of Roman monumental sculpture in relief of the time, whether that sculpture be regarded as the work of Greeks or of purely Roman artists. The most vigorous portraiture is perhaps found under the Flavians. Under the Antonines, although still striking and powerful, the portraits lost in subtlety and from the time of Commodus there is a rapid decline. The age of Diocletian and Constantine shows a well-meant but hopeless attempt at revival of art. In spite of its defects, the fact that many of the greatest medallists of the Renaissance drew their inspiration from the art of imperial coins shows that it had many good qualities, of which the chief was an honest directness of effort. The realism in which this resulted is perhaps best seen in the portraits of Nero, the growth of whose bad passions may be seen in the increasing brutality of his

features and expression. The medallion series is full of charming subjects, though when they have been treated by Greek artists of earlier ages the contrast is trying; the most satisfactory are the representations of older statues; the purely new compositions are either poor inventions, or have a theatrical air that removes them from the province of good art.

III. Medieval and Later Coins or Europe The period of the medieval and later coins of Europe must be considered to begin about the time of the fall of the Western empire, so that its length to the present day is about 1400 years. It is impossible to separate the medieval and later coins, either in the entire class, because the time of change varies, or in each group, since there are usually pieces indicative of transition which display characteristics of both periods. The clearest division of the subject is to place the Byzantine coinage first, then to notice the characteristics of its descendants, and lastly to sketch the monetary history of each country. The coinage of the present day, however, having certain definite characteristics, may be dealt with separately.

The Byzantine money is usually held to begin in the reign of Anastasius (a.d. 491-518, PI. III. fig. 6). The coinage is always in the three metals, but the silver money is rare, and Byzan- was pro b a bly struck in small quantities. At first both Empire. the gold and the silver are fine, but towards the close of the empire they are much alloyed. The gold coin is the solidus of Constantine, with its half and its third, the so- called semissis and tremissis. The Byzantine solidus (besant) had an enormous vogue throughout the middle ages, being the chief gold coin until the introduction of the Italian gold in the 13th century. The chief silver coin was the miliarision, and a smaller coin, the siliqua or keration. Under Heraclius (610- 641) the hexagram or double miliarision was first coined. The silver money of the restored Greek empire is obscure. In 498 Anastasius introduced a new copper coinage, bearing on the reverse, at his time, the following indexes of value as the main type: M, K, I and B, 40 nummi, 20, 10 and 5. These coins bear beneath the indexes the abbreviated name of the place of issue. Justinian I. added the regnal year in a.d. 538, his twelfth year. The money of this class presents extraordinary variations of weight, which indicate the condition of the imperial finances. The Alexandrian coins of this class begin under Anastasius and end with the capture of the city by the Arabs. They have two denominations, IB and S, and T or 12, 6 and 3 denarii, and there 'is an isolated variety of Justinian with A f (33)- The Alexandrian bronze never lost its weight, while that of the empire generally fell, and thus some of the pieces of Heraclius, while associated with his

sons Heraclius Constantinus and Heraclonas, have the double index IB and M. Under Basil I. the bronze money

appears to have been reformed, but the absence of indexes of value makes the whole later history of the coinage in this metal very difficult. There was one curious change in the aspect of the money. Early in the nth century the solidus begins to assume a cup-shaped form, and this subsequently became the shape of the whole coinage except the smaller bronze pieces. These novel coins are called nummi scyphati. The types, except when they refer simply to the sovereign, are of a religious and consequently of a Christian character. This feeling increases to the last. Thus, on the obverse of the earlier coins the emperors are represented alone, but from about the 10th century they are generally portrayed as aided or supported by some sacred person- age or saint. On the reverses of the oldest coins we have such types as a Victory holding a cross (other personifications aJl but disappear), but on those of later ones a representation of Our Saviour or of the Virgin Mary. Christ first appears on a coin of about a.d. 450, where He is represented marrying Pulcheria to Marcian. He does not appear again until the end of the 7 th century, when His bust is introduced by Justinian II. It was perhaps this type, so offensive to Mahommedan feeling, that caused the Caliph Abdalmalik to initiate the Mussulman coinage. From the 9th century Christ appears in various forms on the coins; about 900 we find the Virgin; a few years later saints begin to appear. A remarkable type was introduced by Michael VIII., Palaeologus, who recovered Constantinople from the Latins in 1261, and issued coins with the Virgin standing in the midst of the walls of the city. The principal inscriptions for a long period almost invariably relate to the sovereign, and express his name and titles. The secondary inscriptions of the earlier coins indicate the town at which the piece was struck, and, in the case of the larger bronze pieces, the year of the emperor's reign is also given. From about the 10th century there are generally two principal inscriptions, the one relating to the emperor and the other to the sacred figure of the reverse, in the form of a prayer. The secondary inscriptions at the same time are descriptive, and are merely abbreviations of the names or titles of the sacred personages near the representations of whom they are placed. From the time of Alexius I. (Comnenus) the principal inscriptions are almost disused, and descriptive ones alone given. These are nearly always abbreviations, like the secondary ones of the earlier period. The language of the in- scriptions was at first Latin with a partial use of Greek ; about the time of Heraclius Greek began to take its place on a rude class of coins, probably local ; by the 9th century Greek

inscrip- tions occur in the regular coinage; and at the time of Alexius I. Latin wholly disappears. The Greek inscriptions are remarkable for their orthography, which indicates the changes of thelanguage. In the nth century we notice a few metrical inscriptions, the forerunners of verse-mottoes on later coins. Of the art of these coins little need be said. It has its importance in illustrating contemporary ecclesiastical art, but is generally inferior to it both in design and in execution. It is noticeable that from the beginning of the Byzantine period the facing representation of the bust begins to be popular, and that from the time of Justinian (6th century) onwards the profile practically disappears from the coinage. The last Byzantine gold coin (a piece of John V., 1341-1391) shows a figure of John the Baptist imitated from the Florentine coinage.

Besides the regular series of the Byzantine empire, in which we include the money assigned to the Latin emperors of Con- stantinople, there are several cognate groups connected CoaBate with it,either because of their similarity,or because the groups' sovereigns were of the imperial houses. There are the coinages of the barbarians to be next noticed, and the money of the emperors of Nicaea, of Thessalonica and of Trebizond. The last group consists of small silver pieces, which were prized for their purity; they were called Comnenian white-money (cKTTpa Kofivfivara) , the princes of Trebizond having sprung from the illustrious family of the Comneni.

The coinage of the other states of the West falls into well- defined periods, which have been distinguished as (1) transitional period, from Roman to true medieval coinage, from the fali

NUMISMATICS

Plate III.

ROMAN AND MEDIEVAL COINS.

Plate IV.

NUMISMATICS

ORIENTAL COINS.

LATER EUROPEAN]

NUMISMATICS

of Rome (476) to the accession of Charlemagne (768); (2) true medieval age, during which the Carolingian money was the Periods currency of western Europe, from Charlemagne to the of other fall of the Swabian house (1268) ; (3) early Renaissance, European from the striking of the florin in Florence (1252) to coinage. tne c i ass j ca j Renaissance (1450); (4) the classical Renaissance, from 1450 to 1600; (5) the modern period.

1. The various coinages of the transitional period will best be considered together (see below).

*2. The inconvenience of gold money when it represents a very large value in the necessaries of life must have caused its abandon- Medleval men *- an d the substitution of silver by the Carlovingians.*

' The denier (denarius) or penny of about 24 grains was at first practically the sole coin. The solidus in gold was struck but very rarely, perhaps as a kind of proof of the right of coining. The Byzantine solidus or bezant was used and probably the equivalent Arab gold. The Arab silver piece, the dirhem, was almost exactly the double of the denier, and seems to have been widely current in the north. The new coinage spread from France, where it was first royal and then royal and feudal, to Germany, Italy, where the Byzantine types did not wholly disappear, England, Scandinavia, Castile and Aragon. In Germany and France feudal money was soon issued, and in Italy towns and ecclesiastical foundations largely acquired from the empire the right of coinage, which was elsewhere rare. The consequence of the extended right of coinage was a de- preciation in weight, and in the middle of the 12th century the one- sided pennies called bracteates appeared in Germany, which were so thin that they could only be stamped on one side. The types of this whole second coinage are new, except when the bust of the emperor is engraved. The most usual are the cross; and the church as a temple also appears, ultimately taking the form of a Gothic building. There are also sacred figures, and more rarely heads in the later age.

3. The true herald of the Renaissance was the emperor Frederick II. In restoring the gold coinage, however, he followed in the steps of

the Norman dukes of Apulia. With a large Arab popula-

Reoais? t ' on ' these princes had found it convenient to continue

*" t * le Oriental gold money of the country, part of the great*

currency at that time of all the western Moslems, and Roger II.

(1130-1154) also struck Latin coins of his own as DVX APVLIAE, the first ducats. Frederick II. (1215-1250), continuing the Arab coinage, also struck his own Roman gold money, solidi and half solid:, with his bust as emperor of the Romans, Caesar Augustus, and on the reverse the imperial eagle (PI. III. fig. 7). In workmanship these were the finest coins produced in the middle ages. But the calamities which overwhelmed the Swabian house and threw back the Renaissance deprived this effort of any weight, and it was left to the great republics to carry out the idea of a worthy coinage— a necessity of their large commercial schemes. The famous gold florin was first issued in 1252 (PI. Ill.fig.S). The obverse type is the standing figure of St John the Baptist, the reverse bears the lily of Florence. The weight was about 54 grains, but the breadth of the coin and the beauty of the work gave it dignity. The commercial greatness of Florence and the purity of the florin caused the issue of similar coins in almost all parts of Europe. Venice was not long in striking (in 1284) a gold coin of the same weight as the florin, but with the types of a standing figure of Christ.and the doge receiving the gonfalon at the hands of St Mark (see PI. III. fig. 9). It was first called the ducat, the name it always bears in its inscription ; later it is known as the zecchino or sequin. Though not so largely imitated as the florin, the extreme purity of the sequin was unquestioned to a time within the memory of living persons. Genoa likewise had a great gold currency, and the other Italian states struck in. this metal. It is significant of the power of the Italian republics that the later Mame-luke sultans of Egypt found it convenient or necessary for their position between Europe and India to adopt the weight of the florin and sequin for their gold money. Many varieties of gold money appear in course of time in France, England and to a lessextentin other countries. The need for a heavier silver coinage caused the issue of the large denier (grossus denarius, gros or groat). This coin appears early in the 14th century. The types from the 14th century onwards are very various and distinctly worthy of the art of the time, which as yet is purely decorative and conventional, so that portraits are not possible. The religious intention also is gradually giving way to the desire to produce a beautiful result, and the symbol of the cross is varied to suit the decorative needs of the coin. Heraldic subjects also appear, and in the shield, which is frequently a reverse type, we see the origin of the usual modern reverse of the most important coins.

4, 5. With the classical Renaissance we find ourselves in the presence of modern ideas. The elaborate systems of coinage of the Of I fc/ var ‘ ous states °f Europe are socn to begin, and the Renais-*

prevalence of a general currency to become for the time sance 'and impossible. Silver money now gains new importance with modern l ˆ e ' ssue °f the thaler or dollar in Germany, in 1518.

_ This great coin speedily became the chief European piece in its metal, but as it was coined of various weights and varying purity it failed to acquire the general character of the denier.

Xix. 29

The style of this age is at first excellent. The medals gave the tone to the coinage. Art had wholly thrown off the rules of the age before and attained the faculty of portraiture and the power of simply representing objects of nature and art. Great masters now executed medals and even coins, but speedily this work became a mere matter of commerce, and by the beginning of the modern period it was fast falling into the poverty and barbarism in which it has ever since remained. The details of the numismatics of these two periods belong to the notices of the money of the several countries.

A word must be added on money of account. While the denier was the chief and practically the sole coin, the solidus passed from use as a foreign piece into a money of account. The solidus, like the German schilling (shilling), contained money ot usually 12 deniers. As there were 20 shillings to the accot "' t – pound of silver, we obtain the reckoning by £ s. d., librae, solidi and denarii. The pound as a weight contained 12 oz., and its two-thirds was the German mark of 8 oz.

It would be interesting, did space permit, to notice fully the art of this entire class, to examine its growth, and to trace its decline; but, as with that of Greek and Roman coins, we must mainly limit ourselves to the best period. This is a space of about a hundred and fifty years, the age of the classical Renais- sance, from the middle of the 15th century to the close of the 16th. The finest works are limited to the first half-century of this period, from a little before 1450 to about 1500, in Italy, and for as long a time, beginning and ending somewhat later, in Germany. The artists were then greater than afterwards, and medal-making had not degenerated into a trade; but with the larger production of the period following the work was more mechanical, and so fell into the hands of inferior men. The medals of this first period may not un- worthily be placed by the side of its sculpture and its painting. Not only have some of its medallists taken honourable places in a list where there was no ro'om for ignoble names, but to design medals was not thought an unworthy

occupation for the most famous artists. There are, as we should expect, two principal schools, the Italian and the German. The former attained a higher excellence, as possessing not merely a nobler style but one especially adapted to coins or medals. The object which the artists strove to attain was to present a portrait or to commemorate an action in the best manner possible, without losing sight of the fitness of the designs to the form and use of the piece on which they were to be placed. For the successful attainment of this purpose the style of the later pre-Raphaelites was eminently suited. Its general love of truth, symmetrical grouping, simple drapery and severely faithful portraiture were qualities especially fitted to produce a fine portrait and a good medal. It is to be noted that their idea of portraiture did not depend on such a feeling for beauty as influenced the Greeks. Rather did it set before it the moral or intellectual attainments and capabilities, what the Italians called the virtH, of the subject. The German art, as seen in the medals, is mostly the work of carvers in wood or honestone, or goldsmiths. It excels in vigorous, realistic portraiture, and in decorative treatment of heraldic subjects, but is lacking in breadth of style and in the imagination shown by the best Italian medallists. Both these schools, but especially the Italian, afford the best foundation for a truly excellent modern medallic art. The finest coins and medals of Italy and Germany have an object similar to that which it is sought to fulfil in the English, and their nearness in time makes many details entirely appropriate. Thus, without blindly imitating them, modern artists may derive from them the greatest aid.

There are some delicately beautiful Italian medals of the 16th century, too closely imitated from the Roman style. A vigorous realistic school, the only great one of modern times, arose in France before the close of the 16th century and lasted into the next. It was rendered illustrious by Dupr6 and the inferior but still power- ful Warin. From this age until the time of Napoleon there is nothing worthy of note. The style of his medallists is the weak classical manner then in vogue, but yet is superior to what went before and what has followed.

It is not intended here to enter in any detail into the various divisions of the subject already treated in its main outlines. The questions that would require consideration are of too complicated and technical a nature to be illustrated within reasonable limits; the principal matters of inquiry may, however, be indicated.

We begin with a survey of the transitional coinages in the various countries of the West. They cover the period from the 5th to the 8th

centuries, and are of immense historical significance. The types throughout are monotonous: Tf°*}~ the bust of a Roman emperor or local ruler, a cross of coinages, some kind, a Victory, &c. The style is quite barbarous. The classification of the earliest servile imitations of Roman and Byzantine money rests solely upon provenance and is unce*t;:i*R. The following general series are distinguished: (A) The Vandals (in Africa, 428-534) issued gold (?), silver and bronze from Hunneric (477-484) to Gelamir (530-534) ; the gold is anonymous. (B) The Suevians (Spain, 400-585) had little but imitations of*

Byzantine gold; but Richiar (448-456) issued a denarius in his own name. (C) The Ostrogoths (Italy, 489-553) were preceded by the Herulian Odoacer (476-494), who coined silver and bronze; their kings (including Theodoric, 493-526, and Totila or Baduila, 541-552) issued gold, silver and bronze in their own names, from Rome, Ravenna, Milan, &c. (D) The Lombards (Italy, 568- 774) had no coins in their own names before Grimoald, duke of Beneventum (662-671); later there are gold solidi and thirds and silver from many mints Gold was issued for the duchy of Beneventum in the 8th century. (E) The Burgundians (Gaul, to 534) first issued recognizable coins under Gondebald (473-516). (F) The Visigoths (South Gaul and Spain) had imitative gold thirds in the 5th and 6th centuries; the kings' names appear from Leovigild (573-586) to Roderic (710-711). Sixty-one mints were in operation. (G) The Meroving Franks first issued under Clovisl. (481-511) coins recognizably Frankish (solidi and thirds) . Royal names first appear on silver and copper under Theuderic of Austrasia (511-534) and Childebert I. of Paris (511-558). The chief Frankish inscribed coinage is, however, of gold solidi and thirds, from Theodebert I. (534-548), who broke down the Roman imperial prerogative and issued gold with his own name in full, to the beginning of the 8th century. The last Merovings issued no coins in their own names, being mere puppets. And from the middle of the 6th century the coins with kings' names are far less numerous than those bearing the names only of mints and moneyers; some 800 places (not only in what is now France, but in Germany, the Low Countries and Switzerland) are thus named (PI. III. fig. 1 2). This coinage seems to have been intimately connected with the fiscal organization, though*

the generally accepted theory that the taxes collected in each place were there and then converted into money is by no means proved. Certain religious establishments also possessed the right of coining in their own name. The close of the Meroving dynasty saw a revival of silver in the saiga, which heralded the introduc- tion of the denier. (H) The Anglo-Saxons began with an imitative coinage similar to the Merovingian, viz. gold, solidi and thirds, and silver sceattas (= treasure, Ger. Schatz) of about 20 grains troy, and stycas (= pieces, Ger. Stuck), first of silver, then of copper. The gold is rare and confined to the south ; only two solidi are known, imitations of Honorius, with runic legends on the reverse. The types of the gold thirds, as of the coinage in other metals (which does not begin until the 7th century), are derived more or less directly from Roman. Some of the inscribed sceattas bear the name of London in Roman letters; others, in runes, the names of Epa and Peada (who is perhaps the son of Penda), king of Mercia (d. 655). Sceattas with runic inscriptions were also issued in East Anglia towards the end of the 8th century. But the sceatta was superseded by the penny introduced by Offa (757-796). Offa also struck a gold coin, bearing his name and an inscription copied directly from an almost contemporary Arab coin; but this is quite an exceptional issue, represented now by a unique specimen. The styca, which begins c. 670, was characteristic of the Northumbrian coinage, lasting, long after the introduction of the penny farther south, down to the Danish invasions of the second half of the 9th century. A series was issued by the archbishops of York. Wigmund (837-854) struck a gold solidus inscribed MVNVS DIVINVM, copied from the solidi of Louis le Debonnaire, and evidently meant for a religious purpose (PL III. fig. n). For the whole question of Anglo-Saxon coins see Britain: Anglo-Saxon. (I) The Frisians had a small coinage of gold thirds (imitated from Byzantine), and one with the name of Audulfus also exists (end of the 6th century?). The chief mint was probably Docc'um.

We now proceed to the consideration of the coinages of the various countries from the 8th century to modern times. The „ rt . money of Portugal begins, after the expulsion of the Moors, with Alphonso I. (1112); it is exclusively regal, and not of great interest except as affording indications of the wealth and commercial activity of the state in the early part of the 18th century. The coinage of Spain, after the reconquest from the Moors, is almost without exception regal. The king- dom of Navarre had a coinage from the time of Sancho III. (1000-

Spala,

1035). The series of Castile and Leon begins with Alphonso VI. (1053) with deniers and obols. Aragon first has coins under Sancho Ramirez I. (1063"). Gold (imitated from Moorish money) is introduced in the middle of the 12th century. A plentiful coinage was issued after the union of the crowns in 1479. The Spanish dollar of the 1 7th and 18th centuries was one of the most widely circulating currencies in the West (see PL V. fig. 5). The medals of Spain are not important.

In 755 Pippin abolished the gold coinage of his Merovingian predecessors and introduced the silver denier (see PL III. fig. 10) ; the coinage became a royal prerogative once more, and France. was confined to a few mints. The denier, which at first weighed c. 1-28 gramme (19J grains), was for centuries the most important of European silver coins. Under Charlemagne the weight was slightly raised; the Caroline monogram appears, and there are other modifications in the types. Charlemagne also issued money from various Italian, German and Spanish mints. He also introduced the obol, and struck gold (chiefly at Italian mints) . Among his types must be noted the temple with the inscription XPISTIANA RELIGIO. Louis le Debonnaire (814-840) was the last Carolingian to strike gold. In the 9th century are perceptible the first traces of the movement which led to the extensive feudal coinage. The advent of the house of Capet made no great change in the system, but the feudal issues now become important. The most widespread denier was that of the abbey of St Martin at Tours {denier tournois); the royal coinage was known as the monnaie parisis. St Louis (1226-1270) effected a great reform late in his reign, making the sou (hitherto a money of account) into a real coin as the gros (see PL III. fig. 14), and introducing a gold coinage. Henceforward the coinage increases in complexity; in the 14th century it has great artistic merit (see PL III. fig. 17). The French medals are far more interesting than the modern coins. The earliest of artistic importance not by Italian artists show nevertheless strong Italian influence (medals of Charles VIII. and Anne of Brittany, of Philibert of Savoy and Margaret of Austria) . A series of large medallions of the Valois is attributed to Germain Pilon. The most characteristically French artists are Guillaume Dupre (working 1 595-1643) and Jean and Claude Warin (middle and second half of 17th century). The long historical series of Louis XIV. has no artistic value; but that of the Napoleonic period shows great technical ability on the part of artists like Andrieu, in spite of the false classicalism of their designs.

The silver penny was introduced into England by Offa, king of Mercia (757-796), following the lead of Pippin in France (see PL

III.fig.13). It soon rose in weight to about 22 grains England. troy (1-42 gramme), at which it long remained. The types were usually, obverse the king's head, or some form of cross or religious symbol; reverse some form of cross, religious symbol or ornament. The inscriptions gave the names of the king and of the moneyer, later also the mint. An important gold coin of Offa was imitated from an Arab dinar of 774, with the addition of the words OFFA REX. The Mercian coinage ends about 874. The pennies of the kings of Kent extend from 765 to 825; the archbishops of Canterbury went on striking to the beginning of the 10th century. The East Anglian regal series extends to 890; the memorial coinage of St Edmund circulated largely in East Anglia in the 9th century. The penny appears in Northumbria with the Dane Halfdan (875-877) and continues to the middle of the next century. A coinage of " St Peter " pennies was issued from York c. 920-940. The coinage of Wessex begins with Ecgbert, probably c. 825, when he got posses- sion of the mint at Canterbury (see PL III. fig. 15 with the name of London). The coinage marks the gradual growth of Wessex, until England is united under Edgar (957-975). There is hence- forward for a long time no change of great importance in the coinage, which continued to consist of pennies, with rare half- pennies (the pennies were usually cut into halves and quarters along the lines of the cross to make small change). During the reign of Stephen the monotony is relieved by a few issues by barons like Robert, earl of Gloucester. The number of mints is much reduced by the time of Henry III., and the moneyers cease

to sign the coins in Edward I.'s reign. Henry III. made an abortive attempt to introduce a gold coinage, which was success- fully established by Edward III. in 1343, with the gold florin, and in 1344 with the gold noble (see PI. III. fig. 20). (The obverse type of the noble, the king in a ship, is generally thought to refer to the victory of Sluys in 1340.) He also introduced the silver groat Ud.) and half-groat. The English coinage, both gold and silver, was now of such high quality and reputation that it (especially the silver sterling) was largely exported and imitated, chiefly in the Low Countries. The gold coinage of Edward III. is perhaps the most successful, from an artistic point of view, in the English series. Subsequent developments of the coinage now become very complicated. Edward IV.

distinguished his noble by a rose on the obverse and a sun on the reverse, and introduced a new gold coin, the angel. The Tudor period is distinguished by the splendour, variety and size of the coins; Henry VII. introduced the sovereign of 20s. (240 grains) and the shilling, and on his coins the first serious attempt at portraiture is found (see PI. III. fig. 21). Under Henry VIII. the quality of the silvermoney declines, being not effectually restored until the reign of Elizabeth, when an unsuccessful attempt was made to introduce a copper coinage. Private tokens came into use, but the official copper coinage does not begin until the next reign. The use of the mill, as distinct from the hammer, was begun in 1562, but it took just a century to oust the old-fashioned method. In 1613 John, Lord Harrington, obtained a patent for the issue of copper farthings, and private tradesmen's tokens were prohibited. The gold sovereign of James I., from its inscription (FACIAM EOS IN GENTEM VNAM) and the fact that it was meant to circulate on both sides of the Border, was known as the unite. The coinage of Charles I. presents great varieties owing to the civil war. The best workmanship is seen on the milled coins issued by Nicolas Briot. But the majority of the money was still hammered. The scarcity of gold in the royal treasury during the' troubles induced the king to coin twenty- and ten-shilling pieces of silver, in addition to the crowns and smaller denomina- tions. Gold three-pound pieces, or triple-unites, however, were issued from the Oxford mint. One of the most remarkable of his pieces is a crown struck at Oxford by Rawlins. It bears on the obverse the king on horseback, with a representation of the town beneath the horse, and on the reverse the heads of the " Oxford Declaration." The so-called "Juxon medal," given by Charles to Bishop Juxon on the scaffold, is really a pattern-piece by Rawlins (see PI. V. fig. 1). Of equal interest are the siege-pieces of many castles famous in the annals of those days. They are mostly of silver, often mere pieces of plate with a stamp; but Colchester and Pontefract issued gold. The coinage of the Commonwealth is of a plainness proper to the principles of those who sanctioned it. The great Protector, however, caused money to be designed of his own bearing his head. It is not certain that this was ever sent forth, and it is therefore put in the class of patterns. Simon, the chief of English medallists, designed the coins, which are unequalled in the whole series for the vigour of the portrait (a worthy presentment of the head of Cromwell) and the beauty and fitness of every portion of the work. The finest coin pro- duced under Charles II., and technically the best executed piece in the whole English series, is the " Petition Crown " (see PI. V. fig. 2), a pattern by Simon, to which, however — probably for political reasons — the work of Jan Roettier was preferred. Maundy money was first struck

in this reign, and the name guinea was now applied to the 20s. piece. In 1672 a true copper coinage of halfpence and farthings was introduced. Hence- forward there is a decline in the coinage, although skill is perceived in the portrait of William III., whose grand features could scarcely have failed to stimulate an artist to more than a common effort. Queen Anne's money is also worthy of note, on account of the attempt, on Dean Swift's suggestion, to commemorate current history on the copper coinage, which led to the issue of the famous farthings (see PI. V. fig. 4) . These have been the cause of an extra- ordinary delusion, to the effect that a very small number (some say three) of these pieces were struck, and that their value is a thousand pounds each, instead of usually some shillings. Worth-

less casts of genuine farthings, and counters made in imitation of the sixpence of the time, are constantly mistaken for . such farthings. After this there is little to remark, except the baseness of the art of the coins under the first three Georges, until .the talent of Pistrucci gave a worthier form to the currency. Be- tween 1760 and 1816 hardly any silver or copper money was issued. The gap was filled by the use of Spanish dollars counter- stamped, and silver tokens issued by the Banks of England and Ireland, as well as by vast quantities of tokens issued by private persons. In 1816 the new coinage of gold and silver was issued, since when there have been few changes in the British currency.

The English medals are far more interesting for their bearing on events than as works of art. The best are almost all by foreigners, but the fine pieces of the Simons form notable exceptions. The medals of the Tudors are good in medals. style, and show some excellent portraits, in particular those by Trezzo and Stephen H. (generally known as Stephen of Holland). There is one of Mary queen of Scots by Primavera, representing her in middle life, which is perhaps her most characteristic portrait. Elizabeth's are of historical importance, and some of them, as the Armada medals (see Pl.V. fig. 7), have a certain barbaric grandeur, being probably the work of English artists. The richer series of the Stuart period contains some medals of fine style. These include works by Warin, the Simons and the Roettiers, besides the excellent coin engravers Briot and Rawlins. The numerous badges worn by adherents of various parties during the civil war and Commonwealth have a personal and historical interest. The most curious pieces are those popular issues relating to current events, such as the so- called " Popish plot," and a certain interest attaches to medals of the exiled Stuarts. From this time there are no works deserv- ing notice except military and naval medals, the

historical interest of which makes some amends for their poverty of design and execution. The English tokens form a curious class. They are of two periods: the earlier, which are almost always of copper, were issued chiefly at the middle of the 17th century and some- what later; the later, which are mainly of copper, but also sometimes of silver, were struck during the scarcity of the royal coinage in this metal at the end of the 18th century, and during the earlier years of the 19th century. Both were chiefly coined by tradesmen and bear their names. The colonial money of England was- until lately unimportant, but now (except in style) it is not unworthy of the wealth and activity of the dependencies. The " Anglo-Gallic " money struck by the English kings for their French dominions forms a peculiar class. It was begun by Henry II., who struck deniers and half-deniers for Aquitaine. Richard I. (whose name is not found on his English coinage) struck for most of the French domains, but no coins are attri- buted to John or Henry III. Edward I.'s coins are of billon; of Edward II. there are none. Gold was introduced before 1337, and there are fine series of gold, silver, and billon of Edward III. (see PI. III. fig. 19) and the Black Prince. Henry, earl of Lan- caster, struck silver at Bergerac (1345-1361). The succeeding kings down to Henry VI. (first reign) ail issued Anglo-Gallic coins. There was a temporary revival under Henry VIII. at Tournay (1513-1519). The whole series,' with the exception of the Calais coinage, is French in character.

The coinage of Scotland is allied to that of England, although generally ruder; but it seems to have been more influenced in the early period from England, and towards its close from Scotland. France. The oldest pieces are silver pennies or sterlings, resembling the contemporary English money of the reign of David I. (1124-1153). David II. after 1357 introduced a gold coinage. In the 15th and 16th centuries there is an important coinage, both in gold and silver, not the least interesting pieces being the fine bonnet-piece of James V., and the various issues of Queen Mary, many of which bear her portrait. The indifferent execution of the coins of Mary's reign is traceable to the disturbed state of the kingdom. The Scottish coinage came to an end in 1709.

Wales has never had a coinage of its own, properly speaking. A unique penny attributed with good reason to Howel the Wales. Good, a contemporary of Edmund (died c. 950), was perhaps struck at Chester. Various English kings struck coins at Welsh mints such as Rhuddlan, Pembroke.

The money of Ireland is more scanty and of less importance than that of Scotland. The pieces most worthy of notice are the silver Ireland pennies of the early Danish kings, the earliest being that of Sihtric III. (989-1029), copied from contemporary English pennies. The Anglo-Irish coinage begins in 1177, when John as lord of Ireland received the right of coinage. A copper coinage was introduced as early as the reign of Henry VI. The quality of the Irish coinage was exceedingly poor in the 16th century, especially under Elizabeth. Between 1642 and 1647 various kinds of money of necessity were issued, including the only gold Irish coin, the Inchiquin pistole. After his expulsion from England James II. issued enormous quantities of coins of necessity made of gunmetal or pewter. The latest Irish coins were the penny and halfpenny of

1822.

The Isle of Man had a regular copper coinage, beginning in 1709 with pence and halfpence under the Derby family, continued by James, duke of Athol (issue of 1758), and by the English sovereigns from 1786 to 1864. The badge of the island is the three-legged symbol, with the motto Quocunque jeceris stabit.

Iskof Man.

Belgium occupies the next place in our arrangement. Its coinage, which, except for the few mints operating under the Merovingians and Carolingians, does not begin until Belgium t jj e ˆk cen (;ur y) comprises many pieces struck by Holland, foreign rulers, and has little of an independent character in either the regal or the seignorial class. The most important coinages are those of the house of Burgundy and Charles V. and his son, and of the bishops of Liege. In character the coinage of Belgium approximates to the French on the one side, the German on the other. About 1400 the Burgundian school produced a remarkable series of medals representing Roman emperors, of which two (those of Constantine and Heraclius) have come down to us; these form a link between the late Roman medallion and the Italian medal of the Re- naissance. The series of Holland is similar in character until the period of the revolt of the provinces. The Dutch dollars of the 16th to the 18th centuries had an immense circulation (see PI. V. fig. 3). Among the early Dutch medallists must be men- tioned Stephen H., generally without reason

known as Stephen of Holland (working 1558-1572), whose portraits show great charm. The Dutch historical medals are of great interest, more especially those which were struck by the Protestants in commemoration of current events. There is also a remarkable series of bronze medallets or jettons, which form a continuous commentary on history during the 16th and early part of the 17th centuries. Both are interesting as largely illustrating not only local events but also those of the chief European states. Such are the pieces recording the raising of the siege of Leiden, likened to the destruction of Sennacherib's army, the assassina- tion of William the Silent, and the discomfiture of the Armada, affording striking indications of the zeal, the piety and the con- fidence in the right which built up the great political structure of the Du'xh republic. After this time the medals lose much of their interest.

The money of Switzerland illustrates the varying fortunes of this central state, and the gradual growth of the stronghold of European freedom. First we have the gold money of the Frankish kings, among whose mints Basel, Lausanne, St Maurice-en-Valais and Sitten (Sion) already appear. The silver deniers, which Charlemagne made the coinage of the empire, are issued by fewer mints; the dukes of Swabia began to strike at Zurich in the 10th century, and the empire granted during the 10th and to the 13th century the right of coinage to various ecclesiastical foundations, bishoprics and abbeys. Bern was allowed a mint by the emperor Frederick II. in 1 2 18, and other towns and seigneurs subsequently gained the same right. The demi-bracteate appears about the middle of the nth century, and about 1125 is superseded by the true bracteate, which lasts until about 1300. The 14th century witnessed the rise of the Swiss confederation, and by degrees the cantons struck their own money. These, together with the coins of some few sees and abbacies, form the bulk of Swiss money of the medieval and modern periods. The separate cantonal coinage, inter- rupted by the French occupation, was finally suppressed in 1848, when a uniform currency was adopted by the whole

Switzer- land.

republic. The monetary systems of the cantonal and ecclesias- tical mints were extremely complicated. This was partly due to the variety of coins, partly to the debasement practised by the ecclesiastical mints. Geneva had a peculiar system of her own.

Italy, with Sicily, has peculiar features. Here the barbaric coinages were mixed with the Byzantine issues which marked the recovery of

the Eastern empire, and left a lasting influence in the north at Venice, and in the south at 'ft??"" d Beneventum. Later the Arab conquest left its mark sicUy. in the curious Oriental coinages of the Normans of Sicily and the emperor Frederick II., mixed after his fashion with Latin coinage. The earliest money is that of the barbarians, Ostrogoths and Lombards, and local Byzantine issues in Sicily. This is followed by the deniers of Charlemagne and his successors, supplanted by the gold currencies of the Normans and Frederick II. The age of the free cities is marked by the great coinages of Florence, Venice and Genoa, while the Angevin and Aragonese princes coined in the south, and the popes began to issue a regular currency of their own at Rome. The Italian princes of the next period coined in Savoy, and at Florence, Modena, Mantua and other cities, while Rome and the foreign rulers of the south continued their mintages, Venice and Genoa of the republics alone surviving. The Italian monetary systems have already been touched on in the introductory notice. For art the series is invaluable. First in Italy the revival influenced the coins, and in them every step of advance found its record. The Italian medals are without rivals in the works of modern times.

Following the geographical order which is best suited to the Italian coinage, we first notice the money of Savoy, which is inferior in art to that of the rest of the country. It begins with Umberto II. (1080) ; in 1720 the dukes became kings of Sardinia, and their coinage merged eventually in 1861 in that of the king- dom of Italy. Genoa is the first of the great republics. She obtained the right of coinage from Conrad II. in 1130, and struck gold coins from the time of the general origin of civic coinage in that metal; these are ducats and their divisions, and after a time their multiples also. In the 17th century there are very large silver pieces. In the money of Mantua there are fine coins of Gianfrancesco III. (1484-1519) and Vincenzo II. (1627-1628), these last splendid examples of the late Renaissance, large pieces of gold and silver; the portrait is fine, and the hound on the re- verse a powerful design. The vicissitudes of the story of Milan find their record in no less than ten groups of money — Lombard regal coins, Carolingian deniers, money of the republic (1260- 1310), next of the Visconti family (1329-1447), succeeded by the republic (144 7-1450) and by the Sforza line, next of Louis XII. and Francis I. of France, of the restored Sforza, of Charles V. by Spanish right and his successors of Spain, and lastly of Austria. There are extremely fine coins of the 15th century, showing great beauty in their portraits (see PI. III. fig. 22). The money of Florence is disappointing in its art. The Athens of the middle ages had the

same reason as her prototype to preserve as faithfully as might be the types and aspect of her most famous coin, the gold florin (see PL III. fig. 8), and thus those who expect to see in this series the story of Italian art will be much disappointed. The silver florin was first struck in 1 189. It is heavier than the denier, weighing about 27 grains, and bears the lily of Florence and the bust of St John the Baptist. These are thenceforward the leading types, the flower never changing, but the representation of the saint being varied. On the gold florin, first issued in 1252, the Baptist is represented standing, while in the contemporary silver florins he is seated. In the 14th century the arms of a moneyer appear in the field, two such officers have had the right of striking yearly, each for six months. The coins of the duchy from 1532, in spite of their new types, are not a fine series; the best are those of Alessandro, designed by Cellini.

Venice as a mint even surpasses Florence in conservatism, and, the early style being distinctly Byzantine, this is the more striking in a great artistic city. We find Venice as an imperial mint issuing Carolingian deniers, but the doges begin to coin, placing their own names on their currency, in the 12th century.

NUMISMATICS

Plate V.

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XIX. 500,

MODERN COINS AND MEDALS.

Plate VI.

NUMISMATICS

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ITALIAN MEDALS.

19

LATER EUROPEAN]

NUMISMATICS

The most famous silver coin, the matapan, was first struck in the brilliant time of Enrico Dandolo (1192-1205). This coin is a grossus weighing about a grains, with on the obverse St Mark giving the standard or gonfalon to the doge, both figures standing, and on the reverse the seated figure of the Saviour. The famous Venetian zecchino or sequin(see PI. III. fig. 9) , the rival of the florin of Florence, appears to have been first issued under Giovanni Dandolo (1284). On the obverse St Mark gives the gonfalon to the kneeling doge, and on the reverse is a standing figure of the Saviour within an oval nimbus. Niccolo Trono (1471-1473) introduces his portrait on most of his coins, but this custom is not continued. By the latest part of the 15th century large silver coins appear. The archaic style changes in the beginning of the 1 6th century, but there is no later movement. The large silver pieces increase in size, and large gold is also struck; the last doge, Ludovico Manin (1 788-1 797), issued the 100-sequin piece in gold, a monstrous coin, worth over £40. The doges of Venice from 1521 to 1797 issued a peculiar silver token or medallet, the osella, five of which they annually presented to every member of the Great Council. They replaced the wild ducks (uccelle) which it had been customary to present at Christmas. Two dogaressas struck similar medallets. Their types are usually allegorical; some are commemorative.

The series of the coins of Rome is rather of historical than of artistic merit. The popes begin to strike money with Adrian I. (a.d. 772-795), whose deniers are in a Byzantino- Cotos. Lombard style. The coins of his successors, with few exceptions, down to Leo IX. (1049) associate the names of pope and emperor. From Leo IX. to Urban V. (1362) there is no papal coinage at Rome. The Roman senate strikes from 1 1 88 onwards. We then see on the silver the style of the senate and Roman people, and ROMA CAPUT MUNDI. Some coins have the figures of St Paul and St Peter, ethers Rome seated and a lion. Charles of Anjou, king of Sicily (1 263-1 285), strikes as a senator, and Cola di Rienzo (1347-1348) as tribune. The gold ducat of about 1300 imitates the types of the Venetian sequin. St Peter here gives the gonfalon to a kneeling senator. The arms of the moneying senator next appear in the field. The papal coinage is resumed at Avignon; and Urban V., on his return to Rome, takes the sole right of the mint. From Martin V. (1417) to Pius IX. there is a continuous papal coinage. The later coins, though they have an interest from their bearing on the history of art, are disappointing in style. There is indeed a silver coin of Julius II. struck at Bologna and attributed to Francia, with a very fine portrait. We have beautiful

gold coins of Giovanni Bentivoglio (see PI. III. fig. 23), lord of Bologna, who employed Francia at his mint, and we know that the artist remained at his post after Julius II. had taken the city. There are also pieces of Clement VII. by Cellini, vigorous in design but careless in execution. There were papal mints at Ancona, Bologna, Piacenza, Parma, Ferrara and other Italian towns; and coins were also struck at Avignon from 1342 to 1700. The papal portraits are highly characteristic and interesting. It is, however, in the fine series of papal medals that we find a worthier artistic record.

The coinage of Sicily, afterwards that of the Two Sicilies, or Naples and Sicily, begins with the Normans. Theirs is a „. .. curiously mixed series. It begins with Robert Guiscard

as duke of Apulia (1075) and Roger I. of Sicily (1072). The gold money is almost wholly Arabic, though Roger II. struck the Latin ducat, the earliest of its class; the silver is Arabic, except the great Latin scyphati of Roger II. with Roger III.; the copper is both Latin and Arabic. The gold series (Augustales) of the emperor Frederick II. (1 198-1 2 50) shows the first sentiment of reviving classical art, its work being far in advance of the age. These are Latin coins; he also struck small Arabic pieces in gold. Under Conrad and Manfred there is an insignificant coinage, copper only, but with Charles I. of Anjou (1 266-1 285) the gold money in purely medieval style is very beautiful, quite equal to that of his brother, St Louis of France. After this time there is a great issue of gigliati, silver coins with, for reverse, a cross fleurdelisee cantoned with fleurs-de-lis. These coins acquired

a great reputation in the Levant, and were even struck by the emirs of Asia Minor. With Alphonso, the founder of the Aragonese line, we note the old style of the coins, which are in singular contrast to his fine medals. Good portraiture begins on the money of Ferdinand I., his successor. The later coinage is interesting only for its illustration of the varying fortunes of the Two Sicilies. The curious early gold coinage of the Lombard dukes of Beneventum, which follows the Byzantine type, has been mentioned under the transitional series; the dukes and princes of Beneventum and the princes of Salerno continued to issue coins (sometimes gold, usually deniers) down to the middle of the nth century.

Italian medals (PI. VI.) are next in merit to the works of the Greek die-engravers. Certain small pieces of a medallic character were made in Italy, at Padua, as early as the end of the r4th century, and there existed also large cast and Medals. chased pieces representing

various Roman emperors (perhaps Burgundian work of the 14th century), which influenced the beginnings of the true medal. This began, and also reached its highest excellence, with Vittore Pisano (Pisanello), the Veronese painter, whose medals date from 1438 (or earlier) to 1449. The finest work of Italian medallists is seen in the cast medals cf the 15th and early 16th century; with the increase of classicism in the 16th the style declines rapidly. The earlier medals are independent works, marked by simple vigorous truthfulness. The designs are skilful and the portraits strongly characteristic; the expression of character and virtu takes precedence over ideal beauty, especially in the work of the Florentine school. As the art became popular the execution of medals passed into the hands of inferior artists, and by degrees striking became usual for the smaller pieces; at the same time, a slavish imitation of the classical style weakened or destroyed originality and stamped the works with the feebleness of copies. The great medallists of the first age are Pisano, Matteo de' Pasti, Enzola, Boldii, Sperandio, Guazzalotti, Bertoldo, Gambello, Niccolo Fiorentino, Lysippus, Candida, Caradosso. Some of the most beautiful medals, however, are by unknown artists (PI. VI. fig. 2). In the 1 6th century must be mentioned Pomedello, Benvenuto Cellini, Leone Leoni, Giovanni Cavino " the Paduan," Pastorino of Siena, Giacomo da Trezzo, Pietro Paolo Galeotto, called Romano, and Antonio Abondio. Incom- parably the finest of all Italian medals are the works of Pisano, particularly the medals of Alphonso the Magnanimous, with the reverses of the boar-hunt and the eagle and lesser birds of prey, those of Sigismondo Malatesta, his brother surnamed Novello (see PI. VI. fig. 1), Leonello d'Este, John VIII. (Palaeologus), Nicold Piccinino, Inigo d'Avalos (marquis of Pescara), Ludovico and Cecilia Gonzaga of the same family, the great humanists Vittorino da Feltre and Pier Candido Decembrio. Pisano is great in portraiture, great in composition and design, and marvellously skilful in depicting animals. He alone represents the moral qualities of his subject. in their highest expression and even capability. That he has high ideal power is seen at once if we compare with his portrait Pasti's inferior though powerful head of Sigismondo Malatesta. Pasti's medal of Isotta, wife of Sigismondo, is also noteworthy, likewise the medal by the otherwise unknown Constantius of Mahomet II., the conqueror of Constantinople — interesting works, but lacking Pisano's technical skill and inspiration. An artist of great power is Sperandio of Mantua; but his productions lack the finish necessary to good medallic work, his drawing and composition are careless, and his realism too often becomes brutal or vulgar. The work of Niccolo Fiorentino and of his pupils is astonishingly vigorous in portraiture, but they lack the

power of designing reverses (see PI. VI. fig. 3). In the later age Cavino executed a remarkable series of imitations of Roman sestertii, which have been frequently mistaken for originals. In art these Italian works frequently surpass the originals in spite of a degree of weakness inseparable from copies. A comparison of the Italian with the Roman pieces is thus most instructive. The works of Pastorino of Siena (who had an extraordinary facility in graceful portraiture) are especially charming (see PI. VI. fig. 4) . Historically the Italian

Germany.

medals supply the defects of the coinages of Florence and Rome, and in a less degree of Venice. The papal series is invaluable as a continuous chronicle, although artistically, after the earliest period, it is monotonous.

The money of Germany is, like that of Italy, far too various for it to be possible here to do more than sketch some of its main features. In the Frankish period mints were in operation at cities in the west, such as Mainz, Strass- burg, Spires, Treves, Worms, Cologne. Pippin issued denarii from Strassburg and Mainz; under his successors denarii and obols were also coined at other mints, as Bonn, Cologne, Spires, Treves. After the reign of Louis the Child (910-911) the Carolingian system was continued until the advent of the Swabians with Conrad III. (1138-1152). In the succeeding period, which ends with the introduction of the grossus and the gold coinage under Louis of Bavaria (1314-1347), the uniformity of the currency disappears. In the west (in Lothar- ingia, including the southern Low Countries, the Moselle and Rhine-lands, in Frisia, Bavaria, parts of Franconia and Swabia) the denier continues; but elsewhere we find the bracteate. The right of coinage is acquired in an increasing measure by the feudatories of the empire. These local coinages entirely domin- ated the system, so that even the imperial coinage is not uniform, but consists of denarii in the west and bracteates in the east. The earliest imperial bracteate is of Frederick I.; the large fine bracteates last but a short time, reaching their acme about the end of the 12th century (see PI. III. fig. 18). The fine pieces of the bishops of Halberstadt and the abbesses of Quedlinburg are characteristic of this class. With the

introduction of the regular gold coinage (chiefly florins) and the grossus in the 14th century, Germany enters on the modern period. From the 16th century the thaler (so called from Joachimsthal in Bohemia, where the counts of Schlick first struck the coin in 1518) dominates the silver.currency (see PI. V. fig. 6) . The thalers and other large coins of the 1 6th and 17th centuries areoften good and always vigorous in workmanship. By the convention of 1857 the thaler was recognized as the unit for Berlin and the north, the florin of 100 kreuzers for Austria, the florin of 60 kr. for the south. The present system, based on the gold reichsmark of 100 pfennigs, was established all over the German empire in 1876. Of particular currencies in Germany we must be content with the bare mention of some of the more important. Among the great rulers we note the dukes of Bavaria, who coined from Henry I. (948-955), and issued fine thalers in the 16th century. The Counts Palatine of the Rhine coined from 1294, their mints being at Heidelberg, Frankfort, &c. The Saxon coinage begins with Duke Bernard (973) and includes a large series of bracteates and thalers, the latter being especially famous. The Brunswick coinage begins in the nth century; besides its bracteates we note the large mining- thalers of the 16th and 17th centuries (up to ten-thaler pieces). There are good bracteates and thalers of the margraves of Brandenburg; from 1701 they coin as kings of Prussia. In Austria there is a ducal coinage from the 12th century; the gold florin of Florentine character appears under Albert II. (1330- 1358). The marriage-coin of Maximilian and Maria of Burgundy (a 16th-century reproduction of a medal made by the Italian Candida in 1479) is a striking piece, and in the 16th century there is a large series of fine thalers. The thalers of Maria Theresa had an enormous circulation among savage races, and those of the date 1780 were recoined for the purposes of the Abyssinian War of 1867. In Bohemia there is a ducal coinage from the early 10th century to 1192; then came the regal bracteates. Wenceslas II. (1278-1305) struck the first German grossus at Prague (see PL III. fig. 16). The gold florin appears under John of Luxemburg (1310-1347). In Hungary the regal coinage begins with St Stephen (1000). Charles I. of Anjou (1310-1342) intro- duced the florin and grossus. Of historical interest is the money of John Hunyady as regent (1441-1452). The abundance of gold about this time and later shows the metallic wealth of the land. The same is true of the rich gold coinage of the Transylvanian princes in the 16th and 17th centuries. Of ecclesiastical coinages the most important are at Miinster, Cologne, Mainz, Treves,

Augsburg, Magdeburg, Spires, Wiirzburg, Salzburg. The Cologne

series of coins is almost continuous from the Frankish period; the archbishops first received the right from Otto I., Bruno (953-965) being the first to coin; from Pilgrim (1021-1036) the series, issued at various mints in the Rhineland, is very complete down to 1802. The series of Treves ranges from Theodoric I. (965-975) to Clement Wenceslas (1794). The archiepiscopal coinage of Mainz begins with Willigis (975) and lasts until 1802; its mints included Erfurt, Bingen and many other places. The Salzburg series (beginning 996) is remarkable for its fine thalers (especially of Mathias Lang, 1519-1540). The patriarchs of Aquileia, who may be mentioned here, acquired the right of coinage from Louis II. in the 9th century, but the first who can be identified on the coins is Godfrey (1184) ; thence onwards there is an interesting series of denarii and smaller coins down to the early 15th century. Of cities with large coinages it is sufficient to mention Aix-la-Chapelle (from the time of Frederick I. to 1795), Frankfort-on-the-Main, Hamburg (with great gold pieces of the 16th and 17th centuries, up to 10 ducats) and Nuremberg. Lastly, we may mention the coins of the grand- masters of the Teutonic Order, issued in Prussia from 13 51 to

1512.

German medals perhaps rank next to Italian, although they lack the higher artistic qualities. They are the work of craftsmen ■ — jewellers, wood-carvers, workers in hone-stone — and show great facility of minute workmanship and chasing and . decorative design (the last is especially clear in the heraldic reverses) ; the faults of these qualities are to some extent redeemed by the native German vigour and directness of the portraiture. The original models from which the medals were cast were in many cases made in hone-stone or box-wood, which did not, like the favourite wax of the Italian artists, give much scope for subtlety. The chief centres of the art were Nuremberg and Augsburg. Many medals have been attributed to Albrecht Diirer; whether he did more than design them is uncertain. Among other medallists may be mentioned Hans Schwarz (working 1516- 1527), Ludwig Krug, Friedrich Hagenauer (working 152 5-1. 546, see PL V. fig. 8), Peter Flotner (c. 1538, although it is doubtful whether this artist, whose plaquettes are famous, made any of the portrait-medals ascribed to him), Mattes Gebel, Hans Reinhardt the Elder, &c. Some other good artists are known only by their initials, or quite unidentified. After the middle of the 1 6th century the art declines, although we still have skilful artists like Valentin Maler (1568-1593). In this later period striking gradually supersedes casting.

The earliest Polish coins are of. the 10th century ; the types are copied from English, German and Byzantine sources. In the 12th and 13th centuries there is a bracteate coinage.. The Poland. grossus was introduced about 1300. In later times the town of Danzig, while belonging to the kingdom, issued remarkable gold pieces, thalers, &c, down to its restoration to Prussia (1793).

The origin of the coinage of the Scandinavian states: Norway, Denmark and Sweden, is clearly English and due to the Danish conquest of England. The runic alphabet is employed, scaadln- though not by any means exclusively, on many of the ayjg early coins of Denmark and Norway. The Norwegian series begins with Hakon Jarl (989-996), who copies the pennies of /Ethelred II. In the second half of the nth century begins a coinage of small, thin pennies, which develop into bracteates. Magnus IV. (1263-1280) restores the coinage, more or less imitating the English sterlings of the time. Norway and Denmark were united under Eric of Pomerania in 1396. The money of Denmark begins with pennies of Sweyn (985-1014) which are copied from the coinage of ˆEthelred II.; the coins of Canute theGreat (1014-1035) and Hardicanute (1036-1042) are mainly English in character. With Magnus (1042-1047) other influences, especially Byzantine, appear, and the latter is very strong under Sweyn /Estrithson (1047-1076). Bracteates come in in the second half of the 12th century. The coinage is very difficult of classification until the time of Eric of Pomerania (1396). There are important episcopal coinages at Roskilde and Lund in the 12th and 13th centuries. Sweden has very few early coin's, beginning with imitations by Olaf Skotkonung (995) of English pennies and showing the usual bracteate coinage. The money was restored by Albert of Mecklenburg (1363-1387). The thaler is introduced by Sten Sture the younger (1512-1520). The money of Gustavus Adolphus is historically interesting. Under Charles XII. there is highly curious money of necessity. The daler is struck as a small copper coin, sometimes plated. The types include

Latin

East.

the Roman divinities. At the same time and later there was a large issue of enormous plates of copper, stamped with their full value in silver money as a countermark.

The earliest Russian coinage begins with the princes of Kiev as early as the end of the 10th century; it shows strong Byzantine Russia. influence. The grand princes from the early 15th cen- tury struck curious little silver pieces. The coinage was modernized by Peter the Great, who introduced a regular gold coinage. The large silver and copper coins of his successors are very plentiful. Nicholas I. (1825-1855) introduced a platinum coinage of about two-fifths the value of gold.

The Christian coinages of the northern Balkan States are of great interest. They are chiefly [silver grossi, showing a mixture of Byzantine and Venetian influences. The Bulgarians had a regular silver coinage from Asien I. (1186-1196) to John Sismana (1371-1395). The Servian coinage lasts from Vladislas I. (1234-1240) to the middle of the 15th century. There is also a coinage of the Bans of Bosnia (late 13th to 15th century). The modern coinage of the Balkan States is of interest only as a revival. The independent city of Ragusa is remarkable for the bold style of its early copper (13th century, inspired by Roman models of the 4th century) and the richness and variety of its later issues.

There is a most interesting class of coins struck during the middle ages within the limits of the present Turkish empire, the money of the crusaders and other Latin princes of the East. The multitude of states thus designated have been classed by Schlumberger, the authority on the subject, in the following order, the chief divisions of which are here given: First group, principalities of Syria and Palestine, counts of Edessa, princes of Antioch, kings of Jerusalem, counts of Tripoli, fiefs of Jerusalem, crusaders who struck imitations of Arab coins, kings of Cyprus, lords of Rhodes, grand-masters of the order of St John at Rhodes, to which may be added the later grand-masters at Malta; second group, Latin emperors of Constantinople, Frankish princes and lords of Greece and the Archipelago whose power was due to the crusade of 1204, such as the princes of Achaia, the dukes of Athens, Neapolitan kings who struck money for their Eastern possessions, Latin lords of the Archipelago, the Genoese at Chios, the Gattilusi at Mytilene, the Genoese colonies, the Venetian colonies,

the Turkoman emirs of western Asia Minor who struck Latin coins. The most important currencies are the billon and copper of the princes of Antioch (Bohemund I., 1098, to Bohemund IV., 1201-1232) and the kings of Jerusalem (Baldwin II., 1118, to Conrad, 1243), the silver and copper of the counts of Tripoli (12th and 13th centuries) and the gold imitations of Arab dinars, the currency in that metal of the crusaders of Palestine. These Bisantii Sarracenati, or Saracen bezants, are at first imitations of Fatimite dinars, known to have been struck by Venetian moneyers at Acre, and probably at Tyre and Tripoli also. After these coins had been current for nearly a century and a half they were forbidden on account of their Mahommedan aspect by Pope Innocent IV. The Venetians then issued gold and silver coins with the same aspect but with Christian inscriptions. The kings of Cyprus issued a really good coinage in the three metals and in billon from Guy de Lusignan (1192) to Catherina Cornaro; from 1489 to 1571 the Venetians issued coins for the island. The coinage of the order of St John begins on the con- quest of the island of Rhodes (1309) and the suppression of the Templars; the earliest coins known are of Foulques de Villaret (1305-1319), and the last of the Rhodian series are of Villiers de l'Isle-Adam, the gallant defender of the island who was forced to capitulate to the Turks and sail for a new home in 1522. The coinage is of fine gold, silver, billon and copper. On the establishment of the order at Malta in 1530 it is resumed there till the capture of the island by the French at the close of the 18th century; it has little interest except as showing the wealth of the order. The other currencies of the crusaders, notwithstanding their great historical interest, are far less remarkable numis- matically; the influence of the denier tournois is, however, noticeable on the coinage of the princes of Achaia (1245-1364), and the dukes of Athens (1225-1308).

Of the money of America little need be said here. Neither the coinages of the Spanish and Portuguese dependencies, and of the states which succeeded them, nor those of the English colonies

and of the United States, present much that is worthy of note. In style they all resemble those of the parent countries, but, originating in the decline of art, they are inferior in style and work. They are most remarkable in the south for the abundance of gold and silver. The chief coin is the dollar. Some coins are of historical interest, and there are a few rarities, such as the colonial money of Lord Baltimore struck for Maryland, the pine-tree coins of Massachusetts, and the hog-money of Bermuda.

IV. — Oriental Coins

Oriental coins may be best classed as ancient Persian, Arab, modern Persian and Afghan, Indian and Chinese, and other issues of the far East. The first place is held by the money of the old Persian empire, the Parthians and the Sassanians. The conquests of the Arabs introduce a new currency, carried on by the Moslem inheritors of their empire. The modern Persian and Afghan money, though of Arab origin, is distinguished by the use of the Persian ' language with Arabic. The Indian currencies, though Greek, Sanskrit, Arab and Persian in their inscriptions, must be grouped together on account of their mutual dependence. They rise with the Bactrian kings, whose Greek types are gradually debased by the Indo-Scythians and Guptas; these are followed by a group of currencies with Sanskrit legends; next follow the money of Arab conquerors and the great series of the Pathans of Delhi and subsidiary dynasties, with Arabic inscriptions; the main series is continued in the currency of the Moguls, who largely use Persian, and the last series is closed by local currencies mainly with Sanskrit or Arabic legends. The Chinese coinages form the source and centre of the group of the far East, which, however, includes certain exceptional issues. The order throughout is historical, each empire or kingdom being followed by the smaller states into which it broke up, and then by the larger ones which were formed by the union of these fragments. ……

The Persian coinage was probably originated by Darius I. about the time that he organized the empire in satrapies. The regular taxation thus introduced made a uniform coinage necessary. Avoid- ing the complex gold system of Croesus, which was intended to accommodate the Greek cities in commercial relation with Lydia, Darius chose two weights, the gold shekel of 8-4 grammes and the silver drachm of 5-58 grammes. One gold piece was equal to twenty silver. The gold coin was called the daric, the silver the siglos. The metal was very pure, especially that of the daric. Thus not only were the Lydian gold and silver coins of inferior weight thrown out of circulation, but the Persian gold, from its purity, became dominant, and was the chief gold currency of the ancient world so long as the empire lasted. The issuing of gold was a royal pre- rogative. Silver money was coined not only by the king but in the provinces by satraps, who used local types, and by tributary states. The following classes must be distinguished: (1) regal, (2) satrapal, (3) of tributary states. The art of Persian coins varies according to the locality, from the beautiful purely Greek work of the west coast of Asia Minor to the more formal style of Cilicia and the thoroughly hieratic stiffness of Phoenicia and Persia.

The regal coinage is of darics (PI. IV. fig. 2) and subdivisions in gold and of sigli and subdivisions in silver. The obverse type is the king as an archer, the reverse an irregular obloflg incuse. The darics show differences of style, and must extend through the whole period of the empire. The sigli no doubt run parallel with them. Both these denominations are uninscribed.

The satrapal coinage is very important and interesting. It belongs mainly to Cilicia. The most remarkable series is that with a bearded head wearing a tiara, with various reverses, struck appar- ently at Colophon, Cyzicus and Lampsacus, and in one instance bearing the name of the satrap Pharnabazus, but usually the word " king " in Greek. The coin of Colophon shows a splendid portrait, one of the finest instances of Ionian work. It probably represents Pharnabazus (see PI. IV. fig. 1). Of other satrapal issues those of Datames, of Tiribazus and Cilician issues, struck at Tarsus, are specially noteworthy. Their inscriptions are Aramaic.

The coinages of the tributary states have been in part noticed in their geographical order.

After the fall of the empire, the generals and satraps such as Mazaeus who governed Alexander's newly-acquired dominions issued coins from various mints, especially Babylon. The gold coins were double darics of the same types as their single predecessors. The silver coins were mainly modelled on the coins which Mazaeus had previously issued in Cilicia with the types of Baal-Taro and Lion. Some of them may have been issued as far East as Bactria and North West India. These are followed by the first native coinage, in- scribed below under India.

[ORIENTAL

The conquest of Alexander did not wholly destroy the independ- ence of Persia. Within less than a century the warlike Parthians, once subjects of Persia, revolted (249-248 B.C.) against Parthians. t jj e geleucids and formed a kingdom which speedily became an empire, ultimately the one successful rival of Rome. Their money is Greek in standard and inscriptions, as well as in the origin of types. The coins are silver, following the Attic weight, the chief piece being the drachm, though the tetradrachm is not infrequent; there are also

bronze coins, but none in gold are known. The drachm has the head of the king on the obverse, diademed or with a regal head-dress, and on the reverse the founder Arsaces seated, holding a strung bow, the later tetradrachms varying this uniformity. Every king is styled Arsaces, to which many of the later sovereigns add their proper names. The inscriptions are usually long, reaching a climax in such as BASIAEilS BA2IAEQN MErAAOY AP2AK0Y AEKAIOY EIII AN0Y2 0EOY EYIIA- T0P02 *IAEAAHN02 of Mithradates III. (57-54 B.C. ; see PI. IV. fig. 4), where we see the double influence of Persian and Seleucid styles and the desire to conciliate the Greek cities. Very noticeable are the coins which bear the portraits of Phraataces (3 b.C.-a.d. 4) and his mother, the Italian slave Musa, with the title queen (0EA2 0YPANIA2 M0Y2H2 BA2IAI22H2). The last of the Parthian coins are those attributed to Artavasdes (c. a.d. 227).*

The coinage of Persis, beginning in the second half of the 3rd

century B.C., consists of silver tetradrachms and drachms; the

earliest have fine portraits of the kings, but the style

Persis. rapidly degenerates. The prevailing reverse type is the

Persian fire-altar.

The dynasts of Characene, on the lower Tigris, issued coins (silver,

bronze and base metal) from the time of the founder, Hyspaosines

(c. 124 B.C.), down to the 2nd century a.d. The obverses

Characene. Q f t j, e tetradrachms have portraits of the kings; the

usual reverse type is a seated Heracles.

The Persian line of the Sassanians arose about A.D. 220, and wrested the empire from the Parthians in 226-227, under the leader-ship of Ardashir or Artaxerxes. This dynasty issued a Sassa- national and thus Oriental coinage in gold and silver. mans. -j.^ denominations follow the Roman system, and there

are but two coins, equivalent to the aureus or solidus and the denarius. The obverse has the king's bust, usually wearing a very large and elaborate head-dress, varied with each sovereign, and the reverse the sacred fire-altar (see PI. IV. fig. 3) ordinarily flanked by

the king and a priest. The attachment which Ardashir, the founder, bore to Zoro- astrianism established this national reverse type, which endured through the four hundred years of the sovereignty of his line to a.d. 652. The inscriptions are Pahlavi.

The Arab coinage forms the most important Oriental group. It has a duration of twelve centuries and a half, and at its widest geographical extension was coined from Morocco to the Caliphates. Dor{ j ers f China. When the Arabs made their great con- quests money became a necessity. They first adopted in the East imitations of the current Persian silver pieces of the last Sassanians, but in Syria and Palestine of the Byzantine copper, in Africa of the gold of the same currency. Of these early coins the Sassanian imitations are very curious with Pahlavi inscriptions and shorter ones in Arabic (Cufic). The regular coinage with purely Moslem inscriptions begins with the issue of a silver coin at Basrah, in 40 a.h. (a.d. 660), by the caliph 'Ali; after subsequent efforts thus to replace the Sassanian currency, the orthodox mintage was finally established, in 76 a.h. (a.d. 695), by Abdalmalik. The names of the denominations and the weight of the gold are plainly indicative of Byzantine influence. There were three coins. The dinar of gold (PI. IV. fig. 6) took its name from the aureus or denarius aureus, of which the solidus must have been held to be the representative, for the weight of the Arab coin(about 4-3 grammes)is clearly derived from the Byzantine gold piece. The dirhem of silver (see PI. IV. fig. 7) is in name a revival of the Greek drachm; it weighs at most about 3 grammes. The copper piece is the fels, taking its name from the Follis of the Greek empire. Commercially the gold easily exchanged, and the silver soon passed as the double of the Carolingian denier. For long these were the only coins issued, except, and this but rarely, half and quarter dinars. There are properly no types. There was indeed an attempt in the early Byzantino-Arab money to represent the caliph, and in the course of ages we shall observe some deviations from the general practice of Islam, particularly in the coinage of the atabegs and in Mahommedan coinages not of the Arab group, the modern Persian and that of the Moguls of Delhi. The inscriptions are uniformly religious, save in some Tatar coinages and that of the Turks. In general the coins are for the first five centuries of their issue remarkably uniform in fabric and general appearance. They are always flat and generally thin. The whole of both sides of the coins is occupied by inscriptions in the formal Cufic character usually arranged horizontally in the area and in a single or double band around. Towards the fall of the caliphate a new type of coin begins, mainly differing in the greater size of the pieces. There are new

multiples of the dinar and ultimately of the dirhem, and the silver pieces frequently have their inscriptions within and around a square, a form also used for gold. The Cufic character becomes highly ornamental, and speedily gives way to the flexuous naskhi of modern writing. The inscriptions are religious, with the addition

of the year by the era of the Flight (a.d. 622), the month sometimes being added, and the mint occurs uniformly on silver and copper, but does not appear on the gold until after the fall of the Omayyad dynasty. Subsequently the official name of the caliph occurs. The religious part of the inscriptions is various, the most usual formulae being the profession of the Moslem faith: " There is no deity but God; Mahomet is the apostle of God," to which the Shi'ites or followers of 'Ali in Persia and Africa add " 'Ali is the friend of God." The Moorish coins give long formulae and religious citations and ejaculations, and they, like the money of the Pathans of Delhi of the Indian class, have occasionally admonitions urging or suggesting the purer use of wealth. As Arab and other dynasties arose from the dismemberment of the caliphate, the names of kings occur, but for centuries they continued to respect the authority of their re- ligious chief by coining in his name, even in the case of the shadowy Abbasids of Egypt, adding their own names even when at war with the caliph, as though they were mere provincial governors. After the fall of the caliphate some new denominations came in, chiefly of heavier weight than the dirhem and dinar, but the influence of the commercial states of Italy made the later Egyptian Mamelukes, the Turks and the later Moors adopt the gold sequin. In more modern times the dollar found its way into the Moslem coinage of the states bordering on the Mediterranean. It can be readily seen that Arab coins have no art in the same sense as those of the Greeks. The beautiful inscriptions and the arabesque devices of the pieces of the close of the middle ages have, however, a distinct artistic merit. The Omayyad coins owe their only historical value to the evidence which the silver affords of the extent of the empire at different times. The first separation of that empire dates from the overthrow of this dynasty (which had its capital at OmayyaSs. Damascus, a.d. 661-750) by the 'Abbasids (a.d. 750, capital Bagdad) speedily followed by the formation of the rival Omayyad caliphate of the West with its capital at Cordova. The ^" 6a «™ s – Abbasid money has the same interest as that which it succeeded, but its information is fuller. Towards the fall of the line (which ended at Bagdad in 1258) it becomes very handsome in the great coins, which are multiples of the dinar (see PI. IV. fig. 10) . The Spanish Omayyads (756-1031) struck silver almost exclusively. Their rise was followed by that of

various lesser lines — the Idrisites (788-985, silver) and Aghlabites (800-909, gold chiefly) in western Africa, the Beni Tulun (868-905, gold), and, after a short interval, the Ikhshidids (935-969, gold), both of Turkish origin, in Egypt. Meanwhile a new caliphate arose (909) in western Africa which subdued Egypt (969), the Fatimid of the line of 'Ali, and for a while the allegiance of the Moslems was divided between three rival lines, the Omayyads of Spain, the Fatimids of Africa, and the Abbasids of Bagdad. The Fatimids introduced a new type of dinar, with the inscriptions in concentric circles, and struck little but gold. In the interim the Persians, who had long exercised a growing influence at the court of Bagdad, revived their power in a succession of dynasties which acknowledged the supremacy of the caliphate of Bagdad, but were virtually independent. These were the Tahirids (820-872), Saffarids (867-903), Samanids (874-999), Ziyarids (928-1042), and Buwoyhids or Buyids (932-1055), who mostly struck silver, but the last gold also. As the Persians had supplanted the Arabs, so they were in turn forced to give place to the Turks. The Ghaznevids formed a powerful kingdom in Afghanistan (962-1186, gold and silver), and the Seljuks established an empire (gold), which divided into several kingdoms, occupying the best part of the East (1037-1 194). Of these dynasties the Seljuks of Rum or Asia Minor (1077-1300) first strike a modern type of Arab coinage (silver, PI. IV. fig. 9).

The Seliuk dominions separated into many small states, the central ruled by atabegs or generals (l2th-ljth cent.), and the similar Turkoman Urtukis (1 101-1312). The atabeg money and that of the Turks of the house of Urtuk are mainly large copper pieces bearing on one side a figure borrowed from Greek, Roman, Byzantine and other sources. They form a most remarkable innovation (PI. IV. fig. 11). In the same age the great but short-lived empire of Khwarizm (Khiva, 1150-1231) arose in the far East. The first caliphate to disappear was that of Spain, which broke up (c. 103 1) into small dynasties, some claiming the prerogative of the caliphates. They chiefly struck base silver (billon) coins. The Christian kings gradually overthrew most of these lines. In the meantime various Berber families had gained power in western Africa and the Almoravides and the Almohades crossed the straits and restored the Moslem power in Spain. They struck gold money of fine work, and that of the later Muwahhids is remarkable for its size and thinness. At the fall of the Muwahhids the only powerful kingdom remaining was the Arab house of Granada (Nasrids), which, supported by the Berbers of Africa, lingered on until the days of Ferdinand and Isabella (1492).

The Fatimite dynasty was supplanted by the Kurdish line of the Ayyubites, the family of Saladin, who from 1 169 to 1250 ruled Egypt, Syria and Mesopotamia, with a number of vassal states, some governed by princes of their own family, some by the older lines of the atabeg class which they allowed to survive. In Egypt the Ayyubite coinage is of gold, elsewhere of silver and copper. The caliphate of Bagdad, which latterly was almost limited to that town, though its abundant heavy gold coinage at this very time indicates great wealth, was overthrown by the new power of the Mongols (a.d. 1258), who established a group of empires and kingdoms, comprising the whole

Eastern world eastward of the Euphrates and thence extending northward and reaching into Europe. The most important ot these states for their money are that of the Mongols of Persia (11356-1349), founded by Hulagu, the conqueror of Bagdad, and that of the khans of the Golden Horde (1224-1502). Both struck silver, but there is also gold coinage of the Mongols of Persia, who more frequently use the Mongol character tor their names and titles than is done under the kindred line. The power of the Mongols was held in check by the Mameluke kings of Egypt and Syria, slave-princes of two dynasties, the Bahri (1250-1390) and the Burji (1382-1517), who struck money in the three metals. The Mongol power waned, but was revived by Timur (Tamerlane), who during his rule (1369-1405) recovered all that had been lost. He and his successors (to 1500) struck silver, copper, and brass money (see PI. IV. fig. 13). The Ottoman Turks, whose power had been gradually growing from 1299 onwards, after a desperate struggle with Timur (defeat of Bayezid I. at Angora in 1402), gradually absorbed the whole Mahommedan world west of the Tigris, except only Morocco, where they had but a momentary dominion. Constantinople fell to them in 1453, Syria, Egypt and Arabia in 1517 Their money of gold, silver, base metal and bron?e is devoid of historical interest. In Tunis and Morocco a group of Berber lines long maintained themselves, but at length only one survived, that of the sharifs of Morocco, claiming Arab descent, now ruling as the sole independent Moslem dynasty of northern Africa. Its recent coinage is singularly barbarous. It may be remarked that Tunis and Egypt have long coined Turkish money in their own mints, the more western state latterly adding the name of its here- ditary prince to that of the sultan.

The coins of the shahs of Persia have their origin with Isma'Il (1502). They are struck in the three metals, and are remarkable for the elegance of their inscriptions, sometimes in flowing a ' Arabic, sometimes in the still more flexuous native char- acter (see PI. IV. fig. 12). The inscriptions are at first Arabic; after a time the religious formulae are in this language and the royal legend in Persian, usually as a poetical distich. The Persian series is also re- markable for the autonomous issues of its cities in copper, the obverse bearing some type, usually an animal. The coins of the Afghan amirs form a class resembling in inscriptions those of the Persians, and equally using Persian distichs. They commence with Ahmad Shah Durrani (1747).

The first native Indian coinage consists of primitive pieces (the earliest perhaps of the 4th century B.C.) of silver and copper with countermarks (known as " punch-marked " coins). India. Foreign ccins (Persian and Athenian) circulated in the

country from the 5th century; the silver coinage of Sophytes, a con- temporary of Alexander the Great, shows Athenian influence; and there are not a few coins of Indian provenance showing direct imita- tion or modification of Athenian types (as the substitution of an eagle for the owl). Alexander himself is represented by a coinage of square bronze pieces. Certain tetradrachms and diobols with the name of Alexander and types: head of Zeus and eagle, probably belong to the end of the 4th century. But the coinage which was to have most effect on that of India was the Bactrian (see also under Bactria). This is at first a pure Greek coinage, of fine style, begin- ning with Diodotus (gold, silver, bronze), who revolted from Antiochus II., c. 250 B.C. For about a century the art of these coins, at least as regards portraiture, ranks very high for realism and vigour. The Bactrian rulers seem first to have made incursions into the Kabul valley and north India about 200 B.C., the first Indian con- quests being perhaps made by Euthydemus and Demetrius. Of the latter there exists a bronze coin with the regular Greek types, but of the characteristic square Indian form, with a translation on the reverse into Kharoshthi characters of the obverse Greek inscription. Some of the coins of succeeding kings are very remarkable, as the tetradrachms of Antimachus (see PI. IV. fig. 5), with a portrait re- minding us of good Italian medals, and the unique 20-stater gold piece of Eucratides (the largest Greek gold coin known to us, although its genuineness has been questioned). The coinage from about 160 B.C. becomes more and more Indian, the Greek power being definitely transferred south of the Paropanisus in the second half of the 2nd century. The Attic standard which had been used for

the silver gradually gave way to the Persian. The Greek princes went on reigning in India to about 20 B.C.; their chronology is very obscure. During the last two centuries B.C. several other coinages existed in north India. (1) The Scythic Sacae or Sakas invaded Bactria and then India; the earliest Saka coinage of north India (that of Maues in the Punjab, c. 120 B.C.) shows Parthian influence; so do the slightly later coins of Vonones and others who reigned in Kandahar and Seistan. (2) Another large and varied group of coins consists of the issues of native states, some of which go back to before 200 B.C. Of these we may note the coins of Eran (Sagar district) showing the gradual development of the punch-marked coin into the coin with a type, made up of a collection of such punch-symbols struck from one die ; and the coins of Taxila, the earliest of which are struck with a type on one side only. From these were imitated the copper coins of the Greeks, Pantaleon and Agathocles (c. 190 B.C.), which again inspired the later coins of Taxila with types on both sides. — In the first century of our era the Indo-Parthian dynasty of Gondophares (Gundophorus of the Apocryphal Acts of St Thomas) reigned in Kandahar and Seistan and in India, and is represented by coins.

About 25 B.C. the Kushanas (as the Yue-chi were called, after their most important tribe) conquered the remains of the Greek kingdom in the Kabul valley, and in the 1st century of our era they subdued the Punjab and the territoiy as far as the Jumna. The well-known gold coinage of the Kushanas (due probably to the influx of Roman gold into India) is begun by Hima Kadphises (c. A.D. 30-78; see PI. IV. fig. 14). The best-known kings are Kanishka, Huvishka and Vasudeva. The types are interesting, combining deities of the Greeks, Scythians, the Avesta and the Vedas and Buddha. The Greek inscriptions become meaningless after c. A.D. 1 80. The coinage in gold (of Roman weight) and copper, however, continues probably as late as a.d. 425 in the Kabul valley and the Punjab. Of other dynasties contemporary with the Kushanas, the most important are : (i.) The Andhras, a south Indian power, with territory extending across the peninsula from the Kistna and Godavari deltas to Kolhapur. The coins are chiefly of lead, but copper and silver are also known, (ii.) the satraps of Surashtra and Malwa, whose coinage (chiefly of silver) is copied from the half-drachms of the Greek princes of the Punjab; it lasts until the end of the 4th century, (iii.) Early in the 4th century the important imperial Gupta coinage begins with Chandragupta, and continues unbroken to the death of Skandagupta, c. a.d. 480. The empire at its greatest extent comprised the whole of north India, except the Punjab. The earliest

gold coinage was de- rived from that of the Kushanas (see PI. IV. fig. 15) ; later there was silver derived from the coinage of the satraps; the copper is more original in style. After c. a.d. 480 the empire broke up into various dynasties which lasted until A.D. 606. The Great Kushanas had been succeeded in Gandhara (Kabul valley and Punjab) by the Kidara Kushanas, and these, c. 465-470, were conquered by the Hunas (a branch of the Ephthalites or White Huns). The Huna coinage consists almost entirely of imitations of Sassanian, Kushana or Gupta coins. Their power probably broke up c. a.d. 544. Of other ancient and medieval non-Mahommedan coinages in India the following may be mentioned: (1) Various series of dynasties reign- ing in Kanauj and Delhi, from the 7th to the 12th century. (2) Kashmir — coinage beginning probably as early as Kanishka and continuing with the same types (obverse, king standing, reverse, goddess seated) until the Mahommedan coinage in the 13th century. The coins are very rude ; but the succession of the kings from c. A.D. 850 is fairly certain. (3) Later Shahi coinage of Gandhara, especially the " bull and horseman " coins (c. a.d. 860-950). (4) Pandya, in the extreme south : this district used first the early punch-marked coins, then coins with a type on one side only, and later double-type coins; these are earlier than c. a.d. 300. There is a later gold coinage (type, fish) from the 7th to 10th century. (5) Cola: an earlier coinage, before c. a.d. 1022, with the Cola emblem, a tiger; the later coinage (obverse, king standing, reverse, king seated) influenced the coinage over most of south India. (6) Ceylon: a coinage of the rajas imi- tated from the Cola coins, from A.D. 1153 to 1296. (7) Chalukya coinage, chiefly of gold, in west Deccan and in Pallava country between the Kistna and Godavari; the emblem is a boar. They range from the 7th to the nth century. (8) Vijayanagar: this power preserved the old character of the coinage south of the Kistna long after the Mahommedan conquest had transformed the coinage north of that boundary. The later coinage of South India is too obscure to be dealt with here.

The Arabs in the first days of conquest had subdued Sind and founded an independent state on the banks of the Indus, which was ruled by them for nearly two centuries from 711 ; but it is hard to subdue India from this direction, and the strangers decayed and disappeared. The way into India was first really opened by the campaigns of Mahmud of Ghazni (1001-1024) who annexed the Punjab and gave a raja to Gujarat. The Pathan kings came of the Ghuri stock which rose on the ruins of the empire of Ghazni (1 186). Mohammad ibn Sam (d. 1206) made Delhi his capital, and here he and his successors, Pathans or slave-kings, ruled in great splendour

as the first exclusively Mahommedan Indian dynasty, latterly rivalled by a line of Pathans of Bengal. Of the Pathans of Delhi (1206-1554) we have an abundant coinage, the principal pieces being the gold mohur of about 168 grains and the silver rupee of about the same weight, besides many pieces of bronze, and at one period of base metal. The coins are large and thick, with the profession of Islam or the style of the caliph on one side, on the other the name and titles of the reigning king. Mohammad ibn Tughlak (1324- 1351, PI. IV. fig. 8) struck coins with a great variety of inscriptions, some in the name of the shadowy ' Abbasid caliphs of Egypt, whose successors were for a time similarly honoured by later sovereigns. Towards the close of the rule of the Pathans several dynasties arose (about 1400) in central and southern India and struck similar money, the kings of Gujarat, of Malwa and the Bahmanids of the Deccan (1347-1526). The Pathan lines closed with Sher Shah, an Afghan, the last ruler of Bengal (d. 1539). Babar, the Turki, of the family of Timur, seeking a kingdom, adventured (1525) on the conquest of Hindustan; and after long wars with Sher Shah, carried on by Babar's son Humayun, the famous Shah Akbar, grandson of the invader, was at length peaceably settled on the throne of Delhi, and he and his successors, the so-called Moguls of Delhi, practically subdued the whole of India. They retained the existing standard, but used the Arabic and Persian languages like the shahs of Persia. Akbar (i556-i6o5)issuedasplendid coinage in gold and silver(Pl. IV. fig. 16),

far more elegant than that of the Pathans, but the money of his son, Jahangir (1605-1628) is still more remarkable. He issued the famous zodiacal mohurs and rupees, as well as those astonishing Bacchanalian mohurs on which he is represented holding the wine-cup (see PI. IV. fig. 17)- Scarcely less strange is the money of the beautiful queen Nur-Jahan. Under Shah Jahan (1628-1659) there is a visible falling away in the merit of the coins, and an ordinary modern style is reached cVu 6 lf gn oi , Aurun g zib (1659-1707). To the close of the rule of bhah 'Alam, the last Mogul who actually reigned (1759-1806), gold and silver money is abundant. Much of the money of the East India Company is closely imitated from this late Mogul coinage. Latterly, native states coin with Arabic and also with Sanskrit inscriptions.

j "l 0st , i m P° rtant ar e the kings of Oudh, the nizams of the

Deccan, and the kings of Mysore, besides the maharajas of Indore and the kings of Nepal. The coinage of Tipu Sultan (Tippu Sahib) is ex- tremely curious from his innovations in the calendar. Besides these there are a multitude of small states. Most of the Indian princes ac- knowledged the emperor of Delhi, but some struck independently. At last the English coinage of India has swept away nearly all these moneys, though some native states still issue their own.

We must be content with the briefest summarv of the strange coinages of China and the Further East.

The money of China, more certainly than the square punch- marked coinage of India, may claim an origin independent of the China. Indian and Greek issues. Although " money " is men-

tioned in Chinese literary sources as having been in use rom a very early period (3rd millennium B.C.) it is probable that bet ore the 7th century B.C. it consisted either of uncoined metal or ot other media, such as silk, tortoise-shell, cowries. The shell- currency indeed played a very important part in China even in later times. It was suppressed in 335 B.C., but the usurper Wang Mang, whose reign (a.d. 9-23) separates the two Han dynasties, made an abortive attempt to revive it. The earliest metal currency of which specimens are extant is, like nearly all subsequent Chinese money, of cast bronze. The gold and silver currency, which appeared sporadic- ally, can never have been of much importance; a kin, or cubic inch, oi gold, representing currency of Han times, is preserved in the Paris collection. The bronze coins fall into two main classes. The earlier (as a rule) have the shape of implements, such as spades, knives, &c; the later are the well-known round " cash " with a square hole in the centre (see PI. IV. figs. 18, 19). They are carried strung together, and their value is minute. From the earliest knife-money should be distinguished that of Wang Mang; his coins are short and thick, and the plain ring at the end of the handle is replaced by a piece resembling in shape a cash with ring and square central hole. J. he older knife-currency practically came to an end with the founda- tion ot the 1 s'in dynasty in 221 B.C., though it doubtless lingered on in remote, districts. With this dynasty appears the first organized state mintage. Nevertheless the economic history of Chinese coinage continues to be a melancholy record of doubtful financial expedients, debasement and forgery. The value of the coins was supposed to depend on their weight; but the weight inscribed on them was by no means always the true one. The bronze coinage from the reform ot Wu-ti in 138 b.c. down to a.d. 622 is fairly uniform; it is chiefly cash of 5 chu (see PI. IV. fig. 18). Iron money was issued at various

periods, ihe disturbance of the coinage by the usurper Wang Mang has already been noted. The modern coinage may be said in a sense to date from the introduction of the K'ai yuan pattern of 7! chu under the T'ang dynasty in A.D. 622. On the reverse of this coin was a mark (supposed to have been made by the empress Wen-teh in touching with her nail the wax model submitted to her) which has been much copied on coins of other countries in the Far East (see PI. IV. hg. 19). From this time to the present there has been little change. Paper-money was introduced in the 9th century. The modern cash usually bears on the obverse the name of the reign and the words t'ung pao (' current money "), on the reverse the name of the mint. 1 he coinage under the present (Manchu) dynasty has been regular, except during the Taiping rebellion, when some iron coins and copper tokens were issued, owing to the failure of the copper supply. Gold and silver have not been issued by the government until quite recent times (see below), with one or two unimportant exceptions, but circulate by weight. Imitations of Spanish and Mexican dollars, bearing numerous punch-marks placed on them by successive owners, are common. The most interesting Chinese coins are those of small rival dynasties and of rebels, the study of which is important for the elucidation of the obscurities of the history of the country. The Chinese medals are talismans, usually larger than coins, and bear both subjects and inscriptions. They are distributed by Taoist and Buddhist pnests of temples. The money of Korea and Annam is similar to that of China, and Chinese coins were long the currency ot Java, which more recently has issued the money of its Mahom-medan princes.

The empire of Japan shows in its coinage that Chinese source modified by the influence of native independence which marks all its Japan. institutions. The use of a metallic currency probably began in the 5th century of our era. In character the coins show strong Chinese influence. Amongst the earliest are rude silver pieces, disks of somewhat irregular shape, with a central hole, attributed to the early 5th century; and there are also copper coins ot similar character dating from the end of the 7th century A

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regular copper coinage, Chinese in pattern, began with the exploitation of the copper mines in a.d. 708. There was a silver coinage in a.d. 760, and a gradually deteriorating copper currency was issued at various dates down to a.d. 958. The twelve varieties issued in these two and a half centuries are known as the twelve antique sen (see PI. IV. fig. 20). No copper was issued by the government for six

hundred years after this date; but coins of the old patterns in lead or tin circulated down to 1302. The lack of copper was supplied by the importation and imitation of Chinese cash. These imitations were due to the great nobles, who made them on their own domains. At the end of the 16th century (Ten-sho period) a regular currency of gold, silver and copper, and also iron was instituted, which lasted, with modifications, down to recent times (iron coins with wave- pattern reverse being cast as late as i860). There is a billon coinage of bean-shaped pieces issued at various dates from 1 601-1859. Silver also was frequently issued on the same pattern as the copper coinage; but the greater part of it circulated in ingots or plates. The small oblong pieces known as ichi-bu and ni-bu belong to the 19th century (not issued after 1868). Large plates of silver, like the gold coins to be mentioned immediately, were issued in the 16th century by some provinces. Round coins of gold of the Chinese shape were rarely cast (one in a.d. 760, another in a.d. 1599). But from the 1 6th century to modern times gold circulated chiefly in large oblong plates, with rounded angles, varying from over 6 J to f in. in length. These are called o-ban ("large plate " of 10 ryo), ko-ban (" small plate "of I ryo; see PI. IV. fig. 21), &c. They bore various countermarks, including the mikado's crest, mint-assayer's test- marks, &c; some bear the attestations merely written in ink (a device of the imperial officials, who charged fees for the attestations, and were not sorry that they should be easily obliterated). Small gold oblong pieces were cast at various times from 1 601-1 856 (PI. IV. fig. 22). A European system of currency, with coins in gold (20 yen and under), silver (1 yen and under), nickel (5 sen) and copper (2 sen and under), was adopted in 1870. Japan has also " picture sen " (E-sen) of a magical and religious character like the temple medals already noticed under China.

*Korea has had a copper coinage of Chinese style from the beginning of the twelfth century during its intervals of independence; but its coins do not become common until 1790. ˆDuring „ the 19th century it issued an extensive copper coinage &<»**• from various mints. _ The earliest coins of Annam were imitations of Chinese coins, but since the 10th century its kings have issued a regular coinage bearing their regnal titles as in China. Since 1820 round and oblong silver coins have been struck, the tael and its Anaam ' subdivisions. Peculiar to Annam are the fine series of medals in gold, silver and copper struck since 1841 by its kings for presentation purposes, bearing lucky inscriptions, quotations from the Chinese classics, &c.*

The peculiar forms of primitive currency characteristic of certain partsof Further India and the Malay Peninsula can only be barely mentioned here. Burma provides silver-money in the shape of snail-shells (a relic of a still more primitive shell- Burma > currency). The earlier Siamese ticals are derived from a ˆ a 'l y ring of silver wire doubled up and countermarked. ™" nsu/a » From Pahang come very curious tin " hat coins," shaped like a hollow square pyramid, truncated, with broad, square brim projecting from its base. The peoples of the Indian Ocean and Persian Gulf used in the 16th and 17th centuries pieces of silver wire called lanns which in Ceylon took the shape of fish-hooks.

V. Coins of the Present Day United Kingdom. — The standard of gold and silver has re- mained unchanged for over two hundred years, and until 1887 the denominations were practically the same as instituted at the great recoinage of 1816. The substitution of a bronze for a copper currency had already taken place in i860. On the occasion of Queen Victoria's Jubilee in 1887 it was determined to mark the event by a new coinage of gold and silyer, and to revise the royal portrait. Two new denominations of five and two pounds were added to the gold series, and the double florin to the silver. For the re- verse type of all the gold and of the five-shilling piece, Pistrucci's design of St George and the Dragon was used, and former types of Anne and George IV. were revived for the double florin, florin, half-crown and sixpence; that of the last was, however, soon abandoned. This new coinage did not meet with general approval, especially as regards the portrait of the Queen, and in consequence a third portrait was

Fig. 1. — Sovereign (gold), England: Queen Victoria (obverse by Brock).

Fig. 2. — Sovereign (gold), England : King Edward VII. (obverse by de Saulles).

adopted for the gold and silver in 1893, new reverse types were prepared for the half-crown, florin and shilling, and the issue of the double florin was discontinued. The portrait of the queen was the work of the sculptor Thomas Brock, R.A., who was careful to avoid the defects which had been somewhat severely criticized in Sir J. Edgar Boehm's design of 1887. The new type for the half-crown, a spade-shaped shield within the garter, was also executed by Mr Brock; and those for the florin and shilling, three shields placed triangularly, were by Sir Edward

Poynter. In 1895 a new issue of bronze money was ordered, when the queen's bust of 1893 was adopted,, and a slight alteration made in the reverse type, the repre- sentation of a lighthouse and a ship, which had been added to the design in i860, being eliminated. The coinage of Edward VII. differed but slightly from that of Queen Victoria. The denominations were the same; but on the obverse the head of the king (by G. W. de Saulles, engraver to the Mint) was represented bare, the title " Britanni- arum " was changed to " Britanniarum Omnium Rex," the reverse of the florin showed Britannia standing on a ship, and that of the shilling the royal crest, the lion on a crown, as on the so-called " lion-shillings " of 1826. The designing of the new coinage of George V. was entrusted to Mr Bertram Mackennal.

France. — On the establishment of the Third Republic in France in 1870, the coinage was continued on the same lines as before, the types only being altered. The silver franc of 5 grammes (78 grains) as ordered in 1793 and confirmed by the Latin Monetary Union of 1865, which included Belgium, Italy and

Switzerland, and subsequently in 1868 Greece, has remained the unit of value. The de- nominations ordered were, in gold, the 100, 50 and 20 francs; in silver, the 5, 2 and 1 franc, and 50 and 20 Fig. 3 .- Twenty Francs (gold), centimes; and in bronze,

France (Chaplain).

the 10, 5, 2 and 1 centime. The types adopted were those which had been used previously — thus for the gold that of a genius inscribing the tables ofj the law, as designed by Augustin Dupre for the reverse of the constitutional coinage of Louis XVI.; for the silver and copper the head of the Republic as executed by Oudine for the money of 1848. Subsequently, in 1871, the type of the 5 francs was changed for that of Hercules leaning on Liberty and Strength, as made by Dupre for the First Republic. In 1889 the 10 francs in gold was added to the list, having the head of the Republic crowned with corn, the work of Merley for the Republic of 1848; but only a small number of these coins was struck in that year and in 1893. No further alteration was made till after 1895,

when, in consequence of suggestions that the types should be modified so as to mark the Third Re- public, the artists Chaplain, Roty and Dupuis were com- missioned to execute new designs — the first for the gold, the second for the silver, and the last for the bronze. The types approved were: for the gold 20 francs, the head of the Republic with a Phrygian cap, and the Gallic cock; for the silver 2 and 1 franc and 50 centimes, the sower sowing, with the rising sun in the background, and a laurel

Fig. 4. — T wo Francs (silver) , France (Roty).

branch; and for the bronze, the bust of the Republic wearing a Phrygian cap, and on the reverse France seated amidst clouds, holding a branch and a flag, and accompanied by a genius. These coins were not issued simultaneously — the 50 centimes appearing in 1897, and 2 and 1 franc and 10, 5, 2 and 1 centime in 1898, and the 20 francs in 1899. In 1903 a nickel piece of 25 centimes was introduced, since 1904 with a polygonal edge to facilitate distinction from the silver. The quartering of the franc is a departure from the strictly decimal system, also adopted in Italy. These later coins are characteristic of modern French medallic art, which has a strong tendency to imitate that of Italy of the 16th century.

Belgium.— Of the other states which formed the Latin Monetary Union, Belgium had already in 1832 adopted the French decimal and bimetallic system, with the franc as the unit of value. Her accession to the Union, therefore, only entailed a slight modification of type and denominations, which latter were the same as in France, except that the only gold coin was the 20 francs, the 25 centimes in silver was not issued, and the pieces of 10 and 5 centimes are now in nickel. The gold and silver coins have for types the head of the king and the royal shield, those in nickel the Belgic lion and mark of

value, and those in bronze the royal monogram and the lion holding the tables of the constitution. Some of the silver coins have the inscriptions in Flemish. The nickel coinage introduced in 1902 is perforated in the centre to prevent confusion with silver.

Switzerland. — Like Belgium, Switzerland had before her adhesion to the Latin Monetary Union adopted the French system, with the franc of 100 centimes or rappen as the unit of value. The denominations in gold and silver were the same as issued for Belgium, but no gold was struck before 1883. The coins of baser metal were the 20, 10 and 5 centimes in billon, which metal was in 1879 changed for the nickel, and | in copper the 2 and 1 centime. Certain changes of type have from time to time occurred. The first issue of the 20 francs in 1883 shows the head of the FlG ‘ ^^s^^nd™ ^ ‘

Republic and the shield of the

Confederation; but this was changed in 1897 for the head of Helvetia above a range of mountains, and on the reverse a wreath with mark of value. On the silver coins from 1874 Helvetia is represented standing instead of seated, and on the nickel money of 1879 the shield of the Republic is replaced by the head of Helvetia. The mark of value and a wreath form the general reverse type of all the silver, nickel and copper coins. Since 1888 a 5-franc piece, similar in type to the 20 francs of 1883, has been issued.

Italy. — When Italy joined the Latin Monetary Union in 1865, she adopted as the unit of her coinage the lira of 100 centesimi, equal to the franc. The coins were of gold, silver and bronze, and of the same de- nominations as those struck in Belgium and Switzerland. In 1894 a nickel coinage of 20 centesimi was ordered. The general type for all the coin- age is the head of the king and the royal FlG 6 ._ Tw0 L ; re (s ;i ver), Italy,

arms, but on the re- verse of the copper is the mark of value; and the nickel money has on the reverse a crown with a wreath. A new nickel piece of 25 centesimi indicates a departure from the strictly decimal system. The coinages of all the small Italian states, including the Papal, have now passed out of currency.

Greece. — A special stipulation was made, when Greece was enrolled in the Latin Monetary Union in 1868, that all her money should be struck at a French mint. The unit of the coinage

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is the drachm of ioo lepta, which, like the lira, is equivalent to the franc. The denominations are — in gold, the ioo, 50, 20, 10 and 5 drachms; in silver, the 5, 2 and 1 drachm, and 50 and 20 lepta; and in bronze, the 10, 5, 2 and 1 lepton. In 1893 nickel was substituted for bronze, and coins of the value of 20, 10 and 5 lepta were issued in this metal. The types of the coins of Greece are similar to those of Italy. Crete has had since 1900 a coinage of its own similar to the Greek (silver of 5, 2 drachmae, 1 and 5 drachma; bronze and nickel of 20, 10, 5, 2 lepta and 1 lepton).

Germany. — Since 1871 the coinage of the German empire has been entirely remodelled. By a convention in 1857 between the states of Germany, north and south, and Austria a general coinage of a silver standard was established on the basis of the new pound of 500 grammes as sanctioned by the Zollverein. The contracting countries were divided into three sections, North Germany, South Germany and Austria. From the pound of fine silver of 500 grammes the Northern States struck 30 thalers, Austria 45 florins and the Southern States 525 florins; their relation being 1 North German thaler =15 Austrian florins = if South German florins. The free towns of Hamburg, Liibeck and Bremen did not join the convention. The first reform in the coinage of the German empire occurred in 187 1, when a new gold money was introduced, which had for its unit the silver mark (a money of account) of 100 pfennigs weighing 5-555 grammes. The new gold pieces were of the value of 10 and 20 marks, called crowns and double crowns, and the fineness was i\ pure to “iV alloy. This new issue necessitated a readjustment of the current values of the various silver coinages in circulation. In 1873 a further step was made by the introduction of an entirely new silver coinage throughout the empire, which was also based on the silver mark, and of a new base metal coinage in nickel and bronze. The silver coins were the 5, 2 and 1 mark and 50 and 20 pfennigs; those in nickel the 10 and 5 pfennigs, and in bronze the 2 and 1 pfennig. The silver coins were, like the gold, ˆ fine, so that 90 marks were struck to the pound of pure metal. The gold 5 marks was struck in 1877 and 1878, and the 20 pfennigs in silver was replaced by a coin of the same value in nickel in 1886. The reverse type for all the coins is the imperial eagle, but that of the obverse varies; the gold and silver showing the portrait of the reigning king or prince, but

the mark, and all lesser denominations, the current value. An

exception was made in the case of the coinage of the Free Towns struck at Hamburg, which has the arms of the city instead of a portrait. Each state retained its full rights of coinage, and the various mints throughout the empire with their special marks are: Berlin, A; Hanover, B; Frankfort, C; Munich, D; Dresden (removed since 1877 t0 Muldner-Hutte), E; Stutt- gart, F; Karlsruhe, G; Darmstadt, H; and Hamburg, J. In 1876 a gold standard was proclaimed, and henceforth no person was legally bound to accept in payment more than 20 marks in silver and the value of 1 mark in nickel or bronze. The old thalers (worth 3 marks) still circulate.

Austria-Hungary. — After the convention of 1857 with Germany (see above), when Austria based her coinage on the silver standard of the florin, two series were issued — (i.) Vereinsmiinzen (money of the union), in gold, the crown and half-crown; in silver, the double thaler (= 3 florins) and thaler; (ii.) Landesmunzen (money of the state), in gold, the 4 and 1 ducat; in silver, the double florin and florin; in billon, the 20, 10 and 5 kreuzers; and in copper, the 4, 3, 1 and 5 kreuzer. In 1868 Austria aban- doned the convention, but made no change in her money; and in the same year the coinage of Hungary was made uniform with that of the empire, both in standard and denominations. In 1S70 the Vereinsmiinzen crown and half-crown were dis- continued, and their place was taken by 8- and 4-florin pieces

Fig. 7.-

-Twenty Marks (gold), Germany.

Fig. 8. — Florin (silver), Austria-Hungary.

which were of the current value of 20 and 10 francs. In 1892 the monetary system of Austria-Hungary was entirely reformed on a gold standard, the unit of account being the crown of 100 hellers. This is a decimal coinage, and the denominations are, in gold, the 20 crowns (of 164 from the kilogramme of fine gold), 10 crowns and ducat (= 9 silver crowns 60 hellers); in silver, the crown (=iod.) and half-crown; in nickel, the 20 and 10 hellers; and in bronze, the 2 and 1 heller. The gold ducat was a trade-money (Handelsmiinze) of the current value of 10 francs, and it displaced the 8- and 4-florin pieces of 1870. The types of the Austrian and Hungarian coins somewhat vary. The Aus- trian gold coins show the head

of the emperor ra&WHSBKMBMSSf \«« and the two- headed eagle,' but those of Hungary a full- length figure of the emperor and the

national shield surmounted by the crown of St Stephen held by angels. The silver coins of both series have the head of the emperor and the mark of value under the imperial or royal crown. The nickel and bronze money of Austria displays the imperial eagle on the obverse, whilst that of Hungary has the crown of St Stephen. The legends are respectively in Latin and Magyar.

Spain. — The unit of the Spanish coinage from 1864 to 1868 was the silver escudo of 200 grains divisible into 10 reals. On the dethronement of Isabella in 1868 the provisional government adopted the principles of the Latin Monetary Union and made the peseta the unit of account, this coin being equivalent to the franc. The coins struck during 1869-1870 were, in gold, the 100 pesetas; in silver, the 5, 2 and 1 peseta, and the 50 and 20 centimos; and in bronze, the 10, 5, 2 and 1 centimo. The obverse type of each metal varied; on the gold Spain is standing; on the silver she is reclining; and on the bronze she is seated. During his short reign (1870-1873) Amadeus I. struck only gold coins of 100 and 25 pesetas and silver of 5 pesetas, and there was practically no money issued during the republic which followed his abdication. Don Carlos during the insurrection of 1874-1875 struck 5 pesetas in silver and 10 and 5 centimos in bronze bearing his portrait and title " Carolus VII." After the restoration of Alphonso XII. the coinage consisted of 25 and 10 pesetas in gold; 5, 2 and 1 peseta and 50 centimos in silver; and 10 and 5 centimos in bronze. This coinage was continued under Alphonso XIII., but in 1887 the 20 pesetas in gold was sub- stituted for the 25 pesetas, and in 1897 large coins were struck of 100 pesetas

Fig. 9. — Peseta (silver), Spain.

The types show the head of the king on the obverse and the shield with or without the pillars of Hercules on the reverse.

Portugal. — A gold standard was adopted by Portugal in 1854, the unit of value being the milreis of 1000 reis. The coins are, in gold, the crown or 10 milreis and the half, 'fifth and tenth crown or milreis; in silver, the 10, 5 and 2 testoon; in nickel, the 100 and 50 reis; and in bronze, the 20, 10 and 5 reis. The general type of the gold and silver is the head or bust of the king and the royal shield; but the bronze varies in having on the obverse a shield and on the reverse the mark of value.

Denmark, Sweden and Norway. — Previous to 1872 in Denmark the unit of value was the silver rigsbankdaler of 96 skillings; in Sweden,

the rigsdaler of 100 ore; and in Norway, the species- thaler of 120 skillings; but in that year a monetary convention was concluded between these countries establishing a decimal coinage, which had for its unit the krone of 100 ore, and of which

Fig. 10. — Seven and one-half Roubles (gold), Russia.

the standard was gold. The denominations are, in gold, the 20, 10 and 5 kroner; in silver, the 2 and 1 krone, and 50, 25 and 10 ore; and in bronze, the 5, 2 and 1 or. The gold and silver money of Sweden and Norway to the 50 ore bears the head of the king and the royal shield; the silver of smaller denomina- tions and the bronze, the monogram of the king and the mark of value. Since the separation of the two kingdoms in 1906, Norway has a coinage of its own in the name of Haakon VII. In Denmark the gold and silver have the head of the king, and, for reverse type, a figure of Denmark, a shield, or the mark of value. The bronze coins are similar to those of Norway and Sweden.

Russia. — The Russian coinage previous to 1885 was based on the silver rouble of 278 grains of pure metal; but during the greater part of the reign of Alexander II. (1855-1881) the currency consisted almost entirely of paper money. In 1885 Alexander III. determined to place the coinage on a proper footing, and introduced the rouble of 100 copeks as the unit of account, with a relative value of gold and silver of 1 to is|. The coins issued were, in gold, the imperial of 10 roubles, and the half-imperial; in silver, the rouble, and the 50, 25, 20, 15, 10 and 5 copeks; and in copper, the 5, 3, 2, 1, 5 and j copek. In 1897 the relative value of gold and silver was advanced to

1 to 235, thus raising the current value of the imperial to 15 roubles; but no change 1 was made in the weights I of the coins, and the silver rouble remained the unit of account. In the same year a piece of 5 roubles, called the one-third imperial, was added to the gold coins. The general types of the gold and silver show the head of the emperor and the imperial eagle; and of the copper, the imperial eagle and mark of value.

Georgia, Poland and Finland. — The separate issues of Georgia and Poland were suppressed in 1833 and 1847 respectively; but Finland

in 1878 established a decimal coinage of gold, silver and bronze on the principles of the Latin Monetary Union, having the markhaa (=1 franc) as its unit of value.

Turkey. — There has been practically no change in the money of the Ottoman empire since the reforms of Abdul-Medjid in 1844, when the piastre, or 40-para piece, of the current value of 2jd., was made the unit of the coinage; 100 piastres go to the gold medjidieh or pound. The denominations are, in gold, the 500, 250, 100, 50 and 25 piastres; in silver, the 20, 10, 5, 2, 1 and I piastre; and in copper, the 40, 20, 10, 5 and 1 para. The type in all metals is, on the obverse, the Sultan's lughra, or cipher, and on the reverse, a wreath, and the name of the mint, date, &c.

Balkan States. — Since the dismemberment of the Ottoman empire the kingdoms of Rumania and Servia, and the principality of Bulgaria, have each adopted the decimal system of the Latin Monetary Union. In Rumania the unit of account is the leu of 100 bani; in Servia, the dinar or 100 paras; and in Bulgaria, the lev of 100 stotinki — each of these units being the equivalent of the franc. In all these states gold, silver, bronze and nickel is current money.

United Stales. — In America the most important event con- nected with the coinage was a change of standard. (See Money) . Previous to 1873 the standard was silver, having for its unit the dollar of 4125 grains of ˆ fine; but in that year a gold standard was adopted, the gold dollar of 25-8 grains and -ˆfine being the sole unit of value. This change of standard was accompanied by a slight modification of the denominations, which became, in gold, the double-eagle, eagle, half and quarter eagle, three dollars and dollar; in silver, the half and quarter dollar, 20 cents and dime; in nickel, the 5 and 3 cents; and in bronze, the cent. In addition to these a silver piece called the " trade dollar " of 420 grains was struck, not for circulation in the States, but for export to China. The following changes have since occurred:

In 1878 the silver dollar of 412ˆ grains was resumed, and the 20 cents discontinued; in 1887 the issue of the " trade dollar " was suspended; and in 1890 the same fate befell the three dollars and dollar in gold, and the three cents in nickel. The types are — gold, head of Liberty and eagle; silver, head of Liberty, or Liberty seated, and eagle, except the dime, which has the mark of value; nickel, shield (5 cents) and head of Liberty; bronze, head of an Indian, and (1910) bust of Lincoln; with reverse types for either metal, the mark of value.

Canada, &c. — The ‘ currency for the Dominion of Canada, which includes Nova Scotia, New Brunswick and British Columbia, is of silver and bronze, based on the system of the United States. The denominations are 50, 25, 20, 10 and 5 cents in silver, and the cent in bronze; and they also have a uniform type of the sovereign’s head and mark of value. The same system prevails in Newfoundland, which also issues the double dollar in gold: this is the only gold coin issued in a British colony whose standard is not the same as that of the mother country. There is a separate coinage for Jamaica, but of nickel only, and consisting of the penny, halfpenny and farthing.

Mexico, &c. — We need not give any detailed account of the coins of Mexico, and of the various states of Central and South America, in nearly all of which there have been radical changes since 1870. Most of them have adopted the decimal system, with a gold, silver or bi-metallic standard; the unit of value in the gold standard being generally the peso of 3-225 grammes, and in the silver also the peso, but of silver of 20, 25 or 27 grammes.

India. — As to the coins of the East and Far East, we will limit our remarks to the more important countries. In British India the rupee of silver of 150 grains is still the unit of value. In 1893 the mints were closed to the unrestricted coinage of silver for the public. In 1899 they were opened to the free coinage of gold, the sovereign being declared legal tender. At present £1 = 15 rupees of is. 4d. ; I rupee = 16 annas; I anna = 4 pice; I pice = 3 pie = l farthing.

Persia. — In Persia since 1879 a decimal system in conformity with the principles of the Latin Monetary Union has been adopted, having for its unit the kran weighing 78 grs., thus being equivalent to the franc, but since reduced to 71 grs. or even less. The denominations are: in gold, the 10, 5, 2, I, j and \ toman (the toman = 10 krans); in silver, the 5, 2 and I kran (= 20 shahis), and the 10 and 5 shahis; and in copper, the 4, 2 and I shahi (= 2 pals), and the pal.

Japan. — Since 1870 Japan has formed its coinage on the European decimal system in place of the ancient national coins, the obangs and itsibus, the unit being the yen of 100 sen. The standard was bi-metallic, and the relation of gold and silver stood at 1-16-17. In 1898 a gold standard was adopted, the issue of the silver yen was suspended, and the weight of the gold money was reduced by one-half. The coins issued since that date are, in gold, the 20, 10 and 5 yen; in silver, the 50, 20 and 10 sen; in nickel, the 5 sen; and in bronze, the sen and half-sen. There is one general type for all the silver, nickel and bronze coins, being the dragon on the obverse and

a wreath of flowers with mark of value on the reverse. The gold varies in having flags and flowers on the reverse. On the silver and bronze coins the legends are in English as well as in Japanese.

China. — In 1890 China followed the example of Japan, but only to a limited extent, and instituted a silver coinage having as its unit a dollar of the same value as the United States silver dollar and the Japanese yen. It is calculated in fractions of the tael, a money of account of the value of 2s. njd. The coins are the dollar, and the 50, 25, 10 and 5 cents, with the Chinese dragon and inscriptions, mint and mark of value in English on the obverse, and on the reverse the mark of value in Chinese and Manchu. They were first struck at Canton and Wei-Chang, but later other mints have been established. These are not, strictly speaking, imperial money, the sole official coinage and monetary unit being the copper cash. A decree of the 20th of November 1905 proposed to establish an official dollar on the basis of the Kuping tael. An edict of May 1910 provides for a standard currency dollar of 72 candareens, with a subsidiary decimal coinage in silver, nickel and copper, for circulation throughout the empire.

Korea has had since 1905 a new coinage on the Japanese system, but with the Korean date.

Hong Kong. — The only other Asiatic coinage we shall note is that of Hong Kong, where in 1866 was established a coinage, which was also based on the United States standard, having the silver dollar as its unit. The denominations are the dollar and 50, 20 and 5 cents in silver, and the cent and mill in bronze; and, with the exception of the mill, they all have for type the sovereign's head and the mark of value. In connexion with this coinage there was issued in 1 895 a " trade dollar " for special currency in the Straits Settlements and Hong Kong in lieu of the Mexican dollar, the scarcity of which was a considerable hindrance of trade. This coin, which was struck at the Bombay mint, shows on the obverse Britannia hofding a

trident and shield, and on the reverse within an ornamental design the denomination in Chinese and Malay. Since 1903, however, a new

Trade Dollar " (silver), Hong Kong.j

special dollar with the king's head has been issued for the Straits

settlements.

Egypt.— Glancing cursorily at the coinage of Africa, we may note that since 1885 Egypt has adopted a gold standard with the gold pound of 100 piastres as the unit of account. The piastre is no longer divisible into 40 paras, but into 10 ochr-el-guerche or tenths The types are similar to the Turkish money, and though bearing the legend struck at Cairo the coins are really made at Birmingham For some years gold has not been issued. s

Abyssinia.— In Abyssinia since 1893 there has been a silver coinage but the Austrian Maria Theresa dollar is still current The new coins are in silver, the talari (=dollar, worth about 2s.) \ \ and a talari, and in copper, the guerche, and J and \ guerche. They show

banner g ‘ a ” d ° n the ° her a lion holding a*

*Zanzibar.— Zanzibar has also issued a dollar of the fixed value of otaToUarT * ^“T’ * C ° PP6r C ° in Called a f essa (= 136th*

Sudan.— The ˆ African coinages which have attracted exceptional attention .are those of the Sudan and the South African Republic The former dates from 1885, when the Mahdi struck the pound of 100 piastres m gold and the 20 piastres in silver, of the same type as

” Bv ?rder an of C °Z S ‘ MhS-ˆ f™ ˆ Were P ‘ aCed the word ,,7,™ of the Mahdi, but no mint name. His successor Abcfullah, struck pieces of 20, 10, 5, 2 and 1 piastre in silver and To paras in copper but no gold They bear the name of the mint Omdurman, and the word makbul, i.e. accepted. At first the silver corns were of 6 parts silver and 2 copper, but in a few years they were so debased that they degenerated into mere pieces of copper washed with silver. The last issue is dated 1897 (ah hk

Congo Free State {Belgian Congo).- The coinage issued since 1887 consists of silver of 5, 2, 1 fr. and 50 centimes, and copper (with central hole) from 10 centimes to 1 centime

Transvaal.— The first attempt at a separate coinage in the Transvaal was in .1874, when President Burgers issued sovMrimw pounds showing his portrait on the obverse and the shield of the Republic on the reverse They were struck by Messrs Heaton of Birmingham but as each piece of the current value of 20s. cost 26s to strike only £680 worth was issued, and but few of these passed into circulation, being preserved as curiosities. No further attempt was made till 1891, when President Kruger induced the Raar 1 to order a coinage in gold

*silver and bronze after the English standard. The first issue occurred in 1892, and consisted of the pound and half- pound in gold; the crown, half-crown, florin, shilling, sixpence and threepence m silver; and the penny in bronze. They are all of the same type as the pound of 1874, but with the portrait of President Kruger on the obverse The first issue of the pound, half-pound and crown was minted at Berlin, and a curious mistake was made in the arms of the state, the. wagon being represented with two shafts instead of with one. This blunder was soon noticed, and a recoinage RHHi ■ "I the K sarae , y ear * Pretoria. Since the annexation apSed'm 5 ^ ^ ^ tender ' but a " 6W co ^ c ™age was*

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(R. S. P.;H. A. G.;G. F. H.)*

NUMMULITE, NlfMMULITES, A. d'Orbigny's name for a genus of Perforate Foraminifera (q.v.), distinguished by the flattened, lenticular discoid shell of many turns, finely perforated; chambers subdivided by incomplete septa into squarish chamber- lets. This genus is especially abundant in Eocene Limestones, which attain great thickness around the Mediterranean basin; the Pyramids of Egypt are built of it.

NUN (0. Eng. nunne, from Lat. nonnus, nonna, familiar terms fpr an old man or woman), a member of a community of women, living under vows a life of religious observance (see Monasticism) . In

ecclesiastical Latin nonnus was used by the younger members of a religious community for their elders, and so, in the regula of St Benedict, cap. 62, Juniores autem Priores suos nonnos vocant quod intelligitur paterna reverentia (Du Cange, Glossarium, s.v. nonnus). While nonna has remained as the generic name of a female religious, nonnus has been replaced by monachus and its various derivatives (see Monk) .

NUNATAK, a name applied in Greenland (and thence extended in use elsewhere) to a hill or mountain peak appearing above the surface of a glacier. Greenland is for the most part covered by an ice-cap of a certain thickness which moves slowly down- wards to the sea. It will rise Upwards and pass over a barrier if there is no outlet, but it will flow between and around mountain peaks leaving them standing as hills (nunataks) above the general surface of the ice-cap. These prominences are sometimes covered with arctic vegetation, and arctic flowers bloom freely upon them in the summer.

NUNCIO, or Nuntius Apostolictjs, a representative of the pope sent on diplomatic mission. The nuncios are of lower rank than the legati a latere, but have practically superseded them as ambassadors of the papacy. Nuncios were permanently established at various courts and ecclesiastical centres during the 1 6th century. According to the decision of the congress of Vienna the diplomatic rank of a papal nuncio corresponds to that of an ambassador. The powers of a nuncio are limited by his instructions. If a cardinal, as rarely is the case, he uses the title pro-nuntius. The pro-nuntius at Vienna has practically the position of a legalus a latere.

NUNCOMAR or Nanda kumar (d. 1775), Indian official, best known for his connexion with Warren Hastings (q.v.), was governor of Hugh in 1756, and in 1764 he was appointed collector of Burdwan in place of Hastings, which resulted in a long-stand- ing enmity. In 1775, when Hastings was governor-general, Nuncomar brought accusations of peculation against him, which were entertained by Francis and the other members of council inimical to Hastings. While the matter was still pending Nuncomar was indicted for forgery, condemned and executed. Warren Hastings and Sir Elijah Impey, the chief justice, were both impeached, and were accused by Burke and afterwards by Macaulay of committing a judicial murder; but Sir James Stephen, who examined the trial in detail, states that the indict- ment for forgery arose in the ordinary course, was not brought forward by Hastings, and that Impey conducted the trial with fairness and impartiality.

See Sir James Stephen, The Story of Nuncomar (2 vols., 1885) ; and, for another treatment of the case, H. Beveridge, The Trial of Nanda Kumar (Calcutta, 1886).

NUNEATON, a market town and municipal borough in the Nuneaton parliamentary division of Warwickshire, England, on the river Anker, a tributary of the Tame, and on the Coventry canal. It is an important junction of the London and North

Western railway, by which it is 97 m. N.W. from London, and it is served by the Leicester-Birmingham branch of the Midland railway. Pop. (1901) 24,996, rapidly increasing. The situation is low and almost encircled by rising ground. The church of St Nicholas is a large and handsome structure in various styles of architecture, and consists of nave, chancel and aisles, with a square embattled tower having pinnacles at the angles. It contains several interesting monuments. A free grammar school was founded in the reign of Edward VI., and an English free school for the instruction of forty boys and thirty girls by Richard Smith in 17 12. The ribbon industry is of less importance than formerly, but there are ironworks, cptton, hat, elastic and worsted factories, and tanneries; the making of drain-pipes, tiles and blue and red bricks is a considerable industry. In the neighbourhood there are also coal and ironstone mines. The prefix of the name of the town is derived from a priory of nuns founded here in 1150. In the reign of Henry III. a weekly market was granted to the prioress. Nuneaton was incorporated in 1907, and the corporation consists of a mayor, six aldermen and twelve councillors. Area 10,597 acres.

NUNEZ, PEDRO (Petrtjs Nonius) (1492-1577), Portuguese mathematician and geographer, was born at Alcacer do Sal, and died at Coimbra, where he was professor of mathematics. He published several works, including a copiously-annotated translation of portions of Ptolemy (1537), and a treatise in two books, De arte atque ratione navigandi (1546). His clear state- ment of the scientific equipment of the early Portuguese explorers has become famous. A complete edition of all his writings appeared at Basel in 1592.

See F. de B. Garcao-Stockler, Ensaio historico sobre a origem e progressos das mathematicas em Portugal (Paris, 1819); R. H.

Major, Prince Henry the Navigator (London. 1868, p. 55).

NUNEZ CABEZA DE VACA, ALVARO (c. 1490 c. 1564), Spanish explorer, was the lieutenant of Pamfilo de Narvaez in the expedition which sailed from Spain in 1527; when Narvaez was lost in the Gulf of Mexico, Cabeza de Vaca succeeded in reaching the mainland somewhere to the west of the mouths of the Mississippi, and, striking inland with three companions, succeeded, after long wandering and incredible hardship, in reaching the city of Mexico in 1 536. Returning to Spain in 1 S3 7 , he was appointed " adelantado " or administrator of the province of Rio de la Plata in 1540. Sailing frorn Cadiz in the end of that year, after touching at Cananea (Brazil), he landed at the island of St Catharine in the end of March 1541. Leaving his ships to proceed to Buenos Aires, he set out in November with about 150 men to find his way overland to Ascension (Asuncion) for the relief of his countrymen there. The little band reached their destination in the following year. After various successes in war and diplomacy in his dealings with the Indians, Nunez was sent home under arrest in 1544, and in 1551 was banished to Africa by the council of the Indies for eight years. He was recalled in about a year and appointed to a judgeship in Seville, where he died not later than 1 564.

The Naufragios (" Shipwrecks ") of Cabeza de Vaca, which relate to the Florida expedition and his journey to the city of Mexico, appeared at Zamora in 1542; the work has frequently been reprinted, and an annotated English translation was published by T. Buckingham Smith in 1S51. His Comentarios (1555) chronicle the events of the South American expedition. See Fanny Bandelier, Journey of A. Nunez Cabeza de Vaca (ed. A. F. Bandelier, New York, I905)-

NUNEZ DE ARCE, GASPAR (1834-1903), Spanish poet, dramatist and statesman, was born at Valladolid, where he was educated for the priesthood. He had no vocation for the ecclesiastical state, plunged into literature, and produced a play entitled Amor y Orgdlo which was acted at Toledo in 1849. To the displeasure of his father, an official in the post office, the youth refused to enter the seminary, and escaped to Madrid, where he obtained employment on the staff of El Observador, a Liberal newspaper. He afterwards founded El Bachiller Honduras, a journal in which he advocated a policy of Liberal concentration, and he attracted sufficient notice to justify his appointment as governor of Logroflo, and his nomination as deputy for Valladolid in 1865. He was imprisoned at C&ceres

for his violent attacks on the reactionary ministry of Narvaez, acted as secretary to the revolutionary Junta of Catalonia when Isabella was dethroned, and wrote the " Manifesto to the Nation " published by the provisional government onˆfce 26th of October 1868. During the next few years he practically withdrew from political life till the restoration, when he attached himself to Sagasta's party. He served under Sagasta as minister for the colonies, the interior, the exchequer and education; but ill- health compelled him to resign on the 27 th of July 1890, and henceforth he refused to take office again. He was elected to the Spanish Academy on the 8th of January 1874 and was appointed a life-senator in 1886. He died at Madrid on the 1 2th of February 1903.

*Nunez de Arce first came into notice as a dramatist, and he remained faithful to the stage for nearly a quarter of a century. In addition to three plays written in collaboration with Antonio Hurtado, he produced SQuien es el autor? (1859), La Cuenla del Zapatero (1859), IComo se empena tin maridol (i860), Deudas de la honra (1863), Ni lanto ni tan poco (1865), Quien debe, paga (1867) and El haz de Una (1872). But Nunez de Arce*s talent was more lyrical than dramatic, and his celebrity dates from the appearance of Gritos del combate (1875), a collection of poems exhorting Spaniards to lay aside domestic quarrels and to save their country from anarchy, more dangerous than a foreign foe. He maintained his position (in popular esteem) as the only possible rival of Campoamor by a series of philosophic,elegiac and symbolic poems: — Raimundo Lulio, Ultima lamentacidn de Lord Byron (1879), Un Idilio y una Elegia (1879), La Selva oscura (1879) and La Visidn de Fray Martin (1880). The old brilliance sets off the naturalistic observation of La Pesca (1884) and La Maruja (1886). The list of his works is completed by Poemas cortos (1895) and ISursum. cordal (1900); Herndn el lobo, published in El Liberal (January 23, 1881) and Luzbel remain unfinished. His strength lies in the graciousness of his vision, his sincerity and command of his instrument; his weakness derives from his divided sympathies, his moods of obvious sentiment and his rhetorical facility. But at his best, as in the Gritos del combate, he is a master of virile music and patriotic doctrine. (J. F.-K.)*

NUORO, a town and episcopal see of Sardinia, Italy, in the province of Sassari, 385 m. E. of Macomer by rail. Pop. (1901) 6739. It is situated 1905 ft. above sea-level in the east central portion of the island, amid fine scenery. Nuoro was the capital of a province from 1848 to i860. It is connected by road with Fonni, Bitti and Orosei. An inscription discovered in situ about 13 m. W. of Nuoro in 1889,

near Orotelli, has the letters FIN NVRR (Jin{es)Nurr. . .), which are explained as referring to the boundaries of the territory of Nuoro in Roman times, showing (what was not known before) that the name and the place are of Roman origin (F. Vivanet in Notizie degli scaiii, 1889, 202). (T. As.)

NUPE, formerly an independent state of W. Africa, now a province in the British protectorate of Nigeria. Under Fula rule, Nupe occupied both banks of the Niger for a distance of some 1 50 m. above the Benue confluence. Only the part of Nupe north of the Niger now constitutes the province; area 6400 sq. m.; estimated pop. about 150,000. It is in many portions highly cultivated, and owing to its admirable water supply is likely to prove particularly valuable as a field for the extensive cultivation of cotton. Bida (q.v.), the capital, is connected by railway (built 1907-1908) with Baro, a port on the Niger 70 m. above Lokoja.

Nupe had an ancient and very interesting constitution of which the leading features were adopted by the Fula when their rule was established about the year 1859. Bida was founded in that year. Nupe was conquered by the troops of the Niger Company in 1897, and the legal status of slavery was then nominally abolished. The company was, however, unable to occupy the country, and on the withdrawal of its troops the deposed emir returned. In 1901 it became necessary to subdue Nupe a second time. British troops marched to Bida. The emir fled without fighting and was deposed. Another emir was appointed in his place, took the oath of allegiance to the British crown, and worked cordially with the British resident

who was stationed at Bida. The province is divided into three administrative districts — Bida, Lapai and Agaie. These are again divided into nine native districts, five to the west and four to the east of the Kaduna river. Provincial courts of justice have been established.

See Nigeria, Bida. For an interesting account of the ancient constitution of Nupe see " The Fulani Emirates of Northern Nigeria," by Major J. A. Burdon in the Geo Journ., vol. xxiv (London, 1904).

NUREMBERG (Ger. Niirnberg), a city of Germany, the second town in Bavaria in size, and the first in commercial importance. It lies in

the district of Middle Franconia in a sandy but well- cultivated plain, 124 m. by rail N.W. from Munich. The city is divided by the small river Pegnitz, a tributary of the Main, into two parts, called respectively the Lorenzer Seite and the Sebalder Seite, after the two principal churches. There are four islands in the Pegnitz, which is crossed here by fourteen bridges. Formerly among the richest and most influential of the free imperial towns, Nuremberg is one of the few cities of Europe that have retained their medieval aspect largely un- impaired. Considerable sections of the ancient walls and moat still remain, though the demolition of portions to meet the exigencies of modern traffic and expansion has somewhat destroyed its quaint medieval character. Of the 365 bastions which formerly strengthened the walls, however, nearly 100 are still in situ, and a few of the interesting old gateways have also been preserved. Most of the streets are narrow and crooked, and the majority of the houses have their gables turned towards the street. The general type of architecture is Gothic, but the rich details, which are lavished with especial freedom in the interior courts, are usually borrowed from the Renaissance. Most of the private dwellings date from the 16th century, and there are practically none of earlier date than the 1 5th century. A praiseworthy desire to maintain the picturesqueness of the town has led most of the builders of new houses to imitate the lofty peaked gables, oriel windows and red-tiled roofs of the older dwellings. Altogether Nuremberg presents a faithful picture of a prosperous town of three hundred years ago.

The old burg, or castle (Kaiserschloss) , is picturesquely placed on a rock on the north side of the town. This dates most probably from the early part of the nth century, but it received its present form mainly during the reign of the emperor Frederick I. about 150 years later. It was restored in careful harmony with its original appearance in 1854-1856, and part of the interior is fitted up as a royal residence, the families of the German emperor and of the king of Bavaria having apart- ments therein. In the Heidenturm are two late Romanesque chapels, one above the other. Other parts of the castle are the pentagonal tower, the oldest building in the town, wherein are preserved the famous " iron virgin of Nuremberg," and other instruments of torture; the granary (Kornhaus), also called the Kaiserstallung; and the Vestnertor or Vestnerturm. The castle of Nuremberg was a favourite residence of the German sovereigns in the later middle ages, and the imperial regalia were kept here from 1424 to 1796. Near it are the remains of the burg of the Hohenzollerns, the principal existing part of which is the chapel of St Walpurgis, which was destroyed with the rest of the building in 1420, but was

restored in 1892. Not far from these ruins stands the Luginsland, a stronghold with four corner turrets, said to have been built by the burghers in 1367 as a watch-tower against the burg of the Hohenzollerns.

Nuremberg contains several interesting churches, the finest of which are those of St Lorenz, of St Sebald and of Our Lady. All three are Gothic edifices and are notable for their elaborately carved doorways, in which free play has been given to the exuberant fancy of the Gothic style, and all three enshrine valuable treasures 'of art. The Church of St Lawrence, the largest of the three, was built in the 13th and 14th centuries and has recently been restored. In it is the masterpiece of the sculptor, Adam Krafft, consisting of a ciborium, or receptacle for the host, in the form of a florid Gothic spire 65 ft. high; the carving of this work is exquisitely minute and delicate. The west front contains a magnificent rose-window, and some of

the stained glass dates from the 15th and 16th centuries. In front of the altar hangs a curious piece of wood-carving by Veit Stoss, representing the Salutation. The shrine of St Sebald, in the church of St Sebald, consisting of a bronze sarcophagus and canopy, in the richest Gothic style, adorned with numerous statues and reliefs, is looked upon as one of the greatest achieve- ments of German art. It was executed by Peter Vischer, the celebrated artist in bronze, who was occupied on the work for thirteen years (1506-1519), and has here shown himself no unworthy rival of Lorenzo Ghiberti. The church of Our Lady possesses some fine old stained-glass windows and some paintings by Michael Wohlgemuth. The Tuchersche altar, with its winged picture, is one of the finest works of the Nuremberg school about the middle of the 15th century. This church was restored in 1878-1881. Other noteworthy churches are those of St Jacob, founded about 1200 and restored in 1824; and of St Aegidius.

The town hall (Rathaus), an edifice in the Italian style, • erected in 1616-1619, contains frescoes by Durer, and a curious stucco relief of a tournament held at Nuremberg in 1446. The building incorporated an older one of the 14th century, of which the great hall, with its timber roof, is part. The most interesting secular buildings are the houses of the old patrician families. Among the most characteristic of these are the old residence of the counts of Nassau, and the houses of the Tucher, Funk and Peller families. A special interest attaches to the dwellings of Albert Diirer, Hans Sachs, the cobbler-poet, and Johann Palm, the patriotic bookseller who was shot by order of Napoleon in 1806. There are statues of

Diirer, Sachs, Melanchthon, the reputed founder of the grammar-school, the navigator Martin Behaim, and Peter Henlein, the inventor of the watch; and the streets are further embellished with several fountains, the most noteworthy of which are the Schone Brunnen, 1385-1396, in the form of a large Gothic pyramid, adorned with statues of the seven electors, the " nine worthies," and Moses and the prophets; and the Gansemannchen or goose-mannikin, a clever little bronze figure by Pankratz Labenwolf. On the way to the cemetery of St John, which contains the graves of Diirer, Sachs, Behaim and other Nuremberg worthies, are Krafft's stations, seven pillars bearing stone reliefs of the Passion, and ranked among the finest works of the sculptor.

The Germanic national museum, established in an old Car- thusian monastery, has developed into one of the largest and most important institutions of its kind in Germany. It includes a picture-gallery, principally of German works of the 15th and 1 6th centuries, including masterpieces by Holbein, Durer, Wohlgemuth and others. The municipal library contains about 2000 manuscripts and 80,000 printed books, some of which are of great rarity.

The population of Nuremberg was, in 1905, including a garrison of about 3000 men, 294,344, of whom 145,354 were males and 148,990 females. Of these again 196,907 were Protestants ˆEvangelical) , 86,939 Roman Catholics and 6819 Jews. At the height of its prosperity in the middle ages the population has been estimated at as high a figure as 1 50,000, but there seems good reason to believe that it did not exceed 40,000 to 50,000 souls. In 1818 it had sunk to 27,000, but since then has steadily increased. On the 1st of January 1899, thirteen outlying communes were incorporated, extending the area of the town from 2805 to 13,700 acres.

Nuremberg occupies a high place among the industrial and commercial centres of Europe. The principal manufactures are toys and fancy articles in metal, carved wood and ivory, which are collectively known as Nuremberg wares. Nuremberg is the chief market in Europe for hops. It is an important junction for railways to all parts of Germany, and is on the main line from Cologne and Frankfort-on-Main to Munich, Vienna and Eger. In addition to its railways, trade is facilitated by the Ludwig canal, connecting the Danube and the Main.

History. — The first authentic mention of Nuremberg, which seems to have been called into existence by the foundation of the castle,

occurs in a document of 1050; and about the same period

it received from the emperor Henry III. permission to establish a mint and a market. It is said to have been destroyed by the emperor Henry V. in 1105, but if this was the case the town must have been very speedily rebuilt, as in 11 27 we find the emperor Lothair taking it from the duke of Swabia and assigning it to Henry the Proud, duke of Bavaria. An imperial officer, styled the burggrave of Nuremberg, who, however, seems to have been merely the military governor of the castle, and to have exercised no sway over the citizens, became prominent in the 12th century. This office came into the hands of the counts of Hohenzollern at the beginning of the 13th century, and burggrave of Nuremberg is still one of the titles of their descendant, the German emperor. The government of the town was vested in the patrician families, who, contrary to the usual course of events in the free towns, succeeded in permanently excluding the civic gilds from all share of municipal power, although in 1347 there was a sharp rising against this oligarchy. The town was specially favoured by the German monarchs, who frequently resided and held diets here, and in 12 19 Frederick II. conferred upon it the rights of a free imperial town. By the terms of this charter the town appears to have been immediately subject to the king, who was represented by his magistrate (or Schullheiss). In a short time, however, the latter appears to have been assisted by a council, consisting of 13 consoles (burgomasters) and 13 scabini (assessors), who collectively formed the governing and administrative body under the presidency of the bailiff. The last-named official soon confined himself to the judicial magisterial office, and a further increase in the numbers of the council having taken place by the appointment of 8 nominees of the king, a municipal council of 34, under the direction of the senior consul or burgomaster, dealt with matters exclusively civic. Later this council (the kleine Rat) was increased to 42 members, 8 of whom belonged to the artisan class.

In 1356 Nuremberg witnessed the promulgation of the famous Golden Bull of the emperor Charles IV. At the beginning of the 15th century the burggraves of Nuremberg, who had in the meantime raised themselves to the rank of princes of the Empire, were invested with the margraviate of Brandenburg, and sold their castle to the town. They, however, reserved certain rights, and their insistence on these led to fierce and sanguinary feuds between the burghers and

the margraves Albert Achilles and Frederick and Albert Alcibiades of Bayreuth.

The quarrel with the margraves, however, did not interfere with the growth of the town's prosperity, which reached its acme in the 16th century. Like Augsburg, Nuremberg attained great wealth as an intermediary between Italy and the East on the one hand, and northern Europe on the other. Its manu- factures were so well known that it passed into a proverb — " Nuremberg's hand goes through every land." Its citizens lived in such luxury that Aeneas Sylvius (Pope Pius II.) has left it on record that a simple burgher of Nuremberg was better lodged than the king of Scotland. The town had gradually extended its sway over a territory nearly 500 sq. m. in extent, and was able to furnish the emperor Maximilian with a contingent of 6000 troops. But perhaps the great glory of Nuremberg lies in its claim to be the principal fount of German art. Its important architectural features have already been described. The love of its citizens for sculpture is abundantly manifest in the statues and carvings on their houses. Adam Kraff t, Veit Stoss and Peter Vischer form a trinity of sculptors of which any city might be proud. In painting Nuremberg is not less prominent, as the names of Wohlgemuth and Diirer sufficiently indicate. In the decorative arts the Nuremberg handicraftsman attained great perfection in ministering to the luxurious tastes of the burghers, and a large proportion of the old German furniture, silver-plate, stoves and the like, which are now admired in industrial museums, was made in Nuremberg workshops. Wenzel Jamnitzer (1508- 1585), the worker in silver, is perhaps eminent enough to be added to the above list of artists. Its place in literary history — by no means an unimportant one — it owes to Hans Sachs and the other meistersanger. A final proof of its vigorous vitality at tnis period may be found in the numerous inventions of its

inhabitants, which include watches, at first called " Nuremberg eggs," the air-gun, gun-locks, the terrestrial and celestial globes, the composition now called brass, and the art of wire-drawing.

Nuremberg was the first of the imperial towns to throw in its lot with the Reformation, and it embraced Protestantism with its wonted vigour about 1525. Its name is associated with a peace concluded between Charles V. and the Protestants in 1532. The first blow to its prosperity was the discovery of the sea-route to India in 1497; and the second was inflicted by the Thirty Years' War, during which Gustavus Adolphus was besieged here in an entrenched camp by Wallenstein. During the eight or ten weeks that the blockade lasted

no fewer than 10,000 of the inhabitants are said to have died of want or disease. The down- fall of the town was accelerated by the illiberal policy of its patrician rulers; and the French Revolution reduced it to such a degree that in 1796 it offered itself and its territories to the king of Prussia on condition that he would pay its debts. Prussia, however, refused the offer. In 1803 Nuremberg was allowed to maintain its nominal position as a free city, but in 1806 it was annexed to Bavaria.

See Lochner, Number ger Jahrbiicher bis 13 13 (Nuremberg, 1832-1835); Niirnbergs Vorzeit und Gegenwart (Nuremberg, 1845); and Geschichte der Reichsstadt Niirnberg zur Zeit Kaiser Karis IV. (Berlin, l &73) ‘, Priem, Geschichte der Stadt Niirnberg bis auf die neueste Zeit (Nuremberg, 1874) ; B. Schonlank, Altniimbergische Studien (Leipzig, 1894); L. Rtisel, Alt-Nurnberg (Nuremberg, 1895); E. Mummenhoff, Altnilrnberg bis zum Jahre 1350 (1890); R. Hagen, Bilder aus Niirnbergs Geschichte (Nuremberg, 1 889); F. Roth, Die Einjiihrung der Reformation in Niirnberg (Wiirzburg, 1885) ; J. M. Lotter, Sagen, Legenden und Geschichten der Stadt Niirnberg (Nuremberg, 1898) ; the Quettenschriften zur Staats- und Kulturgeschichte der Reichsstadt Niirnberg (Nuremberg, 1893, fol.) ; and the Mitteilungen of the Vereinfiir Geschichte der Stadt Niirnberg (Nuremberg, 1879, fol.). See also C. Headlam, The Story of Nuremberg (London, 1899).

NURSE (a shortened form of the earlier ” nourice,” adapted through the French from Lat. nutrix, nulrire, to nourish), primarily a woman who suckles and takes care of an infant, and more generally one who has the general charge of children; also a person, male or female, who attends to the sick, and particularly one who has been trained professionally for that purpose (see Nursing).

NURSING. The development of sick-nursing, which has brought into existence a large, highly-skilled, and organised profession, is one of the most notable features of „. modern social life. The evolution of the sick-nurse is S

mainly due to three very diverse influences — religion, war and science — to name them in chronological order. It was religion which first induced ladies, in the earlier centuries of Christianity, to take up the care of the sick as a charitable duty. The earliest forerunner of the great sisterhood of nurses of whom we have any record was Fabiola, a patrician Roman lady, who in a.d. 380 founded a hospital in Rome with a convalescent home attached, and devoted herself and her fortune to the care of the sick poor. She had a rival in the

empress Flaccilla, the pious consort of Theodosius I. (a.d. 379-395), who also personally visited the' hospitals and attended on the sick. Organized nursing does not appear to have formed any part of medical treatment, except in so far as the deacons of the church attended on the poor, until the 4th century of the Christian era. After that date the employment of women for this purpose must have developed rapidly, for in the reign of Honorius (a.d. 395-423) six hundred women were engaged in the hospitals of Alexandria. These institutions were managed by the clergy, and throughout the dark and middle ages the hospital and nursing systems were connected with religious bodies. Nurses were provided by the male and female monastic orders, an arrangement which still continues in most Roman Catholic countries, though it is gradu- ally being abandoned through the increasing 'demands of medical science, which have led the hospitals to establish training schools of their own. The names of the oldest foundations which still survive, such as the H6tel Dieu in Paris, St Thomas's and St Bartholomew's in London, the order of St Augustine, and (in the form of a modern revival) that of St John of Jerusalem, sufficiently indicate the original religious connexion. The

order of St Vincent de Paul, founded in 1633 for the express purpose, is still the largest nursing organization in the World. Even in Protestant England, where purely secular training schools have reached their highest development, the generic title of Sister, alike prized by its holders and honoured by the public, remains the popular and professional synonym for head nurse, and perpetuates the old association. Nursing, as a popular or fashionable occupation, is not a modern invention. Sir Henry Burdett quotes an order, dated 30th May 1578, directing the master and the prior of the Hotel Dieu "not to receive henceforth any novices without speaking of it to the company, because there are an excessive number of nuns and novices, who cause great expense to the said Hotel Dieu." In Protestant countries a secular nursing system came in with the Reformation. The staff appointed for St Bartholomew's, on its re-establishment by Henry VIII. in 1544, consisted of a matron and twelve nurses, who were engaged in domestic occupations when off duty. Thus nursing became a menial office and an inferior means of livelihood, adopted by women of the lower orders without any training or special skill; and so it continued down to the middle of the 19th century, when a new movement began which was destined to revolutionize the status of the nurse.

Its distinctive feature was the systematic training of nurses for their vocation. Previously a certain amount of regular instruc- tion had no doubt been given here and there by individual physicians and surgeons ; lectures to nurses were delivered in the New York Hospital as early as 1790. But these were isolated efforts. Such skill as nurses possessed was picked up in the wards. No qualifications were required, nor indeed would they have been forthcoming, so low had the calling sunk in public estima- tion. The credit of inaugurating the new order of things belongs to Germany, and here again the religious influence came into play. The beginning of the modern system dates from the foundation of the institute for training deaconesses at Kaiserswerth by Pastor Fliedner in 1836. It is true that state training schools for male nurses had previously existed in Prussia, the oldest having been founded at Magdeburg in 1799; but the employment of men in hospital wards is a feature of the German system which has not been copied by other advanced countries, and seems to be in process of abandonment in Germany. It is a heritage from the middle ages, when the Knights Hospitallers undertook for men the duties discharged in female institutions by the nuns. The male schools, therefore, stand somewhat apart, though they mark a stage in the evolution of nursing as the earliest regular training establishments. The Kaiserswerth Institute, on the contrary, had a far-reaching and lasting influence, and may fairly claim to be the mother of the modern system. England, in particular, owes much to it, for there Florence Nightingale acquired the practical knowledge which enabled her afterwards to turn her remarkable gift of organization to such brilliant account. The example of Kaiserswerth was soon followed, and not in Germany only. In 1838 the Society of Friends founded a nursing organization in Philadelphia, and in 1840 Mrs Fry, a member of the same community, started the Institution of Nursing Sisters in London. In 1857 the nurses attached to it numbered ninety. They received their practical training at Guy's and St Thomas's Hospitals. On the continent institutes for nursing deaconesses were founded at Strassburg, Utrecht, Berlin, Breslau, Konigsberg and Carlsruhe between 1842 and 1 85 1. In London a Church of England training institution (St John's House) was opened in 1848. There were three classes — (1) sisters, (2) probationers, (3) nurses. The nursing at King's College Hospital was for many years undertaken by this society, whose members were trained at the hospital.

The training system, thus inaugurated on a semi-religious basis, received a new impetus from the Crimean War, which was further emphasized by the Civil War in America and the subsequent great conflicts on the continent. The despatch of Florence Nightingale with

a staff of trained nurses, to super- intend the administration of the military hospitals was the direct result of the publicity given to the details of the Crimean

War by The Times, and it formed a new departure which riveted the eyes of the civilized world. The work undertaken and accomplished by this lady was far more important than the mere nursing of sick and wounded soldiers. She had grasped the principles of hygiene, which were then beginning to be under- stood, and she applied them to the reform of the hospital administration. In civil life it had a marked effect in stimulating the training movement and raising the status of the nurse; but substantial results were only obtained by degrees. It was not until i860 that the modern hospital school system was definitely inaugurated by the opening of the Nightingale Fund School at St Thomas's Hospital, founded with the money sub- scribed by the British public in recognition of Miss Nightingale's national services, and worked on principles laid down by her. In the meantime several nursing societies, in addition to those previously mentioned, had been founded in England, and else- where. Among them the Baden Ladies' Society, founded in 1859 by the Grand Duchess Luise, deserves mention. In the same year the first district nurse began work in Liverpool; and in 1865 the reform of the much-neglected workhouse nursing was inaugurated by Miss Agnes Jones and twelve nurses from St Thomas's, who took up the work in Liverpool. At this time England took a decided lead, which she has never lost. Other countries gradually followed. In Germany the Albert Nursing Society was founded by Queen Carola of Saxony, and the Alice Society by the Grand Duchess Alice of Hesse, both in 1867. In France, where the nursing was comparatively well performed by the religious orders, no change was made until 1877, when a training school was opened in Paris by the municipality, and two others by the Assistance Publique, in connexion with the Salpetriere and Bicetre Hospitals. In the United States schools were opened in New York, New Haven and Boston in 1873, The British colonies, Austria, and other European countries followed some years later.

It remained for the third influence to complete the work begun and to develop systematic nursing to its present dimensions. Since 1880 the increasing demands of medical knowledge have well-nigh revolutionized the craft in the home, the hospital and the workhouse. A large part of the change may be summed up in the words " scientific cleanliness." The outcome has been to raise the dignity of the calling, to induce persons of a superior class to adopt it in increasing numbers, to enlarge the demand for their services, and to multiply the means of educating them.

Nursing does not appear to be regulated by law in any country, though attempts in this direction had been made in England. 1 Its organization is voluntary, and even in Training state or municipal institutions is dependent on the and direction of the administration. In Great Britain organlza- nearly all the general and special hospitals and many tlon ‘ of the poor-law infirmaries offer systematic professional training to nurses. The provisions differ considerably in detail, but in the larger schools the system is uniform in all important respects. Candidates must be between 23 (sometimes 21 or 22) and 35 years of age, and must produce satisfactory evidence of character, education, health and physique; after a personal interview and one, two or three months’ trial they are admitted for three years’ training. During this period they receive regular instruc- tion in theoretical and practical knowledge, and have to pass periodical examinations. At the end of it they are granted certificates and may serve as staff nurses. They pay no premium, and generally receive a salary of £8 to £12 in the first year, rising annually to £30 or £35 as staff nurse, and subsequently to £40 or £50 as sister or head nurse. They live in a home attached to the institution, under a matron, and in the most modern establishments each nurse has a separate bedroom, with common dining and recreation rooms. Private nursing staffs are attached to several of the hospitals; they are recruited from the staff nurses and probationers on completion of their course, and supply nurses to private patients. In the special

1 In 1902 an act was passed to establish a Central Midwives Board and regulated the training. and employment of midwives.

hospitals the training is shorter, being for one or two years. There seems to be a constant tendency to increase the require- ments. At St Bartholomew’s, St George’s, the London Hospital, St Thomas’s and others, probationers must enter for four years, and at St Bartholomew’s they have to pass an entrance examina- tion in elementary anatomy, physiology and other subjects. At all the more important schools the number of applications is many times greater than the vacancies.

In Great Britain trained and certificated nurses generally belong to a society or association. The most noteworthy of the associations is Queen Victoria’s Jubilee Institute for Nurses. It was founded in 1887

with the object of providing skilled nursing for the sick poor in their own homes. A great many of the provincial nursing associations are affiliated to it. The number of nurses supported by each branch varies. The qualifica- tions for a Queen's nurse are as follows: (1) training at an approved general hospital or infirmary for two years; (2) approved training in district nursing for not less than six months, including the nursing of mothers and infants after child-birth; (3) nurses in country districts must in addition have had at least three months' approved training in midwifery. Candidates possessing the first qualification are received on trial for one month, after which they complete their six months' training for the second qualification, at the same time entering into an agreement to serve as district nurse for one or two years at the end of the six months. The salary during training is £1 2, 10s., and afterwards £30 to £35 a year, with board, lodging, laundry and uniform. With regard to the earnings of nurses in general, the salaries paid in hospitals have already been mentioned; for private work the scales in force at different institutions vary considerably, according to the other advantages and benefits provided. At some the nurses receive all their own earnings, minus a percentage deducted for the maintenance of the institute; at others they are paid a fixed salary, as a rule from £25 to £30 a year, plus a varying percentage on their earnings or a periodical bonus according to length of service. This is perhaps the commonest system, but some of the best nursing homes give a somewhat higher fixed salary without any percentage. In all these cases the nurses receive in addition board and lodging, laundry and uniform, or an equivalent allowance. For special cases — infectious, massage, mental and maternity — nurses on a fixed salary usually receive extra pay. The fees commonly charged by high-class institutions for the services of a trained and certificated nurse are — for ordinary cases £2, 2s. a week, for special cases £2, 12s. 6d. or £3, 3s. a week; but many provincial associations supply nurses for £1, is. a week and upwards. The discrepancy between the fees paid by patients and the salaries received by nurses, especially in London, has occasionally excited unfavourable comment, but it is to be remembered that the nurses are maintained when out of work or ill, and have other advantages; many institutions either provide pensions or assist the members of their staff to join the Royal National Pension Fund.

To complete this account of the organization in Great Britain a few details with regard to special nursing are added.

Fever. — Regular training on the same plan as in general hospitals is provided in London at the fever hospitals of the Metropolitan Asylums Board (12 -in number, with from 360 to 760 beds each),

and at a considerable number of provincial institutions.

Insanity.— The Medico- Psychological Association of Great Britain and Ireland holds examinations and grants certificates in mental nursing; candidates must undergo three years' regular training, with instruction by lectures, &c, which may be obtained in a large number of public asylums by arrangement with the Association; one county asylum (Northampton) gives its own certificates after a three years' course.

District Nursing. — In addition to the Queen's nurses, of whom details have been given above, many local associations train their own nurses for this work. Cottage and village nursing are varieties of the same department ; the former is organized on the benefit, system, and aims at supplying domestic help and sick-nursing combined in rural districts for an annual subscription of from 2s. to 1 os., according to the class in life of the family, and a weekly fee of the same amount during attendance.

Monthly Nursing and Midwifery. — Systematic instruction in these subjects is given at some fifty lying-in institutions in 'different parts

of the kingdom. The usual course for nursing is not less than three months, and for midwifery not less than six months; a premium is required of 12 or 13 guineas for three months, and 25 guineas for six months.

Male Nursing. — Two or three associations in London supply male nurses (fees 2 to 4 guineas a week), but there appears to be only one institution, apart from the military and naval services, at which they are systematically trained — namely, the National Hospital for the Paralysed and Epileptic.

Massage is taught regularly at the hospital just named, and at a few other special hospitals. Competent operators are supplied by the Incorporated Society of Trained Masseuses and, to some extent, by other nursing associations; but this branch of the profession is still imperfectly organized (see Massage).

Children. — A large number of children's hospitals throughout the country give regular training in the nursing of children; they take probationers at a somewhat earlier age than the general schools; the course is usually shorter (one or two years), and the salaries slightly lower.

The State offers employment to nurses in the naval and military

hospitals. Queen Alexandra's Imperial Nursing Service was organized in 1902. Candidates for it must be between 25 and 35 years, single or widows and of good social status. They must have had three years' training in a general hospital. Foreign Service must be taken as required. Nurses are eligible for a pension after 10 years' service, the amount increasing up to the age of 55 when retirement is com- pulsory. The Royal Naval Nursing Service is organized on much the same basis. Other organizations are The Army Nursing Reserve and Queen Alexandra's Imperial Military Nursing Reserve, and there is also a nursing reserve attached to the territorial forces.

In the more important British colonies — Australasia, Canada and South Africa — there are now a considerable number of hospital schools and other institutions formed and conducted on the English model. Salaries and fees are very much the same in Australia; in Canada and South Africa they are higher.

In the United States a similar system prevails in New York, Boston, Brooklyn, Chicago, Baltimore, Philadelphia, New Haven and many other large towns. The period of training is either two or three years. At the Johns Hopkins School at Baltimore twelve scholarships of $100 and $120 each are awarded annually; graduate nurses are paid $360 (£72) a year. Salaries are altogether much higher in the United States. At the Boston City Hospital graduate nurses receive $420 (£84) a year, and at the Indianapolis City Hospital those on private duty are paid $72 a month, which is equivalent to £172 a year, with board, lodging, laundry and uniform. This may be taken to indicate the possible earnings of trained nurses working independently, as they usually do in America. The fees charged for trained nurses run from $12 to $25 a week, and even more for special cases. Male nurses are trained at the Bellevue Hospital, New York, the Grace Hospital, Detroit, and elsewhere. In the American schools more attention is paid to the preparation of nurses for private work than in the British (Burdett), and a directory or registry of them is kept in most large towns.

In Germany, their original home, both training schools and societies have multiplied and developed. The period of training appears to be considerably shorter than in Great Britain and America. Members of the Albert Society of Saxony, however, spend two years in the wards at Dresden, and a third at Leipzig, attending lectures and demonstrations. They are sent out to nurse rich and poor alike, and their pay is very small. Most of the German institutes have pension funds.

In France a great deal of the nursing was formerly in the hands of religious orders, but there too the hospital school system, inaugurated in 1877, has grown. The schools managed by the Assistance Publique in Paris give a very thorough course of instruction.

In Russia nursing is mainly in the hands of the Red Cross Society, whose members are, however, trained in the hospital schools.

In Italy, Spain, Portugal and Belgium scientific nursing is in a backward state. The old religious system still prevails to a large extent, and, though some of the orders do their work with great devotion, the standard of knowledge and skill is not up to modern requirements. At San Remo and Rome institu- tions have been established for providing English trained nurses to private cases.

Austria is also in a very backward state, in spite of the fame of the Vienna cliniques. The Red Cross Society provides a certain amount of trained nursing, and next to it the best- organized work is done by religious orders; but the nursing in the hospitals appears to be still in a neglected state. The Brothers of Mercy have charge of some of the men's hospitals, and also carry on a remarkable system of district nursing.

In Holland and the Scandinavian countries the organization is more modern and fairly adequate.

For full details on the large subject of the duties and qualifica- tions of nurses the reader is referred to the numerous text-books and other technical authorities. Only a few general Duties and observations can be made here. Many candidates jobs." 1 "" approach the calling with a very imperfect apprecia- tion of its exacting character. The work is not easy or to be taken up lightly. It demands physical strength, sound health, scrupulous cleanliness, good temper, self-control, intelli- gence and a strong sense of duty. It embraces many duties — some of them menial and disagreeable — besides the purely medical and surgical functions. This is especially the case with district nursing, which is the highest and most exact- ing branch of the profession, because it imposes the greatest responsibility with the fewest resources and demands the most varied qualifications, while affording none of the attractions incidental to hospital work or

private nursing among the rich. It is comparatively easy to fulfil routine duties, when every means is at hand and the standing conditions are the most favourable possible; when ventilation, warmth, light and cleanliness are all provided of the best, and when assistance can be summoned in a moment. To be thrown on your own resources and make the best of adverse conditions is an entirely different matter; it requires a thorough knowledge not of routine, but of principles. It is impossible, therefore, for nurses to be over-educated in the fullest sense of the word; but it is possible for them to be inappropriately educated, and perhaps that is sometimes the case now. Probably nursing has been elaborated to the inevitablejwint of specialization, and a some- what different preparation is needed for different branches of the art.

Allusion has been made above to the subject of male nursing. It hardly finds a place in the British civil system, and was con- demned for hospitals in Germany, where it is at its best, by so eminent an authority as Professor Virchow. In the South /frican War of 1899-1902 it was even suggested that female nurses should replace orderlies at the front. The only valid •eason for preferring women to attend men rather than members »f their own sex is the difficulty of obtaining a supply of equally well qualified and satisfactory male nurses. But this difficulty need not be permanent, and the assumption is much to be deprecated. It is, indeed, most desirable that men should be nursed by men. The advantages are many and real. For one thing women do not possess the physical strength which is often required. They cannot lift a heavy man, and ought not to be asked to do it. Then it is excessively irksome toa sensitive man to be attended by women for various necessary offices. In order to avoid it he will endeavour to do without assistance, and seriously prejudice his chances of recovery.

Authorities. — Sir Henry C. Burdett, Hospitals and Asylums of the World ; The Nursing Profession (annual) ; Hampton, Nursing ; Percy G. Lewis, Nursing, its Theory and Practice ; Eva C. E. Luckes, Hospital Sisters and their Duties ; Morten, How to become a Nurse ; Florence Nightingale, Notes on Nursing; Nightingale Boyd, " Nursing," in Quain's Dictionary of Medicine.

NUSHKI, a town and district of Baluchistan. The town lies 70 m. south-west of Quetta, and is situated in a plain at the base of the Quetta plateau, 2900 ft. above the sea. Pop. (1901) 644. From this point the flat Baluchistan desert stretches away northwards and westwards to the Helmund river. The adminis- tration of the Nushki district was taken over from the khan of Kalat by the Indian

government in 1896, and was leased from him on a perpetual quit rent in 1899. In 190-2 a railway of 91 m. was sanctioned from Quetta to Nushki, which was com-

pleted in 1905. This railway makes Nushki the starting-point of the caravan route to Seistan. From the strategic point of view a force operating from Nushki would flank any advance from the north on Kandahar, and would also guard the south- west approach to the fortress of Quetta.

NUSKU, the name of the light and fire-god in Babylonia and Assyria, who is hardly to be distinguished, from a certain time on, from a god Girru — formerly read Gibil. Nusku-Girru is the symbol of the heavenly as well as of the terrestrial fire. As the former he is the son of Anu, the god of heaven, but he is likewise associated with Bel of Nippur as the god of the earth and regarded as his first-born son. A centre of his cult in Assyria was in Harran, where, because of the predominating character of the moon-cult, he is viewed as the son of the moon- god Sin (q.v.). Nusku-Girru is by the side of Ea, the god of water, the great purifier. It is he, therefore, who is called upon to cleanse the sick and suffering from disease, which, superinduced by the demons, was looked upon as a species of impurity affecting the body.

The fire-god is also viewed as the patron of the arts and the god of civilization in general, because of the natural association of all human progress with the discovery and use of fire. As among other nations, the fire-god was in the third instance looked upon as the protector of the family. He becomes the mediator between humanity and the gods, since it is through the fire on the altar that the offering is brought into the presence of the gods.

While temples and sanctuaries to Nusku-Girru are found in Babylonia and Assyria, he is worshipped more in symbolical form than the other,gods. For the very reason that his presence is common and universal he is not localized to the same extent as his fellow-deities, and, while always enumerated in a list of the great gods, his place in the systematized pantheon is more or less vague. The conceptions connected with Nusku are of distinctly popular origin, as is shown by his prominence in incantations, which represent the popular element in the cult, and it is significant that in the astro-theological system of the Babylonian priests Nusku-Girru is not assigned to any particular place in the heavens. (M. Ja.)

NUSRETABAD, the capital of Persian Seistan, so called after Nusret

el Mulk, a former deputy governor of Seistan; when built, c. 1870, it was first called Nasirabad in honour of Nasr-ud- din Shah; other names, used locally, are Shahr (town) i Seistan, Shahr i Nassiriyeh, or simply Shahr, the town. It is the residence of British and Russian consuls, and has post and telegraph offices.

NUT (O. Eng. hnutu, cf. Dutch noot, Ger. Nuss; allied with Gael, cno; it is not of the same form as Lat. nux), a term applied to that class of fruit which consists generally of a single kernel enclosed in a hard shell. Botanically speaking, nuts are one- celled fruits with hardened pericarps, sometimes more or less enveloped in a cupule or cup, formed by the aggregation of the bracts as in the hazel and the acorn. In commerce, however, tlie term has a wider application and embraces many fruits having hard woody indehiscent shells or coverings without reference to their enclosed seeds or kernels, besides leguminous pods, ana even tuberous roots. A great number of nuts enter into commerce for various purposes, principally as articles of food or sources of oil, and for several ornamental and useful purposes. For the most part the edible nuts are very rich in oil, with only a small percentage of the other carbohydrates, starch, sugar, &c, and they also contain a large proportion of nitrogenous constituents. Thus possessing rich nutrient principles in a highly concentrated form, nuts are by themselves rather difficult of digestion, and the liability of many of them to become rancid is also a source of danger and a hindrance to their free use. Oleaginous nuts used for food are likewise employed more or less as sources of oil, but on the other hand there are many oil-nuts of commercial importance not embraced in the list of edible nuts.

On the following page is set out an alphabetical enumeration of the more important nuts, and of products passing under that name, used either as articles of food or as sources of oil.

Name.

Almond .

Almond (bitter) . . Ar nut or earth nut . Bambarra ground nut Ben nut

Source.

Bitter nut .

Brazil nut . Bread nut . Butter or Souari nut Cahoun nut Candle nut. Cashew nut

Chestnut

Cob, filbert, or hazel

Cob nut of Jamaica

Coco-nut Cola nut Dika nut Ginkgo nut Ground nut or pea Hickory nut Hog nut Jesuit's nut Mocker nut Moreton Bay chest Nutmeg Nutmeg (wild)

Locality.

Remarks.

Olive nut . Palm nut . Pecan nut . Pekea nut . Physic nut . Pine nut Pistachio nut Quandang nut Ravensara nut Rush nut . Sapucaya nut Tahiti chestnut Walnut . Water chestnut

nut

nut

Amygdalus communis,

var. dulcis A mygdalus communis,

var. amara Tubers of Bunium flexuo-

sum and other species Voandzeia subterranea

Moringa pterygosperma

(a winged seed) Carya amara (swamp

hickory) Berthollelia excelsa Brosimum Alicastrum Caryocar nuciferum . Attalea Cohune Aleurites triloba . Anacardium occidentale .

Castanea vesca Corylus Avellana . Omphalea diandra

Cocos nucifera Cola acuminata . Irvingia Barteri . Ginkgo biloba (seed) Arachis hypogaea Carya alba Carya porcina. Trapa natano .

Carya tomentosa . Castanospermum australe Myristica moschata . Myristica fatua, Mt tom- entosa, &c. Eleocarpus Ganitrus, &c. Elaeis guineensis . Carya olivaeformis Caryocar butyrosum Curcas purgans . Pinus Pinea, &c. Pistachia vera Fusanus acuminatus A gathophyllum aromaticum Cyperus esculentus (tubers) Lecylhis Ollaria . Inocarpus edulis . Juglans regia … Various species of Trapa

S. Europe ….

W. Europe (Britain) .

Tropics, especially

Africa India

N. America

S. America …. W. Indies ….

Guiana

Honduras ….

S. Sea Islands .

W. Indies and Tropical

America S. Europe …. Europe (Britain), &c. W. Indies and Tropical

America Tropics . W. Africa . W. Africa _ . Japan, China Tropics . N. America N. America S. Europe . N. America Australia E. Indies . Tropics .

E. Indies

W. Africa .

N. America

Guiana .

Tropical America

Italy . .

S. Europe, &c.

Australia

Madagascar

S. Europe, &c.

Brazil .

S. Sea Islands

Asia, Europe

S. Europe, India, &c.

There remain'to be enumerated a number of nuts of commercial value for turnery and ornamental purposes, for medicinal use, and for several miscellaneous applications in the arts. These include:

importance are or will be separately noticed, and here further allusion is only made to a few which form current articles of commerce, not otherwise treated of.

The bread nut of Jamaica is the fruit of a lofty tree, Brosimum Alicastrum. It is about an inch in diameter, and encloses a single seed, which, roasted or boiled, is a pleasant and nutritious article of food.

The souari or surahwa nut, called also the " Butter nut of Demerara," and by ' fruiterers the " Suwarrow nut," is the fruit of Caryocar nucijerum, a native of the forests of Guiana, growing 80 ft. in height. This is perhaps the finest of all the fruits called nuts. The kernel is large, soft, and even sweeter than the almond, which it somewhat resembles in taste. The few that are imported come from Demerara, and are about the size of an egg, somewhat kidney-shaped, of a rich reddish-brown colour, and covered with large rounded tubercles.

The pekea nut, similar in appearance and properties, ,is the produce of Caryocar butyrosum, growing in the same regions of tropical America.

The Jamaica cob nut is the produce of a euphor- biaceous tree, Omphalea diandra, the seeds of which resemble in taste the ordinary cob or hazel nut. The seed, however, contains a deleterious em- bryo, which must not be eaten. Cola, kola or goora nuts are

Food, oil.

Oil.

Food.

Food.

Oil.

See Hickory.

Food, oil.

Food.

Food.

Oil.

Oil.

Food, oil.

Food.

See Hazel.

Food.

Food, oil.

Food.

Food, oil.

Food, oil.

See Ground Nut.

See Hickory.

Eaten by animals.

Food.

See Hickory.

Food.

Spice. See Nutmeg.

Spice. See Nutmeg.

Food.

Oil. See Palm.

Food, oil. See Hickory.

Food.

Oil.

Food.

Food.

Food.

Spice.

Food.

Food.

Food.

Food, oil.

Food.

Name.

Betel nut Bladder nut Boomah nut Bonduc nut Clearing nut Coquilla nut Corozo nut or vegetable

ivory Cumara nut (Tonka

bean) Grugru nut. Horse chestnut Marking nut . Nut galls ….

Poison nut ….

Sassafras nut . Snake nut …. Soap nut ….

Source.

Areca Catechu Staphylea pinnata Pycnocoma macrophylla .

Guilandina Bonduc . Strychnos potatorum . A ttalea funifera . Phytelephas macrocarpa .

Dipterix odorata .

Acrocomia selerocarpa Aesculus Hippocastanum Semecarpus A nacardinm Quercus infectoria

Strychnos Nux-Vomica .

Nectandra Puchury . Ophiocaryon paradoxum . Sapindus Saponaria .

Locality.

E. Indies S. Europe . Africa .... India .... India .... Brazil .... Tropical S. America

Tropical S. America

S. America . S. Europe . E. Indies . Levant ....

E. Indies .

S. America . S America . W. Indies .

Remarks.

The application of the term nut to many of these products is purely arbitrary, and it is obvious that numerous other bodies not known commercially as nuts might with equal propriety be included in the list. Most of the nuts of real commercial

the seeds of Cola acuminata (Sterculiaceae), a tree, native of tropical Africa, now intro- duced into the West Indies and South America. The nuts form an important article of commerce through- out Central Africa, being used over a wide area as a kind of stimulant condiment. The nuts, of which there are numerous varieties, are found to contain a notable proportion of theine, as much as 2-13 %, besides theobro- mine and other important food- constituents, to which circumstances, doubtless, their valuable properties are due.

Coquilla nuts, the hard inner portion (" stone ") of the palm, Attalea funifera, the piassaba of Brazil, are highly valued for turnery purposes. They have an elongated oval form, 3 to 4 in. in length, and being intensely hard they take a fine polish, displaying a richly

streaked brown colour.

Necklaces. Tanning. Medicine, beads. Clearing water. Turnery. See Palm.

Perfume.

Beads.

Starch.

Marking ink and varnish.

Dyeing and ink making

See Galls. Medicine. See Nux

Vomica. Aromatic. Curiosity. Washing; ornamental

The marking nut, Semecarpus Anacardium, is a fruit closely allied in its source and properties to the cashew nut (q.v.). The marking nut is a native of the East Indies, where the extremely acrid juice of the shell of the fruit in its unripe state is mixed with quicklime and used as a marking-ink. The juice also possesses medicinal virtues as an external application, and when dry it is the basis of a valuable caulking material and black varnish. The seeds are edible, and the source of a useful oil.

Physic nuts are the produce of the euphorbiaceous tree, Curcas purgans, whence a valuable oil, having similar purgative properties to castor oil, is obtained. The plant is a native of South America, but is now found throughout all tropical countries.

Pine nuts are the seeds of several species of Pinus, eaten in the countries of their growth, and also serving to some extent as sources of oil. Of these the most important are the stone pine, Pinus Pinea, of Italy and the Mediterranean coasts, and the Russian stone pine, Pinus Cembra. The Pinus Sabiniana of California and P. Gerardiana of the Himalayas similarly yield edible seeds. These seeds possess a pleasant, slightly resinous flavour.

Ravensara nuts, the fruit of Agathophyllum aromaticum (Lauraceae) , a native of Madagascar, is used as a spice under the name of the

Madagascar clove nutmeg.

The Sapucaya nut, a native of Brazil, is seen occasionally in fruit-shops. It is produced by a large tree, Lecythis Ollaria, or " cannon-ball tree." Its specific name is taken from the large urn-shaped capsules, called " monkey-pots " by the inhabitants, which contain the nuts. The sapucaya nut has a sweet flavour, resembling the almond, and if better known would be highly appreciated. It is, however, scarce, as the monkeys and other wild animals are said to be particularly fond of it. This nut, which is of a rich amber-brown, is not unlike the Brazil nut, but it has a smooth shell furrowed with deep longitudinal wrinkles.

Soap nuts are the fruits of various species of Sapindus, especially 5. Saponaria, natives of tropical regions. They are so called because their rind or outer covering contains a principle, saponine, which lathers in water, and so is useful in washing. The pods of Acacia concinna, a native of India, possess the same properties, and are also known as soap nuts.

NUTATION (from Lat. nutare, to nod), a revolution of the celestial pole around its mean position, due to inequalities in the action of the sun and moon, on an earth of ellipsoidal form. When either of these attracting bodies is in the plane of the equator, it produces no change in the direction of the celestial pole. The greater their distance from this plane, the greater the change, for reasons shown in the article Astronomy {Celestial Mechanics). The result is a motion which can be divided into two components. One of these is the progressive and nearly uniform motion of a fictitious mean pole, called precession (q.v.), and the other a revolution of the true around the mean pole, de- pending on the varying declinations of the sun and moon, and called nutation. Owing to the revolution of the moon's node and the inclination of its orbit, this body moves through a wider range of declination in some positions of the node than in others. The period of the revolution of the node is 18-6 years. At one time of this period the limits of its declination are more than 28° north" and south, while, at the opposite point, they are little more than 18 . The result of these periodic changes is that the nutation takes place nearly in an ellipse, differing little from a circle, at a distance of about 9", in a period of about 18-6 years'. The motion is not exactly an ellipse, having a great number of minute inequalities arising from the ellipticity of the orbits of the sun and moon and their varying declinations. The amount and formulae of nutation from year to year are given in the Nautical Almanac.

NUTCRACKER, the name given by G. Edwards in 1758 (Gleanings, No. 240) to a bird which had hitherto borne no English appellation, though described in 1544 by Turner, who, meeting with it in the Rhaetic Alps, where it was called " Nous- brecher " (hodie " Nussbrecher "), translated that term into

Latin as Nucifraga. In 1555 C. Gesner figured it and conferred upon it another designation, Caryocatactes. It is the Corvus caryocatactes of Linnaeus and the Nucifraga caryocatactes of modern ornithology. F. Willughby and J. Ray obtained it on the road from Vienna to Venice as they crossed what must have been the Sommerring Pass, 26th September 1663. The first known to have occurred in Britain was, according to T. Pennant, shot at Mostyn in Flintshire, 5th October 1753, and about fifteen more examples have since been procured, and others seen, in the island. Contrary to what was for many years believed, the nest of the Nutcracker seems to be invariably built on the bough of a tree, some 20 ft. from the ground, and is a compara- tively large structure of sticks, lined with grass. The eggs are of a very pale bluish-green, sometimes nearly spotless, but usually more or less freckled with pale olive or ash-colour. The chief food of the Nutcracker appears to be the seeds of various conifers, which it extracts as it holds the cones in its foot, and it has been questioned whether the bird has the faculty of crack- ing nuts — properly so called — with its bill, though that can be used with much force and, at least in confinement, with no little ingenuity. The old supposition that the Nutcrackers had any affinity to the Woodpeckers (Picidae) or were intermediate in position between them and the Crows (Corvidae) is now known to be wholly erroneous, for they undoubtedly belong to the latter family (see also Crow). (A. N.)

NUTHATCH, in older English Nuthack, from its habit of hacking or chipping nuts, which it cleverly fixes, as though in a vice, in a chink or crevice of the bark of a tree, and then hammers them with the point of its bill till the shell is broken. This bird was long thought to be the Sitta europaea of Linnaeus; but that is now admitted to be the northern form, with the lower parts white, and its buff-breasted representative in central, southern and western Europe, including England, is known as Sitta caesia. It is not found in Ireland, and in Scotland its appearance is merely accidental. Without being very plentiful anywhere, it is generally distributed in suitable localities throughout its range — those localities being such as afford it a sufficient supply of food, consisting during the greater part of the year of insects, which it diligently seeks on the boles and larger limbs of old trees; but in autumn and winter it feeds on nuts, beech-mast,

the stones of yew-berries and hard seeds. Being of a bold disposition, and the trees favouring its mode of life often growing near houses, it will become on slight encouragement familiar with men; and its neat attire of ash-grey and warm buff, together with its sprightly gestures, render it an attractive visitor. It generally makes its nest in a hollow branch, plastering up the opening with clay, leaving only a circular hole just large enough to afford entrance and exit; and the interior contains a bed of dry leaves or the filmy flakes of the inner bark of a fir or cedar, on which the eggs are laid. In the Levant occurs another species, 5. syriaca, with somewhat different habits, as it haunts rocks rather than trees; and four or five representatives of the European arboreal species have their respective ranges from Asia Minor to the Himalayas and Northern China. North America possesses nearly as many; but, curiously enough, the geographical difference of coloration is just the reverse of what it is in Europe — the species with a deep rufous breast, 5. canadensis, being that which has the most northern range, while the white-bellied S. carolinensis, with its western form, S. aculeata, inhabits more southern latitudes. The Ethiopian Region has as representative of the group the Hypositta corallirosIris of Madagascar. Cattisitta and Dendro- phila are nearly allied genera, inhabiting the Indian Region, and remarkable for their beautiful blue plumage. Sittella, with four or five species, is found in Australia and New Guinea, whilst Daphnoesitta occurs in New Guinea. The nuthatches are placed in the Passerine family Sittidae, intermediate between the Paridae and the Certhiidae. (A. N.)

NUTMEG (from " nut," and O. Fr. mugue, musk, Lat. muscus), the commercial name of a spice representing the kernel of the seed of Myristica fragrans (fig. 1), a dioecious evergreen tree, about 50 to 60 ft. high, found wild in the Banda Islands and a few of the neighbouring islands, extending to New Guinea.

Nutmeg and mace are almost exclusively obtained from the Banda Islands, although the cultivation has been attempted with varying success in Singapore, Penang, Bengal, Reunion, Brazil, French Guiana and the West Indies. The trees yield fruit in eight

Trom Strasburger's Lehrbuch der Botanik, by permission of Gustav Fischer.

Fig. i. — Myristica fragrans. (Official.) i. Twig with male flowers.

2. Ripe pendulous fruit opening.

3. Fruit after removal of one-half of the pericarp, showing the dark

brown seed surrounded by the ruptured arillus.

4. Kernel freed from the seed-coat.

years after sowing the seed, reach their prime in twenty-five years, and bear for sixty years or longer. Almost the whole surface of the Banda Islands is planted with nutmeg trees, which thrive under the shade of the lofty Canarium commune. In Bencoolen the tree bears all the year round, but the chief harvest takes place in the later months of the year, and a smaller one in April, May and June. The ripe fruit is about 2 in. in diameter, of a rounded pear-shape, and when mature splits into two, exposing a crimson arillus surrounding a single seed (figs. 1,2). When the fruit is collected the pericarp is first removed; then the arillus is carefully stripped off and dried, in which state it forms the mace of commerce. The seed consists of a thin, hard testa or shell, enclosing a wrinkled kernel, which, when dried, is the nutmeg. The kernel consists mainly of the abundant endosperm, which After Berg and Schmidt. j s fi r m, whitish in colour and marbled

From btrasburger s Lehrbuch '

der Botanik, by permission

with numerous reddish-brown vein-like partitions, into which the inner seed- coat penetrates, forming what is known botanically as ruminated endosperm.

To prepare the nutmegs for use, the seed enclosing the kernel is dried at a gentle heat in a drying-house over a smouldering fire for about two months, the seeds being turned every second or third day. When thoroughly dried the shells are broken with a wooden mallet or flat board and the nutmegs picked out and sorted, the smaller and inferior ones being reserved for the expression of the fixed oil which they contain, and which forms the so-called oil of mace.

The dried nutmegs are then rubbed over with dry sifted lime.

of Gustav Fischer.

Fig. 2. — Myristica

fragrans , seed cut

through longitudinally.

(Official.)

g, Aril.

h, Outer integument, interrupted at r by the raphe.

m, Ruminated endo- sperm,

n, Embryo (nat. size).

1

Fig. 3. — Myris- tica fragrans.

The process of liming, which originated at the time when the Dutch held a monopoly of the trade, was with the view of pre- venting the germination of the seeds, which were formerly immersed for three months in milk of lime for this purpose, and a preference is still manifested in some countries for nutmegs so prepared. It has, however, been shown that this treatment is by no means necessary, since exposure to the sun for a week destroys the vitality of the kernel. Penang nutmegs are never limed. The entire fruit preserved in syrup is used as a sweetmeat in the Dutch East Indies.

" Oil of mace," or nutmeg butter, is a solid j_ Male flower fatty substance of a reddish- brown colour, 2 Female flower, obtained by grinding the refuse nutmegs to a

fine powder, enclosing it in bags and steaming it over large cauldrons for five or six hours, and then compressing it while still warm between powerful wedges, the brownish fluid which flows out being after- wards allowed to solidify. Nutmegs yield about one-fourth of their weight of this substance. It is partly dissolved by cold alcohol, the remainder being soluble in ether. The latter portion, about 10% of the- weight of the nutmegs, consists chiefly of myristin, which is a compound of myristic acid, C14H28O2, with glycerin. The fat which is soluble in alcohol appears to consist, according to Schmidt and Roemer {Arch. Pharm. [3], xxi. 34-48), of free myristic and stearic acids; the brown colouring matter has not been satisfactorily in- vestigated. Nutmeg butter yields on distillation with water a volatile oil to the extent of about 6 %, consisting almost entirely of a hydrocarbon called myristicene, Ck>Hi 6 , boiling at 165 C. It is

accompanied by a small quantity of an oxygenated oil, myristicol, isomeric with carvol, but differing from it in not forming a crystalline compound with hydrosulphuric acid. Mace contains a similar volatile oil, macene, boiling at 160 C, which is said by Qoez to differ from that of nutmegs in yielding a solid compound when treated with hydrochloric acid gas.

The name nutmeg is also applied to other fruits or seeds in different countries. The Jamaica or calabash nutmeg is derived from Monodora Myristica, the Brazilian from Cryptocarya moschata, the Peruvian from Laurelia sempervirens, the Mada- gascar or clove nutmeg from Agathophyllum aromaticum, and the Californian or stinking nutmeg from Torreya Myristica. The cotyledons of Nectandra Puchury were at one time offered in England as nutmegs.

NUTRITION. The physiology of nutrition involves the study of the way in which the tissues of the body, and more especially the great master tissues, muscle and nerve, obtain the material for growth and repair and the energy for mechanical work and heat production, and of the mode in which they get rid of the waste products. of their activity. The study is therefore very largely a study of the history of the food of the body, since it is in the food that the necessary matter and energy are supplied. Under Dietetics the composition and special importance of various foods and the laws which regulate the supply of food under different conditions of the body are separately dealt with. Here the mode of digestion, the utilization and the elimination of the end products of the three great constituents, proteins, carbohydrates and fats, are alone considered. They are treated under the following heads: I. The Chemistry of Digestion; II. The Mode of Formation of the Digestive Secretions; III. The Mechanism by which the Food is passed along the Alimentary Canal; IV. The Absorption of Food; V. Metabolism; VI. Excretion.

I. Chemistry of Digestion

The essential step which prepares the ordinary food for utilization in the body, for the change into living matter, is digestion, a process which the food undergoes under the influence of the ferments or enzymes present in the gastro-intestinal tract. By this process it is broken down into simpler substances, which can be utilized by the body tissues for conversion into proto- plasm and as the supply of energy. That part which is unsuited for use in the body is either passed as faeces or absorbed and excreted in the urine.

1. Enzyme Action generally. — The substances which bring about

this change are known as ferments, enzymes or zymins. Formerly it was believed that there were two distinct classes

of enzymes, those which were living or associated with living cells, and those which were non-living. In 1897, however, E. Buchner and M. Hahn showed that from living cells (yeast) a ferment could be obtained which acted quite as well extracellularly as when it was bound up within the cell. Subsequent work has shown that other organisms act by the enzymes they contain, so that it is now recognized that there is no essential difference between the living or organized ferment and the non-living or unorganized ferment. All ferments prob- ably act as catalysators or catalysts. Catalysis is the process by which reactions are either initiated or accelerated by the mere presence of certain substances which remain unchanged during the process; to these substances the name of catalysators has been given. As an example of such catalytic action the accelera- tion of the decomposition of hydrogen peroxide (H2O2) into water (H2O) and oxygen (O) by the action of a colloidal solution of platinum may be given. C. Oppenheimer defines an enzyme as a substance produced by living cells, which acts by catalysis. E. Fischer has shown that the action of ferments is specific, that is, the ferment only exerts its action on definite substances or substrates of definite structural arrangement. He has compared the relation of ferment to substrate to that of a key to its lock. Ferments which bring about the breakdown of proteins are with- out influence on fats and carbohydrates; those which decompose fats leave proteins and carbohydrates untouched, and so on.

The chemical composition of enzymes is unknown. It has been assumed that they are protein in nature, but this is mainly because it has been found that when they are extracted from tissues they are apparently in combination with proteins. In all probability the protein is there as an impurity owing to incomplete separation.

As regards the general properties of enzymes, most of them can be precipitated from their solutions by means of alcohol. They can also be carried down by fine precipitates of certain inorganic salts or by protein precipitation, e.g. when a precipitate of casein is produced by acidifying a casein solution with acetic acid. Most of the ferments are soluble in water or saline solutions, and in glycerin and water. The' ferments are found to have an optimum temperature of action.

This temperature in most cases ranges from 37 to 40 C. All true ferments are thermolabile, being destroyed at about 70° C. Ferments are hindered in their action to some extent by the general protoplasmic poisons, such as salicylic acid, chloroform, &c. The action of many of them is retarded when the products of their action are allowed to accumulate. Just as when a chemical reaction is set up its rate tends to decrease and finally comes to a standstill before the reaction is completed — an equilibrium being established — so the reactions set up by enzymes also tend to come to an equilibrium before the complete conversion of the original substance. In the case of certain enzymes at least this equilibrium may be reached from either side; thus the enzyme maltase may either bring about the breakdown of the sugar maltose to dextrose or cause a synthesis of dextrose to maltose.

A number of the body ferments have now been shown to exist in the tissues in an inactive form. This condition is known as the proferment or zymogen state, and before any action can be exerted it must be activated, usually by some specific substance, as in the case of the activation of trypsinogen by means of enterokinase. The following table gives a list of the principal ferments concerned in the digestion and metabolism of food-stuffs: —

Material acted on.

Enzyme.

Where found.

r Pepsin

Gastric juice

Trypsin

Pancreatic juice

I. Protein

s Erepsin

Small intestine

Various autolytic ˆ enzymes

Tissues generally

II. Fats . . .

(Lipase

Pancreatic juice and certain tissues

Ptyalin

Saliva

(salivary diastase)

Pancreatic diastase

Pancreatic juice

Maltase

Pancreatic juice

III. Carbohydrates

<

Small intestine

Invertase

Small intestine

Lactase

Small intestine

Various tissue

Liver, muscle, &c.

**- diastases*

Certain oxydases, catalases and de-amidizing enzymes are found in the tissues generally and play an important part in the various metabolic processes.

2. Digestion in the Mouth.— The first of the digestive secre- tions which food comes into contact with is the saliva. This

is the mixed secretion from the various glands, salivary and other,

the ducts of which open in the mouth. The saliva, which is for the most part produced by the three large salivary glands, the parotid, the sub-maxillary and the sub-lingual, is a colour- less or a slightly turbid viscous fluid with a faintly alkaline reaction and of low specific gravity. It contains a very small proportion of solids, which vary somewhat in amount and character in the secretions of the different glands. Mucin and traces of other proteins are present. Small amounts of potassium sulphocyanide may nearly always be detected. The functions of the saliva are twofold. First, it has a mechanical action moistening the mouth and the food and thus aiding mastication and swallowing by securing the formation of a proper bolus of food; it also assists by binding the particles together, an action of special importance when the food is dry. Second, in man and in some of the lower animals the enzyme ptyalin exerts an action in digestion on part of the carbohydrates of the diet. The starches or polysaccharides are broken down, first of all to the simple dextrins and then to the still more simple disaccharide, maltose. The further breakdown of the maltose is carried out in the intestine by the action of a ferment maltase which does not exist at all or only in the merest traces in the buccal secretion. The action of ptyalin on starches is thus very similar to that of acids, except that it stops at the formation of maltose. Ptyalin acts best at a temperature of about 40 C. and in a neutral or faintly alkaline medium, its action being inhibited by the presence of even very dilute solutions of the mineral acids. If the acid be in sufficient amount the enzyme is destroyed. For this reason the action ceases in the stomach whenever the bolus is completely per- meated by the gastric juice. As it takes time for the gastric juice thoroughly to permeate the food mass, which remains for a considerable period in the fundus of the stomach unmixed with the secretion, salivary digestion goes on for about half an hour after food is taken.

3. Gastric Digestion. — The passage of food from the mouth to the stomach will be dealt with later. The stomach has two digestive functions: (1) It acts as a store chamber permitting a full meal to be taken; (2) It acts as a digestive organ of importance in preparing the food for further attack in the intestinal canal. But the stomach cannot be regarded as an essential organ, since it has been removed in dogs and in man without apparent interference with nutrition and health.

Gastric digestion is brought about by the action of the gastric juice, a clear watery, colourless and strongly acid fluid with a specific gravity of about 1003. The amount of solids present is extremely small, about 0-3 %. They consist of protein, nucleic acid, lecithin

and inorganic salts, in addition to the more important constituents, the enzymes and hydrochloric acid.

The amount of hydrochloric acid present in the juice varies with the period of digestion. In man the maximum acid con- centration is about 0-2 %. The acid exists in the stomach in two forms as free hydrochloric acid and as combined hydro- chloric acid. The amount of each depends on various factors: (1) the secretion itself; (2) the nature of the food; and (3) the rapidity with which the stomach empties itself, &c. For instance, after a protein-free meal the hydrochloric acid is for the most part free, whereas, when protein is present, it combines with it and, unless secreted in very large amount, most of the acid is in a fixed condition.

The hydrochloric acid is formed by the activities of certain gland cells in the middle region of the stomach, and the fact that it does not exist as such in the blood proves that it is formed within these cells. Further, it has been found that the gastric mucous membranes of starving dogs contain 0-74 % of sodium and potassium chloride, much more than is present in any other organ or in the blood plasma. That the chlorine comes from the sodium chloride in the food has been shown by the fact that, when the tissues are deprived of this salt, and sodium bromide is given, hydrobromic acid may appear in the gastric secretion.

The hydrochloric acid is essential for the action of the gastric enzyme, pepsin, in splitting up the protein of the food. In addition to this, the acid has a slight action in splitting poly- saccharides and disaccharides. Lastly, it acts as a bactericidal agent, preventing bacterial decomposition from taking place, and it may thus prevent certain noxious bacteria, taken in in the food, from gaining access to the intestinal tract, where there is a chance of their flourishing in the rich alkaline medium. It is owing to the presence of hydrochloric acid that gastric juice can be kept for prolonged periods without undergoing putre- faction.

The quantity of juice secreted varies with the nature of the food consumed. Thus in one experiment, after the use of a test meal consisting of 25 grammes bread and 250 c.c. tea, there was a flow of 106 c.c, whereas in another case with an ordinary meal there was an output of practically 600 c.c. gastric juice.

Pawlow has shown that not only does the amount of juice secreted vary with the nature of the food ingested but that the digestive activity of the secretion also varies in the same way. He gives the following table : —

Quantities and properties of Gastric Juice with Different Diets : 200 gms. Flesh, 200 gms. Bread, 600 c.c. Milk.

Hour.

Quantities of Juice in c.c.

Digestive Power in mm.

Flesh.

Bread.

Milk.

Flesh.

Bread.

Milk.

1st

II-2

10-6

4-0

4-94

6-io

4-21

2nd

“■3

5-4

8-6

3-03

7.97

2-35

3rd

7-6

4-0

92

3-01

7-5i

2-35

4th

5-i

3-4

7-7

2-87

6-19

2-65

5th

2-8

33

4-0

3-20

5-29

4-63

6th

2-2

2-2

o-5

3-58

5-72

6-12

7th

1-2

2-6

2-25

5-48

8th

0-6

2-6

3-«7

5-5°

9th

0-9

5-75

10th

0-4

Thus each separate food gives rise to a definite hourly secretion of the juice and to a characteristic alteration in its properties. The meat diet brings about a very rapid flow, the maximum output taking place within the first two hours; with bread the maximum output is

even earlier. With milk somewhat later. When the juice is examined as regards its digestive activity, it is found that with meat the most active juice is secreted within the first hour, with bread in the second and third hours, and with milk in the sixth hour. According to the nature of the food, the stomach seems to be stimulated to form a secretion which will best serve its purpose and give the minimum of waste. It thus works economically.

The principal ferment found in the gastric juice is pepsin, a ferment which acts only in the presence of a mineral acid. The action proceeds best at a temperature of about 37° C. in an acid medium of 0-2 % to 0-3 %. Pepsin is elaborated in the so-called chief cells of che gastric glands as an inert precursor — propepsin. It is only when rt comes into contact with the acid of the juice that it is activated and rendered capable of attacking the protein of the food.

As already mentioned, the main function of the gastric juice is to deal with the protein moiety of the food and to prepare it for further digestion in the intestine.

The first result of the action of this secretion on protein matter is to render it soluble — a metaprotein or acid albumin (syntonin), being formed. This body may be regarded mainly as the product of the action of the hydrochloric acid indepenoontly of the pepsin.

The following steps of decomposition are the result of the action of pepsin. From the metaprotein primary and secondary proteoses, the so-called proto-, hetero- and deutero-albamoscs are formed, and / rom these peptones are finally produced. The result of this process of digestion or hydrolysis induced by the pepsin is that complex protein substances of high molecular weight are converted into simpler bodies of comparatively low molecular weight. Formerly it was believed that the action of the pepsin on protein could not carry the decomposition further than the peptones, but recently it has been shown that still further splitting can be brought about, and that the simple amino acids of which the protein molecule is built up can be produced. This latter process, however, takes a very long time even under favourable circumstances, and it probably never occurs under normal conditions. The contents of the stomach — products of protein digestion — are passed on into the duodenum, chiefly as proteoses and peptones.

In addition to the principal ferment of the gastric juice some workers hold that another enzyme is present. This is the ferment rennet, rennin, orchymosin, the sole action of which, so far as is known at

present, is to bring about the curdling of milk, the curd formed being dealt with in the ordinary way by the pepsin. Clotting of milk under the action of rennin occurs at a suitable temperature with great rapidity. This process is said to take place in two stages: (1) the

rennin converts the caseinogen of the milk into paracasein, and (2) this paracasein unites with the lime salts present in the milk and forms the curd or precipitate. That lime salts are absolutely essential for this process of clotting has been shown by the fact that, if they are removed by precipitation as by oxalates, no clotting will take place even after the addition of a large amount of active rennin. Immedi- ate clotting takes place, however, when the necessary lime salts are restored. Many observers now hold that this rennet action is not the property of a specific ferment but simply another phase of the action of pepsin. For this view, which has been put forward by well-known workers, there is much to be said and certainly the power of curdling milk is not confined to the stomach, but has been found in various tissue extracts, and, indeed, wherever proteolytic enzymes are found.

The speed with which the stomach is emptied depends to a great extent on the nature of the food. Plain water leaves the stomach almost at once, salt and sugar solutions at a somewhat slower rate. Milk under the action of rennin curdles. The whey rapidly leaves the stomach, whereas the casein and fat are retained for further treat- ment. On a mixed diet, emptying of the stomach ih man proceeds very slowly, requiring about four hours. Cannon, by feeding with food impregnated with bismuth and using X-rays, showed that carbohydrates leave most rapidly, then mixtures of carbohydrates and proteins, then proteins, then fats, and finally mixtures of fats, and proteins. The diet which remains longest in the stomach is a mixture of fats and proteins — rich food, as it is popularly called. Here two factors enter to prevent rapid emptying: (1) the presence of much fat, and (2) the acid secretion engendered by the abundant protein.

There is no doubt that fats present in fine emulsion can be de- composed in the stomach. The action proceeds in a medium which is slightly acid or neutral, being entirely prevented by the presence of strong acids and alkalis. Many workers believe this gastrolipase to be of pancreatic or intestinal origin, and suppose that it gains entrance to the stomach by a reflux flow through the pylorus. Evidence is accumulating to show that this view is correct.

By means of pepsin and gastrolipase proteins and fats are dealt with.

No specific enzyme for carbohydrates has been found in the stomach in man. Certainly a small amount of polysaccharide decomposition takes place, but this is dependent (1) on the ptyalin which comes from the mouth, and (2) on a certain amount of hydro- lysis due to the action of the free hydrochloric acid.

4. Digestion in the Intestine. — The passage of food from the stomach to the intestine will be considered later. The food so far digested in the stomach is known as chyme, and it is passed on to undergo intestinal digestion under the influence of (1) the enzymes of the pancreas, and (2) of other enzymes present in the different secretions of the intestine. Digestion in the intestine may accordingly be described under these two heads.

(a) Pancreatic Digestion. — The pancreatic juice is the secretion from the pancreas and is discharged into the duodenum. The secretion obtained from a fistula of the pancreatic duct varies in character according to whether the opening into the duct has been made recently or some time before the examination It is a clear, usually thin fluid with a specific gravity of about 1008, and with an alkaline reaction. It contains a certain amount of protein and ash. The most important inorganic constituent is sodium carbonate, which gives the alkaline re- action (alkalinity is, as Na0H = O'47%). This alkaline salt, along with that contained in the intestinal juice, plays an im- portant part in neutralizing the acid chyme.*

In the pancreatic secretion there are at least three important enzymes, each with a definite action: (a) trypsin, the proteolytic enzyme which brings about the further breakdown of the food proteins; (b) a diastase which deals with the carbohydrates, and ic) a lipase which acts on the fats.

(a) Trypsin. — This ferment, in the form in which it is secreted — trypsinogen — is inert. Before it can exert its hydrolytic action it must be activated. This activation is brought about by another enzyme which is found in the intestinal tract — enterokinase. The con- version is brought about as soon as the trypsinogen comes into con- tact with the enterokinase, the merest trace of which suffices to activate a large amount of trypsinogen.

Trypsin acts on the protein just as pepsin does, by bringing about hydrolytic changes. It differs from the latter in acting best in an alkaline or neutral medium. Its effect is much more energetic than that of pepsin, so that the protein molecule is more completely decomposed. Whilst it generally finishes the decomposition which the

pepsin has begun, it can break down the original protein quite as easily if not more easily than does pepsin, and it carries the splitting as far as the comparatively simple crystalline bodies, the amino acids, or groups of these, the polypeptides, bodies intermediate between the complex peptones and the simple amino acids of which the protein is built up.

The character and properties of the products formed in such digestion depend on the nature of the protein acted upon. As will be seen from the following table these proteins vary fairly widely in the proportion of amino acids which they contain.

100 Grammes Protein yielded

t

Globine

Caseinogen.

Gelatine.

from Oxy- haemoglobine.

Elastine.

Glycocoll

16-5

25-75

Alanine .

0-9

o-8

4-19

6-58

Leucine .

10-5

2-1

29-04

21-38

aProline .

3”i

5-2

2-34

1-74

Phenyalanine

3-2

0-4

4-24

3-89

Glutamic acid

10-7

o-88

i-73

0-76

Aspartic acid

1-2

0-56

4-43

Cystine .

0-065

0-31

Serine

0-23

0-56

Oxyproline .

0-25

3-o

1-04

Tyrosine

4-5

1-33

o-34

Lysine

5-80

2-75

4-28

Histidine

2-59

0-40

10-96

Arginine .

4-84

7-62

5‘42

o-3

Tryptophane

i-5

Present

Whether any of the polypeptides found in digestion are further broken down in the course of normal pancreatic digestion is a moot point, but E. Fischer and E. Abderhalden have shown that many of the synthetic polypeptides prepared by them can be broken into their constituents by the action of trypsin. The previous peptic digestion seems to play some part in the extent to which tryptic digestion is carried out, as one of these observers has demonstrated that protein digested first with pepsin and then with trypsin gives a smaller yield of polypeptide and a larger yield of monamino acids than when digestion has been carried out with trypsin alone.

b. Diastase. — This ferment is found in the pancreatic juice apparently secreted in an active form, although some observers hold that it also is secreted in a zymogen form. It is practically identical in its action with the ptyalin of the saliva, converting starch into maltose. It deals with all the starchy food which has escaped con- version into the simple sugars by the ptyalin.

c. Lipase. — Most of this ferment, if not all, is apparently secreted in the form of a zymogen. There is evidence that the bile is. the activating agent here, just as the enterokinase acts in the case of trypsin. Lipase can act in any medium acid, neutral, and alkaline, and both on emulsified and non-emulsified fats. It converts the fats by a process of hydrolysis into fatty acids and glycerin. Kastle and Loevenhart found that not only can this enzyme break up fats into their components, but that it also has the power to act in the reverse direction, and in this way bring about the union of fatty acids and glycerin so as to form fats, a process which occurs in the intestinal epithelial cells after absorption.

In addition to these three enzymes the pancreatic juice may con- tain traces of others, for example, a rennet-like ferment which curdles milk. This again, as in the case of the stomach rennet, is held by some to be only another phase of proteolytic action. Maltase is also said to be present in small amount, as is also lactase under certain conditions. In pancreatic, as in gastric digestion, the nature of the

food is said to play a part in controlling the amount and the composition of the secretion with respect to its ferments. The action, if it does exist, is not very well defined.

b. Intestinal Digestion. — By this is meant the other digestive processes which go on in the intestine under the action of the secretion of Lieberkiihn's follicles — the succus entericus. This is a yellowish, often opalescent, strongly alkaline fluid. The alkalinity is due to the presence of sodium carbonate. It con- tains a small amount of protein, shed epithelial cells, &c. The secretion of some 170 c.c. in 24 hours has been observed in a short loop of human intestine by H. S. Hamburger and E. Hekrr.a, but it is almost impossible to get a measure of the actual amount of secretion from the whole gut. Most of the ferments are present in very small amount in the intestinal juice. They seem to be actually within the epithelial lining of the intestine, for extracts made from the intestinal mucous membrane are richer in ferments than the secretion.

Apparently the intestinal secretion contains no trace of a ferment acting on native protein, but a ferment — erepsin— is present in fair amount in the intestinal mucous membrane and in small amount in the secretion, which acts in an alkaline medium on proteoses, peptones, and on casein, converting them into crystalline products of the nature of amino acids.

Another ferment, arginase, has been isolated from the intestinal mucous membrane by A. Kossel and H. D. Dakin, which splits the diamino acid arginin into urea and ornithin. A lipase has also been

detected which is very similar to pancreatic lipase; it, however, attacks only emulsified fats.

Several carbohydrate hydrolysing enzymes have been described in the small intestine. Invertin, the ferment which splits cane-sugar, is present in small amount in the secretion, more abundantly in the extract of mucous membrane. In all probability it deals with the saccharose after or in process of absorption. Maltase is also present in large amount, and here again in greater amount in the extract than in the secretion. The presence of lactase has been much dis- cussed, and it seems probable that suckling animals do possess this enzyme. Some workers have stated that an intestinal diastase is to be found, but, if so, it is present in very small amount.

In the large intestine a small amount of erepsin has been dis- covered at the upper end. Any digestion which does take place is probably

either bacterial in origin, or due to ferments which have originated in the lower end of the small intestine, and which have been carried down.

5. Bile. — This fluid, in all probability, has little direct action in ordinary digestion, although it contains substances which act indirectly. The bile salts act as solvents for fats and fatty acids, and as activators of pancreatic lipase. The salts also serve to keep cholestrin in solution. Bile is to be looked upon rather as the excretion, the result of the hepatic metabolism, than as a digestive juice. Various workers have shown that when the bile is prevented from entering the intestine owing to a fistula having been made, the animal or patient may con- tinue to enjoy good health, thus proving that this fluid is not essential to any of the digestive processes which normally take place.

Bile as secreted has an orange-brown colour, but the colour varies according to the pigment present. It is more or less viscous (not so viscous as bile taken from the gall bladder) and has a specific gravity of about 1010. It has a slightly alkaline reaction, a bitter taste and a characteristic smell. The daily output is, for a normal individual, over 500 c.c. On analysis it is found to have over 2 % of solids, of which more than half are organic. It contains in addition to a nucleo-albumin, derived mainly from the bile passages and gall bladder, bile acids, bile pigments, cholesterin, lecithin, fats, &c. The most abundant solids are the salts of the bile acids, of which in man the most important is sodium glycocholate, sodium taurocholate being present in very small amount. The bile acids are formed in the liver cells, and when the duct is ligatured they tend to accumu- late in the blood.

The pigments amount to only about 0-2%. In human bile the chief pigment is bilirubin, whilst in herbivora biliverdin is more abundant. They are derived from the haemoglobin of the blood, but the pigments are iron-free. They may be regarded as purely excretory products arising from the breakdown of the haemoglobin of effete blood corpuscles.

Cholesterin is a monatomic alcohol, and is probably a waste pror duct. It occurs in the bile only in small amount, and there is some evidence that it is not secreted by the liver cells but is added to the bile from the bile passages. Fats and lecithin are both derived from the liver cells. Of the inorganic constituents phosphate of calcium is the most abundant.

The secretion of bile is practically continuous, but it seems to enter the duodenum intermittently. The taking of food increases the flow of bile, the amount of the increase depending to a certain extent on the

nature of the food. A protein meal has been found to have the greatest effect and a carbohydrate one the least. The entry of the acid chyme into the duodenum is the stimulus which brings about the ejection of the bile. Pressure on the liver also seems to cause a flow (see section II.).

In connexion with bile secretion attention may be drawn here to a peculiar enterohepatic circulation which is stated to exist. The bile salts are partly absorbed from the intestine, to be carried again by the portal blood to the liver and to be again eliminated. By this circulation the entrance of various alkaloidal and ptomaine poisons into the general circulation may be prevented.

Faeces. — The bulk of the waste matter arising from the foods along with the secretions from the alimentary canal form the faeces. On an absorbable diet the faeces are almost purely intestinal in origin. As a channel of excretion of nitrogenous metabolic waste products they are not very important, although the work of C. Voit indicates that they do play a certain part. The nature of the excreted nitrogen- ous substances has not been fully examined. Of the inorganic con- stituents iron is probably for the most part excreted into the large intestine. It is, however, very difficult to come to any definite con- clusion as to what is unabsorbed material and what excreted.

II. The Mode of Formation of the Digestive

Secretions

1. Salivary Glands. — The secretion from the various glands is generally evoked by nervous impulses, through the secretory

nerves. K. Ludwig found that the stimulation of the chorda tympani produced a copious flow of watery saliva from the submaxillary gland, and a general dilatation of the blood-vessels supplying the gland. The same is the case in the sublingual gland. In addition to the chorda tympani fibres also pass to the gland through the cervical sympathetic, and when these are stimulated the saliva excreted is viscous and turbid, and contains much solid matter, while the blood- vessels are con- tracted. The conclusion formerly drawn was that the flow of saliva was dependent on the increased blood supply. But it has been definitely proved that true secretory fibres exist. If atropine be administered before stimulation of the chorda tympani, the

dilatation of the vessels takes place, but no flow of saliva. Further, if the circulation be cut off from the gland the stimulation of the chorda tympani may cause a temporary flow of saliva.

The parotid gland is supplied by the auriculo-temporal nerve which receives its secreting fibres from the glossopharyngeal. Stimulation of these fibres brings about an abundant watery secretion poor in solids. Stimulation of the sympathetic fibres system is not followed by any salivary flow, yet it has an effect on the gland, for, if after the sympathetic has been stimulated a secretion be evoked by stimula- tion of the glossopharyngeal nerve, the saliva secreted is very rich in organic solids.

2. Gastric Glands. — The control of the gastric secretion seems to be under two entirely different mechanisms. Pawlow has clearly shown that the stomach is supplied with secretory nerves which reach that organ through the vagus. The stimuli which bring these nerves into action are the sight, the odour or the taste of food. That the course of the stimulus is through the vagus is shown by the fact that an abundant flow of juice may be caused so long as the vagi are intact, but this flow does not take place when these nerves are cut. Between the stimulation and the secretion there is a lengthy latent time amounting to several minutes. The other stimulus of the secretion is apparently a chemical one. Pawlow states that mechanical stimulation of the mucous membrane fails to bring about a flow of juice, but Beaumont in his classical observation on the stomach of St Martin found that the insertion of a tube did cause a flow. There may be certain substances either present in the food or developed in the course of digestion, which directly stimulate the secretion originally started by a nervous reflex. E. Starling has drawn attention to this chemical mode of stimulating different organs. To the substances known and unknown which evoke the action, he gives the name of hormones, and such " hormone " action he does not limit merely to the secretory organs but extends to all cases where one organ is stimulated by chemical products formed in the same or another organ. Attention has already been drawn to the influence of different food-stuffs on the amount and nature of the gastric secretion.

3. Pancreatic Secretion. — The stimuli which evoke this secre- tion are again two in number. Many have failed to demonstrate that the secretion of the pancreas is under nervous control, but Pawlow and his school have shown that stimulation of the vagus evokes a secretion of pancreatic juice. This flow, as in the case of the stomach, has a latent period of several minutes. Most modern

workers hold that the most effective stimulus to the pancreatic flow is the chemical one — a hormone discovered by W. Bayliss and E. Starling, who found that extracts of the duodenal mucous membrane made with dilute hydrochloric acid when injected into the blood caused a flow of pancreatic juice. The active substance present in this extract is known as " secretin," and is supposed to be formed under natural conditions by the action of the acid chyme on a prosecretin. This secretin is not of the ordinary zymin nature, as it is not destroyed by boiling and is soluble in alcohol. The secretin when formed must be absorbed into the blood and then carried round the circulation to the pancreas before it can act.

4. Intestinal Juice. — The mode of action of the stimuli which evoke this secretion has not yet been fully investigated. As has been stated, it is quite possible that very little ferment is secreted, and that ferment action mainly takes place within the cells after the various substances have been absorbed.

How far the flow is controlled by nervous action, and how far by hormone action, is not known.

III. Motor Mechanism or the Alimentary Canal

Mastication. — This is a purely voluntary act, and consists of a great variety of movements produced by the various muscles in connexion with the lower jaw. By the act of chewing the food is thoroughly broken up and intimately mixed with the saliva.

Deglutition. — The food after thorough mastication is collected on the surface of the tongue, principally by the action (voluntary) of the buccinator muscles, and by the contraction of the tongue muscles it is passed backwards. As soon as the food by the action of the tongue enters the pillars of the fauces the action becomes involuntary and reflex. The soft palate is raised to prevent the food entering the nasal cavity, and the larynx is shut off by closure of the glottis, and approximation of the arytenoid cartilages to one another and to the back of tha epiglottis. The food is now passed on into the oesophagus proper by the constrictors of the pharynx. In the oesophagus the downward movement varies with the nature of the food swallowed. If it be fluid it reaches the lower end of the oeso- phagus in about three seconds and lies at the lower end of the gullet for two or three seconds before entering the stomach. When the consistency is firmer the progress downwards is much slower. Either by the force exerted by the wave of contraction passing down the gullet or by some inhibition of the sphincter, the cardiac orifice opens and permits the

food to enter the stomach.

Stomach Movements. — For our knowledge of these we are indebted principally to the work of Cannon, who studied them by feeding an animal with food containing bismuth and then following the movements of the shadow of the food on a screen by means of the X-rays. Soon after food is taken it is found that a contraction begins somewhere about the middle of the stomach and slowly passes towards the pylorus. This is followed by others, in man at regular intervals of about twenty seconds, so that the pyloric part of the organ is soon in active peristalsis. The fundus of the stomach is not actively concerned in these movements; it simply acts as a reservoir. At certain periods, but not with each peristaltic wave, the pyloric sphincter relaxes and allows a portion of the fluid acid chyme to escape into the duodenum. It only opens when stimulated by fluid material; if solid food be forced against it it remains tightly closed. Griitzner, by experiments with feeding with different coloured foods, has shown that the food at the fundus may remain un- disturbed for quite prolonged periods. In this connexion it must be remembered, of course, that the food is not lying loose in a sack larger than the contents. The cavity of the stomach is only the size of the amount of food present; in other words, the food exactly fills the cavity. The motor nerve fibres to the stomach run in the vagi, which also contain fibres inhibitory to the cardiac sphincter. The splanchnic nerves mainly contain inhibitory fibres. The automatic movements are probably in connexion with the intrinsic plexus of Auerbach, since they con- tinue after section of the extrinsic nerves.

Intestinal Movements. — The intestines owe their peculiar movements to the arrangement of their muscular coats, which are disposed in two layers, an inner circular, and an outer longi- tudinal. The movements are of two kinds, the so-called swaying myogenic contraction and the peristaltic waves. The former are rapid and have very little to do with the downward movement of the contents. Probably their action is to mix the contents, since Cannon has shown that these contents, in the lower animals at least, get divided into segments. From time to time the separated segments are caught in the course of a peristaltic wave and carried downward a short distance. Then again in their new situation the rhythmic contractions break up the contents anew.

The peristaltic movements are much more powerful. Under normal conditions they begin at the pylorus and passing down- wards carry the intestinal contents onwards. The normal movement progresses slowly, although under abnormal conditions

peristaltic waves may become extremely violent and rapid, and may indeed run over the whole length of the intestine within a minute. The muscular coat in front of the contracting zone is relaxed, as is that behind the wave. The waves are probably due mainly to the circular fibres, the longitudinal pulling the gut up over the contents as they are forced onwards. The downward movement seems to be due to some definite arrange- ment within the intestinal wall, since it has been shown that, when a segment of bowel has been cut out and then the continuity of the canal made good by fixing the section so that the lower end of the excised portion is fixed to the upper divided end of the real gut, upward peristalsis takes place in this segment. An anti-peristalsis has been described in which the movements are all towards the stomach. Under certain conditions the introduction of foreign substances, as hairs, &c, may evoke such anti-peristaltic waves.

The rhythmical movements are held by some to be purely myogenic in origin, as they still continue after section of all the nerves and when the intrinsic ganglia in the intestinal wall have been thrown out of action by the application of nicotine. But recent work by R. Magnus would tend to show that they are controlled by Auerbach's plexus. Peristaltic waves, on the other hand, according to W. Bayliss and E. Starling, although they continue and indeed may become more energetic after section of the extrinsic nerves, are prevented by the application of nicotine and cocaine; in other words, it is presumed that peristalsis is a complicated reflex action through the intrinsic ganglia. The intestines are therefore not dependent for their movement on their connexion with the central nervous system, although of course their activity is more or less regulated by such a connexion.

As regards the movements of the large intestine, they resemble those of the small, although they are much less frequent. The forward movement is slow, thus permitting of the solidification of the contents by the removal of the water. In the first part of the large intestine anti-peristaltic movements are frequent, the regular peristaltic downward movements only becoming prominent when the descending colon is reached to carry contents to the rectum. The anti-peristalsis serves a useful purpose in giving time for the absorption of the fluid in the formation of faeces. The rate at which the contents travel along the intestine varies greatly. Under average

conditions the food residue reaches the ileo-caecal valve between the small and large intes- tine at about four to four and a half hours after a meal, while it takes nine hours to reach the splenic flexure of the colon.

Defaecation. — Food residues, cellular debris and substances derived from the various secretions of the gastro-intestinal tract are forced downwards by peristalsis, and eventually reach the rectum and accumulate there as the faeces. The pressure of the solid and semi-solid mass gives rise to a definite sensation and a desire to empty the rectum. The faeces are retained within the canal partly by the horizontal direction of the rectum before it opens into the anal canal, and partly by the action of two sphincter muscles. At the act of defaecation the strong internal sphincter is first of all relaxed, but unless the rectal stimulus is very strong, the external can be kept contracted, as it is to a certain extent, under the control of the will. The act of defaecation normally is partly voluntary and partly involuntary. The voluntary part consists in the contraction of the abdominal muscles, the closure of the glottis, and the relaxation of the external sphincter and of the levator ani muscle, thus allowing the horizontal part of the rectum to become more vertical; the involuntary in the energetic contractions of the muscular walls of the colon and rectum which sweep the contents of the whole colon downwards. There is a centre in the lumbar enlargement of the spinal cord which presides over the sphincter muscles and probably over the whole involuntary mechanism of defaecation.

Vomiting. — Sometimes the gastric contents are ejected through the cardiac opening of the stcmach instead of through the pylorus. The act is a reflex one, probably originally protective in nature, irritation of the gastric mucous membrane being the most frequent cause. The act is generally preceded by a feeling of nausea and a copious salivation, succeeded by a series of powerful expiratory efforts with the glottis closed. The diaphragm is held firmly con- tracted, then a convulsive contraction of the abdominal muscles with a simultaneous opening of the cardiac orifice of the stomach brings about the sudden ejection of the contents. The wall of the stomach may also contract and press upon the contents. During the act the glottis is firmly closed, and at the same time, if the act be not too

violent, the gastric contents are prevented from entering the nasal cavity by the contraction of the soft palate.

IV. Absorption

Mouth. — No absorption of food-stuffs takes place here.

Stomach. — Absorption from the stomach occurs only to a small extent. Water passes rapidly through the stomach and is practically unabsorbed. Salts are apparently absorbed in a limited amount from their watery solution, the extent of absorp- tion depending to some extent on the concentration of the solution. Sugar is also absorbed to a small extent from its solutions, the greater the concentration the greater being the amount of sugar taken up. Alcohol is readily absorbed from the stomach. A small amount of the products of protein digestion may be absorbed.' There is no evidence that fats are absorbed under any conditions in the stomach.

Intestine. — The greatest absorption of the foods takes place in the intestine, especially in the small intestine. It has been shown that over 85% of the protein has disappeared before the lower end of the small intestine is reached. How does the absorption take place? There are two channels for the removal of the material from the intestine: (1) the blood capillaries spread in the villi, and (2) the lacteals also present in the villi. The foods may reach the blood direct or through the various lymph channels into the thoracic duct and finally into the blood. The lacteals of the villi are channels for the absorption of the fatty parts of the food. The products of the digestion of the proteins and carbohydrates reach the body directly through the capillaries via the portal system.

Can absorption be explained by the ordinary laws of diffusion and osmosis, or are there certain selective activities of the living epithelial lining ? The work of R. Heidenhain, E. Weymouth Reid, and others shows clearly that whatever part the physical laws play in this exchange, there are other activities also at work. For instance, an animal's own serum can be readily absorbed from its intestine, as can also salt and other solutions of higher concentration than that of the blood. Such absorption cannot be explained by ordinary physical laws. In all such cases of absorption the epithelial lining of the gut must be intact and uninjured. 0. Cohnheim and others have shown that when the epithelial lining is damaged or destroyed, the intestinal wall behaves like any other animal membrane, and the physical laws governing osmotic pressure come into play. Whether the nervous system plays any part in this absorption is not yet determined.

The form in which the various products resulting from digestion are absorbed must next be considered.

Carbohydrates. — These reach the body, as already mentioned, by

way of the blood, and in the form of monosaccharides or simple sugars. F. Rohmann found that the absorption of the disaccharides is dependent on the invert ferment action, and not upon their osmotic characters. E. Weinland too has shown that if lactose be put into a lactase-free intestine, no absorption takes place, the lactose gradually disappearing under bacterial action, whereas when the ferment lactase is present glucose and galactose the products of its splitting are absorbed as readily as cane-sugar and maltose. E. Voit has also demonstrated the fact that the body deals with its carbohydrate supply in the form of mono-saccharides. He injected solutions of various sugars, mono- and di-saccharides, and found that the simple sugars were retained, whereas the double sugars were excreted in the urine. The only di-saccharide which can be dealt with in the body is maltose, as there is a maltase present in the blood which splits it. Carbohydrates which are not absorbed from the intestine are disposed of by bacterial action, giving rise to various fatty acids, carbon dioxide, &c.

Fats. -Fats are absorbed from the intestine in the form of fatty acids and glycerin; i.e. in the form in which they exist after the action of the lipase. That a resynthesis takes place in the epithelium is shown by the fact that fatty acids are of equal value with fat as a source of energy, and that as fat absorption goes on fat droplets are seen to grow in the protoplasm away from the free margin of the cells. As already mentioned, the fat is removed by the lacteals from the cells to the thoracic duct, and then to. the general circulation. A small amount of the fat may pass into the body via the blood, but this is practically all retained by the liver. The amount of fat absorbed depends a good deal on the nature of the fat, especially with reference to its melting-point, fats of low melting-point being most readily taken up.

Protein. — The older workers held that the protein was absorbed in

the form of proteose and peptone. In support of this it was stated that both proteoses and peptones could Be detected in the blood stream. The result of the most recent work tends to show that the material is absorbed in the form of the amino acids either simple or in complex groups, the polypeptides, and that if proteoses or peptones be absorbed they are attacked by the intra-cellular enzyme erepsin, which breaks them down into the simpler products as soon as they

are within the intestinal mucous membrane. Certain proteins appear to be absorbed unchanged ; for instance, blood serum disappears from the intestine without apparently any change through zymin attack. This fact is made use of in practical medicine, as, when administra- tion of food by the mouth is impossible, patients are frequently kept alive by the giving of nutrient enemata. That the food thus given is absorbed is shown by the increase of nitrogen excretion in the urine. In the large intestine very little absorption of nutrient matter takes place under normal conditions, mainly of course because most of the absorbable material is removed whilst the food is in the small intestine. That protein matter can be absorbed is shown by the above statement regarding nutrient enemata. The principal sub- stance absorbed here is water; and thus the excreta become firm and formed.

V. Metabolism

In all living matter there is a constant cycle of chemical changes going on, a constant breaking down (catabolism), and a correspondingly constant building up (anabolism). Unless the former is covered by the latter wasting and finally death must supervene. These two changes together make up the metabolism, and the study of this involves a study of the fate of the food absorbed both when it is used immediately and after it has been stored in the tissues of the body. Protein matter is undoubtedly the main constituent of protoplasm, but in what form it exists there is absolutely unknown. One thing is certain, that for the maintenance of life a constant supply of protein matter is necessary. In fact it might be said that this is the essential food and keeps the body alive, fats and carbohydrates being merely subsidiary. In the mammalian organism with which we are specially concerned a supply of these latter substances is also necessary to yield the energy required. The amounts of these various food stuffs which should be present in a suitable diet are dealt with under Dietetics (q.v.). Here we are only concerned with the part played by the different materials in the various chemical changes which are the bas,is of vital activity.

Not many years ago physiologists were very much in the position of unskilled labourers who saw loads of heterogeneous material being " dumped " for building purposes, but who did not know for what particular purpose each individual substance was used. Thanks, however, to the brilliant work of E. Fischer we are no longer in this position. Gradually our knowledge is being broadened by actual facts obtained by direct experiment, or by inference from previous experiments. But it is still far from complete. It is only possible to

outline what is at present known about the part played by the different food constituents in metabolism.

Proteins. — Since these alone contain the nitrogen necessary for the building up and repair of the tissues they are essential and will be dealt with first. In considering the digestion of proteins it was shown that in all probability all protein food was reduced in the intestine to comparatively simple crystalline bodies. O. Loewi has shown that an animal can be maintained in health without loss of weight by feeding it on a diet consisting of amino acids obtained by prolonged pancreatic digestion in place of proteins. In addition to these acids abundant carbohydrates and fats were given. It has since been shown that the presence of carbohydrate a certain amount of is absolutely essential before utilization of the amino acids can take place. Further, it has been demonstrated that only a mere fraction of the total amino acids resulting from pancreatic digestion is sufficient as the source of nitrogen supply for the animal organism. Not only so, but, in spite of the attempt to insist on the polypeptides as being the valuable nuclei for the rebuilding up of protein in the body, it has been shown that mixtures of amino acids from which the polypeptides have been removed can serve as the nitrogen supply.

What then does the body gain by breaking down food material to such simple bodies, if it is immediately to be resynthesized ? This complete breakdown appears to be to facilitate rebuilding. The protein in the protoplasm of each animal is characteristic and to build up these different proteins the material must be separated into its nuclei. An experiment carried out by E. Abderhalden shows this very clearly. A protein gliadin absolutely different in constitution from the proteins of blood plasma was fed to an animal from which much of its blood had been removed, so that an active reformation

had to take place. The question to be solved was whether by feeding with a protein so absolutely different in constitution the nature of the freshly forming serum protein could be radically changed. But the newly-formed serum was found to be exactly the same in constitution as the old. The tissues had selected simply those nuclei of the gliadin which were required and had rejected the others.

In addition to this breakdown of protein in the intestine, another factor of importance comes into play. After absorption from the lumen of the gut the amino acids are not wholly conveyed as such by the portal blood to the liver. That the portal blood contains a greater amount of ammonia than the systemic blood has long been known, and Jacoby and Lang have shown that many tissues, and among

them the intestinal tissues, are able to split off from the amino acids their amino group NH2. Thus it would seem probable that any excess of the amino acids formed does not reach the liver as such but denitrified as members of the fatty acid series. The ammonia split off is also conveyed to the liver and is excreted for the most part as urea, within the first few hours after a protein meal. Thus, in all probability very early after absorption and before the products of digestion enter into combination or any synthesis occurs, all excess of the absorbed nitrogen is disposed of. The rest of the products circulate in the blood, yielding to the cells the materials of which they are in need. On the other hand some investigators still hold that resynthesis into a neutral protein like serum albumin takes place in the intestinal wall immediately after absorption of the digest products. That the leucocytes play an important part in carrying the products of protein digestion to the tissues is indicated by the enormous increase in their number which occurs during the digestion and absorption of protein foods. How they act, whether simply as carriers of the products of protein digestion combined or uncombined, and how they give the material to the tissues is unknown.

Carbohydrates are generally assumed simply to serve the purpose of yielding energy in their combustion to CO2 and H2O, and to act as protein sparers, i.e. they save the ingestion of large amounts of costly protein material as a source of energy. There may, however, be other activities in which the ingested sugars play a part, for instance, in the utilization of the nitrogen of proteins. It has already been indicated that the nitrogen in the products of pancreatic diges- tion can be used only when a sufficient amount of carbohydrates is given at the same time. Only carbohydrates seem to be able to do this, for it has been found that when isodynamic amounts of fat are given the utilization does not take place.

When taken into the body in excess of the immediate require- ments the sugar is not utilized all at once, but any excess is stored in the form of glycogen both in the liver and the muscles. This glycogen is an insoluble polysaccharide, and is only utilized according to the requirements of the body, especially during muscular exertion. Carbohydrates, when taken in in excess, are also stored in the tissues in the form of fat. This was demonstrated by the feeding experi- ments of Lawes and Gilbert at Rothamstead. They took two young pigs of a litter, killed and analysed one, then fed the other for a definite time upon food of known composition, determining the amount of protein absorbed by analysing the urine and the faeces. They then killed the pig and by analysis ascertained the amount of

fat put on. They found that this was far in excess of the amount of the protein of the food which had been absorbed and was also in excess of what could have been formed from the small amount of fat in the food. The fat must therefore have been formed from the carbohydrates of the food. The consumption of larger amounts of sugar than can be used or stored as glycogen results in its passing straight through the body and being excreted in the urine. This condition is known as alimentary glycosuria. The power of using and storing sugar varies greatly in different individuals and in the same individual at different times.

Fats. — The fats simply serve as stores of energy. After ingestion, if in small amount, they are, like carbohydrates, oxidized to the same final products $C0_2$, and H_2O. If in larger amount they are stored as fat, to serve as a reserve in case of need, in the body tissues. Like the carbohydrates they serve as the sources of part of the energy dissipated as heat, but they are not so efficient as sparers of protein material, evidently in part at least because they are less easily digested and absorbed.

Factors which influence Normal Metabolism.

1. Fasting. — During fasting the body draws upon its own reserve of stored material for the requirements in the production of energy, and the rate of breakdown varies with the energy requirements. An individual who is kept warm in bed therefore stands fasting longer than one who is compelled to take exercise in a cold place. The breakdown of tissue during the early days of a fast is much greater than later, for as the fast progresses the body becomes more economical in its utilization of tissue. During a fast the tissues do not all waste at an equal rate; those which are not essential are utilized at a much greater rate than those which are essential to the maintenance of the organism. For instance, it has been shown that during a fast the skeletal muscles may lose over 40 % of their weight, whereas an essential organ like the heart loses only some 3 %.

The essential tissues obtain their nourishment from the less essential probably by ferment action, a process which has been

termed autolysis. The autolytic products of the stored material in the tissues are practically identical with those which arise during the

ordinary gastro-intestinal digestion.

2. Muscular Work. — The muscular tissue plays the most important part in general metabolism. Not only is muscle the most abundant tissue present, but it is constantly active and is the great energy-liberating machine of the body. Formerly it was believed on the authority of Liebig that muscular work was done at the expense of the protein material, but it has been conclusively shown that the real source of energy in moderate work is the non-protein material, carbohydrates and fats; of these the former plays the greater part in a man on ordinary diet. If, however, the supply of non-nitrogenous material be insufficient, then the energy has to be supplied by the protein and the output of nitrogen is thus increased. Variations in the amount of creatinin and uric acid (both products of muscle metabolism) excreted have been described. In hard work it is sometimes found that there may be no immediate rise in the nitrogen output on the day of the work, but that an increase is manifest on the second or third day after. While the excretion of nitrogen shows no increase proportionate to the work done, the output of carbon dioxide produced by the combustion of the carbohydrates and of the fats is increased proportionately to the work done.

3. Internal Secretions. — Evidence is accumulating to show that the activities of the various tissues of the body are presided over and controlled not merely by the action of the nervous system but also by chemical substances, the result of the activity of certain organs. To these chemical substances, as already stated, the name of hormones has been given.

The hormone which has been most thoroughly investigated is adrenalin, a perfectly definite chemical compound consisting of a secondary alcohol linked to a benzene ring. It is a product of the central or medullary part of the suprarenal bodies. The medullary part of these organs is developed from the sympathetic part of the nervous system, and adrenalin acts as a stimulant to the terminations of the sympathetic nerves which spring from the thoraco-abdominal region. These nerves control the small arteries, and the main action of adrenalin is to cause a powerful contraction of these vessels, and as a result a great rise in the arterial blood pressure. For this purpose it is now largely used in medicine. The constant supply of adrenalin in small quantities seems to play an important part in keeping up the tone of the blood vessels, and when, as a result of disease of the suprarenals, the supply is cut off a serious train of symptoms supervenes.

Allied to adrenalin is a hormone derived from the pituitary body. This also causes a constriction of the small arteries except those of the kidney, which it dilates. An increased flow of urine is produced. In the thyroid gland a substance, iodothyrin, is constantly being produced, and this appears to exercise a stimulating action on the rate of chemical exchange in the various tissues. Under its administration the waste of both proteins and fats is increased. When the thyroid is removed or destroyed by disease a condition of decreased chemical change and mental sluggishness results, accompanied often by nervous tremors.

A difficulty in explaining these symptoms is caused by the fact that in the thyroid are imbedded four small parathyroids, and it is possible that these produce a special hormone. It has been suggested that this exercises a particular influence upon the nervous system, but further evidence is wanting.

The well-known effects of removal of the ovaries or testes on the development and character of an animal is due to the absence of the special hormone or hormones of these structures. These hormones appear to be produced, in the case of the testes at least, not in the true genital cells, but in the intermediate cells, since it has been found that ligature of the duct, which leads to destruction of the genital cells, does not abolish the development of the sexual characters of the animal.

There is growing evidence that from the ovaries different hormones may be produced in varying amounts which play an important part in regulating the pTienomena of sexual life.

The thymus gland is a structure lying in the front of the neck, which is best developed at the time of birth, grows very slowly after birth, and atrophies when the age of puberty is reached. In castrated male animals it continues to grow and persists throughout life. There is some evidence that it may exercise some effect upon the growth of the testes, probably by hormone action.

Pancreas. — Within recent years it has been shown that the internal secretion of this organ plays a very important part in the metabolism of sugar. When the organ is completely extirpated the animal becomes diabetic, i.e. sugar appears in the urine and the animal emaciates. How the internal secretion effects the combustion of the sugar is not yet known. Some workers hold that the action of the pancreatic internal secretion is to control the sugar formation in the various sugar-forming organs, of which the liver is the chief, others

that it dominates the utilization of sugar as a source of energy by the muscles.

These are some of the best-known examples of the way in which the oruducts of the activity of one organ modify the functions of

other organs. In all probability many more examples of hormone action will be discovered, and it will be found that it plays probably even a more important part than the nervous system in the co-ordination of function in the animal.

Other factors, besides these already dealt with, play a part in modifying the various metabolic processes, as age, temperature, climate, &c. Very little, however, is definitely known about these various factors.

Water and inorganic salts are quite as essential for the well-being of the body as the energy-yielding proteins, carbohydrates and fats. They, however, probably undergo little or no change in the body; they are excreted pretty much in the same form in which they are ingested. Although they are not subjected to any very great change yet they are of immense importance. No animal tissue can carry on its work in the absence of the various salts. Many experiments have been carried out in which animals have been fed on food as free from salts as possible, and, although the food was much in excess of the energy requirements, yet all these animals died, whereas other animals to which similar food with salts was given throve well. The most important acids are hydrochloric and phosphoric, and the most important bases sodium of potassium. Calcium and magnesium are also of importance, especially where bone formation is taking place. Another element of really vital importance is iron, which is required for the formation of haemoglobin.

VI. Excretion

While we know comparatively little of the intermediate stages in the breakdown of the food constituents, and more particularly of the protein moiety, our knowledge of the final products of the metabolic changes excreted is fairly full. The urine is the main channel of excretion for the nitrogenous waste products. CO_2, arising for the most part from the metabolism of carbohydrates and fats, is excreted mainly through the lungs. Water is excreted by the lungs, the kidneys and the skin.

So far no entirely satisfactory explanation has been given of how a

fluid like urine, having an acid reaction and containing about one hundred times as much urea and generally more than twice as much sodium chloride as the blood, is formed in the kidneys. The urine is a yellowish fluid which varies greatly in its depth of colour, from pale amber to a deep brown. It has a specific gravity of about 1020, varying with the percentage of solids in solution, and it usually has an acid reaction. It is a fluid of complex character, containing, as already mentioned, practically all the waste nitrogen of the body. Among the principal organic substances present are urea, ammonia, purins (uric acid and the so-called purin bases, xanthin, &c), creatinin, conjugated sulphates, various aromatic bodies and many other substances in small amount, together with the water and inorganic salts.

The following table from Folin gives a good idea of the average composition of the urine as regards the nitrogen-containing constituents, and its variation according to the nature of the diet when this is free of creatin creatinin. and the precursors of the purins: —

Nitrogen-rich Diet.

Nitrogen-poor Diet.

Total nitrogen ....

Ammonia nitrogen Creatinin nitrogen Uric acid nitrogen Undetermined nitrogen

14-8-18-2 grms. per day 86-3-89-4 % of total

3-3- 5-1% „

3-2- 4-5% „

o-5- i-o% ,,

2-7- 5-3% ..

4-8- 8-o grms. per day 62-0-80-4 % of total 4-2-H-7 % „

5-5-n-i % ,, 1-2- 2-4 % „ 4-8-14-6 % „

Urea, which forms the chief nitrogenous constituent, amounting on an ordinary diet to about 30 grms. per diem, is for the most part formed in the liver, from ammonia obtained either directly from the blood after absorption from the intestine, or resulting from the

denitrification of the amino acids. It may also arise in part from the diamino acids and from uric acid.

Ammonia is present in the form of ammonium salts, and forms about 4% of the total urinary nitrogen. It may exceed this amount under certain conditions, for the most part pathological. The ammonia is utilized by the body to neutralize acids which arise during the various metabolic processes.

Purins (uric acid, xanthin, hypoxanthin, &c.) are all members of a series which have as their common nucleus a body which E. Fischer called purin. The most important member of this series is uric acid. It forms about 2 % of the total urinary nitrogen. Recent work has shown that it has two quite definite sources of origin: (1) from ingested food containing the precursors, and (2) from the tissue metabolism. The first is known as the exogenous source, and the second as the endogenous. This acid is chemically known as tri- oxy-purin, and may be regarded as the union of two urea molecules with a three-carbon chain fatty acid. All the uric acid formed in the body is not excreted as such, part being, as already mentioned, con- verted into urea. The amount which is converted into urea varies

with the species of animal. In man, Burian and Schur state that one half of the total amount is so converted. Some workers, like Wiener, hold that uric acid may be synthesized in the body, but while this is undoubtedly so in the case of the bird, in the mammal it has not been definitely established. The other chief purin bodies present in urine are xanthin and hypoxanthin, purins less oxidized than uric acid; the first is a dioxypurin, and the second is a monoxypurin. The main source of total purin supply would seem to be muscle meta- bolism. The mother substances from which all are derived in the body are the nucleins. These complex bodies are apparently first broken down by enzyme action to aminopurins. These in their turn have their amino groups split off, and then, according to the degree of oxidation, the different purin bodies are formed.

Creatinin.— The physiological significance of this substance is as yet unknown. The daily excretion varies little with the character of the diet, provided, of course, that the diet be creatin creatinin free. It appears to be proportional to the muscular de- velopment and muscular activity of the individual. Hence it would seem to be

derived from the creatin of muscle, a substance which is very readily changed into creatinin outside the body. In the body the conversion of creatin into creatinin seems to be strictly limited, and hence when creatin is taken in flesh in the food it tends to appear as such in the urine. It would seem that it is either in great part decomposed in the body into what we do not at present know or that, as suggested by Folin, it may be used as a specialized food. Whatever its source, after urea and ammonia it is one of the most important nitrogenous substances excreted, the daily excretion being about I ■$ grms.

The sulphur excreted in the urine comes chiefly from the sulphur of the protein molecule. It is excreted in various forms, (i) As the ordinary preformed sulphates, that is, sulphur in the form of sulphuric acid combined with the ordinary bases. (2) As ethereal sulphates, that is, in combination with various aromatic substances like phenol, indol, &c. (3) In the form of so-called neutral sulphur in such substances as cystin, which are intermediate products in the complete oxidation of sulphur.

Phosphorus appears linked to the alkalis and alkaline earths as phosphoric acid. A very small part of the phosphoric acid may be eliminated in organic combination such as the glycero-phosphates, &c.

Sodium (mostly as sodium chloride), potassium, calcium and magnesium are the common bases present in the urine.

The lungs are the important channel of excretion for the waste product of carbon metabolism CO_2 (see Respiratory System) ; and also a very important channel for the excretion of water. As regards the skin, the sweat carries off a large amount of the water, but it is difficult to determine the total amount. It has been estimated that about 500 c.c. is excreted per diem under normal conditions. Sweat contains salts, chiefly sodium chloride, and organic waste products. Of the organic solids excreted from this source urea forms the most important under normal conditions. Under pathological conditions, especially when there is interference with free renal action, the amount of nitrogenous waste excreted may become quite important. There is also a small amount of CO_2 excreted by this channel. (D. N. P.; E. P. C.)

NUTTALL, THOMAS (1786-1859), English botanist and ornithologist, who lived and worked in America from 1808 until 1842,

was born at Settle in Yorkshire on the 5th of January 1786, and spent some years as a journeyman printer in England. Soon after going to the United States he was induced by Professor B. S. Barton (1766-1815) to apply himself to the study of the plants of that country. In 1825-1834 he was curator 01 the botanic gardens of Harvard university. In 1834 he crossed the continent to the Pacific Ocean, and visited the Hawaiian Islands. Some property having been left him in England on condition of his residing on it during part of each year, he left America in 1842, and did not again revisit it except for a short time in 1852. He died at St Helens, Lancashire, on the 10th of September 1859.

Almost the whole of his scientific work was done in the United States, and his published works appeared there. The more important of these are, The Genera of North American Plants, and a Catalogue of the Species to the year 18 17 (2 vols., 1818) ; Journal of Travels into the Arkansas Territory during the year 1819 (1821); The North American Sylva: Trees not described by F. A. Michaux (3 vols., 1 842-1 849); Manual of the Ornithology of the United States and of Canada (1832 and 1834); and numerous papers in American scientific periodicals.

NUWARA ELIYA, a town and sanatorium of Ceylon. Pop. (1901) 5026, with 1000 additional visitors during the season. It is situated 6240 ft. above sea-level, with the highest mountain in the island, Pedrotallagalla, towering over the plain for 2056 ft. more. Nuwara Eliya is reached from Colombo by railway, eight hours to Namuoya, and thence, by a light 25-ft.-gauge line,

running up to the heart of the sanatorium. The average shade temperature for the year is 58 F. ; the rainfall, 95 in. Considerable sums have been spent by the government in improving the place. NUX VOMICA, a poisonous drug, consisting of the seed of Slrychnos Nux-Vomica, a tree belonging to the natural order Loganiaceae, indigenous to most parts of India, and found also in Burma, Siam, Cochin China and northern Australia. The tree is of moderate size, with a short, thick, often crooked, stem, and ovate entire leaves, marked with three to five veins radiating from the base of the leaf. The flowers are small, greenish- white and tubular, and are arranged in terminal corymbs. The fruit is of the size of a small orange, and has a thin hard shell, enclosing a bitter, gelatinous white pulp, in which from 1 to 5 seeds are vertically embedded. The seed is disk-shaped, rather less than 1 in. in diameter, and about J in. in thickness, slightly depressed towards the centre, and in some varieties furnished with an acute keel-like ridge at the margin. The

external surface of the seed is of a greyish-green colour and satiny appearance, due to a coating of appressed silky hairs. The interior of the seed consists chiefly of horny albumen, which is easily divided along its outer edge into halves by a fissure, in which lies the embryo. The latter is about -fo in. long, and has a pair of heart-shaped membranous cotyledons.

The chief constituents of the seeds are the alkaloids strychnine (q.v.) and brucine, the former averaging about 0-4%, and the latter about half this amount. The seeds also contain an acid, strychnic or igasuric acid; a glucoside, loganin; sugar and fat. The dose of the seeds is 1 to 4 grains. The British Pharmacopoeia contains three preparations of nux vomica. The liquid extract is standardized to contain 1-5% of strychnine; the extract is standardized to contain 5%; and the tincture, which is the most widely used, is standardized to contain 0-25%.

The pharmacology of nux vomica is practically that of strychnine. The tincture is chiefly used in cases of atonic dyspepsia, and is superior to all other bitter tonics, in that it is antiseptic and has a more powerful action upon the movements of the gastric wall. The extract is of great value in the treatment of simple constipation.

NYACK, a village of Rockland county, New York, U.S.A., in the town of Orangetown, on the western bank of the Hudson river, about 25 m. north of New York City. Pop. (1890) 4111; (1900) 4275, of whom 583 were foreign-born; (1905) 4441; (1910) 4619. Nyack is served by the Northern Railroad of New Jersey (a branch of the Erie), and is connected by ferry with Tarry town, nearly opposite, on the eastern bank of the Hudson. The New York, Ontario & Western and the West Shore railways pass through West Nyack, a small village about 2 m. west. For about 2 m. above and 3 m. below Nyack the river expands into Tappan Zee or Bay, which is about 3 m. wide immediately opposite the village. The first grant of land within the present limits of Nyack was made by Governor Philip Carteret, of New Jersey, to one Claus Jansen, in 1671, but the permanent settlement apparently dates from about 1700. The adjacent villages of Upper Nyack, pop. (1905) 648, (1910) 591, and South Nyack, pop. (1910) 2068, form with Nyack practically one com- munity. Nyack was named from a tribe of Algonquian Indians.

See David Cole, History of Rockland county, (New York, 1884).

NYANZA (from the ancient Bantu root word anza, a river or lake), the Bantu name for any sheet or stream of water of con- siderable

size; especially applied to the great lakes of east Central Africa. The word is variously spelt, and the form " Nyasa " has become the proper name of a particular lake. Nyanza is the spelling used in designating the great lakes which are the main reservoirs of the river Nile.

NYASA, the third in size of the great lakes of Central Africa, occupying the southern end of the great rift-valley system which traverses the eastern half of the equatorial region from north to south. Extending from 9 29′ to 14 25′ S., or through nearly 5° of latitude, the lake measures along its major axis, which is slightly inclined to the west of north, exactly 350 m., while the greatest breadth, which occurs near the middle of its length, between n° 30′ and 12° 20′ S., is 45 m. In the northern and southern thirds of the length the breadth varies generally from 20 to 30 m., and the total area may be estimated at 11,000 sq. m.

where he died on the 22nd of February 1896. His principal books are Bill Nye and Boomerang (1881); Forty Liars and Other Lies (1882); Nye and Riley's Railway Guide (1886), with James Whitcomb Riley; and two comic histories, Bill Nye's History of the United States (1894) and Bill Nye's History of England from the Druids to the Reign of Henry VIII. (1896).

NYEZHIN or Nezhin, a town of Russia, in the government of Chernigov, 62 m. by rail S.E. of the town of Chernigov and 79 m. N.E. of Kiev, on the railway between Kursk and Kiev. The old town is built on the left bank of the (canalized) river Oster, and its suburbs, Novoye-Myesto and Magerki, on the right. It has an old cathedral, a technical school and a former high school (lyceum of Bezborodko, at which N. V. Gogol, the novelist, was a student), now transformed into a philological institute. The inhabitants (33,000), are mostly Little-Russians and Jews; there are also some Greeks, descendants of those who immigrated in the 1 7th century at the invitation of the Cossack chieftain Bogdan Chmielnicki.

Unyezh, which is supposed to have been the former name of Nyezhin, is mentioned as early as 1147. At that time it belonged to the principality of Chernigov; afterwards it fell under the rule of Poland. It was ceded to Russia about 1500, but again became a Polish possession after the treaty of Deulina (1619) between Poland and

Russia. In 1649, after the revolt of Little Russia and its liberation from the Polish rule, Nyezhin was the chief town of one of the most important Cossack regiments. It was annexed to Russia in 1664.

NYIREGYHAZA, the capital of the county of Szabolcs, in Hungary, 169 m. E.N.E. of Budapest by rail. Pop. (1900) 31,875. It is a busy railway junction, and its inhabitants are engaged in agriculture, wine-growing and the manufacture of soda, matches and saltpetre. About 20 m. to the N.W. lies the famous wine-producing district of Tokaj (Tokay) .

NYKJOBING, a seaport of Denmark, in the amt (county) of Maribo,onthe west shore of the island of Falster, 94 m. S.S.W. of Copenhagen by rail. Pop. (1901) 7345. Its church contains a genealogical tree of the Mecklenburg ducal family, with por- traits, dating from 1627 or earlier. Here is the house occupied by Peter the Great of Russia in 1716, restored in 1898. A railway runs south to Gjedser (14 m.), from which the sea-passage (29 m.) to Warnemiinde links the fastest route between Copen- hagen and Berlin.

Other towns of the name of Nykjobing in Denmark are (1) on Limfjord in Thisted amt (pop. 4492) ; and (2) in Zealand, Holbaek amt (pop. 2000).

NYKOPING, a seaport of Sweden, chief town of the district (liln) of Sodermanland, 98 m. S.W. of Stockholm by a branch from the Stockholm-Malmo railway. Pop. (1900) 7375. It lies at the head of the Byfjord, an inlet of the Baltic. The ruins of its once famous castle, the town hall (1662), and the district governor's residence, are notable buildings. The port, together with that of Oxelosund (10 m. S.E.) at the mouth of the bay, which is seldom closed in winter, exports iron and zinc ere, timber, wood-pulp and oats.

Nykoping (i.e. New-Market, Latinized as Nicopia) begins to appear as a town early- in the 13th century. Its castle was the seat of the kings of Sodermanland, and after those of Stockholm and Kalmar was the strongest in Sweden. The death of Walde- mar in 1293, the starving to death of Dukes Waldemar and Eric in 1318, the marriage and the deaths both of Charles IX. and his consort Christina of Holstein, the birth of their daughter Princess Catherine and in 1622 the birth of her son Charles X. are the main incidents of which it was the scene. Burned down in 1665 and again damaged by fire in 1719, it still remained the seat of the provincial authorities till 1760. The town was burned by Albert of Mecklenburg's party in 1389, by an

accidental conflagration in 1665, and by the Russians in 1719.

NYLSTROGM, a town of the Transvaal, South Africa, capital of the Waterberg district, and 81 m. N. of Pretoria by rail; altitude 4250 ft. Pop. (1904) 599. It was founded about i860 and owes its name to the belief of the early Boer trekkers that the river which they had discovered was the head stream of the Nile. The Waterberg gold-fields are 20 m. N.N.E. of the town.

NYMPHAEUM (Gr. vvnaiov, vv/jˆatov), in Greek and Roman antiquities, a monument consecrated to the nymphs (q.v.), especially those of springs. These monuments were originally natural grottoes, which tradition assigned as habitations to the local nymphs. They were sometimes so arranged as to furnish a supply of water. Subsequently, artificial took the place of natural grottoes. The nymphaea of the Roman period were borrowed from the constructions of the Hellenistic east. The majority of them were rotundas, and were adorned with statues and paintings. They served the threefold purpose of sanctuaries, reservoirs and assembly-rooms. A special feature was their use for the celebration of marriages. Such nymphaea existed at Corinth, Antioch and Constantinople; the remains of some twenty have been found at Rome and of many in Africa. The so-called exedra of Herodes Atticus (which answers in all respects to a nymphaeum in the Roman style), the nymphaeum in the palace of Domitian and those in the villa of Hadrian at Tibur (five in number) may be specially mentioned. The term nymphaeum was also applied to the fountains of water in the atrium of the Christian basilica, which according to Eusebius (x. 4) were symbols of purification.

NYMPHENBURG, formerly a village, but since 1899 an in-corporated suburb of Munich, in the kingdom of Bavaria. It has a palace, built about the middle of the 17th century, on the model of that at Versailles, and long a favourite residence of the Bavarian elector, Maximilian Joseph. The famous china manufactory of Nymphenburg, founded in 1754 at Neudeck by a potter named Niedermeyer, was shortly afterwards removed hither and, after being long under royal patronage, is now a private undertaking. The elector Charles Albert of Bavaria was reputed to have made a treaty with Louis XV. of France in May 1 74 1 at the beginning of the War of the Austrian Succession for the division, of Austria, and this was called the treaty of Nymphenburg. It has, however, been conclusively proved a forgery. But a treaty was concluded here on the 28th of May 1 741, between Bavaria and Spain, and another between Bavaria and the Rhenish Palatinate in 1766.

NYMPHS, in Greek mythology, the generic name of a large number of female divinities of inferior rank, personifications of the creative and fostering activities of nature. The word is possibly connected with the root of vkˆxK, nubes (" cloud "), and originally meant " veiled," referring to the custom of a bride being led veiled from her home to that of the husband: hence, a married woman, and, in general, one of marriageable age. Others refer the word (and also Lat. nubere and the Ger. Knospe) to a root expressing the idea of " swelling " (according to Hesychius, one of the meanings of vvy.< $>r) is "rose-bud"). The home of the nymphs is on mountains and in groves, by springs and rivers, in valleys and cool grottoes. They are frequently associated with the superior divinities, the huntress Artemis, the prophetic Apollo, the reveller and god of trees Dionysus, and with rustic gods such as Pan and Hermes (as the god of shepherds).

The nymphs were distinguished according to the different spheres of nature with which they were connected. Sea nymphs were Oceanids or Nereids, daughters of Oceanus or Nereus. Naiades (from Gr. vauv, flow, cf. vajxa., " stream ") presided over springs, rivers and lakes. Oreades (opos, mountain) were nymphs of mountains and grottoes, one of the most famous of whom was Echo. Napaeae (vairri, dell) and Alseides (aKaos, grove) were nymphs of glens and groves. Dryades (q.v.) or Hamadryades were nymphs of forests and trees.

The Greek nymphs, after the introduction of their cult into Latium, gradually absorbed into their ranks the indigenous Italian divinities of springs and streams (Juturna, Egeria, Carmentis, Fons), while the Lymphae (originally Lumpae), Italian water-goddesses, owing to the accidental similarity of name, were identified with the Greek Nymphae. Among the Romans their sphere of influence was restricted, and they appear almost exclusively as divinities of the watery element.

F. G. Ballentine, " Some Phases of the Cult of the Nymphs " in Harvard Studies in Classical Philology, xv. (1904).

The lake lies at an altitude of about 1650 ft. above the sea. The sides cf the valley in which Nyasa lies, which are somewhat irregular towards its southern end, take a decided character cf fault scarps in the northern third, and are continued as such beyond the northern

extremity. Apart from the recent alluvium on the immediate shores, the lake lies almost entirely in granite and gneiss formations, broken, however, by a band of horizontally- bedded sandstones, which cuts the axis of the lake in about io° 30′ S., the flat-topped, terraced form of the latter contrasting strangely with the jagged or rounded outlines of the former. Near the margin, overlying the sandstones, there are beds of limestone with remains of recent molluscs, pointing, like the raised beaches which occur elsewhere, to an upward movement of the coasts. Lacustrine deposits up to 700 ft. above the present lake-level have been discovered. Geologically, the lake is believed to be of no great age, a view supported by topographical evidence. The depth of the lake seems to vary in accordance with the steepness of the shores, increasing from south to north. The greater part of the northern half shows depths of over 200 fathoms, while a maximum of 430 fathoms was obtained by Mr. J. E. S. Moore in 1899, off the high western coast in about n° 40′ S. A more complete series of soundings, however, since made by Lieut. Rhoades, and published in the Geographical Journal in 1902, gives a maximum of 386 fathoms off the same coast in ii° 10′ S. The lake receives its water-supply chiefly from the streams which descend from the mountains to the north, all the rest becoming very small in the dry season. Like other lakes of Central Africa it is subject to fluctuations of level, apparently caused by alternations of dry and wet series of years.

At the north-western end is a plain of great fertility, traversed by the Kivira, Songwe and other streams, rising either among the volcanic masses to the north or on the western plateau. Just north of 13° S. on the delta ot the Rukuru, is the British station of Karonga, the northern port of call for the lake steamers, though with, but an open roadstead. Southwards the plain narrows, and in about 10J S. the sandstone scarp of Mount Waller rises sheer above the indentation of Florence Bay, the high western plateaus continuing to fall steeply to the water in wooded cliffs for more than 80 m. In this stretch occur the land-locked bays of Ruarwe (ll° 5′ S.) and Nkata (n c 36′ S.), and the mouth of the Rukuru (io°43′ S)., which drains the plateau from south to north. At Cape Chirombo (1 1 ° 40′ S.) the coast bends to the west, and soon the plateau escarp- ments recede, and are separated from the lake along its southern half by an undulating plain of varying width. In n° 56′ S. is the British station of Bandawe, and in 12 55′ that of Kota Kota, on a lake-like inlet, forming a sheltered harbour. A little north of the latter the Bua river, coming from a remote source on the upper plateau, enters by a projecting delta. At Domira Bay, in 13° 35’, the coast turns suddenly east, contracting the lake to a comparatively narrow neck, with the British

stations of Fort Rifu on the west, and Fort Maguire, near the headland of Makanjira Point, on the east. Beyond this the lake runs southwards into two bays separated by a granitoid peninsula, off which lie several small rocky islands. On this peninsula was placed the mission station of Livingstonia, the first to be established on the shores of Nyasa. From the extremity of the eastern bay the Shirti makes its exit to the Zambezi. On the eastern side the plateau escarpments keep generally close to the lake, leaving few plains of any extent along its shores. The crest of the eastern water- shed runs generally parallel to the shore, which it approaches in places within 20 m. From the north point to 10° 30′ S. the coast is formed by the unbroken wall of the Livingstone or Kinga range, rising where highest (9 41′ S.) fully 6000 ft. above the water. On this coast, on a projecting spit of land, is the German station of Old Langenburg, some 10 m. from the northern extremity. In io° 30′ the plateau is broken by the valley of the Ruhuhu, the only important stream which enters the lake from the east. The forma- tion is here sandstone, corresponding to that of Mount Waller on the opposite shore. Just north of the Ruhuhu is the German station of Wiedhafen, on an excellent harbour, formerly Amelia Bay. South of the Ruhuhu the wall of mountains recedes somewhat, and the remainder of the eastern shore shows a variation between rocky cliffs, marshy plains of restricted area and groups of low hills. In li° 16′ is the deep inlet of Mbampa Bay, offering a sheltered anchor- age. South of it the coast forms a wide semicircular bay, generally rock-bound, and ending south in Malo Point (12° 10′ S.), off which are the largest islands the lake possesses, Likoma and Chisamulu, the former measuring about 4 m. by 3. In the southern half the coast is highest in about 13° 10′ S., where the Mapangi hills rise to 3000ft.

Nyasa, reached in 1859 both by David Livingstone (from the south) and by the German traveller Albrecht Roscher (from the east), was explored by the former to about n°, and to its xix. 30

northern end by E. D. Young in 1876. From this date onwards it has been the scene of much civilizing work on the part of British (principally Scottish) missionaries, traders and govern- ment officials, and, in more recent years, of Germans also. Its shores have been divided between Great Britain, Portugal and Germany, Great Britain holding (within the British Nyasa- land Protectorate) all the west coast south of the Songwe, and the southern extremity of the east coast (south of 135 S.) ; Portugal the rest of the east coast south of 115° S.; and Germany the remainder. British steamers, including two or three gun- boats, have been launched on Nyasa, which forms an important link in the water-route from the Zambezi mouth to the

heart of the continent. Germany also has a gunboat on the lake. The first detailed survey of its shores was executed by Dr James Stewart (1876-1877), but this has been superseded by later work, especially that of Lieuts. Rhoades and Phillips.

See Proc. R.G.S. (1883), p. 689; Geogr. Journal, vol. xii. p. 580; J. E. S. Moore, ib. vol. x. p. 289, and " The Geology of Nyasaland," by A. R. Andrew and T. E. G. Bailey, with note on fossil plants, fish remains, &c, by E. A. N. Arber and others and bibliography in vol. 66 of Quart. Jnl. Geog. Society (May 1910). (E. He.)

NYBORG, a seaport of Denmark on the east side of the island of Fiinen, in the amt (county) of Svendborg, and the point from which the ferry crosses the Great Belt to Korsor in Zealand (15 m.). Pop. (1901) 7790. The fortress, built by Christian IV. and Frederick III., was dismantled in 1869, and the ruins of the castle are used as a prison. In the 12 th century the town was founded and a castle erected on Knudshoved (Canute's Head) by Knud, nephew of Waldemar the Great; and from the 13th to the 15th century Nyborg was one of the most important places in Denmark. In 1658 it surrendered to the Swedes; but by the defeat of the latter under the walls of the fortress on the 24th of November 1659, the country was freed from their dominion. In 1808 the Marquis La Romana, who with a body of Spanish troops garrisoned the fortress for France, revolted from his allegiance, and held out till he and a portion of his men escaped with the English fleet.

NYCKELHARPA (Swed. nyckel = key, har pa = harp; Ger. Schliisselfiedel) , a kind of bowed hurdy-gurdy, much used in Scandinavia during the late middle ages, and still in use in some parts of Sweden. It consists of a body some 2 ft. long, shaped like an elongated viol, with sloping shoulders and highly arched sound-board glued over a less arched back, and ribs cut out of a single block of wood. There is no fingerboard, but along the neck, arranged like frets, are a number of keys or wooden tangents, which when pressed inwards bring a little knob or stud into contact with the first string of thin catgut, thus stopping it and raising the pitch as in the hurdy-gurdy. At three points these keys also act upon the third string. There are in the comparatively modern instruments usually four melody strings of catgut and three drones of fine spun wire. The bridge is quite flat, so that when the bow is passed over the strings, they all sound at once. The tailpiece is very long, extending over half the length of the body, and the two oval sound-holes, far removed from the strings, are at the tail end of the instrument.

NYE, EDGAR WILSON (1850-1896), American humorist, was born at Shirley, Maine, on the 25th of August 1850. His parents removed to a farm on the St Croix river in northern Wisconsin in 1852, and young Nye was educated in Wisconsin at the academy at River Falls, where he studied law. In 1876 he was admitted to the bar at Laramie, Wyoming, where he served as justice of the peace, superintendent of schools, member of the city council and postmaster. Here he began to contribute humorous articles under the pseudonym of " Bill Nye " to news- papers, especially the Cheyenne Sun and the Denver Tribune. In 1 88 1 he founded at Laramie the Boomerang, and his reputation as a humorist was soon widespread. Later he became a success- ful lecturer, and in 1885, with James Whitcomb Riley, the poet, made an extended tour through the country, each reading from his own writings. Nye removed to New York City in 1886, and passed the later years of his life at Arden, a village in Bun- combe county, North Carolina (about 10 m. south of Asheville),

OThe sixteenth letter of the Phoenician and early Greek alphabets, the fifteenth in English and the fourteenth in Latin. Between N and O the Phoenician and the Ionic Greek alphabet have a sibilant — in Greek a — x. The Western Greek alphabet had a different symbol, X, for the sound of x and placed it at the end, as did its descendant the Latin alphabet. The original form of was a more or less roughly formed circle. The Aramaic ˆ. and Hebrew V, which seem so different, arise from a circle left open at the top, (J, a form which can be traced in Aramaic from the 5th or 6th century B.C. In the Greek alphabets the circle appears sometimes with a dot in the centre, but in many cases it is doubtful whether this mark is ; intentional, or is only the result of fixing a sharp point there while describing the circle. Sometimes O is lozenge-shaped Q and rarely (in Arcadia and Elis) rectangular □. In many varieties of the Greek alphabet this symbol was used, as it always was in Latin, for the long as well as the short 0-sound and also for the long vowel (in the Ionic alphabet written ov) which arose from contraction of two vowels or the loss of a consonant (5T)\oOTe=5?jXcWe, oikovs = olnovs) . As early as the 8th century Ionic Greek had invented a separate symbol for the long o-sound, viz. U. This when borrowed by other dialects showed at first some variety of usage, though practically none in

form. As this was placed at the end of the ordinary (not the numeral) Greek alphabet, " alpha and omega " has become a proverbial phrase for first and last. The Greeks themselves, however, did not call Q omega (great 0) nor did they call O omicron (little 0), though these names are given even in modern Greek grammars. The former was called simply and the latter u {ov, pronounced as 00 in moon). The Hebrew and probably the Phoenician name for O was Ain (Ayin), and in the Semitic alphabet, which does not indicate vowels, the symbol stood for a " voiced glottal stop " and also for a " voiced velar spirant " (Zimmern). The most important feature of this vowel is the rounding of the lips in its production, which, according to its degree, modifies the nature of the vowel considerably, as can be observed in the pronunciation of the increasingly rounded series smv, no, who. In Attic Greek O and U were not really a pair, for o + o became not co but ov, o being a close and w an open sound. In Latin the converse was more nearly true. Though short changed in the Latin of the last age of the Roman republic to u in un- accented syllables always (except after u whether vowel or con- sonant), and sometimes also in accented syllables, this was not equally true of vulgar Latin, as is shown by the Romance languages. In English also the short and the long o are of different qualities, the short in words like not, got being in Sweet's phonetic terminology a low-back-wide-round, the long in words like no a mid-back- wide-round. The long vowel becomes more rounded as it is being pronounced, so that it ends in a «-sound, though this is not so noticeable in weak syllables like the final syllable of follow. The so-called modified 6 is a rounded e-sound found in several varieties. The sound heard in words like the German Goiter is, according to Sweet, a low-front-wide-round, while Jespersen regards it as not low but middle. A mid-front-narrow-round vowel is found short in French words like peu, long in je&ne and in endings like that of honteuse. The Norse sound written c/> is of the same nature. (P. Gi.)

OAK (O. Eng., ac), a word found, variously modified, in all Germanic languages, and applied to plants of the genus Quercus, natural order Fagaceae (Cupuliferae of de Candolle), including some of the most important timber trees of the north temperate zone. All the species are arborescent or shrubby, varying in size from the most stately of forest trees to the dwarfish bush. Monoecious, and bearing their male flowers in catkins, they are readily distinguished from the rest of the catkin-bearing- trees

by their peculiar fruit, an acorn or nut, enclosed at the base in a woody cup, formed by the consolidation of numerous involucral bracts developed beneath the fertile flower, simultaneously with a

cup-like expansion of the thalamus, to which the bracteal scales are more or less adherent. The ovary, three-celled at first, but becoming one-celled and one-seeded by abortion, is surmounted by an inconspicuous perianth with six small teeth. The male flowers are in small clusters on the usually slender and pendent stalk, forming an interrupted catkin; the stamens vary in number, usually six to twelve. The alternate leaves are more or less deeply sinuated or cut in many species, but in some of the deciduous and many of the evergreen kinds are nearly or quite entire on the margin.

The oaks are widely distributed over the temperate parts of Europe, Asia, North Africa and North America. In the western hemisphere they range along the Mexican highlands and the Andes far into the tropics, while in the Old World the genus, well represented in the Himalayas and the hills of China, exists likewise in the peninsula of Malacca, in the Indian Archipelago and Malaya to the Philippine Islands and Borneo. On the

From Kotschy, Die Eichen Europas, Vienna, 1862, Plate XXXIt. Fig. 1. — Flowers of Oak (Quetcus).

a, Diagram of male flower. d, Male flowers of Q. sessiliflora,

b, Diagram of female flower. much enlarged.

c, Female flowers of Q. e, Female flowers of Q. sessili-

pedunculata, slightly en- flora, after fertilization, en-

larged, larged.

mountains of Europe and North America they grow only at moderate elevations, and none approach the arctic circle. The multitude of species and the many intermediate forms render their exact limitation difficult, but those presenting sufficiently marked characters to justify specific rank probably approach 300 in number.

The well-known Q. Robur, one of the most valued of the genus, and the most celebrated in history and myth, may be taken as a type of the oaks with sinuated leaves. Though known in England, where it is the only indigenous species, as the British oak, it is a native of most of the milder parts of Europe, extending from the shores of the Atlantic to the Ural; its most northern limit is attained in Norway, where it is found wild up to lat. 63 , and near the Lindesnaes forms woods of some extent, the trees occasionally acquiring a considerable size. In western Russia it flourishes in lat. 6o°, but on

the slope of the Ural the 56th parallel is about its utmost range. Its northern limit nearly coincides with that of successful wheat cultivation. Southwards it extends to Sardinia, Sicily and the Morea. In Asia it is found on the Caucasus, but does not pass the Ural ridge into Siberia. In Britain and in most of its Continental habitats two varieties exist, regarded by many as distinct species: one, Q. pedunculate, has the acorns, generally two or more together, on long stalks, and the leaves nearly sessile; while in the other, Q. sessiliflora, the fruit is without or with a very short peduncle, and the leaves are furnished with well-developed petioles. But,

though the extreme forms of these varieties are very dissimilar, innumerable modifications are found between them; hence it is more convenient to regard them as at most sub-species of Q. Robur. The British oak is one of the largest trees of the genus, though old specimens are often more remarkable for the great size of the trunk and main boughs than for very lofty growth. The spreading branches have a tendency to assume a tortuous form, owing to the central shoots becoming abortive, and the growth thus being continued laterally, causing a zigzag develop- ment, more exaggerated in old trees and those standing in

From Kotschy, op. at. Plate XXVII.

Fig. 2. — Q. pedunculate.

exposed situations; to this peculiarity the picturesque aspect of ancient oaks is largely due. When standing in dense woods the trees are rather straight and formal in early growth, especially the' sessile-fruited kinds, and the gnarled character traditionally assigned to the oak applies chiefly to its advanced age. The broad deeply-sinuated leaves with blunt rounded lobes are of a peculiar yellowish colour when the buds unfold in May, but assume a more decided green towards midsummer, and eventually become rather dark in tint; they do not change to their brown autumnal hue until late in October, and on brushwood and saplings the withered foliage is often retained until the spring. The catkins appear soon after the young leaves, usually in England towards the end of May; the acorns, oblong in form, are in shallow cups with short, scarcely projecting scales; the fruit is shed the first autumn, often before the foliage changes.

Vast oak forests still covered the greater part of England and central Europe in the earlier historic period; and, though they have been gradually cleared in the progress of cultivation, oak is yet the prevailing tree in most of the woods of France, Germany and southern Russia, while in England the coppices and the few fragments of natural forest yet left are mainly composed of this species. The pedunculated variety is most abundant in the southern and midland counties, the sessile- fruited kinds in the northern parts and in Wales, especially in upland districts; the straighter growth and abundant acorns of this sub-species have led to its extensive introduction into plantations. The name of " durmast " oak, originally given to a dark-fruited variety of Q. sessilifiora in the New Forest, has been adopted by foresters as a general term for this kind of oak ; it seems to be the most prevalent form in Germany and in the south of Europe. Many of the ancient oaks that remain in England may date from Saxon times, and some perhaps from an earlier period; the growth of trees after the trunk has become hollow is extremely slow, and the age of such venerable giants only matter of vague surmise. The celebrated Newland oak in Gloucestershire, known for centuries as " the great oak," was by the latest measurement 47ˆ ft. in girth at 5 ft. from the ground. The Cowthorpe oak, standing (a ruin) near Wetherby in Yorkshire, at the same height measures 38J ft., and seems to have been of no smaller dimensions when described

by Evelyn two centuries ago; like most of the giant oaks of Britain, it is of the pedunculate variety.

The wood of the British oak, when grown in perfection, is the most valuable produced in temperate climates. The heart- wood varies in colour from dark brown to pale yellowfeh- brown; hard, close-grained, and little liable to split accidentally, it is, for a hard wood, easy to work. Under water it excels most woods in durability, and none stand better alternate exposure to drought and moisture, while under cover it is nearly indestructible as long as dry-rot is prevented by free admission of air. Its weight varies from 48 to about 551b the cubic foot, but in very hard slowly-grown trunks sometimes approaches 60 lb. The sap-wood is lighter and much more perishable, but is of value for many purposes of rural economy. The relative qualities of the two varieties have been the frequent subject of debate, the balance of practical testimony seeming to establish the superiority of Q. pedunculata as far as durability in water is concerned; but when grown under favourable circumstances the sessile oak is certainly equally lasting if kept dry. The wood of the durmast oak is commonly heavier and of a darker colour, hence the

other is sometimes called by woodmen the white oak, and in France is known as the " chene blanc." The oak of Britain is still in demand for the construction of merchant shipping, though teak has become in some measure its substitute, and foreign oak of various quality and origin largely takes its place. Its great abundance of curved trunks and boughs rendered the oak peculiarly valuable to the shipwright when the process of bending timber artificially was less understood; the curved pieces are still useful for knees. The younger oaks are employed by the carpenter, wheelwright, wagon-builder and for innumerable purposes by the country artisan. The most durable of fences are those formed of small oaks, split lengthwise by the wedge into thin boards. The finely-grained heart-wood is sought by the cabinetmaker for the manufacture

From Kotschy, op. tit. Plate XXXII.

Fig. 3. — Q. sessilifiora.

of furniture, and high prices are often given for the gnarled and knotted portions of slowly-grown trees, to be sawn into veneers. Oak was formerly largely used by wood-carvers, and is still in some demand for those artists, being harder and more durable than lime and other woods that yield more readily to the sculptor's tool. Oak was thus applied at a very early date; the shrine of Edward the Confessor, still existing in the abbey at Westminster, sound after the lapse of 800 years, is of dark-coloured oak-wood. The wood, of unknown age, found submerged in peat-bogs, and of a black hue, is largely used in decorative art under the name of " bog-oak."

The oak grows most luxuriantly on deep strong clays, cal- careous marl or stiff loam, but will flourish in nearly any deep well-drained soil, excepting peat or loose sand; in marshy or moist places the tree may grow well for a time, but the timber is rarely sound; on hard rocky ground and exposed hillsides the growth is extremely slow and the trees small, but the wood

is generally very hard and durable. The oak will not bear exposure to the full force of the sea gale, though in ravines and on sheltered slopes oak woods sometimes extend nearly to the shore. The cultivation of this tree in Europe forms one of the most important branches of the forester's art. It is frequently raised at once by

sowing the acorns on the ground where the trees are required, the fruit being gathered in the autumn as soon as shed, and perfectly ripe seeds selected; but the risk of destruction by mice and other vermin is so great that transplanting from a nursery-bed is in most cases to be preferred.

The acorns should be sown in November on well-prepared ground, and covered to a depth of I $ or 2 in. ; the seeds germinate in the spring, and the seedlings are usually transplanted when one or two years old to nursery-beds, where they are allowed to grow from two to four years, till required for the plantation. Some authorities recommend the tap-roots to be cut in the second year, with the view of increasing the ball of fibre; but, if the trees are removed from the seed-bed sufficiently early, the root is best left to its natural development. The oak requires shelter in the early stages of growth ; in England the Scotch pine is thought best for this purpose, though Norway spruce answers as well on suitable ground, and larch and other trees are sometimes substituted. The conifers are allowed to grow to a height of from 3 to 5 ft. before the young oaks are planted, and are gradually thinned out as the latter increase in size. The distance between the oaks depends upon the growth intended before thinning the young wood; usually they are placed from 8 to 12 ft. apart, and the superabundant trees cut out as they begin to interfere with each other. The lower branches often require removal, to ensure the formation of a tall straight trunk, and this operation should be performed before the superfluous shoots get too large, or the timber will be injured; but, as with all trees, unnecessary pruning should be avoided, as every branch removed lessens the vigour of growth. Where artificial copsewood is the object, hazel, hornbeam and other bushes may be planted between the oaks; but, when large timber is required, the trees are best without undergrowth.

The growth of the oak is slow, though it varies greatly in different trees; Loudon states that an oak, raised from the acorn in a garden at Sheffield Place, Sussex, became in seventy years 12 ft. in circumference; but the increase of the trunk is usually very much slower, and when grown for large timber oak can rarely be profitably felled till the first century of its growth is completed. The tree will continue to form wood for 150 or 200 years before showing any symptoms of decay. As firewood oak holds a high position, though in Germany it is considered inferior to beech for that purpose. It makes excellent charcoal, especially for metallurgic processes; the Sussex iron, formerly regarded as the best produced in Britain, was smelted with oak charcoal from the great woods of the adjacent Weald, until they became so thinned that the precious fuel was no longer

obtainable.

An important product of oak woods is the bark that from a remote period has been the chief tanning material of Europe. The most valuable kind is that obtained from young trees of twenty to thirty years' growth, but the trunks and boughs of timber trees also furnish a large supply; it is separated from the tree most easily when the sap is rising in the spring. It is then carefully dried by the free action of the air, and when dry built into long narrow stacks until needed for use. The value of oak bark depends upon the amount of tannin contained in it, which varies much, depending not only on the growth of the tree but on the care bestowed on the preparation of the bark itself, as it soon ferments and spoils by exposure to wet, while too much sun-heat is injurious. That obtained from the sessile- fruited oak is richer in tannic acid than that yielded by Q. pedun- culate,, and the bark of trees growing in the open is more valuable than the produce of the dense forest or coppice. The bark of young oak branches has been employed in medicine from the days of Dioscorides, but is not used in modern practice. The astringent principle is a peculiar kind of tannic acid, called by chemists querci-tannic, which, yielding more stable compounds with gelatine than other forms, gives oak bark its high value to the tanner. According to Neubauer, the bark of young oaks contains from 7 to 10% of this principle; in old trees the proportion is much less.

The acorns of the oak possess a considerable economic importance as food for swine. In the Saxon period the " mast " seems to have been regarded as the most valuable produce of an oak wood; nor was its use always confined to the support of the herds, for in time of dearth acorns were boiled and eaten by the poor as a substitute for bread both in England and France, as the sweeter produce of Q. Esculus is still employed in southern Europe. Large herds of swine in all the great oak woods of Germany depend for their autumn maintenance on acorns; and in the remaining royal forests of

England the inhabitants of the neighbouring villages yet claim their ancient right of " pannage," turning their hogs into the woods in October and November. Some trees of the sessile-fruited oak bear sweet acorns in Britain, and several varieties were valued by the ancient Italians for their edible fruit. A peculiar kind of sugar called quercite exists in all acorns. A bitter principle to which the name of quercin has been applied by Gerber, its discoverer, has also been detected in the acorn of the common oak; the nutritive portion seems chiefly a form of starch. A spirit has. been distilled from acorns in process of germination, when the saccharine principle is most

abundant.

The British oak grows well in the northern and middle states of America; and, from the superiority of the wood to that of Q. alba and its more abundant production of acorns, it will probably be much planted as the natural forests are destroyed. The young trees require protection from storms and late frosts even more than in England; the red pine of the north-eastern states, Pinus resinosa, answers well as a nurse, but the pitch pine and other species may be employed. In the southern parts of Australia and in New Zealand the tree seems to flourish as well as in its native home.

The oak in Europe is liable to injury from a great variety of insect enemies: the young wood is attacked by the larvae of the small stag-beetle and several other Coleoptera, and those of the wood-leopard moth, goat moth and other Lepidoplera feed upon it occasionally; the foliage is devoured by innumerable larvae; indeed, it has been stated that half the plant-eating insects of England prey more or less upon the oak, and in some seasons it is difficult to find a leaf perfectly free from their depredations. The young shoots are chosen by many species of Cynipidae and their allies as a receptacle for their eggs, giving rise to a variety of gall-like excrescences, from which few oak trees are quite free.

Of the European timber trees of the genus, the next in importance to the British oak is Q. Cerris, the Turkey oak of the nurserymen. This is a fine species, having when young straighter branches than Q. Robur, but in old age the boughs generally curve downwards, and the tree acquires a wide spreading head; the bark is dark brown, becoming grey and furrowed in large trees; the foliage varies much, but in the prevailing kinds the leaves are very deeply sinuated, with pointed, often irregular lobes, the footstalks short, and furnished at the base with long linear stipules that do not fall with the leaf, but remain attached to the bud till the following spring, giving a marked feature to the young shoots. The large sessile acorns are longer than those of Q. Robur, and are dark-brown when ripe; the hemispherical cups are covered with long, narrow, almost bristly scales, giving them a mossy aspect; the fruit ripens the first autumn. The foliage in some of the numerous varieties is almost evergreen, and in Britain is retained long after the autumnal withering.

This oak abounds all over the Turkish peninsula, and forms a large portion of the vast forests that clothe the slopes of the Taurus ranges and the south shores of the Black Sea; it is likewise common in Italy and Sardinia, and occurs in the south of France and also in

Hungary. It was introduced into England by Philip Miller about ! 735. and is now common in parks and plantations, where it seems to flourish in nearly all soils. The Turkey oak in southern England grows twice as fast as Q. Robur; in the mild climate of Devonshire and Cornwall it has reached a height of 100 ft. and a diameter of 4 ft. in eighty years, which is about the limit of its profitable growth for timber. The wood is hard, heavy and of fine grain, quite equal to the best British oak for indoor use, but of very variable durability where exposed to weather. The ships of Greece and Turkey are largely built of it, but it has not always proved satisfactory in English dockyards. The heart- wood is dark in colour, takes a fine polish, and from the prominence of the medullary rays is valuable to the furniture maker; it weighs from 40 to 50 lb the cubic foot. The comparatively rapid growth of the tree is its great recommenda- tion to the planter; it is best raised from acorns sown on the spot, as they are very bitter and little liable to the attacks of vermin; the tree sends down a long tap-root, which should be curtailed by cutting or early transplanting, if the young trees are to be removed. It seems peculiarly adapted for the mild moist climate of Ireland.

In North America, where the species of oak are very numerous, the most important member of the group is Q. alba, the white oak, abounding all over the eastern districts of the continent from Lake Winnipeg and the St Lawrence countries to the shores of the Mexican Gulf. In aspect it more nearly resembles Q. Robur than any other species, forming a thick trunk with spreading base and, when growing in glades or other open places, huge spreading boughs, less twisted and gnarled than those of

the English oak, and covered with a whitish bark that gives a marked character to the tree. The leaves are large, often irregular in form, usually with a few deep lobes dilated at the end; they are of a bright light green on the upper surface, but whitish beneath; they turn to a violet tint in autumn. The

egg-shaped acorns are placed singly or two together on short stalks; they are in most years sparingly pro- duced, but are occasionally borne in some abund- ance. On rich loams and the alluvial soils of r i ver-vall eys, when well drained, the tree attains a large size, often rivalling the giant ► oaks of Europe; trunks of 3 or 4 ft. in diameter are frequently found, and sometimes these dimensions are greatly ex-

ceeded. The wood is variable in quality and, though hard in texture, is less durable than the best oak of British growth; the heart-wood is of a light reddish brown varying to an olive tint; a Canadian specimen weighs 52ˆ lb the cubic foot.

Q. obtusiloba, the post oak of the backwoodsman, a smaller tree with rough leaves and notched upper lobes, produces an abundance of acorns and good timber, said to be more durable than that of the white oak.

The pin oak, sometimes called the " burr-oak," Q. macrocarpa, is remarkable for its large acorns, the cups bordered on the edge by a fringe of long narrow scales; the leaves are very large, some- times from 10 in. to 1 ft. in length, with very deep lobes at the lower part, but dilated widely at the apex, and there notched. The tree is described by Prof. C. S. Sargent (Silva of North America) as one of the

From Michaux, Histoire des chines de VAmirique.

Fig. 4. — Q. alba.

From Michaux, op. cit. Plate XXXV.

Fig. 5. — Q. rubra.

most valuable timber trees of North America, its wood being superior in strength even to that of Q. alba, with which it is commercially confounded.

The over-cup oak, Q. lyrata, is a large tree, chiefly found on swampy land in the southern states ; the lyrate leaves are dilated at the end ; the globose acorns are nearly covered by the tuberculated cups.

In the woods of Oregon, from the Columbia river southwards, an oak is found bearing some resemblance to the British oak in toliage and in its thick trunk and widely-spreading boughs, but the bark is white as in Q. alba; it is Q. Garryana, the western oak of T. Nuttall. This tree acquires large dimensions, the trunk being often from 4 to 6 ft. in diameter; the wood is strong, hard and close-

grained ; the acorns are produced in great quantity, and are used by the Indians as food.

The red oak, Q. rubra, has thin large leaves on long petioles, the lobes very long and acute, the points almost bristly ; they are pink

when they first expand in spring, but become of a bright glossy green when full-grown ; in autumn they change to the deep purple- red which gives the tree its name. Com- mon throughout the northern and middle states and Canada, the red oak attains a large size only on good soils; the wood is of little value, being coarse and porous, but it is largely used for cask- staves; the bark is a valuable tanning material.

A species nearly allied is the scarlet oak, Q. coccinea, often confounded with the red oak, but with larger leaves, with long lobes ending in several acute points ; they change to a brilliant scarlet with the first October frosts, giving one of the most striking of the various glowing tints that render the American forests so beautiful in autumn. The trunk, though often of considerable size, yields but an indifferent wood, employed for similar purposes to that of Q. rubra; the bark is one of the best tanning materials of the country. Both these oaks grow well in British plantations, where their bright autumn foliage, though seldom so decided in tint as in their native woods, gives them a certain picturesque value.

Nearly akin to these are several other forms of little but botanical interest ; not far removed is the black or dyer's oak, From ' K ; tS chyT"o#. «(. Plate XL. Q. ttnctorta, a large and handsome

species, with a trunk sometimes 4 ft. in Fig. 6.—Q. castaneaefoha. diameter, not uncommon in most forests east of the Mississippi, especially in

somewhat upland districts. The leaves are frequently irregular in outline, the lobes ratlieˆ- short and blunt, widening towards the end, but with setaceous points; the acorns are nearly globular. The wood is coarsely grained, as in all the red-oak group, but harder and more durable than that of Q. rubra, and is often employed for building and for flour-barrels and cask-staves. The bark, very dark externally, is an excellent tanning substance; the inner layers form the quercitron of commerce, used by dyers_ for communicating to fabrics various tints of yellow, and, with iron salts, yielding a series of brown and drab hues; the colouring property depends on a crystalline principle called quercitrin, of which it should contain about 8 %. The cut-leaved oaks are repre- sented in eastern Asia by several species, of which Q. mongolica is

From Kotschy, op. cit. Plate XXXVIII.

Fig. 7. — Q. Ilex.

widely spread over Dahuria, north China and the adjacent countries; one of the Chinese silkworms is said to feed on the leaves.

The chestnut oaks of America represent a section distinguished by the merely serrated leaves, with parallel veins running to the end of the serratures. Q. Prinus, a beautiful tree of large growth, and its subspecies castanea and montana, yield good timber. Q. Chinquapin or prinoid.es, a dwarf species, often only 1 ft. in height, forms dense miniature thickets on the barren uplands of Kansas and Missouri, and affords abundant sweet acorns; the tree is called by the hunters of the plains the "shin-oak;" Q. castaneaefolia, represented in fig. 6,

is a native of the woods of the Transcaucasian region of western Asia.

Evergreen oaks with entire leaves are represented in North America by Q. virginiana, also known as Q. virens, the live oak of the southern states; more or less abundant on the Atlantic coasts of the Carolinas and Florida, its true home is the country around the Mexican Gulf, where it rarely grows more than 50 or 60 m. inland. The oval leaves are dark-green above, and whitish with stellate hairs beneath, the margin entire and slightly recurved. The live oak is one of the most valuable timber trees of the genus, the wood being extremely durable, both exposed to air and under water; heavy and close- grained.it is perhaps the best of the American oaks for shipbuilding, and is invaluable for water-wheels and mill-work. The tree in England is scarcely hardy, though it will grow freely in some sheltered places.

The evergreen oak of southern Europe is Q. Ilex, usually a smaller tree, frequently of rather shrub-like appearance, with abundant glossy dark-green leaves, generally ovate in shape and more or less prickly at the margin, but sometimes with the edges entire; the under surface is hoary ; the acorns are oblong on short stalks. The ilex, also known as the " holm oak " from its resemblance to the holly, abounds in all the Mediterranean countries, showing a partiality for the sea air. The stem sometimes grows 80 or 90 ft. in height, and old specimens are occasionally of large diameter; but it does not often reach a great size. In its native lands it attains a vast age; Pliny attributes to several trees then growing in Rome a greater antiquity than the city itself. The wood is very heavy and hard, weighing 70 lb

the cubic foot; the colour is dark brown; it is used in Spain and Italy for furniture, and in the former country for fire- wood and charcoal. In Britain the evergreen oak is quite hardy in ordinary winters, and is useful to the ornamental planter from its capacity for resisting the sea gales; but it generally remains of small size. Q. Battota, a closely allied species abundant in Morocco, bears large edible acorns, which form an article of trade with Spain ; an oil, resembling that of the olive, is obtained from them by ex- pression. Q. Ilex, var. Gramuntia, also furnishes a fruit which, after acquiring sweetness by keeping, is eaten by the Spaniards.

In America several oaks exist with narrow lanceolate leaves, from which characteristic they are known as " willow oaks." Q.

Phellos, a rather large tree found on swampy land in the southern states, is the most im- portant of this group; it s timber is of indifferent quality.

The cork oak, Q. Suber, the bark of which yields cork (q.v.), is a native of the west Mediterranean area. In Spain the wood is of some value, being hard and close-grained, and the inner bark is, used for tanning. From its rugged silvery bark and dark-green foliage, it is a handsome tree, quite hardy in Cornwall and Devonshire, where it has grown to a large size. The valonia of commerce, one of the richest of tanning materials, is the acorn of Q. Aegilops, a fine species indigenous to Greece and the coasts of the Levant, and sometimes called the " Oak of Bashan." The very large acorns are remarkable for their thick cups with long reflexed scales; the leaves are large, oblong, with deep serratures terminating in a bristle-like point. The cups are the most valuable portion of the valonia, abounding in tannic acid; immature acorns are sometimes exported under the name of " camatina." The allied Q. Vallonea of Asia Minor likewise yields valonia.

Some oaks are of indirect importance from products formed by their insect enemies. Of these the Aleppo gall (see Galls) is yielded by Q. infectoria, a native of Asia Minor and western Asia. Q. cocctfera,_ a small bush growing in Spain and many countries around the Mediterranean, furnishes the kermes dye (Kermes). Q. persica, or according to some Q. mannifera, attacked by a kind of Coccus, yields a sweet exudation which the Kurds collect and use as manna, or as a substitute for honey or sugar in various confections (see Manna).

OAKHAM, a market town, and the county town of Rutland, England,

94 m. N. by W. of London by the Midland railway. Pop. (1901) 3294. The church of* All Saints ranges in style from Early English to Perpendicular, belonging in appearance mainly to the latter style. Of Oakham Castle, founded in the reign of Henry II., the principal remnant is the notable Norman hall, used as the county hall. The manor came in the time of

From Kotschy, op. cil. Plate VII.

Fig. 8. — Q. Vallonea.

Henry II. into the hands of Walcheline de Ferrers, and subse- quently passed, through many owners, to the duchy of Bucking- ham, whence it descended to the earb of Winchelsea. A peculiar custom attaching to the manor is to claim a horseshoe from every peer who, for the first time, passes through the town. Flore's House in the main street is an interesting building dating from the 13th century. Oakham school was endowed as a grammar school by Robert Johnson, archdeacon of Leicester, in 1584; it now has classical and modern sides. Not far from the town are the kennels of the Cottesmore hunt.

OAKLAND, a city and the county-seat of Alameda county, California, U.S.A., situated opposite and about 6 m. distant from San Francisco, on the eastern shore of San Francisco Bay. Pop. (1890) 48,682; (1900) 66,960, of whom 17,256 were foreign- born, 3197 being Irish, 2742 German, 2026 English, 1544 English-Canadians, 1020 Portuguese and 994 Swedish; (1910 census) 1 50, 1 74. It is the terminus of the Ogden branch of the Southern (formerly Central) Pacific, of the Coast Line of the Atchison, Topeka & Santa Fe, and of the Western Pacific railways. Passengers and freight from the East to San Francisco are transferred by ferry from Oakland. A branch of the bay (called Oakland Harbour) divides Oakland from Alameda, and the rail- way piers of Oakland run directly out into the bay for more than 2 m. toward San Francisco, thus shortening the ferry connexions. Lake Merritt, in the heart of the city, a favourite pleasure resort, is the centre of the city's park system. Oakland is the seat of California College (co-educational, Baptist, opened in 1870), and of St Mary's College (Roman Catholic, 1863) for men; and in the suburban village of Mills College, west of the city, is Mills College (non-sectarian, 1871) for women, an institu- tion of high rank. Electric power for the city is derived from Colgate, on the Yuba river, 219 m. distant. Oakland has important manufacturing interests, the total value of its factory products in 1905 being $9,072,539, 69% more than in 1900.

The site of the present city (as well as that of Alameda and Berkeley) lay originally within the limits of a great private Mexican grant which was confirmed by the United States authorities. A settlement was begun — at first by " squatters " in defiance of the private claim — in 1850; in May 1852 this was incorporated as a town (the name being derived from a wood of oaks in the midst of which the first settlement was made), and in March 1854 it was chartered as a city. In 1869 it was selected as the western terminus of the Central Pacific, a choice which greatly promoted Oakland's commercial importance. The water front was recklessly given away in 1852, and the resulting disputes and litigation lasted for more than thirty years; in 1908 the water front reverted to the city. The population increased more than sixfold from i860 to 1870, and doubled in 1900-1910. It became the county-seat in 1874. In December 1910 a commission form of government was adopted.

OAKUM (O. Eng. dcumbe or— acumbe, tow, literally" off-comb- ings "), a preparation of tarred fibre used in shipbuilding, for caulking or packing joints of timbers in wood vessels and the deck planking of iron and steel ships. Oakum is made by pre- ference from old tarry ropes and cordage of vessels, and its picking and preparation has been a common penal occupation in prisons and workhouses. White oakum is made from untarred materials.

OAMARU, a municipal borough on the east coast of South Island, New Zealand, in the county of Waitaki and provincial district of Otago; on the main railway between Christchurch (152 m. N.E.) and Dunedin (78 m. S.S.W.). Pop. (1906) 5071. It is the outlet of the largest agricultural district in New Zealand. A breakwater and mole, constructed of blocks of concrete, enclose a commodious basin, forming one of the safest harbours in the colony. The export of frozen meat is important. The town is built of white Oamaru limestone. Brown coal is ob- tained at the entrance of Shag valley, 40 m. S. The district is famed for its stock, and the fine quality of its grain; also for the character of the English grasses laid down there, which flourish in a rich black loam on a limestone formation.

OANNES, in Babylonian mythology, the name given by Berossus to a mythical being who taught mankind wisdom. He is identical with the god Ea (q.v.), although there may not be any direct connexion between the two names. Berossus describes Oannes as having the

body of a fish but underneath the figure of a man. He is described as dwelling in the Persian Gulf, and rising out of the waters in the daytime and furnishing mankind instruction in writing, the arts and the various sciences. The culture-myth on which the account of Berossus rests has not yet been found in Babylonian literature, but there are numerous indications in hymns and incantations that confirm the indentification with Ea, and also prove the substantial correctness of the conceptions regarding Oannes-Ea as given by Berossus. (M. Ja.)

OAR (A.S. dr; M. Eng. ore; Lat. remus; Gr. kperfjhs : Sans. aritra; Fr. rame; Ital. Span., Port, rama), the instrument used for propelling a boat in rowing (q.v.). The word " oar " is probably derived from an old root ar, meaning to drive, to force away (cf. ar-ar-e, aratrum, plough). Such an appellation would easily be suggested by the visible difference in the action of the power employed by means of the oar against a thowl, or rowlock, from that of the more primitive paddle, where the power is gained by the action of one hand against the other. In the development of rowing from paddling the task of shaping the instrument of propulsion must have followed gradually the necessities indicated by use. In rowing, as well as in paddling, the leverage is of the second order, in which the weight lies between the power and the fulcrum. The point at which the power pressed the arm of the lever against the weight in rowing would soon attract attention by the frequent breakage of the paddle so employed. Experience would demand a thicker loom, and would soon teach the desirability of increasing the leverage where possible, and upon this would arise naturally the practical questions of the length of the oar, of the breadth of the blade, and of the right proportion of the parts of the oar, inboard and outboard, to each other. Then would also occur the problem of how to keep this proportion, which in practice would be liable to dis- arrangement by the slipping outward of the oar during the recovery from each stroke. Hence would arise the use of the thong (rpcwr6s, rpoirwr^p), familiar to ancient Greek and modern Levantine, and, in northern and western waters, the invention of the " button," with which in various shapes the rowing world is now pro- vided. Other devices, such as a hole bored in a piece of wood attached to the oar, or even a metal ring, will, in different localities, be found answering the same purpose.

In the early stages of the transition from paddling to rowing, the oar would naturally be used at an acute angle vertically to the boat's side. In paddling the upper hand is used to push from you, the lower hand to pull towards you. But in rowing both hands are used to pull towards you. As long as the oar was used at an acute angle vertically

to the boat's side, the position of the upper hand on the oar would have to be reversed,

as it would more easily grasp the oar with the wrist turned inward towards the body. In many of the earlier representations of rowing this position of the upper band seems to be indicated. This distinction should not be lost sight of, as the position of the hands on the oar affects not only the character of the stroke, but also the requirements as to the length of the oar and the breadth of the blade. The form of the oars given in the repre- sentations of early Egyptian ships is suggestive of paddles used

as oars. Paddle-shaped also are the oars of the Phoenician ships shown on the Assyrian sculptures at Koyunjik (Layard), the date of which is about 700 B.C. The same form is seen on some of the early vases, but in some that are attributed to two centuries later the form is modified, and the oar blade proper begins to take shape.

The types exhibited in the representations of the Roman galleys are generally heavy and clumsy enough in appearance. Still they are veritable oars, not paddles. The material of which the ancient oars were usually made was pine, which then, as now, was most suitable for the purpose, being tough and comparatively light and easily shaped as regards loom and blade.

The oars of the Attic trireme were, if we may judge by those of which only we have the measurement recorded, not much longer for the upper bank than those of a modern racing eight, while those of the middle and lower banks could not have been much longer than those used now in the whalers and dinghies of the Royal Navy. As the oarsmen on either side probably sat in the same vertical plane, the inboard portion of the oars amidships was longer than the inboard of those fore and aft, having to conform to the curvature of the vessel's sides (cf. Aristotle, Mechanica, v.). No doubt in vessels of larger size the upper tiers of oars would be longer, and, if we are to believe Callixenus, as cited by Athenaeus, in the great ship of Ptolemy the oars of the upper tier were over 50 ft. in length with handles leaded so as to equalize the weight inboard and outboard.

It is difficult to trace any detail of difference between the oars of the Roman period and those of the Byzantine and medieval galleys. In the medieval galley by the invention of the " apostis," a framework on which the thowls were fixed, sufficient room was given for the play of longer oars, and, as the necessity of combining speed with greater carrying power in the galley became pressing, the

arrangement alia scaloccio came into vogue, employing four or five or even seven men to each of the long

Table showing Oars used in Royal Navy.

Description of Vessel.

Oars.

Blades.

Material.

No. allowed.

Length.

Thickness.

Length.

Breadth.

1. Launches, 42′ .

17-16

17 2|-iJ i6 2|-li

5′ 8″ 5′ 4″

Si”

si” OS

18

2. Pinnaces, 36′ .

17-16

16

32’, . .

16-15

15 24-ii

5“o”

01

14

30 •

16-15

12

3. Cutters, 34′ .

15-H

142 -If

4′ 8″

5’*

.13

14

32′ .

15-14

fc

H

3°’ •

15-H

U

12

28′ ,

15-H

*r**

10

26′ .

15-14

10

„ gig, 20′ .

15-H

4

4. Galleys 32′ .

17-16

■y

6

5. Gigs, 30′ .

17-16

6

28′ . .

17-16

, .

. ,

6

6. Whalers, 27′ .

15-H

132 -If

4 ””>

5 V

5

7. Skiff dinghies, 16′ .

10-8

10 if-lf

9 if-if

34″

3 „

A 3ff

%

4a „

*‘4**

1 8. Dinghies, I3§’ .

10-8

8 if-if

2′ 10″

4i”

1

4

- *Allowed spoon-blade oars.*

Notes. — (1) Since 1893 some curved or spoon-bladed oars have been made at Devonport. (2) There is no record of buttons being used, but on fir oars, which were covered with canvas on the loom, it was sometimes customary to work a Turk's head at the end of the canvas for ornament. (3) As regards sweeps, they used to be made of ash and were 30 ft. long. They were used last in training brigs, but there is no record of them for the last twenty years.

sweeps by which the galleys and galleasses were propelled. For these large oars we hear of ash and beech being used as well as pine.

In the Mediterranean the galley propelled by oars long re- mained the principal type of war vessel. In the Atlantic, and in the northern seas, it was otherwise.

The employment of artillery on board ship gradually deter- mined a change in the method of propulsion. The use of sails

became necessary, and remained dominant until the introduction of steam (see Ship). But as late as the time of the Spanish Armada, and even later, large sea-going vessels were provided with long sweeps which came into use when sailing was not available. In our own time, in the lighters on tidal rivers, may be seen long oars, plied by one or two or more men, which recall the type of oars once in general use in large galleys three centuries ago.

The oars used by the Northmen were, to judge by the remains discovered along with old Viking ships x at Gokstad and else- where, very similar to those in use at the present time in the fishing boats around our coasts. Those of the large craft were, to judge by the length of one found whole, somewhat over 18 ft. in length with a 5-in. blade and a diameter of 3 in. halfway down the loom. Some smaller oars, evidently used for boats, measured n ft. with a 4-in. blade. The oars were of pine, and the looms of some of them showed a groove cut for a clamp at the place where the oar rested on the sill of the rowlock. Com- paring these oars with the measurements given

below of oars now in use in the Royal Navy, it is apparent that there is no great difference in type between them.

Passing on to oars used on rivers and fresh water generally, we find the type differs considerably from that of the oars used in sea-going craft. The chief difference consists in the shape of the blade, which, instead of continuing the straight line of the loom in its expansion to its proper breadth, is fashioned in a curve calculated to offer a rigid resistance to the water during the stroke. 2 The loom below the button is not rounded but is more of an oval to the front with a flat back. From the oval front a spine runs down into the blade, in some cases to nearly half its length. During the last few years the so-called " girder " oars, with much thicker looms but double grooved along their length, have been used for racing purposes. This invention gives additional strength and stiffness, without increasing the weight of the oar, which varies a little but is usually about 8 lb. The blades vary much in breadth, as indeed do the oars in total length, and in proportion of inboard to outboard. The neces- sities of the sliding seat in racing boats have given rise to much difference of opinion among rowing men as to the right proportion. In the middle of the 19th century the use of square looms inboard, and of a button to turn inside and against the thowl, was common, and most oars had a small slab of hard wood let in below the button, so as to save the oar from wear and tear at the rowlock. But since round looms came into vogue the round leather ear has taken the place of the old square button, and the loom is covered with leather for some inches above and below this so as to protect it from abrasion.

Of late the introduction of swivel rowlocks for racing boats has caused a further modification in the form of buttons. Swivel rowlocks have come into general use for sculling boats, pair oars And coxswainless fours. But as yet they do not appear to have captured the racing eight, except in a few instances. Neither crews nor coaches in English waters seem inclined to part with the time-honoured rhythmic music of the oar in the rowlock, which from the days of antiquity even until now has, to practised ears, told its own tale as to the crew being together or not in the stroke.

In the case of racing eights, when the round loom oars superseded the square loom, the early patterns were com- monly (e.g. in 1857) 12′ 6″ over all, 3′ 8″ inboard, with a long blade 45″ to 5″ in breadth. These were succeeded by a pattern 12′ 6″ over all, 3′ 6″ inboard, with a much shorter blade 6 broad.*

Since sliding seats came in the average oar has been 12′ 4″ over all,

3′ 83″ inboard, with 53″ to 6|” blades. The modern racing oar may be said to date from 1869, the year of the Oxford and Harvard race at Putney. Until very lately no material alteration had taken place in this pattern, except in the matter of width of blade. Some authorities, however, are, as has been

1 See Vihmg Ship, Nicolaysen (Christiania, 1882).

2 Since 1890 the curved blade seems to have been adopted in some cases in the oars made at Devonport for the Royal Navy.

said above, far from satisfied with the present average oar, and are using shorter patterns, n’ 10″ or 12′ o” over all, 3′ 7″ inboard, and 7″ blades.

Single grooved oars were first made in America. But with the single groove a side weakness is often developed in the loom, and hence the double girder, invented by G. Ayling, has generally superseded the single groove, though many oarsmen prefer the box loom by the same inventor.

It is clear, however, that no finality has been reached in the making of oars. Tubular oars, first introduced at Henley by the Belgian crew in 1906, are now being tried, with circular or quadrangular bores, strengthened by the insertion of an aluminium shell.

For much of the information above given respecting the recent developments in oar-making for racing purposes and river work, the writer is indebted to Messrs Ayling & Sons of Putney, whose patented inventions and improvements are well known to rowing men. (E. Wa.)

OASIS (Gr. oaais, the name given by Herodotus to the fertile spots in the Libyan desert: it probably represents an Egyptian word, cf. Coptic ouahe, ouih, to dwell, from which the Egyptian Arabic wa is derived), a fertile spot surrounded by desert. For example, where the high plateau of the Libyan desert descends into a longitudinal valley between Syrtis and the Nile delta there are a few spots where the water comes to the surface or is found in shallow wells. It may come to the surface in springs, upon the artesian principle, or it may collect and remain in mountain hollows. These areas are of small extent and are closely culti- vated, and support thick forests of date-palms. All kinds of tropical vegetables, grains and small fruits grow under cultiva- tion, and land is so precious in these limited areas of great richness and fertility that very narrow pathways divide each

owner's plot from his neighbour's. Wherever oases are found they present similar features, and are naturally the halting-places and points of departure of desert caravans.

OAST (0. Eng. dst, cf. Dutch eest, " kiln "; the Teutonic root is aidk- " to burn"; the pre-Teutonic idh- is seen in Lat. aestus, " heat," aestas, " summer," Gr. aldos, "burning heat"), a kiln, particularly one used for drying hops; the word usually appears in the term " oast-house," a building containing several of such kilns (see Hop). " Oast " is also sometimes used of a kiln for drying tobacco.

OASTLER, RICHARD (1789-1861), English reformer, was born at Leeds on the 20th of December 1789, and in 1820 suc- ceeded his father as steward of the Thornhills' extensive Fixby estates at Huddersfield, Yorkshire. In 1830 John Wood, a Bradford manufacturer, called Oastler's attention to the evils of child employment in the factories of the district. Oastler at once started a campaign against the existing labour conditions by a vigorous letter, under the title " Yorkshire Slavery," to the Leeds Mercury, Public opinion was eventually aroused, and, after many years of agitation, in which Oastler played a leading part, the Ten Hours Bill and other Factory Acts were passed, Oastler's energetic advocacy of the factory-workers' cause procuring him the title of " The Factory King." In 1838, however, owing to his opposition to the new poor law and his resistance of the commissioners, he had been dismissed from his stewardship at Fixby; and, in 1840, being unable to repay £2000 which he owed his late employer, Thomas Thornhili, he was sent to the Fleet prison, where he re- mained for over three years. From prison he published the Fleet Papers, a weekly paper devoted to the discussion of factory and poor-law questions. In 1844 his friends raised a fund to pay his debt, and on his release he made a triumphant entry into Huddersfield. Oastler died at Harrogate on the 22nd of August 1861. A statue to his memory was erected at Bradford in 1869.*

OAT (O. Eng. ate; the word is not found in cognate languages; it may be allied with Fr. eitel, knot, nodule, cf. Gr. otSos swelling), a cereal (Avena sativa) belonging to the tribe Aveneiz of the order Gramineae or grasses. The genus Avena contains about fifty species mostly dispersed through the temperate regions of the Old World. The spikelets form a loose panicle,

familiar in the cultivated oat (fig. i), the flowering glume having its dorsal rib prolonged into an awn (fig. 2), which is in some species twisted and bent near the base.

The origin of the cultivated oat is generally believed to be A. fatua, or" wild oat," or some similar species, of which several

exist in southern Europe and western Asia. Professor J. Buckman succeeded in raising " the potato-oat type " and " the white Tatarian oat " from grain of this species. A. strigosa, Schreb, " the bristle-pointed oat," is the origin of the Scotch oat, according to Buckman. The white and black varieties of this species were cultivated in England and Scotland from remote times, and are still grown as a crop in Orkney and Shetland. A. strigosa is prob- ably only a variety of the cul- tivated oat. The "naked oat," A. nuda, was found by Bunge in waste ground about Peking; it was identified by the botanist Lindley with the pil- corn of the old agriculture, and we see from Rogers l that it was in cultivation in England in the 13th century. Both this and the " common otes," A. vesca, are described by Gerard. 2 Parkinson tells us that in his time (early in the 1 7 th century) the naked oat was sown in sundry places, but " nothing so frequent " as the common sort. The chief differences between A. fatua and A. sativa, are, that in the former the chaff-scales which adhere to the grain are thick and hairy, and in the latter they are not so coarse and are hairless. The wild oat, moreover, has a long stiff awn, usually twisted near the base. In the cultivated oat it may be wanting, and if present it is not so stiff and is seldom bent. The grain is very small and worthless in the one, but larger and full in the other. There are now many varieties of the cultivated oat included under two principal races — common

Fig. 1. — Panicle of Oat, Avena saliva. (After Le Maout.)

Fig. 2— Spikelet of Oat, A. sativa, with two fertile florets, and one terminal, rudimentary.

Fig. 3.— Spikelet of Wild Oat, A. fatua, glumes hairy and long- pointed, awn twisted at base. (After Buckman.)

oat or panicled oats with a spreading panicle, A. sativa proper, and Tatarian oats or banner oats which has sometimes been regarded as a distinct species, A. orientalis, with contracted one-sided panicles. With regard to the antiquity of the oat, A. de Candolle 3 observes that it was not cultivated by the Hebrews, the Egyptians, the ancient

Greeks and the Romans. Central Europe appears to be the locality where it was cultivated earliest, at least in Europe, for grains have been found among

1 Rarer Kinds of Grain, ii. 173.

2 Herball, p. 68 (1597).

3 Origin of Cultivated Plants, p.

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the remains of the Swiss lake-dwellings perhaps not earlier than the bronze age, while Pliny alludes to bread made of it by the ancient Germans. Pickering also records Galen's observations (De Alim. Fac. i. 14), that it was abundant in Asia Minor, especially Mysia, where it was made into bread as Well as given to horses.

Besides the use of the straw when cut up and mixed with other food for fodder, the oat grain constitutes an important food for both man and beast. The oat grain (excepting the naked oat), like that of barley, is closely invested by the husk. Oatmeal is made from the kiln-dried grain from which the husks have been removed; and the form of the food is the well-known" porridge." In Ireland, where it is sometimes mixed with Indian-corn meal, it is called " stirabout." Groats or grits are the whole kernel from which the husk is removed. Their use is for gruel, which used to be consumed as an ordinary drink in the 17th century at the coffee-houses in London. The meal can be baked into " cake " or biscuit, as the Passover cake of the Jews; but it cannot be made into loaves in consequence of the great difficulty in rupturing the starch grains, unless the temperature be raised to a considerable height. With regard to the nutritive value of oatmeal, as compared with that of wheat flour, it contains a higher percentage of albuminoids than any other grain, viz. 12-6 — that of wheat being io-8 — and less of starch, 58-4 as against 66-3 in wheat. It has rather more sugar, viz. 5-4 — wheat having 4-2 — and a good deal more fat, viz. 5-6, as against 2-0 in flour. Lastly, salts amount to 3-0% in oat, but are only 1-7 in wheat. Its nutritive value, therefore, is higher than that of ordinary seconds flour.

OATES, TITUS (1640-1705), English conspirator, was the son of Samuel Oates (1610-1683), an Anabaptist preacher, chaplain to Pride, and afterwards rector of All Saints' Church, Hastings. He was admitted on the nth of June 1665 to Merchant Taylors' school, having, according to one authority, been previously at Oakham.

There he remained a year, more or less, and " seems afterwards to have gone to Sedlescombe school in Sussex, from whence he passed to Caius College, Cambridge, on the 29th of June 1667, and was admitted a sizar of St John's, on the 2nd of February 1668-1669, aged 18." Upon very doubtful authority he is stated to have been also at Westminster school before going to the university. On leaving the university he apparently took Anglican orders, and officiated in several parishes, Hastings among them. Having brought malicious charges in which his evidence was rejected, he narrowly escaped prosecution for perjury. He next obtained a chaplaincy in the navy, from which he appears to have been speedily dismissed for bad conduct with the reputation of worse. He now, it is said, applied for help to Dr Israel Tonge, rector of St Michael's in Wood Street, an honest half-crazy man, who even then was exciting people's minds by giving out quarterly " treatises in print to alarm and awake his majesty's subjects." Oates offered his help, and it was arranged that he should pretend to be a Soman Catholic so as the better to unearth the Jesuit plots which possessed Tonge's brain. Accordingly he was received into the church by one Berry, himself an apostate, and entered the Jesuit College of Valladolid as Brother Ambrose. Hence he was soon expelled. In October 1677 he made a second application, and was admitted to St Omer on 10th December. So scandalous, however, was his conduct that he was finally dismissed in 1678. Returning in June 1678 to Tonge, he set himself to forge a plot by piecing together things true and false, or true facts falsely interpreted, and by inventing treasonable letters and accounts of preparations for military action. The whole story was written by Oates in Greek characters, copied into English by Tonge, and finally told to one of Charles II. 's confidential servants named Kirkby, Kirkby having given the king his information, Oates was sent for (13th August), and in a private interview gave details, in forty-three articles, of the plot and the persons who had engaged to assassinate Charles. The general improbability of the story was so manifest, and the discrepancies were so glaring, that neither then nor at any subsequent time did Charles express anything but amused

incredulity. To bolster up the case a fresh packet of five forged letters was concocted (31st August); but the forgery was trans- parent, and even Sir William Jones, the attorney-general, though a violent upholder of the plot, dared not produce them as evidence.

Oates now (6th September) made an affidavit before Sir Edmond Berry Godfrey (q.v.) to an improved edition of his story, in eighty-one articles. Among the persons named was Coleman, secretary to the duchess of York, whom Godfrey knew, and to whom he sent word of the charges. Coleman in turn informed the duke, and he, since the immediate exposure of the plot was of the utmost consequence to him, induced Charles to compel Oates to appear (28th September) before the privy council. Here Oates delivered himself of a story the falsehood of which was so obvious that the king was able to expose him by a few simple questions. At this moment an accident most fortunate for Oates took place. Amongst the papers seized at his request were Coleman's, and in them were found copies of letters written by the latter to Pere la Chaise, suggesting that Louis should furnish him with money, which he would use in the French and Catholic interest among members of parliament. Among them, too, were these passages: " Success will give the greatest blow to the Protestant religion that it has received since its birth "; " we have here a mighty work upon our hands, no less than the conversion of three kingdoms, and by that perhaps the utter subduing of a pestilent heresy, which has so long domineered over great part of the northern world." The credit of Oates was thus, in the eyes of the people, re-established, and Coleman and others named were imprisoned. Charles was anxious for his brother's sake to bring the matter to a conclusion, but he dared not appear to stifle the plot; so, when starting for Newmarket, he left orders with Danby (see Leeds, Duke of,) that he should finish the investiga- tion at once. But Danby purposely delayed; an impeachment was hanging over his head, and anything which took men's minds off that was welcome.

On the 1 2th of October occurred the murder of Godfrey, and the excitement was at its highest pitch. On the 21st of October parliament met, and, though Charles in his speech had barely alluded to the plot, all other business was put aside and Oates was called before the House. A new witness was wanted to support Oates's story, and in November a man named William Bedloe came forward. At first he remembered little; by degrees he remembered everything that was wanted. Not even so, however, did their witness agree together, so, as a bold stroke, Oates, with great circumstantiality, accused the queen before Charles of high treason. Charles both disbelieved and exposed him, whereupon Oates carried his tale before the House of Commons. The Commons voted for the queen's removal from court, but, the Lords refusing to concur, the matter dropped. It was not, however, until the 18th of July 1679 that the slaughter of Jesuits and other Roman Catholics upon Oates's

testimony and that of his accomplices was to some extent checked. Sir George Wakeman, the queen's physician, was accused of purposing to poison the king, and the queen was named as being concerned in the plot. The refusals of Charles to credit or to countenance the attacks on his wife are the most creditable episodes in his life". Scroggs had intimation that he was to be lenient. Sir Philip Lloyd proved Oates to have perjured himself in open court, and Wakeman was acquitted. On the 26th of June 1680, upon Oates's testimony, the duke of York was pre- sented as a recusant at Westminster. But the panic had now worn itself out, and the importance of Oates rapidly declined; so much so that after the dissolution in 1682 he was no more heard of during Charles's reign, but enjoyed his pension of £600 or £900, it is uncertain which, in quiet. Shortly before the death of Charles, James brought, and won, a civil action against Oates, with damages of £100,000; in default of payment Oates was taken to prison; while there he was indicted for perjury, and was tried in May 1685, soon after the accession of James II. He was convicted and received a severe sentence, with repeated floggings, the execution of which was expected to kill him, and

which was rigorously carried out; but to the astonishment of all he survived.

Oates was in prison for three and a half years. Upon the flight of James, and during the excitement against the Catholics, he partially gained his liberty, and brought an appeal against his sentence before the Lords, who, while admitting the sentence to be unjust, confirmed it by a majority of thirty-five to twenty- three. The Commons, however, passed a bill annulling the sentence; and a conference was held in which the Lords, while again acknowledging that legally they were wrong, adhered to their former determination. The matter was finally settled by Oates receiving a royal pardon, with a pension of £300 a year. The remainder of his life was spent in retirement, varied by a good deal of sordid intrigue. In 1691 he became acquainted with William Fuller, whom he induced to forge another plot, though not with the success he had himself attained. He married a wealthy widow in 1693, but his extravagance soon brought him into straits. In 1696 he dedicated to William III. a book called Eikon Basilike, an elaborate tissue of invection against " the late king James." In 1698 he obtained admission as a member of the Baptist Church, and used to preach at Wapping; but in 1701, as the result of a financial scandal, he was formally expelled from the sect. He died on the 12th of July 1705.

Authorities. — Oates's, Dangerfield's and Bedloe's Narratives; State Trials; Journals of Houses of Parliament; North's Examen; the various memoirs and diaries of the period; Fuller's Narrative; Dryden's Absalom and Achitophel; Burnet's History; Narcissus Luttrell's Relation. Lingard's History gives an exhaustive and trustworthy account of the Popish terror and its victims; and the chief incidents in Oates's career are graphically described by Macaulay. On the question of the place of his education see Notes and Queries (22nd December 1883). See also T. Seccombe's essay in Twelve Bad Men (1894), where a bibliography is given.

OATH (O. Eng. ddh), a term which may be defined as an asseveration or promise made under non-human penalty or sanction. The word is found throughout the Teutonic languages (Goth. ailhs, Mod. Ger. Eid), but without ascertainable etymology. The verb to swear is also Old Teutonic (Goth, svaran, Mod. Ger. schworen); this word, too, is not clear in original meaning, but is in some way connected with the notion of answering — indeed it still forms part of the word answer, O. Eng. and-swarian; it has been suggested that the swearer answered by word or gesture to a solemn formula or act. Among other terms in this con- nexion, the ~La,t.jurare, whence English law has such derivatives as jury, seems grounded on the metaphorical idea of binding (root jw, as in jungo) ; the similar idea of a bond or restraint may perhaps be traced in Gr. opKos. It may be worth notice that Lat. sacramentum (whence Mod. Fr. serment) does not really imply the sacredness of an oath, but had its origin in the money paid into court in a Roman lawsuit, the loser forfeiting his pledge, which went to pay for the public rites (sacra) ; thence the word passed to signify other solemn pledges, such as military and judicial oaths.

Writers viewing the subject among civilized nations only have sometimes defined the oath as an appeal to a deity. It will be seen, however, by some following examples, that the harm or penalty consequent on perjury may be considered to result directly, without any spirit or deity being mentioned; indeed it is not unlikely that these mere direct curses invoked on'himself by the swearer may be more primitive than the invocation of divinities to punish. Examples of the simplest kind of curse- oath may be seen among the Nagas of Assam, where two men will lay hold of a dog or a fowl by head and feet, which is then chopped in two with a single blow of the dao, this being em- blematic of the fate expected to befall the perjurer. Or a man will stand within a circle of rope, with the implication that if he breaks his vow he may rot as a rope does; or he will take hold of the barrel of a gun, a spear-head or a tiger's tooth, and solemnly declare, " If I do not faithfully perform this my promise, may I fall

by this!" (Butler in Journ. Asiatic Soc. Bengal, 1875, p. 316). Another stage in the history of oaths is that in which the swearer calls on some fierce beast to punish him if he lies, believing that it has the intelligence to know what he says and the power to

interfere in his affairs. In Siberia, in lawsuits between Russians and the wild Ostiaks, it is described as customary to bring into court the head of a bear, the Ostiak making the gesture of eating, and calling on the bear to devour him in like manner if he does not tell the truth (G. A. Erman, Travels in Siberia, i. 492, London, 1848). Similar oaths are still sworn on the head or skin of a tiger by the Santals and other indigenous tribes of India. To modern views, a bear or a tiger seems at any rate a more rational being to appeal to than a river or the sun, but in the earlier stage of nature-religion these and other great objects of nature are regarded as animate and personal. The prevalence of river-worship is seen in the extent to which in the old and modern world oaths by rivers are most sacred. In earlier ages men swore inviolably by Styx or Tiber, and to this day an oath on water of the Ganges is to the Hindu the most binding of pledges, for the goddess will take awful vengeance on the children of the perjurer. The Tungus brandishes a knife before the sun, saying, " If I lie may the sun plunge sickness into my entrails like this knife." The natural transition from swearing by these great objects of nature to invoking gods conceived in human form is well shown in the treaty-oath between the Macedonians and the Carthaginians recorded by Polybius (vii. 9); here the sun and moon and earth, the rivers and meadows and waters, are invoked side by side with Zeus and Hera and Apollo, and the gods of the Carthaginians. The heaven-god, able to smite the perjurer with his lightning, was invoked by the Romans, when a hog was slain with the sacred flint representing the thunderbolt, with the invocation to Jove so to smite the Roman people if they broke the oath (Liv. i. 24; Polyb. iii. 25). Another form of this Aryan rite was preserved by the old Slavonic nation of Prussia, where a man would lay his right hand on his own neck and his left on the holy oak, saying, " May Perkun (the thunder-god) destroy me!" The oaths of the lower culture show a remarkable difference from those of later stages. In the apparently primitive forms the curse on the perjurer is to take effect in this world. But as nations became more observant, experience must have shown that bears and tigers were as apt to kill truth-tellers as perjurers, and that even the lightning- flash falls without moral discrimination. In the

Clouds of Aristophanes, indeed, men have come openly to ridicule such beliefs, the Socrates of the play pointing out that notorious perjurers go unharmed, while Zeus hurls his bolts at his own temple, and the tall oaks, as if an oak-tree could perjure itself. The doctrine of miraculous earthly retribution on the perjurer lasted on in legend, as where Eusebius relates how three villains conspired to bring a false accusation against Narcissus, bishop of Jerusalem, which accusation they confirmed by solemn oath before the church, one wishing that if he swore falsely he might perish by fire, one that he might die of the pestilence, one that he might lose his eyes; a spark no man knew from whence burned to ashes the first perjurer's house and all within, the second was consumed by the plague from head to foot, whereupon the third confessed the crime with tears so copious that he lost his sight (Euseb. Hist. Eccl. vi. 9). As a general rule, however, the supernatural retribution on perjury has been transferred from the present world to the regions beyond the grave, as is evident from any collection of customary oaths. A single instance will show at once the combination of retributions in and after the present life, and the tendency to heap up remote penalties in the vain hope of securing present honesty. The Siamese Buddhist in his oath, not content to call down on himself various .kinds of death if he breaks it, desires that he may after- wards be cast into hell to go through innumerable tortures, among them to carry water over the flames in a wicker basket to assuage the thirst of the infernal judge, then that he may migrate into the body of a slave for as many years as there are grains of sand in four seas, and after this that he may be born a beast through five hundred generations and an hermaphrodite five hundred more.*

The forms of oath belonging to all nations and ages, various as they are in detail, come under a few general heads. It may be first observed that gestures such as grasping hands, or putting

one hand between the hands of another in token of homage, are sometimes treated as of the nature of oaths, but wrongly so, they being rather of the nature of ceremonies of compact. The Hebrew practice of putting the hand under another's thigh is usually reckoned among oath-rites, but it may have been merely a ceremony of covenant (Gen. xxiv. 2, xlvii. 29; see Joseph. Ant. i. 16). Even the covenant among many ancient and modern nations by the parties mixing their blood or drinking one another's is in itself only a solemn rite of union, not an oath proDer, unless some such ceremony is introduced as dipping weapons into the blood, as in the form among the ancient Scythians (Herod, iv. 70); this, by bringing in the idea of death befalling the covenant-breaker, converts the proceeding into an

oath of the strongest kind. The custom of swearing by weapons, though frequent in the world, is far from consistent in meaning. It may signify, in cases such as those just mentioned, that the swearer if forsworn is to die by such a weapon; or the warrior . may appeal to his weapon as a powerful or divine object, as Parthenopaeus swears by his spear that he will level to the ground the walls of Thebes (Aeschyl. Sept. contra Theb. 530; see the custom of the Quadi in Ammian. Marcellin. xvii.); or the weapon may be a divine emblem, as when the Scythians swore by the wind and the sword as denoting life and death (Lucian, Toxaris, 38) . Oaths by weapons lasted into the Christian period; for instance, the Lombards swore lesser oaths by consecrated weapons and greater on the Gospels (see Du Cange, s'.v. " Juramenta super arma "; Grimm, Deutsche Rechtsalterth. p. 896). Stretching forth the hand towards the object or deity sworn by is a natural gesture, well shown in the oath of Agamem- non, who with uplifted hands (Ait x&pa- avaaxkv) takes Heaven to witness with Sun and Earth and the Erinyes who below the earth wreak vengeance on the perjurer (Homer //. xix. 254; see also Pindar, Olymp. vii. 120). The gesture of lifting the hand towards heaven was also an Israelite form of oath: Abraham says, " I have lifted up my hand to Jehovah," while Jehovah Himself is represented as so swearing, " For I lift up My hand to heaven, and say, I live for ever " (Gen. xiv. 22; Deut. xxxii. 40; see Dan. xii. 7; Rev. x. 5). This gesture established itself in Christendom, and has continued to modern times. In England, for example, in the parliament at Shrews- bury in 1398, when the Lords took an oath on the cross of Canterbury never to suffer the transactions of that parliament to be changed, the members of the Commons held up their hands to signify their taking upon themselves the same oath (J. E. Tyler, Oaths, p. 99). In France a juror takes oath by raising his hand, saying, "Jejure!" The Scottish judicial oath is taken by the witness holding up his right hand uncovered, and repeating after the usher, " I swear by Almighty God, and as I shall answer to God at the great day of judgment, that I will," &c.*

In the ancient world sacrifice often formed part of the ceremony of the oath ; typical examples may be found in the Homeric poems, as in Agamemnon's oath already mentioned, or the compact between the Greeks and Trojans (//. iii. 276), where wine is poured out in libation, with prayer to Zeus and the immortal gods that the per- jurer's brains shall, like the wine, be poured on the ground; the rite thus passes into a symbolic curse-oath of the ordinary barbaric type. Connected with such sacrificial oaths is the practice of laying the hand on the victim or the altar, or touching the image of the god. A

classic instance is in a comedy of Plautus (Rudens, v. 2, 45), where Gripus says, " Tange aram hanc Veneris," and Labrax answers "Tango" (Greek instance, Thucyd. v. 47; see Justin xxiv. 2). Thus Livy (xxi. l) introduces the phrase "touching the sacred objects " (tactis sacris) into the picturesque story of Hannibal's oath. Details of the old Scandinavian oath have been preserved in Iceland in the Landnamabok [Islendinga Sogur, Copenhagen, 1843); a bracelet (baugr) of two rings or more was to be kept on the altar in every head court, which the godi or priest should wear at all law- things held by him, and should redden in the blood of the bullock sacrificed, the witness pronouncing the remarkable formula: " Name I to witness that I take oath by the ring, law-oath, so help me Frey, and Niord, and almighty Thor " (hialpi mer sva Freyr, ok Niordr, ok hinn almattki Ass), &c. This was .doubtless the great oath on the holy ring or bracelet which the Danes swore to King Alfred to quit his kingdom ("on tham halgan beage," Anglo-Sax. Ckron.; " in eorum armilla sacra," Ethelwerd, Chron. iv.). An oath, though not necessarily expressed in words, is usually so. In the Homeric

instances the prayer which constitutes the oath has a somewhat con- 1 ventional form, and in the classical ages we find well-marked formulas. These are often references to deities, as " by Zeus! " " I call Zeus to witness" (val /id Aia: laru Zeus); " by the immortal gods!" " I call to witness the ashes of my ancestors " (per deos immortales; testor majorum cineres). Sometimes a curse is invoked on himself

peream si). An important class of Roman oaths invokes the deity to favour or preserve the swearer in so far as he shall fulfil his promise — " as the gods may preserve me," " as I wish the gods to be pro- pitious to me " (me ita di servent; ita deos mihi velim propitios). The best Roman collection is to be found in the old work of Brissonius, De Formulis et Solemnibus Populi Romani Verbis (Paris, _ 1583). Biblical examples of these classes of oaths are " as the Lord liveth " (1 Sam. xiv. 39, and elsewhere), " so do God to me, and more also " (2 Sam. iii. 35, and elsewhere).

The history of oaths in the early Christian ages opens a con- troversy which can hardly be said even yet to have closed. Under Christ's injunction, " Swear not at all " (Matt. v. 34; also James v. 12), many Christians seem at first to have shrunk from taking oaths, and,

though after a time the usual customs of judicial and even colloquial oaths came to prevail among them, the writings of the Fathers show efforts to resist the practice. Chrysostom perhaps goes furthest in inveighing against this " snare of Satan ": " Do as you choose; I lay it down as a law that there be no swearing at all. If any bid you swear, tell him, Christ has spoken, and I do not swear " (Homil. ix. in Act. Aposlol.; see a collection of patristic passages in Sixt. Senens. Bibliothec. Sand. vi. adnot. 26). The line mostly taken by influential teachers, however, was that swearing should indeed be avoided as much as possible from its leading to perjury, but that the passages forbidding it only applied to superfluous or trifling oaths, or those sworn by created objects, such as heaven or earth or one's own head. On the other hand, they argued that judicial and other serious swearing could not have been forbidden, seeing that Paul in his epistles repeatedly introduces oaths (2 Cor. i. 23; Phil. i. 8; Gal. i. 20). Thus Athanasius writes: " I stretch out my hand, and as I have learned of the apostle, I call God to witness on my soul " (Apol. ad Imp. Const. ; see Augustine, De Mend. 28; Epist. cl. iii. 9; cl. iv. 250; Enarr. in Psalm, lxxxviii. (4); Serm. 307, 319). This argument is the more forcible from Paul's expressions being actually oaths in accepted forms, and it has also been fairly adduced that Christ, by answering to the adjuration of the high priest, took the judicial oath in solemn form (Matt. xxvi. 63). The passages here referred to will give an idea of the theological grounds on which in more modern times Anabaptists, Mennonites and Quakers have refused to take even judicial oaths, while, on the other hand, the laws of Christendom from early ages have been only directed against such swearing as was considered profane or otherwise improper, and against perjury. Thus from the 3rd or 4th century we find oaths taking much the same place in Christian as in non-Christian society. In the 4th century the Christian military oath by God, Christ, the Holy Spirit, and the majesty of the emperor is recorded by Vegetius (Rei Milit. Inst. ii. 5). Constantine's laws required every witness in a cause to take oath; this is confirmed in Justinian's code, which even in some cases requires also the parties and advocates to be sworn (Cod. Theod. xi. 39; Justin. Cod. iv. 20, 59). Bishops and clergy were called upon to take oath in ordination, monastic vows, and other ecclesiastical matters (see details in Bingham, Anliq. of Chr. Church, xvi. 7). By the middle ages oaths had increased and multiplied in Christendom far beyond the practice of any other age or religion. The Reformation made no change in principle, as is seen, for instance, in Art. xxxix. of the church of England: " As we confess that vain and rash swearing is forbidden Christian men by our Lord Jesus Christ, and James His apostle, so we judge, that Christian

Religion doth not prohibit, but that a man may swear when the Magistrate re- quireth, in a cause of faith and charity, so it be done according to the Prophet's teaching, in justice, judgement and truth."

The history of swearing in early Christendom would lead us to expect that the forms used would be adopted with more or less modification from Hebrew or Roman sources, as indeed

proves to be the case. The oath introduced in the body of one of Constantine's laws — " As the Most High Divinity may ever be propitious to me " (Ita mihi summa Divinitas semper propitia sit)— follows an old Roman form. The Roman oath by the genius of the emperor being objected to by Christians as recognizing a demon, they swore by his safety (Tertull. Apol. 32). The gesture of holding up the hand in swearing has been already spoken of. The Christian oath on a copy of the Gospels seems derived from the late Jewish oath taken holding in the hand the scroll of the law (or the phylacteries), a ceremony itself possibly adapted from Roman custom (see treatise " Shebuoth " in Gemara). Among the various mentions of the oath on the Gospels in early Christian writers is that characteristic passage of Chrysostom in a sermon to the people of Antioch: " But do thou, if nothing else, at least reverence the very book thou holdest forth to be sworn by, open the Gospel thou takest in thy hands to administer the oath, and, hearing what Christ therein saith of oaths, tremble and desist " (Serm. ad pop. Antioch. Homil. xv.). The usual mode was to lay the hand on the Gospel, as is often stated in the records, and was kept up to a modern date in the oath in the university of Oxford, " tactis sacrosanctis Evangeliis "; the practice of kissing the book, which became so well established in England, appears in the middle ages (J. E. Tyler, Oaths, pp. 119, 151). The book was often laid on the altar, or (after the manner of ancient Rome) the swearer laid his hand on the altar itself, or looked towards it; above all, it became customary to touch relics of saints on the altar, a ceremony of which the typical instance is seen in the representation of Harold's oath in the Bayeux tapestry. Other objects, as the cross, the bishop's crosier, &c, were sworn by (see Du Cange, s.v. " Jurare "). An oath ratified by contact or inspection of a sacred object was called a " corporal " or bodily oath, as distinguished from a merely spoken or written oath; this is well seen in an old English coronation oath, " so helpe me God, and these holy euangelists by me bodily touched vppon this hooly awter." The English word signifying the " sacred object " on which oath is taken is halidome (A.S. hdligddm; Ger. Heiligthum); the halidome on which oaths are now sworn in England is a copy of the New Testament. Jews are sworn on the Old Testament; the sacred books of other religions are used in like manner, a Mohammedan

swearing on the Koran, a Hindu on the Vedas.

Among the oath-formulas used in Christendom, that taken by provincial governors under Justinian is typical of one class: " I swear by God Almighty, and His only begotten Son our Lord Jesus Christ, and the Holy Ghost, and the Most Holy Glorious Mother of God and ever Virgin Mary, and by the Four Gospels which I hold in my hand, and by the Holy Archangels Michael and Gabriel," &c. The famous oath of the kings Louis and Charles at Strassburg in 842 (a.d.) runs: " By God's love and the Christian people and our common salvation, as God shall give me knowledge and power," &c. Earlier than this, as in the oath of fealty in the capitularies of Charlemagne in 802, is found the familiar form " Sic me adjuvet Deus," closely corresponding to above-mentioned formulas of pre-Christian Rome. This became widely spread in Europe, appearing in Old French " Si m'ait Dex," German " So mir Gott helfe," English " So help me God." A remarkable point in its history is its occurrence in the " So help me Frey," &c, of the old Scandinavian ring-oath already described. Among the curiosities of the subject are quaint oaths of kings and other great personages: William Rufus swore " by that and that" (per hoc et per hoc), William the Conqueror " by the splendour of God," Richard I. " by God's legs," John " by God's teeth "; other phrases are given in Du Cange (I.e.), as " per omnes gentes," " per coronam," " par la sainte figure de Dieu," " par la mort Dieu," &c.

Profane swearing, the trifling or colloquial use of sacred oaths, is not without historical interest, formulas used being apt to keep up traces of old manners and extinct religions. Thus the early Christians were reproved for continuing to say " meherclel " some of them not knowing that they were swearing by Hercules (Tertull. De idol. 20). Oaths by deities of pre-Christian Europe

lasted into the modern world, as when a few generations ago Swedish peasants might be heard to swear, " Odin take me if it is not true ! " (Hylten-Cavallius, Warend och Wirdarne, i. 228). The thunder-god holds his place still in vulgar German exclamations, such as "Donner!" (Grimm. Deutsche Mythologie, pp. 10, 166). The affected revival of classical deities in Italy in the middle ages still lingers in such forms as "per Bacco!" " cospetto di Bacco!" (by Bacchus! face of Bacchus!). In France the concluding oath of the last paragraph dwindled into " mordieu !" or " morbieu !" much as in England the

old oaths by God's body and wounds became converted into " oddsbodi- kins ! " and " zounds ! " (E. B. T.)

Law. — Politicians and moralists have placed much reliance on oaths as a practical security. It has been held, as Lycurgus the orator said to the Athenians, that " an oath is the bond that keeps the state together " (Lycurg Leocr. 80; see Montesquieu, Spirit of Laws). Thus modern law-books quote from the leading case of Omichund v. Barker: " No country can subsist a twelve- month where an oath is thought not binding; for the want of it must necessarily dissolve society." On the other hand, wherever the belief in supernatural interference becomes weak- ened, and oaths are taken with solemn form but secret contempt or open ridicu'e, they become a serious moral scandal, as had already begun to happen in classical times. The yet more disastrous effect of the practice of swearing is the public infer- ence that, if a man has to swear in order to be believed, he need not speak the truth when not under oath. The early Christian fathers were alive to this depreciation of ordinary truthfulness by the practice of swearing, and opposed, though unavailingly, the system of oaths which more and more pervaded public business. How in the course of the middle ages oaths were multiplied is best seen by examining a collection of formulas such as the Book of Oaths (London, 1649), which range from the coronation oath to the oaths sworn by such as valuers of cloths and the city scavengers. 1 Oaths of allegiance and other official oaths are still taken throughout Europe, but experience shows that in times of revolution they are violated with little scruple, and in the case of the United Kingdom it is doubtful whether they have any more practical value than, if so much as, simple declarations. The question of legal oaths is more difficult. On the one hand, it is admitted that they do induce witnesses, especially the ignorant and superstitious, to give evidence more truthfully than they would do on even solemn declaration. On the other hand, all who practise in courts of justice declare that a large proportion of the evidence given under oath is knowingly false, and that such perjury is perceptibly detri- mental to public morals.

The oaths now administered among civilized nations are chiefly intended for maintaining governments and securing the performance of public business. In England the coronation oath is to be administered by one of the archbishops or bishops in the presence of all the people, who, on their parts, reciprocally take the oath of allegiance to the crown. The archbishop or bishop shall say : " Will you solemnly promise and swear to govern the people of this United Kingdom of Great Britain and Ireland and the dominions thereto belonging according to the statutes in parliament agreed on, and the

respective laws and cus- toms of the same?" The king shall say: " I solemnly promise so to do." Archbishop or bishop: " Will you to the utmost of your power cause law and justice, in mercy, to be executed in all your judgements?" King: " I will." Archbishop or bishop: " Will you, to the utmost of your power, maintain the laws of God, the true profession of the Gospel, and the Protestant re- formed religion established by law? And will you maintain and preserve inviolably the settlement of the Church of England and the doctrine, worship, discipline and government thereof, as by law established in England. And will you preserve unto the bishops and clergy of England, and to the churches therein all such rights and privileges as by law do or shall appertain to them, or any of them?," King: " All this I promise to do."

1 As to reform of the excessive multiplication of oaths, see Paley, Moral Philosophy, bk. iii. pt. i. ch. 16; and J. E. Tyler, Oaths.

After this the king, laying his hand upon the holy Gospels, shall say: "The things which I have here before promised I will perform and keep; so help me God," and then shall kiss the book.

The chief officers of state take an " official " oath well and truly to serve his majesty. Special oaths are taken by privy councillors, archbishops and bishops, peers, baronets and knights, recruits and others. The old oath of allegiance, as administered (says Blackstone) upwards of 600 years, contained a promise " to be true and faithful to the king and his heirs, and truth and faith to bear of life and limb and terrene honour, and not to know or hear of any ill or damage intended him without defend- ing him therefrom " (Blackstone, Commentaries, book i. chap, x.). In the reign of William III. it was replaced by a shorter form; and it now runs: " I . . . do swear that I will be faithful and bear true allegiance to His Majesty . . . , his heirs and successors, according to law." Statutes of Charles II. and George I. enacted that no member should vote or sit in either house of parliament without having taken the several oaths of allegiance, supremacy and abjuration. The oath of supremacy in the reign of William III. was: " I A B doe swear that I doe from my heart abhorr detest and abjure as impious and hereticall this damnable doctrine and position that princes excommuni- cated or deprived by the pope or any authority of the see of Rome may be deposed or murdered by their subjects or any other whatsoever. And I doe declare that no forreigne prince person prelate state or potentate hath or ought to have any jurisdiction power superiority preeminence or authoritie ecclesi- asticall or spirituall within this realme. Soe," &c. The oath of abjuration introduced in the time of William III. recognizes the king's

rights, engages the juror to support him and disclose all traitorous conspiracies against him, promises to maintain the Hanoverian Protestant succession, and expressly renounces any claim of the descendants of the late Pretender. This oath was not only taken by persons in office, but might be tendered by two justices to any person suspected of disaffection. In modern times a single parliamentary oath was substituted for the three, and this was altered to enable Roman Catholics to take it, and Jews were enabled to sit in parliament by being allowed to omit the words " on the true faith- of a Christian." In its present form the parliamentary oath consists of an oath of allegiance and a promise to maintain the succession to the crown as limited and settled in the reign of William III.

The " judicial " oath taken by judges of the court of appeal or of the High Court of Justice, and by justices of the peace, is " to do right to all manner of people after the laws and usages of this realm, without fear or favour, affection or ill-will." Jurors are sworn, whence indeed their name (juratores); in felonies the oath administered is: " You shall well and truly try and true deliverance make between our sovereign lord the king and the prisoner at the bar whom you shall have in charge, and a true verdict give according to the evidence." In mis- demeanours the form is: " Well and truly try the issue joined between our sovereign lord the king and the defendant, and a true verdict," &c. The oath of the jurors in the Scottish criminal courts is: " You [the jury collectively] swear in the name of Almighty God and as you shall answer to God at the great day of judgment that you will truth say and no truth conˆal in so far as you are to pass upon this assize." The oldest trace of this form of oath in Scotland is in Reg. maj. i. cap. n, copied from Glanvill, which points to an origin in the Norman inquest or " recognition." In the ancient custom of compurgation, once prevalent in Europe, the accused's oath was supported by the oaths of a number of helpers or compurgators who swore to their belief in its validity.

Witnesses in English law courts must give their evidence under the sanction of an oath, or of what is equivalent to an oath, and the ordinary form of oath adapted to Christians is: " The evidence you shall give . . . shall be the truth, the whole truth, and nothing but the truth. So help you God." Many alterations of the English law as to oaths have been made in relief of (1) those Christians who object on conscientious grounds

■*to the taking of an oath, and (z) of those persons who refuse to admit the binding force of an oath. Special provision was first made for Quakers, Moravians and Separatists; then followed general enactments relating to civil and criminal pro- ceedings respectively, till finally the law was embodied in the Oaths Act 1888, which enacted that " every person upon object- ing to being sworn, and stating, as the ground of such objection, either that he has no religious belief, or that the taking of an oath is contrary to his religious belief, shall be permitted to make his solemn affirmation instead of taking an oath in all places and for all purposes where an oath is or shall be required by law, which affirmation shall be of the same force and effect as if he had taken the oath; and if any person making such affirmation shall wilfully, falsely and corruptly affirm any matter or thing which, if deposed on oath, would have amounted to wilful and corrupt perjury, he shall be liable to prosecution, indictment, sentence and punishment in all respects as if he had committed wilful and corrupt perjury." The form of affirmation prescribed by the Oaths Act was as follows: " I, A. B., do solemnly, sincerely, and truly declare and affirm," &c. Under s. 5 of the same act a person might swear in the Scottish form, with uplifted hand (no book of any kind being used) and if he desired to do so " the oath shall be administered to him in such form and manner without question." With the desire of making universal this method of administering the oath the Oaths Act 1009 was passed. It enacted that any oath might be adminis- tered and taken in the following form: " The person taking the oath shall hold the New Testament, or in the case of a Jew, the Old Testament, in his uplifted hand, and shall say or repeat after the officer administering the oath the words ' I swear by Almighty God that . . . ,' followed by the words of the oath prescribed by law." The officer also is directed by the act to administer it in this fashion, unless the person about to take it voluntarily objects or is physically incapable of taking it so. To a person who is neither a Christian nor a Jew the oath may be administered in any way in which it was previously lawful.*

The form of affirmation given above is that used for Quakers, Moravians and Separatists in the witness-box: " I, A. B., being one of the people called Quakers (one of the United Brethren called Moravians), do, &c." A Christian swears on the Gospels, holding a copy of the New Testament in his right hand (the hand being uncovered), and his head being also uncovered. A witness may elect to be sworn on any version of the Bible which he considers most binding on him, as a Roman Catholic on the Douai Testament or Bible. A Jew is sworn on the Pentateuch, holding a copy thereof in

his right hand, the head being covered. A Mahommedan is sworn upon the Koran. He places his right hand flat upon the book and puts the other hand upon his fore- head, bringing his head down to the book and in contact with it. He then looks at the book for some moments. Buddhists are sworn on the Buddhist doctrines, Sikhs upon the Granth, Parsees upon the Zend Avesta, Hindus upon the Vedas, or by touching the Brahmin's foot, and, according to caste custom, Indian witnesses sometimes insist upon the oath being ad- ministered by a Brahmin; but in India witnesses now generally affirm. Kaffir witnesses swear by their own chief, and a Kaffir chief by the king of England. When a Chinese witness is to be sworn, a saucer is handed to him, which he takes in his hand and kneeling down breaks into fragments. The colonial legis- latures generally make provision for receiving unsworn evidence of barbarous and uncivilized people who have no religious belief. The great number of oaths formerly required was much reduced by the Promissory Oaths Act 1868, which prescribed the forms of oath of allegiance, the official oath and the judicial oath. The right to affirm in lieu of taking the parliamentary oath in the case of atheists was first raised in the case of Charles Bradlaugh (?•»•)•

Profane swearing and cursing is punishable by the Profane Oaths Act 1745, any labourer, sailor or soldier being liable to forfeit is., every other person under the degree of a gentleman 2s., and every gentleman or person of superior rank 5s., to the poor of the parish.

The administering or taking of unlawful oaths is criminal in English and Scots law. Statutes relating to the offence were passed in 1797, 1799, 1810 and 1812, and it is evident from the preamble of the latter act (Unlawful Oaths Act 1812) that they were aimed at those societies in the United Kingdom at the time of the French Revolu- tion which required or permitted their members to take an unlawful oath. Supplementary statutes were passed in 1817 and 1837. Children of tender years, who, in the opinion of the court, have not sufficient intelligence to understand the nature of an oath, may give evidence without being sworn.

In the United States an oath is required in practically every case in which it is required in the United Kingdom, and with the same latitude as to affirmation. The formula or details may vary in different states of the Union. The same may be said generally of every civilized country, with the reservation that an affirmation is not so usually accepted as in English-speaking countries. In Germany an oath is compulsory on a witness in criminal cases, except in the case of certain sects, whose tenets forbid the taking of an oath.

Authorities. — Coke's Institutes ; Book of Oaths (1689) ; Stephen's Commentaries; Stringer's Oaths and Affirmations; Tyler, Oaths; Origin, Nature, History (1835) ; Ford, On Oaths.

OAXACA, or Oajaca (officially Oaxaca de Juarez), a southern state of Mexico, lying partly on the southern slope of the great Mexican plateau and covering the southern and larger part of the Isthmus of Tehuantepec, bounded N. by Puebla, N.E. and E. by Vera Cruz, S.E. by Chiapas, S. by the Pacific and W. by Guerrero. Pop. (1900) 948,633, a large majority of whom are Indians. The state has an area of 35,382 sq. m. broken by mountain ranges into numerous broad fertile valleys, chiefly lying in the tierra templadu region. The isthmus districts, however, have lower elevations and are distinctly tropical. The coast line is 329 m. long; behind it is a narrow strip of lowlands lying within the tierras calientes: In places this strip nearly disappears, the sierras rising almost immediately from the sea- shore. The culminating points within the state are Zempoalte- petl (11,145 ft-) about 50 m. E. by N. of the city of Oaxaca in a knot of sierras, San Felipe del Agua (10,253 ft.) standing on the eastern margin of the beautiful Oaxaca Valley, and the Cerro del Leone, south-west of Tehuantepec, the highest summit in the Sierra Madre del Sur. Tributaries of the Mescala drain the western quarter of the state, among which is the Atoyac or headstream of the Mescala, which rises in Tlaxcala, and flows across the state of Puebla. The streams flowing northward to the Gulf coast are the Coatzacoalcos and Papaloapam with its tributary, the San Juan, all flowing across the state of Vera Cruz. The Papaloapam is navigable up to the town of Tuxtepec, iii the state of Oaxaca. The largest of the Pacific coast streams is the Tehuantepec, which with its many tributaries has an aggregate length of 182 m. The Rio Verde has its source farther inland and drains the Oaxaca Valley, but its tributaries are small and less numerous. The only ports on the coast open to foreign trade are Salina Cruz and Puerto Angel — the first, the Pacific terminus of the Tehuantepec railway, with a spacious artificial harbour, and the second a deep but narrow natural harbour, the projected coast terminus of the Mexican Southern railway. The greater part of the state has a sub-tropical climate, with high sun temperatures, moderate rainfall and mild, healthful conditions. The less healthful regions include the isthmus districts, the coastal zone on the Pacific and the low country on the border of Vera Cruz. Agriculture is the principal occupation of the people; the chief products are Indian corn, wheat, coffee, sugar, rubber, cotton, cacao, tobacco, indigo and a great variety of tropical fruits. Among the manufactured products are cotton, woollen and " pita " fibre fabrics, sugar, rum,

mescal, beer, furniture, pottery, soap, candles, leather, matches, choco^ late, flour and cigarettes. Two important railway lines traverse the state — the Tehuantepec (trans-isthmus) line between the ports of Salina Cruz and Coatzacoalcos (Puerto Mexico), and the Mexican Southern line (narrow-gauge) from Puebla to Oaxaca, with branches to San Geronimo on the Tehuantepec line with the Guatemalan frontier as its destination, and toward Puerto Angel on the coast. Two of the most progressive Indian races of Mexico, the Zapotecas and Mixtecas, descendants, it is believed, of the prehistoric races who built the remarkable cities where the ruins of Mitla and Monte Alban (see Central America:

§ Antiquities) now stand, still form the greater part of the population.

OAXACA, Oajaca (from Aztec Huaxyacac), or Oaxaca de Juarez (official title), capital of the Mexican state of Oaxaca, in the central part of the state 288 m. S.E. of the City of Mexico, and about 153 m. from Puerto Angel on the Pacific; in lat. 17 3′ N., long. 06 40′ W. Pop. (1900) 35,049, largely Indians, most of whom are Mixtecas and Zapotecas. Oaxaca is con- nected with Puebla (211 m.) by the Mexican Southern railway. The city lies in a broad, picturesque valley 5085 ft. above sea- level, and has a mild temperate climate; annual rainfall about 33 in.; mean annual temperature 68° F. It forms the see of a bishopric dating from 1535, and has a fine old cathedral (occupy- ing the north side of the plaza mayor), built in the Spanish Renaissance style and dating from 1553; rebuilt in 1702.

According to tradition the Aztec military post and town of Huaxyacac was founded in i486. The date of the first Spanish settlement is uncertain, but it was probably between 1522 and 1528. The Oaxaca Valley, including several native towns, had been given to Cortes, together with the title marquez del Valle de Oaxaca. To injure him, the audiencia then administering the government, founded the villa of Antequera in close proximity to Huaxyacac and on lands belonging to Cortes in 1529, though a settlement had been made at the Indian town at an earlier date. Antequera was made a city in 1532 and the see of a bishopric in 1535, though it had but few Spanish inhabitants and no opportunity to expand. This anomalous state of affairs was eventually settled, Antequera was

absorbed by Huaxyacac, and the Spanish corrupted the pronunciation to Oaxaca. The city suffered severely in the earthquakes of 1727 and 1787, the cathedral being greatly damaged in the former. It had a chequered career in the War of Independence, being captured by Morelos in 181 2, reoccupied by the royalists in 1814, and recaptured by Antonio Leon in 1821. In 1823 it was again captured by Nicolas Bravo in the revolution against Iturbide. In 1865 it was besieged by the French under Bazaine and sur- rendered by General Diaz (4th Feb.) but was recaptured by him on the 1st of November 1866, after his escape from Puebla. In the revolution promoted by Diaz in 1871-1872 the city was captured by the Juarist general Alatorre on the 4th of January 1872, and in a second revolution of 1876 it was captured by the friends of Diaz on the 27th of January of that year.

OB, or Obi, a river of West Siberia, known to the Ostiaks as the As, Yag, Kolta and.Yema; to the Samoyedes as the Kolta or Kuay; and to the Tatars as the Omar or Umar. It is formed, 8 m. S.W. of Biysk in the government of Tomsk, by the confluence of the Biya and the Katun. Both these streams have their origin in the Altai (Sailughem) Mountains, the former issuing from Lake Teletskoye, the latter, 400 m. long, bursting out of a glacier on Mount Byelukha. The Ob zigzags W. and N. until it reaches 55° N.; thence it curves round to the N.W., and again N., wheeling finally eastwards into the Gulf of Ob, a deep (600 m.) bay of the Arctic Ocean. The river splits up into more than one arm, especially after receiving the large river Irtysh (from the left) in 69 E. Other noteworthy tributaries are: on the right, the Tom, the Chulym, the Ket, the Tym and the Vakh; and, on the left, the Vasyugan, the Irtysh (with the Ishim and the Tobol) and the Sosva. The navigable waters within its basin reach a total length of 9300 m. By means of the Tura, an affluent of the Tobol, it secures connexion with the Ekaterinburg-Perm railway at Tyumen, and thus is linked on to the rivers Kama and Volga in the heart of Russia. Its own length is 2260 m., and the area of its basin 1,125,200 sq. m. A system of canals, utilizing the Ket river, 560 m. long in all, connects the Ob with the Yenisei. The Ob is ice-bound at Barnaul from early in November to near the end of April, and at Obdursk, 100 m. above its mouth, from the end of October to the beginning of June. Its middle reaches have been navigated by steamboats since 1845.

OBADIAH, the name prefixed to the fourth of the Old Testa- ment " minor prophets," meaning " servant " or " worshipper " of Yahweh; of a type common in Semitic proper names; cf.

the Arabic 'Abdallah, Taimallat, 'Abd Manat, &c, the Hebrew Abdiel

and Obed Edom, and many Phoenician forms, " The vision of Obadiah " bears no date, or other historical note, nor can we connect Obadiah the prophet with any other Obadiah of the Old Testament, 1 and our only clue to the date and com- position of the book lies in internal evidence.

The prophecy is directed against Edom. Yahweh has sent a messenger forth among the nations to stir them up to battle against the proud inhabitants of Mount Seir, to bring them down from the rocky fastnesses which they deem impregnable. Edom shall be not only plundered but utterly undone and expelled from his borders, and this he shall suffer (through his own folly) at the hand of trusted allies (vers. 1-9), The cause of this judg- ment is his cruelty to his brother Jacob. In the day of Jerusalem's overthrow the Edomites rejoiced over the calamity, grasped at a share of the spoil, lay in wait to cut off the fugitives (vers. 10-14). But now the day of Yahweh is near upon all nations, Esau and all the heathen shall drink full retribution for their banquet of carnage and plunder on Yahweh's holy mountain. A rescued Israel shall dwell in Mount Zion in restored holiness; the house of Jacob shall regain their old possessions; Edom shall be burned up before them as chaff before the flame; they shall spread over all Canaan, over the mountain of Esau and the south of Judah, as well as over Gilead and the Philistine and Phoenician coast. The victorious Israelites shall come up on Mount Zion to rule the mountain of Esau, and the kingdom shall be Yahweh's (vers. 15-21).

The most obvious evidence of date lies in the cause assigned for the judgment on Edom (vers. 10-14). The calamity of Jerusalem can only be the sack of the city by Nebuchadrezzar (586 B.C.) ; the malevolence and cruelty of Edom on this occasion are characterized in similar terms by several writers of the exile or subsequent periods, but by none with the same circumstance and vividness of detail as here (Ezek. xxv. 8, 12 f., xxxv.; Lam. iv. 21; Psalm cxxxvii. 7). The prominence given to Edom, and the fact that Chaldea is not mentioned at all, make it probable that the passage was not written in Babylonia. On this evidence, taken alone, we should be justified in saying that the prophecy was written at some time after 586 B.C., at a period when misfortunes incurred by Edom were interpreted as a Divine judgment on its unforgotten treachery in that year of tragedy.

The critical problem is, however, complicated by certain phenomena of literary relationship. 2 Obad. 1-6, 8 agree so closely and in part verbally with Jer. xlix. 14-16, 9, 10, 7 that the two passages cannot be independent; nor does it seem possible that Obadiah quotes from

Jeremiah, for Obad. 1-8 is a well- connected whole, while the parallel verses in Jeiemiah appear in different order, interspersed with other matter, and in a much less lucid connexion. In Jeremiah the picture is vague, and Edom's unwisdom (ver. 7) stands without proof. In Obadiah the conception is quite definite. Edom is attacked by his own allies, and his folly appears in that, he exposes himself to such treachery. Again, the probability that the passage in Jeremiah incorporates disjointed fragments of an older oracle is greatly increased by the fact that the prophecy against Moab in the preceding chapter uses, in the same way, Isa. xv., xvi., and the prophecy of Balaam. Scholars who assign the passage in Jeremiah to 604 B.C. (e.g. Driver, L.O.T. chap. vi. § 4), explain this relationship by assuming with Ewald (Propheten, i. 489 f.), Graf (Jeremia, p. 558 f.), Robertson Smith and others, that Jeremiah and our book of Obadiah alike quote from an older oracle. Others, however, who do not regard Jer. xlix. as Jere- mianic, explain the relationship as one of dependence on Obadiah. This explanation, simpler in itself, is not discredited by the fact that in some details (cf. Obad. 2 and Jer. xlix. 15) the text

1 An early Hebrew tradition recorded by Jerome {Comm. in Ob.) identified the prophet with the best-known Obadiah of the historical books, the protector of the prophets in the reign of Ahab (1 Kings xviii.).

2 Between Joel and Obadiah there are points of material and verbal agreement so close as to imply that Joel used the earlier book (Joel iii. 19— Ob. 10, 14; Joel iii.3— Ob. n ; Joel ii. 32, iii. 7 — Ob. 17).

of the dependent passage may be preferable to that of the original. On this latter, and more probable, view (taken by Wellhausen, Nowack and Marti) there is no need to separate Obad. 1-7 from 10-14. The immediate occasion of the prophecy 1 was doubtless the pressure of nomadic Arabs (" the men of thy covenant," " the men of thy peace," v. 7) upon Edom, which had resulted, by 312 B.C. at latest, in the occupation by Arabs of Petra, the chief city of the Edomites (Wellhausen, p. 214). But the desolation of Edom has already been accomplished in the time of Malachi i. 1-5, a passage belonging to the earlier half of the 5th century. We may, therefore, with Wellhausen, Nowack and Marti, assign Obadiah 1-14 to the same period.

The remainder of the book, vers. (15) 16-21, must belong to a later date. That the book of Obadiah, short as it is, is a complex document might have been suspected from an apparent change of view between vers. 1-7 and vers. 15 f. In the former verses Esau is destroyed by his allies, and they occupy his territory, but in the latter he perishes with the other heathen in the day of universal retribution, he disappears before the victorious advance of Israel, and the southern Judaeans occupy his land. 2 The ideas of this passage belong to the eschatological outlook of later centuries, but afford no data for chronology. The conceptions of the " rescued ones " (R.V. " those that escape," v.- 17), of the sanctity of Zion, of the kingship of Yahweh, are the common property of the post-exilic writers. The restoration of the old borders of Israel and the conquest of Edom and the Philistines are ideas as old as Amos ix., Isa. xi. 14; but such passages represent this conquest as a suzerainty of Israel over its neighbours, as in the days of David, while in Obadiah, as in other later books, the intensified antithesis — religious as well as political — between Judah and the surrounding heathen finds its expression in the idea of a consuming judgment on the latter —the great " day of Yahweh." The chief interest of the book of Ohadiah lies in its references to the historical relations between Israel and Edom. From the point of view of religion, we may notice the emphasis on the doctrine of strict retribution (vers. 10 f., 156) which remains applicable to other peoples, even when its inadequacy as a complete theory of providence has been slowly and painfully discovered in the case of Israel itself.

Literature. — Wellhausen.Die kleinenPropheten 3 {i8g8) ; Nowack, id. (1897, 2nd ed., 1904); G. A. Smith, The Book of the Twelve, vol. ii. (1898); J. A. Selbie, art. " Obadiah," in Hastings's Diet, of the Bible, iii. 577-580 (1900); Cheyne, id. in Ency. Biblica, iii. c – 3455-3462 (incorporating the article of W. Robertson Smith in the 9th edition of the Ency. Brit.) (1902); Marti, Dodekapropheton (1903). For a sketch of the history of the Edomites, see Noldeke's article " Edom " in the Ency. Biblica. (W. R. S.; H. W. R.)*

OBAN, a municipal and police burgh and seaport of Argyll- shire, Scotland. Pop. (1901)5374. It is situated 1 13 m. N.W. of Glasgow by the Caledonian railway via Stirling and Callander, and about the same distance by water via the Crinan Canal. The fine bay on which it lies is screened from the Atlantic gales by the island of Kerrera (4! m. long by 2 m. broad), which practically converts it into a land-locked harbour. Being also sheltered from the north and east by the hills at the foot of which it nestles, the town enjoys an exceptionally mild climate for its latitude. The public buildings include the Roman

Catholic pro-cathedral, erected by the 3rd marquis of Bute, the county

1 Wellhausen and Nowack regard w. 8, 9 as a later addition, intended to apply w. 1-7 to the future; so Marti, who groups with these verses 15a, because of the common reference to ” the day of Yahweh.”

2 The Judaeans are addressed in v. 16 (” as ye have drunk “), not the Edomites. Verse 20 anticipates that the exiles from northern Israel will occupy Phoenician territory, whilst those from Jerusalem ” which are in Sepharad ” will occupy the southern districts in the Messianic restoration. ” Sepharad ” has been connected with various places, e.g. Saparda in south-west Media (G. A. Smith), and Cparda of Darius in the Behistun inscription (Robertson Smith); whilst, according to Winckler (K.A.T. p. 301), it is the name, from the Persian period onwards, for Asia Minor. Many of the Jews were doubtless sold as slaves by Nebuchadrezzar. Lydia was a great slave-market, and Asia Minor was a chief seat of the Diaspora at an early date (comp. Gutschmidt, Neue Beitrage, p. 77), so that ” Sepharad ” in itself does not supply ground for Hitzig’s argument that Obadiah was written in the Greek period, when we read of many Jews being transplanted to Asia Minor (Tos. Ant. xii. 3).*

buildings and two hospitals. It is the centre of tourist traffic for western Argyllshire and the islands. Oban was a small village at the date of Johnson’s visit during his Hebridean tour; in 1786 it became a government fishing station; it was made a burgh of barony in 181 1 and a parliamentary burgh in 1832. With Ayr, Campbeltown, Inveraray and Irvine (the Ayr burghs) it unites to send one member to parliament.

At the north end of the bay stands the ruin of Dunolly Castle, the old stronghold of the Macdougalls of Lome, whose modern mansion adjoins it. In the grounds is a huge conglomerate rock called the Dog Stone (Clack-a-choin) , from the legend that Fingal used to fasten his favourite dog Bran to it. About 3 m. N.E. are the ruins of Dunstaffnage Castle. It was here that the ” Stone of Destiny,” now contained in the base of the coronation chair at Westminster Abbey, was kept before its removal to Scone. At the south end of the island of Kerrera stand the ruins of Gylen Castle, an old fortalice of the Macdougalls.

OBBLIGATO, or Obligato, in the modern sense, a musical term (adopted from the Italian, and strictly meaning obligatory or

binding) for an instrumental accompaniment to a musical composition which, while in one way independent, is included by the composer on purpose and in a prescribed form, instead of being left to the discretion {ad libitum) of a performer.

OBELISK (Gr. 6|8eXio-Kos, diminutive of 6/3eX6s, a spit), a form of monumental pillar; and also the term for a bibliographical reference-mark in the form of a dagger. The typical Egyptian obelisk is an upright monolith of nearly square section, generally 10 diameters in height, the sides slightly convex, tapering up- wards very gradually and evenly, and terminated by a pyramidion whose faces are inclined at an angle of 60°. Obelisks were usually raised on pedestals of cubical form resting on one or two steps and were set up in pairs in front of the entrance of temples! Small obelisks have been found in tombs of the age of the Old Kingdom. The earliest temple obelisk still in position is that of Senwosri I. of the Xllth Dynasty at Heliopolis (68 ft. high). A pair of Rameses II. (77 and 75 ft. high respectively) stood at Luxor until one of them was taken to Paris in 1831. Single ones of Tethmosis I. and Hatshepsut (109 ft. high) still stand at Karnak and remains of others exist there and elsewhere in Egypt. Colossal granite obelisks were erected by only a few kings, Senwosri I. in the Middle Kingdom and Tethmosis I., Hatshepsut, Tethmosis III. and Rameses II. of the Empire! Smaller obelisks were made in the Saite period. The Romans admired them, and the emperors carried off some from their original sites and caused others to be made in imitation {e.g. that for Antinous at Benevento): twelve are at Rome, one in Con- stantinople; two, originally set up by Tethmosis III. at Helio- polis, were taken by Augustus to adorn the Caesareum at Alex- andria: one of these, " Cleopatra's Needle," was removed in 1877 to London, the other in 1879 to New York. Such obelisks were probably more than mere embellishments of the temples. The pyramidions were sheathed in bright metal, catching and reflecting the sun's rays as if they were thrones of the sunlight. They were dedicated to solar deities, and were especially numer- ous at Heliopolis, where there was probably a single one sacred to the sun of immemorial antiquity. The principal part of the sun-temple at Abusir built by Neuserre of the Vth Dynasty appears to have been in the shape of a stumpy obelisk on a vast scale, only the base now remains, but hieroglyphic pictures indicate this form. The hieroglyph of some other early sun- temples shows a disk on the pyramidion j. The material

employed for the great obelisks was a pink granite from the quarries of Syene, and in these quarries there still remains, partially detached, an example 70 to 80 ft. long. The largest obelisk known is

that in the piazza of St John Lateran at Rome; this had been set up by Tethmosis III. at Heliopolis in the 15th century B.C., was brought over from Egypt by Constantine the Great and erected in the Circus Maximus, being ultimately re-erected in 1552 by Pope Sixtus V. It was 105 ft. 9 in. high, including the pyramidion, and its sides measured 9 ft. 10 in. and 9 ft. 8 in. respectively. On the base of the magnificent

obelisk of Hatshepsut at Karnak, 97 ft. 6 in. high, there is an inscription stating that it and its fellow were made within the short space of seven months. In consequence of the breaking away of the lower part of " Cleopatra's Needles " when removed to Alexandria and re-erected, the Roman engineers supported the angles on bronze crabs, one of which with three reproductions now supports the angles of the obelisk on the Thames Embank- ment.

There was another form of obelisk, also tapering, but more squat than the usual type, with two of the sides narrow and ter- minating in a rounded top. One such of Senwosri I., covered with sculpture and inscriptions, lies at Ebgig in the Fayum. Stelae, inscribed with the names of the kings, occurred in pairs in the royal tombs of the 1st Dynasty at Abydos, and pairs of small obelisks are said to have been found in private tombs of the IV th Dynasty. The origin of the obelisk may be sought in sacred upright stones set up in honour of gods and dead, like the menhirs, and the Semitic Massebahs and bethels.

In Abyssinia, at Axum and elsewhere, there is a marvellous series of obelisk-like monuments, probably sepulchral. They range from rude menhirs a few feet high to elaborately sculptured monoliths of 100 ft. The loftiest of those stili standing at Axum is about 60 ft. high, 8 ft. 7 in. wide, and about 18 in. thick, and is terminated by a rounded apex united by a necking to the shaft. The back of the obelisk is plain, but the front and sides are subdivided into storeys by a series of bands and plates, each storey having panels sunk into it which seem to represent windows with mullions and transom. These architectural decorations are derived from a style of building found by the recent German expedition extant in an ancient church; courses of stone here alternate in the walls (both inside and out) with beams of wood held by circular clamps. In front of the best-preserved obelisk is a raised altar with holes sunk in it apparently to .receive the blood of the sacrifice to the ancestors. Most of these

must date before the adoption of Christianity as the state religion in the 6th century.

See G. Maspero, L'Archeologie igyptienne (new ed., Paris, 1907), p. 105; H. H. Gorringe, Egyptian Obelisks (New York, 1882; London, 1885, &c); F. W. von Bissing and L. Borchardt, Das Re-Heiligtum des Konigs Ne-woser-Re (Berlin, 1905) ; on the ancient method of raising obelisks, L. Borchardt, " Zur Baugeschichte des Amonsterapel von Karnak," in Sethe's Untersuchungen zur Geschichte und Alter tumskunde Aegyptens, v. 15. For the Abyssinian obelisks see especially E. Littmann and D. Krencker, Vorbericht der deutschen Aksum Expedition (Berlin, 1906). (F. Ll. G.)

OBERAMMERGAU, a village of Bavaria, Germany, district of Upper Bavaria, situated amongst the foot-hills of the Alps in the valley of the Ammer, 64 m. S.S.W. of Munich. Pop. about 1400. The village folk are mainly engaged in making toys, and carving crucifixes, rosaries and images of saints.

The place is famous for their performance of a Passion Play every tenth year (e.g. in 1910), to which thousands of visitors flock. This dramatic representation of the sufferings of Christ is not a survival of a medieval mystery or miracle- play, but took its rise from a vow made by the inhabitants in 1633, with the hope of staying a plague then raging. The original text and arrangements were probably made by the monks of Ettal, a monastery a little higher up the valley; but they were carefully remodelled by the parish priest at the beginning of the present century, when the Oberammergau play obtained exemption from the general suppression of such per- formances by the Bavarian government. The music was com- posed by Rochus Dedler, schoolmaster of the parish in 1814. The performances take place on the Sundays of summer, in a large open-air theatre holding 6000 persons, and each lasts about nine hours, with a short intermission at noon. Each scene from the history of Christ is prefaced by a tableau of typical import from the Old Testament. About 700 actors are required, all belonging to the village. The proceeds of the performances are devoted to the good of the community, after defrayal of the costs and payment of a small remuneration to the actors. The villagers regard the Passion Play as a solemn act of religious worship, and the performances are characterized by the greatest reverence.

The principal parts are usually hereditary in certain families, and are assigned with regard to moral character as well as dra- matic ability. It is considered a disgrace not to be allowed to take part in

the play, and the part of Christ is looked upon as one of the greatest of earthly honours.

Edward Devrient (in 1850) was among the first to direct genera! attention to Oberammergau; and numerous accounts have since appeared. An English version of the text of the Passion Play has been published by E. Childe (1880).

OBERHAUSEN, a town of Germany, in the Prussian Rhine province. It is situated 5 m. from the east bank of the Rhine, 20 m. N.E. of Dusseldorf, on the main line of railway to Hanover and Berlin, and at the centre of an important network of lines radiating hence into the extensive Westphalian coal and iron fields. Pop. (1905) 52,096. The town possesses large iron- works, coal-mines, rolling-mills, zinc smelting-works, railway workshops and manufactures of wire-rope, glass, chemicals, porcelain and soap. The first houses of Oberhausen were built in 1845, an d it received its municipal character in 1874.

OBERLAHNSTEIN, a town of Germany, in the Prussian province of Hesse-Nassau, on the right bank of the Rhine, at the confluence of the Lahn 4 m. above Coblenz, on the railway from Cologne to Frankfort-on-Main. Pop. (1905) 8472. It still retains parts of its ancient walls and towers, and possesses a castle, the Schloss Martinsburg, formerly the residence of the electors of Mainz, and the chapel, Marien Kapelle, in which the German king Wenceslaus was deposed by the electors in 1400. Near the town is the castle of Lahneck, built about 1 290, destroyed by the French in 1689, and restored in 1854. In the neigh- bourhood are lead and silver mines.

See J. Wegeler, Lahneck und Oberlahnstein (Trier, 1881).
OBERLANDER, ADAM ADOLF (1845-), German cari- caturist, was born at Ratisbon, but after 1847 lived in Munich. He studied painting at the Munich Academy under Piloty, and soon discovered that the true expression of his genius was in the field of caricature and comic drawings. He joined the staff of the Fliegende Blatter, to which he became a constant contributor. Unlike Busch, whose aim was the utmost simplicity of line and whose drawings form a running commentary to the legend, Oberlander's work is essentially pictorial, and expressive in itself, without the extraneous aid of the written line. Among his best drawings are his parodies on the style of well-known painters, such as the " Variations on the Kissing Theme." His works have been collected in the Oberlander- Album, published by Braun and Schneider in Munich.

OBERLIN, JEAN FREDERIC (1740-1826), German Protestant pastor

and philanthropist, the son of a teacher, was born on the 31st of August 1740 at Strassburg, where he studied theology. In 1766 he became Protestant pastor of Waldbach, a remote and barren region in the Steinthal (Ban-de-la-Roche), a valley in the Vosges on the borders of Alsace and Lorraine. He set himself to better the material equally with the spiritual con- dition of the inhabitants. He began by constructing roads through the valley and erecting bridges, inciting the peasantry to the enterprise by his personal example. He introduced an improved system of agriculture. Substantial cottages were erected, and various industrial arts were introduced. He founded an itinerant library, originated infant schools, and established an ordinary school at each of the five villages in the parish. In the work of education he received great assistance from his housekeeper, Louisa Scheppler (1763-1837). He died on the 1st of June 1826, and was interred with great manifestations of honour and affection at the village of Urbach.

Among the many accounts of the labours of Oberlin, mention may be made of Thomas Sims, Brief Memorials of Oberlin (London, 1830) ; Memoirs of Oberlin, with a short notice of Louisa Scheppler (London, 1838, 2nd ed. 1852); H. Ware, Biography of Oberlin (Boston, 1845); L. Spach, Oberlin le pasteur (Strassburg, 1865, and ed. " """"" F. W. Bodemann, /. F. Oberlin (3rd ed., 1879); K. F. Riff,

Drei Bilder aus dem Leben von Papa Oberlin (Strassburg, 1880); Josephine Butler, Life of J. F. Oberlin (1882); G. H. von Schubert, Ziige aus dem Leben Oberlins (nth ed., 1890); Armin Stein, Johann Friedrich Oberlin, ein Lebensbild (1899). See also the article in Herzog-' Hauck, Realencyklopadie. The collected writings of Oberlin were published by Burkhardt at Stuttgart in 1843 in 4 vols.

OBERLIN, J. J.— OBIT

OBERLIN, JEREMIE JACQUES (1735-1806), Alsatian philo- logist and archaeologist, brother of Jean Frederic Oberlin, was born at Strassburg on the 8th of August 1735. While studying theology at the university he devoted special attention to Biblical archaeology. In 1755 he was chosen professor at the gymnasium of his native town, in 1763 librarian to the university, in 1 7 70 professor of rhetoric, and in 1 782 of logic and metaphysics. Oberlin published several manuals on archaeology and ancient geography, and made frequent excursions into different provinces of France to investigate antiquarian remains and study provincial dialects, the result appearing in Essai sur le patois Lorrain (1775); Dissertations sur les Minnesingers (1782-1780); . and Observations concernant le patois

et les mwurs des gens de la campagne (1791). He also published several editions of Latin authors. He died on the 10th of October 1806.

OBERLIN, a village of Lorain county, Ohio, U.S.A., 34 m. W.S.W. of Cleveland. Pop. (1890) 4376; (1900) 4082 (64r ne- groes); (1910) 4365. It is served by the Lake Shore & Michigan Southern railway, and by the Cleveland & South-Western (electric) railway, which furnishes connexions directly with Cleveland and Elyria, and at the village of Wellington (about 10 m. S.) connects with the Cleveland, Cincinnati, Chicago & St Louis, and the Wheeling & Lake Erie railways. Oberlin is primarily an educational centre, the seat of Oberlin College, named in honour of Jean Frederic Oberlin, and open to both sexes; it embraces a college of arts and sciences, an academy, a Theological Seminary (Congregational), which has a Slavic department for the training of clergy for Slavic immigrants, and a conservatory of music. In 1909 it had twenty buildings, and a Memorial Arch of Indiana buff limestone, dedicated in 1903, in honour of Congregational missionaries, many of them Oberlin graduates, killed in China in 1900. Its libraries contained in 1909 98,000 bound volumes and an equal number of pamphlets, and the college had a faculty numbering 113 and a student enrolment of 1944. The resources of the college in 1909 were about $3,500,000. Under the editorship of a professor emeritus is published the Bibliotheca Sacra, a quarterly founded in 1843, and for many years the organ of the Andover Theological Seminary.

The village was founded as Oberlin Colony in 1833 (in 1846 it was incorporated as the village of Oberlin), by the Rev. John J. Shipherd (1802-1844), pastor of a church in Elyria, and the Rev. Philo Penfield Stewart (1 798-1 868), a missionary to the Choctaws of Mississippi, as a home for Oberlin Collegiate In- stitute, which was chartered in 1834; the name Oberlin College was adopted in 1850. To the Theological Seminary, opened in 1835, there came in the same year forty students from Lane Theological Seminary in Cincinnati, after the discussion of slavery there had been forbidden by its board of trustees. A former member of the board, Asa Mahan (1800-1889), who had strongly disapproved of the action of the trustees, came to Oberlin, and became the first president of the college. Oberlin was the first American college to adopt coeducation of sexes, and was a pioneer in America (1835) in the coeducation of the white and black races. 1 The village became a station on the Underground Railway, and an important centre of anti-slavery sentiment. Manual labour was adopted at first as a means for students to defray their college expenses. As late as 1906 it was

estimated that nearly two-thirds of the men were to a greater or less degree self-supporting, as were many of the young women. What is known as the " Oberlin Theology " (no longer identified with the college) centred in the teaching of Charles Grandison Finney (1792-1875), who became professor of theology in 1835 and was Mahan's successor in the presidency (1851-1866). He was a powerful preacher and teacher, who broke from Calvinism in denying imputation and teaching perfect freedom of the will, by which perfect holiness might be attained. Finney carried

1 A runaway slave, Littlejohn, was taken at Oberlin in September 1858 by a United States marshal, but was rescued at Wellington. Several of the rescuers, notably Professor Henry Everard Peck of Oberlin College, were arrested and were imprisoned in Cleveland for several months. This was a famous fugitive slave case.

on remarkable revival services in Western New York, in Philadelphia (1828), in New York City (1829-1830 and 1832, the New York Evangelist being founded to carry on his work), in Boston (1831, 1842-1843, 1856-1857), in London (1849-1850) and throughout England and Scotland (1858).

James Harris Fairchild (1817-1902) was president from 1866 to 1889; William Gay Ballantine (b. 1848), a distinguished Hebrew scholar, was president in 1891-1896, and John Henry Barrows (1847-1902) from 1899 to 1902, when he was succeeded by Henry Churchill King (b. 1858).

The modern theological position of Oberlin college is reflected in the writings of President King and of Dean Edward I. Bosworth (b. 1861) of the Theological Seminary, especially in President King's Reconstruction in Theology (1901) ; Theology and the Social Conscious- ness (1902) ; The Seeming Unreality of the Spiritual Life (1908) and The Laws of Friendship — Human and. Divine (1909).

See Finney's autobiographical Memoirs (New York, 1876); J. H. Fairchild, Oberlin, the College and the Colony (Oberlin, 1883) ; D. L. Leonard, The Story of Oberlin (Boston, 1898) ; and A. T. Swing, Life of J. H. Fairchild (New York, 1907).

OBERON (Fr. Alberon, Auberon, Ger. Alberich, i.e. rich, Goth, reiks, " ruler " — cf. Lat. rex — and O.H. and M.H. Ger. pi. elbi, elbe, " elves," pi. alp), king of the elves. In the legendary history 2 of the

Merovingian dynasty he figures as a magician, apd is the brother of Merowech (Merovee). He wins for his eldest son Walbert the hand of a princess of Constantinople. In the Nibelungenlied he guarded the treasure of the Nibelungen, but was overcome by Sigfrid. In the German medieval poem of Orlnit, the hero is aided in his wooing by his father Alberich, the king of the dwarfs. As Oberon, king of the fairies, he fills a similar role in Huon of Bordeaux {q.v.). The fairy element in the romance provided Shakespeare with the fairy scenes of the Midsummer Night's Dream, and Wieland with the subject of his epic Oberon (1780). Ben Jcnson wrote a masque of Oberon, or the Fairy Prince (Works, 1616). Weber's opera, Oberon, to the words of J. R. Planchfi, was first produced at Covent Garden on the 12th of April 1826. In the Wagner dramas Alberich is the Nibelung who steals the magic gold from the Rhine maidens. He is there the father of Hagen, and has throughout the Ring a darker character than that assigned to him in the original legend. There have been attempts to find the original Oberon in the Celtic Gwyn Aron, but there is no doubt of his Germanic origin, although his history, as given by the poet of Huon of Bordeaux, contains elements derived from Celtic tradition — the magic cup which remains full for the virtuous, and his parentage (he is the son of Morgan la fay and Julius Caesar) . With Oberon in the character of guardian of the treasure should be compared Andvari, the dwarf of Scandinavian legend, who, in the shape of a pike, was seized by Loki and made to give up his treasure and the magic ring by which he could create more gold. This ring, the Andvaranautr, with the curse of Andvari upon it, caused the misfortunes of the Volsungs and the Burgundian Nibelungs, and is known in German romance as the Ring of the Nibelungen.

See also C. Voretzsch, Epische Studien. Die Kompositionen des Huon von Bordeaux (Halle, 1900); J. Seemuller, " Die Zwergensage von Ortnit," in Zeitschr. fiir dent. Altert. vol. xvi. (1882).

OBERSTEIN, a town of Germany, in the principality of Birkenfeld, belonging to the grand duchy of Oldenburg, on the river Nahe, 33m. S.W. of Kreuznach, by the railway to Miinster- am-Stein. Pop. (1905) 9669. It is famous for the cutting and setting of agates and other precious stones, an industry which has been established here, and in the neighbouring township of Idar, since the 16th century. The Evangelical church, built in the 12th century and restored in 1482, is partly hewn out of the solid rock. On the hills above the town are the ruins of two castles.

See Hisserich, Die Idar-Obersteiner Industrie (Oberstein, 1894).

OBIT (through O. Fr., from Lat. obitus, death, obire, to go down, to die), a term for death, formerly used for the account

2 The last history of Hugo of Toul (12th century) was the authority of Jacques de Guyse (14th century) in his Annates^ historiae ill princip. Hannoniae (Mon. Germ, xxx.), where there is an account (bk. ix. ch. 6) of Alberich.

of a person's death (now " obituary "). An " obit " was also a service performed at a funeral or in commemoration of a dead person, particularly the founder or benefactor of a church, college or other institution, hence "obit-days," "obit Sunday," &c. A "post-obit" is a bond given as a security for the repay- ment of money lent upon the death of a person from whom the borrower has expectations (see Bond).

OBITER DICTUM, that which is said by the way or in passing (Lat. ob, by, and iter, road); specifically, in law, an opinion expressed by • a judge incidentally in the course of a case, on a point of law not necessarily connected with the issue or not forming part of the grounds of the decision; such obiter dicta have no binding authority.

OBJECT and SUBJECT, in philosophy, the terms used to denote respectively the external world and consciousness. The term " object " (from Lat. ob, over against, and jacere, to throw) is used generally in philosophy for that in which an activity of the mind ends, or towards which it is directed. With these may be compared the ordinary uses of the term for " thing " simply, or for that after which one strives, or at which one aims. " Subject," literally that which is " thrown under " (sub), is originally the material or content of a discussion or thought, but in philosophy is used for the thought or the thinking person. The relation between the thinking subject and the object thought is analogous to the grammatical antithesis of the same terms: the " subject " of a verb is the person or thing from which the action proceeds, while the " object," direct or indirect, is the person or thing affected. The true relation between mind or thought (subject) and matter or extension (object) is the chief problem of philosophy, and may be investigated from various standpoints (see Psychology and Metaphysics). It should be observed that the philosophical use of " subject " is precisely the opposite of the common use. In ordinary language the " subject " of discussion, of a

poem, of a work of art, is that which the speaker, author or artist treats.

OBJECTIVE, or Object Glass, the lens of any optical system which first receives the light from the object viewed; in a compound system the rays subsequently traverse the eye-piece. The theoretical investigations upon which the construction of an optical system having specified properties is based, are treated in the article Aberration, and, from another standpoint, in the article Diffraction. Here we deal with the methods by which the theoretical deductions are employed by the practical optician. It should be noted that the mathematical calcula- tions provide data which are really only approximations, and consequently it is often found that a system constructed on such data requires modification before it fulfils the practical require- ments. For example, take the case of a photographic objective. Calculations of the paths of two extreme rays in the meridional section of an oblique pencil of large aperture may prove that the rays intersect on a. plane containing the axial focus, but similar calculations of many other rays would be necessary before the mean point of intersection could be settled with sufficient exactness. Suppose, however, that the optician has accurately realized the results of the mathematician, he can then determine the divergence of the practical from the theoretical properties by measuring the positions and conformation of the most distinct or mean foci, and, if sufficiently acquainted with the theory of the construction, he can modify one or more curvatures or thick- nesses and so attain to a closer agreement with the ideal. Theory and practice co-operate in the realization of an original system. The order is not always the same, but generally the mathe- matician, by notoriously laborious calculations, supplies data which are at first closely followed by the constructor and after- wards modified in accordance with experimental observations.

In addition to the problem of constructing an original system, the optician has to deal with the reproduction of a realized system in different sizes. Two questions then arise: (i) To what degree of accuracy the radii of curvature can, or should, be re- peated, and (2) to what degree of uniformity the surfaces can, or should be figured. With regard to the first point there is no great difficulty in working the requisite iron or brass tools

of any curvature to within an error of j 1 irth% of the radius; male and female templets being used for very deep curves, and the spherometer for tools of longer radii (by appropriate grinding together, the radii are alterable at will within narrow, but sufficient,

limits). The accuracy attained in the grinding, however, is open to very perceptible modification by the sub sequent polishing and figuring processes. This is particularly undesirable in the case of deep curves and large apertures. A variation in a radius of curvature may occasion a little spherical aberration at the axial focus, but if the amount be small it may be neutralized by imparting to the lens a parabolic form or its opposite. Such an artifice is frequently adopted in correcting large telescope objectives.

With optical systems which transmit large pencils with con- siderable obliquity (such as wide angle photographic objectives) the curves are very deep, and a departure from the true radius which would be tolerated in a telescope cannot be permitted here. Such lenses are usually tested by means of a master curve worked in glass. The master curve is fitted to the experimental lens, and an inspection of the interference fringes shows the quality of the fit — whether it be perfect, or too shallow or too deep. The workman then modifies his polisher or stroke in order to correct the divergence. Flat surfaces are tested similarly. This test by contact has been strongly advocated and has been regarded as sufficient to detect all irregularities of any moment. This claim, however, is not justified, for the test is not sensitive to errors sufficient in amount to render a telescope objective almost valueless; but such errors are easily discernible by other optical devices. In general, accuracy in the radii of curvature is of primary importance and trueness of figuring is of secondary importance in photographic objectives, while the reverse holds with telescopic objectives; in wide angle microscopic objectives these two conditions are of equal moment. Eye pieces do not require the same degree of accuracy either in the curvature or the figuring.

A rough idea of the exactitude to which the figuring of the finest telescope objectives must be carried out is readily deduced. If two slips of paper, bearing printed letters ˆ of an in. high be placed in almost exact alignment, one 31-2 in. from the eye and the other 39 in., and viewed in moderate daylight with the eye having a pupil- lary aperture of 3 of an in., one set of the letters will be legible while the other is not. In this case the difference of convergence or refracting power exercised by the eye in transferring its focus from one slip to the other is jjˆ or one quarter diopter. If an image on the retina is J diopter out of focus, then each point of the object is repre- sented by a circle of confusion 0-0004 m – or 2 ‘ 45 i n angular measure in diameter, the focal length of the eye being assumed to be 0-5 in. and the pupillary aperture i of an in. If the effective aperture of the pupil or the aperture of a pencil traversing the pupil be I /nth of this standard, the size of the disk of confusion will be the same*

(viz. 0-0004 m -) it the retinal image be n quarter diopters out of focus. In general, for a constant size of the circle of confusion or, in other words, the same amount of visual blurring, the apertures of the pencils traversing the pupil and the focussing errors (expressed in quarter diopters) vary inversely.

If a portion of a figured surface of a telescope objective differs in curvature from the major portion of the lens so as to form a circle of confusion on the retina of a diameter not less than 2′ 45”, it is clear that the lens is faulty, the image formed by the perfect portion being sharp and well defined, and that formed by the imperfect portion blurred to the extent above determined, and to a greater extent if we allow for the effect of diffraction in the formation of the image. For example, a protuberance 1 in. in diameter at the centre of an object glass of 12 in. aperture refracting to a separate focus would theoretically form a spurious disk of about 5 seconds diameter, which would subtend a diameter of 50 minutes at the retina under a power of 600.

Regarding 2′ 45” as the maximum diameter of a geometric circle of confusion permissible in a telescopic object glass, we proceed to determine the heights of the protuberance or depression which causes it. If / be the equivalent focal length of the eye-piece and F that of the objective (the back focal length in the case of the microscope), then the linear error at the focus of the eye-piece is ˆ Jˆ/ 2 , or, expressed

as a variation of i/F, xb(//F) 2 > (=A T?)- ˆ a ˆ ens nas one s ‘de

plane and is worked to a mathematically sharp edge, its thickness t at the centre is (approximately) A 2 /8r, where A is the whole aperture and r the radius; and if g be the equivalent focal length and y. the refractive index, we may write r = g(u — 1) and obtain

- *= AV8jKm-i) .... (1). ‘*

OBJECTIVISM— OBLIGATION

It is clear that for lenses in which the focal length is large compared with the aperture, the thickness t is independent of the shape of the lens so long as the focal length and aperture remain constant. Consequently a protuberance may be regarded as a thin meniscus lens with mathematically sharp edges accurately fitted to a perfectly regular spherical surface. Substituting for i/g the T £j (//F) 2 obtained above it follows that A 2 i/\ 2

‘ = 80x-i)756~VfJ • • • (2) –

The effective aperture of the eye has been supposed to be f in. ; calling this P, it is then obvious that (since Fff is the magnifying power) P(F//) is the theoretical aperture of objective requisite to supply the | in. eye-pencil. Substituting P(F//) for A in equation (2) we obtain

t = PV8Xi56 .... (3). This relation gives the thickness of a meniscus protuberance fitted to an objective (assumed to have an unlimited aperture) which fills the i in. pupil and occasions the maximum blurring permissible. If n be 1 -5, t is equal to 1/39,936 in.

If the thickness / correspond to the aperture A, then for another aperture a to produce the same blurring we must have A’ (i/F) = A(i/F)A/a, i.e. the focal length of the protuberance, and therefore the thickness t must vary as A. Consider a telescope of 12 in. aperture, focal length of objective (F) = 180 in., focal length of eye-piece (f) 0-3 in. and magnifying power (F//)=6oo. The aperture theoretically requisite to transmit the pupillary pencil of £ in. aperture is £-600 = 75 > n – If the permissible protuberance cover the entire aperture of 75 in. its thickness would be 1/39,936 in. as above, but if restricted to a diameter of 1 in., then the maximum allowable thickness would be 1/75X1/39,936 in. = say 1/3,000,000 in. Since the latter protuberance is assumed to fill only ˆ of the aperture of the pupil of the eye, it produces an error in focussing equivalent to 75 quarter diopters or //j. If we take the power of the eye- piece to be i/-3 in. and subtract from it 75/156, we obtaini /■$$, so that AF is – -05 in.

Either the knife-edge test, or the more usual method of testing figuring by examining the out-of-focus disks formed on the retina when the eye-piece is inside and outside its correct focus, would certainly show the effect of this protuberance as a bright central spot when inside focus, and a dark central patch when outside; a practised eye can detect one-half the above error, and a quarter when the power is 1200 instead of 600. It may be noticed that, under the same circumstances, the error permissible in a reflecting telescope is only one quarter of that admitted in the refractor. In the case of a microscope objective of 10 in. back-focal-length used with a I in. eye-piece, the aperture required to transmit the pupillary pencil of i in. aperture is I J in. Regarding the supposititious protuberance or depression as £g in. in diameter, its thick ness or depth must not exceed 1/39,936X0-05/1 25, or say 1/1,000,000 in. Therefore the accuracy of figuring required in the best micro scopes

does not fall far short of that required in telescopes.

The best optical workmanship, as applied to large reflecting surfaces, aims at reducing local protuberances or depressions to within the limiting height or depth of one twelve-millionth part of their diameter (A) and the optical methods which detect these errors are exceedingly delicate. The finest spherometer detects errors down to about three-millionths of an inch, below which it is valueless. The same applies to the study of the interference fringes formed when a master curve is fitted. It will not show up such fine errors. The figuring of spherical surfaces 12 in. or more in diameter by abrasion with a polisher so that no part of the surface is elevated or depressed above the average level by more than the above defined amounts is commonly practised, but much technical knowledge is necessary for success. It is a sine qua non that the material of the polisher should be as plastic and inelastic as is consistent with a moderate degree of hardness. The best material for large work is Stockholm pitch from which the greater part of the turpentine has been removed by evaporation, and the abrasive used is the finest rouge and water. For small work certain waxes, more or less mixed with rouge or putty powder, are used. Water is used as the lubricant. During delicate figuring temperature, changes must be carefully avoided, otherwise buckling and consequent bad figuring of the lens or a variation in the hardness of the polisher may supervene. The motion of the polisher must therefore be leisurely. Moreover, any surface must be allowed to attain a uniform temperature before testing. When, as often happens, an elevation or depression on a large lens appar- ently refuses to be dislodged by straightforward polishing, recourse is had to local retouching. The faulty parts are localized by optical tests and then rubbed down by small polishers of an inch or more in diameter. In this way a central protuberance I in. in diameter and 1/2,000,000 of an in. high standing on the centre of a large objective may be removed by a polisher less than an inch in diameter worked at 200 half inch strokes per minute and at a pressure of 6 ozs. in about a minute. Great care is required, for if the process be carried too far, the whole surface must be re-figured. Local retouching serves to remove those conspicuous zones of aberration to which certain photographic lenses of large relative aperture are necessarily liable. An annular channel is polished out at a mean distance equal to -ft of the semi-aperture from the centre of the lens, and this i3

carefully shaded off towards the centre and also towards the edge;

this corrects the zone of rays which focus at a point short of the focus of the centre and edge rays. This correction is particularly necessary in the case of certain lenses designed for stellar photography. (H.D. T.)

OBJECTIVISM, in philosophy, a term used, in contradistinc- tion to Subjectivism, for any theory of knowledge which to a greater or less extent attributes reality (as the source and necessary pre-requisite of knowledge) to the external world. The distinction is based upon the philosophical antithesis of the terms Object and Subject, and their respective adjectival forms " objective " and " subjective." In common use these terms are opposed as synonymous respectively with " real " and " imaginary," " practical " and " theoretical," " physical " and " psychic." A man " sees " an apparition; was there any physical manifestation, or was it merely a creation of his mind ? If the latter the phenomenon is described as purely subjective. Subjectivism in its extreme form denies that mind can know more than its own states. Objects, i.e. things-in-themselves, may or may not exist: the mind knows only its own sensa- tions, perceptions, ideal constructions and so forth. In a modified form " subjectivism " is that theory which attaches special importance to the part played by the mind in the accumulation of experience. See Psychology; Relativity or Knowledge.

OBLATION, an offering (Late Lat. oblatio, from offerre, oblatum, to offer), a term, particularly in ecclesiastical usage, for a solemn offering or presentation to God. It is thus applied to certain parts of the Eucharistic service in the Roman Church. There are " two oblations," the " lesser oblation," generally known as the " offertory," in which the bread and wine yet unconsecrated are presented, and the " greater oblation," the " oblation " proper, forming the latter part of the prayer of consecration, when the " Body and Blood " are ceremonially presented. The word " oblate " is an ecclesiastical term for persons who have devoted themselves or have been devoted as children by their parents to a monastic life. " Oblate " is more familiar in the Roman Church as the name of a religious congregation of secular priests, the Oblate Fathers of St Charles. They are placed under the absolute authority of the bishop of the diocese in which they are established and can be employed by him on any duties he may think fit. This congregation was founded in 1578 under the name of Oblates of the Blessed Virgin and St Ambrose by St Charles Borromeo, archbishop of Milan (see Borromeo, Carlo). There is a similar congregation of secular priests, the Oblates of Mary the Immaculate, founded at Marseilles in 181 5.

OBLIGATION, in law, a term derived from the Roman law, in which obligatio signified a tie of law {vinculum juris) whereby one person is bound to perform or forbear some act for another. The obligatio of Roman law arose either from voluntary acts or from circumstances to which legal consequences were annexed. In the former case it was said to arise ex contractu, from contract, in the latter quasi ex contractu, ex delicto, or quasi ex delicto — that is to say, from tort, or from acts or omissions to which the law practically attached the same results as it did to contract or tort. Obligatio was used to denote either end of the legal chain that bound the parties, the right of the party who could compel fulfilment of the obligatio, the creditor, or the duty of the party who could be compelled to fulfilment, the debitor. In English law obligation has only the latter sense. Creditor and debtor have also lost their Roman law signification; they have been narrowed to mean the parties where the obligation is the payment of a sum of money. In English law obligation is used in at least four senses — (1) any duty imposed by law; (2) the special duty created by a vinculum juris; (3) not the duty, but the evidence of the duty — that is to say, an instrument under seal, otherwise called a bond; (4) the operative part of a bond. The third use of the word is chiefly confined to the older writers. Simplex and duplex obligatio were the old names for what are now more commonly called a single and a double or conditional bond. The party bound is still called the obligor, the party in whose favour the bond is made the obligee. The

fourth, like the third, is a use scarcely found except in the older writers. The word " bond " is of course a mere translation of obligatio. Obligations may be either perfect or imperfect. A perfect obligation is one which is directly enforceable by legal proceedings; an imperfect or moral obligation (the naturalis obligatio of Roman law) is one in which the vinculum juris is in some respects incomplete, so that it cannot be directly enforced, though it is not entirely destitute of legal effect. A perfect obligation may become imperfect by lapse of time or other means, and, conversely, an imperfect obligation may under certain circumstances become perfect. Thus a debt may be barred by the Statute of Limitations and so cease to be enforce- able. The obligation, however, remains, though imperfect, for if there be a subsequent acknowledgment by the debtor, the debt revives, and the imperfect obligation becomes again perfect. At one period there was some doubt among English lawyers

whether a moral obligation could be regarded as sufficient consideration for a contract; it has now, however, been long decided that it cannot be so regarded.

American law is in general agreement with English, except in the case of Louisiana, where the terms obligor and obligee are used in as wide a sense as the debitor and creditor of Roman law. By art. 3522 of the Louisiana civil code obligor or debtor means the person who has engaged to perform some obligation, obligee or creditor the person in favour of whom some obligation is con- tracted, whether such obligation be to pay money or to do or not to do something. The term obligation is important in America from its use in art. i. s. 10 of the constitution of the

United States, " No state . . . shall pass any . . . law impairing

the obligation of contracts." This does not affect the power of Congress to pass such a law. Contracts between private individuals are of course within the provision. So are private conveyances, charters of private corporations and statutory and other grants by a state. On the other hand, marriage and divorce, and arrangements which are political in their nature, such as charters of municipal corporations, licences to carry on particular trades or regulations of police are not within the provision. In order to fall within it, the law must act upon the terms of the agreement, and not merely upon the mode of pro- cedure. If it act not upon the terms but upon the remedy, it impairs the obligation if it purport to be retrospective, but it is valid so far as it applies to subsequent contracts.

OBNOXIOUS (Lat. obnoxiosus, from ob, over, against, and noxa, harm), a word originally meaning " exposed to harm or injury," but now " exciting aversion or dislike." The current use dates from the later 17th century.

OBOE, or Hautboy (Fr. hautbois, Ger. Hoboe, Ital. oboe), the treble member of the class of wood- wind instruments, having a conical bore and a double reed mouthpiece. The oboe consists of a conical wooden tube, composed of three joints, upper, middle and bell, and of a short metal tube to which are bound by many turns of waxed silk the two thin pieces of cane that form the mouthpiece. These pieces of cane are so bevelled and thinned at the end which is taken into the mouth that the gentlest stream of compressed air suffices to set them vibrating. Practice has demonstrated that the reed stalk of which the double reed mouthpiece is made, should not be of narrower internal diameter than the pipe containing the column of air upon

which it is destined to act. The player breathes gently into the aperture, which has the form of a very narrow ellipse, managing his breath as for singing. The vibrations of the double reed produce in the stream of compressed air issuing from the player's lips the rhythmical series of pulses necessary to generate sound waves in the stationary column of air within the main tube of the instrument.

In the upper and middle joints are the rings and- keys covering lateral holes bored through the tube, by means of which the column of air, and consequently the wave length, may be shortened at will; the bell joint contains one or two keys normally open, which when closed extend the lowest register by lengthening the air column. These holes and keys produce the fundamental scale of the oboe, which possesses notes sufficient for an octave

with all chromatic intervals. The next octaves are obtained by means of cross fingering (Fr. doigti fourchu, Ger. Cabelgriff), and of the octave keys, which do not give out an independent note of their own, but determine a node in the column of air, whereby the latter divides and vibrates in two half sections producing the second harmonic overtone or octave. In order to obtain this result the player inci eases the pressure of his breath and also the tension of his lips against the reed.

The compass of the oboe is from

fe

: with all

chromatic semitones. The G clef is used in notation and all notes are sounded as written.

The quality of tone or timbre depends primarily on the con- figuration of the sound waves (see Horn), which is influenced by the special characteristics of the mouth- piece: the musical tone of an instrument may be said to be due more directly to the prevalence and relative strength of the many harmonics which go to make up a composite tone or clang. The quality of the oboe tone resembles that of the E string of the violin, but is more nasal, more penetrat- ing and shriller. The lower register is thin and somewhat sweeter, approximating to the upper register of the cor anglais. But the timbre does not vary appreciably in the different registers, and to this want of variety in tone colour is due the unpopularity of the oboe as a solo instrument, although it is invaluable as a melody-leading instrument

in the orchestra, balanced by clarinets and flutes. The oboe lends itself admirably to pastoral music. The technical capabilities of the in- strument are very varied. It is possible to play on it diatonic and chromatic scale and arpeggio passages, legato and staccato; leaps; cantabile passages; sustained notes, cres- cendo and diminuendo, grace notes and shakes (with reservations). The keys having many sharps and flats are the most difficult for the oboist.

The double reed is the most simple, as it is probably the oldest, of all reed contrivances. It is sufficient to flatten the end of a wheat straw to constitute an apparatus capable of setting in vibration by the breath the column of air con- tained in the rudimentary tube; the invention of this reed is certainly due to chance. An apparatus for sonorous disturbance thus found, it was easy to improve it : for the wheat stalk a reed stalk was substituted, and in the extremity of its pipe another reed stalk much shorter in length was inserted, pared and flattened at the end ; and then came the lateral holes, probably another discovery of the great inventor chance. For the reed tube a wooden one was substituted, still preserving the reed tongue, and it is in this form, after having played an important part amongst the sonorous contrivances of an- tiquity, that we find the ancestor of the oboe playing a part no less important in the 16th century, in which it formed the interesting families of the cromornes, the corthols and the cervelas. Ail these families have disappeared from the instrumental combinations of Europe, but they are still to be found in Eastern wind instruments, such as the Caucasian salamouri, the Chinese kwantze, and the hitshiriki of Japan. _

It is impossible to say when it was that man first employed the phenomena of double reeds and conical pipes, but the knowledge of them must at least have been later than that of the cylindrical pipe, which we may regard as directly furnished by nature. That antiquity made use of them, however, has been proved by Gevaert in his admirable Histoire de la musique dans Vanliquite; but this learned author states that the double-reed pipes held but an in- significant place in the instrumental music of ancient Greece and Rome, a statement which is open to challenge (see Aulos).

Rudall, Carte & Co.

Fig. i. —The Oboe.

The first appearance of the instrument we call oboe in a musical work occurs in Sebastian Virdung's Musica gelutscht und aussgezogen (151 1). It there bears the name of Schalmey, and is already associated with an instrument cf similar construction called Bom- bardt.

There exists, however, much earlier evidence, in the illuminated MSS. and in the romances of the middle ages, of the great popularity of the instrument in all parts of Europe. The origin of wind instruments with conical tubes must be sought in the East, in Asia. An early medieval Schalmey with three holes may be seen on the silver cup of the goddess Nana-Anat. 1

There are two or three Schalmeys in the fine 13th-century Spanish MS. Cantigas de Santa Maria executed for Alphonso the Wise, preserved in the Library of the Escorial 2 (J. b 2).

The oboe was known during the early middle ages as Calamus, Chalumeau (France), Schalmei (Germany), Shawm (England). It is mentioned in the Roman de Brut (12th century) (line 10,822 seq.) " Lyres, tympres, et chalemiax." An interesting MS. at the British Museum, Sloane 3983, contains ameng other musical instruments on fol. 13 a large shawm with 6 finger-holes described at the side as Calamus aureus.

A miniature in the Paris Manesse MS. 3 of the 14th century depicts Heinrich von Meissen, better known as Frauenlob, conducting, from a raised platform, a band of musicians, one of whom is holding a Schalmey with 6 or 7 holes.

The chaunter of the bagpipe was a shawm, having the double reed concealed within an air-chamber, while the drones had single beating reeds concealed in the same manner. Mersenne calls both chalumeaux. The cornemuse or chalemie of shepherds and peasants was of this kind, but a special cornemuse, used in the 17th century in concert with the hautbois de Poitou, had double reeds throughout in chaunter and drone. The hautbois de Poitou was a primitive oboe with the reed placed in a bulb, forming an air-chamber, having a raised slit at the top through which the performer breathed in compressed air; as the reed could not be controlled by the lips, it was impossible to play with expression on the hautbois de Poitou or to obtain the harmonic octaves; the compass was therefore limited. The kind of bagpipe (q.v.) known as Musette, 6 inflated by bellows, also had double reeds throughout in spite of having a cylindrical chaunter.*

The manufacture of musical instruments could not remain unaffected by the great artistic movement known as the Renaissance; accordingly, we find them not only improved and purified in form in the 16th century, but also ranged in complete families from the soprano to the bass. Praetorius, in his Syntagma Musicum (1615-1620), gives us the full nomenclature of the family with which we are concerned, composed of the following individuals: (1) The little Schalmey, rarely employed, measured about 17 in. in length, and had

six lateral holes. Its deepest note was f£ _£:] . (2) The discant*

Schalmey (fig. 2), the primitive type of the modern oboe; its length

was about 26 in., and its deepest note fc|~=J~q

*v *

ate /rW—

~^3.

(3)JThe alto Pommer (fig. 3), 30! in. long, with its deepest note Ss=EE- : :3

(4) The tenor Pommer (fig. 4), measuring about 4 ft. 4 in.; besides the six lateral holes of the preceding numbers there were four keys which produced the notes EEzVJ^^J"-^]^! • (5) The bass Pommer, having a length of nearly 6 ft. ; it had six lateral holes and four keys

*which produced *?:*

mm

1

(6) The great double quint

Pommer, measuring about 9 ft. 8 in. in length ; its four keys

permitted the production of the notes — ¯-E£-3r • These in-

b ; Z % 3*

struments, and especially numbers (2), (3), (4) and (5), occupied an important place on the continent of Europe in the instrumental combinations of the i6th-i3th centuries. Fig. 5, borrowed from a

'See Gaz. Archeol. (Paris, 1886), xi. pp. 70 et seq. PI. X.; also 1885, pp. 288-296.

2 A facsimile in colours of part of the Cantigas containing figures of 52 instrumentalists has been published by the Real Academia Espafiola (Madrid, 1889), and can be seen at the British Museum. A reproduction in black and white is included in Juan F. Riafio's Critical and Bibliographical Notes on Early Spanish Music (Quaritch,

l88 7)-

3 The miniature is reproduced in Naumann's History of Music, i. p. 249, fig. 151.

4 Harmonie universelle, ii. pp. 282-289 and 305.

6 See Mersenne — op. cit. ii. pp. 287-292 and Hotteterre le Romain. Mithode pour la musette, le hautbois, &c. (Paris, 1737), chap. xvi.

picture 6 painted in 1616 by Van Alsloot, represents six musicians playing the following instruments indicated in the order of their position in the picture from left to right : a bass oboe, bent over and

become the bassoon, an alto Pommer, a cornet

*(German " zinke "), a discant Schalmey, a second ^=ifcS«&5\ alto Pommer and a trombone. 7 *

The 17th century brought no great changes in ' 1 r

the construction of the four smaller instruments of the family. Michel de la Barre writing in 1740 states that in the archives of the Chambre des Comptes are 4 charges for hautbois and musettes de Poitou created by King John 8 (14th century). Extensively used in France, they were there called " haulx bois " or " hault- bois," to distinguish themfrom the two larger instruments which were designated by the words " gros bois." Haultbois became haut- bois in French, and oboe in English, German and Italian; and this word is now used to distinguish the smallest in- strument of the family.

During the 17th century some of the most important names connected with instru- mental music in France are to be found amongst the Grands Hautbois of the Grande Ecurie du Roi, such as Hot- teterre (Jean, Louis and Nicholas), Philidor (Jacques and Andrf:), Gilles Allain, Destouches, &c. 9

In Germany the Schalmey was represented in the town band, in the Court and the Church orchestras, and later in that of the Opera. In 1580 it is recorded that the Or- chestra of the elector of Brandenburg 10 includedSchal- meys and Bombarts. In Dres- den the orchestra possessed (1593) n° less than 16 Schal- meys, large and small. Hein- rich Schutz, who founded the first Opera in Germany, at Dresden, used two fiffari or early oboes in 1629 in one of his works. 11

The little Schalmey and the tenor Pommer seem to have disappeared in the 17th cen- tury; it is the discant Schalmey and the alto Pommer which by improvement have become two important members of the modern orchestra. The oboe, as such, was employed for the first time in 1671 in the orchestra of the Paris opera in Pomone by Cambert. The

first two keys SEEjEEEjE

Fig. 2.

The Discant

Schalmey.

Fig. 3.

The Alto Pommer.

Fig. 4. The Tenor Pommer.

date from the end of the 17th century.

It is not known who added the first keys to the oboe; there is, however, a drawing of a French Hoboy in an English MS. by the third Randle Holme, which formed part of his Academy of Armoury n known to have been written before 1688, in which the two keys are shown. The instrument must have been well known in England at the time, and Randle Holme's rough little drawing fixes the date of the transformation approximately as not later than 1680, probably earlier, since the oboe was used in Pomone in 1671. According to the flautist Quantz 13 the transformation of Schalmey into oboe took place when the keys for C sharp and D sharp were added, at about the same time as they were added to the flute.

In 1727 Gerhard Hoffmann of Rastenberg u added the keys

A Parisian maker, Delusse, furnished at the end of

6 This picture, belonging to the National Museum of Madrid, represents a procession of all the religious orders in the city of Antwerp on the festival of the Virgin of the Rosary.

7 For further details see Mah:!lon's catalogue of the Musee du Conservatoire royal de musique de Bruxelles (Ghent, 1896, vol. ii. p. 25).

8 See I. Ecorcheville, " Quelques documents sur la musique de la Grande Ecurie du Roi," Int. Mus. Ges. Sbd. ii. 4, p. 6ˆ.

» lb., Table II.

10 See Gropius, Beitrdge z. Gesch. Berlins, 1840, Bd. ii.

11 Complete edition, vol. v. No. 7. See Ernst Euting, Zur Ge- schichte der Blasinstrumente im 16 u. 17 Jahrh. (Berlin Inaugural Dissertation, 1899), published by A. Schulze, Rixdorf (Berlin), p. 47.

12 See British Museum, Harleian MS. 2034, fol. 207b.

13 See Versuch einer A nleitung die Flote traversiere zu spielen, p. 24.

14 See Mattheson, Orchester, i. p. 268 and Eisel, Musikus aWo-SISoktos, p. 96.

the 1 8th century much-appreciated improvements in the boring of the instrument. The Methode of Sellner, published at Vienna

1825, shows nine keys CT | j ^^-jaHfiMfr'— pˆH ■ and one,

the octave key, which, when opened, establishes a loop or ventral segment of vibration in the column of air, facilitating the production of sounds in the octave higher. Triebert of Paris owes his great reputation to the numerous improvements he introduced in the construction of the oboe.

The alto Pommer was but slowly transformed: it was called in French " hautbois de chasse," in Italian " oboe di caccia." In the 18th century we find it more elegant in form, but with all the defects of the primitive instrument. The idea of bending the instrument into a

half circular form to facilitate the handling is usually attri- buted to an oboist of Bergamo, one Jean Ferlendis, who was estab- lished at Salzburg at about 1760. This is obviously incorrect, since Ferlendis would then have been five years old. 1 It has been sug- gested that the fact of the instrument's resembling a kind of hunting

him of the merit of the innovation. The fagottino was transformed in the same fashion.

Sigismund Schnitzer of Nuremberg 7 acquired a great reputation in the 16th century for making the " basson," a French word substi- tuted for the old fagot, and adopted in England as bassoon. His

instrument had only two keys

DESIS-XC AISLOQT, f«6-

horn used at that time in England probably gained for it the name of " corno inglese," which it still retains (" cor anglais " in French). 2 The first employment of it in the orchestra is referred to Gluck, who had two " cors anglais " in his Alceste, as played at Vienna in 1767. But it was not until 1808 that the cor anglais was first heard in the Paris opera; it was played by the oboist Vogt in Alexandre chez Apelle by Catel. The improvements in manufacture of~this instrument closely followed those introduced in the oboe. The 18th century produced an intermediate oboe between (2) and (3), which was called hautbois d'amour, and was frequently employed by J. S. Bach. It was a third lower than the ordinary oboe, and was char- acterized by the pear-shaped bell with narrow aperture common to all wind instruments known as d'amour to which is due their veiled sweet quality. In the Spanish Cantigas, there are two Schalmeys with pear-shaped bells. This is in all probability the doucaine mentioned in the 13th and 14th-century romances. The oboe d'amore fell into disuse after the death of the great German composer. It has been resuscitated by the firm of C. Mahillon of Brussels, and reconstructed with the improvements of modern manufacture. A similar timbre was artificially produced in the oboe by means of mutes or sordini composed of hollow cones of wood, balls of paper, 3 pieces of sponge, 4 &c.

After the 16th century we find the instruments which were designated by the name of " gros bois," the (5) and (6) of Praetorius, transformed into shorter instruments, the Fagott and Contrafagott, having a column of air of the same length and form as the Pommers, but the instrument itself consisted of two conical tubes communicat-

ing at the lower part of the instrument ; they were pierced in a single piece of wood. It is probably owing to the aspect of this double pipe that the satirical name of fagot was given, preserved in Italian as fagotto, and in German as Fagott. A canon of Ferrara named Afranio has been named as the author of the transformation, about 1539, of the bass Pommer, but Count Valdrighi, the curator of the Estense library, 6 and Wasielewski, 6 who has reproduced the drawing of Afranio's invention, deprive

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We cannot tell when

the bassoon gained its present form, but it was probably at the end of the 17th century. It was used in the orchestra in Germany by H. Schiitz in 1619 («r.), 8 and in 1625, 5 fagotti were in use. 9

Cesti, in his grand opera' il Porno d'oro, 1 " which was performed with the utmost brilliancy at the nuptials of the emperor Leopold in Vienna, where printed editions of 1667 and 1668 are preserved, used fagotti combined with two cornets, three trombones and a regal to suggest the terrors of Hades.

Michael Praetorius (1618) expressly mentions the fagotto as an orchestral instrument.

In France it was used with the oboe in 1671 in Cambert's Pomona in the newly founded French Opera, for which Cambert & Perrin had received in 1669 a Royal Privilege expiring in 1672, and there- after granted to Lully.

S

1 See Henri Lavoix, Histoire de V instrumentation (Paris), p. Ill; also Gerber's Lexikon, "Giuseppe Ferlendis"; and Robert Eitner, Quellenlexikon der Tonkunstler, " Gioseffo Ferlendis," born 1755.

2 This question is more fully treated under Cor Anglais.

3 See Mattheson, Orchester, p. 266.

4 See Quantz, op. cit. p. 203.

6 Musurgiana, // Phagolus d' Afranio.

6 Geschichte der Instrumentalmusih im i6" n Jahrhunder't (Berlin, 1878), p. 74.

It had three keys then^n TT I -J = 3. The B flat key render

Sw-

ing a lengthening of the instrument necessary, we may suppose it took its modern form at that epoch. The fourth keySz

qjpz

is found in a bassoon stamped Stanesby Junior, London, 1747," and also in one without maker's name, obviously earlier, to judge by the very early pattern of the keys. 12 The bassoon appears with four keys in the Encyclopedie of Diderot and d'Alembert (Paris, 1751-1765). The number of keys increased by the beginning of the

m

present century to eight, viz. : S = EESES = ^E3 = |s3 , and two

keys to facilitate the production of acute harmonics. It was im-proved by Almenrader in Germany, Savari, and more recently Triebert and Goumas, Paris, and C. Mahillon, Brussels. (See also Bassoon.)

The reform in the construction of the flute due to Theobald Boehm of Munich about 1840, a reform which principally consisted in the rational division of the tube by the position of the lateral holes, prompted Triebert to try to adapt the innovation to the oboes and bassoons; but he failed, because the application of the system denaturalized the timbre of the instruments, which it was necessary, before all things, to preserve, but further improvements made upon

the same lines by Barret and later by Rudall Carte, have transformed the oboe into the most delicate and perfect of reed instruments. In 1856 a French bandmaster, M. Sarrus, thought out the construction of a family of brass instruments with conical tubes pierced at regular distances, which, by diminishing the length of the air column, has rendered a series of fundamental sounds easy — more equal and free in timbre than that of the oboe family. Gautrot of Paris realized the inventor's idea, and, under the name of " sarruso- phones," has created a complete family, from the soprarino in E flat to the contrabass in B flat, of which his firm preserves the monopoly.

In order to replace the old double-bassoon of wood, the firm of C. Mahillon, Brussels, produced in 1868, a reed contrabass of metal, since much used in orchestras and military bands. The first idea of this instrument goes back to 1839, and is attributed to Schollnast & Son of Pressburg. It is a conical brass tube of very large proportions, with lateral holes placed as theory demands, in geometrical relation, with a diameter almost equal to the section of theStube at the point where the hole is cut. From this it results that for each sound one key only is required, and the seventeen keys give the player almost the facility of a keyboard. The compass written for this

ffi 1 £

contrabass is comprised between ■ I ~» an d (g— 1 1 hut sounds

an octave lower. See Contrafagotto. (V. M. ; K. S.)

7 See Doppelmayr, Historische Nachrichten von Niirnbergischen Matematikern und Kiinstlern, Nurnberg, 1730.

8 See complete edition, vol. iii. No. 4.

9 Vol. xiii. No. 1.

10 A fine edition has been published with reproductions of the original sketches for the scenes and the full score by Adler in Denkmaler der Tonkunst in Oesterreich, Bd. iii. p. xxv.

11 See Captain C. R. Day's Catalogue of the Musical Instruments exhibited at the Royal Military Exhibition (London, 1891), p. 75, No. 151.

12 lb. p. 75, No. 150.

OBOK, a seaport on the north shore of the Gulf of Tajura, K.E. Africa, acquired by France in 1862. It gave its name to the colony of Obok, now merged in the French Somali coast pro- tectorate (see Somaliland: French). The port is separated from the open sea by coral reefs, but is only partially sheltered from the winds. This led to the practical abandonment of the town by the French, who in 1896 transferred to Jibuti, on the opposite shore of the Gulf of Tajura, the seat of government of the colony. Obok is connected with Aden and Jibuti by sub- marine cables. Population about 500.

OBRA, a river of Germany, in the Prussian province of Posen, a left-bank tributary of the Warthe. It rises near Obra, N.W. from Koschmin, and forms in its course marshes, lakes and the so-called Great Obrabruch (fen). The latter, 50 m. long and about 5 m. broad, is a deep depression in the undulating country of south-west Posen. The river is here dammed in and canalized and affords excellent water transit for the agri- cultural produce of the district.

O'BRIEN, WILLIAM SMITH (1803-1864), Irish revolutionary politician, son of Sir Edward O'Brien, a descendant of Brian Boroimhe (d. 1014), king of Ireland (see Clare), was born in Co. Clare on the 17th of October 1803, and received his education at Harrow and at Cambridge. He took the additional name of Smith on inheriting his maternal grandfather's estates in Limerick. He entered parliament in 1828 as member for Ennis, and from 1835 to 1848 represented the county of Limerick. Although he spoke in 1828 in favour of Catholic emancipation, he for many years continued to differ on other points from the general policy of O'Connell. But he opposed the Irish Arms Act of 1843, and became an active member of the Repeal Associa- tion. Though he was destitute of oratorical gifts, his arraign- ment of the English government of Ireland secured him enthusiastic attachment as a popular leader. In July 1846 the " Young Ireland " party, with Smith O'Brien and Gavan Duffy at their head, left the Repeal Association, and in the beginnin 5 of 1847 established the Irish Confederation. In May 1848 he was tried at Dublin for sedition, but the jury disagreed. In the following July he established a war directory, and attempted to make a rising among the peasantry of Ballingarry, but although he was at first joined by a large following the movement wanted cohesion, and the vacillating crowd dispersed as soon as news reached them of the approach of the dragoons. O'Brien was arrested at Thurles, tried and sentenced to

death. The sentence was, however, commuted to transportation to Tasmania for life. In February 1854 he received his liberty on condition of never revisiting the United Kingdom; and in May 1856 he obtained a full pardon, and returned to Ireland. In 1856 he published Principles of Government, or Meditations in Exile. He died at Bangor, north Wales, on the 18th of June, 1864. He had five sons and two daughters. His eldest brother, Lucius, became 13th Baron Inchiquin in 1855, as heir male to the 3rd marquis of Thomond, at whose death in 1855 the mar- quisate of Thomond and the earldom of Inchiquin became extinct. (See Inchiquin, ist Earl of.)

OBSCENITY (from the adjective " obscene," Lat. obscenus, evil-looking, filthy). By English law it is an indictable mis- demeanour to show an obscene exhibition or to publish any obscene matter, whether it be in writing or by pictures, effigy or otherwise. The precise meaning of " obscene " is, however, decidedly ambiguous. It has been defined as " something offen- sive to modesty or decency, or expressing or suggesting unchaste or lustful ideas or being impure, indecent or lewd." But the test of criminality as accepted in England and Canada is whether the exhibition or matter complained of tends to deprave and corrupt those whose minds are open to immoral influences and who are likely to visit the exhibition, or to see the matter published. If the exhibition or publication is calculated to have this effect, the motive of the publisher or exhibitor is immaterial. Even in the case of judicial proceedings, newspapers are not privileged to publish evidence which falls within the definition. In dealing with writings alleged to be obscene, the court and jury have to consider the effect of the whole work and not merely

the particular extract challenged as improper; and in practice it is difficult to induce juries to convict the publishers of well- known and cld-established works of real literary quality on the ground that they contain passages offensive to modern notions of propriety. In the case of exhibitions of sculpture and pictures some difficulty is found in drawing the line between representa- tions of the nude and works which fall within the definition above stated — a difficulty raised in a somewhat acute form before the London County Council in 1907 by theatrical repre- sentations of " living statuary."

Besides the remedy by indictment there are statutory pro- visions for punishing as vagabonds persons who expose to public view in public streets or adjacent premises obscene prints, pictures or other indecent exhibitions. These are supplemented by similar provisions, applicable to the metropolis and to county towns, and (by a statute of 1889) for suppressing certain kinds of indecent advertisements. By

an act of 1857 powers are given for searching premises on which obscene books, &c, are kept for sale, distribution, &c, and for ordering their destruction, and the post office authorities have power to seize postal packets containing such matter and to prosecute the sender. In 1906 the London publisher of a weekly comic paper was punished for inserting advertisements inviting readers to acquire by post from abroad matter of this kind.

The use of obscene or indecent language in public places is punishable as a misdemeanour at common law, but it is usually dealt with summarily, under the Metropolitan Police Act 1839, or the Town Police Clauses Act 1847, or under local by-laws.

British Possessions. — In British India obscene publications, exhibitions, &c, are punished under articles 292, 293 and 294 of the Penal Code. Special exception is made for representations in temples or on cars used for conveyance of idols or kept or used for religious purposes. In those British possessions whose law is based on the common law the offences above dealt with are offences at common law or under colonial statutes embodying the common law, e.g.

Bueensland Code, 1899, ss. 172, 227, 228, 374 (3) ; Western Australian ode, 1901, ss. 203, 204, 352 (3); Canadian Criminal Code, s. 179. In New South Wales and Western Australia, by acts of 1901 and 1902, provisions have been, made for dealing summarily with in- decent and obscene publications based to some extent on the English legislation of 1889 against indecent advertisements. In the Colonial acts no penalty is incurred if the defence can prove that the in- criminated publication is a work of recognized literary merit, e.g. Aristophanes or Boccaccio's Decameron, or is a bona-nde medical work circulated in the manner permitted by the statutes.

United States. — Under the Federal Law (Revised Statutes, s. 3893) penalties are imposed for transmitting obscene matter by the U.S. mails; see U.S. v. Wales (1892), 51 Fed. Rep. 41. (W. F. C.)

OBSEQUENS, JULIUS, a Latin writer of uncertain date, generally placed about the middle of the 4th century a.d. He is the author of a small extant work De prodigiis, taken from an epitome of Livy, and giving an account of the prodigies and portents that occurred in Rome between 249-12 B.C.

The editio princeps was published by Aldus (1508) ; later editions by F. Oudendorp (1720) and O. Jahn (1853, with the periochae of Livy).

OBSEQUIES (Med. Lat. obsequiae, formed after class. Lat. exsequiae), a term for funeral rites and ceremonies, especially such as are carried out with great ceremony. The Lat. ob- sequium (from obscqui, to follow close after) produced the obsolete English " obsequy," in the sense of ready complaisant service, especially of an inferior to a superior, still found in the adjective " obsequious."

OBSERVATORY. Up to a comparatively recent date an " observatory " was a place exclusively devoted to the taking of astronomical observations, although frequently a rough account of the weather was kept. When the progress of terres- trial magnetism and meteorology began to make regular observa- tions necessary, the duty of taking these was often thrown on astronomical observatories, although in some cases separate institutions were created for the purpose. In this article the astronomical observatories will be chiefly considered.

Up to about 300 B.C. it can scarcely be said that an observatory existed anywhere, as the crude observations of the heavens then taken were only made by individuals and at intervals, employing the simplest possible apparatus. Thus, according to Strabio.

Eudoxus had an observatory at Cnidus. But, when philo- sophical speculation had exhausted its resources, and an accumu- lation of facts was found to be necessary before the knowledge of the construction of the universe could advance farther, the first observatory was founded at Alexandria, and continued in activity for about four hundred years, or until the middle or end of the 2nd century of the Christian era. Hipparchus of Rhodes, the founder of modern astronomy, by repeating ob- servations made at Alexandria, discovered the precession of the equinoxes, and investigated with considerable success the motions of the sun, moon and planets. His work was continued by more or less distinguished astronomers, until Ptolemy (in the 2nd century a.d.) gave the astronomy of Alexandria its final development. When science again began to be cultivated after the dark ages which followed, we find several observatories founded by Arabian princes; first one at Damascus, next one at Bagdad built by the caliph Al-Mamun early in the 9th century, then one on the Mokattam near Cairo, built for Ibn Yunis by the caliph Hakim (about 1000 A.D.), where the Haki- mite tables of the sun, moon and planets were constructed. The Mongol khans followed the

example; thus arose the splendid observatory at Maragha in the north-west of Persia, founded about a.d. 1260 by Hulagu Khan, where Nasir Uddin constructed the Ilohkhanic tables; and in the 15th century the observatory at Samarkand was founded by Ulugh Beg, and served not only in the construction of new planetary tables but also in the forma- tion of a new catalogue of stars.

With the commencement of scientific studies in Europe in the 15th century the necessity of astronomical observations became at once felt, as they afforded the only hope of improving the theory of the motions of the celestial bodies. Although astronomy was taught in all universities, the taking of observa- tions was for two hundred years left to private individuals. The first observatory in Europe was erected at Nuremberg in 1472 by a wealthy citizen, Bernhard Walther, who for some years enjoyed the co-operation of the celebrated astronomer Regio- montanus. At this observatory, where the work was continued till the founder's death in 1504, many new methods of observing were invented, so that the revival of practical astronomy may be dated from its foundation. The two celebrated observatories of the 16th century, Tycho Brahe's on the Danish island of Hven (in activity from 1576 to 1597) and that of Landgrave William IV. at Cassel (1561-1597), made a complete revolution in the art of observing. Tycho Brahe may claim the honour of having been the first to see the necessity of carrying on for a number of years an extensive and carefully-planned series of observations with various instruments, worked by himself and a staff of assistants. In this respect his observatory (Urani- burgum) resembles our modern larger institutions more closely than do many observatories of much more recent date. The mighty impulse which Tycho Brahe gave to practical astronomy at last installed this science at the universities, among which those of Leiden and Copenhagen were the first to found observa- tories. We still find a large private observatory in the middle of the 17th century, that of Johannes Hevehus at Danzig, but the foundation of the royal observatories at Paris and Greenwich and of numerous university observatories shows how rapidly the importance of observations had become recognized by governments and public bodies, and it is not until within the last hundred and thirty years that the development of various new branches of astronomy has enabled private observers to compete with public institutions.

The instruments employed in observatories have of course changed considerably during the last two hundred years. When the first royal observatories were founded, the principal instru- ments were the mural quadrant for measuring meridian zenith distances of stars,

and the sextant for measuring distances of stars inter se, with a view of determining their difference of right ascension by a simple calculation. These instruments were introduced by Tycho Brahe, but were subsequently much improved by the addition of telescopes and micrometers. When the law oi gravitation was discovered it became necessary to

test the correctness of the theoretical conclusions drawn from it as to the motions within the solar system, and this necessarily added to the importance of observations. By degrees, as theory progressed, it made greater demands for the accuracy of observa- tions, and accordingly the instruments had to be improved. The transit instrument superseded the sextant and offered the advantage of furnishing the difference of right ascension directly; the clocks and chronometers were greatly improved; and lastly astronomers began early in the 19th century to treat their instruments, not as faultless apparatuses but as imperfect ones, whose errors of construction had to be detected, studied and taken into account before the results of observations could be used to test the theory. That century also witnessed the combination of the transit instrument and the mural quadrant or circle in one instrument — the transit or meridian circle.

While the necessity of following the sun, moon and planets as regularly as possible increased the daily work of observatories, other branches of astronomy were opened and demanded other observations. Hitherto observations of the " fixed stars " had been supposed to be of little importance beyond fixing points of comparison for observations of the movable bodies. But when many of the fixed stars were found to be endowed with " proper motion," it became necessary to include them among the objects of constant attention, and in their turn the hitherto totally neglected telescopic stars had to be observed with precision, when they were required as comparison stars for comets or minor planets. Thus the field of work for meridian instruments became very considerably enlarged.

In addition to this, the increase of optical power of telescopes revealed hitherto unknown objects — double stars and nebulae — and brought the study of the physical constitution of the heavenly bodies within the range of observatory work. Researches connected with these matters were, however, for a number of years chiefly left to amateur observers, and it is only since about 1830 that many public observatories have taken up this kind of work. The application of spectrum analysis, photometry, &c, in astronomy has still more increased the number and variety of observations to be made, while the use of photography in work of precision has completely

revolutionized many branches of practical astronomy. It has now become necessary for most observatories to devote themselves to one or two special fields of work.

It would be difficult to arrange the existing observatories into classes either according to the work pursued in them or their organization, as the work in many cases at different times has been directed to different objects, while the organization depends mostly on national and local circumstances. As already alluded to above, one of the principal characteristics of the larger observatories of the present day is the distribution of the work among a number of assistants under the general superintendence of a director. This applies principally to the great observatories, where the sun, moon, planets and a limited number of fixed stars are without interruption being observed, but even among these institutions hardly two are conducted on the same principles. Thus in Greenwich the instruments and observations are all treated according to strict rules laid down by the astronomer- royal, while in Washington or Pulkowa each astronomer has to a certain extent his choice as to the treatment of the instrument and arrangement of the observations. The same is the case with the smaller institutions, in most of which these arrangements vary very much with change of personnel.

The way in which the results of observations are published depends principally on the size of the institutions. The larger observatories issue their " annals " or " observations " as separate periodically-published volumes, while the smaller ones chiefly depend on scientific journals to lay their results before the public, naturally less fully as to details.

Subjoined is a catalogue of public and private observatories still in activity in 1910 or in existence within the past hundred years. (4 m $= i^{\circ}$ of long.)

(Abbreviations: ap., aperture; equat., equatorial; obs., observa- tory or observations; o.g., object-glass; phot., photographic; reft..

reflector; refr., refractor; s.g., silvered glass; vis., visual; univ., university. Where the names of two makers are given, the first is responsible for the optical, the second for the mechanical part of the instrument.)

Great Britain and Ireland

A. Public Observatories.

: Greenwich, royal obs.,lat. +51° 28′ 38-4”. Founded in 1675 for the promotion of astronomy and navigation. The obs. have therefore from the first been principally intended to determine the positions of standard stars, the sun and planets, and above all to follow the motion of the moon with as little interruption as possible, both on and outside the meridian. Since 1873 spectroscopic obs. and a daily phot, record of sun-spots have been taken. The eighth satellite of Jupiter was discovered photographically in 1908. The obs. is under the direction of the astronomer-royal; and from the time of its first astronomer, Flamsteed, the institution has always maintained its place in the foremost rank of obs. Thus the obs. of Bradley (06. 1762) form the foundation of modern stellar astronomy; but it was especially during the directorship of Airy (1835-1881) that the obs. rose to its present high state of efficiency. There are now two chief assistants, six assistants, and a staff of computers employed. The principal instruments now in use are: a meridian circle by Simms (and Ransomes and May as engineers), erected in 1850, having a circle of 6-ft. diameter and a telescope of 8-in. ap., Lassell’s 2-ft. refl., erected 1884; 13-in. phot. refr. with 10-in. vis. o.g. by Grubb; 28-in. refr. by Grubb; 26-in. phot. refr. by Grubb, with the old 12-8-in. refr. as guiding telescope; 9-in. phot. refr. by Grubb, and 30-in. s.g. refl. by Common, the last four being on one stand ; 8-in. altazimuth by Simms, erected 1896. The 26-in. and the 9-in. were presented by Sir H. Thompson. The standard ” motor clock ” is the centre of a system of electrically-controlled clocks scattered over the United Kingdom. The magnetic and meteorological department was founded in 1838; it contains a complete set of instruments giving continuous phot, records. The Observations are published with all details from 1750, beginning with 1836 in annual bulky quarto volumes; special results — e.g.. Star Catalogues, Reductions of Lunar and Planetary Observations — are published in separate volumes.

South Kensington, Solar physics obs., lat. +51 ° 29′ 48-0”, long, o h. o m. 41-5 s. W. Founded 1879, under Sir N. Lockyer; 3-ft. refl. and 30-in. refl. by Common; 10-in. refr. by Cooke, and several side-rostats with attachments for spectroscopic and phot. work.

Oxford, Radcliffe obs., lat. +51° 45′ 35-4’, long, o h. 5 m. 2-6 s. W. Founded in 1771 by the Radcliffe trustees. Obs. were regularly made, but none were published until 1839, when systematic obs. were begun with an 8-ft. transit instrument by Bird (1773) and a 6-

ft. mural circle by Jones (1836). Heliometer (75 in.) by Repsold (1849); meridian circle by Troughton and Simms, mounted in 1861, formerly belonging to Mr Carrington; 10-in. refr. by Cooke (1887), Grubb refr. with 24-in. phot, and 18-in. vis. o.g. (1902); self-recording meteorological instruments. Besides the annual 8vo vols, of Observations (from 1840), four catalogues of stars have been published.

Oxford, univ. obs., lat. +51° 45′ 34-2”, long, o h. 5 m. 0-4 s. W. Finished in 1875; is under the Savilian professor of astronomy; I2j-in. refr. by Grubb, and a 13-in. refl. made and presented by De La Rue. The former has been used for photometric obs. ; the latter for taking lunar photographs, by means of which the late Professor Pritchard investigated the libration of the moon; 13-in. phot. refr. by Grubb attached to the I2|-in., used for phot. zcr,e work.

Cambridge, lat. +52° 12′ 51-6”, long, o h. o m. 22-8 s. E. Founded by the univ. senate in 1820. Chiefly devoted to meridian work — up to 1870 with a 5-in. transit by Dollond and a mural circle by Jones; a new meridian circle by Simms, of 8-in. ap. and 3-ft. circles, was then erected. The ” Northumberland equatorial ” was mounted in the ” English ” fashion in 1838; the o.g. by Cauchoix is of nj-in. ap. R. S. Newall’s 25-in. refr. by Cooke, erected 1891, used for spectrographic work; siderostatic refr. with 12-in. o.g. by Cooke, 1898. In 1908 the instruments of Sir W. Huggins’ obs. were presented by the Royal Society.

Durham, univ. obs., lat. +54° 46′ 6-2”, long, o h. 6 m. 19-8 s. W. Founded in 1841; small meridian circle by Simms, refr. by Fraunhofer of 6J-in. ap., Almucantar of 6-in. ap. by Cooke (1900).

Liverpool (Bidston, Birkenhead), lat. +53° 24′ 4-8”, long, o h. 12 m. 17-3 s. W. Founded in 1838 by the municipal council; transferred in 1856 to the Docks and Harbour Board; moved to Birkenhead in 1867. Specially intended for testing the rates of chronometers under different temperatures. Transit instrument by Troughton and Simms, and an 8-in. refr. by Merz.

Kew (Richmond), lat. +51° 28′ 6”, long, o h. I m. 15-1 s. W. The central meteorological obs. of the United Kingdom, with self-registering meteorological and magnetical instruments. Established in 1842 under the auspices of the British Association, afterwards transferred to the Royal Society. Since 1900 a department of the National Laboratory. A photoheliograph was employed at De La Rue’s expense to take daily sun-pictures from 1863 to 1872.

Edinburgh, royal obs., Blackford Hill, lat. +55° 57′ 28-0”, long. oh. 12 m. 44-2 s. W. Founded in 181 1 by subscription; the building on Calton Hill erected in 1818. In 1834 the founders handed ever the administration to the government, and in 1846 the*

ownership was similarly transferred. Since 1834 the obs. has been under the direction of the astronc mer-rcyal for Scotland, who is also professor of practical astronomy in the univ. Professor T. Henderson (1833-1845) began extensive meridian obs. of fixed stars with a mural circle of 6-ft. diameter ana an 8-ft. transit. A 2-ft. s.g. refl. by Grubb was erected in 1872. New obs. erected on Blackford Hill 1893-1895 for the instruments presented by Lord Crawford; 15-in. refr. by Grubb, transit circle by Simms of 8-in. ap., 12-in. s.g. refl. by Browning, two 6-in. refrs. and a very fine library; also the 2-ft. refl. The old obs. on Calton Hill now belongs to the city and is used for instruction; a 21-in. refr. by Wragge has been erected.

Glasgow, univ. obs., lat. +55° 52′ 42-8”, long, c h. 17 m. io-6 s. W. Organized in 1840 by subscription, aided by subsidies from the univ. and the state. Meridian circle by Ertel of 6-in. ap. ; 9-in. refr. by Ccoke, 20-in. s.g. refl. by Grubb with spectrograph. Two catalogues of stars were published by the late director, R. Grant.

Dublin, situated about 4 m. N.W. of Dublin at Dunsink, lat. +53° 23/ I3 I “i l° n g o h. 25 m. 21-1 s. W. Belongs to the univ.; erected in 1785; is under the direction of the ” Andrews professor of astronomy and royal astrcnomer of Ireland.” In 1808 a re- versible meridian circle by Ramsden and Berge of 8-ft. diameter was put up, with which Brinkley observed assiduously till 1827. In 1868 was erected a refr. of nf-in. ap. by Cauchoix (e.g. formerly belonging to and given by Sir J. South), which has been used for researches on stellar parallax. A meridian circle by Pistor and Martins of 6-4-in. ap. was mounted in 1873, an d a 15-in. s.g. refl. for phot, work in 1889. Astronomical Observations and Researches made at Dunsink in 4to parts.

Armagh, lat. +54° 21 12-7”, long, o h. 26 m. 35-4 s. W. Founded and endowed by Archbishop R. Robinson in 1790. Possessed very few instruments until the obs. was enlarged by Archbishop Lord John George Beresford in 1827, when a mural circle and a transit by Jones were provided, with which meridian obs. were made till 1883, published in two star catalogues; 10-in. refr. by Grubb (1885) used for micrometer work.

B. Principal Private Observatories in 1908.

Mr W. Coleman's obs., Buckland, Dover, lat. +51° 8′ 12", long, o h. 5 m. 11 s. E. Cooke 8-in. refr. used for obs. of double stars.

Mr J. Franklin- Adams's obs., Mervel Hill, Hambledon, Surrey, lat. +51° 8′ 1 1 -6", long, o h. 2 m. 502 s. W. Erected 1903; twin equatorial by Cooke with 12-in. and 6-in. lenses, another with 8-in. and 6-in. lenses, used for phot, survey of the heavens with special reference to the Milky Way. The former instrument was used at the Cape in 1903-1904.

Rev. T. E. Espin's obs., Tow Law, Darlington, lat. +54° 43′ 30", long, o h. 7 m. 14 s. W. I7i-in. refl. by Calver, Used since 1888 for spectroscopy and obs. of double stars.

Mr W. H. Maw's obs., Kensington, lat. +51 ° 30′ 2-8", long, o h. o m. 49-4 s. W., 6-in. refr. by Cooke (1886). Also at Outwood, Surrey, lat. +51° 11′ 38", long, o h. o m. 23-7 s. W., 8-in. refr. by Cooke (1896), both used on double stars.

Sir Wilfrid Peek's obs., Rousdon, Lyme Regis, lat. +50° 42′ 38", long, o h. 11 m. 59-0 s. W. Erected by the late Sir Cuthbert Peek in 1885; 6-4-in. refr. by Merz used for obs. variable stars.

Earl of Rosse's obs., Birr Castle, King's county, Ireland, lat. +53° 5′ 47"> long- o h. 31 m. 40-9 s. W. In 1839 the earl made and mounted a refl. of 3-ft. ap. (remounted as equat. in 1876), and in 1845 he completed the celebrated refl. of 6-ft. ap. and 54-ft. focal length. These instruments, particularly the latter, were used from 1848 to 1878 for obs. of nebulae, and revealed many new features in these bodies ; results published in the Phil. Trans, and collected system- atically in. the Trans. Roy. Dubl. Soc. (1 879-1 880). Experiments were made by the present earl tc determine the amount of heat radi- ated from the moon.

Rugby School (Temple Obs.), lat. +52 22′ 7", long, oh.5ra.2s. W. Founded in 1872; 8|-in. refr. by Clark, used for obs. of double stars and of stellar spectra.

Stonyhurst College obs., Lancashire, lat. +53 50′ 40", long, o h. 9 m. 52-7 s. W. An 8-in. refr. by Troughton and Simms, mounted in 1867, used for spectroscopic and micrometric obs.; 15-in. Perry memorial refr. by Grubb mounted in 1893, used chiefly for solar work.

C. Private Observatories now discontinued.

Mr J. G. Barclay's obs., Leyton, Essex, lat. +51 ° 34′ 34", long, o h. o m. 0-9 s. W. In activity from 1862 till 1886, ic-in. refr. by Cooke ; chiefly devoted to double stars.

Mr G. Bishop's obs., South Villa, Regent's Park, London, lat. +51° 31′ 29-9", long, o h. o m. 37-1 s. W. In activity from 1836 to 1861, then removed to Twickenham, and discontinued in 1874; had a 7-in. refr. by Dollond, with which Mr J. R. Hind discovered ten minor planets and several comets, and constructed maps of stars near the ecliptic.

Mr R. C. Carrington's obs., Redhill, lat. +51° 14′ 25-3", long, o h. o m. 41 -3 s. W. Established in 1 854 ; had a 4|-in. refr. and transit circle of 5-in. ap. (now at Radcliffe Obs.) . With the latter a catalogue of the positions of 3735 stars within 9° of the pole, with the former regular obs. of sun-spots, were made from 1853 to 1861.

Mr A. A. Common's obs., Ealing, London, W. (1876-1903). 18-in. s.g. refl. erected in 1876, s.g. refl. of 36-in. ap. (mirror by Calver, mounting by the owner), erected in 1879; chiefly used for celestial photography, replaced by a refl. of 5-ft. ap. in 1889.

Colonel Cooper's obs., Markree Castle, Co. Sligo, Ireland, lat. +54° 10′ 31-8 , long. oh. 33 m. 48-4 s. W. Founded by the late E. J. Cooper, who in 1834 erected a refr. of 13-3-in. ap. (o.g. by Cauchoix). This instrument was from 1848 to 1856 used for determining the approximate places of 60,000 stars near the ecliptic. The obs. was restored in 1874, and the refr. was used for double-star obs. till 1883.

Earl of Crawford's obs., Dunecht, Aberdeenshire, lat. +57° 9′ 36", long, o h. 9 m. 40 s. W. Founded in 1872; 15-in. refr. by Grubb, 12-111 s.g. refl. by Browning, two 6-in. and several smaller refrs. meridian circle by Simms similar to the one at Cambridge, numerous spectroscopes and minor instruments, also a large library and a collection of physical instruments. Chiefly devoted to spectroscopic and cometary obs. Whole equipment presented to Edinburgh obs in 1888.

Mr E. Crossley's obs., Bermerside, Halifax, Yorkshire. Equatorial refr by Cooke of 9-3 in. ap., erected in 1871, chiefly used for obs. of double stars till 1902.

Rev W. R. Dawes's obs., first at Ormskirk (1830-1839), lat. +53 43 18", long, o h. 11 m. 36 s. W.; afterwards at Cranbrook, Kent (1844-1850), lat. +51° 6′ 31", long, o h. 2 m. 10-8 s. E.; then at Wateringbury, near Maidstone, lat. +51° 15′ 12″ long o h. 1 m. o 39-8 s. E., till 1857; and finally at Hopefield, Haddenham] • tA 1 t 5 54 ' long – ° "• 3 m- 43-4 s. W., till Mr Dawes's death in 1868. Possessed at first only small instruments, then succes- sively a 6-in. refr. by Merz, a 7|-in. and an 8i-in. refr. by Clark, and an 8-in. refr. by Cooke, with all of which a great many measures of double stars were made.

Mr W. De La Rue's obs., Cranford, Middlesex, lat. + 51 28′ 57-8″ long o h. 1 m. 37-5 s. W. Established in 1857; with 13-in. refl., devoted to solar and lunar photography. The Kew photoheliograph was employed here from 1858 to 1863 to take daily photographs of the sun. The refl. was presented to the Oxford univ. obs. in 1874

Mr S. Groombridge's obs., Blackheath, lat. +51 ° 28′ 2-7″ long o h. o m. 0-6 s. E. In 1806 Mr Groombridge obtained a new transit circle of 4-ft. diameter by Troughton, with which he up to 1816 observed stars within 50° of the pole forming a catalogue of 4243

Sir William and Sir John Herschel's obs. at Slough near Windsor ™ T 51 ■ 3 ° 2 °"' long> ° h – 2 m – 2 4 s – w – William Herschel settled at Uatchet in 1782, and at Slough in 1786, and erected several 20-ft refl. (of 18-in. ap.), and in 1789 his 40-ft. refl. of 4-ft. ap. The latter was comparatively little used (two satellites of Saturn were discovered with it), while the former served to discover about 2-500 nebulae and clusters, 800 double stars, and two satellites of Uranus as also to make the innumerable other obs. which have made the name of Herschel so celebrated. Sir J. Herschel used a 20-ft. refl at Slough from 1825 to 1833, and from 1834 to 1838 at the Cape of (-.ood Hope, to examine the nebulae and double stars of the whole of the visible heavens, discovering 2100 new nebulae and 5500 new double stars.

Sir o William Huggins's obs., Upper Tulse Hill, London, lat

■& o 4 – 7 ' r g -/2 h ',°, m ; 27 ' 7 s – W – Founded in 1856 ; furnished with an 8-in. refr. (by Clark and Cooke). In 1870 was erected an equat. mounting with a 15-in. refr. and a Cassegrain refl. of 18-in. ap both made by Grubb for the Royal Society. With these Sir W Huggins has made his well-known spectroscopic observations and photographs of stellar spectra. The instruments were transferred to the Cambridge obs. in 1908.

Rev T. J. Hussey's obs., Hayes, Kent, lat. +51 22′ 38″ long o h. o m. 3-6 s. E In activity from about 1825 for about twelve years; 6j-in refr. by Fraunhofer, used for making one of the star maps published by the Berlin Academy.

,.. M j G. Knott's obs., Cuckfield, Sussex (from i860 to 1873 at Woodcraft, lat. +51° o 41", long, o h. o m. 34 s. W., afterwards at Knowles Lodge Cuckfield) ; 7- 3 -in. refr. by Clark, used for observing double stars and variable stars till 1894.

Mr W. Lassell's obs. .from 1840 to 1861 at Starfield near Liver pool, lat. +53 25′ 28", long, o h. 11 m. 38-7 s. W. ; contained refl. of 9- and 24-in. ap. ; employed for obs. of the satellites of Saturn, Uranus and Neptune and of nebulae. The 2-ft. refl. was used at Malta in

5 j~ˆii 53 o/r a 't ft – r r efl – was m °unted in 1861, also at Malta, and used till 1864 for obs. of satellites and nebulae. The eighth satellite of Saturn, the two inner satellites of Uranus and the satellite of Neptune were discovered at Starfield by Mr Lassell

Dr J. Lee's obs., Hartwell, Bucks, lat. +51 48′ 36", long

c ?u™' i 4 -' 3 S – V' In I 8 – 36 Dr Lee came m to possession of Captain Smyth s 6-in refr., and mounted it at Hartwell House where it continued to be occasionally employed for double-star obs. and other work up to about 1864.

Mr F McClean's obs., Rusthall House, Tunbridge Wells. Phot 12-in. refr. and o.g. prism by Grubb used for photos, of star spectra I 095-1904.

Mr R.S. Newall's obs., Gateshead, Newcastle-on-Tyne. A 25-in retr. by Cooke was mounted in 1870 but never used; presented to Cambridge obs. in 1891. .

Dr Isaac Roberts's obs., Crowborough, Sussex, lat. +51 3′ 7", long, o h. o m. 37 s. E. 20-in. s.g. refl. by Grubb (with 7-in. refr.) used for phot, of nebulae and clusters 1 890-1904.

Captain W. H. Smyth's obs., Bedford, lat. +52 8′ 27-6", long o h. 1 m. 52-0 s. W. In 1830 Captain (afterwards Admiral) Smyth erected a 6-in. refr. by Tulley, and observed the double stars and nebulae contained in his " Bedford Catalogue " (1844).

Sir James South's obs., from 1816 to 1824 at Blackman Street, South wark, long, o h. o m. 21-8 s. W. Here South took transit obs.

of the sun, and he and J. Herschel measured double stars, in 1821-1823. In 1826 South erected an obs. at Campden Hill, Kensington, lat. +51° 30′ 12”, long, o h. o m. 46-8 s. W., and procured a 12-in. o.g. from Cauchoix. As Troughton, however, failed to make a satisfactory mounting, the glass was never used till after it had been presented to Dublin obs. in 1862.

Colonel Tomline’s obs. at Orwell Park, Ipswich, lat. +52° o’ 33”, long, o h. 4 m. 55-8 s. E. 10-in. refr. by Merz, used for obs. of comets from 1874 to 1889.

Mr W. E. Wilson’s (d. 1908), obs., Daramona, Streete, Co. Westmeath, Ireland, lat. +53 41′ 12”, long, o h. 29 m. 59 s. W. 2-ft. refl. by Grubb, and other instruments for phot, and solar work.

Lord Wrottesley’s obs., from 1829 to 1841 at Blackheath, lat. +51 28′ 2”, long, o h. o m. 2-7 s. E., where a catalogue of the right ascensions of 13 18 stars was formed from obs. with a transit instruˆment by Jones. In 1842 a new obs. was built at Wrottesley Hall, lat. +52 37′ 2-3”, long, o h. 8 m. 53-6 s. W., where the transit and a 7t m.-refr. by Dollond were mounted. Obs. were here made of doubie stars.

France

Paris, national obs., lat. +48° 50′ 11-2”, long, o h. 9 m. 20-9 s. E. Founded in 1667, when the construction of a large and monumental building was commenced by the architect Claude Perrault. J. D. Cassini’s obs. made the institution for some time the most celebrated obs. existing, but later the activity declined, although several eminent men, as Bouvard and Arago, have held the post of director. Since 1854, when Leverrier assumed the directorship, the obs. have been conducted with regularity, and, together with a number of most important theoretical works, published in the Annals (Observations and Memoirs). The principal instruments now in use are: a meridian circle by Secretan and Eichens, with an o.g. of 9‘5-in. ap another by Eichens (given by M. Bischoffsheim) of 7-5-in. ap., a 15-in. refr. by Lerebours and Briinner, a 12-in. refr. by Secretan and Eichens, a refr. of 9-5-in. ap., an equat. coudee by Henry and Gautier of ioj-in. ap. (1883), another by the same of 23i-in. ap., vis. and phot. (1891), phot. refr. of 13 in. by the same. A s.g. refl. of 4-ft. ap. was mounted in 1875, but has never been used.

In addition to this national obs. there were during the latter half of the 1 8th century several minor obs. in Paris, which only lasted for

some years. Among these were the obs. at College Mazarin, lat. +48 51′ 29”, where Lacaille observed from 1746 to 1750, and from 1754 to 1762, and the obs. at the Ecole Militaire, lat. +48 51′ 5”, built in 1768 and furnished with an 8-ft. mural quadrant by Bird, with which J. L. d’Agelet observed telescopic stars (1782-1785) and which was afterwards (1789-1801), under Lalande’s direction, employed for observing more than 50,000 stars, published in the Histotre Celeste (1801).

Meudon, close to Paris, lat. +48° 48′ 18”, long, o h. 8 m. 55-6 s. E. Founded in 1875; devoted to physical astronomy, and especially to celestial photography, under the direction of J. Janssen; 32-in vis. and 24J-in. phot. refr. by Henry and Gautier, refl. by the same of 39-in. ap. There is a branch obs. on Mont Blanc, where a polar siderostat with 12-in. o.g. and 20-in. mirror is occasionally used for solar and spectroscopic work (15,780 ft. above sea-level).

Montsouris, situated in the Montsouris Park, south of Paris, lat. +48° 49′ 18”, long, o h. 9 m. 20-7 s. E. Founded in 1875 for the training of naval officers.

Juvissy (Seine-et-Oise), private obs. of N. C. Flammarion, lat. +48 41 37 . long, o h. 9 m. 29-0 s. E. 9 J-in. refr. used for obs. ot planets.

Chevreuse (Seine-et-Oise), private obs. of M. Farman fi903), lat, +48 42′ 33”, long, o h. 8 m. 4-5 s. E.; 8-in. refr. by Mailhat used on double stars.

Besancon, chronometric and meteorol. obs., lat. +47 14′ 59-0”, long, o h. 23 m. 57-1 s. E. Opened 1884; 8-in. refr., 12-in. equat, coudee, 7§-in. transit circle, all by Gautier.

Lyons, old obs. in lat. 45° 45′ 46”, long, o h. 19 m. 18 s. E., at the Jesuit college. A new obs. was erected in 1877 at St Genis-Laval, at some distance from the city, lat. + 45°4i’ 4 i-o”, long. oh. 19 m. 8-5 s. h.. Transit circle by Eichens (6-in. o.g.), 12-in. equat. coudee by Gautier, 12-in. siderostat.

Bordeaux, univ. obs. at Floirac, 4 km. N.W. of the city, lat, +44° 50′ 7/3”. long, o h. 2 m. 5-5 s. W. Founded 1882 ; 7-in. transit circle by Eichens, 14-in. refr. by Merz and Gautier, 13-in. phot. refr. by Henry and Gautier.

Marseilles, lat. 43 18′ 17-5”, long, o h. 21 m. 34-6 s. E. Originally belonging to the Jesuits, taken over by the ministry of the navy in

IJ49- It was here that J. L. Pons made his numerous discoveries ot comets. New buildings erected in 1869; 9f-in. Merz. refr.,' refl. of 32-in. ap. s.g. by Foucault, 7|-in. transit circle.

OBSERVATORY

Toulouse, lat. 43 36′ 45-0", long, o h. 5 m. 49-9 s. E. Erected in 1841 (Darquier had observed at the Lyceum towards the end of the 1 8th century); reorganized 1873; 9-in. refr. and 13-in. phot. refr. by Gautier, 13-in. and 32-in. refi.

Nice, lat. + 43° 43′ 16-9", long, o h. 29 m. 12-2 s. E., founded and endowed by R. L. Bischoffsheim for the Bureau de Longitude (1880), situated at Mont Gros, north-east of Nice; a refr. of 30-in. ap. by Henry and Gautier, a meridian circle by Briinner of 8-in. ap., 15-in. refr. and I5f-in. equat. coudee by Henry and Gautier.

Abbadia (3asses Pyrenees), lat. +43°22′52-2″, long. oh. 7m.o-is. W. Founded by A. d'Abbadie, 1858, belongs now to the Paris Acad, of Science. 6-in. transit circle.

Germany

Allona, lat. -f 53 32′ 45-3", long, o h. 39 m. 46-1 s. E. Founded in 1823 by the Danish government to assist in the geodetic operations in Holstein. A meridian circle by Reichenbach (of 4-in. ap.) was procured, to which in 1858 was added a 45-in. equat. by Repsold. The obs. is best known by the fact that the Astronomische Nach-richten, the principal astronomical journal, was published here from 1821 (by H. C. Schumacher up to 1850, by C. F. W. Peters from 1854). The obs. was moved to Kiel in 1874.

Bamberg, lat. + 49° 53′ 6-o", long, o h. 43 m. 33-6 s. E. Founded and endowed by the late Dr K. Remeis, completed 1889; 7§-in. heliometer by Merz and Repsold, ioj-in. refr. by Schroder.

Berlin, royal obs., lat. + 52° 30′ 16-7", long, o h. 53 m. 34-9 s. E. Was erected in 1705 as part of the building of the Academy of Sciences (lat. + 52 31′ 12-5", long, o h. §3 m. 35 s. E.), a very unsuitable locality. A new obs. was built in the southern part of the city, finished in 1835. Refr. by Utzschneider and Fraunhofer of 9-in. ap. (used chiefly for obs. of minor planets), a meridian circle by Pistor and Martins of 4-in. ap., another by the same makers of 7-in. ap.

Berlin, obs. of Urania Society for diffusing natural knowledge, lat.

+ 52 31′ 307”, long, o h. 53 m. 27-4 s. E. Opened 1889; 12-in. refr. by Schott. In the Treptow Chaussee is a popular obs. with a 27-in. refr. by Schott and Steinheil.

Bonn, univ. obs., lat. + 50° 43′ 45-0”, long, o h. 28 m. 23-2 s. E. Finished in 1845 ˆmeridian circle by Pistor of 45-in. ap., heliometer by Merz of 6-in. ap. The former was used by F. W. A. Argelander for observing the stars contained in his three great catalogues. The obs. is chiefly known by the zone obs., made from 1852 to 1859, with a small comet-seeker, on which Argelander’s great atlas of 324,198 stars between the north pole and -2° decl. is founded, continued with a 6-in. refr. from -2° to -31 ° decl. by Schonfeld. A meridian circle of 6-in. ap. by Repsold was mounted in

1882.

Bothkamp, F. G. von Billow’s obs., lat. + 54 12′ 9-6”, long, o h. 40 m. 31-2 s. E. Situated a few miles from Kiel, founded in 1870. With a refr. of 1 1 -in. ap. by Schroder, Dr K. H. Vogel obtained valuable results in 1871-1874; since then it has only been used occasionally.

Bremen- In the third storey of his house in Sandstrasse, H. W. M. Olbers (d.1840) had his obs., lat. + 53° 4′ 38”, long. oh. 35 m. IOs. E. ; though the principal instrument was only a 3f-in. refr. by Dollond, many comets and the planets Pallas and Vesta were discovered and observed here.

Breslau, univ. obs., lat. + 51 ° 6′ 55-8”, long. 1 h. 8 m. 8-7 s. E. Founded 1790. In a small and unsuitable locality; 8-in. refr. by Clark and Repsold erected 1898.

Dresden, Baron von Engelhardt’s obs., lat. + 51 ° 2′ 16-8”, long, o h. 54 m. 54-8 s. E. A 12-in. refr. by Grubb (mounted 1880), used for obs. of comets and double stars, presented to Kasan obs. in 1897.

Diisseldorf (Bilk, originally a suburb, now part of the city), lat. + 51 ° 12′ 25-0”, long, o h. 27 m. 5-5 s. E. Founded and endowed by Professor J. F. Benzenberg (d. 1846); best known by the discovery of twenty-one minor planets by K. T. R. Luther ;“4§-in. refr. by Merz, 7j-in. refr. by Merz and Bamberg.

Gotha. — In 1791 an obs. was founded by Duke Ernest II. at Seeberg, lat. + 50° 56′ 5-2”, long, o h. 42 m. 55-8 s. E., on a hill a few miles from Gotha, the chief instrument being a large transit instrument by Ramsden. Through the labours, principally theo-retical, of F. X. Zach, B. A. von Lindenau, J. F. Encke and P. A.

Hansen, the institution ranked with the first obs. A new obs. was built at Gotha in 1857, lat. + 50° 56′ 37-5”, long, o h. 42 m. 50-4 s. E., which received the instruments from Seeberg, including a small transit circle by Ertel (made in 1824), also a new equat. by Repsold of 4j-in. ap.

Gottingen, univ. obs., lat. + 5i°3i‘48-2”, long. oh. 39m. 46-2 s. E. An obs. had existed here from 1 751, where Tobias Mayer worked. In 1 81 1 a new building was constructed. Besides his mathematical works, K. F. Gauss found time to engage in important geodetic and magnetic obs.; meridian circle by Repsold (4§-in. ap.), another by Reichenbach (4|-in.), 6-in. heliometer by Repsold (1888).

Hamburg, lat. + 53 33′ 7-0”, long, o h. 39 m. 53-6 s. E. Built in the year 1825. With a meridian circle of 4-in. ap. by Repsold, K. L. C. Rumker observed the places of 12,000 stars. A refr. of 10-in. ap. by Merz and Repsold was mounted in 1868. A new obs. is now being built 20 km. south-east of the city, lat. +53° 28′ 46”, long, o h. 40 m. 585 s. E., with a 23|-in. refr by Steinheil and Repsold, 7§-in. transit circle by Repsold, and a 39-in. refl.

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Heidelberg, grand ducal obs., lat. + 49 23′ 54-9”, long, o h. 34 m. 53-1 s. E. On the Konigstuhl hill, 500 ft. above the Neckar; opened 1898. Consists of an astrometric and an astrophysical department The former has a 13-in. refr. by Steinheil and Repsold, an 8-in. refr by Merz and a 6§-in. transit circle by Repsold. The astrophysical department is chiefly devoted to phot, work with a triple equat. with two 1 6-in. lenses and 10-in. guiding telescope, as well as with a 28-in. s.g. refl. by Zeiss.

Jena, univ. obs., lat.+ 50° 55′ 34-9”, long, o h. 46 m. 20-3 s. 7-in. refr. mounted 1891.

Kiel, univ. obs., lat. + 54 20′ 27-6”, long, o h. 40 m. 35-6 s. E. Contains the instruments removed from Altona in 1874, also an 8-in refr. by Steinheil and a 9-in. transit circle by Repsold.

Kbnigsberg, univ. obs., lat. + 54 42′ 50-4”, long. 1 h. 21 m.‘59-os.E. Built 1813; F. W. Bessel was the director till his death in 1846, and nearly all his celebrated investigations were carried out here, e.g. obs. of fundamental stars, zone obs. of stars, researches on refraction, heliometric obs., by which the annual parallax of the star 61 Cygni was first determined, &c. The instruments are a 4-in.

transit circle by Repsold (1841), a 6-in. heliometer by Utzschneider (1829), and a 13-in. refr. by Reinf elder and Repsold (1898).

Landstuhl (Palatinate), private obs. of J. P. H. Fauth lat + 49° 24′ 42′9″. long. oh. 30 m. 16-3 s. E. ; 7A-H1. refr.

*Leipzigˆ univ. obs. Erected 1787-1790 on the ” Pleissenburg “; lat. + 51 20 20-5”, long, o h. 49 m. 30-2 s. E. ; possessed only small instruments, the largest being a 4i-in. refr. by Fraunhofer (1830). In 1861 a new obs. was erected, lat. + 51 ° 20′ 5-9”, long, o h. 49 m 33-9 s. E., with a refr. of 8£-in. ap. by Steinheil, replaced in 1891 by a 12 j”V/ e •’ by Relnfelder an d Repsold, a meridian circle by Pistor and Martins of 6-3-in. ap. and a 6-in. heliometer by Repsold. **

Lihenlhal, near Bremen, lat. + 53° 8′ 25”, long, o h. 36 m. 1 s. E. J. H. Schroters private obs.; from 1779 to 1813. Contained a number of refl. by Herschel and Schrader, the largest being of 27-ft. focal length and 20-in. ap. (movable round the eye-piece), used for physical obs., chiefly of planets. Destroyed during the war in 1813 ; the instruments (which had been bought by the government in 1800) were, for the greater part, sent to the Gottingen obs.

Mannheim lat. + 49 29′ 10-9”, long, o h. 33 m. 50-5 s. E. Built in 1772; very few obs. were published until the obs. was restored in i860, when a 6-in. refr. by Steinheil was procured. In 1879 the obs was moved to Karlsruhe and later to Heidelberg.

Munich, at Bogenhausen, royal obs., lat. + 48 8′ 45-5”, long, o h. 46 m. 26- 1 s. E. Founded in 1 809 ; a transit circle by Reichenbach was mounted in 1824, an 11-in. equat. refr. by Fraunhofer in 1835. The former was used from 1840 for zone obs. (about 80,000) of telescopic stars. 6-in. transit circle by Repsold mounted

1891.

Potsdam, lat. 4- 52 22′ 56-0”, long, o h. 52 m. 15-9 s. E. “Astro-physical obs.,” founded in 1874, devoted to spectroscopic and photo-graphic obs. A refr. by Schroder of 1 ij-in. ap., another by Grubb of 8-in. ap., a refr. by Steinheil and Merz with Q-in. vis. and 13-in. phot o.g. and a refr. by Steinheil and Repsold with 31-in. phot, and 19I-U1! vis. o.g., spectroscopes, photometers, &c. Results are published in 4to vols.

Slrassburg, univ. obs., lat. + 48 35′ 0-3”, long, o h. 31 m. 4.5 s. E. Finished in 1881 ; an 18-in. refr. by Merz; altazimuth of 5§-in. ap., me ™ d , lan clT ? le of 6 i” ln – ap., and a 6J in. orbit sweeper, all

by Repsold.

Wtlhelmshaven (Prussia), naval obs., lat. + 53° 31′ 52-2”, long, oh. 32 m. 35-1 s. E. ; situated on the Jahde to the north of Oldenburg! Founded in 1874; meridian circle by Repsold of 4§-in. ap., and meteorological, magnetical, and tide-registering instruments.

Austria-Hungary

Vienna, imperial and royal obs. On the univ. building an obs. was founded in 1756, lat. + 48 12′ 35-5”, long. 1 h. 5 m. 317s. E. Owing to the unsuitable locality and the want of instruments, very few obs. of value were taken until the obs. was rebuilt in 1826, when some better instruments were procured, especially a meridian circle of 4-in. ap., and a 6-in. refr. by Fraunhofer (mounted in 1832), used for obs. of planets and comets. From 1874 to 1879 a large and magnificent building (with four domes) was erected at Wahring north-west of the city, lat. + 48 13′ 55.4”, long. 1 h. 5 m. 21-5 s. E. In addition to the old instruments, two refrs. were erected, one by Clark of nf-in. ap., another by Grubb of 27-in. ap. (mounted 1882); later a 15-in. equat. coudee by Gautier and a 13-in. phot. refr. by Repsold have been mounted.

Vienna (Josephstadt), private obs. of T. von Oppolzer (d. 1886), lat. + 48° 12′ 53-8”, long. 1 h. 5 m. 25-3 s. E. Established in 1865; 5-in. refr. by Merz, 4-in. meridian circle.

Ftenraa(Ottakring), private obs.of M.vonKuffner,lat. +48°i2‘46-7”, long. I h. 5 m. u-o s. E. Completed 1886; ioj-in. vis. and 6-3-in. phot. refr. by Steinheil and Repsold, 8-in. heliometer and 4|-in. transit circle by Repsold.

Prague, miv. obs., lat. + 50 5′ 15-8”, long, o h. 57 m. 40-3 s. E. Founded in 1751 at the Collegium Clementinum, on a high tower. 6-in. refr. by Steinheil and a 4-in. meridian circle.

*Senftenberg (in the east of Bohemia), lat. + 50° 5′ 55”, long. rtu 5 *?’ 5I S- E ‘ Baron von Senftenberg’s obs. ; established in 1844. Obs. of comets and planets made with small instruments till the owner s death (1858).*

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OBSERVATORY

Olmiltz, tat. +4Q° 35′ 40”, long. 1 h. 9 m. o s. E. E. von Unkrechts-

berg's obs. ; 5-in. refr. by Merz. J. F. Julius Schmidt observed planets and comets from 1852 to 1858.

Kremsmiinster (Upper Austria), lat. +48 3′ 23-1, long, o h. 56 m. 31-6 s. E. Founded in 1748 at the gymnasium of the Bene- dictines. 3-in. meridian circle (mounted in 1827); 5|-in. refr. (mounted in 1856), used for comets and minor planets. Transit circle by Repsold (1907).*

Pola (sea-coast, Austria), naval obs., lat. +44 51′ 48-7", long.

h. 55 m. 23-1 s. E. Founded in 1871; meridian circle of 6-in. ap. by Simms, 6-in. refr. by Steinheil, magnetic and meteorological instruments. Twenty-eight minor planets were discovered herefrom 1874 to 1880 by J. Palisa.

Cracow, univ. obs., lat. +50 3′ 50-0", long. 1 h. 19 m. 51-1 s. E. Possesses only small instruments.

Lussinpiccolo (island of Lussin, Adriatic), private obs. of Madame Manora, lat. +44° 32′ n-o", long, o h. 57 m. 52-4 s. E. Erected 1894; 7-in. refr. by Reinfelder, used for obs. of planets.

Kis Kartal (north-east of Budapest), private obs. of Baron Podmaniczky, lat. +47° 41′ 54-8", long. I h. 18 m. 11-7 s. E. 75-in. refr. by Merz and Cooke.

O'Gyalla (near Komorn, Hungary), lat. +47° 52′ 27-3", long.

1 h. 12 m. 456 s. E. Nicolas de Konkoly's obs., since 1899 a royal obs. Established in 187 1, rebuilt and enlarged in 1876, devoted to astrophysics. A 10-in. s.g. refl. by Browning was in use up to 188 1, when it was disposed of and a 10-in. refr. (o.g. by Merz) mounted in its place; also a 6-in. refr. by Merz, and a 6-3 in. phot. refr.

Kalocza (south of Budapest), lat. +46 31′ 41 ", long. I h. 15 m. 54 s. E. Obs. of the Jesuit college, founded in 1878 by Cardinal Haynald ; 7-in. refr. by Merz, used for solar obs.

Hereny (Vas, Hungary), lat. +47 15′ 47-4", long. I h. 6 m. 24-7 s. E. E. and A. von Gothard's obs. Founded in 1881; 10-in. refl. by Browning.

Switzerland Zurich, lat. +47° 22′ 40-0", long, o h. 34 m. 12-3 s. E. An obs. existed since 1759; handed over to the Polytechnic School in 1855; new building erected in 1863. A 6-in. refr. by Merz and Kern

with two phot, telescopes, two transit instruments, &c. Sun-spots are regularly observed, but the institution is chiefly devoted to educational purposes.

Neuchdtel, lat. -f 46 ° 59′ 51-0”, long, o h. 27 m. 49-9 s. E. Erected in 1858; meridian circle of 4j-in. ap. by Ertel, 6j-in. refr. by Merz.

Geneva, lat. +46° 11′ 59-3, long, o h. 24 m. 36-6 s. E. Founded in 1773; a new building erected in 1830. The obs. has been the centre of the important geodetic operations carried on in Switzerland since 1861. An 11-in. refr. (o.g. by Merz) was presented by the director E. Plantamour in 1880; 4-in. transit circle.*

Spain and Portugal Madrid, royal obs., lat. +40 24′ 29-7”, long, o h. 14 m. 45-1 s. W. I0j-in. refr. by Merz, 8J-in. refr. by Grubb, 6-in. transit circle by Repsold.

Barcelona, obs. of Acad, of Science, lat. +41° 25′ 18”, long, o h. 8 m. 28 s. E. Opened 1904; 15-in. refr., phot, and vis. by Mailhat, 7|-in. transit circle by the same.

Cadiz, naval obs., at San Fernando, lat. +36 27′ 42-0, long, o h. 24 m. 49-3 s. W. Founded in 1797; il-in. refr. by Briinner, 13-in. phot. refr. by Henry and Gautier, 8-in. transit circle by Simms.*

Lisbon, royal obs., lat. +38° 42′ 31-3”, long, o h. 36 m. 44-7 s. W. Founded 1861; I5j-in. refr. by Merz end Repsold, transit circle by Repsold.

Coimbra, univ. obs., lat. +40° 12′ 25-5”, long, o h. 33 m. 43-1 s. W. Founded 1792; 6j-in. transit circle by Repsold, 16-in. refl. by Secretan.

Italy Turin, univ. obs., lat. +45 4′ 7-9”, long, o h. 30 m. 47-2 s. E. Founded in 1790 by the Academy of Science; rebuilt in 1820 on a tower of the Palazzo Madama, 4§-in. transit circle by Reichenbach, 12-in. refr. by Merz; handed over to the univ. in 1865. A new obs. is being erected 6 km. from the city.

Milan, originally obs. of Brera College, now royal obs. of Brera, lat. +45° 27′ 59-2”, long, o h. 36 m. 45-9 s. E. Founded in 1763. The publication of an annual ephemeris from 1775 to 1875 and important theoretical works absorbed most of the time of the directors B. Oriani and F. Carlini, and the instruments were rather insufficient. In 1875 an 8-in. refr. by Merz was mounted, with which G. V. Schiaparelli has made valuable obs. of Mars; 18-in. refr. by

Merz.

Padua, univ. obs., lat. +45° 24′ i-o”, long, o h. 47 m. 29-2 s. E. Founded in 1767. In 1837 a meridian circle by Starke of 4-in. ap. was mounted, with which stars from Bessei’s zones were reobserved; the results were published in five catalogues; 4|-in. refr. by Merz and Starke (1858); Dembowski’s 7-in. refr. mounted in 1881.

Gallarate, near Lago Maggiore, from i860 to 1879, Baron E. Dembowski’s obs. From 1852 to 1859 Baron Dembowski had observed double stars at Naples with a 5-in. dialyte by Plossl and a small transit circle by Starke. From i860 he used a 7-in. refr. by Merz.

Bologna, univ. obs., lat. +44 29′ 47-0”, long, o h. 45 m. 24-5 s. E. Founded in 1724 on a tower of the univ. building. Obs. have only been made occasionally. A 3f-in. meridian circle was mounted in

1846.

Florence. — In 1774 a museum of science and natural history was established, part of which was used as an obs., but very few obs. were made; a new obs., built 1872 at Arcetri, lat. +43° 45′ I4‘4”, long o h. 45 m. 1-3 s. E. 11-in. and 95-in. refrs. by Amici.

Teramo (Abruzzo), private obs. of V. Cerulli, lat. +42° 39′ 27”, long o h. 54 m. 56 s. E. I5j-in. refr. by Cooke.

Rome, obs. of the Roman College, lat. +41 ° 53′ 53-6”, long, o h. 49 m. 55-4 s. E. Established in 1787, taken over by the govern- ment 1879. In 1853 a new cbs. was erected on the unfinished piles of the church of St Ignatius, and furnished with a 9-in. refr. by Merz, a meridian circle by Ertel of 3§-in. ap. (in use from 1842). With these instruments, to which were later added powerful spectroscopes, A. Secchi made a great many obs., chiefly relating to spectrum analysis and physical astronomy; 15-in. refr. by Steinheil.

Rome, obs. of the Capitol, lat. +41 ° 53′ 33 -6”, long, o h. 49 m. 56-35. E. Established in 1848; belongs to the univ.; small transit circle and a 4§-in. refr. by Merz. The latter was used by L. Respighi for obs. of solar prominences.

Rome (Vatican), papal obs., lat. +41 ° 54′ 4-8”, long, o h. 49 m. 49-3S. E. Founded 1890; ioj-in. refr. by Merz, 13-in. phot, and 8-in. vis. refr. and 5§-in. photoheliograph by Henry.

Naples, royal obs., situated at Capo di Monte, lat. +40 51′ 46-3, long, o h. 57 m. 1-7 s. E. Erected in 1812-1819; a 4-in. meridian circle by Reichenbach, a 6|-in. refr. by Reichenbach and Fraunhofer, 6-in. Merz. refr.*

Palermo, royal obs., lat. +38 6′ 44-5”, long, o h. 53 m. 25-9 s. E. Erected in 1790 on a tower of the royal palace. The principal instruments were a reversible vertical circle by Ramsden of 5-ft. diameter with a 3-in. telescope, and a transit instrument of 3-in. ap. With these G. Piazzi observed the stars contained in his celebrated Catalogue of 7641 Stars (1814); this work led him to the discovery of the first minor planet, Ceres, on the 1st of January 1801. The activity was revived in 1857, when a meridian circle by Pistor and Martins of 5-in. ap. was mounted; a 9i-in. refr. by Merz has been used for spectroscopic work.

Catania, lat. +37° 30′ 13-3”, long. 1 h. o m. 20-6 s. E. Founded 1885; 13-in. phot. refr. by Henry and Gautier, and a 13-in. refr. by Merz. The latter is used in summer on a duplicate mounting on Mount Etna, where in 1879-1880 an obs. was built at the ” Casa degl’ Inglesi,” 9650 ft. above the sea, for solar obs.

Greece Athens, lat. +37° 58′ 20, long. 1 h. 34 m. 55-7 s. E. Erected in 1846; founded by Baron Sina. With a refr. of 6|-in. ap. Julius Schmidt (d. 1884) made obs. of the physical appearance of the moon, planets and cornets. Reorganized 1895; I5|-in. refr. by Gautier, 6J-in. transit circle.*

Russia St Petersburg, obs. of the Academy of Sciences, lat. +59° 56′ 29-7”, long. 2 h. 1 m. 13-5 s. E. Founded in 1725, restored in 1803; meridian circle by Ertel. Abolished in 1884. A univ. obs. was founded in 1880, lat. +59° 56′ 32-0”, long. 2 h. 1 m. 11-4 s. E.; 95-in. refr. by Reinfelder and Repsold, used on double stars, during the summer at Domkino, lat. +5° 35-6’, long. I h. 59 m. 25 s. E.

Fulkovo (Pulkowa), Nicholas Central Obs., lat. +59° 46′ 1.8-7, long. 2 h. 1 m. 18-6 s. E. Finished in 1839. Was under the direction of F. G. W. Struve till 1 861, then of his son O. Struve till 1889. The staff consists now of the director, five astronomers, six assistants and computers. The principal instruments are: a transit instru- ment by Ertel of 6-in. ap., a vertical circle by Ertel of 6-in. ap. (the circle of 35-ft. diameter has been redivided by Repsold), — these two instruments are for determining standard places of stars; a meridian circle by Repsold (6-in. ap., 4-ft. circles), used since 1841 to observe all stars north of -15 decl. down to the 6th mag., and all others*

observed by Bradley; a prime vertical transit by Repsold with 6|-in. ap., used for determining the constant of aberration; a 7i-in. heliometer by Merz; a refr. by Merz of i4-9-in. ap. (remounted by Repsold in 1880), which was used by O. Struve to observe double stars; 30-in. refr. by Clark and Repsold, erected 1884, chiefly used for spectrographic work; 13-in. phot. refr. See also Odessa.

Abo (Finland), univ. obs., lat. +6o° 26′ 56-8, long. 1 h. 29 m. 8-3 s.*

E. Founded in 18 19. With the meridian circle by Reichenbach of 4-in._ ap. F. W. A- Argelander observed the 560 stars con- tained in the Abo catalogue. In consequence of a great fire in 1827 the univ. and obs. were moved to Helsingfors.

Helsingfors (Finland), univ. obs., lat. +6o° c/\2-6", long. I h. 39 m. 49-1 s. E. Erected in 1832-1835; furnished with a 7-in. refr. and the instruments from Abo, including a transit instrument by Fraun- hofer of 5|-in. ap. ; 13-in. phot. refr. erected 1890.

Dorpat (Yuriev), univ. obs., lat. +58 22′ 46-8", long. I h. 46 m. 53-2 s. E. Founded in 1808; 1814-1839 under the direction of

F. G. W. Struve. With a meridian circle by Reichenbach obs. were made from 1822 to 1843, chiefly of double stars, while the gj-in. refr. by Fraunhofer was used from 1824 to 1837 for measuring double stars.

OBSERVATORY

Warsaw, univ. obs., lat. +52° 13′ 5-7', long. 1 h. 24 m. 7-3 s. E. Erected in 1820-1824; meridian circle by Reichenbach; 6-in. refr. by Merz.

Moscow, univ. obs., tat. +55° 45′ 19-8", long. 2 h. 30 m. 17-0 s. E An obs. was built in 1825-1832; the present building was erected about 1850; io-7-in. refr by Merz; a meridian circle by Repsold of 5-3-in. ap.; I5|-in. vis.; and phot. refr. by Henry and Repsold.

Kamn univ. obs., lat. +55° 47′ 24-2", long. 3 h. 16 m. 28-9 s. E. founded in 1814, restored in 1842; 6§-in. refr. by Merz; meridian circle by Repsold. New obs. built 1899, lat. +55 ° 50′ 20-o", long. 3 iˆ7 15 m ‘ l6 ‘ 5 s " E- ‘ for Engelhardt's instruments (see Dresden).

Kharkov, univ. obs., lat. +50 o' 9-6", long. 2 h. 24 m. 55-8 s. E.; 6j-in. transit circle by Repsold.

Kiev, univ. obs., lat. +50° 27′ 1 1 -8”, long. 2 h. 2m. o-6 s E. Erected in the years 1840-1845; 9-in. refr. by Merz and Repsold; and a meridian circle.

Odessa, univ. obs., lat. +46 28′ 367”, long. 2 h. 3 m. 2-0 s. E.; 6J vis. and 6-in. phot. refr.

Odessa, branch of Pulkowa obs., lat. +46° 28′ 37-9, long. 2 h. 3 m. 2-2 s. E. Established 1898 for obs. of more southerly standard stars! with a 4-in. transit by Freiberg and a 4-in. vertical circle by Repsold.*

Nikolayev, naval obs., lat. +46° 58′ 21-8”, long. 2 h. 7 m. 53-8 s. E. Erected in 1824; meridian circle by Ertel of 4-in. ap. ; gi-in. refr. bv Repsold. ‘

Sweden, Norway and Denmark

Stockholm, lat +59° 20′ 33-0”, long. 1 h. 12 m. 14-0 s. E., is under the Academy of Sciences. Founded in 1750. Meridian circle by Ertel of 4 5 -in. ap. ; 71-in. vis. and 6J-in. phot. refr. by Repsold.

Upsala, univ. obs., lat. +59° 51′ 29-4”, long. 1 h. 10 m. 30-1 s. E. founded in 1730, but very little was done until the obs. acquired a 9-in. refr. by Steinheil, which was used by Schultz for micrometric obs. of nebulae. 13-in. phot, and 14-in. vis refr. by Steinheil.

Lund, univ. obs., lat +55° 41′ 52-0’, long o h. 52 m. 45-0 s. E. Built in 1866; gˆ-m. refr., o.g. by Merz; meridian circle by Repsold of 6§-in ap. r

Christians univ. obs., lat. +59 54′ 44.0, long, o h. 42 m. 53-6 s.E. Erected in 1831 ; meridian circle by Ertel of 4-in. ap. ; 7-in. refr bv Merz. ‘*

Copenhagen, univ. obs. Founded in 1641 on the top of a high tower, lat. +55° 40′ 53-0”, long, o h. 50 m. 19-8 s. E. The locality was so very unsuitable that O. Romer (the inventor of the transit ! ns . t , r . u . ment and modern equat., d. 1710) established his own obs. at Vndlosemagle, at some distance from the city. A new obs was erected in 1861, lat.+55 4 i’ 12-9’, long, o h. 50 m.l8-7s.E,, furnished with a refr by Merz of 11-in. ap., with which H. L. d’Arrest made obs. ol nebulae, and a meridian circle by Pistor and Martins of 4i-in. ap. Later the refr. was replaced by a 14-in. vis. and 8-in. phot. refr. by Steinheil.

Copenhagen, Urania obs. (private), lat. +55 41′ 19.2″ lone o h. 50

m. 9-1 s. E. Established 1898; 9 |-in. refr. by Cooke.' Holland and Belgium

Leiden univ obs., lat. +52 9′ 20-0", long, o h. 17 m. 56-2 s. E. founded I already in 1632, but the instruments were always very small and hardly any obs. were taken until F. Kaiser became director in 1837. In 1858-1860 a new obs. was erected and furnished with a 7-m. retr. by Merz, and a meridian circle by Pistor and Martins of 6-3-m ap. Later a ioj-in. refr. by Clarke and Repsold has been erected.

Groningen, astron. laboratory of the univ., lat. +53° 13′ 19-1″ long, o h. 26 m 15.2 s. E. Established 1896; instruments for measuring celestial photographs.

Utrecht, univ. obs., lat. +52° 5′ 9-5", long, o h. 20 m. 31-0 s. E. Erected in 1855; 10-in. refr. by Steinheil.

Brussels, royal obs., lat. +50 51′ 10-7," long, o h. 17 m. 28-6 s. E. Erected in 1829-1834 Had a transit instrument by Gambey and a mural circle by Troughton, but the institution was, while under the direction of L. A. J. Quetelet, chiefly devoted to physics and meteoro-

•ˆi" u d 77 /, 6 ""1- refn h y Merz was mounted, and a meridian circle by Repsold and a 15-in. refr. by Cooke provided. A new obs was erected m 1891 at Uccle, lat +50° 47′ 55-5", long, o h. 17 m.' 26-9 s. E., with the instruments from Brussels, a 9-in. phot. refr. bv Grubb, and a 13-in. phot. refr. by Gautier.*

Liege univ. obs., lat. +50° 37′ 6", long, o h. 22 m. 15-4 s. E. ; 10-in. refr. and 7-in. transit circle by Cooke.

United States

Albany (New York), Dudley obs. Erected in 1851-18S6 by subscription, lat. +42 ° ; 3.9′ 495", long. 4 h. 54 m. 59-2 s.W. Refr.by 1-itz of 13-in. ap meridian circle by Pistor and Martins of 8-in. ap New obs erected 1893, lat. +42° 39′ 12-7', long. 4 h. 55 m. 6-8 s. W ; 12-in. refr. by Brashear.

Allegheny (Pa.), lat. +40° 27′ 41-6, long. 5 h. 20 m. 2-9 s. W. Founded in 1859, transferred to the Western Univ. of Penn. (now Umv of Pittsburgh) in 1867; 13-in. refr. by Fitz (improved by Clark) mounted in 1867; instruments for researches on solar energy.*

Amherst (Mass.), lat. +42° 21′ 56-5", long. 4 h. 50 m. 5-9 s. W.

fpunaed ,n 1857 as an annex to Amherst College; 7i-in. refr. by Clark. New building 1903; 18-in. refr. by Clark; 6i-in. transit circle by fistor and Martins.

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Ann Arbor (Michigan), lat. +42 16′ 4 8-8», long 5 h. 34 m. 55-2 s. W. Detroit obs. of the Univ. of Michigan; erected in 1854; meridian circle by Pistor and Martins of 6J in. ap.; I2j-in. refr by Fitz

Berkeley (Cal.), Students' obs. of Univ. of California, lat. +37 52 23-6", long. 8 h. 9 m. 2-7 s. W. ; 8-in. refr.

Cambridge (Mass.), Harvard College obs., lat. +42° 22′ 47.6″ long 4 h. 44 m. 31-0 s. W. Erected in 1839. Refr. of is-in. ap' by Merz, with which W. C. Bond discovered a satellite of Saturn (Hyperion) in 1848, employed by E. C. Pickering for extensive photometric obs. of fixed stars and satellites; a meridian circle by irougnton and Simms of 8|-in. ap., mounted in 1870; 12-in. hori- zontal telescope for photometric obs. of faint stars, I i-in and 8-in ? ra f. e w r S frS – for , P hot – , w ? r ,k; T 5-in. Draper refl. ; 24-in. phot! doublet (Bruce telescope) with which the ninth and tenth satellites of Saturn have been discovered by W. H. Pickering. Branch obs at Arequipa, Peru.

Charlottesville (Va.), obs. of Univ. of Virginia, lat -H8° 2′ 1-2 " long 5 h. 14 m. 5-2 s. W. Founded 1882 ; 26-in. refr. by Clark. '

Chicago (Illinois), Dearborn obs., lat. +41 51′ i-o" long =; h 50 m. 26-8 s.W Attached to North-western Univ., founded in 1862 '• I8i-in. refr. by Clark; 6-in. meridian circle by Repsold. Obs. removed to Eyanston (111) in 1889, lat. +42 ° 3′ 33"4", long. 5 h. 50 m. 42-3 s.W.

Cincinnati (Ohio) In 1842 an obs. was founded by subscription, lat. +39 6 26-5", long 5 h. 37 m. 58-9 s. W., and furnished with a refr. of llf-in. ap. by Merz. In 1873 the obs. was removed to a distance from the city, to Mount Lookout, lat. +39° 8′ io-s" lone 5 h; 37 m. 41-3 s. W.; 5-in. transit circle by Fauth.

Clinton (New York), Litchfield obs. of Hamilton College, lat

7&1 riJ, 5 .-' ? g – 5 i ˆ\ "V. 37-4 s. W. Erected by subscription 1852-1855; retr. of 134 in. by Spencer, employed by C. H. F Peters tor construction of celestial charts, in the course of which work he discovered forty-one minor planets.

Columbia (Mo.), Laws obs. of Univ. of Missouri, lat.4-i8° 56′ si-7 long. 6 h 9 m I8-3 s. W. Founded 1853; 7 J-i n . refr. by Merz ‘*

Columbus (Ohio), State Univ. obs., lat. + 4 o°o’ 1”, lone Sh 12 m

10 s. W. ; 12-in refr. by Brashear and Warner & Swasey

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Flagstaff (Arizona), private obs. of Percival Lowell, lat +35 12 30-5 , long. 7 h 26 m. 44-6 s. W. 7300 ft. above sea-level. Erected 1894; 24-in refr. by Clark; 6-in. vis. by Clark; and 5-in. phot, refr. by Brashear, all used chiefly on planets.

Georgetown (District of CoIumbia),Georgetown Univ. obs.,lat 4-ˆ8° 54 26-7 long. 5 h 8 m. 18-3 s. W. Erected in 1844; 12-in. refr. by Uacey and Saegmuller; 9-111. phot, transit instr.(i89o)by Saegmuller- 6-in. phot, zenith telescope by Brashear.

Glasgow (Missouri), Morrison obs., lat. +39 16′ i6-8″ long 6 h

11 m . i8-i s W Founded in 1876; attached to Pritchett College; I2j-in. refr by Clark; meridian circle by Simms of 6-in. ap.

Hanover (New Hampshire), Shattuck obs. of Dartmouth College, lat. +43 42 15.3’, long 4 h. 49 m. 7-9 s. W. Founded in 1853 9i-in. refr. by Clark; meridian circle by Simms of 4-in. ap

Hastings New York), Professor Henry Draper’s obs., lat. +40 59 25 , long. 4 h 55 m. 29.7s. W. Built in i860; 28-in. refl. by the owner 11-in refr (with photo, lens) by Clark, both used up to the owner s death (1882) for celestial and spectrum photography

Haverford (Pa.), Haverford College obs., lat. +40° o’ 40- 1» lone 5 h. 1 m. 12-7 s. W.; 10-in. refr. by Clark. ‘ 8 ”

Madison (Wisconsin), Washburn obs., lat. +43° 4′ 36-8″ lone

*L r’sˆsˆi 8 ‘ 1 S ; W ;u ?f e ? ted at * he expense of Governor Washburn in 1878 ; belongs tp the Univ. of Wisconsin ; meridian circle by Repsold of 4-8-in. ap.; 15I-H1. refr. by Clark.*

Mount Hamilton (Cal), Lick obs. of the Univ. of California, lat. +37 20 25-6 Jong. 8 h. 6 m. 34-9 s. W., about 4250 ft. above sea-level. Erected in pursuance of the will of James Lick (1796-1876), opened in 1888; 3 6;in. refr. by Clark with 33-in. phot, lens, 12-im

refr. by Clark, 6J-in. transit circle by Repsold, 3-ft. s.g. refl bv Common, several phot, telescopes, a second 3-ft. s.g. refl. by Brashear with spectrograph. The 5th satellite of Jupiter was discovered by E. E. Barnard in 1892 with the 36 in., and the 6th and 7th by C. D. Pemne on photos with the refl. in 1904-190=;

*Mount Wilson (Cal.). Solar obs. of the Carnegie Institution, lat. +A 54 ,}% 59-5 , long. 7 h. 52 m. 14-3 s . W. Erected 1904; 60-in. refl. ; Snow telescope with 30-in. coelostat and 24-in. concave OTdered™ * spectroheli °g ra P h – A I0O-in, refl. has been*

New Haven (Connecticut), Winchester obs. of Yale College lat +41 19 22-3 ,Iong. 4 h.51 rn. 4 o ; 6 s. W. An obs. had existed since 1830 possessing a 9-in. refr. by Clark and a meridian circle by Ertel. In 1881 the obs. was rebuilt, and furnished with a 6-in. heliometer by Repsold, and an 8-m. refr. by Grubb.

New York, L. M. Rutherfurd's obs., lat. +40 4 V 48V lone 4 h. 55 m. 56-6 s .w.; 13-in. refr. by Rutherfurd and Fitz, used for celestial photography. Presented to Columbia College in 1884.

VS °fe M^' ,at> +^° > 5 2 3- ' '• Ion g- 4 h. 55 m. 5 !-6 s. Northfield (Minnesota), Goodsell obs. of Carieton College, lat

*rRsJ 2 s 7 i * I lo "u g – V?- \ 2 m -,35' 8 s – W. Erected in 1878, enlarged 1887 , 8i-m. refr bv Clark with phot. o.g. ; 16-in. refr. by Brashear; 44-in. transit circle by Repsold.*

Philadelphia, Flower obs. of Univ. of Pennsylvania, lat. +39° 5 8 ' 2 ' 1 "< long- 5«. im. 6-6s. W. Founded 1895; 18-in. refr., 4-in. transit circle and 4-in. zenith telescope, all by Brashear and Warner & Swasey.

Poughkeepsie (N.Y.), Vassar College obs., lat. +41 ° 41' 18", long. 4h. 55m. 33-7 s. W. Founded 1865; 12-in. refr. by Fitz and Clark; small transit circle.

Princeton (New Jersey). Attached to Princeton Univ. are two obs. — the " Observatory of Instruction," lat. +40 20' 57 -8", long. 4I1. 58 m. 37-6 s. W., erected in 1877, and furnished with a 9|-m- refr. by Clark; and the Halsted obs., lat. +40 20' 55-8", long. 4 h. 58 m. 39-4 s. W.,in which a 23-in. refr. by Clark was mounted in 1883.

Rochester (New York), Warner obs., lat. +43° 9′ i6-8”, long. 5h. 10m. 2i-8s. W. Erected by H. H. Warner in 1879-1880; 16-in. refr. by Clark. Discontinued 1895.

■ *Washington (D.C.), U.S. naval obs., lat. +38 53′ 38-8”, long. 5h. 8m. 12-is. W. Organized in 1842; obs.begun in 1845 with a mural circle by Troughton & Simms of 4 in., a transit instrument by Ertel of 5‘3-in. ap., and a 9-6-in. refr. by Merz. A meridian circle by Pistor & Martins of 8-5-in. ap., mounted in 1865, and used for observing standard stars and planets; a 26-in. refr. by Clark, mounted in 1873 — with this instrument A. Hall discovered the satellites of Mars in 1877. A new obs. on Georgetown Heights was opened in 1893, lat. +38 55′ 14-0”, long. 5 h. 8m. i5-8s. W.; in addition to the old instruments there is a 40-i’t. photoheliograph of 5-in. ap., 6-in. transit circle built of steel by Warner & Swasey, 5-in. steel altazimuth by same, 12-in. refr. by Clark.*

Washington (D.C.), astrophysical obs. of the Smithsonian Institution, lat. +38° 53′ 17-3”, long. 5h. 8 m. 6-2 s. W. Founded 1890 for the study of solar radiation ; 20-in. siderostat, spectrobolometer, &c.

Williams Bay (Wis.). — Yerkes obs. of Univ. of Chicago, lat. +42 34′ I2-6”, long. 5h. 54m. I3-2S. W. Opened 1897; 40-in. refr. by Clark and Warner & Swasey; also a 12-in. refr., 24-in. refl., 10-in. phot. refr.

Wiltiamstown (Mass.), lat. +42°42′49”, long. 4h. 52m. 33”5s. W. Founded in 1836; 7j-in. refr. by Clark; meridian circle of 4§-in. ap. by Repsold, mounted in 1882 in the Field Memorial obs., lat. +42 ° 40′ 30”, long. 4h. 52 m. 50 s. W. Canada

Ottawa, Dominion obs., lat. +45° 23’, long. $h. 3m. W. Founded 1902; 15-in. refr. by Brashear; 8-in. transit circle by Simms; 16-in. coelostat.

Mexico

Tacubaya. — National obs. erected 1882, lat. +19 24′ 17-5”, long. 6h. 36m. 46-7 s. W., 7600 ft. above sea-level; 15-in. refr. by Grubb, 13-in. phot. refr. by Henry & Gautier, 8-in. transit circle by Simms.

South America

Santiago (Chile), national obs., lat. —33° 26′ 42-0”, long. 4 h. 42 m. 46-2 s. W. In 1849 the U.S. government sent an astrono- mical

expedition to Chile. When the expedition returned in 1852, the government of Chile bought the instruments — a 6-in. meridian circle by Pistor and Martins, a 65-in. refr. by Fitz, &c. New building erected i860; 9§-in. refr. by Merz and Repsold, 13-in. phot. refr. by Gautier.

Arequipa (Peru). — Branch of Harvard College obs., lat. — 16 24', long. 4 h. 45 m. 30 s. W., 8060 ft. above sea-level; 24-in. Bruce refr. by Clark; and 13-in. Boyden telescope for phot, charts and spectra of faint stars; 4-in. transit photometer extends the Harvard photometry to the south pole.

Rio de Janeiro (Brazil), national obs., lat. —22° 54′ 23-7", long.

2 h. 52 m. 41-4 s. W. Founded in 1845; no work done until 1 87 1. The principal instruments are a meridian circle by Gautier of 7|-in. ap., an altazimuth, a 9j-in. refr. by Henry, &c.

Cordoba (Argentina), national obs., lat. — 31 25′ I5-4", long. 4 h. 16 m. 45-1 s. W. Erected in 1871 under the direction of B. A. Gould till 1883. With a meridian circle by Repsold of 5-in. ap. 105,000 zone obs. of stars between — 23 and — 8o° decl. have been made; iij-in. phot. refr. by Clarke; 5-in. phot. refr. by Henry & Gautier.

La Plata (Argentina), univ. obs., lat. — 34 54′ 30-3", long.

3 h. 51 m. 37-0 s. W. Founded 1883; 18-in. equat. coudee, 13-in. phot. refr. and transit circle, all by Henry & Gautier.

Africa Cape of Good Hope, royal obs., lat. —33° 56′ 3-5", long. 1 h. 13 m. 54-8 s. E. Founded in 1820; erected in 1825-1829, about 3i m. from Cape Town. Obs. were begun in 1829 with a transit instru ment by Dollond of 5-in. ap. and a mural circle by Jones. Thomas Maclear undertook to verify and extend the arc of meridian measured by N. L. de Lacaille in 1751-1753, which work occupied the obs. staff for a number of years. In 1849 a 7-in. refr. by Merz was mounted, and in 1855 a new meridian circle, a facsimile of the one at Greenwich, superseded the older instruments. Maclear was suc- ceeded by E. J. Stone (1870 to 1879), who devoted himself and the staff to obs. of stars, embodied in a catalogue of 12,441 stars for the epoch 1880. Under Sir David Gill (1879-1906) a 7-in. heliometer by Repsold has been used since 1887 for researches on solar parallax

and annual parallax of stars, while a complete review of the heavens has been made south of —23° decl. with a 6-in. phot. Dallmeyer lens.

A 24-in. phot, and 18-in. vis. refr. by Grubb, with 24-in. o.g. prism, and a 6-in. transit circle by Simms have also been mounted.

Besides the obs. of Lacaille in Cape Town (lat. —33° 55′ 16-1”, long. I h. 13 m. 41 s. E.), another temporary obs. at Feldhausen, lat. —33° 58′ 56-6”, long. 1 h. 13 m. 51 s. E„ 6 m. from Cape Town, deserves to be mentioned. It was here that Sir John Herschel observed nebulae and double stars from 1834 to 1838 with a refl. of l8i-in. ap.

Durban (Natal). — Government obs., lat. — 29 50′ 46-6”, long. 2 h. 4 m. 1-2 s. E. Erected in 1882; 8-in. refr. by Grubb.

Mauritius.— 1 Royal Alfred obs., lat. — 20 5′ 39”, long. 3 h. 50 m. 12-5 s. E. Chiefly meteorological, but solar photos regularly taken.

Helwdn (near Cairo, Egypt), khedivial obs., lat. +29° 51′ 34”, long. 2 h. 5 m. 22 s. E. Erected in 1904; 30-in. refl. used for photos of southern nebulae.

Algiers (Algeria), national obs., lat. +36° 47′ 50”, long, o h. 12 m. 8-4 s. E. Founded 1881 ; 12-5-in. equat. coudee and 13-in. phot, refr. by Gautier; transit circle.

St Helena, lat. —15° 55′ 26-0”, long, o h. 22 m. 54-6 s. W. With a transit instrument and mural circle. M. Johnson observed the places of 606 southern stars from 1829 to 1833.

India

Madras, government obs., lat. +13 4′ 8-o”, long. 5 h. 20 m. 59-6 s. E. In 1831 a transit instrument and a mural circle, both of 3j-in. ap., by Dollond, were mounted, and with these T. G. Taylor observed 11,000 stars. A meridian circle by Simms was mounted in 1858, and in 1865 an 8-in. refr., also by Simms, was put up; with the former 5303 stars were observed in 1862-1887. New obs. built in 1899 at Kodaikanal (Palni Hills), lat. +10° 13′ 50”, long. 5 h. 9 m. 52 s. E., 7700 ft. above sea-level; 12-in. siderostat and phot. vis. o.g. by Cooke, spectroheliograph, &c. To be devoted chiefly to solar physics.

Poona. — Obs. of College of Science. Founded 1888. 12-in. siderostat by Cooke with 9-in. lens by Grubb; i6J-in. s.g. refl. by Grubb, with 6-in. refr. by Cooke; spectroscopes, &c, chiefly for solar work.

Dehra. Dun. — Obs. of Indian Survey, lat. +30° .18′ 51 ′8”, long. 5 h. 12 m. 13-5 s. E. Regular solar phot. work.

Trivandrum, lat. + 8° 30′ 32”, long. 5 h. 7 m. 591s. E. Founded by the raja of Travancore in 1836. No astronomical work done, but valuable magnetical and meteorological obs. were made by J. A. Broun from 1852 to 1863.

Japan

Tokyo, univ. obs., lat. +35° 39′ 17-5”, long. 9 h. 18 m. 58-0 s. E. ; 5j-in. transit circle by Repsold; 6j-in. refr.

China

Zo-Se (near Shanghai), Jesuit obs., lat. +31° 5′ 47 – i”, long. 8 h. 4 m. 44-7 s. E. Erected 1899-1901 ; 16-in. vis., and phot. refr. for solar and stellar phot, and spectroscopic work.

Hong Kong, lat. +22° 18′ 13-2”, long. 7 h. 36 m. 41-9 s. E. In 1883 the colonial government established an obs., furnished with a 6-in. refr., a small transit instrument and full equipment of magnetical and meteorological instruments.

Turkestan

Tashkent, lat. +41° 19′ 31 •4”, long. 4 h. 37 m. io-8 s. E. Founded in 1874; 6-in. refr. and meridian circle by Repsold; 13-in. phct. refr. by Henry & Repsold.

Australia

Paramatta (New South Wales), lat. — 33 48′ 50’, long. 10 h. 4 m. 6-3 s. E. Erected by Sir Thomas Macdougall Brisbane in 1821; handed over to the New South Wales government in 1826; furnished with a transit instrument and a mural circle by Troughton. From about 1835 no obs. seem to have been made; the obs. was abolished in 1855.

Sydney (New South Wales), lat. ,—33° 51′ 41 •i”, long. 10 h. 4 m. 49-5 s. E. Founded in 1855; furnished with the instruments from Paramatta. In 1861 a 7|-in. refr. by Merz, and in 1874 an uj-in. refr. by Schroder, were mounted; in 1879 a meridian circle by Simms of 6-in. ap. was acquired, and later a 13-in. phot. refr. by Grubb.

Windsor (New South Wales), lat. —33° 36′ 28-9”, long. 10 h. 3 m. 21-7 s. E. Private obs. of Mr J. Tebbutt, who has devoted himself since 1 861 to discoveries and obs. of comets, using a 42-in. refr. by Cooke and an 8-in. refr. by Grubb.

Melbourne (Victoria) . — Founded in 1 853 at Williamstown, lat. — 37 ° 52′ 7-2”, long. 9 h. 39 m. 38-8 s.E. In 1 861 a meridian circle by Simms of 5-in. ap. was mounted, but in 1863 the obs. was removed to Mel- bourne, lat. —37° 49′ 53-2”, long. 9 h. 39 m. 54-0 s. E. ” The great Melbourne telescope,” a Cassegrain refl., equatorially mounted, of 4-ft. ap., made by T. Grubb, was erected in 1869, but very little used ; there is also an 8-in. refr. by Cooke and a 13-in. phot. refr. by Grubb.

Adelaide (South Australia), lat. —34° 55′ 33-8”, long. 9 h. 14 m. 21-3 s. E. In operation since 1 861; has been gradually improved, and contains now an 8-in. refr. by Cooke and a 6-in. transit circle by Simms.

Perth (West Australia), lat. -31 9 57′ 7-4”, long. 7 h. 43 m. 21 7 s. E. Founded 1897; 13-in. phot, and 10-in. vis. refr. by Grubb; 6-in. transit circle by Simms.

Authorities. — In addition to their Annals or Observations, the leading national obs. (Greenwich, Paris, Washington, &c.) publish annual reports stating the nature of the work and changes in personnel and instruments. Short reports from nearly all British obs. are annually published in the February number of the Monthly Notices R. Astr. Soc, and from most German and some other continental obs. in the Vierteljahrsschrift d. astr. Gesellschaft. Since 1889 much information about American obs. is given in the Publications of the Astr. Soc. of the -Pacific. Stroobant’s Les Observatoires aslronomiques et les astronomes (Brussels, 1907) gives a convenient summary of the personnel and equipment of all existing obs. (J. L. E. D.)

OBSIDIAN, a glassy volcanic rock of acid composition. A similar rock was named obsianus by medieval writers, from its resemblance to a rock discovered in Ethiopia by one Obsius. The early printed editions of Pliny erroneously named the discoverer Obsidius, and the rock obsidianus. Rhyolitic lavas frequently are more or less vitreous, and when the glassy matter greatly predominates and the’ crystals are few and inconspicuous the rock becomes an obsidian; the chemical composition is essentially the same as that of granite; the difference in the physical condition of the two rocks is due to the fact that one consolidated at the surface, rapidly and under low

pressures, while the other cooled slowly at great depths and under such pressures that the escape of the steam and other gases it contained was greatly impeded. Few obsidians are entirely vitreous; usually they have small crystals of felspar, quartz, biotite or iron oxides, and when these are numerous the rock is called a porphyritic obsidian (or hyalo-liparite). These crystals have, as a rule, very good crystalline form, but the quartz and felspar are often filled with enclosures of glass.

All obsidians have a low specific gravity (about 2.4) both because they are acid rocks and because they are non-crystalline. Their lustre is vitreous except when they contain many minute crystals; they are then velvety or even resinous in appearance. Thin splinters and the sharp edges of fragments are transparent. Black, grey, yellow and brown are the prevalent colours of these rocks. In hand specimens they often show a well-marked banding which is sometimes flat and parallel, but may be sinuous and occasionally is very irregular, resembling the pattern of dama- scened steel. In such cases the molten rock cannot have been homogeneous, and as it flowed along the ground the different portions of it were drawn out into long parallel streaks. As the rock was highly viscous and the surface over which it moved was often irregular the motion was disturbed and fluctuating; hence the sinuous and contorted appearance frequently assumed by the banding. When crystals are present they generally have their long axes parallel to the fluxion.

Even when conspicuous and well formed crystals are not Visible in the rock there is nearly always an abundance of minute imperfect crystallizations (microlites, &c). They are often so small that high magnifications may be necessary to ascertain their presence. Some are globular and others are rod-shaped; they may be grouped in clusters, stars, rosettes, rows, chains or swarms of indefinite shape. In banded obsidians these microlites may be numerous in some parts but few or absent in others. The larger ones polarize light, have angular outlines like those of crystals, and may even show twinning and definite optical properties by which they can be identified as belonging to felspar, augite or some other rock-forming mineral. The variety of their shapes is endless. Some are black, very thin and curved like threads or hairs (trichites); often a group of these is seated on a small crystal of augite or magnetite and spreads outwards on all sides. Others have hollow or funnel-shaped ends and are constricted at the middle like a dice cup. In some rocks small rod-like microlites are grouped together in a regular way to form growths which resemble fir branches, fern leaves, brushes or networks, in the same manner as minute needles of ice produce star-

like snow crystals or the frost growths on a window pane.

These crystallites (q.v.) show that the glassy rock has a tendency to crystallize which is inhibited only by the very viscous state

of the glass and the rapidity with which it was cooled. Another type of incipient crystallization which is excessively common in obsidian is spherulites (q.v.), or small rounded bodies which have a radiating fibrous structure. They are of globular shape, less frequently irregular or branching, and may be elongated and cylindrical (axiolites). In some obsidians from Teneriffe and Lipari the whole rock consists of them, so closely packed together that they assume polygonal shapes like the cells of a honeycomb. In polarized light they show a weak grey colour with a black cross, the arms of which are parallel to the cobwebs in the eye- piece of the microscope and remain stationary when the section is rotated. Often bands of spherulites alternate with bands of pure glass, a fact which seems to indicate that the growth of these bodies took place before the rock ceased to flow.

As cooling progresses the glassy rock contracts and strain phenomena appear in consequence. Porphyritic crystals often contract less than the surrounding glass, which accordingly becomes strained, and in polarized light may show a weak double refraction in a limited area surrounding the crystal. Minute cracks are sometimes produced by the contraction; they are often more or less straight, but in other cases a very perfect system of rounded fissures arises. These surround little spherules of glass which are detached when the rock is struck with a hammer. There may be concentric series of cracks one within another. The minute globular bodies have occasionally a sub-pearly lustre, and glassy rocks which possess this structure have been called perlites (q.v.). If we take a thin layer of natural Canada balsam and heat it strongly for a little time most of the volatile oils are driven out of it. When it cools it becomes hard, but if before it is quite cold we plunge it into cold water a very perfect perlitic structure will arise in it. Occasionally the rounded cracks extend from the matrix into some of the crystals especially those of quartz which have naturally a conchoidal fracture. If the matrix, however, is originally crystalline it does not seem probable that perlitic structure can develop in it. Hence it may be regarded as diagnostic of rocks which were vitreous when they consolidated.

In mineralogical collections rounded nodules of brown glass, varying

from the size of a pea to that of an orange, may often be seen labelled marekanite. They have long been known to geologists and are found at Okhotsk, Siberia, in association with a large mass of perlitic obsidian. These globular bodies are, in fact, merely the more coherent portions of a perlite; the rest of the rock falls down in a fine powder setting free the glassy spheres. They are subject to considerable internal strain, as is shown by the fact that when struck with a hammer or sliced with a lapidary's saw they often burst into fragments. Their behaviour in this respect closely resembles the balls of rapidly cooled, unannealed glass which are called Prince Rupert's drops. In their natural condition the marekanite spheres are doubly refracting, but when they have been heated and very slowly cooled they lose this property and no longer exhibit any tendency to sudden disintegration.

Although rocks wholly or in large part vitreous are known" from very ancient geological systems, such as the Devonian, they are certainly most frequent in recent volcanic countries. Yet among the older rocks there are many which, though finely crystalline, have the chemical composition of modern obsidians and possess structures, such as the perlitic and spherulitic, which are very characteristic of vitreous rocks. By many lines of evidence we are led to believe that obsidians in course of time suffer devitrification, in other words they pass from the vitreous into a crystalline state, but as the changes take place in a solid mass they require a very long time for their achievement, and the crystals produced are only of extremely small size. A dull stony-looking rock results, the vitreous lustre having entirely disappeared, and in microscopic section this exhibits a cryptocrystalline structure, being made up of exceedingly minute grains principally of quartz and felspar. Often this felsitic devitrified glass is so fine-grained that its constituents cannot be directly determined even with the aid of the microscope, but chemical analysis leaves little doubt as to the real nature of the minerals which_ have been formed. Many vitreous rocks show- alteration of this type in certain parts where either the glass has been of unstable nature or where agencies of change such as percolat- ing water have had easiest access (as along joints, perlitic cracks and the margins of dikes and sills). Obsidians from Lipari often

have felsitic bands alternating with others which are purely glassy. In Arran there are pitchstone dikes, some of which are very com- pletely vitreous, while others are changed to spherulitic felsites more or less silicified. The pitchstone of the Scuir of Eigg is at its margins characterized by a dull semi-opaque matrix which seems to be the result of secondary devitrification. In the same way artificial glass can be devitrified if it be kept at a temperature slightly below the fusing point for some days. Window glass exposed to alkaline vapours often shows a thin iridescent surface film which is supposed to be due to crystallization; the same change is found in pieces of Roman glass which have been dug out of the ruins of Pompeii.

Obsidians occur in many parts of the world along with rhyolites and pumice. In Europe the best-known localities for them are the Lipari Islands, Pantellaria, Iceland and Hungary. Very fine obsi- dians are also obtained in Mexico, at the Yellowstone Park, in New Zealand, Ascension and in the Caucasus. Included in this group are some rocks which are more properly to be regarded as vitreous forms of trachyte than as glassy rhyolites (Iceland), but except by chemical analyses they cannot be separated. It is certain, however, that most obsidians are very acid or rhyolitic. The dark, semi- opaque glassy forms of the basic igneous rocks are known as tachy- lytes. The typical obsidians exhibit the chemical peculiarities of the acid igneous rocks (viz. high percentage of silica, low iron, lime and magnesia, and a considerable amount of potash and soda).

The chemical composition of typical obsidians is shown by the following analyses : —

SiO_2 .

Al_2O_3 .

FeO.

Fe_2O_3 .

CaO.

MgO.

K_2O.

Na_2O.

H_2O.

I. Yellowstone Park . II. Iceland III. Mexico

7470 75-28 73-63

13-72

10-22 14-25

0-62

l-8o

I-OI

4-24

0-78

i-8i tr.

0-14 0-25 1-42

4-02 2-44 4-39

3-90

5-53 4-61

0-62 0-23

Obsidian, when broken, shows a conchoidal fracture, like that of glass, and yields sharp-edged fragments, which have been used in many localities as arrow-points, spear-heads, knives and razors. For such purposes, as also for use as mirrors, masks and labrets, it was extensively employed, under the name of itztli, by the ancient Mexicans, who quarried it at the Cerro de las Navajas, or " Hill of Knives," near Timapan. The natives of the Admiralty Islands have used it for the heads of spears. By the ancient Greeks and Romans obsidian was worked as a gem-stone; and in consequence of its having been often imitated in glass there arose among collectors of gems in the 18th century the practice of calling all antique pastes " obsidians." At the present time obsidian is sometimes cut and polished as an ornamental stone, but its softness (H = 5 to 5-5) detracts from its value. Certain varieties, notably some from Russia, possess a beautiful metallic sheen, referable to the presence of either microscopic fissures or enclosures. The substance known as moldavite, often regarded as an obsidian, and the so-called obsidian

bombs, or obsidianites, are described under Moldavite. ' (J. S. F.)

OBSTETRICS, the science and art of midwifery (Lat. obstetrix, a midwife, from obstare, to stand before). Along with Medicine and Surgery, Obstetrics goes to form what has been called the Tripos of the medical profession, because every person desiring to be registered under the Medical Acts must pass a qualifying examination alike in medicine, surgery and midwifery. The term Gynaecology (q.v.), which has come to be applied to the study of the diseases of the female generative system, in its primary sense includes all that pertains to women both in health and disease. Obstetrics, or midwifery, is more specially that part of the science of gynaecology which deals with the care of a pregnant woman and the ushering of her child into the world.

Tokology — the doctrine of parturition— is the most distinctive sphere of interest for obstetricians, and here their activities bring them into a closer approximation to the work of surgeons. As a science it demands a study of the phenomena of labour, which in their ordered succession are seen to present three distinct stages: one of preparation, during which the uterus dilates sufficiently to allow of the escape of the infant; a second, of progress, during which the infant is expelled; and a third, of the extrusion of the after-birth or placenta. In each of the stages analysis of the phenomena reveals the presence of three elements which are known as the factors of labour, viz. the powers or forces which are engaged in the emptying of the uterus; the passages or canals through which the ovum is driven; and

the passenger or body that is being extruded. The mechanism of labour depends on the balance of these factors as they become adjusted to each other in the varying phenomena of the several stages. The diversities that are met with in different labours even of the same woman have led to their being classified into different groups. A natural labour is commonly defined as one where the child presents by the head and the labour is terminated within twenty-four hours. From this it is obvious that no case ■of labour can be defined at its onset. The relation of the factors may warrant a favourable expectation; but until the labour is completed, and completed within a reasonably safe period, it cannot be classed as natural. The element of time has this importance, that it is found that, apart from all accidents and interferences, the mortality both to mother and child becomes greater the longer the duration of the labour. Hence lingering or tedious labours, in which the child still presents with the head, but is not expelled within twenty-four hours after the onset of labour-pains, are properly grouped in a separate class, although they

are terminated without operative interference. In the class of preternatural labours, where the head comes last instead of first, there are two subdivisions, according as the child presents by the breech and feet, or lies transversely as a cross-birth, and has usually to be delivered artificially. Operative or instru- mental labours vary according as the pro- cedures adopted are safe in principle to mother and child, such as turning and the application of the midwifery forceps; or as they involve damage to the infant in the various forms of embryotomy; or are more dangerous to the mother, as in the Caesarean section and symphysiotomy. A final class of labours includes the cases where some complication or anomaly arises and becomes a source of danger, independently of disturbances of the mechanism or of any operative interference. These complex labours are due to complications that may be maternal, such as haemorrhage and convulsions; or foetal, such as twins or prolapse of the umbilical cord. To cope with these anomalies an obstetrician requires all the resource of a physician and all the dexterity of a surgeon.

The interest of obstetricians in their patients does not end with the birth of the children, even after natural labours. The puerpera is still a subject of care. The uterus, that during its nine months' evolution had been increasing enormously in all its elements, has in six weeks to undergo an involution that will restore it to its pregravid condition. The allied organs share in their measure in the change, all the systems of the body feel the influence, and especially the mammary glands take on their function of providing milk for the nutriment of the new-born infant. A patient with some latent flaw in her constitution may pass the test of pregnancy and labour with success, only to succumb during the puerperium. Of patients who become insane in connexion with child-bearing, a half manifest their mental disorder first during the days or weeks immediately succeeding their confinement, and numbers more whilst they are suckling their infants. A woman may have had an easy labour, and may have been thankful at the time for help from a hand that she did not know to be unclean; three days later germs left by that hand may have so multiplied within her that she is in mortal danger from septicaemia. The management of the puerperal patient requires not only the warding off of deleterious influences, but the watching of the normal processes, because slight deviations in these, undetected and uncorrected now, may become later a source of lifelong invalidism. It remains further to be noted that to obstetricians belong the earliest stages of pediatrics in their care of the new-born child. In some old works practitioners of this branch of the profession are described as bfufrahoToiMi, because their first business was to cut

the umbilical cord. The causes of the high death-rate among infants, whether due to ante-natal, intra-natal or neo-natal conditions, come under their observation. They have charge of the whole wide field of the hygiene, pathology and therapeutics ! of infancy.

19

OBSTETRICS

9 6 3

Historical Sketch. — The origin of midwifery is lost in the mists] of human origins. The learned Jean Astruc, who gave a lead to higher critics in their analysis of the Pentateuch by pointing out the presence of Elohistic and Jehovistic elements, exercised his imagination in fancying how the earliest pair comported them- selves at the birth of their first child, and especially how the husband would have to learn what to do with the placenta and umbilical cord. His speculations are not in the least illumi- native. The Mosaic writings let us see women of some experience and authority by the side of a Rachel dying inlabour,oraTamar giving birth to twins, and superintending the easy labours of Hebrew slaves in Egypt. The Ebers Papyrus (1550 B.C.), which Moses may have studied when he grew learned in all the wisdom of the Egyptians, is the oldest known medical production. It contains prescriptions for causing abortion, for promoting labour, for curing displacements of the uterus, &c. But there is no indication as to how labours are to be managed, and with regard to the child there are only auguries given as to whether it will live or die, according, e.g. as its first cry after it is born sounds like nl or bd .

The story of the rise and progress of midwifery is intimately bound up with the history of medicine in general. The obstet- rician, looking for the dawn of his science, turns like his fellow- workers in other medical disciplines to the Hippocratic writings (400 B.C.). Now the father of medicine was not an obstetrician. As with Egyptians and Hebrews, the skilled attendants on women in labour among the Greeks were also women. But since nothing that concerned the ailments of humanity was foreign to Hippocrates, there are indications in the writings that are accounted genuine of his interest in the disorders of females — in their menstrual troubles, in their sterility, in their gestation symptoms, and in their puerperal diseases; his oath forswears the use of abortifacients, and he recommends the use of sternutatories to hasten the expulsion of the after-birth. In the Hippocratic writings that are supposed to be products of his

*followers, some of these subjects are more fully dealt with; but whilst the physician is sometimes called in to give advice in difficult labours, so that he can describe different kinds of presentation and can speak of the possibility of changing an unfavourable into a favourable lie of the infant, it is usually only with cases where the child is already dead that he has to deal, and then he tells how he has to mutilate and extract it. So these writings furnish us with the earliest account of the accoucheur's armamentarium, and let us see him possessed of a y.a.xaxpuiv — a knife or perforator for opening the head; a mtcTpov — a comminutor for breaking up the bones; and a eKKvarrip — an extractor for hooking out the infant. The classical writers of Greece give the same impres- sion as to the primitive stage of obstetrics. Women, like the mother of Socrates, have the charge of parturient women. Where divine aid is sought, goddesses are invoked to facilitate the labour. Gods or men are only called in where graver inter- ference is required, as when Apollo rescued the infant Aesculapius by a Caesarean section performed on the dying Semele. Some midwives are known to history, and extracts from the writings of one Aspasia are embedded in the ivorks of later authors. In the great medical school of Alexandria, when the science of human anatomy began to take shape, Herophilus rendered a service to obstetrics in giving a truer idea of the anatomy of the female than had previously prevailed; other physicians give ev'dence of their interest in midwifery and the diseases of women, and some experience was gradually being acquired and trans- mitted through the profession until we find from Celsus (in the reign of Augustus) that when surgeons were called in to help the attendant woman they could sometimes bring about the delivery, without destroying the infant, by the operation of turning. In the 2nd century Soranus wrote a work on midwifery for the guidance of midwives, in which for the first time the uterus is differentiated from the vagina and instruction is given for the use of a speculum. A contemporary, Moschion, wrote a guide for midwives which, with that of Soranus, may be said to touch the high-water mark of archaic midwifery. It is written in the form of question and answer, was much prized at the time xix. 31**

of the Renaissance, and was used as the basis of the first obstetric work that issued from a printing-press. Philumenos wrote a treatise of some value at the same epoch, but it is only known from the free use made of it by subsequent writers, such as Aetius in the beginning of the 6th century. Like Oribasius, who preserved in his compilation the work of Soranus, Aetius draws largely on preceding writers. His treatises on female diseases constitute an advance on previous knowledge, but there is no progress in midwifery, though he still

makes mention of turning. This operation has disappeared from the pages of Paulus Aegineta, an 8th-century author, the last to treat at length of obstetrics and gynaecology ere the night of the dark ages settled down on the Roman world, and it is not heard of again till a millennium had passed. During the centuries when the progress of medicine was dependent on the work of the Arabian physicians, the science of obstetrics stood still. We are curious to know what Rhazes and Avicenna in the 9th and 10th centuries have to say on this subject. But they know little but what they ' have learned from the Greek writers, and they show a great tendency to relapse to the rudest procedures and to have recourse to operative interferences destructive to the child. Interest attaches to the work of Albucasis in the 12 th century, in that he is the first to illustrate his pages with figures of the knives, crushers and extractors that were employed in their gruesome practices, and that he gives the first history of a case of extra- uterine pregnancy.*

We come down to the 16th century before we begin to see any indication of the development of obstetrics towards a place among the sciences. Medicine and surgery profited earlier by the intellectual awakenings of the Renaissance and the Re- formation. In anatomical theatres and hospital wards associated with universities great anatomists and clinicians began to discard the dogmas of Galen, and to teach their pupils to study the body and its diseases with unprejudiced minds. But the practice of midwifery was still among all people in the hands of women, and when in 1513 Eucharius Roesslin of Frankfort published a work on midwifery, it bore the title Der schwangeren Frawen und hebammen Rosengarten. Translated into English by Thomas Raynald with the altered title, The Birth of Mankynd, it is mainly compiled from Moschion, and the Soranus and Philumenos fragments of Oribasius and Aetius, and is intended as a guide to pregnant women and their attendant nurses. It was illustrated with fanciful figures of the foetus in utero that were reproduced in other works of later date — as in the RosengaHen of Walter Reiff of Strassburg in 1546 and the Hebammenbuch of Jacob Rueff of Zurich in 1554, the latter of which appears in English dress as The Expert Midwife. The greatest impulse to the progress of midwifery was given in the middle of the 16th century by the famous French surgeon Ambroise Pare, who revived the operation of podalic version, and showed how by means of it surgeons could often rescue the infant even in cases of head presentation, instead of breaking it up and extracting it piecemeal. He was ably seconded by his pupil Guillemeau, who translated his work into Latin, and at a later period himself wrote a treatise on midwifery, an English translation of

which was published in 16 12 with the title Child- Birth; or, The Happy Deliverie of Women. The close of the 1 6th century is rendered further memorable in the annals of midwifery by the publication of a series of works specially devoted to it. Three sets of compilations, containing extracts from the various writers on obstetrics and gynaecology from the time of Hippocrates onwards, were published under the designa- tion of Gynaecia or Gynaeciorum — the first edited by Caspar Wolff of Zurich in 1566, the second by Caspar Bauhin of Basel in 1586, and the third by Israel Spach of Strassburg in 1597. Spach includes in his collection not only Pare's obstetrical chapters, but the Latin translation of the important Traitte nouveaux de I'hysterotomotokie, published by the French surgeon Francis Rousset in 1581, which is the first distinct treatise on an obstetric operation, and advocates the performance of Cae- sarean section on living women with difficult labours. From this time onwards evidence accumulates of the growing interest

of members of the medical profession, and more especially of surgeons, in the practice of midwifery, and after the middle of the 17th century they began to publish the records of their experiences in special treatises. The most important of these writers were French — as Mauriceau, Viardel, Paul Portal, Peu and Dionis. The work of Mauriceau, which first appeared in 1668, is specially interesting from its having been translated into English in 1672 by Hugh Chamberlen, who in his preface made the then incredible statement that his father, his brothers, and himself had long attained to and practised a way to deliver women in difficult labours without hooks, where other artists used them, and without prejudice to mother or child. Many years had still to elapse before the secret of the Chamberlens leaked out. In the course of this century some women who had large experience in midwifery appeared as authors. Thus in England Jane Sharp in 1671 wrote The Midwives' Booh, or the whole art of Midwifery discovered; in Germany, Justine Siegemund, in 1690, Die Chur-Brandenburgische Hojf-Wehe- mutter; and earlier and better than either, in France, Louise Bourgeois in 1626 published Observations sur la sterilite et maladies des femmes. Perhaps they were beginning to feel that there was some need to assert their power, for it was during this century that parturient ladies began to call in men to attend them in natural labours. According to Astruc, Madame de la Valliere wished her confinement to be kept secret, and Louis XIV., in June 1663, sent for Jules Clement, the court surgeon, to

superintend the delivery. This was accomplished successfully. The king gave him the title of accoucheur. Clement afterwards attended the dauphiness and other court ladies, and went thrice to Madrid to assist at the confinement of the queen of Philip IV. Up till this epoch physicians and surgeons had only been sum- moned to the lying-in room by midwives who found themselves at the end of their resources, to give help in difficult cases where the child was usually dead and the mother often moribund. Now that it began to be a fashion for women in their ordinary confinements to be under the surveillance of a physician, it became possible for men with their scientific training to study the normal phenomena of natural labour, and through the medium of the printing-press to communicate the results of their observation and experience to their professional brethren. Hence the books of the men already referred to, and of others that appeared later, such as the Traits complet des accouchemens of De la Motte, r72i, which is a storehouse of acute observations and wise discussion of obstetric measures. In other countries than France physicians and surgeons began to take up midwifery as a speciality and not as a subsidiary part of their practice, of which they were somewhat ashamed (le Bon, one of the writers whose work is found in Bauhin's Gynaecia, says: " Haec ars viros dedecet "), and it was in Holland that a work was produced that has earned for its author the designation of the Father of Modern Midwifery. Heinrich van Deventer, who practised as an ob- stetrician at the Hague along with his wife (a Vroedvrow, as he was a Vroedmeester), published in 1696 a preliminary treatise called Dageraat {Aurora) der Vroedvrowen, and in 1701 he followed it up by a more complete second volume, of which the Latin edition that came out simultaneously with the Dutch has a title beginning Operationes Chirurgicae Novum Lumen Exhibentes Obstetricanlibus. It has the supreme value of being the first work to give a scientific description of the pelvis, and to take some steps towards the development of the mechanism of labour. The " obstetricantes " for whom Deventer wrote are both men and women. In the early part of the 18th century women had still the main and often the sole charge of their parturient sisters; but the practice of having a doctor to superintend or to supersede the midwives kept spreading among the classes who could afford to pay the doctor's fee; and by the time Deventer's treatise was doing its educational work in an English translation, as The Art of Midwifery Improved, in 17 16, the doctors were getting into their hands the " harmless forceps " with which a living child could be extracted without detriment to the mother, in conditions where formerly her child's life was sacrificed and her own endangered. This life-saving instrument was invented

in London, but by a man not of English birth. The Huguenot, William Chamberlen, fled from Paris to escape the St Bartholo- mew massacres, carrying with him to. Southampton his wife, his two sons, and a daughter. William Chamberlen seems to have been a surgeon, and his descendants through four genera- tions had large and lucrative practices in London. The eldest son Peter, who was old enough when he came to England to be able to attest the birth and baptism of a younger brother, is, on good grounds, credited with being the inventor of the forceps, which for a century was kept a secret among brothers, sons and grandsons. Hugh, indeed, a great-grandson of William, and the translator of Mauriceau, had offered to sell the family secret for 10,000 crowns; but his failure to effect delivery in a test case that Mauriceau put to him led the profession to believe that he was a boastful quack. Palfyn of Ghent, when in Paris in 1723, putting a work on anatomy through the press, laid before the Academy of Science a pair of forceps, which was figured in Heister's surgery in 1724. He has thus the honour of first laying before the profession a midwifery forceps. But his implement was ill-constructed, and never came into general use. Meanwhile the knowledge that the Chamberlens were really possessed of a serviceable instrument must have stimulated other practitioners. Perhaps a colleague with a keen eye may have got sight of it on some occasion, or an intelligent midwife had been able to describe the " tongs " which she had seen one of the family apply. In 1734 Dr Edward Hody published a record of Cases in Midwifery that had been written by Mr William Giffard, " surgeon and man-midwife." The dates range from January 1724 to 1 73 1. Amongst the cases are several where he effected the delivery by means of the forceps — " extractor," he calls it — of which a figure is given; and when Edmund Chapman, who practised first at Halstead and afterwards in London, published his Treatise on the Improvement of Midwifery in 1733, he speaks of the use of the forceps as " now well known to all the principal men of the profession both in town and country."

In the course of the 18th century the development of mid- wifery in the hands of medical men made greater strides than in all the preceding ages. The progress was accelerated by the establishment of chairs of midwifery in the universities of various countries, Edinburgh taking the lead in the appointment of a professor in 1726, and Strassburg coming closely after in 1728. In Strassburg the chair had the advantage of being at once associated with a clinical service. Lecturing was carried out, moreover, by men who were devoting themselves as specialists in midwifery and the diseases of women and infants, and were succeeding in developing lying-in institutions for

the benefit of poor women in labour that became schools of instruction both for midwifery nurses and for medical students. Two new operations came during this epoch to enhance the powers of the obstetrician, viz. symphysiotomy, first introduced by Sigault in Paris; and the induction of premature labour, first carried out by Macauley in London in circumstances described by Denman in the preface to his Midwifery. William Hunter in London, Sir Fielding Ould in Dublin, Roderer in Gottingen, Camper in Amsterdam, Baudelocque in Paris, Saxtorph in Copenhagen, and many other authors contributed to progress by their atlases and their books. But there are three whose names stand out pre-eminently because of the influence they exerted on the whole obstetric world — Levret, Smellie and Bo;r. Kilian, in his vidimus of the history of midwifery, calls Levret " one of the greatest masters in the department that ever lived." Of Smellie he says: "Inferior to Levret in nothing, he excels him in much." Boer he characterizes as " the most meritorious and important of German obstetricians." Levret improved the construction of the forceps, and widened the sphere of their applicability; Smellie worked in the same direction, and furnished, moreover, descriptions and illustrations of natural and morbid labours that are of classical value; and Boer first clearly placed pregnancy (which Mauriceau, e.g. had spoken of as "a nine months' disease") and parturition in the category of physiological processes that might be hindered rather than

helped by the pragmatical interferences of meddlesome mid- wives.

Throughout the 19th century midwifery continued to advance, gynaecology grew into a special department with an extensive literature, the mechanism of labour developed under the clinical observations of men like Nagele and the study of such frozen sections of cadavera as were made by Braune, the indications for interference became more clear and the methods of inter- ference more simple and safe, and a whole realm of antenatal pathology and teratology was added to the domain of science, while practitioners learned the art of saving premature and delicate infants by the use of the incubator and proper alimenta- tion. Every advance in all the cognate sciences was appreciated and applied for the advancement of obstetrics. But there are two achievements which will make the 19th century for ever memorable in the annals of midwifery — the abolition of the pains of labour and the arrest laid on mortality from

the so- called puerperal fever. In February 1847 Sir J. Y. Simpson, choosing a case where he had to deliver by turning, put the patient asleep with ether. Seeing that the uterine contractions continued, though the attendant pain was abolished, he pro- ceeded to administer ether in cases of natural labour, and in November of the same year demonstrated the virtues of chloro- form, and so furnished the most serviceable anaesthetic, not only to the obstetrician in the lying-in room, but to the surgeon on the battlefield, and to the general practitioner in his everyday work. Ignaz Philipp Semmelweiss, assistant in the maternity hospital of Vienna, was struck and saddened with the appalling mortality that attended the delivery of the women under his care, as many as one (in some months three) out of every ten of the puerperae being carried out dead. He observed that the mortality was much higher in the wards allotted to the tuition of students than in those set apart for the training of nurses. In the spring of 1847 he saw at the post-mortem examination of a young colleague who had died of a poisoned wound, that the appearances were the same as he had too often had occasion to see at the post-mortem examinations of his puerperae. He ordered that every student who assisted a woman in her labour must first wash his hands in a disinfectant solution of chloride of lime, and in 1848 already the mortality was less in the students' than it was in the nurses' wards. Thus the first light was shed on the nature of the mischief of which multitudes of puerperal patients perished, and the first intelligent step was taken to lessen the mortality. When, some twenty years later, Lister had applied the bacteriological principles of Pasteur with beneficent results to surgery, obstetricians gladly followed his lead, and the 19th century beheld added to the comfort of anaesthetic midwifery the confidence of midwifery antiseptic and even aseptic.

The most exhaustive treatise on the earlier history of midwifery is von Siebold, Versuch einer Geschichte der Geburtshiilfe (Berlin, 1839). (A. R. S.)

OCALA (a Seminole word for green or fertile land), a city and the county-seat of Marion county, Florida, U.S.A., in the N. central part of the state, about 100 m. S.W. of Jacksonville. Pop. (1900) 3380, (1905) 4493, of whom 2467 were negroes, (1910) 4370. It is served by the Seabord Air Line and the Atlantic Coast Line railways. About 6 m. E. is Silver Spring, the largest and best known of the springs of Florida. Its basin is circular, about 600 ft. in diameter; it is about 65 ft. in depth, and its waters are remarkable for their transparency and refractive powers. According to the estimate of Dr D. G. Brinton, the spring discharges more than 300.000,000 gallons of water daily, its

outflow forming what is known as Silver Spring Run, 9 m. long, emptying into the Oklawaha river and navigable by small river steamers. For the drainage and sewerage of the city a subterranean river whose source and mouth are unknown is utilized. The city is the seat of the Emerson Memorial and Industrial Home (Methodist Episcopal) for negro girls. Ocala was settled in 1845, but its development dates from 1880, when it was first chartered as a city. In December 1890 it was the meeting-place of the National Convention of the Farmers'

Alliance, which promulgated a statement of political principles generally known as the "Ocala Platform." (See Farmers' Movement.)

OCASA, a town of central Spain, in the province of Toledo; on the extreme north of the tableland known as the Mesa de Ocana, with a station on the railway from Aranjuez to Cuenca. Pop. (1900) 6616. The town is surrounded by ruined walls, and in it are the remains of an old castle. In one of its parish churches is the chapel of Nuestra Sefiora de los Remedios, in which Ferdinand and Isabella were married in 1469. Ocana is the Vicus Cuminarius of the Romans, and was the dowry that El Motamid of Seville gave his daughter Zaida on her marriage with Alphonso VI. of Castile (1072-1109). Near Ocana, on the 19th of November 1809, the Spanish under their Irish general Lacy were routed by the French under Joseph Bonaparte and Marshal Soult.

OCARINA, a wind instrument invented in Italy, which must be classed with musical toys or freaks, although concerted music has been written for it. The ocarina consists of an earthen- ware vessel in the shape of an egg with a pointed base and a tube like a spout in the side, which contains the mouthpiece. There are usually 10 holes in the front surface of the instrument, nine for fingers and thumb and a vent hole; the newer models have 8 holes and two keys. By half covering the holes the semi- tones are obtained.

O'CAROLAN (or Carolan), TURLOGH (1670-1738), Irish bard, son of John O'Carolan, a farmer, was born at Newtown, near Nobber, in the county of Meath. The family is said to have belonged to the sept of MacBradaigh, and the bard's great-grandfather was a chieftain. The O'Carolans forfeited their estates during the civil wars, and Turlogh's father settled at Alderford, Co. Roscommon, on the invitation of the family of M'Dermott Roe. In his eighteenth year he became blind from smallpox. He received special instruction in music, and used to wander with his harp round the houses of the surrounding gentry, mainly in Connaught. The famous song Receipt

for Drinking may be responsible for the allegation that he was addicted to intemperate drinking, but Charles O'Conor (1710-1791), the antiquary, who had personal knowledge of him, gives him a good character in private life. The number of Cardan's musical pieces, to nearly all of which he composed verses, is said to exceed two hundred. He died on the 25th March 1738, and was buried at Kilronan.

His poetical Remains in the original Irish, with English metrical translations by Thomas Furlong, were printed in Hardiman's Irish Minstrelsy (1831). Many of his songs were preserved among the Irish MSS. in the British Museum.

OCCAM, WILLIAM OF (d. c. 1349), English schoolman, known as Doctor invincibilis and Venerabilis inceptor, was born in the village of Ockham, Surrey, towards the end of the 13th century. Unattested tradition says that the Franciscans persuaded him while yet a boy to enter their order, sent him to Merton College, Oxford (see G. C. Brodrick, Memorials of Merion College, p. 194), and to Paris, where he was first the pupil, afterwards the successful rival, of Duns Scotus. He probably left France about 13 14, and there are obscure traces of his presence in Germany, in Italy, and in England during the following seven years. It has generally been held that in 1322 he appeared as the provincial of England at the celebrated assembly of the Franciscan order at Perugia, and that there he headed the revolt of the Franciscans against Pcne John XXII, ; but, according to Little {English Historical Revicv, vi. 747), the provincial minister on this occasion was William of Not- tingham. Probably, however, Occam was present at the assembly. His share in this revolt resulted in his imprison- ment, on the charge of heresy, for seventeen weeks in the dungeons of the papal palace at Avignon. He and his companions — Michael of Cesena, general of the order, and Bonagratia — managed to escape, and found their way to Munich, where they aided Louis IV. or V. (q.v.) of Bavaria in his long contest with the papal curia. It was for Occam's share in this controversy) that he was best known in his lifetime. Michael of Cesena

died in 1342, and Occam, who had received from him the official seal of the order, was recognized as general by his party. The date of his death and the place of his burial are both uncertain. He probably died at Munich in 1349.

William of Occam was the most prominent intellectual leader in an age which witnessed the disintegration of the old scholastic realism, the rise of the theological scepticism of the later middle ages, the great contest between pope and emperor which laid the foundations of modern theories of government, and the quarrel between the Roman curia and the Franciscans which showed the long-concealed antagonism between the theories of Hildebrand and Francis of Assisi; and he shared in all these movements.

The common account of his philosophical position, that he reintroduced nominalism, which had been in decadence since the days of Roscellinus and Abelard, by teaching that universals were only flatus vocis, is scarcely correct. The expression is nowhere found in his writings. He revived nominalism by collecting and uniting isolated opinions upon the meaning of universals into a compact system, and popularized his views by associating them with the logical principles which were in his day commonly taught in the universities. He linked the doctrines of nominalism on to the principles of the logic of Psellus, which had been introduced into the West in the Summulae of Peter of Spain, and made them intelligible to common under- standings. The fundamental principles of his system (see Scholasticism) are that " Essentia non sunt multiplicanda praeter necessitatem " (" Occam's Razor "), that nouns, like algebraical symbols, are merely denotative terms whose mean- ing is conventionally agreed upon (suppositio), and that the destructive effect of these principles in theological matters does not in any way destroy faith (see the Centilogium Theologicum, Lyons, 1495, and Tractatus de Sacramento Allaris).

In the Opus nonaginta dierutn (1330) (written in reply to John XXII.'s libellus against Michael of Cesena), and in its successors, the Tractatus de dogmatibus Johannis XXII. papae (1333-1334), the Compendium errorum Johannis XXII. papae (1335-1338) and in the Defensorium contra errores Johannis XXII. papae (1335-1339), Occam only incidentally expounds his views as a publicist; the books are mainly, some of them entirely, theological, but they served the purpose of the emperor and of his party, because they cut at the root of the spiritual as well as of the temporal supremacy of the pope. In his writing Super potestate summi pontificis octo quaeslio- num decisiones (1339-1342) Occam attacks the temporal supremacy of the pope, insists on the independence of kingly authority, which he maintains is as much an ordinance of God as is spiritual rule, and discusses what is meant by the state. His views on the inde- pendence of civil rule were even more decidedly expressed in the Tractatus de jurisdictions imperatoris in causis matrimonialibwi, in which, in

spite of the medieval idea that matrimony is a sacrament, he demands that it belongs to the civil power to decide cases of affinity and to state the prohibited degrees. By 1343 there was in circulation his great work the Dialogus (see Goldast ii. 398-957), in which he attempted to present his views in a complete summary. It consists of three parts. The first is the De fautoribus hereticorum, and deals with the pope as arbiter in the matter of heresy. The second part is the refutation of the doctrines of John XXII. (see above treatises). The third was to be in nine sections, of which the first and second sections alone remain to us. It is probable that the Opus nonaginta dierum and the Compendium errorum were intended to form part of the work. His last work, De Electione Caroli IV., restates his opinions upon temporal authority and adds little that is new.

In all his writings against Pope John XXII. (q.v.), Occam inveighs against the pope's opinions and decisions on the value of the life of poverty. The Compendium errorum selects four papal constitutions which involved a declaration against evangelical poverty, and insists that they are full of heresy. Occam was a sincere Franciscan, and believed with his master that salvation was won through rigid imitation of Jesus in His poverty and obedience, and up to his days it had always been possible for Franciscans to follow the rules of their founder within his order. John XXII., however, condemned the doctrine and excommunicated its supporters, some of whom were so convinced of the necessity of evangelical poverty for a truly Christian life that they denounced the pope when he refused them leave to practise it as Antichrist. After Occam's days the opinions of Francis prevailed in many quarters, but the genuine Franciscans had no place within the church. They were Fraticelli, Beghards, Lollards or other confraternities unrecognized by the church and in steady opposition to her government.

Beside the theological and political works above quoted, Occam

wrote Summa Logices (Paris, 1488, Oxford, 1675) commentaries on Porphyry's Isagoge, on the Categoriae, De Interpretatione and Elenchi of Aristotle. These latter were printed in 1496 at Bologna, and entitled Expositio Aurea super totam artemveterem; Quaestiones in quattuor libros sententiarum (Lyons, 1495).

There is no good monograph on Occam. For an account of his logic, see Prantl, Ceschichte der Logik (1855-1870) ; for his philosophy, see Stockl, Geschichte der Philosophic des Mittelalters (1864-1866), vol. ii. , for his publicist writings, see Riezler, Die literarischen Wider- sacher der Papste zur Zeit Ludwig des Baiers (1874). See also

T. M Lindsay's article on " Occam and his connexion with the Reformation," in the Brit. Quart. Review (July, 1872). Among ancient documents consult Denifle and Chatelain's Chartularium Universitatis Parisiensis, vol. ii. pt. i. (Paris, 1887); Wadding's Annates Minorum (ed. Fonseca, vols. 7 and 8, Rome, 1733). For a list of Occam's works, see Little's Grey Friars, pp. 225-234.

(T. M. L.) OCCASIONALISM (Lat. occasio, an event), in philosophy, a term applied to that theory of the relation between matter and mind which postulates the intervention of God to bring about in the one a change which corresponds to a similar change in . the other. The theory thus denies any direct interaction between matter and mind. It was expounded by Geulincx and Male- branche to avoid the difficulty of Descartes's dualism of thought and extension, and to explain causation. Thus mind and matter are to Geulincx only the " occasional " causes of each other's changes, while Maleb ranch e, facing further the epistemo- logical problem, maintains that mind cannot even know matter, which is merely the " occasion " of knowledge. • OCCLEVE (or Hoccleve), THOMAS (1368-1450?), English poet, was born probably in 1368/9, for, writing in 1421/2 he says he was fifty-three years old {Dialog, i. 246). He ranks, like his more voluminous and better known contemporary Lydgate, among those poets who have a historical rather than intrinsic importance in English literature. Their work rarely if ever rises above mediocrity; in neither is there even any clear evidence of a poetic temperament. Yet they represented for the 15th century the literature of their time, and kept alive, however faintly, the torch handed on to them by their "maister" Chaucer, to whom Occleve pays an affectionate tribute in three passages in the De Regimine Principum. What is known of Occleve's life has to be gathered mainly from his works. At eighteen or nineteen he obtained a clerkship in the Privy Seal Office, which he retained on and off, in spite of much grumbling, for about thirty-five years. He had hoped for a benefice, but none came; and in 1399 he received instead a small annuity, which was not always paid as regularly as he would have wished. " The Letter to Cupid," his first poem to which we can affix a date, was translated from L'Epistre au Dieu a" Amours of Christine de Pisan in 1402, evidently as a sort of antidote to the moral of Troilus and Cressida, to some MSS. of which we find it attached. " La Male Regie," one of his most readable poems, written about 1406, gives some interesting glimpses of his " misruly " youth. But about 1410 he settled down to married life, and the composition of moral and religious poems. His longest work, The Regement of Princes or De Regimine Principum, written for Prince Hal shortly before his

accession, is a tedious homily on the virtues and vices, imitated from Aegidius de Colonna's work of the same name, from the supposititious epistle of Aristotle, known as the Secreta secretorum, and the work of Jacques de Cessoles (fl. 1300) englished later by Caxton as The Game and Playe of Chesse. It is relieved by a proem, about a third of the whole, containing some further reminiscences of London tavern and club life, in the form of dialogue between the poet and a beggar. On the accession of Henry V. Occleve turned his muse to the service of orthodoxy and the Church, and one of his poems is a remonstrance addressed to Oldcastle, calling upon him to " rise up, a manly knight, out of the slough of heresy." Then a long illness was followed for a time, as he tells us, by insanity. His " Dialog with a Friend," written after his recovery, gives a na'ive and pathetic picture of the poor poet, now fifty-three, with sight and mind impaired, but with hopes still left of writing a tale he owes his good patron, Humphrey of Gloucester, and of translating a small Latin I treatise, Scite Mori, before he dies. His hopes were fulfilled in

his moralized tales of " Jereslaus' Wife " and of " Jonathas," both from the Gesta Romanorum, which, with his " Learn to die," belong to his old age. After finally retiring from his privy seal clerkship, he was granted in 1424 sustenance for life in the priory of Southwick, Hants, on which, with his former annuity, he appears to have lived till about the middle of the century. A " Balade to my gracious Lord of Yorke " probably dates from 1448 or later.

The main interest for us in Occleve's poems is that they are characteristic of his time. His hymns to the Virgin, balades to patrons, complaints to the king and the king's treasurer, versified homilies and moral tales, with warnings to heretics like Old- castle, are illustrative of the blight that had fallen upon poetry on the death of Chaucer. The nearest approach to the realistic touch of his master is to be found in Occleve's " Male Regie." But these pictures of 15th-century London are without even the occasional flash of humour that lightens up Lydgate's London Lackpenny. Yet Occleve has at least the negative virtue of knowing the limits of his powers. He says simply what he means, and does not affect what he does not feel. A Londoner, to whom the country was evidently a bore, he has not afflicted us with artificial May mornings; and it is doubtful whether a single reference to nature can be found among his poems. He has yet another distinction among his contemporaries: he wrote no

allegory. Whether we ascribe it to his lack of " engine," or to the influence of Chaucer when in his later years he had dis- covered the limitations of this poetic form, we cannot but be grateful to the poet who has spared us. As a metrist Occleve is also modest of his powers. He confesses that

Fader Chaucer fayn wolde han me taught, But I was dul and learned lite or naught ;

and it is true that the scansion of his verses seems occasionally to require, in French fashion, an accent on an unstressed syllable. Yet his seven-line (or rime royale) and eight-line stanzas, to which he limited himself, are perhaps more frequently reminiscent of Chaucer's rhythm than are those of Lydgate.

A poem, " Ad beatam Virginem," generally known as the " Mother of God," and once attributed to Chaucer, is copied among Occleve's works in MS. Phillipps 8151 (Cheltenham), and may thus be regarded as his work. Occleve found an admirer in the 17th century in William Browne, who included his " Jonathas " in the Shepheards Pipe (1614). Browne added a eulogy of the old poet, whose works he intended to publish in their entirety (Works, ed. W. C. Hazlitt, 1869, ii. 196-198). In 1796 George Mason printed six Poems by Thomas Hoccleve never before printed...; " De Regimine Prin- cipum " was printed for the Roxburghe Club in i860, and by the Early English Text Society in 1897. See Dr F. J. Furnivall's intro- duction to Hoccleve' s Works; I. The Minor Poems, in the Phillipps MS. 8151, and the Durham MS. III. 9 (Early English Text Society, 1892). (W. S. M.)

OCCULTATION (from Lat. occultare, the frequentative of occuler e, to hide), in astronomy, the hiding of one celestial body by another passing in front of it; commonly the passage of the moon or of a planet between the observer and a star or another planet.

OCEAN and OCEANOGRAPHY. "Ocean" is the name applied to the great connected sheet of water which covers the greater part of the surface of the Earth. It is convenient to divide the subject-matter of physical geography into the atmo- sphere, hydrosphere and lithosphere, and in this sense the ocean is less than the hydrosphere in so far as the latter term includes also the water lying on or flowing over the surface of the land. The conception of an encompassing ocean bounding the habitable world is found in the creation myths of the most ancient civiliza- tions. The Babylonians looked on the world as a vast round mountain rising from the midst of a universal sheet

of water. In the Hebrew scriptures the waters were gathered together in one place at the word of God, and the dry land appeared. The Ionian geographers looked on the circular disk of the habitable world as surrounded by a mighty stream named Oceanus, the name of the primeval god, father of gods and men, and thus the bond of union between heaven and earth. The Greek word uKtavos is related to the Sanskrit aqdyanas, " the encompassing." Philologists do not know of any related word in Semitic languages.

Pictet, however, recognizes allied forms in Celtic languages, e.g. the Irish aigean and Cymric eigiawn.

Since the Pythagorean school of philosophy upheld the spherical as against the disk-shaped world, some of the ancient geographers, including Eratosthenes and Strabo, looked upon the hydrosphere as forming two belts at right angles to each other, one belt of ocean following the equator, the other sur- rounding the earth from pole to pole as in the terra quadrifida of Macrobius; while others, including Aristotle and Ptolemy, looked upon the inhabited land, or oikumene, as occupying the greater part of the earth's surface, so that the Indian Ocean was an enclosed sea and India (i.e. eastern Asia) was only separated from Europe by the Atlantic Ocean. The latter view prevailed and was as a rule held by the Arab geographers of the middle ages, so that until the discovery of America and of the Pacific Ocean the belief was general that the land surface was greater than the water surface, or that at least the two were equal, as Mercator and Varenius held. Thus it was that a great South Land appeared on the maps, the belief in the prodigious extension of which certainly received a severe shock by Abel Tasman's voyage of circumnavigation, but was only overthrown after Cook's great voyages had proved that any southern land which existed could not extend appreciably beyond the polar circle. Only in our own day has the existence of the southern continent been demonstrated within the modest limits of Antarctica.

Oceanography is the science which deals with the ocean, and since the ocean forms a large part of the earth's surface oceano- graphy is a large department of geography. The science is termed talassografia by the Italians, and attempts have been made without success to introduce the name " thalassography." Of recent years the use of " hydrography " as the equivalent of physical oceanography has acquired a certain currency, but as the word is also used with more than one other meaning (see Surveying) it ought not to be used for oceanography.

Like geography, oceanography may be viewed in two different ways, and is conveniently divided into general oceanography, which deals with phenomena common to the whole ocean, and special oceanography, which has to do with the individual characteristics of the various divisions of the ocean. This article is restricted to general oceanography in its physical aspects, the closely-related meteorological, biological and economic aspects being dealt with elsewhere.

Methods of Research. — When research in oceanography began, the conditions of the sea were of necessity observed only from the coast and from islands, the information derived from mariners as to the condition of parts of the sea far from land being for the most part mere anecdotes bearing on the marvellous or the frightful. In recent times, especially since the rapid increase in the study of the exact sciences during the 19th century, observations at sea with accurate instruments have become common, and the ships' logs of to-day are provided with headings for entering daily observations of the phenomena of the sea- surface. The contents of the sailors' scientific logs were brought together by the American enthusiast in the study of the sea, Matthew Fontaine Maury (1806-1873), whose methods and plans were discussed and adopted at international congresses held in Brussels in 1853 and in London in 1873. By 1904 more than 6800 of these meteorological logs with 7,000,000 observations had been accumulated by the Meteorological Office in London; 20,000 with 10,600,000 observations by the German Marine Observatory at Hamburg; 4700 with 3,300,000 observations by the Central Institute of the Netherlands at de Bilt near Utrecht. The Hydrographic Office of the United States had collected 3800 meteorological logs with 3,200,000 entries before 1888; but since that time the logs have contained only one observation daily (at Greenwich noon) and of these 2,380,000 entries had been received by 1904. In the archives of the French Marine in Paris there were 3300 complete logs with 830,000 entries and 11,000 abstract logs from men-of-war. The contents of these logs, it is true, refer more to maritime meteorology than to oceanography properly so-called, as their main purpose is to

promote a rational system of navigation especially for sailing ships, and they are supplied by the voluntary co-operation of the sailors themselves.

While the sailors' logs supply the greater part of the scientific evidence available for the study of the surface phenomena of the ocean, they have been supplemented by the records of numerous scientific expeditions and latterly by publications embodying systematic observations on a permanent basis. Valuable observations were made in oceanography during the expeditions of Captain James Cook and the polar explorers, especially those of Sir John Ross in the north and Sir James Ross in the south, but the voyage of H.M.S. " Challenger " in 1872-1876 formed an epoch marking the end of the older order of things and the begin- ning of modern oceanography as a science of precision. The telegraph cable companies were quick to apply and to extend the oceanographical methods useful in cable-laying, and to their practical acuteness many of the most important improve- ments in apparatus are due. A second epoch comparable to that of the " Challenger " and resulting like it in a leap forward in the precision of the methods previously employed was marked by the institution in 1901 of the International Council for the Study of the Sea. This council was nominated by the govern- ments of Norway, Sweden, Denmark, Finland, Russia, Germany, Great Britain, Holland and Belgium, with headquarters in Copenhagen and a central laboratory at Christiania, and its aim was to furnish data for the improvement of the fisheries of the North Sea and surrounding waters. In the course of investigating this special problem great improvements were made in the methods of observing in the deep sea, and also in the representa- tion and discussion of the data obtained, and a powerful stimulus was given to the study of oceanography in all the countries of Europe. The efforts of individual scientific workers cannot as a rule produce such results in oceanography as in other sciences, but exceptions are found in the very special services rendered by the prince of Monaco, who founded the Oceanographical Institute in Paris and the Oceanographical Museum in Monaco; and by Professor Alexander Agassiz in the investigation of the Pacific.

Extent of the Ocean. — The hydrosphere covers nearly three-quarters of the earth's surface as a single and continuous expanse of water surrounding four great insular land-masses known as the continents of the Old World (Europe, Asia, Africa), America, Australia and Antarctica. As we are still ignorant of the pro-portions of land and water in the polar regions, it is only possible to give approximate figures for the extent of the ocean, for the position of the coast-lines is not known exactly enough to exclude possible errors of perhaps several hundred thousand square miles in estimates of the total area. Speaking generally, we may say with confidence that water pre'dominates in the unexplored north polar area, and

that it is very unlikely that new land of any great extent exists there. On the other hand, recent Antarctic ex- ploration makes it practically certain that a great continent surrounds the south pole with a total area considerably more than Sir John Murray's estimate in r8o4, when he assigned to it an area of 0,000,000 sq. km. (3,500,000 sq. statute miles). It is probable that the Antarctic continent measures about 13,000,000 sq. km. (5,000,000 sq. statute miles); and thus if we accept Bessel's figure of 509,950,000 sq. km. (196,900,000 sq. m.) for the whole surface of the sphere, there is a total land area of 148,820,000 sq. km. (57,460,000 sq. m.), and a total water area of 361,130,000 sq. km. (139,435,000 sq. m.), 29% of land and 71 % of water, or a ratio of 1 : 2-43.

Divisions of the Ocean. — The arrangement of the water surface on the globe is far from uniform, the ocean forming 61% of the total area of the northern and 81% of that of the southern hemisphere. Of the whole ocean only 43% (154-9 million sq. km.) lies in the northern hemisphere and 57% (206-2 million sq. km.) in the southern. If the globe is divided into hemispheres by the meridians of 20° W. and 160° E., as is usual in atlases, the eastern hemisphere, to which the Old World belongs, has 62% of its surface made up of water, while the western hemi- sphere, including America, has 81 %. A great circle can be drawn upon a terrestrial globe in such a way as to divide it into

two hemispheres, one of which contains the greatest amount of land and the other the greatest amount of sea of any possible hemispheres. The centre of the so-called land-hemisphere lies near the mouth of the Loire (47 1° N. and 2 J° W.), while the centre of the so-called water-hemisphere lies to the S.E. of New Zealand and eastward of Antipodes Island. Even in the land hemisphere the water area (134-5 million sq. km.) is in excess of the land area (121 million sq. km.), while in the water-hemisphere the amount of land is quite insignificant, being only 24-5 million sq. km. compared with 230-5 million sq. km. of water.

The outline of the water surface depends on the outline of the basins in which it is contained. The four great continental masses therefore give the ocean a distinctly tripartite form, the three great divisions being known as the Atlantic, the Indian and the Pacific Oceans, all three running together into one around Antarctica. Thus the connecting belt of water is narrow as compared with the extent of the oceans from north to south — Drake Strait south of South America is barely 400 m. wide, from Cape Agulhas to Enderby Land, 2200 m., and from Tasmania to Wilkes Land, 1550 m., while the meridianal

extension of the Indian Ocean is 6200 m., of the Pacific, 9300 m., and of the Atlantic, 12,500 m., measuring across the North Pole to Bering Strait. These proportions are not readily grasped from a map of the world on Mercator's projection, and must be studied on a globe. A simple, practical boundary between the three oceans can be obtained by prolonging the meridian of the southern extremity of 'each of the three southern continents to the Ant- arctic circle. A committee of the Royal Geographical Society — the deliberations of which were interrupted by the departure on his last voyage of Sir John Franklin, one of the members — sug- gested these meridians as boundaries; the north and south boundaries of the Atlantic and Pacific Oceans being the polar circles, leaving an Arctic and an Antarctic Ocean to complete the hydrosphere. We now know, however, that the Antarctic circle runs so close to the coast of Antarctica that the Antarctic Ocean may be left out of account. It has been found more convenient to take as northern boundaries the narrowest part of the straits near the Arctic circle, Bering Strait on the Pacific side, and on the Atlantic side the narrowest part of Davis Strait, and of Denmark Strait, then the shortest line from Iceland to the Faeroes, thence to the most northerly island of the Shetlands and thence to Cape Statland in Norway. It has also been found convenient to take the boundary between the Atlantic and Pacific, as the shortest line across Drake Strait, from Cape Horn through Snow Island to Cape Gunnar, instead of the meridian of Cape Horn. Possibly ridges of the sea-bed running southward from the southern continents may yet be discovered which would form more natural boundaries than the meridians. The com- mittee of the Royal Geographical Society settled the existing nomenclature of the three great oceans. Some authors include the Arctic Sea in the Atlantic Ocean, and some prefer to consider the southern part of the Atlantic, Indian and Pacific Oceans as a Great Southern Ocean. Sir John Herschel took as the northern boundary of the southern ocean the greatest circle which could touch the southernmost extremities of the three southern con- tinents. Such a circle, however, runs so near the coast of Antarctica as to make the southern ocean very small. Others, like Malte Brun (1803) and Supan (1903), take the loxodromes between the three capes and call the ocean to the south the Antarctic Ocean. G. v. Boguslawski suggested the parallel of 55° S. and Ratzel that of 40 S. as limits; but in none of these schemes has the coast of Antarctica been adequately considered, and they have all been too much influenced by the Mercator map. Each of the three oceans, Atlantic, Indian and Pacific, possesses an Antarctic facies in the southern part and a tropical fades between the tropics, and the Atlantic and Pacific an Arctic facies in their northern parts.

Where the ocean touches the continents the margin is in places deeply indented by peninsulas and islands marking off portions of the water surface which from all antiquity have been known as " seas." These seas are entirely dependent on the ocean for their regime, being filled with ocean water, though subject to

influence by the land, and the tides and currents of the ocean affect them to a greater or less extent. They owe their origin to depressions of the earth's crust of no very wide extent and not running very far into the continental mass, and geologically they are of recent age and still subject to change. In these respects they contrast with the great oceans which owe their origin to the most extensive and the profoundest depressions of the crust, date back at least to Mesozoic times, and have perhaps remained permanently in their present position from still remoter ages.

Seas may be classified according to their form either as " en- closed " or as " partially enclosed " (or " fringing "). Enclosed seas extend deeply into the land and originate either by the breaking through of the ocean or by the overflowing of a subsiding area. They are connected with the ocean by narrow straits, the salinity of the water contained in them differs in a marked degree from that of the ocean, and the tidal waves are of small amplitude. Four great intercontinental enclosed seas are included between adjacent continents — the Arctic Sea, the Central American or West Indian Sea, the Australo-Asiatic or Malay Sea and the Mediterranean Sea. There are also four smaller con- tinental enclosed seas each with a single channel of communica- tion with the ocean, viz. the Baltic Sea and Hudson Bay with very low salinity, the Red Sea and Persian Gulf with very high salinity.

The fringing or partially enclosed seas adjoin the great land masses and are only separated from the oceans by islands or peninsulas. Hence their tidal conditions are quite oceanic, though their salinity is usually rather lower than that of ocean water. The four fringing seas of eastern Asia, those of Bering, Okhotsk, Japan and East China, are arranged parallel to the main lines of dislocation in the neighbouring land-masses, and so are the Andaman Sea and the Gulf of California. On the contrary, the North Sea, the British fringing seas (English Channel, Irish Sea and Minch), and the Gulf of St Lawrence cross the main lines of dislocation.

In addition to these seas notice must be taken of the sub- ordinate marginal features, such as gulfs and straits. Gulfs may be classified according to their origin as due to fractures of the crust or overflowing of depressed lands. The former are either the extensions of oceanic depressions, e.g. the Arabian Sea, Bay of Bengal and Gulf of Arica, or such caldron-depressions as the Gulfs of Genoa and Taranto, or rift-depressions like the Gulfs of Aden and Akaba. Compound gulfs are formed sea- wards by fracture and landwards by the overflowing of depressed land, e.g. the Bay of Biscay, Gulf of Alaska and Gulf of the Lion. Gulfs formed by the overflowing of depressed lands lie upon the continental shelf, e.g. the Gulf of Maine, Bay of Fundy, Bay of Odessa, Gulf of Martaban.

Straits have been formed (1) by fracture across isthmuses, and such may be by longitudinal fracture as in the Strait of Bab-el-Mandeb, or transverse fracture as in the Strait of Gibraltar or Cook Strait; (2) by erosion, e.g. the Strait of Dover, the Dardanelles and Bosporus; (3) by overflowing through the subsidence of the land, as in the straits of Bering, Torres and Formosa.

Surface of the Ocean. — If the whole globe were covered with a uniformly deep oeean, and if there were no difference of density between one part and another, the surface would form a perfect ellipsoid of revolution, that is to say, all the meridians would be exactly equal ellipses and all parallels perfect circles. At any point a sounding line would hang in the line of the radius of curvature of the water surface. But as things are the water- surface is broken by land, and the mean density of the substance of the land is 2-6 times as great as that of sea- water, so that the gravitational attraction of the land must necessarily cause a heaping up of the sea around the coasts, forming what has been called the continental wave, and leaving the sea-level lower in mid-ocean. Hence the geoid or figure of the sea-surface is not part of an ellipsoid of rotation but is irregular. The differences of level between different parts of the geoid have been greatly overestimated in the past; F. G. Helmert has

shown that they cannot exceed 650 ft. and are probably much less. Recent pendulum observations have shown that it is incorrect to assume a uniform density of 2-6 in the elevated part of the earth's crust, that on the contrary there are great local differences in density, the most important being a con- firmation of Airy's discovery that there is a marked deficiency of mass under high mountains and a marked excess under the bed of the ocean. The intensity of gravity at the surface of the sea far from land has been measured on several occasions. During Nansen's expedition on the "

Fram " in 1894-1895, Scott Hansen made observations with a Sterneck's half-seconds pendulum on the ice where the sea was more than 1600 fathoms deep and found only an insignificant deviation from the number of swings corresponding to a normal ellipsoid. In iqoi O. Hecker took the opportunity of a voyage from Hamburg to La Plata, and in 1904 and 1905 of voyages in the Indian and Pacific Oceans to determine the local attraction over the ocean by comparing the atmospheric pressure measured by means of a mercurial barometer and a boiling-point thermometer, and obtained results similar to Scott Hansen's. The inequalities of the geoid in no case exceed 300 ft. Distortion of the ocean surface may also arise from meteorological causes, and be periodic or unperiodic in its occurrence, but it does not amount to more than a few feet at the utmost. Solar radiation warms the tropical more than the polar waters, but, assuming equal salinity, this cause would not account for a difference of level of more than 20 ft. between tropical and polar seas. The annual range of temperature between summer and winter of a surface layer of water about 25 fathoms thick in the Baltic is as much as 20 F., but this only corresponds to a difference of level of

1 j in. due to expansion or contraction.

Atmospheric precipitation poured into the sea by the great rivers must necessarily create a permanent rise of the sea-level at their mouths, and from this cause the level round the coasts of rainy lands must be greater than in mid-ocean. H. Mohn has shown how the inequalities of what he terms the density- surface can be found from the salinity and temperature; and he calculates that the level of the Skag'errak should be about

2 ft. higher than that of the open Norwegian Sea between Jan Mayen and the Lofoten Islands. The level of the Gulf of Finland at Kronstadt and of the Gulf of Bothnia at Haparanda should similarly be 15 in. higher than that of the Skagerrak. Recent levellings along the Swedish and Danish coasts have confirmed the higher level of the Baltic; and the level of the Mediterranean has also been determined by exact measurements to be from 15 to 24 in. lower than that of the Atlantic on account of evapora tion. Apart from the effects of varying precipitation and evaporation the atmosphere affects sea-level also by its varying pressure, the difference in level of the sea-surface from this cause between two given points being thirteen times as great as the difference between the corresponding readings of the mercurial barometer. In the north tropical belt of high pressure south of the Azores the atmospheric pressure in January is 0-87 in. higher

than in the Irminger Sea; hence the sea-level near the Azores is almost 1 ft. lower than in the northern sea. In the monsoon region, where the barometer rises 0-38 in. between July and January, the level of the sea falls in consequence by 5 in. Wind also gives rise to differences of level by driving the water before it, and the prevailing westerly wind of the southern Baltic is the chief cause of the sea-level at Kiel being 55 in. lower than at Arkona on Rtigen. Periodic variations of level due to meteorological causes account for the Baltic being fuller in the time of the summer rains than in winter, when the rivers and lakes are frozen and most of the precipitation on the land is in the form of snow. The range on the Arkona gauge is from 3-5 in. below mean level in April to 2-75 in. above the mean level in August. A similar range occurs on the Dutch coast in the North Sea, where the maximum level is reached in October, the month of highest rainfall, and there is a range of 8 in. to the minimum level at the time of least rainfall in early spring. In the monsoon regions the half-yearly change from on-shore to off-shore winds produces noticeable differences in

level; thus fifteen years' observations at Aden show a maximum in May at the end of the north-east monsoon, and a rapid falling off after the beginning of the south-west monsoon to a minimum in August, the total range being g\ in. The influence of wind on water-level is most remarkable in heavy storms on the flat coasts of the North Sea and Baltic, when the rise may amount to very many feet. In the region of tropical hurricanes the converging wind system of a circular storm causes a heaping up of water capable of devastating the low coral islands of the Pacific. On the ist of November 1876 a cyclone acting in this way submerged a great area of the level plain of the Ganges delta to a depth of 46 ft.; here the influence of the difference »f pressure within and without the cyclone acted in the same direction as the wind. The old speculations as to a great difference of level between the Mediterranean and the Red Sea, and on the two sides of the Isthmus of Panama, which hindered the projects for canals connecting those waters, have been proved by modern levelling of high precision to be totally erroneous.

Deep-sea Soundings. — The hand-lead attached to a line divided into fathoms was a well-known aid to navigation even in high antiquity, and its use is mentioned in Herodotus (ii. 5) and in the Acts of the Apostles (xxvii. 29). Greater depths than those usually sounded by a

hand-line may possibly not have been beyond the reach of the earlier navigators, for Strabo says " of measured seas the Sardonian is the deepest with full one thousand fathoms " (i. 3, p. 53 Cas.). Yet we find that the great discoverers of the modern period were only familiar with the hand-lead, and the lines in use did not exceed 200 fathoms in length. Ingenious devices had indeed been tried in the 17th century and earlier, by which a lead thrown into the sea without a line detached a float on striking the bottom, and it was proposed to calculate the depth by the time required for the float to re- appear. The earliest deep-sea sounding on record is that of Captain Phipps on the 4th of September 1773 in the Norwegian Sea, in 65 N. 3 E., on his return from his expedition to Spits- bergen. He spliced together all the sounding-lines on board, and with a weight of 1 50 lb attached he found bottom in 683 fathoms and secured a sample of fine soft blue mud. He detected the moment of the lead touching the bottom by the sudden slackening in the rate at which the line ran out. Polar explorers frequently repeated those experiments in deep-sea soundings, both William Scoresby and Sir John Ross obtaining notable results, though not reaching depths of more than 1200 fathoms. The honour of first sounding really oceanic depths belongs to Sir James Clark Ross, who made some excellent measurements in very deep water, though in a few instances he overestimated the depth by failing to detect the moment at which the lead touched bottom. The pursuit of these isolated investigations received a great impetus from the enthusiasm of the great Ameri- can oceanographer Captain Matthew Fontaine Maury, U.S.N., who directed the whole impetuous strength of his character to the task of compelling the silent depths of the ocean to tell their tale. Instead of the expensive mile-long stout hemp lines used by Ross, Maury introduced a ball of strong twine attached to a cannon shot, which ran it out rapidly; when the bottom was reached the twine was cut and the depth deduced from the length of string left in the ball on board. The time of touching bottom was judged by timing each 100-fathom mark and noting the sudden increase in the time interval when the shot reached the bottom. Maury, however, recognized that in great depths the surest guarantee of bottom having been reached was to bring up a sample of the deposit. To do this with a heavy lead attached required a very strong hemp line, and the twine used in the American method was useless for this purpose. In 1854 J. M. Brooke, a midshipman of theU.S.N., invented the principle already foreshadowed by Nicolaus Cusanus in the 15th century and by Robert Hooke in the 17th, of using a heavy weight so hung on the sounding-tube that it was automatically released on striking the bottom and left behind, while the light brass tube containing a

sample of the deposit was easily hauled up. This principle has been adopted universally for deep soundings, and is now applied in many forms. In 1855 Maury published

the first chart of the depths of the Atlantic between 52 N. and io° S. At this period an exact knowledge of the depths of the ocean assumed an unlooked-for practical importance from the daring project for laying a telegraph cable between Ireland and Newfoundland. Deep soundings were made in the Atlantic for this purpose by vessels both of the British and of the American navies, while in the Mediterranean and in the Indian Ocean many soundings were made in connexion with submarine cables to the East. Another stimulus came from the biologists, who began to realize the importance of a more detailed investiga- tion of the life conditions of organisms at great depths in the sea. The lead in this direction was taken by British biologists, beginning with Edward Forbes m 1839, and in 1868 a party on board H.M.S. " Lightning " pursued researches in the waters to the north of Scotland. In 1869 and 1870 this work was extended to the Irish Sea and Bay of Biscay in H.M.S. " Por- cupine," and to the Mediterranean in H.M.S. " Shearwater." The last-named vessel secured 157 trustworthy deep soundings, with samples of the deposits, and also observations of temperature and salinity in different depths, as well as dredgings for the collection of the organisms of the deep sea.

These preliminary trips of scientific marine investigation were followed by the greatest purely scientific expedition ever under- taken, the voyage of H.M.S. " Challenger " round the world under the scientific direction of Sir Wyville Thomson and the naval command of Sir George Nares. This epoch-making expedition lasted from Christmas 1872 to the end of May 1876, and gave the first wide and general view of the physical and biological conditions of the ocean as a whole. Almost simul- taneously with the " Challenger," a German expedition in S.M.S. " Gazelle " conducted observations in the South Atlantic, Indian and South Pacific Oceans; and the U.S.S. " Tuscarora " made a cruise in the North Pacific, sounding out lines for a projected Pacific cable. The successor of Sir Wyville Thomson in the editorship of the " Challenger " Reports, Sir John Murray, has rightly said that since the days of Columbus and Magellan no such revelation regarding the surface of our planet had been made as in that eighth decade of the 19th century. Since that time the British cable-ships have been busy in all the oceans making sections across the great expanses of water with ever- increasing accuracy, and in that work the government surveying ships have also been engaged, vast stretches of the Indian and Pacific Oceans having

been opened up to knowledge byH.M.SS. " Egeria," " Waterwitch," " Dart," " Penguin," " Stork," and " Investigator." American scientific enterprise, mainly under the guidance of Professor Alexander Agassiz, has been active in the North Atlantic and especially in the Pacific Ocean, where very important investigations have been made. The eastern part of the North Atlantic has been the scene of many expeditions, often purely biological in their purpose, amongst which there may be mentioned the cruises of the " Travailleur " and " Talisman " under Professor Milne-Edwards in 1880-1883, and since 1887 those of the prince of Monaco in his yachts, as well as numerous Danish vessels in the sea between Iceland and Greenland, conspicuous amongst which were the expeditions in 1896-1898 on board the " Ingolf." The Norwegian Sea was studied by the Norwegian expedition on board the " Voringen " in 1876-1878, and the north polar basin by Nansen and Sverdrup in the " Fram " in 1 893-1 896, the Mediterranean by the Italians on the " Washington " and by the Austrians on the " Pola " in 1890-1893, the latter carrying the investigations to the Red Sea in 1895-1898, while the Russians investigated the Black Sea in 1890-1893. For high southern latitudes special value attaches to the soundings of the German deep-sea expedition on the " Valdivia " in 1898-1899, and to those of the " Belgica " in 1897-1898, the " Gauss " in 1902-1903, and the " Scotia " in 1903-1904. The soundings of the Dutch expedition on the " Siboga " during 1899-1900 in the eastern part of the Malay seas and those of the German surveying ship " Planet " in 1906 in the South Atlantic, Indian and North Pacific Oceans were notable, and Sir John Murray's expedition on the " Michael Sars " in the Atlantic in 1910 obtained important results.

Modern surveying ships no longer make use of hempen lines with enormously heavy sinkers, such as were employed on the " Challenger," but they sound instead with steel piano wire not more than 3V to -5V of an inch in diameter and a detachable lead seldom weighing more than 70 m. The soundings are made by means of a special machine fitted with a brake so adjusted that the revolution of the drum is stopped automatically the instant the lead touches the bottom, and the depth can then be read directly from an indicator. The line is hauled in by a steam or electric winch, and the sounding-tube containing a sample of the bottom deposit is rapidly brought on board. The sounding machines most frequently employed are those of Admiral C. D. Sigsbee, U.S.N., of Lucas, which was perfected in the

Telegraph Construction and Maintenance Company's ships, and of the Prince of Monaco, constructed by Leblanc of Paris. All attempts to dispense with a lead and line and to measure the depth by determining the pressure at the bottom have hitherto failed when applied to depths greater than 200 fathoms; a new hydraulic manometer has been tried on board the German surveying ship " Planet." A. Siemens has pointed out that a profile of the sea-bed can be delineated by taking account of the varying strain on a submarine cable while it is being laid, and the average depth of a section can thus be ascertained with some accuracy. All deep-sea measurements are subject to uncertainty because the sounding machine merely measures the length of wire which runs out before the lead touches bottom, and this agrees with the depth only when the wire is perpendicular throughout its run. It is improbable, however, that the smooth and slender wire is much influenced by currents, and the best deep-sea soundings may be taken as accurate to within 5 fathoms.

Relief of the Ocean Floor. — Recent soundings have shown that the floor of the ocean on the whole lies some 2 or 3 m. beneath the surface, and O. Kriimmel has calculated the mean depth to be 2010 fathoms (12,060 ft.), while the mean elevation of the surface of the continents above sea-level is only 2300 ft. Viewed from the floor of the ocean the continental block would thus appear as a great plateau rising to a height of 14,360 ft. Nevertheless, the greatest depths of the ocean below sea-level and the greatest heights of the land above it are of the same order of magnitude, the summit of Mount Everest rising to 29,000 ft. above the sea-level, while the Nero Deep near Guam sinks to 31,600 ft. (5268 fathoms) below sea-level. Of course the area at great heights is very much less than the area at corre-sponding depths. Above the height of 15,000 ft. there are 800,000 sq. km. (310,000 sq. m.), and below the depth of 15,000 ft. there are 120,000,000 sq. km. (46,300,000 sq. m.); above the height of 20,000 ft. there are on the whole surface of the earth only 33,000 sq. km. (12,800 sq. m.), while below the depth of 20,000 ft. there are no less than 5,400,000 sq. km. (2,100,000 sq. m.). According to Kriimmel's calculation the areas of the ocean beyond various depths are as follows: —

Fathoms.

sq. km.

sq. st. m.

More than

100

350,500,000

I35.300,ooo

500

319,500,000

123,400,000

1000

304,000,000

117,400,000

1500

276,500,000

106,800,000

2000

215,000,000

83,000,000

2500

120,000,000

46,300,000

3000

22,500,000

8,700,000

350O

3,000,000

1,200,000

4000

1 ,200,000

460,000

On the whole the floor of the ocean is very smooth in its contours, and great stretches can almost be called level. Modern orometry has introduced the calculation of the mean angle of the slope of a given uneven surface provided that maps can be prepared showing equidistant contour lines. If the distance between the contour lines is h and the length of the individual contour lines /, the sum of their lengths 2 (/), and A the area

of the surface under investigation, then the mean angle of slope is obtained from the equation

liZ(l) tan a ~~x~ ■

Calculating from sheet A I of the Prince of Monaco's Atlas of Ocean Depths, 1 Kriimmel obtained a mean angle of slope of o D 27′ 44″ or an average fall of 1 in 124 for the North Atlantic between o° and 47 N.. the enclosed seas being left out of account. In the same way a mean angle of slope of approximately half a degree was found for the Adriatic and the Black Sea. Large angles of slope may, however, occur on the flanks of oceanic islands and the continental borders. On the submarine slopes leading up to isolated volcanic islands angles of 15 to 20 are not uncommon, at St Helena the slopes run up to 385 and even 40°, at Tristan d'Acunha to 335 . E. Hull found a mean angle of slope of 13 to 14 for the edge of the continental shelf off the west coast of Europe, and off Cape Toririana (43°4'N.) as much as 34 . Where the French telegraph cable between Brest and New York passes from the continental shelf of the Bay of Biscay to the depths of the Atlantic the angle of slope is from 30 to 41°. Such gradients are of a truly mountainous character, the angle of slope from the Eibsee to the Zugspitze is 30 , and that from Alpiglen station to the summit of the Eiger is 42 . Particularly steep slopes are found in the case of submarine domes, usually incomplete volcanic cones, and there have been cases in which after such a dome has been discovered by the soundings of a surveying ship it could not be found again as its whole area was so small and the deep floor of the ocean from which it rose so flat that an error of 2 or 3 m. in the position of the ship would prevent any irregularity of the bottom from appearing. While such steep mountain walls are found in the bed of the ocean it must be remembered that they are very

exceptional, and except where there are great dislocations of the submarine crust or volcanic outbursts the forms of the ocean floor are incomparably gentler in their outlines than those of the continents. Being protected by the water from the rapid subaerial erosion which sharpens the features of the land, and subjected to the regular accumulation of deposits, the whole ocean floor has assumed some approach to uniformity. Still there are everywhere gentle inequalities on the smoothest ocean floor which give to its greater featvres a distinct relief.

In spite of the increase of deep-sea soundings in the last few decades, they are still very irregularly distributed in the open ocean, and the attempt to draw isobaths (lines of equal depth) on a chart of the world is burdened with many difficulties which can only be evaded by the widest generalizations. Bearing this caution in mind the existing bathymetrical charts, amongst which that of the prince of Monaco stands first, give a very fair idea of the great features of the bed of the oceans. A definite termin- ology for the larger forms of sub-oceanic relief was put forward by the International Geographical Congress at Berlin in 1899 and adopted by that at Washington in 1004. Equivalent terms, which are not necessarily identical or literal translations, were adopted for the English, French and German languages, the equivalence being closest and most systematic between the English and German terms.

The larger forms designated by special generic terms include the following. The continental shelf is the gentle slope which extends from the edge of the land to a depth usually about 100, though in some cases as much as 300 fathoms, and is there demarcated by an abrupt increase in the steepness of the slope to ocean depths. In the deep sea two types of feature are recognized under the general names of depression and elevation. The depression is distinguished according to form and slope as (1) a basin when of a roughly round outline, (2) a trough when wide and elongated, or (3) a trench when narrow and elongated lying along the edge of a continent. The extension of a basin or trough stretching towards the continent is termed an embayment when relatively wide and a gully when narrow. The elevation includes (1) the gentjy swelling rise which separates 1 Carte generate bathymStrique des oceans dressee par ordre de S.A.S. le Prince Albert de Monaco, 24 sheets (Paris, 1904).

troughs and basins in the middle of the ocean, (2) the steeply sloping ridge which interposes a narrower barrier between two depressions, and (3) the plateau or wide elevation rising steeply on all sides from a depression. The deepest part of a depression is termed a deep, and the highest part of an elevation when not reaching the surface a height. In addition to these larger forms a few minor forms must be recognized. Amongst these are the dome, an isolated elevation rising steeply but not coming within 100 fathoms of the surface; the bank, an elevation coming nearer the surface than 100 fathoms, but not so near as 6 fathoms; and finally the shoal or reef, which comes within 6 fathoms of the surface, and so may constitute a danger to shipping. Similarly we may note the caldron or small steep depression of a round out- line, and the furrow or long narrow groove in the continental shelf.

According to the resolutions of the International Geographical Congress the larger individual forms which have been described by generic terms shall have specific names of a purely geo- graphical character; but in the case of the minor forms the names of ships and persons are considered applicable. In 1899 A. Supan published a chart of the oceans with a suggested nomenclature based on these principles; and the larger forms in the Prince of Monaco's great chart also are named in accordance with the rule. Although put forward by the highest inter- national authority recognized by geographers the system of nomenclature has not been adopted universally. In particular Sir John Murray considers that only deeps exceeding 3000 fathoms in depth should be named, and in his charts he has named these deeps after persons whether the individuals thus honoured had themselves discovered or explored the deeps in question or not. Some of the " deeps " to which names have been given disappear or are divided into two or three smaller deeps when the contour lines representing hundreds of fathoms are translated into contour lines representing hundreds of metres. A similar change in the contour lines may result from the substitution of lines in fathoms for those originally drawn in metres, and hence it is extremely desirable that specific names should only be given to such features as are pronounced enough to appear on maps drawn with either unit. For the sake of uniformity it is to be hoped that the system of nomen- clature recommended by the International Geographical Congress will ultimately be adopted.

The continental shelves are parts of the great continental blocks which have been covered by the sea in comparatively recent times, and their surface consequently presents many similarities to that of the land, modified of course by the de- structive and constructive

work of the waters. Waves and tidal currents produce their full effects in that region, and in high latitudes the effect of transport of materials by ice is very important; while in the warm water of the tropics the reef- building animals and plants (corals and calcareous algae) carry on their work most effectively there. The continental shelves include not only the oceanic border of the continents but also great areas of the enclosed seas and particularly of the fringing seas, the origin of which through secular subsidence is often very clearly apparent, as for instance in the North Sea and the tract lying off the mouth of the English Channel. A closer investigation of the numerous long, narrow banks which lie off the Flemish coast and the Thames estuary shows that they are composed of fragments of rock abraded and transported by tidal currents and storms in the same way that the chalk and lime- stone worn off from the eastern continuation of the island of Heligoland during the last two centuries has been reduced to the coarse gravel of the off-lying Dime. Numerous old river valleys and furrows entrenched in the continental shelf bear witness to its land origin. Such valleys are very clearly indicated in the belts of the western Baltic by furrows a thousand yards wide and twenty to thirty fathoms deeper than the neighbouring sea-bed. Amongst the best known of the furrows of the con- tinental shelf are the Cape Breton Deep, in the Bay of Biscay, the Hudson Furrow, southward of New York, the so-called Congo Canon, the Swatch of No Ground off the Ganges delta, the

Bottomless Pit off the Niger delta, and numerous similar furrows on the west coast of North America and outside the fjords of Norway, Iceland and the west of Scotland, as well as in the Firth of Forth and Moray Firth.

The seaward edge of the continental shelf often falls steeply to the greatest depths of the ocean, and not infrequently forms the slope of a trench, a form of depression which has usually a steep slope towards a continent or an island-bearing rise on one side and a gentler slope towards the general level of the ocean on the other. All the greatest depths of ocean, i.e. all soundings exceeding 4000 fathoms, occur in trenches, and there are only a few small trenches known (on the west coast of Central America) in which the maximum depth is less than 3000 fathoms. Most trenches are narrow, but of considerable length, and their steeper side is believed to be due in every case to a great fracture of the earth's crust. Strong evidence of this is afforded by the associa- tion of some of the depressions, notably the Japan Trench and the Atacama Trench, with the origin of frequent submarine earthquakes. Troughs and rises are features of more frequent occurrence and are best described as

they occur in the particular oceans.

In the Atlantic the prevailing meridianal direction of the shore lines extends to the submarine features also. Captain Sherard Osborn in 1870 was the first to recognize that the North Atlantic Basin was divided by a central rise running generally from north to south into two parallel depressions. In 1876 the " Challenger " expedition found that a similar configuration exists in the South Atlantic also. As the result of all the deep-sea surveys now available we know that the central rise of the Atlantic starts from Iceland as the Reykjanes Ridge with less than 1000 fathoms of water over it in most parts and runs south-westward until in 51° N. it widens into what was called by Maury the Telegraph Plateau. Continuing southwards the rise joins the Azores Plateau, which has in parts a very marked relief, and runs thence southward almost exactly in the middle of the ocean, becoming gradually lower as it goes. As far as 29 N. the depth over it is less than 1500 fathoms, thence to 12 N. the depths are between 1500 and 2000 fathoms, and then it rises again to about 1 500 fathoms and runs eastward under the name of the Equatorial Ridge. Crossing the equator in 13° W. the rise resumes a southerly direction and from Ascension to Tristan d'Acunha, the depth is in many places less than 1500 fathoms. The soundings of Bruce's Antarctic expedition in the " Scotia " showed that the rise cannot be traced beyond 55 S. where the depths increase rapidly to over 2000 fathoms. The whole length of the rise which divides the Atlantic into an eastern and a western basin may be taken as 7500 nautical miles. Between 30°and 40° S. two lateral ridges diverge from the great Atlantic rise, the Rio Grande ridge towards the north-west and the Walfisch ridge towards the north-east. The existence of the latter, which extends to the African continent, was announced by Sir Wyville Thomson in 1876 as a result of his discussion of the deep-sea temperature observations of the " Challenger " expedition, though the fact was not confirmed by soundings until many years later.

The West Atlantic Trough lying on the western side of the Central Rise widens in the north into the North American Basin, and its greatest depths appears to be in the Porto Rico Trench, where in 1882 Capt. W. H. Brownson, U.S.N., obtained a sounding of 4561 fathoms in 19 36′ N., 66° 26′ W. The Brazilian Basin has also a large area lying at a depth greater than 2500 fathoms and culminates in the Romanche Deep close to the Equatorial Ridge in o° 11′ S., 18 15′ W. with a depth of 4030 fathoms. The Eastern Atlantic Trough cannot boast of such great depths though the Peake Deep with 3284 fathoms sinks abruptly from the Azores Plateau in 43 9′ N., 19 45′ W., and several soundings exceeding 2700 fathoms

have been obtained in the Bay of Biscay east of the meridian of 5° E. The North African Basin has several deeps with more than 3300 fathoms to the north- west and the south-west of the Cape Verde Islands, but the South African Basin is less deep. In the South Atlantic there is no connexion between the Central Rise and the Antarctic Shelf,

for the Indo-Atlantic Antarctic Basin stretches from near the South Sandwich Islands towards Kerguelen with depths ex- ceeding 2500 fathoms and reaching in places 3100. The Cape Trough runs northward from this basin. It was long believed on the strength of a sounding of " 4000 fathoms, no bottom " reported by Sir James Ross in 68° 22′ S., 12 49′ W., that the Indo-Atlantic Basin was of enormous depth, but W. S. Bruce, in the " Scotia," showed in 1904 that the real depth at that point is only 2660 fathoms.

In the Indian Ocean the Kerguelen Rise stretches broadly southward, east of the island which gives it a name, to the Antarctic Shelf with the greatest depths upon it usually less than 2000 fathoms, and it stretches northward beyond New Amsterdam to 30° S. This rise is separated from the Crozet Rise by a depression extending to 2675 fathoms, through which the Kerguelen Trough (which lies north of Kerguelen) is brought into free communication with the Indo-Atlantic Antarctic Basin. The greater part of the Indian Ocean is occupied by the great Indian Basin, which covers 35,000,000 sq. km. (13,500,000 sq. m.) and extends from the Chagos Islands eastward to Australia and south-eastward to Tasmania. The Australian Shelf rises steeply as a rule from depths of 2500 to 3000 fathoms. A broad depression with depths of from 3300 to 3500 fathoms lies to the east of the Cocos Islands and extends into the angle between the Malay Archipelago and Australia. On the north this depression sinks into the long and narrow Sunda Trench south of Java, and here in io° 15′ S., 108 5′ E., the German surveying-ship " Planet " obtained a sounding of 3828 fathoms in 1906. The Sunda Trench is distinguished by the wave-like configuration of its floor, and this wave-like character is con- tinued to the westward of Sumatra with islands rising from the higher portions. The western part of the Indian Ocean has been shown by the surveys cf H.M.S. " Sealark " and the German surveying-ship " Planet " to have a somewhat complicated, configuration, the island groups and banks of atolls which occur there rising abruptly as a rule from depths of about

2000 fathoms or more. Between the Seychelles and Sokotra (o°- 9° N.) there are great stretches of the ocean floor forming an almost level expanse at a depth of 2800 fathoms. The Arabian Gulf and Gulf of Aden are also very uniform with depths of about 1900 fathoms, while the floor of the Bay of Bengal rises very gradually northwards and is 1000 fathoms deep close up to the Ganges Shelf.

The Pacific Ocean consists mainly of one enormous basin bounded on the west by New Zealand and the Tonga, Marshall and Marianne ridges, on the north by the festoons of islands marking off the North Pacific fringing seas, on the east by the coast of North America and the great Easter Island Rise and on the south by the Antarctic Shelf. The total area of this basin is about 80,000,000 sq. km. (30,000,000 sq. m.), its surface being almost twice that of Asia. Half of this basin lies deeper than 2750 fathoms, and the greater part of it belongs to the northern hemisphere. From the floor of this vast and profound depression numerous isolated volcanic cones rise with abrupt slopes, and even between the islands of the Hawaiian group there are depths of more than 2000 fathoms. The Society Islands and Tahiti crown a rise coming within 1500 fathoms of the surface, two similar rises form the foundation of the Paumotu group where Agassiz found soundings of 2187 fathoms between Marokau and Hao. This greatest of ocean basins contains also the largest and deepest trenches. The Tuscarora Deep of the Japan Trench (4655 fathoms in 44 55′ N., 152 26′ E.) was famed for many years as the deepest depression of the earth's crust. This great trench is continued along the Luchu Islands where the cable-steamer " Stephan " sounded in 4080 fathoms, and through the Bonin Trench (with a maximum of 3595 fathoms) to the famous Marianne Trench in which the U.S.S. " Nero " in 1899 found 5269 fathoms in 12 43′ N., 145 49′ E., the greatest depth yet measured. The northern part of the Marianne Trench leads to a wave-like configuration of the ocean floor, the depth to the east of Saipan being over 4300 fathoms, followed by a rise to 1089 fathoms and then a descent to 3167 fathoms.

The trenches of Yap (4122 fathoms) and Palau (Pelew) (4450 fathoms) are not immediately connected with that of Marianne. To the east of the Philippines a sounding of 3490 fathoms is found close to the Strait of St Bernardino and north-east of Talaut there is a trench with 4648 fathoms. To the north-east the Japan Trench adjoins the Aleutian Trench, where a depth of 4038 fathoms has been found south-west of Attu. Trenches of great size also occur south of the equator. The Tonga and Kermadec trenches, both deeper than 4000 fathoms, stretch from the Samoa Islands southwards

toward New Zealand for a distance of 1600 nautical miles. The deepest sounding obtained in the Tonga Trench is 5022 fathoms in 23° 39-4′ S., 175 4′ W., and in the Kermadec Trench, 5155 fathoms, 30 27-7′ S., 176 39′ W. The steep western sides of these trenches often show an angle of slope of 7 .

The south-western part of the Pacific Ocean has a very rich and diversified submarine relief, abounding in small basins separated by ridges and rises. There are no depths, however, much exceeding 2500 fathoms amongst these depressions. The south-eastern part of the Pacific is mainly occupied by the Easter Island Rise with depths rarely so great as 2000 fathoms; but close to the continent of South America the Atacama Trench is a typical example of the deepest form of depression culminating with 4175 fathoms in 25 42′ S., 71° 31-5′ W. The Pacific Antarctic Basin occupies the vast region south of 50° S. right up to the Antarctic Shelf, with depths ranging down to 2500- 3000 fathoms, and communicating with the main Pacific Basin to the east of New Zealand.

The greatest of the intercontinental seas, the Arctic, comes nearest to oceanic conditions in the extent and depth of its depressions. The soundings of Nansen and Sverdrup on the " Fram " expedition indicate that northward from the Siberian Shelf the great North Polar Basin has an area of about 4,000,000 sq. km. (1,500,000 sq. m.) with depths down to 2200 fathoms. A rise between Spitsbergen and Greenland separates the Nor- wegian Trough (greatest depth 2005 fathoms in 68° 21′ N., 2° 5′ W.) which in turn is divided from the Atlantic by the Wyville Thomson Ridge which runs between the Faeroe and Shetland islands and is covered by only 314 fathoms of water at the deepest point. The ridge across Denmark Strait west of Iceland nowhere exceeds 300 fathoms in depth, so that the deeper water of the North Polar Basin is effectively separated from that of the Atlantic. A third small basin occupies Baffin Bay and contains a maximum depth of 1050 fathoms. Depths of from 100 to 300 fathoms are not uncommon amongst the channels of the Arctic Archipelago north of North America, and Bering Strait, through which the surface water of the Arctic Sea meets that of the Pacific, is only 28 fathoms deep.

The Central American Sea communicates with the Atlantic through the channels between the Antilles, none of which is quite 1000 fathoms deep, and it sinks to a depth of 2843 fathoms in the Caribbean Basin, 3428 fathoms in the Cayman Trench and 2080 fathoms in the Gulf of Mexico.

The Austral- Asiatic or Malay Sea is occupied by a great shelf in the region west of Borneo and north of Java, while in the east there are eight abruptly sunk basins of widely different size. The China Sea on the north has a maximum depth of 2715 fathoms off the Philippines, the Sulu Basin reaches 2550 fathoms, and the Celebes Basin 2795 fathoms. Some of the channels between the islands are of very great depth, Macassar Strait exceeding 1000 fathoms, the Molucca Passage exceeding 2000 fathoms, and the Halmahera Trough sinking as deep as 2575 fathoms. The deepest of all is the Banda Basin, a large area of which lies below 2500 fathoms and reaches 3557 fathoms in the Kei Trench. A depth of 2789 fathoms also occurs north of Flores. The borders of the Malay Sea are everywhere shallower on the side of the Indian Ocean than on that of the Pacific, and consequently water from the Pacific preponderates in the depths.

The Mediterranean Sea, the best-known member of the inter-continental class, is separated from the Atlantic Ocean by a ridge running from Cape Spartel to Cape Trafalgar on which

the greatest depth is only 175 fathoms. The depth increases so rapidly towards the east that soundings exceeding 500 fathoms occur off Gibraltar. The Balearic Basin, between Spain and the rise bearing Corsica and Sardinia, has a maximum depth of 1742 fathoms, and the Tyrrhenian Basin between that rise, Italy and Sicily deepens to 2040 fathoms. The larger Eastern Mediterranean Basin stretches eastward from Sicily with large tracts more than 2000 fathoms below the surface, and the greatest depth ascertained during the detailed researches of the Austrian expedition on board the " Pola " was 2046 fathoms in 35 44-8′ N., 21 46-8′ E. The Adriatic Sea though very shallow in the north deepens southward to about 900 fathoms, and the Aegean Sea has a maximum depth of 1230 fathoms north of Crete. The Black Sea, connected with the Mediterranean by long and narrow channels, is occupied in the north by an extensive shelf on which

Mean Depths of Oceans and Seas.

Depth. Fathoms.

Area.

Volume.

sq. km.

sq. st. m.

cb. km.

cb. st. m.

Atlantic Ocean …. Indian Ocean …. Pacific Ocean ….

2110

2148 2240

81,657,800

73,441,960

165,715,490

31,529,390 28,357,150 63,985,370

314,821,680 288,527,610 678,837,190

75,533,900

69,225,200

162,870,600

I. Oceans

2186

320,815,250

123,871,910

1,282,186,480

307,629,700

Arctic Sea

Malay Sea

Central American Sea Mediterranean Sea .

640

595

“43

782

14,352,340 8,125,060 4,584,570 2,967,570

5,541.630

3.i37,2io

1,770,170 1,145,830

16,794,140 8,848,110 9,579,490 4,249,020

4,029,400 2,122,900 2,298,400 1,019,400

Intracontinental Seas

718

30,029,540

11,595,840

39,470,760

9,470,100

Baltic Sea

Hudson Bay ....

Red Sea

Persian Gulf ....

30

70

267

14

406,720

1,222,610

458,480

232,850

157,040

472,070

177,030

89,910

22,360

156,690

223,810

5,9lo

5,36o

37,590 53,700

1,420

Smaller Enclosed Seas

96

2,320,660

896,050

408,770

98,070

II. Enclosed Seas

674

32,350,200

12,490,890

39,879,530

9,568,170

Bering Sea . Okhotsk Sea Japan Sea . East China Sea . Andaman Sea Californian Gulf North Sea . Irish Sea Laurentian Sea . Bass Sea

790

694

837

97

426

54o

51

34

70

39

2,274,800

1,507,610

1,043,820

1,242,480

790,550

166,790

57L9IO

213,380

219,300

83,170

878,340 582,110 403,040 479,740

305.240 64,400

220,820 82,390 84,670 32,110

3,286,230

1,895,100

1,597,040

219,820

615,910

164,590

53.730

13,320

28,100

6,020

788,500

454,7oo

383,200

52,700

147,770

39,490

12,890

3,200

6,740

1,440

III. Fringing Seas

53i

8,113,810

3,132,860

7,879,860

1,890,630

Seas (Enclosed and Fringing) .

645

40,464,010

15.623,750

47,759.390

11,458,800

Hydrosphere ....

2013

361,279,160

139.495.660

i.329.945. 8 70

319,087,500

lies the extremely shallow Gulf of Azov; but the greater part of the sea consists of a deep basin, the central part of which is an almost

flat expanse at a uniform depth of 1220 fathoms.

The smaller enclosed seas are for the most part very shallow. The Persian Gulf nowhere exceeds 50 fathoms, the southern part of Hudson Bay does not exceed 100 fathoms except at one spot, though in the less-known fjords of the northern part depths up to 200 fathoms have been reported. The Baltic Sea exceeds 50 fathoms in few places except the broad central portion, though small caldron-like depressions here and there may sink below 200 fathoms. The Red Sea on the other hand, though shut off from the Indian Ocean by shallows of the Strait of Bab-el- Mandeb with little more than 100 fathoms, sinks to a very considerable depth in its central trough, which reaches 1209 fathoms in 20 N.

The fringing seas as a rule show little variety of submarine relief. The Bass Sea (Bass Strait), Irish Sea and North Sea Me on the continental shelf. In the North Sea the depth of 100 fathoms is only exceeded to any extent in the Norwegian gully, which has a maximum depth of 383 fathoms in the Skagerrack.

Most of the other seas of this class are formed on a common plan. Towards the continent there is a broad shelf, and just before the chain of islands separating them from the ocean runs a narrow and deep trough. In the Bering Sea the trough north of Buldir in the Aleutian Islands sinks to 2237 fathoms, and in the Sea of Okhotsk, north-west of the Kuriles, to 1859 fathoms. Similar conditions prevail in the East China Sea and the Andaman Sea. The Sea of Japan has a wide shelf only in the north, the central part forms a broad basin with depths of 1650 fathoms. The Laurentian Sea (Gulf of St Lawrence) has a narrow branching gully running between wide shelves, in which a depth of 312 fathoms is found south of Anticosti.

The area, general depth and total volume of the oceans and principal seas have been recalculated by Krummel, and the accompanying table presents these figures.

Oceanic Deposits. — It has long been known that the deposits which carpet the floor of the ocean differ in different places, and coast- ing sailors have been accus- tomed from time immemorial to use the lead not only to ascertain the depth of the water but also to obtain samples of the bottom, the appearance of which is often characteristic of the locality. In depths down to 100 fathoms the old-fashioned hand-lead, hollow below and " armed " with tallow, suffices to bring up a sample large enough to be recognizable. Captain Phipps in 1773 secured samples of soft blue clay in this

manner from a depth of 683 fathoms, but as a rule when sounding in great depths the sample is washed off the tallow before it can be brought on board. Various devices have con- sequently been attached to leads intended to catch and hold the material when soft enough to be penetrated. One of the most effective early forms was the snapper or " deep-sea clamm " of Sir John Ross, a pair of powerful spring jaws held apart by an arrangement which when released on striking the bottom allowed the jaws to close, biting out and holding securely a substantial portion of the ground. A simpler form of collector, now almost universally used, is a plain brass tube which is driven into the bottom of the sea by the weight of the sounding lead, and in which the deposit may be retained by a valve or other contrivance, though in many cases friction alone suffices to hold the punched-out core. Larger quantities of deposit may be conveniently collected by means of the dredge, which can be worked in any depth and brings up large stones, concretionary nodules or fossils, of the existence of which a sounding-tube could give no indication.

The voyage of the " Challenger " supplied for the first time the nucleus of a collection of deep-sea deposits sufficient to serve as the basis for comprehensive classification and mapping. The " Challenger " collections supplemented by those of other expeditions and of many telegraph and surveying-ships were studied in detail by Sir John Murray and Professor A. Renard, whose monograph, 1 published in 1891, laid the foundations and 1 " Challenger " Reports, " Deep Sea Deposits."

reared the greater part of the structure of our present knowledge on the subject. The classification adopted was a double one, taking account both of the origin and of the distribution in depth of the various deposits, thus: —

I. Deep Sea Deposits) (beyond 100 fathoms)

II. Shallow Water"] Deposits {in less >- than loo fathoms) J

III. Littoral Deposits ""1 (between high and >- low-water marks) J

1. Red Clay.

2. Radiolarian Ooze

3. Diatom Ooze

4. Globigerina Ooze

5. Pteropod Ooze

6. Blue Mud

7. Red Mud

8. Green Mud

9. Volcanic Mud 10. Coral Mud

Sands, gravels, muds, &c.

Sands, gravels, muds, &c.

A. Pelagic Deposits (formed in deep water remote from land)

Terrigenous De- posits (formed in deep or shallow water close to land)

Krummel prefers to simplify this by grouping the deposits in a single category arranged according to their position into :

(a) Littoral (including Murray and Renard's littoral and shallow water deposits [II. and III.]).

(fi) Hemipelagic (including Nos. 6-10 of Deep Sea Deposits). (7) Eupelagic (including Nos. 1-5 of Deep Sea Deposits).

As so defined the hemipelagic deposits are those which occur in general on the slope from the continental shelves to the ocean depths and also in the deep basins of enclosed and fringing seas. The eupelagic deposits are subdivided by Krummel into two main groups; (a) epilophic, 1 including the pteropod, globigerina and diatom oozes occurring on the rises and ridges and in the less deep troughs, (b) Abyssal, including the radiolarian ooze and red clay of the deepest abysses.

The littoral deposits include those of the actual shore on the wash of the waves and of the surface of the continental shelf.

Shore Deposits are the product of the waste of the land arranged and bedded by the action of currents or tidal streams. On the rocky coast of high latitudes blocks of stone detached by frost fall on the beach

and becoming embedded in ice during winter are often drifted out to sea and so carry the shore deposits to some distance from the land. Similar effects are produced along the boulder-clay cliffs of the Baltic. Where the force of the waves on the beach produces its full effect the coarser material gets worn down to gravel, sand and silt, the finest particles remaining long suspended in the water to be finally deposited as mud in quiet bays. A particularly fine-grained mud is formed on the low coasts of the eastern border of the North Sea by a mixture of the finest sediment carried down by the slow-running rivers with the calcareous or siliceous remains of plankton. Pure calcareous sand and calcareous mud are formed by wave action on the shores of coral islands where the only materialavailable is coral and the accompanying calcareous algae, Crustacea, molluscs and other organisms secreting carbonate of lime. Recent limestones are being produced in this way and also in some places by the precipitation of calcium carbonate by sodium or ammonium carbonate which has been carried into the sea or formed by organisms. The precipitated carbonate may agglomerate on mineral or organic grains which serve as nuclei, or it may form a sheet of hard deposit on the bottom as occurs in the Red Sea, off Florida, and round many coral islands in the Pacific. ' Only the sand and the finest-grained sediments of the shore zone are carried outwards over the continental shelf by the tides or by the reaction-currents along the bottom set up by on-shore winds. The very finest sediment is kept in a state of movement until it drops into the gulleys or furrows of the shelf, where it can come to rest together with the finer fragments of the remains of littoral or bank vegetation. Thus are formed the " mud-holes " of the Hudson Furrow so welcome as guides telling their position to ship captains making New York harbour in a fog. Sand may be taken as the predominating deposit on the continental shelves, often with a large admixture of remains of calcareous organisms, for instance the deposits of maerl made up of nullipores off the coasts of Brittany and near Belle Isle. Amongst the most widely distributed of the 1 lirl X6 < £ois — on the threshold.

deposits actually formed on the continental shelf are phosphatic nodules; these are especially abundant on the east coast of the United States and on the Agulhas Bank, where the amount of calcium phosphate in the nodules is as much as 50%. Sir John Murray finds the source of the phosphoric acid to be the decomposition of large quantities of animal matter, and he illustrates this by the well-known circumstance of the death of vast shoals of fish when warm Gulf-Stream water displaces the cold current which usually extends to the American coast. Glacial detritus naturally

plays a great part in the deposits on the polar continental shelves.

Hemipelagic deposits are a mixture of deposits of terrigenous and pelagic origin. The most abundant of the terrigenous materials are the finest particles of clay and calcium carbonate as well as fragments derived from land vegetation, of which twigs, leaves, &c, may form a perceptible proportion as far as 200 m. from land. Blue mud, according to Murray and Renard, is usually of a blue or slaty or grey-green colour when fresh, the upper surface having, however, a reddish tint. The blue colouring substance is ferrous sulphide, the upper reddish layer contains more ferric oxide, which the predominance of decom- posing organic matter in the substance of the mud reduces to ferrous oxide and subsequently by further action to sulphide. The proportion of calcium carbonate varies greatly according to the amount of foraminifera and other calcareous organisms which it contains. Blue mud prevails in large areas of the Pacific Ocean from the Galapagos Islands to Acapulco. In the Indian Ocean it covers the Bay of Bengal, the Arabian Gulf, the Mozambique Channel and the region to the south-west of Madagascar. In the Atlantic it is the characteristic deposit of the slopes of continental shelves of western Europe and of New England, being largely mixed with ice-borne material to the south of Newfoundland. It is particularly in evidence round the ˆ whole of the Antarctic Shelf, where it occurs down to depths of 2500 fathoms. It is the chief deposit, according to Nansen, of the North Polar Basin and, according to Schmelck and Boggild, of the Norwegian Sea also, where it is largely mixed with the shells of the bottom-living foraminifer Biloculina. Max Weber states that blue mud occurs in the deep basins of the eastern part of the Malay Sea. In the form of volcanic mud it is common round the high volcanic islands of the South- western Pacific.

Red mud may be classed as a variety of blue mud, from which it differs on account of the larger proportion of ochreous sub- stance and the absence of sufficient organic matter to reduce the whole of the ferric oxide. This variety surrounds the tropical parts of the continental shelves of South America, South Africa and eastern China.

Green mud differs to a greater extent from the blue mud, and owes its characteristic nature and colour to the presence of glauconite, which is formed inside the cases of foraminifera, the spines of echini and the spicules of sponges in a manner not yet understood. It occurs in such abundance in certain geological formations as to give rise to the name of green-sand. Green mud abounds off the east coast of

North America seawards of Cape Hatteras, also to the north of Cuba, and on the west off the coast of California. The " Challenger " expedition found it on the Agulhas Bank, on the eastern coasts of Australia, Japan, South America and on the west coast of Portugal. When the pro- portion of calcium carbonate in the blue mud is considerable there results a calcareous ooze, which when found on the con- tinental slope and in enclosed seas is largely composed of remains of deep-sea corals and bottom-living foraminifera, pelagic organisms including pteropods being less frequently represented. The floors of the Caribbean, Cayman and Mexican Basins in the Central American Sea are covered with a white calcareous ooze, which is clearly distinguished from the eupelagic pteropod and globigerina oozes by the presence of abundant large mineral particles and the remains of land plants. In this deposit the occurrence of calcareous concretions is very characteristic, as L. F. de Pourtales pointed out in 1870; they consist of remains of deep-sea corals, serpulae, echinoderms and mollusca united

by a calcareous cement. Similar formations are found in the Mediterranean, where a dark mud predominates in the western part, passing into a grey, marly slime in the Tyrrhenian Basin and replaced by a typical calcareous ooze in the Eastern Basin. The bottom of the Black Sea is covered by a stiff blue mud in which Sir John Murray found much sulphide of iron, 1 grains or needles of pyrites making up nearly 50% of the deposit, and there are also grains of amorphous calcium carbonate evidently precipitated from the water. The formation of the blue mud is largely aided by the putrefaction of organic matter, and as a result the water deeper than 120 fathoms is extra- ordinarily deficient in dissolved oxygen and abounds in sul- phuretted hydrogen, the formation of which is brought about by a special bacterium, the only form of life found at depths greater than 120 fathoms in the Black Sea.

In the Red Sea the " Pola " expedition discovered a calcareous ooze similar to that of the Mediterranean, and the formation of a stony crust by precipitation of calcium and magnesium carbonates may be recognized as giving origin to a recent dolomite.

The terrigenous ingredients in the deposits become less and less abundant as one goes farther into the deep ocean and away from the continental margins. Still, according to Murray and Irvine, finely

divided colloidal clay is to be found in all parts of the ocean however remote from land, though in very small amount, and there is less in tropical than in cooler waters. A minute fraction is always separating out of the water, and as a prodigious length of time may be accepted for the accomplish- ment of all the chemical and physical processes in the deep sea, we must take account of the gradual accumulation of even this infinitesimal precipitation. As well as the finest of terrigenous clay there is present in sea-water far from land a different clay derived from the decomposition of volcanic material. Volcanic dust thrown into the air settles out slowly, and some of, the products of submarine and littoral volcanoes, like pumice-stone, possess a remarkable power of floating and may drift into any part of the ocean before they become waterlogged and sink. To this inconceivably slowly-growing deposit of inorganic material over the ocean floor there is added an overwhelmingly more rapid contribution of the remains of calcareous and siliceous planktonic and benthonic organisms, which tend to bury the slower accumulating material under a blanket of globigerina, pteropod, diatom or radiolarian ooze. When those deposits of organic origin are wanting or have been removed, the red clay composed of the mineral constituents is found alone. It is a remarkable geographical fact that on the rises and in the basins of moderate depth of the open ocean the organic oozes preponderate, but in the abysmal depressions below 2500 or 3000 fathoms, whether these lie in the middle or near the edges of the great ocean spaces, there is found only the red clay, with a minimum of calcium carbonate, though sometimes with a considerable admixture of the siliceous remains of radiolarians. Thus red clay and radiolarian ooze are distinguished as abyssal deposits in contradistinction to the epilophic calcareous oozes.

Globigerina ooze was recognized as an important deposit as soon as the first successful deep-sea soundings had been made in the Atlantic. It was described simultaneously in 1853 by Bailey of West Point and Ehrenberg in Berlin. Murray and Renard define globigerina ooze as containing at least 30% of calcium carbonate, in which the remains of pelagic (not benthonic) foraminifera predominate and in which remains of pelagic mollusca such as pteropods and heteropods, ostracodes and also coccoliths (minute calcareous algae) may also occur. Not more than 25% of the deposit may consist of bottom- dwelling foraminifera, echini or worm-tubes, and as a rule these make up only from 9 to 10%. These peculiarities, combined with the striking absence of mineral constituents, distinguish the eupelagic globigerina ooze from the hemipelagic

calcareous mud. Out of 118 samples of globigerina ooze obtained by the "Challenger" expedition 84 came from depths of 1500 to 7500 fathoms, 13 from depths of 1000 to 1500 and only 16 from Scot. Geog. Mag., vol. 16 (1900), p. 695.

depths greater than 2500 fathoms. Viewed as a whole this deposit may be taken as a partial precipitation of the plankton living in the upper waters of the open sea. A small proportion of organic matter including the fat globules of the plankton is mixed with the calcium carbonate, the amount according to Gumbel's analysis being about 1 part in 1000. Secondary products, such as glauconite, phosphatic concretions and man- ganese nodules, occur though less frequently than in the hemi- pelagic sediments. Globigerina ooze is the characteristic deposit of the Atlantic Ocean, where it covers not less than 44,000,000 sq. km. (17,000,000 sq. statute m.). In the Indian Ocean the area covered is 31,000,000 sq. km. (12,000,000 sq. m.) and in the huge Pacific Ocean only 30,000,000 sq. km. (11,500,000 sq. m.).

Pteropod ooze is merely a local variety of globigerina ooze in which the comparatively large but very delicate spindle- shaped shells of pteropods happen to abound. These shells do not retain their individuality at depths greater than 1400 or 1500 fathoms, and in fact pteropod ooze is only found in small patches on the ridges near the Azores, Antilles, Canaries, Sokotra, Nicobar, Fiji and the Paumotu islands, and on the central rise of the South Atlantic between Ascension and Tristan d'Acunha.

Diatom ooze was recognized by Sir John Murray as the characteristic deposit in high latitudes in the Indian Ocean, and later it was found to be characteristic also of the correspond- ing parts of the Indian and Pacific covering a total area of about 22,000,000 sq. km. (8,500,000 sq. m.). It has been found spor- adically near the Aleutian Islands, between the Philippines and Marianne Islands and to the south of the Galapagos group. It is made up to a large extent of the siliceous frustules of diatoms. It is usually yellowish-grey and often straw-coloured when wet, though when dried it becomes white and mealy.

Red clay was discovered and named by Sir Wyville Thomson on the " Challenger " in 1873 when sounding in depths of 2700 fathoms on the way from the Canary Islands to St Thomas. The reddish colour comes from the presence of oxides of iron, and particles of manganese also occur in it, especially in the Pacific region, where the colour is more that of chocolate; but when it is mixed with

globigerina ooze it is grey. Red clay is the deposit peculiar to the abysmal area; 70 carefully investi- gated samples collected by the " Challenger " came from an average depth of 2730 fathoms, 97 specimens collected by the " Tuscarora " came from an average depth of 2860 fathoms, and 26 samples obtained by the " Albatross " in the Central Pacific came from an average depth of 2620 fathoms. Red clay has not yet been found in depths less than 2200 fathoms. The main ingredient of the deposit is a stiff clay which is plastic when fresh, but dries to a stony hardness. Isolated gritty fragments of minerals may be felt in the generally fine-grained homogeneous mass. The dredge often brings up large numbers of nodules formed upon sharks' teeth, the ear-bones of whales or turtles or small fragments of pumice or other volcanic ejecta, and all more or less incrusted with manganese oxide until the nodules vary in size from that of a potato to that of a man's head. A very interesting feature is the small proportion of calcium carbonate, the amount present being usually less as the depth is greater; red clay from depths exceeding 3000 fathoms does not contain so much as 1 % of calcareous matter.

Murray and Renard recognize the progressive diminution of carbonate of lime with increase of depth as a characteristic of all eupelagic deposits. The whole collection of 231 specimens of deep-sea deposits brought back by the " Challenger " shows the following general relationship: —

Proportion of Calcium Carbonate in Deep-Sea Deposits.

68 samples from less than 2000 fathoms = 60-80 %

68 ,, ,, 2000-2500 ,, 46-7 %

65 >, ■,, 2500-3000 ,, 17-4 %

8 ,, ,, more than 3000 ,, 0-9 %

In deep water there is a regular process of solution of the calcareous shells falling from the surface. Murray and Renard ascribe this to the greater abundance of carbonic acid in the

deeper water, which aided by the increased pressure adds to the solvent power of the water for carbonate of lime. It is, however, a curious question how, considering the increase of carbonic acid by

the decomposition of organic bodies and possible submarine exhalations of volcanic origin, the water has not in some places become saturated and a precipitate of amorphous calcium carbonate formed in the deepest water. The whole subject still requires investigation.

Amongst the foreign material found embedded in the red clay are globules of meteoric iron, which are sometimes very abundant. Derived products in the form of crystals of phillipsite are not uncommon, but the most abundant of all are the in- crustations of manganese oxide, as to the origin of which Murray and Renard are not fully clear. The manganese nodules afford the most ample proof of the prodigious period of time which has elapsed since the formation of the red clay began; the sharks' teeth and whales' ear-bones which serve as nuclei belong in some cases to extinct species or even to forms derived from those familiar in the fossils from the seas of the Tertiary period. This fact, together with the extraordinarily rare occurrence of such remains and meteoric particles in globigerina ooze, although there is no reason to suppose that at any one time they are unequally distributed over the ocean floor, can only be explained on the assumption that the rate of formation of the epilophic deposits through the accumulation of pelagic shells falling from the surface is rapid enough to bury the slow- gathering material which remains uncovered on the spaces where the red clay is forming at an almost infinitely slower rate. Sir John Murray believes that no more than a few feet of red clay have accumulated in the deepest depressions since the close of the Tertiary period. The red clay is the characteristic deposit of the Pacific Ocean, whereabout 101,000,000 sq. km. (39,000,000 sq. m.) are covered with it, while only 15,000,000 sq. km. (5,800,000 sq. m.) of the Indian Ocean and 14,000,000 sq. km. (5,400,000 sq. m.) of the Atlantic are occupied by this deposit; it is indeed the dominant submarine deposit of the water- hemisphere just as globigerina ooze is the dominant submarine deposit of the land-hemisphere.

Radiolarian ooze was recognized as a distinct deposit and named by Sir John Murray on the " Challenger " expedition, but it may be viewed as red clay with an exceptionally large proportion of siliceous organic remains, especially those of the radiolarians which form part of the pelagic plankton. It does not occur in the Atlantic Ocean at all, and in the Indian Ocean it is only known round Cocos and Christmas Islands; but it is abundant in the Pacific, where it covers a large area between 5° and 15° N., westward from the coast of Central America to 165 W., and it is also found in patches north of the Samoa Islands, in the Marianne Trench and west of the

Galapagos Islands.

The total areas occupied by the various deposits according to the latest measurements of Krummel are as follows: —

A rea of Submarine Deposits.

Deposit.

Sq. km.

Sq. st. m. 1

%•

I. Littoral deposits

33,000,000

12,700,000

9-1

II. Hemipelagic „ .

55,700,000

21,500,000

15-4

III. Eupelagic „

272,700,000

105,300,000

75-5

1. Globigerina ooze .

105,600,000

40,800,000

(29-2) (0-4)

2. Pteropod ooze .

1 ,400,000

500,000

3. Diatom ooze

23,200,000

8,900,000

(6-4)

4. Red clay

130,300,000

50,300,000

(36-1)

5. Radiolarian ooze .

12,200,000

4,700,000

(3-4)

always remained upon those portions of the earth's crust which they occupy now, and both J. Dana and Louis Agassiz had already arrived at the same conclusion. This theory accords well with the enormous lapse of time required in the accumulation of the red clay.

Salts of Sea-water. — Sea-water differs from fresh water by its salt and bitter taste and by its unsuitability for the purposes of washing and cooking. The process of natural evaporation in the salines or salt gardens of the margin of warm seas made the composition of sea-salt familiar at a very early time, and common salt, Epsom salts, gypsum and magnesium chloride were recognized amongst its constituents. The analyses cf modern chemists have now revealed the existence of 32 out cf the 80 known elements as existing dissolved in sea-water, and it is scarcely too much to say that the remaining elements also exist in minute traces which the available methods of analysis as yet fail to disclose. Many of the elements such as copper, lead, zinc, nickel, cobalt and manganese have only been found in the substance of sea-weeds and corals. Silver and gold also exist in solution in sea-water. Malaguti and Durocher ' estimate the silver in sea-water as 1

part in 100,000,000 or 1 grain in 1430 gallons. If this estimate is correct there exists dissolved in the ocean a quantity of silverequal to 13,300 million metric tons, that is to say 46,700 times as much silver as has been produced from all the mines in the world from the discovery of America down to 1902. No quantitative determination of the amount of gold in solution is available. E. Sonnstadt' detected gold by means of a colour test and roughly estimated the amount as 1 grain per ton of sea-water, and on this estimate all the projects for extracting gold from sea-water have been based.

The elements in addition to oxygen which exist in largest amount in sea salt are chlorine, bromine, sulphur, potassium, sodium, calcium and magnesium. Since the earliest quantitative analyses of sea-water were made by Lavoisier in 1772, Bergman in 1774, Vogel in 1 8 1 3 and Marcet in 1 8 1 9 the view has been held that the salts are present in sea-water in the form in which they are deposited when the water is evaporated. The most numerous analyses have been carried out by Forchhammer, who dealt with 150 samples, and Dittmar, who made complete analyses of 7 7 samples obtained on the " Challenger " expedition. Dittma c showed that the average proportion of the salts in ocean water of 35 parts salts per thousand was as follows (calculated as part? per thousand of the sea- water, as percentage of the total salts and per hundred molecules of magnesium bromide) : —

The Salts in Ocean Water.

Geologists are agreed that littoral and hemipelagic deposits similar to those now forming are to be found in all geological systems, but the existence in the rocks of eupelagic deposits and especially of the abysmal red clay, though viewed by some as probable, is totally denied by others. There is even some hesitation in accepting the continuity of the chalk with the globi- gerina ooze of the modern ocean. From the obvious rarity of true abysmal rocks in the continental area Sir John Murray deduces the permanence of the oceans, which he holds have

Per 1000 Parts Water.

Per cent. Total Salts.

Per 100

Molecules MgBr 2 .

Common salt, sodium

chloride (NaCl) . .

27-213

77-758

112,793

Magnesium chloride

(MgCl 2) ....

3-807

10-878

9,690

Magnesium sulphate

(MgS0 4). . . .

1-658

r 4-737

3.338

Gypsum, calcium sul-

phate (CaSO <) . .

1-260

3-600

2.239

Potassium sulphate

(K 2 S0 4) ....

0-863

2-465

1,200

Calcium carbonate

(CaC0 3) and residue

0-123

o-345

298

Magnesium bromide

(MgBr 2) ....

0-076

0-217

100

35-000

IOO-000

As Marcet had foreshadowed from the analysis of 14 samples in 1 8 1 9, the larger series of exact analyses proved that the varia- tions in the proportion of individual salts to the total salts are very small, and all analyses since Dittmar's have confirmed this result. Although the salts have been grouped in the above

1 Comptes rendus, Acad. Sciences (Paris, 1859), 49, 463, 536.

2 Chemical News (1870), vol. 22, pp. 25, 44; (1872) vol. 26, P-159-

table it is not to be supposed that a dilute solution like sea-water contains all the ingredients thus arbitrarily combined. There must be considerable dissociation of molecules, and as a first approximation it may be taken that of 10 molecules of most of the components about 9 (or in the case of magnesium sulphate 5) have been separated into their ions, and that it is only during slow concentration as in a natural saline that the ions combine to produce the various salts in the proportions set out in the above table. One

can look on sea-water as a mixture of very dilute solutions of particular salts, each one of which after the lapse of sufficient time fills the whole space as if the other constituents did not exist, and this interdiffusion accounts easily for the uniformity of composition in the sea-water throughout the whole ocean, the only appreciable difference from point to point being the salinity or degree of concentration of the mixed solutions.

The origin of the salt of the sea is attributed by some modern authorities entirely to the washing out of salts from the land by rain and rivers and the gradual concentration by evaporation in the oceans, and some (e.g. J. Joiy) go so far as to base a calcula- tion of the age of the earth on the assumption that the ocean was originally filled with fresh water. This hypothesis, however, does not accord with the theory of the development of the earth from the state of a sphere of molten rock surrounded by an atmosphere of gaseous metals by which the first-formed clouds of aqueous vapour must have been absorbed. The great similarity between the salts of the ocean and the gaseous products of volcanic eruptions at the present time, rich in chlorides and sulphates of all kinds, is a strong argument for the ocean having been salt from the beginning. Two other facts are totally opposed to the origin of all the salinity of the oceans from the concentra- tion of the washings of the land. The proportions of the salts of river and sea-water are quite different, as Julius Roth shows thus: —

Carbonates.

Sulphates.

Chlorides.

River water

Sea water ....

80

0-2

13 10

7 89

The salts of salt lakes which have been formed in the areas of internal drainage in the hearts of the continents by the evaporation

of river water are entirely different in composition from those of the sea, as the existence of the numerous natron and bitter lakes shows. .Magnesium sulphate amounts to 4-7% of the total salts of sea-water according to Dittmar, but to 23-6% of the salts of the Caspian according to Lebedinzeff; in the ocean magnesium chloride amounts to 10-9% of the total salts, in the Caspian only to 4-5%; on the other hand calcium sulphate in the ocean amounts to 3-6%, in the Caspian to 6-9%. This disparity makes it extremely difficult to view ocean water as merely a watery extract of the salts existing in the rocks of the land.

The determination of salinity was formerly carried out by evaporating a weighed quantity of sea-water to dryness and weighing the residue. Forchhammer, however, pointed out that this method gave inexact and variable results, as in the act of evaporating to dryness hydrochloric acid is given off as the temperature is raised to expel the last of the water, and Tornoe found that carbonic acid was also liberated and that the loss of both acids was very variable. Tornoe vainly attempted to apply a correction for this loss by calculation; and subsequently S. P. L. Sorensen and Martin Knudsen after a careful investiga- tion decided to abandon the old definition of salinity as the sum of all the dissolved solids in sea-water and to substitute for it the weight of the dissolved solids in 1000 parts by weight of sea-water on the assumption that all the bromine is replaced by its equivalent of chlorine, all the carbonate converted into oxide and the organic matter burnt. The advantage of the new definition lies in the fact that the estimation of the chlorine (or rather of the total halogen expressed as chlorine) is sufficient

to determine the salinity by a very simple operation. According to Knudsen the salinity is given in weight per thousand parts by the expression 5 = 0-030 + 1-8050 CI where S is the salinity and CI the amount of total halogen in a sample. Such a simple formula is only possible because the salts of sea-water are of such uniform composition throughout the whole ocean that the chlorine bears a constant ratio to the total salinity as newly defined whatever the degree of concentration. This definition was adopted by the International Council for the Study of the Sea in 1902, and it has since been very widely accepted.

Besides the determination of salinity by titration of the chlorides, the method of determination by the specific gravity of the sea-water is still often used. In the laboratory the specific gravity is determined in a pyknometer by actual weighing, and on board ship by the use of an areometer or hydrometer. Three types of areometer are in use: (1)

the ordinary hydrometer of invariable weight with a direct reading scale, a set of from five to ten being necessary to cover the range of specific gravity from i-ooo to 1-031 so as to take account of sea-water of all possible salinities; (2) the " Challenger " type of areometer designed by J. Y. Buchanan, which has an arbitrary scale and can be varied in weight by placing small metal rings on the stem so as to depress the scale to any desired depth in sea-water of any salinity, the specific gravity being calculated for each reading by dividing the total weight by the immersed volume; (3) the total immersion areometer, which has no scale and the weight of which can be adjusted so that the instrument can be brought so exactly to the specific gravity of the water sample that it remains immersed, neither floating nor sinking; this has the advantage of eliminating the effects of surface tension and in Fridtjof Nansen's pattern is capable of great precision.

In all areometer work it is necessary to ascertain the tempera- ture of the water sample under examination with great exactness, as the volume of the areometer as well as the specific gravity of the water varies with temperature. All determinations must accordingly be reduced to a standard temperature for comparison. Following the practice of J. Y. Buchanan on the " Challenger " it has, been usual for British investigators to calculate specific gravities for sea-water at 60° F. compared with pure water at the maximum density point (39-2°) as unity. On the continent of Europe it has been more usual to take both at 17-5° C. (63-5° F.), which is expressed as " S^"f ', but for pyknometer work in all countries where the sample is cooled to 32° F. before weighing and pure water 'at 39-2° taken as unity the expression is (o°/4°). On the authority of the first meeting of the Inter- national Conference for the Study of the Northern European Seas at Stockholm in 1899 Martin Knudsen, assisted by Karl Forch and S. P. L. Sorensen, carried out a careful investigation of the relation between the amount of chlorine, the total salinity and the specific gravity of sea-water of different strengths including an entirely new determination of the thermal expansion of sea-water. The results are published in his Hydro graphical Tables in a convenient form for use.

The relations between the various conditions are set forth in the following equations where

(1) <7 = -0-093 +o-8 1 49 S-o-ooo482 S 2 +o-oooo068 S 3

(2)

(3) S= 0-030+1-8050 CI.

The temperature of maximum density of sea-water of any specific gravity was found by Knudsen to be given with sufficient accuracy for all practical purposes by the formula = 3-95-0-266(7 0, where 9 is the temperature of maximum density in degrees centigrade. The temperature of maximum density is lower as the concentration of the sea- water is greater, as is shown in the following table : —

Maximum Density Point of Sea-Water of Different Salinities.

Salinity per mile . .

o

IO

20

3°

35

40

Temperature 0° C .

*3*95°*

i '86°

-o'3l°

- 2'47°

- 3'52°

- 4'54°

Density

o'oo°

8'i8°

16-07°

24'iS°

Further Physical Properties of Sea-water. — The laws of physical chemistry relating to complex dilute solutions apply to sea- water, and hence there is a definite relation between the osmotic pressure, freezing-point, vapour tension and boiling-point by which when one of these constants is given the others can be calculated.

The most easily observed is the freezing-point, and according to the very careful determinations of H. T. Hansen the freezing-point t° C. varies with the degree of concentration according to the formula

t= — o-oo86 — 0-00646330-0— o-oooio55

P. = Po(l +0-00367/) and can thus be reduced to its value at 0° C. Sigurd Stenius has calculated tables of osmotic pressure for sea-water of different degrees of concentration. The relation of the elevation of the boiling-point (t°) to the osmotic pressure (P) is very simply derived from the formula l=o-02407Fo, while the reduction of vapour pressure proportional to the concentration can be very easily obtained from the elevation of the boiling-point, or it may be obtained directly from tables of vapour tension.

Physical Properties of Sea-Water.

Salinity per mille .

10

20

30

35

40

Freezing-point (C.)

-°-53

-1-07

-1-63

-1-91

-2-20

Osmotic pressure P

atmospheres .

6-4

13-0

19-7

23-1

26-6

Elevation of boiling-

point (C.)

0-16

0-31

0-47

0-56

0-64

Reduction of vapour

pressure (mm.)

4-2

8-5

13-0

15-2

The importance of the osmotic pressure of sea-water in biology will be easily understood from the fact that a frog placed in sea-water loses water by exosmosis and soon becomes 20% lighter than its original weight, while a true salt-water fish suddenly transferred to fresh water gains water by endosmosis, swells up and quickly succumbs. The elevation of the boiling- point is of little practical importance, but the reduction of vapour pressure means that sea-water evaporates more slowly than fresh water, and the more slowly the higher the salinity. Unfortunately no observations of evaporation from the surface of the open sea have been made and very few comparisons of the evaporation of salt and fresh water are on record. The fact that sea-water does evaporate more slowly than fresh water has been proved by the observations of Mazelle at Triest and of Okado in Azino (Japan). Their experiments show that in similar conditions the evaporation of sea-water amounts to from 70 to 91 % of the evaporation of fresh water-, a fact of some importance in geophysics on account of the vast expanses of ocean the evaporation from which determines the rainfall and to a large extent the heat-transference in the atmosphere.

The optical properties of sea-water are of immediate import- ance in biology, as they affect the penetration of sunlight into the depths. The refraction of light passing through sea-water is dependent on the salinity to the extent that the index of refraction is greater as the salinity increases. From isolated observations of J. Soret and E. Sarasin and longer series of experiments by Tornoe and Krummel this relation is shown to be so close that the salinity of a sample can be ascertained by determining the index of refraction. According to Krummel the following relations hold good at 18 C. for the monochro- matic light of the D line of the sodium spectrum in units of the fifth decimal place.

Relation of Refractive Index and Salinity.

For water of salinity (per mille)

Refractive index 1-33000 + units of 5th decimal place

o

308

10

502

20 694

30

885

35 981

40 1077

E. von Drygalski for the measurement of salinity at sea, and was found to have the same degree of accuracy as an areometer with the great advantage of being quite unaffected by the motion of the ship in a sea-way.

The transparency of sea-water has frequently been measured at sea by the simple expedient of sinking white-painted disks and noting the depth at which they become invisible as the measure of the transparency of the water. For the north European seas disks of about 18 or 20 in. in diameter are sufficient for this purpose, but in the tropics, where the transparency is much greater, disks 3 ft. in diameter at least must be used or the angle of vision for the reflected light is too small. In shallow seas the transparency is always reduced in rough weather. In the North Sea north of the Dogger Bank, for instance, the disk is visible in calm weather to a depth of from 10 to 16 fathoms, but in rough weather only to 65 fathoms. Knipovitch occasion- ally observed great transparency in the cold waters of the Murman Sea, where he could see the disk in as much as 25 fathoms, and a similar phenomenon has often been reported from Icelandic waters. The greatest transparency hitherto reported is in the eastern basin of the Mediterranean, where J. Luksch found the disk visible as a rule to from 22 to 27 fathoms, and off the Syrian coast even to 33 fathoms. In the open Atlantic there are great differences in transparency; Krummel observed a 6 ft. disk to depths of 31 and 36 fathoms in the Sargasso Sea, but in the cold currents of the north and also in the equatorial current the depth of visibility was only from n to 16J fathoms. In the tropical parts of the Indian and the Pacific Oceans the depth of visibility increases again to from 20 to 27 fathoms. Some allowance should be made for the elevation of the sun at the time of observation. Mill has shown that in the North Sea off the Firth of Forth the average depth of visibility of a disk in the winter half-year was 4! fathoms and in the summer half-year 6J fathoms, and, although the greater frequency of rough weather in

winter might tend to obscure the effect, in- dividual observations made it plain that the angle of the sun was the main factor in increasing the depth to which the disk remained visible.

There are some observations on the transparency of sea-water of an entirely different character. Such, for instance, were those of Spindler and Wrangell in the Black Sea by sinking an electric lamp, those of Paul Regnard by measuring the change of electric resistance in a selenium cell or the chemical action of the light on a mixture of chlorine and hydrogen, by which he found a very rapid diminution in the intensity of light even in the surface layers of water. Many experiments have also been made by the use of photographic plates in order to find the greatest depth to which light penetrates. Fol and Sarasin detected the last traces of sunlight in the western Mediterranean at a depth of 254 to 260 fathoms, and Luksch in the eastern Mediterranean at 328 fathoms and in the Red Sea at 273 fathoms. The chief cause of the different depths to which light penetrates in sea-water is the varying turbidity due to the presence of mineral particles in suspension or to plankton. Schott gives the following as the result of measure- ments of transparency by means of a white disk at 23 stations in the open ocean, where quantitative observations of the plankton under 1 square metre of surface were made at the same time.

The refractometer constructed by C. Pulfrich (of the firm of Zeiss, in Jena) has been successfully used by G. Schott and

Volume of Plankton.

Depth of

Visibility.

Mean of 1 1 stations poor in plankton . Mean of 12 stations rich in plankton .

85 cc. 53° „

141 fathoms

8| „

Any influence on transparency which may be exercised by the temperature or salinity of the water is quite in- significant.

The colour of ocean water far from land is an almost pure

blue, and all the variations of tint towards green are the result of local disturbances, the usual cause being turbidity of some kind, and this in the high seas is almost always due to swarms of plankton. The colour of sea-water as it is seen on board ship is most readily determined by comparison with the tints of Forel's xanthometer or colour scale, which consists of a series of glass tubes fixed like the rungs of a ladder in a frame and filled with a mixture of blue and yellow liquids in varying proportions. For this purpose the zero or pure blue is repre- sented by a solution of i part of copper sulphate and 9 parts of ammonia in 190 parts of water. The yellow solution is made up of 1 part of neutral potassium chromate in 199 parts of water, and to give the various degrees of the scale, 1, 2, 3, 4, &c.,% of the yellow solution is mixed with 99, 98, 97, 96, &c.,% of the blue in successive tubes. Observations with the xantho- meter have not hitherto been numerous, but it appears that the purest blue (0-1 on Forel's scale) is found in the Sargasso Sea, in the North Atlantic and in similarly situated tropical or subtropical regions in the Indian and Pacific Oceans. The northern seas have an increasing tendency towards green, the Irminger Sea showing 5-9 Forel, while in the North Sea the water is usually a pure green (10-14 Forel), the western Medi- terranean shows 5-9 Forel, but the eastern is as blue as the open ocean (0-2 Forel). A pure blue colour has been observed in the cold southern region, where the " Valdivia " found 0-2 Forel in 55 S. between io° and 31 E., and even the water of the North Sea has been observed at times to be intensely blue. The blue of the sea-water as observed by the Forel scale has of course nothing to do with the blue appearance of any distant water surface due to the reflection of a cloudless sky. Over shallows even the water of the tropical oceans is always green. There is a distinct relationship between colour and transparency in the ocean; the most transparent water which is the most free from plankton is always the purest blue, while an increasing turbidity is usually associated with an increasing tint of green. The natural colour of pure sea-water is blue, and this is em- phasized in deep and very clear water, which appears almost black to the eye. When a quantity of a fine white powder is thrown in, the light reflected by the white particles as they sink assumes an intense blue colour, and the experiments of J. Aitken with clear sea-water in long tubes leave no doubt on the subject.

Discoloration of the water is often observed at sea, but that is always due to foreign substances. Brown or even blood-red stripes have been

observed in the North Atlantic when swarms of the ˆopepod Calanus finmarchicus were present; the brown alga Trichodesmium erythraeum, as its name suggests, can change the blue of the tropical seas to red; swarms of diatoms may produce olive-green patches in the ocean, while some other forms of minute life have at times been observed to give the colour of milk to large stretches of the ocean surface.

On account of its salinity, sea-water has a smaller capacity for heat than pure water. According to Thoulet and Chevallier the specific heat diminishes as salinity increases, so that for 10 per mille salinity it is 0-968, for 35 permille it is only 0-932, that of pure water being taken as unity. The thermal con- ductivity also diminishes as salinity increases, the conductivity for heat of sea- water of 35 per mille salinity being 4-2% less than that of pure water. This means that sea-water heats and cools somewhat more readily than pure water. The surface tension, on the other hand, is greater than that of pure water and increases with the salinity, according to Krummel, in the manner shown by the equation = 77-09+0-0221 S at o° C, where a is the coefficient of surface tension and S the salinity in parts per thousand. The internal friction or viscosity of sea- water has also been shown by E. Ruppin to increase with the salinity. Thus at 0° C. the viscosity of sea- water of 35 per mille salinity is 5-2% greater and at 25 C. 4% greater than that of pure water at the same temperatures; in absolute units the viscosity of sea- water at 25° C. is only half as great as it is at o°C. The compressibility of sea-water is not yet fully investigated.

It varies not only to a marked degree with temperature, but also with the degree of pressure. Thus J. Y. Buchanan found a mean of 20 experiments made by piezometers sunk in great depths on board the " Challenger " give a coefficient of com- pressibility K=49iXio~ 7 ; but six of these experiments made at depths of from 2740 to 3125 fathoms gave /c=48oXio~ 7 . The value usually adopted is / c=45oXio~ 7 . The compressibility is in itself very small, but so great in its effect on the density of deep water in situ that the specific gravity (o°/4°) at 2000 fathoms increases by 0-017 and at 3000 fathoms by 0-026. In other words, water which has a specific gravity of 1-0280 at the surface would at the same temperature have a specific gravity of 1-0450 at 2000 and 1-0540 at 3000 fathoms. If the whole mass of water in the ocean were relieved from pressure its volume would expand from 319 million cub. m. to 321-7 million cub. m., which for a surface of 139-5 million sq. m. means an increased depth of 100 ft. The rate of propagation of sound depends on the compressibility, and in ocean water at the tropical

temperature of 77 F. the speed is 1482-6 metres (4860 ft.) per second, in Baltic water of 8 per mille salinity and a temperature of 50 F. it is 1448-5 metres (4750 ft.) per second, that is to say, 45 times greater than the velocity of sound in air. This accounts for the great range of submarine sound signals, which can thus be very serviceable to navigation in foggy weather.

The electrical conductivity of sea-water increases with the salinity; at 59° F. it is given according to E. Ruppin's formula as £, = 0-001465 8—0-00000978 S 2 +o-ooooooo876 S 3 in reciprocal ohms.

The radio-activity of sea-water is extraordinarily small; in- deed in samples taken from 50 fathoms in the Bay of Danzig it was imperceptible, and R. T. Strutt found that salt from evaporated sea-water did not contain one-third of the quantity of radium present in the water of the town supply in Cambridge.

Dissolved Gases of Sea-water. — The water of the ocean, like any other liquid, absorbs a certain amount of the gases with which it is in contact, and thus sea-water contains dissolved oxygen, nitrogen and carbonic acid absorbed from the atmo- sphere. As Gay-Lussac and Humboldt showed in 1805, gases are absorbed in less amount by a saline solution than by pure water. The first useful determinations of the dissolved gases of sea-water were made by Oskar Jacobsen in 1872. Since that time much work has been done, and the methods have been greatly improved. In the method now most generally practised, which was put forward by O. Pettersson in 1894, two portions of sea- water are collected in glass tubes which have been exhausted of air, coated internally with mercuric chloride to prevent the putrefaction of any organisms, and sealed up beforehand. The exhausted tube, when inserted in the water sample and the tip broken off, immediately fills, and is then sealed up so that the contents cannot change after collection. One portion is used for determining the oxygen and nitrogen, the other for the carbonic acid. The former determination is made by driving out the dissolved gases from solution and collecting them in a Torricellian vacuum, where the volume is measured after the carbonic acid has been removed. The oxygen is then absorbed by some appropriate means, and tne volume of the nitrogen measured directly, that of the oxygen being given by difference. In the second portion the carbonic acid is driven out by means of a current of hydrogen, collected over mercury and absorbed by caustic potash.

C. T. T. Fox, of the Central Laboratory of the International Council

at Christiania, has investigated the relation of the atmospheric gases to sea-water by very exact experimental methods and arrived at the following expressions for the absorption of oxygen and nitrogen by sea-water of different degrees of concentration. The formulae show the number of cubic centimetres of gas absorbed by 1 litre of sea-water; t indicates the temperature in degrees centigrade and CI the salinity as shown by the amount of chlorine per mille : —

02 = 10-291-0-2809 / +0-006009 / 2 -o-oooo632 l 3 – Cl(o- 1 161- 0-003922 ˆ+0-000063 t 3) N 2 = 18-561-0-4282 ˆ +0-0074527 <- 0-00005494 * 3 0(0-2149-0-007117 / 2 +o-oooo93i I 3)*

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In the case of ocean water with a salinity of 35 per mille, this gives for saturation with atmospheric gases in cc. per litre : —

at o° C.

15° C.

25° C.

Oxygen . Nitrogen

8-03 14-40

5-84

11-12

4-93 9-78

The reduction of the absorption of gas by rise of temperature is thus seen to be considerable. As a rule the amount of both gases dissolved in sea-water is found to be that which is indicated by the temperature of the water in situ. Jacobsen on some occasions found water in the surface layers of the Baltic super- saturated with oxygen, which he ascribed to the action of the chlorophyll in vegetable plankton; in other cases when examin- ing the nearly stagnant water from deep basins he found a deficiency of oxygen due no doubt to the withdrawal of oxygen from solution, by the respiration of the animals and by the oxidation of the deposits on the bottom. When

these processes continue for a long time in deep water shut off from free circula- tion so that it does not become aerated by contact with the atmosphere the water becomes unfit to support the life of fishes, and when the accumulation of putrefying organic matter gives rise to sulphuretted hydrogen as in the Black Sea below 125 fathoms, life, other than bacterial, is impossible. The water from the greatest depths of the Black Sea, 1160 fathoms, contains 6 cc. of sulphuretted hydrogen per litre.

The distribution of dissolved oxygen in the depths of the open ocean is still very imperfectly known. Dittmar's analysis of the " Challenger " samples indicated an excess of oxygen in the surface water of high southern latitudes and a deficiency at depths below 50 fathoms.

The facts regarding carbonic acid in sea-water are even less understood, for here we have to do not only with the solution of the gas but also with a chemical combination. On this account it is very difficult to know when all the gas is driven out of a sample of sea-water, and a much larger proportion is present than the partial pressure of the gas in the atmosphere and its co- efficient of absorption would indicate. These constants would lead one to expect to find 0-5 cc. per litre at o° C. while as a matter of fact the amount absorbed approaches 50 cc. The form of combination is unstable and apparently variable, so that the quantities of free carbonic acid, bicarbonate and normal carbonate are liable to alter. Since 18 51 it has been known that all sea-water has an alkaline reaction, and Tornoe defined the alkalinity of sea-water as the amount of carbonic acid which is necessary to convert the excess of bases into normal carbonate. The alkalinity of North Atlantic water of 35 per mille salinity is 26-86 cc. per litre, corresponding to a total amount of carbonic acid of 49-07 cc. According to the researches of August Krogh, 1 the alkalinity is greatly increased by the ad- mixture of land water. This is proved by E. Ruppin's analysis of Baltic water, which has an alkalinity of 16 to 18 instead of the s or 6 which would be the amount proportional to the salinity, while the water of the Vistula and the Elbe with a salinity of o-i per mille has an alkalinity of 28 or more. Thus the alkalinity serves as an index of the admixture of river water with sea-water. Carbonic acid passes from the atmosphere into the ocean as soon as its tension in the latter is the smaller; hence in this respect the ocean acts as a regulator. The amount of carbonic acid in solution may also be increased by submarine exhalations in regions of volcanic disturbance, but it must be remembered that the critical pressure for this gas is 73 atmo- spheres, which is reached at a depth of 400 fathoms, so that carbonic acid produced at the bottom of the ocean must be in liquid

form. The respiration of marine animals in the depths of deep basins in which there is no circulation adds to the carbonic acid at the expense of the dissolved oxygen. This is frequently the case in fjord basins; for instance, in the Gullmar Fjord at a depth of 50 fathoms with water of 34-14 per mille salinity and 4 Meddelelser om Gronland (Copenhagen, 1904), p. 331.

a temperature of 40-1° F., the carbonic acid amounts to 51-55 cc. per litre, and the oxygen only to 2-19 cc. Vegetable plankton in sunlight can reverse this process, assimilating the carbon of the carbonic acid and restoring the oxygen to solution, as was proved by Martin Knudsen and Ostenfeld in the case of diatoms. Little is known as yet of the distribution of carbonic acid in the oceans, but the amount present seems to increase with the salinity as shown by the four observations quoted : —

Water from Gulf of Finland of 3-2 per mille salinity = 17-2 cc. CO_2 at4-i°C. Western Baltic of 14-2 „ „ =37-0 „ at 1-6° C.

North Atlantic of 35-0 „ „ =49 – o „ at about

Eastern Mediter- io°C.

ranean of 39-0 „ „ = 53 – o „ at26-7°C.

Unfortunately the very numerous determinations of carbonic acid made by J. Y. Buchanan on the " Challenger " were vitiated by the incompleteness of the method employed, but they are none the less of value in showing clearly that the waters of the far south of the Indian Ocean are relatively rich in carbonic acid and the tropical areas deficient.

Distribution of Salinity. — A great deal of material exists on which to base a study of the surface salinity of the oceans, and Schott's chart published in Petermanns Mitteilungen for 1902 incorporates the earlier work and substantially confirms the first trustworthy chart of the kind compiled by J. Y. Buchanan from the " Challenger " observations. In each of the three oceans there are two maxima of salinity — one in the north, the other in the south tropical belt, separated by a zone of minimum salinity in the equatorial region, and giving place poleward to regions of still lower salinity. The three oceans differ somewhat between themselves. The North Atlantic maximum is the highest with water of 37-9 per mille salinity; the maximum in the South Atlantic is 37-6; in the North Indian Ocean, 36-7; the South Indian Ocean, 36-4; the South Pacific, 36-9; and the

North Pacific has the lowest maximum of all, only 35-9. The comparatively fresh equatorial belt of water, has a salinity of 35-0 to 34-5in the Atlantic,35-o to 34-oin the Indian Ocean, 34-5 in the Western and 33-5 in the Eastern Pacific. Taking each of the oceans as a whole the Atlantic has the highest general surface salinity with 35-37.

The salinity of enclosed seas naturally varies much more than that of the open ocean. Thesaltest include the eastern Mediter- ranean with 39-5 per mille, the Red Sea with 41 to 43 per mille in the Gulf of Suez, and the Persian Gulf with 38. The fresher enclosed seas include the Malay and the East Asiatic fringing seas with 30 to 34-5 per mille, the Gulf of St Lawrence with 30 to 31, the North Sea with 35 north of the Dogger Bank diminishing to 32 further south, and the Baltic, which freshens rapidly from between 25 to 31 in the Skagerrak to 7 or 8 east- ward of Bornholm and to practically fresh water at the heads of the Gulfs of Bothnia and Finland. The Arctic Sea presents a great contrast between the salinity of the surface of the ice-free Norwegian Sea with 35 to 35-4 and that of the Central Polar Basin, which is dominated by river water and melted ice, and has a salinity less than 25 per mille in most parts. The average salinity of the whole surface of the oceans may be taken as 34-5 per mille.

The vertical distribution of salinity has only recently been investigated systematically, as the earlier expeditions were not equipped with altogether trustworthy apparatus for collecting water samples at great depths. Two main types of water-bottle for collecting samples have been long in use. The older, devised by Hooke in 1667, is provided with valves above and below, both opening upward, through which the water passes freely during descent, but which are closed by some device on hauling up. The newer or slip water-bottle type consists of a cylinder allowed to drop on to a base-plate when a sample is to be collected. The first form of slip water-bottle due to Meyer retained the water merely by the weight of the cylinder pressing on the base-plate. J. Y. Buchanan introduced an improved form on the " Chal- lenger," also remaining closed by weight, the cylinder being very heavy and ground to fit the bevelled base-plate very accurately.

H. R. Mill in 1885 devised a self-locking arrangement by which the

bottle once closed was automatically locked and rendered watertight; H. L. Ekman made further improvements; and, finally, O. Pettersson and F. Nansen perfected the instrument, adapting it not only for enclosing a portion of water at any desired depth, but by a series of concentric divisions insulating in the central compartment water at the temperature it had at the moment of collection. By means of a weight dropped along the line the water-bottle can be shut and a sample enclosed at any desired depth. The use of a sliding weight is not recommended in depths much exceeding 200 fathoms on account of the time required and the risk of the line sagging at a low angle and so stopping the weight. In deep water the closing mechanism is usually actuated by a screw propeller which begins to work when the line is being hauled in and can be set so as to close the water- bottle in a very few fathoms. A small but heavy water-bottle has been devised by Martin Knudsen, provided with a pressure gauge or bathometer, by which samples may be collected from any moderate depth down to about 100 fathoms, on board a vessel going at full speed. This has made it possible to obtain many samples from moderate depths along a long line in a very short space of time. Sigsbee's small water-bottle on the double valve principle actuated by a propeller requires extremely skilful handling to enable it to give good results.

As yet it is only possible to speak with confidence of the vertical distribution of salinity in the seas surrounding Europe, where there is a general increase of salinity with depth. For the open ocean the only quite trustworthy results are those obtained by the prince of Monaco in the North Atlantic, and by the recent Antarctic expeditions in the South Atlantic and South Indian Oceans. The observations made on the " Challenger " and " Gazelle," though enabling some perfectly sound general conclusions to be drawn, require to be supplemented. It appears, as J. Y. Buchanan pointed out in 1876, that the great con- trasts in surface salinity between the tropical maxima and the equatorial minima give place at the moderate depth of 200 fathoms to a practically uniform salinity in all parts of the ocean.

In the North Atlantic a strong submarine current flowing outward from the Mediterranean leaves the Strait of Gibraltar with a salinity of 38 per mille, and can be traced as far as Madeira and the Bay of Biscay in depths of from 600 to 2800 fathoms, still with a salinity of 35-6 per mille, whereas off the Azores at equal depths the salinity is from 0-5 to 0-7 per mille less. In the tropical and subtropical belts of the Atlantic and Indian Oceans south of the equator the salinity diminishes rapidly from the surface downwards, and at 500 fathoms reaches a minimum of 34-3 or 34-4 per mille; after that it increases

again to 800 fathoms, where it is almost 34-7 or 34-8, and this salinity holds good to the bottom, even to the greatest depths, as was first shown by the " Gauss " and afterwards by the " Planet " between Durban and Ceylon.

Our knowledge of the Pacific in this respect is still very im- perfect, but it appears to be less salt than the other oceans at depths below 800 fathoms, as on the surface, the salinity at considerable depths being 34-6 to 34-7 in the western part of the ocean, and about 34-4 to 34-5 in the eastern, so that, although the data are by no means satisfactory, it is impossible to assign a mass-salinity of more than 34-7 per mille for the whole body of Pacific water.

The causes of difference of salinity are mainly meteorological. The belt of equatorial minimum salinity corresponds with the excessively rainy belt of calms and of the equatorial counter- current, the salinity diminishing towards the east. The tropical maxima of salinity on the poleward side of the trade-winds coincide with the regions of minimum rainfall, high temperature, strong winds and consequently of maximum evaporation. Evaporation is naturally greatest in the enclosed seas of the nearly rainless subtropical zone such as the Mediterranean and Red Sea. Where the evaporation is at a minimum, the inflow of rivers from a large continental area and the precipitation from the atmo- sphere at a maximum, there is necessarily the greatest dilution

of the sea-water, the Baltic and the Arctic Sea being conspicuous examples.

Temperature of the Oceans. — There is no difficulty in observing the temperature of the surface of the sea on board ship, the' only precautions required being to draw the water in a bucket which has not been heated in the sun in summer or exposed to frost in winter, to draw it well forward of any discharge pipes of the steamer, to place it in the shade on deck, insert the thermometer immediately and make the reading without delay. The measure- ment of temperature in the depths, unless a high-speed water- bottle be used, involves stopping the ship and employing thermo- meters of special construction. Many forms have been tried, but only three types are in general use. The first is the slow-action thermometer which was originally used with good effect by de Saussure in the Mediterranean in 1780. He covered the bulb of the thermometer with layers of non-conducting material and left it immersed at the desired depth for a very long time to enable it to take the temperature of its surroundings. When brought up again the thermometer retained its

temperature so long that there was ample time to take a correct reading. Since 1870 thermometers on this principle have been in use for regular observations at German coast and light-ship stations. Following the suggestion of Cavendish, Irving made observations of deep temperature on Phipps's Spitsbergen voyage of 1773 with a valved water-bottle, insulated by non-conducting material. A similar instrument gave excellent results in the hands of E. von Lenz on Kotzebue's second voyage of circumnavigation in 1823- 1826. The last elaboration of the insulated slip water-bottle by Ekman, Nansen and Pettersson has produced an instrument of great perfection, in which the insulation is effected by layers of water between a series of concentric ebonite cylinders, all of which are closed both above and below when the apparatus encloses a sample, and each of which in turn must be warmed considerably before there is any rise of temperature in the chamber within. This can be used with certainty to -02° C. for water down to 250 fathoms, after taking account of the slight disturbance produced by the expansion of the greatly compressed deep water.

The second form of deep-sea thermometer is the self registering maximum and minimum on James Six's principle. These instruments must be constructed with the greatest care, but when well made in accordance with J. Y. Buchanan's large model they can be trusted to give a good account of the vertical distribution of temperature, provided the water grows cooler as the depth increases. They would act equally well if the water grew continually warmer as the depth increases, but they cannot give an exact account of a temperature inversion such as is produced when layers of warmer and colder water alternate.

The third form is the outflow or reversing thermometer, first introduced by Aime, who used a very inconvenient form in the Mediterranean in 1841-1845, but greatly improved and simplified by Negretti and Zambra in 1875. The principle is to have a constriction in the tube above the bulb so proportioned that when the instrument is upright it acts in every way as an ordinary mercurial thermometer, but when it is inverted the thread of mercury breaks at the constriction, and the portion above the point runs down the now reversed tube and remains there as a measure of the temperature at the moment of turning over. For convenience in reading, the tube is graduated inverted, and when it is restored to its original position the mercury thread joins again and it acts as before. Various modifications of this form of thermometer have been made by Chabaud of Paris and others. It has the advantage over the thermometer on Six's principle that, being filled with mercury, it

does not require such long immersion to take the temperature of the water. A cor- rection has, of course, to be made for the expansion or con- traction of the mercury thread if the temperature of reading differs much from that of reversing. Magnaghi introduced a convenient method of inverting the thermometer by means of a propeller actuated on beginning to heave in the line, and this form is used for all work at great depths. For shallow water greater precision and certainty are obtained by using a lever

actuated by a weight slipped down the line to cause the reversal, as in the patterns of Rung, Mill and others.

All thermometers sunk into deep water must be protected against the enormous pressure to which they are exposed. This may be done by the method suggested by Arago in 1828, intro- duced by Aime in 1841 and again suggested by Glaisher in 1858, of sealing up the whole instrument in a glass tube exhausted of air; or, less effectively, by surrounding the bulb alone with a strong outer sheath of glass. In both forms it is usual to have the space between the bulb and the protecting sheath partly filled with mercury or alcohol to act as a conductor and reduce the time necessary for the thermometer to acquire the tempera- ture of its surroundings.

The warming of the ocean is due practically to solar radiation alone; such heat as may be received from the interior of the earth can only produce a small effect and is fairly uniformly distributed. On account of the high specific heat of sea-water the diurnal range of temperature at the surface is very small. According to A. Buchan's discussion of the two-hourly observa- tions on the " Challenger " the total range between the daily maximum and minimum in the warmer seas is between 0-7° and o-8° F., and for the colder seas still less (0-2° F.), compared with 3-2° F. in the overlying air. The maximum usually occurs between 1 and 2-30 p.m., the minimum shortly before sunrise. The temperature of the surface water is generally a little higher than that of the overlying air, the daily average difference being about o-6° F., varying from 0-9° lower at 1 p.m. to i-6° higher at 1 a.m. There are few observations available for ascertaining the depth to which warmth from the sun penetrates in the ocean. The investigations of Aime in 1845 and Hensen in 1889 indicate that the amount of cloud has a great effect. Aime showed that on a calm bright day in the Mediterranean the temperature rose o-r° C. between

the early morning and noon at a depth of about 12 fathoms. Luksch deduced a much greater penetration of solar warmth from the comparison of observations at different hours at neighbouring stations in the eastern Mediterranean, but his methods were not exact enough to give confidence in the result. The penetration of warmth from the surface is effected by direct radiation, and by convection by particles rendered dense by evaporation increasing salinity. Conduction has practically no effect, for the coefficient of thermal conductivity in sea-water is so small that if a mass of sea-water were cooled to 0° C. and the surface kept at a temperature of 30 C, 6 months would elapse before a tempera- ture of 1 5 C. was reached at the depth of 1-3 metres, 1 year at 1-85 metres, and 10 years at 5-8 metres. Great irregular variations in radiation and convection sometimes produce a remarkably abrupt change of temperature at a certain depth in calm water; the layer in which this sudden change occurs has been termed the Sprungschicht. How closely two bodies of water at different temperatures may come together is shown by the fact that in the Baltic in August between ro and n fathoms there is sometimes a fall of temperature from 57° to 46-5° F. Such a condition of things is only possible in very calm weather, the action of waves having the effect of mixing the water to a considerable depth. After a storm the whole of the water in the North Sea assumes a homothermic condition, i.e. the temperature is the same from surface to bottom, and this occurs not only south of the Dogger Bank, where the condition is normal, but also, though less frequently, in the deeper water farther north. Similar effects are produced in narrow waters by the action of tidal currents, and the influence of a steady wind blowing on- or off-shore has a powerful effect in mixing the water.

The warmest parts of the Indian Ocean and Western Pacific have a mean annual temperature of 82 to 84 F., but such high temperatures are not found in the tropical Atlantic. In the Indian Ocean between 15° N. and 5° S. the surface temperature in May averages 84 to 86° F., and in the Bay of Bengal the temperature is 86°, and no part of the Atlantic has so high a monthly mean temperature at any season. G. Schott's inves- tigations show that the annual range of surface temperature

in the open ocean is greatest in 40 N., with r8-4° F., and in 30 S., with 9-2° F.; on the contrary, near the equator it is less, only 4° F. in io° N., and in high latitudes it is also small, 5-2° F. in 50 S. The figures quoted above are differences between the average surface temperatures of the warmest and of the coldest month. As to the absolute extremes of surface temperature, Sir John Murray points

out that 90 F. frequently occurs in the western part of the tropical Pacific, while among seas the Persian Gulf reaches 96 F., only 2° under blood-heat, and the Red Sea follows closely with a maximum of 94 . The greatest change of temperature at any place has been recorded to the east of Nova Scotia, a minimum of 28 F. and a maximum of 80°, and to the north-east of Japan with a minimum of 27 F. and a maximum of 83°. In those localities, however, it is not the same water which varies in temperature with the season, but the water of different warm and cold currents which periodic- ally occupy the same locality as they advance and retreat. The zones of surface temperature are arranged roughly parallel to the equator, especially in the southern hemisphere. Between 40° N. and 40° S. the currents produce a considerable rearrange- ment of this simple order, the belts of warm water being wider on the western sides of the oceans and narrower on the eastern.

The arrangement of the isotherms thus affords a basis for valuable deductions as to the direction of ocean currents. The surface temperature of the Atlantic is relatively lower than that of the other oceans when the whole area is considered. According to Krummel's calculation the proportional areas at a high temperature are as follows: —

Percentage of Ocean Surface with Temperature.

Atlantic.

Indian.

Pacific.

Over 77 F. (25 C) . . . Over 68° F. (20 C) . . .

22-4

5°-i

38-0 51-7

40-1 58-4

This disparity results in some degree at least from the com- parative narrowness of the inter-tropical Atlantic, and the absence of a cool northern area in the Indian Ocean. Krummel calculates that the mean temperature of the whole ocean surface is 63-3° F., while the mean sea-level temperature of the whole layer of air at the surface of

the earth is given by Hann as 57-8° F.

We are still ignorant of the depth to which the annual tempera- ture wave penetrates in the open ocean, but observations in the Mediterranean enable us to form some opinion on the matter. The observations of Aime in 1845 and of Semmola in the Gulf of Naples in 1881 show that the surface water in winter cools until the whole mass of water from the surface to the bottom, in r6oo fathoms or more, assumes the same temperature. To- wards the end of summer the upper layers have been warmed to a depth which indicates how far the influence of solar radiation and convection have reached. Aime estimated this depth at 1 50-200 fathoms, while the observations of the Austrian expe- dition in the eastern Mediterranean found it to be from 200 to nearly 400 fathoms. In the Red Sea, where a similar seasonal change occurs, the depth to which the surface layer warms up is about 275 fathoms. The great difference in salinity between the surface and the deep water excludes the possibility of effective convection in the seas of northern Europe, and in the open ocean the currents which are felt everywhere, and especially those with a vertical component, must exercise a very disturbing influence on convection.

The vertical distribution of temperature in the open ocean is much better known than that of salinity. The regional differences of temperature {at like depths become less as the depth increases. Thus at 300 fathoms greater differences than 9° F. hardly ever occur between 50° N. and 50° S., in 800 fathoms the differences are less than 5-5° and in 1500 fathoms less than 2 . Even in the tropics the high temperature of the surface is confined to a very shallow layer; thus in the Central Pacific where the surface temperature is 82 F. the temperature at 100

fathoms is only 5 2° F. The whole ocean must thus form but a cold dwelling-place for the organisms of the deep sea. Sir John Murray calculates that at least 80% of the water in the ocean has a temperature always less than 40 F., and a recent calculation by Krummel gave in fact a mean temperature of 39° F. for the whole ocean.

The normal vertical distribution of temperature is illustrated in curve A of fig. 1, which represents a sounding in the South Atlantic; and

this arrangement of a rapid fall of temperature giving place gradually to an extremely slow but steady diminu- tion as depth increases is termed anathermic (ova., back, and dtpfws, warm). Curve B shows the typical distribution of temperature in an enclosed sea, in this case the Sulu Basin of the Malay Sea, where from the level of the barrier to the bottom the temperature remains uniform or homothermic. Curve C shows a typical summer condition in the polar seas, where layers of sea-water at different temperatures are superimposed, the arrangement from the surface to 200 fathoms is termed

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Fig. 1. — Diagram illustrating Distribution of Sea Temperature.

*dickathermic (8ix < *, apart), from 1000 to 2000 fathoms it is termed katathermic (Kara, down). In autumn the enclosed seas of high latitudes frequently present a thermal stratification in which a warm middle layer is sandwiched between a cold upper layer and a cold mass below, the arrangement being termed meso- thermic (titoos, middle). The nature of the change of temperature with depth below 2500 fathoms is entirely dependent on the position of the sub-oceanic elevations, for the rises and ridges act as true submarine watersheds. As the Arctic Basin is shut off from the North Atlantic by ridges rising to within 300 fathoms of the surface and from the Pacific by the shallow shelf of the Bering Sea, and as the ice-laden East Greenland and Labrador currents consist of fresh surface water which cannot appreciably influence the underlying mass, the Arctic region has no practical effect upon the bottom temperature of the three great oceans, which is entirely dominated by the influence of the Antarctic. The existence of deep-lying and extensive rises or ridges in high southern latitudes has been indicated by the deep-sea temperature observations of Antarctic expeditions. Temperatures so low as 31-5° to 31-3° F. do not occur much beyond 50 S. The " Belgica " even found a tempera- ture of 33-1° F. in 6i° S., 63 W., at a depth of 2018 fathoms. The conditions of temperature in the South Atlantic are charac- teristic. South of 55 S. in approximately 3000 fathoms the bottom temperature is 31-1° F.; in the Cape Trough it is 32-7°*

in 45 S., and 33-8° to 34-3° in 35° S., while north of the Walfisch

Ridge and east of the South Atlantic Rise bottom temperatures of 36 to 36-7° F. prevail right northwards across the equator into the Bay of Biscay, showing a steady rise of bottom tempera-‘ ture as successive submarine elevations restrict communication with the Antarctic. On the other hand, in the more open Argen- tine Basin, which carries deep water far to the south, the bottom temperature in 40° S. is only from 32-2° to 32-7° F., and the same low temperature continues throughout the Brazil Basin to the equator; but in the North American Basin from the West Indies to the Telegraph Plateau no satisfactory bottom temperature lower than 35-6° F. has been reported. On the floor of the Indian Ocean temperatures of S3’i° to 33-6° occur south of 35° S. in depths of 2700 fathoms or more, but north of 35° S. the prevailing bottom temperatures are from 34-0° to 34-3°. In similar depths in the Pacific south of the equator temperatures of 33-8° to 34-5° are found, and north of the equator bottom temperatures at the same depth increase to 3 5 • 1° in the neighbour- hood of the Aleutian Islands, again completely justifying the conclusion as to the Antarctic control of deep water temperature throughout the ocean.

The marginal rises and continental shelves prevent this cold bottom water from penetrating into the depths of the enclosed and fringing seas. Thus in the Central American Sea below 930 fathoms, the depth on the bar, no water is found at a tempera- ture lower than that prevailing in the open ocean at that depth, viz. 39-6° F., not even at the bottom of the great Bartlett Deep in 3439 fathoms. Such homothermic masses of water are characteristic of all deep enclosed seas. Thus in the Malay Sea the various minor seas or basins are homothermic below the depth of the rim, at the temperature prevailing at that depth in the open ocean: in the China Sea below 875 fathoms with 36-5° F.; in the Sulu Sea (depth 2550 fathoms) below 400 fathoms with 50-5° F.; in the Celebes Sea below 820 fathoms with 38-6° F.; in the Banda Sea below 902 fathoms with 37-9° F. In other enclosed seas which are shut off from the ocean by a very shallow sill the rule holds good that the homothermic water below the level of the sill is at the lowest temperature reached by the surface water in the coldest season of the year, provided always that the stratification of salinity is such as to permit of convection being set up. To this group belongs the Arctic Sea; the Norwegian Sea is homothermic below 550 fathoms at 29-8° F., but this cold water does not penetrate into the Arctic Basin on account of the ridge between Spitsbergen and Greenland, and there the water below 1400 fathoms has a temperature of 30-6° to 30-7° F. because the surf ace layers of water are too light, on account of the low salinity due to ice-melting,

to enable even the cold of a polar winter to set up a downward convection current. The Mediterranean Sea also belongs to this group; its various deep basins are homothermic (at the winter surface temperature) below the level of their respective sills — the Balearic Basin below 190 fathoms at 55 F.; the Eastern Basin below 270 fathoms at 55-9° F; the Ionian Sea at 56-3° F.; and at 56-7° south of Cyprus. Similarly in the Red Sea the water below 380 fathoms is homothermic at 70-7° F.

An under-current flows out from the Red Sea through the Strait of Bab-el-Mandeb, and from the Mediterranean through the Strait of Gibraltar, raising the salinity as well as the temperature of the part of the ocean outside the gates of the respective seas. The action of the Red Sea water affects the whole of the Gulf of Aden and Arabian Sea, raising the temperature at the depth of 550 fathoms to 52 or 33° F. or 9 Fahrenheit degrees higher than the water of the Bay of Bengal at the same depth. The effect of the Mediterranean water in the North Atlantic does not require such large figures to express it, but is none the less extraordinarily far-reaching, as first indicated by the work of the " Challenger " and subsequently defined by H. N. Dickson's discussion of the observations of Wolfenden in the little sailing yacht " Silver Belle." The temperature at 550 fathoms is raised to 49 or 50° F. between Madeira and the Biscay Shelf, i.e. 5-4° F. above the temperature at the same depth off the Azores.

In shallow seas such as the North Sea and the British fringing

seas, where tidal currents run strong, there is a general mixing together of the surface and deeper water, thus making the arrangement of vertical temperature anathermic in summer and katathermic in winter, while at the transitional periods in spring and autumn it is practically homothermic. Thus at Station E 2 of the international series at the mouth of the English Channel in 40° 27′ N., 4 42′ W., the following distribution of temperature F. has been observed by Matthews: —

August

1904.

November

1904.

February

1905.

May

1905-

Surface

16J fathoms .

52 fathoms

63-7°

55-5

55-4

56-2″

56-5

56-5

50-7°

50-8

50-8

51-3°

50-5

50-5

It is noticeable that there is a marked vertical temperature gradient only at the end of summer when a warm surface layer is formed, though in August 1904 that was only 8 fathoms thick. In small nearly land-locked basins shut off from one another by bars rising to within a short distance of the surface and affected both by strong tidal currents and by a considerable admixture of land water, the contrasts of vertical distribution of temperature with the seasons are strongly marked, and there are also great unperiodic changes

effected mainly by wind, as is shown by the investigations of H. R. Mill in the Clyde Sea Area, and of O. Pettersson, J. Hjort and Helland-Hansen in the Scandinavian fjords.

Sea Ice. — The freezing-point of sea-water is lower as the salinity increases and normal sea- water of 35 per mille salinity freezes at 28-6° F. Experience shows that sea-water can be cooled considerably below the freezing-point without freezing if there is no ice or snow in contact with it. Freezing takes place by the formation of pure ice in fiat crystalline plates of the hexagonal system, which form in perpendicular planes and unite in bundles to form grains so that a thick covering of ice exhibits a fibrous structure. It is only the water that freezes; the dissolved salts are excluded in the process in a regular order according to temperature. At temperatures about 17° F. sodium sulphate is the first ingredient of the salts to separate out, potassium chloride follows at 12 F., sodium chloride at —7-4° F., magnesium chloride at —28-5° F., and, as O. Pettersson was the first to point out, calcium chloride not until —67° F. During the rapid formation of ice the still unfrozen brine is often imprisoned between the little plates of frozen water; hence without some special treatment sea-ice is not suitable as a source of drinking water. After long con- tinued frost the last of the included brine may be frozen and the salts driven out in crystals on the surface; these crystals are known to polar explorers by the Siberian name of rassol. Ice is a very poor conductor of heat and accordingly protects the surface of the water beneath from rapid cooling; hence new-formed pancake ice does not increase excessively in thick- ness in one winter, and even in the centre of the Arctic Basin the ice-covering only amounts to 6 or at most 9 ft. in the course of a year, while in the Antarctic regions the season's growth is only half as great; in the latter also the accumulated snow is an important factor in the thickness of the ice, and snow is an even worse conductor of heat. The influence of wind and tide breaks up the frozen surface of the sea, and sheets yielding to the pressures slide over or under one another and are worked together into a hummocky ice-pack, the irregularities on the surface of which, caused by repeated fractures and collisions, may be from 10 to 20 ft. high. Such formations, termed toross by the Russians, may extend under water, according to Makaroff 's investigations, to at least an equal depth. Such old sea-ice when prevented from escaping forms the palaeocrystic sea of Nares; but, as a rule, it is carried southward in the East Greenland and Labrador currents, and melted in the warmer seas of lower latitudes. In the southern hemisphere the ice- pack forms a nearly continuous fence around the Antarctic continent. Pack-ice forms regularly in the inner part of the

Baltic every winter, but not in the Norwegian fjords. Even

in the Mediterranean sea-ice is formed annually in the northern part of the Black Sea, and more rarely in the Gulf of Salonica and at the head of the Adriatic off Triest. Hudson Bay is blocked by ice for a great part of the year, and the Gulf of St Lawrence is blocked every winter. Ice also clothes the continental shores of the northern fringing seas of eastern Asia. In addition to sea-ice, icebergs which are of land origin occur at sea. In the north, icebergs break off, as a rule, from the ends of the great glaciers of Greenland, and in the far south from the edge of the great Antarctic ice-barrier.. The latter often gives birth to pro- digious icebergs and ice islands, which are carried northward by ocean currents, nearly as far as the tropical zone before they melt. Thus in December 1906, an iceberg was seen off the mouth of the La Plata in 38 S., and in 1840 one was seen near Cape Agulhas in 35 S. The Antarctic icebergs are of tabular form and much larger than those of Greenland, but in either case an iceberg rising to 200 ft. above sea-level is uncommon, and one exceeding 300 ft. is very rare. The Greenland icebergs are carried by the Labrador current across the great banks of Newfoundland, where they are often very numerous in the months from February to August, when they constitute a danger to shipping as far south as 40° N. No icebergs occur in the North Pacific, and none has ever been reported nearer the coasts of Europe than off the Orkney Islands, and there only once, in 1836.

Oceanic Circulation. — Although observations on marine currents were made near land or between islands even in anti- quity, accurate observations on the high seas have only been possible since chronometers furnished a practicable method of determining longitude, i.e. from the time of Cook, the circum- navigator. The difference between the position as determined astronomically and by dead-reckoning gives an excellent idea of the general direction and velocity of the surface currents. The first comprehensive study of the currents of the Atlantic was that carried out by James Renneil (1790-1830), and since that time Findlay in his Directories, Heinrich Berghaus, Maury and the officials of the various Hydrographic Departments have produced increasingly accurate descriptions of the currents of the whole ocean, largely from material supplied by merchant captains. Direct observations of currents in the open sea are difficult, and even when the ship is anchored the veering and rolling of the vessel produce disturbances that greatly affect the result. Such current-meters as those used by Aim6 in 1 84 1 and by Irminger since 1858 only gave the direction of the deeper current by comparison with the surface current at the time of

observation. Later apparatus, such as Pettersson's bifilar current-meter or his more recent electric-photographic apparatus, and Nansen and Ekman's propeller current-meter, measure both the direction and the velocity at any moderate depth from an anchored vessel. One of the indirect methods of investigating currents is by taking account of the initial temperature of the current and following it by the thermometer throughout its course; hence the familiar contrast between warm and cold currents, of which the Gulf Stream and the Labrador current are types. Benjamin Franklin in 1775 and Charles Blagden in 1781, by means of numerous observations of temperature made on board the packets plying on the Atlantic passage, determined the boundaries of these two currents and their seasonal variations with considerable precision. The differences of salinity support this method, and, especially in the northern European seas, often prove a sharper criterion of the boundaries than temperature itself; this is especially the case at the entrance to the Baltic. Evidence drawn from drift-wood, wrecks or special drift bottles is less distinct but still interesting and often useful; this method of investigation includes the use of icebergs as indicators of tne trend of currents and also of plankton, the minute swimming or drifting organisms so abundant at the surface of the sea.

The general lines of the currents of the oceans are fairly well understood, and along the most frequented ocean routes the larger seasonal variations have also been ascertained. The general scheme of ocean currents depends on the prevailing

winds taken in conjunction with the configuration of the coast and its submarine approaches. The trade-wind regions corre- spond pretty closely with westward-flowing currents, while in the equatorial calm belts there are eastward-running counter- currents, these lying north of the equator in the Atlantic and Pacific, but south of the equator in the Indian Ocean. In the region of the westerly winds on the poleward side of 40 N. and S. the currents again flow generally eastward. A cyclonic circu- lation of the atmosphere is associated with a cyclonic circulation of the water of the ocean, as is well shown in the Norwegian Sea and North Atlantic between the Azores and Greenland. Where the trade-winds heap up the surface water against the east coasts of the continents the currents turn poleward. The north equatorial current divides into the current entering the Caribbean Sea and issuing thence by the Strait of Florida as the Gulf

Stream, and the Antilles current passing to the north of the Antilles. Both currents unite off the coast of the United States and run northward, turning towards the east when they come within the influence of the prevailing westerly winds. In a similar manner the Brazil current, the Agulhas current and the East Australian current originate from the drift of the south-east trades, and in the North Pacific the Japan current arises from the north-east trade drift. The west-wind drifts on the poleward side carry back part of the water southward to reunite with the equatorial current, and thus there is set up an anticyclonic circulation of water between io° and 40° in each hemisphere, the movement ■if the water corresponding very closely with that of the wind. The coincidence of wind and current direction is most marked in the region of alternating monsoons in the north of the Indian Ocean and in the Malay Sea.

The accordance of wind and currents is so obvious that it was fully recognized by seafaring men in the time of the first circumnavigators. Modern investigations have shown, however, that the relationship is by no means so simple as appears at first. We must remember that the ocean is a continuous sheet of water of a certain depth, and the conditions of continuity which hold good for all fluids require that there should be no vacant space within it; hence if a single water particle is set in motion, the whole ocean must respond, as Varenius pointed out in 1650. Thus all the water carried forward by any current must have the place it left immediately occupied by water from another place, so that only a complete system of circulation can exist in the ocean. Further, all water particles when moving undergo a deviation from a straight path due to the forces set up by the rotation of the earth deflecting them towards the right as they move in the northern hemisphere and towards the left in the southern. This deflecting force is directly proportional to the velocity and the mass of the particle and also to the sine of the latitude ; hence it is zero at the equator and comes to a maximum at the poles. When the wind acts on the surface of the sea it drives before it the particles of the surface layer of water, and, as these cannot be parted from those immediately beneath, the internal friction of the fluid causes the propelling impulse to act through a considerable depth, and if the wind continued long enough it would ultimately set the whole mass of the ocean in motion right down to the bottom. The current set up by the grip of the wind sweeping over the surface is deflected by the earth's rotation about 45° to the right of the direction of the wind in the northern hemisphere and to the left in the southern. The deeper layers lag behind the upper in deflection and the velocity of the current rapidly diminishes in consequence. The

older theory of the origin of drift currents enunciated by Zoppritz in 1878 was modified as indicated above by Nansen in 1901, and Walfrid Ekman subsequently went further. He showed that at a certain depth the direction of the current becomes exactly the opposite of that which has been imposed by deflection on the surface current, and the strength is reduced thereby to only one-twentieth of that at the surface. He called the depth at which the opposed direction is attained the drift- current depth, and he found it to be dependent on the velocity of the surface current and on the latitude. According to Ekman's calculation with a trade-wind blowing at 16 m. per hour, the

drift-current depth in latitude 5° would be approximately 104 fathoms, in latitude 15 , 55 fathoms, and in latitude 45 only from S3 to 38 fathoms. A strong wind of 38 m. an hour would produce a drift-current depth of 82 fathoms in latitude 45°, and a light breeze of 3 m. an hour only 22 fathoms. It follows that a pure trade-wind drift cannot reach to any great depth, and this seems to be confirmed by observation, as when tow-nets are sunk to depths of 50 fathoms and more in the region of the equatorial current they always show a strong drift away from the side of the ship, the ship itself following the surface current. Ekman shows further that in a pure drift current the mean direction of the whole mass of the current is perpendicular to the direction of the wind which sets it in motion. This produces a heaping-up of warm water towards the middle of the anti- cyclonic current circulation between io° and 40°, and on the other hand an updraught of deep water along the outer side of the cyclonic currents. The latter phenomenon is most clearly shown by the stripes of cold water along the west coasts of Africa and America, the current running along the coast tending to draw its water away seawards on the surface and the principle of continuity requiring the updraught of the cool deep layers to take its place. For this reason the up-welling coastal water is coldest close to the shore, and hence it only appears on the Somali coast during the south-west monsoon. On the flat coasts of Europe the influence of on-shore wind in driving in warm water, and of off-shore wind in producing an updraught of cold water, has long been familiar to bathers. In a similar way updraughts of cold water to the surface occur in the neighbour- hood of the equator, especially in the Central Atlantic and Pacific. When a drift-current impinges directly upon a coast there is a heaping up of surface water, giving rise to a counter-current in the depths, which maintains the level, and this counter-current, although subject to deflection on account of the rotation of the earth, is deflected much less than a pure drift-current would be. Such currents, due to the

banking up of water, have a large share in setting the depths of the sea in motion, and so securing the vertical circulation and ventilation of the ocean.

The difference in density which occurs between one part of the ocean and another, shares with the wind in the production of currents. Vertical movements are also produced by difference of temperature in the water, but these can only be feeble, as below 1000 fathoms the temperature differences between tropical and polar waters are very small. If we assign to a column of

water at the equator the density Sy= 1-022 at the surface and

1-028 at 1000 fathoms, or an average of 1-025, an d to a column of water at the polar circle a mean density of 1-028, there would result a difference of level equal to (1-028—1-025) X 1000 = 3 fathoms in a distance from the equator to the polar circle of some 4600 m. A gradient like this, only 1 in 1,350,000, could give rise only to an extremely feeble surface current polewards and an extremely feeble deep current towards the equator. If there were strong currents at the bottom of the ocean the uniform accumulation of the deposit of minute shells of globi- gerina and radiolarian ooze would be impossible, the rises and ridges would necessarily be swept clear of them, and the fact that this is not the case shows that from whatever cause the waters of the depths are set in motion, that motion must be of the most deliberate and gentlest kind. In exceptional cases, when a strong deep current does flow over a rise, as in the case of the Wyville Thomson Ridge, thebottom is swept clear of fine sediment.

Strongly marked differences in density are produced by the melting of sea-ice, and this is of particular importance in the case of the great ice barrier round the Antarctic continent. O. Pettersson has made a careful study of ice melting as a motive power in oceanic circulation, and points out that it acts in two ways: on the surface it produces dilution of the water, forming a fresh layer and causing an outflow seaward of surface water with very low salinity; towards the deep water it produces a strong cooling effect, leading to increase of density and sinking of the chilled layers. Both actions result in the drawing in of

an intermediate layer of water from a distance which takes part in

the double system of vertical circulation as is indicated in fig. 2. The actual direction of this circulation is strongly modified by the influence of the earth's rotation. The existence of a layer of water of low salinity at a depth of 500 fathoms in the tropical oceans of the southern hemisphere is to be referred to this action of the melting ice of the Antarctic regions. Pettersson's view that ice-melting dominates the whole circulation of the oceans and regulates in particular the currents of the seas round northern Europe must, however, be looked on as carrying the explanation too far.

Differences of density between the waters of enclosed seas and of the ocean are brought about in some instances by concentra- tion of the water of the sea on account of active evaporation, and in other instances by dilution on account of the great influx of land water. A very powerful vertical circulation is thus set up between enclosed seas and the outer ocean. The very dense water of the Red Sea and the Mediterranean makes the column of water Salter and heavier and the level lower than in the ocean beyond the straits. Hence a strong surface current sets inwards through the Straits of Bab-el-Mandeb and Gibraltar, while an undercurrent flows outwards, raising the temperature and salinity of the ocean for a long distance beyond the straits.

Fig. 2. — Diagram of the stratification of temperature and the vertical components of currents in high southern latitudes.

Through the Bosporus and Dardanelles at the entrance of the Black Sea, and through the sound and belts at the entrance of the Baltic, streams of fresh surface-water flow outwards to the Salter Mediterranean and North Sea, while Salter water enters in each case as an undercurrent. Wind and tide greatly alter the strength of these currents due to difference of density, and the surface outflow may either be stopped or, in the case of the belts, actually reversed by a strong and steady wind. Both outflowing and inflowing currents are subject to the deflection towards the right imposed by the earth's rotation.

Modern oceanography has found means to calculate quantita- tively the circulatory movements produced by wind and the distribution of temperature and salinity not only at the surface but in deep water. The methods first suggested by H. Mohn and subsequently elaborated by V. Bjerknes have been usefully applied in many cases, but they cannot take the place of direct observations of currents and of the fundamental processes and conditions underlying them. The determination of the exact relationship of cause and effect in the

origin of ocean currents is a matter of great practical importance. The researches of Pettersson, Meinardus, H. N. Dickson and others leave no doubt, for example, that the variations in the intensity of the Gulf Stream, whether these be measured by the change in the strength of the current or in the heat stored in the water, produce great variations in the character of the weather of northern Europe. The connexion between variations of current strength and the conditions of existence and distribution of plankton are no less important, especially as they act directly or indirectly on the life-conditions of food fishes.

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Washington, the Deutsche Seewarte in Hamburg, and also at intervals by the French, Russian, Dutch and Scandinavian admir- alties. Pilot Charts of the North Atlantic and North Pacific are issued monthly by the U.S. Hydrographic Office, and of the North Atlantic and of the Indian Ocean and Red Sea by the British Meteoro- logical Office, giving a conspectus of the normal conditions of weather and sea.

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(O. K; H. R. M.)

OCEAN CITY, a city and seaside resort of Cape TVIay county, New Jersey, U.S.A., in the S.E. part of the state, about 10 m. S.W. of Atlantic City. Pop. (1890), 452; (1900), 1307; (1905), 1835; (1910), 1950. It is served by the Atlantic City and the W est Jersey & Seashore railways. The city is laid out to face both the ocean and Great Egg Harbor Bay, and is a popular resort during the summer months. Ocean City was incorporated as a borough in 1884, and was chartered as a city in 1897.

OCEAN GROVE, a summer resort of Monmouth county, New Jersey, U.S.A., in the eastern part of the state, on the Atlantic coast, and 55 m. by rail S. of New York City. Pop. (1909), about 2500. It is served by the Pennsylvania and the Central of New Jersey railways. It is noted as a religious and musical seaside resort, and in July and August, and especially in the last ten days of August, during its annual camp-meeting, is visited by thousands of people. Ocean Grove was founded in 1869 by the Ocean Grove Camp- Meeting Association of the Methodist Episcopal Church, as a place for religious worship, rest and recreation, free from all forms of questionable amusement, and is governed under a corporation charter, the corporation having power to place restrictions in all leases.

OCEANIA, or Oceanica, a name used to cover all the islands of the Pacific Ocean (q.v.) which are included in the divisions of Polynesia, Micronesia, Melanesia, Australasia, &c.

OCEANUS (Gr. 'Qxeavk), in Greek mythology, the greatest of rivers and at the same time a divine personification. Never mingling with the sea which it encloses, according to Homer it has neither source nor mouth. On its southern banks, from east to west, dwell the "

blameless Aethiopians " in perfect happiness, and beyond it on the west, in the realms of eternal night, the " Cimmerians," wrapped in fogs and darkness. Here are the grove of Persephone and the entrance of the underworld. Personified, Oceanus is in Hesiod (Theog. 133, 337-370) the son of Uranus and Gaea, the husband of Tethys. father of 3000 streams and 4000 ocean nymphs. In Homer he is the origin of all things, even the father of the gods, and the equal in rank of all of them save Zeus. This conception recurs in the theory of Thales, who made water the first principle of all things. The idea of Oceanus as a river flowing unceasingly round the earth, which was regarded as a flat circle, was of long continuance. Euripides was the first among the tragic poets to speak of it as a sea, but Herodotus before him ridiculed the notion of Oceanus as a river as an invention of the poets and described it as the great world sea. As the geographical knowledge of the Greeks extended, the name was applied to the outer sea (especially the Atlantic).

In art, Oceanus was represented as an old man of noble presence and benevolent expression, with the horns of an ox and sometimes crab's claws on his head. His attributes are a pitcher, cornucopiae (" horn of plenty"), rushes, marine animals and a sceptre. On the altar of Pergamum he is depicted taking part in the battle of the giants.

Homer, Iliad., i. 423, xiv. 201, 24.5, xxi. 196; Odyssey, x. 508, xi. 14; Herodotus ii. 23, iv. 8; Euripides, Orestes, 1376; Caesar, Sell. Gall. iii. 7, iv. 10.

OCELLUS LUCANUS, a Pythagorean philosopher, born in Lucania in the 5th century B.C., perhaps a pupil of Pythagoras himself. Stobaeus (Ed. Phys. i. 13) has preserved a fragment of his Ilepi vltfxov (if he was really the author) in the Doric dialect, but the only one of his alleged works which is extant is a short treatise in four chapters in the Ionic dialect generally known as On the Nature of the Universe. Excerpts from this are given in Stobaeus (i. 20), but in Doric. It is certainly not authentic, and cannot be dated earlier than the 1st century B.C. It maintains the doctrine that the universe is uncreated and eternal; that to its three great divisions correspond the three kinds of beings — gods, men and daemons'; and, finally, that the human race with all its institutions (the family, marriage and the like) must be eternal. It advocates an ascetic mode of life, with a view to the perfect reproduction of the race and its training in all that is noble and beautiful.

Editions of the Ilepi rijs tov iravrds 4>b

OCELOT (Mexican Flalocelotl, literally field-jaguar, from Flalli, field, and ocelotl, tiger, jaguar), an American member {Felis pardalis) of the family Felidae, ranging from Arkansas in the north to Paraguay. The species is subject to great racial

variation. The fur has, however, a tawny yellow or reddish- grey ground colour, marked with black spots, aggregated in streaks and blotches, or in elongated rings enclosing areas rather darker than the general ground-colour. In the typical form the total length may reach 4 ft.; the average measurement of the

Ocelot (Felis pardalis).

head and body lies between 26 in. and 33 in., and of the tail be- tween 1 1 in. and 1 5 in. The ocelot is essentially a forest cat, and a ready climber; its disposition is said to be fierce and bloodthirsty but in confinement it becomes tame and playful. In Asia the group is represented by the Tibetan Felis tristis.

OCHAKOV, a fortified town and port of Russia, in the govern- ment of Kherson, 41 m. E. of Odessa, on a cape of the Black Sea, at the entrance to the estuary of the Dnieper, and opposite to Kinburn. Pop. (1897), 10,784. Strong fortifications have been built at Ochakov and on the Kinburn promontory, to protect the entrance to the Dnieper. Ochakov stands close to the site of the old Miletan (Greek) colony of Olvia and the Greek colony of Alektor. The fortress of Kara-kerman or Ozu-kaleh was built on this spot by the khan of the Crimea, Mengli Girai, in 1492. At a later date it became the centre of a Turkish province which included Khaji-dereh (Ovidiopol), Khaji-bey (Odessa) , and Dubossary, as well as some 1 50 villages. Russia, regarding it as the main obstacle to the possession of the Black Sea littoral, besieged it in 1737, when it was captured by Marshal Munnich, but in the following year it was abandoned, and in 1739 restored to Turkey. The second siege by Russia was begun in 1788, and lasted six months, until the fortress was stormed and taken, after a terrible loss of life. By the peace of 1 791 it became Russian. In 1855 it was bombarded by the Anglo-French fleet, and after that the Russians demolished the fortifications.

OCHILTREE, a barony in the county of Ayr, Scotland, from which a title in the Scottish peerage was held in the 16th and 17th centuries by a branch of the house of Stewart. Sir Andrew Stewart (d. 1488), chancellor of Scotland, a great-grandson of the regent Albany (d. 1420), was created Baron Avandale or Avondale about 1457. This peerage became extinct at his death, but was revived about 1499 in

favour of his nephew and heir Andrew Stewart, who, being killed at the battle of Flodden in 1513, was succeeded by his son Andrew, 2nd Baron Avandale of this creation; and the latter obtained an act of parliament in 1543 empowering him to exchange the title of Lord Avandale for that of Lord Ochiltree, or Lord Stewart of Ochiltree. His son, Andrew, 2nd Lord Ochiltree (d. c. 1600), was a zealous supporter of the lords of the congregation, and especially of John Knox, in the struggle against Mary queen of Scots, and was wounded at the battle of Langside while fighting against the queen. Of his five sons, William was slain by the earl of

Bothwell in 1588, and James, created earl of Arran in 1581, was the father of Sir James Stewart of Killeith who became 4th Lord Ochiltree in 161 5; his daughter Margaret was the second wife of John Knox. His brother Henry Stewart married Margaret Tudor, widow of James IV. of Scotland, and was created Baron Methven by James V. in 1528; and another brother, Sir James Stewart of Beath, was ancestor of the Stewart earls of Moray, through his son James who was created Lord Doune in 1581.

The second Lord Ochiltree was succeeded in the peerage by his grandson Andrew, who resigned the title in 1615, and having been summoned by writ to the Irish House of Lords was created Baron Castle Stewart in the Irish peerage in 1619. The barony of Ochiltree which he thus resigned was conferred in 161 5 on' his cousin Sir James Stewart of Killeith (see above), son of the earl of Arran; and on the death without issue of his son William, 5th Lord Ochiltree, in 1675, the title became extinct. In 1774 Andrew Thomas Stewart successfully claimed the barony of Castle Stewart in the peerage of Ireland as heir male under the creation of 1619; but although he was permitted in 1790 to vote as Lord Ochiltree in an election of Scottish representative peers, his claim to this barony as collateral heir of the grantee of 1615 was disallowed by the House of Lords in 1793.

OCHINO, BERNARDINO (1487-1564), Italian Reformer, was born at Siena in 1487. At an early age he entered the order of Observantine Friars, the strictest sect of the Franciscans, and rose to be its general, but, craving a yet stricter rule, trans- ferred himself in 1534 to the newly founded order of Capuchins, of which in 1538 he was elected vicar-general. In 1539, urged by Bembo, he visited Venice and delivered a remarkable course of sermons, showing a

decided tendency to the doctrine of iustification by faith, which appears still more evidently in his Dialogi VII. published soon after. He was suspected and denounced, but nothing ensued until, at the instigation of the austere zealot Caraffa, the Inquisition was established at Rome, June 1542. Ochino was at once cited, but was deterred from presenting himself at Rome by the warnings of Peter Martyr and of Cardinal Contarini, whom he found at Bologna, dying of poison administered by the reactionary party. After some hesitation he escaped across the Alps to Geneva. He was cordially received by Calvin, and within two years published six volumes of Prediche, tracts rather than sermons, explaining and vindicating his change of religion. Twenty-five of these were published in English at Ipswich in 1548. In 1545 he became minister of the Italian Protestant congregation at Augsburg, which he was compelled to forsake when, in January 1547, the city was occupied by the imperial forces in the Schmalkaldic War. Escaping by way of Strassburg he found an asylum in England, where he was made a prebendary of Canterbury, received a pension from Edward VI. 's privy purse, and com- posed his chief work, A Trajedy or Dialogue of the unjust usurped Primacy of the Bishop of Rome (1549). This remarkable per- formance, originally written in Latin, is extant only in the translation of John Ponet, bishop of Winchester, a splendid specimen of nervous English. The conception is highly dramatic; the form is that of a series of dialogues. Lucifer, enraged at the spread of Christ's kingdom, convokes the fiends in council, and resolves to set up the pope as Antichrist. The state, represented by the emperor Phocas, is persuaded to connive at the pope's assumption of spiritual authority; the other churches are intimidated into acquiescence; Lucifer's projects seem fully accomplished, when Heaven raises up Henry VIII. and his son for their overthrow. The conception bears a remarkable resemblance to that of Paradise Lost; and it is almost certain that Milton, whose sympathies with the Italian Reformation were so strong, must have been acquainted with it, and with some of his later works. In the Labyrinth (dedicated to Queen Elizabeth of England), a discussion of the freedom of the will, he covertly assailed the Calvinistic doctrine of predestination, and showed that his views were tinged with Socinianism. ' The accession of Mary in 1553 drove him from England, and

he became pastor of the Italian congregation at Zurich. In 1563 the long-gathering storm of obloquy burst upon the occasion of the publication of his Thirty Dialogues, in one of which his adversaries maintained that he had justified polygamy under colour of a pretended refutation. His dialogues on divorce and the Trinity were

also obnoxious. Ochino was banished from Zurich, and, after being refused a shelter by other Protestant cities, directed his steps towards Poland, at that time the most tolerant state in Europe. He had not resided there long when the edict of the 6th of August 1564 banished all foreign dis- sidents. Flying from the country, he encountered the plague at Pinczoff; three of his four children were carried off; and he himself, worn out by age and misfortune, died in solitude and obscurity at Schlakau in Moravia, about the end of 1564. His reputation among Protestants was at the time so bad that he was charged with the authorship of the treatise De tribus impostoribus, as well as with having carried his alleged approval of polygamy into practice. It was reserved for Dr Benrath to justify him, and to represent him as a fervent evangelist and at the same time as a speculative thinker with a passion for free inquiry. The general tendency of his mind ran counter to tradition, and he is remarkable as resuming in his individual history all the phases of Protestant theology from Luther to Socinus.

See Life by B. O. Benrath (2nd ed., Brunswick, 1892), translated into English by Helen Zimmern (London, 1876) . In addition to the books already named, he wrote Italian expositions of Romans (Geneva, 1545) and Galatians (Augsburg, 1546).

OCHRES, a class of pigments varying in colour from yellow to red, and consisting mainly of hydrated iron oxide. The Yellow Ochres are native earths coloured with hydrated ferric oxide, the brownish yellow substance that colours, and is deposited from, highly ferruginous water. These ochres are of two kinds — one having an argillaceous basis, while the other is a calcareous earth, the argillaceous variety being in general the richer and more pure in colour of the two. Both kinds are widely distributed, fine qualities being found in Oxfordshire, the Isle of Wight, near Jena and Nuremberg in Germany, and in France in the depart- ments of Yonne, Cher and Nievre. The original colour of these ochres can be modified and varied into browns and reds of more or less intensity by calcination. The nature of the associated earth also influences the colour assumed by an ochre under calcination, aluminous ochres developing red and violet tints, while the calcareous varieties take brownish-red and dark-brown hues. The well-known ochre Terra da Sienna which in its raw state is a dull-coloured ochre, becomes when burnt a fine warm mahogany brown hue highly valued for artistic purposes. Yellow ochres are also artificially prepared — Mars Yellow being either pure hydrated ferric oxide or an intimate mixture of that substance with an argillaceous or calcareous earth, and such compounds by careful calcination can be transformed into Mars

Orange, Violet or Red, all highly important, stable and reliable pigments.

OCHRIDA (also written Okhrida and Achrida; Turkish Ochri), a city of Albania, European Turkey, in the vilayet of Monastir; on the north-eastern shore of Lake Ochrida, and at the eastern end of the Roman Via Egnatia. Pop. (1905) about 11,000, including Albanians, Turks, Greeks and Slavs. Ochrida occupies the site of the ancient Lychnidos, which was added to the Macedonian empire by Philip II. (382-336 B.C.) , and destroyed by the Bulgarians in a.d. 861. It is the seat of Bulgarian and Greek bishops. From the creation of the Bulgarian patriarchate of Ochrida in 893 to its abolition in 1767 the city was the ecclesi- astical headquarters of the Bulgarians in the west of the Balkan Peninsula. Lake Ochrida is 2260 ft. above sea-level, in a moun- tainous limestone region of Karst formation. It measures 107 sq. m., and has a maximum depth of 938 ft. Its waters are supplied by subterranean streams. Its chief outlet is the river Black Drin, on the north.

See Gelzer, Der Patriarchal von Achrida (Leipzig, 1902); and " Dr Jovan Cvijid's Researches in Macedonia, &c.," in The Geo- graphical Journal, vol. xvi. (London, 1900).

OCHSENFURT, a town of Germany, in the kingdom of Bavaria, situated on the left bank of the Main, here crossed by a stone bridge, 13 m. S. from Wiirzburg by the railway to Munich, and at the junction of a line to Rottingen. Pop. (1905) 3333. It contains an Evangelical and five Roman Catholic churches, among them that of St Michael, a fine Gothic edifice. There is a considerable trade in wine and agricultural produce, other industries being brewing and malting.

OCHTERLONY, SIR DAVID, Bart. (1758-1825), British genera], was born at Boston, Mass., U.S.A., on the 12th of February 1758, and went to India as a cadet in 1777. He served under Lord Lake in the battles of Koil, Aligarh and Delhi, and was appointed resident at Delhi in 1803. In 1804, having been promoted to the rank of major-general, he defended the city with a very inadequate force against an attack by Holkar. On the outbreak of the Nepal War (1814-15) he was given the command of one of four converging columns, and his services were rewarded with a baronetcy in 181 5. Subsequently he

was promoted to the command of the main force in its advance on Katmandu, and outmanoeuvring the Gurkhas by a flank march at the Kourea Ghat Pass, brought the war to a successful conclusion and obtained the signature of the treaty of Segauli (1816), which dictated the subsequent relations of the British with Nepal. For this success Ochterlony was created G.C.B., the first time that honour had been conferred on an officer of the Indian army. In the Pindari War (181 7-18) he was in command of the Raj- putana column, made a separate agreement with Amir Khan, detacning him from the Pindaris, and then, interposing his own force between the two main divisions of the enemy, brought the war to an end without an engagement. He was appointed resident in Rajputana in 1818, with which the residency at Delhi was subsequently combined. When Durjan Sal revolted in 1825 against Balwant Singh, the infant Raja of Bharatpur, Ochterlony acting on his own responsibility supported the raja by proclamation and ordered out a force to support him. Lord Amherst, however, repudiated these proceedings. Ochterlony, who was bitterly chagrined by this rebuff, resigned his office, and retired to Delhi. The feeling that the confidence which his length of service merited had not been given him by the governor- general is said to have accelerated his death, which occurred at Meerut on the 15th of July 1825. The Ochterlony column at Calcutta commemorates his name.

See Major Ross of Bladensburg, The Marquess of Hastings (" Rulers of India " series) (1893).

OCHTMAN, LEONARD (1854-), American painter, was born in Zonnemaire, Zeeland, Holland, on the 21st of October 1854. His family removed to Albany, New York, in 1866. In 1882 he began to exhibit landscapes at the National Academy, and he became a National Academician in 1904. His most characteristic pictures, which recall the work of Inness, are scenes on Long Island Sound and on the Mianus river.

OCKLEY, SIMON (1678-1720), English orientalist, was born at Exeter in 1678. He was educated at Queen's College, Cam- bridge, became fellow of Jesus College and vicar of Swavesey, and in 1 7 1 1 was made professor of Arabic at Cambridge. He had a large family, and the pecuniary embarrassments of his later days form the subject of a chapter in D 'Israeli's Calamities of A uthors. The preface to the second volume of his History of the Saracens is dated from Cambridge Castle, where he was imprisoned for debt. Ockley maintained that a knowledge of Oriental literature was essential to the proper study of theology, and in the preface to his first book, the

Introductio ad linguas orientates (1706), he urges the importance of the study. In 1707 he pub- lished a translation of Leon Modena's History of the Present Jews throughout the World; and in 1708 The Improvement of Human Reason, exhibited in the Life of Hai Ebn Yokdhan. His chief work is The History of the Saracens (1708-1718), of which a third volume was published posthumously in 1757. Un- fortunately Ockley took as his main authority a MS. in the Bodleian of the pseudo-Wakidi's Futuh al-Sham, which is rather historical romance than history. He also translated from the

Arabic the Second Book of Esdras and the Sentences of Ali. Ockley died at Swavesey on the 9th of August 1720.

O'CLERY, MICHAEL (1575-1643), Irish chronicler, grandson of a chief of the sept of O'Clery in Donegal, was born at Kil- barrow on Donegal Bay, and was baptized Tadhg (or " poet "), but took the name of Michael when he became a Franciscan friar. He was a cousin of Lughaidh O'Clery (fl. 1595-1630), who, with his son Cacrigcriche O'Clery (d. 1664) — one of Michael's co-workers — is also famous as an Irish historian. He had already gained a reputation as an antiquary and student of Irish history and literature, when he entered the Irish College of St Anthony at Louvain. In 1620, through the initiative of Hugh Boy Macanward (1580-1635), warden of the college, and himself a famous Irish historian and poet, and one of an old family of hereditary bards in Tyrconnell, he began to collect Irish manuscripts and to transcribe everything he could find of historical importance; he was assisted by other Irish scholars, and the results were his Reim Rioghroidhe (Royal List) in 1630, Leabhar Gabhala (Book of Invasions) in 1631, and his most famous work, called by John Colgan (d. 1659), the Irish bio- grapher, the" Annals of the Four Masters" (1636). Subsequently he produced his Martyrologium of Irish saints, based on various ancient manuscripts, an Irish glossary and other works. He lived in poverty, and died at Louvain.

O'CONNELL, DANIEL (1775-1847), Irish statesman, known as " the Liberator," was born on the 6th of August 1775 near Cahirciveen, a small town in Kerry. He was sprung from a race the heads of which had been Celtic chiefs, had lost their lands in the wars of Ireland, and had felt the full weight of the harsh penal code which long held the Catholic Irish down. His ancestors in the 18th century had sent recruits to the famous brigade of Irish exiles in the service of France, 1 and those who remained at home either lived as tenants on the possessions of which they had once been lords, or gradually made money by smuggling, a very general calling in that wild region. Thus

he inherited from his earliest years, with certain traditions of birth and high station, a strong dislike of British rule in Ireland and of the dominant owners of the soil, a firm attachment to his proscribed faith, and habitual skill in evading the law; and these influences may be traced in his subsequent career. While a boy he was adopted by his uncle, Maurice O'Connell of Derrynane, and sent to a school at Queenstown, one of the first which the state in those days allowed to be opened for Catholic teaching; and a few years afterwards he became a student, as was customary with Irish youths of his class, in the English colleges of St Omer and Douai in France. These years in France had a decided effect in forming his judgment on political questions of high moment. He was an eye-witness on more than one occasion of the folly and excesses of the French Revolution; and these scenes not only increased his love for his church, but strongly impressed him with that dread of anarchy, of popular movements ending in bloodshed, and of communistic and socialistic views which characterized him in after life. To these experiences, too, we may partly ascribe the reverence for law, for the rights of property, and for the monarchical form of government whick he appears to have sincerely felt; and, demagogue as he became in a certain sense, they gave his mind a deep Conservative tinge. In 1798 he was called to the bar of Ireland, and rose before long to the very highest eminence among contemporary lawyers and advocates. This position was in the main due to a dexterity in conducting causes, and especially in examining witnesses, in which he had no rival at the Irish bar. He was, however, a thorough lawyer besides, inferior in scientific learning to two or three of his most conspicuous rivals, but well read in every department of law, and especially a master in all that relates to criminal and constitutional jurisprudence. As an advocate, too, he stood in the very highest rank ; in mere oratory he was surpassed by Plunket, and in rhetorical gifts by Bushe, the only

1 See the account of O'Connell's uncle, Count Daniel O'Connell (I 745~ I 833) ! to whose property he fell heir, in Mrs O'Connell's Last Colonel of the Irish Brigade (1892), and O'Callaghan's Irish Brigade in the Service of France (1870).

speakers to be named with him in his best days at the Irish bar; but his style, if not of the most perfect kind, and often disfigured by decided faults, was marked by a peculiar subtlety and manly power, and produced great and striking effects. On the whole, in the art of

winning over juries he had scarcely an equal in the law courts.

To understand, however, O'Connell's greatness we must look to the field of Irish politics. From early manhood he had turned his mind to the condition of Ireland and the mass of her people. The worst severities of the penal code had been, in a certain measure, relaxed, but the Catholics were still in a state of vassal- age, and they were still pariahs compared with the Protestants. The rebellion of 1798 and the union had dashed the hopes of the Catholic leaders, and their prospects of success seemed very remote when, in the first years of the 19th century, the still unknown lawyer took up their cause. Up to this juncture the question had been in the hands of Grattan and other Protestants, and of a small knot of Catholic nobles and prelates; but their efforts had not accomplished much, and they aimed only at a kind of compromise, which, while conceding their principal claims, would have placed their church in subjection to the state. O'Connell inaugurated a different policy, and had soon given the Catholic movement an energy it had not before possessed. Himself a Roman Catholic of birth and genius, unfairly kept back in the race of life, he devoted his heart and soul to the cause, and his character and antecedents made him the champion who ultimately assured its triumph. He formed the bold design of combining the Irish Catholic millions, under the superintendence of the native priesthood, into a vast league against the existing order of things, and of wresting the concession of the Catholic claims from every opposing party in the state by an agitation, continually kept up, and embracing almost the whole of the people, but maintained within constitutional limits, though menacing and shaking the frame of society. He gradually succeeded in carrying out his purpose: the Catholic Association, at first small, but slowly assuming larger proportions, was formed; attempts of the government and of the local authorities to put its branches down were skilfully baffled by legal devices of many kinds; and at last, after a conflict of years, all Catholic Ireland was arrayed to a man in an organization of enormous power, that demanded its rights with no uncertain voice. O'Connell, having long before attained an undisputed and easy ascendancy, stood at the head of this great national movement; but it will be observed that, having been controlled from first to last by himself and the priesthood, it had little in common with the mob rule and violence which he had never ceased to regard with aversion. His election for Clare in 1828 proved the forerunner of the inevitable change, and the Catholic claims were granted the next year, to the intense regret of the Protestant Irish, by a government avowedly hostile to the last, but unable to withstand the overwhelming pressure

of a people united to insist on justice. The result, unquestionably, was almost wholly due to the energy and genius of a single man, though the Catholic question would have been settled, in all probability, in the course of time; and it must be added that O'Connell's triumph, which showed what agitation could effect in Ireland, was far from doing his country unmixed good.

O'Connell joined the Whigs on entering parliament, and gave effective aid to the cause of reform. The agitation, however, on the Catholic question had quickened the sense of the wrongs of Ireland, and the Irish Catholics were engaged ere long in a crusade against tithes and the established church, the most offensive symbols of their inferiority in the state. It may be questioned whether O'Connell was not rather led than a leader in this; the movement, at least, passed beyond his control, and the country for many months was terrorized by scenes of appalling crime and bloodshed. Lord Grey, very properly, proposed measures of repression to put this anarchy down, and O'Connell opposed them with extreme vehemence, a seeming departure from his avowed principles, but natural in the case of a popular tribune. This caused a breach between him and the Whigs; but he gradually returned to his allegiance

to them when they practically abolished Irish tithes, cut down the revenues of the established church and endeavoured to secularize the surplus. By this time O'Connell had attained a position of great eminence in the House of Commons: as a debater he stood in the very first rank, though he had entered St Stephen's after fifty; and his oratory, massive and strong in argument, although too often scurrilous and coarse, and marred by a bearing in which cringing flattery and rude bullying were strangely blended, made a powerful, if not a pleasing, impression. O'Connell steadily supported Lord Melbourne's government, gave it valuable aid in its general measures, and repeatedly expressed his cordial approval of its policy in advancing Irish Catholics to places of trust and power in the state, though personally he refused a high judicial office. Though a strict adherent of the creed of Rome, he was a Liberal, nay a Radical, as regards measures for the vindication of human liberty, and he sincerely advocated the rights of conscience, the emancipation of the slave and freedom of trade. But his rooted aversion to the democratic theories imported from France, which were gradually winning their way into England, only grew stronger with advancing age. His conservatism was most apparent in his antipathy to socialistic doctrines and his tenacious regard for the claims of property. He actually opposed the Irish Poor Law, as encouraging a communistic spirit; he declared a move- ment against rent a crime; and, though he

had a strong sympathy with the Irish peasant, and advocated a reform of his precarious tenure, it is difficult to imagine that he could have approved the cardinal principle of the Irish Land Act of 1881, the judicial adjustment of rent by the state.

O'Connell changed his policy as regards Ireland when Peel became minister in 1841. He declared that a Tory regime in his country was incompatible with good government, and he began an agitation for the repeal of the union. One of his motives in taking this course no doubt was a strong personal dislike of Peel, with whom he had often been in collision, and who had singled him out in 1829 for what must be called a marked affront. O'Connell, nevertheless, was sincere and even consistent in his conduct : he had denounced the union in early manhood as an obstacle to the Catholic cause; he had spoken against the measure in parliament; he believed that the claims of Ireland were set aside or slighted in what he deemed an alien assembly; and, though he had ceased for some years to demand repeal, and regarded it as rather a means than an end, he was throughout life an avowed repealer. It should be observed, however, that in his judgment the repeal of the union would not weaken the real bond between Great Britain and Ireland; and he had nothing in common with the revolutionists who, at a later period, openly declared for the separation of the two countries by physical force. The organization which had effected such marvellous results in 1828-1829 was recreated for the new project. Enormous meetings, convened by the priesthood, and directed or controlled by O'Connell, assembled in 1842-1843, and probably nine-tenths of the Irish Catholics were unanimous in the cry for repeal. O'Connell seems to have thought success certain; but he had not perceived the essential difference between his earlier agitation and this. The enlightened opinion of the three kingdoms for the most part approved the Catholic claims, and as certainly it condemned repeal. After some hesitation Peel resolved to put down the repeal movement. A vast intended meeting was proclaimed unlawful, and in October 1843 O'Connell was arrested and held to bail, with ten or twelve of his principal followers. He was convicted (February 1844) after the trials that followed, but they were not good specimens of equal justice, and the sentence of imprisonment for a year and a fine of £2000 was reversed on a writ of error by the House of Lords (September 1844), and he and his colleagues were again free. The spell, however, of O'Connell's power had vanished; his health had suffered much from a short confinement; he was verging upon his seventieth year; and he was alarmed and pained by the growth of a party in the repeal ranks who scoffed at his views, and advocated the

revolutionary doctrines which he had always feared and abhorred. Before long famine had fallen on the

land, and under this visitation the repeal movement, already-paralysed, wholly collapsed. O'Connell died on the 15th of May 1847, at Genoa, whilst on his way to Rome. His body- was brought back to Dublin and buried in Glasnevin cemetery.

O'Connell was a remarkable man in every sense of the word, of splendid physique, and with all the attractions of a popular leader. Catholic Ireland calls him her " Liberator " still ; and history will say of him that, with some failings, he had many and great gifts, that he was an orator of a high order, and that, agitator as he was, he possessed the wisdom, the caution and the tact of a real statesman. Nevertheless he not only failed to accomplish the chief aim of his life, but Lecky trenchantly observes that " by a singular fatality the great advocate of repeal did more than any one else to make the Union a necessity. ... He destroyed the sympathy between the people and their natural leaders; and he threw the former into the hands of men who have subordinated all national to ecclesiastical con-siderations, or into the hands of reckless, ignorant, and dishonest adventurers." O'Connell married in 1802 his cousin Mary O'Connell, by whom he had three daughters and four sons, Maurice, Morgan, John (1810-1858), known as the " Young Liberator," and Daniel, who all sat in parliament.

His son John published a Life in 1846 and Recollections and Experiences in 1849. There are also biographies by W. Fagan (1847), M. F. Cusack (1872), J. O'Rourke and O'Keeffe (1875), and J. A. Hamilton (1888). See especially W. E. H. Lecky's essay in the revised edition of his Leaders of Public Opinion in Ireland vol. ii. (1903). (W. O. M.)

O'CONNOR, FEARGUS EDWARD (1794-1855), Chartist leader, was a son of the Irish Nationalist politician Roger O'Connor (1762-1834), and nephew of Arthur O'Connor (1763- 1852), who was the agent in France for Emmet's rebellion; both belonged to the " United Irishmen." He entered parlia- ment as member for the county of Cork in 1832. Though a zealous supporter of repeal, he endeavoured to supplant O'Con- nell as the leader of the party, an attempt which aroused against him the popular antipathy of the

Irish. In 1835 he was un- seated on petition, and after standing unsuccessfully for Oldham he took to stumping England in favour of the new Radical doctrines of the day, and the use of physical force for their adoption. In 1837 he established the Northern Star newspaper at Leeds, and became a vehement advocate of the Chartist movement. He was imprisoned for seditious libel in 1840, and after his release became prominent for his attack on John Bright, and the anti-corn-law league. In 1847 he was returned for Nottingham, and in 1848 he presided at a Chartist demon- stration on Kennington Common, which caused great alarm (see Chartism). But the projected march on Westminster fizzled out when the preparations made to receive it became known. The eccentricity which had characterized his opinions from the beginning of his career gradually became more marked until they developed into insanity. He began to conduct himself in a disorderly manner in the House of Commons, and in 1852 he was found to be of unsound mind by a commission of lunacy. He died at London on the 30th of August 1855, and was buried in Kensal Green cemetery.

OCONOMOWOC, a city of Waukesha county, Wisconsin, U.S.A., about ˆt, m. W. of Milwaukee. Pop. (1890) 2729; (1900) 2880; (1905) 3013; (1910) 3054. It is served by the Chicago, Milwaukee & St Paul railway and by an electric railway con- necting with Milwaukee. Oconomowoc is one of the most popular summer resorts in the Middle West. Along the shore of Lakes Fowler and La Belle are some beautiful country estates, several large hotels and fine club houses, and two sanatoria. At Delafield and at Dousman (8 m. S. of Oconomowoc) there are state fish hatcheries, the former for black bass. Oconomowoc was settled about 1837 and incorporated in 1875; its name is an Indian word, said to mean " home of the beaver."

O'CONOR, CHARLES (1 804-1 884), American lawyer, was born in the city of New York on the 22nd of January 1804, and was the son of Thomas O'Conor (1770-1855), who in 1801 emigrated from Roscommon county, Ireland, to New York, where he devoted himself chiefly to journalism. The son

studied law, was admitted to the bar in 1824, and soon won high reputation in his profession. He was United States district attorney for New York in 1853-1854. In politics an extreme States'Rights Democrat, he opposed the coercion of the South, and after the Civil War became senior counsel for Jefferson Davis on his indictment for treason, and was one of his bonds men; these facts and O'Conor's connexion with the Roman Catholic Church affected unfavourably

his political fortunes. In 1872 he was nominated for the presidency by the " Bourbon " Democrats, who refused to support Horace Greeley, and by the " Labour Reformers "; he declined the nomination but received 21,559 votes. He took a prominent part in the prosecution of William M. Tweed and members of the " Tweed Ring," and published Peculation Triumphant, Being the Record of a Five Years' Campaign against Official Malversation, A.D. 1 871-187 5 (1875). He removed to Nantucket, Massachusetts, in 1881, and died there on the 12th of May 1884.

OCONTO, a city and the county-seat of Oconto county, Wisconsin, U.S.A., about 130 m. N. of Milwaukee, on the W. shore of Green Bay, at the mouth of the Oconto river. Pop. (1890) 5219; (1900) 5646, of whom 1544 were foreign-born; (io°S) S722; (191°) S629. It is served by the Chicago & North- western and the Chicago, Milwaukee & St Paul railways. The city lies in a good farming country, and has a considerable lake commerce in lumber and fish. The first settlement was made here in 1846, and Oconto was chartered as a city in 1882.

OCRICULUM (mod. Otricoli), an ancient town of Umbria, Italy, on the Via Flaminia, near the E. bank of the Tiber, 44 m. N. of Rome and 12 m. S. of Narnia. It concluded an alliance with Rome in 308 B.C. The modern village lies higher than the ancient town, and excavations on the site of the latter in 1775 and following years led to the discovery of the baths, a theatre, a basilica and other buildings. In the baths were found a number of works of art, now in the Vatican, notably the mosaic pave- ment of the Sala della Rotonda, and the celebrated head of Zeus and the head of Claudius in the same room. An amphitheatre is still visible, but the other buildings have in the main been covered up again.

OCTAHEDRON (Gr. oktu, eight, Upa, base), a solid bounded by eight triangular faces; it has 6 vertices and 12 edges. The regular octahedron has for its faces equilateral triangles; it is the reciprocal of the cube. Octahedra having triangular faces other than equilateral occur as crystal forms. See Poly- hedron and Crystallography.

OCTAVE (from Lat. octavus, eighth, octo, eight), a period or series of eight members. In ecclesiastical usage the octave is the eighth day after a particular church festival, the feast day itself and the " octave " being counted. The octave thus always falls on the same day of the week as the festival, and any event occurring during the period is said to be " in the octave." In music, an octave is the eighth full tone above or below any given note. It is produced by double or half

the number of vibrations corresponding to the given note. In the interval between a note and its octave is contained the full scale, the octave of a note forming the starting-point of another scale of similar intervals to the first. The interval between a note and its octave is also called an octave. The name is also applied to an open metal stop in an organ, and to a flute (more usually known as the piccolo) one octave higher in pitch than the regular flute. It is also a term for a " parade " in fencing. The " law of octaves " was a term applied in 1865 to a relation- ship among the chemical elements enunciated by J. A. R. Newlands.

In literature an octave is a form of verse consisting of eight iambic lines, and complete in itself. From its use by the poets of Sicily, the recognized type of this form is usually called the Sicilian Octave. It is distinguished from a single stanza of ottava rima, in which the rhyme-arrangement is abababcc, by having only two rhymes, arranged abababab. In German litera- ture the octave has been used not infrequently since 1820, when Ruckert published " Sicilianen," as they are called in German, for the first time. The word octave is also often used to describe

the eight opening lines of a sonnet, in which the rhyme-arrange- ment is abbaabba, or some modification of this, but properly always on two rhymes only.

OCTAVIA, the name of two princesses of the Augustan house, (i) Octavia, daughter of Gaius Octavius and sister of the emperor Augustus, was the wife of Gaius Marcellus, one of the bitterest enemies of Julius Caesar. In 41 B.C. her husband died, and she was married to Marcus Antonius, with the idea of bringing about a reconciliation between him and her brother. Her efforts were at first successful, but in 36 Antony left for the Parthian War and renewed his intrigue with Cleopatra. Though Octavia took out troops and money to him (35), he refused to see her and formally divorced her in 32, but she always protected his children, even those by Fulvia and Cleopatra. Her beauty and virtues are praised by all ancient authorities. By her first husband she was the mother of Marcus Marcellus (q.v.), who died in 23 B.C. (2) Octavia, daughter of the emperor Claudius, was the wife of Nero, by whom she was put to death. A Latin tragedy on her fate is attributed, though wrongly, to Seneca.

OCTAVO, a shortened form of Lat. in octavo, ■" in an eighth, i.e. of a sheet of paper, a term applied to a size of paper and to a size of a printed volume. Paper is in octavo when a whole single sheet is folded three times to form eight leaves; a book is techni- cally termed of " octavo " size when made up of sheets folded three times (see Bibliography and Paper).

OCTOBER, the eighth month of the old Roman year, which began in March. In the Julian calendar, while retaining its old name, it became the tenth month, and had thirty-one days assigned to it. The meditrinalia, when a libation of new wine was made in honour of Meditrina, were celebrated on the nth, the faunalia on the 13th, and the equiria, when the equus October was sacrificed to Mars in the Campus Martius, on the 15th. Several attempts were made to rename the month in honour of the emperors. Thus it was in succession temporarily known as Germanicus, Antoninus, Tacitus and Herculeus, the latter a surname of Commodus. The senate's attempt to christen it Faustinus in honour of Faustina, wife of Antoninus, was equally unsuccessful. The principal ecclesiastical feasts in October are those of St Luke on the 18th and of St Simon and St Jude on the 28th. By the Slavs it is called " yellow month," from the fading of the leaf; to the Anglo-Saxons it was known as Winter-fylleth, because at this full moon (fylleth) winter was supposed to begin.

OCTODON, the generic name for a small South American rodent mammal (Octodon degus) locally known as the degu. It is the type of the family Octodontidae, the members of which ■ — collectively termed octodonts — are exclusively Central and South American. Several of them, such as Echinomys and Loncheres, are rat-like creatures with spiny or bristly fur (see Rodentia).

OCTOPUS (Gr. oktco, eight and ttovs, foot), the name in scientific zoology belonging to a single genus of eight armed Cephalopoda (q.v.), one of whose distinguishing characters is that it has two rows of suckers on each arm. This true octopus occurs occasionally on the British coasts, at least the south coast, but is usually rare. It is more common on the southern coasts of Europe, including those of the Mediterranean. The usual species of Octopoda on the British south coast is Eledone cirrosa, which has only one row of suckers on each arm, and is a smaller animal. The celebrated account of the octopus given by Victor Hugo in his Travailleurs de la mer is not so fictitious as some critics with a knowledge of natural history have maintained. It is true that the great French author has made the mistake of using the name Cephaloptera, which belongs to a large tropical fish similar

to a skate, instead of Cephalopoda, and that he applies the term devil-fish, which belongs to Cephaloptera, to the octopus. His description is exaggerated, imaginative and sensational; but it is correct in its most important particulars, and bears evidence that the author was to some extent personally acquainted with the animal and its habits, although he was not a scientific observer. The octopus feeds on crabs, and crabs feed on carrion, and, therefore, there is nothing impossible in Hugo's

account of the skeleton of a drowned man surrounded by the shells of numbers of crabs which the octopus had devoured. Whether an octopus would attack and kill a man is another question, but, it certainly might seize him with its arms and suckers while holding to the rocks by other arms, and a man seized in this way when in the water might be in danger of being drowned.

The octopus and many of the Octopoda move about by means of their arms on the sea bottom, and are not free-swimming, though like other Cephalopods they can propel themselves on occasion backwards through the water by means of the funnel. Other Octopoda, however, are pelagic and free-swimming, and such habits are not confined to those forms which are provided with lateral fins. The Argonaut (see Nautilus) is one of the Octopoda. The separation of one of the arms of the male for purposes of reproduction is one of the most remarkable peculi- arities of the Octopoda. It does not occur, however, in octopus . nor in many other members of the group. One arm is always considerably modified in .structure and employed in copulation, but it is only in three genera, one of which is Argonauta, that the arm spontaneously separates. The detached arm is found still alive and moving in the mantle cavity of the female, and when first discovered in these circumstances was naturally regarded by the older naturalists as a parasite. Cuvier, on account of the numerous sucker? of the detached arm, gave it the name Hectocotylus (hundred suckers). When the arm is not detached but only altered in structure it is said to be hectocotylized. In Octopus and Eledone it is the third right arm which is hecto- cotylized. The extremity of this arm is expanded and assumes the shape of a spoon. Whether detached or not the modified arm possesses a cavity into which the spermatophores are passed and the arm serves to convey them to the mantle cavity of the female.

It has been mentioned above that the true octopus {Octopus vulgaris) is usually rare on the English coast. In 1899 and 1900, however, they became so abundant on the south coast as to attract general notice, and to constitute a veritable plague which threatened

complete ruin to the shell-fish fisheries. This visita- tion and its effects were described by W. Garstang in the Journal of the Marine Biological Association. The abnormal abundance occurred all along the west coast of France, whence it extended to the Channel, and was probably due to a succession of unusually warm summers and mild winters, beginning with the warm spring and hot summer of 1893. The octopus in the years mentioned entered the lobster pots of the fishermen and devoured or killed the crabs and lobsters captured. The pots when hauled contained usually only living octopus and the mutilated remains of their victims. One fisherman took in a single week 64 specimens of octopus and only 15 living uninjured lobsters. The octopus also almost exterminated the swimming crabs (Portunus) in Plymouth Sound, and in the tanks of the Plymouth aquarium attacked and devoured all the specimens of its smaller relative Eledone cirrosa.

With regard to the size which the octopus may attain, the dimensions of the body are not usually given in records, but it is stated that the arms in the largest specimens measured 35 ft., and in numerous cases were 3 ft. in length. This would enable the eight arms to extend over a circle 6 ft. in diameter, but the globular body is not more than about a third of the length of an arm in diameter. When not in pursuit of prey the octopus hides itself in a hole between rocks and covers itself with stones and shells. Like its victims it seems to be active chiefly at night and to remain in its nest during the day.

For a technical account of the Octopoda see Cephalopoda; also W. Garstang," The Plague of Octopus on the South Coast, and its Effect on the Crab and Lobster Fisheries," J own. Mar. Biol. Assoc. vol. vi. (1900) p. 260. Q. T. C.)

OCTOROON, or Octaroon (from Lat. octo, eight, formed on the example of quadroon), the offspring of a quadroon and a white; a person having one-eighth negro blood. In rare instances such persons are called tercerons, as being third in descent from a negro ancestor. Occasionally persons are called octoroons

when the non- white element is not negro but some other coloured blood.

OCTOSTYLE (Gr. oktco eight, and otOXos, a column), in archi-

tecture, a portico of eight columns in front (see Temple).

OCTROI (0. Fr. octroyer, to grant, authorize; Lat. auctor), a local tax collected on various articles brought into a district for consumption. Octroi taxes have a respectable antiquity, being known in Roman times as vectigalia. These vectigalia were either the portorium, a tax on the entry from or departure to the provinces (those cities which were allowed to levy the portorium shared the profits with the public treasury); the ansarium or foricarium, a duty levied at the entrance to towns; or the edulia, sale imports levied in markets. Vectigalia were levied on wine and certain articles of food, but it Was seldom that the cities were allowed to use the whole of the profits of the taxes. Vectigalia were introduced into Gaul by the Romans, and remained after the invasion by the Franks, under the name of tonlieux and coutumes. They were usually levied by the owners of seigniories. But during the 12th and 13th centuries, when the towns succeeded in asserting their independence, they at the same time obtained the recognition of their right to establish local taxation, and to have control of it. The royal power, however, gradually asserted itself, and it became the rule that permission to levy local taxes should be obtained from the king. From the 14th century onwards, we find numerous charters granting {octroyer) to French towns the right to tax themselves. The taxes did not remain strictly municipal, for an ordinance of Cardinal Mazarin (in 1647) ordered the proceeds of the octroi to be paid into the public treasury, and at other times the government claimed a certain percentage of the product, but this practice was finally abandoned in 1852. From an early time the octroi was farmed out to associations or private individuals, and so great were the abuses which arose from the system that the octroi was abolished during the Revolution. But such a drastic measure meant the stoppage of all municipal activities, and in 1798 Paris was allowed to re-establish its octroi. Other cities were allowed gradually to follow suit, and in 1809 a law was passed laying down the basis on which octrois might be established. Other laws have been passed from time to time in France dealing with the octroi, especially those of 1816, 1842, 1867, 1871, 1884 and 1897. By the law of 1809 octroi duties were allowed on (1) beverages and liquids;

(2) eatables; (3) fuel; (4) forage; (5) building materials. A scale of rates was fixed, graduated according to the population, and farming out was strictly regulated. A law of 1816 enacted that an octroi could only be established at the wish of a municipal council, and that only articles destined for local consumption could be taxed. The law of 1852 abolished the 10% of the gross receipts paid to the treasury.

Certain indispensable commodities are allowed to enter free, such as grain, flour, fruit, vegetables and fish.

French octroi duties are collected either by the (1) regie simple, i.e. by special officers under the direction of the maire; (2) by the bail a ferme, i.e. farming, the contractor paying yearly a certain agreed upon sum calculated on the estimated amount;

(3) the re~gie interesse, a variation of the preceding method, the contractor sharing the profits with the municipality when they reach a given sum; and (4) the abonnement avec la rigie des contributions indirectes, under which a department of the treasury undertakes to collect the duties. More than half the octrois are collected under (1), and the numbers tend to increase; (2) is steadily decreasing, while (3) has been practically abandoned; (4) tends to increase. The gross receipts in 1901 amounted to £11,132,870. A law of 1897 created new sources of taxation, giving communes the option of (1) new duties on alcohol; (2) a municipal licence duty on retailers of beverages; (3) a special tax on wine in bottle; (4) direct taxes on horses and carriages, clubs, billiard tables and dogs; (5) additional centimes to direct taxes.

From time to time there has been agitation in France for the abolition of octroi duties, but it has never been pushed very earnestly. In 1869 a commission was appointed to consider

the matter, and reported in favour of their retention. In Belgium, on the other hand, they were abolished in 1870, being replaced by an increase in customs and excise duties; and in 1903 those in Egypt were also abolished. Octroi duties exist in Italy, Spain, Portugal and in some of the towns of Austria.

Authorities. — A. Guignard, De la suppression des octrois (Paris) ; Saint Julien and- Bienaim<5, Histoire des droits d 'octroi a Paris; M. Tardit and A. Ripert, Traite des octrois municipaux (Paris, 1904) ; L. Hourcade, Manuel encyclopedique des contributions indirectes el des octrois (Paris, 1905); much useful matter from some of the foregoing will be found in Report on the French Octroi System, by Consul-general Hearn (British Diplomatic and Consular Reports 1906) ; the abolition of the Belgian octrois produced a voluminous official report: Abolition des octrois communaux en Belgique: documents et discussions parlementaires. (T. A. I.)

O'CURRY, EUGENE (1796-1862), Irish scholar, was born at Dunaha, county Clare, in 1796, the son of a farmer who was a man

of unusual intelligence. After being employed for some time in the topographical and historical section of the Irish ordnance survey, O'Curry earned his living by translating and copying Irish manuscripts. The catalogue of Irish manuscripts in the British Museum was compiled by him. On the founding of the Roman Catholic University of Ireland (1854) he was appointed professor of Irish history and archaeology. His lectures were published by the university in i860, and give a better knowledge of Irish medieval literature than can be obtained from any other one source. Three other volumes of lectures were published posthum- ously, under the title On the Manners and Customs of the Ancient Irish (1873). His voluminous transcripts, notably eight huge volumes of ancient Irish law, testify to his unremitting industry. The Celtic Society, of the council of which he was a member, published two of his translations of medieval tales. He died in Dublin in 1862.

OCYDROME, a word formed from Ocydromus, meaning " swift-runner," and suggested by J. Wagler in 1830 as a generic term for the New Zealand bird called in the then unpublished manuscripts of J. R. Forster Rallus troglodytes, and so designated in 1788 by S. G. Gmelin, who knew of it through J. Latham's English description. Wagler's suggestion has since been generally adopted, and the genus Ocydromus is accepted by most ornith- ologists as a valid group of Rallidae; but the number of species it contains is admittedly doubtful, owing to the variability in size and plumage which they exhibit, and their correct nomencla- ture must for the present be considered uncertain. Sir W. Buller in his Birds of New Zealand identifies the " Wood-hen," observed in great abundance on the shores of Dusky Bay in 1773 by Cook and his companions on his second voyage, with the Gallirallus fuscus described and figured by Du Bus in 1847, and accordingly calls it O. fuscus; but it cannot be questioned that the species from this locality — which appears to have a somewhat limited range in the Middle Island, 1 and never to be met with far from the sea-coast, where it lives wholly on crus- taceans and other marine animals — is identical with that of the older authors just mentioned. In 1786 Sparrman, who had also been of Cook's company, figured and described as Rallus australis a bird which, though said by him to be that of the southern coast of New Zealand, differs so much from the R. troglodytes as to compel a belief in its specific distinctness; and indeed his species has generally been identified with the common " Weka " of the Maor'ies of the Middle Island, which can scarcely be the case if his statement is absolutely true, since the latter does not appear to reach so far to the southward, or to affect the seashore. It may therefore be fairly

inferred that his subject was obtained from some other locality. The North Island of New Zealand has what is allowed to be a third species, to which the name of Ocydromus earli is attached, and this was formerly very plentiful; but its numbers have rapidly decreased, and there is every chance of its soon being as extinct as is the species which tenanted Norfolk Island on its discovery by Cook in 1774,

1 It also occurs in Stewart Island, and singularly enough on the more distant group known as the Snares. The Gallirallus brachy- pterus of Lafresnaye, of which the typical (and unique?) specimen from an unknown locality is in the Caen Museum, has also been referred to this species, but the propriety of the act may be doubted.

and which was doubtless distinct from all the rest, though no specimen of it is known to exist in any museum. 1 Another species, O. syhestris, smaller and lighter in colour than any of the rest, was found in i860 to linger yet in Lord Howe's Island (Proc. Zool. Society, 1869, p. 473, pi. xxxv.). Somewhat differing from Ocydromus, but apparently very nearly allied to it, is a little bird peculiar, it is believed, to the Chatham Islands (Ibis, 1872, p. 247), and regarded by Captain Hutton as the type of a genus Cabalus under the name of C. modestus, while other naturalists consider it to be the young of the rare Rallus dieffen- bachi. So far the distribution of the Ocydromine form is wholly in accordance with that of most others characteristic of the New Zealand sub-region; but a curious exception is asserted to have been found in the Gallirallus lafresnayanus of New Caledonia, which, though presenting some structural differences, has been referred to the genus Ocydromus.

The chief interest attaching to the Ocydromes is their inability to use in flight the wings with which they are furnished, and hence an extreme probability of the form becoming wholly extinct in a short time. Of this inability there are other instances among the Rallidae (see Moor-hen) ; but here we have coupled with it the curious fact that in the skeleton the angle which the scapula makes with the coracoid is greater than a right angle, a peculiarity shared only, so far as is known, among the Carinatae by the dodo. The Ocydromes are birds of dull plumage, and mostly of retiring habits, though the common species is said to show great boldness towards man, and, from the accounts of Cook and the younger Forster, the birds seen by them displayed little fear. They are extremely destructive to eggs and

to any other birds they can master. (A. N.)

ODAENATHUS, or Odenattjs (Gr. '05alva6os, Palm, ro<-in = " little ear "), the Latinized form of Odainath, the name of a famous prince of Palmyra, in the second half of the 3rd century a.d., who succeeded in recovering the Roman East from the Persians and restoring it to the Empire. He belonged to the leading family of Palmyra, which bore, in token of Roman citizenship, the gentilicium of Septimius; hence his full name was Septimius Odainath (Vogue, Syrie cenirale, Nos. 23, 28 = Cooke, North-Semitic Inscrr. Nos. 126, 130). It is practically certain that he was the son of Septimius Hairan the " senator and chief of Tadmor," the son of Septimius Odainath " the senator " {N.S.I, p. 285). The year when he became chief of Palmyra is not known, but already in an inscription dated a.d. 258 he is styled " the illustrious consul our lord " (N.S.I. No. 126). He possessed the characteristic vigour and astuteness of the old Arab stock from which he sprang; and in his wife, the renowned Zenobia (q.v.), he found an able supporter of his policy. The defeat and captivity of the emperor Valerian (a.d. 260) left the eastern provinces largely at the mercy of the Persians; the prospect of Persian supremacy was not one which Palmyra or its prince had any reason to desire. At first, it seems, Odainath attempted to propitiate the Parthian monarch Shapur (Sapor) I.; but when his gifts were contemptuously rejected (Petr. Patricius, § 10) he decided to throw in his lot with the cause of Rome. The neutrality which had made Palmyra's fortune was abandoned for an active military policy which, while it added to Odainath's fame, in a short time brought his native city to its ruin. He fell upon the victorious Persians returning home after the sack of Antioch, and before they could cross the Euphrates inflicted upon them a considerable defeat. Then, when two usurping emperors were proclaimed in the East (a.d. 261), Odainath took the side of Gallienus the son and successor of Valerian, attacked and put to death the usurper Quietus at Emesa (Horns), and was rewarded for his loyalty by the grant of an exceptional position (a.d. 262). He may have

;. 1 The younger Forster remarked that the birds of Norfolk Island, though believed by the other naturalists of Cook's ship to be generally the same as those of New Zealand, were distinguished by their brighter colouring (see also Nestor). There can be no doubt that all the land-birds were specifically distinct. It is possible that Sparrman's R. dustralis, which cannot very confidently be referred to any known species of Ocydromus, may have been from Norfolk Island.

assumed the title of king before; but he now became " totius Orientis imperator," not indeed joint-ruler, nor Augustus, but " independent lieutenant of the emperor for the East" (Mommsen, Provinces, ii. p. io3). z In a series of rapid and successful campaigns, during which he left Palmyra under the charge of Septimius Worod his deputy (N.S.I. Nos. 127-129), he crossed the Euphrates and relieved Edessa, recovered Nisibis and Carrhae, and even took the offensive against the power of Persia, and twice invested Ctesiphon itself, the capital; probably also he brought back Armenia into the Empire. These brilliant successes restored the Roman rule in the East; and Gallienus did not disdain to hold a triumph with the captives and trophies which Odainath had won (a.d. 264). While observing all due formalities towards his overlord, there can be little doubt that Odainath aimed at independent empire; but during his life- time no breach with Rome occurred. He was about to start for Cappadocia against the Goths when he was assassinated, together with Herodes his eldest son, by his nephew Maconius; there is no reason to suppose that this deed of violence was in- stigated from Rome. After his death (a.d. 266-267) Zenobia succeeded to his position, and practically governed Palmyra on behalf of her young son Wahab-allath or Athenodorus (see Palmyra). (G. A. C.)*

ODALISQUE, a slave-woman who is a member of an oriental harem, especially one in the harem or seraglio of the sultan of Turkey. The word is the French adaptation of the Turkish odaliq, formed from odah, chamber or room in a harem.

ODD (in middle English odde, from old Norwegian oddi, an angle of a triangle; the old Norwegian oddamann is used of the third man who gives a casting vote in a dispute), that which remains over after an equal division, the unit in excess of an even number; thus in numeration the word is used of a number either above or below a round number, an indefinite cardinal number, as " eighty and odd," or " eighty odd." As applied to individuals, the sense of " one left after a division " leads to that of " solitary," and thus of " uncommon " or " strange." In the plural, " odds " was originally used to denote inequalities especially in the phrase " to make odds even." The sense of a difference in benefit leads to such colloquialisms as " makes no odds," while that of variance appears in the expression " to be at odds." In betting " the odds " is the advantage given by one person to another in proportion to the supposed chances of success.

ODDE, or Odda, a village of Norway, in South Bergenhus amt (county), on the Sor Fjord, a head-branch of the great Hardanger

Fjord. It is 48 m. directly S.E. of Bergen, but 123 by water (to Eide) , road (to Vossevangen) , and rail thenceforward, or about the same distance by water alone. It is one of the principal tourist-centres in southern Norway, being at the end of the road from Breifond (27 m.) near which the routes join from Stavanger by Sand, Lake Suldal, and the Bratlandsdal, and from the south-eastern coast towns by the Telemark. This road, descending from the Horrebraekke, passes through the gorge of Seljestadjuvet, passes the Espelandsfos and Lotefos falls, and skirts the Sandven lake. Odde is also a centre for several favourite excursions, as to the Buarbrae, one of the glaciers descending from the great Folgefond snowfield, situated in a precipitous valley (JordaJ) to the west of Sandven lake; to the Skjaeggedalsfos, a magnificent fall (525 ft.); or across the Folgefond to Suldal, a station on the Mauranger branch of the Hardanger fjord. Touring steamers and frequent local steamers from Bergen call at Odde, and there are several large hotels.

8 The late Roman chronicler Trebellius Pollio goes further and asserts " Odenatus rex Palmyrenorum optinuit totius Orientis imperium. . . . Gallienus Odenatum participate imperio Augustum voca.v\t,'\Hist. Aug. xxiii. 10 and 12. This is not borne out by the evidence. The highest rank claimed for him by his own people is recorded in an inscription dated 271 (N.S.I. No. 130) set up by the two generals of the Palmyrene army; Odainath is styled " king of kings and restorer of the whole city " ; but this does not mean that he ever held the title of Augustus, and the inscription was set up after his death and during the revolt of Palmyra.

ODDFELLOWS, ORDER OF, a secret benevolent and social society, having mystic signs of recognition, initiatory rites and ceremonies, and various grades of dignity and honour. Great antiquity has been claimed for the order of Oddfellows — the most popular tradition ascribing it to the Jewish legion under Titus, who, it is asserted, received from the emperor its first charter written on a golden tablet. Oddfellows themselves, however, now generally admit that the institution cannot be traced back beyond the first half of the 18th century, and explain the name as adopted at a time when the severance into sects and classes was so wide that persons aiming at social union and mutual help were a marked exception to the general

rule. Mention is made by Defoe of the society of Oddfellows, but the oldest lodge of which the name has been handed down is the Loyal Aristarcus, No. 9, which met in 1745 " at the Oakley Arms, Borough of Southwark; Globe Tavern, Hatton Garden; or the Boar's Head in Smithfield, as the noble master may direct." The earliest lodges were supported by each member and visitor paying a penny to the secretary on entering the lodge, and special sums were voted to any brother in need. If out of work he was supplied with a card and funds to reach the next lodge, and he went from lodge to lodge until he found employment. The lodges gradually adopted a definite common ritual and became confeder- ated under the name of the Patriotic Order. Towards the end of

the century many of the lodges were broken up by State prosecu- tions on the suspicion that their purposes were " seditious," but the society continued to exist as the Union Order of Oddfellows until 1809. In 1813, at a convention in Manchester, was formed the Independent Order of Oddfellows, Manchester Unity, which now overshadows all the minor societies in England. Oddfellow- ship was introduced into the United States from the Manchester Unity in 1 81 9, and the grand lodge of Maryland and the United States was constituted on the 22nd of February 1821. It now rivals in membership and influence the Manchester Unity, from which it severed its connexion in 1842. In 1843 it issued a dis- pensation for opening the Prince of Wales Lodge No. 1 at Montreal, Canada. The American society, including Canada and the United States, has its headquarters at Baltimore. Organizations, connected either with the United States or England, have been founded in France, Germany, Switzerland, Gibraltar and Malta, Australia, New Zealand, the Fiji Islands, the Hawaiian Islands, South Africa, South America, the West Indies and Barbados, and elsewhere.

The rules of the different societies, various song-books, and a number of minor books on Oddfellowship have been published, but the most complete and trustworthy account of the institution is that in The Complete Manual of Oddfellowship, its History, Principlest Ceremonies and Symbolism, privately printed (1879). See also Friendly Societies.

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Oriel Professor of the Interpretation of Holy Scripture, and Fellow of Oriel College, Oxford. Canon of Rochester. Hon. Canon of St Mary's Cathedral, Edinburgh.

Gerard Baldwin Brown, M.A.

Professor of Fine Art, University of Edinburgh. Formerly Fellow of Brasenose College, Oxford. Author of The Fine Arts; The Arts in Early England; &c.

George Brown Goode (1 851-1896).

Assistant Secretary of the Smithsonian Institution, Washington, 1887-1896. Author of American Fishes.

George Chrystal, M.A., LL.D.

Professor of Mathematics and Dean of the Faculty of Arts, Edinburgh University. Hon. Fellow and formerly Fellow and Lecturer of Corpus Christi College, Cambridge.

George Charles Williamson, Litt.D.

Chevalier of the Legion of Honour. Author of Portrait Miniatures; Life of Richard Cosway, R.A.; George Engleheart; Portrait Drawings; &c. Editor of the New Edition of Bryan's Dictionary of Painters and Engravers.

Oliver, Isaac; Oliver, Peter.

G. E. Rev. George Edmundson, M.A., F.R.Hist.S. f" Oldenbarneveldt;

Formerly Fellow and Tutor of Brasenose College, Oxford. Ford's Lecturer, 1909. J nr»n

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Orinoco.

G. E. C. George Earl Church.

See the biographical article: Church, G. E.

G. H. C. George Herbert Carpenter, B.Sc. f

Professor of Zoology in the Royal College of Science, Dublin. Author of Insects: -j Orthoptera. their Structure and Life. L

G. Sa. George Saintsbury, LL.D., D.C.L. f Orleans, Charles, Duke of;

See the biographical article : Saintsbury, George E. B. \ Pascal (in part).

G. S. W. German Sims Woodhead, M.A., M.D., F.R.S. (Edin.). [

Professor of Pathology, Cambridge University. Fellow of Trinity Hall, Cambridge. “1 Parasitic Diseases. Member of Royal Commission on Tuberculosis, 1902. I

H. A. B. Henry Arthur Bethell. f

Lieut.Col. Commanding 49th Brigade R.F.A. Associate Member of R.A. Com J Ordnance:

mittee. Awarded Lefroy Medal for Contributions to Artillery Science. Author of 1 Field Artillery Equipments.

Modern Guns and Gunnery; The Employment of Artillery; &c. I

H. Br. Henry Bradley, M.A., Ph.D. [

Joint-editor of the New* English Dictionary (Oxford). Fellow of the British “j Orm. Academy. Author of The Story of the Goths ; The Making of English ; &c. I

H. Ch. Hugh Chisholm, M.A. |”

Formerly Scholar of Corpus Christi College, Oxford. Editor of the nth edition of < Parliament (in part). the Encyclopaedia Britannica. Co-editor of the 10th edition. (.

H. CI. Sir Hugh Charles Clifford, K.C.M.G.

Colonial Secretary, Ceylon. Fellow of the Royal Colonial Institute. Formerly Resident, Pahang. Colonial Secretary, Trinidad and Tobago, 1903-1907. Author of -j Pantun Studies in Brown Humanity; Further

India, &c. Joint-author of A Dictionary of the Malay Language.

H. E. Karl Hermann Ethe, M.A., Ph.D.

Professor of Oriental Languages, University College, Aberystwyth (University of Wales). Author of Catalogue of Persian Manuscripts in the India Office Library, London (Clarendon Press) ; &c.

Omar Khayyam (in part)

Sir Henry Enfield Roscoe, LL.D. J” p a< . tellI ,

See the biographical article: Roscoe, Sir Henry Enfield. \ raswur –

Horatio Robert Forbes Brown, LL.D.

Editor of the Calendar of Venetian State Papers, for the Public Record Office, London. Author of Life on the Lagoons; Venetian Studies; John Addington Symonds, a Biography ; &c.

Padua.

Hans Friedrich Gadow, F.R.S., Ph.D. . f

Strickland Curator and Lecturer on Zoology in the University of Cambridge, -j Odontornithes. Author of ” Amphibia and Reptiles,” in the Cambridge Natural History. L

Henry Fairfield Osborn, LL.D., D.Sc, F.R.S. (Edin.).

Da Costa Professor of Zoology, Columbia University, New York. President: American Museum of Natural History, New York. Curator of Department of- Vertebrate Palaeontology. Palaeontologist U.S. Geological Survey. Author of From the Greeks to Darwin ; &c.

Henry Francis Pelham, LL.D., D.CiL.

Palaeontology.

[ry Francis Pelham, LL.D., D.C.L. f m . w „.„. e

See the biographical article: Pelham, Henry Francis. \ UM0 » M 3 -™™ »•

Henry Jackson, Litt.D., LL.D., O.M. r

Regius Professor of Greek in the University of Cambridge. Fellow of

Trinity J d __ („,.j„ « ui „

College. Fellow of the British Academy. Author of Texts to illustrate the History of “j rarmeniaes 01 Uiea.

Greek Philosophy from Thales to Aristotle. [_ ■ ‘

Harriet L. Hennessy, M.D. (Brux.), L.R.C.P.I., L.R.C.S.I. /olfactory System: Diseases.

Hector Munro Chadwick, M.A. ■ r

Librarian and Fellow of Clare College, Cambridge. Reader in Scandinavian, ■} Odin. Cambridge University. Author of Studies on Anglo-Saxon Institutions. [

H, N. D. Henry Newton Dickson, M.A., D.Sc, F.R.S. (Edin.), F.R.G.S. r

Professor of Geography at University College, Reading. Formerly Vice-President, .. .

Royal Meteorological Society. Lecturer in Physical Geography, Oxford. Author of “j Facinc Ocean (m part). Meteorology; Elements of Weather and Climate; &c. _

H. R. T. Henry Richard Tedder, F.S.A. J …

Secretary and Librarian of the Athenaeum Club, London. ˆ FampmetS.

H. W. C. D. Henry William Carless Davis, M.A. ‘ f ndo of Baveux’

Fellow and Tutor of Balliol College, Oxford. Fellow of All Souls’ College, Oxford, -I Q . . vi iLij s ‘ 1895-1902. Author of England under the Normans and Angevins ; Charlemagne. ˆvruenc viuuu.

H. Y. Sir Henry Yule, K.C.S.I. J* Qdoric (in pari).

See the biographical article, Yule, Sir Henry. (.

J. A. C. Sir Joseph Archer Crowe, K.C.M.G. / Ostade (in part).

See the biographical article : Crowe, Sir Joseph Archer. l

INITIALS AND HEADINGS OF ARTICLES

IX

J. A. F.

J. A. H.

J. Bra. J.Bt.

J* B. A. J. C. van D.

J. E. S.*

J. Fi. J. F.-K.

J. H. A. H. J. H. F. J. H. M.

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J. L.H.

J. M.*

J. Mn. J. H. M.

J. P.-B. J.P.E.

John Ambrose Fleming, M.A., D.Sc, F.R.S.

Pender Professor of Electrical Engineering in the University of London. Fellow of University College, London. Formerly Fellow of St John's College, Cambridge. " Vice-President of the Institution of Electrical Engineers. Author of The Principles of Electric Wave Telegraphy ; Magnets and Electric Currents ; &c.

Ohmmeter; Oscillograph.

fOligoeene System; Author of ■{ Oolite; Ordovician System; loxfordian; Palaeozoic Era;

John Allen Howe, B.Sc.

Curator and Librarian of the Museum of Practical Geology, London. Geology of Building Stones.

Joseph Braun, S.J.

Author of Die Liturgische Gewandung &c.

James Bartlett.

Lecturer on Construction, Architecture, Sanitation, Quantities, &c, at King's _ College, London. Member of Society of Architects. Member of Institute of Junior Engineers.

Joseph Beavington Atkinson.

Formerly art-critic of the Saturday Review. Author of An Art Tour in the Northern – Capitals of Europe; Schools of Modern Art in Germany. l_

John Charles van Dyke. f

Professor of the History of Art, Rutgers College, New Brunswick, N.J. Formerly J p a i n f in p. tjˆuˆ

John Edwin Sandys, M.A., Lrrr.D., LL.D. T

Public Orator in the University of Cambridge. Fellow of St John's College, Cam- . bridge. Fellow of the British Academy. Author of History of Classical Scholarship ; &c.

Pastoral Staff.

Painter-work.

Overbeck.

Pausanias: Traveller.

John Fiske, LL.D.

See the biographical article : Fiske, John.

James Fitzmaurice-Kelly, Litt.D., F.R.Hist.S.

Gilmour Professor of Spanish Language and Literature, Liverpool University. Norman McColl Lecturer, Cambridge University. Fellow of the British Academy. Member of the Royal Spanish Academy. Knight Commander of the Order of Alphonso XII. Author of A History of Spanish Literature; &c.

John Henry Arthur Hart, M.A.

Fellow, Theological Lecturer and Librarian, St John's College, Cambridge.

John Henry Freese, M.A.

Formerly Fellow of St John's College, Cambridge.

Parkman, Francis.

Palacio Valdes, Armando: Pardo Bazan.

■I Palestine: History (in part) J Orpheus {in part).

John Henry Middleton, M.A., Litt.D., F.S.A., D.C.L. (1846-1896).

Slade Professor of Fine Arts in the University of Cambridge, 1 886-1 895. Director of the Fitzwilliam Museum, Cambridge, 1889-1892. Art Director of the South i Orcagna. Kensington Museum, 1892-1896. Author of The Engraved Gems of Classical Times; Illuminated Manuscripts in Classical and Medieval Times.

John Holland Rose, M.A., Litt.D. r

Christ's College, Cambridge: Lecturer on Modern History of the Cambridge J Pasquier.

I.; Napoleonic]

University Local Lectures Syndicate. Author of Life of Napoleon Studies ; The Development of the European Nations ; The Life of Pitt ; &c.

Passover.

Joseph Jacobs, Litt.D.

Professor of English Literature in the Jewish Theological Seminary, New York. Formerly President of the Jewish Historical Society of England. Corresponding Member of the Royal Academy of History, Madrid. Author of Jews of Angevin England; Studies in Biblical Archaeology; &c.

Julius Lewkowitsch, M.A., Ph.D. r

Examiner to the City and Guilds of London Institute. Vice-President of Chemical J q.|^ Society. Member of Council of Chemical Society; Institute of Chemistry; and H Society of Public Analysts. Author of Chemical Technology and Analysis of Oils, Fats, and Waxes ; &c.

John Linton Myres, M.A., F.S.A., F.R.G.S.

Wykeham Professor of Ancient History in the University of Oxford and Fellow of Magdalen College. Formerly Gladstone Professor of Greek and Lecturer in Ancient Geography, University of Liverpool. Lecturer of Classical Archaeology in the University of Oxford.

James Muirhead, LL.D. (1831-1889).

Scotch Advocate; Professor of Civil Law in the University of Edinburgh, 1862- 1 889. Author of Historical Introduction to the Private Law of Rome, and of an edition of the Institutes of Gaius and Rules of Ulpian. I

John Macpherson, M.A., M.D., M.R.C.S. (1817-1890). r

Formerly Inspector-General of Hospitals, Bengal. Author of The Baths and Wells J Paranoia. of Europe ; &c. 1

John Malcolm Mitchell. f Ostracism-

Sometime Scholar of Queen's College, Oxford. Lecturer in Classics, East London J p a tricians' College (University of London). Joint-editor of Grote's History of Greece. |_ raineians.

Paphos.

Patron and Client (in part).

James George Joseph Penderel-Brodhurst. Editor of the Guardian (London).

Jean Paul Hippolyte Emmanuel Adhemar Esmein.

Professor of Law in the University of Paris. Officer of the Legion of Honour. Member of the Institute of France- Author of Cours Uementaire d'histoire du droit francais ; &c.

Pawnbroking.

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Parlement.

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L. R. P. M. G. D.

M. H. S.

M. Ja. M. M. Bh. M. N. T.

INITIALS AND HEADINGS OF ARTICLES

Julian Robert John Jocelyn. f Ordnance: Heavy Field and

Colonel, R.A. formerly Member of the Ordnance Committee, Commandant, J <-• » 77 a , / Ordnance College, and Commandant, School of Gunnery. Author of Notes on 1 S ™& Mˆpments, Garrison Tactics and Reconnaissances; &c. I- Mountings.

James Richard Thursfield, M.A.

Honorary Fellow of Jesus College, Oxford. Formerly Dean, Fellow, Lecturer and ” Tutor of Jesus College- Author of Peel ; &c.

Parnell, Charles Stewart.

James Sutherland Cotton, M.A.

Editor of the Imperial Gazetteer of India. Hon. Secretary of the Egyptian Ex-, ploration Fund. Formerly Fellow and Lecturer of Queen’s College, Oxford! Author of India; &c.

John Thomas Bealby.

Joint-author of Stanford’s Europe. Formerly Editor of the Scottish Geographical’ Magazine. Translator of Sven Hedin’s Through Asia, Central Asia and Tibet; &c.

Joseph Thomas Cunningham, M.A., F.Z.S.

Lecturer on Zoology at the South-Western Polytechnic, London. Formerly _ Fellow of University College, Oxford. Assistant Professor of Natural History in The University of Edinburgh. Naturalist to the Marine Biological Association.

The Rev. James Vernon Bartlet, M.A., D.D.

Professor of Church History, Mansfield College, Oxford. Author of The Apostolic “* Age; &c.

Omiehund; Orme.

Odessa; Onega; Orel; Orenburg.

Oyster {in part).

Papias;

Paul, the Apostle.

Paper: Manufacture.

Ophicleide (in part) ;

Orchestra; Orchestrion;

Organ: Ancient History;

Organistrum; Pandura;

Parsifal Bell-instrument. Leonce Benedite. ˆ r

Keeper of the Musee National du Luxembourg. Professor at the £cole du Louvre. J _ .

President of the Societe des Peintres Orientalistes francais. Author of Histoire] Painting: Modern French, des Beaux Arts; &c. L

W. Wyatt, A.M.Inst.C.E. Author of The Art of Making Paper; &c.

Kathleen Schlesinger.

Editor of the Portfolio of Musical Archaeology. Orchestra; &c.

Author of The Instruments of the –

Louis Duchesne.

See the biographical article: Duchesne, L. M. O.

Ludwig von Pastor, Ph.D.

Director of the Austrian Institute of Historical Studies at Rome. Professor of History and Director of the Historical Seminary in the University of Innsbruck. Hofrat of the Austrian Empire. Commander of the Order of Francis Joseph ; &c. Author of Geschichte der Pdpsle ; &c. Editor of the Acta pontificum Romanorum.

Lewis Foreman Day, F.S.A. (1845-1909).

Formerly Vice-President of the Society of Arts. Past Master of the Art Workers' Gild. Author of Windows: a book about Stained Glass ; &c.

Lawrence Johnston Burpee.

Public Librarian of the City of Ottawa. Author of The Search for the Western Sea; &c. Joint-author of Canadian Life in Town and Country; &c.

Leonard James Spencer, M.A.

Assistant in Department of Mineralogy, British Museum. Formerly Scholar of Sidney Sussex College, Cambridge, and Harkness Scholar. Editor of the Mineralogical Magazine.

Lewis Richard Farnell, M.A., Litt.D.

Fellow and Senior Tutor of Exeter College, Oxford ; University Lecturer in Classical Archaeology; Wilde Lecturer in Comparative Religion. Author of Cults of Greek States ; Evolution of Religion.

Rt. Hon. Sir Mountstuart Elphinstone Grant Dufe, G.C.S.I., F.R.S.

(1829-1906).

M.P. for the Elgin Burghs, 1857-1881. Under-Secretary of State for India, 1868- 1874. Under-Secretary of State for the Colonies, 1880-1881. Governor of Madras, ” 1881-1886. President of the Royal Geographical Society, 1889-1893. President of the Royal Historical Society, 1 892-1 899. Author of Studies in European Politics ; Notes from a Diary; &c.

Marion H. Spielmann, F.S.A.

Formerly Editor of the Magazine of Art. Member of Fine Art Committee of Inter- national Exhibitions of Brussels, Paris, Buenos Aires, Rome and the Franco- British Exhibition, London. Author of History of “Punch”; British Portrait Painting to the Opening of the Nineteenth Century; Works of G. F. Watts, R.A.; British Sculpture and Sculptors of To-day; Henriette Ronner; &c.

Morris Jastrow, Ph.D.

Professor of Semitic Languages, University of Pennsylvania. Author of Religion “j Omen. of the Babylonians and Assyrians; &c.

Sir Mancherjee Merwanjee Bhownaggree.

Fellow of Bombay University. M.P. for N.-E. Bethnal Green, 1895-1906. Author -j Patel. of History of the Constitution of the East

India Company ; &c.

Marcus Niebuhr Tod, M.A.

Fellow and Tutor of Oriel College, Oxford. University Lecturer in Epigraphy. -{ Pausanias: Commander. Joint-author of Catalogue of the Sparta Museum.

/Papacy: to 1087; I Paschal I.

Papacy: 1 305-1 5Q0.

Ornament.

Ottawa (Canada).

Oligoclase; Olivenite; Olivine; Orthoclase; Parisite.

Oracle.

Oliphant, Laurence.

Painting: Recent British; Pastel.

INITIALS AND HEADINGS OF ARTICLES xi

M. P.* Leon Jacques Maxime Prinet.

Formerly Archivist to the French National Archives. Auxiliary of the Institute of , France (Academy of Moral and Political Sciences). Author of V Industrie* du sel en Franche-Comte; Francois I. et le comte de Bourgogne; &c.

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R.Mr.

Orleans, Ferdinand, Duke of; Orleans, Gaston, Duke of; Orleans, Philip I. and II., Dukes of.

0- Ba. Oswald Barron, F.S.A.

Editor of The Ancestor, 1902-1905. Hon. Genealogist to Standing Council of thei Paulet: Family, Honourable Society of the Baronetage. L

0. J. R. H. Osbert John Radcliffe Howarth, M.A. f

Christ Church, Oxford. Geographical Scholar, 1901. Assistant Secretary of the-j Oxford. British Association. I

0. T. Oldfield Thomas, F.R.S., F.Z.S. f

Senior Assistant, Natural History Department of the British Museum. Author of) Pangolin {in part). Catalogue of Marsupialia in the British Museum. I

P. A. K. Prince Peter Alexeivitch Kropotkin. J" Odessa; Onega;

See the biographical article : Kropotkin, Prince P. A. I Orel; Orenburg.

P. C. M. Peter Chalmers Mitchell, M.A., F.R.S., F.Z.S., D.Sc, LL.D. f

Secretary to the Zoological Society of London. University Demonstrator in Com- J Ornithology {in part) ; parative Anatomy and Assistant to Linacre Professor at Oxford, 1 888-1 891. Author 1 Parasitism. of Outlines of Biology ; &c. L

P. Gi. Peter Giles, M.A., LL.D., Litt.D. f

Fellow and Classical Lecturer of Emmanuel College, Cambridge, and University J p Reader in Comparative Philology. Formerly Secretary of the Cambridge Philo- logical Society. Author of Manual of Comparative Philology; &c. L

Paul George Konody. J

Art Critic of the Observer and the Daily Mail. Formerly Editor of The Artist, l Ostade {in part). Author of The Art of Walter Crane; Velasquez, Life and Work; &c. I

Robert Alexander Stewart Macalister, M.A., F.S.A. f ophir*

St John's College, Cambridge. Director of Excavations for the Palestine Explora- ~\ Pai-cH-o 1 ■ j, ,\ tion Fund. L rale!,llIle l*» part).

Ronald Brunlees McKerrow, M.A. f

Trinity College, Cambridge. Editor of the Works of Thomas Nashe; &c. \ Parnassus Plays.

Sir Richard Claverhouse Jebb, LL.D., D.C.L. J" . .. ■,

See the biographical article: Jebb, Sir Richard Claverhouse. \ ul y m P ia l*» part).

Richard Garnett, LL.D., D.C.L. f_ .

See the biographical article : Garnett, Richard. \ ranizzi.

Robert Holford Macdowall Bosanquet, M.A., F.R.S., F.R.A.S., F.C.S.

Fellow oi St John's College, Oxford. Author of Musical Temperament; &c.

Robert Hallowell Richards, LL.D. f

Professor of Mining and Metallurgy, Massachusetts Institute of Technology, Boston. -! Ore-dreSSing. President American Institute of Mining Engineers, 1 886. Author of Ore-dressing ; &c. [

R. J. Grewing, Captain, Reserve of Officers. j Officers.

Ronald John McNeill, M.A. f n>r»nnnii. p 7

Christ Church, Oxford. Barrister-at-Law. Formerly Editor of the St James' s\ "„„.„'• r amuy\ Gazette, London. [Neill: Family.

R. K. D. Sir Robert Kennaway Douglas. f

Formerly Keeper of Oriental Printed Books and MSS. in the British Museum; and J _ . _. „ Professor of Chinese, King's College, London. Author of The Language and Litera- 1 P ar kes, Sir H. S.

ture of China; &c. L

R. L.* Richard Lydekker, M.A., F.R.S., F.G.S., F.Z.S. f oka Pi; Opossum;

Member of the Staff of the Geological Survey of India, 1874-1882. Author of J otter (* w part); Catalogues of Fossil Mammals, Reptiles and Birds in British Museum; The Deer of] Ox; Palaeotherium; all Lands; The Game Animals of Africa; &c. . [Pangolin (in part).

-I Organ.

, „„ . [Painting: Recent Dutch, Ger-

Richard Mother (1860-1909). . Austrian, Italian,

Professor of the History of Art, Breslau University, 1895-1909. Author of The J o.'- h r,„ m l cˆ-.i.

History of Modern Painting.

Spanish, Danish, Swedish, Norwegian, Russian and Balkan States.

R. Mr.* Richard Muir.

Demonstrator of Pathological and Bacteriological Technique, University of I

Edinburgh. “1 Pathology {in part).

R. N. B. Robert Nisbet Bain (d. 1909). L _. . n , . H .

Assistant Librarian, British Museum, 1883-1909. Author of Scandinavia, the [u,e * >». UIgiera;

Political History of Denmark, Norway and Sweden, 1513-1900 ; The First Romanovs, J Orduin-Nashchokin;

1613-1725 ; Slavonic Europe, the Political History of Poland and Russia from 1469 1 Orlov; Osterman;

toi7 9 6;&c. Loxenstjerna; Panin; Patkul.

R. 0. Sir Richard Owen, K.C.B. f

See the biographical article: Owen, Sir Richard. -} Oken.

R. P. S. R. Phene Spiers, F.S.A.,’ F.R.I.B.A.

Formerly Master of the Architectural School, Royal Academy, London. Past

President of Architectural Association. Associate and Fellow of King’s College, -j Order; Orientation.

London. Corresponding Member of the Institute of France. Editor of Fergusson’s

History of Architecture. Author of Architecture: East and West; &c.

Xll R. S. C.

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INITIALS AND HEADINGS OF ARTICLES

Robert Seymour Conway, M.A., D.Litt. (Cantab.). [._

Professor of Latin and Indo-European Philology in the University of Manchester. J PacliglU; Formerly Professor of Latin in University College, Cardiff; and Fellow of Gonville] Osca Lingua. and Caius College, Cambridge. Author of The Italic Dialects. v.

Roland Truslove, M.A. J p aris: Geography and

Formerly Scholar of Christ Church, Oxford. Fellow, Dean and Lecturer in Classics 1 ci„4; rl ; at Worcester College, Oxford. I owm » w –

Stanley Arthur Cook, M.A. _

Lecturer in Hebrew and Syriac, and formerly Fellow, Gonville and Caius College, Cambridge. Editor for the Palestine Exploration Fund. Examiner in Hebrew and Aramaic, London University, 1904-1908. Author of Glossary of Aramaic Inscriptions; The Law of Moses and the Code of Hammurabi; Critical Notes on Old Testament History; Religion of Ancient Palestine; &c.

Omri; Palestine: Old

History

Testament

Sydney R. Fremantle.

Captain, R.N. Naval Mobilization Department, Admiralty, London.

Sidney George Owen, M.A.

Student and Tutor of Christ Church, Oxford.

Simon Newcomb, D.Sc, LL.D.

See the biographical article : Newcomb, Simon.

Stephen Paget, F.R.C.S.

Surgeon to Throat and Ear Department, Middlesex Hospital. Hon. Secretary, Research Defence Society. Author of Memoirs and Letters of Sir James Paget ; &c.

Thomas Ashby, M.A., D.Litt.

Director of British School of Archaeology at Rome. Formerly Scholar of Christ Church, Oxford. Craven Fellow, 1897. Conington Prizeman, 1906. Member of * the Imperial German Archaeological Institute. Author of The Classical Topography of the Roman Campagna.

J Ordnance: Naval Guns and \ Gunnery.

{ Ovid.

j Orbit; 1 Parallax.

Paget, Sir James.

Olbia: Sardinia;

Orbetello; Oristano;

Ortona a Mare; Orvieto;

Ostia; Otranto; Paestum;

Palermo {in part);

Pantelleria; Patavium;

Pavia.

Patents {in pari);

Payment;

Payment of Members.

Pacific Blockade.

Thomas Allan Ingram, M.A., LL.D. Trinity College, Dublin.

Sir Thomas Barclay.

Member of the Institute of International Law. Member of the Supreme Council of . the Congo Free State. Officer of the Legion of Honour. Author of Problems of International Practice and Diplomacy; &c. M.P. for Blackburn, 1910.

Rt. Hon. Lord Farnborough.

See the biographical article : Farnborough, Thomas Erskine May, Baron.

Theodore Freylinghuysen Collier, Ph.D.

Assistant Professor of History, Williams College, Williamstown, Mass.

Thomas Hodgkin, Litt. D., LL.D., D.C.L. See the biographical article : Hodgkin, T.

Sir Thomas Hungerford Holdich, K.C.M.G., K.C.I. E., D.Sc.

Superintendent, Frontier Surveys, India, 1892-1898. Gold Medallist, R.G.S.,. London, 1887. Author of The Indian Borderland; The Countries of the King's Award; India; Tibet.

Rev. Thomas Kelly Cheyne, M.A., D.D., LL.D. See the biographical article: Cheyne, T. K.

Theodor Noldeke.

See the biographical article : Noldeke, Theodor.

Sir Thomas Little Heath, K.C.B., D.Sc.

Assistant Secretary to the Treasury. Formerly Fellow of Trinity College, Cambridge. "*

Thomas Okey.

Examiner in Basket Work for the City and Guilds of London Institute.

Thomas William Rhys Davids, LL.D., Ph.D.

Professor of Comparative Religion, Manchester University. President of the Pali Text Society. Fellow of the British Academy. Secretary and

Librarian of – Royal Asiatic Society, 1885-1902. Author of Buddhism; Sacred Books of the Buddhists; Early Buddhism; Buddhist India; Dialogues of the Buddha; &c.

Victor Charles Mahillon. r

Principal of the Conservatoire Royal de Musique at Brussels. Chevalier of the J Ophicleide {in part). Legion of Honour.]

Sir Walter Armstrong.

Director of National Gallery of Ireland. Author of Art in the British Isles; Joint-editor of Bryan's Dictionary of Painters; &c.

Rev. William Augustus Brevoort Coolidge, M.A., F.R.G.S., Ph.D.

Fellow of Magdalen College, Oxford. Professor of English History, St David's College, Lampeter, 1880-188 1. Author of Guide du Haut Dauphine;- The Range, of the Todi; Guide to Grindelwald ; Guide to Switzerland; The Alps in Nature and in History; &c. Editor to The Alpine Journal, 1880-1881 ; &c.

William Alfred Hinds.

President of the Oneida Community, Ltd.

Parliament {in part).

Orange: France;

Paul III., IV., V. {Popes).

Odoacer.

Oman; Oxus; Pamirs.

Paradise.

Pahlavi.

Pappus of Alexandria.

Osier.

Pali.

&c. J Orchardson.

Olivier, J. D.; Orta, Lake of; Ortler.

Author of American Communities; &c. { 0neida Community.

INITIALS AND HEADINGS OF ARTICLES

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R.*

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Formerly Exhibitioner of Merton Colleg* and Senior Scholar of St John's College, Oxford. Author of Modern Europe ; &c.

Papacy: igoo-igio. Paris: History (in part).

Officers: United States.

William Augustus Simpson.

Colonel and Acting Adjutant-General, U.S. Army.

William Burton, M.A., F.C.S.

Chairman, Joint Committee of Pottery Manufacturers of Great Britain. Author of -j Palissy.

English Stoneware and Earthenware; &c.

Rev. William E. Addis, M.A.

Professor of Old Testament Criticism, Manchester College, Oxford. Author oH Order, Holy,

Christianity and the Roman Empire ; &c.

William Edward Garrett Fisher, M.A. Author of The Transvaal and the Boers.

Sir

H.

-j Paper: India Paper. ■< Otter (in part).

William Henry Flower, F.R.S.

See the biographical article : Flower, Sir W.

William Lawson Grant, M.A. r

Professor at Queen's University, Kingston, Canada. Formerly Beit Lecturer in J Colonial History at Oxford University. Editor of Acts of the Privy Council (Colonial 1 Series); Canadian Constitutional Development (in collaboration). L

William Michael Rossetti. f

See the biographical article: Rossetti, Dante Gabriel. \

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Chief Engineer, Department of Marine and Fisheries of Canada. Member of the •< Ontario, Lake, Geographic Board of Canada. Past President of Canadian Society of Civil Engineers. [

Ontario.

Palma, Jacopo; Parmigiano; Paul Veronese.

William Prideaux Courtney.

See the biographical article: Courtney, L. H., Baron.

William Smyth Rockstro.

Author of A General History of Music from the Infancy of the Greek Drama to the Present Period ; and other works on the history of music.

William Walker Rockwell, Lic.Theol.

Assistant Professor of Church History, Union Theological Seminary, New York.

Orford, 1st Earl of (Sir Robert Walpole); Oxford, 1st Earl of.

Palestrina {in part).

‘ Papacy: 15Q0-1870; Paschal III.

PRINCIPAL UNSIGNED ARTICLES

Ohio.

Oklahoma.

Old Age Pensions.

Old Catholics.

Oldenburg.

Olive.

Oporto.

Oran.

Orange.

Orchids.

Oregon.

Original Package.

Orkney Islands.

Orleans.

Orthodox Eastern Church.

Oxfordshire.

Oxygen.

Pacific Ocean: Islands.

Paisley.

Palatinate.

Pallium.

Palm.

Palmerston, Viscount.

Palm Sunday.

Pampas.

Panama (Republic).

Panama Canal.

Pan-American Conferences.

Panathenaea.

Pannonia.

Pansy.

Pantheism.

Para (State).

Parabola.

Paracelsus.

Parachute.

Paraffin.

Paraguay.

Pardon.

Paris, Treaties of.

Parish.

Park, Mungo.

Parma.

Parsees.

Partnership.

Passionflower.

Patagonia.

Patmos.

Patna.

Pau.

ENCYCLOPEDIA BRITANNICA

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ODE (Gr. <$i\, from aelSeiv, to sing), a form of stately and elaborate lyrical verse. As its name shows, the original significa- tion of an ode was a chant, a poem arranged to be sung to an instrumental accompaniment. There were two great divisions of the Greek melos or song; the one the personal utterance of the poet, the other, as Professor G. G. Murray says, " the choric song of his band of trained dancers." Each of these culminated in what have been called odes, but the former, in the hands of Alcaeus, Anacreon and Sappho, came closer to what modern criticism knows as lyric, pure and simple. On the other hand, the choir-song, in which the poet spoke for himself, but always supported, or interpreted, by a chorus, led up to what is now known as ode proper. It was Alcman, as is supposed, who first gave to his poems a strophic arrangement, and the strophe has come to be essential to an ode. Stcsichorus, Ibycus and Simonides of Ceos led the way to the two great masters of ode among the ancients, Pindar and Bacchylides. The form and verse-arrangement of Pindar's great lyrics have regulated the type of the heroic ode. It is now perceived that they are con- sciously composed in very elaborate measures, and that each is the result of a separate act of creative ingenuity, but each preserving an absolute consistency of form. So far

from being, as critics down to Cowley and Boileau, and indeed to the time of August Bockh, supposed, utterly licentious in their irregularity, they are more like the canzos and sirventes of the medieval troubadours than any modern verse. The Latins themselves seem to have lost the secret of these complicated harmonies, and they made no serious attempt to imitate the odes of Pindar and Bacchylides. It is probable that the Greek odes gradually lost their musical character; they were accompanied on the flute, and then declaimed without any music at all. The ode, as it was practised by the Romans, returned to the personally lyrical form of the Lesbian lyrists. This was exemplified, in the most exquisite way, by Horace and Catullus; the former imitated, and even translated, Alcaeus and Anacreon, the latter was directly inspired by Sappho.

The earliest modern writer to perceive the value of the antique ode was Ronsard, who attempted with as much energy as he could exercise to recover the fire and volume of Pindar; his principal experiments date from 1550 to 1552. The poets of the Pleiad recognized in tne ode one of the forms of verse with which French prosody should be enriched, but they went too far, and in their use of Greek words crudely introduced, and in their quantitative experiments, they offended the genius of xx. 1

the French language. The ode, however, died in France almost as rapidly as it had come to life; it hardly survived the 16th century, and neither the examples of J. B. Rousseau nor of Saint-Amant nor of Malherbe possessed much poetic life. Early in the 19th century the form was resumed, and we have the Odes composed between 18 17 and 1824 by Victor Hugo, the philosophical and religious odes of Lamartine, those of Victor de Laprade (collected in 1844), and the brilliant Odes funam- bulesques of Theodore de Banville (1857).

The earliest odes in the English language, using the word in its strict form, were the magnificent Epithalamium and Prothalamium of Spenser. Ben Jonson introduced a kind of elaborate lyric, in stanzas of rhymed irregular verse, to which he gave the name of ode; and some of his disciples, in particular Randolph, Cartwright and Herrick, followed him. The great ” Hymn on the Morning of Christ’s Nativity,”’ begun by Milton in 1629, may be considered an ode, and his lyrics ” On Time ” and ” At a Solemn Music ” may claim to belong to the same category. But it was Cowley who introduced into English poetry the ode consciously built up, on a solemn theme and as definitely as possible on the ancient Greek pattern. Being in exile in France about 1645, and at a place where the only book was the text of Pindar, Cowley set himself to study and to imitate the Epintkia. He conceived,

he says, that this was ” the noblest and the highest kind of writing in verse,” but he was no more perspicacious than others in observing what the rules were which Pindar had followed. He supposed the Greek poet to be carried away on a storm of heroic emotion, in which all the discipline of prosody was disregarded. In 1656 Cowley published his Pindaric odes, in which he had not even regarded the elements of the Greek structure, with strophe, antistrophe and epode. His idea of an ode, which he impressed with such success upon the British nation that it has never been entirely removed, was of a lofty and tempestuous piece of indefinite poetry, conducted ” without sail or oar ” in whatever direction the enthusiasm of the poet chose to take it. These shapeless pieces became very popular after the Restoration, and enjoyed the sanction of Dryden in three or four irregular odes which are the best of their kind in the English language. Prior, in a humorous ode on the taking of Namur (1695), imitated the French type of this poem, as cultivated by Boileau. In 1705 Congreve published a Discourse on the Pindarique Ode, in which many of the critical errors of Cowley were corrected; and Congreve wrote odes, in strophe, antistrophe and epode,

which were the earliest of their kind in English; unhappily they were not very poetical. He was imitated by Ambrose Philips, but then the tide of Cowley-Pindarism rose again and swept the reform away. The attempts of Gilbert West (1703- 1756) to explain the prosody of Pindar (1749) inspired Gray to write his “Progress of Poesy” (1754) and “The Bard” (1756). Collins, meanwhile, had in 1747 published a collection of odes devised in the Aeolian or Lesbian manner. The odes of Mason and Akenside were more correctly Pindaric, but frigid and formal. The odes of Wordsworth, Coleridge and Tennyson are entirely irregular. Shelley desired to revive the pure manner of the Greeks, but he understood the principle of the form so little that he began his noble ” Ode to Naples ” with two epodes, passed on to two strophes, and then indulged in four successive antistrophes. Coventry Patmore, jn 1868, printed a volume of Odes-, which he afterwards enlarged; these were irregularly built up on a musical system, the exact consistency of which is not always apparent. Finally Swinburne, although some of his odes, like those of Keats, are really elaborate lyrics, written in a succession of stanzas identical in form, has cultivated the Greek form also, and some of his political odes follow very closely the type of Bacchylides and Pindar.

See Philipp August Bockh, De metris Pindari (1811); Wilhelm Christ, Metfik der Griechen und Rbmer (1874); Edmund Gosse, English Odes (1881). (E.G.)

ODENKIRCHEN, a town of Germany, in the Prussian Rhine province, 21 m. by rail S.W. of Diisseldorf, and at the junction of lines to Munich, Gladbach and Stolberg. Pop. (1905) 16,808. It has a Roman Catholic church, an Evangelical one, a synagogue and several schools. Its principal industries are spinning, weav- ing, tanning and dyeing. Odenkirchen became a town in 1856.

See Wiedemann, Geschichte der ehemaligen Herrschaft und des Hauses Odenkirchen (Odenkirchen, 1879).

ODENSE, a city of Denmark, the chief town of the ami (county) of its name, which forms the northern part of the island of Fiinen (Fyen). Pop. (1901) 40,138. The city lies 4 m. from Odense Fjord on the Odense Aa, the main portion on the north side of the stream, and the industrial Albani quarter on the south side. It has a station on the railway route between Copenhagen and Jutland and Schleswig-Holstein via Korsbn A canal, 155 to 21 ft. deep, gives access to the town from the fjord. St Canute's cathedral, formerly connected with the great Benedictine monastery of the same name, is one of the largest and finest buildings of its kind in Denmark. It is con- structed of brick in a pure Gothic style. Originally dating from 1081-1093, it was rebuilt in the 13th century. Under the altar lies Canute (Knud), the patron saint of Denmark, who intended to dispute with William of Normandy the posses- sion of England, but was slain in an insurrection at Odense in 1086; Kings John and Christian II. are also buried within the walls. Our Lady's church, built in the 13th century and re- stored in 1851-1852 and again in 1864, contains a carved altar- piece (16th century) by Claus Berg of Liibeck. Odense Castle was erected by Frederick IV., who died there in 1730. In Albani are tanneries, iron-foundries and machine-shops. Ex- ports, mostly agricultural produce (butter, bacon, eggs); im- ports, iron, petroleum, coal, yarn and timber.

Odense, or Odinsey, originally Odinsoe, i.e. Odin's island, is one of the oldest cities of Denmark. St Canute's shrine was a great resort of pilgrims throughout the middle ages. In the 16th century the town was the meeting-place of several parlia- ments, and down to 1805 it was the seat of the provincial assembly of Fiinen.

ODENWALD, a wooded mountainous region of Germany, almost entirely in the grand duchy of Hesse, with small portions in Bavaria

and Baden. It stretches between the Neckar and the Main, and is some 50 m. long by 20 to 30 broad. Its highest points are the Katzenbuckel (2057 ft.), the Neunkircher Hohe (1985 ft.) and the Krahberg (1965 ft.). The wooded heights overlooking the Bergstrasse are studded with castles and medieval ruins, some of which are associated with some of the most memorable adventures of German tradition. Among them are

Rodenstein, the reputed home of the wild huntsman, and near Grasellenbach, the spot where Siegfried of the Nibelungenlied is said to have been slain.

See F. Montanus, Der Odenwald (Mainz, 1884) ; T. Lorenteen, Der Odenwald in Wort und Bild (Stuttgart, 1904) ; G. Volk, Der Odenwald und seine Nachbargebiete (Stuttgart, 1900), and Windhaus, Fiihrer durch den Odenwald (Darmstadt, 1903).

ODER (Lat. Viadua; Slavonic, Vjodr), a river of Germany, rises in Austria on the Odergebirge in the Moravian tableland at a height of 1950 ft. above the sea, and 14 m. to the east of Olmiitz. From its source to its mouth in the Baltic it has a total length of 560 m., of which 480 m.‘are navigable for barges, and it drains an area of 43,300 sq. m. The first 45 m. of its course lie within Moravia; for the next 15 m. it forms the frontier ‘between * Prussian and Austrian Silesia, while the re- maining 500 m. helong to Prussia, where it traverses the provinces of Silesia, Brandenburg and Pomerania. It flows at first towards the south-east, but on quitting Austria turns towards the north-west, maintaining this direction as far as Frankfort-on- Oder, beyond which its general course is nearly due north. As far as the frontier the Oder flows through a well-defined valley, but, after passing through the gap between the Moravian mountains, and the Carpathians and entering the Silesian plain, its valley is wide and shallow and its banks generally low. In its lower course it is divided into numerous branches, forming many islands. The main channel follows the left side of the valley and finally expands into the Pommersches, or Stettiner Haff, which is connected with the sea by three arms, the Peene, the Swine and the Dievenow, forming the islands of Usedom and Wollin. The Swine, in the middle, is the main channel for navigation. The chief tributaries of the Oder on the left bank are the Oppa, Glatzer Neisse, Katzbach, Bober and Lausitzer Neisse; on the right bank the Malapane, Bartsch and Warthe. Of these the only one of importance for navigation is the Warthe, which through the Netze is brought into communication with the Vistula. The Oder is also connected by canals with the Havel and the Spree. The most important towns on its banks are. Ratibor, Oppeln, Brieg, Breslau, Glogau, Frankfort, Custrin and Stettin, with the seaport of

Swinemiinde at its mouth. Glogau; Custrin and Swinemiinde are strongly fortified.

The earliest important undertaking with a view of improving the waterway was due to the initiative of Frederick the Great, who recommended the diversion of the river into a new and straight channel in the swampy tract of land known as the Oderbruch, near Custrin. The work was carried out in the years 1746-1753, a large tract of marshland being brought under cultivation, a considerable detour cut off, and the main stream successfully confined to the canal, 12 m. in length, which is known as the New Oder. The river at present begins to be navigable for barges at Ratibor, where it is about 100 ft. wide, and for larger vessels at Breslau, and great exertions are made by the government to deepen and keep open the channel, which still shows a strong tendency to choke itself with sand in certain places. The alterations made of late years consist of three systems of works: — (1) The canalization of the main stream (4 m.) at Breslau, and from the confluence of the Glatzer Neisse to the mouth of the Klodnitz canal, a distance of over 50 m. These engineering works were completed in 1896. (2) In 1887-1891 the Oder-Spree canal was made to connect the two rivers named. The canal leaves the Oder at Furstenberg (132 m. above its mouth) at an altitude of 93 ft., and after 15 m. enters the Friedrich-Wilhelm canal (134 ft.). After coinciding with this for 7 m., it makes another cut of 5 m. to the Spree at FurstenWalde' (126 ft.). Then it follows the Spree for 12 m., and at Gross Tranke (121 ft.) passes out and goes to Lake Seddin (106 ft.), 15 m. (3) The deepening and regulation of the mouth and lower course of the stream, consisting of the Kaiserfahrt, 3 m. long, affording a waterway between the Stettiner Haff and the river Swine for the largest ocean-going vessels; a new cut, 4! m. long, from Vietzig on the Stettiner Haff to Wollin Island; the Parnitz-Dunzig and Dunzig-Oder canals, together 1 m. long,

constituting the immediate approach to Stettin. . Vessels drawing 24 ft. are now able to go right up to Stettin. In 1905 a project was sanctioned for improving the communication between Berlin and Stettin by widening and deepening the lower course of the river and then connecting this by a canal with Berlin. Another project, born at the same time, is one for the canalization of the upper course of the Oder. About 4,000,000 tons of merchandize pass through Breslau (up and down) on the Oder in the year.

See Der Oderstrom, sein Strom gebiet und seine ivichtigsten Neben-

fiiisse; hydrographtsche, wasserwirtschaftliche und wasserrechtliche Darstellung (Berlin, 1896).

ODERBERG, a town of Germany, in the Prussian province of Brandenburg, on the Alte Oder, 2 m. from Bralitz, a station 44 m. N.W. from Frankfort-on-Oder, by the railway to Anger- munde. Pop. (1905) 4,015. It has a fine Gothic church, dedicated to St Nicholas, and the ruins of an ancient castle, called Baren- kasten. Oderberg is an important emporium for the Russian timber trade.

ODESCALCHI-ERBA, the name of a Roman princely family of great antiquity. They are supposed to be descended from Enrico Erba, imperial vicar in Milan in 1165. Alessandro Erba married Lucrezia Odescalchi, sister of Pope Innocent IX., in 1709, who is believed to have been descended from Giorgio Odescalchi {floruit at Como in 1290). The title of prince of the Holy Roman Empire was conferred on Alessandro in 1714, and that of duke of Syrmium in Hungary in 1714, with the qualification of “serene highness.” The head of the family now bears the titles of Fiirst Odescalchi, duke of Syrmium, prince of Bassano, &c, and he is an hereditary magnate of Hungary and a grandee of Spain; the family, which is one of the most important in Italy, owns the Palazzo Odescalchi in Rome, the magnificent castle of Bracciano, besides large estates in Italy and Hungary.

See A. von Reumont, Geschichte der Stadt Rom (Berlin, 1868), and the Almanack de Gotha.

ODESSA, one of the most important seaports of Russia, ranking by its population and foreign trade after St Petersburg, Moscow and Warsaw. It is situated in 46 28′ N. and 30° 44′ E., on the southern shore of a semi-circular bay, at the north-west angle of the Black Sea, and is by rail 1017 m. S.S.W. from Moscow and 610 S. from Kiev. Odessa is the seaport for the basins of two great rivers of Russia, the Dnieper, with its tributary the Bug, and the Dniester (20 m. to S.). The entrances to the mouths of both these offering many difficulties for navigation, trade has from the remotest antiquity selected this spot, which is situated half-way between the two estuaries, while the level surface of the neighbouring steppe allows easy communication with the lower parts of both rivers. The bay of Odessa, which has an area of 14 sq. m. and a depth of 30 ft. with a soft bottom, is a dangerous anchorage on account of its exposure to easterly winds. But inside it are six harbours — the quarantine harbour, new harbour, coal harbour and ” practical ” harbour, the first and last, on the S. and N. respectively, protected by moles, and the two middle harbours by a breakwater. Besides these, there are the harbour of the principal

shipping company — the Russian Company for Navigation and Commerce, and the petroleum harbour. The harbours freeze for a few days in winter, as also does the bay occasionally, navigation being interrupted every year for an average of sixteen days; though this is materially shortened by the use of an ice-breaker. Odessa experiences the influence of the continental climate of the neighbouring steppes; its winters are cold (the average tempera^ ture for January being 23 -2 9 F., and the isotherm for the entire season that of Konigsberg), its summers are hot (72-8° in July), and the yearly average temperature is 48-5°. The rainfall is scanty (14 in. per annum). The city is built on a terrace 100 to 155 ft. in height, which descends by steep crags to the sea, and on the other side is continuous with the level of the ” black earth” steppe. Catacombs, whence sandstone for building has been taken, extend underneath the town and suburbs, not without some danger to the buildings.

The general aspect of Odessa is that of a wealthy west- European city. Its chief embankment, the Nikolai boulevard, bordered with tall and handsome houses, forms a fine promenade. The central square is adorned with a statue of Armand, due de Richelieu (1826), who was governor of Odessa in 1803-1814. A little back from the sea stands a fine bronze statue of Catherine II. (1900). A magnificent flight of nearly 200 granite steps leads from the Richelieu monument down to the harbours. The central parts of the city have broad streets and squares, bordered with fine buildings and mansions in the Italian style, and with good shops. The cathedral, founded in 1794 and finished in 1809, and thoroughly restored in 1903, can accommodate 5000 persons; it contains the tomb of Count Michael Vorontsov, governor-general from 1823 to 1854, who contributed much towards the development and embellishment of the city. The ” Palais Royal,” with its parterre and fountains, and the spacious public park are fine pleasure-grounds, whilst in the ravines that lead down to the sea cluster the houses of the poorer classes. The shore is occupied by immense granaries, some of which look like palaces, and large storehouses take up a broad space in the west of the city. Odessa consists (i.) of the city proper, contain- ing the old fort (now a quarantine establishment) and surrounded by a boulevard, where was formerly a wall marking the limits of the free port; (ii.) of the suburbs Novaya and Peresyp, extending northward along the lower shore of the bay; and (iii.) of Molda— vanka to the south-west. The city, being in a treeless region, is proud of the avenues of trees that line several of its streets and of its parks, especially of the Alexander Park, with a statue of Alexander II. (1891), and of the summer resorts of Fontaine, Arcadia and Langeron along the bay. Odessa is rising in repute as a

summer sea-bathing resort, and its mud-baths (from the mud of the limans or lagoons) are considered to be efficacious in cases of rheumatism, gout, nervous affections and skin diseases. The German colonies Liebenthal and Lustdorf are bathing-places.

Odessa is the real capital, intellectual and commercial, of so-called Novorossia, or New Russia, which includes the govern- ments of Bessarabia and Kherson. It is the see of an archbishop of the Orthodox Greek Church, and the headquarters of the VIII. army corps, and constitutes an independent ” municipal district ” or captaincy, which covers 195 sq. m. and includes a dozen villages, some of which have 2000 to 3000 inhabitants each. It is also the chief town of the Novorossian (New Russian) educational district, and has a university, which replaced the Richelieu Lyceum in 1865, and now has over 1700 students.

In 1795 the town had only 2250 inhabitants; in 1814, twenty years after its foundation, it had 25,000. The population has steadily increased from 100,000 in 1850, 185,000 in 1873, 225,000 in 1884, to 449)673 in 1900. The great majority of inhabitants are Great Russians and Little Russians; but there are also large numbers of Jews (133,000, exclusive of Karaites), as well as of Italians, Greeks, Germans and French (to which nation- alities the chief merchants belong), as also of Rumanians, Servians, Bulgarians, Tatars, Armenians, Lazes, Georgians. A numerous floating population of labourers, attracted at certain periods by pressing work in the port, and afterwards left un- employed owing to the enormous fluctuations in the corn trade, is one of the features of Odessa. It is estimated that there are no less than 3 5,000 people living from hand to mouth in the utmost misery, partly in the extensive catacombs beneath the city.

The leading occupations are connected with exporting, shipping and manufactures. The industrial development has been rather slow: sugar-refineries, tea-packing, oil-mills, tanneries, steam flour-mills, iron and mechanical works, factories of jute sacks, chemical works, tin-plate works, paper-factories are the chief. Commercially the city is the chief seaport of Russia for exports, which in favourable years are twice as high as those of St Petersburg, while as regards the value of the imports Odessa is second only to the northern capital. The total returns amount to 16 to 20 millions sterling a year, repre- senting about one-ninth of the entire Russian foreign trade, and 14% if the coast trade be included as well. The total

exports are valued at 10 to n millions sterling annually, and the imports at 6 to 9 millions sterling, about 8£% of all the imports into Russia. Grain, and especially wheat, is the chief article of export. The chief imports are raw cotton, iron, agricultural machinery, coal, chemicals, jute, copra and lead. A new and spacious harbour, especially for the petroleum trade, was constructed in 1 894-1 000.

History. — The bay of Odessa was colonized by Greeks at a very early period, and their ports — Istrianorum Portus and Isiacorum Partus on the shores of the bay, and Odessus at the mouth of the Tiligul liman — carried on a lively trade with the neighbouring steppes. These towns disappeared in the 3rd and 4th centuries, and for ten centuries no settlements in these tracts are mentioned. In the 14th century this region belonged to the Lithuanians, and in 1396 Olgerd, prince of Lithuania, defeated in battle three Tatar chiefs, one of whom, Khaji Beg or Bey, had recently founded, at the place now occupied by Odessa, a fort which received his name. The Lithuanians, and subsequently the Poles, kept the country under their dominion until the 16th century, when it was seized by the Tatars, who still permitted, however, the Lithuanians to gather salt in the neighbouring lakes. Later on the Turks left a garrison here, and founded in 1764 the fortress Yani-dunya. In 1789 the Russians, under the French captain de Ribas, took the fortress by assault. In 1791 Khaji-bey and the Ochakov region were ceded to Russia. De Ribas and the French engineer Voland were entrusted in 1794 with the erection of a town and the construction of a port at Khaji-bey. In 1803 Odessa became the chief town of a separate municipal district or captaincy, the first captain being Armand, due de Richelieu, who did very much for the development of the young city and its improvement as a seaport. In 1824 Odessa became the seat of the governors-general of Novorossia and Bessarabia. In 1866 it was brought into railway connexion with Kiev and Kharkov via Balta, and with Jassy in Rumania. In 1854 it was unsuccessfully attacked by the Anglo-Russian fleet, and in 1876-1877 by the Turkish, also unsuccessfully. In 1905- 1906 the city was the scene of violent revolutionary disorders, marked by a naval insurrection. (?• A. K.; J. T. Be.)

ODEUM (Gr. Odeion), the name given to a concert hall in ancient Greece. In a general way its construction was similar to that of a theatre, but it was only a quarter of the size and was provided with a roof for acoustic purposes, a characteristic difference. The oldest known Odeum in Greece was the Skias at Sparta, so called from its resemblance to the top of a parasol, said to have been erected by Theodorus of Samos (600 B.C.); in Athens an Odeum near the spring Enneacrunus on the Uissus was referred to the age of Peisistratus, and

appears to have been rebuilt or restored by Lycurgus (c. 330 B.C.). This is probably the building which, according to Aristophanes (Wasps, 1109), was used for judicial purposes, for the distribution of corn, and even for the billeting of soldiers. The building which served as a model for later similar constructions was the Odeum of Pericles (completed c. 445) on the south-eastern slope of the rock of the Acropolis, whose conical roof, a supposed imitation of the tent of Xerxes, was made of the masts of captured Persian ships. It was destroyed by Aristion, the so-called tyrant of Athens, at the time of the rising against Sulla (87), and rebuilt by Ario- barzanes II., king of Cappadocia (Appian, Mithrid. 38). The most magnificent example of its kind, however, was the Odeum built on the south-west cliff of the Acropolis at Athens about a.d. 160 by the wealthy sophist and rhetorician Herodes Atticus in memory of his wife, considerable remains of which are still to be seen. It had accommodation for 8000 persons, and the ceiling was constructed of beautifully carved beams of cedar wood, probably with an open space in the centre to admit the light. It -,vas also profusely decorated with pictures and other works of art. Similar buildings also existed in other parts of Greece; at Corinth, also the gift of Herodes Atticus; at Patrae, where there was a famous statue of Apollo; at Smyrna, Tralles, and other towns in Asia Minor. The first Odeum in Rome was built by Domitian, a second by Trajan.

ODILIENBERG, or Ottiuenberg (called AUitona in the 8th century), a peak of the Vosges Mountains in Germany, in the imperial province of Alsace-Lorraine, immediately W. of the town of Barr. Its crest (2500 ft.) is surmounted by the ruins of the ancient Roman wall, the Heidenmauer, and by the convent and church of St Odilia, or Ottilia, the patron saint of Alsace, whose remains rest within. It is thus the object of frequent pilgrimages. The convent is said to have been founded by Duke Eticho I., in honour of his daughter St Odilia, about the end of the 7th century, and it is certain that it existed at the time of Charle- magne. Destroyed during the wars of the middle ages, it was rebuilt by the Premonstrants at the beginning of the 1 7th century, and was acquired later by the bishop of Strassburg, who restored the building and the adjoining church, in 1853. Since 1899 the convent has contained a museum of antiquities.

See Reinhard, Le Mont Ste'Odile (Strassburg, 1888); Pfister, Le Duchi merovingien d' Alsace et la legende de Sainte Odile (Nancy, 1892); and R. Forrer, Der Odilienberg (Strassburg, 1899).

ODIN, or Othin (O. Norse Osinn), the chief god of the Northern pantheon. He is represented as an old man with one eye. Frigg is his

wife, and several of the gods, including Thor and Balder, are his sons. He is also said to have been the father of several legendary kings, and more than one princely family claimed descent from him. His exploits and adventures form, the theme of a number of the Eddaic poems, and also of several stories in the prose Edda. In all these stories his character is distinguished rather by wisdom and cunning than by martial prowess, and reference is very frequently' made to his skill in poetry and magic. In Ynglinga Saga he is represented as reigning in Sweden, where he established laws for his people. In notices relating to religious observances Odin appears chiefly as the giver of victory or as the god of the dead. He is frequently introduced in legendary sagas, generally in disguise, imparting secret instructions to his favourites or presenting them with weapons by which victory is assured. In return he receives the souls of the slain who in his palace, Valhalla (q.v.), five a life of fighting and feasting, similar to that which has been their desire on earth. Human sacrifices were very frequently offered to Odin, especially prisoners taken in battle. The commonest method of sacrifice was by hanging the victim on a tree; and in the poem Hdvamdl the god himself is represented as sacrificed in this way. The worship of Odin seems to have prevailed chiefly, if not solely, in military circles, i.e. among princely families and the retinues of warriors attached to them. It is probable, however, that the worship of Odin was once common to most of the Teutonic peoples. To the Anglo-Saxons he was known as Woden (q.v.) and to the Germans as Wodan (Wuotan), which are the regular forms of the same name in those languages. It is largely owing to the peculiar character of this god and the prominent position which he occupies that the mythology of the north presents so striking a contrast to that of Greece.

See Teutonic Peoples, ad fin. ; and Woden. (H. M. C.)

ODO, or Eudes (d. c. 736), king, or duke, of Aquitaine, obtained this dignity about 715, and his territory included the south- western part of Gaul from the Loire to-the Pyrenees. In 718 he appears as the ally of Chilperic II., king of Neustria, who was fighting against the Austrasian mayor of the palace, Charles Martel; but after the defeat of Chilperic at Soissons in 719 he probably made peace with Charles by surrendering to him the Neustrian king and his treasures. Odo was also obliged to fight the Saracens who invaded the southern part of his kingdom, and inflicted a severe defeat upon them at Toulouse in 721. When, however, he was again attacked by Charles Martel, the Saracens renewed their ravages, and Odo was defeated near Bordeaux; he was compelled to crave protection from Charles, who took up this struggle and gained his momentous victory at Poitiers in 732. In 735 the king abdicated, and was succeeded by his son Hunold.

ODO, or Eudes (d. 898), king of the Franks, was a son of Robert the Strong, count of Anjou (d. 866), and is sometimes referred to as duke of France and also as count of Paris. For his skill and bravery in resisting the attacks of the Normans

Odo was chosen king by the western Franks when the emperor Charles the Fat was deposed in 887, and was crowned at Compiegne in February 888. He continued to battle against the Normans, whom he defeated at Montfaucon and elsewhere, but was soon involved in a struggle with some powerful nobles, who supported the claim of Charles, afterwards King Charles III., to the Frankish kingdom. To gain prestige and support Odo owned himself a vassal of the German king, Arnulf, but in 894 Arnulf declared for Charles. Eventually, after a struggle which lasted for three years, Odo was compelled to come to terms with his rival, and to surrender to him a district north of the Seine. He died at La Fere on the 1st of January 898.

See E. Lavisse, Histoire de France, tome ii. (Paris, 1903); and E. Favre, Eudes, comte de Paris et roi de France (Paris, 1893).

ODO 1 OF BAYEUX (c. 1036-1097), Norman bishop and English earl, was a uterine brother of William the Conqueror, from whom he received, while still a youth, the see of Bayeux (1049). But his active career was that of a warrior and states- man. He found ships for the invasion of England and fought in person at Senlac; in 1067 he became earl of Kent, and for some years he was a trusted royal minister. At times he acted as viceroy in William's absence; at times he led the royal forces to chastise rebellions. But in 1083 he was suddenly disgraced and imprisoned for having planned a military expedi- tion to Italy. He was accused of desiring to make himself pope; more probably he thought of serving as a papal condottiere against the emperor Henry IV. The Conqueror, when on his death-bed, reluctantly permitted Odo's release (1087). The bishop returned to his earldom and soon organized a rebellion with the object of handing over England to his eldest nephew, Duke Robert. William Rufus, to the disgust of his supporters, permitted Odo to leave the kingdom after the collapse of this design (1088), and thenceforward Odo was the right-hand man of Robert in Normandy. He took part in the agitation for the First Crusade, and started in the duke's company for Palestine, but died on the way, at Palermo (February 1097). Little good is recorded of Odo. His vast wealth was gained by extortion and robbery. His ambitions were boundless and his morals lax. But he was a patron of learning and, like most prelates of his age, a great

architect. He rebuilt the cathedral of his see, and may perhaps have commissioned the unknown artist of the celebrated Bayeux tapestry.

See the authorities cited for William I. and William II., the biographical sketch in Gallia Christiana, xi. 353-360; H. Wharton Anglia Sacra, i. 334-339 (1691); and F. R. Fowke, The Bayeux Tapestry (London, 1898). ‘ (H.W.C.D.)

ODOACER, or Odovacar (c. 434-493), the first barbarian ruler of Italy on the downfall of the Western empire, was born in the district bordering on the middle Danube about the year 434. In this district the once rich and fertile provinces of Noricum and Pannonia were being torn piecemeal from the Roman empire by a crowd of German tribes, among whom we discern four, who seem to have hovered over the Danube from Passau to Pest, namely, the Rugii, Scyrri, Turcilingi and Heruli. With all of these Odoacer was connected by his subsequent career, and all seem, more or less, to have claimed him as be- longing to them by birth; the evidence slightly preponderates in favour of his descent from the Scyrri.

His father was Aedico or Idico, a name which suggests Edeco the Hun, who was suborned by the Byzantine court to plot the assassination of his master Attila. There are, however,

1 Odo must be distinguished from two English prelates of the same name and also from an English earl. Odo or Oda (d. 959), archbishop of Canterbury, was bishop of Ramsbury from 927 to 942, and went with King ˆEthelstan to the battle of Brunanburh in 937. In 942 he succeeded Wulfhelm as archbishop of Canterbury, and he appears to have been an able and conscientious ruler of the see. He had great influence with King Edwy, whom he had crowned in 956. Odo (d. 1200), abbot of Battle, was a monk of Christ Church, Canterbury, and was prior of this house at the time when Thomas Becket was murdered. In 1 175 he was chosen abbot of Battle, and on two occasions the efforts of Henry II. alone prevented him from being elected archbishop of Canterbury. Odo or Odda (d. 1056), a relative of Edward the Confessor, during whose reign he was an earl in the west of England, built the minster at Deerhurst in Gloucestershire.

some strong arguments against this identification. A certain Edica, chief of the Scyrri, of whom Jordanes speaks as defeated by the Ostrogoths, may more probably have been the father of Odoacer, though even in this theory there are some difficulties, chiefly connected with the low estate in which he appears before us in the next scene of his life, when as a tall young recruit for the Roman

armies, dressed in a sordid vesture of skins, on his way to Italy, he enters the cell of Severinus, a noted hermit-saint of Noricum, to ask his blessing. The saint had an inward premoni- tion of his future greatness, and in blessing him said, ” Fare onward into Italy. Thou who art now clothed in vile raiment wilt soon give precious gifts unto many.”

Odoacer was probably about thirty years of age when he thus left his country and entered the imperial service. By the year 472 he had risen to some eminence, since it is expressly recorded that he sided with the patrician Ricimer in his quarrel with the emperor Anthemius. In the year 475, by one of the endless re- volutions which marked the close of the Western empire, the emperor Nepos was driven into exile, and the successful rebel Orestes was enabled to array in the purple his son, a handsome boy of fourteen or fifteen, who was named Romulus after his grandfather, and nicknamed Augustulus, from his inability to play the part of the great Augustus. Before this puppet emperor had been a year on the throne the barbarian mercenaries, who were chiefly drawn from the Danubian tribes before mentioned, rose in mutiny, demanding to be made proprietors of one-third of the soil of Italy. To this request Orestes returned a peremptory negative. Odoacer now offered his fellow-soldiers to obtain for them all that they desired if they would seat him on the throne. On the 23rd of August 476 he was proclaimed king; five days later Orestes was made prisoner at Placentia and beheaded; and on the 4th of September his brother Paulus was defeated and slain near Ravenna. Rome at once accepted the new ruler. Augustulus was compelled to descend from the throne, but his life was spared.

Odoacer was forty-two years of age when he thus became chief ruler of Italy, and he reigned thirteen years with undisputed sway. Our information as to this period is very slender, but we can perceive that the administration was conducted as much as possible on the lines of the old imperial government. The settlement of the barbarian soldiers on the lands of Italy prob- ably affected the great landowners rather than the labouring class. To the herd of coloni and servi, by whom in their various degrees the land was actually cultivated, it probably made little difference, except as a matter of sentiment, whether the master whom they served called himself Roman or Rugian. We have one most interesting example, though in a small way, of such a transfer of land with its appurtenant slaves and cattle, in the dona- tion made by Odoacer himself to his faithful follower Pierius. 2 Few things bring more vividly before the reader the continuity of legal and social life in the midst of the tremendous ethnical changes of the 5th century than the perusal of such a record.

The same fact, from a slightly different point of view, is illus- trated by the curious history (recorded by Malchus) of the embassies to Constantinople. The dethroned emperor Nepos sent ambassadors (in 477 or 478) to Zeno, emperor of the East, begging his aid in the reconquest of Italy. These ambassadors met a deputation from the Roman senate, sent nominally by the command of Augustulus, really no doubt by that of Odoacer, the purport of whose commission was that they did not need a separate emperor. One was sufficient to defend the borders of either realm. The senate had chosen Odoacer, whose knowledge of military affairs and whose statesmanship admirably fitted him for preserving order in that part of the world, and they there- fore prayed Zeno to confer upon him the dignity of patrician, and entrust the ” diocese ” of Italy to his care. Zeno returned a harsh answer to the senate, requiring them to return to their allegiance to Nepos. In fact, however, he did nothing for the fallen emperor, but accepted the new order of things, and even addressed Odoacer as patrician. On the other hand, the latter

2 Published in Marini’s Papiri diplomatici (Rome, 1815, Nos. 8a and 83) and in Spangenberg’s Juris Romani Tabulm (Leipzig, 1822, pp. 164-173), and well worthy of careful study.

sent the ornaments of empire, the diadem and purple robe, to Constantinople as an acknowledgment of the fact that he did not claim supreme power. Our information as to the actual title assumed by the new ruler is somewhat confused. He does not appear to have called himself king of Italy. His king- ship seems to have marked only his relation to his Teutonic followers, among whom he was “king of the Turcilingi,” ” king of the Heruli,” and so forth, according to the nationality with which he was dealing. By the Roman inhabitants of Italy he was addressed as ” dominus noster,” but his right to exercise power would in their eyes rest, in theory, on his recognition as patricius by the Byzantine Augustus. At the same time he marked his own high pretensions by assuming the prefix Flavius, a reminiscence of the early emperors, to which the barbarian rulers of realms formed out of the Roman state seem to have been peculiarly partial. His internal administration was probably, upon the whole, wise and moderate, though we hear some complaints of financial oppression, and he may be looked upon, as a not altogether unworthy predecessor of Theodoric.

In the history of the papacy Odoacer figures as the author of a decree promulgated at the election of Felix II. in 483, forbidding the pope to alienate any of the lands or ornaments of the Roman Church, and threatening any pope who should infringe this edict with anathema. This decree was loudly condemned in a synod held by Pope Symmachus (502) as an unwarrantable interference of the civil power with the concerns of the church.

The chief events in the foreign policy of Odoacer were his Dalmatian and Rugian wars. In the year 480 the ex-emperor Nepos, who ruled Dalmatia, was traitorously assassinated in Diocletian's palace at Spalato by the counts Viator and Ovida. In the following year Odoacer invaded Dalmatia, slew the murderer Ovida, and reannexed Dalmatia to the Western state. In 487 he appeared as an invader in his own native Danubian lands. War broke out between him and Feletheus, king of the Rugians. Odoacer entered the Rugian territory, defeated Feletheus, and carried him and" his noxious wife " Gisa prisoners to Ravenna. In the following year Frederick, son of the captive king, endeavoured to raise again the fallen fortunes of his house, but was defeated by Onulf , brother of Odoacer, and, being forced to flee, took refuge at the court of Theodoric the Ostrogoth, at Sistova on the lower Danube.

This Rugian war was probably an indirect cause of the fall of Odoacer. His increasing power rendered him too formidable to the Byzantine court, with whom his relations had for some time been growing less friendly. At the same time, Zeno was embarrassed by the formidable neighbourhood of Theodoric and his Ostrogothic warriors, who were almost equally burden- some as enemies or as allies. In these circumstances arose the plan of Theodoric's invasion of Italy, a plan by whom originated it would be difficult to say. Whether the land when conquered was to be held by the Ostrogoth in full sovereignty, ' or ad- ministered by him as lieutenant of Zeno, is a point upon which our information is ambiguous, and which was perhaps intention- ally left vague by the two contracting parties, whose chief anxiety was not to see one another's faces again. The details of the Ostrogothic invasion of Italy belong properly to the life of Theodoric. It is sufficient to state here that he entered Italy in August 480, defeated Odoacer at the Isontius (Isonzo) on the 28th of August, and at Verona on the 30th of September. Odoacer then shut himself up in Ravenna, and there maintained himself for four years, with one brief gleam of success, during which he emerged from his hiding-place and fought the battle of the Addua (nth August 490), in which he was again defeated. A sally from Ravenna (10th July 491) was again the occasion of a murderous defeat. At length, the famine in Ravenna

having become almost intolerable, and the Goths despairing of ever taking the city by assault, negotiations were opened for a compromise (25th February 493). John, archbishop of Raveriha, acted as mediator. It was stipulated that Ravenna should be surrendered, that Odoacer's life should be spared, and that he and Theodoric should be recognized as joint rulers of the Roman state. The arrangement was evidently a precarious one, and

was soon terminated by the treachery of Theodoric. He invited his rival to a banquet in the palace of the Lauretum on the 15th of March, and there slew him with his own hand. " Where is God? " cried Odoacer when he perceived the ambush into which he had fallen. " Thus didst thou deal with my kinsmen," shouted Theodoric, and clove his rival with the broadsword from shoulder to flank. Onulf, the brother of the murdered king, was shot down while attempting to escape through the palace garden, and Thelan, his sort, was not long after put to death by order of the conqueror. Thus perished the whole race of Odoacer. Literature.— The chief authorities for the life of Odoacer are the so-called " Anonymus Valesii," generally printed at the end of Ammianus Mareellinus; the Life of Severinus, by Eugippius; the chroniclers, Cassiodorus and " Cuspiniani Anonymus " (both in Roncalli's collection) ; and the Byzantine historians, Malchus and John of Antioch. A fragment of the latter historian, unknown when Gibbon wrote, is to be found in the fifth volume of Miiller's Fragmenta Historicorum Graecorum. There is a thorough investi- gation of the history of Odoacer in R. Pallmann's Geschichte der Volkerwanderung, vol. ii. (Weimar, 1864). See also T. Hodgkin, Italy and her Invaders, vol. iii. (Oxford, 1885). (T. H.)

ODOFREDUS, an Italian jurist of the 13th century. He was born at Bologna and studied law under Balduinus and Accursius. After having practised as an advocate both in Italy and France, he became professor at Bologna in 1228. The commentaries on Roman law attributed to him are valuable as showing the growth of the study of law in Italy, and for their biographical details of the jurists of the 12th and 13th centuries. Odofredus died at Bologna on the 3rd of December 1265.

Over his name appeared Lecturae in codicem (Lyons, 1480) Lecturae in digestum vetus (Paris, 1504), Summa de libellis formandis (Strassburg, 15 10), Lecturae in tres libros (Venice, 1514), and Lecturae in digestum novum (Lyons, 1552).

O'DONNELL, the name of an ancient and powerful Irish family, lords of Tyrconnel in early times, and the chief rivals of the O'Neills in Ulster. Like the family of O'Neill (q.v.), that of O'Donnell was

descended from Niall of the Nine Hostages, king of Ireland at the beginning of the 5th century ; the O'Neills, or Cinel 1 Owen, tracing their pedigree to Owen (Eoghan),and the O'Donnells, or Cinel Connell, to Conall Gulban, both sons of Niall. Tyrconnel, the district named after the Cinel Connell, where the O'Donnells held sway, comprised the greater part of the modern county of Donegal except the peninsula of Inishowen ; and since it lay conterminous with the territory ruled by the O'Neills of Tyrone, who were continually attempting to assert their supremacy over it, the history of the O'Donnells is for the most part a record of tribal warfare with their powerful neighbours, and of their own efforts to make good their claims to the overlordship of northern Connaught.

The first chieftain of mark in the family was Goffraidh (Godfrey), son of Donnell Mor O'Donnell (d. 1241). Goffraidh, who was " inaugurated " as " The O'Donnell," i.e. chief of the clan, in 1248, made a successful inroad into Tyrone against Brian O'Neill in 1252. In 1257 he drove the English out of northern Connaught, after a single combat with Maurice Fitz- gerald in which both warriors were wounded. O'Donnell while still incapacitated by his wound was summoned by Brian O'Neill to give hostages in token of submission. Carried on a litter at the head of his clan he gave battle to O'Neill, whom he defeated with severe loss in prisoners and cattle; but he died of his wound immediately afterwards near Letterkenny, and was succeeded in the chieftainship by his brother Donnell Oge, who returned from Scotland in time to withstand successfully the demands of O'Neill.

In the 1 6th century, when the English began to make deter- mined efforts to bring the whole of Ireland under subjection to the crown, the O'Donnells of Tyrconnel played a leading part; co-operating at times with the English, especially when such co-operation appeared to promise triumph over their ancient enemies the O'Neills, at other times joining with the latter against the English authorities.

1 The Cinel, or Kinel, was a group of related clans occupying an extensive district. See P. W. Joyce, A Social History of Ireland (London, 1903), i. 166.

Manus P'Donnell (d. 1564), son of Hugh Dubh O'Donnell, was left by his father to rule Tyrconnel, though still a mere youth, when Hugh

Dubh went on a pilgrimage to Rome about 1511. Hugh Dubh had been chief of the O'Donnells during one of the bitterest and most protracted of the feuds between his clan and the O'Neills, which in 1491 led to a war lasting more than ten years. On his return from Rome in broken health after two years' absence, his son Manus, who had proved himself a capable leader in defending his country against the O'Neills, retained the chief authority. A family quarrel ensued, and when Hugh Dubh appealed for aid against his son to the Maguires, Manus made an alliance with the O'Neills, by whose assistance he established his hold over Tyrconnel. But in 1522 the two great northern clans were again at war. Conn Bacach O'Neill, 1st earl of Tyrone, determined to bring the O'Donnells under thorough subjection. Supported by several septs of Munster and Connaught, ind assisted also by English contingents and by the MacDonnells of Antrim, O'Neill took the castle of Ballyshannon, and after devastating a large part of Tyrconnel he encamped at Knockavoe, near Strabane. Here he was surprised at night by Hugh Dubh and Manus O'Donnell, and routed with the loss of 900 men and an immense quantity of booty. Although this was one of the bloodiest fights that ever took place between the O'Neills and the O'Donnells, it did not bring the war to an end; and in 1531 O'Donnell applied to the English government for protection, giving assurances of allegiance to Henry VIII. In 1537 Lord Thomas Fitzgerald and his five uncles were executed for rebellion in Munster, and the English government made every effort to lay hands also on Gerald, the youthful heir to the earldom of Kildare, a boy of twelve years of age who was in the secret custody of his aunt Lady Eleanor McCarthy. This lady, in order to secure a powerful protector for the boy, accepted an offer of marriage by Manus O'Donnell, who on the death of Hugh Dubh in July 1537 was inaugurated The O'Donnell. Conn O'Neill was a relative of Gerald Fitzgerald, and this event accordingly led to the formation of the Geraldine League, a federation which combined the O'Neills, the O'Donnells, the O'Briens of Thomond, and other powerful clans; the primary object of which was to restore Gerald to the earldom of Kildare, but which afterwards aimed at the complete overthrow of English rule in Ireland. In August 1539 Manus O'Donnell and Conn O'Neill were defeated with heavy loss by the lord deputy at Lake Bellahoe, in Monaghan, which crippled their power for many years. In the west Manus made unceasing efforts to assert the supremacy of the O'Donnells in north Connaught, where he compelled O'Conor Sligo to acknowledge his over- lordship in 1539. In 1542 he went to England and presented himself, together with Conn O'Neill and other Irish chiefs, before Henry VIII. , who promised to make him earl of Tyrconnel, though he refused O'Donnell's request to be made earl of

Sligo. In his later years Manus was troubled by quarrels between his sons Calvagh and Hugh MacManus; in 1555 he was made prisoner by Calvagh, who deposed him from all authority in Tyrconnel, and he died in 1564. Manus O'Donnell, though a fierce warrior, was hospitable and generous to the poor and the Church. He is described by the Four Masters as " a learned man, skilled in many arts, gifted with a profound intellect, and the knowledge of every science." At his castle of Portnatrynod near Strabane he supervised if he did not actually dictate the writing of the Life of Saint Columbkille in Irish, which is preserved in the Bodleian Library at Oxford. Manus was several times married. His first wife, Joan O'Reilly, was the mother of Calvagh, and two daughters, both of whom married O'Neills; the younger, Margaret, was wife of the famous rebel Shane O'Neill. His second wife, Hugh's mother, by whom he was ancestor of the earls of Tyrconnel (see below), was Judith, sister of Conn Bacach O'Neill, 1st earl of Tyrone, and aunt of Shane O'Neill.

Calvagh O'Donnell (d. 1 566) , eldest son of Manus O'Donnell, in the course of his above-mentioned quarrel with his father and his half-brother Hugh, sought aid in Scotland from the MacDonnells, who assisted him in deposing Manus and securing the lordship of Tyrconnel for himself. Hugh then appealed

to Shane O'Neill, who invaded Tyrconnel at the head of a large army in 1557, desiring to make himself supreme throughout Ulster, and encamped on the shore of Lough Swilly. Calvagh, acting apparently on the advice of his father, who was his prisoner and who remembered the successful night attack on Conn O'Neill at Knockavoe in 1522, surprised the O'Neills in their camp at night and routed them with the loss of all their spoils. Calvagh was then recognized by the English govern- ment as lord of Tyrconnel; but in 1561 he and his wife were captured by Shane O'Neill in the monastery of Kildonnell. His wife, Catherine Maclean, who had previously been the wife of the earl of Argyll, was kept by Shane O'Neill as his mistress and bore him several children, though grossly ill-treated by her savage captor; Calvagh himself was subjected to atrocious torture during the three years that he remained O'Neill's prisoner. He was released in 1564 on conditions which he had no intention of fulfilling; and crossing to England he threw himself on the mercy of Queen Elizabeth. In 1566 Sir Henry Sidney by the queen's orders marched to Tyrconnel and restored Calvagh to his rights. Calvagh, however, died in the same year, and as his son Conn was a prisoner in the hands of Shane O'Neill, his half-brother Hugh MacManus was inaugurated The O'Donnell in his place. Hugh, who in the family feud with Calvagh had allied himself with O'Neill, now turned round and combined with the English to crush the

hereditary enemy of his family; and in 1567 he utterly routed Shane at Letterkenny with the loss of 1300 men, compelling him to seek refuge with the Mac- Donnells of Antrim, by whom he was treacherously put to death. In 1592 Hugh abdicated in favour of his son Hugh Roe O'Donnell (see below); but there was a member of the elder branch of the family who resented the passing of the chieftainship to the descendants of Manus O'Donnell's second marriage. This was Niall Garve, second son of Calvagh's son Conn. His elder brother was Hugh of Ramelton, whose son John, an officer in the Spanish army, was father of Hugh Baldearg O'Donnell (d. 1704), known in Spain as Count O'Donnell, who commanded an Irish regiment as brigadier in the Spanish service. This officer came to Ireland in 1690 and raised an army in Ulster for the service of James II., afterwards deserting to the side of William III., from whom he accepted a pension.

Niall Garve O'Donnell (1569-1626), who was incensed at the elevation of his cousin Hugh Roe to the chieftainship in 1592, was further alienated when the latter deprived him of his castle of Lifford, and a bitter feud between the two O'Don- nells was the result. Niall Garve made terms with the English government, to whom he rendered valuable service both against the O'Neills and against his cousin. But in 1601 he quarrelled with the lord deputy, who, though willing to establish Niall Garve in the lordship of Tyrconnel, would not permit him to enforce his supremacy over Cahir O'Dogherty in Inishowen. After the departure of Hugh Roe from Ireland in 1602, Niall Garve and Hugh Roe's brother Rory went to London, where the privy council endeavoured to arrange the family quarrel, but failed to satisfy Niall. Charged with complicity in Cahir O'Dogherty's rebellion in 1608, Niall Garve was sent to the Tower of London, where he remained till his death in 1626. He married his cousin Nuala, sister of Hugh Roe and Rory O'Donnell. When Rory fled with the earl of Tyrone to Rome in 1607, Nuala, who had deserted her husband when he joined the English against her brother, accompanied him, taking with her her daughter Grania. She was the subject of an Irish poem, of which an English version was written by James Mangan from a prose translation by Eugene O'Curry.

Hugh Roe O'Donnell (1572-1602), eldest son of Hugh MacManus O'Donnell, and grandson of Manus O'Donnell by his second marriage with Judith O'Neill, was the most celebrated member of his clan. His mother was Ineen Dubh, daughter of James MacDonnell of Kintyre; his sister was the second wife of Hugh O'Neill, 2nd earl of Tyrone. These family con- nexions with the Hebridean Scots and with the O'Neills made the lord deputy, Sir John Perrot, afraid of a powerful

com- bination against the English government, and induced him to

establish garrisons in Tyrconnel and to demand hostages from Hugh MacManus O’Donnell, which the latter refused to hand over. In 1587 Perrot conceived a plan for kidnapping Hugh Roe (Hugh the Red), now a youth of fifteen, who had already given proof of exceptional manliness and sagacity. A merchant vessel laden with Spanish wines was sent to Lough Swilly, and anchoring off Rathmullan, where the boy was residing in the castle of MacSweeny his foster parent, Hugh Roe with some youthful companions was enticed on board, when the ship immediately set sail and conveyed the party to Dublin. The boys were kept in prison for more than three years In 1591 young O’Donnell made two attempts to escape, the second of which proved successful; and after enduring terrible privations from exposure in the mountains he made his way to Tyrconnel, where in the following year his father handed the chieftainship over to him. Red Hugh lost no time in leading an expedition against Turlough Luineach O’Neill, then at war with his kinsman Hugh, earl of Tyrone, with whom O’Donnell was in alliance. At the same time he sent assurances of loyalty to the lord deputy, whom he met in person at Dundalk in the summer of 1592. But being determined to vindicate the traditional claims of his family in north Connaught, he aided Hugh Maguire against the English, though on the advice of Tyrone he ab- stained for a time from committing himself too far. When, however, in 1594 Enniskillen castle was taken and the women and children flung into the river from its walls by order of Sir Richard Bingham, the English governor of Connaught, O’Donnell sent urgent messages to Tyrone for help; and while he himself hurried to Derry to withstand an invasion of Scots from the isles, Maguire defeated the English with heavy loss at Bellana- briska (The Ford of the Biscuits). In 1595 Red Hugh again invaded Connaught, putting to the sword every soul above fifteen years of age unable to speak Irish; he captured Longford and soon afterwards gained possession of Sligo, which placed north Connaught at his mercy. In 1 596 he agreed in conjunction with Tyrone to a cessation of hostilities with the English, and consented to meet commissioners from the government near Dundalk. The terms he demanded were, however, refused; and his determination to continue the struggle was strengthened by the prospect of help from Philip II. of Spain, with whom he and Tyrone had been in correspondence. In the beginning of 1597 he made another inroad into Connaught, where O’Conor Sligo had been set up by the English as a counterpoise to

O'Don- nell. He devastated the country and returned to Tyrconnel with rich spoils; in the following year he shared in Tyrone's victory over the English at the Yellow Ford on the Blackwater; and in 1599 he defeated an attempt by the English under Sir Conyers Clifford, governor of Connaught, to succour O'Conor Sligo in Collooney castle, which O'Donnell captured, forcing Sligo to submission. The government now sent Sir Henry Docwra to Derry, and O'Donnell entrusted to his cousin Niall Garve the task of opposing him. Niall Garve, however, went over to the English, making himself master of O'Donnell's fortresses of Lifford and Donegal. While Hugh Roe was attempting to retake the latter place in 1601, he heard that a Spanish force had landed in Munster. He marched rapidly to the south, and was joined by Tyrone at Bandon; but a night- attack on the English besieging the Spaniards in Kinsale having utterly failed, O'Donnell, who attributed the disaster to the incapacity of the Spanish commander, took ship to Spain on the 6th of January 1602 to lay his complaint before Philip III. He was favourably received by the Spanish king, but he died at Simancas on the 10th of September in the same year.

Rory O'Donnell, 1st earl of Tyrconnel (1575-1608), second son of Hugh MacManus O'Donnell, and younger brother of Hugh Roe, accompanied the latter in the above-mentioned expedition to Kinsale; and when his brother sailed for Spain he transferred his authority as chief to Rory, who led the O'Donnell contingent back to the north. In 1602 Rory gave in his allegiance to Lord Mount joy, the lord deputy; and in the following summer he went to London with the earl of Tyrone,

where he was received with favour by James I., who created him earl of Tyrconnel. In 1605 he was invested with authority as lieutenant of the king in Donegal. But the arrangement between Rory and Niall Garve insisted upon by the government was displeasing to both O'Donnells, and Rory, like Hugh Roe before him, entered into negotiations with Spain. His country had been reduced to a desert by famine and war, and his own reckless extravagance had plunged him deeply in debt. These circumstances as much as the fear that his designs were known to the government may have persuaded him to leave Ireland. In September 1607 " the flight of the earls " (see O'Neill) took place, Tyrconnel and Tyrone reaching Rome in April 1608, where Tyrconnel died on the 28th of July. His wife, the beautiful daughter of the earl of Kildare, was left behind in the haste of Tyrconnel's flight, and lived to marry Nicholas Barnewell, Lord Kingsland. By Tyrconnel she had a son Hugh; and among other children a daughter Mary Stuart O'Donnell, who, born after her

father's flight from Ireland, was so named by James I. after his mother. This lady, after many romantic adventures disguised in male attire, married a man called O'Gallagher and died in poverty on the continent.

Rory O'Donnell was attainted by .the Irish parliament in 1614, but his son Hugh, who lived at the Spanish Court, assumed ti ". title of earl; and the last titular earl of Tyrconnel was this Hugh's son Hugh Albert, who died without heirs in 1642, and who by his will appointed Hugh Balldearg O'Donnell (see above) his heir, thus restoring the chieftainship to the elder branch of the family. To a still elder branch belonged Daniel O'Donnell (1666-1735), a general of the famous Irish brigade in the French service, whose father, Turlough, was a son of Hugh Dubh O'Donnell, elder brother of Manus, son of an earlier Hugh Dubh mentioned above. Daniel served in the French army in the wars of the period, fighting against Marlborough at Oudenarde and Malplaquet at the head of an O'Donnell regiment. He died in 1735.

The famous Cathach, or Battle-Book of the O'Donnells, was in the possession of General Daniel O'Donnell, from whom it passed to more modern representatives of the family, who presented it to the Royal Irish Academy, where it is preserved. This relic, of which a curious legend is told (see P. W. Joyce, A Social History of Ancient Ireland, vol. i. p. 501), is a Psalter said to have belonged to Saint Columba, a kinsman of the O'Donnells, which was carried by them in battle as a charm or talisman to secure victory. Two other circumstances connecting the O'Donnells with ancient Irish literature may be mentioned. The family of O'Clery, to which three of the celebrated " Four Masters " belonged, were hereditary Ollaves (doctors of history, music, law, &c.) attached to the family of O'Donnell; while the " Book of the Dun Cow " (Lebor-na-h Uidhre), one of the most ancient Irish MSS., was in the possession of the O'Donnells in the 14th century; and the estimation in which it was held at that time is proved by the fact that it was given to the O'Conors of Connaught as ransom for an important prisoner, and was forcibly recovered some years later.

See O'Neill, and the authorities there cited. (R. J. M.)

O'DONNELL, HENRY JOSEPH (1760-1834), count of La Bisbal, Spanish soldier, was descended from the O'Donnells who left Ireland after the battle of the Boyne. 1 Born in Spain, he early entered the Spanish army, and in 1810 became general, receiving a command in Catalonia, where in that year he earned his title and the rank of field-marshal. He afterwards held posts of great responsibility under Ferdinand VII., whom he served on the whole with constancy; the

events of 1823 compelled his flight into France, where he was interned at Limoges, and where he died in 1834. His second son Leopold O'Donnell (1809-1867), duke of Tetuan, Spanish general and statesman, was born at Santa Cruz, TenerifTe, on the 12th of January 1809. He fought in the army of Queen Christina, where he attained the rank of general of division; and in 1840 he accompanied the queen into exile. He failed in an attempt to effect a rising in her favour at Pamplona in 1841, but took a more successful part in the movement which led to the overthrow and exile of

1 A branch of the family settled in Austria, and General Karl O'Donnell, count of Tyrconnel(i 71 5-1 771), held important commands during the Seven Years' War. The name of a descendant figures in the history of the Italian and Hungarian campaigns of 1848 and 1849,

Espartero in 1843. From 1844 to 1848 he served the new government in Cuba; after his return he entered the senate. In 1854 he became war minister under Espartero, and in 1856 he plotted successfully against his chief, becoming head of the cabinet from the July revolution until October. This rank he again reached in July 1858; and in December 1859 he took command of the expedition to Morocco, and received the title of duke after the surrender of Tetuan. Quitting office in 1863, he again resumed it in June 1865, but was compelled to resign in favour of Narvaez in 1866. He died at Bayonne on the 5th of November 1867.

There is a Life of Leopold O'Donnell in La Corona de laurel, by Manuel Ibo Alfaro (Madrid, i860).

O'DONOVAN, EDMUND (1844-1883), British war-corre- spondent, was born at Dublin on the 13th of September 1844, the son of John O'Donovan (1809-1861), a well-known Irish archaeologist and topographer. In 1866 he began to contribute to the Irish Times and other Dublin papers. After the battle of Sedan he joined the Foreign Legion of the French army, and was wounded and taken prisoner by the Germans. In 1873 the Carlist rising attracted him to Spain, and he wrote many newspaper letters on the campaign. In 1876 he represented the London Daily News during the rising of Bosnia and Herzegovina against the Turks, and in 1879, for the same paper, made his adventurous and famous journey to Merv. On his arrival at Merv, the Turcomans, suspecting him to be a Russian spy, detained him. It was only after several months' captivity that O'Donovan managed to

get a message to his principals through to Persia, whence it was telegraphed to England. These adventures he described in The Merv Oasis (1882). In 1883 O'Donovan accompanied the ill-fated expedition of Hicks Pasha to the Egyptian Sudan,. and perished with it.

O'DONOVAN, WILLIAM RUDOLF (1844-), American sculptor, was born in Preston county, Virginia, on the 28th of March 1844. He had no technical art training, but after the Civil War, in which he served in the Confederate army, he opened a studio in New York City and became a well-known sculptor, especially of memorial pieces. Among these are statues of George Washington (in Caracas), Lincoln and Grant (Prospect Park, Brooklyn), the captors of Major Andre (Tarry-town, N.Y.), and Archbishop Hughes (Fordham University, Fordham, N.Y.), and a memorial tablet to Bayard Taylor (Cornell University). In 1878 he become an associate of the National Academy of Design.

ODONTORNITHES, the term proposed by O. C. Marsh (Am. Journ. Sci. ser 3, v. (1873) pp. 161-162) for birds possessed of teeth (Gr. odovs, tooth, opvis, opviBos, bird), notably the genera Hesperornis and Ichthyornis from the Cretaceous deposits of Kansas. In 1875 {op. cit. x. pp. 403-408) he divided the " subclass " into Odontolcae, with the teeth standing in grooves, and Odontotormae, with the teeth in separate alveoles or sockets. In his magnificent work, Glontomithes: A monograph on the extinct toothed birds of North America, New Haven, Connecticut, 1880, he logically added the Saururae, represented by Archaeopteryx, as a third order. As it usually happens with the selection of a single anatomical character, the resulting classification was unnatural. In the present case the Odont- ornithes are a heterogeneous assembly, and the fact of their possessing teeth proves nothing but that birds, possibly all of them, still had these organs during the Cretaceous epoch. This, by itself, is a very interesting point, showing that birds, as a class, are the descendants of well-toothed reptiles, to the complete exclusion of the Chelonia with which various authors persistently try to connect them. No fossil birds of later than Cretaceous age are known to have teeth, and concerning recent birds they possess not even embryonic vestiges.

E. Geoffroy St Hilaire stated in 1821 (Ann. Gen. Sci. Phys. viii. pp. 373-380) that he had found a considerable number of tooth-germs in the upper and lower jaws of the parrot Palaeornis torquatus. E. Blanchard (" Observations sur le sys- teme dentaire chez les oiseaux," Comptes rendus 50, i860, pp. 540-542) felt justified in recognizing flakes of dentine. However,

M. Braun (Arbeit Zool. Inst., Wiirzhurg, v. 1879) and especially P.

Fraisse (Phys. Med. Ges., Wurzburg, 1880) have shown that the structures in question are of the same kind as the well-known serrated ” teeth ” of the bill of anserine birds. In fact the papillae observed in the embryonic birds are the soft cutaneous extensions into the surrounding horny sheath of the bill, compar- able to the well-known nutritive papillae in a horse’s hoof. They are easily exposed in the well-macerated under jaw of a parrot, after removal of the horny sheath. Occasionally calcifica- tion occurs in or around these papillae, as it does regularly in the ” egg-tooth ” of the embryos of all birds.

The best known of the Odontornithes are Hesperornis regalis, standing about 3 ft. high, and the somewhat taller H.crassipes. Both show the general configuration of a diver, but it is only by analogy that Hesperornis can be looked upon as ancestral to the Colymbiformes. There are about fourteen teeth in a groove of the maxilla and about twenty-one in the mandible; the vertebrae are typically heterocoelous; of the wing-bones only the very slender and long humerus is known; clavicles slightly reduced; coracoids short and broad, movably connected with the scapula; sternum very long, broad and quite flat, without the trace of a keel. Hind limbs very strong and of the Colymbine type, but the outer or fourth capitulum of the metatarsus is the strongest and longest, an unique arrangement in an otherwise typically steganopodous foot. The pelvis shows much resem- blance to that of the divers, but there is still an incisura ischiadica instead of a foramen. The tail is composed of about twelve vertebrae, without a pygostyle. Enaliornis of the Cambridge Greensand of England, and Baptornis of the mid-Cretaceous of North America, are probably allied, but imperfectly known. The vertebrae are biconcave, with heterocoelous indications in the cervicals; the metatarsal bones appear still somewhat imperfectly anchylosed. The absence of a keel misled Marsh who suspected relationship of Hesperornis with the Ratitae, and L. Dollo went so far as to call it a carnivorous, aquatic ostrich (Bull. Sci. Depart, du Nord, ser. 2, iv. 1881, p. 300), and this mistaken notion of the ” swimming ostrich ” was popularized by various authors. B. Vetter (Festschr. Ges. Isis., Dresden, 1885) rightly pointed out that Hesperornis was a descendant of Carinatae, but adapted to aquatic life, implying reduction of the keel. Lastly, M. Furbringer (Untersuchungen, Amsterdam, 1888, pp. 1543, 1505, 1580) relegated it, together with Enaliornis and the Colymbo-Podicipedes, to his suborder Podicipitiformes. The present writer does not feel justified in going so far. On account of their various, decidedly primitive characters, he prefers to look upon the Odontolcae as a separate group, one of the three divisions of the Neornithes, as birds which form an early offshoot from the later Colymbo-Pelargomorphous stock

; in adaptation to a marine, swimming life they have lost the power of flight, as is shown by the absence of the keel and by the great reduction of the wing-skeleton, just as in another direction, away from the later Alectoromorphous stock the Ratitae have specialized as runners. It is only in so far as the loss of flight is correlated with the absence of the keel that the Odontolcae and the Ratitae bear analogy to each other.

There remain the Odontotormae, notably Ichthyornis victor, I. dispar, Apatornis and Graculavus of the middle and upper Cretaceous of Kansas. The teeth stand in separate alveoles; the two halves of the mandible are, as in Hesperornis, without a symphysis. The vertebrae are amphicoelous, but at least the third cervical has somewhat saddle-shaped articular facets. Tail composed of five free vertebrae, followed by a rather small pygostyle. Shoulder girdle and sternum well developed and of the typical carinate type. Pelvis still with incisura ischiadica. Marsh based the restoration of Ichthyornis, which was obviously a well-flying aquatic bird, upon the skeleton of a tern, a relation- ship which cannot be supported. The teeth* vertebrae, pelvis and the small brain are all so many low characters that the Odontotormae may well form a separate, and very low, order of the typical Carinatae, of course near the Colymbomorphowe Legion. (H. F. G.”>

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ODORIC— ODYLIC FORCE-

DORIC (c. 1286-1331), styled “of Pordenone,” one of the chief travellers of the later middle ages, and a Beatus of the Roman Church, was born at Villa Nuova, a hamlet near the town of Pordenone in Friuli, in or about 1286. According to the ecclesiastical biographers, in early years he took the vows of the Franciscan order and joined their convent at Udine, the capital of Friuli.

Friar Odoric was despatched to the East, where a remarkable extension of missionary action was then taking place, about 1316-1318, and did not return till the end of 1329 or beginning of 1330; but, as regards intermediate dates, all that we can deduce from his narrative or other evidence is that he was in western India soon after 1321 (pretty certainly in 1322) and that he spent three years in China between the opening of 1323 and the close of 1328. His route to the East lay by Trebizond and Erzerum to Tabriz and Sultanieh, in all of which places the order had houses. From Sultanieh he proceeded by Kashan and Yazd, and turning thence followed a somewhat devious

route by Persepolis and the Shiraz and Bagdad regions, to the Persian Gulf. At Hormuz' he embarked for India, landing at Thana. near Bombay. At this city four brethren of his order, three of them Italians and the fourth a Georgian, had shortly before met death at the hands of the Mahommedan governor. The bones of the martyred friars had been collected by Friar Jordanus of Severac, a Dominican, who carried them to Supera — the Suppara of the ancient geographers, near the modern Bassein, about 26 m. north of Bombay — and buried them there Odoric tells that he disinterred these relics and carried them with him on his further travels. In the course of these he visited Malabar, touching at Pandarani (20 m. north of Calicut), at Cranganore, and at Kulam or Quilon, proceeding thence, appar- ently, to Ceylon and to the shrine of St Thomas at Maylapur near Madras. From India he sailed in a junk to Sumatra, visiting various ports on the northern coast of that island, and thence to Java, to the coast (it would seem) of Borneo, to Champa (South Cochin-China), and to Canton, at that time known to western Asiatics as Chin-Kalan or Great China (Maha- chin). From Canton he travelled overland to the great ports of Fukien, at one of which, Zayton or Amoy harbour, he found two houses of his order; in one of these he deposited the bones of the brethren who had suffered in India. From Fuchow he struck, across the mountains into Cheh-kiang and visited Hang- chow, then renowned, under the name of Cansay, Khanzai, or Quinsai (i.e. Kingsze or royal residence), as the greatest city in the world, of whose splendours Odoric, like Marco Polo, Marignolli, or Ibn Batuta, gives notable details. Passing northward by Nanking and crossing the Yangtsze-kiang, Odoric embarked on the Great Canal and travelled to Cambalec (other- wise Cambaleth, Cambaluc, &c.) or Peking, where he remained for three years, attached, no doubt, to one of the churches founded by Archbishop John of Monte Corvino, at this time in extreme old age. Returning overland across Asia, through the Land of Prester John and through Casan, the adventurous traveller seems to have entered Tibet, and even perhaps to have visited Lhasa. After this we trace the friar in northern Persia, in Millestorte, once famous as the Land of the Assassins in the Elburz highlands. No further indications of his homeward route (to Venice) are given, though it is almost certain that he passed through Tabriz. The vague and fragmentary character of the narrative, in this section, forcibly contrasts with the clear and careful tracing of the outward way. During a part at least of these long journeys the companion of Odoric was Friar James, an Irishman, as appears from a record in the public books of Udine, showing that shortly after Odoric's death a present of two marks was made to this Irish friar, Socio beati Fratris Odorici, amore Dei et Odorici. Shortly after his return Odoric betook himself to

the Minorite house attached to St Anthony's at Padua, and it was there that in May 1330 he related the story of his travels, which was taken down in homely Latin by Friar William of Solagna, Travelling towards the papal court at Avignon, Odoric fell ill at Pisa, and turning back to Udine, the capital of his native province, died in the convent there on the 14th of January 1331. The fame of

his vast journeys appears to have made a much greater impression on the laity of his native territory than on his Franciscan brethren. The latter were about to bury him without delay or ceremony, but the gastald or chief magistrate of the city interfered and appointed a public funeral; rumours of his wondrous travels and of posthumous miracles were diffused, and excitement spread like wildfire over Friuli and Carniola; the ceremony had to be deferred more than once, and at last took place in presence of the patriarch of Aquileia and all the local dignitaries. Popular acclamation made him an object of devotion the municipality erected a noble shrine for his body, and his fame as saint and traveller had spread far and wide before the middle of the century, but it was not till four centuries later (1755) that the papal authority formally sanctioned his beatification. A bust of Odoric was set up at Pordenone in 1881.

The numerous copies of Odoric's narrative (both of the original text and of the versions in French, Italian, &c.) that have come down to our time, chiefly from the 14th century, show how speedily and widely it acquired popularity. It does not deserve the charge of mendacity brought against it by some, though the adulation of others is nearly as injudicious. Odoric's credit was not benefited by the , liberties which Sir John Mandeville took with it. The substance of that knight's alleged travels in India and Cathay is stolen from Odoric, though amplified with fables from other sources and from his own invention, and garnished with his own unusually clear astronomical notions. We may indicate a few passages which stamp Odoric as a genuine and original traveller. He is the first European, after Marco Polo, who distinctly mentions the name of Sumatra. The cannibalism and community of wives which he attributes to certain races of that island do certainly belong to it, or to islands closely adjoining. His description of sago in the archipelago is not free from errors, but they are the errors of an eye-witness. In China his mention of Canton by the name of Censcolam or Censcalani (Chin-Kalan), and his descriptions of the custom of fishing with tame cormorants, of the habit of letting the finger-nails grow extravagantly, and of the compression of women's feet, are peculiar to him among the travellers of that age; Marco Polo omits them all.

Seventy-three MSS. of Odoric's narrative are known to exist in Latin, French and Italian: of these the chief is in Paris, National Library, MSS. Lat. 2584, fols. 118 r.-i27 v., of about 1350. The narrative was first printed at Pesaro in 1513, in what Apostolo Zeno calls lingua inculta e rozza. Ramusio's collection first contains it in the 2nd vol. of the 2nd edition (1574) (Italian version), in which are given two versions, diftering curiously from one another, but without any prefatory matter or explanation. (See also edition of 1583, vol. ii. fols. 245 r.-256 r.) Another (Latin) version is given in the Acta Sanctorum (Bollandist) under the 14th of January. The curious discussion before the papal court respecting the beatification of Odoric forms a kind of blue-book issued ex typographia rev. camerae apostolicae (Rome, 1755). , Professor Friedrich Kunstmann of Munich devoted one of his valuable papers to Odoric's narrative (Histor.polit. Blatter von Phillips und Gorres, vol. xxxviii. pp. 507 537)- The best editions of Odoric are by G. Venni, Elogio storico alle gesta del Beato Odorico (Venice, 1761); H. Yule in Cathay and the Way Thither, vol. i. pp. 1-162, vol. ii. appendix, pp. 1-42 (London, 1866), Hakluyt Society; and H. Cordier, Les Voyages . . . du . . . frere Odoric . . . (Paris, 1891) (edition of Old French version of c- 1350). The edition by T. Domenichelli (Prato, 1881) may also be mentioned; likewise those texts of Odoric embedded in the Storia universale delle Missione Francescane, iii. 739-781, and in Hakluyt 's Principal Navigations (1599), ii. 39-67. See also John of Viktring (Joannes Victoriensis) in Pontes rerum Germanicarum, ed. J. F. Boehmer; vol. i. ed. by J . G. Cotta (Stuttgart, 1843), p. 391; Wadding, Annates Minorum, a.d. 1331, vol. vii. pp. 123-126; Bartholomew Albizzi, Opus conformitatum . . . B. Francisci . . ., bk. i. par. ii. conf. 8 (fol. 124 of Milan, edition of 1513); John of Winterthur in Eccard, Corpus historicum medii aevi, vol. i. cols. 1 894- 1 897, especially 1894; C. R. Beazley, Dawn of Modern Geography, iii. 250-287, 548-549. 554. 565-566, 612-613, &c.

(H. Y. ; G. R. B.)

ODYLIC FORCE, a term once in vogue to explain the pheno- menon of hypnotism (q.v.). In 1845 considerable attention was drawn to the announcement by Baron von Reichenbach of a so-called new " imponderable " or " influence " developed by certain crystals, magnets, the human body, associated with heat, chemical action, or electricity, and existing throughout

the universe, to which he gave the name of odyl. Persons sensitive to odyl saw luminous phenomena near the poles of magnets, or even around the hands or heads of certain persons in whose bodies the force was supposed to be concentrated. In Britain an impetus was given to this view of the subject by the translation in 1850 of Reichenbach's Researches on Magnetism, &c, in relation to Vital Force, by Dr Gregory, professor of' chemistry in the university of Edinburgh. These Researches show many of the phenomena to be of the same nature as those described previously by F. A. Mesmer, and even long before Mesmer's time by Swedenborg.

ODYSSEUS (in Latin Ulixes, incorrectly written Ulysses), in Greek legend, son of Laertes and Anticleia, king of Ithaca, a famous hero and typical representative of the Greek race. In Homer he is one of the best and bravest of the heroes, and the favourite of Athena, whereas in later legend he is cowardly and deceitful. Soon after his marriage to Penelope he was summoned to the Trojan war. Unwilling to go, he feigned madness, ploughing a field sown with salt with an ox and an ass yoked together; but Palamedes discovered his deceit by placing his infant child Telemachus in front of the plough; Odysseus afterwards revenged himself by compassing the death ot Pala- medes. During the war, he distinguished himself as the wisest adviser of the Greeks, and finally, the capture of Troy, which the bravery of Achilles could not accomplish, was attained by Odysseus' stratagem of the wooden horse. After the death of Achilles the Greeks adjudged his armour to Odysseus as the man who had done most to end the war successfully. When Troy was captured he set sail for Ithaca, but was carried by unfavour- able winds to the coast of Africa. After encountering many adventures in all parts of the unknown seas, among the lotus- eaters and the Cyclopes, in the isles of Aeolus and Circe and the perils of Scylla and Charybdis, among the Laestrygones, and even in the world of the dead, having lost all his ships and companions, he barely escaped with his life to the island of Calypso, where he was detained eight years, an unwilling lover of the beautiful nymph. Then at the command of Zeus he was sent homewards, but was again wrecked on the island of Phaeacia, whence he was conveyed to Ithaca in one of the wondrous Phaeacian ships. Here he found that a host of suitors, taking advantage of the youth of his son Telemachus, were wasting his property and trying to force Penelope to marry one of them. The stratagems and disguises by which with the help of a few faithful friends he slew the suitors are described at length in the Odyssey. The only allusion to his death is contained in the prophecy of Teiresias, who promised him a happy old age and a peaceful death from the sea. According to a later legend, Telegonus, the son of Odysseus by Circe,

was sent by her in search of his father. Cast ashore on Ithaca by a storm, he plundered the island to get pro- visions, and was attacked by Odysseus, whom he slew. The prophecy was thus fulfilled. Telegonus, accompanied by Penelope and Telemachus, returned to his home with the body of his father, whose identity he had discovered.

According to E. Meyer (Hermes, xxx. p. 267), Odysseus is an old Arcadian nature god identical with Poseidon, who dies at the approach of winter (retires to the western sea or is carried away to the underworld) to revive in spring (but see E. Rohde, Rhein. Mus. 1. p. 631). A more suitable identification would be Hermes. Mannhardt and others regard Odysseus as a solar or summer divinity, who withdraws to the underworld during the winter, and returns in spring to free his wife from the suitors (the powers of winter). A. Gercke (Neue Jahrbiicher jilr das klassische Altertum, xv. p. 331) takes him to be an agricultural divinity akin to the sun god, whose wife is the moon-goddess Penelope, from whom he is separated and reunited to her on the day of the new moon. His cult early disappeared; in Arcadia his place was taken by Poseidon. But although the personality of Odysseus may have had its origin in some primitive religious myth, chief interest attaches to him as the typical representative of the old sailor-race whose adventurous voyages educated and moulded the Hellenic race. The period when the character of Odysseus took shape among the Ionian bards

I was when the Ionian ships were beginning. to penetrate to the farthest shores of the Black Sea and to the western side of Italy, but when Egypt had not yet been freely opened to foreign intercourse. The adventures of Odysseus were a favourite subject in ancient art, in which he may usually be recognized by his conical sailor's cap.

See article by J. Schmidt in Roscher'g Lexikon der Mythologie (where the different forms of the name and its etymology are fully discussed); O. Gruppe, Griechische Mythologie, ii. pp. 624, 705-718; J. E. Harrison, Myths of the Odyssey in Art and Literature (1881), with appendix on authorities. W. Mannhardt, Wald- und Feldkulte (1905), ii. p. 106; O. Seeck, Gesch. des Untergangs der antiken Welt, ii. p. 576; G. Fougeres, Mantinee et I'Arcadie orientate (1898), according' to whom Odysseus is an Arcadian chthonian divinity and Penelope a goddess of flocks and herds, akin to the Arcadian Artemis ; S. Eitrem, Die gottlichen Zwillinge bei den Griechen (1902), who identifies Odysseus with one of the Dioscuri ('OXi«7« = IIoXi>5euKijs); V. B<5rard, Les VMniciens et I'OdyssSe (1902-1903), who regards the Odyssey as "the integration in a Greek pAotos (home-coming) of a Semitic periplus," in the form of a poem written 900-850 B.C. by an

Ionic poet at the court of one of the Neleid kings of Miletus. For an estimate of this work, the interest of which is mainly geographical, see Classical Review (April 1904) and Quarterly Review (April 1905). It consists of two large volumes, with 240 illustrations and maps.

OEBEN, JEAN FRANCOIS, French 18th-century cabinet- maker, is believed to have been of German or Flemish origin; the date of his birth is unknown, but he was dead before 1767. In 1752, twenty years after Boulle's death, we find him occupying an apartment in the Louvre sublet to him by Charles Joseph Boulle, whose pupil he may have been. He has sometimes been confused with Simon Oeben, presumably a relative, who signed a fine bureau in the Jones collection at the Victoria and Albert Museum' J. F. Oeben is also represented in that collection by a pair of inlaid corner-cupboards. These with a bureau and a chiffonier in the Garde Meuble in which bouquets of flowers are delicately inlaid in choice woods are his best-known and most admirable achievements. He appears to have worked extensively for the marquise de Pompadour by whose influence he was granted lodgings at the Gobelins and the title of " Ebeniste du Roi " in 1754. There he remained until 1760, when he obtained an apartment and Workshops at the Arsenal. His work in marquetry is of very great distinction, but he would probably never have enjoyed so great a reputation had it not been for his connexion with the famous Bureau du Roi, made for Louis XV., which appears to have owed its inception to him, notwithstand- ing that it was not completed until some considerable time after his death and is signed by J. H. Riesener (q.v.) only. Docu- mentary evidence under the hand of the king shows that it was ordered from Oeben in 1760, the year in which he moved to the Arsenal. The known work of Oeben possesses genuine grace and beauty; as craftsmanship it is of the first rank, and it is remark- able that, despite his Teutonic or Flemish origin, it is typically French in character.

OECOLAMPADIUS, JOHN (1482-1531), German Reformer, whose real name was Hussgen or Heussgen, 1 was born at Weins- berg, a small town in the north of the modern kingdom of Wiirttemberg, but then belonging to the Palatinate. He went to school at Weinsberg and Heilbronn, and then, intending to study law, he went to Bologna, but soon returned to Heidelberg and betook himself to theology. He became a zealous student of the new learning and passed from the study of Greek to that of Hebrew, taking his bachelor's degree in 1503. He became cathedral preacher at Basel in 151 5, serving under Christopher von Uttenheim, the evangelical bishop of Basel. From the beginning the sermons of Oecolampadius centred in the Atone- ment, and his first reformatory zeal showed itself in a protest (De risu

paschali, 15 18) against the introduction of humorous stories into Easter sermons. In 1520 he published his Greek Grammar. The same year he was asked to become preacher in the high church in Augsburg. Germany was then ablaze with the questions raised by Luther's theses, and his introduction into this new world, when at first he championed Luther's position especially in his anonymous Canonici indocti (1519), seems to have compelled Oecolampadius to severe self-examina-

1 Changed to Hausschein and then into the Greek equivalent.

tion, which ended, in his entering a convent and becoming a monk. A short experience convinced him that this was not for him the ideal Christian life (" amisi monachum, inveni Christia- num "), and in February 1522 he made his way to Ebernburg, near Creuznach, where he acted as chaplain to the little group of men holding the new opinions who had settled there under the leadership of Franz von Sickingen.

The second period of Oecolampadius's life opens with his return to Basel in November 1522, as vicar of St Martin's and (in 1523) reader of the Holy Scripture at the university. Lectur- ing on Isaiah he condemned current ecclesiastical abuses[1] and in a public disputation (20th of August 1523) was so successful that Erasmus writing to Zurich said " Oecolampadius has the upper hand amongst us." He became Zwingli's best helper, and after more than a year of earnest preaching and four public disputations in which the popular verdict had been given in favour of Oecolampadius and his friends, the authorities of Basel began to see the necessity of some reformation. They began with the convents, and Oecolampadius was able to refrain in public worship on certain festival days from some practices he believed to be superstitious. Basel was slow to accept the Reformation; the news of the Peasants' War and the inroads of Anabaptists prevented progress; but at last, in 1525, it seemed as if the authorities were resolved to listen to schemes for restoring the purity of worship and teaching. In the midst of these hopes and difficulties Oecolampadius married, in the beginning of 1528, Wilibrandis Rosenblatt, the widow of Ludwig Keller, who proved to be non rixosa vel garrula vel vaga, he says, and made him a good wife. After his death she married Capito, and, when Capito died, Bucer. She diet! in 1564. In January 1528 Oecolampadius and Zwingli took part in the

disputation at Berne which led to the adoption of the new faith in that canton, and in the following year to the discontinuance of the mass at Basel. The Anabaptists claimed Oecolampadius for their views, but in a disputation with them he dissociated himself from most of their positions. He died on the 24th of November 1531.

Oecolampadius was not a great theologian, like Luther, Zwingli or Calvin, and yet he was a trusted theological leader. With Zwingli he represented the Swiss views at the unfortunate conference at Marburg. His views on the Eucharist upheld the metaphorical against the literal interpretation of the word " body," but he asserted that believers partook of the sacrament more for the sake of others than for their own, though later he emphasized it as a means of grace for the Christian life. To Luther's doctrine of the ubiquity of Christ's body he opposed that of the presence and activity of the Holy Spirit in the church. He did not minutely analyse the doctrine of predestination as Luther, Calvin and Zwingli did, contenting himself with the summary " Our Salvation is of God, our perdition of ourselves."

See J. J. Herzog, Leben Joh. Oecolampads u. die Reformation der Kirche zu Basel (1843); K. R. Hagenbach, Johann Oecolampad u. Oswald Myconius, die Reformatoren Basels (1859). For other literature see W. Hadorn's art. in Herzog-Hauck's Realencyklopddie fur prot. ReL u. Kirche.

OECOLOGY, or Ecology (from Gr. oIkos, house, and X6-yos, department of science), that part of the science of biology which treats of the adaptation of plants or animals to their environ- ment (see Plants: Ecology).

OECUMENICAL (through the Lat. from Gr. oUovfieviKos, universal, belonging to the whole inhabited world, 17 oUovnevr] sc. yrj, oIkuv, to dwell), a word chiefly used in the sense of belonging to the universal Christian Church. It is thus specifi- cally applied to the general councils of the early church (see Council). . In the Roman Church a council is regarded as oecumenical when it has been summoned from the whole church under the presidency of the pope or his legates; the decrees confirmed by the pope are binding. The word has also been applied to assemblies of other religious bodies, such as the Oecumenical Methodist Conferences, which met for the first time in 1881. " Oecumenical " has also been the title of the patriarch of Constantinople since the 6th century (see Orthodox Eastern Church).

OECUS, the Latinized form of Gr. oIkos, house, used by Vitruvius for the principal hall or saloon in a Roman house, which was used

occasionally as a triclinium for banquets. When of great size it became necessary to support its ceiling with columns; thus, according to Vitruvius, the tetrastyle oecus had four columns; in the Corinthian oecus there was a row of columns on each side, virtually therefore dividing the room into nave and aisles, the former being covered over with a semi- circular ceiling. The Egyptian oecus had a similar plan, but the aisles were of less height, so that clerestory windows were introduced to light the room, which, as Vitruvius states, presents more the appearance of a basilica than of a triclinium.

OEDIPUS (OlSiirovs, OlSurobys, OlSLiros, from Gr. oiSelv swell, and tow foot, i.e. ” the swollen-footed “) 1 in Greek legend, son of Laius, king of Thebes, and Jocasta (Iocaste). Laius, having been warned by an oracle that he would be killed by his son, ordered him to be exposed, with his feet pierced, immediately after his birth. Thus Oedipus grew up ignorant of his parentage, and, meeting Laius in a narrow way, quarrelled with him and slew him. The country was ravaged by a monster, the Sphinx; Oedipus solved the riddle which it proposed to its victims, freed the country, and married” his own mother. In the Odyssey it is said that the gods disclosed the impiety. Epicaste (as Jocasta is called in Homer) hanged herself, and Oedipus lived as king in Thebes tormented by the Erinyes of his mother. In the tragic poets the tale takes a different form. Oedipus fulfils an ancient prophecy in killing his father; he is the blind instru- ment in the hands of fate. The further treatment of the tale by Aeschylus is unknown. Sophocles describes in his Oedipus Tyrannus how Oedipus was resolved to pursue to the end the mystery of the death of Laiius, and thus unravelled the dark tale, and in horror put out his own eyes. The sequel of the tale is told in the Oedipus Coloneus. Banished by his sons, he is tended by the loving care of his daughters. He comes to Attica and dies in the grove of the Eumenides at Colonus, in his death welcomed and pardoned by the fate which had pursued him throughout his life. In addition to the two tragedies of Sophocles, the legend formed the subject of a trilogy by Aeschylus, of which only the Seven against Thebes is extant; of the Phoenissae of Euripides; and of the Oedipus and Phoenissae of Seneca.

See A. Hofer’s exhaustive article in Roscher’s Lexikon der Mytho~ logie; F. W. Schneidewin, Die Sage von Oedipus (1852); D. Com- paretti, Edipo e la mitologia comparata (1867); M. Breal, ” Le Mythe d’CEdipe,” in Melanges de mythologie (1878), who explains Oedipus” as a personification of light, and his blinding as the dis- appearance of the sun at the end of the day; J. Paulson in Eranos. Acta philologica Suecana, i. (Upsala, 1896) places the original home of the legend in Egyptian Thebes, and identifies Oedipus with the Egyptian god Seth,

represented as the hippopotamus ” with swollen foot,” which was said to kill its father in order to take its place with the mother. O. Crusius (Beitrdge zur griechischen Mythologie, 1886, p. 21) sees in the marriage of Oedipus with his mother an agrarian myth (with special reference to Oed. Tyr. 1497), while Hofer (in Roscher’s Lexikon) suggests that the episodes of the murder of his father and of his marriage are reminiscences of the overthrow of Cronus by Zeus and of the union of Zeus with his own sister.

Medieval Legends. — In the Golden Legend of Jacobus de Voragine (13th century) and the Mystere de la Passion of Jean Michel (15th century) and Arnoul Grˆban (15th century), the story of Oedipus is associated with the name of Judas. The main idea is the same as in the classical account. The Judas legend, however, never really became popular, whereas that of Oedipus was handed down both orally and in written national tales (Albanian, Finnish, Cypriote). One incident (the incest unwittingly committed) frequently recurs in connexion with the life of Gregory the Great. The Theban legend, which reached its fullest development in the Thebais of Statius and in Seneca, reappeared in the Roman de Thebes (the work of an un- known imitator of Benolt de Sainte-More). Oedipus is also the subject of an anonymous medieval romance (15th century) , Le Roman d’QLdipus, fits de Layus, in which the sphinx is depicted as a cunning and ferocious giant. The Oedipus legend was handed down to the period of the Renaissance by the Roman and its imitations, which then fell into oblivion. Even to the present day the ‘egend has

1 It is probable that the story of the piercing of his feet is a subsequent invention to explain the name, or is due to a false etymology (from ol&eai), oltiivovs in reality meaning the ” wise ” (from olSa), chiefly in reference to his having solved the riddle, the syllable -tous having no significance.

survived amongst the modern Greeks, without any traces of the influence of Christianity (B. Schmidt, Griechische Marchen, 1877). The works of the ancient tragedians (especially Seneca, in preference to the Greek) came into vogue, and were slavishly followed by French and Italian imitators down to the 17th century.

See L. Constans, La Legende d'CEdipe dans I'antiquite, au moyen dge, et dans les temps modernes (1881); D. Comparetti's Edipo and Jebb's introduction for the Oedipus of Dryden, Corneille and Voltaire; A. Heintze, Gregorius auf dem Steine, der mittelalterliche Oedipus (progr., Stolp, 1877); V. Diederichs, " Russische Verwandte der Legende von Gregor auf dem Stein und der Sage von Judas Ischariot," in Russische Revue (1880); S. Novakovitch, "Die Oedipussage in der sildslavischen Volksdichtung," in Archiv fiir slavische Philologie xi. (1

OEHLER, GUSTAV FRIEDRICH (1812-1872), German theo- logian, was born on the 10th of June 181 2 at Ebingen, Wurttem- berg, and was educated privately and at Tubingen where he was much influenced by J. C. F. Steudel, professor of Old Testa- ment Theology. In 1837, after a term of Oriental study at Berlin, he went to Tubingen as Repelent, becoming in 1840 professor at the seminary and pastor in Schonthal. In 1845 he published his Prolegomena zur Theologie des Alien Testaments, accepted an invitation to Breslau and received the degree of doctor from Bonn. In 1852 he returned to Tubingen as director of the seminary and professor of Old Testament Theology at the university. He declined a call to Erlangen as successor to Franz Delitzsch (1867), and died at Tubingen on the 19th of February 1872. Oehler admitted the composite authorship of the Pentateuch and the Book of Isaiah, and did much to counter act the antipathy against the Old Testament that had been fostered by Schleiermacher. In church polity he was Lutheran rather than Reformed. Besides his Old Testament Theology (Eng. trans., 2 vols., Edinburgh, 1874-1875), his works were Gesammelle Seminarreden (1872) and Lehrbuch Symbolik (1876), both published posthumously, and about forty articles for the first edition of Herzog's Realencyklopddie which were largely retained by Delitzsch and von Orelli in the second.

OEHRINGEN, a town of Germany, in the kingdom of Wiirt- temberg, agreeably situated in a fertile country, on the Ohrn, 12 m. E. from Heilbronn by the railways to Hall and Crailsheim. Pop. (1905) 3,450.

It is a quaint medieval place, and, among its ancient buildings, boasts a fine Evangelical church, con- taining carvings in cedar-wood of the 15th century and numerous interesting tombs and monuments; a Renaissance town hall; the building, now used as a library, which formerly belonged to a monastery, erected in 1034; and a palace, the residence of the princes of Hohenlohe-Oehringen.

Oehringen is the Vicus Aurelii of the Romans. Eastwards of it ran the old Roman frontier wall, and numerous remains and inscriptions dating from the days of the Roman settle- ment have been recently discovered, including traces of three camps.

See Keller, Vicus Aurelii, oder Ohringen zur Zeit der Romer (Bonn,

1872).

OELS, a town of Germany, in the Prussian province of Silesia, formerly the. capital of a mediatized principality of its own name. It lies in a sandy plain on the Oelsbach, 20 m. N.E. of Breslau by rail. Pop. (1905) 10,940. The princely chateau, now the property of the crown prince of Prussia, dating from 1558 and beautifully restored in 1891-1894, contains a good library and a collection of pictures. Of its three Evangelical churches, the Schlosskirche dates from the 13th century and the Propstkirche from the 14th. The inhabitants are chiefly engaged in making shoes and growing vegetables for the Breslau market.

Oels was founded about 940, and became a town in 1255. It appears as the capital of an independent principality at the beginning of the 14th century. The principality, with an area of 700 sq. m. and about 130,000 inhabitants, passed through various hands and was inherited by the ducal family of Bruns- wick in 1792. Then on the extinction of this family in 1884 it lapsed to the crown of Prussia.

See W. Hausler, Geschichte des Filrstentums Ols bis zum Aus- sterben der piastischen Herzogslinie (Breslau, 1883) ; and Schulze, Die Succession im Fiirstentum Ols (Breslau, 1884).

OELSCHLAGER [Olearius], ADAM (1600-1671), German traveller and Orientalist, was born at Aschersleben, near Magde- burg, in 1599 or 1600. After studying at Leipzig he became librarian and court mathematician to Duke Frederick III. of Holstein-Gottorp, and in 1633 he was appointed secretary to the ambassadors Philip Crusius, jurisconsult, and Otto Briigge- mann or Brugman, merchant, sent by the duke to Muscovy and Persia in the hope of making arrangements

by which his newly-founded city of Friedrichstadt should become the terminus of an overland silk-trade. This embassy started from Gottorp on the 22nd of October 1633, and travelled by Hamburg, Liibeck, Riga, Dorpat (five months' stay), Revel, Narva, Ladoga and Novgorod to Moscow (August 14, 1634). Here they con- cluded an advantageous treaty with Michael Romanov, and returned forthwith to Gottorp (December 14, 1634- April 7, 1635) to procure the ratification of this arrange- ment from the duke, before proceeding to Persia. This accom- plished, they started afresh from Hamburg on the 22nd of October 1635, arrived at Moscow on the 29th of March 1636; and left Moscow on the 30th of June for Nizhniy Novgorod, whither they had already sent agents (in 1634-1635) to prepare a vessel for their descent of the Volga. Their voyage down the great river and over the Caspian was slow and hindered by accidents, especially by grounding, as near Derbent on the 14th of November 1636; but at last, by way of Shemakha (three months' delay here), Ardebil, Sultanieh and Kasvin, they reached the Persian court at Isfahan (August 3, 1637), and were received by the shah (August 16). Negotiations here were not as successful as at Moscow, and the embassy left Isfahan on the 21st of December 1637, and returned home by Resht, Lenkoran, Astrakhan, Kazan, Moscow, &c. At Revel Oelschlager parted from his colleagues (April 15, 1639) and embarked direct for Liibeck. On his way he had made a chart of the Volga, and partly for this reason the tsar Michael wished to persuade, or compel, him to enter his service. Once back at Gottorp, Oelschlager became librarian to the duke, who also made him keeper of his Cabinet of Curiosities, and induced the tsar to excuse his (promised) return to Moscow. Under his care the Gottorp library and cabinet were greatly enriched in MSS., books, and oriental and other works of art: in 1651 he pur- chased, for this purpose, the collection of the Dutch scholar and physician, Bernard ten Broecke (" Paludanus"). He died at Gottorp on the 22nd of February 167 1.

It is by his admirable narrative of the Russian and the Persian legation (Beschreibung der muscowitischen und persischen Reise, Schleswig, 1647, and afterwards in several enlarged editions, 1656, &c.) that Oelschlager is best known, though he also published a history of Holstein (Kurtzer Begriff einer holsteinischen Chronic, Schleswig, 1663), a famous catalogue of the Holstein-Gottorp cabinet (1666), and a translation of the Gulistan (Persianisches Rosenthal, Schleswig, 1654), to which was appended a translation of the fables of Lokman. A French veision of the Beschreibung was published by Abraham de Wicquefort {Voyages en Moscovie, Tartarie et Perse, par Adam Olearius, Paris, 1656), an English version was made by John Davies of Kidwelly {Travels of the Am- bassadors sent by Frederic, Duke of

Holstein, to the Great Duke of, Muscovy and the King of Persia, London, 1662; 2nd ed., 1669), and a Dutch translation by Dieterius van Wageningen {Beschrijvingh van de nieuwe Parciaensche ofte Orientaelsche Reyse, Utrecht, 1651); an Italian translation of the Russian sections also appeared {Viaggi di Moscovia, Viterbo and Rome, 1658). Paul Flemming the poet and J. A. de Mandelslo, whose travels to the East Indies are usually published with those of Oelschlager, accompanied the embassy. Under Oelschlager's direction the celebrated globe of Gottorp (11 ft. in diameter) and armillary sphere were executed in 1654- 1664; the globe was given to Peter the Great of Russia in 1 7 13 by Duke Frederick's grandson, Christian Augustus. Oelschlager's unpublished works include a Lexicon Persicum and several other Persian studies. (C. R. B.)

OELSNITZ, a town of Germany, in the kingdom of Saxony, on the Weisse Elster, 26 m. by rail S.W. of Zwickau. Pop. (1905) 13,966. It has two Evangelical churches, one of them being the old Gothic Jakobskirche, and several schools. There are various manufactories. Oelsnitz belonged in the 14th and 15th centuries to the margraves of Meissen, anj later to the electors of Saxony. Near it is the village of Voigtsberg, with

the remains of a castle, once a residence of the governor (Vogt) of the Vogtland.

See Jahn, Chronik der Stadt Olsnitz (1875).

OELWEIN, a city of Fayette county, Iowa, U.S.A., in the N.E. part of the state, about 132 m. N.E. of Des Moines. Pop. (1890) 830; (1900) 5142, of whom 789 were foreign-born; (1910 U.S. census) 6028. It is served by the Chicago, Rock Island & Pacific and the Chicago Great Western railways, the latter having large repair shops here, where four lines of its road converge. Oelwein was named in honour of its founder, August Oelwein, who settled here in 1873; it was incorporated in 1888, and chartered as a city in 1897.

OENOMAUS, in Greek legend, son of Ares and Harpinna, king of Pisa in Elis and father of Hippodameia. It was pre- dicted that he should be slain by his daughter's husband. His father, the god Ares-Hippius, gave him winged horses swift as the wind, and Oenomaus promised his daughter to the man who could outstrip him in the chariot race,

hoping thus to prevent her marriage altogether. Pelops, by the treachery of Myrtilus, the charioteer of Oenomaus, won the race and married Hippodameia. The defeat of Oenomaus by Pelops, a stranger from Asia Minor, points to the conquest of native Ares- worshippers by immigrants who introduced the new religion of Zeus.

See Diod. Sic. iv. 73; Pausanias vi. 21, and elsewhere; Sophocles, Electra, 504; Hyginus, Fab. 84. 253. Fig. 33 in article Greek Art represents the preparations for the chariot race.

OENONE, in Greek legend, daughter of the river-god Kebren and wife of Paris. Possessing the gift of divination, she warned her husband of the evils that would result from his journey to Greece. The sequel was the rape of Helen and the Trojan War. Just before the capture of the city, Paris, wounded by Philoctetes with one of the arrows of Heracles, sought the aid of the deserted Oenone, who had told him that she alone could heal him if wounded. Indignant at his faithlessness, she refused to help him, and Paris returned to Troy and died of his wound. Oenone soon repented and hastened after him, but finding that she was too late to save him slew herself from grief at the sight of his dead body. Ovid (Heroides, 5) gives a pathetic description of Oenone ‘s grief when she found herself deserted.

OERLAMS, the name (said to be a corruption of the Dutch Oberlanders) for a Hottentot tribal group living in Great Nam-aqualand. They came originally from Little Namaqualand in Cape Colony. They are of very mixed Hottentot-Bantu blood.

OESEL (in Esthonian Kure-saare or Saare-ma), a Russian island in the Baltic, forming with Worms, Mohn and Runo, a district of the government of Livonia, and lying across the mouth of the Gulf of Riga, 106 m. N.N.W. of the city of Riga. It has a length of 45 m., and an area of 1010 sq. m. The coasts are bold and steep, and, especially towards the north and west, form precipitous limestone cliffs. Like those of Shetland, the Oesel ponies are small, but prized for their spirit and endurance. The population, numbering 50,566 in 1870 and 60,000 in 1900, is mainly Protestant in creed, and, with the exception of the German nobility, clergy and some of the townsfolk, Esthonian by race. The chief town, Arensburg, 021 the south coast, is a place of 4600 inhabitants, with summer sea-bathing, mud baths and a trade in grain, potatoes, whisky and fish. In 1227 Oesel was conquered by the Knights of the Sword, and was governed by its own bishops till 1561, when it passed into the hands of the Danes. By them it was surrendered to the Swedes by the peace of Bromsebro (1645), and, along with Livonia, it was united to Russia in 1721.

OESOPHAGUS (Gr. oura = I will carry, and (bayelv, to eat), in anatomy, the gullet ; see Alimentary Canal for comparative anatomy. The human oesophagus is peculiarly liable to certain accidents and diseases, due both to its function as a tube to carry-food to the stomach and to its anatomical situation (see generally Digestive Organs). One of the commonest accidents is the lodgment of foreign bodies in some part of the tube. The situations in which they are arrested vary with the nature of the.

body, whether it be a coin, fishbone, toothplate or a portion of food. An impacted substance may be removed by the oesophageal forceps, or by a coin-catcher; if it should be impossible to draw it up it may be pushed down into the stomach. When it is in the stomach a purgative should never be given, but soft food such as porridge. Should gastric symptoms develop it may have to be removed by the operation of gastrotomy. Charring and ulceration of the oesophagus may occur from the swallowing of corrosive liquids, strong acids or alkalis, or even of boiling water. Stricture of the oesophagus is a closing of the tube so that neither solids nor liquids are able to pass down into the stomach. There are three varieties of stricture; spasmodic, fibrous and malignant. Spasmodic stricture usually occurs in young hysterical women; difficulty in swallowing is complained of, and a bougie may not be able to be passed, but under an anaesthetic will slip down quite easily. Fibrous stricture is' usually situated near the commencement of the oesophagus, generally just behind the cricoid cartilage, and usually results from swallowing corrosive fluids, but may also result from the healing of a syphilitic ulcer. Occasionally it is congenital. The ordinary treatment is repeated dilatation by bougies. Occasionally division of a fibrous stricture has been practised, or a Symond's tube inserted. Mikulicz recommends dilatation of the stricture by the fingers from inside after an incision into the stomach or a permanent gastric fistula may have to be made. Malignant strictures are usually epitheliomatous in structure, and may be situated in any part of the oesophagus. They nearly always occur in males between the ages of 40 and 70 years. An X-ray photograph taken after the patient has swallowed a preparation of bismuth will show the situation of the growth, and Kilhan and Briinig have introduced an instrument called the oesophagoscope, which makes direct examination possible. The remedy of constant dilatation by bougies must not be attempted here, the walls of the oesophagus being so softened by disease and ulceration that severe haemorrhage or perforation of the walls of the tube might take place. The patient should be fed with purely liquid and concentrated nourishment in order to give the oesophagus as much rest as possible, or if the stricture be too tight rectal feeding

may be necessary. Symond's method of tubage is well borne by some patients, the tube having attached to it a long string which is secured to the cheek or ear. The most satisfactory treatment, however, is the operation of gastro- tomy. a permanent artificial opening being made into the stomach through which the patient can be fed.

OETA (mod. Kolavothra), a mountain to the south of Thessaly, in Greece, forming a boundary between the valleys of the Spercheius and the Boeotian Cephissus. It is an offshoot of the Pindus range, 7080 ft. high. In its eastern portion, called Callidromus, it comes close to the sea, leaving only a narrow passage known as the famous pass of Thermopylae (q.v.). There was also a high pass to the west of Callidromus leading over into the upper Cephissus valley. In mythology Oeta is chiefly celebrated as the scene of the funeral pyre on which Heracles burnt himself before his admission to Olympus.

OETINGER, FRIEDRICH CHRISTOPH (1 702-1 782), German divine and theosophist, was born at Goppingen on the 6th of May 1702. He studied theology at Tubingen (1722-1728), and was much impressed by the works of Jakob Bohme. On the completion of his university course, Oetinger spent some years in travel. In 1 730 he visited Count Zinzendorf at Herrnhut, remaining there some months as teacher of Hebrew and Greek. During his travels, in his eager search for knowledge, he made the acquaintance of mystics and separatists, Christians and learned Jews, theologians and physicians alike. At Halle he studied medicine. After some delay he was ordained to the ministry, and held several pastorates. While pastor (from 1746) at Waldorf near Berlin, he studied alchemy and made many experiments, his idea being to use his knowledge for symbolic purposes. These practices exposed him to the attacks of persons who misunderstood him. " My religion," he once said, " is the parallelism of . Nature and Grace." Oetinger translated Swedenborg's philosophy of heaven and earth, and added notes

of his own. Eventually (1766) he became prelate at Murrhardt, where he died on the 10th of February 1782.

Oetinger's autobiography was published by J. Hamberger in 1845. He published about seventy works, in which he expounded his theosophic views. A collected edition, Sdmtliche Schriflen (1st section, Homiletische Schriflen, 5 vols., 1858-1866; 2nd section, Theosophische Werke, 6 vols., 1858-1863), was prepared by K. F. C. Ehmann, who also wrote Oetinger's Leben una Briefe (1859). See also

C. A. Auberlen, Die Theosophie Friedr. Chr. Oetinger's (1847; 2nd ed., 1859), and Herzog, Friedrich Christoph Otinger (1902).

OEYNHAUSEN, a town and watering-place of Germany, in the Prussian province of Westphalia, on the Werre, situated just above its confluence with the Weser, 9 m. W. from Minden by the main line of railway from Hanover to Cologne, with a station on the Lohne-Hameln line. Pop. (1905) 3894. The place, which was formerly called Rehme, owes its development to the discovery in 1830 of its five famous salt springs, which are heavily charged with carbonic acid gas. The waters are used both for bathing and drinking, and are particularly efficacious for nervous disorders, rheumatism, gout and feminine complaints.

OFFA, the most famous hero of the early Angli. He is said by the Anglo-Saxon poem Widsith to have ruled over Angel, and the poem refers briefly to his victorious single combat, a story which is related at length by the Danish historians Saxo and Svend Aagesen. Offa (Uffo) is said to have been dumb or silent during his early years, and to have only recovered his speech v/hen his aged father Wermund was threatened by the Saxons, who insolently demanded the cession of his kingdom. Offa undertook to fight against both the Saxon king 's son and a chosen champion at once. The combat took place at Rendsburg on an island in the Eider, and Offa succeeded in killing both his opponents. According to Widsith Offa's opponents belonged to a tribe or dynasty called Myrgingas, but both accounts state that he won a great kingdom as the result of his victory. A somewhat corrupt version of the same story is preserved in the Vitae duorum Off arum, where, however, the scene is transferred to England. It is very probable that the Offa whose marriage with a lady of murderous disposition is mentioned in Beowulf is the same person; and this story also appears in the Vitae duorum Offarum, though it is erroneously told of a later Offa, the famous king of Mcrcia. Offa of Mercia, however, was a descendant in the 12th generation of Offa, king of Angel. It is probable from this and other considerations that the early Offa lived in the latter part of the 4th century.

See H. M. Chadwick, Origin of_ the English Nation (Cambridge, 1907), where references to the original authorities will be found.

OFFA (d. 796), king of Mercia, obtained that kingdom in a.d. 757, after, driving out Beornred, who had succeeded a few months earlier on the murder of ˆEthelbald. He traced his descent from Pybba, the father of Penda, through Eowa, brother of that king, his own father's name being Thingferth. In 779 he was at war with Cynewulf of

Wessex from whom he wrested Bensington. It is not unlikely that the Thames became the boundary of the two kingdoms about this time. In 787 the power of Offa was displayed in a synod held at a place called Cealchyth. He deprived Jaenberht, archbishop of Canterbury, of several of his suffragan sees, and assigned them to Lichfield, which, with the leave of the pope, he constituted as a separate archbishopric under Hygeberht. He also took advantage of this meeting to have his son Ecgferth consecrated as his colleague, and that prince subsequently signed charters as Rex Merciorum. In 789 Offa secured the alliance of Berhtric of Wessex by giving him his daughter Eadburg in marriage. In 794 he appears to have caused the death of ˆEthelberht of East Anglia, though some accounts ascribe the murder to Cynethryth, the wife of Offa. In 796 Offa died after a reign of thirty-nine years and was succeeded by his son Ecgferth. It is customary to ascribe to Offa a policy of limited scope, namely the establishment of Mercia in a position equal to that of Wessex and of Northumbria. This is supposed to be illustrated by his measures with regard to the see of Lichfield. It cannot be doubted, however, that at this time Mercia was a much more formidable power than Wessex. Offa, like most of his predecessors,

probably held a kind of supremacy over all kingdoms south of the Humber. He seems, however, not to have been contented with this position, and to have entertained the design of putting an end to the dependent kingdoms. At all events we hear of no kings of the Hwicce after about 780, and the kings of Sussex seem to have given up the royal title about the same time. Further, there is no evidence for any kings in Kent from 784 until after Offa's death. To Offa is ascribed by Asser, in his life of Alfred, the great fortification against the Welsh which is still known as " Offa's dike." It stretched from sea to sea and consisted of a wall and a rampart. An account of his Welsh campaigns is given in the Vitae duorum Offarum, but it is difficult to determine how far the stories there given have an historical basis.

See Anglo-Saxon Chronicle, ed. J. Earle and C. Plummer (Oxford, 1899), s.a. 755, 777, 785, 787, 792, 794, 796, 836; W. de G. Birch, Carlularium Saxonicum (London, 1885-1893), vol. i. ; Asser, Life of Alfred, ed. W. H. Stevenson (Oxford, 1904) ; Vitae duorum Offarum (in works of Matthew Paris, ed. W. Wats, London, 1640).

OFFAL, refuse or waste stuff, the " off fall," that which falls off (cf. Dutch afval, Ger. Abfall). The term is applied especially to the waste parts of an animal that has been slaughtered for food, to putrid flesh or carrion, and to waste fish, especially to the little ones that get caught in the nets with the larger and better fish, and are thrown

away or used as manure. As applied to grain “offal” is used of grains too small or light for use for flour, and also in flour milling of the husk or bran of wheat with a certain amount of flour attaching, sold for feeding beasts (see Flour).

OFFENBACH, JACQUES (1810-1880), French composer of oplra bouffe, was born at Cologne, of German Jewish parents, on the 21st of June 1819. His talent for music was developed at a very early age; and in 1833 he was sent to Paris to study the violoncello at the conservatoire, where, under the care of Professor Vaslin, he became a fairly good performer. In 1834 he became a member of the orchestra of the Op6ra Comique; and he turned his opportunities to good account, so that eventually he was made conductor at the Theatre Francais. There, in 1848, he made his first success as a composer in the Chanson de Fortunio in Alfred de Musset’s play Le Chandelier. From this time forward his life became a ceaseless struggle for the attainment of popularity. His power of production was apparently inexhaustible. His first complete work, Pepito, was produced at the Opera Comique in 1853. This was followed by a crowd of dramatic pieces of a light character, which daily gained in favour with Parisian audiences, and eventually effected a complete revolution in the popular taste of the period. En- couraged by these early successes, Offenbach boldly undertook the delicate task of entirely remodelling both the form and the style of the light musical pieces which had so long been welcomed with acclamation by the frequenters of the smaller theatres in Paris. With this purpose in view he obtained a lease of the Theatre Comte in the Passage Choiseul, reopened it in 1855 under the title of the Bouffes Parisiens, and night after night attracted crowded audiences by a succession of brilliant, humorous trifles. Ludovic Halevy, the librettist, was associated with him from the first, but still more after i860, when Halevy obtained Henri Meilhac’s collaboration (see Halevy). Beginning with Les Deux Aveugles and Le Violoneux, the series of Offenbach’s operettas was rapidly continued, until in 1867 its triumph culminated in La Grande Duchesse de Gerolstein, perhaps the most popular opera bouffe that ever was written, not excepting even his Orphee aux enfers, produced in 1858. From this time forward the success of Offenbach’s pieces became an absolute certainty, and the new form of Optra bouffe, which he had gradually endowed with as much consistency as it was capable of assuming, was accepted as the only one worth cultivating. It found imitators in Lecocq and other aspirants of a younger generation, and Offenbach’s works found their way to every town in Europe in which a theatre existed. Tuneful, gay and exhilarating, their want of refinement formed no obstacle to their popularity, and

perhaps even contributed to it. In 1866 his own connexion with the Bouffes Parisiens ceased, and he wrote for various

theatres. In twenty-five years Offenbach produced no less than sixty-nine complete dramatic works, some of which were in three or even in four acts. Among the latest of these were Le Docteur Ox, founded on a story by Jules Verne, and La Boite au lait, both produced in 1877, and Madame Favart (1879). Offenbach died at Paris on the 5th of October 1880.

OFFENBACH, a town of Germany, in the grand-duchy of Hesse, on the left bank of the Main, 5 m. S.E. of Frankfort-on- Main, with which it is connected by the railway to Bebra and by a local electric line. Pop. (1905) 58,806, of whom about 20,000 were Roman Catholics and 1400 Jews. The most interest- ing building in the town is the Renaissance chateau of the counts of Isenburg. Offenbach is the principal industrial town of the duchy, and its manufactures are of the most varied description. Its characteristic industry, however, is the manufacture of portfolios, pocket-books, albums and other fancy goods in leather. The earliest mention of Offenbach is in a document of 970. In i486 it came into the possession of the counts of Isenburg, who made it their residence in 1685, and in 1816, when their lands were mediatized, it was assigned to Hesse. It owes its prosperity in the first place to the industry of the French Protestant refugees who settled here at the end of the 17th, and the beginning of the 18th century, and in the second place to the accession of Hesse to the German Zollverein in 1828.

See Jost, Offenbach am Main in Vergangenheit und Gegenwart (Offenbach, 1901); Hager, Die Lederwareninduslrie in Offenbach (Karlsruhe, 1905). ,

OFFENBURG, a town of Germany, in the grand-duchy of Baden, 27 m. by rail S.W. of Baden, on the river Kinzig. Pop. (1905) 15,434. It contains a statue of Sir Francis Drake, a mark of honour due to the fact that Drake is sometimes regarded as having introduced the potato into Europe. The chief industries of the town are the making of cotton, linen, hats, malt, machinery, tobacco and cigars and glass. Offenburg is first mentioned about 1 100. In 1223 it became a town; in 1248 it passed to the bishop of Strassburg; and in 1289 it became an imperial free city. Soon, however, this position was lost, but it was regained

about the middle of the 16th century, and Offenburg remained a free city until 1802, when it became part of Baden. In 1632 it was taken by the Swedes, and in 1689 it was destroyed by the French.

See Walter, Kurzer Abriss der Geschichte der Reichsstadt Offenburg (Offenburg, 1896).

OFFERTORY (from the ecclesiastical Lat. offertorium, Fr. offertoire, a place to which offerings were brought), the alms of a congregation collected in church, or at any religious service. Offertory has also a special sense in the services of both the English and Roman churches. It forms in both that part of the Communion service appointed to be said or sung, during the collection of alms, before the elements are consecrated. In music, an offertory is the vocal or instrumental setting of the offertory sentences, or a short instrumental piece played by the organist while the collection is being made.

OFFICE (from Lat. ojficium, ” duty,” ” service,” a shortened form of opifacium, from facere, ” to do,” and either the stem of opes, ” wealth,” ” aid,” or opus, ” work “), a duty or service, particularly the special duty cast upon a person by his position ; also a ceremonial duty, as in the rites paid to the dead, the ” last offices.” The term is thus especially used of a religious service, the ” daily office ” of the English Church or the ” divine office ” of the Roman Church (see Breviary). It is also used in this sense of a service for a particular occasion, as the Office for the Visitation of the Sick, &c. From the sense of duty or function, the word is transferred to the position or place which lays on the holder or occupier the performance of such duties. This leads naturally to the use of the word for the buildings or the separate rooms in which the duties are performed, and for the staff carrying on the work or business in such offices. In the Roman curia the department of the Inquisi- tion is known as the Holy Office, in full, the Congregation of the Holy Office of the Inquisition (see Inquisition and Curia Romana).

Offices of Profit. — The phrase ” office of profit under the crown ” is used with a particular application in British parliamentary practice. The holders of such offices of profit have been subject in regard to the occupation of seats in the House of Commons to certain disabilities which were in their origin due to the fear of the undue influence exercised by the crown during the constitu- tional struggles of the 17th century. Attempts to deal with the danger of the presence of ” place-men ” in the House of Commons were made by the Place Bills introduced in 1672-1673, 1694 and 1743. The Act of Settlement 1700 (§ 3) laid it down that no person who has an office or place of profit

under the king or receives a pension from the crown shall be capable of serving as a member of the House of Commons. This drastic clause, which would have had the disastrous effect of entirely separating the executive from the legislature, was repealed and the basis of the present law was laid down in 1706 by 6 Anne (c. 41). This first disqualifies (§ 24) from membership all holders of ” new offices,” 1 i.e. those created after October 1705; secondly (§ 25) it renders void the election of a member who shall accept any office of profit other than ” new offices ” but allows the member to stand for re-election. The disqualification attaching to many ” new offices ” has been removed by various statutes, and by § 52 of the Reform Act 1867 the necessity of re-election is avoided when a member, having been elected subsequent to the accept- ance of any office named in a schedule of that act, is transferred to any other office in that schedule. The rules as to what offices disqualify from membership or render re-election necessary are exceedingly complicated, depending as they do on a large number of statutes (see Erskine May, Parliamentary Practice, nth ed., pp. 632-645, and Rogers, On Elections, vol. ii., 1906). The old established rule that a member, once duly elected, cannot resign his seat is evaded by the acceptance of certain minor offices (see Chiltern Hundreds) .

OFFICERS. Historically the employment of the word ” officer ” to denote a person holding a military or naval com- mand as representative of the state, and not as deriving his authority from his own powers or privileges, marks an entire change in the character of the armed forces of civilized nations. Originally signifying an official, one who performs an assigned duty (Lat. officium), an agent, and in the 15th century actually meaning the subordinate of such an official (even to-day a constable is so called), the word seems to have acquired a military signific- ance late in the 16th century. 2 It was at this time that armies, though not yet ” standing,” came to be constituted almost exclusively of professional soldiers in the king’s pay. Mercen- aries, and great numbers of mercenaries, had always existed, and their captains were not feudal magnates. But the bond between mercenaries and their captains was entirely personal, and the bond between the captain and the sovereign was of the nature of a contract. The non-mercenary portion of the older armies was feudal in character. It was the lord and not a king’s officer who commanded it, and he commanded in virtue of his rights, not of a warrant or commission.

European history in the late 15th century is the story of the victory of the crown over the feudatories. The instrument of the crown was its army, raised and commanded by its deputies. But these deputies were

still largely soldiers of fortune and, in the higher ranks, feudal personages, who created the armies them- selves by their personal influence with the would-be soldier or the unemployed professional fighting man. Thus the first system to replace the obsolete combination of feudalism and ” free companies ” was what may be called the proprietary system. Under this the colonel was the proprietor of his regiment, the captain the proprietor of his company. The king accepted them as his officers, and armed them with authority to raise men, but they themselves raised the men as a rule from experienced soldiers who were in search of employment, although, like

1 This section also disqualifies colonial governors and deputy governors and holders of certain other offices.

2 At sea the relatively clear partition of actual duties amongst the authorities of a ship brought about the adoption of the term ” officer ” somewhat earlier.

Falstaff, some captains and colonels ” misused the King’s press damnably.” All alike were most rigorously watched lest by showing imaginary men on their pay-sheets they should make undue profits. A ” muster ” was the production of a number of living men on parade corresponding to the number shown on the pay-roll. An inspection was an inspection not so much of the efficiency as of the numbers and the accounts of units. A full account of these practices, which were neither more nor less prevalent in England than elsewhere, will be found in J. W. Fortescue’s History of the British Army, vol. i. So faithfully was the custom observed of requiring the showing of a man for a man’s pay, that the grant of a special allowance to officers administering companies was often made in the form of allowing them to show imaginary John Does and Richard Roes on the pay-sheets.

The next step was taken when armies, instead of being raised for each campaign and from the qualified men who at each recruiting time offered themselves, became ” standing ” armies fed by untrained recruits. During the late 17th and the 18th centuries the crown supplied the recruits, and also the money for maintaining the forces, but the colonels and captains re- tained in a more or less restricted degree their proprietorship.

Thus, the profits of military office without its earlier burdens were in time of peace considerable, and an officer's commission had therefore a " surrender value." The practice of buying and selling commissions was a natural consequence, and this continued long after the system of proprietary regiments and companies had disappeared. In England " purchase " endured until 1873, nearly a hundred years after it had ceased on the continent of Europe and more than fifty after the clothing, feeding and pay- ment of the soldiers had been taken out of the colonels' hands. The purchase system, it should be mentioned, did not affect artillery and engineer officers, either in England or in the rest of Europe. These officers, who were rather semi-civil than military officials until about 1715, executed an office rather than a command — superintended gun-making, built fortresses and so on. As late as 1780 the right of a general officer promoted from the Royal Artillery to command troops of other arms was challenged. In its original form, therefore, the proprietary system was a most serious bar to efficiency. So long as war was chronic, and self-trained recruits were forthcoming, it had been a good working method of devolving responsibility. But when drill' and the handling of arms became more complicated, and, above all, when the supply of trained men died away, the state took recruiting out of the colonels' and captains' hands, and, as the individual officer had now nothing to offer the crown but his own potential military capacity (part of which resided in his social status, but by no means all), the crown was able to make him, in the full sense of the word, an officer of itself. This was most fully seen in the reorganization of the French army by Louis XIV. and Louvois. The colonelcies and captaincies of horse and foot remained proprietary offices in the hands of the nobles but these offices were sinecures or almost sinecures. The colonels, in peace at any rate, were not expected to do regimental duty. They were at liberty to make such profits as they could make under a stringent inspection system. But they were expected to be the influential figure-heads of their regiments and to pay large sums for the privilege of being proprietors. This classifica- tion of officers into two bodies, the poorer which did the whole of the work, and the richer upon which the holding of a com- mission conferred an honour that birth or wealth did not confer, marks two very notable advances in the history of army organiza- tion, the professionalization of the officer and the creation of the prestige attaching to the holder of a commission because he holds it and not for any extraneous reason.

The distinction between working and quasi-honorary officers was much older, of course, than Louvois's reorganization. Moreover it extended to the highest ranks. About 1600 the "general" of a

European army 1 was always a king, prince or nobleman. The lieutenant-general, by custom the com- mander of the cavalry, was also, as a rule, a noble, in 1 Except in the Italian republics.

virtue of his command of the aristocratic arm. But the commander of the foot, the ” sergeant-major-general ” or ” major-general,” was invariably a professional soldier. It was his duty to draw up the army (not merely the foot) for battle, and in other respects to act as chief of staff to the general. In the infantry regiment, the ” sergeant-major ” or ” major ” was second-in-command and adjutant combined. Often, if not always, he was promoted from amongst the lieutenants and not the (proprietary) captains. The lieutenants were the back- bone of the army.

Seventy years later, on the organization of the first great standing army by Louvois, the ” proprietors,” as mentioned above, were reduced to a minimum both in numbers and in military importance. The word “major” in its various meanings had come, in the French service, to imply staff functions. Thus the sergeant-major of infantry became the ” adjudant-major.” The sergeant-major-general, as commander of the foot, had disappeared and given place to numerous lieutenant-generals and ” brigadiers,” but as chief of the staff he survived for two hundred years. As late as 1870 the chief of staff of a French army bore the title of ” the major- general.”

Moreover a new title had come into prominence, that of ” marshal ” or ” field marshal.” This marks one of the most important points in the evolution of the military officer, his classification by rank and not by the actual command he holds. In the 1 6th century an officer was a lieutenant of, not in, a particular regiment, and the higher officers were general, lieutenant-general and major-general of a particular army. When their army was disbanded they had no command and possessed therefore no rank— except of course when, as was usually the case, they were colonels of permanent regiments or governors of fortresses. Thus in the British army it was not until late in the 18th century that general officers received any pay as such. The introduction of a distinctively military rank 2 of “marshal” or “field marshal,” which took place in France and the empire in the first years of the 17th century, meant the establishment of a list of general officers, and the list spread downwards through the various regimental ranks, in proportion as the close proprietary system broke up, until it became the general army list of an army of to-day. At first field marshals were merely officers of high rank and experience, eligible for appointment to the offices of general, lieutenant- general, &c, in a particular army. On an army being formed, the list of field

marshals was drawn upon, and the necessary number appointed. Thus an army of Gustavus Adolphus's time often included 6 or 8 field marshals as subordinate general officers. But soon armies grew larger, more mobile and more flexible and more general officers were needed. Thus fresh grades of general arose. The next rank below that of marshal, in France, was that of lieutenant-general, which had formerly implied the second-in-command of an army, and a little further back in history the king's lieutenant-general or military viceroy. 3 Below the lieutenant-general was the marSchal de camp, the heir of the sergeant-major-general. In the imperial service the ranks were field marshal and lieutenant field marshal (both of which survive to the present day) and major-general. A further grade of general officer was created by Louis XIV., that of brigadier, and this completes the process of evolution, for the regimental system had already provided the lower titles.

The ranks of a modern army, with slight variations in title, are therefore as follows:

(a) Field marshal: in Germany, Generalfeldmarschall; in Spain "captain-general"; in France (though the rank is in abeyance) " marshal." The marshals of France, however, were neither so few in number nor so restricted to the highest commands as are marshals elsewhere. In Germany a new rank, " colonel-general "

2 The title was, of course, far older.

3 In England, until after Marlborough's death, rank followed command and not vice versa. The first field marshals were the duke of Argyll and the earl of Cadogan. Marlborough's title, or rather office, was that of captain-general.

(Generaloberst), has come into existence — or rather has been revived 1 —of late years. Most of the holders of this rank have the honorary style of general-field-marshal. 2

(b) General: in Germany and Russia, "general of infantry," " general of cavalry," " general of artillery." In Austria generals of artillery and infantry were known by the historic title of Feldzeug- meister (ordnance-master) up to 1909, but the grade of general of infantry was created in that year, the old title being now restricted to generals of artillery. In France the highest grade of general officer is the "

general of division.” In the United States army the grade of full ” general ” has only been held by Washington, Grant, Sherman and Sheridan.

(c) Lieutenant-general (except in France) : in Austria the old title of lieutenant field marshal is retained. In the United States army the title ” lieutenant-general,” except within recent years, has been almost as rare as ” general.” Winfield Scott was a brevet lieutenant- general. The substantive rank was revived for Grant when he was placed in command of the Union Army in 1864. It was abolished as an American rank in 1907.

(d) Major-general (in France, general of brigade): this is the highest grade normally found in the United States Army, generals and lieutenant-generals being promoted for special service only. 3

(e) Brigadier-general, in the United States and (as a temporary rank only) in the British services.

The above are the five grades of higher officers. To all intents and purposes, no nation has more than four of these five ranks, while France and the United States, the great republics, have only two. The correspondence between rank and functions cannot be exactly laid down, but in general an officer of the rank of lieutenant-general commands an army corps and a major-general a division. Brigades are commanded by major-generals, brigadier-generals or colonels. Armies are as a rule commanded by field marshals or full generals. In France generals of division command divisions, corps, armies and groups of armies.

The above are classed as general officers. The ” field officers ” (French qfficiers sup&rieurs, German Stabsoffiziere) are as follows :

(a) Colonel. — This rank exists in its primitive significance in every army. It denotes a regimental commander, or an officer of corresponding status on the staff. In Great Britain, with the ” linked battalion ” system, regiments of infantry do not work as units, and the executive command of battalions, regiments of cavalry and brigades of field artillery is in the hands of lieutenant-colonels. Colonels of British regiments who are quasi-honorary (though no longer proprietary) chiefs are royal personages or general officers. Colonels in active employment as such are either on the staff, commanders of brigades or corresponding units, or otherwise extra- regimentally employed.

(b) Lieutenant-colonel: in Great Britain “the commanding officer ” of a

unit. Elsewhere, where the regiment and not the battalion is the executive unit, the lieutenant-colonel sometimes acts as second in command, sometimes commands one of the bat- talions. In Russia all the battalion leaders are lieutenant-colonels.

(c) Major. — This rank does not exist in Russia, and in France is replaced by chef de bataillon or chef d'escadron, colloquially commandant. In the British infantry he preserves some of the characteristics of the ancient " sergeant-major," as a second in command with certain administrative duties. The junior majors command companies. In the cavalry the majors, other than the second-in- command, command squadrons; in the artillery they command batteries. In armies which have the regiment as the executive unit, majors command battalions ("wings" of cavalry, "groups" of artillery).

Lastly the " company officers " (called in France and Germany subaltern officers) are as follows: —

(a) Captain (Germany and Austria, Hauptmann, cavalry Ritt- meister) : in the infantry of all countries, the company commander. In Russia there is a lower grade of captain called " staff -captain," and in Belgium there is the rank of " second-captain." In all countries except Great Britain captains command squadrons and batteries. Under the captain, with such commands and powers as are delegated to them, are the subalterns, usually graded as—

1 The 16th-century " colonel-general " was the commander of a whole section of the armed forces. In France there were several colonels-general, each of whom controlled several regiments, or indeed the whole of an " arm." Their functions were rather those of a war office than those of a troop-leader. If they held high commands in a field army, it was by special appointment ad hoc. Colonels-general were also proprietors in France of one company in each regiment, whose services they accepted.

2 In Russia the rank of marshal has been long in abeyance.

3 In the Confederate service the grades were general for army commanders, lieutenant-general for corps commanders, major- general for divisional commanders and brigadier-general for brigade commanders.

(6) Lieutenant (first lieutenant in U.S.A., Oberleutnant in Germany and Austria).

(c) Sub-lieutenant (second-lieutenant in Great Britain and U.S.A.,

Leutnant in Germany and Austria).

(d) Aspirants, or probationary young officers, not of full commissioned status.

The continental officer is on an average considerably older, rank for rank, than the British; but he is neither younger nor older in respect of command. In the huge ” universal service ” armies of to-day, the regimental officer of France or Germany commands, in war, on an average twice the number of men that are placed under the British officer of equal rank. Thus a German or French major of infantry has about 900 rifles to direct, while a British major may have either half a battalion, 450, or a double company, 220; a German captain commands a company of 250 rifles as against an English captain’s no and so on. At the same time it must be remembered that at peace strength the continental battalion and company are maintained at little more than half their war strength, and the under-officering of European armies only makes itself seriously felt on mobilization.

It is different with the questions of pay and promotion, which chiefly affect the life of an army in peace. As to the former (see also Pensions) the Continental officer is paid at a lower rate than the British, as shown by the table of ordinary pay per annum (without special pay or allowances) below: —

Lieutenant-colonel l . Major 1 . . . . . .

Captain 1

Oberleutnant (Lieutenant) x .

Second Lieutenant (Leutnant,

Sous-lieutenant) l . . .

Great Britain.

328 248 210 118

94

France.

263

224

139 to 200 101 to 120

93

Germany.

292

292

150 to 195

78

45 to 60

1 Infantry, lowest scale, other arms and branches higher, often considerably higher.

It must be noted that in France and Germany the major is a battalion commander, corresponding to the British lieutenant- colonel. But the significance of this table can only be realized when it is remembered that promotion is rapid in the British army and very slow in the others. The senior Oberleutnants' of the German army are men of 37 to 38 years of age; the senior captains 47 to 48. In 1908 the youngest captains were 36, the youngest majors 45 years of age. As another illustration, the captain's maximum pay in the French army, £10 per annum less than a British captain's, is only given after 12 years' service ' in that rank, i.e. to a man of at least twenty years' service. The corresponding times for British regular officers in 1905 (when the effects of rapid promotions during the South African War were still felt) were 6 to 75 years from first commission to promotion to captain, and 14 to 19 years from first commission to promotion to major. In 1908, under more normal conditions, the times were 7 to 8j years to captain, 15 to 20 to major. In the Royal Engineers and the Indian army a subaltern is auto- matically promoted captain on completing 9 years' commissioned service, and a captain similarly promoted major after 18.

The process of development in the case of naval officers (seeNAVY) presents many points of similarity, but also considerable differences. For from the first the naval officer could only offer to serve on the king's ship: he did not build a ship as a colonel raised a regiment, and thus there was no proprietary system. On the other hand the naval officer was even more of a simple office-holder than his comrade ashore. He had no rank apart from that which he held in the economy

of the ship, and when the ship went out of commission the officers as well as the crew were disbanded. One feature of the proprietary system, however, appears in the navy organization; there was a marked distinction between the captain and the lieu- tenant who led the combatants and the master and the master's mate who sailed the ship. But here there were fewer " vested interests," and instead of remaining in the condition, so to speak, of distinguished passengers, until finally eliminated by the " levelling up " of the working class of officers, the lieutenants and captains were (in England) required to educate themselves thoroughly in the subjects of the sea officer's profession. When this process had gone on for two generations, that is, about 1670, the formation of a

permanent staff of naval officers was begun by the institution of half-pay for the captains, and very soon afterwards the methods of admission and early training of naval officers were systematized.

The ranks in the British Royal Navy are shown with the relative ranks of the army in the following table (taken from King's Regu- lations), which also gives some idea of the complexity of the non- combatant branches of naval officers.

Training of British Army Officers.— This may be conveniently

by the Civil Service Commissioners as to their educational qualifica- tions. This examination is competitive in so far that vacancies at the Royal Military College at Sandhurst (for Cavalry, Infantry and Army Service Corps), or the Royal Military Academy at Woolwich (for Engineers and Artillery), go to those who pass highest, if physic- ally fit. Before presenting himself for this examination, the candidate must produce a " leaving certificate " from the school at which he was educated, showing that he already possesses a fair knowledge

Corresponding Ranks.

Army.

Navy.

1. Field Marshals .

2. Generals .

3. Lieutenant-Generals

4. Major-Generals .

5. Brigadier-Generals .

6. Colonels

7. Lieutenant-Colonels

Admirals of the Fleet Admirals Vice-Admirals . Rear-Admirals .

8. Majors

Commodores

Captains of 3 years' seniority

Captains under 3 years' seniority

Commanders, but junior of that rank

Lieutenants of 8 years' seniority .

9. Captains

10. Lieutenants ….

1 1 . Second Lieutenants .

12. Higher ranks of Warrant Officers

Lieutenants under 8 years' seniority

Sub-Lieutenants

But junior of the army rank.

Erigineerˆin-Chief, if Engineer Vice-Admiral. Inspectors-General of Hospitals and Fleets. Engineer-in-Chief, if Engineer Rear-Admiral. Engineer Rear-Admiral.

Deputy Inspectors-General of Hospitals and Fleets.

Secretaries to Admirals of the Fleet.

Paymasters-in-Chief.

Engineer Captains of 8 years'seniority in that rank.

Staff Captains of 4 years' seniority.

Staff Captains under 4 years' seniority (navigating

branch). Secretaries to Commanders-in-Chief, of 5 years'

service as such. Engineer Captains under 8 years' seniority in that

rank. Fleet-Surgeons. 1 Secretaries to Commanders-in-Chief under 5 years'

service. 1 Fleet Paymasters. 1 Engineer Commanders. 1 Naval Instructors of 15 years' seniority. 1 Engineer Lieutenants of 8 years' seniority, qualified

and selected. Staff-Surgeons. Secretaries to Junior Flag Officers, Commodores, 1st

Class. Staff Paymasters and Paymaster. Naval Instructors of 8 years' seniority. Carpenter Lieutenant of 8 years' seniority. Surgeons.

Secretaries to Commodores, 2nd Class. Naval Instructors under 8 years' seniority. Engineer Lieutenant under 8 years' seniority, or

oyer if not duly qualified and selected. Assistant Paymasters of 4 years' seniority. Carpenter Lieutenant under 8 years' seniority. Assistant Paymasters under 4 years' seniority. Engineer Sub-Lieutenants. Chief Gunner. 1 Chief Boatswain. 1 Chief Carpenter. 1 Chief Artificer Engineer. 1 Chief Schoolmaster. 1 Midshipmen. 2 Clerks. 8 Gunners. 1 Boatswains. 1 Carpenters. 1 Artificer Engineer. 1 Head Schoolmaster. 1 Head Wardmaster. 1

divided into two parts: (I.) that which precedes the appointment to a commission; (II.) that which succeeds it.

I. Omitting those officers who obtain their commissions from the ranks, the training which precedes the appointment to a com- mission is subdivided into: (a) General Education; (b) Technical Instruction.

(a) General Education. — A fairly high standard of education is considered essential. Candidates from universities approved by the Army Council must have resided for three academic years at their university, and have taken a degree in any subject or group of subjects other than Theology, Medicine, Music and Commerce. A university

candidate for a commission in the Royal Artillery must further be qualified in Mathematics. The obtaining of first-class honours is considered equivalent to one year's extra service in the army, and an officer can count that year for calculating his service towards his pension. University candidates are eligible for com- missions in the Cavalry, Royal Artillery, Infantry, Indian Army and Army Service Corps. For other branches of the service special regulations are, in force.

Those candidates who have not been at a university are examined

2 But senior of the army rank.

of the subjects of examination. Candidates who fail to secure admission to these institutions, but satisfy the examiners that they are sufficiently well educated, can obtain commissions in the Special Reserve.

Candidates for commissions in the Royal Army Medical Corps and the Army Veterinary Corps are not required to pass an educational examination, the ordinary course of medical or veterinary education being deemed sufficient, but the Army Council may reject a candidate who shows any deficiency in his genera! education.

Officers of the Colonial military forces wishing to obtain com- missions in the British Army must either produce a school or college "leaving certificate" or pass an examination held by the Army Qualifying Board, or must show that they have passed one of certain recognized examinations.

(6) Technical Instruction. — In addition to general educational attainments, a fair knowledge of technical matters is expected from candidates.

For Cavalry, Infantry, Royal Engineers, Royal Artillery and Army Service Corps, an examination must be passed in administration and organization; military history, strategy and tactics; military

topography, engineering and law. In addition, the following conditions must be complied with: (i) University candidates are required to be members of the Senior Division of the Officers' Training Corps (see United Kingdom: Army) should there be a unit of that corps

at the university to which they belong. They are further required to be attached for six weeks to a Regular unit during their residence at the university. If there is no Officers' Training Corps at his university, the candidate is attached to a Regular unit for twelve weeks (consecutively or in two stages). The final examination in military subjects is competitive. (2) Cadets of the Royal Military College are instructed in the following additional subjects: sanitation, French or German (or both), riding and horse management, musketry, physical training, drill and signalling. . Hindustani may be taken instead of French or German. (3) Cadets of the Royal Military Academy are instructed in the same subjects as the cadets at the Royal Military College, with the addition of artillery, advanced mathematics, chemistry, light, heat, electricity and workshop practice. Cadets who pass highest in the final examination for commissions are as a rule appointed to the Royal Engineers, the remainder to the Royal Artillery. (4) Officers of the Special Reserve, Territorial Force and certain other forces must have completed a continuous period of attachment of twelve months to a Regular unit of Cavalry, Artillery, Engineers or Infantry, and have served and been trained for at least one year in the force to which they belong, before presenting themselves at the competitive examination in military subjects. The period of attachment to Regular units may be reduced if certain certificates are obtained. Candidates for commissions in the artillery must belong to the artillery branches of the above forces and have a certificate in riding and mathematics. They are not eligible for the Royal Engineers. (5) The conditions for Officers of the Colonial Military Forces are similar to those for the Special Reserve, &c, except that only two months' attachment to a Regular unit, or unit of the Permanent Colonial Forces, is required. (6) Commissions are also given to Cadets of the Royal Military College, Kingston, Canada; the training of that establishment being similar to that at the Royal Military College and the Royal Military Academy.

Candidates for commissions in the Royal Army Medical Corps and Army Veterinary Corps are not examined in military subjects, but must pass in the appropriate technical subjects; those for the Royal Army Medical Corps passing two written and two oral examinations, one each in medicine and surgery ; those for the Army Veterinary Corps passing a written and an oral examination in veterinary medicine, surgery and hygiene. Candidates for the Royal Army Medical Corps have further to proceed to the Royal Army Medical College for instruction in recruiting duties, hygiene, pathology, tropical medicine, military surgery and military medical administration.

Royal Engineers attend the School of Military Engineering at Chatham, where long and elaborate courses of instruction are given in all subjects appertaining to the work of the corps, including practical work in the field and in fortresses.

II. The training which succeeds the appointment to a commission consists partly of more detailed instruction in the subjects already learned, partly of the practical application of those subjects, and partly of more advanced instruction with its practical application.

On first joining his unit the young officer is put through a course of preliminary drills, lasting, as a rule, for from three months (infantry) to six months (cavalry), though the time depends upon the individual officer's rate of progress. During this period, and for some considerable time afterwards, officers are instructed in " regi- mental duties," consisting of the interior economy of a regiment, such as financial accounts, stores, correspondence, the minor points of military law in their actual working, customs of the service, the management of regimental institutes, &c, with, in the case of the mounted branches, equitation and the care and management of horses. They are required to attend a number of courts-martial, as supernumerary members, before being permitted to attend one in the effective and official capacities of member or prosecutor, although from a legal point of view their qualification depends simply upon their rank and length of service. A course of musketry, theoretical and practical, is then gone through. Field training begins with lectures on the various evolutions of the squadron, battery or company, followed by actual practice in the field, arranged by the commanders of squadrons, batteries or companies.

Before promotion from the rank of second-lieutenant to lieutenant, an examination must be passed in " Regimental Duties " (practical, oral and written) and " Drill and Field Training " (practical only). The officer is then taken in hand by the commanding officer of his regiment, battalion or brigade. He is frequently examined in the subjects in which he has already been instructed, and is practically taught the more advanced stages of topography, engineering, tactics, law and organization. The next stage consists of regimental drills, which include every kind of practical work in the field which can be done by a unit under the command of a lieutenant-colonel. After this come brigade, division and army manoeuvres. Officers have to pass examinations in military subjects for promotion until they attain the rank of major. The chief of these subjects are tactics, military topography, military engineering, military law, administration and military history. For majors, before promotion

to lieutenant-colonel, an examination in ” Tactical Fitness for Command ” has to be passed. This examination is a test of ability in commanding the ” three arms ” in the field; a course of attach- ment to the two arms to which the officer does not belong being a necessary preliminary.

Army Service Corps. — The officers of this corps have usually served for at least one year in the cavalry, infantry or Royal Marines, though commissions are also given to cadets of the Royal Military College. On joining, the officer first spends nine months on proba- tion, during which he attends lectures and practical demonstrations in the following subjects: military administration and organization generally; and as regards Army Service Corps work, in detail; organization of the Field Army and Lines of Communication; war organization and duties of the A.S.C. ; registry and care of corre- spondence; contracts; special purchases; precautions in receiving supplies, and care and issue of same; accounts, forms, vouchers and office work in general and in detail; barrack duties (including all points relating to coal, wood, turf, candles, lamps, gas, water, &c). A thorough and detailed description of all kinds of forage, bread- stuffs, meat, groceries and other field supplies is given. The lectures and demonstrations in transport include, beside mounted and dis- mounted drill, wagon drill; carriages; embarkation and disem- barkation of men and animals; entraining and detraining; harness and saddlery; transport by rail and sea, with the office work involved. This course of instruction is given at the Army Service Corps Training Establishment at Aldershot.

A satisfactory examination having been passed, the officer is permanently taken into the corps. Before promotion to captain he is examined in accounts, correspondence and contracts; judging cattle and supplies; duties of an A.S.C. officer in charge of a sub-district; interior economy of a company; military vehicles and pack animals; embarkation, disembarkation and duties on board ship; convoys; duties of brigade supply and transport officer in war. Captains, before promotion to major, are examined in lines of communication of an army in war; method of obtaining supplies and transport in war, and formation and working of depots; organization of transport in war; schemes of supply and transport for troops operating from a fixed base; duties of a staff -officer administering supply, transport and barrack duties at home. These are in addition to general military subjects.

Royal Army Medical Corps. — On completion of the course of instruction at the Royal Army Medical College, lieutenants on pro- bation proceed to the R.A.M.C. School of Instruction at Aldershot for a

two months' course in the technical duties of the corps, and at the end of the course are examined in the subjects taught. This passed, their commissions are confirmed. After eighteen months' service, officers are examined in squad, company and corps drills and exercises; the Geneva Convention; the administration, organization and equipment of the army in its relation to the medical services; duties of wardmasters and stewards in military hospitals and returns, accounts and requisitions connected therewith; duties of executive medical officers; military law. These successful candi- dates are then eligible for promotion to captain. Before promotion to major the following examination must be passed, after a course of study under such arrangements as the director-general of the Army Medical Service may determine: (1) medicine, (2) surgery, (3) hygiene, (4) bacteriology, (5) one out of seven special subjects named, and (6) military law. The examination for promotion from major to lieutenant-colonel embraces army medical organization in peace and war; sanitation of towns, camps, transports, &c. ; epidemiology and the management of epidemics; medical history of important campaigns; the Army Medical Service of the more important powers; the laws and customs of war, so far as they relate to the sick and wounded ; and a tactical problem in field medical adminis- tration. Officers who pass these examinations with distinction are eligible for accelerated promotion.

Army Ordnance Department. — An officer of this department must have had at least four years' service in other branches of the army and must have passed for the rank of captain. They are then eligible to present themselves at an elementary examination in mathe- matics, - after passing which they attend a one year's course at the Ordnance College, Woolwich. The course comprises the following: (a) Gunnery (including principles of gun construction and practical optics); (b) Materiel, guns, carriages, machine guns, small arms and ammunition of all descriptions; (c) Army Ordnance Duties (functions of the corps; supply, receipt and issue of stores, &c); (d) Machinery; (e) Chemistry and Metallurgy; (/) Electricity. An advanced course follows in which officers take up any two of the subjects of applied mathematics, chemistry and electricity, combined with either small arms, optics or mechanical design. They are then appointed to the department and hold their appointments for four years, with a possible extension of an additional three years.

Army Veterinary Corps. — A candidate on appointment as veterinary officer, on joining at Aldershot, undergoes a course of special training at the Army Veterinary School. The course lasts one year, and consists of (a) hygiene; conformation of the foot and shoeing, conformation, points, colours, markings; stable construction and management ;

management of horses in the open and q{ large bodies of sick; saddles and sore backs; collars and sore shoulders; bits and bitting; transport by sea and rail; mules, donkeys, camels

and oxen; remount depots; training of army horses; marching. (b) Diseases met with specially on active service, (c) Military etiquette and ethics; accounts and returns; administration and organization; veterinary hospitals, mobilization, map-reading and law. At the end of the course he is examined, and if found satis- factory, is retained in the service. Before promotion to captain he is examined in the duties of executive veterinary officers and in law: before promotion to major, in medicine, surgery, hygiene, bacteriology and tropical diseases, and in one special subject selected by the candidate; and before promotion to lieutenant -colonel, in law, duties of administrative veterinary officers at home and abroad, management of epizootics, sanitation of stables, horse-lines and transports.

Army Pay Department. — Officers are appointed to the department, on probation for a period not exceeding one year, after serving for five years in one of the other arms or branches of the service. At the end of this period the candidates are examined in the following subjects: examination of company pay lists and pay and mess book; method of keeping accounts and preparing balance-sheets and monthly estimates; knowledge of pay- warrant, allowance regulations and financial instructions, book-keeping, by double entry and the. duties attending the payment of soldiers; aptitude for accounts, and quickness and neatness in work. On completion of five years' service, officers return to their regiments, unless they elect to remain with the department or are required by the Army Council to be permanently attached to it.

Schools and Colleges. — The training of the officer in his regiment is necessarily incomplete, owing to a far wider knowledge of his pro- fession in general, and of his own branch of the service in particular, being essential, than can be acquired within the comparatively confined limits of his own unit. Accordingly, schools and colleges have been established, in which special courses of instruction are given, dealing more fully with the generalities and details of the various branches of the service.

There is a cavalry school at Netheravon.

Mounted Infantry schools have been established at Longmoor, Bulford and Kilworth, which train both officers and men in mounted infantry duties. The officers selected to be trained at these schools must have at least two years' service, have completed a trained soldier's course of musketry and should have some knowledge of horsemanship and be able to ride. The instruction consists for the most part of riding school and field training.

The School of Gunnery at Shoeburyness gives five courses of instruction per annum; one " Staff " course for Ordnance officers, lasting one month; two courses for senior officers of the Royal Artillery, lasting a fortnight each, and two courses for junior officers of the same regiment, lasting one month each. For Royal Garrison Artillery officers there is one " Staff " course lasting for seven months (this being a continuation of tne previous "Staff " course), and two courses, lasting four months each, for junior officers. There is also a school of gunnery at Lydd, where two courses, lasting for three weeks each, in siege artillery, are given each year.

The Ordnance College at Woolwich provides various courses of instruction in addition to those intended for officers of the Ordnance Department. There is a " Gunnery Staff Course " for senior officers, in gunnery, guns, carriages, ammunition, electricity and machinery ; two courses for junior officers of the Royal Artillery in the same subjects ; a course for officers of the Army Service Corps in mechanical transport, which includes instruction in allied subjects, such as electricity and chemistry. It also gives courses of instruction to officers of the Royal Navy.

The School of Military Engineering at Chatham trains officers of the Royal Engineers, compiles official text-books on field defences, attack and defence of fortresses, military bridging, mining, encamp- ments, railways.

The School of Musketry at Hythe (besides assisting and directing the musketry training of the army at large by revising regulations, experiments, &c.) trains officers of all branches of the service in theoretical and practical musketry, the courses lasting about a month each and embracing fire control, the training of the eye in quick perception, fire effect and so on. Courses in the Maxim gun usually follow.

The Staff College (see also Staff) at Camberley is the most im- portant of the military colleges. Only specially selected officers are eligible to attempt the entrance examination. The course lasts two years, and is

divided into: (a) military history, strategy, tactics, imperial strategy, strategic distribution, coast defence, fortification, war organization, reconnaissance; (b) staff duties, administration, peace distribution, mobilization, movements of troops by land and sea, supply, transport, remounts, organization, law and topographical reconnaissance. Visits are paid to workshops, fortresses, continental battlefields, &c, and staff tours are carried out. Officers of the non-mounted branches attend riding school, and students can be examined in any foreign languages they may have previously studied. They are also attached for short periods to arms of the service other than those to which they belong, and attend at staff offices to ensure their being conversant with the work done there.

The Army Service Corps Training Establishment at Aldershot gives courses of instruction to senior officers of the corps at which

a limited number of officers of other corps may attend, provided they have passed through or been recommended for the Staff College. Other courses, in addition to the nine months' course for officers on probation for the corps are, one of twelve days for senior officers of the corps in mechanical transport; two (one long and one short) in the same subject for other officers; one for officers in other branches of the service in judging provisions; and one for lieutenants of the Royal Army Medical Corps in supply and transport.

Other colleges and schools are: the Balloon School at Farn- borough, for officers of the Royal Engineers; Schools of Electric Lighting at Plymouth and Portsmouth; the School of Signalling at Aldershot, for officers of all branches of the service; the School of Gymnastics, also at Aldershot; and the Army Veterinary School, where a one month's course is given to officers of the mounted branches in the main principles of horsemastership, stable manage- ment and veterinary first aid, in addition to the one year's course for officers on probation for the Army Veterinary Corps.

To encourage the study of foreign languages, officers who pass a preliminary examination in any language they may select are allowed to reside in the foreign country for a period of at least two months. After such residence they may present themselves for examination, and if successful, receive a grant in aid of the expenses incurred. The grant is £80 for Russian, £50 for German, £24 for French and £30 for other languages. The final or " Interpretership " examina- tion for which the grant is given is of a very high standard. In the case of Russian, £80 is paid to the officer during his residence in Russia, in addition to the grant. Special arrangements are made with regard to

the Chinese and Japanese languages; three officers for the former and four officers for the latter being selected annually for a two years' residence in those countries. During such residence officers receive £150 per annum, in addition to their pay, and a reward of £175 on passing the " Interpretership " examination.

There has been a tendency of late years to give officers facilities for going through civilian courses of instruction; for example, at the London School of Economics and in the workshops of the principal railway companies. These courses enable the officer not only to profit by civilian experience and progress, but also to form an opinion as to his own knowledge, as compared with the knowledge of those outside his immediate surroundings.

Promotion from the Ranks. — In several armies aspirant officers may join as privates and pass through all grades. This is hardly promotion from the ranks, however, because it is understood from the first that the young avantageur, as he is called in Germany, is a candidate for officer's rank, and he is treated accordingly generally living in the officers' mess and spending only a brief period in each of the non-commissioned ranks. True promotion from the ranks, won by merit and without' any preferential treatment, is practically unknown in Germany. In France, on the other hand, one-third of the officers are promoted non-commissioned officers. In Italy also a large proportion of the officers comes from the ranks. In Great Britain, largely owing to the chances of distinction afforded by frequent colonial expeditions, a fair number of non-commissioned officers receive promotion to combatants' commissions. The number is, however, diminishing, as shown by the following extracts from a return of 1909 (combatants only) : —

1 885-1 888 annual average 34 (Sudan Wars, &c.)

1889-1892 " " 25

1893-1898 " " 19

1899-1902 " " 35 (S. African War)

1903-1908 " " 14

Quartermasters and riding masters are invariably promoted from the lower ranks.

Officers of reserve and second line forces are recruited in Great Britain both by direct appointment and by transfer from the regular forces. In

universal service armies reserve officers are drawn from retired regular officers, selected non-commissioned officers, and most of all from young men of good social standing who are gazetted after serving their compulsory period as privates in the ranks.

Foreign Armies

The training of the officer of a foreign army differs very slightly from that of the British officer. Each country specializes according to its individual requirements, but in the main the training is much the same.

Germany. — The Germans attend more closely to detail — being even microscopical — and it has been said that a little grit in the German military machine would cause a cessation of its working. Unfortunately for this argument, the German army has not yet given any signs of cessation of work, so few deviations from the smooth working of the military machine being permitted that the introduction of grit into this air-tight casing is practically impossible. At the same time, the German officer is trained to have initiative and to use that initiative, but he is expected to be discreet in the use of it and consequently undue insistence on literal obedience to instructions (as distinct from formal orders), and undue reticence on the part of senior, especially staff, officers is held to be dangerous, in that the regimental officer, if ignorant of the military situation, may, by acts of initiative out of harmony with the general plan, seriously prejudice

the issue. The Germans attach special importance to instruction in the tactical handling of artillery.

Italy. — The Italians make a speciality of horsemanship, their cavalry officers studying for two years at the cavalry school at Modena ; later at the school at Pinerolo, and later still at the school at Tor di Quinto. They also attach much importance to mountain warfare.

France. — The formal training of the French officer does not appear to differ seriously from that of the British officer, with this exception, that as one-third or so of French officers are promoted from the non-commissioned ranks, a great feature of the educational system is the group of schools comprising the Saumur (cavalry), St Maixent (infantry) and Versailles (artillery and engineers), which are intended for under-officer candidates for commissions. The generality of the

officers comes from the ” special school ” of St. Cyr (infantry and cavalry) and the Hcole Polytechnique (artillery and engineers).

(R.J. G.)

United States. — The principal source from which officers are supplied to the army is the famous Military Academy at West Point, N.Y. The President may appoint forty cadets and generally chooses sons of army and navy officers. Each senator and each representa- tive and delegate in Congress may appoint one. These appointments are not made annually, but as vacancies occur through graduation of cadets, or their discharge before graduation. The maximum number of cadets under the Twelfth Census is 533. The commanding officer of the academy has the title of superintendent and commandant. He’is detailed from the army, and has the temporary rank of colonel. The corps of cadets is organized as a battalion, and is commanded by an officer detailed from the army, having the title of commandant of cadets. He has the temporary rank of lieutenant-colonel. An officer of engineers and of ordnance are detailed as instructors of practical military engineering and of ordnance and gunnery respec- tively. The heads of the departments of instruction have the title of professors. They are selected generally from officers of the army, and their positions are permanent. The officers above mentioned and the professors constitute the academic board. The military staff and assistant instructors are officers of the army. The course of instruction covers four years and is very thorough. Theoretical instruction comprises mathematics, French, Spanish, English, drawing, physics, astronomy, chemistry, ordnance and gunnery, art of war, civil and military engineering, law (international, con- stitutional and military), history and drill regulations of all arms. Practical instruction comprises the, service drills in infantry, cavalry and artillery, surveying, reconnaissances, field engineering, construc- tion of temporary bridges, simple astronomical observations, fencing, gymnastics and swimming. Cadets are a part of the army, and rank between second lieutenants and the highest grade of non- commissioned officers. They receive from the government a rate of pay sufficient to cover all necessary expenses at the academy. About 50 % of those entering are able to complete the course. The graduating class each year numbers, On an average, about 60. A class, on graduating, is arranged in order according to merit, and its members are assigned as second lieutenants to corps and arm, according to the recommendation of the academic board. A few at the head of the class go into the corps of engineers ; the next in order generally go into the artillery, and the rest of the class into the cavalry and infantry. The choice of graduates as to arm of service and regiments is consulted as far as practicable.

Any enlisted man who has served honestly and faithfully not less than two years, who is between twenty-one and thirty years of age, unmarried, a citizen of the United States and of good moral character, may aspire to a commission. To obtain it he must pass an educational and physical examination before a board of five officers. This board must, also inquire as to the character, capacity and record of the candidate. Many well-educated young men, unable to obtain appointments to West Point, enlist in the army for the express purpose of obtaining a commission. Vacancies in the grade of second lieutenant remain- ing, after the graduates of the Military Academy and qualified enlisted men have been appointed, are filled from civil life. To be eligible for appointment a candidate must be a citizen of the United States, unmarried, between the ages of twenty-one and twenty- seven years, and must be approved by an examining board of five officers as to habits, moral character, physical ability, education and general fitness for the service. In time of peace very few appointments from civil life are made, but in time of war there is a large number.

There are, in addition to the Engineer School at Washington, D.C. four service schools for officers. These are: the Coast Artillery School at Fort Monroe, Virginia; the General Service and Staff College at Fort Leavenworth, Kansas; the Mounted Service School at Fort Riley, Kansas; the Army Medical School at Wash- ington. The commandants, staffs and instructors at these schools are officers specially selected. The garrison at Fort Monroe is composed of several companies of coast artillery. The lieutenants of these companies, who constitute the class, are relieved and replaced by others on 1st September of each year. The course of instruction comprises the following subjects: artillery, ballistics, engineering, steam and mechanics, electricity and mines, chemistry and explosives, military science, practical military exercises, photography, telegraphy and cordage (the use of ropes, the making of various kinds of knots

and lashings, rigging shears, &c, for the handling of heavy guns). July and August of each year are ordinarily devoted to artillery target practice. The course at the General Service and Staff College is for one year in each School. The class of student officers is made up of one lieutenant from each regiment of infantry arid tavalry, and such others as may be detailed. They are assigned to the organizations comprising the garrison, normally a regiment of infantry, a squadron (four troops) of cavalry and a battery of field artillery. The departments of instruction are: military art, engineering, law, infantry, cavalry, military hygiene. Much attention is paid to practical work in the minor operations of war, the troops of the garrison being utilized in

connexion therewith. At the close of the final examinations of each class at Fort Monroe and Fort Leavenworth, those officers most distinguished for proficiency are reported to the adjutant-general of the army. Two from each class of the Artillery School, and not more than five from each class at the General Service and Staff College, are thereafter, so long as they remain in the service, noted in the annual army register as ” honour graduates.” The work of the Mounted Service School at Fort Riley is mainly practical, .and is carried on by the regular garrison, which usually, in time of peace, consists of two squadrons of cavalry and three field batteries, T ne government reservation at Fort Riley comprises about 40 sq. m. of varied terrain, so that opportunities are afforded, and taken advantage of, for all kinds of field operations. The Army Medical School is established at Washington. The faculty consists of four or more instructors selected from the senior officers of the medical department. The course of instruction covers a period of five months, beginning annually in November. The student officers are recently appointed medical officers, and such other medical officers, available for detail, as may desire to take the course. In- struction is by lecture and practical work, special attention being given to the following subjects: duties of medical officers in peace and war; hospital administration; military medicine, surgery and hygiene; microscopy and bacteriology; hospital corps drill and first aid to the wounded. (W. A. S.)

OFFICIAL (Late Lat. officialis, for class. Lat. apparitor, from officium, office, duty), in general any holder of office under the state or a public body. In ecclesiastical law the word ” official ” has a special technical sense as applied to the official exercising a diocesan bishop’s jurisdiction as his representative and in his name (see Ecclesiastical Jurisdiction). The title of ” official principal,” together with that of ” vicar-general,” is in England now merged in that of ” chancellor ” of a diocese (see Chancellor).

OFFICINAL, a term applied in medicine to drugs, plants and herbs, which are sold in chemists’ and druggists’ shops, and to medical preparations of such drugs, &c, as are made in accord- ance with the prescriptions authorized by the pharmacopoeia. In the latter sense, modern usage tends to supersede ” officinal ” by ” official.” The classical Lat. officina meant a workshop, manufactory, laboratory, and in medieval monastic Latin was applied to a general store-room (see Du Cange, Gloss., s.v.); it thus became applied to a shop where goods were sold rather than a place where things were made.

OGDEN, a city and the county-seat of Weber county, Utah, U.S.A., at the confluence of the Ogden and Weber rivers, and about 3.5 m. N. of

Salt Lake City. Pop. (1890) 14,889; (1900) I 6,3i3, of whom 3302 were foreign-born; {1910 census) 25,580. It is served by the Union Pacific, the Southern Pacific, the Oregon Short Line, and the Denver & Rio Grande railways. It is situated at an elevation of about 4300 ft. in the picturesque region of the Wasatch Range, Ogden Canon and the Great Salt Lake. Ogden is in an agricultural and fruit-growing region, and gold and silver are mined in the vicinity. It has various manufactures, and the value of the factory product increased from $1,242,214 in 1900 to $2,997,057 in 1905, or 141-3%. Ogden, which is said to have been named in honour of John Ogden, a trapper, was laid out under the direction of Brigham Young in 1850, and was incorporated in the next year; in 1861 it received a new charter, but since 1898 it has been governed under a general law of the state.

OGDENSBURG, a city and port of entry of St Lawrence county, New York, U.S.A., on the St Lawrence river, at the mouth of the Oswegatchie, 140 m. N. by E. of Syracuse, New York. Pop. (1890) 11,662; (1900) 12,633, oi whom 3222 were foreign-born; (190:0 census) 15,933. It is served by the New York Central & Hudson River and the Rutland railways, and by several lake and river steamboat lines connecting with ports on the Great Lakes, the city being at the head of lake navigation

on the St Lawrence. Steam ferries connect Ogdensburg with Prescott, Ontario. The city is the seat of the St Lawrence State Hospital for the Insane (1890), and has a United States Customs House and a state armoury. The city became the see of a Roman Catholic bishop in 1872, and here Edgar Philip Wadhams (1817- 1891) laboured as bishop in 1872-1891. It is the port of entry of the Oswegatchie customs district, and has an extensive commerce, particularly in lumber and grain. The city has various manufactures, including lumber, flour, wooden-ware, brass-ware, silks, woollens and clothing. The value of the factory products increased from $2,260,889 in 1900 to $3,057,271 in 1905, or 35-2%. The site of Ogdensburg was occupied in 1749 by the Indian settlement of La Presentation, founded by the Abbe Francois Piquet (1 708-1 781) for the Christian converts of the Iroquois. At the outbreak of the War of Independence the British built here Fort Presentation, which they held until 1796, when, in accordance with the terms of the Jay Treaty, the garrison was withdrawn. Abraham Ogden (1 743-1 798), a prominent New Jersey lawyer, bought land here, and the settlement which grew up around

the fort was named Ogdensburg. During the early part of the War of 1812 it was an important point on the American line of defence. On the 4th of October 1 81 2 Colonel Lethbridge, with about 750 men, prepared to attack Ogdensburg but was driven off by American troops 1 under General Jacob Brown. On the 22nd of February 1813 both fort and village were captured and partially destroyed by the British. During the Canadian rising of 1837-1838 Ogdensburg became a rendezvous of the insurgents. Ogdensburg was incorporated as a village in 181 8, and was chartered as a city in 1868.

OGEE (probably an English corruption of Fr. ogive, a diagonal groin rib, being a moulding commonly employed; equivalents in other languages are Lat. cyma-reversa, Ital. gola, Fr. cymaise, Ger. Kehlleisten) , a term given in. architecture to a' moulding of a double curvature, convex and concave, in which the former is the uppermost (see Moulding). The name "ogee-arch" is often applied to an arch formed by the meeting of two con- trasted ogees (see Arch).

OGIER THE DANE, a hero of romance, who is identified with the Frankish warrior Autchar (Autgarius, Auctarius, Otgarius, Oggerius) of the old chroniclers. In 771 or 772 Autchar accom- panied Gerberga, widow of Carloman, Charlemagne's brother, and her children to the court of Desiderius, king of the Lombards, with whom he marched against Rome. In 773 he submitted to Charles at Verona. He finally entered the cloister of St Faro at Meaux, and Mabillon {Acta SS. ord. St Benedicti, Paris, 1677) has left a description of his monument there, which had figures of Ogier and his friend Benedict or Benoit, with smaller images of Roland and la belle Aude and other Carolingian personages. In the chronicle of the Pseudo Turpin it is stated that innumer- able cantilenae were current on the subject of Ogier, and his deeds were probably sung in German as well as in French. The Ogier of romance may be definitely associated with the flight of Gerberga and her children to Lombardy, but it is not safe to assume that the other scattered references all relate to the same individual. Colour is lent to the theory of his Bavarian origin by the fact that he, with Duke Naimes of Bavaria, led the Bavarian contingent to battle at Roncesvaux.

In the romances of the Carolingian cycle he is, on account of his revolt against Charlemagne, placed in the family of Doon de Mayence, being the son of Gaufrey de " Dannemarche." The Enfances Ogier of Adenes le Rois, and the Chevalerie Ogier de Dannemarche of Raimbert de Paris, are doubtless based on earlier chansons. The Chevalerie is divided into twelve songs or branches. Ogier, who was the hostage for his father at Charle- magne's court, fell into disgrace, but regained the

emperor's favour by his exploits in Italy. One Easter at the court of Laon, however, his son Balduinet was slain by Charlemagne's son, Chariot, with a chess-board (cf. the incident of Renaud and Bertholais in the Quatre Fils Aymon). Ogier in his rage slays the queen's nephew Loher, and would have slain Charlemagne himself but for the intervention of the knights, who connived

at his flight to »Lombardy. In his stronghold of Castelfort he resisted the imperial forces for seven years, but was at last taken prisoner by Turpin, who incarcerated him at Reims, while his horse Broiefort, the sharer of his exploits, was made to draw stones at Meaux. He was eventually released to fight the Saracen chief Brehus or Braihier, whose armies had ravaged France, and who had defied Charlemagne to single combat. Ogier only consented to fight after the surrender of Chariot, but the prince was saved from his barbarous vengeance by the intervention of St Michael. The giant Brehus, despite his 17 ft. of stature, was overthrown, and Ogier, after marrying an English princess, the daughter of Angart (or Edgard), king of England, received from Charlemagne the fiefs of Hainaut and Brabant.

A later romance in Alexandrines (Brit. Mus. MS. Royal 15 E vi.) contains marvels added from Celtic romance. Six fairies visit ,his cradle, the sixth, Morgan la Fay, promising that he shall be her lover. He has a conqueror's career in the East, and after two hundred years in the " castle " of Avalon returns to France in the days of King Philip, bearing a firebrand on which his life depends. This he destroys when Philip's widowed queen wishes to marry him, and he is again carried off by Morgan la Fay. The prose romance printed at Paris in 1498 is a version of this later poem. The fairy element is prominent in the Italian legend of Uggieri il Danese, the most famous redaction being the prose Libro dele balaglie del Danese (Milan, 1498), and in the English Famous and renowned history of Morvine, son to Oger the Dane, translated by J. M. (London, 1612). The Spanish Urgel was the hero of Lope de Vega's play, the Marques de Mantua. Ogier occupies the third branch of the Scandinavian Karlamagnus saga; his fight with Brunamont {Enfances Ogier) was the subject of a Danish folk-song; and as Holger Danske he became a Danish national hero, who fought against the German Dietrich of Bern (Theodoric " of Verona "), and was invested with the common tradition of the king who sleeps in a mountain ready to awaken at need. Whether he had originally anything to do with Denmark seems doubtful. The surname le Danois has been explained as a corruption of 1'Ardennois and Dannemarche as the marches of the Ardennes.

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OGILBY, JOHN (1600-1676), British writer, was born in or near Edinburgh in November 1600. His father was a prisoner within the rules of King’s Bench, but by speculation the son found money to apprentice himself to a dancing master and to obtain his father’s release. He accompanied Thomas Wentworth, earl of Strafford, when he went to Ireland as lord deputy, and became tutor to his children. Strafford made him deputy-master of the revels, and he built a little theatre in St Werburgh Street, Dublin, which was very successful. The outbreak of the Civil War ruined his fortunes, and in 1646 he returned to England. Finding his way to Cambridge, he learned Latin from kindly scholars who had been impressed by his industry. He then ventured to translate Virgil into English verse (1649-1650), which brought him a considerable sum of money. The success of this attempt encouraged Ogilby to learn Greek from David Whitford, who was usher in the school kept by James Shirley the dramatist. Homer his Iliads translated . . . appeared in 1660, and in 1665 Homer his Odysses translated . . . Anthony a. Wood asserts that in these undertakings he had the assistance of Shirley. At the Restoration Ogilby received a commission for the ” poetical part ” of the coronation. His property was destroyed in the Great Fire of 1666, but he rebuilt his house in Whitefriars, and set up a printing press, from which he issued

many magnificent books, the most important of which were a series of atlases, with engravings and maps by Hollar and others. He styled himself ” His Majesty’s Cosmographer and Geographic Printer.” He died in London on the 4th of September 1676.

Ogilby also translated the fables of Aesop, and wrote three epic poems. His bulky output was ridiculed by John Dryden in Mac-

Flecknoe and by Alexander Pope in the Dunciad.

OGILVIE (or Ogilby), JOHN (c. 1580-1615), English Jesuit, was born in Scotland and educated mainly in Germany, where he entered the Society of Jesus, being ordained priest at Paris in 1613. As an emissary of the society he returned to Scotland in this year disguised as a soldier, and in October 1614 he was arrested in Glasgow. He defended himself stoutly when he was tried in Edinburgh, but he was condemned to death and was hanged on the 28th of February 161 5.

A True Relation of the Proceedings against John Ogilvie, a Jesuit (Edinburgh, 1615), is usually attributed to Archbishop Spottiswoode. See also James Forbes, L'Eglise catholique en Ecosse: martyre de Jean Ogilvie (Paris, 1885) ; and W. Forbes-Leith, Narratives of Scottish Catholics (1885).

OGILVY, the name of a celebrated Scottish family of which the earl of Airlie is the head. The family was probably descended from a certain Gillebride, earl of Angus, who received lands from William the Lion. Sir Walter Ogilvy (d. 1440) of Lintrathen, lord high treasurer of Scotland from 1425 to 1431, was the son of Sir Walter Ogilvy of Wester Powrie and Auchterhouse, a man, says Andrew of Wyntoun, " stout and manfull, bauld and wycht," who was killed in 1392. He built a castle at Airlie in Forfarshire, and left two sons. The elder of these, Sir John Ogilvy (d. c. 1484), was the father of Sir James Ogilvy (c. 1430-c. 1504), who was made a lord of parliament in 1491; and the younger, Sir Walter Ogilvy, was the ancestor of the earls of Findlater. The earldom of Findlater, bestowed on James Ogilvy, Lord Ogilvy of Deskford, in 1638, was united in 1711 with the earldom of Seafield and became dormant after the death of James Ogilvy, the 7th earl, in October 181 1 (see Sea- field, Earls of).

Sir James Ogilvy's descendant, James Ogilvy, 5th Lord Ogilvy of Airlie (c. 1541-1606), a son of James Ogilvy, master of Ogilvy, who was killed at the battle of Pinkie in 1547, took a leading part in Scottish politics during the reigns of Mary and of James VI. His grandson, James Ogilvy (c. 1 593-1666), was created earl of Airlie by Charles I. at York in 1639. A loyal partisan of the king, he joined Montrose in Scotland in 1644 and was one of the royalist leaders at the battle of Kilsyth. The destruction of the earl's castles of Airlie and of Forther in 1640 by the earl of Argyll, who " left him not in all his lands a cock to crow day," gave rise to the song " The bonny house o'Airlie." His eldest son, James, the 2nd earl (c. 161 5-c. 1704) also fought among the royalists in Scotland; in 1644 he was taken prisoner, but he was released in the following year as a consequence of Montrose's victory

at Kilsyth. He was again a prisoner after the battle of Philiphaugh and was sentenced to death in 1646, but he escaped from his captivity at St Andrews and was after- wards pardoned. Serving with the Scots against Cromwell he became a prisoner for the third time in 165 1, and was in the Tower of London during most of the years of the Commonwealth. He was a fairly prominent man under Charles II. and James II., and in 1689 he ranged himself on the side of William of Orange. This earl's grandson, James Ogilvy (d. 1731), took part in the Jacobite rising of 171 5 and was attainted; consequently on his father's death in 171 7 he was not allowed to succeed to the earldom, although he was pardoned in 1725. When he died his brother John (d. 1761) became earl dejure, and John's son David (1725-1803) joined the standard of Prince Charles Edward in 1 745. He was attainted, and after the defeat of the prince at Culloden escaped to Norway and Sweden, afterwards serving in the French army, where he commanded " le regiment Ogilvy " and was known as " le bel Ecossais." In 1778 he was pardoned and was allowed to return to Scotland, and his family became extinct when his son David died unmarried in April 181 2. After this event David's cousin, another David Ogilvy

(1 785-1 849), claimed the earldom. He asserted that he was unaffected by the two attainders, but the House of Lords decided that these barred his succession; however, in 1826 the attainders were reversed by act of parliament and David became 6th earl of Airlie. He died on the 20th of August 1849 and was succeeded by his son, David Graham Drummond Ogilvy (1826- 1881), who was a Scottish representative peer for over thirty years. The latter's son, David Stanley William Drummond Ogilvy, the 8th earl (1856-1900), served in Egypt in 1882 and 1885, and was killed on the nth of June 1900 during the Boer War while at the head of his regiment, the 12th Lancers. His titles then passed to his son, David Lyulph Gore Wolseley Ogilvy, the 9th earl (b. 1893).

A word may be said about other noteworthy members of the Ogilvy family. John Ogilvy, called Powrie Ogilvy, was a political adventurer who professed to serve King James VI. as a spy and who certainly served William Cecil in this capacity. Mariota Ogilvy (d. 1575) was the mistress of Cardinal Beaton. Sir George Ogilvy (d. 1663), a supporter of Charles I. during the struggle with the Covenanters, was created a peer as lord of Banff in 1642; this dignity became dormant, or extinct, on the death of his descendant, William Ogilvy, the 8th lord, in June 1803. Sir George Ogilvy of Barras (d. c. 1679) defended Dunnottar Castle against Cromwell in 1651 and 1652, and was instrumental in preventing the regalia of Scotland from falling into his hands; in 1660 he was created a baronet, the title becoming extinct in

1837.

See Sir R. Douglas, Peerage of Scotland, new ed. by Sir J. B. Paul (1904 fol.).

OGIVE (a French term, of which the origin is obscure; auge, trough, from Lat. augere, to increase, and an Arabic astrological word for the ” highest point.” have been suggested as derivations), a term applied in architecture to the diagonal ribs of a vault. In France ‘ the name is generally given to the pointed arch, which has resulted in its acceptance as a title for Gothic archi- tecture, there often called ” le style ogival.”

OGLETHORPE, JAMES EDWARD (1696-1785), English general and philanthropist, the founder of the state of Georgia, was born in London on the 21st of December 1696, the son of Sir Theophilus Oglethorpe (1650-1702) of Westbrook Place, Godalming, Surrey. He entered Corpus Christi College, Oxford, in 1 7 14, but in the same year joined the army of Prince Eugene. Through the recommendation of the duke of Marlborough he became aide-de-camp to the prince, and he served with distinction in the campaign against the Turks, 1716-17, more especially at the siege and capture of Belgrade. After his return to England he was in 1722 chosen member of parliament for Haslemere. He devoted much attention to the improvement of the circum- stances of poor debtors in London prisons; and for the purpose of providing an asylum for persons who had become insolvent, and for oppressed Protestants on the continent, he projected the settlement of a colony in America between Carolina and Florida (see Georgia). In 1745 Oglethorpe was promoted to the rank of major-general. His conduct in connexion with the Scottish rebellion of that year was the subject of inquiry by court- martial, but he was acquitted. In 1765 he was raised to the rank of general. He died at Cranham Hall, Essex, on the 1st of July 1785. ‘

Sir Theophilus Oglethorpe, the father, had four sons and four daughters, James Edward being the youngest son, and another James (b. 1688) having died in infancy. Of the daughters, Anne Henrietta (b. 1680-1683), Eleanor (b. 1684) and Frances Charlotte (Bolingbroke’s ” Fanny Oglethorpe “) may be specified as having played rather curious parts in the Jacobitism of the time; their careers are described in the essay on ” Queen Oglethorpe ” byˆliss A. Shield and A. Lang, in the latter’s Historical Mysteries (1904).

OGOW£, one of the largest of the African rivers of the second class, rising in 3 S. in the highlands known as the Crystal range, and flowing

N.W. and W. to the Atlantic, a little south of the equator, and some 400 m. following the coast, north of the mouth of the Congo. Its course, estimated at 750 m., lies wholly within the colony of Gabun, French Congo. In spite of its considerable size, the river is of comparatively little use for navigation, as

rapids constantly occur as it descends the successive steps of the interior tablelands. The principal obstructions are the falls of Dume, in 13 E.; Bunji, in 12 35'; Chengwe, in 12° 16'; Boue, in 1 1° 53′ ; and the rapids formed in the passes by which it breaks through the outei chains of the mountainous zone, between 10J and nf° E. In its lower course the river passes through a lacustrine region in which it sends off secondary channels. These channels, before reuniting with the main stream, traverse a series of lakes, one north, the other south, of the river. These lakes are natural regulators of the river when in flood. The Ogow6 has a large number of tributaries, especially in its upper course, but of these few are navigable. The most important are the Lolo, which joins on the south bank in 12 20′ E., and the Ivindo, which enters the Ogowe a few miles lower down. Below the Ivindo the largest tributaries are the Ofowe, 400 yds. wide at its mouth (n° 47′ E.), but unnavigable except in the rains, and the Ngunye, the largest southern tributary, navigable for 60 m. to the Samba or Eugenie Falls. Apart from the narrow coast plain the whole region of the lower Ogowe is densely forested. It is fairly thickly populated by Bantu tribes who have migrated from the interior. The fauna includes tht ,gorilla and chimpanzee.

The Ogowe rises in March and April, and again in October and November; it is navigable for steamers in its low- water condition as far as the janction of the Ngunye. At flood time the river can be ascended by steamers for a distance of 235 m. to a place called N'Jole. The first person to explore the valley of the Ogowe was Paul du Chaillu, who travelled in the country during 1857-1859. The extent of the delta and the immense volume of water carried by the river gave rise to the belief that it must either be a bifurcation of the Congo or one of the leading rivers of Africa. However, in 1882 Savorgnan de Brazza (the founder of French Congo) reached the sources of the river in a rugged, sandy and almost treeless plateau, which forms the watershed between its basin and that of the Congo, whose main stream is only 140 m. distant. Since that time the basin of the Ogowe has been fully explored by French travellers.

OGRE, the name in fairy tales and folk-lore of a malignant- monstrous giant who lives on human flesh. The word is French, and occurs first in Charles Perrault's Histoires ou contes du temps passi (1697). The first English use is in the translation of a French version of the Arabian Nights in 1713, where it is spelled hogre. Attempts have been made to connect the word with Ugri, the racial name of the Magyars or Hungarians, but it is generally accepted that it was adapted into French from the O. Span, huerco, huergo, uergo, cognate with Ital. orco, i.e. Orcus, the Latin god of the dead and the infernal regions (see Pluto) , who in Romance folk-lore became a man-eating demon of the woods.

OGYGES, or Ogygus, in Greek mythology, the first king of Thebes. During his reign a great flood, called the Ogygian deluge, was said to have overwhelmed the land. Similar legends were current in Attica and Phrygia. Ogyges is variously described as a Boeotian autochthon, as the son of Cadmus, or of Poseidon.

O'HAGAN, THOMAS O'HAGAN, ist Baron (1812-1885), lord chancellor of Ireland, was born at Belfast, on the 29th of May 181 2. He was educated at Belfast Academical Institution, and was called to the Irish bar in 1836. In 1840 he removed to Dublin, where he appeared for the repeal party in many political trials. _His advocacy of a continuance of the union with England, and his appointment as solicitor-general for Ireland in 1861 and attorney-general in the following year, lost him the support of the Nationalist party, but he was returned to parliament as member for Tralee in 1863. In 1865 he was appointed a judge of common pleas, and in 1868 became lord chancellor of Ireland in Gladstone's first ministry. He was the first Roman Catholic to hold the chancellorship since the reign of James II., an act throwing open the office to Roman Catholics having been passed in 1867. In 1870 he was raised to the peerage, and held office until the resignation of the ministry in 1874. In 1880 he again became lord chancellor on Gladstone's return to office, but resigned in

1881. He died in London on the ist of February 1885, and was succeeded by his eldest son, Thomas Towneley (1878-1900), and then by another son, Maurice Herbert Towneley (b. 1882).

O'HIGGINS, BERNARDO (1778-1842), one of the foremost leaders in the Chilean struggle for independence and head of the first permanent national government, was a natural son of the Irishman Ambrosio O'Higgins, governor of Chile (1 788-1 796), and was born at Chilian on the 20th of August 1778. He was educated in England, and after a visit to Spain he lived quietly on his estate in Chile till the revolution

broke out. Joining the nationalist party led by Martinez de Rozas, he distinguished himself in the early fighting against the royalist troops despatched from Peru, and was appointed in November 1813 to supersede J. M. Carrera in command of the patriot forces. The rivalry that ensued, in spite of O'Higgins's generous offer to serve under Carrera, eventually resulted in O'Higgins being isolated and overwhelmed with the bulk of the Chilean forces at Rancagua in 1814. O'Higgins with most of the patriots fled across the Andes to Mendoza, where Jose de San Martin (q.v.) was prepar- ing a force for the liberation of Chile. San Martin espoused O'Higgins's part against Carrera, and O'Higgins, recognizing the superior ability and experience of San Martin, readily consented to serve as his subordinate. The loyalty and energy with which he acted under San Martin contributed not a little to the organiza- tion of the liberating army, to its transportation over the Andes, and to the defeat of the royalists at Chacabuco (1817) and Maipo (1818). After the battle of Chacabuco O'Higgins was entrusted with the administration of Chile, and he ruled the country firmly and well, maintaining the close connexion with the Argentine, co-operating loyally with San Martin in the preparation of the force for the invasion of Peru, and Seeking, as far as the confusion and embarrassments of the time allowed, to improve the welfare of the people. After the overthrow of the Spanish supremacy in Peru had freed the Chileans from fear of attack, an agitation set in for constitutional government. O'Higgins at first tried to maintain his position by calling a congress and obtaining a constitution which invested him with dictatorial powers. But popular discontent grew in force; risings took place in Concepcion and Coquimbo, and on the 28th of January 1823 O'Higgins was finally patriotic enough to resign his post of director-general, without attempting to retain it by force. He retired to Peru, where he was granted an estate and lived quietly till his death on the 24th of October 1842.

See B. Vicuna Machenna, Vida de O'Higgins (Santiago, 1882), and M. L. Armunategni, La Dictadura.de O'Higgins (Santiago, 1853) ; both containing good accounts of O'Higgins's career. Also P. B. Figueroa, Diccionario biogrdfico de Chile, 1550-1887 (Santiago, 1888), and J. B. Suarez, Rasgos biogrdficos de hombres notables de Chile (Valparaiso, 1886).

OHIO, a north central state of the United States of America, lying between latitudes 38 27′ and 41 57′ N. and between longitudes 80° 34′ and 84° 49′ W. It is bounded N. by Michigan and Lake Erie, E. by Pennsylvania and by the Ohio river which separates it from West Virginia, S. by the Ohio river which separates it from West Virginia

and Kentucky, and W. by Indiana. The total area is 41,040 sq. m., 300 sq. m. being water surface.

Pkysiography.ˆ-The state lies on the borderland between the Prairie Plains and the Alleghany Plateau. The disturbances among the underlying rocks of Ohio have been slight, and originally the surface was a plain only slightly undulating; stream dissection changed the region to one of numberless hills and valleys; glacial drift then filled up the valleys over large broken areas, forming the remarkably level till plains of north- western Ohio ; but at the same time other areas were broken by the uneven distribution of the drift, and south-eastern Ohio, which was unglaciated, retains its rugged hilly character, gradually merging with the typical plateau country farther S.E. The average elevation of the state above the sea is about 850 ft., but extremes vary from 425 ft. at the confluence of the Great Miami and Ohio rivers in the S.W. corner to 1540 ft. on the summit of Hogues Hill about ij m. E. of Bellefontaine in the west central part.

The main water-parting is formed by a range of hills which are composed chiefly of drift and extend W.S.W. across the state from ‘ Trumbull county in the N.E. to Darke county, or about the middle of the W. border. North of this water-parting the rivers flow into Lake Erie; S. of it into the Ohio river. Nearly all of the streams in the N.E. part of the state have a rapid current. Those that flow directly into the lake are short, but some of the rivers of this region, such as the Cuyahoga and the Grand, are turned by drift ridges into circuitous courses and flow through narrow valleys With numerous falls and rapids. Passing the village of Cuyahoga Falls the Cuyahoga river descends more than 200 ft. in 3 m.; a part of its course is between walls of sandstone 100 ft. 01 more in height, and near its mouth, at Cleveland, its bed has been cut down through 60 ft. of drift. In the middle N. part of the state the Black, Vermilion and Huron rivers have their sources in swamps on the water-parting and flow directly to the lake through narrow valleys. The till plains of north-western Ohio are drained chiefly by the Maumee and San- dusky rivers, with their tributaries, and the average fall of the Maumee is only i-i ft. per mile, while that of the Sandusky decreases from about 7 ft. per mile at Upper Sandusky to 2-5 ft. per mile below Fremont. South of the water-parting the average length of the rivers is greater than that of those N. of it, and their average fall per mile is much less. In the S.W. the Great Miami and Little Miami rivers have uniform falls through basins that

are decidedly rolling and that contain the extremes of elevation for the entire state. The central and S. middle part is drained by the Scioto river and its tributaries. The basin of this river is formed mostly in Devonian shale, and is bounded on the W. by a limestone rim and on the E. by preglacial valleys filled with glacial drift. In its middle portion the basin is about 40 m. wide and only moderately rolling, but toward the mouth of the river the basin becomes narrow and is shut in by high hills. In the E. part of Ohio the Muskingum river and its tributaries drain an area of about 7750 sq. m. or nearly one-fifth of the entire state. Much of the unglacial or driftlesg portion of the state is embraced within its limits, and although the streams now have a gentle or even sluggish flow, they have greatly broken the surface of the country. The upper portion of the basin is about 100 m. in width, but it becomes quite narrow below Zanesville. The Ohio river flows for 436 m. through a narrow valley on the S. border of the state, and Lake Erie forms the N. boundary for a' distance of 230 m. At the W. end of the lake are Sandusky and Maumee bays, each with a good natural harbour. In this vicinity also are various small islands of limestone formation which are attractive summer resorts. On Put-in-Bay Island are some interesting "hydration " caves, i.e. caves formed by the uplifting and folding of the rocks while gypsum was forming beneath, followed by the partial collapse of those rocks when the gypsum passed ir.to solution. Ohio has no large lakes within its limits, but there are several small ones on the water-parting, especially in the vicinity of Akron and Canton, and a few laige reservoirs in the W. central section.

Fauna. — Bears, wolves, bison, deer, wild turkeys and wild pigeons were common in the primeval forests of Ohio, but they long ago disappeared. Foxes are still found in considerable numbers in suitable habitats; opossums, skunks and raccoons are plentiful in some parts of the state; and rabbits and squirrels are still numerous. AH the song-birds and birds of prey of the temperate zone are plentiful. Whitefish, bass, trout and pickerel are an important food supply obtained from the waters of the lake, and some perch, catfish and sunfish are caught in the rivers and brooks.

Flora. — Ohio is known as the " Buckeye State " on account of the prevalence of the buckeye (Aesculus glabra). The state was originally covered with a dense forest mostly of hardwood timber, and although the merchantable portion of this has been practically all cut away, there, are still undergrowths of young timber and a great variety of trees. The white oak is the most common, but there are thirteen other varieties of oak, six of hickory, five of ash, five of poplar, five of pine, three of elm, three of birch, two of locust and two of cherry. Beech,

black walnut, butternut, chestnut, catalpa, hemlock and tamarack trees are also common. Among native fruits ˆire the blackberry, raspberry, elderberry, cranberry, wild plum and pawpaw (Asimina triloba). Buttercups, violets, anemones, spring beauties, trilliums, arbutus, orchids, columbine, laurel, honeysuckle, golden rod and asters are common wild flowers, and of ferns there are many varieties.

Climate. — The mean annual temperature of Ohio is about 51 ° F.; in the N., 49-5°, and in the S., 53-5°. But except where influenced by Lake Erie the temperature is subject to great extremes; at Coalton, Jackson county, in the S.fc-. part of the state, the highest recorded range of extremes is from 104 to — 38° or 142 ; at Wauseon, Fulton county, near the N.W. corner, it is from 104 to —32° or 136°; while at Toledo on the lake shore the range is only from 99° to — 16 or 1 1 5° F. July is the warmest month, and in most parts of the state January is the coldest; in a few valleys, however, February has a colder record than January. The normal annual precipitation for the entire state is 38-4 in. It is greater in the S.E. and least in the N.W. At Marietta, for example, it is 42-1 in., but at Toledo it is only 30-8 in. Nearly 60% of it comes in the spring and summer. The average annual fall of snow is about 37 in. in the N. and 22 in. in the S. The prevailing winds in most parts' are westerly, but sudden changes, as well as the extremes of temperature, are caused

\ rnainly by the frequent shifting of the wind from N.W. to S.W. I and from S.W. to N.W. At Cleveland and Cincinnati the winds I blow mostly from the S.E.

Soil. — In the driftless area, the S.E. part of the state, the soil is largely a decomposition of the underlying rocks, and its fertility varies according to their composition; there is considerable lime- stone in the E. central portion, and this renders the soil very pro- ductive. In the valleys also are strips covered with a fertile alluvial deposit. In the other parts of the state* the soil is composed mainly of glacial drift, and is generally deep and fertile. It is deeper and more fertile, however, in the basins of the Great Miami and Little Miami rivers, where there is a liberal mixture of decomposed limestone arid where extensive areas with a clay subsoil are covered with alluvial deposits. North of the lower course of the Maumee river is a belt of sand, but Ohio drift generally contains a large mixture of clay. Agriculture. — Ohio ranks high as an agricultural state. Of its total land surface 24ˆ01,820 acres or nearly 94% was, in 1900, included in farms and 78-5 % of all the farm land was improved. There were altogether 276,719 farms; of these 93,028 contained less than 50 acres, 182,802 contained less than 100 acres, 150,060 con- tained less than 175

acres, 26,659 contained 175 acres or more, and 164 contained 1000 acres or more. The average size of the farms decreased from 125-2 acres in 1850 to 99-2 acres in 1880 and 88-5 acres in 1900. Nearly seven-tenths of the farms were worked in I900 by owners or part owners, 24,051 were Worked by cash tenants, 51,880 were worked by share tenants, and 1969 were worked by negroes as owners, tenants or managers. There is a great variety of produce, but the principal crops are Indian corn, wheat, oats, hay, potatoes, apples and tobacco. In 1900 the acreage of cereals con- stituted 68-4 % of the acreage of all crops, and the acreage of Indian corn, wheat and oats constituted 99-3% of the total acreage of cereals. The Indian corn crop was 67,501,144 bushels in 1870; 152,055,390 bushels in 1899 and 153,062,000 in 1909, when it was grown on 3,875,000 acres and the state ranked seventh among the states of the Union in the production of this cereal. The wheat Crop was 27,882,159 bushels in 1870; 50,376,800 bushels (grown on 3,209,014 acres) in 1899; and 23,532,000 bushels (grown on 1,480,000 acres) in 1909. The oat crop was 25,347,549 bushels in 1870; 42,050,910 bushels (grown on 1,115,149 acres) in 1899; and 56,225,000 bushels (grown on 1,730,000 acres) in 1909. The barley crop decreased from 1,715,221 bushels in 1870 to 1,053,240 bushels in 1899 and 829,000 bushels in 1909. The number of swine was 1,964,770 in 1850; 3,285,789 in 1900; and 2,047,000 in 1910. The number of cattle was 1,358,947 in 1850; 2,117,925 in 1900; and 1,925,000 in 1910. In 1900 there were 868,832 and in 1910 947,000 milch cows in the state. The number of sheep decreased slightly between 1870 and 1900, when there were 4,030,021; in 19,16 there were 3,203,000 sheep in the state. The number of horses was 463,397 in 1850; 1,068,170 in 1900; and 977,000 in 1910. The cultivation of tobacco was of little importance in the state until about 1840; but the product increased from 10,454,449 lb in 1850 to 34,735,235 lb in 1880, and to 65,957,100 lb in 1899, when the crop was grown on 71,422 acres; in 1909 the crop was 83,250,000 lb, grown on 90,000 acres. The value of all farm products in 1899 was $257,065,826. Indian corn, wheat and oats are grown in all parts, but the W. half of the state produces about three-fourths of the Indian corn and two-thirds of the wheat, and in the N. half, especially in the N.W. corner, are the best pat-producing counties. The N.E. quarter ranks highest in the production of hay. Domestic animals are evenly distributed throughout the state; in no county was their total value, in June 1900, less than $500,000, and in only three counties (Licking, Trumbull and Wood) did their value exceed $2,000,000; in 73 counties their value exceeded $1,000,000, but was less than $2,000,000. Dairying and the production of eggs are also important industries in all sections. Most of the tobacco is grown

in the counties on or near the S.W. border.

Fisheries. — Commercial fishing is important only in Lake Erie. In 1903 the total catch there amounted to 10,748,986 lb, valued at $317,027. Propagation facilities are being greatly improved, and tl \ere are stringent laws for the protection of immature fish. Inland streams and lakes are well supplied with game fish; state laws prohibit the sale of game fish and their being taken, except with hook and line.

Mineral Products. — The mineral wealth of Ohio consists largely of bituminous coal and petroleum, but the state also ranks high in the production of natural gas, sandstone, limestone, grindstone, lime and gypsum. The coal fields, comprising a total area of 10,000 sq. m. or more, are in the E. half of the state. Coal was discovered here as early as 1770, and the mining of it was begun not later than 1828, but no accurate account of the output was kept until 1872, in which year it was 5,315,294 short tons; this was increased to 18,988,150 short tons in 1900, and to 26,270,639 short tons in 1908— in 1907 it was 32,142,419 short tons. There are 29 counties in which coal is produced, but 81-4% of it in 1908 came from Belmont, Athens, Jefferson, Guernsey, Perry, Hocking, Tuscarawas and Jackson counties. Two of the most productive petroleum fields of the United States are in part in Ohio ; the Appalachian field in the E. and S. parts of the state, and the Lima-Indiana field in the N.W. part. Some petroleum was obtained in the S.E. as early as 1859, but the state's output was comparatively small until after petroleum

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was discovered in the N.W. in 1884; in 1883 the output was only 47,632 barrels, four years later it was 5,022,632 barrels, and in 1896 it was 23,941,169 barrels, or 39% of the total output in the United States. For the next ten years, however, there was a decrease, and in 1908 the output had fallen to 10,858,797 barrels, of which 6,748,676 barrels (valued at $6,861,885) was obtained in the Lima district, 4,109,935 barrels (valued at $7,315,667) from the south- east district, and 186 barrels (valued at $950), suitable for lubricat- ing purposes, from the Mecca-Belden district in Trumbull and Lorain counties.

Natural gas abounds in the eastern, central and north-western parts of the state. That in the E. was first used in 1866, the N.W. field was opened in 1884, and the central field was opened in 1887. The value of the state's yearly flow increased steadily from $100,000 in 1885 to $5,215,669 in 1889, decreased from the latter year to $1,171,777 in 1897, and then increased to $8,244,835 in 1908. Some of the best sandstone in the United States is obtained from Cuyahoga and Lorain counties; it is exceptionally pure in texture (about 97% being pure silica), durable and evenly coloured light buff, grey or blue grey. From the Ohio sandstone known as Berea grit a very large portion of the country's grindstones and pulpstones has been obtained; in 1908 the value of Ohio's output of these stones was $482,128. Some of the Berea grit is also suitable for making oilstones and scythestones. Although the state has a great amount of limestone, especially in Erie and Ottawa counties, its dull colour renders it unsuitable for most building purposes. It is, however, much used as a flux for melting iron and for making quick lime. The quantity of Portland cement made in Ohio increased from 57,000 barrels in 1890 to, 563,113 barrels in 1902 and to 1,521,764 barrels in 1908. Beds of rock gypsum extend over an area of 150 acres or more in Ottawa county. There is some iron ore in the eastern and south-eastern parts of the state, and the mining of it was begun early in the 19th century; but the output decreased from 254,294 long tons in 1889 to only 26,585 long tons (all carbonate) in 1908. Ohio, in 1908, produced 3,427,478 barrels of_ salt valued at $864,710. Other valuable minerals are clay suitable for making pottery, brick and tile (in 1908 the value of the clay working products was $26,622,490) and sand suitable for making glass. The total value of the state's mineral products in 1908 amounted to $134,499,335.

Manufactures. — The total value of the manufactures increased from $348,298,390 in 1880 to $641,688,064 in 1890, and to $832,438,113 in 1900. The value of the factory product was $748,670,855 in 1900 and $960,811,857 in 1905. 1 The most important manufacturing industry is that of iron and steel. This industry was established near Youngstown in 1804. The value of the products increased from $65,206,828 in 1890 to $138,935,356 in 1900 and to $152,859,124 in 1905. Foundry and machine-shop products, consisting largely of engines, boilers, metal- working machinery, wood- working machinery, pumping machinery, mining machinery and stoves, rank second among the state's manufactures; their value increased from $43,617,072 in 1890 to $72,399,632 in 1900, and to $94,507,691 in 1905. Flour and grist mill products rank third in the state; the value of the products decreased from $39,468,409 in 1890 to $37,390,367 in

1900, and then increased tc $40,855,566 in 1905. Meat (slaughtering and packing) was next in the value of the product, and increased from $20,660,780 in 1900 to $28,729,044 in 1905. Clay products rank fifth in the state; they increased in value from $16,480,812 in 1900 to $25,686,870 in 1905. Boots and shoes rank sixth; their value increased from $8,489,728 in 1890 to $17,920,854 in 1900 and to $25,140,220 in 1905. Other leading manufactures are malt liquors ($21,620,794 in 1905), railway rolling-stock consisting largely of cars ($21,428,227), men's clothing ($18,496,173), planing mill products ($17,725,711), carriages and wagons ($16,096,125), distilled liquors ($ 1 5,976,523) , rubber and elastic goods ($ 1 5,963,603) , furniture ($13,322,608), cigars and cigarettes ($13,241,230), agri- cultural implements ($12,891,197), women's clothing ($12,803,582), lumber and timber products (812,567,992), soap and candles ($11,791,223), electrical machinery, apparatus and supplies ($11,019,235), paper and wood pulp ($10,961,527) and refined petroleum ($10,948,864).

The great manufacturing centres are Cleveland, Cincinnati, Youngstown, Toledo, Columbus, Dayton and Akron, and in 1905 the value of the products of these, cities amounted to 56-7% of that for the entire state. A large portion of the iron and steel is manufactured in Cleveland, Youngstown, Steubenville, Bellaire, Lorain and Ironton. Most of the automobiles are manufactured in Cleveland; most of the cash registers and calculating machines in Dayton; most of the rubber and elastic goods in Akron; nearly one-half of the liquors and about three-fourths of the men's clothing in Cincinnati. East Liverpool leads in the manufacture of pottery; Toledo in flour and grist mill products; Springfield in agricultural implements; Cincinnati and Columbus in boots and shoes; Cleve- land in women's clothing.

Transportation and Commerce. — The most important natural means of transportation are the Ohio river on the S. border and Lake

1 The statistics of 1905 were taken under the direction of the United States Census Bureau, but products other than those of the factory system, such, for example, as those of the hand trades, were excluded.

Erie on the N. border. One of the first great public improvements made within the state was the connexion of these waterways by two canals — the Ohio & Erie Canal from Cleveland to Portsmouth, and the Miami & Erie Canal from Toledo to Cincinnati. The Ohio & Erie was opened throughout its entire length (309 m.) in 1832. The Miami & Erie was completed from Middletown to Cincinnati in 1827 ; in 1845 it was opened to the lake (250 m. from Cincinnati). The national government began in 1825 to extend the National Road across Ohio

from Bridgeport, opposite Wheeling, West Virginia, through Zanesville and Columbus, and completed it to Springfield in 1837. Before the completion of the Miami & Erie Canal to Toledo, the building of railways was begun in this region, and in 1836 a railway was completed from that city to Adrian, Michigan. By the close of 1850 the railway mileage had increased to 575 m., and for the next forty years, with the exception of the Civil War period, more than 2000 m. of railways were built during each decade. At the close of 1908 there was a total mileage of 9,300-45 m. Among the railways are the Cleveland, Cincinnati, Chicago & St Louis, the Baltimore & Ohio, the Lake Shore & Michigan Southern, the New York, Chicago & St Louis, the Pittsburgh, Cincinnati, Chicago & St Louis (Pennsylvania), the Pittsburgh, Ft. Wayne & Chicago (Pennsylvania), the Nypano (Erie), the Wheeling & Lake Erie, the Cincinnati, Hamilton & Dayton, the Detroit, Toledo & Ironton, and the Norfolk & Western. As the building of steam railways lessened, the building of suburban and interurban electric railways was begun, and systems of these railways have been rapidly extended until all the more populous districts are connected by them.

Ohio has six ports of entry. They are Cleveland, Toledo, San- dusky, Cincinnati, Columbus and Dayton, and the value of the foreign commerce passing through these in 1909 amounted to $9,483,974 in imports (more than one-half to Cleveland) and $10,920,083 in exports (nearly eight-ninths from Cleveland). Of far greater volume than the foreign commerce is the domestic trade in coal, iron, lumber, &c, largely by way of the Great Lakes.

Population. — The population of Ohio in the various census years was: (1800) 4S,3 6 S; (1810) 230,760; (1820) 581,434; (1830) 937,903; (1840) 1,519,467; (1850) 1,980,329; (i860) 2 i339>5”; (1870) 2,665,260; (1880) 3,198,062; (1890) 3,672,316; (1900) 4,157,545; (1910) 4,767,121. In 1900 and 1910 it ranked fourth in population among the states. Of the total population in 1900, 4,060,204 or 97-6% were white and 97,341 were coloured (96,901 negroes, 371 Chinese, 27 Japanese and 42 Indians). Of the same total 3,698,811 or 88-9% were native-born and 458,734 were foreign-born; 93-8% of the foreign-born consisted of the following: 204,160 natives of Germany, 65,553 of Great Britain, 55,018 of Ireland, 22,767 of Canada (19,864 English Canadian), 16,822 of Poland, 15,131 of Bohemia, 11,575 °f Austria and 11,321 of Italy. In 1906 there were 1,742,873 communicants of different religious de- nominations, over one-third being Roman Catholics and about one-fifth Methodists. From 1890 to 1900 the urban population {i.e. population of incorporated places having 4000 inhabitants or more) increased from 1,387,884 to

1,864,519, and the semi- urban {i.e. population of incorporated places having less than 4000 inhabitants) increased from 458,033 to 549,741, but the rural {i.e. population outside of incorporated places) decreased from 1,826,412 to 1,743,285. The largest cities are Cleveland, Cincinnati, Columbus (the capital), Toledo, Dayton, Youngstown, Akron, Canton, Springfield, Hamilton, Lima and Zanesville.

Administration. — Ohio is governed under the constitution of 1851 as amended in 1875, 1883, 1885, 1902, 1903, and 1905. An amendment may be proposed at any time by either branch of the General Assembly, and if after being approved by three-fifths of the members of both branches it is also approved at a general election by a majority of those voting on the question it is declared adopted; a constitutional convention may be called after a favourable two-thirds vote of the members of each branch of the Assembly and a favourable popular vote — a majority of those voting on the question; and the question of calling such a convention must be submitted to a popular vote at least once every twenty years. Under the constitution of 1802 and 1851 the suffrage was limited to ” white male ” citizens of the United States, but since the adoption of the Fifteenth Amend- ment to the Federal Constitution (1870), negroes vote, though the constitution is unchanged. Since 1894 women who possess the usual qualifications required of men may vote for and be voted for as members of boards of education. The constitution requires that all elections be by ballot, and the Australian ballot system was adopted in 1891; registration is required in cities having

a population of 11,800 or more. The executive department consists of a governor, lieutenant-governor, secretary of state, auditor, treasurer and attorney-general. As a result of the dispute between Governor Arthur St Clair and the Territorial legislature, the constitution of 1802 conferred nearly all of the ordinary executive functions on the legislature. The governor’s control over appointments was strengthened by the constitution of 1 85 1 and by the subsequent creation of statutory offices, boards and commissions, but the right of veto was not given to him until the adoption of the constitutional amendments of 1903. The power as conferred at that time, however, is broader than usual, for it extends not only to items in appropriation bills, but to separate sections in other measures, and, in addition to the customary provision for passing a bill over the governor’s veto by

a two-thirds vote of each house it is required that the votes for repassage in each house must not be less than those given on the original passage. The governor is elected in November of even-numbered years for a term of two years. He is commander- in-chief of the state's military and naval forces, except when they are called into the service of the United States. He grants pardons and reprieves on the recommendation of the state board of pardons. If he die in office, resign or be impeached, the officers standing next in succession are the lieutenant-governor, the president of the Senate, and the speaker of the House of Representatives in the order named.

Members of the Senate and House of Representatives are elected for terms of two years; they must be residents of their respective counties or districts for one year preceding election, unless absent on public business of the state or of the United States. The ratio of representation in the Senate is obtained by dividing the total population of the state by thirty-five, the ratio in the House by dividing the population by one hundred. The membership in each house, however, is slightly above these figures, owing to a system of fractional representation and to the constitutional amendment of 1903 which allows each county at least one representative in the House of Representatives. The constitution provides for a reapportionment every ten years beginning in 1861. Biennial sessions are held beginning on the first Monday in January of the even-numbered years. The powers of the two houses are equal in every respect except that the Senate passes upon the governor's appointments and tries impeachment cases brought before it by the House of Representatives. The constitution prohibits special, local and retroactive legislation, legislation impairing the obligation of contracts, and legislation levying a poll tax for county or state purposes or a tax on state, municipal and public school bonds (amendment of 1905), and it limits the amount and specifies the character of public debts which the legislature may contract.

The judicial department in 1910 was composed of a supreme court of six judges, eight circuit courts. 1 of three judges each, ten districts (some with sub-divisions) of the common pleas court, the superior court of Cincinnati, probate courts, courts of insolvency in Cuyahoga and Hamilton counties, juvenile courts (established in 1904), justice of the peace courts and municipal courts. Under the constitution of 1802 judges were chosen by the legislature, but since 1851 they have been elected by direct popular vote — the judges of the supreme court being chosen at large. They are removable on complaint by a con-current resolution approved by a two-thirds majority in each house of the legislature. The constitution provides that the terms of supreme

and circuit judges shall be such even number cf years not less than six as may be prescribed by the legislature — ■ the statutory provision is six years — that of the judges of the common pleas six years, that of the probate judges four years, that of other judges such even number of years not exceeding six as may be prescribed by the legislature — the statutory provision is six years — and that of justices of the peace such even number of years not exceeding four as may be thus p rescribed — the statutory provision is four years.

Local Government. — The county and the township are the units of the rural, the city and the village t he units of the urban local

1 The provision for circuit courts was first made in the constitution by an amendment of 1883.

government. The chief county authority is the board of commissioners of three members elected for terms of two years. The other officials are the sheriff, treasurer and coroner, elected for two years; the auditor, recorder, clerk of courts, prosecuting attorney, surveyor and infirmary directors, elected for two years; and the board of school examiners (three) and the board of county visitors (six, of whom three are women); appointed usually by the probate judge for three years. The chief township authority is the board of trustees of three members, elected by popular vote for two years. In the parts of the state settled by people from New England township meetings were held in the early days, but their functions were gradually transferred to the trustees, and by 1820 the meetings had been given up almost entirely. The other township officials are the clerk, treasurer, assessor, supervisor of roads, justices of the peace, constables, board of education and board of health. Under the constitution of 1802, municipal corporations were established by special legislation. The constitution of 1 85 1, however, provided for a general law, and the legislature in 1852 enacted a ” general municipal corporations act,” the first of its kind in the United States. The system of classification adopted in time became so elaborate that many municipalities became isolated, each in a separate class, and the evils of special legislation were revived. Of the two chief cities, Cleveland (under a special act providing for the government of Columbus and Toledo, also) in 1892-1902 was governed under the federal plan, which centralized power in the hands of the mayor; in Cincinnati there was an almost hopeless diffusion of responsibility among the council and various executive boards. The supreme court in June 1902 decided that practically all the existing municipal legislation was special in character and was therefore unconstitu- tional. (State ex. rel. Kniseley vs. Jones, 66 Ohio State Reports, 453. See also 66 Ohio State Reports,

491.) A special session of the legislature was called, and a new municipal code was adopted on the 22nd of October which went into effect in April 1903; it was a compromise between the Cleveland and the Cincinnati plans, with some additional features necessary to meet the conditions existing in the smaller cities. In order to comply with the court's interpretation of the constitution, municipalities were divided into only two classes, cities and villages, the former having a population of five thousand or more; the chief officials in both cities and villages were the mayor, council, treasurer and numerous boards of commissions. This was an attempt to devise a system of government that would apply to Cleveland, a city of 400,000 inhabitants, and to Painesville with its 5000 inhabitants. The code was replaced by the Paine Law of 1909, which provided for a board of control (something like that under the " federal plan " in Cleveland, Columbus and Toledo) of three members: the mayor and the directors (ap- pointed and removable by the mayor) of two municipal departments — public service and public safety, the former including public works and parks, and the latter police, fire, charities, correction and buildings. The mayor's appointments are many, and are seldom dependent on the consent of the council. A municipal civil service commission of three members (holding office for three years) is chosen by the president of the board of education, the president of the city council, and the president of the board of sinking fund commissioners ; the pay (if any) of these commissioners is set by each city. The city auditor, treasurer and solicitor are elected, as under the code.

In 1908 a direct primary law was passed providing for party primaries, those of all parties in each district to be held at the same time (annually) and place, before the same election hoard, and at public expense, to nominate candidates for township and municipal offices and members of the school board; nominations to be by petition signed by at least 2 % of the party voters of the political division, except that for United States senators J of I % is the minimum. The law does not make the nomination of candidates for the United States Senate by this method mandatory nor such choice binding upon the General Assembly.

Laws. — The property rights of husband and wife are nearly equal ; a wife may hold her property the same as if single, and a widower or a widow is entitled to the use for life of one-third of the real estate of which his or her deceased consort was seized at the time of his or her death. Among the grounds on which a divorce may be obtained are adultery, extreme cruelty, fraud, abandonment for three years, gross neglect of duty, habitual drunkenness, a former existing marriage, procurement of divorce without the state by one party, which

continues marriage binding on the other, and imprisonment in a penitentiary. For every family in which there is a wife, a minor son, or an unmarried daughter, a homestead not exceeding $1000 in value, or personal property not exceeding $500 in value, is exempt from sale for the satisfaction of debts.

In 1908 an act was passed providing for local option in regard to the sale of intoxicating liquors, by an election to be called an initiative petition, signed by at least 35 % of the electors of a county.

Charitable and Penal Institutions. — The state charitable and penal institutions are supervised by the board of charities of six members (" not more than three . . . from the same political party ") appointed by the governor, and local institutions by boards of county visitors of six members appointed by the probate judge. Each state institution in addition has its own board of trustees appointed by the governor, and each county infirmary is under the charge of three

infirmary directors chosen by popular vote. There are hospitals for the insane at Athens, Columbus, Dayton, Cleveland, Carthage (10 m. from Cincinnati; Longview Hospital), Massillon, Toledo and Lima; a hospital for epileptics at Gallipolis, opened in 1893; institutions for feeble-minded, for the blind (opened 1839) and for the deaf (opened 1829) at Columbus; a state sanatorium for tuberculous patients at Mt. Vernon (opened 1909) ; an institution for crippled and deformed children (authorized in 1907) ; a soldiers' and sailors' orphans' home at Xenia (organized in 1869 by the Grand Army of the Republic); a home for soldiers, sailors, marines, their wives, mothers and widows, and army nurses at Madison (established by the National Women's Relief Corps; taken over by the state, 1904); and soldiers' and sailors' homes at Sandusky (opened 1888), supported by the state, and at Dayton, supported by the United States. The state penal institutions are the boys' industrial school near Lancaster (established in 1854 as a Reform Farm), the girls' industrial home (1869) at Rathbone near Delaware, the reformatory at Mansfield (authorized 1884, opened 1896) and the penitentiary at Columbus

(1816).

Education. — Congress in 1785 set apart I sq. m. in each township of 36 sq. m. for the support of education The public school system,

however, was not established until 1825, and then it developed very slowly. The office of state commissioner of common schools was created in 1837, abolished in 1840 and revived in 1843. School districts fall into four classes — cities, villages, townships and special districts — each of which has its own board of education elected by popular vote. Laws passed in 1877, 1890, 1893 and 1902 have made education compulsory for children between the ages of eight and fourteen. The school revenues are derived from the sale and rental of public lands granted by Congress, and of the salt and swamp lands devoted by the state to such purposes, from a uniform levy of one mill on each dollar of taxable property in the state, from local levies (averaging 7-2 mills in township districts and 10-07 mills in separate districts in 1908), from certain fines and licences, and from tuition fees paid by non-resident pupils. The total receipts from all sources in 1908 amounted to $25,987,021; the balance from the preceding year was $11,714,135, and the total expenditures were $24,695,157. Three institutions for higher education are supported in large measure by the state: Ohio University at Athens, founded in 1804 on the proceeds derived from two townships granted by Congress to the Ohio Company; Miami University (chartered in 1809) at Oxford, which received the proceeds from a township granted by Congress in the Symmes purchase; and Ohio State University (1873) at Colum- bus, which received the proceeds from the lands granted by Congress under the act of 1862 for the establishment of agricultural and mechanical colleges, and reorganized as a university in 1878. Wilber-force University (1856), for negroes, near Xenia, is under the control of the African Methodist Episcopal Church ; but the state established a normal and industrial department in 1888, and has since contributed to its maintenance. Under an act of 1902 normal colleges, supported by the state, have also been created in connexion with Ohio and Miami universities. Among the numerous other colleges and uni-versities in the state are Western Reserve University (1826) at Cleveland, the university of Cincinnati (opened 1873) at Cincinnati, and Oberlin College (1833) at Oberlin.

Finance. — The revenues of the state are classified into four funds; the general revenue fund, the sinking fund, the state common school fund and the university fund. The chief sources of the general revenue fund are taxes on real and personal property, on liquors and cigarettes, on corporations and on inheritances; in 1909 the net receipts for this fund were $8,043,257, the disbursements $9,103,301, and the cash balance at the end of the fiscal year $3,428,705. There is a tendency to reduce the rate on real property, leaving it as a basis for local taxation. The rate on collateral inheritances is 5 %, on direct

inheritances 2 %, on the excess above $3000. There are state, county and municipal boards of equalization. A special tax is levied for the benefit of the sinking fund — one-tenth of a mill in 1909. The commissioners of the fund are the auditor, the secretary of state and the attorney-general. The public debt, which began to accumulate in 1825, was increased by the canal expenditures to $16,880,000 in 1843. The constitution of 1851 practically deprived the legislature of the power to create new obligations. The funded debt was then gradually reduced until the last installment was paid in 1903. There still remains, however, an irredeemable debt due to the common schools, Ohio University and Ohio State University, in return for their public lands. About one-half of the annual common school fund is derived from local taxes; the state levy for this fund in 1909 was one mill, and the total receipts were $2,382,353. The university fund is derived from special taxes levied for the four institutions which receive aid from the state; in 1909 the levy was 0-245 mills and the total receipts were $582,843. Several banks and trading houses with banking privileges were incorporated by special statutes between 1803 and 1817. Resentment was aroused by the establishment of branches of the Bank of the United States at Chilli- cothe and Cincinnati in 1817, and an attempt was made to tax them out of existence. State officials broke into the vaults of the Chilli- cothe branch in 1819 and took out $100,000 due for taxes. The Federalˆ courts compelled a restoration of the money and pronounced the taxing law unconstitutional. In 1845 the legislature chartered for twenty years the State Bank of Ohio, based on the model of the

State Bank of Indiana of 1834. It became a guarantee of conservative banking, and was highly successful. There were at one time thirty- six branches. Most of the state institutions secured Federal charters after the establishments of the national banking system (1863-1864), but the high price of government bonds and the large amount of capital required led to a reaction, which was only partially checked by the reduction of the minimum capital to $25,000 under the currency act of the 14th of March 1900.

History. — Ohio was the pioneer state of the old North-West Territory, which embraced also what are now the states of Indiana, Illinois, Michigan and Wisconsin, and the N.E. corner of Minnesota. When discovered by Europeans, late in the first half of the 17th century, the territory included within what is now Ohio was mainly a battle-ground of numerous Indian tribes and the fixed abode of none except the Eries who occupied a strip along the border of Lake Erie. From the middle to the close of the 17th century the French were establishing a claim to the territory between the “Great Lakes and the Ohio river by

discovery and occupation, and although they had provoked the hostility of the Iroquois Indians they had helped the Wyandots, Miamis and Shawnees to banish them from all territory W. of the Muskingum river. Up to this time the English had based their claim to the same territory on the discovery of the Atlantic Coast by the Cabots and upon the Virginia, Massachusetts and Connecticut charters under which these colonies extended westward to the Pacific Ocean. In 1701, New York, seeking another claim, obtained from the Iroquois a grant to the king of England of this territory which they claimed to have conquered but from which they had subsequently been expelled, and this grant was confirmed in 1726 and again in 1744. About 1730 English traders from Pennsylvania and Virginia began to visit the eastern and southern parts of the territory and the crisis approached as a French Canadian expedition under Celeron de Bienville took formal possession of the upper Ohio Valley by planting leaden plates at the mouths of the principal streams. This was in 1749 and in the same year George II. chartered the first Ohio Company, formed by Virginians and London merchants trading with Virginia for the purpose of colonizing the West. This company in 1750 sent Christopher Gist down the Ohio river to explore the country as far as the mouth of the Scioto river; and four years later the erection of a fort was begun in its interest at the forks of the Ohio. The French drove the English away and completed the fort (Fort Duquesne) for themselves. The Seven Years' War was the immediate consequence and this ended in the cession of the entire North-West to Great Britain. The former Indian allies of the French, however, immediately rose up in opposition to British rule in what is known as the Conspiracy of Pontiac (see Pontiac), and the supression of this was not completed until Colonel Henry Bouquet made an expedition (1764) into the valley of the Muskingum and there brought the Shawnees, Wyandots and Delawares to terms. With the North-West won from the French Great Britain no longer recognized those claims of her colonies to this territory which she had asserted against that nation, but in a royal proclamation of the 7th of October 1763 the granting of land W. of the Alleghanies was forbidden and on the 22nd of June 1774 parliament passed the Quebec Act which annexed the region to the province of Quebec. This was one of the grievances which brought on the War of Independence and during that war the North-West was won for the Americans by George Rogers Clark (q.v.). During that war also, those states which had no claims in the West contended that title to these western lands should pass to the Union and when the Articles of Con- federation were submitted for ratification in 1777, Maryland refused to ratify them except on that condition. The result was that New York ceded its claim to the United States in 1780, Virginia in

1784, Massachusetts in 1785 and Connecticut in 1786. Connecticut, however, excepted a strip bordering on Lake Erie for 120 m. and containing 3,250,000 acres. This district, known as the Western Reserve, was ceded in 1800 on condition that Congress would guarantee the titles to land already granted by the state. Virginia reserved a tract between the Little Miami and Scioto rivers, known as the Virginia Military District for her soldiers in the War of Independence.

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OHIO

When the war was over and these cessions had been made a great number oi war veterans wished an opportunity to repair their broken fortunes in the West, and Congress, hopeful of receiving a large revenue from the sale of lands here, passed an ordinance on the 20th of May 1785 by which the present national system of land-surveys into townships 6 m. sq. was inaugurated in what is now S.W. Ohio in the summer of 1786. In March 1786 the second Ohio Company (q.v.), composed chiefly of New England officers and soldiers, was organized in Boston, Massa- chusetts, with a view to founding a new state between Lake Erie and the Ohio river. The famous North- West Ordinance was passed by Congress on the 13th of July 1787. This instru- ment provided a temporary government for the Territory with the understanding that, as soon as the population was sufficient, the representative system should be adopted, and later that states should be formed and admitted into the Union. There were to be not less than three nor more than five states. Of these the easternmost (Ohio) was to be bounded on the N., E. and S. by the Lakes, Pennsylvania and the Ohio river, and on the W. by a line drawn due N. from the mouth of the Great Miami river to the Canadian boundary, if there were to be three states, or to its intersection with an E. and W. line drawn through the extreme S. bend of Lake Michigan, if there were to be five. Slavery was forbidden by the sixth article of the ordinance; and the third article read: ” Religion, morality and knowledge being necessary to good government and the happiness of man- kind, schools and the means of education shall for ever be encouraged.” After the adoption of the North- West Ordinance the work of settlement made rapid progress. There were four main centres. The Ohio Company founded Marietta at the mouth of the Muskingum in 1788, and this is regarded as the oldest permanent settlement in the state. An association of New Jerseymen, organized by John Cleves Symmes, secured a grant from Congress in 1788-1792 to a strip of 248,540 acres on the Ohio between the Great Miami and the Little

Miami, which came to be known as the Symmes Purchase. Their chief settle- ments were Columbia (1788) and Cincinnati (1789). The Virginia Military District, between the Scioto and the Little Miami, reserved in 1784 for bounties to Virginia continental troops, was colonized in large measure by people from that state. Their chief towns were Massieville or Manchester (1790) and Chillicothe (1796). A small company of Connecticut people under Moses Cleaveland founded Cleveland in 1796 and Youngstown was begun a few years later, but that portion of the state made very slow progress until after the opening of the Ohio & Erie Canal in 1832.

During the Territorial period (1 787-1803) Ohio was first a part of the unorganized North-West Territory (1787-1799), then a part of the organized North-West Territory (1799-1800), and then the organized North-West Territory (1800-1803), Indiana Territory having been detached from it on the W. in 1800. The first Territorial government was established at Marietta in July 1788, and General Arthur St Clair (1784- 1818), the governor, had arrived in that month. His ad- ministration was characterized by the final struggle with the Indians and by a bitter conflict between the executive and the legislature, which greatly influenced the constitutional history of the state. The War of Independence was succeeded by a series of Indian uprisings. Two campaigns, the first under General Josiah Harmar (1753-1813) in 1790, and the second under General St Clair in 1791, failed on account of bad manage- ment and ignorance of Indian methods of warfare, and in 1793 General Anthony Wayne (q.v.) was sent out in command of a large force of regulars and volunteers. The decisive conflict, fought on the 20th of August 1 794, near the rapids of the Maumee, is called the battle of Fallen Timbers, because the Indians concealed themselves behind the trunks of trees which had been felled by a storm. Wayne's dragoons broke through the brush- Wood, attacked the left flank of the Indians and soon put them to flight. In the treaty of Greenville (3rd August 1795) the Indians ceded their claims to the territory E. and S. of the Cuyahoga, the Tuscarawas, and an irregular line from Fort

Laurens (Bolivar) in Tuscarawas county to Fort Recovery in Mercer county, practically the whole E. and S. Ohio. The Jay Treaty was ratified in the same year, and in 1796 the British finally evacuated Detroit and the Maumee and Sandusky forts. By cessions and purchases in 1804, 1808 and 1817-1818 the state secured all of the lands of the Indians except their immediate ' homes, and these were finally exchanged for territory W. of the Mississippi. The last remnant migrated in 1841. General Wayne's victory was followed by an extensive immigration of New Englanders, of Germans, Scotch-Irish

and Quakers from Pennsylvania, and of settlers from Virginia and Kentucky, many of whom came to escape the evils of slavery. This rapid increase of population led to the establishment of the organized Territorial government in 1799, to the restriction of that govern- ment in Ohio in 1800, and to the admission of the state into the Union in 1803. ,

The Congressional Enabling Act of the 30th of April 1802 followed that alternative of the North-West Ordinance which provided for five states in determining the boundaries, and in consequence the Indiana and Michigan districts were detached. A rigid adherence to the boundary authorized in 1787, however, would have resulted in the loss to Ohio of 470 sq. m. of territory in the N.W. part of the state, including the lake port of Toledo. After a long and bitter dispute — the Toledo War (see Toledo) — the present line, which is several miles N. of the S. bend of Lake Michigan, was definitely fixed in 18ˆ7, when Michigan came into the Union. (For the settlement of the eastern boundary, see Pennsylvania.)

After having been temporarily at Marietta, Cincinnati, Chilli- cothe and Zanesville the capital was established at Columbus in 1816.

Since Congress did not pass any formal act of admission there has been some controversy as to when Ohio became a state. The Enabling Act was passed on the 30th of April 1802, the first state legislature met on the 1st of March 1803, the Territorial judges gave up their offices on the 15th of April 1803, and the Federal senators and representatives took their seats in Congress on the 17th of October 1803. Congress decided in 1806 in connexion with the payment of salaries to Territorial officials that the 1st of March 1803 was the date when state government began. During the War of 181 2 the Indians under the lead of Tecumseh were again on the side of the British. Battles were fought at Fort Meigs (1813) and Fort Stephenson (Fremont, 1813) and Commodore Oliver Hazard Perry's naval victory on Lake Erie in 1813 was on the Ohio side of the boundary line.

Owing to the prohibition of slavery the vast majority of the early immigrants to Ohio came from the North, but, until the Mexican War forced the slavery question into the foreground, the Democrats usually controlled the state, because the principles of that party were more in harmony with frontier ideas of equality. The Whigs were successful in the presidential elections of 1836 and 1840, partly because of the financial panic and partly because their candidate, William Henry Harrison, was a " favourite son," and in the election of 1844, because of the unpopularity of the Texas issue. Victory was with the

Democrats in 1848 and 1852, but since the organization of the Republican party in 1854 the state has uniformly given to the Republican presidential candidates its electoral votes. In the Civil War Ohio loyaUy supported the Union, furnishing 319,659 men for the army. Dissatisfaction with the President's emancipation programme resulted in the election of a Democratic Congressional delegation in 1862, but the tide turned again after Gettysburg and Vicksburg; Clement L. Vallandigham, the Democratic leader, was deported from the state by military order, and the Republicans were successful in the elections of 1863 and 1864. A detachment of the Confederate cavalry under General John Morgan invaded the state in 1863, but was badly defeated in the battle of Buffington's Island (July 18th). Democratic governors were elected in 1873, l8 77> l88 3> 1889, 1905, 1908 and 1910. Five presidents have come from Ohio, William Henry Harrison, Rutherford B. Hayes, James A. Garfield, William McKinley, Jr., and William Howard Taft.

OHIO "COMPANY

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Governors of Ohio

Territorial Period (1787-1803).

Arthur St Clair

. 1 787-1 802 Federalist

Charles W. Byrd (Acting)

. 1802-1803 Dem.-Repub

Period t

/ Statehood.

Edward Tiffin

. 1803-1807- Dem.-Repub

Thomas Kirker (Acting)

. 1 807-1 809 „

Samuel Huntington

. 1809-1811 „

Return Jonathan Meigs

. 1811-1814 „

Othniel Looker (Acting)

. 1814-1815

Thomas Worthington .

. 1815-1819

Ethan Allen Brown

. 1819-1822- „

Allen Trimble (Acting)

. 1822-1823 „

Jeremiah Morrow.

. 1 823-1 827 Democrat.

Allen Trimble

. 1827-1831

Duncan McArthur

. 1831-1833 Nat.-Repub.

Robert Lucas

. 1833-1837 Democrat

Joseph Vance

• i837-l 8 39 Whig

Wilson Shannon .

• 1 839-1 84 1 Democrat

Thomas Corwin .

. 1841-1843 Whig

Wilson Shannon .

. 1 843-1 844 Democrat

Thomas W. Bartley (Acting

;) . 1844-1845

Mordecai Bartley.

. 1 845-1 847 Whig

William Bebb . .

. 1847-1849 „ .

Seabury Ford

. 1849-1851

Reuben Wood

. 1851-1853 Democrat

William Medill (Acting, 1 8,

53) • 1 853-1 856

Salmon P. Chase .

. 1 856-1 860 Republican

William Dennison, Jr. .

. 1860-1862

David Tod .

. 1862-1864 „

John Brough

. 1 864-1 865

Charles Anderson (Acting)

. 1865-1866

Jacob D. Cox

. 1866-1868

Rutherford B. Hayes .

. 1868-1872

Edward F. Noyes.

. 1872-1874

William Allen

. 1 874-1 876 Democrat

Rutherford B. Hayes .

. 1876-1877 Republican

Thomas L. Young (Acting)

. . 1877-1878

Richard M. Bishop

. 1878-1880 Democrat

Charles Foster

. 1 880-1 884 Republican

George Hoadley .

. 1 884-1 886 Democrat

Joseph B. Foraker

. 1 886-1 890 Republican

James E. Campbell

.1890-1892 Democrat

William McKinley, Jr. .

. 1 892-1 896 Republican

Asa S. Bushnell .

. 1896-1900 „

George K. Nash .

. 1900-1904 „

Mvron T. Herrick .

. 1904-1906 „

John M. Pattison 1

. 1906 Democrat

Andrew Lintner Harris

. 1 906-1 909 Republican

Judson Harmon

. 1909- Democrat

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1 Died in office.

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Ohio-Michigan Boundary Line Dispute," in the Ohio Archaeo- logical and Historical Society Publications, vol. iv. pp. 199-230, is a good treatment of that complicated question. W. F. Gephart's Transportation.and Industrial Development in the Middle West (New York, 1909), in the Columbia University Studies in History, Economics and Public Law, is a commercial history of Ohio.

OHIO COMPANY, a name of two 18th century companies organized for the colonization of the Ohio Valley. The first Ohio Company was organized in 1749, partly to aid in securing for the English control of the valley, then in dispute between England and France, and partly as a commercial project for trade with the Indians. The company was composed of Vir- ginians, including Thomas Lee (d. 1750) and the two brothers of George Washington, Lawrence (who succeeded to the manage- ment upon the death of Lee) and Augustine; and of Englishmen, including John Hanbury, a wealthy London merchant. George II. sanctioned a grant to the company of 500,000 acrea generally N.W. of the Ohio, and to the eastward, between the Monongahela and the Kanawha rivers, but the grant was never actually issued. In 1 750-1751 Christopher Gist, a skilful woodsman and surveyor, explored for the company the Ohio Valley as far as the mouth of the Scioto river. In 1752 the company had a pathway blazed between the small fortified posts at Will's Creek (Cumberland), Maryland, and at Redstone Creek (Brownsville), Pennsylvania, which it had established in 1750; but it was finally merged in the Walpole Company (an organization in which Benjamin Franklin was interested), which in 1772 had received from the British government a grant of a large tract lying along the southern bank of the Ohio as far west as the mouth of the Scioto river. The War of Independence interrupted colonization and nothing was accomplished.

The second company, the Ohio Company of Associates, was formed at Boston on the 3rd of March 1786. The leaders in the movement were General Rufus Putnam, Benjamin Tupper (1738-1792), Samuel Holden Parsons (1737-1789) and Manasseh Cutler. Dr Cutler was selected to negotiate with Congress, and seems to have helped to secure the incorporation in the Ordinance . for the government of the North-West Territory of the paragraphs which prohibited slavery and provided for public education and for the support of the ministry. Cutler's original intention was to buy for the Ohio Company only about 1,500,000 acres, but on the 27th of July Congress authorized a grant of about 5,000,000 acres of land for $3,500,000; a reduction of one-third was allowed for bad tracts, and it was also provided that the lands could be paid for in United States securities. On the 27th of October 1787 Cutler and Major Winthrop Sargent (1753- 1820), who

had joined him in the negotiations, signed two con- tracts; one was for the absolute purchase for the Ohio Company, at 66| cents an acre, of 1,500,000 acres of land lying along the north bank of the Ohio river, from a point near the site of the

present Marietta, to a point nearly opposite the site of the present Huntington, Kentucky; the other was for an option to buy all the land between the Ohio and the Scioto rivers and the western boundary line of the Ohio Company's tract, extending north of the tenth township from the Ohio, this tract being pre-empted by " Manasseh Cutler and Winthrop Sargent for themselves and others " — actually for the Scioto Company (see Gallipolis). On the same day Cutler and Sargent " for themselves and associates " transferred to William Duer, then Secretary of the Treasury Board, and his associates " one equal moiety of the Scioto tract of land mentioned in the second contract," it being provided that both parties were to be equally interested in the sale of the land, and were to share equally any profit or loss. Colonists were sent out by the Ohio Company from New England, and Marietta, the first permanent settlement in the present state of Ohio, was founded in April 1788.

OHIO RIVER, the principal eastern tributary of the Mississippi river, U.S.A. It is formed by the confluence of the Allegheny and Monongahela rivers at Pittsburg, Pennsylvania, and flows N.W. nearly to the W. border of Pennsylvania, S.S.W. between Ohio and West Virginia, W. by N. between Ohio and Kentucky, and W.S.W. between Indiana and Illinois on the N. and Kentucky on the S. It is the largest of all the tributaries of the Mississippi in respect to the amount of water discharged (an average of about 158,000 cub. ft. per sec), is first in importance as a highway of commerce, and in length (967 m.) as well as in the area of its drainage basin (approximately 210,000 sq. m.) it is exceeded only by the Missouri. The slope of the river at low water ranges from 1 ft. or more per mile in the upper section to about 0-75 ft. per mile in the middle section and 0-29 ft. per mile in the lower section, and the total fall is approximately 500 ft. Nearly two-thirds of the bed is occupied by 187 pools, in which the fall is very gentle; and the greater part of the descent is made over inter- vening bars, which are usually composed of sand or gravel but occasionally of hard pan or rock. The greatest falls are at Louisville, where the river within a distance of 2-25 m. descends 23-9 ft. over an irregular mass of limestone. The rock floor of the valley is usually 30 to 50 ft. below

low water level, and when it comes to the surface, as it occasionally does, it extends at this height only part way across the valley. In the upper part of the river the bed contains much coarse gravel and numerous boulders, but lower down a sand bed prevails. The ordinary width of the upper half of the river is quite uniform, from 1200 to 1500 ft., but it widens in the pool above Louisville, contracts immediately below the Falls, and then gradually widens again until it reaches a maximum width of more than a mile about 20 m. from its mouth. Islands are numerous and vary in size from an acre or less to 5000 acres; above Louisville there are fifty or more, and below it about thirty. Many of them are cultivated.

Besides its parent streams, the Allegheny and the Monongahela, the Ohio has numerous large branches. On the N. it receives the waters of the Muskingum, Scioto, Miami and Wabash rivers, and on the S. those of the Kanawha, Big Sandy, Licking, Kentucky, Green, Cumberland and Tennessee rivers.

The drainage basin of the Ohio, in which the annual rainfall averages about 43 in., is, especially in the S. part of the river, of the ” quick-spilling ” kind, and as the swift mountain streams in that section are filled in February or March by the storms from the Gulf of Mexico, while the northern streams are swollen by melting snow and rain, the Ohio rises very suddenly and not infrequently attains a height of 30 to 50 ft. or more above low water level, spreads out ten to fifteen times its usual width, submerges the bottom lands, and often causes great damage to property in the lower part of the cities along its banks.

Robert Cavelier, Sieur de La Salle, asserted that he discovered the Ohio and descended it until his course was obstructed by a fall (thought to be the Falls at Louisville) ; this was probably in 1670, but until the middle of the next century, when its strategic importance in the struggle of the French and the English for the possession of the interior of the continent became fully recognized, little was generally known of it. By the treaty of 1763 ending the Seven Years’ War the English finally gained

undisputed control of the territory along its banks. After Virginia had bought, in 1768, the claims of the Six Nations to the territory south of the Ohio, immigrants, mostly Virginians, began to descend the river in considerable numbers, but the Shawnee Indians, whose title to the land was more plausible than that of the Six Nations ever was, resisted their encroachments until the Shawnees were defeated in October 1774 at the battle of Point Pleasant. By the treaty of 1783 the entire Ohio country became a part of the United States and by the famous

Ordinance of 1787 the north side was opened to settlement. Most of the settlers entered the region- by the headwaters of the Ohio and carried much of their market produce, lumber, &c, down the Ohio and Mississippi to New Orleans or beyond. Until the successful navigation of the river by steamboats a considerable portion of the imports was carried overland from Philadelphia or Baltimore to Pittsburg. The first steamboat on the Ohio was the ” New Orleans,” which was built in 181 1 by Nicholas J. Roosevelt and sailed from Pittsburg to New Orleans in the same year, but it remained for Captain Henry M. Shreve (1785-1854) to demonstrate with the ” Washington,” which he built in 1816, the success of this kind of navigation on the river. From 1820 to the Civil War the steamboat on the system of inland water- ways of which the Ohio was a part was a dominant factor in the industrial life of the Middle West. Cincinnati, Louisville and Pittsburg on its banks were extensively engaged in building these vessels. The river was dotted with floating shops — dry- goods boats fitted with counters, boats containing a tinner’s establishment, a blacksmith’s shop, a factory, or a lottery office. Until the Erie Canal was opened in 1825 the Ohio river was the chief commercial highway between the East and the West. It was connected with Lake Erie in 1832 by the Ohio & Erie Canal from Portsmouth to Cleveland, and in 1845 by the Miami & Erie Canal from Cincinnati to Toledo.

In the natural state of the river navigation was usually almost wholly suspended during low water from July to November, and it was dangerous at all times on account of the numerous snags. The Federal government in 1827 undertook to remove the snags and to increase the depth of water on the bars by the construction of contraction works, such as dikes and wing dams, and appropriations for these purposes as well as for dredging were continued until 1844 and resumed in 1866; but as the channel obtained was less than 3 ft. in 1870, locks with movable dams — that is, dams that can be thrown down on the approach of a flood — were then advocated, and five years later Congress made an appropriation for constructing such a dam, the Davis Island Dam immediately below Pittsburg, as an experiment. This was opened in 1885 and was a recognized success; and in 1895 the Ohio Valley Improvement Association was organized in an effort to have the system extended. At first the association asked only for a channel 6 ft. in depth; and between 1896 and 1905 Congress authorized the necessary surveys and made appro priations for thirty-six locks and dams from the Davis Island Dam to the mouth of the Great Miami river. As the association then urged that the channel be made 9 ft. in depth Congress authorized the secretary of war to appoint a board of engineers which should make a thorough

examination and report on the comparative merits of a channel 9 ft. in depth, and one 6 ft. in depth. The board reported in 1908 in favour of a 9-ft. channel and stated that fifty-four locks and dams would be necessary for such a channel throughout the course of the river, and Congress adopted this project. At the Falls is the Louisville & Portland Canal, originally built by a private corporation, with the United States as one of the stockholders, and opened in 1830, with a width of 50 ft., a length of 200 ft., and three locks, each with a lift of about 8f ft. In 1860-1872 the width was increased to 90 ft. and the three old locks were replaced by two new ones. The United States gradually increased its holdings of stock until in 1855 it became owner of all but five shares; it assumed the management of the canal in 1874, abolished tolls in 1880, and thereafter improved it in many respects. Sixty-eight locks and dams have been constructed on the principal tributaries, and the Allegheny, Monongahela, Cumberland, Tennessee,

Muskingum, Kanawha, Little Kanawha, Big Sandy, Wabash, and Green now afford a total of about 960 m. of slack-water navigation.

See the Board of Engineers' Report of Examination of Ohio River with a view to obtaining Channel Depths of 6 and 9 ft. respectively (Washington, 1908) ; A. B. Hulbert, Waterways of Westward Expansion (Cleveland, 1903) and The Ohio River, a Course of Empire (New York, 1906) ; also R. G. Thwaites, Afloat on the Ohio (New York, 1900).

OHLAU, a town of Germany, in the Prussian province of Silesia, 16 m. by rail S.E. of Breslau, on the left bank of the Oder. Pop. (1905) 9233. It has two Roman Catholic and two Evangelical churches, and a castle. Ohlau is the centre of a tobacco-growing district and has manufactures of tobacco and cigars, machinery, beer, shoes and bricks. It became a town in 1291 and passed to Prussia in 1742. In the 17th and 18th centuries it was often the residence of the dukes of Brieg and of the Sobieski family.

See Schulz, A us Ohlaus Vergangenheit (Ohlau, 1902).

OHLENSCHLAGER, ADAM GOTTLOB (1779-1830), Danish poet, was born in Vesterbro, a suburb of Copenhagen, on the 14th of November 1779. His father, a Schleswiger by birth, was at that time organist, and later became keeper, of the royal palace of Frederiksberg; he was

a very brisk and cheerful man. The poet's mother, on the other hand, who was partly German by extraction, suffered from depressed spirits, which afterwaids deepened into melancholy madness. Adam and his sister Sofia were allowed their own way throughout their childhood, and were taught nothing, except to read and write, until their twelfth year. At the age of nine Adam began to make fluent verses. Three years later, while walking in Frederiksberg Gardens, he attracted the notice of the poet Edvard Storm, and the result of the conversation was that he received a nomination to the college called " Posterity's High School," an important institution of which Storm was the principal. Stcrm himself taught the class of Scandinavian mythology, and thus Ohlenschlager received his earliest bias towards the poetical religion of his ancestors. He was confirmed in 1795, and was to have been apprenticed to a tradesman in Copenhagen. To his great delight there was a hitch in the preliminaries, and he returned to his father's house. He now, in his eighteenth year, suddenly took up study with great zeal, but soon again abandoned his books for the stage, where a small position was offered him. In 1797 he actually made his appearance on the boards in several successive parts, but soon discovered that he possessed no real histrionic talent. The brothers Orsted, with whom he had formed an intimacy fruitful of profit to him, persuaded him to quit the stage, and in 1800 he entered the university of Copenhagen as a student. He was doomed, however, to disturbance in his studies, first from the death of his mother, next from his inveterate tendency towards poetry, and finally from the attack of the English upon Copenhagen in April 1801, which, however, inspired a dramatic sketch (April the Second 1801) which is the first thing of the kind by Ohlenschlager that we possess. In the summer of 1802, when Ohlenschlager had an old Scandinavian romance, as well as a volume of lyrics, in the press, the young Norse philosopher, Henrik Steffens, came back to Copenhagen after a long visit to Schelling in Germany, full of new romantic ideas. His lectures at the university, in which Goethe and Schiller were for the first time revealed to the Danish public, created a great sensation. Steffens and Ohlenschlager met one day at Dreier's Club, and after a conversation of sixteen hours the latter went home, suppressed his two coming volumes, and wrote at a sitting his splendid poem Guldhornene, in a manner totally new to Danish literature. The result of his new enthusiasm speedily showed itself in a somewhat hasty volume of poems, published in 1803, now chiefly remembered as containing the lovely piece called Sanci-Hansaften-Spil. The next two years saw the production of several exquisite works, in particular the epic of Thors Reise til Jotunheim, the charming poem in hexa- meters called Langelandsreisen, and the bewitching piece of fantasy Aladdin's

Lampe (1805). At the age of twenty-six Ohlenschlager was universally recognized, even by the opponents of the romantic revival, as the leading poet of Denmark. He XX »

now collected his Poetical Writings in two volumes. He found no difficulty in obtaining a grant for foreign travel from the government, and he left his native country for the first time, joining Steffens at Halle in August 1805. Here he wrote the first of his great historical tragedies, Hakon Jarl, which be sent off to Copenhagen, and then proceeded for the winter monthr. to Berlin, where he associated with Humboldt, Fichte, and the leading men of the day, and met Goethe for the first time . In the spring of 1806 he went on to Weimar, where he spent several months in daily intercourse with Goethe. The autumn of the same year he spent with Tieck in Dresden, and proceeded in December to Paris. Here he resided eighteen months and wrote his three famous masterpieces, Baldur hin Gode (1808), Palnatoke (1809), and Axel og Valborg (1810). In July 1808 he left Paris and spent the autumn and winter in Switzerland as the guest of Madame de Stael-Holstein at Coppet, in the midst of her circle of wits. In the spring of 1809 Ohlenschlager went to Rome to visit Thorwaldsen, and in his house wrote his tragedy of Correggio. He hurriedly returned to Denmark in the spring of 1810, partly to take the chair of aesthetics at the university of Copenhagen, partly to marry the sister-in-law of Rahbek, to whom he had been long betrothed. His first course of lectures dealt with his Danish predecessor Ewald, the second with Schiller. From this time forward his literary activity became very great; in 18 n he published the Oriental tale of Ali og Gulhyndi, and in 181 2 the last of his great tragedies, Staerkodder. From 1814 to 181 9 he, or rather his admirers, were engaged in a long and angry controversy with Baggesen, who represented the old didactic school. This contest seems to have disturbed the peace of Ohlenschlager's mind, and to have undermined his genius. His talent may be said to have culminated in the glorious cycle of verse-romances called Helge, published in 1814. The tragedy of Hagbarth og\Signe, 1815, showed a distinct falling-off in style. In 181 7 he went back to Paris, and published Hroars Saga and the tragedy of Fost- brodrene. In 1818 he was again in Copenhagen, and wrote the idyll of Den lille Hyrdedreng and the Eddaic cycle called Nordens Guder. His next productions were the tragedies of Erik og Abel (1820) and Vaeringerne i Miklagaard (1826), and the epic of Hrolj Krake (1829). It was in the last-mentioned year that, being in Sweden, Ohlenschlager was publicly crowned with laurel in front of the high altar in Lund cathedral by Bishop Esaias Tegner, as the " Scandinavian King of Song." His last volumes were Tordenskjold (1833), Dronning Margrethe (1833),

Sokrates (1835), Olaf den Hellige (1836), Knud den Store (1838), Dina (1842), Erik dipping (1843), and Kiartan og Gudrun (1847). On his seventieth birthday, 14th November 1849, a public festival was arranged in his honour, and he was decorated by the king of Denmark under circumstances of great pomp. He died on the 20th of January 1850, and was buried in the cemetery of Frederiksberg. Immediately after his death his Recollections were published in two volumes.

With the exception of Holberg, there has been no Danish writer who has exercised so wide an influence as Ohlenschlager. His great work was to awaken in the breasts of his countrymen an enthusiasm for the poetry and religion of their ancestors, and this he performed to so complete an extent that his name remains to this day synonymous with Scandinavian romance. He supplied his countrymen with romantic tragedies at the very moment when all eyes were turned to the stage, and when the old-fashioned pieces were felt to be inadequate. His plays, partly, no doubt, in consequence of his own early familiarity with acting, fulfilled the stage requirements of the day, and were popular beyond all expectation. The earliest are the best — Ohlenschlager's dramatic masterpiece being, without doubt his first tragedy, Hakon Jarl. In his poems and plays alike his style is limpid, elevated, profuse; his flight is sustained at a high pitch without visible excitement. His fluent tenderness and romantic zest have been the secrets of his extreme popularity. Although his inspiration came from Germany, he is not much like a German poet, except when he is consciously following Goethe; his analogy is much rather to be found among the English poets

his contemporaries. His mission towards antiquity reminds us of Scott, but he is, as a poet, a better artist than Scott; he has sometimes touches of exquisite diction and of over- wrought sensibility which recall Coleridge to us. In his wide ambition and profuseness he possessed some characteristics of Southey, although his style has far more vitality. With all his faults he was a very great writer, and one of the principal ■ pioneers of the romantic movement in Europe. (E. G.)

0HLI6S, a town of Germany, in the Prussian Rhine Province, 17 m. by rail N. of Cologne, on the railway to Elberfeld. Pop. (1905) 24,264. Its chief manufactures are cutlery and hardware, arid there are iron-foundries and flour-mills. Other industries are brewing, dyeing, weaving and brick-making. Before 1891 it was known as Merscheid.

OHM, GEORG SIMON (1787-1854), German physicist, was born at Erlangenon the 16th of March 1787, and was educated at the university there. He became professor of mathematics in the Jesuits' college at Cologne in 181 7 and in the polytechnic school of Nuremberg in 1833, and in 1852 professor of experi mental physics in the university of Munich, where he died on the 7th of July 1854. His writings were numerous, but, with one important exception, not of the first order. The excep- tion is his pamphlet published in Berlin in 1827, with the title Die galvanische Kette mathematiich bearbeitet. This work, the germs of which had appeared during the two preceding years in the journals of Schweigger and Poggendorff , has exerted most important influence on the whole development of the theory and applications of current electricity, and Ohm's name has been incorporated in the terminology of electrical science. Nowadays " Ohm's Law," as it is called, in which all that is most valuable in the pamphlet is summarized, is as universally known as anything in physics. The equation for the propaga- tion, of electricity formed on Ohm's principles is identical with that of J. B. J. Fourier for the propagation of heat; and if, in Fourier's solution of any problem of heat-conduction, we change the word " temperature " to " potential " and write " electric current" instead of "flux of heat," we have the solution of a corresponding problem of electric conduction. The basis of Fourier's work was his clear conception and definition of conductivity. But this involves an assumption, undoubtedly true for small temperature-gradients, but still an assumption, viz. that, all else being the same, the flux of heat is strictly proportional to the gradient of temperature. An exactly similar assumption is made in the statement of Ohm's law, i.e. that, other things being alike, the strength of the current is at each point proportional to the gradient of potential. It happens, how- ever, that with our modern methods it is much more easy to test the accuracy of the assumption in the case of electricity than in that of heat; and it has accordingly been shown by J. Clerk Maxwell and George Chrystal that Ohm's law is true, within the limits of experimental error, even when the currents are so powerful as almost to fuse the conducting wire.

OHMMETER,. an electrical instrument employed for measuring insulation-resistance or other high electrical resistances. For the purpose of measuring resistances up to a few thousand ohms, the most convenient appliance is a Wheatstone's Bridge (q.v), but when the resistance of the conductor to be measured is several hundred thousand ohms, or if it is the resistance of a so-called insulator, such as the insulating covering of the copper wires employed for distributing electric current in houses and buildings for electric

lighting, then the ohmmeter is more con- venient. An ohmmeter in one form consists of two pairs of coils, one pair called the series coil and the other called the shunt coil. These coils are placed with their axes at right angles to one another, and at the point where the axes intersect a small pivoted needle of soft iron is placed, carrying a longer index needle moving over a scale.

Suppose it is desired to measure the insulation-resistance of a system of electric house wiring ; the ohmmeter circuits are then joined up as shown in fig. I, where W represents a portion of the wiring of the building and I a portion of the insulating materials surrounding it. The object of the test is to discover the resistance of the insulator I, that is, to determine how much current flows through this insulator

*£

VWWW Se I

Fig. 1.

)k

by leakage under a certain electromotive force or voltage which must not be less than that which will be employed in practice when the electric lights supplied through these wires are in operation. For this purpose the ohmmeter is provided with a small dynamo D, contained in a box, which produces a continuous electromotive force of from 200 to 500 _. w

volts when the handle of the instrument is steadily turned. In making the test, the whole of the copper wires belonging to any section of the wiring and the test must be con- (D) Sh*

nected together at some point and then con- nected through the series coil of the ohmmeter with one terminal of the dynamo. The shunt coil Sh and the series coil Se are connected together at one point, and the remaining terminals of

the dynamo and shunt coil must be connected to a ” good earth,” which is generally the gas or water pipes w of the building. On setting the dynamo in operation, a current passes through the shunt coil of the ohmmeter proportional to the voltage of the dynamo, and, if there is any sensible leakage through the insulator to earth, at the same time another current passes through the series coil proportional to the conductivity of the insulation of the wiring under the electromotive force used. The two coils, the shunt and the series coil, then produce

two magnetic fields, with their lines of force at right angles to one another. The small pivoted iron needle ns placed in their common field therefore takes up a certain position, dependent on the relative value of these fields. The tangent of the angle of deflection 6 of this needle measured from its position, when the shunt coil is disconnected, is equal to the ratio of the voltage of the dynamo to the current through the insulator. If we call this last resistance R, the voltage of the working dynamo V, and the current through the insulator C, then tan = C/V = R. Hence the deflection of the needle is proportional to the insulation resistance, and the scale can be graduated to show directly this resistance in megohms.

The Evershed and Vignoles form of the instrument is much used in testing the insulation resistance ol electric wiring in houses. In this case the dynamo and ohmmeter are combined in one instru- ment. The field magnet of the dynamo has two gaps in it. In one the exciting armature is rotated, producing the working voltage of 250, 500 or 1000 volts. In the other gap are pivoted two coils wound on an iron core and connected at nearly a right angle to each other. One of these coils is in series with the armature circuit and With the insulation or high resistance to be measured. The other is a shunt across the terminals of the armature. When the armature is rotated, these two coils endeavour to place themselves in certain directions in the field so as to be perforated by the greatest magnetic flux. The exact position of the core, and, therefore, of an index needle connected with it, is dependent on the ratio of the voltage applied to the terminals of the high resistance or insulator and the current passing through it, This, however, is a measure of the insulation-resistance. Hence the instrument can be graduated to show this directly.

In the Nalder ohmmeter the electrostatic principle is employed. The instrument consists of a high-voltage continuous current dynamo which creates a potential difference between the needle and the two quadrants of a quadrant electrometer (see Electro meter). These two quadrants are interconnected by the high resist- ance to be measured, and, therefore, themselves differ in potential. The exact position taken up by the needle is therefore determined by the potential difference (P.D.) of the quadrants and the P.D. of the needle and each quadrant, and, therefore, by the ratios of the P.D. of the ends of the insulator and the current flowing through it, that is, by its insulation resistance.

The ohmmeter recommends itself by its portability, but in default of the possession of an ohmmeter the insulation-resistanpe can be measured by means of an ordinary mirror galvanometer (see Galvanometer) and insulated battery of suitable voltage. In this case

one terminal of the battery is connected to the earth, and the other terminal is* connected through the galvanometer with the copper wire, the insulation of which it is desired to test. If any sensible current flows through this insulator the galvano- meter will show a deflection.

The meaning of this deflection can be interpreted as follows: If a galvanometer has a resistance R and is shunted by a shunt_ of resistance S, and the shunted galvanometer is placed in series with a large -resistance R' of the order of a megohm, and if the same

battery is applied to the shunted galvanometer, then the current C passing through the galvanometer will be given by the expression

C =

SV R'(R + S) + RS'

Fig

where V is the electromotive force of the battery. It is possible so to arrange the value of the shunt and of the high resistance R' that the same or nearly the same deflection of the galvanometer is obtained as when it is used in series with the battery and the insula- tion-resistance. In these circumstances the current passing through the galvanometer is known, provided that the voltage of the battery is determined by means of a potentiometer (q.v.). Hence the resistance of the insulator can be ascertained, since it is expressed in ohms by the ratio of the voltage of the battery in volts to the

current through the C C galvanometer in

amperes. In apply- ing this method to test the insulation of indiarubber – covered or of insulated copper wire, before employing it for electrical purposes, it is usual to place the coil of wire W (fig. 2) in an insulated tank of water T, which is connected to one terminal of the insulated battery B, the other terminal being connected to the metallic conductor CC of the wire under test, through a galvano- meter G. To prevent leakage over the surface of the insulating covering of the wire which projects above the surface of the water, it is necessary to employ a " guard wire " P, which consists of a piece of fine copper wire, twisted round the extremity of the insu- lated wire

and connected to the battery. This guard wire pre- vents any current which leaks over the surface of the insulator from passing through the galvanometer G, and the galvanometer indication is therefore only determined by the amount of current which passes through the insulator, or by its insulation-resistance.

For -further information on the measurement of high resistance, see J. A. Fleming, A Handbook for the Electrical Laboratory and Testing Room (2 vols., London, 1904); H. R. Kempe, A Handbook of Electrical Testing (London, 1900); H. L. Webb, A Practical Guide to the Testing, of Insulated Wires and Cables (New York, 1902).

(J-A.F.) ;

OHNET, GEORGES (1848-), French novelist and man of letters, was born in Paris on the 3rd of April 1848. After the war of 1870 he became editor of the Pays and the Conslitutionnel in succession. In collaboration with the engineer and dramatist Louis Denayrouze (b. 1848) he produced the play Regina Sarpi, and in 1877 Marthe. He was an admirer of Georges Sand and bitterly opposed to the realistic modern novel. He began a series of novels, Les Batailles de la vie, of a simple and idealistic character, which, although attacked by the critics as unreal and commonplace, were very popular. The series included Serge Panine (1881) which was crowned by the Academy; Le Maitre de forges (1882), La Grande Marniere (1885), Yolontt (1888), Dernier amour (1891). Many of his novels have been dramatized with great success, Le Maitre de forges, produced at the Gymnase in 1 883, holding the stage for a whole year. His later publications include Le CrSpuscule (1902), Le Marchand de poisons (1903), La ConquSrante (1905), La Dixieme Muse (1906).

OHRDRUF, a town of Germany in the duchy of Saxe-Coburg- Gotha, 11 m. by rail S.E. of Gotha. Pop. (1905) 61 14. It has a castle, two Evangelical churches, a technical and other schools, and manufactures of porcelain, paper, copper goods, shoes and small wares. Close by is the summer resort of Luisenthal. As early as 725 there was a monastery at Ohrdruf, which received municipal rights in 1399. With six neighbouring villages it forms the county of Obergleichen.

OIHENART, ARNAULD DE (1592-1668), Basque historian and poet, was born at Mauleon, and studied law at Bordeaux, where he took his degree in 161 2. He practised first in his native town, and after his marriage with Jeanne d'Erdoy, the heiress of a noble family of Saint-Palais, at the bar of the parlement of Navarre. He spent his leisure and his fortune in the search for documents bearing on the old Basque and

Bearnese provinces; and the fruits of his studies in the archives of Bftyonne, Toulouse,

Pau, Perigord and other cities were embodied in forty-five MS. volumes, which were sent by his son Gabriel to Colbert. Twenty- three of these are in the Bibliotheque Nationale of Paris (Coll. Duchesne).

. Oihenart published in 1625 a Declaration historique de Vinjuste usurpation et retention de la Navarre par les Espagnols and a fragment of a Latin work on the same subject is included in Galland's Mbmoires pour I'histoire de Navarre (1648). His most important work is Notitia utriusque Vasconiae, turn Ibericae, turn Aquitanicae, qua praeter situm regionis et alia scitu digna, Navarrae regum coeter- arumque: in Us insignwm vetustaie et dignitate familiarum . . . (Paris, 1638 and 1656), a description of Gascony and Navarre. His collection of over five hundred Basque proverbs, Atsotizac edo Refravac, included in a volume of his poems O ien Gastaroa Nevrthize- tan, printed in Paris in 1657, was supplemented by a second collection, Atsotizen Vrrhenquina. The' proverbs were edited by Francisque Michel (Paris, 1847), and the supplement by P. Hariston (Bayonne, 1892) and by V. Stempf (Bordeaux, 1894). See Julien Vinson, Essai

.d'une bibliographie de la langue basque (Paris, 1891); J; B. E. de Jaurgain, Arnaud d'Oihenart et safamille (Paris, 1885).

OIL CITY, a city of Venango county, Pennsylvania, U.S.A., on the Allegheny river, at the mouth of Oil Creek, about 55 m. S.S.E. of Erie and about 13 5 m. N. of Pittsburg. Pop. (1890) 10,932; (1900)' 13,264, of whom 2001 were foreign-born and 184 were negroes; (1910 census) 15,657. It 'is served by the Pennsylvania (two lines), the Erie, and the Lake Shore & Michigan Southern railways. The city lies about 1000 ft. above the sea, and is divided by the river and the creek into three sections connected by bridges. The business part of the city is on the low ground north of the river; the residential districts are the South Side, a portion of the flats, the West Side, and Cottage Hill and Palace Hill on the North Side. Oil City is the centre and the principal market of the Pennsylvania oil region; It has extensive oil refineries and foundries and machine shops, and manufactures oil-well supplies and a few othier commodities. The city's factory products were valued at $5,164,059 in 1900 and at $3,217,208 in 1905, and in the latter year foundry and machine-shop products were valued at $2,317,505, or 72% of the total. Natural gas is used for power, heat and light. Oil City was founded in i860, incorporated as a borough in 1863 and chartered as a city in 1874. The city was partially destroyed by flood in 1865, and by flood and

fire in 1866 and again in 1892; on this last occasion Oil Creek was swollen by a cloud-burst on the 5th of June, and several tanks farther up the valley, which seem to have been struck by lightning, gave way and a. mass of burning oil was carried by the creek to Oil City, where some sixty lives were lost and property valued at more ˆthan $1,000,000 was destroyed. ; OIL ENGINE. Oil engines, like gas engines (q.v.), are internal combustion motors in which motive power is produced by the explosion or expansion of a mixture of inflammable material and air. The inflammable fluid used, however, consists of vapour produced from oil instead of permanent gas. The thermodynamic operations are the same as in gas engines, and the structural and mechanical differences are due to the devices required to vaporize the oil and supply the measured proportion of vapour which is to mix with the air in the cylinders.

Light and heavy oils are used; light oils may be defined as those which are readily volatile at ordinary atmospheric tempera- tures, while heavy oils are those which require special heating or spraying processes in order to produce an inflammable vapour capable of forming explosive mixture to be supplied to the cylinders. Of the light oils -the most important is known as petroL It is not a definite chemical compound. It is a mixture of various hydrocarbons of the paraffin and define series produced from the distillation of petroleum and paraffin oils. It consists, in fact, of the lighter fractions which distil over first in the process of purifying petroleums or paraffins.

The specific gravity of the standard petrols of commerce generally ranges between 0-700 to about 0-740; and the heat value on complete combustion per yV gallon burned varies from 14,240 to 14,850 British thermal units. The thermal value per gallon thus increases with the density, but the volatility diminishes. Thus, samples of petrol examined by Mr Blount

of from -700 to -730 specific gravity showed that 98% of the lighter sample distilled over below 120 C. while only 88% of the heavier came over within the same temperature range. The heavier petrol is not so easily converted into vapour. The great modern development of the motor car gives the light oil engine a most important place as one of the leading sources of motive power in the world. The total petrol power now applied to cars on land and to vessels on sea amounts to at least two million H.P. The petrol engine has also enabled aeroplanes

to be used in practice.

The earliest proposal to use oil as a means to produce motive power was made by an English inventor — Street — in 1794, but the first practical petroleum engine was that of Julius Hock of Vienna, produced in 1870. This engine, like Lenoir's gas engine, operated without compression. The piston took in a charge of air and light petroleum spray which was ignited by a flame jet and produced a. low-pressure explosion. Like al! non-compression engines, Hock's machine was very cumbrous and gave little power. In 1873, Brayton, an English engineer, who had settled in America, produced a light oil engine working on the constant pressure system without explosion. This appears to have been the earliest compression engine to use oil fuel instead of gas.

Shortly after the introduction of the " Otto " gas engine in 1876, a motor of this type was operated by an inflammable vapour produced by passing air on its way to the cylinder through the light oil then known as gasolene. A further air supply was drawn into the cylinder to form the required explosive mixture, which was subsequently compressed and ignited in the usual way. The Spiel petroleum engine was the first Otto cycle motor introduced into practice which dispensed with an independent vaporizing apparatus. Light hydrocarbon of a specific gravity of not greater than 0.725 was injected directly into the cylinder on the suction stroke by means of a pump. In entering it formed spray mixed with the air, was vaporized, and on compression an explosion was obtained just as in the gas engine.

Until the year 1883 the different gas and oil engines constructed were of a heavy type rotating at about 150 to 250 revolutions per minute. In that year Daimler conceived the idea of con- structing very small engines with light moving parts, in order to enable them to be rotated at such high speeds as 800 and 1000 revolutions per minute. At that time engineers did not consider it practicable to run engines at such speeds; it was supposed that low speed was necessary to durability and smooth running. Daimler showed this idea to be wrong by producing his first small engine in 1883. In 1886 he made his first experiment with a motor bicycle, and on the 4th of March 1887 he ran for the first time a motor car propelled by a petrol engine. Daimler deserves great credit for realizing the possibility of producing durable and effective engines rotating at such unusually high speeds; and, further, for proving that his ideas were right in actual practice. His little engines contained nothing new in their cycles of operation, but they provided the first step in the startlingly rapid development of

petrol motive power which we have seen in the last twenty years. The high speed of rotation enabled motors to be constructed giving a very large power for a very small weight.

Fig. 1 is a diagrammatic section of an early Daimler motor. A is the cylinder, B the piston, C the connecting rod, and D the crank, which is entirely enclosed in a casing. A small fly-wheel is carried by the crank-shaft, and it serves the double purpose of a fly- wheel and a clutch, a is the combustion space, E the single port, which serves both for inlet of the charge and tor discharge of exhaust. W is the «xhaust valve, F the charge inlet valve, which is automatic in its action, and is held closed by a spring /, G the carburettor, H the igniter tube, I the igniter tube lamp, K the charge inlet passage, L the air filter chamber, and M an adjustable air inlet cap for regu- lating the air inlet area. The light oil — or petrol, as it is commonly called — is supplied to the float chamber N of the vaporizer by means of the valve O. So long as the level of the petrol is high, the float n, acting by levers about it, holds the valve O closed against oil forced by air pressure along the pipe P When the level falls, however, the valve opens and more petrol is admitted. When the piston B makes its suction stroke, air passes from the atmosphere by the

passage K through the valve F, which it opens automatically. The pressure falls within the passage K, and a spurt of petrol passes by the jet G l , separate air at the same time passing by the passage K 1 round the jet. The petrol breaks up into spray by impact against the walls of the passage K, and then it vaporizes and passes into the cylinder A as an inflammable mixture. When the piston B returns it compresses the charge into a, and upon compression the incandescent igniter tube H fires the charge. H is a short platinum tube, which is always open to the compression space- It is rendered incandescent by the burner I, fed with petrol from the pipe supplying the vaporizer. The open incandescent tube is found to act well for small engines, and it does not ignite the charge until the com- pression takes place, because the inflammable mixture cannot come into contact with the hot part till it is forced up the tube by the

Fig. 1.

compression. The engine is started by giving the crank-shaft a smart turn round by means of a detachable handle. The exhaust is alone actuated from the valve shaft. The shaft Q is operated by pinion and a spur-wheel Q 2 at halt the rate of the crank-shaft. The governing is accomplished by cutting out explosions as with the gas engine, but the governor operates by preventing the exhaust valve from opening, so

that no charge is discharged from the cylinder, and therefore no charge is drawn in. The cam R operates the exhaust valve, the levers shown are so controlled by the governor (not shown) that the knife edge S is pressed out when speed is too high, and cannot engage the recess T until it falls. The engine has a water jacket V, through which water is circulated. Cooling devices are used to economize water.

Benz of Mannheim followed close on the work of Daimler, and in France Panhard and Levassor, Peugeot, De Dion, Delahaye and Renault all contributed to the development of the petrol engine, while Napier, Lanchester, Royce and Austin were the most prominent among the many English designers.

The modern petrol engine differs in many respects from the Daimler engine just described both as to general design, method of carburetting, igniting and controlling the power and speed. The carburettor now used is usually of the float and jet type shown in fig. 1, but alterations have been made to

allow of the production of uniform mixture in the cylinder under widely varying conditions of speed and load. The original form of carburettor was not well adapted to allow of great change of volume per suction stroke. Tube ignition has been abandoned, and the electric system is now supreme. The favourite type at present is that of the high-tension magneto. Valves are now all mechanically operated; the automatic inlet valve has practically disappeared. Engines are no longer controlled by cutting out impulses; the governing is effected by throttling the charge, that is by diminishing the volume of charge admitted to the cylinder at one stroke. Broadly, throttling by reducing charge weight reduces pressure of com- pression and so allows the power of the explosion to be graduated within wide limits while maintaining continuity of impulses. The object of the throttle control is to keep up continuous impulses for each cycle of operation, while graduating the power produced by each impulse so as to meet the conditions of the load.

Originally three types of carburettor were employed for dealing with light oil; first, the surface carburettor; second, the wick carburettor; and third, the jet carburettor. The surface carburettor has entirely disappeared. In it air was passed over a surface of light oil or bubbled through it; the air carried off a vapour to form explosive mixture. It

was found, however, that the oil remaining in the carburettor gradually became heavier and heavier, so that ultimately no proper vaporization took place. This was due to the fractional evaporation of the oil which tended to carry away the light vapours, leaving in the vessel the oil, which produced heavy vapours. To avoid this fractionation the wick carburettor was introduced and here a complete portion of oil was evaporated at each operation so that no concentration of heavy oil was possible. The wick carburettor is still used in some cars, but the jet carburettor is practically universal. It has the advantage of discharging separate portions of oil into the air entering the engine, each portion being carried away and evaporated with all its fractions to produce the charge in the cylinder.

The modern jet carburettor appears to have originated with Butler, an English engineer, but it was first extensively used in the modification produced by Maybach as shown in fig. i.

A diagrammatic section of a carburettor of the Maybach type is shown in a larger scale in fig. 2.

Petrol is admitted to the chamber A by the valve B which is controlled by the float C acting through the levers D, so that the valve

Fig. 2.

B is closed when the float reaches a determined level and opened when it falls below it. The petrol flows into a jet E and stands at an approximately constant level within it. When the engine piston makes its suction stroke, the air enters from the atmosphere at F and passes to the cylinder through G. The pressure around the jet E thus falls, and the pressure of the atmosphere in the chamber A forces the petrol through E as a jet during the greater part of the suction stroke. An inflammable mixture is thus formed, which enters the cylinder by way of G. The area for the passage of air around the petrol jet E is constricted to a sufficient extent to produce the pressure fall necessary to propel the petrol through the jet E, and the area of the discharge aperture of the petrol jet E is pro-

portioned to give the desired volume of petrol to form the proper mixture with air. The device in this form works quite well when the range of speed required from the engine is not great ; that is, within limits, the volume of petrol thrown by the jet is fairly proportional to the air passing the jet. When, however, the speed range is great, such as in modern motors, which may vary from 300 to 1500 revolu- tions per minute under light and heavy loads, then it becomes impossible to

secure proportionality sufficiently accurate for regular ignition. This implies not only a change of engine speed but a change of volume entering the cylinder at each stroke as deter- mined by the position of the throttle. This introduces further complications. Throttle control implies a change of total charge volume per stroke, which change may occur either at a low or at a high speed. To meet this change the petrol jet should respond in such manner as to give a constant proportionality of petrol weight to air weight throughout all the variations- —otherwise sometimes petrol will be present in excess with no oxygen to burn it, and at other times the mixture may be so dilute as to miss firing altogether. To meet these varying conditions many carburettors have been pro- duced which seek by various devices to maintain uniformity of quality of mixture by the automatic change of throttle a'ound the jet. Fig. 3 shows in diagrammatic section one of the simplest of these contrivances, known as the Krebs carburettor. The petrol enters from the float K

chamber to the jet E; and, while the engine is running slowly, the whole supply of air enters by way of the passage F, mixes with the petrol and .eaches the cylin- ders by way of the pipe G. The volume of charge entering the cylinder per stroke is controlled by the piston throttle valve H, operated by the rod I ; and so long as the charge volume

required remains p

small, air from the ‘ 3′

atmosphere enters only by F. When speed rises, however, and the throttle is sufficiently opened, the pressure within the apparatus falls and affects a spring-pressed diaphragm K, which actuates a piston valve controlling the air passages L, so that this valve opens to the atmosphere more and more with increasing pressure reduction, and additional air thus flows into the carburettor and mixes with the air and petrol entering through F. By this device the required

fjroportion of air to petrol is maintained through a comparatively arge volume range. This change of air admission is rendered necessary because of the difference between the laws of air and petrol flow. In order to give a sufficient weight of petrol at low speeds when the pressure drop is small, it is necessary to provide a somewhat large area of petrol jet. When suction increases owing to high speed, this large area discharges too much petrol, and so necessitates a device, such as that described, which admits more air.

A still simpler device is adopted in many carburettors — that of an additional air inlet valve, kept closed until wanted by a spring. Fig. 4 shows a diagrammatic section as used in the Vauxhall car- burettor. Here the petrol jet and primary and secondary air passages are lettered as before.

The same effect is produced by devices which alter the area of the petrol jet or increase or diminish the number of petrol jets exposed as required. Although engine designers have succeeded in pro- portioning mixture through a considerable range of speed and charge demand, so as to obtain effective power explosions under all these conditions, yet much remains to be done to secure constancy of mixture atall speeds. Notwithstanding much which has been said as to varying mixture, there is only one mixture of air and petrol which gives the best results — that in which there is some excess of oxygen, more than sufficient to burn all the hydrogen and carbon present. It is necessary to secure this mixture under all conditions, not only to obtain economy in running but also to maintain purity of exhaust gases. Most engines at certain speeds discharge consider- able quantities of carbonic oxide into the atmosphere with their exhaust gases, and some discharge so much as to give rise to danger in a closed garage. Carbonic oxide is an extremely poisonous gas which should be reduced to the minimum in the interests of the health of our large cities. The enormous increase of motor traffic makes it important to render the exhaust gases as pure and innocuous as possible. Tests were made by the Royal Automobile Club some years ago which clearly showed that carbonic oxide should be kept down to 2 % and under when carburettors were properly adjusted. Subsequent experiments have been made by Hopkinson, Clerk and

Watson, which clearly prove, that in some cases as much as 30% of the whole heat of the petrol is lost in the exhaust gases by im-

F

Fig. 4.

perfect combustion This opens a wide field for improvement, and makes it probable that with better carburettors motor cars would

not only discharge purer exhaust gases but would work on very much less petrol than they do at present.

Practically all modern petrol engines are controlled by throttling the whole charge. In the earlier days several methods of control) were attempted: (1) missing impulses as in fig. 1 of the Daimler engines; (2) altering the timing of spark; (3) throttling petrol supply, and. (4) throttling the mixture of petrol and air. The last method has proved to be the best. By maintaining the proportion of explosive mixture, but diminishing the total volume. admitted to the cylinder per stroke, graduated impulses are obtained without any, or but few, missed ignitions. The effect of the throttling is to reduce compression by diminish- ing total charge weight. To a certain extent the proportion of petrol to total charge also varies, because the residual exhaust gases remain constant through a wide range. The thermal efficiency diminishes as the throttling increases; but, down to a third of the brake power, the diminution is not great, because although compression is reduced the expansion remains the same. At low compressions, however, the engine works practically as a non-compression engine, and the point of maximum pressure becomes greatly delayed. The efficiency, therefore, falls markedly, but this is not of much importance at light loads. Experiments by Callendar, Hopkinson, Watson and others have proved that the thermal efficiency obtained from these small engines with the throttle full open is very high indeed; 28% of the whole heat in the petrol is often given as indicated work ‘vyhen the carburettor is properly adjusted. As a large gas engine for the same compression cannot do better than. 3 5%,, it appears that the loss of heat due to small dimensions is com 7 pensated by the small time of exposure of the gases of explosion due to the high speed of rotation. Throttle control is very effective, and it has the great advantage of diminishing maximum

A,A. — Cylinders. ,„ B,B.— Water Jackets. – G 1 . — Oil Scoops on Big Ends. I.— Water Uptake. J. — Crank Chamber.

-Under Cover to Crank Chbr.

-Distribution Gear Case. L.— Oil Sump. M— Oil Pump.

M l . — Oil Suction Pipe and Filler.

N.— Oil Channels.

O.— Cam Shaft.

Q. — Throttle and Automatic Air

R. — Main Mixture Pipe. [Valve.

S. — Carburetter.

U. — Magneto.

V. — Inlet Valve.

W— Inlet Trunk.

pressures to which the piston and cylinders are exposed while the engine is running at the lower loads. This is important both for smooth running and good wearing qualities. Theoretically, better results could be obtained from the point of view of economy by retaining a constant compression pressure, constant charge of air, and producing ignition, somewhat in the manner of the Diesel engine. Such a method, however, would have the dis- advantage of producing practically the same maximum pressure for all loads, and this would tend to give an engine which would not run smoothly at slow speeds.

As has been said, tube ignition was speedily abandoned for electric ignition by accumulator, induction coil distributor and sparking plug. This in its turn was largely displaced by the low-tension magneto system, in which the spark was formed between contacts which were mechanically separated within the cylinders. The separable contacts gave rise to complications, and at present the most popular system of ignition is undoubtedly that of the high-tension magneto. In this system the ordinary high-tension sparking plugs are used, and the high-tension current is generated in a secondary winding on the armature of the magneto, and reaches the sparking plugs by way of a rotary distributor. In many cases the high-tension magneto system is used for the ordinary running of the engine, combined with an accumulator or battery and induction coil for starting the engine from rest. Such systems are called dual ignition systems. Sometimes the same ignition plugs are adapted to spark from either source, and in other cases separate plugs are used. The magneto systems have the great advantage of generating current without battery, and by their use noise is reduced to a minimum. All electrical systems are now arranged to allow of advancing and retarding the spark from the steering wheel. In modern magneto methods, however, the spark is automatically retarded when the engine slows and advanced when the speed rises, so that less change is required from the wheel than is necessary with battery and coil. ‘

Sir Oliver Lodge has invented a most interesting system of electric ignition, depending upon the production of an extra oscillatory current of enormous tension produced by the combined use of spark gap and condenser. This extra spark passes freely even under water, and it is impossible to stop it by any ordinary sooting or fouling of the ignition plug.

The most popular engines are now of the four and six cylinder types.

Fig. 5 shows a modern four-cylinder engine in longitudinal and transverse sections as made by the Wolseley Company. A, A are the cylinders; B, B, water jackets; G 1 , oil scoops on the large ends of the connecting-rods. These scoops take up oil from the cra.ik chamber. Forced lubrication is used. The oil pump M is of the toothed wheel type, and it is driven by skew gearing. An oil sump is arranged at L, and the oil is pumped from this sump by the pump described. The overflow from the main bearings supplies the channels in the crank case from which the oil scoops take their charge. It will be seen that the two inside pistons are attached to cranks of co- incident centres, and this is true of the two outside pistons also. This is the usual arrangement in four-cylinder engines. By this device the primary forces are balanced; but a small secondary unbalanced force remains, due to the difference in motion of the pistons at the up and down portions of their stroke. A six-cylinder engine has the advantage of getting rid of this secondary unbalanced force; but it requires a longer and more rigid crank chamber. In this engine the inlet and exhaust valves of each cylinder are placed in the same pocket and are driven from one cam-shaft. This is a very favourite arrangement; but many engines are constructed in which the inlet and exhaust valves operate on opposite sides of the cylinder in separate ports and are driven from separate cam- shafts. Dual ignition is applied to this engine; that is, an ignition composed of high-tension magneto and also battery and coil for starting. U is the high-tension magneto. Under the figure there is shown a list of parts which sufficiently indicate the nature of the engine.

An interesting and novel form of engine is shown at fig. 6. This is a well-known engine designed by Mr Knight, an American inventor, and now made by the Daimler and other companies. It will be observed in the figure that the ordinary lift valves are entirely dispensed with, and slide valves are used of the cylindrical shell type. The engine operates on the ordinary Otto cycle, and all the valve actions necessary to admit charge and discharge exhaust gases are accomplished by means of two sleeves sliding one within the other.

The outer sleeve slides in the main cylinder and the inner sleeve slides within the outer sleeve. The piston fits within the inner sleeve. The sleeves receive separate motions from short connecting links C and E, driven by eccentrics carried on a shaft W. This shaft is driven from the main crank-shaft by a strong chain so as to make half the revolutions of the crank-shaft in the usual manner of the Otto cycle. The inlet port is formed on one side of the cylinder and is marked I. The exhaust port is arranged on the other side and marked J. These ports are segmental. A water-jacketed cylinder head carries stationary rings L, K, which press outwards. These are clearly shown in the drawing. The inner sleeve ports run past the lower broad ring L when compression is to be accomplished, and the contents of the cylinder are retained within the cylinder and compression space by the piston rings and the fixed rings referred to.

Fig. 6. The outer sleeve does not require rings at all. Its function is simply to distribute the gases so that the exhaust port is closed by the outer sleeve when the inlet port is open. The outer sleeve acts really as a distributor; the inner sleeve supplies the pressure tightness required to resist compression and explosion. The idea of working exhaust and inlet by two sleeves within which the main piston operates is very daring and ingenious; and for these small engines the sleeve valve system works admirably. There are many advantages; the shape of the compression space is a most favourable one for reducing loss by cooling. All the valve ports required in ordinary lift valve engines are entirely dispensed with ; that is, the surface exposed to the explosion causing loss of heat is reduced to a minimum. The engines are found in use to be verv flexible and economical.

The petrol engines hitherto described, although light compared to the old stationary gas engines, are heavy when compared with recent motors developed for the purpose of aeroplanes. Many of these motors have been produced, but two only will be noticed here — the Anzani, because Bleriot's great flight

across the Channel was accomplished by means of an Anzani engine, and the Gnome engine, because it was used in the aero- plane with which Paulhan flew from London to Manchester.

Fig. 7 shows transverse and longitudinal sections through the Anzani motor. Looking at the longitudinal section it will be observed that the

cylinders are of the air-cooled type ; the exhaust valves alone are positively operated, and the inlet valves are of the auto- matic lift kind. The transverse section shows that three radially arranged cylinders are used and three pistons act upon one crank-pin. The Otto cycle is followed so that three impulses are obtained for

Fig. 7.

every two revolutions. The cylinders are spaced apart 6o° and project from the upper side of the crank chamber. Although not shown in the drawing, the pistons overrun a row of holes at the out end of the stroke and the exhaust first discharges through these holes. This is a very common device in aeroplane engines, and it greatly increases the rapidity of the exhaust discharged and reduces the work falling upon the exhaust valve. The pistons and cylinders are of cast iron; the rings are of cast iron; the ignition is electric, and the petrol is fed by gravity. The engine used by BleViot in his Cross-Channel flight was 25 H.P., cylinders 105 mm. boreX 130 mm. stroke; revolutions, 1600 per minute; total weight, 145 ft. The engine, it will be seen, is excet dingly simple, although air-cooling seems somewhat primitive for anything except short flights. The larger Anzani motors are water-cooled.

A diagrammatic transverse section of the Gnome motor is shown at fig. 8. In this interesting engine there are seven cylinders disposed

radially round a fixed crank-shaft. The seven pistons are all con- nected to the same crank-shaft, one piston being rigidly connected to a big end of peculiar construction by a connecting-rod, while the other connecting-rods are linked on to the same big end by pins ; that is, a hollow fixed crank-shaft has a single throw to which only one connecting-rod is attached; all the other connecting-rods work on pins let into the big end of that connecting-rod. The cylinders revolve round the fixed crank in the manner of the well- known engines first introdued to practice by Mr John Rigg. The explosive mixture is led from the carburettor through the hollow crank-shaft into the crank-case, and it is admitted into the cylinders by means of automatic inlet valves placed in the heads of the pistons. The exhaust valves are arranged on the cylinder heads. Dual ignition is provided by high tension magneto and storage battery and coil. The cylinders are ribbed outside like the Anzani, and are very effectively air-cooled by their rotation through the air as well as by the passage of the aeroplane through the atmosphere. The cylinders in the 35 H.P. motor are no mm. bore X 120 mm. stroke. The speed of rotation is usually 1200 revolutiors per minute. The total weight of the engine complete is 180 lb, or just over 5 lb per brake horse-power. The subject of aeroplane

petrol engines is a most interesting one, and rapid progress is being made.

So far, only 4-cycle engines have been described, and they are almost universal for use in motor-cars and aeroplanes. Some motor cars, however, use 2-cycle engines. Several types follow the “Clerk” cycle (see Gas Engine) and others the “Day” cycle. In America the Day cycle is very popular for motor

.Fig. 8.

launches, as the engine is of a very simple, easily managed kind. At present, however, the two-cycle engine has made but little way in motor car or aeroplane work. It is capable of great development and the attention given to it is increasing.

So far, petrol has been alluded to as the main liquid fuel for these motors. Other hydrocarbons have also been used; benzol, for example, obtained from gas tar is used to some extent, and alcohol has been applied to a considerable extent both for stationary and locomotive engines. Alcohol, however, has not been entirely successful. The amount of heat obtained for a given monetary expenditure is only about half that obtained by means of petrol. On the continent of Europe, however, alcohol motors have been considerably used for public vehicles.

The majority of petrol motors are provided with water jackets aro\ind their cylinders and combustion spaces. As only a small quantity of water can be carried, it is necessary to cool the water as fast as it becomes hot. For this purpose radiators of various constructions are applied. Generally a pump is used to produce a forced circulation, discharging the hot water from the engine jackets through the radiator and returning the cooled water to the jackets at another place. The radiators consist in some cases of fine tubes covered with projecting fins or gills ; the motion of the car forces air over the exterior of those surfaces and is assisted by the operation of a powerful fan driven from the engine. A favourite form of radiator consists of numerous small tubes set into a casing and arranged somewhat like a steam- engine condenser. Water is forced by the pump round these tubes, and air passes from the atmosphere through them. This type of radiator is sometimes known as the ” honeycomb ”

OIL ENGINE

radiator. A very large cooling surface is provided, so that the same water is used over and over again. In a day's run with a modern petrol engine very little water is lost from the system. Some engines dispense with a pump and depend on what is called the thermo-syphon. This is the old gas-engine system of circulation, depending on the different density of water when hot and cool. The engine shown at fig. 5 is provided with a water-circulation system of this kind. For the smaller engines the thermo-syphon works extremely well.

Heavy oil engines are those which consume oil having a flashing-point above 73° F. — the minimum at present allowed by act of parliament in Great Britain for oils to be consumed in ordinary illuminating lamps. Such oils are American and Russian petroleums and Scottish paraffins. They vary in specific gravity from -78 to -825, and in flashing-point from 75° to 152° F. Engines burning such oils may be divided into three distinct classes: (1) Engines in which the oil is subjected to a spraying operation before vaporization; (2) Engines in # which the oil is injected into the cylinder and vaporized within the cylinder; (3) Engines in which the oil is vaporized in a device external to the cylinder and introduced into the cylinder in the state of vapour.

The method of ignition might also be used to divide the engines into those igniting by the electric spark, by an incandescent tube, by compression, or by the heat of the internal surfaces of the combustion space. Spiel's engine was ignited by a flame igniting device similar to that used in Clerk's gas engine, and it was the only one introduced into Great Britain in which this method was adopted, though on the continent flame igniters were not uncommon. Electrically-operated igniters have come into ex- tensive use throughout the world.

The engines first used in Great Britain which fell under the first head were the Priestman and Samuelson, the oil being

r . % sprayed before being jf .,.?;:[: •//;>. vaporized in both. The ”*”” principle of the spray pro- ducer used is that so well and so. widely known in connexion with the atom- izers or spray producers used by perfumers. Fig. 9 shows such a spray pro- ducer in section. An air blast passing from the small jet A crosses the top of the tube B and creates within it a partial vacuum. The liquid contained in C flows up the tube B and issuing at the top of the tube through a small orifice is at once blown into very fine spray by the action of the air jet. If such a scent distributor be filled with petroleum oil, such as Royal Daylight or Russoline, the oil will be blown into fine spray, which can be ignited by a flame and will burn, if the jets be properly proportioned, with an intense blue non- luminous flame. The earlier inventors often

expressed the idea that an explosive mixture could be prepared without any vaporization whatever, by simply producing an atmosphere containing inflammable liquid in extremely small particles dis- tributed throughout the air in such proportion as to allow of complete combustion. The familiar explosive combustion of lycopodium, and the disastrous explosions caused in the exhaus- tion rooms of flour-mills by the presence of finely divided flour in the air, have also suggested to inventors the idea of producing explosions for power purposes from combustible solids. Al- though, doubtless, explosions could be produced in that way, yet in oil engines the production of spray is only a preliminary to the vaporization of the oil. If a sample of oil is sprayed in the manner just described, and injected in a hot chamber also filled with hot air, it at once passes into a state of vapour within that chamber, even though the air be at a temperature far below the boiling-point of the oil; the spray producer, ki fact, furnishes a ready means of saturating any volume of air with

vm®

ma

Fig. 9. — Perfume Spray Producer.

heavy petroleum oil to the full extent possible from the vapour tension of the oil at that particular temperature. The oil engines described below are in reality explosion gas engines of the ordinary Otto type, with special arrangements to enable them to vaporize the oil to be used. Only such parts of them as are necessary for the treatment and ignition will therefore be described.

Fig. 10 is a vertical section through the cylinder and vaporizer of a Priestman engine, and fig. n is a section on a larger scale, showing the vaporizing jet and the air admission and regulation valve

Fig. 10.— Priestman Oil Engine (vertical section through cylinder and vaporizer).

leading to the vaporizer. Oil is forced by means of air pressure from a reservoir through a pipe to the spraying nozzle o, and air passes from an air-pump by way of the annular channel b into the sprayer c, and there meets the oil jet issuingl from o. The oil is thus broken up into spray, and the air charged with spray flows into the vaporizer E. which is heated up in the first place on starting the engine by means of a lamp. In the vaporizer the oil spray becomes oil vapour, saturating the air within the hot walls. On the out-charging stroke of

the piston the mixture passes by way of the inlet valve H into the cylinder, air flowing into the vaporizer to replace it through the valve / (fig. 11). The cylinder K is thus charged with a mixture of air and hydrocarbon vapour, some of which may exist in the form of very fine spray. The piston L then returns and compresses the mixture, and when the compression is quite complete an electric spark is passed between the points M, and a compression explosion is obtained precisely similar to that obtained in the gas engine. The piston moves out, and on its return stroke the exhaust valve N is opened and the exhaust gases discharged by way of the pipe O, round the jacket P, enclosing the vaporizing chamber. The latter is thus kept hot by the exhaust gases when the engine is at work, and it remains sufficiently hot with- out the use of the lamp pro- vided for starting. To obtain the electric spark a bi- chromate battery with an induction coil is used. The spark is timed by contact pieces operated by an eccentric rod, used to actuate the exhaust valve and the air-pump for supplying the oil chamber and the spraying jet. To start the engine a hand pump is worked until the pressure is sufficient to force the oil through the spraying nozzle, and oil spray is formed in the starting lamp; the spray and air mixed produce a blue flame which heats the vaporizer. The fly-wheel is then rotated by hand and the engine moves away. The eccentric shaft is driven from the crank-shaft by means of toothed wheels, which reduce the speed to one-half the revolutions of the crank-shaft. The charging inlet valve is automatic. Governing is effected by throttling the oil and air supply. The governor operates on the butterfly valve T (fig. 11), and on the plug-cock / connected to it, by means of the spindle /'. The air and oil are thus simultaneously reduced, and the attempt is made to maintain the charge entering the cylinder at a constant proportion by weight of oil and air, while reducing the total weight, and therefore volume, of the charge entering. The Priestman engine thus gives an explosion on every second revolution in all circumstances, whether the engine be running light or loaded.

xx. 2 a

Fig. 11. — Priestman Oil Engine (section on a larger scale).

The compression pressure of the mixture before admission is, however, steadily reduced as the load is reduced, and at very light loads the engine is running practically as a non-compression engine.

A test by Professor Unwin of a 4 J nominal horse-power Priestman engine, cylinder 8-5 in. diameter, 12 in. stroke, normal speed 180 revolutions per minute, showed the consumption of oil per indicated horse-power hour to be 1-066 lb and per brake horse-power hour 1-243 lb. The oil used was that known as Broxburn Lighthouse, a Scottish paraffin oil produced by the destructive distillation of shale, having a density of -8i and a flashing-point about 152° F. With a 5 H.P. engine of the same dimensions, the volume swept by the piston per stroke being -395 cub. ft. and the clearance space in the cylinder at the end of the stroke -2 10 cub. ft., the principal results

were : —

Daylight Oil.

Russoline Oil.

Indicated horse-power …. Brake horse-power . Mean speed (revolutions per minute) Mean available pressure (revolutions per

minute) . . _.. Oil consumed per indicated horse-power

Oil consumed per brake horse-power per hour . . . . . .

9-369

7-722 204-33

53-2

•694 lb . -842 lb

7-408 6-765 207-73

. 41-38

•864 ft

•946 lb

With daylight oil the explosion pressure was 151-4 ft per square inch above atmosphere, and with Russoline 134-3 lb. The terminal pressure at the moment of opening the exhaust valve with daylight oil was 35-4 lb and with Russoline 33-7 per square inch. The compression pressure with daylight oil was 35 ft, and with Russoline 27-6 ft pressure above atmosphere. Professor Unwin calculated the amount of heat accounted for by the indicator as 18-8% in the case of daylight

oil and 15-2 in the case of Russoline oil.

The Hornsby-Ackroyd engine is an example of the class in which the oil is injected into the cylinder and there vaporized. Fig. 12

Fig. 12. — Hornsby-Ackroyd Engine (section through vaporizer and cylinder).

Fig. 13. — Hornsby – Ackroyd Engine (section through valves, vaporizer and cylinder).

is a section through the vaporizer and cylinder of this engine, and fig. .13 shows the inlet and exhaust valves also in section placed in front of the vaporizer and cylinder section. Vaporizing is conducted in the interior of the combustion chamber, which is so arranged that the heat of each explosion maintains it at a temperature sufficiently high to enable the oil to be vaporized by mere injection upon the hot surfaces. The vaporizer A is heated up by a separate lamp, the oil is injected at the oil inlet B, and the engine is, rotated by hand. The piston then takes in a charge of air by the air- inlet valve into the cylinder, the air passing by the port directly into the cylinder without passing through the vaporizer chamber. While the piston is moving forward, taking in the charge of air, the oil thrown into the vaporizer is vaporizing and diffusing itself through the vaporizer chamber, mixing, how- ever, only with the hot products of com- bustion left by the preceding explosion. During the charging stroke the air enters through the cylinder, and the vapour formed from the oil is almost entirely confined to the combustion chamber. On the return stroke of the piston air is forced through the somewhat narrow neck o into the'combustion chamber, and is there mixed with the vapour contained in it. _ At first, however, the mixture is too rich in inflammable vapour to be capable of ignition. As the compression

proceeds, however, more and more air is forced into the vaporizer chamber, and just as compression is completed the mixture attains proper explosive proportions. The sides of the chamber are suffi- ciently hot to cause explosion, under the pressure of which the piston moves forward. As the vaporizer A is not water- jacketed, and is connected to the metal of the back cover only by the small section or area of cast-iron forming the metal neck a, the heat given to the

surface by each explosion is sufficient to keep its temperature at about 700-800 C. Oil vapour mixed with air will explode by contact with a metal surface at a comparatively low temperature; this accounts for the explosion of the compressed mixture in the combustion chamber

A, which is never really raised to a red heat. It has long been known that under certain conditions of internal surface a gas engine may be made to run with very great regularity, without incandescent tube or any other form of igniter, if some portion of the interior surfaces of the cylinder or combustion space be so arranged that the temperature can rise moderately; then, although the temperature may be too low to ignite the mixture at atmospheric temperature, yet when compression is completed the mixture will often ignite in a perfectly regular manner. It is a curious fact that with heavy oils ignition is more easily accomplished at a low temperature than with light oils. The explanation seems to be that, while, in the case of light oils the hydrocarbon vapours formed are tolerably stable from a chemical point of view, the heavy oils very easily decompose by heat, and separate out their carbons, liberating the combined hydrogen, and at the moment of liberation the hydrogen, being in what chemists know as the nascent state, very readily enters into combination with the oxygen beside it. To start the engine the vaporizer is heated by a separate heating lamp, which is supplied with an air blast by means of a hand-operated fan. This operation should take about nine minutes. The engine is then moved round by hand, and starts in the usual manner. The oil tank is placed in the bed plate of the engine. The air and exhaust valves are driven by cams on a valve shaft. The governing is effected by a centrifugal governor which operates a by- pass valve, opening it when the speed is too high, and causes the oil pump to return the oil to the oil tank. At a test of one of these engines, which weighed 40 cwt. and was given as of 8 brake horse-power, with cylinder 10 in. in diameter and 15 in. stroke, aecording to Professor Capper's report, the revolutions were very constant, and the power developed did not vary one quarter of a brake horse-power from day to day. The oil consumed, reckoned on the average of the three days over which, the trial extended, was -919 ft per brake horse-power per hour, the mean power exerted being 8-35 brake horse. At another full-power trial of the same engine a brake horse-power of 8-57 was obtained, the mean speed being 239-66 revolutions per minute and the test lasting for two hours; the indicated power was 10-3 horse, the explosibns per minute 119-83, the mean effective pressure 28-9 per sq. in., the oil used per indicated horse-power per hour was -8i lb, and per brake horse-power per hour — -977 ft. In a test at half power, the brake horse-power developed was 4-57 at 235-9 revolutions per minute, and the oil used per brake horse-power was,, 1-48 lb. On a four hours' test, without a load, at 240 revolutions per minute, the consumption of oil was 4-23 lb per hour. Engines of this class are those manufactured by Messrs Crossley Bros., Ltd., and the National Gas Engine Co., Ltd.

Figs. 14 and 15 show a longitudinal section and detail views of the operative parts of the Crossley oil engine. On the suction stroke, air is drawn into the cylinder by the piston A through the automatic inlet valve D, and oil is then pumped into the heated vaporizer C through the oil sprayer G, as seen in section at fig. 15. The vaporizer C is bolted to the water-jacketed part B ; and, like the Hornsby, this vaporizer is first heated by lamp and then the heat of the ex- plosions keeps up its temperature to a sufficiently high point to vaporize the oil when sprayed against it. On the compression Stroke

V- 1 ‘ -v

IWlAVmU

SSmwAvv

&ZEZZZZ2ZZZZZZZZZZZZZZ2ZZZZZZZ2ZZ

W777A

ˆss >x«s» Ak>A<*,

Fig. 14. — Crossley Oil Engine.

of the piston A the charge of air is forced into the combustion chamber B and the vaporizer chamber C, where it mixes with the oil vapour, and the mixture is ignited at the termination of the •stroke by the ignition tube H. This tube is isolated to some extent from the vaporizer chamber C, and so it becomes hotter than the chamber C and is relied upon to ignite the mixture when formed at times when C would be too cold for the purpose. E is the exhaust valve, which

operates in the usual way The water circulation passes through the jacket by way of the pipes J and K. When the engine is running at heavy loads with full charges of oil delivered by the oil pump through the sprayer G, a second pump is caused to come into action, which discharges a very small quantity of water through the water sprayer valve F. This water passes into the vaporizer and com- bustion chamber, together with a little air, which enters by the automatic inlet valve, which serves as sprayer. This contrivance is found useful to prevent the vaporizer from overheating at heavy

Fig. 15. — Crossley Oil Engine.

loads. The principal difference between this engine and the Hornsby engine already described lies in the use of the separate ignition tube H and in the water sprayer F, which acts as a snifting valve, taking in a little air and water when the engine becomes hot. Messrs Crossley inform the writer that the consumption of either crude or refined oil is about -63 of a pint per horse-power on full load. They also give a test of a small engine developing 7 B.H.P., which consumed •601 pint per B.H.P. per hour of Rock Light refined lamp oil and only •603 pint per B.H.P. per hour of crude Borneo petroleum oil.

Engines in which the oil is vaporized in a device external to the cylinder have almost disappeared, because of the great success of the Hornsby-Ackroyd type, where oil is injected into, and vaporized within, the cylinder. It has been found, however, that many petrol engines having jet carburettors will operate with the heavier oils if the jet carburettor is suitably heated by means qf the exhaust gases. In some engines it is customary to start with petrol, and then when the parts have become sufficiently heated to substitute paraffin or heavy petroleum oil, putting the heavy oil through the same spraying process as the petrol and evaporating the spray by hot walls before entering the cylinder.

Mr Diesel has produced a very interesting engine which departs considerably from other types. In it air alone is drawn into the cylinder on the charging stroke ; the air is compressed on the return stroke to a very high pressure generally to over 400 lb per sq. in. This compression raises the air to incandescence, and then heavy oil is injected into the incandescent air by a small portion of air compressed to a still higher point. The oil ignites at once as it enters the combustion space, and so a power impulse is obtained, but with- out explosion. The pressure does not rise above the pressure of air and oil injection. The Diesel engine thus embodies two very original features; it operates at compression pressures very much higher than those used in any other internal combustion engines, and it dispenses with the usual igniting devices by rendering the air charge incandescent by compression. The engine operates generally on the Otto cycle, but it is also built giving an impulse at every revolution. Mr Diesel has shown great determination and persever- ance, and the engine has now attained a position of considerable commercial importance. It is made on the continent, in England and in America in sizes up to 1000 H.P., and it has been applied to many purposes on land and also to the propulsion of small vessels. The engine gives a very high thermal efficiency. The present writer has calculated the following values from

a test of a 500 B.H.P. Diesel oil engine made by Mr Michael Longridge, M.Inst.C.E. The engine had three cylinders, each of 22-05 m. diameter and stroke 29-52 in., each cylinder operating on the ” Otto ” cycle. The main results were as follows: —

Indicated power 595 horse

Brake power 459 ,,

Mechanical efficiency • 77 %

Indicated thermal efficiency 41%

Brake thermal efficiency 3 I- 7%

(D. C.)

OILLETS (from an 0. Fr. diminutive of mil, eye, in Mod. Fr. millet; other English variants are oy lets, eyelets, or eyelet-holes) , the architectural term given to the arrow slits in the walls of medieval fortifications, but more strictly applied to the round

hole or circle with which the openings terminate. The same term is applied to the small circles inserted in the tracery-head of the windows of the Decorated and Perpendicular periods, sometimes varied with trefoils and quatrefoils.

OILS (adopted from the Fr. oile, mod. huile, Lat. oleum, olive oil), the generic expression for substances belonging to extensive series of bodies of diverse chemical character, all of which have the common physical property of being fluid either at the ordinary temperature cr at temperatures below the boiling-point of water. Formerly, when substances were principally classified by obvious characteristics, the word included such a body as ” oil of vitriol ” (sulphuric acid), which has of course nothing in common with what is now understood under the term oils. In its most com- prehensive ordinary acceptation the word embraces at present the fluid fixed oils or fatty oils (e.g. olive oil) , the soft fats which may be fluid in their country of origin {e.g. coco-nut oil, palm oil), the hard fats {e.g. tallow), the still harder vegetable and animal waxes (e.g. carnaiiba wax, beeswax), the odoriferous ethereal (essential) oils, and the fluid and solid volatile hydro- carbons — -mineral hydrocarbons— found in nature or obtained from natural products by destructive distillation.

The common characteristic of all these substances is that they consist principally, in some cases exclusively, of carbon and hydrogen. They

are all readily inflammable and are practi- cally insoluble in water. The mineral hydrocarbons found in nature or obtained by destructive distillation do not come within, the range of this article (see Naphtha, Paraffin, Petroleum), which is restricted to the following two large groups of bodies, formed naturally within the vegetable and anima! organisms, viz. (1) Fixed oils, fats and waxes, and (2) Essential, ethereal or volatile oils.

i. Fixed Oils, Fats and Waxes.

The substances to be considered under , this head divide themselves naturally into two large classes, viz. fatty (fixed) oils and fats on the one hand, and waxes on the other, the dis- tinction between the two classes being based on a most important Chemical difference. The fixed oils and fats consist essentially of glycerides, i.e. esters formed by the union of three molecules of fatty acids with one molecule of the trihydric alcohol glycerin (q.v), whereas the waxes consist of esters formed by the union of one molecule of fatty acid with one molecule of a monohydric alcohol, such as cetyl alcohol, cholesterol, &c. Only in the case of the wax coccerin two molecules of fatty acids are combined with one molecule of a dihydric (bivalent) alcohol. It must be pointed out that in common parlance this distinction does not find its ready expression. Thus Japan wax is a glyceride and should be more correctly termed Japan tallow, whereas sperm oil is, chemically speaking, a wax. Although these two classes of substances have a number of physical properties in common, they must be considered under separate heads. The true chemical constitution of oils and fats was first expounded by the classical researches of Chevreul, embodied in his work, Recherches sur les corps gras d'origine animale (1823, reprinted

(a) Fatly (fixed) Oils and Fats. — The fatty (fixed) oils and fats form a well-defined and homogeneous group of substances, passing through all gradations of consistency, from oils which are fluid even below the freezing-point of water, up to the hardest fats which melt at about 50 C. Therefore, no sharp distinction can be made between fatty oils and fats. Nevertheless, it is convenient to apply the term " oil " to those glycerides which are fluid below about 20 C, and the term " fat " to those which are solid above this temperature.

Chemical Composition. — No oil or fat is found in nature con- sisting of a single chemical individual, i.e. a fat consisting of the glyceride. of one fatty acid only, such as stearin or tristearin, C 3 Hj(0-Ci8H350)3, the glycerin ester of stearic acid, Ci7H 35 -C0 2 H. The natural oils and fats are mixtures of at least two or three different triglycerides,

the most important of which are tristearin, tripalmitin, CsIUO-CeHˆiOˆ and triolein, C 3 H 6 (0-C 18 H 3 sO)3. These three glycerides have been usually considered the chief

constituents of most oils and fats, but latterly there have been recognized as widely distributed trilinolin, the glyceride of linolic acid, and trilinolenin, the glyceride of linolenic acid. The two last-named glycerides are characteristic of the semi- drying and drying oils respectively. In addition to the fatty acids mentioned already there occur also, although in much smaller quantities, other fatty acids combined with glycerin, as natural glycerides, such as the glyceride of butyric acid in butter- fat, of caproic, caprylic and capric acids in butter-fat and in coco-nut oil, lauric acid in coco-nut and palm-nut oils, and myristic acid in mace butter. These glycerides are, therefore, characteristic of the oils and fats named.

In the classified list below the most important fatty acids occurring in oils and fats are enumerated (cf . Waxes, below) .

Oils and fats must, therefore, not be looked upon as definite chemical individuals, but as representatives of natural species which vary, although within certain narrow limits, according to the climate and soil in which the plants which produce them are grown, or, in the case of animal fats, according to the climate, the race, the age of the animal, and especially the food, and also the idiosyncrasy of the individual animal. The oils and fats are distributed throughout the animal and vegetable kingdom from the lowest organism up to the most highly organized forms of animal and vegetable life, and are found in almost all tissues and organs. The vegetable oils and fats occur chiefly in the seeds, where they are stored to nourish the embryo, whereas in animals the oils and fats are enclosed mainly in the cellular tissues of the intestines and of the back.

Boiling-point.

mm. Pressure.

Melting-point.

•c.

Characteristic of

I. Acids of the Acetic series C n H2n02 —

Acetic acid

Butyric acid

Isovaleric acid

Caproic acid

Caprylic acid

Capric acid

Lauric acid

Myristic acid

Isocetic acid (?)

Palmitic acid

Stearic acid

Arachidic acid

Behenic acid

Lignoceric acid . . . . . , .

II. Acids of the Acrylic or Oleic series C„H2n- 2 02 —

Tiglic acid

Hypogaeic acid

Physetoleic acid . . . .

Oleic acid

Rapic acid

Erucic acid

III. Acids of the Linolic series C n H 2 „_402 —

Linolic acid

Tariricacid . . . .

Telfairic acid

Elaeomargaric acid

IV. Acids of the cyclic Chaulmoogric series

C n H2n_402 —

Hydnocarpic acid

Chaulmoogric acid

V. Acids of the Linolenic series Ctˆn-eOs —

Linolenic acid

Isolinolenic acid . . . .

VI. Acids of the series C»H 2 n-802 —

Clupanodonic acid

VII. Acids of the Ricinoleic series CHUn-sOj —

Ricinoleic acid

Quince oil acid

VIII. Dihydroxylated acids of the series CJˆnO* — Dihydroxystearic acid

IX. Acids of the series C»H2n_ 2 04 —

Japanic acid

CsHUOj

C4HUO2

C6H10O2

C6H12O2

CsHi 6 02

C10H20O2

C12H24O2

C14H2SO2

C15H30O2

C16H32O2

C18H38O2 C20H40O2 C22H44O2 C24H48O2

C 6 H 8 2

CieHso02

C16H30O2

C1SH34O2

C18H34O2

C22H42O2

C18H32O2 C18H32O2 C18H32O2 C18H32O2

C16H28O2 C18H32O2

C18H30O2 C18H30O2

C18H28O2

C18H34O3 C18H34OJ

C18H38O4

C22H42O4

760 760 760 770 761 760

IOO

100 100

760 15

100 30

13

119 162-3

173-7

202-203

236-237

268-270

225

250-5

271-5 291

198-5 236

285-5-286

281

220-225

247-248

15

250

17 -6-5

-5i

-8

16-5 31-3 43-6 53-8 55 62-62

69-32 77-0 83-84 80-5

64-5

33-34

30

14

33-34

50-5 48

59-60 68

(liquid)

4-5

141-143 117-7-117-9

Spindle-tree oil, Macassar oil Butter fat, Macassar oil Porpoise and dolphin oils

/ Butter fat, coco-nut oil, I palm nut oil

Laurel oil, coco-nut oil- Mace butter, nutmeg butter Purging nut Palm oil, Japan wax, myrtle

wax, lard, tallow, &c. Tallow, cacao butter, &c. Arachis oil Ben oil Arachis oil

Croton oil Arachis oil Caspian seal oil Most oils and fats Rape oils Rape oils, fish oils

Maize oil, cotton-seed oil Oil of Picramnia Camboita Koeme oil Tung oil

SHydnocarpus, Lukrabo and Chaulmoogra oils

f Linseed oil

Fish, liver and blubber oils

Castor oil Quince oil

Castor oil

Japan wax

Up to recently the oils and fats were looked upon as consisting in the main of a mixture of triglycerides, in which the three combined fatty acids are identical, as is the case in the above- named glycerides. Such glycerides are termed ” simple glycerides.” Recently, however, glycerides have been found in which the glycerin is combined with two and even three different acid radicals; examples of such glycerides

are dis- tearo-olein, C3H 5 (0-Ci8H 35 0) 2 , (0-Ci 8 H 33 0), and stearo-pal- mito-olein, C 3 H 5 (0-Ci 8 H 35 0) (0-C, 6 H 31 0) (O-dgHˆO). Such glycerides are termed ” mixed glycerides.” The glycerides occurring in natural oils and fats differ, therefore, in the first instance by the different fatty acids contained in them, and secondly, even if they do contain the same fatty acids, by different proportions of the several simple and mixed glycerides.

Since the methods of preparing the vegetable and animal fats are comparatively crude ones, they usually contain certain impurities of one kind or another, such as colouring and mucilagi- nous matter, remnants of vegetable and animal tissues, &c. For the most part these foreign substances can be removed by pro- cesses of refining, but even after this purification they still retain small quantities of foreign substances, such as traces of colouring matters, albuminoid and (or) resinous substances, and other foreign substances, which remain dissolved in the oils and fats, and can only be isolated after saponification of the fat. These foreign substances are comprised in the term ” unsaponifiable matter.” The most important constituents of the ” unsaponifiable matter ” are phytosterol C 26 H 44 or C 2 7H 44 0(?), and the isomeric cholesterol. The former occurs in all oils and fats of vegetable

origin; the latter is characteristic of all oils and fats of animal origin. This important difference furnishes a method of dis- tinguishing by chemical means vegetable oils and fats from animal oils and fats. This distinction will be made use of in the classification of the oils and fats. A second guiding principle is afforded by the different amounts of iodine (see Oil Testing below) the various oils and fats are capable of absorbing. Since this capacity runs parallel with one of the best-known properties of oils and fats, viz. the power of absorbing larger or smaller quantities of oxygen on exposure to the air, we arrive at the following classification : —

I. Fatty Oils or Liquid Fats A. Vegetable oils. B. Animal oils.

1. Drying oils. I. Marine animal oils.

2. Semi-drying oils. (a) Fish oils.

3. Non-drying oils. (b) Liver oils

(c) Blubber oils. 2. Terrestrial animal oils.

A. Vegetable fats.

II. Solid Fats

B. Animal fats.

1. Drying fats.

2. Semi-drying fats.

3. Non-drying fats.

Physical Properties. — The specific gravities of oils and fats vary between the limits of 0-910 and 0-975. The lowest specific gravity is owned by the oils belonging to the rape oil group- -from 0-913 to 0-916. The specific gravities of most non-drying oils lie between 0-916 and 0-920, and of most semi-drying oils between 0-920 and 0-925. whereas the drying oils have specific gravities of about 0-930. The animal and vegetable fats possess somewhat higher specific gravities, up to 0-930. The high specific gravity, 0-970, is owned by castor oil and cacao butter, and the highest specific gravity observed hitherto, 0-975, by Japan wax and myrtle wax.

In thei' liquid state oils and fats easily penetrate into the pores of dry substances; on paper L hey leave a translucent spot- " grease spot " — which cannot be removed by washing with water and subse quent drying. A curious fact, which may be used for the detection of the minutest quantity of oils and fats, is that camphor crushed between layers of paper without having been touched with the fingers rotates when thrown on clean water, the rotation ceasing immediately when a trace of oil or fat is added such as introduced by touching the water with a needle which has been passed previously through the hair.

The oils and fats are practically insoluble in water. With the exception of castor oil they are insoluble in cold alcohol; in boiling alcohol somewhat larger quantities dissolve. They are completely soluble in ether, carbon bisulphide, chloroform, carbon tetrachloride, petroleum ether, and benzene. Oils and fats have no distinct melting or solidifying point. This is not only due to the fact that they are mixtures of several glycerides, but also that even pure glycerides, such as tristearin, exhibit two melting-points, a so-called " double melting-point," the triglycerides melting at a certain temperature, then solidifying at a higher temperature to melt again on further heating. This curious behaviour was looked upon by Duffy as being due to the

existence of two isomeric modifications, the actual occurrence of which has been proved (1907) in the case of several mixed glycerides.

The freezing-points of those oils which are fluid at the ordinary temperature range from a few degrees above zero down to -28° C. (linseed oil). At low temperatures solid portions — usually termed ” stearine ” — separate out from many oils; in the case of cotton-seed oil the separation takes place at 12° C. These solid portions can be filtered off, and thus are obtained the commercial ” demargarinated oils ” or ” winter oils.”

Oils and fats can be heated to a temperature of 200° to 250 C. without undergoing any material change, provided prolonged contact with air is avoided. On being heated above 250 up to 300 some oils, like linseed oil, safflower oil, tung oil (Chinese or Japanese wood oil) and even castor oil, undergo a change which is most likely due to polymerization. In the case of castor oil solid products are formed. Above 300 C. all oils and fats are decomposed; this is evidenced by the evolution of acrolein, which possesses the well- known pungent odour of burning fat. At the same time hydro- carbons are formed (see Petroleum).

On exposure to the atmosphere, oils and fats gradually undergo certain changes. The drying oils absorb oxygen somewhat rapidly and dry to a film or skin, especially if exposed in a thin layer. Extensive use of this property is made in the paint and varnish trades. The semi-drying oils absorb oxygen more slowly than the drying oils, and are, therefore, useless as paint oils. Still, in course of time, they absorb oxygen distinctly enough to become thickened. The property of the semi-drying

oils to absorb oxygen is accelerated by spreading such oils over a large surface, notably over woollen or cotton fibres, when absorption proceeds so rapidly that frequently spontaneous combustion will ensue. Many fires in cotton and woollen mills have been caused thereby. The non-drying oils, the type of which is olive oil, do not become oxidized readily on exposure to the air, although gradually a change takes place, the oils thickening slightly and acquiring that peculiar disagreeable smell and acrid taste, which are defined by the term ” rancid.” The changes conditioning rancidity, although not yet fully understood in all details, must be ascribed in the first instance to slow hydrolysis (” saponification “) of the oils and fats by the moisture of the air, especially if favoured by insolation, when water is taken up by the oils and fats, and free fatty acids are formed. The fatty acids so set free are then more readily attacked by the oxygen of the air, and

oxygenated products are formed, which impart to the oils and fats the rancid smell and taste. The products of oxidation are not yet fully known; most likely they consist of lower fatty acids, such as formic and acetic acids, and perhaps also of aldehydes and ketones. If the fats and oils are well protected from air and light, they can be kept indefinitely. In fact C. Friedel has found unchanged triglycerides in the fat which had been buried several thousand years ago in the tombs of Abydos. If the action of air and moisture is allowed free play, the hydrolysis of the oils and fats may become so complete that only the insoluble fatty acids remain behind, the glycerin being washed away. This is exemplified by adipocere, and also by Irish bog butter, which consist chiefly of free fatty acids.

The property of oils and fats of being readily hydrolysed is a most important one, and very extensive use of it is made in the arts (soap-making, candle-making and recovery of their by-products). If oils and fats are treated with water alone under high pressure (corre- sponding to a temperature of about 220 C), or in the presence of water with caustic alkalis or alkaline earths or basic metallic oxides (which bodies act as ” catalysers “) at lower pressures, they are converted in the first instance into free fatty acids and glycerin. If an amount of the bases sufficient to combine subsequently with the fatty acids be present, then the corresponding salts of these fatty acids are formed, such as sodium salts of fatty acids (hard soap) or potassium salts of the fatty acids (soft soap), soaps of the alkaline earth (lime soap), or soaps of the metallic oxides (zinc soap, &c). The conversion of the glycerides (triglycerides) into fatty acids and glycerin must be looked upon as a reaction which takes place in stages, one molecule of a triglyceride being converted first into diglyceride and one molecule of fatty acid, the diglyceride then being changed into monoglyceride, and a second molecule of fatty acid, and finally the monoglyceride being converted into one molecule of fatty acid and glycerin. All these reactions take place concurrently, so that one molecule of a diglyceride may still retain its ephemeral existence, whilst another molecule is already broken up completely into free fatty acids and glycerin.

The oils and fats used in the industries are not drawn from any very great number of sources. The tables on the following pages contain chiefly the most important oils and fats together with their sources, yields and principal uses, arranged according to the above classification, and according to the magnitude of the iodine value. It should be added that many other oils and fats are only waiting improved conditions of transport to enter into successful competition with some of those that are already on the market.

Extraction. — Since the oils and fats have always served the human race as one of the most important articles of food, the oil and fat industry may well be considered to be as old as the human race itself. The methods of preparing oils and fats range themselves under three heads: (1) Extraction of oil by ” rendering,” i.e. boiling out with water; (2) Extraction of oil by expression; (3) Extraction of oil by means of solvents.

Rendering. — The crudest method of rendering oils from seeds, still practised in Central Africa, in Indo-China and on some of the South Sea Islands, consists in heaping up oleaginous fruits and allowing them to melt by the heat of the sun, when the exuding oil runs off and is collected. _ In a somewhat improved form this process of rendering is practised in the preparation of palm oil, and the rendering the best (Cochin) coco-nut oil by boiling the fresh kernels with water. Since hardly any machinery, or only the simplest machinery, h required for these processes, this method has some fascination for

inventors, and even at thepresent day processes are being patented, having for their object the boiling out of fruits with water or salt solutions, so as to facilitate the separation of the oil from the pulp by gravitation. Naturally these processes can only be applied to those seeds which contain large quantities of fatty matter, such as coco- nuts and olivss. The rendering process is, however, applied on a very large scale to the production of animal oils and fats* Formerly the animal oils and fats were obtained by heating the tissues con- taining the oils or fats over a free fire, when the cell membranes burst and the liquid fat flowed out. The cave-dweller who first collected the fat dripping off the deer on the roasting spit may well be looked upon as the first manufacturer of tallow. This crude process is now classed amongst the noxious trades, owing to the offensive stench given off, and must be considered as almost extinct in this country. Even on whaling vessels, where up to recently

whale oil, seal oil and sperm oil (see Waxes, below) were obtained exclusively by ” trying,’ i.e. by melting the blubber over a free fire, the process of rendering is fast becoming obsolete, the modern prac- tice being to deliver the blubber in as fresh a state as possible to the ” whaling establishments,” where the oil is rendered by methods closely resembling those worked in the enormous rendering establish- ments (for tallow, lard, bone fat) in the United States and in South America.

The method consists essentially in cutting up the fatty matter into small fragments, which are transferred into vessels containing water, wherein the comminuted mass is heated by steam, either under ordinary pressure in open vessels or under higher pressure in digestors. The fat gradually exudes and collects on the top of the water, whilst the membranous matter, ” greaves,” falls to the bottom. The fat is then drawn off the aqueous (gluey) layer, and strained through sieves or filters. The greaves are placed

Vegetable Oils

Name of Oil.

Source.

Yield per cent.

Iodine Value.

Principal Use.

Linseed

Tung (Chinese or Japanese wood) Candle nut . •’ . . . . Hemp seed . . Walnut; Nut . ... Safflower . .

Poppy seed

Sunflower . . . .

Madia

Cameline (German Sesame) ‘. Soja bean . . . .

Maize; Corn

Beech nut . .

Kapok

Cotton-seed . . .

Sesame

Curcas, purging nut

Brazil nut . . . . .

Croton

Ravison . ...

Rape (Colza)

Jamba

Apricot kernel

Peach kernel . . Almond . . . Arachis (ground nut) .

Hazel nut

Olive

Olive kernel

Ben

Grape seed . . . . . Castor . . . .

Linum usitatissimum Aleurites cordata Aleurites moluccana Cannabis sativa Juglans regia . . Carthamus tinctorius Papaver somniferum Helianthus annuus . Madia sativa .

Drying Oils.

Semi-drying Oils

Camelina sativa

Soja hispida

Zea Mays . .

Fagus syhatica

Bombax pentandrum (Eriodendron

anfractuosum) Gossypium herbaceum Sesamum orientate, S. indicum Jatropha curcas Bertholletia excelsa . Croton Tiglium Wild Brassica campestris Brassica campestris Brassica campestris var.?

Non-drying Oils,

Prunus armeniaca Prunus persica Prunus amygdalus Arachis hypogaea Corylus avellana Olea europaea . Olea europaea . Moringa oleifera

Vitis vinifera . Ricinus communis

38-40 40-41 62-64 30-35 63-65 30-32 41-50 21-22 32-33

31-34

6-10 43-45

30-32 24-26 50-57 55-57

53-56

33-40

33-43

24

40-45 32-35 45-55 43-45 50-60 40-60 12-15 35-36 10-20

46-53

175-205 150-165

163 148

145 130-147

I23-H3

1 19-135

118-5

‘35 122

1 13-125 111-120

116

108-110

103-108

98-110

90-106

102-104

105-117

94-102

95

96-108

93-109

93-100

83-roo

83-90

79-88

87

82

96

83-86

Paint, varnish, linoleum, soap Paint and varnish Burning oil, soap, paint Paints and varnishes, soft soap Oil painting

Burning, varnish (" roghan ") Salad oil, painting, soft soap Edible oil, soap Soap, burning

Burning, soap Edible, burning Edible, soap Food, burning

Food, soap Food, soap Food, soap Medicine, soap Edible, soap Medicine

Lubricant, burning Lubricant, burning Burning, lubricant

Perfumery, medicine Perfumery, medicine Perfumery, medicine Edible, soap

Edible, perfumery, lubricating Edible, lubricating, burning, soap Edible, lubricating, burning, soap Edible, perfumery, lubricating Food, burning

Medicine, soap, lubricating, Turkey red oil

Animal Oils

Name of Oil.

Fish oils —

Menhaden .....

Sardine oil

Salmon

Herring

Liver oils —

Cod liver

Shark liver (Arctic) . Blubber oils —

Seal

Whale .....

Dolphin, black fish, body oil .)

Jaw oil)

Porpoise Body oil . • • (Porpoise Jaw oil . . .)

Sheep's foot

Horses' foot .....

Neat's foot . .

Egg . . . .

Source.

Yield per cent.

Alosa menhaden Chipea sardinus Salmo salar Clupea harengus

Gadus morrhua Scymnus borealis

Phoca vitulina . Balaena mysticetus, &c.

Delphinus globiceps Delphinus phocaena

Marine Animal Otis

Terrestrial Animal Oils.

Ovis aries . Equus caballus Bos taurus Gattus domesticus

Iodine Value.

140-173 161-193

161 124-142

167 115

127-147 121-136

99-126

33 119

36

74 74-90

67-73 68-82

Principal Use.

Currying leather Currying leather Currying leather Currying leather

Medicine, currying leather Currying leather

Burning, currying leather Burning, soap-making, fibre dress- ing, currying leather

f Lubricating oil for delicate machinery

Lubricating

Lubricating

Lubricating, leather dressing

Leather dressing

OILS

47

Vegetable Fats

■ •

Name of Fat.

Source.

Yield per cent.

Iodine Value.

Principal Use.

Mahua butter, Illipe butter . Mowrah butter …. Shea butter (Galam butter) .

Ghee butter (Phulwara butter) .

Chinese vegetable tallow Kokum butter (Goa butter) .

Mocaya oil

Maripa fat …. Palm kernel oil/ . Palm nut oil)

Dika oil(oba oil, wild mango oil) .

Bassia latifolia …. Bassia longijolia ….

Elaeis guineensis, E. melanococca Myristica officinalis Bassia butyracea …. Theobroma cacao

Stillingia sebifera {Croton sebiferum) Garcinia indtca …. Shorea stenoptera, Hopea aspera . Cocos sclerocarpa …. Palma (?) Maripa …. , Elaeis guineensis,) .

E. melanococca) Cocos nucifera, C. butyracea . Rhus succedanea, R. vernicifera Irvingia gabonensis …. Myrica cerifera, M. carolinensis .

24-26 50-55 50-55 49-52 65-72 38-40 50-52 44-50 22

49 45-50 60-70

45-50 20-25

25 60-65 20-25

68-80

53-67 50-62

56

53 40-52

42 32-41 28-32

33

15-31

24

17

13-H

8-9

4-10

5-2

2-4

Medicine

Food, soap, candles

Food, soap, candles

Food, soap, candles

Candles, soap

Medicine, perfumery

Food

Chocolate

Soap, candles

Food

Food, candles

Food, soap

Food, soap

Food, soap

Food, soap, candles

Polishes

Food

Soap, candles (?)

Animal Fats

Name of Fat.

Source.

Yield per cent.

Iodine Value.

Principal Use.

Ice bear Rattlesnake

Ursus maritimus Crotalus durissus

Horses' fat I Equus caballus

Drying Fats.

Semi-drying Fats. . . . . I Non-drying Fats.

147 106

Pharmacy Pharmacy

I 75-85 I Food, soap

Goose fat .

Lard

Beef marrow .

Bone .

Tallow, beef

Tallow, mutton

Butter

Anser cinereus Sus scrofa Bos taurus Bos, Ovis . Bos taurus Ovis aries Bos taurus

70 50-70

55 46-56 38-46 35-46 26-38

Food, pomades

Food, soap, candles

Pomades

Soap, candles

Food, soap, candles, lubricants

Food, soap, candles, lubricants

Food

in hair or woollen bags and submitted to hydraulic pressure, by which a further portion of oil or fat is obtained (cf. Pressing, below). In the case of those animal fats which are intended for edible pur- poses, such as lard, suet for margarine, the greatest cleanliness must, of course, be observed, and the temperature must be kept as low as possible in order to obtain a perfectly sweet and pure material.

Pressing. — The boiling out process cannot be applied to small seeds, such as linseed and rape seed. Whilst the original method of obtaining seed oils may perhaps have been the same which is still used in India, viz. trituration of (rape) seeds in a mortar so that the oil can exude, it may be safely assumed that the process of expressing has been applied in the first instance to the preparation of olive oil. The first woman who expressed olives packed in a sack by heaping stones on them may be considered as the forerunner of the inventors of all the presses that subsequently came into use. Pliny describes in detail the apparatus and processes for obtaining olive oil in vogue among his Roman contemporaries, who used already a simple screw press, a knowledge of which they had derived from the Greeks. In the East, where vegetable oils form an important article of food and serve also for

other domestic purposes, various ingenious applications of lever presses and wedge presses, and even of com- bined lever and wedge presses, have been used from the remotest time. At an early stage of history the Chinese employed the same series of operations which are followed in the most advanced oil mills of modern time, viz. bruising and reducing the seeds to meal under an edge-stone, heating the meal in an open pan, and pressing out the oil in a wedge press in which the wedges were driven home by hammers. This primitive process is still being carried out in Man- churia, in the production of soja bean cake and soja bean oil, one of the staple industries of that country. The olive press, which was also used in the vineyards for expressing the grape juice, found its way from the south of France to the north, and was employed there for expressing poppy seed and rape seed. The apparatus was then gradually improved, and thus were evolved the modern forms of the screw press, next the Dutch or stamper press, and finally the hydraulic press. With the screw press, even in its most improved form, the amount of pressure practically obtainable is limited from the failure of its parts under the severe inelastic strain. Hence this kind of press finds only limited application, as in the industry of olive oil for expressing the best and finest virgin oil, and in the production of animal fats for edible purposes, such as lard and oleomargarine. The Dutch or stamper press, invented in Holland in the 17th century, was up to the early years of the 19th century

almost exclusively employed in Europe for pressing oil-seeds. It consists of two principal parts, an oblong rectangular box with an arrangement of plates, blocks and wedges, and over it a framework with heavy stampers which produce the pressure by their fall. The press box first consisted of strongly bound oaken planks, but later on cast-iron boxes were introduced. At each extremity of the box a bag of oil-meal was placed between two perforated Iron plates, next to which were inserted filling-up pieces of wood, two of which were oblique, so that the wedges which exercised the pressure could be readily driven home. This press has had to yield place to the hydraulic press, although in some old-fashioned establishments in Holland the stamper press could still be seen at work in the ‘eighties of the 19th century. The invention of the hydraulic press in 1795 by Joseph Bramah (Eng. pat., 30th April 1795) effected the greatest revolution in the oil industry, bringing a new, easily controlled and almost unlimited source of power into play; the limit of the power being solely reached by the limit of the strength of the material which the engineer is able to produce. Since then the hydraulic press has practically completely superseded all other appliances- used for expression, and in consequence of this epoch-making in- vention, assisted as it was later

on by the accumulator — invented by William George (later Lord) Armstrong in 1843 — tne seed-crushing industry reached a perfection of mechanical detail which soon secured its supremacy for England.

The sequence of operations in treating oil seeds, oil nuts, &c, for the separation of their contained oils is at the present time as follows : As a preliminary operation the oil seeds and nuts are freed from dust, sand and other impurities by sifting in an inclined re- volving cylinder or sieving machine, covered with woven wire,, having meshes varying according to the size and nature of the seed operated upon. This preliminary purification is of the greatest importance, especially for the preparation of edible oils and fats. In the case of those seeds amongst which are found pieces of iron (hammer heads amongst palm kernels, &c), the seeds are passed over magnetic separators, which retain the pieces of iron. The seeds ■ and nuts are then decorticated (where required), the shells removed,, and the kernels (" meats ") converted into a pulpy mass or meal (in older establishments by crushing and grinding between stones in edge-runners) on passing through a hopper over rollers consisting of five chilled iron or steel cylinders mounted vertically like the bowls of a calendar. These rollers are finely grooved so that the seed is cut up whilst passing in succession between the first and second rollers in the series, then between the second and the third, and so

on to the last, when the grains are sufficiently bruised, crushed and ground. The distance between the rollers can be easily regulated so that the seed leaving the bottom roller has the desired fineness. The comminuted mass, forming a more or less coarse meal, is either expressed in this state or subjected to a preliminary heating, accord- ing to the quality of the product to be manufactured. For the preparation of edible oils and fats the meal is expressed in the cold, after having been packed into bags and placed in hydraulic presses under a pressure of three hundred atmospheres or even more. The cakes are allowed to remain under pressure for about seven minutes. The oil exuding in the cold dissolves the smallest amount of colouring matter, &c, and hence has suffered least in its quality. Oils so obtained are known in commerce as "cold drawn oils," " cold pressed oils," " salad oils," " virgin oils."

By pressing in the cold, obviously only part of the oil or fat is recovered. A further quantity is obtained by expressing the seed meal

at a somewhat elevated temperature, reached by warming the comminuted seeds or fruits either immediately after they leave the five-roller mill, or after the ” cold drawn oil ” has been taken off. Of course the cold pressed cakes must be first disintegrated, which may be done under an edge-runner. The same operation may be repeated once more. Thus oils of the ” second expression ” and of the ” third expression ” are obtained.

In the case of oleaginous seeds of low value (cotton-seed, linseed) it is of importance to express in one operation the largest possible quantity of oil. Hence the bruised seed is, after leaving the five- roller mill, generally warmed at once in a steam-jacketed kettle fitted with a mixing gear, by passing steam into the jacket, and send- ing at the same time some steam through a rose, fixed inside the kettle, into the mass while it is being agitated. This practice is a survival of the older method of moistening the seed with a little water, while the seeds were bruised under edge-runners, so as to lower the temperature and facilitate the bursting of the cells. The warm meal is then delivered through measuring boxes into closed pressbags (” scourtins ” of the ” Marseilles ” press), or through measuring boxes, combined with an automatic moulding machine, into cloths open at two sides (Anglo-American press), so that the preliminarily pressed cakes can be put at once into the hydraulic press. In the latest constructions of cage presses, the use of bags is entirely dispensed with, a measured-out quantity of seed falling direct into the circular press cage and being separated from the material forming the next cake by a circular plate of sheet iron. The essentials of proper oil pressing are a slowly accumulating pressure, so that the liberated oil may have time to flow out and escape, a pressure that increases in proportion as the resistance of the material increases, and that maintains itself as the volume of material decreases through the escape of oil.

Numerous forms of hydraulic presses have been devised. Hori- zontal presses have practically ceased to be used in this branch of industry. At present vertical presses are almost exclusively in vogue; the three chief types of these have been already mentioned. Continuously working presses (compression by a conical screw) have been patented, but hitherto they have not been found practicable. Of the vertical presses the Anglo-American type of press is most in use. It represents an open press fitted with a number (usually sixteen) of iron press plates, between which the cakes are inserted by hand. A hydraulic ram then forces the table carrying the cakes against a press-head, and the exuding oil flows down the sides into a tank below. The ” Marseilles press” is largely used in the south of France. There the meal is packed by hand in ” scourtins,” bags made of plaited coco-nut leaves —

replacing the woollen cloths used in England. The packing of the press requires more manual labour than in the case of the Anglo-American press; moreover, the Mar- seilles press offers inconvenience in keeping the bags straight, and the pressure cannot be raised to the same height as in the more modern hydraulic presses. Oil obtained from heated meal is usually more highly coloured and harsher to the taste than cold drawn oil, more of the extractive substances being dissolved and intermixed with the oil. Such oils are hardly suitable for edible purposes, and they are chiefly used for manufacturing processes. According to the care exercised by the manufacturer in the range of temperature to which the seed is heated, various grades of oils are obtained.

In the case of those seeds which contain more than 40% of oil, such as arachis nuts and sesame seed, the first expression in pressbags leads to difficulty, as the meal causes ” spueing,” i.e. the meal exudes and escapes from the press. Hence, in modern installations, the first expression of those seeds is carried out in so-called cage (clodding) presses, consisting of hydraulic presses provided with circular boxes or cages, into which the meal is filled. These cages or boxes are either constructed of metal staves held together by a number of steel rings, or consist of one cylinder having a large number of perforations. The presses having perforated cylinders, although presenting mechanically a more perfect arrangement, are not preferable to the

Cress cages formed by staves, as the holes become easily clogged up y the meal, when the cylinder must be carefully cleaned out. Modern improvements, with a view to cheapening of cost, effect the transport of the cages from one press battery to another on rails. In order to dispense even with the charging of the presses by hand, in some systems the cages are first charged in a preliminary press,

from which they are transferred mechanically by a swinging arrange- ment into the final press.

Whilst the meal is under pressure the oil works its way to the edge of the cake, whence it exudes. For this reason an oblong form is the most favourable one for the easy separation of the oil. The edges of the cakes invariably retain a considerable portion of oil ; hence the soft edges are pared off, in the case of the oblong cake in a cake- paring machine, and the parings are returned to edge-runners, to be ground up and again pressed with fresh meal. Through the introduction of the cage (clodding) presses circular cakes have become fashionable, and as the material of these presses can be made much stronger and therefore higher pressure can be employed, more oil is expressed from

the meal than in open presses. The oil flowing from the presses is caught in reservoirs placed under the level of the floor, from. which it is pumped into storage tanks for settling and clarifying. Extraction by Solvents. — The cakes obtained in the foregoing process still retain considerable proportions of oil, not less than 4 to 5 % — usually, however, about 10 %. If it be desired to obtain larger quantities than are yielded by the above-described methods, processes having for their object the extraction of the seeds by volatile solvents must be resorted to. Extraction by means o r carbon bisulphide was first introduced in 1843 by Jesse Fisher of Birming- ham. Thirteen years later E. Deiss of Brunswick again patented the extraction by means of carbon bisulphide (Eng. Po,t. No. 390, 1856), and added ” chloroform, ether, essences, or benzine or benzole” to the list of solvents. For several years afterwards the process made little advance, for the colour of the oils produced was higher and the taste much sharper. The oil retained traces of sulphur, which showed themselves disagreeably in the smell of soaps made from it, and in the blackening of substances with which it was used. Of course, the meal left by the process was so tainted with carbon bisulphide that it was absolutely out of the question to use the extracted meal as cattle food. With the improvement in the manu- facture of carbon bisulphide, these drawbacks have been surmounted to a large extent, and the process of extracting with carbon bisulphide has specially gained much extension in the extraction of expressed olive marc in the south of France, in Italy and in Spain. Yet even now traces of carbon bisulphide are retained by the extracted meal, so that it is impossible to feed cattle with it. Carbon bisulphide is comparatively cheap, and it is heavier than water, hence there are certain advantages in storing so volatile and inflammable a liquid. But owing to the physiological effect carbon bisulphide has on the workmen, coupled’ with the chemical action of impure carbon bisulphide on iron which has frequently led to conflagrations, the employment of carbon bisulphide must remain restricted. In 1863 Richardson, Lundy and Irvine secured a patent (Eng. Pat. No. 2 3I5) for obtaining oil from crushed seeds, or from refuse cake, by the solvent action of volatile hydrocarbons from ” petroleum, earth oils, asphaltum oil, coal oil or shale oil, such hydrocarbons being required to be volatile under 212° F.” Since that time the development of the petroleum industry in all parts of the world and the large quantities of low boiling-point hydrocarbons — naphtha ˆ—obtained from the petroleum fields, and also the improvements in the apparatus employed, have raised this system of extraction to the rank of a competing practical method of oil production. Of the other proposed volatile solvents ordinary ether has found no practical application, as it is far too volatile and hence for

too dangerous. Carbon tetrachloride, chloroform, acetone and benzene are far too expensive. Carbon tetrachloride would be an ideal solvent, as it is non-inflammable and shares with carbon bisulphide the advantage of being heavier than water. Efforts have been made during the last few years to introduce this solvent on a large scale, but its high price and its physiological effect on the workmen have hitherto militated against it. At the present time the choice lies practically only between the two solvents, carbon bisulphide and naphtha (petroleum ether). Naphtha is preferable for oil seeds, as it extracts neither resins nor gummy matters from the oil seeds, and takes up less colouring matter than carbon bisulphide. Yet even with naphtha traces of the solvents remain, so that the. meal obtained cannot be used for cattle feeding, notwithstanding the many state- ments by interested parties to the contrary. It is true that on the continent extracted meal, especially rape meal from good Indian seed and palm kernel meal, are somewhat largely used as food for cattle in admixture with press cakes, but in England no extracted meal is used for feeding cattle, but finds its proper use in manuring the land.

The apparatus employed on a large scale depends on the tempera- ture at which the extraction is carried out. In the main two types of extracting apparatus are differentiated, viz. for extraction in the cold and for extraction in the hot. The seed is prepared in a similar manner as for pressing, except that it is not reduced to a tine meal, so as not to impede the percolation of the solvent through the mass. In the case of cold extraction the seed is placed in a series of closed vessels, through which the solvent percolates by displacement, on the ” counter-current ” system. A battery of vessels is so arranged that one vessel can always be made the last of the series to discharge finished meal and to be recharged with fresh meal, so that the process is practically a continuous one. The solution of the extracted oil or fat is then transferred to a steam-heated still, where the solvent

is driven off and recovered by condensing the vapours in a cooling coil, to be used again. The last remnant of volatile solvent in the oil is driven off by a current of open steam blown through the oil in the warm state. The extracting process in the hot is carried out in apparatus, the principle of which is exemplified by the well-known Soxhlet extractor. The comminuted seed is placed inside a vessel connected with an upright refrigerator on trays or baskets, and is surrounded there by the volatile solvent. On heating the solvent with

steam through a coil or jacket, the vapours rise through and around the meal. They pass into the refrigerator, where they are condensed and fall back as a condensed liquid through the meal, percolating it as they pass downwards, and reaching to the bottom of the vessel as a more or less saturated solution of oil in the solvent. The solvent is again evaporated, leaving the oil at the bottom of the vessel until the extraction is deemed finished. The solution of fat is then run oft into a still, as described already, and the last traces of solvent are driven out. The solvent is recovered and used again.

With regard to the merits and demerits of the last two mentioned processes — expression and extraction — the adoption of _ either will largely depend on local conditions and the objects for which the products are intended. Wherever the cake is the main product, expression will commend itself as the most advantageous process. Where, however, the fatty material forms the main product, as in the case of palm kernel oil, or sesame and coco-nut oils from damaged seeds (which would no longer yield proper cattle food), the process of extraction will be preferred, especially when the price of oils is high. In some cases the combination of the two processes commends itself, as in the case of the production of olive oil. The fruits are expressed, and after the edible qualities and best class of oils for technical purposes have been taken off by expression, the remaining pulp is extracted by means of solv.ents. This process is known under the name of mixed process (huilerie mixte).

Refining and Bleaching. — The oils and fats prepared by any of the methods detailed above are in their fresh state, and, if got from perfectly fresh (” sweet “) material, practically neutral. If care be exercised in the process of rendering animal oils and fats or expressing oils in the cold, the products are, as a rule, sufficiently pure to be delivered to the consumer, after a preliminary settling has allowed any mucilaginous matter, such as animal or vegetable fibres or other impurities, and also traces of moisture, to separate out. This spontaneous clarification was at one time the only method in vogue. This process is now shortened by filtering oils through filter presses, or otherwise brightening them, e.g. by blowing with air. In many cases these methods still suffice for the production of commercial oils and fats.

In special cases, such as the preparation of edible oils and fats, a further improvement in colour and greater purity is obtained by filtering the oils over charcoal, or over natural absorbent earths, such as fuller’s earth. Where this process does not suffice, as in the case of coco-nut oil or palm kernel oil, a preliminary purification in a current

of steam must be resorted to before the final purifica- tion, described above, is carried out. Oils intended for use on the table which deposit " stearine " in winter must be freed from such solid fats. This is done by allowing the oil to cool down to a low temperature and pressing it through cloths in a press, when a limpid oil exudes, which remains proof against cold — " winter oil." Most olive oils are naturally non-congealing oils, whereas the Tunisian and Algerian olive oils deposit so much " stearine " that they must be " demargarinated." Similar methods are em- ployed in the production of lard oil, edible cotton-seed oil, &c. For refining oils and fats intended for edible purposes only the foregoing methods, which may be summarized by the name of physical methods, can be used; the only chemicals permissible are alkalis or alkaline earths to remove free fatty acids present. Treatment with other chemicals renders the oils and fats unfit for consumption. Therefore all bleaching and refining pro- cesses involving other means than those enumerated can only be used for technical oils and fats, such. as lubricating oils, burning oils, paint oils, soap-making oils, &c.

Bleaching by the aid of chemicals requires great circumspec- tion. There is no universal method of oil-refining applicable to any and every oil or fat. Not only must each kind of oil or fat be considered as a special problem, but frequently even varieties of one and the same oil or fat are apt to cause the same difficulties as would a new individual. In many cases the purification by means of sulphuric acid, invented and patented

by Charles Gower in 1792 (frequently ascribed to Thenard), is still usefully applied. It consists in treating the oil with a small percentage of a more or less concentrated sulphuric acid, according to the nature of the oil or fat. The acid not only takes up water, but it acts on the suspended impurities, carbonizing them to some extent, and thus causing them to coagulate and fall down in the form of a flocculent mass, which carries with it mechanically other impurities which have not been acted upon. This method is chiefly used in the refining of linseed and rape oils. Purification by means of strong caustic soda was first recommended as a general process by Louis C. Arthur Barreswil, his suggestion being to heat the oil and add 2 % to 3 % of caustic soda. In most cases the purifica- tion consisted in removing the free fatty acids from rancid oils and fats, the caustic soda forming a soap with the fatty acids, which would either rise as a scum and lift up with it impurities, or fall to the bottom and carry down impurities. This process is a useful one in the case of cotton-seed oil. As a rule, however, it is a very precarious one, since emulsions are formed which prevent in many cases the separation of oil altogether. After the treatment with sulphuric acid or caustic soda, the oils must be washed

to remove the last traces of chemicals. The water is then allowed to settle out, and the oils are finally filtered. The number of chemicals which have been proposed from time to time for the purification of oils and fats is almost legion, and so long as the nature of oils and fats was little understood, a secret trade in oil-purifying chemicals flourished. With our present knowledge most of these chemicals may be removed into the limbo of useless things. The general methods of bleaching besides those mentioned already as physical methods, viz. filtration over charcoal or bleaching earth, are chiefly methods based on bleaching by means of oxygen or by chlorine. The methods of bleaching by oxygen include all those which aim at the bleaching by exposure to the air and to sunlight (as in the case of artists' linseed-oil), or where oxygen or ozone is introduced in the form of gas or is evolved by chemicals, as manganese dioxide, potassium bichromate or potassium permanganate and sulphuric acid. In the process of bleaching by means of chlorine either bleach- ing powder or bichromates and hydrochloric acid are used. It must again be emphasized that no general rule can be laid down as to which process should be employed in each given case. There is still a wide field open for the application of proper processes for the removal of impurities and colouring matters without running the risk of attacking the oil or fat itself.

Oil Testing.— Reliable scientific methods for testing oils and fats date back only to the end of the 'seventies of the 19th century. Before that time it was believed that not only could individual oils and fats be distinguished from each other by colour reactions, but it was also maintained that falsification could be detected thereby. With one or two exceptions (detec- tion of sesame oil and perhaps also of cotton-seed oil) all colour reactions are entirely useless. The modern methods of oil testing rest chiefly on so-called " quantitative " reactions, a number of characteristic " values " being determined which, being based on the special nature of the fatty acids contained in each individual oil or fat, assist in identifying them and also in revealing adulteration. These " values," together with other useful methods, are enumerated in the order of their utility for the purposes of testing.

The saponification value (saponification number) denotes the number of milligrams which one gramme of an oil or fat requires for saponification, or, in other words, for the neutralization of the total fatty acids contained in an oil or fat. We thus measure the alkali absorption value of all fatty acids contained in an oil or fat. The saponification values of most oils and fats lie in the neighbourhood of 195. But the oils belonging to the rape oil group are characterized by considerably lower saponification values, viz. about 175 on account of

their containing notable quantities of erucic acid, C22H42O2. In the case of those oils which do not belong to the rape oils and yet show abnormally low saponification values, the suspicion is raised at once that a certain amount of mineral oils (which do not absorb

alkali and are therefore termed ” unsaponifiable “) has been admixed fraudulently. Their amount can be determined in a direct manner by exhausting the saponified mass, after dilution with water, with ether, evaporating the latter and weighing the amount of mineral oil left behind. A few of the blubber oils, like dolphin jaw and porpoise jaw oils (used for lubricating typewriting machines), have exceedingly high saponification values owing to their containing volatile fatty acids with a small number of carbon atoms. Notable also are coco-nut and palm-nut oils, the saponification numbers of which vary from 240 to 260, and especially butter-fat, which has a saponification value of about 227. These high saponification values are due to the presence of (glycerides of) volatile fatty acids, and are of extreme usefulness to the analyst, especially in testing butter-fat for added margarine and other fats. These volatile acids are specially measured by the Reichert value (Reichert-Wollny value). To ascertain this value the volatile acids contained in 5 grammes of an oil or fat are distilled in a minutely prescribed manner, and the distilled-off acids are measured by titration with decinormal alkali. Whereas most of the oils and fats, viz. all those the saponification value of which lies at or below 195, contain practically no volatile acids,?’.«. have extremely low Reichert-Wollny values, all those oils and fats haying saponification values above 195 contain notable amounts of volatile fatty acids. Thus, the Reichert- Meis si value of butter-fat is 2 5 _ 3°> that of coco-nut oil 6-7, and of palm kernel oil about 5-6. This value is indispensable for judging the purity of a butter.

One of the most important values in oil testing is the iodine value. This indicates the percentage of iodine absorbed by an oil or fat when the latter is dissolved in chloroform or carbon tetrachloride, and treated with an accurately measured amount of free iodine supplied in the form of iodine chloride. By this means a measure is obtained of the unsaturated fatty acids contained in an oil or fat. On this value a scientific classification of all oils and fats can be based, as is shown by the above-given list of oils and fats. The unsaturated fatty acids which occur chiefly in oils and fats are oleic acid, iodine value 90-07; erucic acid, iodine value 75-15; linolic acid, iodine value 181-42; linolenic

acid, iodine value 274-1; and clupanodonic acid, iodine value 367-7. Oleic acid occurs in all non-drying oils and fats, and to some extent in the semi-drying oils and fats. Linolic acid is a characteristic constituent of all semi-drying, and to some extent of all drying oils. Linolenic acid characterizes all vegetable drying oils; similarly clupanodonic acid characterizes all marine animal oils.

If one individual oil or fat is given, the iodine value alone furnishes the readiest means of finding its place in the above system, and in many cases of identifying it. Even if a mixture of several oils and fats be present, the iodine value assists greatly in the identification of the components of the mixture, and furnishes the most important key for the attacking and resolving of this not very simple problem. Thus it points the way to the application of a further method to resolve the isolated fatty acids of an oil or fat into saturated fatty acids, which do not absorb iodine, and into un- saturated fatty acids, which absorb iodine in various proportions as shown above. This separation is effected by converting the alkali soaps of the fatty acids into lead soaps and treating the latter with ether, in which the lead salts of the saturated acids are insoluble, whereas the salts of the above-named unsaturated acids are soluble. The saturated fatty acids can then be further examined, and valuable information is gained by the determination of the melting-points and by treatment with solvents. Thus some individual fatty acids, such as stearic acid and arachidic acid (which is characteristic of ground nut oil) can be identified. In the mixture of unsaturated fatty acids, by means of some more refined methods, clupanodonic acid, linolenic acid, linolic acid and oleic acid can be recognized. By combining the various methods which have been outlined here, and by the help of some further additional special methods, and by reasoning in a strictly logical manner, it is possible tc resolve a mixture of two oils and fats, and even of three and four, into their components and determine approximately their quantities. The methods sketched here do not yet exhaust the armoury of the analytical chemist, but it can only be pointed out in passing that the detection of hydroxylated acids enables the analyst to ascertain the presence of castor oil, just as the isolation and determination of oxidized fatty acids enables him to differentiate blown oils from other oils.

Tests such as the Maumene test, the elaidin test and others, which formerly were the only resource of the chemist, have been practically superseded by the foregoing methods. The viscosity test, although of considerable importance in the examination of lubricating oils, has been shown to have very little discriminative value as a general test.

Commerce. — It may be safely said of the United Kingdom that it takes the foremost position in the world as regards the extent of the oil and fat industries. An estimate made by the writer (Cantor Lectures, " Oils and Fats, their Uses and Applica- tions," Society of Arts, 1904, p. 795), and based on the most reliable information obtainable, led to the conclusion that the sums involved in the oil and fat trade exceeded £1,000,000 per

week; in 1967 they approximated £1,250,000 per week. The great centres of the seed-oil trade (linseed, cotton-seed, rape- seed, castor-seed) are Hull, London, Liverpool, Bristol, Leith and Glasgow. Linseed is imported principally from the East Indies, Argentina, Canada, Russia and the United States; cotton-seed is chiefly supplied by Egypt and East India; rape-seed and castor-seed chiefly by East India. The importation of copra and palm kernels for the production of coco-nut oil and palm- nut oil is also considerable, but in these two cases Great Britain does not take the first place. Fish and blubber oils are principally produced in Dundee, London and Greenock. The manufacture of cod-liver oil for pharmaceutical purposes is naturally some- what limited, as Norway, Newfoundland, and latterly also Japan, are more favourably situated as regards the supply of fresh cod, but the technical liver oils (cod oil, shark-liver oil) are produced in very large quantities in Grimsby, Hull, Aberdeen, and latterly also on the west coasts of the United Kingdom. The production of edible fats (margarine, lard compounds, and vegetable butters) has taken root in this country, and bids fair to extend largely. With regard to edible oils, edible cotton- seed oil is the only table oil produced in Great Britain. The United Kingdom is also one of the largest importers of fatty materials.

Practically the whole trade in palrn oil, which comes exclusively from West Africa, 1 is confined to Liverpool, and the bulk of the tallow imported into Europe from Australasia, South America and the United States, is sold in the marts of London and Liverpool. Lard reaches Great Britain chiefly from the United States. Amongst the edible oils and fats which are largely imported, butter takes the first rank (to an amount of almost £25,000,000 per annum). This food-stuff reaches Great Britain not only from all butter-exporting countries of the continent of Europe, but in increasing quantities also from Australia, Canada, Argentine, Siberia and the United States of America. Next in importance is margarine, the British produc- tion of which does not suffice for the consumption, so that large quantities must be imported from Holland, edible olive oil from Italy, the south of France, Spain and the Mediterranean ports generally. Coco-nut oil and copra, both for edible and technical purposes, are largely shipped to Great Britain

from the East Indies and Ceylon, Java and the West Indies. Of lesser importance are greases, which form the by-product of the large slaughter-houses in the United States and Argentina, and American (Canadian) and Japanese fish oils.

On the continent of Europe the largest oil-trading centres are on the Mediterranean (Marseilles and Triest), which are geo- graphically more favourably placed than England for the produc- tion of such edible oils (in addition to the home-grown olive oil) as arachis oil, sesame oil and coco-nut oil. Moreover, the native population itself constitutes a large consumer of these oils. In the north of Europe, Hamburg, Rotterdam, Antwerp and Copenhagen are the largest centres of the oil and fat trade. Hamburg and its neighbourhood produces, curiously enough, at present the largest amount of palm-nut oil. The United States takes the foremost place in the world for the production of cotton- seed and maize oils, lard, bone fat and fish oils. Canada is likely to outstrip the United States in the trade of fish and blubber oils, and in the near future Japan bids fair to become a very serious competitor in the supply of these oils. Vast stores of hard vegetable fats are still practically wasted in tropical countries, such as India, Indo-China and the Sunda Islands, tropical South America, Africa and China. With the improvement in transport these will no doubt reach European manufacturing centres in larger quantities than has been the case hitherto.

Waxes

The waxes consist chiefly of the fatty acid esters of the higher monohydric alcohols, with which are frequently associated free alcohols as also free fatty acids. In the following two tables the ” acids ” and ” alcohols ” hitherto identified in waxes are enumerated in a classified order: —

OILS

5,

Acids

Boiling

Point,

Melting Point. ˚C.

Characteristic of

mm.

Pressure. 1

C.

I. Acids of the Acetic series C n H 2n Ficocerylic acid Myristic acid . Palmitic acid . . . Carnaiibic acid Pisangcerylic acid . Cerotic acid Melissic acid . Psyllostearylic acid

O2—

C13H26O2 C14H2PO2 C16H32Q2 C24H48U2 C24H48O2 C26H52O2 C30H60O2 C30H60O2

IOO IOO

250-5 271-5

57

53-8

62 62

72-5

7i

77-8

9i

94-95

Gondang wax

Wool wax

Beeswax, spermaceti

Carnaiiba wax, wool wax

Pisang wax

Beeswax, wool wax, insect wax

Beeswax

Psylla wax

II. Acids of the Acrylic or Oleic series

CnH2n_2 2 —

Physetoleic acid

Doeglic acid (?)

C16H30O2 C19H36O2

30

f Sperm oil

III. Hydroxylated acids of the series C n H 2n 3 — Lanopalmic acid . .

C16H32O2 CS1H62O3

87-88 92-93

Wool wax Cochineal wax

IV. Dihydroxylated acids of the series C„H 2 n04—

Lanoceric acid

C80H60O4

104-105

Wool wax

Alcohols

Boiling

Point.

Melting Point. °C.

Characteristic of

Pressure.

°C.

I. Alcohols of the Ethane series C„l Pisangceryl alcohol Cetyl alcohol (Ethal) . Octodecyl alcohol . Carnaiibyl alcohol . Ceryl alcohol . Myricyl (Melissyl) alcohol Psyllostearyl alcohol

i2n + 2

0—

C16H34O

CieHieO CisHsgO C24H50O

C26Hfi40

C30H62O C33H6SO

760 15

344 210-5

78 . 50 59 68-69

79 85-88 68-70

Pisang wax

I Spermaceti

Wool wax

Chinese wax, opium wax, Beeswax, Carnaiiba wax Psylla wax

wool fat

II. Alcohols of the Allylic series C„H 2 „0 —

Lanolin alcohol

C12H24O

•

102-104

Wool wax

III. Alcohols of the series C„H 2n _sO —

Ficoceryl alcohol

C„H 28

198

Gondang wax

IV. Alcohols of the Glycolic series CnH 2 n + 202 —

Cocceryl alcohol

C30H62O2

101-104

Cochineal wax

V. Alcohols of the Cholesterol series —

Cholesterol .-

Isocholesterol

C26H44O C26H44O

I48-4-I5P-8

137-138

f Wool wax

Spermaceti consists practically of cetyl palmitate, Chinese wax of ceryl palmitate. The other waxes are of more complex composition, especially so wool wax.

The waxes can be classified similarly to the oils and fats as

follows: — 1 t • -j

I. Liquid waxes.

II. Solid waxes.

A. Vegetable waxes.

B. Animal waxes.

The table enumerates the most important waxes:—

Waxes

Name of W T ax.

Source.

Iodine Value.

Principal Use.

Sperm oil . . Arctic sperm oil (Bottlenose oil)

Vegetable Waxes — Carnaiiba wax

Animal Waxes — Wool wax

Beeswax …. Spermaceti (Cetin) Insect wax, Chinese wax .

Liquid Waxes. Physeter macrocephalus Hyperoodon rostratus

Solid Waxes. Corypha cerifera .

Ovis aries

A pis mellifica …. Physeter macrocephalus . Coccus ceriferus

81-90 67-82

13

102

8-n

0-4 0-1-4

Lubricant Lubricant

Polishes. Phonograph mass

Ointment Candles, polishes Candles, surgery Candles, polishes, sizes

There are only two liquid waxes known, sperm oil and arctic sperm oil (bottlenose- whale oil), formerly always classed together with the animal oils. In their physical properties the natural waxes simulate the fatty oils and fats. They behave similarly

to solvents; and in their liquid condition leave a grease spot on paper. An important property of waxes is that of easily forming emulsions with water, so that large quantities of water can be incorporated with them (lanolin).

The liquid waxes occur in the blubber of the sperm whale, and in the head cavities of those whales which yield spermaceti ; this latter is obtained by cooling the crude oil obtained from the head cavities. Vegetable waxes appear to be very widely distributed throughout the vegetable kingdom, and occur mostly

as a very thin film covering leaves and also fruits. A few only are found in sufficiently large quantities to be of com- mercial importance. So far carnaiiba wax is practically the only vegetable wax which is of importance in the world's markets. t The animal waxes are wid«ly distributed amongst the insects, the most important being beeswax, which is collected in almost all parts of the world. An ex- ceptional position is occupied by wool wax, the main constituent of the natural wool fat which covers the hair of sheep, and is obtained as a by-product in scour- ing the raw wool. Wool fat is now being purified on a large scale and brought into commerce, under the name of lanolin, as an

ointment the beneficent properties of which were known to Dioscorides in the beginning of the present era. Its chemical composition is exceedingly complex, and specially remarkable on account of the considerable proportions of cholesterol and isocholesterol it contains.

Commerce. — The sperm oils are generally sold in the same markets as the fish and blubber oils (see above). For beeswax London is one of the chief marts of the world. In Yorkshire, the centre of the woollen industry, the largest amounts of wool- fat are produced, all attempts to recover the hitherto wasted material in Argentine and Australia having so far not been attended with any marked success. Spermaceti is a compara- tively unimportant article of commerce; and of Chinese wax . small quantities only are imported, as the home consumption takes up the bulk of the wax for the manufacture of candles, polishes and sizes.

2. Essential or Ethereal Oils. The essential, ethereal, or " volatile " oils

constitute a very extensive class of bodies, which possess, in a concentrated form, the odour characteristic of the plants or vegetable substances from which they are obtained. The oils are usually contained in special cells, glands, cavities, or canals within the plants either as such or intermixed with resinous substances; in the latter case the mixtures form oleo-resins, balsams or resins according as the product is viscid, or solid and hard. A few do not exist ready formed in the plants, but result from chemical change of inodorous substances; as for instance, bitter almonds and essential oil of mustard.

The essential oils are for the most part insoluble or only very sparingly soluble in water, but in alcohol, ether, fatty oils and mineral oils they dissolve freely. They ignite with great ease, emitting a smoke freely, owing to the large proportion of carbon they contain. Their chief physical distinction from the fatty oils is that they are as a rule not oleaginous to the touch and leave no permanent grease spot. They have an aromatic smell and a hot burning taste, and can be distilled unchanged. The crude oils are at the ordinary temperature mostly liquid, some are solid substances, others, again, deposit on standing a crystalline portion (" stearoptene " in contradistinction to the liquid portion (" elaeoptene "). The essential oils possess a high refractive power, and most of them rotate the plane of the polarized light. Even so nearly related oils as the oils of turpentine, if obtained from different sources, rotate the plane of the polarized light in opposite directions. In specific gravity the essential oils range from 0-850 to 1-142; the majority are, however, specifically lighter than water. In their chemical constitution the essential oils present no relationship to the fats and oils. They represent a large number of classes of substances of which the most important are: (1) Hydrocarbons, such as pinene in oil of turpentine, camphene in citronella oil, limonene in lemon and orange-peel oils, caryophyllene in clove oil and cumene in oil of thyme; (2) ketones, such as camphor from the camphor tree, and irone which occurs in orris root; (3) phenols, such as eugenol in clove oil, thymol in thyme oil, saffrol in sassafras oil, anethol in anise oil; (4) aldehydes, such as citral and citronellal, the most important constituents of lemon oil and lemon-grass oil, benzaldehyde in the oil of bitter almonds, cinnamic aldehyde in cassia oil, vanillin in gum benzoin and helio- tropin in the spiraea oil, &c. ; (5) alcohols and their esters, such as geraniol (rhodinol) in rose oil and geranium oil, linalool, occurring in bergamot and lavender oils, and as the acetic ester in rose oil, terpineol in cardamom oil, menthol in peppermint oil, eucalyptol in eucalyptus oil and borneol in rosemary oil and Borneo camphor; (6) acids and, their anhydrides, such as cinnamic

acid in Peru balsam and coumarin in woodruff; and (7) nitrogenous compounds, such as mustard oil, indol in jasmine oil and anthranilic methyl-ester in neroli and jasmine oils.

Preparation from Plants. — Before essential oils could be prepared synthetically they were obtained from plants by one of the following , methods : (1) distillation, (2) expression, (3) extraction, (4) enfleurage, (5) maceration.

The most important of these processes is the first, as it is applicable to a large number of substances of the widest range, such as oil of peppermint.and camphor. The process is based on the principle that whilst the odoriferous substances are insoluble in water, their vapour tension is reduced on being treated with steam so that they are carried over by a current of steam. The distillation is generally performed in a still with an inlet for steam and an outlet to carry the vapours laden with essential oils into a condenser, where the water and oil vapours are condensed. On standing, the distillate separates into two layers, an aqueous and an oily layer, the oil floating on or sinking through the water according to its specific

gravity. The process of expression is applicable to the obtaining of essential oils which are contained in the rind or skin of the fruits belonging to the citron family, such as orange and lemon oils. The oranges, lemons, &c, are peeled, and the peel is pressed against a large number of fine needles, the exuding oil being absorbed by sponges. It is intended to introduce machinery to replace manual labour. The process of extraction with volatile solvents is similar to that used in the extraction of oils and fats, but as only the most highly purified solvents can be used, this process has not yet gained commercial importance. The process of enfleurage is used in those cases where the odoriferous substance is present to a very small extent, and is so tender and liable to deterioration that it cannot be separated by way of distillation. Thus in the case of neroli oil the petals of orange blossom are loosely spread on trays covered with purified lard or with fine olive oil. The fatty materials then take up and fix the essential oil. This process is principally employed for preparing pomades and perfumed oils. Less tender plants can be treated by the analogous method of maceration, which consists in extracting the odoriferous substances by macerating the flowers in hot oil or molten fat. The essential oil is then dissolved by the fatty substances. The essentia! oil itself can be recovered from the perfumed oils, prepared either by enfleurage or maceration, by agitating the perfumed fat in a shaking machine with pure concen- trated alcohol. The essential oil passes into the alcoholic solution, which is used as such in perfumery.

Synthetic Preparation. — Since the chemistry of the essential oils has been investigated in a systematic fashion a large number of the chemical individuals mentioned above have been isolated from the oils and identified.

This first step has led to the synthetical production of the most characteristic substances of essential oils in the laboratory, and the synthetical manufacture of essential oils bade fair to rival in importance the production of tar colours from the hydrocarbons obtained on distilling coal. One of the earliest triumphs of synthetical chemistry in this direction was the production of terpineol, the artificial lilac scent, from oil of turpentine. At present it is almost a by-product in the manufacture of artificial camphor. This was followed by the production of heliotropin, coumarin and vanillin, and later on by the artificial preparation of ionone, the most char- acteristic constituent of the violet scent. At present the manufacture of artificial camphor may be considered a solved problem, although it is doubtful whether such camphor will be able to compete in price with the natural product in the future. The aim of the chemist to produce essential oils on a manufacturing scale is naturally confined at present to the more expensive oils. For so long as the great bulk of oils is so cheaply produced in nature's laboratory, the natural products will hold their field for a long time to come.

Applications. — Essential oils have an extensive range of uses, of which the principal are their various applications in perfumery (

The examination of essential oils is by no means an easy task. Each oil requires almost a special method, but with the progress of chemistry the extensive adulteration that used to be practised with fatty oils has almost disappeared, as the presence of fatty oils is readily detected. Adulteration of expensive oil with cheaper oils is now more extensively practised, and such tests as the determination

of the saponification value (see above) and of the optical rotation, and in special cases the isolation and quantitative determination of characteristic substances, leads in very many cases to reliable results. The colour, the boiling-point, the specific gravity and solubility in alcohol serve as most valuable adj uncts in the examina- tion with a view to form an estimate of the genuineness and value of a sample. Quite apart from the genuineness of a sample, its special aroma

constitutes the value of an oil, and in this respect the judging of the value of a given oil may, apart from the purity, be more readily solved by an experienced perfumer than by the chemist. Thus roses of different origin or even of different years will yield rose oils of widely different value. The cultivation of plants for essential oils has become a large industry, and is especially practised as an industry in the south of France (Grasse, Nice, Cannes). The rose oil industry, which had been for centuries located in the valleys of Bulgaria, has now been taken up in Germany (near Leipzig), where roses are specially cultivated for the production of rose oil. India and China are also very large producers of essential oils. Owing to the climate other countries are less favoured, although lavender and peppermint are largely cultivated at Mitcham in Surrey, in Hertford- shire and Bedfordshire. Lavender and peppermint oils of English origin rank as the best qualities. As an illustration of the extent to which this part of the industry surfers from the climate, it may be stated that oil from lavender plants grown in England never produces more than 7 to 10% Hnalool acetate, which gives the characteristic scent to lavender oil, whilst oil from lavender grown in the south of France frequently yields as much as 35 % of the ester. The proof that this is due mainly to climatic influences is furnished by the fact that Mitcham lavender transplanted to France produces an oil which year by year approximates more closely in respect of its contents of linalool acetate to the product of the French plant.

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OIRON, a village of western France, in the department of Deux-Sevres, 7! m. E. by S. of Thouars by road. Oiron is celebrated for its chateau, standing in a park and originally built in the first half of the 16th century by the Gouffier family, rebuilt in the latter half of the 17th century by Francis of Aubusson, duke of La Feuillade, and purchased by Madame de Montespan, who there passed the latter part of her life. Marshal Villeroy afterwards lived there. The chateau consists of a main building with two long projecting wings, one of which is a graceful structure of the Renaissance period built over a cloister. The adjoining church, begun in 151 8, combines the Gothic and Renaissance styles and contains the tombs of four members of the Gouffier family. These together with other parts of the chateau and church were mutilated by the Protestants in 1 568. The park contains a group of four dolmens.

For the Oiron pottery see Ceramics.

OISE, a river of northern France, tributary to the Seine, flowing south-west from the Belgian frontier and traversing the departments of Aisne, Oise and Seine-et-Oise. Length, 187 m.; area of basin 6437 sq. m. Rising in Belgium, 5 m. S.E. of Chimay (province of Namur) at a height of 980 ft., the river enters France after a course of little more than 9 m. Flowing through the district of Thierache, it divides below Guise into several arms and proceeds to the confluence of the Serre, near La Fere (Aisne). Thence as far as the confluence of the Ailette its course lies through well-wooded country to Compiegne,

a short distance above which it receives the Aisne. Skirting the forests of Compiegne, Halatte and Chantilly, all on its left bank, and receiving near Creil the Therain and the Breche, the river flows past Pontoise and debouches into the Seine 39 m. below Paris. Its channel is canalized (depth 6 ft. 6 in.) from Janville above Compiegne, to its mouth over a section 60 m. in length. Above Janville a lateral canal continued by the Sambre-Oise canal accompanies the river to Landrecies. It communicates with the canal system of Flanders and with the Somme canal by way of the St Quentin canal (Crozat branch) which unites with it at Chauny. The same town is its point of junction with the Aisne-Oise canal, by which it is linked with the Eastern canal

system.

OISE, a department of northern France, three-fourths of which belonged to Ile-de-France and the rest to Picardy, bounded N. by Somme, E. by Aisne, S. by Seine-et-Mame and Seine-et- Oise, and W. by Eure and Seine-Inf6rieure. Pop. (1906) 410,049; area 2272 sq. m. The department is a moderately elevated plateau with pleasant valleys and fine forests, such as those of Compiegne, Ermenonville, Chantilly and Halatte, all in the south-east. It belongs almost entirely to the basin of the Seine — the Somme and the Bresle, which flow into the English Channel, draining but a small area. The most important river is the Oise, which flows through a broad and fertile valley from north-east to south-west, past the towns of Noyon, Com- piegne, Pont St Maxence and Creil. On its right it receives the Breche and the Therain, and on its left the Aisne, which brings down a larger volume of water than the Oise itself, the Authonne, and the Nonette, which irrigates the valley of Senlis and Chantilly. The Ourcq, a tributary of the Marne, in the south-east, and the Epte, a tributary of the Seine, in the west, also in part belong to the department. These streams are separated by ranges of slight elevation or by isolated hills, the highest point (770 ft.) being in the ridge of Bray, which stretches from Dieppe to Precy-sur-Oise. The lowest point is at the mouth of the Oise, only 66 ft. above sea-level. The climate is very variable, but the range of temperature is moderate.

Clay for bricks and earthenware, sand and building-stone are among the mineral products of Oise, and peat is also worked. Pierrefonds, Gouvieux, Chantilly and Fontaine Bonneleau have mineral springs. Wheat, oats and other cereals, potatoes and sugar beet are the chief agricultural crops. Cattle are reared more especially in the western districts, where dairying is actively carried on. Bee-keeping is general. Racing stables are numerous in the neighbourhood of Chantilly and Compiegne. Among the industries of the department, of manufacture of sugar and alcohol from beetroot occupies a foremost place. The manufacture of furniture, brushes (Beauvais) and other wooden goods and of toys, fancy-ware, buttons, fans and other articles in wood, ivory, bone or mother-of-pearl are widespread industries. There are also woollen and cotton mills, and the making of woollen fabrics, blankets, carpets (Beauvais), hosiery and lace (Chantilly and its vicinity) is actively carried on. Creil and the neighbouring Montataire form an important metallurgical centre. Oise is served by the Northern railway, on which Creil is an important junction, and its commerce is facilitated by the Oise and its lateral canal and the Aisne, which afford about 70 m. of navigable waterway.

There are four arrondissements — Beauvais, Clermont, Com- piegne and Senlis — with 35 cantons and 701 communes. The department forms the diocese of Beauvais (province of Reims) and part of the region of the II. army corps and of the academie (educational division) of Paris. Its court of appeal is at Amiens. The principal places are Beauvais, the capital, Chantilly, Cler- mont-en-Beauvoisis, Compiegne, Noyon, Pierrefonds, Creil and Senlis, which are treated separately. Among the more populous places not mentioned is Meru (S3 17), a centre for fancy-ware manufacture. The department abounds in old churches, among which, besides those of Beauvais, Noyon and Senlis, may be mentioned those at Morienval (nth and 12th centuries), Maignelay (1 5th and 1 6th centuries) , Crepy-en-Valois (St Thomas, 12th, 13th and 15th centuries), St Leu d'Esserent (mainly 12th

century), Tracy-le-Val (mainly 12th century), Viilers St Paul (12th and 13th centuries), St Germer-de-Fly (a fine example of the transition from Romanesque to Gothic architecture), and St Martin-aux-Bois (13th, 14th and 15th centuries). Pont- point preserves the buildings of an abbey founded towards the end of the 14th century and St Jean-aux-Bois the remains of a priory including a church of the 13th century. There are Gallo-Roman remains of Champlieu close to the forest of Compiegne. At Ermenonville there is a chateau of the 17th century where Rousseau died in 1778.

OJIBWA Y (Ojibwa), or Chippeway (Chippewa), the name given by the English to a large tribe of North American Indians of Algonquian stock. They must not be confused with the Chipewyan tribe of Athabascan stock settled around Lake Athabasca, Canada. They formerly occupied a vast tract of country around Lakes Huron and Superior, and now are settled on reservations in the neighbourhood. The name is from a word meaning " to roast till puckered " or " drawn up," in refer- ence, it is suggested, to a peculiar seam in their mocassins, though other explanations have been proposed. They call themselves Anishinabeg (" spontaneous men "), and the French called them Saulteurs ("People of the Falls"), from the first group of them being met at Sault Ste Marie. Tribal traditions declare they migrated from the St Lawrence region together with the Ottawa and Potawatomi, • with which tribes they formed a confederacy known as " The Three Fires." When first en- countered about 1640 the Ojibway were inhabiting the coast of Lake Superior, surrounded by the Sioux and Foxes on the west and south. During the 18th century they conquered these latter and occupied much of their territory. Thrdughout the Colonial wars they were loyal to the French, but

fought for the English in the War of Independence and the War of 181 2, and thereafter permanently maintained peace with the Whites. The tribe was divided into ten divisions. They lived chiefly by hunting and fishing. They had many tribal myths, which were collected by Henry R. Schoolcraft in his Algic Researches (1839), upon which Longfellow founded his ” Hiawatha.”

See Indians, North American, also W.J. Hoffmann, “Midewiwin of the Ojibwa,” in fth Report of Bureau of American Ethnology (1891) ; W. W. Warren, ” History of the Ojibways,” vol. v., Minnesota Historical Society’s Collections; G. Copway, History of the Ojibway Indims (Boston, 1850); P. Jones, History of the Ojebway Indians (1861) ; A. E. Jenks, ” Wild Rice Gatherers,” igth Report of Bureau of American Ethnology (1900).

OKAPI, the native name of an African ruminant mammal {Ocapia johnstoni) , belonging to the Giraffidae, or giraffe-family, but distinguished from giraffes by its shorter limbs and neck, the absence of horns in the females, and its very remarkable type of colouring. Its affinity with the giraffes is, however, clearly revealed by the structure of the skull and teeth, more especially the bilobed crown to the incisor-like lower canine teeth. At the shoulder the okapi stands about 5 ft. In colour the sides of the face are puce, and the neck and most of the body purplish, but the buttocks and upper part of both fore and hind limbs are transversely barred with black and white, while their, lower portion is mainly white with black fetlock-rings, and in the front pair a vertical black stripe on the anterior surface. Males have a pair of dagger-shaped horns on the forehead, the tips of which, in some cases at any rate, perforate the hairy skin with which the rest of the horns are covered. As in all forest-dwelling animals, the ears are large and capacious. The tail is shorter than in giraffes, and not tufted at the tip. The okapi, of which the first entire skin sent to Europe was received in England from Sir H. H. Johnston in the spring of 1901, is a native of the Semliki forest, in the district between Lakes Albert and Albert Edward. From certain differences in the striping of the legs, as well as from variation in skull-characters, the existence of more than a single species has been suggested; but further evidence is required before such a view can be definitely accepted.

Specimens in the museum at Tervueren near Brussels show that in fully adult males the horns are subtriangular and inclined somewhat backwards; each being capped with a small polished epiphysis, which projects through the skin investing the rest of the hon±. As regards its general characters, the skull of tly

okapi appears to be intermediate between that of the giraffe on the one hand and that of the extinct Palaeotragus (or Satrio~ therium) of the Lower Pliocene deposits of southern Europe on the other. It has, for instance, a greater development of air-cells in the diploe than in the latter, but much less than in the former. Again, in Palaeotragus the horns (present only in the male) are situated immediately over the eye-sockets, in Ocapia they are placed just behind the latter, while in Girajfa they are partly on the parietals. In general form, so far as can be judged from the disarticulated skeleton, the okapi was more like an antelope than a giraffe, the fore and hind cannon-bones, and consequently the entire limbs, being of approximately equal length. From this it seems probable that Palaeotragus and Ocapia indicate the ancestral type of the giraffe-line; while it has been further suggested that the apparently hornless Helladotherium of the

Female Okapi.

Grecian Pliocene may occupy a somewhat similar position in regard to the honied Sivatherium of the Indian Siwaliks.

For these and other allied extinct genera see Pecora ; for a' full description of the okapi itself the reader should refer to an illustrated memoir by Sir E. Ray Lankester in the Transactions of the Zoological Society of London (xvi. 6, 1902), entitled " On Okapia, a New Genus of Giraffidae from Central Africa."

Little is known with regard to the habits of the okapi. It appears, however, from the observations of Dr J. David, who spent some time in the Albert Edward district, that the creature dwells in the most dense parts of the primeval forest, where there is an undergrowth of solid-leaved, swamp-loving plants, such as arum, Donax and Phrynium, which, with orchids and climbing plants, form a thick and confused mass of vegetation. The leaves of these plants are blackish-green, and in the gloom of the forest, grow more or less horizontally, and are glistening with moisture. The effect of the light falling upon them is to produce along the midrib of each a number of short white streaks of light, which contrast most strongly with the shadows cast by the leaves themselves, and with the general twilight gloom of the forest. On the other hand, the thick layer of fallen leaves on the ground, and the bulk of the stems of the forest trees are bluish- brown and russet, thus closely resembling the decaying leaves in an European forest after heavy rain; while the whole effect is precisely similar to that produced by the russet head and body and the striped thighs and

limbs of the okapi. The long and mobile muzzle of the okapi appears to be adapted for feeding

on the low forest underwood and the swamp-vegetation. The small size of the horns of the males is probably also an adaptation to life in thick underwood. In Dr David's opinion an okapi in its native forest could not be seen at a distance of more than twenty or twenty-five paces. At distances greater than this it is impossible to see anything clearly in these equatorial forests, and it is very difficult to do so even at this short distance. This suggests that the colouring of the okapi is of purely protective type.

By the Arabianized emancipated slaves of the Albert Edward district the okapi is known as the kenge, 6-a-pi being the Pigmies' name for the creature. Dr David adds that Junker may un- doubtedly claim to be the discoverer of the okapi, for, as stated on p. 299 of the third volume of the original German edition of his Travels, he saw in 1878 or 1879 in the Nepo district a portion of the skin with the characteristic black and white stripes. Junker, by whom it was mistaken for a large water-chevrotain or zebra-antelope, states that to the natives of the Nepo district the okapi is known as the makape. (R. L.*)

OKEHAMPTON, a' market town and municipal borough in the Tavistock parliamentary division of Devonshire, England, on the east and west Okement rivers, 22 m. W. by N. of Exeter by the London & South-Western railway. Pop. (1901) 2569. The church of All Saints has a fine Perpendicular tower, left uninjured when the nave and chancel were burned down in 1842. Glass is made from granulite found in the Meldon Valley, 3 m. distant. Both branches of the river abound in small trout. Okehampton Castle, one of the most picturesque ruins in Devon, probably dates from the 15th century, though its keep may be late Norman. It was dismantled under Henry VIII., but considerable portions remain of the chapel, banqueting hall and herald's tower. Immediately opposite are the traces of a sup- posed British camp, and of the Roman road from Exeter to Cornwall. The custom of tolling the curfew still prevails in Okehampton. The town is, governed by a mayor, 4 aldermen and 12 councillors. Area, 503 acres.

Okehampton (Oakmanton) was bestowed by William the Conqueror

on Baldwin de Brioniis, and became the caput of the barony of Okehampton. At the time of the Domesday Survey of 1086 it already ranked as a borough, with a castle, a market paying 4 shillings, and four burgesses. In the 18th century the manor passed by marriage to the Courtenays, afterwards earls of Devon, and Robert de Courtenay in 1220 gave the king a palfrey to hold an annual fair at his manor of Okehampton, on the vigil and feast day of St Thomas the Apostle. In the reign of Henry III. the inhabitants received a charter (undated) from the earl jf Devon, confirming their rights ” in woods and in uplands, in ways and in paths, in common of pastures, in waters and in mills. They were to be free from all toll and to elect yearly a portreeve and a beadle.” A further grant of privileges was bestowed in 1292 by the earl of Devon, but no charter of incorporation was granted until that from James I. in 1623, and the confirmation of this by Charles II. in 1684 continued to be the governing charter, the ‘ corporation consisting of a mayor, seven principal burgesses and eight assistant burgesses, until the Municipal Corporations Act of 1882. On a petition from the inhabitants the town was reincorporated by a new charter in 1885. Okehampton returned two members to parliament in 1300, and again in 1312 and 1313, after which there was an intermission till 1640, from which date two members were returned regularly until by the Reform Act of 1832 the borough was disfranchised.

See Victoria County History, Devonshire; W. B. Bridges, History of Okehampton (1889).

OKEN, LORENZ (1779-1851), German naturalist, was born at Bohlsbach, Swabia, on the 1st of August 1779. His real name was Lorenz Ockenfuss, and under that name he was entered at the natural history and medical classes in the university of Wiirzburg, whence he proceeded to that of Gottingen, where he became a privat-docent, and abridged his name to Oken. As Lorenz Oken he published in 1802 his small work entitled Grund- riss der Naturphilosophie, der Theorie der Sinne, und dcr darauf

gegriindeten Classification der Thiere, the first of the 5 series of works which placed him at the head of the ” natur-philosophie ” or physio-philosophical school of Germany. In it he extended to physical science the philosophical principles which Kant had applied to mental and moral science. Oken had, however, in this application been preceded by J. G. Fichte, who, acknow- ledging that the materials for a universal science had been discovered by Kant, declared that nothing more was needed than a systematic co-ordination of these materials; and this task Fichte undertook in his famous Doctrine of Science

(Wissen- schaftslehre), the aim of which was to construct a priori all knowledge. In this attempt, however, Fichte did little more than indicate the path; it was reserved for F. W. J. von Schelling fairly to enter upon it, and for Oken, following him, to explore its mazes yet further, and to produce a systematic plari of the country so surveyed.

In the Grundriss der Naturphilosophie of 1802 Oken sketched the outlines of the scheme he afterwards devoted himself to perfect. The position which he advanced in that remarkable work, and to which he ever after professed adherence, is that ” the animal classes are virtually nothing else than a representa- tion of the sense-organs, and that they must be arranged in accordance with them.” Agreeably with this idea, Oken con- tended that there are only five animal classes: (1) the Der- matozoa, or invertebrates; (2) the Glossozoa, or Fishes, as being those animals in which a true tongue makes, for the first time, its appearance; (3) the Rhinozoa, or Reptiles, wherein the nose Opens for the first time into the mouth and inhales air; (4) the Otozoa, or Birds, in which the ear for the first time opens extern- ally; and (5) Ophthalmozoa, or Mammals, in which all the organs of sense are present and complete, the eyes being movable and covered with two lids.

In 1805 Oken made another characteristic advance in the application of the a priori principle, by a book on generation {Die Zeugung), wherein he maintained the proposition that ” all organic beings originate from and consist of vesicles or cells. These vesicles, when singly detached and regarded in their original process of production, are the infusorial mass or proto- plasma (urschleim) whence all larger organisms fashion themselves or are evolved. Their production is therefore nothing else than a regular agglomeration of Infusoria — not, of course, of species already elaborated or perfect, but of mucous vesicles or points in general, which first form themselves by their union or combination into particular species.”

One year after the production of this remarkable treatise, Oken advanced another step in the development of his system, and in a volume published in 1806, in which D. G. Kieser (1779- 1862) assisted him, entitled Beitrctge zur vergleichenden Zoologie, Anatomie, und Physiologie, he demonstrated that the intestines originate from the umbilical vesicle, and that this corresponds to the vitellus or yolk-bag. Caspar Friedrich Wolff had previ- ously proved this fact in the chick (Theoria Generalionis, 1774), but he did not see its application as evidence of a general law. Oken showed the importance of the discovery as an illustration of his system. In the same work Oken described and recalled attention to the corpora Wolffiana, or ”

primordial kidneys.”

The reputation of the young privat-docent of Gottingen had meanwhile reached the ear of Goethe, and in 1807 Oken was invited to fill the office of professor extraordinarius of the medical sciences in the university of Jena. He accepted the call, and selected for the subject of his inaugural discourse his ideas on the ” Signification of the Bones of the Skull,” based upon a discovery he had made in the previous year. This famous lecture was delivered in the presence of Goethe, as privy- councillor and rector of the university, and was published in the same year, with the title, Ueber die Bedeutung der Schddel- knochen.

With regard to the origin of the idea, Oken narrates in his I sis that, walking one autumn day in 1806 in the Harz forest, he stumbled upon the blanched skull of a deer, picked up the partially dislocated bones, and contemplated them for a while, when the truth flashed across his mind, and he exclaimed, “It

is a vertebral column!” At a meeting of the German naturalists held at Jena some years afterwards Professor Kieser gave an account of Oken’s discovery in the presence of the grand-duke, which account is printed in the tageblatt, or ” proceedings,” of that meeting. The professor stated that Oken communicated to him his discovery when journeying in 1806 to the island of Wangeroog. On their return to Gottingen Oken explained his ideas by reference to the skull of a turtle in Kieser’s collection, which he disarticulated for that purpose with his own hands. ” It is with the greatest pleasure,” wrote Kieser, ” that I am able to show here the same skull, after having it thirty years in my collection. The single bones of the skull are marked by Oken’s own handwriting, which may be so easily known.”

The range of Oken’s lectures at Jena was a wide one, and they were highly esteemed. They embraced the subjects of natural philosophy, general natural history, zoology, comparative anatomy, the physiology of man, of animals and of plants. The spirit with which he grappled with the vast scope of science is characteristically illustrated in his essay Ueber das Universum als Fortsetzung des Sinnensystems, 1808. In this work he lays it down that ” organism is none other than a combination of all the universe’s activities within a single individual body.” This doctrine led him to the conviction that ” world and

organism are one in kind, and do not stand merely in harmony with each other." In the same year he published his Erste Ideen zur Theorie des Lichts, &c, in which he advanced the proposition that " light could be nothing but a polar tension of the ether, evoked by a central body in antagonism with the planets, and heat was none other than a motion of this ether " — a sort of vague anticipation of the doctrine of the " correlation of physical forces." In 1809 Oken extended his system to the mineral world, arranging the ores, not according to the metals, but agreeably to their combinations with oxygen, acids and sulphur. In 1810 he summed up his views on organic and inorganic nature into one compendious system. In the first edition of the Lehrbuch der Naturphilosophie, which appeared in that and the following years, he sought to bring his different doctrines into mutual con- nexion, and to " show that the mineral, vegetable and animal kingdoms are not to be arranged arbitrarily in accordance with single and isolated characters, but to be based upon the cardinal organs or anatomical systems, from which a firmly established number of classes would necessarily be evolved; that each class, moreover, takes its starting-point from below, and consequently that all of them pass parallel to each other "; and that, " as in chemistry, where the combinations follow a definite numerical law, so also in anatomy the organs, in physiology the functions, and in natural history the classes, families, and even genera of minerals, plants, and animals present a similar arithmetical ratio." The Lehrbuch procured for Oken the title of Hofrath, or court-councillor, and in 181 2 he was appointed ordinary professor of the natural sciences.

In 1 81 6 he commenced the publication of his well-known periodical, entitled I sis, eine encyclopadische Zeitschrift, vorziiglich fiir Naturgeschichte, vergleichendc Anatomie und Physiologic In this journal appeared essays and notices not only on the natural sciences but on other subjects of interest; poetry, and even comments on the politics of other German states, were occasionally admitted. This led to representations and remon- strances from the governments criticized or impugned, and the court of Weimar called upon Oken either to suppress the I sis or resign his professorship. He chose the latter alternative. The publication of the I sis at Weimar was prohibited. Oken made arrangements for its issue at Rudolstadt, and this continued uninterruptedly until the year 1848.

In 1821 Oken promulgated in his I sis the first idea of the annual general meetings of the German naturalists and medical practitioners, which happy idea was realized in the following year, when the first meeting was held at Leipzig. The British Association for the Advancement of Science was at the outset avowedly organized after

the German or Okenian model.

In 1828 Oken resumed his original humble duties as privat- docent in the newly-established university of Munich, and soon

afterwards he was appointed ordinary professor in the same university. In 1832, on the proposal by the Bavarian govern- ment to transfer him to a professorship in a provincial university of the state, he resigned his appointments and left the kingdom. He was appointed in 1833 to the professorship of natural history in the then recently-established university of Zurich. There he continued to reside, fulfilling his professional duties and pro- moting the progress of his favourite sciences, until his death on the nth of August 1851.

All Oken's writings are eminently deductive illustrations of a foregone and assumed principle, which, with other philosophers of the transcendental school, he deemed equal to the explanation of all the mysteries of nature. According to him, the head was a repetition of the trunk— a kind of second trunk, with its limbs and other appendages; this sum of his observations and comparisons —few of which he ever gave in detail — ought alv/ays to be borne in mind in comparing the share taken by Oken in homological anatomy with the progress made by other cultivators of that philosophical branch of the science.

The idea of the analogy between the skull, or parts of the skull, and the vertebral column had been previously propounded and ventilated in their lectures by J. H. F. Autenreith and K. F. Kiel- meyer, and in the writings of J. P. Frank. By Oken it was applied chiefly in illustration of the mystical system of Schelling — the all- in-all " and " all-in-every-part." From the earliest to the latest of Oken's writings on the subject, " the head is a repetition of the whole trunk with all its systems: the brain is the spinal cord; the cranium is the vertebral column; the mouth is intestine and abdomen; the nose is the lungs and thorax; the jaws are the limbs; and the teeth the claws or nails." J. B. von Spix, in his folio Cephalogenesis (1818), richly illustrated comparative craniology, but presented the facts under the same transcendental guise; and Cuvier ably availed himself of the extravagances of these disciples of Schelling to cast ridicule on the whole inquiry into those higher relations of parts to the archetype which Sir Richard Owen called " general homologies."

The vertebral theory of the skull had practically disappeared from anatomical science when the labours of Cuvier drew to their close. In Owen's Archetype and Homologies of the Vertebrate Skeleton the idea was not only revived but worked out for the first time inductively, and the theory rightly stated, as follows: " The head is not a virtual equivalent of the trunk, but is only a portion, i.e. certain modified segments, of the whole body. The jaws are the ' haemal arches ' of the

first two segments; they are not limbs of the head ” (p. 176).

Vaguely and strangely, however, as Oken had blended the idea with his a priori conception of the nature of the head, the chance of appropriating it seems to have overcome the moral sense of Goethe — unless indeed the poet deceived himself. Comparative osteology had early attracted Goethe’s attention. In 1786 he published at Jena his essay Ueber den Zwischenkieferknochen des Menschen una der Thiere,_ showing that the intermaxillary bone existed in man as well as in brutes. But not a word in this essay gives the remotest hint of his having then possessed the idea of the vertebral analogies of the skull. In 1820, in his Morphologic, he first publicly stated that thirty years before the date of that publi- cation he had discovered the secret relationship between the verte- brae and the bones of the head, and that he had always continued to meditate on this subject. The circumstances under which the poet, in 1820, narrates having become inspired with the original idea are suspiciously analogous to those described by Oken in 1807, as producing the same effect on his mind. A bleached skull is accidentally discovered in both instances: in Oken’s it was that of a deer in the Harz forest ; in Goethe’s it was that of a sheep picked up on the shores of the Lido, at Venice.

It may be assumed that Oken when a privat-docent at Gottingen in 1806 knew nothing of this unpublished idea or discovery of Goethe, and that Goethe first became aware that Oken had the idea of the vertebral relations of the skull when he listened to the intro- ductory discourse in which the young professor, invited by the poet to Jena, selected this very idea for its subject. It is incredible that Oken, had he adopted the idea from Goethe, or been aware of an anticipation by him, should have omitted to acknowledge the source — should not rather have eagerly embraced so appropriate an opportunity of doing graceful homage to the originality and genius of his patron.

The anatomist having lectured for an hour plainly unconscious of any such anticipation, it seems hardly less incredible that the poet should not have mentioned to the young lecturer his previous conception of the vertebro-cranial theory, and the singular coinci- dence of the accidental circumstance which he subsequently alleged to have produced that discovery. On the contrary, Goethe permits Oken to publish his famous lecture, with the same unconsciousness of any anticipation as when he delivered it ; and Oken, in the same state of belief, transmits a copy to Goethe (Isis, No. 7) who thereupon honours the professor with special marks of attention and an invita- tion to his house. No hint of any claim of the host is given to the guest; no word of reclamation in any shape appears for some

years. In Goethe's Tages- und Jahres-Hefte, he refers to two friends, Reimer and Voigt, as being cognizant in 1807 of his theory. Why did not one or other of these make known to Oken that he had been so anticipated? " I told my friends to keep quiet," writes Goethe in 1825! Spix, in the meanwhile, in 1815, contributes his share to the development of Oken's idea in his Cephalogenesis. Ulrich follows in 181 6 with his Schildkrotenschddel ; next appears the contribution, in 1818, by L. H. Bojanus, to the vertebral theory of the skull, amplified in the Paragon to that anatomist's admirable Anatome Testudinis Europaeae (1821). And now for the first time, in 1818, Bojanus, visiting some friends at Weimar, there hears the rumour that his friend Oken had been anticipated by the great poet. He communicates it to Oken, who, like an honest man, at once published the statement made by Goethe's friends in the Isis of that year, offering no reflection on the poet, but restricting himself to a detailed and interesting account of the circumstances under which he himself had been led independently to make his discovery when wandering in 1806 through the Harz. It was enough for him thus to vindicate his own claims; he abstains from any comment reflecting on Goethe, and maintained the same blameless silence when Goethe ventured for the first time to claim for himself, in 1820, the merit of having entertained the same idea, or made the discovery, thirty years previously.

The German naturalists held their annual meeting at Jena in 1836, and there Kieser publicly bore testimony, from personal knowledge, to the circumstances and dates of Oken's discovery. However, in the edition of Hegel's works by Michelet (Berlin, 1842), there appeared the following paragraph: " The type-bone is the dorsal vertebra, provided inwards with a hole and outwards with processes, every bone being only a modification of it. This idea originated with Goethe, who worked it out in a treatise written in 1785, and published it in his Morphologie (1820), p. 162. Oken, to whom the treatise was communicated, has pretended that the idea was his own property, and has reaped the honour of it." This accusation again called out Oken, who thoroughly refuted it in an able, circum- stantial and temperate statement in part vii. of the Isis (1847). Goethe's osteological essay of 1785, the only one he printed in that century, is on a different subject. In the Morphologie of 1820-1824 Goethe distinctly declares that he had never published his ideas on the vertebral theory of the skull. He could not, therefore, have sent any such essay to Oken before the year 1807. Oken, in reference to his previous endurance of Goethe's

pretensions, states that, ” being well aware that his fellow-labourers in natural science thoroughly appreciated the true state of the case, he confided in quiet silence in their judgment. Meckel, Spix, Ulrich, Bojanus, Carus, Cuvier, Geoffroy St Hilaire, Albers, Straus-Durckheim, Owen, Kieser and Lichtenstein had recorded their judgment in his favour and against Goethe. But upon the appearance of the new assault in Michelet’s edition of Hegel he could no longer remain silent.”

Oken’s bold axiom that heat is but a mode of motion of light, and the idea broached in his essay on generation (1805) that ” all the parts of higher animals are made up of an aggregate of Infusoria or animated globular monads,” are both of the same order as his proposition of the head being a repetition of the trunk, with its vertebrae and limbs. Science would have profited no more from the one idea without the subsequent experimental discoveries of H. C. Oersted and M. Faraday, or from the other without the micro- scopical observations of Robert Brown, J. M. Schleiden and T. Schwann, than from the third notion without the inductive demon- stration of the segmental constitution of the skull by Owen. It is questionable, indeed, whether in either case the discoverers of the true theories were excited to their labours, or in any way influenced, by the a priori guesses of Oken; more probable is it that the requisite researches and genuine deductions therefrom were the results of the correlated fitness of the stage of the science and the gifts of its true cultivators at such particular stage.

The following is a list of Oken’s principal works: Grundriss der Naturphilo sophie, der Theorie der Sinne, und der darauf gegrundeten Classification der Thiere (1802); Die Zeugung (1805); Abriss der Biologic (1805); Beitrdge zur vergleichenden-Zoologie, Anatomie und Physiologie (along with Kieser, 1 806-1 807); Ueber die Bedeutung der Schddelknochen (1807); Ueber das Universum als Fortsetzungdes Sinnensystems (1808) ; Erste Ideen zur Theorie des Lichts, der Finster- niss, der Farben und der Wdrme (1808); Grundzeichnung des natur- lichen Systems der Erze (1809); Ueber den Werth der Naturgeschichte (1809); Lehrbuch der Naturphilosophie (1809-1811; 2nd ed., 1831; 3rd ed., 1843; Eng. trans., Elements of Physiophilosophy, 1847); Lehrbuch der Naturgeschichte (1813, 1815, 1825); Handbuch der Naturgeschichte zum Gebrauch bei Vorlesungen (1816-1820) ; Natur- geschichte fixr Schulen (1821); Esquissed’un Systeme d’ Anatomie, de Physiologie, et d’Histoire Naturelle (1812); Allgemeine Naturgeschichte (1833-1842, 14 vols.). He also contributed a large number of papers to the Isis and other journals. (R. O.)

OKHOTSK, SEA OF, a part of the western Pacific Ocean, lying between

the peninsula of Kamchatka, the Kurile Islands, the Japanese island of Yezo, the island of Sakhalin, and the Amur province of East Siberia. The Sakhalin Gulf and Gulf of Tartary connect it with the Japanese Sea on the west of

the island of Sakhalin, and on the south of this island is the La Perouse Strait.

OKI, a group of islands belonging to Japan, lying due north of the province of Izumo, at the intersection of 36 N. and 133″ E. The group consists of one large island called Dogo, and three smaller isles — Chiburi-shima, Nishi-no-shima, and Naka-no- shima — which are collectively known as Dozen. These four islands have a coast-line of 182 m., an area of 130 sq. m., and a population of 63,000. The island of Dogo has two high peaks, Daimanji-mine (2185 ft.) and Omine-yama (2128 ft.). The chief town is Saigo in Dogo, distant about 40 m. from the port of Sakai in Izumo. The name Oki-no-shima signifies ” islands in the offing,” and the place is celebrated in Japanese history not only because the possession of the islands was much disputed in feudal days, but also because an ex-emperor and an emperor were banished thither by the Hojo regents in the 13th century.

OKLAHOMA (a Choctaw Indian word meaning ” red people “), a south central state of the United States of America lying between 3$° 35′ and 37 N. lat. and 94° 29′ and 103° W. long. It is bounded N. by Colorado and Kansas; E. by Missouri and Arkansas; S. by Texas, from which it is separated in part by the Red river; and W. by Texas and New Mexico. It has a total area of 70,057 sq. m., of which 643 sq. m. are water-surface. Although the extreme western limit of the state is the 103rd meridian, the only portion W. of the 1 ooth meridian is a strip of land about 35 m. wide in the present Beaver, Texas and Cimarron counties, and formerly designated as ” No Man’s Land.”

Physiography. — The topographical features of the state exhibit considerable diversity, ranging from wide treeless plains in the W. to rugged and heavily wooded mountains in the E. In general terms, however, the surface may be described as a vast rolling plain having a gentle southern and eastern slope. The elevations above the sea range from 4700 ft. in the extreme N.W. to about 350 ft. in the S.E. The southern and eastern slopes are remark- ably uniform; between the northern and southern boundaries E. of the 100th meridian there is a general difference in elevation of from 200 to 300 ft., while from W. to E. there is an average decline of about 3 ft. to the mile. The state has a mean elevation of 1300 ft. with 34,930 sq. m. below 1000 ft; 25,400 sq. m. between 1000 and 2000 ft.; 6500 sq. m. between 2000

and 3000 ft. ; and 3600 sq. m. between 3000 and 5000 ft.

The western portion of the Ozark Mountains enters Oklahoma near the centre of the eastern boundary, and extends W.S.W. half way across the state in a chain of hills gradually decreasing in height. In the south central part of the state is an elevated tableland known as the Arbuckle Mountains. In its western portion this tableland attains an elevation of about 1350 ft. above the sea and lies about 400 ft. above the bordering plains. At its eastern termination, where it merges with the plains, it has an elevation of about 750 ft. Sixty miles N.W. of this plateau lie the Wichita Mountains, a straggling range of rugged peaks rising abruptly from a level plain. This range extends from Fort Sill north-westward beyond Granite, a distance of 65 m., with some breaks in the second half of this area. The highest peaks are not more than 1500 ft. above the plain, but on account of their steep and rugged slopes they are difficult to ascend. A third group of hills, the Chautauqua Mountains, lie in the W. in Blaine and Canadian counties, their main axis being almost parallel with the North Fork of the Canadian river. With the exception of these isolated clusters of hills the western portion of the state con- sists almost entirely of rolling prairie. The extreme north-western part of Oklahoma is a lofty tableland forming part of the Great Plains region E. of the Rocky Mountains.

The prairies N. of the Arkansas and W. of the Neosho rivers are deeply carved by small streams, and in the western portion of this area, where the formation consists of alternating shales and sand- stones, the easily eroded rocks have been carved into canyons, buttes and mesas. South of the Arkansas river these ledges of sandstone continue as far as Okmulgee, but the evidences of erosion are less noticeable. East of the Neosho river the prairies merge into a hilly woodland. In the N.W. four large salt plains form a striking physical feature. Of these the most noted is the Big Salt Plain of the Cimarron river, in Woodward county, which varies in width from J m. to 2 m. and extends along the river for 8 m. The plain is almost perfectly level, covered with snowy-white saline crystals, and contains many salt springs. The other saline areas are the Little Salt Plain, which lies on the Cimarron river, near the Kansas boundary; the Salt Creek Plain, 3 m. long and 100 yds. wide, in Blaine county; and the Salt Fork Plain, 6 m. wide and 8 m. long, so called from its position on the Salt Fork of the Arkansas river.

Following the slope of the land, the important streams flow from N.W. to S.E. The Arkansas river enters the state from the N. near the 97th meridian, and after following a general south-easterly course, leaves it near the centre of the eastern boundary. Its tribu- taries from the N. and E. — the Verdigris, Grand or Neosho and Illinois — are small and unimportant; but from the S. and W. it receives the, waters of much larger streams — the Salt Fork, the Cimarron and the Canadian, with its numerous tributaries. The extreme southern portion of the state is drained by the Red River, which forms the greater part of the southern boundary, and by its tributaries, the North Fork, the Washita and the Kiamichi.

Fauna and Flora. — Of wild animals the most characteristic are the black bear, puma, prairie wolf, timber wolf, fox, ■ deer, antelope, squirrel, rabbit and prairie dog. Hawks and turkey buzzards are common types of the larger birds, and the wild turkey, prairie chicken and quail are the principal game birds. The total woodland area of the state was estimated in 1900 at 24,400 scj. m., or 34-8 % of the land area. The most densely wooded section is the extreme E. ; among the prairies of the W. timber is seldom found beyond the banks of streams. The most common trees are the various species of the oak and cedar. The pine is confined to the more mountainous sections of the E., and the black walnut is found among the river bottom lands. These four varieties are of commercial value. Other varieties, most of which are widely distributed, are the ash, pecan, Cottonwood, sycamore, elm, maple, hickory, elder, gum, locust and river birch. The prairies are covered with valuable bunch, grama and dropseed grasses; in the extreme N.W. the cactus, sagebrush and yucca, types characteristic of more arid regions, are found.

Climate. — The climate of the state is of a continental type, with great annual variations of temperature and a rainfall which, though generally sufficient for the needs, of vegetation, is considerably less than that of the Atlantic Coast or the Mississippi Valley. The western and central portions of the state are in general cooler and dryer than the E., on account of their greater elevation and greater distance from the Gulf Coast. Thus at Beaver, in the extreme N.W., the mean annual temperature is 57 F. and the mean annual rainfall 189 in.; while at Lehigh, in the S.E., these figures are respectively 62 and 35-1 in. At Oklahoma City, in the centre of the state, the mean annual temperature is 59 ; the mean for the summer (June, July and August) is 78 , with an extreme recorded of 104°; the mean for the winter (December, January and February) is 38 °, with an extreme recorded of – T 7°- At Mangum, in the S.W., the mean annual temperature is 61 ; the mean for the summer is 8i° and for the winter 41 °, while the

highest and lowest temperatures' ever recorded are respectively 114° and -17 . The mean annual precipitation for the state is 317 in.; the variation between the E. and the W. being about 12 in.

Soils. — The prevailing type of soil is a deep dark-red loam, sometimes (especially in the east central part of the state) made up of a decomposed sandstone, and again (in the north central part) made up of shales and decomposed limestone. Not infrequently there are a belt of red sandy loam on uplands N. of a river, a rich' deposit of black alluvium on valley bottom lands, a belt of red clay loam on uplands S. of a river, and a deposit of wind-blown loess on the water parting. Loess, often thin and always containing little humus, z also covers large areas on the high, semi-arid plains in the western part of the state.

Agriculture and Stock-raising. — For some time before the first opening to settlement by white men in 1899, the territory now embraced in Oklahoma was largely occupied by great herds of cattle driven in from Texas, and since then, although the opening was

giecemeal, the agricultural development has been remarkably rapid. y 1900, 22,988,339 acres, or 52-1 %, of the total land surface was included in farms, and 8,574,187 acres, or 37-7 %, of the farm land was improved. 1 The farm land was divided among 108,000 farms containing an average of 212-85 acres; 26,121 of them contained less than 50 acres, but the most usual size was 160 acres; and 48,983, or 45-35 %, contained from 100 to 174 acres. A considerable portion of the larger farms (there were 2390 containing 500 acres or more) were owned by Indians but leased to white men. Much land as late as 1900 was held in common by Indian tribes, but has since been allotted to the members of those tribes and most of it is leased to whites. In 1900, 59,367 (or a little more than one-half of all) farms were worked by owners or part owners, 33,347 were wofked by share tenants, and 13,903 were worked by cash tenants. Indian corn, wheat, cotton, oats and hay are the principal crops, but the variety of farm and garden produce is great, and includes Kafir corn, broom corn, barley, rye, buckwheat, flax, tobacco, beans, castor beans, peanuts, pecans, sorghum cane, sugar cane, and nearly all the fruits and vegetables common to the temperate zone; stock-raising, too, is a very important industry. Of the total acreage of all crops in 1900, 4,431,819 acres, or 68-64 %> were of cereals; and of the cereal acreage 56-45 % was of Indian corn, 34-45 % was of wheat and 7-15 % was of oats. The acreage of Indian corn increased from

1 The statistics in this article were obtained by adding to those for

Oklahoma those for Indian Territory, which was combined with it in 1907.

2,501,945 acres in 1900 to 5,950,000 acres in 1909; 2 between 1899 and 1909 the yield increased from 68,949,300 bushels to 101,150,000 bushels. The acreage of wheat decreased during this period from 1,704,909 acres to 1,225,000 acres, and the yield from 20,328,300 bushels to 15,680,000 bushels. The acreage of oats increased from 317,076 acres to 550,000 acres, and the yield increased from 9,511.340 bushels to 15,950,000 bushels. The hay crop of 1899 w as grown on 1,095,706 acres and amounted to 1,617,905 tons, but nearly one-half. of this was made from wild grasses; since then the amounts of fodder obtained from alfalfa, Kafir corn, sorghum cane and timothy have much increased, and that obtained from wild grasses has decreased; in 1909 the acreage was 900,000 and the crop 810,000 tons. Except in the W. section, where there is good grazing but generally an insufficient rainfall for growing crops, cattle-raising on the range has in considerable measure given way to stock-raising on the farm, and nearly everywhere the quality of the cattle has been greatly improved. The total number of cattle decreased from 3,236,008 in 1900 to 1,992,000 in 1910, but at the same time the number of dairy cows increased from 276,539 to 355,000. The number of horses increased from 557,153 in 1900 to 804,000 in 1910; of mules from 117,562 to 191,000 ; of swine from 1,265,189 to 1,302,000; and of sheep from 88,741 to 108,000. Winter wheat is used extensively for pasturage during the winter months with little or no damage to the crop. No other branch of agriculture in Okla- homa has advanced so rapidly as the production of cotton; the culture of this fibre was introduced in 1890, and the acreage increased from 682,743 acres in 1899 to 2,037,000 acres in 1909, and the yield increased from 227,741 bales to 617,000 bales (in 1907 it was 862,383 bales). There was only a very small crop of broom corn in 1889, but in 1899 the crop was 3,565,510 lb. The state has risen to high rank in the production of sorghum cane and castor beans also; in 1899 16,477 acres of the cane yielded 40,259 tons, and 14,070 acres of castor beans yielded 77,409 bushels. Two crops of potatoes may be grown on the same ground in one year, and the acreage of potatoes increased from 15,360 acres in 1899 to 27,000 acres in 1909, and the yield from 1,191,997 bushels to 1,890,000 bushels. Oklahoma is already producing large crops of apples, peaches, grapes, water-melons and musk-melons, aˆid many large apple and peach orchards and vineyards have been planted. Pears, plums, apricots, cherries, strawberries, blackberries, raspberries, currants, gooseberries, cabbages, onions, sweet potatoes, tomatoes and cucumbers are grown

in considerable quantities. The cereals and most of the fruits and vegetables are grown throughout the greater portion of the middle and E. parts of the state, although the soil of the N. middle section yields the best crops of wheat. Kafir corn and sorghum cane are the most common in the W. sections, where the climate is too dry for other crops. Some cotton is grown N. of the middle of the state, but the S.E. quarter takes in most of the cotton belt.' Broom corn grows best in Woods county on the N. border, and castor beans in the central and N. central sections. About 3000 acres (nearly one-half in the narrow extension in the N.W.) were already irrigated in 1909, and surveys had been made by the Federal Reclamation Service with a view to irrigating about 100,000 acres more — 10,000 to 14,000 acres in Beaver and Woodward counties, under the Cimarron project, and 80,000 to 100,000 acres in Kiowa and Comanche counties, under the Red River project.

Lumber and Timber Products. — The merchantable timber is mostly in that part of the state which formerly constituted Indian Territory, and consists largely of black walnut and other valuable hard woods in the bottom lands, of black jack and post oak on the uplands and of pine on the higher elevations S. of the Arkansas river. The manufactured forest products of Indian Territory increased in value from $189,373 in IQ0 ° to $588,078 in 1905, or 205-78 %.

Minerals. — The coal-fields extend from Kansas on the N. to Arkansas on the E., and have an area of about 20,000 sq. m. The principal mining centres are McAlester, Wilburton, Hartshorn, Coalgate and Phillips. In quality the coal varies from a low grade to a high grade bituminous, and some of the latter is good for coking. The output increased from 446,429 short tons in 1885 to 1,922,298 short tons in 1900, and to 2,948,116 short tons in 1908, the output for the last-named year being much less than for 1906 or 1907, when it was over 3,500,000 tons. The range of hills extending from the centre of the state N.W. to and beyond the Kansas border are composed chiefly of great deposits of rock gypsum. A similar but minor range extends parallel with it 40 to 50 m. S.W. There are also deposits in Greer county in the S.W. corner, and some gypsite in Kay county on the N. middle border. For working these extensive deposits there are, however, few mills; these are in Kay, Canadian and Blaine counties. Some petroleum was discovered in the N. part of Indian Territory near the Oklahoma border as early as 1890, but there was little development until 1903, when several wells were drilled in the vicinity of Bartlesville. Then wells were drilled to the W. on the Osage Reservation, and to the S., until in 1906 about 1 10 wells were drilled into the famous Glen Pool near Sapulpa. One of these wells has a flow

of about 1000 barrels a day, and the total product from the Oklahoma oil-field (which includes wells in

2 The agricultural statistics for 1909 are taken from the Year-Book of the United States Department of Agriculture.

what was Indian Territory) increased from 10,000 barrels in 1901 to 138,911 in 1903, 1,366,748 in 1904 and 45,798,765 in 1908, when it was valued at $17,694,843. Natural gas abounds in the same region, and several strong wells were developed in 1906, and immedi- ately afterwards gas began to be used largely for industrial purposes for which in 1908 the price was from ii to 15 cents per 1000 ft. Pipe lines have been constructed. The value of the output increased from $360 in 1902 to $130,137 in 1905 and to $860,159 in 1908. In the central part of the state S. of the Canadian river are extensive deposits of asphaltum, but their development has been undertaken only on a small scale: in 1908, 2402 short tons were put on the, market, the value being $23,820. Lead and zinc are found in the Miami district, the Peoria district and the Quapaw district; and in 1908 the lead (1409 tons) was valued at $118,356 and the zinc (2235 tons) at $210,090. The total value of the mineral products in 1908 was $26,586,751.

Manufactures. — The manufactures in 1905 were still largely such as are closely related to agriculture. Measured by the value of the products, 61 -8% were represented by flour and grist mill products and cottonseed oil and cake. Among the manufacturing centres are Oklahoma City and Guthrie, and the combined value of their factory products increased from $1,493,998 in 1900 to $4,871,392 in 1905.

Transportation and Commerce. — The navigable waters in Oklahoma are of little importance, and the state is almost wholly dependent on railways as a meansof transportation. The first railway was that of the Missouri, Kansas & Texas, which completed a line across the territory to Denison, Texas, in 1872. The railway mileage was slowly increased to 1260 m. in 1890, and on the 1st of January 1909 was 5829 m. The Missouri, Kansas & Texas railway crosses the E. part of the state, and somewhat parallel with this to the westward are the St Louis & San Francisco, the Atchison, Topeka & Santa Fe, two lines of the Chicago, Rock Island & Pacific, and the Kansas City, Mexico & Orient railways. The Chicago, Rock Island & Pacific also crosses the middle of the state

from E. to W. The Atchison, Topeka & Santa F6 and the Chicago, Rock Island & Gulf cross the N.W. part. The St Louis & San Fiancisco cresses the S.E. quarter. A line of the Frisco system extends along the S. border from the Arkansas line to the middle of the state, and with these main lines numerous branches form an extensive network.

Population. — The population of the territory now embraced within the state increased from 258,657 in 1890, when the first census was taken, to 790,391 in 1900, or 205-6%, to 1,414,177 in 1907, and to 1,657,155 in 1910. Of the total population in 1900, 769,853, or 97-4%, were native-born. The white popula- tion increased from 172,554 in 1890 to 1,054,376 in 1907, or 61 i%, the negro population during the same period from 21,609 to 112,160, or 419%, and the Indian population from 64,456 to 75,012, or 16-3 %. In 1890 the Indians and negroes constituted 33”3%cf the total population, but in 1907 they (with the Mongolians, who numbered 75) constituted only 13-2% of the total. The only Indians who are natives of this region are a few members of the Kiowa, Comanche and Apache tribes. The others are the remnants of a number of tribes collected here from various parts of the country: Choctaws, Chickasaws, Cherokees, Creeks, Seminoles, Osages, Kaws, Poncas, Otoes, Cheyennes, Iowas, Kickapoos, Sauk and Foxes, Sioux, Miami’s, Shawnees, Pawnees, Ottawas and several others. Until 1906 the Osages lived on a reservation touching Kansas on the N. and the Arkansas river on the W. (since then almost all allotted); but to the greater portion of the Indians the government has made individual allotments. Only about one-fourth of the so- called Indians are full bloods. A large portion are one-half or more white blood and the Creeks and some others have more or less negro blood. In 1906 there were 257,100 communicants of various churches in Oklahoma and Indian Territory, the Methodist Episcopalians being the most numerous, and next to them the Baptists. The population in places having 4000 inhabitants or more increased from 29,978 in 1900 to 140,579 in 1907, or 368-9%, while the population outside of such places increased from 760,413 to 1,273,598, or only 67-5%. The principal cities in 1907 were Oklahoma City, Muskogee, Guthrie (the capital), Shawnee, Enid, Ardmore, McAlesterand Chickasha.

Administration. — The constitution now in operation was adopted in September 1907, and is that with which the state was admitted into the Union in November of the same year. Amendments may be submitted through a majority of the members elected to both houses of the legislature or through a petition signed by 15% of the electorate, and a proposed amendment becomes a part of the constitution if the majority

of the votes cast at a popular election are in favour of it. The legislature may also at any time propose a convention foi amending or revising the constitution, but no such convention can be called without first obtaining the approval of the elector- ate. An elector must be able to read or write (unless he or an ancestor was a voter in 1866 or then lived, in some foreign nation) and must be 21 years old, and a resident of the state for one year, in the county six months, and in the election precinct 30 days; and women have the privilege of voting at' school meetings. General elections are held on the first Tuesday after the first Monday in November in odd-numbered years and party candidates for state, district, county and municipal offices and for the United States Senate are chosen at primary elections held on the first Tuesday in August. The Massa- chusetts ballot which had been in use in 1897-1899 was again adopted in 1909. Oklahoma has put into its constitution many things which in the older states were left to legislative enactment.

The governor is elected for a term of four years but is in- eligible for the next succeeding term. The number of officers whom he appoints is. rather limited and for most of his appoint- ments the confirmation of the Senate is required. He is not permitted to pardon a criminal until he has obtained the advice of the board of pardons which is composed of the state super- intendent of public instruction, the president of the board of agriculture and the state auditor. He is a member of some important administrative boards, his veto power extends to items in appropriation bills, and to pass a bill over his veto a vote of two-thirds of the members elected to each house is re- quired. A lieutenant-governor, secretary of state, treasurer, auditor, examiner, and inspector, commissioner of labour, com- missioner of insurance, chief mine inspector, commissioner of charities and corrections, and president of the board of agri- culture are elected each for a term of four years, and the secretary of state, auditor and treasurer are, like the governor, ineligible for the next succeeding term.

The law-making bodies are a Senate and a House of Repre- sentatives. One-half the senators and all the representatives are elected every two years, senators by districts and repre- sentatives by counties. Sessions are held biennially in even- numbered years and begin the first Tuesday after the first Monday in January. The constitution reserves to the people the privilege of rejecting any act or any item of any act whenever 5 % of the legal voters ask that the matter be voted upon at a general election; and the people may initiate legislation by a petition signed by 8% of the electorate.

For the administration of justice there have been established a supreme court composed of six justices elected for a term of six years; a criminal court of appeals composed of three justices appointed by the governor with the advice and consent of the Senate; twenty-one district courts each with one or more justices elected for a term of four years; a county court in each county with one justice elected for a term of two years; a court of a justice of the peace, elected for a term of two years, in each of six districts of each county, and police courts in the cities. The supreme court has appellate jurisdiction in all civil cases, but its original jurisdiction is restricted to a general control of the lower courts. The criminal court of appeals has jurisdiction in all criminal cases appealed from the district and county courts. The district courts have exclusive jurisdiction in civil actions for sums exceeding $1000, concurrent jurisdiction with the county courts in civil actions for sums greater than $500 and not exceeding $iooo, and original or appellate in criminal cases. The county courts have, besides the concurrent jurisdiction above stated, original jurisdiction inall probate matters, original jurisdiction in civil actions for sums greater than $200 and not exceeding $500, concurrent jurisdiction with the justices of the peace in misdemeanour cases, and appellate jurisdiction in all cases brought from a justice of the peace or a police court.

Local Government. — The general' management of county affairs is intrusted to three commissioners elected by districts, but these commissioners are not permitted to incur extraordinary expenses or levy a tax exceeding five mills on a dollar without first obtaining the consent of the people at a general or special election. The

other county officers are a treasurer, clerk, register of deeds, attorney, surveyor, sheriff, assessor and superintendent of public instruction. The counties have been divided into municipal townships, each of which elects a trustee, a clerk and a treasurer, who together constitute a board of directors for the management of township affairs. The trustee is also the assessor. Cities or towns having a population of 2000 or more may become cities of the first class when- ever a favourable majority vote is obtained at a general or special election held in that city or town, and this question must be sub- mitted at such an election whenever 35% of the legal voters petition for it.

Miscellaneous Laws.— The property rights of husband and wife are practically equal, and either may buy, sell or mortgage real estate,

other than the homestead, without the consent of the other. Among the grounds for a divorce are adultery, extreme cruelty, habitual drunkenness, gross neglect of duty and imprisonment for felony. Article XII. of the constitution exempts from forced sale the homestead of any family in the state to the extent of 160 acres of land in the country, or I acre in a City, town or village, provided the value of the same does not exceed $5000 and that the claims against it are not for purchase money, improvements or taxes. A corporation commission of three members, elected for a term of six years, is intrusted with the necessary powers for a rigid control of public service corporations. A state board of arbitration, composed of two farmers, two employers and two employes is authorized to investigate the causes of any strike affecting the public interests, and publish what it finds to be the facts in the case, together with recommendations for settlement. Labour laws, passed by the first legislature (1908), were amended and made more radical by the legislature of 1909: a child labour law forbids the employment of children under 14 in factories, workshops, theatres, bowling-alleys, pool-halls, steam-laundries or other dangerous places (to be defined by the commissioner of labour), and no child under 16 is to be employed in such places unless able to read and write simple English sentences or without having attended school during the previous yeai ; no child under 16 is to be employed in any of several (enumerated) dangerous occupations; no child under 16 is to be employed more than 8 hours in any one day, or more than 48 hours in any one week in any gainful occupation other than agriculture or domestic service; age and schooling certificates are required of children between 14 and 16 in certain occupations. A state dis- pensary system for the sale of intoxicating liquors was authorized by the constitution, but the popular vote in 1908 was unfavourable to the continuance of the system, the sentiment seeming to be for rigid prohibition of the sale of intoxicating liquors. A law passed in May 1908 against nepotism (closely following the Texas law of 1907) forbids public officers to appoint (or vote for) any person related to them by affinity or consanguinity within the third degree to any position in the government of which they are a part; makes persons thus related to public officers ineligible to positions in the branch in which their relative is an official ; and renders any official making such an appointment liable to fine and removal from office.

Education. — The common school system is administered by a state superintendent of public instruction, a state board of education, county superintendents and district boards. The state board is composed of the state superintendent, who is president of the board ;

the secretary of state, who is secretary of the board; the attorney-general and the governor. Each district board is composed of three members elected for a term of three years, one each year. Each district school must be open at least three months each year, and children between the ages of eight and sixteen are required to attend either a public or a private school, unless excused: because of physical or mental infirmity. There are separate schools for whites and negroes. In addition to instruction in the ordinary branches, the teaching in the district schools of the elementary principles of agriculture, horticulture, animal husbandry, stock-feeding, forestry, building country roads and domestic science is required. A law of 1908 requires that an agricultural school of secondary grade be established in each of the five supreme court judicial districts, and that an experimental farm be operated in connexion with each ; and in 1909 the number of these districts was increased to six. There is a state industrial school for girls, teaching domestic science and the fine arts. The higher institutions of learning established by the state are the Oklahoma Agricultural and Mechanical College, a land grant college with an agricultural experiment station at Stillwater; the Oklahoma School of Mines at Wilburton; the Colored Agricultural and Normal University at Langston; the Central Normal School at Edmond; the North-western Normal School at Alva; the South-western Normal School at Weatherford, Custer county ; the South-eastern Normal School at Durant, Bryan county; the East Central Normal School at Ada; the North- eastern Normal School at Tahlequah, Cherokee county; and the University of Oklahoma at Norman. The State University (estab- lished in 1892, opened in 1893) embraces a college of arts and sciences, and schools of fine arts, applied science, medicine, mines and phar- macy. In 1907-1908 it had 40 instructors and 790 students. There is a University Preparatory School (1901) at Tonka wa in Kay county and there are state schools of agriculture at Tishomingo and

at Warner. The common schools are in large part maintained out of the proceeds of the school lands (about 1,200,000 acres), which are sections 16 and 36 in each township of that portion of the state which formerly constituted Oklahoma Territory, and a Congres- sional appropriation of $5,000,000 in lieu of these sections in what was formerly Indian Territory. The university, agricultural and mechanical college and normal schools also are maintained to a considerable extent out of the proceeds of section 13 in several townships. The university owns land valued at $3,670,000. Among the institutions of learning, neither maintained nor controlled by the state, are Epworth University (Methodist Episcopal, 1901) at Oklahoma City, and

Kingfisher College at Kingfisher.

Charities and Correctional Institutions. — The state has a hospital for the insane at Fort Supply, the Whitaker Orphans' Home at Pryor Creek, the Oklahoma School for the Blind at Fort Gibson and the Oklahoma School for the Deaf at Sulphur; and the legisla- ture of 1908 appropriated money for the East Oklahoma Hospital for the Insane at Vinita, a School for the Feebie-Minded at Enid, a State Training School for Boys at Wynnewood and a State Reforma- tory (at Granite, Greer county) for first-time convicts between the ages of sixteen and twenty-five. Under the constitution the super- vision and inspection of charities and institutions of correction is in the hands of a State Commissioner of Charities and Corrections, elected by the people. The commissioner must inspect once each year all penal, correctional and eleemosynary institutions, including public hospitals, jails, poorhouses and corporations and organizations doing charitable work; and the commissioner appears as next friend in cases affecting the property of orphan minors, and has power to investigate complaints against public and private institutions whose charters may be revoked for cause by the commissioner. By act of legislature a State Board of Public Affairs was created ; it is made of five members appointed by the governor, with charge of the fiscal affairs of all state institutions. Convicts were sent to the state penitentiary of Kansas until January 1909, when it was charged that they were treated cruelly there; in 1909 work was begun on a penitentiary at McAlester.

Banking and Finance.— The unique feature of the banking system (with amendments adopted by the second legislature becoming effective on the nth of June 1909) is a fund for the guaranty of deposits. The state banking board, which is composed of the governor, lieutenant-governor, president of the board of agriculture, state treasurer and state auditor, levies against the capital stock of each state bank and trust company, organized or existing, under the laws of the state to create a fund equal to 5 % of average daily deposits other than the deposits of state funds properly secured. One-fifth of this fund is payable the first year and one-twentieth each year thereafter; r % of the increase in average deposits is collected each year. Emergency assessments, not to exceed 2 %, may be made whenever necessary to pay in full the depositors in an insolvent bank; if the guaranty fund is impaired to such a degree that it is not made up by the 2 % emergency assessment, the state banking board issues certificates of indebtedness which draw 6% interest and which are paid out of the assessment. Any national bank may secure its depositors in this manner if it so desires. The bank guarantee law was held to be valid by the United States Supreme Court in 1908 after the

attorney-general of the United States had decided that it was illegal.

The revenue for state and local purposes is derived chiefly from taxes. The constitutional limit on the state tax levy is 3! mills on a dollar, and legislation has fixed the limit of the county levy at 5 mills, of the levy in cities at 7, in incorporated towns at 5, in town- ships at 3, and in school districts at 5. There is a tax on the gross receipts of corporations, a graduated land tax on all holdings exceed- ing 640 acres, a tax on income exceeding $3500, and a tax on gifts and inheritances. The aggregate amount of indebtedness which the state may have at any time is limited by the constitution to $400,000, save when borrowing is necessary to repel an invasion, suppress an insurrection or defend the state in war.

History. — With the exception of the narrow strip N. of the most N. section of Texas the territory comprising the present state of Oklahoma was set apart by Congress in 1834, under the name of Indian Territory, for the possession of the five southern tribes (Cherokees, Creeks, Seminoles, Choctaws and Chickasaws) and the Quapaw Agency. Early in 1809 some Cherokees in the south-eastern states made known to President Jefferson their desire to remove to hunting grounds W. of the Mississippi, and at first they were allowed to occupy lands in what is now Arkansas, but by a new arrangement first entered into in 1828 they received instead, in 1838, a patent for a wide strip extending along the entire N. border of Indian Territory with the exception of the small section in the N.E. corner which was reserved to the Quapaw Agency. By treaties negotiated in 1820, 1825, 1830 and 1842 the Choctaws received for themselves and the Chickasaws a patent for all that portion of the territory which

lies S. of the Canadian and Arkansas rivers, and by treaties negotiated in 1824, 1833 and 185 1 the Creeks received for them- selves and the Seminoles a patent, for the remaining or middle portion. Many of the Indians of these tribes brought slaves with them from the Southern states and during the Civil War they supported the Confederacy, but when that war was over the Federal government demanded not only the liberation of the slaves but new treaties, partly on the ground that the tribal lands must be divided with the freedmen. By these treaties, negotiated in 1866, the Cherokees gave the United States permission to settle other Indians on what was approximately the western half of their domain; the Seminoles, to whom the Creeks in 1855 had granted

as their portion the strip between the Canadian river and its North Fork, ceded all of theirs, and the Creeks, Choctaws and Chickasaws ceded the western half of theirs back to the United States for occupancy by freedmen or other Indians. In the E. portion of the lands thus placed at its disposal by the Cherokees and the Creeks the Federal government within the next seventeen years made a number of small grants as follows: to the Seminoles in 1866, to the Sauk and Foxes in 1867, to the Osages, Kansas, Pottawatomies, Absentee Shawnees and Wichitas in 1871-1872, to the Pawnees in 1876, to the Poncas and Nez Perces in 1878, to the Otoes and Missouris in 1881, and to the Iowas and Kickapoos in 1883; in the S.W. quarter of the Territory, also, the Kiowas, Comanches and Apaches were located in 1867 and the Cheyennes and Arapahoes in 1869. There still remained unassigned the greater part of the Cherokee Strip besides a tract embracing 1,887,800 acres of choice land in the centre of the Territory, and the agitation for the opening of this to settlement by white people increased until in 1889 a complete title to the central tract was purchased from the Creeks and Seminoles. Soon after the purchase President Benjamin Harrison issued a proclamation announcing that this land would be opened to homestead settlement at twelve o'clock noon, on the 22nd of April 1889. At that hour no less than 20,000 people were on the border, and when the signal was given there ensued a remarkably spectacular race for homes. In the next year that portion of Indian Territory which lay S. of the Cherokee Strip and W. of the lands occupied by the five tribes, together with the narrow strip N. of Texas which had been denied to that state in 1850, was organized as the Territory of Oklahoma. In the meantime negotiations were begun for acquiring a clear title to the unoccupied portion of the Cherokee Strip, for in- dividual allotments to the members of the several small tribes who had received tribal allotments since 1866, and for the purchase of what remained after such individual allotments had been made. As these negotiations were successful most of the land between the tract first opened and that of the Creeks was opened to settlement in 1891, a large tract to the W. of the centre was opened in 1892, a tract S. of the Canadian river and W. of the Chickasaws was opened in 1902, and by 1904 the entire Territory had been opened to settlement with the exception of a tract in the N.E. which was occupied by the Osages, Kaws, Poncas and Otoes. By the treaties with the five southern tribes they were to be permitted to make their own laws so long as they preserved their tribal relations, but since the Civil War many whites had mingled with these Indians, gained control for their own selfish ends of such government as there was, and made the country a refuge for fugitives from justice. Con- sequently, in 1893, Congress appointed the Dawes

Commission to induce the tribes to consent to individual allotments as well as to a government administered from Washington, and in 1898 the Curtis Act was passed for making such allotments and for the establishment of a territorial government. When the allot- ments were nearly all made Congress in 1 906 authorized Oklahoma and Indian Territories to qualify for admission to the Union as one state. As both Territories approved, a constitutional convention (composed of 100 Democrats and 12 Republicans) met at Guthrie on the 20th of November 1906. The constitution framed by this body was approved by the electorate on the 17 th of September 1907, and the state was admitted to the Union on the 16th of November.

Governors of Oklahoma — Territorial.

George W. Steele 1890-1891

Robert Martin (acting) 1891-1892

Abraham J. Seay 1 892-1 893

William Cary Renfrew 1893-1897

Cassius McDonald Barnes 1897-1901

William M. Jenkins . . ‘ . . . 1901

Thompson B. Ferguson 1901-1906

Frank Frantz 1906-1907

State.

Charles Nathaniel Haskell, Democrat. . . 1907-1911

Lee Cruce, Democrat 191 1-

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Geological Survey (Washington, 1883 sqq.); Charles Evans and C. O. Bunn, Oklahoma Civil Government (Ardmore, 1908) ; C. A. Beard, ” Constitution of Oklahoma,” in the Political Science Quarterly, vol. 24 (Boston, 1909); R. L. Owen, “Com- ments on the Constitution of Oklahoma, in the Proceedings of the American Political Science Association, vol. 5 (Baltimore, 1909); S. J. Buck, The Settlement of Oklahoma (Madison, 1907), reprinted from the Transactions of the Wisconsin Academy of Sciences, Arts and Letters; and D. C. Gideon, Indian Territory, Descriptive, Biographical and Genealogical . . . with a General History of the Territory (New York, 1901).

OKLAHOMA CITY, a city and the county-seat of Oklahoma County, Oklahoma, U.S.A., on the North Fork of the Canadian river, near the geographical centre of the state. Pop. (1890) 4151; (1900) 10,037; (1907) 32,452; (1910) 64,205. It is served by the Atchison, Topeka & Santa fe, the Chicago, Rock Island & Pacific, the Missouri, Kansas & Texas, and the St Louis & San Francisco railways, and by inter-urban electric lines. It lies partly in a valley, partly on an upland, in a rich agricultural region. The city is the seat of Epworth University (founded in 1901 by the joint action of the Methodist Episcopal Church and the Methodist Episcopal Church, South). Oklahoma City’s prosperity is due chiefly to its jobbing trade, with an extensive farming and stock-raising region, but it has also cotton compresses and cotton gins, and various manufactures. The total value of the factory products in 1905 was $3,670,730. Natural gas is largely used as a fuel. A large settlement was established here on the 22nd of April 1889, the day on which the country was by proclamation declared open for settlement. The city was chartered in 1890.

OKUBO TOSHIMITSU (1830-1878), Japanese statesman, a samurai of Satsuma, was one of the five great nobles who led the revolution in 1868 against the shogunate. He became one of the mikado’s principal ministers, and in the Satsuma troubles which followed he was the chief opponent of Saigo Takamori. But the suppression of the Satsuma rebellion brought upon him the personal revenge of Saigo’s sympathizers, and in the spring of 1878 he was assassinated by six clansmen. Okubo was one of the leading men of his day, and in 1872 was one of the Japanese mission which was sent round the world to get ideas for organizing the new regime.

OKUMA (SHIGENOBU), Count (1838-), Japanese states- man, was born in the province of Hizen in 1838. His father was an officer in the artilleiy, and during his early years his education consisted mainly of the study of Chinese literature. Happily for him, however, he was able to acquire in his youth a knowledge of English and Dutch, and by the

help of some missionaries he succeeded in obtaining books in those languages on both scientific and political subjects. These works effected a complete revolu- tion in his mind. He had been designed by his parents for the military profession, but the new light which now broke in upon him determined him to devote his entire energies to the abolition of the existing feudal system and to the establishment of a constitutional government. With impetuous zeal he urged his views on his countrymen, and though he took no active part

in the revolution of 1868, the effect of his opinions exercised no slight weight in the struggle. Already he was a marked man, and no sooner was the government reorganized, with the mikado as the sole wielder of power, than he was appointed chief assistant in the department of foreign affairs. In 1869 he succeeded to the post of secretary of the joint departments of the interior and of finance, and for the next fourteen years he devoted himself wholly to politics. In 1870 he was made a councillor of state, and a few months later he accepted the office of president of the commission which represented the Japanese government at the Vienna Exhibition. In 1872 he was again appointed minister of finance, and when the expedition under General Saigo was sent to Formosa (1874) to chastise the natives of that island for the murder of some shipwrecked fishermen, he was nominated president of the commission appointed to supervise the campaign. By one of those waves of popular feeling to which the Japanese people are peculiarly liable, the nation which had supported him up to a certain point suddenly veered round and opposed him with heated violence. So strong was the feeling against him that on one occasion a would-be assassin threw at him a dynamite shell, which blew off one of his legs. During the whole of his public life he recognized the necessity of promot- ing education. When he resigned office in the early ‘eighties he established the Semmon Gako, or school for special studies, at the cost of the 30,000 yen which had been voted him when he received the title of count, and subsequently he was instrumental in founding other schools and colleges. In 1896 he joined the Matsukata cabinet, and resigned in the following year in conse- quence of intrigues which produced an estrangement between him and the prime minister. On the retirement of Marquis Ito in 1898 he again took office, combining the duties of premier with those of minister of foreign affairs. But dissensions having arisen in the cabinet, he resigned a. few months later, and retired into private life, cultivating his beautiful garden at Waseda near T6kyo.

OLAF, the name of five kings of Norway. Olaf I. Tryggvesson (969-1000) was born in 969, and began his meteoric career in exile. It is even said that he was bought as a slave in Esthonia. After a boyhood spent in Novgorod under the protection of King Valdemar, Olaf fought for the emperor Otto III. under the Wendish king Burislav, whose daughter he had married. On her death he followed the example of his countrymen, and harried in France and the British Isles, till, in a good day for the peace of those countries, he was converted to Christianity by a hermit in the Stilly Islands, and his maraud- ing expeditions ceased since he would not harry those of his new faith. In England he married Gyda, sister of Olaf K varan, king of Dublin, and it was only after some years spent in admini- stering her property in England and Ireland that he set sail for Norway, fired by reports of the unpopularity of its ruler Earl Haakon. Arriving in Norway in the autumn of 995, he was unanimously accepted as king, and at once set about the conversion of the country to Christianity, undeterred by the obstinate resistance of the people. It has been suggested that Olaf's ambition was to rule a united, as well as a Christian, Scandinavia, and we know that he made overtures of marriage to Sigrid, queen of Sweden, and set about adding new ships to his fleet, when negotiations fell through owing to her obstinate heathenism. He made an enemy of her, and did not hesitate to involve himself in a quarrel with King Sveyn of Denmark by marrying his sister Thyre, who had fled from her heathen husband Burislav in defiance of her brother's authority. Both his Wendish and his Irish wife had brought Olaf wealth and good fortune, but Thyre was his undoing, for it was on an expedition undertaken in the year roco to wrest her lands from Burislav that he was waylaid off the island Svold, near Riigen, by the combined Swedish and Danish fleets, together with the ships of Earl Haakon's sons. The battle ended in the annihila- tion of the Norwegians. Olaf fought to the last on his great vessel, the " Long Snake," the mightiest ship in the North, and finally leapt overboard and was no more seen. Full of energy and daring, skilled in the use of every kind of weapon, genial and

open-handed to his friends, implacable to his enemies, Olaf's personality was the ideal of the heathendom he had trodden down with such reckless disregard of his people's prejudices, and it was no doubt as much owing to the popularity his char- acter won for him as to the strength of his position that he was able to force his will on the country with impunity. After his death he remained the hero of his people, who whispered that he was yet alive and looked for his return. " But however that may be," says the story, " Olaf Tryggvesson never came back to his kingdom in Norway."

Olaf (II.) Hara£dsson (995-1030), king from 1016-1029, called during his lifetime ” the Fat,” and afterwards known as St Olaf, was born in 995, the year in which Olaf Tryggvesson came to Norway. After some years’ absence in England, fighting the Danes, he returned to Norway in 1015 and declared himself king, obtaining the support of the five petty kings of the Uplands. In 1016 he defeated Earl Sveyn, hitherto the virtual ruler of Norway, at the battle of Nesje, and within a few years had won more power than had been enjoyed by any of his pre- decessors on the throne. He had annihilated the petty kings of the South, had crushed the aristocracy, enforced the acceptance of Christianity throughout the kingdom, asserted his suzerainty in the Orkney Islands, had humbled the king of Sweden and married his daughter in his despite, and had conducted a success- ful raid on Denmark. But his success was short-lived, for in 1029 the Norwegian nobles, seething with discontent, rallied round the invading Knut the Great, and Olaf had to flee to Russia. On his return a year later he fell at the battle of Stikle- stad, where his own subjects were arrayed against him. The succeeding years of disunion and misrule under the Danes explain the belated affection with which his countrymen came to regard him. The cunning and cruelty which marred his character were forgotten, and his services to his church and country remembered. Miracles were worked at his tomb, and in 1 164 he was canonized and was declared the patron saint of Norway, whence his fame spread throughout Scandinavia and even to England, where churches are dedicated to him. The Norwegian order of knighthood of St Olaf was founded in 1847 by Oscar I., king of Sweden and Norway, in memory of this king.

The three remaining Norwegian kings of this name are persons of minor importance (see Norway: History).

OLAF, or Anlaf (d. 981), king of the Danish kingdoms of Northumbria and of Dublin, was a son of Sitric, king of Deira, and was related to the English king ˆEthelstan. As his name indicates he was of Norse descent, and he married a daughter of Constan- tine II., king of the Scots. When Sitric died about 927 ˆEthelstan annexed Deira, and Olaf took refuge in Scotland and in Ireland until 937, when he was one of the leaders of the formidable league of princes which was destroyed by ˆEthelstan at the famous battle of Brunanburh. Again he sought a home among his kinsfolk in Ireland, but just after ˆEthelstan’s death in 940 he or Olaf Godfreyson was recalled to England by the North- umbrians. Both crossed over, and in 941 the new English king, Edmund, gave up Deira to the former. The peace between the English and the Danes did not, however, last long. Wulfstan, archbishop of York, sided with Olaf; but in 944 this king was driven from

Northumbria by Edmund, and crossing to Ireland he ruled over the Danish kingdom of Dublin. From 949 to 952 he was again king of Northumbria, until he was expelled once more, and he passed the remainder of his active life in warfare in Ireland. But in 980 his dominion was shattered by the defeat of the Danes at the battle of Tara. He went to Iona, where he died probably in 981, although one account says he was in Dublin in 994. This, however, is unlikely. In the sagas he is known as Olaf the Red.

This Olaf must not be confused with his kinsman and ally, Olaf (d. 941), also king of Northumbria and of Dublin, who was a son of Godfrey, king of Dublin. The latter Olaf became king of Dublin in 934; but he was in England in 937, as. he took part in the fight at Brunanburh. After this event he returned to Ireland, but he appears to have acted for a very short

time as joint king of Northumbria with Olaf Sitricson. It is possible that he was the ” Olaf of Ireland ” who was called by the Northumbrians after ˆEthelstan’s death, but both the Olafs appear to have accepted the invitation. He was killed in 941 at Tyningham near Dunbar.

See W. F. Skene, Celtic Scotland, vol. i. (1876), and J. R. Green, The Conquest oj England, vol. i. (1899).

OLAND, an island in the Baltic Sea, next to Gotland the largest belonging to Sweden, stretching for 85 m. along the east coast of the southern extremity of that country, from which it is separated by Kalmar Sound which is from 5 to 15 m. broad. The greatest breadth of the island is 10 m., and its area 519 sq. m. Pop. (1900) 30,408. Consisting for the most part of Silurian limestone, and thus forming a striking contrast to the mainland with its granite and gneiss, Oland is further remarkable on account of the peculiarities of its structure. Down the west side for a considerable distance runs a limestone ridge, rising usually in terraces, but at times in steep cliffs, to an extreme height of 200 ft.; and along the east side there is a parallel ridge of sand, resting on limestone, never exceeding 90 ft. These ridges, known as the Western and Eastern Landborgar, are connected towards the north and the south by belts of sand and heath; and the hollow between them is occupied by a desolate and almost barren tract: the southern portion, or Alfvar (forming fully half of the southern part of

the island), presents a surface of bare red lime- stone scored by superficial cracks and unfathomed fissures, and calcined by the heat refracted from the surrounding heights. The northern portion is covered at best with a copse of hazel bushes. Outside the ridges, however, Oland has quite a different aspect, the hillsides being not infrequently clothed with clumps of trees, while the narrow strip of alluvial coast-land, with its cornfields, windmills, villages and church towers, appears fruitful and prosperous. There are a few small streams in the island; and one lake, Hornsjo, about 3 m. long, deserves mention. Of the fir woods which once clothed a considerable area in the north the Boda crown-park is the only remnant. Grain, especi- ally barley, and sandstone, are exported from the island, and there are cement works. A number of monuments of unknown age exist, including stones (stensattningar) arranged in groups to represent ships. The only town is Borgholm, a watering-place on the west coast, with one of the finest castle ruins in Sweden. The town was founded in 181 7, but the castle, dating at least from the 13th century, was one of the strongest fortresses, and afterwards, as erected by the architect Nicodemus Tessin the elder (1615-1681), one of the most stately palaces in the country. The island was joined in 1824 to the administrative district {Ian) of Kalmar. Its inhabitants were formerly styled Oningar, and show considerable diversity of origin in the matter of speech, local customs and physical appearance.

From the raid of Ragnar Lodbrok's sons in 775 Oland is frequently mentioned in Scandinavian history, and especially as a battleground in the wars between Denmark and the northern kingdoms. In the middle ages it formed a separate legislative and administrative unity.

OLAUS MAGNUS, or Magni (Magnus, i.e. Stora, great, being the family name, and not a personal epithet), Swedish ecclesi- astic and author, was born at Linkoping in 1490 and died at Rome in 1558. Like his elder brother, Johannes Magnus, he obtained several ecclesiastical preferments (a canonry at Upsala and at Linkoping, and the archdeaconry of Strengnes) , and was employed on various diplomatic services (such as a mission to Rome, from Gustavus I., to procure the appointment of Johannes Magnus as archbishop of Upsala) ; but on the success of the reformation in Sweden his attachment to the old church led him to accompany his brother into exile. Settling at Rome, from 1527, he acted as his brother's secretary, and ultimately became his successor in the (now titular) archbishopric of Upsala. Pope Paul III., in 1546, sent him to the council of Trent; later, he became canon of St Lambert in Liege; King Sigismund I. of Poland also offered him a canonry at Posen; but most of his life, after his brother's death, seems to have been spent in the monaster)' of St Brigitta in Rome, where he

subsisted on a pension assigned him by the pope. He is best remembered as the author of the famous Historia de Gentibus Septentrionalibus (Rome, 1555), a work which long remained for the rest of Europe the chief authority on Swedish matters and is still a valuable repertory of much curious information in regard to Scandinavian customs and folk-lore.

The Historia was translated into Italian (Venice, 1565), German (Strassburg, 1567), English (London, 1658) and Dutch (Amsterdam, 1665); abridgments of the work appeared also at Antwerp (1558 and 1562), Paris (a French abridged version, 1561), Amsterdam (1586), Frankfort (1618) and Leiden (1652). Olaus also wrote a Tabula terrarum septentrionalium . . . (Venice, 1539).

OLBERS, HEINRICH WILHELM MATTHIAS (1758-1840), German astronomer, was born on the nth of October 1758 at Arbergen, a village near Bremen, where his father was minister. He studied medicine at Gottingen, 1777-1780, attending at the same time Kaestner's mathematical course; and in 1779, while watching by the sick-bed of a fellow-student, he devised a method of calculating cometary orbits which made an epoch in the treatment of the subject, and is still extensively used. The treatise containing this important invention was made public by Baron von Zach under the title Ueber die leichteste und bequemste Methode die Bahn eines Cometen zu berechnen (Weimar, 1797). A table of eighty-seven calculated orbits was appended, enlarged by Encke in the second edition (1847) to 178, and by Galle in the third (1864) to 242. Olbers settled as a physician in Bremen towards the end of 1781, and practised actively for above forty years, finally retiring on the 1st of January 1823. The greater part of each night (he never slept more than four hours) was meantime devoted to astronomy, the upper portion of his house being fitted up as an observatory. He paid special attention to comets, and that of 181 5 (period seventy-four years) bears his name in commemoration of its detection by him. He also took a leading part in the discovery of the minor planets, re-identified Geres on the 1st of January 1802, and detected Pallas on the 28th of March following. His bold hypothesis of their origin by the disruption of a primitive large planet {Monatliche Correspondenz, vi. 88), although now discarded, received countenance from the finding of Juno by Harding, and of Vesta by himself, in the precise regions of Cetus and Virgo where the nodes of such supposed planetary fragments should be situated. Olbers was deputed by his fellow-citizens to assist at the baptism of the king of Rome on the 9th of June 181 1, and he was a member of the corps legislatif in Paris 1812-1813. He died on the 2nd of March 1840, at the age of eighty-one. He was twice married, and one son survived

him.

See Biographische Skizzen verstorbener Bremischer Aerzte, by Dr G. Barkhausen (Bremen, 1844) ; Allgemeine geographische Ephemeriden, iv. 283 (1799); Abstracts Phil. Trans, iv. 268 (1843): Astronomische Nachrichten, xxii. 265 (Bessel), also appended to A. Erman's Briefwechsel zwischen Olbers und Bessel (2 vols., Leipzig, 1852) ; Allgemeine Deutsche Biographie (S. Giinther) ; R, Grant, Hist, of Phys. Astr. p. 239; R. Wolf, Geschichie der Astronomic, p. 517. The first two volumes of Dr C. Schilling's exhaustive work, Wilhelm Olbers, sein Leben und seine Werke, appeared at Berlin in 1894 and 1900, a third and later volume including his personal correspondence and biography. A list of Olbers's contri- butions to scientific periodicals is given at p. xxxv of the 3rd ed. of his Leichteste Methode, and his unique collection of works relating to comets now forms part of the Pulkowa library.

OLBIA, the chief Greek settlement in the north-west of the Euxine. It was generally known to the Greeks of Hellas as Borysthenes, though its actual site was on the right bank of the Hypanis (Bug) 4 m. above its junction with the estuary of the Borysthenes river (Dnieper). Eusebius says that it was founded from Miletus c. 650 B.C., a statement which is borne out by the discovery of Milesian pottery of the 7 th century. It first appears as enjoying friendly relations with its neighbours the Scythians and standing at the head of trade routes leading far to the north-east (Herodotus iv.). Its wares also penetrated northward. It exchanged the manufactures of Ionia and, from the 5th century, of Attica for the slaves, hides and corn of Scythia. Changes of the native population (see Scythia) interrupted this commerce, and the city was hard put to it to

defend itself against the surrounding barbarians. We know of these difficulties and of the democratic constitution of the city from a decree in honour of Protogenes in the 3rd century B.C. (C.I.G. ii. 2058, Inscr. Or. Septent. Pont. Euxin. i. 16). In the following century it fell under the suzerainty of Scilurus, whose name appears on its coins, and when his power was broken by Mithradates VI. the Great, of Pontus, it submitted to the latter. About 50 B.C. it was entirely destroyed by the Getae and lay waste for many years. Ultimately at the wish of, and, to judge by the coins, under the protection of the natives themselves, it was restored, but Dio Chrysostom {Or. xxxvi.), who visited it about

a.d. 83, gives a curious picture of its poor state. During the 2nd century A.p. it prospered better with Roman support and was quite flourishing from the time of Septimius Severus, when it was incorporated in Lower Moesia, to 248, when its coins came to an end, probably owing to its sack by the Goths. It was once more restored in some sort and lingered on to an unknown date. Excavations have shown the position of the old Greek walls and of those which enclosed the narrower site of the Roman city, an interesting Hellenistic house, and cemeteries of various dates. The principal cult was that of Achilles Pontarches, to whom the archons made dedications. It has another centre at Leuce (Phidonisi) and at various points in the north Euxine. Secondary was that of Apollo Prostates, the patron of the strategi; but the worship of most of the Hellenic deities is testified to in the inscriptions. The coinage begins with large round copper pieces comparable only to the Roman aes grave and smaller pieces in the shape of dolphins; these both go back into the 6th century B.C. Later the city adopted silver and gold coins of the Aeginetic standard. See E. H. Minns, Scythians and Greeks (Cambridge, 1909) ; V. V. Latyshev, Olbia (St Petersburg, 1887, in Russian). For inscriptions, Boeckh, C.I.G. vol. ii. ; V. V. Latyshev, Inscr. Orae Septent. Ponti Euxini, vols. i. and iv. For excavations, Reports of B. V. Pharmak- ovsky in Compte rendu de la Comm. imp. archiolog. (St Petersburg, 1901 sqq.), and Bulletin of the same, Nos. 8, 13, &c., summarized in Archdologischer Anzeiger (1903 sqq.). (E. H. M.)

OLSIA (Gr. 6X/3ta, i.e. happy; mod. Terranova Pausania, q.v.), an ancient seaport city of Sardinia, on the east coast. The name indicates that it was of Greek origin, and tradition attri- butes its foundation to the Boeotians and Thespians under Iolaus (see Sardinia). Pais considers that it was founded by the Phocaeans of Massilia before the 4th century B.C. (in Tam- poni, op. cil. p. 83). It is situated on low ground, at the extremity of a deep recess, now called the Golfo di Terranova. It was besieged unsuccessfully by L. Cornelius Scipio in 259 B.C. Its territory was ravaged in 210 B.C. by a Carthaginian fleet. In Roman times it was the regular landing-place for travellers from Italy. Cicero notes the receipt of a letter from his brother from Olbia in 56 B.C., and obviously shared the prevailing belief as to the unhealthiness of Sardinia. Traces of the pre- Roman city have not been found. The line of the Roman city walls has been determined on the N. and E., the N.E. angle being at the ancient harbour, which lay to the N. of the modern {Notizie degli Scavi, 1890, p. 224). Among the inscriptions are two tombstones, one of an imperial freedwoman, 1 the other of a freedman of Acte, the concubine of Nero; a similar tomb- stone was also found at Carales, and tiles bearing her name have been

found in several parts of the island, but especially at Olbia, where in building a modern house in 1881 about one thousand were discovered. Pais {op. cit. 89 sqq.) attributes to Olbia an inscription now in the Campo Santo at Pisa, an epistyle bearing the words ” Cereri sacrum Claudia Aug. lib. Acte,” and made of Sardinian (?) granite. In any case it is clear that Acte must have had considerable property in the island {Corp. Inscr. Lat. x. 7980). Discoveries of buildings and tombs have frequently occurred within the area of the town and in its neighbourhood. Some scanty remains of an aqueduct exist outside the town, but hardly anything else of

1 The freedwoman had been a slave of Acte before passing into the property of the emperor, and took the cognomen Acteniana — a practice which otherwise only occurs in the case of slaves of citizens of the highest rank or of foreign kings.

antiquity is to be seen in situ. A large number of milestones, fifty-one in all, with inscriptions, and several more with illegible ones, belonging to the first twelve miles of the Roman road between Olbia and Carales, have been discovered, and are now kept in the church of S. Simplicio {Notizie degli Scavi, 1888, P- 535; 1889, p. 258; 1892, pp. 217, 366; Classical Review, 1889, p. 228; 1890, p. 65; P. Tamponi, Silloge Epigrafica, Olbiense, Sassari, 1895). This large number may be accounted for by the fact that a new stone was often erected for a new emperor. They range in date from a.d. 245 to 375 (one is possibly of Domitian). The itineraries state that the main road from Carales to Olbia ran through the centre of the island to the east of Gennargentu (see Sardinia) ; but a branch certainly diverged from the main road from Carales to Turris Libisonis (which kept farther west, more or less along the line followed by the modern railway) and came to Olbia. The distance by both lines is much the same; and all these milestones belong to the last portion which was common to both roads. (T. As.)

OLD-AGE PENSIONS. The provision of annuities for aged poor by the state was proposed in England in the 18th century— e.g. by Francis Maseres, cursitor baron of the Exchequer, in 1772, and by Mr Mark Rolle, M.P., in 1787. Suggestions for subsidizing friendly societies have also been frequent — e.g. by T. Paine in 1795, tentatively in Sturges Bourne’s Report on the Poor Laws, 181 7, and by Lord Lansdowne in 1837. The subject again became prominent in the latter part of the 19th century. Canon Blackley, who started this movement, proposed to com- pel every one to insure with a state department against sickness and old age, and essentially his scheme was one for the relief of the ratepayers and a more equitable readjustment of the poor- rate. The terms provisionally put forward by him required that

every one in youth should pay £10, in return for which the state was to grant 8s. a week sick allowance and 4s. pension after seventy. These proposals were submitted to the Select Committee on National Provident Insurance, 1885-1887. This body reported unfavourably, more especially on the sick in- surance part of the scheme, but the idea of old-age pension survived, and was taken up by the National Provident League, of which Mr (afterwards Sir) J. Rankin, M.P., was chairman. The subject was discussed in the constituencies and expectation was aroused. An unofficial parliamentary committee was formed, with Mr J. Chamberlain as chairman. This committee published proposals in March 1892, which show a very interesting change of attitude on the part of the promoters. Compulsion, which at the earlier period had found favour with Canon Blackley, Sir J. Rankin and even Mr Chamberlain, was no longer urged. The annuitant was no longer required to pay a premium adequate to the benefits promised, as in Canon Blackley's proposal. The benefit was no longer a pure annuity, but premiums were, in certain cases, returnable, and allowances were provided for widows, children (if any) and for the next of kin. Canon Blackley's professed object was to supersede the friendly societies, which, he alleged, were more or less insolvent; a proposal was now introduced to double every half-crown of pension derived by members from their friendly societies. This suggestion was criticized, even by supporters of the principle of state aid, on the ground that unless a pension was gratuitous, the class from which pauperism is really drawn could not profit by it. Mr Charles Booth in particular took this line. He accordingly proposed that there should be a general endowment of old age, 5s. a week to every one at the age of sixty-five. This proposal was calculated to involve an expenditure of £18,000,000 for England and Wales and £24,000,000 for the United Kingdom, exclusive of the cost of administration. While Mr Booth severely criticized the weak points of the contributory and voluntary schemes, their most influential advocate, Mr Chamberlain, did not spare Mr Booth's proposals. Speaking at Highbury, for instance, on the 24th of May 1899, he described Mr Booth's universal scheme as " a gigantic system of out-door relief for every one, good and bad, thrifty and unthrifty, the waster, drunkard and idler, as well as the industrious," and very forcibly stated his inability to support it.

In 1893 Mr Gladstone referred the whole question to a royal commission (Lord Aberdare, chairman). A majority- report, adverse to the principle of state pensions, was issued in 1895. A minority report,

signed by Mr Chamberlain and Dthers, dissented, mainly on the ground that public expectation would be disappointed if nothing was done. In 1896 Lord Salisbury appointed a committee ” of experts ” (Lord Rothschild, chairman) to report on schemes submitted, and, if necessary, to devise a scheme. The committee were unable to recommend any of the schemes submitted, and added that, ” we ourselves are unable, after repeated attempts, to devise any proposal free from grave inherent disadvantages.” This second condemnation was not considered conclusive, and a select committee of the House of Commons (Mr Chaplin, chairman) was appointed to consider the condition of ” the aged deserving poor.” After an ineffectual attempt by Mr Chaplin to induce the committee to drop the pension idea, and to consider the provision made for the aged by the poor law, the committee somewhat hastily promulgated a scheme of gratuitous pensions for persons possess- ing certain qualificatipns. Of these the following were the most important: age of sixty-five; no conviction for crime; no poor-law relief, ” unless under exceptional circumstances,” within twenty years; non-possession of income of 10s. a week; proved industry, or proved exercise of reasonable providence by some definite mode of thrift. The committee refrained from explaining the machinery and from estimating the cost, and suggested that this last problem should be submitted’ to yet another committee.

Accordingly a departmental committee (chairman, Sir E. Hamilton) was appointed, which reported in January 1900. The estimated cost of the above plan was, by this committee, calculated at £10,300,000 in 1901, rising to £15,650,000 in 1921. Mr Chaplin had publicly suggested that £2,000,000, the proceeds of a is. duty on corn, would go a long way to meet the needs of the case— a conjecture which was obviously far too sanguine. These unfavourable reports discouraged the more responsible advocates of state pensions. Mr Chamberlain appealed to the friendly societies to formulate a plan, an invitation which they showed no disposition to accept. Efforts continued to be made to press forward Mr Booth’s universal endowment scheme or some modification of it. To this Mr Chamberlain declared his hostility. And here the matter rested, till in his Budget speech in 1907 Mr Asquith pledged the Liberal government to start a scheme in 1908.

In 1908 accordingly there was passed the Old- Age Pensions Act, which carried into effect a scheme for state pensions, payable as from the 1st of January 1909 to persons of the age of 70 years and over. The act grants a pension according to a graduated scale of not exceeding 5s. a week to every person, male and female, who fulfils certain statutory conditions, and at the same time is not subject to certain disqualifications. The statutory conditions, as set out in § 2 of

the act, are: (1) The person must have attained the age of seventy; (2) must satisfy the pension authorities that for at least twenty years up to the date of receipt of pension he has been a British subject and has had his residence in the United Kingdom; and (3) the person must satisfy the pension authorities that his yearly means do not exceed £31, 10s. In § 4 of the act there are elaborate pro- visions for the calculation of yearly means, but the following may be particularly noticed: (1) in calculating the means of a person being one of a married couple living together in the same house, the means shall not in any case be taken to be a less amount than half the total means of the couple, and (2) if any person directly or indirectly deprives himself of any income or property in order to qualify for an old-age pension, it shall nevertheless be taken to be part of his means. The disqualifica- tions are (1) receipt of poor-law relief (this qualification was specially removed as from the 1st of January 191 1); (2) habitual failure to work (except in the case of those who have continuously for ten years up to the age of sixty made provision for their future by payments to friendly, provident or other societies or trade unions; (3) detention in a pauper or criminal lunatic asylum; (4) imprisonment without the option of a fine, which

disqualifies for ten years; and (5) liability to disqualification for a period not exceeding ten years in the case of an habitual drunkard. The graduated scale of pensions is given in a schedule to the act, and provide that when the yearly means of a pensioner do not exceed £21 he shall have the full pension of 5s. a week, which diminishes by is. a week for every addition of £2, 12s. 6d. to his income, until the latter reaches £31, 10s., when no pension is payable. The pension is paid weekly, on Fridays (§5), and is inalienable (§6).

All claims for, and questions relating to, pensions are deter- mined by the pension authorities. They are (1) pension officers appointed by the Treasury from among inland revenue officers; (2) a central pension authority, which is the Local Government Board or a committee appointed by it, and (3) local pension com- mittees appointed for every borough and urban district with a population of over 20,000, and for every county.

During the first three months of the year 1909, in which the act came into operation, there were 837,831 claims made for pensions: 490,755 in England and Wales, 85,408 in Scotland, and 261,668 in Ireland. Of these claims a total of 647,494 were granted: 393,700 in England and Wales, 70,294 in Scotland, and 183,500 in Ireland. The pensions in

force on the 31st of March 1909 were as follows: 582,565 of 5s., 23,616 of 4s., 23,275 of 3s., 11,429 of 2s., and 6609 of is. By the 30th of September the total amount of money paid to 682,768 pensioners was £6,063,658, and in the estimates of 1909-1910 a sum of £8,750,000 was provided for the payment of pensions.

Germany. — The movement in favour of state aid to provision for old age has been largely due to the example of Germany. The German system (which for old age dates from 1891) is a form of compulsory and contributory insurance. One half of the premium payable is paid by the labourer, the other half by the employer. The state adds a subvention to the allowances paid to the annuitant. (See Germany.)

France. — By a law of April 1910 a system of old-age pensions, designed to come into operation in 191 1, was adopted. It is a contributory system, embracing all wage-earners, with the exception of railway servants, miners and sailors on the special reserve list of the navy. It applies also to small landowners, tenant farmers and farm labourers. All are eligible for a pension at the age of 65, if in receipt of less than £120 a year. The actual rente or pension is calculated on the basis of the total obligatory contribution, together with a fixed viagere or state annuity. Male wage-earners are required to contribute 9 francs a year, and females 6 francs, the employers contributing a like amount. The largest pension obtainable is for life contributions and amounts to 414 francs. A clause in the act permits wage-earners to claim the rente at the age of 55 on a proportionately reduced scale without the viagere. The total cost of providing pensions in 191 1 is estimated at over £5,500,000.

Denmark. — The Danish system of old-age pensions was in- stituted by a law of 1891, and has been extended by further acts of 1902 and 1908. By the law of 1891 the burden of maintaining the aged was in part transferred from the local to the national taxes, and relief from this latter source was called a pension. Recipients of public assistance must be over 60 years of age, they must be of good character and for 5 years previous to receipt must have had their domicile in Denmark without receiving public charity. Such public assist- ance may be granted either in money, or kind, or by residence in an institution, such as an hospital. The assistance given, whatever it may be, must be sufficient for maintenance, and for attendance in case of illness. The actual amount is determined by the poor-law authorities, but all private assist- ance amounting to more than 100 kroner (£5, 13s.) a year is taken into account in measuring the poverty of the applicant. The cost of assistance is met in the first case by the commune in which the recipient is domiciled, but half the amount is afterwards refunded

by the state. In 1907-1908, 71,185 persons were assisted — 53,008 by money and 18,177 otherwise. The total expenditure was £489,200, £242,660 being refunded by the state.

New Zealand. — In 1898 a bill, introduced by the Rt. Hon- R. J- Seddon, premier, became law which provided for the payment of an old-age pension out of the consolidated fund (revenue of the general government) to persons duly qualified, without contribution by the beneficiaries. The claimants must be 65 years of age, resident in the colony, and have .so resided for 25 years. They must be free from conviction for lesser legal offences for 12 years, and for more serious breaches of the law for 25 years, previous to the application. They must be of good moral character and have a record of sobriety and respectability for five years. Their yearly income must not exceed £52, and they must not be owners of property exceeding in value £270. Aliens, aborigines, Chinese and Asiatics are excluded. The pensions are for £18 per annum, but for each £1 of yearly income over and above £34, and also for each £15 of capital over and above £50, £1 is deducted from the amount of the pension. Applications have to be made to the deputy registrars of one of 72 districts into which the colony is for this purpose divided. The claim is then recorded and submitted to a stipendiary magistrate, before whom the claimant has to prove his qualifications and submit to cross-examination. If the claim is admitted, a certificate is issued to the deputy registrar and in due course handed to the claimant. Payment is made through the local post-office as desired by the pensioner. The act came into force on the 1st of November 1898. An amending act of 1905 increased the amount of the maximum pension to £26 a year. See further, New Zealand. The authors of the measure maintain that it is a great success, while others point to the invidious character of the cross-examination required in proving the necessary degree of poverty, and allege that the arrangement penalizes the thrifty members of the poorer class, and is a direct incentive to transfer of property, of a more or less fraudulent character, between members of a family.

Victoria. — By the Old-Age Pensions Act 1900, £75,000 was appropriated for the purpose of paying a pension of not more than 10s. per week to any person who fulfilled the necessary conditions, of which the following were the principal: The pensioner must be 65

years of age or permanently disabled, must fill up a declara- tion that he has lived twenty years in the state ; has not been convicted of drunkenness, wife-desertion, &c. ; that his weekly income and his property do not exceed a given sum (the regulation of this and other details is intrusted to the governor in council). Further sums were subsequently appropriated to the purposes of the act.

Authorities. — Report and Evidence of Select Committee on National Provident Insurance (1887); Report of Royal Commission on Aged Poor (1895); Report of Lord Rothschild's Committee (1898); Report of the Select Committee on Aged Deserving Poor (1899); Report of Departmental Committee, &c, about the Aged Deserving Poor (1900); J. A. Spender, The State and Pensions in Old Age (1892); George King, Old Age Pensions (1899); Reports of Poor Law Conferences; Annual Reports of the Chief Registrar of Friendly Societies; E. W. Brabrook, Provident Societies and the Public Welfare (1898), ch. viii. For: Charles Booth, The Aged Poor in England and Wales (1894); Old Age Pensions (1899); Right Hon. Joseph Chamberlain, " The Labour Question," Nineteenth Century (November 1892); Speeches (21st April 1891 and 24th May 1 899) ; Rev. J. Frome Wilkinson, Pensions and Pauperism (1892) ; Publi- cations of the National Providence League. Against: C. J. Radley, Self -Help versus State-Pensions (3rd edition) ; Plea for Liberty (1892) ; Report of Royal Commission from a Friendly Society Point of View, reprint from Oddfellows' Magazine (1895); The Foresters' 1 Miscellany (February 1902); Unity, a Monthly Journal of Foresters, &c. (February 1902) ; C. S. Loch, Old-Age Pensions and Pauperism (1892) ; Reply of Bradfield Board of Guardians to circular of National Provident League (1891); Publications of the Charity Organization Society.

OLDBURY, an urban district in the Oldbury parliamentary division of Worcestershire, England, 5 m. W. of Birmingham, on the Great Western and London & North- Western railways and the Birmingham canal. Pop. (1901) 25,191. Coal, iron and limestone abound in the neighbourhood, and the town possesses alkali and chemical works, railway-carriage works, iron, edge- tool, nail and steel works, makings, corn-mills, and brick and tile kilns. The urban district includes the townships of Langley and Warley.

OLDCASTLE, SIR JOHN (d. 141 7), English Lollard leader, was son of Sir Richard Oldcastle of Almeley in Herefordshire. He is first mentioned as serving in the expedition to Scotland in 1400, when he was probably quite a young man. Next year he was in charge of Builth castle in Brecon, and serving all through the Welsh campaigns won the friendship and esteem of Henry, the prince of Wales. Oldcastle

represented Herefordshire in the parliament of 1404. Four years later he married Joan, the heiress of Cobham, and was thereon summoned to parliament as Lord Cobham in her right. As a trusted supporter of the prince, Oldcastle held a high command in the expedition which the young

Henry sent to France in 141 1. Lollardy had many supporters in Herefordshire, and Oldcastle himself had adopted Lollard opinions before 1410, when the churches on his wife's estates in Kent were laid under interdict for unlicensed preaching. In the convocation which met in March 1413, shortly before the death of Henry IV., Oldcastle was at once accused of heresy. But his friendship with the new king prevented any decisive action till convincing evidence was found in a book belonging to Oldcastle, which was discovered in a shop in Paternoster Row. The matter was brought before the king, who desired that nothing should be done till he had tried his personal influence. Old- castle declared his readiness to submit to the king " all his fortune in this world," but was firm in his religious beliefs. When he fled from Windsor to his own castle at Cowling, Henry at last consented to a prosecution. Oldcastle refused to obey the archbishop's repeated citations, and it was only under a royal writ that he at last appeared before the ecclesiastical court on the 23rd of September. In a confession of his /aith he declared his belief in the sacraments and the necessity of penance and true confession; but to put hope, faith or trust in images was the great sin of idolatry. But he would not assent to the ortho- dox doctrine of the sacrament as stated by the bishops, nor admit the necessity of confession to a priest. So on theˆth of September he was convicted as a heretic. Henry was still anxious to find a way of escape for his old comrade, and granted a respite of forty days. Before that time had expired Oldcastle escaped from the Tower by the help of one William Fisher, a parchment- maker of Smithfield (Riley, Memorials of London, 641). Old- castle now put himself at the head of a wide-spread Lollard conspiracy, which assumed a definitely political character. The design was to seize the king and his brothers during a Twelfth-night mumming at Eltham, and perhaps, as was alleged, to establish some sort of commonwealth. Henry, forewarned of their intention, removed to London, and when the Lollards assembled in force in St Giles's Fields on the 10th of January they were easily dispersed. Oldcastle himself escaped into Herefordshire, and for nearly four years avoided capture. Apparently he was privy to the Scrope and Cambridge plot in July 1415, when he stirred some movement in the Welsh Marches. On the failure of the scheme he went again into hiding. Oldcastle was no doubt the instigator of the abortive Lollard plots of 1416, and appears to have

intrigued with the Scots. But at last his hiding-place was discovered and in November 14 17 he was captured by the Lord Charlton of Powis. Oldcastle who was ” sore wounded ere he would be taken,” was brought to London in a horse-litter. On the 14th of December he was formally condemned, on the record of his previous conviction, and that same day was hung in St Giles’s Fields, and burnt ” gallows and all.” It is not clear that he was burnt alive.

Oldcastle died a martyr. He was no doubt a man of fine quality, but circumstances made him a traitor, and it is impossible altogether to condemn his execution. His unpopular opinions and early friendship with Henry V. created a traditional scandal which long continued. In the old play The, Famous Victories of Henry V ., written before 1588, Oldcastle figures as the prince’s boon companion. When Shakespeare adapted that play in Henry IV., Oldcastle still appeared; but when the play was printed in 1598 Falstaff’s name was substituted, in deference, as it is said, to the then Lord Cobham. Though the fat knight still remains ” my old lad of the Castle,” the stage character has nothing to do with the Lollard leader.

Bibliography. — The record of Oldcastle’s trial is printed in Fasciculi Zizaniorum (Rolls series) and in Wilkins’s Concilia, iii. 35 I_ 357- The chief contemporary notices of his later career are given in Gesta Henrici Quinti (Eng. Hist. Soc.) and in Walsingham’s Historia Anglicana. There have been many lives of Oldcastle, mainly based on The Acles and Monuments of John Foxe, who in his turn followed the Briefe Chronycle of John Bale, first published in 1544. For notes on Oldcastle’s early career, consult J. H. Wylie, History of_ England under Henry IV. For literary history see the Introductions to Richard James’s Iter Lancastrense (Chetham Soc, 1845) and tc Grosart’s edition of the Poems of Richard, James (1880). See also W. Barske, Oldcastle-Falstaff in der englischen Literatur bis zu Shakespeare (Palaestra, 1. Berlin, 1905). For a recent Life, see W. T. Waugh in the English Historical Review, vol. xx. (C. L. K.)

OLD CATHOLICS (Ger. Altkatholiken) , the designation assumed by those members of the Roman Catholic Church who refused to accept the decrees of the Vatican Council of 1870 defining the dogma of papal infallibility (see Vatican Council and Infallibility) and ultimately set up a separate ecclesiastical organization on the episcopal model. The Old Catholic move- ment, at the outset at least, differed

fundamentally from the Protestant Reformation of the 16th century in that it aimed not at any drastic changes in doctrine but at the restoration of the ancient Catholic system, founded on the diocesan episco- pate, which under the influence of the ultramontane movement of the 19th century had been finally displaced by the rigidly centralized system of the papal monarchy. In this respect it represented a tendency of old standing within the Church and one which, in the 18th century, had all but gained the upper hand (see Febronianism and Gallicanism). Protestantism takes for its standard the Bible and the supposed doctrines and institutions of the apostolic age. Old Catholicism sets up the authority of the undivided Church, and accepts the decrees of the first seven general councils' — down to the second council of Nicaea (787), a principle which has necessarily involved a certain amount of doctrinal divergence both from the standards of Rome and those of the Protestant Churches.

The proceedings of the Vatican council and their outcome had at first threatened to lead to a serious schism in the Church. The minority against the decrees included many of the most distinguished prelates and theologians of the Roman com- munion, and the methods by which their opposition had been overcome seemed to make it difficult for them to submit. The pressure put upon them was, however, immense, and the reasons for submission may well have seemed overwhelming; in the end, after more or less delay, all the recalcitrant bishops gave in their adhesion to the decrees.

The " sacrificio dell' intelletto," as it was termed — the sub- ordination of individual opinion to the general authority of the Church — was the maxim adopted by one and all. Seventeen of the German bishops almost immediately receded from the position they had taken up at Rome and assented to the dogma, publishing at the same time a pastoral letter in which they sought to justify their change of sentiment on the ground of expediency in relation to the interests of the Church (Michelis, Der neue Fuldaer Hirtenbrief, 1870). Their example was followed by all the other bishops of Germany. Darboy, archbishop of Paris, and Dupanloup, bishop of Orleans, in France adopted a like course, and took with them the entire body of the French clergy. Each bishop demanded in turn the same submission from the clergy of his diocese, the alternative being suspension from pastoral functions, to be followed by deprivation of office. It may be urged as some extenuation of this general abandonment of a great principle, that those who had refused to subscribe to the dogma received but languid support, and in some cases direct discouragement, from their respective governments. The submission of the illustrious Karl Joseph von Hefele was generally attributed to the

influence exerted by the court of Wiirttemberg.

The universities, being less directly under the control of the Church, were prepared to show a bolder front. Dr J. F. von Schulte, professor at Prague, was one of the first to publish a formal protest. A meeting of Catholic professors and dis- tinguished scholars convened at Nuremberg (August 1870) recorded a like dissent, and resolved on the adoption of measures for bringing about the assembling of a really free council north of the Alps. The Appel aux Evtques Catholiques of M. Hyacinthe Loyson (better known as ” Pere Hyacinthe”), after referring to the overthrow of ” the two despotisms,” ” the empire of the Napoleons and the temporal power of the popes,” appealed to the Catholic bishops throughout the world to put an end to the schism by declaring whether the recent decrees were or were not binding on the faith of the Church. This appeal, on its appearance in La Liberta early in 1871, was suppressed by the order of the king of Italy. On the 28th of March Dollinger, in a letter of some length, set forth the reasons which com-

pelled him also to withhold his submission alike as ” a Christian, a theologian, an historical student and a citizen.” The publica- tion of this letter was shortly followed by a sentence of ex- communication pronounced against Dollinger and Professor Johannes Friedrich (g.v.), and read to the different congrega- tions from the pulpits of Munich. The professors of the univer- sity, on the other hand, had shortly before evinced their resolu- tion of affording Dollinger all the moral support in their power by an address (April 3, 1871) in which they denounced the Vatican decrees with unsparing severity, declaring that, at the very time when the German people had ” won for themselves the post of honour on the battlefield among the nations of the earth,” the German bishops had stooped to the dishonouring task of ” forcing consciences in the service of an unchristian tyranny, of reducing many pious and upright men to distress and want, and of persecuting those who had but stood steadfast in their allegiance to the ancient faith” (Friedberg, Aktenstilcke z. ersten Vaticanischen Concil, p. 187). An address to the king, drawn up a few days later, received the signatures of 12,000 Catholics. The refusal of the rites of the Church to one of the signatories, Dr Zenger, when on his deathbed, elicited strong expressions of disapproval; 1 and when, shortly after, it became necessary to fill up by election six vacancies in the council of the university, the feeling of the electors was indicated by the return of candidates distinguished by their dissent from the new decrees. In the following September the demand for another and a free council was responded to by the assembling of a congress at Munich. It was composed of nearly 500 dele- gates, convened from

almost all parts of the world; but the Teutonic element was now as manifestly predominant as the Latin element had been at Rome. The proceedings were pre- sided over by Professor von Schulte, and lasted three days. Among those who took a prominent part in the deliberations were Landammann Keller, Windscheid, Dollinger, Reinkens, Maassen (professor of canon law at Vienna), Friedrich and Huber. The arrangements finally agreed upon were mainly provisional; but one of the resolutions plainly declared that it was desirable if possible to effect a reunion with the Oriental Greek and Russian Churches, and also to arrive at an ” under- standing ” with the Protestant and Episcopal communions.

In the following year lectures were delivered at Munich by various supporters of the new movement, and the learning and eloquence of Reinkens were displayed with marked effect. In France the adhesion of the abbe Michaud to the cause attracted considerable interest, not only from his reputation as a preacher, but also from the notable step in advance made by his declara- tion that, inasmuch as the adoption of the standpoint of the Tridentine canons would render reunion with the Lutheran and the Reformed Churches impossible, the wisest course would be to insist on nothing more with respect to doctrinal belief than was embodied in the canons of the first seven oecumenical councils. In the same year the Old Catholics, as they now began to be termed, entered into relations with the historical little Jansenist Church of Utrecht. Dollinger, in delivering his inaugural address as rector of the university of Munich, expressed his conviction that theology had received a fresh impulse and that the religious history of Europe was entering upon a new phase.

Other circumstances contributed to invest Old Catholicism with additional importance. It was evident that the relations between the Roman Curia and the Prussian government were becoming extremely strained. In February 1872 appeared the first measures of the Falk ministry, having for their object the control of the influence of the clergy in the schools, and in May the pope refused to accept Cardinal Hohenlohe, who during the council had opposed the definition of the dogma, as Prussian minister at the Vatican. In the same year two humble parish priests, Renftle of Mering in Bavaria and Tangermann of Unkel in the Rhineland, set an example of independence by refusing

1 The rites were administered and the burial Sfervice conducted by Friedrich, who had refused to acknowledge his excom- munication.

to accept the decrees. The former, driven from his parish church, was followed by the majority of his congregation, who, in spite of every discouragement, continued faithful to him; and for years after, as successive members were removed by death, the crosses over their graves recorded that they had died ” true to their ancient belief.” Tangermann, the poet, expelled in like manner from his parish by the archbishop of Cologne, before long found himself the minister of a much larger congre- gation in the episcopal city itself. These examples exercised no little influence, and congregations of Oid Catholics were shortly after formed at numerous towns and villages in Bavaria, Baden, Prussia, German Switzerland, and even in Austria. At Warnsdorf in Bohemia a congregation was collected which still represents one of the most important centres of the move- ment. In September the second congress was held at Cologne. It was attended by some 500 delegates or visitors from all parts of Europe, and the English Church was represented by the bishops of Ely and Lincoln and other distinguished members. At this congress Friedrich boldly declared that the movement was directed ” against the whole papal system, a system of errors during a thousand years, which had only reached its climax in the doctrine of infallibility.”

The movement thus entered a new phase, the congress occupying itself mainly with the formation of a more definite organization and with the question of reunion with other Churches. The immediate effect was a fateful divergence of opinion; for many who sympathized with the opposition to the extreme papal claims shrank from the creation of a fresh schism. Prince Chlodwig Hohenlohe, who as prime minister of Bavaria had attempted to unite the governments against the definition of the dogma, refused to have anything to do with proceedings which could only end in the creation of a fresh sect, and would make the prospect of the reform of the Church from within hopeless; more important still, Dollinger refused to take part in setting up a separate organization, and though he afterwards so far modified his opinion as to help the Old Catholic community with sympathy and advice, he never formally joined it.

Meanwhile, the progress of the quarrel between the Prussian government and the Curia had been highly favourable to the movement. In May 1873 the celebrated Falk laws were enacted, whereby the articles 15 and 18 of the Prussian constitution were modified, so as to legalize a systematic state supervision over the education of the clergy of all denominations, and also over the appointment and dismissal of all ministers of religion. The measure,

which was a direct response to the Vatican decrees, inspired the Old Catholics with a not unreasonable expectation that the moral support of the government would henceforth be enlisted on their side. On the nth of August Professor J. H. Reinkens of Breslau, having been duly elected bishop of the new community, 1 was consecrated at Rotterdam by Bishop Heykamp of Deventer, the archbishop of Utrecht, who was to have performed the ceremony, having died a few days before. In the meantime the extension of the movement in Switzerland had been proceeding rapidly, and it was resolved to hold the third congress at Constance. The proceedings occupied three days .(12th to 14th September), the subjects discussed being chiefly the institution of a synod 2 as the legislative and executive organ of the Church, and schemes of reunion with the Greek, the African and the Protestant communions. On the 20th of September the election of Bishop Reinkens was formally recognized by the Prussian government, and on the 7th of October he took the oath of allegiance to the king.

The following year (1874) was marked by the assembling of the first synod and a conference at Bonn, and of a congress

1 Reinkens was elected at Cologne in primitive Christian fashion by clergy and people, the latter being representatives of Old Catholic congregations.

2 The diocesan synod, under the presidency of the bishop, consists of the clergy of the diocese and one lay delegate for every 200 church members. It now meets twi-e a year and transacts the business prepared “for it by an executive committee of 4 clergy and 5 laymen. In Switzerland the organization is still more democratic; the bishop does not preside over the synod and may be deposed by it.

at Freiburg-im-Breisgau. At the congress Bishop Reinkens spoke in hopeful terms of the results of his observations during a recent missionary tour throughout Germany. The conference, held on the 14th, 15th and 16th of September, had for its special object the discussion of the early confessions as a basis of agree- ment, though not necessarily of fusion, between the different communions above-named. The meetings, which were presided over by Dollinger, successively took into consideration the Filioque clause in the Nicene creed, the sacraments, the canon of Scripture, the episcopal succession in the English Church, “the confessional, indulgences, prayers for the dead, and the eucharist (see Dollinger). The synod (May 27-29) was the first of a series, held yearly till 1879 and afterwards twice a year, in which the doctrine and discipline of the new Church were gradually formulated. The tendency was, naturally, to move further and further

away from the Roman model; and though the synod expressly renounced any claim to formulate dogma, or any intention of destroying the unity of the faith, the ” Catholic Catechism” adopted by it in 1874 contained several articles fundamentally at variance with the teaching of Rome. 8 At the first synod, too, it was decided to make confession and fasting optional, while later synods pronounced in favour of using the vernacular in public worship, allowing the marriage of priests, and permitting them to administer the communion in both kinds to members -of the Anglican Church attending their services. Of these developments that abolishing the compulsory celibacy of the clergy led to the most opposition; some opposed it as inexpedient, others — notably the Jansenist clergy of Holland — as wrong in itself, and when it was ultimately passed in 1878 some of the clergy, notably Tangermann and Reusch, withdrew from the Old Catholic movement.

Meanwhile the movement had made some progress in other countries — in Austria, in Italy and in Mexico; but everywhere it was hampered by the inevitable controversies, which either broke up its organization or hindered its development. In Switzerland, where important conferences . were successively convened (at Solothurn in 1871, at Olten in 1872, 1873 and 1874), the unanimity of the ” Christian Catholics,” as they preferred to call themselves, seemed at one time in danger of being shipwrecked on the question of episcopacy. It was not until September 18th, 1876, that the conflict of opinions was so far composed as to allow of the consecration of Bishop Herzog by Bishop Reinkens. The reforms introduced by M. Hyacinthe Loyson in his church at Geneva received only a partial assent from the general body. Among the more practical results of his example is to be reckoned, however, the fact that in French Switzerland nearly all the clergy, in German Switzerland about one half,- are married men.

The end of the Kulturkampf in 1878, and the new alliance between Bismarck and Pope Leo XIII. against revolutionary Socialism, deprived the Old Catholics of the special favour which had been shown them by the Prussian government; they continued, however, to enjoy the legal status of Catholics, and their communities retained the rights and the property secured to them by the law of the 4th of July 1875. In Bavaria, on the other hand, they were in March 1890, after the death of Dollinger, definitely reduced to the status of a private religious sect, with very narrow rights. When Bishop Reinkens died in January 1896 his successor Theodor Weber, professor of theology at Breslau, elected bishop on the 4th of March, was recognized only by the governments of Prussia, Baden and Hesse. The present position of the Old Catholic Church has disappointed the expectation of its friends and of its

enemies. It has neither advanced rapidly, as the former had hoped, nor retrograded, as the latter have frequently predicted it would do. In Germany there are 90 congregations, served by 60 priests, and the number of adherents is estimated at about 60,000. In Switzerland there are 40 parishes (of which only one, that at Lucerne, is in the

- [E.g. especially Question 164: “this (the Christian) community is invisible,” and Question 167, ” one may belong to the invisible Church (i.e. of those sharing in Christ’s redemption) without belong- ing to the visible Church.

Roman Catholic cantons), 60 clergy and about 50,000 adherents. In Austria, though some accessions have been received since the Los von Rom movement began in 1899, the Old Catholic Church has not made much headway; it has some 15 churches and about 15,000 adherents. In Holland the Old Catholic or Jansenist Church has 3 bishops, about 30 congregations and over 8000 adherents. In France the movement headed by Loyson did not go far. There is but one congregation, in Paris, where it has built for itself a beautiful new church on the Boulevard Blanqin. Its priest is George Volet, who was ordained by Herzog, and it has just over 300 members. It is under the supervision of the Old Catholic archbishops of Utrecht. In Italy a branch of the Old Catholic communion was established in 1881 by Count Enrico di Campello, a former canon of St Peter’s at Rome. A church was opened in Rome by Monsignor Savarese and Count Campello, under the supervision of the bishop of Long Island in the United States, who undertook the superintendence of the congregation in accordance with the regulations laid down by the Lambeth conference. But dissensions arose between the two men. The church in Rome was closed; Savarese returned to the Roman Church; and Campello commenced a reform work in the rural districts of Umbria, under the episcopal guidance of the bishop of Salisbury. This was in 1885. In 1900 Campello returned to Rome, and once more opened a church there. In 1902 he retired from active participation in the work, on account of age and bodily infirmity; and his place at the head of it was taken by Professor Cicchitti of Milan. Campello ultimately returned to the Roman communion. There are half-a-dozen priests, who are either in Roman or Old Catholic orders, and about twice as many con- gregations. Old Catholicism has spread to America. The Polish Romanists there, in 1899, complained of the rule of Irish bishops; elected a bishop of their own, Herr Anton Kozlowski; presented him to the Old Catholic

bishops in Europe for consecra- tion; and he presides over seven congregations in Chicago and the neighbourhood. The Austrian and Italian churches possess no bishops, and the Austrian government refuses to allow the Old Catholic bishops of other countries to perform their functions in Austria. Every Old Catholic congregation has its choral union, its poor relief, and its mutual improvement society. Theological faculties exist at Bonn and Bern, and at the former a residential college for theological students was established by Bishop Reinkens. Old Catholicism has eight newspapers — two in Italy, two in Switzerland, and one each in Holland, Germany, Austria and France. It has held reunion conferences at Lucerne in 1892, at Rotterdam in 1894, and at Vienna in 1897. At these, members of the various episcopal bodies have been welcomed. It has also established a quarterly publication, the Revue internationale de iheologie, which has admitted articles in French, German and English, contributed not merely by Old Catholics, but by members of the Anglican, Russian, Greek and Slavonic churches. Old Catholic theologians have been very active, and the work of Dollinger and Reusch on the Jesuits, and the history of the Roman Church by Professor Langen, have attained a European reputation.

An outline of the whole movement up to the year 1875 will be found in The New Reformation, by ” Theodorus “(J. Bass Mullinger) ; and an excellent resume 1 of the main facts in the history of the movement in each European country, as connected with other developments of liberal thought, and with political history, is given in the second volume of Dr F. Nippclci’s Kandbuch der neuesten Kirchengeschichte, vol. ii. (1883). See also A. M. E. Scarth, The Story of the Old Catholic and Kindred Movements (London, 1883); Buhler, Der Altkatholicismus (Leiden, 1880); J. F von Schulte, Der Altkaiholizismus (Giessen, 1887); and article in Hauck-Herzog’s Realencyk. fiir prot. Theol. und Kirche, i. 415. For details the follow- ing sources may be consulted: (a) For the proceedings of the successive congresses: the Slenographische Berichte, published at Munich, Cologne, Constance, &c. ; those of the congress of Constance were summarized in an English form, with other elucidatory matter, by Professor John Mayor, (b) For the questions involved in the consecration of Bishop Reinkens : Rechtsgutachten iiber die Frage der Anerkennung des altkalholischen Bischofs Dr Reinkens in Bayern (Munich, 1874) ; Emil Friedberg, Der Stoat und d. Bischofswahlen in Deutschland (Leipzig, 1874) ; F. von Sybel, Das altkatholische Bisthum und das Vermogen d. rbmischkatholischen Kirchengesellschaften in

Preussen (Bonn, 1874). (c) Reinkens’s own speeches and pastorals, some of which have been translated into English, give his personal

views and experiences; the Life of Huber has been written and published by Eberhard Stirngiebl; and the persecutions to which the Old Catholic clergy were exposed have been set forth in a pamphlet by J. Mayor, Facts and Documents (London, 1875). (d) For Switzer- land, C. Herzog, Beitrage zur Vorgeschichte der Christkathol. Kirche der Schweiz (Bern, 1896).

OLD DEER, a parish and village in the district of Buchan, Aberdeenshire, Scotland. Pop. (1901), 4313. The village lies on the Deer or South Ugie Water, io£ m. W. of Peterhead, and 2 m. from Mintlaw station on the Great North of Scotland Railway Company's branch line from Aberdeen to Peterhead. The industries include distilling, brewing, and the manufacture of woollens, and there are quarries of granite and limestone. Columba and his nephew Drostan founded a monastery here in the 6th century, of which no trace remains. A most interesting relic of the monks was discovered in 1857 in the Cambridge University library by Henry Bradshaw. It consisted of a small MS. of the Gospels in the Vulgate, fragments of the liturgy of the Celtic church, and notes, in the Gaelic script of the 12th century, referring to the charters of the ancient monastery, including a summary of that granted by David I. These are among the oldest examples of Scottish Gaelic. The MS. was also adorned with Gaelic designs. It had belonged to the monks of Deer and been in the possession of the University Library since 1715. It was edited by John Stuart (1813-1877) for the Spalding Club, by whom it was published in 1869 under the title of The Book of Deer. In 1218 William Comyn, earl of Buchan, founded the Abbey of St Mary of Deer, now in ruins, f m. farther up the river than the monastery and on the opposite bank. Although it was erected for Cistercians from the priory of KinloSs, near Forres, the property of the Columban monastery was re- moved to it. The founder (d. 1233) and his countess were buried in the church. The parish is rich in antiquities, but the most noted of them — the Stone of Deer, a sculptured block of syenite, which stood near the Abbey — was destroyed in 1854. The thriving village of New Deer (formerly called Auchriddie) lies about 7 m. W. of the older village; it includes the ruined castle of Fedderat.

OLDENBARNEVELDT, JOHAN VAN (1547-1619), Dutch statesman, was born at Amersfoort on the 14th of September 1547. The family from which he claimed descent was of ancient lineage. After studying law at Louvain, Bourges and Heidelberg, and travelling in France and Italy, Oldenbarneveldt settled down to practise in the law courts at the Hague. In religion a moderate Calvinist, he threw himself with ardour into the revolt against Spanish tyranny and became a zealous adherent of William the Silent. He served as a volunteer for the relief of

Haarlem (1573) and again at Leiden (1574). In 1576 he obtained the important post of pensionary of Rotterdam, an office which carried with it official membership of the States of Holland. In this capacity his industry, singular grasp of affairs, and persuasive powers of speech speedily gained for him a position of influence. He was active in promoting the Union of Utrecht (1579) and the accept- ance of the countship of Holland and Zeeland by William (1584) On the assassination of Orange it was at the proposal of Olden- barneveldt that the youthful Maurice of Nassau was at once elected stadholder, captain-general and admiral of Holland. During the governorship of Leicester he was the leader of the strenuous opposition offered by the States of Holland to the centralizing policy of the governor. In 1586 he was appointed, in succession to Paul Buys, to the post of Land's Advocate of Holland. This great office, which he held for 32 years, gave to a man of commanding ability and industry unbounded influence in a many-headed republic without any central executive authority. Though nominally the servant of the States of Holland he made himself politically the personification of the province which bore more than half the entire charge of the union, and as its mouthpiece in the states-general he practically dominated that assembly. In a brief period he became entrusted with such large and far-reaching authority in all the details of administration, as to be virtually " minister of all affairs."

7°

OLDENBARNEVELDT

During the two critical years which followed the withdrawal of Leicester, it was the statesmanship of the advocate which kept the United Provinces from falling asunder through their own inherent separatist tendencies, and prevented them from becom- ing an easy conquest to the formidable army of Alexander of Parma. Fortunately for the Netherlands the attention of Philip was at their time of greatest weakness riveted upon his con- templated invasion of England, and a respite was afforded which enabled Oldenbarneveldt to supply the lack of any central organized government by gathering into his own hands the con- trol of administrative affairs. His task was made the easier by the whole-hearted support he received from Maurice of Nassau, who, after 1589, held the Stadholderate of five provinces, and was likewise captain-general and admiral of the union. The interests and ambitions of the two men did not clash, for Maurice's thoughts were centred on the training and leadership of armies and he had no special capacity as a statesman or in- clination for politics. The first rift between them came in 1600, when Maurice was forced against his

will by the states-general, under the advocate's influence, to undertake an expedition into Flanders, which was only saved from disaster by desperate efforts which ended in victory at Nieuwport. In 1598 Oldenbarneveldt took part in special embassies to Henry IV. and Elizabeth, and again in 1605 in a special mission sent to con- gratulate James I. on his accession.

The opening of negotiations by Albert and Isabel in 1606 for a peace or long truce led to a great division of opinion in the Netherlands. The archdukes having consented to treat with the United Provinces " as free provinces and states over which they had no pretensions," Oldenbarneveldt, who had with him the States of Holland and the majority of burgher regents throughout the county, was for peace, provided that liberty of trading was conceded. Maurice and his cousin William Louis, stadholder of Frisia, with the military and naval leaders and the Calvinist clergy, were opposed to it, on the ground that the Spanish king was merely seeking an interval of repose in which to recuperate his strength for a renewed attack on the independence of the Netherlands. For some three years the negotiations went on, but at last after endless parleying, on the 9th of April 1609, a truce for twelve years was concluded. All that the Dutch asked was directly or indirectly granted, and Maurice felt obliged to give a reluctant and somewhat sullen assent to the favourable conditions obtained by the firm and skilful diplomacy of the advocate.

The immediate effect of the truce was a strengthening of Oldenbarneveldt's influence in the government of the republic, nowrecognized as a "free and independent state"; external peace, however, was to bring with it internal strife. For some years there had been a war of words between the religious parties, known as the Gomarists (strict Calvinists) and the Arminians (moderate Calvinists). In 1610 the Arminians drew up a petition, known as the Remonstrance, in which they asked that their tenets (defined in five articles) should be submitted to a national synod, summoned by the civil government. It was no secret that this action of the Arminians was taken with the approval and connivance of the advocate, who was what was styled a libertine, i.e. an upholder of the principle of toleration in religious opinions. The Gomarists in reply drew up a Contra-Remonstrance in seven articles, and appealed to a purely church synod. The whole land was henceforth divided into Remonstrants and Contra-Re- monstrants; the States of Holland under the influence of Oldenbarneveldt supported the former, and refused to sanction the summoning of a purely church synod (1613). They likewise (1614) forbade the preachers in the Province of Holland to treat of disputed subjects from their pulpits. Obedience was difficult to

enforce without military help, riots broke out in certain towns, and when Maurice was appealed to, as captain-general, he declined to act. He did more, though in no sense a theologian; he declared himself on the side of the Contra-Remonstrants, and established a preacher of that persuasion in a church at the Hague (161 7).

The advocate now took a bold step. He proposed that the

States of Holland should, on their own authority, as a sovereign province, raise a local force of 4000 men (waardgelders) to keep the peace. The states-general meanwhile by a bare majority (4 provinces to 3) agreed to the summoning of a national church synod. The States of Holland, also by a narrow majority, refused their assent to this, and passed (August 4, 16 17) a strong resolution {Scherpe Resolutie) by which all magistrates, officials and soldiers in the pay of the province were required to take an oath of obedience to the states on pain of dismissal, and were to be held accountable not to the ordinary tribunals, but to the States of Holland. It was a declaration of sovereign independence on the part of Holland, and the states-general took up the challenge and determined on decisive action. A commission was appointed with Maurice at its head to compel the disbanding of the waard- gelders. On the 31st of July 1618 the stadholder appeared at Utrecht, which had thrown in its lot with Holland, at the head of a body of troops, and at his command the local levies at once laid down their arms. His progress through the towns of Holland met with no opposition. The states party was crushed without a blow being struck. On the 23rd of August, by order of the states-general, the advocate and his chief supporters, de Groot and Hoogerbeets, were arrested.

Oldenbarneveldt was with his friends kept in the strictest confinement until November, and then brought for examination before a commission appointed by the states-general. He appeared more than sixty times before the commissioners and was examined most severely upon the whole course of his official life, and was, most unjustly, allowed neither to consult papers nor to put his defence in writing. On the 20th of February 1619 he was arraigned before a special court of twenty-four members, only half of whom were Hollanders, and nearly all of them his personal enemies. It was in no sense a legal court, nor had it any jurisdiction over the prisoner, but the protest of the advocate, who claimed his right to be tried by the sovereign province of Holland, whose servant he was, was disregarded. He was allowed no advocates, nor the use of documents, pen or paper. It was in fact not a trial at all, and the packed bench of judges on Sunday, the 1 2th of May, pronounced sentence of death. On the following day the old

statesman, at the age of seventy-one, was beheaded in the Binnenhof at the Hague. Such, to use his own words, was his reward for serving his country forty-three years.

The accusations brought against Oldenbarneveldt of having been a traitor to his country, whose interests he had betrayed for foreign gold, have no basis in fact. The whole life of the advocate disproves them, and not a shred of evidence has ever been produced to throw suspicion upon the patriot statesman's conduct. All his private papers fell into the hands of his foes, but not even the bitterest and ablest of his personal enemies, Francis Aarssens (see Aarssens), could extract from them anything to show that Oldenbarneveldt at any time betrayed his country's interests. That he was an ambitious man, fond of power, and haughty in his attitude to those who differed from him in opinion, may be granted, but it must also be conceded that he sought for power in order to confer invaluable services upon his country, and that impatience of opposition was not unnatural in a man who had exercised an almost supreme control of administrative affairs for upwards of three decades. His high-handed course of action in defence of what he conceived to be the sovereign rights of his own province of Holland to decide upon religious questions within its borders may be challenged on the ground of inexpediency, but not of illegality. The harshness of the treatment meted out by Maurice to his father's old friend, the faithful counsellor and protector of his own early years, leaves a stain upon the stadholder's memory which can never be washed away. That the prince should have felt compelled in the last resort to take up arms for the Union against the attempt of the province of Holland to defy the authority of the Generality may be justified by the plea reipublicae salus suprema lex. To eject the advocate from power was one thing, to execute him as a traitor quite another. The condemnation of Oldenbarneveldt was carried out with Maurice's consent and approval, and he

cannot be acquitted of a prominent share in what posterity has pronounced to be a judicial murder.

Oldenbarneveldt was married in 1575 to Maria van Utrecht. He left two sons, the lords of Groeneveld and Stoutenburg, and two daughters. A conspiracy against the life of Maurice, in which the sons of Oldenbarneveldt took part, was discovered in 1623. Stoutenburg, who was the chief accomplice, made his escape and entered the

service of Spain; Groeneveld was executed.

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OLDENBURG, a grand-duchy of Germany, with an area of 2479 sq. m. It consists of three widely separated portions of territory — (1) the duchy of Oldenburg, (2) the principality of Ltibeck, and (3) the. principality of Birkenfeld. It ranks tenth among the states of the German empire and has one vote in the Bundesrat (federal council) and three members in the Reichstag.

I. The duchy of Oldenburg, comprising fully four-fifths of the entire area and population, lies between 52° 29′ and 53 44′ N. and between 7 37′ and 8° 37′ E., and is bounded on the N. by the North Sea and on the other three sides by Hanover, with the exception of a small strip on the east, where it is conter- minous with the territory of the free city of Bremen. It forms part of the north-western German plain lying between the Weser and the Ems, and, except on the south, where the Dammerge- birge attain a height of 478 ft., it is almost entirely flat, with a slight inclination towards the sea. In respect of its soil it is divided broadly into two parts — the higher and inland-lying Geest, consisting of sandy plains intermixed with extensive heaths and moors, and the marsh lands along the coast, con- sisting of rich but somewhat swampy alluvial soil. The latter, which compose about one-fifth of the duchy, are protected against the inroads of the sea by dikes as in Holland; and beyond these are the so-called Watten, generally covered at high tide, but at many points being gradually reclaimed. The climate is temperate and humid; the mean temperature of the coldest month at the town of Oldenburg is 26° F. of the warmest 66°. Storms are numerous, and their violence is the more felt owing to the almost entire absence of trees; and fogs and ague are prevalent in the marsh lands. The chief rivers are the Hunte, flowing into the Weser, and the Hase and Leda flowing into the Ems. The Weser itself forms the eastern boundary for 42 m., and internal navigation is greatly facilitated by a canal, passing through the heart of the duchy and connecting the Hunte and the Leda. On the north there are several small coast streams conducted through the dikes by sluices, the only one of importance being the Jade, which empties itself into the Jade

Busen, a deep gulf affording good accommodation for shipping. The duchy also contains numerous small lakes, the chief of which is the Diimmer See in the south-east corner, measuring 4 m. in length by 25 in width. About 30% of the area of the duchy is under cultivation and 17% under pasture and meadows, while the rest consists mainly of marsh, moor and heath. Forests occupy a very small proportion of the whole, but there are some fine old oaks. In the Geest the principal crops are rye, oats, potatoes and buckwheat, for which the heath is some- times prepared by burning. Large tracts of moorland, however, are useful only as producing peat for fuel, or as affording pasture to the flocks of small coarse-woolled Oldenburg sheep. The rich soil of the marsh lands produces good crops of wheat, oats, rye, hemp and rape, but is especially adapted for grazing. The cattle and horses raised on it are highly esteemed throughout Germany, and the former are exported in large numbers to England. Bee-keeping is much in vogue on the moors. The live stock of Oldenburg forms a great part of its wealth, and the ratio of cattle, sheep and horses to the population is one of the highest

among the German states. There are few large estates, and the ground is mostly in the hands of small farmers, who enjoy the right of fishing and shooting on their holdings. Game is scarce, but fishing is fairly productive. The mineral wealth of Oldenburg is very small. Woollen and cotton fabrics, stockings, jute and cigars are made at Varel, Delmenhorst and Lohne; cork-cutting is extensively practised in some districts, and there are a few iron-foundries. Trade is relatively of more importance, chiefly owing to the proximity of Bremen. The agricultural produce of the duchy is exported to Scandinavia, Russia, England and the United States, in return for colonial goods and manufactures. Varel, Brake and Elsfleth are the chief commercial harbours.

II. The principality of Liibeck has an area of 209 sq. m. ano shares in the general physical characteristics of east Holstein, within which it lies. On the east it extends to Ltibeck Bay of the Baltic Sea, and on the south-east it is bounded by the Trave. The chief rivers are the Schwartau, a tributary of the Trave, and the Schwentine, flowing northwards to the Gulf of Kiel. The scenery of Liibeck is often picturesque, especially in the vicinity of the Plon See and the Eutin See, the most important of the small lakes with which it is dotted. Agriculture is practised here even more extensively than in the duchy of Oldenburg, about 75% of the area being cultivated. The population in 1905 was

38,583-

III. The principality of Birkenfeld, 312 sq. m. in extent, lies in the midst of the Prussian province of the Rhine, about 30 m. W. of the Rhine at Worms and 150 m. S. of the duchy of Oldenburg. The population in 1905 was 46,484. (See Birkenfeld.)

The total population of the grand-duchy of Oldenburg in 1880 was 337,478, and in 1905 438,856. The bulk of the inhabitants are of the Saxon stock, but to the north and west of the duchy there are numerous descendants of the ancient Frisians. The differences between the two races are still to some extent percept- ible, but Low German (Platt-deulsch) is universally spoken, except in one limited district, where a Frisian dialect has maintained itself. In general characteristics the Oldenburg peasants resemble the Dutch, and the absence of large landowners has contributed to make them sturdy and independent. The population of Oldenburg is somewhat unequally distributed, some parts of the marsh lands containing over 300 persons to the square mile, while in the Geest the number occasionally sinks as low as 40. About 70% of the inhabitants belong to the ” rural ” population. The town of Oldenburg is the capital of the grand-duchy. The war-harbour of Wilhelmshaven, on the shore of the Jade Busen, was built by Prussia on land bought from Oldenburg. The chief towns of Birkenfeld and Ltibeck respectively are Birkenfeld and Eutin.

Oldenburg is a Protestant country, and the grand-duke is required to be a member of the Lutheran Church. Roman Catholicism, however, preponderates in the south-western pro- vinces, which formerly belonged to the bishopric of Minister. Oldenburg Roman Catholics are under the sway of the bishops of Miinster, who is represented by an official at Vechta. The educational system of Oldenburg is on a similar footing to that of north Germany in general, though the scattered posi- tion of the farmhouses interferes to some extent with school attendance.

The constitution of Oldenburg, based upon a decree of 1849, revised in 1852, is one of the most liberal in Germany. It pro- vides for a single representative chamber (Landtag), elected indirectly by universal suffrage and exercising concurrent rights of legislation and taxation with the grand-duke. The chamber which consists of forty members, one for every 10,000 inhabitants, is elected every three years. The executive consists of three ministers, who are aided by a committee of the Landtag, when that body is not in session. The local affairs of Birkenfeld and Liibeck are entrusted to provincial councils of fifteen members each. All citizens paying taxes and not having been convicted of felony are enfranchised. The municipal communities enjoy an unusual amount of independence. The finances of each

constituent state of the grand-duchy are managed separately, and there is also a fourth budget concerned with the joint

administration. The total revenue and expenditure are each about £650,000 annually. The grand-duchy had a debt in 1967 of £2,958,409.

History. — The earliest recorded inhabitants of the district now called Oldenburg were a Teutonic people, the Chauci, who were afterwards merged in the Frisians. The chroniclers delight in tracing the genealogy of the counts of Oldenburg to the Saxon hero, Widukind, the stubborn opponent of Charlemagne, but their first historical representative is one Elimar (d. 1108) who is described as comes in confinio Saxoniae et Frisiae. Elimar's descendants appear as vassals, although sometimes rebellious ones, of the dukes of Saxony; but they attained the dignity of princes of the empire when the emperor Frederick I. dis- membered the Saxon duchy in 1180. At this time the county of Delmenhorst formed part of the dominions of the counts of Oldenburg, but afterwards it was on several occasions separated from them to form an apanage for younger branches of the family. This was the case between 1262 and 1447, between 1463 and 1547, and between 1577 and 1617. The northern and western parts of the present grand-duchy of Oldenburg were in the hands of independent, or semi-independent, Frisian princes, who were usually heathens, and during the early part of the 13th century the counts carried on a series of wars with these small potentates which resulted in a gradual expansion of their territory. The free city of Bremen and the bishop of Munster were also frequently at war with the counts of Oldenburg.

The successor of Count Dietrich (d. 1440), called Fortunatus, was his son Christian, who in 1448 was chosen king of Denmark as Christian I. In 1450 he became king of Norway and in 1457 king of Sweden; in 1460 he inherited the duchy of Schleswig and the county of Holstein, an event of high importance for the future history of Oldenburg. In 1454 he handed over Olden- burg to his brother Gerhard (c. 1430-1499) a turbulent prince, who was constantly at war with the bishop of Bremen and other neighbours. In 1483 Gerhard was compelled to abdicate in favour of his sons, and he died whilst on a pilgrimage in Spain. Early in the 16th century Oldenburg was again enlarged at the expense of the Frisians. Protestantism was introduced into the county by Count Anton I. (1505-1573), who also suppressed

the monasteries; however, he remained loyal to Charles V. during the war of the league of Schmalkalden, and was able thus to increase his territories, obtaining Delmenhorst in 1547. One of Anton's brothers, Count Christopher (c. 1506-1560), won some reputation as a soldier. Anton's grandson, Anton Giinther (1583-1667), who succeeded in 1603, proved himself the wisest prince who had yet ruled Oldenburg. Jever had been acquired before he became count, but in 1624 he added Knyp- hausen and Varel to his lands, with which in 1647 Delmenhorst was finally united. By his prudent neutrality during the Thirty Years' War Anton Giinther secured for his dominions an immunity from the terrible devastations to which nearly all the other states of Germany were exposed. He also obtained from the emperor the right to levy tolls on vessels passing along the Weser, a lucrative grant which soon formed a material addition to his resources.

When Count Anton Giinther died in June 1667 Oldenburg was inherited by virtue of a compact made in 1649 by Frederick III., king of Denmark, and Christian Albert, duke of Holstein- Gottorp. Some difficulties, however, arose from this joint ownership, but eventually these were satisfactorily settled, and from r7o2 to 1773 the county was ruled by the kings of Denmark only, this period being on the whole one of peaceful development. Then in 1773 another change took place. Christian VII. of Denmark surrendered Oldenburg to Paul, duke of Holstein- Gottorp, afterwards the emperor Paul of Russia, 1 and in return Paul gave up to Christian his duchy of Holstein-Gottorp and his claims on the duchies of Schleswig and Holstein. At once Paul handed over Oldenburg to his kinsman, Frederick Augustus, bishop of Liibeck, the representative of a younger branch of

•His father, Charles Frederick of Holstein-Gottorp (1 700-1 739), a descendant of Christian I. of Denmark, married Anne, daughter of Peter the Great, and became tsar as Peter III. in 1762.

the family, 2 and in 1777 the county was raised to the rank of a duchy. The bishop's son William, who succeeded his father as duke in 1785, was a man of weak intellect, and his cousin Peter Frederick, bishop of Liibeck, acted as administrator and eventually, in 1823, inherited the duchy. This prince is the direct ancestor of the present grand duke.

To Peter fell the onerous task of governing the duchy during the time of the Napoleonic wars. In 1806 Oldenburg was occupied by the French and the Dutch, the duke and the regent being put to flight; but in 1807 William was restored, and in 1808 he joined the Confederation of the Rhine. However, in 1810 his lands were forcibly

seized by Napoleon because he refused to exchange them for Erfurt. This drove him to join the Allies, and at the congress of Vienna his services were rewarded by the grant of the principality of Birkenfeld, an addition to his lands due to the good offices of the tsar Alexander I. At this time Oldenburg was made a grand duchy, but the title of grand-duke was not formally assumed until 1829, when Augustus succeeded his father Peter as ruler. Under Peter's rule the area of Olden- burg had been increased, not only by Birkenfeld, but by the bishopric of Liibeck (secularized in 1802) and some smaller pieces of territory.

Oldenburg did not entirely escape from the revolutionary movement which swept across Europe in &4&, but no serious disturbances took place therein. In 1849 the grand-duke granted a constitution of a very liberal character to his subjects. Hitherto his country had been ruled in the spirit of enlightened despotism, which was strengthened by the absence of a privileged class of nobles, by the comparative independence of the peasantry, and by the unimportance of the towns; and thus a certain amount of friction was inevitable in the working of the new order. In 1852 some modifications were introduced into the constitution, which, nevertheless, remained one of the most liberal in Germany. Important alterations were made in the administrative system in 1855, and again in 1868, and church affairs were ordered by a law of 1853. In 1863 the grand-duke Peter II. (1827-1900), who had ruled Oldenburg since the death of his father Augustus in 1853, seemed inclined to press a claim to the vacant duchies of Schleswig and Holstein, but ultimately in 1867 he abandoned this in favour of Prussia, and received some slight compensation. In 1866 he had sided with this power against Austria and had joined the North German Confederation; in 1871 Oldenburg became a state of the new German empire. In June 1900 Frederick Augustus (b. 1852) succeeded his father Peter as grand- duke. By a law passed in 1904 the succession to Oldenburg was vested in Frederick Ferdinand, duke of Schleswig-Holstein- Sonderburg-Gliicksburg, and his family, after the extinction of the present ruling house. This arrangement was rendered advisable because the grand-duke Frederick Augustus had only one son Nicholas (b. 1897), and his only brother George Louis (1855) was unmarried.

For the history of Oldenburg see Runde, Oldenburgische Chronik (Oldenburg, 1863); E. Pleitner, Oldenburg im 19 Jahrhundert (Oldenburg, 1899-1900); and Oldenburgisches Quellenbuch (Olden- burg, 1903). See also the Jahrbuch fur die Geschichte des Herzogtums Oldenburg (1892 seq.).

OLDENBURG, a town of Germany, and capital of the grand- duchy of

Oldenburg. It is a quiet and pleasant-looking town, situated 27 m. by rail W. of Bremen, on the navigable Hunte and the Hunte-Ems canal. Pop. (1905), including the suburbs, 28,565. The inner or old town, with its somewhat narrow streets, is surrounded by avenues laid out on the site of the former ramparts, beyond which are the villas, promenades and gardens of the modern quarters. Oldenburg has almost nothing to show in the shape of interesting old buildings. The

2 To this branch belonged Adolphus Frederick, son of Christian Augustus bishop of Liibeck (d. 1726), who in 1751 became king of Sweden.

Another branch of the Oldenburg family, descended from John, son of Christian III. of Denmark, is that of Holstein-Sonderburg. This was subdivided into the lines of Sonderburg-Augustenburg and Sonderburg-Glucksburg. Prince Christian, who married Princess Helena of Great Britain, belongs to the former of them. To the latter belong the kings of Denmark, Greece and Norway.

Evangelical Lambertikirche, though dating from the 13th century, has been so transformed in the last century (1874-1886) as to show no trace of its antiquity. The palaces of the grand-duke and the old town-hall are Renaissance buildings of the 17 th and 1 8th centuries. Among the other prominent buildings — all modern — are the palace of the heir apparent, the new town- hall, the theatre, the law-courts, the gymnasium, the com- mercial school, the three hospitals and the new Roman Catholic church. The grand-ducal picture gallery in the Augusteum includes works by Veronese, Velasquez, Murillo and Rubens, and there are collections of modern paintings and sculptures in the two palaces. The public library contains 110,000 volumes and the duke's private library 55,000. There is also a large natural history museum and a museum with a collection of antiquities. The industries of Oldenburg, which are of no great importance, include iron-founding, spinning and the making of glass, tobacco, gloves, soap and leather. A consider- able trade is carried on in grain, and the horse fairs are largely frequented. According to popular tradition Oldenburg was founded by Walbert, grandson of the Saxon hero, Widukind, and was named after his wife Altbufga, but the first historical mention of it occurs in a document of 1108. It was fortified in 1155, and received a municipal charter in 1345. The sub- sequent history of the town is merged in that of the grand- duchy.

See Sello, Historische Wanderung durch die Stadt Oldenburg (Oldenburg, 1896) ; and Alt-Oldenburg (Oldenburg, 1903) ; and Kohl, Die Allmende der Stadt Oldenburg (Oldenburg, 1903).

OLDFIELD, ANNE (1683-1730), English actress, was born in London, the daughter of a soldier. She worked for a time as apprentice to a semptress, until she attracted George Farquhar's attention by reciting some lines from a play in his hearing. She thereupon obtained an engagement at Drury Lane, where her beauty rather than her ability slowly brought her into favour, and it was not until ten years later that she was generally acknowledged as the best actress of her time. In polite comedy, especially, she was unrivalled, and even the usually grudging Cibber acknowledged that she had as much as he to do with the success of the Careless Husband (1704), in which she created the part of Lady Modish, reluctantly given her because Mrs Verbruggen was ill. In tragedy, too, she won laurels, and the list of her parts, many of them original, is a long and varied one. She was the theatrical idol of her day. Her exquisite acting and lady-like carriage were the delight of her contemporaries, and her beauty and generosity found innumerable eulogists, as well as sneering detractors. Alexander Pope, in his Sober Advice from Horace, wrote of her —

" Engaging Oldfield, who, with grace and ease, . Could join the arts to ruin and to please."

It was to her that the satirist alluded as the lady who detested

being buried in woollen, who said to her maid —

" No, let a charming chintz and Brussels lace Wrap my cold limbs and shade my lifeless face ; One would not, sure, be frightful when one's dead, And— Betty — give this cheek a little red."

She was but forty-seven when she died on the 23rd of October 1 730, leaving all the court and half the town in tears.

She divided her property, for that time a large one, between her natural sons, the first by Arthur Mainwaring (1668-1712) — who had left her and his son half his fortune on his death — and the second by Lieut. General Charles Churchill (d. 1745). Mrs Oldfield was buried in Westminster Abbey, beneath the monument to Congreve, but when Churchill applied for per mission to erect a monument there to her memory the dean of Westminster refused it.

OLD FORGE, a borough of Lackawanna county, Pennsylvania, U.S.A., on the Lackawanna river, about 6 m. S.W. of Scranton. Pop. (1900)

5630 (2494 foreign-born, principally Italians); (1910) 11,324. It is served by the Delaware, Lackawanna & Western and the Lehigh Valley railways. The principal public buildings are the town-hall and the high school. The borough is situated in the anthracite coal region, and the mining of coal is the principal industry, though there are also various manufactures.

Old Forge was settled in 1830 and incorporated as a borough in 1899.

OLDHAM, JOHN (1653-1683), English satirist, son of a Presbyterian minister, was born at Shipton Moyne, near Tetbury, Gloucestershire, on the 9th of August 1653. He graduated from St Edmund Hall, Oxford, in 1674, and was for three years an usher in a school at Croydon. Some of his verses attracted the attention of the town, and the earl of Rochester, with Sir Charles Sedley and other wits, came down to see him. The visit did not affect his career apparently, for he stayed at Croy- don until 1 68 1, when he became tutor to the grandsons of Sir Edward Thurland, near Reigate. Meanwhile he had tried, he says, to conquer his inclination for the unprofitable trade of poetry, but in the panic caused by the revelations of Titus Oates, he found an opportunity for the exercise of his gift for rough satire. Garnet's Ghost was published as a broadside in 1679, but the other Satires on the Jesuits, although written at the same time, were not printed until i68r. The success of these dramatic and unsparing invectives apparently gave Oldham hope that he might become independent of teaching. But his undoubted services to the Country Party brought no reward from its leaders. He became tutor to the son of Sir William Hickes, and was eventually glad to accept the patronage of William Pierrepont, earl of Kingston, whose kindly offer of a chaplaincy he had refused earlier. He died at Holme-Pierre- point, near Nottingham, on the 9th of December 1683, of smallpox.

Oldham took Juvenal for his model, and in breadth of treat- ment and power of invective surpassed his English predecessors. He was original in the dramatic setting provided for his satires. Thomas Garnet, who suffered for supposed implication in the Gunpowder Plot, rose from the dead to encourage the Jesuits in the first satire, and in the third Ignatius Loyola is represented as dictating his wishes to his disciples from his death-bed. Old- ham wrote other satires, notably one " addressed to a friend about to leave the university," which contains a well-known description of the state of slavery of the private chaplain, and another " dissuading from poetry," describing the ingratitude shown to Edmund Spenser, whose ghost is the speaker, to Samuel Butler and to Abraham Cowley. Oldham's verse is rugged, and his rhymes often defective, but he met with a generous appreciation from

Dryden, whose own satiric bent was perhaps influenced by his efforts. He says (" To the Memory of Mr Oldham," Works, ed. Scott, vol. xi. p. 99) : —

" For sure our souls were near allied, and thine Cast in the same poetic mould with mine."

The real wit and rigour of Oldham's satirical poetry are un- deniable, while its faults — its frenzied extravagance and lack of metrical polish — might, as Dryden suggests, have been cured with time, for Oldham was only thirty when he died.

The best edition of his works is The Compositions in Prose and Verse of Mr John Oldham . . . (1770), with memoir and explanatory notes by Edward Thompson.

OLDHAM, THOMAS (1816-1878) British geologist, was born in Dublin on the 4th of May 1816. He was educated there at Trinity College, graduating B.A. in 1836, and afterwards studied engineering in Edinburgh, where he gained a good knowledge of geology and mineralogy under Jameson. On his return to Ireland in 1839 he became chief assistant to Captain (afterwards Major General) Portlock, who conducted the geological depart- ment of the Ordnance Survey, and he rendered much help in the field and office in the preparation of the Report on the Geology of Londonderry, &°c. (1843). Subsequently he served under Captain (afterwards Sir Henry) James, the first local director of the Geological Survey of Ireland, whom he succeeded in 1846. Meanwhile in 1845 he was appointed professor of Geology in the university of Dublin. In 1848 he was elected F.R.S. In 1849 he discovered in the Cambrian rocks of Bray Head the problematical fossil named Oldhamia. In 1850 he was selected to take charge of the Geological Survey of India, which he organized, and in due course he established the Memoirs, the Palaeontologia Indica and the Records, to which he contributed

many important articles. In 1864 he published an elaborate report On the Coal Resources of India. He retired in 1876, and died at Rugby on the 17th of July 1878.

OLDHAM, a municipal county and parliamentary borough of Lancashire, England, 7 m. N.E. of Manchester, on the London & North-Western, Great Central and Lancashire & Yorkshire railways and the

Oldham canal. Pop. (1891) 131.463; (1901) 137,246. The principal railway station is called Mumps, but there are several others. The town lies high, near the source of the small river Medlock. Its growth as a manufacturing centre gives it a wholly modern appearance. Among several handsome churches the oldest dates only from the later 18th century. The principal buildings and institutions include the town-hall, with tetrastyle portico copied from the Ionic temple of Ceres near Athens, the reference library, art gallery and museum, the Union Street baths, commemorating Sir Robert Peel the statesman, and the county court. Of educational establishments the chief are the Lyceum, a building in Italian style, containing schools of art and science, and including an observatory; the largely-endowed blue-coat school founded in 1808 by Thomas Henshaw, a wealthy manufacturer of hats; the Hulme grammar school (1895), and municipal technical schools. The Alexandra Park, opened in 1865, was laid out by operatives who were thrown out of employment owing to the cotton famine in the years previous to that date. The site is picturesquely undulating and terraced. Oldham is one of the most important centres of the cotton manufactures, the consumption of cotton being about one-fifth of the total importation into the United Kingdom, the factories numbering some 230, and the spindles over 13 millions, while some 35,000 operatives are employed. The principal manufactures are fustians, velvets, cords, shirtings, sheetings and nankeens. There are also large foundries and mill and cotton machinery works; and works for the construction of gas-meters and sewing-machines; while all these industries are assisted by the immediate presence of collieries. There are extensive markets and numerous fairs are held. Oldham was incorporated in 1849, and became a county borough in 1888. The corporation consists of a mayor, 12 aldermen and 36 councillors. The parliamentary borough has returned two members since 1832. Area of municipal borough, 4736 acres.

A Roman road, of which some traces are still left, passes through the site of the township, but it does not appear to have been a Roman station. It is not mentioned in Domesday; but in the reign of Henry III. Alwardus de Aldholme is referred to as holding land in Vernet (Werneth). A daughter and co-heiress of this Alwardus conveyed Werneth Hall and its manor to the Cudworths, a branch of the Yorkshire family, with whom it remained till the early part of the 18th century. From the Oldhams was descended Hugh Oldham, who died bishop of Exeter in 1519. From entries in the church registers it would appear that linens were manufactured in Oldham as early as 1630. Watermills were introduced in 1770, and with the adoption of

Arkwright's inventions the cotton industry grew with great rapidity.

OLD MAID, a game of cards. Any number may play, and the full pack is used, the Queen of Hearts being removed. The cards are dealt out one by one until exhausted, and each player then sorts his hand and discards the pairs. The dealer then offers his hand, spread out face downwards to the next player, who draws a card, which, if it completes a pair, is discarded, but otherwise remains in the hand. The process continues from player to player, until all the cards have been paired and dis- carded excepting the odd queen, the holder of which is the " Old Maid."

OLDMIXON, JOHN (1673-1742), English historian, was a son of John Oldmixon of Oldmixon, near Bridgwater. His first writings were poems and dramas, among them being Amores Britannici; Epistles historical and gallant (1703); and a tragedy, The Governor of Cyprus. His earliest historical work was The British Empire in America (1708 and again 1741), which was followed by The Secret History of Europe (1712-1715); by Arcana Gallica, or the Secret History of France for the last Century

(1714); and by other smaller writings. More important, how- ever, although of a very partisan character, are Oldmixon's works on English history. His Critical history of England (1724- 1726) contains attacks on Clarendon and a defence of Bishop Burnet, and its publication led to a controversy' between Dr Zachary Grey (1 688-1 766) and the author, who replied to Grey in his Clarendon and W hillock compared (1727). On the same lines he wrote his History of England during the Reigns of the Royal House of Stuart (1730). Herein he charged Bishop Atterbury and other of Clarendon's editors with tampering with the text of the History. From his exile Atterbury replied to this charge in a Vindication, and although Oldmixon continued the controversy it is practically certain that he was in the wrong. He completed a continuous history of England by writing the History of England during the Reigns of William and. Mary, Anne and George I. (1735) ; and the History of England during the Reigns of Henry VIII., Edward VI., Mary and Elizabeth (1739). Among his other writings are, Memoirs of North Britain (1715), Essay on Criticism (1728) and Memoirs of the Press 1710-1740 (1742), which was only published after his death. Oldmixon had much to do with editing two periodicals, The Muses Mercury and The Medley, and he often complained that his services were overlooked by the government. He died on the 9th of July 1742.

OLD POINT COMFORT, a summer and winter resort, in Elizabeth City

county, Virginia, U.S.A., at the southern end of a narrow, sandy peninsula projecting into Hampton Roads (at the mouth of the James river), about 12 m. N. by W. of Norfolk. It is served directly by the Chesapeake & Ohio railway, and indirectly by the New York, Philadelphia & Norfolk (Penn- sylvania System), passengers and freight being carried by steamer from the terminus at Cape Charles; by steamboat lines connecting with the principal cities along the Atlantic coast, and with cities along the James river; by ferry, connecting with Norfolk and Portsmouth; and by electric railway (3 m.) to Hampton and (1 2 m.) to Newport News. There is a U.S. garrison at Fort Monroe, one of the most important fortifications on the Atlantic coast of the United States. Old Point Comfort is included in the reservation of Fort Monroe. The fort lies within the tract of 252 acres ceded, for coast defence purposes, to the Federal government by the state of Virginia in 182 1, the survey for the original fortifications having been made in 1818, and the building begun in 1819. It was named in honour of President Monroe and was first regularly garrisoned in 1823; in 1824 the Artillery School of Practice (now called the United States Coast Artillery School) was established to provide commissioned officers of the Coast Artillery with instruction in professional work and to give technical instruction to the non-commissioned staff. During the Civil War the fort was the rendezvous for several military expeditions, notably those of General Benjamin F. Butler to Hatteras Inlet, in 1861; of General A. E. Burnside, to North Carolina, in 1862; and of General A. H. Terry, against Fort Fisher, in 1865; within sight of its parapets was fought the famous duel between the ” Monitor ” and the ” Merrimac ” (March 9, 1862). Jefferson Davis was a prisoner here for two years, from the 22nd of May 1865, and Clement Claiborne Clay (1819-1882), a prominent Confederate, from the same date until April 1866. Between Fort Monroe and Sewell’s Point is Fort Wool, almost covering a small island called Rip Raps. The expedition which settled Jamestown rounded this peninsula (April 26, 1607), opened its sealed instructions here, and named the peninsula Poynt Comfort, in recognition of the sheltered harbour. (The ” Old ” was added subsequently to distinguish it from a Point Comfort settlement at the mouth of the York river on Chesapeake Bay). On the site of the present fortifica- tion a fort was erected by the whites as early as 1630.

OLD TOWN, a city of Penobscot county, Maine, U.S.A., on the Penobscot river, about 12 m. N.E. of Bangor. Pop. (1890) 5312; (1900) 5763 (1247 foreign-born); (1910) 6317. It is served by the Maine Central and the Bangor & Aroostook railways, and by an electric line connecting with Bangor. The city proper is on an island

(Marsh, or Old Town Island), but considerable territory on the W. bank of the river is included

within the municipal limits. The manufacture of lumber is the principal industry of the city. On Indian Island (opposite the city) is the principal settlement of the Penobscot Indians, an Abnaki tribe, now wards of the state. The abbe Louis Pierre Thury was sent here from Quebec about 1687 and built a church in 1688-1689; in 1705 the mission passed under the control of the Jesuits. The first white settler in the vicinity seems to have been John Marsh, who came about 1774, and who bought the island now known as Marsh Island. From 1806 to 1840, when it was incorporated as a separate township, Old Town was a part of Orono. In 1891 it was chartered as a city. One of the oldest railways in the United States, and the first in Maine, was completed to Old Town from Bangor in 1836.

OLDYS, WILLIAM (1696-1761), English antiquary and biblio- grapher, natural son of Dr William Oldys, chancellor of Lincoln, was born on the 14th of July 1696, probably in London. His father had also held the office of advocate of the admiralty, but lost it in 1693 because he would not prosecute as traitors and pirates the sailors who had served against England under James II. William Oldys, the younger, lost part of his small patrimony in the South Sea Bubble, and in 1724 went to York- shire, spending the greater part of the next six years as the guest of the earl of Malton. On his return to London he found that his landlord had disposed of the books and papers left in his charge. Among these was an annotated copy of Gerard Langbaine's Dramatick Poets. The book came into the hands of Thomas Cox'eter (1689-1747), and subsequently into Theophilus Cibber's possession, and furnished the basis of the Lives of the Poets (1753) published with Cibber's name on the title page, though most of it was written by Robert Shiels. In 1731 Oldys sold his collections to Edward Harley, second earl of Oxford, who appointed him his literary secretary in 1738. Three years later his patron died, and from that time he worked for the booksellers. His habits were irregular, and in 1751 his debts drove him to the Fleet prison. After two years' imprisonment he was released through the kindness of friends who paid his debts, and in April 1755 he was appointed Norroy king-at-arms by the duke of Norfolk. He died on the 15th of April 1761.

Oldys's chief works are: The British Librarian, a review of scarce and

valuable books in print and in manuscript (1737-1738) ; the Harleian Miscellany (1744-1746), a collection of tracts and pamphlets in the earl of Oxford's library, undertaken in conjunction with Dr Johnson; twenty-two articles contributed to the Biographia Britannica (1747-1760) ; an edition of Raleigh's History of the World, with a Life of the author (1736) ; Life of Charles Cotton prefixed to Sir John Hawkins's edition (1760) of the Compleat Angler. In 1727 Oldys began to annotate another Langbaine to replace the one he had lost. This valuable book, with a MS. collection of notes by Oldys on various bibliographical subjects, is preserved in the British Museum.

OLEAN, a city of Cattaraugus county, in south-western New York, U.S.A., on Olean Creek and the N. side of the Allegheny river, 70 m. S.E. of Buffalo. Pop. (1880), 3036; (1890), 7358; (1900), 9462, of whom 1514 were foreign-born and 122 were negroes; (1910 census), 14,743. The city is served by the Erie, the Pittsburg, Shawmut & Northern, and the Pennsylvania railways (the last has large car shops here); and is connected with Bradford, Pa., Allegany, Pa., Salamanca, N.Y., Little Valley, N.Y., and Bolivar, N.Y., by electric lines. Olean is situated in a level valley 1440 ft. above sea-level. The sur- rounding country is rich in oil and natural gas. Six miles from Olean and 2000 ft. above the sea-level is Rock City, a group of immense, strangely regular, conglomerate rocks (some of them pure white) covering about 40 acres. They are remnants of a bed of Upper Devonian Conglomerate, which broke along the joint planes, leaving a group of huge blocks. In the city are a public library, a general hospital and a state armoury; and at Allegany (pop. 1910, 1286), about 3 m. W. of Olean, is St Bonaventure's College (1859; Roman Catholic). Olean's factory product was valued at $4,677,477 in 1905; the city is the terminus of an Ohio pipe line, and of a sea-board pipe line for petroleum; and among its industries are oil-refining and the refining of wood alcohol, tanning, currying, and finishing leather; and the manufacture of flour, glass (mostly bottles),

lumber, &c. The vicinity was settled in 1804, and this was the first township organized (1808), being then coextensive with the county. Olean Creek was called Ischue (or Ischua); then Olean was suggested, possibly in reference to the oil-springs in the vicinity. The village was officially called Hamilton for a time, but Olean was the name given to the post-office in 1817, and Olean Point was the popular local name. In 1909 several suburbs, including the .village of North Olean (pop. in 1905, 1 761), were annexed to Olean, considerably increasing its area and population.

See History of Cattaraugus County, New York (Philadelphia, 1879).

OLEANDER, the common name for the shrub known to botanists as Nerium Oleander. It is a native of the Mediterranean and Levant, and is characterized by its tall shrubby habit and its thick lance-shaped opposite leaves, which exude a milky juice when punctured. The flowers are borne in terminal clusters, and are like those of the common periwinkle (Vinca), but are of a rose colour, rarely white, and the throat or upper edge of the tube of the corolla is occupied by outgrowths in the form of lobed and fringed petal-like scales. The hairy anthers adhere to the thickened stigma. The fruit or seed-vessel consists of two long pods, which, bursting along one edge, liberate a number of seeds, each of which has a tuft of silky hairs like thistle down at the upper end. The genus belongs to the natural order Apocynaceae, a family that, as is usual where the juice has a milky appearance, is marked by its poisonous pro- perties. Cases are re- corded by Lindley of children poisoned by the flowers. The same author also narrates how in the courseof thePenin- sular War some French soldiers died in conse- quence of employing „ . _. , , j / Nerium Oleander. skewers made from

freshly-cut twigs of oleander for roasting their meat. The oleander was known to the Greeks under three names, viz. rhododendron, nerion and rhododaphne, and is well described by Pliny (xvi. 20), who mentions its rose-like flowers and poisonous qualities, at the same time stating that it was considered serviceable as a remedy against snake-bite. The name is supposed to be a corruption of lorandrum, lauridendrum (Du Cange), influenced by olea, the olive-tree, lorandrum being itself a corruption of rhododendron. The modern Greeks still know the plant as ˆoSo5d<ˆwj, although in a figure in the Rinuccini MSS. of Dioscorides a plant is represented under this name, which, however, had rather the appearance of a willow herb (Epilobium). The oleander has long been cultivated in green- houses in England, being, as Gerard says, ” a small shrub of a gallant shewe “; numerous varieties, differing in the colour of their flowers, which are often double, have been introduced.

OLEASTER, known botanically as Elaeagnus hortensis, a handsome deciduous tree, 15 to 20 ft. high, growing in the Mediterranean region and temperate Asia, where it is commonly cultivated for its edible fruit. The brown smooth branches are more or less spiny; the narrow leaves have a hoary look from the presence of a dense covering of star-shaped hairs; the small fragrant yellow flowers, which are borne in the axils of the leaves, are scaly on the outside. The genus contains other species of ornamental deciduous or evergreen shrubs or small trees. E. argentea, a native of North America, has leaves and fruit covered with shining silvery scales. In E. glabra, from Japan, the

evergreen leaves are clothed beneath with rust- coloured scales; variegated forms of this are cultivated, as also of E. pungens, another Japanese species, a spiny shrub with leaves silvery beneath.

OLEFINE, in organic chemistry, the generic name given to open chain hydrocarbons having only singly and doubly linked pairs of carbon atoms. The word is derived from the French olefiant (from oUfier, to make oil), which was the name given to ethylene, the first member of the series, by the Dutch chemists, J. R. Deiman, Paets van Troostwyk, N. Bondt and A. Lauweren- burgh in 1795. The simple olefines containing one doubly- linked pair of carbon atoms have the general formula (C„H 2 „; the di-olefines, containing two doubly-linked pairs, have the general formula C n H 2n 2 and are consequently isomeric with the simple acetylenes. Tri, tetra- and more complicated members are also known. The name of any particular member of the series is derived from that of the corresponding member of the paraffin series by removing the final syllable ” ane,” and replac ing it by the syllable ” ylene.” Isomerism in the define series does not appear until the third member of the series is reached.

The higher olefines are found in the tar which is obtained by distilling bituminous shales, in illuminating gas, and among the products formed by distilling paraffin under pressure (T. E. Thorpe and J. Young, Ann., 1873, 165, p. 1). The olefines may be synthetically prepared by eliminating water from the alcohols of the general formula C n H 2 n+i OH, using sulphuric acid or zinc chloride generally as the dehydrating agent, although phosphorus pentoxide, syrupy phosphoric acid and anhydrous oxalic acid may frequently be substituted. In this method of preparation it is found that the secondary alcohols decompose more readily that the primary alcohols of the series, and when sulphuric acid is used, two phases are present in the reaction, the first being the building up of an intermediate sulphuric acid ester, which then decomposes into sulphuric acid and hydro carbon: C2H50H->C2H5-HS04-ˆC 2 H4-|-H 2 S04. As an alter- native to the above method, V. Ipatiew (Ber., 1901, 34, p. 596 et seq.) has shown that the alcohols break up into ethylenes and water when their vapour is passed through a heated tube containing some ” contact ” substance, such as graphite, kiesel- guhr, &c. (see also J. B. Senderens, Comptes rendus, 1907, 144, pp. 382, 1 109).

They may also be prepared by eliminating the halogen hydride from

the alkyl halides by heating with alcoholic potash, or with litharge at 220° C. (A. Eltekow, Ber., 1878, 11, p. 414); by the action of metals on the halogen compounds C„H 2 ,,Br 2 ; by boiling the aqueous solution of nitrites of the primary amines (V. Meyer, Ber., 1876, 9, p. 543), C 3 H7NH 2 +HN0 2 = N 2 +2H 2 0+C 3 H 6 ; by the electrolysis of the alkali salts of saturated dicarboxylic acids; by the decomposition of /3-haloid fatty acids with sodium carbonate, CH 3 CHBr-CH(CH 3)-C0 2 H =C0 2 +HBr+CH 3 CH :CH-CH 3 ; by dis- tilling the barium salts of acids CiH2n_ 2 2 with sodium methylate in vacuo (I. Mai, Ber., 1889, 22, p. 2135); from the higher alcohols by converting them into esters which are then distilled (F. Krafft, Ber., 1883, 16, p. 3018) : Ci6H 3 3-CH 2 -CH 2 -OHˆCi6H 33 CH 2 -CH 2 -0-CO-R-ˆ

C 16 H 33 CH : CH 2 +R-COOH ; from tertiary alcohols .by the action of acetic anhydride in the presence of a small quantity of sulphuric acid (L. Henry, Comptes rendus, 1907, 144, p. 552) : (CH 3) 2 -C(OH)-CH(CH 3) 2 -> (CH 3) 2 C:C(CH 3) 2 +CH 2 :C(CH 3)-CH

(CH 3) 2 ; from unsaturated alcohols by the action of metal-ammonium com- pounds (E. Chablay, Comptes rendus, 1906, 143, p. 123): 2CH 2 :CH-CH 2 OH+2NH 3 -Na = CH 2 :CH-CH 3 +CH 2 :CH-CH 2 ONa

+NaOH+2NH 3 ; from the lower members of the series by heating them with alkyl halides in the presence of lead oxide or lime: C5Hio +2CH 3 I =2HI + C7H14; and by the action of the zinc alkyls upon the halogen substituted olefines.

A. Mailhe (Chem. Zeit., 1906, 30, p. 37) has shown that on passing the monohalogen derivatives of the paraffins through a glass tube containing reduced nickel, copper or cobalt at 250° C, olefines are produced, together with the halogen acids, and recombination is prevented by passing the gases through a solution of potash. The reaction probably proceeds thus: MCl 2 -j-C»H 2 » + iCl— >HCH” Cl-M-C n H 2 „Cl->MCl 2 +C„H 2n , since the haloid derivatives of the monovalent metals do not act similarly. The anhydrous chlorides of nickel, cobalt, cadmium, barium, iron and lead act in the same way as catalysts at about 300° C, and the bromides of lead, cadmium, nickel and barium at about 320° C.

In their physical properties, the olefines resemble the normal paraffins, the lower members of the series being inflammable gases, the members from C5 to Cu liquids insoluble in water,

and from C16 upwards of solids. The chief normal members of the

series are shown in the table.

Name.

Formula.

Melting- point. C.

Boiling-point. C.

Ethylene

CH 2 :CH 2

-169°

-102-7° (757 mm.)

Propylene .

CH 3 CH:CH 2

-50-2° (749 mm.)

Butylene

C 2 H 5 -CH:CH 2

-5°

Amylene

C 3 H r CH:CH 2

39° — 40°

Hexylene

C 4 H 9 CH:CH 2

68°— 70°

Heptylene .

CbHjiCH :CH2

95°

Octylene

CeHisCH :CH2

I22°— 123°

Decylene

CsHnCHiCHJ C 9 Hi„CH:CH 2]

172°

Undecylene .

84° (18 mm.)

Duodecylene .

CioH 2 iCH :CH 2

-31°

96° (15 mm.)

In chemical properties, however, they differ very markedly from the paraffins. As unsaturated compounds they can combine with two monovalent atoms. Hydrogen is absorbed readily at ordinary temperature in the presence of platinum black, and paraffins are formed; the halogens (chlorine and bromine) combine directly with them, giving dihalogen substituted com- pounds; the halogen halides to form monohalogen derivatives (hydriodic acid reacts most readily, hydrochloric acid, least); and it is to be noted that the haloid acids attach themselves in such a manner that the halogen atom unites itself to the carbon atom which is in combination with the fewest hydrogen atoms (W. Markownikow, Ann., 1870, 153, p. 256)1.

They combine with hypochlorous acid to form chlorhydrins ; and are easily soluble in concentrated sulphuric acid, giving rise to sulphuric acid esters; consequently if the solution be boiled with water, the alcohol from which the olefine was in the first place derived is regenerated. The oxides of nitrogen convert them into nitrosites and nitrosates (O. Wallach, Ann., 1887, 241, p. 288, &c; J. Schmidt, Ber., 1902, 35, pp. 2323 et seq.). They also combine with nitrosyl bromide and chloride, and with many metallic haloid salts (platinum bichloride, iridium chloride), with mercury salts (see K. A. Hofmann and J. Sand, Ber., 1900, 33, pp. 1340 et seq.), and those with a

tertiary carbon atom yield double salts with zinc chloride. Dilute potassium permanganate oxidizes the olefines to glycols (G. Wagner, Ber., 1888, 21, p. 3359). With ozone they form ozonides (C. Harries, Ber., 1904, 37, p. 839). The higher members of the series readily polymerize in the presence of dilute sulphuric acid, zinc chloride, &c.

For the first member of the series see Ethylene.

Propylene, C_3H_6, may be obtained by passing the vapour of trimethylene through a heated tube (S. M. Tanatar, Ber., 1899, 32, pp. 702, 1965). It is a colourless gas which may be liquefied by a pressure of 7 to 8 atmospheres. Butylene, CiHg, exists in three isomeric forms : normal butylene, G_2H_6 -CH :CH_2 ; pseudo-butylene, CH_3 -CH :CH-CH_3 ; and isobutylene, $(CH_3)_2C : CH_2$. Normal butylene is a readily condensible gas. Two spatial modifications of pseudo-butylene, CH_3 -CH:CH-CH_3 , are known, the cis and the trans; they are prepared by heating the sodium salts of hydro-iodo-tiglic and hydro-iodo-angelic acids respectively (J. Wislicenus, Ann., 1900, 313, p. 228). Isobutylene, $(CH_3)_2C : CH_2$, is formed in the dry distillation of fats, and also occurs among the products obtained when the vapour of fusel oil is led through a heated tube. It is a gas at ordinary temperature, and may be liquefied, the liquid boiling at -5° C. It combines with acetyl chloride in the presence of zinc chloride to form a ketone, which on warming breaks down into hydrochloric acid and mesityl oxide (I. L. Kondakow, Jour. Russ. phys. chem. Soc. 26, p. 12). It polymerizes, giving isodibutylene, CjHie, and isotributylene, Ci_2H_{24} , liquids which boil at 110-113° and 178-181° C. Amylene, C5H10, exists in five isomeric forms, viz. (n) propylethvlene, CH_3 -CH_2 -CH_2 -CH: CH_2 ; isopropylethylene, $(CH_3)_2CH \cdot CH : CH_2$; symmetrical methyl-ethy 1-ethylene, $CH_3 – CH : CH \cdot C_2H_6$; unsymmetrical methyl-ethyl-ethylene, $(CH_3)(C_2H_6)C:CH_2$; and trimethyl ethylene, $(CH_3)_2C: CH(CH_3)$. The highest members of the series as yet known are cerotene, $C_{26}He_2$, which is obtained by the distillation of Chinese wax and is a paraffin- like solid which melts at 57° C, and melene, C_3oH_6o(?), which is obtained by the distillation of bees'-wax. It melts at 62° C. (B. J. Brodie, Ann., 1848, 67, p. 210; 1849, 71, p. 156).

OLEG (?~9i2), prince of Kiev, succeeded Rurik, as being the eldest member of the ducal family, in the principality of Great Novgorod, the first Russian metropolis. Three years later he moved southwards and, after taking Smolensk and other places, fixed his residence at Kiev, which he made his capital. He then proceeded to build a fortress there and gradually compelled the surrounding tribes to pay him tribute, extending his conquests in all directions (883-903) at the expense of

the Khazars, who hitherto had held all southern Russia to tribute. In 907,

with a host made up of all the subject tribes, Slavonic and Finnic, he sailed against the Greeks in a fleet consisting, according to the lyetopis, of 2000 vessels, each of which held 40 men; but this estimate is plainly an exaggeration. On reaching Constantinople, Oleg disembarked his forces, mercilessly ravaged the suburbs of the imperial city, and compelled the emperor to pay tribute, provide the Russians with provisions for the return journey, and take fifty of them over the city. A formal treaty was then concluded, which the Slavonians swore to observe in the names of their gods Perun and Volos. Oleg returned to Iliev laden with golden ornaments, costly cloths, wines, and all manner of precious things. In 911 he sent an embassy of fourteen persons to Constantinople to get the former treaty confirmed and enlarged. The names of these ambassadors are preserved and they point to the Scandinavian origin of Oleg's host; there is not a Slavonic name among them. A new and elaborate treaty, the terms of which have come down to us, was now concluded between the Russians and Greeks, a treaty which evidently sought to bind the two nations closely together and obviate all possible differences which might arise between them in the future. There was also to be free trade between the two nations, and the Russians might enter the service of the Greek emperor if they desired it. The envoys returned to Kiev in 912 after being shown the splendours of the Greek capital and being instructed in the rudiments of the Greek faith. In the autumn of the same year Oleg died and was buried at Kiev.

See S. M. Solovev, History of Russia (Rus.), vol. i. (St Petersburg, 1895, &c.) ; M. F. Vladimirsky-Budctnov, Chrestomathy of the History of Russian Law (Rus.), pt. i. (Kiev, 1889). (R. N. B.)

OLEIC ACID, CjsHmO* or C 8 H I7 CH:CH [CH 2] 7 • C0 2 H, an organic acid occurring as a glyceride, triolein, in nearly all fats, and in many oils — olive, almond, cod-liver, &c. (see Oils). It appears as a by-product in the manufacture of candles. To prepare it olive oil is saponified with potash, and lead acetate added; the lead salts are separated, dried, and extracted with ether, which dissolves the lead oleate; the solution is then treated with hydrochloric acid, the lead chloride filtered off, the liquid concentrated, and finally distilled under diminished pressure. Oleic acid is a colourless, odourless solid,

melting at 14 and boiling at 223° (10 mm.). On exposure it turns yellow, becoming rancid. Nitric acid oxidizes it to all the fatty acids from acetic to capric. Nitrous acid gives the isomeric elaidic acid, C 8 H 17 CH:CH(CH 2] 7 -C0 2 H, which is crystalline and melts at 51 . Hydriodic acid reduces both oleic and elaidic acids to stearic acid.

Erucic acid, C s HirCH:CH-[CH 2]irC0 2 H, and the isomeric brassidic acid, belong to the oleic acid series. They occur as gly- cerides in rape-seed oil, in the fatty oil of mustard, and in the oil of grape seeds. Linoleic acid, Ci s H 32 2 , found as glyceride in drying oils, and ricinoleic acid, Ci 8 H 33 (OH)0 2 , found as glyceride in castor oil, closely resemble oleic acid.

OLEN, a semi-legendary Greek bard and seer, and writer of hymns. He is said to have been the first priest of Apollo, his connexion with whom is indicated by his traditional birthplace — Lycia or the land of the Hyperboreans, favourite haunts of the god. The Delphian poetess Boeo attributed to him theintroduc- ion of the cult of Apollo and the invention of the epic metre. Many hymns, nomes (simple songs to accompany the circular dance of the chorus), and oracles, attributed to Olen, were pre- served in Delos. In his hymns he celebrated Opis and Arge, two Hyperborean maidens who founded the cult of Apollo in Delos, and in the hymn to Eilythyia the birth of Apollo and Artemis and the foundation of the Delian sanctuary. His reputed Lycian origin corroborates the view that the cult of Apollo was an importation from Asia to Greece. His poetry generally was of the kind called hieratic.

See Callimachus, Hymn to Delos, 305; Pausanias i. 18; ii. 13; v. 7 ; ix. 27 ; x. 5 ; Herodotus iv. 35.

OLERON, an island lying off the west coast of France, opposite the mouths of the Charente and Seudre, and included in the department of Charente-Inferieure. In 1906 the population numbered 16,747. In area (66 sq. m.) it ranks next to Corsica among French islands. It is about 18 m. in length from N.W.

to S.E., and 7 in extreme breadth; the width of the. strait (Pertuis de Maumusson) separating it from the mainland is at one point less than a mile. The island is flat and low-lying and fringed by dunes on the coast. The greater part is very fertile, but there are also some extensive salt marshes, and oyster culture and fishing are carried on. The chief products are corn, wine, fruit and vegetables. The inhabitants are mostly Protestants and make excellent sailors. The chief places are St Pierre (pop. 1582 in 1906), Le Chateau d'Oleron (1546), and the watering-place of St Trojan-les-Bains.

Oleron, the Uliarus Insula of Pliny, formed part of the duchy of Aquitaine, and finally came into the possession of the French crown in 1370. It gave its name to a medieval code of maritime laws promulgated by Eleanor of Guienne.

OLFACTORY SYSTEM, in anatomy. The olfactory system consists of the outer nose, which projects from the face, and the nasal cavities, contained in the skull, which support the olfactory mucous membrane for the perception of smell in their upper parts, and act as respiratory passages below.

The bony framework of the nose is part of the skull (q.v.), but the outer nose is only supported by bone above; lower down its shape is kept by an ” upper ” and ” lower lateral cartilage ” and two or three smaller plates known as ” cartilagines minores.”

Nasal bone.

Nasal process of superior maxilla’

From R. Howden, in Cunningham’s Text-Book of Anatomy. FlG. 1. — Profile View of the Bony and Cartilaginous Skeleton of the Nose.

The expanded lower part of the side of the outer nose is known as the ” ala ” and is only formed of skin, both externally and internally, with fibro-fatty tissue between the layers. The inner nose or nasal cavities are separated by a septum, which is seldom quite median and is covered in its lower two-thirds by thick, highly vascular mucous membrane composed of columnar ciliated epithelium with masses of acinous glands (see Epithelial Tissues) embedded in it, while in its upper part it is covered by the less vascular but more specialized olfactory membrane. Near the front of the lower part of the septum a slight opening into a short blind tube, which runs upward and backward, may sometimes be found; this is the vestigial remnant of ” Jacobson’s organ,” which will be noticed later. The supporting framework of the septum is made up of ethmoid above, vomer below, and the ” septal cartilage ” in front. The outer wall of each nasal cavity is divided into three meatus by the overhanging turbinated

bones (see fig. 2). Above the superior turbinated is a space between it and the roof known as the ” recessus spheno-ethmoi- dalis,” into the back of which the ” sphenoidal air sinus ” opens. Between the superior

and middle turbinated bones is the ” superior meatus,” containing the openings of the ” posterior ethmoidal air cells,” while between the middle and inferior turbinateds is the “middle meatus,” which is the largest of the three and contains a rounded elevation known as the ” bulla ethmoidalis.” Above and behind this is often an opening for the ” middle ethmoidal cells,” while below and in front a deep sickle-shaped gutter runs, the ” hiatus semilunaris,” which communicates above with the ” frontal air sinus ” and below with the opening into the ” antrum of Highmore ” or ” maxillary antrum.” So deep is this hiatus semilunaris that if, in the dead subject, water is poured into the frontal sinus it all passes into, the

Frontal air-sinus. Bristle passed

Opening of middle ethmoidal cells

Openings of posterior ethmoidal cells Recessus spheno-ethmoidalis

Sphenoidal air-sinus

From R. Howden, in Cunningham’s Text-Book of Anatomy.

Fig. 2. — View of the Outer Wall of the Nose — the Turbinated Bones having been removed.

6. Opening of anterior ethmoidal cells.

7. Cut edge of superior turbinated bone. Cut edge of middle turbinated bone.

Vestibule.

Opening of antrum of Highmore.

Hiatus semilunaris.

Bulla ethmoidalis.

Agger nasi.

9. Pharyngeal orifice of Eustachian tube.

antrum and none escapes through the nostrils until that cavity is full. The passage from the frontal sinus to the hiatus semi- lunaris is known as the ” infundibulum,” and into this open the ” anterior ethmoidal cells,” so that the antrum acts as a sink for the secretion of these cells and of the frontal sinus. Running downward and forward from the

front of the middle turbinated bone is a curved ridge known as the ” agger nasi,” which forms the anterior boundary of a slightly depressed area called the ” atrium.”

The ” inferior meatus” is below the inferior turbinated bone, and, when that is lifted up, the valvular opening of the nasal duct (see Eye) is seen. In front of the inferior meatus there is a depression just above the nostril which is lined with skin instead of mucous membrane and from which short hairs grow; this is called the ” vestibule.” The roof of the nose is very narrow, and here the olfactory nerves pass in through the cribriform plate. The floor is a good deal wider so that a coronal section through each nasal cavity has roughly the appearance of a right- angled triangle. The anterior wall is formed by the nasal bones and the upper and lower lateral cartilages, while posteriorly

the sphenoidal turbinated bone separates the nasal cavity from the sphenoidal sinus above, and below there is an opening into the naso-pharynx known as the ” posterior nasal aperture ” or ” choana.” The mucous membrane of the outer wall is characteristic of the respiratory tract as high as the superior turbinated bone; it is ciliated all over and very vascular where it covers the inferior turbinated : superficial to and above the superior turbinated the olfactory tract is reached and the specialized olfactory epithelium begins.

Embryology.

In the third week of intra-uterine life two pits make their appear- ance on the under side of the front of the head, and are known as the olfactory or nasal pits; they are the first appearance of the true olfactory region of the nose, and some of their epithelial lining cells send off axons (see Nervous System) which arborize with the dendrites of the cells of the olfactory lobe of the brain and so form the olfactory nerves (see J. Disse, Anat. Hefte, 1897; also P. Anat. Soc, J. Anat. and Phys., 1897, p. 12). Between the olfactory pits the broad median fronto-nasal process grows down from the forehead region to form the dorsum of the nose (see fig. 3), and the anterior part of the nasal septum, while outside them the lateral nasal pro- cesses grow down, and later on meet the maxillary processes from the first visceral arch. In this way the nasal cavities are formed, but for some time they are separated from the mouth by a thin bucco- nasal membrane which eventually is broken through; after this the mouth and nose are one cavity until the formation of the palate in the third month (see Mouth and Salivary Glands). In the third month Jacobson’s organ may be seen as a well- marked tube lined with respiratory mucous membrane and running upward and back- ward, close to the septum, from its

orifice, which is just above the foramen of Stensen in the anterior palatine canal. In man it never has any connexion with the olfactory membrane or olfactory nerves. Internally and below it is surrounded by a delicate sheet of cartilage, which is distinct from that of the nasal septum. No explana- tion of the function of Jacobson's organ in man is known, and it is probably entirely atavistic. At birth the nasal cavities are very shallow from above downward, but they rapidly deepen till the age of puberty. The external nose at birth projects very little from the plane of the face except at the tip, the button-like shape of which in babies is well known. In the second and third year the bridge becomes more promi- nent, but after puberty the nasal bones tend to tilt upward at their lower ends to form the eminence which is seen at its best in the Roman nose. (For further details see Quain's Anatomy, vol. i., London, 1908.)

Comparative Anatomy. In Amphioxus among the Acrania there is a ciliated pit above the anterior end of the central nervous system, which is probably a rudi- ment of an unpaired olfactory organ. In the Cyclostomata (lampreys and hags) the pit is at first ventral, but later becomes dorsal and shares a common opening with the pituitary invagination. It furthermore becomes divided internally into two lateral halves. In fishes there are also two lateral pits, the nostrils of which open sometimes, as in the elasmobranchs (sharks and rays), on to the ventral surface of the snout, and sometimes, as in the higher fishes, on to the dorsal surface. Up to this stage the olfactory organs are mere pits, but in the Dipnoi (mud-fish) an opening is established from them into the front of the roof of the mouth, and so they serve as respiratory passages as well as organs for the sense of smell. In the higher Amphibia the nasal organ becomes included in the skull and respiratory and olfactory parts are distinguished. In this class, too, turbinal ingrowths are found, and the naso-lachrymal duct appears. In the lizards, among the Reptilia, the olfactory and respiratory parts are very distinct, the latter being lined only by stratified epithelium unconnected with the olfactory nerves. There is one true turbinal bone growing from the outer wall, and close to this is a large nasal gland. In crocodiles the hard palate is formed, and there is henceforward a considerable distance between the open- ings of the external and internal nares. In this order, too (Crocodilia)

Cut edge of inferior turbinated bone

Bristle passed into opening of nasal duct

air sinuses are first found extending from the olfactory cavities into the skull-bones. The birds' arrangement is very like that of the reptiles; olfactory and respiratory chambers are present, and into the latter projects the true turbinal, though there is a pseudo-turbinal in the upper or olfactory chamber. In mammals the olfactory chamber of the nose is variously developed; most of them are " macrosmatic," and have a large area of olfactory mucous mem- brane ; some, like the seals, whalebone whales, monkeys and man are " microsmatic," while the toothed whales have the olfactory region practically suppressed in the adult, and are said to be " anosrr.atic." There are generally five turbinal bones in macrosmatic mammals, so that man has a reduced number. The lowest of the series or " maxillo-turbinal " is the equivalent of the single true turbinal bone

P. Zocl. Soc. (1891). and ia the kangaroo, J. Anat. and Phys.,vo. 26 (1891); also G. Eliot Smith on Jacobson's organ, Anatorn. Anzeiger, xi. Band No. 6 (1895). For general literature on the comparative anatomy of the olfactory system up to 1906, see R. Wiedersheim's Comparative Anatomy of Vertebrates, translated and adapted by W. N. Parker (London, 1907). (F. G. P.)

Diseases of Olfactory System External Affections and Injuries of the Nose. — Acne rosacea is one of the most frequent nasal skin affections. In an early stage it consists of dilatation or congestion of the capillaries, and later of a hypertrophy of the sebaceous follicles. This may be accompanied by the formation of pustules. In an exaggerated stage the sebaceous

of birds and reptiles, and in most mammals is a double scroll, one I glands become overgrown, forming large protuberant nodular masses

over which the dilated capillaries are plainly visible. This condition is termed

Mesencephalon

Prosencephalon

Prosencephalon

Mesial nasal process

Stomatodaeum

lipoma nasi (rhinophynia or hammer nose), though there is no increase in fatty tissue. Nasal acne occurs mainly in dyspeptics and tea drinkers, and the more advanced condition, lipoma nasi, chiefly in elderly men addicted to al- coholism. The treatment of acne is the removal of the dyspepsia with the local application of sulphur ointment or of a lotion of perchloride of mercury. Un- sightly capillaries may be destroyed by an application of the galvano-cautery or by electrolysis. Free dissection of the re- dundant tissue from around the nasal cartilages is necessary in lipoma nasi, skin being grafted on to the raw surface. The nasal bones are frequently fractured as the result of direct violence, as by a blow from a cricket ball or stick. The fracture is usually transverse, and may be communicated, leading to much deformity if left untreated. The treat- ment is the immediate reposition of the bony fragments. The old-standing cases where there is considerable depression Cerebral wiring the fragments

may be resorted to. hemi- In numerous cases the subcutaneous sphere injection of paraffin may improve the shape of the organ. Deflection of the septum may also result from similar injuries, and lateral displacement may cause subsequent nasal obstruction and

Lateral

nasal

process

Olfactory rec iuire the straightening of the septum.

.. * I £i01/-\T»C3 1fl-irAl»7inrf />An«lHavnrt1n 1.11”.,. n f

pit

Mesial

nasal process

From A. H. Young and A. Robinson, in Cunningham’s Text-Book of Anatomy.

Fig. 3.

I. Side view of the head of human embryo about 27 days old, showing the olfactory pit and the visceral arches and clefts (from His). II. Transverse section through the head of an embryo, showing the relation of the olfactory pits to the forebrain and to the roof of the stomatodaeal space. III. Head of human embryo about 29 days old, showing the division of the lower part of the mesial frontal process into

Lesions involving considerable loss of substance due to injury or to syphilitic or tuberculous disease have led to many methods being devised to supply the Globular missing part. In the Indian method of process rhinoplasty a flap is cut from the fore- head, to which it is left attached by a pedicle; the flap is then turned down- wards to cover the missing portion of the nose; when the parts have united, the pedicle is cut through. In the Italian

leaf turning upward and the other down. Jacobson’s organ first appears in amphibians, where it is found as an anteroposterior gutter in the floor of the nasal cavity, sometimes being close to the septum, at other times far away, though the former position is the more

primitive. In reptiles the roof of the gutter closes in on each side, and a tube is formed lying below and internal to the nasal cavity, opening anteriorly into the mouth and ending by a blind extremity, posteriorly to which branches of the olfactory and tri- geminal nerves are distributed. In the higher reptiles (crocodiles and chelonians) the organ is suppressed in the adult, and the same applies to birds; but in the lower mammals, especially the mono- tremes, it is very well developed, and is enclosed in a cartilaginous sheath, from which a turbinal process projects into its interior. In other mammals, with the exception of the Primates and perhaps the Chiroptera, the organ is quite distinct, though even in man, as has been shown, its presence can be demonstrated in the embryo. The special opening through which it communicates with the mouth is the foramen of Stensen in the anterior palatine canal.

See J. Symington on the organ of Jacobson in the Ornithorynchus,

the two globular processes, the inter- _ _

vention of the olfactory pits between operation devised by fagliacotius (TaglTa- the_ mesial and lateral nasal processes, cozzi), a flap was taken from the patient's and the approximation of the maxillary arm, the arm being kept fixed to the and lateral nasal processes, which, how- head until the flap has united, ever, are separated by the oculo- nasal Diseases of the Interior of the Nose. — _ sulcus (from His). Epistaxis or bleeding of the nose may

IV. Transverse section of head of embryo, arise from many conditions. It is par- showing the deepening of the olfactory ticularly common in young girls at the pits and their relation to the hemi- time of puberty, being a form of vicarious sphere vesicles of the fore-brain. menstruation. It also occurs in cerebral

congestion, heart disease, scurvy, haemo- phylia, or as a sign of local disease. The treatment will depend upon the cause. In patients with high arterial tension epistaxis may be of direct benefit. In other cases rest on the back may be tried, with the local application of tanno- gallic acid or hazelin or adrenalin, either in a spray or on absorbent cotton. If these should not stop the haemorrhage the nose must be plugged. In cases which arise from specific forms of ulceration, such as tuberculosis and syphilis, the area should be rendered anaesthetic by cocaine, the bleeding points found, and the vessels obliteu ted by the electro- cautery. Polypi in the nasal passages are also a frequent cause of epistaxis.

Rhinitis, or inflammation of the mucous membrane of the nose, occurs both in acute and chronic forms. Of the acute ‘he simple catarrhal form termed ” coryza ” forms the widely known ‘ cold in the head.” The tendency of acute coryza to affect entire families, and to be communicable from one person to another, points to its infectious nature, though probably some predisposing condition of health is necessary for its development. It is considered proved that the symptoms are due to the presence and development of

several distinct micro-organisms. Of these flhe most important is the micrococcus catarrhalis described by Martin Kirchner in 1890, but Friedlander’s pneumo-bacillus has also been found. In ordinary cases of coryza, sneezing, congestion of the nasal mucous membrane and a profuse watery discharge usher in the attack, and the inflam- mation may extend to the pharynx, larynx and trachea, blocking of the Eustachian tube producing a temporary deafness. Later the discharge may become muco-purulent. One attack of coryza conveys no immunity from subsequent attacks and some persons seem particularly susceptible. The treatment is directed towards increasing the action of the kidneys, skin and bowels, A brisk mercurial purgative is indicated, and salicin and aspirin are useful in many cases. Considerable relief may be obtained by washing out the nasal cavities several times a day with a warm lotion con- taining boric acid. Those who are unusually prone to catch cold should habituate themselves to an open air life by day and an open window by night, adenoids or enlarged tonsils should be removed, and the diet should be modified so as not to contain an excess of starchy foods. An acute croupous inflammation occasionally attacks the nasal mucous membrane when the Klebs-Loffler bacillus is not present, but the nasal membrane often shares in true diphtheria, or it may be the only organ to be infected thereby. The diagnosis is of course bacteriological.

As a result of frequent catarrhal attacks the nasal mucous mem- brane may become the seat of a chronic rhinitis in which the turbinals become swollen with oedema, and congested and finally thickened by increase in the fibrous tissue. There is an excessive muco-purulent discharge, and the patient is unable to breathe through the nose; deafness and adenoid vegetations may be the result. In the early stages the nasal cavity should be washed out night and morning with an alkaline lotion, such as bicarbonate of soda, or a caustic, such as chromic acid, should be used in swabbing over the affected part. The

application of the galvano-cautery here is useful, but when the areas are much hypertrophied the hypertrophied portion of the inferior turbinals may have to be removed under cocaine. A special form of recurrent hypertrophic rhinitis is hay fever (g.tf.).

Rhinitis Sicca is a form of chronic rhinitis in which there is but little discharge, crusts or scabs which may be difficult to remove forming in the nasal cavities; the pharynx may be also affected.

Atrophic rhinitis or ozaena usually attacks children and young adults, following on measles or scarlet fever. Crusts form, and favour the retention of the purulent discharge. The disease may extend to the nasal sinuses and septic absorption take place. The treatment is to keep the nasal cavity clean by irrigation with solution of permanganate of potash or carbolic acid lotion, the nose then being wiped and smeared with lanolin or partially plugged with a tampon of cotton-wool, the process being repeated at frequent intervals, the general treatment being that for anaemia. Disease of the middle turbinated bone is also a cause of an offensive nasal discharge, and rhinitis occurring in infants gives rise to the obstructed respiration known as ” the snuffles.”

Three forms of nasal polypi are described, the mucous, the fibrous and the malignant. The general symptoms of nasal polypus are a feeling of stuffiness in one or both nostrils, inability to breathe down the nose and a thin watery discharge. A nasal tone of voice, together with cough and asthma, may be present, or there may be partial or complete loss of the sense of smell (anosmia). The treatment of mucous polypi is their removal by the forceps or the snare, the base of the growth being afterwards carefully examined and cauterized with the galvano-cautery.

Fibrous polypi are usually very vascular, and may be a cause of severe epistaxis as well as of obstruction of breathing, ” dead voice,” sleepiness and deafness. The increasing growth may lead to expansion of the bridge of the nose and deformity of the facial bones, known as ” frog-face.” The tendency of fibrous polypi to take on malignant sarcomatous characters is specially noticeable. Extir- pation of the growth as soon as its nature is recognized is therefore urgently demanded.

The chief diseases of the nasal septum are abscesses, due to the breaking down of haematomata, syphilitic gummata (leading to deep excavation and bony destruction), tuberculous disease in which a small yellowish grey ulcer forms and what is known as perforating

ulcer of the septum, which is met with just within the nostril. The latter tends to run a chronic course, and the detachment of one of its crusts may cause epistaxis. Rhinoscleroma was first described by F. Hebra in 1870, and is endemic in Russian Poland, Galicia and Hungary, but is unknown in England, except amongst alien immigrants. The infecting organism is a specific bacillus, and the disease starts as a chronic smooth painless obstruction with the formation of dense plate-like masses of tissue of stony hardness. Treatment other than that of excision of the masses has proved useless, though the recent plan of introduction of the injection of a vaccine of the bacillus may in future modify the progress of the disease.

The accessory sinuses of the nose are also prone to disease. The maxillary antrum may become filled with muco-pus, forming an empyema, pus escaping intermittently by way of the nose. The condition causes pain and swelling, and may require the irrigation and drainage of the antrum. The frontal sinuses may become filled with mucous, owing to the swelling of the nasal mucous membrane

over the middle turbinated bone, or an acute inflammation may spread to the frontal sinuses, giving rise to an empyema in that locality. There is severe frontal pain, and in some cases a fulness on the forehead over the affected side, the pus often pointing in this site, or there may be a discharge of pus through the nose. The treatment is that of incision and irrigation of the sinus (in some cases scraping out of the sinus) and the re-establishment of communication with the nose, with free drainage. The ethmoidal and sphenoidal sinuses are also frequently the site of empyemata. giving rise to pain in the orbit and the back of the nose, and a discharge into the naso- pharynx. In the case of the ethmoidal sinus it may give rise to exophthalmus and to strabismus (squint), with the formation of a tumour at the inner wall of the orbit and fever and delirium at night. In the young the condition may become rapidly fatal. Suppuration in the sphenoidal sinus may lead to blindness from involvement of the sheath of the optic nerve, and dangerous complications such as septic basal meningitis and thrombosis of the cavernous sinus may occur. Acute ethmoiditis and sphenoiditis are serious conditions demanding immediate surgical intervention. (H. L. H.)

OLGA, wife of Igor, prince of Kiev, and afterwards (from 945) regent for Sviatoslav her son, was baptized at Constantinople about 955 and died about 969. She was afterwards canonized in the Russian church, and is now commemorated on the nth of July.

0L6IERD (d. 1377), grand-duke of Lithuania, was one of the seven

sons of Gedymin, grand-duke of Lithuania, among whom on his death in 134 1 he divided his domains, leaving the youngest, Yavnuty, in possession of the capital, Wilna, with a nominal priority. With the aid of his brother Kiejstut, Olgierd in 1345 drove out the incapable Yavnuty and declared himself grand- duke. The two and thirty years of his reign (1345-1377) were devoted to the development and extension of Lithuania, and he lived to make it one of the greatest states in Europe. Two factors contributed to produce this result, the extraordinary political sagacity of Olgierd and the life-long devotion of his brother Kiejstut. The Teutonic knights in the north and the Tatar hordes in the south were equally bent on the subjection of Lithuania, while Olgierd's eastern and western neighbours, Muscovy and Poland, were far more frequently hostile competitors than serviceable allies. Nevertheless, Olgierd not only succeeded in holding his own, but acquired influence and territory at the expense of hoth Muscovy and the Tatars, and extended the borders of Lithuania to the shores of the Black Sea. The principal efforts of this eminent empire-maker were directed to securing those of the Russian lands which had formed part of the ancient grand-duchy of Kiev. He procured the election of his son Andrew as prince of Pskov, and a powerful minority of the citizens of the republic of Novgorod held the balance in his favour against the Muscovite influence, but his ascendancy in both these commercial centres was at the best precarious. On the other hand he acquired permanently the important principalities of Smolensk and Bryansk in central Russia. His relations with the grand-dukes of Muscovy were friendly on the whole, and twice he married orthodox Russian princesses; but this did not prevent him from besieging Moscow in 1368 and again in 1372, both times unsuccessfully. Olgierd's most memorable feat was his great victory over the Tatars at Siniya Vodui on the Bug in 1362, which practically broke up the great Kipchak horde and compelled the khan to migrate still farther south and establish his headquarters for the future in the Crimea. Indeed, but for the unceasing simultaneous struggle with the Teutonic knights, the burden of which was heroically borne by Kiejstut, Russian historians frankly admit that Lithuania, not Muscovy, must have become the dominant power of eastern Europe. Olgierd died in 1377, accepting both Christianity and the tonsure shortly before his death. His son Jagiello ultimately ascended the Polish throne, and was the founder of the dynasty which ruled Poland for nearly 200 years.

See Kazimierz Stadnicki, The Sons of Gedymin (Pol.) (Lemberg, 1849-1853); Vladimir Bonifatevich Antonovich, Monograph on the History of Western Russia (Rus.), vol. i. (Kiev, 1885). (R. N. B.)

OLHAO, a seaport of southern Portugal, in the district of Faro; 5 m. E. of Faro, on the Atlantic coast. Pop. (1900) 10,009. Olhao has a good harbour at the head of the Barra Nova, a deep channel among the sandy islands which fringe the coast. Wine, fruit, cork, baskets and sumach are exported in small coasting

vessels; there are important sardine and tunny fisheries; and boats, sails and cordage are manufactured.

OLIGARCHY (Gr. 6X1701, few, apxn, rule), in political philo- sophy, the term applied to a government exercised by a relatively small number of the members of a community. It is thus the appropriate term for what is now generally known as ” aristo- cracy ” (?.».). The meaning of the terms has substantially altered since Plato’s day, for in the Republic ” oligarchy ” meant the rule of the wealthy, and ” aristocracy ” that of the really best people.

OLIGOCENE SYSTEM (from the Gr. 6X1705, few, and kmvos, recent) , in geology, the name given to the second division of the older Tertiary rocks, viz. those which occur above the Eocene and below the Miocene strata. These rocks were originally classed by Sir C. Lyell as ” older Miocene,” the term Oligocene being proposed by H. E. Beyrich in 1854 and again in 1858. Following A. de Lapparent, the Oligocene is here regarded as divisible into two stages, an upper one, the Etampian (from Etampes), equivalent to the Rupelian of A. Dumont (1849), and a lower one, the Sannoisian (from Sannois near Paris), equivalent to the Tongrian (from Tongris in Limburg) of Dumont (1859). This lower division is the Ligurian of some authors, and corre- sponds with the Lattorfian (Latdorf) of K. Mayer in north Germany; it is in part the equivalent of the older term Ludian of de Lapparent. It should be pointed out that several authors retain the Aquitanian stage (see Miocene) at the top of the Oligocene, but there are sufficiently good reasons for removing it to the younger system.

The Oligocene deposits are of fresh-water, brackish, marine and terrestrial origin; they include soft sands, sandstones, grits, marls, shales, limestones, conglomerates and lignites. The geographical aspect of Europe during this period is indicated on the accompanying map. Here and there, as in N. Germany,

In the early nart of the

Oligocene Period

I \ jan

After A.de LJjigureqt

Emery Walker sc.

the sea gained ground that had been unoccupied by Eocene waters, but important changes, associated with the continuation of elevatory processes in the Pyrenees and Alps which had begun in the preceding period, were in progress, and a general relative uplifting took place which caused much of the Eocene sea floor to be occupied at this time by lake basins and lagoons. The movements, however, were not all of a negative character as regards the water areas, for oscillations were evidently frequent, and subsidence must have been considerable in some regions to admit of the accumulation of the great thickness of material found deposited there. Perhaps the most striking change from Eocene topography in Europe is to be seen in the extension of the Oligocene sea over North Germany, whence it extended eastward through Poland and Russia to the Aral- Caspian region, communicating thence with Arctic waters by way of a Ural depression. The Asian extension of the central mediterranean sea appears to have begun to be limited. It was later in the period when the wide-spread emersion set in.

In Britain Oligocene formations are found only in the Hampshire Basin and the Isle of Wight; from the admixture of fresh-water, marine and estuarine deposits, E. Forbes named these the ” Fluvio- marine series.” The following are the more important subdivisions, in descending order: The Hamstead (Hampstead) beds, marine at the top, with Ostrea callifera, Natica, &c, estuarine and fresh- water below, with Unto, Viviparus and the remains of crocodiles, turtles and mammals. The Bembridge marls, fresh-water, estuarine and marine, resting upon the Bembridge limestone, with many fresh-water fossils such as Limnaea, Planorbis, Chara, large land snails, Amphidromus, Helix, Glandina, and many insects and plant leaves. The Osborne beds, marls, clays and limestones, with Unio, Limnaea, &c. The Headon beds (upper), fresh- water clays, marls and limestones (middle), brackish and marine, more sandy (lower), brackish and fresh-water clays, marls, tufaceous limestones and sandstones. The clays and sands of the Bovey Basin in Devonshire were formerly classed as Miocene, but they are now regarded by C. Reid as Eocene on the evidence of the plant remains, though there is still a possibility that they may be found to be of Oligocene age.

In France the best-known tract of Oligocene rocks rests in the Paris basin in close relationship with the underlying Eocene. These rocks include the first and second gypsum beds, the source of ” plaster of Paris”; at Montmartre the first or upper bed is 20 metres in thickness, and some of the beds contain siliceous nodules (fusils) and numerous mammalian remains. Above the gypsum beds is the travertine of Champigny-sur-Marne, a series of blue and white marls (supra-gypseous marls), followed by the ” glaises verts ” or greenish marls. At the top of the lower Oligocene of this district is the lacustrine ” calcaire de Brie ” or middle travertine, which at Ferte- sous-Jouane is exploited for millstones; this is associated with the Fontainebleau limestone, which at Chateau-Landon and Souppes is sufficiently compact to form an important building stone, used in the Arc de Tnomphe and other structures in Paris. The upper Oligocene of Paris begins with the marnes d huitres, followed by the brackish and fresh-water molasse of Etrechy, and a series of sandy beds, of which the best known are those of Fontainebleau, fitampes and Ormoy; in these occur the groups of calcite crystals, charged with sand, familiar in all mineral collections. Elsewhere in France similar mixed marine, fresh-water and brackish beds are found: in Aqui- taine there are marine and lacustrine marls, limestones and molasse; marine beds occur at Biarritz; lacustrine and fresh-water marls and limestones with lignite appear in the sub-Pyrenees; in Provence there are brackish red clays, conglomerates and lignites, with limestones in the upper parts; and in Limagne there are mottled sands, arkoses, clays and fresh-water limestones. In the Jura region and on the borders of the central massif a peculiar group of deposits, the terrain sidSrolithique, is found in beds and in pockets in Jurassic limestones. Sometimes this deposit consists of red clay (bolus) with nests of pisolitic iron, as in Jura and Franche-comte, Alsace, &c. ; occasionally, as in Bourgogne, Berry, the valley of the Aubois, Chatillon, it is made up of a breccia or conglomerate of Jurassic pebbles cemented with limonite and carbonate of lime or silica (an intimate mixture of marl and iron ore in these districts is called ” castillard “). At Quercy the cementing material is phosphate of lime derived from the bones of mammals (Adapis, Necrolemur, Palaeothcrium, Xiphodon, &c), which are so numerous that it has been suggested that these animals must have been suffocated by gaseous emanations. Similar ferruginous deposits occur in South Germany.

In the Alpine region the Oligocene rocks assume the character of the Flysch, a complex assemblage of marly and sandy shales and soft sandstones with calcareous cement (” macigno “). The Flysch phase of deposition had begun before the close of the preceding period, but the

bulk of it belongs to the Oligocene, and is especially characteristic of the lower part. The Flysch may attain a very great thickness ; in Dauphine it is said to be 2000 metres. Obscure plant- like impressions are common on certain horizons of this formation, and have received such names as Chondrites, Fucoids, Helmin- thoidea. The ” gres de Taveyannaz ” and ” Wildflysch ” of Lake Thun contain fragments of eruptive rocks. Marine beds occur at Barreme, Desert, Chambery, &c, and parallel with the normal Flysch in the higher Alps of Vaudois is a nummulitic limestone; both here and near Interlaken, in the marble of Ralligstocke, calcareous algae are abundant. Part of the ” schistes des Grisons ” (” Biindner Schiefer “) have been regarded as of Oligocene age. In the Leman region the ” Flysch rouge ” at the foot of the Dent du Midi belongs to the upper part of the Flysch formation.

In North Germany the lower Oligocene consists largely of sandy marls, often glauconitic ; typical localities are Egeln near Magdeburg and Latdorf near Bernburg; at Samland the glauconitic sand con- tains nodules of amber, with insects, derived from Eocene strata. The upper Oligocene beds, which cover a wide area, comprise the Stettin sands and Septarian Clay or Rupelton, marine beds tending to merge laterally one into another. In the Mainz basin a petroleum- bearing sandy marl is found at Pechelbronn and Lobsann in Alsace underlying a fresh-water limestone which is followed by the marine ” Meeressand ” of Alzey. Lignites (Braunkohl) are widely spread in this region and appear at Latdorf, Leipzig, in Westphalia and Mecklenburg; at Halle is a variety called pyropissite, which is exploited at Weissenfels for the manufacture of paraffin.

In Belgium a sandy series (Wemmelian, Asschian, Henisian), mainly of brackish-water origin, is succeeded by the marine sands of Bergh (with the clay of Boom), which pass up through the inferior sands of Bolderberg into the Miocene In Switzerland, beyond the limits of the Flysch, nearer the Alpine massif, is a belt of grits, limestones and clays in an uncompacted condition, to which the name ” molasse ” is usually given; mixed with the molasse is an inconstant conglomeratic littoral formation, called Nagelfluh. The molasse occurs also in Bavaria, where it is several thousand feet thick and contains lignites. Oligocene deposits occur in the Carpathian region and Tirol; as Flysch and brackish and lacustrine beds with lignite in Klausenburg, lignites at Haring in Tirol. In the Spanish Pyrenees they are well developed; in the Apennines the scaly clays (” argille scagliose “) are of this age;

while in Calabria they are represented by thick conglomerates and Flysch. Flysch appears also in Dalmatia and Istria (where it is called ” tassello “) and in North Bosnia, where it contains marine limestones. Lignites are found at Sotzka and Styria, marine beds in the Balkan peninsula, glauconitic sands prevail in South Russia, Flysch with sands and grits in the Caucasus, while marine deposits also occupy the Aral-Caspian region and Ar- menia, and are to be traced into Persia. Oligocene rocks are known in North Africa, Algeria, Tunis and Egypt, with the silicified trees and basalt sheets north of the Fayum. In North America the rocks of this period have not been very clearly differentiated, but they may possibly be represented by the White river beds of S. Dakota, the white and blue marls of Jackson on the Mississippi, the ” Jack- sonian ” white limestone of Alabama, the limestone of Ocala in Florida, certain lacustrine clays in the Uinta basin, and by the rib- band shales with asphalt and petroleum in the coastal range of California. In South America and the Antilles upper Oligocene is found, and the lignite beds of Coronel and Lota in Chile and in the Straits of Magellan may be of this age; in Patagonia are the lower Oligocene marine beds (” Patagonian “) and beds with mammalian remains. In New Zealand the Oamaru series of J. Hutton is regarded as Oligocene ; at its base are interstiatified basic volcanic rocks.

A correlation of Oligocene strata is summarized in the following table : —

in the Eocene seas (Coelopleurus, Echinolampus, Clypeaster, Scutella) Corals were abundant, and nummulites still continued till near the close of the period, but they were diminished in size.

References.—” Geology of the Isle of Wight,” Mem. Geol Survey (2nd ed. 1889); A. von Koenen, Abhand. geol. Specialkart Preuss. x. (1889-1894); M. Vollest, Der Braunkohlenbergbaum (Halle, 1889); E. van den Brocek, ” Materiaux pour l’etude de 1 Oligocene beige,” Bull. Soc. Belg. Geol. (1894); also the works of O. Heer, H Filhol, G. Vasseur, H. F. Osborn, A. Gaudry, H. Douville R. B. Newton, H. Dall, M. Cossmann, G. Lambert, &c, and the article Flysch. q_ a. H.)

OLIGOCLASE, a rock-forming mineral belonging to the plagioclase (q.v.) division of the felspars. In chemical com- position and in its crystallographical and physical characters it is intermediate between albite ($NaAlSi_3O_8$) and anorthite ($CaAl_2Si_2O_8$), being an isomorphous mixture of three to six molecules of the former with one of the latter. It is thus a soda- lime felspar crystallizing in the anorthic system. Varieties intermediate between oligoclase and albite are

known as oligo- clase-albite. The name oligoclase was given by A. Breithaupt in 1826 from the Gr. 6X1705, little, and kXcjlv, to break, because the mineral was thought to have a less perfect cleavage than albite. It had previously been recognized as a distinct species by J. J. Berzelius in 1824, and was named by him soda-spodumene (Natron - spodumen), because of its resemblance in appearance to spodumene. The hardness is 6| and the sp. gr. 2-65-2-67. In colour it is usually whitish, with shades of grey, green or red. Perfectly colourless and transparent glassy material found at Bakersville in North Carolina has occasionally been faceted as a gem-stone. Another variety more frequently used as a gem- stone is the aventurine-felspar or ” sun-stone ” (q.v.) found as reddish cleavage masses in gneiss at Tvedestrand in southern

Oligocene System 8.

England.

Paris Basin.

Belgium.

North German Region.

Other Localities.

Alps and S. Europe.

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Hamstead Beds.

Sands and sandstones of Ormoy, Fontainebleau and Pierrefitte.

Sands of Morigny, Falun of Jeurre, Oyster marJs. Molasse of Etrechy.

Lower sands of Bolderberg.

Sands of Bergh

with Clay of Boom.

Septarian Clay,

. or

Rupelton.

Stettin sands.

Cyrena marls of Mainz.

Lignites of Haring,

Gypsiferous limestone of Aix,

and

Lower marine Molasse of

Basel.

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Bembridge Beds. Osborne Beds.

Headon Beds.

Limestone of Brie, marine beds of Sannois, “Glaises vertes,” and

Cyrene marls.

Supragypseous marls,

limestones of Champigny,

“First” and “Second”

masses of gypsum.

Sands of Vieux- Jones.

Clays of Henis.

Sands of Grimmertingen.

Sands of Wemmel.

Clays of Egeln and Latdorf.

Amber-bearing

Glauconitic sands of

Samland.

Lignites of Celas (Languedoc) .

Lignites of Brunstatt.

Marls of Priabona, limestones of Crosara.

The land flora of this period was a rich one consisting largely of evergreens with characters akin to those of tropical India and Australia and subtropical America. Sequoias, sabal palms, ferns, cinnamon-trees, gum-trees, oaks, figs, laurels and willows were common. Chara is a common fossil in the fresh-water beds. The most interesting feature of the land fauna was undoubtedly the astonishing variety of mammalians, especially the long series from the White river beds and others in the interior of North America. Pachyderms were very numerous. Many of the mammals were of mixed types, Hyaenodon (between marsupials and placentals), Adapts (between pachyderms and lemurs), and many were clearly the forerunners of living genera. Rhinocerids were represented in the upper Oligocene by the hornless Aceratherium; Palaeomastodon and Arsinoitherium, from Egypt are early proboscidian forms which may have lived in this period; Anchitherium, Anchippus, &c, were forerunners of the horse. Falaeolherium, Anthracotherium, Palaeogale, Steneofiber, Cynodictis, Dinictis, Ictops, Palaeolagus, Sciurus, Colodon, Hyopotamus, Oreodon, Poebrotherium, Protoceras, Hyperlragulus and the gigantic Titanotherids (Titanotherium, Brontotherium, &c.) are some of the important genera, representatives of most of the modern groups, including carnivores (Canidae and Felidae), insectivores, rodents, ruminants, camels. Tortoises were abundant, and the genus Rana made its appearance. Rays and dog- fish were the dominant marine fish; logoonal brackish-water fish are represented by Prolebias,

Smerdis, &c. Insects abounded and arachnids were rapidly developing. Gasteropods were increasing in importance, most of the genera still existing (Cerithium, Potamides, Melania, large Naticas, Pleurolomaria, Voluta, Turritella, Rostellaria, Pyrula). Cephalopods, on the other hand, show a falling off. Pelecypods include the genera Cardita, PeUunculus, Lucina, Ostrea, Cyrena, Cytherea. Bryozoa were very abundant (Membranipora, Lepralia, Hornera, Idmonea). Echinoids were less numerous than

Norway; this presents a brilliant red metallic glitter, due to the presence of numerous small scales of haematite or gothite enclosed in the felspar.

Oligoclase occurs, often accompanying orthoclase, as a con- stituent of igneous rocks of various kinds; for instance, amongst plutonic rocks in granite, syenite, diorite; amongst dike-rocks in porphyry and diabase; and amongst volcanic rocks in andesite and trachyte. It also occurs in gneiss. The best developed and largest crystals are those found with orthoclase, quartz, epidote and calcite in veins in granite at Arendal in Norway. (L. J. S.)

OLIPHANT, LAURENCE (1829-1888), British author, son of Anthony Oliphant (1793-1859), 1 was born at Cape Town.

1 The family to which Oliphant belonged is old and famous in Scottish history. Sir Laurence Oliphant of Aberdalgie, Perthshire, who was created a lord of the Scottish parliament before 1458, was descended from Sir William Oliphant of Aberdalgie and on the female side from King Robert the Bruce. Sir William (d. 1329) is renowned for his brave defence of Stirling castle against Edward I. in 1304, Sir Laurence was sent to conclude a treaty with England in 1484; he he'ped to establish the young king James IV. on his throne, p.nd he died about 1500. His son John, the 2nd lord (d. 1516), having lo-5t_ his son and heir, Colin, at Flodden, was succeeded by his grandson Laurence (d. 1566), who was taken prisoner by the English at the rout of Solway Moss in 1542. Laurence's son, Laur- ence, the 4th lord (1529-1593). was a partisan of Mary queen of Scots, and was succeeded by his grandson Laurence (1583-1631), who le't no sons when he died. The 6th lord was Patrick Oliphant, a descendant of the 4th lord, and the title was held by his descendants

OLIPHANT, .M; O.

His father was then attorney-general in Cape Colony, but was soon transferred as chief justice to Ceylon. The boy's education was of the most desultory kind. Far the least useless portion of it belonged to the years 1848 and 1849, when he accompanied his parents on a tour on the continent of Europe. In 1851 he accompanied Jung Bahadur from Colombo to Nepaul. He passed an agreeable time there, and saw enough that was new to enable him to write his first book, A Journey to Katmandu (1852). From Nepaul he returned to Ceylon and thence to England, dallied a little with the English bar, so far at least as to eat dinners at Lincoln's Inn, and then with the Scottish bar, so far at least as to pass an examination in Roman law. He was more happily inspired when he threw over his legal studies and went to travel in Russia. The outcome of that tour was his book on The Russian Shores oj the Black Sea (1853). Between 1853 and 1861 he was successively secretary to Lord Elgin during the negotiation of the Canada Reciprocity treaty at Washington, the companion of the duke of Newcastle on a visit to the Circassian coast during the Crimean War, and Lord Elgin's private secretary on his expedition to China. Each of these experiences produced a pleasant book of travel. In 1 86 1 he was appointed first secretary in Japan, and might have made a successful diplomatic career if it had not been interrupted, almost at the outset, by a night attack on the legation, in which he nearly lost his life. It seems probable that he never properly recovered from this affair. He returned to England and resigned the service, and was elected to parliament in 1865 for the Stirling Burghs.

Oliphant did not show any conspicuous parliamentary ability, but made a great success by his vivacious and witty novel, Piccadilly (1870). He fell, however, under the influence of the spiritualist prophet Thomas Lake Harris (q.v.), who about 1861 had organized a small community, the Brotherhood of the New Life, 1 which at this time was settled at Brocton on Lake Erie and subsequently moved to Santa Rosa in California. Harris obtained so strange an ascendancy over Oliphant that the latter left parliament in 1868, followed him to Brocton, and lived there the life of a farm labourer, in obedience to the imperious will of his spiritual guide. The cause of this painful and grotesque aberration has never been made quite clear. It was part of the Brocton regime that members of the community should be allowed to return into the world from time to time, to make money for its advantage. After three years this was permitted to Oliphant, who, when once more in Europe, acted as corres- pondent of The Times during the Franco-German War, and spent afterwards several years at Paris in the service of that journal. There he met Miss Alice le Strange, whom he married. In 1873 he went back to Brocton, taking with him

his wife and mother. During the years which followed he continued to be employed in the service of the community and its head, but on work very different from that with which he had been occupied on his first sojourn. His new work was chiefly financial, and took him much to New York and a good deal to England. As late as December 1878 he continued to believe that Harris was an incarnation of the Deity. By that time, however, his mind was occupied with a large project of colonization in Palestine, and he made in 1879 an extensive journey in that country, going also to Constantinople,

until the death of Francis, the loth lord, in April 1748. It has since been claimed by several persons, but without success.

Another member of the family was Laurence Oliphant (1691- 1767) the Jacobite, who belonged to a branch settled at Gask in Perthshire. He tookpart in the rising of I7i5,and both he and his son Laurence (d. 1792) were actively concerned in that of 1745, being present at the battles of Falkirk and Culloden. After the ruin of the Stuart cause they escaped to France, but were afterwards allowed to return to Scotland. One of this Oliphant's descendants was Carolina, Baroness Nairne (q.v.).

1 It should be mentioned that the unfavourable view of Harris taken by Oliphant's own biographer, and certainly not shaken by subsequent evidence, has been strongly repudiated by some who knew him. Mr J. Cuming Walters, for instance, in the Westminster Gazelle (London, July 28, 1906) defends the purity of his character. It is difficult to arrive at the exact truth as to Oliphant's relations with him, or the financial scandal which ended them; and it must be admitted that Oliphant himself was at least decidedly cranky.

in the vain hope of obtaining a lease of the northern half of the Holy Land with a view to settling large numbers of Jews there. This he conceived would be an easy task from a financial point of view, as there were so many persons in England and America " anxious to fulfil the prophecies, and bring about the end of the world." He landed once more in England without having accomplished anything definite; but his wife, who had been banished from him for years and had been living in California, was allowed to rejoin him, and they went to Egypt together. In 1 88 1 he crossed again to America. It was on this visit that he became utterly disgusted with Harris, and finally split from him. He was at first a little afraid that his wife would not follow him in his renunciation of " the prophet," but this was not the case, and they settled themselves very agree- ably, with one house in the midst of the German community at Haifa, and another about twelve miles

off at Dalieh on Mount Carmel.

It was at Haifa in 1884 that they wrote together the strange book called Sympneumata: Evolutionary Forces now active in Man, and in the next year Oliphant produced there his novel Masollam, which may be taken to contain its author's latest views with regard to the personage whom he long considered as " a new Avatar." One of his cleverest works, Altiora Pelo, had been published in 1883. In 1886 an attack of fever, caught on the shores of the Lake of Tiberias, resulted in the death of his wife, whose constitution had been undermined by the hardships of her American life. He was persuaded that after death he was in much closer relation with her than when she was still alive, and conceived that it was under her influence that he wrote the book to which he gave the name of Scientific Religion. In November 1887 he went to England to publish that book. By the Whitsuntide of 1888 he had completed it and started for America. There he determined to marry again, his second wife being a granddaughter of Robert Owen the Socialist. They were married at Malvern, and meant to have gone to Haifa, but Oliphant was taken very ill at Twickenham, and died on the 23rd of December 1888. Although a very clever man and a delightful companion, full of high aspiration and noble feeling, Oliphant was only partially sane. In any case, his education was ludicrously inappropriate for a man who aspired to be an authority on religion and philosophy. He had gone through no philosophical discipline in his early life, and knew next to nothing of the subjects with regard to which he imagined it was in his power to pour a flood of new light upon the world. His shortcomings and eccentricities, however, did not prevent his being a brilliant writer and talker, and a notable figure in any society.

See Mrs (Margaret) Oliphant, Memoir of the Life of Laurence Oliphant and of Alice Oliphant his Wife (1892). (M. G- D.)

OLIPHANT, MARGARET OLIPHANT (1828-1897), British novelist and historical writer, daughter of Francis Wilson, was born at Wallyford, near Musselburgh, Midlothian, in 1828. Her childhood was spent at Lasswade (near Dalkeith), Glasgow and Liverpool. As a girl she constantly occupied herself with literary experiments, and in 1849 published her first novel, Passages in the Life of Mrs Margaret Maitland. It dealt with the Scottish Free Church movement, with which Mr and Mrs Wilson both sympathized, and had some success. This she followed up in 1851 with Caleb Field, and in the same year met Major Blackwood in Edinburgh, and was invited by him to contribute to the famous Blackwood's Magazine. The connexion thus early commenced lasted during her whole lifetime, and she

contributed considerably more than 100 articles to its pages. In May 1832 she married her cousin, Frank Wilson Oliphant, at Birkenhead, and settled at Harrington Square, in London. Her husband was an artist, principally in stained glass. He had very delicate health, and two of their children died in infancy, while the father himself developed alarming symptoms of consumption. For the sake of his health they moved in January 1859 to Florence, and thence to Rome, where Frank Oliphant died. His wife, left almost entirely without resources, returned to England and took up the burden of supporting her three

children by her own literary activity. She had now become a popular writer, and worked with amazing industry to sustain her position. Unfortunately, her home life was full of sorrow and disappointment. In January 1864 her only daughter died in Rome, and was buried in her father's grave. Her brother, who had emigrated to Canada, was shortly afterwards involved in financial ruin, and Mrs Oliphant offered a home to him and his children, and added their support to her already heavy responsibilities. In 1866 she settled at Windsor to be near her sons who were being educated at Eton. This was her home for the rest of her life, and for more than thirty years she pursued a varied literary career with courage scarcely broken by a series of the gravest troubles. The ambitions she cherished for her sons were unfulfilled. Cyril Francis, the elder, died in 1890, leaving a Life of Alfred de Musset, incorporated in his mother's Foreign Classics for English Readers. The younger, Frank, collaborated with her in the Victorian Age of English Literature and won a position at the British Museum, but was rejected by the doctors. He died in 1894. With the last of her children lost to her, she had but little further interest in life. Her health steadily declined, and she died at Wimbledon, on the 25th of June 1897.

In the course of her long struggle with circumstances, Mrs Oliphant produced more than 120 separate works, including novels, books of travel and description, histories and volumes of literary criticism. Among the best known of her works of fiction are Adam Graeme (1852), Magdalen Hepburn (1854), Lilliesleaf (1855), The Laird of Norlaw (1858) and a series of stories with the collective title of The Chronicles of Carlingford, which, originally appearing in Blackwood's Magazine (1862-1865), did much to widen her reputation. This series included Salem Chapel (1863), The Rector; and the Doctor's Family

(1863), The Perpetual Curate (1864) and Miss Marjoribanks (1866). Other successful novels were Madonna Mary (1867), Squire Arden (1871), He that will not when he may (1880), Hester (1883) ,Kirsteen (1890), TheMarriageof Elinor (1892) and The Ways of Life (1897). Her tendency to mysticism found expression in The Beleaguered City (1880) and A Little Pilgrim in the Unseen (1882). Her biographies of Edward Irving (1 86 2) and Laurence Oliphant (1892), together with her life of Sheridan in the " English Men of Letters " (1883), have vivacity and a sympathetic touch. She also wrote historical and critical works of considerable variety, including Historical Sketches of the Reign of George II. (1869), The Makers of Florence (1876), A Literary History of England' from 1790 to 1825 (1882), The Makers of Venice (1887), Royal Edinburgh (1890), Jerusalem (1891) and The Makers of Modern Romˆ(i8gs), while at the time of her death she was still occupied upon Annals of a Publishing House, a record of the progress and achievement of the firm of Blackwood, with which she had been so long and honourably connected.

Her Autobiography and Letters, which present a touching picture of her domestic anxieties, appeared in 1899.

OLIPHANT, Olifant (Ger. Helfant), the large'signal horn of the middle ages, made, as its name indicates, from the tusk of an elephant. The oliphant was the instrument of knights and men of high degree, and was usually ornamented with scenes of hunting or war carved either lengthways or round the horn in sections divided by bands of gold and studded with gems. The knights used their oliphants in the hunting field and in battle, and the loss of this precious horn was considered as shameful as the loss of sword or banner.

OLIVA, FERNAN PEREZ DE (1492?-! 530), Spanish man of letters, was born at Cordova about 1492. After studying at Salamanca, Alcala, Paris and Rome, he was appointed rector at Salamanca, where he died in 1530. His Didlogo de la dignidad del hombre (1543), an uniinished work completed by Francisco Cervantes de Salazar, was written chiefly to prove the suitability of Spanish as a vehicle for philosophic discussion. He also published translations of the Amphitruo (1525), the Electro (1528) and the Hecuba (1528).

OLIVARES, 6ASPAR DE GUZMAN, count of Olivares and duke of San Lucar (1587-1645), Spanish royal favourite and

minister, was born in Rome, where his father was Spanish ambassador, on the 6th of January 1587. His compound title is explained by the fact that he inherited the title of count of Olivares,

but was created duke of San Lucar by the favour of Philip IV. He begged the king to allow him to preserve his inherited title in combination with the new honour — according to a. practice of which there are a few other examples in Spanish history. Therefore he was commonly spoken of as el conde- duque. During the life of Philip III. he was appointed to a post in the household of the heir apparent, Philip, by the interest of his maternal uncle Don Baltasar de Zufiiga, who was the head of the prince's establishment. Olivares made it his business to acquire the most complete influence over the young prince. When Philip IV. ascended the throne in 1621, at the age of sixteen, he showed his confidence in Olivares by ordering that all papers requiring the royal signature should first be sent to the count-duke. Olivares could now boast to his uncle Don Baltasar de Zufiiga that he was " all." He became what is known in Spain as a valido — something more than a prime minister, the favourite and alter ego of the king. For twenty-two years he directed the policy of Spain. It was a period of constant war, and finally of disaster abroad and of rebellion at home. The Spaniards, who were too thoroughly monarchical to blame the king, held his favourite responsible for the misfortunes of the country. The count-duke became, and for long remained, in the opinion of his countrymen, the accepted model of a grasping and incapable favourite. Of late, largely under the inspiration of Don Antonio Canovas, there has been a certain reaction in his favour. It would certainly be most unjust to blame Olivares alone for the decadence of Spain, which was due to internal causes of long standing. The gross errors of his policy — the renewal of the war with Holland in 1621, the persistence of Spain in taking part in the Thirty Years' War, the lesser wars undertaken in northern Italy, and the entire neglect of all effort to promote the unification of the different states forming the peninsular kingdom — were shared by him with the king, the Church and the commercial classes. When he had fallen from power he wrote an apology, in which he maintained that he had always wished to see more attention paid to internal government, and above all to the complete unification of Portugal with Spain. But if this was not an afterthought, he must, on his own showing, stand accused of having carried out during long years a policy which he knew to be disastrous to his country, rather than risk the loss of the king's favour and of his place. Olivares did not share the king's taste for art and literature, but he formed a vast collection of state papers, ancient and contemporary, which he endeavoured to protect from destruction by entailing them as an heirloom. He also formed a splendid aviary which, under the name of the " hencoop," was a favourite subject of ridicule with his enemies. Towards the end of his period of favour he caused great offence by legitimizing a supposed

bastard son of very doubtful paternity and worthless personal character, and by arranging a rich marriage for him. The fall of Olivares was immediately due to the revolts of Portugal and Catalonia in 1640. The king parted with him reluctantly, and only under the pressure of a strong court intrigue headed by Queen Isabella. It was noted with anxiety by his enemies thjit he was succeeded in the king's confidence by his nephew the count of Haro. There remains, however, a letter from the king, in which Philip tells his old favourite, with frivolous ferocity, that it might be necessary to sacrifice his life in order to avert unpopularity from the royal house. Olivares was driven from office in 1643. He retired by the king's order to Toro. Here he endeavoured to satisfy his passion for activity, partly by sharing in the municipal govern- ment of the town and the regulation of its commons, woods and pastures, and partly by the composition of the apology he published under the title of El Nicandro, which was perhaps written by an agent, but was undeniably inspired by the fallen minister. The Nicandro was denounced to the Inquisition, and it is not impossible that Olivares might have ended in the prisons of the Holy Office, or on the scaffold, if he had not died on the 22nd of July 1645.

See the Estudios del reinado de Felipe IV. of Don Antonio 'Canovas (Madrid, 1889) ; and Don F. Silvela's introduction, much less favourable to Olivares, to his edition of the Cartas de Sor Maria de Agreda y del rey Felipe IV. (Madrid, 1885-1886).

OLIVE (Olea europaea), the plant that yields the olive oil of commerce, belonging to a section of the natural order Oleaceae, of which it has been taken as the type. The genus Olea includes about thirty species, very widely scattered, chiefly over the Old World, from the basin of the Mediterranean to South Africa and New Zealand. The wild olive is a small tree or bush of rather straggling growth, with thorny branches and opposite oblong pointed leaves, dark greyish-green above and, in the young state, hoary beneath with whitish scales; the small white flowers, with four-cleft calyx and corolla, two stamens and bifid stigma, are borne on the last year's wood, in racemes springing from the axils of the leaves; the drupaceous fruit is small in the wild plant, and the fleshy pericarp, which gives the cultivated olive its economic value, is hard and comparatively thin. In the cultivated forms the tree acquires a more compact habit, the branches lose their spinous character, while the young shoots become more or less angular; the leaves are always

hoary on the under-side, and are generally lanceo- late in shape, though varying much in breadth and size in the different kinds. The fruit is sub- ject to still greater changes of form and colour; usually oval or nearly globular, in some sorts it is egg-shaped, in others much elongated; while the dark hue that it commonly assumes when ripe is exchanged in many varieties for violet, green or almost white. At present the wild olive is found in most of the countries around the Mediter- ranean, extending its range on the west to Portugal, and eastward to the vicinity of the Caspian, while, locally, it occurs even in Afghanistan. An undoubted native of Syria and the maritime parts of Asia Minor, its abund- ance in Greece and the islands of the Archipelago, and the frequent allusions to it by the earliest poets, seem to indicate that it was there also indigenous; but in localities remote from the Levant it may have escaped from cultivation, reverting more or less to its primitive type. It shows a marked preference for calcareous soils and a partiality for the sea-breeze, flourishing with especial luxuriance on the limestone slopes and crags that often form the shores of the Greek peninsula and adjacent islands.

The varieties of olive known to the modern cultivator are extremely numerous — according to some authorities equalling or exceeding in number those of the vine. In France and Italy at least thirty kinds have been enumerated, but comparatively few are grown to any large extent. None of these can be safely identified with ancient descriptions, though it is not unlikely that some of the narrow-leaved sorts that are most esteemed may be descendants of the famed ” Licinian ” (see below). Italy retains its old pre-eminence in olive cultivation; and, though its ancient Gallic province now excels it in the production of the finer oils, its fast-improving culture may restore the old prestige. The broad-leaved olive trees of Spain bear a larger fruit, but the pericarp is of more bitter flavour and the oil of ranker quality. The olive tree, even when free increase is

A, Shoot of olive (Olea europaea) (from nature), reduced; B, opened flower; C, vertical section of pistil. B and C en- larged.

unchecked by pruning, is of very slow growth; but, where allowed for ages its natural development, the trunk sometimes attains a considerable diameter. De Candolle records one exceeding 23 ft. in girth, the age being supposed to amount to seven centuries. Some old Italian olives have been credited with an antiquity reaching back to the first years of the empire, or even to the days of republican Rome; but the age of such ancient trees is always doubtful during growth, and their identity with old descriptions still more difficult to establish. The tree in cultivation rarely exceeds 30 ft. in height, and in France

and Italy is generally confined to much “more limited dimensions by frequent pruning. The wood, of a yellow or light greenish- brown hue, is often finely veined with a darker tint, and, being very hard and close grained, is valued by the cabinetmaker and ornamental turner.

The olive is propagated in various ways, but cuttings or layers are generally preferred ; the tree roots in favourable soil almost as easily as the willow, and throws up suckers from the stump when cut down. Branches of various thickness are cut into lengths of several feet each, and, planted rather deeply in manured ground, soon vegetate; shorter pieces are sometimes laid horizontally in shallow trenches, when, covered with a few inches of soil, they rapidly throw up sucker- like shoots. In Greece and the islands grafting the cultivated tree on the wild form is a common practice. In Italy embryonic buds, which form small swellings on the stems, are carefully excised and planted beneath the surface, where they grow readily, these ” uovoli ” soon forming a vigorous shoot. Occasionally the larger boughs are inarched, and young trees thus soon obtained. The olive is also sometimes raised from seed, the oily pericarp being first softened by slight rotting, or soaking in hot water or in an alkaline solution, to facilitate germination. The olives in the East often receive little attention from the husbandman, the branches being allowed to grow freely and without curtailment by the pruning-knife; water, how- ever, must be supplied in long droughts to ensure a crop ; with this neglectful culture the trees bear abundantly only at intervals of three or four years ; thus, although wild growth is favourable to the picturesque aspect of the plantation, it is not to be recommended on economic grounds. Where the olive is carefully cultivated, as in Languedoc and Provence, it is planted in rows at regular intervals, the distance between the trees varying in different ” olivettes,” according to the variety grown. Careful pruning is practised, the • object being to preserve the flower-bearing shoots of the preceding year, while keeping the head of the tree low, so as to allow the easy gathering of the fruit ; a dome or rounded form is generally the aim of the pruner. The spaces between the trees are occasionally manured with rotten dung or other nitrogenous matter; in France woollen rags are in high esteem for this purpose. Various annual crops are sometimes raised between the rows, and in Calabria wheat even is grown in this way; but the trees are better without any intermediate cropping. Latterly a dwarf variety, very prolific and with green fruit, has come into favour in certain localities, especially in America, where it is said to have produced a crop, two or three seasons after planting. The ordinary kinds do not become profitable to the grower until from five to seven years after the cuttings are placed in the olive-ground. Apart from

occasional damage by- weather or organic foes, the olive crop is somewhat precarious even with the most careful cultivation, and the large untended trees so often seen in Spain and Italy do not yield that certain income to the peasant proprietor that some authors have attributed to them ; the crop from these old trees is often enormous, but they seldom bear well two years in succession, and in many instances a luxuriant harvest can only be reckoned upon every sixth or seventh season. The fruit when ripe is, by the careful grower, picked by hand and deposited in cloths or baskets for conveyance to the mill; but in many parts of Spain and Greece, and generally in Asia, the olives are beaten down by poles or by snaking the boughs, or even allowed to drop naturally, often lying on the ground until the convenience of the owner admits of their removal; much of the inferior oil owes its bad quality to the carelessness of the proprietor of the trees. In southern Europe the olive harvest is in the winter months, con- tinuing for several weeks ; but the time varies in each country, and also with the season and the kinds cultivated. The amount of oil contained in the fruit differs much in the various sorts ; the pericarp usually yields from 60 to 70 %. The ancient agriculturists believed that the olive would not succeed if planted more than a few leagues from the sea (Theophrastus gives 300 stadia as the limit), but modern experience does not confirm the idea, and, though showing a prefer- ence for the coast, it has long been grown far inland. A calcareous soil, however dry or poor, seems best adapted to its healthy develop- ment, though the tree will grow in any light soil, and even on clay if well drained ; but, as remarked by Pliny, the plant is more liable to disease on rich soils, and the oil is inferior to the produce of the poorer and more rocky ground the species naturally affects. The olive suffers greatly in some years from the attacks of various enemies. A fungoid growth has at times infested the trees for several

successive seasons, to the great damage of the plantations. A species of coccus, C. oleae, attaches itself to the shoots, and certain lepidopterous caterpillars feed on the leaves, while the ” olive-fly ” attacks the fruit. In France the olivettes suffer occasionally from frost; in the early part of the 1 8th century many trees were cut to the ground by a winter of exceptional severity. Gales and long-continued rains during the gathering season also cause mischief.

The unripe fruit of the olive is largely used in modern as in ancient times as an article of dessert, to enhance the flavour of wine, and to

renew the sensitiveness of the palate for other viands. For this purpose the fruit is picked while green, soaked for a few hours in an alkaline ley, washed well in clean water and then placed in bottles or jars filled with brine; the Romans added amurca to the salt to increase the bitter flavour of the olives, and at the present day spices are sometimes used.

The leaves and bark of the tree are employed in the south, as a tonic medicine, in intermittent fever. A resinous matter called ” olive gum,” or Lucca gum, formed by the exuding juice in hot seasons, was anciently in medical esteem, and in modern Italy is used as a perfume.

In England the olive is not hardy, though in the southern counties it will stand ordinary winters with only the protection of a wall, and will bear fruit in such situations; but the leaves are generally shed in the autumn, and the olives rarely ripen.

The genus Olea includes several other species of some economic importance. 0. paniculata is a larger tree, attaining a height of 50 or 60 ft. in the forests of Queensland, and yielding a hard and tough timber. The yet harder wood of 0. laurifolia, an inhabitant of Natal, is the black ironwood of the South African colonist.

At what remote period of human progress the wild olive passed under the care of the husbandman and became the fruitful garden olive it is impossible to conjecture. The frequent reference in the Bible to the plant and its produce, its implied abundance in the land of Canaan, the important place it has always held in the economy of the inhabitants of Syria, lead us to consider that country the birthplace of the cultivated olive. An improved variety, possessed at first by some small Semitic sept, it was probably slowly distributed to adjacent tribes; and, yielding profusely, with little labour, that oily matter so essential to healthy life in the dry hot climates of the East, the gift of the fruitful tree became in that primitive age a symbol of peace and goodwill among the warlike barbarians. At a later period, with the development of maritime enterprise, the oil was conveyed, as an article of trade, to the neighbouring Pelasgic and Ionian nations, and the plant, doubtless, soon followed.

In the Homeric world, as depicted in the Iliad, olive oil is known only as a luxury of the wealthy — an exotic product, prized chiefly for its value in the heroic toilet; the warriors anoint themselves with it after the bath, and the body of Patroclus is similarly sprinkled; but no mention of the culture of the plant is made, nor does it find any place on the Achillean shield, on which a vineyard is represented. But,

although no reference to the cultivation of the olive occurs in the Iliad, the presence of the tree in the garden of Alcinous and other familiar allusions show it to have been known when the Odyssey was written. Whenever the introduction may have taken place, all tradition points to the limestone hills of Attica as the seat of its first cultivation on the Hellenic peninsula. When Poseidon and Athena contended for the future city, an olive sprang from the barren rock at the bidding of the goddess, the patron of those arts that were to bring undying influence to the rising state. That this myth has some relation to the first planting of the olive in Greece seems certain from the remarkable story told by Herodotus of the Epidaurians, who, on their crops failing, applied for counsel to the Delphic oracle, and were enjoined to erect statues to Damia and Auxesia (symbols of fertility) carved from the wood of the true garden olive, then possessed only by the Athenians, who granted their request for a tree on condition of their making an annual sacrifice to Athena, its patron; they thus obeyed the command of the Pythian, and their lands became again fertile. The sacred tree of the goddess long stood on the Acropolis, and, though destroyed in the Persian invasion, sprouted again from the root — some suckers of which were said to have produced those olive trees of the Academy in an after age no less revered. By the time of Solon the olive had

so spread that he found it necessary to enact laws to regulate the cultivation of the tree in Attica, from which country it was probably distributed gradually to all the Athenian allies and tributary states. To the Ionian coast, where it abounded in the time of Thales, it may have been in an earlier age brought by Phoenician vessels; some of the Sporades may have received it from the same source; the olives of Rhodes and Crete had perhaps a similar origin. Samos, if we may judge from the epithet of Aeschylus (IXotoˆwos), must have had the fruitful plant long before the Persian wars.

It is not unlikely that the valued tree was taken to Magna Graecia by the first Achaean colonists, and the assertion of Pliny (quoted from Fenestella), that no olives existed in Italy in the reign of Tarquinius Priscus, must be received with the caution due to many statements of that industrious compiler. In Latin Italy the cultivation seems to have spread slowly, for it was not until the consulship of Pompey that the production of oil became sufficient to permit of its exportation. In Pliny's time it was already grown abundantly in the two Gallic provinces and in Spain; indeed, in the earlier days of Strabo the Ligurians supplied the Alpine barbarians with oil, in exchange for the wild produce of their mountains; the plant may have been introduced into those districts by Greek settlers in a previous age. Africa was

indebted for the olive mainly to Semitic agencies. In Egypt the culture never seems to have made much progress; the oil found in Theban tombs was probably imported from Syria. Along the southern shore of the great inland sea the tree was carried by the Phoenicians, at a remote period, to their numerous colonies in Africa — ■ though the abundant olives of Cyrene, to which allusion is made by Theophrastus, and the glaucous foliage of whose descendants still clothes the rocks of the deserted Cyrenaica, may have been the offspring of Greek plants brought by the first settlers. The tree was most likely introduced into southern Spain, and perhaps into Sardinia and the Balearic Islands, by Phoenician merchants; and, if it be true that old olive trees were found in the Canaries on their rediscovery by medieval navigators, the venerable trees probably owed their origin to the same enterprising pioneers of the ancient world. De Candolle says that the means by which the olive was distributed to the two opposite shores of the Mediterranean are indicated by the names given to the plant by their respective inhabitants — the Greek eXata passing into the Latin olea and oliva, that in its turn becoming the ulivo of the modern Italian, the olivo of the Spaniard, and the olive, olivier, of the French, while in Africa and southern Spain the olive retains appellatives derived from the Semitic zaii or seit; but the complete subjugation of Barbary by the Saracens sufficiently accounts for the prevalence of Semitic forms in that region; and aceytuno (Arab. zeitUn), the Andalusian name of the fruit, locally given to the tree itself, is but a vestige of the Moorish conquest.

Yielding a grateful substitute for the butter and animal fats consumed by the races of the north, the olive, among the southern nations of antiquity, became an emblem not only of peace but of national wealth and domestic plenty; the branches borne in the Panathenaea, the wild olive spray of the Olympic victor, the olive crown of the Roman conqueror at ovation, and those of the equites at their imperial review alike typified gifts of peace that, in a barbarous age, could be secured by victory alone. Among the Greeks the oil was valued as an important article of diet, as well as for its external use. The Roman people employed it largely in food and cookery — the wealthy as an indispensable adjunct to the toilet; and in the luxurious days of the later empire it became a favourite axiom that long and pleasant life depended on two fluids, ” wine within and oil without.” Pliny vaguely describes fifteen varieties of olive cultivated in his day, that called the ” Licinian ” being held in most esteem, and the oil obtained from it at Venafrum in Campania the finest known to Roman connoisseurs; the produce of Istria and Baetica was regarded as second only to that of the Italian peninsula. The gour- met of the empire valued the unripe

fruit, steeped in brine, as a provocative to the palate, no less than his modern representative;

and pickled olives, retaining their characteristic flavour, have been found among the buried stores of Pompeii. The bitter juice or refuse deposited during expression of the oil (called amurca), and the astringent leaves of the tree have many virtues attributed to them by ancient authors. The oil of the bitter wild olive was employed by the Roman physicians in medicine, but does not appear ever to have been used as food or in the culinary art.

In modern times the olive has been spread widely over the world; and, though the Mediterranean lands that were its ancient home still yield the chief supply of the oil, the tree is now culti- vated successfully in many regions unknown to its early dis- tributors. Soon after the discovery of the American continent it was conveyed thither by the Spanish settlers. In Chile it flourishes as luxuriantly as in its native land, the trunk some- times becoming of large girth, while oil of fair quality is yielded by the fruit. To Peru it was carried at a later date, but has not there been equally successful. Introduced into Mexico by the Jesuit missionaries of the 17th century, it was planted by similar agency in Upper California, where it has prospered latterly under the more careful management of the Anglo-Saxon conqueror. Its cultivation has also been attempted in the south-eastern states, especially in S. Carolina, Florida and Mississippi. In the eastern hemisphere the olive has been established in many inland districts which would have been anciently considered ill-adapted for its culture. To Armenia and Persia it was known at a comparatively early period of history, and many olive-yards now exist in Upper Egypt. The tree has been introduced into Chinese agriculture, and has become an important addition to the resources of the Australian planter. In Queensland the olive has found a climate specially suited to its wants; in South Australia, near Adelaide, it also grows vigorously; and there are probably few coast districts of the vast island-continent where the tree would not flourish. It has likewise been successfully introduced into some parts of Cape Colony.

OLIVEIRA MARTINS, JOAQUIM PEDRO DE (1845-1894), Portuguese writer, was born in Lisbon and received his early education at the Lyceo Nacional and the Academia das Bellas Artes. At the age of fourteen his father’s death compelled him to seek a living as clerk in a

commercial house, but he gradually improved his position until in 1870 he was appointed manager of the mine of St Eufemia near Cordova. In Spain he wrote 0. Socialismo, and developed that sympathy for the industrial classes of which he gave proof throughout his life. Returning to Portugal in 1874, he became administrator of the railway from Oporto to Povoa, residing in Oporto. He had married when only nineteen, and for many years devoted his leisure hours to the study of economics, geography and history. In 1878 his memoir A CirculaQao fiduciaria brought him the gold medal and member- ship of the Royal Academy of Sciences of Lisbon. Two years later he was elected president of the Society of Commercial Geography of Oporto, and in 1884 he became director of the Industrial and Commercial Museum in that city. In 1885 he entered public life, and in the following year represented Vianna do Castello in parliament, and in 1887 Oporto. Removing to Lisbon in 1888, he continued the journalistic work which he had commenced when living in the north, by editing the Reporter, and in 1889 he was named administrator of the Tobacco Regie. He represented Portugal at international conferences in Berlin and Madrid in 1890, and was chosen to speak at the celebration of the fourth centenary of Columbus held in Madrid in 1891, which gained him membership of the Spanish Royal Academy of History. He became minister of finance on the 17th of January 1892, and later vice-president of the Junta do Credito Publico. His health, however, began to break down as a result of a life spent in unremitting toil, and he died on the 24th of August

1894.

His youthful struggles and privations had taught him a serious view of life, which, with his acute sensibility, gave him a reserved manner, but Oliveira Martins was one of the most generous and noble of men. Like Anthero de Quental, he was impregnated with modern German philosophy, and his perception of the low

moral standard prevailing in public life made him a pessimist who despaired of his country's future, but his sense of proportion, and the necessity which impelled him to work, saved him from the fate which befell his friend, and he died a believing Catholic. At once a gifted psychologist, a profound sociologist, a stern moralist, and an ardent patriot, Oliveira Martins deserved his European reputation. His Bibliotheca das sciencias sociaes, a veritable encyclopaedia, comprises literary criticism, socialism, economics, anthropology, histories of Iberian civilization, of the Roman Republic, Portugal and Brazil. Towards the end of his life he specialized in the 15th century and produced two notable volumes, Os fithos de D. Joao I. and A vida de

Nun'Alvares, leaving unfinished O principe perfeito, a study on King John II., which was edited by his friend Henrique de Barros Gomes.

As the literary leader of a national revival, Oliveira Martins occupied an almost unique position in Portugal during the last third of the 19th century. If he judged and condemned the parliamentary regime and destroyed many illusions in his sensa- tional Contemporary Portugal, and if in his philosophic History of: Portugal he showed, in a series of impressionist pictures, the slow decline of his country commencing in the. golden age of the discoveries and conquests, be at the lame time directed the gaze of his countrymen to the days of their real greatness under the House of Aviz, and incited them to work for a better future by describing the faith and patriotism which had animated the foremost men of the race in the middle ages. He had neither time nor opportunity for original research, but his powerful imagination and picturesque style enabled him to evoke the p&st and make it present to his readers.

The chief characteristics of the man — psychological imagination combined with realism and a gentle irony— make his strength as a historian and his charm as a writer. When some critics objected that his Historia de Portugal ought rather to be named " Ideas on Portuguese History," he replied that a synthetic and dramatic picture of one of those collective beings called nations gives the mind a clearer, truer and more lasting impression than a summary narrative of successive events. But just because he possessed the talents and temperament of a poet, Oliveira Martins was fated to make frequent mistakes as well as to discover important truths. He must be read with care because he is emotional, and cannot let facts speak for themselves, but interrupts the narrative with expressions cf praise or blame. Some of his books resemble a series of visions, while, despite his immense erudition, he does not always supply notes or refer to authorities. He can draw admirable portraits, rich with colour and life; in his Historia de Portugal and Contemporaneo Portugal those of King Pedro I. and Herculano are among the best known. He describes to perfection such striking events as the Lisbon earthquake, and excels in the appreciation of an epoch. In these respects Castelar considered him superior to Macaulay, and declared that few men in Europe possessed the universal aptitude and the fullness of knowledge displayed by Oliveira Martins.

The works of Oliveira Martins include Elementos de anihropologia, As Rasas humanas e a civilisacao primitiva, Systema dos mythos religiosos, Quadro das instituicoes primitivas, O Regime ' das riquezas, Politica e economia nacional, Taboas de chronologia e geographia

historica, O Hellenismo e a civilisacao christa, Historia da Republica Romano, Historia da civilisacao iberica, Historia de Portugual, Brazil e as colonias portuguezas, Portugal nos Mares, Portugal em Africa, Portugal contemporaneo, Cam&s os Lusiadas e a renascenca em Portugal — a brilliant commentary on the physiog- nomy of the poet and his poem, Os Filhos de D. Joao I., the preface to which gives his views on the writing of history — A Vida de Nun' Alvares; and A. Inglaterra de Hoje — the result of a visit to England.

See Moniz Barreto, Oliveira Martins, estudo de psychologia (Paris, 1887), a remarkable study; F. Diniz D'Ayalla, Os Ideaes de Oliveira Martins (Lisbon, 1897), which contains an admirable statement of his ideas, philosophical and otherwise; Anthero de Quental, Oliveira Martins (Lisbon, 1894) and Diccionario bibliographico portuguez, xii. 125. (E. Pr.)

OLIVENITE, a mineral consisting of basic copper arsenate with the formula Cu 2 (OH)As04. It crystallizes in the ortho-

rhombic system, and is sometimes found in small brilliant crystals of simple prismatic habit terminated by domal faces. More usually, however, it occurs as globular aggregates of acicular crystals, these fibrous forms often having a velvety lustre: sometimes it is lamellar in structure, or soft and earthy. A characteristic feature, and one to which the name alludes (German, Olivenerz, of A. G. Werner, 1789), is the olive-green colour, which varies in shade from blackish-green in the crystals to almost white in the finely fibrous variety known as " wood- copper." The hardness is 3, and the sp. gr. 4-3. The mineral was formerly found in some abundance, associated with limonite and quartz, in the upper workings in the copper mines of the St Day district in Cornwall; also near Redruth, and in the Tintic district in Utah. It is a mineral of secondary origin, having been formed by the alteration of copper ores and mispickel.

The arsenic of olivenite is sometimes partly replaced by a small amount of phosphorus, and in the species libethenite we have the corresponding basic copper phosphate Cu 2 (OH)P0 4 . This is found as small dark green crystals resembling olivenite at Libethen in Hungary, and in small amount also in Cornwall. Other members of this isomorphous group of minerals are adamite, Zn 2 (OH)As0 4 , and descloizfte (q.v.). (L. J. S.)

OLIVER, ISAAC (c. 1566-1617), English miniature painter, was probably born in London, as in 1571 a certain Peter Olivier of Rouen was residing in London with his wife and had been there for three years with one ” chylde ” named ” Isake.” It would seem likely, therefore, that he was not at that time more than six years old. It has been suggested by Mr Lionel Cust, from the Huguenot records, that he is identical with one Isaac Oliver of Rouen, married at the Dutch church in Austin Friars in 1602. His death occurred in 16 17, and he was buried in the church of St Anne, Blackfriars. He was probably a pupil of Nicholas Hilliard, and connected through his wife, whose name is un- known, with the artists Gheeraerts and De Critz. He was an exceedingly expert miniature painter, and splendid examples of his work can be seen at Montagu House, Windsor Castle, Sher- borne Castle and in the collections of Mr J. Pierpont Morgan and the late Baroness Burdett-Coutts. Some of his pen draw- ings are in the British Museum. (G. C. W.)

OLIVER, PETER (1594-1648), English miniature painter, was the eldest son of Isaac Oliver, probably by his first wife; and to him Isaac Oliver left his finished and unfinished drawings, with the hope that he would live to exercise the art of his father. The younger sons of the artist appear to have been under age at the time of his death, and were probably therefore sons by a later wife than the mother of Peter Oliver. He resided at Isleworth, and was buried beside his father at St Anne’s, Blackfriars. He was even more eminent in minia- ture painting than his father, and is specially remarkable for a series of copies in water-colour he made after celebrated pictures by old masters. Most of these were done by the desire of the king, and seven of them still remain at Windsor Castle. A great many of Oliver’s works were purchased by Charles II. from his widow; several of his drawings are in existence, and a leaf from his pocket-book in the collection of the earl of Derby. His most important work is the group of the three grandsons of the 1st Viscount Montacute with their servant, now belonging to the marquess of Exeter; and there are fine miniatures by him at Welbeck Abbey, Montagu House, Sherborne Castle, Minley Manor, Belvoir Castle and in the private collection of the queen of Holland. (G. C. W.)

OLIVES, MOUNT OF, or Mount Olivet (“Opos ‘EXcuukos or tCsv ‘EXauov; mod. Jebel-et-Tur) , the ridge facing the Temple Mount at Jerusalem on the east, and separated from it by the Kidron. A basis of hard cretaceous limestone is topped with softer deposits of the same, quaternary deposits forming the summit. There are four distinct elevations in the ridge: tradi- tionally the southernmost, which is separated by a cleft from the others, is called the ” Hill of Offence,”

and said to be the scene of Solomon's idolatry. The summit to the north of this is often (wrongly) spoken of as Olivet proper. Still worse is the error of

calling the next hill but one to the north " Scopus." The top of the ridge affords a comprehensive view. There are four Old Testament references: 2 Sam. xv. 30 sqq., Neh. viii. 15, Ezek. xi. 23, Zech. xiv. 4. In the New Testament the place is mentioned in connexion with the last days of the life of Jesus. He crossed it on his kingly entry into Jerusalem, and upon it he delivered his great eschatological address (Mark xiii. 3) . That the Ascension took place from the summit of the Mount of Olives is not necessarily implied in Acts i. 12; the words "over against Bethany" (Luke xxiv. 50) perhaps mean one of the secluded ravines on the eastern slope, beside one of which that village stands. But since Constantine erected the " Basilica of the Ascension " on the spot marked by a certain sacred cave (Euseb. Vita Const, iii. 41), the site of this event has been placed here and marked by a succession of churches. The present building is quite modern, and is in the hands of the Moslems. Close to the Chapel of the Ascension is the vault of St Pelagia, and a little way down the hill is the labyrinth of early Christian rock-hewn sepulchral chambers now called the " Tombs of the Prophets." During the middle ages Olivet was also shown as the mount of the Transfiguration. A chapel, bearing the name of the Caliph Omar, and said to occupy the place where he encamped when Jerusalem surrendered to the Moslems, formerly stood beside the Church of the Ascension. There are a considerable number of monasteries and churches of various religious orders and sects on the hill, from whose beauty their uniform and unredeemed ugliness detracts sadly. On Easter day 1907 was laid the foundation of a hospice for pilgrims, under the patronage of the German empress.

OLIVETANS, one of the lesser monastic orders following the Benedictine Rule, founded by St Bernard Tolomei, a Sienese nobleman. At the age of forty, when the leading man in Siena, he retired along with two companions to live a hermit's life at Accona, a desert place fifteen miles to the south of Siena, 13 13. Soon others joined them, and in 1324 John XXII. approved of the formation of an order. The Benedictine Rule was taken as the basis of the life; but austerities were introduced beyond what St Benedict prescribed, and the government was framed on the mendicant, not the monastic, model, the superiors being appointed only for a short term of years. The habit is white. Partly from the olive trees that abound there, and partly out of devotion to the Passion, Accona was christened Monte Oliveto, whence the order received its name. By the end of the 14th century there were upwards of a hundred monasteries, chiefly in Italy;

and in the 18th there still were eighty, one of the most famous being San Miniato at Florence. The monastery of Monte Oliveto Maggiore is an extensive building of considerable artistic interest, enhanced by frescoes of Signorelli and Sodoma; it is now a national monument occupied by two or three monks as custodians, though it could accommodate three hundred. The Olivetans have a house in Rome and a few others, including one founded in Austria in 1899. There are about 125 monks in all, 54 being priests. In America are some convents of Olivetan nuns.

See Helyot, Hist, des ordres religieux (171S), vi. c. 24; Max Heimbucher, Ordcn u. Kongregationen (1907), i. § 30; Wetzer u. Welte, Kirchenlexicon (ed. 2) ; J. A. Symonds, Sketches and Studies in Italy (1898), ” Monte Oliveto “: B. M. Marechaux, Vie de bien-heureux Bernard Tolomei (1888). (E. C. B.)

OLIVIER, JUSTE DANIEL (1807-1876), Swiss poet, was born near Nyon in the canton of Vaud; he was brought up as a peasant, but studied at the college of Nyon, and later at the academy of Lausanne. Though originally intended for the ministry, his poetic genius (foreshadowed by the prizes he obtained in 1825 and 1828 for poems on Marcos Botzaris and Julia Alpinula respectively) inclined him towards literary studies. He was named professor of literature at Neuchatel (1830), but before taking up the duties of his post made a visit to Paris, where he completed his education and became associated with Ste Beuve, especially from 1837 onwards. He professed history at Lausanne from 1833 to 1846, when he lost his chair in consequence of the religious troubles. He then went to Paris,

where he remained till 1870, earning his bread by various means, but being nearly forgotten in his native land, to which he remained tenderly attached. From 1845 till i860 (when the magazine was merged in the Bibliolheque universelle) Olivier and his wife wrote in the Revue Suisse the Paris letter, which . had been started by Ste Beuve in 1843, when Olivier became the owner of the periodical. After the war of 1870 he settled down in Switzerland, spending his summers at his beloved Gryon, and died at Geneva on the 7th of January 1876. Besides some novels, a semi-poetical work on the Canton of Vaud (2 vols., 1837-1841), and a volume of historical essays entitled £tudes d’hisioire nalionale (1842), he published several volumes of poems, Deux Voix (1835), Chansons lointaines (1847) and

its continuation Chansons du soir (1867), and Sentiers de montagne (Gryon, 1875). His younger brother, Urbain (1810-1888), was well known from 1856 onwards as the author of numerous popular tales of rural life in the Canton of Vaud, especially of the region near Nyon.

Life by Rambert (1877), republished in his £crivains de la Suisse romande (1889), and also prefixed to his edition of Olivier's CEuvres choisies (Lausanne, 1879). (W. A. B. C.)

OLIVINE, a rock-forming mineral composed of magnesium and ferrous crthosilicate, the formula being (Mg, Feˆ SKV The name olivine, proposed by A. G. Werner in 1790, alludes to the olive-green colour commonly shown by the mineral. The transparent varieties, or " precious olivine " used in jewelry, are known as chrysolite (q.v.) and peridot (q.v.). The term olivine is often applied incorrectly by jewellers to various green stones.

Olivine crystallizes in the orthorhombic system, but distinctly developed crystals are comparatively rare, the mineral more often occurring as compact or granular masses or as grains and blebs embedded in the igneous rocks of which it forms a con- stituent part. There are indistinct cleavages parallel to the macropinacoid (M in the fig.) and the brachypinacoid. The hardness is 6f ; and the sp. gr. 3*27-3-37, but reaching 3-57 in the highly ferru- ginous variety known as hyalosiderite. The amount of ferrous oxide varies from 5 (about 9 % in the gem varieties to 30 % in hyalosiderite. The depth of the green, or yellowish-brown colour, also varies with the amount of iron. The lustre is vitreous. The indices of refraction (i-66 and 1-70) and the double refraction are higher than in many other rock-forming minerals; and these characters, together with the indistinct cleavage, enable the mineral to be readily distinguished in thin rock-sections under the microscope. The mineral is decomposed by hot hydrochloric acid with separation of gelatinous silica. Olivine often contains small amounts of nickel and titanium dioxide; the latter replaces silica, and in the variety known as titan- olivine reaches 5 %.

Olivine is a common constituent of many basic and ultrabasic rocks, such as basalt, diabase, gabbro and peridotite: the dunite, of Dun Mountain near Nelson in New Zealand, is an almost pure olivine-rock. In basalts it is often present as small porphyritic crystals or as large granular aggregates. It also occurs as an accessory constituent of some granular dolomitic limestones and crystalline schists. With enstatite it forms the bulk of the material of meteoric stones; and in another type of meteorites large blebs of glassy olivine fill spaces in a cellular mass of metallic iron.

Olivine is especially liable to alteration into serpentine (hydrated magnesium silicate) ; the alteration proceeds from the outside of the crystals and grains or along irregular cracks in their interior, and gives rise to the separation of iron oxides and an irregular net-work of fibrous serpentine, which in rock-sections presents a very characteristic appearance. Large greenish-yellow crystals from Snarum in Buskerud, Norway, at one time thought to be crystals of serpentine, really consist of serpentine pseudo- morphous after olivine. Many of the large rock-masses of

serpentine have been derived by the serpentinization of olivine- rocks. Olivine also sometimes alters, especially in crystalline schists, to a fibrous, colourless amphibole, to which the name pilite has been given. By ordinary weathering processes it alters to limonite and silica.

Closely related to olivine are several other species, which are included together in the olivine group : they have the orthosilicate formula R” 2 Si04, where R” represents calcium, magnesium, iron, manganese and rarely zinc ; they all crystallize in the orthorhombic system, and are isomorphous with olivine. The following may be mentioned : —

Monticellite, CaMgSi04, a rare mineral occurring as yellowish- grey crystals and grains in granular limestone at Monte Somma, Vesuvius.

Forsterite, Mg 2 Si04, as colourless or yellowish grains embedded in many crystalline limestones.

Fayalite, Fe 2 Si04, or iron olivine is dark brown or black in colour. It occurs as nodules in a volcanic rock at Fayal in the Azores, and in granite at the Mourne Mountains in Ireland ; and as small crystals in cavities in rhyolite at the Yellowstone Park, U.S.A. It is a common constituent of crystalline iron slags.

Tephroite, Mn 2 Si04, a grey (reippSs, ash-coloured), cleavable mineral occurring with other manganiferous minerals in Sweden and New Jersey. (L. J. S.)

OLLIVIER, OLIVIER EMILE (1825-), French statesman, was born at Marseilles on the 2nd of July 1825. His father, Demosthenes Ollivier (1799-1884), was a vehement opponent of the July monarchy, and was returned by Marseilles to the Constituent Assembly in 1 848. His opposition to Louis Napoleon led to his banishment after the coup d’etat of December 1851, and he only returned to France in i860. On the establishment of the short-lived Second Republic his father’s

influence with Ledru-Rollin secured for Emile Ollivier the position of com- missary-general of the department of Bouches-du-Rhone. Ollivier was then twenty-three and had just been called to the Parisian bar. Less radical in his political opinions than his father, his repression of a socialist outbreak at Marseilles com- mended him to General Cavaignac, who continued him in his functions by making him prefect of the department. He was shortly afterwards removed to the comparatively unimportant prefecture of Chaumont (Haute-Marne), a semi-disgrace which he ascribed to his father's enemies. He therefore resigned from the civil service to take up practice at the bar, where his brilliant abilities assured his success.

He re-entered political life in 1857 as deputy for the 3rd circumscription of the Seine. His candidature had been sup- ported by the Siecle, and he joined the constitutional opposition. With Alfred Darimon, Jules Favre, J. L. Henon and Ernest Picard he formed the group known as Les Cinq, which wrung from Napoleon III. some concessions in the direction of con- stitutional government. The imperial decree of the 24th of November, permitting the insertion of parliamentary reports in the Moniteur, and an address from the Corps Legislatif in reply to the speech from the throne, were welcomed by him as a first instalment of reform. This acquiescence marked a consider- able change of attitude, for only a year previously a violent attack on the imperial government, in the course of a defence of Etienne Vacherot, brought to trial for the publication of La Democratie, had resulted in his suspension from the bar for three months. He gradually separated from his old associates, who grouped themselves around Jules Favre, and during the session of 1866- 1867 Ollivier formed a third party, which definitely supported the principle of a Liberal Empire. On the last day of December 1866, Count A. F. J. Walewski, acting in continuance of negotiations already begun by the due de Morny, offered Ollivier the ministry of education with the function of representing the general policy of the government in the Chamber. The imperial decree of the 19th of January 1867, together with the promise inserted in the Moniteur of a relaxation of the stringency of the press laws and of concessions in respect of the right of public meeting, failed to satisfy Ollivier's demands, and he refused office. On the eve of the general election of 1869 he published a manifesto, Le ip Janvier, in justification of his policy. The sinatus-consulte of the 8th of September 1869 gave the two chambers the ordinary

parliamentary rights, and was followed by the dismissal of Rouher and the formation in the last week of 1869 of a responsible ministry of which M. Ollivier was really premier, although that office was not nominally recognized by the constitution. The new cabinet, known as the ministry of the 2nd of January, had a hard task before it, complicated a week after its formation by the shooting of Victor Noir by Prince Pierre Bonaparte. Ollivier immediately summoned the high court of justice for the judgment of Prince Bonaparte and Prince Joachim Murat. The riots following on the murder were suppressed without bloodshed; circulars were sent round to the prefects forbidding them in future to put pressure on the electors in favour of official candi- dates; Baron Haussmann was dismissed from the prefecture of the Seine; the violence of the press campaign against the emperor, to whom he had promised a happy old age, was broken by the prosecution of Henri Rochefort; and on the 20th of April a senatus-consulte was issued which accomplished the transformation of the Empire into a constitutional monarchy. Neither concessions nor firmness sufficed to appease the ” Irre- concilables ” of the opposition, who since the relaxation of the press laws were able to influence the electorate. On the 8th of May, however, the amended constitution was submitted, on Rouher’s advice, to a plebiscite, which resulted in a vote of nearly seven to one in favour of the government. The most distinguished members of the Left in his cabinet — L. J. Buffet, Napoleon Daru and Talhouet Roy — resigned in April on the question of the plebiscite. Ollivier himself held the ministry of foreign affairs for a few weeks, until Daru was replaced by the due de Gramont, destined to be Ollivier’s evil genius. The other vacancies were filled by J. P. Mege and C. I. Plichon, both of them of Conservative tendencies.

The revival of the candidature of Prince Leopold of Hohen- zollern-Sigmaringen for the throne of Spain early in 1870 dis- concerted Ollivier’s plans. The French government, following Gramont’s advice, instructed Benedetti to demand from the king of Prussia a formal disavowal of the Hohenzollern candidature. Ollivier allowed himself to be gained by the war party. The story of Benedetti’s reception at Ems and of Bismarck’s mani- pulation of the Ems telegram is told elsewhere (see Bismarck). It is unlikely that Ollivier could have prevented the eventual outbreak of war, but he might perhaps have postponed it at that time, if he had taken time to hear Benedetti’s account of the incident. He was outmanoeuvred by Bismarck, and on the 15th of July he made a hasty declaration in the Chamber that the Prussian government had issued to the powers a note announcing the rebuff received by Benedetti. He obtained a war vote of 500,000,000 francs, and used the fatal words that he accepted the responsibility of

the war ” with a light heart,” saying that the war had been forced on France. On the 9th of August, with the news of the first disaster, the Ollivier cabinet was driven from office, and its chief sought refuge from the general rage in Italy. He returned to France in 1873, but although he carried on ail active campaign in the Bonapartist Estafette his political power was gone, and even in his own party he came into collision in 1880 with M. Paul de Cassagnac. During his retirement he employed himself in writing a history of L’ Empire HbSral, the first volume of which appeared in 1895. The work really dealt with the remote and immediate causes of the war, and was the author’s apology for his blunder. The 13th volume showed that the immediate blame could not justly be placed entirely on his shoulders. His other works include Democratic et liberie (1867), Le Ministere du 2 Janvier, mes discours (1875), Principes et conduite (187s), L’Eglise et I’Etat au concile du Vatican (2 vols., 1879), Solutions politiques et sociales (1893), Nouveau Manuel du droit ecclesiastique franqais (1885). He had many connexions with the literary and artistic world, being one of the early Parisian champions of Wagner. Elected to the Academy in 1870, he did not take his seat, his reception being indefinitely postponed. His first wife, Blandine Liszt, was the daughter of the Abbe Liszt by Mme d’Agoult (Daniel Stern). She died in 1862, and Ollivier married in 1869 Mile Gravier.

Ollivier’s own view of his political life is given in his L’Empire liberal, which must always be an important ” document ” for the history of his time; but the book must be treated with no less caution than respect.

OLMSTED, DENISON (1791-18.59), American man of science, was born at East Hartford, Connecticut, U.S.A., on the 18th of June 1791, and in 1813 graduated at Yale, where he acted as’ college tutor from 1815 to 1817. In the latter year he was appointed to the chair of chemistry, mineralogy and geology in the university of North Carolina. This chair he exchanged for that of mathematics and physics at Yale in 1825; in 1836, when this professorship was divided, he retained that of astronomy and natural philosophy. He died at New Haven, Connecticut, on the 13th of May 1859.

His first publication (1 824-1 825) was the Report of his geological survey of the state of North Carolina. It was followed by various text-books on natural philosophy and astronomy, but he is chiefly known to the scientific world for his observations on hail (1830), on meteors and on the aurora borealis (see Smithsonian Contributions, vol. viii.).

OLMSTED, FREDERICK LAW (1822-1903), American land- scape architect, was born in Hartford, Connecticut, on the 27th of April

1822. From his earliest years he was a wanderer. While still a lad he shipped before the mast as a sailor; then he took a course in the Yale Scientific School; worked for several farmers; and, finally, began farming for himself on Staten Island, where he met Calvert Vaux, with whom later he formed a business partnership. All this time he wrote for the agricul- tural papers. In 1850 he made a walking tour through England, his observations being published in Walks and Talks of an American Farmer in England (1852). A horseback trip through the Southern States was recorded in A Journey in the Seaboard Slave States (1856), A Journey through Texas (1857) and A Journey in the Back Country (i860). These three volumes, reprinted in England in two as Journeys and Explorations in the Cotton Kingdom (1861), gave a picture of the conditions surround- ing American slavery that had great influence on British opinion, and they were much quoted in the controversies at the time of the Civil War. During the war he was the untiring secretary of the U.S. Sanitary Commission. He happened to be in New York City when Central Park was projected, and, in conjunction with Vaux, proposed the plan which, in competition with more than thirty others, won first prize. Olmsted was made superintendent to carry out the plan. This was practically the first attempt in the United States to apply art to the improvement or embellish- ment of nature in a public park; it attracted great attention, and the work was so satisfactorily done that he was engaged thereafter in most of the important works of a similar nature in America — Prospect Park, Brooklyn; Fairmount Park, Phila- delphia; South Park, Chicago; Riverside and Morningside Parks, New York; Mount Royal Park, Montreal; the grounds surrounding the Capitol at Washington, and at Leland Stanford University at Palo Alto (California) ; and many others. He took the bare stretch of lake front at Chicago and developed it into the beautiful World's Fair grounds, placing all the buildings and contributing much to the architectural beauty and the success of the exposition. He was greatly interested in the Niagara reservation, made the plans for the park there, and also did much to influence the state of New York to provide the Niagara Park. He was the first commissioner of the National Park of the Yosemite and the Mariposa Grove, directing the survey and taking charge of the property for the state of California. He had also held directing appointments under the cities of New York, Boston, Philadelphia, Baltimore, Wilmington and San Francisco, the Joint Committee on Buildings and Grounds of Congress, the Niagara Falls Reservation Commission, the trustees of Harvard, Yale, Amherst and other colleges and public institutions. Subsequently to 1886 he was largely occupied in laying out an extensive system of parks and parkways for the city of Boston and the town of Brookline, and on a

scheme of landscape improvement of Boston harbour. Olmsted received honorary degrees from Harvard, Amherst and Yale in 1864, 1867 and 1893. He died on the 28th of August 1903.

OLMUTZ (Czech, Olomouc or Holomauc), a town of Austria, in Moravia, 67 m. N.E. of Brunn by rail. Pop. (1900) 21,933, of which two-thirds are Germans. It is situated on the March, and is the ecclesiastical metropolis of Moravia. Until 1886 Olmiitz was one of the strongest fortresses of Austria, but the fortifications have been removed, and their place is occupied by a town park, gardens and promenades. Like most Slavonic towns, it contains several large squares, the chief of which is adorned with a trinity column, 115 ft. high, erected in 1740. The most prominent church is the cathedral, a Gothic building of the 14th century, restored in 1883-1886, with a tower 328 ft. high and the biggest church-bell in Moravia. It contains the tomb of King Wenceslaus III., who was murdered here in 1306. The Mauritius church, a fine Gothic building of the 15th century, and the St Michael church are also worth mentioning. The principal secular building is the town-hall, completed in 1 the 15th century, flanked on one side by a Gothic chapel, trans- formed now into a museum. It possesses a tower 250 ft. high, adorned with an astronomical clock, an artistic and famous work, executed by Antcn Pohl in 1422. The old university, founded in 1570 and suppressed in 1858, is now represented by a theological seminary, which contains a very valuable library and an important collection of manuscripts and early prints. Olmiitz is an important railway junction, and is the emporium of a busy mining and industrial district. Its industries include brewing and distilling and the manufacture of malt, sugar and starch.

Olmiitz is said to occupy the site of a Roman fort founded in the imperial period, the original name of which, Mons Julii, has been gradually corrupted to the present form. At a later period Olmiitz was long the capital of the Slavonic kingdom of Moravia, but it ceded that position to Brunn in 1640. The Mongols were defeated here in 1241 by Yaroslav von Sternberg. During the Thirty Years' War it was occupied by the Swedes for eight years. The town was originally fortified by Maria Theresa during the wars with Frederick the Great, who besieged the town unsuccessfully for seven weeks in 1758. In 1848 Olmiitz was the scene of the emperor Ferdinand's abdication, and in 1850 an important conference took place here between

Austrian and German statesmen. The bishopric of Olmiitz was founded in 1073, and raised to the rank of an archbishopric in 1777. The bishops were created princes of the empire in 1588. The archbishop is the only one in the Austrian empire who is elected by the cathedral chapter.

See W. Miiller, Geschichte der koniglichen Hauptstadt Olmiitz (2nd ed., Olmiitz, 1895).

OLNEY, RICHARD (1835-), American statesman, was born at Oxford, Massachusetts, on the 15th of September 1835. He graduated from Brown University in 1856, and from the Law School of Harvard University in 1858. In 1859 he began the practice of law at Boston, Massachusetts, and attained a high position at the bar. He served in the state house of repre- sentatives in 1874, and in March 1893 became attorney-general of the United States in the cabinet of President Cleveland. In this position, during the strike of the railway employes in Chicago in 1894, he instructed the district attorneys to secure from the Federal Courts writs of injunction restraining the strikers from acts of violence, and thus set a precedent for " government by injunction." He also advised the use of Federal troops to quell the disturbances in the city, on the ground that the government must prevent interference with its mails and with the general railway transportation between the states. Upon the death of Secretary W. Q. Gresham (1832-1895), Olney succeeded him as secretary of state on the roth of June 1895. He became specially prominent in the controversy with Great Britain concerning the boundary dispute between the British and Venezuelan governments (see Venezuela), and in his correspondence with Lord Salisbury gave an extended interpretation to the Monroe Doctrine which went considerably beyond previous statements on the subject. In 1897, at the expiration of President Cleveland's term, he returned to the practice of the law.

OLNEY, a market town in the Buckingham parliamentary division of Buckinghamshire, England, 59 m. N.W. by N. of London, on a branch of the Midland railway. Pop. of urban district (1901) 2634. It lies in the open valley of the Ouse on the north (left) bank of the river. The church of St Peter and St Paul is Decorated. It has a fine tower and spire; and the chancel has a northerly inclination from the alignment of the nave. The town is chiefly noted for its connexion with William Cowper, who came to live here in 1767 and remained until 1786, when he removed to the neighbouring village of Weston Under- wood. His house and garden at Olney retain relics of the poet, and the house at Weston also remains. In the garden at Olney are his favourite seat

and the house in which he kept his tame hares. John Newton, curate of Olney, had the assistance of Cowper in the production of the collection of Olney Hymns. The trade of Olney is principally agricultural; the town also shares in the manufacture of boots and shoes common to many places in the neighbouring county of Northampton.

OLNEY, a city and the county-seat of Richland county, Illinois, U.S.A., about 30 m. W. of Vincennes, Indiana. Pop. 1(1890) 3831; (1900) 4260 (235 foreign-born); (1910) 501 1. Olney is served by the Baltimore & Ohio South-western, the Illinois Central, and the Cincinnati, Hamilton & Dayton railways, and is a terminus of the Ohio River Division of the last. It has a Carnegie library and a city park of 55 acres. Olney is an important shipping point for the agricultural products of this district; oil is found in the vicinity; and the city has various manufactures. The municipality owns its water-works. Olney was settled about 1842 and was first chartered as a city in 1867.
OLONETS, a government of north-western Russia, extending from Lake Ladoga almost to the White Sea, bounded W. by Finland, N. and E. by Archangel and Vologda, and S. by Novgorod and St Petersburg. The area is 57,422 sq. m., of which 6794 sq. m. are lakes. Its north-western portion belongs oro- graphically and geologically to the Finland region; it is thickly dotted with hills reaching 1000 ft. in altitude, and diversified by numberless smaller ridges and hollows running from north- west to south-east. The rest of the government is a flat plateau sloping towards the marshy lowlands of the south. The geological structure is very varied. Granites, syenites and diorites, covered with Laurentian metamorphic slates, occur extensively in the north-west. Near Lake Onega they are overlain with Devonian sandstones and limestones, yielding marble and sandstone for building; to the south of that lake Carboniferous limestones and clays make their appearance. The whole is sheeted with boulder-clay, the bottom moraine of the great ice-sheet of the Glacial period. The entire region bears traces of glaciation, either in the shape of scratchings and elongated grooves on the rocks, or of eskers (asar, selgas) running parallel to the glacial striations. Numberless lakes occupy the depressions, while a great many more have left evidences of their existence in the extensive marshes. Lake Onega covers 3764 sq. m., and reaches a depth of 400 ft. Lakes Zeg, Vyg, Lacha, Loksha, Tulos and Vodl cover from 140 to 480 sq. m. each, and their crustacean fauna indicates a former connexion with the Arctic Ocean. The south-eastern part of Lake Ladoga falls also within the government of Olonets. The rivers drain to the Baltic and White Sea basins. To the former system belong Lakes Ladoga and Onega, which are connected

by the Svir and receive numerous streams; of these the Vytegra, which communicates with the Mariinsk canal-system, and the Oyat, an affluent of Lake Ladoga, are important for navigation. Large quantities of timber, fire-wood, stone, metal and flour are annually shipped on waters belonging to this government. The Onega river, which has its source in the south-east of the government and flows into the White Sea, is of minor importance. Sixty-three per cent of the area of Olonets is occupied by forests; those of the crown, maintained for shipbuilding purposes, extend to more than 800,000 acres. The climate is harsh and moist, the average yearly temperature at Petrozavodsk (6i° 8′ N.) being 33 ‘6° F. (12-0° in January, 57-4° in July); but the thermometer rarely falls below— 30 F.

The population, which numbered 321,250 in 1881, reached 367,902 in 1897, and 401,100 (estimate) in 1906. They are principally Great Russians and Finns. The people belong mostly to the Orthodox Greek Church, or are Nonconformists. Rye and oats are the principal crops, and some flax, barley and turnips are grown, but the total cultivated area does not exceed 2ˆ% of the whole government. The chief source of wealth is timber, next to which come fishing and hunting. Mushrooms and berries are exported to St Petersburg. There are quarries and iron-mines, saw-mills, tanneries, iron-works, distilleries and flour-mills. More than one-fifth of the entire male population leave their homes every year in search of tem- porary employment. Olonets is divided into seven districts, of which the chief towns are Petrozavodsk, Kargopol, Lodeinoye Pole, Olonets, Povyenets, Pudozh and Vytegra. It includes the Olonets mining district, a territory belonging to the crown, which covers 432 sq. m. and extends into the Serdob6l district of Finland; the ironworks were begun by Peter the Great in i7oi-i7r4. Olonets was colonized by Novgorod in the nth century, and though it suffered much from Swedish invasion its towns soon became wealthy trading centres. Ivan III. annexed it to the principality of Moscow in the second half of the 16th century.

OLOPAN, Olopuen or Olopen (probably a Chinese form of the Syriac Rabban, i.e. monk: fl. a.d. 635), the first Christian missionary in China (setting aside vague stories of St Thomas, St Bartholomew, &c), and founder of the Nestorian Church in the Far East. According to the Si-ngan-fu inscription, our sole authority, Olopan came to China from Ta T’sin (the Roman empire) in the ninth year of the emperor T’ai-Tsung (a.d. 635), bringing sacred books and images. He was received with

favour; his teaching was examined and approved; his Scriptures were translated for the imperial library; and in 638 an imperial edict declared Christianity a tolerated religion. T'ai-Tsung's successor, Kao-Tsung (650-683), was still more friendly, and Olopan now became a " guardian of the empire " and " lord of the great law." After this followed (c. 683-744) a time of disfavour and oppression for Chinese Christians, followed by a revival dating from the arrival of a fresh missionary, Kiho, from the Roman empire.

The Si-ngan-fu inscription, which alone records these facts, was erected in 781, and rediscovered in 1625 by workmen digging in the Chang-ngan suburb of Si-ngan-fu city. It consists of 1789 Chinese characters, giving a history of the Christian mission down to 781, together with a sketch of Nestorian doctrine, the decree of T'ai-Tsung in favour of Christianity, the date of erection, and names of various persons connected with the church in China when the monument was put up. Additional notes in Syriac (Estrangelo characters) repeat the date and record the names of the reigning Nestorian patriarch, the Nestorian bishop in China, and a number of the Nestorian clergy.

See Kircher, China lllustrata; G. Pauthier, De V authenticity de V inscription nestorienne de Si-ngan-fou (Paris, 1857) and L 'inscription syro-chinoise de Si-ngan-fou (Paris, 1858); Henry Yule, Cathay, Preliminary Essay, xcii.-xciv. clxxxi.-clxxxiii. (London, Hakluyt Soc, 1866); F. Hirth, China and the Roman Orient, 323, &c. ; Father Henri Havret, La stele chritienne de Si-ngan-fou, two parts (text and history) published out of three (Shanghai, 1895 and 1897) ; Dr James Legge's edition and translation of the text, The Nestorian Monument of Hsi-an-Fu (London, 1888); Yule and Cordier, Marco Polo, ii. 27-29 (London, 1903) ; C. R. Beazley, Dawn of Modern Geography, i. 215-218.

OLORON-SAINTE-MARIE, a town of south-western France, capital of an arrondissement in the department of Basses- Pyrenees, 21 m. S.W. of Pau on a branch of the Southern railway. It lies at the confluence of the mountain torrents (locally known as gaves) Aspe and Ossau, which, after dividing it into three parts, unite to form the Oloron, a tributary of the Pau. The united population of the old feudal town of Sainte-Croix or Oloron proper, which is situated on an eminence between the two rivers, of Sainte-Marie on the left bank of the Aspe, and of the new quarters on the right bank of the Ossau, is 7715. Oloron has remains of old ramparts and pleasant promenades with beautiful views, and there are several old houses of the 15th,

1 6th and 17 th centuries, one of which is occupied by the h6tel de ville. The church of Sainte-Croix, the building of most interest,

belongs mainly to the nth century; the chief feature of the exterior is the central Byzantine cupola; in the interior there is a large altar of gilded wood, constructed in the Spanish style of the 17th century. The church of Sainte-Marie, which formerly served as the cathedral of Oloron, is in the old ecclesi- astical quarter of Sainte-Marie. It is a medley of various styles from the nth to the 14th century. A square tower at the west end shelters a fine Romanesque portal. In the new quarter there is the modern church of Notre-Dame. Remains of a castle of the 14th century are also still to be seen. Oloron is the seat of a sub-prefect, and its public institutions include tribunals of first instance and of commerce, and a chamber of arts and manufactures. It is the most important commercial centre of its department after Bayonne, and carries on a thriving trade with Spain by way of the passes of Somport and Anso.

A Celtiberian and then a Gallo-Roman town, known as Iluro, occupied the hill on which Sainte-Croix now stands. Devastated by the Vascones in the 6th and by the Saracens in the 8th century, it was abandoned, and it was not until the nth century that the quarter of Sainte-Marie was re-established by the bishops. In 1080 the viscount of Beam took possession of the old town. The two quarters remained distinct till the union of Beam with the crown at the accession of Henry IV. At the Reformation the place became a centre of Catholic reaction. In the 17th century it carried on a considerable trade with Aragon, until the Spaniards, jealous of its prosperity, pillaged the establish- ments of the Oloron merchants at Saragossa in 1694 — a disaster from which it only slowly recovered. The bishopric was sup- pressed in 1790.

OLSHAUSEN, HERMANN (1796-1839), German theologian, was born at Oldeslohe in Holstein on the 21st of August 1796, and was educated at the universities of Kiel (1814) and Berlin (1816), where he was influenced by Schleiermacher and Neander. In 1820 he became Privatdozent and in 1821 professor extra- ordinarius at Berlin; in 1827 professor at Konigsberg, in 1834 atErlangen. He died on the 4th of September 1839. Olshausen's department was New Testament exegesis; his Commentary (completed and revised by Ebrard and Wiesinger) began to appear at Konigsberg in 1830, and was translated into English in 4 vols. (Edinburgh, 1847-1849). He had prepared for it by his other works, Die Achtheit d. iiier Kanon. Evangelien (1823), Ein Wort iiber tieferen Schriftsinn (1824) and Die biblische Schriftauslegung (1825).

OLTENITZA (Oltenita), a town of Rumania, on the left bank of the river Argesh, 33 m. from its outflow into the Danube, and at a terminus of a branch railway from Bucharest. Pop. (1900) 5801. The

principal trade is in grain, timber (floated down the Argesh) and fish. Lake Greca, famous for its carp, lies 10 m. E. and has an area of about 45 sq. m. Its waters reach the Danube through a network of streams, marshes and meres. Oltenitza is the ancient Constantiola, which was the seat of the first bishopric established in Dacia. In the Crimean War the Turks forced the river at this point and inflicted heavy losses on the Russians.

OLUSTEE, a. village of Baker county, Florida, U.S.A., in the precinct of Olustee, about 46 m. W. by S. of Jacksonville. Pop. of the precinct (1910) 466. The village is served by the Seaboard Air Line. The battle of Olustee, or Ocean Pond (the name of a small body of water in the vicinity), one of the most sanguinary engagements of the Civil War in proportion to the numbers engaged, was fought on the 20th of February 1864, about 2 m. east of Olustee, between about 5500 Federal troops, under General Truman Seymour (1824-1891), and about 5400 Con- federates, under General Joseph Finegan, the Federal forces being decisively defeated, with a loss, in killed and wounded, of about one-third of their number, including several officers. The Confederate losses, in killed and wounded, were about 940.

OLYBRIUS, Roman emperor of the West from the nth of July to the 23rd of October 472, was a member of a noble family and a native of Rome. After the sack of the city by Genseric

(Geiseric) in 455, he fled to Constantinople, where in 464 he was made consul, and about the same time married Placidia, daughter of Valentinian III. and Eudoxia. This afforded Genseric, whose son Hunneric had married Eudocia, the elder sister of Placidia, the opportunity of claiming the empire of the West for Olybrius, In 472 Olybrius was sent to Italy by the emperor Leo to assist the emperor Anthemius against his son-in-law Ricimer, but, having entered into negotiations with the latter, was himself proclaimed emperor against his will, and on the murder of his rival ascended the throne unopposed. His reign was as uneventful as it was brief.

See Gibbon, Decline and Fall, ch. xxxvi.; J. B. Bury, Later Roman Empire.

OLYMPIA, the scene of the famous Olympic games, is on the right or north bank of the Alpheus (mod. Ruphia), about n m. E. of the modern

Pyrgos. The course of the river is here from E. to W., and the average breadth of the valley is about f m. At this point a small stream, the ancient Cladeus, flows from the north into the Alpheus. The area known as Olympia is bounded on the west by the Cladeus, on the south by the Alpheus, on the north by the low heights which shut in the Alpheus valley, and on the east by the ancient racecourses. One group of the northern heights terminates in a conical hill, about 400 ft. high, which is cut off from the rest by a deep cleft, and descends abruptly on Olympia. This hill is the famous Cronion, sacred to Cronus, the father of Zeus.

The natural situation of Olympia is, in one sense, of great beauty. When Lysias, in his Olympiacus (spoken here) , calls it ” the fairest spot of Greece,” he was doubtless thinking also — or perhaps chiefly — of the masterpieces which art, in all its forms, had contributed to the embellishment of this national sanctuary. But even now the praise seems hardly excessive to a visitor who, looking eastward up the fertile and well- wooded valley of Olympia, sees the snow-crowned chains of Erymanthus and Cyllene rising in the distance. The valley, at once spacious and definite, is a natural precinct, and it is probable that no artificial boundaries of the Altis, or sacred grove, existed until comparatively late times.

History. — The importance of Olympia in the history of Greece is religious and political. The religious associations of the place date from the prehistoric age, when, before the states of Elis and Pisa had been founded, there was a centre of worship in this valley which is attested by early votive offerings found beneath the Heraeum and an altar near it. The earliest extant building on the site is the temple of Hera-, which probably dates in its original form from about 1000 B.C. There were various traditions as to the origin of the games. According to one of them, the first race was that between Pelops and Oenomaus, who used to challenge the suitors of his daughter Hippodameia and then slay them. According to another, the festival was founded by Heracles, either the well-known hero or the Idaean Dactyl of that name. The control of the festival belonged in early times to Pisa, but Elis seems to have claimed association with it. Sixteen women, representing eight towns of Elis and eight of Pisatis, wove the festal robe for the Olympian Hera. Olympia thus became the centre of an amphictyony (q.v.), or federal league under religious sanction, for the west coast of the Peloponnesus, as Delphi was for its neighbours in northern Greece. It suited the interests of Sparta to join this amphictyony ; and, before the regular catalogue of Olympic victors begins in 776 B.C., Sparta had formed an alliance with Elis. Aristotle saw in the temple of Hera at Olympia a bronze disk, recording the

traditional laws of the festival, on which the name of Lycurgus stood next to that of Iphitus, king of Elis. Whatever may have been the age of the disk itself, the relation which it indicates is well attested. Elis and Sparta, making common cause, had no difficulty in excluding the Pisatans from their proper share in the management of the Olympian sanctuary. Pisa had, indeed, a brief moment of better fortune, when Pheidon of Argos celebrated the 28th Olympiad under the presidency of the Pisatans. This festival, from which the Eleans and Spartans were excluded, was afterwards struck out of the official register,

as having no proper existence. The destruction of Pisa (before 572 B.C.) by the combined forces of Sparta and Elis put an end to the long rivalry. Not only Pisatis, but also the district of Triphylia to the south of it, became dependent on Elis, So far as the religious side of the festival was concerned, the Eleans had an unquestioned supremacy. It was at Elis, in the gymnasium, that candidates from all parts of Greece were tested, before they were admitted to the athletic competitions at Olympia. To have passed through the training (usually of ten months) at Elis was regarded as the most valuable preparation. Elean officials, who not only adjudged the prizes at Olympia, hut decided who should be admitted to compete, marked the national aspect of their functions by assuming the title of Hellanodicae.

Long before the overthrow of Pisa the list of contests had been so enlarged as to invest the celebration with a Panhellenic character. Exercises of a Spartan type — testing endurance and strength with an especial view to war- — had almost exclusively formed the earlier programme. But as early as the 25th Olympiad — i.e. several years before the interference of Pheidon on behalf of Pisa — the four-horse chariot-race was added. This was an invitation to wealthy competitors from every part of the Hellenic world, and was also the recognition of a popular or spectacular element, as distinct from the skill which had a merely athletic or military interest. Horse-races were added later. For such contests the hippodrome was set apart. Mean- while the list of contests on the old racecourse, the stadium, had been enlarged. Besides the foot-race in which the course was traversed once only, there were now the diatdos or double course, and the ” long ” foot-race (dolichos). Wrestling and boxing were combined in the pancration. Leaping, quoit- throwing, javelin-throwing, running and wrestling were com- bined in the pentathlon. The festival was to acquire a new importance under the protection of the Spartans, who, having failed in their plans of actual conquest in the Peloponnese, sought to gain at least the hegemony (acknowledged predominance) of the peninsula. As the Eleans, therefore, were the religious supervisors of Olympia, so the Spartans aimed at constituting

themselves its political protectors. Their military strength — greatly superior at the time to that of any other state— enabled them to do this. Spartan arms could enforce the sanction which the Olympian Zeus gave to the oaths of the amphictyones, whose federal bond was symbolized by common worship at his shrine. Spartan arms could punish any violation of that ” sacred truce ” which was indispensable if Hellenes from all cities were to have peaceable access to the Olympian festival. And in the eyes of all Dorians the assured dignity thus added to Olympia would be enhanced by the fact that the protectors were the Spartan Heraclidae.

Olympia entered on a new phase of brilliant and secure exist- ence as a recognized Panhellenic institution. This phase may be considered as beginning after the establishment of Elean supremacy in 57 2 B.C. And so to the last Olympia always remained a central expression of the Greek ideas that the body of man has a glory as well as his intellect and spirit, that body and mind should alike be disciplined, and that it is by the harmonious discipline of both that men best honour Zeus. The significance of Olympia was larger and higher than the political fortunes of the Greeks who met there, and it survived the overthrow of Greek independence. In the Macedonian and Roman ages the temples and contests of Olympia still interpreted the ideal at which free Greece had aimed. Philip of Macedon and Nero are, as we shall see, among those whose names have a record in the Altis. Such names are typical of long series of visitors who paid homage to Olympia. According to Cedrenus, a Greek writer of the nth century (Siwi/‘is ‘\arofnuiv, i. 326), the Olympian festival ceased to be held after a.d. 303, the first year of the 293rd Olympiad. The list of Olympian victors, which begins in 776 B.C. with Coroebus of Elis, closes with the name of an Armenian, Varastad, who is said to have belonged to the race of the Arsacidae. In the 5th century the desolation of Olympia had set in. The chryselephantine statue of the Olympian Zeus, by Pheidias, was carried to Constantinople, and perished in a great fire, a.d. 476.

The Olympian temple of Zeus is said to have been dismantled, either by the Goths or by Christian zeal, in the reign of Theodosius II. (a.d. 402-450). After this the inhabitants converted the temple of Zeus and the region to the south of it into a fortress, by constructing a wall from materials found among the ancient buildings. The temple was probably thrown down by earth- quakes in the 6th century a.d.

Excavations. — The German excavations were begun in 1875. After six campaigns, of which the first five lasted from September to June, they were completed on the 20th of March 1881. The result of these six years' labours was, first, to strip off a thick covering of earth from the Altis, the consecrated precinct of the Olympian Zeus. This covering had been formed, during some twelve centuries, partly by clay swept down from the Cronion, partly by deposit from the overflowings of the Cladeus. The coating of earth over the Altis had an average depth of no less than 16 ft.

The work could not, however, be restricted to the Altis. It was necessary to dig beyond it, especially on the west, the south and the east, where several ancient buildings existed, not in- cluded within the sacred precinct itself. The complexity of the task was further increased by the fact that in many places early Greek work had later Greek on top of it, or late Greek work had been overlaid with Roman. In a concise survey of the results obtained, it will be best to begin with the remains external to the precinct of Zeus.

I. Remains outside the Altis

A. West Side. — The wall bounding the Altis on the west belongs probably to the time of Nero. In the west wall were two gates, one at its northern and the other at its southern extremity. The latter must have served as the processional entrance. Each gate was Tp6tTTv\os, having before it on the west a colonnade consisting of a row of four columns. There is a third and smaller gate at about the middle point of the west wall, and nearly opposite the Pelopion in the Altis.

West of the west Altis wall, on the strip of ground between the

Altis and the river Cladeus (of which the course is roughly parallel to the west Altis wall), the following buildings were traced. The order in which they are placed here is that in which they succeed each other from north to south.

1. Just outside the Altis at its north-west corner was a Gymnasium. A large open space, not regularly rectangular, was enclosed on two sides — possibly on three — by Doric colonnades. On the south it was bordered by a portico with a single row of columns in front; on the east by a double portico, more than a stadium in length (220 yds.), and serving as a racecourse for practice in bad weather. At the south-east corner of_ the gymnasium, in the angle between the south and the east portico, was a Corinthian doorway, which a double row of columns divided into three passages. Immediately to the east of this

doorway was the gate giving access to the Altis at its north-west corner. The gymnasium was uˆed as an exercise ground for competitors during the last month of their training.

2. Immediately adjoining the gymnasium on the south was a Palaestra, the place of exercise for wrestlers and boxers. It was in the form of a square, of which each side was about 70 yds. long, enclosing an inner building surrounded by a Doric colonnade. Facing this inner building on north, east and west were rooms of different sizes, to which doors or colonnades gave access. The chief entrances to the palaestra were at south-west and south-east, separated by a double colonnade which extended along the south side.

3. Near the palaestra on the south a” Byzantine church forms the central point in a complex group_ of remains, (a) The church itself occupies the site of an older brick building, which is perhaps a remnant of the ” workshop of Pheidias ” seen by Pausanias. (b) North of the church is a square court with a well in the middle, of the Hellenic age. (c) West of this is a small circular structure, enclosedˆ by square walls. An altar found (in situ) on the south side of the circular enclosure shows by an inscription that this was the Heroum, where worship of the heroes was practised down to a late period, (d) East of the court stood a large building, of Roman age at latest, arranged round an inner hall with colonnades. These buildings probably formed the Theocoleon, house of the priests, (e) There is also a long and narrow building on the south of the Byzantine church. This may have been occupied by the cuSp(ivrai, those alleged ” descendants of Pheidias ” (Pausanias v. 14) whose hereditary privilege it was to keep the statue of Zeus clean. The so-called ” workshop of Pheidias ” (see a) evidently owed its preser- vation to the fact that it continued to be used for actual work,

Plan of OLYMPIA

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Water Courses shown thus:-

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and the adjacent building would have been a convenient lodging for the artists.

4. South of the group described above occur the remains of a large building shown by its inscription to be the Leonidaeum, dedicated by an Elean named Leonidas in the 4th century B.C., and probably intended for the reception of distinguished visitors during the games, such as the heads of the special missions from the various Greek cities. It is an oblong, of which the north and south sides measure about 250 ft,, the east and west about 230. Its orientation differs from that of all the other buildings above mentioned, being not from N. to S., but from W.S.W. to E.N.E. Externally it is an Ionic peripteros, enclosing suites of rooms, large and small, grouped round a small interior Doric peristyle. In Roman times it was altered in such a way as to distribute the rooms into (apparently) four quarters, each having an atrium with six or four columns. Traces existing within the exterior porticos on north, west and east indicate much carriage traffic.

B. South Side. — Although the limits of the Altis on the south (i.e. on the side towards the Alpheus) can be traced with approxi- mate accuracy, the precise line of the south wall becomes doubtful after we have advanced a little more than one-third of the distance from the west to the east end of the south side. The middle and eastern portions of the south side were places at which architectural changes, large or small, were numerous down to the latest times, and where the older buildings met with scant mercy.

1. The Council Hall (Bouleuterium, Paus. v. 23) was just outside the Altis, nearly at the middle of its south wall. It comprised two separate Doric buildings of different date but identical form, viz. oblong, having a single row of columns dividing the length into two naves and terminating to the west in a semicircular apse. The orientation of each was from west-south-west to east-north-east, one being south-south-east of the other. In the space between stood a small square building. In front, on the east, was a portico extending along the front of all three buildings; and east of this again a large trapeze-shaped vestibule

or fore-hall, enclosed by a colonnade. This bouleuterium would have been available on all occasions when Olympia became the scene of conference or debate between the representatives of different states — whether the subject was properly political, as concerning the amphictyonic treaties, or related more directly to the administration of the sanctuary and festival. Two smaller Hellenic buildings stood immediately west of the bouleu- terium. The more northerly of the two opened on the Altis. Their purpose is uncertain.

2. Close to the bouleuterium on the south, and running parallel with it from south-west by west to north-east by east, was the South Colonnade, a late but handsome structure, closed on the north side, open on the south and at the east and west ends. _ The external colonnade (on south, east and west) was Doric; the interior row of columns Corinthian. It was used as a promenade, and as a place from which to view the festal processions as they passed towards the Altis.

3. East of the bouleuterium was a triumphal gateway of Roman age, with triple entrance, the central being the widest, opening on the Altis from the south. North of this gateway, but at a somewhat greater depth, traces of a pavement were found in the Altis.

C. East Side. — The line of the east wall, running due north and south, can be traced from the north-east corner of the Altis down about three-fifths of the east side, when it breaks off at the remains known as ” Nero’s house.” These are the first which claim attention on the east side.

1. To the south-east of the Altis is a building of 4th-century date and of uncertain purpose. This was afterwards absorbed into a Roman house which projected beyond the Altis on the east, the south part of the east Altis wall being destroyed to admit of this. A piece of leaden water-pipe found in the house bears NER. AVG. Only a Roman master could have dealt thus with the Altis, and with a building which stood within its sacred precinct. It cannot be doubted that the Roman house — from which three doors gave access to the Altis — was that occupied by Nero when he visited Olympia. Later Roman hands again enlarged and altered the building, which may perhaps have been used for the reception of Roman governors.

2. Following northwards the line of the east wall, we reach at the north-east corner of the Altis the entrance to the Stadium, which extends east of the Altis in a direction from west-south-west to east-north-east. The apparently strange and inconvenient position of the Stadium relatively to the Altis was due simply to the necessity of

obeying the conditions of the ground, here determined by the curve of the lowe~ slopes which bound the valley on the north. The German explorers excavated the Stadium so far as was necessary for the ascertainment of all essential points. Low embankments had originally been built on west, east and south, the north boundary being formed by the natural slope of the hill. These were after- wards thickened and raised. The space thus defined was a large oblong, about 234 yds. in length by 35 in breadth. There were no artificial seats. It is computed that from 40,000 to 45,000 spectators could have found sitting-room, though it is hardly probable that such a number was ever reached. The exact length of the Stadium itself — which was primarily the course for the foot-race— was about 210 yds. or 192-27 metres — an important result, as it determines

the Olympian foot to be 0-3204 metre or- a little more than an English foot (1-05). In the Heraeum at Olympia, it may be remarked, the unit adopted was not this Olympian foot, but an older one of 0-297 metre, and in the temple of Zeus an Attic foot of 1-08 English foot was used. The starting-point and the goal in the Stadium were marked by limestone thresholds. Provision for drainage was made by a channel running round the enclosure. The Stadium was used not only for foot-races, but for boxing, wrestling, leaping, quoit-throwing and javelin-throwing.

The entrance to the Stadium from the north-east corner of the Altis was a privileged one, reserved for the judges of the games, the competitors and the heralds. Its form was that of a vaulted tunnel, 100 Olympian feet in length. It was probably constructed in Roman times. To the west was a vestibule, from which the Altis was entered by a handsome gateway.

3. The Hippodrome, in which the chariot-races and horse-races were held, can no longer be accurately traced. The overflowings of the Alpheus have washed away all certain indications of its limits. But it is clear that it extended south and south-east of the Stadium, and roughly parallel with it, though stretching far beyond it to the east. From the state of the ground the German explorers inferred that the length of the hippodrome was 770 metres or 4 Olympic stadia.

D. North Side. — If the northern limit of the Altis, like the west, south and east, had been traced by a boundary wall, this would have had the effect of excluding from the precinct a spot so sacred as the Cronion, ” Hill of Cronus,” inseparably associated with the oldest worship of Zeus at Olympia. It seems therefore unlikely that any such northern boundary wall ever existed. But the line which such a

boundary would have followed is partly represented by the remains of a wall running from east to west immediately north of the treasure-houses (see below), which it was designed to protect against the descent of earth from the Cronion just above. This was the wall along which, about a.d. 157, the main water-channel constructed by Herodes Atticus was carried.

Having now surveyed the chief remains external to the sacred precinct on west, south, east and north, we proceed to notice those which have been traced within it.

II. — Remains within the Altis The form of the Altis, as indicated by the existing traces, is not regularly rectangular. The length of the west side, where the line of direction is from south-south-east to north-north-west, is about 215 yds. The south side, running nearly due east and west, is about equally long, if measured from the end of the west wall to the point which the east wall would touch when produced due south in a straight line from the place at which it was demolished to make way for ” Nero’s house.” The east side, measured to a point just behind the treasure-houses, is the shortest, about 200 yds. The north side is the longest. A line drawn eastward behind the treasure-houses, from the Prytaneum at the north-west angle, would give about 275 yds.

The remains or sites within the Altis may conveniently be classed in three main groups, viz. — (A) the chief centres of religious worship ; (B) _ votive buildings; (C) buildings, &c, connected with the ad-ministration of Olympia or the reception of visitors.

A. Chief Centres of Religious Worship. — 1 . There are traces of an altar near the Heraeum which was probably older than the great altar of Zeus; this was probably the original centre of worship. The great altar of Zeus was of elliptic form, the length of the lozenge being directed from south-south-west to north-north-east, in such a manner that the axis would pass through the Cronion. The upper structure imposed on this basis was in two tiers, and also, probably, lozenge-shaped. This was the famous ” ash-altar ” at which the Iamidae, the hereditary gens of seers, practised those rights of divina- tion by fire in virtue of which more especially Olympia is saluted by Pindar as ” mistress of truth.” The steps by which the priests mounted the altar seem to have been at north and south.

2. The_ Pelopium, to the west of the Altar of Zeus, was a small precinct in which sacrifices were offered to the hero Pelops. The traces agree with the account of Pausanias. Walls, inclined to each other at

obtuse angles, enclosed a plot of ground having in the middle a low tumulus of elliptic form, about 35 metres from east to west by 20 from north to south. A Doric propylon with three doors gave access on the south-west side.

The three temples of the Altis were those ■ of Zeus, Hera and the Mother of the gods. All were Doric. All, too, were completely surrounded by a colonnade, i.e. were ” peripteral.”

3. The Temple of Zeus, south of the Pelopium, stood on a high 1 substructure with three steps. It was probably built about 470 B.C. , The colonnades at the east and west side were of six columns each ; those at the north and south sides (counting the corner columns again) of thirteen each. The cella had a prodomos on the east and an opisthodomos on the west. The cella itself was divided longi- tudinally {i.e. from east to west) into three partitions by a double row of columns. The central partition, which was the widest, consisted of three sections. The west section contained the throne and image of the Olympian Zeus. The middle section, next to the east, which was shut off by low screens, contained a table and stelae. Here, probably, the wreaths were presented to the victors.

The third or easternmost section was open to the public. This temple was most richly adorned with statues and reliefs. On the east front were represented in twenty-one colossal figures the moment before the contest between Oenomaus and Pelops. The west front exhibited the fight of the Lapithae and Centaurs. The statement of Pausanias that the two pediments were made by Paeonius and Alcamenes is now generally supposed to be an error. The Twelve Labours of Heracles were depicted on the metopes of the prodomos and opisthodomos; and of these reliefs much the greater part was found — enough to determine with certainty all the essential features of the composition. It was near this temple, at a point about 38 yds. E.S.E. from the south-east angle, that the explorers found the statue of a flying goddess of victory — the Nike of Paeonius.

4. The Temple of Hera (Heraeum), north of the Pelopium, was raised on two steps. It is probably the oldest of extant Greek temples, and may date from about 1000 B.C. It has colonnades of six columns each at east and west, and of sixteen each (counting the corner columns again) at north and south. It was smaller than the temple of Zeus, and,

while resembling it in general plan, differed from it by its singular length relatively to its breadth. When Pausanias saw it, one of the two columns of the opisthodomos (at the west end of the cella) was of wood ; and for a long period all the columns of this temple had probably been of the same material. A good deal of patch-work in the restoration of particular parts seems to have been done at various periods. Only the lower part of the cella wall was of stone, the rest being of unbaked brick; the entablature above the columns was of wood covered with terra- cotta. The cella — divided, like that of Zeus, into three partitions by a double row of columns — had four ” tongue-walls,” or small screens, projecting at right angles from its north wall, and as many from the south wall. Five niches were thus formed on the north side and five on the south. In the third niche from the east, on the north side of the cella, was found one of the greatest of all the treasures which rewarded the German explorers — the Hermes of Praxiteles

(1878).

5. The Temple of the Great Mother of the Gods (Metroum) was again considerably smaller than the Heraeum. It stood to the east of the latter, and had a different orientation, viz. not west to east, but west-north-west to east-south-east. It was raised on three steps, and had a peripteros of six columns (east and west) by eleven (north and south), having thus a slightly smaller length relatively to its breadth than either of the other two temples. Here also the cella had prodomos and opisthodomos. The adornment and painting of this temple had once been very rich and varied. It was probably built in the 4th century, and there are indications that in Roman times it underwent a restoration.

B. Votive Edifices. — Under this head are placed buildings erected, either by states or by individuals, as offerings to the Olympian god.

1. The twelve Treasure-houses on the north side of the Altis, immediately under the Cronion, belong to this class.

The same general character — that of a Doric temple in antis, facing south — is traceable in all the treasure-houses. In the cases of several of these the fragments are sufficient to aid a reconstruction. Two — viz. the 2nd and 3rd counting from the west — had been dis- mantled at an early date, and their site was traversed by a roadway winding upward towards the Cronion. This roadway seems to have been older at least than A.D. 157, since it caused a deflexion in the watercourse along the base of the Cronion constructed by Herodes Atticus.

Pausanias, therefore, would not have seen treasure-houses Nos. 2 and 3. This explains the fact that, though we can trace twelve, he names only ten.

As the temples of ancient Greece partly served the purposes of banks in which precious objects could be securely deposited, so the form of a small Doric chapel was a natural one for the ” treasure- house ” to assume. Each of these treasure-houses was erected by a Greek state, either as a thank-offering for Olympian victories gained by its citizens, or as a general mark of homage to the Olympian Zeus. The treasure-houses were designed to contain the various iyadri/iara or dedicated gifts (such as gold and silver plate, &c), in which the wealth of the sanctuary partly consisted. The temple inventories recently discovered at Delos illustrate the great quantity of such possessions which were apt to accumulate at a shrine of Panhellenic celebrity. Taken in order from the west, the treasure-houses were founded by the following states: 1, Sicyon; 2, 3, unknown; 4, Syracuse (referred by Pausanias to Carthage); 5, Epidamnus; 6, Byzantium; 7, Sybaris; 8, Cyrene; 9, Selinus; 10, Metapontum; 11, Megara; 12, Gela. It is interesting to remark how this list represents the Greek colonies, from Libya to Sicily, from the Euxine to the Adriatic. Greece proper, on the other hand, is represented only by Megara and Sicyon. The dates of the foundations cannot be fixed. The architectural members of some of the treasure-houses have been found built into the Byzantine wall, or elsewhere on the site, as well as the terra-cotta plates that overlaid the_ stone- work in some cases, and th« pedimental figures, representing the battle of the gods and giants, from the treasure-house of the Megarians.

2. The Philippeum stood near the north-west corner of the Altis, a short space west-south-west of the Heraeum. It was dedicated by Philip of Macedon, after his victory at Chaeronea (338 B.C.). As a thank-offering for the overthrow of Greek freedom, it might

seem strangely placed in the Olympian Altis. But it is, in fact, only another illustration of the manner in which Philip’s position and power enabled him to place a decent disguise on the real nature of the change. Without risking any revolt of Hellenic feeling, the new ” captain-general ” of Greece could erect a monument of his triumph in the very heart of the Panhellenic sanctuary. The building consisted of a circular Ionic colonnade (of eighteen columns), about 15 metres in diameter, raised on three steps and enclosing a small circular cella, probably adorned with fourteen Corinthian half-columns. It contained portraits by Leochares of Philip, Alexander, and other members of their family, in gold and ivory.

3. The Exedra of Herodes Atticus stood at the north limit of the Altis, close to the north-east angle of the Heraeum, and immediately west of the westernmost treasure-house (that of Sicyon). It con- sisted of a half-dome of brick, 54 ft. in diameter, with south-south- west aspect. Under the half-dome were placed twenty-one marble statues, representing the family of Antoninus Pius, of Marcus Aurelius, and of the founder, Herodes Atticus. In front of the half- dome on the south, and extending slightly beyond it, was a basin of water for drinking, 715 ft. long. The ends of the basin at north- north-west and south-south-east were adorned by very small open temples, each with a circular colonnade of eight pillars. A marble bull, in front of the basin, bore an inscription saying that Herodes dedicates the whole to Zeus, in the name of his wife, Annia Regilla. The exedra must have been seen by Pausanias, but he does not mention it.

C. It remains to notice those features of the Altis which were connected with the management of the sanctuary or with the accommodation of its guests.

1. Olympia, besides its religious character, originally possessed also a political character, as the centre of an arnphictyony. It was, in fact, a sacred t6\is. We have seen that it had a bouleu- terium for purposes of public debate or conference. So also it was needful that, like a Greek city, it should have a public hearth or prytaneum, where fire should always burn on the altar of the Olympian Hestia, and where the controllers of Olympia should exercise public hospitality. The Prytaneum was at the north-west corner cf the Altis, in such a position that its south-east angle was close to the north-west angle of the Heraeum. It was apparently a square building, of which each side measured 100 Olympian feet, with a south-west aspect. It contained a chapel of Hestia at the front or south-west side, before which a portico was afterwards built. The dining-hall was at the back (north-east), the kitchen on the north-west side. On the same side with the kitchen, and also on the opposite side (south-east), there were some smaller rooms.

2. The Porch of Echo, also called the ” Painted Porch,” extended to a length of 100 yds. along the east Altis wall. Raised on three steps, and formed by a single Doric colonnade, open towards the Altis, it afforded a place from which spectators could conveniently view the passage of processions and the sacrifices at the great altar of Zeus. It was built in the Macedonian period to replace an earlier portico which stood farther back. In front of it was a series of pedestals for votive offerings, including two colossal Ionic columns. These columns, as the inscriptions show, once supported statues of Ptolemy and Berenice.

3. The Agora was the name given to that part of the Altis which had the Porch of Echo on the east, the Altar of Zeus on the west, the Metroum on the north, and the precinct of the Temple of Zeus on the south-west. In this part stood the altars of Zeus Agoraios and Artemis Agoraia.

4. The Zanes were bronze images of Zeus, the cost of making which was defrayed by the fines exacted from competitors who had infringed the rules of the contests at Olympia. These images stood at the northern side of the Agora, in a row, which extended from the north-east angle of the Metroum to the gate of the private entrance from the Altis into the Stadium. Sixteen pedestals were here dis- covered in situ. A lesson of loyalty was thus impressed on aspirants to renown by the last objects which met their eyes as they passed from the sacred enclosure to the scene of their trial.

5. Arrangements for Water-supply. — A copious supply of water was required for the service of the altars and temples, for the private dwellings of priests and officials, for the use of the gymnasium, palaestra, &c, and for the thermae which arose in Roman times. In the Hellenic age the water was derived wholly from theCladeus and from the small lateral tributaries of its valley. A basin, to serve as a chief reservoir, was built at the north-west corner of the Altis; and a supplementary reservoir was afterwards constructed a little to the north-east of this, on the slope of the Cronion. A new source of supply was for the first time made available by Herodes Atticus, c. a.d. 157. At a short distance east of Olympia, near the village of Miraka, small streams flow from comparatively high ground through the side-valleys which descend towards the right or northern bank of the Alpheus. From these side-valleys water was now conducted to Olympia, entering the Altis at its north-east corner by an arched canal which passed behind the treasure-houses to the reservoir at the back of the exedra. The large basin of drinking-water in front of the exedra was fed thence, and served to associate the name of Herodes with a benefit of the highest practical value. Olympia further possessed several fountains, enclosed by round or square walls.

chiefly in connexion with the buildings outside the Altis. The drainage of the Altis followed two main lines. One, for the west part, passed from the south-west angle of the Heraeum to the south portico outside the south Altis wall. The other, which served for the treasure-houses,

passed in front of the Porch of Echo parallel with the line of the east Altis wall.

See the official Die Ausgrabungen zu Olympia (5 vols., 1875-1881) ; Laloux and Monceaux, Restauration de I'Olympie (1889); Curtius and Adler, Olympia die Ergebnisse der Ausgrabungen (1890-1897), I. " Topographie und Geschichte," II. " Baudenkmaler," III. " Bildwerke in Stein und Thon " (Treu), IV. " Bronzen " (Furt- wangler), V. " Inschriften " (Dittenberger and Purgold).

(R. C. J.;E. GR.)

OLYMPIA, the capital of the state of Washington, U.S.A., and the county-seat of Thurston county, on the Des Chutes river and Budd's Inlet, at the head of Puget Sound, about 50 m. S.S.W. of Seattle. Pop. (1890) 4698; (1900) 3863, of whom 591 were foreign-born; (1910; U. S. census) 6996. It is served by the Northern Pacific and the Port Townsend Southern railways, and by steamboat lines to other ports on the Sound and along the Pacific coast. Budd's Inlet is spanned here by a wagon bridge and a railway bridge. Among the prominent buildings are the Capitol, which is constructed of native sand- stone and stands in a park of considerable beauty, the county court-house, St Peter's hospital, the governor's mansion and the city hall. The state library is housed in the Capitol. At Tumwater, the oldest settlement (1845) on Puget Sound, about 2 m. S. of Olympia, are the Tumwater Falls of the Des Chutes, which provide good water power. The city's chief industry is the cutting, sawing and dressing of lumber obtained from the neighbouring forests. Olympia oysters are widely known in the Pacific coast region; they are obtained chiefly from Oyster Bay, Skookum Bay, North Bay and South Bay, all near Olympia. Olympia was laid out in 185 1, became the capital of Washington in 1853, and was chartered as a city in 1859.

OLYMPIAD, in Greek chronology, a period of four years, used as a method of dating for literary purposes, but never adopted in every-day life. The four years were reckoned from one celebration of the Olympian games to another, the first Olympiad beginning with 776 B.C., the year of Coroebus, the first victor in the games after their suspension for 86 years, the last with a.d. 394, when they were finally abolished during the reign of Theodosius the Great. The system was first regularly used by the Sicilian historian Timaeus (352-256 B.C.).

OLYMPIAS, daughter of Neoptolemus, king of Epirus, wife of Philip II. of Macedon, and mother of Alexander the Great. Her father claimed descent from Pyrrhus, son of Achilles. It is said that Philip fell in love

with her in Samothrace, where they were both being initiated into the mysteries (Plutarch, Alexander, 2). The marriage took place in 359 B.C., shortly after Philip's accession, and Alexander was born in 356. The fickleness of Philip and the jealous temper of Olympias led to a growing estrangement, which became complete when Philip married a new wife, Cleopatra, in 337. Alexander, who sided with his mother, withdrew, along with her, into Epirus, whence they both returned in the following year, after the assassination of Philip, which Olympias is said to have countenanced. During the absence of Alexander, with whom she regularly corresponded on public as well as domestic affairs, she had great influence, and by her arrogance and ambition caused such trouble to the regent Antipater that on Alexander's death (323) she found it prudent to withdraw into Epirus. Here she remained until 317, when, allying herself with Polyperchon, by whom her old enemy had been succeeded in 319, she took the field with an Epirote army; the opposing troops at once declared in her favour, and for a short period Olympias was mistress of Macedonia. Cassander, Antipater's son, hastened from Peloponnesus, and, after an obstinate siege, compelled the surrender of Pydna, where she had taken refuge. One of the terms of the capitulation had been that her life should be spared; but in spite of this she was brought to trial for the numerous and cruel executions of which she had been guilty during her short lease of power. Condemned without a hearing, she was put to death (316) by the friends xx. 4

of those whom she had slain, and Cassander is said to have denied her remains the rites of burial.

See Plutarch, Alexander, 9, 39, 68; Justin, vii. 6, ix. 7, xiv. 5, 6; Arrian, Anab. vii. 12; Diod. Sic. xviii. 49-65, xix. 11-51; also the articles Alexander III. the Great and Macedonian Empire.

OLYMPIODORUS, the name of several Greek authors, of whom the following are the most important. (1) An historical writer (5th century A.D.), born at Thebes in Egypt, who was sent on a mission to Attila by the emperor Honorius in 412, and later lived at the court of Theodosius. He was the author of a history ('Iaropucoi Airy 01) in 22 books of the Western Empire from 407 to 425. The original is lost, but an abstract is given by Photius, according to whom he was an alchemist (itoitjtˆs) . A MS. treatise on alchemy, reputed to be by him, is preserved in the National Library in Paris, and was printed with a transla- tion by P. E. M. Berthelot in his Collection des aichimistes grecs (1887-1888). (2) A Peripatetic philosopher (5th century a.d.), an elder contemporary of Proclus. He lived at Alexandria and lectured on Aristotle with considerable success. His best-known pupil was Proclus,

to whom he wished to betroth his daughter. (3) A Neoplatonist philosopher, also of Alexandria, who flourished in the 6th century of our era, during the reign of Justinian. He was, therefore, a younger contemporary of Damascius, and seems to have carried on the Platonic tradition after the closing of the Athenian School in 529, at a time when the old pagan philosophy was at its last ebb. His philosophy is in close conformity with that of Damascius, and, apart from great lucidity of expression, shows no striking features. He is, however, important as a critic and a commentator, and preserved much that was valuable in the writings of Iamblichus, Damascius and Syrianus. He made a close and intelligent study of the dialogues of Plato, and his notes, formulated and collected by his pupils (cbrd (jxavfjs 'OTwfiirioSwpov tov /xeyaXov <£iXoero<£ou), are extremely valuable. In one of his commentaries he makes the interesting statement that the Platonic succession had not been interrupted by the numerous confiscations it had suffered. Zeller points out that this refers to the Alexandrian, not to the Athenian, succession; but internal evidence makes it clear that he does not draw a hard line of demarcation between the two schools. The works which have been preserved are a life of Plato, an attack on Strato and Scholia on the Phaedo, Alcibiades I., Philebus and Gorgias. (4) An Aristotelian who wrote a commentary on the Meteorologica of Aristotle. He also lived at Alexandria in the 6th century, and from a reference in his work to a comet must have lived after a.d. 564. But Zeller (iii. 2, p. 582, n. 1) maintains that he is identical with the commentator on Plato (2, above) in spite of the late date of his death. His work, like that of Simplicius, endeavours to reconcile Plato and Aristotle, and refers to Proclus with reverence. The commentary was printed by the Aldine Press at Venice about

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OLYMPUS, the name of many mountains in Greece and Asia Minor, and of the fabled home of the gods, and also a city name and a personal name.

I. Of the mountains bearing the name the most famous is the lofty ridge on the borders of Thessaly and Macedonia. The river Peneus, which drains Thessaly, finds its way to the sea through the great gorge of Tempe, which is close below the south-eastern end of Olympus and separates it from Mount Ossa. The highest peak of Olympus is nearly 10,000 ft. high; it is covered with snow for great part of the year. Olympus is a mountain of massive appearance, in many places rising in tremendous precipices broken by vast ravines, above which is the broad summit. The lower parts are densely wooded; the summit is

naked rock. Homer calls the mountain ayavvupos, jucucpos, iroXi/ Setp&s : the epithets viipods, Tro\v8(v8pos, frondosus and opacus are used by other poets. The modern name is “E\vfiiro, a dialectic form of the ancient word.

The peak of Mount Lycaeus in the south-west of Arcadia was called Olympus. East of Olympia, on the north bank of the Alpheus, was a hill bearing this name; beside Sellasia in Laconia another. The name was even commoner in Asia

Minor: a lofty chain in Mysia (Keshish Dagh), a ridge east of Smyrna (Nif Dagh), other mountains in Lycia, in Galatia, in Cilicia, in Cyprus, &c, were all called Olympus.

II. A lofty peak, rising high above the clouds of the lower atmosphere into the clear ether, seemed to be the chosen seat of the deity. In the Iliad the gods are described as dwelling on the top of the mountain; in the Odyssey Olympus is regarded as a more remote and less definite locality; and in later poets we find similar divergence of ideas, from a definite mountain to a vague conception of heaven. In the elaborate mythology of Greek literature Olympus was the common home of the multitude of gods. Each deity had his special haunts, but all had a residence at the court of Zeus on Olympus; here were held the assemblies and the common feasts of the gods.

III. There was a city in Lycia named Olympus; it was a bishopric in the Byzantine time.

OLYNTHUS, an ancient city of Chalcidice, situated in a fertile plain at the head of the Gulf of Torone, near the neck of the peninsula of Pallene, at some little distance from the sea, and about 60 stadia (7 or 8 m.) from Potidaea. The district had belonged to a Thracian tribe, the Bottiaeans, in whose possession the town of Olynthus remained till 479 B.C. 1 In that year the Persian general Artabazus, on his return from escorting Xerxes to the Hellespont, suspecting that a revolt from the Great King was meditated, slew the inhabitants and handed the town over to a fresh population, consisting of Greeks from the neighbouring region of Chalcidice (Herod, viii. 127). Olynthus thus became a Greek polis, but it remained insignificant (in the quota-lists of the Delian League it appears as paying on the average 2 talents, as compared with 9 paid by Scione, 8 by Mende, 6 by Torone) until the

synoecism (owoi/acrjuos), effected in 43 2 through the influence of King Perdiccas of Macedon, as the result of which the inhabitants of a number of petty Chalcidian towns in the neighbourhood were added to its population (Thucyd. i. 58). Henceforward it ranks as the chief Hellenic city west of the Strymon. It had been enrolled as a member of the Delian League (q.v.) in the early days of the league, but it revolted from Athens at the time of its synoecism, and was never again reduced. It formed a base for Brasidas during his expedition (424). In the 4th century it attained to great importance in the politics of the age as the head of the Chalcidic League (rd koivov twv Xa\Ki8ewv). The league may probably be traced back to the period of the peace of Nicias (421), when we find the Chalcidians (oi kirl 9pˆK7js XaXwSˆs) taking diplomatic action in common, and enrolled as members of the Argive alliance. There are coins of the league which can be dated with certainty as early as 405; one specimen may perhaps go back to 415-420. Un- questionably, then, the league originated before the end of the 5th century, and the motive for its formation is almost certainly to be found in the fear of Athenian attack. After the end of the Peloponnesian War the development of the league was rapid. About 390 we find it concluding an important treaty with Amyntas, king of Macedon (the father of Philip), 2 and by 382 it had absorbed most of the Greek cities west of the Strymon, and had even got possession of Pella, the chief city in Macedonia (Xenophon, Hell. v. 2, r2). In this year Sparta was induced by an embassy from Acanthus and Apollonia, which anticipated conquest by the league, to send an expedition against Olynthus. After three years of indecisive warfare Olynthus consented to dissolve the confederacy (379). It is clear, however, that the dissolution was little more than formal, as the Chalcidians (XaXioSrjs dird GpaKijs) appear, only a year or two later, among the members of the Athenian naval confederacy of 378-377.' Twenty years later, in the reign of Philip, the power of Olynthus is asserted by Demosthenes to have been much greater than before the Spartan expedition. 4 The town itself at this period

1 If Olynthus was one of the early colonies of Chalcis (and there is numismatic evidence for this view; see Head, Hist. Numorum, p. 185) it must have subsequently passed into the hands of the Bottiaeans.

2 For the inscription see Hicks, Manual of Greek Inscriptions, No. 74. » Hicks, No. 81; C.I.A. ii. 17.

4 Demosthenes, De falsa legatione, §§ 263-266.

is spoken of as a city of the first rank (mSXis ixvplavSpos), and the league included thirty-two cities. When war broke out between Philip and Athens (357), Olynthus was at first in alliance with Philip. Subsequently, in alarm at the growth of his power, it concluded an alliance with Athens; but in spite of all the efforts of the latter state, and of its great orator Demosthenes, it fell before Philip, who razed it to the ground (348) .

The history of the confederacy of Olynthus illustrates at once the strength and the weakness of that movement towards federa- tion which is one of the most marked features of the later stages of Greek history. The strength of the movement is shown both by the duration and by the extent of the Chalcidic League. It lasted for something like seventy years; it survived defeat and temporary dissolution, and it embraced upwards of thirty cities. Yet, in the end, the centrifugal forces proved stronger than the centripetal; the sentiment of autonomy stronger than the sentiment of union. It is clear that Philip's victory was mainly due to the spirit of dissidence within the league itself, just as the victory of Sparta had been (cf. Diod. xvi. 53, 2 with Xen. Hell. v. 2, 24). The mere fact that Philip captured all the thirty-two towns without serious resistance is sufficient evidence of this. It is probable that the strength of the league was more seriously undermined by the policy of Athens than by the action of Sparta. The successes of Athens at the expense of Olynthus, shortly before Philip's accession, must have fatally divided the Greek interest north of the Aegean in the struggle with Macedon.

Authorities. — The chief passages in ancient literature are the Olynthiac Orations of Demosthenes, and Xenophon, Hell. v. 2. See E. A. Freeman, History of Federal Government, ch. iv. ; A. H. J. Greenidge, Handbook of Greek Constitutional History (1896), p. 228; B. V. Head, Historia Numorum, pp. 184-186; G. Gilbert, Griechische Staatsalterthiimer, vol. ii. pp. 197-198. The view taken by all these authorities as to the date of the formation of the Confederacy of Olynthus differs widely from that put forward above. Freeman and

Greenidge suppose the league to have originated in 382, Head in 392, Hicks {Manual of Greek Inscriptions, No. 74) before 390. The decisive test is the numismatic one. There are coins of the league in the British Museum which are earlier than 400, and one in the possession of Professor Oman, of Oxford, which he and Mr Head are disposed to think may be as early as 415-420. (E. M. W.)

OMAGH, a market town and the county town of county Tyrone, Ireland, on the river Strule, 129J m. N.W. by N. from Dublin by the Londonderry line of the Great Northern railway, here joined by a branch from Enniskillen. Pop. (1901) 4789. The greater part of the town is picturesquely situated on a steep slope above the river. The milling and linen industries are carried on, and monthly fairs are held. The Protestant church has a lofty and handsome spire, and the Roman Catholic church stands well on the summit of a hill. A castle, of which there are scanty remains, was of sufficient importance to stand sieges in 1509 and 1641, being rebuilt after its total destruction in the first case. The town is governed by an urban district council.

OMAGUAS, Umanas or Cambevas (flat-heads), a tribe of South American Indians of the Amazon valley. Fabulous stories about the wealth of the Omaguas led to several early expeditions into their country, the most famous of which were those of George of Spires in 1536, of Philip von Hutten in 1541 and of Pedro de Ursua in 1560. In 1645 Jesuits began work. In 1687 Father Fritz, ” apostle of the Omaguas,” established some forty mission villages. The Omaguas are still numerous and powerful around the head waters of the Japura and Uaupes.

OMAHA, the county-seat of Douglas county and the largest city in Nebraska, U.S.A., situated on the W. bank of the Missouri river, about 20 m. above the mouth of the Platte. Pop. (1880) 30,518, (1890) 66,S36, 5 (1900) 102,555, of whom 23,552 (comprising 5522 Germans, 3968 Swedes, 2430 Danes, 2170 Bohemians, 2164 Irish, 1526 English, 1141 English Canadians,

5 These are the figures given in Census Bulletin 71, Estimates of Population, 1904, 1905, 1906 (1907), and are the arithmetical mean between the figures for 1880 and those for 1900, those of the census of 1890 being 140,452; these are substituted by the Bureau of the Census, as the 1890 census was in error. In 1910, according to the U.S. census, the population was 124,096.

997 Russians, &c.) were foreign-born and 3443 were negroes, (1906 estimate) 124,167. Originally, with Council Bluffs, Iowa, the eastern terminus of the first Pacific railway, Omaha now has outlets over nine great railway systems : the Chicago, Burlington & Quincy, the Union Pacific, the Chicago, E.ock Island & Pacific, the Chicago Great-Western, the Chicago & North- Western, the Chicago, Milwaukee & St Paul, the Illinois Central, the Missouri Pacific and the Wabash. Bridges over the Missouri river connect Omaha with Council Bluffs. The original town site occupied an elongated and elevated river terrace, now given over wholly to business; behind this are hills and bluffs, over which the residential districts have extended.

Among the more important buildings are the Federal Building, Court House, a city-hall, two high schools, one of which is one of the finest in the country, a convention hall, the Auditorium and the Public Library. Omaha is the see of Roman Catholic and Protestant Episcopal bishoprics. Among the educational institutions are a state school for the deaf (1867); the medical department and orthopaedic branch of the University of Nebraska (whose other departments are at Lincoln); a Presbyterian Theological Seminary (1891); and Creighton University (Roman Catholic, under Jesuit control). This university, which was founded in honour of Edward Creighton (d. 1874) (whose brother, Count John A. Creighton, d. 1907, gave large sums in his lifetime and about $1,250,000 by his will), by his wife Mary Lucretia Creighton (d. 1876), was incorporated in 1879; it includes the Creighton Academy, Creighton College (1875), to which a Scientific Department was added in 1883, the John A. Creighton Medical College (1892), the Creighton Univer- sity College of Law (1904), the Creighton University Dental College (1905) and the Creighton College of Pharmacy (1905). In 1909-1910 it had 120 instructors and 800 students. St Joseph's Hospital (Roman Catholic) was built as a memorial to John A. Creighton. The principal newspapers are the Omaha Bee, the World-Herald and the News. The Omaha Bee was established in 1871 by Edward Rosewater (1841-1906), who made it one of the most influential Republican journals in the West. The World-Herald (Democratic), founded in 1865 by George L. Miller, was edited by William Jennings Bryan from 1894 to 1896.

Omaha is the headquarters of the United States military department of the Missouri, and there are military posts at Fort Omaha (signal corps and station for experiments with war bal- loons), immediately north, and Fort Crook (infantry), 10 m. S. of the city. A carnival, the " Festival of Ak-Sar-Ben," is held in Omaha every autumn. Among the

manufacturing establish- ments of Omaha are breweries (product value in 1905, $1,141,424) and distilleries, silver and lead smelting and refining works, railway shops, flour and grist-mills and dairies. The product- value of its manufactures in 1900 ($43,168,876) constituted 30% of the total output of the state, not including the greater product (48-7% of the total) of South Omaha (q.v.), where the industrial interests of Omaha are largely concentrated. The ” factory ” product of Omaha in 1905 was valued at $54,003,704, an increase of 41-8 % over that ($38,074,244) for 1900. The net debt of the city on the 1st of May 1909 was $5,770,000; its assessed value in 1909 (about ˆ of cash value) was $26,749,148, and its total tax-rate was $5-73 per $1000.

In 1804 Meriwether Lewis and William Clark camped on the Omaha plateau. In 1825 a licensed Indian post was established here. In 1846 the Mormons settled at ” Winter Quarters ” — after 1854 called Florence (pop. in 1900, 668), and in the immedi- ate environs (6 m. N.) of the present Omaha — and by 1847 had built up camps of some 12,000 inhabitants on the Nebraska and Iowa sides of the Missouri. Compelled to remove from the Indian reservation within which Winter Quarters lay, they founded Kanesville” on the Iowa side (which also was called Winter Quarters by the Mormons, and after 1853 was known as Council Bluffs), gradually emigrating to Utah in the years following. Winter Quarters (Florence) was deserted in 1848, but many Mormons were still in Nebraska and Iowa, and their local in- fluence was strong for nearly a decade afterwards. Not all had

left Nebraska in 1853. Speculative land ” squatters ” intruded upon the Indian lands in that year, and a rush of settlers followed the opening of Nebraska Territory under the Kansas-Nebraska Bill of 1854. Omaha (named from the Omaha Indians) was platted in 1854, and was first chartered as a city in 1857. It was the provisional territorial capital in 1854-1855, and the regular capital in 1855-1867. Its charter status has often been modified. Since 1887 it has been the only city of the state governed under the general charter for metropolitan cities. Prairie freighting and Missouri river navigation were of importance before the construction of the Union Pacific railway, and the activity of the city in securing the freighting interest gave her an initial start over the other cities of the state. Council Bluffs was the legal, but Omaha the practical, eastern terminus of that great undertaking, work on which began at Omaha in December 1863. The city was already connected as early as 1863 by telegraph with Chicago, St Louis, and since 1861 with San Francisco. Lines of the present great Rock Island, Burlington and North- western railway systems all entered the city in the years 1867- 1868. Meat-packing

began as early as 1871, but its first great advance followed the removal of the Union stock yards south of the city in 1884. South Omaha (5.11.) was rapidly built up around them. A Trans-Mississippi Exposition illustrating the progress and resources of the states west of the Mississippi was held at Omaha in 1898. It represented an investment of $2,000,000, and in spite of financial depression and wartime, 90% of their subscriptions were returned in dividends to the stockholders.

OMAHAS, a tribe of North American Indians of Siouan stock. They were found on St Peter's river, Minnesota, where they lived an agricultural life. Owing to a severe epidemic of small- pox they abandoned their village, and wandered westward to the Niobrara river in Nebraska. After a succession of treaties and removals they are now located on a reservation in eastern Nebraska, and number some 1200.

OMALIUS D'HALLOY, JEAN BAPTISTS JULIEN D' (1783- 1S75), Belgian geologist, was born on the 16th of February 1783 at Liege, and educated firstly in that city and afterwards in Paris. While a youth he became interested in geology, and being of independent means he was able to devote his energies to geological researches. As early as 1808 he communicated to the Journal des mines a paper entitled Essai sur la gSologie du Nord de la France. He became maire of Skeuvre in 1807, governor of the province of Namur in 1815, and from 1848 occupied a place in the Belgian senate. He was an active member of the Belgian Academy of Sciences from 1816, and served three times as president. He was likewise president of the Geological Society of France in 1852. In Belgium and the Rhine provinces he was one of the geological pioneers in deter- mining the stratigraphy of the Carboniferous and other rocks. He studied also in detail the Tertiary deposits of the Paris Basin, and ascertained the extent of the Cretaceous and some of the older strata, which he for the first time clearly depicted on a map (1817). He was distinguished as an ethnologist, and when nearly ninety years of age he was chosen president of the Congress of Pre-historic Archaeology (Brussels, 1872). He died on the 15th of January 1875. His chief works were: Memoires pour servir d la description giologique des Pays-Bas, de la France et de quelques contrees voisines (1828); EUmenls de giologie (1831, 3rd ed. 1839); Abregg de giologie (r853, 7th ed. 1862); Des races humaines, ou iUments d'ethnographie (5th ed., 1869).

Obituary by J. Gosselet, Bull. soc. geol. de France, ser. 3, vol. vi.

(1878).

OMAN, a kingdom occupying the south-eastern coast districts of Arabia, its southern limits being a little to the west of the meridian of 55 E. long., and the boundary on the north the southern borders of El Hasa. Oman and Hasa between them occupy the eastern coast districts of Arabia to the head of the Persian Gulf. The Oman-Hasa boundary has been usually drawn north of the promontory of El Katr. This is, however, incorrect. In 1870 Katr was under Wahhabi rule, but in the year 1871 Turkish assistance was requested to aid the settlement of a

family quarrel between certain Wahhabi chiefs, and the Turks thus obtained a footing in Katr, which they have retained ever since. Turkish occupation (now firmly established throughout El Hasa) includes Katif (the ancient Gerrha), and El Bidia on the coast of Katr. But the pearl fisheries of Katr are still under the protection of the chiefs of Bahrein, who are themselves under British suzerainty. In 1895 the chief of Katr (Sheikh Jasim ben Thani), instigated by the Turks, attacked Sheikh Isa of Bahrein, but his fleet of dhows was destroyed by a British gunboat, and Bahrein (like Zanzibar) has since been detached from Oman and placed directly under British protection.

Oman is a mountainous district dominated by a range called Jebel Akhdar (or the Green Mountain), which is 10,000 ft. in altitude, and is flanked by minor ranges running approximately parallel to the coast, and shutting off the harbours from the interior. They enclose long lateral valleys, some of which are fertile and highly cultivated, and traversed by narrow precipitous gorges at intervals, which form. the only means of access to the interior from the sea. Beyond the mountains which flank the cultivated valleys of Semail and Tyin, to the west, there stretches the great Ruba el Khali, or Dahna, the central desert of southern Arabia, which reaches across the continent to the borders of Yemen, isolating the province on the landward side just as the rugged mountain barriers shut it off from the sea. The wadis (or valleys) of Oman (like the wadis of Arabia generally) are merely torrential channels, dry for the greater part of the year. Water is obtained from wells and springs in sufficient quantity to supply an extensive system of irrigation.

The only good harbour on the coast is that of Muscat, the capital of the kingdom, which, however, is not directly connected with the interior by any mountain route. The little port of Matrah, immediately

contiguous to Muscat, offers the only opportunity for penetrating into the interior by the wadi Kahza, a rough pass which is held for the sultan or imam of Muscat by the Rehbayin chief. In 1883, owing to the treachery of this chief, Muscat was besieged by a rebel army, and disaster was only averted by the guns of H.M.S. ” Philomel.” About 50 m. south of Muscat the port of Kuryat is again connected with the inland valleys by the wadi Hail, leading to the gorges of the wadi Thaika or ” Devil’s Gap.” Both routes give access to the wadi Tyin, which, enclosed between the mountain of El Beideh and Hallowi (from 2000 to 3000 ft. high), is the garden of Oman. Fifty miles to the north-west of Muscat this interior region may again be reached by the transverse valley of Semail, leading into the wadi Munsab, and from thence to Tyin. This is generally reckoned the easiest line for travellers. But all routes are difficult, winding between granite and limestone rocks, and abounding in narrow defiles and rugged torrent beds. Vegetation is, however, tolerably abundant — tamarisks, oleanders, kafas, euphorbias, the milk bush, rhamnus and acacias being the most common and most characteristic forms of vegetable life, and pools of water are frequent. The rich oasis of Tyin contains many villages em- bosomed in palm groves and surrounded with orchards and fields.

In addition to cereals and vegetables, the cultivation of fruit is abundant throughout the valley. After the date, vines, peaches, apricots, oranges, mangoes, melons and mulberries find special favour with the Rehbayin, who exhibit all the skill and perseverance of the Arab agriculturist of Yemen, and cultivate everything that the soil is capable of producing.

The sultan, a descendant of those Yemenite imams who con- solidated Arab power in Zanzibar and on the East African coast, and raised Oman to its position as the most powerful state in Arabia during the first half of the 19th century, resides at Muscat, where his palace directly faces the harbour, not far from the British residency. The little port of Gwadar, on the Makran coast of the Arabian Sea, a station of the Persian Gulf telegraph system, is still a dependency of Oman.

See Colonel Miles, Geographical Journal, vol. vii. (1896); Com- mander Stiffe, Geographical Journal (1899). (T. H. H.*)

OMAR (c. 581-644), in full ‘Omar ibn al-Khattab, the second of the Mahommedan caliphs (see Caliphate, A, §§ 1 and 2).

Originally opposed to Mahomet, he became later one of the ablest advisers both of him and of the first caliph, Abu Bekr. His own reign

(634-644) saw Islam's transformation from a religious sect to an imperial power. The chief events were the defeat of the Persians at Kadisiya (637) and the conquest of Syria and Palestine. The conquest of Egypt followed (see Egypt and Amr ibn el-Ass) and the final rout of the Persians at Nehawend (.641) brought Iran under Arab rule. Omar was assassinated by a Persian slave in 644, and though he lingered several days after the attack, he appointed no successor, but only a body of six Muhajirun who should select a new caliph. Omar was a wise and far-sighted ruler and rendered great service to Islam. He is said to have built the so-called " Mosque of Omar " (" the Dome of the Rock ") in Jerusalem, which contains the rock regarded by Mahommedans as the scene of Mahomet's ascent to heaven, and by the Jews as that of the proposed sacrifice of Isaac.

'OMAR KHAYYAM [in full, Ghiyathtjddin Abulfath 'Omar bin IbrIhih al-KhayyamI], the great Persian mathe- matician, astronomer, freethinker and epigrammatist, who derived the epithet Khayyam (the tentmaker) most likely from his father's trade, was born in or near Nlshapur, where he is said to have died in a.h. 517 (a.d. 1123). At an early age he entered into a close friendship both with Nizam-ul-mulk and his school- fellow Hassan ibn Sabbah, who founded afterwards the terrible sect of the Assassins. When Nizam-ul-mulk was raised to the rank of vizier by the Seljuk sultan Alp-Arslan (a.d. 1063-1073) he bestowed upon H a ssan ibn Sabbah the dignity of a chamber- lain, whilst offering a similar court office to 'Omar Khayyam. But the latter contented himself with an annual stipend which would enable him to devote all his time to his favourite studies of mathematics and astronomy. His standard work on algebra, written in Arabic, and other treatises of a similar character raised him at once to the foremost rank among the mathemati- cians of that age, and induced Sultan Malik-Shah to summon him in a.h. 467 (a.d. 1074) to institute astronomical observations on a larger scale, and to aid him in his great enterprise of a thorough reform of the calendar. The results of 'Omar's research were — a revised edition of the Zij or astronomical tables, and the introduction of the Ta'rlkh-i-Malikshahl or Jalali, that is, the so-called Jalalian or Seljuk era, which commences in a.h. 471 (a.d. 1079, 15th March).

'Omar's great scientific fame, however, is nearly eclipsed by his still greater poetical renown, which he owes to his ruba'is or quatrains, a collection of about 500 epigrams. The peculiar form of the rubai — viz. four lines, the first, second and fourth of which have the same rhyme, while the third usually (but not always) remains rhymeless — was first successfully introduced into Persian literature as the exclusive vehicle for subtle thoughts on the various topics of Sufic

mysticism by the sheikh Abu. Sa'ld bin Abulkhair, 1 but 'Omar differs in its treatment considerably from Abu Sa'ld. Although some of his quatrains are purely mystic and pantheistic, most of them bear quite another stamp; they are the breviary of a radical freethinker, who protests in the most forcible manner both against the narrowness, bigotry and uncompromising austerity of the orthodox ulema and the eccentricity, hypocrisy and wild ravings of advanced Sufis, whom he successfully combats with their own weapons, using the whole mystic terminology simply to ridicule mysticism itself. There is in this respect a great resemblance between him and Hafiz, but 'Omar is decidedly superior. He has often been called the Voltaire of the East, and cried down as materialist and atheist. As far as purity of diction, fine wit, crushing satire against a debased and ignorant clergy, and a general sympathy with suffering humanity are concerned, 'Omar certainly reminds us of the great Frenchman; but there the comparison ceases. Voltaire never wrote anything equal to 'Omar's fascinat- ing rhapsodies in praise of wine, love and all earthly joys, and his passionate denunciations of a malevolent and inexorable

1 Died Jan. 1049. Comp. Ethels edition of his ruba'is in Sitzungs- berichte der bayr. Akademie (i875),pp. I45seq.,and (i878)pp. 38seq.: and E. G. Browne's Literary Hist, of Persia, ii. 261.

fate which dooms to slow decay or sudden death and to eternal oblivion all that is great, good and beautiful in this world. There is a touch of Byron, Swinburne and even of Schopenhauer in many of his tubals, which clearly proves that the modern pessimist is by no means a novel creature in the realm of philo- sophic thought and poetical imagination.

The Leiden copy of 'Omar Khayyam's work on algebra was noticed as far back as 1742 by Gerald Meerman in the preface to his Specimen calculi fluxionalis; further notices of the same work by Sedillot appeared in the Nouv. Jour. As. (1834) aru i ' n v °b x "i- of the Notices et extraits des MSS. de la Bibl. roy. The complete text, together with a French translation (on the basis of the Leiden and Paris copies, the latter first discovered by M. Libri, see his Histoire des sciences mathematiques en Italie, i. 300), was edited by F. Woepcke, L'Algebre d'Omar Alkhayyami (Paris, 1851). Articles on 'Omar's life and works are found in Reinaud's Geographie d'Aboul- feda, pref., p. 101 ; Notices et extraits, ix. 143 seq.; Garcin de Tassy, Note sur les

Ruba'iyat de 'Omar Hhaiyam (Paris, 1857); Rieu, Cat. Pers. MSS. in the Br. Mus., ii. 546; A. Christensen, Recherches sur les Ruba'iydt de 'Omar Hayyam (Heidelberg, 1905) ; V. Zhukov- ski's 'Umar Khayyam and'the " Wandering " Quatrains, translated from the Russian by E. D. Ross in the Journal of the Royal Asiatic Society, xxx. (1898); E. G. Browne, Literary History of Persia, ii. 246. The quatrains have been edited at Calcutta (1836) and Teheran (1857 and 1862) ; text and French translation by J. B. Nicolas (Paris, 1867) (very incorrect and misleading); a portion of the same, rendered in English verse, by E. FitzGerald (London, 1859, 1872 and 1879). FitzGerald's translation has been edited with commentary by H. M. Batson (1900), and the 2nd ed. of the same (1868) by E. Heron Allen (1908). A new English version was published in Triibner's " Oriental " series (1882) by E. H. Whinfield, and the first critical edition of the text, with translation, by the same (1883). Important later works are N. H. Dole's variorum edition (1896), J. Payne's translation (1898), E. Heron Allen's edition (1898) and the Life by L K. M. Shirazi (1905); but the literature in new translations and imitations has recently multiplied exceedingly. (H. E. ; X.)

OMBRE, a card game, very fashionable at the end of the 18th century, but now practically obsolete. The following recom- mendation of the game is taken from the Court Gamester, a book published in 1720 for the use of the daughters of the prince of Wales, afterwards George II: —

" The game of Ombre owes its invention to the Spaniards, and it has in it a great deal of the gravity peculiar to that nation. It is called Ombre, or The Man. It was so named as requiring thought and reflection, which are qualities peculiar to many or rather alluding to him who undertakes to play the game against the rest of the gamesters, and is called the man. To play it well requires a great deal of application, and. let a man be ever so expert, he will be apt to fall into mistakes if he think of anything else or is disturbed by the conversation of them that look on. ... It will be found the most delightful and entertaining of all games to those who have anything in them of what we call the spirit of play."

Ombre is played by three players with a pack of 40 cards, the 8, 9 and 10 being dispensed with. The order of value of the hands is irregular, being different for trumps and suits not trumps. In a suit not trumps the order is, for red suits: K, Q, Kn, ace, 2, 3, 4, 5, 6, 7; for black suits: K, Q, Kn, 7, 6, 5, 4, 3, 2. In trump suits the ace of spades, called spadiile, is always a trump, and the highest one, whichever of the four suits may be trumps. The order for red suit trumps is; ace of spades 7

(called manille), ace of clubs (called basto), ace (called ponto), K, Q, Kn, 2, 3, 4, 5, 6. For black suit trumps: ace of spades {spadiile), 2 {manille), ace {basto), K, Q, Kn, 7, 6, 5, 4, 3. There is no ponto in black trumps. The three highest trumps are called matador es (or mats). The holder of them has the privilege of not following suit, except when a higher mat is played, which forces a lower one if the hand contains no other trump.

Cards are dealt round, and the receiver of the first- black ace is the dealer. He deals (towards his right) nine cards, by threes, to each player. The remaining 13 cards form the stock or talon, as at piquet. Each deal constitutes a game. One hand plays against the other two, the solo player being called the Ombre. The player at the dealer's right has the first option of being Ombre, which entails two privileges: that of naming the trump suit, and that of throwing away as many of his cards as he chooses, receiving new ones in their place, as at poker. If, with these advantages in mind, he thinks he can win against the other two hands, he says, " I ask leave," or " I play." But in this case his right-hand neighbour has the privilege of claiming

Ombre for himself, providing he is willing to play his hand without drawing new cards, or, as the phrase goes, sans prendre. If, how- ever, the other player reconsiders and decides that he will himself play without drawing cards, he can still remain Ombre. If the second player passes, the dealer in his turn may ask to play sans prendre, as above. If all three pass a new deal ensues. After the ©mbre discards (if he does not play sans prendre) the two others in turn do likewise, and, if any cards are left in the stock, the last discarder may look at them (as at piquet) and the others after him. But if he does not look at them the others lose the privilege of doing so.

The manner of play is like whist, except that it is towards the right. The second and third players combine to defeat Ombre. If in the sequel Ombre makes more tricks than either of his opponents he wins. If one of his opponents makes more than Ombre the latter loses (called codille) . If Ombre and one or both of his opponents make the same number of tricks the game is drawn. When Ombre makes all nine tricks he wins a vole. The game is played with counters having certain values, the pool being emptied by the winner. If all pass, a counter of low value is paid into the pool by each player. If Ombre wins he takes the entire pool. If he draws he forfeits to the pool a sum equal to that already in it, i.e. the pool is doubled. If either of his opponents makes the majority of the tricks {codille), Ombre pays him a sum equal to that in the pool, which itself remains untouched until the next game. When the pool is emptied each player pays in three counters.

OMDURMAN, a town of the Anglo-Egyptian Sudan, on the west bank of the Nile, immediately north of the junction of the White and Blue Niles in 15° 38′ N., 32° 29′ E., 2 m. N. by W. of Khartum. Pop. (1909 census) 42,779, of whom 541 were Europeans. The town covers a large area, being over 5 m. long and 2 broad. It consists for the most part of mud huts, but there are some houses built of sun-dried bricks. Save for two or three wide streets which traverse it from end to end the town is a network of narrow lanes. In the centre facing an open space are the ruins of the tomb of the Mahdi and behind is the house in which he lived. The Khalifa's house (a two-storeyed building), the mosque, the Beit el Amaaa (arsenal) and other houses famed in the history of the town also face the central square. A high wall runs behind these buildings parallel with the Nile. Omdurman is the headquarters of the native' traders in the Anglo-Egyptian Sudan, the chief articles of commerce being ivory, ostrich feathers and gum arabic from Darfur and Kordofan. There is also an important camel and cattle market. Nearly every tribe in the Sudan is represented in the population of the city. Among the native artificers the metal workers and leather dressers are noted. The government maintains elementary and technical schools. Mission work is undertaken by various Protestant and Roman Catholic societies.

Omdurman, then an insignificant village, was chosen in 1884 by the Mahdi Mahommed Ahmed as his capital and so continued after the fall of Khartum in January 1885. Its growth was rapid, the Khalifa (who succeeded the Mahdi) compelling large numbers of disaffected tribesmen to live in the town under the eye of his soldiery. Here also were imprisoned the European captives of the Mahdists — notably Slatin Pasha and Father Ohrwalder. On the 2nd of September 1898 the Anglo-Egyptian army under Lord Kitchener totally defeated the forces of the Khalifa at Kerreri, 7 m. N. of the town. A marble obelisk marks the spot where the 21st Lancers made a charge. Within the enclosure of the Khalifa's house is the tomb of Hubert Howard, son of the 9th earl of Carlisle, who was killed in the house at the capture of the city by a splinter of a shell fired at the Mahdi's tomb. (See Sudan: Angle-Egyptian.)

OMELETTE, sometimes Anglicized as "omelet," a French word of which the history is an example of the curious changes a word may undergo. The ultimate origin is Lat. lamella, diminutive of lamina, plate; this became in French lamelle, and a wrong division of la lamelle gave alamelle, alemelle, or alumelle; thence alemette, metathesized to amelelte and aumelete, the form in which the word appears in the 15th and 16th centuries. The

original meaning seems to be a pancake of a thin fiat shape. Omelettes are made with eggs," beaten up lightly, with the addition of milk, flour, herbs, cheese, mushrooms, &c, according to the requirement, and cooked quickly in a buttered pan.

OMEN (a Latin word, either connected with os, mouth, or more probably with auris (Gr. o5s, ear; apparently, meaning " a thing heard " or " spoken "), a sign in divination, favourable or unfavourable as the case may be (see Divination, Augurs and Oracle). The taking of omens may be said to be a part of all systems of divination, in which the future is predicted by means of indications of one sort or another; and tradition has thus gathered round many subjects — events, actions, colours, numbers, &c.— which are considered " ominous," an adjective which generally connotes ill-fortune.

One of the oldest and most widespread methods of divining the future, both among primitive people and among several of the civilizations of antiquity, was the reading of omens in the signs noted on the liver of the animal offered as a sacrifice to some deity. The custom is vouched for by travellers as still observed in Borneo, Burma, Uganda and elsewhere, the animal chosen being a pig or a fowl. It constituted the most common form of divination in ancient Babylonia, where it can be traced back to the 3rd millennium B.C. Among the Etruscans the prominence of the rite led to the liver being looked upon as the trade-mark of the priest. From the Etruscans it made its way to the Romans, though as we shall see it was also modified by them. The evidence for the rite among the Greeks is sufficient to warrant the conclusion of its introduction at a very early period and its persistence to a late day.

The theory upon which the rite everywhere rests is clearly the belief, for which there is an abundance of concurrent testi- mony, that the liver was at one time regarded as the seat of vitality. This belief appears to be of a more primitive character than the view which places the seat of life in the heart, though we are accustomed to think that the latter was the prevailing view in antiquity. The fact, however, appears to be that the prominence given to the heart in popular beliefs dates from the time when in the course of the development of anatomical knowledge the important function of the heart in animal life came to be recognized, whereas the supposition that the liver is the seat of vitality rests upon other factors than anatomical knowledge, and,- being independent of such knowledge, also

antedates it. Among the reasons which led people to identify the liver with the very source of life, and hence as the seat of all affections and emotions, including what to us are intellectual functions, we may name the bloody appearance of that organ. Filled with blood, it was natural to regard it as the seat of the blood, and as a matter of fact one-sixth of the entire blood of man is in the liver, while in the case of some animals the propor- tion is even larger. Now blood was everywhere in antiquity associated with life, and the biblical passage, Genesis ix. 3, which identifies the blood with the soul of the animal and there- fore prohibits its use fairly represents the current conception both among primitive peoples as well as among those who had advanced along the road of culture and civilization. The liver being regarded as the seat of the blood, it was a natural and short step to identify the liver with the soul as well as with the seat of life, and therefore as the centre of all manifestations of vitality and activity. In this stage of belief, therefore, the liver is the seat of all emotions and affections, as well as of intellectual functions, and it is only when with advancing anatomical know- ledge the functions of the heart and then of the brain come to be recognized that a differentiation of functions takes place which had its outcome in the assignment of intellectual activity to the brain or head, of the higher emotions and affections (as love and courage) to the heart, while the liver was degraded to the rank of being regarded as the seat of the lower emotions and affections, such as jealousy, moroseness and the like.

Hepatoscopy, or divination through the liver, belongs therefore to the primitive period when that organ summed up all vitality and was regarded as the seat of all the emotions and affections— the higher as well as the lower— and also as the seat of intellectual

functions. The question, however, still remains to be answered how people came to the belief or to the assumption that through the soul, or the seat of life of the sacrificial animal, the intention of the gods could be divined. There are two theories that may be put forward. The one is that the animal sacrificed was looked upon as a deity, and that, therefore, the liver represented the soul of the god; the other theory is that the deity in accepting the sacrifice identified himself with the animal, and that, there- fore, the liver as the soul of the animal was the counterpart of the soul of the god. It is true that the killing of the god plays a prominent part in primitive cults, as has been shown more particularly through the valuable researches of J. G. Frazer {The Golden Bough). On the other hand, serious difficulties arise if we assume that every animal sacrificed represents a deity; and even assuming that such a belief underlies the rite of animal sacrifice, a modification of the belief must have been introduced when such

sacrifices became a common rite resorted to on every occasion when a deity was to be approached. It is manifestly impossible to assume, e.g. that the daily sacrifices which form a feature of advanced cults involved the belief of the daily slaughter of some deity, and even before this stage was reached the primitive belief of the actual identification of the god with the animal must have yielded to some such belief as that the deity in accepting the sacrifice assimilates the animal to his own being, precisely as man assimilates the food that enters into his body. The animal is in a certain sense, indeed, the food of the god.

The theory underlying hepatoscopy therefore consists of these two factors: the belief (1) that the liver is the seat of life, or, to put it more succinctly, what was currently regarded as the soul of the animal; and (2) that the liver of the sacrificial animal, by virtue of its acceptance on the part of the god, took on the same character as the soul of the god to whom it was offered. The two souls acted in accord, the soul of the animal becoming a reflection, as it were, of the soul of the god. If, therefore, one understood the signs noted on a particular liver, one entered, as it were, into the mind — as one of the manifesta- tions of soul-life — of the deity who had assimilated the being of the animal to his own being. To know the mind of the god was equivalent to knowing what the god in question proposed to do. Hence, when one approached a deity with an inquiry as to the outcome of some undertaking, the reading of the signs on the liver afforded a direct means of determining the course of future events, which was, according to current beliefs, in the control of the gods. That there are defects in the logical process as here outlined to account for the curious rite constitutes no valid objection to the theory advanced, for, in the first place, primitive logic in matters of belief is inherently defective and even contra- dictory, and, secondly, the strong desire to pierce the mysterious future, forming an impelling factor in all religions — even in the most advanced of our own day — would tend to obscure the weakness of any theory developed to explain a rite which represents merely one endeavour among many to divine the intention and plans of the gods, upon the knowledge of which so much of man's happiness and welfare depended.

Passing now to typical examples, the beginning must be made with Babylonia, which is also the richest source of our knowledge of the details of the rite. Hepatoscopy in the Euphrates valley can be traced back to the 3rd millennium before our era, which may be taken as sufficient evidence for its survival from the period of .primitive culture, while the supreme importance attached to signs read on the livers of sacrificial animals — usually a sheep — follows from the care

with which omens derived from such inspection on occasions of historical significance were pre- served as guides to later generations of priests. Thus we have a collection of the signs noted during the career of Sargon I. of Agade (c. 2800 B.C.), which in some way were handed down till the days of the Assyrian king Assur-bani-pal (668-626 B.C.). One of the chief names for the priest was baru— literally the ” in- spector ” — which was given to him because of the prominence of his function as an inspector of livers for the purpose of divining the intention of the gods. It is to the collections formed by these

Jdrfi-priests as a guidance for themselves and as a basis of instruction for those in training for the priesthood that we owe our knowledge of the parts of the liver to which particular attention was directed, of the signs noted, and of the principles guiding the interpretation of the signs.

The inspection of the liver for purposes of divination led to the study of the anatomy of the liver, and there are indeed good reasons for believing that hepatoscopy represents the starting- point for the study of animal anatomy in general. We find in the Babylonian-Assyrian omen-texts special designations for the three main lobes of the sheep’s liver — the lobus dexter, the lobus sinister and the lobus caudatus; the first-named being called ” the right wing of the liver,” the second ” the left wing of the liver,” and the third ” the middle of the liver.” Whether the division of the lobus dexter into two divisions — (1) lobus dexter proper and (2) lobus quadratus, as in modern anatomical nomenclature — was also assumed in Babylonian hepatoscopy, is not certain, but the groove separating the right lobe into two sections — the fossa venae umbilicalis — was recognized and dis- tinguished by the designation of ” river of the liver.” The two appendixes attached to the upper lobe or lobus pyramidalis, and known in modern nomenclature as processus pyramidalis and processus papillaris, were described respectively as the “finger” of the liver and as the ” offshoot.” The former of these two appendixes plays an especially important part in hepatoscopy, and, according to its shape and peculiarities, furnishes a good or bad omen. The gall-bladder, appropriately designated as ” the bitter,” was regarded as a part of the liver, and the cystic duct (compared, apparently, to a ” penis “) to which it is joined, as well as the hepatic duct (pictured as an ” outlet “) and the ductus choleductus (described as a ” yoke “), all had their

special designations. The depression separating the two lower lobes from the lobus caudatus, and known as the porta hepatis, was appropriately designated as the ” crucible ” of the liver. Lastly, to pass over unnecessary details, the markings of various kinds to be observed on the lobes of the livers of freshly-slaughtered animals, which are due mainly to the traces left by the sub- sidiary hepatic ducts and hepatic veins on the liver surface, were described as ” holes,” ” paths,” ” clubs ” and the like. The constantly varying character of these markings, no two livers being alike in this respect, furnished a particularly large field for the fancy of the fcara-priest.

In the interpretation of these signs the two chief factors were association of ideas and association of words. If, for example, the processus pyramidalis was abnormally small and the pro- cessus papillaris abnormally large, it pointed to a reversion of the natural order, to wit, that the servant should control the master or that the son would be above the father. A long cystic duct would point to a long reign of the king. If the gall-bladder was swollen, it pointed to an extension or enlargement of some kind. If the porta hepatis was torn it prognosticated a plundering of the enemy’s land. As among most people, a sign on the right side was favourable, but the same sign on the left side unfavour- able. If, for example, the porta hepatis was long on the right side and short on the left side, it was a good sign for the king’s army, but if short on the right side and long on the left, it was unfavourable; and similarly for a whole series of phenomena connected with any one of the various subdivisions of the liver. Past experience constituted another important factor in establish- ing the interpretation of signs noted. If, for example, on a certain occasion when the liver of a sacrificial animal was examined, certain events of a favourable character followed, the conclusion was drawn that the signs observed were favourable, and hence the recurrence of these signs on another occasion suggested a favourable answer to the question put to the priests. With this in view, omens given in the reigns of prominent rulers were preserved with special care as guides to the priests.

In the course of time the collections of signs and their inter- pretation made by the i

of instruction and as a basis for the practical work of divination. Divination through the liver remained in force among the Assyrians and Babylonians down to the end of the Babylonian Empire.

Among the Greeks and Romans likewise it was the liver that continued throughout all periods to play the chief role in divina- tion

through the sacrificial animal. Blecher (De Extispicio Capita Tria, Giessen, 1905, pp. 3-22) has recently collected most of the references in Greek and Latin authors to animal divination, and an examination of these shows conclusively that, alth >ugh the general term used for the inspection of the sacrificial animal was iera or iereia (i.e. ” victims ” cr ” sacred parts “) in Greek, and exta in Latin, when specific illustrations are introduced, the reference is almost invariably to some sign or signs on the liver; and we have an interesting statement in Pliny (Hist. Nat. xi. § 186), furnishing the date (274 B.C.) when the examination of the heart was for the first time introduced by the side of the liver as a means of divining the future, while the lungs are not mentioned till we reach the days of Cicero (de Divinatione, i. 85). We are justified in concluding, therefore, that among the Greeks and Romans likewise the examination of the liver was the basis of divination in the case of the sacrificial animal. It f**well known that the Romans borrowed their methods of hepatoscopy from the Etruscans, and, apart from the direct evidence for this in Latin writings, we have, in the case of the bronze model of a liver found near Piacenza in 1877, and of Etruscan origin, the unmistakable proof that among the Etruscans the examination of the liver was the basis of animal divination. Besides this object dating from about the 3rd century B.C., according to the latest investigator, G. Korte (” Die Bronzeleber von Piacenza,” in Mitt. d. K. D. Archaeol. Instituts, 1905, xx. pp. 348-379), there are other Etruscan monuments, e.g. the figure of an Etruscan augur holding a liver in his hand as his trade-mark (Korte, ib. pi. xiv.), which point in the same direction, and indicate that the model of the liver was used as an object lesson to illustrate the method of divination through the liver. For further details the reader is referred to Thulin’s monograph, Die Etruskische Disciplin, II Die Haruspicin (Gothenburg,

1906).

As for the Greeks, it is still an open question whether they perfected their method of hepatoscopy under Etruscan influence or through the Babylonians. In any case, since the Eastern origin of the Etruscans is now generally admitted, we may temporarily, at least, accept the conclusion that hepatoscopy as a method of divination owes its survival in advanced forms of culture to the elaborate system devised in the course of centuries by the Babylonian priests, and to the influence, direct and indirect, exerted by this system in the ancient world. But for this system hepatoscopy, the theoretic basis of which as above set forth falls within the sphere of ideas that belong to primitive culture, would have passed away as higher stages of civilization were reached; and as a matter of fact it plays no part in the Egyptian

culture or in the civilization of India, while among the Hebrews only faint traces of the primitive idea of the liver as .the seat of the soul are to be met with in the Old Testament, among which an allusion in the indirect form of a protest against the use of the sacrificial animal for purposes of divination in the ordinance (Exodus xxix. 13, 22; Leviticus iii. 4, 10, 15, &c.) to burn the processus pyramidalis of the liver, which played a particularly significant r61e in hepatoscopy, calls for special mention.

In modern times hepatoscopy still survives among primitive peoples in Borneo, Burma* Uganda, &c.

It but remains to call attention to the fact that the earlier view of the liver as the seat of the soul gave way among many ancient nations to ‘the theory which, reflecting the growth of anatomical knowledge, assigned that function to the heart, while, with the further change which led to placing the seat of soul-life in the brain, an attempt was made to partition the various functions of manifestations of personality among the three organs, brain, heart and liver, the intellectual activity being assigned to the first-named; the higher emotions, as love

and courage, to the second; while the liver, once the master of the entire domain of soul-life as understood in antiquity, was degraded to serve as the seat of the lower emotions, such as jealousy, anger and the like. This is substantially the view set forth in the Timaeus of Plato (§71 c). The addition of the heart to the liver as an organ of the revelation of the divine will, reflects the stage which assigned to the heart the position once occupied by the liver. By the time the third stage, which placed the seat of soul-life in the brain, was reached through the further advance of anatomical knowledge, the religious rites of Greece and Rome were too deeply incrusted to admit of further radical changes, and faith in the gods had already dech’ned too far to bring new elements into the religion. In phrenology, however, as popularly carried on as an unofficial cult, we may recognize a modified form of divination, co-ordinate with the third stage in the development of beliefs regarding the seat of soul and based on the assumption that this organ is— as were its predecessors — ■ a medium of revelation of otherwise hidden knowledge.

(M. Ja.)

OMICHUND (d. 1767), an Indian whose name is indelibly associated with the treaty negotiated by Clive before the battle of Plassey in 1757. His real name was Amir Chand; and he was not a Bengali, as stated by Macaulay, but a Sikh from the Punjab. It is impossible now to unravel the intrigues in which he may have engaged, but some facts about his career can be stated. He had long been resident at Calcutta, where he had acquired a large fortune by providing the ” investment ” for the Company, and also by acting as intermediary between the English and the native court at Murshidabad. In a letter of Mr Watts of later date he is represented as saying to the nawab (Suraj-ud-daula) : “He had lived under the English protection these forty years; that he never knew them once to break their agreement, to the truth of which he took his oath by touching a Brahman’s foot; and that if a lie could be proved in England upon any one, they were spit upon and never trusted.” Several houses owned by him in Calcutta are mentioned in connexion with the fighting that preceded the tragedy of the Black Hole in 1756, and it is on record that he suffered heavy losses at that time. He had been arrested by the English on suspicion of treachery, but afterwards he was forward in giving help to the fugitives and also valuable advice. On the recapture of Calcutta he was sent by Clive to accompany Mr Watts as agent at Mur- shidabad. It seems to have been through his influence that the nawab gave reluctant consent to Clive’s attack on Chandernagore. Later, when the treaty with Mir Jafar was being negotiated, he put in a claim for 5 % on all the treasure to be recovered, under threat of disclosing the plot. To defeat him, two copies of the treaty were drawn up: the one, the true treaty, omitting his elaim; the other containing it, to be shown to him, which Admiral Watson refused to sign, but Clive directed the admiral’s signature to be appended. When the truth was revealed to Omichund after Plassey, Macaulay states (following Orme) that he sank gradually into idiocy, languished a few months, and then died. As a matter of fact, he survived for ten years, till 1767; and by his will he bequeathed £2000 to the Foundling Hospital (where his name may be seen in the list of benefactors as ” a black merchant of Calcutta “) and also to the Magdalen Hospital in London. (J. S. Co.)

OMNIBUS (Lat. ” for all “), a large closed public conveyance with seats for passengers inside and out (see Carriage). The name, colloquially shortened to ” bus,” was, in the form voiture omnibus, first used for such conveyances in Paris in 1828, and was taken by Shillibeer for the vehicle he ran on the Paddington road in 1829. The word is also applied to a box at the opera which is shared by several subscribers, to a bill or act of parlia- ment dealing with a variety of subjects, and m electrical engineer- ing to the bar to which the

terminals of the generators are attached and from which the current is taken off by the wires supplying the various consumers.

OMRI, in the Bible, the first great king of Israel after the separation of the two kingdoms of Israel and Judah, who nourished in the early part of the 9th century B.C. The

dynasty of Jeroboam had been exterminated by Baasha (see Asa) at a revolt when the army was besieging the Philistines at Gibbethon, an unidentified Danite site. A quarter of a century later, Baasha ‘s son Elah, after a reign of two years, was slain by Zimri, captain of the chariots, in a drinking bout, and again the royal family were put to the sword. Meanwhile, the general Omri, who was at Gibbethon, was promptly elected king by the army, and Zimri himself in a short while 1 met his death in the royal city of Tirzah. However, fresh disturbance was caused by Tibni ben Ginath (perhaps of Naph tali), and Israel was divided into rival factions. Ultimately Tibni and his brother Joram (1 Kings xvi. 22, LXX.) were overcome, and Omri remained in sole possession of the throne. The compiler of the biblical narratives takes little interest in Omri’s work (1 Kings xvi. 15-28), and records briefly his purchase of Samaria, which became the capital of his dynasty (see Samaria). The inscription of Mesha throws welcome light upon his conquest of Moab (q.v.); the position of Israel during the reign of Omri’s son Ahab (q.v.) bears testimony to the success of the father; and the fact that the land continued to be known to the Assyrians down to the time of Sargon as ” house of Omri ” indicates the reputation which this little-known king enjoyed. (S. A. C)

OMSK, a town of Russia, capital of the province of Akmolinsk, capital of western Siberia from 1839 to 1882, and now capital of the general-governorship of the Steppes. Pop. (1881) 31,000, (1900) 53,050. It is the seat of administration of the Siberian Cossacks, and the see of the bishop of Omsk. Situated on the right bank of the Irtysh, at its confluence with the Om, at an altitude of 285 ft., and on the Siberian railway, 1862 m. via Chelyabinsk from Moscow, and 586 m. W.S.W. of Tomsk, it is the meeting-place of the highways to middle Russia, Orenburg and Turkestan. Steamers ply down the Irtysh and the Ob, and up the former to the Altai towns and Lake Zaisan. The climate is dry and relatively temperate, but marked by violent snow-storms and sand-storms. The average temperatures are, for the year, 31° F.; for January, 5°; for July, 68°; the annual rainfall is 12-4 in. The town is poorly built. Apart from the railway workshops, its industries are unimportant (steam saw- mill, tanneries) ; but the trade, especially since the construction of the railway, is growing. There are two yearly fairs. Omsk has a society for education, which organizes schools,

kinder- gartens, libraries and lectures for the people. There are a corps of cadets, medical, dramatic and musical societies, and the west Siberian section of the Russian Geographical Society, with a museum.

The ” fort ” of Omsk was erected in 17 16 to protect the block- houses on the Russian frontier, along the Ishim and the Irtysh. In consequence of the frequent incursions of the Kirghiz about the end of the 18th century, stronger earthworks were erected on the right bank of the Om; but these have now almost entirely disappeared.

ONAGRACEAE, in botany, an order of dicotyledons belonging to the series Myrtiflorae, to which belongs also the myrtle order, Myrtaceae. It contains about 36 genera and 300 species, and occurs chiefly in the temperate • zone of the New World, especially on the Pacific side. It is represented in Britain by several species of Epilobium (willow-herb), Circaea (enchanter’s nightshade), and Ludwigia, a small perennial herb very rare in boggy pools in Sussex and Hampshire. The plants are generally herbaceous, sometimes annual, as species of Epilobium, Clarkia, Godetia, or biennial, as Oenothera biennis — evening primrose — – or sometimes become shrubby or arborescent, as Fuchsia (q.v.). The simple leaves are generally entire or inconspicuously toothed, and are alternate, opposite or whorled in arrangement ; they are generally exstipulate, but small caducous stipules occur in Fuchsia, Circaea and other genera. The flowers are often solitary in the leaf-axils, as in many fuchsias, Clarkia, &c, or associated, as in Epilobium and Oenothera, in large showy terminal spikes or racemes; in Circaea the small white or red

1 He is said to have reigned seven days, but the LXX. (B) in 1 Kings xvi. 15 read seven years. Further confusion is caused by the fact that the LXX. reads Zimri throughout for Omri.

flowers are borne in terminal and lateral racemer. The regular flowers have the parts in fours, the typical arrangement as illustrated by Epilobium, Oenothera and Fuchsia being as

follows: 4 sepals, 4 petals, two alternating whorls of 4 stamens, and 4 inferior carpels. The floral receptacle is pro- duced above the ovary into the so-called calyx- tube, which is often petaloid, as in Fuchsia, and is sharply distin- guished from the ovary, from which it separates after flowering.

In Clarkia the inner whorl of stamens is often barren, and in an allied genus, Eucharidium, it is absent. In Circaea the flower has its parts

Fig. 1. — Fuchsia coccinea. Fig. 2. — Floral diagram

1, Flower cut open after removal of of Circaea.

sepals; 2, fruit; 3, floral diagram.

in twos. Both sepals and petals are free; the former have a broad insertion, are valvate in bud, and reflexed in the flower; in Fuchsia they are petaloid. The petals have a narrow attachment, and are generally convolute in bud; they are entire (Fuchsia) or bilobed (Epilobium); in some species of Fuchsia they are small and scale-like, or absent (F. apetala). The stamens are free, and those of the inner whorl are generally shorter than those of the outer whorl. The flowers of Lopezia (Central America) have only one fertile stamen. The large spherical

pollen grains are connected by viscid threads. The typically quadrilocular ovary contains numerous ovules on axile placentas; the i-to-2-celled ovary of Circaea has a single ovule in each loculus. The long slender style has a capitate (Fuchsia), 4-rayed (Oenothera, Epilobium) or 4-notched (Cir- caea) stigma. The flowers, which have generally an at- tractive corolla and honey secreted by a swollen disk at the base of the style or on the lower part of the ” calyx-tube,” are adapted for pollination by insects, chiefly bees and lepi-

From Vines’ Student Tot-Book of Botany, doptera; sometimes by night- by permission of Swan Sonnenschein & Co. flying insects when the flowers

Fig. 3. are pale and open towards

A, Young flower of Epilobium evening, as in evening primrose.

JEST*.- sepa.s I ;tˆi f cel. mfen0r ™e fruit is generally a capsule

B, Fruit of Epilobium after splitting into 4 valves and dehiscence, w, outer wall; m, leaving a central column on columella formed by the septa; w hi c h the seeds are borne as

sa, seed with tufts of hairs.

in Epilobium and Oenothera —

in the former the seeds are scattered by aid of a long tuft of silky hairs on the broader end. In Fuchsia the fruit is a berry, which is sometimes edible, and in Circaea a nut bearing recurved bristles. The seeds are exalbuminous. Several of

the genera are well known as garden plants, e.g. Fuchsia, Oenothera, ,Clarkia and Godetia. Evening primrose (Oenothera biennis), a native of North America, occurs apparently wild as a garden escape in Britain. Jussieua is a tropical genus of water- and marsh-herbs with well-developed aerating tissue.

ONATAS, a Greek sculptor of the time of the Persian wars, a member cf the flourishing school of Aegina. Many of his works are mentioned by Pausanias; they included a Hermes carrying the ram, and a strange image of the Black Demeter made for the people of Phigalia; also some elaborate groups in bronze set up at Olympia and Delphi. For Hiero I., king of Syracuse, Onatas executed a votive chariot in bronze dedicated at Olympia. If we compare the descriptions of the works of Onatas given us by Pausanias with the well-known pediments of Aegina at Munich we shall find so close an agreement that we may safely take the pedimental figures as an index of the style of Onatas. They are manly, vigorous, athletic, showing great knowledge of the human form, but somewhat stiff and automaton-like.

ONEGA, the largest lake in Europe next to Ladoga, having an area of 3764 sq. m. It is situated in the government of Olonets in European Russia, and, discharging its waters by the Svir into Lake Ladoga, belongs to the system of the Neva. The lake basin extends north-west and south-east, the direction characteristic of the lakes of Finland and the line of glacier-scoring observed in that region. Between the northern and southern divisions of the lake there is a considerable difference: while the latter has a comparatively regular outline, and contains hardly any islands, the former splits up into a number of inlets, the largest being Povyenets Bay, and is crowded with islands (e.g. Klimetsk) and submerged rocks. It is thus the northern division which brings the coast-line up to 870 m. and causes the navigation of the lake to be so dangerous. The north-western shore between Petro-zavodsk and the mouth of the river Lumbosha consists of dark clay slates, generally arranged in horizontal strata and broken by protruding, parallel ridges of diorite, which extend far into the lake. The eastern shore, as far as the mouth of the Andoma, is for the most part alluvial, with outcroppings of red granite and in one place (the mouth of the Pyalma) diorite and dolomite. To the south-east are sedimentary Devonian rocks, and the general level of the coast is broken by Mount Andoma and Cape Petro- pavlovskiy (160 ft. above

the lake) ; to the south-west a quartz sandstone (used as a building and monumental stone in St Petersburg) forms a fairly bold rim. Lake Onega lies 125 ft. above the sea. The greatest depths, 318 to 408 ft., occur at the entrance to the double bay of Lizhemsk and Unitsk. On the continuation of this line the depth exceeds 240 ft. in several places. In the middle of the lake the depth is 1 20 to 282 ft., and less than 120 ft. in the south. The lake is 145 m. long, with an average breadth of 50 m. The most important affluents, the Vodka, the Andoma and the Vytegra, come from the east. The Kumsa, a northern tributary, is sometimes represented as if it connected the lake with Lake Seg, but at the present time the latter drains to the White Sea. The Onega canal (45 m. long) was constructed ini8i8-i85i along the southern shore in order to connect the Svir (and hence Lake Ladoga and the Baltic) with the Vytegra, which connects with the Volga. Lake Onega remains free from ice for 209 days in the year (middle of May to second week of December). The water is at its lowest level in the beginning of March; by June it has risen 2 ft. A considerable population is scattered along the shores of the lake, mainly occupied in the timber trade, fisheries and mining industries. Salmon, palya (a kind of trout), burbot, pike, perchpike and perch are among the fish caught in the lake. Steamboatswere introduced in 1832.

The river Onega, which, after a course of 250 m., reaches the Gulf of Onega, an inlet of the White Sea, has no connexion with Lake Onega. At the mouth of this river (on the right bank) stands the town and port of Onega (pop. 2694 in 1897), which dates from settlements made by the people of Novgorod in the 15th century, and known in history as Ustenskaya or Ustyans- kaya. It has a cathedral, erected in 1 796. (P. A. K. ; J. T. Be.)

ONEIDA, a city of Madison county, New York, U.S.A., on Oneida Creek, about 6 m. S.E. of Oneida Lake, about 26 m. W. of Utica, and about 26 m. E.N.E. of Syracuse. Pop. (1890) 6083; (1900) 6364, of whom 784 were foreign-born; (191c, U.S. census) 8317. It is served by the New York Central & Hudson River, the New York, Ontario & Western, the West Shore and the Oneida (electric) railways (the last connecting with Utica and Syracuse), and by the Erie Canal. The city lies about 440 ft. above the sea on a Jevel site. Across Oneida Creek, to the south-east, in Oneida county, is the village of Oneida Castle (pop. in 1910, 393), situated in the township of Vernon (pop. in 1910, 3197), and the former gathering place of the Oneida Indians, some of

whom still live in the township of Vernon and in the city of Oneida. In the south-eastern part of the city is the headquarters of the Oneida Community (q.v.), which controls important industries here, at Niagara Falls, and elsewhere. Immediately west of Oneida is the village of Wamps- ville (incorporated in 1908), the county-seat of Madison county. Among the manufactures of Oneida are wagons, cigars, furniture, caskets, silver-plated ware, engines and machinery, steel and wooden pulleys and chucks, steel grave vaults, hosiery, and milk bottle caps. In the vicinity the Oneida Community manu- factures chains and animal traps. The site of Oneida was purchased in 1820-1830 by Sands Higinbotham, in honour of whom one of the municipal parks (the other is Allen Park) is named. Oneida was incorporated as a village in 1848 and chartered as a city in i9or. •

ONEIDA (a corruption of their proper name Oneyotka-ono, ” people of the stone,” in allusion to the Oneida stone, a granite boulder near their former village, which was held sacred by them), a tribe of North American Indians of Iroquoian stock, forming one of the Six Nations. They lived around Oneida Lake in New York state, in the region southward to the Susquehanna. They “were not loyal to the League’s policy of friendliness to the English, but inclined towards the French, and were practically the only Iroquois who fought for the Americans in the War of Independence. As a consequence they were attacked by others of the Iroquois under Joseph Brant and took refuge within the American settlements till the war ended, when the majority returned to their former home, while some migrated to the Thames river district, Ontario. Early in the 19th century they sold their lands, and most of them settled on a reservation at Green Bay, Wisconsin, some few remaining in New York state. The tribe now numbers more than 3000, of whom about two-thirds are in Wisconsin, a few hundreds in New York state, and about 800 in Ontario. They are civilized and prosperous.

ONEIDA COMMUNITY (or Bible Communists), an American communistic society at Oneida, Madison county, New York, which has attracted wide interest on account of its pecuniary success, and its peculiar religious and social principles (see Communism) .

Its founder, John Humphrey Noyes (1811-1886), was born in Brattleboro, Vermont, on the 3rd of September 1811. He was of good parentage; his father, John Noyes (1763-1841), was a graduate of and for a time a tutor in Dartmouth College, and was a representative in Congress in 1815-1817; and his mother, Polly Hayes, was an aunt of Rutherford B. Hayes, president of the United States. The son graduated at Dartmouth in 1830, and studied law for a year, but

having been converted in a protracted revival in 183 1 he turned to the ministry, studied theology for one year at Andover (where he was a member of ” The Brethren,” a secret society of students preparing for foreign missionary work), and then a year and a half at Yale, and in 1833 was licensed to preach by the New Haven Association; but his open preaching of his new religious doctrines, and especially that of present salvation from sin, resulted in the revocation of his license in 1834, and his thereafter being called a Perfectionist. He continued to promulgate his ideas of a higher Christian life, and soon had disciples in many places, one of whom, Harriet A. Holton, a woman of means, he married in 1838. In 1836 he returned to his father’s home in Putney, Vt., and founded a Bible School; in 1843 he entered into

a ” contract of Partnership ” with his Putney followers; and in March 1845 the Putney Corporation or Association of Perfec- tionists was formed.

Although the Putney Corporation or Association was never a community in the sense of common-property ownership, yet it was practically a communal organization, and embodied the radical religious and social principles that subsequently gave such fame to the Oneida Community, of which it may justly be regarded as the beginning and precursor. These principles naturally excited the opposition of the churches in the small Vermont village where the Perfectionists resided, and indignation meetings against them were held; and although they resulted in no personal violence Mr Noyes and his followers considered it prudent to remove to a place where they were sure of more liberal treatment. They accordingly withdrew from Putney in 1847, an d accepting the invitation of Jonathan Burt and others, settled near Oneida, Madison county, New York.

Here the community at first devoted itself to agriculture and fruit raising, but had little financial success until it began the manufacture of a steel trap, invented by one of its members, Sewall Newhouse; the manufacture of steel chains for use with the traps followed; the canning of vegetables and fruits was begun about 1854, and the manufacture of sewing and embroidery silk in 1866. Having started with a very small capital (the inventoried valuation of its property in 1857 was only $67,000), the community gradually grew in numbers and prospered as a business concern. Its relations with the surrounding population, after the first few years, became very friendly. The members won the reputation of being good, industrious citizens, whose word was always ” as good as their bond “; against whom no charge of intemperance, profanity or crime was ever brought. But the communists claimed that among true Christians ”

mine and thine ” in property matters should cease to exist, as among the early pentecostal believers; and, moreover, that the same unselfish spirit should pervade and control all human relations. And notwithstanding these very radical principles, which were freely propounded and discussed in their weekly paper, the communists were not seriously disturbed for a quarter of a century. But from 1873 to 1879 active measures favouring legislative action against the community, specially instigated by Prof. John W. Mears. (1825-1881), were taken by several ecclesiastical bodies of Central New York. These measures culminated in a conference held at Syracuse University on the 14th of February 1879, when denunciatory resolutions against the community were passed and legal measures advised.

Mr Noyes, the founder and leader of the community, had repeatedly said to his followers that the time might come when it would be necessary, in deference to public opinion, to recede from the practical assertion of their social principles; and on the 20th of August of this year (1879) he said definitely to them that in his judgment that time had come, and he thereupon proposed that the community ” give up the practice of Complex Marriage, not as renouncing belief in the principles and pro- spective finality of that institution, but in deference to public sentiment.” This proposition was considered and accepted in full assembly of the community on the 26th of the same month.

This great change was followed by other changes of vital importance, finally resulting in the transformation of the Oneida Community into the incorporated Oneida Community, Limited, a co-operative joint-stock company, in which each person’s interest was represented by the shares of stock standing in his name on the books of the company.

In the reorganization the adult members fared alike in the matter of remuneration for past services — those who by reason of ill-health had been unable to contribute to the common fund receiving the same as those who by reason of strength and ability had contributed most thereto; besides, the old and infirm had the option of accepting a life-guaranty in lieu of work; and hence there were no cases of suffering and want at the time the transformation from a common-property interest to an individual stock interest was made; and in the new company all were guaranteed remunerative labour.

O’NEILL (FAMILY)

This occurred on the 1st of January 1881, at which time the business and property of the community were transferred to the incorporated stock company, and stock issued therefor to the amount of $600,000. In the subsequent twenty-eight years this capital stock was doubled, and dividends averaging more than 6 % per annum were paid. Aside from the home buildings and the large acreage devoted to agriculture and fruit raising, the present capital of the company is invested, first, in its hard- ware department at Kenwood, N.Y., manufacturing steel game- traps, and weldless chains of every description; second, the silk department at Kenwood, N.Y., manufacturing sewing silk, machine tw'st and embroidery silks; third, the fruit department at Kenwood, N.Y., whose reputation for putting up pure, whole- some fruits and vegetables is probably the highest in the country; fourth, the tableware department, at Niagara Falls, N.Y., which manufactures the now celebrated Community Silver; fifth, the Canadian department, with factory at Niagara Falls, Ontario, Canada, where the hardware lines are manufactured for Canadian trade. The annual sales of all departments aggregate over $2,000,000. The officers of the company consist of a president, secretary, treasurer and assistant treasurer, and there were in 1909 eleven directors. Each of the five leading departments is managed by a superintendent, and all are under the supervision of the general manager. Nearly all the superintendents and the general manager were in 1909 young men who were born in the community, and have devoted their life-work to the interests of the company. Selling offices are maintained in New York City. Chicago, St Louis, Cleveland, O., Richmond, Va., Atlanta, Ga., and San Francisco.

In addition to the members of the society the company employs between 1 500 and 2000 workmen. The policy has been to avoid trade-unions, but to pay higher wages and give better conditions than other employers in similar lines, and by so doing to obtain a better selection of workmen. The conditions of work as well as of living have been studied and developed with the idea of making both healthful and attractive. With this in view the company has laid out small villages, in many ways making them attractive and sanitary, and has encouraged the building of houses by its employes. Much has been accomplished in this direction by providing desirable building-sites at moderate expense, and paying a bonus of from $100 to $200 in cash to every employe who builds his own home. The company has also taken an interest in the schools in the vicinity of its factories, with the idea of offering to the children of its employes facilities for a good education.

The communism of John H. Noyes was based on his inter- pretation of

the New Testament. In his pamphlet, Bible Communism (1848), he affirmed that the second coming of Christ occurred at the close of the apostolic age, immediately after the destruction of Jerusalem, and he argued from many New Testament passages, especially 1 John 1, 7, that after the second coming and the beginning of Christ's reign upon the earth, the true standard of Christian character was sinlessness, which was possible through vital union with Christ, that all selfishness was to be done away with, both in property in things and in persons, or, in other words, that communism was to be finally established in all the relations of life. But, while affirming that the same spirit which on the day of Pentecost abolished ex- clusiveness in regard to money tends to obliterate all other property distinctions, he had no affiliation with those commonly termed Free Lovers, because their principles and practices seemed to him to tend toward anarchy. " Our Communities," he said, " are families as distinctly bounded and separated from promiscu- ous society as ordinary households. The tie that binds us together is as permanent and sacred, to say the least, as that of common marriage, for it is our religion. We receive no new members (except by deception and mistake) who do not give heart and hand to the family interest for life and for ever. Com- munity of property extends just as far as freedom of love. Every man's care and every dollar of the common property are pledged for the maintenance and protection of the women and the education of the children of the Community."

The community was much interested in the question of race im- provement by scientific means, and maintained with much force of argument that at least as much scientific attention should be given to the physical improvement of human beings as is given to the improvement of domestic animals; and they referred to the results of their own incomplete stirpicultural experiments as indicative of what may be expected in the far future, when the conditions of human reproduction are no longer controlled by chance, social position, wealth, impulse or lust.

The community claimed to have solved among themselves the labour question, all kinds of service being regarded as equally honourable, and every person being respected according to hi? real character.

The members had some peculiarities of dress, mostly confined, however, to the women, whose costumes included a short dress and pantalets, which were appreciated for their convenience, if not for their beauty. The women also adopted the practice of wearing short hair, which it was claimed saved time and vanity. Tobacco, intoxicants, profanity, obscenity found no place in the community.

The community diet consisted largely of vegetables and fruits; meat, tea and coffee being served only occasionally.

For securing good order and the improvement of the members, the community placed much reliance upon a very peculiar system of plain speaking they termed mutual criticism, which originated in a secret society of missionary brethren with which Mr Noyes was connected while pursuing his theological studies at Andover Seminary, and whose members submitted themselves in turn to the sincerest comment of one another as a means of personal improvement. Under Mr Noyes's supervision it became in the Oneida Community a principal means of discipline and govern- ment. There was a standing committee of criticism, selected by the community, and changed from time to time, thus giving all an opportunity to serve both as critics and subjects, and justi- fying the term " mutual " which they gave to the system. The subject was free to ha /e others besides the committee present, or to have critics only of his own choice, or to invite an expression from the whole community.

Noyes edited The Perfectionist (New Haven, Connecticut, 1834, and Putney, Vermont, 1843-1846); The Witness (Ithaca, New York, and Putney, 1 838-1 843); The Spiritual Magazine (Putney, 1846-1847; Oneida, 184S-1850); The Free Church Circular (Oneida, 1850-1851); and virtually, though not always nominally, The Circular and The Oneida Circular (Brooklyn, 1851-1854; Oneida, N.Y., and Wallingford, Conn., 1854-1876); and The American Socialist (Oneida, 1876-1880). He was the author of The Way of Holiness (Putney, 1838); The Berean (Putney, 1847), containing an exposition of his doctrines of Salvation from Sin; the Second Coming of Christ; the Origin of Evil; the Atonement; the Second Birth; the Millennium; Our Relations to the Primitive Church, &c. &c. ; History of American Socialism (Philadelphia, 1870); Home Talks (Oneida, 1876); and numerous pamphlets.

See a series of articles in the Manufacturer and Builder (New York, 1891-1894), by " C. R. Edson " {i.e. C. E. Robinson); The Oneida Community, by Allan Estlake (a member of the community) (1900); Morris Hillquit's History of Socialism in the United States (New York, 1903), and especially William A. Hinds' American Communities and Co-operative Colonies (3rd ed., Chicago, 1908). (W. A. H.)

O'NEILL, the name of an Irish family tracing descent from Niall, king of Ireland early in the 5th century, and known in Irish history and legend as Niall of the Nine Hostages. He is said to have made war not only against lesser rulers in Ireland, but also in Britain and Gaul,

stories of his exploits being related in the Book of Leinster and the Book of Ballymote, both of which, however, are many centuries later than the time of Niall. This king had fourteen sons, one of whom was Eoghan (Owen), from whom the O'Neills of the later history were descended. The descendants of Niall spread over Ireland and became divided into two main branches, the northern and the southern Hy Neill, to one or other of which nearly all the high-kings (ard-ri) of Ireland from the 5th to the 12th century belonged; the descendants of Eoghan being the chief of the northern Hy Neill. 1 Eoghan was grandfather of Murkertagh (Muircheartach) (d. 533),

1 A list of these kings will be found in P. W. Joyce's A Social History of Ancient Ireland (London, 1903), vol. i. pp. 70, 71.

said to have been the first Christian king of Ireland, whose mother, Eire or Erca, became by a subsequent marriage the grandmother of St Columba. Of this monarch, known as Murkertagh MacNeill (Niall), and sometimes by reference to his mother as Murkertagh Mac Erca, the story is told, illustrating an ancient Celtic custom, that in making a league with a tribe in Meath he emphasized the inviolability of the treaty by having it written with the blood of both clans mixed in one vessel. Murkertagh was chief of the great north Irish clan, the Cinel Eoghain, 1 and after becoming king of Ireland about the year 517, he wrested from a neighbour- ing clan a tract of country in the modern County Derry, which remained till the 17th century in the possession of the Cinel Eoghain. The inauguration stone of the Irish kings, the Lia Fail, or Stone of Destiny, fabled to have been the pillow of the patriarch Jacob on the occasion of his dream of the heavenly ladder, was said to have been presented by Murkertagh to the king of Dalriada, by whom it was conveyed toDunstaffnage Castle in Scotland (see Scone). A lineal descendent of Murker- tagh was Niall Frassach (i.e. of the showers), who became king of Ireland in 763 ; his surname, of which several fanciful ex- planations have been suggested, probably commemorating merely weather of exceptional severity at his birth. His grand- son, Niall (791-845), drove back the Vikings who in his time began to infest the coast of Donegal. Niall's son, Aedh (Hugh) Finnlaith, was father of Niall Glundubh (i.e. Niall of the black knee), one of the most famous of the early Irish kings, from whom the family surname of the O'Neills was derived. His brother Domhnall (Donnell) was king of Ailech, a district in Donegal and Derry; the royal palace, the ruined masonry of which is still to be seen, being on the summit of

a hill 800 ft. high overlooking loughs Foyle and- S willy. On the death of Domhnall in 911 Niall Glundubh became king of Ailech, and he then attacked and defeated the king of Dalriada at Glarryford, in County Antrim, and the king of Ulidia near Ballymena. Having thus extended his dominion he became king of Ireland in 915. To him is attributed the revival of the ancient meeting of Irish clans known as the Fair of Telltown (see Ireland: Early History). He fought many battles against the Norsemen, in one of which he was killed in 919 at Kilmashoge, where his place of burial is still to be seen.

His son Murkertagh, who gained a great victory over the Norse in 926, is celebrated for his triumphant march round Ireland, the Moirthimchell Eiream, in which, starting from Portglenone on the Bann, he completed a circuit of the island at the head of his armed clan, returning with many captive kings and chieftains. From the dress of his followers in this expedition he was called ” Murkertagh of the Leather Cloaks.” The exploit was cele- brated by Cormacan, the king’s bard, in a poem that has been printed by the Irish Archaeological Society; and a number of Murkertagh’s other deeds are related in the Book of Leinster. He was killed in battle against the Norse in 943, and was suc- ceeded as king of Ailech by his son, Donnell Ua Niall (i.e. O’Neill, grandson of Neill, or Niall, the name O’Neill becoming about this time an hereditary family surname 2), whose grandson, Flaherty, became renowned for piety by going on a pilgrimage to Rome in 1030.

Aedh (Hugh) O’Neill, chief of the Cinel Eoghain, or lord of Tir-Eoghain (Tir-Owen, Tyrone) at the end of the 1 2th century, was the first of the family to be brought prominently into conflict with the Anglo-Norman monarchy, whose pretensions he took the lead in disputing in Ulster. It was probably his son or nephew (for the relationship is uncertain, the genealogies of the O’Neills being rendered obscure by the contemporaneous occurrence of the same name in different branches of the family) Hugh O’Neill, lord of Tyrone, who was styled ” Head of the liberality and valour of the Irish.” Hugh’s son, Brian, by gaining

1 The Cinel, or Kinel, was a group of related clans occupying an extensive district. See Joyce, op. cit. i. 166.

2 The adoption of hereditary names became general in Ireland, in obedience, it is said, to an ordinance of Brian Boru, about the end of the 10th century. For the method of their formation see Joyce, op. cit. ii. 19.

the support of the earl of Ulster, was inaugurated 3 prince, or lord, of Tyrone in 1291; and his son Henry became lord of the Clann Aodha Buidhe (Clanaboy or Clandeboye), early in the 14th century. Henry's son Murkertagh the Strongminded, and his great-grandson Hugh, described as " the most renowned, hospitable and valorous of the princes of Ireland in his time," greatly consolidated the power of the O'Neills. Niall Og O'Neill, one of the four kings of Ireland, accepted knighthood from Richard II. of England; and his son Eoghan formally acknow- ledged the supremacy of the English crown, though he after- wards ravaged the Pale, and was inaugurated " the O'Neill " (i.e. chief of the clan) on the death of his kinsman Domhnall Boy O'Neill; a dignity from which he was deposed in 1455 by his son Henry, who in 1463 was acknowledged as chief of the Irish kings by Henry VII. of England. Contemporary with him was Neill Mor O'Neill (see below), lord of Clanaboy, from whose son Brian was descended the branch of the O'Neills who, settling in Portugal in the 18th century, became prominent among the Portuguese nobility, and who at the present day are the representatives in the male line of the ancient Irish kings of the house of O'Neill.

Conn O'Neill (c. 1480-1559), 1st earl of Tyrone, surnamed Bacach (the Lame), grandson of Henry O'Neill mentioned above, was the first of the O'Neills whom the attempts of the English in the 16th century to subjugate Ireland brought to the front as leaders of the native Irish. Conn, who was related through his mother with the earl of Kildare (Fitzgerald), became chief of the Tyrone branch of the O'Neills (Cinel Eoghain) about 1520. When Kildare became viceroy in 1524, O'Neill consented to act as his swordbearer in ceremonies of state; but his allegiance was not to be reckoned upon, and while ready enough to give verbal assurances of loyalty, he could not be persuaded to give hostages as security for his conduct; but Tyrone having been invaded in 1541 by Sir Anthony St Leger, the lord deputy, Conn delivered up his son as a hostage, attended a parliament held at Trim, and, crossing to England, made his submission at Green- wich to Henry VIII. , who created him earl of Tyrone for life, and made him a present of money and a valuable gold chain. He was also made a privy councillor in Ireland, and received a grant of lands within the Pale. This event created a deep im- pression in Ireland, where O'Neill's submission to the English king, and his acceptance of an English title, were resented by his clansmen and dependents. The rest of the earl's life was mainly occupied by endeavours to maintain his influence, and by an undying feud with his son Shane (John), arising out of his transaction with Henry VIII. For not only did the nomination of O'Neill's reputed son Matthew as his heir with the title of baron of Dungannon by the

English king conflict with the Irish custom of tanistry (q.v.) which regulated the chieftainship of the Irish clans, but Matthew, if indeed he was O'Neill's son at all, was illegitimate; while Shane, Conn's eldest legitimate son, was not the man to submit tamely to any invasion of his rights. The fierce family feud only terminated when Matthew was murdered by agents of Shane in 1558; Conn dying about a year later. Conn was twice married, Shane being the son of his first wife, a daughter of Hugh Boy O'Neill of Clanaboy. An ille- gitimate daughter of Conn married the celebrated Sorley Boy MacDonnell (q.v.).

Shane O'Neill (c. 1530-1567) was a chieftain whose support was worth gaining by the English even during his father's life- time; but rejecting overtures from the earl of Sussex, the lord deputy, Shane refused to help the English against the Scottish settlers on the coast of Antrim, allying himself instead with the MacDonnells, the most powerful of these immigrants. Neverthe- less Queen Elizabeth, on succeeding to the English throne, was disposed to come to terms with Shane, who after his father's death was de facto chief of the formidable O'Neill clan. She accordingly agreed to recognize his claims to the chieftainship, thus throwing over Brian O'Neill, son of the murdered Matthew,

3 The ceremony of " inauguration " among the ancient Irish clans was an elaborate and important one. A stone inauguration chair of the O'Neills is preserved in the Belfast Museum. See Joyce, op. cit. i. 46.

baron of Dungannon, if Shane would submit to her authority and that of her deputy. O'Neill, however, refused to put himself in the power of Sussex without a guarantee for his safety; and his claims in other respects were so exacting, that Elizabeth consented to measures being taken to subdue him and to restore Brian. An attempt to foment the enmity of the O'Doiinells against him was frustrated by Shane's capture of Calvagh O'Donnell, whom he kept a close prisoner for nearly three years. Elizabeth, whose prudence and parsimony were averse to so formidable an undertaking as the complete subjugation of the powerful Irish chieftain, desired peace with him at almost any price; especially when the devastation of his territory by Sussex brought him no nearer to submission. Sussex, indignant at Shane's request for his sister's hand in marriage, and his demand for the withdrawal of the English garrison from Armagh, was not supported by the queen, who sent the earl of Kildare to arrange terms with O'Neill. The latter, making some trifling concessions, consented to present himself before Elizabeth. Accompanied by Ormonde and

Kildare he reached London on the 4th of January 1562. Camden describes the wonder with which O'Neill's wild gallowglasses were seen in the English capital, with their heads bare, their long hair falling over their shoulders and clipped short in front above the eyes, and clothed in rough yellow shirts. Elizabeth was less concerned with the respective claims of Brian and Shane, the one resting on an English patent and the other on the Celtic custom, than with the question of policy involved in supporting or rejecting the demands of her proud suppliant. Characteristically, she tem- porized; but finding that O'Neill was in danger of becoming a tool in the hands of Spanish intriguers, she permitted him to return to Ireland, recognizing him as " the O'Neill," and chieftain of Tyrone; though a reservation was made of the rights of Hugh O'Neill, who had meantime succeeded his brother Brian as baron of Dungannon, Brian having been murdered in April 1562 by his kinsman Turlough Luineach O'Neill.

There were at this time three powerful contemporary members of the O'Neill family in Ireland — Shane, Turlough and Hugh, 2nd earl of Tyrone. Turlough had been elected tanist (see Tanistry) when his cousin Shane was inaugurated the O'Neill, and he schemed to supplant him in the higher dignity during Shane's absence in London. The feud did not long survive Shane's return to Ireland, where he quickly re-established his authority, and in spite of Sussex renewed his turbulent tribal warfare against the O'Donnells and others. Elizabeth at last authorized Sussex to take the field against Shane, but two several expeditions failed to accomplish anything except some depredation in O'Neill's country. Sussex had tried in 1561 to procure Shane's assassination, and Shane now laid the whole blame for his lawless conduct on the lord deputy's repeated alleged attempts on his life. Force having ignominiously failed, Elizabeth consented to treat, and hostilities were stopped on terms that gave O'Neill practically the whole of his demands. O'Neill now turned his hand against the MacDonnells, claiming that he was serving the queen of England in harrying the Scots. He fought an indecisive battle with Sorley Boy MacDonnell near Coleraine in 1564, and the following year marched from Antrim through the mountains by Clogh to the neighbourhood of Ballycastle, where he routed the MacDonnells and took Sorley Boy prisoner. This victory greatly strengthened Shane O'Neill's position, and Sir Henry Sidney, who became lord deputy in 1566, declared to the earl of Leicester that Lucifer himself was not more puffed up with pride and ambition than O'Neill. Preparations were made in earnest for his subjugation. O'Neill ravaged the Pale, failed in an attempt on Dundalk, made a truce with the MacDonnells, and sought help from the earl of Desmond. The English, on the other hand, invaded Donegal

and restored O'Donnell. Failing in an attempt to arrange terms, and also in obtaining the help which he solicited from France, O'Neill was utterly routed by the O'Donnells at Letter- kenny; and seeking safety in flight, he threw himself on the mercy of his enemies, the MacDonnells. Attended by a small body of gallowglasses, and taking his prisoner Sorley Boy with

him, he presented himself among the MacDonnells near Cushen- dun, on the Antrim coast. Here, on the 2nd of June 1567, whether by premeditated treachery or in a sudden brawl is uncertain, he was slain by the MacDonnells, and was buried at Glenarm. In his private character Shane O'Neill was a brutal, uneducated savage. He divorced his first wife, a daughter of James MacDonnell, and treated his second, a sister of Calvagh O'Donnell, with gross cruelty in revenge for her brother's hostility; Calvagh himself, when Shane's prisoner, he subjected to continual torture; and Calvagh's wife, whom he made his mistress, and by whom he had several children, endured ill-usage at the hands of her drunken captor, who is said to have married her in 1565.

Turlough Luineach O'Neill (c. 1530-1595); earl of Clan- connell, was inaugurated chief of Tyrone on Shane's death. Making professions of loyalty to the queen of England, he sought to strengthen his position by alliance with the O'Donnells, MacDonnells and MacQuillans. But his conduct giving rise to suspicions, an expedition under the earl of Essex was sent against him, which met with such doubtful success that in 1575 a treaty was arranged by which O'Neill received extensive grants of lands and permission to employ three hundred Scottish mercen- aries. In 1578 he was created baron of Clogher and earl of Clanconnell for life; but on the outbreak of rebellion in Munster his attitude again became menacing, and for the next few years he continued to intrigue against the English authorities. The latter, as a counterpoise to Turlough, supported his cousin Hugh, brother of Brian, whom Turlough had murdered. After several years of rivalry and much fighting between the two relatives, Turlough resigned the headship of the clan in favour of Hugh, who was inaugurated O'Neill in 1593. Turlough died in 1595-

Hugh O'Neill (c. 1 540-1616), 2nd earl (known as the great earl) of Tyrone, was the second son of Matthew, reputed illegitimate son of Conn, 1st earl of Tyrone. 1 He succeeded his brother, Brian, when the latter was murdered by Turlough in 1562, as baron of Dungannon. He was brought up in London, but returned to Ireland in 1567 after the

death of Shane, under the protection of Sir Henry Sidney. He served with the English against Desmond in Munster in 1580, and assisted Sir John Perrot against the Scots of Ulster in 1584. In the following year he was allowed to attend parliament as earl of Tyrone, though Conn's title had been for life only, and had not been assumed by Brian. Hugh's constant disputes with Turlough were fomented by the English with a view to weakening the power of the O'Neills, but after Hugh's inauguration as the O'Neill on Turlough's resignation in 1593, he was left without a rival in the north. His career was marked by unceasing duplicity, at one time giving evidence of submission to the English authorities, at another intriguing against them in conjunction with lesser Irish chieftains. Having roused the ire of Sir Henry Bagnal (or Bagenal) by eloping with his sister in 1591, he afterwards assisted him in defeating Hugh Maguire at Belleek in 1593; and then again went into opposition and sought aid from Spain and Scotland. Sir John Norris was accordingly ordered to Ireland with a considerable force to subdue him in 1595, but Tyrone succeeded in taking the Blackwater Fort and Sligo Castle before Norris was prepared; and he was thereupon proclaimed a traitor of Dundalk. In spite of the traditional enmity between the O'Neills and the O'Donnells, Tyrone allied himself with Hugh Roe O'Donnell, nephew of Shane's former enemy Calvagh O'Donnell, and the two chieftains opened communications with Philip II. of Spain, their letters to whom were intercepted by the viceroy, Sir William Russell. They put themselves forward as the champions of the Catholic religion, claiming liberty of conscience as well as political liberty for the native inhabitants of Ireland. In April 1 596 Tyrone received promises of help from Spain. This increased his anxiety to temporize, which he did with signal success for more than two years, making

1 The grave doubt as to the paternity of Matthew involved a doubt whether the great earl of Tyrone and his equally famous nephew Owen Roe had in fact any O'Neill blood in their veins.

from time to time as circumstances required, professions of loyalty which deceived Sir John Norris and the earl of Ormonde. In 1598 a cessation of hostilities was arranged, and a formal pardon granted to Tyrone by Elizabeth. Within two months he was again in the field, and on the 14th of August he destroyed an English force under Bagnal at the Yellow Ford on the Black- water. If the earl had known how to profit by this victory, he might now have successfully withstood the

English power in Ireland; for in every part of Ireland — and especially in the south, where James Fitzthomas Fitzgerald with O'Neill's support was assertirjg his claim to the earldom of Desmond at the head of a formidable army of Geraldine clansmen — discontent broke into flame. But Tyrone, who possessed but little generalship, procrastinated until the golden opportunity was lost. Eight months after the battle of the Yellow Ford, the earl of Essex landed in Ireland to find that Tyrone had done nothing in the interval to improve his position. Acting on the queen's explicit instructions, Essex, after some ill-managed operations, had a meeting with Tyrone at a ford on the Lagan on th 7th of September 1599, when a truce was arranged; but Elizabeth was displeased by the favourable conditions allowed to the O'Neill and by Essex's treatment of him as an equal, Tyrone continued to concert measures with the Irish leaders in Munster, and issued a manifesto to the Catholics of Ireland summoning them to join his standard; protesting that the interests of religion were his first care. After an inconclusive campaign in Munster in January 1600, he returned in haste to Donegal, where he received supplies from Spain and a token of encouragement from Pope Clement VIII. In May of the same year Sir Henry Docwra, at the head of a considerable army, took up a position at Derry, while Mountjoy marched from Westmeath to Newry to support him, compelling O'Neill to retire to Armagh, a large reward having been offered for his capture alive or dead.

The appearance of a Spanish force at Kinsale drew Mountjoy to Munster in 1601; Tyrone followed him, and at Bandon joined forces with O'Donnell and with the Spaniards under Don John D'Aquila. The attack of these allies on the English completely failed. O'Donnell went to Spain, where he died soon afterwards, and Tyrone with a shattered force made his way once more to the north, where he renewed his policy of ostensibly seeking pardon while warily evading his enemies. Early in 1603 Elizabeth instructed Mountjoy to open negotiations with the rebellious chieftains; and in April, Tyrone, in ignorance of Elizabeth's death, made his submission to Mountjoy. In Dublin, whither he proceeded with Mountjoy, he heard of the accession of King James, at whose court he presented himself in June accompanied by Rory O'Donnell, who had become chief of the O'Donnells after the departure of his brother Hugh Roe. The English courtiers were greatly incensed at the gracious reception accorded to these notable rebels by King James; but although Tyrone was confirmed in his title and estates, he had no sooner returned to Ireland than he again engaged in dispute with the government concerning his rights over certain of his feudatories, of whom Donnal O'Cahan was the most important. This dispute dragged on till 1607, when Tyrone arranged to go to London

to submit the matter to the king. Warned, however, that his arrest was imminent, and possibly persuaded by Rory O'Donnell (created earl of Tyrconnel in 1603), whose relations with Spain had en- dangered bis own safety, Tyrone resolved to fly from the country.

" The flight of the earls," one of the most celebrated episodes in Irish history, occurred on the 14th of September 1607, when Tyrone and Tyrconnel embarked at midnight at Rathmullen on Lough Swilly, with their wives, families and retainers, numbering ninety-nine persons, and sailed for Spain. Driven by contrary winds to take shelter in the Seine, the refugees passed the winter in the Netherlands, and in April 1608 proceeded to Rome, where they were welcomed and hospitably entertained by Pope Paul V., and where Tyrconnel died the same year. In 1613 Tyrone was outlawed and attainted by the Irish parliament, and he died in Rome on the 20th of July 1616. He was four times married, and had a large number both of legitimate and illegi- timate children.

Sir Phelim O'Neill (c. 1603-1653), a kinsman and younger contemporary of the earl of Tyrone, took a prominent part in the rebellion of 1641. In that year he was elected member of the Irish parliament for Dungannon, and joined the earl of Antrim and other lords in concerting measures for supporting Charles I. in his struggle with the parliament. On the 22nd of October 1641 he surprised and captured Charlemont Castle; and having been chosen commander-in-chief of the Irish forces in the north, he forged and issued a pretended commission from Charles I. sanctioning his proceedings. Phelim and his followers com- mitted much depredation in Ulster on the pretext of reducing the Scots; and he attempted without success to take Drogheda, being compelled by Ormonde to raise the siege in April 1642. He was responsible for many of the barbarities committed by the Catholics during the rebellion. 1 During the summer his fortunes ebbed, and he was soon superseded by his kinsman Owen Roe O'Neill, who returned from military service abroad at the end of July.

Owen Roe O'Neill (c. 1590-1649), one of the most celebrated of the O'Neills, the subject of the well-known ballad " The Lament for Owen Roe," was the son of Art O'Neill, a younger brother of Hugh, 2nd earl of Tyrone. Having served with distinction for many years in the Spanish army, he was im- mediately recognized on his return to Ireland as the leading representative of the O'Neills. Phelim resigned the northern command in his favour, and escorted him from Lough Swilly to Charlemont. But jealousy between the kinsmen was com- plicated by differences between Owen Roe and the Catholic council which met at Kilkenny in October 1642. Owen Roe professed to be

acting in the interest of Charles I.; but his real aim was the complete independence of Ireland, while the Anglo- Norman Catholics represented by the council desired to secure religious liberty and an Irish constitution under the crown of England. Although Owen Roe O'Neill possessed the qualities of a general, the struggle dragged on inconclusively for three or four years. In March 1646 a cessation of hostilities was arranged between Ormonde and the Catholics; and O'Neill, furnished with supplies by the papal nuncio, Rinuccini, turned against the Scottish parliamentary army under General Monro, who had been operating with fluctuating success in Ireland since April 1642. On the 5th of June 1646 O'Neill utterly routed Monro at Benburb, on the Blackwater; but, being summoned to the south by Rinuccini, he failed to take advantage of the victory, and suffered Monro to remain unmolested at Carrickfergus. For the next two years confusion reigned supreme among the numerous factions in Ireland, O'Neill supporting the party led by Rinuccini, though continuing to profess loyalty to Ormonde as the king of England's representative. Isolated by the departure of the papal nuncio from Ireland in February 1649, he made overtures for alliance to Ormonde, and afterwards with success to Monck, who had superseded Monro in command of the parliamentarians in the north. O'Neill's chief need was supplies for his forces, and failing to obtain them from Monck he turned once more to Ormonde and the Catholic confederates, with whom he prepared to co-operate more earnestly when Cromwell's arrival in Ireland in August 1649 brought the Catholic party face to face with serious danger. Before, however, anything was accomplished by this combination, Owen Roe died on the 6th of November

1649.

The alliance between Owen Roe and Ormonde had been opposed by Phelim O'Neill, who after his kinsman's death expected to be restored to his former position of command. In this he was disappointed; but he continued to fight against the parliamen- tarians till August 1652, when a reward was offered for his apprehension. Betrayed by a kinsman while hiding in Tyrone, he was tried for high treason in Dublin, and executed on the 10th of March 1653. Phelim married a daughter of the marquis of Huntly, by whom he had a son Gordon O'Neill, who was member of parliament for Tyrone in 1689; fought for the king at the siege of Derry and at the battles of Aughrim and the

1 See W. E. H. Lecky, Hist, of Ireland in the Eighteenth Century, i. 66-68 (Cabinet edition, 5 vols,, London, 1892).

in

Boyne; and afterwards commanded an Irish regiment in the French service, and died in 1704.

Daniel O'Neill (c. 1612-1664), son of Conn MacNeill MacFagartach O'Neill, a member of the Clanaboy branch of the family, whose wife was a sister of Owen Roe, was prominent in the Civil Wars. He spent much of his early life at the court of Charles I., and became a Protestant. He commanded a troop of horse in Scotland in 1639; was involved in army plots in 1641, for which he was committed to the Tower, but escaped abroad; and on the outbreak of the Civil War returned to England and served with Prince Rupert, being present at Marston Moor, the second battle of Newbury and Naseby. He then went to Ireland to negotiate between Ormonde and his uncle, Owen Roe O'Neill. He was made a major-general in 1649, and but for his Protestantism would have succeeded Owen Roe as chief of the O'Neills. He joined Charles II. at the Hague, and took part in the expedition to Scotland and the Scotch invasion of England in 1652. At the Restoration he received many marks of favour from the king, including grants of land and lucrative monopolies. He died in 1664.

Hugh O'Neill (d. c. 1660), son of Owen Roe's brother Art Oge, and therefore known as Hugh Mac Art, had served with some distinction in Spain before he accompanied his uncle, Owen Roe, to Ireland in 1642. In 1646 he was made a major- general of the forces commanded by Owen Roe; and after the death of the latter he successfully defended Clonmel in 1650 against Cromwell, on whom he inflicted the latter's most severe defeat in Ireland. In the following year he so stubbornly resisted Ireton's attack on Limerick that he was excepted from the benefit of the capitulation, and, after being condemned to death and reprieved, was sent as a prisoner to the Tower of London. Released in 1652 on .the representation of the Spanish ambassador that O'Neill was a Spanish subject, he repaired to Spain, whence he wrote to Charles II. in 1660 claiming the earldom of Tyrone. He probably died in Spain, but the date of his death is unknown.

The Clanaboy (or Clandeboye) branch of the O'Neills descended from the ancient kings through Neill Mor O'Neill, lord of Clanaboy in the time of Henry VIII., ancestor (as mentioned above) of the Portuguese O'Neills. Neill Mor's great-great- grandson, Henry O'Neill, was created baronet of Killeleagh in 1666. His son, Sir Neill O'Neill fought for James II. in Ireland, and died of wounds received at the battle of the Boyne. Through an elder line from Neill Mor was descended Brian Mac Phelim O'Neill, who was treacherously seized in 1573 by the earl

of Essex, whom he was hospitably entertaining, and executed together with his wife and brother, some two hundred of his clan being at the same time massacred by the orders of Essex. (See Essex, Walter Devereux, 1st earl of.) Sir Brian Mac Phelim's son, Shane Mac Brian O'Neill, was the last lord of Clanaboy, and from him the family castle of Edenduffcarrick, on the shore of Lough Neagh in Co. Antrim, was named Shane's Castle. He joined the rebellion of his kinsman Hugh, earl of Tyrone, but submitted in 1586.

In the 1 8th century the commanding importance of the O'Neills in Irish history had come to an end. But John O'Neill (1740-1798), who represented Randalstown in the Irish parlia- ment 1761-1783, and the county of Antrim from the latter year till his death, took an active part in debate on the popular side, being a strong supporter of Catholic emancipation. He was one of the delegates in 1789 from the Irish parliament to George, prince of Wales, requesting him to assume the regency as a matter of right. In 1793 he was raised to the peerage of Ireland as Baron O'Neill of Shane's Castle, and in 1795 was created a viscount. In defending the town of Antrim against the rebels in 1798 O'Neill received wounds from which he died on the 18th of June, being succeeded as Viscount O'Neill by his son Charles Henry St John (1779-1841), who in 1800 was created Earl O'Neill. Dying unmarried, when the earldom therefore became extinct, Charles was succeeded as Viscount O'Neill by his brother John Bruce Richard (1780-1855), a general in the British army; on whose death without issue in 1855 the male line in the United

Kingdom became extinct. The estates then devolved on William Chichester, great-grandson of Arthur Chichester and his wife Mary, only child and heiress of Henry (d. 1721), eldest son of John O'Neill of Shane's Castle.

William Chichester (1813-1883), 1st Baron O'Neill, a clergyman, on succeeding to the estates as heir-general, assumed by royal licence the surname and arms of O'Neill; and in 1868 was created Baron O'Neill of Shane's Castle. On his death in 1883 he was succeeded by his son Edward, 2nd Baron O'Neill (b. 1839), who was member of parliament for Co. Antrim 1863-1880, and who married in 1873 Louisa, daughter of the 1 1 th earl of Dundonald.

For the history of the ancient Irish kings of the Hy Neill see : The Book of Leinster, edited with introduction by R. Atkinson (Royal Irish Academy, Dublin, 1880); The Annals of Ulster, edited by W. M. Hennessy and B. MacCarthy (4 vols., Dublin, 1887-1901) ; The Annals of Loch Ce, edited by W. M. Hennessy (Rolls Series, London, 187 1).

For the later period see: P. W. Joyce, A Short History of Ireland (London, 1893), and A Social History of Ancient Ireland (2 vols., London, 1903); The Annals of Ireland by the Four Masters, edited by J. O'Donovan (7 vols., Dublin, 1851); Sir J. T. Gilbert, History of the Viceroys of Ireland (Dublin, 1865), and, especi- ally for Owen Roe O'Neill, Contemporary History of Affairs in Ireland, 1641-1652 (Irish Archaeol. Soc, 3 vols., Dublin, 1879) ; also History of the Irish Confederation and the War in Ireland (Dublin, 1882) ; John O'Hart, Irish Pedigrees (Dublin, 1881) ; The Montgomery MSS., " The Flight of the Earls, 1607 " (p. 767), edited by George Hill (Belfast, 1878) ; Thomas Carte, History of the Life of James, Duke of Ormonde (3 vols.,_London, 1735) ; C. P. Meehan, Fate and Fortunes of Hugh O'Neill, £.arl of Tyrone, and Rory O'Donel, Earl of Tyrconnel (Dublin, 1886); Richard Bagwell, Ireland under the Tudors, with an Account of the Earlier History (3 vols., London, 1885-1890); J. F. Taylor, Owen Roe O'Neill (London, 1896); John Mitchell, Life and Times of Hugh, Earl of Tyrone, with an Account of his Predecessors, Con, Shane, Turlough (Dublin, 1846) ; L. O'Clery, Life of Hugh Roe O'Donnell (Dublin, 1893). For the O'Neills of the 18th century, and especially the 1st Viscount O'Neill, see The Charlemont Papers, and F. Hardy, Memoirs of J. Caulfield, Earl of Charlemont (2 vols., London, 1812). The O'Neills of Ulster: Their History and Genealogy, by Thomas Mathews (3 vols., Dublin, 1907), an ill-arranged and un- critical work, has little historical value, but contains a mass of traditional and legendary lore, and a number of translations of ancient poems, and genealogical tables of doubtful authority. (R. J. M.)

O'NEILL, ELIZA (1791-1872), Irish actress, was the daughter of an actor and stage manager. Her first appearance on the stage was made at the Crow Street theatre in 181 1 as the Widow Cheerly in The Soldier's Daughter, and after several years in Ireland she came to London and made an immediate success as Juliet at Covent Garden in 1814. For five years she was the favourite of the town in comedy as well as tragedy, but in the latter she particularly excelled, being frequently compared, not to her disadvantage, with Mrs Siddons. In 1819 she married William Wrixon Becher, an Irish M.P. who was created a baronet in 1831. She never returned to the stage, and died on the 29th of October 1872.

ONEONTA, a city in the township of the same name, in the south-central part of Otsego county, New York, U.S.A., on the N. side of the Susquehanna river, about 82 m. S.W. of Albany. Pop. (1880) 3002, (1890) 6272, (1900) 7147, of whom 456 were foreign-born, (1910, U.S. census) 9491. The city lies about 1 100 ft. above sea-level. It is served by the Ulster & Delaware, by the Susquehanna division of the

Delaware & Hudson, and by the Oneonta & Mohawk Valley (electric) railways. In Oneonta are a state normal school (1889), a state armoury, and the Aurelia Fox Memorial Hospital. The city is situated in a good agricultural region. The principal manufactures are machine- shop products (the Delaware & Hudson has repair and machine shops at Oneonta), knit goods, silk goods, lumber and planing mill products, &c. The first settlement was made about 1780. The township was erected in 1830 from parts of Milford and Otego. Oneonta was known as Milfordville until 1830, when it received its present name. It was first incorporated as a village in 1848, and was chartered as a city in 1908, the charter coming into effect on the 1st of January 1909. The name " Oneonta " is derived from Onahrenton or Onarenta, the Indian name of a creek flowing through the city.

See Edwin F. Bacon, Otsego County, N. Y. (Oneonta, 1902) ; and Dudley M. Campbell, A History of Oneonta (Oneonta, 1906).

ONESICRITUS, or Onesicrates, of Aegina or Astypaleia (probably simply the " old city " of Aegina), one of the writers on Alexander the Great. At an advanced age he became a pupil of Diogenes the Cynic, and gained such repute as a student of philosophy that he was selected by Alexander to hold a conference with the Indian Gymnosophists. When the fleet was constructed on the Hydaspes, Onesicritus was appointed chief pilot (in his vanity he calls himself commander), and in this capacity accompanied Nearchus on the voyage from the mouth of the Indus to the Persian gulf. He wrote a diffuse biography of Alexander, which in addition to historical details contained descriptions of the countries visited, especially India. After the king's death, Onesicritus appears to have completed his work at the court of Lysimachus, king of Thrace. Its historical value was considered small, it being avowedly a panegyric, and contemporaries (including even Alexander himself) regarded it as untrustworthy. Strabo especially takes Onesicritus to task for his exaggeration and love of the marvellous. His Paraplus (or description of the coasts of India) probably formed part of the work, and, incorporated by Juba II. of Mauretania with the accounts of coasting voyages by Nearchus and other geographers, and circulated by him under the name of Onesicritus, was largely used by Pliny.

See Arrian, Anabasis, vi. 2; Indica, 32; Diogenes Laertius vi. 75; Plutarch, Alexander, 46, 65; Strabo xv. 698; Pliny, Nat. Hist. vi. 26;

Aulus Gellius ix. 4; fragments and life in C. W. Muller, appendix to F. Diibner's Arrian (1846); monograph by F. Lilie (Bonn, 1864); E. H. Bunbury, Hist, of Ancient Geography, i. (1879); Meier in Ersch and Gruber's Allgemeine Encyclopddie.

ONION (Fr. oignon, Lat. unio, liberally unity, oneness, applied to a large pearl and to a species of onion), Allium Cepa (nat. ord. Liliaceae), a hardy bulbous biennial, which has been culti- vated in Britain from time immemorial, and is one of the earliest of cultivated species; it is represented on Egyptian monuments, and one variety cultivated in Egypt was accorded divine honours. It is commonly cultivated in India, China and Japan. A. de Candolle, arguing from its ancient cultivation and the antiquity of the Sanskrit and Hebrew names, regards it as a native of western Asia.

The onion should be grown in an open situation, and on a light, rich, well-worked soil, which has not been recently manured. In England the principal crop may be sown at any time from the middle of February to the middle of March, if the weather is fine and the ground sufficiently dry. The seed should be sown in shallow drills, 10 in. apart, the ground being made as level and firm as possible, and the plants should be regularly thinned, hoed and kept free from weeds. At the final thinning they should be set from 3 to 6 in. apart, the latter distance in very rich soil. About the beginning of September the crop is ripe, which is known by the withering of the leaves; the bulbs are then to be pulled, and exposed on the ground till well dried, and they are then to be put away in a store-room, or loft, where they may be perfectly secured from frost and damp.

About the end of August a crop is sown to afford a supply of young onions in the spring months. Those which are not required for the kitchen, if allowed to stand, and if the flower-bud is picked out on its first appearance, and the earth stirred about them, frequently produce bulbs equal in size and quality to the large ones that are imported from the Continent. A crop of very large bulbs may also be secured by sowing about the beginning of September, and transplanting early in spring to very rich soil. Another plan is to sow in May on dry poor soil, when a crop of small bulbs will be produced; these are to be stored in the usual way, and planted in rich soil about February, on ground made firm by treading, in rows about 1 ft. apart, the bulbs being set near the surface, and about 6 in. asunder. The White Spanish and Tripoli are good sorts for this purpose.

To obtain a crop of bulbs for pickling, seed should be sown thickly in March, in rather poor soil, the seeds being very thinly covered, and

the surface well rolled; these are, not to be thinned, but should be pulled and harvested when ripe. The best sorts for this crop are the Silver-skinned, Early Silver-skinned, Nocera and Queen.

Onions may be forced like mustard and cress if required for winter salads, the seeds being sown thickly in boxes which are to be placed in a warm house or frame. The young onions are of course pulled while quite small.

The Potato Onion, Allium Cepa var. aggregation, is propagated by the lateral bulbs, which it throws out, under ground, in considerable numbers. This variety is very prolific, and is useful when other sorts do not keep well. It is sometimes planted about midwinter, and then ripens in summer, but for use during the spring and early summer it is best planted in spring. It is also known as the under- ground onion, from its habit of producing its bulbs beneath the surface.

The Tree Onion or Egyptian Onion, Allium Cepa var. proliferum, produces small bulbs instead of flowers, and a few offsets also underground. These small stem bulbs are excellent for pickling.

The Welsh Onion or Ciboule, Allium fistulosum, is a hardy perennial, native of Siberia. It was unknown to the ancients, and must have come into Europe through Russia in the middle ages or later. It forms no bulbs, but, on account of its extreme hardiness, is sown in July or early in August, to furnish a reliable supply of young onions for use in salads during the early spring. These bulbless onions are sometimes called Scallions, a name which is also applied to old onions which have stem and leaves but no bulbs.

The following are among the best varieties of onions for various purposes : —

For Summer and Autumn. — Queen; Early White Naples: these two sorts also excellent for sowing in autumn for spring salading. Silver-skinned; Tripoli, including Giant Rocca.

For Winter. — Brown Globe, including Magnum Bonum; White Globe; Yellow Danvers; White Spanish, in its several forms; Trebons, the finest variety for autumn sowing, attaining a large size early, ripening well, and keeping good till after Christmas; Ailsa Craig; Ronsham Park Hero; James's Keeping; Cranston's Excelsior; Blood Red, strong-flavoured.

For Pickling. — Queen, Early Silver-skinned, White Nocera, Egyptian.

ONOMACRITUS (c. 530-480 B.C.), seer, priest and poet of Attica. His importance lies in his connexion with the religious movements in Attica during the 6th century B.C. He had great influence on the development of the Orphic religion and mysteries, and was said to have composed a poem on initiatory rites. The works of Musaeus, the legendary founder of Orphism in Attica, are said to have been reduced to order (if not actually written) by him (Clem. Alex. Stromata, i. p. 143 [397]; Pausanias i. 22, 7). He was in high favour at the court of the Peisistratidae till he was banished by Hipparchus for making additions of his own in an oracle of Musaeus. When the Peisistratidae were themselves expelled and were living in Persia, he furnished them with oracles encouraging Xerxes to invade Greece and restore the tyrants in Athens (Herodotus vii. 6). He is also said to have been employed by Peisistratus in editing the Homeric poems, and to have introduced interpola- tions of his own (e.g. a passage in the episode of the visit of Odysseus to the world below). According to Pausanias (viii. 3 1 ; 3! 37; 5! i x – 35> 5) he was also the author of poems on mytho- logical subjects.

See F. W. Ritschl, ” Onomakritos von Athen,” in his Opuscula, i. (1866), and p. 35 of the same volume; U. von Wilamowitz-Mollen- dorff, ” Homerische Untersuchungen” (pp. 199-226 on the Orphic interpolation in Odyssey, X 566-631), in Kiessling-Mollendorff, Philologische Untersuchungen, Heft 7 (1884).

ONOMATOPOEIA, literally the making or formation of words (Gr. ovo/xaTcnroua, from ovoixa, name, word, iroitiv, to make), hence a term used in philology for the formation of words by imitation of natural sounds, e.g. ” hiss,” ” hush,” ” click.” Modern philo- logists prefer the term ” echoism,” ” echoic ” for this process, as suggesting the imitative repetition of the sounds heard. At one time there was an exaggerated tendency to find in echoism a principal source in the origin and growth of language, ridiculed as the ” bow-wow ” theory of language; it is now recognized that it has played only a limited part.

ONONDAGA, a tribe of North American Indians of Iroquoian stock, forming one of the Six Nations. The tribal headquarters was about the lake and creek of the same name in New York state. Their territory extended northward to Lake Ontario and southward to the Susquehanna river. They were the official guardians of the council-fire of the Iroquois. Their chief town, near the site of the present Onondaga, consisted of some 140 houses in the middle of the 17 th century, when the tribe

was estimated as numbering between 1500 and 1700. During the 1 8th century the tribe divided, part loyally supporting the Iroquois league, while part, having come under the influence of French missionaries, migrated to the Catholic Iroquois settle- ments in Canada. Of those who supported the league, the majority, after the War of Independence, settled on a reservation on Grand river, Ontario, where their descendants still are. About 500 are upon the Onondaga reservation in New York state. For Onondaga cosmology see 21st Ann. Report Bureau Amer. Ethnol. (1899-1900).

ONOSANDER, or Onasander, Greek philosopher, lived during the 1st century a.d. He was the author of a commentary on the Republic of Plato, which is lost, but we still possess by him a short but comprehensive work (2Tp

Edition by H. Kochly (i860); see also G. Rathgeber in Ersch and Gruber's Allgemeine Encyclopadie.

ONSLOW, EARL OF, a title borne by an English family claiming descent from Roger, lord of Ondeslowe in the liberty of Shrewsbury in the 13th century. Richard Onslow (1528-1571), solicitor-general and then Speaker of the House of Commons in the reign of Elizabeth, was grandfather of Sir Richard Onslow (1601-1664), who inherited the family estate on the death of his brother, Sir Thomas Onslow, in 1616. Sir Richard was a member of the Long Parliament, and during the great Rebellion was a colonel in the parliamentary army. He was a member of Crom- well's parliament in 1654 and again in 1656, and was also a member of his House of Lords. His son, Sir Arthur Onslow (1621- 1688), succeeded in 1687 by special remainder to the baronetcy of his father-in-law, Sir Thomas Foot, lord mayor of London. Sir Arthur's son, Sir Richard (1654-1717), was Speaker of the House of Commons from 1708 to 17 10, and chancellor of the exchequer in 1715. In 1716 he was created Baron Onslow of Onslow and of Clandon. He was uncle of Arthur Onslow, the famous Speaker (see below), whose only son George became 4th Baron Onslow on the death of his kinsman Richard in October 1776. The 4th baron (1731-1814) had entered parliament in 1754, and was very active in the House of Commons; and in May 1776, just before he succeeded to the family barony, he was created Baron Cranley of Imbercourt. He was comptroller and then treasurer of the royal household, and was present at the marriage of the prince of Wales, afterwards George IV., with Mrs Fitzherbert in 1785. In 1801 he was created Viscount Cranley and earl of Onslow, and he died at his Surrey residence,

Clandon Park, on the 17th of May 1814. The second earl was his eldest son Thomas (1754-1827), whose son Arthur George (1777-1870), the 3rd earl, died without surviving male issue in October 1870. He was succeeded by his grand-nephew, William Hillier, 4th earl of Onslow (b. 1853), who was governor of New Zealand from 1888 to 1892; under-secretary for India from 1895 to 1900; and under-secretary for the Colonies from 1900 to 1903. From 1903 to 1905 he was a member of the Con- servative cabinet as president of the board of agriculture.

ONSLOW, ARTHUR (1691-1768), English politician, elder son of Foot Onslow (d. 1 710), was born at Chelseaonthe 1st of October 1691. Educated at Winchester and at Wadham College, Oxford, he became a barrister and in 1 720 entered parliament as a member for the borough of Guildford. Seven years later he became one of the members for Surrey, and he retained this seat until 1761. In 1728 he was elected Speaker of the House of Commons, being the third member of his family to hold this office; he was also chancellor to George II. ‘s queen, Caroline, and from 1734 to 1742 he was treasurer of the navy. He retired from the position of Speaker and from parliament in 1761, and enjoyed an annuity of £3000 until his death on the 17th of February 1768. As Speaker, Onslow was a conspicuous success, displaying know- ledge, tact and firmness in his office; in his leisure hours he was a collector of books.

Speaker Onslow’s nephew, George Onslow (1731-1792), a son of his brother Richard, was a lieutenant-colonel and member of parliament for Guildford from 1760 to 1784. He had a younger brother Richard (1741-1817), who entered the navy and was made an admiral in 1799.

ONTARIO, a province of Canada, having the province of Quebec to the E., the states of New York, Ohio, Michigan, Wisconsin, and Minnesota to the S., Manitoba to the W., and the district of Keewatin with James Bay to the N. In most cases the actual boundary consists of rivers or lakes, the Ottawa to the north-east, the St Lawrence and its chain of lakes and rivers to the south as far as Pigeon river, which separates Ontario from Minnesota. From this a canoe route over small rivers and lakes leads to the Lake-of-the-Woods, which lies between Ontario, Minnesota and Manitoba; and English and Albany rivers with various lakes Carry the boundary to James Bay. From Lake Temiscaming northwards the boundary is the meridian of 79 30’.

Physical Geography. — Ontario extends 1000 m. from E. to W. and more than 700 m. from N. to S., t etween latitudes 55° and 42 ,

including the most southerly point in Canada. Its area is 260,862 sq. m. (40,354 water), and it is the most populous of the provinces, nine-tenths of its inhabitants living, however, in one- tenth of its area, between the Great Lakes, the Ottawa .and the St Lawrence. This forms part of the plain of the St Lawrence, underlain by Palaeozoic limestones and shales, with some sand- stone, all furnishing useful building material and working up into a good soil. The lowest part cf the plain, including an area of 4500 sq. m. lying between elevations of 100 and 400 ft., was covered by the sea at the close of the Ice Age, which left behind broad deposits of clay and sand with marine shells.

The south-western part is naturally divided into two tracts by the Niagara escarpment, a line of cliffs capped by hard Silurian limestones, running from Queenston Heights near the falls of Niagara west to the head of Lake Ontario near Hamilton, and then north- west to the Bruce Peninsula on Georgian Bay. The tract north-east of the escarpment has an area of 9000 sq. m. and an altitude of 400 to 1000 ft., and the south western tract includes 15,000 sq. m. with an elevation of 600 to 1700 ft. In the last petroleum, natural gas, salt and gypsum are obtained, but elsewhere in southern Ontario no economic minerals except building materials are obtained. Covering the higher parts of the south-western Palaeozoic area in most places are rolling hills of boulder clay or stony moraines; while the lower levels are plains gently sloping toward the nearest of the Great Lakes and sheeted with silt deposited in more ancient lakes when the St Lawrence outlet was blocked with ice at the end of the glacial period. The old shore cliffs and gravel bars of these glacial lakes are still well-marked topographical features, and provide favourite sites for towns and cities. London, for example, is built on the old shore of Lake Warren, the highest of the extinct lakes; and St Catharines, Hamilton and Toronto are on the old shore of Lake Iroquois, the lowest. The Niagara escarpment mentioned above, generally called ” the mountain ” in Ontario, is the cause of waterfalls on all the rivers which plunge over it, Niagara Falls being, of course, the most important; and in most cases these falls have eaten their way back into the tableland, forming deep gorges or canyons like that below Niagara itself, through which the water pours as violent rapids. Between the Palaeozoic area near Ottawa, and Georgian Bay to the north of the region just referred to, there is a southward projection of the Archaean protaxis consisting of granite and gneiss of the Laurentian, enclosing bands of crystalline limestone and schists, which are of interest as furnishing the only mines of ” Old Ontario.” From these rocks in the Ottawa valley are quarried or mined granite, marble, magnificent blue sodalite, felspar, talc, actinolite, mica, apatite, graphite and corundum; the latter

mineral, which occurs on a larger scale here than else- where, is rapidly replacing emery as an abrasive. Several metals have been mined also, including gold, copper, lead, iron and arsenic ; but the amounts produced have not been great, and many of the mines are no longer working.

While all the larger cities and most of the manufacturing and farming districts of the province belong to old Ontario, there is now in process of development a ” New Ontario,” stretching for hundreds of miles to the north and north-west of the region just described and covering a far larger area, chiefly made up of Lauren- tian and Huronian rocks of the Archaean protaxis. The rocky hills of the tableland to the north long repelled settlement, the region being looked on by the thrifty farmers of the south as a wilderness useless except for its forests and its furs; and unfortunate settlers who ventured into it usually failed and went west or south in search of better land. Gradually, however, areas of good soil were opened

up, in the Rainy river valley, near Lake Temiscaming and elsewhere, and mines of various kinds were discovered, as the Canadian Pacific railway and its branches extended through the region, and at length the finding of very rich silver mines attracted world-wide attention to northern Ontario. In the better explored parts along the great lakes and the railways, ores of gold, silver, nickel, cobalt, antimony, arsenic, bismuth and molybdenum have been obtained, and several important mines have been opened up. Gold has been found at many points across the whole province, from the mines of the Lake- of-the- Woods on the west to the discoveries at Larder Lake on the east; but in most cases the returns have been unsatisfactory, and only a few of the gold mines are working. Silver mines have proved of far greater importance, in early days near Thunder Bay on Lake Superior, more recently in the cobalt region near Lake Temiscaming on the east side of the province. Silver Islet mine in Lake Superior produced in all $3,250,000 worth of silver, but this record will no doubt be surpassed by some of the mines in the extraordinarily rich cobalt district. The veins are small, but contain native silver and other rich silver ores running sometimes several thousand ounces per ton, the output being 5,500,000 oz. in 1906. Associated with the silver minerals are rich ores of cobalt and nickel, combined with arsenic, antimony and sulphur, which would be considered valuable if occurring alone, but are not paid for under present conditions, since they are difficult to

separate and refine. The cobalt silver ores are found mainly in Huronian conglomerate, but also in older Keewatin rocks and younger diabase, and the silver- bearing region, which at first included only a few square miles, is found to extend 25 m. to the west and as much to the north. Up to the present the most important mineral product of Ontario is nickel, which is mined only in the neighbourhood of Sudbury, where the ores occur in very large deposits, which in 1905 produced 9503 tons, more than half of the world's supply of the metal. With the nickel copper is always found, and copper ores are worked on their own account in a few localities, such as Bruce mines. Iron ores have been discovered in many places in connexion with the " iron formation " of the Keewatin, but nowhere in amounts com parable with those of the same formation in Michigan and Minnesota. The total mineral output of Ontario, including building materials and cement, is larger than that of any other province of the dominion, and as more careful exploration is carried on in the northern parts, no doubt many more deposits of value will be discovered. It has been found that northern Ontario beyond the divide between the Great Lakes and Hudson Bay possesses many millions of acres of arable land, clay deposits in a post-glacial lake, like those in the southern part of the province, running from east to west from Lake Abitibbi to a point north of Lake Nipigon. Railways are opening up this tract. The clay belt is in latitudes south of Winnipeg, with a good summer climate but cold winters. The spruce timber covering much of the area is of great value, compensating for the labour of clearing the land. . .,,.,,

Lakes and Rivers. — All parts of Ontario are well provided with lakes and rivers, the most important chain being that of the St Lawrence and the Great Lakes with their tributaries, which drain the more populous southern districts, and, with the aid of canals, furnish communication by fairly large vessels between the lower St Lawrence and the Lake Superior. Lake Nipigon, a beautiful body of water 852 ft. above the sea, 70 m. long and 50 m. wide, may be looked upon as the headwaters of the St Lawrence, since Nipigon river is the largest tributary of Lake Superior, though several other important rivers, such as the Kaministiquia, the Pic and the Michi- picoten, enter it from the north. All these rivers have high falls not far from Lake Superior, and Kakebeka Falls on the Kamin- istiquia supplies power to the twin cities of Fort William and Port Arthur, while the deep water of its mouth makes the great shipping port for western wheat during the summer. The north shore of Lake Superior is bold and rugged with many islands, such as Ignace and Michipicoten, but with very few settlements, except fishing stations, owing to its rocky character. At the south-eastern end St Mary's river carries its waters to Lake Huron,

with a fall of 602 to 581 ft., most of which takes place at Sault Sainte Marie, where the largest locks in the world permit vessels of 10,000 tons to pass from one lake to the other, and where water-power has been greatly developed for use in the rolling mills and wood pulp industry. The north-east shores of Lake Huron and its large expansion Georgian Bay are fringed with thousands of islands, mostly small, but one of them, Manitoulin Island, is 80 m. long and 30 in. broad. French river, the outlet of Lake Nipissing, and Severn river, draining Lake Simcoe, come into Georgian Bay from the east, and canals have been projected to connect Lake Huron with the St Lawrence by each of these routes, the northern one to make use of the Ottawa and the southern one of Trent river. The Trent Valley canal is partly in operation. Georgian Bay is cut off from the main lake by Manitoulin Island and the long promontory of Bruce Peninsula. Lakes Superior and Huron both reach depths hundreds of feet below sea-level, but the next lake in the series, St Clair, towards which Lake Huron drains southward through St Clair river, is very shallow and marshy. Detroit river connects Lake St Clair with Lake Erie at an elevation of 570 ft. ; and this comparatively shallow lake, running for 240 m. east and west, empties northwards by Niagara river' into Lake Ontario, which is only 247 ft. above the sea.

Niagara Falls, with rapids above and below, ca:ry the waters of the upper lakes over the Niagara escarpment. Power from the falls is put to use in New York state and Ontario, a large amount being sent to Toronto 80 m. away. Welland canal, between Port Colborne on Lake Erie and Dalhousie on Lake Ontario, carries vessels of 14 ft. draught from one lake to the other. From Lake Ontario the St Lawrence emerges through the meshes of the Thousand Islands, where it crosses Archaean rocks, after which follow several rapids separated by quieter stretches before Montreal is reached at the head of ocean navigation. Steamers not of too great draught can run the rapids going down, but vessels must come up through the canals. All the other rivers in southern Ontario are tributaries of the lakes or of the St Lawrence, the Ottawa, navigable in many parts, being the largest, and the Trent next in importance. In northern Ontario lakes are innumerable and often very picturesque, forming favourite summer resorts, such as Lake Temagami, the Muskoka Lakes and Lake-of-the-Woods. The latter lake with Rainy Lake and other connected bodies of water belong to the Hudson Bay system of waters, their outlet being by Winnipeg river to Lake Winnipeg, from which flows Nelson river. In Ontario the Albany, Moose, Missanabi and Abitibbi flow into Hudson Bay, but none of these rivers is navigable except for canoes.

Climate. — The climate of Ontario varies greatly, as might be

expected from its wide range in latitude and the relationships of the Great Lakes to the southern peninsula of the province. The northern parts as far south as the north shore of Lake Superior have long and cold but bright winters, sometimes with temperatures reaching 50 F. below zero; while their summers are delightful, with much sunshine and some hot days but pleasantly cool nights. Between Georgian Bay and Ottawa the winters are less cold, but usually with a plentiful snowfall; while the summers are warmand sometimes even hot. The south-west peninsula of Ontario has its climate greatly modified by the lakes which almost enclose it. As the lakes never freeze, the prevalent cold north-west winds of North America are warmed in their passage over them, and often much of the winter precipita- tion is in the form of rain, so that the weather has much less certainty than in the north. The summers are often sultry, though the presence of the lakes prevents the intense heat experienced in the states to the west and south. Owing to the mildness of its winters, the south-west peninsula is a famous fruit country with many vine- yards and orchards of apples, plums and peaches. Indian corn (maize) is an important field crop, and tobacco is cultivated on a large scale. Small fruits and tomatoes are widely grown for the city markets and for canning, giving rise to an important industry. The normal temperatures (Fahr.) for three points in the south- western, eastern and north-western portions are given below: —

Toronto.

Ottawa.

Port. Arthur.

December, January and February . March, April and May . June, July and August September, October and November

Average annual precipitation .

23-7 40-6

65-4

47-0

in.

33-944

13-3 38-5 67-4 4.4-8

in.

32-650

7-3

3i-i

58-9

3.8-5

in.

23-580

(A. P. C.) Population. — The following table shows the population of the province: —

1881.

1891.

1901.

1 Townships ....

2 Towns and villages .

1,346,623 323.188 257.1 11

1,283,281 432,912 398,128

1,247,190

| 935,757

1,926,922

2,114,321

2,182,947

1 The name given to the rural municipalities.

2 Anv town in Canada can become incorporated as a city on attaining a population of 10,000.

Ontario is thus pre-eminently an agricultural province, though the growth of manufactures has increased the importance of the towns and cities, and many of the farmers are seeking new homes in the provinces of Manitoba, Alberta and Saskatchewan. This emigration accounts in large measure for the slow increase of the population, though there has also been a slight decrease in the birth-rate. The population was long entirely confined to the southern and eastern sections of the province, which comprise an area of about 33,000 sq. m.; but in these districts it is now stationary or decreasing, whereas the northern and western portions are filling up rapidly. Toronto, the provincial capital, has grown from 50,000 in 187 1 to about 300,000, partly through the absorption of neighbouring towns and villages. _ Other

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important cities are Ottawa (the capital of the Dominion) (59,928 in 1901), Hamilton (52,634), London (37,981), Kingston (17,961). The number of males slightly exceeds that of females. The population is chiefly of British descent, though in the eastern counties numerous French Canadians are flocking in from Quebec and in some instances by purchase of farms replacing the British. There are also about 20,000 Indians, many of whom are civilized, enjoy the franchise and are enrolled in the Dominion militia. There is no state Church, though buildings devoted to religious purposes are almost wholly exempt from municipal taxation. The Methodists are, numerically, the strongest religious body, then come Presbyterians, Roman Catholics and Anglicans, in the order named.

Administration. — The executive power is vested in a lieutenant-governor appointed for five years by the federal government, and assisted by an executive council, who have seats in and are responsible to the local legislature. This consists of one house only, of 106 members, elected by what is practically manhood suffrage.

The municipal system still embodies the spirit and purpose of the Baldwin Municipal Act which originated it in 1849. Though based rather on the simple English model than on the more complicated municipal governments of the United States, it has certain features of its own, and is revised from year to year. On it have been modelled the municipal systems of the other provinces. Municipal ownership does not prevail to any extent, and in the larger cities the powers of certain great corporations have tended to cause friction, but such

matters as the provision of electric power and light are gradually being taken in hand both by the municipalities and by the province, and a railway and municipal board appointed by the local legislature has certain powers over the railways and electric tramlines.

Finance. — By the British North America Act, which formed in 1867 the Dominion of Canada, the provinces have the right of direct taxation only. Against this, however, a strong prejudice exists, and in Ontario the only direct taxation takes the form of taxes on corporations (insurance, loan and railway companies), succession duties, liquor licences, &c. These, together with returns from various investments, earnings of provincial buildings, &c, yield about one-third of the revenue. Another third comes from the Dominion subsidy, granted in lieu of the power of indirect taxation, and the remainder from the sale or lease of crown lands, timber and minerals. Owing to the excellence of the municipal system there has been a tendency to devolve thereon, in whole or in part, certain financial burdens on the plea of decentralization. The finances of the province have been well administered, and only in recent years has a debt been incurred, chiefly owing to the construction of a provincial railway to aid in the development of the northern districts.

Education. — As early as 1797 500,000 acres of crown lands were set apart for educational purposes, and a well-organized system of education now exists, which, since 1876, has constituted a department of the provincial government. A laudable attempt has been made to keep the education department free from the vagaries and the strife of party politics, and the advantages of political control have been as much felt as its drawbacks. Since 1906 a superintendent has been appointed with large powers, independent of political control and with the assistance of an advisory council ; attention is also paid to the advice of the provincial Educational Association, which meets yearly at Toronto.

School attendance is compulsory between the ages of eight and fourteen, and is enforced by truant officers. The primary or public schools are free and undenominational. They cannot, however, be called secular, as they are opened and closed with the Lord’s Prayer and closid with the reading of the Bible. From these religious exercises any children may absent themselves whose parents profess conscientious objections. After a long and bitter struggle the Roman Catholics won in 1863 the right to separate schools. These may be set up in any district upon the request of not less than five heads of families. The rates levied on their supporters are devoted exclusively to the separate schools, which also share pro rata in the government

grant. Although many Roman Catholic children attend the public schools, the number of separate schools is, under the influence of the priesthood, steadily increasing. Under certain conditions, Protest- ants and coloured persons may also claim separate schools, but of these only four or five exist. Numerous kindergartens have been established in the cities.

Secondary education is imparted in high schools and collegiate 1 institutes. These may exact fees or give free education at the

1 A high school is raised to the rank of collegiate institute on complying with certain provisions, chief among which are the em- ployment of at least four teachers with Degrees in Honours from a recognized Canadian university. Such an institution receives a slightly larger government grant.

option of the local trustees. There are also numerous private schools. Of these such as are incorporated are aided by exemption from municipal taxation. In and around Toronto are numerous boarding schools and colleges, of which those for boys are on the model of the great public schools of England. Of these the most celebrated is Upper Canada College, founded in 1829, and long part of the edu- cational system of the province, but now under private control.

The provincial university is situated in Toronto, and since 1906 has been governed by an independent board, over which a power of veto is retained by the lieutenant-governor in council. With the affiliated colleges, it had in 1908 a staff of 356, and 3545 students. There are also numerous universities throughout the province, founded in early days by the various religious bodies. Of these Victoria (Methodist) and Trinity (Anglican) are in Toronto, and have become federated with the provincial university, in which they have merged their degree-conferring powers. MacMaster (Baptist) is also in Toronto, and retains its independence. The others are Queen's University, Kingston (Presbyterian) ; the Western University, London (Anglican) ; and the university of Ottawa (Roman Catholic). Women students are admitted to all the universities save Ottawa on the same terms as men, and form nearly one- third of the whole number of students. Theological colleges are supported by the various religious bodies, and are in affiliation with one or other of the universities.

The public and high schools tend rather to follow American than British methods, though less freedom is allowed to the local authorities than in most of the American states. Only those text books authorized by the central department may be used. Free text books

may be issued at the discretion of the local authorities, but in most cases are provided by parents. Every school, public, separate or high, shares in the provincial grant, but the chief financial burden falls on the local authorities.

Owing to the low rate of salaries, the percentage of women teachers, especially in the public schools, is steadily increasing, and now amounts in these to almost 83 %. The same cause has also reduced their age, and the teachers are in many cases exceedingly immature. The institution of a minimum salary by the provincial department led to such resistance that it was withdrawn, but a distinct advance in salaries has taken place since 1906. In the rural districts an attempt is being made to increase efficiency by the consolidation of several small schools and the conveyance of the children to one central building.

The curriculum, originally modelled on that of England, is being gradually modified by the necessities of a new country. In addition to the ordinary literary and scientific subjects, manual training, domestic science, agriculture and kindred subjects are taught in the public and high schools, and in the larger towns technical institutes are being founded. Many of the rural schools have gardens, in which the elements of agriculture, botany and kindred subjects are taught in a practical manner. Travelling libraries are sent through the country districts, and an attempt is being made to extend similar aid to the lumber-camps.

The training of teachers is carefully supervised. Numerous model and normal schools exist, and a well-equipped normal college at Toronto. The smaller county model schools have, since 1906-1907, been consolidated and centralized in the larger towns.

At Guelph is the Ontario Agricultural College, founded and en- dowed by the provincial government, and greatly enlarged and improved by the generosity of Sir William Macdonald (b. 1832). Its services in placing provincial agriculture on a scientific basis cannot be over-estimated. The government also maintains an institute for the deaf and dumb at Belleville and for the blind at Brantford. At Kingston it supports a dairy school and a large school of mining.

Agriculture. — About three-fifths of the inhabitants are engaged in agricultural pursuits, and in 1910 the amount invested in lands, buildings, implements and stock was double that invested in the manufactures of the whole Dominion. Nearly all the farms are worked by their owners, and a simple and efficient system of land- transfer is in use. The farming population in the older parts of the province tends

to decline in numbers, owing to emigration, partly to the towns, but especially to the newer lands of Manitoba and the west. Yet, owing to the increasing use of scientific implements and methods promoted by the federal and provincial governments, the total value of agricultural products increased by over 50% between 1881 and 1910. In general, the soil is fertile and the climate favourable. , The district north of the Height of Land, long supposed to be a barren wilderness, has proved in part suitable for agriculture, and is steadily increasing in population. Mixed farming and the raising of live stock is becoming more and more the rule, so that the failure of any one crop becomes of less vital importance. The average farm varies in size from 100 to 200 acres. Wheat, barley, oats, peas,

Cotatoes and other roots are staple crops, the average yield of wheat eing about 20 bushels an acre ; cattle are increasing in number and improving in quality, and all branches of dairy farming prosper. Owing to tariff restrictions, the United States' market is being more and more abandoned, and improvements in cold storage are making it possible to export to Great' Britain increasing quantities of butter and cheese. The collection of milk by the creameries and cheese-factories is carried on with great efficiency. The number of

horses and sheep is stationary or declining, but the raising of hogs, formerly abandoned in great part to the western states, is becoming an increasing industry. Large quantities of peas, corn, tomatoes and other vegetables are canned, chiefly for home consumption. Three-quarters of the orchard lands of Canada are in Ontario, the chief crops being apples and peaches. The cultivation of the latter centres in the Niagara peninsula, but apples flourish along the great lakes and the St Lawrence from Godench to Cornwall. In Essex and Kent, and along the shore of Lake Erie, tobacco and grapes form a staple crop, and wine of fair quality is produced.

Lumber. — Slightly less than half remains of the forest which once covered the whole province. The lumber industry exceeds that of any other part of the Dominion, though Quebec possesses greater timber areas untouched. The numerous lakes and rivers greatly facilitate the bringing of the timber to market. All trees were long little thought of in comparison with the pine, but of late years poplar and spruce have proved of great value in the making of paper pulp, and hard-wood (oak, beech, ash, elm, certain varieties of maple) is becoming

increasingly valuable for use in flooring and the making of furniture. In the spring the making of syrup and sugar from the sap of the sugar-maple is a typical industry. _

Much splendid timber has been needlessly destroyed, chiefly by forest-fires, but also by improvident farmers in their haste to clear the land. Increased attention is now being paid by both provincial and federal governments to preservation and to reforestation. Special areas have been set apart on which no timber may be cut, and on which the problems of scientific forestry may be studied. Of these, the earliest was the Algonquin National Park, which also forms a haven of refuge for the wild creatures.

Northern Ontario is still a valuable fur-bearing and hunting country, moose, caribou, fox, bear, otter, mink and skunk being found in large quantities. Wolves, once numerous, have now been almost extirpated, though a bounty on each head is still paid.

Minerals. — The geographical distribution of the great mineral wealth of Ontario has already been indicated (see Physical Geography, above). Save for beds of lignite, said to exist in the extreme north, coal is not found and has to be imported, chiefly from the states of Ohio and Pennsylvania, though Nova Scotia furnishes an increasing quantity. The production of iron is stimulated by federal and provincial bounties. The province supplies over two-thirds of the iron ore mined in the Dominion, but much is still imported. The output of gold is decreasing. The nickel mines in the neighbourhood of Sudbury are the largest in the world, outri vailing those of New Caledonia. In the same district, and chiefly in connexion with the nickel mines, large quantities of copper are produced. When in 1905 the rich silver area was found in northern Ontario, a rush was made to it, comparable to those to the Australian and Californian goldfields. Cobalt, the centre of this area, is 103 m. from North Bay by the provincial railway (Temiscaming & North Ontario railway)-. In the same neighbourhood are found cobalt, arsenic and bismuth. In the older districts of the province are found petroleum and salt. The district around Petrolea produces about 30,000,000 gallons of petroleum yearly, practically the whole output of the dominion. Salt is worked in the vicinity of Lake Huron, but the production is less than half that imported. Natural gas is produced in the counties of Welland and Essex, and exported in pipes to Buffalo and Detroit. Among the less important metals and minerals which are also mined, is corundum of especial purity.

Manufactures and Commerce. — Manufactures are becoming of

increasing importance. The obstacle due to lack of coal is offset by the splendid water powers afforded by the rapid streams in all parts of the province. Save for the flour and grist mills, few do more than supply the markets of the Dominion, of which they control an in- creasing portion. Woollen mills, distilleries and breweries and manufactures of leather, locomotives and iron-work, furniture, agricultural implements, cloth and paper are the chief. The great agricultural development of the western provinces, in which manu- factures are little advanced, has given a great impetus to the in- dustries of the older provinces, especially Ontario.

Communications. — Numerous lakes and rivers afford means of communication, and obstacles thereon have been largely overcome by canals (see Canada). Railways gridiron the province, which contains over one-third the total mileage of the dominion; their construction is aided by provincial and municipal subsidies, in addition to that paid by the federal government. The provincial government owns a line running north from North Bay, operated by a board of commissioners. The other railways are owned by private companies, but are subject to the decisions of a federal railway commission. The provincial railway and municipal board also exercises control, especially over the city and suburban electric lines.

History. — The first white man known to have set foot in what is now Ontario was Champlain. In 1613 he explored the Ottawa river as far as Allumette Island; in 1615, starting from Montreal, he reached the Georgian Bay by way of the Ottawa river, Lake Nipissing and French river, and then by way of Lakes Couchiching and Simcoe and the Trent river system of lakes and streams made his way to Lake Ontario, called by him Entouhoronon. The

winter of 1615-1616 he spent among the Huron Indians, near the Georgian Bay. In 1615 a mission among these Indians was founded by the Recollet friars, and carried on with great success and devotion by the Jesuits, but in 1648-1650 the Huron nation was almost utterly destroyed by an invasion of their hereditary foes, the Iroquois. From its centre at Quebec French civilization extended along the Mississippi and the Great Lakes, and also northwards to Hudson's Bay. In the western country numerous posts were founded, wherein fur-trader and missionary were often at variance, the trader finding brandy his best medium of ex- change, while the missionary tried in vain to stay its ravages among his flock. On the frontiers of what is now Ontario the chief points were at the strategic centres of Fort Frontenac (now Kingston), Niagara, Michilimackinac and Sault-Ste-Marie. Farther north, in what is now New Ontario, their English rivals, the Hudson's

Bay Company, had more or less permanent posts, especially at Fort Albany and Moose Factory.

With the cession of French North America to Great Britain in 1763, the Indian lords of the soil rose under Pontiac in a last attempt to shake off the white man, and in 1763-1765 there was hard fighting along the western frontier from Sault-Ste-Marie to Detroit. Thereafter for almost twenty years, Ontario was traversed only by wandering bands of trappers, chiefly belonging to the Hudson's Bay Company; but'in 1782 bands of American loyalists began to occupy the fertile country along the Bay of Quinte, and in the Niagara peninsula, the first settlement being made in 1782 at Kingston. Between 1782-1784 about 5000 loyalists entered Ontario, and were given liberal grants of land by the British government.

The oligarchic constitution established in Canada in 1774 by the Quebec Act did not suit men trained in the school of local self-government which Britain had unwittingly established in the American colonies, and the gift of representative institutions was soon necessary. In the debates in the British parliament Fox urged that the whole territory should remain one province, and of this the governor-general, the 1st baron Dorchester (q.v.), was on the whole in favour, but in 1701 Pitt introduced and carried the Constitutional Act, by which Upper and Lower Canada were separated. The Ottawa river was chosen as the main boundary between them, but the retention by Lower Canada of the seigneuries of New Longueuil and Vaudreuil, on the western side of the river, is a curious instance of the triumph of social and historical conditions over geographical. To the new province were given English civil and criminal law, a legislative assembly and council and a lieutenant-governor; in the words of its first governor, Colonel John Graves Simcoe, it had, " the British Constitution, and all the forms which secure and maintain it." Simcoe set to work with great energy to develop the pro- vince, but he quarrelled with the governor-general over his pet scheme of founding military colonies of retired soldiers in different parts of the province, and retired in 1796. Even before his retirement political feuds had broken out, which increased in bitterness year by year. In so far as these had other causes than the Anglo-Saxon love of faction, they were due to the formation by the loyalists, their descendants and hangers-on of a clique who more and more engrossed political and social power. The English church also formed a quasi-official clerical oligarchy, and the land reserved by the Constitutional Act for the support of " a protestant clergy " formed a fruitful source of bitterness.

For a time the War of 1812-1814 with the United States put an end to

the strife. The war gave some heroic traditions to the province, and in special cemented that loyalty to Great Britain for which Ontario has been conspicuous. On the other hand, the natural dislike of the United States felt by the loyalists and their descendants was deepened and broadened, and has not yet wholly died away, especially among the women of the province. The jobbing of land by the official clique, whose frequent inter- marriages won for them the name of " The Family Compact," the undoubted grievance of the " Clergy Reserves " and the well-meaning high-handedness and social exclusiveness of military governors, who tried hard but unavailingly to stay the democratic wave, soon revived political discord, which found a voice in

that born agitator, William Lyon Mackenzie. A wiser but less vigorous reformer was Robert Baldwin, who saw that in respons- ible government lay the cure for the political green-sickness from which Upper Canada was suffering. But though Baldwin and Mackenzie were in the right, it is very doubtful whether their party could at the time have given the country as cheap and efficient a civil service as was given by the Family Compact, who had at least education and an honourable tradition.

In 1837 discontent flared up into a pitiful little rebellion, led by Mackenzie. This tragical farce was soon at an end and its author a fugitive in the United States, whence he instigated bands of hooligans to make piratical attacks upon the Canadian frontier. Thus forcibly reminded of the existence of Canada, the British government sent out Lord Durham to investigate, and as a result of his report the two Canadas were in 1841 united in a legislative union.

Meanwhile the southern part of the province had been filling up. In 1791 the population was probably under 20,000; in 1824 it was 150,066, and in 1841, 455,688. The eastern counties of Stormont and Glengarry, and parts of the western peninsula, had been settled by Highlanders; the Canada Company, organized in 1825 by the Scottish novelist, John Gait, had founded the town of Guelph, had cleared large tracts of land in the western peninsula, and settled thereon hundreds of the best class of English and Scotch settlers.

Once granted responsible government, and the liberty to make her own mistakes, Upper Canada went ahead. The popula- tion rose to

952,004 in 1851 and to 1,396,091 in 1861. Politically she found Lower Canada an uneasy yoke-fellow. The equality of representation, granted at the union, at first unfair to Lower Canada, became still more unfair to Upper Canada, as her population first equalled and then surpassed that of her sister province. The Roman Catholic claim to separate state-aided schools, at length conceded in 1863, long set the religious bodies by the ears. Materially the province prospered. The " Clergy Reserves " were secularized in 1854, and in 1851 began a railway development, the excitement and extravagance caused by which led in 1857 to a financial crisis and the bankruptcy of various municipalities, but which on the whole produced great and lasting benefit, The Reciprocity Treaty with the United States, in operation from 1854 to 1866, and the high prices for farm produce due to the American Civil War, brought about an almost hectic prosperity. In the discussions from which sprang the federation of 1867, Ontario was the one province strongly in favour of the union, which was only rendered possible by the coalition of her rival leaders, J. A. Macdonald and George Brown.

Since Federation Upper Canada has been known as the province of Ontario. The first provincial government, formed on coalition lines by John Sandfield Macdonald, was thrifty and not unpro- gressive, but in 1871 was defeated by a reorganized liberal party, which held power from 1871 to 1905, and on the whole worthily. Under Oliver Mowat, premier from 1873 to 1896, the govern- ment, though strongly partisan, was thrifty and honest. An excellent system of primary and secondary schools was organized by Egerton Ryerson (1803-1882) and G. W. Ross (q.v.), higher education was aided and a school of practical science established in Toronto and of mining in Kingston; agriculture was fostered, and an excellent agricultural college founded at Guelph in 1874.

The great struggle of the time was with the federal govern- ment on the question of provincial rights. Several questions in which Ontario and the Dominion came into conflict were carried to the Judicial Committee of the Privy Council, and in all of them Mowat was successful. Connected with this was the boundary struggle with Manitoba, the latter province being aided by the federal government, partly out of dislike for Mowat, partly because the crown lands in the disputed territory would, had it been adjudged to Manitoba, have been under federal control. Had Manitoba won, the boundary line would have been drawn about 6 m. east of Port Arthur, but in 1884 the Judicial Committee of the Privy Council unanimously decided in favour of Ontario; and in 1888 another decision gave her absolute control of the crown lands of New Ontario. Under Mowat's successors

the barnacles which always attach to a party long in power became unpleasantly conspicuous, and in January 1905 the conscience of Ontario sent the conservatives into power, more from disgust at their opponents than from any enthusiasm for themselves. The new government displayed unexpected energy, ability and strength. The primary and model schools were con- solidated and improved; the provincial university was given increased aid from the succession duties; various public utilities, previously operated by private companies, were taken over by the province, and worked with vigour and success. At the election of the 8th of June 1908 the conservative government was returned by an increased majority.

Bibliography. — Statistical: The various departments of the provincial government publish annual reports, and frequent special reports. Among these may be noted those of the Bureau of Mines and the archaeological reports by David Boyle (1886-1906). Since 1889 the university of Toronto has published numerous valuable studies on historical, economic and social questions, e.g. Adam Shortt, Municipal Government in Ontario.

Historical: The early history of the province is best given in the general histories of Canada by MacMullen and Kingsford (see Canada). Ernest Cruikshanks has published numerous excellent studies on the Ontario section of the War of 1812. Lord Durham's celebrated Report (1839, reprinted 1902) is less trustworthy on Ontario than on Quebec. R. and K. M. Lizar's In the Days of the Canada Company depicts the life of the early settlers. Biographies exist of most of the chief men: C. R. W. Biggar, Sir Oliver Mowat (2 vols., I 9°5). ' s practically a history of Ontario from 1867 to 1896. The provincial government has issued an excellent Documentary History of Education in Ontario, by J. G. Hodgins (28 vols.). See alsoW. Kingsford, Early Bibliography of Ontario. (W. L. G.)

ONTARIO, LAKE, the smallest and most easterly of the Great Lakes of North America. It lies between 43 n' and 44 12′ N. and 76 12′ and 79 49′ W., and is bounded on the N. by the province of Ontario and on the S. by the state of New York. It is roughly elliptical, its major axis, 180 m. long, lying nearly east and west, and its greatest breadth is 53 m. The area of its water surface is 7260 sq. m. and the total area of its basin 32,980 sq. m. Its greatest depth is 738 ft., its average depth much in excess of that of Lake Erie, and it is as a general rule free from outlying shoals or dangers.

On the north side of the lake the land rises gradually from the shore, and spreads out into broad plains, which are thickly settled by

farmers. A marked feature of the topography of the south shore is what is known as the Lake ridge, or, as it approaches the Niagara river, the Mountain ridge. This ridge extends, with breaks, from Sodus to the Niagara river, and is distant from the lake 3 to 8 m. The low ground between it and the shore, and between the Niagara escarpment and the water on the Canadian shore, is a celebrated fruit growing district, covered with vine- yards, peach, apple and pear orchards and fruit farms. The Niagara river is the main feeder of the lake; the other largest rivers emptying into the lake are the Genesee, Oswego and Black from the south side, and the Trent, which discharges into the upper end of the bay of Quinte, a picturesque inlet 70 m. long, on the north shore, between the peninsula of Prince Edward, near the eastern extremity of the lake, and the mainland. The east end of the lake, where it is 30 m. wide, is crossed by a chain of five islands, and the lake has its outlet near Kingston, where it discharges into the head of the St Lawrence river between a group of islands. Elsewhere the lake is practically free from islands. There is a general surface current down the lake towards the eastward of about 8 m. a day, strongest along the south shore, but no noticeable return current. As a result of its relatively great depth there are seldom any great fluctuations of level in this lake due to wind disturbance, but the lake follows the general rule of the Great Lakes (q.v.) of seasonal and annual variation. Standard high water (of 1870) is 2-77 ft. below the mean level, of 246-18 ft. above mean sea-level, and standard low water 3-24 ft. below the same plane. The lake never freezes over, and is less obstructed by ice than the other lakes, but the harbours are closed by ice from about the middle of December to the middle of April.

The commerce of Lake Ontario is limited in comparison with that of the lakes above Niagara Falls, and is restricted to vessels

that can pass through the Welland canal locks, which are 270 ft. long, 45 ft. wide and 14 ft. deep. Freight consists principally of coal shipped from Charlotte, Great and Little Sodus bays and Oswego to Canadian ports in the lakes, and to ports on the St Lawrence river; of grain shipped through the Welland canal to the St Lawrence; and of lumber from Canadian ports. There is a large passenger traffic, including pleasure trips, principally radiating from Toronto. Ports on the lake are limited in capacity to vessels drawing not more than 14 ft. of water. The principal Canadian ports are Kingston, at the head of the St

Lawrence river; Toronto, where the harbour is formed by an island with improved entrance channels constructed both east and west of it ; and Hamilton, at the head of the lake, situated on a landlocked lagoon, connected with the main lake by Burlington channel, an artificial cut. The principal United States port is Oswego, where a breakwater has been built, making an outer harbour. The construction of a breakwater was undertaken in 1907 by the United States government at Cape Vincent to form a harbour where westbound vessels can shelter from storm before crossing the lake.

The difference of 327 ft. in level between Lake Ontario and Lake Erie is overcome by the Welland canal, which leads southward from Port Dalhousie. It accommodates vessels 255 ft. in length, with a draught of 14 ft. The Murray canal, opened for traffic on the 14th of April 1890, extends from Presqu'ile bay, on the north of the lake, to the head of the bay of Quinte, and enables vessels to avoid 70 m. of open navigation. It is n ft. deep below the lowest lake level, and has no locks. It is proposed to have the eastern terminus of the Trent canal system (see Great Lakes) at the head of the bay of Quinte, entering through the Trent river. At Kingston the Rideau canal, extending 128 m. to Ottawa, enters the St Lawrence river at the foot of the lake.

Bibliography. — Bulletin No. 17, Survey of Northern and North-western Lakes, U.S. Lake Survey Office (Detroit, Mich., 1907); Publication No. 108 D., Sailing Directions for Lake Ontario, Hydrographic Office, U.S. Navy (Washington, D.C., 1902) ; St Lawrence Pilot (7th ed.), Hydrographic Office, Admiralty (London, 1906).

(W. P. A.)

ONTENIENTE, a town of eastern Spain, in the province of Valencia; on the right bank of the Clariano or Onteniente, a sub-tributary of the Jucar, and on the Jativa-Villena railway. Pop. (1900) 11,430. Onteniente has a parish church remarkable for its lofty square tower, and a palace of the dukes of Almodovar. There is a large modern suburb outside the old town, which was formerly a walled city; some vestiges of the ramparts still remain. Linen and woollen cloth, paper, biandy, furniture and earthenware are manufactured; and there is some trade in cereals, wine and oil.

ONTOLOGY (adapted from a modern Latin form ontologia used by Jean le Clerc 1692; Gr. &v, 5vtos, pres. part, of dvai, to be, and \6yos, science), the name given to that branch of philosophy which deals specially with the nature of being (ovcria) i.e. reality in the abstract. The idea, denoted in modern philo- sophy by the term " ontology " in

contrast to the broader ” metaphysics ” and the correlative ” epistemology,” goes back to such phrases as ovtws &vra, which Plato uses to describe the absolute reality of ideas; Plato, however, uses the term “dia- lectic ” for this particular branch of metaphysics. Aristotle, likewise, holding that the separate sciences have each their own subject matter, postulates a prior science of existence in general which he describes as ” first philosophy.” So far, therefore, the science of being is distinguished not from that of knowing but from that of the special forms of being: as to the possibility of objective reality there is no question. A new distinction arises in the philosophy of Wolff who first made ” ontology ” a technical term. Theoretical philosophy (metaphysics) is by him divided into that which deals with being in general whether objective or subjective, as contrasted with the particular entities, the soul, the world and God. The former is ontology. This intermediate stage in the evolution of the science of being gave place to the modern view that the first duty of the philosopher is to consider knowledge itself (see Epistemology), and that only in the light of conclusion as to this primary problem is it possible to consider

the nature, of being. The evolution of metaphysics has thus relegated ontology to a secondary place. On the other hand it remains true that the science of knowing is inseparable from, and in a sense identical with that of being. Epistemological conclusions cannot be expressed ultimately without the aid of cntological terms; For the wider relations of ontology, see further Philosophy.

ONYX, a banded chalcedony or striped agate, composed of white layers alternating with others of black, brown or red colour. A typical onyx consists of two or more black and white strata, whilst the term sardonyx is applied to the stone if it contains red or brown bands (see Sardonyx). Probably those varieties which show red and white zones originally suggested the name ” onyx,” from Gr. bvv£ (a finger nail), since the colours of such stones may be not unlike those of the nail. The onyx when worked by the lapidary was often designated by the diminutive ovvxlov; and at the present day the term nicolo, a corruption of the Italian diminutive onycolo, is applied to an onyx which presents a thin layer of chalcedony deriving a bluish tint from the subjacent black ground. The Hebrew soham is translated in the authorized version of the Old Testament ” onyx,” but the revised version gives in some of the passages an alternative marginal reading of ” beryl.” The position of the land of Havilah, which yielded the onyx-stone, is uncertain.

India has for ages supplied the finest onyxes, and hence jewellers

apply the expression ” Oriental onyx ” to any stone remarkable for beauty of colour and regularity of stratification, quite regardless of its locality. As far back as the 1st century the author of the Periplus Maris Erythraei mentions the onyx among the products of Plythanae, a locality probably identified with Paithan on the Godavari; and he further states that the stones were taken down to Barygaza, the modern Broach, where the agate trade still flourishes. It is probable that the early Greeks and Romans derived their prized agate-cups from this locality. The Indian onyx is found, with agate and jasper-pebbles, in river gravels derived from the disintegration of the amygdaloidal volcanic rocks of the Deccan. A great deal of onyx now sold is obtained from South American agates, cut in Germany. It often happens that the lower deposits in an agate- nodule are in horizontal layers, forming onyx, while the other deposits have adapted themselves to the curved contours of the cavity. The onyxes cut from agate-nodules are usually stained artificially, as explained under Agate.

The onyx is largely used for beads, brooches, pins, ring-stones and other small ornamental objects, while the larger pieces are occasionally wrought in the form of cups, bowls, vases, &c. Onyx is the favourite stone for cameo work, advantage being taken of the differently-coloured layers to produce a subject in relief on a background of another colour. For fine examples of ancient cameo-work in onyx and sardonyx see Gem.

It should be noted that the term onyx, or onychite, was formerly, and is still sometimes, applied to certain kinds of banded marble, like the “oriental alabaster ” (see Alabaster). Such substances are quite distinct from the hard siliceous onyx, being much softer and less precious: they are, in fact, usually deposits of calcium carbonate like stalagmite and travertine. The ornamental stones known as Mexican onyx, or Tecali marble, and Algerian onyx are of this character; and in order to avoid any confusion with the true onyx it is well to distinguish all the calcareous ” onyxes ” as onyx-marble. The well-known ” Gibraltar stone ” is an onyx-marble, with brown bands, from caverns in the limestone of Gibraltar. The Tecali onyx, some- times with delicate green shades, takes its name from the district of Tecali; one of its localities being La Pedrara, about 21 m. from the city of Puebla.

For onyx-marbles see Dr G. P. Merrill, Rep. U.S. Nat. Mus. for 1893 (1895). P- 539- (F. W. R.*)

OOLITE (Gr. <$6v, egg, Xi0os, stone), in geology, a term having two distinct meanings. In petrology (q.v.) it denotes a type of rock

structure characterized by the presence of minute spherical grains resembling the roe of a fish ; if the grains become larger, the structure is said to be pisolitic (Gr. iricros, pea). In

stratigraphical geology, the oolite is a division of the Jurassic system (q.v.) . The term appears to have been first applied in this latter sense by A. J. M. Brochant de Villiers in 1803, and through the labours of W. Smith, W. D. Conybeare, W. Buckland and others, it was gradually introduced for the calcareous rocks of the British Jurassic until it came to comprehend the whole system above the Lias. Custom still sanctions its use in England, but it has been objected that the Oolitic (Jurassic) system contains many strata that are not oolitic; and since oolitic structure occurs in limestones of all ages, it is misleading to employ the word in this way.

The oolites are usually divided into: the Upper or Portland Oolite, comprising the Purbeck, Portland and Kimeridge stages; the Middle or Oxford Oolite, including the Corallian, Oxfordian and Kellaways beds; and the Lower Oolites, with the Cornbrash, Great or Bath Oolite (Bathonian), Fullonian and the Inferior Oolite (Bajocian). The Great Oolite and Inferior Oolite are treated here.

The Inferior Oolite, called by William Smith the ” Under Oolite ” from its occurrence beneath the Great or ” Upper Oolite ” in the neighbourhood of Bath, received its present name from J. Townsend in 1813. It is an extremely variable assemblage of strata. In the Cotteswold Hills it is a series of marine deposits, 264 ft. thick near Cheltenham, but within 25 m. the strata thin out to 30 ft. at Fawler in Oxfordshire. A typical section N.E. of Dursley contains the following subdivisions: —

a.) White Freestone £” 1 Clypeus Grit .

. -5 ft. . 6-15 ft.

fe f Upper Trigonia Grit 2-12 ft. I i Gryphite Grit

Lj [LowerTrigonia Grit i $ f Upper Freestone . H cJ. Oolite Marl . . .
■•a 0; to 2 I Lower Freestone

»---J + > M

0. < § f Pea Grit . . . oi S "1 Lower Limestone

a w

2-12 ft.

2-12 ft.

6-20 ft. . 5-10 ft. 45-130 ft.

. 3-20 ft. 10-25 ft-

Zone Fossils.

_ Cosmoceras Parkin- soni.

ˆStephanoceras

Humphriesianum.

‘■Harpoceras Murchisonae.

g a) 2 J i2”S J CephalopodLimestone2-7 ft. \Lioceras opalinum. 27,“il ^2 § I Cotteswold Sands 10-120 ft. J Lytoceras jurense.

The basal sandy series, which is closely related with the underlying Lias, is usually described as the Midford Sands (from Midford, near Bath), but it is also known locally as the Bradford, Yeovil or Cotteswold Sands. The Pea Grit series contains pisolitic limestone and coarse, iron-stained oolite and sandy limestone. The freestones are compact oolite lime- stones. The ragstones are fossiliferous, earthy and iron-stained oolitic limestones. The ” grits ” are really coarse-grained limestones or calciferous sandstones. Between Andoversford and Bourton-in-the-Water the Inferior Oolite is represented by ragstones (Ferruginous beds, Clypeus Grit, Trigonia bed, Notgrove Freestone, Gryphite Grit) and freestones (Upper Freestones and Harford Sands, Oolite Marl, Lower Freestone). Near Chipping Norton in Oxfordshire the ” Chipping Norton Limestone ” lies at the top of a very variable series of rocks. In Rutlandshire, Northamptonshire and Lincolnshire the follow- ing beds, in descending order, belong to the Inferior Oolite: Lincolnshire limestone (shelly, coral-bearing and oolitic), Colly- weston slate, Lower Estuarine series and Northampton Sands (hard calcareous sandstones, blue and greenish ironstones and sandy limestones). The Colly weston slates are arenaceous limestones which have been used for roofing slates since the time of Henry VII.; Easton, Dene and Kirkby are important localities. The fissility of the rock is developed by exposure to frost. Similar beds are the Whittering Pendle and White Pendle or Duston slate.

The Inferior Oolite of Yorkshire differs from that of the Cotteswold district; in place of the marine limestones of the latter area there is a thick series of sands and sandstones with

shales and beds of coal; these deposits are mainly estuarine with occasional marine beds. The principal subdivisions, in descend- ing order, are: the Scarborough or Grey Limestone series, the Middle Estuarine series with their coal seams; the Millepore series and Whitwell or Cave Oolite; the Lower Estuarine series with the Eller Beck bed and Hydraulic Limestone; the Dogger and Blea Wyke beds. The last-named beds, like the Midford Sands, exhibit a passage between the Inferior Oolite and the Lias. In Skye and Raasay the Inferior Oolite is represented by sand- stones.

The fossils of the Inferior Oolite are abundant. Over 200 species of Ammonite are known ; gasteropods are numerous : Trigonia, Lima, Ostrea, Gervillia, Pecten, are common pelecypods ; Terebratula,

Waldheimia and Rhynchonelia are the prevailing brachiopods. Corals are very numerous in some limestones (Isastrea, Montivaultia). Urchins are represented by Cidaris, Acrosalenia, Nucleolites, Pygaster, Pseudodiadema, Hemicidaris; starfish by Solaster, Astropecten, and Crinoids by Pentacrinus, Apiocrinns. Plant remains, cycads, ferns, Ginkgo and coniferous trees are found most abundantly in the Yorkshire area.

The economic products of the Inferior Oolite include many well-known building stones, notably those of Ham Hill, Doulting, Dundry, Painswick, Cheltenham, Duston, Weldon, Ketton, Barnack, Stamford, Casterton, Clipsham, Great Ponton, Ancaster, Aislaby (Lower Estuarine series). Several of the stones are used for road metal. Iron ores have been worked in the Grey Limestone, the Eller Beck bed, the Dogger and the Northampton beds, the latter being the most important.

The Great or Bath Oolite is typically developed in the neighbour- hood of Bath, and except in a modified form it does not extend beyond the counties of Wiltshire, Somersetshire, Gloucestershire and Oxfordshire. It does not reach so far as Yorkshire, unless the Upper Estuarine series of that district is its representative. The principal subdivisions of the series are: —

Wiltshire, Somersetshire, Gloucestershire, Oxfordshire.

Northamptonshire, Buckinghamshire, Bed- fordshire, Lincolnshire.

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False – bedded Oolites = Kemble beds, ” White Limestone, ” pale, earthy Limestones, occasionally oolitic, and Marls.

Upper Ragstones of Bath.

False -bedded Oolites = the principal building stones, Bath

Freestone."

Fissile calcareous Sandstones; oolitic Limestones and Clays; Lower Ragstones of Bath and Stonesfield Slate.

Thickness, 100-130 ft.

Great Oolite Clay = Blis- worth Clay.

Great Oolite Limestone (generally non-oolitic).

Upper Estuarine series Thickness, 20-100 ft.

An exact correlation of the Great Oolite strata in the N.E. area with those of the S.W. is not possible on account of the great variability and impersistence of the beds. Current bedding is very prevalent, and minor stratigraphical breaks are common. The absence of the typical Great Oolite from the N.E. district is probably due in part to contemporaneous erosion with overstep of the succeeding formation, and in part to local changes in the sediment in the shallow waters of this epoch. This may also explain the rapid thinning-cut of the Great Oolite south of Bath, where its place may be taken, to some extent, by the Bradford Clay, Forest Marble and Fullonian.

The Great Oolite is not readily divisible into palaeontological zones, but the ammonite Perisphinctes arbusligerus may be taken as the characteristic form along with Belemnites bessinus and Tere- bratula maxillata. Corals (Isastraea, Thamnastria) and Polyzoa (Stomatopora, Diastopora) are abundant. Hemicidaris, Cidaris, Acrosalenia, Clypeus and other urchins are common: Pentacrinus and Apiocrinus represent the Crinoids. Terebratula, Rhynchonelia, Waldheimia, Crania are the prevailing brachiopods; the common pelecypods, Pecten, Ostrea, Lima, Trigonia, Modiola; Natica, Nerinea and other gasteropods are found.' Perisphinctes grandes, Macrocephalites subconlractus, Oppelia discus and Nautilus dispansus are among the more common cephalopods. The remains of fish (Mesodon, Hybodus), crocodiles (Teliosaurus) , dinosaurs (Cetiosaurus,

Megalosaurus) , pterosaurs (RhamphocephcUus), and in the Stonesfield slate the jaws of marsupial mammals (Amphitherium, Amphilestes, Phascolotherium) occur.

The building stones of the Great Oolite are mainly oolitic freestones, viz. the varieties of ” Bath stone ” quarried and mined in the neighbourhood of that city (Corsham Down, Monks Park, Coombe Down, Odd Down, Box Ground, &c.) and more shelly limestones like the Taynton and Milton stone. The Stonesfield slate has been largely worked near Woodstock in Oxfordshire and in Gloucestershire for roofing, &c. The ” slates ” are brown calcareous sandstone, grey and slightly oolitic calcareous sand- stone, and blue and grey oolitic limestone. A curious modifica- tion of the Great Oolite — White Limestone division — is character- ized by irregular ramifying tubular cavities, usually filled with ochreous material; this rock occurs in blocks and layers, and is used for rockeries under the name of ” Dagham stone ” from Dagham Down north of Cirencester. (See also Jurassic.)

(J.A.H.)

OOSTERZEE, JAN JACOB VAN (1817-1882), Dutch divine, was born at Rotterdam on the 1st of April 1817. After acting as pastor at Alkmaar and Rotterdam, in 1863 he was made professor of biblical and practical theology at the university of Utrecht. Oosterzee earned a reputation as a preacher, was editor of the Theolog. Jahrbiicher from 1845, wrote a number of noteworthy books on religious history, and published poems in Dutch (1882). He died on the 29th of July 1882.

A collected edition of Oosterzee’s works was published in French, CEuvres completes, in three volumes (1877-1880). His autobiography appeared in 1882.

OOTACAMUND, or Utakamand, a town of British India, headquarters of the Nilgiris district in Madras, approached by a rack railway from the Mettapolliem station on the Madras railway. Pop. (1901) 18,596. It is the principal sanatorium of southern India, and summer headquarters of the Madras government. It is placed on a plateau about 7230 ft. above the sea, with a fine artificial lake, and mountains rising above 8000 ft. The mean annual temperature is 58 F., with a minimum of 38 in January and a maximum of 76 in May; average annual rainfall, 49 in. The houses are scattered on the hillsides amid luxuriant gardens, and there are extensive carriage drives. In the neighbourhood are plantations of coffee, tea and cinchona. There are a brewery and two dairy farms. The Lawrence asylum for the children of European soldiers was founded in 1858, and there are also the Breeks memorial and Basel Mission high schools.

See Sir F. Price, Ootacamund: A History (Madras, 1908).

OOZE (O. Eng. wdse, cognate with an obsolete waise, mud; cf. O. Nor. veisa, muddy pool), the slime or mud at the bottom of a river, stream, especially of a tidal river or estuary, and so particularly used in deep-sea soundings of the deposit of fine calcareous mud, in which remains of foraminifera are largely present. The word ” ooze ” is also used as a technical term in tanning, of the liquor in a tan vat in which the hides are steeped, made of a solution of oak bark or other substances which yield tannin. This word is in origin different from ” ooze ” in its first sense. It appears in O. Eng. as wds, and meant the juice of plants, fruits, &c.

OPAH (Lampris luna), a pelagic fish, the affinities of which are still a puzzle to ichthyologists. The body is compressed and deep (more so than in the bream) and the scales are minute. A long dorsal fin, high and pointed anteriorly, runs along nearly the whole length of the back; the caudal is strong and deeply cleft. The central fin is also elongated, and all the fins are destitute of spines. The pelvic fins are abdominal in position, long and pointed in shape, and the pelvic bones are connected with the caracoids. These fins contain numerous (15-17) rays, a feature in which the fish differs from the Acanthopterygians.

In its gorgeous colours the opah surpasses even the dolphins, ail the fins being of a bright scarlet. The sides are bluish green above, violet in the middle, red beneath, variegated with oval spots of brilliant silver. It is only occasionally found near the shore; its real home is the Atlantic, especially near Madeira and the Azores, but many captures are recorded from Great

Britain, Ireland and Scandinavia; it strays as far north as Iceland and Newfoundland, and probably southwards to the latitudes of the coast of Guinea. It is rare in the Mediterranean. The name opah, which is now generally used, is derived from the statement of a native of the coast of Guinea who happened to be in England when the first specimen was exhibited (1750), and who thought he recognized in it a fish well known by that name in his native country. From its habit of coming to the surface in calm weather, showing its high dorsal fin above the water, it has also received the name of ” sun-fish,” which it shares with Orthagoriscus and the basking shark. It grows to a length of 4 to 5 ft. and a weight exceeding 100 lb, and is highly esteemed on account of the excellent flavour of its flesh.

OPAL, an amorphous or non-crystalline mineral consisting of hydrated silica, occasionally displaying a beautiful play of colour, whence its value as a gem-stone. It is named from Lat. opalus, Gr. biraWiov, with

which may be compared Sansk. upala, a precious stone. Opal commonly occurs in nodular or stalactitic masses, in the cavities of volcanic rocks, having been deposited in a gelatinous or colloidal condition. It is inferior to quartz in hardness (H. 5-5 to 6-5) and in density (S. G. 1-9 to 2-3), whilst it differs also by its solubility in caustic alkalis. The proportion of water in opal varies usually from 3 to 12%, and it is said that occasionally no water can be detected, the mineral having apparently suffered dehydration. Though normally isotropic, opal is frequently doubly refracting, the anomaly being due to tensipn set up during consolidation. The mineral when pure is transparent and colourless, as well seen in the variety which, from its vitreous appearance, was called by A. G. Werner hyalite (Gr. vakos, glass), or popularly ” Miiller’s glass,” a name said to have been taken from its discoverer. This pellucid opaline silica occurs as an incrustation in small globules, and is by no means a common mineral, being chiefly found at certain localities in Bohemia, Mexico and Colorado, U.S.A. (Cripple Creek).

The beautiful variety known as ” noble ” or ” precious opal ” owes its value to the brilliant flashes of colour which it displays by reflected light. The colours are not due to the presence of any material pigment, but result from certain structural peculi- arities in the stone, perhaps from microscopic fissures or pores or from delicate striae, but more probably from very thin lamellae of foreign matter, or of opaline silica, having a different index of refraction from that of the matrix. The origin of the colours in opal has been studied by Sir D. Brewster, Sir W. Crookes, Lord Rayleigh and H. Behrens. In the variety known to jewellers as ” harlequin opal,” the rainbow-like tints are flashed forth from small angular surfaces, forming a kind of polychromatic mosaic, whilst in other varieties the colours are disposed in broad bands or irregular patches of comparatively large area. By moving the stone, a brilliant succession of fiery flashes may sometimes be obtained. The opal is usually cut with a convex surface, and, being a soft stone, should be protected from friction likely to produce abrasion; nor should it be exposed to sudden alternations of temperature. The loss of water, sometimes effected by heat, greatly impairs the colour, though moderate warmth may improve it. According to Pliny the opal ranked next in value to the emerald, and he relates that the rich Roman senator Nonius was exiled by Mark Antony for sake of his magnificent opal, as large as a hazel nut. The opal, on account of its unique characters, has been the subject of remarkable superstition, and even in modern times has often been regarded as an unlucky stone, but in recent years it has regained popular favour and is now when fine, among the most highly valued gem-stones.

Precious opal is a mineral of very limited distribution. Though ancient writers state that it was brought from India, and fine stones are still called in trade ” Oriental opal,” its occurrence is not known in the East. The finest opals seem to have been always obtained from Hungary, where the mineral occurs, associated with much common opal, in nests in an altered andesitic rock. The fine opals occur only at the Dubnyik mine, near the village of Vorosviig&s (Czerwenitza). The workings

have been carried on for centuries in the mountains near Eperjes, and some remarkable stones from this locality are preserved in the Imperial Natural History Museum in Vienna, including an uncut specimen weighing about 3000 carats. Precious opal is found also in Honduras, especially in trachyte near Gracias a Dios; and in Mexico, where it occurs in a porphyrinic rock at Esperanza in the state of Queretaro. A remarkable kind of opal, of yellow or hyacinth-red colour, occurs in trachytic porphyry at Zimapan in Hidalgo, Mexico, and is known as ” fire-opal.” This variety is not only cut en cabochon but is also faceted. Fire-opal is sometimes called ” girasol.” Much precious opal is worked in Australia. In Queensland it is found lining cracks in nodules of brown ironstone in the Desert Sand- stone, a rock of Upper Cretaceous age, and is distributed over a wide area near the Barcoo river. Bulla Creek is a well-known locality. The layer of opal, when too thin to be cut with a convex surface, is used for inlaid work or is carved into cameos which show to much advantage against the dark-brown matrix. The matrix penetrated by veins and spots of opal, and perhaps heightened in colour artificially, has been called ” black opal “; but true black opal occurs in New South Wales. The ” root of opal ” consists of the mineral disseminated through the matrix. In New South Wales precious opal was accidentally discovered in 1889, and is now largely worked at White Cliffs, Yungnulgra county, where it is found in nodules and seams in a siliceous rock of the Upper Cretaceous series. It is notable that the opal sometimes replaces shells and even reptilian bones, whilst curious pseudomorphs, known as ” pineapple opal,” show the opal in the form of aggregated crystals, perhaps of gypsum, gaylussite or glauberite.

” Common opal ” is the name generally applied to the varieties which exhibit no beauty of colour, and may be nearly opaque. It is frequently found in the vesicular lavas of the N.E. of Ireland, the west of Scotland, the Faroe Isles and Iceland. When of milky- white colour it is

known as ” milk opal “; when of resinous and waxy appearance as ” resin opal “; if banded it is called “agate opal”; a green variety is termed “prase opal “; a dark red, ferruginous variety ” jaspar opal “; whilst ” rose opal ” is a beautiful pink mineral, coloured with organic matter, found at Quincy, near Mehun-sur-Yevre, in France. A brown or grey concretionary opal from Tertiary shales at Menilmontant, near Paris, is known as menilite or ” liver opal.” A dull opaque form of opal, with a fracture imperfectly con- choidal, is called “semi-opal”; whilst the opal which not infrequently forms the mineralizing substance of fossil wood passes as ‘ wood opal.” The name hydrophane is applied to a porous opal, perhaps partially dehydrated, which is almost opaque when dry but becomes more or less transparent when immersed in water. It has been sometimes sold in America as ” magic stone.” Cacholong is another kind of porous opal with a lustre rather like that of mother-of-pearl, said to have been named from the Cach river in Bokhara, but the word is probably of Tatar origin.

Opaline silica is frequently deposited from hot siliceous springs, often in cauliflower-like masses, and is known as geyserite. This occurs in Iceland, New Zealand and the Yellowstone National Park. The fiorite from the hot springs of Santa Fiora, in Tuscany, is opaline silica, with a rather pearly lustre. A variety containing an excep- tionally small proportion of water, obtained from the Yellowstone Park, was named pealite, after the chemist A. C. Peale. The siliceous deposits from springs, often due to organic agencies, are known generally as ” siliceous sinter ” or, if very loose in texture, as ” siliceous tuff.” Opaline silica forms the material of many organic structures, like the frustules of diatoms and the tests of radiolarians, which may accumulate as deposits of tripoli, and be used for polishing purposes. (F. W. R.*)

OPALINA (so named by J. E. Purkinje and G. Valentin), a genus of Protozoa, without mouth or contractile vacuole, covered with nearly equal flagelliform cilia, and possessing numerous nuclei, all similar. It has been referred to Aspirotricha by Biitschli, but by M. Hartog {Cambridge Natural History, vol. ii., 1906) has been transferred to the Flagellates (?.».). All the species are parasitic in cold-blooded Vertebrates.

See Bezzenberger in Archiv.f. Protistenkunde (1903), iii. 138.

OPATA (” enemies,” so called by their neighbours the Pimas), a tribe of Mexican Indians of Piman stock. Their country is the mountainous district of north-eastern Sonora and north- western Chihuahua, Mexico. Though usually loyal to the Mexican government, they

rebelled in 1820, but after a gallant effort were defeated. They number now about 5000, and still largely retain their ancient autonomy.

OPERA (Italian for ” work “), a drama set to music, as distinguished from plays in which music is merely incidental. Music has been a resource of the drama from the earliest times, and doubtless the results of researches in the early history of this connexion have been made very interesting, but they are hardly relevant to a history of opera as an art-form. If language has meaning, an art-form can hardly be said to exist under conditions where the only real connexions between its alleged origin and its modern maturity are such universal means of expression as can equally well connect it with almost every-thing else. We will therefore pass over the orthodox history of opera as traceable from the music of Greek tragedy to that of miracle-plays, and will begin with its real beginning, the first dramas that were set to music in order to be produced as musical works of art, at the beginning of the 17th century.

There seems no reason to doubt the story, given by Doni, of the meetings held by a group of amateurs at the house of theBardi in Florence in the last years of the 16th century, with the object of trying experiments in emotional musical expression by the use of instruments and solo voices. Before this time there was no real opportunity for music-drama. The only high musical art of the 16th century was unaccompanied choral music: its expression was perfect within its limits, and its limits so abso- lutely excluded all but what may be called static or contemplative emotion that ” dramatic music ” was as inconceivable as ” dramatic architecture.” But the literary and musical dilettanti who met at the house of the Bardi were not mature musical artists; they therefore had no scruples, and their imaginations were fired by the dream of restoring the glories of Greek tragedy, especially on the side of its musical declamation. The first pioneer in the new ” monodic ” movement seems to have been Vincenzo Galilei, the father of Galileo. This enthusiastic amateur warbled the story of Ugolino to the accompaniment of the lute, much to the amusement of expert musicians; but he gained the respect and sympathy of those whose culture was literary rather than musical. His efforts must have been not unlike a wild caricature of Mr. W. B. Yeats’s method of reciting poetry to the psaltery. The first public production in the new style was Jacopo Peri’s Euridice (1600), which was followed by a less successful effort of Caccini’s on the same subject. To us it is astonishing that an art so great as the polyphony of the 16th century could ever have become forgotten in a new venture so feeble in its first steps. Sir Hubert Parry has happily charac- terized the general effect of the new

movement on contemporary imagination as something like that of laying a foundation- stone — the suggestion of a vista of possibilities so inspiriting as to exclude all sense of the triviality of the present achievement. Meanwhile those composers who retained the mastery of poly- phonic music tried to find a purely vocal and polyphonic solution of the problem of music-drama; and the Amfiparnasso of Orazio Vecchi (written in 1594, the year of Palestrina's death, and pro- duced three years later) is not alone, though it is by far the most remarkable, among attempts to make a music-drama out of a series of madrigals. From the woodcuts which adorn the first edition of the Amfiparnasso it has been conjectured that the actors sang one voice each, while the rest of the harmony was supplied by singers behind the stage x ; and this may have been the case with other works of this kind. But the words of Vecchi's introductory chorus contradict this idea, for they tell the audience that " the theatre of this drama is the world " and that the spectators must " hear instead of seeing."

1 The first story in Berlioz's Soiries d'orchestre is about a young 16th-century genius who revolts from this practice and becomes a pioneer of monody. The picture is brilliant, though the young genius evidently learnt all his music in) Paris somewhere about 1830.

With the decadence of the madrigal, Monteverde brought a real musical power to bear on the new style. His results are now intelligible only to historians, and they seem to us artistically nugatory; but in their day they were so impressive as to render the further continuance of 16th-century choral art impossible. At the beginning of the 17th century no young musician of lively artistic receptivity could fail to be profoundly stirred by Monteverde's Orfeo (1602), Arianna (1608) and// Combattimento di Tancredi e Clorinda (1624), works in which the resources of instruments were developed with the same archaic boldness, the same grasp of immediate emotional effect and the same lack of artistic organization as the harmonic resources. The spark of Monte- verde's genius produced in musical history a result more like an explosion than an enlightenment; and the emotional rhetoric of his art was so uncontrollable, and at the same time so much more impressive in suggestion than in realization, that we cannot be surprised that the next definite step in the history of opera took the direction of mere musical form, and was not only un-dramatic but anti-dramatic.

The system of free musical declamation known as recitative is said to have been used by Emilio del Cavalieri as early as 1 588, and it was in the nature of things almost the only means of vocal expression conceivable by the pioneers of opera. Formal melody, such as that of popular songs, was as much beneath their dignity as it had been beneath that of the high art from which they revolted; but, in the absence of any harmonic system but that of the church modes, which was manifestly incapable of assimilating the new “unprepared discords,” and’ in the utter chaos of early experiments in instrumentation, formal melody proved a godsend as the novelty of recitative faded. Tunes were soon legalized at moments of dramatic repose when it was possible for the actors to indulge in either a dance or a display of vocalization; it was in the tunes that the strong harmonic system of modern tonality took shape; and by the early days of Alessandro Scarlatti, before the end of the 17th century, the art of tune-making had perennially blossomed uito the musically safe and effective form of the aria (q.v.). From this time until the death of Handel the history of opera is simply the history of the aria; except in so far as in France, under Lully, it is also the history of ballet-music, the other main theatrical occasion for the art of tune-making. With opera before Gluck there is little interest in tracing schools and develop- ments, for the musical art had as mechanical a connexion with drama as it had with the art of scene-painting, and neither it nor the drama which was attached to it showed any real develop- ment at all, though the librettist Metastasio presented as imposing a figure in 18th-century Italian literature as Handel presented in Italian opera. Before this period of stagnation we find an almost solitary and provincial outburst of life in the wonderful patch- work of Purcell’s art (1658-1695). Whether he is producing genuine opera (as in the unique case of Dido and Aeneas) or merely incidental music to plays (as in the so-called opera King Arthur), his deeply inspired essays in dramatic music are no less interesting in their historic isolation from everything except the influence of Lully than they are admirable as evidences of a genius which, with the opportunities of 50 years later or 150 years earlier, might assuredly have proved one of the greatest in all music. Another sign of life has been appreciated by recent research in the interesting farcical operas (mostly Nea- politan) of certain early 18th-century Italian composers (see Leo, Pergolese, Logroscino), which have some bearing on the antecedents of Mozart.

The real reason for the stagnation of high opera before Gluck is (as explained in the articles Music and Sonata Forms) that the forms of music known before 1750 could not express dramatic change without losing artistic organization. The ” spirit of the age ” can have had little

to do with the difficulty, or why should Shakespeare not have had a contemporary operatic brother-artist during the ” Golden Age ” of music? The opportunity for reform came with the rise of the sonata style. It was fortunate for Gluck that the music of his time was too vigorously organized to be upset by new discoveries. Gluck was

a much greater artist than Monteverde, but he too was not over-loaded with academic mastery; indeed, though historians have denied it, Monteverde was by far the better contrapuntist, and seems rather to have renounced his musical powers than to have struggled for need of them. But instead of memories of a Golden Age, Gluck had behind him 150 years of harmonic and orchestral knowledge of good and evil. He also had almost as clear a sense of symphonic form as could find scope in opera at all; and his melodic power was generally of the highest order. It is often said that his work was too far in advance of his time to establish his intended reform; and, if this means that un-dramatic Italian operas continued to outnumber those dramatic masterpieces which no smaller man could achieve, the statement is as true as it is of every great artist. If, however, it is taken to mean that because Mozart’s triumphs do not lie in serious opera he owes nothing to Gluck, then the statement is misleading (see Gluck). The influence of Gluck on Mozart was profound, not only where it is relevant to the particular type of libretto, as in Idomeneo, but also on the broad dramatic basis which includes Greek tragedy and the 18th-century comedy of manners. Mozart, whose first impulse was always to make his music coherent in itself, for some time continued to cultivate side by side with his growing polyphony and freedom of movement certain Italian formalities which, though musically effective and flattering to singers, were dramatically vicious. But these features, though they spoil Idomeneo, correspond to much that in Gluck’s operas shows mere helplessness; and in comic opera they may even become dramatically appropriate. Thus in Cosi fan tutte the florid arias in which the two heroines protest their fidelity are the arias of ladies who do protest too much ; and in Die Zauber- flbte the extravagant vocal fireworks of the Queen of Night are the displays of one who, in the words of the high priest Sarastro, ” hopes to cajole the people with illusions and superstition.” In the article Mozart we have discussed other evidences of his stagecraft and insight into character, talents for which his comic subjects gave him far more scope than those of classical tragedy had given to Gluck. Mozart always extracts the utmost musical effect from every situation in his absurd and often tiresome libretti (especially in vocal ensemble), while his musical effects are always such as give dramatic life to what in other hands are conventional musical forms. These merits would never have been

gainsaid but for the violence of Wagner's earlier partisans in their revolt from the uncritical classicism of his denser and noisier opponents. Wagner himself stands as far aloof from Wagnerian Philistinism as from uncritical classicism. He was a fierce critic of social conditions and by no means incapable of hasty iconoclastic judgments; but he would have treated with scant respect the criticism that censures Mozart for super- ficiality in rejecting the radically unmusical element of mordant social satire which distinguishes the Figaro of Beaumarchais from the most perfect opera in all classical music.

It cannot be said that in any high artistic sense Italian comic opera has developed continuously since Mozart. The vocal athleticism of singers; the acceptance and great development by Mozart of what we may call symphonic (as distinguished from Handelian) forms of aria and ensemble; and the enlargement of the orchestra; these processes gave the Italian composers of Mozart's and later times prosaically golden opportunities for lifting spectators and singers to the seventh heaven of flattered vanity, while the music, in itself no less than in its relation to the drama, was steadily degraded. The decline begins with Mozart's contemporary and survivor, D. Ciniarosa, whose ideas are genuine and, in the main, refined, but who lacks power and resource. His style was by no means debased, but it was just so slight that contemporaries found it fairly easy. His most famous work, // Matrimonio Segreto, is an opera buffa which is still occasionally revived, and it is very like the sort of thing that people who despise Mozart imagine Figaro to be. Unless it is approached with sympathy, its effect after Figaro is hardly more exhilarating than that of the once pilloried spurious " Second Part " to the Pickwick Papers. But this is harsh judgment; for it proves to be a good semi-classic as soon as we take it on its own merits.

It is far more musical, if less vivacious, than Rossini's Barbiere; and the decline of Italian opera is more significantly foreshadowed in Cimarosa's other chef-d'oeuvre, the remarkable opera seria, Gli Orazzi ed i Curiam,. Here the arias and ensembles are serious art, showing a pale reflection of Mozart, and not wholly without Mozart's spirit; the choruses, notably the first of all, have fine moments; and the treatment of conflicting emotions at one crisis, where military music is heard behind the scenes, is masterly. Lastly, the abrupt conclusion at the moment of the catastrophe is good and was novel at the time, though it foreshadows that sacrifice of true dramatic and musical

breadth to the desire for an “effective curtain,” and that mortal fear of anti-climax which in classical French opera rendered a great musical finale almost impossible. But the interesting and dramatic features in Gli Orazzi are unfortunately less significant historically than the vulgarity of its overture, and the impossibility, after the beautiful opening chorus, of tracing any unmistakably tragic style in the whole work except by the negative sign of dullness.

Before Cimarosa’s overwhelming successor Rossini had retired from his indolent career, these tendencies had already reduced both composers and spectators to a supreme indifference to the mood of the libretto, an indifference far more fatal than mere inattention to the plot. Nobody cares to follow the plot of Mozart’s Figaro; but then no spectator of Beaumarchais’s Mariage de Figaro is prevented by the intricacy of its plot from enjoying it as a play. In both cases we are interested in the character-drawing and in each situation as it arises; and we do no justice to Mozart’s music when we forget this interest, even in cases where the libretto has none of the literary merit that survives in the transformation of Beaumarchais’s comedy into an Italian libretto. But with the Rossinian decline all charitable scruples of criticism are misplaced, for Italian opera once more became as purely a pantomimic concert as in the Handelian period; and we must not ignore the difference that it was now a concert of very vulgar music, the vileness of which was only aggravated by the growing range and interest of dramatic subjects. The best that can be said in defence of it was that the vulgarity was not pretentious and unhealthy, like Meyerbeer’s; indeed, if the famous “Mad Scene “in Donizetti’s Lucia di Lammermoor had only been meant to be funny it would not have been vulgar at all. Occasionally the drama pierced through the empty breeziness of the music; and so the spirit of Shakespeare, even when smothered in an Italian libretto unsuccessfully set to music by Rossini, proved so powerful that one spectator of Rossini’s Otello is recorded to have started out of his seat at the catastrophe, exclaiming “Good Heavens! the tenor is murdering the soprano!” And in times of political unrest more than one opera became as dangerous as an over-censored theatre could make it. An historical case in point is brilliantly described in George Meredith’s Vittoria. But what has this to do with the progress of music? The history of Italian opera from after its culmination in Mozart to its subsidence on the big drum amd cymbals of the Rossinians is the history of a protected industry. Verdi’s art, both in its burly youth and in its shrewd old age, is far more the crown of his native genius than of his native traditions; and, though opinions differ as to the spontaneity and depth of the change, the paradox is true that the Wagnerization of Verdi was the musical

emancipation of Italy.

After Mozart the next step in the development of true operatic art was neither Italian nor German, but French. The French sense of dramatic fitness had a wonderfully stimulating effect upon every foreign composer who came to France. Rossini himself, in Guillaume Tell, was electrified into a dramatic and orchestral life of an incomparably higher order than the rollicking rattle of serious and comic Italian opera in its decline. He was in the prime of life when he wrote it, but it exhausted him and was practically his last important work, though he lived to a cheerful old age. The defects of its libretto were grave, but he made unprecedented efforts to remedy them, and finally succeeded, at the cost of an entire act. The experience was very significant; for, from the time of Gluck onwards, while it

cannot be denied that native and naturalized French operatic art has suffered from many forms of musical and dramatic debasement, we may safely say that no opera has met with success in France that is without theatrical merit. And the French contribution to musical history between Gluck and Rossini is of great nobility. If Cherubim and Mehul had had Gluck's melodic power, the classics of French opera would have been the greatest achievements in semi-tragic music-drama before Wagner. As it is, their austerity is not that of the highest classics. It is negative, and tends to exclude outward attractive- ness rather because it cannot achieve it than because it contains all things in due proportion. Be this as it may, Cherubini had a real influence on Beethoven; not to mention that the libretti of Fidelia and Les Deux journies were originally by the same author, though Fidelio underwent great changes in translation and revision. It is impossible to say what French opera might have done for music through Beethoven if Fidelio had not remained his solitary (because very nearly unsuccessful) operatic monument; but there is no doubt as to its effect on Weber, whose two greatest works, Der FreischiUz and Euryanthe, are two giant strides from Cherubini to Wagner. Euryanthe is in respect of Leit-motif (see below) almost more Wagnerian than Lohengrin, Wagner's fourth published opera. It failed to make an epoch in history because of its dreary libretto, to which, however,, the highly dramatic libretto of Lohengrin owes a surprising number of points.

The libretti of classical opera set too low a literary standard to induce critics to give sufficient attention to their aesthetic bearings; and perhaps the great scholar Otto Jahn is the only writer who has applied a first-rate literary analysis to the subject (see his Life of Mozart); a subject which, though of great importance to music, has, like the

music itself, been generally thrust into the background by the countless externals that give theatrical works and institutions a national or political import- ance independent of artistic merit and historical development. Much that finds prominent place in the orthodox history of opera is really outside the scope of musical and dramatic discus- sion; and it may therefore be safely left to be discovered under non-musical headings elsewhere in this Encyclopaedia. Even when what passes for operatic history has a more real connexion with the art than the history of locomotion has with physical science, the importance of the connexion is often overrated. For example, much has been said as to the progress in German opera from the choice of remote subjects like Mozart's Die Entfuhrung aus dem Serail to the choice of a subject so thoroughly German as Der FreischiUz: but this is only part of the general progress made, chiefly in France, towards the choice of romantic instead of classical subjects. Whatever the intrinsic interest of musical ethnology, and whatever light it may throw upon the reasons why an art will develop and decline sooner in one country than in another, racial character will not suffice to produce an art fgs, which no technique as yet exists. Nor will it suffice in any country to check the development or destroy the value of an art of which the principles were developed elsewhere. No music of Mozart's time could have handled Weber's romantic subjects, and all the Teutonism in history could not have pre- vented Mozart from adopting and developing those Italian methods that gave him scope. Again, in the time of Lully, who was the contemporary of Moliere, the French genius of stagecraft was devoted to reducing opera to an effective series of ballets; yet so little did this hamper composers of real dramatic power that Quinault's libretto to Lully's very successful Armide served Gluck unaltered for one of his greatest works 90 years later. If Lully owes so little to Cambert as to be rightly entitled the founder of French opera, if Gluck is a greater reformer than his predecessor Rameau, if Cherubini is a more powerful artist than Mehul, and if, lastly, Meyerbeer developed the vices of the French histrionic machinery with a plausibility which has never been surpassed, then we must reconcile our racial theories with the historic process by which the French Grand Optra, one of the most pronounced national types in all music, was founded by an Italian Jew, reformed by an Austrian,

classicized by another Italian, and debased by a German Jew. This only enhances the significance of that French dramatic sense which

stimulated foreign composers and widened their choice of subjects, as it also preserved all except the Italian forms of opera from falling into that elsewhere prevalent early 19th-century operatic style in which there was no means of guessing by the music whether any situation was tragic or comic. From the time of Meyerbeer onwards, trivial and vulgar opera has been as common in France as elsewhere; but there is a world of difference between, for example, a garish tune naively intended for a funeral march, and a similar tune used in a serious situation with a dramatic sense of its association with other incidents in the opera, and of its contrast with the sympathies of spectators and actors The first case is as typical of 19th-century musical Italy as the second case is of musical France and all that has come under French influence.

As Wagner slowly and painfully attained his maturity he learned to abhor the influence of Meyerbeer, and indeed it accounts for much of the inequality of his earlier work. But it can hardly have failed to stimulate his sense of effect; and without the help of Meyerbeer's outwardly successful novelties it is doubtful whether even Wagner's determination could have faced the task of his early work, a task so negative and destructive in its first stages. We have elsewhere (see Music, Sonata Forms ad finem, and Symphonic Poem) described how if music of any kind, instrumental or dramatic, was to advance beyond the range of the classical symphony, there was need to devise a kind of musical motion and proportion as different from that of the sonata or symphony as the sonata style is different from that of the suite. All the vexed questions of the function of vocal ensemble, of the structure of the libretto, and of instrumentation, are but aspects and results of this change in what is as much a primary category of music as extension is a primary category of matter. Wagnerian opera, a generation after Wagner's death, was still an unique phenomenon, the rational influence of which was not yet sifted from the con- comitant confusions of thought prevalent among many composers of symphony, oratorio, and other forms of which Wagner's principles can be relevant only with incalculable modifications. With Wagner the history of classical opera ends and a new history begins, for in Wagner's hands opera first became a single art-form, a true and indivisible music-drama, instead of a kind of dramatic casket for a collection of objets d'art more or less aptly arranged in theatrical tableaux.

Forms and Terminology of Opera,

The history of pre- Wagnerian opera is not, like that of the sonata forms, a history in which the technical terminology has a clear relationship to the aesthetic development. In order to understand the

progress of classical opera we must understand the whole progress of classical music; and this not merely for the general reason that the development of an art-fo?m is inseparable from the development of the whole art, but because in the case of opera only the most external terminology and the most unreal and incoherent history of fashions and factions remain for consideration after the general development of musical art has been discussed. For completeness, however, the terminology must be included; and a commentary on it will complete our sketch in better historical perspective than any attempt to amplify details on the lines of a continuous history.

1. Secco-recitative is the delivery of ordinary operatic dialogue in prosaic recitative-formulas, accompanied by nothing but a harpsichord or pianoforte. In comic operas it was not so bad a method as some critics imagine; for the conductor (who sat at the harpsichord or pianoforte) would, if he had the wits expected of him by the composer, extemporize his accompani- ments in an unobtrusively amusing manner, while the actors delivered their recitative rapidly in a conversational style known as parlante. In serious operas, however, the conductor dare not be frivolous; and accordingly secco-recitative outside comic opera is the dreariest of makeshifts, and is not tolerated by Gluck in his mature works. He accompanies his recitatives

with the string band, introducing other instruments freely as the situation suggests.

2. Accompanied recitative was used in all kinds of opera, as introductory to important arias and other movements, and also in the course of finales. Magnificent examples abound in Idomeneo, Figaro and Don Giovanni; and one of the longest recitatives before Wagner is that near the beginning of the finale of the first act of Die Zauberflote. Beethoven's two examples in Fidelio are short but of overwhelming pathos.

3. Melodrama is the use of an orchestral accompaniment to spoken dialogue (see Benda). It is wonderfully promising in theory, but generally disappointing in effect, unless the actors are successfully trained to speak without being dragged by the music into an out-of-tune sing-song. Classical examples are generally short and cautious, but very impressive; there is one in Fidelio in which the orchestra quotes two points from earlier movements in a thoroughly Wagnerian way (see Leitmotif below). But the device is more prominent in incidental music to plays, as in Beethoven's music for Goethe's Egmont. Mendels- sohn's music for A Midsummer Night's Dream contains the most brilliant and resourceful examples yet achieved in

this art; but they are beyond the musical capacity of the English stage, which, however, has practised the worst forms of the method until it has become a disease, many modern performances of Shakespeare attaining an almost operatic continuity of bad music.

4. Opera buffa is classical Italian comic opera with secco- recitative. Its central classics are, of course, Figaro and Don Giovanni, while Cimarosa's Matrimonio Segreto and Rossini's Barbiere are the most important steps from the culmination to the fall.

5. Opera seria is classical Italian opera with secco-recitative; almost always (like the Handelian opera from which it is derived) on a Greek or Roman subject, and, at whatever cost to dramatic or historic propriety, with a happy ending. Gluck purposely avoids the term in his mature works. The only great classic in opera seria is Mozart's Idomeneo, and even that is dramatically too unequal to be more than occasionally revived, though it contains much of Mozart's finest music.

6. The Singspiel is German opera with spoken dialogue. In early stages it advanced from the farcical to the comic. With Beethoven it came under French influence and adopted " thrilling " stories with happy endings; and from this stage • it passed to specifically " Romantic " subjects. Its greatest classics are Mozart's Entfiihrung and Zauberflote, Beethoven's Fidelio, and Weber's Freischiitz.

7. Opera comique is the Singspiel of France, being French opera with spoken dialogue. It did not originate in farce but in the refusal of the Academie de Musique to allow rival companies to infringe its monopoly of Grand Optra; and it is so far from being essentially comic that one of its most famous classics, Mehul's Joseph, is on a Biblical subject; while its highest achievement, Cherubini's Les Deuxjournees, is on a story almost as serious as that of Fidelio. All Cherubini's mature operas (except the ballet Anacreon, which is uninterrupted music from beginning to end) are operas comiques in the sense of having spoken dialogue; though Medee, being, perhaps, the first genuine tragedy in the history of music-drama, 1 is simply called " opera " on the title-page. In the smaller French works, especially those in one act, there is so much spoken dialogue that they are almost like plays with incidental music. But they never sink to the condition of the so-called operas of the English composers since Handel. When Weber accepted the commission to write Oberon for the English stage in 1825, he found that he was compelled to set the musical numbers one by one as they were sent to him, without the slightest information as to the plot, the situation, or even the order of the pieces! And, to

crown his disgust, he found that this really did not matter.

1 Even Gluck never contemplated any alternative to the absurd happy ending of Orfeo ; and all his other operatic subjects include a deus ex machina.

8. Grand opira is French opera in which every word is sung, and generally all recitative accompanied by the orchestra. It originated in the Acadimie de Musique, which, from its founda- tion in 1669 to the proclamation of the liberie des thiatres in 1791, claimed the monopoly of operas on the lines laid down by Lully, Rameau and Gluck. Rossini's Guillaume Tell, Spontini's Vestala and the works of Meyerbeer crown this theoretically promising art-form with what Sir Hubert Parry has justly if severely called a crown of no very precious metal. Weber's Euryanthe, Spohr's Jessonda, and others of his operas, are German parallel developments; and Wagner's first published work, Rienzi, is like an attempt to beat Meyerbeer on his own ground.

9. Opira bouffe is not an equivalent of opera buffa, but is French light opera with a prominent strain of persiflage. Its chief representative is Offenbach. It seems to be as native to France as the austere opira comique which it eclipsed. Sullivan assimilated its adroit orchestration as Gilbert purified its literary wit, and the result became a peculiarly English possession.

10. The finale is that part of a classical opera where, some way before the end of an act, the music gathers itself together and flows in an unbroken chain of concerted movements. The " invention " has been ascribed to this or that composer before Mozart, and it certainly must have taken some time in the growing; but Mozart is the first classic whose finales are famous. The finales to the second act of Figaro, the first act of Don Giovanni and the second of the Zauberflote remained unequalled in scale and in dramatic and symphonic continuity, until Wagner, as it were, extended the finale backwards until it met the intro- duction (see below) so that the whole act became musically con- tinuous. This step was foreshadowed by Weber, in whose Euryanthe the numbering of the later movements of each act is quite arbitrary. Great finales are less frequent in Singspiel than in opera buffa. They can hardly be said to exist in opera seria, climax at the end of an act being there (even in Gluck) attained only by a collection of ballet movements, whereas the essence of Mozart's finale is its capacity to

deal with real turning-points of the action. A few finales of the first and second acts of opiras comiques (which are almost always in three acts) are on the great classical lines, e.g. that to the first act of Les Deux journees; but a French finale to a last act is, except in Cherubini's works, hardly ever more than a short chorus, often so perfunctory that, for instance, when Mehul's Joseph was first produced by Weber at Dresden in i8i7,a three-movement finale by Franzl of Munich was added; and Weber publicly explained the difference between French and German notions of finality, in excuse for a course so repugnant to his principles in the performance of other works.

11. The introduction is sometimes merely an instrumental entr'acte in classical opera; but it is more especially an extension of continuous dramatic music at the beginning of an act, like the extension of the finale backwards towards the middle of the act, but much smaller. Beethoven, in his last version of Fidelio, used the term for the perfectly normal duet that begins the first act, and for the instrumental entr'acte which leads to the rise of the curtain on Florestan's great scene in the second act. The classical instances of the special meaning of " introduction " are the first number in Don Giovanni and, more typically, that in the Zauberflote.

12. Leit-motif, or the association of musical themes with dramatic ideas and persons, is not only a natural means of progress in music drama, but is an absolute musical necessity as soon as the lines dividing an opera into separate formal pieces are broken down, unless the music is to become exclusively " atmospheric " and inarticulate. Without recurrence of themes a large piece of music could no more show coherent development than a drama in which the characters were never twice addressed by the same name nor twice allowed to appear in the same guise. Now the classical operatic forms, being mainly limited by the sonata style, were not such as could, when once worked out in appropriate designs of aria and ensemble, be worked out again in recognizable transformations without poverty and monotony ef effect. And hence a system of Leit-motif was not appropriate

to that ingenious compromise which classical opera made between music that completed from 12 to 30 independent designs and the drama that meanwhile completed one. But when the music became as continuous as the drama the case was different. There are plenty of classical instances of a theme superficially marking some cardinal incident or personal characteristic, without affecting the independence of the musical forms; the commonest case being, of course, the allusion some- where in the overture to salient points in the body of

the opera; as, for instance, the allusion to the words ” cosifan tutti ” in the overture to Mozart’s opera of that name, and the Masonic three-fold chord in that to the Zauberflote. Weber’s overtures are sonata-form fantasias on themes to come: and in later and lighter operas such allusiveness, being childishly easy, is a meaningless matter of course. Within the opera itself, songs, such as would be sung in an ordinary non-musical play, will probably recur, as in Les Deux joumies; and so will all phrases that have the character of a call or a signal, a remarkable and pathetic instance of which may be found in Mehul’s Melidore et Phrosine, where the orchestra makes a true Leit-motif of the music of the heroine’s name. But it is a long way from this to the system already clearly marked by Weber in Der Freischutz and developed in Euryanthe to an extent which Wagner did not surpass in any earlier work than Tristan, though in respect of the obliteration of sections his earliest works are in advance of Weber. Yet not only are there some thirteen recurrent musical incidents in the Freischutz and over twenty in Euryanthe, but in the latter the serpentine theme associated with the treacherous Eglantine actually stands the Wagnerian test of being recognizable when its character is transformed. This can hardly be claimed even for the organization of themes in Lohengrin.

Mature Wagnerian Leit-motif is a very different thing from the crude system of musical labels to which some of Wagner’s disciples have reduced it, and Wagner himself had no patience with the catalogue methods of modern operatic analysis. The Leit-motif system of Tristan, the Meister singer, the Ring and Parsifal is a profoundly natural and subtle cross-current of musical thought, often sharply contrasted with the externals of a dramatic situation, since it is free to reflect not only these externals, not only the things which the audience know and the persons of the drama do not know, not only those workings of the dramatic character’s mind which he is trying to conceal from the other characters, but even those which he conceals from himself. There was nothing new in any one of these possibilities taken singly (see, for example, Gluck’s ironic treatment of ” le calme rentre dans mon cceur “), but polyphonic Leit-motif made them all possible simultaneously. Wagner’s mind was not con- centrated on the merely literary and theatrical aspects of music- . drama; he fought his way to the topmost heights of the peculiar musical mastery necessary to his ideals; and so he realized that principle in which none but the very greatest musicians find freedom; the principle that, however constantly necessary and powerful homophonic music may be in passages of artificial simplicity, all harmonic music is by nature and origin polyphonic; and that in polyphony lies the normal and natural means

of expressing a dramatic blending of emotions.

Wagnerian Leit-motif has proved rather a giant's robe for later composers ; and the most successful of recent operas ha ve, while aiming less at the sublime, cultivated Wagner's musical and dramatic continuity more than his principles of musical texture. Certainly Wagnerian continuity is a permanent postulate in modern opera; but it shows itself to be a thing attainable quite independently of any purely musical style or merit, so long as the dramatic movement of the play is good. This condition was always necessary, even where opera was most symphonic. Mozart was incessantly disputing with his librettists; and all his criticisms and changes, though apparently of purely musical purport, had a brilliant effect on the movement of the play. In one desperate case, where the librettist was obstinate, Mozart abandoned a work (L'Oca del Cairo) to the first act of which he had already sketched a great finale embodying a grandiose farcical figure that promised to be unique in classical opera.

Mozart's lesson of dramatic movement has been better learnt than anything peculiar to either music or literature; for, while his libretti show how little that quality has to do with poetic merit, the whole history of Italian opera from Rossini to Mascagni shows how little it has to do with good music. On the other hand, the musical coherence of the individual classical forms used in opera has caused many critics to miss the real dramatic ground of some of the most important operatic conventions. The chief instance of this is the repetition of words in arias and at climaxes, a convention which we are over-ready to explain as a device which prolongs situations and delays action for the sake of musical design. But in the best classical examples th** case is almost the reverse, for the aria does not, as we are apt to suppose, represent a few words repeated so as to serve for a long piece of music. Without the music the drama would have required a long speech in its place; but the classical composer cannot fit intelligible music to a long string of different sentences, and so the librettist reduces the speech to mere headlines and the composer supplies the eloquence. Herein lies the meaning of Mozart's rapid progress from vocal concertos like " Fuor del mar " in Idomeneo and " Martern aller Arten " in Die Entfilhrung to genuine musical speeches like " Non piU andrai " in Figaro, in which the obvious capacity to deal with a greater number of words is far less important than the naturalness and freedom with which the pace of the declamation is varied — a

freedom unsurpassed even in the Elektra of Richard Strauss.

With Wagnerian polyphony and continuity music became capable of treating words as they occur in ordinary speech, and repetitions have accordingly become out of place except where they would be natural without music. But it is not here that the real gain in freedom of movement lies. That gain has been won, not by Wagner's negative reforms alone, but by his combination of negative reform with new depths of musical thought; and modern opera is not more exempt than classical opera from the dangers of artistic methods that have become facile and secure. If the libretto has the right dramatic movement, the modern composer need have no care beyond what is wanted to avoid interference with that movement. So long as the music arouses no obviously incompatible emotion and has no breach of con- tinuity, it may find perfect safety in being meaningless. The necessary stagecraft is indeed not common, but neither is it musical. Critics and public will cheerfully agree in ascribing to the composer all the qualities of the dramatist; and three allusions in the music of one scene to that of another will suffice to pass for a marvellous development of Wagnerian Leit-motif.

Modern opera of genuine artistic significance ranges from the ■ light song-play type admirably represented by Bizet's Carmen to the exclusively " atmospheric " impressionism of Debussy's Pelleas et Mtlisande. Both these extremes are equally natural in effect, though diametrically opposite in method: for both types eliminate everything that would be inadmissible in ordinary drama. If we examine the libretto of Carmen as an ordinary play we shall find it to consist mainly of actual songs and dances, so that more than half of the music would be necessary even if it were not an opera at all. Debussy's opera differs from Maeter- linck's play only in a few omissions such as would probably be made in ordinary non-musical performances. His musical method combines perfect Wagnerian continuity with so entire an absence of Leit-motif that there are hardly three musical phrases in the whole opera that could be recognized if they recurred in fresh contexts. The highest conceivable development of Wagnerian continuity has been attained by Strauss in Salome and Elektra; these operas being actually more perfect in dra- matic movement than the original plays of Wilde and Hof- mannsthal. But their use of Leit-motif, though obvious and impressive, is far less developed than in Wagner; and the poly- phony, as distinguished from the brilliant instrumental technique, is, like that technique, devoted mainly to realistic and physically exciting effects that crown the impression in much the same way as skilful lighting of the stage. Certainly Strauss does not in his whole time-limit of an hour and three-quarters use as many

definite themes (even in the shortest of figures) as Wagner uses in ten minutes.

It remains to be seen whether a further development of Wagnerian opera, in the sense of addition to Wagner's resources in musical architecture, is possible. The uncompromising realism of Strauss does not at first sight seem encouraging in this direc- tion; yet his treatment of Elektra's first invocation of Agamem- non produces a powerful effect of musical form, dimly perceived, but on a larger scale than even the huge sequences of Wagner. In any case, the best thing that can happen in a period of musical transition is that the leading revolutionaries should make a mark in opera. Musical revolutions are too easy to mean much by themselves; there is no purely musical means of testing the sanity of the revolutionaries or of the critics. But the stage, while boundlessly tolerant of bad music, will stand no nonsense in dramatic movement. (The case of Handelian opera is no excep- tion, for in it the stage was a mere topographical term .) In every period of musical fermentation the art of opera has instantly sifted the men of real ideas from the aesthetes and doctrinaires; Monteverde from the prince of Venosa, Gluck from Gossec, and Wagner from Liszt. As the ferment subsides, opera tends to a complacent decadence; but it will always revive to put to the first and most crucial test every revolutionary principle that enters into music to destroy and expand.

See also Aria; .Overture; Cherubini; Gluck; Mozart; Verdi; Wagner; Weber. (d. F. T.)

OPHICLEIDE (Fr. ophicleide, basse d'harmonie; Ger. Ophik- leid; Ital. oficleide). a brass wind instrument having a cup-shaped mouthpiece and keys, in fact a bass keyed-bugle. The name (from Gr. 6 < £is, serpent, and ic\ei8es, keys), applied to it by Halary, the patentee of the instrument, is hardly a happy one, for there is nothing of the serpent about the ophicleide, which has the bore of the bugle and also owes the chromatic arrange- ment of the keys to a principle evolved by Halliday for the bugle, to be explained later on.

The ophicleide is almost perfect theoretically, for it combines the natural harmonic scale of the brass wind instruments having cup-shaped mouthpieces, such as the trumpet, with a system of keys, twelve in number, one for each chromatic semitone of the scale; it is capable of absolutely accurate intonation. It consists of a wooden, or oftener brass, tube with a conical bore having the same proportions as that of the bugle but not wide enough in proportion to its length to make the fundamental or first note of the harmonic series of much

practical use. The tube, theoretically 1 8 ft. long, is doubled upon itself once, ter- minating at the narrow end in a tight coil, from which protrudes the straight piece known as the crook, which bears the cup-shaped mouthpiece; the wide end of the tube terminates in a funnel-shaped bell pointing upwards.

The production of sound is effected in the ophicleide as in other instruments with cup- or funnel-shaped mouthpieces (see Horn). The lips stretched across the mouthpiece act as vibrating reeds or as the vocal chords in the larynx. The breath of the performer, compressed by being forced through the narrow opening between the lips, sets the latter in vibration. The stream of air, instead of proceeding into the cup in an even flow — in which case there would be no sound — is converted into a series of pulsations by the trembling of the lips. On being thrown into communication with the main stationary column of air at the bottom of the cup, the pulsating stream generates ” sound waves,” each consisting of a half wave of expansion and of a half wave of compression. On the frequency per second of the sound waves as they strike the drum of the ear depends the pitch of the note, the acuteness of the sound varying in direct proportion to the frequency. To ensure a higher frequency in the sound waves, their length must be decreased. Two things are necessary to bring this about without shortening the length of the tube: (i) the opening between the lips, fixed at each end by contact with the edges of

1 For an explanation of the difference between theory and practice in the length of the tubes of wind instruments, see Victor Mahillon, ” Le cor ” (Les instruments de musique au musee du conservatoire royal de musique de Bruxelles, pt. ii. Brussels and London, 1907), pp. 27-29.

the mouthpiece, must be made narrower by greater tension; (2) the breath must be sent through the reduced aperture in a more compressed form and with greater force, so that the exciting current of air becomes more incisive. An exact proportion, not yet scientifically determined, evidently exists between the amount of pressure and the degree of tension, which is uncon- sciously regulated by the performer, excess of pressure in pro- portion to the tension of the lips producing a crescendo by causing amplitude of vibration instead of increased speed.

When the fundamental note of a pipe is produced, the tension of the

lips and pressure of breath proportionally combined are at their minimum for that instrument. If both be doubled, a node is formed half way up the pipe, and the column of air no longer vibrates as a whole, but as two separate parts, each half the length of the tube, and the frequency of the sound waves is doubled in consequence. The practical result is the production of the second harmonic of the series an octave above the fundamental. The formation of three nodes and therefore of three separate sound waves produces a note a twelfth above the fundamental, known as the third harmonic, and so on in mathematical ratio. This harmonic series forms the natural scale of the instrument, and is for the ophicleide the following:

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(T) ■

Fundamental.

In some cases the fundamental is difficult to obtain, and the harmonics above the eighth are not used.

The ophicleide has in addition to its natural scale eleven or twelve lateral holes covered by keys, each of which, when succes- sively opened, raises the pitch of the harmonic series a semitone, with the exception of the first, an open key, which on being closed lowers the pitch a semitone. There were ophicleides in C and in Bt>, the former being the more common; contrabass ophicleides were also occasionally made in F and Et>. The keys of the ophicleide, being placed in the lowest register, were intended to bind together by chromatic degrees the first and second harmonics. The compass is a little over three octaves,

from

~p-~— with chromatic semitones throughout.

The unsatisfactory timbre of the ophicleide led to its being superseded by the bass tuba; but it seems a pity that an instrument so powerful, so easy to learn and understand, and capable of such accurate intonation, should have to be discarded. The lower register is rough, but so

powerful that it can easily sustain above it masses of brass harmonics; the medium is coarse in tone, and the upper wild and unmusical.

Although a bass keyed-bugle, the ophicleide owes something of its origin to the application of keys to the serpent (q.v.), a wind instrument, the invention of which is generally attributed to Edme Guillaume, canon of Auxerre, about 1590. The serpent remained in its primitive form for nearly two centuries, and then only it was attempted to improve it by adding keys. It was a musician named Regibo, 1 belonging to the orchestra of the church of St Pierre at Lille, who, about 1780, first thought of giving it the shape of a bassoon. The merit of this innovation was rapidly recognized in England and Germany. Still, to follow Gerber, 2 one Frichot, who was established in London, published in 1800 a description of an instrument, entirely of brass, manufactured by J. Astor, which he claimed as his invention, calling it the basshorn, but which was no other in principle than the new serpent of Regibo. It only made its way to France and Belgium after the passage of the allied armies in 1815. The English brass basshorn was designated on the Continent the English or the Russian basshorn, the ” serpent anglais ” or the ” basson russe.” Under this last name all instruments of the form, whether of wood or brass, were later on confounded in France and Belgium. The ” basson russe ” remained in great vogue until the appearance of the ophicleide, to disappear with it in the complete revolution brought about by the invention of pistons.

The invention of the ophicleide is generally but falsely attributed to Alexandre Frichot, a professor of music at Lisieux, department of Calvados, France. The instrument, which the inventor called ” basse-trompette,” was approved of as early as 13th November 1806 bv a commission composed of professors of the Paris Con-

1 Gerber, Lexicon der Tonkiinstler (Leipzig, 1790).

2 Lexikon, edition of 1812.

servatoire, but the patent bears the date 31st December 1810. The ” basse-trompette,” which Frichot in his specification had at first, in imitation of the English basshorn, called ” basse cor,” was, like the English instrument, entirely of brass, and had, like it, six holes; it only differed in a more favourable disposition brought about by the curvings of the tube, and by the application of four crooks which permitted the instrument to be tuned ” in C low pitch and C high pitch for military bands, in C # for churches, and in D for concert use.” The close relationship between the two instruments suggests the question

whether this was the Frichot who worked with Astor in London in 1800.

The first idea of adding keys to instruments with cupped mouth-pieces, unprovided with lateral holes, with the aim of filling up some of the gaps between the notes of the harmonic scale, goes back, according to Gerber {Lexicon of 1790), to Kolbel, a hornplayer in the Russian imperial band, about 1760. Anton Weidinger, 3 trumpeter in the Austrian imperial band, improved upon this first attempt, and applied it in 1800 to the trumpet. But the honour belongs to Joseph Halliday, bandmaster of the Cavan militia, of being the first to conceive, in 1810, the disposition of a certain number of keys along the tube, setting out from its lower extremity, with the idea of producing by their successive or simultaneous opening a chromatic scale throughout the extent of the instrument. The bugle-horn was the object of his reform; the scale of which, he says, in the preamble of his- patent, ” until my invention contained but five

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My improvements on that

tones, viz.

instrument are five keys, to be used by the performer according to the annexed scale, which, with its five original notes, render it capable of producing twenty-five separate tones in regular progression.” Fig. I represents the keyed bugle of Joseph Halliday.

It was not until 1815 that the use of ‘the new instrument spread upon the Continent. We find in the account-books of a Belgian maker, Tuer-linckx of Mechlin, that his first supply of a bugle- horn bears the date of 25th March 1815, and it was made ” aen den Heer Muldener, lieutenant in het regiment due d’York.”

The acoustic principle inaugurated by Halliday consisted in binding together by chromatic degrees

the second and third harmonics, (S : to

‘^ Fig. 1. — Keyed

He attained it, as we have just seen, Bugle.

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by the help of five keys. The principle once discovered, it became easy to extend it to instruments of the largest size, of which the compass, as in the ” basson russe,” began with the fundamental sound. It was simply necessary to bind this fundamental

- to the next harmonic sound

|— – = -— – by a larger number of keys. This

was done in 1817 by Jean Hilaire Aste, known as Halary, a professor of music and instru- ment-maker at Paris. We find the description of the instruments for which he sought a patent in the Rapport de I’ Academie Roy ale des Beaux-Arts de I’Institut de France, meeting of the l9thof July 1817. These instruments were three in number: (1) the clavi-tube, a keyed trumpet; (2) the quinti-tube, or quinti-clave; (3) the ophicleide, a keyed serpent. The clavi- tube was no other than the bugle-horn slightly modified in some details of construction, and reproduced in the different tonalities Ab, F, Eb, D, C, Bb, A and Ab. The quinti-tube had nearly the form of a bassoon, and was, in the first instance, armed with eight keys and constructed in two tonalities, F and Eb. This was the instrument afterwards named ” alto ophicleide.” The ophicleide (fig. 2) had the same form as the quinti-tube. It was at first adjusted with nine or ten keys, and the number was carried on to twelve — each key to give a semitone (additional patent of 16th August 1822). The ophicleide or bass of the harmony was made in C and in Bb, the contra-bass in F and in Eb. 4

Fig.2. — Ophicleide of Halary.

3 The announcement of Weidinger’s invention of a Klappen- trompete, or trumpet with keys, appears in the Allg. musik. Ztg. (Leipzig, November 1802), p. 158; and further accounts are given in January 1803, p. 245, and 1815, p. 844.

4 The report of the Academie des Beaux-Arts on the subject of this invention shows a strange misconception of it, which it is interesting to recall. ” As to the two instruments which M. Halary designs

It is certain that from the point of view of invention Halary’s labours had only secondary importance; but, if the principle of keyed

chromatic instruments with cupped mouthpiece 1 goes back to Halliday, it was Halary's merit to know how to take advantage of the principle in extending it to instruments of diverse tonalities, in grouping them in one single family, that of the bugles, in so complete a manner that the improvements of modern manufacture have not widened its limits either in the grave or the acute direction. Keyed chromatic wind instruments made their way rapidly; to their introduction into military full or brass bands we can date the regeneration of military music. After pistons had been invented some forty years, instruments with keys could still reckon their partisans. Now these have utterly disappeared, and pistons or rotary cvlinders remain absolute masters of the situation.

(V. M.;K. S.)

OPHIR, a region celebrated in antiquity for its gold, which was proverbially fine (Job xxii. 24, xxviii. 16; Psalms xlv. 9; Isa. xiii. 12). Thence Solomon's Phoenician sailors brought gold for their master (1 Kings ix. 28, x. n; 2 Chron. viii. 18, ix. 10); Ophir gold was stored up among the materials for the Temple (1 Chron. xxix. 4). Jehoshaphat, attempting to follow his ancestors-' example, was foiled by the shipwreck of his navy (1 Kings xxii. 48). The situation of the place has been the subject of much controversy.

The only indications whereby it can be identified are its connexion, in the geographical table (Gen. x. 29), with Sheba and Havilah, the latter also an auriferous country (Gen. ii. n), and the fact that ships sailing thither started from Ezion-Geber at the head of the Red Sea. It must, therefore, have been somewhere south or east of Suez; and must be known to be a gold-bearing region. The suggested identification with the Egyptian Punt is in itself disputable, and it would be more helpful if we knew exactly where Punt was (see Egypt) .

(1) East Africa. — This has, perhaps, been the favourite theory in recent years, and it has been widely popularized by the sensational works of Theodore Bent and others, to say nothing of one of Rider Haggard's novels. The centre of speculation is a group of extensive ruins at Zimbabwe, in Mashonaland, about 200 m. inland from Sofala. Many and wild words have been written on these imposing remains. But the results of the saner researches of Randall Maclver, announced first at the South Africa meeting of the British Association (1905) and later communicated to the Royal Geographical Society, have robbed these structures of much of their glamour; from being the centres of Phoenician and Hebrew industry they have sunk to be mere magnified kraals, not more than three or four hundred years old.

(2) The Far East. — Various writers, following Josephus and the Greek version, have placed Ophir in different parts of the Far East. A chief argument in favour of this view is the length of the voyages of Solomon's vessels (three years were occupied in the double voyage, going and returning, 1 Kings x. 22) and the nature of the other imports that they brought — " almug- trees " (i.e. probably sandal-wood), ivory, apes and peacocks. This, however, proves nothing. It is nowhere said that these various imports all came from one place; and the voyages must have been somewhat analogous to those of modern " coasting tramps," which would necessarily consume a considerable time over comparatively short journeys. It has been sought at

under the names of ' quinti-clave ' and ' ophicleide, ' they bear a great resemblance to those submitted to the Academy in the sitting of the nth of March 181 1 by M. Dumas, which he designed under the names of ' basse et contrebasse guerrieres.' . . . The opinion of our commission on the quinti-clave and ophicleide is that M. Halary can only claim the merit of an improvement and not that of an entire invention; still, for an equitable judgment on this point, we should compare the one with the other, and this our commission cannot do, not having the instruments of M. Dumas at our disposal." This is what the commission ought to have had, but it would have sufficed had they referred to the report of the sittings of 6th and 8th April, in which it is clearly explained that the instruments presented by M. Dumas were bass clarinets (Moniteur Universel of 19th April

1811).

1 We designedly omit the use of the word " brass " to qualify these instruments. The substance which determines the form of a column of air is demonstrably indifferent for the timbre or quality of (one so long as the sides of the tubes are equally elastic and rigid.

Abhira, at the mouth of the Indus (where, however, there is no gold); at Supara, in Goa; and at a certain Mount Ophir in Johore.

(3) Arabia. — On the whole the most satisfactory theory is that Ophir was in some part of Arabia — whether south or east is disputed, and (with the indications at our disposal) probably cannot be settled. Arabia was known as a gold-producing country to the Phoenicians (Ezek. xxvii. 22); Sheba certainly, and Havilah probably, are regions of Arabia, and these are coupled with Ophir in Genesis x.; and the account of the arrival of the navy in 1 Kings x. n, is strangely interpolated into the story of the visit of the queen of Sheba, perhaps because there is a closer connexion between the two events than

appears at first sight.

Historians have been at a loss to know what Solomon could give in exchange for the gold of Ophir and the costly gifts of the queen of Sheba. Mr K. T. Frost (Expos. Times, Jan. 1905) shows that by his command of the trade routes Solomon was able to balance Phoenicians and Sabaeans against each other, and that his Ophir gold would be paid for by trade facilities and protection of caravans. (R. A. S. M.)

OPHITES, or Ophians (Gr. o<£«, Heb. ipnj, " snake "), known also as Naasenes, an early sect of Gnostics described by Hippolytus (Philosoph. v.), Irenaeus (adv. Haer. i. n), Origen (Contra Celsum, vi. 25 seq. and Epiphanius (Haer. xxvi.). The account given by Irenaeus may be taken as representative of these descriptions which vary partly as referring to different groups, partly to different dates. The honour paid by them to the serpent is connected with the old mythologies of Babylon and Egypt as well as with the popular cults of Greece and the Orient. It was particularly offensive to Christians as tending to dishonour the Creator who is set over against the serpent as bad against good. The Ophite system had its Trinity: (1) the Universal God, the First Man, (2)' his conception (%vvot,a), the Second Man, (3) a female Holy Spirit. From her the Third Man (Christ) was begotten by the First and Second. Christ flew upward with his mother, and in their ascent a spark of light fell on the waters as Sophia. From this contact came Ialdabaoth the Demiurgos, who in turn produced six powers and with them created the seven heavens and from the dregs of matter the Nous of serpent form, from whom are spirit and soul, evil and death. Ialdabaoth then announced himself as the Supreme, and when man (created by the six powers) gave thanks for life not to Ialdabaoth but to the First Man, Ialdabaoth created a woman (Eve) to destroy him. Then Sophia or Prunikos sent the serpent (as a benefactor) to persuade Adam and Eve to eat the tree of knowledge and so break the commandment of Ialda- baoth, who banished them from paradise to earth. After a long war between mankind aided by Prunikos against Ialdabaoth (this is the inner story of the Old Testament), the Holy Spirit sends Christ to the earth to enter (united with his sister Prunikos) the pure vessel, the virgin-born Jesus. Jesus Christ worked miracles and declared himself the Son of the First Man. Ialda- baoth instigated the Jews to kill him, but only Jesus died on the cross, for Christ and Prunikos had departed from him. Christ then raised the spiritual body of Jesus which remained on earth for eighteen months, initiating a small circle of elect disciples. Christ, received into heaven, sits at the right hand of Ialdabaoth, whom he deprives of glory and receives the souls that are his own. In some circles the serpent was

identified with Prunikos. There are some resemblances to the Valentinian system, but whereas the great Archon sins in ignorance, Ialdabaoth sins against knowledge; there is also less of Greek philosophy in the Ophite system.

See King, The Gnostics and their Remains (London, 1887) ; G. Salmon, art. ” Ophites ” in Diet. Chr.Biog.

OPHTHALMOLOGY (Gr. 6ˆ0aXju6s, eye), the science of the anatomy, physiology and pathology of the eye (see Eye and Vision). From the same Greek word come numerous other derivatives: e.g. ophthalmia, the general name for conjunctival inflammations (see Eye diseases, under Eye) ; and the instruments ophthalmometer and ophthalmoscope (see Vision).

OPIE, AMELIA (1769-1853), English author, daughter of James Alderson, a physician in Norwich, and was born there on the 1 2th of November 1769. Miss Alderson had inherited radical principles and was an ardent admirer of Home Tooke. She was intimate with the Kembles and with Mrs Siddons, with Godwin and Mary Wollstonecraft. In 1798 she married John Opie, the painter. The nine years of her married life were very happy, although her husband did not share her love of society. He encouraged her to write, and in 1801 she produced a novel entitled Father and Daughter, which showed genuine fancy and pathos. She published a volume of graceful verse in 1802; Adeline Mowbray followed in 1804, Simple Tales in 1806, Temper in 181 2, Tales of Real Life in 1813, Valentine’s Eve in 1816, Tales of the Heart in 1818, and Madeline in 1822. At length, in 1825, through the influence of Joseph John Gurney, she joined the Society of Friends, and beyond a volume entitled Detraction Displayed, and contributions to periodicals, she wrote nothing more. The rest of her life was spent in travelling and in the exercise of charity. Mrs Opie retained her vivacity to the last, dying at Norwich on the 2nd of December 1853.

A Life, by Miss C. L. Brightwell, was published in 1854.

OPIE, JOHN (1761-1807), English historical and portrait painter, was born at St Agnes near Truro in May 1761. He early showed a taste for drawing, besides having at the age of twelve mastered Euclid and opened an evening school for arithmetic and writing. Before long he

won some local reputation by portrait-painting; and in 1780 he started for London, under the patronage of Dr Wolcot (Peter Pindar). Opie was introduced to the town as ” The Cornish Wonder,” a self-taught genius. The world of fashion, ever eager for a new sensation, was attracted; the carriages of the wealthy blocked the street in which the painter resided, and for a time he reaped a rich harvest by his portraits. But soon the fickle tide of popularity flowed past him, and the painter was left neglected. He now applied himself with redoubled diligence to correcting the defects which marred his art, meriting the praise of his rival Northcote — ” Other artists paint to live; Opie lives to paint.” At the same time he sought to supplement his early education by the study of Latin and French and of the best English classics, and to polish the rudeness of his provincial manners by mixing in cultivated and learned circles. In 1786 he exhibited his first important historical subject, the ” Assassination of James I., ” and in the following year the ” Murder of Rizzio,” a work whose merit was recognized by the artist’s immediate election as associate of the Academy, of which he became a full member in 1788. He was employed on five subjects for Boydell’s ” Shakespeare Gallery “; and until his death, on the 9th of April 1807, his practice alternated between portraiture and historical work. His productions are distinguished by breadth of handling and a certain rude vigour, individuality and freshness. They are wanting in grace, elegance and poetic feeling. Opie is also favourably known as a writer on art by his Life of Reynolds in Wolcot’s edition of Pilkington, his Letter on the Cultivation of the Fine Arts in England, in which he advocated the formation of a national gallery, and his Lectures as professor of painting to the Royal Academy, which were published in 1809, with a memoir of the artist by his widow (see above) .

OPINION (Lat. opinio, from opinari, to think), a term used loosely in ordinary speech for an idea or an explanation of facts which is regarded as being based on evidence which is good but not conclusive. In logic it is used as a translation of Gr. S6£a, which plays a prominent part in Greek philosophy as the opposite of knowledge («rioTi7,u>? or dXˆSeta). The distinction is drawn by Parmenides, who contrasts the sphere of truth or knowledge with that of opinion, which deals with mere appearance, error, not-being. So Plato places 56£a between aier077

popular opinion — that which is generally held to be true (Soneiv) — as the starting-point of an inquiry. In modern philosophy the term has been used for various conceptions all having much the same connotation. The absence of any universally acknowledged definition, especially such as would contrast ” opinion ” with ” belief,” ” faith ”

and the like, deprives it of any status as a philosophic term.

OPITZ VON BOBERFELD, MARTIN (1597-1639), German poet, was born at Bunzlau in Silesia on the 23rd of December 1597, the son of a prosperous citizen. He received his early education at the Gymnasium of his native town, of which his uncle was rector, and in 16 17 attended the high school — ” Schonaichianum ” — at Beuthen, where he made a special study of French, Dutch and Italian poetry. In 1618 he entered the university of Frankfort-on-Oder as a student of literae humaniores, and in the same year published his first essay, Aristarchus, she De contemptu linguae Teutonicae, a plea for the purification of the German language from foreign adultera- tion. In 1619 he went to Heidelberg, where he became the leader of the school of young poets which at that time made that university town remarkable. Visiting Leiden in the following year he sat at the feet of the famous Dutch lyric poet Daniel Heinsius (1580-1655), whose Lobgesang Jesu Christi and Lobgesang Bacchi he had already translated into alexandrines. After being for a short year (1622) professor of philosophy at the Gymnasium of Weissenburg (now Karlsburg) in Transylvania,- he led a wandering life in the service of various territorial nobles. In 1624 he was appointed councillor to Duke George Rudolf of Liegnitz and Brieg in Silesia, and in 1625, as reward for a requiem poem composed on the death of Archduke Charles of Austria, was crowned laureate by the emperor Ferdinand II. who a few years later ennobled him under the title ” von Boberfeld.” He was elected a member of the Fruchtbringende Gesellschaft in 1629, and in 1630 went to Paris, where he made the acquaintance of Hugo Grotius. He settled in 1635 at Danzig, where Ladislaus IV. of Poland made him his historio- grapher and secretary. Here he died of the plague on the 20th of August 1639.

Opitz was the head of the so-called First Silesian School of poets(see Germany -.Literature), and was during his life regarded as the greatest German poet. Although he would not to-day be considered a poetical genius, he may justly claim to have been the ” father of German poetry ” in respect at least of its form; his Buck von der deutschen Potter ey (1624) put an end to the hybridism that had until then prevailed, and established rules for the ” purity ” of language, style, verse and rhyme. Opitz’s own poems are in accordance with the rigorous rules which he laid down. They are mostly a formal and sober elaboration of carefully considered themes, and contain little beauty and less feeling. To this didactic and descriptive category belong his best poems, Trost-Gedichte in Widerwdrtigkeit des Krieges (written 162 1, but not published till 1633); Zlatna, oder von Ruhe des Gemiils (1622); Lob des Feldlebens (1623); Vielgut, oder vom wahren

Gliick (1629), and Vesuvius (1633). These contain some vivid poetical descriptions, but are in the main treatises in poetical form. In 1624 Opitz published a collected edition of his poetry under the title Acht Biicher deutscher Poematum (though, owing to a mistake on the part of the printer, there are only five books); his Dafne (1627), to which Heinrich Schiitz composed the music, is the earliest German opera. Besides numerous translations, Opitz edited (1639) Das Annolied, a Middle High German poem of the end of the nth century, and thus preserved it from oblivion.

Collected editions of Opitz's works appeared in 1625, 1629, 1637, 1 64 1, 1690 and 1746. His Ausgewahlte Dichlitngen have been edited by J. Tittmann (1869) and by H. Oesterley (Kiirschner's Deutsche Nationalliteratur, vol. xxvii. 1889). There are modern reprints of the Buck von der deutschen Poeterey by W. Braune (2nd ed., 1882), and, together with Aristarchus, by G. Witkowski (1888), and also of the Teutsche Poemata, of 1624, by G. Witkowski (1902). See H. Palm, Beitrdge zur Geschichte der deutschen Literatur des i6ten und ijlen Jahrhunderts (1877); K. Borinski, Die Poetik der Renaissance (1886); R. Beckherrn, Opitz, Ronsard und Heinsius (1888). Bibliography by H. Oesterley in the Zentralblatt fur Bibliolhekswesen for 1885.

II

13°

OPIUM

OPIUM (Gr. ornov, dim. from 6ir6j, juice), a narcotic drug prepared from the juice of the opium poppy, Papaver somniferum, a plant probably indigenous in the south of Europe and western Asia, but now so widely cultivated that its original habitat is uncertain. The medicinal properties of the juice have been recognized from a very early period. It was known to Theo- phrastus by the name of wkicviov, and appears in his time to have consisted of an extract of the whole plant, since Dioscorides, about a.d. 77, draws a distinction between nyK&veiov, which he describes as an extract of the entire herb, and the more active birds, derived from the capsules alone. From the ist to the 12th century the opium of Asia Minor appears to have been the only kind known in commerce. In the 13th century opium thebaicum is mentioned by Simon Januensis, physician to Pope Nicholas IV., while meconium was still in use. In the 16th century opium is mentioned by Pyres (1516) as a production of the kingdom of Cous (Kuch Behar, south-west of Bhutan) in Bengal, and of Malwa. 1 Its introduction into India appears to have been connected with the

spread of Islam. The opium monopoly was

the property of the Great Mogul and was regularly sold. In the 17th century Kaempfer describes the various kinds of opium prepared in Persia, and states that the best sorts were flavoured with spices and called ” theriaka.” These preparations were held in great estimation during the middle ages, and probably supplied to a large extent the place of the pure drug. Opium is said to have been intro- duced into China by the Arabs probably in the 13th century, and it was originally used there as a medicine, the introduc- tion of opium-smoking being assigned to the 17th century. In a Chinese Herbal compiled before 1700 both the plant and its inspissated juice are described, together with the mode of collecting it, and in the General History of the Southern Provinces of Yunnan, revised and republished in 1736, opium is noticed as a common product. The first edict prohibiting opium-smoking was issued by the emperor Yung Cheng in 1729. Up to that date the amount imported did not exceed 200 chests, and was usually brought from India by junks as a return cargo. In the year 1757 the monopoly of opium cultivation in India passed into the hands of the East India Company through the victory of Clive at Plassey. Up to 1773 the trade with China had been in the hands of the Portuguese, but in that year the East India Company took the trade under their own charge, and in 1776 the annual export reached 1000 chests, and 5054 chests in 1790. Although the importation was forbidden by the Chinese imperial authorities in 1796, and opium-smoking punished with severe penalties (ultimately increased to trans- portation and death), the trade continued and had increased during 1820-1830 to 16,877 chests per annum. The trade was contraband, and the opium was bought by the Chinese from depot ships at the ports. Up to 1839 no effort was made to stop the trade, but in that year the emperor Tao-Kwang sent a com- missioner, Lin Tsze-sii, to Canton to put down the traffic. Lin issued a proclamation threatening hostile measures if the British opium ships serving as depots were not sent away. The demand for removal not being complied with, 20,291 chests of opium (of 149ˆ lb each), valued at £2,000,000, were destroyed by the Chinese commissioner Lin; but still the British sought to 1 Aromalum Historia (ed. Clusius, Ant., 1574).

Fig. 1. — Opium Poppy {Papaver somniferum).

smuggle cargoes on shore, and some outrages committed on both sides led to an open war, which was ended by the treaty of Nanking in 1842. The importation of opium continued and was legalized in 1858. From that time, in spite of the remonstrances of the Chinese government, the exportation of opium from India to China continued,

increasing from 52,925 piculs (of 1333 lb) in 1850 to 96,839 piculs in 1880. While, however, the court of Peking was honestly endeavouring to suppress the foreign trade in opium from 1839 to 1858 several of the provincial viceroys encouraged the trade, nor could the central government put a stop to the home cultivation of the drug. The cultivation increased so rapidly that at the beginning of the 20th century opium was produced in every province of China. The western provinces of Sze-ch'uen, Yun-nan and Kwei-chow yielded respectively 200,000, 30,000 and 15,000 piculs (of 133$ lb); Manchuria 15,000; Shen-si, Chih-li and Shan-tung 10,000 each; and the other provinces from 5000 to 500 piculs each, the whole amount produced in China in 1906 being estimated at 330,000 piculs, of which the province of Sze-ch'uen produced nearly two- thirds. Of this amount China required for home consumption 325,270 piculs, the remainder being chiefly exported to Indo- China, whilst 54,225 piculs of foreign opium were imported into China. Of the whole amount of opium used in China, equal to 22,588 tons, only about one-seventh came from India.

The Chinese government regarding the use of opium as one of the most acute moral and economic questions which as a nation they have to face, representing an annual loss to the country of 856,250,000 taels, decided in 1906 to put an end to the use of the drug within ten years, and issued an edict on the 20th of September 1906, forbidding the consumption of opium and the cultivation of the poppy. As an indication of their earnestness of purpose the government allowed officials a period of six months in which to break off the use of opium, under heavy penalties if they failed to do so. In October of the same year the American government in the Philippines, having to deal with the opium trade, raised the question of the taking of joint measures for its suppression by the powers interested, and as a result a conference met at Shanghai on the ist of February 1909 to which China, the United States of America, Great Britain, Austria-Hungary, France, Germany, Italy, Japan, the Netherlands, Persia, Portugal and Russia sent delegates. At this meeting it was resolved that it was the duty of the respective governments to prevent the export of opium to any countries prohibiting its importation; that drastic measures should be taken against the use of morphine ; that anti-opium remedies should be investigated; and that all countries having concessions in China should close the opium divans in their possessions. The British government made an offer in 1907 to reduce the export of Indian opium to countries beyond the seas by 5100 chests, i.e. -ˆth of the amount annually taken by China, each year until the year 1910, and that if during these three years the Chinese government had carried

out its arrangements for proportionally diminishing the production and consumption of opium in China, the British government were prepared to continue the same rate of reduction, so that the export of Indian opium to China would cease in ten years; the restrictions of the imports of Turkish, Persian and other opiums being separately arranged for by the Chinese government, and carried out simultaneously. The above proposal was gratefully received by the Chinese government. A non-official report by Mr E. S. Little, after travelling through western China, which appeared in the newspapers in May 1910, stated that all over the province of Sze-ch'uen opium had almost ceased to be produced, except only in a few remote districts on the frontier (see further China: § History).

The average annual import of Persian and Turkish opium into China is estimated at 11 25 piculs, and if this quantity were to be reduced every year by one-ninth, beginning in 1909, in nine years the import into China would entirely cease, and the Indian, Persian and Turkish opiums no longer be articles of commerce in that country. One result of these regulations was that the price of foreign opium in China rose, a circumstance which was calculated to reduce the loss to the Indian revenue.

Thus in 1909-1910, with only 350,000 acres under cultivation and 40,000 chests of opium in stock, the revenue was £4,420,600 as against £3,572,944 in 1905-1906 with 613,996 acres under cultivation and a stock of 76,063 chests. No opium dens have been allowed since 1907 in their possessions or leased territories in China by Great Britain, France, Germany, Russia or Japan.

The difficulties of the task undertaken by the Chinese govern- ment to eradicate a national and popular vice, in a country whose population is generally estimated at 400,000,000, are increased by the fact that the opium habit has been indulged in by all classes of society, that opium has been practically the principal if not the only national stimulant; that it must involve a considerable loss of revenue, which will have to be made up by other taxes, and by the fact that its cultivation is more profitable than that of cereals, for an English acre will on the average produce raw dry opium of the value of £5, 16s. 8d. while it will yield grain valued only at £4, 5s. 6d.

Various remedies for the opium habit have been experimented with in

China, but with doubtful success. Under the name of anti-opium cure various remedies containing morphine in the form of powder, or of little pills, have been introduced, as well as the subcutaneous injection of the alkaloid, so that the use of morphine is increasing in China to an alarming extent, and considerable difficulty is experienced in controlling the illicit traffic in it, especially that sent through the post. Its com- parative cheapness, one dollar's worth being equal to three dollars' worth of opium in the effect produced, its portability and the facilities offered in obtaining it, are all in its favour. A good deal of morphine is exported to Japan from Europe, and generally passes into China by way of Manchuria, where Japanese products have a virtual monopoly. The effects of morphine are much more deleterious than those of opium- smoking. The smoke of opium, as shown by H. Moissan, contains only a trifling amount of morphia, and the effect produced by it is apparently due, not to that alkaloid, but to such decom- position products as pyrrol, acetone and pyridine and hydro-pyridine bases. F. Browne finds that after smoking " chandoo," containing 8-98 % of morphine, 7-63 % was left in the dross, so that only 1-35% of morphia was carried over in the smoke or decomposed by the heat.

For many years two Scotch firms, Messrs J. D. Macfarlan and T. and H. Smith of Edinburgh, and T. Whiffen of London manufactured practically the world's supply of this alkaloid, but it is now made in the United States and Germany, although the largest amount is still probably made in Great Britain. A small amount of morphine and codeine is also manufactured in India for medicinal use. The prohibition of the general importa- tion of morphia into China except on certain conditions was agreed to by the British government in Act XL of the Mackay. treaty, but only came into force on the 1st of January 1909. Unless the indirect importation of morphine into China from Europe and the United States is stopped, a worse habit and more difficult to cure than any other (except perhaps that of cocaine) may replace that of opium-smoking in China. It is worse even than opium-eating, in proportion as morphine is more active than opium. The sale and use of morphine in India and Burma is now restricted. The quantity of morphine that any one may legally possess, and then only for medicinal purposes, is in India 10 grams, and in Burma five. The possession of morphine by medical practitioners is also safeguarded by well-defined limitations.

Production aiid Commerce. — Although the collection of opium is possible in all places where there is not an excessive rainfall and the climate is temperate or subtropical, the yield is smaller in temperate than in tropical regions and the industry can only be profitably carried

on where labour and land are sufficiently cheap and abundant; hence production on a large scale is limited to comparatively few countries. The varieties of poppy grown, the mode of cultivation adopted and the character of the opium produced differ so greatly that it will be convenient to consider the opiums of each country separately.

Turkey. — The poppy cultivated in Asia Minor is the variety glabrum, distinguished by the sub-globular shape of the capsule

and by the stigmata or rays at the top of the fruit being ten or twelve in number. The flowers are usually of a purplish colour, but are sometimes white, and the seeds, like the petals, vary in tint from dark violet to white. The cultivation is carried on, both on the more elevated and lower lands, chiefly by peasant proprietors. A naturally light and rich soil, further improved by manure, is neces- sary, and moisture is indispensable, although injurious in excess, so that after a wet winter the best crops are obtained on hilly ground, and in a dry season on the plains. The land is ploughed twice, the second time crosswise, so that it may be thoroughly pulverized; and the seed, mixed with four times its quantity of sand, to prevent its being sown too thickly, is scattered broadcast, about f to I lb being used for every toloom (1600 sq. yds.). The crop is very uncertain owing to droughts, spring frosts and locusts, and, in order to avoid a total failure and to allow time for collecting the produce, there are three sowings at intervals from October to March — the crops thus coming to perfection in succession. But notwith- standing these precautions quantities of the drug are wasted when the crop is a full one, owing to the difficulty of gathering the whole in the short time during which collection is possible. The first sowing produces the hardiest plants, the yield of the other two depending almost entirely on favourable weather. In localities where there is hoar frost in autumn and spring the seed is sown in September or at latest in the beginning of October, and the yield of opium and seed is then greater than if sown later. After sowing, the land is harrowed, and the young plants are hoed and weeded, chiefly by women and children, from early spring until the time of flowering. In the plains the flowers expand at the end of May, on the uplands in July. At this period gentle showers are of great value, as they cause an increase in the subsequent yield of opium. The petals fall in a few hours, and the capsules grow so rapidly that in a short time — generally from nine to fifteen days — the opium is fit for collection. This period is known by the capsules yielding to pressure with the fingers, assuming a lighter green tint and exhibiting a kind of bloom called ‘ ‘ cougak, ‘ ‘ easily rubbed off with the fingers; they are then about I J in. in diameter. The incisions are made by holding the capsule in the left hand and drawing a knife two-thirds round it, or

spirally beyond the starting-point (see fig. 2,0), great care being taken not to let the incisions penetrate to the interior lest the juice should flow inside and be lost. (In this case also it is said that the seeds will not ripen, and that no oil can be obtained from them.) The operation is usually performed after the heat of the day, commencing early in the afternoon and con- tinuing to nightfall, and the exuded juice is collected the next morning. This is done by scraping the capsule with a knife and transferring the concreted juice to a poppy-leaf held in the left hand, the edges of the leaf being turned in to avoid spilling the juice, and the knife-blade moistened with saliva by drawing it through the mouth after every alternate scraping to prevent the juice from adhering to it. When as much opium has been collected as the size of the leaf will allow, another leaf is wrapped over the top of the lump, which is then placed in the shade to dry for several days. The pieces vary in size from about 2 oz. to over 2 lb, being made larger in some districts than in others. The capsules are generally incised only once but the fields are visited a second or third time to collect the opium from the poppy-heads subsequently developed by the branching of the stem. The yield of opium varies, even on the same piece of land, from § to “]\ chequis (of 1-62 lb) per toloom (1600 sq. yds.), the average being i| chequis of opium and 4 bushels (of 50 ft) of seed. The seed, which yields 35 to 42 % of oil, is worth about two-thirds of the value of the opium. The whole of the operation must, of course, be completed in the few days — five to ten — during which the capsules are capable of yielding the drug. A cold wind or a chilly atmosphere at the time of collection lessens the yield, and rain washes the opium off the capsules. Before the crop is all gathered in a meeting of buyers and sellers takes place in each district, at which the price to be asked is discussed and settled, and the opium handed to the buyers, who in many instances have advanced money on the standing crop. When sufficiently solid the pieces of opium are packed in cotton bags, a quantity of the fruits of a species of Rumex being thrown in to pre- vent the cakes from adhering together. The bags are then sealed up, packed in oblong or circular baskets and sent to Smyrna or ether ports on mules. On the arrival of the opium at its destination, in the end of July or beginning of August, it is placed in cool ware- houses to avoid loss of weight until sold. The opium is then of a mixed character and is known as talequale. When transferred to the buyer’s warehouses the bags are opened and each piece is examined by a public inspector in the presence of both buyer and seller, the quality of the opium being judged by appearance, odour, colour and weight. It is then sorted into three qualities: (1) finest quality; (2) current or second; (3) chicanti or rejected pieces. A fourth sort consists of the very bad or wholly factitious pieces. The substances used to adulterate opium are grape-

juice thickened with flour, fig-paste, liquorice, half-dried apricots, inferior gum tragacanth and sometimes clay or pieces of lead or other metals. The chicanti is returned to the seller, who disposes of it at 20 to 30% discount to French and German merchants. After inspection the opium is hermetically sealed in tin-lined boxes con- taining about 150 lb. Turkey opium is principally used in medicine

on account of its purity and the large percentage of morphia that it contains, a comparatively small quantity being exported for smoking purposes.

About three-quarters of the opium prepared in Turkey is pro- duced in Anatolia, and is exported by way of Smyrna, and the remainder is produced in the hilly districts of the provinces near the southern coast of the Black Sea, and finds its way into Con- stantinople, the commercial varieties hearing the name of the district where they are produced. The Smyrna varieties include the produce of Afium Karahissar, Uschak, Akhissar, Taoushanli, Isbarta, Konia, Bulvadan, Hamid, Magnesia and Yerli, the last name being applied to opium coHected in the immediate neighbour- hood of Smyrna. The opium exported by way of Constantinople includes that of Hadjikeuy and Malatia; the Tokat kind, of good quality, including that produced in Yosgad, Sile and Niksar, and the current or second quality derived from Amasia and Oerek; the Karahissar kind including the produce of Mykalitch, Carabazar, Sivrahissar, Eskichehir and Nachlihan; the Balukesri sort, in- cluding that of Balukhissar and Bogaditch; also the produce of Beybazar and Angora. The average amount of Turkish opium exported is 7000 chests, but in rare seasons amounts to 12,000 chests, but the yield depends upon fine weather in harvest time, heavy rains washing the opium off the capsules, and lessening the yield to a considerable extent.

These commercial varieties differ in appearance and quality, and are roughly classified as Soft or Shipping opium, Druggists' and Manufacturers' opium. Shipping opium is distinguished by its soft character and clean paste, containing very little debris, or chaff, as it is technically called. The Hadjikeuy variety is at present the best in the market. The Malatia, including that of Kharput, second, and the Sile, third in quality. The chief markets for the soft or shipping varieties of opium are, China, Korea, the West Indian Islands, Cuba, British Guiana, Japan and Java; the United States also purchase for re-

exportation as well as for home consumption. Druggists' opium includes the kinds purchased for use in medicine, which for Great Britain should, when dried and powdered, contain 9i-lo|% of morphine. That generally sold in this country for the purpose includes the Karahissar and Adet, Balukhissar, Amasia and Akhissar kinds, and for making the tincture and extract, that of Tokat. But the produce of Gheve, Biledjik, Mondourlan, Konia, Tauschanli, Kutahlia and Karaman is often mixed with the kinds first mentioned. The softer varieties of opium are preferred in the American market, as being richer in morphine. In all Turkey opium the pieces vary much in size. On the continent of Europe, especially in Belgium, Germany and Italy, where pieces of small size are preferred, the Gheve, 1 and the Yog-hourma, i.e. opium remade into cakes, at the port of shipment, to contain 7, 8, 9, or 10 % of morphine, are chiefly sold. Manufacturers' opium includes any grade yielding not less than io| % of morphine, but the Yoghourma or " pudding " opium, on account of its paste being more difficult to work, is not used for the extraction of the active principles. For the extraction of codeine, the Persian opium is preferred when Turkey opium is dear, as it contains on the average 25% of that alkaloid, whilst Turkey opium yields only i-f%. But codeine can also be made from morphine.

The ordinary varieties of Turkish opium are recognized in com- merce by the following characteristics: Hadjikeuy opium occurs in pieces of about 5 lb- 1 J lb ; it has an unusually pale-coloured paste of soft consistence, and is very rich in morphia. Malatia opium is in pieces of irregular size usually of a broadly conical shape, weighing from 1-2 lb. It has a soft paste with irregular layers of light and dark colour and is covered with unusually green poppy leaves. Tokat opium resembles that of Malatia, but the cakes are flatter, and the paste is similar in character, though the leaves covering it are of a yellower tint of green. Bogaditz opium occurs in smaller pieces, about 3 or 4 oz. in weight, but sometimes larger pieces of 1-1J lb in weight are met with, approaching more nearly to the Kurgagatsch and Balukissar varieties. The surface is covered with a yellowish green leaf and many Rumex fruits. Karahissar opium, which usually includes the produce of Adet, Akhissar and Amasia, occurs in rather large shortly conical or more or less irregular lumps. Angora opium is met with in small smooth pieces, has generally a pale paste and is rich in morphia. Yerli opium is of good quality, variable in size and shape ; the surface is usually rough with Rumex capsules. Gheve opium formerly came over as a distinct kind, but is now mixed with other varieties; the pieces form small rounded cakes, smooth and shining like those of Angora, about 3-6 oz. in weight, with the midrib of the leaf they are wrapped in

forming a median line on the surface. The interior often shows layers of light and dark colour.

In Macedonia opium culture was begun in 1865 at Istip with seed obtained from Karahissar in Asia Minor, and extended subse- quently to the adjacent districts of Kotchava, Stroumnitza, Tikvish and Kinprulu-veles, most of the produce being exported under the name of Salonica opium. Macedonian opium, especially that

1 Gheve is the commercial name for opium from Geiveh on the river Sakaria, running into the Black Sea. It appears to find its way to Constantinople via the port of Ismid, and hence is known also by the latter name.

produced at Istip, is very pure, and is considered equal to the Malatia opium, containing about 1 1 % of morphine. The pieces vary from f lb to 1 5 lb in weight. For some years past, however, it has been occasionally mixed with pieces of inferior opium, like that of Yoghourma, recognizable on cutting by their solidity and heavy character. The Turkish government encourage the development of the industry by remitting the tithes on opium and poppy-seed for one year on lands sown for the first time, and by distributing printed instructions for cultivating the poppy and preparing the opium. In these directions it is pointed out that the opium crop is ten times as profitable as that of wheat. Four varieties of poppy are distinguished — two with white flowers, large oval capsules without holes under their " combs " (stigmas) and bearing respectively yellow and white seed, and the other two having red or purple flowers and seeds of the same colour, one bearing small capsules perforated at the top, and the other larger oval capsules not perforated. The white varieties are recommended as yielding a more abundant opium of superior quality. The yellow seed is said to yield the best oil; that obtained by hot pressure is used for lamps and for paint, and the cold-pressed oil for culinary purposes. Opium is also grown in Bulgaria, but almost entirely for home consumption; any surplus produce is, however, bought by Jews and Turks at low prices and sent to Constantinople, where it is sold as Turkish opium. It is produced in the districts of Kustendil, Lowtscha and Halitz, and is made into lumps weighing about 4 oz., of a light-brown colour internally and containing a few seeds; it is covered with leaves which have not been identified. Samples have yielded from 7 to 19 % of morphia, and only 2 to 3 % of ash, and are therefore of excellent quality.

India. — The poppy grown in India is usually the white-flowered variety, but in the Himalayas a red-flowered poppy with dark seeds is

cultivated. The opium industry in Bengal is a government monopoly, under the control of officials residing respectively at Patna and Ghazipore. Any one may undertake the industry, but cultivators are obliged to sell the opium exclusively to the government agent at a price fixed beforehand by the latter, which, although small, is said to fully remunerate the grower. It is con- sidered that with greater freedom the cultivator would produce too great a quantity, and loss to the government would soon result. Advances of money are often made by the government to enable the ryots to grow the poppy. The chief centres of production are Bihar in Bengal, and the district of the United Provinces of Agra and Oudh lying along the Gangetic valley, and north of it, of which the produce is known as Bengal opium. The opium manufactured at Patna is of two classes, viz. Provision opium manufactured for export, and Excise or Akbari opium intended for local consumption in India. These differ in consistence: Excise opium is prepared to contain 90% of non-volatile solid matter and made up into cubes weighing one seer or 2 ˆ5 lb, and wrapped in oiled paper, whilst Provision opium is made up into balls, protected by a leafy covering, made of poppy petals, opium and ” pussewah,” or liquid drainings of the crude opium ; that of Patna is made to contain 75 % of solid matter, and that of Ghazipore, which is known as Benares opium, 71 % only. Each ball consists of a little over 3J lb of fine opium, in addition to other poppy products. The Benares ball opium has about 1 1 oz. less of the external covering than the Patna sort. Forty of these balls are packed in each chest. The Excise opium not having a covering of poppy petals lacks the aroma of Provision opium. Malwa opium is produced in a large number of states in the Central India and Rajputana Agencies, chiefly Gwalior, Indore and Bhopal, in the former, and Mewar in the latter. It is also produced in the native state of Baroda, and in the small British territory of Ajmer Merwara. The cultivation cf Malwa opium is free and extremely profitable, the crop realizing usually from three to seven times the value of wheat or other cereals, and in excep- tionally advantageous situations, from twelve to twenty times as much. On its entering British territory a heavy duty is imposed on Malwa opium, so as to raise its price to an equality with the government article. It is shipped from Bombay to northern China, where nearly the whole of the exported Malwa opium is consumed. The poppy is grown for opium in the Punjab to a limited extent, but it has been decided to entirely abolish the cultivation there within a short time. In Nepal, Bashahr and Rampur, and at Doda Kashtwar in the Jammu territory, opium is produced and exported to Yarkand, Khotan and Aksu. The cultivation of the poppy is also carried on in Afghanistan, Kashmir, Nepal and the Shan states of Burma, but the areas and production are not known.

A small amount of opium alkaloids only is manufactured in India. The surplus above that issued to government medical institutions in India is sold in London. The amount manufactured in 1906- 1907 was 346 lb of morphine hydrochlorate, 12 lb of the acetate and 61 lb of codeia.

The land intended for poppy culture is usually selected near villages, in order that it may be more easily manured and irrigated. On a rich soil a crop of maize or vegetables is grown during the rainy season, and after its removal in September the ground is prepared for the poppy-culture. Under less favourable circum- stances the land is prepared from July till October by ploughing, weeding and manuring. The seed is sown between the 1st and

15th of November, and germinates in ten or fifteen days, The fields are divided for purposes of irrigation into beds about 10 ft. square, which usually are irrigated twice between November and February, but if the season be cold, with hardly any rain, the operation is repeated five or six times. When the seedlings are 2 or 3 in. high they are thinned out and weeded. The plants during growth are liable to injury by severe frost, excessive rain, insects, fungi and the growth of a root-parasite (Orobanche indica). The poppy blossoms about the middle of February, and the petals when about to fall are collected for the purpose of making ” leaves ” for the spherical coverings of the balls of opium. These are made by heat- ing a circular-ridged earthen plate over a slow fire, and spreading the petals, a few at a time, over its surface. As the juice exudes, more petals are pressed on to them with a cloth until a layer of sufficient thickness is obtained. The leaves are forwarded to the opium-factories, where they are sorted into three classes, according to size and colour, the smaller and dark-coloured being reserved for the inside of the shells of the opium-balls, and the larger and least coloured for the outside. These are valued respectively at 10 to 7 and 5 rupees per maund of 82f lb. The collection of opium commences in Behar about 25th February, and continues to about 25th March, but in Malwa is performed in March and April. The capsules are scarified vertically (fig. 2, b) in most districts (although in some the incisions are made horizontally, as in Asia Minor), the ” nushtur ” or cutting instrument being drawn twice upwards for each incision, and repeated two to six times at intervals of two or three days. The nushtur (fig. 2, c) consists of three to five flattened

Fig. 2. — Opium Poppy Capsules, &c; a, capsule showing mode of

incision practised in Turkey; b, capsule as incised in India; c, nushtur, or instrument used in India for making the incisions. Drawn from specimens in the Museum of the Pharmaceutical Society of Great Britain.

blades forked at the larger end, and separated about one-sixteenth of an inch from each other by winding cotton thread between them, the whole being also bound together by thread, and the protrusion of the points being restricted to one-twelfth of an inch, by which the depth of the incision is limited. The operation is usually performed about three or four o'clock in the afternoon, and the opium collected the next morning. In Bengal a small sheet-iron scoop or " seetoah " is used for scraping off the dried juice, and, as it becomes filled, the opium is emptied into an earthen pot carried for the purpose. In Malwa a flat scraper is employed, a small piece of cotton soaked in linseed oil being attached to the upper part of the blade, and used for smearing the thumb and edge of the scraper to prevent adhesion of the juice; sometimes water is used instead of oil, but both practices injure the quality of the product. Sometimes the opium is in a fluid state by reason of dew, and in some places it is rendered still more so by the practice adopted by collectors of washing their scrapers, and adding the washings to the morning's collection. The juice, when brought home, is consequently a wet granular mass of pinkish colour, from which a dark fluid drains to the bottom of the vessel. In order to get rid of this fluid, called " pasewa " or " pusse- wah," the opium is placed in a shallow earthen vessel tilted on one side, and the pussewah drained off. The residual mass is then exposed to the air in the shade, and regularly turned over every few days, until it has reached the proper consistence, which takes place in about three or four weeks. The drug is then taken to the govern- ment factory to be sold. It is turned out of the pots into wide tin vessels or " tagars," in which it is weighed in quantities not ex- ceeding 21 lb. It is then examined by a native expert (purkhea) as to impurities, colour, fracture, aroma and consistence. To determine the amount of moisture, which should not exceed 30%, a weighed sample is evaporated and dried in a plate on a metallic surface heated by steam. Adulterations such as mud, sand, powdered charcoal, soot, cow-dung, powdered poppy petals and powdered seeds of various kinds are easily detected by breaking up the drug in cold water. Flour, potato-flour, ghee and ghoor (crude date- sugar) are revealed by their odour and the consistence they impart.

Various other adulterants are sometimes used, such as the inspissated juice of the prickly pear, extracts from tobacco, stramonium and hemp, pulp of the tamarind and bael fruit, mahwah flowers and gums

of different kinds. The price paid to the cultivator is regulated chiefly by the amount of water contained in the drug. When received into the government stores the opium is kept in large wooden boxes holdihg about 50 maunds and occasionally stirred up, if only a little below the standard. If containing much water it is placed in shallow wooden drawers and constantly turned over. During the process it deepens in colour. From the store about 250 maunds are taken daily to be manufactured into cakes.

Various portions, each weighing 10 seers (of 2&lb),are selected by test assay so as to ensure the mass being of standard consist- ence (70% of the pure dry drug and 30% of water), and are thrown into shallow drawers and kneaded together. The mass is then packed into boxes all of one size, and a specimen of each again assayed, the mean of the whole being taken as the average. Before evening these boxes are emptied into wooden vats 20 ft. long, 3I ft. wide and i| ft. deep, and the opium further kneaded and mixed by men wading through it from end to end until it appears to be of a uniform consistence. Next morning the manufacture of the opium into balls commences. The workman sits on a wooden stand, with a brass cup before him, which he lines with the leaves of poppy petals before-mentioned until the thickness of half an inch is reached, a few being allowed to hang over the cup; the leaves are agglutin- ated by means of ” lewa,” a pasty fluid which consists of a mixture of inferior opium, 8 % of ” pussewah ” and the ” dhoe ” or washings of the vessels that have contained opium, and the whole is made of such consistence that 100 grains evaporated to dryness over a water-bath leave 53 grains of solid residue. All the ingredients for the opium-ball are furnished to the workmen by measure. When the inside of the brass cup is ready a ball of opium previously weighed is placed on the leafy case in it, and the upper half of it covered with leaves in the same way that the casing for the lower half was made, the overhanging leaves of the lower half being pressed upwards and the sphere completed by one large leaf which is placed over the upper half. The ball, which resembles a Dutch cheese in size and shape, is now rolled in ” poppy trash ” made from the coarsely- powdered leaves, capsules and stalks of the poppy plant, and is placed in an earthen cup of the same size as the brass one; the cups are then placed in dishes and the opium exposed to the sun to dry for three days, being constantly turned and examined. If it becomes distended the ball is pierced to liberate the gas and again lightly closed. On the third evening the cups are placed in open frames which allow free circulation of the air. This operation is usually completed by the end of July. The balls thus made consist on the average of : —

Standard opium 1 seer 7-50 chittacks.

Lewa o „ 3-75

Leaves (poppy petals) . . . o „ 5-43 Poppy trash o „ 0-50 „

2 seers 1-18 chittacks.

The average number of cakes that can be made daily by one man is about 70, although 90 to 100 are sometimes turned out by clever workmen. The cakes are liable to become mildewed, and require constant turning and occasional rubbing in dry ” poppy trash ” to remove the mildew, and strengthening in weak places with fresh poppy leaves. By October the cakes are dry and fairly solid, and are then packed in chests, which are divided into two tiers of twenty square compartments for the reception of as many cakes, which are steadied by a packing of loose poppy trash. 1 Each case con- tains about 120 catties (about 160 lb). The chests need to be kept in a dry warehouse for a length of time, but ultimately the opium ceases to lose moisture to the shell, and the latter becomes extremely solid.

The care bestowed on the selection and preparation of the drug in the Bengal opium-factories is such that the merchants who purchase it rarely require to examine it, although permission is given to open at each sale any number of chests or cakes that they may desire.

In Malwa the opium is manufactured by private enterprise, the

?overnment levying an export duty of 600 rupees (£60) per chest, t isnot made into balls but into rectangular or rounded masses, and is not cased in poppy petals. It contains as much as 95 % of dry opium, but is of much less uniform quality than the Bengal drug, and, having no guarantee as to purity, is not considered so valuable. The cultivation in Malwa does not differ in any important particular from that in Bengal. The opium is collected in March and April, and the crude drug or ” chick ” is thrown into an earthen vessel and covered with linseed oil to prevent evaporation. In this state it is sold to itinerant dealers. It is afterwards tied up in quantities of 25 lb and 50 ft in double bags of sheeting, which are suspended to a ceiling out of the light and draught to allow the excess of oil to drain off. This takes place in _ seven to ten days, but the bags are left for four to six weeks until the oil remaining on the opium has become oxidized and hardened. In June and July, when the rains begin, the bags are taken down and emptied

1 This is purchased from the ryots at 12 annas per maund.

into shallow vats 10 to 15 ft. across, and 6 to 8 in. deep, in which the opium is kneaded until uniform in colour and consistence and tough enough to be formed into cakes of 8 or 10 oz. in weight. These are thrown into a basket containing chaff made from the capsules. They are then rolled in broken leaves and stalks of the poppy and left, with occasional turning, for a week or so, when they become hard enough to bear packfng. In October and November they are weighed and sent to market, packed in chests containing as nearly as possible I picul = l33ilb, the petals and leaves of the poppy being used as packing materials. The production is said to amount to about 20,000 chests annually.

The amount of opium revenue collected in India Was £10,480,051 in 1881, but in 1 907-1908 was only £5,244,986. It is a remarkable fact that the only Indian opium ever seen in England is an occasional sample of the Malwa sort, whilst the government monopoly opium is quite unknown ; indeed, the whole of the opium used in medicine in Europe and the United States is obtained from Turkey. This is in some measure due to the fact that Indian opium contains less morphia. It has recently been shown, however, that opium grown •n the hilly districts of the Himalayas yields 50% more morphia than that of the plains, and that the deficiency of morphia in the Indian drug is due, in some measure, to the long exposure to the air in a semi-liquid state which it undergoes. In view, therefore, of the probable decline in the Chinese demand, the cultivation of the drug for the European market in the hilly districts of India, and its preparation after the mode adopted in Turkey, viz., by drying the concrete juice as quickly as possible, might be worthy of the con- sideration of the British government.

Persia. — The variety of poppy grown in Persia appears to be P: somniferum, var. album, having roundish ovate capsules. It is most largely produced in the districts of Ispahan, Shiraz, Yezd and Khonsar, and to a less extent in those of Khorasan, Kermanshah and Fars. The Yezd opium is considered better than that of Ispahan, but the strongest or Theriak-e-Arabistani is produced in the neighbourhood of Dizful and Shuster, east of the river Tigris. Good opium is also produced about Sari and Balfarush in the pro- vince of Mazanderan. The capsules are incised vertically, or in some districts vertical cuts with diagonal branches are made. The crop is collected in May and June and reaches the ports for ex- portation between August and

January. Although the cultivation of opium in Persia was probably carried on at an earlier date than in India, Persian opium was almost unknown in England until about the year 1870, except in the form of the inferior quality known as ” Trebizond,” which usually contains only 0-2 to 3 % of morphia. This opium is in the form of cylindrical sticks about 6 in. long and half an inch in diameter, wrapped in white waxed or red paper. Since 1870 Persian opium has been largely exported from Bushire and Bandar- Abbas in the Persian Gulf to London, the Straits Settlements and China. At that date the annual yield is said not to have exceeded 2600 cases; but, the profits on opium having about that time attracted attention, all available ground was utilized for this to the exclusion of cereals, cotton and other produce. The result was a severe famine in 1871-1872, which was further aggravated by drought and other circumstances. Notwithstanding the lesson thus taught, the cultivation is being extended every year, especially in Ispahan, which abounds in streams and rivers, an advantage in which Yezd is deficient. About Shiraz, Behbehan and Kermanshah it now occupies much of the land, and has consequently affected the price and growth of cereals. The trade — only 300 chests in 1859 — gradually increased until 1877, when the Persian opium was much ‘adulterated with glucose. The heavy losses on this inferior opium and the higher prices obtained for the genuine article led to a great improvement in its preparation, and in 1907 the production had increased to 10,000 piculs. About half of the total produce finds its way to the Chinese market, chiefly by sea to Hongkong and the Federated Malay States, although some is carried overland through Bokhara, Khokand and Kashgar; a small quantity is exported by way of Trebizond and Samsun to Constantinople, and about 2000 piculs to Great Britain. The produce of Ispahan and Fars is carried for exportation to Bushire, and that of Khorasan and Kirman and Yezd partly to Bushire and partly to Bandar-Abbas. The Shuster opium is sent partly via Bushire to Muscat for transhipment to Zanzibar, and part is believed to be smuggled into India by way of Baluchistan and Mekran. Smaller quantities grown in Teheran, Tabriz and Kermanshah find their way to Smyrna, where it is said to be mixed with the local drug for the European market, the same practice being carried on at Constantinople with the Persian opium that arrives there from Samsun and Trebizond. For the Chinese market the opium is usually packed in chests containing ioj shahmans (of 13! lb), so that on arrival it may weigh 1 Chinese picul (= 133I lb), 5 to 10% being allowed for loss by drying. At Ispahan, Shiraz and Yezd the drug, after being dried in the sun, is mixed with oil in the proportion of 6 or 7 lb to 141 lb of opium, with the object, it is said, of suiting the taste of the Chinese — triat intended for the London market being now always

free from oil.

Persian opium, as met with in the London market, occurs in several forms, the most common being that of brick-shaped pieces. These occur wrapped separately in paper, and weighing 1 lb each; of these 140-160 are packed in a case. Ispahan opium also occurs

in the form of parallelopipeds weighing about 16-20 oz. ; sometimes flat circular pieces weighing about 20 oz. are met with. The opium is usually of much firmer and smoother consistence than that of Turkey, of a chocolate-brown colour and cheesy appearance, the pieces bearing evidence of having been beaten into a uniform mass previously to being made into lumps, probably with the addition of Sarcocoll, as it is always harder when dry than Turkey opium. The odour differs but slightly, except in oily specimens, from that of Turkey opium. Great care is now taken to prevent adulteration, and consequently Persian opium can be obtained nearly as rich in morphia as the Turkish drug — on the average from 9-12 . The greater proportion of the Persian opium imported into London is again exported, a comparatively small quantity being used, chiefly for the manufacture of codeine when Turkey opium is dear, and a little in veterinary practice. According to Dr Reveil, Persian opium usually contains 75 to 84 of matter soluble in water, and some samples contain from 13 to 30% of glucose, probably due to an extract or syrup of raisins added to the paste in the pots in which it is collected, and to which the shining fracture of hard Persian opium is attributed.

Europe. — Experiments made in England, France, Italy, Switzer- land, Greece, Spain, Germany, and even in Sweden, prove that opium as rich in morphia as that of Eastern countries can be pro- duced in Europe. In 1830 Young, a surgeon at Edinburgh, suc- ceeded in obtaining 56 lb of opium from an acre of poppies, and sold it at 36s. per lb. In France the cultivation has been carried on since 1844 at Clermont-Ferrand by Aubergier. The juice, of which a workman is able to collect about 9-64 troy oz. in a day, is evaporated by artificial heat immediately after collection. The juice yields about one-fourth of its weight of opium, and the percent- age of morphia varies according to the variety of poppy used, the purple one giving the best results. By mixing assayed samples he is able to produce an opium containing uniformly 10 % of morphia. It is made up in cakes of 50 grammes, but is not produced in sufficient quantity to become an article of wholesale commerce. Some specimens of French opium have been found by Guibourt to yield 22-8% of morphia, being the highest percentage observed as yet in any opium. Experiments made in Germany by Karsten, Jobst and Vulpius have shown that it is possible

to obtain in that country opium of excellent quality, containing from 8 to 13% of morphia. It was found that the method yielding the best results was to make incisions in the poppy-heads soon after sunrise, to collect the juice with the finger immediately after incision and evaporate it as speedily as possible, the colour of the opium being lighter and the percentage of morphia greater than when the juice was allowed to dry on the plant. Cutting through the poppy-head caused the shrivelling up of the young fruit, but the heads which had been carefully incised yielded move seed than those which had not been cut at all. Newly-manured soil was found to act prejudicially on the poppy. The giant variety of poppy yielded most morphia.

The difficulty of obtaining the requisite amount of cheap labour at the exact time it is needed and the uncertainty of the weather render the cultivation of opium too much a matter of speculation for it ever to become a regular crop in most European countries.

North America. — In 1865 the cultivation of opium was attempted in Virginia by A. Robertson, and a product was obtained which yielded 4% of morphia. In 1867 H. Black grew opium in Tennessee which contained 10% of morphia. Opium produced in California by H. Flint in 1873 yielded 7 j % of morphia, equal to 10% in perfectly-dried opium. The expense of cultivation exceeded the returns obtained by its sale. As in Europe, therefore, the high price of labour militates against its production on a large scale.

(E. M. H.)

Chemistry of the Opium Alkaloids. — The chemical investigation of opium dates from 1803 when C. Derosne isolated a crystalline compound which he named ” opium salt.” In 1805 F. W. Sertiirner, a German apothecary, independently obtained this same substance, naming it ” morphium,” and recognized its basic nature; he also isolated an acid, meconic acid. A second paper, published in 181 7, was followed in the same year by the identification of a new base, narcoline, by P. J. Robiquet. Thebaine, another alkaloid, was discovered by Thiboumery in 1835; whilst, in 1848, Merck isolated papaverine from com- mercial narcotine. Subsequent investigations have revealed some twenty or more alkaloids, the more important of which are given in the following table (from A. Pictet, Vegetable Alkaloids) ■ — –

Morphine .

• 9-o%

Narcotine .

. 5-o%

Papaverine .

. o-8%

Thebaine .

. 0-4%

Codeine

• 0-3%

Narceine

. 0-2%

Cryptopine .

. 0-08%

Pseudomorphine

. 0-02%

Laudanine

. . 0-01%

Lanthopine

. 0-006%

Protopine .

. . 0-003%

Codamine

. 0-002%

Iritopine .

. . 0-0015%

Laudanosine .

. 0-0008 %

Meconine .

. • 0-3%

OPIUM

135

I. Papaverine

Opium also contains a gum, pectin, a wax, sugar and similar substances, in addition to meconic and lactic acids.

The alkaloids fall into two chemical groups; (1) deiivatives of isoquinoline, including papaverine, narcotine, gnoscopine (racemic narcotine), narceine, laudanosine, laudanine, cotarnine, hydrocotamine (the last two do not occur in opium), and (2) derivatives of phenanthrene, including morphine, codeine, thebaine. The constitutions of the first series have been deter- mined; of the second they are still uncertain.

Papaverine, C20H21NO4, was investigated by G. Goldschmiedt {Monats., 1 883-1 889), who determined its constitution (formula I., below) by a study of its oxidation products, showing that papaver- aldine, which it gives with potassium permanganate, is a tetra- methoxybenzoylisoquinoline. Its synthesis, and also that of laudanosine, C21H27NO4, which is N-methyltetrahydropapaverine , was effected in 1909 by F. L. Pyman {Jour. Chem. Soc, 95, p. 1610) and by A. Pictet and Mile M. Finkelstein (Compt. rend., 1909, 148, p. 925). Laudanine, C20H25NO4, is very similar to laudanosine, differing in having three methoxy groups and one hydroxy instead of four methoxy.

Narcotine, C22H23NO7, has been principally investigated by A. Matthiessen and G. C. Foster, and by W. Roser {Ann., 1888, 249, p. 156; 1889, 254, p. 334.) By hydrolysis it yields opianic acid, G0H10O5, and hydrocotamine, C12H15NO3; reduction gives meco- nine, C10H10O41 and hydrocotamine ; whilst oxidation gives opianic acid and cotarnine, G2H15NO4. Narcotine was shown to be methoxy- hydrastine (II.) (hydrastine, the alkaloid of Golden seal, H ydrastis canadensis, was solved by E. Schmidt, M. Freund, and P. Fritsch) and cotarnine to be III.; the latter has been synthesized by A. H. Salway

{Jour. Chem. Soc, 1910, 97, p. 1208). Narceine, Cnrˆ NO,,, obtained by the action of potash on the methyl iodide of narcotine, is probably IV. (see Pyman, loc. cit. pp. 1266, 1738; M. Freund and P. Oppenheim, Ber., 1909, 42, p. 1084).

The proprietary drug ” stypticin ” is cotarnine hydrochloride, and ” styptol ” cotarnine phthalate; ” antispasmin ” is a sodium narceine combined with sodium salicylate, and ” narcyl ” narceine ethyl hydrochloride.

OMe CH 2 OMe

MeO/NA AOMe |ˆ| /S |CH 2 MeO A

MeoUi N CH U CH ° <0 UjNMeCVcU

Ln2 — MeO CH CH ‘

ILNarcotine CH 2 , AAcH 2

“°K/\ NHMe – VV

MeO CH0 MeO CHi— O

I II. Cotarnine IV.Narceine

The chemistry of morphine, codeine and thebaine is exceedingly complicated, and the literature enormous. That these alkaloids are closely related may be suspected from their empirical formulae, viz.morphine = Ci7Hi 9 N0 3 , codeine = Ci 8 H2iN03, thebaine = C9H21NO3. As a matter of fact, Grimaux, in 1881, showed codeine to be a methylmorphine, and in 1903 Ach and L. Knorr {Ber., 36, p. 3067) obtained identical substances, viz. thebenine and morpho-thebaine, from both codeine and thebaine, thereby establishing their connexion. Our knowledge of the constitution of these alkaloids largely depends on the researches of M. Freund, E. Vongerichten, L. Knorr and R. Pschorr. The presence of the phenanthrene nucleus and the chain system CHsN-C-G- follows from the fact that these alkaloids, by appropriate treatment, yield a substituted phenanthrene and also dimethylaminoethanol (CH 3) 2 N-CH 2 -CH20H. Formulae have been proposed by Pschorr and Knorr explaining this and other decompositions (in Pschorr’s formula the morphine ring system is a fusion of a phenanthrene and pyridine nucleus) ; another formula, containing a fusion of a phenanthrene with a pyrrol ring, was proposed by Bucherer in 1907. The problem is discussed by Pschorr and Einbeck {Ber., 1907, 40, p. 1980), and by Knorr and Horlein

{ibid. p. 2042) ; see also Ann. Reps. Chem. Soc.

Morphine, or morphia, crystallizes in prisms with one molecule of water; it is soluble in 1000 parts of cold water and in 160 of boiling water, and may be crystallized from alcohol; it is almost insoluble in ether and chloroform. It has an alkaline reaction and behaves as a tertiary, monacid base; its salts are soluble in water and alcohol. The official hydrochloride; CnHisNOvHCl + SIˆO, forms delicate needles. Distilled with zinc dust morphine yields phenanthrene, pyridine and quinoline; dehydration gives, under certain conditions, apomorphine, C17H17NO2, a white amorphous substance, readily soluble in alcohol, either and chloroform. The drug ” heroin ” is a diacetylmorphine hydrochloride. Codeine, or codeia, crystallizes in orthorhombic prisms with one molecule of water: it is readily soluble in alcohol, ether and chloroform. Thebaine forms silvery plates, melting at 193 . (C. E.*)

Medicine. — Of the opium alkaloids only morphine and codeine are used to any extent in medicine. Thebaine is not so used, but is an important and sometimes very dangerous constituent of the various opium preparations, which are still largely

ch, < >

ch 2 <8|

CH ;

ˆCH;

OMe

MeOA

NMea H0 2 ClJ

employed, despite the complexity and inconstant composition of the drug. Of the other alkaloids narceine is hypnotic, like morphine and codeine, whilst thebaine, papaverine and narco- tine have an action which resembles that of strychnine, and is, generally speaking, undesirable or dangerous if at all well marked. A drug of so complex a composition as opium is necessarily incompatible with a large number of substances. Tannic acid, for instance, precipitates codeine as a tannate, salts of many of the heavy metals form precipitates of meconates and sulphates, whilst the various alkalis, alkaline carbonates and ammonia precipitate the important alkaloids.

The pharmacology of opium differs from that of morphine (g.».) in a few particulars. The chief difference between the action of opium and morphine is due to the presence in the former of the- baine, which readily affects the more irritable spinal cord of very young_ children. In infants especially opium acts markedly upon the spinal cord, and, just as strychnine is dangerous when given to young children, so opium, because of the strychnine-like alkaloid it contains, should never be administered, under any circumstances or in any dose, to children under one year of age.

When given by the mouth, opium has a somewhat different action from that of morphine. It often relieves hunger, by arresting the secretion of gastric juice and the movements of the stomach and bowel, and it frequently upsets digestion from the same cause. Often it relieves vomiting, though in a few persons it may cause vomiting, but in far less degree than apomorphine, which is a powerful emetic. Opium has a more marked diaphoretic action than morphine, and is much less certain as a hypnotic and analgesic.

There are a few therapeutic indications for the use of opium rather than morphine, but they are far less important than those which make the opposite demand. In some abdominal conditions, for instance, opium is still preferred by the majority of practitioners, though certainly not in gastric cases, where morphine gives the relief for which opium often increases the need, owing to the irritant action of some of its constituents. Opium is often preferred to morphine in cases of diabetes, where prolonged administration is required. In such cases the soporific action is not that which is sought, and so opium is preferable. A Dover's powder, also, is hardly to be surpassed in the early stages of a bad cold in the head or bronchitis. Ten grains taken at bedtime will often give sleep, cause free diaphoresis and quieten the entire nervous system in such cases. The tincture often known as " paregoric " is also largely used in bronchial conditions, and morphine shows no sign of dis- placing it in favour. Opium rather than morphine is also usually employed to relieve the pain of haemorrhoids or fissure of the rectum. This practice is, however, obsolescent.

The alkaloid thebaine may here be referred to, as it is not used separately in medicine. Crum Brown and Fraser of Edinburgh showed that, whilst thebaine acts like strychnine, methyl and ethyl thebaine act like curara, paralysing the terminals of motor nerves. At present we say of such a substance as thebaine, " it acts on the anterior cornua of grey matter in the spinal cord," but why on them and not elsewhere we do not know.

Toxicology. — Under this heading must be considered acute poisoning by opium, and the chronic poisoning seen in those who eat or smoke the drug. Chronic opium poisoning by the taking of laudanum — as in the familiar case of De Quincey — need not be considered here, as the hypodermic injection of morphine has almost entirely supplanted it.

The acute poisoning presents a series of symptoms which are only with difficulty to be distinguished from those produced by alcohol, by cerebral haemorrhage and by several other morbid conditions. The differential diagnosis is of the highest importance, but very frequently time alone will furnish a sufficient criterion. The patient who has swallowed a toxic or lethal dose of laudanum, for instance, usually passes at once into the narcotic state, without any prior excitement. Intense drowsiness yields to sleep and coma which ends in death from failure of the respiration. This last is the cardinal fact in determining treatment. The comatose patient has a cold and clammy skin, livid lips and ear-tips — a grave sign — and ” pin-point pupils.” The heart s action is feeble, the pulse being small, irregular and often abnormally slow. The action on the circulation is largely secondary, however, to the all-important action of opium on the respiratory centre in the medulla oblongata. The centre is directly poisoned by the circulation through it of opium-containing blood, and the patient’s breathing becomes progressively slower, shallower and more irregular until finally it ceases altogether.

In treating acute opium poisoning the first proceeding is to empty the stomach. For this purpose the best emetic is apomorphine, which may be injected subcutaneously in a dose of about one-tenth of a grain. But apomorphine is not always to be obtained, and even if it be administered it may fail, since the gastric wall is often paralysed in opium poisoning, so that no emetic can act. It is therefore better to wash out the stomach, and this should be done, if possible, with a solution containing about ten grains of salt to each ounce of water. This must be repeated at intervals of about

half an hour, since some of the opium is excreted into the stomach after its absorption into the blood. If apomorphine is obtainable, both of these measures may be employed. Potassium permanganate decomposes morphine by oxidation, the action being facilitated by the addition of a small quantity of mineral acid to the solution. The physiological as well as the chemical antidotes must be em- ployed.

The chief of these are coffee or caffeine and atropine. A pint of hot strong coffee may be introduced into the rectum, and caffeine in large doses — ten or twenty grains of the carbonate- may be given by the mouth. A twentieth, even a tenth of a grain of atropine sulphate should be injected subcutaneously, the drug being a direct stimulant of the respiratory centre. Every means must be taken to keep the patient awake. He must be walked about, have smelling salts constantly applied to the nose, or be stimulated by the faradic battery. But the final resort in cases of opium poisoning is artificial respiration, which should be persevered with as long as the heart continues to beat. It has, indeed, been asserted that, if relays of trained assistants are at hand, no one need die of opium poisoning, even if artificial respiration has to be continued for hours or days. (X.)

Opium-eating. — Opium, like many other poisons, produces after a time a less effect if frequently administered as a medicine, so that the dose has to be constantly increased to produce the same result on those who take it habitually. When it is used to relieve pain or diarrhoea, if the dose be not taken at the usual time the symptoms of the disease recur with such violence that the remedy is speedily resorted to as the only means of relief, and thus the habit is exceedingly difficult to break off. Opium- eating is chiefly practised in Asia Minor, Persia and India. Opinions differ widely as to the injurious effect of the habit; the weight of evidence appears, however, to indicate that it is much more deleterious than opium-smoking.

The following statistics collected by Vincent Richards regarding Balasor in Orissa throw some light on the influence of this practice on the health. He estimates that 1 in every 12 or 14 of the population uses the drug, and that the habit is increasing. Of the 613 opium-eaters examined by him he found that the average age at which the habit was commenced was 20 to 26 years for men and 24 to 30 years for women. Of this number 143 had taken the drug for from 10 to 20 years, 62 for from 20 to 30 years and 38 for more than 30 years. The majority took their opium twice daily, morning and evening, the quantity taken varying from 2 to 46 grains daily, large doses being the exception, and the average 5 to 7 grains daily. The dose, when large, had been increased from the beginning; when small, there had usually been no increase at all. The causes which first led to the increase of the drug were disease, example and a belief in its aphrodisiac powers. The diseases for which it was chiefly taken were malarial fever, dysentery, diarrhoea, spitting of blood, rheumatism and elephantiasis. A number began to take it in the famine year, 1866, as it enabled them to exist on less food and mitigated their sufferings; others used it to enable them to undergo fatigue and to make long journeys.

Richards concludes that the excessive use of opium by the agricultural classes, who are the chief consumers in Orissa, is very rare indeed. Its moderate use may be and is indulged in for years without producing any decided or appreciable ill effect except weakening the reproductive powers, the average number of the children of opium-eaters being I • 1 1 after 11 years of married life. It compares favourably as regards crime and insanity with intoxicating drinks, the inhabitants of Balasor being a particularly law-abiding race, and the insane forming only 0-0069 % of the population. Dr W. Dymock of Bombay, speaking of western India, concurs in Richards's opinion regarding the moderate use of the drug. He believes that excessive indulgence in it is confined to a comparatively small number of the wealthier classes of the community. Dr Moore's experience of Rajputana strongly supports the same views. It seems probable that violent physical exercise may counteract in great measure the deleterious, effect of opium and prevent it from retarding the respiration, and that in such cases the beneficial effects are obtained without the noxious results which would accrue from its use to those engaged in sedentary pursuits. There is no doubt that the spread of the practice is connected with the ban imposed in Mohammedan countries on the use of alcoholic beverages, and to some extent with the long religious fasts of the Buddhists, Hindus and Moslems, in which opium is used to allay hunger.

To break off the habit of opium-eating is exceedingly difficult, and can be effected only by actual external restraint, or the strongest effort of a powerful will, especially if the dose has been gradually increased.

Opium-smoking. — This is chiefly practised by the inhabitants of China and the islands of the Indian Archipelago, and _ in countries where Chinese are largely employed. Opium-smoking began in China in the 17th century. Foreign opium was first imported by the Portuguese (early 18th century). In 1906 it was

estimated that 13,455,699 of Chinese smoked opium, or 27% of adult males; but during 1908-1910 the consumption of opium is believed to have diminished by about one-third.

For smoking the Chinese use an extract of opium known as prepared opium or chandoo, and a cheaper preparation is made from 60% used opium known as " opium dross " and 40% native opium. This latter is chiefly used by the poorer classes.

The process of preparation is thus described by Hugh M'Callum, government analyst at Hong-Kong: —

” The opium is removed from its covering of leaves, &c, moistened with a little water, and allowed to stand for about fourteen hours; it is then divided into pans, 2j balls of opium and about 10 pints of water going to each pan ; it is now boiled and stirred occasionally until a uniform mixture having the consistence of a thin paste is obtained. This operation takes from five to six hours. The paste is at once transferred to a larger pan and cold water added to about 3 gallons, covered and allowed to stand for from fourteen to fifteen hours. A bunch of ‘ tang sani ‘ (lamp-wick, the pith of Eriocaulon or Scirpus) is then inserted well into the mass, and the pan slightly canted, when a rich, clear, brown fluid is thus drawn off, and filtered through ‘ chi mui ‘ (paper made from bamboo fibre). The residue is removed to a calico filter and thoroughly washed with boiling water, the wash water being reboiled and used time after time. The last washing is done with pure water; these washings are used in the next day’s boiling.

” The residues on the calico filters are transferred to a large one of the same material and well pressed. This insoluble residue, called ‘ nai chai ‘ (opium dirt), is the perquisite of the head boiling coolie, who finds a ready market for it in Canton, where it is used for adulterating, or rather in manufacturing, the moist inferior kinds of prepared opium. The filtrate or opium solution is concentrated by evaporation at the boiling point, with occasional stirring until of a proper consistence, the time required being from three to four hours; it is then removed from the fire and stirred with great vigour till cold, the cooling being accelerated by coolies with large fans. When quite cold it is taken to the hong and kept there for some months before it is considered in prime condition for smoking. As thus prepared it has the consistence of a thin treacly extract, and is called boiled or prepared opium. In this state it is largely exported from China to America, Australia, &c, being carefully sealed up in small pots having the name of the maker {i.e. hong) on each.

. “The Chinese recognize the following grades of opium: (1) ‘raw opium,’ as imported from India; (2) ‘prepared opium,’ opium made as above; (3) ‘ opium dross,’ the scrapings from the opium pipe; this is reboiled and manufactured as a second-class prepared opium; a Chinese doctor stated lately at a coroner’s inquest on a case of poisoning that it was more poisonous than the ordinary prepared opium; (4) ‘ nai chai ‘ (opium dirt), the insoluble residue left on exhausting the raw opium thoroughly with water. The opium is sent every day from the hong (i.e. shop or firm) to the boiling-house, the previous day’s boiling being then returned to the hong. The average quantity boiled each day is from six to eight chests of Patna opium,

this being the only kind used.”

By this process of preparation a considerable portion of the narcotine, caoutchouc, resin, oil or fatty and insoluble matters are removed, and the prolonged boiling, evaporating and baking over a naked fire tend to lessen the amount of alkaloids present in the extract. The only alkaloids likely to remain in the prepared opium, and capable of producing well-marked physiological results, are morphine, codeine and narceine. Morphine, in the pure state, can be sublimed, but codeine and narceine are said not to give a sub- limate. Even if sublimed in smoking opium, morphine would, in M’Callum’s opinion, probably be deposited in the pipe before it reached the mouth of the smoker. The bitter taste of morphine is not noticeable when smoking opium, and it is therefore possible that the pleasure derived from smoking the drug is due to some product formed during combustion. This supposition is rendered probable by the fact that the opiums most prized by smokers are not those containing most morphine, and that the quality is judged by the amount of soluble matter in the opium, by its tenacity or ” touch,” and by peculiarities of aroma — the Indian opium, especi- ally the Patna kind, bearing much the same relation to the Chinese and Persian drug that champagne does to vin ordinaire. Opium- smoking is thus described by Theo. Sampson of Canton : —

” The smoker, lying on his side, with his face towards the tray and his head resting on a high hard pillow (sometimes made of earthenware, but more frequently of bamboo covered with leather), takes the pipe in his hand; with the other hand he takes a dipper and puts the sharp end of it into the opium, which is of a treacly consistency. Twisting it round and round he gets a large drop of the fluid to adhere to the dipper; still twisting; it round to prevent it falling he brings the drop over the flame of the lamp, and twirling it round and round he roasts it ; all this is done with acquired dexterity. The opium must not be burnt or made too dry, but roasted gently till it looks like burnt worsted; every now and then he takes it, away from the flame and rolls it (still on the end of the

dipper) on the flat surface of the bowl. When it is roasted and rolled to his satisfaction he gently heats the centre of the bowl, where there is a small orifice ; then he quickly thrusts the end of the dipper into the orifice, twirls it round smartly and withdraws it; if this is properly done, the opium (now about the size of a grain of hemp-seed or a little larger) is left adhering to the bowl immediately over the orifice. It is

now ready for smoking.

” The smoker assumes a comfortable attitude (lying down of course) at a proper distance from the lamp. He now. puts the stem to his lips, and holds the bowl over the lamp. The heat causes the opium to frizzle, and the smoker takes three or four long inhalations, all the time using the dipper to bring every particle of the opium to the orifice as it burns away, but not taking his lips from the end of the stem, or the opium pellet from the lamp till all is finished. Then he uses the flattened end of the dipper to scrape away any little residue there may be left around the orifice, and proceeds to preoare another pipe. The preparations occupy from five to ten minutes, and the actual smoking about thirty seconds. The smoke is swallowed, and is exhaled through both the mouth and the nose.”

Fig. 3. — Opium-smoking Apparatus, a, pipe; b, dipper; c, lamp.

So far as can be gathered from the conflicting statements published on the subject, opium-smoking may be regarded much in the same light as the use of alcoholic stimulants. To the great majority of smokers who use it moderately it appears to act as a stimulant, and to enable them to undergo great fatigue and to go for a con- siderable time with little or no food. According to the reports on the subject, when the smoker has plenty of active work it appears to be no more injurious than smoking tobacco. When carried to excess it becomes an inveterate habit; but this happens chiefly in individuals of weak will-power, who would just as easily become the victims of intoxicating drinks, and who are practically moral imbeciles, often addicted also to other forms of depravity. The effect in bad cases is to cause loss of appetite, a leaden pallor of the skin, and a degree of leanness so excessive as to make its victims appear like living skeletons. All inclination for exertion becomes gradually lost, business is neglected, and certain ruin to the smoker Follows. There can be no doubt that the use of the drug is opposed by all thinking Chinese who are not pecuniarily interested in the opium trade or cultivation, for several reasons, among which may be mentioned the drain of bullion from the country, the decrease of population, the liability to famine through the cultivation of opium where cereals should be grown, and the corruption of state officials.

See Pharmaceutical Journ. [1] xi. p. 269, xiv. p. 395; [2] x. p. 434; Impey, Report on Malwa Opium (Bombay, 1848); Report on Trade of Hankow (1869); New Remedies (1876), p. 229; Pharmacographia (1879), p. 42; Journal of the Society of Arts (1882); The Friend of China (1883), &c. Report of the Straits Settlements, Federated Malay

States Opium Commission (1908), App. xxiii. and xxiv. ; Allen, Commercial Organic Analysis, vol. iii. pt. iv. p. 355; Frank Browne, Report on Opium (Hong-Kong, 1908); G. Watt, Dictionary of the Economic Products of India (1892); H. Moissan, Comptes rendus, of the 5th of December 1892, iv. p. 33; Lalande, Archives de medicine navale, t. 1. (1890); International Opium Commission (1909), vol. ii. ” Report of the Delegations “; Squire, Companion to the British Pharmacopeia (1908) (18th edition). (E. M. H.)

OPLADEN, a town of Germany, in the Prussian Rhine Province, 10 m. N.E. from Cologne by the railway to Elberfeld and at the junction of lin;s to Speldorf and Bonn. Pop. (1905) 6338. It has an Evangelical and a Roman Catholic church. It has dyeing works, and manufactures of dynamite, indigo products and railway plant. Before passing to Prussia, Opladen belonged to the duchy of Berg.

OPON, a town of the province of Cebu, Philippine Islands, on the small island of Mactan (area about 45 sq. m.), which is separated from the island of Cebu by a channel only about 1 m. wide. Pop (1903), after the annexation of Cordova and Santa Rosa, 20,166. There are forty-four barrios, or villages, in the town, and three of these had in 1903 more than 1000 inhabitants each. The language is Visayan. Opon is a shipping and commercial suburb of Cebu city, the harbour of which is sheltered by Mactan Island. The town has large groves of coco-nut trees, and its principal industries are the cultivation of Indian corn and maguey and fishing. In the N.E. part of the

town is a monument to Magellan, who discovered the Philippines in March 1521, and was slain here by the natives late in the following month.

OPORTO {i.e. porto, ” the port “), the second city of the kingdom of Portugal, the capital of the district of Oporto and formerly of Entre-Douro-e-Minho; on both banks of the river Douro, about 3 m. from its mouth, in 41° 8′ N. and 8° 37′ W. Pop. (1900) 167,955. In Portuguese the definite article is uncompounded in the name of the city, which in strict accuracy should always be written Porto; the form Oporto has, however, been stereotyped by long usage in English and in some other European languages. The part of the city south of the Douro is known as Villa Nova de Gaia. Oporto is the see of a bishop, in the archiepiscopal province of Braga. It is the true capital of northern Portugal, and the commercial and political rival of Lisbon, in much the same way as Barcelona (q.v.) is the rival of Madrid. Three main railway lines meet here — from Lisbon, from Valenca do Minho on the northern frontier, and from Barca d’Alva on the north-western

frontier. The Valenca line has branches to Guimaraes and Braga, and affords access to Corunna and other cities of north-western Spain; the Barca d'Alva line has a branch to Mirandella and communicates with Madrid via Salamanca. Oporto is built chiefly on the north or right bank of the Douro; its principal suburbs are Bomfim on the E., Monte Pedral and Paranhos on the N., Villar Bicalho, Lordello and Sao Joao da Foz on the W., Ramalde, Villarinha, Matozinhos, Leca da Palmeira and the port of Leixoes on the N.W. The mouth of the river is obstructed by a sandy spit of land which has been enlarged by the deposits of silt constantly washed down by the swift current; on the north side of this bar is a narrow channel varying in depth from 16 ft. to 19 ft. A fort in Sao Joao da Foz protects the entrance, and there is a lighthouse on a rock outside the bar. As large vessels cannot enter the river, a harbour of refuge has been constructed at Leixoes {q.v.}.

The approach to Oporto up the winding and fjord-like estuary is one of singular beauty. On the north the streets rise in terraces up the steep bank, built in many cases of granite over- laid with plaster, so that white is the prevailing colour of the city; on the south are the hamlets of Gaia and Furada, and the red-tiled wine lodges of Villa Nova de Gaia, in which vast quantities of " port " are manufactured and stored. The archi- tecture of the houses and public buildings is often rather Oriental than European in appearance. There are numerous parks and gardens, especially on the outskirts of the city, in which palms, oranges and aloes grow side by side with the flowers and fruits of northern Europe, for the climate is mild and very equable, the mean temperatures for January and July — the coldest and the hottest months — being respectively about 50° and 70°. The Douro is at all seasons crowded with shipping, chiefly small steamers and large sailing vessels. The design of some of the native craft is peculiar — among them may be mentioned the high prowed canoe-like fishing boats, the rascas with their three lateen sails, and the bar cos rabello, flat-bottomed barges with huge rudders, used for the conveyance of wine down stream. Two remarkable iron bridges, the Maria Pia and the Dom Luiz I., span the river. The first was built by Messrs Eiffel & Company of Paris in 1876-1877; it rests on a granite substructure and carries the Lisbon railway line across the Douro ravine at a height of 200 ft. The second, constructed in 1881-1885 by a Belgian firm, has two decks or roadways, one 33 ft., the other 200 ft. above the usual water-level; its arch, one of the largest in Europe, has a span of 560 ft. and is supported by two massive granite towers. The Douro is liable in winter to sudden and violent floods; in 1909-1910 the water rose 40 ft. at Oporto, where it is confined in a deep and narrow bed.

Though parts of the city are modern or have been modernized, the older quarters in the east are extremely picturesque, with their steep and narrow lanes overshadowed by lofty balconied houses. Overcrowding and dirt are common, for the density of population is nearly 13,000 per sq. m., or greater than in any other city of Portugal. Until the early years of the 20th century, when

a proper system of sewerage was installed, the condition of Oporto was most insanitary. Electric lighting and tramways were introduced a little before this, but the completion of the tramway system was long delayed, and in the hilly districts cars drawn by ten mules were not an uncommon sight. Ox-carts are used for the conveyance of heavy goods, and until late in the 19th century sedan-chairs were still occasionally used. A painful feature of the street-life of Oporto is the great number of the diseased and mutilated beggars who frequent the busiest thoroughfares. As a rule, however, the natives of Oporto are strong and of fine physique; they also show fewer sighs of negro descent than the people of Lisbon. Their numbers tend to increase very rapidly; in 1864 the population of Oporto was 86,751, but in 1878 it rose to 105,838, in 1890 to 138,860, and in 1900 to 167,955. Many of the men emigrate to South America, where their industry usually enables them to prosper, and ultimately to return with considerable savings. The local dialect is broader than the Portuguese of the educated classes, from which it differs more in pronunciation than in idiom. The poverty of the people is very great. Out of the 597,935 inhabitants of the district of Oporto (893 sq. m.), 422,320 were returned at the census of 1900 as unable to read or write. Much had been done, however, to remedy this defect, and besides numerous primary schools there are in the city two schools for teachers, a medical academy, polytechnic, art, trade and naval schools, and industrial institute, a commercial athenaeum, a lyceum for secondary education, an ecclesiastical seminary, and a meteorological observatory.

The cathedral, which stands at the highest point of eastern Oporto, on the site of the Visigothic citadel, was originally a Romanesque building of the 12th century; its cloisters are Gothic of the 14th century, but the greater part of the fabric was modernized in the 17th and 18th centuries. The interior of the cloisters is adorned with blue and white tiles, painted to represent scenes from the Song of Solomon. The bishop’s palace is a large and lofty building conspicuously placed

on a high rock ; the interior contains a fine marble staircase. The Romanesque and early Gothic church of Sao Martinho de Cedo Feita is the most interesting ecclesiastical building in Oporto, especially noteworthy being the curiously carved capitals of its pillars. Though the present structure is not older, except in details, than the 1 2th century, the church is said to have been ” hastily built ” {cedo feita, cito facta) by Theodomir, king of the Visigoths, in 559, to receive the relics of St Martin of Tours, which were then on their way hither from France. The Torre dos Clerigos is a granite tower 246 ft. high, built in the middle of the 18th century at the expense of the local clergy {clerigos) ; it stands on a hill and forms a conspicuous landmark for sailors. Nossa Senhora da Lapa is a fine 18th-century church, Corinthian in style; Sao Francisco is a Gothic basilica dating from 1410; Nossa Senhora da Serra do Pilar is a secularized Augustinian convent used as artillery barracks, and marks the spot at which Wellington forced the passage of the Douro in 1809. The exchange {lonja) is another secularized convent, decorated with coloured marbles. Parts of the interior are floored and panelled with polished native-coloured woods from Brazil, which are inlaid in elaborate patterns; there is a very handsome staircase, and the fittings of one large room are an excellent modern copy of Moorish ornamentation.

Other noteworthy public buildings are the museum, library, opera-house, bull-ring, hospital and quarantine station. The crystal palace is a large glass and iron structure built for the industrial exhibition of 1865; its garden commands a fine view of the city and river, and contains a small menagerie. The English factory, built in 1790, has been converted into a club for the British residents — a large and important community whose members are chiefly connected with the wine and shipping trades. Lawn tennis, cricket, boat-racing on the Douro, and other British sports have been successfully introduced, and there is keen competition between the Oporto clubs and those of Lisbon and Carcavellos. The English club gave its name to the Rua Nova dos Inglezes, one of the busiest streets, which contains many banks, warehouses and steamship offices. The

Rua da Alfandega, skirting the right bank of the Douro and passing the custom house {alfdndega), is of similar character; here may be seen characteristic types of the fishermen and peasants of northern Portugal. The Rua das Flores contains, on its eastern side, the shops of the cloth-dealers; on the west are the jewellers’ shops, with a remarkable display of gold and silver filigree-work and enamelled gold. Oporto is famous for these ornaments, which are often very artistic, and are largely worn on holidays by women of the poorer classes, whose savings or dowries are often kept in this readily

marketable form.

Oporto is chiefly famous for the export of the wine which bears its name. An act passed on the 29th of January 1906 defined ” port ” as a wine grown in the Douro district, exported from Oporto, and containing more than 16-5% of alcoholic strength. The vines from which it is made grow in the Paiz do Vinho, a hilly region about 60 m. up the river, and having an area of 27 m. in length by 5 or 6 in breadth, cut off from the sea, and shut in from the north-east by mountains. The trade was established in 1678, but the shipments for some years did not exceed 600 pipes (of 115 gallons each). In 1703 the British government concluded the Methuen treaty with Portugal, under which Portuguese wines were admitted on easier terms than French or German, and henceforward ” port ” began to be drunk (see Portugal: History). In 1747 the export reached 17,000 pipes. In 1754 the great wine monopoly company of Oporto originated, Under which the shipments rose to 33,000 pipes. At the begin- ning of the 19th century the policy of the government more and more favoured port wine, besides which the vintages from 1802 to 18 1 5 were splendid both in Portugal and in Madeira— that of 181 5 has, in fact, never been excelled. For the next few years the grape crop was not at all good, but the 1820 vintage was the most remarkable of any. It was singularly sweet and black, besides being equal in quality to that of 18 15. This was long regarded as the standard in taste and colour for true port, and to keep up the vintage of following years to this exceptional standard adulteration by elder berries, &c, was resorted to. This practice did not long continue, for it was cheaper to adul- terate the best wines with inferior sorts of port wine itself. In 1852 the Oidium which spread over Europe destroyed many of the Portuguese vineyards. In 1865 Phylloxera did much damage, and in 1867 the second monopoly company was abolished. From this time the exports again increased. (See Wine.)

A third of the population is engaged in the manufacture of cottons, woollens, leather, silk, gloves, hats, pottery, corks, tobacco, spirits, beer, aerated waters, preserved foods, soap or jewelry. Oporto gloves and hats are highly esteemed in Portugal. Cotton piece goods are sent to the African colonies, and, in small quantities, to Brazil; their value in 1905 was £120,360, but a larger quantity was retained for the home market. The fisheries — chiefly of hake, bream and sardines — are extensive. Steam- trawling, though unsuccessful in the 19th century, was resumed in 1904, and in 1906 there were 136 British, 10 Dutch and 3 Portuguese steamers thus engaged. The innovation was much resented by the owners of more than 350 small sailing boats, and protective legislation was demanded. In 1905 the combined port

of Oporto and Leixoes was entered by 1734 vessels of 1,562,724 tons, but in this total some vessels were counted twice over — i.e. once at each port. Nearly three-fourths of the tonnage was entered at Leixoes. About the close of the 19th century there was an important development of tourist traffic from Liverpool and Southampton via Havre. Reduced railway rates and improved hotel accommodation have facilitated the growth of this traffic. Many tourists land at Oporto and visit Braga {q.v.), Bussaco {q.v.) and other places of interest, on their way to Lisbon. There is also a large tourist traffic from Germany. The exports of Oporto include wine, cottons, wood, pitwood, stone, cork, salt, sumach, onions, oranges, olives and beans. American competition has destroyed the export trade in live cattle for which Great Britain was the principal market. Dried codfish {bacalhdo) is imported in great quantities from Newfoundland and Norway; other noteworthy imports are

coal, iron, steel, machinery and textiles. The total yearly value of the foreign trade exceeds £5,000,000.

The history of Oporto dates from an early period. Before the Roman invasion, under the name of Portus Cale, Gaia or Cago, it was a town on the south bank of the Douro with a good trade; the Alani subsequently founded a city on the north bank, calling it Castrum Novum. About a.d. 540 the Visigoths under Leovigild obtained possession, but yielded place in 716 to the Moors. The Christians, however, recaptured Oporto in 997, and it became the capital of the counts of Portucalia for part of the period during which the Moors ruled in the southern provinces of Portugal. (See Portugal: History.) The Moors once more became its masters for a short period, till in 1092 it was brought finally under Christian domination. The citizens rebelled in 1628 against an unpopular tax, in 1661 for a similar reason, in 1757 against the wine monopoly, and in 1808 against the French. The town is renowned in British military annals from the duke Of Wellington's passage of the Douro, by which he surprised and put to flight the French army under Marshal Soult, capturing the city on the 12th of May 1809. Oporto sustained a severe siege in 1832-1833, being bravely defended against the Miguelites by Dom Pedro with 7000 soldiers; 16,000 of its inhabitants perished. In the constitutional crises of 1820, 1826, 1836, 1842, 1846-1847, 1891 and 1907-1908 the action of Oporto, as the capital of northern Portugal, was always of the utmost importance.

OPOSSUM, an American Indian name properly belonging to the American marsupials (other than Caenolestes) , but in Australia applied to the phalangers (see Phalanger). True opossums are found throughout the greater part of America from the United States to Patagonia, the number of species being largest in the more tropical parts (see Marsupialia). They form the family Didelphyidae, distinguished from other marsupial families by the equally developed hind-toes, the nailless but fully oppos- able first hind-toe, and by the dentition, of which the formula is i. ■£, c. \, p. f, m. f; total 50. The peculiarity in the mode of succession of these teeth is explained in the article referred to. Opossums are small animals, varying from the size of a mouse to that of a large cat, with long noses, ears and tails, the latter being as a rule naked and prehensile, and with the first toe in the hind-foot so fully opposable to the other digits as to constitute a

functionally perfect posterior “hand.” These opposable first toes are without nail or claw, but their tips are expanded into broad flat pads, which are of great use to these climbing animals. On the anterior limbs all the five digits are provided with long sharp claws, and the first toe is but little opposable. The numerous cheek-teeth are crowned with minute sharply-pointed cusps, with which to crush the insects on which these creatures feed, for the opossums seem to take in South America the place in the economy of nature filled in other countries by hedgehogs, moles, shrews, &c. The true opossums are typically represented by Didelphys marsupialis, a species, with several local races, ranging over the greater part of North America (except the extreme north). It is of large size, and extremely common, being even found living in towns, where it acts as a scavenger by night, retiring for shelter by day upon the roofs or into the sewers. It produces in the spring from six to sixteen young ones, which are placed by the mother in her pouch immediately after birth, and remain there until able to take care of themselves; the period of gestation being from fourteen to seventeen days. A local race found in Central and tropical South America is known as the crab-eating opossum (D. marsupialis cancrivora). The second sub-genus, or genus, Metachirus contains a considerable number of species found all over the tropical parts of the New World. They are of medium size, with short, close fur, very long, scaly and naked tails, and have less developed ridges on their skulls. They have, as a rule, no pouch in which to carry their young, and the latter therefore commonly ride on their mother’s back, holding on by winding their prehensile tails round hers, as in the figure of the woolly opossum. The latter belongs to the sub-genus Philander, which is nearly allied to the last; its full title being Didelphy

(Philander) lanigera. The philander (D. [P:\ philander) is closely related.

The fourth sub-genus (or genus) is Marmosa (Micoureus, or Grymaeomys), differing from the two last by the smaller size of its members and by certain slight differences in the shape of their teeth. Its best-known species is the murine opossum (D. murina), no larger than a mouse, of a bright-red colour, found as far north as central Mexico, and extending thence to the south of Brazil. A second well-known species is D. cinerea, which ranges from Central America to western Brazil, Peru and Bolivia. Yet another group (Peramys) is represented by numerous shrew-like species, of very small size, with short, hairy and non-prehensile tails, not half the length of the trunk, and unridged skulls. The most striking member of the group

The Woolly Opossum {Didelphys lanigera) and young, is the Three-

striped Opossum (D. americana) from Brazil, which is of a reddish grey colour, with three clearly-defined deep-black bands down its back, as in some of the striped mice of Africa. D. dimidiata, D. nudicaudata, D. domestica, D. unistriata and several other South American species belong to this group. Lastly we have the Chiloe Island [opossum (D. gliroides), alone representing the sub-genus Dromiciops, which is most nearly allied to Marmosa, but differs from all other opossums by the short furry ears, thick hairy tail, doubly swollen auditory bulla, short canines and peculiarly formed and situated incisors.

Whatever difference of opinion there may be as to the right of the above-mentioned groups to generic separation from the typical Didelphys, there can be none as to the distinctness of the water-opossum (Chironectes minimus), which differs from all the other members of the family by its fully webbed feet, and the dark-brown transverse bands across the body (see Waters- Opossum).

See O. Thomas, Catalogue of Marsupialia and Monotremata (British Museum, 1888) ; " On Micoureus griseus, with the Descrip- tion of a New Genus and Species of Didelphyidae," Ann. Mag. Nat. Hist. ser. 6, vol. xiv. p. 184, and later papers in the same and other serials. (R. L>*)

OPPEL, CARL ALBERT (1831-1865), German palaeontologist, was born at Hohenheim in Wiirttemberg, on the 19th of December 1831. After studying mineralogy and geology at Stuttgart, he entered the university of Tubingen, where he graduated Ph.D. in 1853. Here he came under the influence of Quenstedt and devoted his special attention to the fossils of the Jurassic system. With this object he examined in detail during 1854 and the following year the succession of strata in England, France and Germany and determined the various palaeontological stages or zones characterized by special guide-fossils, in most cases ammonites. The results of his researches were published in his great work Die Juraformation Englands, Frankreichs und des sudwesllichen Deutschlands (1856-1858). In 1858 he became an assistant in the Palaeontological Museum at Munich. In i860 he became professor of palaeontology in the university at Munich, and in 1861 director of the Palaeontological Collection. There he continued his labours on the Jurassic fauna, describing new species of Crustacea, ammonites, &c. To him also we owe

the establishment of the Tithonian stage, for strata (mainly equivalent to the English Portland and Purbeck Beds) that occur on the borders of Jurassic and Cretaceous. Of his later works the most important was Palaontologische Mittheilungen aus dem Museum des Konigl. Bayer. Staats. (1862-1865). He died at Munich on the 23rd of December 1865.

OPPELN (Polish, Oppolie), a town of Germany, in the Prussian province of Silesia, lies on the right bank of the Oder, 51 m. S.E. of Breslau, on the railway to Kattowitz,. and at the junction of lines to Beuthen, Neisse and Tarnowitz. Pop. (1005) 30,769. It is the seat of the provincial administration of Upper Silesia, and contains the oldest Christian church in the district, that of St Adalbert, founded at the close of the 10th century. It has two other churches and a ducal 15th-century palace on an island in the Oder. The most prominent among the other buildings are the offices of the district authorities, the town hall, the normal seminary and the hospital of St Adalbert. The Roman Catholic gymnasium is established in an old Jesuit college. The industries of Oppeln include the manufacture of Portland cement, machinery, beer, soap, cigars and lime; trade is carried on by rail and river in cattle, grain and the vast mineral output of the district, of which Oppeln is the chief centre. The upper classes speak German, the lower Polish.

Oppeln was a flourishing place at the beginning of the nth century, and became a town in 1228. It was the capital of the duchy of Oppeln and the residence of the duke from n 63 to 1532, when the ruling family became extinct. Then it passed to Austria, and with the rest of Silesia was ceded to Prussia in 1742.

See Idzikowski, Geschichte der Stadt Oppeln (Oppeln, 1863); and Vogt, Oppeln beim Eintritt in das Jahr igoo (Oppeln, 1900).

OPPENHEIM, a town of Germany, in the grand duchy of Hesse, picturesquely situated on the slope of vine-clad hills, on the left bank of the Rhine, 20 m. S. of Mainz, on the railway to Worms. Pop. (1905) 3696. The only relic of its former import- ance is the Evangelical church of St Catherine, one of the most beautiful Gothic edifices of the 13th and 14th centuries in Germany, and recently restored at the public expense. The town has a Roman Catholic church, several schools and a memorial of the War of 1870-71. Its industries and commerce are principally concerned with the manufacture and export of wine. Above the town are the ruins of the fortress of Landskron, built in the nth century and destroyed in 1689.

Oppenheim, which occupies the site of the Roman Bauconica, was formerly much larger than at present. In 1226 it appears as a free town of the Empire and later as one of the most important members of the Rhenish League. It lost its independence in 1375, when it was given in pledge to the elector palatine of the Rhine. Duringthe Thirty Years' War it was alternately occupied by the Swedes and the Imperialists, and in 1689 it was entirely destroyed by the French.

See W. Franck, Geschichte der ehemaligen Reichs stadt Oppenheim (Darmstadt, 1859).

OPPERT, JULIUS (1825-1905), German Assyriologist, was born at Hamburg, of Jewish parents, on the 9th of July 1825. After studying at Heidelberg, Bonn and Berlin, he graduated at Kiel in 1847, and in the following year went to France, where he was teacher of German at Laval and at Reims. His leisure was given to Oriental studies, in which he had made great progress in Germany, and in 1852 he joined Fresnel's archaeological expedition to Mesopotamia. On his return in 1854 he occupied himself in digesting the results of the expedition in so far as they concerned cuneiform inscriptions, and published an important work upon them (Dechriffrement des inscriptions cun&iformes, 1861). In 1857 he was appointed professor of Sanscrit in the school of languages connected with the National Library in Paris, and in this capacity he produced a Sanscrit grammar; but his attention was chiefly given to Assyrian and cognate subjects, and he was especially prominent in establishing the Turanian character of the language originally spoken in Assyria. In 1869 Oppert was appointed professor of Assyrian philology and archaeology at the College de France. In 1865 he published

a history of Assyria and Chaldaea in the light of the results of the different exploring expeditions. At a later period he devoted much attention to the language and antiquities of ancient Media, writing Le Peuple et la langue des Medes (1879). He died in Paris on the 21st of August 1905. Oppert was a voluminous writer upon Assyrian mythology and jurisprudence, and other subjects connected with the ancient civilizations of the East. Among his other works may be mentioned: Elements de la grammaire assyrienne (1868); L'Immortalite* de I'dme chez les Chaldiens, (1875); Salomon et ses successeurs (1877); and, with J. Menant, Doctrines juridiques de I'Assyrie et de la Chaldie (1877).

OPPIAN (Gr. 'Omrtaws), the name of the authors of two (or three) didactic poems in Greek hexameters, formerly identified, but now generally regarded as two different persons. (1) Oppian of Corycus (or

Anabarzus) in Cilicia, who flourished in the reign of Marcus Aurelius (emperor a.d. 161-180). According to an anonymous biographer, his father, having incurred the dis- pleasure of Lucius Verus, the colleague of Aurelius, by neglecting to pay his respects to him when he visited the town, was banished to Malta. Oppian, who had accompanied his father into exile, returned after the death of Verus (169) and went on a visit to Rome. Here he presented his poems to Aurelius, who was so pleased with them that he gave the author a piece of gold for each line, took him into favour and pardoned his father. Oppian subsequently returned to his native country, but died of the plague shortly afterwards, at the early age of thirty. His contemporaries erected a statue in his honour, with an inscription which is still extant, containing a lament for his premature death and a eulogy of his precocious genius. His poem on fishing (Halieulica), of about 3500 lines, dedicated to Aurelius and his son Commodus, is still extant. (2) Oppian of Apamea (or Pella) in Syria. His extant poem on hunting (Cynegetica) is dedicated to the emperor Caracalla, so that it must have been written after 211. It consists of about 2150 lines, and is divided into four books, the last of which seems incomplete. The author evidently knew the Halieulica, and perhaps intended his poem as a supple- ment. Like his namesake, he shows considerable knowledge of his subject and close observation of nature; but in style and poetical merit he is inferior to him. His versification also is less correct. The improbability of there having been two poets of the same name, writing on subjects so closely akin and such near contemporaries, may perhaps be explained by assuming that the real name of the author of the Cynegetica was not Oppian, but that he has been confounded with his predecessor. In any case, it seems clear that the two were not identical.

A third poem on bird-catching (Ixeutica, from Li-6s, bird-lime), also formerly attributed to an Oppian, is lost; a paraphrase in Greek prose by a certain Eutecnius is extant. The author is probably one Dionysius, who is mentioned by Suidas as the author of a treatise on stones (Lithiaca).

The chief modern editions are J. G. Schneider (1776); F. S. Lehrs (1846); U. C. Bussemaker (Scholia, 1849); (Cynegetica) P. Boudreaux (1908). The anonymous biography referred to above will be found in A. Westermann's Biogtaphi Graeci (1845). On the subject generally see A. Martin, Etudes sur la vie et les muvres d'Oppien de Cilicie (1863); A. Ausfeld, De Oppiano et scriptis sub ejus nomine traditis (1876). There are translations of the Halieutica, in English by Diaper and Jones (1722), and in French by E. J. Bourquin (1877).

OPPIUS, GAIUS, an intimate friend of Julius Caesar. He managed the dictator's private affairs during his absence from Rome, and, together with L. Cornelius Balbus, exercised con- siderable influence in the city. According to Suetonius (Caesar, 56), many authorities considered Oppius to have written the histories of the Spanish, African and Alexandrian wars which are printed among the works of Caesar. It is now generally held that he may possibly be the author of the last (although the claims of Hirtius are considered stronger), but certainly not of the two first, although Niebuhr confidently assigned the Bellum Africanum to him; the writer of these took an actual part in the wars they described, whereas Oppius was in Rome at the time. He also wrote a life of Caesar and the elder I Scipio.

For a discussion of the whole question, see M. Schanz, Ceschichte der rdmischen Literatur, pt. i. p. 210 (2nd ed., 1898); Teuffel- Schwabe, Hist, of Roman Literature (Eng. trans.), § 197; see also Cicero, Letters, ed. Tyrrell and Purser, iv. introd. p. 69.

OPTICS, the science of light, regarded as the medium of sight (Gr. &// ls). Generally the noun is qualified by an adjective so as to delimitate the principal groups of optical phenomena, e.g. geometrical optics, physical optics, meteorological optics, &c. Greek terminology included two adjectival forms — rd ottuccl, for all optical phenomena, including vision and the nature of light, and 17 ormij (sc. 6eo>pla), for the objective study of light, i.e. the nature of light itself and the theory of vision. See Light and Vision.

OPTION (Lat. optio, choice, choosing, optare, to choose), the action of choosing or thing chosen, choice or power or opportunity of making a choice. The word had a particular meaning in ecclesiastical law, where it was used of a right claimed by an archbishop to select one benefice from the diocese of a newly appointed bishop, the next presentation to which would fall to his, the archbishop's, patronage. This right was abolished by various statutes in the early part of the 19th century. As a term in stock-exchange operations, " option " is used to express the privilege given to conclude a bargain at some future time at an agreed-upon price (see Call and Stock Exchange). The phrase " local option " has been specifically used in politics of the power given to the electorate of a particular district to choose whether licences for the sale of intoxicating liquor should be granted or not. This form of "local option" has been also and more rightly termed "

local veto ” (see Liquor Laws).

OPUS (‘ChroDs) , in ancient Greece, the chief city of the Opuntian Locrians; the walls of the town may still be seen on a hill about 6 m. S.E. of the modern Atalante, and about 1 m. from the channel which separates the mainland from Euboea. It is men- tioned in the Homeric catalogue among the towns of the Locrians, who were led by Ajax Oileus; and there were games called Aiantea and an altar at Opus in honour of Ajax. Opus was also the birthplace of Patroclus. Pindar’s Ninth Olympian Ode is mainly devoted to the glory and traditions of Opus. Its founder was Opurf the son of Zeus and Protogeneia, the daughter of an Elian Opus, or, according to another version, of Deucalion and Pyrrha, and the wife of Locros. The Locrians deserted the Greek side in the Persian Wars; they were among the allies of Sparta in the Peloponnesian War. In the struggle between Philip V. of Macedon and the Romans the town went over to the latter in 197 B.C., but the Acropolis held out for Philip until his defeat at Cynoscephalae (Livy xxxii. 32). The town suffered from earthquakes, such as that which destroyed the neighbouring Atalante in 1894.

ORACH, or Mountain Spinach, known botanically as Atriplex hortensis, a tall-growing hardy annual, whose leaves, though coarsely flavoured, are used as a substitute for spinach, and to correct the acidity of sorrel. The white and the green are the most desirable varieties. The plant should be grown quickly in rich soil. It may be sown in rows 2 ft. apart, and about the same distance in the row, about March, and for succession again in June. If needful, water must be freely given, so as to maintain a rapid growth. A variety, A. sortensis var. rubra, commonly called red mountain spinach, is a hardy annual 3 to 4 ft. high with fine ornamental foliage.

ORACLE (Lat. oraculum, from orat”, to pray; the correspond- ing Greek word is ixavretov or xPtˆTˆpiov) , a special place where a deity is supposed to give a response, by the mouth of an inspired priest, to the inquiries of his votaries; or the actual response. The whole question of oracles — whether in the sense of the response or the sacred place— is bound up with that of magic, divination and omens, to the articles on which the reader is referred. They are commonly found in the earlier stages of religious culture among different nations. But it is as an ancient Greek institution that they are most interesting historically.

A characteristic feature of Greek religion which distinguishes it from many other systems of advanced cult was the wide prevalence of a ritual of divination and the prominence of certain

oracular centres which were supposed to give voice to the will of Providence. An account of the oracles of Greece is concerned with the historical question about their growth, influence and career. But it is convenient to consider first the anthropologic question, as to the methods of divination practised in ancient Greece, their significance and the original ideas that inspired them. Only the slightest theoretical construction is possible here; and the true psychologic explanation of the mantic facts is of very recent discovery. In the Greek world these were of great variety, but nearly all the methods of divination found there can be traced among other communities, primitive and advanced, ancient and modern. The most obvious and useful classification of them is that of which Plato 1 was the author, who distinguishes between (a) the ” sane ” form of divination and (b) the ecstatic, enthusiastic or “insane” form. The first method appears to be cool and scientific, the diviner (ixolvtls) interpreting certain signs according to fixed principles of inter- pretation. The second is worked by the prophet, shaman or Pythoness, who is possessed and overpowered by the deity, and in temporary frenzy utters mystic speech under divine suggestion. To these we may add a third form ©, divination by communion with the spiritual world in dreams or through intercourse with the departed spirit: this resembles class (a) in that it does not necessarily involve ecstasy, and class (b) in that it assumes immediate rapport with some spiritual power.

It will be convenient first to give typical examples of these various processes of discovering the divine will, and then to sketch the history of Delphi, the leading centre of divination. We may subdivide the methods that fall under class (a), those that conform to the ” omen “-system, according as they deal with the phenomena of the animate or the inanimate world; although this distinction would not be relevant in the period of primitive animistic thought. The Homeric poems attest that auguries from the flight and actions of birds were commonly observed in the earliest Hellenic period as they occasionally were in the later, but we have little evidence that this method was ever organized as it was at Rome into a regular system of state-divination, still less of state-craft. We can only quote the passage in the Antigone where Sophocles describes the method of Teiresias, who keeps an aviary where he studies and interprets the flight and the cries of the birds; it is probable that the poet was aware of some such practice actually in vogue. But the usual examples of Greek augury do not suggest deliberate and systematic observation; for instance, the phenomenon in the Iliad of the eagle seizing the snake and dropping it, or, in the Agamemnon of Aeschylus, of the eagles swooping on the pregnant hare. Other animals besides birds could furnish omens; we

have an interesting story of the omen derived from the contest between a wolf and a bull which decided the question of the sovereignty of Argos when Danaus arrived and claimed the kingdom; 2 and the private superstitious man might be en- couraged or depressed by any ominous sign derived from any part of the animal world. But it is very rare to find such omens habitually consulted in any public system of divination sanctioned by the state. We hear of a shrine of Apollo at Sura in Lycia, 3 where omens were taken from the movements of the sacred fish that were kept there in a tank; and again of a grove conse- crated to this god in Epirus, where tame serpents were kept and fed by a priestess, who could predict a good or bad harvest according as they ate heartily or came willingly to her or not. 4

But the method of animal divination that was most in vogue was the inspection of the inward parts of the victim offered upon the altar, and the inteipretation of certain marks found there according to a conventional code. Sophocles in the passage referred to above gives us a glimpse of the prophet's procedure. A conspicuous example of an oracle organized on this principle was that of Zeus at Olympia, where soothsayers of the family of the Iamidai prophesied partly by the inspection of entrails,

1 Phaedrus, p. 244.

2 Serv. Verg. Aen. iv. 377; Paus. ii. 19. 3.

8 Steph. Byz. s.v. SoCpo. Plut. De sollerl. anim. p. 976 c. Ael. Nat. anim. xii. 1. 4 Ael. Nat. anim. xi. 2.

partlyby the observation of certain signs in the skin when it was cut or burned. 1 Another less familiar procedure that belongs to this subdivision is that which was known as divination 6td kXtiSovuv, which might sometimes have been the cries of birds, but in an oracle of Hermes at the Achaean city of Pharae were the casual utterances of men. Pausanias tells us 2 how this was worked. The consultant came in the evening to the statue of Hermes in the market-place that stood by the side of a hearth- altar to which bronze lamps were attached; having kindled the lamps and put a piece of money on the altar, he whispered into the ear of the statue what he wished to know; he then departed, closing his ears with his hands, and whatever human speech

he first heard after withdrawing his hands he took for a sign. The same custom seems to have prevailed at Thebes in a shrine of Apollo, and in the Olympian oracle of Zeus. 3

Of omens taken from what we call the inanimate world salient examples are those derived from trees and water, a divination to be explained by an animistic feeling that may be regarded as at one time universal. Both were in vogue at Dodona, where the ecstatic method of prophecy was never used; we hear of divination there from the bubbling stream, and still more often of the ” talking oak “; under its branches may once have slept the Selloi, who interpreted the sounds of the boughs, and who may be regarded as the depositories of the Aryan tradition of Zeus, the oak god who spoke in the tree. 4 At Korope in Thessaly we hear vaguely of an Apolline divination by means of a branch of the tamarisk tree, 6 a method akin no doubt to that of the divining rod which was used in Greece as elsewhere; and there is a late record that at Daphne near Antioch oracles were obtained by dipping a laurel leaf or branch in a sacred stream. 6 Water divination must have been as familiar at one time to the Greeks as it was to the ancient Germans; for we hear of the fountain at Daphne revealing things to come by the varying murmur of its flow; 7 and marvellous reflections of a mantic import might be seen in a spring on Taenaron in Laconia; 8 from another at Patrae omens were drawn concerning the chances of recovery from disease. 9 Thunder magic, which was practised in Arcadia, is usually associated with thunder divination; but of this, which was so much in vogue in Etruria and was adopted as a state-craft by Rome, the evidence in Greece is singularly slight. Once a year watchers took their stand on the wall at Athens and waited till they saw the lightning flash from Harma, which was accepted as an auspicious omen for the setting out of the sacred procession to Apollo Pythius at Delphi; and the altar of Zeus Sij/ xaXeos, the sender of omens, on Mount Parnes, may have been a religious observatory of meteorological phenomena. 10 No doubt such a rare and portentous event as the fall of a meteor-stone would be regarded as ominous, and the state would be inclined to consult Delphi or Dodona as to its divine import.

We may conclude the examples of this main department of tiavTud] by mentioning a method that seems to have been much in vogue in the earlier times, that which was called 17 Sid \pri(j>oiv fiaVTUir;, or divination by the drawing or throwing of lots; these must have been objects, such as small pieces of wood or dice, with certain marks inscribed upon them, drawn casually or thrown down and interpreted according to a certain code. This simple process of immemorial antiquity, for other Aryan peoples such as the Teutonic possessed it,

was practised at Delphi and Dodona by the side of the more solemn procedure; we hear of it also in the oracle of Heracles at Bura in Achaea. 11 It is this method of ” scraping ” or ” notching ” (xpdewO signs on wood

I Schol. Pind. 01. 6. III. 2 vii. 22. 2.

3 Farnell, Cults of the Greek States, iv., p. 221.

4 Horn. II. xvi. 233, Od. xiv. 327; Hesiod, ap. Schol. Soph. Track. 1169; Aesch. Prom. Vine. 829.

6 Nikander, Theriaka, 612; Schol. ibid.

c See Robertson-Smith, Religion of the Semites, p. 128, quoting Sozomen v. 19.

7 Ammian. Marcell. xxii. 12; cf. Plut. Vita Caes. c. 19.

8 Paus. iii. 25. 8. 9 Paus. vii. 21. 11. 10 Paus. i. 32. 2.

II Cic. De div. i. 76. Suid. s.v. iruSi. Paus. vii. 25. 10.

that explains probably the origin of the words xPtvpk, XPVˆo-i-, avaipeiv for oracular consultation and deliverance.

The processes described above are part of a world-wide system of popular divination. And most of them were taken up by the oracular shrines in Greece, Apollo himself having no special and characteristic mantic method, but generally adopting that which was of local currency. But much that is adopted by the higher personal religions descends from a more primitive and lower stage of religious feeling. And all this divination was originally independent of any personal divinity. The primitive diviner appealed directly to that mysterious potency which was sup- posed to inhere in the tree and spring, in the bird or beast, or even in a notched piece of wood. At a later stage, it may be, this power is interpreted in accordance with the animistic, and finally with the theistic, belief; and now it is the god who sends the sign, and the bird or animal is merely his organ. Hence the omen-seeker comes to prefer the sacrificed animal, as likely to be filled with the divine spirit through contact with the altar. And, again, if we are to understand the most primitive thought, we probably ought to conceive of it as regarding the omen not as a mere sign, but in some confused sense as a cause of that which is to happen. By sympathetic magic the flight of the bird, or the appearance of the entrails, is mysteriously connected, as cause with effect, with the event which is

desired or dreaded. Thus in the Aztec sacrifice of children to procure rain, the victims were encouraged to shed tears copiously; and this was not a mere sign of an abundant rainfall, but was sympathetically connected with it. And in the same way, when of the three beasts over which three kings swore an oath of alliance, one died prematurely and was supposed thereby to portend the death of one of the kings, 12 or when in the Lacedaemonian sacrifice the head of the victim mysteriously vanished, and this portended the death of their naval commander, 13 these omens would be merely signs of the future for the comparatively advanced Hellene; but we may discern at the back of this belief one more primitive still, that these things were somehow casually or sympathetically connected with the kindred events that followed. We can observe the logical nexus here, which in most instances escapes us. This form of divination, then, we may regard as a special branch of sympathetic magic, which nature herself performs for early man, and which it concerns him to watch.

The other branch of the mantic art, the ecstatic or inspired, has had the greater career among the peoples of the higher religions; and morphologically we may call it the more ad- vanced, as Shamanism or demoniac or divine possession implies the belief in spirits or divinities. But actually it is no doubt of great antiquity, and it is found still existing at a rather low grade of savagery. Therefore it is unsafe to infer from Homer's silence about it that it only became prevalent in Greece in the post-Homeric period. It did not altogether supersede the simpler method of divination by omens; but being far more impressive and awe-inspiring, it was adopted by some of the chief Apolline oracles, though never by Dodona.

The most salient example of it is afforded by Delphi. In the historic period, and perhaps from the earliest times, a woman known as the Pythoness was the organ of inspiration, and it was generally believed that she delivered her oracles under the direct afflatus of the god. The divine possession worked like an epileptic seizure, and was exhausting and might be dangerous; nor is there any reason to suppose that it was simulated. This communion with the divinity needed careful preparation. Originally, as it seems, virginity was a condition of the tenure of the office; for the virgin has been often supposed to be the purer vehicle for divine communication ; but later the rule was established that a married woman over fifty years of age should be chosen, with the proviso that she should be attired as a maiden. As a preliminary to the divine possession, she appears to have chewed leaves of the sacred laurel, and then to have drunk water from the prophetic stream called Kassotis which flowed underground. But the culminating point of the afflatus was reached when she seated herself

upon the tripod; and here, according to the belief

12 Plut. Vita Pyrrh. c. 6. 13 Diod. Sic. xiii. 97.

of at least the later ages of paganism, she was supposed to be inspired by a mystic vapour that arose from a fissure in the ground. Against the ordinary explanation of this as a real mephitic gas producing convulsions, there seem to be geological and chemical objections; 1 nor have the recent French excava- tions revealed any chasm or gap in the floor of the temple. But the strong testimony of the later writers, especially Plutarch, 2 cannot wholly be set aside; and we can sufficiently reconcile it with the facts if we suppose a small crack in the floor through which a draught of air was felt to ascend. This, combining with the other mantic stimulants used, would be enough to throw a believing medium into a condition of mental seizure; and the difficulty felt by the older generation of scholars, who had to resort to the hypothesis of charlatanism or diabolic agency, no longer exists in the light of modern anthropology and the modern science of psychic phenomena. The Pythoness was no ambitious pretender, but ordinarily a virtuous woman of the lower class. It is probable that what she uttered were only unintelligible murmurs, and that these were interpreted into relevance and set in metric or prose sentences by the ” prophet ” and the ” Holy Ones ” or”0

Examples of the same enthusiastic method can be found in other oracles of Apollo. At Argos, the prophetess of the Apollo Pythius attained to the divine afflatus by drinking the blood of the lamb that was sacrificed in the night %o him; 3 this is obviously a mantic communion, for the sacrificial victim is full of the spirit of the divinity. And we find the same process at the prophetic shrine of Ge at Aegae in Achaea, where the prophetess drank a draught of bull’s blood for the same purpose. 4 In the famous oracle shrines of Apollo across the sea, at Klaros and Branchidae 6 near Miletus, the divination was of the same ecstatic type, but produced by a simple draught of holy water. The Clarian prophet fasted several days and nights in retirement and stimulated his ecstasy by drinking from a subterranean spring which is said by Pliny to have shortened the lives of those who used it. 6 Then., ” on certain fixed nights after many sacrifices had been offered, he delivered his oracles, shrouded from the eyes of the consultants.” 7

The divination by ” incubation ” was allied to this type, because though lacking the ecstatic character, the consultant received direct communion with the god or departed spirit. He attained it by laying himself down to sleep or to await a vision, usually by night, in some holy place, having prepared himself by a course of ritualistic purification. Such consultation was naturally confined to the underworld divinities or to the departed heroes. It appears to have prevailed at Delphi when Ge gave oracles there before the coming of Apollo, and among the heroes Amphiaraus, Calchas and Trophonius are recorded to have communicated with their worshippers in this fashion. And it was by incubation that the sick and diseased who repaired to the temple of Epidaurus received their prescriptions from Asclepius, originally a god of the lower world.

After this brief account of the prevalent forms of prophetic consultation, it remains to consider the part played by the Greek oracles in the history of Greek civilization. It will be sufficient to confine our attention to Delphi, about which our information is immeasurably fuller than it is about the other shrines. In the earliest period Dodona may have had the higher prestige, but after the Homeric age it was eclipsed by Delphi, being consulted chiefly by the western Greeks, and occasionally in the 4th century by Athens.

The gorge of Delphi was a seat of prophecy from the earliest

1 See Opp6 on ” The Chasm at Delphi,” J own. of Hellenic Studies

(1904).

8 De defect. Orac. c. 43. 3 Paus. ii, 24, 1.

4 Farnell, op. cit. iii. 11.

6 The prophetic fountain at Branchidae is attested by Strabo, p. 814, and in a confused mystic passage of Iamblichus, De Myst.

3. ii- 6 Nat. Hist. ii. 232. ‘ Iambi, loc. cit.

days of Greek tradition. Ge, Themis and perhaps Poseidon had given oracles here before Apollo. But it is clear that he had won it in the days before Homer, who attests the prestige and wealth of his Pythian shrine; and it seems clear that before the Dorian conquest of the Peloponnese a Dryopian migration had already carried the cult of Apollo Pythius to Asine in Argolis. Also the constitution of the Amphictyones, ” the dwellers around the temple,” reflects the early age when the tribe rather than the city was the political unit, and the

Dorians were a small tribe of north Greece. The original function of these Amphictyones was to preserve the sanctity and property of the temple; but this common interest early developed a certain rule of intertribal morality. By the formula of the Amphictyonic oath preserved by Aeschines, which may be of great antiquity, the members bound themselves ” not to destroy any city of the league, not to cut any one of them off from spring-water, either in war or peace, and to war against any who violated these rules.” We discern here that Greek religion offered the ideal of a federal national union that Greek politics refused to realize.

The next stage in the history of the oracle is presented by the legend of the Dorian migration. For we have no right to reject the strong tradition of the Delphic encouragement of this move- ment, which well accounts for the devotion shown by Sparta to the Pythian god from the earliest days; and accounts also for the higher position that Delphi occupied at the time when Greek history is supposed to begin.

We have next to consider a valuable record that belongs to the end of the 8th century or beginning of the 7th, the Homeric hymn to Apollo, which describes the coming of the Dolphin-God — Ae\

The influence of Delphi was great in various ways, though no scholar would now maintain the exaggerated dogma of Curtius, who imputed to the oracle a lofty religious enthusiasm and the consciousness of a religious political mission.

We may first consider its political influence upon the other states. The practice of a community consulting an oracle on important occasions undoubtedly puts a powerful weapon into the hands of the priesthood, and might lead to something like a theocracy. And there are one or two ominous hints in the Odyssey that the ruler of the oracle might overthrow the ruler of the land. Yet owing to the healthy temperament of the early Greek, the civic character of the priesthood, the strength of the autonomous feeling, Greece might flock to Delphi without exposing itself to the perils of sacerdotal control. The Delphic priesthood, content with their rich revenues, were probably never tempted to enter upon schemes of far-reaching political ambition, nor were they in any way fitted to be the leaders of a national policy. Once only, when the Spartan state applied to Delphi to sanction their attack on Arcadia, did the oracle speak as if, like the older papacy, it claimed to dispose of territory 8 — “Thou askest of me Arcadia; I will not give it thee.” But here the oracle is on the side of righteousness, and it is the Spartan that is the aggressor. In the various oracles that have come down to us, many of which must have been genuine and

preserved in the archives of the state that received them, we cannot discover any marked political policy consistently pursued by the ” Holy Ones ” of Delphi. As conservative aristocrats they would probably dislike tyranny; their action against the Peisistratidae was interested, but one oracle contains a spirited rebuke to Cleisthenes, while one or two others, perhaps not genuine, express the spirit of temperate constitutionalism. As exponents of an 8 Herod, i. 66.

Amphictyonic system they would be sufficiently sensitive of the moral conscience of Greece to utter nothing in flagrant violation of the ” jus gentium.” In one department of politics, the legislative sphere, it has been supposed that the influence of Delphi was direct and inspiring. Plato and later writers imagined that the Pythoness had dictated the Lycurgean system, and even modern scholars like Bergk have regarded the pyrptu of Sparta as of Delphic origin. But a severer criticism dispels these suppositions. The Delphic priesthood had neither the capacity nor probably the desire to undertake so delicate a task as the drafting of a code. They might make now and again a general suggestion when consulted, and, availing themselves of their unique opportunities of collecting foreign intelligence, they might often recommend a skilful legislator or arbitrator to a state that consulted them at a time of intestine trouble. Finally, a legislator with a code would be well advised, especially at Sparta, in endeavouring to obtain the sanction and the blessing of the Delphic god, that he might appear before his own people as one possessed of a religious mandate. In this sense we can understand the stories about Lycurgus.

There is only one department of the secular hif tory of Greece where Delphi played a predominant and most effective part, the colonial department. The great colonial expansion of Greece, which has left so deep an imprint on the culture of Europe, was in part inspired and directed by the oracle. For the proof of this we have not only the evidence of the xPVO”ˆol preserved by Herodotus and others, such as those concerning the foundation of Cyrene, but also the worship of Apollo ‘Apx?77«™?s> ” the Founder,” prevalent in Sicily and Magna Graecia, and the early custom of the sending of tithes or thanksgiving offerings by the flourishing western states to the oracle that had encouraged their settlements.

Apollo was already a god of ways — ‘Ayvtefc — who led the migration of tribes before he came to Delphi. And those legends are of

some value that explain the prehistoric origin of cities such as Magnesia on the Maeander, the Dryopian Asine in the Peloponnese, as due to the colonization of temple-slaves, acquired by the Pythian god as the tithe of conquests, and planted out by him in distant settlements. The success of the oracle in this activity led at last to the establishment of the rule that Herodotus declares to be almost universal in Greece, namely, that no leader of a colony would start without consulting Delphi. Doubt- less in many cases the priesthood only gave encouragement to a pre-conceived project. But they were in a unique position for giving direct advice also, and they appear to have used their opportunities with great intelligence.

Their influence on the state cults can be briefly indicated, for it was not by any means far-reaching. They could have felt conscious of no mission to preach Apollo, for his cult was an ancient heritage of the Hellenic stocks. Only the narrower duty devolved upon them of impressing upon the consultants the religious obligation of sending tithes or other offerings. Nevertheless their- opportunity of directing the religious ritual and organization of the public worships was great; for Plato's view 1 that all questions of detail in religion should be left to the decision of the god " who sits on the omphalos " was on the whole in accord with the usual practice of Greece. Such con- sultations would occur when the state was in some trouble, which would be likely to be imputed to some neglect of religion, and the question to the oracle would commonly be put in this way — "to what god or goddess or hero shall we sacrifice ? " The oracle would then be inclined to suggest the name of some divine personage hitherto neglected, or of one whose rites had fallen into decay. Again, Apollo would know the wishes of the other divinities, who were not in the habit of directly communicat- ing with their worshippers; therefore questions about the sacred land of the goddesses at Eleusis would be naturally referred to him. From both these points of view we can understand why Delphi appears to have encouraged the tendency towards hero-worship which was becoming rife in Greece from the 7th century onwards. But the only high cult for which we can 1 Republ. 427 A.

discover a definite enthusiasm in the Delphic priesthood was that of Dionysus. And his position at Delphi, where he became the brother-deity of Apollo, sufficiently explains this.

As regards the development of religious morality in Greece; we must reckon seriously with the part played by the oracle. The larger number of deliverances that have come down to us bearing on this point are probably spurious, in the sense that the Pythia did not actually utter

them, but they have a certain value as showing the ideas entertained by the cultivated Hellene concerning the oracular god. On the whole, we discern that the moral influence of Delphi was beneficent and on the side of righteousness. It did nothing, indeed, to abolish, it may even have encouraged at times, the barbarous practice of human sacrifice, which was becoming abhorrent to the Greek of the 6th and 5th centuries; but a conservative priesthood is always liable to lag behind the moral progress of an age in respect of certain rites, and in other respects it appears that the ” Holy Ones” of Delphi kept well abreast of the Hellenic advance in ethical thought. An oracle attributed to the Pythoness by Theopompus (Porph. De abstinentia, 2, 16 and 17) expresses the idea contained in the story of ” the widow’s mite,” that the deity prefers the humble offering of the righteous poor to the costly and pompous sacrifice of the rich. Another, of which the authenticity is vouched for by Herodotus (vi. 86), denounces the contemplated perjury and fraud of a certain Glaucus, and declares to the terrified sinner that to tempt God was no less a sin than to commit the actual crime. A later XWˆMOS, f° r which Plutarch (de Pyth. Or. p. 404 B) is the authority, embodies the charitable conception of forgivenness for venial faults committed under excessive stress of temptation: ” God pardons what man’s nature is too weak to resist.” And in one most important branch of morality, with which progressive ancient law was intimately concerned, namely, the concept of the sin of homicide, we have reason for believing that the Apolline oracle played a leading part. Perhaps so early as the 8th century, it came to lay stress on the impurity of bloodshed and to organize and impose a ritual of purification; and thus to assist the development and the clearer definition of the concept of murder as a sin and the growth of a theory of equity which recognizes extenuating or justifying circumstances. 2 Gradually, as Greek ethics escaped the bondage of ritual and evolved the idea of spiritual purity of conscience, this found eloquent expression in the utterances imputed to the Pythoness. 3 Many of these are no doubt literary fictions; but even these are of value as showing the popular view about the oracular god, whose temple and tripod were regarded as the shrine and organ of the best wisdom and morality of Greece. The downfall of Greek liberty before Macedon destroyed the political influence of the Delphic oracle; but for some centuries after it still retained a certain value for the individual as a counsellor and director of private conscience. But in the latter days of paganism it was eclipsed by the oracles of Claros and Branchidae.

Authorities. — A. Bouchd-Leclercq, Histoire de la divination dans I’antiquite, in 4 vols., is still the chief work: cf. L. R. Farnell, Culls of

the Greek States, vol. iv. pp. 179-233; Buresch, Apollo Klarios; Bernard Haussoullier, Eludes stir I'histoire de Milet et du Didymeion ; Legrand, " Questions oraculaires " in Revue des itudes grecques, vol. xiv. ; Pomtow's article on " Delphoi " in Pauly-Wissowa Realencyclopddie.

Ancient Authorities. — Plutarch, De Pythio Oraculo and De ' defectu oraculorum; Cicero, De divinatione; Euseb. Praep. Ev. 4, 2, 14. (L. R .F.)

ORAKZAI, a Pathan tribe on the Kohat border of the North- West Frontier Province of India. The Orakzais inhabit the mountains to the north-west of Kohat district, bounded on the N. and E. by the Afridis, on the S. by the Miranzai valley and on the W. by the Zaimukht country and the Safed Koh mountains. Their name means " lost tribes," and their origin is buried in obscurity; though they resemble the Afghans in language, features and many of their customs, they are rejected by them as brethren. One branch, the Ali Khel, has been traced to Swat, whence they were expelled by the other inhabitants,

1 Farnell, Cults, vol. iv. p. 300, Hibbert Lectures, pp. 139-152.

3 Aelian, Var. Hist, iii. 44: Anth. Pal. xiv. 71 and 74.

and it is not improbable that the whole tribe consists of refugee clans of the surrounding races. They are very wiry-looking mountaineers, but they are not as fine men or as brave fighters as their neighbours the Afridis. They cultivate a good deal of the Khanki and Kurmana valleys in the winter, but in the hot months retire to the heights of Tirah, of which they occupy the southern half called the Mastura valley. They have been estimated at 28,000 fighting men, but this estimate must be largely exaggerated, as the country could not possibly support the consequent population of over 100,000. They have been the object of various British military expeditions, notably in 1855, 1868, 1869, 1801, and the Tirah campaign of 1897.

ORAN (Arabic Wahran, i.e. ravine), a city of Algeria, capital of the department and military division of the same name. It stands at the head of the Gulf of Oran, on the Mediterranean in 35° 44′ N., o° 41′ W. The city is 261 m. by rail W.S.W. of Algiers, 220 m. E. of Gibraltar and 130 m. S. of Cartagena, Spain. It is built on the steep slopes of the Jebel Murjajo, which rises to a height of 1900 ft. The city was

originally cut in two by the ravine of Wad Rekhi, now for the most part covered by boulevards and buildings. West of the ravine lies the old port, and above this rises what was the Spanish town with the ancient citadel looking down on it; but few traces of Spanish occupation remain. The modern quarter rises, like an amphitheatre, to the east of the ravine. The place d'Armes, built on the plateau above the ravine, is the centre of the modern quarter. It contains a fine column commemorative of the battle of Sidi Brahim (1845), between the French and Abd-el- Kader. The Chateau Neuf, built in 1563 by the Spaniards, overlooks the old port. Formerly the seat of the beys of Oran, it is occupied by the general in command of the military division and also serves as barracks. The kasbah (citadel) or Chateau Vieux, used for military purposes, lies S. W. of the Chateau Neuf. It was partly destroyed by the earthquake of the 8th and 9th of October 1790. On the hills behind the kasbah are Fort St Gregoire, a votive chapel commemorative of the cholera of 1849, and Fort Santa Cruz, crowning at a height of 1312 ft. the summit of the Aidur. Fort de la Moune (so called from the monkeys said to have haunted the neighbourhood) is at the western end of the harbour, and commands the road from Oran to Mers-el- Kebir (see below). Fort St Philippe, south of the kasbah, replaces the old Castle of the Saints of the Spaniards. There is subterranean communication between all the ancient forts. The cathedral, dedicated to St Louis, and built in 1839, occupies the site of a chapel belonging in the days of Spanish dominion to a convent of monks of St Bernard. The Grand Mosque (in rue Philippe) was erected at the end of the 18th century to commemorate the expulsion of the Spaniards, and with money paid as ransom for Christian slaves. Other mosques have been turned into churches or utilized for military purposes. The military hospital, a large building adjoining the cathedral, contains 1400 beds. A house in the place de l'hopital, now used by the military, was once the home of the Inquisition; it was built at the expense of Spain in 1772. The museum formed by the Oran Society of Geography and Archaeology (founded in 1878) has a fine collection of antiquities,

Oran is the seat of a large trade. There is regular communica- tion with Marseilles, Cette, Barcelona, Valencia, Cartagena, Malaga, Gibraltar, and the various ports on the Barbary coast. The railway to Algiers is joined at Perregaux (47 m. E. of Oran) by the line from Arzeu to Saida and Ain Sefra which serves the high plateau whence esparto is obtained. There is also a railway to Sidi-Bel-Abbes and Tlemgen. The export trade is chiefly in esparto grass, cereals, wines, olive oil, marbles, cattle and hides. The imports include manufactured goods, coal and other commodities. The inner harbour, or old port,

contains two basins, one of 10 acres and another of 60 acres, formed by the construction of a pier eastward from Fort de la Moune, with two cross piers. In consequence of the growing importance of the port and the decision of the French government to make Oran the chief naval station in Algeria, it was decided to build an eastern harbour. This outer harbour, on which work was

begun in 1005, lies east of the old port and is about double its size. The least depth of water in the old harbour is 18 ft., the average depth in the new harbour is 30 ft., the depth at the entrance being 40 ft.

The population of the city in 1906 was 100,499, of whom 21,906 were French, and 23,071 Spanish. There were also 27,570 naturalized Frenchmen, mostly of Spanish origin. There is a negro colony in the city, numbering about 3000, included in the census in the native population of 16,296. Including the garrison and naval forces the total population of the commune was 106,517.

Four miles west of Oran a small promontory forms the harbour of Mers-el-Kebir, formerly a stronghold of the Barbary pirates. The promontory is strongly fortified and crosses fire with a battery erected to the east of Oran. A road along the east coast, cut for the most part out of the solid rock, connects Oran and Mers-el-Kebir.

Attempts have been made to identify Oran with the Quiza, and Mers-el-Kebir with the Tortus Magnus, of the Romans. There are, however, no Roman ruins at Oran or at Mers-el-Kebir. The foundation of Oran is more properly ascribed to Andalusian Arabs, who settled there in the beginning of the 10th century, and gave it its name. Rapidly rising into importance as a sea- port, Oran was taken and retaken, pillaged and rebuilt, by the various conquerors of northern Africa. Almoravides, Almohades and Marinides succeeded each other, and in the space of half a century the city changed hands nine times. In the latter half of the 15th century it became subject to the sultans of Tlemcen, and reached the height of its prosperity. Active commerce was maintained with the Venetians, the Pisans, the Genoese, the Marseillais and the Catalans, who imported the produce of their looms, glass-wares, tin-wares, and iron, and received in return ivory, ostrich feathers, gold-dust, tanned hides, grain and negro slaves. Admirable woollen cloth and splendid arms were manufactured. The magnificence of its mosques and other public buildings, the number of its schools, and the extent of its warehouses shed lustre on the city; but wealth and luxury began to undermine its prosperity, and its ruin was hastened by the conduct of the Moslem refugees from Spain. Under the influence of these refugees the legitimate trade of the town

gave place to piracy, Mers-el-Kebir becoming the stronghold of the pirates.

Animated by the patriotic enthusiasm of Cardinal Ximenes, the Spaniards determined to put a stop to these expeditions which were carrying off their countrymen, destroying their commerce, and even ravaging their country. Mers-el-Kebir fell into their hands on the 23rd of October 1505, and Oran in May 1509. The latter victory, obtained with but trifling loss, was stained by the massacre of a third of the Mahommedan population. From 6000 to 8000 prisoners, 60 cannon, engines of war and a considerable booty from the wealth accumulated by piracy fell into the hands of the conquerors. Cardinal Ximenes introduced the Inquisition, &c, and also restored and extended the fortifications. Oran became the penal settlement of Spain, but neither the convicts nor the noblemen in disgrace who were also banished thither seem to have been under rigorous surveillance; contemporary accounts speak of constant fetes, games and bull-fights. Meanwhile the Turks had become masters of Algeria, and expelled the Spaniards from all their possessions except Oran. The bey of Mascara watched his opportunity, and at length, in 1708, the weakness of Spain and the treason of the count of Vera Cruz obliged the city to capitulate. The Spaniards recovered possession in 1732, but found the main- tenance of the place a burden rather than a benefit, the neighbour- ing tribes having ceased to deal with the Christians. The earthquake of 1790 furnished an excuse for withdrawing their forces. Commencing by twenty-two separate shocks at brief intervals, the oscillations continued from the 8th of October to the 22nd of November, Houses and fortifications were over- thrown and a third of the garrison and a great number of the inhabitants perished. Famine and sickness had begun to aggravate the situation when the bey of Mascara appeared before the town with 30,000 men. By prodigies of energy the Spanish commander held out till August 1791, when theSpanish

government having made terms with the bey of Algiers, he was allowed to set sail for Spain with his guns and ammunition. The bey Mahpmmed took possession of Oran in March 1792, and made it his residence instead of Mascara. On the fall of Algiers the bey (Hassan) placed himself under the protection of the conquerors, and shortly afterwards removed to the Levant. The French army entered the city on the 4th of January 1831, and took formal possession on the 17th of August. In 1832 a census of the town showed that it had but 3800

inhabitants, of whom more than two-thirds were Jews. Under French rule Oran has regained its ancient commercial activity and has become the second city in Algeria.

ORANGE, HOUSE OF. The small principality of Orange, a district now included in the French department of Vaucluse, traces back its history as an independent sovereignty to the time of Charlemagne. William, surnamed le Cornet, who lived towards the end of the 8th century, is said to have been the first prince of Orange, but the succession is only certainly known after the time of Gerald Adhemar (fl. 1086). In 1174 the principality passed by marriage to Bertrand de BauX, and there were nine princes of this line. By the marriage of John of Chalons with Marie de Baux, the house of Chalons succeeded to the sovereignty in 1393. The princes of Orange-Chalons were (1) John I., 1393-1418, (2) Louis I., 1418-1463, (3) William VIII., 1463-1475, (4) John II., (1475-1502, (5) Philibert, 1502-1530. Philibert was a great warrior and statesman, who was held in great esteem by the emperor Charles V. For his services in his campaigns the emperor gave him considerable possessions in the Netherlands in 1522, and Francis I. of France, who had occupied Orange, was compelled, when a prisoner in Madrid, to restore it to him. Philibert had no children, and he was succeeded by his nephew Rene of Nassau-Chalons, son of Philibert's sister Claudia and Henry, count of Nassau, the confidential friend and counsellor of Charles V. He too died without an heir in 1544 at the siege of St Dizier, having devised all his titles and possessions to his first cousin William, the eldest son of William, count of Nassau-Dillenburg, who was the younger brother of Rene's father, and had inherited the German possessions of the family.

William of Orange-Nassau was but eleven years old when he succeeded to the principality. He was brought up at the court of Charles V. and became famous in history as William the Silent, the founder of the Dutch Republic. On his assassination in 1584 he was succeeded by his eldest son Philip William, who had been kidnapped by Philip II. of Spain in his boyhood and brought up at Madrid. This prince never married, and on his death in 1618 his next brother, Maurice, stadtholder in the United Netherlands and one of the greatest generals of his time, became prince of Orange. Maurice died in 1625, also unmarried. Frederick Henry, the son of Louise de Coligny, William's fourth wife, born just before his father's murder, now succeeded to the princedom of Orange and to all his brothers' dignities, posts and property in the Netherlands. Frederick Henry was both a great general and statesman. His only son, William, was married in 1641 to Mary, princess royal of England, he being fifteen and the princess nine years old at that date, and he succeeded to the

title of prince of Orange on his father's death in 1647. At the very outset of a promising career he suddenly succumbed to an attack of smallpox on the 6th of November 1650, his son William III. being born a week after his father's death.

A revolution now took place in the system of government in the United Provinces, and the offices of stadtholder and captain-and admiral-general, held by four successsive princes of Orange, were abolished. However, the counter revolution of 1672 called William III. to the head of affairs. At this time Louis XIV. conquered the principality of Orange and the territory was in- corporated in France, the title alone being recognized by the treaty of Ryswick. William married his cousin Mary, the eldest daughter of James, duke of York, in 1677. In 1688 he landed in England, expelled his father-in-law, James II., from his throne, and reigned as king of Great Britain and Ireland until his death in 1702. He left no children, and a dispute arose among various

claimants to the title of prince of Orange. The king of Prussia claimed it as the descendant of the eldest daughter of Frederick Henry; John William Friso of Nassau-Dietz claimed it as the descendant of John, the brother of William the Silent, and also of the second daughter of Frederick Henry. The result was that at the peace of Utrecht in 17 13, the king of Prussia abandoned the principality to the king of France in exchange for compensation elsewhere, and John William Friso gained the barren title and became William IV. prince of Orange. His sons William V. and William VI. succeeded him. William VI. in 181 5 became William I. king of the Netherlands.

See Bastet, Histoire de la ville et de la principauti d'Orange (Orange 1856). (G. E.)

ORANGE, a town of Wellington and Bathurst counties, New South Wales, Australia, 192 m. by rail W.N.W. of Sydney. It lies in a fruit and wheat-growing district, in which gold, copper and silver also abqund. It is the centre of trade with the western interior and has a number of flourishing industries. Orange also has a great reputation as a health resort. Its suburb, East Orange, in the county of Bathurst, is a separate municipality. Pop., including East Orange (1901), 6331.

ORANGE, a town of south-eastern France, capital of an arrondissement in the department of Vaucluse, 18 m. N. of Avignon on the railway from Lyons to Marseilles. Pop. (1906) of the town, 6412; of the commune, 10,303. Orange is situated at some distance from the left bank of the Rhone, in the midst of meadows, orchards

and mulberry plantations, watered by a stream called the Meyne, and overlooked by the majestic summit of Mount Ventoux, which lies 22 m. to the east. The district is highly fertile, and the town deals largely in fruit, and millet- stalks for brooms, as well as in wool, silk, honey and truffles.

Orange is interesting mainly from its Roman remains. The triumphal arch is not only far finer than any other in France, but ranks third in size and importance among those still extant in Europe. Measuring 72 ft. in height, 69 ft. in width, and 26 ft. in depth, it is composed of three arches supported by Corinthian columns. On three sides it is well preserved, and displays remarkable variety and elegance in its sculptured decorations. To judge from the traces of an inscription, the arch seems to have been erected in honour of Tiberius, perhaps to commemorate his victory over the Gallic chieftain Sacrovir in a.d. 21. It suffered from being used as a donjon in the middle ages. Another most imposing structure is the theatre, dating from the time of the emperor Hadrian and built against a hill from the summit of which a colossal figure of the Virgin commands the town. The facade, which is 121 ft. high, 340 ft. long and 13 ft. thick, is pierced by three square gates surmounted by a range of blind arches and a double row of projecting corbels, with holes in which the poles of the awning were placed. Of the seats occupied by the spectators, only the lower tiers remain. It was used as an out-work to the fortress built on the hill by Maurice of Nassau in 1622, and destroyed fifty years later by order of Louis XIV., whose troops in 1660 captured the town. Up to the beginning of the 19th century it was filled with hovels and stables; these were subsequently cleared out, and at the end of the century the building was restored, and now serves as a national theatre. In the neighbourhood of the theatre traces have been found of a hippodrome; and statues, bas-reliefs and ruins of an amphitheatre also serve to show the importance of the Roman town. Notre Dame, the old cathedral, originally erected by the prefect of Gaul, was ruined by the Barbarians, rebuilt in the nth and 12th centuries, and damaged by the Protestants.

The town has a sub-prefecture, a tribunal of first instance, and a communal college among its institutions; and it has tile and mosaic works and flour-mills, and manufactories of boots and shoes and brooms. There is trade in truffles, fruit, wine, &c.

Orange (Arausio), capital of the Cavari, was in 105 B.C. the scene of the defeat of a Roman army by the Cimbri and Teutones. It became after Caesar an important Roman colony. Its ramparts and fine buildings were partly destroyed by the

Alamanni and Visigoths, and partly ruined by the erections of the middle ages. Orange was included in the kingdom of Austrasia,fell into the hands of the Saracens and was recovered by Charlemagne It became the seat of an independent count- ship in the 1 ith century. From the 14th century till the Revolu- tion the town had a university. At the latter period the town suffered severely from the excesses of a popular commission.

See R. Peyre, Nimes, Aries el Orange (Paris, 1903) ; A. de Pont- briant, Histoire de la principaute d'Orange (Avignon and Paris, 1891).

Councils of Orange. — In 441 a synod of sixteen bishops was held at Orange under the presidency of St Hilary of Aries, which adopted thirty canons touching the reconciliation of penitents and heretics; the ecclesiastical right of asylum, diocesan pre- rogatives of , bishops, spiritual privileges of the defective or demoniac, the deportment of catechumens at worship, and clerical celibacy (forbidding married men to be ordained as deacons, and digamists to be advanced beyond the sub-diaconate). In 529 a synod of fifteen bishops, under the presidency of Caesarius of Aries, assembled primarily to dedicate a church, the gift of Liberius, the lieutenant of Theodoric, in Gaul, but proved to be one of the most important councils of the 6th century. Caesarius had sought the aid of Rome against semi- Pelagianism, and in response Pope Felix IV. had sent certain capitula concerning grace and free-will, drawn chiefly from the writings of Augustine and Prosper. These to the number of twenty-five the synod subscribed, and adopted a supplementary statement, reaffirming the Augustinian doctrines of corruption, human inability, prevenient grace and baptismal regeneration. Its acts were confirmed by Boniface II. on the " 25th of January 530," a date which is open to question.

See F. H. Woods, Canons of the Second Council of Orange (Oxford, 1882). , (T. F. C.)

ORANGE, a city of Essex county, New Jersey, U.S.A., in the N.E. part of the state, about 14 m. W. of New York City. Pop. (1890) 18,844, (1900) 24,141, of whom 6598 were foreign- born and 1903 were negroes, (1910 census) 29,630. It is served by the Morris & Essex Division of the Delaware, Lacka- wanna & Western railroad and by the Orange branch (of which it is a terminus) of the Erie railroad, and is connected with Newark, South Orange and Bloomfield by electric

lines. The city lies at the base of the eastern slope of the first Watchung, or Orange, Mountain, and is primarily a residential suburb of New York and Newark; with East Orange, West Orange and South Orange it constitutes virtually a single community, popularly known as ” the Oranges.” The city has a good public school system and various private schools, including the Dearborn- Morgan School (for girls) and the Carteret Academy (for boys). Of historical interest is the First Presbyterian Church, erected in 1813, the third structure used by this church organization, whose history dates back to 17 18. The value of the factory products of Orange increased from $2,995,688 in 1900 to $6,150,635 in 1905, or 105-3%, and the capital invested in manufacturing from $1,359,523 in 1900 to $3,441,183 in 1905, or 1531%. Of the total product-value in 1905, $2,311,614 was the value of felt hats manufactured. Among other manu- factures are beer, pharmaceutical supplies and lawn mowers. The city owns and operates its water- works and electric lighting plant. Settlements were made in or near the limits of the present city soon after the founding of Newark, in 1666, and, on account of the mountainous ridge in this region, they were generally referred to collectively as ” Newark Mountain.” As a disagreement soon arose between the people of Newark and those of ” the mountain ” on questions of church administration, the latter in 17 18 severed their connexion with the church at Newark and formed an independent congregation, the ” Mountain Society.” The church, which was known also as ” The Church of the New Ark Mountains,” was at first Congregational, but in 1748 became Presbyterian. In 1782 occurs the earliest reference to the neighbourhood as ” Orange Dale,” and two years later it is sometimes referred to as ” Orange.” In 1806 the legislature incorporated the township of Orange. Parts of its territory were included in South Orange and Fairmourt (now West Orange)

in 1861 and 1862 respectively, and in 1863 East Orange was created out of part of Orange. Orange was incorporated as a town in i860 and was chartered as a city in 1872.

See H. Whittemore, The Founders and Builders of the Oranges (Newark, 1896) ; J. H. Condit, Early Records of the Township of Orange (1807-1845) (Orange, 1897); and S. Wickes, History of the Oranges (1666-1806), (Newark, 1892).

ORANGE, the longest river of South Africa, almost traversing the continent from ocean to ocean. It rises in Basutoland, less than 200 m. from the Indian Ocean, and flows west, with wide sweeps south and north, to the Atlantic. It drains, with its tributaries, an area estimated at over 400,000 sq. m., passing through more than twelve degrees of

longitude or 750 m. in a straight line from source to mouth. The valley of the river exceeds 1000 m., and the stream has a length of not iess than 1300 m. Its headstreams are in the highest part of the Drakens- berg range, the principal source, the Senku, rising, at an elevation of more than 10,000 ft., on the south face of the Mont aux Sources in 28 48′ E., 28° 50′ S. The other headstreams are S.E. of the Senku source, in Champagne Castle, Giant's Castle and other heights of the Drakensberg. The Giant's Castle source is not more than 130 m. west of the Indian ocean in a direct line.

Rising on the inner slopes of the hills these rivulets all join the Senku, which receives from the north several streams which rise in the Maluti Mountains. Of these the largest are the Semene and Senkunyane (little Senku) and the best known the Maletsunyane, by reason of its magnificent waterfall — an unbroken leap of 630 ft. Increased by the perennial waters of these numerous torrents the Senku makes its way S.W. across the upland valleys between the Maluti and Drakensberg ranges. After a course of some 200 m., passing the S.W. corner of the Maluti Mountains, the Senku, already known as the Orange, receives the Makhaleng or 'Kornet Spruit (90 m.), which rises in Machacha Mountain. The Orange here enters the great inner plateau of South Africa, which at Aliwal North, the first town of any size on the banks of the river, 80 m. below the Kornet Spruit confluence, has an elevation of 4300 ft. Forty miles lower down the Orange is joined by the first of its large tributaries, the Caledon (230 m.), which, rising on the western side of the Mont aux Sources, flows, first west and then south, through a broad and fertile valley north of the Maluti Mountains. At the confluence the united stream has a width of 350 yards. Thirty miles lower down the Orange reaches, in 25 40′ E., its southernmost point — 30° 40′ S., approaching within 20 m. of the Zuurberg range. In this part of its course the river receives from the south the streams, often intermittent, which rise on the northern slopes of the Storm- berg, Zuurberg and Sneeuwberg ranges — the mountain chain which forms the water-parting between the coast and inland drainage systems of South Africa. Of these southern rivers the chief are the Kraai, which joins the Orange near Aliwal North, the Stormberg and the Zeekoe (Sea Cow), the last named having a length of 120 m.

From its most southern point the Orange turns sharply N.W. for 200 m., when having reached 29° 3′ S., 23° 36′ E. it is joined by its second great affluent, the Vaal (q.v?). Here it bends south again, and with many a zigzag continues its general westerly direction, crossing the arid plains of Bechuana, Bushman and Namaqualands. Flowing between steep banks, considerably below the general level of the

country, here about 3000 ft., it receives, between the Vaal confluence and the Atlantic, a distance of more than 400 m. in a direct line, no perennial tributary but on the contrary loses a great deal of its water by evaporation. In this region, nevertheless, skeleton river systems cover the country north and south. These usually dry sandy beds, which on many maps appear rivers of imposing length, for a few hours or days following rare but violent thunder- storms, are deep and turbulent streams. The northern system consists of the Nosob and its tributaries, the Molopo and the Kuruman. These unite their waters in about 20 40′ E. and 27° S., whence a channel known as the Molopo or Hygap runs south to the Orange. The southern system, which at one time rendered fertile the great plains of western Cape Colony, is represented by the Brak and Ongers rivers, and, farther west, by the Zak and Olifants rivers, which, united as the Hartebeest, reach the Orange about 25 rh. above the mouth of the Molopo. These rivers, in the wet season and in places, have plenty of water, generally dissipated in vleis, pans and vloers (marshy and lake land).

Between the mouths of the Hartebeest and Molopo, in 28° 35′ S., 20° 20′ E., are the great waterfalls of the Orange, where in a series of cataracts and cascades the river drops 400 ft. in 16 m. The Aughrabies or Hundred Falls, as they are called, are divided by ledges, reefs and islets, the last named often assuming fantastic shapes. Below the falls the river rushes through a rocky gorge, and openings in the cliffs to the water are rare. These openings are usually the sandy beds of dried-up or intermittent affluents, such as the Bak, Ham, Houm, Aub (or Great Fish) rivers of Great Nama- qualand. As it approaches the Atlantic, the Orange, in its efforts to pierce the mountain barrier which guards the coast, is deflected

north and then south, making a loop of fully 90 m., of which the two ends are but 38 m. apart. Crossing “the narrow coast plain the river, with a south-westerly sweep, enters the ocean by a single mouth, studded with small islands, in 28 37′ S., 16° 30′ E. A large sand bar obstructs the entrance to the river, which is not quite I m. wide. The river when in flood, at which time it has a depth of 40 ft., scours a channel through the bar, but the Orange is at all times inaccessible to sea-going vessels. Above the bar it is navigable by small vessels for 30 or 40 m. In the neighbourhood of the Vaal confluence, where the river passes through alluvial land, and at some other places, the waters of the Orange are used, and are capable of being much more largely

used, for irrigation purposes.

The Hottentots call the Orange the Garib (great water), corrupted by the Dutch into Gariep. The early Dutch settlers called it simply Groote-Rivier. It was first visited by Europeans about the beginning of the 18th century. In 1685 Simon van der Stell, then governor of the Cape, led an expedition into Little Namaqualand and discovered the Koper Berg. In 1704 and 1705 other expeditions to Namaqualand were made. Attempts to mine the copper followed, and the prospectors and hunters who penetrated northward sent to the Cape reports of the existence of a great river whose waters always flowed. The first scientific expedition to reach the Orange was that under Captain Henry Hop sent by Governor Tulbagh in 1761, partly to investigate the reports concerning a semi-civilized yellow race living north of the great river. Hop crossed the Orange in September 1761, but shortly afterwards returned. Andrew Sparrman, the Swedish naturalist, when exploring in the Sneeuw- berg in 1776, learned from the Hottentots that eight or ten days' journey north there was a large perennial stream, which he rightly concluded was the groote-rivier of Hop. The next year Captain (afterwards Colonel) R. J. Gordon, a Dutch officer of Scottish extraction, who commanded the garrison at Cape Town, reached the river in its middle course at the spot indicated by Sparrman and named it the Orange in honour of the prince of Orange. In 1778 Lieut. W. Paterson, an English traveller, reached the river in its lower course, and in 1779 Paterson and Gordon journeyed along the west coast of the colony and ex- plored the mouth of the river. F. Le Vaillant also visited the Orange near its mouth in 1784. Mission stations north of the Orange were established a few years later, and in 18 13 the Rev. John .Campbell, after visiting Griqualand West for the London Missionary Society, traced the Harts river, and from its junction with the Vaal followed the latter stream to its confluence with the Orange, journeying thence by the banks of the Orange as far as Pella, in Little Namaqualand, discovering the great falls. These falls were in 1885 visited and described by G. A. Farini, from whom they received the name of the Hundred Falls. The source of the Orange was first reached by the French Protestant missionaries T. Arbousset and F. Daumas in 1836.

The story of Hop's expedition is told in the Nouvelle description du Cap de Bonne Esperance (Amsterdam, 1778). Lieut. Paterson gave his experiences in A Narrative of Four Journeys into the Country of the Hottentots and Caffraria in the Years 1777-1778-1779 (London, 1789). See also Campbell's Travels in South Africa (London, 1815), Arbousset and Daumas ' Relation d'un voyage a" exploration au nord-est de la colonie du Cap de Bonne Esperance en 1836 (Paris, 1842),

and Farini's Through the Kalahari Desert (London,

1886).

ORANGE (Citrus Aurantium). The plant that produces the familiar fruit of commerce is closely allied to the citron, lemon and lime, all the cultivated forms of the genus Citrus being so nearly related that their specific demarcation must be regarded as somewhat doubtful and indefinite. The numerous kinds of orange chiefly differing in the external shape, size and flavour of the fruit may all probably be traced to two well-marked varieties or sub-species — the sweet or China orange, var. sinensis, and the bitter orange or bigarade, var. amara.

The Bitter Seville or Bigarade Orange, C. Aurantium, var. amara (C. vulgaris of Risso), is a rather small tree, rarely exceeding 30 ft. in height. The green shoots bear sharp axillary spines, and alternate evergreen oblong leaves, pointed at the extremity, and with the margins entire or very slightly serrated; they are of a bright glossy green tint, the stalks distinctly winged and, as in the other species, articulated with the leaf. The fragrant

white or pale pinkish flowers appear in the summer months, and the fruit, usually round or spheroidal, does not perfectly ripen until the following spring, so that flowers and both green and mature fruit are often found on the plant at the same time. The bitter aromatic rind of the bigarade is rough, and dotted closely over with concave oil-cells; the pulp is acid and more or less bitter in flavour.

The Sweet or China Orange, including the Malta or Portugal orange, has the petioles less distinctly winged, and the leaves more ovate in shape, but chiefly differs in the fruit, the pulp of which is agreeably acidulous and sweet, the rind comparatively smooth, and the oil-cells convex. The ordinary round shape of the sweet orange fruit is varied greatly in certain varieties, in some being greatly elongated, in others much flattened; while several kinds have a conical protuberance at the apex, others are deeply ribbed or furrowed, and a few are distinctly " horned " or lobed, by the partial separation of the carpels. The two sub- species of orange are said to reproduce themselves infallibly by seed; and, where hybridizing is prevented, the seedlings of the sweet and bitter orange appear to retain respectively the more distinctive features of the parent plant.

Though now cultivated widely in most of the warmer parts of the world, and apparently in many completely naturalized, the

Orange (Citrus Aurantium, var. amara), from nature, about one- third natural size, a, diagram of flower.

diffusion of the orange has taken place in comparatively recent historical periods. To ancient Mediterranean agriculture it was unknown; and, though the later Greeks and Romans were familiar with the citron as an exotic fruit, their ” median apple ” appears to have been the only form of the citrine genus with which they were acquainted. The careful researches of Gallesio have proved that India was the country from which the orange spread to western Asia and eventually to Europe. Oranges are at present found wild in the jungles along the lower mountain slopes of Sylhet, Kumaon, Sikkim and other parts of northern India, and, according to Royle, even in the Nilgiri Hills; the plants are generally thorny, and present the other characters of the bitter variety, but occasionally wild oranges occur with sweet fruit; it is, however, doubtful whether either sub-species is really indigenous to Hindustan, and De Candolle is probably correct in regarding the Burmese peninsula and southern China as the original home of the orange. Cultivated from a remote period in Hindustan, it was carried to south-western Asia by the Arabs, probably before the 9th century, towards the close of which the bitter orange seems to have been well known to that people; though, according toMas’udi, it was not cultivated in Arabia itself until the beginning of the 10th century, when it was first planted in ‘Oman, and afterwards carried to Mesopotamia and Syria. It spread ultimately, through the agency of the same race, to Africa and Spain, and perhaps to Sicily, following

everywhere the tide of Mohammedan conquest and civilization. In the 1 2th century the bigarade was abundantly cultivated in all the Levant countries, and the returning soldiers of the Cross brought it from Palestine to Italy and Provence. An orange tree of this variety is said to have been planted by St Dominic in the year 1200, though the identity of the one still standing in the garden of the monastery of St Sabina at Rome, and now attributed to the energetic friar, may be somewhat doubtful. No allusion to the sweet orange occurs in contemporary literature at this early date, and its introduction to Europe took place at a considerably later period, though the exact time is unknown. It was commonly cultivated in Italy early in the 16th century, and seems to have been known there previously to the expedition of Da Gama (1497), as a Florentine narrator of that voyage appears to have been familiar with the fruit. The importation of this

tree into Europe, though often attributed to the Portu- guese, is with more probability referred to the enterprise of the Genoese merchants of the 15th century, who must have found it growing abundantly then in the Levant. The prevailing European name of the orange is sufficient evidence of its origin and of the line taken in its migration westward. The Sanskrit designation nagrungo, becoming narungee in Hindustani, and corrupted by the Arabs into naranj (Spanish naranja), passed by easy transitions into the Italian arancia (Latinized aurantium), the Romance arangi, and the later Provencal orange. The true Chinese variety, however, was undoubtedly brought by the Portuguese navigators direct from the East both to their own country and to the Azores, where now luxuriant groves of the golden-fruited tree give a modern realization to the old myth of the gardens of the Hesperides. 1 Throughout China and in Japan the orange has been grown from very ancient times, and it was found diffused widely when the Indian Archipelago was first visited by Europeans. In more recent days its cultivation has extended over most of the warmer regions of the globe, the tree growing freely and producing fruit abunda'ntly wherever heat is sufficient and enough moisture can be supplied to the roots; where night-frosts occur in winter or spring the culture becomes more difficult and the crop precarious.

The orange flourishes in any moderately fertile soil, if it is well drained and sufficiently moist; but a rather stiff loam or cal- careous marl, intermingled with some vegetable humus, is most favourable to its growth. Grafting or budding on stocks raised from the seed of some vigorous variety is the plan usually adopted by the cultivator. The seeds, carefully selected, are sown in well-prepared ground, and the seedlings removed to a nursery-bed in the fourth or fifth year, and, sometimes after a second trans- plantation, grafted in the seventh or eighth year with the desired variety. When the grafts have acquired sufficient vigour, the trees are placed in rows in the permanent orangery. Pro- pagation by layers is occasionally adopted; cuttings do not readily root, and multiplication directly by seed is always doubtful in result, though recommended by some authorities. The distance left between the trees in the permanent plantation or grove varies according to the size of the plants and subsequent culture adopted. In France, when the trunks are from 5 to 6| ft. in height, a space of from 16 to 26 ft. is left between; but the dwarfer trees admit of much closer planting. In the West Indies and Azores an interval of 24 or even of 30 ft. is often allowed. The ground is kept well stirred between the trunks, and the roots manured with well-rotted dung, guano or other highly litrogenous matter; shallow pits are sometimes formed above the roots for the reception of liquid or other manures; in dry climates

water must be abundantly and frequently supplied. The trees require regular and careful pruning, the heads being trained as nearly as possible to a spherical form. Between the rows melons, pumpkins and other annual vegetables are frequently raised. In garden culture the orange is often trained as an espalier, and with careful attention yields fruit in great profusion when thus grown. In favourable seasons the oranges are produced in great abundance, from 400 to 1000 being

“The modern Arabic name, Bortukan (that is, Portuguese), shows that the China apple reached the Levant from the West.

commonly borne on a single plant in full bearing, while on large trees the latter number is often vastly exceeded. The trees will continue to bear abundantly from fifty to eighty years, or even more; and some old orange trees, whose age must be reckoned by centuries, still produce their golden crop; these very ancient trees are, however, generally of the bitter variety. Oranges intended for export to colder climates are gathered long before the deep tint that indicates maturity is attained, the fruit ripening rapidly after picking; but the delicious taste of, the mature China orange is never thus acquired, and those who have not eaten the fruit in a perfectly ripe state have little idea of its flavour when in that condition. Carefully gathered, the oranges are packed in boxes, each orange being wrapped in paper, or with dry maize husks or leaves placed between them. The immense quantities of this valuable fruit imported into Britain are derived from various sources, the Azores (” St Michael’s” oranges), Sicily, Portugal, Spain and other Mediter- ranean countries, Jamaica, the Bahamas and Florida, California, &c. In Florida the bitter orange has grown, from an unknown period, in a wild condition, and some of the earlier botanical explorers regarded it as an indigenous tree; but it was un- doubtedly brought by the Spanish colonists to the West India Islands, and was probably soon afterwards transplanted to Florida by them or their buccaneering enemies; its chief use in America is for stocks on which to graft sweet orange and other species of Citrus.

Orange cultivation has been attempted with success in several parts of Australia, especially in New South Wales, where the orange groves near Paramatta yield an abundant colonial supplyˆ The orangeries of Queensland and South Australia likewise produce well. In many of the Pacific Islands the plant has been long established. There are numerous varieties of the sweet orange, a few of which deserve mention on account of some striking peculiarity. Maltese or Blood oranges are characterized by the deep-red tint of the pulp, and comprise some of the best varieties. Gallesio refers to the blood orange as cultivated extensively in Malta and Provence; they are largely

grown in the Mediterranean region in the present day, and have been introduced into America. So-called navel oranges have an umbilical mark on the apex of the fruit due to the production of an incipient second whorl of carpels. Baptiste Ferrari, a Jesuit monk, in his work Hesperides, siveDe malorum aureorum cultura et usus Libri Quatuor, published at Rome in 1646, figures and describes (pp. 403, 405) such an orange. The mandarin orange of China, sometimes regarded as a distinct species, C. nobilis, is remarkable for its very flat spheroidal fruit, the rind of which readily separates with the slightest pressure; the pulp has a peculiarly luscious flavour when ripe. The small Tangerine oranges, valued for their fine fragrance, are derived from the mandarin.

Diseases. — Several are caused by fungi, others by insects. Of the fungus diseases that known as foot-rot in Florida and mal-di-gomma in Italy is very widely distributed. It occurs on the lower part of the trunk and the main roots of the tree, and is indicated by exudation of gum on the bark covering the diseased spot. The diseased patches spread into the wood; killing the tissues, which emit a foetid odour; the general appearance of the tree is unhealthy, the leaves become yellow and the twigs and young branches die. A fungus, Fusarium limonis is found associated with the disease, which is also fostered by faulty drainage, a shaded condition of the soil, the use of rank manures and other conditions. For treatment the soil should be removed from the base of the trunk, the diseased patches cut away and the wound treated with a fungicide. Decay of oranges in transit often causes serious losses; this has been shown to be due to a species of Penicillium, of which the gerrninating spores penetrate the skin of damaged fruits. Careful picking, handling and packing have much reduced the amount of loss from this cause. Another fungus disease, scab, has been very injurious to the lemon and bitter orange in Florida. It is caused by a species of Cladosporium, which forms numerous small warts on the leaves and fruits; spraying with a weak

solution of Bordeaux mixture or with ammoniacal solution of carbonate of copper is recommended. The sooty mould of orange, which forms a black incrustation on the leaves and also the fruit, probably occurs wherever the orange is cultivated. It is caused by species of Meliola; in Europe and the United States, by M. Fenzigii and M. Camelliae. The fruit is often rendered unsaleable and the plant is also injured as the leaves are unable properly to perform their

functions. The fungus is not a parasite, but lives apparently upon the honey-dew secreted by aphides, &c, and is therefore dependent on the presence of these insects. Spraying with resin-wash is an effective preventive, as it destroys the insects. Several insect enemies attack the plant, of which the scale insect Aspidiotus is the most injurious in Europe and the Azores. In Florida another species, Mytilaspis citricola (purple scale), sometimes disfigures the fruit to such an extent as to make it unfit for market. Several species of Aleyrodes are insect pests on leaves of the orange; A. citri, the white fly of Florida, is described as the most im- portant of all the insect pests of the crop in Florida at the present time, and another species, A . Howardi, is a very serious pest in Cuba. Cold weather in winter has sometimes proved destructive in Provence, and many plantations were destroyed by the hard frosts of 1789 and 1820.

Besides the widespread use of the fruit as an agreeable and wholesome article of diet, that of the sweet orange, abounding in citric acid, possesses in a high degree the antiscorbutic pro- perties that render the lemon and lime so valuable in medicine; and the free consumption of this fruit in the large towns of England during the winter months has doubtless a very beneficial effect on the health of the people. The juice is sometimes em- ployed as a cooling drink in fevers, as well as for making a pleasant beverage in hot weather.

The bitter orange is chiefly cultivated for the aromatic and tonic qualities of the rind, which render it a valuable stomachic. Planted long ago in Andalusia by the Moorish conquerors, it is still extensively grown in southern Spain — deriving its common English name of ” Seville” orange from the abundant groves that still exist around that city, though the plant is now largely cultivated elsewhere. The fruit is imported into Great Britain and the United States in considerable quantities for the manu- facture of orange marmalade, which is prepared from the pulp and rind, usually more or less mingled with the pulp of the China orange. In medicine the fresh peel is largely employed as an aromatic tonic, and often, in tincture and syrup and ” orange wine,” as a mere vehicle to disguise the flavour of more nauseous remedies. The chief constituents are three glucosides, hesperidin, isohesperidin and aurantiamarin, the latter being the bitter principle; and an oil which mainly consists of a terpene known as limonene. The essential oil of the rind is collected for the use of the perfumer, being obtained either by the pressure of the fresh peel against a piece of sponge, or by the process known as ecuelle, in which the skin of the ripe fruit is scraped against a series of points or ridges arranged upon the surface of a peculiarly-shaped dish or broad funnel, when the oil flows freely from the broken cells. Another

fragrant oil, called in France essence de petit grain, is procured by the distillation of the leaves, from which also an aromatic water is prepared. The flowers of both sweet and bitter orange yield, when distilled with water, the ” oil of Neroli ” of the druggist and perfumer, and likewise the fragrant liquid known as ” orange- flower water,” which .is a- saturated solution of the volatile oil of the fresh flowers. The candied peel is much in request by cook and confectioner; the favourite liqueur sold as “curacoa ” derives its aromatic flavour from the rind of the bigarade. The minute immature oranges that drop from the trees are manu- factured into “issue-peas”; from those of the sweet orange in a fresh state a sweetmeat is sometimes prepared in France. Orange trees occasionally acquire a considerable diameter; the trunk of one near Nice, still standing in 1789, was so large that two men could scarcely embrace it; the tree was killed by the intense cold of the winter of that year. The wood of the orange is of a fine yellow tint, and, being hard and close-grained,

is valued by the turner and cabinetmaker for the manufacture of small articles; it takes a good polish.

Although the bitter ” Poma de Orenge ” were brought in small quantities from Spain to England as early as the year 1290, no attempt appears to have been made to cultivate the tree in Britain until about 1595, when some plants were introduced by the Carews of Beddihgton in Surrey, and placed in their garden, where, trained against a wall, and sheltered in winter, they remained until destroyed by the great frost of 1 739-1 740. In the 1 8th century the tree became a favourite object of con- servatory growth; in the open air, planted against a wall, and covered with mats in winter, it has often stood the cold of many seasons in the southern counties, in such situations the trees occasionally bearing abundant fruit. The trees are usually imported from Italy, where, especially near Nervi, such plants are raised in great numbers for exportation; they are generally budded on the stocks of some free-growing variety, often on the lemon or citron.

The orange has been usually cultivated in England for the beauty of the plant and the fragrance of its blossoms, rather than for the purpose of affording a supply of edible fruit. The latter can, however, be easily grown in a hot-house, some of the fruits thus grown, especially those of the pretty little Tangerine variety, being superior in quality to the imported fruit. The best form of orange house is the span-roofed, with glass on both sides, the height and other conditions being similar to those recom- mended for stove plants. The trees may be planted out, a row on each side a central path, in a house of moderate width. They will flourish in a compost of good, light, turfy loam and well- decayed

leaf-mould in equal proportions, to which a little broken charcoal may be added. Each year the trees should be top-dressed with a similar compost, removing some of the old soil beforehand. The trees, if intended to be permanent, should be placed 10 to 12 ft. apart. It will often be found more convenient to grow the plants in pots or tubs, and then bottom heat can be secured by placing them on or over a series of hot-water pipes kept near to or above the ground level. The pots or tubs should be thoroughly well drained, and should not be too large for the plants; and repotting should take place about every third year, the soil being top-dressed in intervening years. The temperature may be kept at about 50 or 55 in winter, under which treatment the trees will come into bloom in February; the heat must then be increased to 6o° or 65° in the day time, and later on to 8o° or 85 . Throughout the growing season the trees should be liberally watered, and thoroughly syringed everyday; this will materially assist in keeping down insects. When the trees are in bloom, however, they must not be syringed, but the house must be kept moist by throwing water on the pathways a few times during the day. When the flowers have fallen the syringe may be used again daily in the early morning and late afternoon. The fruit may be expected to ripen from about the middle of October to January, and if the sorts are good will be of excellent quality. When the trees are at rest the soil must not be kept too wet, since this will produce a sickly condition, through the loss of the small feeding roots. The trees require little pruning or training. The tips of the stronger shoots are just pinched out when they have made about 6 in. of growth, but when a branch appears to be robbing the rest, or growing ahead of them, it should be shortened back or tied down.

When grown for the production of flowers, which are always in great request, the plants must be treated in a similar manner to that already described, but may do without bottom heat.

For details of orange varieties, cultivation, &c, see Risso and Poiteau, Histoire et culture des orangers (edited by A. Du Breuil, Paris, 1872); for early history and diffusion, G. Gallesio, Traite du citrus (Paris, 181 1). A useful modern handbook is Citrus Fruits and their Culture, by Harold Hume (New York, 1907).

There are many varieties of the sweet orange that ma> “be grown under glass in the British Isles. Amongst the best for dessert is the St Michaels, a heavy cropper with large juicy fruits; and closely related are Bittencourt, Egg, Bom Louise, Sustain, Excelsior and Brown’s Orange. The White Orange,

so called from its pale skin, is excellent. Silver or Plata is a sweet, pale-coloured variety with a curious weal-like orange stripe, the fruit being rather small but heavy. Embiguo, or the Washington Navel Orange; produces splendid fruit under glass. The Jaffa, with large oblong fruits and large wavy crinkled leaves, although a shy bearer, makes up for this in the size of its fruits. The Maltese Blood Orange is remarkable for the blood-like stains in the pulp, although these are not present in every fruit even on the same tree.

Other kinds of oranges are the Tangerine with small aromatic fruits and willow-like leaves. The Seville orange is a handsome free-flowering tree, but its fruits are bitter and used only for preserving and marmalade.

ORANGEBURG, a city and the county-seat of . Orangeburg county, South Carolina, U.S.A., on the North Edisto river, 50 m. S. by E. of Columbia. Pop. (1890) 2964; (1900) 4455 (2518 negroes) ; (1910) 5906. Orangeburg is served by the Atlantic Coast Line and the Southern railways. It is the seat of Claflin University for negroes, and of the State Colored Normal, In- dustrial, Agricultural and Mechanical College. Claflin University, incorporated in 1869, was named in honour of Lee Claflin (1791- 187 1) of Massachusetts, and is under the control of the. Freed- men's Aid and Education Society of the Methodist Episcopal Church. In 1908 it had 25 instructors and 538 students (241 men and 297 women). The State Colored Normal, Industrial, Agri- cultural and Mechanical College was established here by the state in 1872 as the College of Agriculture and Mechanics' Institute (for negroes), on property immediately adjoining the campus of Claflin University, and the two schools were under one manage- ment (although otherwise distinct and separate) until 1896, when the present name of the state college was adopted. Among the city's manufactures are cotton-seed oil, cotton (yarn and cloth), lumber, bricks, concrete and turpentine. The munici- pality owns the water-works and the electric-lighting plant. A trader and trapper settled on the site of what is now Orangeburg in 1704. In 1735 a company of Germans and Swiss established the first real settlement and named it Orangeburg, in honour of the prince of Orange. Orangeburg was incorporated as a town in 1 85 1, and was first chartered as a city in 1883.

ORANGE FREE STATE, an inland province of British South Africa;

formerly — from 1854 to 1900 — an independent republic. From May 1900 to June i9ioit was known as the Orange River Colony, since when under the style of Orange Free State it has formed a province of the Union of South Africa. It lies north of the Orange and south of the Vaal rivers, between 26 30′ and 30° 40′ S. and 24 20′ and 29° 40′ E., and has an area of 50,392 sq. .m., being nearly the size of England. It is surrounded by other British possessions, being bounded N. by the Transvaal, E. by Natal, S.E. by Basutoland, S. and W. by the Cape province. Its greatest length is 356 m., its greatest breadth 304 m.

Physical Features. — The country forms part of the inner tableland of South Africa and has an elevation of between 4000 and 5000 ft. On the N.E. or Natal border the crest of the Drakensberg forms the frontier. The northern slopes of Mont aux Sources (11,000 ft.), the highest land in South Africa, are within the province, as are also the Draken's Berg (5682 ft.), the mountain from which the range takes its name, Melanies Kop (7500 ft.) and Platberg (about 8000 ft.), near Harrismith. Though rugged in places, with outlying spurs and secondary chains, the westward slopes of the Drakensberg are much gentler than the eastern or Natal versant of the chain. Several passes exist through the mountains, that of Van Reenen, 5500 ft., being traversed by a railway. From the mountainous eastern district the country dips gradually westward. No natural boundary marks the western frontier, a line across the veld (separating it from the Griqualand West district of the Cape) from the Orange to the Vaal rivers.

The aspect of the greater part of the country is that of vast undulating treeless plains, diversified by low rands and isolated tafelbergs and spitzkops, indicating the former level of the country. These hills are either of sandstone or ironstone and in altitude vary from about 4800 ft. to 5300 ft. Ironstone hills are numerous in the south-west districts. The whole country forms part of the

drainage basin of the Orange river, its streams, with insignificant exceptions, being tributaries of the Vaal or Caledon affluents of that river. The watershed between the Vaal and Caledon is formed by chains of hills, which, leaving the main range of the Drakensberg at Mont aux Sources, sweep in semicircles west and south. These hills are known as the Roodebergen, Wittebergen, Korannaberg, Viervoet, &c, and rise to nearly 7000 ft. The well-known Thaba Nchu (Black Mountain) is an isolated peak between this range and Bloemfontein. Three-fourths of the country lies north of these hills and is typical veld; the valley of the Caledon, sheltered east- ward by the Maluti Mountains in Basutoland, is well watered and extremely fertile. The

Caledon, from its source in Mont aux Sources to Jammerberg Drift near Wepener, forms the boundary of the province, the southern bank being in Basutoland; below Wepener the land on both sides of the Caledon is in the province. Here, between the Caledon and the Orange, is the fertile district of Roux- ville. The north bank of the Orange, from the Kornet Spruit con- fluence to a point a little east of the spot where the railway from Cape Town to Kimberley crosses the river, forms the southern frontier of the province. The chief tributaries of the Vaal (q.v.) wholly or partly within the province are, going from east to west, the Klip (this stream from near its source to its confluence with the Vaal divides the Free State from the Transvaal), the Wilge, Rhe- noster, Vet, Modder and Reit. The Sand river, on whose banks the convention recognizing the independence of the Transvaal Boers was signed in 1852, is a tributary of the Vet and passes through the centre of the country. All the affluents of the Vaal mentioned flow north or west. The Vaal itself for the greater part of its course forms the boundary between the province and the Transvaal. From the Klip river confluence it flows west and south-west, entering Griqualand West above Kimberley. The river beds are generally 40 to 80 ft. below the level of the surrounding land. Most of the rivers have a considerable slope and none is navigable. Except the Caledon, Vaal and Orange, they are dry or nearly dry for three or four months in the year, but in the rainy season they are often raging torrents. The valleys of the Modder, Reit and the lower Caledon contain rich alluvial deposits. Besides the rivers Water is obtained from numerous springs. A remarkable feature of the western plains is the large number of salt pans and salt springs grouped together in extensive areas, especially in the Boshof district.

Geology. — Except a small area around Vredefort in the north, the whole of the province is occupied by rocks of Karroo age. At Vredefort there is a granitic boss, belonging to the Swaziland series, regarded as being an intrusive in the overlying Witwatersrand series by G. A. F. Molengraaff, but to be of older date by F. A. Hatch. This boss is bounded, except on the south, by the Witwatersrand series, the lower portion of which consists of quartzites and slates and the upper portion of quartzites and conglomerates. At Hoopstad and at Stinkhoutboom the Witwatersrand series is unconformably overlain by 500 ft. of boulder beds and amygdaloidal lavas belonging to the Vaal River System. The Black Reef series of quartzites and conglomerates and dolomite form a narrow outcrop resting uncon- formably upon the last-mentioned system. Of the Karroo System all the groups from the basal Dwyka Conglomerate to the Cave Sandstone of the Stormberg series (see Cape Colony) are repre- sented; but these rocks have not

been so minutely subdivided as in the Cape. The Dwyka Conglomerate forms a narrow outcrop in the north-west, and is known from boreholes to extend over large areas beneath the Ecca Shales and to rest directly on rocks of older age. At Vierfontein a seam of coal is worked above it. The Ecca series extends over the major portion of the province. It consists mainly of sandstones, but these are often thin-bedded and pass into shales. Impressions of plants and silicified stems are frequently found. The Beaufort series occupies a portion of the area formerly regarded as being composed of the Stormberg beds. The pre- vailing rocks are sandstones, mudstones and shales. Reptilian remains abound ; plants are also plentiful. The Stormberg series is confined to the north-east. 1

Climate. — Cut off from the warm, rain-bearing winds of the Indian Ocean by the Drakensberg, the country is swept by the winds from the dry desert regions to the west. It is also occasionally subject to hot, dry winds from the north. The westerly wind is almost constant and, in conjunction with the elevation of the land, greatly modifies the climatic conditions. The heat usual in sub- tropical countries is tempered by the cool breezes, and the atmosphere is dry and bracing. The climate indeed is noted for its healthiness, the chief drawback being dust-storms. The average temperature for the four winter months — May-August — is 49 F. ; hard frosts at night are then common. For the other eight months the average temperature is 66°, December-February being the hottest months. The average daily range of the thermometer is from 25° to 30 °,

1 See for geology, A. H. Green, ” A Contribution to the Geology and Physical Geography of the Cape Colony,” Quart. Journ. Geol. Soc. vol. xliv., 1888; E. J. Dunn, Geological Sketch Map of S. Africa (Melbourne, 1887); D. Draper, ” Notes on the Geology of South-Eastern Africa,” Quart. Journ. Geol. Soc. vol. 1., 1894; F. H. Hatch and G. S. Corstorphine, The Geology of South Africa (and ed. London, 1909).

the highest recorded range in one day being 74° (from 20° to 94 °). Rain falls on from sixty to seventy days during the year, chiefly in the summer (December- April). Rain is generally preceded by thunder and lightning and falls heavily for a short period. Most of the water runs off the surface into the spruits and in a little while the veld is again dry. The western part of the province is driest, as the rain clouds often

pass over the lower levels but are caught by the eastern hills. The average annual rainfall varies from 18 in. or less in the west to 24 in. in the central regions and 30 in the eastern highlands.

Flora and Fauna. — The flora is typical of a region of scanty rain- fall. Over the greater part of the plains little now grows save veld, the coarse long grass of South Africa. Formerly, much of the country was covered with mimosa bush, but the trees were to a large extent cut down by the early white immigrants. Thorny acacias, euphorbias and aloes are still, however, found in patches on the plains. Timber trees are almost confined to the river valleys, where willows, yellow wood, iron wood, red wood, mimosas and, in deep gorges, the wild fig are found. The tobacco plant also grows wild. In moist regions ferns and mosses, the arum and other broad flat-leaved plants are found. The characteristic plants are thorny and small leaved, or else bulbous. Among veld plants the elands- boontje provides tanning material equal to oak bark. European fruit trees and vines flourish in certain localities, while in the drier regions the Australian wattle, gum trees and pepper trees have been introduced with success.

The fauna has undergone a great alteration since the first white settlers entered the country. Big game was then abundant. The elephant, giraffe, lion, leopard, hyena, zebra, buffalo, gnu, quagga, kudu, eland and many other kinds of antelope roamed the plains; the rhinoceros, hippopotamus and crocodile lived in or frequented the rivers, and ostriches and baboons were numerous. The immigrant farmers ruthlessly shot down game of all kinds and most of the animals named were exterminated, so far as the province was concerned. Of animals still found may be mentioned baboons and monkeys, the leopard, red lynx (Felis caracal), spotted hyena, aard wolf, wild cat, long-eared fox, jackals of various kinds, the dassie or rock rabbit, the scaly anteater, the ant bear (aardvaark), the mongoose and the spring haas, a rorfent of the jerboa family. Antelope of any kind are now scarce; a few white- tailed gnu are preserved. None of the dangerous wild beasts is common, but there are several varieties of poisonous snakes. Scorpions and tarantulas are numerous, and lizards, frogs, beetles, ants, butterflies, moths and flies are abundant. Locusts are an intermittent plague. There are few earthworms or snails. The birds_ include eagles — some are called lammervangers from their occasional attacks on young lambs — vultures, hawks, kites, owls, crows, ravens, the secretary bird, cranes, a small white heron, quails, partridges, korhaans, wild geese, duck, and guineafowl, swallows, finches, starlings, the mossie or Cape sparrow, and the widow bird, noted for the length of its tail in summer. Barbel and yellow mudfish are found in the rivers.

Inhabitants.— The Bushmen (q.v.) are, presumably, the oldest inhabitants of this, as of many other parts of South Africa. Next came the Hottenots (q.v.), and in the 16th century Bantu negroes of the Bechuana tribes appear to have established themselves in the country. The Barolong, one of the oldest Bechuana tribes, are believed to have entered the country sub- sequently to the Bakuena, the particular tribe from which the general name of the race is derived (seeBECHUANA; andTRANSVAAL: Inhabitants). Clans representing the southern Bakuena were welded together into one tribe in the 10th century, and are now known as Basuto (see Basutoland). The Basuto were already a strong force when the first white settlers, Dutch farmers from the Cape, entered the country in 1824; the white element has since been reinforced by a considerable strain of British, particu- larly Scottish, blood. Since the advent of the whites there has also been a considerable immigration of Zulus. The majority of the inhabitants live in the eastern part of the country; the arid regions west of the main railway line containing a scanty pastoral population and no towns of any size. The first census, taken in 1880, showed a total population of 133,518; in 1890 there were 207,503 inhabitants — an increase in ten years of 55-41% — and at the census of 1904 there were 387,315 inhabitants, a further increase of 85-56%. The density in 1904 was under 8 persons per sq. m. The inhabitants are officially divided into ” Europeans or white,” ” aboriginal natives” and ” mixed and other coloured races.” Between 1880 and 1904 the proportion of whites dropped from 45‘7°% to 36-84%. Of the 142,679 white inhabitants in 1904, 85,036 were born in the province; 29,727 in the Cape; 3116 in the Transvaal; 1835 in Natal, and 18,487 in the United Kingdom. Of the 2726 European

immigrants born in non-British states 1025 came from Russian Poland.

According to the 1904 census classification the ” aboriginal inhabitants” numbered in that year 229,149. In this term are included, however, Zulu-Kaffir immigrants. The tribe most largely represented was the Basuto (130,213 persons), former owners of considerable tracts in the eastern part of the country, now known as ” The Conquered Territory.” In the eastern districts of Harrismith, Bethlehem, Ficksburg and Ladybrand the Basutos are largely concentrated. Barolong numbered 37,998 and other Bechuana 5115. Of the Zulu- Kaffir tribes Zulus proper numbered 35,275, Fingoes 6275, and Ama Xosa 5376 (see Kaffirs; and Zululand: Inhabitants). The Bushmen numbered 4048 persons. Of these 1 1 3 1 were in the Bloemfontein district. The Bushmen have left in drawings on caves and in rocks traces of their habitation in regions where they are no longer to be found. In Thaba’nchu a petty Barolong state enjoyed

autonomy up to 1884, and the majority of the Barolong are found in that district and the adjoining district of Bloemfontein. The Zulus are mostly found in that part of the country nearest Zululand. In 1904 the number of persons belonging to ” mixed and other coloured races” was 15,487. The proportion between the sexes was, for all races, 84-35 females to 1 00 males; for white inhabitants only 74-91 females to 100 males; for aboriginal inhabitants only 90-86 females to 100 males. Of the population above fifteen years old 55-87% of the men and 33-69% of the women were unmarried. Among whites for every 100 unmarried men there were 65-33 unmarried women; there were 93-04 married women for every 100 married men, and 173-81 widows for every 100 widowers.

Classified by occupations the census of 1904 gave the following results: dependants, mainly young children, 28-53%; agri- culture, 39-51%; commercial and industrial pursuits, 7-62%; professional, 3-18%; domestic (including women living at home other than those helping in farm work), 15-75%. Divided by races 8-19% of the whites were engaged in professional work and only 0-26% of the coloured classes.

Chief Towns. — The capital, Bloemfontein (pop. in 1904, 33,883), is fairly centrally situated on the trunk railway to Johannesburg. Kroonstad (pop. 7191) lies 127 m. N.N.E. of Bloemfontein on the same railway line. Harrismith, 8300, is in the N.E. of the colony, 60 m. by rail from Ladysmith, Natal. Jagersfontein, 5657, is m the S.W. of the province and owes its importance to the existence there of a diamond mine. Ladybrand, 3862, Ficksburg, 1954, ana Wepener, 1366, lie in the valley of the Caledon near the Basutoland frontier. Winburg, 2762, lies between Bloemfontein and Kroonstad. All these towns are separately noticed. Other towns on the trunk railway, going from south to north, are Springfontein, 1000, an important railway junction; Trompsburg, 1378; Edenburg, 1562, and Brandfort, 1977. In the S.E. Thaba’nchu, 1134, Zastron, 1157, Dewetsdorp, 971 (named after the father of Christian De Wet), Reddersburg, 750, Smithfield, 999, and Rouxville, 990. These are all centres of fine agricultural regions. Bethulie, 1686, on the Orange river, in the ” Conquered Territory,” has been the scene of the labours of French Protestant missionaries since 1832, and possesses a fine park. Through it passes the main line from East London. In the N.E. are: Bethlehem, 1777, on the railway, 57 m. W. of Harrismith, an agricultural and coal- mining centre; Senekal, 1039; Heilbron, 1544; Vrede, 1543; Frankfort, 747; Lindley, 646; and Reitz, 526. In the north-west of the trunk railway are: Parijs, 1732, finely situated on the Vaal, and Vredefort, 759. Farther west and south are: Hoopstad, 452, on the Vet river; Boshof,

1308, a fruit and vegetable centre, 30 m. N.E. of Kimberley; and Jacobs- dal, 764. In the S.W. are: Philippolis, 809, at one time capital of the Griqua chief Adam Kok and named after the Rev. John Philip (q.v.). Fauresmjth, 1363, a mining centre, 6 m. W. of Jagers- fontein, and Koffyfontein, 1657, where is a diamond mine. Many of the towns were the scenes of encounters between the Boers and British, March 1900-May 1902. At Boshof fell the leader of the Boers' European Legion, Colonel de Villebois Mareuil, on the 5th of April 1900. At the census of 1904 Harrismith and Kroonstad were the only towns where the white inhabitants outnumbered the coloured population. Nine towns contained more than 1000 white inhabitants, the total white population of these towns being 31,505, of whom 15,501 lived in Bloemfontein.

Communications. — Largely owing to its situation- — being on the direct route between the Cape ports and the Transvaal, and between Durban and Kimberley — the province possesses an extensive net- work of railways. The railways are state owned and of the standard South African gauge — 3 ft. 6 in. They may be divided into two

systems, (1) those connecting the province with the Cape and the Transvaal, and (2) those linking it with Natal.

The first system consists of a trunk line, formed by the junction of lines from Cape Town and Port Elizabeth, which crosses the Orange at Norvals Pont, traverses the province from south to north, passing through Bloemfontein and Kroonstad, and enters the Transvaal at Viljoens Drift (331 m. from Norvals Pont), being con- tinued thence to Johannesburg. This line is joined at Springfontein by a railway from East London which crosses the Orange near Bethulie. From Bloemfontein a line (102 m. long) runs west to Kimberley, on the main line from Cape Town to Rhodesia, and from Springfontein a branch (56 m. long), goes past Jagersfontein to Fauresmith.

The second system is formed by a line leaving the Natal trunk railway at Ladysmith which crosses the Drakensberg at Van Reenen's Pass and is continued thence through Harrismith to Bethlehem. At Bethlehem it divides, one branch going N.W. to Kroonstad (178 m. from the Natal border and 393 m. from Durban), the other S.W. along the Caledon valley to Modderpoort near Ladybrand, and thence directly west to Bloemfontein. The distance from Van Reenen's Pass to Bloemfontein

by this route is 278 m. The two systems, it will be seen, are doubly connected, namely at Bloem- fontein and at Kroonstad, and the lines running east from those towns afford the quickest connexion between Cape Town and Durban. Besides the lines enumerated there are various local lines, one branching at Sannah's Post station from the Bloemfontein- Bethlehem line running south-east to Wepener. Another branch from the same line crosses the Caledon to Maseru, Basutoland. In 19 10 there were in all 1060 m. of railway open in the province. There are well-kept high-roads connecting all the towns,and a government service of mail carts to places not on the railway. The light Cape cart is largely used, and the wagon, drawn by a team of oxen, is still employed by farmers to bring their produce to market. There is an extensive telegraphic system and a well-organized postal service.

Agriculture. — The chief industry is agriculture, including sheep farming and stock raising. The dry western plains are best adapted for sheep rearing, while the well-watered eastern regions are specially suitable for the growing of cereals and also for horse breeding. The land under cultivation in 1904 was 371,515 morgen (a morgen is 2′ 1 1 acres) or about 1230 sq. m. The chief crop is mealies, the staple food of the natives; wheat, oathay, Kaffir corn and oats coming next. Little barley is cultivated. The " Conquered Territory," that is the valley of the Caledon, is the most fertile region and is styled tha granary of South Africa. Here, in the districts of Lady- brand, Ficksburg, Bethlehem and Rouxville, most wheat is grown, The same regions, together with the adjacent regions of Harrismith and Thaba'nchu, produce the most oats and oathay. Besides grains the chief crops are those of pumpkins, potatoes and other table vegetables, and tobacco. The cultivation of potatoes and tobacco largely increased between the census years 1890 and 1 904. The principal tobacco-growing regions are Vredefort, which produced 258,645 lb in 1904, and Kroonstad (80,385 lb), the districts of Bethlehem, Ladybrand and Winburg also producing considerable quantities. Fruit farming engages attention, about 8000 morgen being devoted to orchards in 1904. The fruit trees commonly cultivated are the peach, apricot, apple, orange, lemon, pear, fig and plum.

The rearing of live stock, the chief pursuit of the first Dutch settlers, is an important industry. Rinderpest and other epidemic diseases swept over the country in 1 895-1 896, and during the war of 1 899- 1 902 the province was practically denuded of live stock. There was a rapid increase of stock after the close of hostilities. Sheep numbered over 5,000,000 in 1910, cattle over 600,000, horses over 100,000, goats (chiefly owned by natives) over 1,000,000. Large numbers of pigs are reared. Ostrich farming is growing in favour. The eastern and south-

eastern districts have the greatest amount of stock per square mile, Ficksburg leading in cattle, horses and mules. Sheep are most abundant in the Rouxville, Wepener and Smithfield districts, goats in Philippolis. The dairying industry is increasing. The Afrikander cattle, powerful draught animals, large horned, bony and giving little milk, are being crossed with other stock. A government Department of Agriculture, created in 1904, affords help to the farmers in various ways, notably in com- batting insect plagues, in experimental farms, and in improving the breed of horses, sheep and cattle.

Land Settlement. — Under the provisions of a Land Settlements Ordinance of 1902 over 1,500,000 acres of crown land had been by 1907 allotted, and in September 1909 there were 642 families, of whom over 570 were British, settled on the land. In 1907 a Land Settle- ment Board was created to deal with the affairs of these settlers. At the end of five years the Board was to hand over its duties to the government.

Diamond Mining and other Industries. — Next to agriculture the most important industry is that of diamond mining. The chief diamond mines are at Jagersfontein (q.v.) and Koffyfontein. There are also diamond mines in the Winburg and Kroonstad districts, and near Ficksburg, where old workings have been found 40 ft. deep. The alluvial deposits on the banks of the Vaal, N.E. of Kimberley, yield occasional diamonds of great purity. The value of the output

from the diamond mines rose from £224,000 in 1890 to £1,508,000 in 1898. The war hindered operations, but the output was valued at £648,000 in 1904 and at £1,048,000 in 1909.

Coal-mines are worked in various districts in the north near the Vaal, notably at Vierfontein, and at Clydesdale, which lies a few miles south of Vereeniging. Before 1905 the mines were little worked ; in that year the output was 1 18,000 tons, while in 1907 over 500,000 tons were raised. It dropped to 470,000 in 1909 owing to loss of railway contracts.

Of other minerals gold has been found, but up to 1909 was not worked; iron ore exists near Kroonstad and Vredefort, but it also is not worked. Petroleum has been found in the Ficksburg, Ladybrand and Harrismith districts, and is pumped to a limited extent. Good building stone is obtained near Bloemfontein, Lady- brand and other places, and excellent pottery clay near Bloemfontein.

Besides the industries mentioned flour-milling, soap-making, and the

manufacture of jam and salt are carried on. During 1905 over 12,300,000 lb of salt were obtained from the salt springs at Zoutpan, near Jacobsdal, and Haagenstad, to the west of Brandfort. In 1907 the output had increased to nearly 23,000,000 lb.

Trade. — The bulk of the direct trade of the country is with the Cape and the Transvaal, Natal, however, taking an increasing share. Basutoland comes fourth. Its chief exports are diamonds, live stock (cattle, horses and mules, sheep and goats), wool, mohair, coal, wheat and eggs. Except the diamonds, which go to London via Cape Town, all the exports are taken by the neighbouring territories. The principal imports, over 90% being of British origin, are cotton goods, clothing and haberdashery, leather, boots, &c, hardware, sugar, coffee, tea and furniture.

The volume of trade in 1898, as represented by imports and exports, was £3,114,000 (imports £1,190,000; exports £1,923,000). For the four years beginning on June 30, 1902, that is immediately after the close of hostilities, the imports increased from, £2, 460,000 to £4,053,000, the exports from £285,000 to £3,045,000. For the fiscal year 1908-1909 the imports were valued at £2,945,000, the exports at £3,558,000. About a third of the imports are the produce or manufactures of other South African countries. Imported goods re-exported are of comparatively slight value— some £381,000 in

1908-1909.

Constitution. — From July 1907 to June 19 10 the province was a self-governing colony. It is now represented in the Union parliament by sixteen senators and seventeen members of the house of assembly. For parliamentary purposes the province is divided into single-member constituencies. The franchise is given to all adult white male British subjects. There is no property qualification, but six months' residence in the province is essential. There is a biennial registration of voters, and every five years the electoral areas are to be redivided, with the object of giving to each constituency an approximately equal number of voters. The qualifications for membership of the assembly are the same as those for voters.

At the head of the provincial government is an administrator (who holds office for five years) appointed by the Union ministry. This official is assisted by an executive committee of four members elected by the provincial council. The provincial council con- sists of 25 members (each representing a separate constituency) elected by the parliamentary voters and has a statutory existence of three years. Its

powers are strictly local and delegated. The control of elementary education was guaranteed to the council for a period of five years following the establish- ment of the Union.

Justice. — The law of the province is the Roman-Dutch law, in so far as it has been introduced into and is applicable to South Africa, and as amended by local acts. Bloemfontein is the seat of the Supreme Court of the Union of South Africa and also of a provincial division of the same court. For judicial purposes the province is divided into twenty-four divisions, in each of which is a resident magistrate, who has limited civil and criminal jurisdiction. There are also special justices of the peace, having criminal jurisdiction in minor cases. The provincial court has jurisdiction in all civil and criminal matters, and is a court of appeal from all inferior courts, From it appeals can be made to the Appellate Division of the Supreme Court. Criminal cases are tried before one judge and a jury of nine, who must give a unanimous opinion. Circuit courts are also held by judges of the provincial court.

Finance. — The bulk of the revenue, e.g. that derived from customs and railways, is now paid to the Union government, but the pro- vincial council has power to levy taxes and (with the consent of the Union ministry) to raise loans for strictly provincial purposes. In 1870-1871, when the province was an independent state and possessed neither railways nor diamond mines, the revenue was £78,000 and the expenditure £71,000; in 1884-1885 the revenue had risen to £228,000 and the expenditure to £229,000; in 1898, the last full year of the republican administration, the figures

were: revenue; including railway profits, £799,000; expenditure, including outlay on new railways, £956,000. Omitting the figures during the war period, the figures for the year ending June 1903 were: revenue, £956,000; expenditure, £839,000. The depression in trade which followed caused a reduction in revenue, the average for the years 1904-1909 being: revenue, £820,000; expenditure, £819,000. These figures are exclusive of railway receipts and ex- penditure (see Transvaal: Finance).

Religion. — The vast majority (over 95 %) of the white inhabitants are Protestants, and over 70 % belong to the Dutch Reformed Church, while another 3 % are adherents of the very similar organi- zation, the Gereformeerde Kerk. Anglicans are the next numerous body, forming

12-53% ot the white population. The Wesleyans number nearly 4% of the inhabitants. The Roman Catholics number 2-30% of the whites, the head of their church in the province being a vicar apostolic. At the head of the Anglican community, which is in full communion with the Church of England, is the bishop of Bloemfontein, whose diocese, founded in 1863, includes not only the Orange Free State, but Basutoland, Griqualand West and British Bechuanaland. All the churches named have missions to the natives, and in 1904, 104,389 aboriginals and 10,909 persons of mixed race were returned as Protestants, and 1093 aboriginals and 117 of mixed race as Roman Catholics. The total number of persons in the country professing Christianity was 251,904 or 65 . The Dutch Reformed Church had the largest number (21,272) of converts among the natives, the Wesleyans coming next. The African Methodist Episcopal (Ethiopian) Church had 41 10 members, of whom only two were whites. The Jewish community numbered 1616. Nearly 33 of the population, 127,637 persons, were re- turned officially at the census of 1904 as of ‘ no religion,” under which head are classed the natives who retain their primitive forms of belief, for which see Kaffirs, Bechuanas, &c.

Education. — At the census of 1904, 32-57 % of the total population could read and write; of the whites over fifteen years old 82-63% could read and write. Of the aboriginals, 8-15% could read and write; of the mixed and other races, 12-28%. In the urban areas the proportion of persons, of all races, able to read and write was 50-67%; in the rural areas the proportion was 26-43%. By sexes, 35% of males and 29-63 % of females could read and write.

Elementary education is administered by the provincial council, assisted by a permanent director of education. From 1900 to 1905 the schools were managed, teachers selected and appointed and all ex- penses borne by the government. They were of an undenominational character and English was the medium of instruction. The teaching of Dutch was optional. In 1904ˆ the Dutch Reformea Church started Christian National {i.e. Denominational) Schools, but in March 1905 an agreement was come to whereby these schools were amalgamated with the government schools, and in June 1905 a further agreement was arrived at between the government and the leading religious denominations. By this arrangement ” religious instruction of a purely historical character ” was given in all government schools for two hours every week, and might be given in Dutch. Further, ministers of the various denominations might give, on the special request of the parents, instruction to the children of their own congregations for one hour on one day in each week. The attendance at government schools reached in 1908 a total of nearly 20,000, as against 8000 in 1898, the

highest attendance recorded under re- publican government. On the attainment of self-government the colonial legislature passed an act (1908) which in respect to primary and secondary education made attendance compulsory on all white children, the fee system being maintained. English and Dutch were, nominally, placed on an equal footing as media of instruction. Every school was under the supervision of a committee elected by the parents of the children. Schools were grouped in districts, and for each district there was a controlling board of nine members, of whom five were elected by the committees of the separate schools and four appointed by the government. Religious instruction could only be given by members of the school staff. Dogmatic teaching was prohibited during school hours, except in rural schools when parents required such teaching to be given. The application of the provision as to the media of instruction gave rise to much friction, the English-speaking community complaining that in- struction in Dutch was forced upon their children (see further, § History). Primary education for natives is provided in private schools, many of which, receive government grants. In 1908 over 10,000 natives were in attendance at schools.

Provision is made for secondary education in all the leading town schools, which prepare pupils for matriculation. At Bloem- fontein is a high school for girls, the Grey College school for boys, and a normal school for the training of teachers. The Grey Uni- versity College is a state institution providing university education for the whole province. It is affiliated to the university of the Cape of Good Hope.

History.

The country north of the Orange river was first visited by Europeans towards the close of the 18th century. At that time

it was somewhat thinly peopled. The majority of the in- habitants appear to have been members of the Bechuana division of the Bantus, but in the valleys of the” Establish- Orange and Vaal were Korannas and other Hottentots, ment ot and in the Drakensberg and on the western border lived a Boer numbers of Bushmen. Early in the 19th century re i’ ublc ‘ Griquas established themselves north of the Orange. Between 181 7 and 1 83 1 the country was devastated by the chief Mosilikatze and his Zulus, and large areas were depopulated. Up to this time the few white men who had crossed the Orange had been chiefly hunters or missionaries. In 1824 Dutch farmers from Cape Colony seeking pasture for their flocks settled in the country. They were followed in 1836 by the first parties of the Great Trek. These emigrants left Cape Colony from various motives, but all were

animated by the desire to escape from British sovereignty. (See South Africa, History; and Cape Colony, History.) The leader of the first large party of emigrants was A. H. Potgieter, who concluded an agreement with Makwana, the chief of the Bataung tribe of Bechuanas, ceding to the farmers the country between the Vet and Vaal rivers. The emigrants soon came into collision with Mosilikatze, raiding parties of Zulus attack- ing Boer hunters who had crossed the Vaal without seeking permission from that chieftain. Reprisals followed, and in November 1837 Mosilikatze was decisively defeated by the Boers and thereupon fled northward. In the meantime another party of emigrants had settled at Thaba'nchu, where the Wesleyans had a mission station for the B'arolong. The emigrants were treated with great kindness by Moroko, the chief of that tribe, and with the Barolong the Boers maintained uniformly friendly relations. In December 1836 the emigrants beyond the Orange drew up in general assembly an elementary republican form of government. After the defeat of Mosilikatze the town of Winburg (so named' by the Boers in commemoration of their victory) was founded, a volksraad elected, and Piet Retief, one of the ablest of the voortrekkers, chosen " governor and commandant-general." The emigrants already numbered some 500 men, besides women and children and many coloured servants. Dissensions speedily arose among the emigrants, whose numbers were constantly added to, and Retief, Potgieter and other leaders crossed the Drakensberg and entered Natal. Those that remained were divided into several parties intensely jealous of one another.

Meantime a new power had arisen along the upper Orange and in the valley of the Caledon. Moshesh, a Bechuana chief of high descent, had welded together a number of scattered and broken clans which had sought refuge in that Ba l r, ˆ l mountainous region, and had formed of them the wlth Basuto nation. In 1833 he had welcomed as workers British, among his people a band of French Protestant mission- Basutos aries, and as the Boer immigrants began to settle &iqaas. in his neighbourhood he decided to seek support from the British at the Cape. At that time the British govern- ment was not prepared to exercise effective control over the emigrants. Acting upon the advice of Dr John Philip, the superintendent of the London Missionary Society's stations in South Africa, a treaty was concluded in 1843 with Moshesh, placing him under British protection. A similar treaty was made with the Griqua chief, Adam Kok III. (See Basutoland and Griqualand.) By these treaties, which recognized native sovereignty over large areas on which Boer farmers were settled, it was sought to keep a check on the emigrants and to protect both the natives and

Cape Colony. Their effect was to precipitate collisions between all three parties. The year in which the treaty with Moshesh was made several large parties of Boers recrossed the Drakensberg into the country north of the Orange, refusing to remain in Natal when it became a British colony. During their stay there they had inflicted a severe defeat on the Zulus under Dingaan (December 1838), an event which, following on the flight of Mosilikatze, greatly strengthened the position of Moshesh, whose power became a menace to that of the emigrant farmers. Trouble first arose, however, between the Boers and the Griquas in the Philippolis district. Many of the white

farmers in this district, unlike their fellows dwelling farther north, were willing to accept British rule, and this fact induced Mr Justice Menzies, one of the judges of Cape Colony then on circuit at Colesberg, to cross the Orange and proclaim (October 1842) the country British territory, a proclamation disallowed by the governor, Sir George Napier, who, nevertheless, maintained that the emigrant farmers were still British subjects. It was after this episode that the treaties with Adam Kok and Moshesh were negotiated. The treaties gave great offence to the Boers, who refused to acknowledge the sovereignty of the native chiefs. The majority of the white farmers in Kok's territory sent a deputation to the British commissioner in Natal, Henry Cloete, asking for equal treatment with the Griquas, and expressing the desire to come, on such terms, under British protection. Shortly afterwards hostilities between the farmers and the Griquas broke out. British troops were moved up to support the Griquas, and after a skirmish at Zwartkopjes (May 2, 1845) a new arrange- ment was made between Kok and Sir Peregrine Maitland, then governor of Cape Colony, virtually placing the administration of his territory in the hands of a British resident, a post filled in 1846 by Captain H. D. Warden. The place chosen by Captain (afterwards Major) Warden as the seat of his court was known as Bloemfontein, and it subsequently became the capital of the whole country.

The volksraad at Winburg during this period continued to claim jurisdiction over the Boers living between the Orange Annexa- an(ˆ tne Vaal and was in federation with the volksraad tiott by at Potchefstroom, which made a similar claim upon the Qreat Boers living north of the Vaal. In 1 846 Major Warden

Britain. occupied Winburg for a short time, and the relations between

the Boers and the British were in a continual state of tension. Many of the farmers deserted Winburg for the Transvaal. Sir Harry Smith became governor of the Cape at the end of 1847. He recognized the failure of the attempt to govern on the lines of the treaties with the Griquas and Basutos, and on the 3rd of February 1848 he issued a proclamation declaring British sovereignty over the country between the Orange and the Vaal eastward to the Drakensberg. The justness of Sir Harry Smith's measures and his popularity among the Boers gained for his policy considerable support, but the republican party, at whose head was Andries Pretorius (q.v.), did not submit without a struggle. They were, however, defeated by Sir Harry Smith in an engagement at Boomplaats (August 29, 1848). Thereupon Pretorius, with those most bitterly opposed to British rule, retreated across the Vaal. In March 1849 Major Warden was succeeded at Bloemfontein as civil commissioner by Mr C. U. Stuart, but he remained British resident until July 1852. A nominated legislative council was created, a high court estab- lished and other steps taken for the orderly government of the country, which was officially styled the Orange River Sovereignty. In October 1849 Moshesh was induced to sign a new arrangement considerably curtailing the boundaries of the Basuto reserve. The frontier towards the Sovereignty was thereafter known as the Warden line. A little later the reserves of other chieftains were precisely denned. The British Resident had, however, no force sufficient to maintain his authority, and Moshesh and all the neighbouring clans became involved in hostilities with one another and with the whites. In 1851 Moshesh joined the republican party in the Sovereignty in an invitation to Pretorius to recross the Vaal. The intervention of Pretorius resulted in the Sand River Convention of 1832, which acknowledged the independence of the Transvaal but left the status of the Sovereignty untouched. The British government (the first Russell administration), which had reluctantly agreed to the annexation of the country, had, however, already repented its decision and had resolved to abandon the Sovereignty. Lord Grey (the 3rd earl), secretary of state for the colonies, in a despatch to Sir Harry Smith dated the 21st of October 1851, declared, " The ultimate abandonment of the Orange Sovereignty should be a settled point in our policy." A meeting of representa- tives of all European inhabitants of the Sovereignty, elected on manhood suffrage, held at Bloemfontein in June 1852, never-

theless declared in favour of the retention of British rule. At' the close of that year a settlement was at length concluded with Moshesh, which left, perhaps, that chief in a strongerposition than he had hitherto been. (See Bastjtoland: History.) There had been ministerial

changes in England and the ministry then in power— that of Lord Aberdeen — adhered to the determina- tion to withdraw from the Sovereignty. Sir George Russell Clerk was sent out in 1853 as special commissioner “for the settling and adjusting of the affairs ” of the Sovereignty, and in August of that year he summoned a meeting of delegates to determine upon a form of self-government. At that time there were some 15,000 whites in the country, many of them recent emigrants from Cape Colony. There were among them numbers of farmers and tradesmen of British blood. The majority of the whites still wished for the continuance of British rule provided that it was effective and the country guarded against its enemies. The representations of their delegates, who drew up a proposed constitution retaining British control, were unavailing. Sir George Clerk announced that, as the elected delegates were unwilling to take steps to form an independent govern- j ndepea(t , ment, he would enter into negotiations with other ence persons. “And then, ” writes Dr Theal, “was seen forced on the strange spectacle of an English commissioner taeBoer s. addressing men who wished to be free of British control as the friendly and well-disposed inhabitants, while for those who desired to remain British subjects and who claimed that protection to which they believed themselves entitled he had no sympathizing word.” While the elected delegates sent two members to England to try and induce the government to alter their decision Sir George Clerk speedily came to terms with a committee formed by the republican party and presided over by Mr J. H. Hoffman. Even before this committee met a royal proclamation had been signed (January 30, 1854) “abandoning and renouncing all dominion” in the Sovereignty. A convention recognizing the independence of the country was signed at Bloemfontein on the 23rd of February by Sir George Clerk and the republican committee, and on the nth of March the Boer government assumed office and the republican flag was hoisted. Five days later the representatives of the elected delegates had an interview in London with the colonial secretary, the duke of Newcastle, who informed them that it was now too late to discuss the question of the retention of British rule. The colonial secretary added that it was impossible for England to supply troops to constantly advancing outposts, “especially as Cape Town and the port of Table Bay were all she really required in South Africa.” In withdrawing from the Sovereignty the British government declared that it had “no alliance with any native chief or tribes to the northward of the Orange River with the exception of the Griqua chief Captain Adam Kok.” Kok was not formidable in a military sense, nor could he prevent individual Griquas from alienating their lands. Eventually, in 1 861, he sold his sovereign rights to the Free State for £4000 and removed

with his followers to the district now known as Griqualand East. (F; R. C.)

On the abandonment of British rule representatives of the people were elected and met at Bloemfontein on the 28th of March 1854, and between that date and the 18th R of April were engaged in framing a constitution. The canruie < country was declared a republic and named the Orange Free State. All persons of European blood possessing a six months' residential qualification were to be granted full burgher rights. The sole legislative authority was vested in a single popularly elected chamber styled the volksraad. Executive authority was entrusted to a president elected by, the burghers from a list submitted by the volksraad. The president was to be assisted by an executive council, was to hold office for five years and was eligible for re-election. The constitution was subsequently modified but remained of a liberal character. A residence of five years in the country was required before aliens could become naturalized. The first president was Mr Hoffman, but he was accused of being too complaisant towards Moshesh and resigned, being succeeded in 1855 by Mr J. N. Boshof, one oi,

the voortrekkers, who had previously taken an active part in the affairs of Natal.

Distracted among themselves, with the formidable Basuto power on their southern and eastern flank, the troubles of the A Trans- infant state were speedily added to by the action of vaal raid the Transvaal Boers. Marthinus Pretorius, who had into the succeeded to his father's position as commandant- ree ' general of Potchefstroom, wished to bring about a confederation between the two Boer states. Peaceful overtures from Pretorius were declined, and some of his partisans in the Free State were accused of treason (February 1857). Thereupon Pretorius, aided by Paul Kruger, conducted a raid into the Free State territory. On learning of the invasion President Boshof proclaimed martial law throughout the country. The majority of the burghers rallied to his support, and on the 25th of May the two opposing forces faced one another on the banks of the Rhenoster. President Boshof not only got together some eight hundred men within the Free- State, but he received offers of support from Commandant Schoeman, the Transvaal leader in the Zoutpansberg district and from Commandant Joubert of Lydenburg. Pretorius and Kruger, realizing that they would

have to sustain attack from both north and south, abandoned their enterprise. Their force, too, only amounted to some three hundred. Kruger came to Boshof's camp with a flag of truce, the " army " of Pretorius returned north and on the 2nd of June a treaty of peace was signed, each state acknowledging the absolute independence of the other. The conduct of Pretorius was stigmatized as " blameworthy. " Several of the malcontents in the Free State who had joined Pretorius permanently settled in the Transvaal, and other Free Staters who had been guilty of high treason were arrested and punished. This experience did not, however, heal the party strife within the Free State. In consequence of the dissensions among the burghers President Boshof tendered his resignation in February 1858, but was for a time induced to remain in office. The difficulties of the state were at that time (1858) so great that the volksraad in December of that year passed a resolution in favour of confederation with the Cape Colony. This proposition received the strong support of Sir George Grey, then governor of Cape Colony, but his view did not commend itself to the British government, and was not adopted (see South Africa: History). In the same year the disputes between the Basutos and the Boers culminated in open war. Both parties laid claims to land beyond the Warden line, and each party had taken possession of what it could, the Basutos being also expert cattle-lifters. In the war the advantage rested with the Basutos; thereupon the Free State appealed to Sir George Grey, who induced Moshesh to come to terms. On the 15th of October 1858 a treaty was signed denning anew the boundary. The peace was nominal only, while the burghers were also involved in disputes with other tribes. Mr. Boshof again tendered his resignation (February 1859) and retired to Natal. Many of the burghers would have at this time welcomed union with the Transvaal, but learning from Sir George Grey that such a union would nullify the conventions of 1852 and 1854 and necessitate the reconsideration of Great Britain's policy towards the native tribes north of the Orange and Vaal rivers, the project dropped. Commandant Pretorius was, however, elected president in place of Mr Boshof. Though unable to effect a durable peace with the Basutos, or to realize his ambition for the creation of one powerful Boer republic, Pretorius saw the Free State begin to grow in strength. The fertile district of Bethulie as well as Adam Kok's territory was acquired, and there was a considerable increase in the white population. The burghers generally, however, had not learned the need of dis- cipline, of confidence in their elected rulers, or that to carry on a government taxes must be levied. Wearied like Mr Boshof of a thankless task, and more interested in affairs in the Transvaal than in those of the Free State, Pretorius resigned the presidency in 1863, and after an interval of seven months Mr (afterwards Sir) John

Henry Brand (q.v.), an advocate at the Cape bar, was elected president. He assumed office in February 1864. His election proved a turning-point in the history of the country,

which, under his beneficent and tactful guidance, became peaceful and prosperous and, in some respects, a model state. But before peace could be established an end had to be made of the difficulties with the Basutos. Moshesh continued B j e a ° d d to menace the Free State border. Attempts at accom- President modation made by the governor of Cape Colony (Sir Philip Wodehouse) failed, and war between the Free State and Moshesh was renewed in 1865. The Boers gained considerable successes, and this induced Moshesh to sue for peace. The terms exacted were, however, too harsh for a nation yet unbroken to accept permanently. A treaty was signed at Thaba Bosigo in April 1866, but war again broke out in 1867, and the Free State attracted to its side a large number of adventurers from all parts of South Africa. The burghers thus reinforced gained at length a decisive victory over their great antagonist, every stronghold in Basutoland save Thaba Bosigo being stormed. Moshesh now turned in earnest to Sir Philip Wodehouse for preservation. His prayer was heeded, and in 1868 he and his country were taken under British protection. Thus the thirty years' strife between the Basutos and the Boers came to an end. The settlement intervention of the governor of Cape Colony led to the of the conclusion of the treaty of AM wal North (Feb. 12, 1869), Basuto which defined the borders between the Orange Free troub,es – State and Basutoland. The country lying to the north of the Orange river and west of the Caledon, formerly a part of Basuto- land, was ceded to the Free State (see Basutoland). This country, some hundred miles long and nearly thirty wide, is a fertile stretch of agricultural land on the lower slopes of the Maluti mountains. It lies at an altitude of nearly 6000 ft., and is well watered by the Caledon and its tributaries. It has ever since been known as the Conquered Territory, and it forms to-day one of the richest corn-growing districts in South Africa. A year after the addition of the Conquered Territory to the state another boundary dispute was settled by the arbitration of Mr Keate, lieutenant-governor of Natal. By the Sand River Convention independence had been granted to the Boers living " north of the Vaal," and the dispute turned on the question as to what stream constituted the true upper course of that river. Mr Keate decided (Feb. 19, 1870) against the Free State view and fixed the Klip river as the dividing line, the Transvaal thus securing the Wakkerstroom and adjacent districts.

The Basutoland difficulties were no sooner arranged than the Free Staters found themselves confronted with a serious difficulty on their

western border. In the years 1870-1871 a Di scoverr large number of diggers had settled on the diamond of the fields near the junction of the Vaal and Orange rivers, Klmberley which were situated in part on land claimed by the % a ˆ. ond Griqua chief Nicholas Waterboer and by the Free State. The Free State established a temporary government over the diamond fields, but the administration of this body was satisfactory neither to the Free State nor to the diggers. At this juncture Waterboer offered to place the territory under the administration of Queen Victoria. The offer was accepted, and on the 27th of October 187 1 the district, together with some adjacent territory to which the Transvaal had laid claim, was proclaimed, under the name of Griqualand West, British territory. Waterboer's claims were based on the treaty concluded by his father with the British in 1834, and on various arrangements with the Kok chiefs; the Free State based its claim on its purchase of Adam Kok's sovereign rights and on long occupation. The difference between proprietorship and sovereignty was confused or ignored. That Waterboer exercised no authority in the dis- puted district was admitted. When the British annexation took place a party in the volksraad wished to go to war with Britain, but the wiser counsels of President Brand prevailed. The Free State, however, did not abandon its claims. The matter involved no little irritation between the parties concerned until July 1876. It was then disposed of by the 4th earl of Carnarvon, at that time secretary of state for the colonies, who granted to the Free State £90,000 " in full satisfaction of all claims which it considers it may possess to Griqualand West." Lord Carnarvon declined to entertain the proposal made by Mr Brand that the territory

should be given up by Great Britain. One thing at least is certain with regard to the diamond fields — they were the means of restoring the credit and prosperity of the Free State. In the opinion,, moreover, of Dr Theal, who has written the history of the Boer Republics and has been a consistent supporter of the Boers, the annexation of Griqualand West was probably in the best interests of the Free State. " There was," he states, " no alternative from British sovereignty other than an independent diamond field republic."

At this time, largely owing to the exhausting struggle with the Basutos, the Free State Boers, like their Transvaal neighbours, had drifted into financial straits. A paper currency had been instituted, and the notes — currently known as " bluebacks "— soon dropped to less

than half their nominal value. Commerce was largely carried on by barter, and many cases of bankruptcy occurred in the state. But as British annexation in 1877 saved the Transvaal from bankruptcy, so did the influx of British and other immigrants to the diamond fields, in the early ‘seventies, restore public credit and individual prosperity to the Boers of the Free State. The diamond fields offered a ready market for stock and other agricultural produce. Money flowed into the pockets of the farmers. Public credit was restored. ” Blue- backs ” recovered par value, and were called in and redeemed by the government. Valuable diamond mines were also discovered within the Free State, of which the one at Jagersfontein is the richest. Capital from Kimberley and London was soon provided with which to work them.

The relations between the British and the Free State, after the question of the boundary was once settled, remained perfectly Cordial amicable down to the outbreak of the Boer War in relations 1899. From 1870 onward the history of the state with Great wa s one of quiet, steady progress. ■ At the time of the

‘ ” first annexation of the Transvaal the Free State declined Lord Carnarvon’s invitation to federate with the other South African communities. In 1880, when a rising of the Boers in the Transvaal was threatening, President Brand showed every desire to avert the conflict. He suggested that Sir Henry de Villiers, Chief Justice of Cape Colony, should be sent into the Transvaal to endeavour to gauge the true state of affairs in that country. This suggestion was not acted upon, but when war broke out in the Transvaal Brand declined to take any part in the struggle. In spite of the neutral attitude taken by their government a number of the Free State Boers, living in the northern part of the country, went to the Transvaal and joined their brethren then in arms against the British. This fact was not allowed to influence the friendly relations between the Free State and Great Britain. In 1888 Sir John Brand died. In him the Boers, not only in the Free State but in the whole of South Africa, lost one of the most enlightened and most upright rulers and leaders they have ever had. He realized the disinterested aims pursued by the British government, without always approving its methods. Though he had thrown the weight of his influence against Lord Carnarvon’s federation scheme Brand disapproved racial rivalries.

During the period of Brand’s presidency a great change, both political and economic, had come over South Africa. The re- newal of the policy of British expansion had been answered by the formation of the Afrikander Bond, which represented the racial aspirations of the

Dutch-speaking people, and had active branches in the Free State. This alteration in the political outlook was accompanied, and in part occasioned, by economic changes of great significance. The development of the diamond mines and of the gold and coal industries — of which Brand saw the beginning — had far-reaching consequences, bringing the Boer republics into vital contact with the new industrial era. The Free Staters, under Brand's rule, had shown considerable ability to adapt their policy to meet the altered situation. In 1889 an agreement was come to between the Free State and the Cape Colony government, whereby the latter were empowered to extend, at their own cost, their railway system to Bloemfontein. The Free State retained the right to purchase this extension at cost price, a right they exercised after the Jameson Raid.

Having accepted the assistance of the Cape government in constructing its railway, the state also in 1889 entered into a Customs Union Convention with them. The convention was the outcome of a conference held at Cape Town in 1888, at which delegates from Natal, the Free State and the Colony attended. Natal at this time had not seen its way to entering the Customs Union, but did so at a later date.

In January 1889 Mr F. W. Reitz was elected president of the Free State. His accession to the presidency marked the begin- ning of a new and disastrous line of policy in the external affairs of the country. Mr Reitz had no AU . 1 t aa ˆ sooner got into office than a meeting was arranged with Transvaal. Mr Kruger, president of the Transvaal, at which various terms of an agreement dealing with the railways, terms of a treaty of amity and commerce and what was called a political treaty, were discussed and decided upon. The political treaty referred in general terms to a federal union between the Transvaal and the Free State, and bound each of them to help the other, whenever the independence of either should be assailed or threatened from without, unless the state so called upon for assistance should be able to show the injustice of the cause of quarrel in which the other state had engaged. While thus committed to a dangerous alliance with its northern neighbour no change was made in internal administration. The Free State, in fact, from its geographical position reaped the benefits without incurring the anxieties consequent on the settlement of a large uitlander population on the Rand. The state, however, became increasingly identified with the reactionary party in the Transvaal. In 1895 the volksraad passed a resolution, in which they declared their readiness to entertain a proposition from the Transvaal in favour of some form of federal union. In the same year Mr Reitz retired from the presidency of the Free State, and was succeeded in February 1896 by M. T. Steyn (g.v.), a judge of the High Court. In

1896 President Steyn visited Pretoria, where he received an ovation as the probable future president of the two Republics. A further offensive and defensive alliance between the two Republics was then entered into, under which the Free State took up arms on the outbreak of hostilities with the Transvaal in 1899.

In 1897 President Kruger, bent on still further cementing the union with the Free State, visited Bloemfontein. It was on this occasion that President Kruger, referring to the London Conven- tion, spoke of Queen Victoria as a kwaaje Vrouw, an expression which caused a good deal of offence in England at the time, but which, to any one familiar with the homely phraseology of the Boers, obviously was not meant by President Kruger as insulting.

In order to understand the attitude which the Free State took at this time in relation to the Transvaal, it is necessary to review the history of Mr Reitz from an earlier date. Pre- viously to his becoming president of the Free State ™ e .. he had acted as its Chief Justice, and still earlier in / dea /. life had practised as an advocate in Cape Colony. In 1881 Mr Reitz had, in conjunction with Mr Steyn, come under the influence of a clever German named Borckenhagen, the editor of the Bloemfontein Express. These three men were principally responsible for the formation of the Afrikander Bond (see Cape Colony: History). From 1881 onwards they cherished the idea of an independent South Africa. Brand had been far too sagacious to be led away by this pseudo-nationalist dream, and did his utmost to discountenance the Bond. At the same time his policy was guided by a sincere patriotism, which looked to the true prosperity of the Free State as well as to that of the whole of South Africa. From his death may be dated the dis- astrous line of policy which led to the extinction of the state as a republic. The one prominent member of the volksraad who inherited the traditions and enlightened views of President Brand was Mr (Afterwards Sir) John G. Fraser. Mr Fraser, who was an unsuccessful candidate for the presidency in 1896, was the son of a Presbyterian minister, who had acted as a minister in the Dutch Reformed Church since the middle of the century. He grew up in the country of his father's adoption, and he consistently warned the Free State of the inevitable

result — the loss of independence — which must follow their mischievous policy in being led by the Transvaal. The mass of Boers in

the Free State, deluded by a belief in Great Britain's weakness, paid no heed to his remonstrances. Mr Fraser lived to see the fulfilment of these prophecies. After the British occupation of Bloemfontein he cast in his lot with the Imperial Government, realizing that it had fought for those very principles which President Brand and he had laboured for in bygone years.

On entering Bloemfontein in 1900 the British obtained posses- sion of certain state papers which contained records of negotiations between the Transvaal and the Orange Free State. The evidence contained in these state records so clearly marks the difference between the policy of Mr Kruger and the pacific, commercial policy of President Brand and his followers, that the documents call for careful consideration. From these papers it was found that, in 1887, two secret conferences had taken place between representatives of the Republics, dealing with various political and economical questions. At the first of these conferences, held in Pretoria, the object of the Free State deputies were to arrange a general treaty of amity and commerce which would knit the states more closely together, and to come to some agree- ment with reference to the scheme for building a railway across the Free State from the Cape, to connect with a farther extension in the Transvaal to Pretoria. The deputation also urged the Transvaal to join the South African Customs Union. Both of these suggestions were strongly disapproved by Mr Kruger, inasmuch as they meant knitting together the Boer republics and the British possessions, instead of merely bringing the Free State into completer dependence on the Transvaal. From the minutes of this conference it is clear that the two deputations were practically at cross purposes. In the minds of President Kruger and his immediate followers one idea was dominant, that of ousting and keeping out at all costs British influence and interests. On the part of the Free State there was obviously a genuine desire to further the best interests of the state, to- gether with the general prosperity of the whole of South Africa. In President Kruger's eyes British trade meant ruin; he desired to keep it out of the Republic at all costs, and he begged the Free State to delay the construction of their railway until the Delagoa Bay line was completed. He said, " Delagoa is a life or death question for us. Help us: if you hook on to the Colony you cut our throat. . . . How can our state exist without the Delagoa railway ? Keep free." With regard to the Customs Union, President Kruger was equally emphatic; he begged the Free State to steer clear of it. " Customs Unions," he said, " are made between equal states with equal access to harbours. We are striving to settle the question of our own harbour peacefully. The English will only use their position to swindle the Transvaal of its proper receipts." In

response, Mr Fraser, one of the Free State delegates, remarked that a harbour requires forts, soldiers, ships and sailors to man them, or else it would be at the mercy of the first gunboat that happened to assail it. President Kruger replied that once the Transvaal had a harbour foreign powers would intervene. Mr Wolmarans was as emphatic as President Kruger. • ” Wait a few years. . . . You know our secret policy. We cannot treat the [Cape] Colony as we would treat you. The Colony would destroy us. It is not the Dutch there we are fighting against. Time shall show what we mean to do with them; for the present we must keep them off.”

The result of this conference was a secret session of the Transvaal volksraad and the proposition of a secret treaty with the Free State, by which each state should bind b hi h itself not to build railways to its frontier without the designs. consent of the other, the eastern and northern frontiers of the Transvaal being excepted. The railway from Pretoria to Bloemfontein was to be proceeded with; neither party was to enter the Customs Union without the consent of the other. The Transvaal was to pay £20,000 annually to the Free State for loss incurred for not having the railway to Cape Colony. Such a treaty as the one proposed would simply have enslaved the Free State to the Transvaal, and it was rejected by the Free State volksraad. President Kruger

determined on a still more active measure, and proceeded with Dr Leyds to interview President Brand at Bloemfontein. A series of meetings took place in October of the same year (1887). President Brand opened the proceedings by proposing a treaty of friendship and free trade between the two Republics, in which a number of useful and thoroughly prac- tical provisions were set forth. President Kruger, however, soon brushed these propositions aside, and responded by stating that, in consideration of the common enemy and the dangers which threatened the Republic, an offensive and defensive alliance must be preliminary to any closer union. To this Brand rejoined that, as far as the offensive was concerned, he did not desire to be a party to attacking any one, and as for the defensive, where was the pressing danger of the enemy which Kruger feared ? The Free State was on terms of friendship with its neighbours, nor (added Brand) would the Transvaal have need for such an alliance as the one proposed if its policy would only remain peace- ful and conciliatory. At a later date in the conference (see Transvaal) President Brand apparently changed his policy, and himself drafted a constitution Tesembling that of the United States. This constitution appears to have been modelled on terms a great deal too liberal and enlightened to please Mr Kruger, whose one idea was to have at his command the armed forces of the

Free State when he should require them, and who pressed for an offensive and defensive alliance. Brand refused to allow the Free State to be committed to a suicidal treaty, or dragged into any wild policy which the Transvaal might deem it- ex- pedient to adopt. The result of the whole conference was that Kruger returned to Pretoria completely baffled, and for a time the Free State was saved from being a party to the fatal policy into which others subsequently drew it. Independent power of action was retained by Erand for the Free State in both the railway and Customs Union questions.

After Sir John Brand's death, as already stated, a series of agreements and measures gradually subordinated Free State interests to the mistaken ambition and narrow views of the Transvaal. The influence which the Kruger party had obtained in the Free State was evidenced by the presidential election in 1896, when Mr Steyn received forty-one votes against nineteen cast for Mr Fraser. That this election should have taken place immediately after the Jameson Raid probably increased Mr Steyn's majority. Underlying the new policy adopted by the Free State was the belief held, if not by President Steyn himself, at least by his followers, that the two republics combined would be more than a match for the power of Great Britain should hostilities occur.

In December 1897 the Free State revised its constitution in reference to the franchise law, and the period of residence necessary to obtain naturalization was reduced from five to three years. The oath of allegiance to the state was alone required, and no renunciation of nationality was insisted upon. In 1898 the Free State also acquiesced in the new convention arranged with regard to the Customs Union between the Cape Colony, Natal, Basutoland and the Bechuanaland Protectorate. These measures suggest that a slight reaction against the extreme policy of President Kruger had set in. But events were moving rapidly in the Transvaal, and matters had proceeded too far for the Free State to turn back. In May 1899 President Steyn suggested the conference at Bloemfontein between President Kruger and Sir Alfred Milner, but this act, if it expressed a genuine desire for reconciliation, was too late. President Kruger had got the Free State ensnared in his meshes. The Free Staters were practically bound, under the offensive and defensive alliance, in case hostilities arose with Great Britain, either to denounce the policy to which they had so unwisely been secretly party, or to throw in their lot with the Transvaal. War occurred, and they accepted the inevitable consequence. For President Steyn and the Free State of 1899, in the light of the negotiations we have recorded, neutrality was impossible. A resolution was passed by the volksraad on the 27th of September declaring that the state would observe its obligations to the Transvaal whatever might happen.

Before war had actually

British adminis- tration.

broken out the Free State began to expel British subjects, and the very first act of war was committed by Free State Boers, who, on the nth of October, seized a train upon the border belonging to Natal. The events of the war are given elsewhere (see Transvaal: History).

After the surrender of Cronje at Paardeberg on the 27th of February 1900 Bloemfontein was occupied by the British troops under Lord Roberts (March 13,) and on the 28th of May a proclamation was issued annexing the Free State to the British dominions under the title of Orange River Colony. For nearly two years longer the burghers kept the field under Christian de Wet (q.v.), and other leaders, but by the articles of peace signed on the 31st of May 1902 British sovereignty was acknowledged. A civil administration of the colony was established early in 1901 with Sir Alfred Milner as governor. Major (afterwards Sir) H. J. Goold-Adams was appointed lieutenant-governor, Milner being governor also of the Transvaal, which country claimed most of his attention. A nominated legislative council was established in June 1902 of which Sir John Fraser and a number of other prominent ex-burghers became unofficial members. The railways and constabulary of the two colonies were (1903) placed under an irtter-coloriial council; active measures were taken for the repatriation of the prisoners of war and the residents in the concentration camps, and in every direction vigorous and successful efforts were made to repair the ravages of the war. Over £4,000,000 was spent by the British government in Orange Colony alone on these objects. At the same time efforts were made, with a fair measure of success, to strengthen the British element in the country by means of land settlements. Special attention was also devoted to the development of the resources of the country by building new lines of railway traversing the fertile south-eastern districts and connecting Bloemfontein with Natal and with Kimberley. The educational system was reorganized and greatly improved.

To a certain extent the leading ex-burghers co-operated with the administration in the work of reconstruction. The loss of their independence was, however, felt bitterly by the Onui//e Boers, and the attitude assumed by the majority was formed. highly critical of the

work of the government. Having recovered from the worst effects of the war the Boers, both in the Transvaal and Orange Colony, began in 1904 to make organized efforts to regain their political ascendancy, and to bring pressure on the government in respecˆ to compensation, repatriation, the position of the Dutch language, education and other subjects on which they alleged unfair treatment. This agitation, as far as the Orange River Colony was concerned, coincided with the return to South Africa of ex-President Steyn. Mr Steyn had gone to Europe at the close of the war and did not take the oath of allegiance to the British Crown until the autumn of 1904. A congress of ex-burghers was held at Brand- fort in December 1904, when among other resolutions passed was one demanding the grant of self-government to the colony. This was followed in July 1905 by a conference at Bloemfontein, when it was resolved to form a national union. This organization, known as the Oranjie Unie, was formally constituted in May 1906, but had been in existence for some months previously. A similar organization, called Het Volk, had been formed by the Transvaal Boers in January 1905. Both unions had constitutions almost identical with that of the Afrikander Bond, and their aims were similar — to secure the triumph of Boer ideals in state and society. Of the Oranjie Unie Mr Abraham Fischer became chairman, other prominent members being Messrs Hertzog, C. de Wet and Steyn. Mr Fischer, the leader of the party, was one of the ablest statesmen on the Boer side in the pre-war period. He was originally an attorney in Cape Colony and had joined the Free State bar in 1875. He became vice-president of the volksraad in 1893 and a member of the executive council of the state in 1896. He was one of the most trusted counsellors of Presidents Steyn and Kruger, and the ultimatum sent to the British on the eve of hostilities was recast by him. While the war was in progress he went to Europe to seek support for

the Boer cause. He returned to South Africa early in 1903 and was admitted to the bar of the Orange Colony.

A counter-organization was formed by the ex-burghers who had whole-heartedly accepted the new order of things. They took the title of the Constitutional party, and Sir John Fraser was chosen as chairman. In Bloemfontein the Constitutionalists had a strong following; elsewhere their supporters were numeri- cally weak. It was noteworthy that the programmes of the two parties were very similar, the real difference between them being the attitude with which they regarded the British connexion. While the ideal of the Unie was an Afrikander state, the Con- stitutionalists desired the perfect equality of both white races.

The advent of a Liberal administration under Sir Henry Campbell-Bannerman in Great Britain in December 1905 completely altered the political situation in the late Rem Boer states. The previous (Conservative) government sponsible had in March 1905 made public a form of representative govern- government, intended to lead up to self-government meaU for the Transvaal, and had intimated that a similar constitution would be subsequently conferred on the Orange Colony. The Campbell-Bannerman administration decided to do without this intermediary step in both colonies. In April 1906 a committee, under the chairmanship of Sir J. West-Ridgeway, was sent to South Africa to inquire into and report upon various questions regarding the basis of the franchise, single-member constituencies and kindred matters. There was in the Orange Colony a considerable body of opinion that the party system of government should be avoided, and that the executive should consist of three members elected by the single representative chamber it was desired to obtain, and three members nominated by the governor — in short, what was desired was a restoration as far as possible of the old Free State constitution. These views were laid before the committee on their visit to Bloemfontein in June 1906. When, however, the outline of the new constitu- tion was made public in December 1906 it was found that the British government had decided on a party government plan which would have the inevitable and fully foreseen effect of placing the country in the power of the Boer majority. It was not until the 1st of July 1907 that the letters-patent conferring self-government on the colony were promulgated, the election for the legislative assembly taking place in November following. They resulted in the return of 29 members of the Oranjie Unie, 5 Constitutionalists and 4 Independents. The Constitutionalists won four of the five seats allotted to Bloemfontein, Sir John Fraser being among those returned. Following the elections the governor, Sir Hamilton Goold-Adams, sent for Mr Fischer, who formed a ministry, his colleagues being ex-General J.B.M. Hertzog, attorney-general and director of education; Dr A. E. W. Ramsbottom, treasurer; Christian de Wet, minister of agri- culture, and Mr C. H. Wessels, minister of public works, &c. Mr Fischer, besides the premiership, held the portfolio of colonial secretary. The new ministry took office on the 27th of November. Of the members of the first legislative council five were supporters of the Oranjie Unie and five were regarded as Constitutionalists, the eleventh member holding the balance.

The responsible government entered upon its task in favourable conditions. Despite the many obstacles it had to meet, including drought, commercial depression and the hostility of many of the ex-

burghers, the crown colony administration had achieved remarkable results. During each of its seven years of existence there had been a surplus of revenue over expenditure, despite the fact that taxation had not materially increased, save in respect to mining, which did not affect the general population. Custom duties were about the same as in 1898, but railway rates were materially lower and many new lines had been opened. The educational system had been placed on a sound basis. Departments of agriculture, mining, health and native affairs had been organized, and the civil service rendered thoroughly efficient. A substantial cash balance was left in the treasury for the use of the new government. Over 700 families had been settled on the land and thus an additional source of strength provided for the state. The first parliament under the new

constitution met on the 18th of December 1907, when it was announced that the Transvaal and Orange Colony had each given notice of the termination of the intercolonial council with the intention of each colony to gain individual control of its railways and constabulary.

After a two days' session the legislature was prorogued until May 1908, when the chief measure submitted by the government was an education bill designed to foster the knowledge uaifica- of the Dutch language. This measure became law Hon (see above § Education). Parliament also passed a

move- measure granting ex-President Steyn a pension of menU £1000 a year and ex-President Reitz a pension of £500. In view of the dissolution of the intercolonial council a convention was signed at Pretoria on the 29th of May which made provision for the division of the common property, rights and liabilities of the Orange Colony and the Transvaal in respect to the railways and constabulary, and established for four years a joint board to continue the administration of the railway systems of the two colonies. The Orange Colony assumed responsibility for £7,700,000 of the guaranteed loan of £35,000,000 of 1903 (see Transvaal: Finance). The colony took part during this month in an inter-state conference which met at Pretoria and Cape Town, and determined to renew the existing customs convention and to make no alteration in railway rates. These decisions were the result of an agreement to bring before the parliaments of the various colonies a resolution advocating the closer union of the South

African states and the appointment of delegates to a national convention to frame a draft constitution. In this convention Mr Steyn took a leading and conciliatory part, and subsequently the Orange River legislature agreed to the terms drawn up by the convention for the unification of the four self-governing colonies. Under the imperial act by which unification was established (May 31, 1910) the colony entered the union under the style of the Free State Province. (For the union movement see South Africa: History.) Mr Fischer and General Hertzog became members of the first union ministry while Dr A. E. W. Ramsbottom, formerly colonial treasurer, became the first administrator of the Free State as a province of the union.

The period during which the province had been a self-governing colony had been one of steady progress in most directions, but was greatly embittered by the educational policy Education pursuec j by General Hertzog. From the date of the ”” ”” passing of the education act in the middle of 1908 until the absorption of the colony into the union, General Hertzog so administered the provisions of the act regarding the media of instruction as to compel every Euro- pean child to receive instruction in every subject partly in the medium of Dutch. This policy of compulsory bilingualism was persisted in despite the vehement protests of the English-speaking community, and of the desire of many Dutch burghers that the medium of instruction for their children should be English. Attempts to adjust the difficulty were made and a conference on the subject was held at Bloemfontein in November 1909. It was fruitless, and in March 1910 Mr Hugh Gunn (director of education since 1904) resigned. 1 The action of General Hertzog had the support of his colleagues and of Mr Steyn and kept alive the racial spirit. Failing to obtain redress the English- speaking section of the community proceeded to open separate schools, the terms of the act of union leaving the manage- ment of elementary education to the provincial council.

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contra versy.

‘ 1 See Mr Gunn’s pamphlet, The Language Question in the Orange / fiver Colony, 1902-iQio.

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ORANGEMEN, members of the Orange Society, an association of Irish Protestants, originating and chiefly flourishing in Ulster, but with ramifications in other parts of the United Kingdom, and in the British colonies. Orangemen derive their name from King William III. (Prince of Orange). They are enrolled in lodges in the ordinary form of a secret society. Their toasts, about which there is no concealment, indicate the spirit of the Orangemen. The commonest form is ” the glorious, pious and immortal memory of the great and good King William, who saved us from popery, slavery, knavery, brass money and wooden shoes,” with grotesque or truculent additions according to the orator’s taste. The brass money refers to James II. ‘s finance, and the wooden shoes to his French allies. The final words are often ” a fig for the bishop of Cork,” in allusion to Dr Peter Browne, who, in 1715, wrote cogently against the practice of toasting the dead. Orangemen are fond of beating drums and flaunting flags with the legend ” no surrender,” in allusion to Londonderry. Orangeism is essentially political. Its original object was the maintenance of Protestant ascendancy, and that spirit still survives. The first regular lodges were founded in 1795, but the system existed earlier. The Brunswick clubs, founded to oppose Catholic emancipation, were sprigs from the original Orange tree. The orange flowers of the Lilium hulbiferum are worn in Ulster on the 1st and 12th July, the anniversaries of the Boyne and Aughrim, Another great day is the 5th of November, when William III. landed in Torbay.

ORANG-UTAN (” man of the woods “), the Malay name of the giant red man-like ape of Borneo and Sumatra, known to the Dyaks as the mias, and to most naturalists as Simia satyrus. The red, or brownish-red, colour of the long and coarse hair at once distinguishes the orang-utan from the African apes; a further point of distinction being the

excessive length of the arms, which are of such proportions that the animal when in the upright posture (which it seldom voluntarily assumes) can rest on its bent knuckles. Very characteristic of the old males, which may stand as much as 5I ft. in height, is the lateral expansion of the cheeks, owing to a kind of warty growth, thus producing an extraordinarily broad and flattened type of face. Such an expansion is however by no means characteristic of all the males of the species, and is apparently a feature of racial value. Another peculiarity of the males is the presence of a huge throat-sac or pouch on the front of the throat and chest, which may extend even to the arm-pits; although present in females, it does not reach nearly the same dimensions in that sex. More than half-a-dozen separate races of orang- utan are recognized in Borneo, where, however, they do not appear to be restricted to separate localities. In Sumatra the Deli and Langkat district is inhabited by S. satyrus deliensis and Abong by S. s. abongensis.

In Borneo the red ape inhabits the swampy forest-tract at the foot of the mountains. In confinement these apes (of which adult specimens have been exhibited in Calcutta) appear very slow and deliberate in their movements; but in their native forests they swing themselves from bough to bough and from tree to tree as fast as a man can walk on the ground beneath. They construct platforms of boughs in the trees, which are used as sleeping-places, and apparently occupied for several nights in succession. Jack-fruit or durian, the tough spiny hide of which is torn open with their strong fingers, forms the chief food of orang-utans, which also consume the luscious mangustin and other fruits. (See Primates.)

ORANIENBAUM, a town of European Russia, in the govern- ment of St Petersburg, lying 100 ft. above the sea on the south

coast of the Gulf of Finland, opposite Kronstadt. Pop. (1897) 5333. It is well known for its imperial palace and as a summer resort for the inhabitants of St Petersburg, from which it is 25 m. W. by rail. In 17 14 Menshikov, to whom the site was presented by»Peter the Great, erected for himself the country-seat of Oranienbaum; but confiscated, like the rest of his estates, in 1727, it became an imperial residence. In 1743 the empress Elizabeth assigned the place to Peter III., who built there a castle, Peterstadt (now destroyed) , for his Holstein soldiers.

ORAONS, an aboriginal people of Bengal. They call themselves Kurukh, and are sometimes also known as Dhangars. Their home is in Ranchi district and there are Communities in the Chota Nagpur states and Palamau, while elsewhere they have scattered settlements, e.g. in Jalpaiguri and the Darjeeling Terai, whither they have gone to work in the tea-gardens. They number upwards of three quarters of a million. According to their traditions the tribe migrated from the west coast of India. The Oraons are a small race (average 5 ft. 2 in.); the usual colour is dark brown, but some are as light as Hindus. They are heavy-jawed, with large mouths, thick lips and projecting teeth. They reverence the sun, and acknowledge a supreme god, Dharmi or Dharmest, the holy one, who is perfectly pure, but whose beneficent designs are thwarted by evil spirits. They burn their dead, and the urn with the ashes is suspended outside the deceased's hut to await the period of the year especially set apart for burials. The language is harsh and guttural, having much connexion with Tamil. In 1001 the total number of speakers of Kurukh or Oraon in all India was nearly 600,000.

See E. T. Dalton, Descriptive Ethnology of Bengal (Calcutta, 1872), and his article " The Kols of Chota-Nagpore," in Supplement to Journ. of Asiatic Soc. of Bengal, vol. xxxv. (1887), part ii. p. 154; Batsch, " Notes on the Oraon Language " in Journ. Roy. Asiatic Soc. of Bengal for 1866; F. B. Bradley Birt, The Story of an Indian Upland (1905).

ORATORIO, the name given to a form of religious music with chorus, solo voices and instruments, independent or at least separable from the liturgy, and on a larger scale than the cantata (q.v.) . Its early history is involved in that of opera (see Aria and Opera), though there is a more definite interest in its antecedents. The term is supposed, with good reason, to be derived from the fact that St Filippo Neri's Oratory was the place for which Animuccia's setting of the Laudi Spirituali were written; and the custom of interspersing these hymns among liturgical or other forms of the recitation of a Biblical story is certainly one of several sources to which the idea of modern oratorio may be traced. Further claim to the " invention " of the oratorio cannot be given to Animuccia. A more ancient source is the use of incidental music in miracle-plays and in such medieval dramatic processions as the 12th-century Prose de L'Ane, which on the 1st of January celebrated at Beauvais the Flight into Egypt- But the most ancient origin of all has hardly been duly brought into line, although it is the only form that led to classically artistic results before the time of Bach. This is the Roman Catholic rite of reciting, during Holy Week, the story of the Passion according to the Four Gospels, in such a manner that the words of the Evangelist are sung in Gregorian tones

by a tenor, all directly quoted utterances are sung by voices appropriate to the speakers, and the responsa turbae or utterances of the whole body of disciples (e.g. ” Lord, is it I ?”) and of crowds, are sung by a chorus. The only portion of this scheme that concerned composers was the responsa turbae, to which it was optional to add polyphonic settings of the Seven Last Words or other special utterances of the Saviour. The narrative and the parts of single speakers were sung in the Gregorian tones appointed in the liturgy. Thus the settings of the Passion by Victoria and Soriano represent, in a very simple form, a perfect solution of the art-problem of oratorio, as that problem presented itself to an age in which ” dramatic music,” or even ” epic music,” would have been a contradiction in terms. It has been aptly said that the object of the composer in setting such words as ” Crucify Him ” was not to express the feelings of an infuriated crowd, but rather to express the contrition of devout Christians telling the story; though this view must be admitted to be, xx. 6

like the 16th-century music itself, decidedly more modern than the quaintly dramatic traditional methods of performance. As an art-form this early Passion-music owes its perfection primarily to the church. The liturgy gives body to all the art-forms of 16th-century church music, and it is for the composer to spirit- ualize or debase them by his style.

With the monodic revolution at the beginning of the 17th century the history of oratorio as an art-form controlled by composers has its real beginning. There is nothing but its religious subject to distinguish the first oratorio from the first opera; and so Emilio del Cavaliere’s Rappresentazione di anima e di corpo (1600) is in no respect outside the line of early attempts at dramatic music. In the course of the 17th; century the differentiation between opera and oratorio increased, but not systematically. The gradual revival of choral art found its best opportunity in the treatment of sacred subjects; not only because it was with such subjects that the greatest 16th- century choral art was associated, but also because these subjects tended to discourage such vestiges of dramatic realism as had not been already suppressed by the aria form. This form arose as a concession to dire musical necessity and to the growing ; vanity of singers, and it speedily became almost the only possibility of keeping music alive, or at least embalmed, until the advent of Bach and HandeL The efforts of Carissimi (d. 1674) in oratorio clearly show the limited rise from the musical , standards of opera that was then possible where music was emancipated from the stage. Yet in his art the corruption of church music by secular ideas is far more evident than any tendency to elevate Biblical music-drama to the dignity of church music. Normal Italian oratorio remains

indistinguishable from serious Italian opera until as late as the boyhood of Mozart, Handel's La Resurrezzione and II Trionfo del Tempo contain many pieces almost simultaneously used in his operas, and they show not the slightest tendency to indulge in. choral writing, Nor did // Trionfo del Tempo become radically different from the musical masques of Acts and Galatea and Semele, when Handel at the close of his life dictated an adaptation of it to an English transla- tion with several choral and other numbers interpolated from other works. Yet between these two versions of the same work lies more than half the history of classical oratorio. The rest lies in that specialized German art of which the text centres round the Passion and the music culminates in Bach; after which there is no very dignified connected history of the form, until the two streams, sadly silted up, and never afterwards quite pure, united in Mendelssohn.

One feature of the Reformation in Germany was that Luther was very musical. This had the curious result that, though the German Reformation was far from conservative in its attitude towards ancient liturgy, it retained almost everything which makes for musical coherence in a church service; while the English, church, with all its insistence on historic continuity, so rearranged the liturgy that no possible music for an English church service can ever form a coherent whole. We are accustomed to think of German Passion-music as typically Pro- testant; yet the four Passions and the Historia der Auferstehung Christi of H. Schiitz (who was born in 1585, exactly a century before Bach) are as truly the descendants of Victoria's Passions . as they are the ancestors of Bach's. The difference between them and the Roman Catholic Passions is, of course, eminently characteristic of the Reformation: the language is German (so that it may be " understanded of the people "), and the narrative and dialogue is set to free composition instead of to forms of Gregorian chant, though it is written in a sort of Gregorian notation. Schutz's preface to the Historia der Auferstehung Christi shows that he writes his recitative for solo voices, though he calls it Chor des Evangelisten and Chor der Personen Colloquenien. The Marcus Passion is, on internal evidence, of doubtful authenticity, being later in style and quite stereotyped in its recitative. But in the other Passions, and most of all in the Auferstehung, the recitative is wonderfully expressive. It was probably accompanied by the organ, though the Passions contain no hint of accompaniment at all. In the ,

Auferstehung the Evangelist is accompanied by four viole da gamba in preference to the organ. In any case, Schiitz tells us, the players are to ” execute appropriate runs or passages ” during the sustained chords. Apart from their remarkable dramatic force, Schiitz’s oratorios show another approximation to the Passion oratorio of Bach’s time in ending with a non- scriptural hymn-chorus, more or less clearly based on a chorale- tune. But in the course of the work the Scriptural narrative is as uninterrupted as it is in the Roman Catholic Passions. And there is one respect in which the Auferstehung, although perhaps the richest and most advanced of all Schiitz’s works, is less realistic than either the Roman Passions or those of later times; namely, that single persons, Other than the Evangelist, are frequently represented by more than one voice. In the case of the part of the Saviour, this might, to modern minds, seem natural as showing a reverent avoidance of impersonation; and it was not without an occasional analogy in Roman Catholic Passion-music (in the polyphonic settings of special words). But Schiitz’s Passions show no such convention; this feature is peculiar to the Auferstehung; and, while the three holy women and the two angels in the scene at the tomb are represented realistically by three and two imitative voices, it is curious to see Mary Magdalene elsewhere always represented by two sopranos, even though Schiitz remarks in his preface that ” one of the two voices may be sung and the other done instrumenlaliter, or, si placet, simply left out.”

Shortly before Bach, Passion oratorios, not always so entitled, were represented by several remarkable and mature works of art, most notably by R. Keiser (1673-1739). Chorale-tunes, mostly in plain harmony, were freely interspersed in order that the congregation might take part in what was, after all, a musical church service for Holy Week. The feelings of devout contem- plative Christians on each incident of the story were expressed in accompanied recitatives (arioso) leading to arias; and the Scriptural narrative was sung to dramatic recitative and ejacu- latory chorus on the ancient Roman plan, exactly followed, even in the detail that the Evangelist was a tenor.

The difference between Bach’s Passions and those of his predecessors and contemporaries is simply the difference between his music and theirs. Where his chorus represents the whole body of Christendom it has as peculiar an epic power as it is dramatic where it represents with brevity and rapid climax the response, turbae of the Scriptural narrative. Take, for example, the double chorus at the beginning of the Passion according to St Matthew, where one chorus calls to the other to ” come and behold ” what has come to pass, and the other

chorus asks ” whom? ” ” what? ” ” whither? ” to each exhor- tation, until at last the two choruses join, while above all is heard, phrase by phrase, the hymn ” Lamm Gottes unSchuldig.” Still more powerful, indeed unapproached even in external effect by anything else in classical or modern oratorio, is the duet with chorus that follows the narrative of the betrayal. Its tremendous final outbreak in the brief indignant appeal to heaven for the vengeance of damnation on the traitor is met by the calm conclusion of the Evangelist’s interrupted narrative and the overpowering tenderness of the great figured chorale (” Mensch bewein’ dein’ Siinde gross “), which ends the first part with a call to repentance. Such contrasts might seem to be but the natural use of fine opportunities furnished by the librettist; but the composer appears to owe less to the librettist when we find that this chorale originally belonged to the Passion according to St John, where it was to follow Peter’s denial of Christ. To modern ears the most striking device in the Matthew Passion is that by which the part of Christ is separated from all the rest by being accompanied with the string band, generally at a high pitch, though deepening at the most solemn moments with an effect of sublime euphony and tenderness. And a peculiarly profound and startling thought, which has not always met with the attention it deserves, is the omission of this musical halo at the words ” Eli, Eli, lama sabacthani.” These points are aesthetically parallel with Wagnerian Leit-motif, though entirely different in method. (See Opera.)

In his amazing power of declamation Bach was not altogether unanticipated by Keiser; but no one before or since approached him in sustained elevation and variety of oratorio style. Analogies to the forms of Passion music may be found in many of Bach’s church-cantatas; a very favourite form being the Dialogus; as, for instance, a dispute between a fearing and a trusting soul, with, perhaps, the voice of the Saviour heard from a distance; or a dialogue between Christ and the Church, on the lines of the Song of Solomon. The Christmas Oratorio, a set of six closely connected church-cantatas for performance on separate days, is treated in exactly the same way as the Passions, with a larger proportion of non-dramatic choruses expressive of the triumphant gratitude of Christendom. Many of the single church- cantatas are called oratorios. If it were not that Bach’s idea of oratorio seems to be definitely connected with that of dialogue, 1 there is really no reason in musical terminology why the B minor Mass should not be so called, for it can never have been liturgical either in a Roman Catholic or in a Protestant church. But in all respects it stands alone ; and we must now return to Handel’s far more heterogeneous work, which forms the staple of almost

everything else that has been understood by oratorio until the most recent times.

Handel discovered and matured every possibility of oratorio as an art-form, except such as may now be brought to light by those composers with whom the influence of Wagner is not too overwhelming for them to consider how far his principles are applicable to an art unconnected with the stage. Handel shows us that a definite oratorio style may exist in many different degrees. He was evidently impressed by the German forms of Passion-music as combining the utmost dramatic interest with the most intense contemplative devotion; and it is signifi-‘ cant that it was after he came to England, and before his first English oratorio, that he set to music the famous poetic version of the Passion by Brockes, a version which had been adopted by all the German composers of the time, and which, with very necessary and interesting improvements of taste, was largely drawn upon by Bach for the text of his Johannes-Passion. Handel’s Brockes-Passion does not appear ever to have been performed, though Bach found access to it and made a careful copy; and it is difficult to see what motive, except interest in the form, Handel had for composing it. At all events it furnishes an important connecting-link between Bach’s solution of the problem of oratorio and the various other solutions which Handel after- wards produced so successfully. He soon discovered how many kinds of oratorio were possible. The freedom from stage restrictions admitted of subjects ranging from semi-dramatic histories, like those of Saul, Esther and Belshazzar, to cosmic schemes based exclusively on the words of the Bible, such as Israel in Egypt and the Messiah. Between these types there is every gradation of organization; and it may be added, every gradation between sacred and secular subjects and treatment. The very name of Handel’s first English oratorio, Esther, with the facts of its production as a masque and the origin of its libretto in Racine, show the transition from the stage to the church ; and a really scandalous example of the converse transi- tion may be found by any one rash enough to look for the source of some of Haman’s music in the Brockes-Passion. Roughly speaking we may reduce the types of Handelian oratorio to a convenient three; not divisible among works as wholes, but always evident here and there. Firstly, there is the semi- operatic method, in which the arias are the utterances of char- acters in the story, while the conception of the chorus rarely diverges from that of multitudes of actors (e.g. Athalia, Bel- shazzar, Saul, &c.) . The second method is a more or less recogniz- able application of the forms of the Passion-music to other subjects, without, however, the conception of a special r61e of narrator, but (as, for instance, in ” Envy, eldest born of Hell ” in Saul)

with the definite conception of the choruses as descriptive of the feelings of spectators rather than of actors. Handel's

1 It is possible that a false etymology may by Bach's time have given this colour to the word oratorio. Schiitz inscribes a monodic sacred piece" in stilo Oratorio," meaning " in the style of recitative."

audience demanded an inconvenient number of arias, most of which are clumsily accounted for by a conventional assignment to dramatic roles with a futile attempt at love-interest; which makes many of the best solos in Saul and Joshua rather absurd. The third Handelian method is that which has since become embodied in the modern type of sacred or secular cantata; a series of choruses and numbers on a subject altogether beyond the scope of dramatic narrative (as, for instance, the greater part of Solomon), and, in the case of the Messiah and Israel in Egypt, treated entirely in the words of Scripture.

After Bach and Handel the history of oratorio becomes dis- jointed. The rise of the sonata style, which brought life to the opera, was almost wholly bad for the oratorio; since not only did it cause a serious decline in choral art by distracting attention from that organization of texture which is essential even to mere euphony in choral writing (see Counterpoint and Contra- puntal Forms), but its dramatic power became more and more disturbing to the essentially epic treatment demanded by the conditions of oratorio. Bach and Handel (especially Handel) were as dramatic in characterization as the greatest epic poets, and were just as far removed from the theatre. Any doubt on this point is removed by the history of Handelian opera and the reforms of Gluck. But the power of later composers to rise above the growing swarms of 18th-century and 19th-century oratorio-mongers depended largely on the balance between their theatrical and contemplative sensibilities. Academicism natur- ally mistrusted the theatre, but, in the absence of any con- templative depth beyond that of a tactful asceticism, it has then and ever since made spasmodic concessions to theatrical effect, with the intention of avoiding pedantry, and with the effect of encouraging vulgarity. Philipp Emanuel Bach's oratorios, though not permanently convincing works of art, achieved a remarkably true balance of style in the earlier days of the conflict; indeed, with judicious reduction to the size of a large cantata, Die Israeliten in der Wiiste (1769) would perhaps bear revival almost better than Haydn's Tobias (1774), in spite of the supe- rior

musical value of that ambitious forerunner of The Creation and The Seasons. These two great products of Haydn's old age owe their vitality not only to Haydn's combination of contra- puntal and choral mastery with his unsurpassable freedom of movement in the sonata style, but also to his priceless redis- covery of the fact (well known to Bach, the composer of " Mein glaubiges Herze," but since forgotten) that, in Haydn's own words, " God will not be angry with me for worshipping him in a cheerful manner." This is the very spirit of St Francis of Assisi, and it brings the naively realistic birds and beasts of The Creation into line with even the Bacchanalian parts of the mainly secular Seasons, and so removes Haydn from the dangers of a definitely bad taste, which began to beset Roman Catholic oratorio onthe one hand, and those of no taste at all, which engulfed Protestant oratorio on the other.

From the moment when music became independent of the church, Roman Catholic religious music, liturgical or other, lost its high artistic position. Some of the technical hindrances to greatness in liturgical music after the Golden Age are mentioned in the article Mass; but the status of Roman Catholic non- liturgical religious music was from the outset lowered by the use of the vulgar tongue, since that implied a condescension to the laity, and composers could not but be affected by the assumption that oratorio belonged to a lower sphere than Latin church music. With this element of condescension came a reluctance to foster the fault of intellectual pride by criticizing pious verse on grounds of taste. Even in Protestant England this reluctance still causes educated people to strain tolerance of bad hymns to an extent which apostles of culture denounce as positively immoral: but the initial impossibility of basing a non-Latin Roman Catholic oratorio directly on the Bible would already have been detrimental to good taste in religious musical texts even if criticism were not disarmed. It must be confessed that Protestant taste (as shown in the texts of many of Bach's cantatas) was often unsurpassably bad; but in its most morbid phases its badness was mainly barbarian, and could either be

ignored by composers and listeners, or easily improved away, as Bach showed in his alterations of Brockes's vile verses in the Passion according to St John. But the bad taste of the text of Beethoven's Christus am Oelberge (The Mount of Olives, c. 1800) is ineradicable, for it represents the standpoint of writers who may be very devout and innocent, but whose purest source of sacred art has been the pictures of Guido Reni. It was one thing for Sir Joshua Reynolds to admire the wrong period of Italian art: he had his own access to great ideas; but for Beethoven's librettist, who had no such access, it was very

different. The real sacred subject has no chance of penetrating through a tradition which is neither naive nor ecclesiastical, but is simply that of a long-tolerated comfortable vulgarity. An operatic tenor represents the Saviour; an operatic soprano represents the ministering angel; and in the garden of Gethsemane the two sing an operatic duet. The music is brilliant and well worthy of Beethoven's early powers, but he afterwards greatly regretted it; and indeed its circumstances are intolerable, and the English attempt at a new libretto (Engedi, or David in the Wilderness) only sub- stituted ineptitude for irreverence,

Schubert's wonderful fragment Lazarus (1820) suffers less from the sickliness of its text; for the music seizes on a certain genuine quality aimed at by all typical Roman Catholic religious verse-writers, and embodies it in a kind of romantic mysticism unexampled in Protestant oratorio. Modern literature shows this peculiar strain in Cardinal Newman's Dream of Gerontius, just as Sir Edward Elgar's setting of that poem to music of Wagnerian continuity and texture presents the only parallel discoverable later or earlier to the slightly oppressive aroma of Schubert's unique experiment. 1 Lazarus also surprises us by a rather invertebrate continuity of flow, anticipating early Wagnerian opera; indeed, in almost every respect it is two generations ahead of its time; and, if only Schubert had finished it and allowed it to see publicity, the history of 19th-century oratorio might have become a more interesting subject than it is. The ascendancy of Mendelssohn, as things happened, is really its main redeeming feature. Mendelssohn applied an unpre- cedented care and a wide general culture to the structure and criticism of his libretto (see his correspondence with Schubring, his principal helper with the texts of St Paul and Elijah), and was able to bear witness of his new-found gospel according to Bach by introducing chorales into St Paul as well as by dis- interring and performing Bach's works. But he had not the strength to rescue oratorio from the slough into which it had now fallen, no less in Protestant than in Roman Catholic forms. As the interest in Biblical themes becomes more independent of church and dogma, oratorio once more tends to become con- fused with Biblical opera. The singular fragrance and tenderness of the best parts of Berlioz's little masterpiece L'Enfance du Christ (put together from sections composed between 1847 and 1854) give it high artistic value; but if " oratorio " means " sacred music " Berlioz was incapable of anything of the sort; for the Christianity of his Grande Messe des morts and his Te Deum is the Christianity of Napoleon; and, if oratorio means a consistent treatment of a legend or subject in terms of musical epic, Berlioz can never fix his attention long enough to remember how he began by the time he has got half way through. Though Berlioz's essay in oratorio is

not quite so irresponsible a vocal- symphonic-dramatic medley as his RomSo et Juliette and Damna- tion de Faust, it unmistakably marks a transition towards the complete secularizing of the Bible for musical purposes. But the long-continued prejudice in England against the representa- tion of religious subjects on the stage has wrought peculiar confusion in the theory of their romantic treatment in music. It may be noted as a curiosity that Saint-Saens's Biblical opera, Samson et Dalila (written in 1877), after being known in England for many quiet years as an oratorio, suddenly, in 1910, was permitted by the censor of plays, under royal command, to be produced at Covent Garden for what it was intended. It may

1 Schubert's well-known cantata, Miriam's Siegesgesang, has been discussed as a small oratorio; but it is of slight artistic and , i no historic importance.

even be suggested that this occurred just early enough to prevent Strauss's Salome from being regarded by the British public as an oratorio.

The earnest efforts of Cesar Franck prevented French oratorio from drifting entirely towards the stage; and meanwhile year by year Brahms's Deutsches Requiem (completed, except for one movement, in 1868) towers ever higher above all choral music since Beethoven's Mass in D, and draws us away from the semi-dramatic oratorio towards the musically perfectible form of an enlarged cantata in which a group of choral movements is concentrated on a set of religious ideas differing from liturgical forms only in free choice of text. Within the essentially non-theatrical limitations of dramatic or epic oratorio, we may note the spirited new departures of Sir Charles Stanford in Eden (1891), and of Sir Hubert Parry in Judith (1888), Job (1892) and King Saul- (1894), which showed that Wagnerian Leitmotif and continuity might well avail to produce an oratorio style standing to Mendelssohn as Wagner stands to Mozart, if musical interest be retained in the foreground. Freedom from the restrictions of the stage also means absence of the resources of the stage, so that Wagnerian Leitmotif is no sufficient substitute for formal musical coherence when the audience has no action before its eyes. Accordingly these leaders of the English musical renascence are by no means exclusively Wagnerian in their oratorios. A fine and typical example of their peculiar non-theatrical resources may be seen in the end of King Saul,

where Parry (who, like Wagner, is his own librettist) makes the Witch of Endor foresee the battle of Gilboa, and allows her tale to become real in the telling: so that it is followed immediately by the final dirge. (D. F. T.)

ORATORY (Lat. oratoria, sc. ars; from orare, to speak or pray), the art of speaking eloquently or in accordance with the rules of rhetoric (?.».). From Lat. oratorium, so. templum, a place of prayer, comes the use of the word for a small chapel or place of prayer for the use of private individuals, generally attached to a mansion and sometimes to a church. The name is also given to small chapels built to commemorate some special deliverance.

ORATORY OF ST PHILIP NERI, CONGREGATION OF THE, or Oratorians, a religious order consisting of a number of independent houses. The first congregation was formally organized in 1575 by the Florentine priest, Philip Neri. (See Neri, Philip.)

ORB, a circle or ring (Lat. orbis), hence a globe or disk or other spherical object. It is thus used, chiefly poetically, of any of the heavenly bodies, including the earth itself (Lat. orbis ter- rarum), or of the eye-ball or eye. The ” orb,” also known as the “mound” (Lat. tnundus, “world”), consisting of a globe surmounted by a cross, forms part of many regalia, being a symbol of sovereignty (see Regalia). In architecture the meaning to be attached to the word ” orb ” is doubtful. It is usually now taken to mean properly a blank or blind window, and thence a blank panel. If so the word represents Lat. orbus, ” bereft of,” ” orphaned,” fenestra orba luminis. It is also identified with a circular boss concealing the intersection of arches in a vault.

ORBETELLO, a town of Tuscany, Italy, in the province of Grosseto, 24 m. S. by E. of Grosseto by rail, 13 ft. above sea- level. Pop. (1901) 4188 (town), 5335 (commune). It is situated on a tongue of land projecting westward into a lagoon which is enclosed on the W. and S. by two long narrow sandy spits, and on the seaward (S.W.) side by the peninsula of Monte Argentario. A causeway connecting the town with this peninsula was built across the lagoon in 1842. On every side except the landward (E.) side the town is enclosed by an ancient terrace wall of poly- gonal work, and tombs have been discovered in the vicinity and even within the town itself. On the N. side of the promon- tory are the remains of a Roman- villa partly below sea-level. The town must thus occupy an ancient site, the name of which is unknown. The town still has the bastions which the Spaniards built during the period (1 557-1 713) when they were masters of this

corner of Italy. There is a large convict prison with which

is connected another at Porto Ercole, on the east side of the peninsula. The mother house of the Passionist order crowns an eminence of Monte Argentario, now strongly fortified. The salt-water lagoon (11 sq. m. in extent), in the middle of which the town stands, abounds in white fish, soles and eels. On the eastern edge of the Monte Argentario is an active manganese iron ore mine, yielding some 30,000 tons per annum.

After the fall of the Republic of Siena, when the territory of Siena passed to Tuscany, Philip II. of Spain retained Orbetello, Talamone, Monte Argentario and the island of Giannutri until 1713, under the name of the Reali Stati dei Presidii. There are still many Spanish names among the inhabitants of Orbetello. In 1713 this district passed by treaty to the emperor, in 1736 to the king of the' two Sicilies, in 1801 to the kingdom of Etruria, and in 1814 to the grand-duchy of Tuscany.

See G. Dennis, Cities and Cemeteries of Etruria (London, 1883), ii. 240; M. Carmichael, In Tuscany (London, 1901), 283, sqq.

(T. As.)

ORBIGNY, ALCIDE DESSALINES D' (1802-1857), French palaeontologist, was born at Couerzon, Loire Inferieure, on the 6th of September 1802. He was educated at La Rochelle, where he became interested in the study of natural history, and in particular of zoology and palaeontology. His first appointment was that of travelling naturalist for the Museum of Natural History at Paris. In the course of his duties he proceeded in 1826 to South America, and gathered much information on the natural history and ethnology, the results being embodied in his great work Voyage dans I'Amirique MSridionale (1839-1842). Meanwhile he had decided to devote his time and energies to palaeontology, and he dealt in course of time with various invertebrata from foraminifera to crinoids and ■ mollusca. In 1840 he commenced the publication of PaUonto- logie FranQaise, ou description des fossiles de la France, a monu- mental work, accompanied by figures of the species. Eight volumes were published by him dealing with Jurassic and Cretaceous invertebrata, and since his death many later volumes have been issued. (See notes by C. D. Sherborn, " On the Dates of the PaUontologie Franˆaise of D'Orbigny," Geol. Mag., 1899, p. 223.) Among his other works were Cours HSmentaire de paliontologie et de gSologie stratigraphiques (3 vols., 1849-1852), and Prodrome de paleontologie str itigraphique (3 vols.,

1850-1852). D'Orbigny introduced (1852) a methodical system of nomen- clature for geological formations based partly on the English terms— thus Bathonian for the Great or Bath Oolite, Bajocian from Bajocea or Bayeux in Calvados for the Inferior Oolite. Many of these names have been widely adopted, but some are of too local application to be generally used. In 1853 he was appointed professor of palaeontology at the Museum of Natural History in Paris, but died four years later, on the 30th of June 1857, at Pierresitte, near St Denis.

ORBILIUS, PUPILLUS, a Latin grammarian of the '1st century A.D., who had a school at Rome, where the poet Horace was one of his pupils. Horace {Epistles, ii.) criticizes his old school- master and describes him as plagosus (a flogger), and Orbilius has become proverbial as a disciplinarian pedagogue.

ORBIT (from Lat. orbita, a track, orbis, a wheel), in astronomy, the path of any body, and especially of a heavenly body, revolving round an attracting centre. If the law of attraction is that of gravitation, the orbit is a conic sections-ellipse, parabola or hyperbola — having the centre of attraction in one of its foci; and the motion takes place in accordance with Kepler's laws (see Astronomy). But unless the orbit is an ellipse the body will never complete a revolution, but will recede indefinitely from the centre of motion. Elliptic orbits, and a parabolic orbit considered as the special case when the eccentricity of the ellipse is 1, are almost the only ones the astronomer has to consider, and our attention will therefore be confined to them in the present article. If the attraction of a central body is not the only force acting on the moving body, the orbit will deviate from the form of a conic section in a degree depending on the amount of the extraneous force; and the curve described may not be a re-entering curve at all, but one winding around so as

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to form an indefinite succession of spires. In all the cases which have yet arisen in astronomy the extraneous forces are so small compared with the gravitation of the central body that the orbit is approximately an ellipse, and the preliminary computations, as well as all determinations in which a high degree of precision is not necessary, are made on the hypothesis of elliptic orbits. Below are set forth the methods of determining and dealing with such orbits.

We begin by considering the laws of motion in the orbit itself, regardless of the position of the latter.

Let the curve represent an elliptic orbit, AB being the major axis, DE the minor axis, and F the focus in which the centre of

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attraction is situated, which centre we shall call the sun.

properties

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ellipse, A is the pericentre or nearest point of the orbit to the centre of attrac- tion and B the apocentre or most distant point. The semi-major axis, GA or CB, is called the mean distance, and is represented by the symbol a. We put e for the eccentricity of the ellipse, represented by the ra tio CF : CA. P is the

-~ —‘D position of the

planet at any time, and we call r the radius vector FP. The angle AFP between the pericentre and the position P of the planet is the anomaly called v. By Kepler’s second law the radius vector, FP, sweeps over equal areas in equal times. To do this the actual speed in the orbit, and in a yet higher degree the angular speed around F, must be greatest at pericentre, and continually diminish till the apocentre is reached. Let P, P’ be two consecutive positions of the radius vector. Since the area of the triangle FPP’ is one half the product of FP into the perpendicular p from P on FP’, it follows that if these perpendiculars were equal all round the orbit, the areas described during the infinitesimal time would be smallest at the pericentre and continually increase during the passage of the body to B. It follows that p must be greatest at pericentre, where its distance from F is least. By geometrical consideration it can be shown that the angle subtended by p, as seen from F, must be inversely as the square of its distance r. We therefore have the fundamental theorem that the angular velocity of the body around the centre of attraction varies inversely as the square of its distance, and is therefore at every point proportional to the gravitation of the sun. Another curious theorem proposed by Bouilland in 1625 as a substitute for Kepler’s second law is that the angular motion of the body as measured around the empty focus F’ is (approximately) uniform. That is to an eye at F’, the planet would seem to move around the sky with a nearly uniform speed,

The true anomaly, AFP, is commonly determined through the mean anomaly conceived thus: Describe a circle of radius a = CA around F, and let a fictitious planet start from K at the same moment that the actual planet passes A, and let it move with a uniform speed such that it shall complete its revolution in the same time T as the actual planet. From the law of angular motion of the latter its radius vector will run ahead of PQ near A, PQ, will overtake and pass it at apocentre, and the two will again coincide at pericentre when the revolution is completed. The anomaly AFQ of Q at any moment is called the mean anomaly, and the angle QFP by which the true anomaly exceeds it at that moment is the equation of the centre.

Two elements define the position of the plane passing through the attracting centre in which the orbit lies. One of these is the position of the line MN through the sun at F in which the plane of the orbit cuts some fundamental plane of reference, commonly the ecliptic. This is called the line of nodes, and its position is; specified by the angle which it makes with some fixed line FX in the fundamental plane. At one of the nodes, say N, the body passes from the south to the north side of the fundamental plane; this is called the ascending node. The other element is the inclina- tion of the plane of the orbit to the fundamental plane, called the inclination simply. A fifth element is the position of the pericentre, which may be expressed by its angular distance XFN from the ascending node. A sixth is the position of the planet in the orbit at a given moment, for which may be substituted the moment at which it passed the pericentre. Another element is the time of revolution of the body in its orbit, called its period. Instead of the period it is common in astronomical practice to use the mean angular

speed, called the mean motion of the body. This is defined as the speed of revolution of the fictitious body already described, revolv- ing with a uniform angular motion and the same periodic time as the planet. It follows that putting n for the mean motion and T for the period of revolution we shall have in degrees raT = 36o°.

It is shown in the article Astronomy {Celestial Mechanics) that the mean distance and mean motion or time of revolution of a planet are so related by Kepler's third law that, when one of these elements is given, the other can be found. Hence the number of independent elements assigned to a planet or Other body moving around the sun is commonly six. But the same relation does not hold of a satellite the mass of whose primary is not regarded as an absolutely known quantity, or of a binary star. In these cases therefore the mean distance and mean motion are regarded as different elements, and the

whole number of the latter is seven.

The process by which the position of a planet at any time is determined from its elements may now be conceived as follows: — The epoch of passage through pericentre being given, let t be the interval of time between this epoch and that for which the position of the body is required. Representing by P this position, it follows that the area of that portion of the ellipse contained between the radii vectores FB and FP will bear the same ratio to the whole area of the ellipse that t does to T, the time of revolution. The problem of finding a radius vector satisfying this condition is one which can be solved only by successive approximations, or tentatively. Its discussion may be found in any work on theoretical astronomy. The solution may be worked out directly or through the deter- mination of the equation of the centre which, being added to the mean anomaly, gives the true anomaly. The angle from the peri- centre to the actual radius vector, and the length of the latter being found, the angular distance of the planet from the node in the plane of the orbit is found by adding to the true anomaly the distance from the node to the pericentre. This, and the inclination of the orbit being given, we have all the geometrical data necessary to compute the coordinates of the planet itself. The coordinates thus found will in the case of a body moving around the sun be helio- centric. The reduction to the earth's centre is a problem of pure geometry.

When a new celestial body, say a planet or a comet is discovered, the astronomer meets with the problem of determining the orbit from several observed positions of the body. To form a conception of this problem it is to be noted that since the position of the body in space can be computed from the six elements of the orbit at any time we may ideally conceive the coordinates of the body to be algebraically expressed as functions of the six elements and of the time. Since the distance of a body from the observer cannot be observed directly, but only the right ascension and declination, calling these a and 8 we conceive ideal equations of the form

a = f(a, b, c, e,f, g, t) and S = ˆ> {a, b, c, e,f, g, t), the symbols a, b, ... I, representing the six elements and the time. If the values of a and 5, defining the position of the body on the celestial sphere, are observed at three different times, we may conceive six equations like the above, one for each of the three observed values of o and 5. Then by solving these equations, regarding the six elements as unknown quantities, the values of the latter may be computed. The actual process of solution is vastly more complex than is indicated by this description of it. Instead of the six ideal equations just described we have to combine a number

of equations of various forms containing other quantities than the elements. But the logical framework of the process is that which we have set forth.

The problem of determining an orbit may be regarded as coeval with Hipparchus, who, it is supposed, found the moving positions of the apogee and perigee of the moon's orbit. The problem of determining a heliocentric orbit first presented itself to Kepler, who actually determined that of Mars. The modern method of deter- mining orbits from three or four observations was first developed by C. F. Gauss in his celebrated work Theoria Motus Corporum Ccelestium. This classical work is still a favourite among students, the improvements on its methods made since its publication being rather in details than in general principles.

Authorities. — Among recent works on the determination of orbits, J. C. Watson's Theoretical Astronomy is the most complete in the English language. The most complete existing work, an encyclopaedia of the subject in fact, is T. von Oppolzer's Lehrbuch zur Bahnbestimmung der Kometen und Planeten (2 vols.), which contains voluminous tables, formulae, and instructions for the computation of orbits in the many special Cases that arise. More recent and better adapted to study is Bauschinger's Bahnbestimmung der Himmelskorper (1 vol., Leipzig, 1906), which, alone of the three, treats orbits of satellites and double stars. (S. N.)

ORCAGNA (c. 1308-c. 1368 1), Italian painter, sculptor and architect, whose full name was Andrea di Cione, called

1 The dates of Orcagna's birth and death are not exactly known. According to Vasari, he died in 1389 at the age of sixty; but a document dated 1376 provides a guardian for Tessa and Romola, daughters of Orcagna's widow Francesca (see Bonaini, Mem.Ined. pp. 105- 106). In that case 1376 was perhaps the year of his death; and if

Argagndolo, 1 was the son of a very able Florentine goldsmith, Maestro Cione, said to have been one of the principal artists who worked on the magnificent silver frontal of the high altar of San Giovanni, the Florentine Baptistery . The result of Orcagna's early training in the use of the precious metals may be traced in the extreme delicacy and refined detail of his principal works in sculpture. He had at least three brothers who all practised some branch of the fine arts: Lipnardo or Nardo, the eldest, a painter; Matteo, a sculptor and mosaicist ; and Jacopo, also a painter. They were frequently

associated with Orcagna in his varied labours.

From the time of Giotto to the end of the 14th century Orcagna stands quite pre-eminent even among the many excellent artists of that time. In sculpture he was a pupil of Andrea Pisano; in painting, though indirectly, he was a disciple of Giotto. Few artists have practised with such success so many branches of the arts. Orcagna was not only a painter and sculptor, but also a worker in mosaic, an architect and a poet. His importance in the history of Italian art rests not merely on his numerous and beautiful productions, but also on his widespread influence, transmitted to his successors through a large and carefully-trained school of pupils. In style as a painter Orcagna. comes midway between Giotto and Fra Angelico: he combined the dramatic force and realistic vigour of the earlier painter with the pure brilb'ant colour and refined unearthly beauty of Fra Angelico. His large fresco paintings are works of extreme decorative beauty and splendour — composed with careful reference to their architectural surroundings, arranged for the most part on one plane, without the strong foreshortening or effects of perspective with which the mural paintings of later masters are so often marred.

1. Orcagna as a Painter. — His chief works in fresco were at Florence, in the church of S Maria Novella. He first covered the walls of the retro-choir with scenes from the life of the Virgin. These, unfortunately, were much injured by damp very soon after their completion, and towards the end of the following century were replaced by other frescoes of the same subjects by Ghir- landaio, who, according to Vasari, made much use of Orcagna's motives and invention. Orcagna also painted three walls of the Strozzi chapel, at the north-east of the same church, with a grand series of frescoes, which still exist, though in a much injured and " restored " state. On the northern end wall is the Last Judgment, painted above and round the window, the light from which makes it difficult to see the picture. In the centre is Christ floating among clouds, surrounded by angels; below are kneeling figures of the Virgin and St John the Baptist, with the twelve apostles. Lower still are patriarchs, prophets and saints, with the resurrection of the blessed and the lost. The finest composition is that on the west wall, unbroken by any window. It represents paradise, with Christ and the Virgin enthroned in majesty among rows of brilliantly-coloured cherubim and seraphim tinged with rainbow-like rays of light. Below are long lines of the heavenly hierarchy mingled with angel musicians; and lower still a crowd of saints floating on clouds. Many of these figures are of exquisite beauty especially the few that have escaped restoration. Faces of the most divine tenderness and delicacy occur among the female saints; the two

central angels below the throne are figures of wonderful grace in pose and movement; and the whole picture, lighted by a soft luminous atmosphere, seems to glow with an unearthly gladness and peace. Opposite to this is the fresco attributed by Vasari to Orcagna's brother Bernardo, or rather Nardo (i.e. Lionardo); it was completely repainted in 1530, so that nothing but the design remains, full of horror and weird imagina- tion. To some extent the painter has followed Dante's scheme of successive circles.

These paintings were probably executed soon after 1350, and in 1357 Orcagna painted one of his finest panel pictures, as a retable for the altar of the same chapel, where it still remains.

Vasari is right about his age his birth would have been in 1316.

Milanesi, the editor of Vasari, is, however, inclined to think that

Orcagna died in 1368, when he is known to have been seriously ill.

1 Of this form, sometimes spelt Orcagnliolo, Orcagna is a corruption.

In the centre is Christ in majesty between kneeling figures of St Peter and St Thomas Aquinas, attended by angel musicians; on each side are standing figures of three other saints. It is a work of the greatest beauty both in colour and composition ; it is painted with extreme miniature-like delicacy, and is on the whole very well preserved. This retable is signed, " An. dni. mccclvii Andreas Cionis de Florentia me pinxit." Another fine altar-piece on panel by Orcagna, dated 1363, is preserved in the Cappella de' Medici, near the sacristy Sta Croce; it represents the four doctors of the Latin church. According to Vasari, Orcagna also painted some very fine frescoes in Sta Croce, similar in subjects to those attributed to him in the Campo Santo of Pisa, and full of fine portraits. These do not now exist. In the cathedral of Florence, on one of the northern piers, there hangs a nobly designed and highly finished picture on panel by Orcagna, representing S Zanobio enthroned, trampling under his feet Cruelty and Pride; at the sides are kneeling figures of SS Eugenius and Crescentius — the whole very rich in colour. The retable mentioned by Vasari as having been painted for the Florentine church of S Pietro Maggiore is now in the National Gallery of London. It is a richly decorative composition of the Coronation of the Virgin, between rows of saints, together with nine other subjects painted in miniature. Other paintings on panel by Orcagna were sent by the Pope to Avignon, but cannot now be traced. The frescoes also have been destroyed with which, according to Vasari, Orcagna decorated the facade of S Apollinare and the Cappella

de' Cresci in the church of the Servi in Florence. 2

2. Orcagna as a Sculptor and Architect? — In 1355 Orcagna was appointed architect to the chapel of Or San Michele in Florence. This curiously-planned building, with a large upper room over the vaulting of the lower part, has been begun by Taddeo Gaddi as a thank-offering for the cessation of the plague of 1348. It took the place of an earlier oratory designed by Arnolfo del Cambio, and was the gift of the united trade-gilds of Florence. As to the building itself, it is impossible to say how much is due to Taddeo Gaddi and how much to Orcagna, but the great marble tabernacle was wholly by Orcagna. This, in its combined splendour of architectural design, sculptured reliefs and statuettes, and mosaic enrichments, is one of the most important and beautiful works of art which even rich Italy possesses. It combines an altar, a shrine, a reredos and a baldacchino. In general form it is perhaps the purest and most gracefully designed of all specimens of Italian Gothic. It is a tall structure of white marble, with vaulted canopy and richly decorated gables and pinnacles, reaching almost to the vaulted roof of the chapel. The detail is extremely delicate, and brilliant gem-like colour is given by lavish enrichments of minute patterns in glass mosaic, inlaid in the white marble of the structure. It is put together with the greatest care and precision; Vasari especially notes the fact that the whole was put together without any cement, which might have stained the purity of the marble, all the parts being closely fitted together with bronze dowels. The spire-like summit of the tabernacle is surmounted by a figure of St Michael, and at a lower stage on the roof are statuettes of the apostles. The altar has a relief of Hope between panels with the Marriage of the Virgin and the Annunciation. On the right side, looking east, of the base of the tabernacle are reliefs of the Birth of the Virgin and her Presentation in the Temple; on the left, the Nativity and the Adoration of the Magi; and behind, the Presentation of Christ in the Temple, and the

2 The magnificent but much injured frescoes of the Last Judgment, Hell, and the Triumph of Death in the Pisan Campo Santo, described with great minuteness and enthusiasm by Vasari, are attributed by him to Orcagna, but internal evidence seems to show that they are productions of the Sienese school. Crowe and Cavalcaselle attribute them to the two brothers Lorenzetti of Siena, but they have been so injured by wet, the settlement of the wall, and repeated retouchings that it is difficult to come to any clear decision as to their authorship. It appears, however, much more probable that they are the work of Bernardo Daddi.

3 Orcagna was admitted as a member of the Sculptors' Gild in 1352.

His name occurs in the roll as ” Andreas Cionis vocatus Arcagnolus, pictor.”

Angel warning the Virgin to escape into Egypt. Above the last two subjects are large reliefs of the Death of the Virgin, sur- rounded by the apostles, and higher still her Assumption; she stands in a vesica, and is borne by angels to heaven. On the base of the Virgin’s tomb is inscribed ” Andreas Cionis pictor Florentinvs oratorii archimagister extitit hvjvs mccclix.” Orcagna’s own portrait is given as one of the apostles. In addition to these richly-composed subject-reliefs the whole work is adorned with many other single figures and heads of prophets, angels, and the Virtues, all executed with wonderful finish and refinement. The shrine, which forms an aumbry in the reredos, contains a miraculous picture of the Madonna. A fine bronze screen, with open geometrical tracery, encloses the whole. No work of sculpture in Italy is more magnificent than this wonderful tabernacle, both in general effect and in the delicate beauty of the reliefs and statuettes with which it is so lavishly enriched. It cost the enormous sum of 96,000 gold florins. Unfortunately it is very badly placed and insufficiently lighted, so that a minute examination of its beauties is a work of difficulty.

No mention is made by Vasari of Orcagna’s residence in Orvieto, where he occupied for some time the post of ” capo- maestro ” to the duomo. He accepted this appointment on the 14th of June 1358 at the large salary (for that time) of 300 gold florins a year. His brother Matteo was engaged to work under him, receiving 8 florins a month. When Orcagna accepted this appointment at Orvieto he had not yet finished his work at Or San Michele, and so was obliged to make long visits to Florence, which naturally interfered with the satisfactory performance of his work for the Orvietans. The result was that on the 1 2th of September 1360 Orcagna, having been paid for his work up to that time, resigned the post, of ” capo-maestro ” of the duomo, though he still remained a little longer in Orvieto to finish a large mosaic picture on the west front. When this mosaic (made of glass tesserae from Venice) was finished in 1362, it was found to be uneven in surface, and not fixed securely into its cement bed. An arbitration was therefore held as to the price Orcagna was to receive for it, and he was awarded 60 gold florins.

Vasari mentions as other architectural works by Orcagna the design

for the piers in the nave of the Florentine duomo, a zecca or mint, which appears not to have been carried out, and the Loggia dei Lanzi in the Piazza della Signoria. It is, however, more than doubtful whether Orcagna had any hand in this last building, a very graceful vaulted structure, with three semicircular open arches on the side and one at each end, intended to form a sheltered meeting-place for the Priori during elections and other public transactions. This loggia was ordered by the General Council of Florence in 1356, but was not actually begun till the year 1376, after Orcagna's death. The architects were Benci di Cione (possibly a brother of Orcagna) and Simone di Francesco Talenti, both men of considerable reputation in Florence. The sculptured reliefs of the seven Virtues in the spandrels of the arches of the loggia, also attributed to Orcagna by Vasari, were later still. They were designed by Angelo Gaddi (1383-1386), and were carried out by three or four different sculptors.

Pupils of Orcagna named by Vasari are Bernardo Nello, a Pisan, Tommaso di Marco, a Florentine, and, chief of all, Francesco Traini, whose grand painting on panel of St Thomas Aquinas enthroned with the arch-heretics at his feet still hangs in the church for which it was painted — Sta Caterina at Pisa. Orcagna had, in addition to the two daughters mentioned above, a son named Cione, who was a painter of but little eminence. Some sonnets attributed to Orcagna exist in MS. in the Strozzi and Magliabecchian libraries in Florence. They have been published by Trucchi (Poesie inedite, ii. p. 25, Prato, 1846). They are graceful in language, but rather artificial and over-elaborated.

Authorities. — Vasari, ed. Milanesi, i. p. 593 (Florence, 1878); Giornale degli Archivi Toscani, iii. p. 282, &c. ; Passerini, Curiositd, storico-artistiche; Gaye, Carteggio inedito, i. pp. 500-513, ii. p. 5; Rosini, Storia della pittura, vol. ii. ; Baldinucci, Professori del disegno, vol. i. ; Rumohr, Ricerche Italiane, ii., and Antologia di Firenze, iii.; Crowe and Cavalcaselie, Painting in Italy, i. p. 425 (London, 1864); Perkins, Tuscan Sculptors, p. 77 (London, 1865). (J. H. M.)

ORCHARD (O. Eng. ort-geard, later orceard; a combination apparently of Lat. hortus, garden, and " yard " or " garth "), a piece of ground enclosed for the purposes of horticulture. The term was formerly used in a general way for a garden where herbs and fruit-trees were cultivated, but is now used exclusively for a piece of enclosed ground for fruit-trees only, and particularly for apples, pears, plums and cherries.

ORCHARDSON, SIR WILLIAM QUILLER (1835-1910), British painter, was born in Edinburgh, where his father was engaged in business, in

1835. ” Orchardson ” is a variation of ” TJrquhartson,” the name of a Highland sept settled on Loch Ness, from which the painter is descended. At the age of fifteen he was sent to the Trustees’ Academy, then under the mastership of Robert Scott Lauder, where he had as fellow-students most of those who afterwards shed lustre on the Scottish school of the second half of the 19th century. As a student he was not especi- ally precocious or industrious, but his work was distinguished by a peculiar reserve, by an unusual determination that his hand should be subdued to his eye, with the result that his early things reach their own ideal as surely as those of his maturity. By the time he was twenty, Orchardson had mastered the essentials of his art, and had produced at least one picture which might be accepted as representative, a portrait of Mr John Hutchison, the sculptor. For seven years after this he worked in Edinburgh, some of his attention being given to ” black and white,” his practice in which had been partly acquired at a sketch club, which included among its members Mr Hugh Cameron, Mr Peter Graham, Mr George Hay, Mr M’Taggart, Mr John Hutchison and others. In 1862 he came to London, and estab- lished himself in 37 Fitzroy Square, where he was joined twelve months later by his friend John Pettie. The same house was afterwards inhabited by Ford Madox Brown.

The English public was not immediately attracted by Orchard- son’s work. It was too quiet to compel attention at the Royal Academy, and Pettie, Orchardson’s junior by four years, stepped before him for a time, and became the most readily accepted member of the school. Orchardson confined himself to the simplest themes and designs, to the most reticent schemes of colour. Among his best pictures during the first eighteen years after his migration to London were ” The Challenge,” ” Christopher Sly,” ” Queen of the Swords,” ” Conditional Neutrality,” ” Hard Hit “—perhaps the best of all — and protraits of Mr Charles Moxon, his father-in-law, and of his own wife. In all these good judgment and a refined imagination were united to a restrained but consummate technical dexterity. During these same years he made a few drawings on wood, turning to account his early facility in this mode. The period between 1862 and 1880 was one of quiet ambitions, of a character- istic insouciance, of life accepted as a thing of many-balanced interests rather than as a matter of sturm und drang. In 1865 Pettie married, and the Fitzroy Square mSnage was broken up. In 1868 Orchardson was elected A.R.A. In 1870 he spent the summer in Venice, travelling home in the early autumn through a France overrun by the German armies. In 1873 he married Miss Helen Moxon’, and in 1877 he was elected to the full member- ship of the Royal Academy. In this same year he finished building a house at Westgate-on-Sea,

with an open tennis-court and a studio in the garden. He was knighted in June 1907, and died in London on the 13th of April 1910.

Orchardson's wider popularity dates from 1881. To that year's Academy he sent the large " On Board the Bellerophon," which now hangs in the Tate Gallery. Its success with the public was great and instantaneous, and for ten or twelve years Orchard- son's work was more eagerly looked for at the Academy than that of any one else. He followed up the " Bellerophon " with the still finer " Voltaire," now in the Kunsthalle at Hamburg. Technically, the " Voltaire " is, perhaps, his high-water mark. Fine both in design and colour, it is carried out with a supple dexterity of hand which has scarcely been equalled in the British school since the death of Gainsborough. The subject is not entirely happy, for it does not explain itself, but requires a previous knowledge on the part of the spectator of how Voltaire

was beaten by the servants of the Chevalier de Rohan-Cabot, and how the due de Sully failed to avenge his guest. The painter was attracted by the opportunity it gave for effective opposition of character, line, colour and movement. The " Voltaire " was at the Academy of 1883; it was followed, in 1884, by the " Mariage de convenance," perhaps the most popular of all Orchardson's pictures; in 1885, by " The Salon of Madame Recamier "; in 1886, by " After," the sequel to the " Mariage de convenance," and " A Tender Chord," one of his most exquisite productions; in 1887, by " The First Cloud "■; in 1888, by " Her Mother's Voice "; and in 1889, by " The Young Duke," a canvas on which he returned to much the same pictorial scheme as that of the " Voltaire." Subsequently he exhibited a series of pictures in which fine pictorial use was made of the furniture and costumes of the early years of the 19th century, the subjects, as a rule, being only just enough to suggest a title: " An Enigma," " A Social Eddy," " Reflections," " If music be the food of love, play on!" "Music, when sweet voices die, vibrates on the memory," " Her First Dance," — in these, oppor- tunities are made to introduce old harpsichords, spinets, early pianofortes, Empire chairs, sofas and tables, Aubusson carpets, short^waisted gowns, delicate in material and primitive in ornament. Between such things and Orchardson's methods as a painter the sympathy is close, so that the best among them, " A Tender Chord," for instance, or " Music, when sweet voices die," have a rare distinction.

As a portrait-painter Orchardson must be placed in the first class. His portraits are not numerous, but among them are a few which rise to the highest level reached by modern art. ” Master Baby,” a picture, connecting subject-painting with portraiture, is a masterpiece of design, colour and broad execution. “Mrs Joseph,” “Mrs Ralli,” ” Sir Andrew Walker, Bart.,” ” Charles Moxon, Esq.,” ” Mrs Orchardson,” ” Conditional Neutrality ” (a portrait of Orchardson’s eldest son as a boy of six), ” Lord Rookwood,” ” The Provost of Aberdeen,” and, above all, ” Sir Walter Gilbey, Bart.,” would all deserve a place in any list of the best portraits of the 19th century. In this branch of art the ” Sir Walter Gilbey ” may fairly be called the painter’s masterpiece, although the sumptuous full-length of the Scottish provost, in his robes, runs it closely. The scheme of colour is reticent; had the picture been exhibited at the time of the Boer War of 1900 the colour would have been called khaki; the design is simple, uniting nature to art with a rare felicity; and the likeness has been found satisfactory by the sitter’s friends. The most important commission ever received by Orchardson as a portrait-painter was that for a group of Queen Victoria, with her son (afterwards King Edward VII.), grandson, and great-grandson, to be painted on one canvas for the Royal Agricultural Society. The painter hit upon a happy notion for the bringing of the four figures together, and as time goes on and the picture slowly turns into history, its merit is likely to be better appreciated. He continued painting to the end of his life, and had three portraits ready for the Royal Academy in 1910.

Orchardson’s method was that of one who worked under a creative, decorative and subjective impulse, rather than under one derived from a wish to observe and record. His affiliation is with Watteau and Gainsborough, rather than with those who would base all pictorial art on a keen eye for actuality and ” value.” Among French painters his pictures have excited particular admiration. (W.Ar.)

ORCHESTRA (Fr. Orchestre; Ger. Kapelle, Orckester; Ital. Orchestra), in its modern acceptation (1) the place in a theatre or concert hall set apart for the musicians; (2) a carefully- balanced group of performers on stringed, wind and percussion instruments adapted for playing in concert and directed by a conductor. In ancientGreece the 6pxv

A modern orchestra is composed of (1) a basis of strings — first and second violins, violas, violoncellos and double basses;

(2) flutes, sometimes including a piccolo; (3) the reed contingent, consisting of two complete families, the oboes with their tenors and basses (the cor Anglais, the fagotto or bassoon and the contrafagotto

or double bassoon), the clarinets with their tenor and basses (the basset horn and the bass and pedal clarinets) with the addition sometimes of saxophones; (4) the brass wind, consisting of the horns, a group sometimes completed by the tenor and tenor-bass Wagner tubas, the trumpet or cornet, the trombones (tenor, bass and contrabass), the tubas (tenor, bass and contrabass); (5) the percussion instruments, including the kettledrums, bells, Glockenspiel, cymbals, triangle, &c. Harps are added when required for special effects.

Although most of the instruments from the older civilizations of Egypt, Chaldea, Persia, Phoenicia and of the Semitic races were known to the ancient Greeks, their conception of music led them to discourage all imitation of their neighbours' love of orchestral effects, obtained by combining harps, lyres, guitars, tanburs, double pipes and long flutes, trumpets, bagpipes, cymbals, drums, &c, playing in unison or in octaves. The Greeks only cultivated to any extent the various kinds of citharas, lyres and auloi, seldom used in concert. To the predilection of the Romans for wind instruments of all kinds, we owe nearly all the wind instruments of the modern orchestra, each of which had its prototype among the instruments of the Roman Empire: the flute, oboe and clarinet, in the tibia; the trombone and trumpet in the buccina; the tubas in the tuba; and the French horn in cornu and buccina. The 4th century a.d. witnessed the downfall of the Roman drama and the debasement of instrumental music, which was placed under a ban by the Church. During the convulsions which the migrations of Goths, Vandals and Huns caused in Europe after the fall of Rome, instrumental music was preserved from absolute extinction by wandering actors and musicians turned adrift after the closing of the theatres by command of the Church. Later, as demand arose, reinforcements of instruments, instru- mentalists and instrument makers filtered through the Byzantine Empire and the Christian East generally on the one side and from the Moors on the West. It is towards the dawn of the nth century that we find the first definite indications of the status of instrumental music in Western and Central Europe. Everywhere are the evidences, so conspicuously absent from the catacombs and from Romano-Christian monuments, of the growing favour in which instrumental music was held, to instance only such sculptures as those of the Abbey of Boscherville in Normandy, of the portico of the Cathedral of Santiago da Compostella (12th century) with its orchestra of 24 musicians, and the full-page illuminations of Psalters representing David and his musicians and of the 24 elders in the Apocalypses.

The earliest instrumental compositions extant are certain 15th-century dances and pieces in contrapuntal style preserved in the libraries of

Berlin and Munich. The late development of notation, which long remained exclusively in the hands of monks and troubadours, personally more concerned with vocal than with instrumental music, ensured the preservation of the former, while the latter was left unrecorded. Instrumental music was for centuries dependent on outcasts and outlaws, tolerated by Church and State but beyond the pale. Little was known of the construction and technique of the instruments, and their possibilities were undreamed. Nevertheless, the innate love and yearning of the people for tone-colour asserted itself with sufficient strength to overcome all obstacles. It is true that the development of the early forms of harmony, the organum, diaphony, the discant and the richer forms of polyphony grew up round the voice, but indications are not wanting of an independent energy and vitality which must surely have existed in unrecorded medieval instrumental music, since they can be so clearly traced in the instruments themselves. It is, for example, significant of the attitude of 10th-century instru- mentalists towards musical progress that they at once assimi- lated Hucbald's innovation of the organum, a parallel succession of fourths and fifths, accompanied sometimes by the octave, for two or three voices respectively, and they produced in the

same century the organistrum, named after Hucbald's organum, and specially constructed to reproduce it.

Shortly after the introduction of polyphony, instruments such as flutes-a-bec, or flaiols, cornets, cromornes, shawms, hunting horns, bagpipes, as well as lutes and bowed instruments began to be made in sizes approximately corresponding in pitch with the voice parts. It is probably to the same yearning of instru- mentalists after a polyphonic ensemble, possible until the 14th century only on organs, hurdy-gurdies and bagpipes, that we owe the clavichord and clavicembalo, embodying the application of keys, respectively, to the dulcimer and the psaltery.

There are two reasons which account for the development of the brass wind proceeding more slowly. (1) These instru- ments, trumpets or busines, tubas and horns, were for many centuries mainly used in medieval Europe as military or hunt- ing signal instruments, and as such the utmost required of them was a fanfare. Specimens of 14th-century tablature and 16th-century notation for the horn, for instance, show that for that instrument rhythm alone was taken into account.

(2) Whereas in most of the instruments named above the notes of the diatonic scale were either fixed or easily obtained, the acoustic principles of tubes without lateral holes and blown by means of a cup mouthpiece do not allow of a diatonic scale, except for the fourth octave from the fundamental, and that only in trumpets and horns, the notes of the common chord with the addition of the flattened seventh being the utmost that can be produced without the help of valves, keys or slides. These instruments were, therefore, the last to be added to the orchestra, although they were extensively used for special military, civil and religious functions and were the most highly favoured of all.

The earliest improvement in the status of the roving instru- mentalists came with the rise of minstrelsy. The courts of the counts of Toulouse, Provence and Barcelona were the first to foster the art of improvising or composing songs known as trobar (or Ir ouver in the north of France), and Count Guillaume of Poitiers (1087-1127) is said to have been the first troubadour. The noble troubadour seldom sang the songs he composed him- self, this duty devolving upon his professional minstrel skilled in singing and in playing upon divers instruments who interpreted and disseminated his master's verses. In this respect the trouba- dour differed from his German contemporary the Minnesinger, who frequently sang himself. The professional musicians were included under the general term of jongleurs or jugleors, gleemen or minstrels, whose function was to entertain and amuse, but there Were among them many subtle distinctions and ranks, such as chanteors and estrumanieors. Love was the prevailing theme in the south, while in the north war and heroic deeds inspired the bards. To the former was due the rapid development of bowed instruments, which by reason of their singing quality were more suitable for accompanying passionate love songs, while instru- ments of which the strings were plucked accorded better with the declamatory and dramatic style of the north.

The first assertive move towards independence was made by the wandering musicians in the 13th century, when some of these, tired of a roving life, settled down in cities, forming gilds or brotherhoods for the protection of their mutual interests and privileges. In time they Came to be recognized by the burgo- masters and municipalities, by whom they were engaged to pro- vide music at all civic and private festivities, wandering musicians being prohibited from playing within the precincts of the cities. The oldest of these gilds was the Brotherhood of Nicolai founded in Vienna in 1288. In the next century these pioneers chose as patron of their brotherhood Peter von Eberstorff, from 1354 to 1376 known as Vogt der Musikanten, who

obtained for the members an imperial charter. This example was gradually followed in other parts of Germany and elsewhere in Europe. In England, John of Gaunt was in 1381 chosen King of the Minstrels. In France there was the Confrerie of St Julien des Menestriers, incorporated in 1321. Exalted patrons of instru- mental music multiplied in the 1 5th century, to instance only the dukes of Burgundy J the emperors of the House of Austria, the dukes of Lorraine, of Este, Ferrara and Tuscany, the electors

of Saxony and the kings of France with their renowned institu- tions La Chapelle-Musique du Roi (c. 1440), la Musique de la Chambre, la Musique de la Grande Ecurie duRoi.

At the time of the revival of the drama with music, afterwards modified and known as opera, at the end of the 16th century, there was as yet no orchestra in our sense of the word, but merely an abundance of instruments used in concert for special effects, without balance or grouping; small positive organs, regals, harpsichords, lutes, theorboes, archlutes and chittarone (bass and contrabass lutes), guitars, viols, lyras da braccio and da gamba, psalteries, citterns, harps, flutes, recorders, cornets, trumpets and trombones, drums and cymbals.

Monteverde was the first to see that a preponderance of strings is necessary to ensure a proper balance of tone. With the per- fected models of the Cremona violins at his disposal, a quartett of strings was established, and all other stringed instruments not played with the bow were ejected from the orchestra with the exception of the harp. Under the influence of Monteverde and his successors, Cavalli and Cesti, the orchestra won for itself a separate existence with music and laws of its own. As instru- ments were improved, new ones introduced, and old ones abandoned, instrumentation became a new and favourite study in Italy and in Germany. Musicians began to find out the capabilities of various families of instruments and their individual value.

The proper understanding of the compass and capabilities of wind instruments, and more especially of the brass wind, was of later date (18th century). At first the scores contained but few indications for instruments other than strings; the others played as much as they could according to the compass of their instru- ments at the direction of the leader. The possibility of using instruments for solos, by encouraging virtuosi to acquire great skill, raised the standard of excellence of the whole orchestra.

At first the orchestra was an aristocratic luxury, performing privately at the courts of the princes and nobles of Italy; but in the 17th century performances were given in theatres, and Germany eagerly followed. Dresden, Munich and Hamburg successively built opera houses, while in England opera flourished under Purcell, and in France under Lully, who with the collabora- tion of Moliere also greatly raised the status of the entertainments known as ballets, interspersed with instrumental and vocal music.

The revival of the drama seems to have exhausted the enthusi- asm of Italy for instrumental music, and the field of action was shifted to Germany, where the perfecting of the orchestra was continued. Most German princes had at the beginning of the r8th century good private orchestras or Kapelle, and they always endeavoured to secure the services of the best available instrumentalists. Kaiser, Telemann, Graun, Mattheson and Handel contributed greatly to the development of German opera and of the orchestra in Hamburg during the first quarter of the century. Bach, Gluck and Mozart, the reformers of opera; Haydn, the father of the modern orchestra and the first to treat it independently as a power opposed to the solo and chorus, by scoring for the instruments in well-defined groups; Beethoven, who individualized the instruments, writing solo passages for them; Weber, who brought the horn and clarinet into prominence; Schubert, who inaugurated the conversations between members of the wood wind — all left their mark on the orchestra, leading the way up to Wagner and Strauss.

A sketch of the rise of the modern orchestra would not be complete without reference to the invention of the piston or valve by Stolzel and Blumel, both Silesians, in 181 5. A satis- factory bass for the wind, and more especially for the brass, had long been a desideratum. The effect of this invention was felt at once: instrument-makers in all countries vied with each other in making use of the contrivance and in bringing it to perfection; and the orchestra was before long enriched by a new family of valved instruments, variously known as tubas, or euphoniums and bombardons, having a chromatic scale and a full sonorous tone of great beauty and immense volume, forming a magnificent bass. (K. S.)

ORCHESTRION, a name applied to three different kinds of instruments. (1) A chamber organ, designed by Abt Vogler at the end

of the 18th century, which in a space of 9 cub. ft. contained no less than 900 pipes, 3 manuals of 63 keys each and 39 pedals (see Harmonium). (2) A pianoforte with organ pipes attached, invented by Thomas Anton Kunz of Prague in 1791. This orchestrion comprised two manuals of 65 keys and 25 pedals, all of which could be used either independently or coupled. There were 21 stops, 230 strings and 360 pipes which produced 105 different combinations. The bellows were worked either by hand or by machinery. (3) A mechanical instrument, auto- matically played by means of revolving cylinders, invented in 1851 by F. T. Kaufmann of Dresden. It comprises a complete wind orchestra, with the addition of kettle-drums, side-drums, cymbals and triangle. (K. S.)

ORCHHA, or Urchha (also called Tehri or Tikamgarh), a native state of Central India, in the Bundelkhand agency. Orchha is the oldest and highest in rank of all the Bundela principalities, and was the only one not held in subjection by the peshwa. Area, 2080 sq. m.; pop. (1901) 321,634; estimated revenue, £47,000; no tribute. The maharaja, Sir Pratap Singh, G.S.C.I. (born in 1854, succeeded in 1874), took a great personal interest in the development of his state, and himself designed most of the engineering and irrigation works that have been executed here within recent years. He bears the hereditary title of ORCHIDS. The word Orchis is used in a special sense to denote a particular genus of the Orchid family (Orchidaceae) ; very frequently, also, it is employed in a more general way to indicate any member of that large and very interesting group. It will be convenient here to use the word Orchis as applying to that particular genus which gives its name to the order or family, and to employ the term ” orchid ” in the less precise sense.

The flowers of all orchids, though extremely diverse within certain limits, and although superficially very different from those

of other monocotyledons, are all formed upon one common plan, which is only a modifica- tion of that observable in such flowers as those of the narcissus or snowdrop (Galanthus) . The conformation of those flowers consists essentially in the pres- ence of a six-parted perianth, the three outer segments of which correspond to a calyx, the three inner ones to a corolla. These segments spring apparently from the top of the ovary — the real explanation, however, being that the end of the flower-stalk or “thala- mus,” as it grows, becomes dilated into a sort of cup or tube enclosing and indeed closely adhering to the ovary, so that the latter organ appears to be beneath the perianth instead of above it as in a lily, an appearance which has given origin to the term ” inferior ovary.” Within the perianth, and springing

Fig. i.

A. Floral diagram of typical orchid flower; I, labellum; a, anther; s, rudiments of barren stamens (staminodes).

B. Diagram of the symmetrical trimerous flower of Fritillary (FritUlaria).

from its sides, or apparently from the top of the ovary, are six stamens whose anthers contain pulverulent pollen-grains. These stamens encircle a style which is the upward continuation of the ovary, and which shows at its free end traces of the three originally separate but now blended carpels of which the ovary consists. An orchid flower has an inferior ovary like that just

- ■ ■ >.„

Pt’

Fig. 2. — Diagram of the flower of Orchis.

s, si, si, The three divisions of the outer perianth.

pi, pi, The two lateral divisions of the inner perianth.

ps, The superior division or the labellum, which may become inferior by the twisting of the ovary.

e, The fertile stamen, with its two pollen-masses in the anther-lobes.

c, The one-celled ovary cut transversely, having three parietal placentas.

Fig. 3. — Flower of Orchis.

s, s, s, The three outer divisions of the perianth.

p, p, I, The three inner, I being the label- lum, here inferior by the twisting of the ovary.

e, Spur of the label- lum.

o. The twisted ovary.

st, The stigma.

a, The anther, con- taining pollen- masses.

described, but with the ovules on the walls of the cavity (not in its axis or centre), a six-parted perianth, a stamen or stamens and stigmas. The main distinguishing features consist in the fact that one of the inner pieces of the perianth becomes in course of its growth much larger than the rest, and usually different in colour, texture and form. So different is it that it receives a dis- tinct name, that of the ” lip ” or ” labellum.” In place of the six stamens we commonly find but one (two in Cypripedium) , and that one is raised together with the stigmatic surfaces on an elongation of the floral axis known as the “column.” Moreover, the pollen, instead of consisting of separate cells or grains, consists of cells aggregated into “pollen-masses,” the number varying in different genera, but very generally two, four, or eight, and in many of the genera provided at the base with a strap-shaped stalk or ” caudicle ” ending in a flattish gland or “viscid disk” like a boy’s sucker. In Cypripedium all three stigmas are functional, but in the great majority of orchids only the lateral pair form recep- tive surfaces (st, fig. 3), the third being sterile and forming the rostellum which plays an important part in the process of pollination, often forming a peculiar pouch-like process (fig. 4, r) in which the viscid disk of the pollen-masses is concealed till released in the manner presently to be mentioned. It would appear, then, that the orchid flower differs from the more general mono- cotyledonous type in the irregularity of the perianth, in the suppression of five out of six stamens, and in the union of the one stamen and the stigmas. In addition to these modifica- tions, which are common to nearly all orchids, there are others generally but not so universally met with; among them is the displacement of the flower arising from the twisting of the inferior ovary, in consequence of which the flower is so completely turned round that the ” lip,” which originates in that part of the flower, conventionally called the posterior or superior part, or that

Fig. 4. — Diagram illus- trating arrangement of parts in flower of Orchis, s, Sepals. p, Petals. a, Anther.

st, Two united stigmas. r, Rostellum (barren stigma).

Fig. 5.— Pollen- masses of an Orchid,

nearest to the supporting stem, becomes in course of growth turned to the anterior or lower part of the flower nearest to the bract, from

whose axil it arises. Other common modifications arise from the union of certain parts of the perianth to each other, and from the varied and often very remarkable outgrowths from the lip. These modifications are associated with the structure and habits of insects and their visits to the flowers.

Cross fertilization, or the impregnation of any given flower by pollen from another flower of the same species on the same or on another plant, has been proved to be of great advantage to the plant by securing a more numerous or a more robust offspring, or one better able to adapt itself to the varying with their caudicles conditions under which it has to live. This c and common cross fertilization is often effected by the gland g. agency of insects. They are attracted to the

flower by its colour or its perfume; they seek, collect or feed on its honey, and while so doing they remove the pollen from the anther and convey it to another flower, there to germinate on the stigma when its tubes travel down the style to the ovary where their contents ultimately fuse with the ” oosphere ” or immature egg, which becomes in consequence fertilized, and forms a seed which afterwards develops into a new plant (see article Angiosperms). ■ To facilitate the operations of such insects, by compelling them to move in certain lines so as to secure the due removal of the pollen and its subsequent deposit on the right place, the form of the flower and the conformation of its several parts are modified in ways as varied as they are wonderful. Other insects visit the flower with more questionable result. For them the pollen is an attraction as food, or some other part of the flower offers an inducement to them for a like object. Such visitors are clearly prejudicial to the flower, and so we meet with arrangements which are calculated to repel the intruders, or at least to force them to enter the flower in such a way as not to effect mischief. See Darwin’s Fertilization of Orchids and similar works.

In the common orchids of British meadows, Orchis Morio, mascula (Shakespeare’s long purples), &c, the general structure of the flower is as we have described it (figs. 2, 3). In addition there is in this particular genus, as indeed in many others, a long tubular spur or horn projecting downwards from the back of the lip, whose office it is to secrete and store a honeyed juice; the forepart of the lip forms an expanded plate, usually larger and more brightly coloured than the other parts of the flower, and with hairs or ridges and spots of various kinds according to the species. The remaining parts of the perianth are very much smaller, and commonly are so arranged as to form a hood

over- arching the ” column. ” This column stands up from the base of the flower, almost at right angles to the lip, and it bears at the top an anther, in the two hollow lobes of which are concealed the two pollen-masses, each with its caudicle terminating below in a roundish gland, concealed at first in the pouch-like rostellum at the front of the column. Below the anther the surface of the column in front is hollowed out into a greenish depression covered with viscid fluid — this is the two united stigmas. The other parts of the flower need not detain us. Such being in general terms the mechanism of the flower of a common orchis, let us now see how it acts. A bee, we will assume, attracted by the colour and perfume of the flower, alights on that part of it which is the first to attract its attention — the lip. There, guided by the hairs or ridges before-mentioned, it is led to the orifice of the spur with its store of honeyed juice. The position of this orifice, as we have seen, is at the base of the lip and of the column, so that the insect, if of sufficient size, while bending its head to insert the proboscis into the spur, almost of necessity displaces the pollen-masses. Liberated from the anthers, these adhere to the head or back of the insect by means of the sticky gland at the bottom of the caudicle (fig. 4). Having attained its object the insect withdraws, taking the pollen-masses, and visits another flower. And now occurs another device or adaptation no

less marvellous than those of which mention has been made. The two anther-cases in an orchis are erect and nearly parallel the one to the other; the pollen-masses within them are of course in like case, as may be thus represented II, but immediately the pollen-masses are removed movements take place at the base of the caudicle so as to effect the bending of this stalk and the placing the pollen-mass in a more or less horizontal position, thus =, or, as in the case of O. pyramidalis, the two pollen-masses originally placed parallel 1 1 diverge from the base like the letter V. The movements of the pollen-masses may readily be seen with the naked eye by thrusting the point of a needle into the base of the anther, when the disks adhere to the needle as they would do to the antenna of an insect, and may be withdrawn. Sometimes the lip is mobile and even sensitive to impressions, as are also certain processes of the column. In such cases the contact of an insect or other body with those processes is sufficient to liberate the pollen often with elastic force, even when the anther itself is not touched. In other orchids move- ments take place in different ways and in other directions. The object of these movements will be appreciated when it is re- membered that, if the pollen-masses retained the original direction they had in the anther in which they were formed, they would, when transported by the insect to another flower, merely come

in contact with the anther of that flower, where of course they would be of no use; but, owing to the divergences and flexions above alluded to, the pollen-masses come to be so placed that, when transplanted to another flower of the same species, they come in contact with the stigma and so effect the fertiliza- tion of that flower. These illustrations are comparatively simple; it would have been easy to select others of a more com- plicated nature, but all evidently connected with the visits of insects and the cross fertilization of the flower. In some cases, as in Catasetum, male flowers are produced so different from the female that before the different flowers had been found on the same pike, and before the facts of the case were fully known, they were taken to be representatives of distinct genera.

The fruit is a capsule splitting generally by three longitudinal slits forming valves which remain united above and below. The seeds are minute and innumerable; they contain a small rudi- mentary embryo surrounded by a thin loose membraneous coat, and are scattered by means of hygroscopic hairs on the inside of the valves which by their movements jerk out the seeds. The floral structure is so curious that perhaps less attention has been paid to the vegetative organs than the peculiarities of their organisation demand. We can only allude to some of these points. The orchids of British fields are all of terrestrial habit, and their roots are mostly tuberous (fig. 6), the tubers being partly radical partly budlike in their character. There is often a marked alter- nation in the production of vegetative and flowering shoots respectively; and, some- times, from various circumstances, the flowering shoots are not produced for several years in succession. This fact will account for the profusion with which some orchids, like the common bee orchis for instance, are found in some seasons and their scarcity in others. Tropical orchids are mostly epiphytal — that is, they grow upon trees without deriving nourishment from them. They are frequently provided with ” pseudo-bulbs, ” large solid swellings of the stem, in the tissues of which water and nutritive materials are stored. They derive this moisture from the air by means of aerial roots, developed from the stem and bearing an outer spongy structure, or velamen, consisting of empty cells kept open by spiral thicken- ings in the wall; this sponge-like tissue absorbs dew and rain and condenses the moisture of the air and passes it on to the internal tissues.

Fig. 6.— Tuber- cular roots of Orchis mascula, a terrestrial Orchid.

The number of species of orchids is greater than that of any other monocotyledonous order — not even excepting grasses — amounting to 6000, contained in 400 genera. This large number is partly accounted for by the diligent search in all countries that has been made for these plants for purposes of cultivation — they being held at present in the greatest esteem by plant- lovers, and prices being paid for new or rare varieties which recall the days of the tulipomania.

The economic uses of orchids are not remarkable. When we have mentioned vanilla (q.v.), which consists of the fleshy pods of an orchid, we have mentioned about the only economic product that now comes into market. Salep (q.v.), still used in the Levant, consists of the dried tubers of a terrestrial orchid, and contains a relatively large amount of nutritious matter. The cultivation of orchids is treated under Horticulture.

The order is divided into two main groups based on the number of the stamens and stigmas. The first Diandreae, has two or rarely three fertile stamens and three functional stigmas. It contains two small genera of tropical Asia and Africa with almost regular flowers, and the large genus Cypripedium containing about 80 species in the north-temperate zone and tropical Asia and America. In Cypripedium two stamens are present, one on each side of the column instead of one only at the top, as in the group Monandreae, to which belong the remaining genera in which also only two stigmas are fertile. What may be considered the normal number of stamens is, as has been said, six, arranged in two rows. In most orchids the only stamen developed to maturity is the posterior one of the three opposite to the lip (anterior before the twisting of the ovary), the other two, as well as all three inner ones, being entirely absent, or present only in the form of rudiments. In Cypripedium two of the outer stamens are wanting; the third — the one, that is, which corresponds to the single fertile stamen in the Monandreae — forms a large sterile structure or staminode; the two lateral ones of the inner series are present, the third being undeveloped. This arrange- ment may be understood by reference to the following diagram, representing the relative position of the stamens in orchids generally and in Cypripedium. The letter L indicates the position of the labellum; the large figures indicate the developed stamens; the italic figures show the position of the suppressed stamens.

2 L 3

Arrangement of stamens Arrangement of stamens

in Orchis. in Cypripedium.

The Monandreae have been subdivided into twenty-eight tribes, the characters of which are based on the structure of the anther and pollinia, the nature of the inflorescence, whether terminal or lateral, the vernation of the leaf and the presence or absence of a joint between blade and sheath, and the nature of the stem. The most important are the following:

Ophrydineae, with about 45 genera, of terrestrial orchids, mainly north temperate, including the British genera Orchis, Aceras, Ophrys, Herminium, Gymnadenia and Habenaria. Also some genera mainly represented in South and tropical Africa, such as Satyrium, Disa and others. ,

Neottiineae, including 90 genera, also terrestrial, contains thirteen more or less widely distributed tropical or subtropical subtribes, some of which extend into temperate zones; one, Cephalanthereae, which includes our British genera Cephalanthera and Epipactis is chiefly north temperate. The British genera Spiranlhes, Listera arid Neottia are also included in this tribe, as is also Vanilla, the elongated stem of which climbs by means of tendril-like aerial roots — the long fleshy pod is the vanilla used for flavouring.

Coelogyninae, 7 genera, mostly epiphytes, and inhabitants of tropical Asia. A single internode of each shoot is swollen to form a pseudobulb.

Liparidinae, 9 genera, terrestrial, two, Malaxis and Corallorhiza, ‘are British. Liparis is a large genus widely distributed in the tropics.

Pleurothallidinae, characterized by a thin stem bearing one leaf which separates at a distinct joint; the sepals are usually much larger than the petals and lip. Includes 10 genera, natives of tropical America, one of which, Pleurothallis, contains about 400 species. Masde-‘.allia is common in cultivation and has often brilliant scarlet, crimson or orange flowers.

Laeliinae, with 22 genera, natives of the warmer parts of America, including three of those best known in cultivation, Epidendrum,

CatUeya and Laelia. The jointed leaves are fleshy or leathery; the flowers are generally large with a well-developed lip.

Phajinae, includes 15 genera chiefly tropical Asiatic, some— Phajus and Calanthe — spreading northwards into China and Japan.

Cystopodiinae, includes 9 genera tropical, but extending into north

temperate Asia and South Africa; Eulophia and Lissochilus are important African genera.

Cataselinae, with three tropical American genera, two of which, Caiaselum and Cycnoches, have di- or tri-morphic flowers. They are cultivated for their strange-looking flowers.

Dendrobiinae, with six genera in the warmer, parts of the Old World ; the chief is Dendrobium, with 300 species, often with showy flowers.

Cymbidiinae, with 8 genera in the tropics of the Old World. The leaves are generally long and narrow. Cymbidium is well known in cultivation.

Oncidiinae, with 44 genera in the warmer parts of America. Odontoglossum and Oncidium include some of the best-known cultivated orchids.

Sarcanthinae, with 42 genera in the tropics. Vanda (Asia) and Angraecum (Africa and Madagascar) are known in cultivation. The flower of Angraecum sesquipedale has a spur 18 in. in length.

The order is well represented in Britain by 18 genera, which include several species of Orchis: — Gymnadenia (fragrant orchis), Habenaria (butterfly and frog orchis), Aceras (man orchis), Hermin- ium (musk orchis), Ophrys (bee, spider and fly orchis), Epipactis (Helleborine), Cephalanthera, Neottia (bird's-nest orchis), one of the few saprophytic genera, which have no green leaves, but derive their nourishment from decaying organic matter in the soil, Listera (Tway blade), Spiranlhes (lady's tresses), Malaxis (bog-orchis), Liparis (fen-orchis), Corallorhiza (coral root), also a saprophyte, and Cypripedium (lady's slipper), represented by a single species now very rare in limestone districts in the north of England.

. ORCHOMENUS (local form on coins and inscriptions, Ercho- menos), the name borne by two cities of ancient Greece.

1. A Boeotian city, situated in an angle between the Cephissus and its

tributary the Melas, on a long narrow hill which projects south from Mount Acontium. Its position is exceedingly strong, being defended on every side by precipice or marsh or river, and it was admirably situated to be the stronghold of an early kingdom. The acropolis is at the north end of the hill, on a peak which is overhung by Acontium, but at a distance sufficient to be safe from an enemy with the weapons of early warfare posted on the mountain. At the foot of the acropolis are the springs of the Melas.

In prehistoric times Orchomenus, as is proved alike by archaeo- logical finds and by an extensive cycle of legends, was one of the most prosperous towns of Greece. It was at once a conti- nental and a maritime power. On the mainland it controlled the greater part of Boeotia and drew its riches from the fertile low- lands of Lake Copais, upon, the drainage of which the early kings of Orchomenus bestowed great care. Its maritime connexions have not been as yet determined, but it is clear that its original inhabitants, the Minyae, were a seafaring nation, and in historical times Orchomenus remained a member of the Calaurian League of naval states. At the end of the second millennium the Minyae were more or less supplanted by the incoming stock of Boeotians. Henceforth Orchomenus no longer figures as a great commercial state, and its political supremacy in Boeotia passed now, if not previously, to the people of Thebes. Never- theless, owing perhaps to its strong military position, it long continued to exercise some sort of overlordship over other towns of northern Boeotia, and maintained an independent attitude within the Boeotian League. In 447 it served as the headquarters of the oligarchic exiles who freed Boeotia from Athenian control. In the 4th century Orchomenus was actuated throughout by an anti-Theban policy, which may have been nothing more than a recrudescence of old-time rivalry, but seems chiefly inspired by aversion to the newly established democracy at Thebes. In the Corinthian War the city supported Lysander and Agesilaus in their attacks upon Thebes, and when war was renewed between the Thebans and Spartans in 379 Orchomenus again sided with the latter. After the battle of Leuctra it was left at the mercy of the Thebans, who first, on Epaminondas's advice, readmitted it into the Boeotian League, but in 368 destroyed the town and exterminated or enslaved its people. By 353 Orchomenus had been rebuilt, probably by the Phocians, who used it as a bulwark against Thebes. After the subjection of the Phocians in 346 it was again razed by the Thebans, but was restored by Philip of Macedon as a check upon the latter (338). Orchomenus springs into prominence once again in 85 B.C., when it provided the battle-field on which

the Roman general Sulla destroyed an army of Mithradates VI. of Pontus. Apart from this event its later history is obscure, and its decadence is further attested by the neglectful drainage of the plain and the consequent encroachments of Lake Copals. Since medieval times the site has been occupied by a village named Skripou. Since 1867 drainage operations have been resumed, and the land thus reclaimed has been divided into small holdings. The most remarkable relic of the early power of Orchomenus is the so-called “treasury’ 1 (of “Minyas”) which resembles the buildings of similar style at Mycenae (see Mycenae), and is almost exactly the same size as the treasury of Atreus. The admiration which Pausanias expresses for it is justified by the beautiful ornamentation, especially of the roof, which has been brought to light by Schliemann’s excavations in the inner chamber opening out of the circular vaulted tomb. The monument, undoubtedly the tomb of some ancient ruler, or of a dynasty, lies outside the city walls. Other remains of early date have been found upon this site.

The worship of the Charites (see Graces) was the great cultus of Orchomenus-, and the site of the temple is now occupied by a chapel, the Kot/u?j(ns tt?s Uavaylas. The Charites were worshipped under the form of rude stones, which had fallen from heaven during the reign of Eteocles; and it was not till the time of Pausanias that statues of the goddesses were placed in the temple. Near this was another temple dedicated to Dionysus, in whose festival, the ‘Aypi&via, are apparent the traces of human sacrifice in early times (see Agbionia).

See Strabo viii. p. 374, ix. pp. 407, 414-416; Pausanias ix. 34-38; Thucydides i. 12, iv. 76; Xenophon, Hellenica, hi. 5, iv. 3, vi. 4; Diodorus xv., xvi.; Plutarch, Sulla, chs. 30-31; K. O. Miiller, Orchomenos und die Minyer (Breslau, 1844); B. V. Head, Historia numorum (Oxford, 1877), pp. 293-294; Journal of Hellenic Studies, vol. ii. pis. xii., xiii.

2. An Arcadian city, situated in a district of the same name, north of Mantineia and west of Stymphalus. The district was mountainous, but embraced two valleys — the northern con- taining a lake which is drained, like all Arcadian lakes, by a kalavolhron; the southern lying under the city, separated from Mantineia by a mountain ridge called Anchisia. The old city occupied a strong and lofty situation; in the time of Strabo it was a ruin, but Pausanias mentions that a new town

was built below the old. A primitive wooden image of Artemis Cedreatis stood in a large cedar tree outside the city. Orcho- menus is mentioned in the Homeric catalogue with the epithet 7roAivu7jXos.

In early history Orchomenus figures as a town of some im- portance, for its kings until the late 7th century B.C. held some sort of sovereignty over all Arcadia. In the 5th century it was overshadowed by its southern neighbour Mantineia, with whom it is henceforth generally found to be at variance. In 418 B.C. Orchomenus fell for a time into the hands of the Mantineians; in 370 it held aloof from the new Arcadian League which the Mantineians were organizing. About this time it further declined in importance through the loss of some posses- sions on the east Arcadian watershed to the new Arcadian capital Megalopolis. In the 3rd century Orchomenus belonged in turn to the Aetolian League, to the Lacedaemonians, and, since 222, to the Achaean League. Though a fairly extensive settlement still existed on the site in the 2nd century a.d., its history under the Roman rule is quite obscure.

See Pausanias, viii. chs. 5, n-13, 27; B. V. Head, Historia numorum (Oxford, 1887), pp. 377-378.

ORCIN, a dioxytoluene, C 6 H 3 (CH 3)(OH)2 (1:3:3), found in many lichens, e.g. Rocella tinctoria, Lecanora, and formed by fusing extract of aloes with potash. It may be synthesized from toluene; more interesting is its production when acetone dicarboxylic ester is condensed with the aid of sodium. It crystallizes in colourless prisms with one molecule of water, which redden on exposure. Ferric chloride gives a bluish- violet coloration with the aqueous solution. Unlike resorcin it does not give a fluorescein with phthalic anhydride. Oxidation of the ammoniacal solution gives orcein, C28H24N2O7, the chief constituent of the natural dye archil (q.v.). Homo-pyrocatechin

is an isomer (CH 3 :OH:OH = i :$ -.4), found as its methyl ether (crebsol) in beech-wood tar.

ORDEAL (O.Eng. ordal, ordael, judgment), a term correspond- ing to modern Ger. Urteil, but bearing the special sense of the medieval Lat. Dei judicium, a miraculous decision as to the truth of an accusation or claim. The word is adopted in the late Lat. ordalium, Fr. ordalie. The ordeal had existed for many ages before it was thus named in Europe. In principle, and often in the very forms used, it belongs to ancient culture, thence flourishing up to the medieval European and modern Asiatic levels, but dying out before modern civilization. Some ordeals, Which possibly represent early stages of the practice, are simply

magical, being processes of divination turned to legal purpose. Thus in Burma suits are still determined by plaintiff and defendant being each furnished with a candle, equal in size and both lighted at once— he whose candle outlasts: the other being adjudged, amid the acclamations of his friends, to have won his cause (Shway Yoe, The Burman, ii. 254). Even quainter is a Dyak ordeal in Borneo, where the two parties are represented by two shell-fish on a plate, which are irritated by pouring on some lime-juice, and the one first moving settles the guilt or innocence (as has. been before arranged) of ; its owner (St John, Forests of the Far East, i.89). The adminis- tration of ordeals has been much in the hands of priests, and they are more often than not worked on a theological basis, the intervention of a deity being invoked and assumed to take place even when the process is in its nature one of symbolic magic. For instance, an ancient divining instrument consisted of a sieve held suspended by a thread or by a pair of shears with the points stuck into its rim, and considered to move at the mention of the name to be discovered, &c. Thus girls consulted the "sieve- witch " {KoaKivonavTts) about lovers (Theocr., Idyll, iii. 31). This coscinomancy served in the same way to discover a thiet when, with prayer to the gods for direction, the names of the suspected persons were called over to it (Potter, Greek Antiquities, i. 352). When a suspended hatchet was used in the same way to turn to the guilty, the process was called axinomancy. The sieve-ordeal remained popular in the middle ages (see the de- scription and picture in Cornelius Agrippa, De Occ. Phil.) ; it is mentioned in Hudibras (ii. 3):

"... th' oracle of sieve and shears That turns as certain as the spheres."

From this ancient ordeal is evidently derived the modern Christian form of the key and Bible, where a Psalter or Bible is suspended by a key tied in at Psalm 1. 18: " When thou sawest a thief, then thou consentedst with him "; the bow of the key being balanced on the fingers, and the names of those suspected being called over, he or she at whose name the book turns or falls is the culprit (see Brand, Popular Antiquities, ed. Bohn, iii. 35i)-

One of the most remarkable groups of divinations passing into ordeals are those which appeal to the corpse itself for discovery of its murderer. The idea is rooted in that primitive state of mind which has not yet realized the full effect of death, but regards the body as still able to hear and act. Thus the natives of Australia will ask the dead man carried on his bier of boughs, who bewitched him; if he has died by witchcraft he will make the bier move round, and if the sorcerer who killed him be present a bough will touch him (Eyre, Australia, ii.

344). That this is no isolated fancy is shown by its recurrence among the negroes of Africa, where, for instance, the corpse causes its bearers to dash against some one's house, which accuses the owner of the murder (J. L. Wilson, Western Africa, p. 231; Waitz, ii. 193). This somewhat resembles the well-known ordeal of the bier in Europe in the middle ages, which, however, seems founded on a different principle, the imagination that a sympathetic action of the blood causes it to flow at the touch or neighbourhood of the murderer. Apparently the liquefaction of the blood which in certain cases takes place after death may have furnished the ground for this belief. On Teutonic ground, this ordeal appears in the Nibelungenlied, where the murdered Siegfried is laid on his bier, and Hagen is called on to prove his innocence by going to the

corpse, but at his approach the dead chief's wounds bleed afresh. The typical instance in English history is the passage of Matthew Paris, that after Henry II. 's death at Chinon his son Richard came to view the body, " Quo superveniente, confestim erupit sanguis ex naribus regis mortui; ac si indignaretur spiritus in adventu ejus, qui ejusdem mortis causa esse credebatur, ut videretur sanguis clamare ad Deum." In Shakespeare (Rich. III., act i, sc. 2):

" O gentlemen, see, see! dead Henry's wounds Open their congeal'd mouths, and bleed afresh! "

At Hertford assizes (1628) the deposition was taken as to certain suspected murderers being required to touch the corpse, when the murdered woman thrust out the ring finger three times and it dropped blood on the grass (Brand, iii. 231); and there was a case in the Scottish High Court of Justiciary as late as 1668 (T. F. Thiselton Dyer, Folklore of Shakespeare, p. 487). Durham peasants, apparently remembering the old belief, still expect those who come to look at a corpse to touch it, in token that they bear no ill-will to the departed (W. Henderson, Folklore of Northern Counties, p. 57). ■

Certain ordeals are closely related to oaths, so that the two shade into one another. Let the curse which is to fall on the oath-breaker take effect at once, it then becomes a sign con- demning the swearer — in fact, an ordeal. Thus the drinking of water on which a curse or magical penalty has been laid is a mere oath so long as the time of fulfilment is unfixed (see Oath). But it becomes an ordeal when, as in

Brahmanic India, the accused drinks three handfuls of water in which a sacred image has been dipped; if he is innocent nothing happens, but if he is guilty sickness or misfortune will fall on him within one to three weeks (for accounts of these and other Hindu ordeals see Ali Ibrahim Khan in Asiatic Researches, i. 389, and Stenzler's sum- mary in Z. D. M. G., vol. ix.). The earliest account of such an ordeal is in Numbers v., which describes the mode of administering to a woman charged with unfaithfulness the bitter water mixed with the dust of the tabernacle floor, with the curse laid on it to cause her belly to swell and her thigh to fall if guilty. Ewald [Antiquities of Israel, 236) regards the draught as in itself harm- less, and the operation of this curse on the guilty as due to the influence of the mind on the body. But the term " bitter " is applied to the water before it has been cursed, which suggests that it already contained some drug, as in the poison-water ordeal still in constant use over a great part of Africa. Thus the red water of Guinea is a decoction made by pounding in a wooden mortar and steeping in water the inner bark of one of the irtimosas, producing a liquor like that of a tan-vat, astringent, narcotic, and when taken in sufficient quantity emetic. The accused, with solemn ceremony and invocation, drinks freely of it; if it nauseates him and he throws it up he is triumphantly acquitted, but if he becomes dizzy he is guilty, and the assembly fall on him, pelt him with stones and even drag him over the rocks till he is dead. Here the result of the ordeal depends partly on the patient's constitution, but more on the sorcerer who can prepare the proper dose to prove either guilt or innocence. Among the various drugs used in different parts of Africa are the mbundu root, the Calabar bean, the tangena nut (Tanghinia veneniflua, a strong poison and emetic). The sorcerers who administer this ordeal have in their hands a power of inflicting or remitting judicial murder, giving them boundless influence (details in J. L. Wilson, Western Africa, pp. 225, 398; Burton, Lake Regions of Central Africa, ii. 357; Bosman, " Guinea," in Pinkerton's Voyages, xvi. 398, &c). The poison-ordeal is also known to Brahmanic law, decoction of aconite root being one of the poisons given, and the accused if not sickening being declared free (Stenzler, I.e.). Theoretically connected with the ordeal by cursed drink is that by cursed food, which is, however, distin- guished among this black catalogue by being sometimes an effectual means of discovering the truth. The ordeal by bread and cheese, practised in Alexandria about the 2nd century, was practically the same as that known to English law five to ten centuries later as the corsnaed or " trial slice " of consecrated bread and cheese which was administered from the altar, with

the curse that if the accused were guilty God would send the angel Gabriel to stop his throat, that he might not be able to swallow that bread and cheese. In fact, if guilty and not a hardened offender he was apt to fail, dry-mouthed and choking through terror, to get it down. The remembrance of this ancient ordeal still lingers in the popular phrase, ” May this bit choke me if I lie! ” In India the corresponding trial by rice is prescribed in the old laws to be done by suspected persons chewing the consecrated grains of rice and spitting them out, moist and untinged with blood, on a banyan leaf; this or the mere chewing and swallowing of a mouthful of rice-grains is often used even by the English as a means of detecting a thief. A classical mention of the ordeals by carrying hot iron in the hands and by passing through the fire is made more interesting by the guards who offer to prove their innocence in this way offering further to take oath by the gods, which shows the intimate connexion between oaths and ordeals (Soph., Ant. 264, see also Aeschyl., fr. 284).

rjlitv &’ froi/jot koX fii&povs atptiv Xtpoiv Kal Trup dtkpireiv, Kai deoiis dpKWfwretv rb ixjfTt Spacrcu fiijre rip iˆvvtiikvai t6 irpay/ia f3ov\ei

The passing through the fire is described in the Hindu codes of Yajnavalkya and others, and is an incident in Hindu poetry, where in the Rdmdyana the virtuous Sita thus proves her innocence to her jealous husband Rama (Stenzler, p. 669; Pictet, Origines Indo-Europeennes, part ii. p. 457). It was not less known to European law and chronicle, as where Richardis, wife of Charles the Fat, proves her innocence by going into a fire clothed in a waxed shift, and is unhurt by the fire (Grimm, Deutsche Rechtsalterthiimer, p. 912). Yet more minutely prescribed in the Hindu ordeal-books is the rite of carrying the glowing hot iron seven steps, into the seven or nine circles traced on the ground, the examination of the hands to see if they show traces of burning, and the binding them up in leaves. The close historical connexion of the Hindu ordeal laws with the old European is shown by the correspondence of minute details, as where in a Scandinavian law it is prescribed that the red-hot iron shall be carried nine steps {Grimm, op. cil., p. 918). In Anglo- Saxon laws the iron to be carried was at first only one pound weight, but Athelstan’s law (in Ancient Laws and Institutes of England, iv. 6) enacts that it be increased to weigh three pounds. Another form well known in old Germany and England was the walking barefoot over glowing ploughshares, generally nine. The law-codes of the early middle ages show this as an ordinary criminal procedure (see the two works last referred to), but it is perhaps best remembered in two non-historical legends. The German queen Kunigunde, ” haec dicens stupentibus et flentibus

universis qui aderant, vomeres candentes nudo vestigio calcavit , et sineadustionis molestiatransiit ” {Vista Henrici, ap. Canisium, vi. 387). Queen Emma, mother of Edward the Confessor, accused of familiarity with Alwyn bishop of Winchester, triumphantly purges herself and him by the help of St S within — each of the two thus acquitted giving nine manors to the church of Winchester, in memory of the nine ploughshares, and the king being corrected with stripes (John Bromton, see Freeman’s Norm. Cong., vol. ii. App.). To dip the hand in boiling water or oil or melted lead and take cut a stone or ring is another ordeal of this class. The traveller may find some of these fiery trials still in use, or at least in recent memory, in barbaric regions of Africa or further Asia — the negro plunging his arm into the caldron of boiling oil, the Burman doing feats with melted lead, while the Bedouin will settle a conflict of evidence by the opposing witnesses licking a glowing hot-iron spoon (Burckhardt, Arabien, pp. 98, 233). This latter feat may be done with safety by any one, provided the iron be clean and thoroughly white hot, while if only red-hot it would touch and burn the tongue. Probably the administerers of the ordeal are aware of this, and of the possibility of dipping the hand in melted metal; and there are stories of arts of protecting the skin (see the recipe in Albertus Magnus, DeMirabilibus), though it is not known what can be really done beyond making it horny like a smith’s, which would serve as a defence in stepping on

hot coals, but not in serious trials like that of carrying a heavy- red-hot iron. The fire-ordeals are still performed by mounte- banks, who very likely keep up the same means of trickery which were in official use when the accused was to be acquitted. The actual practice of the fire-ordeal contrasts shamefully with its theory, that the fire rather than harm the innocent restrained its natural action. Thus it stands in the Hindu code of Manu (viii. 115) : ” He whom the flame does not burn, whom the water does not cast up, or whom no harm soon befals, is to be taken as truthful in his oath.” The water-ordeal here referred to is that well known in Europe, where the accused is thrown bound into the water, which receives him if innocent, but rejects him if guilty. The manner of carrying out this test is well explained in the directions given by Archbishop Hincmar in the oth century: he who is let down into the water for trial is to be fastened by a rope, that he may not be in danger if the water receives him as innocent, but may be pulled out. In the later middle ages this ordeal by ” swimming ” or ” fleeting ” became the most approved means of trying a suspected

witch: she was stripped naked and cross bound, the right thumb to the left toe, and the left thumb to the right toe. In this state she was cast into a pond or river, in which it was thought impossible for her to sink (Brand iii. 21). The cases of ” ducking ” witches which have occurred in England within the last few years are remains of the ancient ordeal.

If there is one thing that may be predicated of man in a state of nature it is that two disputants tend to fight out their quarrel. When in the warfare of Greeks and Trojans, of Jews and Philistines, of Vandals and Alamans, heroes come out from the two sides and their combat is taken to mark the powers of the opposing war-gods and decide the victory, then the principle of the ordeal by battle has been practically called in. Among striking instances of the Teutonic custom which influenced the whole of medieval Europe may be cited the custom of the Franks that the princes, if they could not quell the strife, had to fight it out between themselves, and Wipo’s account of the quarrel between the Christian Saxons and the Pagan Slavs as to which broke the peace, when both sides demanded of the emperor that it should be settled by duel, which was done by choosing a champion on each side, and the Christian fell. The Scandinavian term ” holmgang ” refers to the habit of fighting duels on an island. A passage from old German law shows the single combat accepted as a regular legal procedure: ” If there be dispute concerning fields, vineyards, or money, that they avoid perjury let two be chosen to fight, and decide the cause by duel ” (Grimm, Rechtsaltert., p. 928). In England, after the Conquest, trial by combat superseded other legal ordeals, which were abolished in the time of Henry III. Among famous instances is that of Henry de Essex, hereditary standard-bearer of England, who fled from a battle in Wales, in 1158, threw from him the royal standard, and cried out that the king was slain. Robert de Montfort afterwards, accusing him of having done this with treasonable intent, offered to prove his accusation by combat, and they fought in presence of Henry II. and his court, when Essex was defeated, but the king spared his life, and, his estate being confiscated, he became a monk in Reading Abbey. A lord often sent his man in his stead to such combats, and priests and women were ordinarily represented by champions. The wager of battle died out so quietly in England without being legally abolished that in the court of king’s bench in 1818 it was claimed by a person charged with murder, which led to its formal abolition (Ashford v. Thornton in Barnewall and Alderson 457; see details in H. C. Lea, Superstition and Force, ii.). A distinct connexion may, however, be traced between the legal duel and the illegal private duel, which has disappeared from England, but still flourishes in France and Germany (see Duel). (E. B. T.)

ORDER (through Fr. ordre, for earlier ordene, from Lat. ordo, ordinis, rank, service, arrangement; the ultimate source is generally taken to be the root seen in Lat. oriri, rise, arise, begin; cf. ” origin “), a row or series, hence grade, class or rank, succession, sequence or orderly arrangement; from these, the

original meanings of ordo, have developed the numerous applications attached to the word, many, if not most, of which appear in classical and medieval Latin. In the sense of a class or body of persons or things united by some common status, rank or distinguishing characteristics, or as organized and living under some common rules and regulations, we find the term applied, in such expressions as ” lower ” or ” higher orders,” to the class divisions of society; to the various grades of persons exercising spiritual functions in the Christian church (see Order, Holy, below); to the bodies of persons bound by vows to a religious life (see Monasticism, and separate articles on the chief religious orders) ; to the military and monastic fraternities of the middle ages, such as the Templars, Hospitallers, &c, and to those institutions, founded by sovereigns or states, in part imitation of these fraternities, which are conveniently divided into orders of knighthood, or orders of merit (see Knighthood). The term ” order ” is thus used, in an easily transferred sense, for the various insignia, badge, star, collar, worn by the members of the institution. As applied to a group of objects, an ” order ” in zoological, botanical and mineral classification ranks next below a ” class,” and above a ” family.” The use of the word in architecture is treated in a separate article below.

The word has several technical mathematical usages. In number-theory it denotes a relative rank between the elements of an aggregate so that the collection becomes an ordered aggregate (see Number) . The order of a plane curve is the number of points (real or imaginary) in which the curve is intersected by a straight line; it is equal to the degree (or coefficient of the highest power) of the Cartesian equation expressing the curve. The order of a non-plane curve is the number of points (real or imaginary) in which the curve intersects a plane (see Curve). The order of a surface is the number of points in which the surface intersects a straight line. For the order of a congruence and complex see Surface. The order of a differential equation is the degree of its highest differential coefficient (see Differential Equation).

Another branch of the sense-development of the word starts from the meaning of orderly, systematic or proper arrangement, which appears in the simplest form in such adverbial expressions as ” in order,” ” out of order ” and the like. More particular instances are the use of the word for the customary procedure observed in the conduct of the

business of a public meeting, or of parliamentary debates, and for the general maintenance and due observance of law and authority, ” public order.”

In liturgical use ” order ” is a special form of divine service prescribed by authority, e.g: the ” Order of Confirmation,” in the English Prayer Book.

The common use of ” order ” in the sense of a command, in- struction or direction is a transference from that of arrangement in accordance with intention to the means for attaining it. It is a comparatively late sense-development; it does not appear in Latin, and the earliest quotations in the New English Dictionary are from the 16th century. Particular applications of the term are, in commercial usage, to a direction in writing to a banker or holder of money or goods, by the person in whom the legal right to them lies, to pay or hand over the same to a third person named or to his order. A bill or negotiable instrument made ” payable to order ” is one which can be negotiated by the payee by endorsement. At common law a negotiable instrument must contain words expressly authorizing transfer. By the Bills of Exchange Act 1882, § 8, “a bill is payable to order which is expressed to be so payable, or which is expressed to be payable to a particular person, and does not contain words prohibiting transfer or indicating an intention that it should not be transferable.” Other applications are to a direction for the supply of goods and to a pass for free admission to a place of amusement, a building, &c.

In law an ” order of the court ” is a judicial direction on matters outside the record; as laid down by Esher, M.R., in Onslow v. Inland Revenue, 59, L.J.Q.B. 556, a “judgment” is a decision obtained in an action and every other decision is an “order.” For ” Order in Council ” see below.

ORDER, in classic architecture the term employed (Lat. genus, Ital, ordine, Sp. order, Ger. Ordnung) to distinguish the varieties of column and entablature which were employed by the Greeks and Romans in their temples and public buildings. The first attempt to classify the architectural orders was made by Vitruvius, who, to those found in Greek buildings, viz. the Doric, Ionic and Corinthian, added a fourth, the Tuscan. On the revival of classic art in Italy, the revivalists translated Vitruvius’s work De Architectura, and added a fifth

example, the Composite, so that nominally there are five orders. The Tuscan, however, is only an undeveloped and crude modification of the Doric order, and the Composite is the same as the Corinthian with the exception of the capital, in which the volutes of the Ionic order were placed above the acanthus leaves of the Corinthian.

An order in architecture consists of several parts, constructive in their origin, but, as employed afterwards, partly constructive and partly decorative; its principal features are the column, consisting of base (except in the Greek Doric order), shaft and capital, and the entablature, subdivided into the architrave (the supporting member), the frieze (the decorative member) and the Cornice (the crowning and protecting member). Two only of the orders were independently evolved, viz. the Doric in Greece and Magna Grecia, and the Ionic in Ionia. For the Corinthian order, thejGlreeks borrowed with slight variations the entabla- ture for their Ionic order, and the Romans employed this modified entablature for their Composite order. Owing to a certain re- semblance in form, it was at one time thought that the Greeks owed the origin of the Doric order to Egypt, but the Egyptian column has no echinus under its abacus, which in the earliest Doric examples is an extremely important element in its design, owing to its great size and projection; moreover, the Doric column ceased to be employed in Egypt after the XlXth Dynasty, some seven or eight centuries before the first Greek colony was established there. Dr Arthur Evans's discoveries in the palace of Cnossus in Crete have shown that the earliest type of the Doric column (c. 1500 B.C.) is that painted in a fresco which represents the facades of three temples or shrines, the truth of this representation being borne out by actual remains in the palace; the columns were in timber, tapered from the top downwards, and were crowned by a projecting abacus supported by a large torus moulding, probably moulded in stucco. The next examples of the order are those in stone, which flank the entrance doorway of the tomb of Agamemnon at Mycenae (c. 1200 B.C.), the greater portions of which are now set up in the British Museum; and here both capital and shaft are richly decorated with the chevron pattern, probably derived from the metal plates which in Homeric times sheathed the wood columns. The columns of the Mycenae tombs are semi-detached only, and of very slender proportions, averaging 10 to 11 diameters in height; as isolated columns, therefore, they would have been incapable of carrying any weight, so that in the next examples known, those of the temple at Corinth, where the columns had to carry an entablature in stone supporting a stone ceiling over the peristyle, the relation of diameter to height is nearly one to four, so diffident were the Greek architects as to the bearing power of the

stone. In the temple of Apollo at Syracuse, also a very archaic example, the projection of the capital was so great that the abaci nearly touched one another, and the columns are less than one diameter apart. The subsequent development which took place was in the lightening of the column and the introduction of many refinements, so that in the most perfected example known, the Parthenon, the columns are ij diameters apart and nearly 55 diameters high. In a somewhat later example, the temple of the Nemaean Zeus (Argos) the columns are 65 diameters high. A similar lightening of the structure took place in the entablature, which in the earliest temple in Sicily is about half the height of the columns, in the Parthenon less than a third, and in the Temple of the Nemaean Zeus a little over a fourth.

The origin of the Ionic order is not so clear, and it cannot be traced beyond the remains of the archaic temple of Diana at Ephesus (c. 560 B.C.), now in the British Museum, in which the capitals and the lower drum of the shaft enriched with sculpture

in their design and execution suggest many centuries of development. Here again attempts have been made to trace the source to Egypt, but the volute capital of the archaic temple of Diana at Ephesus and the decorative lotus bud of Egypt are entirely different in their form and object. The latter is purely decorative and vertical in its tendency, the former is a feature intended to carry a superincumbent weight, and is extended horizontally so as to perform the function of a bracket-capital, viz. to lessen the bearing of the architrave or beam which it carries. A similar constructive expedient is found in Persian work at Persepolis, which, however, dates about forty years later than the Ephesian- work. The volutes of the capitals of the Lycian tombs are none of them older than the 4th century, being copies of Greek stone examples. As with the Doric order, the columns became more slender than at first, those of the archaic temple being probably between 6 and 7 diameters high, of the temple on the Ilissus (c. 450 B.C.) 85, and of the temple of Athena Polias at Priene (c. 345 B.C.) over 10 diameters high.

The employment of the two orders in Athens simultaneously, and sometimes in the same building, led to a reciprocal influence one on the other; in the Doric order to an increased refinement in the contour of its mouldings, in the Ionic order to greater severity in treatment, more particularly in the bedmould, the members of which were reduced in number and simplified, the dentil course (which in Ionia was a very important feature) being dispensed with in the temple on the Ilissus and in that of Nike Apteros, and employed only in the caryatide portico of the Erechtheum. The capital of the Corinthian

order, its only original feature, may have been derived from the Egyptian bell-capital, which was constantly employed there, even in Roman times; its decoration was, however, purely Greek, and would seem to have been based on the application to the bell of foliage and ornament derived from metallic forms. The inventor of the capital is said to have been Callimachus of Corinth, who was a craftsman in metal and designed the bronze lamp and its cover for the Erechtheum in Corinthian bronze, which may account for the origin and title of the capital. The earliest example of the Corinthian capital is that found at Bassae by Cockerell, dating from about 430 B.C., and the more perfected type is that of the Tholos of Epidaurus (400 B.C.).

Whilst the entablatures of the Doric and Ionic orders suggest their origin from timber construction, that of the Corinthian was simply borrowed from the Ionic order, and its subsequent development by the Romans affords the only instance of their improvement of a Greek order (so far as the independent treat- ment of it was concerned) by the further enrichment of the bedmould of the cornice, where the introduction of the modillion gave an increased support to the corona and was a finer crowning feature.

The Greek Doric order was not understood by the Romans, and was, with one or two exceptions, utilized by them only as a decorative feature in their theatres and amphitheatres, where in the form of semi-detached columns they formed divisions between the arches; the same course was taken with the Ionic order, which, however, would seem to have been employed largely in porticoes. On the other hand, the Corinthian order, in consequence of its rich decoration, appealed more to the Roman taste; moreover, all its faces were the same, and it could be employed in rectangular or in circular buildings without any difficulty. The earliest examples are found in the temple of Castor and Pollux at Cora, near Rome, which is Greek in the style of its carving, and in the portico of the Pantheon at Rome erected by Agrippa (27 B.C.), where the Roman order is fully developed. The next developments of the orders are those which followed the revival of classic architecture in the 1 6th century, and these were largely influenced by the discovery in 1456 of the manuscript of Vitruvius, an architect who flourished in the latter half of the 1st century B.C. In his work De Architectura he refers constantly to drawings which he had pre- pared to illustrate his descriptions; these, however, have never been found, so that the translators of his work put their own interpretation on his text and published woodcuts representing

the Roman orders as defined by him. They did not, however, confine themselves to the actual remains, which in their day were in much better preservation than at present, but attempted to complete the orders by the addition of pedestals to the columns, which were not employed by the Greeks, and only under special conditions by the Romans; as, however, they are included in the two chief authorities on the subject, Palladio and Vignola, the text-book of the former being the standard in England, and that of the latter in France, the rules and proportions set forth in them for pedestals, as also for the em- ployment of the superposing of the orders with arches between, will follow the analysis of the Greek and Roman orders.

The Greek Doric Order. — The Doric was the favourite order of the Greeks, and the one in which they introduced all their principal refinements; these were of so subtle a nature that until the site was cleared in 1837 their existence was not known, and the earlier explorers, though recognizing the extreme beauty of the proportions and some of the refinements, were unable to grasp the extent to which they were carried, and it was reserved for Penrose in 1846 to verify by micrometrical studies the theories put forward by Pennethorne and other authors. The whole structure of the Doric temple (which consisted of the columns, subdivided into shaft and capital, and the entablature, subdivided into architrave, frieze and cornice) rested on a platform of three steps, of which the upper step wasthestylobate or column base (fig. 1). The tread and rise of the steps varied

in accordance with the diameter of the column; in temples of great dimensions, therefore, supple- mentary steps were provided for access to the stylobate, or, as found in many temples, slight inclined planes. Resting on the stylobate was the shaft of the column, which was either monolithic or composed of frusta or drums. The shaft tapered as it rose, the diminution of the upper diameter being more pronounced in early examples, as in one of the temples at Selinus and in the great temple at Paestum. In the Parthenon at Athens the lower diameter is 6 ft. 3 in. and the upper 4 ft. in., which gives a dimi- nution slightly over one-quarter of the lower diameter. The shaft was always fluted, with two or three exceptions, where the temples were not completed, and there were usually twenty flutes. In two temples at Syracuse, the most ancient temple at Selinus, the temple at Assos, and the temple at Sunium there are only sixteen flutes; the flutes were elliptic in section and intersected with an arris. In order to correct an optical illusion, which arises in a diminish- ing shaft, a slight entasis or swell- ing in the centre was given, the greatest departure from the straight line

being about one- third up the shaft. The shaft was crowned by the capital, the juncture of the two being marked by a groove (orje in the Parthenon, but up to three in more ancient examples) known as the hypotrachelion. Above this the trachelion or necking curves over, constructing what is known as the apophyge up to the fillets, round the base of the echinus, which forms the transition to the square abacus. The varying curve of the echinus, from the earliest times down to the later examples, is shown in the article on mouldings. The relative proportions of the lower diameter and the height of the columns vary accord- ing to the date of the example, in the early examples the column

Fig. 1. — The Greek Doric Order. The Parthenon, Athens; section through front.

being just on 4 diameters high, in the Parthenon nearly 5ˆ diameters, and in the Temple of Jupiter Nemaeus 6| diameters high. The distance between the columns or intercolumniation varied also according to the date, that of the earliest examples in Sicily being about 1 diameter (that between the angle columns being always less), in the Parthenon in the proportion of 1 to 1-24, and in the temple at Argos as 1 to 1-53.

Above the columns rested the entablature (fig. 2), of which the lower member, the architrave, was plain and crowned by a projecting fillet, known as the regula; under which, and below the triglyph, was a fillet (taenia), with six guttae under- neath. The propor- tional height of the architrave, which was the chief sup- porting member, varied according to date, in one of the earliest examples at Syracuse being of greater depth than the diameter of the column, and in the Parthenon ab o u 1 1 w o-t h i r d s of the diameter. Above the archi- trave was the frieze, divided into tri- glyphs, so called because they are divided into three bands by two vertical grooves, and metopes or spaces between the triglyphs. It is supposed that the triglyphs repre- sented the beams in the primitive cella before the peristyle was

added, the spaces between being filled with shutters or boards to prevent the temple being entered by birds. The face of the metopes, which are nearly square, is set back behind that of the triglyphs, and is sometimes decorated with sculpture in high relief. There is generally one triglyph over each column and one between, but at each end of the temple there is a triglyph at the angle, so that the intercolumniation of the angle columns is less than that of the others, which gives a sense of increased strength. Above the frieze is the cornice, which projects forward about one-third of the diameter of the column and slopes down- wards at an angle generally the same as the

slope of the roof. On its under surface are mutules, one over each triglyph and one between, which are studded with guttae, probably repre- senting the wood pins which secured the rafters in their position Generally speaking, in the Doric temples there is no cymatium or gutter, and the rain fell directly off the roof; in order to prevent it trickling down there was an upper moulding, throated, with a bird's beak moulding behind and a second throating near the bottom, so that the corona had an upper fillet projecting, and a lower fillet receding, from its fascia plane. The roof itself was covered with tiles in terra-cotta or marble, which consisted of flat slabs with raised edges and covering tiles over the joints; the lower ends of the covering tiles were decorated with antefixae, and the top of the roof was protected by ridge tiles, on the top of

Pig. 2. — Greek Doric Order. Athens.

The Parthenon,

which were sometimes additional antefixae placed parallel with the ridge tile. As the mouldings of the pediment were returned for a short distance along the side, there was a small cymatium or gutter with lions' heads, through the mouth of which the water ran. In the principal and rear front of the temple the lines of the cornice were repeated up the slope of the pediment, which coincided with that of the roof, and the tym- panum, which they enclosed, was enriched with sculpture. On the centre of the pediment and at each end were pedestals (acroteria), on which figures, or conventional ornaments, were placed. Supplementary to the order at the back of the peristyle were antae, slightly projecting pilasters which terminated the walls of the pronaos; these had a small base, were of the same diameter from the top to the bottom, and had a simple moulded capital.

The Greek Ionic Order. — The Ionic order, like the Doric, owes its origin to timber prototypes, but varies in its features; the columns are more slender, being from 8 to 9 diameters high, with an intercolumniation of sometimes as much as 2 diameters; the architrave also is subdivided into three fascia, which suggests that in its origin it consisted of three beams superposed, in contradistinction to that of the Doric architrave, which con- sisted of a single beam. As in the Doric order, the Ionic temple rested on a stylobate of three steps (fig. 3). The columns con- sisted of base, shaft and capital. In the Ionic

examples the base consisted of a torus moulding, fluted horizontally, beneath which were three double astragals divided by the scotia, some- times, as in the temple at Priene, resting on a square plinth. In the Attic base employed in Athens, under the upper torus, which is either plain, fluted or carved with the guilloche, is a fillet and deep scotia, with a second torus underneath. The shaft tapers much less than in the Doric order; it has a slighter

entasis, and is fluted, the flutes being. elliptical in section but subdivided by fillets. The number of flutes is generally 24. The lower and upper parts of the shaft have an apophyge and a fillet, resting on the base in the former case and supporting the capital in the latter. The capital consists of an astragal, sometimes carved with the bead and reel, and an echinus moulding above enriched with the egg-and-dart, on which rests the capital with spiral volutes at each end, and from front to back with cushions which vary in design and enrichment. In the capitals of the angle columns the end volute is turned round on the diagonal, so as to present the same appearance on the front and the side; this results in an awkward arrangement at the back, where two half-volutes intersect one another at right angles. A small abacus, gener- ally carved with ornament, crowns the capital. In early examples the channels be- tween the fillets of the spiral are convex, in later examples concave. In the capitals of

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Fig. 3. — The Greek Ionic Order. Temple of Nike Apteros, Athens.

the Erechtheum (fig. 4), a greater richness is given by inter- mediary fillets. In all great examples the second fillet dips down in the centre of the front and a small anthemion ornament marks the receding of the echinus moulding, which is circular and sometimes nearly merged into the cushion. In the Erech- theum the enrichment of the capital is carried further in the

necking, which is decorated with the anthemion and divided off from the upper part of the shaft by a bead and reel. The en- tablature is divided, like that of the Doric order, into architrave, frieze and cornice. The architrave is subdivided into three fasciae, the upper one pro- jecting slightly beyond the lower, and crowned by small

mouldings, the lower one sometimes carved with the Lesbian leaf. Above this is the frieze, sometimes plain and at other times enriched with figure sculpture in low relief. In the Ionian ex- amples there was no frieze, its place being taken by dentils of great size and projection. The cornice consists of bedmould, corona and cymatium; in the Ionian examples the bedmould is of great rich- ness, consisting of a lower moulding of egg-and-dart with bead and reel, a dentil course above, and another egg-and-dart with bead and reel above, sink- ing into the soffit of the corona, which projects in the Ionian examples more than half a diameter. The corona consists of a plain fascia with moulding and cymatium above, and as the cymatium or gutter is carried through from end to end of the temple it is provided with lions' heads to throw off the water, and sometimes enriched with the anthemion ornament.

Fig. 4. — Greek Ionic Order. Erechtheum, Athens.

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In the Attic examples much greater simplicity, ascribed to Dorian influence, is given to the bedmould, in which only the cyma-reversa with the Lesbian leaf carved on it and the bead and reel are retained. The mouldings of the cornice, including the cymatium, are carried up as a pediment, as in the Doric temple, and the roofs are similar. The base and capital of the antae are more elaborate than in those of the Doric order, and are sometimes, both in Ionic and Attic examples, richly carved with the Lesbian leaf and egg-and-dart, in both cases with the bead and reel underneath. The chief variation from the usual entablature is found in that of the caryatide portico of the Erechtheum, where the frieze is omitted, dentils are introduced in the bedmould, paterae are carved on the upper fascia of the architrave, and the covering was a flat marble roof. The caryatide figures, the drapery of which recalls the fluting of the columns, stood on a podium which enriched cornice and base.

The Greek Corinthian Order (fig. 5). — As the entablature of this order was adapted by the Greeks from that of the Ionic order, the capital only need be described, and its evolution from the earliest examples known, that in the temple at Bassae, to the fully developed type in the temple of Zeus Olympius at Athens, can be easily traced. It consisted of either a small range of leaves at the bottom, or of a bead-and-reel moulding, a bell decorated in various ways and a moulded abacus, the latter as a rule being concave in plan on each face and generally terminating in an arris or point. In the Bassae capital we find the first example of the spiral tendrils which rise up to and

support the abacus with other spirals crossing to the centre and the acanthus leaf and flower. In the more perfected example of the Choragic

monument of Lysicrates (fig. 6), there is a lower range of small leaves of some river plant, between which and the tops of the flutes (which here are turned over as leaves) is a sinking which was probably filled with a metal band. From the lower range of leaves spring eight acanthus leaves, bending forward at the top, with small flowers between, representing the heads of nails which in the metal prototype fastened these leaves to the bell; from the caulicolae, on the right and left, spring spiral tendrils rising to the angles under the abacus, and from the same caulicolae double spirals which cross to the centre of the bell, the upper ones Carrying the anthemion flower, which rises across the abacus. The abacus in this capital has a deep scotia with fillet, and an echinus above, and is one of the few great examples in which the angles are canted. The architrave, frieze and cornice are adaptations from the Ionic order. The corona has in the place of the cymatium a cresting of antefixae, which is purely decora- tive, as there are no covering tiles, the roof of the monument being

Fro. 5. — Greek Corinthian Order Choragic monu- ment of Lysicrates.

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Fig. 6.

in one block of marble carved with leaves. Set back and on the same plane as the architrave and frieze is a second cresting with the Greek wave scroll. There are other types of Greek Corinthian capital, of

which the finest example is in the interior of the Tholos at Epidaurus [c. 400 B.C.), with two rows of leaves round the lower part, angle and central spirals, and a flower in the centre of the abacus. Of other examples the capitals of the interior of the temple of Apollo Branchidae in Asia Minor, and of the vestibule at Eleusis, and of the two porches of the temple of the Winds at Athens, are the best known. Except for the pointed ends of the abacus, which are Greek, the capital of the temple of Zeus Olympius might almost be classed among the Roman examples, and it is thought to have been the model copied by the Romans from those which Sulla took to Rome for the temple of Jupiter Capitolinus.

The Roman Boric Order. — The earliest example of this order is probably that of the temple at Cora, about 20 m. from Rome, attributed to Sulla (80 B.C.), in which the leading features of the Greek Doric order are employed, but extremely degraded in style. The temple was raised on a podium with a flight of steps in front; the shaft has 20 flutes and is carried on a small torus base, and the echinus of the capital is very poor. The archi- trave and triglyph- frieze are cut out of the same stone, the former being much too shallow to allow of its carrying the frieze and cornice. Two other early ex- amples are those

employed in the

decoration of the

arcades of the

Tabularium and of

the theatre of

Marcellus (fig. 7);

they are only semi- detached. The Doric order was not a favourite with the Romans, and did not appeal to their tastes for rich decoration; the only other ex- amples known are those at Praeneste, at Albano, and in the thermae of Dio- cletian. At Albano

the echinus of the

capital is carved |

with the egg and

anchor, and in the

thermae a cyma-recta carved with a leaf ornament takes the

place of the echinus. There is no base to any of these examples,

the Albano base consisting only of an apophyge and fillet, and

only the Diocletian example is fluted.

The Roman Ionic Order. — The complete degradation cf the Ionic order is clearly shown in the so-called temple of Fortuna Virilis (ascribed to about 100 B.C.), in the profuse decoration of architrave, frieze and cornice with coarse ornament, and, in the capital, the raising of the echinus to the same level as the top of the second fillet of the volute, so that it is no longer visible under the cushion. The shaft has twenty flutes, the fillet being much wider than in the Greek examples, and the flute is semi- circular. Much more refinement is shown in the order as em- ployed on the upper storey of the theatre of Marcellus (fig. 8), where the only part enriched with ornament is in the egg and tongue of the bedmould. In the capital the fillet of the volute runs across above the echinus, and the canalis is stopped at each end over the volute, an original treatment. The most corrupt example of the Roman Ionic capital is that of the temple of Saturn on

the Forum Romanum, which fortunately does not seem to have been copied later. The base of all the Roman Ionic columns is that known as the Attic base, viz. a lower and upper torus with scotia and fillets between, always raised on a square plinth.

The Roman Corinthian Order. — The great varieties of design in the Greek Corinthian capital (fig. 9), and the fact that its entablature was copied from Ionic examples, suggests that no definite type sufficient to constitute an order had been evolved by the Greeks; it remained therefore a problem to be worked out by the Romans, who, with the assistance of Greek artists,

Fig. 7.

employed generally by the Romans, not only in Rome but throughout Greece, Asia Minor and Syria, developed an order

which, though

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Fig. 8.

Fig. 9. — Roman Corinthian Order; Pantheon.

wanting in the refinement and subtlety found in Greek work, is one of the most monu- mental kind, and has in its adoption by the Italian re- vivalists had more influence than any other in the raising of palatial struc- tures. Even in Rome itself the portico of the Pan- theon, erected by Agrippa (27 B.C.), and the temple of Castor (rebuilt by Domitian a.d. 86) in the Forum, are remarkable in- stances of early work, which hold their own with some of the later examples even of Greek art.

The develop- ment of the Roman Corinthian order will be best understood by a description in detail similar to that given of the great Doric and Ionic orders. Tak- ing the Pantheon portico as the earlier example, the base consists of an upper and lower torus separated by a double astragal with scotia and fillet above and below, and resting on a square plinth. The shaft, a monolith, is unfluted, tapering up- wards, 9! diameters in height, with apophyge and fillet at the bottom, and an apophyge, fillet and astragal at the top. The capital consisted of a square abacus with concave sides carried on a circular inverted bell,

two rows of acanthus leaves, rising three-fifths of the bell, being carved round it (fig. ro), the stems of the upper range of eight leaves lying in the axis of each face and of the dia- gonals, and those of the lower range between them; the stems of the caulicolae from which spring the spirals, which rise to support the angles of the abacus, and to the centre of the capital, carrying the central flower, start from between the upper range of leaves. The abacus has concave sides, canted angles, and is moulded, with a quarter round, fillet and cavetto. The archi-

trave, like that of the Greek Ionic order, has three fasciae, but they are further elaborated by a small cyma-reversa under the upper fascia and a bead

under the second fascia. The architrave is crowned with a moulding, consisting of a fillet with cyma-reversa and bead underneath. The frieze is plain, its only decoration being the well-known inscription of Agrippa. The bedmould consists of a bead, cyma-reversa and fillet, under a plain dentil course, in which the dentils are not carved; bead-and-reel and egg-and- dart above these carried a plain face on which is found the new feature introduced by the Romans, viz. the modillion. This, though carved out of one solid block with the whole bedmould, suggested an appropriate support to the projecting cornice. The modillion was a bracket, a horizontal version of the ancones which supported the cornice of the Greek doorway cornice, and was here crowned by a small cyma-reversa carved with leaves which profiled round the modillion and along the upper part of the plain face. The cornice f— is simple, consisting of a corona, fillet and cymatium, the latter omitted across the front of the temple, but carried up over the cornice of the pediment. All the columns are equi-distant with an in- tercolumniation. of 25 diameters. The order of the interior of the rotunda built by Hadrian (a.d. 121) is similar to that of the portico, the lower moulding of the bed- mould and the bead being carved, and the tongue or anchor taking the place of the dart between the eggs. The order of the temple of Castor (fig. n) was enriched to a far greater extent, and parts were carved with ornament, which in Greek examples was probably only painted. The base was similar, but the columns (10 diameters high) had twenty-four flutes, with fillets between. The capital was further enriched with

Fig. 10.-

-The Roman Corinthian Order ; Pantheon.

foliage, which rising from the caulicolae was carried along the cavetto

of the abacus, whose upper moulding was carved with the egg^and-dart. The middle fascia of the architrave was carved with a version of the Greek anthemion, the cyma- reversa under the upper fascia being carved with leaves and bead-and-reel under. The lower moulding of the bedmould was carved with the egg-and- tongue; the dentil course was carved with finely proportioned dentils, the cyma-reversa and mouldings above being similar to those of the Pantheon portico. In the latter, on the soffit of the corona, square panels are sunk with a flower in the centre. In the temple of Castor the panel is square, but there is a border in front and back, which shows that the cornice had a greater projection. The corona was carved with fluting, departing from the simplicity of the Pantheon example, but evidently more to the taste ■ of the Romans, as it is found in many subsequent examples. The intercolumniation is only two and one-third of the diameter. Though not quite equal to Greek foliage, that of the capitals of the temple of Castor is of great beauty, and there is one other feature in the capital

which is unique; the spirals of the centre are larger than usual and interlace one another. A variety of the bedmould of the cornice is found in the so-called Temple of the Sun on the Quirinal Hill; although of late date, the entablature has the character of the Renaissance of the Augustan era, so fine and simple are

Fig. ii. — The Roman Corinthian Order; Temple of Castor.

its proportions and details; there are only two fasciae to the architrave, and the upper feature of the bedmould consisted of large projecting blocks with two fascia and an upper egg-and- tongue moulding, like the Ionic dentil, these blocks projecting half-way between the fascia of the frieze and the edge of the corona.

The Roman Composite Order. — As already noted, the Com- posite order differs from the Corinthian only in the design of its capital, which is a compound of the foliage of the Corinthian and the volutes of the Ionic capital. Already, in the Ionic capital of the Erechtheum, a further enrichment with the anthemion was provided round the necking; this was copied in the capitals of the interior of Trajan's basilica; in Asia Minor at Aizani (ist century a.d.) a single row of leaves was employed round the capitals of the pronaos under the volutes of an Ionic capital; the architect of the Arch of Titus (a.d. 8i) went one step farther and introduced the double row of leaves; both

examples exist in the Arch of Septimus Severus (fig. 12), in the tepidarium of the thermae of Diocletian; and, to judge by the numerous examples still existing in the churches at Rome, it would seem to have been the favourite capital. The Byzantine architects also based most of their capitals on the Roman Composite examples. There are other hybrid Roman capitals, in which figures of a winged Victory, rams' heads or cornucopia, take the place of the angle spirals of the Corinthian capital.

The Arcade Order. — This, which was defined by Fergusson as the true Roman order, is a compound of two distinct types of construction, the arcuated and the trabeated, the former

derived from the Etruscans, the latter from the Greeks. Whilst, however, the arcade was a constructive feature, the employ* ment of the semi- or three-quarter detached column with its> entablature complete, as a decorative screen, was a travesty of its original constructive function, without even the excuse of its adding in any way to the solidity of the structure, for the whole screen could be taken off from the Roman theatres and amphi- theatres without in any sense interfering with their stability. The employment of the attached column only, as a vertical decorative feature subdividing the arches, might have been admissible, but to add the entablature was a mistake, on account of the intercolumniation, which was far in excess of that em- ployed in any order, so that not only was it necessary to cut the architrave into voussoirs, thus forming a flat arch, but the stones composing it had to be built into the wall to ensure their stability; the entablature thus became an element of weakness instead of strength (fig. 13). The earliest example of the Arcade order is the Tabularium in Rome (80 B.C.) where it was employed to light a vaulted corridor running from one end to the other of the structure and raised some 50 ft. from the ground. The column is semi-detached, 7 J diameters high with an intercolumniation of nearly 4 diameters, and an entablature with an architrave which is less than half a diameter, quite incapable, therefore, of carrying itself, much less than the rest of the entablature; the impost pier of the arch is half a diameter, and the height of the open arcade a little more than half its width. The shaft

Fig. 12. — The Composite Order; Arch of Septimus Severus.

had twenty-four flutes with arrises, and rested on a square plinth, and in the capital the echinus was only about one-twelfth of the diameter, the shallowest known. The frieze was divided by triglyphs, there being four between those over the axis of each column; the correct number in the Greek Doric order being one. In the theatre of Marceilus there

were three triglyphs; the impost pier was f diameter, thus giving greater solidity to the wall, but resulting in a narrower opening. The Tabularium had originally a second arcade above that now existing, with

semi-detached columns of the Ionic order, and these are found in the upper storey of the theatre of Marcellus, the earliest example existing of the superposed orders. A certain proportion exists between the orders employed; thus the upper diameter of the Doric column (which is 7ˆ diameters high with a diminution of between one-fifth and one-sixth of the lower diameter) is the same as the lower diameter of the Ionic column, which is 8J diameters high and a much slighter diminution. In the Colosseum

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Fig. 13. — The Arcade Order; Theatre of Marcellus.

there were three storeys pierced with arcades, with the Corinthian order on the third storey, and a superstructure (added at a later date) without an arcade, and decorated with Corinthian pilasters only. Apparently this scheme of decoration was considered to be the best for the purpose, and with some slight changes was employed for all the amphitheatres throughout the Empire. The intercolumniation, on which the design is made, varies in the examples of later date. With an intercolumniation of 6 diameters, the arcades are wider and a lighter effect is obtained, and this is the proportion in the Colosseum.

The Five Orders; Italian. — The two Italian architects whose text-books with illustrations of the five orders have been accepted generally as the chief authorities on the subject are Vignola

and Palladio, the former in France and the latter in England, the dates of the publication of their works being 1563 and 1570 respectively. In 1759 Sir William Chambers published a treatise on civil architecture, in which he set forth las interpretation of the five orders, and his treatise is still consulted by students. They all of them based their conjectural restorations on the descriptions given by Vitruvius, who, however, avoids using the same term throughout, the words genus, ratio, species, mores being employed, from which it may be concluded that the Greeks themselves had no such term as that which is now

defined as ” order,” especially as in his book he invariably quotes the Greek name when describing various parts of the temple. In the preface to the fourth book he speaks only of the three orders (genus), so that the Tuscan described in Book IV. chap. vii. would seem to have been an afterthought, and his descrip- tion of the entablature shows that it was entirely in wood and therefore an incomplete development. The Italian revivalists, however, evolved one of their orders out of it and added a fifth, the Composite, of which there was no example in Rome before a.d. 82. In the description which follows it must be understood that it refers only to the Italian version of what the revivalists considered the Roman orders to consist of, and as a rule Vignola’s interpretation will be given, because he seems to have kept closer to Vitruvius’s descriptions and to have taken as his models the finest examples then existing in Rome.

The Tuscan Order.— The base consists of a torus moulding, resting on square plinths; the shaft is terminated below by an apophyge and fillet and tapers upwards, the diminution being between one-quarter and one-fifth of the lower diameter, with an apophyge, fillet and astragal at the top, the capital consists of a square abacus with fillet and cavetto, an echinus, fillet and a necking; the whole column being 7 diameters high. The intercolumniation given by Vignola is 25 diameters, instead of the 35 diameters of Vitruvius’s areostyle. The architrave, frieze and cornice, are simple versions of the Doric, except that there are no triglyphs in the frieze.

The Doric Order. — In his Doric order Vignola has followed the Roman Doric order of the theatre of Marcellus, but he gives it a base consisting of an astragal and torus resting on a square plinth; in his shaft he copies the fluting (24 flutes) with the arris of the columns of the thermae of Diocletian; his capital, except the flowers decorating the necking and his entablature, are entirely taken from the theatre of Marcellus; in a second study he introduces an Attic base, carves the echinus of the capital with the egg-and-tongue, introduces two fasciae in his architrave, and to support the cornice provides shallow plain modillions with guttae on the soffits. In both the examples given the columns taper upwards and are 8 diameters high.

The Ionic Order. — For the Ionic order Vignola discards the temple of Fortuna Virilis, but enriches the order of the theatre of Marcellus, adopting the base of the temple of Castor and the fluted columns of the same; in his frieze he introduces that of the Corinthian temple of Antoninus’ and Faustina, and in the bedmould and cornice copies that of the thermae of Diocletian. Palladio in his entablature introduces the convex friezes and adopts a single uncarved modillion under the

cornice. In both cases the columns are fluted and 9 diameters high.

The Corinthian Order. — In this order Vignola, for his base, returns to the temple of Castor, makes his columns 10 diameters high, copies the capital of the portico of the Pantheon, introduces a rib frieze with winged female figures and a bull about to be sacrificed, and adopts the bedmould of the temple of Castor, reversing the carving of two of the mouldings and the cornice, and omitting the fluting of the corona of that temple. In Palladio's Corinthian order the frieze is too narrow and the bedmould, though copied from the temple of Castor, is of smaller scale.

The Composite Order. — As in the Roman Composite order the only original feature was the capital, there were no new versions to be given of the entablature, but unfortunately they were unable to copy the many examples in Rome. In the three best- known capitals, those of the arches of Titus and Septimus

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Tuscan.

Doric.

Ionic. Fig. 14. — The Italian Orders.

Corinthian.

Composite.

Severus and in the thermae of Diocletian, the upper fillet of the volute runs straight across the capital, being partially sunk in the cavetto of the abacus; in the canalis of the volutes of all these examples is a band of foliage which dips down to carry the centre flower, and, on account of its projection, it hides, from those looking only from below, the upper fillet of the volute. The architects of the Revival, therefore, in their studies of the capital, turned the volutes (which they would seem, like Ruskin, to have thought were horns) down on to the top of the echinus, producing a composition which is not in accordance with ancient examples and shows ignorance of the origin and development of the Ionic volute; unfortunately their interpretations of the Composite capital were followed by Inigo Jones, and are employed

even in Regent Street, London, at the present day; there are, however, two or three Renaissance examples in Paris, in which the true Composite capital has been retained.

The Pedestal. — The architects of the Revival would seem to have conceived the idea that no order was complete without a pedestal. The only Roman examples of isolated columns with pedestals known are those of the columns of Trajan, Marcus Aurelius, Antoninus Pius and others of less importance, but they carried statues only and had no structural functions as supports to an entablature; the pedestals under the columns which decorated the arches of triumph were built into and formed part of the structure of the arch. The columns of the tepidarium of the Roman thermae had pedestals of moderate height (about 3 to 4 ft.) which bore no proportional relation to the diameter of the column. Vignola, however, gave definite proportions for the pedestal, which in the Doric order was to be 2 diameters in height, in the Ionic 2$ diameters, and in the Corinthian order 3 diameters, the result being that in the front of the church of St John Lateran, where the Corinthian pilasters are of great height, the pedestals are 12 to 13 ft. high. In conjunction with the arcade there was more reason for pedestals

to the semi-detached columns on the upper storeys, but none was employed on the ground storey, either in the theatre of Marcellus or in the Colosseum. (R. P. S.) ;

ORDER, HOLY. “Holy Orders” {ordines sacri) may be defined as the rank or status of persons empowered by virtue of a certain form or ceremony to exercise spiritual functions in the Christian church. Thus Tertullian {Idol. 7, Monog. n) mentions the ” ecclesiastical order,” including therein those who held office in the church, and {Exhort. Cast. 71) he dis- tinguishes this ordo from the Christian plebs or laity. We may compare the common use of the word ordo in profane writers, who refer, e.g., to the ordo senatorius, ordo equester, &c. It is true that the evidence of Tertullian does not carry us back farther than the close of the 2nd or opening of the 3rd century a.d. But a little before Tertullian, Trenaeus, though he does not use the word ordo, anticipates in some measure Tertullian’s abstract term, for he recognizes a magisterii locus, ” a place of magistracy ” or ” presidency ” in the church. Indeed, phrases more or less equivalent occur in the sub-apostolic litera- ture, and even in the New Testament itself, such as those who are ” over you in the Lord ” (1 Thess. v. 12), those ” that bear the rule” (Heb. xiii. 7; cf. 1 Clem. i. 3; Herm. Vis. ii. 2, 6). Here we pause to remark that in Tertullian’s view the church as a whole possesses the power of self-government and administra- tion, though

in the interest of discipline and convenience it delegates that power to special officers. It is, he says, the ” authority of the church ” which has constituted the difference between the governing body and the laity, and in an emergency a layman may baptize and celebrate {Exhort. Cast. 7), nor can this statement be lightly set aside on the plea that Tertullian, when he so wrote, had lapsed into Montanism. The fact is that the Montanists represented the conservatism of their day, and even now the Roman Church admits the right of laymen to baptize when a priest cannot be had. The Apostolic Constitutions (viii. 32)

allow a layman to preach, if he be skilful and reverent, and the language of St Ignatius (Ad Smyrn. 8), ” Let that be esteemed a valid Eucharist which is celebrated in the presence of the bishop, or of some one commissioned by him,” is really incon- sistent’ with any firmly established principle that celebration by a layman was in itself absolutely null (see also Eucharist).

When we go on to inquire what special offices the church from the beginning, or almost from the beginning, adopted and recognized, two points claim preliminary attention. In the first place, much would be done in practical administration by persons who held no definite position formally assigned to them, although they wielded great influence on account of their age, talents and character. Next, it must be carefully remembered that the early church was, in a sense hard for us even to under- stand, ruled and edified by the direct action of the Holy Spirit. St Paul (i Cor. xii. 28) furnishes us with a list of church offices very different from those which obtain in any church at the present day. 1 ” God,” he says, ” hath set some in the church, first apostles, secondly prophets, thirdly teachers, then miracles, then gifts of healing, helps, governments, (divers) kinds of tongues.” Ministry of this sort is not to be confounded with ” order,” of which this article treats. It died out very gradually, and the Didache or Teaching of the Apostles, compiled probably between a.d. 130 and 160, gives clear information on the nature of this prophetic or charismatic ministry. The title of ” apostle ” was not limited to the immediate disciples of our Lord, but was given to missionaries or evangelist* who went about founding new churches; the prophets spoke by revelation; the teachers were enabled by supernatural illumination to instruct others. All of these men were called to their work by the internal voice of the Holy Spirit: none of them was appointed or elected by their fellows: none of them, and this is an important feature, was necessarily confined to a

local church. Nevertheless, side by side with this prophetic ministry there was another, mediately at least of human appointment, and local in its character. Here we have the germ of orders in the technical sense. At first this local ministry was twofold, consisting of presbyters or bishops and deacons. Christian presbyters first appear (Acts xi. 30) in the church of Jerusalem, and most likely the name and office were adopted from the Jewish municipalities, perhaps from the Jewish synagogues (see Priest). Afterwards St Paul and St Barnabas in their first missionary journey "appointed 2 (Acts xiv. 23) presbyters in every church." Further, we find St Paul about a.d. 62 addressing the " saints " at Philippi " with the bishops and deacons." The word kwicrKowos or overseer may be of Gentile origin, just as presbyter may have been borrowed from the Jews. There is strong proof that presbyter and episcopus are two names for the same office. It has indeed been maintained by eminent scholars, chiefly by Hatch and Harnack, that the word episcopus was given originally to the chief officer of a club or a confraternity, so that the episcopus was a financial officer, whereas the presbyters regulated the discipline. To this it may be objected that presbyters and bishops are never mentioned together, and that the names were interchangeable (Acts xx. 17 and 28; 1 Pet. v. 1, 2; 1 Tim. iii. 1-7 and v. 17-19; Tit. i. 5-7). The work of the presbyter or bishop was concerned at first with discipline rather than with teaching, which was largely in the hands of the charismatic ministry; nevertheless, the Pastoral Epistles (1 Tim. iii. 2) insist that an episcopus must be " apt to teach," and some presbyters (1 Tim. v. 1 7) not only ruled but also " laboured in the word and in teaching." They also '•' offered the gifts " (1 Clem. 44), i.e. to adopt Bishop Lightfo'ot's interpretation, " they led the prayers and thanksgivings of the congregation, presented the alms and contributions to God and asked His blessing on them in the name of the whole body." Under the bishops or presbyters stood the deacons or " helpers " (Philipp. i. 1, 1 Tim. iii. 8-13). Whether they were the successors, as most of the Fathers believed, of the seven chosen by the church of Jerusalem

•' A partial exception may be made in favour of the " Catholic Apostolic Church " founded by Edward Irving.

' Josephus, e.g. Antiq. vi. 4. 2, abundantly justifies this translation.

to relieve the apostles in the administration of alms (Acts vi.) is a question still disputed and uncertain. Be that as it may, the deacon was long considered to be the " servant of the widows and the poor " (Jerome, Ep. 146), and the archdeacon, who first appears towards the end of the 4th century, owes the greatness of his position to the fact

that he was the chief administrator of church funds (see Archdeacon). This ancient idea of the diaconate, ignored in the Roman Pontifical, has been restored in the English ordinal. The growth of sacerdotal theories, which were fully developed in Cyprian's time, fixed attention on the bishop as a sacrificing priest, and on the deacon 3 as his assistant at the altar.

Out of the twofold grew the threefold ministry, so that each local church was governed by one episcopus surrounded by a council of presbyters. James, the Lord's brother, who, partly because of his relationship to Christ, stood supreme in the church at Jerusalem, as also Timothy and Titus, who acted as temporary delegates of St Paul at Ephesus and in Crete, are justly considered to have been forerunners of the monarchical episcopate. The episcopal rule in this new sense probably arose in the lifetime of St John, and may have had his sanction. At 'all events the rights of the monarchical bishop are strongly asserted in the Ignatian epistles (about a.d. no), and were already recognized in the contemporary churches of Asia Minor. We may attribute the origin of the episcopate to the need felt of a single official to preside at the Eucharist, to represent the church before the heathen state and in the face of rising heresy, and to carry on correspondence with sister churches. The change of constitution occurred at different times in different places. Thus St Ignatius in writing to the Romans never refers to any presiding bishop, and somewhat earlier Clement of Rome in his epistles to the Corinthians uses the terms presbyter and episcopus interchangeably. Hermas (about a.d. 140) confirms the impression that the Roman Church of his day was under presbyteral rule. Even when introduced, the monarchical episcopate was not thought necessary for the ordination of other bishops or presbyters. St Jerome (Ep. 146) tells us that as late as the middle of the 3rd century the presbyters of Alexandria, when the see was vacant, used to elect one of their own number and without any further ordination set him in the episcopal office. So the canons cf Hippolytus (about a.d. 250) decree that a. confessor who has suffered torment for his adherence to the Christian faith should merit and obtain the rank of presbyter forthwith — " Immo confessio est ordinatio ejus." Likewise in a.d. 314 the thirteenth canon of Ancyra (for the true reading see Bishop Wordsworth's Ministry of Grace, p. 140) assumes that city presbyters may with the bishop's leave ordain other presbyters. Even among the medieval schoolmen, some (Gore, Church and Ministry, p. 377) maintained that a priest might be empowered by the pope to ordain other priests.

The threefold 4 ministry was developed in the 2nd, a seven- fold ministry in the middle of the 3rd century. There must, says Cornelius

(apud Euseb., H.E. vi. 43), be one oishop in the Catholic Church; and he then enumerates the church officers subject to himself as bishop of Rome. These are 46 presbyters, 7 deacons, 7 subdeacons, 42 acolytes, 52 exorcists and readers, together with doorkeepers. The subdeacons, no doubt, became a necessity when the deacons, whose number was limited to seven in memory of their original institution, were no longer equal to their duties in the ” regions ” of the imperial city, and left their lower work, such as preparation of the sacred vessels, to their subordinates. The office of acolyte may have been suggested by the attendant assigned to heathen priests. The office of door- keeper explains itself, though it must be remembered that it was the special duty of the Christian ostiarius to exclude the un- baptized and persons undergoing penance from the more solemn part of the Eucharistic service. But readers and exorcists claim

3 ” Fixed attention ” on the deacon’s ministration, the ministra- tion itself being much more ancient. See Justin, Apol. i. 65.

4 The Nestorians may be said to have a fourfold ministry, for they reconsecrated a bishop when he was made catholicos or patriarch. Chardon, v. p. 222.

special notice. The reader is the only minor official mentioned by Tertullian (Praescr. 41). An ancient church order which belongs to the latter part of the 2nd century (see Harnack’s Sources of Apostolic Canons, Engl. Transl. p. 54 seq.) mentions the reader before the deacon, and speaks of him as filling ” the place of an evangelist.” We are justified in believing that both exorcists and readers, whose functions differed essentially from the mechanical employments of the other minor clerics, belonged originally to the ” charismatic ” ministry, and sank afterwards to a low rank in the ” orders ” of the church (see Exorcist and Lector). There were also other minor orders in the ancient church which have fallen into oblivion or lost their clerical character. Such were the copiatae or grave-diggers, the psalmistae or chaunters, and the parabolani, who at great personal risk — whence the name — visited the sick in pestilence. The modern Greek Church recognizes only two minor orders, viz. those of subdeacons and readers, and this holds good of the Oriental churches generally, with the single exception of the Armenians. 1 The Anglican Church is content with the threefold ministry of bishops, priests and deacons, but in recent times the bishops have appointed lay-readers,

licensed to read prayers and preach in buildings which are not consecrated. The Latins, and Armenians who have borrowed from the Latins, have sub- deacons, acolytes, exorcists, readers and doorkeepers. Since the pontificate of Innocent III., however, the Latin Church has placed the subdiaconate among the greater or sacred orders, the subdeacon being obliged to the law of celibacy and bound to the daily recitation of the breviary offices. The minor orders, and even the subdiaconate and diaconate, are now regarded as no more than steps to the priesthood. Roman theologians generally reckon only seven orders, although, if we count the episcopate an order distinct from the presbyterate, the sum is not seven, but eight. The explanation given by St Thomas (Supp. xl. 5.) is that, whereas all the orders have reference to the body of Christ present on the altar, the episcopate, so far forth, is not a separate order, since a simple priest no less than a bishop celebrates the Eucharist. The Council of Trent takes the same view; it enumerates (Sess. xxiii. cap. 2) only seven orders, and yet maintains (cap. 4) the ecclesiastical hierarchy of bishops, priests and minsters, the bishops as successors of the Apostles holding the highest place. The Roman Church forbids ordina- tion to higher grades unless the candidate has received all the inferior orders. Further, a cleric is bound to exercise the minor orders for a year before he can be ordained subdeacon, he must be subdeacon for a year before he is ordained deacon, deacon for a year before he is made priest. However, instances of men elevated at once from the condition of laymen to the priesthood were known in the early church, and Chardon (Hist, des sacra- ments, vol. v. part 1, ch. v.) shows that in exceptional cases men were consecrated, bishops without previous ordination to the priesthood.

Passing to the effect of ordination, we meet with two views, each of which still finds advocates. According to some, ordina- tion simply entitles a man to hold an office and perform its functions. It corresponds to the form by which, e.g., a Roman official was put in possession of his magistracy. This theory is clearly stated by Cranmer: ” In the New Testament he that is appointed bishop or priest needed no consecration, by the Scripture, for election or appointment thereto is sufficient.” 2 This view, widely held among modern scholars, has strong support in the fact that the words used for ordination in the first three centuries (xtiporoveiv, KaSiOTavtw , KkqpovaBat., con- stituere, ordinare) also expressed appointment to civil office. Very different is the medieval theory, which arose from the gradual acceptance of the belief that the Jewish was the proto- type of the Christian priest . According, then , to the Roman view,

1 The Syrian Jacobites and the Maronites also ordain ” singers,”

Denzinger, Rit. Oriental, i. p. 118 seq.; Silbernagl, Kirchen des Orients, pp. 254. 315.

2 Cranmer's works are to be found in Burnet, " Collection of Records " appended to his History of the Reformation (ed. Pocock), iv. 478. Cranmer also maintained that " bishops and priests are but both one office in the beginning of Christ's religion," ib. p. 471.

holy order is a sacrament, and as such instituted by Christ; it confers grace and power, besides setting a mark or character upon the soul, in consequence of which ordination to the same office cannot be reiterated. Such is the teaching of the Roman Church, accepted by the Greeks and with certain modifications by Anglicans of the High Church school, who appeal to 1 Timi iv. 14, 2 Tim. i. 6. We may conclude with brief reference to the most important aspects of the Roman doctrine.

The ordinary minister of orders is a bishop. The tonsure and minor orders are, however, still sometimes conferred by abbots, who, though simple priests, have special faculties for the ordina- tion of their monks. Some account has been already given of scholastic opinion on presbyteral ordination tothe diaconate and even to the priesthood. Can a heretical or schismatical bishop validly ordain ? Is a simoniacal ordination valid ? All modern theologians of . the Roman Church answer these questions in the affirmative, but from the 8th to the beginning of the 13th century they were fiercely agitated with the utmost divergence of opinion and practice. Pope Stephen reconsecrated bishops consecrated in the usual way by his schismatical predecessor Constantine. Pope Nicholas declared orders given by Photius of Constantinople null St Peter Damian was grievously per- plexed about the validity of simoniacal ordinations. Similarly William of Paris held that degradation deprived a priest of power to consecrate. 3 St Thomas, on the contrary, contends that " heretics and persons cut off from the church " {Summ. Suppl. xxxviii. 2) may ordain validly, and that a priest who has been degraded can still celebrate the Eucharist (Summ. iii. 82. 8) validly, though of course not lawfully. This opinion, defended by Bonaventura, Alexander of Hales. Scotus and others, soon became and is now generally accepted.

The Schoolmen had no historical sense and little historical information; hence they fell into one error after another on the essentials in the rite of ordination. Some of them believed that the essential matter in the consecration of a bishop consisted in the placing the book of the gospels on his head and shoulders. True, this

rite was used both in East and West as early as the 4th century; it was not, however, universal. According to common opinion, the matter and form of ordination to the episcopate were the imposition of the consecrating bishop's hands with the words, " Receive the Holy Ghost." The words in question, and indeed any imperative form of this kind, are still unknown to the East and were of very late introduction in the West. The final imposition of hands and the bestowal of power to forgive sins at the end of the ordination rite for priests in the Roman Pontifical is later even than the tradition of instru- ments. For like reasons the tradition of the instruments, i.e. the handing over of paten and chalice in ordination to the priesthood, are admittedly non-essential, unless we adopt the opinion of some Roman theologians that our Lord left the determination of matter and form to the church, which has insisted on different rites at different times.

The necessity of reference to sacerdotal power in the ordination of priests and bishops will be considered a little farther on in connexion with Anglican orders.

Deaconesses in the East received the imposition of the bishop's hands, but could not ascend to the priesthood. The Roman theologians regard them as incapable of true ordination, alleging 1 Tim. ii. 12. An unbaptized person is also incapable of valid ordination. On the other hand, St Thomas holds that orders may be validly conferred on children who have not come to the use of reason. For lawful ordination in the Roman Church, a man must be confirmed, tonsured, in possession of all orders lower than that which he proposes to receive, of legitimate birth, not a slave or notably mutilated, of good life and competent knowledge. By the present law (Concil. Trid. Sess. xxiii. de Ref. cap. 12) a subdeacon must have begun his twenty - second, a deacon his twenty-third, a priest his twenty-fifth year. 4 The

3 In reality this is a survival of the primitive view that holy order is institution for an office which the local church confers and can therefore take away.

4 The canon law fixes the thirtieth year as the lowest age for episcopal consecration.

Council of Trent also requires that any one who receives holy orders must have a " title," i.e. means of support. The chief titles are poverty,

i.e. solemn profession in a religious order, patrimony and benefice. Holy orders are to be conferred on the Ember Saturdays, on the Saturday before Passion Sunday or on Holy Saturday (Easter Eve). The ancient and essential rule that a bishop must be ” chosen by all the people ” (Can. Hipp. ii. 7) has fallen into disuse, partly by the right of confirmation allowed to the bishops of the province, partly by the influence of Christian emperors, who controlled the elections in the capital where they resided, most of all by the authority exercised by kings after the invasion of the northern tribes and the dissolution of the empire (see Church History).

Such in brief were the doctrine and use of the early churches, gradually systematized, developed and transformed in the churches of the Roman obedience. The Reformation brought in radical changes, which were on the whole a return to the primitive type. Calvin states his views clearly in the fourth book of his Institutes, cap. iii. Christ, as he holds, has established in His church certain offices which are always to be retained. First comes the order of presbyters or elders. These are sub- divided into pastors, who administer the word and sacraments, doctors, who teach and expound the Bible, elders pure and simple, who exercise rule and discipline. The special care of the poor is committed to deacons. Ordination is to be effected by imposition of hands. The monarchical episcopate is rejected. This view of order was accepted in the Calvinistic churches, but with various modifications. Knox, for example, did away with the imposition of hands (M’Crie’s Knox, period vii.), though the rite was restored by the Scottish Presbyterian Church in the Second Book of Discipline. Knox also provided the Church of Scotland with superintendents or visitors, as well as readers and exhorters, offices which soon fell into disuse. Nor do Scottish presbyterians now recognize any special class of doctors, unless we suppose that these are represented by professors of theology. Independents acknowledge the two orders of presbyters and deacons, and differ from the Calvinistic presbyterians chiefly in this, that with them the church is complete in each single con- gregation, which is subject to no control of presbytery or synod.

Luther was not, like Calvin, a man of rigid system. He refused to look upon any ecclesiastical constitution as binding for all time. The keys, as he believed, were entrusted to the church as a whole, and from the church as a whole the ” ministers of the word and sacraments ” are to derive their institution and authority. The form of government was not essential. Pro- vided that the preaching of the gospel was free and full, Luther was willing to tolerate episcopacy and even papacy. Hence the Lutheran churches exhibit great variety of constitution. In Scandinavia they are under episcopal rule. The Lutheran Bugenhagen,

who was in priest's orders, ordained seven super- intendents, afterwards called bishops, for Denmark in 1527, and Norway, then under the same crown, derives its present episcopate from the same source. Sweden stands in a different position. There three bishops were consecrated in 1528 by Peter Magnusson, who had himself been consecrated by a cardinal with the pope's approval at Rome in 1524, for the see of Westiras, to which he had been elected by the chapter. J. A. Nicholson (Apostolical Succession in the Church of Sweden, 1880) seems to have proved so much from contemporary evidence. A reply to Mr Nicholson was made in Swedish by a Roman priest, Bern- hard, to whom Mr Nicholson replied in 1887. Unfortunately Mr Nicholson gives no detailed account of the form used in con- secration, and on this and other points fuller information is needed. We may say, however, that Mr Nicholson has presented a strong case for the preservation of episcopal succession in the Swedish Church.

If the Swedish Church has preserved the episcopal succession, it does not make much of that advantage, for it is in communion with the Danish and Norwegian bodies, which can advance no such claim. On the other hand, the Church of England adheres closely to the episcopal constitution. It is true that in articles xix. and xxxvi. she defines the church, without any express

reference to the episcopate, as a " congregation of faithful men in which the pure word of God is preached and the sacraments be duly administered according to Christ's ordinance," and simply adds that the ordinal of Edward VI. for the consecration of bishops, priests and deacons, contains all that is necessary for such ordination and nothing which is of itself superstitious. The preface to the ordinal (1550) goes farther. Therein we are told that the threefold ministry of bishops, priests and deacons may be traced back to apostolic times, and in the final revision of 1662 a clause was added to the effect that no one is to be accounted " a lawful bishop, priest or deacon in the Church of England," unless he has had episcopal consecration or ordination. The words " in the Church of England " deserve careful notice. Nothing is said to condemn the opinion of Hooker (Eccl. Pol. vii. 14. n) that "there may be sometimes very just and sufficient reason to allow ordination made without a bishop," or of the High Church Thorndike (apud Gibson on the Articles, ii. 74), who " neither justifies nor condemns the orders of foreign Protestants." The church lays down a rule of domestic policy, and neither gives, nor pretends to give any absolute criterion for the validity of ordination.

But while the Church of England has declined communion with non-episcopal churches, she has been involved in a long controversy with

the Church of Rome on the validity of her own orders. It will be best to give first the leading facts, and then the inferences which may be drawn from them.

The English Church derives its orders through Matthew Parker, archbishop of Canterbury, who was consecrated in 1559 by William Barlow, bishop-elect of Chichester. We may assume that the rite employed was serious and “ders.” reverent, and there is no longer any need to refute the fable of a ludicrous consecration at the ” Nag’s Head ” tavern. We may further take for granted that Barlow was a bishop in the Catholic sense of the word. He had been nominated bishop of St Asaph in 1536, translated to St David’s in the same year, and to Bath and Wells in 1547. He also sat in the upper house of Convocation and in the House of Peers. Now if Barlow all this time was not consecrated — and so far the only form of consecration known in England was according to the Roman rite — he would have incurred the penalties of praemunire, let alone the fact that Henry VIII. would not have tolerated such a defiance of Catholic order for a moment. The registers at St David’s make no mention of his consecration, but this counts for nothing. No reference in the registers can be produced for many ordinations of undoubted validity. Parker thus was consecrated by a true bishop according to the Edwardine ordinal, i.e. he received imposition of hands with the words,” Take the Holy Ghost and remember that thou stir up the grace of God which is in thee by imposition of hands.” The corresponding form for the ordination of a priest was” Receive thou the Holy Ghost: whose sins thou dost forgive,” &c. These were the sole forms in use from 1552 to 1562.

Roman authorities have from the beginning and throughout consistently repudiated orders given according to the Edwardine ordinal. The case first came under consideration when Cardinal Pole returned to England early in Mary’s reign with legatine authority for reconciling the realm to the Holy See. In his instructions to the bishops (Burnet Collect., pt. iii., bk. v., 33; see also Dixon, Hist. Ch. of England, v. 238 seq. 1) he clearly recognizes orders schismatical but valid, i.e. those conferred in Henry’s reign, and so distinguishes them by implication from invalid orders, i.e. those given according to the Edwardine book. In the former alone were ” the form and intention of the church preserved.” He could not doubt for a moment the utter invalidity of Edwardine ordinations to the priesthood. He knew very well that the theologians of his church almost without exception held that the handing over of the paten and chalice with the words, ” Receive power of offering sacrifice,” &c, were the essential matter and form of ordination to the priesthood; indeed he published the decree

of Eugenius IV. to that effect

1 Compare also the article on Anglican orders in the Catholic Encyclopedia, vol. i., especially at p. 492.

(Wilkins, Concil. iv. 121). The Anglican priesthood being gone, the episcopate also lapses. For according to the Pontifical, the episcopate is the ” summum sacerdotium “; the bishop in con- secration receives ” the sacerdotal grace “; it is “his office to consecrate, ordain, offer, baptize, confirm.” Thus in the Pon- tifical the words ” Receive the Holy Ghost ” are determined and defined by the context. There is nothing in. the Anglican ordinal to show that the Holy Ghost is given for the consecration of a bishop in the Roman sense. In 1704 John Gordon, formerly Anglican bishop of Galloway, gave to the Holy Office an account of the manner in which he had been consecrated. The Sacred Congregation, with the pope’s approval, declared his orders to be null. The constant practice has been to reordain uncon- ditionally Anglican priests and deacons. In 1896 Leo XIII. summoned eight divines of his own communion to examine the question anew. Four of those divines were, it is said, decidedly opposed to the admission of Anglican orders as valid; four were more or less favourably disposed to them. The report of this commission was then handed over to a committee of cardinals, who pronounced unanimously for the nullity of the orders in question. Thereupon the pope published his bull Apostolicae curae. In it he lays the chief stress on the indeterminate nature of the Anglican form ” Receive the Holy Ghost ” at least from 1552 till the addition of the specific words, ” for the office and work of a bishop (or priest) in the church of God,” as also on the changes made in the Edwardine order ” with the manifest intention. . . of rejecting what the church does.” His conclusion is that Anglican orders are ” absolutely null and utterly void.” More- over, in a letter to Cardinal Richard, archbishop of Paris, the pope affirms that this his solemn decision is ” firm, authoritative and irrevocable.”

For Roman Catholics the decision necessarily carries great weight, and it may perhaps have its influence on Anglicans of the school which approximates most closely to Roman belief. It need not affect the opinion of dispassionate students. It is not the judgment of experts. The rejection of Anglican orders in the 16th and 17 th centuries was based on a theory about the ” tradition of instruments,” which has long ceased to be tenable in the face of history, and is abandoned by

Romanists themselves. The opinion of a liturgical scholar like Mgr. Louis Duchesne, who was a member of the papal commission, on the general question would be interesting in the highest degree. Unfortunately we know nothing of his vote or of the reasons he gave for it, and outside of the Roman pale the ‘unanimous decision of a committee of cardinals counts for very little. We may grant the pope’s contention that the Edwardine church had no belief in priests who offered in sacrifice the body and blood of Christ or in bishops capable of ordaining such priests. We may grant further that the medieval offices have been deliberately altered to exclude this view. But then the liturgy of Serapion, the friend of Athanasius, recently discovered, contains forms for the ordination of priests and bishops which do not say a word about power to sacrifice, much less about power to sacrifice Christ’s literal body and blood. The canons of Hippolytus, which are about 150 years older, and indeed all the oldest forms for celebration, absolutely ignore any such power of sacrifice. If they speak of sacrifice at all, it is a sacrifice of the gifts brought by the faithful and distributed in the con- gregation and among the poor, or again they refer to those spiritual sacrifices which a bishop is to offer ” day and night.” The Didache and Justin Martyr are no less unsatisfactory from the Roman point of view. In short, the English reformers knew very well that the ordinal and communion office which they drew up could not satisfy the requirements of medieval theology. They appealed not to the school divines, but to Scripture and primitive antiquity. That is the standard by which we are to test their work.

Authorities. — For holy order in the apostolic and sub-apostolic age the reader may consult R. Rothe, Anfange der christlichen Kirche (! 837) ; A. Ritschl’s Entstehung der allkatholischen Kirche (2nd ed., 1857); J- B. Lightfoot’s dissertation on the ” Christian Ministry” in his commentary on the Philippians (1868). A new era was opened by E. Hatch’s Organization of the Early Christian Church

(1880); to this Bishop C. Gore's Church and Ministry (1888) is a reply. The facts are judicially stated and weighed in Bishop J. Wordsworth's Ministry of Grace (1902). Dr T. M. Lindsay's Church and Ministry in Early Centuries (1902) on the whole agrees with Hatch, but is too eager to find modern Presbyterianism in the early chur.ch. A. Harnack's edition of the Didache (1884), his Sources of the Apostolic Canons (Eng. trans., 1895), the edition of the Canons of Hippolytus by H. Achelis, in Texte und Untersuchungen, vol. vi. (1891), the translation of Serapion's Prayer-book (translated by Bishop J. Wordsworth, 1899), are indispensable for serious study of the subject.

Joann Morinus, De sacris ordinationibus (1655) and A. C. Chardon, Histoire des sacraments, vol. v. (1745), are rich in material chiefly relating to the patristic and medieval periods.

For the controversy on Anglican orders see P. F. Courayer, Validite des ordinations anglaises (1732), and two works in reply by M. Le Quien, Nullite des ordinations anglicanes (1725), Nullite des ordinations anglicanes demonstree de nouveau (1730). In recent times Anglican orders have been defended by A. W. Haddan, Apostolical Succession in the Church of England; F. W. Puller, The Bull Apostolicae Curae and the Edwardine Ordinal. They have been attacked by E. E. Estcourt, Question of Anglican Ordinations (1873), and by A. W. Hutton. The Anglican Ministry, with a preface by Cardinal J. H. Newman (1879). (W. E. A.*)

ORDER IN COUNCIL, in Great Britain, an order issued by the sovereign on the advice of the privy council, or more usually on the advice of a few selected members thereof. It is the modern equivalent of the medieval ordinance and of the proclamation so frequently used by the Tudor and Stewart sovereigns. It is opposed to the statute because it does not require the sanction of parliament; it is issued by the sovereign by virtue of the royal prerogative. But although theoretically orders in council are thus independent of parliamentary authority, in practice they are only issued on the advice of ministers of the crown, who are, of course, responsible to parliament for their action in the matter. Orders in council were first issued during the 18th century, and their legality has sometimes been called in question, the fear being evidently prevalent that they would be used, like the earlier ordinances and proclamations, to alter the law. Con- sequently in several cases parliament has subsequently passed acts of indemnity to protect the persons responsible for issuing them, and incidentally to assert its own authority. At the present time the principle seems generally accepted that orders in council may be issued on the

strength of the royal prerogative, but they must not seriously alter the law of the land.

The most celebrated instance of the use of orders in council was in 1807 when Great Britain was at war with France. In answer to Napoleon's Berlin decree, the object of which was to destroy the British shipping industry, George III. and his ministers issued orders in council forbidding all vessels under penalty of seizure to trade with ports under the influence of France. Supplementary orders were issued later in the same year, and also in 1808. Orders in council are used to regulate the matters which need immediate attention on the death of one sovereign and the accession of another.

In addition to these and other orders issued by the sovereign by virtue of his prerogative, there is another class of orders in council, viz. those issued by the authority of an act of parliament, many of which provide thus for carrying out their provisions. At the present day orders in council are extensively used by the various administrative departments of the government, who act on the strength of powers conferred upon them by some act of parliament. They are largely used for regulating the details of local government and matters concerning the navy and the army, while a new bishopric is sometimes founded by an order in council. They are also employed to regulate the affairs of the crown colonies, and the lord-lieutenant of Ireland, the viceroy of India, the governor-general of Canada, and other repre- sentatives of the sovereign may issue orders in council under certain conditions.

In times of emergency the use of orders in council is indispens- able to the executive. In September 1766, a famine being feared, the export of wheat was forbidden by an order in council, and the Regulation of the Forces Act 187 1 empowers the govern- ment in a time of emergency to take possession of the railway system of the country by the issue of such an order.

ORDERIC VITALIS (1075-c. 1142), the chronicler, was the son of a French priest, Odeler of Orleans, who had entered the service of Roger Montgomery, earl of Shrewsbury, and had received from his patron a chapel in that city. Orderic was the eldest son of his parents. They sent him at the age of five to learn his letters from an English priest, Siward by name, who kept a school in the church of SS Peter and Paul at Shrewsbury. When eleven years old he was entered as a novice in

the Norman monastery of St Evroul en Ouche, which Earl Roger had formerly persecuted but, in his later years, was loading with gifts. The parents paid thirty marks for their son's admission; and he expresses the conviction that they imposed this exile upon him from an earnest desire for his welfare. Odeler's respect for the monastic profession is attested by his own retirement, a few years later, into a religious house which Earl Roger had founded at his persuasion. But the young Orderic felt for some time, as he tells us, like Joseph in a strange land. He did not know a word of French when he reached Normandy; his book, though written many years later, shows that he never lost his English cast of mind or his attachment to the country of his birth. His superiors rechristened him Vitalis (after a member of the legendary Theban legion) because they found a difficulty in pronouncing his baptismal name. But, in the title of his Ecclesiastical History he prefixes the old to the new name and proudly adds the epithet Angligena* His cloistered life was uneventful. He became a deacon in 1093, a priest in 1107. He left his cloister on several occasions, and speaks of having visited Croyland, Worcester, Cambrai (1105) and Cluny (1132). But he turned his attention at an early date to literature, and for many years he appears to have spent his summers in the scriptorium. His superiors (at some time between 1099 and 1122) ordered him to write the history of St Evroul. The work grew under his hands until it became a general history of his own age. St Evroul was a house of wealth and distinction. War-worn knights chose it as a resting-place of their last years. It was constantly entertaining visitors from southern Italy, where it had planted colonies of monks, and from England, where it had extensive possessions. Thus Orderic, though he witnessed no great events, was often well informed about them. In spite of a cumbrous and affected style, he is a vivid narrator; and his character sketches are admirable as summaries of current estimates. His narrative is badly arranged and full of unexpected digressions. But he gives us much invaluable information for which we should search the more methodical chroniclers in vain. He throws a flood of light upon the manners and ideas of his own age; he sometimes comments with surprising shrewdness upon the broader aspects and tendencies of history. His narrative breaks off in the middle of 1 141, though he added some finishing touches in 1 142. He tells us that he was then old and infirm. Probably he did not long survive the completion of his great work.

The Historia ecclesiaslica falls into three sections. (1) Bks. i., ii., which are historically valueless, give the history of Christianity from the birth of Christ. After 855 this becomes a bare catalogue of popes, ending with the name of Innocent I. These books were added, as an

afterthought, to the original scheme; they were com- posed in the years 1136-1141. (2) Bks. iii.-vi. form a history of St Evroul, the original nucleus of the work. Planned before 11 22, they were mainly composed in the years 1123-1131. The fourth and fifth books contain long digressions on the deeds of William the Conqueror in Normandy and England. Before 1067 these are of little value, being chiefly derived from two extant sources. William of Jumieges' Historia Normannorum and William of Poitiers' Gesta Guilelmi. For the years 1067-1071 Orderic follows the last portion of the Gesta Guilelmi, and is therefore of the first importance. From 1071 he begins to be an independent authority. But his notices of political events in this part of his work are far less copious than in (3) Bks. vii.-xiii., where ecclesiastical affairs are relegated to the background. In this section, after sketching the history of France under the Carolingians and early Capets, Orderic takes up the events of his own times, starting from about 1082. He has much to say concerning the empire, the papacy, the Normans in Italy and Apulia, the First Crusade (for which he follows Fulcher of Chartres and Baudri of Bourgueil). But his chief interest is in the histories of Duke Robert of Normandy, William Rufus and Henry I. He continues his work, in the form of annals, up to the defeat and capture of Stephen at Lincoln in 1141.

The Historia ecclesiastica was edited by Duchesne in his Historiae

Normannorum scriptores (Paris, 1619). This is the edition cited by Freeman and in many standard works. It is, however, inferior to that of A. le Prevost in five vols. (Soc. de I'histoire de France, Paris, 1838-1855). The fifth volume contains excellent critical studies by M, Leopold Delisle, and is admirably indexed. Migne's edition (Patrologia latina, clxxxviii.) is merely a reprint of Duchesne. There is a French translation (by L. Dubois) in Guizot's Collection des memoires relatifs a I'histoire de France (Paris, 1825-1827); and one in English by T. Forester in Bohn's Antiquarian Library (4 vols., 1 853-1 856). In addition to the Historia there exists, in the library at Rouen, a manuscript edition of William of Jumieges' Historia Normannorum which Leopold Delisle assigns to Orderic (see this critic's Lettre a M Jules Lair (1873). (H. W. C. D.)

ORDINANCE, or Ordonnance, in architecture, a composition of some particular order or style. It need not be restricted to columnar composition, but applies to any kind of design which is subjected to conventional rules for its arrangement.

ORDINANCE, in medieval England, a form of legislation. The ordinance differed from the statute because it did not require the

sanction of parliament, but was issued by the sovereign by virtue of the royal prerogative, although, especially during the reign of Edward I., the king frequently obtained the assent of his council to his ordinances. Dr Stubbs (Const. Hist. vol. ii.) defines the ordinance as " a regulation made by the king, by himself or in his council or with the advice of his council, pro- mulgated in letters patent or in charter, and liable to be recalled by the same authority." But after remarking that" these generaliza- tions do not cover all the instances of the use of ordinance," he adds: " The statute is primarily a legislative act, the ordinance is primarily an executive one." Legislation by ordinance was very common during the reigns of Henry III. and Edward I. when laws were issued by the king in council or enacted in parliament indifferently. Both were regarded as equally binding, Soon, however, legislation by ordinance aroused the jealousy of parliament, especially when it was found that acts of parliament were altered and their purpose defeated by this means. Con- sequently in 1389 the Commons presented a petition to King Richard II. asking that no ordinance should be made contrary to the common law, or the ancient customs of the land, or the statutes ordained by parliament. For this and other reasons this form of legislation fell gradually into disuse, becoming obsolete in the 15th century. The modern equivalent of the ordinance is the order in council.

In 13 10, when Edward II. was on the throne and England was in a very disturbed condition, a committee of twenty-one bishops, earls and barons was chosen to make certain ordinances for the better government of the country. These men were called ordainers.

In the 17th century the use of the word ordinance was revived, and was applied to some of the measures passed by the Long Parliament, among them the famous self-denying ordinance of 1645. This form was used probably in conformity with the opinion of Sir Edward Coke, who says in his Fourth Institute " an ordinance in parliament wanteth the threefold consent, and is ordained by one or two of them " (i.e. king, lords and commons). The ordinances of the Long Parliament did not, of course, obtain the assent of the king. At the present time the word ordinance is used to describe a body of laws enacted by a body less than sovereign. For example, the ordinances of Southern Nigeria are issued by the governor of that colony with the assent of his council.

Before 1789 the kings of France frequently issued ordonnances. These were acts of legislation, and were similar to the ordinances of the English kings in medieval times.

ORDINARY (med. Lat. ordinarius, Fr. ordinaire), in canon law, the name commonly employed to designate a superior ecclesiastic exercising ” ordinary ” jurisdiction (jurisdictionem ordinariam) ,i.e. in accordance with the normal organization of the church. It is usually applied to the bishop of a diocese and to those who exercise jurisdiction in his name or by delegation of his functions. Thus, in Germany, the term ordinariat is applied to the whole body of officials, including the bishop, through whom a diocese is administered. In English law, however, the term ordinary is now confined to the bishop and the chancellor

of his court. The pope is the ordinarius of the whole Roman Catholic Church, and is sometimes described as ordinarius ordinariorum. Similarly in the Church of England the king is legally the supreme ordinary, as the source of jurisdiction.

The use of the term ordinary is not confined to ecclesiastical jurisdiction. In the civil law the judex ordinarius is a judge who has regular jurisdiction as of course and of common right as opposed to persons extraordinarily appointed. The term survived throughout the middle ages wherever the Roman law gained a foothold. In the Byzantine empire it was applied to any one filling a regular office (e.g. wra-ros 6p5ivapios= consul ordinarius, apxˆv opSwapios = praefectus ordinarius); but it also occasionally implied rank as distinct from office, all those who had the title of clarissimus being sometimes described as bp&ivapioi. In England the only case of the term being employed in its civil use was that of the office of judge ordinary created by the Divorce Act of 1857, a title which was, however, only in existence for the space of about eighteen years owing to the incorporation of the Divorce Court with the High Court of Justice by the Judicature Act 1875. But in Scotland the ordinary judges of the Inner and Outer Houses are called lords ordinary, the junior lord ordinary of the Outer House acts as lord ordinary of the bills, the second junior as lord ordinary on teinds, the third junior as lord ordinary on Exchequer causes. In the United States the ordinary possesses, in the states where such an officer exists, powers vested in him by the constitution and acts of the legislature identical with those usually vested in the courts of probate. In South Carolina he was a judicial officer, but the office no longer exists, as South Carolina has now a probate court.

In the German universities the Professor ordinarius is the occupant of one of the regular and permanent chairs in any faculty.

ORDINATE, in the Cartesian system of co-ordinates, the distance of a point from the horizontal axis (axis of x) measured parallel to the axis of y. Thus PR is the ordinate of P. The word appears to have been first used by Rene Descartes, and to be derived from lineae ordinatae, a term used by Roman surveyors for parallel lines. (See Geometry: Analytical.)

ORDNANCE (a syncopated form of ” ordinance ” or ” or- donnance,” so spelt in this sense since the 17th century), a general term for great guns for military and naval purposes, as opposed to “small arms” and their equipment; hence the term also includes miscellaneous stores under the control of the ordnance department as organized. In England the Master- General of the Ordnance, from Henry VIII.‘s time, was head of a board, partly military, partly civil, which managed all affairs concerning the artillery, engineers and matiriel of the army; this was abolished in 1855, its duties being distributed. The making of surveys and maps (see Map) was, for instance, handed over eventually (1889) to the Board of Agriculture, though the term ” ordnance survey ” still shows the origin.

I. History and Construction The efficiency of any weapon depends entirely on two factors: (1) its power to destroy men and material, (2) the moral effect upon the enemy. Even at the present day the moral effect of gun fire is of great importance, but when guns were first used the noise they made on discharge must have produced a be- wildering fear in those without previous experience of them: more especially would this be the case with horses and other animals. Villani wrote of the battle of Cressy that the ” English guns made a noise like thunder and caused much loss in men and horses” (Hime, Proc. R. A. Institution, vol. 26). Now, the moral effect may be considered more or less constant, for, as men are educated to the presence of artillery, the range of guns, their accuracy, mobility and on shore their invisibility, so increase that there is always the ever present fear that the stroke will fall without giving any evidence of whence it came.

On the other hand, the development, of the gun has always had an upward tendency, which of late years has been very marked; the demand for the increase of energy has kept pace with— or rather in recent times may be said to have caused— imptovements in metallurgical science.

The evolution of ordnance may be divided roughly into three epochs.

The first includes that period during which stone shot were principally employed; the guns during this period (1313 to 1520) were mostly made of wrought iron, although the art of casting bronze was then well known. This was due to the fact that guns were made of large size to fire heavy stone shot, and, in consequence, bronze guns would be very expensive, besides which wrought iron was the stronger material. The second epoch was that extending from 1520 to 1854, during which cast iron round shot were generally employed. In this epoch, both bronze and cast iron ordnance were used, but the progress achieved was remarkably small. The increase of power actually obtained was due to the use of corn, instead of serpentine, powder, but guns were undoubtedly much better proportioned towards the middle and end of this period than they were at the begin- ning. The third or present epoch may be said to have commenced in 1854, when elongated projectiles and rifled guns were be- ginning to be adopted. The rapid progress made during this period is as remarkable as the unproductiveness of the second epoch. Even during recent years the call for greater power has produced results which were believed to be impossible in

1890.

The actual date of the introduction of cannon, and the country in which they first appeared, have been the subject of much antiquarian research ; but no definite conclusion has been arrived at. Some writers suppose (see Brackenbury, “Ancient Cannon in Europe ” in Proc. Royal Artillery Inst., vol. iv.) that gun- powder was the result of a gradual development from incendiary compounds, such as Greek and sea fire of far earlier times, and that cannon followed in natural sequence. Other writers attribute the invention of cannon to the Chinese or Arabs. In any case, after their introduction into Europe a comparatively rapid progress was made. Early in the 14th century the first guns were small and vase shaped; towards the end they had become of huge dimensions firing heavy stone shot of from 200 to 450 lb weight.

The earliest known representation of a gun in England is contained in an illuminated manuscript ” De Officiis Regum ” at Christ Church, Oxford, of the time of Edward II. (1326). This clearly shows a knight in armour firing a short primitive weapon shaped something like a vase and loaded with an in- cendiary arrow. This type of gun was a muzzle loader with a vent channel at the breech end. There seems to be undoubted evidence that in 1338 there existed breech-loading guns of both iron and brass, provided with one or more movable chambers to facilitate loading (Proc. R. A. I., vol. iv. p. 291). These fire- arms

were evidently very small, as only 2 lb of gunpowder were provided for firing 48 arrows, or about seven-tenths of an ounce for each charge.

The great Bombarde of Ghent, called ” Dulle Griete ” (fig. 1) is believed to belong to the end of the century, probably about

Fig. 1. — Dulle Griete, Ghent.

1382, and, according to the Guide des voyageurs dans la ville de Gand (Voisin) the people of Ghent used it in 141 1. This gun,

which weighs about 13 tons, is formed of an inner lining of wrought iron longitudinal bars arranged like the staves of a cask and welded together, surrounded by rings of wrought iron driven or shrunk on. The chamber portion is of smaller dia- meter, and some suppose it to be screwed to the muzzle portion. The length of the gun is 197 in., the diameter of the bore 25 in., and the chamber 10 in. at the front and tapering to 6 in. dia- meter at the breech end. It fired a granite ball weighing about 700 lb. Two wrought iron guns left by the English in 1423 when they had to raise the siege of Mont St Michel in Normandy belong to about the same period; the larger of these guns has a bore of

19 in. diameter. ‘ ” Mons Meg ” (fig. 2) in Edin- burgh Castle is a wrought iron gun Fig. 2.— Mons Meg. of a little later

period; it is built up in the same manner of iron bars and external rings. It has a calibre of 20 in. and fired a granite shot weighing 330 lb.

Bronze guns of almost identical dimensions to the ” Dulle Griete ” were cast a little later (1468) at Constantinople (see Lefroy, Proc. R. A. I., vol. vi.). One of these is now in the Royal Military Repository, Wollwich. It is in two pieces screwed together: the front portion has a calibre of 25 in. and is for the reception of the stone shot, which weighed 672 lb; and a rear portion, forming the powder chamber, of 10 in. diameter. The whole gun weighs nearly i8| tons.

To give some idea of the power of these guns, the damage done by them to Sir John Duckworth’s squadron in 1807 when the Dardanelles

were forced may be instanced. In this engage- ment six men-of-war were more or less damaged and some 126 men were killed or wounded. The guns were too unwieldy to lay for each round and were consequently placed in a permanent position; they were often kept loaded for months.

The 16th century was remarkable from the fact that the large bombard type was discarded and smaller wrought iron guns were made. This was due to the use of iron projectiles, which enabled a blow to be delivered from a comparatively small gun as destructive as that from the very weighty bombards throwing stone shot.

Bronze guns also now came into great favour. They were first cast in England in 1521 (Henry VIII.), and iron cannon about 1540, foreign founders being introduced for the purpose of teaching the English the art. The " Mary Rose," which sank off Spithead in 1545, had on board both breech-loading wrought- iron and muzzle-loading bronze guns.

The smaller guns cast at this period were of considerable length, probably on account of the large charges of meal powder which were fired. The long bronze gun in Dover Castle known as " Queen Elizabeth's pocket pistol" has a calibre of 4-75 in.; its bore is 23 ft. 1 in. long or 58 calibres, but its total length including the cascable is 24 ft. 6 in. It was cast at Utrecht in 1544 and presented by Charles V. to Henry VIII.

Little or no classification of the various types of guns was attempted during the 15th century. The following century saw some attempt made at uniformity and the division of the several calibres into classes, but it was not until about 1739, when Maritz of Geneva introduced the boring of guns from the solid, that actual uniformity of calibre was attained, as up to this date they were always cast hollow and discrepancies naturally occurred. In France organization was attempted in 1732 by Valliere, but to Gribeauval (q.v.) is due the credit of having simplified artillery and introduced great improvements in the equipment.

It is not possible to compare properly the power of the earlier guns; at first small and feeble, they became later large and unwieldy, but still feeble. The gunpowder called " serpentine " often compounded from separate ingredients on the spot at the time of loading,burnt slowly without strength and naturally varied from round to round. The more fiercely burning gtanulated or corned powder, introduced into Germany about 1429, and

into England shortly after, was too strong for the larger pieces of that date, and could be used only for small firearms for more than a century after. These small guns were often loaded with a lead or lead-coated ball driven down the bore by hammering.

The bronze and cast iron ordnance which followed in the 16th century were strengthened in the 17th century, and so were more adapted to use the corned powder. By this means some access of energy and greater effective ranges were obtained.

In the 18th century and in the first half of the 19th no change of importance was made. Greater purity of the ingredients and better methods of manufacture had improved gunpowder; the windage between the shot and the bore had also been reduced, and guns had been strengthened to meet this progress, but the principles of construction remained unaltered until the middle of the 19th century. Metallurgical science had made great progress, but cast iron was still the only metal considered suitable for large guns, whilst bronze was used for field guns. Many accidents, due to defects developing during practice, had, however, occurred, in order to prevent which experimental guns constructed of stronger material such as forged iron and steel had been made. Some of these weapons were merely massive solid blocks, with a hole bored in for the bore, and only with- stood a few rounds before bursting. This result was attributed to the metal being of an indifferent quality — quite a possible reason as the treatment of large masses of steel was then in its infancy, and even with the best modern appliances difficulties have always existed in the efficient welding of large forgings of iron. Forged iron, however, always gave some evidence of its impending failure whereas the steel burst in pieces suddenly; steel was, therefore, considered too treacherous a material foi use in ordnance. This view held for many years, and steel was only again employed after many trials had been made to demon- strate its reliability. It will be seen later that the ill success of these experiments was greatly due to a want of knowledge of the correct principles of gun construction.

The progress made since 1854 is dependent on and embraces improvements in gun construction, rifling and breech mechan- isms.

Considerable obscurity exists as regards the means adopted for mounting the first cannon. From illuminations in con- temporary manuscripts it appears that the earliest guns, which were trunnionless, were simply laid on ® ,a the ground and supported by a timber framing at m’nte! each side, whilst the flat breech end rested against a strong wood support let into the ground to prevent recoil. This

arrangement was no doubt inconvenient, and a little later small cannon were fastened in a wooden stock by iron bands; larger guns were supported m massive timber cradles (fig. 3) and

Redrawn from Mallet's Construction of A rtillery.

Fig. 3. — Primitive Gun-mounting.

secured thereto by iron straps or ropes. The ponderous weight to be moved and the deficiency of mechanical means prevented these large cannon and their cradles from being readily moved when once placed in position. Laying was of the most primitive kind, and the bombard was packed up in its wood cradle to the required elevation once for all. When it was desired to breach a wall the bombard with its bed would be laid on the ground at about 100 yds. distance, the breech end of the gun or the rear end of the bed abutting against a solid baulk of wood fixed to the ground. " Mons Meg " was originally provided with a wood cradle. It is by no means certain when wheeled carriages were

introduced. They must have gradually appeared as a means of surmounting the difficulties engendered by the recoil of the piece and of transport of the early guns and their cradles. Andrea Redusio mentions in Chronicon Tarvisinum the use of two wheeled bombard carriages at the siege of Quero by the Venetians in 1376. It does not follow that these weapons Were of large dimensions, as the term " bombard " was applied to small guns as well as to the more ponderous types.

The ancient carriages used on land are remarkable from the fact that in general design" they contain the main principles which have been included in field carriages up to the present day. Until 1870 the body of all field carriages was made of wood. In an early type the trail portion was made of a solid baulk of timber supported at the front by a hard wood axletree, on the arms of which the wheels were placed (iron axletrees were introduced by Gribeauval in 1765). The gun resting in its wooden cradle was carried in bearings on the trail immediately over the axletree (fig. 4), the cradle being provided with an

From Clephan, Early Ordnance.

Fig. 4. — Early Field Gun.

axle or trunnions for the purpose. For giving elevation a wood arc was fixed to the trail towards the rear end, and the breech end could be moved up and down along this arc and fixed at certain positions by a pin passing through both cradle and arc.

About the middle of the 15th century the trunnions were formed with the gun — the wood cradle therefore became un- necessary and was discarded. The carriage was then formed of two strong cheeks or sides of wood fastened together by four wood transoms. At the front end the cheeks were secured to the wooden axletree, which was strengthened by a bar of iron let into its under side. Trunnion bearings were cut in the upper surface of the cheeks over the axletree, and these were lined with iron, while the trunnions were secured in position by iron cap-squares. Elevation was given by a wedge or ” quoin ” being placed under the breech and supported by a transom or stool bed. For transport the trail end of the carriage was sup- ported on a Umber, a pintle on the limber body passing through a hole in the trail. One set of shafts were fixed to the limber, and a single horse was harnessed to them; the remainder of the team were attached in pairs in front. A driver was provided for every two pairs of horses. In Italy oxen were often yoked to the larger guns instead of horses. Tartaglia mentions in his Nova scienlia (1562) that 28 oxen were required for a gun 15 ft. in length and weighing 13,000 lb; horses were used for small guns only.

For service on board ship the difficulties of the cramped situation seem to have been surmounted in an ingenious manner. In the ” Mary Rose, ” sunk in the reign of Henry VIII., the brass guns with trunnions were mounted on short wood carriages provided with four small wood wheels called ” trucks ” and fastened to the gun ports by rope breechings. The iron breech- loading guns were employed in restricted positions where loading

Fig. 5. — Truck Carriage.

at the muzzle would be difficult. They had no trunnions and were mounted in a wood cradle, the under side of which was grooved to enable it to slide on a directing bar.

At the end of the 17th century not much progress had been made. The larger guns were mounted on short wood carriages having two or four ” trucks. ” The guns and carriages recoiled along the vessel’s deck, and

where this endangered the masts or other structures the recoil was hindered by soft substances being laid do wn in the path of the recoil .

The small guns were mounted in iron Y pieces — the upper arms being provided with bearings for the gun trunnions — and the stalk formed a pivot which rested in a socket in the vessel's side or on a wall, so that the gun could be turned to any quarter.

Similar carriages (fig. 5) existed until the advent of rifled guns, but a few small improvements, such as screw elevating gear in place of the quoin, had been approved. Cast iron standing carriages were also, about 1825, used on land for hot climates and situations not much exposed.

The earliest guns were not provided with sights or other means for directing them. This was not important, as the range seldom exceeded 100 yds. As, however, ranges became longer, some means became necessary for s, z ht,n Z' giving the correct line and elevation (see also Sights). The direction for line was easily obtained by looking over the gun and moving the carriage trail to the right or left as was necessary. For elevation an instrument invented by Tartaglia called a Gunner's Quadrant (sometimes also called a Gunner's Square) was used; this was a graduated quadrant of a circle (fig. 6) connecting a long and short arm forming a right angle; a line with a plummet hung from the angle in such a manner that on the long arm being placed along the bore near the muzzle the plummet hung down against the quadrant and indicated the de- grees of elevation given to the piece. The quadrant was divided into 90° and also into 12 parts; it was continued past the short arm for some degrees to enable depression to be given to the gun. The instrument was also used for surveying in obtaining the heights of buildings, and is still much employed for elevating guns in its clinometer form, in which a level takes the place of the plummet.

For short range firing a dispart sight was in use early in the 1 7th century. A notch was cut on the top of the breech or base ring, and on the muzzle ring a notched fore sight (called the dispart sight) was placed in the same vertical plane as the notch, and of such a height that a line stretched from the top of the breech ring notch to the notch of the foresight was parallel to the axis of the bore. These sights were well enough for close, horizontal fire and so long as the enemy were within what was called "point blank" range; that is the range to the first graze, on a horizontal plane, of the shot when fired from a gun the axis of which is horizontal. As this range depends entirely, other things being equal, on the height of the gun's axis above the

horizontal plane, it is not very definite. When, however, the enemy were at a greater distance, elevation had to be given to the gun and, as a quadrant was slow and not easy to use, there was introduced an instrument, called a Gunner's Rule (see The Art of Gunnery, by Nathanael Nye, 1670), which was really a primitive form of tangent sight. This was a flat brass

Fig. 6. — Gunner's Quadrant.

scale 12 or 14 in. long divided on its flat surface into divisions proportional to the tangents of angles with a base equal to the distance from the notch on the base ring to the dispart notch. A slit was made along the rule, and a thread with a bead on it was mounted on a slider so that it could be moved in the slit to any- required graduation. By sighting along the bead to the dispart the gun could be laid on any oDJect. Later still, the requisite elevation was obtained by cutting a series of notches on the side of the base ring and one on the muzzle ring. These were called " Quarter Sights " and allowed of elevations up to 3 ; the lowest notch with the one on the muzzle swell gave a line parallel to the axis of the bore but above it so as to clear the cap-squares of the trunnions. This system was also used in bronze field guns and in all cast iron guns up to the 32-pdr. Difficulties in laying occurred unless the direction was obtained by looking over the top or dispart sight and the elevation then given by the quarter sights. This was the system of sighting in use during the great naval actions of the end of the 18th century and the beginning of the 19th century. A pointed dispart sight was often used, and for naval purposes it was fixed on the reinforce near the trunnions, as the recoil of the gun through the port would destroy it if fixed on the muzzle swell.

The double sighting operation was rendered unnecessary by the use of " tangent scales " introduced by Gribeauval. Similar scales were soon adopted in the English land service artillery, but they were not fully adopted in the English navy until about 1854 (see Naval Gunnery, by Sir Howard Douglas, p. 390}, although in the United States navy a system of sighting, which enabled the guns to be layed at any degree of elevation, had been applied as early as 181 2. These tangent scales were of brass fitting into sockets on the breech end of the gun; they were used in conjunction with the dispart fore sight and gave eleva-

tion up to 4 or 5 over the top of the gun. For greater elevation a wooden tangent scale was provided which gave elevation up to 8° or io°.

In the British navy, before tangent sights were used, the plan often adopted for rapidly laying the guns was by sighting, with the notch on the breech ring and the dispart sight, on some part of the masts of the enemy's vessel at a height corresponding to the range.

With sailing ships about the middle of the 19th century the angle of heel of the vessel when it was sailing on a wind was ascertained from the ship's pendulum, and the lee guns elevated or the weather guns depressed to compensate by means of a graduated wooden stave called a "heel scale " of which one end was placed on the deck or last step of the carriage whilst the upper end read in connection with a scale of degrees engraved on the fiat end of the cascable.

Subsequently the term " tangent sight " was given to the " tangent scales," and they were fitted into holes made in the body of the gun — the foresight usually being fitted to a hole in the gun near the trunnions. Two pairs of sights — one at each side — were generally arranged for, and in rifled guns the holes for the tangent sight bars were inclined to compensate for the drift of the projectile. As the drift angle varies with the muzzle velocity, the tangent sights of howitzers were set vertically, so that for the various charges used the deflection to compensate for drift had to be given on the head of the sight bar. Modern forms of sights are described and illustrated in the article Sights.

Breech-loading ordnance dates from about the end of the 14th century, or soon after the introduction of cannon into England (Brackenbury, Proc. R.A.I, v. 32). The gun body, in some cases, was fixed to a wood

Breecb- loading

Ordnance, cradle by iron straps and the breech portion kept in position between the muzzle portion and a vertical block of wood fixed to the end of the cradle, by a wedge. Acci- dents must have been common, and improvements were made by dropping the breech or chamber of the weapon into a re- ceptacle, solidly forged on or fastened by lugs to the rear end of the gun (fig. 7). This system was used for small guns only, such as wall pieces, &c, which could not be easily loaded at the

muzzle owing to the position in which they were placed, and in order to obtain rapidity each gun was furnished with several chambers.

Guns of this nature, called Petrieroes a Braza, were used in particular positions even at the end of the 1 7th century. Moretii states that they carried a stone ball of from 2 lb to 14 lb, which

Fig. 7. — Early Breech-loader.

was placed in the bore of the gun and kept in position by wads. The chambers, resembling an ordinary tankard in shape, had a spigot formed on their front end which entered into a corre- sponding recess at the rear end of the bore and so formed a rude joint. Each chamber was nearly filled with powder and the mouth closed by a wood stopper driven in; it was then inserted into the breech of the gun and secured by a wedge. Even with feeble gunpowder this means of securing the chamber does not commend itself, but as powder improved there was a greater probability of the breech end of the gun giving way; besides which the escape of the powder gas from the imperfect joint between the chamber and gun must have caused great in- convenience. To these causes must be attributed the general disuse of the breech-loading system during the 18th and first half of the 19th centuries.

Robins mentions {Tracts of Gunnery, p. 337) that experi- mental breech-loading rifled pieces had been tried in 1745 in England to surmount the difficulty of loading from the muzzle. In these there was an opening made in the side of the breech which, after the loading had been completed, was closed by a screw. The breech arrangement (fig. 8) of the rifled gun in-

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Fig. 8.— Cavalli Gun, 1845.

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vented by Major Cavalli, a Sardinian officer, in 1845, was far superior to anything tried previously. After the projectile and charge had been loaded into the gun through the breech, a cast iron cylindrical plug, cupped on the front face, was introduced into the chamber; a copper ring was placed against its rear face; finally a strong iron wedge was

passed through the body of the gun horizontally just in rear of the plug, and prevented it being blown out of the gun. In England the breech of one of the experimental guns was blown off after only a few rounds had been fired. In Wahrendorff's gun, invented in 1846, the breech arrangement (fig. 9) was very similar in principle to the Cavalli gun. In addition to the breech plug and horizontal wedge there was an iron door, hinged to the breech face of the gun, which carried a rod attached to the rear of the breech plug. The horizontal wedge had a slot cut from its right side to the centre, so that it might freely pass this rod. After loading,

the hinged door, with the breech plug resting against its front face, was swung into the breech opening, and the plug was pushed forward to its position in the chamber of the gun; the

Fig. 9. — Wahrendorff Gun, 1846.

wedge was then pushed across to prevent the plug being blown back, and, finally, a nut screwed to the rear end of the plug rod was given a couple of turns so that all was made tight and secure. After firing, the breech was opened by reversing these operations.

The Armstrong system of breech-loading introduced in 1854 was the first to give satisfactory results; its simple design and few parts produced a favourable effect in the minds of artillerists, which was increased by the excellent accuracy obtained in shooting. The gun (fig. 10) had a removable breech block having

Fig. io. — Armstrong B.L. Arrangement.

on its front face a coned copper ring which fitted into a coned seating at the breech end of the powder chamber. The breech block was secured by means of a powerful breech screw; a hole was made through the screw so that, in loading, the shell and cartridge could be passed through it after the breech block had been removed. After loading, the block was dropped into its place and the breech screw turned rapidly so that it might jam the block against its seating, and so prevent the escape of powder gas when the gun was fired. This gun was most successful, and a great number of guns of this type were soon introduced into the British army and navy.

They were employed in the China campaign of i860, and satisfactory reports were made as to their serviceableness; but while the breech-loading system had obtained a firm footing on the Continent of Europe, there was a strong prejudice against it in England, and about 1864 M-L.R. guns were adopted. Breech- loaders did not again find favour until about 1882, when a demand was made for more powerful guns than the M.L.R. In conse- quence, M.L. guns having enlarged chambers for burning large charges of prismatic powder were experimented with by the Elswick Ordnance Co. and subsequently by the War Office. The results were so promising that means were sought for further improvements, and breech-loading guns, having the Elswick cup obturation, were reintroduced. xx. 7

Up to about 1850 the dimensions of canon had been propor- tioned by means of empirical rules, as the real principles under- lying the construction of ordnance had been little understood. It was known of course that a gun was

Built-up guns.

subjected to two fundamental stresses — a circum- ferential tension tending to split the gun open longitudinally, and a longitudinal tension tending to pull the gun apart lengthwise; the longitudinal strength of a gun is usually greatly in excess of any requirements. It is easy to demonstrate that any so-called homogeneous gun, i.e. a gun made of solid material and not built up, soon reaches a limit of thickness beyond which additional thickness is practically useless in giving strength to resist circumferential stress. This is due to the fact that the stress on the metal near the bore is far higher than that on the outer portion and soon reaches its maximum resistance which additional thickness of metal does not materially increase. The ” gun can, however, be arranged to withstand a considerably higher working pressure by building it up on the principle of initial tensions. The inner layers of the metal are thereby compressed so that the gas pressure has first to reverse this compression and then to extend the metal. The gun barrel supported by the contraction of the outer hoops will then be able to endure a gas pressure which can be expressed as being pro- portional to the initial compressionplus the extension, whereas in the old type solid gun it was proportional to the extension only. The first to employ successfully this important principle for all parts of a gu”n was Lord Armstrong (q.v.), who in 1855-1856 produced

Fig. 11. — Armstrong B.L. Construction.

a breech-loading field gun with a steel barrel strengthened by wrought iron hoops. In this system (fig. 11) wrought iron coils were shrunk over one another so that the inner tube, or barrel, was placed in a state of compression and the outer portions in a state of tension — the parts so proportioned that each performs its maximum duty in resisting the pressure from within. Further, by forming the outer parts of wrought iron bar coiled round a mandril and then welding the coil into a solid hoop, the fibre of the iron was arranged circumferentially and was thus in the best position to resist this stress. These outer coils were shrunk over a hollow breech-piece of forged iron, having the fibre running lengthwise to resist the longitudinal stress. The several cylinders were shrunk over the steel inner tube or barrel. To obtain the necessary compression the exterior diameter of the inner portion is turned in a lathe slightly greater than the interior diameter of the outer coil. The outer coil is heated and expands; it is then slipped over the inner portion and contracts on cooling. If the strength of the two parts has been properly adjusted the outer will remain in a state of tension and the inner in a state of compression.

Every nation has adopted this fundamental principle which governs all systems of modern gun construction. The winding, at a high tension, of thin wire or ribbon on the barrel or on one of the outer coils may be considered as having an exactly similar effect to the shrinking of thin hoops over one another. The American, Dr Woodbridge, claims to have originated the system of strengthening guns by wire in 1850; Brunei, the great railway engineer, also had similar plans; to Longridge, however, belongs the credit of pointing out the proper mode of winding on the wire with initial tension so adjusted as to make the firing tension (i.e. the tension which exists when the gun is fired) of the wire uniform for the maximum proof powder pressure. Great

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success attended the early introduction of the coil system.

Large numbers (about 3500) of breech-loading Armstrong guns

from 2-5 in. to 7 in. calibre were manufactured for England

alone; most of these had. barrels of coiled iron, but solid forged

iron barrels were also employed and a few were of steel. This manufacture continued until 1867, when M.L. guns built up on the coil system (fig. 12) with the French form of rifling were adopted; but as the knowledge of the proper treatment and the quality of the steel had improved, steel barrels bored from a solid steel forging were mostly used; the exterior layers were still iron hoops with the fibre of the metal disposed as in the original type. In order to cheapen manufacture the 1 coils were thickened: by Mr Fraser of Woolwich Arsenal, so that a few thick coils were used instead of a number of thin ones (fig. 13).

In the Fraser system an attempt was made to obtain rigidity of construction and additional longitudinal strength by interlocking the various coils from breech to muzzle; this feature still exists in all designs adopted by the English government, but foreign designers do not favour it altogether, and many of their guns of the latest type have a number of short independent hoops shrunk on, especially over the chase. Their view is that movements — such as stretching of the inner parts — are bound to take place under the huge forces acting upon the tubes, and that it is better to allow freedom for these to take place naturally rather than to make any attempt to retard them. On the other hand it cannot be denied that the rigid construction is

A stronger material than ordinary carbon gun steel was conse- quently demanded from the steel-makers, in order to keep the weights of the heavier natures of guns within reasonable limits. The demand was met by the introduction of a gun steel having about 4% of nickel in addition to about 0-4 % of carbon. This alloy gives great

Fig. 12. — M.L. Gun Construction, conducive to strength and durability, but it is essential that massive tubes of the highest quality of steel should be employed.

The actual building up of a gun entails operations which are exactly similar, whether it be of the M.L. or B.L. system; and the hardening treatment of the steel is also the same — the coiled iron hoops when welded, of course, received no such treatment.

Fig. 13. — M.L. Gun Construction (Fraser). Fig. 14 shows the various stages of building up a B.L. gun and illustrates at the same time the principle of the interlocking system.

The steel barrels of the M.L. guns were forged solid ; the material was then tested so as to determine the most suitable temperature at which the oil hardening treatment should be carried out after the barrel had been bored. The bored barrel was simply heated to the required temperature and plunged vertically into a tank of oil. The subsequent annealing process was not introduced until some years after; it is therefore not to be wondered at that steel proved untrustworthy and so was used with reluctance.

Since 1880 the steel industry has made so much progress that this material is now regarded as the metal most to be relied on. The long high-power guns, however, require to be worked at a greater chamber pressure than the older B.L. guns, with which 15 tons or 16 tons per square inch was considered the maximum. With the designs now produced 18-5 tons to 20 tons per square inch working pressure in the chamber is the general rule.

Fig. 14. — Modern B.L. Construction, toughness and endurance under a suitable oil hardening and annealing process, the yielding stress being about 26 tons to 28 tons and the breaking stress from 45 tons to 55 tons per square inch, with an elongation of 16 . The tests for ordinary carbon gun steel are : ” yield not less than 21 tons, breaking stress between 34 tons and 44 tons per square inch, and elongation 17.”

The toughness of nickel steel forgings renders them much more difficult to machine, but the advantages have been so great that practically all barrels and hoops (except jackets) of modern guns are now made of this material.

The gun steel, whether of the carbon or nickel quality, used in England and most foreign countries, is prepared by the open hearth

method in a regenerative gas furnace of the Siemens- Martin type (see Iron and Steel). The steel is run from 7”” the furnace into a large ladle, previously heated by gas, tor S la S s – and from this it is allowed to run into a cast iron ingot mould of from 10 to 12 ft. high and 2 ft. or more in diameter. With very large ingots two furnaces may have to be employed. The external shape of these ingots varies in different steel works, but they are so arranged that, as the ingot slowly cools, the contraction of the metal shall not set up dangerous internal stresses. The top of the ingot is generally porous, and consequently, after cooling, it is usual for about one-third of the length of the ingot to be cut from the top and remelted; a small part of the bottom is also often discarded. The centre of the larger ingots is also inclined to be unsound, and a hole is therefore bored through them to remove this part. In the Whitworth and Harmet methods of fluid compressed steel, this porosity at the top and centre of the ingot does not occur to the same extent, and a much greater portion can therefore be utilized.

The sound portion of the ingot is now heated in a reheating gas furnace, which is usually built in close proximity to a hydraulic forging press (fig. 15, Plate I.). This press is now almost exclusively used for forging the steel in place of the steam hammers which were formerly an important feature in all large works. The largest of these steam hammers could not deliver a blow of much more than some 500 ft. tons of energy; with the hydraulic press, however, the pressure amounts to, for ordinary purposes, from 1000 tons to 5000 tons, while for the manufacture of armour plates it may amount to as much as 10,000 or 12,000 tons.

For forgings of 8-in. internal diameter and upwards, the bored out ingot, just mentioned, is forged hollow on a tubular mandril, kept cool by water running through the centre; from two to four hours forging work can be performed before the metal has cooled down too much. Generally one end of the ingot is forged down to the proper size; it is then reheated and the other end similarly treated.

The forging of the steel and the subsequent operations have a very marked influence on the structure of the metal, as will be seen from the micro-photographs shown in the article Alloys, where (a) and (b) show the structure of the cast steel of the actual ingot; from this it will be noticed that the crystals are very large and prominent, but, as the metal passes through the various operations, these crystals become smaller and less pronounced. Thus © and (d) show the metal after forging; (e) shows the pearlite structure with a magnification of 1000 diameters, which disappears on the steel being oil hardened, and (/) shows the oil hardened and annealed crystals. At the Bofors Works in

Sweden, gun barrels up to 24 cm. (9-5 in.) calibre have been formed of an unforged cast steel tube; but this practice, although allowing of the production of an in- expensive gun, is not followed by other nations.

After the forging is completed, it is annealed by reheating and cooling slowly, and test pieces are cut from each end tangei > tially

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Fig. 15.— FORGING PROCESS.

Plate II.

ORDNANCE

Fig. i 8.— SHRINKING-ON PROCESS.

to the circumference of the bore; these are tested to ascertain the quality of the steel in the soft state.

It is found that the quality of the steel is greatly improved by forging, so long as this is not carried so far as to set up a laminar structure in the metal, which is thereby rendered less suitable for gun construction — being weaker across the laminae than in the other directions. It is then termed over-forged.

If the tests are satisfactory the forging is rough-turned and bored, then reheated to a temperature of about 1600 F., and hardened by plunging it into a vertical tank of rape oil. This process is a some- what critical one and great care is observed in uniformly heating, to the required temperature, the whole of the forging in a furnace in close proximity to the oil tank into which it is plunged and completely submerged as rapidly as possible. In some cases the oil in the tank is circulated by pumping, so that uniformity of cooling is ensured; and, in addition, the oil tank is surrounded by a water jacket which also helps to keep it at a uniform heat. The forging is subsequently again heated to about J200 F. and allowed to cool slowly by being placed in warm sand, &c.

This last operation is termed annealing, and is intended to dissipate any internal stress which may have been induced in the forging by any of the previous processes, especially that of oil-hardening. After this annealing process a second set of test pieces, two for tensile and two for bending test, are cut from each end of the forging in the positions above mentioned ; for guns of less than 3-in. calibre only half this number of test pieces is taken ; and with hoops of less than 48 in. in length the test pieces are taken only from the end which formed the upper part of the cast ingot.

In all cases of annealed steel the test pieces of 2 in. length and 0- 533 i n – diameter must give the stipulated tests according to the character of the steel. For breech screws the steel is made of a harder quality, as it has to resist a crushing stress. These are the tests required in England, but they differ in different countries; for instance in France a harder class of carbon steel is employed for hoops, in which the tensile strength must not be less than 44-5 tons, nor the elastic limit less than 28-5 tons per square inch, neither must the elongation fall below 12 %.

Assuming that the tests of the annealed forging are satisfactory, the forging, which we will suppose to be a barrel, is tested for straight-ness and if necessary rectified. It is then rough-turned in a lathe (fig. 16) “to break the skin ” (as it is termed technically) and so

interior of the covering tube or hoop finished to suit. The covering hoop is allowed usually only a small shrinkage, or sometimes none, as it is simply intended as a protection to the wire and to give longitudinal strength ; but in order to place it over the wire it must be heated and thus some little contraction always does take place on cooling. The heat to which these hoops are brought for shrinking never exceeds that used in annealing, otherwise the modifying effects of this process would be interfered with.

In the earliest modern type B.L. guns, the breech screw engaged directly with a screw thread cut in the barrel, which thus had to resist a large portion, if not all, of the longitudinal stress. This was also the system first adopted in France, but there are certain objections to it, the principal being that the barrel must be made of large diameter to meet the longitudinal stress, and this in consequence reduces the circumferential strength of the gun. Again, the diameter of the screw is always considerably larger than the breech opening, and so an abrupt change of section takes place, which it is always best to avoid in structures liable to sudden shocks. The thick barrel, however, gives stiffness against bending and, moreover, does not materially lengthen

with firing; thin barrels on the other hand are gradually extended by the drawing out action of the shot as it is forced through the gun. In some large guns with excessively thin barrels this action was so pronounced as to entail considerable inconvenience. In the English system the breech screw is engaged either in the breech piece, i.e. the hoop which is shrunk on over the breech end of the barrel, or in a special bush screwed into the breech piece. This latter method suits the latest system of con- struction in which the breech piece is put on the barrel from the muzzle, while with the earlier type it was put on from the breech end.

With the earlier modern guns short hoops were used whenever possible, as, for instance, over the chase, principally because the steel in short lengths was less likely to contain flaws, but as .the metallurgical processes of steel making developed the necessity for this disappeared, and the hoops became gradually longer. This has however, increased correspondingly the difficulties in boring and turning, and, to a much greater extent, those encountered in building up the gun. In this operation the greatest care has to be taken, or warping will occur during heating. The tubes are heated in a vertical cylindrical furnace, gas jets playing both on the exterior and interior of the tube. When sufficiently hot, known by the diameter of the tube expanding to equal previously prepared gauges, the tube is

Fig. 16. — Lathe used in Gun Construction.

prevent warping during the subsequent operations. It is then bored out to nearly the finished dimension and afterwards fine turned on the exterior. In the meantime the other portions of the gun are in progress, and as it is far easier to turn down the outside of a tube than to bore out the interior of the superimposed one to the exact measurements required to allow for shrinkage, the interior of the jacket and other hoops are bored out and finished before the exterior of the internal tubes or of the barrel is fine turned. The process of boring is illustrated in fig. 17. The barrel or hoop A, to be bored, is passed through the revolving headstock B and firmly held by jaws C, the other end being supported on rollers D. A head E, mounted on the end of a boring bar F, is drawn gradually through the barrel, as it revolves, by the leading screw K actuated by the gear G. The boring head is provided with two or more

raised out of the furnace and dropped vertically over the barrel or other portion of the gun (fig. 18, Plate II.). In. cooling it shrinks longitudinally as well as circumferentially, and in order to avoid gaps between adjoining tubes the tube is, after being placed in position,

cooled at one end by a ring of water jets to make it grip, while the other portions are kept hot by rings of burning gas flames, which are successively extinguished to allow the hoop to shorten gradually and thus prevent internal longitudinal stress. A stream of water is also directed along the interior of the gun during the building up process, in order to ensure the hoop cooling from the interior. After the building up has been completed, the barrel is fine-bored, then chambered and rifled. The breech is then screwed either for the bush or breech screw and the breech mechanism fitted to the gun.

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Fig. 17. — Boring.

cutting tools, and also with a number of brass pins or pieces of hard wood to act as guides, in order to keep the boring head central after it has entered the barrel. The revolving headstock B is driven by a belt and suitable gearing.

With wire guns the procedure is somewhat different. The wire is wound on to its tube, which has been previously fine turned ; the exterior diameter of the wire is then carefully measured and the

In order to obtain additional longitudinal strength the outer tubes are so arranged that each hooks on to its neighbour from muzzle to breech. Thus, the chase hoop hooks on to the barrel by a step, and the succeeding hoops hook on to each other until the jacket is reached which is then secured to the breech piece by a strong screwed ring. In all the latest patterns of English cuns there is a single chase hoop covering the forward portion ofthe

gun and a jacket covering the breech portion, an arrangement which simplifies the design but increases the difficulties of manu- facture.

Wire guns are now made of almost all calibres, ranging from 3 in. to 12 in. Many authorities objected to guns of less calibre than

Wme f*3rc»t*o rf”Vff

Elswick System Woolwich System

Fig. 19. — Wire Fastening, j

4-7 in. being wound with wire, as they considered that on diameters so small the interior surface of each layer of wire is over-compressed, while the exteridr is too much extended ; but by proportioning the thickness of the wire to the diameter of the tube on which it is wound there is no reason for this to be so.

The wire is wound on the barrel at a certain tension, ascertained by calculation, and varying from about 50 tons per square inch for the layers first wound on the gun, to about 35 or 40 for the outer layers. To fasten the wire at the beginning and end several methods are adopted. In the Woolwich system a narrow annular ring (fig. 19), with slots cut into one of its faces, is shrunk on to the gun; into these slots one end of the wire is inserted and secured in position by a steel screwed plug. The wire is wound on for the distance desired and then back again to the ring, where the end is fastened off in the same way. At Elswick the wire is fastened by bending it into a shunt cut groove in a similar annular ring, but the wire is only fastened off in the same way after several layers have been wound.

With each succeeding layer of wire the interior layers are compressed, and these in turn compress the barrel. It is therefore

necessary, in order to prevent the fatigue of the material, to make the barrel comparatively thick, or, better still, to have an outer barrel superimposed on the inner one. This latter arrangement is now used in all guns of 4 in. calibre and upwards. It is not so important with smaller guns as the barrel is always relatively thick, and therefore meets the conditions.

With many modern guns the interior of the outer barrel, termed the ” A ” tube, is taper bored, the larger end being towards the breech ; and the exterior of the” inner barrel or liner, called the ” inner A tube,” is made tapered to correspond. The latter is, after careful fitting, inserted in the outer barrel while both are cold, and forced into position by hydraulic pressure or other mechanical means.

The details of the machines for winding on the wire (see fig. 20) differ

somewhat in different works, but all are arranged so that any desired tension can be given to the wire as it is being wound on to the gun. The wire is manufactured in much the same way as ordinary wire. A red-hot bar of steel, gradually rolled down between rollers to a section about double that which it is finally intended to have, is annealed and carefully pickled in an acid bath to detach any scale. It is then wound on a drum, ready for the next process, which consists in drawing it through graduated holes made in a hardened steel draw-plate, the wire being often annealed and pickled during this process. The drawplate holes vary in size from slightly smaller than the rolled bar section to the finished size of the wire, and, as a rule, the sharp corners of the wire are only given by the last draw. It is found that considerable wear takes place in the holes of the draw-plate, and a new plate may be required for each hank of 500 or 600 yds. of wire. Great importance is attached to the absence of scale from the wire when it is being drawn, and, after pickling, the rolled bar and wire are treated with lime or some similar substance to facilitate the drawing. The tests for the finished wire are as follows: it has to stand a tensile stress of from 90 to no tons per square inch of section, and a test for ductility in which a short length of wire is twisted a considerable number of turns in one direction, then unwound and re-twisted in the opposite direction, without showing signs of fracture. It will be seen that the wire is extremely strong and the moderate stress of from 35 to 50 tons per square inch, which at most it is called upon to with- stand in a gun, is far less than what it could endure with perfect safety.

The wire after being manufactured is made up into hanks for storage purposes; but when required for gun construction _ it is thoroughly cleaned and wound on a drum R about 3 ft. 6 in. in diameter, which is placed in one portion of the machine in connexion with a powerful band friction brake M. The wire is then led to the gun A placed between centres or on rollers B.B. parallel to the axis of the wire drum. By rotating the gun the wire is drawn off from the drum against the resistance of the band brake, which is so designed that, by adjusting the weight S suspended from the brake strap, any desired resistance can be given in order to produce the necessary tension in the wire as it is being wound on the gun. The stress on

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Fig. 20. — Wire-winding Machine.

the wire is indicated on a dial, and the headstock, containing the drum of wire, is capable of being moved along the bed G by a leading screw H, driven by a belt through variable speed cones I; the belt is moved along the cones by forks J, traversed by screws K, which in their turn are actuated by chain belts from the hand wheel L. The traversing speed is regulated to suit the speed of winding by moving the belt along the speed cones.

The wire is rectangular in section, 0-25 in. wide and 0-06 in. thick, and after it has been wound on to the gun it presents a very even surface which requires little further preparation. The diameter over the wire is gauged and the jacket or other covering hoop is carefully bored equal to this, if no shrinkage is to be allowed; or the dimension is diminished in accordance with the amount of shrinkage to be arranged for.

The gun is built up, after wiring, in the same manner as a gun without

wire, the jacket or other hoop being heated in the vertical gas furnace and when hot enough dropped into place over the wire, cooled by the ring of water jets at the end first required to grip and kept hot at the other, exactly as before described.

The machine arranged for rifling modern guns_ is very similar to that employed for the old muzzle-loaders; it is a special tool Rlfllag used in gun construction only (fig. 21), and is in reality operation. a copying machine. A steel or cast-iron bar J which forms the. copy of the developed rifling curve is first made. The copying bar — which is straight if the rifling is to be uni- form but curved if it is to be increasing — is fixed, inclined at the

bullet, from the muzzle. In 1836 Russia made a large number of experiments with a rifled gun invented by Montigny, a Belgian; this was not a success, but in England the guns invented by Major Cavalli, in 1845, and by Baron Wahrendorff in 1846, obtained some measure of favour. Both these guns were breech- loaders. The Cavalli gun had a bore of 6-5 in. diameter; it was rifled in two grooves having a uniform twist of 1 in 25 calibres, and the elongated projectile had two ribs cast with it to fit the grooves, but no means were taken to prevent windage. The Wahrendorff gun had an enlarged chamber and the bore of 6-37 in. diameter was rifled in 2 grooves; the projectile had ribs similar to that for the Cavalli gun; but Wahrendorff had also tried lead-coated projectiles, the coating being attached by grooves undercut in the outside of the shell. In 1854 Lancaster submitted his plan of rifling; in this (fig. 22) the bore was made of an oval section which twisted round the axis of the gun from the breech to the muzzle; a projectile having an oval section was fired. Several old cast-iron guns bored on this system burst in the Crimean War from the projectile wedging in the gun. In 1855 Armstrong experimented with a breech-loading rifled gun, firing a lead-coated projectile. The rifling consisted

Fig. 21. — Rifling Machine.

proper angle, to standards K on the machine. The cutting tool is carried at one end C of a strong hollow cylindrical rifling bar B, the other end of which is fixed to a saddle M. This is moved along the bed of the machine by a long screw N, and the rifling bar is conse- quently either pushed into the gun or withdrawn by the motion of the saddle along the machine. During this motion it is made to rotate slowly by being connected to the copying bar by suitable gearing I. It will thus be seen that the cutting tool will cut a spiral groove along the bore of the gun in strict conformity with the copy. In most English machines

the cutting tool cuts only as the rifling bar is drawn out of the gun; during the reverse motion the cutter F is withdrawn out of action by means of a wedge arrange- ment actuated by a rod passing through the centre of the rifling bar, which also pushes forward the cutter at the proper time for cutting. One, two or more grooves may be cut at one time, the full depth being attained by slowly feeding the tool after each stroke. After each set of grooves is cut the rifling bar or the gun is rotated so as to bring the cutters to a new position. In some foreign machines the cut is taken as the rifling bar is pushed into the gun.

Rifling is the term given to the numerous shallow grooves cut spirally along the bore of a gun; the rib between two Rlfliaz grooves is called the ” land.” Rifling has been known for many years; it was supposed to increase the range, and no doubt did so, owing to the fact that the bullet having to be forced into the gun during the loading operation became a mechanical fit and prevented to a great extent the loss of gas by windage which occurred with ordinary weapons. Kotter (1520) and Danner (1552), both ot Nuremberg, are respectively credited as being the first to rifle gun barrels; and there is at the Rotunda, Woolwich, a muzzle-loading barrel dated 1547 rifled with six fine grooves. At this early period, rifling was applied only to small arms, usually for sporting purposes. The disadvantage of having, during loading, to force a soft lead (or lead-covered) ball down a bore of smaller diameter prevented its general employment for military use. In 1661 Prussia experimented with a gun rifled in thirteen shallow grooves, and in 1696 the elliptical bore — similar to the Lancaster — had been tried in Germany. In 1745 Robins was experimenting with rifled guns and elongated shot in England. During the Peninsular War about 1809, the only regiment (the ” Rifle Brigade,” formerly called the 95th) equipped with rifled arms, found con- siderable difficulty in loading them with the old spherical lead

of a large number of shallow grooves having a uniform twist of 1 in 38 calibres. When the gun was fired the lead-coated projectile, which was slightly larger in diameter than the bore of the gun, was forced into the rifling and so gave rotation to the elongated projectile. Whitworth in 1857 brought out his

WHITWORTH BORE

LANCASTER OVAL BORE

(ARLV ARMSTRONG GROOVE

FRENCH GROOVE

For t-twdded projectile*

POLYGROOVE (Hook Section)

MODERN GROOVE (% Type)

^

t

M

KRUPP GROOVE

MODERN GROOVE (latest Type)

Map*- -m&

Fig. 22. — Sections of Rifling.

hexagonal bore method of rifling and a projectile which was a good mechanical fit to the bore. Good results were obtained,

but although this system had certain advantages it did not fulfil all requirements.

In 1863, England re-opened the whole question, and after exhaustive trials of various inventions decided on the adoption of the muzzle-loading type foi all guns, with the French system of rifling. This system was invented in 1842 by Colonel Treuille de Beaulieu and consisted of a few wide and deep grooves which gave rotation to a studded projectile. At the first trials two grooves only were tried, but the number was afterwards in- creased to three or more, as it was found that two grooves only would not correctly centre the projectile. The adoption of the muzzle-loading system with studded shot was a distinctly retrograde step, as a considerable amount of clearance was necessary between the bore and projectile for the purposes of loading, and this resulted in the barrel being seriously eroded by the rush of gas over the shot, and also led to a considerable loss of energy. In the Wahrendorff and Armstrong systems however the lead-coated projectiles entirely prevented windage, besides which the projectile

was perfectly centred and a high degree of accuracy was obtained.

Shunt rifling was a brief attempt to make loading by the muzzle easy without forfeiting the centring principle: in this the rifling varied in width and in depth, at different portions of the bore in such a manner that, during loading, the studs on the projectile could move freely in the bore. When the gun was fired the studs of the projectile were forced to travel in the shallow part of the rifling, thus gripping and centring the projectile as it left the muzzle.

With uniform rifling on the French system, the few studs — generally two per groove — had to bear so high a pressure to produce rotation that they sometimes gave way. This subject was investigated by Captain (Sir Andrew) Noble, who showed that by making the rifling an increasing twist, commencing with no twist and gradually increasing until the necessary pitch was obtained, the maximum pressure due to rotation was much reduced. Increasing rifling was consequently adopted, with beneficial results.

In order to prevent the heavy erosion due to windage, a gas check was adopted which was attached to the base end of the studded projectiles. In some guns the number of grooves of the rifling was sufficiently great to admit of rotation being insured by means of the gas check alone; in these guns studded pro- jectiles were not employed, but the gas check, called ” auto- matic,” to distinguish it from that fitted to studded projectiles was usually indented around its circumference to correspond with the rifling of the gun. It was found that the studless projectile had considerably greater range and accuracy than the studded projectile, with the additional advantage that the shell was not weakened by the stud holes.

The introduction of the plain copper driving band for rotating projectiles with breech-loading guns included a return to the polygroove system with shallow grooves; this still exists, but the continuous demand for greater power has had the effect of in- creasing the number of grooves from that at first considered necessary, in order to keep the rotating pressure on the driving band within practical limits.

Many ingenious devices for giving rotation and preventing the escape of gas past the projectile were tried in the early days of modern rifling. Experiments of this nature still continue to be made with a view to improving the shooting and to prevent the erosion of the bore of the gun. Briefly considered, without going into any detail of the numerous plans, all rotating devices fitted to projectiles can be

divided into three classes — the “centring, ” the ” compressing ” and the ” expansion ” systems. The two last named almost invariably include the ” centring ” type. Studded (fig. 23) and Whitworth (fig. 24) hexagonal projectiles, which can freely slide in the bore, come under the first system.

In the compression class the coating or rings on the projectile are larger in diameter than the bore and when fired the coating (or rings) is squeezed or engraved by the rifling to fit the bore — the projectile is consequently also centred. The old-fashioned

lead-coated shell (fig. 25), and the modern system of plain copper driving bands (fig. 26), come under this class. Mpst variety exists in the expansion type, where the pressure of the powder gas acts on the base of the projectile or on the driving ring and compresses a lead, copper or asbestos ring into the rifling grooves. One of the earliest was the Hotchkiss (1865) shell (fig. 27), in which a separate base end B was driven forward by the gas pressure and squeezed out the lead ring L into the rifling. The automatic gas check (fig. 28), and the gas check driving band (fig. 29), belong to this system; in the last the lip L is expanded into the rifling groove. In fig. 30 a copper driving band is

A

Fig. 29. Fig. 30.

Figs. 23-30.— Projectiles for Rifled Ordnance.

associated with an asbestos packing A, contained in a canvas bag or copper casing made in the form of a ring on the principle of the de Bange obturator; but the results of this have not been entirely satisfactory.

It will be seen that with breech-loading guns the projectile is better centred, and the copper driving band forms a definite stop for the projectile; and, in consequence, the capacity of the gun chamber is practically constant. In addition, the use of a copper driving band ensures a uniform resistance while this is being engraved and the projectile forced through the gun, and also prevents the escape of gas. These elements have a very great influence on the accuracy of the shooting, and fully account for the vastly superior results obtained from breech- loading ordnance when compared with the muzzle-loading type. Driving bands of other materials such as cupro-nickel and ferro-nickel have also been tried.

Many authorities believe that the best results are obtained when the

projectile is fitted with two bands, one near the head and the other near the base, and no doubt it is better centred when so arranged, but such shot can only be fired from guns rifled with a uniform twist, and it must also not be forgotten that the groove formed for the front band in the head of the projectile necessarily weakens that part of the projectile which should be strongest.

Projectiles with a driving band at the base only can be fired from guns rifled either uniformly or with increasing twist.

The introduction of cordite (g.v.) about 1890 again brought into special prominence the question of rifling. The erosion caused by this explosive soon obliterated the rifling for some 4 or 5 calibres at the breech end. The driving band of the shell consequently started with indifferent engraving, and with the increasing twist, then in general use, it was feared that the wear would quickly render the gun useless. To remedy this the late Commander Younghusband, R.N., proposed straight rifling, which was adopted in 1895, for that portion of the rifling mostly affected by the erosion, with a gradual increase of the twist thence to the required pitch at the muzzle. Thus, any erosion of the straight part of the rifling would not affect that portion giving rotation, and it was argued that the gun would remain efficient for a longer period. The defect in this system is that when the projectile arrives at the end of the straight rifling it has a considerable forward velocity and no rotation. Rotation is then imparted by the increasing twist of rifling, and the

resulting pressure on the engraved ribs of the driving band rises suddenly to a maximum which, in high velocity guns, the driving band is unable to resist. For this reason the straight portion at the commencement of the rifling has been discarded, and with high power guns firing a slow burning propellant uniform rifling has again found favour.

It is evident that in order that a projectile may have a definite amount of spin as it leaves the gun a determinate amount of work must be imparted to rotate it during its passage along the rifled portion of the bore. Put briefly, this work is the sum of the products of the pressure between the engraved ribs on the driving band and the lands of the

rifling in the gun multiplied by the length of the rifling over which this pressure acts. Sir Andrew Noble has proved theoretically and experimentally (see Phil. Mag., 1863 and 1873; also Proc. Roy. Soc. vol. 50) that the rotating pressure depends on the propelling pressure of the powder gas on the base of the projectile and on the curve of the rifling. If this curve was so proportioned as to make the rotating pressure approximately constant along the bore, the result was an increasing or progressive curve partaking of the nature of a parabola, in which case it was usual to make the last two or three calibres of rifling at the muzzle of uniform twist for the purpose of steadying the projectile and aiding accuracy.

In uniform rifling- the curve is a straight line and the rotating pressure is consequently mainly proportional to the propelling gas pressure. The pressure for rotation with uniform rifling therefore rises to a maximum with the propelling pressure and falls as it becomes less towards the muzzle.

With increasing rifling, owing to the angle of twist continually changing as the projectile travels along the bore, the ribs originally engraved by the rifling on the driving band are forced to change their direction correspondingly, and this occurs by the. front surface of the ribs wearing away. They are therefore weakened considerably, and it is found that with high velocities the engraved part of the band often entirely disappears through this progressive action.

It will thus be seen that although an increasing twist of rifling may be so arranged as to give uniform pressure, it is evident that if wear takes place, the engraved rib becomes weaker to resist shearing as the shot advances, and the rate of wear also increases owing to the increase of heat by friction. With the very narrow driving bands used for low velocity guns this action was not so detrimental.

With the longmodern guns and the high muzzle velocities required, the propelling gas pressures along the bore rise comparatively slo%vly to a maximum and gradually fall until the muzzle is reached. The pressure of the gas at all points of the bore is now considerably higher than with the older patterns of B.L. guns.

For modern conditions, in order to obtain an increasing curve giving an approximately constant driving pressure between the rifling and driving band, this pressure becomes comparatively high. The maximum rotating pressure, with uniform rifling, is certainly somewhat higher, but not to a very great extent, and as it occurs when the projectile is still moving slowly, the wear due to friction will be

correspondingly low; the pressure gradually falls until the muzzle is reached, where it is much lower than with increasing rifling. The projectile thus leaves the gun without any great disturbance from the rifling pressure. Further, as the band is engraved once for all with the angle it will have all along the bore the pressure is distributed equally over the driving face of the engraved ribs instead of being concentrated at the front of the ribs as in progressive or increasing rifling.

The following formulae showing the driving pressures for increas- ing and uniform rifling are calculated from Sir Andrew Noble's for- mula, which Sir G. Greenhill has obtained independently by another method.

Let R = total pressure, in tons, between rifling and driving band. G = gaseous pressure, in tons, on the base of the projectile. r = radius, in feet, of the bore. HT = coefficient of friction. p = radius of gyration of projectile. 8 = angle between the normal to the driving surface of groove

and radius. h — the pitch of the rifling, in feet. k = cotangent of angle of rifling at any point of rifling. M = weight of the projectile in pounds. z = the length, in feet, travelled by the projectile. Then for parabolic rifling

apˆGs+Mn*)

R =

(r 2 fe 2 +4p 2 z 2) sin 6 ~ Tjirkz(p'-r 2) (4a 2 sinˆ-t-* 2)* + (42 2 +#)»

For uniform rifling R =

2xp 2 G

lii(2irp'k-rh) . {2irp*--rkk) sirnS (i + fe 2)* + (£ 2 + sin 2 5)i

For parabolic rifling R =

2p 2 (4 z 2 +fe 2)i(Gz+Mi> 2)

kr 2 (k – 2/4i z) +2p 2 2 (2Z +)iik) '

For uniform rifling we can write hk = 2vr and the expression reduces to

p 2 il ± Mi_.G.

R =

” i (p2 *“9 p2 ” 2

Fig. 31 shows graphically the calculated results obtained for a 4-7-in. 50-calibre gun which has a shot travel of 17-3 ft. ; the pressure

For modern rifling 5 = 90° ; therefore sin 5 = 1 ; by which the above expressions may be considerably simplified.

1

,r0*ceiHii»‘3 < ATiˆyi

,«*»•* i-ˆ

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10 ti t4

16 I*

4-7 INCH SO CALIBRE GVN

Fig. 31. — Pressure Curves (uniform and increasing twist).

curve A is for a rifling twist increasing from 1 in 60 calibres at the breech to 1 in 30 calibres at the muzzle ; curve B is for rifling having a uniform twist of I in 30 calibres.

It must be remembered that this comparison is typical for modern conditions; with old-fashioned guns firing black or brown powder the maximum rotating pressure for uniform rifling could attain a value 50 % above that for increasing rifling.

In this example, with the increasing twist there is a loss of energy of about 1 1 % of the total muzzle energy, and for the uniform rifling a loss of about 8 %. This explains the reason for uniformly rifled guns giving a higher muzzle velocity than those with increasing rifling, supposing the guns to be otherwise similar.

The pitch of the rifling or the amount of twist to be given to it depends altogether on the length of the projectile; if this is short a small amount of twist only is necessary, if long a greater amount of twist must be arranged for, in order to spin the shell more rapidly. Sir G. Greenhill has shown that the pitch of the rifling necessary to keep a projectile in steady motion is independent of the velocity, of the calibre, or of the length of the gun, but depends principally on the length of the shell and on its description, so that for similar projectiles one pitch would do for all guns.

Table I., on following page, has been calculated from Greenhill's formula.

In most modern guns the projectile varies in length from 3-5 to 4 calibres, so that the rifling is made to terminate at the muzzle with a twist of 1 turn in 30 calibres, which is found ample to ensure a steady flight to the projectile. In the United States a terminal twist ot 1 in 25 calibres is often adopted; Krupp also uses this in some guns. With howitzers the projectile may be 4-5 calibres long, and the rifling has to be made of a quicker twist to suit.

If the gun has, as is usually the case, a right-hand twist of rifling the projectile drifts to the right; if it has a left-hand twist the drift takes place to the left. The drift increases with nrlH

the range but in a greater ratio ; further, the greater the _ Dim. twist (i.e. the smaller the pitch of rifling) the greater the drift. On the other hand the smooth B.L. projectiles drift less than studded M.L. projectiles.

To find the angle, usually called the permanent angle of deflection, at which the sights must be inclined to compensate for the drift, a number of shots are fired at various ranges. The results obtained are plotted on paper, and a straight line is then drawn from the point representing the muzzle through the mean value of the plotted curve.

The early guns were fired by inserting a red-hot wire into the vent, or by filling the vent with powder and firing it by a red- hot iron. Slow match held in a cleft stick afterwards took the place of the hot iron, and this again was Fl ^*gg. replaced by a port-fire. Filling the vent with loose meats. powder was inconvenient and slow, and to improve matters the powder was placed in a paper, tin or quill tube

which was simply pushed into the vent and fired by the slow match or port-fire.

The first attempt to fire guns by mechanical means was made in 1 781 by Sir Charles Douglas, who fitted flint locks, similar to musket locks, but with the trigger actuated by a lanyard, to the guns on board his ship H.M.S. ” Duke.” A double flint lock introduced in 1818 by Sir Howard Douglas, R.A., continued to

Table I.

Minimum twist at muzzle of gun requisite to give stability of rotation

Length of

= one turn in n calibres; or a pitch of « calibres.

projectile

Cast-iron common

Solid lead and tin

in calibres.

shell,

Palhser shell,

Solid steel bullet

bullets of similar

cavity = 5 8 7 vol.

cavity =£ vol.

(s.g.—8’o).

composition

of sheU

(s.g.-8'o).

to M.-H. bullets

(s.g. of iron =7*2).

(s.g. = lo-g).

it.

».

».

ft.

2

63-87

71-08

72-21

84-29

1

59-84

66-59

67-66

78-98

2

56-3I

62-67

63-67

74-32

3

53-19

59-19

60-14

70-20

4

50-41

56-10

57-oo

66-53

5

47-91

53-32

54-17

63-24

6

45-65

5o-8i

51-62

60-26

7

43-6i

48-53 ‘

49-30

57-55

8

41-74

46-45

47-19

55-09

9

40-02

44-54

45-25

52-72

3

38-45

42-79

43-47

50-74

1

3 6-99

41-16

41-82

48-82

2

35-64

39-66

40-30

47-04

3

34-39

38-27

38-84

45-38

4

33-22

36-97

37-56

43-84

5

32-13

35-75

36-33

42-40

6

31-11

34-62

35-17

41-05

7

30-15

33-55

34-09

39-79

8

29-25

32-55

33-°7

38-61

9

28-40

31-61

32-11

37-48

4

27-60

30-72

31-21

36-43

1

26-85

29-88

30-36

35-43

2

26-13

29-08

29-55

34-49

3

25-45

28-33

28-78

33-59

4

24-81

27-61

28-05

32-74

5

24-20

26-93

27-36

31-94

6

23-65

26-32

26-74

31-21

7

23-06

25-66

26-08

30-44

8

22-53

25-08

25-48

29-74

9

22-03

24-51

24-91

29-07

5

21-56

23-98

24-36

28-44

1

21-08

23-46

23-84

27-83

2

20-64

22-97

23-34

27-24

3

20-22

22-50

22-86

26-68

4

I9-8I

22-05

22-40

26-14

5

19-42

2I-6I

21-96

25-63

6

19-04

21-19

21-53

25-13

7

18-68

20-79

21-12

24-66

8

18-33

20-40

20-73

24-20

9

18-00

20-03

20-35

23-75

6

17-67

19-67

19-98

23-33

7

14-99

16-68

16-95

19-78

8

13-02

14-48

14-72

17-18

9

u -50

12-80

13-00

15-18

io-o

10-31

n-47

11-65

13-60

be used until about 1842, when it was replaced by a percussion lock invented by an American named Hiddens. In this lock one pull on the lanyard caused the hammer to fall and strike a per- cussion patch or cap hung on a small hook over the vent, and afterwards caused the hammer to be drawn backwards out of the way of the blast from the vent. These somewhat clumsy contrivances were swept away on the adoption in 1853 of friction tubes (see Ammunition), which had simply to be placed in the vent and the friction bar withdrawn by means of a lanyard.

Friction tubes continued to be used with all muzzle-loading ordnance except in one or two natures with which the charge was ignited axially at the breech of ‘the gun. In these a vent sealing friction tube

retained in the vent by a tube holder was employed. With breech-loading field guns ordinary friction tubes were also used until the introduction of cordite, which eroded the vents so quickly by the escape of the gases that vent sealing tubes became a necessity.

In all other breech-loading ordnance and with the latest

pattern field guns the firing gear forms part of the breech mechanism.

All modern breech mechanisms form two groups- (a) the sliding type as with the Krupp wedge system, (b) the swinging type as in the interrupted screw system. Either type may be _ . used with B.L. guns (i.e. those with which the charge is me ch an . no(contained in a metallic cartridge case) and Q.F. guns . (i.e. those with which a metallic cartridge case is used).

Sliding mechanisms may be divided into two forms: (1) those having the block or wedge sliding horizontally, and (2) those in which the block works in a vertical direction. (1) is that used principally by Krupp; (2) is best illustrated by the Hotchkiss system for small Q.F. guns; the Nordenfelt, Skoda and the Driggs- Schroeder mechanisms for small Q.F. guns are an adaptation of the same principle.

The Krupp gear is in reality an improved Cavalli mechanism; it is capable of being worked rapidly, is simple, with strong parts not liable to derangement, except perhaps the obturator. The breech end of the gun, however, occupies valuable space especially when these guns are mounted in the restricted turrets or gun houses on board ship.

Later it will be seen that owing to the difficulty of arranging a convenient and efficient obturating device for the smokeless nitro-powders, which have a peculiarly severe, searching effect, a metal cartridge case has to be used with even the heaviest guns; naturally this assumes large dimensions for the 305 m/m. gun.

The wedge (fig. 32) is housed in the breech piece, which covers the breech part of the barrel, made very massive and extended to the rear of the barrel. A slot, cut transversely through the extended portion, forms a seat for the sliding block. The slot is formed so that its front is a plane surface perpendicular to the axis of the gun, while the rear is, rounded and slightly inclined to the axis. One or more ribs similarly inclined on the upper and lower surfaces of the slot guide the breech block in its movements. For traversing the block a quick pitched screw is fitted to its upper surface and works in a nut attached to the upper part of the slot (in small guns this traversing screw is dispensed with,

as the block can be easily moved by hand). As the rear seat of the sliding block is inclined, there is a tendency for the block to be moved sideways, when the gun is fired by the pressure in the chamber acting on the front face of the wedge ; this is prevented by a locking gear, consisting of a cylinder, having a series of interrupted collars, which is mounted on a screw. When the breech has been traversed into position, the collars are rotated, by a cross handle at the side of the block, into grooves cut in the rear surface of the slot; a further movement makes the screw jam the collars hard in contact with the gun and secures the breech. With small guns having no traversing gear a short strong screw takes the place of the collars, and on the handle being turned enters a threaded portion at the rear surface of the slot, actuates the breech for the last (or first in opening) portion of its movement in closing and secures it. To open the gun the movements are reversed.

The gun is fired by a friction tube, screwed into an axial vent bored through the sliding block, or, in field guns, by a copper friction tube through an oblique vent drilled through the top of the breech end of the gun and through the block.

There is also fitted in some guns a percussion arrangement for firing, a percussion tube.

The qbturation is effected by a Broadwell ring or some modifica- tion of it; this is placed in a recess cut in the gun and rests against a hard steel plate fitted in the breech block.

For modern Krupp mechanisms, for use with cartridge cases, the arrangement (fig. 33) is very similar to that described above, but some improvements have added to its simplicity. The' transporting screw is fitted with a strong projection which, at the end of the movement for closing the breech, locks with a recess cut in the upper surface of the slot and secures the breech. The extra locking device is consequently dispensed with. The firing gear consists of a striker fitted in the sliding block in line with the axis of the gun ; the striker is pushed back by a lever contained in the block and, on release, is driven forward against the primer of the cartridge case by a spiral spring.

In the Hotchkiss gun the mechanism has a vertical breech block of a rectangular section. The actuating lever F (fig. 34) is on the right side of the gun, and connected to a powerful crank arm C working in a groove E cut on the right side of the breech block. By pulling the lever towards the rear, the crank arm forces down the block A and extracts the fired case by an extractor X, which is actuated by a cam groove Y

cut on one side or on both sides of the block. As the mechanism is opened the hammer H is cocked ready for the next round. To close the mechanism the lever is pushed over to the front, and by releasing the trigger sear by pulling the lanyard the hammer falls and fires the cap of the cartridge case.

Automatic gear is now generally fitted which opens the breech as the gun runs up after recoil and extracts the fired case by means of a supplementary mechanism and strong spring actuated by the recoil of the gun, and on pushing a new cartridge into the gun the breech which was retained by the extractor is released and closes automatically.

The Nordenfelt mechanism consists of a breech block (fig. 35) and a wedge to secure it. A hand lever on the shaft is pulled to the rear, and this works the action cam, which pulls down the wedge; the breech block is then caused to rotate and falls back to the rear. This motion of the breech block actuates the extractor

Fig. 32 — Krupp Breech Action.

and extracts the case. While the wedge is being withdrawn the firing pin is pulled back and cocked for the next round. The mechanism is closed by reversing the hand lever; this rotates the breech block upwards and pushes home the cartridge case, and the wedge is then forced up and secures the breech block.

These small type Q.F. guns, which were introduced to cope with torpedo boats, are now, however, of little account, since experiment has proved that nothing smaller than a 12-pounder is sufficient so to injure a modern torpedo boat as to stop it. Most of these small guns are therefore in the English and in some other Services being converted into ” sub-calibre ” guns for exercise purposes. These sub-calibre guns retain their ordinary breech mechanism, but the bodies are fitted with a strong steel plug screwed on the outside in a similar manner to the breech screw of the parent gun. The sub-calibre gun is placed in the parent gun and the screwed plug engages in the threads of the breech opening.

There has been a gradual development of ideas regarding the repelling

power required by a vessel against torpedo boat attack. The 12-pounder Q.F. 40-calibre guns were replaced by the more powerful 12-pounder Q.F. 50-calibre gun; this again by the 4-in. high power gun of 50 calibres, and now 6-in. guns are being used.

One other form of sliding mechanism is of importance owing to its adoption for the 75 m/m. French long recoil field gun (see below : Field equipments). This mechanism is on the Nordenfelt eccentric screw system and is very similar to that proposed by Clay about i860; it has a breech screw (fig. 36) of large diameter mounted in the breech opening, which is eccentric to the bore. For loading, the breech block has a longitudinal opening cut through it, so that when the mechanism is in the open –

position this opening coincides I

with the chamber, while a half turn of the breech screw brings its solid part opposite the chamber and closes the_ gun. The mechanism is very simple and strong, but it is only suitable for small Q.F. guns using cartridge cases; the firing gear is similar to that applied to other types of mechanism, and the fired case is extracted by an extractor actuated by the face of the breech screw as it is opened.

With the swinging type of breech mechanism we are con- fronted with numberless pat- terns, many of undoubted merit and claiming certain advantages over others, and all showing the vast amount of ingenuity expended in so designing them that they may be as simple, and, at the same time, as effective and quick acting as possible. It is impossible to deal with all these, and there- fore only the more important systems will be described. The special feature of this type is that the breech is closed by an interrupted breech screw; the screw is either supported in a carrier ring or tray hinged near the breech opening, or on a carrier arm which is hinged near the outer circumference of the gun.

The screw may be of the cylindric interrupted, Welin and coned types ; these, or their modifications, practically embrace the various forms used. The cylindric form (fig. 37) is the simplest ; it consists of a strong screwed plug engaging with a corresponding screw

thread cut on the interior of the breech opening of the gun. The screw surface of the breech plug is. cut away in sections equally divided and alternating with the threaded portions. The screw surface of tht breech opening is similarly cut away, so that the plug can be pushed nearly home into the breech opening without

(trouble; by then revolving the breech screw through a small angle the screwed por- tions of the plug and breech opening engage. Thus if three screwed sections alternate with three plain sections the angle of revolution necessary to ensure a full engagement J of the screw surfaces will be 60°. The Welin screw (fig. 38) is an ingenious adaptation of the cylindric type; in this the surface is divided into sections each formed of two or three cylindrical screwed steps with a single plain por- tion; thus if there are three sections, each section of which has one plain division and two screwed divisions, there will be in all six screwed portions and three plain. The breech opening is correspondingly formed so that the screwed threads would fully engage with 40 of movement. There is consequently a greater amount of screwed circumferential surface with the Welin screw than with the ordinary cylindric interrupted type; the latter form has 50% screw surface while the Welin has 60%. For equal screw surface the Welin can therefore be made shorter.

For medium guns the Elswick type of coned screw (fig. 39) has found much favour, and this mechanism has been fitted to guns of all calibres from 3-inch to 6-inch, both for the British and numerous other governments. The coned breech screw is formed with the front part conical and the rear cylindrical, to facilitate its entrance into the gun, and also its exit; this form, moreover, is taken ad- vantage of by cutting the interruptions in the screwed surface alternately on the coned part and on the cylindrical part, so that there is a screwed surface all round the circumference of the breech screw. By this means the stress is taken all round the circumference, both of the breech screw and in the gun, instead of in portions alternately, as with other forms.

The Bofors breech screw is a modification. The surface is formed of a truncated ogive instead of a cylinder and cone, and the threaded portions are not alternate.

In the older types of mechanism for heavy B.L. guns the breech was opened in from three to four different operations which involved considerable loss of time. Fig. 40 shows the general type for g-2-in., 10-in. and 12-in. B.L. guns. To open the breech the cam lever C was folded up so that it engaged the pin B in connexion with the

Fig. 33. — Krupp Breech Action

ratchet lever E. This was worked and so disengaged the breech screw from the threads cut in the gun ; the cam lever was then folded down as to to start the breech screw, and the winch handle Q rotated and so

withdrew the screw and swung it clear of the breech opening. During these operations the firing lock was actuated and made safe, but the fired tube had to be extracted by hand. To close the gun these various operations must be reversed, and to open or close the gun would certainly occupy at least half a minute with trained men. To compare with this a modern 12-in. breech mechanism is shown in fig. 41. In order to open this breech it is only necessary to turn

the handwheel continuously in one direction, and to close it again the motion of the handwheel is simply reversed; either closing or opening the breech by hand occupies about 6 seconds. Supposing the breech closed, the handwheel when rotated gives motion to the link G through the worm wheel S and crank F. By this means the

required for opening the breech. Thus, with the 6-in. B.L. gun Mark IV., introduced about 1885 (fig. 42) the breech is opened in three separate operations— (a) the cam lever, which also locks the breech, is raised into the vertical position and pulled over to the left ; this disengages the screw threads; (b) the cam lever is folded down so

Fig. 34. — Hotchkiss Q.F. Breech Mechanism.

tooth B is moved from its extreme left position to the right, and so disengages the breech screw A from the threads in the gun; the rack A 2 on the breech screw then comes into gear with the pinion E and draws the breech screw out of the gun into the carrier ring C, which finally swings on the axis pin and clears the breech open- ing. While the opening is being performed the firing lock L is operated by the cam groove A 3 ; this puts the firing mechanism, either electric or percussion, to safety by withdrawing the firing needle, extracts the fired tube and leaves the primer chamber open for a fresh primer. All these operations are performed in the reverse order on closing.

With both these types of mechanism the de Bange system of obturation, with the pad only slightly coned, is used.

With smaller guns the mechanism is simpler, as less power is

Fig. 35. — Nordenfeldt Q.F. Breech Mechanism.

that the cam acting on the rear face of the gun releases the de Bange obturator, and the screw is then pulled by hand through the carrier ring out of the breech; (c) the carrier ring and breech screw are revolved together to the right, clear of the breech opening.

In a modern 6-in. gun fitted with de Bange obturator all these operations are combined and the mechanism (fig. 43) worked by a horizontal hand lever which is moved frojn left to right through an angle of about 200 °. The hand lever A moves a link B connected to a pin C on the breech screw D and disengages the screw from the gun ; a small lateral movement is then given to the ttxis pin of the carrier so as to allow the obturator pad E to swing out of its seating ; when

Fig. 36. — Eccentric Screw, Breech Mechanism.

this is quite free, the whole mechanism revolves on the axis pin and thus clears the breech opening. The firing lock Fis actuated at the same time and ejects the fired tube G. A new tube is inserted while the gun is being loaded, so that immediately the breech is closed the charge can be fired without loss of time. In the old mechanisms the breech had to be closed first, and the firing tube inserted after.

HISTORY AND CONSTRUCTION]

ORDNANCE

The breech mechanism for Q.F. guns firing metallic cartridge cases is worked on similar principles, but is somewhat simpler than that for the de Bange obturation, due principally to the fact of the firing primer being already contained in the cartridge case when this is introduced into the gun.

In the English service the later patterns of breech mechanism for medium and heavy B.L. guns have a Welin screw, with a ” steep

HAND GEAR

Fig. 37. — Interrupted Breech Screw-

SHAFT TO MOTOR

Cylindrical.

cone ” de Bange obturator, supported on a carrier arm. This arrangement allows the mechanism (fig. 44) to swing clear of the breech opening immediately the threads of the breech screw are

disengaged from those in the breech in a similar manner to the Q.F. guns fitted with a cone screw. The mechanism is actuated by the handwheel L which rotates the hinge pin; this in turn, through gearing, moves a crank arm D connected, by a link B, to the pin on the breech screw. By continuously moving the handwheel the link B is drawn towards the hinge pin until the breech screw threads are disengaged ; the catch C then drops into a pocket on the breech screw and fixes it to the carrier arm. The whole of the mechanism then rotates around the hinge pin and leaves the breech open ready for loading. As the breech screw threads are being disengaged the electric or percussion lock W is operated by a cam groove in a similar manner to that already described. In the latest modification of this mechanism a roller at the end of the crank arm D works a long lever connected to the breech screw by two pins. This forms what is termed a ” pure-couple ” mechanism and it is claimed that greater ease of working is ensured by its use. While the loading is going on a new firing tube is placed in the vent, so that on closing the gun, by turning the handwheel in the opposite direction, the gun is ready for firing. For 9-2-in. guns and those of smaller calibre the handwheel is replaced by a hand lever pivoted on the carrier (fig. 45). By giving this lever a single motion from left to right the mechanism is opened.

For 6-in. and 4-in. guns a shot support is attached to the breech face which is operated by the breech mechanism so that when the breech is open the shot

support is in position for loading, and it falls out of the way when the breech is being closed.

In the larger types of all breech mechanisms ball bearings are employed in various parts, such as the hinge pin bearings, &c, to reduce friction and in most of the modern heavy guns on board ship the breech mechanism is arranged to be worked by a hydraulic cylinder placed on the breech face, or by a small hydraulic engine or electric motor placed in some convenient position on the mounting. The hand gear, however, is always retained for emergency and a clutch is provided so that it can be put into action at a moment’s notice.

The Welin screw is largely used in the United States, but in heavy guns the ordinary cone (not ” steep cone “) de Bange obturator is employed. The screw is mounted either in a carrier ring or on a carrier tray. In France the ordinary type of interrupted screw is adopted and this rests in a carrier tray. The operations of opening and closing are very similar to those already described.

All the recent patterns of mechanism have an extractor fitted to extract the empty cartridge case with Q.F. guns or the fired tube with B.L. guns. In Q.F. field guns it generally takes the form of a lever working on an axis pin. The longer arm of the lever is formed into a jaw which rests on the inner face of the breech opening beneath the rim of the cartridge case, and the short arm is so arranged that when the breech is opened the carrier, in swinging mechanisms, or the breech block itself, in sliding systems, suddenly comes in contact with it; the long arm is thus jerked backwards and extracts the case. In B.L. mechanisms the tube extractor is

Fig. 38. — Welin Breech Screw.

arranged on the same principle but in this case usually forms part of the box slide, i.e. that portion of the mechanism attached by interrupted collars to the rear end of the vent axial, in which the firing lock slides as it is actuated by the opening or closing of the breech mechanism. When the breech is being opened the firing pin of the lock is drawn back to safety and the lock is moved aside from over the tube ; a tripper then actuates the extractor and ejects the fired tube. The extractor and tripper are so contrived that when a new tube is pushed home the extractor is also pushed back into the closed position, or, if the tube is somewhat stiff to insert, the action of closing the mechanism moves the lock over the primer and forces it home.

The firing lock used in B.L. guns is an important part of the

Fig. 39. — Elswick Coned Screw.

mechanism. They are all designed on the same principle, with a view to safety and rapidity, and may be regarded as a miniature sliding breech mechanism. In the older types the lock or its sub- stitute was manipulated by hand, and with electric firing the wires from the tubes were joined up to the loose ends of the firing circuit;

Fig. 41. — 12-in. Gun, Breech Mechanism.

safety depended therefore on everything being in order and all operations correctly performed. The gun could, however, be fired before the breech was properly secured and a serious accident caused; to prevent this all the movements of modern locks are

arranged to be automatic, and wireless electric tubes are used so that immediately the breech mechanism commences to open, the lock itself is moved in the box slide so as to uncover the vent opening. During the first part of this movement a foot on the

striker rides up an incline I (fig. 45) on the box slide and thus pushes back the striker from contact with the tube. The ex- tractor described above is actuated at the same time. Most locks

Fig. 40. — Breech Mechanisms, Heavy Guns.

consist of a steel frame with a socket for containing the striker and main spring. They are contrived so as to be capable of firing both electric and percussion tubes, but others are arranged for firing only electric, separate locks being employed for use with percussion tubes. The construction of both is very similar, but with the percussion lock, or the combined lock, a trigger is provided

Fig. 42. — Breech Mechanism, 6-in. B.L. Mark IV.

which drops into a notch in the striker when this is pulled back by the lugs E E (fig. 45) on the outer attachment of the striker. On the trigger being pulled by a lanyard the striker is released and fires the tube.

For Q.F. guns with interrupted or coned breech screws the striker is contained in the breech screw, but, in order to provide for safety, a small lever cam or other contrivance is fitted which, when the mechanism commences to open, is operated by the hand lever and withdraws the striker from contact with the primer inserted in the cartridge case.

The striker consists of a steel needle, with the stem insulated by ebonite or some similar material, contained in an outer steel sheath. The sheath is formed with a foot or lug which is acted upon by the safety gear; a collar is also provided for taking the thrust of the main

spring.

Another form of lock now much in favour, especially for field-gun mechanisms, is that known as a trip lock. It is mainly used for percussion firing but can also be combined for use with electric tubes. In this pattern the striker is withdrawn, cocked and released by the con- tinuous pull of a hand lever attached to the mounting or by a lanyard attached to the lock. Should a miss-fire occur the striker may be actuated as often as necessary by releasing the hand lever or lanyard and again giving a continuous pull (fig. 46).

In all modern heavy guns, especially when firing to windward, there is a tendency, when the breech is opened rapidly after firing, for a sheet of flame to issue from the open breech. It was practically un- known with the old black powders, but is of frequent occurrence with all smokeless propellants. If the gun is loaded immediately after the breech is opened the fresh charge may be ignited and an accident caused. Several serious accidents have already been traced to this cause, notably one on the United States battleship ” Missouri ” on 13th April 1904, when 33 lives were lost. The flame is due to the large amount of highly heated carbonic oxide remaining in the gun from the explosion of the charge; this mixing with the oxygen of the air when the breech is opened burns rapidly as a sheet of flame in rear of the gun, and should wind be blowing down the gun the action is more intense. By looking into the gun from the muzzle, before the breech is opened, the gas can often be seen burning with a pale-blue flame as it slowly mixes with air and a

curious singing noise is heard at the same time. It is now usual to

fit a special apparatus on the gun, so that directly the breech is

partly opened a blast of compressed air is allowed to enter the

rear end of the chamber and thus sweep the whole of the

residual gas out at the muzzle.

The purpose of the obturator is to render the breech end of the gun gas-tight, and to prevent any escape of gas past the breech mechanism. In the first obturators Armstrong B.L. gun this object was attained by fitting to the breech block a copper ring coned on the exterior; the coned surface was forcibly pressed by screwing up the breech screw against a corresponding copper ring fitted at the breech opening of the gun chamber. It is only possible to use this method when the copper surfaces can be jammed together by a power- ful

screw.

Except the above, all obturators in use are arranged to act automatically, i.e. the pressure set up in the gun when it is fired expands the arrangement and seals the opening; immediately the projectile leaves the bore the pressure is relieved and the obturator, by its elasticity, regains its original shape, so that the breech mechan- ism can be opened or closed with ease. In the French naval service B.L. guns have been in use since 1864, an d the system of obturation was arranged on the same expansion principle as the leather packing ring of the hydraulic press. A steel ring A (fig. 47) of cupped form was fastened by a screwed plug to a thick steel plate, carried on the face of the breech screw, so that it could rotate when the breech screw was rotated in opening or clos- ing the gun. The outer lip of the cup fitted against a slightly coned seating formed in the breech end of the gun chamber. When the gun was fired, the gas pressure expanded the cup ring and forced it into close bearing against the seating in the gun and the thick steel plate on the breech screw, thus preventing any escape of gas. Very similar to this was the Elswick cup obturator (fig. 48) intro- duced by the Elswick Ordnance Company in 1 881; its rear surface was flat and it was held by a central bolt against the front of the breech screw which was slightly rounded. The cup yielded to the gas pressure until it was supported by the breech screw; this action expanded the lip against a copper seating, let into the gun, which could be renewed when necessary. Many of both types are still in use and act perfectly efficiently if carefully treated. The use of modern smokeless powder renders them and similar devices, such as the Broad well ring (fig. 49), &c, peculiarly liable to damage, as a slight abrasion of the lip of the cup or ring, or of its seating, allows gas to escape, and so accentuates the defect with each round fired. Unless, therefore, the fault be immediately remedied considerable damage may be caused to the gun. The Broad well gas ring is still in use in the French naval service, where

Back flash.

Fig. 43. — Breech Mechanism, Modern 6-in. Gun.

it is made of copper (fig. 50), and also of steel in a modified form (Piorkowski) in the German service (fig. 5 1) ; in the last-named service, owing to the defect already named, all the latest guns, both light and heavy, use metal cartridge cases. In the French navy, as in

most other services, cartridge cases are used for the smaller and medium guns only.

One of the most efficient obturators not liable to damage is the plastic device introduced by Colonel de Bange of the French service and adopted by the French army and also by the British and other governments. It consists of a pad (fig. 52) made up of a strong annular-shaped canvas bag A, containing a mixture of asbestos fibre and mutton suet; the bag with its contents is placed in a properly formed die and subjected to hydraulic pressure by which it becomes hard and firm. The pad so made is then placed on the front of the breech screw B, and it is protected on its faces by disks C, C, of metallic tin or copper having steel wedge rings on the outer edges ; the circumference of the complete pad and disks is

WN9E Pin

CARRiffl

LOCKW

Fig. 44. — English modern Breech Mechanism, for heavy and medium guns.

generally only slightly coned and fits into a corresponding seating formed at the breech end of the chamber, the canvas of the circumference of the pad being in immediate contact with the seat. In the English service the steep cone pattern (fig. 53) of de Bange obturator is used with mechanisms having the Welin screw. In front of the pad is placed a strong steel disk formed with a spindle, and called a mushroom head D, the spindle passing through the hole in the pad and through the breech screw, being secured in rear by a nut. The firing vent is generally drilled through the mushroom head and spindle and the part is then termed a ” vent axial.” On the gun being fired the gas exerts a great pressure on the mushroom head, which compresses the pad and squeezes it out on the circumference into close contact with the seating, thus forming a perfect gas seal. It is found that this apparently delicate arrangement will stand considerable ill-usage and act perfectly for an indefinite time, and, as it is easily replaced, it is regarded as one of the best and most reliable forms of obturator. In some countries the Freyre obturator is in use; this has a somewhat similar axial head to the de Bange, but the

asbestos pad is replaced by a single-

steel wedge ring into which the axial head fits. On firing the gun the head is forced into the wedge ring and expands it against the seating in the gun.

One other means of obturation has to be considered, viz. metallic cartridge cases. These are made of a kind of brass; aluminium cases have been experimented with, but have not proved satisfactory. The case (fig. 54) acts on the same principle as the cup obturation and is extremely efficient for the purpose; more- over, they have certain advantages conducive to rapid firing when used for small guns. The idea has developed from the use of such cartridges in small arms, and larger cartridges of the same type were introduced for 3-pounder and 6-pounder guns by Hotchkiss and Nordenfelt about the year 1880 for the purpose of rapid firing against torpedo boats. Then in 1886 the Elswick Company produced a 36-pounder (soon converted to a 45-pounder) of 4-7-in. calibre with the powder charge contained in metallic cases, and about 1888 a 6-in. 100- pounder gun using similar cartridges. A special advantage of the cartridge case is that it contains the firing primer by which the charge is ignited and con- sequently renders the firing gear of the gun more simple; on the other hand, should a miss-fire occur the gun must be opened to replace the primer. This is a proceeding liable to produce an accident, unless a long enough time is allowed to elapse before attempting to open the breech ; guns having de Bange obturators and firing tubes inserted after the breech is closed are therefore safer in this respect.

Some means of extracting the case after firing must be fitted to the gun; this is simple enough with small guns, but with those of heavy natures the extractor becomes a somewhat pon- derous piece of gear.

Metallic cases of a short pattern have been tried for large calibre guns; although their action is quite efficient, they are difficult to handle, and if a case must be used it is preferable to employ a fairly long one. It was for this reason that in England up to 1898 it was considered that for guns above 6-in. calibre the de Bange obturation was the most advantageous. Since then the de Bange obturator has been employed in guns of 4-in. calibre and above, the cart- ridge case being retained only for 3-in. and smaller guns. Krupp, however, uses cartridge cases with all guns even up to 12-in. calibre, but this is undoubtedly due to the difficulties, which have already been noticed, attending the use of smokeless powder with the ordinary forms of obturation applicable to the wedge breech system. In the most modern Krupp 12-in. guns the charge is formed in two pieces; the piece forming the front portion of

the charge is contained in a consumable envelope, while the rear portion is contained in a brass cartridge case, which forms the obturator, about 48 in. long.

It will be seen that such large and heavy cases add to the difficulties which occur in handling or stowing the am- munition of large calibre guns, and although the use of cartridge cases with small guns adds to their rapidity of firing this is not the case with heavy guns. It seems, therefore, that the balance of advantages is certainly in favour of the de Bange system, for all guns except those of small calibre. With ordinary field guns cart- ridge cases are now considered obligatory owing to their con- venience in loading.

While the ordinary types of plastic obturators last for an inde- finite time a cartridge case can be used for a limited number of rounds only, depending on the calibre of the gun; with field guns from ten to twenty rounds or even more may be fired from one case if care is taken to reform it after each round; with large guns they_ will not, of course, fire so many. Cartridge cases are an expensive addition to the ammunition, so that there should be no doubt about the advantages they offer before they are definitely adopted for heavy guns.

The rapidity with which modern guns can be fired and the ˆiioTiOus energy they develop is especially striking when one

Range

and

power.

6MECH SCREW LDCR ”

UVta BREECH HCCKANISM. J

CATCH AETMNiHC LEVEH ittECH MECHANISM

considers the same facts in connexion with the early guns. Fave states in his Histoire et tactique des trois armes (p. 23) that during the invasion of Italy in 1494 by Charles VIII. the guns were so unwieldy

and the firing so slow that the damage caused by one shot could be repaired before the next could be fired. The range, too, about 100 yds. for battering purposes, now seems absurdly short; even at Waterloo 1200 yds. was all that separated the antagonists at the commencement of the battle, but they approached to within 200 or 300 yds. without suffering serious loss from either musketry or gun fire. Nelson fought his ships side by side with the enemy's; and fifty years after Nelson's day a range of 1000 yds. at sea was looked upon as an extreme distance at which to engage an enemy. Contrast this with the lange of 12,000 yds. at which the opposing Russian and Japanese fleets more than once commenced a naval battle in 1904, while the critical part of the action took place at a distance of 7000 yds.

These long ranges naturally intensified the requirements of the British and other navies, and, so that they shall not be outclassed and beaten by an enemy's long- range fire, guns of continu- ally increasing power are demanded. In 1900 a 12-in. gun of 40 calibres was con- sidered all that was necessary. After the Russo-Japanese War the demand rose first for a45-calibre gun and then for a 50-calibre gun, and muzzle velocities from about 2400 f .s. to about 3000 f.s. In 1910 greater shell power was de- manded, to meet which new type guns of i3-5-in. and 14-in.calibre were being made. In the days of M.L. heavy guns one of the most difficult problems was that of loading. The weight of the shell and powder was such that some mechanical power had to be employed for moving and ramming them home, and as hydraulic gear had by that date been introduced it was generally used for all loading

operations. To load, the guns had to be run back until their muzzles were within the turret, or, in the case of the 16-in. 80-ton guns of H.M.S. "Inflexible," until they were just outside the turret. The guns were then depressed to a fixed angle so as to bring the loading gear, which was protected below the gun deck, in line with the bore; the charge was first rammed home and then the projectile. With this arrangement, and in order to keep the turret of manageable dimensions, the guns had to be made short. Thus the 12-5-01. 38-ton M.L. gun had a length of bore of but 16 calibres, and the largest English service gun of 16-in. diameter had a bore of 18 calibres in length; while the largest of the type weighing 100 tons, built by Sir W. G. Arm- strong & Co., for the Italian navy, had a bore of 17-72 in. and a length of 20 calibres. The rate of fire was fairly rapid — two rounds could be fired from one turret with the i2-5-in. guns in about three minutes, while it took about four minutes to fire the same number from the 80-ton and 100-ton gun turrets.

The possibility of double loading M.L. guns was responsible for the

bursting on the 2nd January 1879 of a 38-ton gun in a turret on H.M.S. ” Thunderer “; and it was partly due to this

accident that B.L. guns were subsequently more favourably regarded in England, as it was argued that the double loading of a B.L. gun was an impossibility.

With the B.L. system guns gradually grew to be about 30 calibres in length of bore, and they were not made longer because this was considered a disadvantage, not to be compensated for by the small additional velocity which the old black and brown prismatic powders were capable of imparting with guns of greater length. Increase in the striking energy of the projectile was consequently sought by increasing the weight of the pro- jectile, and, to carry this out with advantage, a gun of larger calibre had to be adopted. Thus the 12-in. B.L. gun of about 25 calibres in length gave place to the 13-5-01. gun of 30 calibres and weighing 67 tons, and to the 16 25-in. also of 30 calibres and weighing in tons. The 10,000- or 12,000-ton battleships

CATCH K1NMNG BREECH SCREW

6A0C&WT. BREECH WHEW IEXCR. CANUCK.

FEkCUSSION LOCK.

Fig. 45. — Breech Mechanism for 6-inch B.L. Gun

carrying these enormous pieces were, judged by our present-day standard, far too small to carry such a heavy armament with their ponderous armoured machinery, which restricted the coal supply and rendered other advantages impossible; even the 24,000-ton battleships are none too large to carry the number of heavy guns now required to form the main armament.

The weight and size of the old brown prismatic charges had also reached huge dimensions; thus, while with heavy M.L. guns the weight of the full charge was about one-fourth that of the projectile, it had with heavy B.L. guns become one-half of the weight of the shell or even a greater proportion. The intro- duction of smokeless powder about 1890, having more than three times the amount of energy for the same weight of the older powders, allowed longer guns to be used, which fired a much smaller weight of charge but gave higher velocities; the muzzle or striking energy demanded for piercing hard-faced armour could consequently be obtained from guns of more moderate calibre. The 13-5-ˆ1. and i6-25-in. guns were therefore gradually discarded and new ships were armed with 1 2-in. guns of

greater power. As the ballistic requirements are increased the weight of the charge becomes proportionately greater; thus for the

present high velocity guns it has reached a ratio of about 0-4 of the weight of the projectile.

VENT AXIAL

BOX SLIDE

PERCUSSION FIRING LEVER

Fig. 46.

The progress of artillery and the improvements made in armour have been reciprocal; as the protective value of iron and

the case at the present time as regards both projectiles and armour. As a matter of fact, armour, at the present-day

fighting ranges, is rather ahead of artillery — hence the demand for greater power; but even with this the probability of per- foration is small, and is usually only obtained when the projectile strikes normally to the surface of the plate; the chance of this happening in action is somewhat re- mote. During the Russo-Japanese War no instance of perforation of the thick belt or turret armour is known; the chief cause of the Russian losses was the bursting of 12-in. and 6-in.shells inside the un- armoured portions of their ships; it is stated that no ship survived after being struck by ten 12-in. projectiles.

Some authorities have lately sought to increase the

Fig. 47. — French Obturator.

Fig. 48. — Elswick Cup.

subsequently of steel plates has increased, so the penetrative force or quality of the projectile has advanced. Often, after a

Fig. 50. Figs. 49-51. — Broadwell Ring.

Fig. 51.

period of apparent inactivity, fresh ideas or new metallurgical processes have enabled further progress to be made; this is

ELECTRIC FIRING WIRE muzzle energy—

without adding weight or length to the gun — by in- creasing the weight of the projectile. This can be done to a limited extent with beneficial results, but it is impossible to carry the idea very far, as the projectile becomes very long and difficulties may be encountered with the rifling; or, if these are avoided, the thickness of the walls of the shell is increased so much that

Fig. 52. — De Bange Obturator.

Fig. 53. — Steep Cone de Bange Obturator.

the heavier projectiles is in reality less powerful owing to its in- ternal bursting charge being comparatively small. Again, many foreign gunmakers claim that their guns are, in comparison with English guns of the same power, of less weight. This is true in a limited sense, but such guns have nothing like the same factor of resistance as English guns, or, in other words, the English

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guns are much stronger. This is an obvious advantage, but an equally solid one is the fact that owing to the greater weight of

as near the breech end as possible; by this means the radius of the gun house is reduced to the smallest dimension and, in

Fig. 54. — Metallic Cartridge Case.

the mounting can be made of a lighter pattern. Besides, the weight of the gun is so disposed as to bring its centre of gravity

the home-made weapon the recoil energy is less and consequently 1 consequence, there is a great saving of weight of armour. The

extra weight of the gun is therefore more than compensated for. m\ \vuvwvMuui.,>, , Until late into the 16th century

m\\\\\NW ^^ the calibres of the guns were not

regulated with a view to the inter- changeability of shot. In the following century ordnance was divided into classes, but even then, owing no doubt to manufacturing difficulties, there was no fixed size for the bore. The Tables II.-VII. give some idea of the size and weight of these pieces.

Table II. is taken from Cleveland's Notes, but corrected from " An Old Table of Ordnance " (Proc. R.A.I. , vol. xxviii. p. 365) ; the last column gives the range in scores of paces at point- blank, a term used in those days to denote the first part of the trajectory which was supposed to be a straight line. Later the point-blank range was that distance from the gun on its carriage to the first graze of the shot on the horizontal plane when the axis of the gun was placed horizontal ; this depended on the height of the gun above the ground plane, but it was the only method of determining the relative power of these early guns.

In power, smooth-bore guns in Europe did not differ very much from each other, and it may be taken for granted that the progress made since has been much the same in all.

D'Antoni, in his Treatise of Fire Arms (translated by Captain Thomson, R.A.), gives particulars of Italian guns of about 1746, which are shown in Table III.

It will be seen that the velocities given in Table III. are not inferior to those obtained from guns actually in use in i860 (see Table IV.). They were considerably higher than those for elongated rifled projectiles (Table V.) for many years after their introduction; the last-named, however, during flight only lost their velocity slowly, while the spherical shot lost their velocity so rapidly that at 2000 yds. range only about one- third of the initial velocity was retained. Table IV. — British Smooth Bore Guns, i860.

Table II. — Names and Weights of English Cannon, 1574.

Names.

Weight.

Diameter of Bore.

Diameter of Shot.

Weight of Shot.

Weight of

Charge. Serpentine.

Scores of

Paces at

point-blank.

tb

in.

in.

lb

tb

Robinet

200

Ii

I

1

1

I*

Falconet

500

2

if

2

14

Falcon

800

2i

2|

2|

24

16

Minion .

IIOO

3i

3

44

44

17

Sacre

1500

34

3i

5

5

18

Demi-Culverin

2500

4l

4

9

9

20

Culverin

4000

si

5

18

18

25

Demi-Cannon .

6000

6J

61

30

28

28

Cannon .

7000

■7*

It

74

60

40

20

Eliza-Cannon

8000

8

71

63

42

20

Basiliske

9000

81

«J

60

60

21

Table III.

Gun.

Weight of Charge.

Weight of Shot.

Muzzle Velocity.

27-pr. 66 cwt. ....

i34-pr. 37-5 cwt

6| pr. 20 cwt. .... 3f pr. 11 cwt

lb.

13-125 6-562 4-922 2-469

lb.

27

13-5 6-75 3-375

f.s.

1517 1618 1696 1720

Official Designation of Gun.

Calibre.

Weight of

Weight of

Weight of

Muzzle

1

Muzzle

Gun.

Charge.

Projectile.

Velocity.

Energy.

In.

Tons.

lb.

lb.

Ft. Sees.

Ft. Tons.

rio in. 87 cwt.

10

4-35

12

88-31

1292

1022

a

68 pr. 95 „

8-12

4-75

16

66-25

1579

1 145

8 in. 65 „

8-05

3-22

10

49-875

1464

742

3

32 pr. 58 „

6-375

2-9

10

31-375

1690

621

24 .. 50 „

5-823

2-5

8

23-5

1720

482

L18 ,,38 „

5-292

19

6

17-69

1690

350

a

12 „ 18 „

4-623

0-9

4

12-66

1769

275

M

9 .- 13 ..

4-20

0-65

2-5

9-36

1614

169

n

. 6 „ 6 „ . .

3-668

o-3

i-5

6-23

1484

95

Table V. — British B.L. Ordnance, i860. Armstrong System.

Official Designation of Gun.

Calibre.

Weight of Gun.

Weight of Charge.

Weight of Projectile.

Muzzle Velocity.

Muzzle Energy.

100 pr. ...

4° .. ...

20 „ ‘.

12 „ ...

9 6

In.

7

4-75

3-75 3.0 3-0 2-5

Tons

4-1

3-6

1-75

1-6

o-8

0-65

0-425

0-3

0-175

- *

lb.

12

5

2-5

i-5

1-125

o-75

R).

103-75

41-5

21-22

11-56 9-0 6-0

Ft. Sees.

1 166

(1 164

I 1 134

J 1114

I 997

1 184

1141

946

Ft. Tons.

978

39°

37°

162 146 112 81 37

At a later date the velocities of these guns were altered.

‘ Two patterns were in existence.

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Table VI. — British Rifled Ordnance, i8po.

[HISTORY AND CONSTRUCTION

Official Designation of Gun.

Calibre.

Weight of Gun.

Weight of Charge.

Weight of Projectile.

Muzzle Velocity.

Muzzle Energy.

Perforation

of Wrought

Iron.

Rate of

Firing

Rounds.

Propeliant.

M.L. Guns —

In.

Tons.

lb.

ft.

Ft. Sees.

Ft. Tons.

In.

Per Minute.

17-72 in.

17-72

100

450

2000

1548

33,233

24-5

1

f

1

Prism Black

16

16

80

450

1700

1540

29,806

25-0

Prism Brown

12-5 „

12-5

38

210

818

1575

14,140

19-2

1 3

Prism Black

12

12

35

140

7H

1390

9.563

15-2

s

P 2

II M

11

25

85

548

1360

6,51°

13-5

1

Pebble

1° ,,

10

18

70

410

1379

5.406

12-5

•

n

9

9

12

5°

256

1440

3,695

II-O

2. 2

»»

8

8

9

35

179

1390

2.391

9-2

1

11

7

7

1 7

3°

114-6

1525

1,854

9-2

1

64-pr. 1

6-3

3-2

10

66-9

1390

897

6-4

1

R.L.G.*

B.L. Guns —

16-25 in.

16-25

no-5

960

1800

2087

54,390

38

\

S.B.C.

13-5 ,.

13-5

67

630

1250

2016

35,230

33

4

jj

12

12

45

295

7H

1914

18,137

24-5

1

PrismBrown

10

10

29

252

500

2100

15,290

25-8

1

) >

9 2 „

9-2

22

166

380

2036

10,915

22-3

8

8

14

118

210

2200

7,046

20-0

2

6 „

6

5

48

100

i960

2,435

13-5

3

E.X.E.

5

5

2

16

5°

1800

1,123

9-2

3

S.P.

4

4

i-3

12

25

1900

626

7-8

3

)I

Q.F. Guns —

4-7 m.

4-72

2-1

12

45

1786

995

8-8

8

»»

6-pr.

2-24

0-4

1-94

6

1837

141-2

5-3

20

Q.F.

3..

1-85

0-25

i-5

3-3

1873

80-2

4-0

20

) >

1 And many smaller guns.

Table VII

— British B.L. Ordnance

‘, 1900.

Official Designation of Gun.

Calibre.

Weight of Gun.

Weight of Charge.

Weight of Projectile.

Muzzle Velocity.

Muzzle Energy.

Perforation

of Wrought

Iron.

Rate of

Firing

Rounds.

Propeliant.

In.

Tons.

lb.

lb.

Ft. Sees.

Ft. Tons.

In.

Per Minute.

16-25 in.

16-25

uo-5

960

1800

2087

54,390

38

1 3

S.B.C.

13-5 “i.

13-5

,67

187

1250

2016

35,230

33

Cordite

12 in. Mark VIII.

12

46

167-5

850

2367

33,000

36-9

1

10 in.

10

29

76

500

2040

H,39l

24-8

it

9-2 in. Mark X.

9-2

28

103

380

2601

17,826

32-3

2i

8 in.

8

14

32-625

210

2200

7,046

20-0

6 in. Mark VII.

6

7

20

100

2493

4,335

19-25

7

5 in.

5

2

4-45

50

1750

1 ,062

8-8

3

4 in.

4

i-3

3. 06

25

1900

626

7-8

3

Q.F. Guns—

6 in.

6

7

13-25

100

2200

3,356

16-0

6

4-7 „

4-72

2-1

5-43

45

2188

1,494

12-0

8

4 „

4

1-3

3-75

25

2456

1,046

n-6

9

12-pr.

3

o-6

1-94

12-5

2210

423

8-o

15

6„ –

2-24

0-4

0-483

6

1818

137

4-8

20

3„

i-8i

0-25

0-396

3-3

1873

80-2

4-0

20

As regards rapidity of aimed fire — and no shooting is worth consideration which is not aimed — much depends on the quickness with

which the gun can be opened, loaded and closed again ready for firing, but quite as much depends on the ease and convenience of moving to any required direction the gun with its mounting; also on the system of recoil adopted and the method of sighting. Two identically similar guns may consequently give entirely different rates of firing, unless mounted and sighted on the same system — without taking into consideration the personal element of the gun detachment or crew. The rates of firing shown in many tables are therefore not always a trustworthy criterion of the guns'

capabilities. The advantage of, the Q.F. system {i.e. a gun firing charges contained in metallic cases), when suitably mounted, over the old B.L. guns was exhibited in a very marked manner in 1887, when the first 4'7-in. Q.F. gun fired ten rounds in 47-5 seconds and subsequently fifteen rounds in one minute. The 5-in. B.L. gun when fired as rapidly as possible only fired ten rounds in 6 minutes 16 seconds; so that the Q.F. gun fired its tenth round before the then service gun fired its second shot. Recent improvements made in the mechanism of the B.L. gun. enable it to compete with the Q.F. system.

The tabulated armour-piercing value of a gun is based on the

Table VIII. — British Ordnance, 1910.

Official Designation of Gun.

Calibre.

Weight of Gun.

Weight of Charge.

Weight of Projectile.

Muzzle Velocity.

Muzzle Energy.

Perforation

of Wrought

Iron.

Rate of

Firing

Rounds.

Propeliant.

12 in. Mark XI. 12 in. Mark X 10 in.

9-2 Mark X.

7-5 in.

6 in. Mark VI 1.

4 in.

In.

12

12 10

9-2

7-5 6

4

Tons.

66 58 31 28 16 7.4

i-3

ft.

309 148 103

69-5 20

3-75

lb.

850 850 500 380 200 100

25

Ft. Sees.

2959 2900 2800 2640 2800

2493 2456

Ft. Tons. 5i,58o

47,697 27,205 18,400 10,883 4,308 1,046

In. •

51-5 51-0

39-5 33-3 290 19-6

n-6

Per Minute.

2 2 2 3 4 6

9

M.D.Cordite

I» »» l»

ft

Q.F. guns as in 1900.

results given by various formulas. These often vary considerably, so in order that a direct comparison in the tables may be made, this value is obtained for wrought iron plate only, using Tresidder's formula, which is one of the most trustworthy. The equivalent thickness of Krupp cemented steel armour can be obtained immediately by dividing the tabulated value for wrought iron by a " factor of effect " of 2-3 to 2-4 for uncapped armour piercing

shot, and about 2-0 for capped armour piercing shell. These factors are dependent on the nature of the projectile and must therefore be taken as approximate.

Tables VIII.-XXII. are obtained from trustworthy sources, but as great secrecy is now observed in many countries there may be a few inaccuracies; in some cases the whole of the data are not available.

Table IX

— French Naval Ordnance, 1910.

Official Designation of Gun.

Calibre.

Weight of Gun.

Weight of Charge.

Weight of Projectile.

Muzzle Velocity.

Muzzle Energy.

Perforation

of Wrought

Iron.

Rate of

firing Rounds.

Propellant.

In.

Tons.

ft.

lb.

Ft.-Secs.

Ft.-Tons.

In.

Per Minute.

305 mm.

12-01

750

2870

42,890

46-0

1-5

Smokeless

274

io-8

34-5

562

2650

27,186

38-8

i-5

B. Powder

240

9-45

23-6

375

2870

21,445

37-0

2

,,

194

7-64

12-5

190

2870

10,890

29-0

2

1647 „

6-46

8-5

115

3000

7,185

26-3

4

Q.F. Guns —

164-7 mm –

6-46

8-1

“5

2870

. 6,568

24-5

5

,,

140

5-44

4-13

66

2625

3-153

20-0

6

,,

100 „

3-94

31

2395

1,234

12-4

6

,,

75

2-9

14

3116

943

H-5

12

65 „

2-57

8-8

2871

503

io-8

12

47

1-85

3-3

2871

188

7-9

15

,»

Table X. — German Naval Ordnance.

Official Designation ot Gun.

Calibre.

Weight of Gun.

Weight of Charge.

Weight of Projectile.

Muzzle Velocity.

Muzzle Energy.

Perforation

of Wrought

Iron.

Rate of

firing Rounds.

Propellant.

Q.F. Guns —

In.

Tons.

tb.

ft.

Ft.-Secs.

Ft.-Tons.

In.

Per Minute.

(Nitro-

28 cm.

II-02

33-3

529

2854

29,878

40-2

1

■j Glycerine (powder

24

9-45

25-4

88-2

309

2740

16,086

31-0

ih

,,

21 „

8-2

15-75

49-5

242

2526

10,707

26-1

3

,

17

6-7

7-8

43-1

132

2887

7,629

26-1

5

15

5-9

473

19-83

88

2461

3,696

18-0

. 7

,

io-5 „

4-13

1-645 ,

7-27

38-35

2297

1,403

12-75

8

»

8-8 ,,

3-42

1-34

4-85

23-6

2789

1,273

14-7

10

»

5

1-97

0-236

0-66

3-86

2165

125

5-4

,

Note. — It is stated that the new German 28 cm. 50 calibre naval gun weighing 43-9 tons fires, with a charge of 291 lb, a projectile of 760 lb with a velocity of 2871 f.s.

Table XI

— Italian Naval Otdnance, 19 to.

Official Designation of Gun.

Calibre.

Weight of Gun.

Weight of Charge.

Weight of Projectile.

Muzzle Velocity.

Muzzle Energy.

Perforation

of Wrought

Iron.

Rate of

firing Rounds.

Propellant.

In.

Tons.

lb.

lb.

Ft.-Secs.

Ft.-Tons.

In.

Per Minute.

343 mm.

13-5

67-9

187-2

1215

2067

36,050

34-0

(Strip (Ballistite

305

12

51

231-5

850

2580

39,220

42-0

»f

254

10

30

85

450

2461

19,000

31-0

1

203

8

19

57

250

2526

1 1 ,060

27-0

,

152

6

5-7

17-6

100

2296

3,655

17-0

»

120 „

4-72

2-1

5-5

45

2116

1,397

n-4

76 „

3-0

o-6

2-17

12-5

2296

457

8-5

,

57

2-24

0-4

1-05

6

2198

201

6-3

t

47

l-8l

0-25

0-67

3-3

2330

124

5-8

>

Table XII

— Russian Naval Ordno

nee, 1910.

Official Designation of Gun.

Calibre.

Weight of Gun.

Weight of Charge.

Weight of Projectile.

Muzzle Velocity.

Muzzle Energy.

Perforation

of Wrought

Iron.

Rate of

firing Rounds.

Propellant.

In.

Tons.

ft. .

lb.

Ft.-Secs.

Ft.-Tons.

In.

Per Minute.

12 in.

12

59

720

2600

33,730

39-0

(Nitro- (Cellulose

10 „

10

32

488

2550

22,003

34-o

8 „

8

14

87 ‘

188

2950

n,345

29-5

6 „

6

6-28

506

91-5

2118.

2,849

14-4

9 pr.

4-2

0-87

4-88

27-75

1226

289

4-2

»»

4 -,

3-43

o-45

3-1

15-0

1451

219

4-6

,,

Q.F. Guns —

6 in.

6

575

28

9i-5

2502

3,970

18-5

,,

4-7 -,

4-72

2-95

15-4

45-o

2502

1,953

14-6

,,

2-9 „

0-87

3-53

io-8

2700

546

10-3

,,

i-8i „

i-8i

0-323

3-3

2003

91-8

4-6

,,

212

Table XIII.-

-Austrian Naval Ordnance, 1910.

Official Designation of Gun.

Calibre.

Weight of Gun.

Weight of Charge.

Weight of Projectile.

Muzzle Velocity.

Muzzle Energy.

Perforation

of Wrought

Iron.

Rate of

firing Rounds.

Propellant.

In.

Tons.

lb.

lb.

Ft.-Secs.

Ft.-Tons,

In.

Per Minute.

30-5 cm.

I2-OI

990

2625

47,300

46-0

24

9-45

21-5

120-6

474

2595

22,121

34-5

19

7-5

n-6

56

198

2700

10,025

27-3

3

15

5-91

5-2

28-8

1 12-5

2608

5,308

22-0

10

12

4-72

2-0

9-7

52-4

2264

3,554

13-7

10

7

2-75

3-3

15-2

2378

10-4

4-7 „

1-85

0-253

0-79

3-3

2329

5-8

3-7 »

1-46

1-0

2346

Table XIV.-

-Austrian Coast Artillery, 1910.

Official Designation of Gun.

Calibre.

Weight of Gun.

Weight of Charge.

Weight of Projectile.

Muzzle Velocity.

Muzzle Energy.

Perforation

of Wrought

Iron.

Rate of

firing

Rounds.

Propellant.

30-5 cm.

28

15

In.

12-01 1 1 -024 5906

Tons.

38′

4-28

lb.

198-4 220

18-28

lb.

981 760 100

Ft.-Secs.

2297 1722 2297

Ft.-Tons.

35,86o

15,615

3,659

In.

37-8 22-5 17-2

Per Minute.

4

Tubular Prism

Table XV. — -United States Naval Guns, 1910.

Rate of

Official Designation of Gun.

Calibre.

Weight of Gun.

Weight of Charge.

Weight of Projectile.

Muzzle Velocity.

Muzzle Energy.

of Wrought Iron.

firing Rounds.

Propellant.

In.

Tons.

lb.

lb.

Ft.-Secs.

Ft.-Tons.

In.

Per Minute.

(Nitro- (Cellulose

13 in.

13

61-4

180

1 130

2000

31,333

31-8

12 „

12

56-1

340

870

2950

52,483

52

,,

10

,

10

34-6

207-5

5IO

2700

25,772

38

8

,

8

18-7

98-5

260

2750

13,630

3i-i

7

,

7

12-7

58

165

2700

8,340

25-9

6

,

6

8-6

37

105

2800

8,710

23-5

,,

5

,

5

5

23-8

50

3150

3,439

2I-I

47

,

4-72

45

2600

2,110

15-5

,,

4

,

4

29

12-3

33

2800

1,794 •

16-1

3

,

3

1-0

3-85

13

2700

657

11-0

,,

6 pr.

2-24

6

2240

209

6-6

,,

3 ,,

i-8i

3

2200

100

5-4

,,

Table XVI. — United States Coast Defence Guns.

Official Designation of Gun.

Calibre.

Weight of Gun.

Weight of Charge.

Weight of Projectile.

Muzzle Velocity.

Muzzle Energy.

Perforation

of Wrought

Iron.

Rate of

firing

Rounds.

Propellant.

In.

Tons.

lb.

lb.

Ft.-Secs.

Ft.-Tons.

In.

Per M

nute.

(Nitro- (Cellulose

16 in.

16

127

612

2400

2150

77,000

46-4

14

14

50

280

1660

2150

53,220

41-0

12 ,,

12

59

340

1046

2250

36,730

37-6

10

10

34-3

205

604

2250

21,200

3i-5

8

8

14-4

80

316

2200

10,600

24-5

6 „

6

9-45

35

106

2600

4,970

2I-I

5

5

4-96

20

58

2600

2,718

17-2

M

4-72 „

4-72

2-75

10-5

45

2600

2,110

15-5

4

4

i-6i

7-5

33

2300

1,210

12-0

3

3

1-2

6-o

15

2600

704

11-25

2-24 „

2-24

0-38

1-35

6

2400

240

7-3

,,

12 „ mortar

12

13

i 54

62

1046 824

1 150 1325

9,590 10,025

,,

Table XVII-

-Japanese Naval Ordnance, 1910.

Official Designation of Gun.

Calibre.

Weight of ti&in.

Weight of Charge.

Weight of Projectile.

Muzzle Velocity.

Muzzle Energy.

Perforation

of Wrought

Iron.

Rate of

firing Prop Rounds.

ellant.

In.

Tons.

lb.

ft.

Ft.-Secs.

Ft.-Tons.

In.

Per Minute.

12-5

66

990

2308

36,500

37-3

0-2 MD.

Cordite

12

59

305

850

2800

46,200

47-2

2-0 ,

10

34

166-5

500

2850

28,170

40-9

3-o

8

17-5

44

250

2740

13,015

30-3

2-0 ,

6

7

35

100

2800

5,436

29-3

7-o

4-72

2-1

5-5

45

2188

1,494

12-0

8

3

o-6

1-94

12-5

2210

423

8-o

12 ,

3

0-9

io-8

2716

553

10-2

2-24

0-4

o-5

6-0

1818

138

4-8

20 ,

1-35

0-25

0-4

3-3

1873

80

4-25

20 ,

Note. — The Japanese fleet has mainly been armed by Armstrong's Works, but the " Katori " was armed by Vickers', and those ships taken from the Russians during the late war are armed with guns from Krupp or Obuchoff. Guns of all sizes are now, however, being constructed in Japan, so that the country is no longer dependent on foreign factories.

Table XVIII.— Sir W. G. Armstrong, Whitworth & Co.'s Guns. Abridged Table.

Official Designation of Gun.

Calibre.

Weight of Gun.

Weight of Charge.

Weight of Projectile.

Muzzle Velocity.

Muzzle Energy.

Perforation

of Wrought

Iron.

Rate of

firing

Rounds.

Propellant.

In.

Tons.

lb.

lb.

Ft.-Secs.

Ft.-Tons.

In.

Per Minute.

12 in.

12

69

3i8

850

2960

51,640

51-5

2

10 ,,

10

36

200

500

3000

33.318

44-0

3

9-2 „

9-2

28

138

380

3030

24,190

40-8

4

8 „

8

21

90

250

3000

15,600

34-9

5

7-5,.

7-5

15-75

76

200

3000

12,481

32-1

6

6 „

6

8-75

35-5

100

3050

6,492

26-0

9

4-7 „

4-7

3-3

15

45

3000

2,808

19- 1

12

4 ..

4

2-1

11

3i

3000

1.934

17-3

12

3 ..

3

I-I

575

14-3

3050

922

13-9

3°

(Semi- l automatic

6 pr.

2-24

•52

i-i3

6

2400

240

7-3

25

3 ,.

1-85

•25

•625

3-3

2300

121

5-7

25

Note. — The most powerful gun of each calibre has been selected.

Table XIX.

— Vickers, Sons and Maxim’s Guns

. Abridged

Table.

Official Designation of Gun.

Calibre.

Weight of Gun.

Weight of Charge.

Weight of Projectile.

Muzzle Velocity.

Muzzle Energy.

Perforation

of Wrought

Iron.

Rate of

firing Rounds.

Propellant.

In.

Tons.

lb.

lb.

Ft.-Secs.

Ft.-Tons.

In.

Per Minute.

12 in.

12

65-85

344

850

3010

53.400

53-o

2

10 „

10

27-85

172

496-6

2863

28,225

41-0

3

9-2 „

9-2

27-8

184

380

3070

24,835

4i-3

4

8 „

8

H-I5

90

216-7

3090

H.350

33-9

6

7-5..

7-5

16-0

80-03

200

3007

12,540

32-3

8

6 „

6

7-8

43

100

3190

7,056

27-9

10

4-7 .,

4-72

3-i

17

45-14

3050

2,910

18-5

12

4 ..

4

2-1

11-25

3i

3030

1.975

17-6

15

3 ..

3

o-95

3-625

12-5

2700

632

io-8

25

\ Semi- (automatic

6 pr.

2-24

0-46

1-55

6

2600

281

8-2

28

3 ..

1-85

0-28

1-066

3-3

2800

179-4

7-5

30

Note. — The most powerful gun of each calibre has been selected.

Table XX. — Krupp's Naval and Coast-Defence Ordnance. Abridged from Table of Ordnance, 1906.

Official Designation of Gun.

Calibre.

Weight of Gun.

Weight of Charge.

Weight of Projectile.

Muzzle Velocity.

Muzzle Energy.

Perforation

of Wrought

Iron.

Rate of

firing Rounds.

Propellant.

30-5 cm.

28

24

21 ,,

19

17

15 ,.

12

10-5 „

7-5 ..

5-7 ..

5-o „

In.

12-01 11-02

9-45 8-27

7-48

6-7

5-91

4-72

4-13

3-54 2-95 2-24 1-97

Tons.

\ 52-2 5 i36‘4i I 40-4 5

(22-93)

t 25-45 5

15-20

) 16-90 5

5 n-37 j

/i2-6 4 5

$ 8 ‘ 55 l I 9-48 5

it! I

i jsi

! i?A

[1-28

(i-45 •74 •84

\ -325 { -367 •220 •248

lb.

357 276

173-6 115-2 86-2 64-6 41-7 21-72

H-55

7-72 7-94 4.48 4-61 1-96 2-03 1-32 1-37

lb.

5771

?98i

5 595

J 760

5374 (474 5 249

?3o8

1.87 (235 (141 (176 5 90 (112 (46

I 59

5 30

l 39

5 19 25

x 9,

25 11 14 11 14

5 6

5 6

3

4 3

4

I

55 I

Ft.-Secs.

3251 / 2884)

3255 2881

3255 2894

3251 I

2920 5

3241 I

2890 5

3238/

2897S 3245 I

2910 5

3274 I

28875 3281 1

2897?

3162

2812

3248 2887 3165) 2812 5 3251 1 28875

3156 j

28085 3242 1 28845 3156/ 28145

3242 l

28905

Ft.-Tons.

56,540

43.754

27,540

18,101

13,572

10,259

6,603

3.442

2,306

1,377

i,452

797

840

35o

369

236

249

In. I 53-0 S

i 52 ‘°

I 49-0 5 44-5 I

42-0 5

\ 38-6 I 36-5 5 35-0 I

33-1 5

32-0 I

30-3 5

27-4

26-

22-2 20-8

i

5 22-2 I

1 20-8 5

IS! I

!! 5 6 :SS

i

. i

io-i I

, 9-5)

HI

181

9-0

8-75

16-5

?i5-6

5 13-3

I 12-6

5 13-9

(i3-o

Per Minute.

2-3

2-3 3-4 4-5 5-6

6-7

6-8 15-20 20-25

25-30

30-40

40-50

40-50

The explosive for the charges of guns of 10-5 cm. and up wards contains 25 % of nitroglycerin

The explosive for charges of guns up to 9-5 cm contains40% nitroglycerin

Note. — The above table includes a light and heavy type of gun, but for each the length of bore is 50 calibres; in the unabridged table guns of 40 and 45 calibres are included. The particulars of the shorter pieces can be easily obtained from Table XX., as the

construction of Krupp's complete table is based on very simple rules. Thus, for the same relative length of gun, the weight of the projectile and of the charge are, with few exceptions, in proportion to the cube of the calibre. Again, the weight of the gun varies as the cube of the calibre multiplied by the length. The muzzle velocity is practically identical for guns of the same relative length, and varies as the square root of the length; consequently the muzzle energy varies directly as the length. Two weights of projectile are given for every gun, but the muzzle energy of each, for the same charge, is identical; this result is never the case in actual practice. Similar arithmetical processes are utilized for the Schneider-Canet, Bofors and Skoda tables, and only the first named is therefore given.

Table XXI.

— Schneider-Canet Guns

A bridged

Table.

Official Designation of Gun.

Calibre.

Weight of Gun.

Weight of Charge.

Weight of Projectile.

Muzzle Velocity.

Muzzle Energy.

Perforation

of Wrought

Iron.

Rate of

firing

Rounds.

Propellant.

In.

Tons.

ft).

ft.

Ft.-Secs.

Ft.-Tons.

In.

Per Minute.

305 mm.

12-01

57-6

826

3116

55.717

54-8

274-4 ..

10-9

41 -9

606

3116

40,859

49-1

240

9-45

28-0

407

3116

27 > 487

43-2

200

7-87

16-25

231

3”6

15,601

35-9

175

6-89

io-8

165

3116

11. 143

32-1

150 ,,

5-9 1

6-8

99

3116

6,686

27-0

120 ,,

4-72

3-5

48

3116

3.268

21-0

100 ,,

3-94

2-0

28-6

31 16

1,931

17-8

75

2-95

1-2

H-3

3116

917

14-6

57

2-24

•55

6-0

3116

400

10-7

47

1-85

•30

3-3

31 16

223

8-9

Note. — The unabridged table gives only 45 and 50 calibre guns; the above table gives the particulars for 50 calibre guns.

Table XXII. — Bethlehem Steel Co.‘s Guns.

Abridged Table.

Perforation

Rate of

Official Designation

Calibre.

Weight of

Weight of

Weight of

Muzzle

Muzzle

of Wrought

firing

Propellant.

of Gun.

Gun.

Charge.

Projectile.

Velocity.

Energy.

Iron.

Rounds.

In.

Tons.

lb.

lb.

Ft.-Secs.

Ft.-Tons.

In.

Per Minute.

18 in.

18

60

2000

2250

70,185

42-7

12 „

12

53

850

2800

46,195

47-4

10 „

10

35

500

2800

27,174

39-8

8

8

18-6

250

2800

13,587

3i-5

7

7

14-5

165

2900

9,619

28-8

6

6

8-4

105

2900

6,180

24-9

5

5

4-75

60

2900

3,490

20-5

4-724 ,.

4-724

4-2

45

2900

2,623

18-3

4 >•

4

2-6

33

2900

1,924

17-0

3

3

•85

13

2800

707

ii-7

2-24 „

2-24

•43

6

2400

240

7-3

1-85 „

1-85

■245

3

2600

142

6-4

Note. — The most powerful gun of each calibre has been selected.

Modern naval artillery may be looked upon as the high water mark of gun construction, and keeps pace with the latest scientific improvements. For coast defence the latest pattern of ordnance is not of the same importance; in general very similar guns are employed, although perhaps of an older type. Formerly in the British Service the heaviest guns have been used for this purpose; but; of late years, where fortifications could be erected in suitable situations, the largest gun favoured is the 9-2-in. of the latest model. Other governments have, however, selected still heavier pieces up to 12-in. calibre, mounted in heavily armoured cupolas or gunhouses.

As regards field material, mobility is still one of the primary conditions, and, as high power is seldom required, ordnance of medium calibre is all that is necessary. For siege purposes guns of 4-in. to 6-in. calibre are generally sufficient, but howitzers up to 28 cm. (11 -02 in.) were used at the siege of Port Arthur, 1904. AH authorities seem agreed that for ordinary field guns 75 mm. or 3-in. calibre is the smallest which can be efficiently employed for the purpose, and the muzzle velocity is in nearly all equipments about 500 m.s. (1640 f.s.).

For mountain equipments all foreign governments have selected a 75-millimetre gun with a velocity of about 350 m.s. (1148 f.s.); in England, however, a 2-75-in. has been supplied to mountain batteries; this fires a projectile of 10 lb with 1440 f.s.

Field Howitzer batteries abroad have pieces of from 10 to 12 centimetres calibre and a low velocity; in England a 5-in. howitzer is at present used, but it is intended to adopt a 4-5-in. howitzer of 17 calibres in length for future manufacture.

Heavy shell power and long range fighting render the work of the gun designer particularly difficult, especially when this is

combined with conditions restricting length and Theory of we jgj 1 t ; and, in addition, other considerations, making. especially for naval guns, may have to be taken into

account such as the allowable weight of the armament, and the size of the gun house or turret. These and other similar conditions are important factors in deciding on the type of design

which embodies most advantages for a heavy gun intended for the main armament. For land defence more latitude is allowed so long as this is combined with economy. With both heavy and medium naval guns the length is often limited to 45 calibres on account of peculiarities in the design of the vessel, but usually great rapidity of fire, high velocity and large shell power are insisted upon. Again for Q.F. field guns, where high velocity is not of importance, ease of manipulation, rapidity of working and reliability even after months of arduous service are essential. Supposing, however, that the initial conditions, imposed by the shipbuilder or by the exigency of the case, can be fulfilled, it still remains to so design the gun that, when it is fired, there is an ample margin of safety to meet the various stresses to which the several portions of the structure are subject. The two principal stresses requiring special attention are the circum- ferential stress, which tends to burst open the gun longitudinally, and the longitudinal stress. The calculation for the last named is based on the supposition that the gun is a hollow cylinder, closed at one end by the breech screw and at the other by the shot, both being firmly fixed to the cylinder. The gas pressure exerts its force on the face of the breech screw and on the base of the shot thus tending to pull the walls of the cylinder asunder. But besides these there is the special stress on the threads of the breech screw which must receive very careful consideration.

Regard must also be had to the fact that in building up the gun, the smaller the diameter of the hoop and the longer it is, the higher must be the temperature to which it is heated before shrink- ing. This is necessary in order that the dilatation may allow sufficient clearance to place the hoop correctly in position on the gun, without the possibility of its contracting and gripping before being so placed. Should it warp while being heated or while

being placed in position the hoop may prematurely grip on the gun and may consequently have to be sacrificed by cutting it off and shrinking on another.

The dilatation must be so adjusted that the required tempera- ture to obtain it is not higher than that used for annealing the forging, otherwise the effect of this annealing will be modified: There is, therefore, for this reason, considerable risk in shrinking up long hoops of small diameter.

Before heating hoops of large diameter two or three narrow reference bands are turned on the exterior and their diameter measured; special gauges are prepared to measure these plus the dilatation required. After heating the hoop but before shrinking it, the diameter of the reference bands when tested by these gauges should not be in excess of them. The temperature can then be easily ascertained by dividing the dilatation by the coefficient of expansion of steel per degree F. or C, taking of course the diameter into account.

For small hoops this method is not convenient, as the hoop cools too quickly; the dilatation must then be obtained by ascertaining the temperature, and this is best done by the use of some form of pyrometer, such as a Siemens water pyrometer, before the hoop is withdrawn from the furnace.

It may also be desired to obtain a given striking energy or velocity at some definite range — then, the weight of the pro- jectile being decided upon, the muzzle velocity is found from the formulas (see Ballistics) given in Exterior Ballistics. From this and the length of the gun allowable the designer has, with the aid of former experience and the formulas given in Internal Ballistics, to decide on the weight and nature of the powder charge necessary and the internal dimensions of

the powder chamber and bore. These data are used to plot what is termed a ” gunmakers’ curve,” i.e. the curve of pressures along the bore which the powder charge decided upon will give. The factor of safety and the maximum allowable stress of the steel forgings or steel wire also being known, the necessary strength of each section of the gun can be easily found and it remains to so proportion each part as to conform to these conditions and to meet certain others, such as facilities for manufacture, which experience only can determine.

When the second course consists of a single long tube into which a tapered barrel is driven, as in the system adopted by the English government, the two tubes are treated as a single tube equal in thickness to the two together; but when the second course consists of several tubes shrunk on to the barrel the addi- tional strength, obtained by the initial tension of the shrunk tubes, is sometimes taken account of in the calculation, or the two may be treated as one thick tube.

The gunmakers’ formulas for the strength of the gun are ob- tained from considering the strength of a thick cylinder exposed to unequal internal and external pressures. Supposing a transverse section of the gun to cut through n tubes, the internal radius of the barrel is r in., the external radius n in., the external radius of the second course is r 2 and so on ; and the external radius of the jacket is r n . Then if T = a circumferential stress (tension) in tons per square inch, T n = a circumferential stress at radius r„ in., P = a radial stress (pressure) in tons per square inch, and P n = a radial stress at radius r„ in., the formulas used in the calculation of the strength of built- up guns are as follows: —

2 r„ 2 P„_i-P„

consider that the proof tension of the barrel should not exceed 15 tons and of the outer hoops 18 tons per square inch; with nickel gun steel these become 20 tons and 24 tons respectively. If the n’ h hoop is the exterior tube then P„ = o; neglecting the atmospheric pressure.

In all gun calculations for strength three cases must be con- sidered:

(a) When the built-up gun is fired, the stress is called the Firing

Stress and is obtained by the repeated use of equation (4) ;

(b) When the gun, supposed to be a solid homogeneous block of

metal is fired, the stress is termed the Powder Stress and is obtained

from the equations (1) and (2) ;

(c) When the built-up gun is in repose, the stress is then called

the Initial Stress or Stress of Repose.

Between these three cases the following relations hold :- —

Initial Stress -f Powder Stress — Firing Stress (5).

It is best to use different symbols to distinguish each kind of stress. We will use for the Firing Stress P, T; for Powder Stress p, t; and for the Initial Stress (p), (t).

The method of working will be illustrated by a practical example. Take, for instance, a section across the chamber of a 4-7-in. Q.F. gun, for which the diameter of the chamber is 5 in., that of the barrel 8-2 in., and the external diameter of the jacket 15 in.

Here

*o = 2-5; n = 4-i; ^ = 7-5 T = i5; Ti = i8; P 2 = o.

From (4) for the Firing Stress

Pi =

Po =

(7-5) 2 -(4-i) 2 (7-5) 2 +(4'i) s

X 18 = 9-72 tons per square inch.

(4-i) 2 -(2-5) :

2X(i5+9-72)+9-72 = 2i tons per square inch.

ro ^(4-i) 2 + (2V 5)*

From (3) the tension T'„ of the outer fibres of the hoops is obtained ; thus

T' 2 = P 2 +Ti-Pi = i8-Q-72 = 8-28 tons per square inch.

T'i = Pi-|-To-Po = 9-72-t-l5-2i =3-72 tons per square inch.

For any intermediate radius r the stress can be found by using equations (1) and (2) or (1) or (2) and (3).

For the Powder Stress equations (1) and (2) are used by putting; n = i, and then pi — o (also remembering that, as there are two hoops, the outer radius must be written r 2); the formulas become

, ro 2 rj +r 2 ˆ

/> =

ro” r 2 *

r’ rtf — rtf’

When r = ro = 2-$, t = h, po = Po already found and:

(7-5) 2 + (2-5) 2

(6) (7)-

k-

2 X2I =26-25 tons.

“(7-5)*- (2-5) 1

For the tension of the fibres at the outer circumference

t’i = 26-25 -21 =5-25 tons,

from (3) and for a radius r 2 = 7-5 inches.

The stress for any intermediate radius r can be obtained from (6) and (7) or, from (6) or (7) and (3).

Subtracting the Powder Stress from the Firing Stress the Initial Stress is obtained, and the various results can be tabulated as follows:—

At Radius.

Tensions.

Pressures. •

Firing Stress.

Powder

Stress.

Initial Stress.

Firing Stress.

Powder Stress.

Initial

Stress.

Jacket -ZU

15-0

3-72 18-0 8-28

26-25

n-57 n-57

5-25

-11-25

- 7-85

6-43

3-03

21-0

9-72

9-72

21-0 6-32 6-32

3-4

3-4

P„_ir n -1 2 — Pnfn 2 TV

p =

r n ‘ — rn-S

r ,2 r 2 p , _ P

in— l rn 1 n—l a n

P n -.r„_, 2

Tn—l

-P„r„ 2

(1) (2),

where r is any intermediate radius in the thickness of a tube

T„-P„ = T-P (3)

in the same tube; also the pressure between the («-i)*and »” hoops is

rn 1

■J-r

2 OVi + P„) + P„

(4).

“- 1 r n 2 + r„.

Equation (4) is usually known as the Gunmakers’ formula and from it, when P» and T„_i, T„_ 2 . . . are known the other pressures can be found. The proof tension of the material is kept well below the yielding stress. For ordinary carbon gun steel it is usual to

It is generally stipulated that the initial compression of the material at the interior surface of the barrel shall not exceed 26 tons per square inch, i.e. (/o) = -26 tons; in the example above (to) = -11-25 tons only, but in wire-wound guns special attention to this condition is necessary.

It now remains for the designer so to dimension the several hoops that they shall, when shrunk together, give the stresses found by calculation. To do this the exterior diameter of the barrel must be a little larger than the interior diameter of the covering hoop; after this hoop is shrunk on to the barrel its exterior diameter is turned in a lathe so that it is slightly larger than the interior of the next course hoop and so on. It will be seen that the fibres of the barrel must be compressed while the fibres of the superimposed hoop are extended,

and thus produce the Initial Stress. The shrinkage S may be defined as the excess of the external diameter of the tube over the internal diameter of the hoop, when separate and both are in trw “o ,fl fate. Then

if »Sn + i denotes the shrinkage between the n th and (n + i)’* hoops

-(«’»)} (8)

‘ — r- 2

nS» f l = -J^’{(«»)-

H [&• > <'-») + ■

/•„ 2 + r„ 2

:!(‘»

4) + (* > »)(] (9).

(-11

■25 + 3-4)]

Wire guns.

Here M can be taken as 12,500 tons per square inch for gun steel. In the example already calculated the shrinkage between the jacket and barrel is 0-009 in.

S -i2,5ooL 6 43 + u – 2 5 + (4 .i)2 + (2.5)3 = 0-009 i n –

In that portion of the gun in which wire is used in the con- struction, exactly the same principles are involved. It may be assumed that the tube on which the wire is wound is so large, in comparison to the thickness of the wire, that the compression of the concave surface of the wire and the extension of its convex surface may be neglected without sensible error.

The greatest advantage is obtained from the wire coils when in the

Firing Stress the tension T is uniform throughout the thick- ness of the wiring. The Firing Stress T in the wire may be as low as 25 tons per square inch and as high as 50 tons, but as the yielding strength of the wire is never less than 80 tons per square inch nor its breaking strength less than 90 tons, there is still an ample margin especially when it is remembered that the factor of safety is included in the calculation.

If the wire is wound direct on to the barrel and is covered by a jacket, ro, n being the radii in inches of the barrel, r u r 2 the radii of the internal and external layers of wire, and r 2 , rz the radii of the jacket; then for the, Firing Stress in the wire

T(r 2 -r) = Pr-P 2 r 2 .(9),

or

T(r-r l) = Pir l -Pr (io)-3

By combining these the gunmakers' formula for the wire is obtained

(10a).

At Radius.

Tensions.

. . ■

Pressures.

Firing

Stress.

Powder

Stress.

Initial Stress.

Firing

Stress.

Powder Stress.

Initial Stress.

“arrel i ri = 3 . 75 Wire iˆ3;75

Jacket j ™

o-6

-5-4

25-0

25-0

7-5

5-25

26-25

13-125

13-125

7-5 7-5 5-25

-25-65 -18-525 11-875

17-5

21-0

15-0 15-0 2-25 2-25

21-0

7-875 7-875 2-25 2-25

7-125 7-125

Pi-ˆTpCT + PO + P,

As T is to be uniform, when the gun is fired, the Initial Tensions of the wire are arranged accordingly, and the tensions at which the wire must be wound on to the guns have now to be determined.

Let 6 = the winding tension at radius r in. (/) = the initial tension at radius r in.

(p) = the radial pressure between any two layers of wire at radius r in.

It is assumed Then

that M is uniform for the gun steel and wire.

» -«+(*)

r*+n*

where

and

-ro’

(0-T-

■P r ±

r, 2 +r* r s 2 — r 2

(“).

(12),

(/>)

= P-Po ?

fo’ r 3 °

ri’-r a *

By means of these two equations and becomes

F :+: G

(9)

-w

(13)-

the expression (11)

(14). .

ra ‘ r+r where

E = -(T+P s)r,

F = (T+P 2)r a -(T+P„)r

G = (T+P 2)r 2 + (T+Po)r .

To compare with the previous example, the stress for a [4-7-in- Q.F. wire gun will be calculated. This consists of a barrel, inter- mediate layer of wire and jacket.

Here r = 2-5; ri=3-75; ˆ = 5-5; (-3 = 7-5 inches; the firing tension Ti to T’ 2 of the wire = 25 tons per square inch, suppose.

Take Po = 2i tons per square inch and consider that the jacket fits tightly over the wire, but has no shrinkage. Then for the Firing Stress, from (2), P 2 = 2-25 tons, and from (9) and (10), Ti(rr-ri) = Pj7i-Piri

Pi = 14-97. say 15 tons; from (4) we can obtain T and T 2 since P , Pi and P 2 are known; from (3) T = o-6 tons. T 2 = 7-5 tons.

T’ 2 =-5-4 tons (a compression), and

T s =5-25 tons.

The Powder Stress is obtained in the same way as in the previous example, so also is the Initial Stress; therefore we may tabulate as follows : —

As the wire is wound on, the pressure of the external layers will compress those on the interior, thus producing an extension in the wire which is equivalent to a reduction in the winding tension 6 of the particular layer at radius r considered. If t represents this reduction then

where

= (O-

■T,

At the interior layer of wire t is the initial stress on the exterior of the barrel and the winding tension must commence at 19 = 11-875 + 18-525=30-4 tons per square inch.

As the jacket is supposed to have no shrinkage T = o and con-

sequently

9 = (/) = 17-5 tons per square inch.

These winding tensions can be found directly from formula (14) and then

E =-149-875; F = 34-875; G = 264-875.

Sir G. Greenhill has put these formulas, both for the built-up and wire-wound guns, into an extremely neat and practical geometrical form, which can be used instead of the arithmetical processes; for these see Text-Book of Gunnery, Treatise of Service Ordnance, 1893, and Journal of the United Stales Artillery, vol. iv.

The longitudinal strength of the gun is very important especially at the breech end ; along the forward portion of the gun the thickness of the barrel and the interlocking of the covering hoops provide ample strength, but at the breech special pro- vision must be made. It is usual to provide for this by means of a strong breech piece or jacket in small guns or by both combined in large ones. Its amount is easily calculated on the hypothesis that the stress is uniformly distributed throughout the thickness of the breech piece, or jacket, or of both. If n> is the largest radius of the gun chamber, r C i the radius of the obturator seating, n the external radius of the barrel, and Po the maximum powder pressure, then, with the usual form of chamber adopted with guns fitted with obturation other than cartridge cases, there will be a longitudinal stress on the barrel at the breech end of the chamber due to the action of the pressure Po on the rear slope of the chamber, of

z{r

this is resisted by the barrel of section – (n 2 r s) so that the re sistance

Longi- tudinal stress.

R =

n'—rm'

Po tons.

n — r

This portion of the longitudinal stress is not of great importance as the breech end of the barrel is supported in all modern designs by the breech bush. In Q.F. guns, i.e. those firing cartridge cases, the breech end of the chamber has the largest diameter, and n-rm so that there is no longitudinal stress on the chamber part of the barrel.

For the breech piece or outer tube of radii n and r 2 , the resistance

Rˆ ,.,” 1 _\, Po tons for B.L. guns

~r? — ri-

ro 2 ~rj — r{

Po tons in Q.F. guns.

If the longitudinal stress is taken by a jacket only, the resistance is found in the same way.

Generally for ordinary gun steel, the longitudinal stress on the material is always kept below 10 tons per square inch or 13 tons for nickel steel; but even with these low figures there is also included a factor of safety of 1-5 to 2. In large guns it is best to consider the jacket as an auxiliary aid only to longitudinal resistance, as, owing to the necessary connexions between it and the breech bush and its distance from the centre of pressure, there is a possibility that it may not be taking its proportionate share of the stress.

The thread of the breech screw and of the breech bush (or opening) must be so proportioned as to sustain the full pressure on the maximum obturator area ; V or buttress shaped threads are always used as they are stronger than other forms, but V threads have the great advantage of centring the breech screw when under pressure.

In most modern B.L. guns fitted with de Bange obturation the

diameter of the seating is made just large enough to freely admit the projectile ; this is usually considerably smaller than the maximum diameter of the chamber, consequently a less area is exposed to the gas pressure and less screw thread section is required.

The principal features of the various systems of construction of modern heavy guns may be briefly described.

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Figs. 55-57. — British, French and American Construction.

Fig. 55 is that adopted in England. The barrel or ” inner A tube ” is surmounted by a second layer which is either shrunk on in two or three pieces, as at Elswick, or is formed of one Systems of long p ; ece ca ii ec j tne “A tube,” as in the Woolwich construe- svstem This second layer is covered with wire, and tloa – over this is shrunk the chase hoop or B tube and the

jacket. The breech bush is screwed into the rear end of the A tube so that the principal longitudinal stress is taken by this tube.

Fig. 56 is the system adopted in the French service. In this the barrel is surmounted over the breech end with two layers of short thin

hoops, which consequently approximate to the wire system.

Over the muzzle end two or three long tubes are shrunk ; the chase hoop is also screwed to the barrel near the muzzle. A jacket is shrunk over the breech portion of the gun, and the breech bush is screwed into it at the rear end. The gun is further strengthened by a long tube in front of the jacket to which it is attached by a screwed collar.

Fig. 57 shows the design adopted for the United States navy. Here the barrel is surmounted by a second course in two lengths, and over the breech a third and fourth layer are shrunk. The breech screw is screwed into the rear end of the second course.

Fig. 58 is the Krupp system, of which, however,it is an old example; it is believed, however, that Krupp still retains the essential peculiarities of this design, viz. that over the breech end of the barrel is shrunk a solid breech piece, made particularly massive in rear where the breech wedge is seated. The remainder of the layers consist of hoops which are comparatively short but may be covered with longer thin tubes.

Fig. 58. — Krupp Construction.

When guns are fired, the interior surface is gradually worn away by the action of the powder gases ; the breech end of the rifled portion of the bore becomes enlarged, and the rifling Bfasiea itself partly obliterated. The ballistics suffer in conse- quence of the enlarged diameter of the bore, and the rifling may be worn so much as not to properly rotate the projectile.

In all modern gun designs provision has, therefore, to be made for repairing or replacing the barrel when it is worn out. There are two methods of providing for the repair in the original design — the first is by replacing the whole of the barrel by an entirely new one ; the second is to make the original barrel thick so that when it is worn the interior can be bored out, either over a portion of its length to cover the eroded part, or the full length for ” through lining’ In large guns it is usual to make the original barrel, if it is intended to be removed as a whole, tapered from end to end, so that by warming the gun in a vertical position breech downwards to about 300 F. and then suddenly cooling the barrel by a jet of water it can be knocked out by heavy blows from a falling weight. A new tapered barrel can then be inserted by driving it in. When a gun which had originally a thick barrel is lined part of the barrel is bored out in a machine, and it is usual to make the hole tapered so that a new tapered liner can be inserted and

driven home.

The wearing of the barrel owing to erosion is one of the most difficult problems the gun constructor has to face. Sir Andrew Noble (see" Some Modern Explosives," a paper read at the Royal Institution, 1900, also " Researches on Explosives," part iii., Phil. Trans. Roy. Soc.) has conclusively proved that the erosion is mainly dependent on the very high temperature to which the interior surface of the gun is raised and on the quantity of this heat. Both these factors are, for any particular explosive, determined by some function of the proportion of the weight of the charge to the extent of the exposed surface. The passage for the products of combustion gradually reduces from the maximum diameter of the chamber to the diameter of the bore. The highly heated gases therefore impinge more directly on that part of the bore which forms the seating for the shot and acts on it for the longest time, i.e. for the whole time the shot is in the gun. Consequently this part suffers most wear.

It may be assumed that the weights of the charges vary as the cube of the diameters of the bore, while the circumference of the bore varies directly as the calibre; how as the wear depends princi- pally on the weight of the charge in relation to the exposed surface at the shot seating it varies as the square of the calibre. It is evident too that the allowable wear will vary as the calibre, so that the life of the gun or the number of rounds which can be fired is inversely proportionate to the calibre.

The heat of combustion and the time of burning of the explosive are factors in determining the amount of heat developed per unit of time, and thus influence the proportion of heat conducted away from the interior surface of the gun. The time of burning of the explosive depends on the size and form of the explosive and on the density of loading, while the heat of combustion depends on its composition and cannot be treated of here, but it may be stated generally that for equal weights Ballistite is more erosive than Cordite Mark I., and Cordite Mark I. than Cordite M.D. All of these explosives contain a fairly large proportion of nitroglycerine, and it is found that as the proportion of this ingredient is reduced the erosion also decreases, so that for pure nitro-cellulose powders it is less still. Unfortunately pure nitro-cellulose powders are not ballistically equal to the same weight of nitroglycerin powder; the advantage of the less erosive action is lost owing to the greater weight of pure nitro-cellulose explosive required to obtain the same n 3.11 is tics

The effect of erosion on large high-power guns is serious, for in a

12-in. gun after some 150 or fewer rounds are fired with a full charge the barrel is worn so much as to need replacing. In the British service it is considered that the wear produced by firing sixteen half charges is equivalent to that of one full charge.

In small high-velocity guns the number of rounds with full charge which can be fired without replacing the barrel is considerably greater ; while for low-velocity guns the number is higher still. In some guns this number appears abnormally high; in others of exactly similar type it may be low and for no apparent reason.

The first effect of the powder gases on the steel is a very characteristic hardening of the surface of the whole of the bore; so much is this the case that it is difficult to carry out any mechanical opera- tion, except grinding, after a gun has been fired. When ignited the explosive contained in the chamber of the gun burns fiercely, and as the projectile travels along the bore the highly heated gases follow. The surface of the bore near the chamber is naturally the most highly heated and for the longest time ; here too the rush of gas is greatest. There is in consequence a film of steel swept off from the surface, but this becomes less as the distance from the chamber becomes greater, owing to the abstraction of heat by the bore. It is a noticeable fact that only where a decided movement of gas takes place is there any erosion: thus, towards the breech end of the chamber where no rush of gas occurs there is no perceptible erosion, even after many rounds have been fired. Again, at the muzzle end there is very little erosion, as here the gases are in contact with the bore for a minute fraction of time.

As the firing proceeds, the interior surface of the bore, where the erosion is greatest, becomes covered with a network of very fine cracks running both longitudinally and circumferentially. The sides of these cracks in their turn become eroded and gradually fissures are formed. With the old black and brown powders these fissures were a feature of the erosion, while with the new type smokeless powders the eroded surface is usually smooth, and it is only after prolonged firing that fissures occur although fine cracks occur after a. comparatively few rounds have been fired.

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II. Field Artillery Equipments

General Principles. — A field gun may be considered as a machine for delivering shrapnel bullets and high-explosive shell at a given distant point. The power of the machine is limited by its weight, and this is limited by the load which a team of six horses is able to pull at a trot on the road and across open country. For under these conditions it is found that six is the maximum number of horses which can work in one team without loss of efficiency. The most suitable load for a gun-team is variously estimated by different nations, according to the size of the horses available and to the nature of the country in the probable theatre of war. Thus in England the field artillery load is fixed at 43 cwt. behind the traces; France, 41-5 cwt., Germany 42.5 cwt., and Japan (1903) 30 cwt. This load consists of the gun with carriage and shield, the limber with ammunition and entrenching tools, and the gunners with their kits and accoutrements. The weights may be variously distributed, sub- ject to the condition that for ease of draught the weight on the gun wheels must not greatly exceed that on the limber wheels. It is still usual to carry two gunners on seats on the

gun axletree, and two on the limber. But a Q.F. gun capable of firing 20 rounds a minute requires to be constantly accompanied by an

ammunition wagon, and the modern tendency is to take advant- age of this to carry some of the gunners on the wagon. Thus in the British field artillery two gunners are carried on the gun limber, two on the wagon limber, one on the wagon body and none on the gun. These five gunners, with the sergeant, called the No. 1, on his horse, make a full gun-detachment. Three Wagons for each gun usually are provided, two of which, with the spare gunners and non-commissioned officers, are posted under cover at some distance behind the battery. Besides lightening the weight on the gun, the presence of the wagon allows the number of rounds in the limber to be reduced. The result of this redistribution of weights is that field artillery may now be equipped with a much heavier and more powerful gun than was formerly the case. A gun weighing 24 cwt. in action is about as hfeavy as a detachment of six can man-handle.

i The power of a field gun is measured by its muzzle energy, which is proportional to the weight of the shell multiplied by the square of its velocity. The ; muzzle energy varies in different equipments- from 230 to 380 foot-tons. Details of the power, weight and dimensions of the guns of the principal military nations are given in Table A.

A gun of given weight and power may fire a heavy shell with a low velocity, or a light shell with a high velocity. High velocity is the gunner's ideal, for it implies a flat trajectory and- a small angle of descent. The bullets when blown forward out of the shrapnel fly at first almost parallel to the surface of the ground, covering at medium ranges a depth of some 350 yards, as against half that distance for a low-velocity gun. Under modern tactical conditions a deep zone of shrapnel effect is most desirable. On the other hand, for a given power of gun, flatness of trajectory means, a corresponding reduction in the weight of the shell; that is, in the number of shrapnel bullets discharged per minute. We have accordingly to compromise between high velocity and great shell power. Thus the British field gun fires an 185 lb shell With muzzle velocity of 1590 ft. per second, while the French gun, which is practically of the same power, fires a 16 lb shell with M.V. of 1740, f.s. Again, a shell of given weight may be fired either from a large-bore gun or from a small-bore gun; in the latter case the length of the shell will be proportionately increased. The small-bore gun is naturally the lighter of the two. But the longer the shell the thicker must its walls be, in order not to break up or collapse in the gun. The shorter the shell, the higher is the percentage of useful weight, consisting of powder and bullets, which it contains. We must,

therefore, compromise between these antagonistic conditions, and select the calibre which gives the maximum useful weight of projectiles for a given weight of equipment. In practice it is found that a calibre of 3 in. is best suited to a shell weighing 15 lb; and that, starting with this ratio, the calibre should vary as the cube root of the weight of the shell.

As to rifling, the relative advantages of uniform and increasing twist are disputed. The British field guns are rifled with uniform twist, but the balance of European opinion is in favour of a twist increasing from 1 turn in 50 calibres at the breech to 1 in 25 at the muzzle. Mathematically, the development of the groove is a parabola.

For field guns the favourite breech actions are the interrupted screw and the wedge. The latter is simpler, but affords a less powerful extractor for throwing out the empty cartridge case. This point is of importance, since cartridge cases hastily manu- factured in war time might not all be true to gauge. Modern guns have percussion locks, in which a striker impinges upon a cap in the base of the metallic cartridge. All Q.F. guns have repeating trip-locks. In these, when the firing-lever or lanyard is pulled, the striker is first drawn back and then released, allow- ing it to fly forward against the cap. The gun is usually fired by the gun-layer; it is found that he lays more steadily if he knows that the gun cannot go off till he is ready. A field gun has to be sighted (see Sights) for laying (a) by direct vision (b) by clinometer and aiming-point (see Artillery). The first purpose is served by the ordinary and telescopic sights; the second by the goniometric sight or the panorama sight. The

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independent line of sight is an arrangement of sights and elevating gear found in many modern field guns, which divides between two gunners the work of aiming (called laying) the gun, and of giving it the elevation required to hit the target.

In fig. 59 the gun is shown mounted on an intermediate carriage elevated and depressed by the screw A. The telescopic

From Bethell's Modern Guns and Gunnery.

Fig. 59. — Diagram illustrating the independent line of sight.

or ordinary sight is fixed to this carriage. The gun, in its cradle, is elevated and depressed by the screw B. To lay the gun, the layer works the laying screw A till the telescope points at the target; the gun also, if no elevation has been given, is then pointing straight at the target. To give the gun the elevation necessary for the range, the elevating number on the right of the gun now works the elevating screw B till the gun is sufficiently elevated, the amount given being shown in yards of range on a drum. The motion given to the gun does not disturb the intermediate carriage with the telescope attached to it, and the telescope still remains layed on the target. Once the sights are layed on the target, the elevation of the gun may be changed in a moment by a turn of the elevating wheel, without disturbing the laying. The layer does not have to concern himself about the elevation; he has only to keep his sights on the target while the other numbers continue the service of the gun. This device is especially valuable when firing at moving targets, when the range and the laying have to be altered simultaneously.

The same result may also be obtained by other mechanical devices without the use of the intermediate carriage. Thus the British field guns have a long elevating screw with the sight connected to its centre, the lower end passing through a nut at the side of the upper carriage, the upper end through a nut at the side of the cradle. Then, if the lower nut be turned by the laying wheel, the screw, the sight and the gun will go up or down together; if the upper nut be turned by the elevating wheel, the gun will go up or down the screw without moving the sights. Colonel Scott's " automatic " line of sight is an improvement on the ordinary gear in that the sight can be cross-levelled to eliminate the error due to difference of level of wheels. Krupp has a similar device in which the sight-socket is on the cradle so that it can be cross-levelled. The sight itself is connected to the elevating gear, and is screwed out of its socket as the breech of the gun is depressed, so that the sight remains in the same place.

Construction of the Gun.— Field guns are made of steel, usually containing a small percentage of nickel or chromium, or both, and having a tensile breaking strain of about 50 tons per square inch. In Austria, for facility of local manufacture, hard-drawn bronze is still

used, although this is considerably heavier than steel.

The Carriage (see Artillery, Plate I.). — The first field guns used in war were supported by crossed stakes under the muzzle and anchored by a spike on the breech which penetrated into the ground. The next improvement was to mount the gun on a sleigh. This method is still used in Norway and in Canada. The next step was to mount the gun on a two-wheeled carriage, connected to a second two-wheeled carriage (the limber) by a flexible coupling. For centuries the gun-carriage was a rigid construction, recoiling on firing, and having to be run up by hand after each round. In 1895 . spring-spade equipments were introduced. In these a spade attached to a helical spring was set under the carriage; on discharge the spade dug into the ground, compressing the spring as the carriage recoiled The extension of the spring ran the gun up again without assistance from the gunners.

The British 15 pr. used in the South African War (1899-1902) had a spring spade carriage designed by Sir George Clarke. Similar equipments were introduced by several continental powers. The Japanese gun used in Manchuria (1904) had dragshoes attached by

wire ropes passing round drums on the wheels to a strong spring in the trail. On recoil the wheels revolved backwards, compressing the spring; after recoil the pull of the spring on the wire ropes revolved the wheels forward and returned the gun to its former position. The Italian 1902 semi-Q.F. carriage was constructed on a very similar principle. All these semi-Q.F. equipments were open to the objection that the gunners had to stand clear of the shield every time the gun was fired. They have since been superseded by Q.F. gun-recoil equipments.

The gun-carriage must be strong enough to carry the gun across country, and it must be so constructed as not to move when the gun is fired. If the gun-carriage were allowed to recoil to the rear on discharge, the gunners would have to stand clear on firing, abandoning the protection of the shield, and, moreover, the loss of time entailed by running up and relaying the gun would render the fire slow. The requirement of steadiness of the carriage is met by allowing the gun itself to recoil on its carriage. Its motion is gradually checked by the hydraulic buffer (see below) and the gun is returned to the firing position by helical springs, or, in the French, Spanish and Portuguese equipments, by compressed air. The carriage is held from recoiling by a spade fixed to the point of the trail, which digs into the earth on discharge, and (usually) by brakes on the wheels. This is known as the gun-recoil system, and is now universally

adopted. Field guns constructed on this principle are styled Q.F., or quick-firing, guns.

Steadiness of Carriage. — In the gun-recoil equipment the constructional difficulty lies not in preventing the carriage from recoiling but in preventing the wheels from rising off the ground on the shock of discharge. The force of recoil of the gun, acting in the line of motion of the centre of gravity of the recoiling parts, tends to turn the carriage over backwards about the point of the trail, or, more correctly, about the centre of the spade. This force is resisted by the weight of the gun and carriage, which tends to keep the wheels on the ground. The leverage with which the overturning force acts is that due to the distance of its line of motion above the centre of the spade; the leverage with which the steadying force acts is that due to the horizontal distance of the centre of gravity of the gun and carriage from the centre of the spade. If the force of recoil be 6 ft. tons, and if it be absorbed during a recoil of 3 ft., the average overturning force is 2 tons; since the weight of the gun in action may not greatly exceed I ton, the trail must be so long as to give a leverage of at least two to one in favour of the steadying force. It follows from the above that the steadiness of the carriage, for a given muzzle energy, may be promoted by four factors, (a) In creasing the weight of the gun and recoiling parts. This reduces the recoil-energy, (b) Increasing the length of recoil allowed. This reduces the overturning pull, (c) Keeping the gun as low as possible, either by reducing the height of the wheels, or by cranking the axle- tree downwards. This reduces the leverage of the overturning force. (d) Increasing the length of the trail. This increases the leverage of the steadying force.

It wili be seen from Table A that the condition of steadiness is satisfied in the various Q.F. equipments by not very dissimilar combinations of the above factors.

The cradle is the portion of the carriage upon which the gun slides when it recoils. It also contains the buffer and running-up springs, which are fixed either above or below the gun. The latter method gives the stronger and simpler construction, and is favoured by all nations except Great Britain. By putting the buffer on top the gun can be set lower on the carriage, which is an advantage as regards steadiness. A top-buffer cradle is of ring section, surrounding the gun ; the gun is formed with ribs or guides extending for its whole length, which, on recoil, slide in grooves in the cradle. The cradle is pivoted on horizontal trunnions to the intermediate carriage and carries the buffer and springs on top. This construction is shown in the illustration of the 18 pr. Q.F. gun (fig. 60, Plate III.).

In carriages having the buffer under the gun the cradle is a trough of steel plate, usually closed in at the top. It has guides formed on the upper edges fitted to take guide-blocks on the gun. The cradle contains the buffer-cylinder, which is fixed to a horn projecting downwards from the breech of the gun, and recoils with it; the piston-rod is fixed to the front of the cradle. The running-up springs are usually coiled round the buffer-cylinder, and, on recoil, are compressed between a shoulder on the front end of the cylinder and the rear plate of the cradle.

The cradle is mounted on a vertical pivot set in a saddle pivoted on horizontal trunnions between the sides of the trail (Krupp) ; or, as in the earlier Ehrhardt equipments, the vertical pivot is set in the axletree itself, which has then to turn when the gun is elevated or depressed. The Krupp cradle is shown in the drawing of the German gun.

The buffer consists of a steel cylinder nearly filled with oil or glycerine. In this cylinder works a piston with piston-rod attached to the carriage; the cylinder is attached to the gun. On recoil the piston is drawn from one end of the cylinder to the other, so that the liquid is forced to flow past the piston. The friction thus caused gradually absorbs the recoil of the gun and brings it gently to a standstill. As the gun recoils the centre of gravity of the gun and carriage shifts to the rear, reducing the stability. The buffer- resistance has to be gradually reduced proportionately to the reduced

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Plate III.

Fig. 6o.™ BRITISH 18-PR. QUICK-FIRING GUN.

Fig. 61.— BRITISH 18-PR. QUICK-FIRING GUN AND LIMBER.

Fig. 62.— FRENCH 75-MM. QUICK-FIRING GUN AND WAGON BODY IN ACTION.

Plate IV.

ORDNANCE

Fig. 67.— EHRHARDT 47-IN. QUICK-FIRING FIELD HOWITZER (CONTROLLED RECOIL).

Fig 68— KRUPP 7-5-CM. MOUNTAIN GUN.

stability. To allow the liquid to flow past the piston, grooves (called ports) are formed in the sides of the cylinder, and by varying the depth of the grooves at different points the resistance can be adjusted as required.

Running-up Gear. — In compressed-air equipments a separate piston is attached to the gun, working in a cylinder on the carriage connected with a reservoir of air at a pressure of about 300 lb to the square inch. This gear is much lighter than the springs, but the difficulty of keeping the piston and gland tight is a serious objection to it, although this difficulty is partly overcome by filling the cylinder with glycerine so that the air has nc direct access to the piston or the gland. In spring equipments the principal difficulty lies in providing a sufficient length of recoil without undue compression of the column of springs. Thus if the spring column be 6 ft. long and the gun recoils 43 ft. the springs are compressed into a space of 1 1 ft., or a quarter of their working length. This treatment is liable to crush the springs. German gun-makers get over this difficulty by the use of very high-class springs made of steel having a tenacity of about 140 tons to the square inch with an elastic limit of 90 tons. They also use a valve in the buffer piston which relieves the springs of resistance in running-up, and so allows slighter springs to be used. But in England the telescopic spring-case patented by the Elswick Ordnance Company is preferred. Suppose that the spring-columns before firing are each 4 ft. long ; then if the telescopic gear be pulled out for a distance of 4 ft. on recoil, each spring column will be compressed to 2 ft., or only to half its length. Tensile running- up springs are used by some firms, as Cockerill of Seraing (Liege). They are open to the objection that if a spring breaks the gun is for the time being rendered useless, which is not the case with compression springs.

The intermediate carriage is used chiefly in equipments with buffer above the gun ; it serves as a means of connecting the cradle to the lower carriage. When the spade is fixed in the ground it is impossible to shift the carriage laterally in order to correct the aim, the intermediate carriage is therefore pivoted so that it can traverse laterally about 3 degrees each way. Instead of using an intermediate carriage the direction may be given to the gun by shifting the whole carriage sideways along the axle in an arc about the point of the trail,

which is fixed by the spade. This system is used in guns of French manufacture and in the 1902 Russian gun. It is simple in action, but requires the shield to be cut away on either side to clear the wheels at extreme traverse.

The trail is either a drawn steel tube, of circular section as in the 18 pr., or of closed U section as in the Ehrhardt carriages, or else a box trail built up of sheet steel. In the Krupp equipments the trail is bent downwards to give a greater range of elevation to the gun.

Elevating Gear, in order to save space, is usually of the telescopic screw pattern, in which one screw is inside the other so that the two pack into half the length of a single screw. The spade is of the shape shown in the illustration of the 18 pr. Q.F. gun. For equip- ments which may have to be used on rock, such as the Swiss gun, the spade is made to fold upwards when desired. The axletree is usually a hollow steel forging with the ends tapered to receive the wheels. The wheels are of wood, with naves of stamped steel. Steel wheels have been tried but are less elastic than wood and have been found unsuitable. England and the United States use 4 ft. 8 in. wheels; most European nations use wheels 4 ft. 3 J in. in diameter.'

The shield is made of hard steel, from 0-12 to 0-236 in. thick. The size and thickness of the shield are limited by considerations of weight. Thus if 150 lb of weight be available this will provide a shield about 5 ft. square and 35 mm. or 0-138 in. thick, proof against rifle bullets at distances over 600 yds., and against shrapnel bullets at all distances. The present tendency, since the introduction of the French D bullet and German S bullet (see Ammunition: Bullet), is to make shields thicker than this, 5 mm. or 0-2 in. being the usual thickness.

Recent Developments of the Q.F. Gun-Carriage. — The principle of " differential " recoil gear is as follows: Suppose an ordinary Q.F. field gun held in the recoil position by a catch, loaded, released and allowed to fly forward under the action of the running-up springs. A valve in the buffer relieves the gun of any resistance to running-up. While in rapid motion forward the gun is fired by a tripper which catches the firing lever. The gun then returns to the recoil position and is again held by the catch. On firing, the recoil-velocity is reduced by the amount of the forward velocity previously imparted to the gun. Thus if the ordinary recoil-velocity of a Q.F. gun be 30 fs., and if it be fired while running up at a velocity of 10 fs., the recoil-velocity with respect to the carriage will be only 20 fs. And since the recoil-energy is proportional to the weight of the gun multiplied by the square of the recoil-velocity, the recoil-energy is reduced in the proportion of

900 to 400, or roughly by one-half. This halves the overturning stress on the carriage, and renders it possible to make the gun and carriage lighter for the same power, or to obtain greater power for. the same weight. This increase of efficiency is due to the fact that the whole of the recoil-energy is not, as in ordinary Q.F. guns, absorbed by the friction in the buffer, but that part of it is stored up and used to counteract the recoil of the next round. If the hydraulic buffer be dispensed with, and the whole of the recoil taken on the springs or compressed air gear,

the overturning stress is reduced to one-fourth of its normal amount. One practical difficulty in the way of applying the differential system to field guns lies in the vibration and slight lateral motion of the carriage during running-up. Since this motion takes place after laying and before firing, it is liable to cause inaccuracy. The only equipment on this principle as yet in use is the French 1907 mountain gun referred to below.

" Semi-automatic " Q.F. field and mountain guns are made by the leading firms, but have not been generally introduced. In these equipments the breech is thrown open by tripping gear during the run-up, and the cartridge case is ejected. When the gun is reloaded the action of introducing the cartridge releases the breech-block, which is closed by a spring. In the Krupp semi-automatic gun the breech-block is set vertically to facilitate loading. This equipment is capable of firing thirty rounds per minute. The principal advantage of the semi-automatic system lies not in the increased rate of fire but in the fact that three gunners are sufficient to carry out the service of the gun. This is of importance in mountain equipments, where the size of the shield is limited.

The introduction of airships into military operations has pro- duced the anti-airship gun, which differs from the ordinary field gun in almost every respect. The attack of airships presents special problems. High elevation, higher even than the howitzer's, may have to be given, and, unlike the howitzer, the airship gun must be a high-velocity weapon, both ranging power and flatness of tra- jectory being essential. As regards the shell, to bring down a gas- bag, or even to kill a crew, with time shrapnel is difficult, owing to the speed of the airship and the difficulty of observing bursts. Direct hits with ordinary shell are equally hard to obtain, unless the balloon is stationary and the range known. Even if such a hit were got, the ordinary fuse would not act on encountering the slight resistance of the balloon envelope. As regards the equipment, the absorption of recoil at high elevations presents difficulties, the exaggeration of the angle of sight makes the

sighting arrangements complicated, and rapidity in changing the line of fire is essential. The most powerful equipment that, in June 1910, had been constructed to meet these conditions was the Krupp 75 mm., which is mounted on a motor lorry, the weight of the equipment and carriage, without gunners, being about 4I tons. The equipment is constructed on the differential recoil principle, with rear trunnions on the cradle. The shell is a 12 lb H.E., fitted with a highly sensitive fuse and con- taining, beside the H.E. burster, a quantity of composition which gives off a trail of smoke to facilitate ranging.

The British 18-pr. Q.F. Field Gun {1905) (see Plate III., figs. 60 and 61 ; also Artillery, Plate II.). — Taking fig. 60 from the top, we see the buffer, telescopic spring-case and springs on top of the cradle, the buffer being attached to the horn projecting upwards from the breech. The cradle, of bronze, surrounds the gun, and is pivoted on horizontal trunnions on the upper carriage. The gun recoils in the cradle on the guide ribs, which extend for its whole length. The upper carriage is pivoted vertically on the trail and is traversed by the handle seen below the breech. The long elevating screw is formed as a telescopic screw at its lower end to avoid any downward projection; the screw does not turn, but the nut at bottom raises the gun, screw and sights for laying, while the nut at top raises and lowers the gun alone for giving elevation. The tubular trail supports the brake-arms, which also carry the seats for the layer and elevating number. The spade and traversing hand- spike are seen at the end of the trail. The telescopic sight is on the left of the gun. The shield is curved well back to give as much protection as possible to the detachment. The lower portion of the shield is hinged and folds up for travelling.

The French Q.F. Field Gun {1898) (fig. 62, Plate III.; see also Artillery, Plate II.). — This is a powerful gun, of unusual length, namely 36 calibres. The breech mechanism is of the eccentric screw type (see Part I. of thisarticle). The gun has compressed-air running- up gear and traverses along the axletree. The carriage is anchored by a trail spade and two brake-blocks which are arranged so as to go under the wheels, forming dragshoes, on firing. This method of anchoring causes some delay on coming into action and considerable delay in changing on to a fresh target. The gun has a goniometric sight with independent line of sight. The body of the ammunition wagon is tilted alongside the gun, and, with its armoured bottom and steel doors, forms a good protection for the gunners supplying ammunition.

The German Q.F. Field Gun (1906) (fig. 63). — This is the 1896 gun remounted on a Q.F. carriage. It is not a powerful gun, the ballistics being the same as those of the British 15-pr. B.L. of 1893. It has a

single-motion wedge breech action. The gun is mounted on a cradle with buffer and springs under the gun ; the cradle traverses on a vertical pivot set in a traversing bed which turns about the axletree. The gun has an arc sight with prismatic telescope and a clinometer mounted on it, and a circular laying-plane for laying on an auxiliary mark. It has not the independent line of sight. The shield is in three pieces, the top flap folding down for travelling. The carriage stands perfectly steady on discharge.

The Russian Q.F. Field Gun {1903) is intended as an improvement on the French gun, being of even greater power. Springs are used for running-up instead of compressed air. To ensure steadiness the gun is kept very low on the carriage ; this is effected by the use of

a cranked axletree. The gun has not the independent line of sight, but has a panorama sight. It traverses on the axletree.

The Danish Q.F. Field Gun (fig. 64, Plate IV.) is a good example of the heavier or more powerful type of Krupp field gun. The gun may be seen supported on the cradle, which contains the hydraulic buffer and running-up springs. The wedge breech-block is open.

j Horse Artillery Guns. — A horse artillery gun must be mobile I enough to accompany cavalry. This is secured partly by the I adoption of a light type of gun, partly by carrying the gunners on J horseback instead of on the carriage. It is considered that the weight behind the team should not exceed 30 cwt. The Germans I have declined to introduce a special type of light gun, as they

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Redrawn from Bethell’s Modern Guns and Gunnery.

Fig. 63— The German Q.F. Gun. C. 96. n./A. (1906).

The arc sight with panorama telescope is seen behind the shield, which is curved backwards for better protection. The seats for the

gunners who lay and attend to the breech are on either side of the trail. At the point of the trail are the spade, the traversing lever and the trail eye by which the gun is limbered up.

The American Q.F. Field Gun. — This is an example of the Ehrhardt type of gun. It is considerably more powerful than the field guns adopted by most European powers. Steadiness is ensured by making the trail I0j ft. long, or if ft. longer than the Krupp trail. The construction is otherwise very similar to that of the Krupp gun shown in fig. 64, Plate IV. Four rounds are carried in tubes on the carriage.

Other Q.F. Equipments. — These closely resemble the standard types of their makers,, as given in the above table of field guns. The Swiss and Dutch guns are light Krupps; the Spanish and Portuguese guns, by Schneider of Creus6t, are improved and lighter models of the French gun.

The new Italian gun is a medium Krupp. The Austrian gun is similar to the American (Ehrhardt) but the gun itself is of bronze. •

object to the complication entailed by the supply of two natures of ammunition on the battlefield. The H.A. guns of other nations are merely lighter and less powerful editions of their field guns.

The Q.F. Field Howitzer. — A field howitzer is a gun capable of throwing a shell weighing 35 to 45 lb at high angles of elevation, and light enough to manoeuvre at a trot across open country. The permissible weight of the equipment is but slightly greater than that ofa field gun. The object of the howitzer is to throw a heavy shell with an angle of descent of not less than 25 , so as to destroy overhead cover with high-explosive shell, and to search entrench- ments and reach gunners behind their gun-shields with shrapnel. Effect is obtained, not by the striking velocity of the shell, but by the amount of its high-explosive burster, or, in the case of shrapnel fire, by the use of a large driving charge in the base of the shell which gives the necessary forward and downward velocity to the bullets.

Since the muzzle energy of a howitzer is limited by the weight of the equipment, the heavy shell can only be fired with a low velocity,

Fig. 65. — Rumanian (Krupp) Quick-Firing Field Gun.

The Rumanian Q.F. field gun (fig. 65) is a recent type of medium Krupp gun. The shield is set well back, and has a hood projecting forwards and fitting close to the gun. The brake is used for travelling only; the brake- wheel is seen in front of the shield. The panorama

telescope is mounted on top of the arc sight; no foresight is used. There are no axletree seats, the gunners being carried on the gun limber and wagon limber. The wagon body (fig. 66) is tipped beside the gun in action.

usually not exceeding 1000 ft. per second. And in order to secure a steep angle of descent at short ranges this velocity is still further reduced by using half and quarter charges.

The construction of the howitzer is much the same as that of a gun. The calibre is usually between 4-3 and 4-7 in., and the length does not much exceed 12 calibres. Case ammunition is used, and the breech action is similar to that of a Q.F. gun. Howitzers are usually provided with shields in order to enable them to come into

action in the open when necessary. At short ranges, with full charge, they make very powerful guns.

Construction of the Carriage. — The gun-recoil system is used as in a gun equipment. There is however one important difference. If the recoil allowed be sufficient to keep the carriage steady at low elevations, then when fired at an elevation of 45 ° the breech will strike the ground. This may be to some extent avoided by placing the trunnions of the cradle which supports the howitzer at the extreme rear end, so that when elevated the breech of the howitzer is not brought any nearer the ground (Krupp). One objection to this is that the forward preponderance of the howitzer has to be balanced by a spring to enable it to be elevated.

A second method is known as controlled recoil. The buffer-liquid, on recoil, has to pass through holes in the piston. The access of the buffer-liquid to these holes is controlled by a disk valve rotated by rifled grooves in the cylinder. By connecting the piston-rod to the carriage so as to rotate the piston when the gun is elevated, the area of the holes exposed by the disk valve can be decreased at high elevations so as to shorten the recoil. This is known as the Vavasseur-Ehrhardt control valve. Messrs Cockerill use a channel through which the liquid is forced on recoil, which is partly closed by a stop- cock connected to the left trunnion when the howitzer is elevated. The running-up springs require to be strong in order to lift the weight of

the howitzer at 45° elevation. In most equipments twin columns of springs are used.

The Ehrhardt Q.F. Field Howitzer, fig. 67 (Plate IV.), may be taken as a type of the light field howitzer with controlled recoil, as opposed

Fig. 66. — Wagon Body, Rumanian (Krupp) Quick-firing Field Gun.

to the Krupp pattern with rear trunnions and constant long recoil. The howitzer is represented immediately after firing, before it has run up. The recoil is automatically shortened so that when fired at this high elevation the buffer, which is seen under the breech, does not strike the ground. The sights are on the bar which passes through the shield. The calibre is 4-7 in.: the howitzer fires a 46 lb shell with M.V. 985 f.s., and weighs 25 cwt. in action with shield.

The Q.F. Mountain Gun. — A mountain gun has the same tactical duties to fulfil as a field gun. It is merely a field gun sufficiently mobile for mountain transport. Its weight and dimensions are restricted by the following considerations: (1) The whole equip- ment has to be carried on pack animals. (2) The average load for a battery mule is about 280 lb, including 65 lb of saddle and equip- ment. A few specially selected gun-mules can carry about 40 lb more, or 320 lb. In Spain and Italy, where exceptionally fine mules are available, some of the mountain battery loads amount to 375 ft). (3) The loads must be short, the length being limited by that of the neck of a mule. If possible no part of the equipment should be more than 4′ 6″ long. (4) The equipment must, therefore, be subdivided into component parts such that no part weighs more than 320—65 or 255 lb, and these parts must be so designed as to be quickly as- sembled. (5) The number of parts into which the equipment may be subdivided is either four or five. British mountain batteries have five gun and carriage mules, and yet they come into action and fire the first round within one minute. Other nations mostly divide the equipment into four parts only, and use rather heavier loads than is in England considered consistent with activity on a hillside,. (6) Mountain guns are usually provided with shafts to enable them to be drawn instead of being carried when travelling along a road.

On a 5-mule basis the total weight of gun and carriage carried amounts to ioj cwt. or more than half the weight of a field gun. But the power obtainable is not commensurate, being in practice limited by the weight of the gun itself, which is restricted by the carrying power of the transport animals. In B.L. mountain equip-

ments this difficulty has been got over by carrying the gun in two parts, which are screwed together on coming into action.

In the British service the. 7 pr. R.M.L. of 400 ft>, the original ” screw gun,” was superseded in 1900 by the 10 pr. B.L., also in two pieces. A quick-firing mountain gun has since been introduced

(I907)- .

In modern mountain equipments, such as the Schneider-Danglis gun adopted by Russia, the gun is not divided across the bore but is lightened for transport by removing the breech-piece and breech-block, which are carried separately. These guns fire a shell of 14-3 ft) with M.V. of 1 100 f.s.

When the gun is in one piece, the equipment naturally divides itself into four parts, namely the gun, cradle, trail and axletree and wheels. When a long jointed trail is used, as in the Krupp Q.F. mountain equipment, the point of the trail is carried with the wheels, which form a light load. In addition to this the folding shield with ammunition forms a fifth load. The shield need not, however, be brought up till after the gun has opened fire.

Since the length of a mountain gun in one piece may not exceed 4 ft. 6 in., the calibre has to be comparatively large to get the neces- sary power, and is usually 75 mm. or 3 in. The weight may not exceed 255 lb. A short breech action such as the swinging block or the eccentric screw is preferred. The sights must be of simple pattern; the independent line of sight is too complicated for moun- tain work. But it is most desirable that the sight-socket should be capable of being cross-levelled to eliminate the error introduced by difference of level of wheels. Except in the French gun, the recoil gear and running-up springs are similar to those used in Q.F. field guns. In the Krupp mountain equip- ment the gun does not slide directly on the cradle guides, but a steel forging called a sleigh is inter- posed. This forms a sliding cover to the cradle, and protects the guides. On coming into action the gun is dropped into the sleigh and secured by a keyed lug. The trail of a Q.F. mountain gun has to be from 6 ft. to 7 ft. long to keep the gun steady. It is either carried in two pieces(Krupp)or is hinged and folded (Ehrhardt). The spade is similar to that used with field guns. The wheels are of wood, about 3 ft. in diameter. The elevating gear is a plain screw. The gun and cradle traverse on a vertical pivot about 3 degrees each way. A shield high enough to protect the gunners kneeling weighs up to 1 cwt., and is carried in two pieces.

The Krupp mountain gun, fig. 68 (Plate IV.), may be taken as an example of ordinary practice. The gun is seen mounted on the sleigh, which slides to the rear on the cradle when the gun recoils. The cradle is pivoted vertically on a saddle mounted on horizontal trunnions between the trail brackets; the rearward extension of the saddle forms the traversing bed and is supported by the elevating screw. The foresight and arc sight are attached to the cradle. Near the middle of the 7-ft. trail are seen the seats for the laying_ and loading numbers. The trail is divided immediately in rear of the seats. The calibre is 2-95 in., the gun fires a shell weighing 1 1 ft> 10 oz. with a muzzle velocity of 920 f.s. The weight in action is 820 lb, without shield.

The French 1907 mountain gun differs markedly from other types in that the carriage is constructed with differential recoil gear as described above. There is no hydraulic buffer, and the whole of the recoil-energy is absorbed by the springs. The gun is held in the recoil position by a catch, and when loaded and released it is fired automatically by a tripper on the cradle. The calibre is 2-65 in., and the shell weighs 11 lb 10 oz.

Authorities. — H. A. Bethell, Modern Guns and Gunnery (Wool- wich, 1907, 3rd edition, 1910); Kenyon, FA. Material on the Con- tinent (R.A. Institution, Woolwich, 1905); Greenhill, “The Dynamics of Gun Recoil,” The Engineer (23rd August 1907); Roskoten, Die heutige Feldartillerie (Berlin, 1909); Rohne, Progris de Vartillerie de campagne moderne (Paris, 1906), Challeat, Theorie des affilts d deformation (Paris, 1906), Siacci, Balistique exterieure; Witzleben, Feldgeschutzfrage in Portugal (Dresden, 1906) ; Castner, ” Development of Recoil Apparatus,” Journal U S Artillery (1904) ; and Der Erfolg des standigen Rohrrucklaufs bei Feldhaubitzen (Frauenfeld, 1906) ; v. Reichenau, Munitionsausriistung (Berlin, I 9°5) 1 Shrapnels et boucliers and L’Obusier de campagne moderne (Lucerne, 1906) , Bahn, Die Entwieklung der Rohrrucklauf- Feld- haubitze (Berlin, 1907). (H. A. B.)

III. Heavy Field and Siege Equipments

Heavy Field Batteries. — Since the days of Gujrat and Inker- mann the value of heavy metal in the field has been recognized, at all events in theory, but it was mainly due to the South African war that ” heavy ” batteries have become a component part of modern armies. Guns heavier than field guns have formfcc part of the equipment of the Indiaa army for many years.

but they have existed for a specific purpose, and ordnance originally designed for quite other functions has, from the exigencies of war, been occasionally utilized in the field, as was the case in South Africa and Manchuria, but the heavy field battery as we know it to-day is a new military product. Its r61e is an extensive one, as it embraces many of the functions of ordinary field guns as well as some of those usually attributed to light siege pieces. In the heavy field armaments of the Powers as they stand at the present time will be found guns, howitzers and mortars, and projectiles that vary from 50 lb to more than five times that weight, and no boundary line can be assigned which will separate these field equipments from those of the light units of a siege train It will be convenient to consider in turn the three natures of ordnance (guns, howitzers and mortars) employed and to quote some typical instances of each kind

The United States 60 pr. Gun. — This gun and its equipment are of modern type (1904) Its general appearance is shown in figs. 69 Quas and 70, Plate V. The calibre is 4-7”; the charge 5-94 lb

of smokeless powder and the muzzle velocity developed is 1700 f.s, Fixed ammunition is employed, and with an elevation of 15° the range is 7600 yds The weight of the equipment limbered up is given as 71 £ cwt. : it is known as a siege gun

In its general aspect the carriage resembles a field carriage, but of stronger type, with a special arrangement of cradle.

In fig. 71 two sections are given; the cradle, it will be seen, consists of three cylinders (seen in section in the upper figure) which

From Lieut. -Colonel Ormond M. Lissak’s Ordnance and Gunnery. Fig. 71. — Diagram of 47-in. Siege Gun, U.S.A. b, Traversing bracket, r, Rails. x, Axle.

p, Pintle bearing. s, Spring cylinders, y, Pintle yoke.

sue bound together by broad steel bands; the two outer cylinders carry rails r upon which the gun slides in recoil. The centre cylinder contains the hydraulic gear for checking recoil, the two outer contain the running-up springs s. These springs are arranged in three con- centric columns, the front end of each outer column being con- nected to the rear end of the next inner column by a steel tube, flanged

outwardly at the front end and inwardly at the rear end. A rod carrying a head which acts on the inner coil only passes through the centre of the cylinder and is fixed to a yoke that is Connected with a lug at the breech of the gun. The flanged tubes thus convey the pressure from the innermost coil to the next outer coil and finally to the outermost coil, so that in each cylinder the ■springs work in tandem and have a long stroke with short assembled length. It is thus seen the recoil takes place partially on the carriage and only a portion of the energy remains to tend to cause movement in the mounting.

The cradle is supported by trunnions in the casting y, which is itself seated in the casting p, which forms a bearing for it. This bearing is mounted between the front ends of the trail brackets, its rear end embracing the hollow axle *. Attached to the lower surface of y is the traversing bracket b, which extends to the rear under the axle and forms a support for the traversing shaft t and for the elevating mechanism.

For travelling (Plate V., fig. 69) the gun .is withdrawn to the rear and the breech is attached to a holding-down arrangement about the middle of the trail. A spade is hinged at the point of the trail.

The British. 60 pr. Gun. — This is known as a heavy battery gun; its calibre is 5*, its length 32 calibres, its weight 39 cwt.; its charge is 9ˆ m of cordite, its muzzle velocity 2080 f.s. and its effective shrapnel range 10,000 yds. The weight behind the team is 106 cwts., 3 qrs.

The German 10 cm. Gun is called a heavy battery gun ; its calibre is 4”, its effective shrapnel range is 5750 yds., but common shell can be used up to 11,000 yds. The organization is a six-gun battery, but a platform has always to be used.

A howitzer is a comparatively light piece that fires a comparatively heavy shell with a comparatively low muzzle velocity, and changes in range are effected sometimes by alteration of charge „ as well as of elevation. On the continent of Europe Howltzers – howitzers are more popular than guns for heavy field batteries and light siege units.

The French 15 cm. {Rimailho) Howitzer.— This piece is at the present time very popular in France, where, in 1907, some 120 bat- teries of the field army were said to be armed with it. It came into being from the conversion of an old pattern siege howitzer and its adaptation to a new form of carriage, according- to the plans of Commandant Rimailho. The gun {canon de 155 R) is a short piece, made of steel, with a calibre of 6-i”; the shell weighs about 94 lb and has an effective

range of 7000 yds. The breech opens auto- matically after each round and a rapidity of fire of from 4 to 5 rounds a minute is claimed. The howitzer is supported On two trunnions near its rear end so that the weight pivots about a point near the breech, with the result that the latter remains nearly 5 ft. above the ground level at all angles of elevation ; space is thus left for recoil, which is checked by a buffer, the construction of which is a secret ; running-out springs are provided to return the gun to the firing position. The piece recoils in a cradle to which is attached the elevation scale, but the elevating gear is independent of the carriage proper; the line of sight is also independent. The howitzer has a special transporting carriage, but it can be placed on its firing carriage, it is said, in two minutes. The weight behind the teams is in each case about 47 cwt. On a war footing three ammunition wagons per howitzer would be provided.

The German 75 cm. Howitzer. — The Germans also possess a 15 cm. howitzer of modern type; its rate of fire is 2 to 3 rounds a minute; its shell is 87! lb in weight and the weight behind the team is about 53 cwt.

The British 6″ B.L. Howitzer. — This piece is made of steel, it weighs 30 cwt., its shell weighs 122 lb and has an effective range of 7000 yds. The weight behind the team is 85 cwt.

Fig. 72 shows the howitzer and cradle A mounted on the travelling carriage, from which it can be fired up to an angle of 35°: in fig. 73

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Fig. 72. — Diagram of British 6-in. B.L. Howitzer.

the wheels have been removed, the trail B has been lowered on to the pivot plate C and secured to a pivot plug screwed into the plate : to the trail is fitted the top carriage D, and when the howitzer and cradle are thus mounted 70° elevation can be given. The howitzer recoils through the cradle, in which are two hydraulic buffers side by side, fig. 74, whose piston rods E are attached to the howitzer so that the recoil of the latter draws the pistons J to the rear. Consider now, in fig. 74, the right buffer only ; forged in one piece with the piston and piston rod is a tail rod F of larger diameter than the piston rod, and in the front of the cylinder is an annular bronze casting G, called a floating piston, which bears against the rear of the springs. On discharge, the howitzer slides along the cradle to the rear, the piston rod E is drawn out of the cylinder and the tail rod F is drawn in, and from its larger diameter causes a pressure of oil against the floating

piston G, which slides forward and compresses the springs which are prevented moving by the rods H. The action is the same in each buffer. After recoil the springs expand and return the howitzer into the firing position.

The floating pistons are tapered slightly inside towards the front to prevent violence in the running out action. The elevating gear, which can be placed on the left side of either the trail or the top carriage, actuates the arc K, bolted to the left side of the cradle. When the gun is fired on wheels (fig. 72) an anchorage buffer M, attached to the platform, checks the recoil, whilst the springs with which it is provided cause the carriage to return to its position.

The United States 6″ Howitzer. — This is a more modern equipment, its date being 1905. The howitzer is a short piece, 13 calibres long; it fires a 120-lb shell with a muzzle velocity of 900 f.s. It has an

Fig. 73. — Diagram of British 6-in. B.L. Howitzer (70 elevation).

extreme elevation of 45 ° and an effective range of 7000 yds. The weight behind the team is 7oJ cwt. The carriage is of peculiar construction (fig. 75). The howitzer is supported under its cradle, which is carried on trunnions seated in the top carriage. The cradle consists of three cylinders generally similar in arrangement and in functions to those described for the 4-7″ 60 pr. gun: the howitzer is made in a single forging and carries a lug on its breech end for the attachment of the recoil piston rod and the yoke for the rods of the spring cylinders; flanged rails are formed on its upper surface, which support it on its cradle. The top carriage rests on a framework called a ” pintle bearing.” Flanges in the former engage under clips in the latter; the pintle bearing is riveted to the front part of the trail brackets, and forms a turn-table upon which the top carriage and all supported by it have a movement of 3 traverse on either side.

This movement of traverse is effected by a shaft and worm: the former is supported in a fixture attached to the left trail bracket, and the latter works in a nut pivoted to the top carriage.

Elevation is effected by a forging called the rocker. The rear part of the latter is U-shaped and passes under the gun, being

Fig. 74. — Hydraulic buffers of British 6-in. B.L. Howitzer. (N.B. — Spiral, instead of volute springs, are now used.)

attached to the cradle by a pivoted hook k. From either side of the U arms extend which embrace the cradle trunnions between the cradle and the cheeks of the top carriage so that the rocker can rotate about the cradle trunnions. The elevating gear is supported in lugs on the under side of the top carriage, while the upper end of the elevating screw is attached to the bottom of the rocker. The rocker thus moves in elevation in the top carriage and gives elevation to the cradle, and therefore to the gun, by means of the pivoted hook above referred to.

The brackets of the trail extend separately to the rear, sufficiently providing for free movements of recoil at any elevation; they are then joined by transoms and top and bottom plates and terminate

xx. 8

in a detachable spade which is secured to the top of the trail in travelling. The axle is of special shape to admit of the movements of the cradle; it is lower in the middle than at the sides and is made in three parts, held together by shrinkage in cylinders formed in the sides of the pintle bearing.

A peculiarity of this carriage is that recoil is automatically shortened as elevation increases. Thus the length of recoil is 50 at angles of firing from g° to 0°, from 0° to 25° the 50″ is gradually reduced to 28”, which is not changed for higher angles. This is effected as follows: Four apertures are made in the piston of the recoil cylinder and there are two longitudinal throttling grooves in the walls of the cylinder. All apertures being open and deepest part of grooves in use would correspond to a 50″ recoil; apertures closed and grooves alone at work would mean a 28″ recoil. A rotating disk with apertures similar and similarly placed to those on the piston is carried by the piston rod and rests against the front of the piston, and is actuated during recoil by two lugs pro jecting into helical guide slots cut in the walls of the recoil cylinder. The latter is mounted so as to be capable of rotation in the cradle, and its outer surface carries teeth which engage with similar teeth in a ring surrounding the right spring cylinder. When the elevation is between 0° and 25 these latter teeth engage in special gearing which is seated in the hollow trunnion of the cradle and is attached to the right cheek of the top carriage. The buffer conditions are thus made to correspond with the elevation.

The mortar is a short piece of ordnance that is always fired from a

bed. Changes in range are usually effected by varying Mortars. the charge.

United States 3-6″ Mortar. — This equipment is not modern; the piece was intended for vertical fire against troops in entrenchments ; the mortar weighs 245 lb, and its bed, which is made in a single casting of steel, 300 ft. The latter rests in action on a wooden plat- form and is held down by ropes and pickets.

The German 8-4″ Mortar.— This equipment is perhaps the heaviest field equipment existing. The mortar in action weighs about 4-9 tons; it has to be transported in a special vehicle and can only be fired from a platform; four hours are required for bringing it into action. Two platform wagons are attached to each mortar, weighing respectively 2-9 and 4-9 tons. The equipment can be moved at a walk on good roads, but two companies of infantry are always attached for haulage in case of need. A battery consists of 4 mortars, and 160 rounds are carried. The shell weighs 250 lb and carries a heavy charge of high explosive, with or without delay action fuze.

A special equipment designed by Messrs Krupp is shown in Plate vi., figs. 76 and 77. It is a mobile mounting for an 8-26″ mortar with constant long recoil, which is fired, like a howitzer, from its travelling carriage without a platform. This equipment weighs about 5 tons in action.

All the foregoing equipments may be considered mobile; that is to say, the batteries in which they are organized are self-contained, can move from place to place without external assistance, and may be employed on either field or siege duties. Their uses may be summed up as follows: The first object of the heavy artillery accompanying an army is to demolish the barrier forts or other frontier fortifications of a permanent nature in order to enable the army to penetrate into the enemy’s country. After this has been done, a small portion of this artillery will be employed in connexion with the siege of fortresses, while another, by far the more con- siderable portion, will accompany the advance of the field army.

Heavy Siege Units. — When a serious siege has to be under- taken it is necessary to organize one or more siege trains in addition to the troops of the field army. Both heavy and light siege units enter into the composition of a siege train. As to the armament of the latter, we have said that it is not -p. exactly distinguishable from that of heavy field batteries, :@” and it has already been described. That of the former is less definite. Heavy siege units are seldom mobile in the

sense that light siege units are: the ordnance comprising the former has usually to be transported by some special means; thus it might be conveyed by ordinary rail or ship to some place from which special siege railways would admit of its conveyance to its place in battery, and probably great variety of calibre and mounting would exist. For example, during the siege of Sevastopol a civil engineer, Robert Mallet (1810-1881), designed a 36″ mortar; it did not, how- ever, reach the seat of war; and in 1904 the Japanese made use of their ii-i” coast howitzers at Port Arthur. At the siege manoeuvres in France in 1906 the heavy siege units were repre- sented by their 6-i” gun and their 10-7″ howitzer. The official British pieces are a 6″ gun and a 9-4″ howitzer. Generally speaking, whereas the most suitable armament of the light units can as a rule be foreseen, that of the heavy would depend very much on circumstances.

{GARRISON MOUNTINGS

The French 10-7″ Howitzer. — As a typical piece the 10-7″ howitzer may be taken, which the French transported by special horse draught, as it was found too heavy for the type of siege railway made use of at the mock siege of Langres in 1907. Its total equip- ment weighs 22 tons and it is transported in four components, namely, the piece, the carriage, the slide and the platform. A battery of six pieces would thus require, exclusive of ammunition

From Lieut.-Colonel Ormond M. Lissak’s Ordnance and Gunnery.

Fig. 75. — Diagram of 6-in. Siege Howitzer, U.S.A. b, Hand-wheel actuating wheel k, Hook, 1, 2, 3, 4 and

brakes. e, Elevating hand-wheel. h. Handle.

5 me-

chanism for loading position. Elevating screw. Traversing wheel.

transport, 24 vehicles that would weigh 130 tons. The howitzer was designed originally for coast defence) it weighs about 5! tons and its bed weighed b\ tons: to this equipment was added a slide and a platform, consisting of a thick plate of iron upon which the slide moves. The platform is provided with a pivot upon which the front part of the slide fits. The latter consists of an iron frame- work, having

lateral movement around the aforesaid pivot; its rear portion is provided with rollers to facilitate its movement on the platform. Its upper portion consists of two inclined rails along which the bed or carriage of the howitzer slides. To check recoil a

hydraulic buffer is attached to the front of the slide and also to the bed.

The fighting units of siege artillery in the British service are companies and brigades; each company would be armed with from 4 to 6 light siege pieces or from 2 to 4 heavy pieces. A com- pany is usually a major's command. Three such companies would form a siege brigade under a lieutenant-colonel. If a siege train of any magnitude were organized it might be necessary to combine two or more brigades into a division under a colonel or brigadier. In the French service each siege train consists of three divi- sions. A division is divided into groups and comprises some 50 pieces of ord- nance, heavy and light. (J. R. J. J.)

IV. Garrison Mountings

The armament of modern coast fronts consists of (a) heavy B .L. guns, g" and upwards; (b) medium guns, 4″ and upwards, and © light Q.F. guns; all these being for direct fire; and (d) guns, howitzers or mortars of various calibres for high angle fire. Typical guns of type (a) are the Krupp 12″ gun and the British 9-2 B.L. gun. The Krupp 12″ gun is built up of crucible cast nickel steel, not wire wound. It is 45 calibres long and has the Krupp wedge-shaped breech- closing apparatus. It is fitted with a repeating trip lock. The cartridge is a metallic case containing a charge of 290 lb of tubular powder. The projectiles are of two weights, 770 lb and 980 lb, and the respective muzzle velocities are 3025 f.s. and 2700 f.s. The British 9-2 B.L. gun is of wire-wound construction and is over 48 calibres long. It has the asbestos pad and Welin screw system of obturation, and its charge of 103 lb of cordite, contained in a cartridge of silk cloth, fires a 380 lb projectile with a muzzle velocity of 2643 f-s- A typical gun of class (6) is the British 6″ mark VII. It is similar in construction and breech mechanism to the last-named and fires a 100 lb projectile with a charge of 23 lb cordite, giving a muzzle velocity of 2493 f.s. A typical gun of class © is the British 12 pr. Q.F.; its weight is 12 cwt., it is made of steel, is 10-3 calibres long, and with a cordite charge of 1 lb 15 oz. it fires a projectile i2§ lb in weight with a muzzle velocity of 2197 f.s. and a possible rate of 15 aimed rounds a minute. A typical piece of class {d) is the n" Krupp howitzer. It is 12 calibres long, has a charge of 285 lb smokeless powder and fires steel shell weighing 470 lb or 760 lb. It is

provided with a shrapnel shell of the former weight which contains 1880 bullets.

The methods of mounting of coast ordnance are many; space only permits of referring to certain typical arrangements.

I . The Moncrieff Principle. — The disappearing carriage originated, at all events in England, with Colonel Sir A. Moncrieff, who, about l864,_ proposed to utilize the energy of recoil to bring a gun into a protected position and at the same time to .

store up sufficient energy to raise it to a firing position when a PP ea ” n X loading was completed. To effect this a heavy counter- ”””””” weight was so adjusted that its tendency was to raise the ngs ‘ gun; when the latter was fired, it raised the counterweight and a ratchet and pawl followed the action up: when the pawl was re- leased the counterweight brought the gun back to the firing position ; this application of the principle had many drawbacks, and never had any success with guns over 7 tons in weight. It was not until Moncrieff invented the hydropneumatic appliances that any real progress was made. In 1888 was introduced into the British service the first of a large group of disappearing mountings for guns of types (a) and (b), where the energy of recoil was absorbed chiefly by forcing a iarge volume of liquid through a narrow opening or recoil valve, and also by further compressing a large volume of already highly compressed air; when recoil was completed the recoil valve closed and the air was retained at very high pressure: the energy thus stored up returned the gun to the firing position. The action will be understood from the following example.

The British 6″ B.L. Gun on TI.P. Mounting, Mark IV. — Fig. 78 shows a general view of the mounting; fig. 79 is a vertical and

Fig. 78.— British 6″ B.L. Gun on H.P. Mounting, Mark IV.

fig. 80 a transverse section through the recoil cylinder. The gun trunnions (fig. 78) are supported by the two arms of the elevator A, which is pivoted to the front of the lower carriage at B. The breech is supported by the two elevating bars C whose lower ends are attached to the elevating arcs D. These arcs are worked by the elevating gear

actuated by the hand-wheel E. The arcs are struck with the bars C as radii, their centres being points at the upper end of the bars when the gun is in the loading position. Elevation can thus be given to the gun whilst it is being loaded. The lower carriage rests on a ring of live rollers G, which are free to traverse round on a circular racer H, motion being given by traversing gear actuated by the hand-wheel I. Supported by vertical stanchions attached to the lower carriage is a horizontal circular shield J through which the gun rises to the firing position. The manganese bronze ram F which is attached to the elevators A by the cross-head L is forced on recoil into the central chamber of the recoil cylinder (see fig. 79), which is supported by trunnions M resting in the brackets of the lower carriage. There are ten chambers N (figs. 79 and 80), all of which are connected at the bottom with the recoil valve chamber O, and consequently with each other. Nine of these contain liquid in their lower portions and highly compressed air above, and are connected at the top by a channel P to equalize the

f>ressure in each chamber. The tenth chamber N', which is situated owest in the cylinder, contains liquid alone and has at its upper end the raising valve Q. On recoil the liquid in the central chamber is forced by the ram through the recoil valve R into the outer chambers N, thus further compressing the air. As R is a non-return valve the air is maintained in this highly compressed state during loading. The gun is raised by pushing the lever S (fig. 78) to the front which actuates the rack T (fig. 79), thus opening Q, which allows the air in the nine chambers to force liquid from the tenth chamber N' into the centre ram chamber, lifting the ram. U is a pump (fig. 79) by which the gun can be pumped down at drill. The liquid employed in the buffer is a mixture of methylated spirits, mineral oil, distilled water and carbonate of soda, and its aeration, due to the churning it receives on recoil, is a serious drawback to this class of mounting. From a 6″ B.L. gun mounted in this fashion somewhat more than one aimed round a minute can be obtained; from a <)-i" B.L. about four such rounds in five minutes.

The foregoing description is now, however, principally interesting as showing an ingenious application of mechanical principles for military purposes. Mountings of this type are being gradually withdrawn from the British service.

Tlie Buffington-Crozier Principle.— -In the United States a type of disappearing carriage known as the Buffington-Crozier (fig. 81) is used. Here, as in the earlier types of Moncrieff carriage, a counter-weight is employed, but the energy of recoil is partly absorbed by a

buffer, and the counterweight, which is constrained by guides to move vertically up and down, is just able to raise the gun to the

firing position . A satisfactory rate of fire is claim sd for this mounting, which has recently been improved.

Balanced Pillar. — Another type of disappearing mount- ing for guns of type \b~) or ©, known as the balanced pillar, is found on the continent ot Europe and in the United States, where it is used for 5″ guns and under. A long steel cylinder, which supports the gun and its carriage, has a vertical movement of about 3! ft. in an outer cylinder. The inner cylinder and all that it carries is balanced by a counterweight. After the gun is fired it can be brought with its length parallel to the parapet. Then by the action of the mechanism the inner cylinder can be made to sink

Fig. 79. — Vertical Section through Recoil Cylinder of Gun shown in fig. 78.

Fig. 80. — Transverse Sec- tion through Recoil Cylinder of Gun shown in fig. 78.

in the outer cylinder and the gun is brought down to the loading position; the release of the counterweight will cause it to rise again. The gun has the usual motion of traverse round the common axis of the two cylinders.

The heavy gun cupola is found on the continent of Europe in the armaments of various Powers for guns of type (a), the German

Fig. 8i. — Buffington-Crozier Disappearing Carriage for 10*

Practice being occasionally to mount two 1 1 ” guns in the same cupola, ‘he cast-iron cupola was introduced by Gruson of Magdeburg, Cuoolas k ut n ‘ c kel stee ‘ * s now generally employed by Krupp. * In Gruson’s design the gun and mounting are placed upon a turn-table upon which also rest the bases of a series of cast- iron plates; these are very massive, are curvilinear in section, and are built up into a shallow dome which completely covers the mountings as with a cap : the whole structure turns together, being traversed round a central

pivot. The chase of the gun emerges through a port which admits of the necessary play of elevation. A notable example of a cupola was erected at Spezzia containing two 120-ton Krupp guns, the structure complete weighing 2050 tons. A Krupp cupola of chilled cast-iron for two 28-cm. (11”) is shown in fig. 82. These are designed principally for coast defence in low sites. The cupola, which is built up like a Gruson cupola of several heavy iron masses, is revolved and the guns laid by hydraulic power.

A heavy chilled cast-iron collar protects the under side of the armoured structure and the working mechanism of the guns. Fig. 83,

Plate VI., represents a Krupp mounting for an 1 1 -2 ” howitzer, with a cupola-like shield. This is worked both electrically and by hand. Vertical fire from a weapon of this type is sufficiently powerful to penetrate the protective deck of a vessel. Light and medium guns, types (b) and ©, are some- times mounted in cupolas, especially on land fronts (see below) , and disappearing cupolas have also been proposed for them: in the latter the whole structure is made to sink by the action of mechanism till the top of the cupola is level with the ground. Types and further de- tails will be found in the article Fortifi- cation and Siege- craft. Mountings of the barbette type are much favoured in the British service for guns of types (a) and (b) : one of the most B _ r6e « e modern is shown in fig. 84, where a 9-2″ B.L. gun, Mark X., is placed upon a Mark V. mounting, a combination which admits of over five aimed rounds in two minutes.

The British g-2″ B.L. Gun.— Fig. 84 shows a general view of the mounting, fig. 85 a longitudinal section through the cradle on a larger scale. The gun, which is trunnionless, carries a cross-head A and recoils in the cradle C, being supported by its guides D, which slide in longitudinal grooves in the cradle. To this cross-head is attached the buffer cylinder B (see fig. 85) which recoils with the gun, while the piston rod L is attached to the front of the cradle: engaging with the buffer cylinder and in the same axial line is a bronze casting containing two air chambers F and G : the casting is attached to the rear of the cradle, which is supported by trunnions E in the lower carriage. Thus on firing, the gun carries the buffer

B.L. .Gun, U.S.A.

mount- ings.

Fig. 82. — Krupp Cupola for two 28-cm. Guns.

ORDNANCE

Plate V.

Fig. 69.~4.7-IN. SIEGE GUN, TRAVELLING POSITION (U.S.A.).

From Lieut—Col. Ormond M. Lissak's Ordnance and Gunnery.

Fig. 70.— 4-7-IN. SIEGE GUN, IN ACTION (U.S.A.).

Plate VL

ORDNANCE

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Fig. 83.— KRUPP ii-2-IN. HOWITZER AND SHIELD.

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Fig. 76.— KRUPP 8-26-IN. MORTAR, TRAVELLING.

Fig. 77.— KRDPP 8-26-IN. MORTAR, FIRING POSITION.

Fig. 88.ˆKRUPP 3-4-IN. AUTOMATIC GUN.

From photographs by Friedrich Krupp A. G., Essen/Ruhr.

GARRISON MOUNTINGS]

ORDNANCE

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Fig. 84. — British 9-2″ B.L. Gun, Mark X., on Barbette Mounting,

cylinder backwards with it, draws it off its piston rod L and forces it into the air chamber F. The air in the chambers F and G is at a high initial tension and, on recoil, the air in F is further compressed and forced through the valve H into the chamber G. At the con- clusion of

recoil the air expands and forces the buffer cylinder to the front, which carries with it the gun into its loading position; but the valve H closes and the air has to make its way through a narrow hole before it can act on the end of the buffer, thus preventing violent action, which is further guarded against by the ” control ram ” M which is bolted into the rear end of the buffer. To prevent leakage of air between the air chamber and the buffer at the gland K the packing employed is a viscous liquid which is in communication by means of the pipe J with the intensifier I. The latter consists of a cylinder containing a piston and rod free to move: the front face of this piston is subject to the pressure of the air in the air chamber, the rear face is in communication with the liquid in the gland. Now, as the piston head is held in position by the pressures on either side of it, and as the effective area of the front face is greater than that of the rear — on account of the rod — the liquid pressure per square inch of the fluid in the gland, &c, must be greater than that of the air in the air chamber, hence the latter cannot escape through the former. The pressure in the chambers F and G is adjusted on preparing for action by an air pump worked by hand. The energy of recoil is further utilized as follows: hydraulic cylinders called compressors are held in the cradle, and in them work rams connected with the cross-head A (see fig. 85) : they are

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Fig. 85. — Details of Mounting shown in fig. 84.

also connected with a hydraulic accumulator (not shown) which can be placed in any convenient position in the work, and the power thus stored up be employed for raising the projectiles, for which purpose two lifts are provided. One of these (W) is in the floor of the emplacement, the other (W) is attached to and moves with the mounting. Underneath and suspended from the circular gun plat-

form RR, which forms a shield, is an overhead railway QQ, on which run trollies, each taking a projectile. The projectiles are stored in the recess shown in section at O. By means of a shell barrow any projectile can be placed on the lift W and raised to a trolley which can be run round over the lift W, which raises the projectile, as shown at

S, to a point suitable for loading.

The British 6″ B.L. Gun. — A typical mounting for guns of type (b) is afforded by the British C.P. (central pivot), Mark II. mounting for the 6″ B.L. Mark VII. gun, a combination which admits of six rounds a minute aimed fire. Fig. 86 shows a side elevation of the mounting with half the shield removed; fig. 87 a longitudinal section of part of the cradle through the axis of the buffer. The gun, which is trunnionless, recoils in the cradle A; the latter con- tains a buffer B and two cylindrical boxes containing springs S. Attached to the breech of the gun is a piston rod C with piston D, the latter having an opening or ” port ” E, through which the oil passes on recoil, the pressure in the buffer, which would otherwise vary with the velocity of the recoil, being kept constant by the variation in the area of aperture afforded by E. This area is governed by the action of the valve key strip F of varying section, which is inserted in the buffer in such a way that as the gun recoils the port E is constrained to pass over it. On recoil the rods J, which are attached to the gun in rear and screwed into the flanged cylinder H in front, force back the front of the springs S, whose rear ends butt up against the rear of the spring boxes. After recoil the springs return the gun to the firing position. To check the violence of this action a control ram G is made use of : the piston rod has a cylindrical hole in front which, as the gun recoils, becomes filled with oil, and before the piston can come up against the front of the buffer this oil has to be displaced by the thrust of the ram G which checks the forward movement of the gun. The cradle A rests on its trunnions in seatings in the lower carriage and is elevated or depressed by the gear K’. The last-named drives the elevating arc L, which is attached to the cradle at M, the axis of the gun moving parallel to the axis of the cradle. In fig. 86 the lower carriage is almost entirely hidden by the gears carried on it, namely, the elevating gear K, the traversing gear N, which works a spur pinion, gearing into the rack O attached to the pedestal P: the elevation indicators Q and R for record- ing the angle of elevation of the gun and the bracket S’ which support the 6″ armour plate T. The weight of the lower carriage, cradle and gun is taken by a horizontal ring of hard steel balls resting on the top of a massive forged steel ” pivot ” U, the lower portion of which is shown supported in the cast-iron pedestal. The elevation indicator consists of a sector Q bolted to the cradle trunnions; to its edge is attached a metal tape, the

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WQKf

Fig. 86. Fig. 86.— British Mark II. Barbette Mounting for 6″ B.L. Gun. Fig. 87. — Longitudinal Section of Part of Cradle of Gun shown in fig. 13, through Axis of Buffer.

ether end of which is fixed to the spindle supporting a pointer, reading angles of elevation on the drum R. As the gun elevates the tape is paid out, the slack being taken in and the pointer re- volved by the action of a clock spring. 1 The mounting carries an automatic sight (see Sights, Gun Sights).

The British 12-pr. Q.F. Gun. — A typical mounting for guns of class © is the British pedestal mounting for the 12-pr. Q.F. gun. This mounting consists of a cradle, a pivot, a pedestal and holdfast. The cradle is a gunmetal casting, provided with trunnions that rest in bearings on the pivot; the gun recoils in the upper portion of the cradle and the lower part of the latter is bored at the rear for an hydraulic buffer and at the front for a running-out spring. The pivot is of steel, is fork-shaped at the top end, where are the trunnion bearings for the cradle; its lower end is conical and fits Into bushes in the pedestal, where it is free to revolve but is pre- vented from lifting by a holding-down screw. 2 The pedestal is bolted down to the platform. The gun has a shoulder-piece and it can be trained and elevated by the layer. It has also an automatic sight.

A typical Krupp mounting of this kind is shown in fig. 88, Plate VI., which represents an 8-8-cm. (3′4″) automatic gun firing, it is stated, 40 aimed rounds in the minute.

The United States 12″ Mortar. — A typical mounting for pieces of class (d) is afforded by the United States mounting, model of 1896, for the 12” B.L. mortar. The piece is mounted in a top carriage or saddle consisting of two arms connected by a heavy web. This saddle is hinged on a heavy bolt ?nd is connected to the “front of the turntable (fig. 89). The saddle inclines to the rear and upwards at an angle of 45 , the upper ends forming trunnion bearings: it is supported at a point about one-third of its length from the bolt or fulcrum by five columns of double springs arranged in a row, side by side. The recoil is checked by two hydraulic cylinders, one on each side, the pistons of

which are attached to the saddle near the trunnions of the piece. When the mortar is fired the saddle revolves about its fulcrum to the rear and downwards, carrying the mortar and compressing the spring columns until the action is stopped by the hydraulic buffers ; the springs then assert themselves and return the piece to the firing position. The mortar must always be brought horizontal for loading.

1 The elevation indicators are now read on a plate provided with a spiral groove, which guides a stud on the reader along the scale of graduations.

2 In a later mark there is no holding-down screw for pivot

The fighting units of coast artillery in the British service are the fire command, the battery command and the group. The limits of a fire command are governed by the possibility of efficient surveil- lance and control that can be exercised by an individual, and these limits vary much from time to time. Usually a number of forts or emplacements are included in a fire command. The fire command is broken up into battery commands, in every one of which it must be possible for its commander actually to take charge of the guns therein contained in all phases of action. The battery command is divided up into gun groups, each consisting of one or more pieces of like calibre, nature and shooting qualities. As a' rule a fire commander is a field officer, a battery commander a major or a captain, a gun group commander a subaltern or senior N.C. officer. In connexion with coast artillery range-finders (q.v.) and electric lights (see Coast Defence) are installed and electric communications established for the chain of command. (J. R. J. J.)

V. Naval Guns and Gunnery

In dealing with naval guns and gunnery, we shall take the British navy as the basis. At the close of the 19th and at the beginning of the 20th century it appeared that a type of British battleship (see Ship) had been evolved which was stable as regards disposition of armament, and that further advance would consist merely in greater efficiency of individual guns, in improvements of armour rendering possible the protection of greater areas, and in changes of engine and boiler design resulting in higher speeds. The " Majestic," " Glory," " Ex- mouth," " London " and " Bulwark " classes differed from each other only in such details, all of them subordinate to the main raison d'Ure of the battleship, i.e. the number and nature of the guns which she carries.

The strength and disposition of the armaments of the ships of these

classes were identical except in small details (see fig. 90). In every case the main armament consisted of a pair of 12- in. guns forward and a pair aft, each pair enclosed in a hooded barbette, which was more commonly designated a turret. The turrets were on the midship line, and the guns in each com- manded an arc of fire of 240 , i.e. from right ahead to 30 abaft the beam on either side in the case of the fore turret, and from

astern to 30 before either beam in the case of the after turret. The secondary armament, consisting of twelve 6-in. guns, was also symmetrically disposed. Two guns on either side (four in the ” Majestic ” class) were mounted with arcs of fire of from 6o°

capacity which were to kill and demoralize his personnel, pierce his funnels, destroy any navigational or sighting appliances which were exposed, set his woodwork on fire and render extinc- tion of the fires impossible, and by piercing or bursting on

wmmmm

Fig. 89.— 12″ B.L. Mortar, Model 1896, U.S.A.

before to 6o° abaft the beam, while two guns each side forward and two aft (one forward and one aft in the ” Majestic ” class) fired through similar arcs to the turret guns, ‘but on their own sides only. Four of these 6-in. guns were mounted on either side of the main deck and two on either side of the upper deck, all being enclosed in casemates.

In the armoured and large protected cruisers built contempor- aneously with these classes of battleships, the 9- 2-in. gun had been largely mounted, and it was the improvements brought about by practical experience in the rate and accuracy of fire of this gun that suggested its adoption in battleships to replace the whole or a part of the 6-in. armament. During the period in which the battleships referred to above were constructed, the idea of the

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Dreadnought

Lord Nelson”

London

Fig. 90. — Diagrams showing Disposition of Armament in Typical Ships.

functions of the respective divisions of the armament was that the 12-in. guns were to injure the enemy’s vitals by piercing his armour with armour-piercing shot or shell, while the business of the 6-in. guns was to cover him with a hail of shells of large

unarmoured portions of his side diminish his reserve of buoyancy and so impair his sea-going qualities.

These ideas were gradually losing favour; it was realized that the damage done by an armour-piercing shot, whether or not it hit and pierced armour, was limited to its own path, while that done by an armour-piercing shell striking an un- armoured portion of the ship’s side was inconsiderable as com- pared with that effected by a common shell of the same calibre. Further, the area of side, by piercing which an armour-piercing projectile would reach any portion of the propelling machinery or magazines of an enemy, was so small compared with the whole exposed area of his side and upper works that it was scarcely advantageous to fire at it projectiles, the effectiveness of which, if they struck another portion of the enemy, was small in com- parison with that of other projectiles which might equally well be fired from the same gun. Again, the lessons of practical experience showed that ships might be and were defeated by shell fire alone, while their armour remained unpierced, and propelling machinery and magazines intact.

All these considerations led to the conclusion that it was to intensity of shell-fire, and especially to the fire of large capacity and high explosive shell, that attention should be directed. At the same time, while the rate of fire of the 6-in. guns, to which great attention had been paid, remained stationary or nearly so, the rate of fire of the 9-2 in. and 12-in. guns had considerably improved, and their ballistic powers rendered possible more accurate firing at long ranges than could be effected with the 6-in. guns. The explosive effect of a shell is said to vary as the square of the weight of its bursting charge. The bursting charge, with shell of the same type, bears a constant proportion to the weight of the shell. Now the weight of the 12-in.

shell is 850 lb, that of the g-2-in. 380 lb, that of the 6-in. 100 lb. Hence it would require fourteen 6-in. shells to produce the same effect as one 9-2-in., and seventy-two to produce the same effect as one 12-in. shell, consequently the 6-in. gun to produce the same shell effect as the 12-in. or 9-2-in. gun must fire 72 times, or 14 times, respectively, faster. The rate of fire of guns in action depends upon a variety of conditions, an important one being that of smoke interference, which tends to reduce the maximum rate of fire of the smaller guns nearer to that practicable with the heavier guns, but the rate of fire of the three guns in question,

under battle conditions, is in the approximate proportions of i: 1-5: 4, which would thus produce a shell effect (supposing the hits made by each type of gun to bear a fixed proportion to the rounds fired), in the proportions of 72: 22: 4, for the 12-in., 9-2-in. and 6-in. guns respectively. This argument of course takes no account of the probably greater effect produced by the dispersion of the larger number of hits of the smaller gun over the exposed area of the target, nor, on the other hand, does it take account of the greater armour-piercing power of the 12-in. shell which would have the result that a larger proportion of the hits from the smaller gun would be defeated by the enemy's armour, and so prove innocuous.

The shell effect forms a strong argument for the weight avail- able for the heavy gun armament of a ship being disposed of in the form only of the heaviest gun available. Another strong argument is that deduced from the fact already stated, that, as the calibre of the gun increases, its ballistic powers enable accurate shooting to be made at a Jpnger range.

The accuracy of a gun at any range depends mainly, for practical naval purposes, on what is known as the " dangerous space," or the limit within which the range must be known in order that a target of a given height may be struck. Again, the dangerous space at any range depends upon the remaining velocity of the projectile at that range, which, as between guns of different calibres but with the same initial muzzle velocity, is greater, the greater the calibre of the gun and weight of projectile, the advantage possessed by the larger gun in this respect being much increased at great ranges. As a practical example,

for a target 30 ft. high at a range of 8000 yds., the dangerous spaces of modern 12-in., (p-2-in. and 6-in. guns, which do not differ greatly in muzzle velocity, are 75, 65 and 40 yds. respectively. At whatever range a naval action is to be fought, it is evident that there must be a period during which .the enemy is within the practical 12-in. gun range, and outside the practical 6-in. gun range, and that during this period the weight allotted to 6-in. guns will be wasted, and this at the outset of an action, when it is more important than at any time during its progress to inflict damage on the enemy as a means of preventing him from inflicting damage on ourselves. But if all the weight available be allotted to 12-in. guns, the whole of the armament which will bear on the enemy will come into action at the same time, and that the earliest, and consequently most advantageous, time possible. This train of argument led to the substitution of o-2-in. guns in the 8 " King Edward VII." class (the first of which was completed in 1905) for the upper deck 6-in. guns, and eventually in the " Lord Nelson " and " Agamemnon " (com- pleted in 1008) to the abolition of the 6-in. armament, which was replaced by ten 9-2-in. guns.

At the beginning of the present century the subject of " fire control " began to receive considerable attention, and a short statement is necessary of the causes which render essential an accurate and reliable system of controlling the fire of a ship if hits are to be made at long range. In the first place, even with the 12-in. gun, the range must be known with considerable nicety for a ship to be hit. At a target 30 ft. high, at 8000 yds., for example, the range on the sights must be correct within 75 yds. or the shot will fall over or short of the target. No range- finder has yet proved itself reliable, under service conditions, to such a degree, and even if one were found, it could not be relied upon to do more than place the first shot in fair proximity tc the target. The reason for this lies in the distinction which must be drawn between the distance of a target and its " gun range," or, in other words, the distance to which the sights must be adjusted in order that the target may be hit.

This gun range varies with many conditions, foremost among which are the wear of the gun, the temperature of the cordite, the force and direction of the wind and other atmospheric conditions. It can only be ascertained with certainty by a process of " trial and error," using the gun itself. The error, or distance which a shot falls short of or beyond the target, can be estimated with a greater approach to accuracy the greater the height of the observer. It is the 1 process of forming this estimate

which is termed " spotting," a duty the performance of which calls for

the exercise of the most accurate judgment on the part of the " spotter," and which requires much practice in order that efficiency may be secured. In practice, the first shot is fired with the sights adjusted for the distance of the target given by the range-finder, corrected as far as is practicable for the various con- ditions affecting the gun range. The first shot is spotted, and the result of the spotting observations governs the adjustment of the sights for the next shot, which is spotted in its turn, and the sights are readjusted until the target is hit. From this time onwards it is (in theory) only necessary to apply the change in range, due to the movements of our own ship and of the enemy, for the interval between successive shots, in order to continue hitting. This change of range, which may be considerable (e.g. 1000 yds. per minute in the extreme case of ships approaching each other directly, and each steaming at the rate of 15 knots), is in practice extremely difficult to estimate correctly, and the spotting is consequently continued in order to rectify errors in estimating the rate of change in range. For various reasons the " gun range " which has been referred to is not the same for different natures of guns. This is mainly on account of the difference in the height attained by their projectiles in the course of their respective trajectories. While it is possible, by careful calibration (i.e. the firing from the several guns of carefully aimed rounds at a fixed target with known range and under favourable conditions for practice), to make the shots from all guns of the same nature fall in very close proximity to each other when the sights of all are similarly adjusted, it has not been found possible in practice to achieve this result with guns of different natures. Consequently guns of each nature must be spotted for independently, and it is obvious that this adds considerably to the elaboration and complication of the fire control system.

This constitutes one of the reasons for the adoption of the uniform armament in the " Dreadnought " and her successors; another important reason lies in the fact that with the weight available for the heavy gun armament disposed of in a small number of very large guns, a greater proportion of these guns can be mounted on the midship line, and consequently be avail- able for fire on either side of the ship (see fig. 90) . Thus in the " Dreadnought," eight of her ten 12-in. guns can bear through a considerable arc on either beam, while in the " Lord Nelson," although all her four 12-in. guns can bear on either beam, half at least of her 9-2-in. armament (i.e. that half on the opposite side to the enemy) will be at any moment out of bearing, and consequently be for the time a useless weight. The same principle of a uniform armament of 12-in. guns has been adopted in the " Invincible " type, the only large cruisers designed since the inception of the

“Dreadnought.” Thus the 12-in. gun forms the sole heavy gun armament of all battleships and large cruisers of the ” Dreadnought ” era. The gun so carried is known as the Mark X., it is 45 calibres in length, and fires a projectile weighing 850 lb with a charge of cordite of 260 lb, resulting in a muzzle velocity of 2700 ft. per second. The Mark XI. gun was designed to be mounted in the later ” Dreadnoughts.” Following the same line of development as resulted in the Mark X. gun, it is longer, heavier, fires an increased charge of cordite, and has a higher muzzle velocity, viz. of 2960 ft. per second. This gun appears to mark the climax of development along the present lines, since the price to be paid in greater weight, length and diminished durability of rifling is out of all proportion to the small increase in muzzle velocity. Further developments would therefore be looked for in some other direction, such as the adoption either of a new form of propellant or of a gun of larger calibre. A modern gun of 10-in. calibre is found in the battle- ships ” Triumph ” and ” Swiftsure.” The next gun in importance to the 12-in. is the 9‘2-in., which forms part of the armament of the ” Lord Nelson ” and ” King Edward VII.” classes of battle- ships, and the principal armament of all armoured cruisers (ex- cepting the ” County ” class) antecedent to the ” Invincibles.” The latest gun of this calibre has developed from earlier types in a similar manner to the 12-in., that is to say, it has experienced a gradual increase in length, weight, and weight of charge, with

From a drawing supplied by Messrs. Vickers, Sons & Maxim.

A,

Roller ring.

K,

B,

Gun slide.

L,

c,

Recoil buffer.

N,

D,

Gun cradle.

Pi,

G,

Rammer.

P2,

H,

Loading cage.

Elevating presses. Guide rail for loading cage. Trunk cage.

Breech block in open position. Breech operating hand wheel.

power, and a douche of water or blast of air, or a combination of both, removes any smouldering fragments of cordite or cartridge material before a fresh round is loaded.

Although there is little difference in principle between the arrangements of the mountings in the later ” Majesties ” and those in the ” Dreadnought,” improvements in detail have enabled the interval between successive rounds to be reduced from about 55 seconds in the former case to 25 or 30 seconds in the latter.

In the turrets containing o-2-in. and 7-5-in, guns, which exist in most British armoured and first-class protected cruisers, the moving weights are, of course, not so large, and, as might be expected, the assistance of hydraulic machinery is not necessary in so many operations. A drawing of a typical o-2-in. gun and mounting is shown in fig. 92.

Training the turret and elevating the guns are, however, in all cases performed by hydraulic power, as is the raising of the pro- jectiles to their place on the loading tray in rear of the gun, but the breech is opened and closed, and the charge and projectile rammed home, by hand power only, while the gun, after recoil, is forced out again to its firing position by means of springs. A ready supply of thirty-two projectiles is stowed in a ” shell carrier,” which is a circular trough running on rollers round the turret, but independently of it. When a projectile is required to be loaded into the gun, the shell carrier is

rotated until the required projectile is under a hatch in rear of the gun, when the projectile is raised by a hydraulic press on to a swinging loading tray. It is intended that the shell carrier shall be replenished direct from the shell-room during the pauses of an engagement. A new type of 9-2-in. mounting has been installed in the " Lord Nelson " and " Agamemnon," in which greater use is made .of hydraulic power with a view to improving rapidity of fire. In this mounting, each- projectile is brought up from the shell- room as it is required, and the loading operations are performed by hydraulic power instead of by hand.

The " King Edward VII." class of battleships and " Duke of Edinburgh " class of cruisers are the last ships in which any 6-in. guns have been mounted, and with the exception of the 7-5-in. guns in the " Triumph " and " Swiftsure," these are the largest guns which are worked entirely by hand. Other hand- worked guns are

Fig. 91,— Diagram of 12-in. Gun Mounting, " Dreadnought " type.

Ri, Transferring rammer pro- jectiles from trunk cage to gun-loading cage.

R2, Transferring rammer for powder charges from trunk cage to gun-loading cage.

Rs, Transferring chamber.

R4, Training rack.

R 5 , Training engine.

S, Rotating trunk.

T, Turntable.

W, Casing for chain rammer.

the 4-in. and 12-pounder, which are mounted in small cruisers and destroyers.

_ The principles of the 6-in., 4-in. and 12-pounder mountings are similar. The rear part of the gun is partially enclosed in a metal cradle, which carries the recoil cylinder and running out spring box. The gun and cradle are balanced for elevation about trunnions on the cradle, which fit into trunnion bearings on the carriage. The latter carries the elevating and training gear, and the whole moving weight is borne by

a pivot pin which rotates on a ball bearing. The gun recoils in the line of fire, and the energy of recoil is absorbed by means of the recoil piston, whose rod is secured to the gun, passing over a valve key secured to the cradle, in such a way as to produce a channel of varying sectional area through which the liquid in the recoil cylinder must pass from one side of the piston to the other. Springs run the gun out again after firing into its original position. The breech is opened by the single motion of a hand lever. A ” bare ” charge is used in the 6-in. and 4-in. guns, with the de Bange type of obturation, while a brass cartridge case has been retained with the 12-pounder, as with the earlier Q.F. guns.

Firing is by electricity, percussion being available as an alternative if required, and the current is usually taken off the dynamo mains of the ship.

Sighting. — The great advances recently made in accuracy of fire have been rendered possible, to a very great extent, by the use of telescopic sighting apparatus. Arrangements are made in all modern sights for the bars or disks which carry the range graduations to be of considerable length or diameter respectively, in order that no difficulty may be found in adjusting the sights for every 25 or 50 yds. of range. In the larger hand-worked mountings, where the laying of the gun for elevation and for direction is effected by two men on opposite sides of the gun, the sights used by them are ” cross-connected, ” i.e. connected by rods and gearing to one another in such a way that, initial parallelism of the axes of the two telescopes having

a consequently increased muzzle velocity. The latest type, which is known as the Mark XI., and is mounted in the ” Lord Nelson ” and ” Agamemnon,” is 50 calibres in length, weighs 28 tons, and with a charge of cordite of 130 lb gives to a projectile of 380 lb a muzzle velocity of 2875 ft. per second. The 7-5 in. gun forms the secondary armament of the ” Triumph ” and ” Swiftsure,” and is mounted in the armoured cruisers of the ” Minotaur,” ” Duke of Edinburgh ” and ” Devonshire ” classes. The 6-in. gun, of which there are a very large number afloat in modern, though not the most recent, battleships, and in armoured and first and second class cruisers, is the largest gun which is worked by hand power alone. For this reason, and on

account of its rapidity of fire, it was for many years popular as an efficient weapon. It was evolved from the 6-in. 80-pounder B.L. gun, constructed at Elswick, which was the first breech- loader adopted by the Royal Navy, and whose development has culminated in the 6-in. Mark XI. gun of the " King Edward VII." class and contemporary cruisers, which fires a 100-lb projectile with a muzzle velocity of 2900 ft. per second. It has only now passed out of favour on account of its inferior hitting power at long range as compared with that of guns of larger calibre, and as a secondary armament of 6-in. guns is still being included in the latest battleship designs of more than one foreign navy — notably that of the Japanese, with their practical experi- ence of modern war at sea — its abandonment in the British Navy can scarcely be considered final. The 4-in. Q.F. gun is mounted in the third-class cruisers of the " P " class as their main armament, and an improved gun of this calibre, with muzzle velocity of about 2800 ft. per second, is mounted in the later " Dread- noughts," as their anti-torpedo-boat armament.

The increase in size of modern torpedo craft and the increased range of modern torpedoes has led to a reconsideration of the type of gun suitable for the protection of large ships against torpedo attack. The conditions under which the anti-torpedo- boat armament comes into play are the most unfavourable possible for accurate gun-fire. The target is a comparatively small one; it comes into view suddenly and unexpectedly; it is moving rapidly, and the interval during which the boat must be stopped, i.e. that between her being first sighted and her arrival at the distance at which she can expect to fire her torpedo with success, is in all probability a very short one. Moreover, in the great majority of cases the attack will be made at night, When the difficulties of rapid and correct adjustment of sights, and of range-finding and spotting, are intensified. Two require- ments then are paramount to be satisfied by the ideal anti- torpedo-boat gun: (1) it must have a low trajectory, so that its shooting will not be seriously affected by a small error in the range on the sights; (2) one hit from it must suffice to stop a hostile destroyer.

For many years it was considered that these requirements would be met by the 1 2-pounder, which was the anti-torpedo-boat gun for battleships from the " Majesties " to the " Dreadnought," the 1 2-pounders mounted in the " King Edwards " and the " Dreadnought " being of a longer and heavier type, giving a higher muzzle velocity. The introduction of a larger gun has, however, been considered desirable, and a 4-in. gun of new type is mounted in the later " Dreadnoughts," while in the older battleships and large cruisers with secondary armaments it is considered by many officers that the 6-in.

guns will prove to be the most effective weapon against torpedo craft. The gun armament of destroyers being required to answer much the same purpose as the anti-torpedo-boat armament of large ships, namely, to disable hostile torpedo craft, the type of gun used has followed a similar line of development.

Starting with 6-pounders in the first destroyers built, the majority of the new destroyers have a fixed armament consisting of one 1 2-pounder forward, and four 6-pounders. This armament has been changed in the larger destroyers to one of 1 2-pounders only, while the latest ocean-going destroyers have two 4-in. guns. Owing, however, to the strength of the decks of such craft being insufficient to withstand the stresses set up by the discharge of a gun giving very high muzzle velocity, the 4-in. gun for use in

light craft is one giving 2300 ft. per second muzzle velocity only and has a very long recoil. The 6-pounder and 3-pounder Q.F. guns are no longer being mounted as part of the armaments of modern ships. A very high rate of fire was attained in the ” semi-automatic ” mounting of the 3-pounder, which was last fitted in the ” Duke of Edinburgh ” class, but for reasons already given guns of this type are no longer required, and the 3-pounder is retained only as a boat gun for sub-calibre practice. _

All double-banked pulling boats and all steam-boats are fitted with arrangements for mounting one or two guns, according to the size of the boat; the object of the boat armaments being for use in river operations, for covering a landing, or in guard- boats. Three descriptions of gun are used, the 1 2-pounder 8 cwt. and 3-pounder, light Q.F. guns, and the Maxim rifle-calibre machine gun.

Gun-Mountings. — Gun mountings in the British navy may be divided broadly into two classes, power-worked and hand- worked mountings. The former class includes the mountings of guns of all calibres mounted in turrets or barbettes, also of o-2-in. guns mounted behind shields; the latter class includes mountings of guns of all sizes up to the 7‘5-in. which are mounted in batteries, casemates or behind shields.

Hydraulic power has been adopted almost universally in the British navy for power-worked mountings, although electricity has been experimented with, and has been largely applied in some foreign navies. The principal advantages of hydraulic, as compared with electric, power are its comparative noiselessness and reliability, and the ease with which defects can be diagnosed and rectified. On the

other hand, electric power is more easily transmitted, and is already installed in all ships for working electric light and other machinery, whereas hydraulic power, when used, is generally installed for the purpose of working the guns only. The 12-in. guns in the ” Majestic ” class, following the practice with the earliest heavy B.L. guns, were loaded normally at extreme elevation of 13I , and the turret had to be trained to the fore and aft line and locked there for each occasion of loading. An alternative loading position was also provided, in which the guns could be loaded at 1° of elevation and with the turret trained in any direction. Loading in the alternative position could, however, only be continued until the limited supply of projectiles which could be stowed in the turret was exhausted. Experience showed that a greater rapidity of fire could be obtained by the use of this ” all round ” loading position, as it was termed, and in the latest ships of the ” Majestic ” class, and in subsequent battleships, the fixed loading position has been abandoned.

The details of recent 12-in. mountings vary considerably, a drawing of one of the most recent being shown in fig. 91, for which thanks are due to Messrs Vickers, Sons & Maxim, but in the majority of cases there is a ” working chamber ” revolving with the turret. A fixed ammunition hoist brings the shell and cartridges from shell- room and magazine respectively into the working chamber, where they are transferred to a cage which takes them up, by hydraulic power, to the rear of the gun. The gun is strapped by steel bands to a cradle (see fig. 91) which moves in and out along a slide on recoil, the gun always remaining parallel to the slide. Gun, slide and cradle are pivoted for elevation on trunnions carried in trunnion bearings fixed to the structure of the turret, and the whole moving weight is balanced with the gun in the ” run out ” position. The recoil of the gun on firing is taken up by a hydraulic press placed underneath the slide, and the gun is run out again into the firing position by hydraulic power. Loading is carried out by means of a hydraulic rammer, with the gun in the ” run out ” position, and at an angle of elevation which varies with different mountings. In the most recent mountings loading can be carried out with the gun at any elevation, thus affording considerably greater facility to the gun- layer for keeping his sights on the target during the process of loading, and so increasing the rate of fire by enabling the gun to be discharged immediately the loading operations are completed. Elevating is by hydraulic power, and is effected by cylinders placed underneath the slide, the pistons working on an arm projecting downwards. Turret turning engines are also hydraulic, and much attention has been given of late years to the perfection of elevating and turning gear such as will enable the turret or gun to

respond instantly to the wish of the gun-layer, and to move either with con- siderable rapidity, or very slowly and steadily as would be the case when following a target at long range and with but little motion on the ship. The breech is opened and closed by hand or by hydraulic

From a drawing supplied by Messrs Vickers, Sons & Maxim.

Fig. 92. — Diagram of a 9-2-im Gun and Mounting,

A, Roller ring. G, Elevating press.

B, „ Recoil buffer. H, ~

C, Gun cradle slide frame. K,

D, Loading tray. L,

E, Shell carrier. M,

F, Pressure water pivot pipes. Pi,

Shell-lifting press. Fixed armoured trunk. Radial shell-lifting crane. Axial powder hoist. Breech block.

Hogue ” Pt,

type. Breech operating

wheel. Training rack. Training engine. Turntable. Powder door.

hand

Ri, R 2 , T,

u,

been secured, the adjustments to one sight made by the sight- setter are simultaneously effected at the sight on the opposite of the gun.

In practice with the 6-in. and 4-in. guns, one man is responsible for the laying of the gun for direction, and has consequently only to think

about the coincidence of the vertical cross-wire with the target, while another man, who also fires, keeps the gun laid for elevation, and is responsible only for the coincidence of the target with the horizontal cross- wire. The 12-pounder has one sight only, one man being considered sufficient to keep the gun laid for elevation as well as for direction, and to fire. It is essential that the sights shall be unaffected by the recoil of the gun, so that they can be adjusted up to the moment of firing by the sight-setter, and that it shall not be necessary for the gun- layer to remove his eye from the telescope while the gun is being fired and reloaded. It is also essential that the sights shall move automatically in elevation and direction with the gun. These two requirements are easily met in the hand-worked mountings by the attachment of the sights to the cradle, which does not move on recoil, and remains constantly parallel to the gun; but in turret mountings the case is more complicated and involves greater complexity of gearing.

The older turret sighting arrangement consisted of two horizontal shafts, one for each gun, running across the turret, which were rotated by pinions gearing into racks underneath the gun-slides, the latter remaining of course always parallel to the guns. Pinions keyed to these shafts geared in their turn into racks formed on vertical sighting columns in the sighting positions, these columns, which carried the sighting telescopes, accordingly moving up and down with the guns.. With this arrangement an appreciable amount of backlash was found to be inevitable, owing to the play between the teeth of the several racks and pinions, and to the torsion of the •shafts, and the arrangement was also open to the objection that the telescopes were much exposed to possible injury from an enemy's fire. These defects have been very largely obviated by the " rocking motion sights," which have been fitted in the turrets of the latest British battleships and cruisers. In these sights a sight-bracket is secured to and rotates with the trunnion of the mounting; the sight-carrier and telescope move along the top of the sight-bracket, on a curved arc of which the trunnion is not the centre. When the sight is at zero, the telescope is parallel to the axis of the gun, while to adjust the sight, the sight-carrier with telescope is moved along the curved arc by means of a rack and pinion a distance corresponding

to the graduations shown on the range dial, which is concentric with the pinion.

Organization. — The organization of a large ship for action is necessarily highly elaborate. Among the officers, next to the captain, the most important duties are probably those of the fire control officer. He is in communication by telephone or voice tube with each

of the several units composing the ship's armament. This office is usually filled by the gunnery lieutenant. In the conning tower with the captain is the navigating officer, who attends to the course and speed of the ship, assisted by petty officers to work the wheel and engine-room telegraphs. The torpedo lieutenant, or another officer at the torpedo director, is also in the conning tower, prepared to fire the torpedoes if opportunity offers. Other officers of the military branch, and marine officers, are in charge of various sections of the " quarters."

The rate of advance in naval gunnery has been much accelerated since 1902. The construction of the " Dreadnought," which em- bodied a new principle both in nature and disposition of armament, the rise of the United States and Japanese navies to the first rank, and the practical experience of the Russo-Japanese war, were ali factors which contributed to the increase of the normal rate of advance due to progress in metallurgy and engineering science. In the British as well as in other navies, notably those of Germany, the United States and Japan, ever-increased attention is being devoted to the attainment of a rapid and accurate shell-fire, and large sums are being expended upon fire control instruments and elaborate aiming and sighting appliances. Size of armaments, power of guns, resistance of armour, efficiency of projectiles, and, above all, rapidity and accuracy of fire, all seem to be advancing with giant strides. But there are two important ingredients of naval gunnery which are not subject to change: the human factor, and the factor of the elements — wind, sea and weather. The latter ensures at any rate one datum point to the student of the science, that is, that the extreme range in action is limited by the maximum distance at which the enemy can be clearly seen, which may be considered to be a distance of 8000 to 10,000 yds. The permanence of the human factor assures that, however great the advance in material, and, provided that no great discrepancies exist in this respect between opposing navies, success at sea will be the lot of the nation whose officers are the coolest and most in- telligent, whose men are the best disciplined and best trained, and whose navy is in all respects the most imbued with the habits and traditions of the sea. (S. Fr.)

ORDOVICIAN SYSTEM, in geology, the group of strata which occur normally between the Cambrian below and the Silurian above; it is here regarded as including in ascending order the Arenig, Llandeilo, and Caradoc or Bala series {qq.v.). The name was introduced by C.

Lapworth in 1879 to embrace those rocks — well developed in the region formerly inhabited by the Ordovices — which had been classed by Sir R. Murchison as Lower Silurian and by A. Sedgwick in his Cambrian system. The term is convenient and well established, but Lower Silurian is still used by some authors. The line of demarcation between the Ordovician and the Cambrian is not sharply denned, and beds on the Tremadoc horizon of the Cambrian are placed by many writers at the base of the Ordovician, with good palaeonto- logical reasons.

The rocks of this system include all types of sedimentation; when they lie flat and undisturbed, as in the Baltic region and Russia, the sands and clays are as soft and incoherent as the similar rocks of Tertiary age in the south of England; where they have been subjected to powerful movements, as in Great Britain, they are represented by slates, greywackes, quartzites, chlorite-, actinolite- and garnet-schists, amphibolites and other products of metamorphism. In Europe the type of rock varies rapidly from point to point, limestones, shales, sandstones, current-bedded grits and conglomerates or their metamorphosed equivalents are all found within limited areas; but in northern Europe particularly the paucity of limestones is a noteworthy feature in contrast with the rocks of like age in the south, and still more with the Ordovician of North America, in which limestones are prevalent. In the Highlands of Scotland, in north-west England, in Wales and Ireland, there are enormous developments of contemporaneous lavas and tuffs and their metamorphosed representatives; tuffs occur also in Brittany, and lavas on a large scale in Nova Scotia and New Brunswick.

Distribution. — The Ordovician system is widely distributed. The accompanying map indicates roughly the relative positions of the principal land-masses and seas, but it must be accepted with reserve.

A study of the fossils appears to point to the existence of definite faunal regions or marine basins. The Ordovician rocks

waters, embracing China, Siberia and the Himalayas; con- cerning the last-named marine area not much is known. In the opposite direction, the Baltic basin may have communicated, through Greenland, with the North American and Arctic seas. Over central and eastern North America another large body of water probably lay, with open communications with the north and west, and with a more constricted connexion with the

Continent

Hypothetical Lantl & Sea~ari in the Early

Ordovician Period

‘■* Aftef F. Freeh 8t R. Rucdemarm

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Atlantic sea. The lagoonal character of some of the rocks of the Tunguska region of Siberia may perhaps be indicative of continental border conditions in that quarter.

Some of the principal subdivisions of the Ordovician rocks are enumerated in the table. Owing to the universal distribu- tion of the graptolites, the correlation of widely separated areas has been rendered possible wherever the muds and shales, in which their remains are preserved, are found. Where they are absent the correlation of the minor local subdivisions of distant deposits is more difficult. In Great Britain, through

Ordovician System. Ordovician Rocks: Generalized Correlation Table.

England

and Wales.

Graptolite Zones.

Scotland.

Scandinavia.

Bohemia.

N.-W. France.

W. Russia.

North American Continent.

New York.

Quebec.

Caradoc

or

Bala group.

Dicellograplus

anceps.

D. complanatus.

Pleurograpius

linearis.

Dicranograptus

clingani.

Hartfell Shales, Ardmillan Series,

and Lowther Shales.

Brachiopod beds, Trinucleus beds, and Leptaena limestone. Trinucleus limestone.

D5- D3.

Gres de May.

Calcaire de Rosan.

Borkholm

and

Lyckholm beds.

Wesenberg beds.

Richmond beds

and % Hudson river Shales. *£

a •

Lorraine beds. •§ u

n ■”

Utica Shale. a

Lowest m

Anticosti •*

limestone g

and -o

Hudson river “3

beds. 8″

O

n

Llandeilo group.

Coenograptus gracilis.

Didymograptus Murchisoni.

Glenkiln Shales

and

Barr Series.

Middle Graptolite beds and Ckasmops limestone. Cyslidean limestone.

D2. Diy.

Schistes des Gembloux

and ironstone.

Jewe, Itfer, and Kuckers beds.

Echinosphaerite limestone.

Trenton beds rt

and d

Galena limestone. .9 ”””*

f ft

Black river beds. 9 -,

l –

Lowville limestone. ˆ ea

Trenton id j

limestone. 6*3

PS

Coenograptus t3 “*•

Shales. g “©

1

(Lanvirn)

and

Arenig group.

Didymograptus bifidus.

Tetragraptus bryomdes.

Radiolarian

Cherts

and

Ballantrae Series.

Lower

Graptolite beds

and

Orlhoceras

limestone.

Dip.

Gres

Armoricain (part).

Vaginatus limestone

and t Glauconite limestone.

Chazy limestone pj , , (part) .3 u and rt St Peter’s sandstone. §

Levis Shales ,9

with X,

Tetragraptus, £

and 5

Phyllograptus. ˆ

Tremadoc beds, Ceratopyge beds, and beds with Euloma-Niobe fauna here regarded as Cambrian : not invariably present.

of the British Isles seem to have been deposited in a North Atlantic sea which embraced also the north of France and Belgium. Confluent with this sea on the east was a rather peculiar basin which included Bohemia, southern France, Spain, Portugal, the eastern Alps, Thuringia, Fichtelgebirge and the Keller Wald. Another European basin, probably separated from the Bohemian or Mediterranean sea in early Ordovician times, lay over the Baltic region, Scandinavia, the Baltic pro- vinces and north Germany, and communicated eastwards by way of Russian Poland and central Russia with far eastern

C. Lapworth and his school, and J. E. Marr and the Cambridge school, and in Scandinavia and the Baltic region, through W. C. Brogger, S. A. Tulberg, F. Schmidt and others, the most elaborate subdivision of the Ordovician rocks has been attained.

In the Baltic provinces of Russia, F. Schmidt describes the follow- ing stages, in descending order: (Stage F) the Lyckholm and Borkholm zones, a highly fossiliferous series, equivalent to the Middle Bala of Britain ; many of the limestones are largely formed of Rhabdoporella and other calcareous algae. (E) Wesenberg zone = Bala. (D) Jewe and Kegel zone. (C) Itfer beds, Kuckers Shale (bituminous limestones and marls = Brandschiefer), Echinosphaerite

limestone = Upper Orthoceratite limestone of Sweden. (B) Ortho- ceratite (Vaginaten) limestone = Orthoceratite limestone of Sweden, Glauconitic limestone, Glauconitic sand (Greensand). The last- mentioned reposes on Cambrian Dictyonema shales. While the Ordovician rocks in Scania, the Baltic provinces and north-central Russia are undisturbed and level-bedded, those on the western side of the Scandinavian axis and in the Urals have suffered movement and are metamorphosed into schists, phyllites, quartzite, marble, &c. ; and, especially in Scandinavia, have been extensively thrust. The Bohemian Ordovician, ” stage D ” of Barrande, consists mainly of greywackes and shales with some ironstone beds and eruptive rocks in the lower parts. In Germany the only large areas are found in the Thuringer Wald, Fichtelgebirge, Frankenwald and Vogtland, where they consist

principally of unfossiliferous greywackes and shales with some oolites and glauconitic ironstone (chamosite) in the lower part. They are divisible into the Hauptschiefer or Lederschiefer and the Ober-Thuringit beds above, and the Griffelschiefer and Unter- Thuringit beds below, which rest upon the Leitmitzschiefer of the Euloma-Niobe (Cambrian) horizon. Across northern Russia Ordovician rocks cover a great area; they consist of clays, bitumin- ous and calcareous shales, sands and marls, which in the Ural region have been metamorphosed; the Bukowka sandstone of Russian Poland is of this age. In north-west France this system is represented in Brittany and Normandy by the slates of Riadan, the gres de May, the sckistes a calymenes (with an ironstone bed at the base) and the gres armoricain. In the Ardennes are the schistes de Qembloux, resting upon graptolitic shales of Arenig age. Sandstones and shales occur in Languedoc, and various rocks in the Pyrenees. In the Iberian peninsula Ordovician rocks are widely spread, represented by sandstones, slates and shales covering the whole of the period; they are well developed in Asturia and Galicia. In the eastern Alps about Graz are found calcareous shales with crinoids, the " Schock- elkalk " and " Semriacher " shales; the Marthener beds of the Carnic Alps are of this age. In China (Kiang-su, Kian-chang), in Burma (Mandalay) and in the Himalayas (Niti and Spiti) Ordo- vician fossil-bearing rocks are known.

On the North American continent Ordovician rocks cover a very large area in the central, eastern and northern parts (north of lat. 30°). As regards the classification and correlation of the strata, which change in character from point to point, as is natural over so large an area, much remains to be done. In the table the divisions of the system that obtain in the New York district are enumerated; but in each state there is a local nomenclature for the beds. Thus in Iowa, Wisconsin and Minnesota we find (1) Lower Magnesian lime- stone, St Peter's sandstone; (2) Trenton limestone, Galena lime- stone; (3) Hudson river shales; in Arkansas, the California or Magnesian limestone, Saccaroidal limestone, Izard limestone and Polk Bayou limestone; in Oklahoma, the Arbuckle limestone, Simpson series, Viola limestone and Sylvan shales; and in east Tennessee, the Chickamauga limestone, Athens shale, Tellia sand- stone, Sievier shale and Bays sandstone. In Massachusetts there are enormous series of schists which have been assigned to this period. In west Virginia are the Martinsburg shales (tooo ft. or more). In Canada the Ordovician rocks (Quebec group) are thickly developed. In the upper division there are the lowest of the Anticosti limestones, the Hudson river beds, and Trenton limestone; to the middle division belong the Coenograptus shales; and the lower division consists of the Levis shales with Sillery beds at the base. In

Nova Scotia and New Brunswick are the lower and upper divisions of the Cobequid group, a series of shales, quartzites and conglomer- ates with igneous rocks. In the polar regions Ordovician rocks are represented by the Trenton limestone in Boothia and King William's Land; by limestones with Caryocystis granetum in east Greenland; and in the Barrow Straits by beds with Asaphus and Maclurea.

In North Africa Ordovician rocks are probably present, and in New Zealand the Arorere series (Wanaka group), and in Australia (Victoria) the graptolitic, gold-bearing shales and slates belong to this period. During this period there appears to have been a general tendency for the sea to transgress on the land, a tendency which increased towards its close, especially in the northern hemisphere (Europe and the Appalachian regions). One of the results of this movement was the interchange and commingling of many previously separated faunal groups. About the beginning of the period the sea withdrew from the land in Texas and south of the Rocky Mountains. The folding of the Appalachians was in progress early in Ordovician times and later in the period the first symptoms of the Scandinavian and British folding set in.

Volcanic Activity. — This period was one of great volcanic activity in several widely separated regions. " In Ayrshire and the south-western districts (of the southern uplands), where the volcanic constituents attain a great development, they consist of basic lavas (diabase, &c), with intercalated tuffs and agglomerates. A characteristic feature of these lavas is the development of ellipsoidal or pillow-structure in them. This volcanic platform appears to underlie the Silurian region over an area of at least 2000 sq. m., inasmuch as it comes to the surface wherever the crests of the anticlines bring up suffi-

ciently deep parts of the formations. It is thus one of the most extensive as well as one of the mo r .t ancient volcanic tracts of Europe " (Sir A. Geikie, Text-boot of Geology, 4th ed. vol. ii. p. 951). In the west of England and in Wales there was also a very active volcanic centre. In the Snowdon district thousands of feet of contemporaneous felsitic lavas and tuffs occur in the Bala beds; while in Cader Idris, the Arenig Mountains and the Arans there are similar eruptions of felsitic and rhyolitic lavas, tuffs and agglomerates — probably many of them sub- marine — interstratified in the Arenig formation. In the Lake district a great series of lavas and ashes — the Borrowdale series — was erupted during the middle of the period; the earlier effusions were andesitic, the later ones felsitic and rhyolitic. In Ireland the Arenig lavas of Tyrone resemble some of those in Scotland. Volcanic rocks (porphyrites, syenites and lavas) occur in considerable

force in the Ordovician rocks of Nova Scotia and New Brunswick and New Zealand. Tuffs of this age are found in Brittany, and diabase in Bohemia.

The economic products obtained from rocks of this period include gold in Australia, New Zealand and Wales ; iron ore in France ; lead and zinc from the Galena and Trenton horizons in Wisconsin, Iowa and Illinois; manganese in Arkansas; oil and gas from the Trenton stage in Ohio and east Indiana; roofing slates and slate pencils in Wales and the Lake district; limestone in Great Britain and Tennessee; phosphate beds in Wales and Tennessee; marble in the Appalachian district; graphite (plumbago) in the Lake district; and jasper in Wales and southern Scotland.

Ordovician Life. — Compared with the preceding Cambrian period, the Ordovician is remarkable for the great expansion in numbers and variety of organisms, apart from the fact that fossils are better preserved in the younger formations.

All the great classes of mollusks were represented, the most numerous being the brachiopods, which, in addition to the simple forms of the Cambrian, began at this time to develop spire-bearing genera (Chonetes, Orthis, Orthisina, Strophomena, “Crania, Schizotreta, Porambonites, Rafinesquina, Leptaena,Zygospira). The gasteropods now developed all the leading types of shell (Pleurotomaria, Omphalotrochus) ; but both this class and the pelecypods {Lyrodesma, Ctenodonia, Modiolopsis) were subordinate in importance to the cephalopods. These mollusks were probably the most powerful living creatures in the Ordovician seas; straight-shelled, slightly curved, and nautiloid forms predominated (Orthoceras, Cyrtoceras, Gyroceras, Trocholites, Endoceras, Litoceras, Lituites, Actinoceras). Some of the straight shells were of enormous size, 12 to 15 ft. long and as much as 1 ft. in diameter, in the widest part. Trilobites were present in great abundance, and in this period they reached the climax of their development. In the lower stage we find Agnostus, Calymene, Asaphus, Illaenus, Placoparia; on the Llandeilo horizon, Calymene, Asaphus, Megalaspis, Dalmanitis; and, at the summit, Trinucleus and Homalonotus. In the transition zone between Ordovician and Cambrian, Ceratopyge, Euloma, Niobe, flourished. Other important genera are Ogygia, Cheirurus, Harpes, Acidaspis. Ostracods (Leperditia, Beyrichia), cyprids (Bairdia, Macrocypris), phyllocarids (Ceratiocaris, Peltocaris), cirripeds (Lepidocoleus) , and, later, eurypterids represented other crustacean groups. The bryozoans, Stomatopora, Monticulipora, Phylloporina, Fenestella and others, were abundant and frequently formed beds of limestone. Among the

echinoderms the cystoids were the most prominent (Pleurocystis, Aristocystis) and at this period reached their climax; crinoids (Archaeocrinus, Dendrocrinus) became more important; while ophiuroids, echinoids (Bothriocidaris) and asteroids (Taeniaster, Palaeaster) made their appearance. Corals (Streptelasma, Colutnnaria) were scarce, and sponges (Aulocopium, Caryospongia, Archaeocyathus) were not particularly important; Receptaculites , Ischadites, are well-known fossils doubtfully referred to this group. Radiolaria assisted in the formation of certain beds of chert, and foraminifera have been observed. The remarkable group, the graptolites, evi- dently inhabited the seas in countless numbers and have left their remains in the dark shales of this period all over the world. At this time the diprionidian forms alone were represented by such genera as Tetragraptus, Phyllograptus, Didymograptus, Dicellograptus, Diplograptus and others. Of great interest are the earliest known indications of vertebrate life in the form of dermal plates and teeth of fish-like organisms from the Ordovician of Colorado. The terrestrial life of the period is very meagrely represented by the remains of land plants, mostly poorly preserved in certain sandstones, and byscorpions and several orders of insects, Protocimex (Sweden), Palaeoblattina (Colorado).

One of the most striking facts brought out by the study of the distribution of Ordovician fossils is the wide range of the northern or ” periarctic ” faunal assemblage. This periarctic fauna prevails over the whole world — so far as our present knowledge shows — with the exception of the peculiar Bohemian or Mediterranean region, which

includes north-west and south-west France, Spain, Italy, the Alps, the Fichtelgebirge, east Thuringia, Harz and Rhenish Mountains.

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Band 2 (Lethaea palaeozoica) (Stuttgart, 1897- 1902) ; Sir A. Geikie, Text-book of Geology (4th ed., 1903) ; and for recent papers, Geological Literature, Geol. Soc. (London, annual). See also Cambrian and Silurian Systems. (J. A. H.)

ORDU (anc. Cotyora, where the " Ten Thousand " embarked for home), a town on the N. coast of Asia Minor, between Samsun and Kerasund, connected with Zara, and so with Sivas, by a carriage road, and with Constantinople and Trebizond by steamer. Pop. about 6000, more than half Christian. Ordu has exceptionally good Greek schools, and a growing trade in filberts.

ORDUIN – NASHCHOKIN, ATHANASY LAVRENTEVICH (?-i68o), Russian statesman, was the son of a poor official at Pskov, who saw to it that his son was taught Latin, Germari and mathematics. Athanasy began his public career in 1642 as one of the delineators of the new Russo-Swedish frontier after the peace of Stolbova. Even then he had a great reputation at Moscow as one who thoroughly understood " German ways and things." He was one of the first Muscovites who diligently collected foreign books, and we hear of as many as sixty-nine Latin works being sent to him at one time from abroad. He attracted the attention of the young tsar Alexius by his resource-fulness during the Pskov rebellion of 1650, which he succeeded in localizing by personal influence. At the beginning of the Swedish War, Orduin was appointed to a high command, in which he displayed striking ability. In 1657 he was appointed minister- plenipotentiary to treat with the Swedes on the Narova river. He was the only Russian statesman of the day with sufficient fore- sight to grasp the fact that the Baltic seaboard, or even a part of it, was worth more to Muscovy than ten times the same amount of territory in Lithuania, and, despite ignorant jealousy of his colleagues, succeeded (Dec. 1658) in concluding a three-years' truce whereby the Muscovites were left in possession of all their conquests in Livonia. In 1660 he was sent as pleni- potentiary to a second congress, to convert the truce of 1658 into a permanent peace. He advised that the truce with Sweden should be prolonged and Charles II. of England invited to mediate a northern peace. Finally he laid stress upon the immense importance of Livonia for the development of Russian trade. On being overruled he retired from the negotiations. He was the chief plenipotentiary at the abortive congress of Durovicha, which met in 1664, to terminate the Russo-Polish War; and it was due in no small measure to his superior ability and great tenacity of purpose that Russia succeeded in concluding with Poland the advantageous truce of Andrussowo (Feb. 11, 1667). On his return to Russia he was created a boyar of the first class and entrusted with the direction of the foreign office, with the title of "

Guardian of the great Tsarish Seal and Director of the great Imperial Offices." He was, in fact, the first Russian chancellor. It was Orduin who first abolished the onerous system of tolls on exports and imports, and established a combination of native merchants for promoting direct commercial relations between Sweden and Russia. He also set on foot a postal system between Muscovy, Courland and Poland, and introduced gazettes and bills of exchange into Russia. With his name, too, is associated the building of the first Russian merchant-vessels on the Dvina and Volga. But his whole official career was a constant struggle with narrow routine and personal jealousy on the part of the boyars and clerks of the council. He was last employed in the negotiations for con- firming the truce of Andrussowo (September 1660; March 1670). In January 167 1 we hear of him as in attendance upon the tsar on the occasion of his second marriage; but in February the same year he was dismissed, and withdrew to the Kruipetsky

monastery near Kiev, where he took the tonsure under the name of Antony, and occupied himself with good works till his death in 1680. In many things he anticipated Peter the Great. He was absolutely incorruptible, thus standing, morally as well as intellectually, far above the level of his age.

See S. M. Solovev, History of Russia (Rus.), vol. xi. (St Petersburg, 1895, seq.); V. Ikonnikov, " Biography of Orduin-Nashchokin " (in Russkaya Starina, Nos. 1 1-12) (St Petersburg, 1883) : R. Nisbet Bain, The First Romanovs (London, 1905, chaps. 4 and 6). (R. N. B.)

OREBRO, a town of Sweden, capital of the district (Ian) of Orebro, lying on both banks of the Svarta a mile above its entrance into Lake Hjelmar, 135 m. W. of Stockholm by rail. Pop. (1900), 22,013. I n great part rebuilt since a fire in 1854, it has a modern appearance. An ancient castle, however, with four round towers, remains on an island in the stream. It is used as a museum. There may be mentioned also the church of St Nicholas, of the 13th century; and the King's House (Kungsstuga) , an old and picturesque timber building. In front of the modern town hall stands a statue, by Karl Gustav Qvarnstrom (1810-1867), of the patriot Engelbrecht (d. 1436), who was born here. The Swedish reformers of the 16th century, Olaus and Laurentius Petri, are commemorated by an obelisk. Orebro is in close connexion with the iron-mining district of central Sweden; it has mechanical works and a technical college. A large trade is carried on, by way of the Orebro canal and lakes Hjelmar and Malar, with Stockholm.

Orebro was in existence in the nth century. Its castle, erected by Birger Jarl in the 13th century, played an important part in the early

annals of Sweden; and no fewer than twenty diets or important assemblies were held either in the castle or in the town. Such were the Orebro concilium of 1537, the diet of 1540 in which the crown was declared hereditary, and that of 1810 when Bernadotte was elected crown prince.

ORE-DRESSING, one of the principal processes in the work of mining (q.v.). When the miner hoists his ore 1 to the surface, the contained metal may be either in the native uncombined state, as, for example, native gold, native silver, native copper, or combined with other substances forming minerals of more or less complex composition, as, for example, telluride of gold, sulphide of silver, sulphide of copper. In both cases the valuable mineral is always associated with minerals of no value. The province of the ore-dresser is to separate the ” values ” from the waste — for example, quartz, felspar, calcite — by mechanical means, obtaining thereby ” concentrates ” and ” tailings.” The province of the metallurgist is to extract the pure metal from the concentrates by chemical means, with or without the aid of heat. There are also a number of non-metallic minerals which do not have any value, or at best do not reach their highest value until they have been subjected to some form of mechanical preparation; among them are diamonds, graphite, corundum, garnet, asbestos and coal. Ore-dressing, for the purposes of this article, may be divided into three parts: (1) properties of minerals which render aid in their separation; (2) simple opera- tions; (3) operations combined to form processes or mills.

I. The specific gravity of minerals varies greatly, some being heavy, others light. The rate of settling in water is affected by the specific gravity in this way : of two particles of the same properties size but different specific gravity, the heavier settles more rapidly than the lighter, while of two particles of different specific . gravity which settle at the same rate in water, that of higher specific gravity is of smaller diameter than the other. The same state- ments are true in regard to settling in air, and in regard to momentum in air when the particles are thrown out in a horizontal direction. Colour, lustre and fracture are of especial value in hand-picking, to aid the eye in selecting the mineral sought. Instances are, of colours, the white of quartz, the pale straw colour of felspar, the dull yellow o(limonite, the brass yellow of chalcopyrite, the pale metallic yellow of pyrite ; of lustres, the vitreous of quartz, the adamantine_ of diamond and cerussite, the resinous of blende, the earthy of limonite, and the metallic of pyrite; and of fractures, the cleavage planes of felspar and galena, the conchoidal fracture of quartz and pyrite, the granular of some forms of magnetite and blende. Magnetism is a most direct and

simple method of separating minerals where it is available. The discovery that by the use of el ectro-magnets of great

1 The O. Eng. word was ora, corresponding with Du. oer, the origin of which is unknown. The form ” ore ” represents the O.Eng. ar, brass; cf. Lat. aes, Skt. ayas.

power minerals formerly regarded as non-magnetic are attracted, has made it possible to separate several classes of minerals present in an ore; for example, the strongly magnetic mineral may first be taken out, then the mildly magnetic, and last the weakly magnetic, the non-magnetic being left behind. Adhesion acts when brightly burnished particles of gold issuing with the sand from the stamp mill come in contact with an amalgamated copper plate, for they are instantly plated with mercury and adhere to the copper, while the sand is carried forward by the water. In this way a very perfect separation of the gold from the sand is effected. In the South African diamond fields it has been found that if the diamond-bearing sand is taken in a stream of water over a smooth surface covered with a suitable coating of grease, the diamonds will adhere to the grease while the sand does not.

2. The concentration of ores always proceeds by steps or stages. Thus the ore must be crushed before the minerals can be separated, and certain preliminary steps, such as sizing and classify- Slmple – m ˆ must precede the final operations which produce the Operations. nnisned concentrates. The more important of these simple operations will now be described.

The ore as mined contains the valuable minerals attached to and enclosed in lumps of waste rock. The province of crushing or dis-integrating is to sever or unlock the values from the waste, so that

the methods of separation are then able to part the one from the other. In crushing ores it is found wise to progress by stages, coarse crushing being best done by one class of machine, medium by another, and fine by a third. Coarse crushing is accomplished by breakers of the Blake type (fig. I) or of the Gates Comet type (fig. 2). All of these machines break by direct pressure, caused by a movable jaw,

Fig.

1. — Blake Breaker.

a, Movable jaw.

b, Fixed jaw.

a (figs. 1,2), approaching towards and receding from a fixed jaw, b. The largest size ever fed to a breaker is 24 in. in diameter, and the smallest size to which the finest crushing commonly done by these machines brings the ore is about | in. diameter. The machine is generally supplied with ore in lumps not larger than 9 in. in diameter, and crushes them to about ii in. in diameter. Medium-size crushing is done mostly by rolls or steam stamps. Rolls (fig. 3) crush by direct pressure caused by the ore being drawn between two revolving rolls held closely together. They make the least fine slimes or fines to be lost in the subsequent treatment, and are therefore preferred for all brittle minerals. The steam stamp works upon the same principle as a steam hammer, the pestle being forced down by steam pressure acting through piston and cylinder with great c f V (crushing force in the mortar. Steam stamps — vLj" have been very successful with the native

Rˆ copper rock, because they break up the little

"' leaves, flakes and filaments of copper, and

render them susceptible of concentration, which rolls do not. Fine crushing is done by gravity stamps, pneumatic stamps, by cen- trifugal roller mills, by amalgamating pans, by ball mills, by Chile edgestone mills, by tube mills and by arrastras. The gravity stamp (fig. 4) is a pestle of 900-lb weight trie hub and with more or less, which is lifted by a revolving loose fit on the cam and falls by the force of gravity to spindle. strike a heavy blow on the ore resting

on the die in the mortar and do the work of crushing; the frequent revolution of the cam gives a more or less rapid succession of blows. Gravity stamps are especially adapted to the fine crushing of gold ores, which they reduce to aVin. and sometimes even to ˆ-in. grains. The blow of the stamp upon the fragments of quartz not only liberates the fine particles of gold, but brightens them so that they are quickly caught upon the amalgamatedplates. The centrifugal roller mills are suited to fine crushing of middle products, namely by-products composed of grains con- taining both values and waste, since they avoid making much fine slimes. They crush by the action of a roller, rolling on the inside steel ring, both having vertical axes. The

amalgamating pan is suitable for grinding silver ores for amalgamation where the finest grinding is sought, together with the chemical action from the contact with iron. It crushes by a true grinding action of one surface sliding upon another. The Chile edgestone mill is employed for the finest grinding ever used preparatory to concentration. The arrastra or drag-stone mill grinds still finer for amalgamating. The ball mill

Fig. 2. — Gates Breaker, o, Movable jaw.

b, Fixed jaw.

c, Gear with

Fig

of

3. — Crushing Rolls.

is a horizontal revolving cylinder with iron balls in it which do the grinding; the pulverized ore passes out through screens in the cylinder wall. It is a fine grinder, making a small amount of im- palpable slimes. It is used for preparation for concentrating. The tube mill is of similar construction, but it is fed through the hollow shaft at one end and discharged through the hollow shaft at the other; the finely ground ore is floated out by water and contains a large proportion of impalpable slimes. It is used for preparation for cyaniding of gold.

A considerable class of workable min- erals, among which are surface ores of iron and surface phosphates, contain worthless clay mixed with the valuable material, the removal of which is accomplished by the log washer. This is a disintegrator •consisting of a long narrow cylinder re- volving in a trough which is nearly hori- zontal. Upon the cylinder are knives or paddles set at an angle, which serve the double purpose of bruising and disintegrat- ing the clay and of conveying the cleaned lump ore to be discharged at the upper end of the trough, the water meanwhile washing away the clay at the lower end.

Roasting for Friability. — When two min- erals—for example, pyrite and cassiterite (tin ore) — one of which is decomposed and rendered porous and friable by heat and oxygen — are roasted in a furnace, the pyrite becomes porous oxide of iron, while the cassiterite is not changed. A gentle crush- ing and washing operation will then break and float away the lighter iron oxide, leaving the cleaned cassiterite behind.

Sizing. — This is the first of the pre- liminary operations of separation. It is found useful in concentration, for dividing

an ore into a number of portions graded p IG . Gravity Stamp.

from coarser sizes down to finer sizes.

Each portion is made suitable for treatment on its respective machine. If crushed ore be sifted upon a screen with holes of definite size, two products will result — the oversize, which is unable to pass through the screen, and the undersize, which does pass. If the latter size be sifted upon another screen with smaller holes, it will again make oversize and undersize. The operation can be repeated with more sieves until the desired number of portions is obtained. P. von Rittinger adopted for close sizing the following diameters in millimetres for the holes in a set of screens: 64, 45-2, 32, 22-6, 16, 11-3, 8, 5-6, 4, 2-8, 2, 1-4, I. Each of these holes has an area double that of the one next below it; this may be called the screen ratio. A process which does not need such close sizing might use every other screen of the above set, and in ex- treme cases even every fourth screen. In mills the screen ratio for coarse sizes often differs from that for fine. Sizing is done by cylindrical screens revolving upon their inclined axes (fig. 5), by flat shaking screens, and by fixed screens with a com- paratively steel slope. Either wire cloth with square holes or steel plate punched with round holes is used. To remove the largest lumps in the preliminary sizing, fixed-bar screens (grizzlies) are preferred, on account of their strength and durability.

Sizes smaller than can be satisfactorily graded by screens are treated by means of hydraulic classifiers and box classifiers. The lower limit of screening and therefore the beginning of this work

Fig. 5. — Trommel or Revolving Screen.

Fig. 6. — Hydraulic Classifier, varies from grains of 5 millimetres to grains of 1 millimetre in diameter. A hydraulic classifier (fig. 6) is a trough-like washer through which the water and sand flow from one end to the other. In the bottom, at regular intervals, are pockets or pits with hydraulic devices which hinder the outflowing discharge of sand, b, by an inflowing stream of clear water, a. By regulating the speed of these water currents, the size of the grains in the several discharges can be regulated, the first being the coarsest and the overflow at the end the finest. Box classifiers (spitzkasten) are similar, except that the pockets are much larger and no inflowing clear water is used ; they therefore do their work much less perfectly. Classifiers

do not truly size the ore, but merely class together grains which have equal settling power. In any given product, except the first, the grain of high specific gravity will always be smaller than that of low. The

Fig. 7. — Harz Jig.

box classifiers are suited to treating finer sizes than the hydraulic classifiers, and therefore follow them in the mill treatment. _

Picking Floors, the first of the final operations of separation, are areas on which men, boys or girls pick out the valuable mineral which is rich enough to ship at once to the smelter. The picking is often accompanied and aided by breaking with a hammer. Picking tables are generally so constructed that the pickers can sit still and have the ore pass before them on a moving surface, such as a re- volving circular table or travelling belt. Stationary picking tables require the ore to be wheeled to and dumped in front of the pickers. Picking out the values by hand has the double advantage that it saves the power and time of crushing, and prevents the formation of a good deal of fine slimes which are difficult to save. _

Jigs treat ores ranging from i| in. in diameter down to fo in. U an intermittently pulsating current of water is passed up through a horizontal sieve on which is a bed of ore, the heavy mineral and the quartz quickly form layers, the former beneath the latter, ine machine by which this work is done is called a jig, and the operation is called jigging. In the hand jig the sieve is moved up and down in J && b a tank of water to get

the desired separation. In the power jig (fig. 7)

P ■ the sieve, a, is stationary

*^ Jr_ p-stjand the pulsating current is obtained by placing a vertical longitudinal par- tition, c, extending part of the way down to the bottom of the jig box. The sieve, a, is firmly fastened on one side of the partition, and on the other a piston or plunger, d, is moved rapidly up and down by an eccentric, causing an up-and-down current of water through the sieve, a. The sieve is fed at one end, e, with a constant supply of water and ore, and the quartz over- flows at the other. Clear water (” hydraulic water”) is brought by the pipe, *, into the space, g, below called the hutch, to regulate the condi- tion of the

bed of ore on a. The constantly accumulating bed of con- centrates is either discharged through the sieve into the hutch, g, or by some special device at the side. On jigs where the concentrates pass through the sieve, a bed of heavy mineral grains too large to pass holds back the lighter quartz. The quartz overflow from one sieve, a, generally carries too much value to be thrown away, and it is therefore jigged again upon a second sieve, b. In jigging difficult ores, three, four, five and even six sieves are used. A succession of sieves gives a set of products graded both in kind and in richness, the heavier mineral, as galena, coming first, the lighter, as pyrites and blende, coming later. The best jigging is done upon closely sized products using a large amount of clear water added beneath the sieve. Very good jigging may, however, be done upon the products of hydraulic classifiers, where the heavy mineral is in small grains and the quartz is large, by using a bed on the sieve and diminished hydraulic water, which increases the suction or downward pull by the'returning plunger.

Bumping Tables. — Rittinger's table is a rectangular gently sloping plane surface which by a bumping motion throws the heavy particles to one side while the current of water washes down the

quartz to another, a wedge-shaped divider separating and guiding the concentrates and tailings into their re- spective hoppers. The capacity on pulp of 5*5 to 5ˆ in. size is some 4 tons in twenty -four hours. In the Wilfley table (fig. 8) and those derived from it a gentler vanning motion is substituted for the harsh bump; they have a greatly increased width and a set of riffle blocks, b, at right angles to the direction of flow, c, tapering in height towards the side where the concentrates are discharged, d. This combination has produced a table of great efficiency and capacity for treating grains from | in. in diameter down to 2 Jjj in. or even finer. The capacity on -fa in. pulp is from 15 to 25 tons in twenty-four hours.

Vanners are machines which treat ores on endless belts, generally of rubber with flanges on the two sides. The belt (fig. 9) travels up a gentle slope, o, on horizontal transverse rollers, and is shaken about 200 times a minute, either sidewise or endwise, to the extent of about 1 in. The lower 10 ft. is called the concentrating plane, 6, and slopes 2-78% more or less from the horizontal; the upper 2 ft. of length is called the cleaning plane, c, and slopes 4-45 % more or less. The fine ore is fed on with water (technically called pulp) at the intersection of the two planes, d. The vibration separates the ore into layers, the heavy minerals beneath and the light above. The downward flow of the water carries the light waste off and discharges it over the tail roller e into the waste launder, while the upward travel of the belt

carries up the heavy mineral. On the cleaning plane the latter passes under a row of jets,/, of clean water, which remove the

Fig. 8.— Wilfley Table.

Fig. 9.— Frue Vanner.

last of the waste rock; it clings to the belt while it passes over the head roller, and only leaves it when the belt is forced by the dipping roller to dip in the water of the concentrates tank, g. The cleaned belt then continues its return journey over the guide roller h to the tail roller e, which it passes round, and again does concentration duty. Experience proves that for exceedingly fine ores the end shake with steep slope and rapid travel does better work than the side-shake vanner. For ordinary

gold stamp-mill pulp, where clean- ...

ness of tailings is the most important end, and where to gain it the engineer is willing to throw a little quartz into the concentrates, the end-shake vanner is again probably a little better than the side- shake, but where cleanness of concentrates is sought the side-shake vanner is the most satisfactory. The latter is much the most usual

Slime-Tables are circular revolving tables (fig. 10) with flattened conical surfaces, and a slope of i£ in. more or less per foot from centre to circumference ; a common size is 17 ft. in diameter, and a common speed one revolution per minute. These tables treat material of T ˆ in. and less in diameter coming from box classifiers. The principle on which the table works is that the film of water upon the smooth surface rolls the larger grains (quartz) towards the margin of the table faster than the smaller grains (heavy mineral) which are in the slow-moving bottom current. The revolution of the table then discharges the quartz earlier at a, a, a, a, an intermediate middling product next at b, and the heavy mineral last at c. Suitable launders or troughs and catch-boxes are supplied for the three products. The capacity of such a table is 12 tons or more of pulp, dry weight, in twenty-four hours. Frames, used in concentrating tin ore in Cornwall, are rectangular slime-tables which separate the waste from the concentrates on the same principle as the circular tables, though they

Fig. 10. — Convex Revolving SHme-table.ˆ

run intermittently. They treat very fine pulp, and after being fed for a short period (about fifteen minutes) the pulp is shut off, the concentrates are flushed off with a douche of water and caught in a

box, and the feed pulp is again turned on. Canvas tables are rectangular tables with plane surfaces covered with cotton duck (canvas) free from seams; they slope about i| in. to the foot. They are fed with stamp-mill pulp, with the tailings of vanners, or, best of all, with very fine pulp overflowing from a fine classifier. The rough surface of the duck is such an efficient catching surface that they can run for an hour before the concentrates are removed — an operation which is effected by shutting off the. feed pulp, rinsing the surface with a little clean water, and hosing or brooming off the concentrates into a catch-box. The feed-pulp is then again turned on and the work resumed. They have been more successful than any other . machine in treating the finest pulp, especially when their concen- trates are finally cleaned on a steep slope end-shake vanner (the G. G. Gates canvas table system of California).

Buddies act in principle like slime-tables, but they are stationary, and they allow the sand to build itself up upon the conical surface, which is surrounded by a retaining wall. When charged, the tailings are shovelled from the outer part of the circle, the middlings from the intervening annular part, and the concentrates from the inner part. They treat somewhat coarser sizes than the slime-table. The term buddle is sometimes applied to the slime-tables, but the majority confine the phrase to the machine on which the sand builds up in a deep layer.

Riffles. — When wooden blocks or cobble-stones of uniform size are placed in the bottom of a sluice, the spaces between them are called riffles ; and when gold-bearing gravel is carried through the sluice by a current of water, a great many eddies are produced, in which the gold and other heavy minerals settle.

Kieves. — The kieve or dolly-tub is a tub as large or larger than an ordinary oil-barrel, with sides flaring slightly upwards all the way from the bottom. In the centre is a Tittle vertical shaft, with hand-crank at the top and stirring blades like those of a propeller at the bottom. Fine concentrates from buddies or slime-tables are still further enriched by treatment in the kieve. The kieve is filled perhaps half full of water, and the paddles set in motion ; concen- trates are now shovelled in until it is nearly full, the rotation is continued a little longer and then the shaft is quickly withdrawn and

the side of the kieve steadily thumped by a bumping-bar as long as settling continues. When this is completed, the water is siphoned off, the top sand skimmed off and sent back to the buddle, and the enriched bottom shovelled out and sent to the smelter.

3. In designing concentration works, the millwright seeks so to combine the various methods of coarse and fine crushing and of r preliminary and final concentration that he will obtain the

Combined max j mum re turn from the ore with the minimum cost. operations. g ome Q f t jj e more i mpor tant of these mill schemes will now be described.

The hand-jig process used for the zinc and lead ores of Missouri is first to clean the ore from adhering clay by raking it back and forth in a sluice with a running stream of water, and then shovel it upon a sloping screen with holes of about I in., where it yields oversize and undersize. The former is hand-picked into lead ore, zinc ore and waste, while the latter is jigged upon a hand -jig and yields several layers of minerals removed by a hand-skimmer. The top skimmings are waste, the middle skimmings come back with the next charge to be jigged over, and the bottom skimmings go to a second jig with finer screen. The coarsest of the hutch product, i.e. the product which passed through the sieve and settled at the bottom of the tank, goes to the second jig, the finest is sold to a sludge mill to be finished on buddies. The second jig makes top skimmings which are sent back to the first jig, middle skimmings which are zinc concentrates, and bottom skimmings and hutch, which are lead concentrates.

In the Missouri zinc-concentrating mill the ore carrying blende and calamine with a little galena is in very large crystallizations and contains, when crushed, very little in the way of included grains. It is crushed by Blake breaker and rolls, to pass through a sieve with holes f in. in diameter, and is then treated on a power jig with six consecutive sieves, yielding discharge and hutch products from each sieve, and tailings to waste. The earlier discharges are finished products, while the later are re-crushed and re-treated on the same jig. The hutch products are treated on a finishing-jig with .five sieves, and yield galena from the first discharge and hutch, and zinc ore from the others. The capacity of such jigs is very large, even to 75 or 100 tons per day of ten hours.

In the diamond washing of Kimberley, South Africa, the material taken from the mine is weathered by exposure to the air and rain for several months, and the softening and disintegration thus well started

are completed by stirring in vats with water. Breaker and rolls were tried in order to hasten the process, but the larger diamonds were broken and ruined thereby. The material from the vats is screened and jigged, and of the jig concentrates containing about 2% of diamonds the coarser are hand-picked and the finer are treated on a greased surface.

Lead and copper ores contain their values in brittle minerals, and are concentrated in mills which vary somewhat according to local conditions ; the one here outlined is typical of the class. The ore is crushed by breaker and rolls, and separated into a series of products diminishing in size by a set of screens, hydraulic classifier and box classifier. All the products of screens and hydraulic classifiers are jigged on separate jigs yielding concentrates, middlings and tailings; those of the box classifier are treated on the slime-table, vanner or Wilfley table, yielding concentrates and tailings and perhaps middlings. The coarser middlings contain values attached to grains of quartz and are therefore sent back to be re-crushed and re-treated. The finer middlings contain values difficult to save from their shape only, and are sent back to the same machine or to another to be finished.

The native copper rock of Lake Superior is broken by powerful breakers, sometimes preceded by a heavy drop-hammer weighing a ton, more or less. The operation is accompanied by hand-picking, yielding rich nuggets with perhaps 75% of copper ready for the smelter ; at some mines a second grade is also picked out which goes to a steam finishing-hammer and yields cleaned mass copper for the smelter and rich stamp stuff. The run of rock which passes by the hand-pickers is of a size that will pass through a bar screen with bars 3 in. apart, and goes to the steam stamps. The stamp crushes the rock and discharges coarse copper through a pipe 4 in. in diameter, in which it descends against a rising stream of water which lifts out the lighter rock. The copper is let out about once an hour by opening a gate at the bottom. The rest of the rock is crushed to pass through a screen with round holes \ in. in diameter, more or less. This sand is treated in hydraulic classifiers with four pockets, the products from the pockets being jigged by four roughing-jigs yielding finished mineral copper for the smelter, included grains for the grinder, partially concentrated products for the finishing-jigs, and tailings which go to waste. The overflow of the hydraulic classifier runs to a tank of which the overflow is sent to waste in order to diminish the quantity of water, while the discharge from beneath, treated upon slime-tables, yields concentrates, middlings and tailings. The middlings are re-treated. All the finished concentrates put together

will assay from 60 to 80% of copper according to circumstances. The extraction from the rock is from 50 to 80 % of the copper con- tained in it.

Cornwall Tin. — Tinstone in Cornwall occurs associated with sulphides, wolfram, quartz, felspar, slate, &c, and is broken by Bpalling-hammers to i-in. lumps. Hammers make less slimes than

the rock-breakers, and they also break the ore more advantageously for the hand-picking. The latter rejects waste, removes as far as possible the hurtful wolfram, and classes the values into groups according to richness. Gravity or pneumatic stamps then crush the ore to ˆ5 in., and stripes (a species of long rectangular buddle) yield heads, middlings, tailings and fine slimes: the first three are sent separately to circular buddies, and the last to frames. The buddies yield concentrates, middlings and tailings: the middlings are re-treated, the tailings are all waste; the concentrates are still further enriched by kieves, which yield tops to the buddle again and bottoms shipped to the smelter. The fine slimes are treated on frames, the concentrates of which go to buddies; of these the concentrates go to kieves.

The Missouri zinc-lead sludge mill takes the finest part of the hutch product of the hand-jigs. The treatment begins on revolving screens with two sizes of holes, 25 mm. and I mm. : these take out two coarser sizes, of which the coarser is waste and the other is jigged, yielding concentrates and waste. The main treatment begins with the finest size, which is much the largest product. It is fed to a convex circular buddle (first buddle), and yields a coarser product at the outer part of the circle and a finer product in the inner. The finer product is treated by a series of buddlings which vary somewhat, but in general are as follows: fed to a second buddle it yields zinc and lead ore in the centre, next zinc ore, next middlings which come back, and, outside of all, tailings. The zinc-lead ore is set on one side until enough has accumulated to make a buddle run, when it is run upon a third buddle yielding in the central part pure lead concen- trates, next lead ore (which is returned to this treatment), next zinc ore, and outside of all a zinc product which is fed to the second buddle. The coarse outside product of the first buddle is treated in much the same way as the fine, but it yields practically no lead zinc product, which simplifies the series of buddlings necessary.

Gold Mill. — Gold ores usually contain their value in two con- ditions — the free gold, which can be taken out by mercury, and the combined gold, in which the metal is either coated with or combined

with compounds of sulphur, tellurium, &c. The usual gold-milling scheme is to crush the ore by rock-breaker to about I J in. diameter, and then to crush with water by gravity stamps, a little mercury being added to the mortar from time to time. to begin the amalgamation at the first moment the gold is liberated. The pulp leaves the mortar through a screen with holes or slots ˆ0 to jˆs in. in width, and is then passed over amalgamated plates of copper or silver-plated copper. The free gold, amalgamated by the mercury, adheres to the mercurial surface on the plate; the rest of the pulp flows on through mercury traps to catch any of the mercury, which drains off the end of the plate. The plates and mortar are periodic- ally cleaned up, the plates being scraped to recover the amalgam and leave them in good condition to do their work: if plates are used inside the mortar, they are cleaned in the same way. The residue of partly crushed ore in the mortar, with amalgam -and free mercury scattered through it, is ground for a time in a ball mill, panned to recover the amalgam, and returned to the mortar. The pulp flowing away from the mercury traps flows to a Frue vanner or Wilfley table, on which it yields concentrates for the chlorination plant or smelter and tailings: these are waste when the heavy mineral is of low grade, but if the vanner concentrates are of high grade, they still contain values in very fine sizes which can and should be saved. Recent improvements in California for saving this material have been made. The vanner tailings are sent to a fine classifier, from which the light overflow only is saved; this is treated upon canvas tables yielding concentrates and tailings, and these concentrates, treated upon a little end-shake vanner with steep slope and rapid travel, give clean, very fine, high-grade concentrates for the chlorination works.

Iron Ores. — The brown ores of iron from surface deposits are contaminated with a considerable amount of clay and some quartz. The crude ore from surface pits or shallow underground workings is treated in a log-washer and yields the fine clay, which runs to waste, and the coarse material which is caught upon a screen and hand-picked, to free it from the little quartz, or jigged if it contains too much quartz. The magnetic oxide of iron occurs associated with felspar and quartz, and can often be separated from them by the magnet. The ore, after being broken by breaker and rolls to a size varying from J to ˆ of an inch in diameter, goes to a magnetic machine which yields (1) the strongly magnetic, (2) the weakly magnetic, and (3) the non-magnetic portions. The second or middlings product contains grains of magnetite attached to quartz, and is therefore re-crushed and sent back to the magnets; the strongly magnetic portion is shipped to the furnace; and the waste to the dump heap. In

concentrating by water certain zinc sulphides, siderite (carbonate of iron) follows the zinc, and would seriously injure the furnace work. By a carefully adjusted roasting of the product in a furnace the siderite is converted into magnetic oxide of iron, and can then be separated by magnet from the zinc ore. A special magnet of very high power, known from its inventor as the Wetherill magnet, has been designed for treating the franklinite of New Jersey, a mineral which is non-magnetic in the usual machines. ,The ore, crushed by breaker and rolls and hand-picked to remove garnet, is treated upon a belt with a roughing magnet to take out the most magnetic portion, and then very closely sized by screens with

*6, 24, 30 and 50 meshes per linear inch. The several products are treated each on its own magnetic machine, yielding the franklinite for the zinc oxide grates, and followed by spiegel furnace; the residue, which is jigged, yields the zinc silicate and oxide for the spelter furnaces, and waste carrying the calcite, quartz and mica.

Asbestos, when of good quality, is in compact masses, which by suitable bruising and beating are resolved into fine flexible fibres. The Canadian asbestos is associated with serpentine, and is crushed by breakers to J in., screened on iV-in. screens to reject fines. The values are removed by hand-picking and are crushed by rolls carefully set so as not to break the fibre; this product is then sized by screens and the various sizes are sent to the Cyclone pulverizer, which by beating liberates the individual fibres. It then goes to a screen with eleven holes to the linear inch, and yields a granular undersize and oversize, and a fibrous oversize which is drawn off by a suction fan to a settling-chamber with air outlets covered by fine screen cloth. This fibrous product is the clean mineral for the market. A special treatment separates the fibres of different lengths.

The usual method of dressing corundum and emery, after the preliminary breaking, is to treat the material in an edge-stone mill fitted with light wooden rollers. The action is that of grinding one particle against another, whereby the talc, chlorite, mica, &c, are worn off from the harder mineral. A constant current of water carries off the light impurities. This is called the ” t muller” process. At Corundum Hill, North Carolina, the first step in removing the im- purities from ” sand ” corundum is to subject it to the scouring action of a stream of water while it is being sluiced from the mine to the mill, the action

being increased by several vertical drops of 5 to 10 ft. in the sluice. After reaching the mill all that will not pass through a 14-mesh screen is crushed by rolls, and the undersize of the screen is treated in a washing trough; this removes part of the light waste, and the ” mullers ” mentioned above complete the cleaning.

Graphite occurs in schist, but being of less specific gravity than the other minerals which enter into the composition of the schist, it settles later than they do. It also breaks into thin scales, which reduces its settling rate still further. The ore is broken by breakers, and by Chile edge-stone mills or by gravity stamps, to a size varying with the character of the minerals from perhaps j”tj to -ˆ in. diameter. The pulp is then conveyed through a series of settling tanks of which the later are larger than the earlier. The quartz and other waste minerals settle in the earlier tanks, while the graphite settles later: the latest tank gives the best graphite. In the Dixon Company’s works in New York some forms of concentrators are believed to have replaced the slower settling tanks.

The phosphates of Florida are of four kinds: hard rock, soft rock, land pebble and river pebble. The hard rock is crushed by toothed rolls, and cleaned in log washers. The washed product is screened ; the sizes finer than A in. are thrown away because too poor; the other sizes are dried and sold, some waste having been picked out of the coarsest. The soft rock is simply dried, ground and sold. Land pebble is treated by log washers, any clay balls remaining being re- moved by a screen, and the phosphate dried and sold. In special cases land pebble is treated by hydraulicking, followed by a log washer, and this again by a powerful jet washer, to remove the last of the clay. River pebble is taken from the river by centrifugal pumps, and screened on two screens with i-in. and A-in. holes respectively; the oversize of the first sieve and the undersize of the second sieve are thrown away because of too low grade. (R. H. R.)

OREGON, a North- Western state of the American Union, on the Pacific slope, lying between 42 and 46° 18′ N. lat. and 116 33′ and 124 32′ W. long. It is bounded N. by the state of Washington, from which it is separated in part by the Columbia river, the 46th parallel forming the rest of the boundary; E., by Idaho, from which it is separated in part by the Snake river; S., by Nevada and California, and W., by the Pacific Ocean. It has an extreme length, E. and W., of 375 m., an extreme width, N. and S., of 290 m., and a total area of 96,699 sq. m., of which 1092 sq. m. are water-surface.

Topography. — The coast of the state extends in a general N. and S.

direction for about 300 m., and consists of long stretches of sandy beach broken occasionally by lateral spurs of the Coast Range, which project boldly into the sea and form high rocky headlands. With the exception of the mouth of the Columbia river, the bays and inlets by which the shore is indented are small and of very little importance. Parallel with the coast and with its main axis about 20 m. inland is an irregular chain of hills known as the Coast Range. It does not attain a great height, but has numerous lateral spurs, especially toward the W. Euchre Peak (Lincoln county), probably the highest point in the range in Oregon, rises 3962 ft. above the sea. In southern Oregon the general elevation of this range is greater than in the N., but the individual peaks are less prominent, and the range in some respects resembles a plateau. Its western slope is generally longer and more gentle than the eastern. A number of small streams, among them the Nehalem, Coquille and Umpqua rivers, cut their' way through the Coast Range to reach the ocean. For the greater portion of its length in Oregon, in the northern half of the state, the

Coast Range is bordered on the E. by the Willamette Valley, a region about 200 m. long and about 30 m. wide, and the most thickly populated portion of the state; here, therefore, the range is easily defined, but in the S., near the Rogue river, it merges apparently with the Cascade and the Sierra Nevada Mountains in a large complex group designated as the Klamath Mountains, lying partly in Oregon and partly in California, and extending from the northern extremity of the Sierra Nevada to the sea. The Klamath Mountains separate topographically southern Oregon from northern California. A number of ridges and peaks bearing special names, such as the Rogue river, Umpqua and Siskiyou Mountains, belong to this group. The Cascade Mountains, the most important range in Oregon, extend parallel with the coast and lie about 100 m. inland. The peaks of this system are much higher than those of the Coast Range, varying from 5000 to 11,000 ft., and the highest of them are cones of extinct volcanoes. Mount Hood (11,225 ft.), which is the highest point in the state, Mount Jefferson (10,200 ft.), the Three Sister Peaks, Mount Adams, Bachelor Mountain, and Diamond Peak (8807 ft.) all have one or more glaciers on their sides. The Calapooya Mountains, forming the water-parting between the Willamette and the Umpqua rivers, are a lateral spur of the Cascades, and extend westward as far as the Coast Range. The Cascade Mountains divide the state topo- graphically into two sharply contrasted parts. West of this range the country exhibits a great variety of surface structure, and is humid and densely wooded ; east of the range it consists of a broken table- land, arid or semiarid, with a general elevation of 5000 ft. This eastern tableland, though

really very rugged and mountainous, seems to have few striking topographic features when compared with the more broken area to the W. In the north-eastern part of this eastern plateau lie the Blue Mountains, which have an average elevation of about 6000 ft. and decline gradually toward the N. A south-western spur, about 100 m. in length, and the principal ridge together enclose on several sides a wide valley drained by the tributaries of the John Day river. South of these mountains lies the northern limit of the Great Basin region. In Oregon this area extends from the Nevada boundary northward for about 160 m., to the head of the Silvies river, and embraces an area of about 16,000 sq. m. None of its streams reaches the sea, but all lose their waters by seepage or evaporation. On the E., N., and N.W. the Great Basin is bounded by the drainage systems of the tributaries of the Columbia river, and on the S.W. by the drainage system of the Klamath river. Its boundaries, however, cannot be definitely fixed, as they change with the periods of humidity and drought. Goose Lake, for example, lies in the Great Basin at some seasons; but at other times it overflows and becomes a part of the drainage system of the Sacramento river. Many of the mountains within the Basin region consist of great faulted crust blocks, with a general N. and S. trend. One face of these mountains is usually in the form of a steep palisade, while the other has a very gradual slope. Between these ridges lie almost level valleys, whose floors consist partly of lava flows, partly of volcanic fragmental material, and partly of detritus from the bordering mountains. During the wet season the valleys often contain ephemeral lakes, whose waters on evaporating leave a playa, or mud flat, often covered with an alkaline encrustation of snowy whiteness. Some large permanent lakes occupy the troughs between faulted blocks in southern Oregon. The greatest level, or approximately level, area in the Great Basin region of Oregon is the so-called Great Sandy Desert, a tract about 150 m. long and from 30 to 50 m. wide, lying in parts of Crook, Lake and Harney counties. Its surface consists of a thick sheet of pumiceous sand and dust, from which arise occasional buttes and mesas. On account of the small amount of precipitation, the fissured condition of the under- lying lava sheets, and the porous soil, the Great Sandy Desert has practically no surface streams even in the wet season, and within its limits no potable waters have been found. The most prominent mountain range in the Oregon portion of the Great Basin is the Steens Mountains in the S.E., which attain an altitude of about 9000 ft. above the sea and of 5000 ft? above Alvord Valley, which lies along the eastern base. This range is a large monoclinal block, with a trend almost N.E. and S.W., presenting a steep escarpment toward the E., and sloping very gradually toward the W. It exhibits much' evidence of powerful erosion, having deep

canyons in its sides, and it bears evidence of previous glaciers. The region adjoining the Great Basin on the E. is usually known as the Snake River Plains, and embraces an area of about‘1200 sq. m. in Malheur county. Here the hills are deeply sculptured and the valleys much carved by streams which often flow through deep canyons. Where the streams cut their way through sheets of basaltic lava their banks are steep, almost vertical cliffs, but where they cut through sedimentary rocks the sides have a more gentle slope. When several alternate layers of hard and soft rock are cut through by a stream its banks some- times have the form of steps. The destruction of the grasses on the hillsides by overgrazing in recent years has increased the flooding by temporary streams, and consequently has tended to deepen and increase the gulleys and channels of the mountains and valleys.

The state as a whole has an average elevation of 3300 ft. ; with 20,300 sq. m. below loop ft. ; 19,200 sq. m. between 1000 and 3000 ft.; 33,500 sq. m. between 3000 and 5000 ft.; and 23,030 sq. m. between 5000 and 9000 ft.

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The most important stream is the Columbia river, which forms the

northern boundary for 300 m. and receives directly the waters of all

the, important rivers in the state except a few in the S.W.

vers ” and a few in the extreme E. About 160 m. from its mouth are the Cascades, where the river cuts through the lava beds of the Cascade Mountains and makes a descent of about 300 ft. through a canyon 6 m. long and nearly 1 m. deep. The passage of vessels through the river at this point is made possible by means of locks. Fifty-three m. farther up the stream is a second set of rapids known as the Dalles, where the stream for about 2 m. is confined within a narrow channel from 130 to 200 ft. wide. The largest tributary of the Columbia is the Snake river, which for nearly 200 m. of its course forms the boundary between Oregon and Idaho. It flows through a canyon from 2000 to 5000 ft. deep, with steep walls of basaltic and kindred rocks. The powerful erosion has often caused the columnar black basalt to assume weird and fantastic shapes. The chief tributaries of the Snake river in Oregon are the Grand Ronde, Powder, Burnt, Malheur and Owyhee rivers. The principal tributaries of the

Columbia E. of the Cascade Mountains and lying wholly within the state are the John Day river, which rises in the Blue Mountains and enters the Columbia 29 m. above the Dalles after pursuing a winding course of about 250 m. ; and the Deschutes river, which rises on the eastern slope of the Cascade Mountains, and after flowing northward for about 320 m. enters the Columbia 12 m. above the Dalles. The Deschutes river drains a region which is less arid than the plateau farther E., and which contains a number of small lakes. A peculiar feature of the stream is the uniformity of its volume throughout the year; the great crevasses in the lava bed' through which it flows form natural spillways and check any tendency of the stream to rise within its banks. The Willamette river, W. of the Cascade Mountains, is the most important stream lying wholly within the state. It rises on the western slope of the Cascades and enters the Columbia river about 100 m. above its mouth, having with its branches a length of about 300 m. In the western part of the state a number of short streams flow directly into the Pacific Ocean, the most important of these being the Rogue and the Umpqua rivers, which have their sources in the Cascades.

In Southern Oregon, especially in the Great Basin region, there are numerous lakes. Malheur Lake, in Harney county, during the wet season is about 25 m. long and has an average width of Lakes. 5 or 6 m. It is not over 10 ft. deep in any part, and is only a few inches in depth a mile from the shore. In the summer most of its bed is a playa or mud flat. Almost continuous with this body of water on the S.W. is Harney Lake, roughly circular in form and about 7-8 m. in diameter. The waters of both lakes are alkaline, but Malheur Lake is often freshened by overflowing into Harney Lake, while the latter, having no outlet, is growing continually more alkaline. East of the Steens Mountains there is a chain of very small lakes, such as the Juniper, Manns and Alvord lakes, and also a playa known as the Alvord Desert, which in the spring is covered with a few inches, or perhaps 1 or 2 ft., of water, and becomes a lake with an area of 50 or 60 sq. m. In the summer the dry bed is smooth and very hard, and when the skies are clear the monotony of the landscape is sometimes broken by a mirage. In Lake county, occupying fault-made troughs, are several large bodies of water- Lake Abert (about 5 m. by 15 m.), Warner Lake (50 m. long, 4-8 m. wide), Summer Lake (a little smaller than Abert), and Goose Lake, the one last named lying partly in California and draining into the Sacramento system. The Upper and the Lower Klamath lakes of Klamath county are noted for their scenic beauty. Near the north-western boundary of Klamath county is the famous Crater Lake, whose surface is 6239 ft. above the sea. This lake lies in a great pit or caldera

created by the wrecking in prehistoric times of the volcano Mount Mazama, which according to geologists once had an altitude of about 14,000 ft. above the sea and of 8000 ft. above the surrounding tableland; the upper portion of the mountain fell inward, possibly owing to the withdrawal of interior lava, and left a crater-like rim, or caldera, rising 2000 ft. above the surrounding country. The lake is 4 m. wide and 6 m. long, has a depth in some places of nearly 2000 ft., and is surrounded by walls of rock from 500 to 2000 ft. high. In spite of its great elevation the lake has never been known to freeze, and though it has no visible outlet its waters are fresh.

Fauna and Flora. — Large game has disappeared from the settled areas, but is still fairly abundant on the plains of the east and among the mountains of the west. In the mountain forests of south-western Oregon bears, deer, elk, pumas, wolves and foxes are plentiful. Among the south-eastern plateaus antelope are found at all seasons, and deer and big-horn (mountain sheep), and occasionally a few elk, in the winter. Bears, wolves, lynxes and foxes are also numerous in the east, and there the coyote is found in disagreeable numbers. The pocket-gopher and the jack-rabbit are so numerous as to be great pests. The principal varieties of game-birds are ducks, geese, grouse and California quail. Sage-hens are occasionally seen on the dry plateaus and valleys, especially in Harney county. The Oregon robin (Merula naevia) and the Oregon snowbird (Junco Oregonus) are common in Oregon and northward. On the rocky headlands and islands of the coast nest thousands of gulls, cormorants, puffins, guillemots, surf - ducks (Oedemia), dotterels, terns, petrels and numerous other birds. There, too, the Steller's sea-lion (Eumetopias stelleri) spends the mating season. The marine fauna is abundant

and of great economic importance. The river fauna of the coast is of two distinct types: the type of the Columbia fauna in rivers north of the Rogue ; and another type in the Klamath and its tributaries. Typical of the Columbia river is Catastomus macrocheilus and of the Klamath, C. rimiculus. Lampreys, sticklebacks, cattoids, sturgeons — the white sturgeon (Acipenser transmontanus) is commonly known as the "Oregon sturgeon" — trout and salmon are the principal anadromous fish, the salmon and trout being the most important economically. The best varieties of the salmon for canning are: the king, Chinook or quinnat (Oncorhynchus tschawytscha), far better than any other variety; and the steel-head, blue back or sukkegh (0. nerka).

The total woodland area of the state according to the United States census of 1900 was 54,300 sq. m. or 56-8% of the land area. The

Federal government established in 1907 and 1908 thirteen forest reserves in the state, ten of which had an area of more than 1,000,000 acres each; their total area on the 1st of January 1910 was 25,345 sq. m. From the coast to the eastern base of the Cascade Mountains the state is heavily timbered, except in small prairies and clearings in the Willamette and other valleys, and the most important tree is the great Douglas fir, pine or spruce (Pseudotsuga Douglasii), commonly called Oregon pine, which sometimes grows to a height of 300 ft., and which was formerly in great demand for masts and spars of sailing-vessels and for bridge timbers ; the Douglas fir grows more commercial timber to the acre than any other American variety, a*d constitutes about five-sevenths of the total stand of the state. Timber is also found on the Blue Mountains in the north-east and on a number of mountains in the central and south-eastern parts of the state. East of the Cascades the valleys are usually treeless, save for a few willows and cottonwoods in the vicinity of streams. Over the greater part of this region the sage-brush is the most common plant, and by its ubiquity it imparts to the landscape the monotonous greyish tint so characteristic of the arid regions of the western United States. West of the Cascades most of the trees of commercial value consist of Douglas fir. Cedar and hemlock also are commercially valuable. There are small amounts of sugar pine, yellow pine, red fir and silver fir {Abies grandis and A. nobilis) and spruce; and among the broad-leaved varieties the oak, ash, maple, mahogany- birch or mountain mahogany {Cercocarpus ledifolia), aspen, cotton- wood and balsam are the most common. East of the Cascades the forests consist for the most part of yellow pine. In the south-east the hills and lower slopes of the mountains are almost bare of trees. At higher altitudes, however, the moisture increases and scattered junipers begin to appear. Blending with these at their upper limit and continuing above them are clumps of mountain mahogany, which sometimes attains a height of 20 or 30 ft. Above this belt of mahogany, pines and firs are sometimes found. In this region the mountains have an upper, or cold, timber line, the height of which depends upon the severity of the climate, and a lower, or dry, timber line, which is determined by the amount of rainfall. These upper and lower limits of the timber belt are sometimes very sharply defined, so that tall mountains may be marked by a dark girdle of forest, above and below which appear walls of bare rock. In a very arid region the dry timber line may rise above the cold timber line, and in such a case the mountain will contain no forests. Of this phenomenon the Steens Mountains furnish a conspicuous example. It was estimated that the forests of Oregon contained in 1900 about 150,000,000,000 ft. of Douglas fir or spruce, 40,000,000,000 ft. of yellow pine and 35,000,000,000 ft. of other species — chiefly cedar,

hemlock and spruce. In the most heavily wooded region along the Pacific coast and the lower course of the Columbia river are forests of the Douglas fir with stands of 100,000 ft. of timber per acre. The value of the lumber and timber products increased from $1,014,211 in 1870 to $6,530,757 in 1890, to $10,257,169 in 1900, and to $12,483,908 in 1905.

Climate.- — Perhaps no state in the union has such great local variations in its climate as has Oregon. Along the coast the climate is humid, mild and uniform, and, as has often been remarked, very like the climate of the British Isles; in the eastern two-thirds of the state, from which the moisture-laden winds are excluded by the high coastwise mountains, the climate is dry and marked by great daily and annual ranges of temperature. The mean annual temperature varies with the elevation and the distance from the sea, being highest along the western slope of the Coast Range at altitudes below 2000 ft., and lowest in the elevated regions E. of the Cascade Mountains. The temperatures along the coast are never as high as ioo° F. or as low as zero. In the valleys between the Coast Range and the Cascade Mountains the range of temperature is much greater than it is along the coast; the absolute maximum and minimum being respectively 102 and -2° at Portland, in the N.W., and 108 and -4 at Ashland. in the S.W. Owing to its greater elevation the southern portion of Oregon experiences greater extremes of temperature than the northern. In that part of the state E. of the Cascades the climate is of a continental type, with much greater ranges of temperature than in the W., although in a few low valleys, as at the Dalles, the extremes are somewhat modified. While flowers bloom throughout the year at Portland, frosts have occurred in every month of the year at Lakeview, in the Great Basin. At Astoria, near the mouth of the Columbia river, the mean annual temperature is 52° F., with extremes recorded of 97° and 10°; but at Silver Lake, in the Great

Basin region, while the mean annual temperature is 44 , the highest and lowest ever recorded are respectively 104 and -32°. These records afford a striking illustration of the moderating influence of the ocean upon climate.

As is the case in all the Pacific states, the amount of rainfall decreases from N. to S., and is greatest on the seaward slopes of the hills and mountains. As the winds from the ocean are deprived of their

moisture on reaching the Coast and Cascade ranges, the amount of annual precipitation, which in the coast counties varies from 75 to 138 in., constantly diminishes toward the E. until in the extreme south-eastern part of the state it amounts to only about 8 in. No other state, except perhaps Washington, has such a great variation in the amount of its rainfall. Precipitation on the Coast Range at altitudes above 2000 ft. amounts to about 138 in. annually; in the valleys E. of this range it varies from 20-2 in. at Ashland to 78-2 in. at Portlands On the western slope of the Cascades it varies from 50 in. in the S. to 100 in. in the N. ; in the Columbia Valley the amount is from 10 to 15 in.; in the valleys and foothills of the Blue Mountains, 12 to 25 in.; and in the plateau region of central and south-eastern Oregon, 8 to 22 in. In the region W. of the Cascade Mountains there is a so-called wet season, which lasts from October to March, and the summers are almost rainless. In the rest of the state there is a maximum rainfall in the winter and a secondary wet season in May and June, with the rest of the summer very dry. During the winter the prevailing winds are from the S. and bring moisture; during the summer they are from the N.W. and are accompanied by cloudless skies and moderate temperatures. WincS from the N.E. bring hot weather in the summer and intense cold in the winter.

Soils. — The state has almost as great a variety of soils as of climate. In the Willamette Valley the soils are mostly clay loams, of a basaltic nature on the foothills and greatly enriched in the river bottom lands by washings from the hills and by deposits of rich black humus. In south-western Oregon, in the Rogue and Umpqua valleys, the characteristic soil js a reddish clay, though other varieties are numerous. In eastern Oregon the soils are of an entirely different type, being usually of a greyish appearance, lacking in humus, and composed of volcanic dust and alluvium from the uplands. They are deep, of fine texture, easily worked and contain abundant plant food in the form of soluble compounds of calcium, sodium and potassium. At times, however, these salts are present in such excess as to render the soils too alkaline for plant growing. Where there is no excess of alkali and the water supply is sufficient, good crops can be grown in this soil without the use of fertilizers.

Agriculture and Stock-Raising. — Oregon has some of the most productive agricultural lands in the United States, but they are rather limited in extent, being confined for the most part to the valleys west of the Cascade Mountains and the counties bordering on the Columbia river east of those mountains. The other parts of the state are generally too dry or too mountainous for growing crops, but contain considerable areas suitable for grazing. In 1900 only about one-sixth

of the total land surface was included in farms, and a trifle less than one-third of the farm land was improved. There were 35,837 farms, and their average size was 28 1 acres. Of the whole number 33-0% (11,827) contained less than 100 acres each, 30-5% (ii>°55) contained from 100 to 175 acres each, and 10-4% (3727), devoted mainly to stock-raising, contained 500 acres or more each. Nearly four-fifths of the farms (28,636) were operated by owners or part owners, 3729 were operated by share tenants, 2637 by cash tenants and 835 by owners and tenants or managers. The principal crops are wheat, oats, hay, fruits, hops, potatoes and miscellaneous vegetables. Sheep and cattle are raised extensively on ranches in the semi-arid regions, large herds of cattle are kept on lands too wet for cultivation in the western counties, and stock-raising and dairying have become important factors in the operation of many of the best farms. The acreage of wheat was 810,000 in 1909 and the crop was 16,377,000 bushels. The oat crop was 10,886,000 bushels. The barley crop was 1,984,000 bushels. The nights are so cool that Indian corn is successfully grown only by careful cultivation, and the crop amounted to only 552,000 bushels in 1909. The hay crop, 865,000 tons in 1909, is made quite largely from wild grasses and grains cut green; on the irrigated lands alfalfa is grown extensively for the cattle and sheep, which are otherwise almost wholly dependent for sustenance upon the bunch grass of the semi-arid plains. Both cattle and sheep ranches in the region east of the Cascade Mountains have been considerably encroached upon by the appropriation of lands for agricultural purposes, and the cattle, also, have been forced to the south and east by the grazing of sheep on lands formerly reserved for them; but the numbers of both cattle and sheep on the farms have become much larger. The whole number of sheep in the state was 2,581,000 in 1910. The number of cattle other than dairy cows was 698,000 and that of dairy cows 174,000. The dairy business is a promising industry in the farming regions, especially in the Willam- ette Valley. The number of horses in 1910 was 308,000. The small number of swine (267,000 in 19 10) is partly due to the small crop of Indian corn. Fruit-growing has been an increasingly important industry in the region between the Cascade and Coast Ranges and (to a less degree) east of the Cascade Range ; and the cultivation of apples is especially important. The cultivation of hops was begun in Oregon about 1850; the soil and climate of the Willamette Valley

were found to be exceedingly favourable to their growth, and the product increased to 20,500,000 lb in 19,05, when the state ranked first in the Union in this industry.

The agricultural resources of the state may be considerably in- creased

by irrigation east of the Cascade Mountains. The irrigated areas* which are widely distributed, increased from a total of 177,944 acres in 1889 to 388,310 acres in 1902. In 1894 Congress passed the " Carey Act " which authorizes the Secretary of the Interior, with the approval of the President, to donate to each of the states in which there are Federal desert lands as much of such lands (less than 1,000,000 acres) as the state may apply for, on condition that the state reclaim by irrigation, cultivation and occupancy not less than 20 acres of each 160-acre tract within ten years, and under the operation of this Act the state chose 432,203 acres for reclamation, mostly in the basin of the Deschutes river. Furthermore there is a state association engaged in irrigation projects, and the United States Reclamation Service, established by an Act of Congress in 1902, has projects fpr utilizing the flood waters of the Umatilla, Malheur, Silvies and Grande Ronde rivers, the waters of the Owyhee and Wallowa rivers and Willow Creek, and the waters of some of the lakes in the central part of the state. Two of these projects had been begun by 1909 : the Umatilla project in Umatilla county, to irrigate 20,440. acres with water diverted from the Umatilla river by a dam (98 ft. high, 3500 ft. long) 2 m. above Echo, with a reservoir of 1 500 acres, was authorized in 1905 and was 855% finished in 1909; the Klamath project, to irrigate 181,000 acres in Klamath county, Oregon (about 145,000 acres) and Siskiyou and Modoc counties, California, by two canals from Upper Klamath Lake and by a storage dam (33 ft. high, 940 ft. long) in the Clear Lake reservoir of 25,000 acres, was authorized in 1905 and was 38% completed in 1909. It has been estimated that the irrigated and irrigable area under private canals is about 80,000 acres, and that that still undisposed of in 1909, irrigated by the state under the Carey Act, amounted to 180,000 acres.

Fisheries.— The Columbia river has long been famous for its salmon, and as the supply seemed threatened with exhaustion for several years following the maximum catch in 1883, the state legislature in 1901 passed an act establishing a close season both early in the spring and late in the summer and prohibiting any fishing, except with hook and line, at any time, without a licence. In 1908 two laws pro posed by initiative petition were passed, stopping all fishing by night and fishing in the navigable channels of the lower river, limiting the length of seines to be used in the lower river and abolishing the use of gear by fishermen of the upper river— the mouth of the Sandy river, in Multnomah county, being the dividing line between the upper and lower Columbia. Several hatcheries have been established by the state authorities of Oregon and Washington and by the Federal government for propagating the best varieties : the Chinooks (0. tschawytscha), the

bluebacks (0. nerka) and, when the bluebacks became scarce, silversides (0. kisutch). The total catch of salmon on the Oregon side of the Columbia river in 1901 was 16,725,435 lb; from this it rose to 24,575,228 lb in 1903, but fell to 18,151,743 lb in 1907 and 18,463,546 in 1908. Salmon are caught in smaller quantities in the coast streams: 4,371,618 lb in 1901 and 8,043,690 lb in 1906, but only 6,738,682 lb in 1907 and 6,422,51 1 lb in 1908. Some catfish, shad, smelt, halibut, herring, perch, sturgeon, flounders, oysters, clams, crabs and crawfish are also obtained from Oregon waters.

Minerals. — Gold was discovered in the Rogue and Klamath rivers in the S. part of Oregon in 1852, and placer-mining was prosecuted here without interruption until i860, when the metal was found in larger quantities on the streams in Baker and Grant counties in the north-eastern part of the state. Quartz-mining has since very largely taken the place of placer-mining, but the two principal gold-producing districts are still that traversed by the Blue Mountains in the north-eastern quarter and that drained by the Rogue river in the south-western corner, a continuation of the California field. The value of the total output of the state was $2,113,356 in 1894, but only $865,076 in 1908. Silver is obtained almost wholly in the form of alloy with gold, and in 1908 the value of the output was only $23,109. Lignitic coal was discovered on or near the coast of Coos Bay as early as 1855, and this is still the only productive coalfield within the state, although there are outcroppings of the mineral all along the Coast Range N. of the Rogue river, along the W. foothills of the Cascade Range and in the Blue Mountains; this coal is suitable for steam and heating purposes but will not coke. The quantity of the output was 86,259 short tons in 1908. Copper ores are known to be quite widely distributed in the mountain districts, but there has been little work on any except some in Josephine and Grant counties ; in 1908 the state's output amounted to 291,377 lb of copper. Iron ore, platinum, lead, quicksilver and cobalt have been obtained in the state in merchantable quantities, and there is some zinc ore in the Cascade Range. In Union county is a great amount of blue lime- stone, and there is limestone, also, in Baker, Grant, Wallowa, Jackson and Josephine counties. Sandstone-is abundant, and there is some granite, in the Coast Range. A variegated marble is obtained in Douglas county, and other marbles are found in several counties. Clays suitable for making brick and tile are found in nearly every part of the state: in 1908 the clay products of the state were valued a * $555.768- Soapstone is abundant in both the E. and W. counties. Ochre, or mineral paint, and mineral waters, too, are widely

distributed. There is some roofing slate along the Rogue river, natural cement, nickel ore, bismuth and wolframite in Douglas county, gypsum in Baker county, fire-clay in Clatsop county, borate of soda on the marsh lands of Harney county, infusorial earth and tripoh in the valley of the Deschutes river, chromate of iron in Curry and Douglas counties, molybdenite in Union county, bauxite in Clackamas county, borate of lime in Curry county, manganese ore in Columbia county, and asbestos in several of the southern and eastern counties. The total value of all mineral products in 1908 was

$2,743,434.

Manufactures. — Manufacturing is encouraged both by the variety and abundance of raw material furnished by the mines, the forests, the farms and the fisheries, and by the coal and water-power avail- able for operating the machinery. The total value of manufactures increased from $10,931,232 in 1880 to $41,432,174 in 1890, or 279% in ten years, and although progress was slow from 1890 to 1900 there was a rapid advance again from 1900 to 1905, when the value of factory products increased from $36,592,714 to $55,525,123. The manufactures of greatest value are lumber and timber products ($12,483,908 in 1905). Portland' and Astoria are the chief manu- facturing centres; in 1905 the value of the factory products of these two cities was 57-2 % of that of the factory products of the entire state.

Transportation and Commerce. — For no m. from the mouth of the Columbia river to Portland, 12 m. up the Willamette river, is a channel which in 1909 was navigable (20-22 ft. deep) by large ocean-going vessels, and which will have a minimum depth of 25 ft. at low water upon the completion of the Federal project of 1902. From the mouth of the Willamette river vessels of light draft ascend the Columbia (passing the Cascade Falls through a lock canal, which was opened in 1896 and has a depth of 8 ft., a width of 92 ft. and two locks, each 462 ft. long) to the mouth of the Snake river (in the state of Washington), up that river to the mouth of the Imnaha, in Wallowa county, on the eastern boundary of Oregon, and, when the water is high, up the Imnaha river to the town of Imnaha, 516 m. from the sea. The Willamette river is navigable to Harrisburg, 152 m. above Portland, but boats seldom go farther up the river than Corvallis, 1 19 m. above Portland, and the depth at low water to Corvallis is only 3 ft. On the coast, Coos Bay, a' tidal estuary, is the principal harbour between the mouth of the Columbia and San Francisco; it admits

vessels drawing 14 to 16 ft. of water, and both the north and south forks of the Coos river are navigable for vessels of light draft (the depth at low water is only 1-5 ft.) 14 m. from the mouth of that river, and 8-5 m. on each fork. Farther north, Yaquina Bay and Tillamook Bay also admit small steamboats. The Coquille river is navigable for about 37 m., the Yaquina river for 23 m. with a depth of 13 to 15 ft., the Siuslaw river for 6 m. (for vessels drawing less than 6 ft., 15 m. farther for very light draft vessels) and a few other coast streams for short distances. The beginning of railway building in Oregon was delayed a few years by a contest between parties desiring a line on the east side of the Willamette river and parties desiring one on the west side. Finally, on the 14th of May 1868, ground was broken for the proposed line on the west side, and two days later it was broken for one on the east side ; that on the east side was completed for 20 m. south of Portland in 1869 and that on the west side was completed to the Yamhill river in 1872. In 1870 the mileage was 159 m. The principal period of railway building was from 1880 to 1890, during which 931-97 m. were built and the state's mileage increased from 508 m. to i,439'97 m – In 1909 the total mileage was 2089-46 m. There is a state rail- way commission. The principal railways are: that of the Oregon Railroad & Navigation Company (controlled by the Union Pacific), which crosses the north-eastern corner of the state and then runs along the bank of the Columbia river to Portland; three lines of the Southern Pacific in the Willamette Valley, the main line connecting Portland with San Francisco ; the Astoria & Columbia River, con- necting Portland and Astoria; the Coos Bay, Roseburg & Eastern Railroad & Navigation Company (owned by the Southern Pacific), connecting Coos Bay with one of the Southern Pacific lines; and the Corvallis & Eastern (owned by the Southern Pacific), connecting Yaquina Bay with all three lines of the Southern Pacific. Throughout the Cascade Mountain Region and the great semi-arid region east of those mountains, which together embrace more than two-thirds of the state's area, there is not a railway.

The state carries on an extensive commerce with the Orient and with the Canadian provinces. Its exports are principally lumber, wheat, live-stock, fish and wool; its imports are largely a variety of products of the Oriental countries. There are four customs districts : southern Oregon, with Coos Bay as the port of entry ;_ Willamette, with Portland as the port of entry; Oregon, with Astoria as the port of .entry ; and Yaquina, at the mouth of the Yaquina river.

Population. — The population of Oregon was 13,294 in 1850; 52,465 in i860; 90,923 in 1870; 174,768 in 1880; 317,704 m 1890; 413,536 in 1900, an increase of 30-2% in the decade; and 672,765 in 1 9 10, a

further increase of 62-7 . Of the total population in 1900, 347,788, or 84-1, were native-born, 65,748 were foreign- born, 394,582, or 95-4%, were of the white race, and 18,954

were coloured. Of those born within the United States only 164,431, or less than one-half, were natives of Oregon, and of those born in other states of the Union 128,654, or about seven- tenths, were natives of one or another of the following states: Missouri, Illinois, Iowa, Ohio, California, New York, Indiana, Kansas, Washington, Wisconsin and Pennsylvania. Nearly three-fourths of the foreign-born were composed of the following: 13,292 Germans, 9365 Chinese, 9007 Scandinavians, 7508 Canadians, 5663 English and 4210 Irish. The coloured popula- tion consisted of 10,397 Chinese, 4951 Indians, 2501 Japanese and 1 105 negroes.

The Indians are remnants of a large number of tribes, most of which are aboriginal to this region, and they represent ten or more distinct linguistic stocks. Most of them have been collected under five government schools; the Clackamas, Cow Creek, Calapooya, Lakmiut, Mary's River, Molala, Nestucca, Rogue River, Santiam, Shasta, Tumwater, Umpqua, Wapato and Yamhill, numbering 145 in 1909, under the Grande Ronde school, on the Grande Ronde reservation in Polk and Yamhill counties; the Klamath (658), Modoc (216), Paiute (103), and Pit River or Achomawi (56), under the Klamath school on the Klamath reservation (1362-8 sq. m.) in Klamath and Lake counties; the Alsea, Coquille, Kusan, Kwatami, Rogue River, Skoton, Shasta, Saiustkea, Siuslaw, Tututni, Umpqua and several other small tribes, numbering 442 in 1909, under the Siletz school, on the Siletz reservation (5 sq. m.) in Lincoln county; the Cayuse, Umatilla and Wallawalla, numbering 1205 in 1908, under the Umatilla school, on the Umatilla reservation (124-73 sq. m.) in Umatilla county, and the Paiute, Tenino, Warm Springs and Wasco Indians, numbering 765 in 1909, under the Warm Springs school on the Warm Springs reservation (503-29 sq. m.) in Wasco and Crook counties. Most of the Indians are engaged in farming and stock-raising, but a few still derive their maintenance mainly from fishing and hunting.

Roman Catholics are the most numerous religious sect in the state (in 1906 out of a total of 120,229 communicants of all religious bodies, they numbered 35.317)- The rura l popula- tion {i.e. population outside of incorporated places) is very sparse, only about 25, in 1900, to the square mile, and while it increased from 203,973 in 1890 to 229,894 in 1900, or only 11-3%, the urban {i.e. population of places having 4000 in- habitants or more) together with the semi-urban {i.e. population of incorporated places having less than 4000 inhabitants)

in- creased during the same decade from 113,731 to 183,642, or 61-5%. The principal cities are Portland, Astoria, Baker City and Salem, which is the capital.

Administration. — The state is still governed under its original constitution of 1857, with the amendments adopted in 1902, 1906 and 1908. This constitution may be amended: by a majority of the popular vote at a regular general election, if the amendment has been passed. by a majority vote of all the elected members of each house of the legislature; or by an initiative petition; or by a constitutional convention, which may not be called, however, unless the law providing for it is approved by popular vote. The right of suffrage is conferred by the constitution upon all white male citizens twenty-one years of age and over who have resided in the state during the six months immediately preceding the election, and upon every white male of the required age who has been a resident of the state for six months, and who, one year before the election, has declared his intention of becoming a citizen and who has resided in the United States for one year and in the state for six months prior to the election. Idiots, insane persons and persons convicted of serious crimes are disfranchised. The clause excluding negroes and Chinese from the suffrage has never been repealed, although it has been rendered nugatory by the Fifteenth Amendment to the Federal Constitution. Another provision which has been annulled by amendment to the Federal Constitution, but which still remains in the state constitution, is a clause forbidding free negroes or mulattoes, not residing in the state at the time of the adoption of the constitution, to enter the state or to own real estate or make contracts and maintain suits therein, and bidding the legislature provide for the removal of such negroes and mulattoes and for the punishment of persons bringing them into the state, or employing or harbouring them. The constitution provides that no Chinaman, not a resident of the state at the time of

the adoption of the constitution, shall ever hold any real estate or mining claim, or work any mining claim in the state.

The chief executive functions are vested in a governor, who is elected for a term of four years, and who must be at least 30 years old and must have been a resident of the state for three years before his election. He is not eligible to the office for more than eight years in

any period of twelve years. He has the right of pardon and a veto of legislative acts, which may be overridden by a two-thirds vote of the members present of each house of the legislature. The other important adminis- trative officers are the secretary of state (who succeeds the governor if he dies or resigns — there is no lieutenant-governor), treasurer, attorney-general, superintendent of public instruction and labour commissioner. No public officer may be impeached, but for sufficient cause the governor may remove a justice of the supreme court or a prosecuting attorney from office, upon a joint resolution of the legislature adopted by a two-thirds vote in each house. A public official may be tried for incom- petence, corruption or malfeasance according to the regular procedure in criminal cases, and if convicted he may be dis- missed from office and receive such other penalties as the law provides.

The legislative department (officially called ” the legislative assembly “) consists of a Senate of thirty 1 members chosen for four years, with half the membership retiring every two years, and a House of Representatives with sixty 1 members elected biennially. A senatorial district, if it contains more than one county, must be composed of contiguous counties, and no county may be divided between different senatorial districts. The sessions of the legislature are biennial. Bills for raising revenue must originate in the House of Representatives, but the Senate may offer amendments. Until 1902 the legislature was the sole law-making body in the state, but on the 2nd of June of this year the voters adopted a constitutional amend- ment which declared that ” the people reserve to themselves power to propose laws and amendments to the constitution, and to enact or reject the same at the polls, independent of the legislative assembly, and also reserve power at their own option to approve or reject at the polls any act of the legislative assembly.” This provision for the initiative and the referendum was made effective by a legislative act of 1903. Eight per cent of the number of voters who at the last preceding election voted for a justice of the supreme court, by filing with the secretary of state a petition for the enactment of any law or constitutional amendment — the petition must contain the full text of the law and must be filed at least four months before the election at which it is to be voted upon — may secure a vote on tne proposed measure at the next general election, and if it receives the approval of the voters it becomes a law without interposition of the legislature, and goes into effect from the day of the governor’s proclamation announcing the result of the election. A referendum ot legislative enactments may be ordered in two ways: the legislature itself may refer any of its acts to the people for approval or rejection at the next regular election, in which case the

act may not be vetoed by the governor and does not go into effect until approved at the polls; or 5 % of the number of voters at the last election for a supreme court justice may by petition order any act, except such as are ” necessary for the immediate preservation of the public peace, health or safety,” to be referred to the voters for their approval or rejection. Such a petition must be filed within ninety days after the adjournment of the session in which the act was passed. The secretary of state is required to mail to every voter whose address he has a pamphlet containing the text of the laws to be voted upon at the ensuing election. Along with the text of the law, the state will print argu- ments in its favour if any are submitted by the persons initiating the measure and the cost of the extra printing is paid by the initiators. In like manner, any one who will defray the expense of the printing may submit arguments in opposition to any proposed measure, and these will be included in the pamphlet and distributed by the state at its own expense. This ” text-book ” for the voters contained 60 pages in 1906 and 126 pages in 1908.

The power of the initiative was first exercised by the people of Oregon in 1904, when they proposed and enacted a local option liquor law and a direct primary law. As a result of the first of these measures, in 1908 nineteen of the thirty-three counties ot the state had prohibited the sale of intoxicants since 1905. The most important effect of the direct primary law has been the choice of United States senators by what is practically a popular vote. Candidates for the United States Senate are voted for in the primaries, and between 1904 and 1909 candidates for the state legislature were required to say whether or not they would support the people’s choice *or United

1 The constitution set 30 as the maximum number or senators, 60 as the maximum number of representatives, and provided for 16 senators and 34 representatives in 1 857-1 860. It provided for an enumeration and a reapportionment each tenth year aftei 1865.

States senator regardless of their own preferences. 2 In the state election in June 1908 a Democrat received the highest popular vote for the senatorship, and as a majority of the legislature of 1909 had committed itself to vote for the people’s choice, he was elected by that body, although five-sixths of its members were Republicans. 3 This was an anomaly in American politics. In June 1906 five laws and five amendments to the constitution, proposed by initiative petitions, and one law on which the referendum was ordered by petition, were submitted to a popular vote. An amendment giving women the right to vote was defeated, and among those adopted was one providing for the initiative upon special and local laws and parts of laws, and

another giving cities and towns the exclusive right to enact or amend their own charters, subject only to the constitution and the criminal laws. Oregon was thus the first American state to grant complete home rule to its municipalities. At the election in June 1908 the number of initiative and referendum measures amounted to nineteen, and the ballot required forty-one separate marks and was over 2j ft. long.

The measures to be voted on consisted of eleven laws or constitutional amendments proposed by initiative petition, four constitutional amendments referred to the people by the legislature, and four laws upon which the voters had ordered a referendum. Among the measuresdefeated were the fourth woman's suffrage amendment voted down in Oregon, a single-tax bill and an " open town " bill designed to defeat the purpose of the local option liquor law. Among the measures adopted were: a law (of doubtful constitutionality) requiring legislators to vote for the people's choice for a United States senator — this was adopted by a vote of 69,668 to 21,162; a corrupt practices act, regulating the expenditure of moneys in political campaigns and limiting a candidate's expenses to one- fourth of one year's salary ; an amendment permitting the establish- ment of state institutions elsewhere than at the capital; an amend- ment changing the time of state elections from June to November; an amendment permitting the legislature to pass a law providing for proportional representation, i.e. representation for each political party in proportion to its numerical strength, by providing for first and second choice in voting — the system of preferential voting adopted in Idaho in 1909; and the " recall," by which the voters may remove from office after six months' service by a special election any local official. 4

Judiciary. — The judicial department of the state consists of a supreme court, circuit courts, county courts (held by a county judge in each county) and the courts of local justices of the peace. The supreme court consists of five (before 1909 the number was three) justices elected for a term of six years, and its jurisdiction extends only to appeals from the decisions of the circuit courts. The judges of the circuit courts were formerly supreme court justices on circuit ; they also are chosen for six years, and they have cognizance over all cases, including appeals from inferior courts, not specifically re- served by law for some other tribunal. The judges of the county courts are elected for four years, and their courts have jurisdiction over probate matters, civil cases involving amounts not exceeding $500, and criminal cases in which the offence is not punishable by death or imprisonment in the penitentiary. Each county is divided into a

number of districts or precincts, for each of which there is a justice of the peace, elected biennially and having jurisdiction in minor cases.

Local Government. — For the purposes of local government the state is divided into thirty-four counties. The constitution provides that no county may have an area of less than 400 sq. m., and that no new county may be created unless its population is at least 1200. County affairs are administered by the county judge acting with two commissioners. Any portion of a county containing as many as 1 50 inhabitants may be incorporated as a town or city, and as such it possesses complete self-government in all purely local matters, even

2 Before 1904, under a law of 1901, the people voted for candidates for the United States Senate, but the legislative assembly was in no way bound to carry out the decision of the popular vote; and in 1904 the legislature chose as United States senator a candidate for whom no votes had been cast in the popular election.

3 It is to be noted that the Republican party had not favoured requiring a pledge from members of the legislature that they would vote for the people's choice for senator; that the Democratic candidate for senator (Gov. G. E. Chamberlain) was a prominent advocate of the initiative, the referendum and the direct election of United States senators; and that a wing of the Republican party worked for the choice of the Democratic candidate by the people in the hope that the (Republican) legislature would not ratify the popular choice and so would nullify the direct primary law.

4 At times the two law-making bodies — the legislature and the people — have come into conflict. In 1906, for example, the people by the initiative secured a law forbidding public officers from accepting free passes from railways. In 1907 the legislature repealed all laws on this subject and .required railways to furnish free transportation to certain officials. Upon this measure, however, the people ordered a referendum and it was rejected at the polls. In 1908 the people voted against increasing the number of supreme court judges; in 1909 the legislature increased the number.

having the power to revise its own charter. A constitutional amendment of 1906 forbids the formation of corporations by special laws (formerly the constitution provided that corporations " shall not be

created by special laws except for municipal purposes “) and says: ” The legislative assembly shall not enact, amend or repeal any charter or act of incorporation for any municipality, city or town.” The initiative and the referendum are employed in municipal ordinances as well as in state laws; towns and cities make their own provisions as to ” the manner of exercising the initiative and refer- endum powers as to their own municipal legislation ” ; but ” not more than 10 % of the legal voters may be required to order the referendum nor more than 15 % to propose any measure by the initiative, in any city or town.”

Miscellaneous Laws. — The value of the homestead exempt from judicial sale for the satisfaction of liabilities is limited to $1500; the homestead must be owned and occupied by some member of the family claiming the exemption and may not exceed in area one block in a town or city or 160 acres outside of a municipality. The ex- emption is not valid against a mortgage, but the mortgage must be executed by both husband and wife, if the householder is married. The debtor claims the exemption where the levy is made, but if the sheriff deems the homestead greater in value than the law allows, he may choose three disinterested persons to appraise it and sell any portion that may be adjudged in excess of the legal limit. The constitution provides that the property and pecuniary rights of every married woman, at the time of her marriage, or afterwards, acquired by gift, devise or inheritance, shall not be subject to the debts or contracts of the husband; and that laws shall be passed providing for the registration of the wife’s separate property. Marriages between whites and persons of negro descent, between whites and Indians, and between first cousins are forbidden or are void. One year’s residence is necessary to secure a divorce, for which the causes recognized are a conviction of felony, habitual drunkenness for one year, physical incapacity, desertion for one year and cruelty or personal indignities.

Education. — The public school system (organized 1873) i s a d- ministered by the state superintendent of public instruction, who exercises a general supervision over the schools, and by the state board of education, which prescribes the general rules and regulations for their management. For the support of the schools there is a school fund, amounting on the 1st of April 1909 to $5,861,475, and consisting of the moneys derived from the sale of lands donated by the Federal government and of small sums derived from miscellane- ous sources. The fund is administered by a board consisting of the governor, the secretary of state and the state treasurer, and the income from it is apportioned among the counties according to the number of children of school age. The counties are also required to

levy special school taxes, the aggregate annual amount of which shall be equivalent to at least seven dollars for every child between the ages of four and twenty years. If the total annual fund for a school district amounts to less than $300, the district must levy a special tax to bring the fund up to that sum. Each school district in the state is required to have a school term of six months or more. Special county taxes are levied for the maintenance of public school libraries also. For all children between the ages of nine and fourteen inclusive, school attendance is compulsory.

The total number of teachers in the public schools in 1908 was 4243; the total school enrollment, 107,493; the average daily attendance 94,333. In 1908 there was paid for the support of common schools $3,061,994; the average monthly salary of rural teachers was $49-60, and of school principals, $80-87. . The _ pro- portion of illiterates is low: in 1900 of the total population 10 years of age or over only 3-3 % was illiterate; of the male population of the same age 3-9 %, of the female 2-3 % and of the native white population only o-8 % were illiterate.

In addition to the public schools, the state maintains; the Uni- versity of Oregon at Eugene (q.v.) ; the State Agricultural College (1870), at Corvallis (pop. 1900, 1819), the county-seat of Benton county, and the State Normal School (1882) at Monmouth (pop.ˆ in 1900, 606), in Polk county. Among the institutions not receiving state aid are Albany College (Presbyterian, 1867) , at Albany ; Colum- bia University (Roman Catholic, 1901), at Portland; Dallas College (United Evangelical, 1900), at Dallas; Pacific University (Congre- gational, 1853), at Forest Grove; McMinnville College (Baptist, 1858), at McMinnville; Pacific College (Friends, founded in 1885 as an academy, college opened in 1891), at Newberg; Philomath College (United Brethren, 1866), at Philomath; and Willamette University (Methodist Episcopal, 1844), at Salem.

Charitable and Correctional Institutions. — The state supports the following charitable and correctional institutions: a soldiers' home (1894) at Roseburg and a school for deaf mutes (1870), an institute for the blind (1873), a reform school, an insane asylum and a peni- tentiary at Salem, the capital of the state. These institutions (except the penitentiary, of which the governor of the state is an inspector) are governed each by a board of three trustees, the governor of the state and the secretary of state serving on all boards, and the third trustee being the state treasurer on the boards for the state insane asylum, the state reform school and the institute for the feeble- minded, and the superintendent of public instruction

on the boards for the school for deaf mutes and the institute for the blind.

Finance. — The constitution forbids the establishment or incorporation by the legislative assembly of any bank or banking company; and it forbids any bank or banking company in the state from issuing bills, checks, certificates, promissory notes or other paper to circulate as money. Except in case of war the legislative assembly may not contract a state debt greater than $50,000. To pay bounties to soldiers in the Civil War a debt of $237,000 was contracted; but in 1870 only $90,000 of it was still outstanding. An issue of bonds (to be redeemed from the sale of public lands) for a privately built canal at Oregon City was authorized in 1870. About $175,000 more of debt was incurred by Indian wars in 1874 and 1878; in the latter year the public debt amounted to more than $650,000, but about $350,000 of this was in 10 % warrants for road-building, &c. ; the bonds and warrants (with the exception of some never presented for redemption) were speedily redeemed by a special property tax. Revenues for the support of the government are derived from the following sources : the general property tax, the poll tax (the proceeds of which accrue to the county in which it is collected), the inheritance tax, corporation taxes, business taxes and licenses and fees. By far the most im- portant source of revenue is the general property tax, which is assessed for state, county and municipal purposes. The amount of revenue to be raised for state purposes each year by this tax is com- puted by a board consisting of the governor, the secretary of state and the state treasurer, and it is apportioned among the counties on the basis of their average expenditures for the previous five years. At the close of the year 1907 the state was free from bonded indebtedness; receipts into the treasury during the year were $2,851,471, and the expenditure was $2,697,645.

History. — As to the European who first saw any portion of the present Oregon there is some controversy and doubt. It is known that within thirty years after the discovery of the Pacific Ocean the Spaniards had explored the western coasts of the American continent from the isthmus to the vicinity of the forty-second parallel of north latitude, and it is possible that the Spanish pilot Bartolome Ferrelo (or Ferrer), who in 1543 made the farthest northward voyage in the Pacific re- corded in the first half of the 16th century, may have reached a point on the Oregon coast. The profitable trade between the Spanish colonies and the Far East, however, soon occupied the whole attention of the Spaniards, and caused them to neglect the exploration of the coast of north-western America for many years. In 1579 the Englishman, Francis Drake, came to this region seeking a route home

by way of the North- west Passage, and in his futile quest he seems to have gone as far north as 43 . 1 He took possession of the country in the name of Queen Elizabeth and called it Albion. Near the end of the century persistent stories of a North-west Passage caused the Spanish rulers to plan further explorations of the Pacific coast, so as to forestall other nations in the discovery of the alleged new route and thus retain their monopoly of the South Sea (Pacific Ocean). In 1603 Sebastian Vizcaino, acting under orders of the viceroy of Mexico, reached the latitude of 42° N., and Martin Aguilar, with another vessel of the fleet, reached a point near latitude 43 which he called Cape Blanco and claimed to have discovered there a large river. For the next century and a half Spain again neglected this region, until the fear of English and Russian encroachment caused her to resume the work of exploration. In 1774 Juan Perez sailed up the coast as far as 54 N. lat., and on his return followed the shore line very closely, thus making the first real and undisputed exploration of the Oregon coast of which there is any record. In the following year Bruno Heceta landed off what is now called Point Grenville and took formal possession of the country, and later, in lat. 46°g', he discovered a bay whose swift currents led him to suspect that he was in the mouth of a large river or strait. In 1778 Jonathan Carver {q.v.) published in London Travels throughout the Interior Parts of North America, in which, following the example of the Spaniards, he asserted that there was a great river on the western coast, although, so far as is known, no white man had then ever seen such a stream. Whether his declaration was based on stories told by the Indians of the interior, or upon reports of Spanish sailors, or had no basis at all, is not known; its chief importance lies in the fact that Carver called this undiscovered stream the Oregon, and that

1 Some early writers assert that Drake even reached the lat. of 48 N. and anchored in the Straits of Juan de Fuca.

this name was eventually applied to the territory drained by this great western river. The name, like the whole story, may have been of Spanish or Indian origin, or it may have been purely fanciful. 1

The Spaniards made no effort to colonize north-western America or to develop its trade with the Indians, but toward the end of the 18th century the traders of the great British fur companies of the North were gradually pushing overland to the Pacific. Upon the sea, too, the

English were not idle. Captain James Cook in March 1778 sighted the coast of Oregon in the lat. of 44°, and examined it between 47 and 48 in the hope of finding the Straits of Juan de Fuca described in Spanish accounts. Soon after the close of the War of Independence American merchants began to buy furs along the north-west coast and to ship them to China to be exchanged for the products of the East. It was in the prosecution of this trade that Captain Robert Gray (1755-1806), an American in the service of Boston merchants, discovered in 1792 the long-sought river of the West, which he named the Columbia, after his ship. By the discovery of this stream Gray gave to the United States a claim to the whole territory drained by its waters. Other explorers had searched in vain for this river. Cook had sailed by without suspecting its presence; Captain John Meares (c. 1756-1809), another English navigator, who visited the region in 1788, declared that no such river existed, and actually called its estuary ” Deception Bay”; and George Vancouver, who visited the coast in 1792, was sceptical until he learned of Gray’s discovery.

Spanish claims to this part of North America did not long remain undisputed by England and the United States. By the Nootka Convention of 1790 Spain acknowledged the right of British subjects to fish, trade and settle in the parts of the northern Pacific coast not already occupied; and under the treaty of 181 9 (proclaimed in 1821) she ceded to the United States all the territory claimed by her N. of 42 . But even before these agreements had been reached, Alexander Mackenzie, in the service of the North-west Company, in 1793 had explored through Canada to the Pacific coast in lat. about 52 20′ N., and Meriwether Lewis and William Clark, American explorers acting under the orders of President Jefferson, in 1805-1806 had passed west of the Rocky Mountains and down the Columbia river to the Pacific Ocean. Both British and American adventurers were attracted to the region by the profitable fur trade. In 1808 the North-west Company had several posts on the Fraser river, and in the same year the American Fur Company was organized by John Jacob Astor, who was planning to build up a trade in the West. In 181 1 the Pacific Fur Company, a kind of western division of the American Fur Company, founded a trading post at the mouth of the Columbia which they called Astoria, and set up a number of minor posts on the Willamette, Spokane and Okanogan rivers. On hearing of the war between England and the United States, Astor’s associates, deeming Astoria untenable, sold the property in October 1813 to the North-west Company. In the following month a British ship arrived, and its captain took formal possession of the post and renamed it Fort George.

Soon after the restoration of peace between England and the United

States by the treaty of Ghent (1814), there arose the so-called ” Oregon question ” or ” North-western boundary dispute,” which agitated both countries for more than a genera- tion and almost led to another war. As that treaty had stipulated that all territory captured during the war should be restored to its former owner, the American government in 1817 took

1 There have been many ingenious, but quite unsatisfactory, efforts to explain the derivation of the word Oregon. They are enumerated at length in Bancroft’s History of Oregon, vol. i. pp. 17-25. It seems that after the publication of Carver’s book the word Oregon did not appear again in print until William Cullen Bryant employed it in his poem Thanatopsis, in 181 7. It was applied to the territory drained by the Columbia river for the first time perhaps, by Hall J. Kelley, a promoter of immigration into the North-west, who in memorials to Congress and numerous other writings referred to the country as Oregon.

steps to reoccupy the Columbia Valley. The British government at first protested, on the ground that Astoria was not captured territory, but finally surrendered the post to the United States in 1818. The United States was willing at the time to extend the north-western boundary along the forty-ninth parallel from the Lake of the Woods to the Pacific, but to this the British government would not consent; and on the 20th of October 18 18 both nations agreed to a convention providing for the ” joint occupation ” for ten years of the country ” on the north-west coast of America, westward of the Stony [Rocky] Mountains.” In the following year, as already stated, Spain waived her claim to the territory north of 42 in favour of the United States. In 1821, however, Russia asserted her claim to all lands as far south as the fifty-first parallel. Against this claim both England and the United States protested, and in 1824 the United States and Russia concluded a treaty by which Russia agreed to make no settle- ments south of 54 40’, and the United States agreed to make none north of that line. From this time until the final settle- ment of the controversy the Americans were disposed to believe that their title was clear to all the territory south of the Russian possessions; that is, to all the region west of the Rocky Mountains between 42 and 54° 40′ N. lat. In 1827 the agreement of 1818 between Great Britain and the United States as to joint occupa- tion was renewed for an indefinite term, with the proviso that it might be terminated by either party on twelve months’ notice.

For the next two decades the history of Oregon is concerned mainly with the British fur traders and the American immigrants. The Hudson’s Bay Company absorbed its rival, the North-west Company,

in 182 1, and thus secured a practical monopoly of the fur trade of the North and West. Its policy was to dis- courage colonization so as to maintain the territory in which it operated as a vast game preserve. Fortunately for the Americans, however, the company in 1824 sent to the Columbia river as its chief factor and governor west of the Rocky Mountains Dr John McLoughlin (1784-1857), who ruled the region with an iron hand, but with a benevolent purpose, for twenty-two years. On the northern bank of the Columbia in 1824-1825 he built Fort Vancouver, which became a port for ocean vessels and a great entrepot for the western fur trade; in 1829 he began the settlement of Oregon City; and, most important of all, he extended a hearty welcome to all settlers and aided them in many ways, though this was against the company's interests.

In 1832 four Indian chiefs from the Oregon country journeyed to St Louis to obtain a copy of the white man's Bible; and this incident aroused the missionary zeal of the religious denomina- tions. In 1834 Jason Lee (d. 1845) and his nephew, Daniel Lee, went to Oregon as Methodist missionaries, and with McLoughlin's assistance they established missions in the Willamette valley. Samuel Parker went as a Presbyterian missionary in 1835, and was followed in the next year by Marcus Whitman and Henry H. Spalding (c. 1801-1874), who were accompanied by their wives, the first white women, it is said, to cross the American continent. Whitman settled at Wai-i-lat- pu, about 5 m. W. of the present Walla Walla and 25 m. from the Hudson's Bay Company's Fort Walla Walla; and Spalding at Lapwai, near the present Lewiston, Idaho. Roman Catholic missions were established near Fort Walla Walla in 1838. In this year Jason Lee returned to the Eastern states and carried back to Oregon with him by sea over fifty people, missionaries and their families. It is significant, if true, that part of the money for chartering his vessel was supplied from the secret- service fund of the United States government.

As early as 1841 the Americans in Oregon began to feel the need of some form of civil government, as the regulations of the Hudson's Bay Company were the only laws then known to the country. After several ineffectual attempts a provisional government was finally organized by two meetings at Champoeg (in what is now Marion county, north-east of Salem) on the 2nd of May and on the 5th of July 1843. The governing body was at first an executive committee of three citizens, but in 1845 this committee was abolished and a governor was chosen. In

the ” fundamental laws ” of the provisional government were incorporated a number of Articles from the Ordinance of 1787, among them the one prohibiting slavery. The new govern- ment encountered the opposition of the missionaries and of the non-American population, but it was spon strengthened by the ” Great Immigration ” in 1843, when nearly nine hundred men, women and children, after assembling at Independence, Missouri, crossed the plains in a body and settled in the Columbia Valley. After this year the flow of immigrants steadily increased, about 1400 arriving in 1844, and 3000 in 184s. 1 Signs of hostility to the Hudson’s Bay Company now began to appear among the American population, and in 1845 the provisional government sought to extend its jurisdiction north of the Columbia river, where the Americans had hitherto refrained from settling. A compromise was finally reached, whereby the company was to be exempt from taxes on all its property except the goods sold to settlers, and the officers and employees of the company and all the British residents were to become subject to the provisional government. Meanwhile the western states had inaugurated a movement in favour of the immediate and definite settlement of the Oregon question, with the result that the Democratic national convention of 1844 declared that the title of the United States to ” the whole of the territory of Oregon ” was ” clear and unquestionable,” and the party made ” Fifty- four forty or fight ” a campaign slogan. The Democrats were successful at the polls, and President Polk in his inaugural address asserted the claim of the United States to all of Oregon in terms suggesting the possibili ty of war. Negotiations, however, resulted in a treaty, drafted by James Buchanan, the American Secretary of State, and Richard Pakenham, the British envoy, which the president in June 1846 submitted to the Senate for its opinion and which he was advised to accept. By this instru- ment the northern boundary of Oregon was fixed at the forty- ninth parallel, extending westward from the crest of the Rocky Mountains to the middle of the channel separating Vancouver’s Island from the mainland, ” and thence southerly through the middle of the said channel, and of Fuca’s Straits, to the Pacific Ocean.”

Although President Polk immediately urged the formation of a territorial government for Oregon, the bill introduced for this purpose was held up in the Senate on account of the opposi- tion of Southern leaders, who were seeking to maintain the abstract principle that slavery could not be constitutionally prohibited in any territory of the United States, although they had no hope of Oregon ever becoming slave territory. Indian outbreaks, however, which began in 1847,

compelled Congress to take measures for the defence of the inhabitants, and on the 14th of August 1848 a bill was enacted providing a territorial govern- ment. As then constituted, the Territory embraced the whole area to which the title of the United States had been confirmed by the treaty of 1846, and included the present states of Oregon, Washington and Idaho, and parts of Wyoming and Montana. Its area was reduced in 1853 by the creation of the Territory of Washington. The discovery of gold in California drew many Oregon settlers to that country in 1848-1850, but this exodus was soon offset as a result of the enactment by Congress in 1850 of the ” land donation law,” by which settlers in Oregon between 1850 and 1853 were entitled to large tracts of land free of cost. The number of claims registered under this act was over eight thousand.

In 1856 the people voted for statehood; and in June 1857 they elected members of a constitutional convention which drafted a constitution at Salem in August and September 1857; the constitution was ratified by popular vote in November

1 For many years it was generally believed that the administration at Washington was prevented from surrendering its claims to Oregon, in return for the grant by Great Britain of fishing stations in Newfoundland, by Marcus Whitman, who in 1 842-1 843 made a journey across the entire continent in the depth of winter to dissuade the government from this purpose. This story seems to have no foundation in fact; it was not Whitman, but the great influx of settlers in 1 843-1 844 that saved Oregon, if, indeed, there was then any danger of its being given up. (See Whitman, Marcus.)

1857; and on the 14th of February 1859 Oregon was admitted into the Union with its present boundaries. The new state was at first, Democratic in politics, and the southern faction of the Democratic party in i860 made a bid for its support by nominating as their candidate for vice-president, on the ticket with John C. Breckinridge, Joseph Lane (1801-1881), then a senator from Oregon and previously its territorial governor. The Douglas Democrats and the Republicans, however, worked together as a union party, and Lincoln carried the state by a small majority. The so-called union party broke up after the Civil War, and by 1870 the Democrats were strong enough to prevent the ratification by Oregon of the Fifteenth Amendment to the Federal Constitution. In 1876, after the presidential election, two sets of electoral returns were forwarded from Oregon, one showing the choice of three Republican electors, and the other (signed by the governor, who was a Democrat) showing the election of two Republicans and one Democrat. The popular vote was admittedly for

the three Republican electors, but one of the Republican electors (Watts) was a deputy-postmaster and so seemed ineligible under the constitutional provision that ” no . . . person holding an office of trust or profit under the United States shall be an elector.” Watts resigned as deputy- postmaster, and the secretary of state of Oregon, who under the state law was the canvassing officer, certified the election of the three Republican electors. On the 6th of December the three met, Watts resigned, and was immediately reappointed by the other two. The Democratic claimant, with whom the two Republican electors whose election was conceded, refused to meet, met alone, appointed two other Democrats to fill the two ” vacancies,” and the ” electoral college ” of the state so constituted forthwith cast two votes for Hayes and one for Tilden. The Electoral Commission decided that the three votes should be counted for Hayes — if the one Democratic elector had been adjudged chosen, the Democratic candidate for the presidency, S. J. Tilden, would have been elected. The political complexion of the state has generally been Republican, although the contests between the two leading parties have often been very close. The Indian outbreaks which began in 1847 continued with occasional periods of quiet for nearly a generation, until most of the Indians were either killed or placed on reservations. The Indians were very active during the Civil War, when the regular troops were withdrawn for service in the eastern states, and Oregon’s volunteers from 1861 to 1865 were needed for home defence. The most noted Indian conflicts within the state have been the Modoc War (1864-73) and the Shoshone War (1866-68). During the Spanish-American War Oregon furnished a regiment of volunteers which served in the Philippines.

Governors of Oregon Under the Provisional Government.

George Abernethy

Under the Territorial Government.

Joseph Lane

Knitzing Pritchett (acting) ....

John P. Gaines

Joseph Lane

George Law Curry (acting) ....

John W. Davis

George Law Curry

1845-1849

I 849-1 850

1850

I 850-1 852

i853 2

1853 1853-1854 1854-1859

Under the State Government. John Whiteaker, Dem. . Addison Crandall Gibbs, Rep. George Lemuel Woods, Rep. La Fayette Grover, Dem. Stephen Fowler Chadwick (acting) William Wallace Thayer, Dem. . Zenas Ferry Moody, Rep. Sylvester Pennoyer, Dem. . William Paine Lord, Rep. . Theodore Thurston Geer, Rep. . George Earle Chamberlain, Dem. Frank W. Benson, Rep. Oswald West, Dem.

859-1862

862-1866

866-1870

870-1877

877-1878

878-1882

882-1887

887-1895

895-1899

899-1903

903-1909

909-191 1 3

911-

ˆTTeld office only three days, May 1 6-1 9 . 3 Secretary of State;

succeeded G. E. Chamberlain, who resigned to become a member of the U.S. Senate.

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OREGON CITY, a city and the county-seat of Clackamas county, Oregon, U.S.A., on the E. bank of the Willamette river, and S. of the mouth of the Clackamas river, about 15m.' S. by E. of Portland. Pop. (1890) 3062; (1900) 3494 (535 being foreign-born) ; (1910) 4287. It

is served by the Southern Pacific railway, by an electric line to Portland, by other electric lines, and by small river steamboats. The principal business streets are Main Street, on level ground along the river, and Seventh Street, on a bluff which rises abruptly 100 ft. above the river and is reached by four stairways elevated above the tracksof the Southern Pacific. The residences are for the most part on this bluff, which commands views of the peaks of the Cascade Mountains. The river here makes a picturesque plunge of about 40 ft. over a basalt ridge extending across the valley, and then flows between nearly vertical walls of solid rock 20-50 ft. high; it is spanned by a suspension bridge nearly 100 ft. above the water. A lock canal enables vessels to pass the falls. The water-power works woollen-mills, flour-mills, paper-mills, and an electric power plant (of the Portland Railway, Light and Power Company), which lights the city of Portland and transmits power to that city for street railways and factories. The muni- cipality owns the waterworks. Next to Astoria, Oregon City is the oldest settlement in the state. In 1829 Dr John McLoughlin (1784-1857), chief agent of the Hudson's Bay Company, established a claim to the water-power at the Falls of the Willamette and to land where Oregon City now stands, and began the erection of a mill and several houses. After 1840, in which year McLoughlin laid out a town here and named it Oregon City, a Methodist Mission disputed his claim. He aided many destitute American immigrants, left the service of the company, and removed to Oregon City. In 1850 Congress gave a great part of his claim at Oregon City for the endowment of a university, and in 1862 the legislature of Oregon reconveyed the land to McLoughlin's heirs on condition that they should give $1000 to the university fund; but the questionable title between 1840 and 1862 hindered the growth of the place, which was chartered as a city in 1850.

O'REILLY, JOHN BOYLE (1844-1800), Irish-American politician and journalist, was born near Drogheda on the 28th of June 1844, the son of a schoolmaster. After some years of newspaper experience, first as compositor, then as reporter, during which he became an ardent revolutionist and joined the Fenian organization known as the Irish RepublicanBrotherhood, he enlisted in a British cavalry regiment with the purpose of winning over the troops to the revolutionary cause (1863).

At this period wholesale corruption of the army, in which there was a very large percentage of Irishmen, was a strong feature in the Fenian programme, and O'Reilly, who soon became a great favourite, was successful in disseminating disaffection in his regiment. In 1866 the extent of the sedition in the regiments in Ireland was discovered by

the authorities. O'Reilly was arrested at Dublin, where his regiment was then quartered, tried by court-martial for concealing his knowledge of an impend- ing mutiny, and sentenced to be shot, but the sentence was subsequently commuted to twenty years' penal servitude. After confinement in various English prisons, he was transported in 1867 to Bunbury, Western Australia. In 1869 he escaped to the United States, and settled in Boston, where he became editor of The Pilot, a Roman Catholic newspaper. He subsequently organized the expedition which rescued all the Irish military political prisoners from the Western Australia convict establish- ments (1876), and he aided and abetted the American propaganda in favour of Irish nationalism. O'Reilly died in Hull, Mass., on the 10th of August 1890. His reputation in America naturally differed very much from what it was in England, towards whom he was uniformly mischievous. He was the author of several volumes of poetry of considerable merit, and of a novel of convict life, Moondyne, which achieved a great success. He was also selected to write occasional odes in commemoration of many American celebrations. See J. J. Roche, Life of John Boyle O'Reilly, (Boston, 1891).

OREL, or Orlov, a government of central Russia, bounded by the governments of Smolensk, Kaluga and Tula on the N., and by Voronezh and Kursk on the S., with an area of 18,036 sq. m. The surface is an undulating plateau sloping gently towards the west; the highest hills barely exceed 900 ft., and none of the valleys is less than 450 ft. above the sea. The principal rivers are the Don, which forms part of the eastern boundary, and its tributary the Sosna; the Oka, which rises in the district of Orel and receives the navigable Zusha; and the Desna, with the Bolva, draining the marshy lowlands in the west. Geologi- cally Orel consists principally of Lower Devonian limestones, marls and sandstones, covered with Jurassic clays, the last appearing at the surface, however, only as isolated islands, or in the valleys, being concealed for the most part under thick beds of Cretaceous chalk, marls and sands. The Carboniferous limestones and clays (of the so-called Moscow basin) show in the north-west only at a great depth. The Jurassic clays and marls are overlain at several places with a stratum of clay containing good iron-ore, while the Devonian sandstones and limestones are worked for building purposes. The whole is buried under a bed, 30 to 40 ft. thick, of boulder-clay and loess, the last covering extensive areas as well as the valleys. The soil — a mixture of " black earth " with clay — is fertile, except in the Desna region in the west, where sands and tenacious clays predominate. On the Oka, Zusha, Desna and Bolva there is a brisk traffic in corn, oil, hemp, timber, metal, glass, china, paper and

building-stone. Marshes occupy large areas in the basin of the Desna, as also in several parts of that of the Oka; they are mostly covered with forests, which run up to 50 to 65 % of the area in the districts of Bryansk, Trubchevsk and Karachev, while towards the east, in the basin of the Don, wood is so scarce that straw is used for fuel The climate is moderate, the average yearly temperature at Orel being 41-2° (i4-8° in January and 67-0° in July).

The estimated population m 1906 was 2,365,700. It consists almost exclusively of Great Russians, belonging to the Orthodox Greek. Church; the Nonconformists are reckoned at about 12,000, the Roman Catholics at 3000 and the Jews at 1000. The chief occupation is agriculture, which is most pro- ductive in the east and towards the centre of the government. The principal crops are rye, oats, barley, wheat, hemp, potatoes, hops, vegetables, tobacco and fruit. Of the grain not used in the distilleries a large proportion is exported to the Baltic. Hemp and hemp-seed oil are extensively exported from the west to Riga, Libau and St Petersburg. Tobacco is cultivated with profit. Cattle and horse-breeding flourishes better than in the

neighbouring governments — the Orel breeds of both carriage and draught horses being held in estimation throughout Russia. Bee-keeping is widely diffused in the forest districts, as are also the timber-trade and the preparation of tar and pitch. Manu- factures are rapidly increasing; they produce cast-iron rails, machinery, locomotive engines and railway wagons, glass, hemp-yarn and ropes, leather, timber, soap, tobacco and chemical produce. There are also distilleries and a great many smaller oil-works and flour-mills. Karachev and Syevsk are important centres for hemp-carding; Bolkhov and Elets are the chief centres of the tanning industry; while the districts of Elets, Dmitrov and partly Mtsensk supply flour and various food- pastes. At Bryansk there is a government cannon-foundry. The ” Maltsov works ” in the district of Bryansk are an industrial colony (20,000), comprising several iron, machinery, glass and rope works, where thousands of peasants find temporary or permanent employment; they have their own technical school, employ engineers of their own training, and have their own narrow-gauge railways and telegraphs, both managed by boys of the technical school. Numerous petty trades are carried on by the peasants, along with agriculture. The government is divided into twelve districts, of which the chief towns are Orel, the capital, Bolkhov, Bryansk, Dmitrovsk, Elets, Karachev, Kromy, Livny, Malo-

arkhangelsk, Mtsensk, Syevsk and Trubchevsk.

In the 9th century the country was inhabited by the Slav tribes of the Syeveryanes on the Desna and the Vyatichis on the Oka, who both paid tribute to the Khazars. The Syeveryanes recognised the rule of the princes of the Rurik family from 884, and the Vyatichis from the middle of the 10th century; but the two peoples followed different historical lines, the former being absorbed into the Suzdal principality, while the latter fell under the rule of that of Chernigov. In the nth century both had wealthy towns and villages; during the Mongol invasion of 1 239-1 242 these were all burned and pillaged, and the entire territory devastated. With the decay of the Great Horde of the Mongols the western part of the country fell under Lithuanian rule, and was the object of repeated struggles between Lithuania and Moscow. In the 16th century the Russians began to erect new forts and fortify the old towns, and the territory was rapidly colonized by immigrants from the north. In 1610 the towns of the present government of Orel (then known as the Ukrayna Ukraine, i.e. ” border-region,”) took an active share in the insurrection against Moscow under the false Demetrius, and suffered much from the civil war which ensued. They continued, however, to be united with the rest of Russia.

(P. A. K.; J. T. Be.) OREL, a town of Russia, capital of the government of the same name, lies at the confluence of the Oka with the Orlik, on the line of railway to the Crimea, 238 m. S.S.W. from Moscow. Pop. (1875) 45,000. (1900) 70,075. It was founded in 1566, but developed slowly, and had only a very few houses at the beginning of the 1 8th century. The cathedral, begun in 1794, was finished only in 1861. The town possesses a military gymnasium (corps of cadets) , a public library, and storehouses for grain and timber. The manufactures are rapidly increasing, and include hemp- carding and spinning, rope-making, flour-mills and candle factories. Orel is one of the chief markets of central Russia for corn, hemp, hempseed oil, and tallow, exported; metal wares, tobacco, kaolin, and glass ware are also exported, while salt, groceries and manufactured goods are imported.

O’RELL, MAX, the nom-de- plume of Paul Blouet (1848- 1903), French author and journalist, who was born in Brittany in 1848. He served as a cavalry officer in the Franco-German War, was captured at Sedan, but was released in time to join the Versaillist army which overcame the Commune, and was severely wounded during the second siege of Paris. In 1872 he went to England as correspondent of several French newspapers, and in 1876 became the very efficient French master at St Paul’s school, London, retaining that post until 1884. What induced

him to leave was the brilliant success of his first book, John Bull et son tie, which in its French and English forms was so widely read as to make his pseudonym a household word in England and America.

Several other volumes of a similar type dealing in a like spirit with Scotland, America and France followed. He married an Englishwoman, who translated his books. But the main work of the years between 1890 and 1900 was lecturing. Max O'Rell was a ready and amusing speaker, and his easy manner and his humorous gift made him very successful on the platform. He lectured often in the United Kingdom and still more often in America. He died in Paris, where he was acting as correspondent of the New York Journal, on the 25th of May 1903.

ORELLI, HANS KONRAD VON (1846-), Swiss theolo- gian, was born at Zurich on the 25th of January 1846 and was educated at Lausanne, Zurich and Erlangen. He also visited Tubingen for theology and Leipzig for oriental languages. In 1869 he was appointed preacher at the orphan house, Zurich, and in 1871 Privatdozent at the university. In 1873 he went to Basel as professor extraordinarius of theology, becoming ordinary pro- fessor in 1 88 1. His chief work is on the Old Testament; in addi- tion to commentaries on Isaiah, Jeremiah (1886), Ezekiel and the Twelve Prophets (1888), most of which have been translated, he wrote Die alttestamentliche Weissagung von der Vollendung des Gottesreiches (Vienna, 1882; Eng. trans. Edinburgh, 1885), Die himmlischen Heerschaaren (Basel, 1889), and a journal of Palestinian travel, Durchs Heilige Land (Basel, 1878).

ORELLI, JOHANN CASPAR VON (1787-1849), Swiss classical scholar, was born at Zurich on the 13th of February 1787. He belonged to a distinguished Italian family, which had taken refuge in Switzerland at the time of the Reformation. His cousin, Johann Conrad Orelli (1770-1826), was the author of several works in the department of later Greek literature. From 1807 to 1814 Orelli worked as preacher in the reformed community of Bergamo, where he acquired the taste for Italian literature which led to the publication of Contributions to the History of Italian Poetry (1810) and a biography (181 2) of Vittorino da Feltre, his ideal of a teacher. In 1814 he became teacher of modern languages and history at the cantonal school at Chur (Coire); in 1819, professor of eloquence and hermeneutics at the Carolinum in Zurich, and in 1833 professor at the new university, the foundation of which was largely due to his efforts. His attention during this period was mainly devoted to classical literature and antiquities. He had already published (18 14) an edition, with critical notes and commentary, of the Antidosis of Isocrates, the complete text of which, based upon the MSS. in the Ambrosian and Laurentian libraries, had recently been

made known by Andreas Mystoxedes of Corfu. The three works upon which his reputation rests are the following. (1) A complete edition of Cicero in seven volumes (1826-1838). The first four volumes contained the text (new ed., 1845-1863), the fifth the old Scholiasts, the remaining three (called Ono- masticon Tullianum) a life of Cicero, a bibliography of previous editions, indexes of geographical and historical names, of laws and legal formulae, of Greek words, and the consular annals. After his death, the revised edition of the text was completed by J. G. Baiter and C. Halm, and contained numerous emenda- tions by Theodor Mommsen and J. N. Madvig. (2) The works of Horace (1837-1838; 4th ed., 1886-1892). The exegetical commentary, although confessedly only a compilation from the works of earlier commentators, shows great taste and exten- sive learning, although hardly up to the exacting standard of modern criticism. (3) Inscriptionum Lalinarum Selectarum Collectio (1828; revised edition by W. Henzen, 1856), extremely helpful for the study of Roman public and private life and religion. His editions of Plato (1839-1841, including the old scholia, in collaboration with A. W. Winckelmann) and Tacitus (1846-1848, new ed. by various scholars, 1875-1894) also deserve mention. Orelli died at Zurich on the 6th of January 1849. He was a most liberal-minded man, both in politics and religion, an enthusiastic supporter of popular education and a most inspiring teacher. He took great interest in the struggle of the Greeks for independence, and strongly favoured the appointment of the notorious J. F. Strauss to the chair of dog- matic theology at Zurich, which led to the disturbance of the 6th of September 1839 and the fall of the liberal government.

See Life by his younger brother Conrad in Neujahrsblatt der Stadtbibliothek Zurich (1851); J. Adert, Essai sur la Vie et les Travaux de J. CO. (Geneva, 1849); H. Schweizer-Sidler, Geddcht- nissrede auf J.C.O. (Zurich, 1874); C. Bursian, Geschichte der klassischen Philologie in Deutschland (1883).

ORENBURG, a government of south-eastern Russia, bounded N. by the governments of Ufa and Perm, E. by Tobolsk, S.E. by Turgai, and W. by Uralsk and Samara, with an area of 73,794 sq. m. Situated at the southern extremity of the Urals and extending to the north-east on their eastern slope, Orenburg consists of a hilly tract bordered on both sides by steppes. The central ridge occasionally reaches an elevation of 5000 ft.; there are several parallel ridges, which, however, nowhere

exceed 2600 ft., and gradually sink towards the south. A great variety of geological formations are represented within the government, which is rich in minerals. Diorites and granites enter it from the north and crop out at many places from underneath the Silurian and Devonian deposits. The Carboniferous limestones and sandstones, as well as softer Permain, Jurassic and Cretaceous depqsits, have a wide extension in the south and east. Coal has been found on the Miyas (in N.) and near Iletsk (in S.). The extremely rich layers of rock salt at Iletsk yield about 24,000 tons every year. Very fertile ” black earth ” covers wide areas around the Urals. The government is traversed from north to south by the Ural river, which also forms its southern boundary ; the chief tributaries are the Sakmara and the Ilek. The upper courses of the Byelaya and Samara, tributaries of the Kama and the Volga, also lie within the government, as well as affluents of the Tobol on the eastern slope of the Ural range. Numerous salt lakes occur in the district of Chelyabinsk; but several parts of the flat lands occasionally suffer from want of water. Sixteen per cent of the surface is under wood. The climate is continental and dry, the average temperature at Orenburg being 37-4° Fahr. (4-5° in January, 69-8° in July). Frosts of — 33 and heats of 98 are not uncommon.

The estimated population in 1906 was 1,836,500, mainly Great Russians, with Bashkirs and Meshcheryaks (25%). Gold is extracted chiefly from alluvial deposits, about 116,500 oz. every year; also some silver. Nearly one-fifth of all the copper ore extracted in Russia comes from Orenburg (about 16,000 tons annually); and every year 16,000 to 20,000 tons of cast iron and 11,500 tons of iron are obtained. Agriculture is carried on on a large scale, the principal crops being wheat, rye, oats, barley and potatoes. Horses, cattle and sheep are kept in large numbers and camels are bred. Kitchen-gardening gives occupation to nearly 11,000 persons. Various kinds of animal produce are largely exported, and by knitting ” Orenburg shawls ” of goats’ wool the women earn £10,000 every year. The growth of the industries is slow, but trade, especially with the Kirghiz, is prosperous. The chief towns of the five districts into which the government is divided are Orenburg, Orsk, Chelyabinsk, Troitsk and Verkhne-Uralsk.

The government of Orenburg was formerly inhabited by the Kirghiz in the south, and by the Bashkirs in the north. The latter were brought under the rule of Russia in 1557, and a few years later the fort of Ufa was erected in order to protect them against the raids of the Kirghiz. The frequent risings of the Bashkirs, and the continuous attacks of the Kirghiz, led the Russian government in the 18th century to erect a line of forts and blockhouses on the Ural and Sakmara rivers, and these were afterwards extended south-westwards towards the Caspian, and

eastwards towards Omsk. The central point of these military lines was the fort of Orenburg, originally founded in 1735 at the confluence (now Orsk) of the Or with the Ural, and removed in 1 740-1 743 120 m. lower down the Ural river to its present site. In 1773 it was besieged by Pugachev, the leader of the revolt of the peasantry. (P. A. K.; J. T. Be.)

ORENBURG, a town of Russia, capital of the government of the same name, on the Ural river; connected by rail with Samara (262 m.), and since 1905 with Tashkent (1150 m.). Pop. (1900) 65,906, of whom about 30% were Tatars, Jews, Bashkirs, &c. The town now includes the former suburbs of

Golubinaya and Novaya. It is an episcopal see of the Orthodox Greek Church and the headquarters of the hetman of the Oren- burg Cossacks. To a " barter house," 3 m. from the town, the camel caravans bring carpets, silks, cottons, lambskins, dried fruits, &c, from Bokhara, Khiva, Kokand and Tashkent, to be bartered against the textiles, metallic goods, sugar and manufactured wares of Russia. From 20,000 to 100,000 horses, 40,000 to 160,000 cattle, and 450,000 to 750,000 sheep are also sold every year at the barter ' house. Formerly most of these were sent alive to Russia; now some 200,000 head of cattle and sheep are killed every year, and exported in cold-storage wagons. Cattle are also bought by wandering merchants in the Steppe provinces and Turkestan. Every year many tons of tallow, hams, sausages, butter, cheese and game are exported by rail to Samara. Besides these, nearly a million hides and sheepskins, goat and astrakhan skins, as well as wool, horsehair, bristles, down, horns, bones, &c, are exported. There are two cadet corps, a theological seminary, seminaries for Russian and Kirghiz teachers, a museum, branches of the Russian Geographical Society and the Gardening Society, and a military arsenal.

ORENDEL, a Middle High German poem, of no great literary merit, dating from the close of the 12th century. The story is associated with the town of Treves (Trier), where the poem was probably written. The introduction narrates the story of the Holy Coat, which, after many adventures, is swallowed by a whale. It is recovered by Orendel, son of King Eigel of Treves, who had embarked with twenty-two ships in order to woo the lovely Brida, the mistress of the Holy Sepulchre, as his wife. Suffering shipwreck, he falls into the hands of the fisherman Eise, and in his service catches the whale that has swallowed the Holy Coat. The coat has the property of rendering the wearer proof against wounds, and Orendel successfully overcomes innumer- able perils and eventually wins Brida for his wife. A message brought by an angel

summons both back to Treves, where Orendel meets with many adventures and at last disposes of the Holy Coat by placing it in a stone sarcophagus. Another angel announces both his and Brida's approaching death, when they renounce the world and prepare for the end.

The poem exists in a single manuscript of the 15th century, and in one print, dated 1512. It has been edited by von der Hagen (1844), L. Ettmiiller (1858) and A. E. Berger (1888); there is a modern German translation by K. Simrock (1845). See H. Harkensee, Untersuchungen iiber das Spielmannsgedicht Orendel (1879); F. Vogt, in the Zeitschrift fur deutsche Philologie, vol. xxii. (1890) ; R. Heinzel, pber das Gedicht vom Konig Orendel (1892); and K. Mullenhoff, in Deutsche Alter turns kunde, vol. i. (2nd ed., 1890), pp. 32 seq.

ORENSE, an inland province of north-western Spain, formed in 1833 of districts previously included in Galicia, and bounded on the N. by Pontevedra and Lugo, E. by Leon and Zamora, S. by Portugal, and W. by Portugal and Pontevedra. Pop. (1900) 404,311; area 2694 sq. m. The surface of the province is almost everywhere mountainous. Its western half is traversed in a south-westerly direction by the river Mirio (Portuguese Minho), which flows through Portugal to the Atlantic; the Sil, a left-hand tributary of the Mifio, waters the north-eastern districts; and the Limia rises in the central mountains and flows west-south-west, reaching the sea at the Portuguese port of Vianna do Castello. The upper valley of the Limia is the only large tract of level country. The climate is very varied, mild in some valleys, cold and damp in the highlands, rainy near the northern border, and subject to rapid changes of temperature. The railway from Monforte to Vigo runs through the province. There are a few iron foundries of a primitive sort, but lack of transport and of cheap coal hinder the growth of mining and manufactures.

Though the soil is fertile and well watered, agricultural products are not so important as arboriculture. The oak, beech, pine, chestnut, walnut and plane grow in abundance on the hills and mountains; pears, apples, cherries, almonds, figs, roses and olives in the valleys, and even oranges and lemons in sheltered spots. The chief towns are the capital, Orense, Allariz, Carballino, Viana, Nogueira de Ramuin, Boboras, Cartella and La Vega. See also Galicia.

ORENSE, an episcopal see and the capital, of the Spanish province of Orense; on the left bank of the river Mino, and on the Tuy-Monforte railway. Pop. (1900) 15,194- The river is here crossed by a bridge — one of the most remarkable in Spain — of seven arches, 13 19 ft. in length, and at its highest point 135 ft. above the bed of the river. This bridge was built by Bishop Lorenzo in 1230, but has frequently been repaired. The Gothic cathedral, also dating from Bishop Lorenzo's time, is a comparatively small building, but has an image, El Santo Cristo, which was brought from Cape Finisterre in 1330 and is celebrated throughout Galicia for its miraculous powers. The city contains many schools, a public library and a theatre. In the older streets there are some interesting medieval houses. Chocolate and leather are manufactured, and there are saw- mills, flour-mills and iron foundries. The three warm springs to the west, known as Las Burgas, attract many summer visitors; the waters were well known to the Romans, as their ancient name, Aquae Originis, Aquae Urentes, or perhaps Aquae Salien- tis, clearly indicates.

The Romans named Orense Aurium, probably from the alluvial gold found in the Mino valley. The bishopric, founded in the 5th century by the Visigoths, was named the Sedes Auriensis (see of Aurium), and from this the modern Orense is derived. The city became the capital of the Suevi in the 6th century; it was sacked by the Moors in 716, and rebuilt only in 884.

OREODON (i.e. " hillock-tooth "), the name of an Oligocene genus of North American primitive ruminants related to the camels, and typifying the family Oreodontidae. Typical oreo- donts were long-tailed, four-toed, partially plantigrade ruminants with sharp-crowned crescentic molars, of which the upper ones carry four cusps, and the first lower premolar canine-like both in shape and function. In the type genus there are forty-four teeth, forming an uninterrupted series. The vertebral artery pierces the neck-vertebrae in the normal manner. The name Oreodon is preoccupied by Orodus, the designation of a genus of Palaeozoic fishes, and is likewise antedated by Merycoidodon, which is now used by some writers. See Tylopoda.

ORESME, NICOLAS (c. 13 20-1382), French bishop, celebrated for his numerous works in both French and Latin on scholastic, scientific and political questions, was- born in Normandy at the opening of the 14th century. In 1348 he was a student in the college of Navarre at Paris, of which he became head in 1356. In 1361 he was named dean of the cathedral of Roueri. Charles V. had him appointed bishop of Lisieux on the 16th of November 1377. He died in that city on the nth of July 1382. One of his works, of great importance for the history of

economic conceptions in the middle ages, was the De origine, natura, jure et mutationibus monetarum, of which there is also a French edition. Oresme was the author of several works on astrology, in which he showed its falseness as a science and denounced its practice. At the request of Charles V. he trans- lated the Ethics, Politics and Economics of Aristotle. In Decem- ber 1363 he preached before Urban V. a sermon on reform in the church, so severe in its arraignment that it was often brought forward in the 16th century by Protestant polemists.

See Francis Meunier, Essai sur la vie et les ouvrages de Nicole Oresme (Paris, 1857); Feret, La Facitlte.de theologie de I'Universite de Paris (Paiis, 1896, t. iii. p. 290 sqq.); fimile Bridrey, Nicole Oresme. Etude des doctrines et des faits economiques (Paris, 1906).

ORESTES, in Greek legend, son of Agamemnon and Clytaem- nestra. According to the Homeric story he was absent from Mycenae when his father returned from the Trojan War and was murdered by Aegisthus. Eight years later he returned from Athens and revenged his father's death by slaying his mother, and her paramour (Odyssey, iii. 306; xi. 542). According to Pindar (Pythia, xi. 25) he was saved by his nurse, who con- veyed him out of the country when Clytaemnestra wished to kill him. The tale is told much more fully and with many pariations in the tragedians. He was preserved by his sister Electra from his father's fate, and conveyed to Phanote on Mount Parnassus, where King Strophius took charge of him.

In his twentieth year he was ordered by the Delphic oracle to return home and revenge his father's death. According to Aeschylus, he met his sister Electra before the tomb of Agamem- non, whither both had gone to perform rites to the dead; a recognition takes place, and they arrange how Orestes shall accomplish his revenge. Orestes, after the deed, goes mad, and is pursued by the Erinyes, whose duty it is to punish any violation of the ties of family piety. He takes refuge in the temple at Delphi; but, though Apollo had ordered him to do the deed, he is powerless to protect his suppliant from the consequences. At last Athena receives him on the acropolis of Athens and arranges a formal trial of the case before twelve Attic judges. The Erinyes demand their victim; he pleads the orders of Apollo; the votes of the judges are equally divided, and Athena gives her casting vote for acquittal. The Erinyes are propitiated by a new ritual, in which they are worshipped as Eumenides (the Kindly), and Orestes dedicates an altar to Athena Areia. With Aeschylus the punishment ends here, but, according to Euripides, in order to escape the persecutions of the Erinyes, he was ordered by Apollo to go to Tauris, carry off the statue of Artemis

which had fallen from heaven, and bring it to Athens. He repairs to Tauris with Pylades, the son of Strophius and the intimate friend of Orestes, and the pair are at once imprisoned by the people, among whom the custom is to sacrifice all strangers to Artemis. The priestess of Artemis, whose duty it is to perform the sacrifice, is his sister Iphigeneia (q.v.). She offers to release Orestes if he will carry home a letter from her to Greece; he refuses to go, but bids Pylades take the letter while he himself will stay and be slain. After a conflict of mutual affection, Pylades at last yields, but the letter brings about a recognition between brother and sister, and all three escape together, carrying with them the image of Artemis. After his return to Greece, Orestes took possession of his father's kingdom of Mycenae, to which were added Argos and Laconia. He is said to have died of the bite of a snake in Arcadia. His body was conveyed to Sparta for burial (where he was the object of a cult), or, according to an Italian legend, to Aricia, whence it was removed to Rome (Servius on Aeneid, ii. 116). The story of Orestes was the subject of the Oresteia of Aeschylus (Agamem- non, Choephori, Eumenides), of the Electra of Sophocles, of the Electra, Iphigeneia in Tauris, and Orestes, of Euripides. There is extant a Latin epic poem, consisting of about 1000 hexa- meters, called Orestes Tragoedia, which has been ascribed to Dracontius of Carthage.

Orestes appears also as a central figure in various legends connected with his madness and purification, both in Greece and Asia. In these Orestes is the guilt-laden mortal who is purified from his sin by the grace of the gods, whose [merciful justice is shown to all persons whose crime is mitigated by extenuating circumstances. These legends belong to an age when higher ideas of law and of social duty were being established ; the implacable blood-feud of primitive society gives place to a fair trial, and in Athens, when the votes of the judges are evenly divided, mercy prevails.

The legend of Orestes is the subject of a lengthy monograph by T. Zielinski, “Die Orestessage und die Rechtfertigungsidee” in Neue Jahrbiicher fur das klassische Altertum, ii. (1899). Orestes, according to Zielinski, is the son of the sky-god Zeus-Agamemnon, who overcomes his wife the earth-goddess Gaia-Clytaemnestra ; with the assistance of the dragon Aegisthus, she slays her husband, whose murder is in turn avenged by his son. The religion of Zeus is then reformed under the influence of the cult of Apollo, who slays the dragon brought up by the earth-goddess on Parnassus, the seat of one of her oldest sanctuaries. Parnassus becomes the holy mountain of Apollo, and Orestes himself an hypostasis of Apollo ” of the mountain,” just as Pylades is Apollo “of the plain”; similarly Electra, Iphigeneia and Chrysothemis are hypostases of Artemis. Zeus being firmly seated on his throne as the result of the slaying of the dragon by Orestes, the theological significance of the myth is forgotten, and the identifications Zeus-Agamemnon and Gaia- Clytaemnestra are abandoned. In the Homeric Oresteia the soul of the murdered wife has no claim to vengeance, and Orestes rules unmolested in Argos. But the Apolline religion introduces the theory of the rights of the soul and revenge for bloodshed. Apollo, who has urged Orestes to parricide and has himself expiated the crime of slaying the dragon, is able to purify others in similar case. Hence

Orestes, freed from the guilt of blood, is enabled to take possession of the throne of his father. This is the Delphic Oresteia. But a new idea is introduced by the Attic Oresteia. The claim that Apollo can in every case purify from sin is met by Athens with a counterclaim on behalf of the state. It is the community of which murdered and murderer were members which has the right to exact revenge and retribution, an idea which found expression in the foundation of the Areopagus. If the accused is acquitted, the state undertakes to appease the soul of the murdered person or its judicial representative, the Erinys.

Others attach chief importance to the slaying of Neoptolemus (Pyrrhus) by Orestes at Delphi; according to Radermacher (Das Jenseits im Mythos der Hellenen, 1903), Orestes is an hypostasis of Apollo, Pyrrhus the principle of evil, which is overcome by the god ; on the other hand, Usener (Archiv fur Religionswesen, vii., 1899, 334) takes Orestes for a god of winter and the underworld, a double of the Phocian Dionysus the ” mountain ” god (among the Ionians a summer-

god, but in this case corresponding to Dionysus iiekavtuyis) , who subdues Pyrrhus ” the light,” the double of Apollo, the whole being a form of the well-known myths of the expulsion of summer by winter. S. Reinach (reviewing P. Mazan’s L’Orestie d’Esckyle, 1902) defends the theory of Bachofen, who finds in the legend of Orestes an indication of the decay of matriarchal ideas.

See article by Hofer in Roscher’s Lexikon der Mythologie; A. Olivieri, ” Sul mito di Oreste nella letteratura classica ” (with a section on modern literature) in Rivista di Filologia, xxvi. (1898), and Jebb’s edition of the Electro, of Sophocles.

ORFILA, MATHIEU JOSEPH BONAVENTURE (1787-1853), French toxicologist and chemist, was by birth a Spaniard, having been born at Mahon in Minorca on the 24th of April 1787. An island merchant’s son, he looked naturally first to the sea for a profession; but a voyage at the age of fifteen to Sardinia, Sicily and Egypt did not prove satisfactory. He next took to medicine, which he studied at the universities of Valencia and Barcelona with such success that the local authorities of the latter city made him a grant to enable him to follow his studies at Madrid and Paris, preparatory to appointing him professor. He had scarcely settled for that purpose in Paris when the out- break of the Spanish war, in 1807, threatened destruction to his prospects. But he had the good fortune to find a patron in the chemist L. N. Vauquelin, who claimed him as his pupil, guaranteed his conduct, and saved him from expulsion from Paris. Four years afterwards he graduated, and immediately became a private lecturer on chemistry in the French capital. In 1819 he was appointed professor of medical jurisprudence, and four years later he succeeded Vauquelin as professor of chemistry in the faculty of medicine at Paris. In 1830 he was nominated dean of that faculty, a high medical honour in France. Under the Orleans dynasty, honours were lavishly showered upon him ; he became successively member of the council of education of France, member of the general council of the department of the Seine, and commander of the Legion of Honour. But by the republic of 1848 he was held in less favour, and chagrin at the treatment he experienced at the hands of the governments which succeeded that of Louis Philippe is supposed to have shortened his life. He died, after a short illness, in Paris on the 1 2th of March 1853.

Orfila’s chief publications are Traiti des poisons, or Toxicologie generate (1813); Elements de chimie medicate (1817); Lecons de medecine legale (1823); Traite des exhumations juridiques (1830); and Recherches sur I’ empoisonnement par I’acide arsenieux (1841). He also wrote many valuable papers, chiefly on subjects connected

with medical jurisprudence. His fame rests mainly on the first- named work, published when he was only in his twenty-seventh year. It is a vast mine of experimental observation on the symptoms of poisoning of all kinds, on the appearances which poisons leave in the dead body, on their physiological action, and on the means of de- tecting them. Few branches of science, so important on their bear- ings on every-day life and so difficult of investigation, can be said to have been created and raised at once to a state of high advancement by the labours of a single man.

ORFORD, EDWARD RUSSELL, Earl of (1653-1727), British admiral, was born in 1653, the son of Edward Russell, a younger brother of the ist duke of Bedford. He was one of the first gentleman afficers of the navy regularly bred to the sea. In 1671 he was named lieutenant of the “Advice” at the age of eighteen, captain in the following year. He continued in active service against the Dutch in the North Sea in 1672-73, and in the Mediterranean in the operations against the Barbary Pirates

with Sir John Narborough and Arthur Herbert, afterwards earl of Torrington, from 1676 to 1682. In 1683 he ceased to be employed, and the reason must no doubt be looked for in the fact that all members of the Russell family had fallen into dis- favour with the king, after the discovery of William, Lord Russell’s connexion with the Rye House Plot. The family had a private revenge to take which sharpened their sense of the danger run by British liberties from the tyranny of King James

II. Throughout the negotiations preceding the revolution of 1688 Edward Russell appears acting on behalf and in the name of the head of this great Whig house, which did so much to bring it about, and profited by it so enormously in purse and power. He signed the invitation which William of Orange insisted on having in writing in order to commit the chiefs of the opposition to give him open help. Edward Russell’s prominence at this crisis was of itself enough to account for his importance after the Revolution. When the war began with France in 1689, he served at first under the earl of Torrington. But during 1690, when that admiral avowed his intention of retiring to the Gunfleet, and of leaving the French in command of the Channel, Russell was one of those who condemned him most fiercely. In December 1690 he succeeded Torrington, and during 1691 he cruised without meeting the French under Tourville (q.v.), who made no attempt to meet him. At this time Russell, like some of the other extreme Whigs, was discontented with the moderation of William of Orange and had entered into negotiations with the exiled court, partly

out of spite, and partly to make themselves safe in case of a restoration. But he was always ready to fight the French, and in 1692 he defeated Tourville in the battle called La Hogue, or Barfleur. Russell had Dutch allies with him, and they were greatly superior in number, but the chief difficulty encountered was in the pursuit, which Russell conducted with great resolution. His utter inability to work with the Tories, with whom William

III. would not quarrel altogether, made his retirement imperative for a short time. But in 1694 he was appointed to the command of the fleet which, taking advantage of the inability of the king of France to maintain a great fleet in the Channel from want of money, followed the French into the Mediterranean, confined them to Toulon for the rest of the war; and co-operated with the Spanish armies in Catalonia. He returned in 1695, and in 1697 was created. earl of Orford. For the rest of his life he filled posts of easy dignity and emolument, and died on the 26th of November 1727. He married his cousin, Mary Russell; but his title became extinct on his death without issue.

See Chamock, Biog. Nav. i. 354; Campbell's Lives of the Admirals, ii-317- (D. H.)

ORFORD, ROBERT WALPOLE, ist Earl of (1676-1745), generally known as Sir Robert Walpole, prime minister of England from 1721 to 1742, was the third but eldest surviving son of Robert Walpole, M.P., of Houghton in Norfolk, by Mary, only daughter and heiress of Sir Jeffery Burwell, of Rougham, in Suffolk. The father, a jolly old squire of Whig politics who revelled in outdoor sport and the pleasures of the table, trans- mitted to his son the chief traits in his own character. The future statesman was born at Houghton on the 26th of August 1676, was an Eton colleger from 1690 to 1695 and was admitted at King's College, Cambridge, as scholar on the 22nd of April 1696. At this time he was destined, as a younger son, for the church, but his two elder brothers died young and he became the heir to an estate producing about £2000 a year, whereupon on the 25th of May 1698 he resigned his scholarship, and was soon afterwards withdrawn by his father from the university. In classical attainments he was excelled by Pulteney, Carteret, and many others of his contemporaries in politics.

On his father's death in November 1700 the electors of the family borough of Castle Rising returned him (January 1701) to the House of Commons as their representative, but after two short-lived parliaments he sought the suffrages of the more important constituency of King's Lynn (July 23, 1702), and was elected as its member at every subsequent dissolution until he left the Lower House. From the first

his shrewdness in counsel and his zeal for the interests of the Whigs were generally

recognized. In June 1705 he was appointed one of the council to Prince George of Denmark, the inactive husband of Queen Anne, and then lord high admiral of England. Complaints against the administration of the navy were then loud and frequent (Burton's Queen Anne, ii. 22-31), and the responsibilities of his new position tested his capacity for public life. His abilities justified his advancement, in succession to his lifelong rival, Henry St John, to the more important position of secretary- at-war (February 25, 1708), which brought him into immediate contact with the duke of Marlborough and the queen. With this post he held for a short time (17 10) the treasurership of the navy, and by the discharge of his official duties and by his skill in debate became admitted to the inmost councils of the ministry. He could not succeed, however, in diverting Godolphin from the great error of that statesman's career, the impeachment of Sacheverell, and when the committee was appointed in December 1700 for elaborating the articles of impeachment Walpole was nominated one of the managers for the House of Commons. On the wreck of the Whig party which ensued, Walpole shared in the general misfortune, and in spite of the flattery, followed by the threats, of Harley he took his place with his friends in opposition. His energies now shone forth with irresistible vigour ; both in debate and in the pamphlet press he vindicated Godolphin from the charge that thirty-five millions of public money were not accounted for, and in revenge for his zeal his political opponents brought against him an accusation of personal corruption. On these charges, now universally acknowledged to have proceeded from party animosity, he was in January 1712 expelled from the House and committed to the Tower. His prison cell now became the rendezvous of the Whigs among the aristocracy, while the populace heard his praises commemorated in the ballads of the streets. The ignominy which the Tories had endeavoured to inflict upon him was turned into augmented reputation. In the last parliament of Queen Anne he took the leading part in defence of Sir Richard Steele against the attacks of the Tories.

After the accession of George, the Whigs for nearly half a century retained the control of English politics. Walpole obtained the lucrative if unimportant post of paymaster- general of the forces in the

administration which was formed under the nominal rule of Lord Halifax, but of which Stanhope and Townshend were the guiding spirits. A committee of secrecy was appointed to inquire into the acts of the late ministry, and especially into the Peace of Utrecht, with a view to the impeachment of Harley and St John, and to Walpole was en- trusted the place of chairman. Most of his colleagues in office were members of the House of Lords, and the lead in the Commons quickly became the reward of his talents and assiduity. Halifax died on the 19th of May 1715, and after a short interval Walpole was exalted into the conspicuous position of first lord of the treasury and chancellor of the exchequer (October n, 1715). Jealousies, however, prevailed among the Whigs, and the German favourites of the new monarch quickly showed their discontent with the heads of the ministry. Townshend was forced into resigning his secretaryship of state for the dignified exile of viceroy of Ireland, but he never crossed the sea to Dublin, and the support which Sunderland and Stanhope, the new advisers of the king, received from him and from Walpole was so grudging that Townshend was dismissed from the lord- lieutenancy (April 9, 1 717), and Walpole on the next morning withdrew from the ministry. They plunged^ into opposition with unflagging energy, and in resisting the measure by which it was proposed to limit the royal prerogative in the creation of peerages (March-December 17 18) Walpole exerted all his powers. This display of ability brought about a partial re- conciliation of the two sections of the Whigs. To Townshend was given the presidency of the council, and Walpole once again assumed the paymastership of the forces (June 1720).

On the financial crash which followed the failure of the South Sea scheme, the public voice insisted that he should assume a more prominent place in public life. At this crisis in England's fortunes Stanhope and James Craggs, the two secretaries of state, were seized by death, John Aislabie, the chancellor of

the exchequer, was committed to the Tower, and Sunderland, though acquitted of corruption, was compelled to resign the lead. Walpole, at first lord of the treasury and chancellor of the exchequer (April 1721), became with Townshend responsible for the country's government (though for some years they had to contend with the influence of Carteret), the danger arising from the panic in South Sea stock was averted by its amalgama- tion with Bank and East India stock, and during the rest of the reign of George I. they remained at the head of the ministry. The hopes of the Jacobites, which revived with these financial troubles, soon drooped in disappointment. Atterbury, their boldest leader, was exiled in 1723; Bolingbroke, in dismay at their feebleness, sued for pardon, and was permitted to return to his own

country. The troubles which broke out in Ireland over Wood's patent for a copper coinage were allayed through the tact of Carteret, who had been banished in April 1724 as its lord-lieutenant by his triumphant rivals. The con- tinent was still troubled with wars and rumours of wars, but a treaty between England, Prussia and France was successfully effected at Hanover in 1725.

England was kept free from warfare, and in the general prosperity which ensued Walpole basked in the royal favour. His eldest son was raised to the peerage as Baron Walpole (June 10, 1723) and he himself became a Knight of the Bath on the 27th of May 1725, and was rewarded with the Garter in May 1726. Next year the first King George died, and Walpole's enemies fondly believed that he would be driven from office, but their expectations were doomed to disappointment. The confidence which the old king had reposed in him was renewed by his successor, and in the person of Queen Caroline, the discreet ruler of her royal spouse, the second George, the Whig minister found a faithful and lifelong friend. For three years he shared power with Townshend, but the jealous Walpole brooked no rival near the throne, and his brother-in-law withdrew from official life to Norfolk in May 1730. Before and after that event the administration was based on two principles, sound finance at home and freedom from the intrigues and wars which raged abroad. On the continent congresses and treaties were matters of annual arrangement, and if the work of the plenipotentiaries soon faded it was through their labours that England enjoyed many years of peace. Walpole's influence received a serious blow in 1733. The enormous frauds on the excise duties forced themselves on his attention, and he proposed to check smuggling and avoid fraud by levying the full tax on tobacco and wine when they were removed from the warehouses for sale. His opponents fastened on these proposals with irresistible force, and so serious an agitation stirred the country that the ministerial measure was dropped amid general rejoicing. Several of his most active antagonists were dismissed from office or deprived of their regiments, but their spirits remained unquenched, as the incessant attacks in the Craftsman showed, and when Walpole met a new House of Commons in 1734 his supporters were far less numerous. The Gin Act of 1736, by which the tax on that drink was raised to an excessive amount, led to disorders in the suburbs of London; and the imprisonment of two notorious smugglers in the Tolbooth at Edinburgh resulted in those Porteous riots which have been rendered famous in the Heart of Midlothian. These events weakened his influence with large classes in England and Scotland, but his parliamentary supremacy remained umimpaired, and was illustrated in 1737 by his defeat of Sir John

Barnard's plan for the reduction of the interest on the national debt, and by his passing of the Playhouse Act, under which the London theatres are still regulated. That year, however, heralded his fall from power. His constant friend Queen Caroline died on the 20th of November 1737, and the prince of Wales, long discontented with his parents and their minister, flung himself into active opposition. Many of the boroughs within the limits of the duchy of Cornwall were obedient to the prince's will, and he quickly attracted to his cause a considerable number of adherents, of whom Pitt and the Grenvilles were the most influential. The leading orators of England thundered against Walpole in the senate,

and the press resounded with the taunts of the poet and pamphleteer, illustrious and obscure, who found abundant food for their invectives in the troubles with Spain over its exclusive pretensions to the continent of America and its claim to the right of searching English vessels. The ministei long resisted the pressure of the opposition for war, but at the close of 1739 he abandoned his efforts to stem the current, and with a divided cabinet was forced, as the king would not allow him to resign, into hostility with Spain. The Tory minority known as " the patriots " had seceded from parliament in March 1739, but at the commencement of the new session, in November 1739, they returned to their places with redoubled energies. The campaign was prosecuted with vigour, but the successes of the troops" brought little strength to Walpole's declining popularity, and when parliament was dissolved in April 1741 his influence with his fellow-countrymen had faded away. His enemies were active in opposition, while some of his colleagues were lukewarm in support. In the new House of Commons political parties were almost evenly balanced. Their strength was tried immediately on the opening of parliament. After the ministry had sustained some defeats on election petitions, the voting on the return for Chippenham was accepted as a decisive test of parties, and,asWalpole was beaten in the divisions, he resolved on resigning his places. On the 9th of February 1742 he was created earl of Orford, and two days later he ceased to be prime minister. A committee of inquiry into the conduct of his ministry for the previous ten years was ultimately granted, but its deliberations ended in nought. Although he withdrew to Houghton for a time, his influence over public affairs was unbroken and be was still consulted by the monarch. He died at Arlington Street, London, on the 18th of March 1745 and was buried at Houghton on the 25th of March. With the permanent places, valued

at £15,000 per annum, which he had secured for his family, and with his accumulations in office, he had rebuilt the mansion at great expense, and formed a gallery of pictures within its walls at a cost of £40,000, but the collection was sold by his grandson for a much larger sum in r779 to the empress of Russia, and the estate and house of Houghton passed to Lord Cholmondeley, the third earl having married the premier's younger daughter.

Walpole was twice married — in 1700 to Catherine, eldest daughter of John Shorter and grand-daughter of Sir John Shorter, lord mayor of London, who died in 1737, having had issue three sons and two daughters, and in March 1738 to Maria, daughter of Thomas Skerret, a lady often mentioned in the letters of Lady Mary Wortley Montagu. He was succeeded in his earldom and other titles by his eldest son Robert (1701- 1751), who had been created Baron Walpole of Walpole in 1723; the 3rd earl was the latter's only son George (1 730-1 791), " the last of the English nobility who practised the ancient sport of hawking," and the 4th earl was the famous Horace Walpole (q.v.) the youngest son of the great Sir Robert. Horace Walpole died unmarried on the 2nd of March 1797, when the earldom became extinct, but the barony of Walpole of Walpole passed to his cousin, Horatio (17 23-1 809), who had already succeeded his father, Horatio Walpole, 1st Baron Walpole of Wolterton in that barony. In 1806 he was created earl of Orford, and this title still remains in the possession of his descendants, Robert Horace Walpole (b. 1854) becoming the 5th earl in 1894. When Horace Walpole died his splendid residence at Houghton and the Norfolk estates did not pass with the title, but were inherited by George James Cholmondeley, 4th earl and afterwards 1st marquess of Cholmondeley.

Sir R. Walpole's life has been written by Archdeacon William Coxe (1798 and 1800, 3 vols.), A. C. Ewald (1878) and John Viscount Morley (1889), See also Walpole, a Study in Politics, by Edward Jenks (1894); English Hist. Rev. xv. 251, 479, 665, xvi. 67, 308, 439 (his foreign policy, by Basil Williams) ; Bolingbroke, by Walter Sichel (1901-1902, 2 vols.) ; the histories, letters and reminiscences by his son, Horace Walpole; and the other lives of the chief political personages of the period. (W. P. C.)

ORFORD, a small town, once of greater importance, in the south-eastern parliamentary division of Suffolk, England,

21 m. E. by N. of Ipswich. Pop. (1901) 987. It lies by the right bank of the river Aide, where that river flows south-west- ward on the inner side of the great beach which has blocked its direct outflow to the sea,

and swells out seaward in the blunt promontory of Orford Ness. The church of St Bartholomew is of much interest. It retains a ruined Norman chancel of rich and unusual design, while the body of the church is Decorated. Of Orford castle the keep remains, standing high on a mound; it is partly of Caen stone and partly of fiintwork, and is of Norman date.

ORGAN, in music, the name (from Gr. opyavov, Lat. organum, instrument) given to the well-known wind-instrument. The notes of the organ are produced by pipes, which are blown by air under pressure, technically called wind.

Pipes differ from one another in two principal ways — (1) in pilch, (2) in quality of tone. (1) Consider first a series of pipes producing notes of similar quality, but differing in pitch. Such a series is called a stop. Each stop of the organ is in effect a musical instrument in itself. (2) The pipes of different stops differ, musically speaking, in their quality of tone, as well as sometimes in their pitch. Physically, they differ in shape and general arrangement. The sounding of the pipes is determined by the use of keys, some of which are played by the hands, some by the feet. A complete stop possesses a pipe for every key of some one row of manuals or pedals. If one stop alone is caused to sound, the effect is that of performance on a single instrument. There are such things as incomplete stops, which do not extend over a whole row of keys; and also there are stops which have more than one pipe to each key. Every stop is provided with mechanism by means of which the wind can be cut off from its pipes, so that they cannot sound even when the keys are pressed. This mechanism is made to terminate in a handle, which is commonly spoken of as the stop. When the handle is pushed in, the stop does not sound; when the handle is pulled out, the stop sounds if the keys are pressed. An organ may contain from one to four manuals or keyboards and one set of pedals. There are exceptional instruments having five manuals, and also some having two sets of pedals. The usual compass of the manuals approximates to five octaves, from C to c”” inclusive. The compass of the pedal is two and a half octaves, from C to f. This represents the pitch in which the notes of the pedal are written; but the pedal generally possesses stops sounding one octave lower than the written note, and in some cases stops sounding two octaves below the written note. Each manual or pedal has as a rule one soundboard, on which all its pipes are placed. Underneath the soundboard is the windchest, by which the wind is conveyed from the bellows, through the soundboard to the pipes. The windchest contains the mechanism of valves by which the keys control the admission of wind to the soundboard. The soundboard contains the grooves which receive the

wind from the valves, and the slides by which the handles of the stops con- trol the transmission of the wind through the soundboard to the pipes of the different stops.

The grooves of the soundboard are spaces left between wooden bars glued on to the table of the soundboard. There is usually one groove for every key. The grooves of the bass notes, which have to supply wind for large pipes, are broader than those of the treble.

The bass bars are also thicker than those of the treble, that they may the better support the great weight which rests on the bass portion of the soundboard. The table forms the top of the grooves. The grooves are generally closed below with

Fig. 1. — A portion of the Table with the open grooves seen from above.

leather, except the opening left in each, which is closed by the key-valve or pallet.

The sliders are connected with the draw-stops or stop-handles, which are covered in withstout upper boards, on which the pipes

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Fig. 2. — A section of a groove, with the table, windchest and pallet.

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Fig. 3. — A section at right angles to fig. 2.

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Fig. 4. — A portion of the table as it appears from above, with the places for the sliders of the stops; the small circles show the holes for the wind.

stand. The stop-handles are pulled out, and holes are then bored straight down through the upper boards, sliders and table to admit the wind from the grooves to the pipes. When the sliders are shifted by pushing in the handles, the holes no longer corre- spond, and the pipes are silenced.

Pipes are divided first into flue-pipes and reed-pipes. Flue- pipes are blown by a wind mouthpiece characteristic of the organ,

while in reed-pipes the wind acts on a metal tongue vibrat- ing on a reed, and the motion of the tongue determines the speech of the pipe.

Pipes are made either of wood or of metal. Wood flue-pipes are generally of the form of a rectangular parallel- epiped, metal flue-pipes of a cylindrical shape. Reed-pipes are conical or pyramidal, and widen towards the top. Some flue-pipes are made with stopped ends ; these as a rule sound a note about an octave lower than the corresponding open pipes of the same length. Such are the stopped diapason, bourdon, and stopped flute.

The general elementary theory of the resonance of a pipe is tolerably simple. The effective length of the pipe is determined by measuring from the upper lip to the open end in open pipes, and from the upper lip to the stopper and back again in stopped

pipes. To this is added

an allowance for the effect of each opening, since the condition of perfect freedom from constraint does not subsist at the opening itself. The corrected length is traversed twice (backwards and forwards) by sound, in the time of one vibration of the re- sultant note. This describes in a rough and general manner” the way in which any disturbance gives rise to the note of the pipe; but the theory of the mouth-pieces is a much more difficult matter, into which we cannot here enter.

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Fig. 5. — a, An open diapason; b, a stopped diapason; c, an oboe; and d, a trumpet — c and d being forms of reed- pipes.

In reed-pipes which are simply conical the resonance of the body is nearly the same as that of an open pipe of the same length. Where the form is irregular no simple rule can be given. xx. o

Fig. 6. — Mouthpieces in some- what greater detail.

But the resonance of the body of the pipe is generally the same as the note produced. The tongue of a reed-pipe alternately opens and closes the aperture of the reed. In this way it admits pulses of wind to the body of the pipe; these, if they recur at the proper intervals, maintain its vibration, wb,ich takes place when the note produced corre- sponds to the resonance of the pipe. The reed itself has its vibrating length determined by a wire which presses against it. The free end of this wire is touched with the tuning tool until a satisfactory note is pro- duced.

The pitch of the different stops is commonly denoted by the conventional approximate length of the pipe sounded by C, the lowest key of the manual. Even in incomplete stops which have no bass, the length of the pipe which C would have if the stop were extended down serves to indicate the pitch.

The conventional length of the C-pipe for stops having the normal pitch of the keys is 8 ft. ; a pipe having twice this length sounds the octave below, a pipe having half that length the octave above, and so on. Thus stops which sound the octave below the normal pitch of the keys are spoken of as 16-foot stops. Even where the pipes are stopped so that the actual length is only 8 ft., they are spoken of as having ” 16-ft. tone.” Similarly 3 2-ft. stops sound two octaves below the normal pitch of the keys. But if these notes are produced by stopped pipes, whose actual length isonlyi6ft.,theyarespokenofashaving “32-ft.tone.” Sixteen- foot and 3 2-ft. stops are specially characteristic of the pedal, where the names also signify the length of the open pipe which would sound the note actually produced by the lowest C. Of stops higher than the normal pitch of the keys, the octave is denoted by 4 ft. if made with open pipes, 4-ft. tone if stopped; the twelfth is commonly spoken of as 25, the fifteenth or double octave as 2 ft.

Higher-sounding stops are occasionally used, but these generally form part of “mixtures,” and the foot- lengths of the separate ranks are not usually given.

The true or accurate lengths of the pipes vary within con- siderable limits. The base of the scales (dimensions) varies according to the standard of pitch, and the voicing and the complicated natural laws of pipes produce other deviations from simple relations, so that the conventional dimensions can only be regarded as a simple means of classifying the stops according to their pitch-relations. For this purpose they are essential; they are continually appealed to in discussion and description; and they are almost invariably marked on the stop-handles in all countries, so that a moderate knowledge of foreign nomenclatures, combined with the habit of seizing the meaning of the figures such as 16, 8, 4, on the stop- handles, will frequently suffice as a key to the complexities of a foreign organ.

Each of the manuals, or rows of keys, of an organ constitutes a separate organ, which is more or less complete in itself. The names of the different manuals or organs are great organ, swell organ, choir organ and solo organ. The fifth manual, where it occurs, is the echo organ. The above is the usual order in point of development and frequency of occurrence, although the solo is sometimes preferred to the choir organ. The great organ is in a certain sense the principal department of the organ. It may be regarded as formed by a completely developed series of those fundamental stops which constitute the solid basis of the tone of the instrument. If an instrument be constructed with only a single manual this necessarily assumes, in general, the character- istics of a great organ. The great organ is called ” grande orgue ” in French, and first manual or ” haupt-werk ” in German.

It is proposed to describe the principal organ-stops under the

heads of the manuals to which they belong. The enumeration will not be exhaustive, but will include all the usual types.

The great organ begins generally with stops of 16 ft. in large instruments. In some cases a 32-foot sounding stop is introduced, ^^ but this cannot be said to be a proper characteristic of the

great organ. The foundation tone is of 8 ft.; the stops organ. Q £

higher pitch serve to add brilliancy: those of 16 ft., which sound the octave below the normal pitch, se^e to add gravity and weight to the tone. Sixteen-foot stops are commonly spoken of as ” doubles,” their conventional length being twice that of stops of normal pitch.

The 16-ft, stops are the 16 double open diapason, and the 16 bourdon or double stopped diapason, to which, in very large instru- ments, there may be added a 16 double trumpet. The double open diapason on the great organ consists usually of metal pipes, having moderate ” scale,” or transverse dimensions. These are of the same general character as the pipes of the ordinary open diapason, though they are made somewhat less powerful. In the better instruments of the second class as to size this stop alone would probably be regarded as representing suitably and sufficiently the class of doubles on the great organ. It gives great body to the general tone, and appears decidedly preferable to the bourdon, which frequently takes its place.

The 16 bourdon, when used on the great organ, is made of rather small scale and light tone. It gives great body to a large great organ and affords interesting combinations with other stops, such as the 4-ft. flute. It is used either alone in smaller organs of the second class, or in addition to a double open in larger instruments.

The 16 double trumpet is a trumpet (large reed stop) sounding the octave below the normal pitch. It is used generally in instruments of the largest size, but is somewhat more common in Germany. It is useful in giving a massive character to the tone of the full great organ, which is apt to become disagreeable on account of the great development of stops of a piercing character. If, however, the double trumpet is rough in tone, it is apt to communicate to the whole a corresponding impression.

We now proceed to the 8-ft. stops (the reeds come at the end according to ordinary usage). An ordinary great organ may contain 8 stopped diapason, 8 open diapason (one or more), 8 gamba and 8 hohlflote. The 8 stopped diapason on the ‘ste’t great organ is usually of moderate scale, and some con-

e ‘ siderable fulness of tone. Few stops admit of more

variety and individuality in their quality of tone than the stopped diapason ; but too frequently the great organ stopped diapason fails to attract attention on its merits, being regarded simply as an in- considerable portion of the foundation tone.

If there is any one stop which in itself represents the organ as a whole it is the open diapason. The pipes of this stop are the typical metal pipes which have always been characteristic of the appearance of the organ. A single open diapason stop is capable of being used as an organ of sufficient power for many purposes, though of course without variety. The pipes of this stop are called ” principal ” in German, this appellation apparently corresponding to the fact that they are the true and original organ-pipes. The English appellation of ” diapason ” has been taken to mean that these are the normal pipes which run through the whole compass. This, however, does not appear to be the actual derivation of the term; originally it is technically applied to the organ-builder’s rule, which gives the dimensions of pipes; and it appears that the application to the stop followed on this meaning.

The scales, character and voicing of the open diapason vary with fashion, and are different in different countries. We may distinguish three principal types. The old English diapasons of the days before the introduction of pedal organs into England were characterized by a rich sweet tone, and were not very powerful. They were generally voiced on a light wind, having a pressure equivalent to that of a column of water of from 2 to i\ in. The scale was in some cases very large, as in Green’s two open diapasons in the old organ at St George’s, Windsor; in these the wind was light, and the tone very soft. In other cases the scale was smaller and the voicing bolder, as in Father Smith’s original diapasons in St Paul’s Cathedral. But on the whole the old English diapasons presented a lovely quality of tone. English travellers of those days, accustomed to these diapasons, usually found foreign organs harsh, noisy and uninteresting. And there are many still in England who, while recognizing the necessity of a firmer diapason tone in view of the introduction of the heavy pedal bass, and the corresponding strengthening of the upper de- partments of the organ tone, lament the disappearance of the old diapason tone. However, it is possible with care to obtain diapasons presenting the sweet characteristics of the old English tone, com- bined with sufficient fulness and power to form a sound general foundation. And there can be no doubt that this should be one of the chief points to be kept in view in organ design.

The German diapason was of an entirely different character from the English. The heavy bass of the pedals has been an essential characteristic of the German organ for at least two or three centuries, or, as it is said, for four. The development of the piercing stops of high pitch was equally general. Thus foundation work of com- paratively great power was required to maintain the balance of tone; the ordinary German diapason was very loud, and we may

almost say coarse, in its tone when compared with the old English diapason. The German stop was voiced as a rule on from 3§ to 4 in. of wind, not quite twice the pressure used in England.

The French diapason is a modern variety. It may be described as presenting rather the characteristics of a loud gamba than of a diapason. In other words the tone tends towards a certain quality which may be described as ” nasal ” or metallic, or as approaching to that of a string instrument of rather coarse character. Some modern English builders appear to aim at the same model, and not without success.

The tone of a diapason must be strong enough to assert itself It is the foundation of the whole organ tone. It is the voicer’s business to satisfy this condition in conjunction with the requirement that the tone shall be full and of agreeable quality.

The 8 spitzflote may be regarded as a variety of open diapason. The pipes taper slightly towards the top, and the quality is slightly stringy. This stop was much used at one time in place of a second open diapason. But it appears better that, where two open diapasons are desirable, they should both be of full diapason quality, though possibly of different strengths and dimensions. The ad- mixture of stringy qualities of tone with the diapasons is always to be deprecated.

The 8 gamba was originally an imitation of the viola da gamba, a sort of violoncello. When made of a light quality of tone it is a pleasing stop ; but its use in the great organ instead of a second open diapason is greatly to be deprecated for the reasons just stated.

The 8 hohlflote is an open flute, usually of wood, and of small scale. If made to a moderate scale and fully voiced it possesses a full pleasant tone, which is a useful support to the foundation tone of the great organ. The 8 clarabella differs from the hohlflote in being usually of rather large scale, and having the open pipes only in the treble. _ In old organs a separate bass was generally provided; now it is more usual to supply the stop with a stopped bass.

The 4-ft. stops of the great organ comprise the 4 principal and the 4 flute. The 4 principal is the octave of the open diapason, generally of somewhat reduced scale and light but bright quality of r ‘ t

tone. The use of the word ” principal ” in connexion « rea »

with this stop is purely English, and is said to be con- °Iˆtet

nected with the use made of it as the standard of tuning for the whole organ. The Germans and French both designate this stop as ” octave.”

Of the 4 flute there are several varieties — open, stopped, wood, metal and harmonic. The harmonic flute has open metal pipes of double the conventional length, which speak their octave. This is determined partly by the voicing, partly by making a small hole about the middle of the length, which determines the motion as that of the two separate lengths between which the hole lies. Harmonic flutes have a sweet but full and powerful tone. Other flutes are generally rather light, except the waldflote, which is a powerful stop of a somewhat hooting quality.

The great organ flute is frequently used to give brilliancy to light combinations. Thus it may be used with the stopped diapason alone, or with the 16 bourdon alone, or with anyˆof these and either or both of the open diapasons.

The ordinary use of the 4-ft. stops is to add a degree of loudness to the diapasons. This is accompanied with a certain measure of keen- ness, which may become disagreeable if the 4-ft. tone is dispro- portionately strong. The ordinary practice is to use the 4-ft. tone very freely.

The 2§ twelfth stop sounds fiddle g on the C key. It is composed of diapason pipes, rather small and gently voiced. Its _ use is said to be to thicken the tone, which it certainly does. But how far the particular effect produced is °^ a ” desirable is another question. It is generally necessary i, £ „ u that this stop should be accompanied by the fifteenth or * ” other octave sounding stop of higher pitch.

The 2 fifteenth, or superoctave, of the great organ consists of diapason pipes sounding notes two octaves above the normal pitch of the keys. The 2 piccolo is a fluty stop of less power, having the same pitch. The 2-ft. tone is commonly used as giving a degree of loudness to the great organ beyond that obtainable with the 4-ft. tone.

The modern great organ fifteenth is generally a very powerful stop, and requires great caution in its use in organs of moderate size, or in limited spaces. The old English high pitched stops had little power, and their brilliancy was capable of pleasing without offence. The modern great organ up to fifteenth can only be heard with comfort in very large spaces. Under such suitable circumstances the fifteenth is capable of giving to the whole tone a ringing or silvery character, which lends itself specially to contrast with the tone of reeds. This peculiar keen tone requires for its full development the mixtures.

Mixture, sesquialtera, furniture, cymbal, scharf, cornet, are various names applied to a description of stop which possesses several ranks or several pipes to each note. The pipes of each note sound a chord which is generally composed of concordant notes of the harmonic series whose fundamental is the proper note of the key. Modern mixtures generally consist of fifths and octaves. Their composition is not the same throughout the whole range of the keyboard. A

three-rank mixture may consist of the following (the numbers signify intervals, reckoned along the scale) —

C — c (tenor) 15 — 19 — 22 c# to top 8—12 — 15.

For a somewhat larger full mixture this may be modified as follows —

C— c’ (middle) 15 — 19 — 22

c’# to top 1 — 8 — 12 — 15.

A sharp mixture suitable for a large instrument may be as follows —

Five Ranks. C — c’ 15 — 19 — 22 — 26 — 29 <:'#—/"# 8— 12— 15 — 19— 22 g"— c" I— 8— 12— 15— 19 c'" to top 1— 5 — 8 — 12 — 15. The last two compositions are given by Hopkins in his great treatise on the organ.

The early mixtures generally included the tierce (17th, or two octaves and a third). The German practice was to unite this with a twelfth, carrying the combination 12-17 throughout the keyboard under the name of sesquialtera. The combination is not now usually provided. The old English sesquialtera was ordinarily simply a form of mixture, as was the furniture. The mounted cornet consisted usually of five ranks —

1 — 8 — 12 — 15 — 17.

It extended from middle c upwards. The pipes were raised on a small soundboard of their own. The stop was used for giving out a melody. It is now obsolete.

The question of the employment and composition of mixtures is of the greatest importance with respect to the good effect of the full organ

proper, i.e. without reeds. With reference to the whole question of keen-toned stops it may be laid down that their free employment in the great organ does not produce a good effect unless the organ is situated in a very large space. If this is the case, properly proportioned mixtures are capable of giving to the tone of the full diapason work a character which is brilliant without being over- powering. The contrast between this class of tone and that afforded by the reeds is one of the most charming and legitimate effects within the range a the instrument.

We now pass to the reeds. The 16-ft. trumpet has been already alluded to, and there remain 8 trumpet and 4 clarion or octave „ trumpet. These are both stops of great power. The best

re ” trumpets possess also richness and smoothness of tone.

reeds Stops of this class can be used with the diapasons only,

producing what may be described as a rich-toned blare of moderate strength. The more usual employment of the reeds is in connexion with the entire great organ, the whole forming the ordinary fortissimo of the instrument.

The second department of the English organ is the swell organ. The whole of the swell pipes are enclosed in a box, faced on one or _ „ more sides with a set of balanced shutters. When these’

are closed the tone is almost completely muffled. When ‘ the shutters are opened, by means of a pedal usually, the

sound bursts out. In order that the use of the swell may be effective, it is necessary that the shutters should close tightly, and that there should be a sufficient volume of tone to produce an effect when they are opened. The swell is of entirely English origin; it has been introduced in Germany to a very small extent, but more widely in France. It is usually called ” recitatif ” on the Continent. The chief characteristic of the swell is the rich and powerful volume of reed-tone of a peculiar character which it contains. But other stops are also of importance. We consider them in order. The 16 bourdon, small scale, is very commonly used in swells. It assists in giving body to the tone. It occupies, however, a large space within the swell box; and where the choice between it and a 16-ft. reed has to be made there can be no doubt that the reed should be preferred, as it contributes so much more to the development of the characteristic swell tone. The 16 contra fagotto is the usual name of this stop. It imparts great

richness to the tone of the other swell reeds.

The 8-ft. diapason work is principally valuable for the soft effects obtained from it. The diapasons are voiced less loudly than for the great organ; and with the shutters closed they sound very soft. The dulciana is the softest stop generally available; and either this or some similar stop is introduced into the swell for the purpose of obtaining effects of the most extreme softness. Space within the swell box has generally to be economized. The complete bass of the open diapason or dulciana requires an 8-ft. swell box, whereas even a 16-ft. reed can be bent round so as to go within a smaller box if necessary. The open diapason and the dulciana are therefore often cut short at tenor c, and completed, if desired, with stopped pipes. The 4 principal and the 4 flute stops are similar to the corresponding stops in the great organ, but are somewhat lighter in tone.

The 2 fifteenth and mixtures are much more pleasing in the swell than in the great organ. The shutters tone them down, so that they cannot easily become offensive. Added to the reeds, they give a peculiar brilliancy to the full swell. But perhaps their most pleasing use is when all the diapason work of the swell is used alone, and as a contrast to the reeds.

Choir organ.

The usual reeds are as follows, besides the doubles already mentioned : 8 oboe, 8 cornopean, 8 trumpet and 4 clarion (octave trumpet). The oboe (hautboy) is a conventional imitation of the orchestral instrument. It is a stop of delicate tone, and perhaps is at its best in solo passages, softly accompanied on another manual. The cornopean has a powerful horn-like tone. It is the stop which, more than any other, gives to the English swell its peculiar character. The trumpet is used in addition to the cornopean in large instruments. The clarion serves to add brightness and point to the whole. The vox humana is also frequently placed on the swell.

The third department is the choir organ. The 8-ft. work may contain 8 stopped diapason, 8 open diapason, 8 gamba, 8 keraulophon and 8 hohlflote.

As a rule no open diapason is provided for choir organs, unless they are larger than usual; but a small open is most useful as a means of obtaining a better balance than usual against the other manuals. The stopped diapason is generally made to contrast in some way with that on the great organ. The hohlflote, or its representative, is generally a

lighter stop than what would be put on the great organ. The gamba is better placed in the choir organ than in the great or the swell. Such stops as the gamba and the keraulophon are frequently placed in the swell with the idea of adding to the reediness of the tone. But this is fallacious. Their tone is not strong enough to assert itself through the shutters, and their peculiar character is therefore lost. On the choir organ, on the other hand, the sort of strength required is just about what they possess, and they show to advantage. The keraulophon is a stop invented by Gray and Davison, and has been widely adopted for many years. It has a hole made in each pipe near the top, and gives a peculiar tone very well described by its name (horn-flute). Though not very like the gamba, its tone is so far of the same type of quality that the two stops would hardly be used together. It is generally the case that similar stops of exceptional characters do not combine well, whereas stops of opposed qualities do combine well. Thus a gamba and a keraulophon would not combine well, whereas either of them forms an excellent com- bination with a stopped diapason or a hohlflote.

The 4 principal is sometimes very useful. A light combination on the choir, with excess of 4-ft. tone, may often be advantageously contrasted with the more full and solid tone of the great diapasons, or with other attainable effects. The 4 flute is constantly used. The 2 piccolo is frequently found on the choir organ, but is not particularly useful.

In organs which have no solo manual there is usually a clarionet (cremona, cromorne or krummhorn, in old organs sometimes corno di bassetto) on the choir, and often an orchestral oboe (real imitation of the instrument). These are reed-stops. The dulciana and another soft stop, the salicional, salcional or salicet (of similar strength, but slightly more pungent quality), are often placed on the choir. They are, however, hardly strong enough to be of much use there, and in the swell they are useful for effects of extreme softness. In very large instruments a fifteenth and a mixture are sometimes placed on the choir, which in this case has a complete series of diapason work. If the fifteenth and the mixtures are light enough the result is a sort of imitation of the tone of the old English organ. It also forms a useful echo to the great organ, i.e. a passage played on the great may be repeated on the similar but fainter tone of the choir with the effect of an echo. In instruments of the largest size the choir is sometimes provided with a very small bourdon of 16-ft. tone, which helps to give to the tone the character of that of a small full organ without reeds.

The solo organ is comparatively modern, at all events in its present

usual form. A fourth manual was not unknown in old German organs; but the contents of all four resembled each other in a general sort of way, and there was nothing like the English swell or the modern solo. The solo appears to have arisen with Cavaille-Coll in France, and Hill in England, as a vehicle for the powerful reed-stops on heavy wind introduced by these builders. Thus the French term for the solo is "clavier des bombardes"; and in the earlier English solos the " tuba mirabilis " was usually prominent. A solo organ may suitably contain any of the following stops: 8 tromba (a powerful reed on heavy wind), 8 harmonic flute (powerful tone and heavy wind), 8 clarionet and 8 orchestral oboe (real imitations of the instruments) and 8 vox humana (conventional imitation of the human voice). The last three stops are reeds. They may be with advantage enclosed in a swell box, having a separate pedal. In very large instruments a complete series of both diapason and reed stops is occasionally placed on the solo. But there does not seem to be much advantage in this arrangement.

We now come to the pedal. This forms the general bass to the whole organ. Thirty-two foot stops only occur in the largest instruments; they are as follows: 32 open diapason (wood or metal), 32-ft. tone bourdon and 32 contra trombone, posaune, bombarde, sackbut (reed). The 32-ft. open diapason, whether wood or metal, is usually made of large scale, and produces true musical notes throughout. Its musical effect in the lower part of its range is, however, questionable, so far as this depends on the possibility of recognizing the pitch of the notes. It adds great richness to the general effect, particularly in large spaces. The 32-ft. tone bourdon is not usuallv a successful stop.

Solo, organ.

Pedal organ.

It rarely produces its true note in the lower part of its range. The 32-ft. reed on the pedal has long been a characteristic of the largest instruments. With the old type of reed it was rarely pleasant to hear. The manufacture has been greatly improved, and these large reeds are now made to produce a fairly smooth effect. Deep reed notes, when rich and good, undoubtedly form one of the principal elements in giving the impression of power produced by large organs. From this point of view they are of great importance. Nevertheless the effect of large pedal reeds is generally more satisfactory to the performer than

to the listener.

The 16-ft. pitch may be regarded as the normal pitch of the pedal ; the principal stops are as follows: 16 open diapason (wood or metal), 16-ft. tone bourdon, 16 violone (imitation of double bass) and 16 trombone or posaune (reed). The 16-ft. open diapason on the pedal assumes different forms according to circumstances. As a rule the character is sufficiently indicated by the stop being of wood or metal. The wooden open is generally of very large scale, and produces a ponderous tone of great power and fulness, which is only suitable for the accompaniment of the full organ, or of very powerful manual combinations. Such a stop is, as a rule, unsuitable in organs of moderate size, unless supplemented by lighter 16s for ordinary purposes. The metal open is of considerably smaller scale (in fact all metal pipes are effectively of much smaller scale than wooden pipes of similar diameter). The metal gives a clear tone, lighter than that of large wooden pipes, and pleasanter for ordinary purposes. The metal open combines advantageously with a bourdon. In the largest organs both wood and metal open 16s may be suitably provided. Where metal pipes are made a feature in the organ-case, both the double open diapason in the great organ and the metal 16 of the pedal may be properly made of good metal (polished tin or spotted metal), and worked in to the design of the organ-case. 1 The same applies to the 32-ft. metal opens of the largest instruments. This saves space in the interior, and gives the large pipes room to speak, which is apt to be wanting when they are placed inside. The 16-ft. tone bourdon on the pedal may be made of any scale according to circumstances. If it is the chief bass of the organ it is made very large and with great volume of tone. Such stops are un- suitable for soft purposes, and a soft 16, usually a violone, is required in addition. If the loud department of the 16 tone is otherwise provided for the bourdon may be made of moderate strength. It may also be made very soft, like a manual bourdon. These three different strengths ought always to be provided for in an instrument of a complete character. The violone is also made of all three strengths. In a few cases it furnishes the principal bass; frequently it furnishes the moderate element; and it is often applied to obtain a very soft 16-ft. tone. The 16-ft. reed is very common. The observations made as to the effect of 32-ft. reeds are applicable also in this case.

The 8-ft. department of the pedal is only less important than the 16, because it is possible to replace it to a certain extent by coupling or attaching the manuals to the pedals. The usual 8-ft. pedal- stops are as follows: 8 principal bass (metal or wood), 8 bass flute (stopped) , 8 violoncello (imitation of the instrument) and 8 trumpet. The remarks

made above as to the scale of open 16s apply with little change to the pedal principal. Only, since the manuals are generally coupled, it is perhaps best to provide the large scale wood-stop, which presents the powerful class of tone in which the manual diapasons are deficient. The bass flute is almost a necessity in combination with the light 16-ft. tone. A composition ought to be provided by which the pedal can be reduced to these two elements by a single move- ment. The violoncello is sometimes used instead of the bass flute for the last-named purpose, for which, however, it is not so suitable. It is a favourite stop for some solo purposes, but is not of much general utility. The 8-ft. trumpet serves to give clearness and.point to the tone of the 16-ft. reed.

In the short preface to Mendelssohn's Organ Sonatas it is stated that everywhere, even in pianissimo, it is intended that the 16-ft. tone of the pedal should be accompanied by 8-ft. tone. For the purpose of realizing this as a general direction the soft 16-ft. and 8-ft. stops are required; large instruments are, however, occasionally found which possess nothing of the kind.

The following stops of higher pitch are occasionally found on the pedal: 5j twelfth bass, 4 fifteenth bass, mixture and 4 clarion. These serve to make the pedal tone practically independent of coupling to the manual, which is a matter of _ great importance, especially in the performance of certain compositions of Bach and other writers, who appear to have been independent of couplers.

In some instruments two sets of pedals are provided, which may

be described as great and choir pedals. The great pedal is in the

usual position ; the choir pedal is in front of the other, and

°, sloping. It is so placed that the feet rest on it naturally

pedal. when stretched out in front of the performer. There is a

choir pedal of this kind in the organ in the minster at Ulm, built by Walcker of Ludwigsburg. It is a very large instrument, having 100

1 Anything down to one-third tin and two-thirds lead is called tin. But "pure tin" should have over 90% of tin. Absolutely pure tin could not be worked. Spotted metal is said to have from one- third to two-thirds tin. Under one-third tin no spots are said to rise, and the mixture has the general characters of lead.

Fig. 7. — A, square, B, tracker ; C, metal square.

sounding stops. It has no compositions, which indeed are but little known in Germany ; and without some arrangement such as this a soft pedal would hardly be obtainable. There are a few other instru- ments which have choir pedals, but they have not been introduced into England.

In organs which have a single manual the characteristics of the great and choir organs are usually united. In organs which have two manuals the lower usually represents the united great and choir, the upper is the swell. In organs which have Arrange- three manuals the lower is usually the choir, but some- m eatot times combines choir and solo, the middle is the great, manuals. and the top is the swell. In organs which have four manuals the order is solo, swell, great, choir, the solo being at the top and the choir at the bottom.

Compositions are mechanical contrivances for moving the stop-handles in groups at a time. The ordinary form consists of pedals, which project from the front just above the pedal keys. The arrangements are various. We may refer to the c ” m POsl- arrangement in the organ at Windsor, given later on. Mofls * A species of composition was introduced by Willis some years ago, and has been adopted in many large English instruments, which acts by means of a series of brass disks placed just under the front of the keys of each manual, within reach of the thumb. These act by means of pneumatic levers. A slight pressure on one of the disks sets the machine attached to it in action, and the required change in the stops is made without any exertion on the part of the performer.

The connexion between the keys and their pallets is made by various mechanisms, some of which are very ancient. In square and trackerwork (fig. 7) the old squares were General made of wood. They « ,ecAafl – resemble in function the ‘

squares used for taking bell-wires round a corner. The trackers are slight strips of wood, having screwed wires whipped on to their ends.which hold by leather buttons. The trackers play the part of the bell-wires. Where pressure has to be transmitted instead of a pull, thin but broad slips of wood are used, having pins stuck into their ends to keep them in their places. These are stickers (fig. 8). Back- falls (fig. 9) are narrow wooden levers turning on pins which pass through their centres. The fan frame (fig. 10) is a set of backfalls having one set of ends close together, usually corres- ponding to the keys; the other ends are spread widely apart. The roller board (fig. 11) is a more

general mode of shifting the movements sideways. The roller is a slip of wood, or a bit of metal

tube, which turns on two pins inserted into its ends. It has two arms projecting at right angles to its length. One of these receives the pull at one point, the other gives it off at another. In case a pull has to be transmitted

to more than one quarter, r _ l ~ rˆ i,ˆ

a roller will sometimes

have more than two arms.

The name of couplers

(fig. 12) is given to the

mechanical stop by which

the keys of one manual are made to take down those of another,

or those of the pedal to take down those of the manuals. Some

old forms of the mechanism could not be put on while any of the

keys were depressed; others had a

tendency to throw the fingers off the

keys. These forms have been entirely

superseded. That now used consists

of a series of backfalls centred on a

movable support. The one set of ends

is connected with the moving keys;

the other set of ends is pierced by the

wires of the trackers or stickers from

the keys to be moved. In the one

position of the support these ends play

freely over the wires; in the other

they are brought up against the buttons

of the trackers or against the stickers

to be moved. The usual couplers are

— each of the manuals to the pedal,

swell to great, swell to great octave,

swell to great sub-octave, swell to

choir, choir to great sub-octave, and solo to great. The swell octave

and sub-octave couplers are sometimes placed on the swell itself. The

objection to this is, that if they are used when the swell is coupled to

3

Fig. 8. — A and B as in fig. 7 ; C, sticker.

Fig. 9.— Backfall.

Fig. 10. — Fan Frame.

Fig. 11. — Roller Board.

-=r

Fig. 12. — Coupler.

the great organ, as is very commonly the case, the octaves are reached through two couplers. And, as couplers are not generally screwed up quite tight, the octaves are often not sufficiently put down to sound in tune. The choir to great sub-octave coupler was used

chiefly as a substitute for a double on the great organ. It is common in organs of the transition period, but is not a good arrangement. The pneumatic lever (fig. 13) consists of a small power bellows attached to each key, so that the de- pression of the key admits high-pressure wind to the power bellows. The power bellows then performs the

work of opening the valves, &c. In large organs the work to be done would be beyond the reach of the most powerful finger with- out this device. Similar devices are sometimes applied to the compositions and other mechanical arrangements.

Pneumatic transmission, with many other mechanical devices, was invented by Willis. It consists of a divided pneumatic action. The

Eneumatic wind, instead of being at once admitted to the power ellows, is made to traverse a length of tubing, at the farther end of which it reaches the work to be done. This principle admits of application to divided organs, the pneumatic transmission passing under the floor, as in the organ at St Paul's Cathedral.

Ventils are valves which control the wind-supply of the different groups of stops. They were much recommended at one time as a

substitute for compositions. The practical difference is that com- positions shift the stop-handles, so that one can always see what there is on the organ; ventils leave the stop handles unmoved, so that the player is liable to be deceived. Other inconveniences might be mentioned, but it is enough to say that practical opinion appears decidedly to condemn the use of ventils.

The original pedal boards of Germany were flat and of very large scale. The early practice in England was to make them very small, as well as of short compass. Of late the compass C — /', thirty notes, has been universally adopted with scales varying from 2j to l\ in. from centre to centre of the naturals; 2f in. is the scale now recommended. A large number of organs have been provided with concave radiating pedal boards. The objections to this arrange ment are mainly two: They present different scales at different distances from the front; and, except just in front, they become so

narrow that the smallest foot can hardly put down the pedals singly. This renders difficult the old Bach style of playing, the essence of which consists in putting the feet over each other freely, so as to use the alternate method as much as possible; and this requires that the back of the pedal board shall be as available as the front.

The diversities of the arrangements of different organs present a great difficulty. The best players take a certain time to master the arrangements of a strange instrument. With a view to the intro- duction of uniformity a conference on the subject was arranged by the Col- lege of Organists in London, and a series of resolutions and a

series of recommendations were published which deserve attention (1881), though they have now been withdrawn. We may mention that the parallel concave form was recommended for the pedal board, and 2§ in. for the scale. The positions of the stops of the various organs were to be as follows : — Left. Right.

Swell. Solo.

Pedal. Great.

Couplers. Choir.

The order of compositions, &c, from piano to forte was to be in all cases from left to right. The groups of compositions were to be in the order from left to right — pedal, swell, couplers, great.

Two other points of detail may be alluded to. One is the position of the pedal board with reference to the keys. The heightfrom the

Arrange- ments about the per- former.

Great Orgnn *»ˆ j

1 Old arrojˆcfernj&rvt

middle of the pedals to the great organ keys, it is agreed, should be 32 in. But as to the forward position there is a difference. The resolutions said that ” a plumb-line dropped from the front of the great organ sharp keys falls 2 in. nearer the player than the front of the centre short key of the pedal board.” The old arrangement gave usually 1 J in. for this distance. But it is thought that the change has not gone far enough, and 4 in. has been found preferable. There is scarcely any single arrangement which is so important for the comfort of the player as having sufficient space in this direction (fig. 14). The second matter is the provision of some other means of acting on the swell than by the swell pedal. The use of the swell pedal is inconsistent with the proper use of both feet on the pedal keys; and there is no doubt that incorrect habits 1

in this respect are com- ! , ,

monly the result of the English use of the swell pedal. In fact, players sometimes keep one foot on the swell pedal all the time, so that proper pedal playing is impossible. Arrangements have been devised by means of which a movable back to the seat can be made the means of acting on the swell. The first ” recommendation ” of the College of

Organists illustrated the require- ment; it was, that “the consideration of organ- builders be directed to the widely-expressed desire for some means of operating on the swell in addition to the ordinary swell pedal.” ~~~

G. Cooper had a movable back to the seat of the organ at St Sepulchre’s, Fig. 14, London. The swell was opened by leaning back,

so that it could only be used when the swell was coupled to the great. The writer has had an organ for more than twenty years in which the movable back is provided with a strap passing over one shoulder and buckling in front. It opens the swell when the player leans forward. It is most valuable, particularly in such things as accompanying the service. The emphasis required is obtained when wanted without taking the feet from their other duties. Young people pick it up easily ; older people have difficulty. As an example of an organ of a complete but not enormously large character, we give the details of the organ at St George’s Chapel, Windsor, which was rebuilt by Messrs Gray and Davidson, according to Sir Walter Parratt’s designs, in the year 1883.

Q

j.2 College of Organists

‘Magdalen College Se **$■* Georges – Windsor

-Relative Position of Manual and Pedal.

2 t

z 3

2

in ranks

Four manuals, C to a’”, 58 notes. Pedal, C to/’, 30 notes.

Great Organ (3§-in. wind) Double open diapason Large open diapason Open diapason Stopped diapason Clarabella . Principal . Harmonic flute Twelfth . . . Fifteenth . Sesquialtera 1 . Harmonic piccolo Posaune Clarion

Swell Organ (3-in, Lieblich bourdon Open diapason Stopped diapason Dulciana . Vox coelestis 1 . Principal Octave duiciana Fifteenth . Mixture 2 Contra fagotto Cornopean Oboe . . . Vox humana . Clarion

wind)

16

16

4

4

2

ill ranks

16

Choir Organ (2|-in. wind) Dulciana . Keraulophon . Stopped diapason Viol d'orchestre . Flute .... Piccolo .... Corno di bassetto (reed)

Solo Organ (6-in. wind) Harmonic flute Orchestral oboe Tromba

Pedal Organ (4-in. wind). Open diapason (wood) Violone (metal) Bourdon (wood) . Wood flute .... Trombone (wood tubes)

16 16 16 8 16

Couplers. Solo to great. Swell to pedal. Swell to great. Great to pedal. Solo to pedal. Choir to pedal.

Pneumatic action to great organ and its couplers.

The arrangement of the stops and compositions is as follows : — Left. Over the keys. Right. Solo. Couplers. Swell.

Choir. Tremulant. Great. Pedal. (Knob below swell keys.)

1 These are the old mixtures.

Composition Pedals.

even.

Great and pedal combined

s

1

jˆ

rrn

mj

I Great to pedal in and out.

/ St

Rednce pedal to violone Great to pedal in.

One swell pedal controls two sides of the swell box. The other controls the box in which the orchestral oboe is placed. The vox humana is in a box which is always shut, inside the swell box.

History of the Modern Organ.

The history of the ancient organ is dealt with in a separate section below. The first keyboard is said to have been intro- duced into the organ in the cathedral at Magdeburg about the close of the nth century. There were sixteen keys; and a drawing exists in a work of the 17th century 1 which purports to represent them. They are said to have been an ell long and 3 in. broad. The drawing represents a complete octave with naturals and short keys (semitones) , arranged in the same relative positions as in the modern keyboard. In early organs with keyboards the keys are said to have required blows of the fist to put them down. In these cases probably sounding the notes of the plain song was all that could be accomplished.

As to the precise time and conditions under which the key- board assumed its present form we know nothing. It is commonly said that the change to narrow keys took place in the course of the 14th century, and the semitones were introduced about the same time.

Many examples of organ keyboards still exist, both in England and on the Continent, which have black naturals and white short keys (semitones). The organ in the church' at Heiligenblut in Tirol had in 1870 two manuals, one having black naturals and white semitones, the other white naturals and black semi- tones. In this organ the stops were acted on by iron levers which moved right and left. It had a beautiful tone; it pos- sessed a reservoir bellows of great capacity, and

was altogether a remarkable instrument. Harpsichords with black keyboards also exist.

The mode of blowing practised about the time of the intro- duction of the first keyboard appears to have been that which _ „ ultimately developed into the method still generally

used in Germany. There were a great many separate bellows, each like a magnified kitchen-bellows, but provided with a valve, so that the wind could not return into the bellows. One man had charge of two of these. Each foot was attached to one bellows, and the blower held on by a bar above. It was possible, by raising each of the two bellows in turn and then resting his weight upon it, to produce a constant supply of wind with the pressure due to his weight. A great many such bellows were provided, and it seems that each pair required one man; so that great numbers of blowers were employed. A slight modification is enough to change this method into the German one. Instead of fastening the feet to the bellows and pulling them up, the blower treads on a lever which raises the bellows. The bellows being loaded then supplies the wind of itself. The bellows thus used have diagonal hinges, and various expedients are employed to make them furnish steady wind. But the English system of horizontal reservoirs and feeders appears far superior.

The invention of the pedal may be set down to the 15th century. About that time the organ assumed on the Continent of Europe the general form which it has retained till lately, more especially in Germany. This may be described generally as having a compass of about four octaves in the manuals and of two octaves in the pedal, with occasionally extra notes at the top in both, and frequently ” short octaves ” at the bottom. German short octaves are as follows. The manual and pedal appear to terminate on E instead of C. Then the E key sounds C, F = F, F#=D, G = G, G# = E, and the rest as usual. There were often three, sometimes four, manuals in large organs. 1 Praetorius, Theatrum Instrumentorum.

Pedal.

Cases.

The character of all these was in general much the same, but they were more softly voiced in succession, the softest manual being sometimes spoken of as an echo organ. There are one or two examples of the echo as a fourth or fifth manual in England at the present time, in organs which have been designed more or less under German

inspiration. The old echo was long ago super- seded by the swell in England.

A few ancient cases survive in a more or less altered condition. Of these the following are worthy of mention, as bearing on the question of date.

Sion (Switzerland). Gothic. A sma.. instrument . . 1390

Amiens. Originally Gothic. Large, with 16-ft. pipes . . 1429

Perpignan. Gothic. Large, with 32-ft. pipes …. 1490

Lubeck. One of the finest Gothic organs in Europe. 32s. 1504 (or, according to Hopkins, 15 18).

In all these the cases are sufficiently preserved to make it almost certain that pipes of the same lengths were originally employed. The actual pipes are generally modern. Shortly after this date we find Renaissance cases. At La Fert6 Bernard (dep. Sarthe) part of the substructure is Gothic, and is known to be of date 1501; the organ above is Renaissance, and is known to be of date 1536. At St Maurice, Angers, an organ was built in 1511, with Renaissance case, two towers of 32-ft. pipes, 48 stops and a separate pedal. An account of the instrument in a proces verbal of 1533 furnishes good evidence. In the 16th century, therefore, the organ had attained great completeness, and the independent pedal was general on the Continent.

We cannot follow the history of German organs through the intervening centuries; but we propose to give the items of one of the principal organs of the Silbermanns, the great builders of the 18th century — namely, that standing in the Royal Catholic Church, Dresden. Without being an enormously large instrument it is complete in its way, and gives a very good idea of the German organ The account is taken from Hopkins. The date is 1754. 2

Great.

German organ.

Principal

16

Octave

2

Bourdon

16 tone

Tertia .

i|

Principal

8

Mixtur

iv ranks

Viola da Gamba

8

Cymbel

in,

Rohrfiote . .

8 tone

Cornet

V

Octave

4

Fagott

16

Spitzflote .

4

Trumpet .

8

Quinta .

0^

-=3

Clarin .

4

Echo.

Quintaton .

16 tone

Octave

2

Principal

8

Tertia

n

Gedackt

8 tone

Flageolet .

1

Unda Maris

8 tone

Mixtur

iv ranks

Octave .

4

Echo .

V

Rohrfiote . .

4 tone

Vox humana .

8 tone

Nassat .

2f

Choir.

Gedackt

8 tone

Quinta

if

Principal

4

Siffiote . .

1

Rohrfiote . .

4 tone

Mixtur

m ranks

Nassat .

2f

Sesquialtera .

11

Octave …

2 Chalumeaux . Pedal.

8 tone

Untersatz .

32 tone

Mixtur

iv ranks

Principal

16

Pausan (trombone

) 16

Octave-bass

8

Trompette

8

Octave .

4

Clarin .

4

Accessories.

Echo to great.

1 Tremulant echo.

Great to pedal.

1 Tremulant great. Compass.

Manuals— C to d'"

in alt.

Pedal — Ci to tenor c.

The chief difference between English organs and those of the Continent was that until the 19th century the pedal was absolutely unknown in England. The heavy bass given by the pedal being absent, a lighter style of voicing was ^"ns. adopted, and the manuals were usually continued down below the 8-ft. C so as to obtain additional bass by

2 The writer heard this instrument as a boy, and has a very pleasant recollection of the general effect.

playing octaves with the hands. Thus theold organ (date 1697) cr Father Smith in St Paul's Cathedral had manuals descending to the 16-ft. C (Ci), with two open diapasons throughout. Green's old organ at St George's/Windsor, had manuals descend- ing to the 12-ft. F, also two open diapasons throughout, no F#. But the more usual practice was to make the manual descend to the iof G, leaving out the G#. At the Revolution most of the organs in England had been destroyed. Shortly afterwards Bernard Smith, a German, commonly called Father Smith, and Thomas and Rene Harris, Frenchmen, were largely employed in building organs, which were wanted everywhere. Father Smith perhaps had the greatest reputation of any builder of the old time, and his work has lasted wonderfully. There is a list in Rimbault of forty-five organs built for churches by him. The list of Rene Harris is scarcely less extensive.

The most important step in the development of the old English organ was the invention of the swell. This was first introduced into an organ built by two Jordans, father and son, for St Magnus's church near London Bridge, in 171 2.

Burney writes (1771): —

” It is very extraordinary that the swell, which has been introduced into the English organ more than fifty years, and which is so capable of expression and of pleasing effects that it may be well said to be the greatest and most important improvement that was ever made in any keyed instrument, should be utterly unknown in Italy; and, now I am on this subject, I must observe that, most of the organs I have met with on the Continent seem to be inferior to ours by Father Smith, Byfield or Snetzler, in everything but size ! As the churches there are very often immense, so are the organs; the tone is indeed somewhat softened and refined by space and distance; but, when heard near, it is intolerably coarse and noisy; and, though the number of stops in these large instruments is very great, they afford but little variety, being for the most part duplicates in unisons and octaves to each other, such as the great and small I2ths, flutes and I5ths; hence in our organs, not only the touch and tone, but the imitative stops, are greatly superior to those of any other organs I have met with.”

(As to these opinions, compare what is said on great organ open diapasons above.)

In the course of the 18th century most of the old echoes were altered into swells, and the swell came into almost universal use in England. The development of the swell is inseparably associated with the peculiar quality of English swell reeds. These must have originated during the development of the swell. We hear of a ” good reed voicer ” named Hancock, who worked with Cranz, changing echoes into swells. However it originated, the English reed is beautiful when properly made. The original swells were usually short in compass downwards, frequently extending only to fiddle g. It is only lately that the value of the bass of the swell has been properly appreciated. Short-compass swells may be said to have now disappeared.

The organ in St Stephen’s, Coleman Street, was probably nearly Avery’s ‘ n ˆ s or ‘g ma l condition at the date when it was old described by Hopkins. It was built by Avery in 1775.

English At all events the following arrangements might very organ. we jj jj aV e Deen the original ones. The pedal clavier without pipes is no doubt a subsequent addition, and is omitted.

Great. Open diapason.

Stopped diapason. Principal. Twelfth. Fifteenth.

Stopped diapason.

Principal.

Flute.

Open diapason. Stopped diapason. Principal.

Great and choir — Gi to e’

no Gi#.

Choir.

Swell.

Compass.

Sesquialtera — III ranks.

Mixture — n ranks.

Trumpet.

Clarion.

Cornet to middle c — v ranks.

Fifteenth. Cremona to tenor c.

Cornet — in ranks.

Trumpet.

Hautboy.

Swell— fiddle g to e”

This gives an excellent idea of the old English organ. There are several different accounts of the introduction of pedals

into England. It took place certainly before the end of the 18th century, but only in a few instances; and for long after the usual arrangement was simply to provide a pedal clavier, usually from Fj or Gi to tenor c or d, ˆ,-hich took ˆ„ˆaJd down the notes of the great organ. Unison diapason pipes (12-ft.) were occasionally used. In one or two cases, as in the transition states of the old organ at St George’s, Windsor, a 24-ft. open diapason was employed as well as the unison stop. But a more usual arrangement, of a most objectionable

character, was to combine the Gi — c pedal-board with a single octave of so-called pedal-pipes, extending from the 16-ft. to the 8— ft. C; so that, instead of a uniform progression in ascending the scale, there was always a break or repetition in passing C.

About the middle of the 19th century it began to be generally admitted that the German arrangement of the pedal was the better, and the practice gradually became general of providing a complete pedal-board of 25 octaves (C— /), with at least one stop of 16-ft. tone throughout, even on the smallest organs that pretended to be of any real use. The study of the classical works of Bach and Mendelssohn went hand in hand with this change; for that study was impossible without the change, and yet the desire for the study was one of the principal motives for it. In the meantime Bishop, an English builder, had invented composition pedals, which so greatly facilitate dealing with groups of stops. About the same time (1850) the mechanics of the organ were advanced by the general introduction of the pneumatic lever into large instruments; the whole mechanism of the organ was revolutionized by Willis's improve- ments; and the organ-builders of England, having obtained from the Continent the fundamental ideas necessary for com- pleteness, advanced to a point at which they appear to have been decidedly ahead.

In the early part of the last quarter of the 19th century, the future of the English organ appeared to be one of great promise. Much confidence was felt in the brilliant combinationsofWillis'smechanism. Theemployment Present of electricity had reached a certain stage, and the organs. necessary fundamental mechanism, under the name of the electro-pneumatic lever, was to be obtained in a practical form. Several new devices were in the air, by means of which the control of the various valves was accomplished by the action of wind, traversing channels, with complete abolition of trackers, and even of stop slides; and Willis's classical mechanisms, including those for acting on stop slides pneumatically without direct mechanical connexion between slide and handle, were almost universally adopted in large organs. The delicate device of pneumatic lever on pneumatic lever, by which alone the small electromagnetic impulses available could be made to do heavy work, had obtained recognition. If there was an occasional failure, it was thought to be no more than might be expected with work of a novel t and delicate character. And it was con- fidently expected that these devices would, in time, with the improvements associated with practical use, come to be reliable. This expectation has not been realized. The objections to the modern pneumatic, and still more to the electropneumatic machinery, are of two kinds — noise and inefficiency.

Noise in the Key Action. — We take as the standard of comparison the old tracker organ, without pneumatics. There was always a certain amount of noise. Now, even in the best instruments of Willis himself during his lifetime, and still more in the best instru- ments of the present day, the noise of the key action is judged to be as bad as in the old tracker organ. The pneumatics have to be driven by a powerful wind ; the consequence is they get home with a knock.

Noise in the Stop Action. — If in a large instrument with pneumatic drawstop action one of the compositions which affects several stops is put in action, the movement of the stops is followed by a blow like a hammer, which is caused by the pneumatics getting home under the powerful force employed. This is much worse than any- thing there was in the old organ.

Inefficiency in the Key Action ; Delay and Cyphering. — This chiefly shows itself in delay, both at the depressing and at the recovery of the_ key. Some of the causes are the size of the pneumatic bellows, which takes time to fill and time to empty; and, very often, defective regulation of the valves. The regulation of the valves is an art

in itself, and it is often the case that the performance in this respect can be greatly improved by going over the regulation. The test is the possibility of executing shakes and repetitions. It is quite common to find mechanism by the first organ-builders of the day on which shakes or repetitions cannot be executed.

Pneumatic transmission is also specially liable to cause delay. In divided organs the swell is usually on the far side from the keys, and the pneumatic transmission tubes pass it under the floor. The swell touch is then considerably worse than the great. In all cases there must be some delay on account of the time the pulse takes to traverse the transmission tube with the velocity of sound. And if a pneumatic bellows has to be filled at the far end the delay will be more. Some of the delay experienced in large buildings may be due to the time taken in supplying the energy necessary for setting up and maintaining the vibrations of the air in the building. This should, however, have been the same with the old tracker action; and the opinion of old players is unanimous that they never ex- perienced anything of the kind. The shake and repetition are the only real tests so far as the action is concerned.

Inefficiency in the key action also takes the form of ” cyphering,” i.e. a note sticks down. With the old tracker organ this could gener- ally be cured without much difficulty by working on the action, and with the separate pneumatic lever something could be done. But the modern types of elaborated action are entirely enclosed in wind-chest and sound-board. It was always foreseen that these types would be dangerous, unless they could be made quite perfect, and they have not been made perfect. When a note sticks, there is no way of curing it except to get at the inside of the wind-chest, or to remove all the pipes belonging to the note. A case happened recently where, during a performance on an organ by a first-rate modern builder, two cypherings took place. To cure the first all the pipes belonging to the note were removed. In the second the last three pages of a Bach fugue were played with a note cyphering all the time ; and such cases are of frequent occurrence.

Inefficiency in the Stop Action. — In this case the power provided is insufficient to move the stop slide. As there is no direct connexion between slide and handle, nothing can be done but to get inside the organ and move the slide by hand. A case has recently occurred where an organ by a first-rate builder, in constant use, and perfectly cared for, got one of the slides stuck while in use. The organ was locked, so nothing could be done. The same happened to another slide a couple of days later. It is also an everyday experience that the pneumatic compositions are insufficient to move the stops; sometimes they move the stops about halfway, when a sort of wail is heard.

One practical result is — where an organ is not too large to be dealt with by the old mechanical methods, there is much to be said for adhering to them.

It seems worth while to mention two suggestions by which these imperfections in large organs might be reduced to a minimum.

For blowing, motors for stop action, &c, the writer would suggest the employment of the Armstrong hydraulic accumulator system, at a pressure of say 600 tt> on the square inch. The pumping of the system would be done by external power (electricity, gas, oil or steam), quite away from the building containing the organ. The blowing would be done by the hydraulic system at a point near the organ. The small hydraulic motors attached to the stop slides, swell, &c, might have almost infinite power and be perfectly noiseless. The key-work should be pneumatic and should use Willis’ s floating lever. The swell pedal should be hydraulic, with the floating lever, as also the action of the back of the seat if employed for opening the swell.

The effect of the floating lever is that the movement of the work corresponds exactly with the movement of the part connected with key or pedal. The connexion with the key would have a regulation so that the lever would begin to move a little later than the key, the regulation being adjusted by trial so as to give shakes and repetitions.

The principle of the floating lever is the same as that of the steam steering gear in ships. The control of the power is attached to the floating centre. It is always such that the movement of the work brings back the floating centre into its standard position, and it acts like a fixed centre with added power.

As to the general arrangement of the instrument, it is desired to make two protests. Firstly, the organ chamber is a monstrosity. Shutting up the organ in a confined space is simply throwing money away. An organ of a quarter the size would do the work better if not shut up in an organ chamber. Secondly, it has become customary to separate the different parts of an organ, putting the pipes of the pedal, great and swell perhaps in different places at a distance from one another, and the soft choir organ, which should be close to the singers, perhaps, as in one actual case, in a remote position where it cannot be heard at all and is useless for accompani- ment. The parts of an organ so dispersed will not give a tone which blends into a whole. The practice is undesirable. The divided organ with pneumatic or electric transmission is to be avoided for all reasons.

General Remarks on Organ Treatment The organ probably presents more difficulties then any other instrument in the way of a sound elementary mastery. A

person of ordinary capacity may work at it for years before being able to play passages of moderate difficulty with con- fidence and correctness. The special difficulty appears to be chiefly mental, and arises from the number of things that have to be thought of simultaneously. It does not lie in the execution — at least not chiefly; for to play a hymn-tune correctly, the bass being taken with the pedals, the tenor with the left hand, and the two upper parts with the right, is a matter in which there is no execution required; but it is of great difficulty to an inexperienced player. Other distributions of parts — such as bass with pedals, treble with right hand on a solo stop (e.g. clarinet), two inner parts with a soft open diapason, or some- thing of the kind — are of much greater difficulty in the first instance. Another distribution is bass with pedals, melody with reed or solo combination in the tenor with left hand (an octave below its true pitch), inner parts with right hand on a soft open diapason, or something that balances.

This is of far greater difficulty, as it requires rearrangement of parts to avoid those faults of inversion the avoidance of which is known as double counterpoint. All this can be practised with common hymn-tunes; but the performer who can do these things with ease is in some respects an advanced player.

There is a natural gift, which may be called the polyphonic ear-brain. It is possessed by (roughly) about one in fifty of musical students, by students of the organ in much the largest proportion, and probably by a much smaller proportion of the unsifted population. For the polyphonic ear-brain these diffi- culties have no existence, or take little trouble to surmount. It consists of the power of hearing the notes of a combination simul- taneously, each being heard as an ordinary person hears a single note. When a composition is played or sung in parts, each part is heard as a separate tune; and the effect is realized in a manner quite different from the single melody with accom-paniment, which is all that an ordinary person usually hears. This is in many but not all cases associated with the rare power of remembering permanently the actual pitch of notes heard.

The observations made in the 9th edition of this Encyclopaedia on ” Balance of tone ” do not now call for the stress there laid on them, as there is an improvement in this respect. But it is still desirable to insist on the importance of balance in the performance of organ trios such as the organ sonatas of Bach. In these compositions there are generally three notes sounding, which may be regarded as belonging to three different voices, of nearly equal strength but different mean pitch, and, if possible, different quality; of these one is appropriated by each hand and one by the pedal. They are written in three lines, and are intended to be played on two manuals and the pedal.

The fugues of Bach are the classical organ music par excellence. As to these nothing has come down to us as to the composer’s intentions, except that he generally played the fugues on the full organ with doubles. It does not seem clear that this was the case with the preludes; and, any way, the modern organ, with its facilities for managing the stops, appears to counten- ance a different treatment. The effect of doubles when a subject or tune is given out in solo on a manual is very bad. The doubles may be drawn with advantage when the parts are moving in massive chords. The usual practice is perhaps to employ various manual effects of a light character until the pedal enters, and then to produce full organ in its various modifications, but always to aim at variety of tone. If a prelude begins with heavy chords and pedal, then produce full organ at once. If it then passes to lighter matter, reduce to some extent. Some begin a fugue on the stopped

diapason of the great organ, add more as the parts enter, and continue working up throughout. But perhaps it is the better practice to throw in loud organ during the pedal parts, and soften between times.

One of the greatest requisites in organ-playing is dignity of treatment. This is continually competing with clearness. The chief mode of keeping the different parts distinct, where that is necessary, is by using reeds of a pronounced character. These reeds sometimes verge on the comic, and anything more than

the most sparing and careful employment of them is undesirable. 1 Expression is not possible unless the stops are enclosed in a swell box — a most desirable arrangement. In all cases hurry- is to be avoided. A calm steadiness, a minute finish of all the phrasing, forms most of the difference between first- and second- rate players.

With reference to the general treatment of modern music we quote the preface to Mendelssohn's Organ Sonatas: "In these sonatas very much depends on the correct choice of the stops; but, since every organ with which I am acquainted requires in this respect special treatment, the stops of given names not producing the same effect in different instruments, I have only indicated certain limits, without specifying the names of the stops. By fortissimo I mean the full organ; by pianissimo usually one soft 8-foot stop alone; by forte, full organ without some of the most powerful stops; by piano, several soft 8-foot stops together; and so on. In the pedal I wish everywhere, even in pianissimo, 8-foot and 16-foot (tone) together, except where the contrary is expressly indicated, as in the sixth sonata [this refers to a passage where an 8-foot pedal is used without 16]. It is therefore left to the player to combine the stops suit- ably for the different pieces, but particularly to see that, in the simultaneous use of two manuals, the one keyboard is distin- guished from the other by its quality, without forming a glaring contrast."

Importance is attached to the above directions as to single stops. The habit of mixing up two or more stops unnecessarily results in the loss of the characteristic qualities of tone which reach their highest value in single stops.

A habit is prevalent of using couplers in excess. One hears the swell coupled to the great during an entire service. The characteristics of

the two manuals, which, separated, lend them- selves to such charming contrasts, are lost in the mixture, just as the characteristics of single stops are lost when employed in groups. It is common to see an English organist keep the right foot on the swell pedal and hop about with the left on the pedals. This cannot be called pedal-playing. Both feet should be used, except where the swell pedal is actually required. It is a common habit to hold a note down when it should be repeated. It should be struck again when indicated. The repetition is a relief to the ear.

The older organists commonly filled up their chords, striking pretty nearly every concordant note within reach. The effect of this was in many cases to destroy effects of parts, or effects of re- straint leading to contrasts intended by the composer. There is a well-known case of a climax about a line before the end of Bach's " Passacaglia." Here there is a pause on a chord of four notes; one low in the bass (pedal); two forming a major third in the middle; and one high in the treble. Some players fill in every concordant note within the reach of both hands. Others consider the effect of Bach's four notes superior. The writer thinks that the average listener prefers the full chord, and the polyphonic hearer the thin arrangement of parts. Of course the parts are lost if thick chords are used. Restraint in the use of the pedal is also sometimes intended to lead up to a con- trast which is lost if the pedal is introduced too soon.

Contrast and variety are essential elements in organ effects. A suitable phrase repeated on solo stops of different characters; a see-saw in a series of rhythmical chords between two manuals of different characters — contrasts generally — are charming when suitably employed. Phrasing we cannot describe here. It is just as important in the organ as in any solo instrument, or in song.

There has been a tendency to attempt too much in the imita- tion of orchestral instruments. While such stops as good flutes and good imitations of wind instruments have their value, the imitation of stringed instruments and of the orchestra in general

1 As some difficulty has been felt as to what is here meant, an instance is given. The writer has heard a first-rate player emphasize the entrance of a chorale in the pedal (Mendelssohn's 3rd sonata in A) by coupling the choir clarinet to the pedal. The effect was coarse and disagreeable, and would have been ridiculous if it had not been so ugly. It was clear, but not dignified.

is undesirable. The organ's own proper tones are unequalled, and it is

a pity to make it a mere caricature of the orchestra.

The writer has had the opportunity of inspecting two of the installations known by the name of R. Hope- Jones; both under the care of an able enthusiast in the matter, Mr Collinson, of Edinburgh. The Hope- Jones system consists of two parts: a mechanism, and a system of pipe-work. These must be con- sidered separately. The mechanism is entirely electric. One example consisted of an application of this mechanism to a fine organ by Willis. The conditions were as favourable as possible, with temperature regulation and constant use. Yet even in this case the contacts failed occasionally. The difficulty about repetition appeared to have been entirely got over, the perform- ance being satisfactory when the contact was in good order. These contacts appear to be the weak part of the system. All the mechanism, couplers and all, is worked by means of these con- tacts. With the care which is taken no difficulty is found in getting the arrangement to work in the case of the Willis instru- ment. The system is very complicated, with double touch couplers throughout, by means of which a solo can be effected on one manual by varying the pressure. The study of the double touch appears very difficult. Stop handles are done away with. They are replaced by rockers, the faces of which are about the size of small railway tickets. The appearance is as if the surface where the stop handles would be was plastered over with these rockers. They turn on a horizontal axis through the middle, and a touch of the finger at top or bottom opens or closes the stop. The other instrument was Hope- Jones thoughout, pipes and mechanism. The curator was the same as in the case of the Willis instrument. But, the hall being little used, there was no temperature regulation, and very little use. The state of the mechanism was inferior, the contacts failing freely. It could not be regarded as an admissible mechanism from the writer's point of view. As to the pipe-work, the effect was remarkable; but it could not be regarded as genuine organ work, as the player admitted. Our requirement in the matter of action is a perfectly unfailing connexion between key and pipe. And in this respect we adhere to a preference for the old tracker action, where possible. Anything that leaves a possibility of failure in the connexion we regard as inadmissible.

The writer desires to acknowledge his obligations to Sir Walter Parratt for much assistance in the preparation of this article.

(R. H. M. B.)

History of the Ancient Organ.

The earliest authentic records of the organ itself do not extend beyond the second century B.C., but the evolution of the instru- ment from the Syrinx or Pan-pipe goes back to a remote period. The hydraulic and pneumatic organs of the ancients were practically the same instrument, differing only in the method adopted for the compression of the wind supply; in the former this was effected by the weight of water, and in the latter by the more primitive expedient of working the bellows by hand or foot. What is known, therefore, of the evolution of the organ before hydraulic power was applied to it is common to both hydraulic and pneumatic organs. The organ of the ancients was a simple contrivance, consisting, in order of evolution, of three essential parts: (1) a sequence of pipes graduated in length and made of reed, wood or bronze; (2) a contrivance for com- pressing the wind and for supplying it to the pipes in order to make them speak, the ends of such pipes as were required to be silent being at first stopped by the fingers; and (3) a system for enabling the performer to store the wind and to control the distribution of the supply separately to the several pipes at will. The pipes of the syrinx were the prototypes of No. 1; the bellows and the bag-pipe — which was but the application of the former to the reed — foreshadowed No. 2. The third part of the organ was composed of contrivances and common objects used by carpenters, such as boxes having sliding lids running in grooves, levers, &c.

It seems probable that the syrinx was recognized by the ancients as the basis of the organ. Hero of Alexandria, in his description of the hydraulic organ, calls it a syrinx. Philo of Alexandria (c. 200 B.C.), mentioning the invention of the hydraulis(us) by Ctesibius,

says, ” the kind of syrinx played by hand which we call hydraulis.” The fact that the syrinx was an assemblage of independent stopped pipes, which in their original condition could not be mechanically blown, since the movable lip of the player used to direct the air stream against the sharp edge of the open end of the pipe was a necessity, is no bar to the suggested derivation. VVind projected into a pipe can produce no musical sound unless the wind be first compressed and the even flow of the stream be interrupted and converted into a series of pulses. In order to produce these pulses in an organ-pipe, it is necessary to make use of some such contrivance as a reed, flute or whistle mouthpiece (q.v.).

In the earliest organs there is no doubt that the pipes consisted of lengths of the large reed known as KdXctjuos used for the syrinx, but converted into open flue-pipes. Instead of cutting off the reed immediately under the knot, as for syrinx pipes, a little extra length was left and shaped to a point to form a foot or mouthpiece, which was placed over the aperture in the wind-chest, so that it caused the stream of air to split in two as it was driven through the hole into the pipe by the action of the bellows. A narrow fissure was made through the knot near the front of the pipe, and above it a horizontal slit was cut in the reed, the two edges being bevelled inwards. When the wind was pumped into the chest it found an outlet through one of the holes in the lid, and the current, being divided by the foot of the pipe, became compressed and was forced through the fissure in the knot. It then ascended the pipe in an even stream, as yet silent, until thrown into commotion by another obstacle, the upper sharp edge or lip of the notch, which produced the regular flutterings or pulses requisite for the emission of a note. The very simplicity of this process disposes of any difficulty in accepting the syrinx as an important factor in the evolution of the organ. The conversion of a syrinx pipe is, in fact, a simpler and more natural expedient than the more elaborate construction of a wooden flue-pipe.

In order to convert the syrinx into a mechanically played instru- ment, the addition of the actuating principle of the bag-pipe was necessary. It is probable that in the earliest attempts the leather bag was actually retained and that the supply of wind was still furnished by the mouth through an insufflation pipe. Such an instrument is described and illustrated by Father Athanasius Kircher, 1 but his drawing should be accepted with reserve, as it was probably only an effort of the imagination to illustrate the text. In the instrument, which he calls the Magraketha or Mashrokitha of the Chaldees, the bag is described as being inside the wind-chest, the insufflation pipe being carried through a hole in the side of the ,box. Little wooden sliders manipulated by the fingers formed a primitive means of controlling the escape of the wind through any given pipe.

We have two pottery figures of musicians playing on primitive organs in the next stage of development, namely with bellows, and a description in the Talmud. The quotation as given by Blasius Ugolinus states that the instrument known as the Magrepha d'Aruchin 2 " consisted, as theSchilte Haggiborim teaches, of several rows of pipes and was blown by bellows. It had, besides, holes and small sliders answering to each pipe, which were set in motion by the pressure of the organist ; the vent-holes being open, a wonderful variety of sounds was produced." The spurious letter of St Jerome to Dardanus might

also be consulted in this connexion. At Tarsus in Asia Minor pottery and coins dating from c. 200 B.C. were ex- cavated by W. Burckhardt Barker, 3 and amongst them is the frag- ment of a figure of a musician playing upon an instrument fastened to his breast, and having seven pipes set in a rectangular wind-chest, in the centre of which appear to be two bellows of unequal sizes. Unfortunately both drawing and description are somewhat vague : nevertheless, there is no room for doubt that this was an organ, perhaps without sliders or keys, the pipes being stopped at the open end, nearest the player's mouth, by the fingers, supposing that there was only one bellows. Another piece of pottery from Tarsus, dis- covered in 1852, during excavations carried out at Kusick-Kolah by M. M. Mazvillier and V. Langlois, 4 and preserved in the Louvre, shows the back of an organ having fifteen pipes. Two models of organs of more recent date recall the construction of that found by Mr Barker. One found in Chinese Turkestan on the site of ancient Khotan 6 (fig. 1) represents a musician holding the instrument to his breast ; both hands seem to be pressing what might be bellows ; and there are seven pipes below the bellows. The other instrument (fig. 2) is of Roman origin, and forms part of the decoration on a medallion on a yellow pottery vase, which was excavated at Orange (Dauphinˆ, France), and is now preserved in the collection of M. Emilien Dumas de Sommieres. The subject represented in the

1 See Musurgia, bk. ii. ch. iv. § 3, p. 3.

2 or Eruchin. Treatise XXXIII. of Babyl. Talmud. See Thesaurus Antiquitatum Sacrarum (Venice, 1744-1769), xxxii. 11 and 21.

3 See Lares and Penates (London, 1853), p. 260, fig. 69.

4 See W. Froehner, Monuments antiques du musee de France (Paris, 1873), pi. 32; also Archives des missions scientifiques, iv.

64-67.

6 See Ancient Khotan, detailed report of archaeological explorations in Chinese Turkestan, carried out by H.M. Indian Government, by Marc. Aurel Stein (Oxford, 1907), plate xliii.

From Marc Aurel Stein, Ancient Khotan, by permis- sion of the Clarendon Press.

Fig. 1.

From Orange.

Fig. 2.— Roman Pneumatic Organ.

medallion is an amphitheatre, and in the centre a pneumatic organ

with bellows is plainly visible (fig. 2).

This brings us to a point in the history of the organ when the existence of the hydraulic organ can no longer be ignored. Some writers consider that the invention of the hydraulis in the 2nd century B.C. by Ctesibius 6 of Alexandria constitutes the invention of the organ, and that the pneumatic organ followed as an improve- ment or variety. Such an assertion would seem to be untenable in the face of what has been said above. It is most improbable that a man busy with the theory and practice of hydraulics would invent a highly complex musical instrument in which essential parts lying out- side his realm, such as the flue-pipes, the balanced keyboard, the arrangements within the wind-chest for the dis- tribution of the wind, are all in a highly de- veloped state; it would be a case for which no parallel exists in the history of musical instru- ments, all of which have evolved slowly and surely through the ages. On the other hand, given a pneumatic organ in which the primitive un- weighted bellows worked unsatisfactorily, an engineer would be prompt to see an opportunity for the advan- tageous application of his art.

There are two detailed and duly accredited descriptions of the hydraulis extant, both of which presuppose the existence of a pneu- matic organ. One is in Greek by Hero of Alexandria, 7 said to be a pupil of Ctesibius, 8 and the other in Latin by Vitruvius {De Arch. lib. x. cap. ii.). In both accounts reference is made to drawings now lost. Mr Woodcroft states that in each MS. the diagrams are said to have been copied faithfully, and that on consulting four MSS. and three early printed editions 9 he found that the mechanical parts in all agree essentially, and that it is only the case of the organ and the arrangement of the pipes which vary according to the fancy of the artist.

The principle of the hydraulis, which remained a complete mystery until recently, is now well understood. Representations of Roman hydraulic organs abound, but they were not always identified as such. 10 As the front of the organ (the performer sat or stood at the back) was invariably represented, there had been no indication of the manner in which the pipes were made to sound. A clue was furnished by a little baked clay model of an hydraulus, and parts of the performer, excavated in 1885 on the ruins of Carthage and now preserved in the Musee Lavigerie, attached to the cathedral of S. Louis

of Carthage. This little clay model, measuring 71ˆ in. by 2f in. (figs. 3 and 4), modelled by Possessoris, a potter working at the beginning of the 2nd century a.d., whose name appears on the front, below the ends of the sliders, is so accurately designed that it tallies in every point with the description of the instrument by Hero and Vitruvius. The number and relative sizes of the three

6 Tertullian (De anima, 14) names Archimedes, which is probably an error. See in this connexion Hermann Degering, who devotes considerable space to the question, Die Orgel, ihre Erfindung und ihre Ceschichte (Muenster, 1905).

7 See The Pneumatics of Hero of Alexandria, translated from the original Greek by Bennett Woodcroft (London, 1851), with diagrams.

8 Edward Buhle in Die musikalischen Instrumente in den Minia- turen des fruhen Mittelalters, pt. i. (Leipzig, 1903), p. 55. Note 1 corrects this as an error, assigning Hero's activity to the beginning of our era, in which case the de»cription by Vitruvius would be the earlier in spite of the fact that the hydraulus, as he describes it, contains an improvement on that of Hero, i.e. registers, and two pumps instead of one, and that he omits to explain the purpose for which water is used. Buhle gives as his authority Diels, " Das phys. System des Strabon," p. 291, in Berliner Monatsberichte (Feb.

1893)-

9 For an exhaustive and careful compilation of these editions, and of the literature of the hydraulus generally, see Dr Charles Maclean's article, " The Principle of the Hydraulic Organ," Intern. Mus. Ges. Sbd. vi. 2, pp. 183-237; also John W. Warman, Biblio- graphy of the Organ, who, however, takes the erroneous view that the medieval editions of Vitruvius and Hero may be taken as evidence that the instrument itself was in use until about the middle or end of the 17th century. See Proc. Mus. Assoc. (1903-1904), p. 40.

10 The present writer was apparently the first in England to draw attention to this identity by introducing the drawing from the Utrecht Psalter and the model of the Carthage Organ, &c. See Music (London, Sept. 1898), p.. 438.

Fig. 3. — Pottery Model of the Hydraulus — Car- thage, c. a.d. 150.

Fig. 4. Carthage, c. a.d.

150.

rows of pipes, gauged by the remains of the organist, give the requisite compass for the production of the six Greek scales in use at that date. 1 A working reproduction based on the proportions of the remains of the organist, but at half scale for the sake of portability (the real organ must have measured 10 ft. in height by

4§ ft. in width), was successfully carried out by the Rev. F. W. Galpin in 1900-1901 by the help of photo- graphs 2 and of the text of Vitruvius. The principle of the hydraulus is simple. An in- verted funnel, or bell of metal, standing on short feet and immersed in water within the altar-like re- ceptacle forming the base or pede- stal, communi- cates by means of a pipe, with the wind-chest, placed above it. When the air is pumped into the funnel by the alternate action of two pumps, one on each side of the organ, constructed bucket within bucket and fitted with valves, the water retreating before the compressed air, rises in the receptacle and by its weight holds the air in a state of compression in ,the funnel, whence it travels through the pipe into the wind-chest. The rest of the process is common also to the pneumatic organ. As there are two pumps worked alternately, these conditions remain unchanged, until by pressure on a key working a slider under the apertures leading to the pipes, the compressed air is afforded an exit through the latter, thus producing the desired note. 3 It will be seen, therefore, that water acts on the air as a compressor exactly in the same manner as lead weights are used on the wind reservoir of modern pneumatic organs. The discovery of the Carthage model was of the greatest importance to the history of the keyboard (q.v.), for it proved beyond a doubt the use at the beginning of our era of balanced keys (seen in front of the organist) on the principle described by Vitruvius. What appears to be a second keyboard with smaller keys on the side of the hydraulus labelled Possessoris (fig. 4) is simply the ends of the sliders, which are pushed out or drawn in by the action of the keys.

The principle of the hydraulus made it possible to construct large organs of powerful tone more suitable for use in the arena than the small pneumatic instruments, but the hydraulic organ never entirely supplanted the pneumatic, which was probably not so im- perfect at the beginning of our era as has been thought, since it outlived the former and seems to have differed from it only in the matter of pressure. The hydraulus, on the other hand, must have had many drawbacks, that of causing damp in the instrument being of a serious

nature; it was also unwieldy and difficult to carry about, pneumatic organ in portable and portative form,

From the Church of St Paul extra muros, Rome. 4th or 5th cent.

A.D.

Fig. 5.

Of the

traces have been found during the palmy days of the Roman empire, and the art of organ-building, of which the organ in fig. 5 is an example, never seems to have quite died out during the decline of classic Rome and the dawn of Western civilization. This illustration is derived from a 4th- or sth-century slab in the church of St Paul extra muros at Rome. It is evident that the hydraulic organ was widely known and used in the East during the early centuries of our era, but it never won a footing in the

1 See Anonymi scriptio de musica, ed. Bellermann, p. 35.

2 See ” Notes on a Roman Hydraulus,” Reliquary (1904) ; also the writer’s ” Researches into the Origin of the Organs of the Ancients ” in Intern. Mus. Ges., Sbd. ii. 2, pp. 167-202 (Leipzig, 1901), and Proc. Mus. Assoc. (1903-1904), pp. 54-55.

3 For a more complete explanation of the action of the hydraulus, with diagrams, see Victor Loret, ‘ Revile archeol. (Paris, 1890); W. Chappell, History of Music (London, 1874), pp. 325-361.

West, although a few solitary specimens found their way into the palaces of kings and princes. On account of its association with the theatre, gladiatorial combats and pagan amusements of corrupt Rome, it was placed under a ban by the Church. The ignorance and misinformation displayed on the subject by writers and miniaturists of the early and late middle ages leave no room for doubt that the instrument itself was unknown to them except from hearsay.

Venice seems to have been famed for its organ-builders during the 9th century, for Louis le Debonnaire (778-840) sent there, it is recorded, for a certain monk, Georgius Benevento, 4 to con- struct an hydraulic organ for his palace at Aix-la-Chapelle.

No progress in the art of organ-building is recorded until the use of organs in the churches had long been established. The recognition of

the value of the organ in Christian worship proved an incentive which led to the rapid development of the instrument.

In France and Germany the Romans must have used organs and have introduced them to the conquered tribes as they did in Spain, but the art of making them was soon lost after Roman influence and civilization were withdrawn. Pippin, when he wished to introduce the Roman ritual into the churches of France, felt the need of an organ and applied to the Byzantine emperor, Constantine Copronymus, to send him one, which arrived by special embassy in 757 and was placed in the church of St Corneille at Compiegne; the arrival of this organ was obviously considered a great event; it is mentioned by all the chroniclers of his reign. Charlemagne received a similar present from the emperor of the East in 812, of which a description has been preserved. 5 The bellows were of hide, the pipes of bronze; its tone was as loud as thunder and as sweet as that of lyre and psaltery. This organ must have had registers like those of the hydraulus of Vitruvius and the portative from Pompeii. In 826 we hear that his son Louis le Debonnaire obtained a pneumatic organ for the church at Aix-la-Chapelle, not to be confounded with the hydraulus installed in his palace.

The statement that the organ was introduced into the Roman Church by Pope Vitalian at the end of the 7th century, which has been generally accepted, is rejected by Buhle 6 on the ground of insufficient proof. There is abundant evidence to show that the organ had taken its place in the churches in the 10th century, not only in England but in Germany, where the construction by monks had become so general that we find no fewer than three treatises on organ-building 7 written by monks, followed by three more in the nth century. 8

Considerable activity was displayed in England in the 10th century in organ-building on a large scale for churches and monasteries, such as the monster organ for Bishop Alphege at Winchester, which had 400 bronze pipes, 26 bellows and 2 manuals of 20 keys, each governing 10 pipes. 9 There is also the elaborate organ presented by St Dunstan to his monastery at Malmesbury. 10

- ” Vita Hludovici Imperatoris,” Mon. Germ. ii. pp. 629-630; see also Buhle, op. cit. p. 58, note 4, where fuller references are given.

6 Gesta Karoli Monachi Sangallensis, lib. ii. cap. x. p. 751.

6 Op. cit. p. 61, note 2, where the evidence is caretully sifted.

7 (1) by Notker of St Gallen (see Hattemer, Denkmaler, Bd. iii. pp. 568 seq. ; Hugo Riemann, Studien g. Gesch. der Notenschrift, pp. 297 seq.; Martin Gerbert, i. pp. 100 seq. (2) By Bernelinius (see Gerbert, i. pp. 318 and 325). The third is an anonymous 9th- century tract, the earliest of all, De mensura fistularum, giving only the proportions of organ pipes. MS. Lat. 12949 fol. 43°. Paris Bibl. Nat. reproduced by Buhle, op. cit. p. 104 (Latin only).

8 (1) Defistulis organicis, introduced in a MS. copy of Mart. Cap. by a Bernese monk; see A. Schubiger, Musikal. Spicilegien, pp. 82 seq. Reproduced also by Buhie, op. cit. Beilage iv. pp. 114-116, collated with a German translation. (2) Theophilus. De divers, arlibus, edited and translated into English by Robert Hendrie (London, 1847); reproduced by Buhle, op. cit. Beilage iii. pp. 105 seq., Latin and German collated, who gives the title as Schedula artium. (3) Tractatus de mensura fistularum, by Bishop Eberhard of Freising. Martin Gerbert, op. cit. ii. pp. 279-281.

9 See Wolstani, monachi Ventani, De Vita S. Swithuni; Cousse- maker, ” Essai sur les instruments de musique du moyen-age,” in Ann. Archeol., iii. pp. 281-282.

*° William of Malmesbury, Gest. Pontif., lib. v.

Earl El win gave money ” triginta libras ” to the monastery at Ramsay for copper pipes for a great pneumatic organ to be played on high days and holidays. 1

The great activity recorded in the 12th and 13th centuries in Germany is probably due to the influence and teaching of

, Byzantine masters during the 9th cen- tury. Pope John VIII. (872-880) ap- plied to Bishop Anno of Freising to send him an organ and an organist. 2 Organs were installed in Cologne (10th cen- tury) , in Halberstadt, in Erfurt, in Augs- burg, Weltenburg (nth century); in Utrecht, Constance, Petershausen (12th century) ; Peters- 13th century. 3 The rest of the

From the Bible of St Etienne Harding at Dijon. 1 2th cent.

Fig. 6.

berg, Cologne Cathedral literary and archaeological material — treatises, monuments, miniatures — available during the later middle ages yields very scant authenticated information as to the progressive

steps which lie between the 12th- century organ as described by Theophilus and the large church organs of the days of Praetorius *

(1618).

The keyboard is the principal feature concerning which miniatures offer any evidence. Here arid there a 13th- century miniature gives a hint _ of balanced keys on small portative organs which already abound during that and the next century. The Bernese monk in his treatise on the organ, to which reference was made in the note above, clearly describes balanced keys, depressa lamina, pressed down, not pulled out, as were those mentioned by Theophilus; his description conforms strictly with that of Hero, which suggests that he was borrowing from classical authorities rather than describing an actual instrument with which he was well acquainted, an expedient to which

Brit. Mus. Cotton MSS. Tiberius A vii. fot 104b. 14th century.

Fig. 7.

Brit. Mus. Add. MS. 27*95. 14th century.

Fig. 8.

many medieval writers had recourse. In the 14th-century minia- tures, balanced keys are general for the larger portable organs. The adoption of narrower keys in the larger organs may no doubt be traced to the influence of the portatives, in which they in

1 Vita S. Oswaldi: see Mabillon Acta S. scl. v. p. 756.

2 See Baluze, Miscell. v. p. 490.

3 Buhle {op. cit.) gives a list with quotations from authorities; see pp. 66 and 67.

4 See Michael Praetorius Syntagma Musicum (Wolfenbiittel, 1618).

fol.

Brit. Mus. Add. MS. 29902, 6. 14th century.

Fig. 9.

most cases resemble the white keys of the modern pianoforte. There is no miniature on record in which the fist action on the keys is indicated, the performer during the 10th, nth and 12th centuries being depicted in the act of drawing out the stop-like sliders — as for instance, in the 12th-century manuscript Bible of St Etienne Harding at Dijon 6 (fig. 6), where the organist is playing the notes D and F, the sliders being lettered from C to C. From the 13th century the keys are shown pressed down by means of one finger or of finger and thumb (fig. 7). In the beautiful Spanish MS. said to have been compiled for Alphonso XII. (c. 1237), known as the Cantigas de Santa Maria, a portative is shown having balanced keys, one of which is being lightly pressed by the thumb, the instrument resting on the palm — while the left hand manipu- lates the bellows.

The keys themselves varied in shape, being either like a T; a wide rectangle, with or without the corners rounded off, or a narrow rectangle. The earliest in- stance of chromatic keyboard is that of the organ at Halberstadt 8 built in 1 36 1 and restored in 1495. An inscription on the keyboard states that it formed part of the original organ, which had the semitonal arrangement of keys. 7

It must not, however, be inferred from these isolated cases that balanced keys were general from the 13th century, nor that the chromatic keys were common in the 14th. The St Cecilia in the altar-piece in Ghent by the brothers Hubert and Jan van Eyck (15th cent.) is repre- sented as playing upon an organ with a modern-looking keyboard.

A picture by Fra Angelico (15th cent.) in the National Gallery shows a portative with accidentals. It will probably be found that the earliest development of the organ took place in Germany and in the Netherlands. (K. S.)

ORGANISTRUM, the medieval Latin name for the earliest known form of the hurdy-gurdy (q.v.). The organistrum was large enough to rest on the knees of two performers sitting side by side, one of whom turned the crank setting the wheel in motion, while the other, the artist, manipulated the keys. The word organistrum is derived from organum and instrumentum; the former term was applied to the primitive harmonies, con- sisting of octaves accompanied by fourths or fifths, first practised by Hucbald in the 10th century. This explanation enables us to fix with tolerable certainty the date of the invention of the organistrum, at the end of the 10th or beginning of the nth century, and also to understand the construction of the instru- ment. A stringed instrument of the period — such as a guitar- fiddle, a

rotta or oval vielle — being used as model, the proportions were increased for the convenience of holding the instrument and of dividing the performance between two persons. Inside the body was the wheel, having a tire of leather well rosined, and working easily through an aperture in the sound-board. The three strings resting on the wheel and supported besides on a bridge of the same height all sounded at once as the wheel revolved, and in the earliest examples the wooden tangents taking the place of fingers on the frets of the neck acted upon all three strings at once, thus producing the harmony known as organum.

The organistrum appears on a bas-relief from the abbey of St Georges de Boscherville (nth cent.), now preserved in the museum of Rouen, where it is played by a royal lady, her maid turning the crank. It has the place of honour in the centre of the band of musicians representing the twenty-four elders of the Apocalypse in the tympanum of the Gate of Glory of the cathedral of Santiago da Compostella (12th cent.). There is also a fine example in a miniature of a psalter of English workmanship (12th cent.), forming part of the Hunterian collection in Glasgow University; this was shown at the Exhibition of Illuminated MSS. at the Burlington Fine Arts Club in 1908. (K. S.)

6 See also for other organs with sliders being drawn out, A. Haseloff . Eine Sdchsischthiiringische Malerschule um die Wende des XIII. Jahrh., pi. xxvi. No. 57, part of Studien zu der Kunsigeschichte-, the same is reproduced in G'ori's Thesaurus diptychorum, Bd. iii. Tab. 16, where it is falsely ascribed to the 9th century.

6 Praetorius mentions the Halberstadt and Erfurt organs as having been built 600 years before his time (1618), and still bearing on them the date inscribed. See op. cit. -p. 93.

7 See A. J. Hipkins, History of the Pianoforte (London, 1896).

ORGANON (Gr. opyavov, instrument, from ipyov, work), the name given to Aristotle's logical treatises. They are so called because logic is itself neither a speculative science nor a practical art in the ordinary sense, but an aid or instrument to all scientific thought. Francis Bacon, regarding the Aris- totelian logic as he understood it as of no avail, gave to his own treatise the name Novum Organum in the belief that

he had discovered a new inductive logic which would lead necessarily to the acquisition of new scientific knowledge. Compare also Whewell's Novum Organum Renovatum and Lambert's Neues Organon. In medieval music the term was applied in a similar sense to early attempts at improvised counterpoint i.e. a part sung as an accompaniment above or below the melody or plain- song; it consisted of 8ths and sths (or 4ths) added to the plainsong.

ORGY (through French from Lat. orgia, Gr. opyia, in deriva- tion connected probably with epyov, work; cf. Lat. operate, to sacrifice), a term originally denoting the secret rites or cere- monies connected with the worship of certain deities, especially those of Dionysus-Bacchus. The Dionysiac orgies, which were restricted to women, were celebrated in the winter among the Thracian hills or in spots remote from city life. The women met, clad in fawn-skins, with hair dishevelled, swinging the thyrsus and beating the cymbal; they danced and worked themselves up to a state of mad excitement. The holiest rites took place at night by the light of torches. A bull, the repre- sentative of the god, was torn in pieces by them as Dionysus- Zagreus had been torn; his bellowing reproduced the cries of the suffering god. The women tore the bull with their teeth, and the eating of the raw flesh was a necessary part of the ritual. Some further rites, which varied in different districts, represented the resurrection of the god in the spring. On Mount Parnassus the women carried back Dionysus-Licnites, the child cradled in the winnowing fan. The most famous festival of the kind was the rpierripls celebrated every second winter on Parnassus by the women of Attica and Phocis. The celebrants were called Maenads or Bacchae. The ecstatic enthusiasm of the Thracian women, 'KXuScoves or Mi/mXXoues, was especially distinguished. The wild dances, songs, drinking and other " orgiastic " cere- monies which were characteristic of these rites have given rise to the use of the word "orgy" for any drunken, wild revel or festivity (see Dionysus and Mystery).

ORIA, a town of Apulia, Italy, in the province of Lecce, 25 m. E. of Taranto and 19 m. S.W. of Brindisi by rail, 540 ft. above sea-level. Pop. (1901), 8838. It occupies the site of the ancient Uria, the chief town of the Sallentini, which stood in a command- ing position in the centre of the peninsula of the ancient Calabria (q.v.), almost midway between Brundusium and Tarentum on the Via Appia. Strabo mentions that he saw there the old palace of the Messapian kings (vi. 3. 6, p. 282). The town contains a small museum and a fine castle of Frederick II., erected in 1227. The Doria family of Genoa and Rome is said to derive its name from a certain Tommaso d'Oria, who led the rebellion against Frederick's son Manfred. Much damage was done by

a cyclone in 1878.

ORIBI, or Ourebi, the local name of a small South African antelope {Oribia scoparia), standing about 24 in. at the shoulder, and characterized by the presence of a bare glandular spot below the ear, the upright horns of the bucks, which are ringed for a short distance above the face, and the tufted bushy tail, of which the terminal two-thirds are black. The name is extended to include the other members of the same genus, such as the Abyssinian, O. montana; the Gambian, O. nigricandata; the British East African, 0. haggardi; and the Mozambique, 0. petersi.

ORIEL, JOHN FOSTER, Baron (1740-1828), Irish politician, was the son of Anthony Foster of Louth, an Irish judge. He was returned to the Irish parliament in 1761, and made his mark in financial and commercial questions, being appointed chancellor of the Irish exchequer in 1784. His law giving bounties on the exportation of corn and imposing heavy taxes on its importation is noted by Lecky as responsible for making

Ireland an arable instead of a pasture country. In i78she became Speaker. He opposed the Union, and ultimately refused to surrender the Speaker's mace, which was kept by his family. He was returned to the united parliament, and in 1804 became chancellor of the Irish exchequer under Pitt. In 1821 he was created a peer of the United Kingdom as Baron Oriel of Ferrard in the county of Louth, and died on the 23rd of August 1828. His wife (d. 1824) had in 1790 been created an Irish peeress, as Baroness Oriel, and in 1797 Viscountess Ferrard; and their son, Thomas Henry (d. 1843), who married Viscountess Massereene (in her own right) and took the name of Sherrington, inherited all these titles; the later Viscounts Massereene being their descendants.

ORIEL, in architecture, a projecting bay window on an upper storey, which is carried by corbels or mouldings. It is usually polygonal or semicircular in plan, but at Oxford in some of the colleges there are examples which are rectangular and rise through two or three storeys. In Germany it forms a favourite feature, and is sometimes placed at the angle of a building, carried up through two or three floors and covered with a Ipfty roof. The oriel is also said to have been provided as a recess for an altar in an oratory or small chapel. In the 15th century oriels came into general use, and are frequently found over entrance gateways.

The origin of the word is unknown. The suggested derivation from

Lat. aureolum, with the supposed meaning of a gilded chamber or room, is not, according to the New English Dictionary, borne out by any historical evidence, and early French forms — such as eurieul — do not point to an origin in a word beginning with au. Du Cange (Glossarium, s.v. Oriolum) quotes Matthew of Paris (1251, Vitae Abbatum S. Albani): adjacet atrium nobilis- simum in introitu, quod porticus vel Oriolum appellatur; and also a French use of 1338, where a licence to build an oriol is granted to one Jehan Bourgos. The earliest meaning seems to be a gallery, portico or corridor, and the application of the term to a particular form of window apparently arose from such a window being in an ” oriel.” In Cornwall ” orrel ” is still used of a balcony or porch at the head of an outside staircase leading to an upper story in a fisherman’s cottage. The name of Oriel College, at Oxford, comes from a tenement known as Seneschal Hall or La Oriole, and granted to the college in 1327. There is no trace of the reason why the tenement was so called, but it would seem that it referred to one of the earlier applications of the word, to a gallery or porch, rather than to a window.

ORIENTATION, the term in architecture given to the position of a building generally with reference to the points of the com- pass, and more especially (as the word implies) to that of the East. It would seem that some of the Egyptian temples were orientated in the direction of the sun or of some selected star, the exact position of which on some particular day would be an indication to the priest of the exact time of the year — a matter of great importance in an agricultural country, when the calendar was not known. The orientation of Greek temples has enabled astronomers to calculate the dates of the foundation of early temples, allowance being made for the gradual changes which in the course of centuries had taken place in the precession of the equinox. The principal front of the Greek temple always faced east; and the rays of the risjng sun, passing through the great doorway of the naos, lighted up the statue at the further end, this being the only occasion on which the people who came to witness the event were able to gaze on the sculptured figure of the deity. In early Christian architecture, in the five first basilicas built by Constantine, the apse of the church was at the west end, and the priest, standing behind the altar, faced the east; this orientation being probably derived from that of the church of the Holy Sepulchre at Jerusalem and the church at Bethlehem. Three- fourths of the early churches in Rome followed this orientation, but in many it was reversed at a later date. In Sta. Sophia, Constantinople, and all the Byzantine churches, the apse was always at the east end, and the same custom obtains in the early churches in Syria and the Coptic churches

in Egypt.

In Spain, Germany and England generally the eastern

orientation is generally observed, but in France and Italy there are many variations. In Scotland it was the custom to fix a pole in the ground over night, and in the morning at sunrise to note the direction taken by the shadow of the pole, which was followed when setting out the axis of the choir; if such a custom had been followed in an early church, when setting out another of later date there should be some difference in the orientation of the two, on account of the varia- tion of the obliquity of the ecliptic in the interval, and this in some cases accounts for the change of the axial line which is found in some churches, either when the east end has been rebuilt, as was constantly the case throughout Europe, or when a nave has been added to an earlier structure. In describing churches it is usual to use the terms east, west, north and south, on the assumption that the altar is at the east end, although this may not be the real bearing of the edifice.

Indirectly also the term is sometimes used in the planning of houses and the relation of the windows of the various rooms to the sunshine and the weather — in other words, to the points of the compass; thus an eastward aspect should be provided for the morning- and dining-rooms, a south-western aspect for the drawing-room, a westward for the library, and north by west for the kitchen, larder, &c. (R. P. S.).

ORIENTE, or La Region Orientale, a large undefined territory of Ecuador, comprising all that part of the republic lying east of the Andes. Pop. (1887 estimate), 80,000. The territory was formed in 1884 from the older territories of Napo, Canelos and Zamora, but its boundaries with the neighbouring republics of Colombia and Peru are disputed. The territory is covered with great forests, inhabited by wild Indians, and its climate is hot and exceptionally humid. There are some mission settlements and trading stations in the Andean foothills and on some of the river course?, one of which is Archidona, on a small tributary of the Napo, which is the nominal capital.

ORIGEN (c. 185-c 254), the most distinguished and most influential of all the theologians of the ancient church, with the possible exception of Augustine. He is the father of the church's science; he is the founder of a theology which was brought to perfection in the 4th and 5th

centuries, and which still retained the stamp of his genius when in the 6th century it disowned its author. It was Origen who created the dogmatic of the church and laid the foundations of the scientific criticism of the Old and New Testaments. He could not have been what he was unless two generations before him had laboured at the problem of finding an intellectual expression and a philosophic basis for Christianity (Justin, Tatian, Athenagoras, Pantaenus, Clement). But their attempts, in comparison with his, are like a schoolboy's essays beside the finished work of a master. Like all great epoch-making personalities, he was favoured by the circum- stances of his life, notwithstanding the relentless persecution to which he was exposed. He lived in a time when the Christian communities enjoyed almost uninterrupted peace and held an acknowledged position in the world. By proclaiming the reconciliation of science with the Christian faith, of the highest culture with the Gospel, Origen did more than any other man to win the Old World to the Christian religion. But he entered into no diplomatic compromises; it was his deepest and most solemn conviction that the sacredoracles of Christendom embraced all the ideals of antiquity. His character was as transparent as his life was blameless; there are few church fathers whose biography leaves so pure an impression on the reader. The atmosphere around him was a dangerous one for a philosopher and theologian to breathe, but he kept his spiritual health un- impaired, and even his sense of truth suffered less injury than was the case with most of his contemporaries. To us, indeed, his conception of the universe, like that of Philo, seems a strange medley, and one may be at a loss to conceive how he could bring together such heterogeneous elements; but there is no reason to doubt that the harmony of all the essential parts of his system was obvious enough to himself. It is true that in addressing the Christian people he used different language from that which he employed to the cultured; but there was no dissimulation in

that — on the contrary, it was a requirement of his system. Orthodox theology has never, in any of the confessions, ventured beyond the circle which the mind of Origen first measured 'out. It has suspected and amended its author, it has expunged his heresies; but whether it has put anything better or more tenable in their place may be gravely questioned.

Origen was born, perhaps at Alexandria, of Christian parents in the year 185 or 186. As a boy he showed evidence of remark- able talents, and his father Leonidas gave him an excellent education. At a very early age, about the year 200, he listened to the lectures of Pantaenus and Clement in the catechetical school. This school, of which the origin (though assigned to Athenagoras) is unknown, was the first and

for a long time the only institution where Christians were instructed simultaneously in the Greek sciences and the doctrines of the holy Scriptures. Alexandria had been, since the days of the Ptolemies, a centre for the inter- change of ideas between East and West — between Egypt, Syria, Greece and Italy; and, as it had furnished Judaism with an Hellenic philosophy, so it also brought about the alliance of Christianity with Greek philosophy. Asia Minor and the West developed the strict ecclesiastical forms by means of which the church closed her lines against heathenism, and especially against heresy; in Alexandria Christian ideas were handled in a free and speculative fashion and worked out with the help of Greek philosophy. Till near the end of the 2nd Century the line between heresy and orthodoxy was less rigidly drawn there than at Ephesus, Lyons, Rome or Carthage. In the year 202 a persecution arose, in which the father of Origen becarrie a martyr, and the family lost their livelihood. Origen, who had distinguished himself by his intrepid zeal, was supported for a time by a lady of rank, but began about the same time to earn his bread by teaching; and in 203 he was placed, with the sanction of the bishop Demetrius, at the head of the catechetical school. Even then his attainments in the whole circle of the sciences were extraordinary. But the spirit of investigation impelled him to devote himself to the highest studies, philosophy and the exegesis of the sacred Scriptures. With indomitable perseverance he applied himself to these subjects; although himself a teacher, he regularly attended the lectures of Ammonius Saccas, and made a thorough study of the books of Plato and Numenius, of the Stoics and the Pythagoreans. At the same time he endeavoured to acquire a knowledge of Hebrew, in order to be able to read the Old Testament in the original. His manner of life was ascetic; the sayings of the Sermon on the Mount and the practical maxims of the Stoics were his guiding stars. Four oboli a day, earned by copying manuscripts, sufficed for his bodily sustenance. A rash resolve led him to mutilate himself that he might escape from the lusts of the flesh, and work unhindered in the instruction of the female sex. This step he afterwards regretted. As the attend- ance at his classes continually increased — pagans thronging to him as well as Christians — hs handed over the beginners to his friend Heracles, and took charge of the more advanced pupils himself. Meanwhile the literary activity of Origen was increasing year by year. He commenced his great work on the textual criticism of the Scriptures; and at the instigation of his friend Ambrosius, who provided him with the necessary amanuenses, he published his commentaries on the Old Testament and his dogmatic investigations. In this manner he laboured at Alexandria for twenty-eight years (till 231-232). This period, however, was broken

by many journeys, undertaken partly for scientific and partly for ecclesiastical objects. We know that he was in Rome in the time of Zephyrinus, again in Arabia, where a Roman official wanted to hear his lectures, and in Antioch, in response to a most flattering invitation from Julia Mammaea (mother of Alexander Severus, afterwards emperor), who wished to become acquainted with his philosophy. In the year 216 — the time when the imperial executioners were ravaging Alexandria — we find Origen in Palestine. There the bishops of Jerusalem and Caesarea received him in the most friendly manner, and got him to deliver public lectures in the churches. In the East, especially in Asia Minor, it was still no unusual thing for

laymen, with permission of the bishop, to address the people in the church. In Alexandria, however, this custom had been given up, and Demetrius took occasion to express his disapproval and recall Origen to Alexandria. Probably the bishop was jealous of the high reputation of the teacher; and a coolness arose between them which led, fifteen years later, to an open rupture. On his way to Greece (apparently in the year 230) Origen was ordained a presbyter in Palestine by his friends the bishops. This was undoubtedly an infringement of the rights of the Alexandrian bishop; at the same time it was simply a piece of spite on the part of the latter that had kept Origen so long without any ecclesi- astical consecration. Demetrius convened a synod, at which it was resolved to banish Origen from Alexandria. Even this did not satisfy his displeasure. A second synod, composed entirely of bishops, determined that Origen must be deposed from the presbyterial status. This decision was communicated to the foreign churches, and seems to have been justified by referring to the self-mutilation of Origen and adducing objectionable doctrines which he was said to have promulgated. The details of the incident are, however, unfortunately very obscure. No formal excommunication of Origen appears to have been decreed; it was considered sufficient to have him degraded to the position of a layman. The sentence was approved by most of the churches, in particular by that of Rome. ‘At a later period Origen sought to vindicate his teaching in a letter to the Roman bishop Fabian, but, it would seem, without success. Even Heracles, his former friend and sharer of his views, took part against him; and by this means he procured his own election shortly afterwards as successor to Demetrius.

In these circumstances Origen thought it best voluntarily to retire

from Alexandria (231-232) . He betook himself to Palestine, where his condemnation had not been acknowledged by the churches any more than it had been in Phoenicia, Arabia and Achaea. He settled in Caesarea, and very shortly he had a flourishing school there, whose reputation rivalled that of Alexandria. His literary work, too, was prosecuted with unabated vigour. Enthusiastic pupils sat at his feet (see the Panegyric of Gregory Thaumaturgus), and the methodical instruction which he imparted in all branches of knowledge was famous all over the East. Here again his activity as a teacher was interrupted by frequent journeys. Thus he was for two years together at Caesarea in Cappadocia, where he was over- Liken by the Maximinian persecution; here he worked at his recension of the Bible. We find him again in Nicomedia, in Athens, and twice in Arabia. He was called there to combat the unitarian christology of Beryllus, bishop of Bostra, and to clear up certain eschatological questions. As he had formerly had dealings with the house of Alexander Severus, so now he entered into a correspondence with the emperor Philip the Arabian and his wife Severa. But through all situations of his life he pre- served his equanimity, his keen interest in science, and his indefatigable zeal for the instruction of others. In the, year 250 the Decian persecution broke out, Origen was arrested, imprisoned and maltreated. But he survived these troubles — it is a malicious invention that he recanted during the persecution — and lived a few years longer in active intercourse with his friends. He died, probably in the year 254 (consequently under Valerian), at Tyre, where his grave was still shown in the middle ages.

Writings. — Origen is probably the most prolific author of the ancient church. ” Which of us,” asks Jerome, ” can read all that he has written?” The number of his works was estimated at 6000, but that is certainly an exaggeration. Owing to the increasing unpopularity of Origen in the church, a comparatively small portion of these works have come down to us in the original. We have more in the Latin translation of Rufinus; but this translation in by no means trustworthy, since Rufinus, assuming that Origen’s writings had been tampered with by the heretics, considered himself at liberty to omit or amend heterodox state- ments. Origen’s real opinion, however, may frequently be gathered from the Philocalia — a sort of anthology from his works prepared by Basil the Great and Gregory Nazianzenus. The fragments in Photius and in the Apology of Pamphilus serve

for comparison. The writings of Origen consist of letters, and of works in textual criticism, exegesis, apologetics, dogmatic and practical theology.

1. Eusebius (to whom we owe our full knowledge of his life) collected more than a hundred of Origen's letters, arranged them in books, and deposited them in the library at Caesarea (H. E. vi. 36). In the church library at Jerusalem (founded by the bishop Alexander) there were also numerous letters of this father (Euseb. H. E. vi. 20). But unfortunately they have all been lost except two — one to Julius Africanus (about the history of Susanna) and one to Gregory Thaumaturgus. There are, besides, a couple of fragme its.

2. Origen's textual studies on the Old Testament were under- taken partly in order to improve the manuscript tradition, and partly for apologetic reasons, to clear up the relation between the LXX and the original Hebrew text. The results of more than twenty years' labour were set forth in his Hexapla and Tetrapla, in which he placed the Hebrew text side by side with the various Greek versions, examined their mutual relations in detail, and tried to find the basis for a more reliable text of the LXX. The Hexapla was probably never fully written out, but excerpts were made from it by various scholars at Caesarea in the 4th century; and thus large sections of it have been saved. 1 Origen worked also at the text of the New Testa- ment, although he produced no recension of his own.

3. The exegetical labours of Origen extend over the whole of the Old and New Testaments. They are divided into Scholia (otj /uacoaeis, short annotations, mostly grammatical), Homilies (edifying expositions grounded on exegesis), and Commentaries (to/mi). In the Greek original only a very small portion has been preserved; in Latin translations, however, a good deal. The most important parts are the homilies on Jeremiah, the books of Moses, Joshua and Luke, and the commentaries on Matthew, John and Romans. With grammatical precision, antiquarian learning and critical discernment Origen combines the allegorical method of interpretation — the logical corollary of his conception of the inspiration of the Scriptures. He distinguishes a threefold sense of scripture, a grammatico- historical, a moral and a pneumatic — the last being the proper and highest sense. He thus set up a formal theory of allegorical exegesis, which is not quite extinct in the churches even yet, but in his own system was of fundamental importance. On this method the sacred writings are regarded as an inexhaustible mine of philosophical and dogmatic wisdom; in reality the exegete reads his own ideas into any passage he chooses. The commentaries are of course intolerably diffuse and tedious, a great deal of them is now quite unreadable; yet, on the other hand, one has not unfrequently occasion to admire the sound linguistic perception and the critical talent of the author. 2

4. The principal apologetic work of Origen is his book Kara KeXcrou (eight books), written at Caesarea in the time of Philip the Arabian. It has been completely preserved in the original. This work is invaluable as a source for the history and situation of the church in the 2nd century; for it contains nearly the whole of the famous work of Celsus (A670J aXqflifr) against Christianity. What makes Origen's answer so instructive is that it shows how close an affinity existed between Celsus and himself in their fundamental philosophical and theological presuppositions. The real state of the case is certainly unsuspected by Origen himself; but many of his opponent's arguments he is unable to meet except by a speculative reconstruction of the church doctrine in question. Origen's apologetic is most effective when he appeals to the spirit and power of Christianity as an evidence of its truth. In details his argument is not free from sophistical subterfuges and superficial reasoning. 3

1 Field, Origenis Hexaplorum quae supersunt (2 vols., Oxon.,

1867-1874).

2 See Reuss, Geschichte der heil. Schriften d. N.T. (5th ed.), § 511.

3 Keim, Celsus (1873); Aub6, Hist, des persecut. de I'eglise, vol. ii. (1875) ; Ornsby, " Origen against Celsus," Dublin Review (July 1879), p. 58; P61agaud, Hiude sur Celse (1878); Lebedeff, Origen's Book against Celsus (Moscow, 1 878) (Russian) ; Overbeck in the Theolog. Lit. Zeitung (1878), No. 22 (1879), No. 9; Orig. c. Cels., ed. Selwyn (1876).

5. Of the dogmatic writings we possess only one in its integrity, and that only in the translation of Rufinus, 1 Hepl apx&v (On the Fundamental Doctrines). This work, which was composed before 228, is the first attempt at a dogmatic at once scientific and accommodated to the needs of the church. The material is drawn from Scripture, but in such a way that the' propositions of the regula fidei are respected. This material is then formed into a system by all the resources of the intellect and of specula- tion. Origen thus solvedˆ after his own fashion, a problem which his predecessor Clement had not even ventured to grapple with. The first three books treat of God, the world, the fall of spirits, anthropology and ethics. " Each of these three books really embraces, although not in a strictly comprehensive

way, the whole scheme of the Christian view of the world, from different points of view, and with different contents." The fourth book explains the divinity of the Scriptures, and deduces rules for their interpretation. It ought properly to stand as first book at the beginning. The ten books of Stromata (in which Origen compared the teaching of the Christians with that of the philosophers, and corroborated all the Christian dogmas from Plato, Aristotle, Numenius and Cornutus) have all perished, with the exception of small fragments; so have the tractates on the resurrection and on freewill. 2

6. Of practical theological works we have still the UporpeirTLKds eis ixaprbpiov and the 'Svvrayp.a wepl evxrjs. For a knowledge of Origen's Christian estimate of life and his relation to the faith of the church these two treatises are of great importance. The first was written during the persecution of Maximinus Thrax, and was dedicated to his friends Ambrosius and Protoctetus. The other also dates from the Caesarean period; it mentions many interesting details, and concludes with a fine exposition of the Lord's Prayer.

7. In his own lifetime Origen had to complain of falsifications of his works and forgeries under his name. Many pieces still in existence are wrongly ascribed to him ; yet it is doubtful whether a single one of them was composed on purpose to deceive. The most noteworthy are the Dialogues of a certain Adamantius " de recta in Deum fide," which seem to have been erroneously attributed to Origen so early as the 4th century, one reason being the fact that Origen himself also bore that name. (Eusebius, H.E. vi. 14.)

Outline of Origen's View of the Universe and of Life. — The system of Origen was formulated in opposition to the Greek philosophers on the one hand, and the Christian Gnostics on the other. 3 But the science of faith, as expounded by him, bears unmistakably the stamp both of Neo-Platonism and of Gnosticism. As a theologian, in fact, Origen' is not merely an orthodox traditionalist and believing exegete, but a speculative philosopher of Neo-Platonic tendencies. He is, moreover, a judicious critic. The union of these four elements gives character to his theology, and in a certain degree to all subsequent theology. It is this combination which has determined the peculiar and varying relations in which theology and the faith of the church have stood to each other since the time of Origen. That relation depends on the predominance of one or other of the four factors embraced in his theology.

As an orthodox traditionalist Origen holds that Christianity is a practical and religious saving principle, that it has unfolded itself in an historical series of revealing facts, that the church has accurately

embodied the substance of her faith in the regula fidei, and that simple faith is sufficient for the renewal and salva- tion of man. As a philosophical idealist, however, he transmutes the whole contents of the faith of the church into ideas which bear the mark of Neo-Platonism, and were accordingly recognized by the later Neo-Platonists as Hellenic. 4 In Origen, however,

1 There are, however, extensive fragments of the original in existence.

2 See Redepenning, Origenis de principiis, first sep. ed. (Leipzig, 1836) ; Schnitzer, Orig. iiber die Crundlehren des Glaubens, an attempt at reconstruction (1835).

3 The opposition to the unitarians within the church must also be kept in mind.

4 Porphyry says of Origen, kut&. t&s irepl vpayn&Twv Kal tov Btlov 86£as “EXXTji-ifwc (Euseb. H.E. vi. 19).

the mystic and ecstatic element is held in abeyance. The ethico-religious ideal is the sorrowless condition, the state of superioiity to all evils, the state of order and of rest. In this condition man enters into likeness to God and blessedness; and it is reached through contemplative isolation and self- knowledge, which is divine wisdom. ” The soul is trained as it were to behold itself in a mirror, it shows the divine spirit, if it should be found worthy of such fellowship, as in a mirror, and thus discovers the traces of a secret path to participation in the divine nature.” As a means to the realization of this ideal, Origen introduces the whole ethics of Stoicism. But the link that connects him with churchly realism, as well as with the Neo- Platonic mysticism, is the conviction that complete and certain knowledge rests wholly on divine revelation, i.e. on oracles. Consequently his theology is cosmological speculation and ethical reflection based on the sacred Scriptures. The ” Scriptures, however, are treated by Origen on the basis of a matured theory of inspiration in such a way that all their facts appear as the vehicles of ideas, and have their highest value only in this aspect. That is to say, his gnosis neutralizes all that is empirical and historical, if not always as to its actuality, at least absolutely in respect of its value. The most convincing proof of this is that Origen (1) takes the idea of the immutability of God as the regulating idea of his system, and (2) deprives the historical ” Word made flesh ” of all significance for the true Gnostic. To him Christ appears simply as the Logos who is with the Father from eternity, and works from all eternity, to whom alone the instructed Christian directs his thoughts, requiring nothing more than a perfect — i.e. divine — teacher. In such

propositions historical Christianity is stripped off as a mere husk. The objects of religious knowledge are beyond the plane of history, or rather — in a thoroughly Gnostic and Neo-Platonic spirit — they are regarded as belonging to a supra-mundane history. On this view contact with the faith of the church could only be maintained by distinguishing an exoteric and an esoteric form of Christianity. This distinction was already current in the catechetical school of Alexandria, but Origen gave it its boldest expression, and justified it on the ground of the incapacity of the Christian masses to grasp the deeper sense of Scripture, or unravel the difficulties of exegesis. On the other hand, in dealing with the problem of bringing his heterodox system into conformity with the regula fidei he evinced a high degree of technical skill. An external conformity was possible, inasmuch as speculation, proceeding from the higher to the lower, could keep by the stages of the regula fidei, which had been developed into a history of salvation. The system itself aims in principle at being thoroughly monistic; but, since matter, although created by God out of nothing, was regarded merely as the sphere in which souls are punished and purified, the system is pervaded by a strongly dualistic element. The immutability of God requires the eternity of the Logos and of the world. At this point Origen succeeded in avoiding the heretical Gnostic idea of God by assigning to the Godhead the attributes of goodness and righteous- ness. The pre-existence of souls is another inference from the immutability of God, although Origen also deduced it from the nature of the soul, which as a spiritual potency must be eternal. Indeed this is the fundamental idea of Origen — ” the original and indestructible unity of God and all spiritual essences.” From this follows the necessity for the created spirit, after apostasy, error and sin, to return always to its origin in God. The actual sinfulness of all men Origen was able to explain by the theological hypothesis of pre-existence and the premundane fall of each individual soul. He holds that freedom is the inalienable prerogative of the finite spirit; and this is the second point that distinguishes his theology from the heretical Gnosticism. The system unfolds itself like a drama, of which the successive stages are as follows: the transcendental fall, the creation of the material world, inaugurating the history of punishment and redemption, the clothing of fallen souls in flesh, the dominion of sin, evil and the demons on earth, the appearing of the Logos, His union with a pure human soul, His esoteric preaching of salvation, and His death in the flesh, then the imparting of the

Spirit, and the ultimate restoration of all things. The doctrine of the restoration appeared necessary because the spirit, in spite of its inherent freedom, cannot lose its true nature, and because the final purposes of God cannot be foiled. The end, however, is only relative, for spirits are continually falling, and God remains through eternity the creator of the world. Moreover the end is not conceived as a transfiguration of the world, but as a liberation of the spirit from its unnatural union with the sensual. Here the Gnostic and philosophical character of the system is particularly manifest. The old Christian eschatology is set aside; no one has dealt such deadly blows to Chiliasm and Christian apocalypticism as Origen. It need hardly be said that he spiritualized the church doctrine of the resurrection of the flesh. But, while in all these doctrines he appears in the character of a Platonic philosopher, traces of rational criticism are not wanting. Where his fundamental conception admits of it, he tries to solve historical problems by historical methods. Even in the christology, where he is treating of the historical Christ, he entertains critical considerations; hence it is not altogether without reason that in after times he was suspected of ” Ebionitic ” views of the Person of Christ. Not unfrequently he represents the unity of the Father and the Son as a unity of agreement and harmony and ” identity of will.”

Although the theology of Origen exerted a considerable in- fluence as a whole in the two following centuries, it certainly lost nothing by the circumstance that several important pro- positions were capable of being torn from their original setting and placed in new connexions. It is in fact one of the peculiarities of this theology, which professed to be at once churchly and philosophical, that most of its formulae could be interpreted and appreciated in utramque partem. By arbitrary divisions and rearrangements the doctrinal statements of this ” science of faith ” could be made to serve the most diverse dogmatic tendencies. This is seen especially in the doctrine of the Logos. On the basis of his idea of God Origen was obliged to insist in the strongest manner on the personality, the eternity (eternal generation) and the essential divinity of the Logos. 1 On the other hand, when he turned to consider the origin of the Logos he did not hesitate to speak of Him as a Kncrjua, and to include Him amongst the rest of God’s spiritual creatures. A Krlana, which is at the same time bfiooixnov rcj) 9e4 >, was no contradiction to him, simply because he held the immutability, the pure know- ledge and the blessedness which constituted the divine nature to be communicable attributes. In later times both the orthodox and the Arians appealed to his teaching, both with a certain plausibility; but the inference of Arius, that an imparted divinity must be divinity in the second degree, Origen did not draw. With respect to

other doctrines also, such as those of the Holy Spirit and the incarnation of Christ, &c, Origen prepared the way for the later dogmas. The technical terms round which such bitter controversies raged in the 4th and 5th centuries are often found in Origen lying peacefully side by side. But this is just where his epoch-making importance lies, that all the later parties in the church learned from him. And this is true not only of the dogmatic parties; solitary monks and ambitious priests, hard-headed critical exegetes, 2 allegorists, mystics, all found something congenial in his writings. The only man who tried to shake off the theological influence of Origen was Marcellus of Ancyra, who did not succeed in producing any lasting effect on theology.

The attacks on Origen, which had begun in his lifetime, did not cease for centuries, and only subsided during the time of the fierce Arian controversy. It was not so much the relation between pistis and gnosis — faith and knowledge — as defined by Origen that gave offence, but rather isolated propositions, such as his doctrines of the pre-existence of souls, of the soul and body of Christ, of the resurrection of the flesh, of the final restoration,

1 ” Communis substantiae est filio cum patre; &ir6ppoia enim diioovcrim videtur, i.e. unius substantiae cum illo corpore ex quo est d7r6ppoia.”

2 E.g. Dionysius of Alexandria; compare his judicious verdict on the Apocalypse.

and of the plurality of worlds. Even in the 3rd century Origen’s view of the Trinity and of the Person of Christ was called in question, and that from various points of view. It was not till the 5th century, however, that objections of this kind became frequent. In the 4th century Pamphilus, Eusebius of Caesarea, Athanasius, the Cappadocians, Didymus, and Rufinus were on the side of Origen against the attacks of Methodius and many others. But, when the zeal of Epiphanius was kindled against him, when Jerome, alarmed about his own reputation, and in defiance of his past attitude, turned against his once honoured teacher, and Theophilus, patriarch of Alexandria, found it prudent, for political reasons, and out of consideration for the uneducated monks, to condemn Origen — then his authority received a shock from which it never recovered. There were, doubtless, in the 5th century church historians and theologians who still spoke of him with reverence, but such men became fewer and fewer. In the West Vincent of Lerins held up Origen as a warning example (Commonit. 23), showing how iven the most learned and most eminent of church

teachers might become a misleading light. In the East the exegetical school of Antioch had an aversion to Origen; the Alexandrians had utterly repudiated him. Nevertheless his writings were much read, especially in Palestine. The monophysite monks appealed to his authority, but could not prevent Justinian and the fifth oecumeni- cal council at Constantinople (553) from anathematizing his teaching. It is true that many scholars (e.g. Hefele, Concilien- gesch. ii. p. 858 sq.) deny that Origen was condemned by this council; but Moller rightly holds that the condemnation is proved (Realencyklop. f. protest. Theol. u. Kirche, xi. 113).

Sources and Literature. — Next to the works of Origen (see Redepenning, ” Des Hieionymus wiederaufgefundenes Verzeichnis der Schriften des Origens,” in Zeit.f. d. hist. Theol. (1851), pp. 66 seq.) the most important sources are: Gregory Thaumat., Panegyricus in Orig.; Eusebius, H.E. vi. ; Epiphanius, Haer. 64; the works of Methodius, the Cappadocians, Jerome (see De vir. ill. 54, 61) and Rufinus; Vincent. Lerin. Commonit. 23; Palladius, Hist. Laus. 147; Justinian, Ep. ad Mennam (Mansi, ix. p. 487 seq.) ; Photius, Biblioth. 118, &c. There is no complete critical edition of Origen’s works. The best edition is that of Car. and C. Vine. Delarue (4 vols, fol.) (Paris, 1733-1759), reprinted by Lommatzsch (25 vols. 8vo) (Berlin, 1831-1848) and by Migne, Patrol, curs, cotnpl. ser. Gr., vols, xi.-xvii. Several new pieces have been edited by Gallandi and A. Mai. Amongst the older works on Origen those of Huetius (printed in Delarue, vol. iv.) are the best; but Tillemont, Fabricius, Walch (Historie d. Ketzereien, vii. pp. 362-760) and Schrockh also deserve to be mentioned. In recent times the doctrine of Origen has been expounded in the great works on church history by Baur, Dorner, Bohringer, Neander, Moller {Geschichte der Kosmologie in der grieckischen Kirche) and Kahnis (Die Lehre vom h. Geist, vol. i.) ; compare with these the works on the history of philosophy by Ritter, Erdmann, Ueberweg and Zeller. Of monographs, the best and most complete is Redepenning, Origenes, eine Darstellung seines Lebens und seiner Lehre (2 vols., 1841, 1846). Compare Thomasius, Orig. (183ˆ7) ; Kriiger, ” fiber das Verhaltnis des Orig. zu Ammonius Sakkas,” in the Ztschr. f. hist. Theol. (1843), i. p. 46 seq.; Fischer, Comment, de Orig. theologia et cosmologia (1846); Ramers, Orig. Lehre von der Auferstehung des Fleisches (1851); Knittel, “Orig. Lehre von der Menschwerdung,” in the Theol. Quartalschr. (1872); Schultz, ” Christologie des Orig.,” in the Jahrb. f. protest. Theol. (1875); Mehlhorn, ” Die Lehre von der menschlichen Freiheit nach Orig.,” in Zeitschr. f. Kirchengesch. vol. ii. (1878); Freppel, Origene, vol. i., 2nd ed. (Paris, 1875). A full list of the later bibliography will be found in Harnack’s Dogmengeschichte and

Chronologie. (A. Ha.) .

ORIGINAL PACKAGE, a legal term in America, meaning, in general usage, the package in which goods, intended for interstate commerce, are actually transported wholesale. The term is used chiefly in determining the boundary between Federal and state jurisdiction in the regulation of commerce, and derives special significance by reason of the conflict between the powers of Congress to regulate commerce and the police legislation of the several states with respect to commodities considered injurious to public health and morals, such as in- toxicating liquors, cigarettes and oleomargarine. By the Federal constitution Congress is vested with the power “to regulate commerce with foreign nations and among the several states, and with the Indian tribes,” and each state is forbidden, without the consent of Congress, to ” lay any imposts or duties on imports or exports, except what may be absolutely necessary for executing

its inspection laws,” and the basis of the law on the subject of “original package ” was laid when, in 1827, Chief Justice Marshall interpreted these clauses in his decision of the case of Brown v. Maryland, 1 which tested the constitutionality of an act of the legislature of Maryland requiring a licence from importers of foreign goods by bale or package and from persons selling the same by wholesale, bale, package, hogshead, barrel or tierce. After pronouncing such a licence to be in effect a tax, the chief justice observed that so long as the thing imported remained ” the property of the importer, in his warehouse, in the original form or package in which it was imported,” a tax upon it was too plainly a duty on imports to escape the prohibition of the Constitution, that imported commodities did not become subject to the taxing power of the state until they had ” become incor- porated and mixed with the mass of property in the country,” that the right to sell a thing imported was incident to the right to import it, and consequently thai a state tax upon the sale was repugnant to the power of Congress to regulate foreign commerce; and he added that the court supposed the same principles applied equally to interstate commerce. Later decisions agree that the right to import commodities or to ship them from one state to another carries with it the right to sell them and have established the boundary line between Federal and state control of both foreign imports and interstate ship- ments at a sale in the original package 2 or at the breaking of the original package before sale for

other purposes than inspection. 3 A state or a municipality may, however, tax while in their original packages any commodities which have been shipped in from another state provided there be no discrimination against such commodities; this permission being granted on the theory that a general non-discriminating tax is not a regulation of commerce and therefore not repugnant to the power of Congress to regulate interstate commerce. 4 The first cases involving a serious conflict between the power of Congress to regulate inter- state commerce and the police powers of the several states were the Licence Cases adjudicated by the Supreme Court of the United States in January 1847. 5 They were to test the con- stitutionality of a law of Massachusetts requiring a licence for the sale of wines or spirituous liquors in a less quantity than 28 gallons, of a law of Rhode Island requiring a licence for the sale of such liquors in a less quantity than 10 gallons, and a law of New Hampshire requiring a licence for the sale of wines or spirituous liquors in any quantity whatever, and in this case a barrel of gin had been bought in Boston Mass., carried to Dover, N.H., and there sold in the same barrel. Although the justices based their opinions on different principles, the court pronounced the laws constitutional. The justices did not even agree that the power of Congress to regulate an interstate shipment in- cluded the power to authorize a sale after shipment, which is the basis of the original package doctrine as applied to Interstate commerce, and Chief Justice Taney with two other justices who were of this opinion held that a state might nevertheless in the exercise of its police powers regulate such sales so long as- Congress did not pass an act for that purpose. In this confused and uncertain state the matter rested until the adjudication of Leisy v. Hardin* in 1889. In this case beer had been shipped from Illinois into Iowa and then sold in the original kegs and cases by an agent of the Illinois firm when Iowa had a law absolutely prohibiting the sale of intoxicating liquors within its limits except for pharmaceutical, medicinal, chemical or sacramental purposes. None of the justices now denied that the power of Congress to regulate an interstate shipment included the power to authorize a sale after shipment, and although there was dis- agreement with reference to the right of a state to regulate the sale in the absence of an act of Congress for that purpose, the

1 12 Wheaton 419.

2 Waring v. Mobile, 8 Wall. 1 10.

5 Mayn. New Orleans, 178 U.S. 498 and in re McAllister (C.C.Md.), 51 Fed. 282.

4 Woodruff v. Parham, 8 Wallace 123, and Hinson v. Lott, 8 Wallace 148.

6 5 Howard 504. 6 135 U.S. 100.

majority of the court were of the opinion that: ” Whenever a particular power of the general government is one which must necessarily be exercised by it, and Congress remains silent, this is not only not a concession that the powers reserved by the states may be exerted as if the specific power had not been elsewhere reposed, but, on the contrary, the only legitimate conclusion is that the general government intended that power should not be affirmatively exercised, and that the action of the states cannot be permitted to effect that which would be incompatible with such intention. Hence, inasmuch as inter- state commerce, consisting in the transportation, purchase, sale and exchange of commodities, is national in its character and must be governed by a uniform system, so long a£ Congress does not pass any law to regulate it, or allowing the states so to do, it thereby indicates its will that such commerce shall be free and untrammelled.” The opinion of Chief Justice Taney in Pierce v. New Hampshire was therefore in part overruled and the Iowa law in so far as it applied to the sale in the original packages of liquors shipped in from another state was pronounced uncon- stitutional. As a consequence of this decision, Congress, in 1890, passed the Wilson Act providing that all fermented, distilled, or other intoxicating liquors or liquids transported into any state or Territory for use, consumption, sale or storage therein should, even though in the original packages, be subject to the police laws of the State or Territory to the same extent as those produced within the state or Territory. Even with this act, however, a state is not permitted to interfere with an interstate shipment of liquor direct to the consumer. 7

What constitutes an original package was the principal question in Austin v. Tennessee* which was decided in November 1900. The general assembly of Tennessee had in this case made it a misdemeanour for any party to sell or to bring into the state for selling or giving away any cigarettes. The defendant had purchased at Durham, North Carolina, a quantity of cigarettes. They were packed in pasteboard boxes containing ten cigarettes each. The boxes were then placed in an open basket and in this manner the cigarettes were delivered at the defendant’s place of business in Tennessee where he sold a package without breaking it. The court decided against the defendant because it held that the manner of transportation was evidently for the purpose of evading the state law and that the boxes were not original packages within the meaning of the Federal law, and

in this connexion it observed that ” The whole theory of the exemption of the original package from the operation of the state laws is based upon the idea that the property is imported in the ordinary form in which, from time to time immemorial, foreign goods have been brought into the country. These have gone at once into the hands of the wholesale dealers, who have been in the habit of breaking the package and distributing their contents among the several retail dealers throughout the state. It was with reference to this method of doing business that the doctrine of the exemption of the original package grew up. ” In the case of Schollenberger v. Pennsylvania, 91 however, the court decided that the state of Pennsylvania could not prohibit the sale of oleomargarine by retail when it had been shipped from Rhode Island in packages con- taining only 10 lb each, and the original package doctrine has been sharply criticized because of the difficulty in determining what constitutes an original package as well as because of the conflict between the doctrine and the police powers of the several states. It has been urged that the doctrine be abandoned and that commodities shipped into one state from another ” be treated just like other goods already there are treated.”

See J. B. Uhle, ” The Law Governing an Original Package,” in The American Law Register, vol. xxix. (Philadelphia, 1890); Shackel- ford Miller, ” The Latest Phase of the Original Package Doctrine,” and M. M. Townley, ” What is the Original Package Doctrine?” both in The American Law Review, vol. xxxv. (St Louis, 1901); also F. H. Cooke, The Commerce Clause of the Federal Constitution (New York, 1908).

7 See Vance v. W. A. Vandercook Company, 170 U.S. 438.

8 179 U.S. 343.

9 171 U.S. 1.

ORIHUELA, a town and episcopal see of eastern Spain, in the province of Alicante; 13 m. N.E. of Murcia and about 15 m. from the Mediterranean Sea, on the Murcia-Elche railway. Pop. (1900) 28,530. Orihuela is situated in a beautiful and exceedingly fertile huerta, or tract of highly cultivated land, at the foot of a limestone bridge, and on both sides of the river Segura, which divides the city into two parts, Roig and San Augusto, and is spanned by two bridges. There are remains of a Moorish fort on the hill commanding the town; and the

north gateway — the Puerta del Colegio — is a fine lofty arch, surmounted by an emblematic statue and the city arms. The most prominent buildings are the episcopal palace (1733), with a frontage of 600 ft.; the town house (1843), containing im- portant archives; and the cathedral, a small Gothic structure built on the site of a former mosque in the 14th century, and enlarged and tastelessly restored in 1829. The university of Orihuela, founded in 1568 by the archbishop of Valencia, was closed in 1835, part of the revenue being applied to the support of a college affiliated to the university of Valencia. Besides numerous primary schools there are a theological seminary and a normal school. The trade in fruit, cereals, oil and wine is considerable. There are also tanneries, dye-works and manu- factures of silk, linen and woollen fabrics, leather and starch.

Orihuela was captured by the Moors in 713, and retaken by James I. of Aragon, for his father-in-law Alphonso of Castile, in 1265. It was sacked during the disturbances at the beginning of the reign of Charles V. (1520), and again in the War of Succes- sion (1706). Local annals specially mention the plague of 1648, the flood of 1651 and the earthquake of 1829.

ORILLIA, a town and port of entry of Simcoe county, Ontario, Canada, situated 84 m. N. of Toronto, on Lake Couchiching and on the Grand Trunk railway. Pop. (1901) 4907. It is a favourite summer resort, and has steamboat communication with other ports on Lakes Simcoe and Couchiching. It contains an asylum maintained by the provincial government; also saw and grist mills and iron foundries.

ORINOCO, a river in the north of South America, falling north-east into the Atlantic between 6o° 20′ and 62 30′ W. It is approximately 1500 m. long, but it is several hundred miles longer if measured by its Guaviare branch. lying south and east of the main stream is a vast, densely forested region called Venezuelan Guiana, diversified by ranges of low mountains, irregular broken ridges and granitic masses, which define the courses of many unexplored tributaries of the Orinoco.

In 1498, Columbus, when exploring the Gulf of Paria, which receives a large part of the outflow of the Orinoco, noted the freshness of its waters, but made no examination of their origin. The caravels of Ojeda which, in 1499, followed almost the same track as that of Columbus, probably passed in sight of one or more of the mouths of the Orinoco. The first to explore any portion of the mighty river was the reckless and daring adven- turer Ordaz. In his expedition (1531-1532) he entered its principal outlet, the Boca de Navios, and, at the cost of many lives, ascended to the junction of the Meta with the parent stream. From Ordaz up to recent times the Orinoco has been the scene of many voyages of discovery, including those in quest of El Dorado, and seme scientific surveys have been made, especially among its upper waters, by Jose Solano and Diaz de la Fuente of the Spanish boundary line commission of Yturriaga and Solano (1757-1763), Humboldt (1800) and Michelena y Rojas (1855-1857). The last ascended to the Mawaca, a point about 170 m. above the northern entrance to the Casiquiare canal, and then a few miles up the Mawaca. A little knowledge about its sources above these points was given by the savages to de la Fuente in 1759 and to Mendoza in 1764, and we are also indebted to Humboldt for some vague data.

At the date of the discovery, the_ Orinoco, like the Amazon, bore different names, according to those of the tribes occupying its margins. The conquistador Ordaz found that, at its mouth, it was called the Uriaparia, this being the name of the cacique of the tribe there. The Caribs, holding a certain section of the river, named it the Ibirinoco, corrupted by the Spaniards into

Orinoco. It was known to other tribes as the Barraguan and to others as the Maraguaca. The Cabres called it the Paragua, because it flooded such a vast area of country.

The principal affluent of the Orinoco from the Guiana district is the Ventuari, the head-waters of which are also unknown. It is an important stream, which, running south-west, joins the Orinoco about 90 m. above its Guaviare branch. Two other large tributaries of the Orinoco flow north from the interior of this mysterious Guiana region, the Caura and the Caroni. The former has recently been explored by Andre, who found it greatly obstructed by falls and rapids; the latter is about 800 m. long, 400 of which are more or less navigable.

South of the Guaviare, as far as the divortium aquarum, between it and the Rio Negro branch of the Amazon, the country is dry and only partially swept by moisture-laden winds, so that few streams of moment are found in its southern drainage area; but north of it, as far as 6° 30′ N., the north-east trade winds, which have escaped condensation in the hot lower valley of the Orinoco, beat against the cold eastern slopes of the lofty Colombian Andes, and ceaselessly pour down such vast volumes of water that the almost countless streams which flow across the plains of Colombia and western Venezuela are taxed beyond their capacity to carry it to the Orinoco, and for several months of the year they flood tens of thousands of square miles of the districts they traverse. Among these the Apure, Arauca, Meta and Guaviare hold the first rank.

The Apure is formed by two great rivers, the Uribante and Sarare. The former, which rises in the Sierra de Merida, which overlooks the Lake of Maracaibo, has 16 large affluents; the latter has its sources near the Colombian city of Pamplona, and they are only separated from the basin of the river Magdalena by the ” Oriental ” Andean range. From the Uribante-Sarare junction to the Orinoco the length of the Apure is 645 m., of which Codazzi makes the doubtful claim that 564 are navigable, for there are some troublesome rapids 1 14 m. above its mouth, where the Apure is 3 m. wide. The numerous affluents which enter it from the north water the beautiful eastern and southern slopes of the Merida, Caraboso and Caracas mountain ranges. A few of them

are navigable for a short distance; among these the most important is the many-armed Portugueza, on the main route south from the Caribbean coast to the llanos. A few large streams enter the lower Apure from the south, but they are frequently entangled in lateral canals, due to the slight elevation of the plains above sea-level, the waters of the Apure, especially during flood time, having opened a great number of canos before reaching the Orinoco.

The " Oriental " Andes of Colombia give birth to another great affluent of the Orinoco, the Arauca, which soon reaches the plain and parallels the Apure on the south. Perez says that the Sarare branch of the Apure has formed a gigantic dam across its own course by prodigious quantities of trees, brush, vines and roots, and thus, impounding its own waters, has cut a new channel to the southward across the lowlands and joined the Arauca, from which the Sarare may be reached in small craft and ascended to the vicinity of Pamplona. The Arauca is navigable for large boats and barges up to the Andes, and by sail to its middle course. In floods, unable to carry the additional water contributed by the Sarare, it overflows its banks, and by several canos gives its surplus to the Capanaparo, which, about 18 m. farther south, joins the Orinoco.

The Meta is known as such from the union of two Andean streams, the Negro and Humadea, which rise near Bogota. At their junction, 700 ft. above sea-level, it is 1000 ft. wide and 7 ft. deep in the dry season, but in flood the Meta rises 30 ft. It is navigable up to the old " Apostadero," about 150 m. above its mouth, but launches may ascend it, in the wet season, about 500 m., to the junction of the Negro with the Humadea. In the dry season, however, it is obstructed by reefs, sandbanks, shallows, snags, trees and floating timber from the " Apostadero " up, so that even canoes find its ascent difficult, while savage hordes along its banks add to the dangers to be encountered. The Guaviare is the next great western tributary of the Orinoco. Eugenio Alvarado, a Spanish commissioner for the boundary delimitation of Colombia with Brazil in 1759, informed the viceroy at Bogota that the rivers Arivari and Guayabero rise between Neiva and Popayan, and unite to take the composite name of Guaviare. In those times they called it Guaibari, or Guayuare. The Guaviare is about 500 m. long, of which 300 are called navigable, although not free from obstructions. Its upper portion has many rapids and falls. The banks are forested throughout, and the river is infested by numerous alligators, so ferocious that they attack canoes. Two-thirds of the way up, it receives its Ariari tributary from the north-west, which is navigable for large boats. Near its mouth the Guaviare is joined by its great south-western affluent, the Ynirida. Above its rapid of Mariapiri,

180 m. up, this stream runs swiftly through a rough country, but for a long distance is a succes- sion of lakes and shallow, overflowed areas. Its head-waters do not reach the Andes.

Between the Guaviare and the Meta the Orinoco is obstructed by the famous Maipures cataract, where, in several channels, it breaks through a granite spur of the Guiana highlands for a length of about

4 m., with a total fall of about 40 ft., and then, after passing two minor reefs, reaches the Atures rapids, where it plunges through a succession of gorges for a distance of about 6 m., winding among confused masses of granite boulders, and falling about 30 ft. At the mouth of the Meta it is about I m. wide, but as it flows north- wards it increases its width until, at the point where it receives its Apure affluent, it is over 2 m. wide in the dry season and about 7 m. in floods. It rises 32 ft. at Cariben, but at the Angostura, or narrows, where the river is but 800 ft. wide, the difference between high and low river is 50 ft., and was even 60 in 1892.

The Orinoco finds its way to the ocean through a delta of about 700 sq. m. area, so little above sea level that much of it is periodically flooded. The river is navigable for large steamers up to the raudal or rapid of Cariben, 700 m. from the sea, and to within 6 m. of the mouth of the Meta. Maintaining its eastern course from the Apure, the main stream finds its way along the southern side of the delta, where it is called the Corosimi river, and enters the sea at the Boca Grande; but in front of the Tortola island, at the beginning of the Corosimi and 100 m. from the sea, it throws northwards to the Gulf of Paria another great arm which, about 100 m. long, and known as the Rio Vagre, bounds the western side of the delta. En route to the gulf the Vagre sends across the delta, east and north, two curios or canals of considerable volume, called the Macareo and Cuscuino. The delta is also cut into many irregular divisions by other canals which derive their flow from its great boundary rivers, the Corosimi and Vagre, and its numerous islands and vast swamps are covered with a dense vegetation. The Boca Grande outlet is the deepest, and is the main navigable entrance to the Orinoco at all seasons, the muddy bar usually maintaining a depth of 16 ft.

The Spanish conquistador and his descendants have not been a blessing to the basin of the Orinoco. All they can boast of is the

destruction of its population and products, so that the number of inhabitants of one of the richest valleys in the world is less to-day than it was four centuries ago. The entire river trade centres upon Ciudad Bolivar, on the right bank of the Orinoco, 373 m. above its mouth. The only other river port of any importance is San Fernando, on the Apure. It is a stopping- point for the incipient steamer traffic of the valley, which is principally confined to the Apure and lower Orinoco. It occupies, however, but a few small steam craft. There is steam connexion between Ciudad Bolivar and the island of Trinidad. Cattle are carried by vessels from the valley to the neighbouring foreign colonies, and a few local steamers do a coasting trade between the river and the Caribbean ports of Venezuela. A transit trade with Colombia, via the Meta river, has been carried on by two small steamers, but subject to interruptions from political causes. (G. E. C.)

ORIOLE (O. Fr. Oriol, Lat. aureolus), the name once applied to a bird, from its golden colouring — the Oriolus galbula of Linnaeus — but now commonly used in a much wider sense. The golden oriole, which is the type of the Passerine family Oriolidae, is a far from uncommon spring-visitor to the British Islands, but has very rarely bred there. On the continent of Europe it is a well-known if not an abundant bird, and its range in summer extends so far to the east as Irkutsk, while in winter it is found in Natal and Damaraland. In India it is replaced by a closely allied form, 0. kundoo, the mango-bird, chiefly distinguishable by the male possessing a black streak behind as well as in front of the eye; and both in Asia and Africa are several other species more or less resembling O. galbula, but some depart considerably from that type, assuming a black head, or even a glowing crimson, instead of the ordinary yellow colouring, while others again remain constant to the dingy type of plumage which characterizes the female of the more normal form. Among these last are the aberrant species of the group Mimetes or Mimela, belonging to the Australian Region, respecting which A. R. Wallace pointed out, first in the Zoological Society's Proceedings (1863, pp. 26-28), and afterwards in his Malay Archipelago (ii. pp. 150-153), the very curious signs of " mimi- cry " (see Honey-eater). It is a singular circumstance that this group Mimeta first received its name from P. P. King {Survey, &c. of Australia, ii. 417) under the belief that the birds composing it belonged to the family Meliphagidae, which had assumed the appearance of orioles, whereas Wallace's investiga- tions tend to show that the imitation (unconscious, of course) is on the part of the latter. The external similarity of the Mimeta and the Tropidorhynchus of the island of Bouru, one

of the Moluccas, is perfectly wonderful, and has again and again

deceived some of the best ornithologists, though the birds are structurally far apart. Another genus which has been referred to the Oriolidae, and may here be mentioned, is Sphecotheres, peculiar to the Australian Region, and distinguishable from the more normal orioles by a bare space round the eye. Orioles are shy and restless birds, frequenting gardens and woods, and living on insects and fruit. The nest is pocket-shaped, of bark, grass and fibres, and the eggs are white or salmon-coloured with dark spots. The ” American orioles ” (see Icterus) belong to a different Passerine family, the Icteridae. (A. N.)

ORION (or Oarion), in Greek mythology, son of Hyrieus (Eponymus of Hyria in Boeotia), or of Poseidon, a mighty hunter of great beauty and gigantic strength, perhaps corresponding to the ” wild huntsman ” of Teutonic mythology. He is also sometimes represented as sprung from the earth. He was the favourite of Eos, the dawn-goddess, who loved him and carried him off to Delos; but the gods were angry, and would not be appeased till Artemis slew him with her arrows (Odyssey, v. 121). According to other accounts which attribute Orion’s death to Artemis, the goddess herself loved him and was deceived by the angry Apollo into shooting him by mistake; or he paid the penalty of offering violence to her, or of challenging her to a contest of quoit-throwing (Apollodorus i. 4; Hyginus, Poet, aslron. ii. 34; Horace, Odes, iii. 4, 71). In another legend he was blinded by Oenopion of Chios for having violated his daughter Merope; but having made his way to the place where the sun rose, he recovered his sight (Hyginus, loc. cit.; Parthenius, Erotica, 20). He afterwards retired to Crete, where he lived the life of a hunter with Artemis; but having threatened to exterminate all living creatures on the island, he was killed by the bite of a scorpion sent by the earth-goddess (Ovid, Fasti, v – 537)- I n the lower world his shade is seen by Odysseus driving the wild beasts before him as he had done on earth (Odyssey, xi. 572). After his death he was changed into the constellation which is called by his name. It took the form of a warrior, wearing a girdle of three stars and a lion’s skin, and carrying a club and a sword. When it rose early it was a sign of summer; when late, of winter and stormy weather; when it rose about midnight it heralded the season of vintage.

See Kiientzle, tlber die Sternsagen der Griechen (1897), and his article in Roscher’s Lexikon; he shows that in the oldest legend Orion the constellation and Orion the hero are quite distinct, without deciding which was the earlier conception. The attempt sometimes made to attribute an astronomical origin to the myths connected with his name is unsuccessful, except in the case of Orion’s pursuit of Pleione and her daughters (see Pleiades) and his death from the bite of the scorpion;

see also C. O. Mtiller, Kleine Deutsche Schriften, ii. (1848); O. Gruppe, Griechische Mythologie, ii. pp. 945, 952; Preller-Robert, Griechische Mythologie (1894), pp. 448-454; Grimm, Teutonic Mythology (Eng. trans., 1883), ii. p. 726, iii. p. 948.

In Astronomy. — The constellation Orion is mentioned by Homer (II. xviii. 486, xxii. 29; Od. v. 274), and also in the Old Testament (Amos v. 8, Job ix. 9). The Hebrew name for Orion also means ” fool,” in reference perhaps to a mytho- logical story of a ” foolhardy, heaven-daring rebel who was chained to the sky for his impiety ” (Driver). For the Assyrian names see Constellation. Ptolemy catalogued 38 stars, Tycho Brahe 42 and Hevelius 62. Orion is one of the most conspicuous constellations. It consists of three stars of the 1st magnitude, four of the 2nd, and many of inferior magnitude. a Orionis, or Betelgeuse, is a bright, yellowish-red star of varying magnitude (0-5 to 1-4, generally 0-9). j3 Orionis or Regel is a 1st magnitude star. 7 Orionis or Bellatrix, and k Orionis are stars of the 2nd magnitude. These four stars, in the order a, (3, 7, k, form an approximate rectangle. Three collinear stars f, € and 5 Orionis constitute the “belt of Orion”; of these €, the central star, is of the 1st magnitude, 5 of the 2nd, while f Orionis is a fine double star, its components having magnitudes 2. and 6; there is also a faint companion of magnitude 10. a Orionis, very close to f Orionis, is a very fine multiple star, described by Sir William Herschel as two sets of treble stars; more stars have been revealed by larger telescopes. 6 Orionis is

a multiple star, situated in the famous nebula of Orion, one of the most beautiful in the heavens. (See Nebula.)

ORION and ORUS, the names of several Greek grammarians, frequently confused. The following are the most important. (1) Orion of Thebes in Egypt (5th century a.d.), the teacher of Proclus the neo-Platonist and of Eudocia, the wife of the younger Theodosius. He taught at Alexandria, Caesarea in Cappadocia and Byzantium. He was the author of a partly extant etymological Lexicon (ed. F. W. Sturz, 1820), largely used by the compilers of the Etymologicum Magnum, the Etymolo- gicum Gudianum and other similar works; a collection of maxims in three books, addressed to Eudocia, also ascribed to him by Suidas, still exists in a Warsaw MS. (2) Orus of Miletus, who, according to Ritschl, flourished not later than the 2nd century a.d., and was a contemporary of Herodian and a little junior to Phrynichus

(according to Reitzenstein he was a contemporary of Orion). His chief works were treatises on orthography; on Atticisms, written in opposition to Phrynichus; on the names of nations.

See F. Ritschl, De Oro el Orione Commentatio (1834); R. Reitzenstein, Geschichte der griechischen Etymologika (1897); and article " Orion " in Smith's Dictionary of Greek and Roman Biography.

ORISKANY, a village of Oneida county, New York, U.S.A., about 7 m. N.W. of Utica. Pop. about 800. Oriskany is served by the New York Central & Hudson River railway. There are malleable iron works and a manufactory of paper makers' felts here. In a ravine, about 2 m. west of Oriskany, was fought on the 6th of August 1777 the battle of Oriskany, an important minor engagement of the American War of Independence. On the 4th of August Gen. Nicholas Herkimer, who had been colonel of the Tyrone county (New York) militia in 1775, and had been made a brigadier-general of the state militia in 1776, had gathered about 800 militiamen at Fort Dayton (on the site of the present Herkimer, New York) for the relief of Fort Schuyler (see Rome, N.Y.) then besieged by British and Indians under Colonel Barry St Leger and Joseph Brant. On the 6th General Herkimer's force, on its march to Fort Schuyler, was ambushed by a force of British under Sir John Johnson and Indians under Joseph Brant in the ravine above mentioned. The rear portion of Herkimer's troops escaped from the trap, but were pursued by the Indians, and many of. them were overtaken and killed. Between the remainder and the British and Indians there was a desperate hand-to-hand conflict, interrupted by a violent thunderstorm, with no quarter shown by either side. On hearing the firing near Fort Schuyler (incident to a sortie by Lieut.-Colonel Marinus Willett) the British withdrew, after about 200 Americans had been killed and as many more taken prisoners, the loss of the British in killed being about the same. General Herkimer (who had advised advancing slowly, awaiting signal shots announcing the sortie, and had been called " Tory " and " coward " in consequence), though his leg had been broken by a shot at the beginning of the action, continued to direct the fighting on the American side, but died on the 16th of August as a result of the clumsy amputation of his leg. The battle, though indecisive, had an important influence in preventing St Leger from effecting a junction with General Burgoyne. The battlefield is marked by a monument erected in 1884.

See Orderly Book of Sir John Johnson during the Oriskany Campaign (Albany, 1882), with notes by W. L. Stone and J. W. De Peyster; Publications of the Oneida Historical Society, vol. i. (Utica, N.Y., 1877) ; and Phoebe S. Cowen, The Herkimers and Schuylers (Albany,

1903)-

ORISSA, a tract of India, in Bengal, consisting of a British division and twenty-four tributary states. The historical capital is Cuttack; and Puri, with its temple of Jagannath, is world- famous. Orissa differs from the rest of Bengal in being under a temporary settlement of land revenue. A new settlement for a term of thirty years was concluded in 1900, estimated to raise the total land revenue by more than one half; the greater part of this increase being levied gradually during the first eleven years of the term. To obviate destructive inun- dations and famines, the Orissa system of canals has been con- structed, with a capital outlay of nearly two millions sterling.

(See Mahanadi). The province is traversed by the East Coast railway, which was opened throughout from Calcutta to Madras in 1 901.

The Division ov Orissa consists of the five districts of Cuttack, Puri, Balasore, Sambolpur and the forfeited state of Angul. Total area 13,770 sq. m.; pop. (1901) 5,003,121, showing an increase of 7% in the decade. According to the census of 1901 the total number of persons in all India speaking Oriya was more than 95 millions, showing that the linguistic area (extending into Madras and the Central Provinces) is much larger than the political province.

The whole of Orissa is holy ground. On the southern bank of the Baitarani shrine rises after shrine in honour of Siva, the All-Destroyer. On leaving the stream the pilgrim enters Jajpur, literally the city of sacrifice, the headquarters of the region of pilgrimage sacred to the wife of the All-Destroyer. There is not a fiscal division in Orissa without its community of cenobites, scarcely a village without consecrated lands, and not a single ancient family that has not devoted its best acres to the gods. Every town is filled with temples, and every hamlet has its shrine. The national reverence of the Hindus for holy places has been for ages concentrated on Puri, sacred to Vishnu under his title of Jagannath, the Lord of the World. Besides its copious water- supply in time of high flood, Orissa has an average rainfall of 625 in. per annum. Nevertheless, the uncontrolled state of the water-supply has subjected the country from time im- memorial to droughts no less than to inundation. Thus the terrible famine of 1865-1866, which swept away one-fourth of the entire population, was followed in 1866 by a flood which destroyed crops to the value of £3,000,000. Since then much has been done by government to husband the abundant water-supply.

The early history of the kingdom ot Orissa (Odra-desa), as recorded in

the archives of the temple- of Jagannath, is largely mythical. A blank in the records from about 50 B.C. to a.d. 319 corresponds to a period of Yavana occupation and Buddhist influence, during which the numerous rock monasteries of Orissa were excavated. The founder of the Kesari or Lion dynasty, which ruled from a.d. 474 to 113 2, is said to have restored the worship of Jagannath, and under this line the great Sivaite temple at Bhuvaneswar was constructed. In 1132 a new line (the Gajapati dynasty) succeeded, and Vishnu took the place of Siva in the royal worship. This dynasty was extinguished in 1532-1534, and in 1578, after half a century of war, Orissa became a province of the Mogul empire. It nominally passed to the British in 1765, by the Diwani grant of Bengal, Bhar and Orissa; but at that time it was occupied by the Mahratta raja of Nagpur, from whom it was finally conquered in 1803.

The Tributary States of Orissa, known also as the Tributary Mahals, or the Garhjats, occupy the hills between the British districts and the Central Provinces. The most important are Mayurbhanj, Keonjhar, Dhenkanal, Baud and Nayagarh. In 1905 five Oriya-speaking states (Bamra, Rairakhol, Sonpur, Patna and Kalahandi) were added from the Central Provinces and two (Gangpur and Bonai) from the Chota Nagpur states. This made the total area 28,046 sq. m. and the pop. (1901)

3.173,395-

Up to the year 1888 some doubt existed as to the actual position of the Tributary states of Orissa; but in that year the secretary of state accepted the view that they did not form part of British India, and modified powers were handed over to the Orissa chiefs under the control of a superintendent.

See Sir W. W. Hunter, Orissa (1872).

ORISTANO, a town and archiepiscopal see of Sardinia, situated 23 ft. above sea-level, about 3 m. from the eastern shore of a gulf on the W. coast, to which it gives its name, and 59 m. N. by W. of Cagliari by rail. Pop. (1901) 7107. The town preserves some scanty remains of the walls (dating from the end of the 13th century), by which it was surrounded, and two gates, the Porta Manna, surmounted by a lofty square tower, known also as the Torre S. Cristoforo, and the Porta Marina. The houses are largely constructed of sun-dried bricks, and are low, so that the area of the town is considerable in proportion to its population.

The cathedral was reconstructed in 1733 in the baroque style, and scanty traces of the original building of the 12th century exist (see D. Scano in L' Arte, 1901, p. 359; 1903, p. 15): and also in Storia dell' arte in Sardegna dal XI. al XI V. secolo, Cagliari- Sassari, 1907). Some statuettes and sculptured slabs partly belonging to its pulpit, perhaps the work of Andrea Pisano, have been found; upon the reverse side of two of the slabs are still older reliefs of the 8th or 9th century; so that the slabs perhaps originally came from Tharros. In the sacristy is some fine silverwork. The church of S. Francesco also dates from the end of the 13th century, but has been altered. A fine statue by Nino, son of Andrea, is preserved here. Two m. south of Oristano is the village of S. Giusta, with a beautiful Romanesque church of the Pisan period dedicated to this saint (D. Scano, Bollettino dell' arte, Feb. 1907, p. 8), containing several antique columns. It was once an independent episcopal see. The lagoons on the coast are full of fish, but are a cause of malaria. The environs are fertile, and a quantity of garden produce is grown; while good wine (vernaccia) is also made, and also ordinary pottery in considerable quantities, supplying most of the island. The bridge crossing the river Tirso, a little to the north of the town, over 300 ft. long, with five arches, took the place, in 1870, of an old one which is said to have been of Roman origin. A m. south of the mouth of this river is the landing-place for shipping. The large orange groves of Milis lie 13 m. N. of Oristano at the base of Monte Ferru, where they are sheltered from the wind. The finest belong to the Marchese Boyl, whose plantation contains some 500,000 orange and lemon trees. The inhabitants of Milis manufacture reed baskets and mats, which they sell throughout Sardinia.

Oristano occupies the site of the Roman Othoca, the point at which the inland road and the coast road from Carales to Turris Libisonis bifurcated, but otherwise an unimportant place, overshadowed by Tharros. The medieval town is said to have been founded in 1070. It was the seat from the nth century onwards of the giudici (judges) of Arborea, one of the four divisions of the island. Almost the last of these judges was Eleonora (1347-1403); after her death Oristano became the seat of a marquisate, which was suppressed in 1478. The frontier castles of Monreale and Sanluri, some 20 and 30 m. respectively to the S.S.E., were the scene of much fighting between the Aragonese government and the giudici and marquises of Arborea in the 14th and 15th centuries. (T. As.)

ORIYA (properly Oriya), the Aryan language of Odra or Orissa in India. It is the vernacular not only of that province but also of the adjoining districts and native states of Madras and of the Central Provinces. In 1901 it was spoken by 9,687,429 people. It is closely related to Bengali and Assamese, and with them and with Bihari it forms the Eastern Group of the Indo- Aryan vernaculars. See Bengali.

ORIZABA (Aztec, Citlaltepetl, ” star mountain “), an extinct or dormant volcano, on the boundary between the Mexican states of Puebla and Vera Cruz and very nearly on the 19th parallel. It rises from the south-eastern margin of the great Mexican plateau to an elevation of 18,314 ft., according to Scovell and Bunsen’s measurements in 1891-1892, or 18,250 and 18,209 ft- according to other authorities, and 18,701 (5700 metres) by the Comision Geografica Exploradora. It is the highest peak in Mexico and the second highest in North America. Its upper timber line is about 13,500 ft. above sea-level, and Hans Gadow found patches of apparently permanent snow at an elevation of 14,400 ft. on its S.E. side in 1902. The first ascent of Orizaba was made by Reynolds and Maynard in 1848, since when other successful attempts have been made and many failures have been recorded. Its last eruptive period was 1545-1566, and the volcano is now considered to be extinct, although Humboldt records that smoke was seen issuing from its summit as late as the beginning of the 19th century.

ORIZABA (Indian name Akuaializ-apan, pleasant waters), a city of Mexico in the state of Vera Cruz, 82 m. by rail W.S.W. of the port of Vera Cruz. Pop. (1900) 32,894, including a large percentage of Indians and half-breeds. The Mexican railway

affords frequent communication with the City of Mexico and Vera Cruz, and a short line (4-3- m.) connects with Ingemo, an industrial village. Orizaba stands in a fertile, well-watered, and richly wooded valley of the Sierra Madre Oriental, 4025 ft. above sea-level, and about 18 m. S. of the snow-crowned volcano that bears its name. It has a mild, humid and healthful climate. The public edifices include the parish church of San Miguel, a chamber of commerce, a handsome theatre, and some hospitals. The city is the centre of a rich agricultural region which produces sugar, rum, tobacco and Indian corn. In colonial times, when tobacco was one of the crown monopolies, Orizaba was one of the districts officially licensed to produce it. It is also a manufacturing centre of importance, having good water power from the Rio Blanco and producing cotton and woollen fabrics. Its cotton factories are among the largest in the republic. Paper is also made at Cocolapan in the canton of Orizaba.

The forests in this vicinity are noted for orchids and ferns. An Indian town called Ahuaializapan, subject to Aztec rule, stood here when Cortes arrived on the coast. The Spanish town that succeeded it did not receive its charter until 1774, though it was one of the stopping-places between Vera Cruz and the capital. In 1862 it was the headquarters of the French.

ORKHON INSCRIPTIONS, ancient Turkish inscriptions of the 8th century a.d., discovered near the river Orkhon to the south of Lake Baikal in 1889. They are written in an alphabet derived from an Aramaic source and recount the history of the northern branch of the Turks or Tu-kiue of Chinese historians. See Turks.

ORKNEY, EARL OP, a Scottish title held at different periods by various families, including its present possessors the Fitz- maurices. The Orkney Islands (q.v.) were ruled by jarls or earls under the supremacy of the kings of Norway from very early times to about 1360, many of these jarls being also earls of Caithness under the supremacy of the Scottish kings. Perhaps the most prominent of them were a certain Paul (d. 1099) who assisted the Norwegian king, Harald III. Haardraada, when he invaded England in 1066; and his grandson Paul the Silent, who built, at least in part, the cathedral of St Magnus at Kirkwall. They were related to the royal families of" Scotland and Norway.

In its more modern sense the earldom dates from about 1380, and the first family to hold it was that of Sinclair, Sir Henry Sinclair (d. c. 1400) of Roslin, near Edinburgh, being recognized as earl by the king of Norway. Sir Henry was the son of Sir William Sinclair, who was killed by the Saracens whilst accom- panying Sir James Douglas, the bearer of the Bruce's heart, to Palestine in 1330, and on the maternal side was the grandson of Malise, who called himself earl of Strathearn, Caithness and Orkney. He ruled the islands almost like a king, and employed in his service the Venetian travellers Nicolo and Antonio Zeno. His son Henry (d. 1418) was admiral of Scotland and was taken prisoner by the English in 1406, together with Prince James, afterwards King James I.; his grandson William, the 3rd earl (c. 1404-1480), was chancellor of Scotland and took some part in public affairs. In 1455 William was created earl of Caithness, and in 1470 he resigned his earldom of Orkney to James III. of Scotland, who had just acquired the sovereignty of these islands through his marriage with Margaret, daughter of Christian I., king of Denmark and Norway. In 1567 Queen Mary's lover, James Hepburn, earl of Both well, was created duke of Orkney, and in 1581 her half-brother Robert Stewart (d. 1592), an illegiti- mate son of James V., was made earl of Orkney.

Robert, who was abbot of Holyrood, joined the party of the reformers and was afterwards one of the principal enemies of the regent Morton. His son Patrick acted in a very arbitrary manner in the Orkneys, where he set the royal authority at defiance; in 1609 he was seized and imprisoned, and, after his bastard son Robert had suffered death for heading a rebellion, he himself was executed in February 16 14, when his honours and estates were forfeited.

In 1696 Lord George Hamilton was created earl of Orkney (see below). He married Elizabeth Villiers (see below), and he was succeeded by his daughter Anne (d. 1756), the wife of

William O'Brien, 4th earl of Inchiquin. Anne's daughter Mary (c. 1721-1791) and her granddaughter Mary (1755-1831) were both countesses of Orkney in their own right; the younger Mary married Thomas Fitzmaurice (1742-1793), son of John Petty, earl of Shelburne, and was succeeded in the title by her grandson, Thomas John Hamilton Fitzmaurice (1803-1877), whose descendants still hold the earldom.

ORKNEY, ELIZABETH HAMILTON, Countess of (c. 1657- 1733); mistress of the English King William III., daughter of Colonel Sir Edward Villiers of Richmond, was born about 1657. Her mother, Frances Howard, daughter of the 2nd earl of Suffolk, was governess to the princesses Mary and Anne, and secured place and influence for her children in Mary's household. Edward Villiers, afterwards created 1st earl of Jersey (1656-1711), became master of the horse, while his sisters Anne and Elizabeth were among the maids of honour who accompanied Mary to the Hague on her marriage. Elizabeth Villiers became William's acknowledged mistress in 1680. After his accession to the English crown he settled on her a large share of the confiscated Irish estates of James II. This grant was revoked by parliament, however, in 1699. Mary's distrust of Marlborough was fomented by Edward Villiers, and the bitter hostility between Elizabeth Villiers and the duchess of Marlborough perhaps helped to secure the duke's disgrace with William. Shortly after Mary's death, William, actuated, it is said, by his wife's expressed wishes, broke with Elizabeth Villiers, who was married to her cousin, Lord George Hamilton, fifth son of the 3rd duke of Hamilton, in November 1695. The husband was gratified early in the next year with the titles of earl of Orkney, viscount of Kirkwall and Baron Dechmont. The countess of Orkney served her

husband's interests with great skill, and the marriage proved a happy one. She died in London on the 19th of April 1733.

ORKNEY, GEORGE HAMILTON, Earl of (1666-1737), British soldier, was the fifth son of William, duke of Hamilton, and was trained for the military career by his uncle, Lord Dumbarton, in the 1st Foot. In 1689 he became lieut.- colonel and a few months later brevet colonel. He served at the battles of the Boyne and of Aughrim, and, at the head of the Royal Fusiliers, at Steinkirk. As colonel of his old regiment, the 1st Foot, he took part in the battle of Landen or Neerwinden, and in the siege of Namur, serving also at Athlone and Limerick in the Irish war. At Namur Hamilton received a severe wound, and in recognition of his services was made a brigadier. In 1695 he married Elizabeth Villiers (see above), who was " the wisest woman " Swift "ever knew." The following year he was made earl of Orkney in the Scottish peerage. As a major- general he took the field with Marlborough in Flanders, and on January 1st, 1 703-1 704 he became lieutenant-general. At Blenheim it was Orkney's command which carried the village, and in June 1 705 he led a flying column which marched from the Moselle to the rescue of Liege. At Ramillies he headed the pursuit of the defeated French, at Oudenarde he played a dis- tinguished part and in 1708 he captured the forts of St Amand and St Martin at Tournay. At the desperately fought battle of Malplaquet Lord Orkney's battalions led the assault on the French entrenchments, and suffered very severe losses. He remained with the army in Flanders till the end of the war, as " general of the foot," and at the peace he was made colonel- commandant of the 1st Foot as a reward for his services. He occupied various civil and military posts of importance, culminat- ing with the appointment of " field marshal of all His Majesty's forces " in 1736. This appointment is the first instance of field marshal's rank (as now understood) in the British Service. A year later he died in London.

ORKNEY ISLANDS, a group of islands, forming a county, off the north coast of Scotland. The islands are separated from the mainland by the Pentland Firth, which is 6\ m. wide between Brough Ness in the island of South Ronaldshay and Duncansbay Head in Caithness-shire. The group is commonly estimated to consist of 67 islands, of which 30 are inhabited (though in the case of four of them the population comprises only the light-

house attendants), but the number may be increased to as many as 90 by including rocky islets more usually counted with the islands of which they probably once formed part. The Orkneys lie between 58° 41′ and 59 24′ N., and 2 22′ and 3° 26′ W., measure 50 m. from N.E.

to S.W. and 29 m. from E. to W., and cover 240,476 acres or 375-5 sq. m. Excepting on the west coasts of the larger islands, which present rugged cliff scenery remarkable both for beauty and for colouring, the group lies somewhat low and is of bleak aspect, owing to the absence of trees. The highest hills are found in Hoy. The only other islands containing heights of any importance are Pomona, with Ward Hill (880 ft.), and Wideford (740 ft.) and Rousay. Nearly all of the islands possess lakes, and Loch Harray and Loch Stenness in Pomona attain noteworthy proportions. The rivers are merely streams draining the high land. Excepting on the west fronts of Pomona, Hoy and Rousay, the coast-line of the islands is deeply indented, and the islands themselves are divided from each other by straits generally called sounds or firths, though off the north-east of Hoy the designation Bring Deeps is used, south of Pomona is Scapa Flow and to the south-west of Eday is found the Fall of Warness. The very names of the islands indicate their nature, for the terminal a or ay is the Norse ey, meaning ” island,” which is scarcely disguised even in the words Pomona and Hoy. The islets are usually styled holms and the isolated rocks skerries. The tidal currents, or races, or roost (as some of them are called locally, from the Icelandic) off many of the isles run with enormous velocity, and whirlpools are of frequent occurrence, and strong enough at times to prove a source of danger to small craft. The charm of the Orkneys does not lie in their ordinary physical features, so much as in beautiful atmospheric effects, extraordinary examples of light and shade, and rich coloration of cliff and sea.

Geology. — All the islands of this group are built up entirely of Old Red Sandstone. As in the neighbouring mainland of Caithness, these rocks rest upon the metamorphic rocks of the eastern schists, as may be seen on Pomona, where a r.arrow strip is exposed between Stromness and Inganess, and again in the small island of Graemsay; they are represented by grey gneiss and granite. The upper division of the Old Red Sandstone is found only in Hoy, where it forms the Old Man and neighbouring cliffs on the N.W. coast. The Old Man presents a characteristic section, for it exhibits a thick pile of massive, current-bedded red sandstones, resting, near the foot of the pinnacle, upon a thin bed of amygdaloidal porphyrite, which in its turn lies unconformably upon steeply inclined flagstones. This bed of volcanic rock may be followed northward in the cliffs, and it may be noticed that it thickens considerably in that direction. The Lower Old Red Sandstone is represented by well-bedded flagstones over most of the islands; in the south of Pomona these are faulted against an overlying series of massive red sandstones, but a gradual passage from the flagstones to the sandstones may be followed from Westray S.E. into

Eday. A strong synclinal fold traverses Eday and Shapin- say, the axis being N. and S. Near Haco's Ness in Shapinsay there is a small exposure of amygdaloidal diabase which is of course older than that in Hoy. Many indications of ice action are found in these islands; striated surfaces are to be seen on the cliffs in Eday and Westray, in Kirkwall Bay and on Stennie Hill in Eday; boulder clay, with marine shells, and with many boulders of rocks foreign to the islands (chalk, oolitic limestone, flint, &c), which must have been brought up from the region of Moray Firth, rests upon the old strata in many places. Local moraines are found in some of the valleys in Pomona and Hoy.

Climate and Industries. — The climate is remarkably temperate and equable for so northerly a latitude. The average temperature for the year is 46 F., for winter 39 F. and for summer 54° 3′ F. The winter months are January, February and March, the last being the coldest. Spring never begins till April, and it is the middle of June before the heat grows genial. September is frequently the finest month, and at the end of October or beginning of November occurs the peerie (or little) summer, the counterpart of the St Martin's summer of more southerly climes. The average annual rainfall varies from 33-4 in. to 37 in. Fogs occur during summer and early autumn, and furious gales may be expected four or five times in the year, when the crash of the Atlantic waves is audible for 20 m. To tourists one of the fascinations of the islands is their " nightless summers." On the longest day the sun rises at 3 o'clock A.M. and sets at 9.25 p.M. ; and darkness is unknown, it being possible to read at midnight. Winter, however, is long and depressing. On the shortest day the sun rises at 9.10 a.m. and sets at 3.17 P.M. The soil generally is a sandy loam or a strong but friable clay, and very fertile. Large quantities of seaweed as well as lime and marl are available for manure. Until the middle of the 19th century

the methods of agriculture were of a primitive character, but since then they -have been entirely transformed, and Orcadian farming is now not below the average standard of the Scottish lowlands. The crofters' houses have been rebuilt of stone and lime, and are superior to those in most parts of the Highlands. The holdings run fairly small, the average being between 30 and 40 acres. Practically the only grain crops that are cultivated are oats (which greatly predominate) and barley, while the favoured root crops are turnips (much the most extensively grown) and potatoes. Not half of the area has been

brought under cultivation, and the acreage under wood is insignificant. The raising of live stock is rigorously pursued. Shorthorns and polled Angus are the commonest breeds of cattle; the sheep are mostly Cheviots and a Cheviot-Leicester cross, but the native sheep are still reared in considerable numbers in Hoy and South Ronaldshay; pigs are also kept on several of the islands, and the horses — as a rule hardy, active and small, though larger than the famous Shetland ponies — are very numerous, but mainly employed in connexion with agricultural work. The woollen trade once promised to reach considerable dimensions, but towards the end of the 18th century was superseded by the linen (for which flax came to be largely grown) ; and when this in turn collapsed before the products of the mills of Dundee, Dunfermline and Glasgow, straw-plaiting was taken up, though only to be killed in due time by the competition of the south. The kelp industry, formerly of at least minor importance, has ceased. Sandstone is quarried on several islands, and distilleries are found in Pomona (near Kirkwall and Stromness). But apart from agriculture the principal industry is fishing. For several centuries the Dutch practically monopolized the herring fishery, but when their supremacy was destroyed by the salt duty, the Orcadians failed to seize the opportunity thus pre- sented, and George Barry (d. 1805) says that in his day the fisheries were almost totally neglected. The industry, however, has now been organized, and over 2000 persons are employed in the various branches of it. The great catches are herring, cod and ling, but lobsters and crabs are also exported in large quantities. There is a regular com- munication by steamer between Stromness and Kirkwall, and Thurso, Wick, Aberdeen and Leith, and also between Kirkwall and Lerwick and other points of the Shetlands.

Population and Administration. — In 1891 the population numbered 30,453, and in 1901 it was 28,699, or 67 persons to the sq. m. In 1901 there were 70 persons who spoke Gaelic and ‘English, but none who spoke Gaelic only. Orkney unites with Shetland to send one member to parliament, and Kirkwall, the county town and the only royal burgh, is one of the Wick district groups of parliamentary burghs. There is a combination poorhouse at Kirkwall, where there are also two hospitals. Orkney forms a sheriffdom with Shetland and Caithness, and a resident sheriff-substitute sits at Kirkwall. The county is under the school-board jurisdiction, but at Kirkwall and Stromness there are public schools giving secondary education.

The Inhabited Islands. — Premising that they are more or less scattered, and that several lie on the same plane, the following list gives the majority of the inhabited islands from south to north, the number within brackets indicating the population. Sule Skerry (3) and

the Pentland Skerries (8) lie at the eastern entrance of the Portland Firth; Swona (23), if m. from the mainland, belongs to Caithness and is situated in the parish of Canisbay ; South Ronald- shay (1991) is the best cultivated and most fertile of the southern isles of the group. On Hoxa Head, to the west of the large village of St Margaret's Hope, is a broch, or round tower, and the island contains, besides, examples of Picts' houses and standing stones. Hoy {q.v. ; 1216) is the southernmost of the larger islands. _ Flotta (372), east of Hoy, was the home for a long time of the Scandinavian compiler of the Codex Flotticensis, which furnished Thormodr Torfaeus (1636-1719), the Icelandic antiquary, with many of the facts for his History of Norway, more particularly with reference to the Norse occupation of Orkney. Pharay (59) also lies E. of Hoy. Burray (677) is famous for the broch from which the island takes its name (Borgarey, Norse, " island of the broch "). The tower stands on the north-western shore, is 15 ft. high, has walls from 15 to 20 ft. thick, built of layers of flat stones without cement or mortar, and an interior diameter of 40 ft. It is entered from the east by a passage, on each side of which there is a small chamber constructed within the thickness of the wall. Similar chambers occur on the west, north and south sides, accessible only from the interior. Adjoining the southern chamber is the inside stair conducting to the top of the broch ; of this stair some twenty steps remain. Between Hoy and Pomona are Hunda (8), Cava (17), and Graemsay (195), which has excellent soil and is mostly under cultivation. The isle is surrounded by shoals, and high-level and low-level lighthouses have been erected, the one at the north-west and the other at the north-east corner. The cliffs of Copinshay (10) are a favourite haunt of sea-birds, which are captured by the cragsmen for their feathers and eggs. Half a mile to the N.E. is the great rock which, from a fancied resemblance to a horse rearing its head from the sea, is called the Horse of Copinshay. Pomona {q.v. ; 16,235) ' s the principal

island and as such is known also as Mainland. Shapinshay (765) was the birthplace of William Irving, father of Washington Irving. It possesses several examples of Pictish and Scandinavian an- tiquities, such as the " Odin stone " and the broch of Burrowstone. Balfour Castle, a mansion in the Scottish Baronial style built in 1848, is situated near the south-western extremity of the island. The island takes its name from Hjalpand, a Norse viking. Gairsay (33) was the residence of Sweyn Asleifson, the rover, celebrated in the Orkneyinga Saga for his exploits as a trencherman and his feats in battle. Stronsay (1159) is a busy station of the herring fishery, and is also largely under cultivation. At Lamb Head, its south- easterly point, is a broch and Pictish pier, and about 2 m. farther north, on Odin Bay, is a round

pit in the rocks called the Vat of Kirbuster. The well of Kildinguie was once resorted to as a specific for leprosy. Papa Stronsay (16) commemorates in its name, as others of both the Orkneys and Shetlands do, the labours of the Celtic papae, or missionaries, who preached the Christian gospel before the arrival of the Northmen. The adjacent Veira or Wire has a population of 60. Egilshay (142) is the island on which St Magnus was murdered by his cousin Hacco in 1115. It derives its name — Church (ecclesia) Island — from the little church of St Magnus, now in ruins, consisting of a chancel 15 ft. long, and nave 30 ft. long. The building has a round tower at the west end of the nave. The tower resembles similar constructions found beside Irish churches of the 7th and 8th centuries and has walls 3 ft. thick. It is doubtful whether it must be ascribed to the Celtic evangelists or to a much later period — not earlier than the 12th century. On Rousay (627) the cairn of Blotchnie Fiold (811 ft.), the highest point of the island, commands a beautiful survey of the northern isles of the archipelago. At the southern base of the hill stands the fine mansion of Trumbland House. Eday (596) contains several specimens of weems, mounds and standing stones. It affords good pasturage and has sandstone quarries. Carrick village, once a burgh of barony, with salt pans and other manufactures, was named after the earl of Carrick, brother of Patrick Stewart, 2nd earl of Orkney (d. 1614). It was off this island that John Gow, the pirate, was taken in 1725. Sanday (1727), with an area of 19 sq. m., is one of the largest of the northern isles, and yields excellent crops of potatoes and grain. It has safe harbours, in the north at Otterswick and in the south at Kettletoft. The antiquities include a broch in Elsness. Pharay (47) lies W. of Edey. Westray (1956), one of the seats of the cod fishery, has a good harbour at Pier-o'wall. Noltland Castle, in the vicinity, is interesting as having been proposed as the refuge of Queen Mary after her flight from Loch Leven. It dates from the 15th century or even earlier, and was at one time the property of Sir Gilbert Balfour, the Master of Queen Mary's Household. The building, now in ruins, was never completed. On one side of the inner court, to which a finely ornamental doorway gives access, is a large hall with a vaulted ceiling of stone, 20 ft. high. The cliffs and overhanging crags at Noup Head (250 ft.), the most westerly point, are remark ably picturesque. An isolated portion, divided from the headland by a narrow chasm, is known as the Stack of Noup. Gentleman's Cave, I m. to the south, was so called from the circumstance that it afforded shelter to five of the leading followers of Prince Charles Edward, who lay here during the winter of 1 745-1 746. Papa Westray (295) and North Ronaldshay (442) are the most northerly islands of the group. The latter is only reached from Sanday, from which it is separated by a dangerous firth

2\ m. wide. The monu- mental stone with Ogham inscription, which was discovered in the broch of Burrian, must date from the days of the early Christian missionaries.

History. — The Orkneys were the Orcades of classical writers, and the word is probably derived from the Norse Orkn, seal, and ey, island. The original inhabitants were Picts, evidence of whose occupation still exists in numerous weems or under- ground houses, chambered mounds, barrows or burial mounds, brochs or round towers, and stone circles and standing stones. Such implements as have survived are of the rudest description, and include querns or stone handmills for grinding corn, stone worls and bone combs employed in primitive forms of woollen manufacture, and specimens of simple pottery ware. If, as seems likely, the Dalriadic Scots towards the beginning of the 6th century established a footing in the islands, their success was short-lived, and the Picts regained power and kept it until dispossessed by the Norsemen in the 9th century. In the wake of the Scots incursionists followed the Celtic missionaries about 565. They were companions of St Columba and their efforts to convert the folk to Christianity seem to have impressed the popular imagination, for several islands bear the epithet ” Papa ” in commemoration of the preachers. Norse pirates having made the islands the headquarters of their buccaneering expedi- tions indifferently against their own Norway and the coasts and isles of Scotland, Harold Haarfager (” Fair Hair “) subdued

the rovers in 875 and both the Orkneys and Shetlands to Norway. They remained under the rule of Norse earls until 1 231, when the line of the jarls became extinct. In that year the earldom of Caithness was granted to Magnus, second son of the earl of Angus, whom the king of Norway apparently con- firmed in the title. In 1468 the Orkneys and Shetlands were pledged by Christian I. of Denmark for the payment of the dowry of his daughter Margaret, betrothed to James III. of Scotland, and as the money was never paid, their connexion with the crown of Scotland has been perpetual. In 147 1 James bestowed the castle and lands of Ravenscraig in Fife on William, earl of Orkney, in exchange for all his rights to the earldom of Orkney, which, by act of parliament -passed on the 20th of February of the same year, was annexed to the Scottish crown. In 1564 Lord Robert Stewart, natural son of James V., who had visited Kirkwall twenty-four years before, was made sheriff of the Orkneys

and Shetlands, and received possession of the estates of the udallers; in 1 581 he was created earl of Orkney by James IV., the charter being ratified ten years later to his son Patrick, but in 161 5 the earldom was again annexed to the crown. The islands were the rendezvous of Montrose's expedition in 1650 which culminated irl his imprisonment and death. During the Protectorate they were visited by a detachment of Cromwell's troops, who initiated the inhabitants into various industrial arts and new methods of agriculture. In 1707 the islands were granted to the earl of Morton in mortgage, redeemable by the Crown on payment of £30,000, and subject to an annual feu-duty of £500; but in 1766 his estates were sold to Sir Lawrence Dundas, ancestor of the earls of Zetland. In early times both the archbishop of Hamburg and the archbishop of York disputed with the Norwegians ecclesiastical jurisdiction over the Orkneys and the right of consecrating bishops; but ultimately the Norwegian bishops, the first of whom was William the Old, consecrated in 1 102, continued the canonical succession. The see remained vacant from 1580 to 1606, and from 1638 till the Restoration, and, after the accession of William III., the episcopacy was finally abolished (1697), although many of the clergy refused to conform. The topography of the Orkneys is wholly Norse, and the Norse tongue, at last extinguished by the constant influx of settlers from Scotland, lingered until the end of the 18th century. Readers of Scott's Pirate will remember the frank contempt which Magnus Troil expressed for the Scots, and his opinions probably accurately reflected the general Norse feeling on the subject. When the islands were given as security for the princess's dowry, there seems reason to believe that it was intended to redeem the pledge, because it was then stipulated that the Norse system of govern- ment and the law of St Olaf should continue to be observed in Orkney and Shetland. Thus the udal succession and mode of land tenure (or, that is, absolute freehold as distinguished from feudal tenure) still obtain to some extent, and the remaining udallers hold their lands and pass them on without written title. Among well-known Orcadians may be mentioned James Atkine (1613-1687), bishop first of Moray and afterwards of Galloway; Murdoch McKenzie (d. 1797), the hydrographer; Malcolm Laing (1762-1818), author of the History of Scotland from the Union of the Crowns to the Union of the Kingdoms; Mary Brunton (1778-1818), author of Self-Control, Discipline and" other novels; Samuel Laing (1780-1868), author of A Residence in Norway, and translator of the Heimskringla, the Icelandic chronicle of the kings of Norway; Thomas Stewart Traill (1781-1862), pro- fessor of medical jurisprudence in Edinburgh University and editor of the 8th edition of the Encyclopaedia Britannica; Samuel Laing (1812-1897), chairman of the London, Brighton & South Coast railway, and

introducer of the system of ” parliamentary ” trains with fares of one penny a mile; Dr John Rae (1813-1893), the Arctic explorer; and William Balfour Baikie (1825-1864), the African traveller.

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(1868); D. Balfour, Odal Rights and Feudal Wrongs • (i860); J. Fergusson, The Brochs and Rude Stone Monuments of the Orkney Islands (1877); J. B. Craven, History of the Episcopal Church in Orkney (1883) ; J. R. Tudor, Orkney and Shetland (1883).

ORLEANAIS, one of the provinces into which France was divided before the Revolution. It was the country around Orleans, the pagus Aurelianensis; it lay on both banks of the Loire, and for ecclesiastical purposes formed the diocese of Orleans. It was in the possession of the Capet family before the advent of Hugh Capet to the throne of France in 987, and in 1344 Philip VI. gave it with the title of duke to Philip (d. 1375), one of his younger sons. In a geographical sense the region around Orleans is sometimes known as Orleanais, but this is somewhat smaller than the former province.

See A. Thomas, Les Utats provinciaux de la France centrale (1879).

ORLEANISTS, a French political party which arose out of the Revolution, and ceased to have a separate existence shortly after the establishment of the third republic in 1872. It took its name from the Orleans branch of the house of Bourbon, the descendants of the duke of Orleans, the younger brother of Louis XIV., who were its chiefs. The political aim of the Orleanists may be said to have been to find a common measure for the monarchical principle and the ” rights of man ” as set forth by the revolutionary leaders in 1789. The articles on Philippe, nicknamed Egalite (see Orleans, L.P.J.,dukeof), and his son Louis Philippe, king of the French (1830-1848), will show the process of events by which it came to pass that the Orleans princes became the more or less successful advocates of this attempted compromise between old and new. It may be noted here, however, that a certain attitude of opposition, and of patronage of ” freedom,” was traditional in this branch of the house of Bourbon. Saint-Simon tells us that the regent Orleans who died in 1723 was in the habit of avowing his admiration for English liberty — at least in safe company

and private con- versation. Egalite, who had reasons to dislike King Louis XVI. and his queen, Marie Antoinette, stepped naturally into the position of spokesman of the liberal royalists of the early revolutionary time, and it was a short step from that position to the attitude of liberal candidates for the throne, as against the elder branch of the royal house which claimed to reign by divine right. The elder branch as represented by Louis XVIII. was prepared to grant [octroy er), and did grant, a charter of liberties. The count of Chambord, the last of the line (the Spanish Bourbons who descended directly from Louis XIV. were considered to be barred by the renunciation of Philip V. of Spain), was equally ready to grant a constitution. But these princes claimed to rule " in chief of God " and to confer constitutional rights on their subjects of their own free will, and mere motion. This feudal language and these mystic pretensions offended a people so devoted to principles as the French, and so acute in drawing deductions from premises, for they concluded, not unreasonably, that rights granted as a favour were always subject to revocation as a punishment. Therefore those of them who considered a monarchical government as more beneficial to France than a republic, but who were not disposed to hold their freedom subject to the pleasure of a king, were either Bonapartists who professed to rule by the choice of the nation, or supporters of the Orleans princes who were ready to reign by an " original com- pact " and by the will of the people. The difference therefore between the supporters of the elder line, or Legitimists, and the Orleanists was profound, for it went down to the very foundations of government.

The first generation of Orleanists, the immediate supporters of Philippe Egalite, were swamped in the turmoil of the great revolution. Yet it has been justly pointed out by Albert Sorel in his L' 'Europe et la revolution francaise, that they subsisted under the Empire, and that they came naturally to the front when the revival of liberalism overthrew the restored legitimate monarchy of Louis XVIII. and Charles X. During the Restora- tion, 1815-1830, everything tended to identify the liberals with the Orleanists. Legitimism was incompatible with constitutional freedom. Bonapartism was in eclipse, and was moreover essentially a Caesarism which in the hands of the great Napoleon

had been a despotism, calling itself democratic for no better reason than because it reduced all men to an equality of submission to a

master. Those rights of equality before the law, and in social life, which had been far dearer to Frenchmen of the revolutionary epoch than political freedom, were secured. The next step was to obtain political freedom, and it was made under the guidance of men who were Orleanists because the Orleans princes seemed to them to offer the best guarantee for such a government as they desired — a government which did not profess to stand above the people and to own it by virtue of a divine and legitimate hereditary right, nor one which, like the Bonapartists, implied a master relying on an army, and the general subjection of the nation. The liberals who were Orleanists had the advantage of being very ably led by men eminent in letters and in practical affairs — Guizot, Thiers, the Broglies, the banker Laffitte and many others. When the unsurpassed folly of the legitimate rulers brought about the revolution of 1830, the Orleanists stepped into its place, and they marked the pro- found change which had been made in the character of the govern- ment by calling the king. ” King of the French ” and not ” King of France and Navarre.” He was chief of the people by compact with the people, and not a territorial lord holding, in feudal phrase, ” in chief of God.”

The events of the eighteen years of Orleanist rule cannot be detailed here. They were on the whole profitable to France. That they ended in another ” general overturn ” in 1848 was due no doubt in part to errors of conduct in individual princes and politicians, but mainly to the fact that the Orleanis't conception of what was meant by the word ” people ” led them to offend the long-standing and deeply-rooted love of the French for equality. It had been inevitable that the Orleanists, in their dislike of ” divine right ” on the one hand, and their fear of democratic Caesarism on the other, should turn for examples of a free government to England, and in England itself to the Whigs, both the old Whigs of the Revolution Settlement of 1689, and the new Whigs who extorted political franchises for the middle classes by the Reform Bill. They saw there a monarchy based on a parliamentary title, governing constitutionally and supported by the middle classes, and they endeavoured to establish the like in France under the name of a juste-milieu, a via media between absolutism by divine right, and a democracy which they were convinced would lead to Caesarism. The French equivalent for the English middle-class constituencies was to be a pays legal of about a quarter of a million of voters by whom all the rest of the country was to be ” virtually represented.” The doctrine was expounded and was acted upon by Guizot with uncompromising rigour. The Orleanist monarchy became so thoroughly middle-class that the nation outside of the pays legal ended by thinking that it was being governed by a privileged class less offensive, but also a great

deal less brilliant, than the aristocracy of the old monarchy.

The revolution of 1848 swept the Orleanist party from power for ever. The Orleanists indeed continued throughout the Second Republic and the Empire (1848-1870) to enjoy a marked social and literary prestige, on the strength of the wealth and capacity of some of their members, their influence in the French Academy and the ability of their organs in the press — particu- larly the Revue des deux mondes, the Journal des debats, and the papers directed by E. Herve. During the Empire the discreet opposition of the Orleanists, exercised for the most part with infinite dexterity and tact, by reticences, omissions, and historical studies in which the Empire was attacked under foreign or ancient names, was a perpetual thorn in the side of Napoleon III. Yet they possessed little hold on the country and outside of a cultivated liberal circle in Paris. Their weakness was demon- strated when the second empire was swept away by the German War of 1870-71. The country in its disgust at the Bonapartists and its fear of the Republicans, chose a great many royalists to represent it in the Assembly which met in Bordeaux on the 12th of February 1872. In this body the Orleanists again exercised a kind of leadership by virtue of individual capacity, but they were counterbalanced by the Legitimists. The most effective

proof of power they gave was to render possible the expulsion from power of Thiers on the 24th of May 1873, as punishment for his dexterous imposition of the Republic on the unwilling majority of the Assembly. Their real occupation was to en- deavour to bring about a fusion between themselves and the Legitimists which should unite the two royalist parties for the confusion of the Bonapartists and Republicans. The belief that a fusion would strengthen the royalists was natural and was not new. As far back as 1850 Guizot had proposed, or had thought of proposing, one, but it was on the condition that the comte de Chambord would resign his divine pretentions. When a fusion was arranged in 1873 it was on quite another footing. After muchexchange of notes and many agitated conferences in committee rooms and drawing-rooms, the comte de Paris, the representative of the Orleanists, sought an interview with the comte de Chambord at Frohsdorff, and obtained it by giving a written engagement that he came not only to pay his respects to the head of his house, but also to ” accept his principle.” It has been somewhat artlessly pleaded by the Orleanists that this engagement was given with mental reservations. But there were no mental reservations on the part of the comte de Chambord, and the country showed its belief that the liberal royalists had been fused by absorption in the divine right royalists. It returned republicans at by-

elections till it transformed the Assembly. The Orleanist princes had still a part to play, more particularly after the death of the comte de Chambord in 1883 left them heads of the house, of France, but the Orleanist party ceased to exist as an independent political organization.

Authorities— The Orleanists are necessarily more or less dealt with in all histories of France since 1789, and in most political memoirs, but their principles can be learnt and their fortunes followed from the following: A. Sorel, L' Europe et la revolution francaise (Paris, 1 885-1904); F. Guizot, Histoire parlementaire de la France (Paris, 1819-1848) and Memoires pour servir a I'hisloire de mon temps (Paris, 1 858-1 867); P. de la Gorce, Histoire du second empire (Paris, 1894-1904); and G. Hanotaux, Histoire de la France contemporaine (Paris, 1903, &c). (D. H.)

ORLEANS, DUKES OF. The title of duke of Orleans was first created by King Philip VI. in favour of his son Philip, who died without legitimate issue in 1375. The second duke of Orleans, created in 1392, was Louis, a younger son of Charles V., whose heir was his son, the poet Charles of Orleans. Charles's son Louis, the succeeding duke, became king of France as Louis XII. in 1498, when the duchy of Orleans was united with the royal domain. In 1626 Louis XIII. created his brother, Jean Baptiste Gaston, duke of Orleans, and having become extinct on the death of this prince in 1660 the title was revived in the following year by Louis XIV. in favour of his brother Philip. Descendants of this duke have retained the title until the present day, one of them becoming king of France as Louis Philippe in 1830. Two distinguished families are descended from the first house of Orleans: the counts of Angouleme, who were descended from John, a son of Duke Louis I., and who furnished France with a king in the person of Francis I. ; and the counts and dukes of Longueville, whose founder was John, count of Dunois, the bastard of Orleans, a natural son of the same duke. In addition to the dukes of Orleans the most important members of this family' are: Anne Marie Louise, duchess of Montpensier; Francis, prince of Joinville; Louis Philippe Albert, count of Paris; and the traveller Prince Henry of Orleans. See the genealogical table to the article Bourbon.

See below for separate articles on the chief personages.

ORLEANS, CHARLES, Duke or (1391-1465), commonly called Charles d'Orleans, French poet, was the eldest son of Louis, duke of Orleans (brother of Charles VI. of France), and of Valentina Visconti, daughter of Giau Galeazzo, duke of Milan. He was born on the 26th of May

1391. Although many minor details are preserved of his youth, nothing except his reception in 1403, from his uncle the king, of a pension of 12,000 livres d'or is worth noticing, until his marriage three years later (June 29, 1406) with Isabella, his cousin, widow of Richard II. of England. The bride was two years older than her husband, and is thought to have married him unwillingly.

but she brought him a great dowry — it is said, 500,000 francs. She died three years later, leaving Charles at the age of eighteen a widower and father of a daughter. He was already duke of Orleans, for Louis had been assassinated by the Burgundians two years before (1407). He soon saw himself the most im- portant person in France, except the dukes of Burgundy and Brittany, the king being a cipher. This position his natural temperament by no means qualified him to fill. His mother desired vengeance for her husband, and Charles did his best to carry out her wishes by filling France with intestine war. Of this, however, he was only nominally one of the leaders, the real guidance of his party resting with Bernard VII., the great count of Armagnac, whose daughter, Bonne, he married, or at least formally espoused, in 1410. Five years of confused negotia- tions, plots and fightings passed before the English invasion and the battle of Agincourt, where Charles was joint commander- in-chief. According to one account he was dangerously wounded and narrowly escaped with his life. He was certainly taken prisoner and carried to England, which country was his residence thenceforward for a full quarter of a century. Windsor, Ponte- fract, Ampthill, Wingfield (Suffolk) and the Tower are named among other places as the scenes of his captivity, which, how- ever, was anything but a rigorous one. He was maintained in the state due not merely to one of the greatest nobles of France but to one who ranked high in the order of succession to the crown. He hunted and hawked and enjoyed society amply, though the very dignities which secured him these privileges made his ransom great, and his release difficult to arrange. Above all, he had leisure to devote himself to literary work. But for this he would hardly be more than a name.

This work consists wholly of short poems in the peculiar artificial metres which had become fashionable in France about half a century or more before his birth, and which continued to be fashionable till nearly a century after his death. Besides these a number of English poems have been attributed to him, but without certainty. They have

not much poetical merit, but they exhibit something of the smoothness of versification not uncommon in those who write, with care, a language not their own. The ingenuity of a single English critic has striven to attribute to him a curious book in prose, called Le Debat des herauts de France et d'Angleterre, but Paul Meyer, in his edition of the book in question, has completely disposed of this theory. For all practical purposes, therefore, Charles's work consists of some hundreds of short French poems, a few in various metres, but the majority either ballades or rondels. The chrono- logy of these poems is not always clear, still less the identity of the persons to whom they are addressed, and it is certain that some, perhaps the greater part of them, belong to the later years of the poet's life. But many are expressly stated in the manuscripts to have been " composed in prison," others are obviously so composed, and, on the whole, there is in them a remarkable unity of literary flavour. Charles d'Orleans is not distinguished by any extraordinary strength of passion or origin- ality of character; but he is only the more valuable as the last and not the least accomplished representative of the poetry of the middle of the middle ages, in which the form was almost everything, and the personality of the poet, save in rare instances, nothing. Yet he is not entirely without differentia. He is a capital example of the cultivated and refined— it may almost be called the lettered — chivalry of the last chivalrous age, expert to the utmost degree in carrying out the traditional details of a graceful convention in love and literature. But he is more than this; in a certain easy grace and truth of ex- pression, as well as in a peculiar mixture of melancholy, which is not incompatible with the enjoyment of the pleasures, even the trifling pleasures, of life, with listlessness that is fully able to occupy itself about those trifles, he stands quite alone. He has the urbanity of the 18th century without its vicious and prosaic frivolity, the poetry of the middle ages without their tendency to tediousness. His best-known rondels — those on Spring, on the Harbingers of Summer, and others — rank second to nothing of their kind.

Poetry, however, could hardly be an entire consolation, and Charles was perpetually scheming for liberty. But the English . government had too many reasons for keeping him, and it was not till his hereditary foe Philip the Good of Burgundy interested himself in him that the government of Henry VI., which had by that time lost most of its hold on France, released him in return for an immediate payment of 80,000 saluls d'or, and an engagement on his part to pay 140,000 crowns at a future time. The agreement was concluded on the 2nd of July, 1440. He was actually released on the 3rd of November following, and almost immediately cemented his friendship with Duke

Philip by marry- ing his niece, Mary of Cleves, who brought him a considerable dowry to assist the payment of his ransom. He had, however, seme difficulty in making up the balance, as well as the large sum required for his brother, Jean d'Angouleme, who also was an English prisoner. The last twenty-five years of his life (for, curiously enough, it divides itself into three almost exactly equal periods, each of that length) were spent partly in negotiat- ing, with a little fighting intermixed, for the purpose of gaining the Italian county of Asti, on which he had claims through his mother, partly in travelling about, but chiefly at his principal seat of Blois. Here he kept a miniature court which, from the literary point of view at least, was not devoid of brilliancy. At this most of the best-known French men-of-letters at the time — Villon, Olivier de la Marche, Chastelain, Jean Meschinot and others — were residents or visitors or correspondents. His son, afterwards Louis XII., was not born till 1462, three years before Charles's own death. He had become, notwithstanding his high position, something of a nullity in politics, and tradition ascribes his death to vexation at the harshness with which Louis XL rejected his attempt to mediate on behalf of the duke of Brittany. At any rate he died, on the 4th of January, 1465, at Amboise. Many of his later poems are small occasional pieces addressed to his courtiers and companions, and in not a few cases answers to them by those to whom they were addressed exist.

The best edition of Charles d'Orleans's poems, with a brief but sufficient account of his life, is that of C. d'Hericault in the Nouvelle collection Jannet (Paris, 1874). For the English poems see the edition by Watson Taylor for the Roxburghe Club (1827). (G. Sa.)

ORLEANS, FERDINAND PHILIP LOUIS CHARLES HENRY,

Duke of (1810-1842), born at Palermo on the 3rd of September 1 8 10, was the son of Louis Philippe, duke of Orleans, afterwards king of France, and Marie Amelie, princess of the Two Sicilies. Under the Restoration he bore the title of duke of Chartres, and studied classics in Paris at the College Henri IV. At the out- break of the Revolution, which in 1830 set his father on the throne, he was colonel of a regiment of Hussars. He then assumed the title of duke of Orleans, and was sent by the king to Lyons to put down the formidable riots which had broken out there (1831), and then to the siege of Antwerp (1832). He was appointed lieutenant-general, and made several campaigns in Algeria (1835, 1839, 1840). On his return to France he organized the battalions of light infantry known as the chasseurs d'OrUans. He died as the result of a carriage accident at Neuilly, near Paris, on the 13th of July 1842.

The duke of Orleans had married (May 30, 1837) Helene Louise Elisabeth of Mecklenburg-Schwerin, and had by her two sons, the count of Paris and the duke of Chartres. On the 24th of February 1848, after the abdication of Louis Philippe, the duchess of Orleans went to the Chamber of Deputies assembled in the Palais Bourbon in the hope of having her eldest son proclaimed and of obtaining the regency; but the threatening attitude of the populace forced her to flee. She took refuge in England, and died at Richmond on the 18th of May 1858.

(M. P.*)

ORLEANS, HENRI, Prince of (1867-1901), eldest son of Robert, duke of Chartres, was born at Ham, near Richmond, Surrey, on the 16th of October 1867. In 1889, at the instance of his father, who paid the expenses of the tour, he undertook, in company with MM. Bonvalot and Dedecken, a journey through Siberia to Siam. In the course of their travels they crossed the

mountain range of Tibet, and the fruits of their observations, submitted to the Geographical Society of Paris (and later incorporated in De Paris au Tonkin a travers le Tibet inconnu, published in 1892), brought them conjointly the gold medal of that society. In 1892 the prince made a short journey of exploration in East Africa, and shortly afterwards visited Madagascar, proceeding thence to Tongking. From this point he set out for Assam, and was successful in discovering the sources of the river Irrawaddy, a brilliant geographical achieve- ment which secured the medal of the Geographical Society of Paris and the cross of the Legion of Honour. In 1897 he revisited Abyssinia, and political differences arising from this trip led to a duel with the comte de Turin, in which both combatants were wounded. While on a trip to Assam in 1901 he died at Saigon on the 9th of August. Prince Henri was a somewhat violent Anglophobe, and his diatribes against Great Britain contrasted rather curiously with the cordial reception which his position as a traveller obtained for him in London, where he was given the gold medal of the Royal Geographical Society.

ORLEANS, HENRIETTA, Duchess of (1644-1670), third daughter of the English king, Charles I., and his queen, Henrietta Maria, was born during the Civil War at Exeter on the 16th of June 1644. A few days

after her birth her mother left England, and provision for her maintenance having been made by Charles she lived at Exeter under the care of Lady Dalkeith (afterwards countess of Morton) until the surrender of the city to the parlia- mentarians, when she was taken to Oatlands in Surrey. Then in July 1646 Lady Dalkeith carried the princess in disguise to France, and she rejoined her mother in Paris, where her girlhood was spent and where she was educated as a Roman Catholic. Henrietta was present at the coronation of Louis XIV., and was mentioned as a possible bride for the king, but she was betrothed, not to Louis, but to his only brother Philip. After, the restoration of her brother Charles II., she returned to England with her mother, but a few months later she was again in Paris, where she was married to Philip, now duke of Orleans, on the 30th of March 1661. The duchess was very popular at the court of Louis XIV., and was on good terms with the grand monarch himself; she shared in the knowledge of state secrets, but was soon estranged from her husband, and at the best her conduct was very imprudent. In 1670, at the instigation of Louis, she visited. England and obtained the signature of Charles II. ‘s ministers to the treaty of Dover; her success in this matter greatly delighted Louis, but it did not improve her relations with Philip, who had long refused his consent to his wife’s visit to England. Shortly after returning to France, Henrietta died at St Cloud on the 30th of June 1670. She was buried at St Denis, her funeral oration being pronounced by her friend Bossuet, and it was asserted that she had been poisoned by order of her husband. She left two daughters, Marie Louise, wife of Charles II. of Spain, and Anne Marie, wife of Victor Amadeus II. of Savoy. According to legitimist principles, the descendants of Henrietta, through her daughter Marie of Savoy, are entitled to wear the British crown.

ORLEANS, JEAN BAPTISTE GASTON, Duke of (1608-1660), third son of the French king Henry IV., and his wife Marie de Medici, was born at Fontainebleau on the 25th of April 1608. Known at first as the duke of Anjou, he was created duke of Orleans in 1626, and was nominally in command of the army which besieged La Rochelle in 1628, having already entered upon that course of political intrigue which was destined to occupy the remainder of his life. On two occasions he was obliged to leave France for conspiring against the government of his mother and of Cardinal Richelieu; and after waging an unsuccessful war in Languedoc, he took refuge in Flanders. Reconciled with his brother Louis XIII. , he plotted against Richelieu in 1635, fled from the country, and then submitted to the king and the cardinal. Soon afterwards the same process was repeated. Orleans stirred up Cinq-Mars to attempt Riche- lieu’s murder, and then deserted his

unfortunate accomplice. In 1643, on the death of Louis XIII., Gaston became lieutenant- general of the kingdom, and fought against Spain on the northern

frontiers of France; but during the wars of the Fronde he passed with great facility from one party to the other. Then exiled by Mazarin to Blois in 1652 he remained there until his death on the 2nd of February 1660. Gaston's first wife was Marie (d. 1627), daughter and heiress of Henri de Bourbon, due de Mont- pensier (d. 1608), and his second wife was Marguerite (d. 1672), sister of Charles III., duke of Lorraine. By Marie he left a daughter, Anne Marie, duchesse de Montpensier (q.v.) ; and by Marguerite he left three daughters, Marguerite Louise (1645- 1721), wife of Cosimo III., grand duke of Tuscany; Elizabeth (1646-1696), wife of Louis Joseph, duke of Guise; and Francoise Madeleine (1648-1664), wife of Charles Emmanuel II., duke of Savoy. (M. P.*)

ORLEANS, LOUIS, Duke of (1372-1407), younger son of the French king, Charles V., was born on the 13th of March 1372. Having been made count of Valois and of Beaumont-sur-Oise, and then duke of Touraine, he received the duchy of Orleans from his brother Charles VI. in 1392, three years after his marriage with Valentina (d. 1408), daughter of Gian Galeazzo Visconti, duke of Milan. This lady brought the county of Asti to her husband ; but more important was her claim upon Milan, which she transmitted to her descendants, and which furnished Louis XII. and Francis I. with a pretext for interference in northern Italy. When Charles VI. became insane in 1392, Orleans placed himself in opposition to his uncle Philip II., duke of Burgundy, who was conducting the government; and this quarrel was not only the dominating factor in the affairs of France, but extended beyond the borders of that country. Continued after Philip's death in 1404 with his son and successor, John the Fearless, it culminated in the murder of Orleans by one of John's partisans on the 23rd of November 1407. The duke, who was an accomplished and generous prince, was suspected of immoral relations with several ladies of the royal house, among them Isabella of Bavaria, the queen of Charles VI. He had eight children by Valentina Visconti, including his successor, Charles of Orleans, the poet, and one of his natural sons was the famous bastard of Orleans, John, count of Dunois.

See E. Jarry, La Vie politique de Louis d'Orleans (Paris, 1889).

ORLEANS, LOUIS, Duke of (1703-1752), only son of Duke Philip II., the regent Orleans, was born at Versailles on the 4th of August 1703. A pious, charitable and cultured prince, he took very little part in the

politics of the time, although he was conspicuous for his hostility to Cardinal Dubois in 1723. In 1730 Cardinal Fleury secured his dismissal from the position of colonel-general of the infantry, a post which he had held for nine years; and retiring into private life, he spent his time mainly in translating the Psalms and the epistles of St Paul. Having succeeded his father as duke of Orleans in 1723, he died in the abbey of St Genevieve at Paris on the 4th of February 1752. His wife Augusta (d. 1726), daughter of Louis William, margrave of Baden, bore him an only son, Louis Philippe, who succeeded his father as duke of Orleans.

ORLEANS, LOUIS PHILIPPE, Duke of (1725-1785), son of Louis, duke of Orleans, was born at Versailles on the 12th of May 1725, and was known as the duke of Chartres until his father's death in 1752. Serving with the French armies he distinguished himself in the campaigns of 1742, 1743 and 1744, and at the battle of Fontenoy in 1745, retiring to Bagnolet in 1757, and occupying his time with theatrical performances and the society of men of letters. He died at St Assise on the 18th of November 1785. The duke married Louise Henriette de Bourbon-Conti, who bore him a son Philip (figalite), duke of Orleans, and a daughter, who married the last duke of Bourbon. His second wife, Madame de Montesson, whom he married secretly in 1773, was a clever woman and an authoress of some repute. He had two natural sons, known as the abbot of St Far and the abbot of St Albin.

See L'Automne d'un prince, a collection of letters from the duke to his second wife, edited by J. Hermand (1910).

ORLEANS, LOUIS PHILIPPE JOSEPH, Duke of (1747-1793), called Philippe Egalite, son of Louis Philippe, duke of Orleans, and of Louise Henriette of Bourbon-Conti, was born at St Cloud

on the 13th of April 1747. Having borne the title of duke of Montpensier until his grandfather's death in 1752, he became duke of Chartres, and in 1769 married Louise Marie Adelaide de Bourbon-Penthievre, daughter and heiress of the duke of Penthievre, grand admiral of France, and the richest heiress of the time. Her wealth made it certain that he would be the richest man in France, and he determined to play a part equal to that of his great-grandfather, the regent, whom he resembled in character and debauchery. As duke of Chartres he opposed the plans of Maupeou in 1771, and was promptly

exiled to his country estate of Villers-Cotterets (Aisne). When Louis XVI. came to the throne in 1774 Chartres still found himself looked on coldly at court ; Marie Antoinette hated him, and envied him for his wealth, wit and freedom from etiquette, and he was not slow to return her hatred with scorn. In 1778 he served in the squadron of D'Orvilliers, and was present in the naval battle of Ushant on the 27th of July 1778. He hoped to see further service, but the queen was opposed to this, and he was removed from the navy, and given the honorary post of colonel-general of hussars. He then abandoned himself to pleasure; he often visited London, and became an intimate friend of the prince of Wales (afterwards George IV.); he brought to Paris the " anglo-mania," as it was called, and made jockeys as fashionable as they were in England. He also made himself very popular in Paris by his large gifts to the poor in time of famine, and by throwing open the gardens of the Palais Royal to the people. Before the meeting of the notables in 1787 he had succeeded his father as duke of Orleans, and showed his liberal ideas, which were largely learnt in England, so boldly that he was believed to be aiming at becoming constitutional king of France. In November he again showed his liberalism in the lit de justice, which Brienne had made the king hold, and was again exiled to Villers-Cotterets. The approaching convocation of the states- general made his friends very active on his behalf; he circulated in every bailliage the pamphlets which F. J. Sieyes had drawn up at his request, and was elected in three — by the noblesse of Paris, ■ Villers-Cotterets and Crepy-en-Valois. In the estate of the nobility he headed the liberal minority under the guidance of Adrien Duport, and led the minority of forty-seven noblemen who seceded from their own estate (June 1789) and joined the Tiers Etat. The part he played during the summer of 1789 is one of the most debated points in the history of the Revolution. The court accused him of being at the bottom of every popular movement, and saw the " gold of Orleans " as the cause of the Reveillon riot and the taking of the Bastille, as the republicans later saw the " gold of Pitt " in every germ of opposition to themselves. There can be no doubt that he hated the queen, and bitterly resented his long disgrace at court, and also that he sincerely wished for a thorough reform of the government and the establishment of some such constitution as that of England ; and no doubt such friends as Adrien Duport and Choderlos de Laclos, for their own reasons, wished to see him king of France. The best testimony for the behaviour of Orleans during this summer is the testimony of an English lady, Mrs Grace Dalrymple Elliott, who shared his heart with the comtesse de Buffon, and from which it is absolutely certain that at the time of the riot of the 1 2th of July he was on a fishing excursion, and was rudely treated by the king on the

next day when going to offer him his services. He indeed became so disgusted with the false position of a pretender to the crown, into which he was being forced, that he wished to go to America, but, as the comtesse de Buffon would not go with him, he decided to remain in Paris. He was again accused, unjustly, of having caused the march of the women to Versailles on the 5th of October. La Fayette, jealous of his popularity, persuaded the king to send the duke to England on a mission, and thus get him out of France, and he accordingly remained in England from October 1789 to July 1790. On the 7th of July he took his seat in the Assembly, and on the 2nd of October both he and Mirabeau were declared by the Assembly entirely free of any complicity in the events of October. He now tried to keep himself as much out of the political world as possible, but in vain, for the court would

suspect him, and his friends would talk about his being king. The best proof of his not being ambitious of such a doubtful piece of preferment is that he made no attempt to get himself made king, regent or lieutenant-general of the kingdom at the time of the flight to Varennes in June 1791. He, on the contrary, again tried to make his peace with the court in January 1792, but he was so insulted that he was not encouraged to sacrifice himself for the sake of the king and queen, who persisted in remembering all old enmities in their time of trouble. In the summer of 1792 he was present for a short time with the army of the north, with his two sons, the duke of Chartres and the duke of Montpensier, but had returned to Paris before the 10th of August. After that day he underwent great personal risk in saving fugitives; in particular, he saved the life of the count of Champcenetz, the governor of the Tuileries, who was his personal enemy, at the request of Mrs Elliott. It was impossible for him to recede, and, after accepting the title of Citoyen Egalite, conferred on him by the commune of Paris, he was elected twentieth and last deputy for Paris to the Convention. In that body he sat as quietly as he had done in the National Assembly, but on the occasion of the king's trial he had to speak, and then only to give his vote for the death of Louis. His compliance did not save him from suspicion, which was especially aroused by the friendship of his eldest son, the duke of Chartres, with Dumouriez, and when the news of the desertion of Chartres with Dumouriez became known at Paris all the Bourbons left in France, including Egalite, were ordered to be arrested on the 5th of April. He remained in prison till the month of October, when the Reign of Terror began. He was naturally the very sort of victim wanted, and he was decreed " of accusation " on the 3rd of October. He was tried on the 6th of November and was guillotined on the same day, with a

smile upon his lips and without any appearance of fear. No man ever was more blamed than Orleans during the Revolution, but the faults of ambition and intrigue were his friends', not his own; it was his friends who wished him to be on the throne. Personally he possessed the charming manners of a polished grand seigneur: debauched and cynical, but never rude or cruel, full of gentle consideration for all about him but selfish in his pursuit of pleasure, he has had to bear a heavy load of blame, but it is ridiculous to describe the idle and courteous voluptuary as being a dark and designing scoundrel, capable of murder if it would serve his ambition. The execution of Philippe Egalite made the friend of Dumouriez, who was living in exile, duke of Orleans. Authorities. — Baschet, Histoire de Philippe Ugalite; Journal of Mrs Grace Dalrymple Elliott (1859); A. Nettement, Philippe- Egalile (Paris, 1842) ; Laurentie, Histoire des dues d'Orleans (Paris, 1832); G. Peignot, Precis historique de la maison d'Orleans (Paris, 1830); L. C. R(ousselet), Correspondance de Louis-Philippe Joseph d'Orleans avec Louis XVI (Paris, 1800); Rivarol, Portrait du due d'Orleans et de Madame de Genlis; Tournois, Histoire du Louis Philippe Joseph due d'Orleans (Paris, 1842).

ORLEANS, LOUIS PHILIPPE ROBERT, Duke of (1869-), eldest son of the comte de Paris, was born at York House, Twickenham, on the 6th of February 1869. The law of exile against the French princes having been abrogated in 1871, he returned with his parents to France. He was first educated by a private tutor, and then followed the courses of the municipal college at Eu. In 1882 he entered the College Stanislas, Paris, and took a first prize in a competitive Latin translation. On the death of the comte de Chambord, the comte de Paris became head of the Bourbons; and in 1886 he and his son were exiled from France. Queen Victoria appointed the duke of Orleans a super- numerary cadet at the Royal Military College, Sandhurst. After passing his examinations he received a commission in the 4th battalion of the 60th Rifles, then quartered in India. In January 1888 the duke went out to India, accompanied by Colonel de Parseval as military governor and adviser. At Bombay he was received by the duke of Connaught and Lord Reay, and at Calcutta he became the guest of the viceroy, the marquess of Dufferin, who organized for the duke and his cousin, Prince Henry of Orleans, a grand tiger-shooting expedition in Nepaul. The duke now reported himself to the commander-in-

chief , afterwards Earl Roberts.and joined his regiment at Chakrata.

After seeing service, the duke ceased his connexion with the Indian army in February 1889, and returned to England. On attaining his majority, he entered Paris (February 7, 1890), and proceeding to the mairie, expressed his desire, as a French- man, to perform his military service. This act caused great excitement, and he was arrested in conformity with the law of 1886, which forbade the soil of France to the direct heirs of the families which had reigned there. He was tried, and sentenced to two years' imprisonment; but he was liberated by President Carnot after a few months' nominal incarceration (June 4), and conducted to the Swiss frontier. This escapade won for him the title of " Le Premier Conscrit de France." After the comte de Paris's funeral (September 12, 1894) the duke received his adherents in London, and then removed to Brussels, as being nearer France. On the 5th of November 1896 the duke married the archduchess Maria Dorothea Amalia of Austria, the ceremony taking place at Vienna. It was alleged that some of his followers were implicated in the conspiracies against the French Republic in 1899. A letter which the duke wrote in 1900, approving the artist whose caricatures were grossly insulting to Queen Victoria, excited great indignation both in England and in many French circles, and estranged him from many with whom he had formerly been upon friendly terms; but after Queen Victoria's death it was allowed to become known that this affair had been forgotten and forgiven by the British royal family. The duke of Orleans made several long ex- ploring journeys, being particularly interested in polar dis- coveries. In 1905 he published Une croisiere au Spitzberg, and, later, another account of his travels, under the title A travers la Banquise.

ORLEANS, PHILIP I., Duke of (1640-1701), son of the French king Louis XIII., was born at St Germain-en-Laye on the 21st of September 1640. In 1661 he. was created duke of Orleans, and married Henrietta, sister of Charles II. of England; but the marriage was not a happy one, and the death of the duchess in 1670 was attributed to poison. Subsequently he married Charlotte Elizabeth, daughter of Charles Louis, elector palatine of the Rhine. Having fought with distinction in Flanders in 1667, Monsieur, as Orleans was generally called, returned to military life in 1672, and in 1677 gained a great victory at Cassel and took St Omer. Louis XIV., it was said, was jealous of his brother's success; at all events Orleans never commanded an army again. He died at St Cloud on the 8th of June 1701, leaving a son, Philip, the regent Orleans, and two daughters: Anne Marie (1669-1728), wife of Victor Amadeus II., duke of Savoy; and Elizabeth Charlotte (1676-1744), wife of Leo- pold, duke of Lorraine. His eldest daughter, Marie Louise (1662-1689), wife of Charles II. of Spain, died

before her father. (M. P.*)

ORLEANS, PHILIP II., Duke or ˆ674-1723), regent of France, son of Philip I., duke of Orleans, and his second wife, the princess palatine, was born on the 2nd of August 1674, and had his first experience of arms at the siege of Mons in 1691. His marriage with Mile de Blois, the legitimized daughter of Louis XIV., won him the favour of the king. He fought with distinc- tion at Steinkerk, Neerwinden and Namur (1692-1695). During the next few years, being without employment, he studied natural science. He was next given a command in Italy (1706) and in Spain (r 707-1 708) where he gained some important successes, but he cherished lofty ambitions and was suspected of wishing to take the place of Philip V. on the throne of Spain. Louis XIV. was angry at these pretensions, and for a long time held him in disfavour. In his will, however, he appointed him president of the council of regency of the young King Louis XV. (17 1 5). After the death of the king, the duke of Orleans went to the parlement, had the will annulled, and himself invested with absolute power. At first he made a good use of this, counselling economy, decreasing taxation, disbanding 25,000 soldiers and restoring liberty to the persecuted Jansenists. But the inquisi- torial measures which he had begun against the financiers led to disturbances. He was, moreover, weak enough to countenance

the risky operations of the banker John Law (17 17), whose bankruptcy, led to such a disastrous crisis in the public and private affairs of France.

There existed a party of malcontents who wished to transfer the regency from Orleans to Philip V., king of Spain. A con- spiracy was formed, under the inspiration of Cardinal Alberoni, first minister of Spain, and directed by the prince of Cellamare, Spanish ambassador in France, with the complicity of the duke and duchess of Maine; but in 1718 it was discovered and defeated. Dubois, formerly tutor to the duke of Orleans, and now his all-powerful minister, caused war to be declared against Spain, with the support of the emperor, and of England and Holland (Quadruple Alliance). After some successes of the French marshal, the duke of Berwick, in Spain, and of the imperial troops in Sicily, Philip V. made peace with the regent

(1720).

On the majority of the king, which was declared on the 15th of February 1723, the duke of Orleans resigned the supreme power; but he became first minister to the king, and remained in office till his

death on the 23rd of December 1723. The regent had great qualities, both brilliant and solid, which were unfortunately spoilt by an excessive taste for pleasure. His dissolute manners found only too many imitators, and the regency was one of the most corrupt periods in French history.

See J. B. H. R. Capefigue, Histoire de Philippe d'OrlSans, regent de France (2 vols., Paris, 1838); A. Baudrillart, Philippe V. ct la cour de France, vol. ii. (Paris, 1890); and L. Wiesener, Le regent, I' abbe Dubois et les Anglais (3 vols., Paris, 1891-1899). (M. P.*)

ORLEANS, a city of north central France, chief town of the department of Loiret, on the right bank of the Loire, 77 m. S.S.W. of Paris by rail. Pop. (1906), town, 57,544; commune, 68,614. At Les Aubrais, a mile to the north, is one of the chief railway junctions in the country. Besides the Paris and Orleans railway, which there divides into two main lines — a western to Nantes and Bordeaux via Tours, and a southern to Bourges and Toulouse via Vierzon — branches leave Les Aubrais eastwards for Pithiviers, Chalons-sur-Marne and Gien, north-west for Chateaudun and Rouen. The whole town of Orleans is clustered together on the right bank of the river and surrounded by fine boulevards, beyond which it sends out suburbs along the various roads. It is connected with the suburb of St Marceau on the left bank by a handsome stone bridge of nine arches, erected in the 1 8th century. Farther up is the railway bridge. The river is canalized on the right, and serves as a continuation of the Orleans Canal, which unites the Loire with the Seine by the canal of the Loing.

Owing to its position on the northernmost point of the Loire Orleans has long been the centre of communication between the Loire basin and Paris. The chief interest of the place lies in its public buildings and the historical events of which it has been the scene. Proceeding from the railway station to the bridge over the Loire, the visitor crosses Orleans from north to south and passes through the Place du Martroi, the heart of the city. In the middle of the square stands an equestrian statue of Joan of Arc, in bronze, resting on a granite pedestal surrounded by bas-reliefs representing the leading episodes in her life. In 1855 it took the place of an older statue executed in the beginning of the century, which was then transferred to the left bank of the Loire at the end of the bridge, a few paces from' the spot where a simple cross marks the site of the Fort des Tourelles captured by Joan of Arc in ˆ29.- From the Place du Martroi, the Rue Jeanne d'Arc leads to the cathedral of Ste Croix. This church, begun in 1287, was burned by the Huguenots in 1 567 before its completion. Henry IV., in i6or, laid the first stone of the new structure, the building of which

continued until 1829. It consists of a vestibule, a nave with double aisles, a corresponding choir, a transept and an apse. Its length is 472 ft., its width at the transept 220 ft. and the height of the central vaults 1 1 2 f t. The west front has two flat-topped towers, each of three storeys, of which the first is square, the second octagonal and the third cylindrical. The whole front is Gothic, but was designed and constructed in the 1 8th century and exhibits all the defects of the period, though its

proportions are impressive. A central spire (19th century) 3 28 ft. high, on the other hand, recalls the pure Gothic style of the 13th century. In the interior the choir chapels and the apse, dating from the original erection of the building, and the fine modern tomb of Mgr. F. A. P. Dupanloup, bishop from 1849 to 1878, are worthy of note. In the episcopal palace and the higher seminary are several remarkable pictures and pieces of wood- carving; and the latter building has a crypt of the 9th century, belonging to the church of St Avit demolished in 1428. The church of St Aignan consists of a transept and choir of the second half of the 15th century; it contains in a gilded and carved wooden shrine the remains of its patron saint, who occupied the see of Orleans at the time of Attila's invasion. The crypt dates from the 9th to the beginning of the 1.1th century. The once beautiful sculpture of the exterior has been altogether ruined; the interior has been restored, but not in keeping with the original style. A third church, St Euverte, dedicated to one of the oldest bishops of Orleans (d. 391), is an early Gothic building dating from the 13th, completely restored in the 15th century. St Pierre-le-Puellier dates in its oldest portions from the 10th or even the 9th century. To the west of the Rue Royale stand the church of St Paul, whose facade and isolated tower both bear fine features of Renaissance work, and Notre-Dame de Recouvrance, rebuilt between 151 7 and 15 19 in the Renaissance style and dedicated to the memory of the deliverance of the city. The hotel de ville, built under Francis I. and Henry II. and restored in the 19th century, was formerly the residence of the governors of Orleans, and was occupied by the kings and queens of France from Francis II. to Henry IV. The front of the building, with its different coloured bricks, its balconies sup- ported by caryatides attributed to Jean Goujon, its gable-ends and its windows, recalls the Flemish style. There are several niches with statues. Beneath, between the double flight of steps leading up to the entrance, stands a bronze reproduction of the statue of Joan of Arc, a masterpiece of the

princess Mary of Orleans, preserved in the Versailles museum. The richly- decorated apartments of the first storey containpaintings, interest- ing chimneys, and a bronze statuette (also by the princess Mary) representing Joan of Arc mounted on a caparisoned horse and clolhed in the garb of the knights of the 15th century. The great hall in which it is placed also possesses a chimney decorated with three bas-reliefs of Domremy, Orleans and Reims, all associated with her life. The historical museum at Orleans is one of the most interesting of provincial collections, the numismatic, medieval and Renaissance departments, and the collection of ancient vases being of great value. The city also possesses a separate picture gallery, a sculpture gallery and a natural history museum, which are established in the former hotel de ville, a Renaissance building of the latter half of the 15th century. The public library comprises among its manuscripts a number dating from the 7th century, and obtained in most cases from St Benoit on the Loire. The general hospital is incorporated with the Hotel Dieu, and forms one of the finest institutions of the kind in France. The salle des fetes, formerly the corn-market, stands within a vast cloister formed by 15th-century arcades, once belonging to the old cemetery. The salle des Theses (141 1) of the university is the meeting-place of the Archaeological Society of the city. Among the old private houses numerous at Orleans, that of Agnes Sorel (15th and 16th century), which contains a large collection of objects and works of art relating to Joan of Arc, that of Francis I., of the first half of the 16th century, that occupied by Joan of Arc during the siege of 1429, and that known as the house of Diane de Poitiers (16th century), which contains the historical museum, are of special interest. The hotel dela Vieille-Intendance, built in the 15th and 16th centuries, served as residence of the intendanis of Orleans in later times. The ” White Tower ” is the last representative of the towers rendered famous by the siege. A statue to the jurisconsult, R. J. Pothier (1699-1772), one of the most illustrious of the natives of Orleans, stands in front of the hotel de ville. The anniversary of the raising of the siege in 1429 by Joan of Arc is celebrated every year with great pomp. After the English had

retired, the popular enthusiasm improvised a procession, which marched with singing of hymns from the cathedral to St Paul, and the ceremony is still repeated on the 8th of May by the clergy and the civil and military functionaries. Orleans is the seat of a bishopric, a prefect, a court of appeal, and a court of assizes and headquarters of the V. army corps. There are tribunals of first instance and of commerce, a board of trade-arbitration, a chamber of commerce and a branch of the Bank of France; and training colleges for both sexes, a

lycee for boys, a technical school and an ecclesiastical seminary.

The more important industries of the town are the manufacture of tobacco (by the state), blankets, hairpins, vinegar, machinery, agricultural implements, hosiery, tools and ironware, and the preparation of preserved vegetables. Wine, wool, grain and live stock are the commercial staples of the city, round which there are important nurseries.

The site of Orleans must have been occupied very early in history by a trading post for commerce between northern and central and southern Gaul. At the time of the Roman conquest the town was known as Cenabum, and was the starting-point of the great revolt against Julius Caesar in 52 B.C. In the 5th century it had taken the name Aurelianum from either Marcus Aurelius or Aurelian. It was vainly besieged in 451 by Attila, who was awed by the intercession of its bishop, St Aignan, and finally driven off by the patrician Aetius. Odoacer and his Saxons also failed to take it in 471, but in 498 it fell into the hands of Clovis, who in 511 held here the first ecclesiastical council assembled in France. The dignity which it then obtained, of being the capital of a separate kingdom, was lost by its union with that of Paris in 613. In the 10th century the town was given in fief to the counts of Paris, who in 987 ousted the Carolingian line from the throne of France. In 999 a great fire devastated the town. Orleans remained during all the medieval period one of the first cities of the French monarchy; several of the kings dwelt within its walls, or were consecrated in its cathedral; it had a royal mint, was the seat of councils, and obtained for its schools the name of university (1309), and for its soldiery an equal standing with those of Paris. Philip, fifth son of Philip VI. , was the first of the dukes of Orleans. After the assassination of his successor Louisbyjean Sans-Peur, duke of Burgundy (1407), the people of Orleans sided resolutely with the Armagnacs, and in this way brought upon themselves the attacks of the Bur- gundians and the English. Joan of Arc, having entered the beleaguered city on the 29th of April 1429, effected the raising of the siege by means of an attack on the 7th of May on the Fort des Tourelles, in the course of which she was wounded. Early in the 16th century the town became a centre of Pro- testantism. After the Amboise conspiracy (1560) the states-general were convoked at Orleans, where Francis II. died. In 1562 it became the headquarters of Louis I. of Bourbon, prince of Conde, the Protestant commander-in-chief. In 1563 Francis, duke of Guise, laid siege to it, and had captured the tete-du-pont on the left bank of the Loire when he was assassin- ated. Orleans was surrendered to the king, who had its fortifica- tions razed. It was held by the Huguenots from 1567 to 1568. The St Bartholomew massacre there in 1572

lasted a whole week. It was given as a lieu de sfirete to the League under Henry III., but surrendered to Henry IV. in person in 1594.- During the Revolution the city suffered from the sanguinary excesses of Bertrand Barere and Collot d'Herbois. It was occupied by the Prussians in 1815 and in 1870, the latter campaign being dis- cussed below.

See E. Bimbenet, Histoire de la ville a" Orleans (Orleans, 1884-

1888).

The Orleans Campaign of 1870 Orleans was the central point of the second portion of the Franco-German War (q.v.), the city and the line of the Loire being at first the rendezvous of the new armies improvised by the government of National Defence and afterwards the starting- point of the most important attempt made to relieve Paris. The campaign has thus two well-marked phases, the first ending with the first capture of Orleans on the 10th of October, and

the second with the second and final capture on the night of the 4th of December.

Shortly after the fall of the empire the government of National Defence, having decided that it must remain in Paris in spite of the impending siege, despatched a delegation to Tours to direct the government and the war in the provinces. This was originally composed (10-15 September) of two aged lawyers, Cremieux and Glais-Bizoin, and a naval officer, Vice-Admiral Fourichon, who had charge of both the war and the marine ministries. A retired general, de la Motte-Rouge, was placed in command of the " territorial division of Tours." He found, scattered over the south and west of France, a number of regular units, mostly provisional regiments, squadrons and batteries, assembled from the dep6ts, and all exceed- ingly ill supplied and equipped; but of such forces as he could muster he constituted the 15th corps. There were also ever-growing forces of mobiles, but these were wholly untrained and undisciplined, scarcely organized in battalions and for the most part armed with old-pattern weapons.

In these circumstances — the relative unimportance of the pro- vincial war, the senility of the directors, the want of numbers, equipment and training in the troops available outside the walls of Paris — the r61e of the delegation was at first restricted to the estab- lishment of a

cordon of weak posts just out of reach of the German cavalry, with the object of protecting the formation of new corps and divisions in the interior. At the time of the investment of Paris part of the provincial forces were actually called in to reinforce the garrison. Only Reyau's weak cavalry division was sent out from Paris into the open country.

On their side the Germans had not enough forces left, after in- vesting the capital with the III. and IV. Armies and Metz with the I. and II., to undertake a long forward stride to the Loire or the Cher. The only covering force provided on the south side of their Paris lines was the I. Bavarian corps, which had also to act as the reserve of the III. Army, and the cavalry divisions (6th, 4th, 2nd), whose chief work was the collection of supplies for the besiegers.

Shortly after this, near the end of September, francs-tireurs and small parties of National Guards became very active in Beauce, Perche and Gatinais, and the German 4th cavalry division between fitampes and Toury was reinforced by some Bavarian battalions in consequence. But no important assemblies of French troops were noted, and indeed Orleans was twice evacuated on the mere rumour of the German advance. Moltke and every other German soldier gave no credence to rumours of the formation of a 15th corps behind the Loire — Trochu himself disbelieved in its existence — and the cavalry divisions, with their infantry supports, went about their ordinary business of gathering supplies.

In reality, however, the Delegation, unready as were its troops, was on the point of taking the offensive. In deference to popular clamour, a show of force in Beauce was decided upon. This was carried out by a force of all arms under Reyau on the 5th of October. It succeeded only too well. Prince Albert of Prussia, commander of the 4th cavalry division, which engaged Reyau at Toury, was so much impressed that he gave back 20 m. and sent alarming reports to army headquarters, which thereupon lost its incredulity and announced in army orders that the French " Army of the Loire " was advancing from Orleans. Von der Tann, the commander of the I. Bavarian corps, was ordered to take up a defensive position at Montlhery and to send out a detachment to cover Prince Albert's retreat. The 22nd infantry division was added to his command, and the 2nd and 6th cavalry divisions warned to protect his flanks. Thus the Germans were led to pay attention to the existence of the 15th corps when that corps was not only itself incomplete but also unsupported by the 16th, 17th and other still merely potential formations.

The preparations of the Germans were superfluous, for the demon-

stration ended in nothing. Reyau drew away leisurely towards Fontainebleau forest, and only a part of the 15th corps was sent up from Bourges to Orleans. Further, the fears of a sortie from Paris, which had occupied the German headquarters for some time, having for a moment ceased, Moltke on the 7th ordered von der Tann, with the I. Bavarian corps, 22nd division, and the three cavalry divisions, to advance. Next day these orders expanded. Orleans and, if possible, Tours itself were to be captured.

The punishment for the military promenade in Beauce was

at hand. The main body of the 15th corps, which had not been

required to take part in it, was kept back at Bourges

Flts * . and Vierzon, and only the miscellaneous troops capture of . ‘ J .. . , 1 i_ 1

Orleans, actually in Beauce were available to meet the blow

they had provoked. On the 10th von der Tann at- tacked Reyau, who had returned from Fontainebleau towards Orleans, at Artenay. Had it not been that von der Tann believed that the 1 5th corps was in front of him, and therefore attacked deliberately and carefully, Reyau’s resistance would have been even more brief than it was. The French were enormously outnumbered, and, after a brave resistance, were driven towards

Orleans in great disorder. Being still without any real offensive intentions, the Delegation and La Motte-Rouge decided, the same night, to evacuate Orleans. On the nth, therefore, von der Tann’s advance had to deal with no more than a strong rearguard on the outskirts of Orleans. But he was no longer on the plain of Beauce; villas, hedges and vineyards, as well as the outskirts of the great forest of Orleans, gave excellent cover to the French infantry, all of which showed steadiness and some battalions true heroism, and the attack developed so slowly that the final positions of the defenders were not forced till close upon nightfall. The Germans lost at least 1000 men, and the harvest of prisoners proved to be no more than 1500. So far from pressing on to Tours, the Germans were well content with the occupation of Orleans.

The defeated enemy disappeared into Sologne, whither the assail- ants could not follow. Rumours of all sorts began to assail the German commander, who could not collect reliable news by means of the agencies under his own control because of the fluctuating but dense

cordon of mobiles and francs-tireurs all around him. Moltke and Blumenthal wished him to strike out southward towards the arsenals of Bourges, the dep6ts of vehicles at Ch&teauroux and the improvised government offices at Tours. But he represented that he could not maintain himself nine or ten marches away from his nearest supports, and he was therefore allowed to stay at Orleans. The 22nd division and the 4th cavalry division, however, were withdrawn from him, and under these conditions von der Tann became uneasy as to his prospects of retaining even Orleans. His uneasiness was emphasized by reports of the appearance of heavy masses of French troops on the Loire above and below Orleans — reports that were true as regards the side of Blois, and more or less false as regards the Gien country. This news was obtained by the III. Army headquarters on the 19th of October, and next day von der Tann was ordered ” not to abandon Orleans unless threatened by a greatly superior force.” Such a threat soon became pronounced.

A new directing influence was at work at Tours in the person of Leon Gambetta, who arrived there by balloon from Paris and took control of the Delegation on the nth. With de Freycinet (who was appointed deputy minister of war) as his most valued assistant, Gambetta at once became not merely the head of the government in the provinces, but the actual director of the war, in virtue of the fact that he was the very incarnation of the spirit of resistance to the invader. De la Motte-Rouge was replaced at the head of the 15th corps by General dAurelle de Paladines, under whom at the same time the embryo 16th corps was placed. The new commander with practically dictatorial powers occupied himself first of all with the organization and training of his motley troops. The Delegation indeed planned an advance from Gien on Fontainebleau, but this was given up on dAurelle’s representations, and the 15th corps drew back to a strong position at Salbris in front of _. _ Bourges. There by dint of personal ascendancy, relent- , 1 ~J? “j^ less drilling and a few severe courts-martial, d’Aurelle s ”

produced an enormous improvement in the quality of his troops. Gambetta reinforced the troops at Salbris to the figure of 60,000, for the camp there was not merely a rendezvous but a school, the atmosphere of which profoundly affected even troops that only spent three or four days within its bounds. Meantime the 16th corps was formed at Blois and Vendome, covered by a screen of francs-tireurs and National Guards. On October 23 a large force was sent over to the 1 6th corps from Salbris. This step was the first in a new plan of campaign.

A few days before it was taken, there had occurred an incident which

led Moltke to a fresh misunderstanding of the situation towards the Loire. As mentioned above, the 22 nd infan- „. a, try and 4th cavalry divisions had been withdrawn from rf * eau ” von der Tann’s command and ordered back to Paris, and on their way thither they were told to clear the country round Chateaudun and Chartres. General von Wittich, therefore, with the 22nd division and some cavalry, appeared before Chateaudun on the 1 8th of October. The little town was strongly held and repulsed the first attack. Wittich then prepared a second assault so carefully that sunset was at hand when it was made. It would seem indeed that at this period, when the Germans were hoping for a speedy return to their fatherland, the spirit of the offensive in all ranks had temporarily died away. The assailants carried the edge of the town, only to find themselves involved in a painful struggle in the streets. House-to-house fighting went on long after dark, but at last the inhabitants gave way, and the Germans punished the town for its unconventional resistance by subjecting it to what was practically a sack. 1 After this von Wittich passed on to Charters, which, making his preparations more carefully, he was able to occupy after a few shells had been fired. These events, and the presence of a French force at Dreux, as a matter of fact signified nothing, for the 15th and 16th corps were still on the Loire and at Salbris, but they

1 In 1879 the government added the cross of the Legion of Honour to the town arms of Chateaudun.

bewildered the German headquarters and conjured up a phantom ” Army of the West,” just as the promenade in Beauce had fashioned ” the Army of the Loire ” out of the small force under Reyau. Once more, indeed, as so often in the war, the Germans tried to solve the French problem by German data, and in their devotion to the net idea of ” full steam ahead,” could not conceive of military activity being spasmodic or unaimed. But this time the Versailles strategists were wrong only in their guess as to the direction of the blow. A blow was certainly impending.

By now the deliverance of Paris had become the defined objective of the ” new formations ” and of the provincial Delegation. Many plans were discussed, both at Paris and at Tours, for a combined effort, but

each strategist had to convince the rest of the soundness of his own views, and the interchange of information and plans between Trochu and Gambetta was necessarily precarious. In the end, however, a few clear principles were accepted — Paris must be relieved, not merely revictualled, and the troops must be set in motion with that object at the earliest possible moment. For 200,000 French regulars were closely invested in Metz by Prince Frederick Charles with the I. and II. Armies, if they passed into captivity, the veterans of Vionville and St Privat could be brought over to the Loire, and already there were strange rumours of intrigues between Bazaine, Bismarck and the empress Eugenie. But de Freycinet and d'Aurelle had different views as to the method of recapturing Orleans, which was agreed upon as the first thing to be done, and a compromise had to be made, by which 25,000 men were to advance by Gien and Chateauneuf and the main mass (75,000) from Blois by Beaugency, the hazards of this double movement being minimized by the weakness of the forces under von der Tann (the highest estimate of these that reached Tours was 60,000 and their real number only 26,000). The preliminary movements were to be completed by the 29th of October, when one strong division of the 15th corps was to be set at Gien and the remainder of the 15th and 1 6th corps between Blois and VendSme.

This was duly carried out, and the Germans were confirmed in their suspicions of a concentration to the west of Paris by the despatch of dummy troop-trains to Le Mans. But bad weather, the news of the disastrous capitulation of Bazaine and the opening of a series of futile peace negotiations delayed the denouement, the Gien column

was hastily recalled, and the French armies stood fast all along 'the line in their original grouping, 75,000 men (15th and 16th corps) at Blois- Vend6me, 10,000 men in Sologne and 25,000 at Gien. The Germans round Orleans were some 25,000 strong. Between Montlhery and Chartres were 21,000 more; but these were paralysed by the fictitious " Western Army " of the French, and von Wittich even thought of obtaining assistance from von der Tann. The activity of the irregulars, and the defiant attitude of the civil population everywhere, presaged a blow to be delivered by the once despised " new formations," but the direction of this blow was misconceived by the German headquarters, by the staff of the III. Army and by von der Tann alike, till the eve of its delivery. The halt of the French army allowed this uneasiness to grow, and, in default of a target, Moltke was unable to assign a definite task to the II. Army, now on its way from Metz. One of its corps, therefore, was sent to the lines before

Paris to release the 17th and 22nd infantry divisions from siege duties, and these, with the I. Bavarian corps and the 2nd, 4th and 6th cavalry divisions, were constituted into a special detachment of the III. Army, under Friedrich Franz, grand duke of Mecklenburg-Schwerin. The duke was ordered to cover the siege of Paris and to break up the " new formations," but he was directed, not towards Orleans or even Tours, but towards Le Mans, concentrating with that object between Chateaudun and Chartres.

D'Aurelle, if cautious and slow, at least employed spare time well. The 16th corps was disciplined to the standard attained by the 15th and Chanzy was placed at the head of it, General Fiereck, commanding at Le Mans, was ordered to attract the enemy's notice to the west by demonstrations, the defence of localities by irregulars was thoroughly organized, and in the first days of November, on de Freycinet's demand, the general advance was resumed. There was a difference of opinion between d'Aurelle and Chanzy as to the objective, the latter wishing to make the main effort by the left, so as to cut off the Bavarians from Paris, the former, to make it by the right with a view to recapturing Orleans, and, as on the German side at Gravelotte, a compromise was made whereby the army was deployed in equal force all along the line.

The debut was singularly encouraging. Part of the German 2nd cavalry division, with its infantry supports, was severely handled

by the French advanced guard near the hamlet of St Laurent des Bois (November 8). The half-heartedness of the Germans, evidenced by the number of prisoners taken unwounded, greatly encouraged the " new formations," who cheerfully submitted to a cold bivouac in anticipation of victory. Next morning the advance was resumed, d'Aurelle with the 15th corps on the right wing, Chanzy with the 16th on the left and Reyau's cavalry to the front. The march was made straight across country, in battle order, each brigade in line of battalion columns covered by a dense skirmish line. The French generals were determined that no accident should occur to shake the moral of the young troops they commanded.

At Orleans, meanwhile, von der Tann, in ever-growing suspense, had,

rightly or wrongly, decided to stand his ground. He had been instructed by the headquarters staff not to fall back except under heavy pressure. He had his own reputation, dimmed by the failure of 1866, to retrieve, and national honour and loyalty seemed to him to require, in the words of his own staff officer, that ” ere actual conflict had taken place with the ‘ greatly superior ‘ enemy, no hostile force should enter the city placed under the protection of the Bavarians.” But he could not allow himself to be enveloped in Orleans itself, and therefore, calling upon the far-distant III. Army reserves for support, he took up his position with 23,500 men around Coulmiers, leaving 2500 men to hold Orleans. The line of defence was from St Peravy on the Chateaudun road through Coulmiers to La Renardiere, and thence along the Mauve stream, and here he was attacked in force on the 9th of November. The French approached from the south-west, and when their right had taken contact, the remainder gradually swung round and attacked the Bavarian centre and right. The result was foregone, given the disparity of force, but the erratic movements of Reyau’s Battle of ca valry on the extreme left of d’Aurelle’s line exposed Coulmiers chanzy to a partial repulse and saved the Bavarian right. When at last the French stormed Coulmiers, and von der Tann had begun to retire, it was already nightfall, and the exhausted remnant of the I. Bavarian corps was able to draw off unpursued. The Orleans garrison followed suit, and the French army, gathering in its two outlying columns from Sologne and Gien, reoccupied the city. So ended the first blow of the Republic’s armies. Coulmiers would indeed have been a crushing victory had Reyau’s cavalry performed its part in the scheme and above all had d’Aurelle, adopt- ing unreservedly either his own plan or Chanzy’s, massed his troops here, economized them there, in accordance with the plan, instead of arraying them in equal strength at all points. But d’Aurelle wished above all to avoid what is now called a ” regrettable incident ” —hence his advance across country en bataille — and to thin out his line at any point might have been disastrous. And incomplete as it was, the victory had a moral significance which can scarcely be overrated. The ” new formations ‘ had won the first battle, and it was confidently hoped by all patriots that the spell of defeat was broken.

But d’Aurelle and the government viewed their success from the standpoint of their own side, and while von der Tann, glad to escape from the trap, fell back quickly to Angerville, d’Aurelle’s only fear was an offensive return. Not even when von der Tann’s defen- sive intentions were established did d’Aurelle resume the advance. The columns from Gien and the Sologne peacefully reoccupied Orleans”, while the victors of Coulmiers went into cold and muddy bivouacs

north of the city, for d'Aurelle feared that their dispersion in comfortable quarters would weaken the newly forged links of discipline. The French general knew that he had only put his hand to the plough, and he thought that before ploughing in earnest he must examine and overhaul his implement. In this opinion he was supported not only by soldiers who, like Chanzy, distrusted the staying power of the men, but even by the government, which knew that the limit of the capital's resistance was still distant, and felt the present vital necessity of protecting Bourges, Chateauroux and Tours from Prince Frederick Charles, who with the II. Army was now approaching from the east. The plan of General Borel, the chief of staff, for a lateral displacement of the whole army towards Chartres and Dreux, which would have left the prince without an animate target and concentrated the largest possible force on the weakest point of Moltke's position, but would have exposed the arsenals of the south, was rejected, and d'Aurelle organized a large fortified camp of instruction to the north of the captured city, to which came, beside the 15th and 16th corps, the new 17th and 18th.

To return to the Germans. An army at the halt, screened by active irregulars, is invisible, and the German commanders were again at a loss. It has been mentioned that a day or two before the battle of Coulmiers Moltke had created an Army Detachment under the grand duke of Mecklenburg cm 1 > *° r P erat i° ns south of Paris. His objects in so doing ""• must now be briefly summarized. On November the isf he had written to the II. Army to the effect that " the south of France would hardly make great efforts for Paris," and that the three disposable corps of the army were to range over the country as far as Chalon-sur-Sa6ne, Nevers and Bourges. By the 7th his views had so far changed that he sanctioned the formation of the " Detachment " with a view to breaking up the Army of the Loire by a march into the west towards Le Mans, the right wing of the II. Army at the same time hurrying on to Fontainebleau to cover the

German

plans

after

south side of the Paris investment. The king, however, less con- vinced than Moltke of the position of the Army of the Loire, suspended the westward deployment of the Detachment, with the result that on the 10th the retreating Bavarians were reinforced by two fresh divisions. But the same day all touch with the French was lost— perhaps

deliberately, in accordance with the maxim that defeated troops should avoid contact with the victor. The curtain descended, and next day a few vague movements of small bodies misled the grand duke into seeking his target towards Chartres and Dreux, directly away from d'Aurelle's real position. Once more the king intervened and brought him back to the Orleans-Paris road (Nov. 13-14), but Moltke hurried forward the IX. corps (II. Army) from Fontainebleau to Etampes so as to release the grand duke from covering duties while satisfying the king's wishes for direct protection towards Orleans.

Moltke's views of the problem had not fundamentally changed since the day when he ordered the II. Army to spread out over southern France. He now told the grand duke to beat the Army of the Loire or Army of the West near Dreux or Chartres, and, that done, to sweep through a broad belt of country on the line Alencon- Verneuil towards Rouen, the outer wing of the II. Army meanwhile, after recapturing Orleans and destroying Bourges, to descend the Loire and Cher valleys towards Tours (14 Nov). On the 15th a fresh batch of information and surmises caused the leader of the Detachment, who had not yet received orders to do so, to leave the Paris-Orleans road to take care of itself and to swing out north- westward at once. The Detachment reached Chartres, Rambouillet and Auneau that night, and headquarters, having meanwhile been mystified by the news of a quite meaningless fight between German cavalry and some mobiles at Dreux, did not venture to reimpose the veto. The adventures of the Detachment need not be traced in detail. It moved first north towards the line Mantes-Dreux, and delivered a blow in the air. Then, hoping to find a target towards Nogent le Rotrou, it swung round so as to face Move ' south-west. Everywhere it met with the sharpest resist- meots ot ance from small parties, nowhere it found a large body the ˆe- of all arms to attack. Matters were made worse by staff tachmeBt – blunders in the duke's headquarters, and on the 19th, after a day of indescribable confusion, he had to halt to sort out his divisions. Moltke gave him the rest day he asked for the more readily as he was beginning to suspect that the king was right, that there were considerable forces still at Orleans, and that the Detachment might be wanted there after all.

This alteration in his views had been brought about by the reports from the II. Army during its advance from Champagne to the Gatinais. At the time of the first order indicating Chalon, Nevers and Bourges as its objectives this army had just Aiv t'"ˆ opened out into line from its circular position round of the It. Metz, and it therefore naturally faced south. Moving Arm y- forward, it reached the line Troyes-Neufchateau about the time Coulmiers was fought, and was ordered to send in its

right (IX. corps) to Fontainebleau. The II. corps had already been taken to strengthen the besiegers, thereby releasing the two Prussian divisions (17th and 22nd) that joined von der Tann on the 10th. The II. Army next changed front, in accordance with Moltke's directions, so as to face S.E. towards Orleans and Gien, and on the 16th the IX. corps and 1st cavalry division were at Mereville and on the Orleans-Paris road, the III. at Sens and the X. at Tonnerre. The III. and X. from this time onward marched, camped and slept in the midst of a population so hostile that von Voigts-Rhetz kept his baggage in the midst of the fighting troops, and Prince Frederick Charles himself, with an escort, visited the villages lying off the main roads to gauge for himself the temper of the inhabitants.

From prisoners it was gleaned that the French 1 8th corps, supposed by the Germans to be forming in the Dijon- Lyons region, had arrived on the Loire, and a deserter said that there were 40,000 men encamped at Chevilly, just north of Orleans. Moltke's faith in his own reading of the situation was at last shaken ; whether the Army of the Loire had joined the Army of the West or was still on the Loire, he did not yet know, but it was almost certain that from wherever they came, considerable French forces were around Orleans. He warned the prince to check the southward swing of the X. corps " because it cannot yet be foreseen whether the whole army will not have to be employed towards Chateaudun and Orleans," and turned to the Detachment for further information, cautioning the grand duke at the same time .to keep touch with the II. Army. But, ignoring the hint, the grand duke, thinking that he had at last brought the elusive " Army of the West " to bay in the broken ground round Nogent-le-Rotrou, opened out, in accordance with German strategic principles, for a double envelopment of the enemy. He struck another blow in the air. The " Army of the West " had never really existed as an army, and its best-organized units had been sent back to join the new2ist corps at Le Mans ere the Detach- ment came into action at all, while the older mobiles continued the " small war " in front of the Germans, and sniped their sentries and trapped their patrols as before. Almost simultaneously with the news of this disappointment, the prince, who had meanwhile used his cavalry vigorously, sent word to Versailles on the 20th that the French 15th, 16th, 17th and 18th corps (in all over 150,000 men) were round Orleans. At this moment the III. corps was close to the

ordered towards Orleans.

Forest of Orleans, the IX. corps away to the right rear at Angerville, and the X. equally distant to the south-east, as well as separated in three self-contained columns a day's march apart. It seemed as if another Vionville was at hand, but this time Alvensleben and Voigts-Rhetz did not attack an obscure objective coute que coute. They stood fast, by the prince's order, to close up for battle and to wait on events in front of the Detachment.

The Germans had now discovered their target, and their strategical system, uncomplicated by past nightmares, should have worked smoothly to a decisive result. But there was nearly as much confusion between the various high officers as before. Prince Frederick Charles, in possession of the facts and almost in contact with the enemy, wrote to the grand duke to say that the II. Army was about to attack the enemy, and to suggest that the Detachment, Which he knew to be heading for Le Mans, should make a " diver- sion " in his favour towards Tours, reserving to himself and his own army, as on the 2nd of July 1866 before Koniggratz, the perils and the honours of the battle. The grand duke meanwhile, whose temper was now roused, was making a last attempt to bring the phantom " Army of the West " to action. Rejecting Blumenthal's somewhat timidly worded advice to go slowly, the grand duke spread out his forces for the last time for an enveloping advance on Le Mans.

He had not gone far when, on the 23rd, he received a peremptory order from the king, through the III. Army headquarters, to bring back his forces to Beauce and to be on the middle Loire TheDe- at i atest – by t ije 26th. In vain he pleaded for a day to tachment c j ose up . t i le j^g re plied that the march must go on, for much depended on it. Moltke, in fact, had seized the reins more firmly at the critical moment, and given directions to the army commandersthat the II. Army and the Detachment were to make a combined and concerted attack as soon as possible after the 26th. By that date the last brigades of the II. Army would have come up, and the Detachment was to time its own march accordingly. Yet even at this step Blumenthal, the original author of the Western expedition, in transmitting the king's order to the grand duke, assigned not Orleans but Beaugency, some miles down the river, as the objective of the Detachment.

D'Aurelle meanwhile had resolutely maintained his policy of inaction, confirmed in that course by the miserable and ill-equipped condition of the troops that came from the east and the French wgst to double the numbers of the relatively well-discip- plans. lined army of

Coulmiers. In the grand duke's move to

the west, d'Aurelle saw only a trap to lure him into the plains and to offer him up as a victim to the approaching II. Army, the force of which he at first greatly exaggerated. All this time Gambetta and de Freycinet were receiving messages from Paris that spoke of desperate sorties being planned, and assigned December 15th as the last day of resistance. On the 19th of November de Freycinet wrote to d'Aurelle urging him to form a plan of active operations without delay, and even suggesting one (which was, in fact, vicious), but in reply the general merely promised to study the civilian's scheme. A severe letter from Gambetta, which followed this, had no better effect. D'Aurelle had, in fact, become a pessimist, and the Delegation, instead of removing him, merely suggested fresh plans.

On the 24th, however, the French at last took the offensive, in the direction of Fontainebleau Forest, to co-operate with the great sortie from Paris which was now definitely arranged. But owing to d'Aurelle's objections, the first orders were modified so far that on attaining the points ordered, Chilleurs (15th corps) Boiscommun-Bellegarde (20th), the troops were to await the order to advance. Shortly afterwards the 1 8th corps from Gien was ordered to advance on the line Montargis-Ladon. The rest of d'Aurelle's huge army was scarcely affected by these movements. Meanwhile Prince Frederick Charles, to clear up the situation, had pushed out strong reconnaissances of all arms from the front of the II. Army, and these naturally developed strong forces of the defenders. The advanced troops of the X. corps had severe engagements with fractions of the 20th corps at Ladon and Maizieres, and those of the III. corps were sharply repulsed at Neuville and drew the fire of several battalions and batteries at Artenay. The French offensive slowly developed on the 25th and 26th, for the Germans were not ready to advance, and in addition greatly puzzled. The erratic movements of the grand duke towards Le Mans before he was recalled to the Loire had seriously disquieted both the Delegation and d'Aurelle, and the 17th corps, under a young and energetic leader, de Sonis, was moved restlessly hither and thither in the country south and west of Chateaudun. A fight at Brou (10 m. W. of Bonneval) provoked the grand duke into another false move. This time the Detachment, then near Droue (12 m. W. of Chateaudun) and Authon (22 m. W. of Bonneval), swung round north-east in defiance of the order to go to Beaugency, and had to be brought back by the drastic method of placing it under the orders of Prince Frederick Charles. General von Stosch of the headquarters staff was at the same time sent to act as Moltke's representative with the duke's headquarters, and Lieut.-Colonel von

Waldersee to Prince Frederick Charles's to report thence direct to the king, who was dissatisfied with the diluted information with which the various staff offices furnished him. Still, the upshot was that Prince Frederick Charles was entrusted with affairs on the Loire, and all

superior control was voluntarily surrendered. The prince had very clear ideas, at the outset, of the task before him. If the French advanced towards Fontainebleau or elsewhere, he expected to be able to repeat Napoleon's strategy of 1814, fighting p"^ e H k containing actions with the IX. and X. corps and deliver- ' e * c ing blow after blow at different points on d'Aurelle's line ares n

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of march with the III. If the French, as seemed more

command.

likely, stood fast, he thought his task more formidable, and therefore, abandoning the idea of a strategic envelopment, he ordered the Detachment inwards with the intention of directly attacking the Orleans position from the north-west.

As regards the method of the offensive, there is herein no material advance on the prince's first scheme; the detachment is simply added to the forces making the attack, and the diversion on Tours is abandoned. But the prince was at any rate a leader who enjoyed the responsibilities of director of operations — he even said that he would find the shuttle-play of the III. corps alluded to above " an interesting novelty in his experience of Army command " — while at the same time the unfortunate d'Aurelle was asking the Delegation to give orders direct to his generals.

It was now November 27th. The Versailles headquarters were in a state of intense nervous exaltation waiting for the sortie of 70,000 men that was daily expected to be launched at the investing line, and the king's parting words to von Waldersee indicate sufficiently the gravity of the decision that was now entrusted to the most resolute troop-leader in the service : ' ' We are on the eve of a decisive moment. I know well that my troops are better than the French, but that does not deceive me into supposing that we have not a crisis before us. . . . If Prince Frederick Charles is beaten, we must give up the investment of Paris. . . ." The II. Army was waiting events on a dangerously extended front from Toury on the Paris- Orleans road

(which the prince still thought it his duty to cover) to Beaune-la-Rolande. The Detachment, which never yet had concen- trated save to deliver blows in the air, was approaching Chateaudun and Bonneval when von Stosch arrived and gave it the encourage- ment, the reforms in the staff work and the rest-day it needed. The French, who themselves had suffered from over-extension, had by now condensed on the extreme right. In these general conditions the battle of Beaune-la-Rolande took place — an engagement almost as honourable to Voigts-Rhetz and the X. corps as Vionville to Alvensleben and the III. The French attack began early on the morning of the 28th, under command of General Crouzat. It was directed on Beaune-la-Rolande from three sides, and only the want of combination between the various units of the French and the arrival in the afternoon of part of the III. corps oeaune- saved the X. from annihilation. As it was, the Germans _". . engaged were utterly exhausted, and the X. corps had but three rounds of ammunition per man left. But the magnificent resist- ance of the men of Vionville prolonged the fight until night had fallen and Crouzat, thinking the battle lost, ordered his troops to evacuate the battlefield. As at Coulmiers, and with even more deplorable results, the French commander saw only the confusion in his own lines, and feared to hazard the issue of the campaign on the mere supposition that the enemy was even more exhausted. There was another resemblance, too, between Coulmiers and Beaune-la- Rolande, in that the French forces on the outer flank towards Artenay stood idle without attempting to influence the decision.

Prince Frederick Charles himself took only a cursory survey of the battlefield, and failed to realize 'that the whole of the enemy's right wing had been engaged, in spite of what Waldersee, who had been in Beaune, told him of events there. So far, therefore, from considering the battle as a great victory to be followed up by an energetic pursuit, he still feared a move round his left flank from Gien and Montargis towards Fontainebleau. The II. Army orders issued on the night of the battle actually had in view a farther ex- tension eastward. Beaune-la-Rolande was a French defeat without being a German victory, and for the fact that it was a defeat, not a mere check, there was no cause but Crouzat's impressions of the state of the 20th corps, which, composed as it was of the newest levies in his army, was the most susceptible of unreasoning bravery and unreasoning depression.

In view of this, d'Aurelle and de Freycinet decided that the offensive was to be continued not towards Beaune-Nemours, but from the front of the steadier 15th and 16th corps towards Pithiviers, and with that object, on the 29th — a day of inaction for the Germans — the 1 8th and 20th corps began to close on the centre. There was sharp fighting

on the 30th at various points along the north-eastern and eastern fringes of the Forest of Orleans, in which for the most part the French were successful. On the 29th the II. Army was inactive in spite of almost frantic appeals from Versailles to go forward (the great sortie from Paris had begun) , and the Detachment, in accordance with the prince's orders and not with the views held by von Stosch, headed eastward to prolong the right of the II. Army, halting on the 29th in the area Orgeres-Toury. The prince's message to the grand duke contained the significant phrase, " my plans to drive the enemy out of Orleans " — he no longer thought of a strategical envelopment of the Army of the Loire in Orleans. Disillusioned during the 30th as to the supposed danger on the side of Montargis, he closed from both wings towards the centre, but still defensively and well clear of the edge of the dangerous forest.

On this day d'Aurelle and the French generals assembled to receive de Freycinet's orders for the next advance. The 18th and 20th corps were to attack Beaune-la-Rolande, the 15th and 16th Pithi- viers, while the 17th, aided by the 21st from Le Mans, was to look after the security of Orleans against a possible southward advance of the Detachment. A wise modification was arranged between d'Aurelle and Chanzy, whereby the first day's operations should be directed to driving away the Detachment with the 17th and 1 6th corps, preparatory to the move on Pithiviers. On the 1st of December, then, no events of importance took place on the front of the II. Army, the centre of gravity having shifted to Advance of Orgeres-Toury and the direction of events to the grand the French duke and Stosch . Fortunately for the Germans the ettwng. cava i r y g enera l V on Schmidt, who had been called upon to return to the II. Army with his division, managed to impress Stosch, in a farewell interview, with the imminence of the danger, and a still more urgent argument was the action of Villepion-Terminiers, in which Chanzy with one infantry and one cavalry division attacked part of the I. Bavarian corps and drove it to Orgeres with a loss of 1000 men. Von Stosch, therefore, so far from literally obeying the waiting policy indicated in the orders from Prince Frederick Charles, cautiously led the grand duke to prepare for a battle, and the grand duke, seeing the chance of which he had been cheated so often, and secure in his royal rank and in the support of Moltke, Stosch and Blumenthal, took control again. Lastly, von Stosch called back the 22nd division, which had been taken from the Detachment to form the reserve of the II. Army.

The result of the decision thus made at the Detachment head- quarters was of the highest importance. The French main body . . moving north-westward in the general direction of Toury Li e °- encountered first the I. Bavarian corps, then the 17th Poudtv division, and finally the 22nd division, and the leadership of the German generals, who took every advantage of the disconnected and spasmodic movements of the enemy, secured a complete success (battle of Loigny-Poupry, 2nd Dec). Mean- while, and long before victory had declared itself, Prince Frederick Charles, still keeping the III. and X. corps on the side of Boiscommun and Bellegarde, had sent the IX. corps westward to support the Detachment, and halted von Schmidt's returning cavalry division on the Paris road. But from this point there began an interchange of telegrams which almost nullified the strategical effect of the battle. The grand duke and von Stosch, desirous above all of enveloping — that is, driving into Orleans — the target that after so many disappointments they had found and struck, wished to expand westwards so as to prevent the escape of the French towards Chateaudun, and with that object asked the II. Army " to attack Artenay and to take over the protection of the great road." Both von Stosch and von Waldersee had reported to the II. Army the importance of the French troops west of the main road, and Prince Frederick Charles, as above mentioned, had already moved the IX. corps and 6th cavalry division towards the Detachment. But when after the battle the grand duke's request to the II. Army arrived at the prince's headquarters, the reply was a curt general order for a direct concentric attack on -Orleans by all forces under his command.

This was Moltke's doing. Before Waldersee's telegrams from the front arrived at Versailles, he had sent to the prince a peremptory order " to attack Orleans and thus to bring about the decision." This order was based on Moltke's view that the main body of the French had, after Beaune-la-Rolande, gathered on the west side of the great road, and although the king, in spite of the repulse of the great sortie from Paris, was still uneasy as to the possibility of a French offensive on Fontainebleau, he allowed the chief of his staff to have his way. The order, consequently, went forth. Long before it could be translated into action, the battle of Loigny- Poupry had completely changed the situation. Yet it was obeyed, and no attempt was made by the prince either to obtain its cancel- lation or to override it by the exercise of the beloved " initiative." At the prince's headquarters it was construed as a reflection upon the lethargy of that army after Beaune-la-Rolande, and — although it was the incompleteness of his own reports of that action that had misled Moltke as to the magnitude of the effort that had been expended to win k — the prince, bitterly resentful, fell into

that dangerous condition of mind which induces a punctilious execution of orders to the letter, at whatever cost and without regard to circumstances. Hence the order to the Detachment, which allowed the French field army -to escape, and substituted for a decisive victory the barren ” second capture of Orleans.”

The plan for this second capture was simple: III. corps to fight its way from Pithiviers to Chilleurs-aux-Bois and thence down the Pithiviers-Orleans road through the forest, IX. corps to J? e advance on Artenay and thence down the main road,

inHˆ” Detachment to fight its way southward over the plains, Forest*”* ˆ- cor P s m rear ˚f the centre as reserve. Only a small force was left on the side of Montargis, and the III. and X. corps, which were many miles away to the south and south-east, had to get into position at once (evening of the 2nd) by night marches if necessary. In short, a single grand line of battle, 40 m. long, supported only by one corps in rear of the centre, was to sweep over all obstacles, woods, fields, orchards and enemy, at a uniform rate

of progress, and on the evening of the second day to converge on Orleans. 1 The advance opened on the morning of the 3rd of December. The Fiench left or main group included the 15th, 16th and 17th corps, the right of the 15th corps being in advance of the forest edge near Santeau. The right group, now under Bourbaki, consisted of the 18th and 20th corps, and faced north-east towards Beaune-la-Rolande and Montargis, the left flank being at Chambon. Fortunately for the III. corps, which numbered barely 13,000 rifles in all, the thinnest part of the opposing cordon was its centre, and the adventurous march of this corps carried it far into the forest to Loury. Only at Chilleurs was any serious resistance met with; elsewhere the French sheered off to their left, leaving the Pithiviers- Orleans road clear. In the night of the 3rd~4th isolated fractions of the enemy came accidentally in contact with von Alvensleben’s outposts, but a sudden night encounter in woods was too much for the half-trained French, and a panic ensued, in which five guns were abandoned. But, as Alvensleben himself said, when he marched into the forest from Chilleurs he ” went with open eyes into a den ” from which it was more than probable he would never emerge — Chilleurs was, in fact, reoccupied behind him by part of the 15th corps. By the fortune of war the III. corps actually did emerge safely, but only thanks to the inactivity of the French right group under Bourbaki, 2 and to the almost entire absence of direct opposition, not to Prince Frederick Charles’s dispositions.

On the main road, meantime, the IX. corps had captured a series of villages, and at nightfall of the short December day reached the N.W. corner of the Forest. The Detachment, slowly pushing before it part of the army it had defeated at Loigny, and protecting itself on the outer flank by a flank guard (I. Bavarians) against the rest, had closed in towards Chevilly. Prince Frederick Charles, angered by the slow, painful and indecisive day's work, ordered the advance to be continued and the French positions about Chevilly stormed in the dark, but fortunately was dissuaded by von Stosch, who rode over to his headquarters. But the prince never (except perhaps for a brief moment during the battle of Loigny-Poupry) believed that there was any serious obstacle in the way of the Detach- ment except its own fears, and repeatedly impressed upon Stosch the fact that Orleans was the watchword and the objective for every one.

In pursuance of the idee fixe, the prince issued orders for the 4th to the following effect: III. corps to advance on Orleans and to " bring artillery into action against the city," at the same time carefully guarding his left flank; IX. and 6th cavalry division to go forward along the general line of the main road; Detachment to make an enveloping attack on Gidy in concert with the attack of the IX. corps. In the forest Alvensleben, knowing tha-t he could not capture Orleans single-handed, guarded his left with a whole division and with the other advanced on the city, stormed the village of Vaumainbert, which was stubbornly defended by a small French force, and close upon nightfall perfunctorily threw a few shells into Orleans. The flank-guard division had meanwhile been gravely imperilled by the advance of Crouzat's 20th corps, but once again the III. corps was miraculously saved, for Bourbaki, receiving word from d'Aurelle that the left group could not hold its position in advance of the Loire, and that the line of retreat of the right group was by Gien, ordered the fight to be broken off.

In the centre the IX. corps, after fighting hard all day, progressed no farther than Cercottes. The prince and the grand duke had a short interview, but, being personal enemies, their inter.- second course was confined to the prince's issuing his orders Battle ot without inquiring closely into the positions of the Detach- Orleans ment and its opponents. Thus while the main body of the French left group, under the determined Chanzy, slipped away to the left, to continue the struggle for three months longer, the Detachment was compelled to conform to the movements of the IX. corps. But it was handled resolutely, and in the afternoon its right swung in to Ormes. The 2nd cavalry division, finding a target and open ground, charged the demoralized defenders with great effect, a panic began and spread,

and by nightfall, when the prince, who was with the IX. corps, had actually given up hope of capturing Orleans that day and had issued orders to suspend the fight, his rival and subordinate was marching into Orleans with bands playing and colours flying. There was no pursuit, and the severed wings of the French army thenceforward carried on the campaign as two separate armies under Chanzy and Bourbaki respectively.

See F. Hoenig, Volkskrieg an der, Loire, and L. A. Hale, The People's War, besides general and special histories and memoirs referred to in Franco-German War. (C. F. A.)

ORLEY, . BERNARD VAN (1401-1542), Flemish painter, the son and pupil of the painter Valentyn van Orley, was born at

1 The same night Moltke received copies of the prince's orders and also news of the victory of Loigny-Poupry, but for some reason that is still unknown he let events take their course.

2 With all his faults, Bourbaki was hardly responsible for this failure. Gambetta had for some days been giving orders to the 18th and 20th corps direct, but precisely at the moment he handed back the control of the group to d'Aurelle, this being arranged over the wires while the III. corps was advancing.

Brussels and completed his art education in Rome in the school of Raphael. He returned to Brussels, where he held an appoint- ment as court painter to Margaret of Austria until 1527, in which year he lost this position and left the city. He only returned to it upon being reinstated by Mary of Hungary in 1532, and died there in 1542. Whilst in his earlier work he continued the tradition of the Van Eycks and their followers, he inaugurated a new era in Flemish art by introducing into his native country the Italian manner of the later Renaissance, the style of which he had acquired during his sojourn in Rome. His art marks the passing from the Gothic to the Renaissance period; he is the chief figure in the period of decline which preceded the advent of Rubens. Meticulously careful execution, brilliant colouring, and an almost Umbrian sense of design are the chief characteristics of his work.

Van Orley, together with Michael Cocxie, superintended the execution of van Aelst's tapestries for the Vatican, after Raphael's designs, and is

himself responsible for some remark- able tapestry designs, such as the panels at Hampton Court. His also are the designs for some of the stained glass windows in the cathedral of Ste Gudule, in Brussels, at the museum of which city are a number of his principal works, notably the triptych representing “The Patience of Job” (1521). Among his finest paintings are a ” Trinity ” at Liibeck cathedral, a ” Pieta ” at Brussels, a Madonna at Munich and another at Liverpool.

The National Gallery ownsa ” Magdalen, reading,” another version of the same subject being at the Dublin National Gallery. Lord Northbrook possesses a portrait of Charles V. by the master.

ORLOV, the name of a noble Russian family that produced several distinguished statesmen, diplomatists and soldiers.

Gregory (Grigorii) Grigorievich Orlov, Count (1734- 1 783), Russian statesman, was the son of Gregory Orlov, governor of Great Novgorod. He was educated in the corps of cadets at St Petersburg, began his military career in the Seven Years’ War, and was wounded at Zorndorf. While serving in the capi- tal as an artillery officer he caught the fancy of Catherine II., and was the leader of the conspiracy which resulted in the dethronement and death of Peter III. (1762). After the event, Catherine raised him to the rank of count and made him adjutant- general, director-general of engineers and general-in-chief. At one time the empress thought of marrying her favourite, but the plan was frustrated by Nikita Panin. Orlov’s influence became paramount after the discovery of the Khitrovo plot to murder the whole Orlov family. Gregory Orlov was no states- man, but he had a quick wit, a fairly accurate appreciation of current events, and was a useful and sympathetic counsellor during the earlier portion of Catherine’s reign. He entered with enthusiasm, both from patriotic and from economical motives, into the question of the improvement of the condition of the serfs and their partial emancipation. He was also their most prominent advocate in the great commission of 1767, though he aimed primarily at pleasing the empress, who affected great liberality in her earlier years. He was one of the earliest propagandists of the Slavophil idea of the emancipation of the Christians from the Turkish yoke. In 1771 he was sent as first Russian plenipotentiary to the peace-congress of Focshani; but he failed in his mission, owing partly to the obstinacy of the Turks, and partly (according to Panin) to his own outrageous insolence. On returning without permission to St Petersburg, he found himself superseded in the empress’s favour by Vasil’- chikov. When Potemkin, in 1771, superseded Vasil’chikov, Orlov became of no account at court and went abroad for some years. He returned to Russia a few months previously to his death, which

took place at Moscow in 1780. For some time before his death he was out of his mind. Late in life be married his niece, Madame Zinoveva, but left no children.

See A. P. Barsukov, Narratives from Russian History in the 18th Century (Rus.) (St Petersburg, 1885).

Alexis Grigorievich Orlov, Count (1737-1808), brother of the above, was by far the ablest member of the Orlov countly family, and was also remarkable for his athletic strength and dexterity. In the revolution of 1762 he played an even more

important part than his brother Gregory. It was he who conveyed Peter III. to the chateau of Ropsha and murdered him there with his own hands. In 1770 he was appointed com- mander-in-chief of the fleet sent against the Turks, whose far superior navy he annihilated at Cheshme (July 5th 1770), a victory which led to the conquest of the Greek archipelago. For this exploit he received, in 1774, the honorific epithet Chesmensky, and the privilege of quartering the imperial arms in his shield. The same year he went into retirement and settled at Moscow. He devoted himself to horse-breeding, and produced the finest race of horses then known by crossing Arab and Frisian, and Arab and English studs. In the war with Napoleon during 1806-07 Orlov commanded the militia of the fifth district, which was placed on a war footing almost entirely at his own expense. He left an estate worth five millions of roubles and 30,000 serfs.

See article, ” The Associates of Catherine II.,” No. 2, in Russkaya Starina (Rus.) (St Petersburg, 1873).

Theodore (Fedor) Grigorievich Orlov, Count (1741-1796), Russian general, first distinguished himself in the Seven Years’ War. He participated with his elder brothers, Gregory and Alexis, in the coup d’etat of 1762, after which he was appointed chief procurator of the senate. During the first Turkish War of Catherine II. he served under Admiral Spiridov, and was one of the first to break through the Turkish line of battle at Cheshme. Subsequently, at Hydra, he put to flight eighteen Turkish vessels. These exploits were, by the order of Catherine, commemorated by a triumphal column, crowned with naval trophies, erected at Tsarskoe Selo. In 1775 he retired from the public service. Orlov was never married, but had five natural children, whom Catherine ennobled and legitimatized.

Alexis Fedorovich Orlov, Prince (1787-1862), Russian statesman, the son of a natural son of Count Theodore Grigorie- vich Orlov, took part

in all the Napoleonic wars from 1805 to the capture of Paris. For his services as commander of the cavalry regiment of the Life Guards on the occasion of the rebellion of 1825 he was created a count, and in the Turkish War of 1828-29 rose to the rank of lieutenant-general. It is from this time that the brilliant diplomatic career of Orlov begins. He was the Russian plenipotentiary at the peace of Adrianople, and in 1833 was appointed Russian ambassador at Constantinople, holding at the same time the post of commander- in-chief of the Black Sea fleet. He was, indeed, one of the most trusty agents of Nicholas I., whom in 1837 he accompanied on his foreign tour. In 1854 he was sent to Vienna to bring Austria over to the side of Russia, but without success. In 1856 he was one of the plenipotentiaries who concluded the peace of Paris. The same year he was raised to the dignity of prince, and was appointed president of the imperial council of state and of the council of ministers. In 1857, during the absence of the emperor, he presided over the commission formed to consider the question of the emancipation of the serfs, to which he was altogether hostile.

His only son, Prince Nikolai Aleksyeevich Orlov (1827- 1885), was a distinguished Russian diplomatist and author. He first adopted a military career, and was seriously wounded in the Crimean War. Subsequently he entered the diplomatic service, and represented Russia successively at Brussels (1860- 1870), Paris (1870-1882) and Berlin (1882-1885). As a publicist he stood in the forefront of reform. His articles on corporal punishment, which appeared in Russkaya Starina in 1 88 1 , brought about" its abolition. He also advocated tolerance towards the dissenters. His historical work, Sketch of Three Weeks' Campaign in 1806 (St Petersburg, 1856) is still of value. (R. N. B.)

ORM, or Ormin, the author of an English book, called by himself Ormulum (" because Orm made it "), consisting of metrical homilies on the gospels read at mass. The unique MS., now in the Bodleian Library, is certainly Orm's autograph, and contains abundant corrections by his own hand. On palaeo- graphical grounds it is referred to about a.d. 1200, and this date is supported by the linguistic evidence. The dialect is midland, with some northern features. It is marked in an

unparalleled degree by the abundance of Scandinavian words, while the French element in its vocabulary is extraordinarily small. The

precise determination of the locality is not free from difficulty, as it is now recognized that the criteria formerly relied on for distinguishing between the eastern and the western varieties of the midland dialect are not valid, at least for this early period. The Ormulum certainly contains a surprisingly large number of words that are otherwise nearly peculiar to western texts; but the inference that might be drawn from this fact appears to be untenable in face of the remarkable lexical affinities between this work and Havelok, which is certainly of ncrth-east midland origin. On the whole, the language of the O'mulum seems to point to north Lincolnshire as the author's native district.

The work is dedicated to a certain Walter, at whose request it was composed, and whom Orm addresses as his brother in a threefold sense — " according to the flesh," as his fellow- Christian, and as being a member of the same religious fraternity, that of the Augustinian Canons. The present writer has sug- gested {Athenaeum, 19th May 1906) that Orm and Walter may have been inmates of the Augustinian priory of Elsham, near the Humber, which was established about the middle of the 12th century by Walter de Amundeville. In his foundation charter (Dugdale's Monasticon, ed. Caley and Bandinel, vi. 560) Walter endows the priory with lands, and also grants to it the services of certain villeins, among whom are his steward (praepositus) William, son of Leofwine, and his wife and family. As this William is said to have had an uncle named Orm, and probably owed his Norman name to a godfather belonging to the Amunde- ville family, it seems not unlikely that the author of the Ormulum and his brother Walter were his sons, named respectively after their father's uncle and his lord, and that they entered the religious house of which they had been made subjects.

The name Orm is Scandinavian (Old Norse Ormr, literally " serpent," corresponding to the Old Eng. wyrm, " worm "), and was not uncommon in the Danish parts of England. It occurs once in the book. The Gallicized form Ormin is found only in one passage, where the author gives it as the name by which he was christened. If this statement be meant literally (i.e. if the writer was not merely treating the two names as equivalent), it shows that he must, like his brother, have had a Norman godfather. The ending -in was frequently appended to names in Old French, e.g. in Johannin for Johan, John. The title Ormulum for the book which Orm made was probably an imitation of Speculum, a common medieval name for books of devotion or religious edification.

The Ormulum is written in lines alternately of eight and seven syllables, witho'it either rhyme or alliteration. The rhythm may be

seen from the opening couplet:

Nu, brof>err Wallter, brof>err min Affterr J>e fiaeshess kinde.

The extant portion of the work, not including the dedication and introduction, consists of about 20,000 lines. But the table of contents refers to 242 homilies, of which only 31 are preserved; and as the dedication implies that the book had been completed, and that it included homilies on the gospels for nearly all the year, it would seem that the huge fragment which we possess is not much more than one-eighth of this extraordinary monu- ment of pious industry.

The Ormulum is entirely destitute of poetic merit, though the author's visible enjoyment of his task renders it not un- interesting reading. To the history of biblical interpretation and of theological ideas it probably contributes little or nothing that is not well-known from other sources. For the philologist, however, the work is of immense value, partly as a unique specimen of the north-midland dialect of the period, and partly because the author had invented an original system of phonetic spelling, which throws great light on the contemporary pronuncia- tion of English. In closed syllables the shortness of a vowel is indicated by the doubling of the following consonant. In open syllables this method would have been misleading, as it would have suggested a phonetic doubling of the consonant. In such

cases Orm had recourse to the device of placing the mark « over the vowel. Frequently, but apparently not according to any discoverable rule, he distinguishes long vowels by one, two or three accents over the letter. Like some earlier writers, he retained the Old English form of the letter g (3) where it expressed a spirant sound (not, however, distinguishing between the guttural and the palatal spirant), and used the continental g for the guttural stop and the sound dzh. He was, however, original in distinguishing the two latter sounds by using slightly different forms of the letter. This fact was unfortunately not perceived by the editors, so that the printed text confounds the two symbols throughout. The discovery was made by Professor A. S. Napier in 1890. It must be confessed that Orm often forgets his own rules of spelling, and although hundreds of oversights are corrected by interlineation, many inconsistencies still remain. Nevertheless, the orthography of the Ormulum is the most valuable existing source of information on the development of sounds in Middle English.

The Ormulum was edited for the first time by R. M. White in 1854. A revised edition, by R. Holt, was published in 1878. Many im- portant corrections of the text were given by E. Kolbing in the first volume of

Englische Siudien. With reference to the three forms of the letter g, see A. S. Napier, Notes on the Orthography of the Ormulum, printed with A History of the Holy Rood Tree (Early English Text Society, 1894). (H. Br.)

ORMAZD, or Ormuzd (0. Persian Auramazda or Ahuramazda) , the supreme deity of Zoroastrianism. He is represented as the god and creator of good, light, intelligence, in perpetual opposi- tion to Ahriman the lord of evil, darkness and ignorance. The dualism of the earlier Zoroastrians, which may be compared with the Christian doctrine of God and Satan, gradually tended in later times towards monotheism. At all times it was believed that Ormazd would ultimately vanquish Ahriman. See further Zoroaster.

ORME, ROBERT (1728-1801), English historian of India, was born at Anjengo on the Malabar coast on the 25th of December 1728, the son of a surgeon in the Company's service. Educated at Harrow, he was appointed to a writership in Bengal in 1743. He returned to England in 1753 in the same ship with Clive, with whom he formed a close friendship. From 1754 to 1758 he was a member of council at Madras, in which capacity he largely influenced the sending of Clive to Calcutta to avenge the catastrophe of the Black Hole. His great work — A History of the Military Transactions of the British Nation in Indoslan from 174s — was published in three volumes in 1763 and 1778 (Madras reprint, 1861-1862). This was followed by a volume of Historical Fragments (1781), dealing with an earlier period. In 1769 he was appointed historiographer to the East India Company. He died at Ealing on the 13th of January 1801. His valuable collections of MSS. are in the India Office library. The characteristics of his work, of which the influence is admirably shown in Thackeray's The Newcomes, are thus described by Macaulay: " Orme, inferior to no English historian in style and power of painting, is minute even to tediousness. In one volume he allots, on an average, a closely printed quarto page to the events of every forty-eight hours. The consequence is that his narrative, though one of the most authentic and one of the most finely written in our language, has never been very popular, and is now scarcely ever read." Not a few of the most picturesque passages in Macaulay's own Essay on Clive are borrowed from Orme. (J. S. Co.)
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ORMEROD, ELEANOR A. (1828-1901), English entomologist, was the daughter of George Ormerod, F.R.S., author of The History of Cheshire, and was born at Sedbury Park, Gloucester- shire, on the nth of May 1828. From her earliest childhood insects were her delight, and the opportunity afforded for entomological study by the large

estate upon which she grew up and the interest she took in agriculture generally soon made her a local authority upon this subject. When, in 1868, the Royal Horticultural Society began forming a collection of insect pests of the farm for practical purposes, Miss Ormerod largely contributedto it, and was awarded the Flora medal of the society. In 1877 she issued a pamphlet, Notes for Observations

#» Injurious Insects, which was distributed among persons interested in this line of inquiry, who readily sent in the results of their researches, and was thus the beginning of the well-known Annual Series of Reports on Injurious Insects and Farm Pests. In 1 88 1 Miss Ormerod published a special report upon the ” turnip-fly,” and in 1882 was appointed consulting entomologist to the Royal Agricultural Society, a post she held until 1892. For several years she was lecturer on scientific entomology at the Royal Agricultural College, Cirencester. Her fame was not confined to England: she received silver and gold medals from the university of Moscow for her models of insects injurious to plants, and her treatise on The Injurious Insects of South Africa showed how wide was her range. In 1899 she received the large silver medal from the Societe Nationale d’ Acclimatation de France. Among others of her works are the Cobden Journals, Manual of Injurious Insects, and Handbook of Insects injurious to Orchard and Bush Fruits. Almost the last honour which fell to her was the honorary degree of LL.D. of Edinburgh University — a unique distinction, for she was the first woman upon whom the university had conferred this degree. The dean of the legal faculty in making the presentation aptly summoned up Miss Ormerod’s services as follows: ” The pre- eminent position which Miss Ormerod holds in the world of science is the reward of patient study and unwearying observation. Her investigations have been chiefly directed towards the discovery of methods for the prevention of the ravages of those insects which are injurious to orchard, field and forest. Her labours have been crowned with such success that she is entitled to be hailed the protectress of agriculture and the fruits of the earth — a beneficent Demeter of the 19th century.” She died at St Albans on the 19th of July 1901.

ORMOC, a town of the province of Leyte, island of Leyte, Philippine Islands, on the W. coast about 35 m. S.W. of Tacloban. Pop. (1903), after the annexation of Albuera, 20,761. There are thirty-three barrios or villages in the town, and the largest of them had a population in 1903 of 5419. The language is Visayan. Ormoc is in a great hemp-producing region and is open to coast trade.

ORMOLU (Fr. or moulu, gold ground or pounded), an alloy of copper and zinc, sometimes with an addition of tin. The name is also used to describe gilded brass or copper. The tint of ormolu approximates closely to that of gold; it is heightened by a wash of gold lacquer, by immersion in dilute sulphuric acid, or by burnishing. The principal use of ormolu is for the mountings of furniture. With it the great French ebenistes of the 18th century obtained results which, in the most finished examples, are almost as fine as jewelers' work. The mounts were usually cast and then chiselled with extraordinary skill and delicacy.

ORMOND, a village and winter resort of Volusia county, Florida, U.S.A., about 68 m. by rail S. of St Augustine. It is situated on the Halifax river, an arm of the Atlantic Ocean extending for 25 m. along the E. coast of Florida. Pop. (1900) 595 ; (1905) 689; (1910) 780. It is served by the Florida East Coast Railway. The Halifax river region is famous for its excellent oranges and grape-fruit. The hard and compact Ormond-Daytona beach, about 200 ft. wide at low tide and about 20 m. long, offers exceptional facilities for driving, motoring and bicycling; on it are held the annual tournaments of the Florida East Coast Automobile Association. The old King's Road, built by the English between 1763 and 1783, from St Mary's, Georgia, some 400 m. to the south, has been improved for automobiles • between Ormond and Jacksonville. About 2 m. west of Ormond are the ruins of an old sugar mill, probably dating from the last quarter of the 18th century and not, as is frequently said, from the Spanish occupation in the 16th century. About 5 m. south of Ormond and also on the Halifax river is another popular winter resort, Daytona (pop. 1900, 1690; 1905, 2199; 1910, 3182), founded in 1870 as Tomoka by Mathias Day of Mansfield, Ohio, in whose honour it was renamed Daytona in 1871. Its streets and drives are shaded by live oaks, palmettos, hickories and magnolias.

ORMONDE, EARL AND MARQUESS OF, titles still held by the famous Irish family of Butler {q.v.), the name being taken from a district now part of Co. Tipperary. In 1328 James Butler (c. 1305-1337), a son of Edmund Butler, was created earl of Ormonde, one reason for his elevation being the fact that his wife Eleanor, a daughter of Humfrey Bohun, earl of Hereford, was a granddaughter of King Edward I. His son James, the 2nd earl (1331-1382), was four times governor of Ireland; the latter's grandson James, the 4th earl (d. 1452), held the same position several times, and won repute not only as a soldier, but as a scholar. His son James, the 5th earl (1420- c. 1461), was created an English peer as earl of Wiltshire in 1449. A truculent partisan of the house of Lancaster, he was lord high treasurer of England in 1455

and again in 1459, and was taken prisoner after the battle of Towton in 1461. He and his two brothers were than attainted, and he died without issue, the exact date of his death being unknown. The attainder was repealed in the Irish parliament in 1476, when his brother Sir John Butler (c. 1422-1478), who had been pardoned by Edward IV. a few years previously, became 6th earl of Ormonde. John, who was a fine linguist, served Edward IV. as ambassador to many European princes, and this king is said to have described him as ” the goodliest knight he ever beheld and the finest gentleman in Christendom.” His brother Thomas, the 7th earl (c. 1424-1515), a courtier and an English baron under Richard III. and Henry VII., was ambassador to France and to Burgundy; he left no sons, and on his death in August 151 5 his earldom reverted to the crown.

Margaret, a daughter of this earl, married Sir William Boleyn of Blickling, and their son Sir Thomas Boleyn (1477-1539) was created earl of Ormonde and of Wiltshire in 1529. He went on several important errands for Henry VIII., during one of which he arranged the preliminaries for the Field of the Cloth of Gold: he was lord privy seal from 1530 to 1536, and served the king in many other ways. He was the father of Henry’s queen, Anne Boleyn, but both this lady, and her only brother, George Boleyn, Viscount Rochford, had been put to death before their father died in March 1539.

Meanwhile in 151 5 the title of earl of Ormonde had been assumed by Sir Piers Butler (c. 1467-1539), a cousin of the 7th earl, and a man of great influence in Ireland. He was lord deputy, and later lord treasurer of Ireland, and in 1528 he surrendered his claim to the earldom of Ormonde and was created earl of Ossory. Then in 1 538 he was made earl of Ormonde, this being a new creation; however, he counts as the 8th earl of the Butler family. In 1550 his second son Richard (d. 1571) was created Viscount Mountgarret, a title still held by the Butlers. The 8th earl’s son, James, the 9th earl (c. 1490-1546), lord high treasurer of Ireland, was created Viscount Thurles in 1536. In 1544 an act of parliament confirmed him in the possession of his earldom, which, for practical purposes, was declared to be the creation of 1328, and not the new creation of

1538-

Thomas, the 10th earl (1532-1614), a son of the 9th earl, was lord high treasurer of Ireland and a very prominent personage during the latter part of the 16th century. He was a Protestant and threw his great influence on the side of the English queen and her ministers in their efforts to crush the Irish rebels, but he was perhaps more anxious

to prosecute a fierce feud with his hereditary foe, the earl of Desmond, this struggle between the two factions desolating Munster for many years. His successor was his nephew Walter (1 569-1633), who was imprisoned from 1617 to 1625 for refusing to surrender the Ormonde estates to his cousin Elizabeth, the wife of Sir R. Preston and the only daughter of the 10th earl. He was deprived of the palatine rights in the county of Tipperary, which had belonged to his ancestors for 400 years, but he recovered many of the family estates after his release from prison in T625.

Walter's grandson, James, the 12th earl, was created marquess of Ormonde in 1642 and duke of Ormonde in 1661 (see below); his son was Thomas Butler, earl of Ossory (q.v.), and his grandson was James Butler, 2nd duke of Ormonde (see below).

ORMONDE, ist DUKE OF

When Charles Butler, earl of Arran (1671-1758), the brother and successor of the 2nd duke, died in December 1758, the dukedom and marquessate became extinct, but the earldom was claimed by a kinsman, John Butler (d. 1766). John's cousin, Walter (1703-1783), inherited this claim, and Walter's son John (1740-1795) obtained a confirmation of it from the Irish House of Lords in 1791. He is reckoned as the 17th earl. His son Walter, the 18th earl (1770-1820), was created marquess of Ormonde in 1816, a title which became extinct on his death, but was revived in favour of his brother James (1774-1838) in 1825. James was the grandfather of James Edward William Theobald Butler (b. 1844), who became the 3rd marquess in 1854. The marquess sits in the House of Lords as Baron Ormonde of Llanthony, a creation of 1821.

See J. H. Round on " The Earldoms of Ormonde " in Joseph Foster's Collectanea Genealogica (1881-1883).

ORMONDE, JAMES BUTLER, ist Duke of (1610-1688), Irish statesman and soldier, eldest son of Thomas Butler, Viscount Thurles, and of Elizabeth, daughter of Sir John Poyntz, and grandson of Walter, nth earl of Ormonde (see above), was born in London on the 19th of October 1610. On the death of his father by drowning in 1619, the boy was made a royal ward by James I., removed from his Roman Catholic tutor, and placed in the household of Abbot, archbishop of Canterbury, with whom he stayed until 1625, residing afterwards in Ireland with his grandfather. In 1629, by his marriage with his cousin,

the Lady Elizabeth Preston, daughter and heiress of Richard, earl of Desmond, he put an end to the long-standing quarrel between the families and united their estates. In 1632 on the death of his grandfather he succeeded him to the earldom.

He was already noted in Ireland, as had been many of his race, for his fine presence and great bodily vigour. His active career began in 1633 with the arrival of Strafford, by whom he was treated, in spite of his independence of character, with great favour. Writing to the king, Strafford described him as ” young, but take it from me, a very staid head,” and Ormonde was throughout his Irish government his chief friend and support. In 1640 during Strafford’s absence he was made commander-in- chief of the forces, and in August he was appointed lieutenant- general. On the outbreak of the rebellion in 1641 he rendered admirable service in the expedition to Naas, and in the march into the Pale in 1642, though much hampered by the lords justices, who were jealous of his power and recalled him after he had succeeded in relieving Drogheda. He was publicly thanked by the English parliament and presented with a jewel of the value of £620. On the 15th of April 1642 he gained the battle of Kilrush against Lord Mountgarret. On the 30th of August he was created a marquess, and on the 16th of September was appointed lieutenant-general with a commission direct from the king. On the 18th of March 1643 he won the battle of New Ross against Thomas Preston, afterwards Viscount Tara. In September, the civil war in England having meanwhile broken out, Ormonde, in view of the successes of the rebels and the un- certain loyalty of the Scots in Ulster, concluded with the latter, in opposition to the lords justices, on the 15th of September, the ” cessation ” by which the greater part of Ireland was given up into the hands of the Catholic Confederation, leaving only small districts on the east coast and round Cork, together with certain fortresses in the north and west then actually in their possession, to the English commanders. He subsequently, by the king’s orders, despatched a body of troops into England (shortly afterwards routed by Fairfax at Nantwich) and was appointed in January 1644 lord lieutenant, with special instruc- tions to do all in his power to keep the Scotch army occupied. In the midst of all the plots and struggles of Scots, Old Irish, Catholic Irish of English race, and Protestants, and in spite of the intrigues of the pope’s nuncio as well as of attempts by the parliament’s commissioners to ruin his power, Ormonde showed the greatest firmness and ability. He assisted Antrim in his unsuccessful expedition into Scotland. On the 28th of March 1646 he concluded a treaty with the Irish which granted re- ligious concessions and removed various grievances. Mean-

while the difficulties of his position had been greatly increased by Glamorgan's treaty with the Roman Catholics on the 25th of August 1645, and it became clear that he could not long hope to hold Dublin against the Irish rebels. He thereupon applied to the English parliament, signed a treaty on the 19th of June 1647, gave Dublin into their hands upon terms which protected the interests of both Protestants and Roman Catholics so far as they had not actually entered into rebellion, and sailed for England at the beginning of August. He attended Charles during August and October at Hampton Court, but subsequently, in March 1648, in order to avoid arrest by the parliament, he joined the queen and prince of Wales at Paris. In September of the same year, the pope's nuncio having been expelled, and affairs other- wise looking favourable, he returned to Ireland to endeavour to unite all parties for the king. On the 17th of January 1649 he concluded a peace with the rebels on the basis of the free exercise of their religion, on the execution of the king proclaimed Charles II. and was created a knight of the Garter in September. He upheld the royal cause with great vigour though with slight success, and on the conquest of the island by Cromwell he returned to France in December 1650.

Ormonde now, though in great straits for want of money, resided in constant attendance upon Charles and the queen- mother in Paris, and accompanied the former to Aix and Cologne when expelled from France by Mazarin's treaty with Cromwell in 1655. In 1658 he went disguised, and at great risk, upon a secret mission into England to gain trustworthy intelligence as to the chances of a rising. He attended the king at Fuent- errabia in 1659 and had an interview with Mazarin; and was actively engaged in the secret transactions immediately pre- ceding the Restoration. On the return of the king he was at once appointed a commissioner for the treasury and the navy, made lord steward of the household, a privy councillor, lord lieutenant of Somerset (an office which he resigned in 1672), high steward of Westminster, Kingston and Bristol, chancellor of Dublin University, Baron Butler of Llanthony and earl of Brecknock in the peerage of England; and on the 30th of March 1 66 1 he was created duke of Ormonde in the Irish peerage and lord high steward of England. At the same time he recovered his enormous estates in Ireland, and large grants in recom- pense of the fortune he had spent in the royal service were made to him by the king, while in tte following year the Irish parlia- ment presented him with £30,000. His losses, however, according to Carte, exceeded his gains by £868,000. On the 4th of Novem- ber 1661 he once more received the lord lieutenantship of Ireland, and was busily engaged in the work of settling that country.

The most important and most difficult problem was the land question, and the Act of Explanation was passed through the Irish parliament by Ormonde on the 23rd of December 1665. His heart was in his government, and he vehemently opposed the bill prohibiting the importation of Irish cattle which struck so fatal a blow at Irish trade; and retaliated by prohibiting the import into Ireland of Scottish commodities, and obtained leave to trade with foreign countries. He encouraged Irish manufactures and learning to the utmost, and it was to his efforts that the Irish College of Physicians owes its incorporation.

Ormonde's personality had always been a striking one, and in the new reign his virtues and patriotism became still more conspicuous. He represented almost alone the older and nobler generation. He stood aloof while the counsels of the king were guided by dishonour; and proud of the loyalty of his race which had remained unspotted through five centuries, he bore with silent self-respect calumny, envy and the loss of royal favour, declaring, " However ill I may stand at court I am resolved to lye well in the chronicle."

He soon became the mark for attack from all that was worst in the court. Buckingham especially did his utmost to under- mine his influence. Ormonde's almost irresponsible govern- ment of Ireland during troublous times was no doubt open to criticism. He had billeted soldiers on civilians, and had executed martial law. The impeachment, however, threatened by Buckingham in 1667 and 1668 fell through. Nevertheless by

1669 constant importunity had had its usual effect upon Charles, and on the 14th of March Ormonde was removed from the govern- ment of Ireland and from the committee for Irish affairs. He made no complaint .insisted that his sons and others over whom he had influenceshould retain their posts, and continued to fulfil with dignified persistence the duties of his other offices, while the greatness of his character and services was recognized by his election as chancellor of Oxford University on the 4th of August. In 1670 an extraordinary attempt was made to assassinate the duke by a ruffian and adventurer named Thomas Blood, already notorious for an unsuccessful plot to surprise Dublin Castle in 1663, and later for stealing the royal crown from the Tower. Ormonde was attacked by this person and his ac- complices while driving up Sr James's Street on

the night of the 6th of December, dragged out of his coach, and taken on horseback along Piccadilly with the intention of hanging him at Tyburn. Ormonde, however, succeeded in overcoming the horseman to whom he was bound, and his servants coming up, he escaped. The outrage, it was suspected, had been instigated by the duke of Buckingham, who was openly accused of the crime by Lord Ossory, Ormonde's son, in the king's presence, and threatened by him with instant death if any violence should happen to his father; and some colour was given to these sus- picions by the improper action of the king in pardoning Blood, and in admitting him to his presence and treating him with favour after his apprehension while endeavouring to steal the crown jewels.

In 1671 Ormonde successfully opposed Richard Talbot's attempt to upset the Act of Settlement. In 1673 he again visited Ireland, returned to London in 1675 to give advice to Charles on affairs in parliament, and in 1677 was again restored to favour and reappointed to the lord lieutenancy. On his arrival in Ireland he occupied himself in placing the revenue and the army upon a proper footing. Upon the outbreak of the popish terror in England, he at once took the most vigorous and comprehensive steps, though with as little harshness as possible, towards rendering the Roman Catholics, who were in the proportion' of 15 to 1, powerless; and the mildness and moderation of his measures served as the ground of an attack upon him in England led by Shaftesbury, from which he was defended with great spirit by his son Lord Ossory. In 1682 Charles summoned Ormonde to court. The same year he wrote " A Letter … in answer to the earl of Anglesey, his Observa- tions upon the earl of Castlehaven's Memoires concerning the Rebellion of Ireland," and gave to Charles a general support. On the gth of November 1683 an English dukedom was conferred upon him, and in June 1684 he returned to Ireland; but he was recalled in October in consequence of fresh intrigues. Before, however, he could give up his government to Rochester, Charles II. died; and Ormonde's last act as lord lieutenant was to proclaim James II. in Dublin. Subsequently he lived in retire- ment at Cornbury in Oxfordshire, lent to him by Lord Clarendon, but emerged from it in 1687 to offer a firm and successful opposi- tion at the board of the Charterhouse to James's attempt to assume the dispensing power, and force upon the institution a Roman Catholic candidate without taking the oaths according to the statutes and the act of parliament. He also refused the king his support in the question of the Indulgence; notwith- standing which James, to his credit, refused to take away his offices, and continued to hold him in respect and favour to the last. Ormonde died on the 21st of July 1688, not having, as he rejoiced to know, "

outlived his intellectuals “; and with him disappeared the greatest and grandest figure of the times. His splendid qualities were expressed with some felicity in verses written on welcoming his return to Ireland and printed in

1682:

” A Man of Plato’s grand nobility,

An inbred greatness, innate honesty;

A Man not form’d of accidents, and whom

Misfortune might oppress, not overcome . . .

Who weighs himself not by opinion

But conscience of a noble action.”

He was buried in Westminster Abbey on the 1st of August.

He had, besides two daughters, three sons who grew to maturity. The eldest of these, Thomas, earl of Ossory (1634- 1680) predeceased him, his eldest son succeeding as 2nd duke of Ormonde. The other two, Richard, created earl of Arran, and John, created earl of Gowran, both dying without male issue, and the male descent of the 1st duke becoming extinct in the person of Charles, 3rd duke of Ormonde, the earldom subse- quently reverted to the descendants of Walter, nth earl of Ormonde.

Authorities. — Life of the Duke of Ormonde, by Thomas Carte ; the same author’s Collection of Original Letters, found among the Duke of Ormonde’s Papers (1739), and the Carte MSS. in the Bodleian Library _ at Oxford; Life of Ormonde, by Sir Robert Southwell, printed in the History of the Irish Parliament, by Lord Mountmorres (1792), vol. i. ; Correspondence between Archbishop Williams and the Marquess of Ormonde, ed. by B. H. Beedham (reprinted from Archae- ologia Cambrensis, 1869); Observations on the Articles of Peace between James, Earl of Ormonde, and the Irish Rebels, by John Milton; Hist. MSS. Comm. Reps, ii.-iv. and vi.x., esp. Rep. viii., appendix p. 499, and Rep. xiv. App.: pt. vii., MSS. of Marquis of Ormonde, together with new series; Notes and Queries, vi. ser. v., PP 343i ‘r’i 1 ; Gardiner’s Hist, of the Civil War; Calendar of State Papers (Domestic)a.ndIrish,l633-l662,with introductions ; Biographia Britannica (Kippis) ; Scottish Hist. Soc. Publications: Letters and Papers of 1650, ed. by S. R. Gardiner, vol. xvii. (1894).

ORMONDE, JAMES BUTLER, 2nd Duke of (1665-1745), Irish statesman and soldier, son of Thomas, earl of Ossory, and grandson of the 1st duke, was born in Dublin on the 29th of April 1665, and was educated in France and afterwards at Christ Church, Oxford. On the death of his father in 1680 he became earl of Ossory by courtesy. He obtained command of a cavalry regiment in Ireland in 1684, and having received an appointment at court on the accession of James II., he served against the duke of Monmouth. Having succeeded his grandfather as duke of Ormonde in 1688, he joined William of Orange, by whom he was made colonel of a regiment of horse-guards, which he commanded at the battle of the Boyne. In 1691 he served on the continent under William, and after the accession of Anne he was placed in command of the land forces co-operating with Sir George Rooke in Spain. Having been made a privy councillor, Ormonde succeeded Rochester as viceroy of Ireland in 1703, a post which he held till 1707. On the dismissal of the duke of Marlborough in 1711, Ormonde was appointed captain- general in his place, and allowed himself to be made the tool of the Tory ministry, whose policy was to carry on the war in the Netherlands while giving secret orders to Ormonde to take no active part in supporting their allies under Prince Eugene^ Ormonde's position as captain-general made him a personage of much importance in the crisis brought about by the death of Queen Anne. Though he had supported the revolution of 1688, he was traditionally a Tory, and Lord Bolingbroke was his political leader. During the last years of Queen Anne he almost certainly had Jacobite leanings, and corresponded with the duke of Berwick. He joined Bolingbroke and Oxford, however, in signing the proclamation of King George I., by whom he was nevertheless deprived of the captain-generalship. In June 171 5 he was impeached, and fled to France, where he for some time resided with Bolingbroke, and in 17 16 his immense estates were confiscated to the crown by act of parliament, though by a subsequent act his brother, Charles Butler, earl of Arran, was enabled to repurchase them. After taking part in the Jacobite invasion in 1715, Ormonde settled in Spain, where he was in favour at court and enjoyed a pension from the crown. Towards the end of his life he resided much at Avignon, where he was seen in 1733 by Lady Mary Wortley Montagu. Ormonde died on the 16th of November 1745, and was buried in West- minster Abbey.

With little of his grandfather's ability, and inferior to him in elevation of character, Ormonde was nevertheless one of the great figures of his time. Handsome, dignified, magnanimous and open-handed, and free from the meanness, treachery and venality of many of his leading contemporaries, he enjoyed a popularity which, with greater stability

of purpose, might have enabled him to exercise commanding influence over events.

See Thomas Carte, Hist, of the Life of James, Duke of Ormonde (6 vols., Oxford, 1851), which contains much information respecting the life of the second duke ; Earl Stanhope, Hist, of England, com- prising the Reign of Queen Anne until the Peace of Utrecht (London, 1870) ; F. W. Wyon, Hist, of Great Britain during the Reign of Queen Anne (2 vols., London, 1876); William Coxe, Memoirs of Marl- borough (3 vols., new edition, London, 1847).

ORMSKIRK, a market town and urban district in the Ormskirk parliamentary division of Lancashire, England, 11 m. N.E. of Liverpool by the Lancashire and Yorkshire railway. Pop. (1901), 6857. The church of St Peter and St Paul is a spacious building in various styles of architecture, but principally Per- pendicular. It possesses the rare feature of two western towers, the one square and embattled, the other octagonal and bearing a short spire. There are various Norman fragments, including a fine early window in the chancel. To the south-east of the church, and divided from it by a screen, is the Derby chapel, the exclusive property of the earls of Derby, whose vault is contained within. A free grammar school was founded about 1614. Rope and twine making, iron-founding and brewing are carried on, and the town has long been famous for its ginger- bread.

The name and church existed in the time of Richard I., when the priory of Burscough was founded. A few fragments of this remain about 2 m. N. of Ormskirk. The prior and convent obtained from Edward I. a royal charter for a market at the manor of Ormskirk. On the dissolution of the monasteries the manor was granted to the earl of Derby.

ORNAMENT (Lat. ornate, to adorn), in decorative art, that element which adds an embellishment of beauty in detail. Orna- ment is in its nature accessory, and implies a thing to be orna- mented, which is its active cause and by rights suggests its design (q.v.). It does not exist apart from its application. Nor is it properly added to a thing already in existence (that is but a makeshift for design), but is rather such modification of the thing in the making as may be determined by the consideration of beauty. For example, the construction and proportions of a chair are determined by use (by the necessity of

combining the maximum of strength with the minimum of weight, and of fitting it to the proportions of the human body, &c); and any modification of the plan, such as the turning of legs, the shaping of arms and back, carving, inlay, mouldings, &c. — any recon- sideration even of the merely utilitarian plan from the point of view of art — has strictly to do with Ornament, which thus, far from being an afterthought, belongs to the very inception of the thing. Ornarrr ,s good only in so far as it is an indispens- able part of sometm'ng, helping its effect without hirt to its use. It is begotten of use by the consideration of beauty. The test of ornament is its fitness. It must occupy a space, fulfil a purpose, be adapted to the material in which and the process by which it is executed. This implies treatment. The treatment befitting a wall space does not equally befit a floor space of the same dimensions. What is suitable to hand-painting is not equally suitable to stencilling, nor what is proper to mosaic proper to carpet-weaving. Neither the purposes of decoration nor the conditions of production allow great scope for naturalism in ornament. Its forms are derived from nature, more or less; but repose is best secured by some removedness from nature — necessitated also by the due treatment of material after its kind and according to its fashioning. In the case of recurring ornament it is inept to multiply natural flowers, &c, which at every repetition lose something of their natural attraction. The artist in ornament does not imitate natural forms. Such as he may employ he transfigures. He does not necessarily set out with any idea of natural form (this comes to him by the way) ; his first thought is to solve a given problem in design, and he solves it perhaps most surely by means of abstract ornament — witness the work of the Greeks and of the Arabs. The extremity of tasteless naturalism, reached towards the beginning of the Victorian era, was the opportunity of English reformers, prominent amongst whom was Owen Jones, whose fault was in insisting upon a form of ornament too abstract to suit English ideas. William Morris and others led the way

back to nature, but to nature trained in the way of ornamen' The Styles of ornament, so-called, mark the evolution of design, being the direct outcome of Greek, Roman, Byzantine, Gothic or other conditions, in days when fashion moved slowly. Post- Renaissance ornament goes by the name of the reigning king; but the character of the historic periods was not sought by artists; it came of their working in the way natural to them and doing their best. " Style," as distinguished from " the Styles," comes of an artist's intelligent and sympathetic treatment of his material, and of his personal sincerity and strength. Inter- national traffic has gone far to do away with national character- istics in ornament, which becomes yearly more

and more alike all the world over. The subsidiary nature of ornament and its subjection to conditions lead to its frequent repetition, which results in pattern, repeated forms falling inevitably into lines, always self-asserting, and liable to annoy in proportion as they were not foreseen by the designer. He cannot, therefore, safely disregard them. Indeed, his first business is to build pattern upon lines, if not intrinsically beautiful, at least helpful to the scheme of decoration. He may disguise them; but capable designers are generally quite frank about the construction of their pattern, and not afraid of pronounced lines. Of course, adaptation being all-essential to pattern, an artist must be versed in the technique of any manufacture for which he designs. His art is in being equal to the occasion. (L. F. D.)

ORNE, a department of the north-west of France, about half of which formerly belonged to the province of Normandy and the rest to the duchy of Alencon and to Perche. Pop. (1906) 315,993. Area, 2371 sq. m. It is bounded N. by Calvados, N.E. by Eure, E. and S.E. by Eure-et-Loir. S. by Sarthe and Mayenne and W. by Manche. Geologically there are two distinct regions; to the west of the Orne and the railway from Argentan to Alencon lie primitive rocks connected with those of Brittany; to the east begin the Jurassic and Cretaceous formations of Normandy. The latter district is agriculturally the richest part of the depart- ment; in the former the poverty of the soil has led the inhabit- ants to seek their subsistence from industrial pursuits. Between the northern portions, draining to the Channel, -and the southern portion, belonging to the basin of the Loire, stretch the hills of Perche and Normandy, which generally have a height of from 800 to 1000 ft. The highest point in the department, situated in the forest of ficouves north of Alencon, reaches 1368 ft. The department gives birth to three Seine tributaries — the Eure, its affluent the Iton, and the Risle, which passes by Laigle. The Touques, passing by Vimoutiers, the Dives and the Orne fall into the English Channel, the last passing Sees and Argentan, and receiving the Noireau with its tributary the Vere, which runs past Flers. Towards the Loire flows the Huisne, a feeder of the Sarthe passing by Mortagne, the Sarthe, which passes by Alencon, and the Mayenne, some of whose affluents rise to the north of the dividing range and make their way through it by the most picturesque defiles. The department, indeed, with its beautiful forests containing oaks several centuries old, its meadows, streams, deep gorges and stupendous rocks, is one of the most picturesque of all France. In the matter of climate Orne belongs to the Seine region. The mean temperature is 50° F.; the summer heat is never extreme; the west winds are the most frequent; the rainfall, distributed over about a hundred days in the year, amounts to 36 in. or about 5 in. more than

the average for France.

Horse-breeding is the most flourishing business in the rural districts; there are three breeds — those of Perche, Le Merlerault and Brittany. The great government stud of Le Pin-au-Haras (established in 1714), with its school of horse-breeding, is situated between Le Merlerault and Argentan. Several horse-training establishments exist in the department. A large number of lean cattle are bought in the neighbouring departments to be fattened; the farms in the vicinity of Vimoutiers, on the borders of Calvados, produce the famous Camembert cheese, and others excellent butter. The bee industry is very flourishing. Oats, wheat, barley and buckwheat are the chief cereals, besides which fodder in great quantity and variety, potatoes and some

hemp are grown. The variety of production is due to the great natural diversity of the soils. Small farms are the rule, and the fields in those cases are surrounded by hedges relieved by pollard trees. Along the roads or in the enclosures are planted numerous pear and apple trees, the latter yielding cider, part of which is manufactured into brandy. Beech, oak, birch and pine are the chief timber trees in the extensive forests of the department. Orne has iron mines and freestone quarries; a kind of smoky quartz known as Alencon diamond is found. Its most celebrated mineral waters are those of the hot springs of Bagnoles, which contain salt, sulphur and arsenic, and are employed for tonic and restorative purposes in cases of general debility. In the forest of Belleme is the chalybeate spring of La Hesse, which was used by the Romans.

Cotton and linen weaving, principally carried on at Flers (q.v.) and La Ferte-Mace (pop. 4355), forms the staple industry of Orne. Alencon and Vimoutiers are engaged in the production of linen and canvas. Vimoutiers has bleacheries, which, together with dye-works, are found in the textile centres. Only a few workmen are now employed at Alencon in the making of the lace which takes its name from the town. Foundries and wire- works also exist in the department, and articles in copper, zinc and lead are manufactured. Pins, needles, wire

and hardware are produced at Laigle (pop. 4416), and Tinchebray is also a centre for hardware manufacture. There are also glass-works, paper-mills, tanneries (the waters of the Orne being reputed to give a special quality to the leather) and glove-works. Coal, raw cotton, metals and machinery are imported into the depart- ment, which exports its woven and metal manufacture, live stock and farm produce.

The department is served by the Western railway. There are four arrondissements, with Alencon, the capital, Argentan, Domfront and Mortagne as their chief towns, 36 cantons and 512 communes. The department forms the diocese of Sees (province of Rouen) and part of the academie (educational division) of Caen, and the region of the IV. army corps; its court of appeal is at Caen. The chief places are Alencon, Argentan, Mortagne, Flers and Sees. Carrouges has remains of a chateau of the 15th and 17th centuries; Chambois has a donjon of the 12th century; and there is a fine Renaissance chateau at O. A church in Laigle has a fine tower of the 15th century. There are a great number of megalithic monuments in the department.

ORNITHOLOGY, 1 properly the methodical study and conse- quent knowledge of birds with all that relates to them; but the difficulty of assigning a limit to the commencement of such study and knowledge gives the word a very vague meaning, and practically procures its application to much that does not enter the domain of science. This elastic application renders it im- possible in the following sketch of the history of ornithology to draw any sharp distinction between works that are emphatically ornithological and those to which that title can only be attached by courtesy; for, since birds have always attracted far greater attention than any other group of animals with which in number or in importance they can be compared, there has grown up concerning them a literature of corresponding magnitude and of the widest range, extending from the recondite and laborious investigations of the morphologist and anatomist to the casual observations of the sportsman or the schoolboy.

Though birds make a not unimportant appearance in the earliest written records of the human race, the painter’s brush has preserved their counterfeit presentment for a still longer period. A fragmentary fresco taken from a tomb at Medum was desposited some years ago, though in a decaying condition, in the Museum of Egyptian Antiquities, Cairo. This Egyptian picture was said to date from the time of the third or fourth dynasty, some three thousand years before the Christian era. In it were depicted with a marvellous fidelity, and thorough appreciation of form and colouring (despite a certain

conventional

1 Ornithqlogia, from the Greek opvtB-, crude form of 6p«s, a bird, and -\oyia, allied to \670s, commonly Englished a discourse. The earliest known use of the word Ornithology seems to be in the third edition of Blount's Glossographia (1670), where it is noted as being " the titie of a late Book."

treatment), the figures of six geese. Four of these figures can be unhesitatingly referred to two species (Anser albifrons and A. ruficollis) well known at the present day. In later ages the representations of birds of one sort or another in Egyptian paintings and sculptures become countless, and the bassi-rilievi of Assyrian monuments, though mostly belonging of course to a subsequent period, are not without them. No figures of birds, however, seem yet to have been found on the incised stones, bones or ivories of the prehistoric races of Europe.

History of Ornithology to End of 18th Century.

Aristotle was the first serious author on ornithology with whose writings we are acquainted, but even he had, as he tells us, predecessors; and, looking to that portion of his works on animals which has come down to us, one ˆorits. finds that, though more than 170 sorts of birds are mentioned, 2 yet what is said of them amounts on the whole to very little, and this consists more of desultory observations in illustration of his general remarks (which are to a considerable extent physiological or bearing on the subject of reproduction) than of an attempt at a connected account of birds. One of his commentators, C. J. Sundevall — equally proficient in classical as in ornithological knowledge — was, in . 1863, compelled to leave more than a score of the birds of which Aristotle wrote unidentified. Next in order of date, though at a long interval, comes Pliny the Elder, in whose Historia Naturalis Book X. is devoted to birds. Neither Aristotle nor Pliny attempted to classify the birds known to them beyond a very rough and for the most part obvious grouping. Aristotle seems to recognize eight principal groups: (1) Gampsonyches , approximately equivalent to the Accipitres of Linnaeus; (2) Scoleccphaga, containing most of what would now be called Oscines, excepting indeed the (3) Acanthophaga, composed of the goldfinch, siskin and a few others; (4) Scnipophaga, the woodpeckers; (5) Peristeroide, or pigeons; (6) Schizopoda, (7) Steganopoda, and (8) Barea, nearly the same respectively as the Linnaean Grallae, Anser es and Gallinae. Pliny, relying wholly on characters taken from the feet, limits himself to three groups — without assigning names to them —

those which have ” hooked tallons, as Hawkes; or round long clawes, as Hennes; or else they be broad, flat, and whole-footed, as Geese and all the sort in manner of water-foule ” — to use the words of Philemon Holland, who, in 1601, published a quaint and, though condensed, yet fairly faithful English translation of Pliny’s work.

About a century later came Aelian, who died about a.d. 140, and compiled in Greek (though he was an Italian by birth) a number of miscellaneous observations on the peculiarities of animals. His work is a kind of commonplace book kept without scientific discrimination. A considerable number of birds are mentioned, and something said of almost each of them; but that something is too often nonsense according to modern ideas. The twenty-six books De A nimalibus of Albert us Magnus (Groot) , printed in 1478, are founded mainly on Aristotle. The twenty- third of these books is De Avibus, and therein a great number of birds’ names make their earliest appearance, few of which are without interest from a philologist’s if not an ornithologist’s point of view, but there is much difficulty in recognizing the species to which many of them belong. In 1485 was printed the first dated copy of the volume known as the Ortus sanitatis, to the popularity of which many editions testify. 3 Though said by its author, Johann Wonnecke von Caub (Latinized as Johannes de Cuba), to have been composed from a study of the

2 This is Sundevall’s estimate ; Drs Aubert and Wimmer in their excellent edition of the ‘laropiai irtpl foW (Leipzig, 1868) limit the number to 126.

3 Absurd as much that we find both in Albertus Magnus and the Ortus seems to modern eyes, if we go a step lower in the scale and consult the ” Bestiaries “or treatises on animals which were common from the 12th to the 14th century we shall meet with many more absurdities. See for instance that by Philippe de Thaun (Philippus Taonensis), dedicated to Adelaide or Alice, queen of Henry I. of England, and probably written soon after 1121, as printed by the late Mr Thomas Wright, in his Popular Treatises on Science written during the Middle Ages (London, 1841).

collections formed by a certain nobleman who had travelled in Eastern

Europe, Western Asia and Egypt — possible Breiden- bach, an account of whose travels in the Levant was printed at Mentz in i486 — it is really a medical treatise, and its zoological portion is mainly an abbreviation of the writings of Albertus Magnus, with a few interpolations from Isidorus of Seville (who flourished in the beginning of the 7th century, and was the author of many works highly esteemed in the middle ages) and a work known as Pkysiologus (q.v.). The third tractatus of this volume deals with birds — including among them bats, bees and other flying creatures; but as it is the first printed book in which figures of birds are introduced it merits notice, though most of the illustrations, which are rude woodcuts, fail, even in the coloured copies, to give any precise indication of the species intended to be represented.

The revival of learning was at hand, and William Turner, a Northumbrian, while residing abroad to avoid persecution at home, printed at Cologne in 1544 the first commentary on the birds mentioned by Aristotle and Pliny conceived in any- thing like the spirit that moves modern naturalists. 1 In the same year and from the same press was issued a Dialogus de Avibus by Gybertus Longolius, and in 1570 Caius brought out in London his treatise De rariorum animalium alque stirpium historia. In this last work, small though it be, ornithology has a good share; and all three may still be consulted with interest and advantage by its votaries. 2 Meanwhile the study received a great impulse from the appearance, at Zurich in 1555, of the third book of Conrad Gesner's Historia Animalium " qvi est de Auium natura," and at Paris in the same year of Pierre Belon's (Bellonius) Histoire de la nature des Oyseaux. Gesner brought an amount of erudition, hitherto unequalled, to bear upon his subject; and, making due allowance for the times in which he wrote, his judgment must in most respects be deemed excellent. In his work, however, there is little that can be called systematic treatment. Like nearly all his pre- decessors since Aelian, he adopted an alphabetical arrangement, though this was not too pedantically preserved, and did not hinder him from placing together the kinds of birds which he supposed (and generally supposed rightly) to have the most resemblance to that one whose name, being best known, was chosen for the headpiece (as it were) of his particular theme, thus recognizing to some extent the principle of classification. 3 Belon, with perhaps less book-learning than his contemporary, was evidently no mean scholar, and undoubtedly had more practical knowledge of birds — their internal as well as external structure. Hence his work, written in French, contains a far greater amount of original matter; and his personal observa- tions made in many countries, from England to

Egypt, enabled him to avoid most of the puerilities which disfigure other works of his own or of a preceding age. Besides this, Belon disposed the birds known to him according to a definite system, which (rude as we now know it to be) formed a foundation on which several of his successors were content to build, and even to this day traces of its influence may still be discerned in the arrange- ment followed by writers who have faintly appreciated the principles on which modern taxonomers rest the outline of their schemes. Both his work and that of Gesner were illustrated with woodcuts, many of which display much spirit and regard to accuracy.

Belon, as has just been said, had a knowledge of the anatomy

1 This was reprinted at Cambridge in 1 823 by Dr George Thackeray.

2 The Seventh of Wotton's De differenliis animalium Libri Decern, published at Paris in 1552, treats of birds; but his work is merely a compilation from Aristotle and Pliny, with references to other classical writers who have more or less incidentally mentioned birds and other animals. The author in his preface states — " Veterum scriptorum sententias in unum quasi cumulum coaceruaui, de meo nihil addidi." Nevertheless he makes some attempt at a systematic arrangement of birds, which, according to his lights, is far from despicable.

3 For instance, under the title of " Accipiter " we have to look, not only far the sparrow-hawk and gos-hawk, but for many other birds of the family (as we now call it) removed comparatively far from those species by modern ornithologists.

of birds, and he seems to have been the first to institute a direct comparison of their skeleton with that of man; but in this respect he only anticipated by a few years the more precise researches of Volcher Coiter, a Frisian, who in 1573 and 1575 published at Nuremberg two treatises, in one of which the internal structure of birds in general is very creditably described, while in the other the osteology and myology of certain forms is given in considerable detail, and illustrated by carefully drawn figures. The first is entitled Externarum et intemarum principalium humani corporis Tabulae, &c. while the second, which is the most valuable, is merely appended to the Lectiones Gabrielis Fallopii de partibus similaribus humani corporis, &c, and thus, the scope of each work being regarded as medical, the author's labours were wholly overlooked by the mere natural-historians who followed, though Coiter introduced a table, " De differentiis Auium," furnishing a key to a rough classification of such

birds as were known to him, and this as nearly the first attempt of the kind deserves notice here.

Contemporary with these three men was Ulysses Aldro- vandus, a Bolognese, who wrote an Historia Naluralium in sixteen folio volumes, most of which were not printed till after his death in 1605; but those on birds appeared between 1599 and 1603. The work is almost wholly a compilation, and that not of the most discriminative kind, while a peculiar jealousy of Gesner is continuously displayed, though his statements are very constantly quoted — nearly always as those of " Orni- thologus," his name appearing but few times in the text, and not at all in the list of authors cited. With certain modifications in principle not very important, but characterized by much more elaborate detail, Aldrovandus adopted Belon's method of arrangement, but in a few respects there is a manifest retro- gression. The work of Aldrovandus was illustrated by copper- plates, but none of his figures approach those of his immediate predecessors in character or accuracy. Nevertheless the book was eagerly sought, and several editions of it appeared. 4

Mention must be made of a medical treatise by Caspar Schwenckfeld, published at Liegnitz in 1603, under the title of Theriotropheum Silesiae, the fourth book of which consists of an " Aviarium Silesiae," and is the earliest of the works we now know by the name of fauna. The author was well acquainted with the labours of his predecessors, as his list of over one hundred of them testifies. Most of the birds he describes are characterized with accuracy sufficient to enable them to be identified, and his observations upon them have still some interest; but he was innocent of any methodical system, and was not exempt from most of the professional fallacies of his time.

Hitherto, from the nature of the case, the works aforesaid treated of scarcely any but the birds belonging to the orbis veteribus notus; but the geographical discoveries of the 16th century began to bear fruit, and many animals of kinds un- suspected were, about one hundred years later, made known. Here there is only space to name Bontius, Clusius, Hernandez (or Fernandez), Marcgrave, Nieremberg and Piso," whose several works describing the natural products of both the Indies — whether the result of their own observation or compilation — together with those of Olina and Worm, produced a marked effect, since they led up to what may be deemed the foundation of scientific ornithology. 7

" The Historia Naturalis of Johannes Johnstonus, said to be of Scottish descent but by birth a Pole, ran through several editions during the

17th century, but is little more than an epitome of the work of Aldrovandus.

5 The Hierozoicon of Bochart — a treatise on the animals named in Holy Writ — was published in 1619.

6 For Lichtenstein's determination of the birds described by Marcgrave and Piso see the Abhandlungen of the Berlin Academy for 1817 (pp ; I55_seq.).

7 The earliest list of British birds seems to be that in the Pinax Rerum Naturalium of Christopher Merrett, published in 1667. In the following year appeared the Onomasticon Zooicon of Walter Charleton, which contains some information on ornithology. An enlarged edition of the latter, under the title of Exercitationes, &c, was published in 1677; but neither of these writers is of much authority. In 1684 Sibbald in his Scotia illustrata published the earliest Fauna of Scotland.

Linnaeus.

This foundation was laid by the joint labours of Francis Willughby (1635-1672) and John Ray (1628-1705), for it is impossible to separate their share of work in natural anS'fiay* history more than to say that, while the former more especially devoted himself to zoology, botany was the favourite pursuit of the latter. Together they studied, together they travelled and together they collected. Willughby, the younger of the two, and at first the other's pupil, seems to have gradually become the master; but, he dying before the promise of his life was fulfilled, his writings were given to the world by his friend Ray, who, adding to them from his own stores, published the Ornithologia in Latin in 1676, and in English with many emendations in 1678. In this work birds generally were grouped in two great divisions — " land-fowl " and "water-fowl" — the former being subdivided into those which have a crooked beak and talons, and those which have a straighter bill and claws, while the latter was separated into those which frequent waters and watery places, and those that swim in the water — each subdivision being further broken up into many sections, to the whole of which a key was given. Thus it became possible for almost any diligent reader without much chance

of error to refer to its proper place nearly every bird he was likely to meet with. Ray's interest in ornithology continued, and in 1694 he completed a Synopsis Methodica Avium, which, through the fault of the booksellers to whom it was entrusted, was not published till 17 13, when Derham gave it to the world. 1

Two years after Ray's death, Linnaeus, the great reformer of natural history, was born, and in 1735 appeared the first edition of the celebrated Systema Naturae. Successive editions of this work were produced under its author's supervision in 1740, 1748, 1758 and 1766. Impressed by the belief that verbosity was the bane of science, he carried terseness to an extreme which frequently created obscurity, and this in no branch of zoology more than in that which relates to birds. Still the practice introduced by him of assigning to each species a diagnosis by which it ought in theory to be distinguishable from any other known species, and of naming it by two words — the first being the generic and the second the specific term, was so manifest an improvement upon anything which had previously obtained that the Linnaean method of differentiation and nomenclature established itself before long in spite of all opposition, and in principle became almost universally adopted. In his classification of birds Linnaeus for the most part followed Ray, and where he departed from his model he seldom improved upon it.

In 1745 P. Barrere brought out at Perpignan a little book called Ornithologiae Specimen novum, and in 1752 Mohring published at Aurich one still smaller, his Avium Genera. Both these works (now rare) are manifestly framed on the Linnaean method, so far as it had then reached; but in their arrangement of the various forms of birds they differed greatly from that which they designed to supplant, and they deservedly obtained little success. Yet as systematists their authors were no worse than Klein, whose Historiae Avium Prodromus, appearing at Liibeck in 1750, and Stemmata Avium at Leipzig in 1759, met with considerable favour in some quarters. The chief merit of the latter work lies in its forty plates, whereon the heads and feet of many birds are indifferently figured. 2

But, while the successive editions of Linnaeus's great work were revolutionizing natural history, and his example of precision in language producing excellent effect on scientific writers, several other authors were advancing the study of ornithology in a very different way — a way that pleased the eye even more than his labours were pleasing the mind. Between 1731 and

1 To this was added a supplement by Petiver on the Birds of Madras, taken from pictures and information sent him by one Edward Buckley of Fort St George, being the first attempt to catalogue the birds of any part of the British possessions in India.

2 After Klein's death his Prodromus, written in Latin, had the unwonted fortune of two distinct translations into German, pub- lished in the same year 1760, the one at Leipzig and Liibeck by Behn, the other at Danzig by Reyger — each of whom added more or less to the original.

1743 Mark Catesby brought out in London his Natural History of Carolina — two large folios containing highly coloured plates of the birds of that colony, Florida and the Bahamas. 3 Eleazar Albin between 1738 and 1740 produced a Natural History of Birds in three volumes of more modest dimensions; but he seems to have been ignorant of ornithology, and his coloured plates are greatly inferior to Catesby's. Far better both as draughtsman and as authority was George Edwards, who in 1743 began, under the same title as Albin, a series of plates with letterpress, which was continued by the name of Gleanings in Natural History, and finished in 1760, when it had reached seven parts, forming four quarto volumes, the figures of which are nearly always quoted with approval. 4

The year which saw the works of Edwards completed was still further distinguished by the appearance in France, where little had been done since Belon's days, 6 in six quarto volumes, Brisson of the Ornithologie of Mathurin Jacques Brisson — a work of very great merit so far as it goes, for as a descriptive ornithologist the author stands even now unsurpassed; but it must be said that his knowledge, according to internal evidence, was confined to books and to the external parts of birds' skins. It was enough for him to give a scrupulously exact description of such specimens as came 'under his eye, distinguishing these by prefixing two asterisks to their name, using a single asterisk where he had only seen a part of the bird, and leaving unmarked those that he described from other authors. His attempt at classification was certainly better than that of Linnaeus; and it is rather curious that the researches of the latest ornithologists point to results in some degree comparable with Brisson's systematic arrangement, for they refuse to keep the birds-of-prey at the head of the Class Aves, and they require the establishment of a much larger number of " Orders " than for a long while was thought advisable. Of such " Orders " Brisson had twenty-six and he gave pigeons and poultry precedence of the birds which are plunderers and scavengers. But greater value lies in his generic or sub-generic divisions, which, taken as a whole, are far more natural than those of Linnaeus, and consequently capable of better diagnosis. More than this, he seems to be the earliest ornithologist, perhaps the earliest zoologist, to conceive the idea of each genus possessing what is now called a " type " — though such a term does not occur in his work; and, in like manner, without declaring it in so many words, he indicated unmistakably the existence of subgenera — all this being effected by the skilful use of names. Unfortunately he was too soon in the field to avail himself, even had he been so minded, of the convenient mode of nomenclature brought into use by Linnaeus. Immediately on the completion of his Regne Animale in 1756, Brisson set about his Ornithologie, and it is only in the last two volumes of the latter that any reference is made to the tenth edition of the Systema Naturae, in which the binomial method was introduced. 'It is certain that the first four volumes were written if not printed before that method was promulgated, and when the fame of Linnaeus as a zoologist rested on little more than the very meagre sixth edition of the Systema Naturae and the first edition of his Fauna Suecica. Brisson has been charged with jealousy of, if not hostility to, the great Swede, and it is true that in the preface to his Ornithologie he complains of the insufficiency of the Linnaean characters, but, when one considers how much better acquainted with birds the Frenchman was, such criticism must be allowed to be pardonable if not wholly just. Brisson's work was in French, with a

parallel translation (edited, it is said, by Pallas) in Latin, which last was reprinted separately at Leiden three years afterwards.

3 Several birds from Jamaica were figured in Sloane's Voyage, &c. (1705-1725), and a good many exotic species in the Thesaurus, &c, of Seba (1734-1765), but from their faulty execution these plates had little effect upon Ornithology.

4 The works of Catesby and Edwards were afterwards reproduced at Nuremberg and Amsterdam by Seligmann, with the letterpress in German, French and Dutch.

6 Birds were treated of in a worthless fashion by one D. B. in a Dictionnaire raisonne et universel des animaux, published at Paris in

1759-

In 1767 there was issued at Paris a book entitled L'Histoire naturelle iclaircie dans une de ses parties principales, I'orni- thologie. This was the work of Salerne, published after his death, and is often spoken of as being a mere translation of Ray's Synopsis, but a vast amount of fresh matter, and mostly of good quality, is added.

The success of Edwards's very respectable work seems to have provoked competition, and in 1765, at the instigation of Buffon, the younger d'Aubenton began the publication known as the Planches enluminiez d'histoire naturelle, which appearing in forty-two parts was not completed till 1780, when the plates 1 it contained reached the number of 1008 — all coloured, as its title intimates, and nearly all representing birds. This enormous work was subsidized by the French government; and, though the figures are utterly devoid of artistic merit, they display the species they are intended to depict with sufficient approach to fidelity to ensure recognition in most cases without fear of error, which in the absence of any text is no small praise. 2

But Buffon was not content with merely causing to be pub- lished this unparalleled set of plates. He seems to have regarded the work just named as a necessary precursor to his own labours in ornithology. His Histoire naturelle, gSnerale et particuiiere, was begun in 1749, and in

1770 he brought out, with the assist- ance of Guenau de Montbeillard, 3 the first volume of his great Histoire naturelle des oiseaux. Buffon was the first man who formed any theory that may be called reasonable of the geo- graphical distribution of animals. He proclaimed the variability of species in opposition to the views of Linnaeus as to their fixity, and moreover supposed that this variability arose in part by degradation. 4 Taking his labours as a whole, there cannot be a doubt that he enormously enlarged the purview of naturalists, and, even if limited to birds, that, on the completion of his work upon them in 1783, ornithology stood in a very different position from that which it had before occupied.

Great as were the services of Buffon to ornithology in one direction, those of a wholly different kind rendered by John Latham must not be overlooked. In 1781 he began a work the practical utility of which was immediately recognized. This was his General Synopsis of Birds, and, though formed generally on the model of Linnaeus, greatly diverged in some respects therefrom. The classification was modified, chiefly on the old lines of Willughby and Ray, and certainly for the better; but no scientific nomenclature was adopted, which, as the author subsequently found, was a change for the worse. His scope was co-extensive with that of Brisson, but Latham did not possess the inborn faculty of picking out the character wherein one species differs from another. His op- portunities of becoming acquainted with birds were hardly inferior to Brisson's, for during Latham's long lifetime there poured in upon him countless new discoveries from all parts of the world, but especially from the newly-explored shores of Australia and the islands of the Pacific Ocean. The British Museum had been formed, and he had access to everything it contained in addition to the abundant materials afforded him by the private museum of Sir Ashton Lever. 5 Latham entered, so far as the limits of his work would allow, into the

1 They were drawn and engraved by Martinet, who himself began in 1787 a Histoire des oiseaux with small coloured plates which have some merit, but the text is worthless.

2 Between 1767 and 1776 there appeared at Florence a Storia Naturale degli Uccelli, in five folio volumes, containing a number of ill-drawn and ill-coloured figures from the collection of Giovanni Gerini, an ardent collector who died in 1751, and therefore must be acquitted of any share in the work, which, though sometimes attri- buted to him, is that of certain learned men who did not happen to be ornithologists (cf. Savi, Ornitologia Toscana, i. Introduzione, p. v.).

3 He retired on the completion of the sixth volume, and thereupon Buffon associated Bexon with himself.

4 See St George Mivart's address to the Section of Biology, Rep. Brit. Association (Sheffield Meeting, 1879), p. 356.

6 In 1792 Shaw began the Museum Leverianum in illustration of this collection, which was finally dispersed by sale, and what is known to remain of it found its way to Vienna. Of the specimens in the British Museum described by Latham it is to be feared that scarcely any exist. They were probably very imperfectly prepared.

Latham.

history of the birds he described, and this with evident zest whereby he differed from his French predecessor; but the number of cases in which he erred as to the determination of his species must be very great, and not unfrequently the same species is described more than once. His Synopsis was finished in 1785; two supplements were added in 1787 and 1802, 6 and in 1790 he produced an abstract of the work under the title of Index Ornithologicus, wherein he assigned names on the Linnaean method to all the species described. Not to recur again to his labours, it may be said here that between 1821 and 1828 he published at Winchester, in eleven volumes, an enlarged edition of his original work, entitling it A General History of Birds; but his defects as a compiler, which had been manifest before, rather increased with age, and the consequences were not happy. 7

About the time that Buffon was bringing to an end his studies of birds, Mauduyt undertook to write the Ornithologie of the Encyclop&die _ mUhodique — a comparatively easy task, con- sidering the recent works of his fellow-countrymen on that subject, and finished in 1784. Here it requires no further com- ment, especially as a new edition was called for in 1790, the ornithological portion of which was begun by Bonnaterre, who, however, had only finished three hundred and twenty pages of it when he lost his life in the French Revolution; and the work thus arrested was continued by Vieillot under the slightly changed title of Tableau encyclopedique et methodique des trois regnes de la Nature — the Ornithologie forming volumes four to seven, and not completed till 1823. In the former edition Mauduyt had taken the subjects alphabetically; but here they are disposed according to an arrangement, with some few modifications, furnished by d'Aubenton, which is extremely shallow and unworthy of consideration.

Several other works bearing upon ornithology in general, but of less importance than most of those just named, belong to this period. Among others may be mentioned the Genera of Birds by Thomas Pennant, first printed at Edinburgh in 1773, but best known by the edition which appeared in London in 1 781; the Elementa Ornithologica and Museum Ornithologicum of Schaffer, published at Ratisbon in 1774 and 1784 respectively; Peter Brown's New Illustrations of Zoology in London in 1776; Hermann's Tabulae Affinitatum Animalium at Strasburg in 1783, followed posthumously in 1804 by his Observationes Zoologicae; Jacquin's Beytraege zur Geschichte der Voegel at Vienna in 1784, and in 1790 at the same place the larger work of Spalowsky with nearly the same title; Sparrman's Museum Carlsonianum at Stockholm from 1786 to 1789; and in 1794 Hayes's Portraits of rare and curious Birds from the menagery of Child the banker at Osterley near London. The same draughtsman (who had in 1775 produced a History of British Birds) in 1822 began another series of Figvres of rare and curious Birds.*

The practice of Brisson, Buffon, Latham and others of neglecting to name after the Linnaean fashion the species they described gave great encouragement to compilation, and led to what has proved to be of some inconvenience to modern ornithologists. In 1773 P. L. S. Miiller brought out at Nuremberg a German translation of the Systema Naturae, completing it in 1776 by a Supplement con- taining a list of animals thus described, which had hitherto been technically anonymous, with diagnoses and names on the Linnaean model. In 1783 Boddaert printed at Utrecht a Table des planches enlumineez? in which he attempted to refer every species of bird figured in that extensive series to its proper Linnaean genus, and to assign it a scientific name if it did not already possess one. In like manner in 1786, Scopoli — already the author of a little book published at Leipzig in 1769 under the title of Annus I. Historico- naturalis, in which are described many birds, mostly from his

6 A German translation by Bechstein subsequently appeared.

7 He also prepared for publication a second edition of his Index Ornithologicus, but this was never printed, and the manuscript came into A. Newton's possession.

8 The Naturalist's Miscellany or Vivarium Naturale, in English and Latin, of Shaw and Nodder, the former being the author, the latter the draughtsman and engraver, was begun in 1789 and carried on till Shaw's death, forming twenty-four volumes. It contains figures of more than 280 birds, but very poorly executed. In 1814 a sequel, The

Zoological Miscellany, was begun by Leach, Nodder continuing to do the plates. This was completed in 1817, and forms three volumes with 149 plates, 27 of which represent birds.

9 Of this work only fifty copies were printed, and it is one of the rarest known to the ornithologist. Only two copies are believed to exist in England, one in the British Museum, the other in orivatp hands. It was reprinted in 1874 by Mr Tegetmeier.

own collection or the Imperial vivarium at Vienna — was at the pains to print at Pavia in his miscellaneous Deliciae Florae et Faunae Insubricae a Specimen Zoologicum l containing diagnoses, duly named, of the birds discovered and described by Sonnerat in his a Voyage aux Indes orientales and Voyage a la Nouvelle

Sonnerat. Q uin ˆ severally published at Paris in 1772 and 1776. But the most striking example of compilation was that exhibited by J. F. Gmelin, who in 1788 commenced what he called the Thir- _ .. teenth Edition of the celebrated Systema Naturae, which

obtained so wide a circulation that, in the comparative rarity of the original, the additions of this editor have been very frequently quoted, even by expert naturalists, as though they were the work of the author himself. Gmelin availed himself of every publication he could, but he perhaps found his richest booty in the labours of Latham, neatly condensing his English descriptions into Latin diagnoses, and bestowing on them binomial names. Hence it is that Gmelin appears as the authority for so much of the nomen- clature now in use. He took many liberties with the details of Linnaeus's work, but left the classification, at least of the birds, as it was — a few new genera excepted. 2

During all this time little had been done in studying the internal structure of birds; 3 but the foundations of the science of embry- ology had been laid by the investigations into the development of the chick by the great Harvey. Between 1666 and 1669 Perrault edited at Paris eight accounts of the dissection by du Verney of as many species of birds, which, translated into English, were pub- lished by the Royal Society in 1702, under the title of The Natural History of Animals. After the death of the two anatomists just named, another series of

similar descriptions of eight other species was found among their papers, and the whole were published in the Memoires of the French Academy of Sciences in 1733 and 1734. But in 1681 Gerard Blasius had brought out at Amsterdam an Anatome Animalium, containing the results of all the dissections of animals that he could find; and the second part of this book, treating of Volatilia, makes a respectable show of more than one hundred and twenty closely-printed quarto pages, though nearly two-thirds is devoted to a treatise De Ovo et Pullo, containing among other things a reprint of Harvey's researches, and the scientific rank of the whole book may be inferred from bats being still classed with birds. In 1720 Valentini published, at Frankfort-on-the-Main, his Amphitheatrum Zootomicum, in which again most of the existing accounts of the anatomy of birds were reprinted. But these and many other contributions, 4 made until nearly the close of the 18th century, though highly meritorious, were unconnected as a whole, and it is plain that no conception of what it was in the power of Comparative Anatomy to set forth had occurred to the most diligent dissectors.

It was reserved for Georges Cuvier, who in 1798 published at Paris his Tableau elementaire de Vhistoire natureUe des ani- maux, to lay the foundation of a thoroughly and hitherto unknown mode of appreciating the value of the various groups of the animal kingdom. Yet his first attempt was a mere sketch. 5 Though he made a perceptible advance on the classification of Linnaeus, at that time pre- dominant, it is now easy to see in how many ways — want of sufficient material being no doubt one of the chief — Cuvier failed to produce a really natural arrangement. His principles, however, are those which must still guide taxonomers, not- withstanding that they have in so great a degree overthrown the entire scheme which he propounded. Confining our atten- tion here to ornithology, Cuvier's arrangement of the class Aves is now seen to be not very much better than any which it superseded. But this view is gained by following the methods which Cuvier taught. In the work just mentioned few details are given; but even the more elaborate classification of birds contained in his Leqons d'anatomie comparee of 1803 is based wholly on external characters, such as had been used by nearly all his predecessors; and the Regne Animal of 181 7, when he

1 This was reprinted in 1882 by the Willughby Society.

2 Daudin's unfinished Traite elementaire et complet a" ' ornithologie appeared at Paris in 1800, and therefore is the last of these general works published in the 18th century.

3 A succinct notice of the older works on ornithotomy is given by Professor Selenka in the introduction to that portion of Dr Bronn's Klassen und Ordnungen des Thierreichs relating to birds (pp. 1-9) published in 1869; and Professor Carus's Geschichte der Zoologie, published in 1872, may also be usefully consulted for further information on this and other heads.

4 The treatises of the two Bartholinis and Borrichius published at Copenhagen deserve mention if only to record the activity of Danish anatomists in those days.

6 It had no effect on Lacepede, who in the following year added a Tableau methodique containing a classification of birds to his Discours Souverture {Mem. de I'lnstitut, iii. pp. 454-468, 503-519).

Cuvier.

was in his fullest vigour, afforded not the least evidence that he had ever dissected a couple even of birds e with the object of determining their relative position in his system, which then, as before, depended wholly on the configuration of bills, wings and feet. But, though apparently without such a knowledge of the anatomy of birds as would enable him to apply it to the formation of that natural system which he was fully aware had yet to be sought, he seems to have been an excellent judge of the characters afforded by the bill and limbs, and the use he made of them, coupled with the extraordinary reputation he acquired on other grounds, procured for his system the adhesion for many years of the majority of ornithologists. 7

Hitherto mention has chiefly been made of works on general ornithology, but it will be understood that these were largely aided by the enterprise of travellers, and as there were many of them who published their narratives in separate forms their contributions have to be considered. Of those travellers then the first to be here especially named is Marsigli, the fifth volume of whose Danubius Pannonico-Mysicus is devoted to the birds he met with in the valley of the Danube, and appeared at the Hague in 1725, followed by a French translation in 1 744.* Most of the many pupils whom Linnaeus sent to foreign countries submitted their discoveries to him, but Kalm, Hasselqvist and Osbeck published separately their respective travels in North America, the Levant and China. 9 The incessant journeys of Pallas and his colleagues — Falk, Georgi, S. G. Gmelin, Giildenstadt, Lepechin and others — in the exploration of the recently extended Russian empire supplied not only much material to the Commentarii and Acta of the Academy of St Petersburg, but more that is to be

found in their narratives — all of it being of the highest interest to students of Palaearctic or Nearctic ornithology. Nearly the whole of their results, it may here be said, were summed up in the important Zoographia Rosso-Asiatica of the first-named naturalist, which saw the light in 181 1 — the year of its author's death — but, owing to circumstances over which he had no control, was not generally accessible till twenty years later. Of still wider interest are the accounts of Cook's three famous voyages, though unhappily much of the information gained by the naturalists who accompanied him on one or more of them seems to be irretrievably lost: the original observations of the elder Forster were not printed till 1844, and the valuable collection of zoological drawings made by the younger Forster still remains unpublished in the British Museum. The several accounts by John White, Collins, Phillips, Hunter and others of the colonization of New South Wales at the end of the last century ought not to be overlooked by any Australian ornithologist. The only information at this period on the ornitho- logy of South America is contained in the two works on Chile by Molina, published at Bologna in 1776 and 1782. The travels of Le Vaillant in South Africa having been completed in 1785, his great Oiseaux d'Afrique began to appear in Paris in 1797; but it is hard to speak properly of this work, for several of the species described in it are certainly not, and never were in his time, inhabitants of that country, though he sometimes gives a long account of the circum- stances under which he observed them. 10

From travellers who employ themselves in collecting the animals of any distant country the zoologists who stay at home and study those of their own district, be it great or small, are really not so much divided as at first might appear. Both may well be named " Faunists," and of the latter there were not a few who having turned their attention more or less to ornithology should here be

6 So little regard did he pay to the osteology of birds that, according to de Blainville {Jour, de Physique, xcii. p. 187, note), the skeleton of a fowl to which was attached the head of a hornbill was for a long time exhibited in the Museum of Comparative Ana- tomy at Paris ! Yet, in order to determine the difference of structure in their organs of voice, Cuvier, as he says in his Legons (iv. 464), dissected more than one hundred and fifty species of birds. Un- fortunately for him, as will appear in the sequel, it seems not to have occurred to him to use any of the results he obtained as the basis of a classification.

7 It is unnecessary to enumerate the various editions of the Regne Animal. Of the English translations, that edited by Griffiths and Pidgeon is the most complete. The ornithological portion of it

contained in these volumes received many additions from John Edward Gray, and appeared in 1829.

‘Though much later *in date, the Iter per Poseganam Sclavoniae of Piller and Mitterpacher, published at Buda in 1783, may perhaps be here most conveniently mentioned.

9 The results of Forskal’s travels in the Levant, published after his death by Niebuhr, require mention, but the ornithology they contain is but scant.

10 It has been charitably suggested that, his collection and notes having suffered shipwreck, he was induced to supply the latter from his memory and the former by the nearest approach to his lost specimens that he could obtain. This explanation, poor as it is, fails, however, in regard to some species.

mentioned, and first among them Rzaczynski, who in 1721 brought out at Sandomirsk the Historia naturalis curiosa regni Poloniae, to which an Auctuarium was posthumously published at Danzig in 1742. This also may be perhaps the most proper place to notice the Historia avium Hungariae of Grossinger, published at Posen in 1793. In 1734 J. L. Frisch began the long series of works on the birds of Germany with which the literature of ornithology is en- riched, by his Vorstellung der Vogel Teutscklands, which was only completed in 1763, and, its coloured plates proving very attractive, was again issued at Berlin in 1817. The little fly-sheet of Zorn 1 — for it is scarcely more — on the birds of the Hercynian Forest made its appearance at Pappenheim in 1745. In 1756 Kramer published at Vienna a modest Elenckus of the plants and animals of Lower Austria, and J. D. Petersen produced at Altona in 1766 a Verzeichniss balthiscker Vogel; while in 1791 J. B. Fischer’s Versuch einer Naturgeschickte von Livland appeared at Konigsberg, next year Beseke brought out at Mitau his Beytrag zur Naturgeschickte der V’dgel Kurlands, and in 1794 Siemssen’s Handbuck of the birds of Mecklenburg was published at Rostock. But these works, locally useful as they may have been, did not occupy the whole attention of German ornithologists, for in 1791 Bechstein reached the second volume of his Gemeinniitzige Naturgeschickte Deutschlands, treating of the birds of

that country, which ended with the fourth in 1795. Of this an abridged edition by the name of Ornithologisckes Tascken- buch appeared in 1802 and 1803, with a supplement in 1812; while between 1805 and 1809 a fuller edition of the original was issued. Moreover in 1795 J. A. Naumann humbly began at Cothen a treatise on the birds of the principality of Anhalt, which on its completion in 1804 was found to have swollen into an ornithology of northern Germany and the neighbouring countries. Eight supplements were successively published between 1805 and 1817, and in 1822 a new edition was required. This Naturgeschickte der Vogel Deutschlands, being almost wholly rewritten by his son J. F. Naumann, is by far the best thing of the kind as yet produced in any country. The fulness and accuracy of the text, combined with the neat beauty of its coloured plates, have gone far to promote the study of ornitho- logy in Germany, and while essentially a popular work, since it is suited to the comprehension of all readers, it is throughout written with a simple dignity that commends it to the serious and scientific. Its twelfth and last volume was published in 1844 — by no means too long a period for so arduous and honest a performance, and a supplement was begun in 1847; but, the editor — or author as he may be fairly called — dying in 1857, this continuation was finished in i860 by the joint efforts of J. H. Blasius and Dr Baldamus. In 1800 Borkhausen with others commenced at Darmstadt a Teutscke Ornithologie in folio which appeared at intervals till 1812, and remains unfinished, though a reissue of the portion published took place between 1837 a “d 1841.

Other European countries, though not quite so prolific as Germany, bore some ornithological fruit at this period; but in all southern Europe only four faunistic products can be named: the Saggio di storia naturale Bresciana of Pilati, published at Brescia in 1769; the Ornitologia dell’ Europa meridionale of Bernini, published at Parma between 1772 and 1776; the Uccelli di Sardegna of Cetti, published at Sassari in 1776; and the Romana ornithologia of Gilius, published at Rome in 1 781 — the last being in great part devoted to pigeons and poultry. More appeared in the North, for in 1770 Amsterdam sent forth the beginning of Nozeman’s Nederlandsche Vogelen, a fairly illustrated work in folio, but only completed by Houttuyn in 1829, and in Scandinavia most of all was done. In 1746 the great Linnaeus had produced a Fauna Svecica, of which a second edition appeared in 1761, and a third, revised by Retzius, in 1800. In 1764 Brunnich published at Copenhagen his Ornithologia borealis, a compendious sketch of the birds of all the countries then subject to the Danish crown. At the same place appeared in 1767 Leem’s work, De

Lapponibus Finmarckiae, to which Gunnerus contributed some good notes on the ornithology of northern Norway, and at Copenhagen and Leipzig was published in 1780 the Fauna Groenlandica of Otho Fabricius.

Of strictly American origin can here be cited only .W. Bartram's Travels through North and South Carolina and B. S. Barton's Fragments of the Natural History of Pennsylvania, 1 both printed at Philadelphia, one in 1 79 1, the other in 1799; but J. R. Forster published a Catalogue of the Animals of Nortk America in London in 1771, and the following year described in the Philosophical Transactions a few birds from Hudson Bay. 3 A greater undertaking was Pen- nant's Arctic Zoology, published in 1785, with a supplement in 1787. The scope of this work was originally intended to be limited to North America, but circumstances induced* him to include all the species of Northern Europe and ˆNorthern Asia, and though not free from errors it is a praiseworthy performance. A second edition appeared in 1792.

The ornithology of Britain naturally demands greater attention.

1 His earlier work under the title of Pelinotheologie can hardly be deemed scientific.

5 This extremely rare book has been reprinted by the Willughby Society.

3 Both of these treatises have also been reprinted by the Willughby Society.

The earliest list of British birds we possess is that given by Merrett in his Pinax rerum naturalium Britannicarum, printed in London in 1667. 4 In 1677 Plot published his Natural History of Oxfordshire, which reached a second edition in 1705, and in 1686 that of Stafford- shire. A similar work on Lancashire, Cheshire and the Peak was sent out in 1700 by Leigh, and one on Cornwall by Borlase in 1758 — all these four being printed at Oxford. In 1766 appeared Pennant's British Zoology, a well-illustrated folio, of which a second edition in octavo was published in 1768, and considerable additions (forming the nominally third edition) in 1770, while in 1777 there were two issues, one in octavo, the other in quarto, each called the fourth edition. In 1812, long after the author's death, another edition was printed, of which his son-in-law Hanmer was the reputed editor, but he received much assistance from Latham, and through carelessness many of the additions herein made have often been ascribed to Pennant. In 1769

Berkenhout gave to the world his Outlines of tke Natural History of Great Britain and Ireland, which reappeared under the title of Synopsis of the same in 1795. Tunstall's Ornitko- logia Britannica, which appeared in 1771, is little more than a list of names. 6 Hayes's Natural History of Britisk Birds, a folio with forty plates, appeared between 1771 and 1775, but was of no scientific value. In 1781 Nash's Worcester skire included a few ornithological notices; and Walcott in 1789 published an illustrated Synopsis of Britisk Birds, coloured copies of which are rare. Simultaneously William Lewin began his seven quarto volumes on the Birds of Great Britain, a reissue in eight volumes following between 1795 and 1801. In 1791 J. Heysham added to Hutchins's Cumberland a list of birds of that county, whilst in the same year began Thomas Lord's valueless Entire New System of Ornitkology, the text of which was written or corrected by Dr Dupree, and in 1794 Donovan began a History of British Birds which was only finished in 1819 — the earlier portion being reissued about the same Donovaa – time. Bolton's Harmonia ruralis, an account of British song-birds, first appeared between 1794 and 1796, but subsequent editions appeared up to 1846.

AH the foregoing publications yield in importance to two that remain to be mentioned, a notice of which will fitly conclude this part of our subject. In 1767 Pennant, several of whose works have already been named, entered into correspondence with Gilbert White, receiving from him much information, almost wholly drawn from his own observation, for the succeeding editions of the Britisk Zoology. In 1769 White began exchanging letters of a similar character with Barrington. The epistolary intercourse with the former continued until 1780 and with the latter until 1787. In 1789 White's share of the correspondence, together with some miscellaneous matter, was published as The Natural History of Selborne — from the name of the village in which he lived. Observa- tions on birds form the principal though by no means the whole theme of this book, which may be safely said to have done more to promote a love of ornithology in England than any other work that has been written, nay more than all the other works (except one next to be mentioned) put together. It has passed through a far greater number of editions than any other work on natural history in the whole world, and has become emphatically an English classic — the graceful simplicity of its style, the elevating tone of its spirit, and the sympathetic chords it strikes recommending it to every lover of Nature, while the severely scientific reader can scarcely find an error in any statement it contains, whether of matter of fact or opinion. It is almost certain that more than half the zoologists of the British Islands for many years past have been infected

with their love of the study of Gilbert White; and it can hardly be supposed that his influence will cease.

The other work to the importance of which on ornithology in England allusion has been made is Bewick's History of Britisk Birds. The first volume of this, containing the land-birds, appeared in 1797 6 — the text being, it is understood, by Beilby — the second, containing the water-birds, in 1804. The woodcuts illustrating this work are generally of surpassing excellence, and it takes rank in the_ category of artistic publications. Fully admitting the extra- ordinary execution of the engravings, every ornithologist may perceive that as portraits of the birds they are of very unequal merit. Some of the figures were drawn from stuffed specimens, and accord- ingly perpetuate all the imperfections of the original; others represent species with the appearance of which the artist was not

4 In this year there were two issues of this book; one, nominally a second edition, only differs from the first in having a new title- page. No real second edition ever appeared, but in anticipation of it Sir Thomas Browne prepared in or about 1671 (?) his " Account of Birds found in Norfolk," of which the draft, now in the British Museum, was printed in his collected works by Wilkin in 1835. If a fair copy was ever made its resting-place is unknown.

6 It has been republished by the Willughby Society.

6 There were two issues— virtually two editions — of this with the same date on the title-page, though one of them is said not to have been published till the following year. Among several other indicia this may be recognized by the woodcut of the " sea eagle " at page 11, bearing at its base the inscription " Wycliffe, 1791," and by the additional misprint on page 145 of Sakaeniclus for Schaeniclus.

familiar, and these are either wanting in expression or are caricatures j 1 but those that were drawn from live birds, or represent species which he knew in life, are worthy of all praise. It is well known that the earlier editions of this work, especially if they be upon large paper, command extravagant prices; but in reality the copies on smaller paper are now the rarer, for the stock of them has been consumed in nurseries and schoolrooms, where they have been torn

up or worn out with incessant use. Moreover, whatever the lovers of the fine arts may say, it is nearly certain that the ” Bewick Collector ” is mistaken in attaching so high a value to these old editions, for owing to the want of skill in printing — in- different ink being especially assigned as one cause — many of the earlier issues fail to show the most delicate touches of the engraver, which the increased care bestowed upon the edition of 1847 (published under the supervision of John Hancock) has revealed — though it must be admitted that certain blocks have suffered from wear of the press so as to be incapable of any more producing the effect intended. Of the text it may be said that it is respectable, but no more.

The existence of these two works explains the widely-spread taste for ornithology in England, which is to foreigners so puzzling, and the zeal — not always according to knowledge, but occasionally reaching to serious study — with which that taste is pursued.

Ornithology in the igth Century. On reviewing the progress of ornithology since the end of the 1 8th century, the first thing that will strike us is the fact that general works, though still undertaken, have become proportionally fewer, while special works, whether relating to the ornithic portion of the fauna of any particular country, or limited to certain groups of birds — works to which the name of ” Monograph ” has become wholly restricted — have become far more numerous. Another change has come over the condi- tion of ornithology, as of kindred sciences, induced by the multiplication of learned societies which issue publications as well as of periodicals of greater or less scientific pretension. A number of these must necessarily be left unnoticed here. Still it seems advisable to furnish some connected account of the progress made in the ornithological knowledge of the British Islands and those parts of the European continent which lie nearest to them or are most commonly sought by travellers, the Dominion of Canada and the United States of America, South Africa, India, together with Australia and New Zealand. The more important monographs will usually be found cited in the separate articles on birds contained in this work, though some, by reason of changed views of classification, have for practical purposes to be regarded now as general works.

It will perhaps be most convenient to begin by mentioning some of these last, and in particular a number of them which appeared at Paris very early in the 19th century. First inorderof them is the Histoire naturelle d’une partie d’oiseaux nouveaux et rares de VAmhique et des Indes, a folio volume 2 published in 1 801 by Le Vaillant. This is devoted to the very distinct and not nearly-allied groups of hornbills

and of birds which for want of a better name we must call ” Chatterers,” and is illustrated, like those works of which a notice immediately follows, by coloured plates, done in what was then considered to be the highest style of art and by the best draughtsmen procurable. The first volume of a Histoire naturelle des perroquets, a companion work by the same author, appeared in the same year, and is truly a monograph, since the parrots constitute a family of birds so naturally severed from all others that there has rarely been anything else confounded with them. The second volume came out in 1805, and a third was issued in 1 837-1 838 long after the death of its predecessor’s author, by Bourjot St-Hilaire. Between 1803 and 1806 Le Vaillant also published in just the same style two volumes with the title of Histoire naturelle des oiseaux de Paradis et des rolliers, suivie de celle des toucans et des barbus, an assemblage of forms, which, miscellaneous as it is, was surpassed in incongruity by a fourth work on the same scale, the Histoire naturelle des promerops et des guipiers, des couroucous et des touracos, for herein are found jays, waxwings, the cock-of-the-rock (Rupicola), and what not besides. The plates in this last are by Barraband, for many years regarded as the per- fection of ornithological artists, and indeed the figures, when they happen to have been drawn from the life, are not bad ; but his skill was quite unable to vivify the preserved specimens contained in museums, and when he had only these as subjects he simply copied the distortions of the ” bird-stuff er.” The following year, 1808, being aided by Temminck of Amsterdam, of whose son we shali presently hear more, Le Vaillant brought out the sixth volume of

1 This is especially observable in the figures of the birds of prey.

2 There is also an issue of this, as of the same author’s other works, on large quarto paper.

Le Vail- lant.

Audeberi

and

Vieillot.

his Oiseaux d’Afrique, already mentioned. Four more volumes of this work were promised; but the means of executing them were denied to him, and, though he lived until 1824, his publications ceased.

A similar series of works was projected and begun about the same time as that of Le Vaillant by Audebert and Vieillot, though the

former, who was by profession a painter and illustrated the work, was already dead more than a year before the appearance of the two volumes, bearing date 1802, and entitled Oiseaux dores ou d, reflets metalliques, the effect of the plates in which he sought to heighten by the lavish use of gilding. The first volume contains the ” Colibris, Oiseaux-mouches, Jacamars et Promerops,” the second the ” Grimpereaux ” and ” Oiseaux de Paradis ” — associations which set all the laws of system- atic method at defiance. His colleague, Vieillot, brought out in 1805 a Histoire naturelle des plus beaux chanteurs de la Zone Torride with figures by Langlois of tropical finches, grosbeaks, buntings and other hard-billed birds; and in 1807 two volumes of a Histoire naturelle des oiseaux de I’Amerique septentrionale, without, however, paying much attention to the limits commonly assigned by geo- graphers to that part of the world. In 1805 Anselme Desmarest published a Histoire naturelle des tangaras, des manakins n .

et des todiers, which, though belonging to the same uesmares • category as all the former, differs from them in its more scientific treatment of the subjects to which it refers; and, in 1808, K. J. Temminck, whose father’s aid to Le Vaillant has already _ been noticed, brought out at Paris a Histoire naturelle ‘ ea ” nlack – des pigeons illustrated by Madame Knip, who had drawn the plates for Desmarest’s volume. 3

Since we have begun by considering these large illustrated works in which the text is made subservient to the coloured plates, it may be convenient to continue our notice of such others of similar character as it may be expedient to mention here, though thereby we shall be led somewhat far afield. Most of them are but luxuries, and there is some degree of truth in the remark of Andreas Wagner in his Report on the Progress of Zoology for 1843, drawn up for the Ray Society (p. 60), that they ” are not adapted for the extension and promotion of science, but must inevitably, on account of their unnecessary costliness, constantly tend to reduce the number of naturalists who are able to avail themselves of them, and they thus enrich ornithology only to its ultimate injury.” Earliest in date as it is greatest in bulk stands Audubon’s Birds of America in four volumes, containing four hundred and Aaauhoa – thirty-five plates, of which the first part appeared in London in 1827 and the last in 1838. It does not seem to have been the author’s original intention to publish any letterpress to this enormous work, but to let the plates tell their own story, though finally, with the assistance, as is now known, of William Macgillivray, a text, on the whole more than respectable, was produced in five large Maarlt. octavos under the title of Ornithological Biography, of .. Jjf ‘ which more will be said in the sequel. Audubon has been v

greatly extolled as an ornithological artist; but he was far too much addicted to representing his subjects in violent action and in postures that outrage nature, while his drawing is very frequently defective. 4 In 1866 D. G. Elliot began, and in 1869 finished, a sequel to Audubon's great work in two volumes, on the same Elliot.

scale — The New and Hitherto unfigured Species of the Birds of North America, containing life-size figures of all those which had been added to its fauna since the completion of the former.

In 1830 John Edward Gray commenced the Illustrations of Indian Zoology, a series of plates of vertebrated animals, rf

but mostly of birds, from drawings, it is believed by ~T a Z. an . . native artists in the collection of General Hardwicke, araw ' whose name is therefore associated with the work. Scientific names are assigned to the species figured; but no text was ever supplied. In 1832 Edward Lear, afterwards Lear '

well known as a humorist, brought out his Illustrations of the Family of Psittacidae, a volume which deserves especial notice from the extreme fidelity to nature and the great artistic skill with which the figures were executed.

This same year (1832) saw the beginning of the marvellous series of illustrated ornithological works by which the name of John Gould is likely to be always remembered. A Century of Birds from the Himalaya Mountains was followed by The

Gould.

3 Temminck subsequently reproduced, with many additions, the text of this volume in his Histoire naturelle des pigeons et des gallina- cees, published at Amsterdam in 1813-1815, in 3 vols. 8vo. Between 1838 and 1848 M. Florent-Provost brought out at Paris a further set of illustrations of pigeons by Mme Knip.

4 On the completion of these two works, for they must be regarded as distinct, an octavo edition in seven volumes under the title of The Birds of America was published in 1840-1844. In this the large plates were reduced by means of the camera lucida, the text was revised, and the whole systematically arranged. Other reprints have since been issued, but they are vastly inferior both in execution and value. A sequel to the octavo Birds of America, corresponding with it in form, was brought out in 1 853-1 855 by Cassin as Illustra- tions of the Birds of California, Texas, Oregon, British and Russian America.

Birds of Europe in five volumes, published between 1832 and 1837, while in the interim (1834) appeared A Monograph of the Ramphastidae, of which a second edition was some years later called for, then the Icones avium, of which only two parts were published (1837-1838), and A Monograph of the Trogonidae (1838), which also reached a second edition. Sailing in 1838 for New South Wales, on his return in 1840 he at once commenced the greatest of all his works, The Birds of Australia, which was finished in 1848 in seven volumes, to which several supplementary parts, forming another volume, were subsequently added. In 1849 he began A Monograph of the Trochilidae or Humming-birds extending to five volumes, the last of which appeared in 1861, and was followed by a supplement by Mr Salvin. A Monograph of the Odontophorinae or Partridges of America (1850); The Birds of Asia, in seven volumes, the last completed by Mr Sharpe (1 850-1 883); The Birds of Great Britain, in five volumes (1 863-1 873) ; and The Birds of New Guinea, begun in 1875, and, after the author's death in 1881, undertaken by Mr Sharpe, make up the wonderful tale consisting of more than forty folio volumes, and containing more than three thousand coloured plates. The earlier of these works were illustrated by Mrs Gould, and the figures in them are fairly good; but those in the later, except when (as he occasionally did) he secured the services of Mr Wolf, are not so much to be commended. There is, it is true, a smoothness and finish about them not often seen elsewhere; but, as though to avoid the exaggerations of Audubon, Gould usually adopted the tamest of attitudes in which to represent his subjects, whereby expression as well as vivacity is wanting. Moreover, both in drawing and in colouring there is frequently much that is untrue to nature, so that it has not uncommonly happened for them to fail in the chief object of all zoological plates, that of affording sure means of recognizing specimens on comparison. In estimating the letterpress, which was avowedly held to be of secondary importance to the plates, we must bear in mind that, to ensure the success of his works, it had to be written to suit a very peculiarly composed body of subscribers. Nevertheless a scientific character was so adroitly assumed that scientific men — some of them even ornitholo- gists — have thence been led to believe the text had a scientific value, and that of a high class. However, it must also be remembered that, throughout the whole of his career, Gould consulted the con- venience of working

ornithologists by almost invariably refraining from including in his folio works the technical description of any new species without first publishing it in some journal of comparatively easy access.

An ambitious attempt to produce in England a general series of coloured plates on a large scale was Louis Fraser-‘s Zoologia Typica, p the first part of which bears date 1 841-1842, Others

raser. appeared at irregular intervals until 1 849, when the work, which seems never to have received the support it deserved, was discontinued. The seventy plates (forty-six of which represent birds) composing, with some explanatory letterpress, the volume, are by C. Cousens and H. N. Turner — the latter (as his publications prove) a zoologist of much promise, who in 1851 died, a victim to his own zeal for investigation, of a wound received in dissecting. The chief object of the author, who had been naturalist to the Niger Expedition, and curator to the Museum of the Zoological Society of London, was to figure the animals contained in its gardens or described in its Proceedings, which until the year 1848 were not illustrated.

The publication of the Zoological Sketches of Joseph Wolf, from animals in the gardens of the Zoological Society of London, was w .. begun about 1855, with a brief text by D. W. Mitchell, at

‘ that time the Society’s secretary, in illustration of them.

After his death in 1859, the explanatory letterpress was rewritten by P. L. Sclater, his successor in that office, and a volume was completed in 1861. Upon this a second series was commenced, and brought to an end in 1868. Though a comparatively small number of species of birds are figured in this magnificent work (seventeen only in the first series, and twenty- two in the second), it must be mentioned here, for their likenesses are so admirably executed as to place it in regard to ornithological portraiture at the head of all others. There is not a single plate that is unworthy of the greatest of all animal painters.

Proceeding to illustrated works generally of less pretentious size, but of greater ornithological utility than the books last mentioned, which are fitter for the drawing-room than the study, we next have to consider some in which the text is not wholly subordinated to the plates, though the latter still form a conspicuous feature of the publication. First of these in point of time sis well as in importance is the Nouveau recueil des planches coloriees d’oiseaux of Temminck and Langier, intended as a sequel to the Planches en- luminees of D’Aubenton before noticed, and like that work issued both in folio and

quarto size. The first portion of this was published at Paris in 1820, and of its one hundred and two livraisons, which appeared with great irre- gularity (Ibis, 1868, p. 500), the last was issued in 1839, containing the titles of the five volumes that the whole forms, together with a ” Tableau methodique ” which but indifferently serves the purpose of an index. There are six hundred plates, but the exact number of species figured (which has been computed at six hundred and sixty-one) is not so easily ascertained. Generally the subject of

Temminck

and

Langier.

each plate has letterpress to correspond, but in some cases this is wanting, while on the other hand descriptions of species not figured are occasionally introduced, and usually observations on the dis- tribution and construction of each genus or group are added. The plates, which show no improvement in execution on those of Martinet, are after drawings by Huet and Pretre, the former being perhaps the less bad draughtsman of the two, for he seems to have had an idea of what a bird when alive looks like, though he was not able to give his figures any vitality, while the latter simply delineated the stiff and dishevelled specimens from museum shelves. Still the colouring is pretty well done, and experience has proved that generally speaking there is not much difficulty in recognizing the species represented. The letterpress is commonly limited to technical details, and is not always accurate; but it is of its kind useful, for in general knowledge of the outside of birds Temminck probably surpassed any of his contemporaries. The ” Tableau methodique ” offers a convenient concordance of the old Planches enluminees and its successor, and is arranged after the system set forth by Temminck in the first volume of the second edition of his Manuel d’ornithologie, of which something must presently be said.

The Galerie des oiseaux, a rival work, with plates by Oudart, seems to have been begun immediately after the former. The original project was apparently to give a figure and ˆ. description of every species of bird; but that was soon found to be impossible; and, when six parts had been issued, with text by some unnamed author, the scheme was brought within practicable limits, and the writing of the letterpress was vielllot entrusted to Vieillot, who, proceeding on a systematic plan, performed his task very creditably, completing the work, which forms two quarto volumes, in 1825, the original text and fifty-seven

plates being relegated to the end of the second volume as a supplement. His portion is illustrated by two hundred and ninety-nine coloured plates that, wretched as they are, have been continually reproduced in various text-books— a fact possibly due to their subjects having been judiciously selected. It is a tradition that, this work not being favourably regarded by the authorities of the Paris Museum, its draughtsman and author were refused closer access to the specimens required, and had to draw and describe them through the glass as they stood on the shelves of the cases.

In 1825 Jardine and Selby began a series of Illustrations of Ornithology, the several parts of which appeared at long and irregular intervals, so that it was not until 1839 that three volumes . ., containing one hundred and fifty plates were completed. . „ .. Then they set about a Second Series, which, forming a y ‘

single volume with fifty-three plates, was finished in 1843. These authors, being zealous amateur artists, were their own draughtsmen to the extent even of lithographing the figures. In 1828 James Wilson (author of the article Ornithology in the 7th and wilson 8th editions of the present work) began, under the title of Illustrations of Zoology, the publication of a series of his own drawings (which he did not, however, himself engrave) with corre- sponding letterpress. Of the thirty-six plates illustrating this volume, a small folio, twenty are devoted to Ornithology, and contain figures, which, it must be allowed, are not very successful, of several species rare at the time.

Though the three works last mentioned fairly come under the same category as the Planches enluminees and the Planches coloriees, no one of them can be properly deemed their rightful rtesMurs heirs. The claim to that succession was made in 1845 by Des Murs for his Iconographie ornithologique, which, containing seventy- two plates by Prevot and Oudart 1 (the latter of whom had marvellously improved in his drawings since he worked with Vieillot), was completed in 1849. Simultaneously with this Du Bus began a work on a plan precisely similar, the Esquisses ornitho- nuBu logiques, illustrated by Severeyns, which, however, s ”

stopped short in 1849 with its thirty-seventh plate, while the letter-press unfortunately does not go beyond that belonging to the twentieth. In 1866 the succession was again taken up by the Exotic Ornithology of Messrs Sclater and Salvin, containing one sclst hundred plates, representing one hundred and four . er

species, all from Central or South America, which are Salvtn neatly

executed by J. Smit. The accompanying letter- press is in some places copious, and useful lists of the species of various genera are occasionally subjoined, adding to the definite value of the work, which, forming one volume, was completed in 1 869.

Rowley's Ornithological Miscellany in three quarto volumes, profusely illustrated, appeared between 1875 and 1878. The contents are as Varied as the authorship, and, most of the Rowley leading English ornithologists having contributed to the work, some of the papers are extremely good, while in the plates, which are in Keulemans's best manner, many rare species of birds are figured, some of them for the first time.

More recent monographs have been more exact, and some of them equally sumptuous. Amongst these may be mentioned F. E. Blaauw's Monograph of the Cranes (1897, folio); St G. Mivart's Monograph of the Lories (1898, folio); the Hon. W. Rothschild's Monograph of the Genus Casuarius (1899, quarto); R- B. Sharpe's

1 On the title-page credit is given to the latter alone, but only two-thirds of the plates (from pi. 25 to the end) bear his name.

Monograph of the Paradiseidae (1898, folio); H. Seebohm's Monograph of the Thrushes (1900, imp. quarto) ; J. G. Millais' British Surface-feeding Ducks (1902, folio): and the Hon. W. Rothschild's Extinct Birds (1907, quarto).

Most of the works lately named, being very costly, are not easily accessible. The few next to be mentioned, being of smaller size (octavo), may be within reach of more persons, and, therefore, can be passed over in a briefer fashion without detriment. In many ways, however, they are nearly as important. Swainson's Zoological Illustrations in three volumes, containing one hundred 3 nsoB ' and eighty-two plates, whereof seventy represent birds, appeared between 1820 and 1 821, and in 1829 a second series of the same was begun by him, which, extending to another three volumes, contained' forty-eight more plates of birds out of one hundred and thirty-six, and was completed in 1833. All the figures were drawn by the author, who as an ornithological artist had no rival in his time. Every plate is not beyond criticism, but his worst drawings show more knowledge of

bird-life than do the best of his English or French contemporaries. A work of somewhat similar character, but one in which the letterpress is of greater value, is the Centurie zoologique of Lesson, a single volume that, Lesson. though bearing the date 1830 on its title-page, is believed to have been begun in 1829, 1 and was certainly not finished until 1831. It received the benefit of Isidore Geoffroy St-Hilaire's assistance. Notwithstanding its name it only contains eighty plates, but of them forty-two, all by Pretre and in his usual stiff style, represent birds. Concurrently with this volume appeared Lesson's Traite d' ornithologie, which is dated 1831, and may perhaps be here most conveniently mentioned. Its professedly systematic form strictly relegates it to another group of works, but the presence of an " Atlas " (also in octavo) of one hundred and nineteen plates to some extent justifies its notice in this place. Between 1831 and " 1834 the same author brought out, in continuation of his Centurie, his Illustrations de zoologie with sixty plates, twenty of which represent birds. In 1832 Kittlitz began to publish some Kup- tcmilt fertafeln zur Naturgeschichte der Vogel, in which many new

species are figured; but the work came to an end with its thirty-sixth plate in the following year. In 1845 Reichenbach _ commenced with his Praktische Naturgeschichte der Vogel Keicnea- t j ie ex t raorc j mar y series of illustrated publications which, ac ' under titles far too numerous here to repeat, ended in or

about 1855, and are commonly known collectively as his Voll- standigste Naturgeschichte der Vogel? Herein are contained more than nine hundred coloured and more than one hundred uncoloured plates, which are crowded with the figures of birds, a large proportion of them reduced copies from other works, and especially those of Gould.

It now behoves us to turn to general and particularly systematic works in which plates, if they exist at all, form but an accessory to the text. These need not detain us for long, since, however well some of them may have been executed, regard being had to their epoch, and whatever repute some of them may have achieved, they are, so far as general information and especially classification is concerned, wholly obsolete, and most of them almost useless except as matters of antiquarian interest. It will be enough merely to same Dumeril's Zoologie analytique (1806) and Gravenhorst's Ver- gleichende Ubusicht des linneischen und einiger neuern zoologischen Shaw and Systeme (1807); nor need we linger over Shaw's General Stephens Zo °l°?y> a pretentious compilation continued by Stephens. 9 ' The last seven of its fourteen volumes include the Class Aves, and the first part of them appeared in 1809, but, the original author dying in 1815,

when only two volumes of birds were published, the remainder was brought to an end in 1826 by his successor, who afterwards became well known as an entomologist. The engravings which these volumes contain are mostly bad copies, often of bad figures, though many are piracies from Bewick, and the whole is a most unsatisfactory performance. Of a very different kind is the next we have to notice, the Prodromus systematis mammalium et lllixer avium of Illiger, published at Berlin in 1811, which must

g in its day have been a valuable little manual, and on

many points it may now be consulted to advantage — the characters of the genera being admirably given, and good explanatory lists of the technical terms of ornithology furnished. The classification was quite new, and made a step distinctly in advance of anything Vielllot t ‘ lat ˆ- a ˆ before appeared. 3 In 1816 Vieillot published at Paris an Analyse d’une nouvelle ornithologie elementaire, containing a method of classification which he had tried in vain to get printed before, both in Turin and in London. 4 Some of the

1 In 1828 he had brought out, under the title of Manuel d’ ornithologie, two handy duodecimos which are very good of their kind.

2 Technically speaking they are in quarto, but their size is so small that they may be well spoken of here. In 1879 Dr A. B. Meyer brought out an Index to them

3 Illiger may be considered the founder of the school of nomenclatural purists. He would not tolerate any of the ” barbarous ” generic terms adopted by other writers, though some had been in use for many years.

4 The method was communicated to the Turin Academy, on 10th January 1814, and was ordered tojje printed (Mtm. Ac. Sc. Turin,

ideas in this are said to have been taken from Illiger; but the two systems seem to be wholly distinct. Vieillot’s was afterwards more fully expounded in the series of articles which he contributed between

1816 and 1819 to the second edition of the Nouveau dictionnaire d’histoire naturelle containing much valuable information. The views of neither of these systematizers pleased Temminck, who in

1 81 7 replied rather sharply to Vieillot in some Observations

sur la classification methodique des oiseaux, a pamphlet Tern-

published at Amsterdam, and prefixed to the second edition mlnck. of his Manuel d' ornithologie, which appeared in 1820, an Analyse du systeme general d' ornithologie. This proved a great success, and his arrangement, though by no means simple, 5 was not only adopted by many ornithologists of almost every country, but still has some adherents. The following year Ranzani of Bologna, in his Elementi di zoologiWt—3. very respectable compilation — came to treat of birds, and then followed to some extent the plan R a"zanl. of De Blainville and Merrem (concerning which much more has to be said by and by), placing the Struthious birds in an Order by themselves. ' In 1827 Wagler brought out the first part of a Systema avium, in this form never completed, Wagler. consisting of forty-nine detached monographs of as many genera, the species of which are most elaborately described. The arrange- ment he subsequently adopted for them and for other groups is to be found in his Natiirliches System der Amphibien (pp. 77-128), published in 1 830, and is too fanciful to require any further attention. The several attempts at system-making by Kaup, from his Allgemeine Zoologie in 1829 to his Uber Classification *■««/».

der Vogel in 1849, were equally arbitrary and abortive; but his Shizzirte Entiuickelungs-Geschichte in 1829 must be here named, as it is so often quoted on account of the number of new genera which the peculiar views he had embraced compelled him to invent. These views he shared more or less with Vigors and Swainson, and to them attention will be immediately especially invited, while consideration of the scheme gradually developed from 1831 onward by Charles Lucien Bonaparte,, and still not without its influence, is deferred until we come to treat of the rise Bona-

and progress of what we may term the reformed school parte.

of ornithology. Yet injustice would be done to one of the ablest of those now to be called the old masters of the science if mention were not here made of the Conspectus generum avium, begun in 1850 by the naturalist last named, with the help of Schlegel, and unfortunately interrupted by its author's death six years later. 6 The systematic publications of George Robert Gray, so long in charge of the ornithological collection of the J* **

British Museum, began with A List of the Genera of Birds uray.

published in 1840. This, having been closely, though by no means in a hostile spirit, criticized by Strickland {Ann. Nat. History, vi. p. 410; vii. pp. 26 and 159), was followed by a second edition in 1 841, in

which nearly all the corrections of the reviewer were adopted, and in 1844 began the publication of The Genera of Birds, beautifully illustrated — first by Mitchell and afterwards by Mr Wolf — which will always keep Gray's name in remembrance. The enormous labour required for this work seems scarcely to have been appreciated, though it remains to this day one of the most useful books in an ornithologist's library. Yet it must be confessed that its author was hardly an ornithologist, but for the accident of his calling. He was a thoroughly conscientious clerk, devoted to his duty and unsparing of trouble. However, to have conceived the idea of executing a work on so grand a scale as this — it forms three folio volumes, and contains one hundred and eighty-five coloured and one hundred and forty-eight uncoloured plates, with references to upwards of two thousand four hundred generic names — was in itself a mark of genius, and it was brought to a successful conclusion in 1849. Costly as it necessarily was, it has been of great service to working ornithologists. In 1855 Gray brought out, as one of the Museum publications, A Catalogue of the Genera and Subgenera of Birds, a. handy little volume, naturally founded on the larger works. Its chief drawback is that it does not give any more reference to the authority for a generic term than the name of its inventor and the year of its application, though of course more precise information would have at least doubled the size cf the book. The same de- ficiency became still more apparent when, between 1869 and 1871, he published his Hand-List of Genera and Species of Birds in three

1813-1814, p. xxviii.); but, through the derangements of that stormy period, the order was never carried out (Mem. Accad. Sc. Torino, xxiii. p. xcvii.). The minute-book of the Linnean Society of London shows that his Prolusio was read at meetings of that Society between the 15th of November 1814 and the 21st of February 1815. Why it was not at once accepted is not told, but the entry respecting it, which must be of much later date, in the " Register of Papers " is " Published already." It is due to Vieillot to mention these facts,_ as he has been accused of publishing his msthod in haste to anticipate some of Cuvier's views, but he might well complain of the delay in London. Some reparation has been made to his memory by the reprinting of his Analyse by the Willughby Society.

6 He recognized sixteen Orders of Birds, while Vieillot had been content with five, and Illiger with seven.

6 To this very indispensable work a good index was supplied in 1865 by Dr Finsch.

octavo volumes (or parts, as they are called). Giebel's Thesaurus „ . . ornithologiae, also in three volumes, published between

1872 and 1877, is a slight advance, but both works have been completely superseded by the British Museum Catalogue of Birds, the twenty-seventh and final volume of which was published in 1895, and by the compact and invaluable British Museum Hand- List, the four volumes of which were completed by Dr R. B. Sharpe in 1903.

It may be convenient here to deal with the theory of the Quinary System, which was promulgated with great zeal by its

upholders during the end of the first and early part of Quinary tˆe second quarter of the 19th century, and for some y e ' years seemed likely to carry all before it. The success it gained was doubtless due in some degree to the difficulty which most men had in comprehending it, for it was enwrapped in alluring mystery, but more to the confidence with which it was announced as being the long-looked-for key to the wonders of creation, since its promoters did not hesitate to term it the discovery of " the Natural System," though they condescended, by way of explanation to less exalted intellects than their own, to allow it the more moderate appellation of the Circular or Quinary System.

A comparison of the relation of created beings to a number of intersecting circles is as old as the days of Nieremberg, who in 1635 wrote (Historia naturae, lib. iii. cap. 3) — " Nullus hiatus est, nulla fractio, nulla dispersio formarum, invicem connexa sunt velut annulus annulo "; but it is almost clear that he was thinking only of a chain. In 1806 Fischer de Waldheim, in his Tableaux syn- optiques de zoognosie (p. 181), quoting Nieremberg, extended his figure of speech, and, while justly deprecating the notion that the series of forms belonging to any particular group of creatures — the Mammalia was that whence he took his instance — could be placed in a straight line, imagined the various genera to be arrayed in a series of contiguous circles around Man as a centre. Though there is nothing to show that Fischer intended, by what is here said, to do anything else than illustrate more fully the marvellous interconnexion of different animals, or that he attached any realistic meaning to his metaphor, his

words were eagerly caught up by the prophet of the new faith. This was William Sharpe Macleay. Macleay, a man of education and real genius, who in 1 819 and 1 82 1 brought out a work under the title of Home Entomo- logicae, which was soon after hailed by Vigors as containing a new revelation, and applied by him to ornithology in some Vigors. .. Observations on the Natural Affinities that connect the Orders and Families of Birds," read before the Linnean Society of London in 1823, and afterwards published in its Transactions (xiv. pp. 395-517). In the following year Vigors returned to the subject in some papers published in the recently established Zoological Journal, and found an energetic condisciple and coadjutor in Swainson, who, for more than a dozen years — to the Swain- en ˆ – m f actj Q f j,; s career as an ornithological writer — so "' was instant in season and out of season in pressing on all

his readers the views he had, through Vigors, adopted from Macleay, though not without some modification of detail if not of principle. What these views were it would be manifestly improper for a sceptic to state except in the terms of a believer. Their enunciation must therefore be given in Swainson's own words, though it must be admitted that space cannot be found here for the diagrams, which it was alleged were necessary for the right understanding of the theory. This theory, as originally propounded by Macleay, was said by Swainson in 1835 (Geogr. and Classific. of Animals, p. 202) to have consisted of the following propositions :' —

" 1. That the series of natural animals is continuous, forming, as it were, a circle; so that, upon commencing at any one given point, and thence tracing all the modifications of structure, we shall be imperceptibly led, after passing through numerous forms, again to the point from which we started.

" 2. That no groups are natural which do not exhibit, or show an evident tendency to exhibit, such a circular series.

" 3. That the primary divisions of every large group are ten, five of which are composed of comparatively large circles, and five of smaller: these latter. being termed osculant, and being intermediate between the former, which they serve to connect.

" 4. That there is a tendency in such groups as are placed at the opposite points of a circle of affinity ' to meet each other.'

" 5. That one of the five larger groups into which every natural circle is divided ' bears a resemblance to all the rest, or, more strictly

speaking, consists of types which represent those of each of the four other groups, together with a type peculiar to itself.' "

1 We prefer giving them here in Swainson's version, because he seems to have set them forth more clearly and concisely than Macleay ever did, and, moreover, Swainson's application of them to ornithology — a branch of science that lay outside of Macleay's proper studies — appears to be more suitable to the present occasion.

As subsequently modified by Swainson (torn. cit. pp. 224, 225), the foregoing propositions take the following form : —

"I. That every natural series of beings in its progress from a given point, either actually returns, or evinces a tendency to return, again to that point, thereby forming a circle.

" II. The primary circular divisions of every group are three actually, or five apparently.

" III. The contents of such a circular group are symbolically (or analogically) represented by the contents of all other circles in the animal kingdom.

" IV. That these primary divisions of every group are character- ized by definite peculiarities of form, structure and economy, which, under diversified modifications, are uniform throughout the animal kingdom, and are therefore to be regarded as the primary types of nature.

"V. That the different ranks or degrees of circular groups ex- hibited in the animal kingdom are nine in number, each being involved within the other."

Though, as above stated, the theory here promulgated owed its temporary success chiefly to the extraordinary assurance and perti- nacity with which it was urged upon a public generally incapable of understanding what it meant, that it received some support from men of science must be admitted. A " circular system " was advocated by the eminent botanist Fries, and the views of Macleay met with the partial approbation of the celebrated entomologist Kirby, while at least as much may be said of the imaginative Oken, whose mysticism far surpassed that of the Quinarians. But it is obvious to every one who nowadays indulges in the profitless pastime of studying their writings that, as a whole, they failed in grasping the essential difference between homology (or " affinity," as they generally termed it) and analogy — though this difference had been fully understood

and set forth by Aristotle himself — and, moreover, that in seeking for analogies on which to base their ‘ foregone conclusions they were often put to hard shifts. Another singular fact is that they often seemed to be totally unaware of the tendency if not the meaning of some of their own expressions: thus Macleay could write, and doubtless in perfect good faith (Trans. Linn. Society, xvi. p. 9, note), ” Naturalists have nothing to do with mysticism, and but little with a priori reasoning.” Yet his followers, if not he himself, were ever making use of language in the highest degree metaphorical, and were always explaining facts in accordance with preconceived opinions. Fleming, already the author of a harmless and extremely orthodox ” emu, X- Philosophy of Zoology, pointed out in 1829 in the Quarterly Review (xli. pp. 302-327) some of the fallacies of Macleay’s method, and in return provoked from him a reply, in the form of a letter addressed to Vigors On the Dying Struggle of the Dichotomous System, couched in language the force of which no one even at the present day can deny, though to the modern naturalist its invective power contrasts ludicrously with the strength of its ratiocination. But, confining ourselves to what is here our special business, it is to be remarked that perhaps the heaviest blow dealt at these strange doctrines was that delivered by Rennie, who, in an edition of Montagu’s Ornitho- logical Dictionary (pp. xxxiii.lv.), published in 1831 and again issued in 1833, attacked the Quinary System, and especially its application to ornithology by Vigors and Swainson, in a way tha* might perhaps have demolished it, had not the author mingled with his undoubtedly sound reason much that is foreign to any question with which a naturalist, as such, ought to deal — though that herein he was only following the example of one of his opponents, who had constantly treated the subject in like manner, is to be allowed. This did not hinder Swainson, who had succeeded in getting the ornithological portion of the first zoological work ever published at the expense of the British government (namely, the Fauna Boreali Americana) executed in accordance with his own opinions, from maintaining them more strongly than ever in several of the volumes treating of Natural History which he contributed to the Cabinet Cyclopaedia— among others that from which we have just given some extracts — and in what may be deemed the culmination in England of the Quinary System, the volume of the ” Naturalist’s Library ” on The Natural Arrangement and History of Flycatchers, published in 1838, of which unhappy performance mention has already been made in this present work (vol. x. p. 584, note). This seems to have been his last attempt; for, two years later, his Bibliography of Zoology shows little trace of his favourite theory, though nothing he had uttered in its support was retracted. Appearing

almost simultaneously with this work, an article by Strickland {Mag. Nat. History, ser. 2, iv. pp. 219-226) entitled Observations upon the Affinities and A nalogies of Organized Beings administered land. to the theory a shock from which it never recovered, though attempts were now and then made by its adherents to revive it; and, even ten years or more later, Kaup, one of the few foreign ornithologists who had embraced Quinary principles, was by mis- taken kindness allowed to publish Monographs of the Birds-of-Prey (Jardine's Contributions to Ornithology, 1849, pp. 68-75, 96-121; 1850, pp. 51-80; 1851, pp. 119-130; 1852, pp. 103-122; and Trans. Zool. Society, iv. pp. 201-260), in which its absurdity reached the climax.

The mischief caused by this theory of a Quinary System was very great, but was chiefly confined to Britain, for (as has been

already stated) the extraordinary views of its adherents found little favour on the continent of Europe. The purely artificial character of the System of Linnaeus and his successors had been perceived, and men were at a loss to find a substitute for it. The new doctrine, loudly proclaiming the discovery of a " Natural " System, led away many from the steady practice which should have followed the teaching of Cuvier (though he in ornithology had not been able to act up to the principles he had lain down) and from the extended study of Comparative Anatomy. Moreover, it veiled the honest attempts that were making both in France and Germany to find real grounds for establishing an improved state of things, and con- sequently the labours of De Blainville, Etienne, Geoffroy St-Hilaire and L'Herminier, of Merrem, Johannes Muller and Nitzsch — to say nothing of others— were almost wholly unknown on this side of the Channel, and even the value of the investigations of British ornithotomists of high merit, such as Macartney and Macgillivray, was almost completely overlooked. True it is that there were not wanting other men in these islands whose common sense refused to accept the metaphorical doctrine and the mystical jargon of the Quinarians, but so strenuously and persistently had the latter asserted their infallibility, and so vigorously had they assailed any who ventured to doubt it, that most peaceable ornithologists found it best to bend to the furious blast, and in some sort to.acquiesce at least in the phraseology of the self-styled interpreters of Creative Will. But, while thus lamenting this

unfortunate perversion into a mistaken channel of ornithological energy, we must not over- blame those who caused it. Macleay indeed never pretended to a high position in this branch of science, his tastes lying in the direction of Entomology; but few of their countrymen knew more of birds than did Swainson and Vigors; and, while the latter, as editor for many years of the Zoological Journal, and the first secretary of the Zoological Society, has especial claims to the regard of all zoologists, so the former's indefatigable pursuit of Natural History, and conscientious labour in its behalf — among other ways by means of his graceful pencil — deserve to be remembered as a set-off against the injury he unwittingly caused.

It is now incumbent upon us to take a rapid survey of the

ornithological works which come more or less under the designa-

tion of " Faunae ";* but these are so numerous that it

will be necessary to limit this survey, as before indicated,

to those countries alone which form the homes of English

people, or are commonly visited by them in ordinary travel.

Beginning with New Zealand, it is hardly needful to go further back than Sir W. L. Buller's beautiful Birds of New Zealand (4to, 1872- N 1873), with coloured plates by Keulemans, since the publi-

Zealand cat i° n °f which the same author has issued a Manual of the \ Birds of New Zealand (8vo, 1882), founded on the former; but justice requires that mention be made of the labours of G. R.Gray, first in the Appendix to Dieffenbach's Travels in New Zealand (1843) and then in the ornithological portion of the Zoology of the Voyage of H. M.S. "Erebus" and " Terror," begun in 1864, but left un- finished from the following year until completed by Mr. Sharpe in 1876. A considerable number of valuable papers on the ornithology of the country by Sir W. L. Buller, Drs Hector and Von Haast, F. W. Hutton. Mr Potts and others are to be found in the Transactions and Proceedings of the New Zealand Institute. Sir W. L. Buller's Supple- ment to the Birds of New Zealand (1905-1906) completes the great work of this author.

Passing to Australia, we have the first good description of some of its birds in the several old voyages and in Latham's works before Australia men tioned. Shaw's Zoology of New Holland (4to, 1794) added those of a few more, as did J. W. Lewin's Natural History of the Birds of New South Wales (4to, 1822), which reached a third edition

in 1838. Gould's great Birds of Australia has been already named, and he subsequently reproduced with some additions the text of that work under the title of Handbook to the Birds of Australia (2 vols. 8vo, 1865). In 1866 Mr Diggles commenced a similar publication, The Ornithology of Australia, but the coloured plates, though fairly drawn, are not comparable to those of his pre- decessor. This is still incomplete, though the parts that have appeared have been collected to form two volumes and issued with title-pages. Some notices of Australian birds by Mr Ramsay and others are to be found in the Proceedings of the Linnaean Society of New South Wales and of the Royal Society of Tasmania.

Coming to British Indian possessions, and beginning with Ceylon, we have Kelaart's Prodromus faunae Zeylanicae (8vo, 1852), and Ceylon t ' le admirable Birds of Ceylon by Captain Legge (4to, ' 1 878-1 880), with coloured plates by Mr Keulemans of all the peculiar species. It is hardly possible to name any book that has been more conscientiously executed than this. Blyth's Mammals and Birds of Burma (8vo, 1875) 2 contains much valuable information. Jerdon's Birds of India (8vo, 1 862-1 864;

1 A very useful list of more general scope is given as the Appendix to an address by Mr Sclater to the British Association in 1875 (Report, pt. ii. pp. 1 14-133).

2 This is a posthumous publication, nominally forming an extra number of the Journal of the Asiatic Society; but, since it was separately issued, it is entitled to notice here.

South Africa.

West ladles.

reprinted 1877) is a comprehensive work on the ornithology of the peninsula. A very fairly executed compilation on the subject by an anonymous writer is to be found in a late edition of , .,

the Cyclopaedia of India, published at Madras, and W. T. Blanford's Birds of British India {1898) remains the standard work. Stray Feathers, an ornithological journal for India and its de- pendencies, contains many interesting and some valuable papers.

In regard to South Africa, besides the well-known work of Le Vaillant already mentioned, there is the second volume of Sir Andrew Smith's Illustrations of the Zoology of South Africa (4to, 1838-1842), which is devoted to birds. This is an important but cannot be called a

satisfactory work. Its one hundred and fourteen plates by Ford truthfully represent one hundred and twenty-two of the mounted specimens obtained by the author in his explorations into the interior. Layard's handy Birds of South Africa (8vo, 1867), though by no means free from faults, has much to recommend it. A so-called new edition of it by R. B. Sharpe appeared in 1875-1884, but was executed on a plan so wholly different that it must be regarded as a distinct work. C. J. Andersson's Notes on the Birds of Damara Land (8vo, 1872), edited by I. H. Gurney, was useful in its day, but has been super- seded by the more comprehensive and extremely accurate volumes, the Birds of Africa, by G. E. Shelley (1900-1907), and the German work on the same subject by Anton Reichenow (1900-1905).

Of special works relating to the British West Indies, C. Waterton's well-known Wanderings has passed through several editions since its first appearance in 1825, and must be mentioned here, though, strictly speaking, much of the country he traversed was not British territory. To Dr Cabanis we are indebted for the ornithological results of Richard Schomburgh's researches given in the third volume (pp. 662-765) of the latter's Reisen im Britisch-Guiana (8vo, 1848), and then in Leotaud's Oiseaux de Vile de la Trinidad (8vo, 1866). Of the Antilles there is only to be named P. H. Gosse's excellent Birds of Jamaica (i2mo, 1847), together with its Illustrations (sm. fol., 1849) beautifully executed by him. A nominal list, with references, of the birds of the island is contained in the Handbook of Jamaica.

[An admirable "List of Faunal Publications relating to North American Ornithology " up to 1878 has been given by Elliott Coues as an appendix to his Birds of the Colorado Valley (PP- 567-784)- Special ment.on should be made of the ™° rt * following works most of which have appeared since Amerie *~ that time: S. F. Baird, T. M. Brewer and Robert Ridgway, History of North American Birds: The Land Birds (3 vols., Boston, 1875), The Water Birds (2 vols., Boston, 1884); Elliott Coues, Check List of North American Birds (Boston, 1882), Key to North American Birds (Boston, 1887), Birds of the Northwest, U.S. Geological Survey, Misc. pubs., No. 3 (1874) and Birds of the Colorado Valley, ibid, No. 11 (1878); Robert Ridgway, Manual of North American Birds (Philadelphia, 1887); Frank M. Chapman, Color Key to North American Birds (New York, 1903); Handbook of Birds of Eastern North America (ibid, 1895) and The Warblers of North America (ibid, 1907), with notable coloured illustrations by L. A: Fuertes and Bruce Horsfall ; Dr. A. K. Fisher, Hawks and Owls of the United States in their Relation to Agriculture, U.S. Department of Agriculture, Bull. No. 3 (Washington, 1893), a very important work; D. G. Elliot, Gallinaceous Game Birds of North America (New York,

1897) and Wild Fowl of the United States and British Possessions (1898), and Robert Ridgway's learned and invaluable Birds of North and, Middle America, published by the Smithsonian Institution, Bull. No. 50 (Washington, 1901 sqq.). Among con- temporary writers in a more popular style are John Burroughs (q.v.) ; Herbert K. Job and A. R. Dugmore who have done much remarkable work in bird photography; Dallas Lore Sharp, Bradford Torrey, E. H. Parkhurst, Mrs Florence Merriam Bailey, Olive Thome Miller (Mrs Harriet Mann Miller) and Mrs Mabel Osgood Wright. Alexander Wilson's American Ornithology, originally published be- ween 1808 and 1814, has gone through many editions including those issued in Great Britain, by Jameson (4 vols. 16 mo, 1831), and Jardine (3 vols. 8vo, 1832). The former of these has the entire text, but no plates; the latter reproduces the plates, but the text is in places much condensed, and excellent notes are added. A contin- uation of Wilson's work was issued by Bonaparte between 1825 and 1833, and most of the later editions include the work of both authors. The works of Audubon, and the Fauna Boreali-AmericanaoiRKhard- son and Swainson have already been noticed, but they need naming here, as also do Nuttall's Manual of the Ornithology of the United States and of Canada (2 vols., Boston, 1832-1834; 2nd ed., 1840); and the Birds of Long Island (8 vo, New York, 1844) by J. P. Giraud, remarkable for its excellent account of the habits of shore-birds. The Bulletin of the Nuttall Ornithological Club was published from 1876 to 1884, when it was superseded by The Auk. A bi-monthly, Bird-Lore, established in 1899, is edited by Frank M. Chapman. A tecent valuable work is that of Mary B. Beebe and C. W. Beebe, Our Search for a Wilderness (New York, 1910) which deals with the birds of Venezuela and British Guiana, while Central America is fully treated in the comprehensive and beautiful Biologia Centrali- Americana of F. du Cane Godman and O. Salvin (1898-1905). X.l

Returning to the Old World, we have first Iceland, the fullest — indeed the only full — account of the birds oi which is

tHISTORY

Faber's Prodromus der isldndischen Ornithologie (8vo, 1822), though the island has since been visited by several good ornithologists — Scandl- Proctor, Kriiper and Wolley among them. A list of its navla birds, with some notes, bibliographical and biological, has been given

as an Appendix to Baring-Gould's Iceland, its Scenes and Sagas (8vo, 1862) ; and Shepherd's North-west Peninsula of Iceland (8vo, 1867) recounts a somewhat profitless expedition made thither expressly for ornithological objects. For the birds of the Faeroes there is H. C. Miiller's Faeroernes Fuglefauna (8vo, 1862), of which a German translation has appeared. 1 The ornithology of Norway has been treated in a great many papers by Herr Collett, some of which may be said to have been separately published as N or ges Fugle (8vo, 1868; with a supplement, 1871), and The Ornithology of Northern Norway (8vo, 1872)— this last in English. For Scandinavia generally Herr Collin's Skandinaviens Fugle (8vo, 1873) is a greatly bettered edition of the very moderate Danmarks Fugle of Kjaerbolling; but the ornithological portion of Nilsson's Skandinavisk Fauna, Foglarna (3rd ed., 2 vols., 8vo, 1858) is of great merit ; while the text of Sundevall's Svenska Foglarna (obi. fob, 1856-1873), unfortunately unfinished at his death, and Herr Holm- gren's Skandinaviens Foglar (2 vols. 8vo, 1866-1875) deserve naming. Works on the birds of Germany are far too numerous to be re- counted. That of the two Naumanns stands at the head of all, Germany anc * P erna P s at tne head of the " Faunal " works of all countries. It- has been added to by C. R. Hennicke — Naumann's Birds of Middle Europe (1907). For want of space it must here suffice simply to name some of the ornithologists who have elaborated, to an extent elsewhere unknown, the science as regards their own country: Altum, Baldamus, Bechstein, Blasius (father and two sons), Bolle, Borggreve, whose Vogel-Fauna von Norddeutschland (8vo, 1869) contains what is practically a biblio- graphical index to the subject, Brehm (father and sons), Von Droste, Gatke, Gloger, Hintz, Alexander and Eugen von Homeyer, Jackel, Koch, Konig-Warthausen, Kriiper, Kutter, Landbeck, Landois, Leisler, Von Maltzan, Bernard Meyer, Von der Miihle, Neumann, Tobias, Johann Wolf and Zander. 2 Were we to extend the list beyond the boundaries of the German empire, and include the ornithologists of Austria, Bohemia and the Other states subject to the same monarch, the number would be nearly doubled; but that would overpass our proposed limits, though Herr von Pelzeln must be named. 3 Passing onward to Switzerland, we must content ourselves by referring to the list of works, forming a Bibliographia ornithologica Helvetica, drawn up by Dr Stolker for Dr Fatio's Italy Bulletin de la Societi Ornithologique Suisse (ii. pp. 90-119).

As to Italy, we can but name here the Fauna d'ltalia, of which the second part, Vccelli (8vo, 1872), by Count Salvadori, contains an excellent bibliography of Italian works on the subject, and the posthumously published Ornitologia italiana of Savi (3 vols. Spain and

8v °. l8 73- l8 77)- 4 Comingto the Iberian peninsula.we must Portugal m default of separate works depart from our rule of not * ‘ mentioning contributions to journals, for of the former there are only Colonel Irby ‘s Ornithology of the Straits of Gibraltar (8vo, 1875) and Mr A. C. Smith’s Spring Tour in Portugal 6 to be named, and these only partially cover the ground. However, Dr A. E. Brehm has published a list of Spanish birds (Allgem. deutsche natur- hist. Zeitung, iii. p. 431), and The Ibis contains several excellent papers by Lord Lilford and by H. Saunders, the latter of whom there records (187 1, p. 55) the few works on ornithology by Spanish authors,’ and in the Bulletin de la Societe Zoologique de France (i. p. 315; ii. pp. 11, 89, 185) has given a list of the Spanish birds known to him. Returning northwards, we have of the birds of the whole of France nothing of real importance more recent than the volume France Oiseaux in Vieillot’s Faune francaise (8vo, 1 822-1 829); but there is a great number of local publications of which Mr Saunders has furnished (Zoologist, 1878, pp. 95-99) a catalogue.

1 Journal fur Ornithologie (1869), pp. 107, 341, 381. One may almost say an English translation also, for Major Feilden’s con- tribution to the Zoologist for 1872 on the same subject gives the most essential part of Herr Miiller’s information.

2 This is, of course, no complete list of German ornithologists. Some of the most eminent of them have written scarcely a line on the birds of their own country, as Cabanis (editor since 1853 of the Journal fur Ornithologie), Finsch, ‘Hartlaub, Prince Max of Wied, A. B. Meyer, Nathusius, Nehrkorn, Reichenbach, Reichenow and Schalow among others.

3 A useful ornithological bibliography of the Austrian-Hungarian dominions was printed in the Verhandlungen of the Zoological and Botanical Society of Vienna for 1878, by Victor Ritter von Tschusi zu Schmidhofen. A similar bibliography of Russian ornithology by Alexander Brandt was printed at St Petersburg in 1877 or 1878.

4 A useful compendium of Greek and Turkish ornithology by Drs Kriiper and Hartlaub is contained in Mommsen’s Griechische Jahrzeiten for i875_(Heft III.). For other countries in the Levant there are Canon Tristram’s Fauna and Flora of Palestine (4to, 1884) and Captain Shelley’s Handbook to the Birds of Egypt (8vo, 1872).

6 In the final chapter of this work the author gives a list of Portuguese birds, including besides those observed by him those recorded by Professor Barboza du Bocage in the Gazeta medica de Lisboa (1861),

pp. 17-21.

Some of these seem only to have appeared in journals, but many have certainly been issued separately. Those of most interest to English ornithologists naturally refer to Britannv, Normandy and Picardy, and are by Baillon, Benoist, Blandin, “Bureau, Canivet, Chesnon, Degland, Demarle, De Norguet, Gentil, Hardy, Lemetteil, Lemonnicier, Lesauvage, Maignon, Marcotte, Nourry and Tasl6, while perhaps the Ornithologie parisienne of M. Ren6 Paquet, under the pseudonym of Neree Quepat, should also be named. Of the rest the most important are the Ornithologie provencale of Roux (2 vols. 4to, 1825-1829); Risso’s Histoire naturelle … des environs de Nice (5 vols. 8vo. 1826-1827); the Ornithologie du Dauphine’ of Bouteille and Labatie (2 vols. 8vo, 1 843-1 844); the Faune mkri dionale of Crespon (2 vols. 8vo, 1844); the Ornithologie de la Savou of Bailly (4 vols. 8vo, 1 853-1 854), and Les Riches ses ornithologiques du midi de la France (4*0, 1859-1861) of MM. Jaubert and Barth61emy-Lapommeraye. For Belgium the Faune „ llrl beige of Baron De Selys-Longchamps (8vo, 1842), old as Be «”” n – it is, remains the classical work, though the Planches coloriees des oiseaux de la Belgique of M. Dubois (8vo, 1851-1860) is so much later in date. In regard to Holland we have Schlegel’s „ De Vogels van Nederland (3 vols. 8vo, 1854-1858 ; 2nd ed., Hoaana – 2 vols., 1878), besides his De Dieren van Nederland: Vogels Vivo,

1861).

Before considering the ornithological works relating solely to the British Islands, it may be well to cast a glance on a few of those that refer to Europe in general, the more so since most p of them are of Continental origin. First we have the tsuropela already-mentioned Manuel d’ ornithologie of Temminck, X eneral ‘ which originally appeared as a single volume in 1815 ; 6 but that was speedily superseded by the second edition of 1820, in two volumes. Two supplementary parts were issued in 1835 and 1840 respectively, and the work for many years deservedly maintained the highest position as the authority on European ornithology — indeed in England it may almost without exaggeration be said to have been nearly the only foreign ornithological work known; but, as could only be expected, grave defects are now to be discovered in it. Some of them were already manifest when one of its author’s col- leagues, Schlegel (who had been employed to write the»text for Susemihl’s plates, originally intended to illustrate Temminck’s work), brought out his bilingual Revue critique des oiseaux d ‘Europe (8vo, 1844), a very remarkable volume, since it correlated and consolidated the labours of French and

German, to say nothing of Russian, ornithologists. Of Gould's Birds of Europe (5 vols, fob, 1832-1837) nothing need be added to what has been already said. The year 1849 saw the publication of Degland's Ornithologie euro- peenne_ (2 vols. 8vo), a work fully intended to take the place of Temminck's; but of which Bonaparte, in a caustic but by no means ill-deserved Revue critique (12 mo, 1850), said that the autho/ had performed a miracle since he had worked without a collection of specimens and without a library. A second edition, revised by M. Gerbe (2 vols. 8vo, 1867), strove to remedy, and to some extent did remedy, the grosser errors of the first, but enough still remain to make few statements in the work trustworthy unless corroborated by other evidence. Meanwhile in England Dr Bree had in 1858 begun the publication of The Birds of Europe not observed in the British Isles (4 vols. 8vo), which was completed in 1863, and in 1875 reached a second and improved edition (5 vols.). In 1862 M. Dubois brought out a similar work on the " Especes non observers en Belgique," being supplementary to that of his above named. In 1870 Anton Fritsch completed his Naturgeschichte der Vdgel Europas (8vo, with atlas in folio); and in 1 871 Messrs Sharpe and Dresser began the publication of their Birds of Europe, which was completed by the latter in 1879 (8 vols. 4to), and is unquestionably the most complete work of its kind, both for fulness of information and beauty of illustration — the coloured plates being nearly all by Keulemans. This work has since been completed by H. E. Dresser's Supplement to the Birds of Europe (1896). H. Noble's List of Euro- pean Birds (1898) is a useful compilation, and Dresser's magnificent Eggs °f the Birds of Europe is another great contribution by that author to European ornithology.

Coming now to works on British birds only, the first of the present century that requires remark is Montagu's Ornithological Dictionary (2 vols. 8vo, 1802; supplement 1813), the merits of which have been so long and so fully acknowledged both abroad and at home that no further comment is here wanted. In 1 831 Rennie brought out a modified edition of it (reissued in 1833), and Newman another in 1866 (reissued in 1883); but those who wish to know the author's views had better consult the original. Next in order come the very inferior British Ornithology of Graves (3 vols. 8vo, 1811-1821), and a work with the same title by Hunt (3 vols. 8vo, 1815-1822), published at Norwich, but never finished. Then we have Selby's Illustrations of British Ornithology, two folio volumes of coloured plates engraved by himself, between 1821 and 1833, with letterpress also in two volumes (8vo, 1825-1833), a second edition of the first volume being also issued (1833), for the author, having yielded to the pressure of the "

Quinarian ” doctrines then in vogue, thought it necessary to adjust his classification accordingly, and it must be admitted that for information the

British Isles.

6 Copies are said to exist bearing the date 1814.

second edition is best. In 1828 Fleming brought out his History of British Animals (8vo), in which the birds are treated at consider- able length (pp. 41-146), though not with great success. In 1835 Mr Jenyns (afterwards Blomefield) produced as excellent Manual of British Vertebrate Animals, a volume (8vo) executed with great scientific skill, the birds again receiving due attention (pp. 49-286), and the descriptions of the various species being as accurate as they are terse. In the same year began the Coloured Illustrations of British Birds and their Eggs of H. L. Meyer (4to), which was com- pleted in 1843, whereof a second edition (7 vols. 8vo, 1842-1850) was brought out, and subsequently (1852-1857) a reissue of the latter. In 1836 appeared Eyton’s History of the rarer British Birds, intended as a sequel to Bewick’s well-known volumes, to which no important additions had been made since the issue of 1 821. The year 1837 saw the beginning of two remarkable works by Macgillivray and Yarrell respectively, and each entitled A History of British Birds. Of Yarrell’s work in three volumes, a second edition was published in 1845, a third in 1856, and a fourth, begun in 1871, and almost wholly rewritten. Of the compilations based upon this work, without which they could not have been composed, there is no need to speak. One of the few appearing since, with the same scope, that are not borrowed is Jardine’s Birds of Great Britain and Ireland (4 vols. 8vo, 1838-1843), forming part of his Naturalist’ ‘s Library; and Gould’s Birds of Great Britain has been already mentioned. The local works on English birds are too numerous to be mentioned ; almost every county has had its ornithology recorded. Of more recent general works there should be mentioned A. G. Butler’s British Birds with their Nests and Eggs (6 vols., 1896), the various editions of Howard Saunders’s Manual of British Birds, and Lord Lilford’s beautifully illustrated Coloured Figures of the Birds of the British Islands (1 885-1897).

Taxonomy. The good effects of ” Faunal ” works such as those named in the foregoing rapid survey none can doubt, but important as they are, they do not of themselves constitute ornithology as a science; and an inquiry, no less wide and far more recondite, still remains. By whatever term we choose to call it— Classifica- tion, Arrangement, Systematizing or Taxonomy — that inquiry which has for its object the discovery of the natural groups into which birds fall, and the mutual relations of those groups, has always been one of the deepest interest. It is now for us to trace the rise of the present more advanced school of ornithologists, whose labours yet give signs of far greater promise.

It would probably be unsafe to place its origin further back than a few scattered hints contained in the ” Pterographische Fragmente ” of Christian Ludwig Nitzsch, published in the Magazin fur den neuesten Zustand der Natur- kunde (edited by Voigt) for May 1S06 (xi. pp. 393-417), and even these might be left to pass unnoticed, were it not that we recog- nize in them the germ of the great work which the same admirable zoologist subsequently accomplished. In these ” Fragments,” apparently his earliest productions, we find him engaged on the subject with which his name will always be especially identified, the structure and arrangement of feathers. In the following year another set of hints — of a kind so different that probably no one then living would have thought it possible that they should ever be brought in correlation with those of Nitzsch — are contained in a memoir on Fishes contributed to the tenth volume of the Annates du Museum d’histoire naturelle of Paris by Etienne Geoffroy St-Hilaire in 1807. 1 Here we have it stated as a general truth (p. 100) that young birds have the sternum formed of five separate pieces — one in the middle, being its keel, and two ” annexes ” on each side to which the ribs are articulated — all, however, finally uniting to form ■ the single ” breast-bone.” Further on (pp. 101, 102) we find observations as to the number of ribs which are attached to each of the ” annexes ” — there being sometimes more of them articulated to the anterior than to the posterior, and in certain forms no ribs belonging to one, all being applied to the other. Moreover, the author goes on to remark that in adult birds trace of the origin of the sternum from five centres of ossification is always more or less indicated by sutures, and that, though these sutures had been generally regarded as ridges for the attachment of the sternal muscles, they indeed mark the extreme points of the five primary bony pieces of the sternum.

} In the Philosophie anatomique (i. pp. 69-101, and especially PP-135. 136), which appeared in 1818, Geoffroy St-Hilaire explained the views he had adopted at greater length.

Nitzsch.

E. O. St Hilaire.

Tlede-

In 1 8 10 appeared at Heidelberg the first volume of F. Tiedemann's carefully-wrought Anatomie und Naturgeschichte der Vogel — which shows a remarkable advance upon the work which Cuvier did in 1805, and in some respects is superior to his later production of 181 7. It is, how- ever, only noticed here on account of the numerous references made to it by succeeding writers, for neither in this nor in the author's second volume (not published until 18 14) did he pro- pound any systematic arrangement of the Class. More germane to our present subject are the Osteographische Beitrdge zur Naturgeschichte der Vogel of C. L. Nitzsch, printed at Leipzig in 181 1 — a miscellaneous set of detached essays on some peculiarities of the skeleton or portions of the skeleton of certain birds — one of the most remarkable of which is that on the component parts of the foot (pp. 101-105) pointing out the aberration from the ordinary structure exhibited by the Goat- sucker (Caprimulgus) and the Swift (Cypselus) — an aberration which, if rightly understood, would have conveyed a warning to those ornithological systematists who put their trust in birds' toes for characters on which to erect a classification, that there was in them more of importance, hidden in the integument, than had hitherto been suspected; but the warning was of little avail, if any, till many years had elapsed. However, Nitzsch had not as yet seen his way to proposing any methodical arrangement of the various groups of birds, and it was not until some eighteen months later that a scheme of classification in the main anatomical was attempted.

This scheme was the work of Blasius Merrem, who, in a communication to the Academy of Sciences of Berlin on the 10th December 1812, which was published in its Abhandlungen for the following year (pp. 237-259), set forth a Tentamen systematis naturalis avium, no less modestly entitled than modestly executed. The attempt of Merrem must be regarded as the virtual starting-point of the latest efforts in Systematic Ornithology, and in that view its proposals deserve to be stated at length. Without pledging ourselves to the acceptance of all its details — some of which, as is only natural, cannot be sustained with our present knowledge — it is certainly not too much to say that Merrem's merits are almost incompar- ably superior to those of any of his predecessors. Premising then that the chief characters assigned by this systematist to his several groups are drawn from almost all parts of the structure of birds, and are

supplemented by some others of their more prominent peculiarities, we present the following abstract of his scheme: — 2

jl. AVES CARINATAE.

1. Aves aereae.

A. Rapaces. — a. Accipitres — Vultur, Falco, Sagittarius.

b. Strix.

B. Hymenopodes. — a. Chelidones: a. C. nocturnae —

Caprimulgus; /3. C. diurnae — Hirundo. b. Oscines: a. O. conirostres — Loxia, Fringilla, Emberiza, Tan- gara; /3. O. tenuirostres — Alauda, Motacilla, Muscicapa, Todus, Lanius, Ampelis, Tur- dus, Paradisea, Buphaga, Stur- nus, Oriolus, Gracula, Coracias. Corvus, Pipra?, Parus, Sitta, Certhiae quaedam.

C. Mellisugae. — Trochilus, Certhiae et Upupae plurimae.

D. Dendrocolaptae. — Picus, Yunx.

E. Brevilingues. — a. Upupa; b. Ispidae.

F. Levirostres. — a. Ramphastus, Scythrops? ; b. Psittacus.

G. Coccyges. — Cuculus, Trogon, Bucco, Crotophaga.

2. Aves terrestres.

A. Columba.

B. Gallinae.

3. Aves aquaticae.

A. Odontorhynchi : a. Boscades — Anas; b. Mergus; c. Phoenicopterus.

2 The names of the genera are, he tells us, for the most part those of Linnaeus, as being the best-known, though not the best. To some of the Linnaean genera he dare not, however, assign a place, for instance, Buceros, Haematopus, Merops, Glareola (Brisson's genus, by the by) and Palamedea.

[TAXONOMY

B. Platyrhynchi. — Pelicanus, Phaeton, Plotus.

C. Aptenodytes.

D. Urinatrices: a. Cepphi — Alca, Colymbi pedibus

palmatis; b. Prodiceps, Colymbi pedibus lobatis.

E. Stenorhynchi. — Procellaria, Diomedea, Larus, Sterna,

Rhynchops. 4. Aves palustres.

A. Rusticolae: a. Phalarides — Rallus, Fulica, Pane;

b. Limosugae — Numenius, Scolopax, Tringa, Char- adrius, Recurvirostra,

B. Grallae:a. Erodii — Ardeae ungue intermedio serrato,

Cancroma; b. Pelargi — Ciconia, Mycteria, Tantali quidam, Scopus, Platalea; c. Gerani — Ardeae cristatae, Grues, Psophia.

C. Otis.

II. Aves ratitae. — Struthio.

The most novel feature, and one the importance of which most ornithologists of the present day are fully prepared to admit, is the separation of the class Aves into two great divisions, which from one of the most obvious distinctions they present were called by its author Carinatae l and Ratitae? according as the sternum possesses a keel {crista in the phraseology of many anatomists) or not. But Merrem, who subsequently communi- cated to the Academy of Berlin a more detailed memoir on the ” flat-breasted ” birds, 3 was careful not here to rest his divisions on the presence or absence of their sternal character alone. He concisely cites (p. 238) no fewer than eight other characters of more or less value as peculiar to the Carinate Division, the first of which is that the feathers have their barbs furnished with hooks, in consequence of which the barbs, includ- ing those of the wing-quills, cling closely together; while among the rest may be mentioned the position of the furcula and coracoids, 4 which keep the wing-bones apart; the limitation of the number of the lumbar vertebra to fifteen, and of the carpals to two; as well as the divergent direction

of the iliac bones — the corresponding characters peculiar to the Ratite Division being the disconnected condition of the barbs of the feathers, through the absence of any hooks whereby they might cohere; the non-existence of the furcula, and the coalescence of the coracoids with the scapulae (or, as he expressed it, the extension of the scapulae to supply the place of the coracoids, which he thought were wanting); the lumbar vertebrae being twenty and the carpals three in number; and -the parallelism of the iliac bones.

As for Merrem's partitioning of the inferior groups there is less to be said in its praise as a whole, though credit must be given to his anatomical knowledge for leading him to the percep- tion of several affinities, as well as differences, that had never before been suggested by superficial systematists. But it must be confessed that (chiefly, no doubt, from paucity of accessible material) he overlooked many points, both of alliance and the opposite, which since his time have gradually come to be admitted.

Notice has next to be taken of a Memoir on the Employment of Sternal Characters in establishing Natural Families among Birds, which was read by De Blainville before the vUie. 3 "' Academy of Sciences of Paris in 181 5, 5 but not pub- lished in full for more than five years later (Journal de physique . . . et des arts, xcii. 185-215), though an abstract forming part of a Prodrome d'une nouvelle distribution du r'egne animal appeared earlier (op. tit. lxxxiii. 252, 253, 258, 250; and Bull. soc. philomath, de Paris, 1816, p. no). This is a very disappointing performance, since the author observes that, notwithstanding his new classification of birds is based on a study of the form of the sternal apparatus, yet, because that lies wholly within the body, he is compelled to have recourse to such outward characters as are afforded by the

1 From carina, a keel.

2 From rates, a raft or flat-bottomed barge.

3 " Beschreibung des Gerippes eines Casuars nebst einigen beilau- figen Bemerkungpn iiber die flachbriistigen Vogel," Abhandl. der Berlin. Akademie, Phys. Klasse (1817), pp. 179-198, tabb. i.-iii.

4 Merrem, as did many others in his time, calls the coracoids " claviculae " ; but it is now well understood that in birds the real claviculae form the furcula or " merry-thought."

6 Not 1812, as has sometimes been stated.

proportion of the limbs and the disposition of the toes — even as had been the practice of most ornithologists before him! It is evident that the features of the sternum of which De Blainville chiefly relied were those drawn from its posterior margin, which no very extensive experience of specimens is needed to show are of comparatively slight value; for the number of ” echancrures ” — notches as they have sometimes been called in English — when they exist, goes but a very short way as a guide, and is so variable in some very natural groups as to be even in that short way occasionally misleading. 6 There is no appearance of his having at all taken into consideration the far more trustworthy characters furnished by the anterior part of the sternum, as well as by the coracoids and the furcula. Still De Blainville made some advance in a right direction, as for instance by elevating the parrots 7 and the pigeons as ” Ordres,” equal in rank to that of the birds of prey and some others. According to the testimony of L’Herminier (for whom see later) he divided the ” Passer eaux ” into two sections, the “faux ” and the ” vrais “; but, while the latter were very correctly defined, the former were most arbitrarily separated from the ” Grimpeurs.” He also split his Grallatores and Natatores (practically identical with the Grallae and Anseres of Linnaeus) each into four sections; but he failed to see — as on his own principles he ought to have seen — that each of these sections was at least equivalent to almost any one of his other ” Ordres.” He had, however, the courage to act up to his own professions in collocating the rollers (Coracias) with the bee- eaters (Merops), and had the sagacity to surmise that Menura was not a Gallinaceous bird. The greatest benefit conferred by this memoir is probably that it stimulated the efforts, presently to be mentioned, of one of his pupils, and that it brought more distinctly into sight that other factor, originally discovered by Merrem, of which it now clearly became the duty of systematizers to take cognizance.

Following the chronological order we are here adopting, we next have to recur to the labours of Nitzsch, who, in 1820, in a treatise on the nasal glands of birds — a subject that had already attracted the attention of Jacobson (Nouv. Bull. soc. philomath, de. Paris, iii. 267-269) — first put forth in Meckel’s Deutsches Archiv fur die Physiologic (vi. 251- 269) a statement of his general views on ornithological classifica- tion which were based on a comparative examination of those bodies in various forms. It seems unnecessary here to occupy space by giving an abstract of his plan, 8 which hardly includes any but European species, because it was subsequently elaborated with no inconsiderable modifications in a way that must presently be mentioned at greater length. But the scheme, crude as it

was, possesses some interest. It is not only a key to much of his later work — to nearly all indeed that was published in his life- time — but in it are founded several definite groups (for example, Passerinae and Picariae) that subsequent experience has shown to be more or less natural; and it further serves as additional evidence of the breadth of his views, and his trust in the teachings of anatomy.

That Nitzsch took this extended view is abundantly proved by the valuable series of ornithotomical observations which he must have been for some time accumulating, and almost immedi- ately afterwards began to contribute to the younger Naumann's excellent Naturgeschichte der Vogel Deutschlands, already noticed above. Besides a concise general treatise on the organization of birds to be found in the Introduction to this work (i. 23-52), a brief description from Nitzsch's pen of the peculiarities of the internal structure of nearly every genus is incorporated with the author's prefatory remarks, as each passed under consideration,

6 Cf. Philos. Transactions (1869), p. 337, note.

7 This view of them had been long before taken by Willughby, but abandoned by all later authors.

8 This plan, having been repeated by Schopss in 1829 (op. tit. xii. p. 73), became known to Sir R. Owen in 1835, who then drew to it the attention of Kirby (Seventh Bridgewater Treatise, ii. pp. 444, 445). and in the next year referred to it in his own article " Aves " in Todd's Cyclopaedia of Anatomy (i. p. 266), so that Englishmen need no excuse for not being aware of one of Nitzsch's labours, though his more advanced ˆ rk of 1829, presently to be mentioned, was not referred to by Sir R. Owen.

and these descriptions being almost without exception so drawn up as to be comparative are accordingly of great utility to the student of classification, though they have been so greatly neglected. Upon these descriptions he was still engaged till death, in 1837, put an end to his labours, when his place as Naumann's assistant for the remainder of the work was taken by Rudolph Wagner; but, from time to time, a few

more, which he had already completed, made their posthumous appearance in it, and, in subsequent years, some selections from his unpub- lished papers were through the care of Giebel presented to the public. Throughout the whole of this series the same marvellous industry and scrupulous accuracy are manifested, and attentive study of it will show how many times Nitzsch anticipated the conclusions of modern taxonomers. Yet over and over again his determination of the affinities of several groups even of European birds was disregarded; and his labours, being con- tained in a bulky and costly work, were hardly known at all outside of his own country, and within it by no means appreciated so much as they deserved 1 — for even Naumann himself, who gave them publication, and was doubtless in some degree influenced by them, utterly failed to perceive the importance of the characters offered by the song-muscles of certain groups, though their peculiarities were all duly described and recorded by his coadjutor, as some indeed had been long before by Cuvier in his famous dissertation 2 on the organs of voice in birds (Lemons d'anatomie comparie, iv. 450-491). Nitzsch's name was subsequently dismissed by Cuvier without a word of praise, and in terms which would have been applicable to many another and inferior author, while Temminck, terming Naumann's work an " ouvrage de luxe " — it being in truth one of the cheapest for its contents ever published — effectually shut it out from the realms of science. In Britain it seems to have been positively unknown until quoted some years after its completion by a catalogue- compiler on account of some peculiarities of nomenclature which it presented.

Now we must return to France, where, in 1827, L'Herminier, a Creole of Guadaloupe and a pupil of De Blainville's, contributed , to the Actes of the Linnaean Society of Paris for

mlaler. tnat vear (y i- 3 _ 93) the " Recherches sur l'appareil sternal des Oiseaux," which the precept and example of his master had prompted him to undertake, and Cuvier had found for him the means of executing. A second and considerably enlarged edition of this very remarkable treatise was published as a separate work in the following year. We have already seen that De Blainville, though fully persuaded of the great value of sternal features as a method of classification, had been compelled to fall back upon the old pedal characters so often employed before; but now the scholar had learnt to excel his teacher, and not only to form an at least provisional arrangement of the various members of the Class, based on sternal characters, but to describe these characters at some length, and so give a reason for the faith that was in him. There is no evidence, so far as we can see, of his having been aware of Merrem's views; but like that anatomist he

without hesitation divided the class into two great ” coupes,” to which he gave, however, no other names than ” Oiseaux normaux ” and ” Oiseaux anomaux ” — exactly corresponding with his predecessor’s Carinatae and Ratitae — and, moreover, he had a great advantage in founding these groups, since he had discovered, apparently from his own investigations, that the mode of ossification in each was distinct; for hitherto the statement of there being five centres of ossification in every bird’s sternum seems to have been accepted as a general truth, without contradiction, whereas in the ostrich and the rhea, at any rate, L’Herminier found that there were but two such primitive points, 3 and from analogy

1 Their value was, however, understood by Gloger, who in 1834, as will presently be seen, expressed his regret at not being able to use them.

2 Cuvier’s first observations on the subject seem to have appeared in the Magazin encyclopedique for 1795 (ii. pp. 330, 358).

3 This fact in the ostrich appears to have been known already to Geoffroy St-Hilaire from his own observation in Egypt, but does not seem to have been published by him.

he judged that the same would be the case with the casso- wary and the emeu, which, with the two forms mentioned above, made up the whole of the ” Oiseaux anomaux ” whose existence was then generally acknowledged. 4 These are the forms which composed the family previously termed Cursores by De Blainville; but L’Herminier was able to distinguish no fewer than thirty-four families of ” Oiseaux normaux,” and the judgment with which their separation and definition were effected must be deemed on the whole to be most creditable to him. It is to be remarked, however, that the wealth of the Paris Museum, which he enjoyed to the full, placed him in a situation incompar- ably more favourable for arriving at results than that which was occupied by Merrem, to whom many of the most remarkable forms were wholly unknown, while L’Herminier had at his disposal examples of nearly every type then known to exist. But the latter used this privilege wisely and well — not, after the manner of De Blainville and others subsequent to him, relying solely or even chiefly on the character afforded by the posterior portion of the sternum, but taking also into considera- tion those of the anterior, as well as of the in some cases still more important characters presented by the pre-sternal bones, such as the furcula, coracoids and scapulae. L’Herminier thus separated the families of ” Normal Birds “: —

9- 10. 11.

12. 13-

14. 15-

16.

17-

” Accipitres ” — Accipitres,

Linn. ” Serpentaires “— Gypogera-

nus, Illiger. ” Chouettes ” — -Strix, Linn. “Touracos” — Opaetus,

Vieillot. ” Perroquets ” — Psittacus,

Linn. ” Colibris ” — Trochilus, Linn. ” Martinets ” — Cypselus, Illiger. ” Engoulevents ” — Capri-

mulgus, Linn. ” Coucous ” — Cuculus, Linn. “Couroucous” — Trogon,hinn. ” Rolliers ” — Galgulus, Bris-

son. ” Gufipiers ” — Merops, Linn. ‘ ‘ Martins-Pficheurs’ ‘ — Alcedo,

Linn. ” Calaos ” — Buceros, Linn. ” Toucans ” — ■ Ramphastos,

Linn. ” Pies ” — Pious, Linn. ” Epopsides ” — Epopsides,

Vieillot.

18.

19- 20. 21.

22.

23-

24.

25-

26.

27-

28. 29.

3°-

31-

32-

33-

34-

” Passereaux ” — Passeres,

Linn. ” Pigeons ” — Columba, Linn. ” Gallinaces ” — Gallinacea. ” Tinamous ” — Tinamus,.

Latham. ” Foulques ou Poules d’eau ”

— Fulica, Linn. ” Grues ” — Grus, Pallas. ” Herodions ” — Herodii, Illi- ger. No name given, but said to

include ” les ibis et les

spatules.” ” Gralles ou Hchassiers ” —

Grallae. ” Mouettes ” — Larus, Linn. ” Petrels” — Procellaria, Linn. ” Pelicans ” — Pelecanus , Linn. ” Canards ” — Anas, Linn. “Grebes ” — Podiceps,

Latham. ” Plongeons ” — Colymbus,

Latham. ” Pingouins ” — Aha, Latham. ” Manchots ” — • Aptenodytes,

Forster.

The preceding list is given to show the very marked agreement of L’Herminier’s results compared with those obtained fifty years later by another investigator, who approached the subject from an entirely different, though still osteological, basis. Many of the excellencies of L’Herminier’s method could not be pointed out without too great a sacrifice of space, because of the details into which it would be necessary to enter; but the trenchant way in which he showed that the ” Passereaux ” — a group of which Cuvier had said, ” Son caractere semble d’abord purement negatif,” and had then failed to define the limits — differed so completely from every other assemblage, while maintaining among its own innumerable members an almost perfect

essential homogeneity, is very striking, and shows how admirably he could grasp his subject. Not less conspicuous are his merits in disposing of the groups of what are ordinarily known as water-birds, his indicating the affinity of the rails (No. 22) to the cranes (No. 23), and the severing of the latter from the herons (No. 24). His union of the snipes, sandpipers and plovers into one group (No. 26) and the alliance, especially dwelt upon, of that group with the gulls (No. 27) are steps which, though indicated by Merrem, are here for the first time clearly laid down; and the separation of the gulls from the petrels (No. 28) — step in advance already taken, it is true, by Illiger — is here placed on indefeasible ground. With all this, perhaps on account of all this, L'Herminier's efforts did not

4 Considerable doubts were at that time entertained in Paris as to the existence of the Apteryx.

find favour with his scientific superiors, and for the time things remained as though his investigations had never been carried on. Two years later Nitzsch, who was indefatigable in his endeavour to discover the natural families of birds and had been pursuing a series of researches into their vascular system, ˆupiag. published the result, at Halle in Saxony, in his Observa- tiones de avium arteria carotide communi, in which is included a classification drawn up in accordance with the variation of structure which that important vessel, presented in the several groups that he had opportunities of examining. By this time he had visited several of the principal museums on the Continent, among others Leyden (where Temminck resided) and Paris (where he had frequent intercourse with Cuvier), thus becoming acquainted with a considerable number of exotic forms that had hitherto been inaccessible to him. Con- sequently his labours had attained to a certain degree of complete- ness in this direction, and it may therefore be expedient here to name the different groups which he thus thought himself entitled to consider established. They are as follows: — ■ I. Aves Carinatae [L'H. " Oiseaux nofmaux "]. A. Aves Carinatae aereae. I. Accipitrinae [L'H. I, 2 partim, 3]; 2. Passerinae [L'H. 18]; 3. Macrochires [L'H. 6, 7]; 4. Cuculinae [L'H. 8, 9, 10 (qu. II, 12?)]; 5. Picinae [L'H. 15, 16]; 6. Psiitacinae [L'H. 5]; 7. Lipoglossae [L'H. 13, 14, 17]; 8. Amphibolae [L'H. 4].

B. Aves Carinatae terrestres. 1. Columbinae [L'H. 19]; 2. Gallinaceae [L'H. 20].

C. Aves Carinatae aquaticae.

Grallae. I. Alectorid.es (=Dicholophus+Otis) [L'H. 2 partim, 26 partim]; 2. Gruinae [L'H. 23]; 3. Fulicariae [L'H. 22]; 4. Herodiae [L'H. 24 partim]; 5. Pelargi [L'H. 24 partim, 25]; 6. Odonto- glossi (= Phoenicopterus) [L'H. 26 partim]; 7, Limicolae [L'H. 26 paene omnes].

Palmatae. 8. Longipennes [L'H. 27]; 9. Nasutae [L'H. 28]; io. Unguirostres [L'H. 30]; 11. Steganopodes [L'H. 29]; 12. Pygopodes [L'H. 31. 32, 33. 34l-

II. Aves Ratitae [L'H. " Oiseaux anomaux "].

To enable the reader to compare the several groups of Nitzsch with the families of L'Herminier, the numbers applied by the latter to his families are suffixed in .square brackets to the names of the former; and, disregarding the order of sequence, which is here immaterial, the essential correspondence of the two systems is worthy of all attention, for it obviously means that these two investigators, starting from different points, must have been on the right track, when they so often coincided as to the limits of what they considered to be, and what we are now almost justified in calling, natural groups. 1 But it must be observed that the classification of Nitzsch, just given, rests much more on characters furnished by the general structure than on those furnished by the carotid artery only. Among all the species (188, he tells us, in number) of which he examined specimens, he found only jour variations in the structure of that vessel, namely: —

1. That in which both a right carotid artery and a left are present. This is the most usual fashion among the various groups of birds, including all the " aerial " forms excepting Passerinae, Macrochires and Picinae.

2. That in which there is but a single carotid artery, springing from both right and left trunk, but the branches soon coalescing, to take a midway course, and again dividing near the head. This form Nitzsch was only able to find in the bittern (Ardea stellaris).

1 Whether Nitzsch was cognizant of L'Herminier's views is in no way apparent. The latter's name seems not to be even mentioned by him, but Nitzsch was in Paris in the summer of 1827, and it is almost impossible that he should not have heard of L'Herminier's labours, unless the relations between the followers of Cuvier to whom Nitzsch attached himself, and those of De Blainville, whose pupil L'Herminier was, were such as to forbid any communication between the rival schools. Yet we have L'Herminier's evidence that Cuvier gave him every assistance. Nitzsch's silence, both on this occasion and afterwards, is very curious; but he cannot be accused of plagiarism, for the scheme given above is onlv an amplification of that foreshadowed by him (as already mentioned) in 1820 — a scheme which seems to have been equally unknown to L'Herminier, perhaps through linguistic difficulty.

3. That in which the right carotid artery alone is present, of which, according to our author's experience, the flamingo {Phoenicopterus) was the sole example.

4. That in which the left carotid artery alone exists, as found in all

other birds examined by Nitzsch, and therefore as regards species and individuals much the most common — since into this category come the countless thousands of the passerine birds — a group which outnumbers all the rest put together.

Considering the enormous stride in advance made by L'Herminier, it is very disappointing for the historian to have to record that the next inquirer into the osteology of birds achieved a Berthold. disastrous failure in his attempt to throw light on their arrangement by means of a comparison of their sternum. This was Berthold, who devoted a long chapter of his Beitrdge zur Ana- tomie, published at Gottingen in 1831, to a consideration of the subject. So far as his introductory chapter went — the development of the sternum — he was, for his time, right enough and somewhat instructive. It was only when, after a close examination of the sternal apparatus of one hundred and thirty species, which he carefully described, that he arrived (pp. 177-183) at the conclusion — astonishing to us who know of L'Herminier's previous results — that the sternum of birds cannot be used as a help to their classification on account of the egregious anomalies that would follow the pro- ceeding — such anomalies, for instance, as the separation of Cypselus from Hirundo and its alliance with Trochilus, and the grouping of Hirundo and Fringilla together.

At the very beginning of the year 1832 Cuvier laid before the Academy of Sciences of Paris a memoir on the progress of ossifi- cation in the sternum of birds, of which memoir an abstract will be found in the Annates des sciences aod naturelles (xxv. pp. 260-272). Herein he traced in Qeottroy. detail, illustrating his statements by the preparations he exhibited, the progress of ossification in the sternum of the fowl and of the duck, pointing out how it differed in each, and giving his interpretation of the differences. It had hitherto been generally believed that the mode of ossification in the fowl was that which obtained in all birds — the ostrich and its allies (as L'Herminier, we have seen, had already shown) excepted. But it was now made to appear that the struthious birds in this respect resembled, not only the duck, but a great many other groups — waders, birds-of-prey, pigeons, passerines and perhaps all birds not gallinaceous — so that, according to Cuvier's view, the five points of ossification observed in the Gallinae, instead of exhibiting the normal process, exhibited one quite exceptional, and that in all other birds, so far as he had been enabled to investigate the matter, ossification of the sternum began at two points only, situated near the anterior upper margin of the side of the sternum, and gradually crept towards the keel, into which it presently extended; and, though he allowed the appearance of detached portions of calcareous matter at the base of

the still cartilaginous keel in ducks at a certain age, he seemed to consider this an individual peculiarity. This fact was fastened upon by Geoffroy in his reply, which was a week later presented to the Academy, but was not published in full until the following year, when it appeared in the Annates du Museum (ser. 3, ii. pp. 1-22). Geoffroy here maintained that the five centres of ossification existed in the duck just as in the fowl, and that the real difference of the process lay in the period at which they made their appear- ance, a circumstance which, though virtually proved by the preparations Cuvier had used, had been by him overlooked or misinterpreted. The fowl possesses all five ossifications at birth, and for a long while the middle piece forming the keel is by far the largest. They all grow slowly, and it is not until the animal is about six months old that they are united into one firm bone. The duck, on the other hand, when newly hatched, and for nearly a month after, has the sternum wholly cartilaginous. Then, it is true, two lateral points of ossification appear at the margin, but subsequently the remaining three are developed, and when once formed they grow with much greater rapidity than in the fowl, so that by the time the young duck is quite independent of its parents, and can shift for itself, the whole sternum is com- pletely bony. Nor, argued Geoffroy, was it true to say, as Cuvier had said, that the like occurred in the pigeons and true passerines. In their case the sternum begins to ossify from three very distinct points — one of which is the centre of ossification of

the keel. As regards the struthious birds, they could not be likened to the duck, for in them at no age was there any indica- tion of a single median centre of ossification, as Geoffroy had satisfied himself by his own observations made in Egypt many years before. Cuvier seems to have acquiesced in the corrections of his views made by Geoffroy, and attempted no rejoinder; but the attentive and impartial student of the discussion will see that a good deal was really wanting to make the latter's reply effective, though, as events have shown, the former was hasty in the con- clusions at which he arrived, having trusted too much to the first appearance of centres of ossification, for, had his observa- tions in regard to other birds been carried on with the same attention to detail as in regard' to the fowl, he would certainly have reached some very different results.

In 1834 C. W. L. Gloger brought out at Breslau the first (and unfortunately the only) part of a Vollstdndiges Handbuch der Natur-Cl er geschichte der Vogel Europa's, treating of the land-birds.

° s ' In the Introduction to this book (p. xxxviii., note) he expressed his regret at not being able to use as fully as he could wish the excellent researches of Nitzsch which were then appearing (as has been above said) in the successive parts of Naumann's great work. Notwithstanding this, to Gloger seems to belong the credit of being the first author to avail himself in a book intended for practical ornithologists of the new light that had already been shed on Systematic Ornithology; and accordingly we have the second order of his arrangement, the Aves Passennae, divided into two suborders: singing passerines (melodusae) , and passerines without an apparatus of song-muscles (anomalae)— the latter including what some later writers called Picariae. For the rest his classification demands no particular remark; but that in a work of this kind he had the courage to recognize, for instance, such a fact as the essential difference between swallows and swifts lifts him considerably above the crowd of other ornithological writers of his time.

An improvement on the old method of classification by purely external characters was introduced to the Academy of Sciences of Stockholm byC. J. Sundevall in 1835, and was published Sundevall. the following year in its Handlingar (pp. 43-130). This was the foundation of a more extensive work of which, from the influence it still exerts, it will be necessary to treat later at some length, and there will be no need now to enter much into details respecting the earlier performance. It is sufficient here to remark that the author, even then a man of great erudition, must have been aware of the turn which taxonomy was taking; but, not being able to divest himself of the older notion that external characters were superior to those furnished by the study of internal structure, and that Comparative Anatomy, instead of being a part of zoology, was something distinct from it, he seems to have endeavoured to form a scheme which, while not running wholly counter to the teachings of Comparative Anatomists, should yet rest ostensibly on external characters. With this view he studied the latter most laboriously, and in some measure certainly not without success, for he brought into prominence several points that had hitherto escaped the notice of his predecessors. He also ad- mitted among his characteristics a physiological consideration (apparently derived from Oken l) dividing the class Aves into two sections Altrices and Praecoces, according as the young were fed by their parents or, from the first, fed themselves. But at this time he was encumbered with the hazy doctrine of analogies, which, if it did not act to his detriment,

was assuredly of no service to him. He prefixed an ” Idea Systematis ” to his ” Exp’ositio “; and the former, which appears to represent his real opinion, differs in arrange- ment very considerably from the latter. Like Gloger, Sundevall in his ideal system separated the true passerines from all other birds, calling them Volucres; but he took a step further, for he assigned to them the highest rank, wherein nearly every recent authority agrees with him; out of them, however, he chose the thrushes and warblers to stand first as his ideal ” Centrum ” — a selection which, though in the opinion of the present writer erroneous, is still largely followed.

The points at issue between Cuvier and Etienne Geoffroy St-Hilaire before mentioned naturally attracted the attention L’Her- °^ L’Herminier, who in 1836 presented to the French minier and Academy the results of his researches into the mode Isidore of growth of that bone which in the adult bird he had Geoffroy already studied to such good purpose. Unfortunately re * the full account of his diligent investigations was never published. We can best judge of his labours from an abstract reprinted in the Comptes rendus (iii. pp. 12-20) and reprinted in the Annates des sciences naturelles (ser. 2, vol. vi. pp. 107-115), and from the report upon them by Isidore Geoffroy

1 He says from Oken’s Naturgeschichte fur Schulen, published in 1 82 1, but the division is to be found in that author’s earlier Lehrbuch ier Zoologie (ii. p. 371), which appeared in 1816.

St-Hilaire, to whom with others they weie referred. This report is contained in the Comptes rendus for the following year (iv. pp. 5 5-574)) an(i is v ery critical in its character.

L’Herminier arrived at the conclusion that, so far from there being only two or three different modes by which the process of ossification in the sternum is carried out, the number of different modes is very considerable — almost each natural group of birds having its own. _ The principal theory which he hence conceived himself justified in propounding was that instead of five being (as had been stated) the maximum number of centres of ossification in the sternum, there are no fewer than nine entering into the com- position of the perfect sternum of birds in general, though in every species some of these nine are wanting, whatever be the condition of development at the time of examination. These nine theoretical centres or ” pieces ” L’Herminier deemed to be disposed in three transverse series (rangees), namely the anterior or ” prosternal,” the middle or ” mesosternal ” and the posterior or ” metasternal ” —each series

consisting of three portions, one median piece and two side-pieces. At the same time he seems, according to the abstract of his memoir, to have made the somewhat contradictory assertion that sometimes there are more than three pieces in each series, and in certain groups of birds as many as six. 2 It would occupy more space than can here be allowed to give even the briefest abstract of the numerous observations which follow the statement of his theory and on which it professedly rests. They extend to more than a score of natural groups of birds, and nearly each of them presents some peculiar characters. Thus of the first series of pieces he says that when all exist they may be developed simultaneously, or that the two side-pieces may precede the median, or again that the median may precede the side-pieces — according to the group of birds, but that the second mode is much the commonest. The same variations are observable in the second or middle series, but its side-pieces are said to exist in all groups of birds without exception. As to the third or posterior series, when it is complete the three constituent pieces are developed almost simultaneously; but its median piece is said often to originate in two, which soon unite, especially when the side-pieces are wanting. By way of examples of L'Herminier's observations, what he says of the two groups that had been the subject of Cuvier's and the elder Geoffroy's contest may be mentioned. In the Gallinae the five well-known pieces or centres of ossification are said to consist of the two side-pieces of the second or middle series, and the three of the posterior. On two occasions, however, there was found in addition, what may be taken for a representation of the first series, a little " noyau " situated between the coracoids — forming the only instance of all three series being present in the same bird. As regards the ducks, L'Herminier agreed with Cuvier that there are commonly only two centres of ossification — the side-pieces of the middle- series ; but as these grow to meet one another a distinct median " noyau," also of the same series, sometimes appears, which soon forms a connexion with each of them. In the ostrich and its allies no trace of this median centre of ossification ever occurs; but with these exceptions its existence is invariable in all other birds. Here the matter must be left; but it is undoubtedly a subject which demands further investigation, and naturally any future investigator of it should consult the abstract of L'Herminier's memoir and the criticisms upon it of the younger Geoffroy.

Hitherto our attention has been given wholly to Germany and France, for the chief ornithologists of Britain were occupying themselves at this time in a very useless way — not but that there were several distinguished men who were Maczim- paying due heed at this time to

the internal structure *’

of birds, and some excellent descriptive memoirs on special forms had appeared from their pens, to say nothing of more than one general treatise on ornithic anatomy. 3 Yet no one in Britain

2 We shall perhaps be justified in assuming that this apparent inconsistency, and others which present themselves, would be explicable if the whole memoir with the necessary illustrations had been published.

3 Sir Richard Owen’s celebrated article ” Aves,” in Todd’s Cyclopaedia of Anatomy and Physiology (i. pp. 265-358), appeared in 1836, and, as giving a general view of the structure of birds, needs no praise here ; but its object was not to establish a classification, or throw light especially on systematic arrangement. So far from that being the case, its distinguished author was content to adopt, as he tells- us, the arrangement proposed by Kirby in the Seventh Bridgwater Treatise (ii. pp. 445-474), being that, it is true, of an estimable zoologist, but of one who had no special knowledge of ornithology. Indeed it is, as the latter says, that of Linnaeus, improved by Cuvier, with an additional modification of Illiger’s — all these three authors having totally ignored any but external characters. Yet it was regarded ” as being the one which facilitates the expression of the leading anatomical differences which obtain in the class of birds, and which therefore may be considered as the most natural.”

seems to have attempted to found any scientific arrangement of birds on other than external characters until, in 1837, William Macgillivray issued the first volume of his History of British Birds, wherein, though professing (p. 19) ” not to add a new system to the many already in partial use, or that have passed away like their authors,” he propounded (pp. 16-18) a scheme for classifying the birds of Europe at least founded on a ” considera- tion of the digestive organs, which merit special attention, on account, not so much of their great importance in the economy of birds, as the nervous, vascular and other systems are not behind them” in this respect; but because, exhibiting great diversity of form and structure, in accordance with the nature of the food, they are more obviously qualified to afford a

basis for the classification of the numerous species of birds ” (p. 52). Fuller knowledge has shown that Macgillivray was ill-advised in laying stress on the systematic value of adaptive characters, but his contributions to anatomy were valuable, and later investi- gators, in particular H. Gadow and P. Chalmers Mitchell, have shown that useful systematic information can be obtained from the study of the alimentary canal. Macgillivray himself it was, apparently, who first detected the essential difference of the organs of voice presented by some of the New- World Passerines (subsequently known as Clamatores) , and the earliest intimation of this seems to be given in his anatomical description of the Arkansas Flycatcher, Tyrannus verticalis, which was published in 1838 (Ornithol. Biography, iv. p. 425), though it must be admitted that he did not — because he then could not — perceive the bearing of their difference, which was reserved to be shown by the investigation of a still greater anatomist, and of one who had fuller facilities for research, and thereby almost revolutionized, as will presently be mentioned, the views of systematists as to this order of birds. There is only space here to say that the second volume of Macgillivray’s work was published in 1839, and the third in 1840; but it was not until 1852 that the author, in broken health, found an opportunity of issuing the fourth and fifth. His scheme of classification, being as before stated partial, need not be given in detail. Its great merit is that it proved the necessity of combining another and hitherto much-neglected factor in any natural arrangement, though vitiated as so many other schemes have been by being based wholly on one class of characters.

But a bolder attempt at classification was that made in 1838 by Blyth in the New Series (Charlesworth’s) of the Magazine of Natural History (ii. pp. 256-268, 314-319, 351-361, 420-426, 589-601; iii. pp. 76-84). It was limited, however, to what he called Insessores, being the group upon which that name had been conferred by Vigors {Trans. Linn. Society, xiv. p. 405) in 1823, with the addition, however, of his Raptores, and it will be unnecessary to enter into particulars concerning it, though it is as equally remarkable for the insight shown by the author into the structure of birds as for the philo- sophical breadth of his view, which comprehends almost every kind of character that had been at that time brought forward. It is plain that Blyth saw, and perhaps he was the first to see it, that geographical distribution was not unimportant in suggesting the affinities and differences of natural groups (pp. 258, 259); and, undeterred by the precepts and practice of the hitherto dominant English school of Ornithologists, he declared that ” anatomy, when aided by every character which the manner of propagation, the progressive changes,

and other physiological data supply, is the only sure basis of classification." He was quite aware of the taxonomic value of the vocal organs of some groups of birds, presently to be especially mentioned, and he had himself ascertained the presence and absence of caeca in a not inconsiderable number of groups, drawing thence very justifiable inferences. He knew at least the earlier investigations of L'Herminier, and, though the work of Nitzsch, even if he had ever heard of it, must (through ignorance of the language in which it was written) have been to him a sealed book, he had followed out and extended the hints already given by Temminck as to the differences which various groups of birds display in their moult. With all this it is not surprising to find, though the fact has

Blyth.

Bartlett.

been generally overlooked, that Blyth's proposed arrangement in many points anticipated conclusions that were subsequently reached, and were then regarded as fresh discoveries. It is proper to add that at this time the greater part of his work was carried on in conjunction with A. Bartlett, the superin- tendent of the London Zoological Society's Gardens, and that, without his assistance, Blyth's opportunities, slender as they were compared with those which others have enjoyed, must have been still smaller. Considering the extent of their materials, which was limited to the bodies of such animals as they could obtain from dealers and the several menageries that then existed in or near London, the progress made in what has since proved to be the right direction is very wonderful. It is obvious that both these investigators had the genius far recognizing and interpreting the value of characters; but their labours do not seem to have met with much encouragement; and a general arrangement of the class laid by Blyth before the Zoological Society at this time l does not appear in its publications. The scheme could hardly fail to be a crude performance — a fact which nobody would know better than its author; but it must have presented much that was objectionable to the opinions then generally prevalent. Its line to some extent may be partly made out — very clearly, for the matter of that, so far as its details have been published in the series of papers to which reference has been given — and some traces of its features are probably preserved in his Catalogue of the specimens of birds in the museum of the Asiatic Society of Bengal, which, after several years of severe labour, made its appearance at Calcutta in 1849; but, from the time of his arrival in India, the onerous duties imposed upon Blyth, together with the want of sufficient books of reference, seem to have hindered him from

seriously continuing his former researches, which, interrupted as they were, and born out of due time, had no appreciable effect on the views of systematisers generally.

Next must be noticed a series of short treatises communicated by Johann Friedrich Brandt, between the years 1836 and 1839, to the Academy of Sciences of St Petersburg, and published „ in its Memoires. In the year last mentioned the greater Braaat. part of these was separately issued under the title of Beitrdge zur Kenntniss der Naturgeschichte der Vogel. Herein the author first assigned anatomical reasons for rearranging the order Anseres of Linnaeus and Natatores of Illiger, who, so long before as 181 1, had proposed a new distribution of it into six families, the definitions of which, as was his wont, he had drawn from external characters only. Brandt now retained very nearly the same arrangement as his predecessor; but, notwithstanding that he could trust to the firmer foundation of internal framework, he took at least two retro- grade steps. First he failed to see the great structural difference between the penguins (which Illiger had placed as a group, Impennes, of equal rank to his other families) and the auks, divers and grebes, Pygopodes — combining all of them to form a ” Typus ” (to use his term) Urinatores; and secondly he admitted among the Natatores, though as a distinct ” Typus ” Podoidae, the genera Podoa and Fulica, which are now known to belong to the Rallidae — the latter indeed (see Coot) being but very slightly removed from the moor- hen (q.v.). At the same time he corrected the error made by Illiger in associating the Phalaropes with these forms, rightly declaring their relationship to Tringa (see Sandpiper), a point of order which other systematists were long in admitting. On the whole Brandt’s labours were of no small service in asserting the principle that con- sideration must be paid to osteology; for his position was such as to gain more attention to his views than some of his less favourably placed brethren had succeeded in doing.

In the same year (1839) another slight advance was made in the classification of the true Passerines. Keyserling and Blasius briefly pointed out in the Archiv fur Naturgeschichte (v. pp. 332- 334) that, while all the other birds provided with perfect Ke y Me ““X song- muscles had the ” planta ” or hind part of the *” ” tarsus ” covered with two long and undivided horny Blaslus – plates, the larks (q.v.) had this part divided by many transverse sutures, so as to be scutellated behind as well as in front; just as is the case in many of the passerines which have not the singing- apparatus, and also in the hoopoe (q.v.). The importance of this singular but superficial departure from the normal structure has been so needlessly exaggerated as a character that at the present time its value is apt to

be unduly depreciated. In so large and so homogeneous a group as that of the true Passerines, a constant

1 An abstract is contained in the Minute-book of the Scientific Meetings of the Zoological Society, 26th June and 10th July 1838. The class was to contain fifteen orders, but only three were dealt with in any detail.

Nitzsch.

character of this kind is not to be despised as a practical mode of separating the birds which possess it; and, more than this, it would appear that the discovery thus announced was the immediate means of leading to a series of investigations of a much more important and lasting nature — those of Johannes Miiller to be presently mentioned.

Again we must recur to that indefatigable and most original investigator Nitzsch, who, having never intermitted his study of

the particular subject of his first contribution to

science, long ago noticed, in 1833 brought out at Halle, where he was professor of Zoology, an essay with the title Pterylographiae Avium Pars prior. It seems that this was issued as much with the object of inviting assistance from others in view of future labours, since the materials at his disposal were comparatively scanty, as with that of making known the results to which his researches had already led him. Indeed, he only communicated copies of this essay to a few friends, and examples of it are comparatively scarce. Moreover, he stated subsequently that he thereby hoped to excite other naturalists to share with him the investigations he was making on a subject which had hitherto escaped notice or had been wholly neglected, since he considered that he had proved the disposition of the feathered tracts in the plumage of birds to be the means of furnishing characters for the discrimination of the various natural groups as significant and important as they were new and unexpected. There was no need for us here to quote this essay in its chronological place, since it dealt only with the generalities of the subject, and did not enter upon any systematic details. These the author reserved for a second treatise which he was destined never to complete. He kept on

diligently collecting materials, and as he did so was con- strained to modify some of the statements he had published. He consequently fell into a state of doubt, and before he could make up his mind on some questions which he deemed important he was overtaken by death. 1 Then his papers were handed over

to his friend and successor Professor Burmeister, now mei'ster. an d f° r many years past of Buenos Aires, who, with

much skill, elaborated from them the excellent work known as Nitzsch's Pterylographie, which was published at Halle in 1840, and translated into English for the Ray Society in 1867. There can be no doubt that Professor Burmeister discharged his editorial duty with the most conscientious scrupulosity; but, from what has been just said, it is certain that there were im- portant points on which Nitzsch was as yet undecided — some of them perhaps of which no trace appeared in his manuscripts, and therefore as in every case of works posthumously published, unless (as rarely happens) they have received their author's " imprimatur," they cannot be implicitly trusted as the expression of his final views. It would consequently be unsafe to ascribe positively all that appears in this volume to the result of Nitzsch's mature consideration. Moreover, as Professor Burmeister states in his preface, Nitzsch by no means regarded the natural sequence of groups as the highest problem of the systematist, but rather their correct limitation. Again, the arrangement followed in the Pterylographie was of course based on pterylo- graphical considerations, and we have its author's own word for it that he was persuaded that the limitation of natural groups could only be attained by the most assiduous research into the species of which they are composed from every point of view. The combination of these three facts will of itself explain some defects, or even retrogressions, observable in Nitzsch's later systematic work when compared with that which he had formerly done. On the other hand, some manifest improvements are introduced, and the abundance of details into which he enters in his Pterylographie render it far more instructive and valuable than the older performance. As an abstract of that has already been given, it may be sufficient here to point out the chief changes made in his newer arrangement. To begin with, 1 Though not relating exactly to our present theme, it would be improper to dismiss Nitzsch's name without reference to his extra- ordinary labours in investigating the insect and other external parasites of birds, a subject which as regards British species was subsequently elaborated by Denny in his Monographia Anoplurorum Britanniac (1842) and in his list of the specimens of British Anoplura in the collection of the British Museum.

the three great sections of aerial, terrestrial, and aquatic birds are abolished. The ” Accipitres ” are divided into two groups, Diurnal and Nocturnal; but the first of these divisions is separated into three sections: (1) the Vultures of the New World, (2) those of the Old World, and (3) the genus Falco of Linnaeus. The ” Passerinae,” that is to say, the true Passeres, are split into eight families, not wholly with judgment, 2 but of their taxonomy more is to be said presently. Then a new order ” Picariae ” is instituted for the reception of the Macrochires, Cuculinae, Picinae Psittacinae and Amphibolae of his old arrangement, to which are added three 3 others — Caprimulginae, Todidae and Lipoglossae — the last consisting of the genera Buceros, Upupa and Alcedo. The association of Alcedo with the other two is no doubt a misplacement, but the alliance of Buceros to Upupa, already sug- gested by Gould and Blyth in 1838 4 {Mag. Nat. History, ser. 2, ii. pp. 422 and 589), though apparently unnatural, has been corro- borated by many later systematisers; and taken as a whole the establishment of the Picariae was certainly a commendable proceeding. For the rest there is only one considerable change, and that forms the greatest blot on the whole scheme. Instead of recognizing, as before, a subclass in the Ratitae of Merrem, Nitzsch now reduced them to the rank of an order under the name ” Platysternae,” placing them between the ” Gallinaceae ” and ” Grattae,” though admitting that in their pterylosis they differ from all other birds, in ways that he is at great pains to describe, in each of the four genera examined by him — Struthio, Rhea, Dromaeus and Casuarius. 6 It is significant that notwithstanding this he did not figure the pterylosis of any one of them, and the thought suggests itself that, though his editor assures us he had convinced himself that the group must be here shoved in (eingeschoben is the word used) , the intrusion is rather due to the necessity which Nitzsch, in common with most men of his time (the Quinarians excepted), felt for deploying the whole series of birds into line, in which case the proceeding may be defensible on the score of convenience. The extraordinary merits of this book, and the admirable fidelity to his principles which Professor Burmeister showed in the difficult task of editing it, were un- fortunately overlooked for many years, and perhaps are not sufficiently recognised now. Even in Germany, the author’s own country, there were few to notice seriously what is certainly one of the most remarkable works ever published on the science, much less to pursue the investigations that had been so laboriously begun. 6 Andreas Wagner, in his report on the progress of

2 A short essay by Nitzsch on the general structure of the Passerines, written, it is said, in 1836, was published in 1862 (Zeitschr. Ges.,

Naturwissenschaft, xix. pp. 389-408). It is probably to this essay that Professor Burmeister refers in the Pterylographie (p. 102, note; Eng. trans., p. 72, note) as forming the basis of the article ” Passerinae ” which he contributed to Ersch and Gruber’s Encyklo- pddie (sect. iii. bd. xiii. pp. 139-144), and published before the Pterylographie.

3 By the numbers prefixed it would look as if there should be four new members of this order; but that seems to be due rather to a slip of the pen or to a printer’s error.

4 This association is one of the most remarkable in the whole series of Blyth’s remarkable papers on classification in the volume cited above. He states that Gould suspected the alliance of these two forms ” from external structure and habits alone “; otherwise one might suppose that he had obtained an intimation to that effect on one of his Continental journeys. Blyth ” arrived at the same conclusion, however, by a different train of investigation,” and this is beyond doubt.

5 He does not mention Apteryx, at that time so little known on the Continent.

6 Some excuse is to be made for this neglect. Nitzsch had of course exhausted all the forms of birds commonly to be obtained, and specimens of the less common forms were too valuable from the curator’s or collector’s point of view to be subjected to a treatment that might end in their destruction. Yet it is said, on good authority, that Nitzsch had the patience so to manipulate the skins of many rare species that he was able to ascertain the characters of their pterylosis by the inspection of their inside only, without in any way damaging them for the ordinary purpose of a museum. Nor is this surprising when we consider the marvellous skill of Continental and especially German taxidermists, many of whom have elevated their profession to a height of art inconceivable to most Englishmen, who are only acquainted with the miserable mockery of Nature which is the most sublime result of all but a few ” bird-stuffers.”

ornithology, as might be expected from such a man as he was, placed the Pterylographie at the summit of those publications the appearance of which he had to record for the years 1839 and 1840, stating that for” Systematik” it was of the greatest import- ance. 1 On the other

hand Oken (7m, 1842, pp. 391-394), though giving a summary of Nitzsch's results and classification, was more sparing of his praise, and prefaced his remarks by asserting that he could not refrain from laughter when he looked at the plates in Nitzsch's work, since they reminded him of the plucked fowls hanging in a poulterer's shop, and goes on to say that, as the author always had the luck to engage in researches of which nobody thought, so had he the luck to print them where nobody sought them. In Sweden Sundevall, without accepting Nitzsch's views, accorded them a far more appreciative greeting in his annual reports for 1840-1842 (i. pp. 152-160); but, of course, in England and France 2 nothing was known of them beyond the scantiest notice, generally taken at second hand, in two or three publications. Thanks to Mr Sclater, the Ray Society was induced to publish, in 1867, an excellent translation by Mr Dallas of Nitzsch's Pterylography, and thereby, however tardily, justice was at length rendered by British ornithologists to one of their greatest foreign brethren. 3 Nitzsch's work on feathers has been carried farther by many 'later observers, and its value is now generally accepted (see Feather).

The treatise of Kessler on the osteology of birds' feet, published in the Bulletin of the Moscow Society of Naturalists for 1841, next „ , claims a few words, though its scope is rather to show

Kessier. differences than affinities; but treatment of that kind is undoubtedly useful at times in indicating that alliances generally admitted are unnatural ; and this is the case here, for, following Cuvier's method, the author's researches prove the artificial character of some of its associations. While furnishing — almost uncon- sciously, however — additional evidence for overthrowing that classification, there is, nevertheless, no attempt made to construct a better one; and the elaborate tables of dimensions, both absolute and proportional, suggestive as is the whole tendency of the author's observations, seem not to lead to any very practical result, though the systematist's need to look beneath the integument, even in parts that are so comparatively little hidden as birds' feet, is once more made beyond all question apparent.

It has already been mentioned that Macgillivray contributed to Audubon's Ornithological Biography a series of descriptions of some parts of the anatomy of American birds, from subjects supplied to him by that enthusiastic naturalist, whose zeal and prescience, it may be called, in this respect merits all praise. Thus he (prompted very likely by Macgillivray) wrote: " I believe the time to be approaching when much of the results obtained from the inspection of the exterior alone

will be laid aside; when museums filled with stuffed skins will be considered insufficient to afford a knowledge of birds; and when the student will go forth, not only to observe the habits and haunts of animals, but to preserve specimens of them to be carefully dissected" (Ornith. Biography, iv., Introduction, p. xxiv). As has been stated, the first of this series of anatomical descriptions appeared in the fourth volume of his work, published in 1838, but they were continued until its completion with the fifth volume in the following year, and the whole was incorporated into what may be termed its second edition, The Birds of America, which appeared between 1840 and 1844. Among the many species whose anatomy Mac- gillivray thus partly described from autopsy were at least half a dozen 4 of those now referred to the family Tyrannidae (see King-

1 Archiv fur Naturgeschichte, vii. 2, pp. 60, 61.

2 In 1836 Jacquemin communicated to the French Academy {Comptes rendus, ii. pp. 374, 375 and 472) some observations on the order in which feathers are disposed on the body of birds; but, however general may have been the scope of his investigations, the portion of them published refers only to the crow, and there is no mention made of Nitzsch's former work.

3 The Ray Society had the good fortune to obtain the ten original copper-plates, all but one drawn by the author himself, wherewith the work was illustrated. It is only to be regretted that the Society did not also adopt the quarto size in which it appeared, for by issuing their English version in folio they needlessly put an impedi- ment in the way of its common and convenient use.

4 These are, according to modern nomenclature, Tyrannus carolinensis and (as before mentioned) T. verticalis, Myiarchus crinitus, Sayornis fuscus, Contopus virens and Empidonax acadicus.

Mac- gillivray and Audubon,

Bird), but then included, with many others, according to the irrational, vague and rudimentary notions of classification of the time, in what was termed the family " Muscicapinae." In all these species he found the vocal organs to differ essentially in structure from those of other birds of the Old World, which we now call Passerine, or, to be still more precise, Oscinian. But by him these last were most arbitrarily severed, dissociated from their allies, and wrongly combined with other forms by no means nearly related to them (Brit. Birds, i. pp. 17, 18) which he also examined; and he practically,

though not literally, 5 asserted the truth, when he said that the general structure, but especially the muscular appendages, of the lower larynx was ” similarly formed in all other birds of this family” described in Audubon’s work. Macgillivray did not, however, assign to this essential difference any systematic value. Indeed he was so much pre- possessed in favour of a classification based on the structure of the digestive organs that he could not bring himself to consider vocal muscles to be of much taxonomic use, and it was reserved to Johannes Muller to point out that the contrary was the fact. This the great German comparative anato- niiihrˆ mist did in two communications to the Academy of Sciences of Berlin, one on the 26th June 1845 and the other on the 14th May 1846, which, having been first briefly published in the Academy’s Monatsbericht, were afterwards printed in full, and illustrated by numerous figures, in its Abhandlungen, though in this latter and complete form they did not appear in public until 1847. This very remarkable treatise forms the groundwork of almost all later or recent researches in the comparative anatomy and consequent arrangement of the Passeres, and, though it is certainly not free from imperfections, many of them, it must be said, arise from want of material, notwithstanding that its author had command of a much more abundant supply than was at the disposal of Nitzsch. Carrying on the work from the anatomical point at which he had left it, correcting his errors, and utilizing to the fullest extent the observations of Keyserling and Blasius, to which reference has already been made, Muller, though hampered by mistaken notions of which he seems to have been unable to rid himself, propounded a scheme for the classifica tion of this group, the general truth of which has been admitted by all his successors, based, as the title of his treatise expressed, on the hitherto unknown different types of the vocal organs in the Passerines. He freely recognized the prior discoveries of, as he thought, Audubon, though really, as has since been ascertained, of Macgillivray; but Muller was able to perceive their systematic value, which Macgillivray did not, and taught others to know it. At the same time Muller showed himself, his power of discrimina- tion notwithstanding, to fall behind Nitzsch in one very crucial point, for he refused to the latter’s Picariae the rank that had been claimed for them, and imagined that the groups associated under that name formed but a third ” tribe” — Picarii — of a great order Insessores, the others being (1) the Oscines or Poly- myodi — the singing birds by emphasis, whose inferior larynx was endowed with the full number of five pairs of song-muscles, and (2) the Tracheo phones, composed of some South-American families. Looking on Muller’s labours as we now can, we see that such errors as he committed are chiefly due to his want of special knowledge of ornithology, combined with the absence

in several instances of sufficient materials for investigation. Nothing whatever is to be said against the composition of his first and second ” tribes” ; but the third is an assemblage still more heterogeneous than that which Nitzsch brought together under a name so like that of Muller — for the fact must never be allowed to go out of sight that the extent of the Picarii of the latter is not at all that of the Picariae of the former. 6 For

5 Not literally, because a few other forms such as the genera Polioptila and Ptilogonys, now known to have no relation to the Tyrannidae, were included, though these forms, it would seem, had never been dissected by him. On the other hand, he declares that the American redstart, Muscicapa, or, as it now stands, Setophaga ruticilla, when young, has its vocal organs like the rest — an extraordinary statement which is worthy the attention of the many able American ornithologists.

6 It is not needless to point out this fine distinction, for more than one modern author would seem to have overlooked it.

instance, Miiller places in his third “tribe” the group which he called Ampelidae, meaning thereby the peculiar forms of South America that are now considered to be more properly named Cotingidae, and herein he was clearly right, while Nitzsch, who (misled by their supposed affinity to the genus Ampelis — peculiar to the Northern Hemisphere, and a purely Passerine form) had kept them among hisPasserinae, was as clearly wrong. But again Miiller made his third ” tribe ” Picarii also to contain the Tyrannidae, of which mention has just been made, though it is so obvious as now to be generally admitted that they have no very intimate relation- ship to the other families with which they are there associated. There is no need here to criticise more minutely this projected arrangement, and it must be said that, notwithstanding his researches, he seems to have had some misgivings that, after all, the separation of the Insessores into those ” tribes ” might not be justifiable. At any rate he wavered in his estimate of their taxonomic value, for he gave an alternative proposal, arranging all the genera in a single series, a proceeding in those days thought not only defensible

and possible, but desirable or even requisite, though now utterly abandoned. Just as Nitzsch had laboured under the disadvantage of never having any example of the abnormal Passeres of the New World to dissect, and, therefore, was wholly ignorant of their abnormality, so Miiller never succeeded in getting hold of an example of the genus Pitta for the same purpose, and yet, acting on the clue furnished by Keyserling and Blasius, he did not hesitate to predict that it would be found to fill one of the gaps he had to leave, and this to some extent it has been since proved to do.

It must not be supposed that the vocal muscles were first discovered by Miiller; on the contrary, they had been described long before, and by many writers on the anatomy of birds. To say nothing of foreigners, or the authors of general works on the subject, an excellent account of them had been given to the Linnean Society by W. Yarrell in 1829, and published with elaborate figures in its Transactions (xvi. 305-321, pis. 17, 18), ah abstract of which was subsequently given in the article ” Raven” in his History of British Birds, and Macgillivray also described and figured them with the greatest accuracy ten years later in his work with the same title (ii. 21-37, pis. x.xii.), while Blyth and Nitzsch had (as already mentioned) seen some of their value in classification. But Miiller has the merit of clearly outstriding his predecessors, and with his accustomed perspicuity made the way even plainer for his successors to see than he himself was able to see it. What remains to add is that the extraordinary celebrity of its author actually procured for the first portion of his researches notice in England (Ann. Nat. History, xvii. 499), though it must be confessed not then to any practical purpose; but more than thirty years after there appeared an English translation of his treatise by F. Jeffrey Bell, with an appendix by Garrod contain ing a summary of the latter’s own continuation of the same line of research. 1

It is now necessary to revert to the year 1842, in which Dr Cornay of Rochefort communicated to the French Academy of Sciences a memoir on a new classification of birds, of which, however, Cornay. nothing but a notice has been preserved (Comptes rendus, xiv. p. 164). Two years later this was followed by a second contri- bution from him on the same subject, and of this only an extract appeared in the. official organ of the Academy (ut supra, xvi. pp. 94i 95)i though an abstract was inserted in one scientific journal (L’Institut, xii. p. 21), and its first portion in another (Journal des Decouvertes, i. p. 250). The Revue Zoologique for 1847 (pp. 360-369) contained the whole, and enabled naturalists to consider the merits of the author’s project, which was to found a new classification of birds on the form of the anterior palatal bones, which he declared to be subjected more evidently than any

other to certain fixed laws. These laws, as formulated by him, are that (1) there is a coincidence of form of the anterior palatal and of the cranium in birds of the same order; (2) there is a likeness between the anterior palatal bones in birds of the same order; (3) there are relations of likeness

1 The title of the English translation is Johannes Miiller on Certain Variations in the Vocal Organs of the Passeres that have hitherto escaped notice. It was published at Oxford in 1878. By some unaccountable accident, the date of the original communication to the Academy of Berlin is wrongly printed. It has been rightly given above.

between the anterior palatal bones in groups of birds which are near to one another. These laws, he added, exist in regard r.o all parts that offer characters fit for the methodical arrangement of birds, but it is in regard to the anterior palatal bone that they unquestionably offer the most evidence. In the evolution of these laws Dr Cornay had most laudably studied, as his observations prove, a vast number of different types, and the upshot of his whole labours, though not very clearly stated, was such as to wholly sub- vert the classification at that time generally adopted by French ornithologists. He of course knew the. investigations of L'Herminier and De Blainville on sternal formation, and he also seems to have been aware of some pterylological differences exhibited by birds — whether those of Nitzsch or those of Jacquemin is not stated. True it is the latter were never published in full, but it is quite conceiv- able that Dr Cornay may have known their drift. Be that as it may, he declares that characters drawn from the sternum or the pelvis— hitherto deemed to be, next to the bones of the head, the most important portions of the bird's framework — are scarcely worth more, from a classificatory point of view, than characters drawn from the bill or the legs ; while pterylological considerations, together with many others to which some systematists had attached more or less importance, can only assist, and apparently must never be taken to control, the force of evidence furnished by this bone of all bones — the anterior palatal.

_ That Dr Cornay was on the brink of making a discovery of con- siderable merit will by and by appear; but, with every disposition to regard his investigations favourably, it cannot be said that he accomplished it. Whatever proofs Dr Cornay may have had to satisfy himself of his being on the right track, these proofs were not adduced in sufficient number nor arranged with sufficient skill to persuade a somewhat stiff-necked generation of the truth of his views — for it was a generation whose leaders, in France at any rate, looked with suspicion upon any one who professed to go beyond the bounds which

the genius of Cuvier had been unable to overpass, and regarded the notion of upsetting any of the positions maintained by him as verging almost upon profanity. Moreover, Dr Cornay's scheme was not given to the world with any of those adjuncts that not merely please the eye but are in many cases necessary, for, though on a subject which required for its proper comprehension a series of plates, it made even its final appearance unadorned by a single explanatory figure, and in a journal, respectable and well- known indeed, but one not of the highest scientific rank.

The same year which saw the promulgation of the crude scheme just described, as well as the publication of the final researches of Miiller, witnessed also another attempt at the classifica- tion of birds, much more limited indeed in scope, but, so Cabanis. far as it went, regarded by most ornithologists of the time as almost final in its operation. Under the vague title of " Ornithologische Notizen "Professor Cabanis of Berlin contributed to the Archiv fur Naturgeschichte (xiii. 1, pp. 186-256, 308-352) an essay in two parts, wherein, following the researches of Midler 2 on the syrinx, in the course of which a correlation had been shown to exist between the whole or divided condition of the planta or hind part of the " tarsus," first noticed, as has been said, by Keyserling and Blasius, and the presence or absence of the perfect song-apparatus, the younger author found an agreement which seemed almost invariable in this respect, and he also pointed out that the planta of the different groups of birds in which it is divided is divided in different modes, the mode of division being generally characteristic of the group. Such a coincidence of the internal and external features of birds was naturally deemed a discovery of the greatest value by those ornithologists who thought most highly of the latter, and it was unquestionably of no little practical utility. Further examination also revealed the fact 3 that in certain groups the number of " primaries," or quill-feathers growing from the manus or distal segment of the wing, formed another characteristic easy of observa- tion. In the Oscines or Polymyodi of Miiller the number was either nine or ten — and if the latter the outermost of them was generally very small. In two of the other groups of which Professor Cabanis especially treated — groups which had been hitherto more or less confounded with the Oscines — the number of primaries was in- variably ten, and the outermost of them was comparatively large. This observation was also hailed as the discovery of a fact of extra- ordinary importance; and, from the results of these investigations, taken altogether, ornithology was declared by Sundevall, un- doubtedly a man who had a right to speak with authority, to have made greater progress than had been achieved since

the days of Cuvier. The final disposition of the ” Sub-class Insessores ” — all the

2 On the other hand, Miiller makes several references to the labours of Professor Cabanis. The investigations of both authors must have been proceeding simultaneously, and it matters little which actually appeared first.

3 This seems to have been made known by Professor Cabanis the preceding year to the Gesellschaft der Naturforschender Freunde (cf. Miiller, Stimmorganen der Passerinen, p. 65). Of course the variation to which the number of primaries was subject had not escaped the observation of Nitzsch, but he had scarcely used it as a classificatory character.

perching birds, that is to say, which are neither birds of prey nor pigeons — proposed by Professor Cabanis, was into four ” Orders,” as follows : : —

1. Oscines, equal to M tiller’s group of the same name;

2. Clamatores, being a majority of that division of the Picariae of Nitzsch, so called by Andreas Wagner, in 1841, 1 which have their feet normally constructed ;

3. Strisores, a group now separated from the Clamatores of Wagner, and containing those forms which have their feet abnor- mally constructed ; and

4. Scansores, being the Grimpeurs of Cuvier, the Zygodactyli of several other systematists.

The first of these four ” Orders ” had been already indefeasibly established as one perfectly natural, but respecting its details more must presently be said. The remaining three are now seen to be obviously artificial associations, and the second of them, Clamatores, in particular, containing a very heterogeneous assemblage of forms; but it must be borne in mind that the internal structure of some of them was at that time still more imperfectly known than now.

This will perhaps be the most convenient place to mention another kind of classification of birds, which, based on a principle wholly different from those that have just been explained, Bo °?~ requires a few words, though it has not been productive,

parte. nor ; g i;j ce iy t f rom a (i t hat appears, to be productive of

any great effect. So long ago as 1831, Prince C. L. Bonaparte, in his Saggio di una distribuzione metodica degli Animali Vertebrati, published at Rome, and in 1837 communicated to the Linnean Society of London, ” A new Systematic Arrangement of Vertebrated Animals,” which was subsequently printed in that Society’s Trans- actions (xviii. pp. 247-304), though before it appeared there was issued at Bologna, under the title of Synopsis Vertebratorum Systema- tis, a Latin translation of it. Herein he divided the class Aves into two subclasses, to which he applied the names of Insessores and Grallatores (hitherto used by their inventors Vigors and Illiger in a different sense), in the latter work relying chiefly for this division on characters which had not before been used by any systematist, namely that in the former group monogamy generally prevailed and the helpless nestlings were fed by their parents, while the latter group were mostly polygamous, and the chicks at birth were active and capable of feeding themselves. This method, which in process of time was dignified by the title of a Physiological Arrangement, was insisted upon with more or less pertinacity by the author throughout a long series of publications, some of them separate books, some of them contributed to the memoirs issued by many scientific bodies of various European countries, ceasing only at his death, which in July 1857 found him occupied upon a Conspectus Generum Avium, that in consequence remains unfinished. In the course of this series, however, he saw fit to alter the name of his two subclasses, since those which he at first adopted were open to a variety of meanings, and in a communication to the French Academy of Sciences in 1853 (Comptes rendus, xxxvii. pp. 641-647) the denomination Insessores was changed to Altrices, and Grallatores to Praecoces — the terms now preferred by him being taken from Sundevall’s treatise of 1835 already mentioned. The views of Bonaparte were, it appears, also shared by an ornithological amateur of some distinction, John Hogg, who propounded a scheme Hogg. which, as he subsequently stated {Zoologist, 1850, p. 2797),

was founded strictly in accordance with them; but it would seem that, allowing his convictions to be warped by other considerations, he abandoned the original ” physiological ” basis of his system, so that this, when published in 1846 {Edinb. N. Philosoph. Journal, xli. pp. 50-71), was found to be established on a single character of the feet

only; though he was careful to point out, immediately after formulating the definition of his subclasses Constriclipedes and Inconstrictipedes, that the former ” make, in general, compact and well-built nests, wherein they bring up their very weak, blind, and mostly naked young, which they feed with care, by bringing food to them for many days, until they are fledged and sufficiently strong to leave their nest,” observing also that they ” are princi- pally monogamous ” (pp. 55, 56); while of the latter he says that they ” make either a poor and rude nest, in which they lay their eggs, or else none, depositing them on the bare ground. The young are generally born with their full sight, covered with down, strong, and capable of running or swimming immediately after they leave the egg-shell.” He adds that the parents, which ” are mostly polygamous,” attend their young and direct them where to find their food (p. 63). The numerous errors in these assertions hardly need pointing out. The herons, for instance, are much more ” Constriclipedes ” than are the larks or the kingfishers, and, so far from the majority of ” Inconstrictipedes ” being polygamous, there is scarcely any evidence of polygamy obtaining as a habit among birds in a state of nature except in certain of the Gallinae and a very few others. Furthermore, the young of the goatsuckers are

1 Archiv fur Naturgeschichte, vii. 2, pp. 93, 94. The division seems to have been instituted by this author a couple of years earlier in the second edition of his Handbuch der Naturgeschichte (a work not seen by the present writer), but not then to have received a scien- tific name. It included all Picariae which had not ” zygodactylous ” feet, that is to say, toes placed in pairs, two before and two behind.

at hatching far more developed than are those of the herons or the cormorants; and, in a general way, nearly every one of the as- serted peculiarities of the two subclasses breaks down under careful examination. Yet the idea of a ” physiological ” arrangement on the same kind of principle found another follower, or, as he thought, inventor, in Edward Newman, who in 1 850 communicated v to the Zoological Society of London a plan published in ” ewman ‘ its Proceedings for that year (pp. 46-48), and reprinted also in his own journal The Zoologist (pp. 2780-2782), based on exactly the same considerations, dividing birds into two groups, ” Hesthogenous ” — a word so vicious in formation as to be incapable of amendment, but intended to signify those that were hatched with a clothing of down — and ” Gymnogenous,” or those that were hatched naked. These three systems are essentially identical; but, plausible as they may be at the first aspect, they have been found to be practically useless, though such of their characters as their upholders have advanced with truth deserve attention. Physiology may one day very likely assist the

systematist; but it must be real physiology and not a sham.

In 1856 Paul Gervais, who had already contributed to the Zoologie of M. de Castelnau's Expedition dans les parties centrales de I'Amerique du Sud some important memoirs describing the anatomy of _ . the hoactzin and certain other birds of doubtful or anomai- nervals. ous position, published some remarks on the characters which could be drawn from the sternum of birds {Ann. Sc. Nat. Zoologie, ser. 4, vi. pp. 5- 1 5). The-considerations are not very striking from a general point of view; but the author adds to the weight of evidence which some of his predecessors had brought to bear on certain matters, particularly in aiding to abolish the artificial groups " Deodactyls," "Syndactyls, ' and " Zygodactyls," on which so much reliance had been placed by many of his countrymen; and it is with him a great merit that he was the first apparently to recognize publicly that characters drawn from the posterior part of the sternum, and particularly from the " ichancrures," commonly called in English " notches " or " emar- ginations," are of comparatively little importance, since their number is apt to vary in forms that are most closely allied, and even in species that are usually associated in the same genus or unquestionably belong to the same family, 2 while these " notches " sometimes become simple foramina, as in certain pigeons, or on the other hand foramina may exceptionally change to " notches," and not unfrequently disappear wholly. Among his chief systematic determinations we may mention that he refers the tinamous to the rails, because apparently of their deep " notches," but otherwise takes a view of that group more correct according to modern notions than did most of his contemporaries. The bustards he would place with the " Limicoles," as also Dromas and Chionis, the sheath-bill {q.v.). Phaethon, the tropic-bird {q.v.), he would place with the "Larides " and not with the " Pelecanidds," which it only resembles in its feet having all the toes connected by a web. Finally divers, auks and penguins, according to him, form the last term in the series, and it seems fit to him that they should be regarded as forming a separate order. It is a curious fact that even at a date so late as this, and by an investigator so well informed, doubt should still have existed whether Apteryx (see Kiwi) should be referred to the group containing the cassowary and the ostrich. On the whole the remarks of this esteemed author do not go much beyond such as. might occur to any one who had made a study of a good series of specimens; but many of them are published for the first time, and the author is careful to insist on the necessity of not resting solely on sternal characters, but associating with them those drawn from other parts of the body.

Three years later in the same journal (xi. 11-145, pis. 2-4) M.

Blanchard published some Recherches sur les caractires osteo- logiques des oiseaux appliquees d, la classification naturelle de ces animaux, strongly urging the superiority of such h'd

characters over those drawn from the bill or feet, which, "hara. he remarks, though they may have sometimes given correct notions, have mostly led to mistakes, and, if observations of habits and food have sometimes afforded happy results, they have often been de- ceptive; so that, should more be wanted than to draw up a mere inventory of creation or trace the distinctive outline of each species, zoology without anatomy would remain a barren study. At the same time he states that authors who have occupied themselves with the sternum alone have often produced uncertain results, especially when they have neglected its anterior for its posterior part; for in truth every bone of the skeleton ought to be studied in all its details. Yet this distinguished zoologist selects the sternum as furnishing the key to his primary groups or " Orders " of the class, adopting, as Merrem had done long before, the same two divisions Carinatae and Ratitae, naming, however, the former Tropidosternii and the latter Homalosternh. 3 Some unkind fate has hitherto hindered

2 Thus he cites the cases of Machetes pugnax and Scolopax rusti- cola among the " Limicoles," and Larus cataractes among the " Larides," as differing from their nearest allies by the possession of only one " notch " on either side of the keel. Several additional instances are cited in Philos. Transactions (1869), p. 337, note.

3 These terms were explained in his great work V Organisation du regne animal, oiseaux, begun in 1855, to mean exactly the same as those applied by Merrem to his two primary divisions.

him from making known to the world the rest of his researches in regard to the other bones of the skeleton till he reached the head, and in the memoir cited he treats of the sternum of only a portion of his first " Order." This is the more to be regretted by all ornitho- logists, since he intended to conclude with what to them would have been a very great boon — the showing in what way external characters coincided with those presented by osteology. It was also within the scope of his plan to have continued on a more extended scale the

researches on ossification begun by L'Herminier, and thus M. Blanchard's investigations, if completed, would obviously have taken extraordinarily high rank among the highest contributions to ornithology. As it is, so much of them as we have are of con- siderable importance; for, in this unfortunately unfinished memoir, he describes in some detail the several differences which the sternum in a great many different groups of his Tropidosternii presents, and to some extent makes a methodical disposition of them accordingly. Thus he separates the birds of prey into three great groups — (1) the ordinary Diurnal forms, including the Falconidae and Vulturidae of the systematist of his time, but distinguishing the American Vultures from those of the Old World; (2) Gypogeranus, the secretary-bird (q.v.); and (3) the owls (q.v.). Next he places the parrots (q.v.), and then the vast assemblage of " Passereaux " — which he declares to be all of one type, even genera like Pipra (manakin, q.v.) and Pitta — and concludes with the somewhat heterogeneous conglomeration of forms, beginning with Cypselus (swift, q.v.), that so many systematists have been accustomed to call Picariae, though to them as a group he assigns no name. A continuation of the treatise was promised in a succeeding part of the Annates, but a quarter of a century has passed without its appearance. 1

Important as are the characters afforded by the sternum, that bone even with the whole sternal apparatus should obviously not be _ considered alone. To aid ornithologists in their studies

Eyton. j n t j 1 j s reS p ect| t q_ Eyton, who for many years had been forming a collection of birds' skeletons, began the publication of a series of plates representing them. The first part of this work, Osteologia Avium, appeared early in 1859, and a volume was com- pleted in 1867. A Supplement was issued in 1869, and a Second Supplement, in three parts, between 1873 and 1875. The whole work contains a great number of figures of birds' skeletons and detached bones ; but they are not so drawn as to be of much practical use, and the accompanying letterpress is too brief to be satisfactory. That the eggs laid by birds should offer to some extent characters of utility to systematists is only to be expected, when it is con- sidered that those from the same nest generally bear an extraordinary family likeness to one another, and also that in certain groups the essential peculiarities of the egg-shell are constantly and dis- tinctively characteristic. Thus no one who has ever examined the egg of a duck or of a tinamou would ever be in danger of not referring another tinamou's egg or another duck's, that he might see, to its proper family, and so on with many others. But at the same time many of the shortcomings of oology in this respect must be set down to the defective information

and observation of its votaries, among whom some have been very lax, not to say incautious, in not ascer- taining on due evidence the parentage of their specimens, and the author next to be named is open to this charge. After several minor notices that appeared in journals at various times, Des Murs _ „ in i860 brought out at Paris his ambitious Traiti giniral es urs. ftgoiggig ornithologique au point de vue de la classification, which contains (pp. 529-538) a ” Systema Oologicum ” as the final result of his labours. In J:his scheme birds are arranged according to what the author considered to be their natural method and sequence; but the result exhibits some unions as ill-assorted as can well be met with in the whole range of tentative arrangements of the class, together with some very unjustifiable divorces. Its basis is the classification of Cuvier, the modifications of which by Des Murs will seldom commend themselves to systematists whose opinion is generally deemed worth having. Few, if any, of the faults of that classification are removed, and the improvements suggested, if not established by his successors, those especially of other countries than France, are ignored, or, as is the case with some of those of L’Herminier, are only cited to be set aside. Oologists have no reason to be thankful to Des Murs, notwithstanding his zeal in behalf of their study. It is perfectly true that in several or even in many instances he acknowledges and deplores the poverty of his informa- tion, but this does not excuse him for making assertions (and such assertions are not unfrequent) based on evidence that is either wholly untrustworthy or needs further inquiry before it can be accepted (Ibis, i860, pp. 331-335). This being the case, it would seem useless to take up further space by analysing the several proposed modifications of Cuvier’s arrangement. The great merit of the work is that the author shows the necessity of taking oology into account when investigating the classification of birds; but it also proves that in so doing the paramount consideration lies in the thorough sifting of evidence as to the parentage of the eggs which

1 M. Blanchard’s animadversions on the employment of external characters, and on trusting to observations on the habits of birds, called forth a rejoinder from A. R. Wallace (Ibis, 1864, pp. 36-41), who successfully “showed that they are not altogether to be despised.

are to serve as the building stones of the fabric to be erected. The attempt of Des Murs was praiseworthy, but in effect it has utterly failed, notwithstanding the encomiums passed upon it by friendly critics (Rev. deZoologie, i860, pp. 176-183, 313-325, 370-373). 2

Until about this time systematists, almost without exception, may be said to have been wandering with no definite purpose. At least their purpose was indefinite compared with that which they now have before them. No doubt J/'j they all agreed in saying that they were prosecuting Bvolatlon. a search for what they called the true system of nature; but that was nearly the end of their agreement, for in what that true system consisted the opinions of scarcely any two would coincide, unless to own that it was some shadowy idea beyond the present power of mortals to reach or even compre- hend. The Quinarians, who boldly asserted that they had fathomed the mystery of creation, had been shown to be no wiser than other men, if indeed they had not utterly befooled themselves; for their theory at best could give no other explana- tion of things than that they were because they were. The conception of such a process as has now come to be called by the name of evolution was certainly not novel; but except to two men the way in which that process was or could be possible had not been revealed. 3 Here there is no need to enter into details of the history of evolution; but there was possibly no branch of zoology in which so many of the best informed and consequently the most advanced of its workers sooner accepted the principles of evolution than ornithology, and of course the effect upon its study was very marked. New spirit was given to it. Ornithologists now felt they had something before them that was really worth investigating. Questions of affinity, and the details of geographical distribution, were endowed with a real interest, in comparison with which any interest that had hitherto been taken was a trifling pastime. Classification assumed a wholly different aspect. It had up to this time been little more than the shuffling of cards, the ingenious arrange- ment of counters in a pretty pattern. Henceforward it was to be the serious study of the workings of nature in producing the beings we see around us from beings more or less unlike them, that had existed in bygone ages and had been the parents of a varied and varying offspring — our fellow-creatures of to-day. Classification for the first time was something more than the expression of a fancy, not that it had not also its imaginative side. Men's minds began to figure to themselves the original type of some well-marked genus or family of birds. They could even discern dimly some generalized stock whence had descended whole groups that now differed strangely in habits and appear- ance — their discernment aided, may be, by some isolated form which yet retained undeniable traces of a primitive structure. More dimly still visions of what the first bird may have been like could be reasonably entertained; and, passing even to a higher antiquity, the reptilian parent whence all birds have sprung was brought within reach of man's consciousness. But, relieved as it may

be by reflections of this kind — dreams some may perhaps still call them — the study of ornithology has un- questionably become harder and more serious; and a correspond- ing change in the style of investigation, followed in the works that remain to be considered, will be immediately perceptible.

That this was the case is undeniably shown by some remarks of Canon Tristram, who, in treating of the Alaudidae and Saxicolinae of Algeria (whence he had recently brought _. a large collection of specimens of his own making), stated (Ibis, 1859, pp. 429-433) that he could ” not help feeling convinced of the truth of the views set forth by Messrs Darwin and Wallace,” adding that it was ” hardly possible, I ‘should think, to illustrate this theory better than by the larks and chats of North Africa.” It is unnecessary to continue the

2 In this historical sketch of the progress of ornithology it has not been thought necessary to mention other oological works, since they have not a taxonomic bearing, and the chief of them have been already named (see Birds).

3 Neither Lamarck nor Robert Chambers (the now acknowledged author of Vestiges of Creation), though thorough evolutionists, rationally indicated any means whereby, to use the old phrase, ” the transmutation of species ” could be effected.

quotation; the few words just cited are enough to assure to their author the credit of being (so far as is known) the first ornithological specialist who had the courage publicly to recognize and receive the new and at that time unpopular philosophy. But greater work was at hand. In June i860 W. K. Parker. p arker broke, as most will allow, entirely fresh ground by communicating to the Zoological Society a memoir ” On the Osteology of Balaeniceps,” subsequently published in that Society’s Transactions (iv. 269-351). Of this contribution to science, as of all the rest which have since proceeded from him, may be said in the words he himself has applied (ul supra, p. 271) to the work of another labourer in a not distant field: ” This is a model paper for unbiassed observation, and freedom from that pleasant mode of supposing instead of ascertaining what is the true nature of an

anatomical element." 1 Indeed, the study of this memoir, limited though it be in scope, could not fail to convince any one that it proceeded from the mind of one who taught with the authority derived directly from original knowledge, and not from association with the scribes — a con- viction that has become strengthened as, in a series of successive memoirs, the stores of more than twenty years' silent observa- tion and unremitting research were unfolded, and, more than that, the hidden forces of the science of morphology were gradually brought to bear upon almost each subject that came under discussion. These different memoirs, being technically mono- graphs, have strictly no right to be mentioned in this place; but there is scarcely one of them, if one indeed there be, that does not deal with the generalities of the study; and the in- fluence they have had upon contemporary investigation is so strong that it is impossible to refrain from noticing them here, though want of space forbids us from enlarging on their contents.

For some time past rumours of a discovery of the highest interest had been agitating the minds of zoologists, for in 1861 Andreas Wagner had sent to the Academy of Sciences Wagner. q{ Munich (Silzungsberichte, pp. 146-154; Ann. Nat. History, series 3, ix. 261-267) an account of what he con- ceived to be a feathered reptile (assigning to it the name Griphosaurus), the remains of which had been found in the lithographic beds of Solenhofen; but he himself, through failing health, had been unable to see the fossil. In 1862 the slabs containing the remains were acquired by the British Museum, and towards the end of that year Sir R. Owen corn- Owen. mun icated a detailed description of them to the Philo- sophical Transactions (1863, pp. 33-47), proving their bird-like nature, and referring them to the genus Archaeopteryx of Hermann von Meyer, hitherto known only by the impression of a single feather from the same geological beds. Wagner foresaw the use that would be made of this discovery by the adherents of the new philosophy, and, in the usual language of its opponents at the time, strove toward off the "misinterpretations" that they would put upon it. His protest, it is needless to say, was unavailing, and all who respect his memory must regret that the sunset of life failed to give him that insight into the future which is poetically ascribed to it. To Darwin and those who believed with him scarcely any discovery could have been more welcome; but that is beside our present business. It was quickly seen— even by those who held Archaeopteryx to be a reptile— that it was a form intermediate between existing birds' and existing reptiles ; while those who were convinced by Sir R. Owen's researches of its ornithic affinity saw that it must belong to a type of birds wholly unknown before, and one that

in any future for the arrangement of the class must have a special rank reserved for it. 2

It behoves us next to mention the ” Outlines of a Systematic Review of the Class of Birds ,” communicated by W. Lilljeborg

1 It is fair to state that some of Professor Parker’s conclusions respecting Balaeniceps were contested by the late Professor J. T. Reinhardt (Overs. K. D. Vid. Selsk. Forhandlinger , 1861, pp. 135-154; Ibis, 1862, pp. 158-175), and as it seems to the present writer not ineffectually. Professor Parker replied to his critic (Ibis, 1862,

2 This was done shortly afterwards by Professor Haeckel, who proposed the name Saururae for the group containing it.

to the Zoological Society in 1866, and published in its Proceedings for that year (pp. 5-20), since it was immediately after reprinted by the Smithsonian institution, and with that authoriza- uille-

tion has exercised a great influence on the opinions of borg ˆ

American ornithologists. Otherwise the scheme would hardly need notice here. This paper is indeed little more than an English translation of one published by the author in the annual volume (Arsskrift) of the Scientific Society of Upsala for i860, and belonging to the pre-Darwinian epoch should perhaps have been more properly treated before, but that at the time of its original appearance it failed to attract attention. The chief merit of the scheme perhaps is that, contrary to nearly every precedent, it begins with the lower and rises to the higher groups of birds, which is of course the natural mode of proceeding, and one therefore to be commended. Otherwise the ” principles ” on which it is founded are not clear to the ordinary zoologist. One of them is said to be ” irritability,” and, though this is explained to mean, not ” muscular strength alone, but vivacity and activity generally,” 3 it does not seem to form a character that can be easily appreciated either as to quantity or quality; in fact, most persons would deem it quite immeasurable, and, as such, removed from practical consideration. Moreover, Professor Lilljeborg’s scheme, being actually an adaptation of that of Sundevall, of which we shall have to speak at some length almost immediately, may possibly be left for the present with these remarks.

In the spring of the year 1867 Professor T. H. Huxley, to the delight of an appreciative audience, delivered at the Royal College of Surgeons of England a course of lectures Hux j ey , on birds, and a few weeks

after presented ‘an abstract of his researches to the Zoological Society, in whose Proceedings for the same year it will be found printed (pp. 415-472) as a paper ” On the Classification of Birds, and on the taxonomic value of the modifications of certain of the cranial bones observ- able in that Class.” Starting from the basis ” that the phrase ‘birds are greatly modified reptiles ‘ would hardly be an exagger- ated expression of the closeness ” of the resemblance between the two classes, which he had previously brigaded under the name of Sauropsida (as he had brigaded the Pisces and Amphibia as Ichthyopsida), he drew in bold outline both their likenesses and their differences, and then proceeded to inquire how the Aves could be most appropriately subdivided into orders, sub- orders and families. In this course of lectures he had already dwelt at some length on the insufficiency of the characters on which such groups as had hitherto been thought to be established were founded; but for the consideration of this part of his subject there was no room in the present paper, and the reasons why he arrived at the conclusion that new means of philosophi- cally and successfully separating the class must be sought are herein left to be inferred. The upshot, however, admits of no uncertainty: the class Aves is held to be composed of three ” Orders” —

I. Saururae, Hackel; II. Ratitae, Merrem; and III. Carinatae, Merrem.

The Saururae have the metacarpals well developed and not ancy- losed, and the caudal vertebrae are numerous and large, so that the caudal region of the spine is longer than the body. The furcula is complete and strong, the feet very passerine in appearance. The skull and sternum were at the time unknown, and indeed the whole order, without doubt entirely extinct, rested exclusively on the celebrated fossil, then unique, Archaeopteryx.

The Ratitae comprehend the struthious birds, which differ from all others now extant in the combination of several peculiarities, some of which have been mentioned in the preceding pages. The sternum has no keel, and ossifies from lateral and paired centres only; the axes of the scapula and coracoid have the same general direction ; certain of the cranial bones have characters very unlike those possessed by the next order— the vomer, for example, being broad posteriorly and generally intervening between the basi- sphenoidal rostrum and the palatals and pterygoids; the barbs of the feathers are disconnected; there is no syrinx or inferior larynx; and the diaphragm is better developed than in other birds. 4

3 On this ground it is stated that the Passeres should be placed highest

in the class. But those who know the habits and demeanour of many of the Limicolae would no doubt rightly claim for them much more ” vivacity and activity ” than is possessed by most Passeres.

4 This peculiarity had led some zoologists to consider the struthious birds more nearly allied to the Mammalia than any others.

The Carinatae are divided, according to the formation of the palate, into four ” Suborders,” and named (i.) Dromaeognathae, (ii.) Schizognathae, (iii.) Desmognathae, and (iv.) Aegithognathae. 1 The Dromaeognathae resemble the Ratitae, and especially the genus Dromaeus, in their palatal structure, and are composed of the Tinamous (q.v.). The Schizognathae include a great many of the forms belonging to the Linnaean Orders Gallinae, Graflae and Anseres. In them the vomer, however variable, always tapers to a point anteriorly, while behind it includes the basisphenoidal rostrum between the palatals; but neither these nor the pterygoids are borne by its posterior divergent ends. The maxillo-palatals are usually elongated and lamellar, uniting with the palatals, and, bending backward along their inner edge, leave a cleft (whence the name given to the ” Suborder “) between the vomer and themselves. In the Desmognathae, the vomer is either abortive or so small as to disappear from the skeleton. When it exists it is always slender, and tapers to a point anteriorly. The maxillo-palatals are bound together (whence the name of the ” Suborder “) across the middle line, either directly or by the ossification of the nasal septum. The posterior ends of the palatals and anterior of the pterygoids articulate directly with the rostrum. The Aegithognathae, the fourth and last of the ” Suborders,” is characterized by a form of palate in some respects intermediate between the two preceding. The vomer is broad, abruptly truncated in front, and deeply cleft behind, so as to embrace the rostrum of the sphenoid; the palatals have pro- duced postero-external angles; the maxillo-palatals are slender at their origin, and extend obliquely inwards and forwards over the palatals, ending beneath the vomer in expanded extremities, not united either with one another or with the vomer, nor does the latter unite with the nasal septum, though that is frequently ossified.

The above abstract shows the general drift of this very re- markable

contribution to ornithology, and it has to be added that for by far the greater number of his minor groups Huxley relied solely on the form of the palatal structure, the importance of which Dr Cornay had before urged, though to so little purpose. That the palatal structure must be taken into consideration by taxonomers as affording hints of some utility there can no longer be a doubt; but perhaps the characters drawn thence owed more of their worth to the extraordinary perspicuity with which they were presented by Huxley than to their own in- trinsic value, and if the same power had been employed to eluci- date in the same way other parts of the skeleton — say the bones of the sternal apparatus or even of the pelvic girdle — either set might have been made to appear quite as instructive and perhaps more so. Adventitious value would therefore seem to. have been acquired by the bones of the palate through the fact that so great a master of the art of exposition selected them as fitting examples upon which to exercise his skill. 2 At the same time it must be stated this selection was not premeditated by Huxley, but forced itself upon him as his investigations proceeded. 3 In reply to some critical remarks (Ibis, 1868, pp. 85-96), chiefly aimed at showing the inexpediency of relying solely on one set of characters, especially when those afforded by the palatal bones were not, even within the limits of families, wholly diagnostic, the author (Ibis, 1868, pp. 357-362) announced a slight modification of his original scheme, by introducing three more groups into it, and concluded by indicating how its bearings upon the great question of ” genetic classification” might be represented so far as the different groups of Carinatae are concerned: —

1 These names are compounded respectively of Dromaeus, the generic name applied to the emeu, o-xifa, a split or cleft, Se

2 The notion of the superiority of the palatal bones to all others for purposes of classification has pleased many persons, from the fact that these bones are not unfrequently retained in the dried skins of birds sent home by collectors in foreign countries, and are therefore available for study, while such bones as the sternum and pelvis are rarely preserved. The common practice of ordinary collectors, until at least very recently, has been tersely described as being to ” shoot a bird, take off its skin, and throw away its char- acters.”

3 Perhaps this may be partially explained by the fact that the Museum of the College of Surgeons, in which these investigations were chiefly carried on, like most other museums of the time, con- tained a much larger series of the heads of birds than of their entire skeletons, or of any other portion of the skeleton. Consequently the materials available for the comparison of different forms con- sisted in great

part of heads only.

Tinamomorphae. Turaicomorphae.

Charadriomorphae.

Cecomorphae. Geranomorphae.

Sphenisco- Actomorphae.

morphae.

Psittaco-

Alectoro morphae.

Hetero- morphae.

Coccygo-

Pterodo- morphae.

Peristero- morphae.

ˆgitho- morphae. .morphae. gnathae.

Palamedea.

Chenomorphae.

Amphimorphae.

I Pelargomorphae.

Dysporo- morphae.

Huxley regarded the above scheme as nearly representing the affinities of the various Carinate groups— the great difficulty being to determine the relations to the rest of the Coccygo- morphae, Psittacomorphae and Aegithognathae, which he indicated ” only in the most doubtful and hypothetic fashion.” Almost simultaneously with this he expounded more particularly before the Zoological Society, in whose Proceedings (1868, pp. 294-310) his results were soon after published, the groups of which he believed the Alectoromorphae to be composed and the. relations to them of some outlying forms usually regarded as Gallinaceous, the Turnicidae and Plerochdae, as well as the singular hoactzin, for all three of which he had to institute new

groups — the last forming the sole representative of his Heleromorphae, More than this, he entered upon their geo- graphical distribution, the facts of which important subject are here, almost for the first time, since the attempt of Blyth already mentioned, 4 brought to bear practically on classification.

Here we must mention the intimate connexion between classification and geographical distribution as revealed by the palaeontologicalresearchesofAlphonseMilne-Edwards, whose magnificent Oiseaux Fossiles de la France war began to appear in 1867, and was completed in 1871— the more so, since the exigencies of his undertaking compelled him to use materials that had been almost wholly neglected by other investigators. A large proportion of the fossil remains, the determination and description of which was his object, were what are very commonly called the ” long bones,” that is to say, those of the limbs. The recognition of these, minute and fragmentary as many were, and the referring them to their proper place, rendered necessary an attentive study of the com- parative osteology and myology of birds in general, that of the “long bones,” whose sole characters were often a few muscular ridges or depressions, being especially obligatory. Hence it became manifest that a very respectable classification can be found in which characters drawn from these bones play a rather important part. Limited by circumstances as is that followed by Milne-Edwards, the details of his arrangement do not require setting forth here. It is enough to point out that we have in his work another proof of the multiplicity of the factors which must be taken into consideration by the systematist, and another proof of the fallacy of trusting to one set of characters alone. But this is not the only way in which the author has rendered service to the advanced student of ornithology. The unlooked- for discovery in France of remains which he has referred to, forms now existing it is true, but existing only in countries far removed from Europe, forms such as Collocalia, Leptosomus, Psittacus, Serpentarius and Trogon, is perhaps even more sugges- tive than the finding that France was once inhabited by forms that are wholly extinct, of which in the older formations there is abundance. Unfortunately none of these, however, can be compared for singularity with Archaeopteryx or with some American fossil forms next to be noticed, for their particular

4 It is true that from the time of Buffon, though he scorned any regular classification, geographical distribution had been occasionally held to have something to do with systematic arrangement ; but the way in which the two were related was never clearly put forth, though people who could read between the lines might have guessed the secret from Darwin’s Journal of Researches, as well as from his

bearing on our knowledge of ornithology will be most con- veniently treated here.

In November 1870 O. C. Marsh, by finding the imperfect fossilized tibia of a bird in the middle cretaceous shale of Kansas, began a series of wonderful discoveries of great im- portance to ornithology. Subsequent visits to the same part of North America, often performed under circum- stances of discomfort and occasionally of danger, brought to this intrepid and energetic explorer the reward he had so fully earned. Brief notices of his spoils appeared from time to time in various volumes of the American Journal of Science and Arts (Silliman’s), but it is unnecessary here to refer to more than a few of them. In that Journal for May 1872 (ser. 3, iii. p. 360) the remains of a large swimming bird (nearly 6 ft. in length, as afterwards appeared) having some affinity, it was thought, to the Colymbidae were described under the name of Hesperornis regalis, and a few months later (iv. p. 344) a second fossil bird from the same locality was indicated as Ichthyornis dispar — from the fish-like, biconcave form of its vertebrae. Further examination of the enormous collections gathered by the author, and preserved in the Museum of Yale University at New Haven, Connecticut, showed him that this last bird, and another to which he gave the name of Apatornis, had possessed well- developed teeth implanted in sockets in both jaws, and induced him to establish (v. pp. 161, 162) for their reception a ” sub- class” Odontomithes and an order Ichthyornithes. Two years mote and the originally found Hesperornis was discovered also to have teeth, but these were inserted in a groove. It was accordingly regarded as the type of a distinct order Odontolcae (x. pp. 403-408), to which were assigned as other characters vertebrae of a saddle-shape and not biconcave, a keelless ster- num, and wings consisting only of the humerus. In 1880 Marsh brought out Odontomithes, a monograph of the extinct toothed birds of North America. Herein remains, attributed to no fewer than a score of species, which were referred to eight different genera, are fully described and sufficiently illustrated, and, instead of the ordinal name Ichthyornithes previously used, that of Odontotormae was proposed. In the author’s concluding summary he remarks on the fact that, while the Odontolcae, as exhibited in

Hesperornis, had teeth inserted in a continuous groove — a low and generalized character as shown by reptiles, they had, however, the strongly differentiated saddle-shaped vertebrae such as all modern birds possess. On the other hand the Odontotormae, as exemplified in Ichthyornis, having the primitive biconcave vertebrae, yet possessed the highly specialized feature of teeth in distinct sockets. Hesperornis too, with its keelless sternum, had aborted wings but strong legs and feet adapted for swimming, while Ichthyornis had a keeled sternum and powerful wings, but diminutive legs and feet. These and other characters separate the two forms so widely as quite to justify the establishment of as many orders for their reception. Marsh states that he had fully satisfied himself that Archaeopteryx belonged to the Odontomithes, which he thought it advisable for the present to regard as a subclass, separated into three orders — Odontolcae, Odontotormae and Saururae — all well marked, but evidently not of equal rank, the last being clearly much more widely distinguished from the first two than they are from one another. But that these three oldest-known forms of birds should differ so greatly from each other unmistakably points to a great antiquity for the class. The former efforts at classification made by Sundevall have already several times been mentioned, and a return to their con- sideration was promised. In 1872 and 1873 he brought out at Stockholm a Methodi naturalis avium dis- ponendarum tentamen, two portions of which (those relating to the diurnal birds-of-prey and the Cicklomorphae, or forms related to the thrushes) he found himself under the necessity of revising and modifying in the course of 1874, in as many communications to the Swedish Academy of Sciences (K. V.-Ak. Forhandlingar, 1874, No. 2, pp. 21-30; No. 3, pp. 27-30). This Tentamen, containing his complete method of classifying birds in general, naturally received much attention, the more so perhaps, since,

Sundevall.

with its appendices, it was nearly the last labour of its respected author, whose industrious life came to an end in the course of the following year. From what has before been said of his works it may be gathered that, while professedly basing his systematic arrangement of the groups of birds on their external features, he had hitherto striven to make his schemes harmonize if possible with the dictates of internal structure as evinced by the science of anatomy, though he uniformly and persistently protested against the inside being better than the outside. In thus acting he proved himself a true follower of his great countryman Linnaeus; but, without disparagement of his efforts in this respect, it must be said that when internal and external char- acters

appeared to be in conflict he gave, perhaps with unconscious bias, a preference to the latter, for he belonged to a school of zoologists whose natural instinct was to believe that such a conflict always existed. Hence his efforts, praiseworthy as they were from several points of view, and particularly so in regard to some details, failed to satisfy the philosophic taxonomer when generalizations and deeper principles were concerned, and in his practice in respect of certain technicalities of classification he was, in the eyes of the orthodox, a transgressor. Thus instead of contenting himself with terms that had met with pretty general approval, such as class, subclass, order, sub-order, family, subfamily, and so on, he introduced into his final scheme other designations, ” agmen,” ” cohors,” ” phalanx,” and the like, which to the ordinary student of ornithology convey an indefinite meaning, if any meaning at all. He also carried to a very extreme limit his views of nomenclature, which were certainly not in accordance with those held by most zoologists, though this is a matter so trifling as to need no details in illustra- tion. His Tentamen was translated into English by F. Nicholson in 1889, and had a considerable influence on later writers, especially in the arrangement of the smaller groups. In the main it was an artificial system. Birds were divided into Gymnopaedes and Dasypaedes, according as the young were hatched naked or clothed. The Gymnopaedes are divided into two ” orders ” — Oscines and Volucres — the former intended to be identical with the group of the same name established by older authors, and, in accordance with the observations of Keyserling and Blasius already mentioned, divided into two “series” — Laminiplantares, having the hinder part of the ” tarsus ” covered with two horny plates, and Scutelliplantares, in which the same part is scutellated. These Laminiplantares are composed of six cohorts as follows: —

Cohors 1. Cicklomorphae.

Cohors 2. Coniroslres.

Cohors 3. Coliomorphae.

Cohors 4. Certhiomorphae. — 3 families: tree-creepers, nut-hatches.

Cohors 5. Cinnyrimorphae. — 5 families: sun-birds, honey-suckers.

Cohors 6. Chelidonomorphae. — I family : swallows.

The Scutelliplantares include a much smaller number of forms, and, with the exception of the first ” cohort ” and a few groups of the fourth and fifth, all are peculiar to America.

Cohors 1. Holaspideae.

Cohors 2. Endaspideae.

Cohors 3. Exaspideae.

Cohors 4; Pycnaspideae.

Cohors 5. Taxaspideae.

We then arrive at the second order Volucres, which is divided into two ” series.” Of these the first is made to contain, under the name Zygodactyli,

Cohors 1. Psittaci.

Cohors 2. Pici.

Cohors 3. Coccyges.

Cohors 4. Coenomorphae.

Cohors 5. Ampligulares.

Cohors 6. Longilingues or Mellisugae.

Cohors 7. Syndactylae.

Cohors 8. Peristeroideae.

The Dasypaedes of Sundevall are separated into six ” orders “; but these will occupy us but a short while. The first of them, Accipitres, comprehending all the birds-of-prey, were separated into 4 ” cohorts ” in his original work, but these were reduced in his appendix to two — Nyctharpages or owls with 4 families divided into 2 series, and Hemeroharpages containing all the rest, and comprising 10 families (the last of which is the seriema, Dicholoplrjs) divided into 2 groups as Rapaces and Saprophagi — the latter including the vultures. Next stands the order Gallinae with 4 “cohorts “•

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(1) Tetraonomorphae, comprising 2 families, the sand-grouse

(Pterocles) and the grouse proper, among which the Central American Oreophasis finds itself; (2) Phasianomorphae, with 4 families, pheasants pea- cocks, turkeys, guinea fowls, partridges, quails, and hemipodes (Turnix); (3) Macronyches, the megapodes, with 2 families; (4) the Duodecimpennatae, the curassows and guans, also with 2 families; (5) the Struthioniformes, composed of the tinamous; and (6) the Subgrallatores with 2 families, one consisting of the curious South American genera Thinocorus and Attagis and the other of the sheath-bill (Chionis). The fifth order (the third of the Dasypaedes) is formed by the Grallatores, divided into 2 ” series ” — (1) Altinares, consisting of 2 ” cohorts,” Herodii with I family, the herons, and Pelargi with 4 families, spoonbills, ibises, storks, and the umbre (Scopus), with Balaeniceps ; (2) Humilinares, also consisting of 2 “cohorts,” Limicolae with 2 families, sandpipers and snipes, stilts and avocets, and Cursores with 8 families, including plovers, bustards, cranes, rails, and all the other ” waders.” The sixth order, Natatores, consists of all the birds that habitually swim and a few that do not, containing 6 “cohorts”: Longipennes and Pygopodes with 3 families each; Totipalmaiae with I family; Tubinares with 3 families; Impennes with 1 family, penguins; and Lamellirostres with 2 families, flamingoes and ducks. The seventh ofder, Proceres, is divided into 2 ” cohorts ” — Vert with 2 families, ostriches and emeus; and Subnobiles, consisting of the genus Apteryx. The eighth order is formed by the Saururae.

Later systems of classification owe much to anatomy, and the pioneers in the modern advances in this respect were A. H.

Garrod and W. A. Forbes, two brilliant and short- s’ stems l*ved young men who occupied successively the post

of prosector to the Zoological Society of London, and who made a rich use of the material provided by the collection of that society. Garrod was the more skilled and ingenious anatomist, Forbes had a greater acquaintance with the ornith- ology of museums and collectors. Garrod founded his system (1874) on muscular anatomy, making the two major divisions of Aves (his Homalogonatae and Anomalogonatae, depend in the first instance on the presence or absence of a peculiar muscular slip in the leg, known as the ambiens, although indeed he expressly stated that this was not on account of the intrinsic importance of the muscle in question, but because of its invariable association with other peculiarities. The system of Forbes was reconstructed after his death from notebook jottings, and neither Garrod nor Forbes have left any permanent mark on the classification of birds, although the material they furnished and the lines they indicated have proved valuable in later hands. In 1880 Dr P. L. Sclater

published in the Ibis a classification which was mainly a revision of the system of Huxley, modified by the investigations of Garrod and Forbes and by his own large acquaintance with museum specimens.

In the article ” Ornithology ” in the ninth edition of this encyclopaedia, A. Newton accepted the three subclasses of Huxley, Saururae, Ratitae and Carinitae, and made a series of cautious but critical observations on the minor divisions of the Carinates. In 1882 A. Reichenow in Die Vogel der zoolo- gischen Garten published a classification of birds with a phylo- genetic tree. In this he departed considerably from the lines that had been made familiar by English workers, and made great use of natural characteristics. The next attempt of import- ance appeared in the American Standard Natural History, pub- lished in Boston in 1885. The volume on birds was written by Dr L. Stejneger and was founded on Elliot Coues’s Key to North American Birds. Apart from its intrinsic merits as a learned and valuable addition to classification, this work is interesting in the history of ornithology because of the wholesale changes of nomenclature it introduced as the result of much diligence and zeal in the application of the strict rule of priority to the names of birds.

In 1888 there was published the huge monograph by Max Fiirbringer entitled Unlersuchungen zur Morphologie und Systematik der Vogel. In addition to an enormous body of new information chiefly on the shoulder girdle, the alar muscles and the nerve plexuses of birds, this work contained a critical and descriptive summary of practically the whole pre-existing literature on the structure of birds, and it is hardly necessary for the student of ornithology to refer to earlier literature at first hand. Fiirbringer supposes that birds must have begun with toothed forms of small or moderate size, with long tails and four lizard-like feet and bodies clothed with a primitive kind of down. To these succeeded forms where the down had developed into body feathers for warmth, not flight, whilst the fore-limbs had become organs of prehension, the hind-limbs of progression. In such bipedal creatures the legs and pelvis became transformed to a condition similar to that of Dinosaurian reptiles. Many of them were climbing animals, and from these true birds with the power of flight were developed. In the course of this evolution there were many cases of arrest or degradation, and one of the most novel of the ideas of Fiirbringer, and one now accepted by not a few anatomists, was that the ratites or ostrich-like birds were not a natural group but a set of stages of arrested development or of partial degradation. It is impossible to reproduce here Fiirbringer’s elaborate details and phylogenetic trees with their various horizontal sections, but the following tables give the main outlines: —

Order. Archornithes .

Struthiornithes Rheornithes . hlppalectryornithes

Classis Aves I. Subclassis Saururae Suborder. Gens.

Archaeopterygiformes …. Archaeopteryges II. Subclassis Ornithurae

Struthioniformes Struthiones

Rheiformes Rheae .

Casuariiformes Casuarii

Pelargornithes.

Intermediate suborder :- Aepyornithiformes .

Intermediate suborder: Palamedeiformes .

Anseriformes

Family. Archaeopterygidae.

Struthionidae. Rheidae.

(Dromaeidae + Casuariidae + Dro- mornithidae).

Aepyornithes Aepyornithidae.

Podicipitiformes

Ciconiiformes

Palamedae

Gastornithes

Anseres or Lamellirostres

Enaliornithes . .

Hesperornithes

Colymbo-Podicipites . Phoenicopteri . . . .

Pelargo-Herodii

Accipitres (Hemeroharpages, Pdargoharpages)

Steganopodes

Palamedeidae.

Gastornithidae.

Anatidae.

Enaliornithidae.

Hesperornithidae.

Colymbidae.

Podicipidae.

Palaeolodidae.

Phoenicopteridae.

(Plataleidae or Hemiglottides. Ciconiidae or Pelargi. Scopidae. Ardeidae or Herodii. Balaenicipitidae. {Gypogeranidae. Cathartidae. Gypo-Falconidae. tPhaetontidae. Phalacrocoracidae. Pelecanidae. Fregatidae.

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ORODES

Order.

CHARADRIORNITHES(Aegialor.

nithes)

Suborder. Intermediate suborder :—

Procellariiformes . Intermediate suborder: —

Aptenodytiformes Intermediate suborder: —

Gens.

Family.

Pfocellariae or Tubinares.

Ichthyornithiformes

Charadriif ormes

Aptenodytes or Impennes Ichthyornithes

Procellariidae. Aptenodytidae.

Alectorornithes (Chameor- nithes)

Ichthyornithidae. Apatornithidae. (Charadriidae.

Charadrii J Glareolidae.

[Dromadidae. Laro-Limicolae . . . . Chionididae.

Laridae. Alcidae. Thinocoridae. Parrae ……. Paridae.

/-…. S Oedicnemidae.

0t,des | Otididae

f Eurypygidae.

f Eurypygae < Rhinochetidae.

[Aptornithidae.

{(” Gruidae. Grues J Psophiidae. 1 Cariamidae. _ ,. . (Heliornithiriae.

Fuhcanae • Rallidae. Hemipodii. ... . .jEˆ dae .

a + \ Apterygidae.

Apterygiformes Apteryges . . . . . ˆ Dinornithidae.

Crypturiformes . . . . . Crypturi Crypturidae.

alHdae j Sd

Intermediate suborder:- Gruiformes . .

Intermediate suborder: —

t.

Galliformes

Intermediate suborder: — Columbiformes

(Opisthocomidae

A

[Gallidae or Alectoropodes.

Pterocletes Pteroclidae.

Columbae …... \ Dididae.

Columbidae.

Intermediate suborder: — .

Psittaciformes Psittaci

Coracornithes (Dendrorni- thes)

‘Coccygiformes Coccyges . . .

Intermediate gens:-

Galbulae

Pico- Passerif ormes

Pici

Psittacidae.

Musophagidae.

Cuculidae.

Bucconidae.

Galbulidae. f Capitonidae. J Rhamphastidae.

Passeres

Pico-Passeres 1 Indicatoridae.

[Picidae.

S Pseudoscines.

I Passeridae or Passeres.

Makrochires ? yp v}ˆ 6-

(1 rochihdae.

. Colii . Coliidae.

Intermediate gens: —

Trogones Trogonidae.

fHalcyones i Kf f

Halcyoniformes J g

iucerotes

[Meropes … Intermediate gens:-

Alcedinidae. Upupidae. Bucerotidae. Meropidae.

Todi ‘ Coraciae

Coraciif ormes

Whilst Fiirbringer was engaged on his gigantic task, Dr Hans Gadow was preparing the ornithological volume of Bronn’s Thier-Reich. The two authors were in constant communication, and the classifications they adopted had much in common. It is unnecessary here to discuss the views of Gadow, as that author himself has contributed the article Bird to this edition of the Encyclopaedia Britannica, and has there set forth his revised scheme. (A. N.; P. C. M.)

ORODES (also called Hyrodes, Pers. Hurauda), the name of two Parthian kings.

i. Orodes I., son of Phraates III., whom he murdered in 57 B.C., assisted by his brother Mithradates III. This Mithra- dates was made king of Media, but soon afterwards was expelled by Orodes and fled into Syria. Thence he invaded the Parthian kingdom, but having reigned for a short time (55) was besieged by Surenas, general of Orodes, in Seleucia, and after a prolonged

Momotidae. Todidae. Coraciidae. } Leptosomidae. f Caprimulgidae. Caprimulgi . . . . . < Steatornithidae.

resistance was captured and slain. Meanwhile Crassus had begun his attempt to conquer the east, but he was defeated and killed in 53 at Carrhae by Surenas, while Orodes himself invaded Armenia and forced King Artavasdes, the son of Ti- granes, to abandon the Romans. By the victory of Carrhae the countries east of the Euphrates were secured to the Parthians. In the next year they invaded Syria, but with little success, for Surenas, whose achievements had mao.e him too dangerousˆ was killed by Orodes (Plut. Crass. 33), and Pacorus, the young son of the king, was defeated by C. Cassius in 51. During the civil war the Parthians sided first with Pompey and then with Brutus and Cassius, but took no action until 40 B.C., when Pacorus, assisted by the Roman deserter Labienus, conquered a great part of Syria and Asia Minor, but was.defeated and killed by Ventidius in 38 (see Pacorus). The old king, Orodes, who was deeply afflicted by the death of his gallant son, appointed

his son Phraates IV. successor, but was soon afterwards killed by him (37 B.C.; Dio. Cass. 49.23; Justin 42.4; Hut. Crassus, 33). Plutarch relates that Orodes understood Greek very well; after the death of Crassus the Bacchae of Euripides were repre- sented at his court (Plut. Crass. 33).

2. Orodes II., raised to the throne by the magnates after the death of Phraates V. about a.d. 5, was killed after a short reign “on account of his extreme cruelty” (Joseph. Ant. xviii. 2, 4). (Ed. M.)

OROGRAPHY (Gr. opos, mountain, ypaeiv, to write), that part of physical geography which deals, with the geological formation, the surface features and description of mountains. The terms ” oreography,” ” orology” and “oreology” are also sometimes used.

ORONTES, the ancient name of the chief Syrian river, also called Draco, Typhon and Axius, the last a native form, from whose revival, or continuous employment in native speech, has proceeded the modern name ‘Asi (“rebel”), which is variously interpreted by Arabs as referring to the stream’s impetuosity, to its unproductive channel, or to the fact that it flows away from Mecca. The Orontes rises in the great springs of Labweh on the east side of the Buka’a, or inter-Lebanon district, very near the fountains of the southward-flowing

Litani, and it runs due north, parallel with the coast, falling 2000 ft. through a rocky gorge. Leaving this it expands into the Lake of Horns, having been dammed back in antiquity. The valley now widens out into the rich district of Hamah {Hamaih-Epiphaneia), below which lie the broad meadow-lands of Ghab, containing the sites of ancient Apamea and Larissa. This central Orontes valley ends at the rocky barrier of Jisr al-Hadid, where the river is diverted to the west, and the plain of Antioch opens. Two large tributaries from the N., the Afrln and Kara Su, here reach it through the former Lake of Antioch, which is now drained through an artificial channel (Nahr al-Kowsit). Passing N. of the modern Antakia (Antioch) the Orontes plunges S.W. into a gorge (compared by the ancients to Tempe), and falls 150 ft. in 10 m. to the sea just south of the little port of Suedia (anc. Seleucia Pieriae), after a total course of 170 m. Mainly un- navigable and of little use for irrigation, the Orontes derives its historical importance solely from the convenience of its valley for traffic from N. to S. Roads from N. and N.E., con- verging at Antioch, follow the course of the stream up to Horns, where they fork to Damascus and to Coele-Syria and the S.; and along its valley have passed the armies and traffic bound to and from Egypt in all ages. (See Antioch and Homs.) (D. G. H.)

OROPUS, a Greek seaport, on the EuripUs, in the district n«pcuKi7, opposite Eretria. It was a border city between Boeotia and Attica, and its possession was a continual cause of dispute between the two countries; but at last it came into the final possession of Athens, and is always alluded to under the Roman empire as an Attic town. The actual harbour, which was called Delphinium, was at the mouth of the Asopus, about a mile north of the city. A village still called Oropo occupies the site of the ancient town. The famous oracle of Amphiaraus was situated in the territory of Oropus, 12 stadia from the city. The site has been excavated by the Greek Archaeological Society; it contained a temple, a sacred spring, into which coins were thrown by worshippers, altars and porti- coes, and a small theatre, of which the proscenium is well pre- served. Worshippers used to consult the oracle of Amphiaraus by sleeping on the skin of a slaughtered ram within the sacred building.

OROSIUS, PAULUS (fl. 415), historian and theologian, was born in Spain (possibly at Braga in Galicia) towards the close of the 4th century. Having entered the Christian priesthood, he naturally took an interest in the Priscillianist controversy then going on in his native country, and it may have been in connexion with this that he went to consult Augustine at Hippo in 413 or 414. After staying for some time in Africa as the dis- ciple of Augustine, he was sent by him in 415 to

Palestine with a letter of introduction to Jerome, then at Bethlehem. The

ostensible purpose of his mission (apart, of course, from those of pilgrimage and perhaps relic-hunting) was that he might gain further instruction from Jerome on the points raised by the Priscillianists and Origenists; but in reality, it would seem, his business was to stir up and assist Jerome and others against Pelagius, who, since the synod of Carthage in 411, had been living in Palestine, and finding some acceptance there. The result of his arrival was that John, bishop of Jerusalem, was induced to summon at his capital in June 415 a synod at which Orosius communicated the decisions of Carthage and read such of Augustine's writings against Pelagius as had at that time appeared. Success, however, was scarcely to be hoped for amongst Orientals who did not understand Latin, and whose sense of reverence was unshocked by the question of Pelagius, et guts est mihi Augustinus? All that Orosius succeeded in obtaining was John's consent to send letters and deputies to Innocent of Rome; and, after having waited long enough to learn the unfavourable decision of the synod of Diospolis or Lydda in December of the same year, be returned to north Africa, where he is believed to have died. According to Gen- nadius he carried with him recently discovered relics of the protomartyr Stephen from Palestine to Minorca, where they were efficacious in converting the Jews.

The earliest work of Orosius, Consultatio she commonitorium ad Augustinum de err ore Priscillianistarum et Origenistarum, explains its object by its title ; it was written soon after his arrival in Africa, and is usually printed in the works of Augustine along with the reply of the latter, Contra Priscillianistas et Origenistas liber \ad Orosium. His next treatise, Liber apologeticus de arbitrii libertate, was written during his stay in Palestine, and in connexion with the controversy which engaged him there. It is a keen but not always fair criticism of the Pelagian position from that of Augustine. The Historiae adversum Paganos was undertaken at the suggestion of Augustine, to whom it is dedicated. When Augustine proposed this task he had already planned and made some progress with his own De civitate Dei; it is the same argument that is elaborated by his disciple, namely, the evidence from history that the circum- stances of the world had not really become worse since the intro- duction of Christianity. The work, which is thus a pragmatical chronicle of the calamities that have happened to mankind from the fall down to the Gothic period, has little accuracy or learning, and even less of literary charm to commend it ; but it was the first attempt to write the history of the world as a history of God guiding humanity. Its purpose gave it value in the eyes of the

orthodox, and the Hormesta, Ormesta, or Ormista as it was called, no one knows why (from Or[osii] M[undi] Hist[oria] or from de miseria mundil see Morner, p. 180, for list of guesses), speedily attained a wide popularity. Nearly two hundred MSS. of it have survived. A free ˆbridged translation by King Alfred is still extant (Old English text, with original in Latin, edited by H. Sweet, 1883). The editio princeps of the original appeared at Augsburg (1471); that of Haverkamp (Leiden, 1738 and 1767) has now been superseded by C. Zangemeister, who has edited the Hist, and also the Lib. apol. in vol. v. of the Corp. scr. eccl. Lat. (Vienna, 1882), as well as an edit. min. (Leipzig, Teubner, 1889). The ” sources ” made use of by Orosius have been investigated by T. de Morner (De Orosiivita ejusque hist. libr. vii. adversus Paganos, 1844); besides the Old and New Testaments, he appears to have consulted Caesar, Livy, Justin, Tacitus, Suetonius, Florus and a cosmography, attaching also great value to Jerome’s translation of the Chronicles of Eusebius.

ORPHAN, the term used of one who has lost both parents by death, sometimes of one who has lost father or mother only. In Law, an orphan is such a person who is under age. The Late Lat. orpharius, from which the word, chiefly owing to its use in the Vulgate, was adopted into English, is a transliteration of bp4>a.v6s, in the same sense, the original meaning being ” bereft of,” ” destitute,” classical Lat. orbus. The Old English word for an orphan was stedpcild, stepchild. By the custom of the city of London, the lord mayor and aldermen, in the Court of Orphans, have the guardianship of the children still under age of deceased freemen. Orphans’ courts exist for the guardian- ship of orphans and administration of their estates in Delaware, Maryland, New Jersey and Pennsylvania in the United States. In other states these are performed by officers of the Probate Court, known as ” surrogates,” or by other titles.

ORPHEUS, in Greek legend, the chief representative of the art of song and playing on the lyre, and of great importance in the religious history of Greece. The derivation of the name is uncertain, the most probable being that which connects it with

6p0-(” dark,” opfy’aios, 6pt>T]). In accordance with this, Orpheus ‘ may have been originally a god of darkness; or the liberator from the power of darkness by his gift of song; or he may have been so called because his rites were celebrated by night (cf. Dionysus Nyctelius). It

is possible, but very improbable, that Orpheus was an historical personage; even in ancient times his existence was denied. According to Maass, he was a chthonian deity, the counterpart of Dionysus, with whom he is closely connected; J. E. Harrison, however, regards him as a religious reformer from Crete, who introduced the doctrine of ecstasis without intoxication amongst the Thracians and was slain by the votaries of the frenzied ritual. S. Reinach sees in him the fox roaming " in the darkness," to the Thracians a personification of the wine-god, torn in pieces by the Bassarae (fox-maidens). Although by some he was held to be a Greek, the tradition of his Thracian origin was most generally accepted. His name does not occur in Homer or Hesiod, but he was known in the time of Ibycus (c. 530 B.C.), and Pindar (522-442 B.C.) speaks of him as " the father of songs." From the 6th century onwards he was looked upon as one of the chief poets and musicians of antiquity, the inventor or perfecter of the lyre, who by his music and singing was able not only to charm the wild beasts, but even to draw the trees and rocks from their places, and to arrest the rivers in their course. As one of the pioneers of civilization, he was supposed to have taught mankind the arts of medicine, writing and agriculture. As closely connected with religious life, he was an augur and seer; practised magical arts, especially astrology; founded or rendered accessible many important cults, such as those of Apollo and Dionysus; instituted mystic rites, both public and private; prescribed initiatory and puri- ficatory ritual. He was said to have visited Egypt, and to have become acquainted there with the writings of Moses and with the doctrine of a future life.

According to the best-known tradition, Orpheus was the son of Oeagrus, king of Thrace, and the muse Calliope. During his residence in Thrace he joined the expedition of the Argonauts, whose leader Jason had been informed by Chiron that only by the aid of Orpheus would they be able to pass by the Sirens un- scathed. His numerous services during the journey are described in the Argonautica that goes under his name; But the most famous story in which he figures is that of his wife Eurydice. While fleeing from Aristaeus, she was bitten by a serpent and died. Orpheus went down to the lower world and by his music softened the heart of Pluto and Persephone, who allowed Eurydice to return with him to earth. But the condition was attached that he should walk in front of her and not look back until he had reached the upper world. In his anxiety he broke his promise, and Eurydice vanished again from his sight. The story in this form belongs to the time of Virgil, who first introduces the name of Aristaeus. Other ancient writers, however, speak of his visit to the underworld; according to Plato, the infernal gods only " presented an apparition"

of Eurydice to him.

After the death of Eurydice, Orpheus rejected the advances of the Thracian women, who, jealous of his faithfulness to the memory of his lost wife, tore him to pieces during the frenzy of the Bacchic orgies. His head and lyre floated ” down the swift Hebrus to the Lesbian shore,” where the inhabitants buried his head and a shrine was built in his honour near Antissa. The lyre was carried to heaven by the Muses, and was placed amongst the stars. The Muses also gathered up the fragments of his body and buried them at Leibethra below Olympus, where the nightingales sang over his grave, while yet another legend places his tomb at Dium, near Pydna in Macedonia. Other accounts of his death are: that he killed himself from grief at the failure of his journey to Hades; that he was struck with lightning by Zeus for having revealed the mysteries of the gods to men; or he was torn to pieces by the Maenads for having abandoned the cult of Dionysus for that of Apollo.

According to Gruppe, the legend of the death of Orpheus is a late imitation of the Adonis-Osiris myth. Osiris, like Orpheus, is torn in pieces, and his head floats down every year from Egypt to Byblus; the body of Attis, the Phrygian counterpart of Adonis, like that of Orpheus, does not suffer decay. The story is repeated

of Dionysus; he is torn in pieces, and his head is carried down to Lesbos. Without going so far as to assert that Orpheus is a hypo- stasis of Dionysus, there is no doubt that a close connexion existed between them from very early times. According to Frazer, these traditions may be ” distorted reminiscences ” of the practice of human sacrifice, especially of divine kings, the object of which was to ensure fertility in the animal and vegetable worlds. Orpheus, in the manner of his death, was considered to personate the god Dionysus, and was thus the representative of the god torn to pieces every year, a ceremony enacted by the Bacchae in the earliest times with a human victim, afterwards with a bull to represent the bull-formed god. A distinct feature of this ritual was difioQayla. (eating the flesh of the victim raw), whereby the communicants imagined that they consumed and assimilated the god represented by the victim, and thus became filled with the divine ecstasy. A. W. Bather (Journ. Hell. Studies, xiv. p. 254) sees in the myth an allusion to a ritual, the object of which is the expulsion of death or winter. It is possible that the floating of the head of Orpheus to Lesbos has reference to the fact that the island was the first home of lyric poetry, and may be symbolical of the route taken by the Aeolian emigrants from Thessaly on their way to their new home in Asia Minor.

The name of Orpheus is equally important in the religious history of Greece. He was the mythic founder of a religious school or sect, with a code of rules of life, a mystic eclectic theo- logy, a system of purificatory and expiatory rites, and peculiar mysteries. This school is first observable under the rule of Peisistratus at Athens in the 6th century B.C. Its doctrines are founded on two elements: the Thraco-Phrygian religion of Dionysus with its enthusiastic orgies, .‘its mysteries and its purifications, and the tendency to philosophic speculation on the nature and mutual relations of the numerous gods, developed at this time by intercourse with Egypt and the East, and by the quickened intercourse between different tribes and different religions in Greece itself. These causes produced similar results in different parts of Greece. The close analogy between Pytha- goreanism and Orphism has been recognized from Herodotus (ii. 81) to the latest modern writers. Both inculcated a peculiar kind of ascetic life; both had a mystical speculative theory of religion, with purificatory rites, abstinence from beans, &c; but Orphism was more especially religious, while Pythagoreanism, at least originally, inclined more to be a political and philosophical creed.

The rules of the Orphic life prescribed abstinence from beans, flesh, certain kinds of fish, &c, the wearing of a special kind of clothes, and

numerous other practices and abstinences. The ritual of worship was peculiar, not admitting bloody sacrifices. The belief was taught in the homogeneity of all living things, in the doctrine of original sin, in the transmigration of souls, in the view that the soul is entombed in the body (

The chief ceremonies of the nightly ritual were sacrifice and libation; prayer and purification; the representation of sacred legends (e.g. the myth of Zagreus, the chief object of worship, who was identified with most of the numerous gods of the Orphic pantheon); the rape of Persephone;, and the descent into Hades. These were introduced as a ” sacred explanation” (lepds X670S) of the rules and prescriptions. To these also belong the rite of ayia.,a.nd the communication of liturgical formulae for the guidance of the soul of the dead man on his way to the underworld, which also served as credentials to the gods below. Some of the so-called ” Orphic tablets,” metrical inscriptions engraved on small plates of gold, chiefly dating from the 4th and 3rd centuries B.C., have been discovered in tombs in southern Italy, Crete and Rome.

It does not appear, however, that a regularly organized or numerous Orphic sect ever existed, nor that Orphism ever became popular; it was too abstract, too full of symbolism. On the other hand, the genuine Orphics, a fraternity of religious ascetics, found unscrupulous imitators and impostors, who preyed upon the credulous and ignorant. Such were the Orpheotelestae or Metragyrtae, wandering priests who went round the country with an ass carrying the sacred properties (Aristophanes, Frogs, 159) and a bundle of sacred books. They promised an easy expiation for crimes to both living and

dead on payment of a fee, undertook to punish the enemies of their clients, and held out to them the prospect of perpetual banqueting and drinking-bouts in Paradise.

A large number of writings in the tone of the Orphic religion were ascribed to Orpheus. They dealt with such subjects as the origin of the gods, the creation of the world, the ritual of purification and initiation, and oracular responses. These poems were recited at rhapsodic contests together with those of Homer and Hesiod, and Orphic hymns were used in the Eleusinian mysteries. 1 The best-known name in connexion with them is that of Onomacritus (?.».),

who, in the time of the Peisistratidae, made a collection (including forgeries of his own) of Orphic songs and legends. In later times Orphic theology engaged the attention of Greek philosophers — Eudemus the Peripatetic, Chrysippus the Stoic, and Proclus the Neoplatonist, but it was an especially favourite study of the grammarians of Alexandria, where it became so intermixed with Egyptian elements that Orpheus came to be looked upon as the founder of mysticism. The ” rhapsodic theogony ” in particular exercised great influence on Neoplatonism. The Orphic literature (of which only fragments remain) was united in a corpus, called to ‘Op< £ucd, the chief poem in which was -q toD 'Op< £«os 660X07(0. It also included a collection of Orphic hymns, liturgic songs, practical treatises, and poems on various subjects. The so-called Orphic Poems, still extant, are of much later date, probably belonging to the 4th century A.D. ; they consist of: (1) an Argonautica, glorify- ing the deeds of Orpheus on the " Argo," (2) a didactic poem on the magic powers of stones, called Lithica, (3) eighty-seven hymns on various divinities and personified forces of nature. Some of these hymns are probably earlier (1st and 2nd centuries). The Orphic poems also played an important part in the controversies between Christian and pagan writers in the 3rd and 4th centuries after Christ; pagan writers quoted them to show the real meaning of the multitude of gods, while Christians retorted by reference to the obscene and disgraceful fictions by which the former degraded their gods.

Bibliography. — C. A. Lobeck’s Aglaophamus (1829) is still indispensable. Of more modern writings on Orpheus and Orphism the following may be consulted. The articles by O. Gruppe in Roscher’s Lexikon der Mythologie and by P. Monceaux in Daremberg and Saglio’s Dictionnaire des antiquites; ” Orphica ” in Smith’s Dictionary of Greek and Roman Antiquities (3rd ed., 1891), by L. C. Purser; J. E. Harrison, Prolegomena to the Study of Greek Religion (2nd ed., 1908, with a critical appendix by Gilbert Murray on the Orphic tablets) ; E. Rohde, Psyche, ii. (1907), and article in Heidel- berger Jahrbucher (1896); E. W. Maass, Orpheus (1895); S. Reinach, “La mort d’Orphee ” in Cultes, mylhes, et religions, ii. (1906); 0. Gruppe, Griechische Mythologie, ii. (1906), pp. 1028-1041 ; T. Gomperz, Greek Thinkers, i. (Eng. trans., 1901), pp. 84-90, 123-147; E. Gerhard, tlber Orpheus und die Orphiker (1861); A. Dieterich, Nekyia (1893), pp. 72-108, 136-162, 225-232; O. Kern, De Orphei, Epimenidis, Pherecydis theogoniis (1888); O. Gruppe, Die rhap- sodische Theogonie (1890); A. Dieterich, De hymnis Orphicis (1891); G. F. Schomann, Griechische Alterthiimer, ii. (ed. J. H. Lipsius, 1902), p. 378; P. Stengel, Die griechischen Kultusaltertiimer (1898), p. 150.

There is an edition of the Orphic Fragments and of the poems by E. Abel (1885). The Argonautica has been edited separately by J. W. Schneider (1803), the Lithica by T. Tyrwhitt (179 1). and there is an English translation of the Hymns by T. Taylor (re- printed, 1896).

On the representations of Orpheus in heathen and Christian art (in which he is finally transformed into the Good Shepherd with his sheep), see A. Baumeister, Denkmdler des classischen Altertums, ii. p. 1 120; P. Knapp, Vber Orpheusdarstellungen (Tubingen, 1895); F. X. Kraus, Realencyklopadie des christlichen Alterthums, ii. (1886); J. A. Martigny, Dictionnaire des anliquMs chretiennes (1889); A. Heussner, Die altchristlichen Orpheusdarstellungen (Leipzig, 1893); and the articles in Roscher's and Daremberg and Saglio's Lexicons.

The story of Orpheus, as was to be expected of a legend told both by Ovid and Boetius, retained its popularity throughout the middle ages and was transformed into the likeness of a northern fairy tale. In English medieval literature it appears in three some- what different versions: Sir Orpheo, a "lay of Brittany" printed from the Harleian MS. in J. Ritson's Ancient English Metrical Romances, vol. ii. (1802); Orpheo and Heurodis from the Auchinleck MS. in David Laing's Select Remains of the Ancient Popular Poetry of Scotland (new ed., 1885); and Kyng Orfew from the Ashmolean MS. in J.O. HaUiwelFs Illustrations of Fairy Mythology (Shakespeare Soc., 1842). The poems show traces of French influence.

(J. H. F.;X.)

ORPHREY, gold or other richly ornamented embroidery, particularly an embroidered border on an ecclesiastical vestment (see Vestments). The word is from O. Fr. orfreis, mod. orfroi, from med. Lat. aurifrisium, aurifrigium, &c, for auriphrygium,

l For Orphism in relation to the Eleusinian and other mysteries see Mystery.

aurum, gold, and phrygium, Phrygian; a name given to gold-embroidered tissues, also known as vestes Phrygiae, the Phrygians being famous for their skill in embroidering in gold.

ORPIHENT (auripigmentum) , arsenic trisulphide, AS2S3, or yellow realgar (q.v.), occurring in small quantities as a mineral crystallizing in the rhombic system and of a brilliant golden- yellow colour in Bohemia, Peru, &c. For industrial purposes an artificial orpiment is manufactured by subliming one part of sulphur with two of arsenic

trioxide. The sublimate varies in colour from yellow to red, according to the intimacy of the combination of the ingredients; and by varying the relative quantities used many intermediate tones may be obtained. These artificial preparations are highly poisonous. Formerly, under the name of ” king’s yellow,” a preparation of orpiment was in considerable use as a pigment, but now it has been largely superseded by chrome-yellow. It was also at one time used in dyeing and calico-printing, and for the unhairing of skins, &c; but safer and equally efficient substitutes have been found.

ORPINGTON, a town in the Dartford parliamentary division of Kent, England, 13! m. S.E. of London, and 2\ m. S. by E. of Chislehurst, on the South-Eastern & Chatham railway. Pop. (1901), 4259. The church (Early English) contains some carved woodwork and ancient brasses. An old mansion called the Priory dates in part from 1393. The oak-panelled hall and the principal rooms are of the 15th century. In 1873 John Ruskin set up at Orpington a private publishing house for his works, in the hands of his friend George Allen. Fruit and hops are extensively grown in the neighbourhood. From its pleasant situation in a hilly, wooded district near the headwaters of the Cray stream, Orpington has become in modern times a favourite residential locality for those whose business lies in London. A line of populous villages extends down the valley between Orpington and Bexley — St Mary Cray (pop. 1894), St Paul’s Cray (1207), Foots Cray (an urban district, 5817), and North Cray.

ORRERY, 2 CHARLES BOYLE, 4 th Earl of (1676-1731),- the second son of Roger, 2nd earl, was born at Chelsea in 1676”. He was educated at Christ Church, Oxford, and soon distin- guished himself by his learning and abilities. Like the first earl, he was an author, soldier and statesman. He translated Plutarch’s life of Lysander, and published an edition of the epistles of Phalaris, which engaged him in the famous controversy with Bentley. He was three times member for the town of Hunting- don; and on the death of his brother, Lionel, 3rd earl, in 1703, he succeeded to the title. He entered the army, and in 1709 was raised to the rank of major-general, and sworn one of her Majesty’s privy council. At the battle of the Wood he acted with distinguished bravery. He was appointed queen’s envoy to the states of Brabant and Flanders; and having discharged this trust with ability, he was created an English peer, as Baron Boyle of Marston, in Somersetshire. He received several additional honours in the reign of George I.; but having had the misfortune to fall under the suspicion of the government he was committed to the Tower, where he remained six months, and was then admitted to bail. On a subsequent inquiry it was found impossible to criminate him, and he was discharged. He

died on the 28th of August 1731. Among the works of Roger, earl of Orrery, will be found a comedy, entitled As you find it, written by Charles Boyle. His son John (see Cork, Earls op), the 5th earl of Orrery, succeeded to the earldom of Cork on the failure of the elder branch of the Boyle family, as earl of Cork and Orrery.

ORRERY, ROGER BOYLE, ist Earl of (1621-1679), British soldier, statesman and' dramatist, 3rd surviving son of Richard Boyle, ist earl of Cork, was born on the 25th of April 1621, created baron of Broghill on the 28th of February 1627, and educated at Trinity College, Dublin, and, according to Wood,

2 The orrery, an astronomical instrument — consisting of an apparatus which illustrates the motions of the solar system by means of the revolution of balls moved by wheelwork — invented, or at least constructed, by Graham, was named after the earl.

also at Oxford. He travelled in France and Italy, and coming home took part in the expedition against the Scots. He returned to Ireland on the outbreak of the rebellion in 1641 and fought with his brothers at the battle of Liscarrol in September 1642. On the resignation of the marquis of Ormonde, Lord Broghill consented to serve under the parliamentary commissioners till the execution of the king, when he retired altogether from public affairs and took up his residence at Marston in Somersetshire. Subsequently he originated a scheme to bring about the Restora- tion, but when on his way abroad to concert measures with Charles he was unexpectedly visited by Cromwell in London, who, after informing him that his plans were well known to the council, and warning him of the consequence of persisting in them, offered him a command in Ireland against the rebels, which, as it entailed no obligations except faithful service, was accepted. His assistance in Ireland proved invaluable. Appointed master of the ordnance, he soon assembled a body of infantry and horse, and drove the rebels into Kilkenny, where they surrendered. On the 10th of May 1650 he completely defeated at Macroom a force of Irish advancing to the relief of Clonmell, and joining Cromwell assisted in taking the latter place. On Cromwell's departure for Scotland he co-operated with Ireton, whom he joined at the siege of Limerick, and defeated the force marching to its relief under Lord Muskerry, thus effecting the capture of the town. By this time Broghill had become the fast friend and follower of Cromwell, whose stern measures in Ireland and sup-

port of the English and Protestants were welcomed after the policy of concession to the Irish initiated by Charles I. He was returned to Cromwell's parliaments of 1654 and 1656 as member for the county of Cork, and also in the latter assembly for Edinburgh, for which he elected to sit. He served this year as lord president of the council in Scotland, where he won much popularity; and when he returned to England he was included in the inner cabinet of Cromwell's council, and was nominated in 1657 a member of the new house of Lords. He was one of those most in favour of Cromwell's assumption of the royal title, and proposed a union between the Protector's daughter Frances and Charles II. On Cromwell's death he gave his support to Richard; but as he saw no possibility of maintaining the government he left for Ireland, where by resuming his command in Munster he secured the island for Charles and anticipated Monk's overtures by inviting him to land at Cork. He sat for Arundel in the Convention and in the parliament of 1661, and at the Restoration was taken into great favour. On the 5th of September 1660 he was created earl of Orrery. The same year he was appointed a lord justice of Ireland and drew up the Act of Settlement. He continued to exercise his office as lord-president of Munster till 1668, when he resigned it on account of disputes with the duke of Ormonde, the lord-lieutenant. On the 25th of November he was impeached by the House of Commons for " raising of money by his own authority upon his majesty's subjects," but the prorogation of parliament by the king interrupted the proceedings, which were not afterwards renewed. He died on the 26th of October 1679. He married Lady Margaret Howard, 3rd daughter of Theophilus, 2nd earl of Suffolk, whose charms were celebrated by Suckling in his poem " The Bride." By her he had besides five daughters, two sons, of whom the eldest, Roger (1646-1681 or 1682), succeeded as 2nd earl of Orrery.

In addition to Lord Orrery's achievements as a statesman and administrator, he gained some reputation as a writer and a dramatist. He was the author of An Answer to a Scandalous Letter . . . A Full Discovery of the Treachery of the Irish Rebels (1662), printed with the letter itself in his State Letters (1742), another answer to the same letter entitled Irish Colours Displayed . . . being also ascribed to him; Parthenissa, a novel (1654); English Adventures by a Person of Honour (1676), whence Otway drew his tragedy of the Orphan; Treatise of the Art of War (1677), a work of considerable historical value ; poems, of little interest, including verses On His Majesty's Happy Restoration (unprinted), On the Death of Abraham Cowley (1677), The Dream (unprinted), Poems on most of the Festivals of the Church (1681); plays in verse, of some literary but -no dramatic merit,

of which Henry V. (1664), Mustapha (1665), Tryphon (acted 1668), The Black Prince (1669), Herod the Great (published 1694), and Altemira (1702) were tragedies, and Guzman (1669) and Mr Anthony

comedies. A collected edition was published in 1737, to which was added the comedy As you find it. The General is also attributed to him.

Authorities. — State Letters of Roger Boyle, 1st Earl of Orrery, ed. with his life by, Th. Morrice (1742); Add. MSS. (Brit. Mus.) 25,287 (letter-book when governor of Munster), and 32,095 sqq. 109-188 (letters); article in the Diet, of Nat. Biog. and authorities there collected; Wood's Athenae Oxonienses, iii. 1200; Biographia Britannica (Kippis) ; Orrery Papers, ed. by Lady Cork and Orrery (!9°3) (Preface) ; Contemporary Hist, of Affairs in Ireland, ed. by John T. Gilbert (1879-1880) ; Cat. of State Pap., Irish and Domestic.

ORRIS-ROOT (apparently a corruption of " iris root"), the rhizomes or underground stems of three species of Iris, I. ger- manica, I. florentina and /. pallida, closely allied plants growing in subtropical and temperate latitudes, but principally identified with North Italy. The three plants are indiscriminately culti- vated in the neighbourhood of Florence as an agricultural product under the name of " ghiaggiuolo." The rhizomes are in August dug up and freed of the rootlets and brown outer bark; they are then dried and packed in casks for sale. In drying they acquire a delicate but distinct odour of violets. As it comes into the market, orris-root is in the form of contorted sticks and irregular knobby pieces up to 4 in. in length, of a compact chalky appearance. It is principally powdered for use in dentifrices arid other scented dry preparations.

ORSEOLO, the name of a Venetian family, three members of which filled the office of doge.

Pietro Orseolo I. (c. 928-997) acted as ambassador to the emperor Otto I. before he was elected doge in August 976. Just previous to this event part of Venice had been burned down and Pietro began the rebuilding of St Mark's church and the ducal palace. He is chiefly celebrated, however, for his piety and his generosity, and after holding office for two years he left Venice secretly and retired to a monastery in Aquitaine, where he passed his remaining days. He was canonized in 1731.

Pietro Orseolo II. (d. 1009), a son of the previous doge, was himself elected to this office in 991. He was a great builder, but his chief work

was to crush the pirates of the Adriatic Sea and to bring a long stretch of the Dalmatian coast under the rule of Venice, thus relieving the commerce of the republic from a great and pressing danger. The fleet which achieved this result was led by the doge in person; it sailed on Ascension Day > the 9th of May 1000, and its progress was attended with uninterrupted success. In honour of this victory the Venetians instituted the ceremony which afterwards grew into the sposa- lizio del mar, or marriage of the sea, and which was celebrated each year on Ascension Day, while the doge added to his title that of duke of Dalmatia. In many other ways Pietro's services to the state were considerable, and he may be said to be one of the chief founders of the commercial greatness of Venice. The doge was on very friendly terms with the emperor Otto III. and also with the emperors at Constantinople, and in 1003 he sailed against the Saracens and compelled them to raise the siege of Bari. In 1003 his son Giovanni was associated with him in the dogeship, and on Giovanni's death in 1007 another son, Ottone, succeeded to this position.

Ottone Orseolo (d.' 1032), whose godfather was the emperor Otto III., became sole doge on his father's death in 1009. He married a sister of St Stephen, king of Hungary, and under his rule Venice was powerful and prosperous. One of his brothers, Orso, was patriarch of Grado, another, Vitalis, was bishop of Torcello, but the growing wealth and influence of the Orseolo family soon filled the Venetians with alarm. About 1024 Ottone and Orso were driven from Venice, but when Orso's rival, Poppo, patriarch of Aquileia, seized Grado, the exiled doge and his brother was recalled and Grado was recovered. In 1026 Ottone was banished; he found a refuge in Constanti- nople,, where he remained until his death, although in 1030 an embassy invited him to return to Venice, where his brother Orso acted as agent for fourteen months. Orso remained patri- arch of Grado until his death in 1045, and another member of the Orseolo family, Domenico, was doge for a single day in 1031. After the fall of the Orseoli the Venetians decreed that no doge should name his successor, or associate any one with Kim in the

dogeship. Ottone's son, Pietro, was king of Hungary for some time after the death of his uncle, St Stephen, in 1038.

See Kohlschutter, Venedig unter dent Herzog Peter II. Orseolo (Gottingen, 1868); H. F. Brown, Venice (1895); F. C. Hodgson. The

Early History of Venice (1901) ; and W. C. Hazlitt, The Venetian Republic (1900).

ORSHA (Polish Orsza), a town of Russia, in the government of Mogilev, 74 m. by rail W.S.W. of Smolensk on the Moscow- Warsaw railway, and on the Dnieper. Pop. (1897), 13,161. It is an important entrepot for grain, seeds and timber. It is a very old town, mentioned in the annals under the name of Rsha in 1067. In the 13th century it was taken by the Lithuanians, who fortified it. In 1604 the Poles founded there a Jesuit college. The Russians besieged Orsha more than once in the 16th and 17th centuries, and finally annexed it in 1772.

ORSINI, the name of a Roman princely family of great anti- quity, whose perpetual feuds with the Colonna are one of the dominant features of the history of medieval Rome. According to tradition the popes Paul I. (757) and Eugenius II. (824) were of the Orsini family, but the probable founder of the house was a certain Ursus (the Bear), about whom very little is known, and the first authentic Orsini pope was Giacinto Orsini, son of Petrus Bobo, who assumed the name of Celestin III. (1191). The latter endowed his nephews with church lands and founded the fortunes of the family, which alone of the Guelf houses was able to confront the Ghibelline Colonna. ” Orsini for the Church ” was their war-cry in opposition to ” Colonna for the people.” In the 13th century the ” Sons of the Bear ” were already powerful and rich, and under Innocent III. they waged incessant war against other families, including that of the pope himself (Conti). In 1241 Matteo Orsini was elected senator qf Rome, and sided with Pope Gregory IX. against the Colonna and the Emperor Frederick II., saving Rome for the Guelfic cause. In 1266 the family acquired Marino, and in 1277 Gio- vanni Orsini was elected pope as Nicholas III. When Boniface VIII. proclaimed a crusade against the Colonna in 1297, the Orsini played a conspicuous part in the expedition and captured Nepi, which the pope granted them as a fief. On the death of Benedict XL (1304) fierce civil warfare broke out in Rome and the Campagna for the election of his successor, and Cardinal Napoleone Orsini appears as the leader of the French faction at the conclave. The Campagna was laid waste by the feuds of the Orsinis, the Colonnas and the Caetanis. At this time the Orsini held the castle of S. Angelo, and a number of palaces on the Monte Giordano, which formed a fortified and walled quarter. In 1332, during the absence of the popes at Avignon, the feuds between Orsini and Colonna, in which even Giovanni Orsini, although cardinal legate, took part, reduced Rome to a state of complete anarchy. We find the Orsini again at war with the Colonna at the time of Rienzi. In 1435 Francesco Orsini was appointed prefect

of Rome, and created duke of Gravina by Pope Eugenius IV. In 1484 war between the Orsini and the Colonna broke out once more, the former supporting the pope (Sixtus IV.). Virginio Orsini led his faction against the rival house's strongholds, which were stormed, the Colonna being thereby completely defeated. The Orsini fortunes waxed and waned many times, and their property was often confiscated, but they always remained a powerful family and gave many soldiers, statesmen and prelates to the church. The title of prince of Solofra was conferred on them in 1620, and that of prince of the Holy Roman Empire in 1629. In 1724 Vincenzo Maria Orsini was elected pope (Benedict XIII.) and. gave his family the title of Roman princes.

Authorities. — F. Sansovino, Storiadi casa Orsina (Venice, 1565) ; F. Gregorovius, Geschichte der Stadt Rom (Stuttgart, 1872); A. von Reumont, Geschichte der Stadt Rom (Berlin, 1868); Almanach de Gotha.

ORSINI, FELICE (1819-1858), Italian revolutionist, was born at Meldola in Romagna. He was destined for an ecclesiastical career, but he soon abandoned that prospect, and became an ardent liberal, joining the Giovane Italia, a society founded by Giuseppe Mazzini. Implicated together with his father in revolutionary plots, he was arrested in 1844 and condemned to

imprisonment for life. The new pope, Pius IX., however, set him free, and he led a company of young Romagnols in the first war of Italian independence (1848), distinguishing himself in the engagements at Treviso and Vicenza. He was elected member of the Roman Constituent Assembly in 1849, and after the fall of the republic he conspired against the papal autocracy once more in the interest of the Mazzinian party. Mazzini sent him on a secret mission to Hungary, but he was arrested in 1854 and imprisoned at Mantua, escaping a few months later. In 1857 he published an account of his prison experiences in English under the title of Austrian Dungeons in Italy, which led to a rupture between him and Mazzini. He then entered into negotia- tions with Ausonio Franchi, editor of the Ragione of Turin, which he proposed to make the organ of the pure republicans. But having become convinced that Napoleon III. was the chief obstacle to Italian independence and the principal cause of the anti-liberal reaction throughout Europe, he went to Paris in 1857 to conspire against him. On the evening of the 14th of January 1858, while the emperor and empress were on their way to the theatre, Orsini and his accomplices threw three bombs at the imperial carriage. The intended victims were unhurt, but several other persons were killed or wounded. Orsini himself was wounded, and at once arrested; on the

nth of February he wrote his famous letter to Napoleon, in which he exhorted him to take up the cause of Italian freedom. He addressed another letter to the youth of Italy, stigmatizing political assassination. He was condemned to death and executed on the 13th of March 1858, meeting his fate with great calmness and bravery. Of his accomplices Pieri also was executed, Rudio was condemned to death but obtained a com- mutation of sentence, and Gomez was condemned to hard labour for life. The importance of Orsini's attempt lies in the fact that it terrified Napoleon, who came to believe that unless he took up the Italian cause other attempts would follow and that sooner or later he would be assassinated. This fear con- tributed not a little to the emperor's subsequent Italian policy.

Bibliography. — Memoirs and Adventures of Felice Orsini written by himself (Edinburgh, 1857, 2nd ed., edited by Ausonio Franchi, Turin, 1858); Lettere edite e inedite di F. 0. (Milan, 1861); Enrico Montazio, I contemporanei I taliani- Felice Orsini (Turin, 1862); La verite sur Orsini, par un ancien proscrit (1879); Angelo Arboit, Tofin e lafuga di Felice Orsini (Cagliari, 1893).

ORTA, LAKE OF, in N. Italy, W. of Lago Maggiore. It has been so named since the 16th century, but was previously called the Lago di San Giulio, the patron of the region — Cusio is a merely poetical name. Its southern end is about 22 m. by rail N.W. of Novara on the main Turin-Milan line, while its north end is about 4 m. by rail S. of the Gravellona-Toce railway station, half-way between Ornavasso and Omegna. It has an area of about £>\ sq. m., it is about 8 m. in length, its greatest depth is 482 ft., and the surface is 951 ft. above sea-level, while its width varies from \ to \ m. Its scenery is characteristically Italian, while the large island of San Giulio (just W. of the village of Orta) has some very picturesque buildings, and takes its name from the local saint, who lived in the 4th century. The chief place is Orta, built on a peninsula projecting from the east shore of the lake, while Omegna is at its northern extremity. It is supposed that the lake is the remnant of a much larger sheet of water by which originally the waters of the Toce or Tosa flowed south towards Novara. As the glaciers retreated the waters flowing from them sank, and were gradually diverted into Lago Maggiore. This explains why no considerable stream feeds the Lake of Orta, while at its north end the Nigoglia torrent flows out of it, but in about \ m. it falls into the Strona, which in turn soon joins the Toce or Tosa, a short distance before this river flows into Lago Maggiore. (W. A. B. C.)

ORTELIUS (Ortels, Wortels), ABRAHAM, next to Mercator the greatest geographer of his age, was born at Antwerp on the 14th of April 1527,

and died in the same city on the 4th of July 1598. He was of German origin, his family coming from Augsburg. He travelled extensively in western Europe, especi- ally in the Netherlands; south and west Germany (e.g. 1560, ‘ I57S, IS78); France (1550-1560, &c); England and Ireland

(1577), and Italy (1578, and perhaps twice or thrice between 1550 and 1558). Beginning as a map-engraver (in 1547 he enters the Antwerp gild of St Luke as aj ‘setter van Karten), his early career is that of a business man, and most of his journeys before 1560 are for commercial purposes (such as his yearly visits to the Frankfort fair). In 1560, however, when travelling with Gerhard Kremer (Mercator) to Trier, Lorraine and Poitiers, he seems to have been attracted, largely by M creator’s influence, towards the career of a scientific geographer; in particular he now devoted himself, at his friend’s suggestion, to the com- pilation of that atlas or Theatre of the World by which he became famous. In 1 564 he completed a mappemonde, which afterwards appeared in the Theatrum. He also published a map of Egypt in 1565 a plan of Britenburg Castle on the coast of Holland, and perhaps a map of Asia, before the appearance of his great work. In 1570 (May 20) was issued, by Gilles Coppens de Diest at Antwerp, Ortelius’ Theatrum Orbis Terrarum, the ” first modern atlas” (of 53 maps). Three Latin editions of this (besides a Flemish, a French and a German) appeared before the end of 1572; twenty-five editions came out before Ortelius’ death in 1598; and several others were published subsequently, for the vogue continued till about 161 2. Most of the maps were admittedly reproductions (a list of 87 authors is given by Ortelius himself), and many discrepancies of delineation or nomenclature occur. Errors, of course, abound, both in general conceptions and in detail; thus South America is very faulty in outline, and in Scotland the Grampians lie between the Forth and the Clyde; but, taken as a whole, this atlas with its accompanying text was a monument of rare erudition and industry. Its immediate precursor and prototype was a collection of thirty- eight maps of European lands, and of Asia, Africa, Tartary and Egypt, gathered together by the wealth and enterprise, and through the agents, of Ortelius’ friend and patron, Gilles Hooft- man, lord of Cleydael and Aertselaer: most of these were printed in Rome, eight or nine only in Belgium. In 1573 Ortelius pub- lished seventeen supplementary maps under the title of Addita- mentum Theatri Orbis Terrarum. By this time he had formed a fine collection of coins, medals and antiques, and this produced (also

in 1573, published by Philippe Galle of Antwerp) his Deorum dearumque capita . . . ex Museo Ortelii (reprinted in Gronovius, Thes. Gr. Ant. vol. vii.). In 1575 he was appointed geographer to the king of Spain, Philip II., on the recommenda- tion of Arius Montanus, who vouched for his orthodoxy (his family, as early as 1535, na d fallen under suspicion of Protestant ism). In 1578 he laid the basis of a critical treatment of ancient geography by his Synonymia geographica (issued by the Plantin press at Antwerp and republished as Thesaurus geographicus in 1596). In 1584 he brought out his Nomenclator Ptolemaicus y his Parergon (a series of maps illustrating ancient history, sacred and secular), and his Itinerarium per nonnullas Galliae Belgicae paries (published at the Plantin press, and reprinted in Hegenitius, Itin. Frisio-Holl.), a record of a journey in Belgium and the Rhineland made in 1575. Among his last works were an edition of Caesar (C. J. Caesaris omnia quae extant, Leiden, Raphelingen, 1 593)> an d the Aurei saeculi imago, sive Germanorum veterum vita (Philippe Galle, Antwerp, 1 596) . He also aided Welser in his edition of the Peutinger Table in 1598. In 1596 he received a presentation from Antwerp city, similar to that afterwards bestowed on Rubens; his death and burial (in St Michael's Abbey church) in 1 598 were marked by public mourning.

See Emmanuel van Meteren, Historia Belgica (Amsterdam, 1670) ; General Wauwermans, Histoire de Vecole cartographique beige et anversoiss (Antwerp, 1895), and article " Ortelius " in Biographie nationale (Belgian), vol. xvi. (Brussels, 1901); J. H. Hessels, Abrahami Ortelii epistulae (Cambridge, England, 1887); Max Rooses, Ortelius et Plantin (1880) ; Genard, " G6nealogie d'Ortelius," in the Bulletin de la Soc. roy. de Geog. d'Anvers (1880 and 1881). (C. R. B.)

ORTHEZ, a town of south-western France, capital of an arrondissement in the department of Basses-Pyrenees, 25 m. N.W. of Pau on the Southern railway to Bayonne. Pop. (1906) town 4159; commune 6254. It is finely situated on the right bank of the Gave de Pau which is crossed at this point by a

bridge of the 14th century, having four arches and surmounted at its centre by a tower. Several old houses, and a church of the 1 2th, 14th and 15th centuries are of some interest, but the most remarkable building is the Tour de Moncade, a pentagonal tower of the r3th century, once the keep of a castle of the vis- counts of Beam, and now used as a meteorological observatory. A building cf the 16th century is all that remains of the old Calvinist university (see below). The hotel de ville is a modern building containing the library.

Orthez has a tribunal of first instance and is the seat of a sub- prefect. The spinning and weaving of cotton, especially of the fabric called toile de BSarn, flour-milling, the manufacture of paper and of leather, and the preparation of hams known as jambons de Bayonne and of other delicacies are among its in- dustries. There are quarries of stone and marble in the neigh- bourhood, and the town has a thriving trade in leather, hams and lime.

At the end of the r 2th century Orthez passed from the posses- sion of the viscounts of Dax to that of the viscounts of B6arn, whose chief place of residence it became in the 13th century. Froissart records the splendour of the court of Orthez under Gaston Phoebus in the latter half of the 14th century. Jeanne d'Albret founded a Calvinist university in the town and Theodore Beza taught there for some time. An envoy sent in 1569 by Charles IX. to revive the Catholic faith had to stand a siege in Orthez which was eventually taken by assault by the Protestant captain, Gabriel, count of Montgomery. In 1684 Nicholas Foucault, intendant under Louis XIV., was more successful, as the inhabitants, ostensibly at least, renounced Protestantism, which is nevertheless still strong in the town. In i8r4 the duke of Wellington defeated Marshal Soult on the hills to the north of Orthez.

ORTHOCLASE, an important rock-forming mineral belonging to the felspar group (see Felspar). It is a potash-felspar, KAlSisOs, and crystallizes in the monoclinic system. Large and distinctly developed crystals are frequently found in the drusy cavities of granites and pegmatites. Crystals differ somewhat in habit; for example, they may be prismatic with an orthorhombic aspect (fig. 1), as in the variety adularia (from the Adular Mountains in the St Gotthard region) ; or tabular (fig. 2), being flattened parallel to the clino-pinacoid or plane of sym- metry b (010), as in the variety sanidine (aavis, vavidos, a board); or again the crystals may be elongated in the direction of the edge between b and the basal plane c (001), which is a character- istic habit of orthoclase from the granite quarries at Baveno in Italy. Twinning is frequent, and there are three well-defined twin-laws: (1) Carlsbad twins (fig. 4). Here the two individuals of the twin interpenetrate or are united parallel to the clino-

Fig. 1.

Fig. 2.

Fig. 3.

pinacoid: one individual may be brought into the position of the other

by a rotation of 180 about the vertical crystallographic axis or prism-edge. Such twinned crystals are found at Carlsbad in Bohemia and many other places. (2) Baveno twins (fig. 5). These twins, in which n (021) is the twin-plane, are common at Baveno. (3) Manebach twins (fig. 6). The twin-plane here is c (001); examples of this rarer twin were first found at Manebach in Thuringia.

An important character of orthoclase is the cleavage. There is a direction of perfect cleavage parallel to the basal plane c, on which plane the lustre is consequently often pearly; and one less highly developed parallel to the plane of symmetry b.

The angle between these two cleavages is 90 , hence the name orthoclase (from the Gr. bpdos, right, and k\S.p, to break), given by A. Breithaupt in 1823, who was the first to distinguish orthoclase from the other felspars. There are also imperfect cleavages parallel to the faces of the prism m (no).

The hardness is 6, and the sp. gr. 2-56. Crystals are some- times colourless and transparent with a glassy aspect, as in the varieties adularia, sanidine and the rhyacolite of Monte Somma, Vesuvius.

The optical characters are somewhat variable, the plane of the optic axes being perpendicular to the plane of symmetry in

Fig. 4. Fig. 5.

Twinned Crystals of Orthoclase.

Fig. 6.

some crystals and parallel to it in others: further, when some crystals are heated, the optic axes gradually change from one position to the other. In all cases, however, the acute negative bisectrix of the optic axes lies in the plane of symmetry and is inclined to the edge bjc at 3-7 , or, in varieties rich in soda, at 10-12 . The mean refractive index is 1-524, and the double refraction is weak (0-006).

Analyses of orthoclase usually prove the presence of small amounts of soda and lime in addition to potash. These con- stituents are, however, probably present as plagioclase (albite and oligoclase) intergrown with the orthoclase. The two minerals are interlaminated parallel to

the ortho-pinacoid (100) or the pinacoid (801) , and they may readily be distinguished in the flesh- red aventurine-felspar, known as perthite, from Perth in Lanark county, Ontario. Frequently, however, as in microperthite and cryptoperthite, this is on a microscopic scale or so minute as to be no longer recognizable. These directions (ioo)and (801) are planes of parting in orthoclase, and along them alteration fre- quently takes place, giving rise to schiller effects. Moon-stone (q.v.) shows a pearly opalescent reflection on these planes; and brilliant coloured reflections in the same directions are exhibited by the labradorescent orthoclase from the augite-syenite of Fredriksvarn and Laurvik in southern Norway, which is much used as an ornamental stone. The same effect is shown to a lesser degree by murchisonite, named in honour of Sir R. I. Murchison, from the Triassic conglomerate of Heavitree near Exeter.

Orthoclase forms an essential constituent of many acidic igneous rocks (granite, syenite, porphyry, trachyte, phonolite, &c.) and of crystalline schists and gneisses. In porphyries and in some granites {e.g. those of Shap in Westmorland, Cornwall, &c.) it occurs as em- bedded crystals with well-defined outlines, but usually it presents no crystalline form. In the trachyte of the Drachenfels and the Laacher See in Rhenish Prussia there are large porphyritic crystals of glassy sanidine. The best crystals are those found in the crystal- lined cavities and veins of granites, pegmatites and gneisses , for example, at Baveno and Elba in Italy, Alabashka near Mursinka in the Urals, Hirschberg in Silesia, Tanokami-yama in the province Omi, Japan, and the Mourne Mountains in Ireland.' As a mineral of secondary origin orthoclase is sometimes found in cavities in basaltic rocks, and its occurrence in metalliferous mineral-veins has been observed. It has been formed artificially in the laboratory and is sometimes met with in furnace products.

The commonest alteration product of orthoclase is kaolin (q.v.); the frequent cloudiness or opacity of crystals is often due to partial alteration to kaolin. Mica and epidote also result by the alteration of orthoclase. (L. J. S.)

ORTHODOX EASTERN CHURCH (frequently spoken of as " the Greek Church," and described officially as " The Holy Orthodox 1

1 The Orthodox Eastern Church has always laid especial stress upon the unchanging tradition of the faith, and has claimed ortho- doxy as its especial characteristic. The " Feast of Orthodoxy " (ˆ Kvpianii rfjs 6p6o&oˆias), celebrated annually on the first Sunday of the Greek Lent, was founded in honour of the restoration of the

Catholic Apostolic Eastern Church “), the historical repre- sentative of the churches of the ancient East. It consists of (a) those churches which have accepted all the origins ot decrees of the first seven general councils, and have the Greek remained in full communion with one another, (b) such or Eastern churches as have derived their origin from these by ” ‘ missionary activity, or by abscission without loss of communion. The Eastern Church is both the source and background of the Western. Christianity arose in the East, and Greek was the language of the Scriptures and early services of the church, but when Latin Christianity established itself in Europe and Africa, and when the old Roman empire fell in two, and the eastern half became separate in government, interests and ideas from the western, the term Greek or Eastern Church acquired gradually a fixed meaning. It denoted the church which included the patriarchates of Antioch, Alexandria, Jerusalem and Constantinople, and their dependencies. The ecclesiastical division of the early church, at least within the empire, was based upon the civil. Constantine introduced a new partition of the empire into dioceses, and the church adopted a similar division. The bishop of the chief city in each diocese naturally rose to a pre-eminence, and was commonly called exarch— & title borrowed from the civil jurisdiction. In process of time the common title patriarch was restricted to the most eminent of these exarchs, and councils decided who were worthy of the dignity. The council of Nicaea recognized three patriarchs — the bishops of Rome, Alexandria and Antioch. To these were afterwards added the bishops of Constantinople and Jerusalem. When the empire was divided, there was one patriarch in the West, the bishop of Rome, while in the East .there were at first two, then four and latterly five. This geographical fact has had a great deal to do in determining the character of the Eastern Church. It is not a despotic monarchy governed from one centre and by a monarch in whom plenitude of power resides. It is an oligarchy of patriarchs. It is based, of course, on the great body of bishops ; but episcopal rule, through the various grades of metropolitan, primate, exarch, attains to sovereignty only in the five patriarchal thrones. Each patriarch is, within his diocese, what the Gallican theory makes the pope in the universal church. He is supreme, and not amenable to any of his brother patriarchs, but is within the jurisdiction of an oecumenical synod. This makes the Eastern Church quite distinct in government and traditions of polity from the Western. It has ever been the policy of Rome to efface national distinctions, but under the shadow of the Eastern Church national churches have grown and flourished. Revolts against Rome have always implied a repudiation of the ruling principles of the papal system; but the schismatic churches of the East have always

reproduced the ecclesiastical polity of the church from which they seceded. The Greek Church, like the Roman, soon spread far beyond the imperial dioceses which at first fixed its boundaries, but it was far less successful than the Roman in preserving T . . its conquests for Christianity. This was due in the barlan in- main to the differing quality of the forces by which vasions la the area covered by the two churches was respectively ^“f ani invaded. The northern barbarians by whom the Western empire was overrun had long stood in awe of the power and the civilization of Rome, which theyTecognized as superior; the conquerors were thus predisposed to enter into the heritage of the law and the religion of the conquered empire and, whether they were pagans or Arian heretics, became in the end Catholic Christians. In the East it was otherwise. The empire maintained itself long, and died hard; but its decline and fall meant not only the overthrow of the emperors of the East, but largely that of the civilization and Christianity which they represented. The Arabs, and after them the Turks, attacked the empire as the armed missionaries of what they regarded as a superior religion; Christianity survived in the vast territories they

Holy Images to the churches after the downfall of Iconoclasm (February 19, 842) ; but it has gradually assumed a wider significance as the celebration of victory over all heresies, and is now one of the most characteristic festivals of the Eastern Church.

and schisms.

conquered only as a despised and tolerated superstition, its ecclesiastical organization only as a convenient mechanism for governing a subject and tributary population. It is true that the Eastern Church made up in some sort for her losses by missionary conquests elsewhere. Greek Christianity became the religion of the Slavs as Latin Christianity became that of the Germans; but the Orthodox Church never conquered her conquerors, and the historian is too apt to enlarge on her past glories and forget her present strength.

Early History. — The early history of the Eastern Church is outlined in the article Church History. Here it is proposed only to give in somewhat more detail the causes of division which led (i) to the formation of the schismatic churches of the East, and (2) to the open rupture with Latin Christianity.

The great dogmatic work of the Eastern Church was the definition of that portion of the creed of Christendom which Contra- concerns theology proper — the doctrines of the essential versies nature of the Godhead, and the doctrine of the God- head in relation with manhood in the incarnation, while it fell to the Western Church to define anthro- pology, or the doctrine of man's nature and needs. The contro- versies which concern us are all related to the person of Christ, the Theanthropos, for they alone are represented in the schismatic churches of the East. These controversies will be best described by reference to the oecumenical councils of the ancient and undivided church.

All the churches of the East, schismatic as well as orthodox, accept unreservedly the decrees of the first two councils. The schismatic churches protest against the additions made to the creeds of Nicaea and Constantinople by succeeding councils. The Nicaeo-Constantinopolitan creed declared that Christ was consubstantial {o/ xoovaws) with the Father, and that He had become man (evavdponrijo-as) . Disputes arose when theo- logians tried to explain the latter phrase. These differences took two separate and extreme types, the one of which forcibly separated the two natures so as to deny anything like a real union, while the other insisted upon a mixture of the two, or an absorption of the human in the divine. The former was the creed of Chaldaea and the latter the creed of Egypt; Chaldaea was the home of Nestorianism, Egypt the land of Monophysitism. The Nestorians accept the decisions of the first two councils, and reject the decrees of all the rest as unwarranted alterations of the creed of Nicaea. The Monophysites accept the first three councils, but reject the decree of Chalcedon and all that come after it.

The council of Ephesus (a.d. 431), the third oecumenical, had insisted upon applying the term Theotokos to the Virgin Mary, and this was repeated in the symbol of Chalcedon, which says that Christ was born of the Virgin Mary, the Theotokos, " according to the manhood." The same symbol also declares that Christ is " to be acknowledged in two natures . . . in- divisibly and inseparably." Hence the Nestorians, who insisted upon the duality of the natures to such a degree as to lose sight of the unity of the person, and who rejected the term Theotokos, repudiated the decrees both of Ephesus and of Chalcedon, and upon the promulgation of the decrees of Chalcedon formally separated from the church. Nestorianism had sprung from an exaggeration of the tReology of the school of Antioch, and the schism weakened that patriarchate and its dependencies. It took root in Chaldaea, and became very powerful. No small part of the literature and science of

the Mahommedan Arabs came from Nestorian teachers, and Nestorian Christianity spread far and wide through Asia (see Nestorius and Nestorians).

The council of Chalcedon (451), the fourth oecumenical, declared that Christ is to be acknowledged ” in two natures — unconfusedly, unchangeably,” and therefore decided against the opinions of all who either believed that the divinity is the sole nature of Christ, or who, rejecting this, taught only one composite nature of Christ (one nature and one person, instead of two natures and one person). The advocates of the one nature theory were called Monophysites (q.v.), and they gave rise to numerous sects, and to at least three separate national

churches — the Jacobites of Syria, the Copts of Egypt and the Abyssinian Church, which are treated under separate headings.

The decisions of Chalcedon, which were the occasion of the formation of all these sects outside, did not put an end to Christo- logical controversy inside the Orthodox Greek Church. The most prominent question which emerged in attempting to define further the person of Christ was whether the will belonged to the nature or the person, or, as it came to be stated, whether Christ had two wills or only one. The church in the sixth oecumenical council at Constantinople (680) declared that Christ had two wills. The Monothelites (q.v.) refused to submit, and the result was the formation of another schismatic church — the Maronite Church of the Lebanon range. The Maronites, however, were reconciled to Rome in the 12th century, and are reckoned as Roman Catholics of the Oriental Rite.

Later History. — The relation of the Byzantine Church to the Roman may be described as one of growing estrangement from the 5th to the nth century, and a series of abortive attempts at reconciliation since the latter date. The Conflict estrangement and final rupture may be traced to the Rome. increasing claims of the Roman bishops and to Western innovations in practice and in the doctrine of the Holy Spirit, accompanied by an alteration of creed. In the early church three bishops stood forth prominently, principally from the political eminence of the cities in which they ruled — the bishops of Rome, Alexandria and Antioch. The transfer of the seat of empire from Rome to Constantinople gave the bishops of Rome a possible rival in the patriarch of Constantinople, but the absence of an overawing court and of meddling statesmen did more than recoup the loss to the head of the Roman Church. The theological calmness of the West, amid the violent theo- logical disputes which troubled the Eastern patriarchates,

and the statesmanlike wisdom of Rome's greater bishops, combined to give a unique position to the pope, which councils in vain strove to shake, and which in time of difficulty the Eastern patriarchs were fain to acknowledge and make use of, however they might protest against it and the conclusions deduced from it. But this pre-eminence, or rather the Roman idea of what was involved in it, was never acknowledged in the East; to press it upon the Eastern patriarchs was to prepare the way for separation, to insist upon it in times of irritation was to cause a schism. The theological genius of the East was different from that of the West. The Eastern theology had its roots in Greek philosophy, while a great deal of Western theology was based on Roman law. The Greek fathers succeeded the Sophists, the Latin theologians succeeded the Roman advocates (Stanley's Eastern Church, ch. i.) . This gave rise to misunderstandings, and at last led to two widely separate ways of regarding and defining one important doctrine — the procession of the Holy Spirit from the Father or from the Father and the Son. Political jealousies and interests intensified the disputes, and at last, after many premonitory symptoms, the final break came in 1054, when Pope Leo IX. smote Michael Cerularius and the whole of the Eastern Church with an excommunication. There had been mutual excommunications before, but they had not resulted in permanent schisms. Now, however, the separation was final, and the ostensible cause of its finality was the introduction by the Latins of two words Filioque into the creed. 1 It is this addition which was and which still remains the permanent cause of separation. Ffoulkes has pointed out in his second volume (ch. 1-3) that there was a resumption of intercourse more than once between Rome and Constantinople after 1054, and that the overbearing character of the Norman crusaders, and finally the horrors of the sack of Constantinople in the fourth crusade

1 After the words_ " and in the Holy Ghost " of the Apostles- Creed the Constantinopolitan creed added " who proceedeth from the Father." The Roman Church, without the sanction of an oecumenical council and without consulting the Easterns, added " a "d.the Son." The addition was first made at Toledo (589) in opposition to Arianism. The Easterns also resented the Roman enforcement of clerical celibacy, the limitation of the right of con- firmation to the bishop and the use of unleavened bread in the Eucharist.

at reunion.

(i 204) , were the real causes of the permanent estrangement. It is undeniable, however, that the Filioque question has always come Tne up to bar the way in any subsequent attempts at inter-

“Fittoque” communion. The theological question involved is a contro- ver y sm all one, but it brings out clearly the opposing rersy. characteristics of Eastern and Western theology, and so has acquired an importance far beyond its own worth. The question is really one about the relations subsisting between the persons of the Trinity and their hypostatical properties. The Western Church affirms that the Holy Spirit ” proceeds from ” the Father and from the Son. It believes that the Spirit of the Father must be the Spirit of the Son also. Such a theory seems alone able to satisfy the practical instincts of the West, which did not concern itself with the metaphysical aspect of the Trinity, but with Godhead in its relation to re- deemed humanity. The Eastern Church affirms that the Holy Spirit proceeds from the Father only, and takes its stand on John xv. 26. The Eastern theologian thinks that the Western double procession degrades the Deity and destroys the perfec- tion of the Trinity. The double procession, in his eyes, means two active principles (airiat) in the Deity, and it means also that there is a confusion between the hypostatical properties; a property possessed by the Father and distinctive of the First Person is attributed also to the Second. This is the theological, and there is conjoined with it an historical and moral dispute. The Easterns allege that the addition of the words Filioque was made, not only without authority, and therefore unwarrantably, but also for the purpose of forcing a rupture between East and West in the interests of the barbarian empire of the West.

Attempts at reconciliation were made from time to time afterwards, but were always wrecked on the two points of papal supremacy, when it meant the right to impose Western Attempts usa g es upon the East, and of the addition to the creed. First there was the negotiation between Pope Gregory IX. (1 227-1 241) and Germanus, patriarch of Con- stantinople. The Roman conditions were practically recogni- tion of papal jurisdiction, the use of unleavened bread and permission to omit Filioque if all books written against the Western doctrine were burnt. The patriarch refused the terms. Then, later in the 13th century, came negotiations under Innocent IV. and Clement IV., in which the popes proposed the same conditions as Gregory IX., with additions. These proposals were rejected by the Easterns, who regarded them as attempts to enforce new creeds on their church.

The negotiations at the council of Lyons (1274) were, strictly speaking, between the pope and the Byzantine emperor, and were

more political than ecclesiastical. Michael Palaeologus ruled in Constantinople while Baldwin II., the last of the Latin emperors, was an exile in Europe. Palaeologus wished the pope to acknowledge his title to be emperor of the East, and in return promised submission to the papal supremacy and the union of the two churches on the pope's own terms. This enforced union lasted only during the lifetime of the emperor. The only other attempt at union which requires to be mentioned is that made at the council of Florence. It was really suggested by the political weakness of the Byzantine empire and the dread of the approach of the Turks. John Palaeologus the emperor, Joseph the patriarch of Constantinople, and several Eastern bishops came to Italy and appeared at the council of Florence — the papal council, the rival of the council of Basel. As on former occasions the representatives of the East were at first deceived by false representations; they were betrayed into recognition o'f papal supremacy, and tricked into signing what could afterwards be represented as a submission to Western doctrine. The natural consequences followed — a repudiation of what had been done; and the Eastern bishops on their way home took care to make emphatic their ritualistic differences from Rome. Soon after came the fall of Constantinople, and with this event an end to the political reasons for the sub- mission of the Orthodox clergy. Rome's schemes for a union which meant an unconditional submission on the part of the Orthodox Church did not cease, however, but they were no

longer attempted on a grand scale. Jesuit missionaries after the Reformation stirred up schisms in some parts of the Eastern Church, and in Austria, Poland and elsewhere large numbers of Orthodox Christians submitted, either willingly or under com- pulsion to the see of Rome (see Roman Catholic Church, section Uniat Oriental Churches).

Doctrines and Creeds. — The Eastern Church has no creeds in the modern Western use of the word, no normative summaries of what must be believed. It has preserved the older idea that a creed is an adoring confession of the church engaged in worship; and, when occasion called for more, the belief of the church was expressed more by way of public testimony than in symbolical books. Still the doctrines of the church can be gathered from these confessions of faith. The Eastern creeds may thus be roughly placed in two classes — the oecumenical creeds of the early undivided church, and later testimonies defining the position of the Orthodox Church of the East with regard to the belief of the Roman Catholic and of Protestant Churches. These testimonies were called forth mainly by the protest of Greek theologians against Jesuitism on the one hand, and against the

reforming tendencies of the patriarch Cyril Lucaris on the other. The Orthodox Greek Church adopts the doctrinal decisions of the seven oecumenical councils, together with the canons of the Concilium Quinisextum or second Trullan council (692); and they further hold that all these definitions and canons are simply explanations and en- forcements of the Nicaeo-Constantinopolitan creed and the decrees of the first council of Nicaea. The first four councils settled the orthodox faith on the doctrines of the Trinity and of the Incarnation; the fifth supplemented the decisions of the first four. The sixth declared against Monothelitism ; the seventh sanctioned the worship (SovKeLa, not Hhrfiivfi Xarpeia) of images; the council held in the Trullus (a saloon in the palace at Constantinople) supplemented by canons of discipline the doctrinal decrees of the fifth and sixth councils.

The Reformation of the 16th century was not without effect on the Eastern Church. Some of the Reformers, notably Melanchthon, expected to effect a reunion of Christen- dom by means of the Easterns, cherishing the same . heRe ‘ 1 1 1 ., , n ‘ . ,. . ° ... formation

hopes as the modern Old Catholic divines and their an dthe

English sympathizers. Melanchthon himself sent a Orthodox Greek translation of the Augsburg Confession to Cnurcn – Joasaph, patriarch of Constantinople, and some years afterwards Jacob Andreae and Martin Crusius began a correspondence with Jeremiah, patriarch of Constantinople, in which they asked an official expression of his opinions about Lutheran doctrine. The result was that Jeremiah answered in his Censura Orientalis Ecclesiae condemning the distinctive principles of Lutheranism.

The reformatory movement of Cyrillos Lucaris (q.v.), patriarch of Constantinople (162 1), brought the Greek Church face to face with Reformation theology. Cyril conceived the plan of reform- ing the Eastern Church by bringing its doctrines into harmony with those of Calvinism, and by sending able young Greek theologians to Switzerland, Holland and England to study Protestant theology. His scheme of reform was opposed chiefly by the intrigues of the Jesuits, who in the end brought about his death. The church anathematized his doctrines, and in its later testimonies repudiated his confession on the one hand and Jesuit ideas on the other. The most important of these testi- monies are (1) the Orthodox confession or catechism of Peter Mogilas, confirmed by the Eastern patriarchs and by the synod of Jerusalem (1643), and (2) the decree of the synod of Jerusalem or the confession of Dositheus (1672). Besides these, the cate- chisms of the Russian Church should be consulted, especially the catechism of

Philaret, which since 1839 has been used in all the churches and schools in Russia. Founding onHhese doctrinal sources the teaching of the Orthodox Eastern Church is 1 : —

1 This summary has been taken, with corrections, from G. B. Winer, Comparative Darstellung des Lehrbegriffs der verschiedenen Kirchenparteien (Leipzig, 1824, Eng. tr., Edin., 1873). Small capitals denote differences from Roman Catholic, italics differences from Protestant doctrine.

Christianity is a Divine revelation communicated to mankind through Christ; its saving truths are to be learned from the Bible and tradition, the former having been written, Compart- an ˆ fa i a u er maintained uncorrupted through the influ- J™’ ence of the Holy Spirit; the interpretation of the Bible

Orthodox, belongs to the Church, which is taught by the Holy Spirit, Protestant DUt everv believer may read the Scriptures. doctrine According to the Christian revelation, God is a Trinity,

thatis, the Divine Essenceexists in Three Persons, perfectly equal in nature and dignity, the Father, the Son and the Holy Ghost ; the Holy Ghost proceeds from the Father only. Besides the Triune God there is no other object of divine worship, but homage (bwepSovXia) may be paid to the Virgin Mary, and reverence (dovXla) to the saints and to their pictures and relics.

Man is born with a corrupt bias which was not his at creation; the first man, when created, possessed immortality, perfect wisdom, and A will regulated by reason. Through the first sin Adam and his posterity lost immortality, and his will received a bias towards evil. In this natural state man, who even before he actually sins is a sinner before God by original or inherited sin, commits manifold actual transgressions; but he is not absolutely without power of will towards good, and is not always doing evil.

Christ, the Son of God, became man in two natures, which in- ternally and inseparably united make One Person, and, according to the eternal purpose of God, has obtained for man reconciliation with God, and eternal life, inasmuch as He by His vicarious death has made satisfaction to God for the world’s sins, and this satisfac- tion was perfectly commensurate with the sins of the world. Man is made

partaker of reconciliation in spiritual regeneration, which he attains to, being led and kept by the Holy Ghost. This divine help is offered to all men without distinction, and may be rejected. In order to attain to salvation, man is justified, and when so justified can do no more than the commands of God. He may fall from a state of grace through mortal sin.

Regeneration is offered by the word of God and in the sacraments, which under visible signs communicate God's invisible grace to Christians when administered cum intentione. There are seven mysteries or sacraments. Baptism entirely destroys original sin. In the Eucharist the true body and blood of Christ are substantially present, and the elements are changed into the substance of Christ, whose body and blood are corporeally partaken of by communicants. All Christians should receive the bread and the wine. The Eucharist is also an expiatory sacrifice. The new birth when lost may be restored through repentance, which is not merely (i) sincere sorrow, but also (2) confession of each individual sin to the priest, and (3) the discharge of penances imposed by the priest for the removal of ,the temporal punishment which may have been imposed by God and the Church. Penance accompanied by the judicial absolution of the priest makes a true sacrament.

The Church of Christ is the fellowship of ALL those who accept and profess all the articles of faith transmitted by the Apostles and approved by General Synods. Without this visible Church there is no salvation. It is under the abiding influence of the Holy Ghost, and therefore cannot err in matters of faith. Specially appointed persons are necessary in the service of the Church, and they form a threefold order, distinct jure divino from other Christians, of Bishops, Priests and Deacons. The four Patriarchs, of equal dignity, have the highest rank among the bishops, and the bishops united in a General Council repre- sent the Church and infallibly decide, under the guidance of the Holy Ghost, all matters of faith and ecclesiastical life. All ministers of Christ must be regularly called and appointed to their office, and are consecrated by the sacrament of orders. Bishops must be un- married, and priests and deacons must not contract a second marriage. To all priests in common belongs, besides the preaching of the word, the administration of the six sacraments — baptism,

CONFIRMATION, PENANCE, EUCHARIST, MATRIMONY, UNCTION OF

the sick. The bishops alone can administer the sacrament of orders. Ecclesiastical ceremonies, are part of the divine service; most of them

have apostolic origin; and those connected with the sacrament must not be omitted by priests under pain of mortal sin.

Liturgy and Worship. — The ancient liturgies of the Eastern Church were very numerous, and have been frequently classified. J. M. Neale makes three divisions — the liturgy of Jerusalem or of St James, that of Alexandria or of St Mark, and that of Edessa or of St Thaddaeus; and Daniel substantially agrees with him. The same passion for uniformity which suppressed the Gallican and Mozarabic liturgies in the West led to the almost exclusive use of the liturgy of St James in the East. It is used in two forms, a shorter revised by Chrysostom, and a longer called the liturgy of St Basil. This liturgy and the service generally are either in Old Greek or in Old Slavonic, and frequent disputes have arisen in particular districts about the language to .be employed. Both sacred languages differ from the language of the people, but it cannot be said that in

the Eastern Church worship is conducted in an unknown tongue — " the actual difference," says Neale, " may be about that between Chaucer's English and our own." There are eleven chief service books, and no such compendium as the Roman breviary. Fasting is frequent and severe. Besides Wednesdays and Fridays, there are four fasting seasons, Lent, Pentecost to SS. Peter and Paul, August 1-15 preceding the Feast of the Sleep of the Theotokos, and the six weeks before Christ- mas. Indulgences are not recognized; an intermediate and purificatory state of the dead is held but not systematized into a doctrine of purgatory. The Virgin receives homage, but the dogma of her Immaculate Conception is not admitted. While ikons of the saints are found in the churches there is no " graven image " apart from the crucifix. There is plenty of singing but no instrumental music. Prayer is offered standing towards the East; at Pentecost, kneeling. The celebration of the Eucharist is an elaborate symbolical representation of the Passion. The consecrated bread is broken into the wine, and both elements are given together in a spoon.

The ritual generally is as magnificent as in the West, but of a more archaic type. (For the liturgical dress see Vestments and subsidiary articles.)

Monastic Life. — Monasticism is, as it has always been, an important feature in the Eastern Church. An Orthodox monastery is perhaps the most perfect extant relic of the 4th century. The simple idea that possesses the monks is that of fleeing the world; they have no distinctions of orders, and though they follow the rule of St Basil object to being called Basilians. A few monasteries (Mt Sinai and some

on Lebanon) follow the rule of St Anthony. K. Lake in Early Days of Monasticism on Mount Athos (1909) traces the development through three well-defined stages in the 9th and 10th centuries — (a) the hermit period, (b) the loose organization of hermits in lauras, (c) the stricter rule of the monastery, with definite buildings and fixed rules under an riyovntvos or abbot. The monasteries now have taken over the name lauras. They are under the jurisdiction of the metropolitan; a few of the most important deal direct with the patriarch and are called Stauropegia. The convent on Mt Sinai is absolutely independent. Apart from hermits there are (1) Kotvofiianol, monks who possess nothing, live and eat together, and have definite tasks given them by their superiors; (2) ibiopvdixaKoi, monks who live apart from each other, each receiving from the monastery fuel, vegetables, cheese, wine and a little money. They only meet for the Divine Office and on great feasts, and are the real suc- cessors of the laura system. The most famous monasteries are those on Mount Athos; in 1902 there were twenty lauras with many dependent houses and 7522 monks there, mainly Russian and Greek. The monks are, for the most part, ignorant and unlettered, though in the dark days of Mahommedan persecu- tion it was in the monasteries that Greek learning and the Greek nationality were largely preserved. Since priests must be married and bishops must not, only monks are eligible for appointment to bishoprics in the Eastern Church. See further, Monasticism.

The Branches of the Church. — In addition to the ancient churches which have separated themselves from the Orthodox faith, many have ceased to have an independent existence, owing either to the conquests of Islam or to their absorption by other churches. For example, the church of Mount Sinai may be regarded as all that survives of the ancient church of northern Arabia; the autocephalous Slavonic churches of Ipek and Okhrida, which derived their ultimate origin from the missions of Cyril and Methodius, were absorbed in the patriarchate of Constantinople in 1766 and 1767 respectively; and the Church of Georgia has been part of the Russian Church since 1801-1802. At the present day, then, the Orthodox Eastern Church consists of twelve mutually independent churches (or thirteen if we reckon the Bulgarian Church), using their own language in divine service (or some ancient form of it, as in Russia) and varying not a little in points of detail, but standing in full communion with one another, and united as equals in what has been described as one great ecclesiastical federation. However, in using such

language it must be remembered that we are not dealing with bodies which were originally separated from one another and have now entered into fellowship, but with bodies which have grown naturally from a single origin and have not become estranged.

A. The Four Ancient Patriarchates i. The Patriarchate of Constantinople or New Rome. — The ancient patriarchate of Constantinople included the imperial dioceses of Pontus, Asia, Thrace and Eastern Illyricum — i.e. speaking roughly, the greater part of Asia Minor, European Turkey, and Greece, with a small portion of Austria. The imperial diocese of Pontus was governed by the exarch of Caesarea, who ruled over thirteen metro- politans with more than 100 suffragans. Asia was governed by the exarch of Ephesus, who ruled over twelve metropolitans with more than 350 suffragan bishops. In Asia Minor the church maintains but a small remnant of her former greatness; in Europe it is other- wise. The old outlines, however, are effaced wherever the Christian races have emancipated themselves from the Turkish rule, and the national churches of Greece, Servia and Rumania have re- organized themselves on a new basis. Where the Turkish rule still prevails the church retains her old organization, but greatly im- paired. Still, the Oecumenical Patriarch, as he has been called since early in the 6th century, is the most exalted ecclesiastic of the Eastern churches, and his influence reaches far outside the lands of the patriarchate. His jurisdiction extends over the dominions of the Sultan in Turkey, together with Asia Minor and the Turkish islands of the Aegean; there are eighty-two metropolitans under him, and the ” monastic republic ” of Mount Athos. He has great privileges and responsibilities as the recognized head of the Greek community in Turkey, and enjoys also many personal honours which have survived from the days of the Eastern emperors.

The patriarch under the old Ottoman system had his own court at Phanar, and his own prison, with a large civil jurisdiction over, and responsibility for, the Greek community. In ecclesiastical affairs he acts with two governing bodies — (a) a permanent Holy Synod (‘Iepd 2i»po5os ttjs ‘EKK\rj7ias Kwf aravTivoviToXeuis), consist- ing of twelve metropolitans, six of whom are re-elected every year from the whole number of metropolitans, arranged in three classes according to a fixed cycle; (b) the Permanent National Mixed Council (Aiapxis ‘Eˆvucoi/ 1&ikt6v Zv/t/9o6Xtoi>),. a remarkable assembly, which is at once the source of great power by introducing a strong lay element into the administration, and of a certain amount of weakness by its liability to sudden changes of popular feeling. It consists of four metropolitans, members of the Holy Synod, and eight laymen. All of these are chosen by an electoral body, consisting of all the members of

the Holy Synod and the National Mixed Council, and twenty-five representatives of the parishes of Constantinople. The election of the patriarch is also, to a considerable extent, popular. An electoral assembly is formed for the purpose consisting l of the twelve members of the Holy Synod, the eight lay members of the National Mixed Council, twenty- eight representatives of as many dioceses (the remaining dioceses having only the right to nominate a candidate by letter), ten repre- sentatives of the parishes of Constantinople, ten representatives of all persons who possess political rank, ten representatives of the Christian trades of Constantinople, the two representatives of the secretariat of the patriarchate, and such metropolitans, to the number of ten but no more, as happen to be in Constantinople at the time for some canonical reason (irape-mbripiovvris). On the death or deposition of the patriarch, the Holy Synod and the National Mixed Council at once meet and elect a temporary substitute for the patriarch (TojroTTjpTjTifc). Forty days afterwards the electoral assembly meets, under his presidency, and proceeds to make a list of twenty candidates (at the present day they must be metropolitans), who may be proposed either by the members of the electoral as- sembly or by any of the metropolitans of the patriarchate by letter. This list is sent to the sultan, who has by prescription the right to strike out five names. From the fifteen which remain the electoral assembly chooses three. These names are then submitted to the clerical members of the assembly, i.e. to the members of the Holy Synod and the irapeiriStjAtoDj'Tes, who meet in church, and, after the usual service, make the final selection. The patriarch-elect is pre- sented to the Porte, which thereupon grants the berat or diploma of investiture and several customary presents; after which the new ruler is enthroned. The patriarch has the assistance and support of a large household, a survival from Byzantine times. Amongst them, actually or potentially, are the grand steward (jikyas 0'wbvop.os), who serves him as deacon in the liturgy and presents candidates for orders; the grand visitor frhn i>\a.i) ; the chancellor (xapTo<£6Xa£) , who superintends ecclesiastical causes; the deputy- visitor (6 tov aaneWiov), who visits the nunneries; the protonotary (7rp-j)TocoT(ipios) ; the logothete (XoYo0e-n;s), a most important lay officer, who represents the patriarch at the Porte and elsewhere outside; the censer-bearer, who seems to be also a kind of captain of the guard (KovtrTpi-rios or kokctt privates) ; the referendary (fefapev-Sdpios) ; the secretary ({/imiivrnxdypa(l>-ov) ; the chief syndic (irpwrticStKos),

1 The numbers have varied from time to time.

who is a judge of lesser causes; the recorder (Uponvt)nwt>) ; and so

on, down to the cleaners of the lamps (Xa/wraMptot), the attendant of the lights {Trtpieioepxoiitvos), and the bearer of the images (fiaaTayapios) and of the holy ointment (/iupo56rijs).

2. The Patriarchate of Alexandria, consisting of Egypt and its dependencies, was at one time the most powerful, as it was the most centralized, of all, and the patriarch still preserves his ancient titles of ” pope ” and ” father of fathers, pastor of pastors, arch- priest of archpriests, thirteenth apostle, and oecumenical judge.” But the secession of the greater part of his church to Monophysitism [Coptic Church], and the Mahommedan conquest of Egypt, have left him but the shadow of his former greatness; and at the present time he has only the bishop of Libya under him, and rules over some 20,000 people at the outside, most of whom are settlers from elsewhere.

3. The Patriarchate of Antioch has undergone most changes in extent of jurisdiction, arising from the transfer of sees to Jerusalem, from the progress of the schismatic churches of the East and from the conquests of the Mahommedans. At the heigbt of his power the patriarch of Antioch ruled over 12 metropolitans and 250 suffragan bishops. In the time of the first crusade 153 still survived; now there are scarcely 20, 14 of which are metropolitan sees. The patriarch, though he is ” father of fathers and pastor of pastors,” thus retains little of his old importance. His jurisdiction includes Cilicia, Syria (except Palestine) and Mesopotamia. Cyprus has been independent of Antioch since the council of Ephesus.

4. The Patriarchate of Jerusalem. — In the earlier period of the church, ecclesiastical followed civil divisions so closely that Jerusalem, in spite of the sacred associations connected with it, was merely an ordinary bishopric dependent on the metropolitan of Caesarea. Ambitious prelates had from time to time endeavoured to advance the pretensions of their see, but it was not until the council of Chalcedon, in 451, that Jerusalem was made a patriarchate with jurisdiction over Palestine. From this time on to the inroad of the Saracens the patriarchate of Jerusalem was highly prosperous. It ruled over three metropolitans with eighty suffragans. The modem patriarch has under his jurisdiction 5 archbishops and 5 bishops. The chief importance of the patriarchate is derived from the position of Jerusalem as a place of pilgrimage.

B. The Nine National Churches G. Finlay, in his History of Greece, has shown that there has been always a very close relation between the church and national life. Christianity from the first connected itself with the social organiza- tion of the people, and therefore in every

province assumed the language and the usages of the locality. In this way it was able to command at once individual attachment and universal power. This feeling died down to some extent when Constantine made use of the church to consolidate his empire. But it revived under the persecution of the Arian emperors. The struggle against Arianism was not merely a struggle for orthodoxy. Athanasius «was really at the head of a national Greek party resisting the domination of a Latin-speaking court. From this time onwards Greek patriotism and Greek orthodoxy have been almost convertible terms, and this led naturally to revolts against Greek supremacy in the days of Justinian and other emperors. Dean Stanley was probably correct when he described the heretical churches of the East as the ancient national churches of Egypt, Syria, and Armenia in revolt against supposed innovations in the earlier faith imposed on them by Greek supremacy. In the East, as in Scotland, the history of the church is the key to the history of the nation, and in the freedom of the church the Greek saw the freedom and supremacy of his race. For this very reason Orthodox Eastern Christians of alien race felt compelled to resist Greek domination by means of independent ecclesiastical organization, and the structure of the church rather favoured than interfered with the coexistence of separate national churches professing the same faith. Another circumstance favoured the creation of separate national churches. While the Greek empire lasted the emperors had a right of investiture on the election of a new patriarch, and this right was retained by the Turkish sultans after the conquest of Constantinople. The Russian people, for example, could not contemplate with calmness as the head of their church a bishop appointed by the hereditary enemy of their country. In this way the jealousies of race and the necessities of nations have produced various national churches which are independent or autocephalous and yet are one in doctrine.

1. The ancient Church of Cyprus (see Cyprus, Church of).

2. The Church of Mount Sinai, consisting of little more than the famous monastery of St Catherine, under an archbishop who frequently resides in Egypt. It has, however, a few branch houses (liijoxia.) in Turkey and Greece. The archbishop is chosen, from a list of candidates submitted by the monks of St Catherine, by the patriarch of Jerusalem and his Synod; and the patriarch consecrates him.

3. The Hellenic Church. — The constitution of the Church of Modern Greece is the result of the peculiar position of the patriarch of Constantinople. The war of liberation was sympathized in, not merely by the inhabitants of Greece, but by all the Greek-speaking Christians

in the East. But the patriarch was in the hands of the Turks; he had been appointed by the sultan- and he was compelled

by the Turkish authorities to ban the movement for freedom. When the Greeks achieved independence they refused to be subject ecclesiastically to a patriarch who was nominated by the sultan (June 9, 1828) ; and, to add to their difficulties, there were in the country twenty-two bishops who had been consecrated by the patriarch, twelve bishops who had been consecrated irregularly during the war, and about twenty bishops who had been deprived of their sees during the troubles — i.e. fifty-three bishops claimed to be provided for. In these circumstances the government and people resolved that there should be ten diocesan bishops and forty ad- ditional provisional sees. They also resolved that the church should be governed after the fashion of the Russian Church by a synod; and they decreed that the king of Greece was to be head of the church. AH these ideas were carried out with some modifications, and gradually. The patriarch of Constantinople in 1850 acknow- ledged the independence of the church, which gradually grew to be more independent of the state. By the Greek constitution of l6th/28th November 1864 ” the Orthodox Church of Greece remains indissolubly united, as regards dogmas, to the great Church of Constantinople, and to every other church professing the same doctrines, and, like these churches, it preserves in their integrity the apostolical constitutions and those of the councils of the Church, together with the holy traditions; it is airoKia\os, it exercises its sovereign rights independently of every other church, and it is governed by a synod of bishops.”

4. The Servian Church. — After the suppression of the Church of Ipek in 1766 Servia became ecclesiastically subject to Constanti- nople; but in 1830 the sultan permitted the Serbs to elect a patriarch (as a matter of fact he is merely styled metropolitan), subject to the confirmation of the patriarch of Constantinople. Eight years later the seat of ecclesiastical government was fixed at Belgrade; and when Servia gained its independence its church became auto- cephalous.

5. The Rumanian Church. — The fall of the church of Okhrida in 1767 had made Moldavia and Wallachia ecclesiastically subject to Constantinople. On the union of the two principalities under Alexander Couza (December 1861) the Church was declared auto- cephalous under a metropolitan at Bucharest; and the fact was

recognized by the patriarchs, as it was in the case of Servia, after the treaty of Berlin had guaranteed their independence.

6. The Church of Montenegro has from early times been inde- pendent under its bishops, who from 1516 to 1851 were also the temporal rulers, under the title of Vladikas, or prince-bishops.

7. The Orthodox Church in Austria-Hungary, which, however, really consists of four independent sections : the Servians of Hungary and Croatia, under the patriarch of Karlowitz: the Rumanians of Transylvania, under the archbishop of Hermannstadt ; the Ruthenians of Bukovina, under the metropolitan of Czernowitz; and the Serbs of Bosnia-Herzogovina, where there are four sees, that of Sarajevo holding the primacy.

8. The Russian Church dates from 992, when Prince Vladimir and his people accepted Christianity. The metropolitan, who was subject to the patriarch of Constantinople, resided at Kiev on the Dnieper. During the Tatar invasion the metropolis was destroyed, and Vladimir became the ecclesiastical capital. In 1320 the metro- politans fixed their seat at Moscow. In 1582 Jeremiah, patriarch of Constantinople, raised Job, 46th metropolitan, to the patriarchal dignity; and the act was afterwards confirmed by a general council of the East. In this way the Russian Church became autocephalous, and its patriarch had immense power. In 1700 Peter the Great forbade the election of a new patriarch, and in 1 721 he established the Holy Governing Synod to supply the place of the patriarch. This body now governs the Russian Church, and consists of a procurator representing the emperor, the metropolitans of Kiev, Moscow and St Petersburg, the exarch of Georgia and five or six other bishops appointed by the emperor. There are altogether some 90 bishops and about 40 auxiliary bishops called vicars. There are 481 monasteries for men and 249 convents of nuns. The Church of Georgia, which has existed from a very early period, and was dependent first on the patriarch of Antioch and then on the patriarch of Constantinople, has since 1802 been incorporated in the Russian Church. Its head, the archbishop of Tiflis, bears the title of exarch of Georgia, and has under him four suffragans. A petition was presented to the emperor by the Georgians in 1904 asking for the restoration of their church and their language, but nothing came of it.

9. The Bulgarian Church, unless indeed it be classed with the separated churches. It differs from the national churches already mentioned in that it had its origin in a revolt of Turkish subjects against the patriarchal authority. From the earliest times the Bulgarians had occupied an anomalous position on the borders of

Eastern and Western Christendom, but they had ultimately become subject to Constantinople. The revival of Bulgarian national feeling near the middle of the 19th century led tc a movement for religious independence, the leaders of which were the archimandrite Neophit Bozveli and the bishop Ilarion Mikhailovsky. The Porte espoused the cause of the Bulgarians, partly to pacify them, but still more to strengthen its hold on all the Christians of Turkey by fostering their differences. Ultimately, on 28th February 1870, the sultan issued a firman constituting a new church, including all Bulgarians

who desired to join it within the vilayet of the Danube (i.e. the subsequently-formed principality of Bulgaria), and those of Adrian-ople, Salonica, Kossovo and Monastir {i.e. part of Macedonia, Eastern Rumelia and a tract farther south). The members of this Church were to constitute a millet or community, enjoying equal rights with the Greeks and Armenians; and its head, the Bulgarian exarch, was to reside at Constantinople. Naturally, this was re- sented by the patriarch Anthimus, who stigmatized the racial basis of the Bulgarian Church as the heresy of Phyletism. A local synod at Constantinople, in August 1872, pronounced it schismatical ; Antioch, Alexandria and Greece followed suit; Jerusalem pro- nounced a modified condemnation; and the Servian and Rumanian churches avoided any definite expression of opinion. Russia was more favourable. It never actually acknowledged the Bulgarian Church, and Bulgarian prelates may not officiate publicly in Russian churches; on the other hand, the Holy Synod of Moscow refused to recognize the patriarch's condemnation, and Russian ecclesiastics have secretly supplied the Bulgarians with the holy oil. _ Above all, when Prince Boris,, the heir-apparent of the principality, was re- ceived into the Bulgarian Church on 14th February 1896, the emperor of Russia was his godfather. The position is further com- plicated by the fact that many Bulgarians, both within and without the kingdom of Bulgaria, still remain subject to the patriarch. Nevertheless, the Bulgarian Church has made great headway both in Bulgaria itself and in Macedonia. The curious thing is that, the Russian Church is in communion with both sides. The patriarch of Constantinople dares not excommunicate Russia, but the chief of its many grievances against that country is its patronage of the Bulgarian exarchate. The Bulgarians of course say they are not schismatics, but a national branch of the Church Catholic, using their sacred right to manage their own affairs in their own way. They have never excommunicated the Patriarchists. On the whole it seems likely that the patriarch will ultimately have to yield, in spite of the strong Greek feeling against the Bulgars. 1

Present Position of the Orthodox Church. — Although the signs of

weakness which have characterized the past are still present, there are some indications of improvement. The encyclical on unity of Pope Leo XIII. (1895) called forth a reply from the patriarch Anthimus V. of Constantinople and his Synod, which was eminently learned, dignified and charitable. 2 The theo- logical school of the patriarchate, at Halke, is not undistinguished, and the university of Athens has a good record. Whilst the parochial clergy are still as unlearned as ever, there are not a few amongst the higher clergy who are distinguished for their learning beyond the limits of their own communion: for ex- ample, the metropolitan Ph. Bryennios, who discovered and edited the Didache; the archbishop N. Kalogeras, who dis- covered and edited the second part of the commentary of Euthymius Zigabenus (d. c. 11 18) on the New Testament; the archimandrite D. Latas, author of a valuable work on Christian archaeology (Athens, 1883); and the logothete S. Aristarchi, who edited a valuable collection of 83 newly discovered homilies of the patriarch Photius. This was published in 1900 at the Phanar press, erected as a memorial to Theodore of Tarsus, archbishop of Canterbury, by Greek and English churchmen, which was set up by the patriarch Constantine V. in 1899. An authorized version of the Scriptures in ancient Greek is also one of the works undertaken by this institution. On the other hand, the attempt made in 1901 by the Holy Synod at Athens, with the co-operation of Queen Olga of Greece (a Russian princess), to circulate a modern Greek version of the Gospels was resented as a symptom of a Pan-Slavist conspiracy, and led to an ebullition of popular feeling which could only be pacified by the withdrawal of the obnoxious version and the abdication of the metropolitan of Athens. The patriarch Constantine V. was deposed on the 12th of April 1901, and was succeeded on the 28th of May by Joachim III. (and V.), who had previously occupied the patri- archal throne from 1878 to 1884, when he was deposed through the ill-will of the Porte and banished to Mount Athos. His re-election had therefore no little importance. His progressive sympathies, illustrated by his proposals to reform the monasteries and the calendar, to modify the four long fasts and to treat for union (especially with the Old Catholics), were not very well received, and in 1905 an attempt was made to depose him. The sultan Abd-ul-Hamid, to whom the different parties appealed,

1 H. Brailsford in Macedonia (London, 1906) brings a crushing indictment against the Patriarchist party.

2 For a different opinion see A. Fortescue, The Orthodox Eastern Church, 435 sqq.

lectured them on charity and concord! The patriarch's great rival was Joachim of Ephesus. Undoubtedly the question of the most pressing importance with regard to the future of Eastern Christendom is the relation between Russia and Con- stantinople. The Oecumenical Patriarch is, of course, officially the superior; but the Russian Church is numerically by far the greatest, and the tendency to regard Russia as the head, not only of the Slav races, but of all orthodox nations, inevitably reacts upon the church in the form of what has been called pan-Ortho- doxy. The Russian Church is the only one which is in a position to display any missionary activity. It has been a powerful factor in the development of several of the churches already spoken of, especially those of Servia and Montenegro, which are usually very much subject to Russian influences CFocr64 > poves or 'Pco(rcra)0iXot). It has taken great interest in non-orthodox churches, such as those of Assyria, Abyssinia and Egypt. Above all, it has shown an increasing tendency to intervene in the affairs of the three lesser patriarchates.

In America the Russian archbishop, who resides in New York, has (on behalf of the Holy Synod) the oversight of some 152

churches and chapels in the United States, Alaska rh' AO ft / X anc ^ Canada. He is assisted by two bishops, one for America. Alaska residing at Sitka, one for Orthodox Syrians

residing in Brooklyn. There are 75 priests and 46,000 registered parishioners. The English language is in- creasingly used in the services. The increase of Orthodox communities has been very marked since 1888 owing to the immigration of Austrian Slavonians. Those of Greek nationality have churches in New Orleans, Chicago, New York, Boston, Lowell (Massachusetts) and other places. If, as seemed likely in 1010, in addition to the Russian and Syrian bishops, Greek and Servian ones were appointed, an independent synod could be formed, and the bishops could elect their own metropolitan. The total number of " Orthodox " Christians in North America is estimated at 300,000. Many of them were Austrian and Hungarian Uniats, who, after emigrating, have shown a tendency to separate from Rome and return to the Eastern Confession. One reason for this tendency is the attempt of the Roman Church to deprive the Uniats in America of their married priests.

The Catholic reaction represented by the Oxford movement in the Church of England early raised the question of a possible ~_ e union

between the Anglican and Eastern Orthodox

question of Churches. Into the history of the efforts to promote Anglican this end, which have never had any official sanction on reun on. ˆe one s ide or the other, it is impossible to enter here. The obstacles would seem, indeed, to be insurmountable. From the point of view of Orthodoxy the English Church is schismatical, since it has seceded from the Roman patriarchate of the West, and doubly heretical, since it retains the obnoxious Filioque clause in the creed while rejecting many of the doctrines and practices held in common by Rome and the East; moreover, the Orthodox Church had never admitted the validity of Anglican orders, while not denying it. Union would clearly only be possible in the improbable event of the English Church surrender- ing most of the characteristic gains of the Reformation in order to ally herself with a body, the traditions of which are “almost wholly alien to her own. At the same time, especially as against the universal claims of the papacy, the two churches have many interests and principles in common, and efforts to find a modus vivendi have not been wanting on either side. The question of union was, for instance, more than once discussed at the un- official conferences connected with the Old Catholic movement (see Old Catholics). These and other discussions could have no definite result, but they led to an increase of good feeling and of personal intercourse. Thus, on the coronation of the emperor Nicholas II. of Russia in 1895, Dr Creighton, bishop of Peterborough, as representative of the English Church, was treated with peculiar distinction, and the compliment of his visit was returned by the presence of a high dignitary of the Russian Church at the service at St Paul’s in London on the occasion of Queen Victoria’s ” diamond ” jubilee in 1897. In 1899 there was further an interchange of courtesies between the archbishop

of Canterbury and Constantine V., patriarch of Constantinople. To promote the ” brotherly feeling between the members of the two churches,” for which the patriarch expressed a desire, a committee was formed under the presidency of the Anglican bishop of Gibraltar.

On this question of reunion see A. Fortescue, The Orthodox Eastern Church, 257 sqq., 429 sqq.

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ORTHOGRAPHY (from Gr. 6p06s, correct, right or straight, and ypa.4>uv, to write), spelling which is correct according to accepted use. The word is also applied, in architecture, to the geometrical elevation of a building or of any part of one in which all the details are shown in correct relative proportion and drawn to scale. When the representation is taken through a building it is known as a section, and when portions of the structure only are drawn to a large scale they are called details.

ORTHONYX, the scientific name given in 1820, by C. J. Temminck, to a little bird, which, from the straightness of its claws — a character somewhat exaggerated by him — its large feet and spiny tail, he judged to be generically distinct from any other form. The typical species, O. spinicauda, is from south- eastern Australia, where it is very local in its distribution, and strictly terrestrial in its habits. It is rather larger than a skylark, coloured above not unlike a hedge-sp,arrow. The wings are, however, barred with white, and the chin, throat and breast are in the male pure white, but of a bright reddish-

orange in the female. The remiges are very short, rounded and much incurved, showing a bird of weak flight. The rectrices are very broad, the shafts stiff, and towards the tip divested of barbs. O. spaldingi from Queensland is of much greater size than the type, and with a jet-black plumage, the throat being white in the male and orange-rufous in the female.

Orthonyx is a semi-terrestrial bird of weak flight, building a domed nest on or near the ground. Insects and larvae are its chief food, and the males are described as performing dancing antics like those of the lyre-bird (q.v.). Orthonyx belongs to the Oscines division of the Passeres and is placed in the family Timeliidae. . (A. N.)

ORTHOPTERA (Gr. 6p86s, straight, and mtpbv, a wing), a term used in zoological classification for a large and important order of the class Hexapoda. The cockroaches, grasshoppers, crickets and other insects that are included in this order were first placed by C. Linne (1735) among the Coleoptera (beetles), and were later removed by him to the Hemiptera (bugs, &c.).. J. C. Fabricius (1775) was the first to recognize the unnaturalness of these arrangements, and founded for the reception of the group an order Ulonata. In 1806 C. de Geer applied to these insects the name Dermaptera (8ep[ia, a skin, and irrepov) ; and A. G.

Olivier subsequently used for the assemblage the name Orthop- tera, which is now much better known than the earlier terms. W. Kirby (1815) founded an order Dermaptera for the earwigs, which had formed part of de Geer's Dermaptera, accepting Olivier's term Orthoptera for the rest of the assemblage, and as modern research has shown that the earwigs undoubtedly deserve original separation from the cockroaches, grasshoppers, crickets, &c, this terminology will probably become established. W. E. Erichson and other writers added to the Orthoptera a number of families which Linne had included in his order Neuroptera. These families are described and their affinities discussed in the articles Neuroptera and Hexapoda (qq.v.). In the present article a short account of the characters of the Dermaptera and Orthoptera is given, while for details the reader is referred to special articles on the more interesting families or groups.

The Dermaptera and the Orthoptera agree in having well- developed mandibles, so that the jaws are adapted for biting ; in the incomplete

fusion of the second maxillae (which form the labium) so that the parts of a typical maxilla can be easily made out (see the description and figures of the cockroach's jaws under Hexapoda) ; in the presence of a large number of excretory (Malpighian)' tubes; in the firm texture of the forewings; in the presence of appendages (cerci) on the tenth abdominal segment; and in the absence of a metamorphosis, the young insect after hatching closely resembling the parent.

Order Dermaptera.

In addition to the characters just enumerated, the Dermaptera are distinguished by the presence of small but distinct maxillulae (fig. 2, see Hexapoda, Aptera) in association with the tongue (hypopharynx) ; by the forewings when present being modified into short quadrangular elytra without nervuration, the complex hind- wings (fig. 1) being folded beneath these both longitudinally and transversely so that nearly the whole abdomen is left uncovered; and by the entirely mesodermal nature of the genital ducts, which,

according to the ob- servations of F. Meinert, open to the exterior by a median aperture, the terminal part of the duct being single, either by the fusion of the primi- tive paired ducts or by the suppression of one of them. In the vast majority of winged insects the terminal part of the , – . genital system (vagina

?/r a n y r X , \ i and ductus ejacula Maxillulae (m) of torius) is un J paired

common earwig and ectodermal.

(Forficula aurzcul- Thus the condition

ana). Magnified in the Dermaptera is

about twenty- more prim j tive than

seven times. in any other Ptery .

gote order except the Ephemeroptera (Mayflies) which are still more generalized, the primitive mesodermal ducts (oviducts and vasa deferentia) opening by paired apertures as in the Crustacea. In the vast majority of the Dermaptera the cerci are — in the adult insect at least — stout, unjointed appendages forming a strong forceps (fig. 1) which the insect uses in arranging the hindwings beneath the elytra. In at least one genus the unjointed pincers of the forceps are preceded, in the youngest instar by jointed cerci. Very many members of the

order are entirely wingless.

There are two families of Dermaptera. The Hemimeridae include the single genus Hemimerus (q.v.), which contains only two species of curious wingless insects with long, jointed cerci, found among the hair of certain West African rodents. The other family is that of the Forficulidae or earwigs (q.v.), all of which have the Cerci modified as a forceps, while wings of thecharacteristic form described above are present in many of the species.

Order Orthoptera.

The bulk of de Geer's " Dermaptera " form the order Orthoptera of modern systematists, which includes some 10,000 described species. The insects comprised in it are distinguished from the earwigs by their elongate, rather narrow forewings, which usually cover, or nearly cover, the abdomen when at rest, and which are firmer in texture than the hindwings. The hindwings have a firm costal area, and a more delicate anal area which folds fanwise,

2. — Hypo-

From Carpenter's Insects. Dent & Co.

Fig. i.— Common Earwig (Forficula auri- cularia). Male. Magni- fied.

so that they are completely covered by the forewings when the insect rests. Rarely (in certain cockroaches) the hindwing undergoes transverse folding also. Wingless forms are fairly frequent in the order, but their relationship to the allied winged species is evident. The female of the common cockroach (fig. 30) shows an interesting vestigial condition of the wings, which are but poorly developed in the male (fig. 36). More important characters of the Orthoptera than the nature of the wings — characters in which they differ from

After Marlatt, Ent. Bull. 4, n. s. U.S. Dept. Agr.

Fig. 3. — Common Cockroach (Blatta orientalis) ; a, female b, male ; c, female (side view) ; d, young. Natural size.

the Dermaptera and agree with the vast majority of winged insects — are the absence of distinct maxillulae and the presence of an unpaired ectodermal tube as the terminal region of the genital system in both sexes. The cerci are nearly always joined, and a typical insectan ovipositor with its three pairs of processes is present in connexion with the vagina of the female. In many Orthoptera this ovipositor is

very long and conspicuous (fig. 5). Information as to the internal structure of a typical orthopteron — the cockroach — will be found under Hexapoda.

Classification. — Six families of Orthoptera are here recognized, but most special students of the order consider that these should be rather regarded as super-families, and the number of families greatly multiplied. Those who wish to follow out the classifica- tion in detail should refer to some of the recent monographs men- tioned below in the bibliography. There is general agreement as to the division of the Orthoptera into three sub-orders or tribes.

I. Phasmodea. — This division includes the single family of the Phasmidae whose members, generally known as ” stick-insects ” (q.v.) and ” leaf-insects ” (q.v.), are among the best-known examples of ” protective resemblance ” to be found in the whole animal kingdom. The prothorax is short and the mesothorax very long, the three pairs of legs closely similar, the wings often highly modified or absent, and the cerci short and unjointed. Each egg is contained in a separate, curiously formed, seed-like capsule, provided with a lid which is raised to allow the escape of the newly-hatched insect.

II. Oothecaria. — In this tribe are included Orthoptera with a large prothorax, whose eggs are enclosed in a common purse or capsule formed by the hardening of a maternal secretion. The Mantidae or ” praying insects ” have the prothorax elongate and the fore- legs powerful and raptorial, while the large, broad head is prominent. The eggs are enclosed

in a case attached to a twig or stone and con- taining many chambers. Fromthiscurioushabita- tion the young mantids hang by threads till after their first moult (see After Howard, Ent. Bull. 4, n. s. U.S. Dept. Agr. Mantis). The Blattidae Fig. 4.— Egg-purse of American Cock- ing. 3) or cockroaches roac h (Periplaneta americana). Magnified. (q.v.) form the second a < side view; b, end view; the outline family of this division. c sno ws natural size. They are readily dis- tinguished by the somewhat rounded prothorax beneath which the head is usually concealed, while the forelegs are unmodified. Sixteen eggs are enclosed together in a compact capsule or " purse "

(fig- 4)-

III. Saltatoria. — The three families included in this tribe are distinguished by their elongate and powerful hindlegs (fig. 5) which enable _ them to leap far and high. They are remarkable for the

possession of complex ears (described in the article Hexapoda) and

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a

stridulating organs which produce chirping notes (see Cricket). The families are the Acridiidae and Locustidae — including the insects familiarly known as locusts and grasshoppers (q.v.) and the Gryllidae or crickets (q.v.). The Acridiidae have the feelers and the ovipositor relatively short, and possess only three tarsal segments; their ears are situated on the first abdominal segment and the males stridulate by scraping rows of pegs on the inner aspect of the hind thigh, over the sharp edges of the forewing nervures. The Locustidae

(see Grasshopper, Katydid) have the feelers and often also the ovipositor very elongate; the foot is four-segmented ; the ears are placed at the base of the foreshin and the stridulation is due to the friction of a transverse ” file ” be- neath the base of the left forewing over a sharp ridge on the upper aspect of the right. In some of these insects the wings are so small as to be useless for flight, being modi- fied altogether for stridulation. TheGryl- After Marlatt, Enl. Bull. 4, n. s. U.S. Dept. Agr. lidae (fig. 5) are nearly

Fig. 5. — House Cricket (Gryllus domesticus) ; related to the Locust- (5 1 , male ;$, female. Natural size. idae, having long

feelers and ovipositors, and agreeing with the latter family in the position of the ears. The forewings are curiously arranged when at rest, the anal region of the wing lying dorsal to the insect and the rest of the wing being turned downwards at the sides (see Cricket).

Fossil History. — The Orthoptera are an exceedingly interesting order of insects as regards their past history. In Palaeozoic rocks of Carboniferous age the researches of S. H. Scudder have revealed insects with the general aspect of cockroaches and phasmids, but with the two pairs of wings similar to each other in texture and form. In the Mesozoic rocks (Trias and Lias) there have been dis- covered remains of insects intermediate between those ancient forms and our modern cockroaches, the differentiation between forewings and hindwings having begun. The Orthopteroid type of wings appears therefore to have arisen from a primitive Isopteroid condition.

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ORTHOSTATAE (Gr. SpflooraTTjs, standing upright), the term in Greek architecture given to the lowest course of masonry of the external walls of the naos or cella, consisting of vertical slabs of stone or marble equal in height to two or three of the horizontal courses which constitute the inner part of the wall.

ORTHOSTYLE (Gr. opdos, straight, and orDXos, a column), in architecture, a range of columns placed in a straight row, as for instance those of the portico or flanks of a classic temple.

ORTIGUEIRA, a seaport of north-western Spain, in the province of Corunna; on the northern slope of the Sierra de la Faladoira, on the river Nera and on the eastern shore of the Ria de Santa Marta — a winding, rock-bound and much indented inlet of the Bay of Biscay, between Capes Ortegal and Vares, the northern- most headlands of the Peninsula. The official total of the in-

habitants of Ortigueira (18,426 in 1900) includes many families which dwell at some distance; the actual urban population does not exceed 2000. The industries are fishing and farming. Owing to the shallowness of the harbour large vessels cannot enter, but there is an

important coasting trade, despite the dangerous character of the coast-line and the prevalence of fogs and gales. The sea-bathing and magnificent, scenery attract visitors in summer even to this remote district, which has no railway and few good roads.

ORTLER, the highest point (12,802 ft.) in Tirol, and so in the whole of the Eastern Alps. It is a great snow-clad mass, which rises E. of the Stelvio Pass, and a little S. of the upper valley of the Adige (whence it is very conspicuous) between the valleys of Trafoi (N.W.) and of Sulden (N.E.). It was long considered to be wholly inaccessible, but was first conquered in 1804 by three Tirolese peasants, of whom the chief was Josef Pichler. The first traveller to make the climb was Herr Gebhard in 1805 (sixth ascent). In 1826 Herr Schebelka, and in 1834 P. K. T. Thurwieser attained the summit, but it was only after the discovery of easier routes in 1864 by F. F. Tuckett, E. N. and H. E. Buxton, and in 1865 by Herr E. von Mojsisovics that the expedition became popular. Many routes to the summit are now known, but that usually taken (from the Payer Club hut, easily accessible from either Sulden or Trafoi) from the north is daily traversed in summer and offers no difficulties to moderately experienced walkers. (W. A. B. C.)

ORTNIT, or Otnit, German hero of romance, was originally Hertnit or Hartnit, the elder of two brothers known as the Hartungs, who correspond in German mythology to the Dioscuri. His seat was at Holmgard (Novgorod), according to the Thidreks- saga (chapter 45), and he was related to the Russian saga heroes. Later on his city of Holmgard became Garda, and in ordinary German legend he ruled in Lombardy. Hartnit won his bride, a Valkyrie, by hard fighting against the giant Isungs, but was killed in a later fight by a dragon. His younger brother, Hardheri (replaced in later German legend by Wolfdietrich), avenged Ortnit by killing the dragon, and then married his brother's widow. Ortnit's wooing was corrupted by the popular interest in the crusades to an Oriental Brautfahrtsaga, bearing a very close resemblance to the French romance of Huon of Bordeaux. Both heroes receive similar assistance from Alberich (Oberon), who supplanted the Russian Ilya as Ortnit's epic father in middle high German romance. Neumann maintained that the Russian Ortnit and the Lombard king were originally two different persons, and that the incoherence of the tale is due to the welding of the two legends into one.

See editions of the Heldenbuch and one of Ortnit and Wolfdietrich by Dr. J. L. Edlen yon Lindhausen (Tubingen, 1906) ; articles in the Zeitschrift fur deutsches Altertum by K. Miillenhoff (xii. pp. 344-354, 1865; xiii. pp. 185-192, 1867), by J. Seemiiller (xxvi. 201-211, 1882),

and by E. H. Meyer (xxxviii. pp. 85-87, 1894), and in Germania by F. Neumann (vol. xxvii. pp. 191-219, Vienna, 1882). See also the literature dealing with Huon of Bordeaux.

ORTOLAN, JOSEPH LOUIS ELZEAR (1802-1873), French jurist, was born at Toulon, on the 21st of August 1802. He studied law at Aix and Paris, and early made his name by two volumes, Explication historique des institutes de Juslinien (1827), and Histoire de la ligislation romaine (1828), the first of which has been frequently republished. He was made assistant librarian to the court of cassation, and was promoted after the Revolution of 1830 to be secretary general. He was also commissioned to give a course of lectures at the Sorbonne on constitutional law, and in 1836 was appointed to the chair of comparative criminal law at the university of Paris. He pub lished many works on constitutional and comparative law, of which the following may be mentioned: Histoire du droit conslitiitionnel en Europe pendant lemoyen dge (1831) ; Introduction historique au cours de ligislation pinale comparie (1841); he was the author of a volume of poetry Les enfantines (1845). He died in Paris, on the 27th of March 1873.

ORTOLAN (Fr. ortolan, Lat. hortulanus, the gardener bird, from hortus, a garden), the Emberiza hortulana of Linnaeus, a bird celebrated for the delicate flavour of its flesh, and a member

of the Emberizidae, a Passerine family not separated by most modern authors from the Fringillidae. A native of most European countries — the British Islands (in which it occurs but rarely) excepted — as well as of western Asia, it emigrates in autumn presumably to the southward of the Mediterranean, though its winter quarters cannot be said to be accurately known, and returns about the end of April or beginning of May. Its distribution throughout its breeding-range seems to be very local, and for this no reason can be assigned. It was long ago said in France, and apparently with truth, to prefer wine-growing districts; but it certainly does not feed upon grapes, and is found equally in countries where vineyards are unknown — reach- ing in Scandinavia even beyond the arctic circle — and then generally frequents corn-fields and their neighbourhood. In appearance and habits it much resembles its congener the yellow-hammer, but wants the bright colouring of that species, its head for instance being of a greenish-grey, instead of a lively yellow. The somewhat monotonous

song of the cock is also much of the same kind; and, where the bird is a familiar object to the country people, who usually associate its arrival with the return of fair weather, they commonly apply various syllabic interpretations to its notes, just as our boys do to those of the yellow-hammer. The nest is placed on or near the ground, but the eggs seldom show the hair-like markings so characteristic of those of most buntings. Its natural food consists of beetles, other insects and seeds. Ortolans are netted in great numbers, kept alive in an artificially lighted, or darkened room , and fed with oats and millet. In a very short time they become enor- mously fat and are then killed for the table. If, as is supposed, the ortolan be the Miliaria of Varro, the practice of artificially fattening birds of this species is very ancient. In French the word Ortolan is used so as to be almost synonymous with the English ” bunting ” — thus the Ortolan-de-neige is the snow-bunting {Plectrophanes nivalis), the Ortolan-de-riz is the rice-bird or “bobolink” of North America (Dolichonyx oryzivorus), so justly celebrated for its delicious flavour; but the name is also applied to other birds much more distantly related, for the Ortolan of some of the Antilles, where French is spoken, is a little ground-dove of the genus Chamaepelia.

In Europe the Beccafico (fig-eater) shares with the ortolan the highest honours of the dish, and this may be a convenient place to point out that the former is a name of equally elastic signification. The true Beccafico is said to be what is. known In England as the garden-warbler (the Motacilla salicaria of Linnaeus, the Sylvia hoHensis of modern writers); but in Italy any soft-billed small bird that can be snared or netted in its autumnal emigration passes under the name in the markets and cook-shops. The ” beccafico,” however, is not as a rule artificially fattened, and on this account is preferred by some sensitive tastes to the Ortolan. (A. N.)

ORTON, JOB (17 1 7-1 783), English dissenting minister, was born at Shrewsbury on the 4th of September 171 7. He entered the academy of Dr Philip Doddridge at Northampton (

Among his numerous works are Letters to Dissenting Ministers (ed. by S. Palmer, 2 vols., 1806), and Practical Works (2 vols., with letters and memoir, 1842).

ORTONA A MARE, a small seaport and episcopal see of the Abruzzi, Italy, in the province of Chieti, 12 m. direct E. of that town and 105 m. by rail S.S.E. of Ancona. Pop. (1901) 8667 (town); rs,523 (commune). It is situated on a promontory 230 ft. above sea-level, and connected with the port below by a wire-rope railway. From the

ruined castle magnificent views to the south as far as the Punta di Penna can be obtained.

The cathedral has been restored at various times, but preserves a fine portal of 13 12 by a local artist, Nicolo Mancini. At one side of it is the Palazzo de Pirris with five pointed windows.

The town occupies the site of the ancient Ortona, a seaport of the Frentani; it lay on the Roman coast-road, which here turned inland to Anxanum (Lanciano), 10 m. to the S. The town suffered much from the ravages of the Turks, who laid it in ruins in 1566, and also from frequent earthquakes.

For discoveries in the neighbourhood see A. de Nino in Notizie degli Scavi (1888), 646. (T. As.)

ORTZEN, GEORG, BARON VON (1829-), German poet and prose-writer, was born at Brunn irr Mecklenburg-Schwerin. He served as an officer of Prussian hussars (1850-1855), entered the consular service and after employment at New York (1879) and Constantinople (1880) was appointed to Marseilles (1881), and then to Christiania (1889), retiring in 1892. He published about thirty volumes, mostly of lyrics and aphorisms, including Gedichte (3rd ed. 1861), Aus den Kampfen des Lebens (1868), Deutsche Traume, deutsche Siege (1876), Epigramme und Epiloge in Prosa (1880), Es war ein Traum (1902). His Erlebnisse und Studien in der Gegenwart (Leipzig, 1875) appeared under the pseudonym Ludwig Robert, and Nacht (Stuttgart, 1899), a collection of sonnets, under that of Stephen Ervesy.

ORURO, a department and town of Bolivia. The department is bounded N. by La Paz, E. by Cochabamba and Potosi, S. by Potosi, and W. by Chile; it forms a part of the ancient Titicaca lacustrine basin, and has an area of 19,127 sq. m., the greater part of which is semi-arid and covered with extensive saline deposits. It is bordered by Cordilleras on the E. and W., and by transverse ridges and detached groups of elevations on the N. and S. The slope and drainage is toward the S., but many of the streams are waterless in the dry season. The outlet of Lake Titicaca, the Desaguadero river, flows southward into Lake Pampa-Aullaguas, or Poopo, on the eastern side of the department near the Cordillera de los Frailes. Lake Poopo is 12,139 ft. above sea-level, or 506 ft. lower than Titicaca, and its waters discharge through a comparatively small outlet, called the Lacahahuira, into the lagoon and saline morasses of Coipasa (r2,o57 ft. elevation) in the S.W. corner of the department. Oruro is almost exclusively a mining department, the country being too arid for

agriculture, with the exception of a narrow strip in the foothills of the Cordillera de los Frailes, where a few cattle, mules and llamas, and a considerable number of sheep are reared. The mineral wealth has not been fully developed except in the vicinity of the capital, in the north-east part of the department, where there are large deposits of tin, silver and copper, Oruro being the second largest producer of tin in the republic. There are borax deposits in the western part of the department, but the output is small.

The capital of the department is Oruro, 115 m. S.S.E. (direct) of La Paz; it is an old mining town dating from the 17th century, when it is said to have had a population of 70,000. The census of 1900 gave it a population of 13,575, the greater part of whom are Indians. A considerable number of foreigners are interested in the neighbouring mines. The elevation of Oruro is 12,250 ft. above sea-level, and its climate is characterized by a short cool summer and a cold rainy winter, with severe frosts and occasional snow-storms. The mean annual temperature is about 43 F. Oruro is the Bolivian terminus of the Antofagasta railway (0-75 metre gauge) , 5 74 m . long, the first constructed in Bolivia. A law of the 27th of November rgo6 piovided for the construction of other lines, of metre gauge, from La Paz (Viacha) to Oruro, from Oruro to Cochabamba, and from Oruro to Tupiza, making Oruro the most important railway centre in Bolivia. Oruro enjoys the nominal distinction pf being one of the four capitals of the republic, an anomaly which was practically ended by the revolution of 1898, since which time the government has remained at La Paz.

ORVIETO (anc. Volsinii (q.v.), later Urbs Vetus, whence the modern name), a town and episcopal see of the province of Perugia, Italy, on the Paglia, 78 m. by rail N. by W of Rome. Pop. (1901) 8820 (town); 18,208 (commune). It crowns an isolated rock, 1033 ft. above sea-level, 640 ft. above the plain,

commanding splendid views, and is approached on the east by a funicular railway from the station. The town is very picturesque, both from its magnificent position and also from the unusually large number of fine 13th-century houses and palaces which still exist in its streets. The chief glory of the place is its splendid cathedral, dedicated to the Virgin; it was begun before 1285, perhaps by Arnolfo di Cambio, on the site of an older church; and from the 13th till the 16th

century was enriched by the labours of a whole succession of great Italian painters and sculptors. The exterior is covered with black and white marble; the interior is of grey limestone with bands of a dark basaltic stone. The plan consists of a large rectangular nave, with semicircular recesses for altars, opening out of the aisles, north and south. There are two transeptal chapels and a short choir. The most magnificent part of the exterior and indeed the finest polychrome monument in existence is the west facade, built of richly- sculptured marble from the designs of Lorenzo' Maitani of Siena, and divided into three gables with intervening pinnacles, closely resembling the front of Siena cathedral, of which it is a reproduc- tion, with some improvements. With the splendour of the whole, the beauty of the composition is marvellous, and it may rank as the highest achievement of Italian Gothic. It was begun in 13 10, but the upper part was not completed till the 16th century. The mosaics are modern, and the whole church has suffered greatly from recent restoration. The four wall-surfaces that flank the three western doorways are decorated with very beautiful sculpture in relief, once ornamented with colour, the designs for which, according to Burckhardt, must be ascribed to the architect of the whole, though executed by other (but still Sienese, not Pisan) hands. The Madonna above the principal portal falls into the same category. The subjects are scenes from the Old and New Testaments, and the Last Judgment, with Heaven and Hell. In the interior on the north, the Cappella del Corporale possesses a large silver shrine, resembling in form the cathedral facade, enriched with countless figures in relief and subjects in translucent coloured enamels — one of the most important specimens of early silversmith's work that yet exists in Italy. It was begun by Ugolino Vieri of Siena in 1337, and was made to contain the Holy Corporal from Bolsena, which, according to the legend, became miraculously stained with blood during the celebration of mass to convince a sceptical priest of the truth of the doctrine of transubstantiation. This is supposed to have happened in 1263, while Urban IV. was residing at Orvieto; and it was to commemorate this miracle that the existing cathedral was built. On the south side is the chapel of S. Brizio, separated from the nave by a fine 14th-century wrought- iron screen. The walls and vault of this chapel are covered with some of the best-preserved and finest frescoes in Italy — among the noblest works of Fra Angelico and Luca Signorelli, mainly painted between 1450 and 1501 — the latter being of especial importance in the history of art owing to their great influence on Michelangelo in his early days. The choir stalls are fine and elaborate specimens of tarsia and rich wood-carving — the work of Antonio and Pietro della Minella (1431-1441). In 16th- century sculpture the cathedral is especially rich, containing many statues,

groups and altar-reliefs by Simone Mosca and Ippolito Scalza. Close by are two Gothic buildings, the bishop's palace (1264) and the Palazzo dei Papi (begun in 1296), the latter with a huge hall now containing the Museo Civico, with various medieval works of art, and also objects from the Etruscan necropolis of the ancient Volsinii (q.v.). The Palazzo Faina has another interesting Etruscan collection. The Palazzo del Comune is Romanesque (12th century), but has been restored. S. Andrea and S. Giovenale are also Romanesque churches of the nth century; both contain later frescoes. To the 12th century belongs the ruined abbey of S. Severo, 1 m. south of the town. The church of S. Domenico contains one of the finest works in sculpture by Arnelfo del Cambio. This is the tomb with re- cumbent effigy of the Cardinal Brago or De Braye (1282), with much, beautiful sculpture and mosaic. It is signed hoc opvs fecit arnvlfvs. It was imitated by Giovanni Pisano in his monument to Pope Benedict XL at Perugia. Among the later

buildings, a few may be noted by Sanmicheli of Verona, who was employed as chief architect of the cathedral from 1509 to 1528. The fortress built in 1364 by Cardinal Albornoz has been converted into a public garden. The well, now disused, called II pozzo di S. Patrizio, is one of the chief curiosities of Orvieto. It is 200 ft. deep to the water-level and 42 ft. in diameter, cut in the rock, with a double winding inclined plane, so that asses could ascend and descend to carry the water from the bottom. It was begun by the architect Antonio da San Gallo the younger in 1527 for Clement VII., who fled to Orvieto after the sack of Rome, and was finished by Simone Mosca under Paul III.

The town appears under the name OvpffifievTos in Procopius (Bell. Goth. ii. n, &c), who gives a somewhat exaggerated description of the site, and as Urbs Vetus elsewhere after his time. Belisarius starved out Vitiges in 539, and became master of it. In 606 it fell to the Lombards, and was recovered by Charlemagne. It formed part of the donation of the Countess Matilda to the papacy. Communal independence had probably been acquired as early as the end of the 10th century, but the first of the popes to reside in Orvieto and to recognize its com- munal administration was Hadrian IV. in n 57. It was then governed by consuls, but various changes of constitution super- vened in the direction of enlarging the governing body. Its sympathies were always Guelphic, and it was closely allied with Florence, which it assisted in the battle of Monteaperto (1260), and its constitution owed much to her model. In 1199 the first podesta, was elected, and in 1251 the first capitano del popolo. There were considerable Guelph and Ghibelline struggles even at Orvieto, the latter party being finally destroyed in 13 13, and the representatives of the former, the Monaldeschi, obtaining the supreme power. The territory of Orvieto extended from Chiusi to

the coast at Orbetello, to the Lake of Bolsena and the Tiber. The various branches of the Monaldeschi continually fought among themselves, however, and the quarrels of two of them divided the city into two factions under the names of Muffati and Mercorini, whose struggles lasted until 1460, when peace was finally made between them. After this period Orvieto was peaceably ruled by papal governors, and had practically no history. Owing to the strong Guelphic sympathies of the in- habitants, and the inaccessible nature of the site, Orvieto was constantly used as a place of refuge by the popes. In 1814 it became the chief town of a district, in 183 1 of a province, and in i860 with Umbria became part of the kingdom of Italy, and became a subprefecture.

See L. Fumi, II Duomo a" Orvieto e i suoi restauri (Rome, 1891); Orvieto, note storiette e biogrufiehe (Citti di Castello, 1891), and other works. (T. As.)

ORYX (Gr. opvl;, a pickaxe, hence applied to the animal), the scientific name of a group of African antelopes of relatively large size with long straight or scimitar-shaped horns, which are present in both sexes, and long tufted tails. They are all desert animals. The true oryx of classical writers was probably the East and North-east African beisa-oryx (Oryx beisa), which is replaced in South Africa by the gemsbuck (oryx gazella). In Northern Africa the group is represented by the scimitar-horned 0. leucoryx or O. algazal, and in Arabia by the small white oryx (O. beatrix). See Antelope.

ORZESZKO or Orszeszko, ELIZA (1842-), Polish novelist, was born near Grodno, of the noble family of Pawlowski. In her sixteenth year she married Piotr Orzeszko, a Polish nobleman, who was exiled to Siberia after the insur- rection of 1863. She wrote a series of powerful novels and sketches, dealing with the social conditions of her country. Eli Makower (1875) describes the relations between the Jews and the Polish nobility, and Meir Ezofowicz (1878) the conflict between Jewish orthodoxy and modern liberalism. On the Niemen (1888), perhaps her best work, deals with the Polish aristocracy, and Lost Souls (1886) and Cham (1888) with rural life in White Russia. Her study on Patriotism and Cosmo- politanism appeared in 1880. A uniform edition of her works appeared in Warsaw, 1884-1888.

OSAKA, or Ozaka, a city of Japan in the province of Settsu. Pop.

(1908) 1,226,590. It lies in a plain bounded, except westward, where it opens on Osaka Bay, by hills of considerable height, on both sides of the Yodogawa, or rather its headwater the Aji (the outlet of Lake Biwa), and is so intersected by river- branches and canals as to suggest a comparison with a Dutch town. Steamers ply between Osaka and Kobe-Hiogo or Kobe, and Osaka is an important railway centre. The opening of the railway (1873) drew foreign trade to Kobe, but a harbour for ocean-steamers has been constructed at Osaka. The houses are mainly built of wood, and on the 31st of July 1909 some 12,000 houses and other buildings were destroyed by fire. Shin-sai Bashi Suji, the principal thoroughfare, leads from Kitahama, the district lying on the south side of the Tosabori, to the iron suspension bridge (Shin-sai Bashi) over the Dotom-bori. The foreign settlement is at Kawaguchi at the junction of the Shirinashi and the Aji. It is the seat of a number of European mission stations. Buddhist and Shinto temples are numerous. The principal secular buildings are the castle, the mint and the arsenal. The castle was founded in 1583 by Hideyoshi; the enclosed palace, probably the finest building in Japan, survived the capture of the castle by Iyeyasu (1615), and in 1867 and 1868 witnessed the reception of the foreign legations by the Tokugawa shoguns; but in the latter year it was fired by the Tokugawa party. It now provides military headquarters, containing a garrison and an arsenal. The whole castle is protected by high and massive walls and broad moats. Huge blocks of granite measuring 40 ft. by 10 ft. or more occur in the masonry. The mint, erected and organized by Europeans, was opened in 1871. Osaka possesses iron-works, sugar refineries, cotton spinning mills, ship-yards and a great variety of other manufactures. The trade shows an increase commensurate with that of the popula- tion, which in 1877 was only 284,105.

Osaka owes its origin to Rennio Shonin, the eighth head of the Shin-Shu sect, who in 1495-1496 built, on the site now occupied by the castle, a temple which afterwards became the principal residence of his successors. In 1580, after ten years' successful defence of his position, Kenryo, the eleventh " abbot," was obliged to surrender; and in 1583 the victorious Hideyoshi made Osaka his capital. The town was opened to foreign trade in 1868.

OSAWATOMIE, a city of Miami county, Kansas, U.S.A., about 45 m. S. by W. of Kansas City, on the Missouri Pacific railway. Pop. (1900)4191 (227 negroes); (1905, state census) 4857; (1910) 4046. A state hospital for the insane (1866) is about 1 m. N.E. of the city. The region is a good one for general farming, and natural gas and petroleum are found in abundance in the vicinity. Osawatomie was settled about 1854 by colonists sent by the Emigrant Aid Company,

and was platted in 1855; its name was coined from parts of the words ” Osage ” and ” Pottawatomie.” It was the scene of two of the ” battles ” of the ” Border War,” and of much of the political violence resulting from the clashes between the “pro-slavery ” and the ‘ ” free-state ” factions of Missouri and Kansas. On the 7th of June 1856 it was plundered by about 170 pro-slavery men from Missouri. On the 30th of August 1856 General John W. Reid, commanding about 400 Missourians, attacked the town. The attack was resisted by Captain John Brown (who had come to Osawatomie in the autumn of 1855) at the head of about 40 men, who were soon overpowered. Of Captain Brown’s men, four were killed and two were executed. The town was looted and practically destroyed. A park commemorating the battle was dedicated here on the 31st of August 1010.

OSBORN, SHERARD (1822-1875), English admiral and Arctic explorer, the son of an Indian army officer, was born on the 25th of April 1822. Entering the navy as a first-class volunteer in 1837, he was entrusted in 1838 with the command of a gunboat at the attack on Kedah in the Malay Peninsula, and was present at the reduction of Canton in 1841, and at the capture of the batteries of Woosung in 1842. From 1844 till 1848 he was gunnery mate and lieutenant in the flag-ship of Sir George Seymour in the Pacific. He took a prominent part in 1849 in advocating

a new search expedition for Sir John Franklin, and in 1850 was appointed to the command of the steam-tender ” Pioneer ” in the Arctic expedition under Captain Austin, in the course of which he performed (1851) a remarkable sledge- journey to the western extremity of Prince of Wales Island. He published an account of this voyage, entitled Stray Leaves from an Arctic Journal (1852), and was promoted to the rank of commander shortly afterwards. In the new expedition (1852-1854) under Sir Edward Belcher he again took part as commander of the ” Pioneer.” In 1856 he published the journals of Captain Robert M’Clure, giving a narrative of the discovery of the North-West Passage. Early in 1855 he was called to active service in connexion with the Crimean War, and being promoted to post-rank in August of that year was appointed to the ” Medusa,” in which he commanded the Sea of AzofE squadron until the conclusion of the war. For these services he received the C.B., the Cross of the Legion of Honour, and the Medjidie of the fourth class. As commander of the ” Furious ” he took a prominent part in the operations of the second Chinese War, and performed a piece of difficult and intricate navigation in taking his ship 600 m. up the Yangtse-kiang to Hankow (1858). He returned to England in broken health in 1859, and at this time contributed a number of articles on naval and Chinese topics to

Blackwood's Magazine, and wrote The Career, Last Voyage and Fate of Sir John Franklin (i860). In 1861 he commanded the "Donegal" in the Gulf of Mexico during the trouble there, and in 1862 undertook the command of a squadron fitted out by the Chinese government for the suppression of piracy on the coast of China; but owing to the non-fulfilment of the condition that he should receive orders from the imperial government only, he threw up the appointment. In 1864 he was appointed to the command of the " Royal Sovereign " in order to test the turret system of ship-building, to which this vessel had been adapted. In 1865 he became agent to the Great Indian Peninsula Railway Company, and two years later managing di- rector of the Telegraph Construction and Maintenance Company. In 1873 he attained flag-rank. His interest in Arctic exploration had never ceased, and in 1873 ne induced Commander Albert Markham to undertake a summer voyage for the purpose of testing the conditions of ice-navigation with the aid of steam, with the result that a new Arctic expedition, under Sir George Nares, was determined upon. He was a member of the committee which made the preparations for this expedition, and died a few days after it had sailed.

OSBORNE, a mansion and estate in the Isle of Wight, England, S.E. of the town of East Cowes. The name of the manor in early times is quoted as Austerborne or Oysterborne, and the estate comprised about 2000 acres when, in 1845, it was purchased from Lady Isabella Blackford by Queen Victoria. The queen subsequently extended the estate to nearly 3000 acres, and a mansion, in simple Palladian style, was built from designs of Mr T. Cubitt. Here the queen died in 1901, and by a letter, dated Coronation Day 1902, King Edward VII. presented the property to the nation. By his desire part of the house was transformed into a convalescent home for officers of the navy and army, opened in 1904.

In 1903 there was opened on the Osborne estate a Royal Naval College. The principal buildings lie near the Prince of Wales's Gate, the former royal stables being adapted to use as class-rooms, a mess-room, and other apartments, while certain adjacent buildings were also adapted, and a gymnasium and a series of bungalows to serve as dormitories, each accommodating thirty boys, were erected, together with quarters for officers, and for an attached body of marines. By the river Medina, on the Kingsdown portion of the estate, a machine shop and facilities for boating are provided.

At the church of St Mildred, Whippingham, ij m. S.S.E. of East Cowes, there 'are memorials to various members of the royal family.

OSCA LINGUA, or Oscan, the name given by the Romans to the language of (1) the Samnite tribes, and (2) the inhabitants of Campania (excluding the Greek colonies) from the 4th century

B.C. onwards. We know from inscriptions that it extended southwards over the whole of the Peninsula, except its two extreme projections (see Bruttii and Messapii) covering the districts known as Lucania and Frentanum, and the greater part of Apulia (see Lucania, Frentani, Apulia). Northward, a very similar dialect was spoken in the Central Apennine region by the Paeligni, Vestini (q.v.) and others. But there is some probability that both in the North and in the South the dialect spoken varied slightly from what we may call the standard or central Oscan of Samnium. There can also be no reasonable doubt, though doubt has strangely been raised, that the popular farces at Rome called Atellanae were acted in Oscan; Strabo (v. p. 233) records this most explicitly as a curious survival.

This name, for what ought probably to be called the Samnite or Safine speech, is due to historical causes, but is, in fact, incorrect. The Osci proper were not Samnites, but the Italic, Pre-Tuscan and Pre-Greek inhabitants of Campania. This is the sense in which Strabo regularly uses the name “Octmm. (cf. v. 247), so that it is quite possible that we should con- nect them with the other tribes whose Ethnica were formed with the co suffix and with the plebs of Rome (see Volsci and Rome).

For further evidence as to the history of the names Osci, Opsci, Opici, see R. S. Conway, The Italic Dialects, p. 149.

The chief monuments of the language, as spoken in Campania, come from Pompeii, Nola, Capua and Cumae (q.v.). From the two towns last mentioned we have the interesting group of heraldic inscriptions known as lovilae (q.v.), and two interesting curses inscribed on lead plates and, so to speak, posted in graves, for conveyance to the deities of the Underworld. One of these may be quoted as a typical specimen of the Oscan of Campania:

From the memnim-Curse : —

luvikis uhtavis

staliis gaviis nep fatlum nep deikum putlans;

luvkis uhtavis nuvellum velliam

nep deikum nep fatlum putlad,

nep memnim nep ulam slfel heriiad.

” (Lucius Octauius, Statius Gauius neue memorare neue indicare possint. Lucius Octauius Nouellum Velliam neue memorare neue indicare possit, neue monumentum neue sepulcrum (?) sibi adipiscatur.”)

The language as spoken in Samnium may be illustrated by a few sentences from the Tabula Agnonensis, now in the British Museum : —

status pus set hurtln herrliln; diuvel verehasiM statif, diuvel regaturel statlf, hereklul kerrliul statif, palanal pilstial statlf, delval genetal statlf. aasal purasial saahtum tefurum alttrel puterelpid akenel sakahlter.

fluusasials az hurtum sakarater; pernal kerrlial statlf, ammal kerrlial statlf, fluusal kerrlial statif, evklul paterel statif.

(” Qui erecti sunt in horto Cereali. Ioui uigiliarum patrono (?) statua, Ioui Rectori statua, Herculi Cereali statua, Pandae HurTlq. (?) statua, Diuae Genetae statua. In ara ignea crematio sancta altero quoque festo (an ‘anno’?) sancitur (an ‘ sanciatur ‘ ?). Deabus Floralibus iuxta hortum sacratur (an ‘ sacrantur ‘ ?) : Anteuortae (?) Cereali statua, Nutrici Cereali statua, Florae Cereali statua, Mercurio patri statua.”)

It remains to notice briefly (1) the chief characteristics which mark off the Osco-Umbrian, or, as they might more conveniently be termed, the Safine group of dialects, from the Latinian, and (2) the features which distinguish Oscan and the dialects most closely allied to it, e.g. North-Oscan (see Paeligni), from the Umbrian or (more strictly) Iguvine dialect (see Iguvium) .

(A.) Phonology. — 1. The conversion of the Indo-European velars into labials, e.g. Oscan and Umbrian pis = Lat. quis, Osc. Umb. pod = Lat. quod.

Umb. petur-pursus = Lat. quadrupedibus ; Osc. kombened = Lat. convenii, from the Indo-European root *g u em-, Eng. come, Sanskrit gam-; Umb. accusative bum = Sanskritgam, Eng. cow, the Lat. bos, bouis having been borrowed from some Safine dialect, since the pure Latin form would have been *uos-

2. The extrusion or syncope (a) of short vowels in the second syllable of a word, e.g. Oscan opsd-, Umbrian osa-, from an Italic stem *opesa-, ” to work, build,” cf. Lat. opera, ” work,” and operari (although this verb appears in Latin to have been invented only at a late period); Osc. actud, Umb. aitu = \js.t. agito; Umb. mersto-, from Italic *medesto-, ” iustus,” beside Lat. modestus. (b) Of short vowels before final s, Osc. hiirz (pronounced horts) = Lat. hortus ; Umb. ikuvins = Lat. Iguuinus; Osc. nom. pi. humuns, O. Lat. hombnes; Umb. abl. pi. avis for *avifos = Lat. auibus.

3. The preservation of s before n, m and I (whereas in Latin it is lost with ” compensatory lengthening ” of the previous vowel when the change is medial): Umb. ahesnes, abl. pi. = Lat. ahenis; Paelignian prismu (nom. sing. fem.) = Lat. prima; Osc. Slabiis = Lat. Labius.

4. Instead of Lat. nd we have in Osco-Umbrian nn — which the Umbrian poet Plautus reproduces as a vulgarism in the well- known line {Miles Glor., v. 14, 1. 1399), distennite hominem, et dis- pennite; hence the gerundives, Osc. opsannam = Lat. operandam. So Umbrian pihaner, from pihanneis (gen. sing, masc.), equivalent to Lat. piandi. It is not certain what the original group of sounds was which appears in the shape of nn in Osco-Umbrian and nd in Latin, nor whether this group of sounds, whatever it was (possibly »£), became nd before it became nn.

5. Final 6 became in both Oscan {■&) and Umbrian (often written u), e.g. Oscan aim = Lat. uia; Umb. adro (nom. pi. neut.) = Lat. atra.

6. Italic e became closer in Osco-Umbrian ; in the Oscan alphabet it is denoted by a special sign k, which is best reproduced by I (although the misleading symbol i with an accent upon it is fre- quently used). In the Umbrian alphabet (see Iguvium) it is variously written e and i, and in the Latin alphabet, when used to write Oscan and Umbrian, we have e, i, and occasionally even ei, e.g. Osc. llgatuls = Lat. legatis, but ligis (in Latin alphabet) = Lat. legibus; Umb. tref and /n/ = Lat. tres; N. Osc. se/ei = Lat. sibi.

7. An original short * in Osco-Umbrian became identical in quality, though not in quantity, with the vowel just described, and is written with just the same symbols in all the alphabets, e.g. Osc. pld, Umb. ped- = Lat. quid.

8. Precisely analogous changes happened with Italic and u; the resulting vowel being denoted in Oscan alphabet both by u and by u (V), in Umbrian alphabet by u, in Latin alphabet by 0.

It is well to add here one or two other characteristics in which Oscan alone is more primitive, not merely than Latin, but even than Umbrian.

(a) Oscan retains s between vowels, whereas in both Latin and Umbrian it became r. In Oscan it seems to have become voiced, as it is represented by z in Latin alphabet, e.g. gen. pi. fem. egmazum, ” rerum ” ; ezum, in Oscan alphabet esom, pres. infin. ” esse.”

(b) Oscan retains the diphthongs ai, ei, oi, ou (representing both original eu and ou) and au even in unaccented syllables, e.g. abl. pi. felhuls, “muris”; dat. pi. diumpals, “lymphis”; infin. deicum ” dicere.”

(c) Oscan retains final, d, e.g. abl. masc. sing, dolud = Lat. dolo. (B.) Morphology. — I. In nouns, (a) Considerable levelling has

taken place between the consonantal and the 0 stems; thus the gen. sing. masc. of Osc. teerom (neut. =Lat. ” terra “) is teerels, just like that of the consonantal stem tangin-, gen. tangineh. Conversely we have the abl. tanginud on the pattern of 0- stem ablatives, like dolud. (b) In the o-stems and the e-stems we have several primitive forms which are obscured in Latin, e.g. gen. sing. fem. eiluas, ” pecu- niae “; gen. pi. masc. Nuvlanum, ” Nolanorum “; and the locative is still a living case in both declensions, e.g. Osc. terel ” in terra,” vial ” in via.”

II. In verbs, (a) The formation of the infinitive in um, e.g. Osc. ezum, Umb. erom, “esse”; opsaum, “operari, facere ” (cf. art Latin Language, § 32). (6) The formation of the future, and future perfect indicative respectively, with stems in es and us; Oscan didest, ” dabit ” ; deivast ” iurabit ” ; censaze (n)t, ” censebunt ” ; Umb. ferest, ” feret “; fut. perf. Osc. fefacust, ” fecerit “; Osc. and Umb. fust, ” fuerit “; Umb. fakust, ” fecerit, ” fakurent, “fecerint”; furent, ” fuerint.” (c) Several new methods of forming the perfect from vowel stems, e.g. the Oscan and Umbrian / perfects. Osc. 1st sing. perf. manafum, ” mandaui ” ; 3rd sing, aamanaffed, ” mandauit, imperauit “; 3rd pi. Osc. fufens, ” fuerunt ” (cf. Umb. perf. subj. passive impersonal pihafei, ” piatum sit”). One other formation occurs frequently in Oscan (from a- verbs), whose origin is obscure. In this the perfect characteristic is «, e.g. pr&fatted, ” probauit.” (d) The peculiar and interesting impersonal or semi-personal forms which ultimately developed into a full passive, e.g. Osc. sakraflr, ” sacrauerit aliquis ” governing an accusative; Umb. ferar, ” ferat aliquis ” (see the section on the passive under Latin Language).

(C.) Syntax. — It may be said generally that there are very few if any

peculiarities in the syntax of the Oscan and Umbrian inscrip- tions as compared with Latin usage, though a large number of familiar Latin idioms appear, such as the abl. absolute; the abl.

of circumstance, the genitive in judicial phrases, the use of the neut. adj. as an abstract substantive, e.g. Oscan ualaemom touticom, ” optimum publicum,” i.e. ” optima rei publicae ratio.” In verbal forms the same use of the gerundive combined with the noun to represent the total verbal action, e.g. Umb. ocrer pehaner paca, ” arcis piandae causa”; the usual sequence of tenses, e.g. the imperfect subj. in Oratio Obliqua representing the fut. indie, in Oratio Recta (see Cippus Abellamus b 23, 25); and finally the use of the perf. subj. in Oscan in prohibitions (nep fefacid, ” neue fecerit “), but also in positive commands (Osc. sakraflr, see above).

Fuller accounts of the dialects in all these aspects will be found most exhaustively in Von Planta, Grammatih der Oskisch-umbrischen Dialekte (Strassburg, 1 892-1 897). Less fully, but very clearly and acutely in C. D. Buck’s Oscan and Umbrian Grammar (Boston, U.S.A., 1904). R. S. Conway, The Italic Dialects, vol. ii. (Cambridge, 1897), gives a fuller account of the alphabets and their history, a Conspectus of the Accidence and an account of the Syntax at some length. _, (R. S. C.)

OSCAR I. (1799-1859), king of Sweden and Norway, was the son of General Bernadotte, afterwards King Charles XIV. of Sweden, and his wife, Eugenie Desiree Clary, afterwards Queen Desideria. When, in August 1810, Bernadotte was elected crown prince of Sweden, Oscar and his mother removed from Paris to Stockholm (June 181 1). From Charles XIII. the lad received the title of duke of Sodermanland (Sudermania). He quickly acquired the Swedish language, and, by the time he reached manhood, had become a general favourite. His very considerable native talents were developed by an excellent education, and he soon came to be regarded as an authority on all social-political questions. In 1839 he wrote a series of articles on popular education, and (in 1841) an anonymous work, Om Straff och straff anstalter, advocating prison reforms. Twice during his father’s lifetime he was viceroy of Norway. On the 19th of June 1823 he married the princess Josephine, daughter of Eugene de Beauharnais, duke of Leuchtenberg, and grand- daughter of the empress Josephine. In 1838 the king began to suspect his heir of plotting with the Liberal party to bring about a

change of ministry, or even his own abdication. If Oscar did not actively assist the Opposition on this occasion, his dis- approbation of his father's despotic behaviour was notorious, though he avoided an actual rupture. Yet his liberalism was of the most cautious and moderate character, as the Opposition, shortly after his accession (March 8th, 1844), discovered to their great chagrin. He would not hear of any radical reform of the cumbrous and obsolete constitution. But one of his earliest measures was to establish freedom of the press. Most of the legislation during Oscar I.'s reign aimed at improving the economic position of Sweden, and the riksdag, in its address to him in 1857, rightly declared that he had promoted the material prosperity of the kingdom more than any of his predecessors. In foreign affairs Oscar I. was a friend of the principle of nationality. In 1848 he supported Denmark against Germany; placed Swedish and Norwegian troops in cantonments in Fiinen and North Schleswig (1849-1850); and mediated the truce of Malmo (August 26th, 1848). He was also one of the guarantors of the integrity of Denmark (London protocol, May 8th, 1852). As early as 1850 Oscar I. had conceived the plan of a dynastic union of the three northern kingdoms, but such difficulties presented themselves that the scheme had to be abandoned. He succeeded, however, in reversing his father's obsequious policy towards Russia. His fear lest Russia should demand a stretch of coast along the Varanger Fjord induced him to remain neutral during the Crimean .War, and, subsequently, to conclude an alliance with Great Britain and France (November 25th, 1855) for preserving the territorial integrity of Scandinavia. Oscar I. left four sons, of whom two, Carl (Charles XV.) and Oskar Fredrik (Oscar II.) , succeeded to his throne.

See T. Almen, Atten Bernadotte (Stockholm, 1896); and C. E. Akrell, Minnen frdn Carls XIV., Oscars I. och Carls XV. Lagar (Stockholm, 1884, 1885). Also Norway (history) and Sweden (history).

OSCAR II. (1829-1907), king of Sweden and Norway, son of Oscar I., was born at Stockholm on the 21st of January 1829. He entered the navy at the age of eleven, and was appointed junior lieutenant in July 1845. Later he studied at the univer-

sity of Upsala, where he distinguished himself in mathematics. In 1857 he married Princess Sophia Wilhelmina, youngest daughter of Duke William of Nassau. He succeeded his brother Charles XV. on the 18th of September 1872, and was crowned in the Norwegian cathedral of Drontheim on the 18th of July 1873. At his accession he adopted as his motto Brodrafolkens Val, " the welfare of the brother folk," and from the first he realized the essential difficulties in the maintenance

of the union between Sweden and Norway. The political events which led up to the final crisis in 1905, by which the thrones were separated, are dealt with in the historical articles under Norway and Sweden: But it may be said that the peaceful solution eventu- ally adopted could hardly have been attained but for the tact and patience of the king himself. He declined, indeed, to permit any prince of his house to become king of Norway, but better relations between the two countries were restored before his death, which took place at Stockholm on the 8th of December 1907. His acute intelligence and his aloofness from the dynastic considerations affecting most European sovereigns gave the king considerable weight as an arbitrator in international questions. At the request of Great Britain, Germany and the United States in 1889 he appointed the chief justice of Samoa, and he was again called in to arbitrate in Samoan affairs in 1899. In 1897 he was empowered to appoint a fifth arbitrator if neces- sary in the Venezuelan dispute, and he was called in to act as umpire in the Anglo-American arbitration treaty that was quashed by the senate. He won many friends in England by his outspoken and generous support of Great Britain at the time of the Boer War (1899-1902), expressed in a declaration printed in The Times of the 2nd of May 1900, when continental opinion was almost universally hostile.

Himself a distinguished writer and musical amateur, King Oscar proved a generous friend of learning, and did much to encourage the development of education throughout his dominions. In 1858 a collection of his lyrical and narrative poems, Memorials of the Swedish Fleet, published anonymously, obtained the second prize of the Swedish Academy. His ” Con- tributions to the Military History of Sweden in the Years 1711, 1712, 1713,” originally appeared in the Annals of the Academy, and were printed separately in 1865. His works, which in- cluded his speeches, translations of Herder’s Cid and Goethe’s Torquato Tasso, and a play, Castle Cronberg, were collected in two volumes in 1875-1876, and a larger edition, in three volumes, appeared in 1885-1888. His Easter hymn and some other of his poems are familiar throughout the Scandinavian countries. His Memoirs of Charles XII. were translated into English in 1879. In 1885 he published his Address to the Academy of Music, and a translation of one of his essays on music appeared in Literature on the 19th of May 1900. He had a valuable collection of printed and MS. music, which was readily accessible to the historical student of music.

His eldest son, Oscar Gustavus Adolphus, duke of Warmland (b. 1858), succeeded him as Gustavus V. His second son, Oscar (b. 1859), resigned his royal rights on his marriage in 1888 with a lady-in-

waiting, Froken Ebba Munck, when he assumed the title of Prince Bernadotte. From 1892 he was known as Count Wisborg. The king's other sons were Charles, duke of Westergotland (b. 1861), who married Princess Ingeborg of Denmark; and Eugene, duke of Nerike (b. 1865), well known as an artist.

OSCEOLA (a corruption of the Seminole As-se-he-ho-lar, meaning black drink) (c. 1804-1838), a Seminole American Indian, leader in the second Seminole War, was born in Georgia, near the Chattahoochee river. His father was an Englishman named William Powell; his mother a Creek of the Red Stick or Mikasuki division. In 1808 he removed with his mother into northern Florida. When the United States commissioners negotiated with the Seminole chiefs the treaties of Payne's Landing (9th of May 1832) and Fort Gibson (28th of March 1833) for the removal of the Seminoles to Arkansas, Osceola seized the opportunity to lead the opposition of the young warriors, and declared to the U.S. agent, General Wiley Thomp-

son, that any chief who prepared to remove would be killed. At the Agency (Fort King, in Marion county) he became more violent, and in the summer of 1835 Thompson put him in irons. From this confinement he obtained his release by a profession of penitence and of willingness to emigrate. Late in November 1835 he murdered Charley Emathla (or Emartla), a chief who was preparing to emigrate with his people, and on the 28th of December he and a few companions shot and killed General Thompson. On the same day two companies of infantry under Major Francis L. Dade were massacred at the Wahoo Swamp near the Withlacoochee river, while marching from Fort Brooke on Tampa Bay to the relief of Fort King. In a battle fought three days later at a ford of the Withlacoochee, Osceola was at the head of a negro detachment, and although the Indians and negroes were repulsed by troops under General Duncan L. Clinch (1787-1849), they continued, with Osceola as their most crafty and determined leader, to murder and devastate, and occasionally to engage the troops. In February 1836 General Edmund P. Gaines (1777-1849), with about 1100 men from New Orleans, marched from Fort Brooke to Fort King. When he attempted to return to Fort Brooke, because there were not the necessary provisions at Fort King, the Indians disputed his passage across the Withlacoochee. In the same year Generals Winfield Scott and Richard K. Call (1791-1862) conducted campaigns against them with little effect, and the year closed with General

Thomas Sidney Jesup (1788-1860) in command with 8000 troops at his disposal. With mounted troops General Jesup drove the enemy from the Withlacoochee country and was pursuing them southward toward the Everglades when several chiefs expressed a readiness to treat for peace. In a conference at Fort Dade on the Withlacoochee on the 6th of March 1837 they agreed to cease hostilities, to withdraw south of the Hillsborough river, and to prepare for emigration to Arkansas, and gave hostages to bind them to their agreement. But on the 2nd of June Osceola came to the camp at the head of about 200 Mikasuki (Miccosukees) and effected the flight of all the Indians there, about 700 including the hostages, to the Everglades. Hostilities were then resumed, but in September Brigadier General Joseph M. Hernandez captured several chiefs, and a few days later there came from Osceola a request for an interview. This was granted, and by command of General Jesup he was taken captive at a given signal and carried to Fort Moultrie, at Charleston, South Carolina, where he died in January 1838. The war continued until 1842, but after Osceola's death the Indians sought to avoid battle with the regular troops and did little but attack the unarmed inhabitants. See J. T. Sprague, The Origin, Progress and Conclusion of the Florida War (New York, 1848).

OSCHATZ, a town in the kingdom of Saxony, in the. valley of the Dollnitz, 36 m. N.W. of Dresden, on the trunk railway to Leipzig. Pop. (1905) 10,854. One of its three Evangelical churches is the handsome Gothic church of St Aegidius, with twin spires. Sugar, felt, woollens, cloth and leather are manu- factured, and there is .considerable trade in agricultural produce. Four miles west lies the Koimberg, the highest eminence in the north of Saxony.

See C. Hoffmann, Historische Beschreibung der Stadt Oschatz (Oschatz, 1873-1874); and Gurlitt, Bau- und Kunstdenkmdler der Amtsmannschajt Oschatz (Dresden, 1905).

OSCHERSLEBEN, a town of Germany, in the Prussian province of Saxony, on the Bode, 24 m. by rail S.W. of Magdeburg, and at the junction of lines to Halberstadt and Jerxheim. Pop. (1905) 13,271. Among its industrial establishments are sugar- refineries, iron-foundries, breweries, machine-shops and brick works. Oschersleben is first mentioned in 803, and belonged in the later middle ages to the bishops of Halberstadt.

OSCILLA, a word applied in Latin usage to small figures, most commonly masks or faces, which were hung up as offerings to various deities, either for propitiation or expiation, and in connexion with festivals and other ceremonies. It is usually taken as the plural of

oscillum (dimin. of os) , a little face. As the oscilla swung in the wind, oscillare came to mean to swing, hence

in English ” oscillation,” the act of swinging backwards and forwards, periodic motion to and fro, hence any variation or fluctuation, actual or figurative. For the scientific problems connected with oscillation see Mechanics and Oscillograph.

Many oscilla or masks, representing the head of Bacchus or of different rustic deities, are still preserved. There is a marble oscillum of Bacchus in the British Museum. Others still in existence are made of earthenware, but it seems probable that wax and wood were the ordinary materials. Small rudely shaped figures of wool, known as pilae, were also hung up in the same way as the oscilla.

The festivals at which the hanging of oscilla took place were: (1) The Sementivae Feriae, or sowing festivals, and the Paganalia, the country festivals of the tutelary deities of the pagi; both took place in January. Here the oscilla were hung on trees, such as the vine and the olive, oak and the pine, and represented the faces of Liber, Bacchus or other deity connected with the cultivation of the soil (Virg. Georg. ii. 382-396). (2) The Feriae Latinae; in this case games were played, among them swinging (oscillatio); cf. the Greek festival of Aeora (see Erigone). Festus (s.v. Oscillum, ed. Mtiller, p. 194) says that this swinging was called oscillatio because the swingers masked their faces (os celare) out of shame. (3) At the Compitalia, Festus says (Paul, ex Fest. ed. Muller, p. 239) that pilae and effigies viriles et muliebres made of wool were hung at the cross- roads to the Lares, the number of pilae equalling that of the slaves of the family, the effigies that of the children; the purpose being to induce the Lares to spare the living, and to be content with the pilae and images. This has led to the generally accepted conclusion that the custom of hanging these oscilla represents an older practice of expiating human sacrifice. There is also no doubt a connexion with lustration by the purifying with air.

OSCILLOGRAPH. In connexion with the study of alternating or varying electric current, appliances are required for determin- ing the mode in which the current varies. An instrument for exhibiting optically or graphically these variations is called an oscillograph, or sometimes an ondograph. Several methods have been employed for making observations of the form of alternating current curves — (1) the point-by-point method, ascribed generally to Jules Joubert; (2) the stroboscopic methods, of which the wave transmitter of H. L. Callendar, E. B. Rosa, and E, Hospitalier are examples; (3) methods employing a high-fre- quency galvanometer or oscillograph, which

originated with A. E. Blondel, and are exemplified by his oscillograph and that of W. Duddell; and (4) purely optical methods, such as those of I. Frohlich and K. F. Braun.

In the point-by-point method the shaft of an alternator, or an alternating current motor driven in step with it, is furnished with an insulating disk having a metallic slip inserted in its edge. Against this disk press two springs which are connected together at each revolution by the contact of the slip at an assigned instant during the phase of the alternating current. This contact may be made to close the circuit of a suitable voltmeter, or to charge a condenser in connexion with it, and the reading of the voltmeter will therefore not be the average or effective voltage of the alternator, but the instantaneous value of the electromotive force corresponding to that instant during the phase, determined by the position of the rotating contact shp with reference to the poles of the alternator. If the contact springs can be moved round the disk so as to vary the instant of contact, we can plot out the value of the observed in- stantaneous voltage of the machine or circuit in a wavy curve, showing the wave form of the electromotive force of the alternator. This process is a tedious one, and necessarily only gives the average form of thousands of different alternations.

In the Hospitalier ondograph, 1 a synchronous electric motor driven in step with the periodic current in the circuit being tested drives a cylinder of insulating material having a metallic slip let into its edge. This cylinder is driven at a slightly lower speed than that of synchronism. Three springs press against the cylinder and make contact for a short time during each revolution, so that a condenser is charged by the circuit at an assigned instant during the alternating current phase, and then subsequently connected to a voltmeter. This process, so to speak, samples or tests the varying electromotive force of the alternating current at one particular instant during the phase and measures it on a voltmeter. Owing to the fact that the cylinder is losing or gaining slightly in speed on the circuit periodicity, the voltmeter goes slowly, say in one minute, through all the phases

1 E. Hospitalier, ” The Slow Registration of Rapid Phenomena by Stroboscopic Methods,” Journ. Inst. Elec. Eng. (London, 1904), 33. IJ5- In this paper the author describes the ” Ondographe ” and ” Puissancegraphe.” See also a description of the ondograph in the Electrical Review, (1902), 50, 969.

of voltage which are performed rapidly during each period by the alternating current. The voltmeter needle may then be made to record its variations graphically on a drum covered with paper and so to delineate the wave form of the current. The process is analo- gous to the optical experiment of looking at a quickly rotating wheel or engine through slits in a disk, rotating slightly faster or slower than the object observed. We then see the engine going through all its motions but much more slowly, and can follow them easily. In another form devised by Callendar, 1 a revolving contact disk is placed on the shaft of an alternator, or of a synchronous motor driven by the alternating current under test. A pair of contact springs are slowly shifted over so as to close the circuit at successive assigned instants during a complete phase. The electromotive force so selected is balanced against the steady potential difference produced between a fixed and a sliding contact on a wire traversed by another steady current, and if there is any difference between this last, the potential difference, and the instantaneous potential difference balanced against it, a relay is operated and sets in action a motor which shifts the contact point along the potentiometer wire and so restores the balance. This contact point also carries a pen which moves over a rotating drum covered with paper. As the brushes are slowly shifted over on the revolving contact so as to select different phases of the alternating electromotive force, the pen follows and draws a curve delineating the wave form of that electromotive force or current. An instrument devised by E. B. Rosa is not very different in construction. 2 A commutator method has also been devised by T. R. Lyle {Phil. Mag., November 1903, 6. 517) in which at an assigned instant during the phase a selection is made from the periodic current and measured on a galvanometer.

The oscillographs of A. E. Blondel 3 and W. Duddell operate on a different principle. They consist essentially of a galvanometer of which the needle or coil has such a short natural periodic time that it can follow all the variations of a current which runs through its cycle in say 1 Jˆth second. This needle or coil must be so damped that when the current is cut off it returns to zero at once without overshooting the mark. By means of an attached mirror and reflected ray of light the motion of the movable system can be indi- cated on a screen. This ray is also given a periodic motion of the same frequency by reflection from a separate oscillating mirror so as to make the two motions at right angles to one another, and thus we have depicted on the screen a bright line having the same form as the periodic current being tested. In W. Duddell's oscillo- graph 4 (fig. 1) the galvanometer part consists

of an electromagnet in the field of which is stretched a loop of very fine wire. To this is attached a mirror; hence, if a current goes up one side of a loop and down another, the wires are oppositely displaced in the field. The loop and mirror move in a cavity full of oil to render the system dead-beat. A ray of light is reflected from this mirror and from another mirror which is rocked by a small motor driven off the same circuit, so that the ray has two vibratory motions imparted to it at right angles, one a simple harmonic motion and the other a motion imitating the variation of the current or electromotive force under test. This ray can be received on a screen or photographic plate, and thus the wave form of the current is recorded. In the Duddell oscillograph it is usual to place a pair of loops in the magnetic field, each with its own mirror, so that a pair of curves can be delineated at the same time, and if there is any difference in phase between them, it will be detected. Thus we can take two curves, one showing the potential difference at the end of an inductive circuit, and the other the current flowing through the circuit. In one form of Blondel's oscillograph, the vibrating system is a small magnetic needle carrying a mirror, but the principle on which it operates is the same as that of the instrument above described. The oscillo- graph can be made to exhibit optically the form of the current curve in non-cyclical phenomena, such as the discharge of a condenser. In this case the large vibrating mirror must be oscillated by a current from an alternator, on the shaft of which is a disk of non- conducting material with brass slips let into it and so arranged with contact brushes that in each period of the alternator a contact is made, charging say a condenser and discharging it through the oscillograph. In this way an optical representation is obtained of the oscillatory discharge of the condenser. A form of thermal oscillograph has been devised by J. T. Irwin (Jour. Inst. Elec. Eng. Lond. 1907, 39. 617). In this instrument the periodic current, the time variation of which is being studied, passes through a pair of fine wires or strips, going up one wire and down the other. These wires are also traversed in the same direction by a constant current from a battery. The two currents are therefore added in one wire and subtracted in the other, and produce a differential heating effect which causes unequal expansion, and this in turn is made to tilt a

1 H. L. Callendar, " An Alternating Cycle Curve Recorder," Electrician, 41. 582.

2 E. B. Rosa, " An Electric Curve Tracer," Electrician, 40. 126.

3 See Assoc. Franc, pour I'Avanc. des Sciences (1898), for a paper on oscillographs describing Blondel's original invention of the

oscillograph in 1 891.

4 Electrician (1897). 39. 636

mirror which reflects a ray of light on to a screen or photographic plate as in the Duddell oscillograph.

Finally, purely optical methods have been employed. Braun' devised a form of cathode ray tube, consisting of a vacuum tube having a narrow tubular portion and a bulbous end. The cathode terminal is connected to the negative pole of an electrostatic machine, such as a Wimshurst or Voss machine, giving a steady pressure. A cathode discharge is projected through two small holes in plates in the narrow part of the tube on a fluorescent screen at the end of the enlarged end, and the cathode ray or pencil depicts on it a small bright greenish patch of light. If a pair of coils of wire through which an alternating current is passing are placed on either side of the tube, just beyond one of the plates with a hole in it, the field

Fig. 1.

causes a periodic displacement of the cathode ray and elongates the patch of light into a bright line. If this patch is also given a displacement in the direction of right angles by examining it in a steadily vibrating mirror, we see a wavy or oscillatory line of light which is an optical representation of the wave form of a current in the coils embracing the Braun tube.

References. — See J. A. Fleming, A Handbook for the Electrical Laboratory and Testing Room, vol. i. (London, 1901), which contains a list of original papers on the oscillograph; Id., The Principles of Electric Wave Telegraphy (London, 1906), which gives illustrations of the use of the oscillograph and the Braun cathode- ray tube in depicting condenser discharges; also, for the development of the oscillograph, A. E. Blondel, " Oscillographs : New Apparatus for registering Electrical Oscillations " (a short description of the bifilar and soft iron oscillographs), Comptes rendus (1893), 116. 502; Id., " On the Determination and Photographic Registration of Periodic Curves," La Lumicre eleclrique (August 29th, 1901); Id.,

6 See K. F. Braun, Wied. Ann. (1897), 60. 552; H. M. Varley, Phil. Mag. (1902), 3500; and J. M. Varley and W. H. F. Murdock, " On some Applications of the Braun Cathode Ray Tube," Electrician

(1905). 55- 335-

” New Oscillographs,” L’£clairage ihctrique (May 1902) ; Id., ” Theory of Oscillographs,” V £clairage Uectrique (October 28th, 1902). ” Hot Wire Wattmeters and Oscillographs,” J. T. Irwin, Jour. Inst. Elec. Eng. (1907), 39. 617. (J. A. F.)

OSH, a town of Russian Turkestan, in the government of Ferghana, 31m. S.E. of Andijan railway terminus, at an altitude of 4030 ft. Pop. (1900) 37,397. It consists of two parts, native and Russian. Here begins a good road up to the Pamirs, practic- able for artillery. The trade with China is considerable.

O’SHANASSY, SIR JOHN (1818-1883), British colonial states- man, was born in 1818 at Holycross Abbey, near Thurles, Tipperary, his father being a land surveyor. He married in 1839, and the same year emigrated to the Port Phillip district of New South Wales, where he was for some time engaged in farming, and subsequently commenced business in Melbourne. Dr Geoghegan, afterwards Roman Catholic bishop of Adelaide, induced him to take part in public affairs. He was one of the founders, and later the president, of the St Patrick’s Society of Melbourne, and represented the Roman Catholic body on the denominational board of education. When Port Phillip was separated from New South Wales in 1851 and became the colony of Victoria, O’Shanassy was returned to the Legislative Council as one of the members for Melbourne. A few weeks after the new colony began its independent existence gold was dis- covered, and the local government had to solve a number of difficult problems. The legislature was composed partly of elected representatives, and partly of nominees appointed by the governor in council. The great natural ability of O’Shanassy forced him to the front, and for some time the policy of the country was virtually shaped by him and by Mr (afterwards Sir) W. F. Stawell, the attorney-general. It was very much owing to the strong position taken by O’Shanassy that the Legislative Council was allowed to control not only the ordinary revenue raised by taxation, but also the territorial revenue derived from the sale and occupation of crown lands. From that date the Legislative Council, led by O’Shanassy, became virtually supreme. After the Ballarat riots in 1854, O’Shanassy was one of the members of a commission appointed to inquire into the con- dition of the gold-fields. The commission’s report was the founda- tion of the mining legislation which, initiated in Victoria, was gradually followed by all the Australasian colonies. O’Shanassy, together with Sir Andrew Clarke, was one of the framers

of the responsible government constitution. Under this constitution O'Shanassy was returned in 1856 to the Legislative Assembly for Melbourne and Kilmore, but took his seat for the latter con- stituency. Early in 1857 the Haines ministry, the first formed after the concession of responsible government, was defeated, and O'Shanassy formed a ministry of which he became the premier. But he was defeated after holding office for little more than six weeks. He returned to power in 1858 as chief secretary and premier. One of the first duties of the new ministry was to inaugurate the system of railways, and to raise the necessary funds for their construction. O'Shanassy decided to float a loan of eight millions sterling through the instrumentality of six of the Melbourne banks, and he began the series of borrowings by the Australian governments which subsequently attained such large proportions. In 1859 the ministry resigned, but in August 1861 O'Shanassy formed his third administration. During the two years that it held office the government passed an Education, a Local government, a Civil Service and a Land Act. The object of this last act was to abolish the system of selling the crown lands by auction, and to substitute another which insisted rather upon residence and cultivation than upon obtaining the highest possible price. The act did not carry out all the inten- tions of its framers, but it was a step in the right direction. The O'Shanassy government was defeated in June 1863, and its chief never again succeeded in regaining office. He did not stand at the general election of 1866, and paid a visit to Europe. In 1867 he returned to Victoria, and was elected to the Legislative Council. In 1870 he was created C.M.G., and in 1874 K.C.M.G. In the latter year he resigned his seat in the council, and did not re-enter public life until 1877, when he was returned to the

Assembly for Belfast. His strongly expressed Conservative opinions and his devotion to the interests of the Roman Catholic church impaired his influence in the legislature, which had become extremely democratic during the eleven years that he had been absent from it ; and although Sir John was a fearless critic of the policy of the government, he never succeeded in defeating it. He had a singularly comprehensive grasp of all constitutional questions, was an eloquent speaker and an ardent free-trader. He retired from parliament in 1880, and died in 1883.

O'SHAUGHNESSY, ARTHUR WILLIAM EDGAR (1844- 1881), English poet, was born in London on the 14th of March 1844, and at the age of seventeen obtained through the first Lord Lytton, who took a peculiar interest in him, the post of transcriber in the library of the British Museum. Two years later he was appointed to be an assistant

in the natural history department, where he specialized in ichthyology. But his natural bent was towards literature. He published his Epic of Women in 1870, Lays of France, a free version of the Lais of Marie de France, in 1872, and Music and Moonlight in 1874. In his thirtieth year he married a daughter of John Westland Marston, and during the last seven years of his life printed no volume of poetry. Songs of a Worker was published posthumously in 1881, O'Shaughnessy dying on the 30th of January in that year from the effects of a chill upon a delicate constitution. O'Shaughnessy was a true singer; but his poems lack importance in theme and dignity in thought. His melodies are often magnificent; and, as in The Fountain of Tears, the richness of his imagery conceals a certain vagueness and indecision of the creative faculty. He was very felicitous in bold uses of repetition and echo, by which he secured effects which for haunting melody are almost inimitable. His spirit is that of a mild melancholy, drifting helplessly through the realities of life and spending itself in song. By some critics he has been disparaged, but reparation was done to his memory by Francis Turner Palgrave, who, in the second series of the Golden Treasury, said with some exaggeration that his metrical gift was the finest, after Tennyson, of any of the later poets, and that he had " a haunting music all his own." •■■

OSHAWA, a manufacturing town and port of entry of Ontario county, Ontario, Canada, on Lake Ontario and the Grand Trunk railway, 30 m. E.N.E. of Toronto. Pop. (1901) 4394. It contains flour, woollen and grist-mills, piano, farm implement and carriage factories, foundries, tanneries, canning factories, &c. There are a ladies' college and good schools.

OSHIMA, a group of three small islands belonging to Japan, lying southwards of Kiushiu, in 30 50′ N. and 130° E. Their names, from west to east, are Kuroshima, Iwo-shima and Taka- shima.- Kuro-shima rises to a height of 2475 ft., and Iwo-shima has an active volcano 2480 ft. high. These islands are not to be confounded with Oshima, the most northerly island of the Izu-noshichito, or with the northern group of the Luchu Islands. There are several other islands of the same name in Japan, Oshima signifying " big island." One of the best known lies off the Kii promontory, and has been the scene of many maritime disasters.

OSHKOSH, a city and the county-seat of Winnebago county, Wisconsin, U.S.A., about 75 m. N.N.W. of Milwaukee, on the W. shore of Lake Winnebago at the mouth of the Upper Fox river. Pop. (1900) 28,284, of whom 7356 were foreign-born (including 4500 from Germany), and 16,942 of foreign parentage (including 10,655 of

German and 1015 of Bohemian parentage); (1910 census) 33,062. Oshkosh is served by the Chicago, Milwaukee & St Paul, the Chicago & Northwestern and the Minneapolis, St Paul & Sault Ste. Marie railways, by river steam- boat lines connecting with other Fox River Valley cities, with the Wisconsin river at Portage, and with the Great Lakes at Green Bay, and by interurban electric lines connecting with Fond du Lac on the S., Green Bay on the N. and Omro on the W. The city lies on both sides of the Fox river, here spanned by six steel bridges, and stretches back to Lake Butte des Morts, an expansion of the Fox. North Park (60 acres), on the lake front,

is the most noteworthy of its parks; and there are Chautauqua grounds on the lake front. Yacht races take place annually on Lake Winnebago. Among the public buildings are the City Hall, Post Office, Winnebago County Court House, Public Library (22,000 volumes). Oshkosh is the seat of a State Normal School (187 1), the largest in the state. The principal industries are the manufacture of lumber and of lumber products, although the former, which was once of paramount importance, has declined with the cutting of neighbouring forests. In 1905 the value of the city's factory product was $8,706,705, the lumber, timber and planing mill products being valued at $4,671,003, the furniture at $751,511 and the waggons and carriages at $475,935. Oshkosh is an important wholesale distributing centre for a large part of central Wisconsin. Farming and dairying are important industries in the vicinity.

Under the French regime the site of Oshkosh was on the natural route of travel tor those who crossed the Fox-Wisconsin portage, and was visited by Marquette, Joliet and La Salle on their way to the Mississippi. There were temporary trading posts here in the 18th century. About 1827 the first permanent settlers came, and in 1830 there were a tavern, a store and a ferry across the river to Algˆma, as the S. side of the river was at first called. The settlement was first known as Saukeer, but in 1840 its name was changed to Oshkosh in honour of a Menominee chief who had befriended the early settlers and who lived in the vicinity until his death in 1856. The real prosperity of the place began about 1845 with the erection of two saw mills; in 1850 Oshkosh had 1400 inhabitants, and between i860 and 1870 the population increased from 6086 to 12,663. In July 1874 and April 1875 the city was greatly damaged by fire.

OSIANDER, ANDREAS (1498-15 5 2), German reformer, was born at Gunzenhausen, near Nuremberg, on the 19th of December 1498. His German name was Heiligmann, or, accord- ing to others, Hosemann. After studying at Leipzig, Altenburg and Ingolstadt, he was ordained priest in 1520 and appointed Hebrew tutor in the Augustinian convent at Nuremberg. Two years afterwards he was appointed preacher in the St Lorenz Kirche, and about the same time he publicly joined the Lutheran party, taking a prominent part in the discussion which ultimately led to the adoption of the Reformation by the city. He married in 1525. He was present at the Marburg conference in 1529,

at the Augsburg diet in 1530 and at the signing of the Schmalkald articles in 1537, and took part in other public transactions of importance in the history of the Reformation; that he had an exceptionally large number of personal enemies was due to his vehemence, coarseness and arrogance in controversy. The introduction of the Augsburg Interim in 1548 necessitated his departure from Nuremberg; he went first to Breslau, and afterwards settled at Konigsberg as professor in its new university at the call of Duke Albert of Prussia. Here in 1550 he published two disputations, the one De lege et evangelio and the other De justijicatione, which aroused a controversy still unclosed at his death on the 17th of October 1552. While he was funda- mentally at one with Luther in opposing both Romanism and Calvinism, his mysticism led him to interpret justification by faith as not an imputation but an infusion of the essential righteousness or divine n?ture of Christ. His party was after- wards led by his son-in-law Johann Funck, but disappeared after the Iatter's execution for high treason in 1566. Osiander's son Lukas (1534-1604), and grandsons Andreas (1562-1617) and Lukas (1571-1638), were well-known theologians.

Osiander, besides a number of controversial writings, published a corrected edition of the Vulgate, with notes, in 1522, and a Harmony of the Gospels — the first work of its kind — in 1537. The best-known work of his son Lukas was an Epitome of the Magdeburg Centuries. See the Life by W. Moller (Elberfeld, 1870).

OSIER (through Fr. from Late Lat. osaria, auxaria, a bundle of osier or willow twigs), the common term under which are included the various species, varieties and hybrids of the genus Salix, used in the manufacture of baskets. The chief species in cultivation are: Salix viminalis (the common osier) and 5. Iriandra, S. amygdalina, S. purpurea and S. fragilis, which

botanically are willows and not osiers. The first named with some forty of its varieties, formed until recent times the staple basket-making material in England. It is an abundant cropper, sometimes attaining on low-lying soils 13 ft. in height. Full- topped and smooth, it is by reason of its pithy nature mainly cultivated for coarse work and is generally used as brown stuff. Some harder varieties, known as stone osiers and raised on drier upland soils, are peeled and used for fine work. 5, jragilis, with some half-score varieties, is almost exclusively used by market gardeners for bunching greens, turnips and other produce. Owing to the increased demand for finer work much attention has been given (see Basket) in recent years to the cultivation of the more ligneous and tougher species, S. triandra, S. purpurea and

S. amygdalina with their many varieties and hybrids.

It is commonly supposed that osiers or willows will prove remunerative and flourish with little attention on any poor, wet, marshy soil. This is, however, not the case. No crop responds more readily to careful husbandry and skilful cultiva- tion. For the successful raising of the finer sorts of willows good, well-drained, loamy upland soil is desirable, which before planting should be deeply trenched and cleared of weeds. J. A. Krabe of Prummern near Aachen, the most scientific and practical of German cultivators, the results of whose experiments have been published in his admirable Lehrbuch der rationellen Weidenkultur (Aix-la-Chapelle, 1886, et seq.) went so far as to assert that willows prefer a dry to a wet soil. T. Selby of Otford, Kent, in a report dated the 18th of November 1800 (see Jour. Soc. Arts, 1801, xix., 75) stated that all kinds of willows invariably throve best on the driest spots of some wet land planted by him. Krabe found that in addition to loam, willows did well on dry ferrugineous, sandy ground with a good top soil of about 6 in. in depth; on poor loamy clay, and even on peaty moors.

At any time, from late winter to early spring, the ground may be planted with " sets," i.e. cuttings of about 9 to 16 in. in length, taken from clean, well-ripened rods. These are firmly set to within 3 to 6 in. of the top in rows, 16 to 20 in. apart and spaced at intervals of 8 to 12 in. Yearling sets are largely planted, but the experiments of Krabe tend to prove, and the practice of the best Midland and West of England growers confirms, the superior productiveness of sets cut from two yearling rods. W. P. Ellmore of Leicester, the most experienced and enterprising of Midland cultivators, preferred to plant his sets in squares, 18 to 20 in. apart, in order to admit of the use of the horse hoe in both directions and a freer play of sun and air. Great care should be exercised in planting lest the bark be fractured, loosened or removed from the wood. The ground should be kept free of weeds by frequent hoeing and, if not subject to periodical alluvial floods, manured yearly. The coarser S. viminalis may be raised on lowland soil if not water-logged or marshy, but the same attention to trenching and weeding is imperative. Ap- proved varieties of willows cost from 5s. to 17s. 6d. per 1000 sets. The more valuable kinds are known as: New kind, Black mauls, Spaniards, Glibskins, Long-bud, Long-skin, Lancashire red-bud, French, Italians, Pomeranians and Councillors and scores of other local names. A hybrid of 5. viminalis and S. triandra, known as Black-top and introduced by Ellmore has been found to produce the heaviest crops on the best Leicestershire grounds.

Cutting and binding take place in early winter after the fall of the leaf,

the crop being known as green whole stuff. The coarser kinds are sorted, cured (dried in the sun and wind) and stacked ready for market. These are known as brown rods. The finer kinds, after the more shrubby or ill-grown rods, termed Ragged, have been re- jected, are peeled or buffed. Two methods of stripping are chiefly practised : from the heads (sets) and from the pit. By the former method the rods are left on the ground until spring advances, when a rapid growth of the cork cambium begins. They are then cut direct from the head and the bark is easily removed by drawing the rods through a bifurcated hand-brake of smooth, well-rounded steel, framed in wood. Improved brakes worked by a treadle strip two rods at a time. For the smaller sizes, rubber brakes are sometimes used and, for the very smallest, the fingers either bare or protected by linen bands. This method ensures a clean-butted unfractured rod, but unless great judgment is exercised in selecting the proper time for cutting, the rods will remain double-skinned and the head may bleed. By the ” pit ” process the green rods are stood upright in shallow pits of water at a depth of about 6 to 9 in. until the sap rises and growth begins, when they are ready for the brake. The defects of this method are that the tops are liable to split in the brake and the butts to remain foul. A third, known as the ” pie ” system enables the grower to bridge over the interval, and to keep his hands employed, between the end of the ” head ” and the

beginning of the ” pit ” strippings. The willows are cut at the first indication of the sap rising and ” couched ” in rotten peelings and soil at a slight angle, the butts being on the ground, which should be strewn with damp straw from a manure heap. The tops are covered lightly with rotted peelings and by periodical application of water, fermentation is induced at the bottom, heat is engendered, the leaves force their way through the covering and peeling may begin. Peeling is chiefly done by women and lasts from early May to the middle of July. After stripping, the rods are bleached in the sun and stored for sale as White. If the rods are to be buffed they are immersed in large tanks of boiling water from 4 to 6 hours. They are then allowed to cool and mellow, are stripped and caiefully dried in sun and air and remain dyed a rich tawny brown or buff colour. Brown rods may also be buffed by sinking them in cold water which is heated to boiling point, and maintained at that temperature for the requisite period. Sticks (two or three yearling osiers) are also grown for whitening and buffing: the less ligneous varieties of S. viminalis are best adapted for this purpose. Osiers or willows when tied for market vary locally in

girth. In the west of England, the Thames vailey, Cambridgeshire and Norfolk a ” bolt of green stuff measures 42 to 45 in. in circumference at 10 in. from the butt; a bolt of white or brown, 40 in. In the northern and midland counties the stuff is invariably sold by weight. On the continent of Europe osiers or willows are bunched in sizes of one metre in girth at the butts and (except in Belgium) are also sold by weight.

The cost of planting an acre of fine willows varies greatly ; it was estimated by R. L. and R. Cotterell of Ruscombe, Berks, as follows : trenching and cleaning ground, £12; sets, 20,000 at 5s. per 1000, £5; planting and levelling £1. Hoeing, first year, £2; succeeding years about £3, 15s. per annum. After 12 to 15 years the heads become ” tired,” and should be grubbed up. The first year’s crop, known as the ” maiden ” crop, is of small value but should be cut and the ensuing years of maturity will yield crops of about 130 bolts, green, per acre, worth £9, 15s. If whitened, the loss in bulk and in rejection being two-thirds, this would produce about 44 bolts, which at £30 per load of 80 bolts, the appreciated market value of 1907, would be worth £16, 10s. The cost of whitening is is. 6d. per bolt, but against this the value of the rejected Ragged, sold as Brown, should be set off. In years of abundant crops and short demand, prices have fallen to £24 per load. . ...

The cost of planting and the outlay for manuring and weeding during the years of maturity of the crop, are higher in the Midlands and the yield was estimated by Ellmore at 6 to 10 tons per acre, green, worth from £3, 10s. to £6, per ton. White rods, costing from £3, to £3, 7s. 6d. per ton for extra labour, will realize from £22 to £24 per ton. Buff rods costing (with coal at 10s. per ton) £5 per ton extra, will realize from £22 to £32 per ton. From 2| to 3 tons of green are required to produce one ton white or buff. Wm. Scaling of Notts estimated the entire cost of an osier plantation at £33, 12s. per acre for the first year and the outlay for the next two years at £7, 5s. and £6, 15s. respectively. The maiden crop he valued at £8, 12s. and the second and third years’ crop at £17 and £22. .

A table given by Krabe, based on results obtained for 12 planta- tions amounting to 20 hectares (50 English acres) during 20 years showed the value of produce per Prussian acre (-2553 of an hectare) to be in the 1st year, £3, 6s. In the 2nd year the value of the produce was £8, 19s; in the 3rd year, £9, 15s.; in the 4th year, £8, ios.; in the 5th year, £8, is.; in the 6th year, £7, 6s.; in the 7th year, £5, 19s.; in the 8th year, £8, 9s.; in the 9th year, £5, 5s.; in the 10th year, £6, ios.; in the nth year, £5, lis.; in the 12th year, £4; in the 13th year, £6, is.; in the

14th year, £2, 9s.; in the 15th year, £2, 8s.; in the 16th year, £1, 18s.; in the 17th year, £2, 7s.; in the 18th year, £2, 2s.; in the 19th year, £3, 13s.; and in the 20th year, £1, ns.

The cultivation of osiers is attended with many disturbing causes- winter floods, spring frosts, ground vermin and insect pests of various kinds, sometimes working great havoc to the crop.

The best comprehensive work on the subject is that by Krabe, which has passed through several editions. A pamphlet on the cultivation of osiers in the Fen districts is issued in England by the Board of Agriculture. (T. 0.)

OSIMO (anc. Auximum, q.v.), a town and episcopal see of the Marches, Italy, in the province of Ancona, 10 m. S. of that town by rail. Pop. (1901) 6404 (town); 18,475 (commune). It is situated on the top of a hill 870 ft. above sea-level, whence there is a beautiful view, and it retains a portion of its ancient town wall (2nd century B.C.). The restored cathedral has a portal with sculptures of the 13th century, an old crypt, a fine bronze font of the 1 6th century and a series of portraits of all the bishops of the see; the town hall contains a number of statues found on the site of the ancient forum and also a few good pictures. The , castle (1489) was built by Baccio Pontelli. Silk-spinning and the raising of cocoons are carried on.

OSIRIS, one of the principal gods of the ancient Egyptians. See Egypt, section Egyptian Religion.

OSKALOOSA, a city and the county-seat of Mahaska county, Iowa, U.S.A., about 62 m. S.E. of Des Moines. Pop. (1900) 9212, of whom 649 were foreign-born and 344 were negroes; 1(1910 U.S. census) 0466. It is served by the Chicago, Burling- ton & Quincy, the Chicago, Rock Island & Pacific, and the Iowa Central railways, and by interurban electric lines. The city is built on a fertile prairie in one of the principal coal-producing regions of the state. At Oskaloosa is held the Iowa yearly meeting of the Society of Friends; and the city is the seat of Penn College (opened 1873), a Friends' institution, and of the Iowa Christian College (incorporated as Oskaloosa College in 1856 and reincorporated under its present name in 1902). At the village of University Park (incorporated in 1909), a suburb adjoining the city on the E., is the Central Holiness University (1906; coeducational), where the annual camp meeting of the National and Iowa Holiness Associations is held. Coal-mining is the most important industry in the surrounding region. There are deposits of clay and limestone in the vicinity, and among the city's manufactures are drain and sewer tile,

paving and building bricks, cement blocks, and warm-air furnaces; in 1905 the factory products were valued at $779,894: Oskaloosa was first settled in 1843; it was selected in 1844 by the county commissioners as a site for the county-seat, and was chartered as a city in 1853. It is said to have been named in honour of the wife of the Indian chief Mahaska (of the Iowa tribe), in whose honour the county was named; a bronze statue of Mahaska (by Sherry E. Fry, an Iowa sculptor) was erected here in 1909.

See W. A. Hunter! ” History of Mahaska. County,” in Annals oj Iowa, vols, vi.-vii. (Davenport, Iowa, 1868-1869), published by the Iowa State Historical Society.

OSMAN (“Usman), the usual form of the Arabic name ‘Othman, as representing the Turkish and Persian pronunciation of the name. It is used, therefore, for (1) the founder of the Osmanli or Ottoman dynasty, Osman I., who took the title of sultan, ruled in Asia Minor, and died in 1326, and (2) the sixteenth sultan Osman II., who reigned 1616-1621 (see Turkey: History). For the third Mahommedan caliph see Othman and Caliphate.

OSMAN (1832-1900), Turkish pasha and mushir (field marshal), was born at Tokat, in Asia Minor, in 1832. Educated at the military academy at Constantinople, he entered the cavalry in 1853, and served under Omar Pasha in the Russian War of 1853-56, in Wallachia and the Crimea. Appointed a captain, in the Imperial Guard, he went through the campaigns of the Lebanon in i860 and of Crete in 1867 to 1869, under Mustapha Pasha, when he distinguished himself at the capture of the convent of Hagia Georgia, and was promoted lieut.-colonel. He served under Redif Pasha in suppressing an insurrection in Yemen in 1871, was promoted major-general in 1874, and general of division in 1875. Appointed to command the army corps at Widin in 1876 on the declaration of war by Servia, he defeated Tchnernaieff at Saitschar and again at Yavor in July, invaded Servia and captured Alexinatz and Deligrad in October, when the war ended. Osman was promoted to be mushir, and continued in the command of the army corps at Widin. When the Russians crossed the Danube in July 1877, Osman moved his force to Plevna, and, with the assistance of his engineer, Tewfik Pasha, entrenched himself there on the right flank of the Russian line of communication, and gradually made the position a most formidable one. He repulsed the three general assaults of the Russians on the 20th and 30th July and the nth September, inflicting on them great loss — some 30,000 men in the three battles. He held the position, after being closely invested, until the 9th December, when, compelled by want to cut his way out, he was severely

wounded and forced to capitulate. This famous improvised defence of a position delayed the Russians for five months, and entailed their crossing the Balkan range in the depth of winter after the third battle of Plevna. The sultan conferred on Osman the Grand Cross of the Osmanie in brilliants and the title of ” Ghazi ” (victorious), and, when he returned from imprisonment in Russia,

made him commandant of the Imperial Guard, grand-master of the artillery and marshal of the palace. In December 1878 he became war minister, and held the post, with a small break, until 1885. He died at Constantinople, in the palace built for him by the sultan near Yildiz Kiosk, on the 14th of April 1900, and his body was buried with great pomp in the Sultan Muhammad Mosque.

OSMIUM [symbol Os., atomic weight 190-9 (0 = i6)], in chemistry, a metallic element, found in platinum ore in small particles, consisting essentially of an alloy of osmium and iridium and known as osmiridium. It was first obtained in 1803 by Smithson Tennant (Phil. Trans., 1804, 94, p. 411). It may be prepared from osmiridium by fusing the alloy with zinc, the zinc being afterwards removed by distillation. The residue so obtained is then powdered and ignited with barium nitrate, which converts the iridium into its oxide and the osmium into barium osmiate. The barium salt is extracted by water and boiled with nitric acid, when the osmium volatilizes in the form of its tetroxide. As an alternative the osmiridium is fused with zinc, the regulus treated with hydrochloric acid, and then heated with barium nitrate and barium peroxide. After fusion, the mass is finely powdered and treated with cold dilute hydro- chloric acid; and when action has finished, nitric and sulphuric acids are added, the precipitated barium sulphate removed, the liquid distilled and the osmium precipitated as sulphide. The sulphide is converted into sodium osmichloride by fusion with salt, in a current of chlorine, the sodium salt transformed into ammonium salt by precipitation with ammonium chloride, and the ammonium salt finally heated strongly (H. Sainte- Claire-Deville and H. J. Debray, An. min., 1859 [5], 16, 74; see also C. E. Claus, Jour, prakt. Chem., 1862, 85, p. 142; F. Wohler, Pogg. 31, p. 161; E. Leidie and L. Quenessen, Bull, soc. chim., 1903 (8), 29, p. 801). The tetroxide, OsQi, can be easily reduced to the metal by dissolving it in hydrochloric acid and adding zinc, mercury, or an alkaline formate to the liquid, or by passing its vapour, mixed with carbon dioxide and monoxide, through a red-hot porcelain tube.

The metal has a blue-grey colour, and may be obtained in the crystalline state by solution in tin. Its specific gravity is 21 -3-22-48 (Deville and Debray) and its specific heat is 0-03113 (Regnault). It can be distilled in the electric furnace. In the massive state it is insoluble in all acids, but when freshly precipitated from solutions it dissolves in fuming nitric acid. On fusion with caustic potash it yields potassium osmiate. It combines with fluorine at ioo° C, and when heated with chlorine it forms a mixture of chlorides. A colloidal variety was obtained by A. Gutbier and G. Hofmeier {Jour, prakt. Chem., 1905 (2), 71, p. 452) by reducing osmium compounds with hydrazine hydrate in the presence of gum arabic.

Several oxides of osmium are known. The protoxide, OsO, is obtained as a dark grey insoluble powder when osmium sulphite is heated with sodium carbonate in a current of carbon dioxide. The sesquioxide, OS2O3, results on heating osmium with an excess of the tetroxide. The dioxide, Os0 2 , is formed when potassium osmi- chloride is heated with sodium carbonate in a current of carbon dioxide, or by electrolysis of a solution of the tetroxide in the presence of alkali. It is insoluble in acids and exists in several hydrated forms. The osmiates, corresponding to the unknown trioxide OSO3, are red or green coloured salts; the solutions are only stable in the presence of excess of caustic alkali ; on boiling an aqueous solution of the potassium salt it decomposes readily, forming a black precipitate of osmic acid, H 2 0s0 4 . Potassium osmiate, KsOs042H 2 0, formed when an alkaline solution of the tetroxide is decomposed by alcohol, or by potassium nitrite, crystallizes in red octahedra. It is stable in dry air, but in moist air rapidly decom- poses. The tetroxide, OSO4, is formed when osmium compounds are heated in air, or with aqua regia, or fused with caustic alkali and nitre. It is obtained as a yellowish coloured mass and can be sublimed in the form of needles which melt at 40 C. It possesses an unpleasant smell and its vapour is extremely poisonous. It dissolves slowly in water, and the aqueous solution is reduced by most metals with precipitation of osmium. It acts as an oxidizing agent, liberating iodine from potassium iodide, converting alcohol into acetaldehyde, &c.

Osmium dichloride, OsCU, is obtained as a dark coloured powder when the metal is heated in a current of chlorine. Its solution in water is deep blue in colour, but the colour changes rapidly to

green and yellow. The trichloride, OsCls, is only known in solution and is formed by the reducing action of mercury on ammonia- cal solutions of the tetroxide. A hydrated form of composition OsCU . 3H 2 has been described. The tetrachloride, OsCU, is obtained as a dark

red sublimate (mixed with the dichloride) when osmium is heated in dry chlorine. It is soluble in water, but the dilute solution readily decomposes on standing. It combines with the chlorides of the alkali metals to form characteristic double salts of the type OsCU.2MCl (osmichlorides). Potassium osmichloride, K 2 0sCl 6 , is formed when a mixture of osmium and potassium chloride is heated in a current of chlorine, or on adding potassium chloride and rlcohol to a solution of the tetroxide in hydrochloric acid. It crystallizes in dark red octahedra which are almost insoluble in cold water. The aqueous solution decomposes rapidly on boiling. Iodine has no action on osmium, but on warming the tetroxide with a mixture of potassium iodide and hydrochloric acid a deep emerald green colour is produced, due to the formation of a compound OsI 2 .2HI; this reaction is a delicate test for osmium (E. Pinerua Alvarez, Comptes rendus, 1905, 140, p. 1254). Osmium disulphide, OsS 2 , is obtained as a dark brown precipitate, insoluble in water, by passing sulphuretted hydrogen into a solution of an osmichloride. The tetrasulphide, OsS 4 , is similarly prepared when sulphuretted hydrogen is passed into acid solutions of the tetroxide. It is a brownish black solid, insoluble in solutions of the alkaline sulphides. The atomic weight of the metal has been determined by K. Seubert (Ber., 1888, 21, p. 1839) from the analysis of potassium and ammonium osmi- chlorides, the values obtained being approximately 191.

OSNABRUCK, a town and episcopal see of Germany, in the Prussian province of Hanover, situated on the Hase, 70 m. W. of the city of Hanover, 31 m. by rail N.E. of Munster, and at the junction of the lines Hamburg-Cologne and Berlin- Amsterdam. Pop. (1905) 59,580. The older streets contain many interesting examples of Gothic and Renaissance domestic architecture, while the substantial houses of the modern quarters testify to the present prosperity of the town. The old fortifica- tions have been converted into promenades. The Roman Catholic cathedral, with its three towers, is a spacious building of the 13th century, partly in the Romanesque and partly in the Transitional style; but it is inferior in architectural interest to the Marienkirche, a fine Gothic structure of the 14th and 15th centuries. The town hall, a 15th-century Gothic building, contains portraits of some of the plenipotentiaries engaged in concluding the peace of Westphalia, the negotiations for which were partly carried on here from 1644 to 1648. Other im- portant buildings are the museum, erected in 1888- 1889 and containing scientific and historical collections; the episcopal palace and the law courts. The lunatic asylum on the Ger- trudenberg occupies the site of an ancient nunnery. The town has an equestrian statue of the emperor William I., a statue of Justus Moser (17 20-1

794) and a memorial of the war of 1870-1871 . Linen was formerly the staple product, but it no longer retains that position. The manufactures include machinery, paper, chemicals, tobacco and cigars, pianos and beer. Other in- dustries are spinning and weaving. The town has large iron and steel works and there are coal mines in the neighbourhood. A brisk trade is carried on in grain and wood, textiles, iron goods and Westphalian hams, while important cattle and horse fairs are held here.

Osnabriick is an ancient place and in 888 received the right to establish a mint, a market and a toll-house. Surrounded with walls towards the close of the nth century, it maintained an independent attitude towards its nominal ruler, the bishop, and joined the Hanseatic League, reaching the height of its prosperity in the 15th century. The decay inaugurated by the dissension? of the Reformation was accelerated by the ravages of the Thirty Years' War, but a new period of prosperity began about the middle of the 18th century. The bishopric of Osnabriick was founded by Charlemagne about 800, after he had subdued the Saxons. It embraced the district between the Ems and the Hunte, and was included in the archbishopric of Cologne. By the peace of Westphalia it was decreed that it should be held by a Roman Catholic and a Protestant bishop alternately, and this state of affairs lasted until the seculariza- tion of the see in 1803. In 181 5 the bishopric was given to Hanover. The last bishop was Frederick, duke of York, a son of the English king George III. Since 1857 Osnabriick has been the seat of a Roman Catholic bishop.

See Friederici and Stieve, Geschichte der Stadt Osnabriick (Osna- briick, 1816-1826); Wurra, Osnabriick, seine Geschichte, seine Bau- und Kunstdenkmaler (Osnabriick, 1906); and Hoffmeyer, Ge- schichte der Stadt und des Regierungsbezirks Osnabriick (Osnabriick, 1904). See also the Osnabriicker Geschichtsquellen (Osnabriick, 1 89 1 fol.); the Osnabriicker Urkundenbuch, edited by F. Philippi and M. Bar (Osnabriick, 1892-1902); and the publications of the Verein fur Geschichte und Landeskunde von Osnabriick (Osnabriick, 1882 fol.). For the history of the bishopric see J. C. Moller, Geschichte der Weihbischofe von Osnabriick (Lingen, 1887); and C. Stiive, Geschichte des Hochstifts Osnabriick (Jena, 1872-1882).

OSNABURG, the name given to a coarsish type of plain fabric, originally made from flax yarns. It is now made from either flax, tow

or jute yarns — sometimes flax or tow warp with mixed or jute weft, and often entirely of jute. The finer and better qualities form a kind of common sheeting, and the various kinds may contain from 20 to 36 threads per inch and 10 to 15 picks per inch.

OSORIO, JERONYMO (1506-1580), Portuguese historian, was a native of Lisbon and son of the Ouvidor Geral of India. In 1 5 19 his mother sent him to Salamanca to study civil law. and in 1525 he went on to Paris to study philosophy, and there became intimate with Peter Fabre, one of the founders of the Society of Jesus. Returning to Portugal, Osorio next proceeded for theology to Bologna, where he made such a name that King John III. invited him in 1536-1537 to lecture on scripture in the reorganized university of Coimbra. He returned to Lisbon in 1540, and acted as secretary to Prince Luiz, and as tutor to his son, the prior of Crato, obtaining also two benefices in the diocese of Vizeu. In 1542 he printed in Lisbon his treatise De nobilitate. After the death of Prince Luiz in 1553, he with- drew from court to his churches. He was named archdeacon of Evora in 1560, and much against his will became bishop of Silves in 1564. The Cardinal Prince Henry, who had bestowed these honours, desired to employ him at Lisbon in state business when King Sebastian took up the reins of power in 1568, but Osorio excused himself on the ground of his pastoral duties, though he showed his zeal for the commonwealth by writing two letters, one in which he dissuaded the king from going to Africa, the other sent during the latter's first expedition there (1574), in which he called on him to return to his kingdom. Sebastian looked with disfavour on opponents of his African adventure, and Osorio found it prudent to leave Portugal for Parma and Rome on the pretext of a visit ad limina. His scruples regarding residence, and the appeals of the king and the Cardinal Prince, prevented him enjoying for long the hospi- tality of Pope Gregory XIII. , and he returned to his diocese and died at Tavira on the 20th of August 1580. An exemplary prelate, a learned scholar and an able critic, Osorio gained a European reputation by writing in Latin, then the lingua franca of the studious throughout Christendom, and the per- fection of his prose style caused him to be named by contem- poraries " the Portuguese Cicero." His well-stocked library was carried off from Faro when the earl of Essex captured the town in 1596, and many of the books were bestowed on the Bodleian at Oxford.

His principal works written in Latin include: (1) De gloria et nobilitate civile et Christiana, an English version of which by W. Blandie appeared in London in 1576. (2) De justitia. (3) De regis inslitutione et disaplina. (4) De vera sapientia. (5) De rebus Emmanuelis (1586), a history of the reign of King Emanuel which is little more than a

translation of the chronicle on the same subject by Damiao de Goes. Osorio's book was turned into Portu- guese by F. M. do Nascimento (q.v.), into French by J. Crispin (2 vols., Geneva, 1610), and an English paraphrase in 2 vols, by J. Gibbs came out in London in 1752. His Opera omnia were published by his nephew (4 vols., Rome, 1592). Two of his polemical treatises have been translated into English, his Epistle to Elizabeth Quene of England by R. Shacklock (Antwerp, 1565), and his Con- futation of M. W. Haddon by J. Fen (Louvain, 1568). His Portuguese epistles, including the two before mentioned, were printed in Lisbon in two editions in 1818 and 1819, and in Paris in 1859. For his biography see Obras de D. F. A. Lobo, bishop of Vizeu, i. 293-301 (Lisbon, 1848). (E. PR.)

OSPREY, or Ospray, a word said to be corrupted from " Ossifrage," Lat. ossifraga, bone-breaker. The Ossifraga of Pliny (H.N. x. 3) and some other classical writers seems to have xx. 12

been the L&mmergeyer (q.v.); but the name, not inapplicable in that case, has been transferred to another bird which is no breaker of bones, save incidentally those of the fishes it devours. 1 The osprey is a rapacious bird ; of middling size and of conspicu- ously-marked plumage, the white of its lower parts, and often of its head, contrasting sharply with the dark brown of the back and most of its upper parts when the bird is seen on the wing. It is the Falco haliaetus of Linnaeus, but was, in 1810, established by J. C. Savigny (Ois. de I'Ugypte, p. 35) as the type of a new genus Pandion. It is closely related to the family Falconidae, but is the representative of a separate family, Pandionidae. Pandion differs from the Falconidae not only pterylologically, as observed by C. L. Nitzsch, but also osteologically, as pointed out by A. Milne-Edwards (Ois. foss. France, ii. pp. 413, 419). In some of the characters in which it differs structurally from the Falconidae, it agrees with certain of the owls; but the most important parts of its internal structure, as well as of its pterylosis, forbid a belief that there is any near alliance of the two groups. The special characters of the family are the presence of a revers- ible outer toe, the absence of an aftershaft and the feathering of the tibiae.

The osprey is one of the most cosmopolitan birds-of-prey. From Alaska to Brazil, from Lapland to Natal, from Japan to Tasmania, and in some of the islands of the Pacific, it occurs as a winter-visitant or as a resident. Though migratory in Europe at least, it is generally independent of climate. It breeds equally on the half-thawed shores of Hudson's Bay and on the cays of Honduras, in the dense forests of Finland and on the barren rocks of the Red Sea, in Kamchatka and in West Australia. Among the countries it does not frequent are Iceland

and New Zealand. Where, through abundance of food, it is numerous — as in former days was the case in the eastern part of the United States — the nests of the fish-hawk (to use its American name) may be placed on trees to the number of three hundred close together. Where food is scarcer and the species accordingly less plentiful, a single pair will occupy an isolated rock, and jealously expel all intruders of their kind, as happens in Scotland. 2 Few birds lay eggs so beautiful or so rich in colouring: their white or pale ground is spotted, blotched or marbled with almost every shade of purple, orange and red— passing from the most delicate lilac, buff and peach-blossom, through violet, chestnut and crimson, to a nearly absolute black. The fierceness with which ospreys defend their eggs and young, in addition to the dangerous situation not infrequently chosen for the eyry, make the task of robbing the nests difficult.

The term ” osprey,” applied to the nuptial plumes of the egrets in the feather trade, is derived from the French esprit; it has nothing to do with the osprey bird, and its use has been supposed to be due to a confusion with ” spray.” (A. N.)

OSROENE, or Osrhoene, a district of north-western Mesopo- tamia, in the hill country 611 the upper Bilechas (Belichus; mod. Nahr Belik, Bilikh), the tributary of the Euphrates, with its capital at Edessa (q.v.), founded by Seleucus I. About 130 B.C. Edessa was occupied by a nomadic Arabic tribe, the Orrhoei (Plin. v. 85; vi. 25, 117, 129), who founded a small state ruled by their chieftains with the title of kings. After them the district was called Orrhoene (thus in the inscriptions, in Pliny and Dio Cassius), which occasionally has been changed into Osroene, in assimilation to the Parthian name Osroes or Chosroes (Khosrau). The founder of the dynasty is therefore called Osroes by Procop. Bell Pers. i. 17; but Orhai or Urhai, son of Hewya (i.e. ” the

1 Another supposed old form of the name is “Orfraie”; but that is said by M. Rolland (Faune popul. France, ii. p. 9, note), quoting M. Suchier (Zeitschr. rom. Philol. i. p. 432), to arise from a mingling of two wholly different sources: (1) Oripelargus, Oriperagus, Orprais and (2) Ossifraga. ” Orfraie ” again is occasion- ally interchanged with Effraie (which, through such dialectical forms as Fresaie, Fressaia, is said to come from the Latin praesaga), the ordinary French name for the barn-owl, Aluco flammeus (see Owl). According to Skeat’s Dictionary (i. p. 408), u Asprey ” is the oldest English form; but ” Osprey ” is given by Cotgrave, and is found as early as the 15th century.

2 Two good examples of the different localities chosen by this bird for its nest are illustrated in Ootheca Wolleyana, pis. B. & H.

snake “), in the chronicle of Dionysius of Tellmahre; he is no historical personality, but the eponym of the tribe. In the Syrian Doctrine oj Addai (ed. Philipps 1876, p. 46) he is called Arjaw, i.e. ” the lion.” The kings soon became dependants of the Parthians; their names are mostly Arabic (Bekr, Abgar, Ma’nu), but among them occur some Iranian (Parthian) names, as Pacorus and Phratamaspates. Under Tigranes of Armenia they became his vassals, and after the victories of Lucullus and Pompey, vassals of the Romans. Their names occur in all wars between Romans and Parthians, when they generally inclined to the Parthian side, e.g. in the wars of Crassus and Trajan. Trajan deposed the dynasty, but Hadrian restored it. The kings generally used Greek inscriptions on their coins, but when they sided with the Parthians, as in the war of Marcus Aurelius and Verus (a.d. 161-165), an Aramaic legend appears instead. Hellenism soon disappeared and the Arabs adopted the language and civilization of the Aramaeans. This develop- ment was hastened by the introduction of Christianity, which is said to have been brought here by the apostle Judas, the brother of James, whose tomb was shown in Edessa. In 190 and 201 we hear of Christian churches in Edessa. King Abgar IX. (or VIII.) (170-214) himself became a Christian and abolished the pagan cults, especially the rite of castration in the service of Atargatis, which was now punished by the loss of the hands (see Bardesanes, ” Book of the Laws of Countries,” in Cureton, Spicilegium Syriacum, p. 31). His conversion has by the legend been transferred to his ancestor Abgar V. in the time of Christ himself, with whom he is said to have exchanged letters and who sent him his miraculous image, which afterwards was fixed over the principal gate of the city (see Abgar; Lipsius, Die edesse- niscke Abgarsage (1880); Dobschutz, Christusbilder (1896)). Edessa now became the principal seat of Aramaic-Christian (Syriac) language and literature; the literary dialect of Syriac is the dialect of Edessa.

Caracalla in 216 abolished the kingdom of Osroene (Dio Cass. 77, 12. 14) and Edessa became a Roman colony. The list of the kings of Osroene is preserved in the Syrian chronicle of Dionysius of Tellmahre, which is checked by the coins and the data of the Greek and Roman- authors; it has been reconstructed by A. v. Gutschmid, ” Untersuchungen iiber die Geschichte des Konig- reichs Osroene,” in MSmoires de l’ Acad, de St PStersbourg, t. xxxv. (1887). Edessa

remained Roman till it was taken by Chosroes II. in 608; but in 625 Heraclius conquered it again. In 638 it was taken by the Arabs. (Ed. M.)

OSROES falso Osdroes or Chosroes), the Greek form of the Persian name Khosrau (see Chosroes). The form Osroes is generally used for a Parthian king who from his coins appears to have reigned from about a.d. 106-129, as successor of his brother Pacorus. But during all this time another king, Vologaeses II. (77-147) maintained himself in a part of the kingdom. Osroes occupied Armenia, and placed Exedares, a son of Pacorus, and afterwards his brother Parthamasiris on the throne. This encroachment on the Roman sphere led to the Parthian war of Trajan. In 114 Parthamasiris surrendered to Trajan and was killed. In Mesopotamia a brother of Osroes, Meherdates (Mithradates IV.), and his son Sanatruces II. took the diadem and tried to withstand the Romans. Against them Trajan united with Parthamaspates, whom he placed on the throne, when he had advanced to Ctesiphon (116). But after the death of Trajan (117) Hadrian acknowledged Osroes and made Parthamaspates king of Edessa (Osroene); he also gave back to Osroes his daughter who had been taken prisoner by Trajan (Dio Cass. 68, 17, 22. 33; Malalas, p. 270 ff.; Spartian, Vita Hadr. 5. 13; Pausan. v. 12, 6). But meanwhile Vologaeses II. had regained a dominant position; his coins begin again in 122 and go on to 146, whereas after 121 we have no coins of Osroes except in 128.

By Procopius, Pers. i. 17, 24, the name of the territory of Osroene is derived from a dynast Osroes, but this is a false etymology (see Osroene). (Ed. M.)

OSSA (mod. Kissovo or Kissavo) , a mountain in the district of Magnesia in Thessaly, between Pelion and Olympus, from which

it is separated by the valley of Tempe. Height about 6400 ft. The Giants are said to have piled Pelion upon it in their attempt to scale Olympus.

OSSETT, a municipal borough in the Morley parliamentary division of the West Riding of Yorkshire, England, 3 m. W. of Wakefield, on the Great Northern and (Horbury and Ossett station) the Lancashire and Yorkshire railways. Pop. (1901) 12,903. It includes the contiguous townships of Ossett, South Ossett and Gawthorpe. The church of the Holy Trinity, a fine cruciform structure in the Early Decorated style, was erected in 1865. Woollen cloth mills, and extensive collieries in the neighbourhood, employ the large industrial population. There are medicinal springs similar in their properties to those of Cheltenham.

The municipal borough, incorporated in 1890, is under a mayor, 4 aldermen and 12 councillors. Area 3238 acres.

OSSIAN, Ossin or Oisin, the legendary Irish 3rd-century hero of Celtic literature, son of Finn. According to the legend embodied in the Ossianic or Ossinic poems and prose romances which early spread over Ireland and Scotland, Ossian and his Fenian followers were defeated in 283 at the battle of Gabhra by the Irish king Carbery, and Ossian spent many years in fairy- land, eventually being baptized by St Patrick. As Oisin he was long celebrated in Irish song and legend, and in recent years the Irish literary revival has repopularized the Fenian hero. In Scotland the Ossianic revival is associated . with the name of James Macpherson (q.v).

See Celt: Literature; also Nutt's Ossian and the Ossianic Literature (1899).

OSSINGTON, JOHN EVELYN DENISON, Viscount (1800- 1873), English statesman, was the eldest son of . John Denison (d. 1820) of Ossington, Nottinghamshire, where he was born on the 27th of January 1800. Educated at Eton and Christ Church, Oxford, he became member of parliament for Newcastle-under- Lyme in 1823, being returned for Hastings three years later, and holding for a short time a subordinate position in Canning's ministry. Defeated in 1830 both at Newcastle-under-Lyme and then at Liverpool, Denison secured a seat as one of the members for Nottinghamshire in 1831; and after the great Reform Act he represented the southern division of that county from 1832 until the general election of 1837. He represented Malton from 1841 to 1857, and North Nottinghamshire from 1857 to 1872. In April 1857 Denison was chosen Speaker of theHouse of Commons. Re-elected at the beginning of three successive parliaments he retained this position until February 1872, when he resigned and was created Viscount Ossington. He refused, however, to accept the pension usually given to retiring Speakers. In 1827 he had married Charlotte (d. 1889), daughter of William, 4th duke of Portland, but he left no children. He died on the 7th of March 1873, and his title became extinct.

OSSINING, a village of Westchester county, New York, U.S.A., 30 m. N. of New York city, on the E. bank of the Hudson river. Pop. (1900) 7939, of whom 1642 were foreign-born; (1910, U.S. census) 11,480. It is served by the New York Central & Hudson River railway, and by river steamboats. It is finely situated overlooking the Tappan Zee, an expansion of the Hudson river, and has excellent facilities for boating, sailing and yachting. The village is the seat of Mount Pleasant

Academy (1814), Holbrook School (1866) and St John's School (1843), all for boys, and has a fine public library. The Croton Aqueduct is here carried over a stone arch with an eighty-foot span. At Ossining, near the river front, is the Sing Sing Prison, the best-known penitentiary in the United States. In 1906 a law was enacted providing for a new prison in the eastern part of the state in place of Sing Sing. The site of Ossining, originally a part of the Phillipse Manor, was first settled about 1700, taking the name of Sing Sing from the Sin Sinck Indians. The village was in- corporated in 1813, and was reincorporated, with enlarged boundaries and a considerably increased population, in 1906, the name being changed from Sing Sing to Ossining in 1901.

OSSORY, THOMAS BUTLER, Earl of (1634-1680), eldest son of James Butler, 1st duke of Ormonde, was born at Kilkenny on the 8th or 9th of July 1634. His early years were spent in

Ireland and France, and he became an accomplished athlete and by no means an indifferent scholar. Having come to London in 1652 he was rightly suspected of sympathizing with the exiled royalists, and in 1655 was put into prison by Cromwell; after his release about a year later he went to Holland and married a Dutch lady of good family, accompanying Charles II. to England in 1660. In 1661 Butler became a member of both the English and the Irish Houses of Commons, representing Bristol in the former and Dublin University in the latter House; and in 1662 was made an Irish peer as earl of Ossory. He held several military appointments, in 1665 was made lieutenant- general of the army in Ireland, and in 1666 was created an English peer as Lord Butler; but almost as soon as he appeared in the House of Lords he was imprisoned for two days for chal- lenging the duke of Buckingham. In 1665 a fortunate accident had allowed Ossory to take part in a big naval fight with the Dutch, and in May 1672, being now in command of a ship, he fought against the same enemies in Southwold Bay, serving with great distinction on both occasions. The earl was partly responsible for this latter struggle, as in March 1672 before war was declared he had attacked the Dutch Smyrna fleet, an action which he is said to have greatly regretted later in life. Whilst visiting France in 1672 he rejected the liberal offers made by Louis XIV. to induce him to enter the service of France, and returning to England he added to his high reputation by his conduct during a sea-fight in August 1673. The earl was intimate with William, prince of

Orange, and in 1677 he joined the allied army in the Netherlands, commanding the British section and winning great fame at the siege of Mons in 1678. He acted as deputy for his father, who was lord-lieutenant of Ireland, and in parliament he defended Ormonde's Irish administration with great vigour. In 1680 he was appointed governor of Tangier, but his death on the 30th of July 1680 prevented him from taking up his new duties. One of his most intimate friends was John Evelyn, who eulogizes him in his Diary. Ossory had eleven children, and his eldest son James became duke of Ormonde in

1688.

See T. Carte, Life of James, duke of Ormonde (1851); and J. Evelyn, Diary, edited by W. Bray (1890).

OSSORY (Osraighe), an ancient kingdom of Ireland, in the south-west of Leinster. The name is preserved by dioceses of the Church of Ireland and the Roman Catholic Church. The kingdom of Ossory was founded in the 2nd century A.D., and its kings maintained their position until 11 10.

OSTADE, the name of two Dutch painters whose ancestors were settled at Eyndhoven, near the village of Ostaden. Early in the 17th century Jan Hendricx, a weaver, moved from Eyndhoven to Haarlem, where he married and founded a large family. The eldest and youngest of his sons became celebrated artists.

1. Adrian Ostade (1610-1685), the eldest of Jan Hendricx's sons, was born and died at Haarlem. According to Houbraken he was taught by Frans Hals, at that time master of Adrian Brouwer. At twenty-six he joined a company of the civic guard at Haarlem, and at twenty-eight he married. His wife died in 1640 and he speedily re-married, but again became a widower in 1666. He took the highest honours of his profession, the presidency of the painters' gild at Haarlem, in 1662. Among the treasures of the Louvre collection, a striking picture represents the father of a large family sitting in state with his wife at his side in a handsomely furnished room, surrounded by his son and five daughters, and a young married couple. It is an old tradition that Ostade here painted himself and his children in holiday attire; yet the style is much too refined for the painter of boors, and Ostade had but one daughter. The number of Ostade's pictures is given by Smith at three hundred and eighty-five, but by Hofstede de Groot (1910) at over 900. At his death the stock of his unsold pieces was over two hundred. His engraved plates were put up to auction, with the pictures, and fifty etched plates — most of them dated 164 7-1648 —

were dis- posed of in 1686. Two hundred and twenty of his pictures are in public and private collections, of which one hundred

and four are signed and dated, while seventeen are signed with the name but not with the date.

Adrian Ostade was the contemporary of David Teniers and Adrian Brouwer. Like them he spent his life in the delineation of the homeliest subjects — tavern scenes, village fairs and country quarters. Between Teniers and Ostade the contrast lies in the different condition of the agricultural classes of Brabant and Holland, and the atmosphere and dwellings that were peculiar to each region. Brabant has more sun, more comfort and a higher type of humanity; Teniers, in consequence, is silvery and sparkling; the people he paints are fair specimens of a well- built race. Holland, in the vicinity of Haarlem seems to have suffered much from war; the air is moist and hazy, and the people, as depicted by Ostade, are short, ill-favoured and marked with the stamp of adversity on theirfeatures and dress. Brouwer, who painted the Dutch boor in his frolics and passion, imported more of the spirit of Frans Hals into his delineations than his colleague; but the type is the same as Ostade's. During the first years of his career Ostade displayed the same tendency to exaggeration and frolic as his comrade, but he is to be dis- tinguished from his rival by a more general use of the principles of light and shade, and especially by a greater concentration of light on a small surface in contrast with a broad expanse of gloom. The key of his harmonies remains for a time in the scale of greys. But his treatment is dry and careful, and in this style he shuns no difficulties of detail, representing cottages inside and out, with the vine leaves covering the poorness of the outer walls, and nothing inside to deck the patchwork of rafters and thatch, or tumble-down chimneys and ladder staircases, that make up the sordid interior of the Dutch rustic of those days. The greatness of Ostade lies in the fact that he often caught the poetic side of the life of the peasant class, in spite of its ugliness, and stunted form and misshapen features. He did so by giving their vulgar sports, their quarrels, even their quieter moods of enjoyment, the magic light of the sungleam, and by clothing the wreck of cottages with gay vegetation.

It was natural that, with the tendency to effect which marked Ostade from the first, he should have been fired by emulation to rival the masterpieces of Rembrandt. His early pictures are not so rare but that we can trace how he glided out of one period into the other. Before the dispersion of the Gsell collection at Vienna in 1872, it was easy to study the steel-grey harmonics and exaggerated caricature of his early works in the period intervening between 1632 and 1638. There is a

picture of a ” Countryman having his Tooth Drawn,” in the Vienna Gallery, unsigned, and painted about 1632; a “Bagpiper” of 1635 in the Liechtenstein Gallery at Vienna; cottage scenes of 1635 and 1636, in the museums of Karls- ruhe, Darmstadt and Dresden; and ” Card Players ” of 1637 in the Liechtenstein palace at Vienna, which make up for the loss of the Gsell collection. The same style marks most of those pieces. About 1638 or 1640 the influence of Rembrandt suddenly changed his style, and he’painted the ” Annunciation ” of the Brunswick museum, where the angels appearing in the sky to Dutch boors half asleep amidst their cattle, sheep and dogs, in front of a cottage, at once recall the similar subject by Rembrandt and his effective mode of lighting the principal groups by rays propelled to the earth out of a murky sky. But Ostade was not successful in this effort to vulgarize Scripture. He might have been pardoned had he given dramatic force and expression to his picture; but his shepherds were only boors’ without much emotion, passion or surprise. His picture was an effect of light, as such masterly, in its sketchy rubbings, of dark brown tone relieved by strongly impasted lights, but without the very qualities which made his usual subjects attractive. When, in 1642, he painted the beautiful interior at the Louvre, in which a mother tends her child in a cradle at the side of a great chimney near which her husband is sitting, the darkness of a country loft is dimly illumined by a beam from the sun that shines on the case- ment; and one might think the painter intended to depict the Nativity, but that there is nothing holy in all the surroundings, nothing attractive indeed except the wonderful Rembrandtesque transparency, the brown tone, and the admirable keeping of the minutest parts. Ostade was more at home in a similar effect applied to the commonplace incident of the ” Slaughtering of a Pig,” one of the masterpieces of 1643, once in the Gsell collection. In this and similar subjects of previous and succeeding years, he returned to the homely subjects in which his power and wonderful observa- tion made him a master. He does not seem to have gone back to gospel illustrations till 1667, when he produced an admirable ” Nativity,” which is only surpassed as regards arrangement and colour by Rembrandt’s ” Carpenter’s Family ” at the Louvre, or the

” Woodcutter and Children ‘ ‘ in the gallery of Cassel. Innumerable almost are the more familiar themes to which he devoted his brush during this interval, from small single figures, representing smokers or drinkers, to vulgarized allegories of the five senses (Hermitage and

Brunswick galleries), half-lengths of fishmongers and bakers and cottage brawls, or scenes of gambling, or itinerant players and quacks, and nine-pin players in the open air. The humour in some of these pieces is contagious, as in the ” Tavern Scene ” of the Lacaze collection (Louvre, 1653). His art may be studied in the large series of dated pieces which adorn every European capital, from St Petersburg to London. Buckingham Palace has a large number, and many a good specimen lies hidden in the private collections of England. But if we should select a few as peculiarly worthy of attention, we might point to the ” Rustics in a Tavern ‘ of 1662 at the Hague, the ” Village School ” of the same year at the Louvre, the ” Tavern Court-yard ” of 1670 at Cassel, the ” Sportsmen’s Rest ” of 1671 at Amsterdam and the ” Fiddler and his Audience ” of 1673 at the Hague. At Amsterdam we have the likeness of a painter, sitting with his back to the spectator, at his easel. The colour-grinder is at work in a corner, a pupil prepares a palette and a black dog sleeps on the ground. A replica of this picture, with the date of 1666, is in the Dresden gallery. Both specimens are supposed to represent Ostade himself. But unfortunately we see the artist’s back and not his face. In his etching (Bartsch, 32) the painter shows himself in profile, at work on a canvas. Two of his latest dated works, the ” Village Street ” and ” Skittle Players,” which were noteworthy items in the Ashburton and Ellesmere collections, were executed in 1676 without any sign of declining powers. The prices which Ostade received are not known, but pictures which were worth £40 in 1750 were worth £1000 a century later, and Earl Dudley gave £4120 for a cottage interior in 1876. The .signatures of Ostade vary at different periods. But the first two letters are generally interlaced. Up to 1635 Ostade writes himself Ostaden, e.g. in the ” Bagpiper ” of 1635 in the Liechtenstein collection at Vienna. Later on he uses the long j (f), and occasionally he signs in capital letters. His pupils are his own brother Isaac, Cornelis Bega, Cornells Dusart and Richard Brakenburg.

2. Isaac Ostade (1621-1649) was born in Haarlem, and began his studies under Adrian, with whom he remained till 1641, when he started on his own account. At an early period he felt the influence of Rembrandt, and this is apparent in a ” Slaughtered Pig ” of 1630, in the gallery of Augsburg. But he soon reverted to a style more suited to his brush. He produced pictures in 1641-T.642 on the lines of his brother — amongst these, the ” Five Senses,” which Adrian afterwards represented by a ” Man reading a Paper,” a ” Peasant tasting Beer,” a ” Rustic smearing his Sores with Ointment ” and a ” Countryman sniffing at a Snuff-box.” A specimen of Isaac’s work at this period may be seen in the ” Laughing Boor with a Pot of Beer,” in the museum of

Amsterdam; the cottage interior, with two peasants and three children near a fire, in the Berlin museum; a ” Concert,” with people listening to singers accompanied by a piper and flute player, and a ” Boor stealing a Kiss from a Woman,” in the Lacaze collection at the Louvre. The interior at Berlin is lighted from a casement in the same Rembrandtesque style as Adrian’s interior of 1643 at the Louvre. The low price he received for his pictures of this character — in which he could only hope to remain a satellite of Adrian — induced him gradually to abandon the cottage subjects of his brother for landscapes in the fashion of Esaias Van de Velde and Salomon Ruisdael. Once only, in 1645, he seems to have fallen into the old groove, when he produced the ” Slaughtered Pig,” with the boy puffing out a bladder, in the museum of Lille. But this was an exception. Isaac’s progress in his new path was greatly facilitated by his previous experience as a figure painter; and, although he now selected his subjects either from village high streets or frozen canals, he gave fresh life to the scenes he depicted by groups of people full of movement and animation, which he relieved in their coarse humours and sordid appearance by a refined and searching study of picturesque contrasts. He did not live long enough to bring his art to the highest perfection. He died on the r6th October 1649 having painted about 400 pictures (see H. de Groot, 1910).

The first manifestation of Isaac’s surrender of Adrian’s style is apparent in 1644 when the skating and sledging scenes were executed which we see in the Lacaze collection and the galleries of the Hermitage, Antwerp and Lille. Three of these examples bear the artist’s name, spelt Isack van Ostade, and the dates of 1644 and 1645. The roadside inns, with halts of travellers, form a compact

series from 1646 to 1649. In this, the last form of his art, Isaac has very distinct peculiarities. The air which pervades his composition is warm and sunny, yet mellow and hazy, as if the sky were veiled with a vapour coloured by moor smoke. The trees are rubbings of umber, in which the prominent foliage is tipped with touches hardened in a liquid state by amber varnish mediums. The same principle applied to details such as glazed bricks or rents in the mud lining of cottages gives an unreal and conventional stamp to those particular parts. But these blemishes are forgotten when one looks at the broad contrasts of light and shade and the masterly figures of horses and riders, and travellers and rustics, or quarrelling children and dogs, poultry and cattle, amongst which a favourite place is always given to the white horse, which seems as invariable an accom- paniment as the grey in the skirmishes and fairs of Wouverman. But it is in winter scenes that Isaac displays the best qualities. The absence of foliage, the crisp

atmosphere, the calm air of cold January days, unsullied by smoke or vapour, preclude the use of the brown tinge, and leave the painter no choice but to ring the changes on opal tints of great variety, upon which the figures emerge with masterly effect on the light background upon which they are thrown. Amongst the roadside inns which will best repay attention we should notice those of Buckingham Palace, the National Gallery, the Wallace and Holford collections in England, and those of the Louvre, Berlin, Hermitage and Rotterdam museums and the Rothschild collection at Vienna on the Continent. The finest of the ice scenes is the famous one at the Louvre.

For paintings and etchings see Les Freres Ostade, by Marguerite van de Wiele (Paris, 1893). For his etchings seeL'CEuvr? d'Ostade, cu description des eaux-fortes de ce maitre, &c, by Auguste d'Orange (i860); and Catalogue raisonne de toutes les estampes qui forment I'xuvre gravi d 'Adrian van Ostade, by L. E. Faucheux (Paris, 1862). (J.A.C.;P. G. K.)

OSTASHKOV, a town of Russia, in the government of Tver, on Lake Seliger, 108 m. W.N.W. of the city of Tver; pop. 10,457. The climate is damp and unhealthy. The town has tanneries, and is a centre for the making of boots and shoes, for agricultural implements, fishing-nets and the building of boats. The advantageous site, the proximity of the Smolenskiy Zhitnyi monastery, a pilgrim resort on an island of the lake and the early development of certain petty trades combined to bring prosperity to Ostashkov. Its cathedral (1672-1685) contains valuable offerings, as also do two other churches of the same century.

OSTEND (Flemish and French Ostende), a town of Belgium in the province of West Flanders. Pop. (1904) 41,181. It is the most fashionable seaside resort and the second port of the kingdom. Situated on the North Sea it forms almost the central point on the 42 m. of sea-coast that belong to Belgium. In the middle ages it was strongly fortified and underwent several sieges; the most notable was that of 1601-1604, when it only surrendered by order of the states to Spinola. In 1865 the last vestiges of its ramparts were removed, and since that date, but more especially since 1898, a new town has been created. The digue or parade, constructed of solid granite, extends for over 2 m. along the shore in a southerly direction from the long jetty which protects the entrance to the port. A fine casino and the royal chalet are prominent objects along the sea front, and the sea-bathing is unsurpassed. In the rear of the town is a fine park to which a race-course has been added. Extensive works were begun in 1900 for the purpose of carrying the harbour back 2 m., and a series of large docks were excavated and extensive quays constructed. The docks

accommodate ships of large tonnage. Apart from these docks Ostend has a very considerable passenger and provision traffic with England, and is the head- quarters of the Belgian fishing fleet, estimated to employ 400 boats and 1600 men and boys. Ostend is in direct railway communication with Brussels, Cologne and Berlin. It is also the starting point of several light railways along the coast and to the southern towns of Flanders.

OSTEND COMPANY. The success of the Dutch, English and French East India Companies led the merchants and shipowners of Ostend to desire to establish direct commercial relations with the Indies. A private company was accordingly formed in 1 717 and some ships sent to the East. The emperor Charles VI. encouraged his subjects to raise subscriptions for the new enterprise, but did not grant a charter or letters patent. Some success attended these early efforts, but the jealousy of the neighbouring nations was shown by the seizure of an Ostend

merchantman with its rich cargo by the Dutch in 1719 off the coast of Africa, and of another by the English near Madagascar.

The Ostenders, however, despite these losses, persevered in their project. The opposition of the Dutch made Charles VI. hesitate for some time to grant their requests, but on the 19th of December 1722 letters patent were granted by which the company of Ostend received for the period of thirty years the privilege of trading in the East and West Indies and along the coasts of Africa on this side and on that of the Cape of Good Hope. Six directors were nominated by the emperor, and subscriptions to the company flowed in so rapidly that the shares were at the end of August 1723 at 12 to 15% premium. Two factories were established, one at Coblom on the coast of Coromandel near Madras, the other at Bankibazar on the Ganges. At the outset the prospects of the company appeared to be most encouraging, but its promoters had not reckoned with the jealousy and hostility of the Dutch and English. The Dutch appealed to the treaty of Westphalia (1648) by which the king of Spain had prohibited the inhabitants of the southern Netherlands from trading with the Spanish colonies. The transference of the southern Netherlands to Austria by the peace of Utrecht (1713) did not, said the Dutch, remove this disability. The Spanish government, however, after some hesitation concluded a treaty of commerce with Austria and recognized the company of

Ostend. The reply to this was a defensive league concluded at Herrenhausen in 1725 by England, the United Provinces and Prussia. ‘ Confronted with such formidable opposition the court of Vienna judged it best to yield. By the terms of a treaty signed at Paris on the 31st of May 1727 the emperor suspended the charter of the company for seveti years, and the powers in return guaranteed the Pragmatic Sanction. The company, after nominally existing for a short time in this state of suspended animation, became extinct. The Austrian Netherlands were con- demned to remain excluded from maritime commerce with the Indies until their union with Holland in 1815. (G. E.)

OSTEOLOGY (Gr. oareov, bone), that part or branch of the science of anatomy which has for its subject the bony framework of the body (see Bone, Skeleton, Anatomy, &c).

OSTERMAN, ANDREI IVANOVICH, Count (1686-1747), Russian statesman, was born at Bochum in Westphalia, of middle-class parents, his name being originally Heinrich Johann Friedrich Ostermann. He became secretary to Vice-Admiral Cornells Kruse, who had a standing commission from Peter the Great to pick up promising young men, and in 1767 entered the tsar’s service. His knowledge of the principal European languages made him the right hand of Vice-Chancellor Shafirov, whom he materially assisted during the troublesome negotiations which terminated in the peace of the Pruth (1711). Osterman, together with General Bruce, represented Russia at the Aland peace congress of 1718. Shrewdly guessing that Sweden was at exhaustion point, and that Gortz, the Swedish plenipotentiary, was acting ultra vires, he advised Peter to put additional pressure on Sweden to force a peace. In 1721 Osterman concluded the peace of Nystad with Sweden, and was created a baron for his services. In 1723 he was made vice-president of the ministry of foreign affairs for bringing about a very advantageous com- mercial treaty with Persia. Peter also constantly consulted him in domestic affairs, and he introduced many administrative novelties, e.g. ” the table of degrees,” and the reconstruction of the College of Foreign Affairs on more modern lines. During the reign of Catherine I. (1725-1727) Osterman’s authority still further increased. The conduct of foreign affairs was left entirely in his hands, and he held also the posts of minister of commerce and postmaster-general. On the accession of Peter II. Osterman was appointed governor to the young emperor, and on his death (1730) he refused to participate in the attempt of Demetrius Golitsuin and the Dolgorukis to convert Russia into a limited constitutional monarchy. He held aloof till the empress Anne was firmly established on the throne as autocrat. Then he got his reward.

His unique knowledge of foreign affairs made him indispensable to the empress and her counsellors, and even as to home affairs his advice was almost invariably

followed. It was at his suggestion that the cabinet system was introduced into Russia. All the useful reforms introduced between 1730 and 1740 are to be attributed to his initiative. He improved the state of trade, lowered taxation, encouraged industry and promoted education, ameliorated the judicature and materially raised the credit of Russia. As foreign minister he was cautious and circumspect, but when war was necessary he prosecuted it vigorously and left nothing to chance. The successful conclusions of the War of the Polish Succession (1733- 1735) and of the war with Turkey (1736-30) were entirely due to his diplomacy. During the brief regency of Anna Leopoldovna (October 1 740-December 1741) Osterman stood at the height of his power, and the French ambassador, La Chetardie, reported to his court that " it is not too much to say that he is tsar of all Russia." Osterman's foreign policy was based upon the Austrian alliance. He had, therefore, guaranteed the Pragmatic Sanction with the deliberate intention of defending it. Hence the determination of France to remove him at any cost. Russia, as the natural ally of Austria, was very obnoxious to France; indeed it was only the accident of the Russian alliance which, in 1 74 1, seemed to stand between Maria Theresa and absolute ruin. The most obvious method of rendering the Russian alliance unserviceable to the queen of Hungary was by implicat- ing Russia in hostilities with her ancient rival, Sweden, and this was brought about, by French influence and French money, when in August 1741 the Swedish government, on the most frivolous pretexts, declared war against Russia. The dispositions previously made by Osterman enabled him, however, to counter the blow, and all danger from Sweden was over when, early in September, Field-Marshal Lacy routed the Swedish general Wrangel under the walls of the frontier-fortress of Villmanstrand, which was carried by assault. It now became evident to La Chetardie that only a revolution would overthrow Osterman, and this he proposed to promote by elevating to the throne the tsesarevna Elizabeth, who hated the vice-chancellor because, though he owed everything to her father, he had systematically neglected her. Osterman was therefore the first and the most illustrious victim of the coup d'Stat of the 6th of December 1741. Accused, among other things, of contributing to the elevation of the empress Anne by his cabals and of suppressing a supposed will of Catherine I. made in favour of her daughter Elizabeth, he threw himself on the clemency of the new empress. He was condemned first to be broken on the wheel and then beheaded; but, reprieved on the

scaffold, his sentence was commuted to lifelong banishment, with his whole family, to Berezov in Siberia, where he died six years later.

See S. Shubinsky, ” Count A. I. Osterman ” (Rus.) in Syevernoye Siyanie, vol. ii. (St Petersburg, 1863); D. Korsakov, From the Lives of Russian Statesmen of the XVIIIth Century (Rus.) (Kazan, 1891) ; A. N. Filippov, ” Documents relating to the Cabinet Ministers of the Empress Anne ” (Rus.) (St Petersburg, 1898) in the collections of the Russ. Hist. Soc. vol. 104; A. A. Kochubinsky, Count A. I. Osterman and the proposed Partition of Turkey (Rus.) (Odessa, 1889) ; Hon. C. Finch, Diplomatic Despatches from Russia, 1740-1742 (St Petersburg, 1893-1894) in the collections of the Russ. Hist. Soc. vols. 85 and 91 ; R. Nisbet Bain, The Pupils of Peter the Great (London, 1897) ; and The Daughter of Peter the Great (London, 1899), chapters 1-3. (R. N. B.)

OSTERODE, a town in the Prussian province of East Prussia, 75 m. by rail N.E. of Thorn, on Lake Drewenz, and at the junction of lines to Memel, Elbing and Schonsee. Pop. (1905) I 3,957- It has a castle built by the Teutonic knights in 1270, to whom the town owes its birth. Its principal manufactures are railway plant, machinery, beer, spirits and bricks, while it has several saw-mills. Osterode has a lively trade in cattle, grain and timber.

See J. Miiller, Osterode und Ostpreussen (Osterode, 1905).

OSTERODE, a town in the Prussian province of Hanover, at the south foot of the Harz Mountains, 34 m. N.W. of Nord- hausen by rail. Pop. (1905) 7467. The church of St Aegidius (Evangelical), founded in 724 and rebuilt after a fire in 1578, contains some fine tombs of the dukes of Brunswick-Grubenhagen, who made Osterode their residence frorn 1361 to 1452. Other buildings are the fine town-hall and the hospital. There are

manufactures of cotton and woollen goods, cigars and leather, and tanneries, dyeworks and gypsum quarries. In recent years Osterode has become celebrated as a health resort.

OSTERSUND, a town of Sweden, capital of the district {Ian) of Jemtland, on the east shore of Storsjo’ (Great Lake), 364 m. N. by W. of Stockholm by rail. Pop. (1900) 6866. It lies at an elevation of about 1000 ft. and is the metropolis of a moun- tainous and beautiful district. Immediately facing the town is the lofty island of Fros, with

which it is connected by a bridge 1 148 ft. long. A runic stone commemorates the building of a bridge here by a Christian missionary, Austmader, son of Gudfast. Ostersund was founded in 1786. It has a considerable trade in timber, and a local trade by. steamers on Storsjo. Electricity is obtained for lighting and other purposes by utilizing the abundant water-power in the district.

OSTERVALD, JEAN FREDERIC (1663-1747), Swiss Pro- testant divine, was born at Neuchatel on the 25th of November 1663. He was educated at Zurich and at Saumur (where he gradu- ated), studied theology at Orleans under Claude Pajon, at Paris under Jean Claude and at Geneva under Louis Tronchin, and was ordained to the ministry in his native place in 1683. As preacher, pastor, lecturer and author, he attained a position of great influence in his day, he and his friends, J. A. Turretin of Geneva and S. Werenfels (1657-1740) of Basel, forming what was once called the ” Swiss triumvirate.” He was thought to show a leaning towards Socinianism and Arminianism. He died on the 14th of April 1747.

His principal works are Trait& des sources de la corruption qui regne aujourd’hui parmi les Chretiens (1700), translated into English, Dutch and German, practically a plea for a more ethical and less doctrinal type of Christianity; Catechisme ou instruction dans la religion chretienne (1702), also translated into English, Dutch and German; Traite contre Vimpurete (1707); Sermons sur divers textes (1722-1724); Theologiae compendium (1739); and Traduction de la Bible (1724). All his writings attained great popularity among French Protestants; many were translated into various languages; and ” Ostervald’s Bible,” a revision of the French translation, in particular, was long well known and much valued in Britain.

OSTIA, an ancient town and harbour of Latium, Italy, at the mouth of the river Tiber on its left bank. It lies 14 m. S.W. from Rome by the Via Ostiensis, a road of very ancient origin still followed by a modern road which preserves some traces of the old pavement and remains of several ancient bridges. It was the first colony ever founded by Rome — according to the Romans themselves, by Ancus Martius — and took its name from its position at the mouth {ostium) of the river. Its origin is connected with the establishment of the salt-marshes {salinae — see Salaeia, Via) which only ceased to exist in 1875, though it acquired importance as a harbour in very early times. When it began to have magistrates of its own is not known : nor indeed have we any inscriptions from Ostia that can be certainly attri- buted to the Republican period. Under the empire, on the other hand, it had the ordinary magistrates of a colony, the chief being duoviri, charged with

the administration of justice, whose place was taken every fifth year by duoviri censoria poteslate quinquennales, then quaestores (or financial officials) and then aediles (building officials). There were also the usual decuriones (town councillors) and Augustales. We learn much as to these magistrates from the large number of inscriptions that have been found (over 2000 in Ostia and Portus taken together) and also as to the cults. Vulcan was the most important — perhaps in early times the only — deity worshipped at Ostia, and the priest- hood of Vulcan was held sometimes by Roman senators. The Dioscuri too, as patrons of mariners, were held in honour. Later we find the worship of Isis and of Cybele,the latter being especially flourishing, with large corporations of dendrophori (priests who carried branches of trees in procession) and canephori (basket- carriers); the worship of Mithras, too, had a large number of followers. There was a temple of Serapis at Portus. No traces of Jewish worship have been found at Ostia, but at Portus a considerable number of Jewish inscriptions in Greek have come to light.

Of the church in Ostia there is no authentic record before the

4th century a.d., though there are several Christian inscriptions of an earlier date; but the first bishop of Ostia of whom we have any certain knowledge dates from a.d. 313. The see still continues, and is indeed held by the dean of the sacred college of cardinals. A large number of the inscriptions are also connected with the various guilds — firemen {centonarii) , carpenters and metal workers {fabri), boatmen, lightermen and others (see J. P. Waltzing, Les Corporations professionelles, Brussels and Liege). ■

Until Trajan formed the port of Centumcellae (Civitavecchia) Ostia was the best harbour along the low sandy coast of central Italy between Monte Argentario and Monte Circeo. It is mentioned in 354 B.C. as a trading port, and became important as a naval harbour during the Punic Wars. Its commerce increased with the growth of Rome, and this, and the decay of agriculture in Italy, which obliged the capital to rely almost entirely on imported corn (the importation of which was, from 267 B.C. onwards, under the charge of a special quaestor stationed at Ostia), rendered the possession of Ostia the key to the situation on more than one occasion (87 B.C., a.d. 409 and 537). The inhabitants of the colony were thus regarded as a permanent garrison, and at first freed from the obligations of ordinary military service, until they were later on obliged to serve in the fleet. Ostia, however, was by no means an ideal harbour; the mouth of the Tiber is exposed to the south-west wind, which often did damage in the harbour itself; in a.d. 62 no less than 200 ships with their cargoes

were sunk, and there was an important guild of divers {urinatores) at Ostia. The difficulties of the harbour were increased by the continued silting up, produced by the enormous amount of solid material brought down by the riv*r. Even in Strabo's time (v. 3. 5, p. 231) the harbour of Ostia had become dangerous: he speaks of it as a " city without a harbour owing to the silting up brought about by the Tiber . . . : the ships anchor at considerable risk in the roads, but the love of gain prevails: for the large number of lighters which receive the cargoes and reload them renders the time short before they can enter the river, and having lightened a part of their cargoes they sail in and ascend to Rome."

Caesar had projected remedial measures, but (as in so many cases) had never been able to carry them out, and it was not until the time of Claudius that the problem was approached. That emperor constructed a large new harbour on the right bank, 2% m. N. of Ostia, with an area of 170 acres enclosed by two curving moles, with an artificial island, supporting a lofty lighthouse, in the centre of the space between them. This was connected with the Tiber by an artificial channel, and by this work Claudius, according to the inscriptions which he erected in a.d. 46, freed the city of Rome from the danger of inundation. The harbour was named by Nero, Portus Augusti.

Trajan found himself obliged in .a.d. 103, owing to the silting up of the Claudian harbour, and the increase of trade, to con- struct another port further inland — a hexagonal basin enclosing an area of 97 acres with enorrhous warehouses — communicating with the harbour of Claudius and with the Tiber by means of the channel already constructed by Claudius, this channel being prolonged so as to give also direct access to the sea. This became blocked in the middle ages, but was reopened by Paul V. in 161 2, and is still in use. Indeed it forms the right arm of the Tiber, by which navigation is carried on at the present-day, and is known as the Fossa Trajana. The island between the two arms acquired the name of Insula Sacra (still called Isola Sacra) by which Procopius mentions it.

Ostia thus lost a considerable amount of its trade, but its importance still continued to be great. The 2nd and 3rd centuries, indeed, are the high- water mark of its prosperity: and it still possessed a mint in the 4th century a.d. During the Gothic wars, however, trade was confined to Portus, and the ravages of pirates led to its gradual abandonment. Gregory IV. constructed in 830 a fortified enceinte, called Gregoriopolis, in the eastern portion of the ancient city, and the Saracens were signally defeated here under Leo IV. (847-856). The battle is represented in Giulio Romano's fresco from Raphael's design

in the Stanza dell' Incendio in the Vatican.

In the middle ages Ostia regained something of its importance, owing to the silting up of the right arm of the Tiber. In 1483- 1486 Giuliano della Rovere (nephew of Pope Sixtus IV., and afterwards himself Pope Julius II.) caused the castle to be erected by Baccio Pontelli, a little to the east of the ancient city. It is built of brick and is one of the finest specimens of Renaissance fortification, and exemplifies especially the transition from the old girdle walls to the system of bastions; it still has round corner towers, not polygonal bastions (Burckhardt). Under the shelter of the castle lies the modern village. The small cathedral of St Aurea, also an early Renaissance structure, with Gothic windows, is by some ascribed to Meo del Caprina (1430-1501). Hitherto Ostia does not seem to have been very unhealthy. In 1557, however, a great flood caused the Tiber to change its course, so that it no longer flowed under the walls of the castle, but some half a mile farther west; and its old bed (Fiume Morto) has ever since then served as a breeding ground for the malarial mosquito (Anopheles claviger). An agricultural colony, founded at Ostia after 1875, and consisting mainly of cultivators from the neighbourhood of Ravenna, has produced a great change for the better in the condition of the place. The modern village is a part of the commune of Rome. The marshes have been drained, and a pumping station erected near Castel Fusano. An electric tramway has been constructed from Rome to Ostia and thence to the seashore, now some 2 m. distant, where sea-bathing is carried on.

Excavations on the site of Ostia were only begun towards the close of the 18th century, and no systematic work was done until 1854, when under Pius IX. a considerable amount was done (the objects are now in the Lateran museum). The Italian government, to whom the greater part of it now belongs, laid bare many of the more important buildings in 1880-1889; but much was left undone. Owing to the fact that the site is largely covered with sand and to the absence of any later alterations, the preservation of the buildings excavated is very good, and Ostia is, with the exception of Pompeii, the best example in Italy of a town of the Roman period. On the east the site is approached by an ancient road, flanked by tombs. On the right (N.) are some small well-preserved thermae, and the barracks of the firemen (vigiles),a. special cohort of whom was stationed here. On one side of the central courtyard of the latter building is a chapel with

inscribed pedestals for imperial statues (2nd and 3rd century a.d.) and a well-preserved black and white mosaic representing a sacrifice (see J. Carcopino in Melanges de I'Ecole Francaise, 1907).

To the south-west is the Forum, an area 265 ft. square sur- rounded by colonnades, in which were placed the offices of the various collegia or guilds of boatmen, raftmen and others, which had a special importance at Ostia; the names of the guilds may still be read in inscriptions in the mosaic pavements of the chambers. In the centre of the area are the substructions of a temple, and on the south-east side are the remains of the theatre, built in the early imperial period, restored by Septi- mius Severus in 196-197 and again in the 4th or 5th century. To the south-west of the Forum are the remains of three small temples, one dedicated to Venus, and a well-preserved Mith- raeum, with mosaics representing the seven planets, &c. To the sputh-west again is the conspicuous brick cella of a lofty temple, on arched substructures, generally supposed to be that of Vulcan, with a threshold block of africano (Euboean) marble over 15 ft. long: from it a street over 20 ft. wide leads north- west to the river. It is flanked on each side by well-preserved warehouses, another group of which, surrounding a large court, lies to the south-west. The brick and opus reticulatum facing of the walls is especially fine. Hence an ancient road, leading between warehouses (into which the Tiber is encroaching), in one room of which a number of well-preserved large jars may be seen embedded in the floor, runs close to the river to a large private house with thermae, in which five mosaics were found: it (groundlessly) bears the name of " imperial palace." Farther to the south-west are remains of other warehouses, and (possibly) of the docks — long narrow chambers, which may have served

to contain ships. Here are remains of (earlier) structures in opus quadratum whereas the great bulk, of the ruins are in brickwork and belong to the imperial period. The medieval Torre Boacciana marks approximately the mouth of the river in Roman times.

The south-eastern portion of the city has been excavated only very partially. To the south-west of the conspicuous temple alluded to are the remains of a temple of Cybele, with a portico. This lay close to the commencement of the Via Severiana (see Severiana, Via), and the line of tombs which flanked it soon begins. Farther south-east, a line of sand dunes, covering the ruins of ancient villas, marks the coastline of the Roman period. Some 2 m. to the south-east is the pine forest of Castel Fusano, taking its name from a castle erected by the marchese Sacchetti in the 16th century. It is now the property of the Chigi and is leased to the king (see Laurentina, Via). Here Drs Lowe and Sambon

made the decisive experiments which proved that the pro- pagation of malaria was due to the mosquito Anopheles claviger.

See Notizie degli scavi, passim: H. Dessau in Corp. inscript. Latin, xiv. (Berlin, 1887), pp. I sqq., and the works of M. Jerome Carcopino. (T. As.)

OSTIAKS, or Ostyaks, a tribe who inhabit the basin of the Ob in western Siberia belonging to the Finno-Ugric group and related to the Voguls. The so-called Ostyaks of the Yenisei speak an entirely different language. The best investigators (Castren, Lerberg, A. Schrenck) consider the trans-Uralian Ostiaks and Samoyedes as identical with the Yugra of the Russian annals. During the Russian conquest their abodes extended much farther south than now, forty-one of their fortified places having been destroyed by the Cossacks in 1501, in the region of Obdorsk alone. Remains of these ” towns ” are still to be seen at the Kunovat river, on the Ob 20 m. below Obdorsk and elsewhere. The total number of the Ostiaks may be estimated at 27,000. Those on the Irtysh are mostly settled, and have adopted the manner of life of Russians and Tatars. Those on the Ob are mostly nomads; along with 8000 Samoyedes in the districts of Berezov and Surgut, they own large herds of reindeer. The Ob Ostiaks are russified to a great extent. They live almost exclusively by fishing, buying from Russian merchants corn for bread, the use of which has become widely diffused.

The Ostiaks call themselves As-yakh (people of the Ob), and it is supposed that their present designation is a corruption of this name. By language they belong (Castren, Reiseberichte, Reisebriefe ; Ahl-qvist, Ofvers. af Finska Vet.Soc. Fork, xxi.) to the Ugrian branch of the eastern Finnish stem. All the Ostiaks speak the same language, mixed to some extent with foreign elements ; but three or four lead ing dialects can be distinguished.

The Ostiaks are middle-sized, or of low stature, mostly meagre, and not ill made, however clumsy their appearance in winter in their thick fur-clothes. The extremities are fine, and the feet are usually small. The skull is brachycephalic, mostly of moderate size and height. The hair is dark and soft for the most part, fair and reddish individuals being rare; the eyes are dark, generally narrow; the nose is flat and broad; the mouth is large and with thick lips; the beard is scanty. The Mongolian type is more strongly pronounced in the women than in the men. On the whole, the Ostiaks are not a pure race ; the purest type is found among the fishers on the Ob, the reindeer-breeders of the tundra being largely intermixed with Samoyedes. Investigators

describe them as kind, gentle and honest; rioting is almost unknown among them, as also theft, this last occurring only in the vicinity of Russian settle- ments, and the only penalty enforced being the restitution twofold of the property stolen.

They are very skilful in the arts they practice, especially in. carving wood and bone, tanning (with egg-yolk and brains), pre- paration of implements from birch-bark, &c. Some of their carved or decorated bark implements (like those figured in Middendorff's Sibirische Reise, iv. 2) show considerable artistic skill.

Their folk- lore, like that of other Finnish stems, is imbued with a feeling of natural poetry, and reflects also the sadness, or even the despair, which has been noticed among them. Christianity has made some progress among them and St Nicholas is a popular saint, but their ancient pagan observances are still retained.

For the language see Ahlqyist, ffber die Sprache der Nord-Ostyaken (1880) and for customs, religion, &c, the Journal de la Soctite Finno-Ougrienne, particularly papers by Sirelius and Karjalainen, and the papers by Munkacsi, Gennep, Fuchs and others in the Revue orientate pour les etudes Ouralo-Altaiques; Patkanov, Die Irtysch-Ostiaken und ihre Volkspoesie (Petersburg, 1900) ; Patkanov, Irtirsch- Ostjaken und ihre Volkspoesie (1897-1900); Papay, Sammlung ostj'akischer Volksdichtungen (1906).

OSTRA, an ancient town of Umbria, Italy, near the modern Montenovo, S.E. of Sena Gallica (Sinigaglia). It is hardly mentioned by ancient authors, but excavations have brought to light remains of various buildings and some inscriptions exist. Pliny mentions with it another ancient town, Suasa, 5 m. W.. which also did not survive the classical period.

OSTRACISM, a political device instituted, probably by Cleis- thenes in 508 B.C., as a constitutional safeguard for the Athenian democracy. Its effect was to remove from Athens for a period of ten years any person who threatened the harmony and tranquillity of the body politic. A similar device existed at various times in Argos, Miletus, Syracuse and Megara, but in these cities it appears to have been introduced under Athenian influence. In Athens in the sixth prytany of each year the representatives of the Boule asked the Ecclesia whether it was for the

welfare of the state that ostracism should take place. If the answer was in the affirmative, a day was fixed for the voting in the eighth prytany. No names were mentioned, but it is clear that two or three names at the most could have been under consideration. The people met, not as usual in the Pnyx, but in the Agora, in the presence of the Archons, and recorded their votes by placing in urns small fragments of pottery (which in the ancient world served the purpose of waste-paper) (ostraca) on which they wrote the name of the person whom they wished to banish. As in the case of other privilegia, ostracism did not take effect unless six thousand votes in all were recorded. Grote and others hold that six thousand had to be given against one person before he was ostracized, but it seems unlikely that the attendance at the Ecclesia ever admitted of so large a vote against one man, and the view is contradicted by Plut. Arist. c. 7. The ostracized person was compelled to leave Athens for ten years, but he was not regarded as a traitor or criminal. When he returned, he resumed possession of his property and his civic status was unimpaired. The adverse vote simply implied that his power was so great as to be injurious to the state. Ostracism must therefore be carefully distinguished from exile in the Roman sense, which involved loss of property and status, and was for an indefinite period {i.e. generally for life). Certain writers have even spoken of the ” honour ” of ostracism. At the same time it was strictly unjust to the victim, and a heavy punishment to a cultured citizen for whom Athens contained all that made life worth living. Its political importance really was that it trans- ferred the protection of the constitution from the Areopagus to the Ecclesia. Its place was afterwards taken by the Graphs Paranomon.

There is no doubt that Cleisthenes’ object was primarily to get rid of the Peisistratid faction without perpetual recourse to armed resistance (so Androtion, Ath. Pol. 22, Ephorus, Theopompus, Aristotle, Pol. iii. 13, 1284 a 17 and 36; viii. (v.), 3, 1302 b 15). Aristotle’s Constitution of Athens (c. 22) gives a list of ostracized persons, the first of whom was a certain Hipparchus of the Peisistratid family (488 B.C.). It is an extra- ordinary fact that, if ostracism was introduced in 508 B.C. for the purpose of expelling Hipparchus it was not till twenty years later that he was condemned. This has led some critics (see Lugebil in Das Wesen . . . der Osirakismos, who arrives at the conclusion that ostracism could not have been introduced till after 496 B.C.) to suspect the unanimous evidence of antiquity that Cleisthenes was the inventor of ostracism. The problem is difficult, and no satisfactory answer has been given. Aelian’s story that Cleisthenes himself was the first to be ostracized is attractive in view of his overtures to Persia (see Cleisthenes) , but it has little historical value and conflicts with the

chapter in Aristotle's Constitution — which, however, may conceivably be simply the list of those recalled from ostracism at the time of Xerxes' Invasion, all of whom must have been ostracized less than ten years before 481 {i.e. since Marathon). With the end of the Persian Wars, the original object of ostracism was removed, but it continued in use for forty years and was revived in 41 7 B.C. It now became a mere party weapon and the farcical result of its use in 417 in the case of Hyperbolus led to its abolition either at once, or, as Lugebil seeks to prove, in the archonship of Euclides

(403 B.C.). Such a device inevitably lent itself to abuse (see Aristotle, Pol. 38, 1284 b 22 oracriaarixcos ixpoovro).

Grote maintains that ostracism was a useful device, on the grounds that it removed the danger of tyranny, and was better than the perpetual civil strife of the previous century. The second reason is strictly beside the point, and the first has no force after the Persian Wars. As a factor in party politics it was both unnecessary and injurious to the state. Thus in the Persian Wars, it deprived Athens of the wisdom of Xanthippus and Aristides, while at the battle of Tanagra and perhaps at the time of the Egyptian expedition the assistance of Cimon was lacking. Further, it was a blow to the fair-play of party politics; the defeated party, having no leader, was reduced to desperate measures, such as the assassination of Ephialtes. To defend it on the ground that it created and stimulated the national consciousness is hardly reconcilable with the historic remark of the voter who voted against Aristides because he wished to hear no more of his incorruptible integrity; moreover in democratic Athens the " national consciousness " was, if anything, too frequently stimulated in the ordinary course of government. Aristotle, admitting its usefulness, rightly describes ostracism as in theory tyrannical; Montesquieu {Esprit des lois, xii. cc. 19, 29, &c.) defends it as a mild and reasonable institution. On the whole, the history of its effect in Athens, Argos, Miletus, Megara and Syracuse (where it was called Petalismus), furnishes no sufficient defence against its admitted disadvantages. The following is a list of persons who suffered ostracism: — Hipparchus (488); Megacles (487), Xanthippus (485), Aristides (483), Themistocle* (471?); Cimon (461?) Thucydides, son of Melesias (444), Damon, Hyperbolus (417) and possibly Cleisthenes himself {q.v.).

Authorities. — For the procedure in O. see Appendix Photii (Porson, p. 675) ; see also, besides authorities quoted above, Busolt, i. 620; M tiller's Handbuch, iv. 1, 121; Gilbert, Gr. St. i. 446-466 and Greek Constitutional Antiquities (Eng. trans., 1895); A. H. J. Greenidge,

Handbook of Greek Constitutional Antiquities (1896); histories of Greece in general. The view maintained in the text as to the number of votes necessary is supported by Duruy (H. of G. ii. i, 36), Boeckh, Wachsmuth, &c. ; opposed by Grote, Oman and (on the whole) by Evelyn Abbott. On the danger of privilegia in general see Cicero, de Legibus, iii. 4, and note that in Athens, ostra- cism gratuitously anticipated a crime which, if committed, would have been punishable in the popular Heliaea. Cf. also article Exile. (J. M. M.)

OSTRACODERMS or Ostracophores, the earliest and most primitive group of fish-like animals, found as fossils in Upper

From the Trans. Roy. Soc, Edinburgh.

Fig. i. — Thelodus scoticus, from the Upper Silurian of Lanarkshire, restored by Dr R. H. Traquair; about one-half nat. size.

From the Proc. Geol. Assoc.

Fig. 2. — Cephalaspis murchisoni, from the Lower Old Red Sand- stone of Herefordshire, restored by Dr A. S. Woodward ; about one-half nat. size.

Silurian and Devonian formations both in Europe and in North

America. They are so named t.Gr. sheil-skins or shell-bearers) in allusion to the nacreous shell-like appearance of the inner face of the plates of armour which cover the more common

From British Museum, Catalogue of Fossil Fishes -by permission of the Trustees.

Fig. 3. — Pleraspis rostrata, from the Lower Old Red Sandstone of Herefordshire, restored by Dr A. S. Woodward; about one-third nat. size.

members of the group. The Ostracoderms are, indeed, known only by the hard armature of the skin, but this sometimes bears impressions of certain internal soft parts which have perished

From the Monogr. Palaeonl. Soc.

Fig. 4. — Pterichthys milleri, from the Middle Old Red Sandstone of

Scotland, restored by Dr R. H. Traquair; upper (A), lower (B), and left-side view ©, about one-half nat. size.

m.occ. Median occipital. m.v.. Median ventral. nix., Maxilla. o., Ocular.

p.d.l., Posterior dorso-lateral. p.m., Pre-niedian. p.tn.d., Posterior median dorsal Posterior ventro-lateral.

ag., Angular.

a.d.l., Anterior dorso-lateral.

a.m.d., Anterior median dorsal.

a.v.L, Anterior ventro-lateral,

c, Central.

d.a., Dorsal anconeal.

d.ar., Dorsal articular.

e.L, Extra lateral.

e.m., External marginal.

i.m., Internal marginal.

I., Lateral.

l.occ, Lateral occipital.

m., Median.

m.m., Marginals of lower limb.

p.v.l., pt.tn., s.L, ‘ t,

v.a., v.ar.,

Post-median. Semilunar. Terminal. Ventral anconeal. Ventral articular.

during fossilization. They agree with fishes in the possession of median fins, and resemble the large majority of early fishes in their unequal-lobed (heterocercal) tail, but they have no ordinary

paired fins. They must also have been provided with the usual gill-

apparatus, but there is reason to believe that their lower jaw was not on the fish plan. They are, therefore, at least as low in the zoological scale as trie existing lampreys, with which Cope, Smith, Woodward and others have associated them. They are all small animals, many of them only a few centimetres in length.

The oldest and lowest family of Ostracoderms, that of Coelolepidae, is known by nearly complete skeletons of Thelodus (fig. I) and Lanarkia from the Upper Silurian mudstones of Lanarkshire, Scotland. The body is completely and uniformly covered with minute granules which resemble the shagreen of sharks, and were erroneously ascribed to sharks when they were first discovered in the Upper Silurian bone-bed at Ludlow, Shropshire. The head and anterior part of the trunk are depressed and shown from above or below in the fossils, and this region sharply contracts behind into the slender tail, which is generally seen in side view, with one small dorsal fin and a forked heterocercal tail. The eyes are far forwards and wide apart. In another family, that of the Cephalaspidae (fig. 2), the animals resemble the Coelolepids in shape, but their skin- granules are fused into small plates, which are polygonal where there must have been much flexibility, and in rings round the tail where the underlying successive plates of muscle necessitated this arrangement. The eyes are close together. At the opening of the gill-cavity on each side at the back of the head, there is a flexible flap, which is sometimes interpreted as a paired limb. Part of the armour of the Cephalaspidians contains bone-cells, but the dermal plates of two other families, the Pteraspidae (fig. 3) and Drepanas- pidae, consist merely of fused shagreen granules without any advance towards bone. The Pteraspidae are interesting as showing on the inner side of the dorsal shield impressions which suggest that the gill-cavities extended unusually far forwards to the front of the head. Another family, known only by nearly complete skeletons from the Upper Silurian mudstones of Lanarkshire, is that of the Birkenndae, comprising small fusiform species which are covered with granules disposed in curiously-arranged rows. The highest Ostracoderms are the Asterolepidae, which occur only in Devonian rocks and include the familiar Pterichthys (fig. 4) from the Middle Old Red Sandstone of Scotland. In this family the primitive skin- tubercles seem to have fused, not into polygonal plates, but along the lines of the slime-canals. The Asterolepid armour consists o? symmetrically arranged, overlapping plates on the top of the head and round the body, with a pair of flippers similarly armoured and appended to the latter. The tail resembles that of other Ostraco- derms and is sometimes covered with scales.

See E. Ray Lankester, The Cephalaspidae (Monogr. Palaeont. Soc.

1868, 1870); R. H. Traquair, The Asterolepidae (Monogr. Palaeont. Soc. 1894, 1904, 1906) and papers in Trans. Roy. Soc. Edinb. vol. xxxix. No. 32 ˆ1899), vol. xl. Nos. 30, 33 (1903, 1905); A. S. Woodward, Catal. Foss. Fishes, B.M. pt. ii. (1891); W. H. Gaskell, Origin of Vertebrates (London, 1908). (A. S. Wo.)

OSTRAU, the name of two Austrian towns in the Ostrau- Karwin coal-mining district. (1) Mahrisch-Ostrau (Moravian Ostrau), a town in Moravia, 95 m. N.E. of Briinn by rail. Pop. (1900) 30,125. It is situated on the right bank of the Ostrawitza, near its confluence with the Oder, and it derives its importance from the neighbouring coal mines, and the blast furnaces and iron-works which they have called into existence. The manu- factures comprise sheet-iron, boilers, zinc, brick and tiles, paraffin, petroleum, soap and candles. The Rothschild iron-works at Witkowitz are in the vicinity. (2) Polnisch-Ostrau (Polish Ostrau), a mining town in Austrian Silesia, opposite Mahrisch-Ostrau. Pop. (1900) 18,761, mostly Czech. It has large coal mines, which form the south-western portion of the extensive Upper Silesian coal fields, the largest Austrian deposit.

OSTRICH (O. Eng. estridge; Fr. autruche; Span, aveslrus; Lat. avis struthio; Gr. arpovdUav or 6 fxeyas orpovObs); the Struthio camelus of Linnaeus, and the largest of living birds, an adult male standing nearly 8 ft. high and weighing 300 lb.

The genus Struthio forms the type of the group of Ratite birds, characterized chiefly by large size, breast-bone without a keel, strong running legs, rudimentary wings and simple feathers (see Bird). The most obvious distinctive character presented by the ostrich is the presence of two toes only, the third and fourth, on each foot — a character absolutely peculiar to the genus Struthio. In South America another large .Ratite bird, the rhea, is called ostrich; it can be dis- tinguished at once from the true ostrich by its possession of three toes.

The wild ostrich 1 is disappearing before the persecution of man, and there are many districts, some of wide extent, frequented by the ostrich in the 19th century — especially towards the extremities of its African range — in which it no longer occurs, while in Asia there is evidence, more or less trustworthy, of its former existence in most parts of the south-western desert- tracts, in few of which it is now to be found. Xenophon’s notice of its abundance in Assyria (Anabasis, i.

5) is well known. It is probable that it still lingers in the wastes of Kirwan in eastern Persia, whence examples may occasionally stray north- ward to those of Turkestan, 2 even near the Lower Oxus; but the assertion, often repeated, as to its former occurrence in Baluchistan or Sind seems to rest on testimony too slender

for acceptance. Apparently the most northerly limit of the ostrich's ordinary range at the present day is that portion of the Syrian Desert lying directly eastward of Damascus; and, within the limits of what may be called Palestine, H. B. Tristram (Fauna and Flora of Palestine, p. 139) regards it as but a straggler from central Arabia, though we have little information as to its distribution in that country.

Africa is still, as in ancient days, the continent in which the ostrich chiefly flourishes. There it appears to inhabit every waste sufficiently extensive to afford it the solitude it loves. Yet even there it has to contend with the many species of carnivora which prey upon its eggs and young — the latter especially; and H. Lichtenstein long ago remarked 3 that if it

1 A good summary of the present distribution is contained in the Ostriches and Ostrich Farming of De Mosenthal and Harting, from which the accompanying figure is, with permission, taken. Von Heuglin, in his Ornithologie Nordost-Afrikas (pp. 925-935), and A. Reichenow in Die Vogel Afrikas, have given more particular details of the ostrich's distribution in Africa.

2 Drs Finsch and Hartlaub quote a passage from Remusat's Remarques sur I'extension de V empire chinoise, stating that in about the 7th century of our era a live " camel-bird " was sent as a present with an embassy from Turkestan to China.

3 H. Lichtenstein, Reise im siidlichen Africa, ii. 42-45 (Berlin,

1812).

were not for its numerous enemies "the multiplication of ostriches would be quite unexampled."

Though sometimes assembling in troops of from thirty to fifty, and then generally associating with zebras or with some of the larger antelopes, ostriches commonly, and especially in the breeding season, live in companies of not more than four or five, one of which is a cock and the rest are hens. The latter lay their eggs in one and the same

nest, a shallow pit scraped out by their feet, with the earth heaped around to form a kind of wall against which the outermost circle of eggs rest. As soon as ten or a dozen eggs are laid, the cock begins to brood, always taking his place on them at nightfall sur- rounded by the hens, while by day they relieve one another, more it would seem to guard their common treasure from jackals and small beasts of prey than directly to forward the process of hatching, for that is often left wholly to the sun. 4 Some thirty eggs are laid in the nest, and round it are scattered perhaps as many more. These last are said to be broken by the old birds to serve as nourish- ment for the newly-hatched chicks, whose stomachs cannot bear the hard food on which their parents thrive. The greatest care is taken to place the nest where it may not be discovered, and the birds avoid being seen when going to or from -it, while they display great solicitude for their young. C. J. Andersson in his Lake N' garni (pp. 253-269) has given a lively account of the pursuit by himself and Francis Galton of a brood of ostriches, in the course of which the male bird feigned being wounded to distract their attention from his offspring. Though the ostrich ordinarily inhabits the most arid districts, it requires water to drink; more than that, it will fre- quently bathe, and sometimes even, according to Von Heuglin, in the sea.

The question whether to recognize more than one species of ostrich has been continually discussed without leading to a satis- factory solution. While eggs from North Africa present a perfectly smooth surface, those from South Africa are pitted. Moreover northern birds have the skin of the parts not covered with feathers flesh-coloured, while this skin is bluish in southern birds, and hence the latter have been thought to need specific designation as 5. australis. Examples from the Somali country have been described as forming a distinct species under the name of S. molybdophanes from the leaden colour of their naked parts.

The great mercantile value of ostrich-feathers, and the increas- ing difficulty, due to the causes already mentioned, of procuring them from wild birds, has led to the formation in Cape Colony, Egypt, the French Riviera and elsewhere of numerous " ostrich- farms," on which these birds are kept in confinement, and at regular intervals deprived of their plumes. In favourable localities and with judicious management these establishments yield very considerable profit (see Feather).

See, besides the works mentioned, E. DAlton, Die Skelete der Straussartigen Vogel abgebildet und beschrieben (Bonn, 1827)? P. L. Sclater, " On the Struthious Birds living in the Zoological Society's

Menagerie, ” Transactions, iv. p. 353, containing a fine representation (pi. 67), by J. Wolf, of the male Struthio camelus; J. Forest, L’Autruche (Paris, 1894); A. Douglass, Ostrich Farming in South Africa (London, 1881); modern anatomical work on the group is referred to in the article Birds. (A. N.)

OSTROG, a town of Russia, in the government of Volhynia, 95 m. W. of Zhitomir, at the confluence of the Vilya with the Goryn. Pop. (1897) 14,530. It is an episcopal see of the Orthodox Greek Church, and in the 16th century had a classical academy, converted later into a Jesuit college. Here was made and printed in 1581 the first translation of the Bible into old Slav. In the town is a brotherhood of Cyril and Methodius, which maintains schools of its own. The tanning of light leather is an active domestic trade; other industries are potteries, oil-works, soap, candle and tobacco factories. After being plundered by the Cossack chieftain Khmelnitski in 1648, and conquered by the Russians seven years later, the town fell into decay.

OSTROGOTHS, or East Goths, one of the two main branches into which the Goths were divided, the other being the Visigoths, or West Goths. See Goths.

OSTROVSKIY, ALEXANDER NIKOLAIVICH (1823-1886), Russian dramatic author,-was born on the 12th of April 1823 in Moscow, where his father was an official of the senate. He studied

4 By those whose experience is derived from the observation of captive ostriches this fact has been often disputed. But, the differ- ence of circumstances under which they find themselves, and in particular their removal from the heat-retaining sands of the desert and its burning sunshine, is quite enough to account for the change of habit. Von Heuglin also (p. 933) is explicit on this point.

, law in the university of that city, which he quitted without having submitted to the final examination. He was then employed as a clerk in the office of the ” Court of Conscience,” and subsequently in that of the Commercial Court at Moscow. Both tribunals were called upon to settle disputes chiefly among the Russian merchant class, from which Ostrovskiy was thus enabled to draw the chief characters for his earliest comedies. Among these are Byednaya Nivesta (“The Poor Bride”), Byednost ne Porok (” Poverty not a Vice “), and Ne v’svoi sani

ne sadis (literally ” Don’t put yourself in another’s sledge,” meaning ” Don’t put yourself in a position for which you are not suited “). Of this last Nicholas I. said, ” it was not a play, but a lesson.” The uncultured, self-satisfied Moscow merchants are strikingly portrayed in Grozd (” The Tempest “) and Svoyi lyudi sochtyomsya (” Between near relatives no accounts are needed “), which was originally called ” The Bankrupt.” The last-mentioned comedy was prohibited for ten years, until the accession of Alexander II., and Ostrovskiy was dismissed the government service and placed under the supervision of the police. The Liberal tendencies of the new reign, however, soon brought relief; Ostrovskiy was one of several well-known literary men who were sent into the provinces to report on the condition of the people. Ostrovskiy’s field of inquiry lay along the upper Volga, a part of the country memorable for some of the most important events in Russian history. This mission induced him to write several historical dramas of great merit, such as Ku’zma Zakharich Minin Soukhorouk (the full name of the famous butcher who saved Moscow from the Poles) ; ” The False Demetrius” and ” Vassily Shuisky “; Vassilisa Melentieva (the name of a favourite court lady of Ivan the Terrible), and the comedy, VoivodaeeliSonna Volge (” The Military Commander,” or ” A dream on the Volga “). Many of his later works treat of the Russian nobility, and include Byeshani Dengi (literally ” Mad Money “), Vospeetinitsa (” A Girl brought up in a Stranger’s Family”), and Volki e Ovtsi (“Wolves and Sheep”); others relate to the world of actors, such as Liess (” Forest “), Bez vini vinovatiya (” Guiltlessly guilty”), and Talenti e Pokloniki (” Talents and their Admirers “). Ostrovskiy enjoyed the patronage of Alexander III., and received a pension of 3000 roubles a year. With the help of Moscow capitalists he established in that city a model theatre and school of dramatic art, of which he became the first director. He also founded the Society of Russian Dramatic Art and Opera Composers. His death took place on the 24th of June 1886, while travelling to his estate in Kostroma.

OSTUNI, a picturesque walled city of Apulia, Italy, in the province of Lecce, 23 m. by rail N.W. of Brindisi. Pop. (ioor) 7734 (town); 22,811 (commune). It has a cathedral of the 15th century with a fine Romanesque facade, and a municipal library with a collection of antiquities. The see has been amalgamated with that of Brindisi.

OSUNA, PEDRO TELLEZ GIRON, 3rd duke of (1575-1624), Spanish viceroy of Sicily and Naples, was born at Osuna, and baptized on the 18th of January 1575. He was the son of Juan Tellez Giron, the 2nd duke, and of his wife Ana Maria de Velasco, a daughter of the constable of Castile. When a boy he accompanied his grandfather, the 1st duke, to Naples, where he was viceroy. He saw service at the age

of fourteen with the troops sent by Philip II. to put down a revolt in Aragon, and was married while still young to Dona Catarina Enriquez de Ribera, a grand-daughter on her mother's side of Hernan Cortes, the conqueror of Mexico. In 1598 he inherited the dukedom. Before and after his marriage he was known for the reckless dissipation of his life. The scandals to which his excesses gave rise led to his imprisonment at Arevalo in 1600. This sharp lesson had a wholesome effect on the duke, and in the same year he left for Flanders, with a body of soldiers raised at his own expense. His appearance in Flanders as a grandee with a following of his own caused some embarrassment to the king's officers. But Osuna displayed unexpected docility and good sense in the field. He was content to serve as a subordinate, and took a full share of work and fighting both by land and sea. I

When peace was made with England in 1604 he is said to have visited London. He is said also to have paid a visit to Holland during the armistice arranged to allow of the negotiations for the twelve years' truce of 1609; but, as he was back in Spain by that year, he cannot have seen much of the country. Bis services had purged his early offences, and he had been decorated with the Goldep Fleece. On the 18th of September 1610 he was named viceroy of Sicily, and he took possession of his post at Melazzo on the 9th of March 1611. Ini6i6he was promoted to the viceroyalty of Naples, and held the office till he was recalled on the 28th of March 1620. The internal government of Osuna in both provinces was vigorous and just. During his Sicilian viceroyalty he organized a good squadron of galleys with which he freed the coast for a time from the raids of the Mahommedan pirates of the Barbary States and the Levant. After his transfer to Naples Osuna continued his energetic wars with the pirates, but he became concerned in some of the most obscure political intrigues of the time. He entered into a policy of unmeasured hostility to Venice, which he openly attacked in the Adriatic. The princes of the Spanish branch of the Habsburgs were at all times anxious to secure safe communication with the German possessions of their family. Hence their anxiety to dominate all northern Italy and secure possession of the Alpine passes. It would have suited them very well if they could have reduced Venice to the same state of servitude as Genoa. Osuna threw himself into this policy with a whole heart. There can be no reasonable doubt that he was engaged with the Spanish ambassador, and the viceroy of Milan, in the mysterious conspiracy against Venice in 1618. As usual, the Spanish government had miscalculated its resources, and was compelled to draw back. It then found extreme difficulty in controlling its fiery viceroy. Osuna continued to act against Venice in an almost piratical fashion, and treated orders from home with scant

respect. Serious fears began to be entertained that he meant to declare himself independent in Naples, and had he tried he could have brought about a revolt which the enfeebled Spanish government could hardly have suppressed. It is, however, unlikely that he had treasonable intentions. He allowed his naval forces to be gradually reduced by drafts, and when superseded returned obediently to Madrid. After his return he was imprisoned on a long string of charges, and largely' at the instigation of the Venetians. No judgment was issued against him, as he died in prison on the 24th of September 1624. The " great duke of Osuna," as he is always called by the Spaniards, impressed the imagination of his countrymen pro foundly as a vigorous, domineering and patriotic leader of the stamp of the 16th century, and he was no less admired by the Italians. His ability was infinitely superior to that of the ordinary politicians and courtiers of the time, but he was more energetic than really wise, and he was an intolerable subordinate to the bureaucratic despotism of Madrid.

The Vita di Don Pietro Giron, duca d' Ossuna, vicere di Napoli e di Sicilia of Gregorio Leti (Amsterdam, 1699) is full of irrelevances, and contains much gossip, as well as speeches which are manifestly the invention of the author. But it is founded on good documents, and Leti, an Italian who detested the Spanish rule, knew the state of his own country well. See also Don C. Fernandez Duro, El Gran Duque de Osuna y su Marina (Madrid, 1885), and Documenlos ineditos para la historia de Espaiia (Madrid, 1842, &c), vols, xliv.- xlvii.

OSUNA, a town of southern Spain, in the province of Seville; 57 m. by rail E.S.E. of Seville. Pop. (1900) 18,072. Osuna is built on a hill, overlooking the fertile plain watered by the Salado, a sub-tributary of the Guadalquivir. On the top of the hill stands the collegiate church, dating from 1534 and con- taining interesting Spanish and early German paintings. These, however, as well as the sculptures over the portal, suffered considerably during the occupation of the place by the French under Soult. The vaults, which are supported by Moorish arches, contain the tombs of the Giron family, by one of whom, Don Juan Tellez, the church was founded in 1534. The univer- sity of Osuna, founded also by him in 1549, was suppressed in 1820; but its large building is still used as a secondary school.

The industries are agriculture and the making of esparto mats, pottery, bricks, oil, soap, cloth, linen and hats.

Osuna, the Urso of Hirtius, famous in the ist century B.C. for its long resistance to the troops of Caesar, and its fidelity to the Pompeians, was subsequently called by the Romans Orsona and Gemina Urbanorum, the last name being due, it is said, to the presence of two urban legions here. Osuna was taken from the Moors in 1239, and given by Alphonso X. to the knights of Calatrava in 1264. Don Pedro Giron appro- priated it to himself in 1445. One of his descendants, Don Pedro Tellez, was the first holder of the title duke of Osuna, conferred on him by Philip II. in 1562.

Estepa (pop. 8591), a town 6 m. E.N.E. is the Iberian and Carthaginian Astepa or Ostipo, famous for its siege in 207 B.C. by the Romans under Publius Cornelius Scipio. When further resistance became impossible, the people of Astepa set fire to their town, and all perished in the flames.

OSWALD (c. 603-642), king of Northumbria, was one of the sons of ˆEthelfrith and was expelled from Northumbria on the accession of Edwin, though he himself was a son of Edwin's sister Acha. He appears to have spent some of his exile in Iona, where he was instructed in the principles of Christianity. In 634 he defeated and slew the British king Ceadwalla at a place called by Bede Denisesburn, near Hefenfelth, which has been identified with St Oswald's Cocklaw, near Chollcrford, Northumberland. By this he avenged his brother Eanfrith, who had succeeded Edwin in Bernicia, and became king of Northumbria. Oswald reunited Deira and Bernicia, and soon raised his kingdom to a position equal to that which it had occupied in the time of Edwin, with whom he is classed by Bede as one of the seven great Anglo-Saxon kings. His close alliance with the Celtic church is the characteristic feature of his reign. In 635 he sent to the elders of the Scots for a bishop. On the arrival of Aidan in answer to this request he assigned to him the island of Lindisfarne as his see, near the royal city of Bam- borough. He also completed the minster of St Peter at York which had been begun by Paulinus under Edwin. Bede declares that Oswald ruled over " all the peoples and provinces of Britain, which includes four languages, those of the Britons, Picts, Scots and Angles." His relationship to Edwin may have helped him to consolidate Deira and Bernicia. Early in his reign he was sponsor to the West Saxon king Cynegils, whose daughter he married. In 642 he was defeated and slain at a place called Maserfeld, probably Oswestry in Shropshire, by Penda of Mercia.

See Bede, Historia Ecclesiastica, ed. C. Plummer (Oxford, 1896), ii. 5, 14, 20; iii. 2, 3, 5, 6, 7, 9-14; Anglo-Saxon Chronicle, ed. J. Earle and C. Plummer (Oxford, 1899), s.a., 617, 634, 635, 642, 654.

OSWALD (d. 992), archbishop of York, was a nephew of Oda, archbishop of Canterbury, and at an early age became, by purchase, head of the Old Minster at Winchester. Desiring to become a monk, he went with Oda's approval to the monastery of Fleury on the Loire — at that time the great centre of reviving Benedictinism. Here he soon distinguished himself by the monastic austerity of his life. In 959 he returned to England at the request of Oda, who, however, died before his arrival. He now went to York to his kinsman the Archbishop Oskytel, who took him with him on a pilgrimage to Rome. Soon after his return he was appointed bishop of Worcester at the re-commendation of Dunstan, his predecessor in the see (961). As bishop he took a prominent part in that revival of monastic discipline on Benedictine lines of which Aethelwold, bishop of Winchester, was the most ardent leader. His methods, how- ever, were less violent than those of Aethelwold. Among other religious houses he founded that of Ramsey in conjunction with Aethelwine, Ealdorman of East Anglia. In 97 2 he was translated (again at Dunstan's recommendation) to the archbishopric of York, with which he continued to hold the see of Worcester. He died on the 29th of February 992 and was buried at Worcester.

See Memorials of St Dunstan, edited by W. Stubbs, Rolls series (London, 1874).

OSWALDTWISTLE, an urban district in the Accrington parliamentary division of Lancashire, England, on the Leeds and Liverpool Canal, 3ˆ m. E.S.E. of Blackburn. Pop, (1901) 14,192. It possesses cotton-mills, printworks, bleachworks and chemical works, and in the neighbourhood are collieries, stone quarries and potteries. At Peelfold, in the township, was born (1750) Sir Robert Peel, first baronet, who, as a factory-owner, effected wide developments in the cotton industry.

OSWEGO, a city, port of entry, and the county-seat of Oswego county, New York, U.S.A., on the S.E. shore of Lake Ontario, at the mouth of the Oswego river, about 35 m. N.W. of Syracuse. Pop. (1900) 22,199, of whom 3989 were foreign born; (1910 census) 23,368. It is served by the New York Central & Hudson River, the Delaware, Lackawanna & Western, and the New York, Ontario & Western railways, by several lines of lake steamboats, and by the Oswego Canal, which connects Lake Ontario with the Erie Canal at Syracuse. There is an inner harbour of 9-35 acres and an outer harbour of 140 acres, which are defended by Fort Ontario. The city lies at an altitude of 300 ft., and is divided into two parts by the Oswego river. Oswego is the seat of a state Normal and Training School (founded as the City Training School in 1861, and a state school since 1867), a state armoury, and a

United States life-saving station; among the public buildings are the City Library (about 14,000 volumes in 1909), founded by Gerrit Smith in 1855, the Federal Building and Custom House, the City Hall, the City Hospital, the County Court House, an Orphan Asylum, and a business college. The Oswego river has here a fall of 34 ft. and furnishes excellent water power. Among the principal manufactures are starch (the city has one of the largest starch factories in the world), knit goods, railway car springs, shade-cloth, boilers and engines, wooden-ware, matchesˆ paper-cutting machines, and eau de cologne. The factory products were valued in 1905 at $7,592,125. Oswego has a considerable trade with Canada; in 1908 its exports were valued at $2,880,553 and its imports at $999,164. Lake commerce with other American Great Lake ports is also of some importance, the principal articles of trade being lumber, grain and coal.

The site of Oswego was visited by Samuel de Champlain in 1616. Subsequently it was a station for the Jesuit missionaries and the coureurs des bois. In 1722 a regular trading post was established here by English traders, and in 1727 Governor William Burnet of New York erected the first Fort Oswego (sometimes called Fort Burnet, Chouaguen or Pepperrell). It was an important base of operations during King George's War and the French and Indian War. In the years 1755-1756 the British erected two new forts at the mouth of the river, Fort Oswego (an enlargement of the earlier fort) on the east and Fort Ontario on the west. In August 1756 Montcalm, marching rapidly from Ticonderoga with a force of 3000 French and Indians, appeared before the forts, then garrisoned by 1000 British and colonial troops, and on the 14th of August forced the abandonment of Fort Ontario. On the following day he stormed and captured Fort Oswego, and, dismantling both, returned to Ticonderoga. The British restored Fort Ontario in 1759, and maintained a garrison here until 1796, when, with other posts on the lakes, they were, in accordance with the terms of Jay's Treaty, made over to the United States. It was here in 1766 that Pontiac formally made to Sir William Johnson his acknowledgment of Great Britain's authority On the 6th of May 1814 Sir James Yeo, with a superior force of British and Canadians, captured the fort, but soon afterwards withdrew. In 1839 the fort was rebuilt and occupied by United States troops; it was abandoned in 1899, but, after having been recon- structed, was again garrisoned in 1905. The modern city may be said to date from 1796. Oswego became the county-seat in 1816, was incorporated as a village in 1828 (when the Oswego Canal was completed), and was first chartered as a city in 1848.

See Churchill, Smith and Child, Landmarks of Oswego County (Syracuse, 1895).

‘ OSWESTRY, a market town and municipal borough in the Oswestry parliamentary division of Shropshire, England, on

the borders of Wales, 18 m. N.W. from Shrewsbury. Pop. (1001) 9579. It is on a branch from the Chester line of the Great Western railway, and on the Cambrian main line. The situation is pleasant and the neighbouring district well wooded and hilly. The church of St Oswald, originally conventual, is Early English and Decorated, but has been greatly altered by restoration. There is a Roman Catholic chapel with presbytery, convent and school. The grammar school, founded in the reign of Henry IV., occupies modern buildings. The municipal buildings (1893) include a library, and a school of science and art. On a hill W. of the town are the castle grounds, laid out in 1890, but of the castle itself only slight remains are seen. The Cambrian railway engine and carriage works are here; and there are tanneries, malting works, machinery works and iron foundries. Frequent agricultural fairs are held. The town is governed by a mayor, 6 aldermen and 18 councillors. Area, 1887 acres.

Old Oswestry, also called Old Fort (Welsh Kin Dinas), is a British earthwork about a mile from the modern town. There are various unsatisfactory accounts of the early history of Oswestry (Blaneminster, or Album Monasterium), as that it was called Trer Cadeirau by the Britons and Osweiling after Cunelda Wledig, prince of North Wales, had granted it to his son Osweil. It derives its present name from Oswald, king of Northumbria, who is said to have been killed here in 642, although it was not definitely known as Oswestry until the 13th century. In the Domesday Survey it is included in the manor of Maesbury, which Rainald, sheriff of Shropshire, held of Roger, earl of Shrews- bury; but Rainald or his predecessor Warin had already raised a fortification at Oswestry called Louvre. The manor passed in the reign of Henry I. to Alan Fitz-Flaad, in whose family it continued until the death of Henry Fitzalan, earl of Arundel, without male issue in 1580. The first charter, of which a copy only is preserved among the corporation records, is one given in 1262 by John Fitzalan granting the burgesses self-government. Richard II. by a charter dated 1398 granted all the privileges which belonged to Shrewsbury, and a similar charter was obtained from Thomas, earl of Arundel in 1407. The town

was incorporated by Elizabeth in 1582 under the government of two bailiffs and a common council of 24 burgesses, and her charter was confirmed by James I. in 1616. A charter granted by Charles II. in 1672 appointed a mayor, 12 aldermen and 15 common councilmen, and remained the governing charter until the Municipal Corporations Act of 1835 changed the corporation. In 1228 John Fitzalan obtained the right of holding a market every week on Monday instead of Thursday. The market rights were held by the lord of the manor until 1819, when Earl Powis sold them to the corporation. In the 15th and 16th centuries a weekly market was held at Oswestry for the sale of woollen goods manufactured in North Wales, but in the 17th century the drapers of Shrewsbury determined to get the trade into their own town, and although an Order in the Privy Council was passed to restrain it to Oswestry they agreed in 162 1 to buy no more cloth there. The town was walled by the time of Edward I., but was several times burnt during Welsh invasions. In 1642 it was garrisoned for Charles I., but two years later surrendered to the parliamentary forces.

See William Cathrall, The History of Oswestry (1855); William Price, The History of Oswestry from the Earliest Period (1815); Victoria County History, Shropshire.

OSWIO (c. 612-670), king of Northumbria, son of .fEthelfrith and brother of Oswald, whom he succeeded in Bernicia in 642 after the battle of Maserfeld, was the seventh of the great English kings enumerated by Bede. He succeeded in making the majority of the Britons, Picts and Scots tributary to him. At Gilling in 651 he caused the murder of Oswine, a relative of Edwin, who had become king of Deira, and a few years later took possession of that kingdom. He appears to have consolidated his power by the aid of the Church and by a series of judicious matrimonial alliances. It was probably in 642 that he married Eanfled, daughter of Edwin, thus uniting the two rival dynasties of Northumbria. His daughter Alhfled he married to Peada, son of Penda, king of Mercia, while another

daughter, Osthryth, became the wife of ˆEthelred, third son of the same king. Oswio was chiefly responsible for the recon- version of the East Saxons. He is said to have convinced their king Sigeberht of the truth of Christianity by his arguments, and at his request sent Cedd, a brother of Ceadda, on a mission to Essex. In 655 he was attacked by Penda, and, after an unsuccessful attempt to buy him off, defeated and slew the Mercian king at the battle of the Winwaed. He then took possession of part of Mercia, giving the rest to Peada. As a thank-offering he dedicated his daughter rifled to the Church, and founded the monastery of Whitby. About this time he is thought by many to

have obtained some footing in the kingdom of the Picts in succession to their king Talorcan, the son of his brother Eanfrid. In 660 he married his son Ecgfrith to .(Ethelthryth, daughter of the East Anglian king Anna. In 664 at the synod of Whitby, Oswio accepted the usages of the Roman Church, which led to the departure of Colman and the appointment of Wilfrid as bishop of York. Oswio died in 670 and was succeeded by his son Ecgfrith.

See Bede, Historia Ecclesiaslica, ii., iii., iv., v., edited by C. Plummer (Oxford, 1896); Anglo-Saxon Chronicle, edited by Earle and Plummer (Oxford, 1899).

OTHMAN (c. 574-656), in full Othman ibn ‘Aitan, the third of the Mahommedan caliphs, a kinsman and son-in-law of Mahomet and cousin of Abu Sofian, whose son Moawiya became the first of the Omayyad dynasty. He was elected caliph in succession to Omar in 644, but owing to his alternate weakness and cruelty and his preference of the Koreish for all responsible positions irrespective of their capacity, he produced strife throughout the empire which culminated in his assassina- tion by Mahommed, son of Abu Bekr. He was succeeded by Ali (q.v.). See Caliphate, A. § 3.

OTHNIEL, in the Bible, a clan settled at Debir or Kirjath- sepher in S. Palestine (Judg. i. 12 sqq., Josh. xv. 16 sqq., contrast Josh. x. 38 seq.), described as the “brother” of Caleb. Tht name appears in Judg. iii. 7-1 1 (see Judges), as that of a hen, who delivered Israel from a North Syrian king. That a kin& from the Euphrates who had subjugated Canaan should hav < * been defeated by a clan of the south of Palestine has beeit doubted. There is no evidence of such a situation, and it has been conjectured that Cushan-Rishathaim (the name suggests " C. of double wickedness " !) of Aram (oik) has arisen from some king (cp. Husham, Gen. xxxvi. 34) or clan (cp. Cush, Num. xii. 1; Cushan, Hab. iii. 7) of Edom (arm) to the south or south-east of Palestine. Othniel recurs in 1 Chron. iv. 13.

See A. Klostermann, Gesch. d. Volkes Israel (1896), p. 122 ; Cheyne, Ency. Bib. col. 969 seq. and references; also the literature to Judges.

OTHO, MARCUS SALVIUS (32-69), Roman emperor from the 15th of January to the 15th of April a.d. 69, was born on the 28th of April a.d. 32. He belonged to an ancient and noble Etruscan family settled at Ferentinum in Etruria. He appears first as one of the most reckless and extravagant of the young nobles who surrounded Nero. But his friendship with Nero was brought to an abrupt close in 58, when Otho refused to divorce his beautiful wife Poppea Sabina at the bidding of

Nero, who at once appointed him governor of the remote province of Lusitania. Here Otho remained ten years, and his administration was marked by a moderation unusual at the time. When in 68 his neighbour Galba, the governor of Hispania Tarraconensis, rose in revolt against Nero, Otho accompanied him to Rome. Resent- ment at the treatment he had received from Nero may have impelled him to this course, but to this motive was added before long that of personal ambition. Galba was far advanced in years, and Otho, encouraged by the predictions of astrologers, aspired to succeed him. But in January 69 his hopes were dissipated by Galba's formal adoption of L. Calpurnius Piso as the fittest man to succeed him. Nothing remained for Otho but to strike a bold blow. Desperate as was the state of his finances, thanks to his previous extravagance, he found money to purchase the services of some three-and-twenty soldiers of the praetorian guard. On the morning of January 15, five days only after the adoption of Piso, Otho attended as usual to pay his respects to

the emperor, and then hastily excusing himself on the score of private business hurried from the Palatine to meet his accom- plices. By them he was escorted to the praetorian camp, where, after a few moments of surprise and indecision, he was saluted imperator. With an imposing force he returned to the Forum, and at the foot of the Capitol encountered Galba, who, alarmed by vague rumours of treachery, was making his way through a dense crowd of wondering citizens towards the barracks of the guard. The cohort oh duty at the Palatine, which had accom- panied the emperor, instantly deserted him; Galba, Piso and others were brutally murdered by the praetorians. The brief struggle over, Otho returned in triumph to the camp, and on the same day was duly invested by the senators with the name of Augustus, the tribunician power and the other dignities belonging to the principate. Otho had owed his success, not only to the resentment felt by the praetorian guards at Galba's well-meant attempts to curtail their privileges in the interests of discipline, but also largely to the attachment felt in Rome for the memory of Nero; and his first acts as emperor showed that he was not unmindful of the fact. He accepted,or appeared to accept, the cog- nomen of Nero conferred upon him by the shouts of the populace, whom his comparative youth and the effeminacy of his appearance reminded of their lost favourite. Nero's statues were again set up, his freedmen and household officers reinstalled, and the intended completion of the Golden House announced. At the same time the fears of the more

sober and respectable citizens were allayed by Otho's liberal professions of his intention to govern equitably, and by his judicious clemency towards Marius Celsus, consul-designate, a devoted adherent of Galba.

But any further development of Otho's policy was checked by the news which reached Rome shortly after his accession, that the army in Germany had declared for Vitellius, the commander of the legions on the lower Rhine, and was already advancing upon Italy. After in vain attempting to conciliate Vitellius by the offer of a share in the empire, Otho, with unexpected vigour,' prepared for war. From the remoter provinces, which had acquiesced in his accession, little help was to be expected; but the legions of Dalmatia, Pannonia and Moesia were eager in his cause, the praetorian cohorts were in themselves a formidable force and an efficient fleet gave him the mastery of the Italian seas. The fleet was at once despatched to secure Liguria, and on the 14th of March Otho, undismayed by omens and prodigies, started north- wards at the head of his troops in the hopes of preventing the entry of the Vitellian troops into Italy. But for this he was too late, and all that could be done was to throw troops into Placentia and hold the line of the Po. Otho's advanced guard successfully defended Placentia against Alienus Caecina, and compelled that general to fall back on Cremona. But the arrival of Fabius Valens altered the aspect of affairs. The Vitellian commanders now resolved to bring on a decisive battle, and their designs were assisted by the divided and irresolute counsels which prevailed in Otho's camp. The more experienced officers urged the im- portance of avoiding a battle, until at least the legions from Dalmatia had arrived. But the rashness of the emperor's brother Titianus and of Proculus, prefect of the praetorian guards, added to Otho's feverish impatience, overruled all opposition, and an immediate advance was decided upon, Otho himself remaining behind with a considerable reserve force at Brixellum, on the southern bank of the Po. When this decision was taken the Othonian forces had already crossed the Po and were encamped at Bedriacum (or Betriacum), a small village on the Via Postumia, and on the route by which the legions from Dalmatia would naturally arrive. Leaving a strong detachment to hold the camp at Bedriacum, the Othonian forces advanced along the Via Postumia in the direction of Cremona. At a short distance from that city they unexpectedly encountered the Vitellian troops. The Othonians, though taken at a disadvantage, fought desper- ately, but were finally forced to fall back in disorder upon their camp at Bedriacum. Thither on the next day the victorious Vitellians followed them, but only to come to terms at once with their disheartened enemy, and to be welcomed into

the camp as friends. More unexpected still was the effect produced at

Brixellum by the news of the battle. Otho was still in command of a formidable force — the Dalmatian legions had already reached A'quileia; and the spirit of his soldiers and their officers was unbroken. But he was resolved to accept the verdict of the battle which his own impatience had hastened. In a dignified speech he bade farewell to those about hirri, and then retiring to rest slept soundly for some hours. Early in the morning he stabbed him- self to the heart with a dagger which he had concealed under his pillow, and died as his attendants entered the tent. His funeral was celebrated at once, as he had wished, and not a few of his soldiers followed their master's example by killing themselves at his pyre. A plain tomb was erected in his honour at Brixellum, with the simple inscription " Diis Manibus Marci Othonis." At the time of his death (the 15th of April 69) he was in his thirty-eighth year, and had reigned just three months. In all his life nothing became him so well as his manner of leaving it; but the fortitude he then showed, even if it was not merely the courage of despair, cannot blind us to the fact that he was little better than a reckless and vicious spendthrift, who was not the less dangerous because his fiercer passions were concealed beneath an affectation of effeminate dandyism. (H. F. P.)

See Tacitus, Histories, i. 12-50, 71-90, ii. 11-51 ; Lives by Suetonius and Plutarch ; Dio Cassius lxiv. ; Merivale, History of the Romans under the Empire, ch. 56: H. Schiller, Geschichte der romischen Kaiserzeit (1883); L. Paul, " Kaiser M. Salvius Otho" in Rhein. Mus. lvii. (1902) ; W. A. Spooner, On the Characters of Galba, Otho, and Vitellius, in Introd. to his edition (1891) of the Histories of Tacitus; B. W. Henderson, Civil War and Rebellion in the Roman Empire, A.d. 69-70 (1908).

OTIS, HARRISON GRAY (1765-1848), American politician, was born in Boston, Massachusetts, on the 8th of October 1765. He was a nephew of James Otis, and the son of Samuel Allyne Otis (1740-1814), who was a member of the Confederation Congress in 1 787-1 788 and secretary of the United States Senate from its first session in 1789 until his death. Young Otis graduated from Harvard College in 1783, was admitted to the bar in 1786, and soon became prominent as a Federalist in politics. He served in the Massachusetts House of Repre- sentatives in 1 796-1 797, in the National House of Representa- tives in 1797-1801, as district-attorney for Massachusetts in 1801, as speaker of the state House of Representatives in 1803-1805, as a member of the state Senate from 1805 to 181 1, and as president of that body in 1805-1806 and 1808-1811, as a member of

the United States Senate from 1817 to 1822, and as mayor of Boston in 1829-1832. He was strongly opposed to the War of 181 2, and was a leader in the movement culminating in the Hartford Convention, which he defended in a series of open letters published in 1824, and in his inaugural address as mayor of Boston. A man of refinement and education, a member of an influential family, a popular social leader and an eloquent speaker— at the age of twenty-three he was chosen by the town authorities of Boston to deliver the Independence Day oration — Otis yet lacked conspicuous ability as a statesman. He died in Boston on the 28th of October 1848.

OTIS, JAMES (1725-1783), American patriot, was born at West Barnstable, Massachusetts, on the 5th of February 1725. He was the eldest son of James Otis (1702-1778), fourth in descent from John Otis (1581-1657), a native of Barnstaple, Devon, and one of the first settlers (in 1635) of Hingham, Mass. The elder James Otis was elected to the provincial General Court in 1758, was its speaker in 1760-1762, and was chief justice of the Court of Common Pleas from 1764 until 1776; he was a prominent patriot in the colony of Massachusetts. The son graduated at Harvard in 1743; and after studying law in the office of Jeremiah Gridley (1702-1767), a well-known lawyer with Whig sympathies, rose to great distinction at the bar, practising first at Plymouth and after 1 7 50 at Boston. In 1 760 he published Rudiments of Latin Prosody, a book of authority in its time. He wrote a similar treatise upon Greek prosody; but this was never published, because, as he said, there was not a font of Greek letters in the country, nor, if there were, a printer who could have set them up. Soon after the accession of George III. to the throne of England in 1760, the British government

decided upon a rigid enforcement of the navigation acts, which had long been disregarded by the colonists and had been almost wholly evaded during the French and Indian War. The Writs of Assistance issued in 1755 were about to expire, and it was decided to issue new ones, which would empower custom house officers to search any house for smuggled goods, though neither the house nor the goods had to be specifically mentioned in the writs. Much opposition was aroused in Massachusetts, the legality of the writs was questioned, and the Superior Court consented to hear argument. Otis held the office of advocate-general at the time, and it was his duty to appear on behalf of the government. He refused, resigned his office, and appeared for

the people against the issue of the writs, Gridley appearing on the opposite side. The case was argued in the Old Town House of Boston in February 1 76 1 , and the chief speech was made by Otis. His plea was fervid in its eloquence and fearless in its assertion of the rights of the colonists. Going beyond the question at issue, he dealt with the more fundamental question of the relation between the English in America and the home government, and argued that even if authorized by act of parliament such writs were null and void. The young orator was elected in May of the same year a repre- sentative from Boston to the Massachusetts General Coifrt. To that position he was re-elected nearly every year of the re- maining active years of his life, serving there with his father. In 1766 he was chosen Speaker of the House of Representatives, but the choice was negatived. In September 1762 the younger Otis published A Vindication of the Conduct of the House of Representatives of the Province of Massachusetts Bay, in defence of the action of that body in sending to the governor a message (drafted by Otis) rebuking him for asking the assembly to pay for ships he had (with authorization of the Council and not of the representatives) sent to protect New England fisheries against French privateers; according to this message ” it would be of little consequence to the people whether they were subject to George or Louis, the king of Great Britain or the French king, if both were as arbitrary as both would be if both could levy taxes without parliament.” He also wrote various state papers addressed to the colonies to enlist them in the common cause, or sent to the government in England to uphold the rights or set forth the grievances of the colonists. His influence at home in controlling and directing the movement of events which led to the War of Independence was universally felt and acknowledged; and abroad no American was so frequently quoted, denounced, or applauded in parliament and the English press before 1769 as the recognized head and chief of the rebellious spirit of the New England colonists. In 1765 Massachusetts sent him as one of her representatives to the Stamp Act Congress at New York, which had been called by a Committee of the Massachusetts General Court, of which he was a member; and here he was a conspicuous figure, serving on the committee which prepared the address sent by that body to the British House of Commons. In 1769 he denounced m the Boston Gazette certain customs commissioners who had charged him with treason. Thereupon he became involved in an altercation in a public-house with Robinson, one of the commissioners; the altercation grew into an affray, and Otis received a sword cut on the head, which is considered to have caused his subsequent insanity. Robinson was mulcted in £2000 damages, but in view of his having made a written apology, Otis declined to take

this sum from him. From 1769 almost continuously until his death Otis was harm- lessly insane, though he had occasional lucid intervals, serving as a volunteer in the battle of Bunker Hill in 1775 and arguing a case in 1778. He was killed by lightning (it is said that he had often expressed a wish that he might die in this way) at Andover, Mass., on the 23rd of May 1783.

Otis's political writings were chiefly controversial and exercised an enormous influence, his pamphlets being among the most effective presentations of the arguments of the colonists against the arbitrary, measures of the British ministry. His more important pamphlets were A Vindication of the Conduct of the House of Representatives of the Province of Massachusetts Bay (1762); The Rights of the British Colonies Asserted and Proved (1764); A Vindication of the British Colonies against the Aspersions of the Halifax Gentleman in

his Letter to a Rhode Island Friend — a letter known at the time ae the "Halifax Libel" (1765); and Considerations on Behalf of the Colonists in a Letter to a Noble Lord (1765).

The best biography is that by William Tudor (Boston, 1823); there is a shorter one by Francis Bowen (Boston, 1847). The best account of Otis's characteristics and influence as a writer may be found in M. C. Tyler's Literary History of the American Revolution (New York, 1897). See also the notes on the Writs of Assistance by Horace Gray, Jr., in Quincy's Massachusetts Reports, 1761-1772 (Boston, 1865). Otis'.s speech on the writs, reprinted from rough notes taken by John Adams, appears in Appendix A of vol. ii. of C. F. Adams's edition of the Works of John Adams (Boston, 1850).

OTLEY, a market town in the Otley parliamentary division of the West Riding of Yorkshire, England, 13 m. N.W. of Leeds on the Midland and the North-Eastern railways. Pop. of urban district (1901) 9230. It is picturesquely situated on the south bank of the Wharfe, at the foot of the precipitous Chevin Hill, 925 ft. in height. In this neighbourhood excellent building-stone is quarried, which was used for the foundations of the Houses of Parliament in London, and is despatched to all parts of England. The church of AH Saints has Norman portions, and a cross and other remains of pre-Norman date were discovered in restoring the building. There are interesting monuments of members of the Fairfax family and others. Worsted spinning and weaving, tanning and leather-dressing, paper-making and the making of printing-machines are the principal industries. The scenery of Wharfedale is very pleasant. In the dale, 7 m. below Otley, are the fine ruins of Harewood Castle, of the 14th century. The neighbouring

church contains a noteworthy series of monuments of the 15th century in alabaster.

OTRANTO, a seaport and archiepiscopal see of Apulia, Italy, in the province of Lecce, from which it is* 29! m. S.E. by rail, 49 ft. above sea-level. Pop. (1901) 2295. It is beautifully situated on the east coast of the peninsula of the ancient Calabria (q.v.). The castle was erected by Alphonso of Aragon; the cathedral, consecrated in 1088, has a rose window and side portal of 148 1. The interior, a basilica with nave and two aisles, contains columns said to come from a temple of Minerva and a fine mosaic pavement of 1166, with interesting representa- tions of the months, Old Testament subjects, &c. It has a crypt supported by forty-two marble columns. The church of S. Pietro has Byzantine frescoes. Two submarine cables start from Otranto, one for Valona, the other for Corfu. The harbour is small and has little trade.

Otranto occupies the site of the ancient Hydrus or Hydruntum, a town of Greek origin. In Roman times it was less important than Brundusium as a point of embarkation for the East, though the distance to Apollonia was less than from Brundusium. It remained in the hands of the Byzantine emperors until it was taken by Robert Guiscard in 1068. In 1480 it was utterly destroyed by the Turkish fleet, and .has never since recovered its importance. About 30 m. S.E. lies the promontory of S. Maria di Leuca (so called since ancient times from its white cliffs), the S.E. extremity of Italy, the ancient Promontorium Iapygium or Sallentinum. The district between this promontory and Otranto is thickly populated, and very fertile. (T. As.)

OTTAKAR I, (d. 1230), king of Bohemia, was a younger son of King Vladislav II. (d. 1174) and a member of the Premy- slide family, hence he is often referred to as Premysl Ottakar I. His early years were passed amid the anarchy which prevailed everywhere in his native land; after several struggles, in which he took part, he was recognized as ruler of Bohemia by the emperor Henry VI. in 1192. He was, however, soon overthrown, but renewing the fight in 1196 he forced his brother, King Vladislav III., to abandon Bohemia to him and to content himself with Moravia. Although confirmed in the possession of his kingdom by the German king, Philip, duke of Swabia, Ottakar soon deserted Philip, who thereupon declared him deposed. He then joined the rival German king, Otto of Brunswick, afterwards the emperor Otto IV., being recognized as king of Bohemia both by Otto and by his ally, Pope Innocent III. Philip’s consequent invasion of Bohemia was a great success. Ottakar, having been compelled to pay a fine, again ranged himself among Philip’s partisans and still later was

among the supporters of the young king, Frederick II. He united Moravia with Bohemia in 1222, and when he died in December 1230 he left to his son, Wenceslaus I., a kingdom united and comparatively peaceable.

Ottakar n., or Premysl Ottakar II. (c. 1 230-1 278), king of Bohemia, was a son of King Wenceslaus I., and through his mother, Kunigunde, was related to the Hohenstaufen family, being a grandson of the German king, Philip, duke of Swabia. During his father's lifetime he ruled Moravia, but when in 1248 some discontented Bohemian nobles acknowledged him as their sovereign, trouble arose between him and his father, and for a short time Ottakar was imprisoned. However, in 1 2 5 1 the young prince secured his election as duke of Austria, where he strengthened his position by marrying Margaret (d. 1267), sister of Duke Frederick II., the last of the Babenberg rulers of the duchy and widow of the German king, Henry VII. Some years later he repudiated this lady and married a Hungarian princess. Both before and after he became king of Bohemia in succession to his father in September 1 2 53 Ottakar was involved in a dispute with Bela IV., king of Hungary, over the possession of Styria, which duchy had formerly been united with Austria. By an arrangement made in 1254 he surrendered part of it to Bela, but when the dispute was renewed he defeated the Hungarians in July 1260 and secured the whole of Styria for himself, owing his formal investiture with Austria and Styria to the German king, Richard, earl of Cornwall. The Bohemian king also led two expeditions against the Prussians. In 1260 he inherited Carinthia and part of Carniala; and having made good his claim, contested by the Hungarians, on the field of battle, he was the most powerful prince in Germany when an election for the German throne took place in 1273. But Ottakar was not the successful candidate. He refused to acknowledge his victorious rival, Rudolph of Habsburg, and urged the pope to adopt a similar attitude, while the new king claimed the Austrian duchies. Matters reached a climax in 1276. Placing Ottakar under the ban of the empire, Rudolph besieged Vienna and compelled Ottakar in November 1276 to sign a treaty by which he gave up Austria and the neighbouring duchies, retaining for himself only Bohemia and Moravia. Two years later the Bohemian king tried to recover his lost lands; he found allies and collected a large army, but he was defeated by Rudolph and killed at Diirnkrut on the March on the 26th of August 1278. Ottakar was a founder of towns and a friend of law and order, while he assisted trade and welcomed German

immigrants. Clever, strong and handsome, he is a famous figure both in history and in legend, and is the subject of a tragedy by F. Grillparzer, Konig Ottokars Gliick und Ende. His son and successor was Wenceslaus II.

See O. Lorenz, Geschichte Konig Ottokars, ii. (Vienna, 1866) ; A. Huber, Geschichte Oesterreichs, Band i. (Gotha, 1885); and F. Palacky, Geschichte von Bbhmen, Band i. (Prague, 1844).

OTTAVA RIMA, a stanza of eight iambic lines, containing three rhymes, invariably arranged as follows: — a b a b a b c c. It is an Italian invention, and we find the earliest specimens of its use in the poetry of the fourteenth century. Boccaccio employed it for the Teseide, which he wrote in Florence in 1340, and for the Filostrato, which he wrote at Naples some seven years later. These remarkable epics gave to ottava rima its classic character. In the succeeding century it was employed by Politian, and by Boiardo for his famous Orlando Innamorato (i486). It was Pulci, however, in the Morgante Maggiore (1487), who invented the peculiar mock-heroic, or rather half-serious, half-burlesque, style with which ottava rima has been most commonly identified ever since and in connexion with which it was introduced into England by Frere and Byron. The measure, which was now recognized as the normal one for all Italian epic poetry, was presently wielded with extraordinary charm and variety by Berni, Ariosto and Tasso. The merits of it were not perceived by the English poets of the 16th and 17th centuries, although the versions of Tasso by Carew (1594) and Fairfax (1600) and of Ariosto by Harington (1501) preserve its external construction. The stanzaic forms invented

by Spenser and by the Fletchers have less real relation to ottava rima than is commonly asserted, and it is quite incorrect to say that the author of the Fairy Queen adopted ottava rima and added a ninth line to prevent the sound from being monotonously iterative. A portion of Browne's Britannia's Pastorals is composed in pure ottava rima, but this is the only important specimen in original Elizabethan literature. Two centuries later a very successful attempt was made to introduce in English poetry the flexibility and gaiety of ottava rima by John Hookham Frere, who had studied Pulci and Casti, and had caught the very movement of their diverting measure. His Whistlecraft appeared in 18 17. This is a specimen of the ottava rima of Frere: —

But chiefly, when the shadowy moon had shed

O'er woods and waters her mysterious hue, Their passive hearts and vacant fancies fed

With thoughts and aspirations strange and new, Till their brute souls with inward working bred

Dark hints that in the depths of instinct grew Subjection — not from Locke's associations,

Nor David Hartley's doctrine of vibrations.

Byron was greatly impressed by the opportunities for satire involved in Frere's experiment, and in October 1817, in imitation of Whistlecraft, but keeping still closer to Pulci, he wrote Beppo. By far the greatest monument in ottava rima which exists in English literature is Don Juan (1819-1824). Byron also employed this measure, which was peculiarly adaptable to the purposes of his genius, in The Vision 0) Judgment (1822). Meanwhile Shelley also became attracted by it, and in 1820 translated the Hymns of Homer into ottava rima. The curious burlesque epic of William Tennant (1 784-1848), Anster Fair (181 2), which preceded all these, is written in what woulc" be ottava rima if the eighth line were not an alexandrine. The form has been little used in other languages than Italian and English. It was employed by Boscan (1490-1542), who imitated Bembo vigorously in Spanish, and the very fine Araucana of Ercilla y Zuniga (1533- 1 595) is in the same measure. Lope de Vega Carpio wrote plenti- fully in ottava rima. In Portuguese poetry of the 16th and 17th centuries this measure obtained the sanction of Camoens, who wrote in it his immortal Lusiads (1572). Ottava rima has been attempted in Geiman poetry by Uhland and others, but not for pieces of any considerable length. (E. G.)

OTTAWA, a tribe of North American Indians of Algonquian stock, originally settled on the Ottawa river, Canada, and later on the north shore of the upper peninsula of Michigan. They were driven in 1650 by the Iroquois beyond the Mississippi, only to be forced back by the Dakotas. Then they settled on Manitoulin Island, Lake Huron, and joined the French against the English. During the War of Independence, however, they fought for the latter. Some were moved to Indian Territory (Oklahoma), but the majority live to-day in scattered commu- nities throughout lower Michigan and Ontario.

OTTAWA, the largest tributary of the river St Lawrence; ranking ninth in length among the rivers of Canada, being 685 m. long. It flows first westward to Lake Temiscaming; thence south-east and east. The principal tributaries on the left bank are the Rouge (115 m.), North Nation (60) , Lievre (205), Gatineau (240), Coulonge (135), Dumoine (80); and on the right bank, the South Nation (90), Mississippi (105),

Madawaska (130) and Petawawa (95). Canals at Ste Anne, Carillon and Grenville permit the passage of vessels drawing 9 ft., from Montreal up to the city of Ottawa. At Ottawa the river is connected with Lake Ontario by the Rideau Canal. The Chaudiere Falls, and the Chats and other rapids, prevent continuous navigation above the capital, but small steamers ply on the larger navigable stretches. The Montreal, Ottawa and Georgian Bay Canal is designed to surmount these obstructions and provide a navigable channel from Georgian Bay up French river, through Lake Nipissing and over the height of land to the Ottawa, thence down to Montreal, of sufficient depth to enable vessels drawing 20 or 21 ft. to carry cargo from Chicago, Duluth, Fort William, &c. to Montreal, or, if necessary, to Europe, without breaking bulk. Except the suggested Hudson Bay route, this canal would form

the shortest route to the Atlantic seaboard from the great grain-producing areas of western America.

The Ottawa was first explored by Samuel de Champlain in 1613. Champlain describes many of its tributaries, the Chaudiere and Rideau Falls, the Long Sault, Chats and other rapids, as well as the character of the river and its banks, with minuteness and reasonable accuracy. He places the Chaudiere Falls in 45° 38', the true position being 45° 27'. The Long Sault Rapids on the Ottawa, about midway between Montreal and the capital, were the scene of one of the noblest exploits in Canadian history, when in 1661 the young Sieur des Ormeaux with sixteen comrades and a handful of Indian allies deliberately gave their lives to save New France from an invasion of the Iroquois. They intercepted the war party at the Long Sault, and for nearly a week held them at bay. When finally the last Frenchman fell under a shower of arrows, the Iroquois were thoroughly dis- heartened and returned crestfallen to their own country. For a hundred and fifty years thereafter the Ottawa was the great highway from Montreal to the west for explorers and fur-traders. The portage paths around its cataracts and rapids were worn smooth by the moccasined feet of countless voyageurs ; and its wooded banks rang with the inimitable chansons of Old Canada, as the canoe brigades swept swiftly up and down its broad stream. Throughout the 19th century the Ottawa was the thoroughfare of the lumbermen, whose immense rafts were carried down from its upper waters to Montreal and Quebec.

OTTAWA, a city of Carleton county, province of Ontario, and the

capital of the Dominion of Canada, on the right bank of the Ottawa river, 101 m. W. of Montreal and 217m. N.E. of Toronto. The main tower of the parliament building is in 45 25′ 28″ N., and 75° 42′ 03″ W.

The city stands for the most part on a cluster of hills, 60 to 155 ft. above the river.. It is on the main line of the Canadian Pacific railway, which affords direct communication with Montreal by two routes, the North Shore and the Short Line, one on either side of the Ottawa river. Branches of the same railway lead to Brockville, on the St Lawrence river, passing through the town of Smith's Falls where connexion is made with the direct line from Montreal to Toronto ; to Prescott, also on the St Lawrence ; northward through the Gatineau valley to Maniwaki, in the heart of a famous sporting country, and westward to Waltham, on the north side of the Ottawa. The Grand Trunk offers a third route to Montreal, and another line of the same railway leads to Parry Sound, on Georgian Bay. The Ottawa and New York (New York Central) runs to Cornwall, on the St Lawrence, thence to New York. Electric railways afford communication with all parts of the city and extend eastward to Rockliffe Park and the rifle ranges, westward to Britannia on Lake Deschenes, and through the neighbouring town of Hull to Aylmer and Victoria Park. During the summer months steamers ply down the Ottawa to Montreal, and by way of the Rideau canal and lakes to Kingston on the St Lawrence. A road bridge, partially destroyed in the great fire of 1900, connects Ottawa with Hull ; a railway bridge spans the river above the Chaudiere Falls ; and the Royal Alexandra Bridge, below the falls, carries both steam and electric railway tracks, as well as roadways for vehicular and pedestrian traffic. The site of the city is exceedingly picturesque. For 3 m. it follows the high southern bank, of the Ottawa, from the Chaudiere Falls, whose mist-crowned cauldron is clearly visible from the summit of Parliament Hill, to and beyond the Rideau Falls, so named by early French explorers because of their curtain-like appearance. The Rideau, a southern tributary of the Ottawa, once formed the eastern boundary of the city, which, however, is now absorbing a string of suburbs that lie along its eastern banks. The Rideau Canal cuts the city in two, the western portion being known as Upper Town and the eastern as Lower Town. Roughly speaking the canal divides the two sections of the population, the English occupying Upper Town and the French Lower Town, though Sandy Hill, a fashionable residential district east of the canal, is mainly occupied by the English. Opposite and a little below the mouth of the Rideau, the Gatineau flows into the

Ottawa from the north. Above the Chaudiere Falls the river is broken

by the Deschenes Rapids, and beyond these again it expands into Lake Deschenes, a favourite summer resort for the people of the city. To the north lie the Laurentian Hills, broken by the picturesque Gatineau Valley.

The crowning architectural feature of the city is the splendid group of Gothic buildings on the summit of Parliament Hill, whose limestone bluffs rise 150 ft. sheer from the river. The three blocks of these buildings form sides of a great quadrangle, the fourth side remaining open. The main front of the central or Parliament building is 470 ft. long and 40 ft. high, the Victoria Tower (180 ft. high) rising over the principal entrance. Behind and connected with the Parliament building is an admirably proportioned polygonal hall, 90 ft. in diameter, in which the library of parliament is housed. The corner stone of the main building was laid by the then prince of Wales in i860. The buildings forming the eastern and western sides of the quadrangle are devoted to departments of the Dominion government. To the south, but outside the grounds of Parliament Hill, stands the Langevin Block, a massive structure in brown sandstone, also used for departmental purposes. The increasing needs of the government have made necessary the erection of several other buildings and an effort has been made to bring as many of these as possible into a harmonious group. The Archives building and the Royal Mint stand on the commanding eminence of Nepean Point, to the eastward of Parliament Hill, [the Rideau Canal lying between. Two large departmental buildings occupy ground south of the Archives building and facing Parliament Hill, one containing the Supreme Court as well as the Federal Department of Justice. At the foot of Metcalfe Street, south of Parliament Hill, stands the Victoria Museum, with the department of mines, with the splendid collections of the Geological and Natural History Museum, the departmental library, and the National Art Gallery. The Dominion Observatory stands outside the city, in the grounds of the Central Experimental Farm. Plans were approved in 1909 by the government for a union railway station east of the canal, and immediately south of Rideau Street, and a large hotel (Grand Trunk Railway), the Chateau Laurier, at the southern end of Major's Hill Park. Other prominent buildings are the city hall, post office, Carnegie library, normal and. model schools, government printing bureau, county court house, the Basilica or Roman Catholic cathedral, and Christ Church cathedral (Church of England), the Roman Catholic university of Ottawa and the collegiate institute.

The city charities include four large general hospitals, two of which are under Protestant auspices; one is controlled by Roman Catholics; the fourth is devoted to contagious diseases. Ottawa is the seat of the

Church of England bishop of Ottawa, and of the Roman Catholic archbishop of Ottawa. Several of the philanthropic and educational orders of the latter church are established here, in nunneries, convents or monasteries. As elsewhere in Ontario, the educational system is divided into public schoola (undenominational), and separate schools (Roman Catholic), the latter supported by Roman Catholic taxpayers, the former by all other members of the community. The collegiate institute is common to both, and is used as a preparatory school for the universities.

Ottawa has been a great seat of the lumber trade, and the manufacture of lumber still forms an important part of the industrial life of the city, but the magnificent waterpowers of the Chaudiere and Rideau Falls are now utilized for match- works, flour-mills, foundries, carbide factories and many other flourishing industries, as well as for the development of electric light and power, for the lighting of the city and the running of the electric railways.

The people of Ottawa possess a number of public parks, both within and outside the city, partly the result of their own fore- sight, and partly due to the labours of the Government Improve- ment Commission. Parliament Hill itself constitutes a park of no mean proportions, one of the noted features of which is the beautiful Lover's Walk, cut out of the side of the cliff half way between the river and the summit. The grounds above contain

statues of Queen Victoria, as well as of Sir John Macdonald, Alexander Mackenzie, Sir George Cartier and other Canadian political leaders. On the eastern side of the canal is Major's Hill Park, maintained by the government. Below Sandy Hill, on the banks of the Rideau, lies Strathcona Park, an admirable piece of landscape gardening constructed out of what was once an unsightly swamp. Crossing the bridges above the Rideau Falls, and passing the heavily wooded grounds of Rideau Hall, the official residence of the governor-general, we come to Rock- liffe Park, beyond which lies the government rifle ranges. Rock- liffe Park is the easternmost point of an ambitious scheme of landscape gardening planned by the Improvement Commission. From here a driveway extends tp Rideau Hall ; thence it crosses the Rideau river to a noble thoroughfare cut through the heart of Lower Town, and known as King Edward Avenue. Crossing the canal by the Laurier bridge, the driveway turns south and follows the

west bank of the canal for 4 m. to the Central Ex- perimental Farm, an extensive tract of land upon which experi- ments in model farming are carried out by government specialists, for the benefit of Canadian farmers. From the Experimental Farm the driveway will be carried around the western side of the city to the banks of the Ottawa, connecting by light bridges with a group of islands above the Chaudiere Falls which are to be con- verted into a park reserve.

Ottawa is governed by a mayor, elected by the city at large; a board of control consisting of four members, similarly elected and a board of 16 aldermen, 2 elected by each of the 8 wards. The city returns 2 members to the Dominion House of Commons and two to the provincial legislature.

The population, of which one-third is French-speaking, the remainder English (with the exception of a small German element), has increased rapidly since the incorporation of the city in 1854. It was 59,928 in 1901; 67,572 in 1906; and in 1907, including the suburbs and the neighbouring town of Hull, over 100,000.

The earliest description of the site of Ottawa is that of Samuel de Champlain, in his Voyages. In June 1613, on his way up the river, he came to a tributary on the south side, ” at the mouth of which is a marvellous fall. For it descends a height of twenty or twenty-five fathoms with such impetuosity that it makes an arch nearly four hundred paces broad. The savages take pleasure in passing under it, not wetting themselves, except from the spray that is thrown off.” This was the Rideau Falls, but a good deal of allowance must be made for exaggeration in Champlain’s account. Continuing- up the river, ” we passed,” he says, ” a fall, a league from there, which is half a league broad and has a descent of six or seven fathoms. There are many little islands. The water falls in one place with such force upon a rock that it has hollowed out in course of time a large and deep basin, in which the water has a circular motion and forms large eddies in the middle, so that the savages call it Asticou, which signifies boiler. This cataract produces such a noise in this basin that it is heard for more than two leagues.” The present name, Chaudiere, is the French equivalent of the old Indian name. For two hundred years and more after Champlain’s first visit the Chaudiere portage was the main thoroughfare from Montreal to the great western fur country; but it was not until 1800 that any permanent settlement was made in the vicinity. In that year Philemon Wright, of Woburn, Massachusetts, built a home for himself at the foot of the portage, on the Quebec side of the river, where the city of Hull now stands; but for some time the precipitous cliffs on the south side seem to have discouraged settlement there. Finally about

1820 one Nicholas Sparks moved over the river and cleared a farm in what is now the heart of Ottawa. Seven years later Colonel John By, R.E., was sent out to build a canal from a point below the Chaudiere Falls to Kingston on Lake Ontario. The canal, completed at a cost of $2,500,000, has never been of any great commercial importance; it has never been called upon to fulfil its primary object, as a military work to enable gun-boats and military supplies to reach the lakes from Montreal without being exposed to attack along the St Lawrence frontier. The building of the canal created a fair-

sized settlement at its Ottawa end, which came to be known as Bytown. As the lumber trade developed Bytown rapidly increased in wealth and importance. In 1854 it was incorporated as a city, the name being changed to Ottawa; and four years later Queen Victoria selected Ottawa as the capital of Canada. Ottawa was admirably situated for a capital from a political and military point of view; but there is reason to believe that the deciding factor was the pressure exerted by the four other rival claimants, Montreal, Quebec, Toronto and Kingston, any three of which would have fiercely resented the selection of the fourth. The first session of parliament in the new capital was opened in 1865.

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OTTAWA, a city arid the county-seat of La Salle county, Illinois, U.S.A., on the Illinois river, at the mouth of the Fox, about 84 m. S.W. of Chicago. Pop. (1900) 10,588, of whom 1804 were foreign-born; (1910 census) 9535. It is served by the Chicago, Burlington & Quincy, and the Chicago, Rock Island & Pacific railways, by interurban electric railways, and by the Illinois & Michigan Canal. There is a monument at Ottawa to the 1400 soldiers from La Salle county who died in the Civil War, and among the public buildings are the County Court House, the Court House for the second district of the Illinois Appellate

Court, and Reddick's Library, founded by William Reddick. Ottawa is the seat of the Pleasant View Luther College (co-educational), founded in 1896 by the Norwegian Lutherans of Northern Illinois. There is a medicinal spring, the water of which is called " Sanicula " water. The water supply of the city is derived from eight deep wells. There are about 150 privately owned artesian wells. In the vicinity are large deposits of coal, of glass-sand, and of clay suitable for brick and tile. The city's manufactures include glass, brick, tile, carriages and wagons, agricultural implements, pianos and organs and cigars. The value of the factory products increased from $1,737,884 in 1900 to $2,078,139 in 1905, or 19-6%.

The mouth of the Fox was early visited by French explorers, and Father Hennepin is said to have discovered here in 1680 the first deposit of coal found in America. On Starved Rock, a bold hillock about 125 ft. high, on the southern bank of the Illinois, about midway between Ottawa and La Salle, the French explorer La Salle, assisted by his lieutenant Henri de Tonty and a few Canadian voyageurs and Illinois Indians, established (in December 1682) Fort St Louis, about which he gathered nearly 20,000 Indians, who were seeking protection from the Iroquois. The plateau-like summit, which originally could be reached only from the south by a steep and narrow path, was rendered almost impregnable to Indian attack by a sheer cliff on the river side of the hill, a deep ravine along its eastern base and steep declivities on the other sides. On the summit La Salle built store-houses and log huts, which he surrounded by intrenchments and a log palisade. The post was used by fur traders as late as 1718. The hill has borne its present name since about 1770, when it became the last refuge of a small band of Illinois flying before a large force of Pottawattomies, who believed that an Illinois had assassinated Pontiac, in whose conspiracy the Pottawattomies had taken part. Unable to dislodge the Illinois, the Pottawattomies cut off their escape and let them die of starvation. Ottawa was laid out in 1830, incorporated as a village in 1838 and chartered as a city in 1853. On the 21st of August 1858 the first of the series of political debates between Abraham Lincoln and Stephen A. Douglas, in their contest for the United States senatorship, was held at

Ottawa. The semi-centennial of this debate was celebrated in 1908, when the Ulini Chapter, Daughters of the American Revolution, caused a suitably inscribed boulder weighing 23 tons to be set up in

Washington Park as a memorial.

OTTAWA, a city and the county-seat of Franklin county, eastern Kansas, U.S.A., situated on the Osage (Marais des Cygnes) river, about 58 m. (by rail) S.W. of Kansas City. Pop. (1900) 6934, of whom 333 were foreign born; (1905) 7727; (1910) 7670. It is served by the Atchison, Topeka & Santa Fe (which has large repair shops here) and the Missouri Pacific railways. There is a Carnegie library, and Forest Park, within the city limits, is a popular meeting place of conventions and summer gatherings, including the annual Ottawa Chautauqua Assembly. Ottawa University (Baptist) was established here in 1865, as the outgrowth of Roger Williams University, which had been chartered in i860 for the education of Indians on the Ottawa Reservation, and had received a grant of 20,000 acres from the Federal government in 1862. The university comprises an academy, a college, a school of fine arts and a commercial college, and in 1909 had 406 students. Ottawa has an important trade in grain and live-stock; soft coal and natural gas are found in the vicinity; the manufactures include flour, wind- mills, wire-fences, furniture, bricks/ brooms and foundry products. Ottawa was settled in 1854, and was first chartered as a city in 1866.

OTTER (O. Eng. ote, otor, a common Teutonic word, cf. Dutch and Ger. Otter, Dan. odder, Swed. utter; it is to be referred to the root seen in Gr. vSup, water), a name properly given to the well-known European carnivorous aquatic mammal (Lutra vulgaris, or L. lutra), but also applicable to all the members of the lutrine section of the family Mustelidae (see Carnivora). The otter has an elongated, low body, short limbs, short broad feet, with five toes on each, connected together by webs, and all with short, moderately strong, compressed, curved, pointed claws. Head rather small, broad and flat; muzzle very broad; whiskers thick and strong; eyes small and black; ears short and rounded. Tail a little more than half the length of the body and head together, broad and strong at the base, and gradually tapering to the end, somewhat flattened horizontally. The fur is of fine quality, consisting of a short soft whitish grey under-fur, brown at the tips, interspersed with longer, stiffer and thicker hairs, shining, greyish at the base, bright rich brown at the points, especially on the upper-parts and outer surface of the legs; the throat, cheeks, under-parts and inner surface of the legs brownish grey throughout. Individual otters vary in size. The total length from the nose to the end of the tail averages about 35 ft., of which the tail occupies 1 ft. 3 or 4 in. The weight of a full-sized male is from 18 to 24 lb, that of a female about 4 lb less.

As the otter lives almost exclusively on fish, it is rarely met with far

from water, and usually frequents the shores of brooks, rivers, lakes and, in some localities, the sea itself. It is a most expert swimmer and diver, easily overtaking and seizing fish in the water; but when it has captured its prey it brings it to shore to devour. When lying upon the bank, it holds the fish between its fore-paws, commences at the head and then eats gradually towards the tail, which it is said to leave. The female produces three to five young ones in March or April, and brings them up in a nest formed of grass or other herbage, usually placed in a hollow place in the bank of a river, or under the shelter of the roots of some overhanging tree. The otter is found in localities suitable to its habits throughout Great Britain and Ireland, though less abundantly than formerly, for, being destructive to fish, it is rarely allowed to live in peace when its haunts are discovered. Otter-hunting with packs of hounds of a special breed, and trained for the purpose, is a pastime in many parts of the country. It was formerly the practice to kill the otter with long spears, which the huntsmen carried ; now the quarry is picked up and ” tailed,” or run into by the pack.

The otter ranges throughout the greater part of Europe and. Asia; and a closely allied but larger species, L. canadensis, is extensively distributed throughout North America, where it is

pursued for its fur. An Indian species, L. nair, h trained by the natives of some parts of Bengal to assist in fishing, by driving the fish into the nets. In China otters are taught to catch fish, being let into the water for the purpose attached to a long cord.

Otters are widely distributed, and, as they are much alike in size and coloration, their specific distinctions are by no means well defined. Besides those mentioned above, the following have been described, L. californica, North America; L. felina, Central America, Peru, and Chili; L. brasiliensis , Brazil; L. maculicollis, South Africa; L. whiteleyi, Japan; L. chinensis, China and Formosa, and other species. Some, with the feet only slightly webbed, and the claws exceedingly small or altogether wanting on some of the toes, and also with some difference in dental characters, have been separated as a distinct genus, A onyx. These are L. inunguis from South Africa and L. cinerea from India, Java, and Sumatra.

More distinct still is the sea-otter (Laiax, or Enhydra, lutris) . The entire length of the animal from nose to end of tail is about 4 ft., so that the body is considerably larger and more massive than that of the English otter. The skin is peculiarly loose, and stretches when removed from the animal. The fur is remarkable for the preponderance of the beautifully soft woolly under-fur, the longer

stiffer hairs being scanty. The general colour is deep liver-brown, silvered or frosted with the hoary tips of the longer stiff hairs. These are, however, removed when the skin is dressed for commercial purposes.

Sea-otters are only found upon the rocky shores of certain parts of the North Pacific Ocean, especially the Aleutian Islands and Alaska, extending as far south on the American coast as

The Sea-Otter {Latax, or Enhydra, lutris). From Wolf.

Oregon; but, owing to the persecution to which they are subjected for the sake of their valuable skins, their numbers are greatly diminishing. The otters are captured by spearing, clubbing, nets and bullets. They do not feed on fish, like true otters, but on clams, mussels, sea-urchins and crabs; and the female brings forth but a single young one at a time, appar- ently at any season of the year. They are excessively shy and wary; young cubs are often captured by the hunters who have killed the dam, but all attempts to rear them have hitherto failed.

See Elliott Coues, Monograph on North American Fur-bearing Animals (1877). (W.H.F.; R.L.')

OTTERY ST MARY, a market town in the Honiton parlia- mentary division of Devonshire, England, 15 m. E. by N. of Exeter, on a branch of the London & South-Western railway. Pop. of urban district (1901) 3495. It is pleasantly situated in the rich valley of the small river Otter. The parish church, the finest in the county, is cruciform, and has the unique feature of transeptal towers, imitated from Exeter Cathedral. The northern has a low spire. The church, which is Early English, with Decorated and Perpendicular additions, contains several ancient tombs. The manor of Ottery belonged to the abbey of Rouen in the time of Edward the Confessor. The church was dedicated in 1260 by Walter Bronescombe, bishop of Exeter; and c. 1335 Bishop John Grandisson, on founding

a secular college here, greatly enlarged the church; it has been thought that, by copying the Early English style, he is responsible for more of the building than is apparent. The town has a large agricultural trade. It is the birthplace of Samuel Taylor Coleridge (1772); and W. M. Thackeray stayed in the vicinity in youth, his knowledge of the locality appearing in Pendennis.

OTTIGNIES, a town of Belgium, in the province of Brabant. It is an important station on the main line from Brussels to Namur, and forms the point of junction with several cross lines. It has extensive modern flower and vegetable gardens. Pop.

(1904) 2405.

OTTO, king of Greece (1815-1867), was the second son of Louis I., king of Bavaria, and his wife Teresa of Saxe-Altenburg. He was born at Salzburg on the 1st of June 1815, and was educated at Munich. In 1832 he was chosen by the conference of London to occupy the newly-erected throne of Greece, and on the 6th of February 1833 he landed at Nauplia, then the capital of independent Greece. Otto, who was not yet eighteen, was accompanied by a council of regency composed of Bavarians under the presidency of Count Josef Ludwig von Armansperg (1787-1853), who as minister of finance in Bavaria had succeeded in restoring the credit of the state at the cost of his popularity. The task of governing a semi-barbarous people, but recently emancipated, divided into bitter factions, and filled with an exaggerated sense of their national destiny, would in no case have been easy; it was not facilitated by the bureaucratic methods introduced by the regents. Though Armansperg and his colleagues did a good deal to introduce system and order into the infant state, they contrived to make themselves hated by the Greeks, and with sufficient reason. That the regency refused to respond to the demand for a constitution was perhaps natural, for the experience of constitutional experiments in emancipated Greece had not been encouraging. The result, however, was perpetual unrest; the regency, too, was divided into a French and a Russian party, and distracted by personal quarrels, which led in 1834 to the recall by King Louis of G. L. von Maurer and Karl von Abel, who had been in bitter opposition to Armansperg. Soon afterwards the Mainotes were in open revolt* and the money obtained from foreign loans had to be spent in organizing a force to preserve order. On the 1st of June 1835 Otto came of age, but, on the advice of his father and under pressure of Great Britain and of the house of Rothschild, who all believed that a capable finance minister was the supreme need of Greece, he retained Armansperg as chancellor of state. The wisdom of this course was more than doubtful; for the expenses of government, of which the con- version of Athens into a dignified capital was not the least, exceeded the resources of the exchequer, and the state was only saved from bankruptcy by the continual intervention of the powers. Though King Louis, as the most exalted of Philhellenes, received an enthusiastic welcome when he visited Greece in the winter of 1835, his son’s government grew increasingly unpopular. The Greeks were more heavily taxed than

under Turkish rule; they had exchanged government by the sword, which they understood, for government by official regulations, which they hated; they had escaped from the sovereignty of the Mussulman to fall under that of a devout Catholic, to them a heretic. Otto was well intentioned, honest and inspired with a genuine affection for his adopted country; but it needed more than mere amiable qualities to reconcile the Greeks to his rule.

In 1837 Otto visited Germany and married the beautiful and talented Princess Amalie of Oldenburg. The union was unfruitful, and the new queen made herself unpopular by interfering in the government. Meanwhile, at the instance of the Swiss Philhellene Eynard, Armansperg had been dismissed by the king immediately on his return, but a Greek minister was not put in his place, and the granting of a constitution was still postponed. The attempts of Otto to conciliate Greek sentiment by efforts to enlarge the frontiers of his kingdom, e.g. by the suggested acquisition of Crete in 1841, failed of their object and only succeeded in embroiling him with the powers.

His power rested wholly on Bavarian bayonets; and when, in 1843, the last of the German troops were withdrawn, he was forced by the outbreak of a revolutionary movement in Athens to grant a constitution and to appoint a ministry of native Greeks.

With the grant of the constitution Otto's troubles increased. The Greek parliament, like its predecessors during the War of Liberation, was the battleground of factions divided, not by national issues, but by their adherence to one or other of the great powers who made Greece the arena of their rivalry for the control of the Mediterranean. Otto thought to counteract the effects of political corruption and incompetence by overriding the constitution to which he had sworn. The attempt would have been perilous even for a strong man, a native ruler and an Orthodox believer; and Otto was none of these. His prestige, moreover, suffered from the " Pacifico incident " in 1850, when Palmerston caused the British fleet to blockade the Peiraeus, to exact reparation for injustice done to a Levantine Jew who happened also to be a British subject. For the ill-advised inter- vention in the Crimean War, which led to a second occupation of the Peiraeus, Otto was not responsible; his consent had been given under protest as a concession to popular clamour. His position in Greece was, however, becoming untenable. In 1861 a student named Drusios attempted to murder the queen, and was hailed by the populace as a modern Harmodios. In October 1862 the troops in Acarnania under General Theodore Srivas declared for the king's deposition; those in Athens followed suit; a provisional government was set up and sum- moned a

national convention. The king and queen, who were at sea, took refuge on a British war-ship, and returned to Bavaria, where they were lodged by King Louis in the palace of the former bishops of Bamberg. Here, on the 26th of July 1867, Otto died. He had become strangely persuaded that he held the throne of Greece by divine right; and, though he made no effort to regain it, he refused to acknowledge the validity of the election of Prince George of Denmark,

See E. A. Thouvenel, La Grece du roi Othon (Paris, 1890) ; G. L. von Maurer, Das griechische Volk, &c. (1836) ; C. W. P. Mendelssohn-Bartholdy, ” Die Verwaltung Konig Ottos von Griechenland und sein Sturz ” (in Preuss. Jahrbilcher, iv. 365) ; K. T. v. Heigel, Ludwig I., Konig von Baiern, pp. 149 et seq. (Leipzig, 1872); H. H. Parish, The Diplomatic History of the Monarchy of Greece from the Year 1830 (London, 1838), the author of which was attached to the British Legation at Athens.

OTTO I. (912-973), surnamed the Great, Roman emperor, eldest son of King Henry I. the Fowler by his second wife Matilda, said to be a descendant of the Saxon hero Widukind, was born on the 23rd of November 912. Little is known of his early years, but he probably shared in some of his father’s campaigns. In 929 he married Edith, daughter of Edward the Elder, king of the English, and sister of the reigning sovereign ˆEthelstan. It is said that Matilda wished her second son Henry to succeed his father, as this prince, unlike his elder brother, was born the son of a king. However this may be, Henry named Otto his successor, and after his death in July 936 Otto was chosen German king and crowned by flildebert, archbishop of Mainz. This ceremony, according to the historian Widukind, was followed by a banquet at which the new king was waited upon by the dukes of Lorraine, Bavaria, Franconia and Swabia. Otto soon showed his intention of breaking with the policy of his father, who had been content with a nominal superiority over the duchies; in 937 he punished Eberhard, duke of Franconia, for an alleged infringement of the royal authority; and in 938 deposed Eberhard, who had recently become duke of Bavaria. During these years the Bohemians and other Slavonic tribes ravaged the eastern frontier of Germany, but although one expe- dition against them was led by the king in person, the defence of this district was left principally to agents. Trouble soon arose in Saxony, probably owing to Otto’s refusal to give certain lands to his half-brother, Thankmar, who, although the king’s senior, had been passed over in the succession as illegitimate. Thankmar, aided by an influential Saxon noble named Wichmann, and by Eberhard of Franconia, seized

the fortress of Eresburg and took Otto's brother Henry prisoner; but soon afterwards he was defeated by the king and killed whilst taking sanctuary. The other conspirators were pardoned, but in 939 a fresh revolt broke out under the leadership of Henry, and Giselbert, duke of Lorraine. Otto gained a victory near Xanten, which was followed by the surrender of the fortresses held by his brother's adherents in Saxony, but the rebels, joined by Eberhard of Franconia and Archbishop Frederick of Mainz continued the struggle, and Giselbert of Lorraine transferred his allegiance to Louis IV., king of France. Otto's precarious position was saved by a victory near Andernach when Eberhard was killed, and Giselbert drowned in the subsequent flight. Henry took refuge with Louis of France, but was soon restored to favour and entrusted with the duchy of Lorraine, where, however, he was unable to restore order. Otto therefore crossed the Rhine and deprived his brother of authority. Henry then became involved in a plot to murder the king, which was discovered in time, and the good offices of his mother secured for him a pardon at Christmas 941. The deaths of Giselbert of Lorraine and of Eberhard of Franconia, quickly followed by those of two other dukes, enabled Otto to unite the stem-duchies more closely with the royal house. In 944 Lorraine was given to Conrad, surnamed the Red, who in 947 married the king's daughter Liutgard; Franconia was retained by Otto in his own hands; Henry married a daughter of Arnulf, duke of Bavaria, and received that duchy in 947 ; and Swabia came in 949 to the king's son Ludolf, who had married Ida, a daughter of the late duke, Hermann. During these years the tribes living between the Elbe and the Oder were made tributary, bishoprics were founded in this district, and in 950 the king himself marched against the Bohemians and reduced them to dependence. Strife between Otto and Louis IV. of France had arisen when the French king sought to obtain authority over Lorraine and aided the German rebels in 939; but after the German king had undertaken an expedition into France, peace was made in 942. Afterwards, when Louis became a prisoner in the hands of his powerful vassal Hugh the Great, duke of France, Otto attacked the duke, who, like the king, was his brother-in-law, captured Reims, and negotiated a peace between the two princes; and in subsequent struggles between them his authority was several times invoked. In 945 Berengar I., margrave of Ivrea, left the court of Otto and returned to Italy, where he soon obtained a mastery over the country. After the death in 950 of Lothair, king of Italy, Berengar sought the hand of his widow Adelaide for his son Adalbert ; and Henry of B avaria and

Ludolf of Swabia had already been meddling independently of each other in the affairs of northern Italy. In response to an appeal from Adelaide, Otto crossed the Alps in 951. He assumed the title of king of the Lombards, and having been a widower since 946, married Adelaide and negotiated with pope Agapetus II. about his reception in Rome. The influence of Alberic, prince and senator of the Romans, prevented the pope returning a favourable answer to the king's request. But when Otto returned to Germany in 952 he was followed by Berengar, who did homage for Italy at Augsburg. The chief advisers of Otto at this time were his wife and his brother Henry. Henry's influence seems to have been resented by Ludolf, who in 946 had been formally designated as his father's successor. When Adelaide bore a son, and a report gained currency that Otto intended to make this child his heir, Ludolf rose in revolt and was joined by Conrad of Lorraine and Frederick of Mainz. Otto fell into the power of the rebels at Mainz and was compelled to agree to demands made by them, which, however, he promptly revoked on his return to Saxony. Ludolf and Conrad were declared deposed, and in 953 war broke out in Lorraine and Swabia, and afterwards in Saxony and Bavaria. Otto failed to take Mainz and Augsburg; but an attempt on the part of Conrad and Ludolf to gain support from the Magyars, who had seized the opportunity to invade Bavaria, alienated many of their supporters. Otto's brother Bruno, archbishop of Cologne, was successful in restoring the royal authority in Lorraine, so that when Conrad and Frederick soon afterwards submitted to Otto, the struggle was confined to Bavaria. Ludolf was not long in

following the example of Conrad; and with the capture of Regensburg in 955 the rising ended. Conrad and Ludolf retained their estates, but their duchies were not restored to them. Mean- while the Magyars had renewed their ravages and were attacking Augsburg. Otto marched against them, and in a battle fought on the Lechfeld on the 10th of August 955 the king's troops gained a brilliant victory which completely freed Germany from these invaders; while in the same year Otto also defeated the Slavs who had been ravaging the Saxon frontier.

About this time the king seems to have perceived the necessity of living and ruling in closer union with the church, a change of policy due perhaps to the influence of his brother Bruno, or forced upon him when his plans for uniting the duchies with the royal house brought rebellion in their train. Lands and privileges were granted to prelates, additional bishoprics were founded, and some years later Magdeburg was made the seat of an arch- bishop. In 960 Otto was invited to come to Italy by Pope John XII., who was hard pressed by Berengar, and he

began to make preparations for the journey. As Ludolf had died in 957 and Otto, his only son by Adelaide, had been chosen king at Worms, the government was entrusted to Bruno of Cologne, and Arch- bishop William of Mainz, a natural son of the king. Reaching Pavia at Christmas 961, the king promised to defend and respect the church. He then proceeded to Rome, where he was crowned empqror on the 2nd of February 962. After the ceremony he confirmed the rights and privileges which had been conferred on the papacy, while the Romans promised obedience, and Pope John took an oath of fidelity to the emperor. But as he did not long observe his oath he was deposed at a synod held in St Peter's, after Otto had compelled the Romans to swear they would elect no pope without the imperial consent; and a nominee of the emperor, who took the name of Leo VIII., was chosen in his stead. A pestilence drove Otto to Germany in 965, and finding the Romans again in arms on his return in 966, he allowed his soldiers to sack the city, and severely punished the leaders of the rebellion. His next move was against the Greeks and Saracens of southern Italy, but seeking to attain his objects by negotiation, sent Liudprand, bishop of Cremona, to the eastern emperor Nicephorus II. to arrange for a marriage treaty between the two empires. Nicephorus refused to admit the validity of Otto's title, and the bishop was roughly repulsed; but the succeeding emperor, John Zimisces, was more reasonable, and Theophano, daughter of the emperor Romanus II., was married to the younger Otto in 972. The same year witnessed the restoration of peace in Italy and the return of the emperor to Germany, where he received the homage of the rulers of Poland, Bohemia and Denmark; but he died suddenly at Memleben on the 7th of May 973, and was buried at Magdeburg.

Otto was a man of untiring perseverance and relentless energy, with a high idea of his position. His policy was to crush all tendencies to independence in Germany, and this led him to grant the stem-duchies to his relatives, and afterwards to ally himself with the church. Indeed the necessity for obtaining complete control over the church was one reason which induced him to obtain the imperial crown. By this step the pope became his vassal, and a divided allegiance was rendered impossible for the German clergy. The Roman empire of the German nation was indeed less universal and less theocratic under Otto, its restorer, than under Charlemagne, but what it lacked in splendour it gained in stability. His object was not to make the state religious but the church political, and the clergy must first be officials of the king, and secondly members of an ecclesiastical order. He shared the piety and superstition of the age, and did much for the spread of Christianity. Although himself a stranger to letters he welcomed

scholars to his court and eagerly seconded the efforts of his brother Bruno to encourage learning; and while he neither feared nor shirked battle, he was always ready to secure his ends by peaceable means. Otto was of tall and com- manding presence, and although subject to violent bursts of passion, was liberal to his friends and just to his enemies.

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OTTO II. (955-983), Roman emperor, was the son of the emperor Otto the Great, – by his second wife Adelaide. He received a good education under the care of his uncle, Bruno, archbishop of Cologne, and his illegitimate half-brother, William, archbishop of Mainz. He was chosen German king at Worms in 961, crowned at Aix-la-Chapelle on the 26th of May 961, and on the 25th of December 967 was crowned joint emperor at Rome by Pope John XIII. On the 14th of April 972 he married Theophano, daughter of the eastern emperor Romanus II., and after sharing in various campaigns in Italy, returned to Germany and became sole emperor on the death of his father in May 973. After suppressing a rising in Lorraine, difficulties arose in

southern Germany, probably owing to Otto's refusal to grant the duchy of Swabia to Henry II., the Quarrelsome, duke of Bavaria. The first conspiracy was easily suppressed, and in 974 an attempt on the part of Harold III., king of the Danes, to throw off the German yoke was also successfully resisted; but an expedition against the Bohemians led by the king in person in 975 was a partial failure owing to the outbreak of further trouble in Bavaria. In 976 Otto deposed Duke Henry, restored order for the second time in Lorraine, and made another expedi- tion into Bohemia in 977, when King Boleslaus II. promised to teturn to his earlier allegiance. Having crushed an attempt made by Henry to regain Bavaria, Otto was suddenly attacked by Lothair, king of France, who held Aix in his possession for a few days; but when the emperor retaliated by invading France he met with little resistance. He was, however, compelled by uickness" among his troops to raise the siege of Paris, and on the return journey the rearguard of his army was destroyed and the baggage seized by the French. An expedition against the Poles was followed by peace with France, when Lothair renounced his claim on Lorraine. The emperor then prepared for a journey to Italy. In Rome, where he restored Pope Benedict VII., he held a splendid court, attended by princes and nobles from all parts of western Europe. He was next required to punish inroads of the Saracens on the Italian mainland, and in September 981 he marched into Apulia, where he met at first with consider- able success; but an alliance between the Arabs and the Eastern Empire, whose hostility had been provoked by the invasion of Apulia, resulted in a severe defeat on Otto's troops near Stilo in July 982. Without revealing his identity, the emperor escaped on a Greek vessel to Rossano. At a diet held at Verona, largely attended by German and Italian princes, a fresh campaign was arranged against the Saracens. Proceeding to Rome, Otto secured the election of Peter of Pavia as Pope John XIV. Just as the news reached him of a general rising of the tribes on the eastern frontier of Germany, he died in his palace in Rome on the 7th of December 983. He left a son, afterwards the emperor Otto III., and three daughters. He was buried in the atrium of St Peter's, and when the church was rebuilt his remains were removed to the crypt, where his tomb may still be seen. Otto, who is sometimes called the " Red," was a man of small stature, by nature brave and impulsive, and by training an accomplished knight. He was generous to the church and aided the spread of Christianity in many ways.

See Die Urkunden des Kaisers Otto II., edited by Th. von Sickel, in the Monumenta Germaniae historica. Diplomata (Hanover, 1879) ;

L. von Ranke, Weltgeschichte, Part vii. (Leipzig, 1886); W. von

Giesebrecht, Geschichte der deutschen Kaiserzeit (Leipzig, 1881-1890); and Jahrbiicher des deutsclien Reichs unter Kaiser Otto II. (Berlin, 1837-1840); H. Detmer, Otto II. bis zum Tode seines Voters (Leipzig, 1878); J. Moltmann, Theophano die Gemahlin Ottos II. in ihrer Bedeutung fiir die Polilik Ottos I. und Ottos II. (Gottingen, 1878) ; and A. Matthaei, Die Handel Ottos II. mit Lothar von Frankreich (Halle, 1882).

OTTO III. (980-1002), Roman emperor, son of the emperor Otto II. and Theophano,daughter of the eastern emperor Romanus II., was born in July 980, chosen as his father's successor at Verona in June 983 and crowned German king at Aix-la-Chapelle on the 25th of the following December. Otto II. had died a few days before this ceremony, but the news did not reach Germany until after the coronation. Early in 984 the king was seized by Henry II., the Quarrelsome, the deposed duke of Bavaria, who claimed the regency as a member of the reigning house, and probably entertained the idea of obtaining the kingly dignity himself. A strong opposition was quickly aroused, and when Theophano and Adelaide, widow of the emperor Otto the Great, appeared in Germany, Henry was compelled to hand over the young king to his mother. Otto's mental gifts were considerable, and were so carefully cultivated by Bernward, afterwards bishop of Hildesheim, and by Gerbert of Aurillac, archbishop of Reims, that he was called " the wonder of the world." The government of Germany during his minority was in the hands of Theophano, and after her death in June 991 passed to a council in which the chief influence was exercised by Adelaide and Willigis, archbishop of Mainz. Having accom- panied his troops in expeditions against the Bohemians and the Wends, Otto was declared of age in 995. In 996 he crossed the Alps and was recognized as king of the Lombards at Pavia. Before he reached Rome, Pope John XV., who had invited him to Italy, had died, whereupon he raised his own cousin Bruno, son of Otto duke of Carinthia, to the papal chair as Pope Gregory V., and by this pontiff Otto was crowned emperor on the 21st of May 996. On his return to Germany, the emperor learned that Gregory had been driven from Rome, which was again in the power of John Crescentius, patrician of the Romans, and that a new pope, John XVI., had been elected. Leaving his aunt, Matilda, abbess of Quedlinburg, as regent of Germany, Otto, in February 998, led Gregory back to Rome, took the castle of St Angelo by storm and put Crescentius to death. A visit to southern Italy, where many of the princes did homage to the emperor, was cut short by the death of the pope, to whose chair Otto then appointed his former tutor Gerbert, who took the name of Sylvester II. In the palace which he built on the

Avenfine, Otto sought to surround himself with the splendour and ceremonial of the older emperors of Rome, and dreamed of making Rome once more the centre of a universal empire. Many names and customs were introduced into his court from that of Constantinople; he proposed to restore the Roman senate and consulate, revived the office of patrician, called himself ” consul of the Roman senate and people ” and issued a seal with the inscription, ” restoration of the Roman empire.” Passing from pride to humility he added ” servant of the apostle,” and ” servant of Jesus Christ ” to the imperial title, spent a fortnight in prayer in the grotto of St Clement and did penance in various Italian monasteries. Leaving Italy in the summer preceding the year 1000, when it was popularly believed that the end of the world was to come, Otto made a pilgrimage to the tomb of his old friend Adalbert, bishop of Prague, at Gnesen, and raised the city to the dignity of an archbishopric. He then went to Aix, and opened the tomb of Charlemagne, where, according to a legendary tale, he found the body of the great emperor sitting upright upon a throne, wearing the crown and holding the sceptre. Returning to Rome, trouble soon arose between Otto and the citizens, and for three days the emperor was besieged in his palace. After a temporary peace, he fled to the monastery of Classe near Ravenna. Troops were collected, but whilst conducting a campaign against the Romans, Otto died at Paterno near Viterbo on the 23rd of January 1002, and was buried in the cathedral at Aix-la-Chapelle. Tradition

says he was ensnared and poisoned by Stephania, the widow of Crescentius. The mystic erratic temperament of Otto, alternat- ing between the most magnificent scheir.es of empire, and the lowest depths of self-debasement, was not conducive to the welfare of his dominions, and during his reign the conditions of Germany deteriorated. He was liberal to the papacy, and was greatly influenced by the eminent clerics with whom he eagerly associated.

See Thangmar, Vita Bernwardi episcopi Hildesheimensis in the Monumenta Germaniae historica. Scriptores, Band iv. (Hanover and Berlin, 1826 fol.) ; Lettres de Gerbert, edited by J. Havet (Paris, 1889); Die Urkunden Kaisers Ottos III., edited by Th. von Sickel in the Monumenta Germaniae historica. Diplomata (Hanover, 1879) ; R. Wilmans, Jahrbiicher des deutschen Reichs unter Kaiser Otto III. (Berlin, 1 83 7-1 840); P. Kehr, Die Urkunden Otto III. (Innsbruck, 1890).

OTTOIV,(c. 1182-1218), Roman emperor, second son of Henry the Lion, duke of Saxony, and Matilda, daughter of Henry II., king of England, was most probably born at Argenton in central France. His father died when he was still young, and he was educated at the court of his uncle Richard I., king of England, under whose leadership he gained valuable experience in war, being appointed duke of Aquitaine, count of Poitou and earl of Yorkshire. When the emperor Henry VI. died in September 1 197, some of the princes under the leadership of Adolph, archbishop of Cologne, were anxious to find a rival to Philip, duke of Swabia, who had been elected German king. After some delay their choice fell upon Otto, who was chosen king at Cologne on the 9th of June 1198. Hostilities broke out at once, and Otto, who drew his main support from his hereditary possessions in the Rhineland and Saxony, seized Aix-la-Chapelle, and was crowned there on the 12th of July n 98. The earlier course of the war was unfavourable to Otto, whose position was weakened by the death of Richard of England in April 1 1 99; but his cause began to improve when Pope Innocent III. declared for him and placed his rival under the ban in April 1201. This support was purchased by a capitulation signed by Otto at Neuss, which ratified the independence and decided the boundaries of the States of the Church, and was the first authentic basis for the practical authority of the pope in central Italy. In 1200 an attack made by Philip on Brunswick was beaten off, the city of Worms was taken, and subsequently the aid of Ottakar I., king of Bohemia, was won for Otto. The papal legate Guido worked energetically on his behalf, several princes were persuaded to desert Philip and by the d.d of 1203 his success seemed assured. But after a period of reverses, Otto was wounded during a fight in July 1206 and compelled to take refuge in Cologne. Retiring to Denmark, he obtained military assistance from King Waldemar II.. and a visit to England procured monetary aid from King John, after which he managed to maintain his position in Brunswick. Preparations were made to drive him from his last refuge, when he was saved by the murder of Philip in June 1 208. Many of the supporters of Philip now made overtures to Otto, and an attempt to set up Henry I. duke of Brabant having failed, Otto submitted to a fresh election and was chosen German king at Frankfort on the nth of November 1208 in the presence of a large gathering of princes. A general reconciliation followed, which was assisted by the betrothal of Otto to Philip’s eldest daughter Beatrix, but as she was only ten years old, the marriage was deferred until the 22nd of July 1212. The pope who had previously recognized the victorious Philip, hastened to return to the side of Otto; the capitulation of Neuss was renewed and large concessions were made to the church.

In August 1209 the king set out for Italy. Meeting with no opposition, he was received at Viterbo by Innocent, but refused the papal demand that he should concede to the church all the territories which, previous to 1197, had been in dispute between the Empire and the Papacy, consenting, however, not to claim supremacy over Sicily. He was crowned emperor at Rome on the 4th of October 1 209, a ceremony which was followed by fighting between the Romans and the German soldiers. The pope then requested the emperor to leave Roman territory ;

but he remained near Rome for some days, demanding satisfaction for the losses suffered by his troops. The breach with Innocent soon widened, and in violation of the treaty made with the pope Otto attempted to recover for the Empire all the property which Innocent had annexed to the Church, and rewarded his supporters with large estates in the disputed territories. Having occupied Tuscany he marched into Apulia, part of the kingdom of Frederick of Hohenstaufen, afterwards the emperor Frederick II., and on the 18th of November 1210 was excommunicated by the pope. Regardless of this sentence Otto completed the conquest of southern Italy, but the efforts of Innocent had succeeded in arousing considerable opposition in Germany, where the rebels were also supported by Philip Augustus, king of France. A number of princes assembled at Nuremberg declared Otto deposed, and invited Frederick to fill the vacant throne. Returning to Germany in March 12 12, Otto made some headway against his enemies until the arrival of Frederick towards the close of the year. The death of his wife in August 121 2 had weakened his hold on the southern duchies, and he was soon confined to the district of the lower Rhine, although supported by money from his uncle King John of England. The final blow to his fortunes came when he was decisively defeated by the French at Bouvines in July 1214. He escaped with difficulty from the fight and took refuge in Cologne. His former supporters hastened to recognize Frederick; and in 1 2 16 he left Cologne for Brunswick, which he had received in 1 202 by arrangement with his elder brother Henry. The conquest of Hamburg by the Danes, and the death of John of England, were further blows to his cause. On the 19th of May 1218 he died at the Harzburg after being loosed from the ban by a Cistercian monk, and was buried in the church of St Blasius at Brunswick. He married for his second wife in May 12 14 Marie, daughter of Henry I., duke of Brabant, but left no children. See Regesta imperii V., edited by J. Ficker (Innsbruck, 1881); L. von Ranke, Weltgeschichle, Part viii. (Leipzig, 1887-1888); W. von Giesebrecht, Geschichte der deutschen Kaiserzeit, Band v. (Leipzig, 1888); O. Abel, Kaiser Otto IV. und Konig Friedrich II.

(Berlin, 1856); E. Winkelmann, Philipp von Schwaben und Otto IV. von Braunschweig (Leipzig, 1873-1878); G. Langerfeldt, Kaiser Otto der Vierte (Hanover, 1872); R. Schwemer, Innocenz III. und die deutsche Kirche wdhrend -des Thronstreites (Strassburg, 1882); and A. Luchaire, Innocent III., la papaule et V empire (Paris, 1906); and Innocent III., la question d'Orient (Paris, 1906).

OTTO OF FREISING (c. 1114-1158), German bishop and chronicler, was the fifth son of Leopold III., margrave of Austria, by his wife Agnes, daughter of the emperor Henry IV. By her first husband, Frederick I. of Hohenstaufen, duke of Swabia, Agnes was the mother of the German king Conrad III., and grandmother of the emperor Frederick I.; and Otto was thus related to the most powerful families in Germany. The notices of his life are scanty and the dates somewhat uncertain. He studied in Paris, where he took an especial interest in philosophy, is said to have been one of the first to introduce the philosophy of Aristotle into Germany, and he served as provost of a new foundation in Austria. Having entered the Cistercian order, Otto became abbot of the Cistercian monastery of Morimond in Burgundy about 1136, and soon afterwards was elected bishop of Freising. This diocese, and indeed the whole of Bavaria, was then disturbed by the feud between the Welfs and the Hohen- staufen, and the church was in a deplorable condition; but a great improvement was brought about by the new bishop in both ecclesiastical and secular matters. In 1147 he took part in the disastrous crusade of Conrad III. The section of the crusad- ing army led by the bishop was decimated, but Otto reached Jerusalem, and returned to Bavaria in 1 148 or 1 149. He enjoyed the favour of Conrad's successor, Frederick I.; was probably instrumental in settling the' dispute over the duchy of Bavaria in 1156; was present at the famous diet at Besancon in 1157, and, still retaining the dress of a Cistercian monk, died at Morimond on the 22nd of September 1158. In 1857 a statue of the bishop was erected at Freising.

Otto wrote a Chronicon, sometimes called De duabus civitatibus, an historical and philosophical work in eight books, which follows to some extent the lines laid down by Augustine and Orosius.

Written during the time of the civil war in Germany, it contrasts Jerusalem and Babel, the heavenly and the earthly kingdoms, but also contains much valuable information about the history of the time. The chronicle, which was held in very high regard by con- temporaries,

goes down to 1146, and from this date until 1209 has been continued by Otto, abbot of St Blasius (d. 1223). Better known is Otto's Gesta Friderici imperatoris, written at the request of Frederick I., and prefaced by a letter from the emperor to the author. The Gesta is in four books, the first two of which were written by Otto, and the remaining two, or part of them, by. his

Eupil Ragewin, or Rahewin; it has been argued that the third 00k and the early part of the fourth were also the work of Otto. Beginning with the quarrel between Pope Gregory VII. and the emperor Henry IV., the first book takes the history down to the death of Conrad III. in 1152. It is not confined to German affairs, as the author digresses to tell of the preaching of Bernard of Clair- vaux, of his zeal against the heretics, and of the condemnation of Abelard; and discourses on philosophy and theology. The second book opens with the election of Frederick I. in 1 152, and deals with the history of the first five years of his reign, especially in Italy, in some detail. From this point (1156) the work is continued by Ragewin. Otto's Latin is excellent, and in spite of a slight partiality for the Hohenstaufen, and some minor inaccuracies, the Gesta has been rightly described as a " model of historical composition." First printed by John Cuspinian at Strassburg in 1515, Otto's writings are now found in the Monumenta Germaniae historica, Band xx. (Hanover, 1868), and have been translated into German by H. Kohl (Leipzig, 1881-1886). The Gesta Friderici has been

published separately with introduction by G. Waitz. Otto is also said to have written a history of Austria (Historia Austriaca).

See J. Hashagen, Otto von Freising als Geschichtsphilosoph und Kirchenpolitiker (Leipzig, 1900) ; J. Schmidlin, Die geschichtsphilosophische und kirchenpolitische Weltanschauung Otto von Freising (Freiburg, 1906); W. Wattenbach, Deutschlands Geschichtsquellen, Band ii. (Berlin, 1894); and for full bibliography, A. Potthast, Bibliotheca historica (Berlin, 1896). (A. W. H.*)

OTTO OF NORDHEIM (d. 1083), duke of Bavaria, belonged to the rich and influential Saxon family of the counts of Nordheim, and having distinguished himself in war and peace alike, received the duchy of Bavaria from Agnes, widow of the emperor Henry III., in 106 1. In 1062 he assisted Anno, archbishop of Cologne, to seize the person of the German king, Henry IV.; led a success- ful expedition into Hungary in 1063 ; and took a prominent part in the government during the king's minority. In 1064 he went to Italy to settle a papal schism, was largely instrumental in securing the banishment from court of Adalbert, archbishop of Bremen, and crossed the Alps in the royal interests on two other occasions. He neglected his duchy, but added to his personal possessions, and in 1069 shared in two expeditions in the east of Germany. In 1070 Otto was accused by a certain Egino of being privy to a plot to murder the king, and it was decided he should submit to the ordeal of battle with his accuser. The duke asked for a safe-conduct to and from the place of meeting, and when this was

refused he declined to appear, and was con- sequently deprived of Bavaria, while his Saxon estates were plundered. He obtained no support in Bavaria, but raised an army among the Saxons and carried on a campaign of plunder against Henry until 107 1, when he submitted; in the following year he received back his private estates. When the Saxon revolt broke out in 1073 Otto is represented by Bruno, the author of De bello Saxonico, as delivering an inspiring speech to the assembled Saxons at Wormsleben, after which he took command of the insurgents. By the peace of Gerstungen in 1074 Bavaria was restored to him; he shared in the Saxon rising of 1075, after which he was again pardoned and made adminis- trator of Saxony. After the excommunication of Henry IV. in 1076 Otto attempted to mediate between Henry and the Saxons, but when these efforts failed he again placed himself at their head. He assented to the election of Rudolph, count of Rheinfelden, as German king, when his restoration to Bavaria was assured, and by his skill and bravery inflicted defeats on Henry's forces at Mellrichstadt, Flarchheim and Hohenmolsen. He remained in arms against the king until his death on. the nth of January 1083. Otto is described as a noble, prudent and warlike man, and he possessed great abilities. His repeated pardon showed that Henry could not afford to neglect such a powerful personality, and his military talents were repeatedly displayed. By his wife Richenza, widow of Hermann, count of Werla, he left three sons and three daughters.

See W. von Giesebrecht, Geschichte der deutschen Kaiserzeit, Band iii. (Leipzig, 1881-1890); H. Mehmel, Otto von Nordheim, Herzog von Bayern (Gottingen, 1870); E. Neumann, De Ottone de Nordheim. (Breslau, 1871); S. Riezler, Geschichte Bayerns (Gotha, 1878); and A. Vogeler, Otto von Nordheim (Gottingen, 1880).

OTTOMAN, a form of couch which usually has a head but no back, though sometimes it has neither. It may have square or semicircular ends, and as a rule it is what upholsterers call " stuffed over " — that is to say no wood is visible. It belongs to the same order of ideas as the divan (q.v.); its name indeed betokens its Oriental origin. It was one of the luxurious appoint- ments which Europe imported from the East in the 18th century; the first mention that has been found of it is in France in 1729. In the course of a generation it made its way into every boudoir, but it appears originally to have been much larger than at present. The word is also applied to a small foot-stool covered with carpet, embroidery or beadwork.

OTTUMWA, a city and the county-seat of Wapello county, Iowa, U.S.A., on both sides of the Des Moines river, in the S.E. part of the

state, about 85 m. S.E. of Des Moines. Pop. (1900) 18,197, ˚f whom 1759 were foreign-born; (1910 census) 22,012. It is served by the Chicago, Burlington & Quincy, the Chicago, Milwaukee & Saint Paul, the Chicago, Rock Island & Pacific, and the Wabash railways. The site on which it is built forms a succession of terraces receding farther and farther from the river. In the city are a Carnegie library, a city hospital and St Joseph's Academy. Ottumwa is the headquarters of the Ottumwa Division of the Southern Federal Judicial District of Iowa, and terms of United States District and Circuit courts are held there. The city is in one of the richest coal regions of the state, and ranks high as a manufacturing centre, pork-packing, and the manufacture of iron and steel, machinery and agricultural and mining implements being the leading industries. The value of the factory product in 1905 was $10,374,183, an increase of 19-5% since 1900. Ottumwa was first settled in 1843, was incorporated as a town in 1851, and first chartered as a city in i8S7-

OTWAY, THOMAS (1652-1685), English dramatist, was born at Trotton, near Midhurst, Sussex, on the 3rd of March 1652. His father, Humphrey Otway, was at that time curate of Trotton, but Otway's childhood was spent at Woolbeding, a parish 3 m. distant, of which his father had become rector. He was educated at Winchester College, and in 1669 entered Christ Church, Oxford, as a commoner, but left the university without a degree in the autumn of 1672. At Oxford he made the acquaintance of Anthony Cary, 5th viscount Falkland, through whom, he says in the dedication to Caius Marius, he first learned to love books. In London he made acquaintance with Mrs Aphra Behn, who in 1672 cast him for the part of the old king in her Forc'd Marriage, or The Jealous Bridegroom, at the Dorset Garden Theatre, but he had a bad attack of stage fright, and never made a second appearance. In 1675 Thamas Betterton produced at the same theatre Otway's first dramatic attempt, Alcibiades, which was printed in the same year. It is a poor tragedy, written in heroic verse, but was saved from absolute failure by the actors. Mrs Barry took the part of Draxilla, and her lover, the earl of Rochester, recommended the author of the piece to the notice of the duke of York. He made a great advance on this first work in Don Carlos, Prince of Spain (licensed June 15, 1676; an undated edition probably belongs to the same year). The material for this rhymed tragedy Otway took from the novel of the same name, written in 1672 by the Abbe de Saint-Real, the source from which Schiller also drew his tragedy of Don Carlos. In it the two characters familiar throughout his plays make their appearance. Don Carlos is the impetuous, unstable youth, who seems to be drawn from Otway himself, while the queen's part is the gentle

pathetic character repeated in his more celebrated heroines, Monimia and Belvidera. ” It got more money,” says John Downes (Roscius Anglicanus, 1708) of this play, ” than any preceding modern tragedy.” In 1677 Betterton produced two adaptations from the French by Otway, Titus and Berenice (from Racine’s Birenice), and the Cheats of Scapin (from Moliere’s Fourberies de Scapin). These were printed

together, with a dedication to Lord Rochester. In 1678 he produced an original comedy, Friendship in Fashion, popular at the moment, though it was hissed off the stage for its gross indecency when it was revived at Drury Lane in 1749. Mean- while he had conceived an overwhelming passion for Mrs Barry, who filled many of the leading parts in his plays. Six of his letters to her survive, the last of them referring to a broken appointment in the Mall. Mrs Barry seems to have coquetted with Otway, but she had no intention of permanently offending Rochester. In 1678, driven to desperation by Mrs Barry, Otway obtained a commission through Charles, earl of Plymouth, a natural son of Charles II., in a regiment serving in the Nether- lands. The English troops were disbanded in 1679, but were left to find their way home as best they could. They were also paid with depreciated paper, and Otway arrived in London late in the year, ragged and dirty, a circumstance utilized by Rochester in his ” Sessions of the Poets,” which contains a scurrilous attack on his former protege. Early in the next year (February 1680) was produced at Dorset Garden the first of Otway’s two tragic masterpieces, The Orphan, or The Unhappy Marriage, Mrs Barry playing the part of Monimia. Written in blank verse, which shows a study of Shakespeare, its success was due to the tragic pathos, of which Otway was a master, in the characters of Castalio and Monimia. The History and Fall of Caius Marius, produced in the same year, and printed in 1692, is a curious grafting of Shake- speare’s Romeo and Juliet on the story of Marius as related in Plutarch’s Lives. In 1680 Otway also published The Poet’s Complaint of his Muse, or A Satyr against Libells, in which he retaliated on his literary enemies. An indifferent comedy, The Soldier’s Fortune (1681), was followed in February 1682 by Venice Preserved, or A Plot Discover ‘d. The story is founded on the Histoire de la conjuration des Espagnols contre la Venise en 1618, by the Abb6 de Saint-Real, but Otway modified the story considerably. The character of Belvidera is his own, and the leading part in the conspiracy, taken by Bedamor, the Spanish ambassador, is given in the play to the historically insignificant Pierre and Jaffier. The piece has a political meaning,

enforced in the prologue. The Popish Plot was in Otway's mind, and Anthony, 1st earl of Shaftesbury, is caricatured in Antonio. The play won instant success. It was translated into almost every modern European language, and even Dryden said of it: " Nature is there, which is the greatest beauty." The Orphan and Venice Preserved remained stock pieces on the stage until the 19th century, and the leading actresses of the period played Monimia and Belvidera. One or two prefaces, another weak comedy, The Atheist (1684), and two posthumous pieces, a poem, Windsor Castle (1685), a panegyric of Charles II., and a History of the Triumvirates (1686), translated from the French, complete the list of Otway's works. He apparently ceased to struggle against his poverty and misfortunes. The generally accepted story regarding the manner of his death was first given in Theophilus Cibber's Lives of the Poets. He is said to have emerged from his retreat at the Bull on Tower Hill to beg for bread. A passer-by, learning who he was, gave him a guinea, with which Otway hastened to a baker's shop. He began too hastily to satisfy his ravenous hunger, and choked with the first mouthful. Whether this account of his death be true or not, it is certain that he died in the utmost poverty, and was buried on the 16th of April 1685 in the churchyard of St Clement Danes. A tragedy entitled Heroick Friendship was printed in 1686 as Otway's work, but the ascription is unlikely.

The Works of Mr Thomas Otway with some account of his life and •writings, published in 1712, was followed by other editions (1757, 1768, 1812). The standard edition is that by T. Thornton (1813). A selection of his plays was edited for the Mermaid series (189 1 and 1903) by Roden Noel. See also E. Gosse, Seventeenth Century Studies (1883); and Genest, History of the Stage.

OUBLIETTE, a French architectural term (from oublier, to forget), used in two senses of a dungeon or cell in a prison or castle which could only be reached by a trap-door from another dungeon, and of a concealed opening or passage leading from a dungeon to the moat or river, into which bodies of prisoners who were to be secretly disposed of might be dropped. Viollet le

Due {Diet, de V architecture) gives a diagram of such an oubliette at the castle of Pierrefonds, France. Many so-called " oubli- ettes " in medieval castles were probably outlets for the disposal of drainage, refuse, &c, which at times may have served for the getting rid of prisoners.

OUCH, a brooch, clasp or buckle, especially one ornamented with

jewels, enamels, &c, and used to clasp a cope or other ecclesiastical vestment. It is also used, as in Exod. xxxix. 6, of the gold or silver setting of jewels. The word is an example of the misdivision of a substantive and the indefinite article, being properly ” nouche,” ” a nouche ” being divided into ” an ouche,” as a napron into an apron, a nadder into an adder, and, reversely, an ewt, i.e. eft, into a newt. ” Nouche “was adapted into O. Fr., whence English took the word, from the Late Lat. nusca, brooch; probably the original is Celtic, cf. O. Irish nasc, ring, nasgaim, fasten.

OUDENARDE (Flemish Oudenaerde), a town of Belgium in the province of East Flanders, 18 m. S. of Ghent. Pop. (1904) 6572. While it is best known for the great victory gained by Marlborough and Eugene over the French under Vendome in 1 708, Oudenarde has many features of interest. The town hall, which took ten. years to build (1525-1535), has after that of Louvain the most elaborately decorated facade in Belgium. It was designed by H. van Peede and G. de Ronde, and is in tertiary Gothic style. The belfry tower of five storeys with three terraces, surmounted by a golden figure, is a striking feature. The council chamber contains a fine oak door and Gothic chimney-piece, both c. 1530. There are also two interesting old churches, St Walburga, partly of the 12th and partly of the 14th century, and Notre Dame, dating from the 13th century. The former contains several fine pictures by Craeyer and other old Flemish masters.

The Battle of Oudenarde (June 30th- July nth 1708) was fought on the ground north-west and north of the town, which was then regularly fortified and was garrisoned by a force of the Allies. The French army under the duke of Burgundy and Marshal Vendome, after an abortive attempt to invest Oudenarde, took up a defensive position north of the town when Marlborough and Eugene, after a forced march, arrived with the main Allied army. The advanced guard of the Allies under General (Lord) Cadogan promptly crossed the Scheldt and annihilated an out- lying body of French troops, and Cadogan established himself on the ground he had won in front of the French centre. But the Allied main army took a long time to defile over the Scheldt and could form up (on the left of Cadogan’s detachment) only slowly and by degrees. Observing this, Burgundy resolved to throw forward his right towards Oudenarde to engage and hold the main body of the Allies before their line of battle could be formed. This effected, it was hoped that the remainder of the French army could isolate and destroy Cadogan’s detachment, which was already closely engaged with the French centre. But he miscalculated both the endurance of Cadogan’s men (amongst whom the Prussians were conspicuous for their tenacity)

and the rapidity with which in Marlborough's and Eugene's hands the wearied troops of the Allies could be made to move. Marlborough, who personally directed the operations on his left wing, not only formed his line of battle successfully, but also began seriously to press the forces that had been sent to check his deployment, Before long, while the hostile left wing still remained inactive, the unfortunate troops of the French centre and right were gradually hemmed in by the whole force of the Allies. The decisive blow was delivered by the Dutch marshal, Overkirk, who was sent by Marlborough with a large force (the last reserve of the Allies) to make a wide turning movement round the extreme right of the French, and at the proper time attacked them in rear. A belated attempt of the French left to intervene was checked by the British cavalry, and the pressure on the centre and right, which were now practically surrounded, continued even after nightfall. A few scattered units managed to escape, and the left wing retreated unmolested, but at the cost of about 3000 casualties the Allies inflicted a loss of 6000 killed and wounded and 9000 prisoners on the enemy, who were,

moreover, so shaken that they never recovered their confidence to the end of the campaign. The battle of Oudenarde was not the greatest of Marlborough's victories, but it affords almost the best illustration of his military character. Contrary to all the rules of war then in vogue, he fought a piecemeal and unpre- meditated battle, with his back to a river, and with wearied troops, and the event justified him. An ordinary commander would have avoided fighting altogether, but Marlborough saw beyond the material conditions and risked all on his estimate of the moral superiority of his army and of the weakness of the French leading. His conduct of the battle, once it had opened, was a model of the " partial " victory — the destruction of a part of the enemy's forces under the eyes of the rest — which was in the 1 7th and 18th centuries the tactician's ideal, and was sufficient to ensure him the reputation of being the best general of his age. But it is in virtue of having fought at all that he passes beyond the criteria of the time and becomes one of the great captains of history.

OUDINfi, EUGENE ANDRE (1810-1887), French sculptor and medallist, was born in Paris in 1810, and devoted himself from the beginning to the medallist's branch of sculpture, although he also excelled in monumental sculpture and portrait busts. Having carried off the grand prize for medal engraving in 1 83 1, he had a sensational

success with his ” Wounded Gladiator,” which he exhibited in the same year. He subse- quently occupied official posts as designer, first to the Inland Revenue Office, and then to the Mint. Among his most famous medals are that struck in commemoration of the annexation of Savoy by France, and that on the occasion of the peace of Villafranca. Other remarkable pieces are ” The Apotheosis of Napoleon I.,” ” The Amnesty,” ” Le Due d’Orleans,” ” Ber- tholet,” ” The Universal Exposition,” ” The Second of December, 1851,” ” The Establishment of the Republic,” ” The Battle of Inkermann,” and ” Napoleon’s Tomb at the Invalides.” For the Hotel de Ville in Paris he executed fourteen bas-reliefs, which were destroyed in 1871. Of his monumental works, many are to be seen in public places in and near Paris. In the Tuileries gardens is his group of ” Daphnis and Hebe “; in the Luxembourg gardens the ” Queen Bertha “; at the Louvre the ” Buffon “; and in the courtyard of the same palace the ” Bathsheba.” A monument to General Espagne is at the Invalides, and a King Louis VIII. at Versailles. Oudine, who may be considered the father of the modern medal, died in Paris in 1887.

OUDINOT, CHARLES NICOLAS (1767-1847), duke of Reggio, marshal of France, came of a bourgeois family in Lorraine, and was born at Bar-le-duc on the 25th of April 1767. He had a passion for a military career, and served in the regiment of Medoc from 1784 to 1787, when, having no hope of promotion on account of his non-noble birth, he retired with the rank of sergeant. The Revolution changed his fortunes, and in 1792, on the outbreak of war, he was elected lieutenant-colonel of the 3rd battalion of the volunteers of the Meuse. His gallant defence of the little fort of Bitsch in the Vosges in 1792 drew attention to him; he was transferred to the regular army in November 1793, and after serving in numerous actions on the Belgian frontier he was promoted general of brigade in June 1794 for his conduct at the battle of Kaiserslautern. He continued to serve with the greatest distinction on the German frontier under Hoche, Pichegru and Moreau, and was repeatedly wounded and once (in 1795) made prisoner. He was Massena’s right hand all through the great Swiss campaign of 1799 — first as a general of division, to which grade he was promoted in April, and then as chief of the staff — and won extraordinary distinction at the battle of Zurich. He was present under Massena at the defence of Genoa, and so distinguished himself at the combat of Monzam- bano that Napoleon presented him with a sword of honour. He was made inspector-general of infantry, and, on the establish- ment of the empire, given the Grand Cross of the Legion of Honour, but was not included in the first creation of marshals. He was at this time elected a member of the chamber of deputies, but he had

little time to devote to politics. He took a conspicu- ous part in the war of 1805 in command of the famous division

of the ” grenadiers Oudinot,” formed of picked troops and organized by him, with which he seized the Vienna bridges, received a wound at Hollabriinn, and delivered the decisive blow at Austerlitz. In 1806 he won the battle of Ostrolenka, and fought with resolution and success at Friedland. In 1808 he was made governor of Erfurt and count of the Empire, and in 1809, after displaying brilliant courage at Wagram, he was promoted to the rank of marshal. He was made duke of Reggio, and received a large money grant in April 1810. Oudinot admin- istered the government of Holland from 1810 to 1812, and commanded the II. corps of the Grande Armee in the Russian campaign. He was present at Liitzen and Bautzen, and when holding the independent command of the corps directed to take Berlin was defeated at Gross Beeren (see Napoleonic Cam- paigns). He was then superseded by Ney, but the mischief was too great to be repaired, and Ney was defeated at Dennewitz. Oudinot was not disgraced, however, holding important com- mands at Leipzig and in the campaign of 1814. On the abdica- tion of Napoleon he rallied to the new government, and was made a peer by Louis XVIII. , and, unlike many of his old comrades, he did not desert to his old master in 1815. His last active service was in the French invasion of Spain in 1823, in which he commanded a corps and was for a time governor of Madrid. He died as governor of the Invalides on the 13th of September 1847. Oudinot was not, and made no pretence of being, a great commander, but he was a great general of division. He was the beau-ideal of an infantry general, energetic, thoroughly conversant with detail, and in battle as resolute and skilful as any of the marshals of Napoleon.

Oudinot’s eldest son, Charles Nicolas Victor, 2nd duke of Reggio (1791-1863), lieutenant-general, served through the later campaigns of Napoleon from 1809 to 18 14, being in the latter year promoted major for gallant conduct. Unlike his father he was a cavalryman, and as such held command of the cavalry school at Saumur (1822-1830), and the inspector- generalcy of cavalry (1836-1848). He is chiefly known as the commander of the French expedition which besieged and took Rome in 1840 and re-established the temporal power of the pope. After the coup d’etat of the 2nd of December 1851, in resistance to which he took a prominent part, he retired from military and political life, dying at Paris on the 7th of June 1863.

The 2nd duke wrote Apergu historique sur la dignite de marechal de France (1833) ; Considerations sur les ordres militaires de Saint Louis, &c. (1833); L’Emploi des troupes aux grands travaux d’utilite publique

(1839) ; De la Cavalerie et du casernement des troupes d. cheval (1840); Des Remontes de Varmee (1840); and a brief account of his Italian operations of 1849.

OUGHTRED, WILLIAM (fi. 1575-1660), English mathe- matician, was born at Eton, and educated there and at King's College, Cambridge, of which he became fellow. Being admitted to holy orders, he left the university about 1603, and was pre- sented to the rectory of Aldbury, near Guildford in Surrey; and about 1628 he was appointed by the earl of Arundel to instruct his son in mathematics. He corresponded with some of the most eminent scholars of his time on mathematical subjects; and his house was generally full of pupils from all quarters. It is said that he expired in a sudden transport of joy upon hearing the news of the vote at Westminster for the restora- tion of Charles II.

He published, among other mathematical works, Clavis Maihe- matica, in 1631, in which he introduced new signs for certain mathe- matical operations (see Algebra) ; a treatise on navigation entitled Circles of Proportion, in 1632; works on trigonometry and dialling, and his Opuscula Mathematica, published posthumously in 1676.

OUIDA, the pen name — derived from a childish attempt to pronounce " Louisa " — of Maria Louise [de la] Ramee (1839- 1908), English novelist, born at Bury St Edmunds, where her birth was registered on the 7th of January 1839. Her father, Louis Ramee, was French, and her mother, Susan Sutton, English. At an early age she went to live in London, and there began to contribute to the New Monthly and Benlley's Magazine. In i860 her first story, afterwards republished as Held in Bondage (1863), appeared in the New Monthly under the title of Granville de Vigne, and this was followed in quick succession by Straihmore

(1865), Chandos (1866) and Under Two Flags (1867). The list of Ouida's subsequent works is a very long one; but it is sufficient to say that, together with Moths (1880), those already named are not only the most characteristic, but also the best. In a less dramatic genre, her Bimbi: Stories for Children (1882) may also be mentioned; but it was by her more flamboyant stories, such as Under Two Flags and Moths, that her popular success was achieved. By purely literary critics and on grounds of morality or taste Ouida's novels may be condemned. They are generally flashy, and frequently unwholesome. It is im-

possible, however, to dismiss books like Chandos and Under Two Flags merely on such grounds. The emphasis given by Ouida to motives of sensual passion was combined in her with an original gift for situation and plot, and also with genuine descriptive powers which, though disfigured by inaccurate observation, literary solecisms and tawdry extravagance, enabled her at her best to construct a picturesque and powerful story. The character of ” Cigarette ” in Under Two Flags is full of fine touches, and this is not an isolated instance. In 1874 Ouida made her home in Florence, and many of her later novels have an Italian setting. She contributed from time to time to the magazines, and wrote vigorously on behalf of anti- vivisection and on Italian politics; but her views on these subjects were marked by characteristic violence and lack of judgment. She had made a great deal of money by her earlier books, but had spent it without thought for the morrow; and though in 1907 she was awarded a Civil List pension, she died at Viareggio in poverty on the 25th of January 1908.

OUNCE. (1) (Through O. Fr. unce, modern once, from Lat. uncia, twelfth part, of weight, of a pound, of measure, of a foot, in which sense it gives the O.Eng. ynce, inch), a unit of weight, being the twelfth part of a pound troy, =480 grains; in avoirdupois = 437-5 grains, iV of a pound. The, fluid ounce is a measure of capacity; in the United Kingdom it is equivalent to an avoirdupois ounce of distilled water at 62° F.; in the United States of America it is the 128th part of the gallon, = i giU, =456-033 grains of distilled water at its maximum density (see Weights and Measures). (2) A name properly applied to the Felis uncia or snow leopard (q.v.). It appears to have been originally used of various species of lynx, and is still sometimes the name of the Canada lynx. The word appears in O. Fr. and Ital. as once and lonce, onza and lonza respectively, and it is usually explained as being due to the confusion of the I with the article, lonce and lonza being changed to Vonce or Vonza, and the /’ subsequently dropped. If this be so the word is the same as ” lynx,” from the popular Lat. luncia=lyncia, Gr. \uy£. On the other hand once and onza may be nasalized forms of yuz, the Persian name of the panther.

OUNDLE, a market-town in the Northern parliamentary division of Northamptonshire, England, 305 m. N.E. of North- ampton by a branch of the London & North- Western railway. Pop. of urban district (1901) 2404. It is picturesquely situated on an eminence, two sides of which are touched by the river Nene, which here makes a deep bend. The church of St Peter is a fine building with Early English, Decorated and Perpendicular porticos, with a western tower and lofty spire. Oundle School, one of the English public schools, was founded under

the will of Sir William Laxton, Lord Mayor of London (d. 1556). There are about 200 boys. The school is divided into classical and modern sides, and has exhibitions to Oxford and Cambridge universities. A second-grade school was instituted out of the foundation in 1878. Oundle has a considerable agricultural trade.

Wilfrid, archbishop of York, is said to have been buried in 711 at a monastery in Oundle (Undele) which appears to have been destroyed shortly afterwards, and was certainly not in existence at the time of the Conquest. The manor, with a market and tolls, was among the possessions confirmed in 972 by King Edgar to the abbot of Peterborough, to whom it still belonged in 1086. The market was then worth 20s. yearly and is shown by the quo warranto rolls to have been held on Saturday, the day being changed to Thursday in 1835. After the Dissolu-

tion the market was granted with the manor to John, earl of Bedford, and still belongs to the lord of the manor. The abbot of Peterborough about the 13th century confirmed to his men of Oundle freedom from tallage, ” saving to himself pleas of portmanmoot and all customs pertaining to the market,” and they agreed to pay 8 marks, 12s. nd., yearly for their privileges. The town was evidently governed by bailiffs in 1401, when the ” bailiffs and good men ” received a grant of pontage for the repair of the bridge called ” Assheconbrigge,” but the town was never incorporated and never sent members to parliament.

OURO PRETO (” Black Gold “), a city of the state of Minas Geraes, Brazil, 336 m. by rail N. by W. of Rio de Janeiro, and about 300 m. W. of Victoria, Espirito Santo, on the eastern slope of the Serra de Espinhaco and within the drainage basin of the Rio Doce. Pop. (1890) 17,860; (1900) 11,116. Ouro Preto is connected with Miguel Burnier, on the Central of Brazil railway, by a metre-gauge line 3r m. in length. The city is built upon the lower slope of the Serra do Ouro Preto, a spur of the Espinhaco, deeply cut by ravines and divided into a number of irregular hills, up which the narrow, crooked streets are built and upon which groups of low, old-fashioned houses form each a separate nucleus. From a mining settlement the city grew as the in-equalities of the site permitted. R. F. Burton (Highlands of Brazil, London, 1869) says that its shape ” is that of a huge serpent, whose biggest end is about the Praca. . . . The extremities stretch two good miles, with raised convolutions. . . . The ‘ streeting ‘ of both upper and lower town is very tangled, and the old thoroughfares, mere ‘ wynds ‘ . . . show how valuable once was building ground.” The rough streets are too steep and narrow for vehicles, and even riding on horseback is often difficult. Several rivulets follow the ravines and drain into the

Ribeirao do Carmo, a sub-tributary of the Rio Doce. The climate is sub-tropical and humid, though the elevation (3700-3800 ft.) gives a temperate climate in winter. The days are usually hot and the nights cold, the variations in temperature being a fruitful cause of bronchial and pulmonary diseases. Ouro Preto has several historic buildings; they are of antiquated appearance and built of the simplest materials — broken stone and mortar, with an exterior covering of plaster. The more noteworthy are the old government house (now occupied by the school of mines), the legislative chambers, municipal hall and jail — all fronting on the Praca da Independencia — and elsewhere the old Casa dos Contos (afterwards the public treasury), a theatre (the oldest in Brazil, restored in 1861-1862) and a hospital. There are 15 churches in the city, some occupying the most conspicuous sites on the hills, all dating from the more prosperous days of the city's history, but all devoid of archi- tectural taste. Ouro Preto is the seat of the best mining school in Brazil.

The city dates from 1701, when a gold-mining settlement was established in its ravines by Antonio Dias of Taubate. The circumstance that the gold turned black on exposure to the humid air (owing to the presence of silver) gave the name of Ouro Preto to the mountain spur and the settlement. In 1711 it became a city with the name of Villa Rica, a title justified by its size and wealth. At one period of its prosperity its population was estimated at 25,000 to 30,000. In 1720 Villa Rica became the capital of the newly created captaincy of Minas Geraes, and in 1823 the capital of the province- of the same name under the empire of Dom Pedro I. When the empire was overthrown in 1889 and Minas Geraes was reorganized as a republican state, it was decided to remove the capital to a more favourable site and Bello Horizonte was chosen, but Ouro Pret-o remained the capital until 1898, when the new town (also called Cidade de Minas) became the seat of govern- ment. With the decay of her mining industries, Ouro Preto had become merely the political centre of the state. The removal of the capital was a serious blow, as the city has no industries to support its population and no trade of importance. The event most prominent in the history of the city was the conspiracy of 1789, in which several leading citizens were concerned, and for

which one of its less influential members, an alferes (ensign) of cavalry named Joaquim Jos6 da Silva Xavier, nicknamed " Tira-dentes

” (teeth-puller), was executed in Rio de Janeiro in 1792. The conspiracy originated in a belief that the Portuguese crown was about to enforce payment of certain arrears in the mining tax known as the ” royal fifths,” and its object was to set up a republic in Brazil. Although a minor figure in the conspiracy, Tira-dentes was made the scapegoat of the thirty- two men arrested and sent to Rio de Janeiro for trial, and posterity has made him the proto-martyr of republicanism in Brazil.

OUSE, the name of several English rivers.

(1) The Great Ouse rises in Northamptonshire, in the slight hills between Banbury and Brackley, and falls only about 500 ft. in a course of 160 m. (excluding lesser windings) to its mouth in the Wash (North Sea). With an easterly direction it flows past Brackley and Buckingham and then turns N.E. to Stony Stratford, where the Roman Watling Street forded it. It receives the Tove from the N.W., and the Ouzel from the S. at Newport Pagnell. It then follows an extremely sinuous course past Olney to Sharnbrook, where it turns abruptly S. to Bedford. A north-easterly direction is then resumed past St Neot’s to Godmanchester and Huntingdon, when the river trends easterly to St Ives. Hitherto the Ouse has watered an open fertile valley, and there are many beautiful wooded reaches between Bedford and St Ives, while the river abounds in coarse fish. Below St Ives the river debouches suddenly upon the Fens; its fall from this point to the mouth, a distance of 55 m. by the old course, is little more than 20 ft. (the extensive system of artificial drainage cuts connected with the river is considered under Fens). From Earith to Denver the waters of the Ouse flow almost wholly in two straight artificial channels called the Bedford Rivers, only a small head passing, under ordinary conditions, along the old course, called the Old West River. This is joined by the Cam from the S. 4 m. above Ely. In its northward course from this point the river receives from the E. the Lark, the Little Ouse, or Brandon river, and the Wissey. Below Denver sluice, 16 m. from the mouth, the Ouse is tidal. It flows past King’s Lynn, and enters the Wash near the S.E. corner. The river is locked up to Bedford, a distance of 745 m. by the direct course. In the lower part it bears a considerable traffic, but above St Ives it is little used, and above St Neot’s navigation has ceased. The drainage area of the Great Ouse is 2607 sq. m.

(2) A river of Yorkshire. The river Ure, rising near the N.W. boundary of the county in the hpart of the Pennines, and travers- ing the lovely valley famous under the name Wensleydale, unites with the river Swale to form the Ouse near the small town of Boroughbridge, which

lies in the rich central plain of Yorkshire. The course of the Swale, which rises in the north of the county on the eastern flank of the Pennines, is mostly through this plain, and that of the Ouse is wholly so. It flows S.E. to York, thence for a short distance S. by W., then mainly S.E. again past Selby and Goole to the junction with the Trent; the great estuary so formed being known as the Humber. The course of the Ouse proper, thus defined, is 61 m. The Swale and Ure are each about 60 m. long. Goole is a large and growing port, and the river bears a considerable traffic up to York. There is also some traffic up to Boroughbridge, from which the Ure Navigation (partly a canal) continues up to Ripon. The Swale is not navigable. The chief tributaries are the Nidd, the Wharf e, the Don and the Aire from the W., and the Derwent from the N.E., but the detailed consideration of these involves that of the hydrography of the greater part of Yorkshire (q.v.). All, especially the western tributaries, traverse beautiful valleys, and the Aire and Don, with canals, are of importance as affording communications between the manufacturing district of south Yorkshire and the Humber ports. The Derwent is also navigable. The drainage area of the Ouse is 4133 sq. m. It is tidal up to Naburn lock's, a distance of 37 m. from the junction with the Trent, and the total fall from Boroughbridge is about 40 ft.

(3) A river of Sussex, rising in the Forest Ridges between

Horsham and Cuckfield, and draining an area of about 200 sq. m., mostly in the Weald. Like other streams of this locality, it breaches the South Downs, and reaches the English Channel at Newhaven after a course of 30 m. The eastward drift of beach-building material formerly diverted the mouth of this river from its present place to a ooint to the east near Seaford. The Ouse is navigable for small vessels to Lewes, and Newhaven is an important harbour.

OUSEL, or Ouzel, Anglo-Saxon 6sle, equivalent of the German Amsel (a form of the word found in several old English books), apparently the ancient name for what is now more commonly known as the blackbird (q.v.), Turdus merula, but at the present day not often applied to that species, though used in a compound form for birds belonging to another genus and family.

The water-ousel, or water-crow, is now commonly named the " dipper " — a term apparently invented and bestowed in the first edition of T. Bewick's British Birds (ii. 16, 17) — not, as is commonly supposed, from the bird's habit of entering the water in pursuit of its _» . , .^. _,,

prey, but because "it may be seen perched on the top of a stone in the

midst of the torrent, in a con- tinual dipping motion, or short courtesy often re- peated." The English dipper, Cinclus aquations, is the type of a small family, the Cinclidae, prob- ably more nearly akin to the wrens

Cinclus mexicanus.

(q.v.) than to the thrushes, and with examples throughout the more temperate portions of Europe and Asia, as well as North and South America. The dipper haunts rocky streams, into which it boldly enters, generally by deliberately wading, and then by the strenuous combined action of its wings and feet makes its way along the bottom in quest of its living prey — fresh-water molluscs and aquatic insects in their larval or mature condition. Com- plaints of its attacks on the spawn of fish have not been justified by examination of the stomachs of captured specimens. Short and squat of stature, active and restless in its movements, dusky above, with a pure white throat and upper part of the breast, to which succeeds a broad band of dark bay, it is a familiar figure to most fishermen on the streams it frequents. The water-ousel's nest is a very curious structure — outwardly resembling a wren's, but built on a wholly different principle— an ordinary cup-shaped nest of grass lined with dead leaves, placed in some convenient niche, but encased with moss so as to form a large mass that covers it completely except a small hole for the bird's passage. The eggs laid within are from four to seven in number, and are of a pure white. The young are able to swim before they are fully fledged. (A. N.)

OUSELEY, SIR FREDERICK ARTHUR GORE (1825-1889), English composer, was the son of Sir Gore Ouseley, ambassador to Persia, and nephew to Sir William Ouseley, the Oriental scholar. He was born on the 12th of August 1825 in London, and manifested an extraordinary precocity in music, composing an opera at the age of eight years. In 1844, having succeeded to the baronetcy, he entered at Christ Church, and graduated B.A. in 1846 and M.A. in 1849. He was ordained in the latter year, and, as curate of St Paul's, Knightsbridge, served the parish of St Barnabas, Pimlico, until 1851. In 1850 he took the degree of Mus.B. at Oxford, and four years afterwards that of Mus.D., his exercise being the oratorio St Polycarp. In 1855 he succeeded Sir Henry Bishop as professor of music in the University of Oxford, was ordained priest and appointed precentor of Hereford. In 1856 he became vicar of St Michael's, Tenbury, and warden

of St Michael's College, which under him became an important educational institution both in music and general subjects. His works include a second oratorio, Hagar (Hereford, 1873), a great number of services and anthems, chamber music, songs, &c, and theoretical works of great importance, such as Harmony (1868) and Counterpoint (1869) and Musical Form (1875). One of his most useful works is a series of chapters on English music added to the translation of Emil Naumann's History of Music, the subject having been practically ignored in the German treatise. A profoundly learned musician, and a man of great general culture, Ouseley's influence on younger men was wholly for good, and he helped forward the cause of musical progress in England perhaps more effectually than if he himself had been among the more enthusiastic supporters of " advanced " music. The work by which he is best known, St Polycarp, shows, like most compositions of its date, the strong influence of Mendels- sohn, at least in its plan and scope; but if Ouseley had little individuality of expression, his models in other works were the English church writers of the noblest school. He died at Here- ford on the 6th of April 1889.

OUSELEY, SIR WILLIAM (1769-1842), British Orientalist, eldest son of Captain Ralph Ouseley, of an old Irish family, was born in Monmouthshire. After a private education he went to Paris, in 1787, to learn French, and there laid the foundation of his interest in Persian literature. In 1788 he became a cornet in the 8th regiment of dragoons. At the end of 1794 he sold his commission and went to Leiden to study Persian. In 1795 he published Persian Miscellanies; in 1797-1799, Oriental Collec- tions; in 1799, Epitome of the Ancient History of Persia; in 1806, The Oriental Geography of Ebn Haukal; and in 1801 , a translation of the Bakhtiyar Nama and Observations on Some Medals and Gems. He received the degree of LL.D. from the university of Dublin in 1797, and in 1800 he was knighted. When his brother, Sir Gore Ouseley, was sent, in 1810, as ambassador to Persia, Sir William accompanied him as secretary. He returned to England in 1813, and in 1819-1823 published, in three volumes, Travels in Various Countries of the East, especially Persia, in 1810, 1811 and 1812. He also published editions of the Travels and Arabian Proverbs of Burckhardt. He contributed a number of important papers to the Transactions of the Royal Society of Literature. He died at Boulogne in September 1842.

OUSTER (from Anglo-Fr. ouster, to remove, take away, O. Fr. oster, mod. Fr. oter, Eng. " oust," to eject, exclude; the deriva- tion is not known; Lat. obstare, to stand in the way of, resist, would give the form but does not suit the sense; a more probable suggestion connects with a supposed haustare, from haurire, to draw water; cf. " exhaust

“), a legal term signifying disposses- sion, especially the wrong or injury suffered by a person dis- possessed of freeholds or chattels real. The wrong-doer by getting into occupation forces the real owner to take legal steps to regain his rights. Ouster of the freehold may be effected by abatement; i.e. by entry on the death of the person seized before the entry of the heir, or devisee, by intrusion, entry after the death of the tenant for life before the entry of the reversioner or remainder- man, by disseisin, the forcible or fraudulent expulsion of the occupier or person seized of the property. Ouster of chattels real is effected by disseisin, the turning out by force or fraud of the legal proprietor before his estate is determined. In feudal law, the term ouster-le-main (Lat. amovere manum, to take away the hand) was applied to a writ or judgment granting the livery of land out of the sovereign’s hand on the plea that he has no title to it, and also to the delivery by a guardian of land to a ward on his coming of age.

OUTLAWRY, the process of putting a person out of the protection of the law; a punishment for contemptuously refusing to appear when called in court, or evading justice by disappearing. It was an offence of very early existence in England, and was the punishment of those who could not pay the were or blood-money to the relatives of the deceased. By the Saxon law, an outlaw, or laughlesman, lost his libera lex and had no protection from the frank-pledge in the decennary in which he was sworn. He was, too, a frendlesman, because he forfeited

his friends; for if any of them rendered him any assistance, they became liable to the same punishment. He was, at one time, said to be caput lupinum, or to have a wolf’s head, from the fact that he might be knocked on the head like a wolf by any one that should meet him; but so early as the time of Bracton an outlaw might only be killed if he defended himself or ran away; once taken, his life was in the king’s hands, and any one killing him had to answer for it as for any other homicide. The party guilty of outlawry suffered forfeiture of chattels in all cases, and in cases of treason or murder forfeiture of real property: for other offences the profits of land during his lifetime. In cases of treason or felony, outlawry was followed also by corruption of blood. An outlaw was civiliter mortuus. He could not sue in any court, nor had he any legal rights which could be enforced, but he was personally liable upon all causes of action. An outlawry might be reversed by proceedings in error, or by application to a court. It was finally abolished in civil proceedings in 1879, while in criminal proceedings it has practically become obsolete, being unnecessary through the general adoption of extradition treaties. A woman was said to be waived rather than outlawed.

In Scotland outlawry or fugitation may be pronounced by the supreme criminal court in the absence of the panel on the day of trial. In the United States outlawry never existed in civil cases, and in the few cases where it existed in criminal proceedings it has become obsolete.

OUTRAGE (through O. Fr. ultrage, ollrage, oultrage, from Lat. ultra, beyond, exceeding, cf. Ital. oltraggio; the meaning has been influenced by connexion with ” rage,” anger), originally extravagance, violence of behaviour, language, action, &c, hence especially a violent injury done to another.

OUTRAM, SIR JAMES (1803-1863), English general, and one of the heroes of the Indian Mutiny, was the son of Benjamin Outram of Butterley Hall, Derbyshire, civil engineer, and was born on the 29th of January 1803. His father died in 1805, and his mother, a daughter of Dr James Anderson, the Scottish writer on agriculture, removed in 1810 to Aberdeenshire. From Udny school the boy went in 1818 to the Marischal College, Aberdeen; and in 1819 an Indian cadetship was given him. Soon after his arrival at Bombay his remarkable energy attracted notice, and in July 1820 he became acting adjutant to the first battalion of the 12th regiment on its embodiment at Poona, an experience which he found to be of immense advantage to him in his after career. In 1825 he was sent to Khandesh, where he trained a light infantry corps, formed of the wild robber Bhils, gaining over them a marvellous personal influence, and employing them with great success in checking outrages and plunder. Their loyalty to him had its principal source in their boundless admiration of his hunting achievements, which in cool daring and hairbreadth escapes have perhaps never been equalled. Originally a ” puny lad,” and for many years after his arrival in India subject to constant attacks of sickness, Outram seemed to win strength by every new illness, acquiring a constitution of iron, ” nerves of steel, shoulders and muscles worthy of a six-foot Highlander.” In 1835 he was sent to Gujarat to make a report on the Mahi Kantha district, and for some time he remained there as political agent. On the outbreak of the first Afghan War in 1838 he was appointed extra aide-de- camp on the staff of Sir John Keane, and besides many other brilliant deeds performed an extraordinary exploit in capturing a banner of the enemy before Ghazni. After conducting various raids against Afghan tribes, he was in 1839 promoted major, and appointed political agent in Lower Sind, and later in Upper Sind. Here he strongly opposed the policy of his superior, Sir Charles Napier, which led to the annexation of Sind. But when war broke out he heroically defended the residency at Hyderabad against 8000 Baluchis; and it was Sir C. Napier who then described him as ” the Bayard of India.” On his return from a short

visit to England in 1843, he was, with the rank of brevet lieutenant-colonel, appointed to a command in the Mahratta country, and in 1847 ne was transferred from Satara to Baroda, where he incurred the resentment of the Bombay government by his fearless exposure of corruption.

In 1854 he was appointed resident at Lucknow, in which capacity two years later he carried out the annexation of Oudh and became the first chief commissioner of that province. Appointed in 1857, with the rank of lieutenant-general, to command an expedition against Persia, he defeated the enemy with great slaughter at Khushab,-and conducted the campaign with such rapid decision that peace was shortly afterwards concluded, his services being rewarded by the grand cross of the Bath.

From Persia he was summoned in June to India, with the brief explanation — ” We want, all our best men here.” It was said of him at this time that ” a fox is a fool and a lion a coward by the side of Sir J. Outram.” Immediately on his arrival in Calcutta he was appointed to command the two divisions of the Bengal army occupying the country from Calcutta to Cawnpore; and to the military control was also joined the commissionership of Oudh. Already the mutiny had assumed such proportions as to compel Havelock to fall back on Cawnpore, which he only held with difficulty, although a speedy advance was necessary to save the garrison at Lucknow. On arriving at Cawnpore with reinforcements, Outram, ” in admiration of the brilliant deeds of General Havelock,”” conceded to him the glory of relieving Lucknow, and, waiving his rank, tendered his services to him as a volunteer. During the advance he commanded a troop of volunteer cavalry, and performed exploits of great brilliancy at Mangalwar, and in the attack at the Alambagh; and in the final conflict he led the way, charging through a very tempest of fire. The volunteer cavalry unani- mously voted him the Victoria Cross, but he refused the choice on the ground that he was ineligible as the general under whom they served. Resuming supreme command, he then held the town till the arrival of Sir Colin Campbell, after which he con- ducted the evacuation of the residency so as completely to deceive the enemy. In the second capture of Lucknow, on the commander-in-chief’s return, Outram was entrusted with the attack on the side of the Gumti, and afterwards, having recrossed the river, he advanced ” through the Chattar Manzil to take the residency,” thus, in the words

of Sir Colin Campbell, ” putting the finishing stroke on the enemy.” After the capture of Lucknow he was gazetted lieutenant-general. In February 1858 he received the special thanks of both houses of parliament, and in the same year the dignity of baronet with an annuity of £1000. When, on account of shattered health, he returned finally to England in i860, a movement was set on foot to mark the sense entertained, not only of his military achievements, but of his constant exertions on behalf of the natives of India, whose ” weal,” in his own words, ” he made his first object.” The movement resulted in the presentation of a public testimonial and the erection of statues in London and Calcutta. He died on the nth of March 1863, and was buried in Westminster Abbey, where the marble skb on his grave bears the pregnant epitaph ” The Bayard of India.”

See Sir F. J. Goldsmid, James Outram, a Biography (2 vols., 1880), and L. J. Trotter, The Bayard of India (1903).

OVAL (Lat. ovum, egg), in geometry, a closed curve, generally more or less egg-like in form. The simplest oval is the ellipse; more complicated forms are represented in the notation of analytical geometry by equations of the 4th, 6th, 8th . . . degrees. Those of the 4th degree, known as bicircular quartics, ate the most important, and of these the special forms named after Descartes and Cassini are of most interest. The Cartesian ovals presented themselves in an investigation of the section of a surface which would refract rays proceeding from a point in a medium of one refractive index into a point in a medium of a different refractive index. The most convenient equation is $lr \pm mr' = n$, where r,r’ are the distances of a point on the curve from two fixed and given points, termed the foci, and I, m, n are constants. The curve is obviously symmetrical about the line joining the foci, and has the important property that the normal at any point divides the angle between the radii into segments whose sines are in the ratio I : m. The Cassinian oval has the equation $rr' = a^2$, where r/ are the radii of a point on the curve from two given foci, and a is a constant. This curve is

symmetrical about two perpendicular axes. It may consist of a single closed curve or of two curves, according to the value of a; the transition between the two types being a figure of 8, better known as Bernoulli’s lemniscate (q.v.).

See Curve ; also Salmon, Higher Plane Curves.

OVAR, a town of Portugal, in the district of Aveiro and at the northern extremity of. the Lagoon of Aveiro (q.v.); 21 m. S. of Oporto by the

Lisbon-Oporto railway. Pop. (1900) 10,462. Ovar is the centre of important fisheries and has some trade in wine and timber. It is visited by small coasting vessels which ply to and from north-west Africa. Millet, wheat and vegetables — especially onions — are the chief products of the low-lying and unhealthy region, in which Ovar is situated.

OVARIOTOMY, the operation for removal of one or of both of the female ovaries (for anatomy see Reproductive System) . The progress of modern surgery has been conspicuously successful in this department. From 1701, the date when Houston of Carluke, Lanarkshire, carried out his successful partial extirpation , progress was arrested for some time, although the Hunters (1780) indicated the practicability of the operation. In 1809 Ephraim M'Dowell of Kentucky, inspired by the lectures of John Bell, his teacher in Edinburgh, performed ovariotomy, and, con- tinuing to operate with success, established the possibility of surgical interference. He was followed by others in the United States. The cases brought forward by Lizars of Edinburgh were not sufficiently encouraging; the operation met with great opposition; and it was not until Charles Clay, Spencer Wells, Baker Brown and Thomas Keith began work that the procedure was placed on a firm basis and was regarded as justifiable. Improved methods were introduced, and surgeons vied with one another in trying to obtain good results. Eventually, by the introduction of the antiseptic system of treating wounds, this operation, formerly regarded as one of the most grave and anxious in the domain of surgery, came to be attended with a lower mortality than any other of a major character.

To give an idea of tiie terrible record associated with the opera- tion in the third quarter of the 19th century, a passage may be quoted from the English translation of the Life of Pasteur: " As it was supposed that the infected air of the hospitals might be the cause of the invariably fatal results of the operation, the Assistance Publique hired an isolated house in the Avenue de Meudon, near Paris, a salubrious spot.' In 1863, ten women in succession were sent to that house; the neighbouring inhabit- ants watched those ten patients entering the house, and a short time afterwards their ten coffins being taken away." But as time went on, the published statistics showed an increasing success in the practice of almost every operator. Spencer Wells states that in his first five years one patient in three died; in his second and third five years one in four; in his fourth five years one in five; in 1876-1877, one in ten. After the introduction of antiseptics (1878-1884) he lost only 10-9% of his operation cases, but this series showing a marked absence of septic complications. These figures have

been greatly improved upon in later years, and at the present time the mortality may be taken at somewhere about S, 7 or 9%.

Removal of the ovaries is performed when the ovaries are the seat of cystic and other morbid changes; for fibroid tumours of the womb, in which case, by operating, one hastens the menopause and causes the tumours to grow smaller; and in cases where dysmenor- rhoea is wearing out and rendering useless the life of the patient — less severe treatment having proved ineffectual. Oophorectomy, by which is meant removal of the ovaries with the view of producing a curative effect upon some other part, was introduced in 1872 by Robert Battey of Georgia (1828-1895). The operation is sometimes followed by loss of sexual feeling, and has been said to unsex the patient, hence strong objections have been urged against it. The patient and her friends should clearly understand the object of the operation and the results likely to be gained by it. Lastly, the ovaries are sometimes removed with the hope of checking the progress of inoperable cancer of the breast.

From the time that the operation of ovariotomy was first estab- lished as a recognized and lawful surgical procedure, there has been much disputation as to how the pedicle of the ovary, which consists of a fold of peritoneum (the broad ligament) with included blood- vessels, should be treated. Some operators were in favour of tying it with strong silk, and bringing the ends of the ligatures outside

the abdomen. Others were in favour of having a. strong metal clamp upon those structures, or of searing them with the actual cautery, whilst others claimed that the best results were to be obtained by firmly tying the pedicle, cutting the ligatures short, dropping the pedicle into the abdomen and closing the wound. This last method is now almost universally adopted. (E. O.*)

OVATION (Lat. ovaiio), a minor form of Roman ” triumph.” It was awarded either when the campaign, though victorious, had not been important enough for the higher honour; when the war was not entirely put an end to; when it had been waged with unworthy foes; or when the general was not of rank sufficient to give him the right to a triumph. The ceremonial was on the whole similar in the two cases, but in an ovation the general walked or more commonly rode on horseback, wore a simple magisterial robe, carried no sceptre and

wore a wreath of myrtle instead of laurel. Instead of a bull, a sheep was sacrificed at the conclusion of the ceremony. The word is not, however, derived from ovis, sheep, but probably means ” shouting ” (cp. avw) as a sign of rejoicing.

OVEN (O. Eng. ojn, Ger. Of en, cf . Gr. iirvbs, oven) , a close chamber or compartment which may be raised to a considerable tempera- ture by heat generated either within or without it. In English the term generally refers to a chamber for baking bread and other food substances, but it is also used of certain appliances employed in manufacturing operations, as in coking coal or making pottery. See Heating.

OVERBECK, JOHANN FRIEDRICH (1 789-1 869), German painter, the reviver of ” Christian art ” in the 19th century, was born in Liibeck on the 4th of July 1789. His ancestors for three generations had been Protestant pastors; his father was doctor of laws, poet, mystic pietist and burgomaster of Liibeck. Within a stone’s throw of the family mansion in the Konigstrasse stood the gymnasium, where the uncle, doctor of theology and a voluminous writer, was the master; there the nephew became a classic scholar and received instruction in art.

The young artist left Liibeck in March 1806, and entered as student the academy of Vienna, then under the direction of F. H. Fiiger, a painter of some renown, but of the pseudo-classic school of the French David. Here was gained thorough knowledge, but the teachings and associations proved unendurable to the sensitive, spiritual-minded youth. Overbeck wrote to a friend that he had fallen among a vulgar set, that every noble thought was suppressed within the academy and that losing all faith in humanity he turned inwardly on himself. These words are a key to his future position and art. It seemed to him that in Vienna, and indeed throughout Europe, the pure springs of Christian art had been for centuries diverted and corrupted, and so he sought out afresh the living source, and, casting on one side his contemporaries, took for his guides the early and pre- Raphaelite painters of Italy. At the end of four years, differences had grown so irreconcilable that Overbeck and his band of followers were expelled from the academy. True art, he writes, he had sought in Vienna in vain — ” Oh! I was full of it; my whole fancy was possessed by Madonnas and Christs, but nowhere could I find response.” Accordingly he left for Rome, carrying his half-finished canvas ” Christ’s Entry into Jerusalem,” as the charter of his creed — ” I will abide by the Bible; I elect it as my standing-point.”

Overbeck in 1810 entered Rome, which became for fifty-nine years

the centre of his unremitting labour. He was joined by a goodly ■ company, including Cornelius, Wilhelm Schadow and Philip Veit, who took up their abode in the old Franciscan convent of San Isidoro on the Pincian Hill, and were known among friends and enemies by the descriptive epithets — ■ ” the Nazarites,” ” the pre-Raphaelites,” ” the new-old school,” ” the German-Roman artists,” ” the church-romantic painters,” ” the German patriotic and religious painters.” Their precept was hard and honest work and holy living; they eschewed the antique as pagan, the Renaissance as false, and built up a severe revival on simple nature and on the serious art of Perugino, Pinturicchio, Francia and the young Raphael. The character- istics of the style thus educed were nobility of idea, precision

and even hardness of outline, scholastic composition, with the addition of light, shade and colour, not for allurement, but chiefly for perspicuity and completion of motive. Overbeck was mentor in the movement; a fellow-labourer writes: ” No one who saw him or heard him speak could question his purity of motive, his deep insight and abounding knowledge; he is a treasury of art and poetry, and a saintly man.” But the struggle was hard and poverty its reward. Helpful friends, however, came in Niebuhr, Bunsen and Frederick Schlegel. Overbeck in 1813 joined the Roman Catholic Church, and thereby he believed that his art received Christian baptism.

Faith in a mission begat enthusiasm among kindred minds, and timely commissions followed. The Prussian consul, Bartholdi, had a house on the brow of the Pincian, and he engaged Overbeck, Cornelius, Veit and Schadow to decorate a room 24 ft. square with frescoes (now in the Berlin gallery) from the story of Joseph and his Brethren. The subjects which fell to the lot of Overbeck were the ” Seven Years of Famine ” and ” Joseph sold by his Brethren.” These tentative wall-pictures, finished in 1818, produced so favourable an impression among the Italians that in the same year Prince Massimo commissioned Overbeck, Cornelius, Veit and Schnorr to cover the walls and ceilings of his garden pavilion, near St John Lateran, with frescoes illustrative of Tasso, Dante and Ariosto. To Overbeck was assigned, in a room 15 ft. square, the illustration of Tasso’s Jerusalem Delivered; and of eleven compositions the largest and most noteworthy, occupying one entire wall, is the ” Meeting of Godfrey de Bouillon and Peter the Hermit.” The completion of the frescoes — very unequal in merit — after ten years’ delay, the overtaxed and enfeebled painter delegated to his friend Joseph Ftihrich. The leisure thus gained was devoted to a thoroughly congenial theme, the ” Vision of St Francis,” a wall-painting 20 ft. long, figures life size, finished in 1830, for the church of Sta Maria degli Angeli near Assisi.

Overbeck and the brethren set themselves the task of recovering the neglected art of fresco and of monu- mental painting; they adopted the old methods, and their success led to memorable revivals throughout Europe.

Fifty years of the artist's laborious life were given to oil and easel paintings, of which the chief, for size and import, are the following: " Christ's Entry into Jerusalem " (1824), in the Marien Kirche, Liibeck; " Christ's Agony in the Garden " (1835), in the great hospital, Hamburg; " Lo Sposalizio " (1836), Raczynski gallery, Berlin; the " Triumph of Religion in the Arts " (1840), in the Stadel Institut, Frankfort; " Pieta " (1846), in the Marien Kirche, Liibeck; the " Incredulity of St Thomas " (1851), in the possession of Mr Beresford Hope, London; the " Assumption of the Madonna " (1855), in Cologne Cathedral; "Christ delivered from the Jews " (1858), tempera, on a ceiling in the Quirinal Palace — a commission from Pius IX., and a direct attack on the Italian temporal government, therefore now covered by a canvas adorned with Cupids. All the artist's works are marked by religious fervour, careful and protracted study, with a dry, severe handling, and an abstemious colour.

Overbeck belongs to eclectic schools, and yet was creative; he ranks among thinkers, and his pen was hardly less busy than his pencil. He was a minor poet, an essayist and a voluminous letter-writer. His style is wordy and tedious; like his art it is borne down with emotion and possessed by a somewhat morbid " subjectivity." His pictures were didactic, and used as means of propagandas for his artistic and religious faith, and the teachings of such compositions as the " Triumph of Religion and the Sacra- ments " he enforced by rapturous literary effusions. His art was the issue of his life: his constant thoughts, cherished in solitude and chastened by prayer, he transposed into pictorial forms, and thus were evolved countless and much-prized drawings and cartoons, of which the most considerable are the Gospels, forty cartoons (1852); Via Crucis, fourteen water-colour drawings (1857); the Seven Sacraments, seven cartoons (1861). Over- beck's compositions, with few exceptions, are engraved. His life-work he sums up in the words — " Art to me is as the harp of David, whereupon I would desire that psalms should at all times be sounded to the praise of the Lord." He died in Rome in

1869, aged eighty, and lies buried in San Bernardo, the church

wherein he worshipped.

There are biographies by J. Beavington Atkinson (1882) and Howitt (i386). (J. B. A.)

OVERBURY, SIR THOMAS (1581-1613), English poet and essayist, and the victim of one of the most sensational crimes in English history, was the son oi Nicholas Overbury, of Bourtcn- on-the-Hill, and was born in 1581 at Compton Scorpion, near Ilmington, in Warwickshire. In the autumn of 1505 he became a gentleman commoner of Queen's College, Oxford, took his degree of B.A. in 1598 and came to London to study law in the Middle Temple. He found favour with Sir Robert Cecil, travelled on the Continent and began to enjoy a reputation for an accom- plished mind and free manners. About the year 1601, being in Edinburgh on a holiday, he met Robert Carr, then an obscure page to the earl of Dunbar; and so great a friendship was struck up between the two youths that they came up to London together. The early history of Carr remains obscure, and it is probable that Overbury secured an introduction to Court before his young associate contrived to do so. At all events, when Carr attracted the attention of James I., in 1606, by break- ing his leg in the tilt-yard, Overbury had for some time been servitor-in-ordinary to the king. He was knighted in June 1608, and in 1609 he travelled in France and the Low Countries. He seems to have followed the fortunes of Carr very closely, and " such was the warmth of the friendship, that they were inseparable, . . . nor could Overbury enjoy any felicity but in the company of him he loved [Carr]." When the latter was made Lord Rochester in 16 10, the intimacy seems to have been sustained. But it was now destroyed by a new element. Early in 161 1 the Court became aware of the mutual attraction between Rochester and the infamous and youthful countess of Essex, who seemed to have bewitched the handsome Scots adventurer. To this intrigue Overbury was from the first violently opposed, pointing out to Rochester that an indulgence in it would be hurtful to his preferment, and that the woman, even at this early stage in her career, was already " noted for her injury and immodesty." He went so far as to use, in describing her, a word which was not more just than scandalous. But Rochester was now infatuated, and he repeated to the countess what Overbury had said. It was at this time, too, that Overbury wrote, and circulated widely in MS., the poem called " His Wife," which was a picture of the virtues which a young man should demand in a woman before he has the rashness to marry her. It was represented to Lady Essex that Overbury's object in writing this poem was to open the eyes of Rochester to her defects. The situation now resolved itself into a deadly duel for the person of Rochester between the mistress and the friend. The countess contrived

to lead Overbury into such a trap as to make him seem disrespectful to the king, and she succeeded so completely that he was thrown into the Tower on the 22nd of April 1613. It was not known at the time, and it is not certain now, how far Rochester participated in this first crime, or whether he was ignorant of it. But the queen, by a foolish phrase, had sown discord between the friends; she had called Overbury Rochester's " governor." It is, indeed, apparent that Overbury had become arrogant with success, and was no longer a favourite at Court. Lady Essex, however, was not satisfied with having had him shut up; she was determined that " he should return no more to this stage." She had Sir William Wade, the honest Governor of the Tower, removed to make way for a creature of her own, Sir Gervaise Elvis (or Helwys) ; and a gaoler, of whom it was ominously said that he was " a man well acquainted with the power of drugs," was set to attend on Overbury. This fellow, afterwards aided by Mrs Turner, the widow of a physician, and by an apothecary called Franklin, plied the miserable poet with sulphuric acid in the form of copper vitriol. But his constitution long withstood the timid doses they gave him, and he lingered in exquisite sufferings until the 15th of September 1613, when more violent measures put an end to his existence. Two months later Rochester, now earl of Somerset, married the chief murderess, Lady Essex. More than a year passed before

suspicion was roused, and when it was, the king showed a hateful disinclination to bring the offenders to justice In the celebrated trial which followed, however, the wicked plot was all discovered. The four accomplices were hanged; the countess of Somerset pleaded guilty but was spared, and Somerset himself was dis- graced. Meanwhile, Overbury's poem, The Wife, was published in 1614, and ran through six editions within a year, the scandal connected with the murder of the author greatly aiding its success. It was abundantly reprinted within the next sixty years, and it continued to be one of the most widely popular books of the 17th century. Combined with later editions of The Wife, and gradually adding to its bulk, were "Characters" (first printed in the second of the 1614 editions), " The Remedy of Love " (1620), and " Observations in Foreign Travels " (1626). Later, much that must be spurious was added to the gathering snow- ball of Overbury's Works. Posterity has found the praise of his contemporaries for the sententious and graceful moral verse of Overbury extravagantly expressed. The Wife is smooth and elegant, but uninspired. There is no question that the horrible death of the writer, and the extraordinary way in which his murderers were brought to justice, gave an extraneous chaim to his writings. Nor can we be quite sure that Overbury was in fact such a " glorious

constellation ” of all the religious virtues as the 17th century believed. He certainly kept very bad company, and positive evidence of his goodness is wanting. But no one 1 was ever more transcendently canonized by becoming the victim of conspirators whose crimes were equally detestable and unpopular. (E. G.)

OVERDOOR, the name given to any ornamental moulding placed over a door. The overdoor is usually architectural in form, but is sometimes little more than a moulded shelf for the reception of china or curiosities.

OVERMANTEL, the name given to decorative cabinet work, or joinery, applied to the upper part of a fireplace. The over- mantel is derived from the carved panelling formerly applied to chimney-pieces of importance, but the word is now generally restricted to a movable fitment, often consisting of a series of shelves and niches for the reception of ornaments.

OVERSOUL (Ger. Uberseele), the name adopted by Emerson to describe his conception of that transcendent unity which embraces subject and object, mind and matter, and in which all the differences in virtue of which particular things exist are absorbed. The idea is analogous to the various doctrines of the absolute, and to the idea of Plato.

OVERSTONE, SAMUEL JONES LOYD, ist Baron (1796- 1883), English banker, the only son of the Rev. Lewis Loyd, a Welsh dissenting minister, was born on the 25th of September 1796. He was educated at Eton and Trinity College, Cambridge. His father, who had married a daughter of John Jones, a banker of Manchester, had given up the ministry to take a partnership in his father-in-law ‘s bank, and had afterwards founded the London branch of Jones, Loyd & Co., afterwards incorporated in the London and Westminster Bank. Loyd, who had joined his father in the banking business, succeeded to it on the latter’s retirement in 1844. He conducted the business so successfully that on his death he left personal property of over £2,000,000. He sat in parliament as liberal member for Hythe from 1819 to 1826, and unsuccessfully contested Manchester in 1832. As early as 1832 he was recognized as one of the foremost authorities on banking, and he enjoyed much influence with successive ministries and chancellors of the exchequer. He was created Baron Overstone in 1850. He died in London on the 17th of November 1883, leaving one daughter, who married Robert James Loyd-Lindsay, afterwards Lord Wantage.

OVERT ACT (O. Fr. overt, from ouvrir, to open), in law, an open act, one that can be clearly proved by evidence, and from which criminal intent can be inferred, as opposed to a mere intention in the mind to commit a crime (see Intent). The term is more particularly employed in cases of treason (g.v.) , which must be demonstrated by some overt or open act.

OVERTURE (Fr. ouverlure, opening), in music, the instru- mental introduction to a dramatic or choral composition. The

notion of an overture thus has no existence until the 17th century. The toccata at the beginning of Monteverde's Orfeo is a barbaric flourish of every procurable instrument, alternating with a melodious section entitled ritornello; and, in so far as this con- stitutes the first instrumental movement prefixed to an opera, it may be called an overture. As an art-form the overture began to exist in the works of J. B. Lully. He devised a scheme which, although he himself did not always adhere to it, constitutes the typical French overture up to the time of Bach and Handel (whose works have made it classical). This French overture consists of a slow introduction in a marked " dotted rhythm " (i.e. exaggerated iambic, if the first chord is disregarded), followed by a lively movement in fugato style. The slow introduction was always repeated, and sometimes the quick movement concluded by returning to the slow tempo and material, and was also repeated (see Bach's French Overture in the Klavierubung).

The operatic French overture was frequently followed by a series of dance tunes before the curtain rose. It thus naturally became used as the prelude to a suite; and the Klavierubung French Overture of Bach is a case in point, the overture proper being the introduction to a suite of seven dances. For the same reason Bach's four orchestral suites are called overtures; and, again, -the prelude to the fourth partita in the Klavierubung is an overture.

Bach was able to use the French overture form for choruses, and even for the treatment of chorales. Thus the overture, properly so called, of his fourth orchestral suite became the first chorus of the church cantata Unser Mund sei voll Lachens; the choruses of the cantatas Preise Jerusalem den Herrn and H delist erwiinschtes Freudenfest are in overture form; and, in the first of the two cantatas entitled Nun komm der Heiden Heiland, Bach has ingeniously adapted the overture

form to the treatment of a chorale.

With the rise of dramatic music and the sonata style, the French overture became unsuitable for opera; and Gluck (whose remarks on the function of overtures in the preface to Alceste are historic) based himself on Italian models, of loose texture, which admit of a sweeping and massively contrasted technique (see Symphony). By the time of Mozart's later works the overture in the sonata style had clearly differentiated itself from strictly symphonic music. It consists of a quick movement (with or without a slow introduction), in sonata form, loose in texture, without repeats, frequently without a development section, but sometimes substituting for it a melodious episode in slow time. Instances of this substitution are Mozart's " symphony " in G (Kochel's catalogue 318), which is an overture to an unknown opera, and his overtures to Die Entfiihrung and to Lo Sposo deluso, in both of which cases the curtain rises at a point which throws a remarkable dramatic light upon the peculiar form. The overture to Figaro was at first intended to have a similar slow middle section, which, however, Mozart struck out as soon as he had begun it. In Beethoven's hands the overture style and form increased its distinction from that of the symphony, but it no longer remained inferior to it; and the final version of the overture to Leonora (that known as No. 3) is the most gigantic single orchestral movement ever based on the sonata style.

Overtures to plays, such as Beethoven's to Collin's Coriolan, naturally tend to become detached from their surroundings; and hence arises the concert overture, second only to the symphony in importance as a purely orchestral art-form. Its derivation associates it almost inevitably with external poetic ideas. These, if sufficiently broad, need in no way militate against musical integrity of form; and Mendelssohn's Hebrides overture is as perfect a masterpiece as can be found in any art. The same applies to Brahms 's Tragic Overture, one of his greatest orchestral works, for which a more explanatory title would be misleading as well as unnecessary. His Academic Festival Overture is a highly organized working out of German student songs.

In modern opera the overture, Vorspiel, Einleitung, Intro- duction, or whatever else it may be called, is generally nothing XX. 13

more definite than that portion of the music which takes place before the curtain rises. Tannhauser is the last case of high importance in which the overture (as originally written) is a really complete instrumental piece prefixed to an opera in tragic and continuous dramatic style. In lighter opera, where sectional forms are still

possible, a separable overture is not out of place, though even Carmen is remarkable in the dramatic way in which its overture foreshadows the tragic end and leads directly to the rise of the curtain. Wagner's Vorspiel to Lohengrin is a short self-contained movement founded on the music of the Grail. With all its wonderful instrumentation, romantic beauty and identity with subsequent music in the first and third acts, it does not represent a further departure from the formal classical overture than that shown fifty years earlier by Mehul's interesting overtures to Ariodant and Uthal, in the latter of which a voice is several times heard on the stage before the rise of the curtain. The Vorspiel to Die Meister singer, though very enjoyable by itself and needing only an additional tonic chord to bring it to an end, really loses incalculably in refinement by so ending in a concert room. In its proper position its otherwise dis- proportionate climax leads to the rise of the curtain and the engaging of the listener's mind in a crowd of dramatic and spectacular sensations amply adequate to account for that long introductory instrumental crescendo. The Vorspiel to Tristan has been very beautifully finished for concert use by Wagner himself, and the considerable length and subtlety of the added page shows how little calculated for independent existence the original Vorspiel was. Lastly, the Parsifal Vorspiel is a composition which, though finished for concert use by Wagner in a few extra bars, asserts itself with the utmost lucidity and force as a prelude to some vast design. The orchestral preludes to the four dramas of the Ring owe their whole meaning to their being mere preparations for the rise of the curtain; and these works can no more be said to have overtures than Verdi's Falstaff and Strauss's Salome, in which the curtain rises at the first note of the music. (D. F. T.)

OVERYSEL, or Overyssel, a province of Holland, bounded S. and S.W. by Gelderland, N.W. by the Zuider Zee, N. by Friesland and Drente, and E. by the Prussian provinces of Hanover and Westphalia respectively; area 1201 sq. m.; pop. (1904) 359,443. It includes the island of Schokland in the Zuider Zee. Like Drente on the north and Gelderland on the south, Overysel consists of a sandy flat relieved by hillocks, and is covered with waste stretches of heath and patches of wood and high fen. Along the shores of the Zuider Zee, however, west of the Zwolle-Leeuwarden railway, the country is low-lying and covered for the most part with fertile pasture lands. Cattle- rearing and butter and cheese making are consequently the chief occupations, while on the coast many of the people are engaged in making mats and besoms. The river system of the province is determined by two main ridges of hills. The first of these extends from the southern border at Markelo to the Lemeler hill (262 ft.) near the confluence of

the Vecht and Regge, and forms the watershed between the Regge and the Salland streams (Sala, whence Salis, Isala, Ysel), which unite at Zwolle to form the Zwarte Water. The other ridge of hills extends through the south-eastern division of the province called Twente, from Enschede to Ootmarsum, and divides the basin of the Almelosche Aa from the Dinkel and its streams. The river Vecht crosses the province from E. to W. and joins the Zwarte Water, which com- municates with the Zuider Zee by the Zwolsche Diep and with the Ysel by the Willemsvaart. Everywhere along the streams is a strip of fertile grass-land, from which agriculture and cattle- rearing have gradually spread over the sand-grounds. A large proportion of the sand-grounds, however, is waste. Forest culture is practised on parts of them, especially in the east, and pigs are largely bred. The deposits of the Salland and the Dinkel streams are found to contain iron ore, which is extracted and forms an article of export to Germany. Peat-digging and fen reclamation have been carried on from an early period, and the area of high fen which formerly covered the portion of the province to the north of the Vecht in the neighbourhood

of Dedemsvaart has been mostly reclaimed. This industry is now most active on the eastern borders between Almelo and Hardenberg, Vriezenveen being the chief fen colony. Cotton- spinning, together with bleaching-works, has come into promin- ence in the 19th century in the district of Twente. The reason of its isolated settlement here is to be found in the former general practice of weaving as a home craft and its organization as an industry by capitalist Baptist refugees who arrived in the 17th and 1 8th centuries. The chief town of the province is Zwolle, and other thriving industrial centres are Deventer, famous for its carpets and cake, and Almelo, Enschede, Hengelo and Oldenzaal in Twente. Kampen, Genemuiden, Vollenhove and Blokzyl, on the Zuider Zee, carry on some fishing trade. Near Vollenhove was the castle of Toutenburg, built in 1502-1533 by the famous stadtholder of the emperor Charles V., George Schenk. The castle was demolished in the beginning of the 19th century and the remains are slight. The railway system of the province is supplemented by steam tram-lines between Zwolle, Dedems- vaart and Hardenberg.

OVID [Publius Ovidius Naso] (43 b.c.-a.d. 17), Roman poet, the last of the Augustan age, was born in 43 B.C., the last year of the republic, the year of the death of Cicero. Thus the only form of political life known to Ovid was that of the absolute rule of Augustus and his

successor. His character was neither strengthened nor sobered, like that of his older contemporaries, by personal recollection of the crisis through which the republic passed into the empire. There is no sense of political freedom in his writings. The spirit inherited from his ancestors was that of the Italian country districts, not that of Rome. He was born on the 20th of March (his self-consciousness has preserved the exact day of the month) 1 at Sulmo, now Sulmona, a town of the Paeligni, picturesquely situated among the mountains of the Abruzzi: its wealth of waters and natural beauties seem to have strongly affected the young poet's imagination (for he often speaks of them with affectionate admiration) and to have quickened in him that appreciative eye for the beauties of nature which is one of the chief characteristics of his poems. The Paeligni were one of the four small mountain peoples whose proudest memories were of the part they had played in the Social War. But in spite of this they had no old race-hostility with Rome, and their opposition to the senatorial aristocracy in the Social War would predispose them to accept the empire. Ovid, whose father was of equestrian family, belonged by birth to the same social class as Tibullus and Propertius, that of old hereditary landowners; but he was more fortunate than they in the immunity which his native district enjoyed from the confiscations made by the triumvirs. His vigorous vitality was apparently a gift transmitted to him by heredity; for he tells us that his father lived till the age of ninety, and that he performed the funeral rites to his mother after his father's death. While he mentions both with the piety characteristic of the old Italian, he tells us little more about them than that " their thrift curtailed his youthful expenses," 2 and that his father did what he could to dissuade him from poetry, and force him into the more profitable career of the law. He and his brother had been brought early to Rome for their education, where they attended the lectures of two most eminent teachers of rhetoric, Arellius Fuscus and Porcius Latro, to which influence is due the strong rhetorical element in Ovid's style. He is said to have attended these lectures eagerly, and to have shown in his exercises that his gift was poetical rather than oratorical, and that he had a distaste for the severer processes of thought.

Like Pope, "he lisped in numbers," 3 and he wrote and destroyed many verses before he published anything. The earliest edition of the Amores, which first appeared in five books, and the Heroides were given by him to the world at an early age. " Virgil," he informs us, " he had only seen "; but Virgil's friend and contemporary Aemilius Macer used to read his didactic poems to him; and even the fastidious Horace some-

1 Trist. iv. 10. 13. 2 Am. i. 3. 10.

‘ Trist. iv. 10. 26 ” et quod temptabam scribere, versus erat.”

times delighted his ears with the music of his verse. He had a close bond of intimacy with the younger poets of the older generation — Tibullus, whose death he laments in one of the few pathetic pieces among his earlier writings, and Propertius, to whom he describes himself as united in the close ties of comrade- ship. The name of Maecenas he nowhere mentions. The time of his influence was past when Ovid entered upon his poetical career. But the veteran politician Messalla, the friend of Tibullus, together with his powerful son Cotta Messallinus and Fabius Maximus, who are mentioned together by Juvenal 4 along with Maecenas as types of munificent patrons of letters, and other influential persons whose names are preserved in the Epistles from Pontus, encouraged his literary efforts and extended to him their support. He enjoyed also the intimacy of poets and literary men, chiefly of the younger generation, whose names he enumerates in Ex Ponto, iv. 16, though, with the exception of Domitius Marsus and Grattius, they are scarcely more than names to us. With the older poet, Macer, he travelled for more than a year. Whether this was immediately after the com- pletion of his education, or in the interval between the publica- tion of his earlier poems and that of the Medea and Ars amatoria is unknown, but it is in his later works, the Fasti and Meta- morphoses, that we chiefly recognize the impressions of the scenes he visited. In one of the Epistles from Pontus (ii. 10) to his fellow-traveller there is a vivid record of the pleasant time they had passed together. Athens was to a Roman then what Rome is to an educated Englishman of the present day. Ovid speaks of having gone there under the influence of literary enthusiasm, and a similar impulse induced him to visit the supposed site of Troy. The two friends saw together the illustri- ous cities of Asia, which had inspired the enthusiasm of travel in Catullus, and had become familiar to Cicero and Horace during the years they passed abroad. They spent nearly a year in Sicily, which attracted him, as it had attracted Lucretius 6 and Virgil, 6 by its manifold charm of climate, of sea-shore and inland scenery, and of legendary and poetical association. He recalls with a fresh sense of pleasure the incidents of their tour, and the endless delight which they had in each other’s conversa- tion. We would gladly exchange the record of his life of pleasure in Rome for more of these recollections. The highest type of classic Roman culture shows its affinity to that of modern times by nothing more clearly than the enthusiasm- for travel among lands famous for their natural beauty, their monuments of art and their historical associations.

When settled at Rome, although a public career leading to senatorial position was open to him, and although he filled various minor

judicial posts and claims to have filled them well, he had no ambition for such distinction, and looked upon pleasure and poetry as the occupations of his life. He was three times married; when little more than a boy to his first wife, whom he naively describes as unworthy of himself: 7 but he was soon separated from her and took a second wife, with whom his union, although through no fault of hers, did not last long. She was probably the mother of his one daughter. Later he was joined to a third wife, of whom he always speaks with affection and respect. She was a lady of the great Fabian house, and thus connected with his powerful patron Fabius Maximus, and was a friend of the empress Livia. It therefore seems likely that he may have been admitted into the intimacy of the younger society of the Palatine, although in the midst of his most fulsome flattery he does not claim ever to have enjoyed the favour of Augustus. His liaison with his mistress Corinna, whom he celebrates in the Amores, took place probably in the period between his first and second, or between his second and third marriages. It is doubtful whether Corinna was, like Catullus' Lesbia, a lady of recognized position, or whether she belonged to

4 Juv. vii. 95. 6 Lucret. i. 726—

" quae cum magna modis multis miranda videtur gentibus humanis regio visendaque fertur."

6 Sueton. (Donatus) ; Vita Virg. 13 " quamquam secessu Cam- paniae Siciliaeque plurimum uteretur. '

7 Trist. iv. 10. 69-70.

the same class as the Chloes and Lalages of Horace's artistic fancy. If we can trust the poet's later apologies for his life, in which he states that he had never given occasion for any serious scandal, it is probable that she belonged to the class of libertinae. However that may be, Ovid is not only a less constant but he is a less serious lover than his great predecessors Catullus, Tibullus and Propertius. His tone is that either of mere sensuous feeling or of irony. In his complete emancipation from all restraint he goes beyond them, and thus reflects the tastes and spirit of fashionable Rome between the years 20 B.C. and the beginning of our era. Society was then bent simply on amuse- ment; and, as a result partly of the loss of political interests, women

came to play a more important and brilliant part in its life than they had done before. Julia, the daughter of the emperor, was by her position, her wit and beauty, and her reck- less dissipation, the natural leader of such a society. But the discovery of her intrigue (2 B.C.) with lulus Antonius, the son of Mark Antony, was deeply resented by Augustus as being at once a shock to his affections and a blow to his policy of moral reform. Julia was banished and disinherited; Antonius and her many lovers were punished; and the Roman world awoke from its fool's paradise of pleasure. Nearly coincidently with this scandal appeared Ovid's Ars amatoria, perhaps the most immoral work ever written by a man of genius, though not the most demoralizing, since it is entirely free from morbid sentiment. By its brilliancy and heartlessness it appealed to the prevailing taste of the fashionable world; but its appearance excited deep resentment in the mind of the emperor, as is shown by his edict, issued ten years later, against the book and its author. Augustus had the art of dissembling his anger; and Ovid appears to have had no idea of the storm that was gathering over him. He still continued to enjoy the society of the court and the fashionable world; he passed before the emperor in the annual procession among the ranks of the equites; and he developed a richer vein of genius than he had shown in his youthful prime. But he was aware that public opinion had been shocked,, or professed to be shocked, by his last work; and after writing a kind of apology for it, called the Remedia amoris, he turned to other subjects, and wrote during the next ten years the Metamorphoses and the Fasti. He had already written the Heroides, in which he had imparted a modern and romantic interest to the heroines of the old mythology, 1 and a tragedy, the Medea, which must have afforded greater scope for the dramatic and psychological treatment of the passion with which he was most familiar. In the Fasti Ovid assumes the position of a national poet 2 by imparting poetical life and interest to the ceremonial observances of the Roman religion; but it is as the brilliant narrator of the romantic tales that were so strangely blended with the realistic annals of Rome that he succeeds in the part assumed by him. The Metamorphoses is a narrative poem which recounts legends in which the miracul- ous involved transformations of shape. Beginning with the change from Chaos to Cosmos, legends first Greek and then Roman are passed in review, concluding with the metamorphosis of Julius Caesar into a star and a promise of immortality to Augustus. The long series of stories, which consist to a large extent of tales of the love adventures of the gods with nymphs and the daughters of men, is strongly tinged with Alexandrine influence, being in fact a succession of epyllia in the Alexandrine manner. This work, which Ovid regards as his most serious claim to immortality, had not been finally revised

at the time of his disgrace, and in his despair he burnt it; but other copies were in existence, and when he was at Tomi it was published at Rome by one of his friends. He often regrets that it had not received his final revision. The Fasti also was broken off by his exile, after the publication of the first six books, treating of the first six months of the year.

Ovid assigns two causes for his banishment, his Ars amatoria, and an actual offence. 3 What this was is not known, but his

l The essentially modern character of the work appears in his making a heroine of the time of the Trojan war speak of visiting ” learned ” Athens (Heroid. ii. 83).

2 ” Animos ad publica carmina flexi ” {Trist. v. I. 23). 1 • Trist. ii. 207.

frequent references to it enable us to conjecture its character. He tells us that there was no breach of law on his part; he distinctly disclaims having been concerned in any treasonable plot: his fault was a mistake of judgment {error), an unpre- meditated act of folly. He had been an unintentional witness of some culpable act committed by another or others — of some act which nearly affected the emperor, and the mention of which was likely to prove offensive to him. Ovid himself had reaped no personal gain from his conduct. Though his original act was a pardonable error, he had been prevented by timidity from atoning for it subsequently by taking the straightforward course. In a letter to an intimate friend, to whom he had been in the habit of confiding all his secrets, he says that had he confided this one he would have escaped condemnation. 4 In writing to another friend he warns him against the danger of courting too high society. This offence, which excited the anger of Augustus, was connected in some way with the publication of the Ars amatoria, since that fact was recited by the emperor in his sentence. All this points to his having been mixed up in a scandal affecting the imperial family, and seems to connect him with one event, coincident with the time of his disgrace (a.d. 9), the intrigue of the younger Julia, granddaughter of Augustus, with D. Silanus, mentioned by Tacitus. 5 Augustus deeply felt these family scandals, looking upon them as acts of treason and sacrilege. Julia was banished to the island of Trimerus, off the coast of Apulia. Silanus withdrew- into voluntary exile. The chief punishment fell on Ovid, who was banished. The poet at the worst could only have been a confidant of the intrigue; but Augustus must have regarded him and his works as, if not the corrupter of the age, at least the most typical representative of that corruption which had tainted so diiely even the imperial family. Ovid’s form of banishment was the mildest possible

(relegatio) ; it involved no deprivation of civic rights, and left him the possession of his property. He was ordered to remove to the half-Greek, half-barbaric town of Tomi, near the mouth of the Danube. He recounts vividly the agony of his last night in Rome, and the hardships of his November voyage down the Adriatic and up the Gulf of Corinth to Lechaeum, where he crossed the isthmus and took ship again from Cenchreae to Samothrace, whence in the following spring he proceeded over- land through Thrace to his destination. For eight years he bore up in his dreary solitude, suffering from the unhealthiness of the climate and the constant alarm of inroads of barbarians. In the hope of procuring a remission of his punishment he wrote poetical complaints, first in the series of the five books of the Tristia, sent successively to Rome, addressed to friends whose names he suppresses; afterwards in a number of poetical epistleSj the Epistulae ex Ponto, addressed by name to friends who were likely to have influence at court. He believed that Augustus had softened towards him before his death, but his successor Tiberius was inexorable to his appeals. His chief consolation was the exercise of his art, though as time goes on he is painfully conscious of failure in power. But although the works written by him in exile lack the finished art of his earlier writings, their personal interest is greater. They have, like the letters of Cicero to Atticus, the fascination exercised by those works which have been given to the world under the title of Confessions; they are a sincere literary expression of the state of mind produced by a unique experience — that of a man, when well advanced in years but still retaining extraordinary sensibility to pleasure and pain, withdrawn from a brilliant social and intellectual position, and cast upon his own resources in a place and among people affording the dreariest contrast to the brightness of his previous life. How far these confidences are to be regarded as equally sincere expressions of his affection or admiration for his correspondents is another question. Even in those addressed to his wife, though he speaks of her with affection and respect, there may perhaps be detected a certain ring of insincerity in his conventional comparisons of her to the Penelopes and Laodamias of ancient legend. Had she been a Penelope or Laodamia she would have accompanied him in 4 Trist. iii. 6. 11. 6 Ann. iii. 24.'

his exile, as we learn from Tacitus was done by other wives 1 in the more evil days of which he wrote the record. The letters, which compose the Tristia and Epistulae ex Ponto, are addressed either to his

wife, the emperor, or the general reader, or to his patrons and friends. To his patrons he writes in a vein of supplication, beseeching them to use their influence on his behalf. To his rather large circle of intimate acquaintances he writes in the language of familiarity, and often of affectionate regard; he seeks the sympathy of some, and speaks with bitter- ness of the coldness of others, and in three poems 2 he complains of the relentless hostility of the enemy who had contributed to procure his exile, and whom he attacked in the Ibis. There is a note of true affection in the letter to the young lyric poetess Perilla; of whose genius and beauty he speaks with pride, and whose poetic talents he had fostered by friendly criticism. 1 He was evidently a man of gentle and genial manners; and, as his active mind induced him to learn the language of the new people among whom he was thrown, his active interest in life enabled him to gain their regard and various marks of honour. One of his last acts was to revise the Fasti, and re-edit it with a dedication to Germanicus. The closing lines of the Epistulae ex Ponto sound like the despairing sigh of a drowning man who had long struggled alone with the waves: —

” Omnia perdidimus: tantummodo vita relicta est, Praebeat ut sensum materiamque mali.”

Shortly after these words were written he died in his sixty-first year in a.d. 17, the fourth year of the reign of Tiberius.

The temperament of Ovid, as indicated in his writings, has more in common with the suppleness of the later Italian than with the strength and force of the ancient Roman. That stamp of her own character and understanding which Rome impressed on the genius of those other races which she incorporated with herself is fainter in Ovid than in any other great writer. He ostentatiously disclaims the manliness which in the republican times was regarded as the birthright not of Romans only but of the Sabellian races from which he sprang. He is as devoid of dignity in his abandonment to pleasure as in the weakness with which he meets calamity. He has no depth of serious conviction, no vein of sober reflection, and is sustained by no great or elevat- ing purpose. Although the beings of a supernatural world fill a large place in his writings, they appear stripped of all sanctity and mystery. It is difficult to say whether the tone of his references to the gods and goddesses of mythology implies a kind of half-believing return to the most childish elements of paganism, or is simply one of mocking unbelief. He has absolutely no reverence, and consequently inspires no reverence in his reader. With all a poet’s feeling for the life, variety and subtlety of nature, he has no sense of her mystery and majesty. The love which he celebrates is sensual and superficial, a matter of

vanity as much as of passion. He prefers the piquant attrac- tion of falsehood and fickleness to the charm of truth and con- stancy. Even where he follows the Roman tendencies in his art he perverts them. The Fasti is a work conceived in the prosaic spirit of Roman antiquarianism. It is redeemed from being prosaic by the picturesqueness and vivacity with which the legends are told. But its conception might have been more poetical if it had been penetrated by the religious and patriotic spirit with which Virgil invests ancient ceremonies, and the mysticism with which he accepts the revelations of science. In this respect the contrast is great between the reverential treatment which the trivialities of legend and science receive in the Georgics and Aeneid, and the literal definiteness of the Fasti.

These defects in strength and gravity show a corresponding result in Ovid's writings. Though possessing diligence, per- severance and literary ambition, he seems incapable of conceiv-

1 Tac. Hist. i. 3 " comitatae profugos liberos matres, secutae maritos in exilia coniuges."

2 Trist. iii. 11, iv. 9, v. 8.

' Trist. iii. 7. Perilla has by many been erroneously supposed to have been the poet's own daughter; but this is impossible, since she is described as young and still living under her mother's roof, whereas at the time of Ovid's exile his daughter was already married to her senond husband.

ing a great and serious whole. Though a keen observer of the superficial aspects of life, he has added few great thoughts to the intellectual heritage of the world. 4 But with all the levity of his character he must have had qualities which made him, if not much esteemed, yet much liked in his own day, and which are apparent in the genial amiability of his writings. He claims for himself two virtues highly prized by the Romans, fides and candor — the qualities of social honour and kindly sincerity. There is no indication of anything base, ungenerous or morose in his relations to others. Literary candor, the generous apprecia- tion of all sorts of excellence, he possesses in a remarkable degree. He heartily admires everything in literature, Greek or Roman, that had any merit. In him more than any of the Augustan poets we find words of admiration applied to the rude genius of Ennius and the majestic style of Accius. It is by him, not by Virgil or Horace, that Lucretius is first named and his sub- limity is first acknowledged. 5 The image of Catullus that most haunts the imagination is that of the poet who died so early —

” hedera iuvenalia cinctus Tempora,”

as he is represented by Ovid coming to meet the shade of the young Tibullus in Elysium. 6 To his own contemporaries, known and unknown to fame, he is as liberal in his words of recognition. 7 He enjoyed society too in a thoroughly amiable and unenvious spirit. He lived on a friendly footing with a large circle of men of letters, poets, critics, grammarians, &c, but he showed none of that sense of superiority which is manifest in Horace’s estimate of the ” tribes of grammarians ” and the poetasters of his day. Like Horace too he courted the society of the great, though probably not with equal independence; but unlike Horace he expresses no contempt for the humbler world outside. With his irony and knowledge of the world it might have been expected that he would become the social satirist of his age. But he lacked the censorious and critical temper, and the admixture of gall necessary for a successful satirist. In his exile he did retaliate on one enemy and persistent detractor in the Ibis, a poem written in imitation of a similar work by Callimachus; but the Ibis is not a. satire, but an invective remarkable rather for recondite learning than for epigrammatic sting.

But Ovid’s chief personal endowment was his vivacity, and his keen interest in and enjoyment of life. He had no grain of discontent in his composition; no regrets for an ideal past, or longings for an imaginary future. The age in which he lived was, as he tells us, that in which more than any other he would have wished to live. 8 He is its most gifted representative, but he does not rise above it. The great object of his art was to amuse and delight it by the vivid picture he presented of its fashions and pleasures, and by creating a literature of romance which reflected them, and which could stimulate the curiosity and fascinate the fancy of a society too idle and luxurious for serious intellectual effort. The sympathy which he felt for the love adventures of his contemporaries, to which he probably owed his fall, quickened his creative power in the composition of the Heroides and the romantic tales of the Metamorphoses. None of the Roman poets can people a purely imaginary world with such spontaneous fertility of fancy as Ovid. In heart and mind he is inferior to Lucretius and Catullus, to Virgil and Horace, perhaps to Tibullus and Propertius; but in the power and range of imaginative vision he is surpassed by no ancient and by few modern poets. This power of vision is the counterpart of his lively sensuous nature. He has a keener eye for the apprehension of outward beauty, for the life and colour and forms of nature, than any Roman or perhaps than any Greek poet. This power, acting upon the wealth of his varied reading, gathered with eager curiosity and received into a singularly retentive mind, has enabled

him to depict with consummate skill and sympathy legendary scenes of the most varied and picturesque beauty. If his tragedy, the

4 There are found in him some exceptionally fine expressions, such as Her. iii. 106 ” qui bene pro patna cum patriaque iacent “; and Met. vii. 20 ” video meliora proboque, deteriora sequor.”

6 Am. i. 15; 19 ff. e Am. iii. 9. 61.

7 Ex Ponto, iv. 16. s Ars amatoria, iii. 121 ff.

Medea, highly praised by ancient critics, had been preserved, we should have been able to judge whether Roman art was capable of producing a great drama. In many of the Heroides, and in several speeches scattered through his works, he gives evidence of true dramatic creativeness. Unlike his great pre- decessor Catullus, he has little of the idyllic in his art, cr whatever of idyllic there is in it is lost in the rapid movement of his narra- tive. But he is one, among the poets of all times, who can imagine a story with the most vivid inventiveness and tell it with the most unflagging animation. The faults of his verse and diction are those which arise from the vitality of his temperament — too facile a flow, too great exuberance of illustration. He has as little sense of the need of severe restraint in his art as in his life. He is not without mannerism, but he is quite unaffected, and. however far short he might fall of the highest excellence of verse or style, it was not possible for him to be rough or harsh, dull or obscure.

As regards the school of art to which he belongs, he may be described as the most brilliant representative of Roman Alexandrinism. The latter half of the Augustan age was, in its social and intellectual aspects, more like the Alexandrine age than any other era of antiquity. The Alexandrine age was like the Augustan, one of refinement and luxury, of outward magnificence and literary dilettantism flourishing under the fostering influence of an absolute monarchy. Poetry was the most important branch of literature cultivated, and the chief subjects of poetry were mythological tales, various phases of the passion of love, the popular aspects of science and some aspects of the beauty of nature. These two were the chief subjects of the later Augustan poetry. The higher feelings and ideas which found expression in the poetry of Virgil, Horace and the writers of an older generation no longer acted

on the Roman world. It was to the private tastes and pleasures of individuals and society that Roman Alexandrinism had appealed both in the poetry of Catullus, Cinna, Calvus and their school, and in that of Gallus, Tibullus and Propertius. Ovid was the last of this class of writers.

His extant works fall naturally into three divisions, those of his youth, of middle life and of his later years. To the first of these divisions belong the amatory poems: (1) the three books of Amoves (originally five, but reduced in a later recension to three) relating to his amours with his mistress Corinna; (2) the Medicamina formae, or, as it is sometimes called Medicamina faciei, a fragment of a hundred lines on the use of cosmetics; (3) the three books of the Ars amatoria, rules for men and women by which they may gain the affections of the other sex; (4) the Remedia amoris (one book), a kind of recantation of the Ars amatoria. To the second division belong (5) the fifteen books of the Metamorphoses, and (6) the six books of the Fasti, which was originally intended to be in twelve books, but which breaks off the account of the Roman calendar with the month of June. To the third division belong (7) the five books of the Tristia, (8) the Ibis, an invective against an enemy who had assisted to procure his fall, written in elegiac couplets probably soon after his exile; (9) the four books of Epistulae ex Ponto. Of these the first three were published soon after the Tristia, while the fourth book is a collection of scattered poems published by some friend soon after the author's death. The Halieutica is a didactic fragment in hexameters on the natural history of fishes, of doubtful genuineness, though it is certain that Ovid did begin such a work at the close of his life. 1

In his extant works Ovid confined himself to two metres — the elegiac couplet and the hexameter. The great mass of his poetry is written in the first; while the Metamorphoses and the Halieutica are composed in the second. Of the elegiac couplet he is the acknowledged master. By fixing it into a uniform mould he brought it to its highest perfection; and the fact that the great mass of elegiac verse written subsequently has en- deavoured merely to reproduce the echo of his rhythm is evidence of his pre-eminence. In the direct expression and illustration of feeling his elegiac metre has more ease, vivacity and sparkle than that of any of his predecessors, while he alone has com- 1 Plin. Hist. Nat. xxxii. 152.

municated to it, without altering its essential characteristic of recurrent and regular pauses, a fluidity and rapidity of move- ment which make it an admirable vehicle for pathetic and picturesque narrative It was impossible for him to give to the hexameter greater

perfection, but he imparted to it also a new character, wanting indeed the weight and majesty and intricate harmonies of Virgil, but rapid, varied, animated in complete accord with the swift, versatile and fervid movement of his imagination. One other proof he gave of his irrepressible energy by composing during his exile a poem in the Getic (Gothic) language in praise of Augustus, Tiberius and the imperial family, the loss of which, whatever it may have been to literature, is much to be regretted in the interests of philology.

It was in Ovid's writings that the world of romance and wonder created by Greek imagination was first revealed to modern times. The vivid fancy, the transparent lucidity, the liveliness, ease and directness through which he reproduced his models made his works the most accessible and among the most attractive of the recovered treasures of antiquity. His influence was first felt in the literature of the Italian Renaissance. But in the most creative periods of English literature he seems to have been read more than any other ancient poet, not even excepting Virgil, and it was on minds such as those of Marlowe, Spenser, Shakespeare, 2 Milton and Dryden that he acted most powerfully. His influence is equally unmistakable during the classical era of Addison and Pope. The most successful Latin verse of modern times has been written in imitation of him; the faculty of literary composition and feeling for ancient Roman culture has been largely developed in the great schools of England and France by the writing of Ovidian elegiacs. His works afforded also abundant stimulus and materials to the great painters who flourished during and immediately after the Renaissance. Thus his first claim on the attention of modern readers is the influence which he has exercised on the development of literature and art; for this, if for no other reason, his works must always retain an importance second only to those of Virgil and Horace.

He is interesting further as the Sole contemporary exponent of the last half of the Augustan age, the external aspects and inner spirit of which is known from the works, not of contemporary historians or prose-writers, but from its poets. The successive phases of Roman feeling and experience during this critical period are revealed in the poetry of Virgil, Horace and Ovid. Virgil throws an idealizing and religious halo around the hopes and aspirations of the nascent empire. Horace presents the most complete image of its manifold aspects, realistic and ideal. Ovid reflects the life of the world of wealth and fashion under the influence of the new court, its material prosperity, its refine- ment, its frivolity and its adulation. For the continuous study of the Roman world in its social and moral relations his place is important as marking the transition between the repre- sentation of Horace, in

which the life of pleasure and amusement has its place, but is subordinate to the life of reflection and serious purpose, and that life which reveals itself in the cynicism of Martial and the scornful indignation of Juvenal. He is the last true poet of the great age of Roman literature, which begins with Lucretius and closes with him. No Roman poet writes with such vivacity and fertility of fancy; in respect of these two qualities we recognize in him the countryman of Cicero and Livy. But the type of genius of which he affords the best example is more familiar in modern Italian than in ancient Roman literature. While the serious spirit of Lucretius and Virgil reappeared in Dante, it is Ariosto who may be said to reproduce the light-hearted gaiety and brilliant fancy of Ovid.

Bibliography. — The life of Ovid was first treated systematically by J. Masson, Ovidii vita ordine chronologico digesta (1780) (often reprinted, e.g. in Burmann's edition). Modern literature on this subject will be found in Teuffel's History of Roman Literature (Eng. trans., ed. 2), § 247, and S. G. Owen's edition of Tristia, bk. i. The very numerous manuscripts of Ovid are chiefly of late date, 13th to 15th century. The earliest and best are: for the Heroides a Paris MS. of the 9th, a Wolfenbuttel MS. of the 12th and an Eton

5 The influence of Ovid on Shakespeare is shown conclusively by T. S. Baynes, Shakespeare Studies (1894), p. 195 ff.

fragmentary MS. of the I ith century (the Epistula Sapphus, found in no early MS., is best preserved in a 13th-century Frankfort, and a 15th-century Harleian MS.); for the Amoves, Ars amatoria, Remedia amorts, two Paris MSS. of the 9th and 10th century re- spectively; for the Medicamina formae a Florence MS. (Marcianus) of the nth; for the Metamorphoses two Florence MSS. (Marcianus and Laurentianus) and a Naples MS., all of the nth century; for the Fasti two Vatican MSS. of the 10th and nth century; for the Tristia a Florence MS. of the nth; for the Epistulae ex Ponto a fragmentary Wolfenbuttel MS. of the 6th and a Hamburg and two Munich MSS. of the 12th; for the Ibis a Trinity College, Cam- bridge. MS. of the 12th; for the Halieutica a Paris MS. of the 9th or 10th, and a Vienna MS. of the 9th century. Important for the text of the Heroides and Metamorphoses is the interesting paraphrase written in Greek by the monk Maximus Planudes in the latter half of the 13th century at Constantinople; that of the Heroides is printed in Palmer's edition of the Heroides (1898), that of the

Metamorphoses in Lemaire's edition of Ovid, vol. v., edited by Boissonade. See also Gudeman, De Heroidum Ovidii codice Planudeo (Berlin, 1888).

Two independent editiones principes of Ovid were published contemporaneously in 1471, one at Rome, printed by Sweynheym and Pannartz, and one at Bologna by Balthasar Azoguidius: these present entirely different texts. See Owen's Tristium libri, v. p. lv. ff. The following are the most important editions: those marked with an asterisk have explanatory notes. Of the whole works: "Heinsius-Burmann (1727); *Amar-Lemaire (1820-1824); Merkel- Ehwald (1874-1888); Riese (1871-1889); _ Postdate's Corpus poetarum Latinorum,by various editors (1894), "reprinted separately (1898). Of separate works: Amores, *Nemethy (1907); Heroides, Sedlmayer (critical) (1886); *Palmer (1898); Epistula Sapphus (separately), *De Vries (1888); Ars amatoria, *P. Brandt (1902); Medicamina formae (critical), Kunz (1881); Metamorphoses, *J. C. Jahn (1821); *Loers (1843); Korn (critical) (1880); *Magnus (1885); *Haupt-Ehwald (1898-1903); Fasti, *Gierig (1812); Merkel (1841) (critical, with learned prolegomena on the sources, the Roman calendar, &c); *Keightley (1848); *Paley (1854); *Peter (1889); Tristia, *Loers (1839); S. G. Owen (1889) (critical) *Bk. i. (1885), *Bk. iii. (1889); *Cocchia (1900); Epistulae ex Ponto, Korn (1868) (critical), Bk. i. Keene (1887); *Ellis (1881); Halieutica, *Birt, De Halieuttcis Ovidio poelaefalso adscriptis (1878). The following verse translations in English deserve mention: Amores, C. Marlowe (1600) (?); Heroides, Turbervile (1579); Saltonstall (1639); Sherburne (1639), various hands, preface by Dryden (3rd edition, 1683); Art of Love and Remedy of Love, Creed (1600); Dryden and others (1709); Metamorphoses, Golding (1567); Sandys (1626); Dryden and others (1717); King (1871); Fasti, Gower (1640); Rose (1866); Tristia, Saltonstall (1633); Catlin (1639); Churchyarde (1816); Epistles from Pontus, Saltonstal (1639) ; Jones (1658).

The special treatises on matters connected with Ovid are very numerous; a fairly complete list up to the time of publication is given in Owen's Tristia (critical edition), p. cviii. ff. ; in Teuffel's History of Roman Literature (trans. byjWarr)and in Schanz's Geschichte der rdmtschen Litteratur; and in the excellent critical digests of recent literature by Ehwald in the Jahresbericht uber die Fortschritte der classischen Altertumswissenschaft, xxxi. (1884) pp. 157 ff., lxxx. (1894) pp. 1, ff., cix. (1902) pp. 157 ff. The following deserve special mention. On the history of the text: Ehwald, Ad historiam carminum Ovidianorum symbolae (1889); Kritische Beitrage zu Ovids Epistulae ex Ponto (1896); Sedlmayer, Prolegomena ad Heroidas (1878);

Gruppe, Minos, pp. 441 ff. (on interpolations). On style: Ovid's diction in connexion with other writers, — A. Zingerle, Ovidius und sein Verhdltnis zu den Vorgangern (1869- 1871); Martial's Ovid-Studien (1877); W. Zingerle, Untersuchungen zur Echtheitsfrage der Heroiden Ovids (1878); W. Vollgraff, Nikander und Ovid (Groningen, 1909 foil.). Peculiarities of Ovid's style: van Iddekinge, De Ovidii Romani iuris peritia (1811); Washietl, De similitudinibus imaginibusque Ovidianis (1883); M'Crea, On Ovid's Use of Colour and Colour Terms (Classical studies in honour of H. Drisler) (1894). Metre: the structure of the Ovidian pentameter examined in, relation to the textual criticism, — Hilberg, Gesetze der Worlstellung im Pentameter des Ovid (1894) (fully reviewed by EJlis, Classical Review, ix. 157). Literary appreciation: Sellar, Roman Poets of the Augustan Age; Lafaye, Les Metamorphoses d'Ovid et leurs modeles grecs. Ovid's relation to works of art: Wunderer, Ovids Werke in ihrem Verhdltnis zur antiken Kunst (1 890-1 891); Engelmann, Bilder-Allas zu Ovid's Metamorphosen (1890). Cause of exile: the most interesting discussion is by Boissier in his V Op- position sous les Cesars. See also Nageotte, Ovide, sa vie, ses auvres (1872); Huber, Die Ursachen der Verbannung des Ovid (1888). Influence of Ovid upon Shakespeare: T. S. Baynes, Shakespeare Studies (1894), PP IQ 5 ff. ; Constable, Shakespeare's "Venus und Adonis " in Verhdltnis zu Ovid's Metamorphosen (1890). (S. G. O.)

OVIEDO, a maritime province of northern Spain, bounded on the N. by the Bay of Biscay, E. by Santander, S. by Leon and W. by Lugo. Pop. (1900) 627,069; area, 4205 sq. m. In popular speech Oviedo is often called by its ancient name of

Asturias, which only ceased to be the official title of the province in 1833, when the Spanish system of local government was reorganized. An account of the physical features, history and inhabitants of this region is given under Asturias (q.v.). Oviedo is rich in forests, coal, streams and waterfalls, which have largely contributed to its modern industrial development. The climate is generally mild, but overcharged with humidity, and in the higher regions the winters are protracted and severe. The broken character of the surface prevents anything like extensive agricultural industry, but abundant pasturage is found in the valleys. The wheat crop frequently fails. Rye succeeds better, and is often mixed with the maize which forms the principal food of all but the higher classes. Chestnuts — here, as elsewhere in Spain, an important article of diet — are very abundant on the hills, and the trees supply valuable timber. Apples are abundant, and cider forms the common drink of the people; but little attention is paid to vines. The horses of Oviedo rank among the best in Spain. Wild deer,

boars and bears were formerly common among the mountains; and the sea-coasts, as well as the streams, abound with fish, including salmon and lampreys, which are sent to the markets of Madrid. Large quantities of sardines and tunny are also cured and exported. Although no trace exists of the gold for which Asturias was celebrated under its Roman rulers, Oviedo possesses valuable coal measures, which are worked at Langreo, Mieres, Santo Firme, Siero and elsewhere. More than 1,400,000 tons of coal were produced in 1903, besides a considerable amount of iron, mercury and cinnabar. The copper mines near Aviles and Cangas de Onis, and the copper works which long supplied the fairs of Leon and Castile with kettles, pots and similar utensils, have lost their importance; but lead, magnesia, arsenic, cobalt, lapis lazuli, alum, antimony, jet, marble and rock-crystal are found in various parts of the province, while amber and coral are gathered along the coast. There are manufactures of fine textiles, coarse cloth and ribbons in Salas, Pilofia, Casas and Aviles; of paper in Pianton; of porcelain and glass in Gijon, Aviles and Pola de Surro; of arms in Oviedo and Trubia; while foundries and works for the manufacture of agricultural imple- ments, rails and pig-iron are numerous. An important highway is the 16th-century Camino real, or royal road, leading from Gijon to Leon and Madrid, which cost so much that the emperor Charles V. inquired if it were paved with silver. A railway from Madrid to Oviedo, Gijon and Aviles runs through some of the most difficult parts of the Cantabrian chain. There are also several branch railways, including numerous narrow-gauge lines. OVIEDO, an episcopal city and capital of the Spanish province . of Oviedo; 16 m. S. of the Bay of Biscay, on the river Nalon, and on the Leon-Gij6n Oviedo-Trubia and Oviedo-Infiesto railways. Pop. (1900) 48,103. Oviedo is built on a hill rising from a broad and picturesque valley, which is bounded on the north-west by the Sierra de Naranco. The four main streets of Oviedo, which meet in a central square called the Plaza Mayor or Plaza de la Constitucion, are the roads connecting Gij6n and Leon (north and south) and Santander and Grado (east and west). The streets are clean and well lighted; the projecting roofs of the houses give a characteristic effect, and some portions of the old Calle de la Plateria are highly picturesque. In the Plaza Mayor is the handsome Casa Consistorial or town hall dating from 1662; the Jesuit church of San Isidro (1578), and some ancient palaces of the Asturian nobility are architecturally interesting. The university was founded by Philip III. in 1604; connected with it are a fine library and physical and chemical museums. The Gothic cathedral, founded in 1388, occupies the site of a chapel founded in the 8th century, of which only the Camara Santa remains. The west front has a fine portico of ornamented arches between the two towers.

The interior contains some fine stained glass, but has been much disfigured with modern rococo additions. The Camara Santa (dating from 802) contains the famous area of Oviedo, an 11th-century Byzantine chest of cedar, overlaid with silver reliefs of scenes in the lives of Christ, the Virgin and the apostles. In it are preserved some highly sacred relics, two crosses dating from the 8th and 9th centuries

and other valuable pieces of gold and silver plate. The cathedral library has some curious old MSS., including a deed of gift made by Alphonso II. of Asturias in 81 2, and a collection of illuminated documents of the 1 2th century, called the Libro gdtico. On the Sierra de Naranco is the ancient Santa Maria de Naranco, originally built by Ramiro I. of Asturias in 850 as a palace, and afterwards turned into a church. Higher up the hill is San Miguel de Lino, also of the 9th century; and on the road to Gijon, about a mile outside the town, is the Santullano or church of St Julian, also of very early date. Few towns in Spain have better schools for primary and higher education, and there are a literary and scientific institute, a meteorological observatory, a school for teachers, a school of art, adult classes for artisans, an archaeological museum and several public libraries. Oviedo is the centre of a thriving trade in agricultural products; its other industries are marble-quarrying, and the manufacture of arms, cotton and woollen fabrics, iron goods, leather and matches.

Oviedo, founded in the reign of Fruela (762), became the fixed residence of the kings of the Asturias in the time of Alphonso II., and continued to be so until about 924, when the advancing reconquest of Spain from the Moors led them to remove their capital to Leon. From that date the history of the city was comparatively uneventful, until the Peninsular War, when it was twice plundered by the French — under Ney in 1809 and under Bonnet in 18 10.

OVIEDO Y VALDES, GONZALO FERNANDEZ DE (1478- 1557), Spanish historian, was born at Madrid in August 1478. Educated at the court of Ferdinand and Isabella, in his thirteenth year he became page to their son, the Infante Don John, was present at the siege of Granada, and there saw Columbus previous to his voyage to America. On the death of Prince John (4th of October 1497), Oviedo went to Italy, and there acted as secretary to Gonzalo Fernandez de Cordoba. In 1514 he was appointed supervisor of gold-smeltings at San Domingo, and on his return to Spain in 1523 was appointed historiographer of the Indies. He paid five more visits to America before his death, which took place at Valladolid in 1557.

Besides a romance of chivalry entitled Claribalte (1519) Oviedo wrote two extensive works of permanent value: La General y natural historia de las Indias and Las Quinquagenas de la nobleza de Espafla. The former work was first issued at Toledo (1526) in the form of a summary entitled La Natural hystoria de las Indias; the first part of La Historia general de las Indias appeared at Seville i n ‘535; but the complete work was not published till 1851-1855, when it was edited by J. A. de los Rios for the Spanish Academy of History. Though written in a diffuse style, it embodies a mass of curious information collected at first hand, and the incomplete Seville edition was widely read in the English and French versions

Eublished by Eden and Poleur respectively in 1555 and 1556. as Casas describes it as ” containing almost as many lies as pages,” and Oviedo undoubtedly puts the most favourable interpretation on the proceedings of his countrymen; but, apart from a patriotic bias which is too obvious to be misleading, his narrative is both trustworthy and interesting. In his Quinquagenas he indulges in much lively gossip concerning eminent contemporaries; this col- lection of quaint, moralizing anecdotes was first published at Madrid in 1880, under the editorship of Vicente de la Fuente.

OVOLO (adapted from Ital. uowlo, diminutive of novo, an egg; other foreign equivalents are Fr. ove, echine, quart de rond; Lat. echinus), in architecture, a convex moulding known also as the echinus, which in Classic architecture was invariably carved with the egg and tongue. In Roman and Italian work the moulding is called by workmen a quarter round. It must not be confounded with the echinus of the Greek Doric capital, as this was of a more varied form and of much larger dimensions than the ovolo, which was only a subordinate moulding.

OWATONNA, a city and the county-seat of Steele county, Minnesota, U.S.A., on the Straight river, in the S.E. part of the state, about 67 m. S. of Minneapolis and St Paul. Pop. (1900) 5561, of whom 1160 were foreign-born; (1905) 5651; (1910) 5658. It is served by the Chicago, Milwaukee & St Paul, the Chicago & North- Western, the Chicago, Rock Island & Pacific and the Minneapolis, Rochester & Dubuque (electric) railways. Four fine steel bridges span the river at or near the city. Among the Dublic buildings are a handsome county court-house, a city

hall, an armoury, a city hospital and a public library. Owatonna is the seat of the Pillsbury Academy (Baptist), the Sacred Heart Academy

(Roman Catholic) and the Canfield Commercial School, and immediately west of the city is the State Public School for Dependent and Neglected Children (1886). The city's commercial importance is largely due to its situation in a rich dairying and farming district, for which it is the shipping centre. It has also various manufactures. There are valuable mineral springs in the vicinity. The municipality owns and operates the water-works. Owatonna was settled about 1853, was in- corporated as a village in 1865, was chartered as a city in 1875 and received a new charter in 1909. Its name is a Sioux word meaning " straight," the river having been previously named Straight river.

0WE60, a village and the county-seat of Tioga county, New York, U.S.A., on the Owego Creek and on the N. side of the Susquehanna river, 21 m. W. of Binghamton. Pop. (1910, U.S. census) 4633. It is served by the Erie, the Lehigh Valley and the Delaware, Lackawanna & Western railways; a branch of the last connects with Ithaca, N.Y. Owego occupies the site of an Indian (probably Tuscarora) village named " Ah-wa-ga," which was destroyed by General James Clinton in 1779. The name, of which " Owego " is a corruption, is said to mean " where the valley widens." A white settlement and trading post were set up here in 1785, and the village of Owego was incorporated in 1827.

OWEN, SIR HUGH (1804-1881), Welsh educationist, was born near Talyfoel Ferry, Anglesey, on the 14th of January 1804. Educated at a private school at Carnarvon, he became clerk in 1825 to a barrister in London. In 1836 he entered the office of the Poor Law Commission, eventually becoming chief clerk of the Poor Law Board, and retiring in 1872 to devote himself exclusively to educational work. As early as 1839 he had become secretary for an association to start a National school in Islington, and in 1843 he had published A Letter to the Welsh People on the need of educational activity, which was widely read. Successful in arousing the interest of the British and Foreign School Society, he became in 1846 honorary secretary of its newly-formed branch, the Cambrian School Society. He was one of the founders of the Bangor Normal College, for the training of teachers, and qf the University College of Wales at Aberystwith, of which for many years he was honorary secretary and treasurer. He was for three years a member of the London School Board. His scheme for secondary education, formulated in 1 88 1, was almost wholly adopted after his death in the Welsh Intermediate Education Act of 1889. The revival of the Honour- able Cymrodoribn Society, the National Eisteddfod Association and the Social Science Section of the National Eisteddfod was due to Owen. He was knighted in recognition of his service to Welsh education in August 1881, but died at Mentone

on the 20th of November. A bronze statue was erected at Carnarvon in 1888 by public subscription.

OWEN, JOHN [Ovenus or Atjdoenus] (c. 1560-1622), Welsh epigrammatist, was born at Plas Dhu, Carnarvonshire, about 1 560. He was educated under Dr Bilson at Winchester School, and at New College, Oxford. He was a fellow of his college from 1584 to 1591, when he became a schoolmaster, first at Trelleck, near Monmouth, and then at Warwick, where he was master of the school endowed by Henry VIII. He became distinguished for his perfect mastery of the Latin language, and for the humour, felicity and point of his epigrams. The Continental scholars and wits of the day used to call him ” the British Martial.” He was a staunch Protestant besides, and could not resist the temptation of turning his wit against the Roman Catholic Church. This practice caused his book to be placed on the Index prohibitorius in 1654, and led a rich old uncle of the Roman Catholic com- munion to cut him out of his will. When the poet died in 1622, his countryman and relative, Bishop Williams of Lincoln, who is said to have supported him in his later years, erected a monu- ment to his memory in St Paul’s cathedral with a Latin epitaph.

Owen’s Epigrammala are divided into twelve books, of which the first four were published in 1606, and the rest at four different

times. Owen frequently adapts and alters to his own purpose the lines of his predecessors in Latin verse, and one such borrowing has become celebrated as a quotation, though few know where it is to be found. It is the first line of this epigram : —

” Tempora mutantur, nos et mutamur in illis: Quo modo? fit semper tempore pejor homo.”

(Lib. I. ad Edoardum Noel, epig. 58.) This first line is altered from an epigram by Matthew Borbonius, one of a series of mottoes for various emperors, this one being for Lothaire I.

” Omnia mutantur, nos et mutamur in illis: Ilia vices quasdam res habet, ilia vices.” There are editions of the Epigrammata by Elzevir and by Didot; the best is that edited by Renouard (2 vols., Paris, 1795). Transla- tions into English, either in whole or in part, were made by Vicars (1619); by Pecke, in his Parnassi Puerperium (1659); and by Harvey in 1677, which is the most complete. La Torre, the Spanish epigrammatist, owed much to Owen, and translated his works

into Spanish in 1674. French translations of the best of Owen's epigrams were published by A. L. Lebrun (1709) and by Kerivalant (1819).

OWEN, JOHN (1616-1683), English Nonconformist divine, was born at Stadham in Oxfordshire in 1616, and was educated at Queen's College, Oxford (B.A. 1632, M.A. 1635), noted, as Fuller tells us, tor its metaphysicians. A Puritan by training and conviction, in 1637 Owen was driven from Oxford by Laud's new statutes, and became chaplain and tutor in the family of Sir Robert Dormer and then in that of Lord Lovelace. At the outbreak of the civil troubles he sided with the parliament, and thus lost both his place and the prospects of succeeding to his Welsh royalist uncle's fortune. For a while he lived in Charter- house Yard, in great unsettlement of mind on religious questions, which was removed at length by a sermon preached by a stranger in Aldermanbury Chapel whither he had gone to hear Edmund Calamy. His first publication, The Display of Arminianism (1642), was a spirited defence of rigid Calvinism. It was dedi- cated to the committee of religion, and gained him the living of Fordham in Essex, from which a " scandalous minister " had been ejected. At Fordham he remained engrossed in the work of his parish and writing only The Duty of Pastors and People Distinguished until 1646, when, the old incumbent dying, the presentation lapsed to the patron, who gave it to some one else. He was now, however, coming into notice, for on the 29th of April he preached before the Long parliament. In this sermon, and still more in his Country Essay for the Practice of Church Government, which he appended to it, his tendency to break away from Presbyterianism to the more tolerant Independent or Congregational system is plainly seen. Like Milton he saw little to choose between " new presbyter " and " old priest," and disliked a rigid and arbitrary polity by whatever name it was called. He became pastor at Coggeshall in Essex, where a large influx of Flemish tradesmen provided a congenial Independent atmosphere. His adoption of Congregational principles did not effect his theological position, and in 1647 he again attacked the Arminians in The Death of Death in the Death of Christ, which drew him into long debate with Richard Baxter. He made the friendship of Fairfax while the latter was besieging Colchester, and urgently addressed the army there against religious persecu- tion. He was chosen to preach to parliament on the day after the execution of Charles, and succeeded in fulfilling his delicate task without directly mentioning that event. Another sermon preached on the 19th of April, a vigorous plea for sincerity of religion in high places, won not only the thanks of parliament but the friendship of Cromwell, who carried him off to Ireland as his chaplain,

that he might regulate the affairs of Trinity College. He pleaded with the House of Commons for the religious needs of Ireland as some years earlier he had pleaded for those of Wales. In 1650 he accompanied Cromwell on his Scottish campaign. In March 1651 Cromwell, as chancellor of Oxford, gave him the deanery of Christ Church, and made him vice-chancellor in September 1652; in both offices he succeeded the Presbyterian Edward Reynolds.

During his eight years of official Oxford life Owen showed himself a firm disciplinarian, and infused a new spirit of thorough- ness into dons and undergraduates alike, though, as John Locke testifies, the Aristotelian traditions in education suffered

no change. With Philip Nye he unmasked the popular astro- loger, William Lilly, and in spite of his share in condemning two Quakeresses to be whipped for disturbing the peace, his rule was not intolerant. 1 Anglican services were conducted here and there, and at Christ Church itself the Anglican chaplain remained in the college. While little encouragement was given to a spirit of free inquiry, 2 it is unhistorical to say that Puritanism at Oxford was simply ” an attempt to force education and culture into the leaden moulds of Calvinistic theology.” It must be remembered, too, that Owen, unlike many of his contemporaries, found his chief interest in the New Testament rather than the Old. During his Oxford years he wrote Justitia Divina (1653), an exposition of the dogma that God cannot forgive sin without an atonement; Communion with God (1657), which has been called a “piece of wire-drawn mysticism”; Doctrine of the Saints’ Perseverance (1654), his final attack on Arminianism; Vindiciae Evangelicae, a treatise written by order of the Council of State against Socinianism as expounded by John Bidle; On the Mortification of Sin in Believers (1656), an introspective and analytic work; Schism (1657), one of the most read- able of all his writings; Of Temptation (1658), an attempt to recall Puritanism to its cardinal spiritual attitude from the jarring anarchy of sectarianism and the pharisaism which had followed on popularity and threatened to destroy the early simplicity.

Besides all his academic and literary concerns Owen was continually in the midst of affairs of state. In 1651, on October 24 (after Worcester), he preached the thanksgiving sermon before parliament. In 1652 he sat on a council to consider the condition of Protestantism in Ireland. In October 1653 he was one of several ministers whom Cromwell summoned to a consultation as to church union. 3 In December the degree of D.D. was conferred upon him by his

university. In the parlia- ment of 1654 he sat, but only for a short time, as member for Oxford university, and, with Baxter, was placed on the committee for settling the ” fundamentals ” necessary for the toleration promised in the Instrument of Government. In the same year he was chairman of a committee on Scottish Church affairs. He was, too, one of the Triers, and appears to have behaved with kindness and moderation in that capacity. As vice- ichancellor he acted with readiness and spirit when a Royalist rising in Wiltshire broke out in 1655; his adherence to Cromwell, however, was by no means slavish, for he drew up, at the request of Desborough and Pride, a petition against his receiving the kingship. Thus, when Richard Cromwell succeeded his father as chancellor, Owen lost his vice-chancellorship. In 1658 he took a leading part in the conference of Independents which drew up the Savoy Declaration.

On the death of Cromwell Owen joined the Wallingford House party, and though he denied any share in the deposition of Richard Cromwell, he threw all his weight on the side of a simple republic as against a protectorate. He assisted in the restoration of the Rump parliament, and, when Monk began his march into England, Owen, in the name of the Independent churches, to whom Monk was supposed to belong, and who were keenly anxious as to his intentions, wrote to dissuade him from the enterprise.

In March 1660, the Presbyterian party being uppermost, Owen was further deprived of his deanery, which was given back to Reynolds. He retired to Stadham, where he wrote various controversial and theological works, in especial the laborious Theologoumena Pantodapa, a history of the rise and progress of theology. The respect in which many of the authorities held his intellectual eminence won him an immunity denied to other Nonconformists. In 1661 was published the celebrated Fiat Lux, a work by the Franciscan monk John

1 H. L. Thompson, Christ Church (” Oxford College Histories “) pp. 70 seq.

2 Owen made a very unhappy attack on Brian Walton’s Polyglot Bible.

- Owen probably drew up the scheme for a national church surrounded by bodies of tolerated dissent which was presented to parliament. See D. Masson, Milton, iv. 390, 566.

OWEN, SIR RICHARD

Vincent Cane, in which the oneness and beauty of Roman Catholicism are contrasted with the confusion and multiplicity of Protestant sects. At Clarendon's request Owen answered this in 1662 in his Animadversions; and so great was its success that he was offered preferment if he would conform. Owen's condition for making terms was liberty to all who agree in doctrine with the Church of England; nothing therefore came of the negotiation.

In 1663 he was invited by the Congregational churches in Boston, New England, to become their minister, but declined. The Conventicle and Five Mile Acts drove him to London; and in 1666, after the Fire, he, like other leading Nonconformist ministers, fitted up a room for public service and gathered a congregation, composed chiefly of the old Commonwealth officers. Meanwhile he was incessantly writing; and in 1667 he published his Catechism, which led to a proposal, " more acute than diplomatic," from Baxter for union. Various papers passed, and after a year the attempt was closed by the following laconical note from Owen: " I am still a well-wisher to these mathematics." It was now, too, that he published the first part of his vast work upon the Epistle to the Hebrews, together with his exposition of Psalm 130 and his searching book on Indwelling Sin.

In 1669 Owen wrote a spirited remonstrance to the Congregationalists in New England, who, under the influence of Presbyterianism, had shown themselves persecutors. At home, too, he was busy in the same cause. In 1670 Samuel Parker's Ecclesiastical Polity attacked the Nonconformists in a style of clumsy intolerance. Owen answered him (Truth and Innocence Vindicated); Parker replied with personalities as to Owen's connexion with Wallingford House. Then Andrew Marvell with banter and satire finally disposed of Parker in The Rehearsal Transposed. Owen himself produced a tract On the Trinity (1669), and Christian Love and Peace (1672).

At the revival of the Conventicle Acts in 1670, Owen was appointed to draw up a paper of reasons which was submitted to the House of Lords in protest. In this or the following year Harvard College invited him to become its president; he received similar invitations from some of the Dutch uni- versities.

When Charles issued his Declaration of Indulgence in 1672, Owen drew up an address of thanks. This indulgence gave the dissenters an opportunity for increasing their churches and services, and Owen was one of the first preachers at the weekly lectures which the

Independents and Presbyterians jointly held at Princes' Hall in Broad Street. He was held in high respect by a large number of the nobility (one of the many things which point to the fact that Congregationalism was by no means the creed of the poor and insignificant), and during 1674 both Charles and James held prolonged conversations with him in which they assured him of their good wishes to the dissenters. Charles gave him 1000 guineas to relieve those upon whom the severe laws had chiefly pressed, and he was even able to procure the release of John Bunyan, whose preaching he ardently admired. In 1674 Owen was attacked by William Sherlock, dean of St Paul's, whom he easily vanquished, and from this time until 1680 he was engaged upon his ministry and the writing of religious works. The chief of these were On Apostasy (1676), a sad account of religion under the Restoration; On the Holy Spirit (1677-1678) and The Doctrine of Justification (1677). In 1680, however, Stillingfleet having on May 11 preached his sermon on " The Mischief of Separation," Owen defended the Nonconformists from the charge of schism in his Brief Vindica- tion. Baxter and Howe also answered Stillingfleet, who replied in The Unreasonableness of Separation. Owen again answered this, and then left the controversy to a swarm of eager com- batants. From this time to his death he was occupied with continual writing, disturbed only by suffering from stone and asthma, and by an absurd charge of being concerned in the Rye House Plot. His most important work was his Treatise on Evangelical Churches, in which were contained his latest views regarding church government. He died at Ealing on the 24th

of August 1683, just twenty-one years after he had gone out with so many others on St Bartholomew's day in 1662, and was buried on the 4th of September in Bunhill Fields.

For engraved portraits of Owen see first edition of S. Palmer's Nonconformists' Memorial and Vertue's Sermons and Tracts (1721). The chief authorities for the life are Owen's Works; W. Orme's Memoirs of Owen; A. Wood's Alhenae Oxonienses; R. Baxter's Life; D. Neal's History of the Puritans; T. Edwards's Gangraena; and the various histories of the Independents. See also The Golden Book of John Owen, a collection of extracts prefaced by a study of his life and age, by James Moffatt (London, 1904).

OWEN, SIR RICHARD (1804-1892), English biologist, was born at Lancaster on the 20th of July 1804, and received his early education at the grammar school of that town. In 1820 he was apprenticed to a local surgeon and apothecary, and in 1824 he proceeded as a medical student to the university of Edinburgh. He left the university in the

following year, and completed his medical course in St Bartholomew's Hospital, London, where he came under the influence of the eminent surgeon, John Abernethy. He then contemplated the usual professional career; but his bent was evidently in the direction of anatomical research, and he was induced by Abernethy to accept the position of assistant to William Clift, conservator of the museum of the Royal College of Surgeons. This congenial occupation soon led him to abandon his intention of medical practice, and his life henceforth was devoted to purely scientific labours. He prepared an important series of catalogues of the Hunterian collection in the Royal College of Surgeons; and in the course of this work he acquired the unrivalled knowledge of comparative anatomy which enabled him to enrich all depart- ments of the science, and specially facilitated his researches on the remains of extinct animals. In 1836 he was appointed Hunterian professor in the Royal College of Surgeons, and in 1849 he succeeded Clift as conservator. He held the latter office until 1856, when he became superintendent of the natural history department of the British Museum. He then devoted much of his energies to a great scheme for a National Museum of Natural History, which eventually resulted in the removal of the natural history collections of the British Museum to a new building at South Kensington, the British Museum (Natural History). He retained office until the completion of this work in 1884, when he received the distinction of K.C.B., and thenceforward lived quietly in retirement at Sheen Lodge, Richmond Park, until his death on the 18th of December

1892.

While occupied with the cataloguing of the Hunterian collection, Owen did not confine his attention to the preparations before him, but also seized every opportunity of dissecting fresh subjects. He was especially favoured with the privilege of investigating the animals which died in the Zoological Society's gardens; and when that society began to publish scientific proceedings in 1 83 1, he was the most voluminous contributor of anatomical papers. His first notable publication, however, was his Memoir on the Pearly Nautilus (London, 1832), which was soon recognized as a classic. Henceforth he continued to make important contributions to every department of comparative anatomy and zoology for a period of over fifty years. In the sponges Owen was the first to describe the now well-known " Venus's flower basket " or Euplectella (1841, 1857). Among Entozoa his most noteworthy discovery was that of Trichina spiralis (1835), the parasite infesting the muscles of man in the disease now termed trichinosis (see also, however, the article on Paget, Sir James). Of Brachiopoda he made very special studies, which much advanced

knowledge and settled the classification which has long been adopted. Among Mollusca, he not only described the pearly nautilus, but also Spirula (1850) and other Cephalo- poda, both living and extinct; and it was he who proposed the universally-accepted subdivision of this class into the two orders of Dibranchiata and Tetrabranchiata (1832). The problematical Arthropod Limulus was also the subject of a special memoir by him in 1873.

Owen's technical descriptions of the Vertebrata were still more numerous and extensive than those of the invertebrate

animals. His Comparative Anatomy and Physiology of Verte- brates (3 vols., London, 1866-1868) was indeed the result of more personal research than any similar work since Cuvier's Lecons d'anatomie comparee. He not only studied existing forms, but also devoted great attention to the remains of extinct groups, and immediately followed Cuvier as a pioneer in verte- brate palaeontology. Early in his career he made exhaustive studies of teeth, both of existing and extinct animals, and pub- lished his profusely illustrated work on Odontography (1840- 184 5) . He discovered and described the remarkably complex structure of the teeth of the extinct animals which he named Labyrintho- donts. Among his writings on fishes, his memoir on the African mud-fish, which he named Protopterus, laid the foundations for the recognition of the Dipnoi by Johannes Muller. He also pointed out later the serial connexion between the teleostean and ganoid fishes, grouping them in one sub-class, the Teleostomi. Most of his work on reptiles related to the skeletons of extinct forms, and his chief memoirs on British specimens were reprinted in a connected series in his History of British Fossil Reptiles (4 vols., London, 1840-1884). He published the first important general account of the great group of Mesozoic land-reptiles, to which he gave the now familiar name of Dinosauria. He also first recognized the curious early Mesozoic land-reptiles, with affinities both to amphibians and mammals, which he termed Anomodontia. Most of these were obtained from South Africa, beginning in 1845 (Dicynodon), and eventually furnished materials fcr his Catalogue of the Fossil Reptilia of South Africa, issued by the British Museum in 1876. Among his writings on birds, his classical memoir on the Apteryx (1840- 1846), a long series of papers on the extinct Dinornithidae of New Zealand, other memoirs on Aplornis, Notornis, the dodo, and the great auk, may be specially mentioned. His monograph on Archaeopteryx

(1863), the long-tailed, toothed bird from the Bavarian lithographic stone, is also an epoch-making work. With regard to living mammals, the more striking of Owen's contributions relate to the monotremes, marsupials, and the anthropoid apes. He was also the first to recognize and name the two natural groups of typical Ungulata, the odd-toed (Perissodactyla) and the even-toed (Artiodactyla), while describ- ing some fossil remains in 1848. Most of his writings on mammals, however, deal with extinct forms, to which his attention seems to have been first directed by the remarkable fossils collected by Darwin in South America. Toxodon, from the pampas, was then described, and gave the earliest clear evidence of an extinct generalized hoof animal, a " pachyderm with affinities to the Rodentia, Edentata, and Herbivorous Cetacea." Owen's interest in South American extinct mammals then led to the recognition of the giant armadillo, which he named Glyptodon (1839), and to classic memoirs on the giant ground-sloths, Mylodon (1842) and Megatherium (i860), besides other important contributions. At the same time Sir Thomas Mitchell's dis- covery of fossil bones in New South Wales provided material for the first of Owen's long series of papers on the extinct mammals of Australia, which were eventually reprinted in book-form in 1877. He discovered Diprotodon and Thylacoleo, besides extinct kangaroos and wombats of gigantic size. While occupied with so much material from abroad, Owen was also busily collecting facts for an exhaustive work on similar fossils from the British Isles, and in 1 844-1 846 he published his History of British Fossil Mammals and Birds, which was followed by many later memoirs, notably his Monograph of the Fossil Mammalia of the Mesozoic Formations (Palaeont. Soc, 1871). One of his latest publications was a little work entitled Antiquity of Man as deduced from the Discovery of a Human Skeleton during Excavations of the Docks at Tilbury (London, 1884).

Owen's detailed memoirs and descriptions require laborious attention in reading, on account of their nomenclature and ambiguous modes of expression; and the circumstance that very little of his terminology has found universal favour causes them to be more generally neglected than they otherwise would be. At the same time it must be remembered that he was a pioneer in concise anatomical nomenclature; and, so far

at least as the vertebrate skeleton is concerned, his terms were based on a carefully reasoned philosophical scheme, which first clearly distinguished between the now familiar phenomena of " analogy " and " homology." Owen's theory of the Arche- type and Homologies of the Vertebrate Skeleton (1848), subsequently illustrated also by his little work On the Nature of Limbs (1849), regarded the vertebrate frame as

consisting of a series of funda- mentally identical segments, each modified according to its position and functions. Much of it was fanciful, and failed when tested by the facts of embryology, which Owen systematically ignored throughout his work. However, though an imperfect and distorted view of certain great truths, it possessed a distinct value at the time of its conception. To the discussion of the deeper problems of biological philosophy he made scarcely any direct and definite contributions. His generalities rarely extended beyond strict comparative anatomy, the phenomena of adaptation to function, and the facts of geographical or geological distribution. His lecture on ” virgin reproduction ” or parthenogenesis, however, published in 1849, contained the essence of the theory of the germ-plasm elaborated later by August Weismann; and be made several vague statements concerning the geological succession of genera and species of animals and their possible derivation one from another. He referred especially to the changes exhibited by the successive forerunners of the crocodiles (1884) and horses (1868); but it has never become clear how much of the modern doctrines of organic evolution he admitted. He contented himself with the bare remark that ” the inductive demonstration of the nature and mode of operation ” of the laws governing life would ” henceforth be the great aim of the philosophical naturalist.”

See The Life of Richard Owen, by his grandson, Rev. Richard Owen (2 vols., London, 1894). (A. S. Wo.)

OWEN, ROBERT (1771-1858), English social reformer, was born at Newtown, Montgomeryshire, in North Wales, on the 14th of May 1771. His father had a small business in Newtown as saddler and ironmonger, and there young Owen received all his school education, which terminated at the age of nine. After serving in a draper’s shop for some years he settled in Manchester. His success was very rapid. When only nineteen years of age he became manager of a cotton mill in which five hundred people were employed, and by his administrative intelligence and energy soon made it one of the best establishments of the kind in Great Britain. In this factory Owen used the first bags of American sea-island cotton ever imported into the country; it was the first sea-island cotton from the Southern States. Owen also made remarkable improvement in the quality of the cotton spun; and indeed there is no reason to doubt that at this early age he was the first cotton-spinner in England, a position entirely due to his own capacity and knowledge of the trade. In 1794 or 179S he became manager and one of ths partners of the Chorlton Twist Company at Manchester. During a visit to Glasgow he had fallen in love with the daughter of the proprietor of the New Lanark mills, David Dale. Owen

induced his partners to purchase New Lanark; and after his marriage with Miss Dale he settled there, as manager and part owner of the mills (1800). Encouraged by his great success in the management of cotton factories in Manchester, he had already formed the intention of conducting New Lanark on higher principles than the current commercial ones.

The factory of New Lanark had been started in 1784 by Dale and Arkwright, the water-power afforded by the falls of the Clyde being the great attraction. Connected with the mills were about two thousand people, five hundred of whom were children, brought, most of them, at the age of five or six from the poor- houses and charities of Edinburgh and Glasgow. The children especially had been well treated by Dale, but the general condition of the people was very unsatisfactory. Many of them were the lowest of the population, the respectable country people refusing to submit to the long hours and demoralizing drudgery of the factories; theft, drunkenness, and other vices were common; education and sanitation were alike neglected; most families

lived only in one room. It was this population, thus committed to his care, which Owen now set himself to elevate and ameliorate. He greatly improved their houses, and by the unsparing and benevolent exertion of his personal influence trained them to habits of order, cleanliness and thrift. He opened a store, where the people could buy goods of the soundest quality at little more than cost price; and the sale of drink was placed under the strictest supervision. His greatest success, however, was in the education of the young, to which he devoted special attention. He was the founder of infant schools in Great Britain; and, though he was anticipated by reformers on the continent of Europe, he seems to have been led to institute them by his own views of what education ought to be, and without hint from abroad. In all these plans Owen obtained the most gratifying success. Though at first regarded with suspicion as a stranger, he soon won the confidence of his people. The mills continued to be a great commercial success, but it is needless to say that some of Owen’s schemes involved considerable expense, which was displeasing to his partners. Tired at last of the restrictions imposed on him by men who wished to conduct the business on the ordinary principles, Owen formed a new firm, who, content with 5 % of return for their capital, were ready to give freer scope to his philanthropy (1813). In this firm Jeremy Bentham

and the well-known Quaker, William Allen, were partners. In the same year Owen first appeared as an author of essays, in which he expounded the principles on which his system of educational philanthropy was based. From an early age he had lost all belief in the prevailing forms of religion, and had thought out a creed for himself, which he considered an entirely new and original discovery. The chief points in this philosophy were that man's character is made not by him but for him; that it has been formed by circumstances over which he had no control ; that he is not a proper subject either of praise or blame, — these principles leading up to the practical conclusion that the great secret in the right formation of man's character is to place him under the proper influences — physical, moral and social— from his earliest years. These principles — of the irresponsibility of man and of the effect of early influences — are the keynote of Owen's whole system of education and social amelioration. As we have said, they are embodied in his first work, A New View of Society, or Essays on the Principle of the Formation of the Human Character, the first of these essays (there are four in all) being published in 18 13. It is needless to say that Owen's new views theoretically belong to a very old system of philosophy, and that his originality is to be found only in his benevolent application of them. For the next few years Owen's work at New Lanark continued to have a national and even a European significance. His schemes for the education of his workpeople attained to something like completion on the opening of the institution at New Lanark in 1816. He was a zealous supporter of the factory legislation resulting in the act of 1810, which, however, greatly disappointed him. He had interviews and communications with the leading members of government, including the premier, Lord Liverpool, and with many of the rulers and leading statesmen of Europe. New Lanark itself became a much-frequented place of pilgrimage for social reformers, statesmen, and royal personages, including Nicholas, afterwards emperor of Russia. According to the unanimous testimony of all who visited it, the results achieved by Owen were singularly good. The manners of the children, brought up under his system, were beautifully graceful, genial and unconstrained; health, plenty, and contentment prevailed; drunkenness was almost unknown, and illegitimacy was extremely rare. The most perfect good feeling subsisted between Owen and his workpeople, and all the operations of the mill proceeded with the utmost smoothness and regularity; and the business was a great commercial success.

Hitherto Owen's work had been that of a philanthropist, whose great distinction was the originality and unwearying unselfishness of his methods. His first departure in socialism took place in 181 7, and was

embodied in a report communicated to the committee of the House of Commons on the poor law.

The general misery and stagnation of trade consequent on the termination of the great war was engrossing the attention of the country. After clearly tracing the special causes connected with the war which had led to such a deplorable state of things, Owen pointed out that the permanent cause of distress was to be found in the competition of human labour with machinery, and that the only effective remedy was the united action of men, and the subordination of machinery. His proposals for the treatment of pauperism were based on these principles. He recommended that communities of about twelve hundred persons each should be settled on quantities of land from 1000 to 1500 acres, all living in one large building in the form of a square, with public kitchen and mess-rooms. Each family should have its own private apart- ments, and the entire care of the children till the age of three, after which they should be brought up by the community, their parents having access to them at meals and all other proper times. These communities might be established by individuals, by parishes, by counties, or by the state; in every case there should be effective supervision- by duly qualified persons. Work, and the enjoyment of its results, should be in common. The size of his community was no doubt partly suggested by his village of New Lanark; and he soon proceeded to advocate such a scheme as the best form for the reorganization of society in general. In its fully developed form — and it cannot be said to have changed much during Owen's lifetime — it was as follows. He considered an association of from 500 to 3000 as the fit number for a good working community. While mainly agricultural, it should possess all the best machinery, should offer every variety of employment, and should, as far as possible, be self-contained. " As these townships," as he also called them, " should increase in number, unions of them federatively united shall be formed in circles of tens, hundreds and thousands," till they should embrace the whole world in a common interest.

His plans for the cure of pauperism were received with great favour. The Times and the Morning Post and many of the lead- ing men of the country countenanced them; one of his most steadfast friends was the duke of Kent, father of Queen Victoria. He had indeed gained the ear of the country, and had the prospect before him of a great career as a social reformer, when he went out of his way at a large meeting in London to declare his hostility to all the received forms of religion. After this defiance to the religious sentiment of the country, Owen's theories were in the popular mind associated with infidelity, and were hencefor- ward suspected and discredited. Owen's own confidence,

however, remained unshaken; and he was anxious that his scheme for establishing a community should be tested. At last, in 1825, such an experiment was attempted under the direction of his disciple, Abram Combe, at Orbiston near Glasgow; and in the next year Owen himself commenced another at New Harmony (q.v.), Indiana, U.S. A. After a trial of about two years both failed completely. Neither of them was a pauper experi- ment; but it must be said that the members were of the most motley description, many worthy people of the highest aims being mixed with vagrants, adventurers, and crotchety, wrong- headed enthusiasts. After a long period of friction with William Allen and some of his other partners, Owen resigned all connexion with New Lanark in 1828. On his return from America he made London the centre of his activity. Most of his means having been sunk in the New Harmony experiment, he was no longer a flourishing capitalist, but the head of a vigorous propaganda, in which socialism and secularism were combined. One of the most interesting features of the movement at this period was the establishment in 1832 of an equitable labour exchange system, in which exchange was effected by means of labour notes, the usual means of exchange and the usual middlemen being alike superseded. The word ” socialism ” first became current in the discussions of the Association of all Classes of all Nations, formed by Owen in 1835. During these years also his secularistic teaching gained such influence among the working classes as to give occasion for the statement in the Westminster Review (1839) that his principles were the actual creed of a great portion of them. His views on marriage, which were certainly lax, gave

just ground for offence. At this period some more communistic experiments were made, of which the most important were that at Ralahine, in the county of Clare, Ireland, and that at Tytherly in Hampshire. It is admitted that the former (183 1) was a remarkable success for three and a half years, till the proprietor, having ruined himself by gambling, was obliged to sell out. Tytherly, begun in 1839, was an absolute failure. By 1846 the only permanent result of Owen’s agitation, so zealously carried on by public meetings, pamphlets, periodicals, and occasional treatises, was the co-operative movement, and for the time even that seemed to have utterly collapsed. In his later years Owen became a firm believer in spiritualism. He died at his native town on the 17th of November 1858.

r Owen left four sons, Robert Dale, William, David Dale and Richard,

all of whom became citizens of the United States. Robert Dale Owen, the eldest (1801-1877), was for long an able exponent in his adopted country of his father's doctrines. In 1836-39 and 1851-52 he was a member of the Indiana House of Representatives and in 1844-47 was a Representative in Congress, where he drafted the bill for the founding of the Smithsonian Insti- tution. He was elected a member of the Indiana Constitutional Convention in 1850, and was instrumental in securing to widows and married women control of their property, and the adoption of a common free school system. He later succeeded in passing a state law giving greater freedom in divorce. From 1853 to 1858 he was United States minister at Naples. He was a strong believer in spiritualism and was the author of two well-known books on the subject: Footfalls on the Boundary of Another World (1859) and The Dcbateable Land Between this World and the Next (1872). Owen's third son, David Dale Owen (1807-1860), was in 1839 appointed a United States geologist, and made exten- sive surveys of the north-west, which were published by order of Congress. The youngest son, Richard Owen (1810-1890), was a professor of natural science in Nashville University.

Of R. Owen's numerous works in exposition ol ms system, the most important are the New View of Society; the Report communi- cated to the Committee on the Poor Law ; the Book of the New Moral World ; and Revolution in the Mind and Practice of the Human Race. See Life of Robert Owen written by himself (London, 1857), and Threading my Way, Twenty-seven Years of Autobiography, by Robert Dale Owen (London, 1874). There are also Lives of Owen by A. J. Booth (London, 1869), W. L. Sargant (London, i860), Lloyd Jones (London, 1889), F. A. Packard (Philadelphia, 1866) and F. Podmore (London, 1906). See also H. Simon, Robert Owen: sein Leben und seine Bedeutung fiir die Gegenwart (Jena, 1905) ; E. Dolleans, Robert Owen (Paris, 1905) ; G. J. Holyoake, History of Co-operation in England (London, 1906) ; and the article Com- munism.

OWENS, JOHN (1790-1846), English merchant, was born at Manchester in 1790, the son of a prosperous merchant. Early in life he became a partner in his father's business and was soon noted for his ability as a cotton buyer. His business prospered, and the firm traded with China, India, South America and the United States, dealing in many other commodities. His large fortune he suggested leaving to his friend and partner George Faulkner (1790-1860), already a rich man. But by the latter's advice he bequeathed it to trustees for the foundation of a college (Owens College, Manchester, opened 1851, now part of Victoria University), based upon his own ideas of education. He died in Manchester on the 29th of July 1846. His

bequests to friends and charities amounted to some £52,000, while for the college he left £96,654. Among the conditions for its foundation the most important was that which discountenanced any sort of religious test for students or teachers.

OWENS BORO, a city and the county-seat of Daviess county, Kentucky, U.S.A., on the Ohio river, 112 m. by rail W.S.W. of Louisville. Pop. (1890) 9837; (1900) 13,189, of whom 3061 were negroes; (1910 census) 16,011. The city is served by the Illinois Central, the Louisville & Nashville, and the Louisville, Henderson & St Louis railways, and by steamboat lines to river ports. At Owensboro are the Owensboro College for women (non- sect.), opened in 1890, Saint Francis Academy, and a Roman Catholic school for boys. Two miles S. of the city is Hickman Park (20 acres), a pleasure resori, and E. of the city is a summer

Chautauqua park. Owensboro is situated in a good agricultural region; coal, iron, building stone, clay, oil, lead and zinc abound in the vicinity; and the city has a notably large trade in tobacco (especially strip tobacco) and has various manufactures. The value of the city's factory products increased from $1,740,128 in 1900 to $4,187,700 in 1905, or 140-6%. The municipality owns and operates its electric-lighting plant and water-works. Owensboro was settled about 1798, and for several years was commonly known as Yellow Banks; in 1816 it was laid out as a town and named Rossborough, and two years later the present name was adopted in honour of Colonel Abraham Owen (1760- 1811), a Virginian who removed to Kentucky in 1785, served in several Indian campaigns, and was killed in the battle of Tippe-canoe. Owensboro was incorporated as a city in 1866.

OWEN SOUND, a town and port of entry in Ontario, Canada, and capital of Grey county, situated 99 m. N.W. of Toronto, on Georgian Bay. Pop. (1901) 8776. It is the terminus of branches of the Canadian Pacific and Grand Trunk railways, and of the Canadian Pacific and other steamship lines plying to ports on Lakes Huron and Superior. Its harbour is one of the best on Lake Huron, and navigable by lake vessels of the largest size. It is a flourishing town, containing shipbuilding yards, and manufactories of mill machinery, agricultural implements, furniture and sewing-machines, flour-mills, saw-miils and large grain elevators.

OWL (O. Eng. tie, Swed. Uggla, Ger. Eule—all allied to Lat. Ulula, and evidently of imitative origin), the general English name for every nocturnal bird of prey, of which group nearly two hundred species have been recognized. The owls form a very natural assemblage, and

one about the limits of which no doubt has for a long while existed. They were formerly placed with the Accipitres or diurnal birds of prey, but are now known to belong to a different group of birds, and are placed as a suborder Striges of Coraciiform birds, their nearest allies being the goatsuckers. The subdivision of the group has always been a fruitful matter of discussion, owing to the great resemblance obtaining among all its members, and the existence of safe characters for its division has only lately been at all generally recognized. By the older naturalists, it is true, owls were divided, as was first done by F. Willughby, into two sections — one in which all the species exhibit tufts of feathers on the head, the so-called ” ears ” or ” horns, ” and the second in which the head is not tufted. The artificial and therefore untrustworthy nature of this distinction was shown by Isidore Geoffroy St-Hilaire {Ann. Sc. Nalurelles, xxi. 194-203) in 1830. The later work of C. L. Nitzch on pterylography and of A. Milne-Edwards on osteology has led to a division of the family Strigidae into the sub-families Striginae, in which the unnotched sternum has its broad keel joined to the furcula, and Buboninae, in which the sternum is notched posteriorly, the clavicles do not always meet to form a furcula, nor meet the sternum. The Striginae contain the screech- or barn-owls (Strix) and the partly intermediate Heliodilus of Madagascar, whilst all the other genera are now placed with the Buboninae.

Among owls are found birds which vary in length from 5 in. — as Glaucidium cobanense, which is therefore much smaller than a skylark — to more than 2 ft., a size that is attained by many species. Their plumage, none of the feathers of which possesses an aftershaft, is of the softest kind, rendering their flight almost noiseless. But one of the most characteristic features of this whole group is the ruff, consisting of several rows of small and much curved feathers with stiff shafts — originating from a fold of the skin, which begins on each side of the base of the beak, runs above the eyes, and passing downwards round and behind the ears turns forward, and ends at the chin — and serving to support the longer feathers of the ” disk ” or space immediately around the eyes, which extend over it. A considerable number of species of owls, belonging to various genera, and natives of countries most widely separated, are remarkable for exhibiting two phases of coloration- — one in which the prevalent browns have a more or less rusty-red tinge, and the other in which they incline to grey. Another characteristic of

owls is the reversible property of their outer toes, which are when perching quite backwards. Many forms have the legs and toes thickly clothed to the very claws ; others have the toes, and even the tarsi, bare, or only sparsely beset by bristles. Among the bare-legged owls those of the Indian Ketupa are conspicuous, and this feature is usually correlated with their fish-catching habits; but certainly other owls that are not known to catch fish present much the same character.

Among the multitude of owls there is only room here to make further mention of a few of the more interesting. First must be noticed the tawny owl — the Strix stridula of Linnaeus, the type, as has been above said, of the whole group, and especially of the Strigine section as here understood. This is the Syrnium aluco of some authors, the chat-huant of the French, the species whose tremulous hooting ” tu-whit, to-who,” has been celebrated by Shakespeare, and, as well as the plaintive ‘call, ” keewick,” of the young after leaving the nest, will be familiar sounds to many readers, for the bird is very generally distributed throughout most parts of Europe, extending its range through Asia Minor to Palestine, and also to Barbaiy — but not belonging to the Ethiopian Region or to the eastern half of the Palaearctic. It

Strix occidentalis..

is the largest of the species indigenous to Britain, and is strictly a woodland bird, only occasionally choosing any other place for its nest than a hollow tree. Its food consists almost entirely of small mammals, chiefly rodents; but, though on this account most deserving of protection from all classes, it is subject to the stupid persecution of the ignorant, and is rapidly declining in numbers. 1 Its nearest allies in North America are the S. nebulosa, with some kindred forms, one of which, the S. occidentalis of California and Arizona, is figured above; but none of them seem to have the ” merry note ” that is uttered by the European species. Common to the most northerly forest-tracts of both continents (for* though a slight difference of coloration is observable between American examples and those from the Old World, it is impossible to consider it specific) is the much larger S. cinerea or 5. lapponica, whose iron-grey plumage, delicately mottled with dark brown, and the concentric circles of its facial disks make it one of the most remarkable of the group. Then may be noticed the genus Bubo — containing several species 1 All owls have the habit of casting up the indigestible parts of the food swallowed in the form of pellets, which may often be found in abundance under the owl-roost, and reveal without any manner of doubt what the prey of the birds has been. The result in nearly every case shows the enormous service they

render to man in destroy- ing rats and mice. Details of many observations to this effect are recorded in the Bericht iiber die XIV. Versammlung der Deutschen Ornithologen-Gesellschaft (pp. 30-34).

which from their size are usually known as eagle-owls. Here the Nearctic and Palaearctic forms are sufficiently distinct — the latter, B. ignavus," 1 the due or grand due of the French, ranging over the whole of Europe and Asia north of the Himalayas, while the former, B. virginianus, extends over the whole of North America. A contrast to the generally sombre colour of these birds is shown by the snowy owl, Nyctea scandiaca, a circumpolar species, and the only one of its genus, which disdains the shelter of forests and braves the most rigorous arctic climate, though compelled to migrate southward in winter when no sustenance is left for it. Its large size and white plumage, more or less mottled with black, distinguish this from every other owl. Then may be mentioned the birds commonly known in English as " horned " owls — the hibous of the French, belonging to the genus Asio. One, A. otus (the Otus vulgaris of some authors), inhabits woods, and, distinguished by its long tufts, usually borne erected, would seem to be common to both America and Europe — though experts profess their ability to distinguish between examples from each country. Another species, A. accipitrinus (the Otus br achy otus of many authors), has much shorter tufts on its head, and they are frequently carried depressed so as to escape observation. This is the " woodcock-owl " of English sportsmen, for, though a good many are bred in Great Britain, the majority arrive in autumn from Scandinavia, just about the time that the immigration of woodcocks occurs. This species frequents heaths, moors and the open country generally, to the exclusion of woods, and has an enormous geographical range, including not only all Europe, North Africa and northern Asia, but the whole of America — reaching also to the Falklands, the Galapagos and the Sandwich Islands — for the attempt to separate specifically examples from those localities only shows that they possess more or less well-defined local races. Commonly placed near Asio, but whether really akin to it cannot be stated, is the genus Scops, of which nearly forty species, coming from different parts of the world, have been described; but this number should probably be reduced by one half. The type of the genus S. giu, the petit due of the French, is a well-known bird in the south of Europe, about as big as a thrush, with very delicately pencilled plumage, occasionally visiting Britain, emigrating in autumn across the Mediterranean, and ranging very far to the eastward. Farther southward, both in Asia and Africa, it is represented by other species of very similar size, and in the eastern part of North America by S. asio, of which there is a tolerably distinct western form,

S. kennicotti, besides several local races. 5. asio is one of the owls that especially exhibits the dimorphism of coloration above mentioned, and it was long before the true state of the case was understood. At first the two forms were thought to be distinct, and then for some time the belief obtained that the ruddy birds were the young of the greyer form which was called S. naevia; but now the ” red owl ” and the ” mottled owl ” of the older American ornithologists are known to be one species. 3 One of the most remarkable of American owls is Speotyto cunicularia, the bird that in the northern part of the continent inhabits the burrows of the prairie dog, and in the southern those of the biscacha, where the latter occurs — making holes for itself, says Darwin, where that is not the case— rattle- snakes being often also joint tenants of the same abodes. The odd association of these animals, interesting as it is, cannot here be more than noticed, for a few words must be said, ere we leave the owls of this section, on the species which has associations of a very different kind — the bird of Pallas Athene, the emblem of the city to which science and art were so welcome. There can be no doubt, from the many representations on coins and sculptures, as to their subject being the Carine noctua of modern ornithologists, but those who know the grotesque actions and ludicrous expression of this veritable buffoon of birds can never

2 This species bears confinement very well, and propagates freely therein. To it belong the historic owls of Arundel Castle.

3 See the remarks of Mr Ridgway in the work before quoted (B. N. America, iii. ,9, 10), where also response is made to the observations of Mr Allen in the Harvard Bulletin (ii. 338, 339).

Fig. 2.-

-Strix flammea.

cease to wonder at its having been seriously selected as the symbol of learning, and can hardly divest themselves of a suspicion that the choice must have been made in the spirit of sarcasm. This little owl (for that is its only name — though it is not even the smallest that appears in England), the cheve’che of the French, is spread throughout the greater part of Europe, but it is not a native of Britain. It has a congener in C. brama, a bird well known to all residents in India.

Finally, we have owls of the second section, those allied to the

screech-owl, Strix flammea, the Etfraie 1 of the French. This,

with its discor- dant scream, its snoring, and its hissing, is far too well known to need description, for it is one of the most widely- spread of birds, and is the owl that has the greatest geo- graphical range, inhabiting almost every country in the world — ■ Sweden and Nor- way, America north of lat. 45 , and New Zealand being the prin- cipal exceptions. It varies, however, not inconsiderably, both in size and intensity of colour, and several ornithologists have tried to found on these variations more than half-a-dozen distinct species. Some, if not most of them, seem, however, hardly worthy to be considered geographical races, for their differences do not always depend on locality. R. Bowdler Sharpe, with much labour and in great detail, has given his reasons (Cat. B. Brit. Museum, ii. 291-309; and Ornith. Mis- cellany, i. 269-298; ii. 1-21) for acknowledging four" subspecies " of 5. flammea, as well as five other species. Of these last, 5. tenebricosa is peculiar to Australia, while S. novae-hollandiae inhabits also New Guinea, and has a " subspecies," S. castanops, found only in Tasmania; a third, S. Candida, has a wide range from Fiji and northern Australia through the Philippines and Formosa to China, Burmah and India; a fourth, 5. capensis, is peculiar to South Africa; while 5. thomensis is said to be confined to the African island of St Thomas. To these may perhaps have to be added a species from New Britain, described by Count Salvadori as Strix aurantia, but it may possibly prove on further investigation not to be a strigine owl at all. (A. N.)

OWLING, in English law, the offence of transporting wool or sheep out of the kingdom,, to the detriment of the staple manu- facture of wool. The name is said to owe its origin to the fact that the offence was usually carried on at night-time, when the owls were abroad. The offence was stringently regulated by a statute of Edward III. (1336-7), while many subsequent statutes also dealt with it. In 1 566 the offence was made punish- able by the cutting off of the left hand and nailing it in a public place. By a statute of 1660 the ship and cargo were to be forfeited. In the reign of George I. (17 17-17 18) the penalty was altered to transportation for seven years. The offence was abolished in 1824.

OWOSSO, a city of Shiawassee county, Michigan, U.S.A., on Shiawassee river, about 79 m. N.W. of Detroit and 28 m. N.E. of Lansing. Pop. (1900) 8696, of whom 1396 were foreign-born; (1910 census) 9639. It is served by the Michigan Central, the Grand Trunk, and the Ann Arbor railways, and is a division

1 Through the dialectic forms Fresaie and Presaie, the origin of the

word is easily traced to the Latin praesaga — a bird of bad omen ; but it has also been confounded with Orfraie, a name of the Osprey (q.v.).

point of the last. It is situated in the coal area of Michigan, and has various manufactures, including beet-sugar, for which Owosso is an important centre. The value of the city's factory products increased from $2,055,052 in 1900 to $3,109,232 in 1905, or 51-3%. The municipality owns and operates its water-works. Owosso was settled about 1834 and chartered as a city in 1859.

OX, strictly speaking, the Saxon name for the males of domesti- cated cattle (Bos taurus), but in a zoological sense employed so as to include not only the extinct wild ox of Europe but likewise bovine animals of every description, that is to say true oxen, bison and buffaloes. The characteristics of the sub-family Bovinae, or typical section of the family Bovidae, are given in the article Bovidae (q.v.); for the systematic position of that family see Pecora.

In the typical oxen, as represented by the existing domesti- cated breeds (see Cattle) and the extinct aurochs (q.v.), the horns are cylindrical and placed on an elevated crest at the very vertex of the skull, which has the frontal region of great length. The aurochs was a black animal, with a lighter dorsal streak, and horns directed upwards in the shape of a pitchfork, black at their tips, but otherwise whitish. The fighting bulls of Spain, the black Pembroke cattle of Wales, with their derivatives the white park-cattle of Chillingham in Northumberland, are undoubtedly the direct descendants of the aurochs. The black Kerry breed and the black or brown Scotch cattle are also more or less nearly related; and a similar kinship is claimed for the Siemental cattle of Switzerland, although their colour is white and fawn. Short-horns are a modern derivative from cattle of the same general type. Among other British breeds may be mentioned theDevonsand Heref ords, both characterized by their red colour; the long-horned and Sussex breeds, both with very large horns, showing a tendency to grow downwards; and the Ayrshire. Polled, or hornless, breeds, such as the polled Angus and polled Suffolk, are of interest, as showing how easily the horns can be eliminated, and thus indicating a hornless ancestry. The white cattle formerly kept at Chartley Park, Staffordshire, exhibit signs of affinity with the long-horn breed. The Channel Island cattle, which are either black or fawn, would seem to be nearly allied to the Spanish fighting breed, and thus to the aurochs. The great white or cream coloured cattle of Italy, Austria, Hungary and Poland, which have very long black-tipped horns, are also prob- ably not far removed from the aurochs stock.

On the other hand, the great tawny draught cattle of Spain seem to indicate mixture with a different stock, the horns having a double curvature, quite different from the simple one of the aurochs type. There are reports as to these cattle having been formerly crossed with the humped eastern species; and their characteristics are all in favour of such an origin. Humped cattle are widely spread over Africa, Madagascar and India, and form a distinct species, Bos indicus, characterized by the presence of a fleshy hump on the shoulders, the convexity (instead of concavity) of the first part of the curve of the horns, the very large size of the dewlap, and the general presence of white rings round the fetlocks, and light circles surrounding the eyes. The voice and habits of these cattle are also markedly different from those of European cattle. Whether humped cattle are of Indian or African origin cannot be determined, and the species is known only in the domesticated condition. The largest horns are found in the Galla cattle, in which they attain enormous dimen- sions. In Europe the name zebu is generally applied to the Indian breed, although no such designation is known in India itself.

A third type is apparently indicated by the ancient Egyptian cattle, which were not humped, and for which the name Bos aegyptiacus has been suggested. The cattle of Ankole, on the Uganda frontier, which have immense horns, conform to this type.

A second group of the genus Bos is represented by the Indo- Malay cattle included in the sub-genus Bibos (see Bantin, Gaur and Gayal) ; they are characterized by the more or less marked flattening of the horns, the presence of a well-marked ridge on the anterior half of the back, and the white legs.

More distinct are the bisons, forming the sub-genus Bison, represented by the European and the American species (see Bison), the forehead of the skull being much shorter and wider, and the horns not arising from a crest on the extreme vertex, wu'le the number of ribs is different (14 pairs in bisons, only 13 :m oxen), and the hair on the head and neck is long and shaggy. Very dose to this group, if indeed really separable, is the Tibetan yak (q.v.), forming by itself the sub-genus Poephagus.

The most widely different from the true oxen are, however, the buffaloes (see Buffalo), which have consequently the most claim to

generic distinction. From all other Bovinae they differ by the triangular section of their horns. They are divisible into two groups, an African and an Asiatic, both of which are gener- ally included in the sub-genus, or genus, Bubalus, although the latter are sometimes separated as Buffelus. The smallest member of the group is the anoa (q.v.) of Celebes.

As regards the origin of the ox-tribe we are still in the dark. The structure of their molar teeth affiliates them to the antelopes of the Oryx and Hippotragus groups; but the early bovines lack horns in the female, whereas both sexes of these antelopes are horned.

Remains of the wild ox or aurochs are abundant in the superficial deposits of Europe, Western Asia, and Northern Africa; those from the brick-earths of the Thames valley indicating animals of immense proportions. Side by side with these are found remains of a huge bison, generally regarded as specifically distinct from the living European animal and termed Bos {Bison) priscus. In the Pleistocene of India occurs a large ox (Bos namadicus), possibly showing some affinity with the Bibos group, and in the same forma- tion are found remains of a buffalo, allied to, but distinct from the living Indian species. Large oxen also occur in the Lower Pliocene of India, although not closely allied to the living kinds; while in the same formation are found remains of bison (or [?] yak) and buffaloes, some of the latter being nearly akin to the anoa, although much larger. Perhaps, however, the most interesting are the remains of certain oxen from the Lower Pliocene of Europe and India, which have been described under the sub-generic (or generic) title of Leptobos, and are characterized by the absence of horns in the females. In other respects they appear to come nearest to the bantin. Remains of extinct bisons, some of gigantic size, occur in the superficial formations of North America as far south as Texas.

See R. Lydekker, Wild Oxen, Sheep and Goats (London, 1898).

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OXALIC ACID, H 2 C2O4 -2H 2 0, one of the oldest known organic acids. Scheele prepared it by oxidizing sugar with nitric acid, and showed it to be identical with the acetosellic acid obtained from wood-sorrel. It is found in the form of its acid potassium salt in many plants, especially in wood-sorrel (Oxalis acetosella) and in varieties of Rumex; as ammonium salt in guano; as calcium salt in rhubarb root, in various lichens and in plant cells; as sodium salt in species of Salicornia and as free acid in varieties of Boletus. It is also present in

urine and in urinary calculi. It is formed in the oxidation of many organic compounds (e.g. sugar, starch and cellulose) by nitric acid, and also by the fusion of many oxygen-holding compounds with caustic alkalis, this latter method being employed for the manufacture of oxalic acid. In this process cellulose (in the form of sawdust) is made into a stiff paste with a mixture of strong caustic potash and soda solution and heated in flat iron pans to 200-250° C. The some- what dark-coloured mass is lixiviated with a small amount of warm water in order to remove excess of alkali, the residual alkaline oxalates converted into insoluble calcium oxalate by boiling with milk of lime, the lime salt separated, and decom- posed by means of sulphuric acid. It is found that the sawdust obtained from soft woods is the best material for use in this process. It may be obtained synthetically by heating sodium in a current of carbon dioxide to 360° C; by the oxidation of ethylene glycol; by heating sodium formate to 400 C. (V. Merz and W. Weith, Ber., 1882, 15, p. 1513), and by the spontaneous hydrolysis of an aqueous solution of cyanogen gas.

The hydrated acid crystallizes in prisms which effloresce in air, and are readily soluble in water. It loses its water of crystallization at too C, and begins to sublime at about 1 50- 160 C, whilst on heating to a still higher temperature it partially decomposes into carbon dioxide and formic acid, or into carbon dioxide, carbon monoxide and water; the latter

decomposition being also brought about by heating oxalic acid with concentrated sulphuric acid. The anhydrous acid melts at 189-5° C. (E. Bamberger, Ber., 1888, 21, p. 1901) and is frequently used as a condensing agent. Phosphorus penta- chloride decomposes it into carbon monoxide and dioxide, the reaction being the one generally applied for the purpose of preparing phosphorus oxychloride. When heated with glycerin to ioo° C. it yields formic acid and carbon dioxide; above this temperature, ally! alcohol is formed. Nascent hydrogen reduces it to glycollic acid. Potassium permanganate in acid solution oxidizes it to carbon dioxide and water; the manganese sulphate formed has a catalytic accelerating effect on the decomposition.

Oxalic acid is very poisonous, and by reason of its great similarity in appearance to Epsom salts, it has been very fre- quently mistaken for this substance with, in many cases, fatal results. The antidotes for oxalic acid poisoning are milk of lime, chalk, whiting, or even wall-plaster, followed by evacua- tion brought about by an enema or castor oil. Only the salts of the alkali metals are soluble in water. Beside the ordinary acid and neutral salts, a series of salts called quadroxalates is

known, these being salts containing one molecule of acid salt, in combination with one molecule of acid, one of the most common being “salt of sorrel,” KHC2O4 -HjCˆOˆHaO. The oxalates are readily decomposed on heating, leaving a residue of carbonate, or oxide of the metal. The silver salt decomposes with explosive violence, leaving a residue of the metal.

Potassium ferrous oxalate, FeKˆCsOˆ-rˆO, is a strong reducing agent and is used as a photographic developer. Potassium ferric oxalate, FeKs(C204’)3, is used in the preparation of platinotypes, owing to the fact that its solution is rapidly decomposed by sun- light, 2FeK 3 (C204) 3 = 2FeK 2 (C 2 04) 2 -l-K2C 2 04-l-2C02. Ethyl oxalate, (CO-OC 2 H5) 2 , prepared by boiling anhydrous oxalic acid with absolute alcohol, is a colourless liquid which boils at 186° C. Methyl oxalate (CO-OCH 3) 2 , which is prepared in a similar manner, is a solid melting at 54° C. It is used in the preparation of pure methyl alcohol. On treatment with zinc and alkyl iodides or with zinc alkyls they are converted into esters of hydroxy-dialkyl acetic acids. An impure oxalyl chloride, a liquid boiling at 70° C, has been ob- tained by the action of phosphorus pentachloride on ethyl oxalate. Oxamic acid, HO2OCONH2, is obtained on heating acid ammonium oxalate; by boiling oxamide with ammonia; and among the products produced when amino-acids are oxidized with potassium permanganate (J. T. Halsey, Zeit.f. physiol. Chem., 1898, 25, p. 325). It is a crystalline powder difficultly soluble in water and melting at 210° C. (with decomposition). Its ethyl ester, known as oxamae- thane, crystallizes in rhombic plates which melt at II4-H5°C. Phosphorus pentachloride converts it into cyan-carbonic ester, the ethyl oxamine chloride first formed being unstable: ROOC-CONH 2 -> ROOC-C(Cl 2)-NH2-> CN-COOR. Oximide,[Cq],NU, produced by the action of a mixture of phosphorus pentachloride and oxychloride on oxamic acid (H. Ost and A. Mente, Ber., 1886, 19, p. 3229), crystallizes in prisms, and when boiled with water is rapidly hydro- lysed to oxamide and oxalic acid. Oxamide, (CONH 2) 2 , is best pre- pared by the action of ammonia on the esters of oxalic acid. It is also obtained by the action of hydrogen peroxide on hydrocyanic acid, or of manganese dioxide and sulphuric acid on potassium cyanide. It is a white crystalline powder which is almost insoluble in cold water. It melts at 417-419° C. (with decomposition) when heated in a sealed tube (A. Michael, Ber., 1895, 28, p. 1632). When heated with phosphorus pentoxide it yields cyanogen. It is readily hydrolysed by hot solutions of the caustic alkalis. Substituted oxamides are produced by the action of primary amines on ethyl oxalate. Semioxamazide, H 2 N-CO-CO-NH-NH2, is prepared by the action of hydrazine hydrate on oxamaethane (W. Kerp

and K. Unger, Ber. 1897, 30, p. 586). It crystallizes in plates which melt at 220-221° C. (with decomposition). It is only slightly soluble in water, but is readily soluble in acids and alkalis. It reduces silver salts rapidly. It condenses with aldehydes and ketones to produce semioxamazones.

OXALIS, in botany, a large genus of small herbaceous plants, comprising, with a few small allied genera, the natural order Oxalidaceae. The name is derived from Gr. o£us, acid, the plants being acid from presence of acid calcium oxalate. It contains about 220 species, chiefly South African and tropical and South American. It is represented in Britain by the wood- sorrel, a small stemless plant with radical trefoil-like leaves growing from a creeping scaly rootstcck, and the flowers borne singly on an axillary stalk; the flowers are regular with five sepals, five obovate, white, purple-veined, free petals, ten stamens and a central five-lobed, five-celled ovary with five

free styles. The fruit is a capsule, splitting by valves; the seeds have a fleshy coat, which curls back elastically, ejecting the true seed. The leaves, as in the other species of the genus, show a ” sleep-movement,” becoming pendulous at night.

Oxalis crenata. Oca of the South Americans, is a tuberous-rooted half-hardy perennial, native of Peru. Its tubers are comparatively small, and somewhat acid; but if they be exposed in the sun from six to ten days they become sweet and floury. In the climate ot England they can only be grown by starting them in heat in March, and planting out in June in a light soil and warm situation. They grow freely enough, but few tubers are formed, and these of small size. The fleshy stalks, which have the acid flavour ot the family, may, however, be used in the same way as rhubarb for tarts. The

leaves may be eaten in salads. It is easily propa- gated by cuttings of the stems or by means of sets like the potato.

Oxalis Deppei or O. tetraphylla, a bulbous perennial, native of Mexico, has scaly bulbs, from which are produced fleshy, tapering, white, semi-transparent roots, about 4 in. in length and 3 to 4 in. in diameter. They strike down into the soil, which should therefore be made light and rich with abundance of decayed vegetable matter. The

bulbs should be planted about the end of April, 6 in. apart, in rows 1 ft. asun- der, being only just covered with soil and having a situation with a southern aspect. The roots should be dug up before they become affected by frost, but if protected they will continue to increase in size till November. When taken up the bulbs should be stored in a cool dry place for replanting and the roots for use. The roots are gently boiled with salt and water, peeled and eaten like acparagus with melted butter and the yolks of eggs, or served up like salsafy and scorzonera with white sauce.

Many other species are known in cultivation for edgings, rockwork or as pot-plants for the greenhouse, the best hardy and half-hardy kinds being 0. arenaria, purple; 0. Bowiei, crimson; 0. ennea- phylla, white or pale tose; 0. floribunda, rose; 0. lasiandra, pink; 0. luteola, creamy yellow; 0. variabilis, purple, white, red; and 0. violacea, violet.

OXAZOLES, a group of organic compounds containing a ring complex (shown below) composed of three carbon atoms, and one oxygen and one nitrogen atom; they are isomeric with the isoxazoles (q.v.). They are obtained by condensing o halogen derivatives of ketones with acid-amides (M. Lewy, Ber. 1887, 20, p. 2576; 1888, 21, p. 2195)

R r ˆNH,HO-C.R' .N-CR'

RC

Wood-sorrel (Oxalis Acetosella). 1, Fruit which has split open; the seeds are shot out by the elastic contractions of their outer coat, s.

•CH

by the action of concentrated sulphuric acid on nitriles and benzoin (F. Japp, Jour. Chem. Soc. 1893, 63, p. 469); and by passing hydrochloric acid gas into a mixture of aromatic alde- hydes and their cyanhydrins (E. Fischer, Ber. 1896, 29, p. 205).

RCH OHC – R ˆ R – C <0-?R They are weak bases, and the ring system is readily split by evaporation with hydrochloric acid, or by the action of reducing and oxidizing agents.

The dihydro-oxazoles or oxazolines are similarly formed when 0-halogen alkyl amides are condensed with alkali (S. Gabriel, Ber. 1889, 22, p. 2220), or by the action of alkali on the compounds formed by the interaction of ethylene chlorhydrin on nitriles. They

are strong bases characterized by a quinoline-like smell. The amino-

oxazolines are known as alkylene-i//-areas and are formed by the action of potassium cyanate on the hydrobromides of the bromalkylamines (S. Gabriel, Ber. 1895, 28. p. 1899). They ar-. strong bases. Tetrahydro-oxazoles or oxazolidines result from the action of aldehydes on amino-alcohols (L. Knorr, Ber. 1901, 34″ p. 3484). The above types of compounds may be represented by the following formulae : —

N = CH X N = CH X N = C(NH S V NH-CH 2 I >°. I >0, I >0. I V>

ch=ch/ ch 2 -ch/ ch 2 -ch 2 / ch 2 -ch 2 /

oxazole oxazoline amino-oxazoline oxazolidines.

The benzoxazoles are formed when ortho-aminophenols are con- densed with organic acids (A. Ladenburg, Ber. 1876, 9, p. 1524; 1877, 10, p. 1 1 13), or by heating aldehydes and ortho-aminophenols to high temperature (G. Mazzara and A. Leonardi, Gazz. 1871, 21, p. 251). They are mostly crystalline solids which distil unchanged. When warmed with acids they split into their components. They behave as weak bases. By the condensation of ortho-aminophenols with phosgene or thiophosgene, oxy and thio-derivatives are obtained, the (OH) and (SH) groups being situated in the 11 position, and these compounds on treatment with amines yield amino de- rivatives.

OXE, PEDER (1520-1575), Danish Finance Minister, was born in 1520. At the age of twelve he was sent abroad to complete his education, and resided at the principal universities of Germany, Holland, France, Italy and Switzerland for seventeen years. On his return he found both his parents dead, and was appointed the guardian of his eleven young brothers and sisters, in which capacity, profiting by the spoliation of the church, he accumulated immense riches. His extraordinary financial abilities and pronounced political capacity soon found ample scope in public life. In 1552 he was raised to the dignity of Rigsraad (councillor of state); in 1554 he successfully accom- plished his first diplomatic mission, by adjusting the differences between the elector of Saxony and the margrave of Brandenburg. The same year he held the post of governor of Copenhagen and shared with Byrge Trolle the control of the treasury. A few years later he incurred the royal disfavour for gross malversation in the administration of public property, and failing to com- promise matters with the king, fled to Germany and engaged in political intrigues with the adventurer Wilhelm von Grumbach (1503-1567) for the purpose of dethroning Frederick II. in favour of Christina of Lorraine, the daughter of Christian II. But the financial difficulties of Frederick II. during the

stress of the Scandinavian Seven Years' War compelled him, in 1566, to recall the great financier, when his confiscated estates were restored to him and he was reinstated in all his offices and dignities. A change for the better immediately ensued. The finances were speedily put on an excellent footing, means were provided for carrying on the war to a successful issue (one of the chief expedients being the raising of the Sound tolls) and on the conclusion of peace Oxe, as lord treasurer, not only reduced the national debt considerably, but redeemed a large portion of the alienated crown-lands. He reformed the coinage, developed trade and commerce and introduced numerous agricultural reforms, especially on his own estates, which he was never weary of enlarging, so that on his death he was the wealthiest land- owner in Denmark. Oxe died on the 24th of October 1575, after contributing, more than any other statesman of his day, to raise Denmark for a brief period to the rank of a great power. See P. Oxe's live og levnet (Copenhagen, 1675); Danmarks riges historie, vol. 3 (Copenhagen, 1897-1905).

OXENBRIDGE, JOHN (1608-1674), English Nonconformist divine, was born at Daventry, Northamptonshire, on the 30th of January 1608, and was educated at Emmanuel College, Cambridge, and Magdalen Hall, Oxford (B.A. 1628, M.A. 16.31). As tutor of Magdalen Hall he drew up a new code of articles referring to the government of the college. He was deprived of his office in May 1634, and began to preach, with a similar disregard for constituted authority. After his voyages to the Bermudas he returned to England (1641), and after exercising an itinerant and unattached ministry settled for some months in Great Yarmouth and then at Beverley. He was minister at Berwick-on-Tweed when in October 1652 he was appointed a fellow of Eton College. There in 1658 he preached the funeral

sermon of Francis Rous, the provost, and thence in 1660 he was ejected. He returned to his preaching at Berwick-on-Tweed, but was expelled by the Act of Uniformity in 1662, and after spending some time in the West Indies settled (1670) at Boston, Massachusetts, where he was ordained minister of the First Church. He died on the 28th of December 1674. A few sermons are all that he published. His first wife (d. 1658) was " a scholar beyond what was usual in her sex," and Andrew Marvell, who was their friend, wrote an epitaph for her tomb at Eton which was defaced at the Restoration; his second wife (d. 1659) was Frances Woodward, daughter of the famous vicar of Bray;

his third was a widow whom he met at Barbados.

OXENFORD, JOHN (1812-1877), English dramatist, was born at Camberwell on the 12th of August 181 2. He began his literary career by writing on finance. He was an excellent linguist, and the author of many translations from the German, notably of Goethe's Dicktung und Wahrheit (1846) and Ecker- mann's Conversations of Goethe (1850). He did much by his writing to spread the fame of Schopenhauer in England. His first play was My Fellow Clerk, produced at the Lyceum in 1835. This was followed by a long series of pieces, the most famous of which was perhaps the Porter's Knot (1858) and Twice Killed (1835). About 1850 he became dramatic critic of The Times. He died in South wark on the 21st of February 1877.

Many references to his pieces will be found in The Life and Re- miniscences of E. L. Blanchard (ed. C. Scott and C. Howard, 1891).

OXENHAM, HENRY NUTCOMBE (1829-1888), English ecclesiologist, son of a master at Harrow, was born there on the 15th of November 1829. From Harrow he went to Balliol College, Oxford. He took Anglican orders in 1854, but became a Roman Catholic in 1857. At first his thoughts turned towards the priesthood, and he spent some time at the London Oratory and at St Edmund's College, Ware; but being unable to sur- render his belief in the validity of Anglican orders, he proceeded no further than minor orders in the Roman Church. In 1863 he made a prolonged visit to Germany, where he studied the language and literature, and formed a close friendship with Dollinger, whose First Age of the Christian Church he translated in 1866. Oxenham was a regular contributor to the Saturday Review. A selection of his essays was published in Short Studies in Ecclesiastical History and Biography (1884), and Short Studies, Ethical and Religious (1885). He also translated in 1876 the 2nd vol. of Bishop Hefele's History of the Councils of the Church, and published several pamphlets on the reunion of Christendom. His Catholic Doctrine of the Atonement (1865) and Catholic Eschatology and Universalism (1876) are standard works. Oxenham died at Kensington on the 23rd of March 1888.

S£e J. Gillow's Bibliographical Dictionary of English Catholics, vol. v. An interesting obituary notice on Oxenham was written by Vicesimus, i.e. Dean John Oakley of Manchester, for the Manchester Guardian, and published in pamphlet form (Manchester, 1888).

OXENSTJERNA, an ancient Swedish senatorial family, the origin of which can be traced up to the middle of the 14th century, which had

vast estates in Sodermanland and Uppland, and began to adopt its armorial designation of Oxensljerna (" Ox-forehead ") as a personal name towards the end of the 16th century. Its most notable members were the following.

1. Count Axel Gustafsson (1583-1654), chancellor of Sweden, was born at Fond in Uppland, and was educated with his brothers at the universities of Rostock, Jena and Wittenberg. On returning home in 1603 he was appointed kammerjunker to King Charles IX. In 1606 he was entrusted with his first diplomatic mission, to Mecklenburg, was appointed a senator during his absence, and henceforth became one of the king's most trusted servants. In 1610 he was sent to Copenhagen to prevent a war with Denmark, but was unsuccessful. This embassy is important as being the beginning of Oxenstjerna's long diplomatic struggle with Sweden's traditional rival in the north, whose most formidable enemy he continued to be throughout life. Oxenstjerna was appointed a member of Gustavus Adolphus's council of regency. High aristocrat as he was, he would at first willingly have limited the royal power.

An oligarchy guiding a limited monarchy was ever his ideal government, but the genius of the young king was not to be fettered, so Oxenstjerna was content to be the colleague instead of the master of his sovereign. On the 6th of January 161 2 he was appointed chancellor. His controlling, organizing hand was speedily felt in every branch of the administration. For his services as first Swedish plenipotentiary at the peace of Knared, 1613, he was richly rewarded. During the frequent absences of Gustavus in Livonia and Finland (1614-1616) Oxenstjerna acted as his vice-regent, when he displayed manifold abilities and an all-embracing activity. In 1620 he headed the brilliant embassage despatched to Berlin to arrange the nuptial contract between Gustavus and Mary Eleanora of Brandenburg. It was his principal duty during the king's Russian and -Polish wars to supply the armies and the fleets with everything necessary, including men and money. By this time he had become so indispensable that Gustavus, in 1622, bade him accompany him to Livonia, where Oxenstjerna was appointed governor-general and commandant of Riga. His services in Livonia were rewarded with four castles and the whole bishopric of Wenden. He was entrusted with the peace negotiations which led to the truce with Poland in 1623, and succeeded, by skilful diplomacy, in averting a threatened rupture with Denmark in 1624. On the 7th of October 1626 he was appointed governor-general of the newly-acquired province of Prussia. In 1629 he concluded the very advantageous truce of Altmark with Poland. Previ- ously to this (September 1628) he arranged with Denmark a

joint occupation of Stralsund, to prevent that important fortress from falling into the hands of the Imperialists. After the battle of Breitenfeld (September 7th, 1631) he was summoned to assist the king with his counsels and co-operation in Germany. During the king's absence in Franconia and Bavaria in 1632 he was appointed legalus in the Rhine lands, with plenipotentiary authority over all the German generals and princes in the Swedish service. Although he never fought a battle, he was a born strategist, and frustrated all the efforts of the Spanish troops by his wise regulations. His military capacity was strikingly demonstrated by the skill with which he conducted large reinforcements to Gustavus through the heart of Germany in the summer of 1632. But it was only after the death of the king at Lutzen that Oxenstjerna's true greatness came to light. He inspired the despairing Protestants both in Germany and Sweden with fresh hopes. He reorganized the government both at home and abroad. He united the estates of the four upper circles into a fresh league against the common foe (1634), in spite of the envious and foolish opposition of Saxony. By the patent of the 12th of January 1633 he had already been ap- pointed legate plenipotentiary of Sweden in Germany with absolute control over all the territory already won by the Swedish arms. No Swedish subject, either before or after, ever held such an unrestricted and far-reaching authority. Yet he was more than equal to the extraordinary difficulties of the situation. To him both warriors and statesmen appealed invariably as their natural and infallible arbiter. Richelieu himself declared that the Swedish chancellor was " an inexhaustible source of well-matured counsels." Less original but more sagacious than the king, he had a firmer grasp of the realities of the situation. Gustavus would not only have aggrandized Sweden, he would have transformed the German empire. Oxenstjerna wisely abandoned these vaulting ambitions. His country's welfare was his sole object. All his efforts were directed towards pro- curing for the Swedish crown adequate compensation for its sacrifices. Simple to austerity in his own tastes, he nevertheless recognized the political necessity of impressing his allies and confederates by an almost regal show of dignity; and at the abortive congress of Frankfort-on-Main (March 1634), held for the purpose of uniting all the German Protestants, Oxenstjerna appeared in a carriage drawn by six horses, with German princes attending him on foot. But from first to last his policy suffered from the slenderness of Sweden's material resources, a cardinal defect which all his craft and tact could not altogether conceal from the vigilance of her enemies. The success of his system

postulated an uninterrupted series of triumphs, whereas a single reverse was likely to be fatal to it. Thus the frightful disaster of Nordlingen (September 6th, 1634; see Sweden: History) brought him, for an instant, to the verge of ruin, and compelled him, for the first time, so far to depart from his policy of independence as to solicit direct assistance from France. But, well aware that Richelieu needed the Swedish armies as much as he himself needed money, he refused at the conference of Compiegne (1635) to bind his hands in the future for the sake of some slight present relief. In 1636, however, he concluded a fresh subsidy-treaty with France at Wismar. The same year he returned to Sweden and took his seat in the Regency. His presence at home overawed all opposition, and such was the general confidence inspired by his superior wisdom that for the next nine years his voice, especially as regarded foreign affairs, was omnipotent in the council of state. He drew up beforehand the plan of the Danish War of 1643-1645, so brilliantly executed by Lennart Torstensson, and had the satisfaction of severely crippling Denmark by the peace of Bromsebro (1645). His later years were embittered by the jealousy of the young Queen Christina, who thwarted the old statesman in every direction. He always attributed the exiguity of Sweden's gains by the peace of Osnabruck to Christina's undue interference. Oxenstjerna was opposed at first to the abdication of Christina, because he feared mischief to Sweden from the unruly and adventurous disposition of her appointed successor, Charles Gustavus. The extraordinary consideration shown to him by the new king ultimately, however, reconciled him to the change. He died at Stockholm on the 28th of August 1654.

See Axel Oxenstjernas skriften och brefvexling (Stockholm, 1888 et seq.) ; A. de Marny, Oxenstjerna et Richelieu & Compiegne (Paris,

1878).

2. Count Johan Axelsson (1611-1657), son of the foregoing, completed his studies at Upsala in 1631, and was sent by his father on a grand tour through France, the Netherlands and Great Britain. He served under Count Gustavus Horn in the Thirty Years' War from 1632, and was subsequently employed by his father in various diplomatic missions, though his instruc- tions were always so precise and minute that he was little more than the executor of the chancellor's wishes. He was one of the commissioners who signed the truce of 1635 with Poland, and in 1639, much against his father's will, was made a senator. Along with Salvius he represented Sweden at the great peace congress of Osnabruck, but as he received his instructions direct from his father, whereas Salvius was in the queen's confidence, the two ”

legates ” were constantly at variance. From 1650 to 1652 he was governor-general of Pomerania. Charles X. made him earl marshal.

3. Gabriel Gustafsson (1587-1640), brother of (1), was from 161 2 to 1618 the chief adviser of Duke John, son of King John III., and Gustavus Adolphus’s competitor for the Swedish throne. After the duke’s death he became, virtually, the locum-tenens of the chancellor (with whom he was always on the most intimate terms) during Axel’s frequent absences from Sweden. He was also employed successfully on numerous diplomatic missions. He was most usually the intermediary between his brother and the riksdag and senate. In 1634 he was created lord high steward. His special department, ” Svea Hofret,” the supreme court of justice, was ever a model of efficiency, and he frequently acted as chancellor and lord high treasurer as well.

See Gabriel Gustafssons bref till Riks Konsler Axel Oxenstjerna, 1611-1640 (Stockholm, 1890).

4. Count Bengt or Benedict Gabrielsson (1623-1702), was the son of Axel Oxenstjerna’s half-brother, Gabriel Bengtsson (1586-1656). After a careful education and a long residence abroad, he began his diplomatic career at the great peace con- gress of Osnabruck. During his stay in Germany he made the acquaintance of the count palatine, Charles Gustavus, after- wards Charles X., whose confidence he completely won. Two years after the king’s accession (1634), Oxenstjerna was sent to represent Sweden at the Kreistag of Lower Saxony. In 1655 he accompanied Charles to Poland and was made governor

of the conquered provinces of Kulm, Kujavia, Masovia and Great Poland. The firmness and humanity which he displayed in this new capacity won the affectionate gratitude of the inhabitants, and induced the German portion of them, notably the city of Thorn, to side with the Swedes against the Poles. During Charles’s absence in Denmark (1657), Oxenstjerna, in the most desperate circumstances, tenaciously defended Thorn for ten months, and the terms of capitulation ultimately ob- tained by him were so advantageous that they were made the basis of the subsequent peace negotiations at Oliva, between Poland and Sweden, when Oxenstjerna was one of the chief plenipotentiaries of the Swedish regency. During the domina- tion of Magnus de la Gardie he played but a subordinate part in affairs. From 1662 to 1666 he was governor-general of Livonia. In 1674 he was sent to Vienna to try and prevent the threatened outbreak of war between France and the empire. The con- nexions which he formed and the sympathies which he won here had a

considerable influence on his future career, and resulted in his appointment as one of the Swedish envoys to the congress of Nijmwegen (1676). His appointment was generally regarded as an approximation on the part of Sweden to Austria and Holland. During the congress he laboured assiduously in an anti-French direction; a well-justified distrust of France was, indeed, henceforth the keynote of his policy, a policy diametric- ally opposed to Sweden's former system. In 1680 Charles XL entrusted him absolutely with the conduct of foreign affairs, on the sole condition that peace was to be preserved, an office which he held for the next seventeen years to the very great advantage of Sweden. His leading political principles were friendship with the maritime powers (Great Britain and Holland) and the emperor, and a close anti-Danish alliance with the house of Holstein. Charles XL appointed Oxenstjerna one of the regents during the minority of Charles XII. The martial proclivities of the new king filled the prudent old chancellor with alarm and anxiety. His protests were frequent and energetic, and he advised Charles in vain to accept the terms of peace offered by the first anti-Swedish coalition. Oxenstjerna has been described as " a shrewd and subtle little man, of gentle disposition, but remarkable for his firmness and tenacity of character."

See F. F. Carlson, Sveriges historia under Konungame af Pfahiska huset (Stockholm, 1883, 1885); O. Sjogren, Karl den elfte och Svenska folket (Stockholm, 1897); and Negotiations du comte d'Avaux pendant les annees 16Q3, 1607-1698 (Utrecht, 1882, &c).

(R. N. B.)

OXFORD, EARLS OF, an English title held successively by the families of Vere and Harley. The three most important earls of the Vere line (see Vere) are noticed separately below. The Veres held the earldom from IT42 until March 1703, when it became extinct on the death of Aubrey de Vere, the 20th earl. In 1 71 1 the English statesman Robert Harley (see below) was created earl of Oxford; but the title became extinct in this family on the death of the 6th earl in 1853.

OXFORD, EDWARD DE VERE, 17TH Earl 1 or (1550-1604), son of John de Vere, the 16th earl, was born on the 12th of April 1550. He matriculated at Queen's College, Cambridge, but he removed later to St John's College, and was known as Lord Bolebec or Bulbeck until he succeeded in 1562 to the earldom and to the hereditary dignity of great chamberlain of England. As one of the royal wards the boy came under the care of Lord Burghley, at whose house in London he lived under the tutorship of his maternal uncle, Arthur Golding, the translator of Ovid. His violent temper and erratic doings were a

constant source of anxiety to Burghley, who nevertheless in 1571 gave him his eldest daughter, Anne, in marriage. Oxford more than once asked for a military or a naval command, but Burghley hoped that his good looks together with his skill in dancing and in feats of arms would win for him a high position at court. His accomplishments did indeed secure Elizabeth's favour, but he offended her by going to Flanders without her consent in 1574, and more seriously in 1582 by a duel with one of her gentle- men, Thomas Knyvet. Among his other escapades was a futile 1 I.e. in the Vere line.

plot to rescue from the Tower Thomas Howard, 4th duke of Norfolk, with whom he was distantly connected. In 1579 he insulted Sir Philip Sidney by calling him a " puppy " on the tennis-court at Whitehall. Sidney accordingly challenged Oxford, but the queen forbade him to fight, and required him to apologize on the ground of the difference of rank between the disputants. On Sidney's refusal and consequent disgrace Oxford is said to have schemed to murder him. The earl sat on the special commission (1586) appointed for the trial of Mary queen of Scots; in 1589 he was one of the peers who tried Philip Howard, earl of Arundel, for high treason; and in 1601 he took part in the trial of Essex and Southampton. It has been suggested that Oxford was the Italianated Englishman ridiculed by Gabriel Harvey in his Speculum Tuscanismi. On his return from a journey to Italy in 1 575 he brought back various inventions for the toilet, and his estate was rapidly dissipated in satisfying his extravagant whims. His first wife died in 1588, and from that time Burghley withdrew his support, Oxford being reduced to the necessity of seeking help among the poor men of letters whom he had at one time or another befriended. He was himself a lyric poet of no small merit. His fortunes were partially retrieved on his second marriage with Elizabeth Trentham, by whom he had a son, Henry de Vere, 18th earl of Oxford (1593-1625). He died at Newington, near London, on the 24th of June 1604.

His poems, scattered in various anthologies — the Paradise of Dainty Devices, England's Parnassus, Phoenix Nest, England's Helicon — and elsewhere, were collected by Dr A. B. Grosart in vol. iv. of the Fuller Worthies Library (1876).

OXFORD, JOHN DE VERE, 13TH Earl of (1443-1513), was second son of John, the 12th earl, a prominent Lancastrian, who, together with his eldest son Aubrey de Vere, was executed in February 1462. John

de Vere the younger was himself attainted, but two years later was.restored as 13th earl. But his loyalty was suspected, and for a short time at the end of 1468 he was in the Tower. He sided with Warwick, the king-maker, in the political movements of 1469, accompanied him in his exile next year, and assisted in the Lancastrian restoration of 1470-1471. As constable he tried John Tiptoft, earl of Worcester, who had condemned his father nine years before. At the battle of Barnet, Oxford was victorious in command of the Lancastrian right, but his men got out of hand, and before they could be rallied Warwick was defeated. Oxford escaped to France. In 1473 he organized a Lancastrian expedition, which, after an attempted landing in Essex, sailed west and seized St Michael's Mount in Cornwall. It was only after a four months' siege that Oxford was forced to surrender in February 1474. He was sent to Hammes near Calais, whence, ten years later, in August 1484, he escaped and joined Henry Tudor in Brittany. He fought for Henry in high command at Bosworth, and was rewarded by restoration to his title, estates and hereditary office of Lord Chamberlain. At Stoke on the 16th of June i486 he led the van of the royal army. In 1492 he was in command in the expedition to Flanders, and in 1497 was foremost in the defeat of the Cornish rebels on Blackheath. Bacon (Hist, of Henry VII. p. 192, ed. Lumby) has preserved a story that when in the summer of 1498 Oxford entertained the king at Castle Hedingham, he assembled a great number of his retainers in livery; Henry thanked the earl for his reception, but fined him 15,000 marks for the breach of the laws. Oxford was high steward at the trial of the earl of Warwick, and one of the commissioners for the trial of Sir James Tyrell and others in May 1502. Partly through ill-health he took little part after- wards in public affairs, and died on the 10th of March 1513. He was twice married, but left no children.

Oxford is frequently mentioned in the Paston Letters, which include twenty written by him, mostly to Sir John Paston the younger. See The Paston Letters, ed. J. Gairdner; Chronicles of London, ed. C. L. Kingsford (1905); Sir James Ramsay, Lancaster and York; and The Political History of England, vols. iv. and v. (1906). (C. L. K.)

OXFORD, ROBERT DE VERE, 9TH Earl of (1362-1392), English courtier, was the only son of Thomas de Vere, 8th earl of

Oxford, and Maud (d. 1413), daughter of Sir Ralph de Ufford (d. 1346), and a descendant of King Henry III. He becam? 9th earl of Oxford on his father's death in 1371, and married Philippa (d. 141 2), daughter of his guardian Ingelram de Couci, earl of Bedford, a son-in-law of Edward III., quickly becoming very intimate with Richard II.

Already hereditary great chamberlain of England, Oxford was made a member of the privy council and a Knight of the Garter; while castles and lands were bestowed upon him, and he was constantly in the company of the young king. In 1385 Richard decided to send his friend to govern Ireland, and Oxford was given extensive rights in that country and was created marquess of Dublin for life; but although preparations were made for his journey he did not leave England. Meanwhile the discontent felt at Richard's incompetence and extravagance was increasing, one of the contributory causes thereto being the king's partiality for Oxford, who was regarded with jealousy by the nobles and who made powerful enemies about this time by divorcing his wife, Philippa, and by marrying a Bohemian lady. The king, however, indifferent to the gathering storm, created Vere duke of Ireland in October 1386, and gave him still more extensive powers in that country, and at once matters reached a climax. Richard was deprived of his authority for a short time, and Vere was ordered in vain to proceed to Ireland. The latter was then among those who were accused by the king's uncle Thomas of Woodstock, duke of Gloucester, and his supporters in November 1387; and rushing into the north of England he gathered an army to defend his royal master and himself. At Radcot Bridge in Oxfordshire, however, his men fled before the troops of Gloucester, and Oxford himself escaped in disguise to the Nether- lands. In the parliament of 1388 he was found guilty of treason and was condemned to death, but as he remained abroad the sentence was never carried out. With another exile, Michael de la Pole, duke of Suffolk, he appears to have lived in Paris until after the treaty between England and France in June 1389, when he took refuge at Louvain. He was killed by a boar whilst hunting, and left no children. In 1395 his body was brought from Louvain to England, and was buried in the priory at Earl's Colne, Essex.

See T. Walsingham, Historia Anglicana, edited by H. T. Riley (London, 1863-1864); J. Froissart, Chroniques, edited by S. Luce and G. Raynaud (Paris, 1869-1897); H. Wallon, Richard II. (Paris, 1864) ; and W. Stubbs, Constitutional History, vol. ii. (Oxford,

1896).

OXFORD, ROBERT HARLEY, ist Earl 1 of (1661-1724), English statesman, commonly known by his surname of Harley, eldest son of Sir Edward Harley (1624-1700), a prominent land- owner in Herefordshire, and grandson of the celebrated letter- writer Lady Brilliana Harley (c. 1600-1643), was born in Bow Street, Covent Garden, London, on the 5th of December 1661. His school days were passed at Shilton, near Burford, in Oxford- shire, in a small school

which produced at the same time a lord high treasurer (Harley), a lord high chancellor (Simon Harcourt) and a lord chief justice of the common pleas (Thomas Trevor). The principles of Whiggism and Nonconformity were instilled into his mind at an early age, and if he changed the politics of his ancestors he never formally abandoned their religious opinions. At the Revolution of 1688 Sir Edward and his son raised a troop of horse in support of the cause of William III., and took posses- sion of the city of Worcester in his interest. This recommended Robert Harley to the notice of the Boscawen family, and led to his election, in April 1689, as the parliamentary representative of Tregony, a borough under their control. He remained its member for one parliament, when he was elected by the con- stituency of New Radnor, and he continued to represent it until his elevation to the peerage in 1711.

From the first Harley gave great attention to the conduct of public business, bestowing especial care upon the study of the forms and ceremonies of the House. His reputation marked him out as a fitting person to preside over the debates of the House, and from the general election of February 1701 until the dissolution of 1705 he held with general approbation the office 1 I.e. in the Harley line.

of speaker. For a part of this period, from the 18th of May 1704, he combined with the speakership the duties of a principal secretary of state for the northern department, displacing in that office the Tory earl of Nottingham. In 1703 Harley first made use of Defoe's talents as a political writer, and this alliance with the press proved so successful that he afterwards called the genius of Swift to his aid in many pamphlets against his opponents in politics. While he was secretary of state the union with Scotland was effected. At the time of his appointment as secretary of state Harley had given no outward sign of dissatisfaction with the Whigs, and it was mainly through Marlborough's good opinion of his abilities that he was admitted to the ministry. For some time, so long indeed as the victories of the great English general cast a glamour over the policy of his friends, Harley continued to act loyally with his colleagues. But in the summer of 1707 it became evident to Godolphin that some secret influence behind the throne was shaking the confidence of the queen in her ministers. The sovereign had resented the intrusion into the administration of the impetuous earl of Sunderland, and had persuaded herself that the safety of the church depended on the fortunes of the Tories. These convictions were strengthened in her mind by the new favourite Abigail Hill (a cousin of the duchess of Marlborough through her mother, and of Harley on her father's side), whose soft and silky ways contrasted only too favourably in the eyes of the queen with the haughty manners of her old friend, the duchess of Marlborough. Both the duchess and Godolphin were convinced that this change in the disposition of the queen was due to the sinister conduct of Harley and his relatives ; but he was for the present permitted to remain in his office. Subsequent experience showed the necessity for his dis- missal and an occurrence supplied an opportunity for carrying out their wishes. An ill-paid and poverty-stricken clerk, William Gregg, in Harley's office, was detected in furnishing the enemy with copies of many documents which should have been kept from the knowledge of all but the most trusted advisers of the court, and it was found that through the carelessness of the head of the department the contents of such papers became the common property of all in his service. The queen was thereupon informed that Godolphin and Marlborough could no longer serve in concert with him. They did not attend her next council, on the 8th of February 1708, and when Harley proposed to proceed with the business of the day the duke of Somerset drew attention to their absence, when the queen found herself forced (February n,) to accept the resignations of both Harley and St John.

Harley went out of office, but his cousin, who had now become Mrs Masham, remained by the side of the queen, and contrived to convey to her mistress the views of the ejected minister. Every device which the defeated ambition of a man whose strength lay in his aptitude for intrigue could suggest for hasten- ing the downfall of his adversaries was employed without scruple, and not employed in vain. The cost of the protracted war with France, and the danger to the national church, the chief proof of which lay in the prosecution of Sacheverell, were the weapons which he used to influence the masses of the people. Marlborough himself could not be dispensed with, but his relations were dis- missed from their posts in turn. When the greatest of these, Lord Godolphin, was ejected from office, five commissioners to the treasury were appointed (August 10, 1710), and among them figured Harley as chancellor of the exchequer. It was the aim of the new chancellor to frame an administration from the moderate members of both parties, and to adopt with but slight changes the policy of his predecessors; but his efforts were doomed to disappointment. The Whigs refused to join in an alliance with the man whose rule began with the retirement from the treasury of the finance minister idolized by the city merchants, and the Tories, who were successful beyond their wildest hopes at the polling booths, could not understand why their leaders did not adopt a policy more favourable to the interests of their party. The clamours of the wilder spirits, the country members who met at the ” October Club,” began to be re-echoed even by those who were attached to the person of Harley, when, through an

unexpected event, his popularity was restored at a bound. A French refugee, the ex-abbe de la Bourlie (better known by the name of the marquis deGuiscard), was being examined before the privy council on a charge of treachery to the nation which had befriended him, when he stabbed Harley in the breast with a penknife (March 8, 1711). To a man in good health the wounds would not have been serious, but the minister had been for some time indisposed — a few days before the occurrence Swift had penned the prayer ” Pray God preserve his health, every- thing depends upon it ” — and the joy of the nation on his re- covery knew no bounds. Both Houses presented an address to the crown, suitable response came from the queen, and on Harley’s reappearance in the Lower House the speaker made an oration which was spread broadcast through the country. On the 23rd of May 1711 the minister became Baron Harley of Wigmore and earl of Oxford and Mortimer; on the 29th of May he was created lord treasurer, and on the 25th of October 1 71 2 became a Knight of the Garter. Well might his friends exclaim that he had ” grown by persecutions, turnings out,

and stabbings.”

With the sympathy which this attempted assassination had evoked, and with the skill which the lord treasurer possessed for conciliating the calmer members of either political party, he passed through several months of office without any loss of reputation. He rearranged the nation’s finances, and continued to support her generals in the field with ample resources for carrying on the campaign, though his emissaries were in com- munication with the French king, and were settling the terms of a peace independently of England’s allies. After many weeks of vacillation and intrigue, when the negotiations were frequently on the point of being interrupted, the preliminary peace was signed, and in spite of the opposition of the Whig majority in the Upper House, which was met by the creation of twelve new peers, the much-vexed treaty of Utrecht was brought to a con- clusion on the 31st of March 17 13. While these negotiations were under discussion the friendship between Oxford and St John, who had become secretary of state in September 17 10, was fast changing into hatred. The latter had resented the rise in fortune which the stabs of Guiscard had secured for his colleague, and when he was raised to the peerage with the title of Baron St John and Viscount Bolingbroke, instead of with an earldom, his resentment knew no bounds. The royal favourite, whose husband had been called to the Upper House as Baron Masham, deserted her old friend and relation for his more vivacious rival. The Jacobites found that, although the lord treasurer was profuse in his expressions of good will for their cause, no steps were taken to ensure its triumph, and they no longer placed reliance in promises which were repeatedly made and repeatedly broken. Even Oxford’s friends began to com- plain of his habitual dilatoriness, and to find some excuse for his apathy in ill-health, aggravated by excess in the pleasures of the table and by the loss of his favourite child. By slow degrees the confidence of Queen Anne was transferred from Oxford to Bolingbroke; on the 27th of July 1714 the former surrendered his staff as lord treasurer, and on the ist August the queen died.

On the accession of George I. the defeated minister retired’ to Herefordshire, but a few months later his impeachment was decided upon and he was committed to the Tower on the 16th of July 1715. After an imprisonment of nearly two years the prison doors were opened in July 171 7 and he was allowed to resume his place among the peers, but he took little part in public affairs, and died almost unnoticed in London on the 21st of May 1724, He married, in May 1685, Edith, daughter of Thomas Foley, of Witley Court, Worcester. She died in November 1691. His second wife was Sarah, daughter of Simon Middleton, of Edmonton. His son Edward (1689-1741), who

succeeded to the title, married Henrietta (d. 1755), daughter and heiress of John Holies, duke of Newcastle; and his only child, a daughter Margaret (1715-1785), married William Bentinck, 2nd duke of Portland, to whom she brought Welbeck Abbey and the London property which she inherited from her mother. The earldom

then passed to a cousin, Edward, 3rd earl (c. 1600-1755), and eventually became extinct with Alfred, the 6th earl (1809-1853). Harley's statesmanship may seem but intrigue and finesse, ' but his character is set forth in the brightest colours in the poems of Pope and the prose of Swift. The Irish dean was his discrimin- ating friend in the hours of prosperity, his unswerving advocate in adversity. The books and manuscripts which the 1st earl of Oxford and his son collected were among the glories of their age. The manuscripts became the property of the nation in 1753 and are now in the British Museum; the books were sold to a bookseller called Thomas Osborne in 1742 and described in a printed catalogue of five volumes (1 743-1 745), Dr Johnson writing an account of the library. A selection of the rarer pam- phlets and tracts, which was made by William Oldys, was printed in eight volumes (1744-1746), with a preface by Johnson. The best edition is that of Thomas Park, ten volumes (1808-1813). In the recollection of the Harleian manuscripts, the Harleian library and the Harleian Miscellany, the family name will never die.

Bibliography. — The best life of Harley is by E. S. Roscoe (1902). Articles relating to him are in Engl. Hist. Rev. xv. 238-250 (Defoe and Harley by Thomas Bateson) ; Trans, of the Royal Hist. Soc. xiv. N.S. 69-121 (development of political parties temp. Q. Anne by W. Frewen Lord); Edinburgh Review, clxxxvii. 151-178, cxciii. 457-488 (Harley papers). For his relations with St John see Walter Sichel's Bolingbroke (1901-1902, 2 vols.); for those with Swift, consult the Journal to Stella and Sir Henry Craik's Life of Swift (2nd ed., 1894, 2 vols.). (W. P. C.)

OXFORD, a city, municipal and parliamentary borough, the county town of Oxfordshire, England, and the seat of a famous university. 1 Pop. (1901) 49,336. It is situated on the river Thames, 51 m. by road and 63! m. by rail W.N.W. of London. It is served by the main northern line of the Great Western rail- way, and by a branch from the London & North- Western system at Bletchley; while the Thames, and the Oxford canal, running north from it, afford water communications. The ancient nucleus of the city stands on a low gravel ridge between

the Thames and its tributary the Cherwell, which here flow with meandering courses and many branches and backwaters through flat meadows. Modern extensions of Oxford cross both rivers, the suburbs of Osney and Botley lying to the west, Grandpont to the south, and St Clement's to the east beyond the Cherwell. To the north is a large modern residential district. The low meadow land is bounded east and west by well-wooded hills, rising rather abruptly, though only to a slight elevation, seldom exceeding 500 ft. Several points on these hills command celebrated views, such as that from Bagley Hill to the S.W., or from Elsfield to the N.E., from which only the inner Oxford is visible, with its collegiate buildings, towers and spires — a peerless city.

Main roads from east to west and from north to south inter- sect near the centre of ancient Oxford at a point called Carfax, 2 and form four principal streets, High Street (east), Queen Street (west), Cornmarket Street (north) and St Aldate's (south). 3 Cornmarket Street is continued northward by Magdalen Street, and near their point of junction Magdalen Street is intersected by a thoroughfare formed, from west to east, by George Street, Broad Street, Holywell Street and Long Wall Street, the last of which sweeps south to join High Street not far from Magdalen Bridge over the Cherwell. This thoroughfare is thus detailed, because it approximately indicates the northern and north- eastern confines of the ancient city. The old walls indeed (of which there are many fragments, notably a very fine range in New College garden) indicate a somewhat smaller area than that defined by these streets. Their line, which slightly varied, as excavations have shown, in different ages, bent south-westward from Cornmarket Street, where stood the north gate, till it reached the enceinte of the castle, which lies at the west of the old city,

1 See also Universities.

2 This word, which occurs elsewhere in England, means a place where four roads meet. Its ultimate origin is the Latin quadrifurcus, four-forked. Earlier English forms are carfuks, carrefore. The modern French is carrefour.

3 In the common speech of the university some streets are never spoken of as such, but, e.g., as " the High," " the Corn " (i.e. Corn-market), " the Broad." St Aldate's is pronounced St Olds, and the Cherwell (pronounced Charwell) is called " the Char."

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flanked on one side by a branch of the Thames. From the castle the southern wall ran east, along the modern Brewers' Street; the south gate of the city was in St Aldate's Street, where it is joined by this lane, and the walls then continued along the north side of Christ Church meadow, and north-eastward to the east gate, which stood in High Street near the junction of Long Wall Street. Oxford had thus a strong position: the castle and the Thames protected it on the east; the two rivers, the walls and the water-meadows between them on the south and east; and on the north the wall and a deep ditch, of which vestiges may be traced, as between Broad and Ship Streets.

An early rivalry between the universities of Oxford and Cambridge led to the circulation of many groundless legends respecting their foundation. For example, those which connected Oxford with " Brute the Trojan," King Mempric (1009 B.C.), and the Druids, are not found before the 14th century. The town is as a fact much older than the uni- versity. The historian, John Richard Green, epitomizes the relation between the two corporations when he shows 4 that " Oxford had already seen five centuries of borough life before a student appeared within its streets. . . . The university found Oxford a busy, prosperous borough, and reduced it to a cluster of lodging-houses. It found it among the first of English munici- palities, and it so utterly crushed its freedom that the recovery of some of the commonest rights of self-government has only been brought about by recent legislation." A poor Romano-British village may have existed on the peninsula between Thames and Cherwell, but no Roman road of importance passed within 3 m. of it. In the 8th century an indication of the existence of Oxford is found in the legend of St Frideswide, a holy woman who is said to have died in 73 5, and to have founded a nunnery on the site of the present cathedral. Coins of King Alfred have been discovered (though not at Oxford) bearing the name Oksna- forda or Orsnaforda, which seems to prove the existence of a mint at Oxford. It is clear, at any rate, that Oxford was already important as a frontier town between Mercia and Wessex when the first unquestionable mention of it occurs, namely in the English Chronicle under the year 912, when Edward the Elder " took to himself " London and Oxford. The name points to a ford for oxen across the Thames, though some have connected the syllable " ox-" with a Celtic word meaning " water," com- paring it with Ouse, Osney and Exford. The first mention of the townsmen of Oxford is in the English Chronicle of 1013, and that of its trade in the Abingdon Chronicle, which mentions the toll paid from the nth century to the abbot of Abingdon by boats passing that town. Notices during that century prove the growing importance of Oxford. As the chief stronghold in

the upper Thames valley it sustained various attacks by the Danes, being burned in 979, 1002 and 1010, while in 1013 Sweyn took hostages from it. It had also a considerable political importance, and several gemots were held here, as in 1015, when the two Danish thanes Sigfrith and Morkere were treacherously killed by the Mercian Edric; in 1020, when Canute chose Oxford as the scene of the confirmation of " Edgar's law " by Danes and English; in 1036, when Harold I. was chosen king, and in 1065. But Oxford must have suffered heavily about the time of the Conquest, for according to the Domesday Survey (which for Oxford is unusually complete) a great proportion of the " man- sions " (106 out of 297) and houses (478 out of 721) were ruined or unoccupied. The city, however, had already a market, and under the strong hand of the Norman sheriff Robert d'Oili (c. 1070-1119) it prospered steadily. He made heavy exactions on the townsfolk, though it may be noted that they withheld from him Port Meadow, the great meadow of 440 acres which is still a feature of the low riverside tract north of Oxford. But d'Oili did much for Oxford, and the strong tower of the castle and possibly that of St Michael's church are extant relics of his building activity. His nephew, another Robert, who held the castle after him, founded in 1 1 29 the most notable building that

4 In his essay on " The Early History of Oxford," reprinted from Stray Studies, in Studies in Oxford History, by the Oxford Historical Society (1901).

Oxford has lost. This was the priory (shortly afterwards the abbey) of Osney, which was erected by the branch of the Thames next west of that by which the castle stands. In its finished state it had a splendid church, with two high towers and a great range of buildings, but only slight fragments may now be traced. About 1 130 Henry I. built for himself Beaumont Palace, the site of which is indicated by Beaumont Street, and the same king gave Oxford its first known charter (not still extant), in which mention is made of a gild merchant. This charter is alluded to in another of Henry II., in which the citizens of Oxford and London are associated in the possession of similar customs and liberties. The most notable historical incident connected with the city in this period is the escape of the empress Matilda from the castle over the frozen river and through the snow to Abingdon, when besieged by Stephen in 1142.

It is about this time that an indication is first given of organized teaching in Oxford, for in 1133 one Robert Pullen is said to have instituted theological lectures here. No earlier facts are known concerning the origin of the university, though it may with probability be associated with schools connected with the ecclesiastical foundations of Osney and St Frideswide; and the tendency for Oxford to become a centre of learning may have been fostered by the frequent presence of the court at Beaumont. A chancellor, appointed by the bishop of Lincoln, is mentioned in 1214, and an early instance of the subordination of the town to the university is seen in the fact that the townsfolk were required to take oaths of peace before this official and the arch- deacon. It may be mentioned here that the present practice of appointing a non-resident chancellor, with a resident vice-chancellor, did not come into vogue till the end of the 15th century. In the 13th century a number of religious orders, which here as elsewhere exercised a profound influence on education, became established in Oxford. In 1221 came the Dominicans, whose later settlement (c. 1260) is attested by Blackfriars Street, Preacher's Bridge and Friars' Wharf. In 1224 the Franciscans settled near the present Paradise Square. In the middle of the century the Carmelites occupied part of the present site of Worcester College, but their place here was taken by the Benedictines when, about 1315, they were given Beaumont by Edward II., and removed there. The Austin Friars settled near the site of Wadham College; for the Cistercians Rewley Abbey, scanty remains of which may be traced near the present railway stations, was founded c. 1280. During the same century the political importance of Oxford was maintained. Several parliaments were held here, notably the Mad Parliament of 1258, which enforced the enactment of the Provisions of Oxford. Again, the later decades of the 13th century saw the initiation of the collegiate system. Merton, University and Balliol were the earliest foundations under this system. The paragraphs below, dealing with each college successively, give the dates and circumstances of foundation for all. As to the relations between the university and the city, in 1248 a charter of Henry III. afforded students considerable privileges at the expense of townsfolk, in the way of personal and financial protection. Moreover, the chancellor already possessed juridical powers; even over the townsfolk he shared jurisdiction with the mayor. Not unnaturally these peculiar conditions engendered rivalry between " town and gown "; rivalry led to violence, and after many lesser encounters a climax was reached in the riot on St Scholastica's and the following day, February 10th and nth, J 3S4/S- Its immediate cause was trivial, but the townsmen gave rein to their long-standing animosity, severely handled the scholars, killing many, and paying the penalty, for Edward III. gave the

university a new charter enhancing its privileges. Others followed from Richard II. and Henry IV. A charter given by Henry VIII. in 1523 at the instigation of Wolsey conferred such power on the university that traders of any sort might be given its privileges, so that the city had no jurisdiction over them. In 1571 was passed the act of Elizabeth which incorporated and reorganized the universities of Oxford and Cambridge. In 1635 a charter of Charles I. confirmed its privi- leges to the university of Oxford, of which William Laud had

become chancellor in 1630. Vestiges of these exaggerated powers (as distinct from the more equable division of rights between the two corporations which now obtains) long survived. For example, it was only in 1825 that the ceremony of reparation enforced on the municipality after the St Scholastica riots was discontinued.

During the reign of Mary,in 1555, there took place, on a spot in Broad Street, the famous martyrdom of Ridley and Latimer. Cranmer followed them to the stake in 1556, and the three are commemorated by the ornate modern cross, an early work of Sir G. G. Scott (1841), in St Giles Street beside the church of St Mary Magdalen. A period such as this must have been in many ways harmful to the university, but it recovered prosperity under the care of Elizabeth and Wolsey. During the civil war, however, Oxford, as a city, suddenly acquired a new prominence as the headquarters of the Royalist party and the meeting-place of Charles I.‘s parliament. This importance is not incomparable with that which Oxford possessed in the Mercian period. How- ever the frontier shifted, between the districts held by the king and by the parliament, Oxford was always close to it. It was hither that the king retired after Edgehill, the two battles of Newbury and Naseby; from here Prince Rupert made his dashing raids in 1643. In May 1644 the earl of Essex and Sir William Waller first approached the city from the east and south, but failed to enclose the king, who escaped to Worcester, returning after the engagement at Copredy Bridge. The final investment of the city, when Charles had lost every other stronghold of importance, and had himself escaped in disguise, was in May 1646, and on the 24th of June it surrendered to Fairfax. Throughout the war the secret sympathies of the citizens were Parliamentarian, but there was no conflict within the walls. The disturbances of the war and the divisions of parties, however, had bad effects on the university, being subversive of discipline and inimical to study; nor were these effects wholly removed during the Commonwealth, in spite of the care of Cromwell, who was himself chancellor in 1651-1657. The Restoration led to conflicts between students and citizens. Charles II. held the last Oxford parliament in 1681. James II. ‘s action in forcing his nominees into certain high

offices at last brought the univer- sity into temporary opposition to the crown. Later, however, Oxford became strongly Jacobite. In the first year of George I.'s reign there were serious Jacobite riots, but from that time the city becomes Hanoverian in opposition to the university, the feeling coming to a head in 1755 during a county election, which was ultimately the subject of a parliamentary inquiry. But George III., visiting Oxford in 1785, was well received by both parties, and this visit may be taken as the termination of the purely political history of Oxford. Details of the history of the university may be gathered from the following description of the colleges, the names of which are arranged alphabetically.

All Souls College was founded in 1437 by Henry Chicheley (q.v.), archbishop of Canterbury, for a warden, 40 fellows, 2 chaplains, and clerks. The charter was issued in the name of collems Henry VI., and it has been held that Chicheley wished, by founding the college, to expiate his own support of the disastrous wars in France during the reign of Henry V. and the ensuing regency. Fifty fellowships in all were provided for by the modern statutes, besides the honorary fellowships to which men of eminence are sometimes elected. Some of the fellowships are held in connexion with university offices; but the majority are awarded on examination, and are among the highest honours in the university offered by this method. The only under-graduate members of the college are four bible-clerks, 1 so that the college occupies a peculiar position as a society of graduates. The college has its beautiful original front upon High Street; the first quadrangle, practically unaltered since the foundation, is one of the most characteristic in Oxford. The chapel has a splendid reredos occupying the whole eastern wall, with tiers of figures in niches. After the original figures had been destroyed during the Reformation the reredos was plastered over, but

1 Here and in some other colleges this title is connected with the duties of reading the Bible in chapel and saying grace in hall.

when the plaster was removed, Sir Gilbert Scott found enough remains to render it possible to restore the whole. The second quadrangle is divided from Radcliffe Square by a stone screen and cloister. From the eastern range of buildings twin towers rise in graduated stages. On the north side is the library. The whole is in a style partly Gothic, partly classical, fantastic, but not without dignity. The architect was Sir

Christopher Wren's pupil, Nicholas Hawksmoor; the building was spread over the first half of the 18th century. The fine library originated in a bequest of Sir Christopher Codrington (d. 171°), and bears his name. One of the traditional customs surviving in Oxford is found at All Souls. Legend states that a mallard was discovered in a drain while the foundations were being dug. A song (probably Elizabethan) on this story is still' sung at college gaudies, and later it is pretended to hunt the bird. With such a foundation as All Souls, a great number of eminent names are naturally associated (see Montagu Burrows, Worthies of All Souls, 1874).

Balliol College is one of the earliest foundations. About 1263 John de Baliol (see Baliol, family) began, as part of a penance, to maintain certain scholars in Oxford. Dervorguila, his wife, developed his work after his death in 1269 by founding the college, whose statutes date from 1282, though not brought into final form (apart from modern revision) until 1504. There are now twelve fellowships and fifteen scholarships on the old foundation. Two fellowships, to be held by members already holding fellowships of the college, were founded by James Hozier, second Lord Newlands, in 1906, in commemoration of Benjamin Jowett, master of the college. The buildings, which front upon Broad Street, Magdalen Street and St Giles Street, are for the most part modern, and mainly by Alfred Waterhouse, Anthony Salvin and William Butterfield. The college has a high reputa- tion for scholarship. Its master and fellows possess the unique right of electing the visitor of the college. In 1887 Balliol College absorbed New Inn Hall, one of the few old halls which had survived till modern times. In the time of the civil wars a royal mint was established in it.

Brasenose College (commonly written and called B.N.C.) was founded by William Smith, bishop of Lincoln, and Sir Richard Sutton of Prestbury, Cheshire, in 1509. Its name, however, perpetuates the fact that it took the place of a much earlier community in the university. There were several small halls on its site, all dependent on other colleges or religious houses except one — Brasenose Hall. The origin of this hall is not known, but it existed in the middle of the 12th century. In 1334 certain students, wishing for peace from the faction-fights which were then characteristic of their life in Oxford, migrated to Stamford, where a doorway remains of the house then occupied by them as Brasenose Hall. From this an ancient knocker in the form of a nose, which may have belonged to the hall at Oxford, was brought to the college in 1890. It presumably gave name to the hall, though a derivation Lorn brasinium (Latin for a brew-house) was formerly upheld. The original foundation of the college was for a principal and twelve fellows. This number is maintained, but supernumerary

fellowships are added. Of a number of scholarships founded by various bene- factors several are confined to certain schools, notably Manchester Grammar School. William Hulme (1691) established a founda- tion which provides for twelve scholars and a.varying number of exhibitioners on entrance, and also for eight senior scholarships open under certain conditions to members of the college already in residence. The main front of the college faces Radcliffe Square; the whole of this and the first quadrangle, excepting the upper storey, is of the time of the foundation; and the gateway tower is a specially fine example. The hall and the chapel, with its fine fan-tracery roof, date from 1663 and 1666, and are attributed to Sir Christopher Wren. In both is seen a curious attempt to combine Gothic and Grecian styles. Modern buildings (by T. G. Jackson) have a frontage upon High Street. Robert Burton, author of The Anatomy of Melancholy, became an undergraduate of the college in 1593; Reginald Heber in 1800; Walter Pater became a fellow in 1864.

Christ Church, in point of the number of its members the largest collegiate foundation in Oxford, is also eminent owing to its unique constitution, the history of which involves that of the see of Oxford. Mention has been made of the priory of St Frideswide and its very early foundation, also of the later but more magnificent foundation of Osney Abbey. Both of these were involved in the sweeping changes initiated by Wolsey and carried on by Henry VIII. Wolsey projected the foundation of a college on an even grander scale than that of the present house. In 1 524-1 525 he obtained authority from Pope Clement VII. to suppress certain religious houses for the purpose of this new foundation. These included St Frideswide's, which occupied part of the site which Wolsey intended to use. The new college, under the name of Cardinal College, was licensed by the king in 1525. Its erection began immediately. The monastic buildings were in great part removed. Statutes were issued and appointments were made to the new offices. But in 1529 Wolsey fell from power. Cardinal College was sup- pressed, and in 1532 Henry VIII. established in its place another college, on a reduced foundation, called King Henry VIII. 's College. Oxford had been, and was at this time, in the huge diocese of Lincoln. But in 1542, on the suppression of Osney Abbey, a new see was created, and the abbey church was made its cathedral. This arrangement obtained only until 1545, when both the new cathedral church and the new college which took the place of Wolsey's foundation were surrendered to the king. In 1546 Henry established the composite foundation which now (subject to certain modern alterations) exists. He provided for a dean and eight canons and 100 students, to which number one was added in 1664. The church of St

Frides- wide's foundation became both the cathedral of the diocese and the college chapel. The establishment was thus at once diocesan and collegiate, 1 and it remains so, though now the foundation consists of a dean, six canons, and the usual cathedral staff, a reduced number of students (corresponding to the fellows of other colleges) and scholars. Five of the canons are university professors. The disciplinary administration of the collegiate part of the foundation is under the immediate supervision of two students who hold the office of censors. Queen Elizabeth established the connexion with Westminster School by which not more than three scholars are elected thence each year to Christ Church. There is also a large number of valuable exhibi- tions. The great number of eminent men associated with Christ Church can only be indicated here by the statement that its books have borne the names of several members of the British and other royal families, including that of King Edward VII. as prince of Wales and of Frederick VIII. of Denmark as crown prince; also of ten prime ministers during the 19th century. The stately front of Christ Church is upon St Aldate's Street. The great gateway is surmounted by a tower begun by Wolsey, but only completed in 1682 from designs of Sir Christopher Wren. Though somewhat incongruous in detail, it is of singular and beautiful form, being octagonal and surmounted by a cupola. It contains the great bell " Tom " (dedicated to St Thomas of Canterbury), which, though recast in 1680, formerly belonged to Osney Abbey. A clock strikes the hours on it, and at five minutes past nine o'clock in the evening it is rung 101 times by hand, to indicate the hour of closing college gates, the number being that of the former body of students. The gate, the tower, and the first quadrangle are all commonly named after this bell. Tom Quadrangle is the largest in Oxford, and after various restorations approximates to Wolsey's original design, though the cloisters which he intended were never built. On the south side lies the hall, entered by a staircase under a magnifi- cent fan tracery roof dating from 1640. The hall itself is one of the finest refectories in England; its roof is of ornate timber work (1529) and a splendid series of portraits of eminent alumni of the house adorn the walls, together with Holbein's portraits

1 As a whole it is therefore properly to be spoken of as Christ Church, not Christ Church College. In the common speech of the university it has become known as The House, though all the colleges are technically " houses."

of Henry VIII. and Wolsey. With the hall is connected the great kitchen, the first building undertaken by Wolsey. An entry through the eastern range of Tom Quadrangle forms the west portal of the Cathedral Church of Christ.

The cathedral, of which the nave and choir serve also as the college chapel, is the smallest English cathedral, but is of high architectural interest. The plan is cruciform, with a northward extension from the north choir aisle, comprising the Lady chapel and the Latin chapel. It has been seen that probably in the 8th century St Frideswide founded a religious house. In the east end of the north choir aisle and Lady chapel may be seen two blocked arches, T'ude, narrow and low. Excavations outside the wall in 1887 revealed the foundations of three apses corresponding with these two arches and another which has been traced between them, and in this wall, therefore, there is clearly a remnant of the small Saxon church, with its eastward triple-apsidal termination. In 1002 there took place the massacre of the Danes on St Brice's day at the order of ˆEthelred II. Some Danes took refuge in the tower of St Frideswide's church, which was fired to ensure their destruction. In 1004 the king undertook the rebuilding of the church. There is full reason to believe that he had assistance from his brother-in- law, Richard II., duke of Normandy, and that much of his work remains, notably in some of the remarkable capitals in the choir. About 1 160, however, there was an extensive Norman restoration. The arcades of the choir and of the nave, which was shortened by Wolsey for the purpose of his collegiate building, have massive pillars and round arches. Within these arches, not, as usual, above them, a blind arcade forms the triforium, and below this a lower set of arches springs from the outer side of the main pillars. The Norman stone-vaulted aisles conform in height with these lower arches. Over all is a clerestory with passage. The east end is a striking Norman restoration by Sir Gilbert Scott, consisting of two windows and a rose window above them, with an intervening arcade. The choir has a Perpendicular fan-tracery roof in stone, one of the finest extant, and the early clerestory is here altered to conform with this style. The nave roof is woodwork of the 16th century, and there is a fine Jacobean pulpit. The lower part of the tower, with internal arcades in the lantern, is Norman; the upper stage is Early English, as is the low spire, possibly the earliest built in England. St Lucy's chapel in the south transept aisle contains a rich flamboyant Decorated window. In the north choir aisle are the fragments which have been discovered and roughly recon- structed of St Frideswide's shrine, of marble, with foliage beautifully carved, representing plants symbolical of the life of the saint. The Latin chapel is of various dates, but mainly of the 14th

century. The north windows contain contemporary glass; the east window is a rich early work of Sir E. Burne-Jones, set in stonework of an inharmonious Venetian design. There are other beautiful windows by Burne-Jones at the east ends of the aisles and Lady chapel, and at the west end of the south nave aisle. The corresponding window of the north aisle is a curious work by the Dutch artist Abraham Yan Ling (1630). There are many fine ancient monuments, notably those of Bishop Robert King (d. 1557), and of Lady Elizabeth Montacute (d. 1355). The so-called watching-chamber for St Frideswide's shrine is a rich structure in stone and wood dating from c. 1500. The peculiar arrangement of the collegiate seats in the cathedral, the nave and choir being occupied by modern carved pews or stalls running east and west, and the position of the organ on a screen at the west end, add to the distinctive interior appearance of the building. Small cloisters adjoin the cathedral on the south, and an ornate Norman doorway gives access from them to the chapter-house, a beautiful Early English room. Ahove the cloisters on the south rises the " old library," originally the monastic re- fectory, which has suffered conversion into dwelling and lecture- rooms.

To the north-east of Tom Quadrangle is Peckwater Quadrangle, named from an ancient hall on the site, and built from the design of the versatile Dean Henry Aldrich (1705) with the exception of the library (1716-1761), which forms one side of it. The whole is classical in style. The library contains some fine pictures by Cimabue, Holbein, Van Dyck and others, and sculpture by Rysbrack, Roubillac, Chantrey and others. The small Canterbury Quadrangle, to the east, was built in 1773- 1783, and marks the site of Canterbury College or Hall, founded by Archbishop Islip in 1363, and absorbed in Henry VIII. 's foundation. To the south of the hall and old library are the modern Meadow Buildings (1862-1865), overlooking the beautiful Christ Church Meadows, whose avenues lead to the Thames and Cherwell.

Corpus Christi College (commonly called Corpus) was founded in 1516 by Richard Fox, bishop of Winchester (1500-1528). He at first intended his foundation to be a seminary connected with St Swithin's priory at Winchester, but Hugh Oldham,

bishop of Exeter, foresaw the dissolution of the monasteries and advised against this. Fox had especially in view the object of classical education, and his foundation, besides a president, 20 fellows and 20 scholars, included 3 professors — in Greek, Latin and theology — whose lectures should be open to the whole university. This arrangement fell into desuetude, but was revived in 1854, when fellowships of the college were annexed to the professorial chairs of

Latin and jurisprudence. The foundation now consists of a president, 16 fellows, 26 scholars and 3 exhibitioners. The college has its front upon Merton Street. The first quadrangle, with its gateway tower, is of the period of the foundation, and the gate- way has a vaulted roof with beautiful tracery. In the centre of the quadrangle is a curious cylindrical dial in the form of a column surmounted by a pelican (the college symbol), constructed in 1 581 by Charles Turnbull, a mathematician who entered the college in 1573. The hall has a rich late Perpendicular roof of timber; the chapel, dating from 1517, contains an altar-piece ascribed to Rubens, and the small library includes a valuable collection of rare printed books and MSS. The college retains its founder's crozier, and a very fine collection of old plate, for the preservation of which it is probable that Corpus had to pay a considerable sum in aid of the royalist cause. Behind the main quadrangle are the classical Turner buildings, erected during the presidency of Thomas Turner (1706), from a design attributed to Dean Aldrich. The picturesque college garden is bounded by the line of the old city wall. There are modern buildings (1885) by T. G. Jackson on the opposite side of Merton Street from the main buildings. Among the famous names associated with the college may be mentioned those of four eminent theologians — Reginald Pole, afterwards cardinal (nominated fellow in 1523), John Jewel, bishop of Salisbury (fellow 1542- JSSS); Richard Hooker (scholar, 1573) and John Keble (scholar, 1806). Thomas Arnold, the famous headmaster of Rugby school, was a scholar of the college (181 1).

Exeter College was founded, as Stapeldon Hall, by Walter Stapeldon, bishop of Exeter, in 13 14, but by the middle of the century it had become known as Exeter Hall. The foundation was extended by Sir William Petre in 1565. Stapeldon's original foundation for 12 scholars provided that 8 of them should be from Devonshire and 4 from Cornwall. There are still 8 " Stapeldon " scholarships confined to persons born or educated within the diocese of Exeter. The foundation consists of a rector, 12 fellowships and 21 scholarships or more. There are also a number of scholarships and exhibitions on private foundations, several of which are limited in various ways, including 3 confined to persons born in the Channel Islands or educated in Victoria College, Jersey, or Elizabeth College, Guernsey. The college has its front, which is of great length, upon Turl 1 Street. It has been extensively restored, and its gateway tower was rebuilt in 1703, while the earliest part of the quadrangle is Jacobean, the hall being an excellent example dating from 1618. The chapel (1857-1858) is an ornate structure by Sir Gilbert Scott; it is in Decorated style, of great height, with an eastern apse, and has some resemblance to the Sainte

Chapelle in Paris. The interior contains mosaics by Antonio Salviati and tapestry by Sir E. Burne-Jones and William Morris. Scott's work is also seen in the frontage towards Broad Street, and in the library (1856). The college has a beauti- ful secluded garden between its own buildings and those of the divinity school or Bodleian library.

Hertford College, in its present form, is a modern foundation. There were formerly several halls on the site, and some time between 1283 and 1300 Elias of Hertford acquired one of them, which became known as Hert or Hart Hall. In 13 12 it was sold to Bishop Stapeldon, the founder of Exeter, and was occupied by his scholars for a short time. Again, some of William of Wykeham's scholars were lodged here while New College was building. The dependence of the hall on Exeter College was maintained until the second half of the 16th century. In 1710

1 " The Turl " takes its name from a postern (Turl or Thorold Gate) in the city wall, to which the street led.

Richard Newton, formerly a Westminster student of Christ Church, became principal, and in 1740, in spite of opposition from Exeter, he obtained a charter establishing Hertford as a college. The foundation, however, did not prosper, and by an inquisition of 1816 it was declared to have lapsed in 1805. With part of its property the university was able to endow the Hertford scholarship in 1834. Magdalen Hall, which had become inde- pendent of the college of that name in 1602, acquired the site and buildings of the dissolved Hertford College and occupied them, but was itself dissolved in 1874, when its principal and scholars were incorporated as forming the new Hertford College. An endowment was provided by Thomas Charles Baring, then M.P. for South Essex, for 15 fellows and 30 scholars, 7 lecturers and dean and bursar. The foundation now consists of a principal, 17 fellows and 40 scholars. Of the college buildings, which face those of the Bodleian library and border each side of New College Lane, no part is earlier than Newton's time. Modern buildings by T. G. Jackson (1903) incorporate remains of the little early Perpendicular chapel of Our Lady at Smith Gate (incorrectly called St Catherine's), which probably stood on the outer side of the town ditch. There is a striking modern chapel.

Jesus College has always had an intimate association with Wales.

Queen Elizabeth figures as its foundress in its charter of 1571, but she was inspired by Hugh ap Rice (Price), a native of Brecon, who endowed the college. The original foundation was for a principal, 8 fellows and 8 scholars. It now consists of a principal and not less than 8 or more than 14 fellows, and there are 24 foundation scholarships, besides other scholarships and exhibitions, mainly on the foundation of Edmund Meyricke, a native of Merionethshire, who entered the college in 1656 and was a fellow in 1662. Not only his scholarships but others also are restricted (unless in default of suitable candidates) to persons born or educated in Wales, or of Welsh parentage. At Jesus, as at Exeter, there are also some ” King Charles I.” scholarships for persons born or educated in the Channel Islands. The college buildings face Turl Street; the front is an excellent reconstruc- tion of 1856. The chapel dates from 1621, the hall from about the same time, and the library from 1677, being erected at the expense of the eminent principal (1661-1673) Sir Leoline Jenkins. He and his predecessor, Sir Eubule Thelwall (1621-1630), were prominent in raising the college from an early period of depression.

Kcble College is modern; it received its charter in 1870. It was erected by subscription as a memorial to John Keble (q.v.). Its stated object was to provide an academical education com- bined with economical cost in living and a ” training based upon the principles of the Church of England.” The college is governed by a warden (who has full charge of the internal administration) and a council. There is a staff of tutors, and a number of scholar- ships and exhibitions on private foundations. The buildings lie somewhat apart from other collegiate buildings towards the north of the city, facing the university parks, which extend from here down to the river Cherwell. They are from the designs of William Butterfield, and are principally in variegated brick. The chapel has an elaborate scheme of decoration in mosaic; and the library contains a great number of books collected by Keble, and Holman Hunt’s picture, ” The Light of the World.”

Lincoln College was founded in 1427 by Richard Flemyng, bishop of Lincoln. It was an outcome of the reaction against the doctrines of Wycliffe, of which the founder of the college, once their earnest supporter, was now an equally earnest opponent. He died (1431) before his schemes were fully carried out, and the college was struggling for existence when Thomas Rotherham, while bishop of Lincoln and visitor of the college, reconstituted and re-endowed it in 1478. The foundation consists of a rector, 1 2 fellows and 14 scholars. The buildings face Turl Street. The hall dates from 1436, but its wainscoting within was added in 1 701. The chapel, in the back quadrangle, is an interesting example of Perpendicular work of very

late date (1630). The interior is wainscoted in cedar, and the windows are filled with Flemish glass introduced at the time of the building. There is a modern library building in a classic Jacobean style, completed in 1906; the collection of books was originated by Dean

John Forest, who also built the hall. Among the eminent associates of this college was John Wesley, fellow 1726-17 51.

Magdalen College (pronounced Maudlen; in full, St Mary Magdalen) was founded in 1458 by William of Waynflete, bishop of Winchester and lord chancellor of England. In 1448 he had obtained the patent authorizing the foundation of Magdalen Hall. In the college he provided for a president, 40 fellows, 30 demies, 1 and, for the chapel, chaplains, clerks and choristers. To the college he attached a grammar-school with a master and usher. The foundation now consists of a president, from 30 to 40 fellowships, of which 5 are attached to the Waynflete pro- fessorships in the university, 2 senior demies up to 8 and junior demies up to 35 in number. The choir, &c, are maintained, and the choral singing is celebrated. In order to found his college, Waynflete acquired the site and buildings of the hospital of St John the Baptist, a foundation or refoundation of Henry III. for a master and brethren, with sisters also, for " the relief of poor scholars and other miserable persons." The Magdalen buildings, which are among the most beautiful in Oxford, have a long frontage on High Street, while one side rises close to or directly above a branch of the river Cherwell. The chief feature of the front is the bell-tower, a structure which for grace and beauty of proportion is hardly surpassed by any other of the Perpendicular period. It was begun in 1492, and com- pleted in about thirteen years. From its summit a Latin hymn is sung at five o'clock on May-day morning annually. Various suggestions have been made as to the origin of this custom; it may have been connected with the inauguration of the tower, but nothing is certainly known. The college is entered by a modern gateway, giving access to a small quadrangle, at one corner of which is an open pulpit of stone. This was connected with the chapel of St John's Hospital, which was incorporated in the front range of buildings. Adjoining this is the west front of the college chapel. 3 This chapel was begun in 1474, but has been much altered, and the internal fittings are in the main excellent modern work (1833 seq.). At the north-west corner of the entrance quadrangle is a picturesque remnant of the later buildings of Magdalen Hall. To the west is the modern St Swithun's quad- rangle, the buildings of which were designed by G. F. Bodley and T. Garner, and begun in 1880, and to the west again a Perpendicular building erected for Magdalen College school in 1849. To the east lies the main quadrangle, called the cloister quadrangle,

from the cloisters which surround it. These have been in great part reconstructed, but in accordance with the plan of the time of the foundation. Above the west walk rises the beautiful ” founder’s ” tower, low and broad. On this side also is the valuable library. The south walk is bounded by the chapel and the hall, which lie in line, adjoining each other. The hall is a beautiful room, improved in 1906 by the substitution of an open timber roof for one of plaster erected in the 18th century. The panelling dates mainly from 1541; there is a tradition that the part at the west end came from the dissolved Reading Abbey. A curious series of figures which surmount the buttresses on three sides of the cloisters date from 1508-1509. Some are apparently symbolical, others scriptural, others again heraldic. To the north of the cloister quadrangle (a garden with broad lawns intervening) stand the so-called New Buildings, a massive classical range (1733). To the north and west of these extends the Grove or deer park, where the first deer were established probably c. 1720; to the east, across a branch of the Cherwell, is the meadow surrounded by Magdalen Walks, part of which is called Addison’s Walk after Joseph Addison (demy and fellow). Perhaps the most notable period in the history of the college is that of 1687-1688, when the fellows resisted James II. ‘s attempt to force a president upon them, in place of their own choice, John Hough (1651-1743), successively bishop of Oxford,

1 Singular demy, the last syllable accented. They correspond to the scholars of other colleges. The name is derived from the fact that their allowance was originally half (demi-) that of fellows.

2 Waynflete himself had founded three readerships, in natural and moral philosophy and in theology.

3 It actually faces about N.W. ; the same deviation applies to other buildings described.

Lichfield, and Worcester. Cardinal Wolsey was a fellow of the college about the time when the bell-tower was building, but the attribution of the design to him, or even of any active part in the erection, is not borne out by evidence. Among alumni of the college were William Camden, Sir Thomas Bodley, John Hampden, at the time of whose matriculation (1610) Magdalen was strongly Puritan, Joseph Addison, Dr Sacheverell, and for a short period Gibbon the historian. Mention

should be made of the eminent president, Martin Joseph Routh, who was elected to the office in 1791, and held it till his death in his 100th year in 1854. Magdalen College school had new buildings opened for it in 1894. ‘

Merton College is of peculiar interest as regards its foundation, which is generally cited as the first on the present collegiate model. At some time before 1264 Walter de Merton, 1 a native of Merton, Surrey, devoted estates in that county to the main- tenance of scholars in Oxford. Thus far he followed an estab- lished practice. In 1264 he founded at Maiden a ” house of scholars of Merton ” for those who controlled the estates in the interest of the scholars, who should study preferably at Oxford, though any centre of learning was open to them. By 1268 the Oxford community had acquired the present site of the college; in 1270 new statutes laid down rules of living and study, and in 1274 the whole foundation was established under a final set of statutes at Oxford — i.e. the society ceased to be administered from the house in Surrey. The society was under a warden, and certain other officers were established, but no limit was set on the number of scholars. The foundation now consists of a warden, from 19 to 26 fellows, and 20 or more postmasterships. The postmasters of Merton correspond to the scholars of other colleges; they had their origin in the portionistae {i.e. founda- tioners who had a smaller portion or emolument than fellows), instituted in 1380 on the foundation of John Wyllyot (fellow 1334, chancellor 1349). The college is adjacent to Corpus, with its front upon Merton Street, and some of its buildings are of the highest interest, notably the chapel and library. The chapel consists of a choir and transepts with a tower at the crossing; but a nave, though intended, was never built. The choir is of the purest Decorated workmanship (dating probably from the last decade of the 13th century), with beautiful windows exhibit- ing most delicate tracery. The transepts show the appearance of Perpendicular work, but there is also work of the earlier style in them; the massive tower is wholly of the later period (c. 1450). The library, which lies on two sides of the so-called ” mob ” quadrangle, dates from 1377-1378, and was mainly the gift of William Rede, bishop of Chichester (1369-1386). It occupies two beautiful rooms and is of great interest from its early founda- tion and the preservation of its ancient character. The treasury is a small room coeval with the foundation, with a curious high- pitched ashlar roof. The other buildings, which are of various dates, are mainly disposed about four quadrangles, including that of St Alban’s Hall, which, possibly dating from the early part of the 15th century, was incorporated with Merton College in 1882. The college hall retains an original door with fine ironwork, but

the building is in great part modernized. A beautiful garden lies east of the buildings, being separated from the meadows to the south by part of the old city wall. Modern buildings (1907) have a frontage upon Merton Street; others (1864) overlook the meadows. Traditionally the names of Roger Bacon, Duns Scotus and Wycliffe have been associated with this college. Anthony Wood (1632-1695), the antiquary and historian of the university, was a postmaster of the college.

New College was founded by William of Wykeham in 13 79- The founder's name for it, which it still bears in its corporate title, is the College of St Mary of Winchester. But there was already a St Mary's College (Oriel) . Wykeham's house thus soon became known as the New College, and the substantive is still retained in the ordinary speech of the university, whereas in mentioning the titles of other colleges it is generally omitted.

1 He was chancellor of the kingdom in 1261-1263, and again in 1272-1274, justiciar in 1271 and bishop of Rochester in 1274. He died in 1277.

Wykeham designed an exclusive connexion between his Oxford college and his school at Winchester. This connexion is main- tained in a modified form. Wykeham's foundation was for a warden, and 70 fellows and scholars, with chaplains and a choir. The present foundation consists of a warden, and not more than 36 fellows, while to the scholarships 6 elections are made annually from Winchester and 4 from elsewhere. The choir is maintained, ' as at Magdalen. Five of the fellowships were attached to university professorships, of which three (logic, ancient history and physics) are called Wykeham professorships. The buildings of New College remain in great measure as designed by the founder, and illustrate the magnificence of his scheme. The main gateway tower fronts New College Lane. The chapel and hall stand in line (as at Magdalen), on the north side of the front quadrangle. The period of building was that of the develop- ment of the Perpendicular style. In shape the chapel was the prototype of a form common in Oxford, consisting of a choir, with transepts forming an antechapel, but with no nave. The remarkable west window in monochrome was erected, c. 1783, from a design by Sir Joshua Reynolds. The reredos, with its tiers of figures in niches, had a history similar to that at All Souls, being plastered over in 1567. In the same way, too, it was restored c. 1890; but previously James Wyatt had dis- covered traces of the original, and had unsuccessfully attempted the restoration of the niches in plaster, carrying out also, as elsewhere in Oxford, other extensive alterations of which the obliteration was

demanded by later taste. Portions of the old woodwork were incorporated in the excellent new work of 1879 (Sir Gilbert Scott). In the chapel is preserved the beautiful pastoral staff of the founder, and there is a fine series of memorial brasses, mainly of the 1 3th century, in the antechapel. To the west of the chapel are the cloisters, consecrated in 1400, and the detached tower, a tall massive building on the line of the city wall. As already mentioned, a fine remnant of this wall adds to the picturesqueness of the college garden. The hall was completed in 1368, and has a Tudor screen and wainscoting. The garden quadrangle, the east side of which is open to the gardens, dates from 1 68 2-1 708. On the north side of the college precincts, facing Holywell Street, are extensive modern buildings by Sir G. G. Scott and B. Champneys. In 1642, when Oxford was play- ing its prominent part in the Civil War, the tower and cloisters of New College became a royalist magazine.

Oriel College was founded by Edward II. in 1326. The originator of the scheme and the prime mover in it was Adam de Brome, the king's almoner, who in 1324 had obtained royal licence to found a college; but in 1326 he surrendered his rights to the king, who issued charter and statutes, and created Brome the first provost. This foundation was for a provost and 10 fellows, but a number of bequests extending over nearly a century from 1445 enabled additional fellowships to be established. The foundation, however, now consists of the provost, 12 fellows and 2 professorial fellows, with at least 12 scholars and a number of exhibitioners. St Mary Hall, which had been the manse of St Mary's church, was given with the church to the college by the founder, and was opened as a hall with a principal of its own. It was, however, incorporated with the college in 1902. Oriel College was dedicated to St Mary the Virgin, and the name by which it is now known appears first in 1349. It was derived from a tenement called La Oriole (but the origin of this name is unknown), which had occupied part of the college site, had belonged to Eleanor of Provence, wife of Edward I., and had been given by her to her chaplain, James of Spain (JacoDus de Ispania). The buildings of Oriel, which face Oriel Street, are not coeval with the foundation. The first quadrangle, with its elaborate battlements, dates from 1620- 1637. The inner quadrangle has buildings of 1719, 1729 and later dates. The modern extension on Cecil Rhodes's founda- tion faces High Street. Early in the 19th century a number of eminent men associated with Oriel gave the college its well- known connexion with the " Oxford Movement." Edward Copleston, elected fellow in 1795, became provost in 1814. In 181 1 John Keble and Richard Whately were elected fellows,

the one from Corpus; the other had been at Oriel. Again in 18×5 Thomas Arnold, afterwards headmaster of Rugby, was elected from Corpus, with Renn Dickson Hampden of Oriel. Later fellows were John Henry Newman (1822) and Edward Pusey (1823). James Anthony Froude entered the college in 1835; Matthew Arnold became a fellow in 1845. Cecil John Rhodes matriculated in 1873, and, besides his foundation of Rhodes scholarships, made a large bequest to the college.

Pembroke College was founded in 1624. Thomas Tesdale (1547-1609) of Glympton, Oxfordshire, left money for the support of scholars in Oxford, indicating Balliol College as his preference, but not insisting on this. Richard Wightwick (d. 1630), rector of East Ilsley, Berkshire, added to Tesdale's bequest, and though Balliol College desired to benefit by it, James I. preferred to figure as the founder of a new college with these moneys. Pembroke, which was named after William Herbert, earl of Pembroke, then chancellor of the university, was thus developed out of Broadgates Hall, which had long been eminent as the residence of students in law. The original college foundation was for a master, 10 fellows and 10 scholars, but a number of scholarships and exhibitions has been added by benefactors. Of the scholarships some are awarded by preference to candidates possessing certain qualifications, notably that of education at Abingdon school, which Tesdale intended to benefit by his bequest. The buildings of Pembroke lie south and west of St Aldate's Church, opposite Christ Church; they surround two picturesque quadrangles, but are in great part modern. The college preserves some relics of Samuel Johnson, who entered it in 1728.

Queen's College was founded in 1340-1341 by Robert de Eglesfield, chaplain of Philippa, queen-consort of Edward III., and was named in her honour. Her son, Edward the Black Prince, was entered on the books of the college, and Henry V. received education here. Several queens were among the benefactors of the college — Henrietta Maria, Caroline, Charlotte. The queen-consort is always the patroness of the college. The foundation consists of a provost, from 14 to 16 fellows, and about 25 scholars. There was formerly an intimate ■ connexion between this college and the north of England. Five scholarships, called Eglesfield scholarships, are now given by preference to natives of Cumberland or Westmorland, and the Hastings exhibitions founded by Lady Elizabeth Hastings (1682-1739) are open only to candidates from various schools in these counties and in Yorkshire. This connexion dates from the foundation. Eglesfield (d. 1349) was

probably a native of Eaglesfield in Cumberland, and provided that the 12 fellows or scholars of his foundation were preferably to be natives of this county or Westmorland. During the time of Wycliffe, who while rector of Lutterworth resided for two years in the college, the foundation was by a ruling of the visitor (the archbishop of York) actually confined to the two counties mentioned, and so remained until 1854. The buildings date mainly from the close of the 17th century and the beginning of the 18th. They front High Street with a massive classical screen, flanked by the ends of the east and west ranges of buildings of the front quadrangle, and surmounted in the centre by a statue of Queen Caroline under a cupola. The buildings are the work of Sir Christopher Wren and Nicholas Hawksmoor. The library contains a valuable collection, especially of historical works, and is fitted with wood-carving by Grinling Gibbons. There is also here an interesting contemporary statue in wood of Queen Philippa. The chapel retains several medieval windows from the former Gothic chapel, and some stained glass painted by Abraham van Ling (1635). The college preserves two early customs — on Christmas day a dinner is held at which a boar's head is carried in state into the hall, and an appropriate ancient carol is sung; and on New Year's day a threaded needle, with the motto " Take this and be thrifty," is presented to members in the college hall. The origin of this custom is traced to a rebus on the founder's name — aiguille etjU (needle and thread). St John's College was founded in 1555 by Sir Thomas White, Kt., alderman of London (1492-1567). It occupied the site

of a house for Cistercian students in the university, founded by Archbishop Chicheley in 1437 and dedicated to St Bernard of Clairvaux. White's foundation was originally for a president, 50 fellows and scholars, and a chaplain, choir, &c, for the chapel. White established the intimate connexion which still exists between his college and the Merchant Taylors' school in London, in the foundation of which, as a prominent officer in the Merchant Taylors' Company, he had a share. The college foundation now consists of a president, from 14 to 18 fellowships, not less than 28 scholarships, of which 15 are appropriated to Merchant Taylors' school, and 4 senior scholarships, similarly appropriated. The buildings incorporate some of Chicheley's work, as in the front upon St Giles's Street, with its fine gateway. Similarly, in the front quadrangle, the hall and chapel belonged to the house of St Bernard, though subsequently much altered. A passage with a rich fan-traceried roof gives access from the front to the back quadrangle, on the south and east sides of which is the library. The south wing dates from 1596, the east from 1631. The latter is of the greater interest; it was built at the charge of William

Laud, and the designs have been commonly attributed to Inigo Jones. The north and west sides of the quadrangle, of the same period, have cloisters. The union of the classical style, which predominates here, with the characteristic late Perpendicular of the period, makes this quadrangle architecturally one of the most interesting in Oxford, as the college gardens, which its east front overlooks, are among the most picturesque. The most notable period of the history of the college is associated with Laud, who entered the college in 1589, was elected a fellow in 1593, became president in 161 1 and chancellor of the university in 1629. Relics of him are preserved in the library, and he is buried in the chapel, together with White, the founder, and William Juxon, president 1621-1633, and afterwards archbishop of Canterbury.

Trinity College was founded in 1555 by Sir Thomas Pope, Kt. (d. 1559), of Tittenhanger, Hertfordshire. He acquired and used for his college the ground and buildings of Durham College, the Oxford house of Durham Abbey, originally founded in the 13th century (see Durham, city). Trinity is therefore one of the instances of collegiate foundation forming a sequel to the dissolution of the monasteries, for Durham had been surrendered in 1540. Pope's foundation provided for a president, 12 fellows and 12 scholars. There are now 16 scholarships and a number of exhibitions. There are also some scholarships in natural science, on the foundation (1873) of Thomas Millard, whose bequest also provides for a lecturer and laboratory. The front quadrangle of Trinity lies open to Broad Street; on its east side are modern buildings (by T. G. Jackson, 1887), on the north, the president's house and the chapel in a classic style, dating from 1694. It contains a rich alabaster tomb of Pope, the founder, and his third wife, and has a fine carved screen and altar-piece by Grinling Gibbons. The remainder of the buildings, forming two small quadrangles north of the chapel, includes parts of the old Durham college, but these have been much altered. Gardens extend to the east. John Henry Newman was a commoner of this college; Edward Augustus Freeman, the historian, and William Stubbs, bishop of Oxford, were among its fellows.

University College (commonly abbreviated Univ.) has claimed to find its origin in a period far earlier than that to which the earliest historical notice Of the university itself can be assigned. In a petition to Richard II., respecting a dispute as to property the members of the " mickel universitie hall in Oxford " quote King Alfred as the founder of the house, for 26 divines. The date of 872 was claimed, and in 1872 a millenary celebration was held by the college. Moreover, in 1727 a dispute as to the mastership of the college led to an appeal to the

Court of King's Bench to determine the right of visitation, and it was found that this right rested with the crown (as it now does) on the ground of the foundation by Alfred. Leaving tradition, however, it is found that William of Durham, archdeacon of Durham, dying in 1249, bequeathed money to the university to support masters at Oxford. In 1253 the university acquired its first

tenement on this bequest; further acquisitions followed; and in 1280 an inquiry was held as to the disposition of the bequest, and statutes were issued to the society on Durham's foundation, the university finding it necessary to make provision for its individual governance. This intimate connexion between the university and the early development of a college has no parallel, and to it the college owes its name. The college, as it may now be called, developed slowly, further statutes being found neces- sary in 1292 and 1311; unlike other foundations which were established, with a definite code of statutes from the outset, by individual founders. It is possible, however, to maintain that the founders of Merton and Balliol were influenced in their work by that of William of Durham. The foundation consists of a master, 13 fellows and 16 scholars, and there are a large number of exhibitions. The buildings have a long front- age upon High Street. The oldest part of the buildings was begun in 1634. The chapel, built not long after, was altered in Decorated style by Sir Gilbert Scott, but contains fine wood- work of 1694, and windows by Abraham van Ling (1641). The old library dates from 1668-1670, but a new library was built by Scott, in Decorated style, and contains great statues of Lord Eldon and Lord Stowell, members of the college, the design of which was by Sir Francis Chantrey. The hall dates from 1657, but has been greatly altered. The extension of the college has necessitated that of its buildings in modern times. A chamber built for the purpose contains a statue, by Onslow Ford, of Percy Bysshe Shelley, presenting him lying drowned. The poet entered the college in 1810.

Wadham College was founded in 161 2 l by Nicholas Wadham (d. 1609) of Merifield, near Uminster, Somersetshire, and Dorothy his wife, who as his executrix carried out his plans. The original foundation consisted of a warden, 15 fellows, 15 scholars, with 2 chaplains and 2 clerks. It now consists of a warden, 8 to 10 fellows and 18 scholars. The college, which has its frontage upon Parks Road, occupies the site of the house of the Austin Friars. No part of their buildings is re- tained. The erection of the college occupied the years

1610- 1613, and while the buildings are in the main an excellent example of their period, the chapel (as distinct from the ante- chapel) is of peculiar interest. This appears and was long held to be pure Perpendicular work of the 15th century, but the record of its building in 161 1 is preserved, and as the majority of the builders seem to have been natives of Somersetshire it is supposed that in the chapel they closely imitated the style which is so finely developed in that county. The buildings of Wadham have remained practically unchanged since the founda- tion, either by alteration of the existing fabric or by addition. Beautiful gardens lie to the east and north of them – r the warden's garden is especially fine. In the quadrangle is a clock designed by Christopher Wren, who entered the college in 1649. It was in this year that John Wilkins, warden (1648-1659), initiated a weekly philosophical club, out of the meetings of which grew the Royal Society, which received its charter in 1662.

Worcester College was founded in its present form in 17 14, out of a bequest by Sir Thomas Cookes, Bart. (d. 1761) of Bentley Pauncefoot, Worcestershire. On part of the site, in 1283, Gloucester Hall had been founded for Benedictine novices from Gloucester. After the dissolution of the monasteries, the buildings were used by Robert King, first bishop of Oxford, as a palace (1542); later it was acquired by Sir Thomas White, founder of St John's College, and again became a hall. This fell into difficulties, and was in great poverty when the present foundation superseded it. Cookes's foundation provided for a provost, 6 fellows and 6 scholars ; there are now from 6 to 10 fellows, and from 10 to 18 scholars. Four of the scholarships are appropriated to Bromsgrove school, of which Cookes was a benefactor. The frontage of the buildings, in Worcester Street, is in a classical style, but the quadrangle retains some of the old buildings of Gloucester Hall. The gardens, with their lake, are fine.

x The year in which the statutes were issued; Dorothy Wadham had received the royal charter in 1610.

Halls, &c

The academical halls, which were of very early origin, were originally in the nature of lodging-houses, in which students lived under a principal chosen by themselves. But they were gradually absorbed by the colleges as these became firmly established. The only remaining academical hall is that of St Edmund, which is said to have been founded in 1226, and to derive its name from Edmund Rich, archbishop of Canterbury, who is known to have taught at Oxford, and was canonized in 1248. The hall came into the possession of

Queen's College in 1557, and the principal is nominated by that society. The buildings, which form a small quadrangle east of Queen's College, date mainly from the middle of the 18th century. There are three private halls in Oxford, established under a university statute of 1882, which provides for such establishment by any member of convocation under certain conditions and under licence from the vice-chancellor. Non-collegiate students, 2 i.e. members of the university, possessing all its privileges without being members of any college, were first admitted in 1868. As a body they are under the care of a delegacy and the supervision of a censor. Women are admitted to lectures and university examinations but not to its degrees; they have four colleges or halls — Somer- ville College (1879), Lady Margaret Hall (1879), St Hugh's Hall (1886) and St Hilda's Hall (1893). Among foundations in- dependent of university jurisdiction and intended primarily for the teaching of theology are the Pusey House (1884, founded in memory of Edward Bouverie Pusey), St Stephen's House (1876) and Wycliffe Hall (1878), both theological colleges; Mansfield College (Congregational, founded to take the place of Spring Hill College, Birmingham, in 1889) and Manchester College (1893), also a nonconformist institution. The buildings of Mansfield, especially the chapel, should be noticed as of very good design in Decorated and Perpendicular styles. None of these houses is a residence for undergraduates. There is a theological college at Cuddesdon, near Oxford, where also is the bishop of Oxford's palace.

A notable group of buildings connected with the university stands between Broad Street and High Street, and between Exeter and Brasenose and All Souls colleges. Among these the prin- cipal are the old schools buildings, which form a fine J'/J^ y quadrangle, and are now mainly occupied by the Bodleian JLhib? Library, more extensive accommodation for the schools gotutiom. (examinations, &c.) being provided in the modern range of buildings facing High Street and King Street, completed in 1882 from the designs of T. G. Jackson. The erection of the old schools quadrangle was begun in Ttlj, and the architecture combines late Gothic with classical details. On the inner face of the gateway towers are seen the five Roman orders, in tiers, one above another. The windows, parapet and rich pinnacles, however, are Gothic. The quadrangle was founded by Sir Thomas Bodley, who conceived the addition of schools to the celebrated library which bears his name. The main chamber of the Bodleian Library is entered from the quadrangle. The library (see Libraries) was opened in 1602. The central part of the room dates from 1480, when it was completed to contain the library given to the university by Humphrey, duke of Gloucester (d. 1447). This library was destroyed

in the time of Edward VI. Bodley added the east wing, the west wing followed in 1 634-1 640, being built to house the collection of John Selden, one of the principal of many benefactors of the library. The whole forms a most beautiful room, enhanced by the finely painted ceiling and the excellent design of the fittings. In the storey above the library is the picture-gallery, containing portraits of chancellors, founders and benefactors of the university. The basement of the central part of the library is formed by the Divinity School, a splendid chamber (1480), in which the most notable feature is the groined roof, divided into compartments by widely splayed arches, and adorned with rich tracery and carved pendants. The Convocation House, below the west wing of the library, and entered from the west end of the school, has a roof with fan tracery. To the north of these buildings, flanking Broad Street, are the Sheldonian Theatre, the old building of the Clarendon Press and the Old Ashmolean building. ” The Sheldonian ” was built in 1664-1669 at the charge of Gilbert Sheldon (1 598-1677), chancellor of the university and archbishop of Canterbury, from the design of Sir Christopher Wren. The principal public ceremonies of the university, including the ” En- caenia,” the annual commemoration of benefactors, accompanied by the conferring of honorary degrees and the recitation of prize compositions, are generally held in this building, which is particularly w ell adapted for its’ purpose. The university printing press w as 2 This title was given by a statute of 1884.

early established in its upper part. This institution bears the name of the Clarendon Press from the fact that it was founded partly from the proceeds of the sale of the earl of Clarendon’s History of the Rebellion, the copyright of which was given to the university by his son Henry, the second earl. In 1713 it occupied the building erected for it close to the theatre; in 1830 it was moved to the larger build- ings it now occupies in Walton Street. Printing in Oxford dates from the seventh or eighth decade of the 15th century, but was only carried on spasmodically until 1585, when the first university printer was Joseph Barnes. All the subsidiary processes of type- founding, stereotyping, &c, are carried on in the buildings of the press, and paper is supplied from the university mill at Wolvercote. The press is to a large extent a commercial firm, in which the uni- versity has a preponderating influence, governing it through a delegacy. The Broad Street building is used for other purposes of the university, as is the adjacent Old Ashmolean building, which originally (1683) contained the

Ashmolean Museum, described here- after, and now affords rooms for the School of Geography (1899). To the south of the old schools, between Brasenose and All Souls colleges, is the fine classical rotunda known as the Radcliffe Library or camera, founded in 1737 by the eminent physician John Radcliffe (1650-1714). The architect was James Gibbs. In 1 861 the building was devoted to the purpose it now serves, that of a reading room to the Bodleian Library, the collection of medieval and scientific works it contained being removed to the University Museum. The exterior gallery round the dome is celebrated as a view-point.

To the south of the Radcliffe Library, bordering High Street, is the church of St Mary the Virgin, commonly called the University church, on a site which is traditionally said to have been occupied by a church even from King Alfred's time. Its principal feature is a fine Decorated tower and spire, dating from the early part of the 13th century. The body of the church, however, is mainly an excellent example of Perpendicular work. The main entrance from High Street is beneath a classical porch erected in 1637 by Morgan Owen, a chaplain of Archbishop Laud; the statue of the Virgin and Child above it was alluded to in the impeachment of the archbishop. On the north side of the chancel is a building of earlier date than the present church; it is Decorated, of two storeys, and has served various purposes connected with the university, including that of housing a library before the foundation by Humphrey, duke of Gloucester. The university sermons are preached in St Mary's church.

A massive pile of classical buildings (1845) at the corner of Beaumont and St Giles's Streets is devoted to the Taylor Institution, the University Galleries and the Ashmolean Museum. Sir Robert Taylor, architect (1714-1788), left a bequest to establish the teaching of modern European languages in Oxford, and to provide a building for the purpose, and the eastern wing is devoted to this purpose, containing a library. In the University Galleries the most notable features are the celebrated Arundel marbles, a large series of drawings for pictures by Raphael and Michelangelo, and models for busts and statues by Sir Francis Chantrey. The new building for the Ash- molean Museum was added in 1893; and in connexion both with the building and with subsequent additions to the collections the benefactions of Charles Drury Edward Fortnum (1820-1899) should be remembered. The nucleus of this collection was formed by John' Tradescant, a traveller and botanist (1608-1662), who left it to Elias Ashmole (q.v.), who added books, paintings and other objects, and presented the whole to the university in 1679. When the museum was moved from the Old Ashmolean building, the collection was in great part

distributed; thus, books were sent to the Bodleian Library, and natural history objects to the University Museum. The Ashmolean Museum now contains excellent collections of Egyptian, Greek, Roman and British antiquities, and many other objects, among which perhaps the most widely famous is the Alfred Jewel, an ornament of crystal, enamel and gold, bearing King Alfred's name, and found at Athelney. The University Museum is an extensive building close to the parks, opposite Keble College. Its foundation was the outcome of the necessity of keeping pace in the university with the extended range of modern scientific study. It was built in 1856 seq., and contains the following departments: — medicine and public health, comparative anatomy, physiology, human anatomy, zoology, experimental philosophy, physics, chemistry, geology, mineralogy and pathology. There is also here' the Pitt-Rivers ethnographical museum, which had its origin in the collection of Augustus Henry Lane Fox Pitt-Rivers, presented to the university in 1883. Additional buildings contain the Radcliffe Library and various laboratories. The university observatory is in the parks, not far from the museum, but an older observatory is that called the Radcliffe (1 772-1 795), built by the trustees of the Radcliffe bequest, as was the Radcliffe Infirmary (1770) standing near the observatory, in Woodstock Road. Opposite Magdalen College, by the bank? of the Cherwell, is the beautiful botanic garden founded by Henry Danvers, earl of Danby, in 1622, with which are con- nected a library, herbarium and museum. The Indian Institute (1882), in Broad Street, was founded as a centre for the study of Indian subjects, and for the use of native students in the university and prospective Indian civil servants. The Oxford Union Society, the principal university club, founded in 1825, has its rooms, with library and debating hall, near Cornmarket Street.

Ancient buildings in Oxford, apart from collegiate and university buildings, are mainly ecclesiastical, but there are a few notable exceptions. The castle, which, as already indicated, was erected by Robert d'Oili at the west of the ancient city, % , MI retains its massive tower, standing picturesquely by the ””“*•• river, and a mound within which is a curious chamber containing a well. There is also a Norman crypt-chapel, but the county court and gaol buildings adjacent are modern. Among old houses, of which not a few survive in Holywell Street and elsewhere, Bishop King's palace in St Aldate's Street may be mentioned; it has been in great part defaced by modern alterations, while the remaining front is a beautiful half-timbered and gabled example dated 1628; but ornate ceilings preserved in some of the rooms date from the erection in the time of Edward VI. Kettell Hall in Broad Street is another fine house, now used as a private residence,

but formerly put to collegiate use, having been built bv Ralph Kettell, president of Trinity (1599- 1 643). Among ancient churches in Oxford, after the cathedral and St Mary's, the chief in interest is St Peter's-in-the- East, which has a fine Norman chancel, crypt and south doorway, with additions of Early English and later date. St Michael's church, the body of which as now existing is of little interest, has a very early tower (nth century) of massive construction, which probably served as a defence for the north gate of the city. St Giles s church has Norman remains, but is chiefly notable for the excellent character of its Early English portions and for a beautiful font of that period. Holywell church retains a fine Norman chancel arch; and the churches of St Mary Magdalen, St Aldate's, St Ebbe's and St Thomas the Martyr are all of some antiquarian interest in spite of extensive modern alteration. Only the 14th century tower remains of St Martin's church at Carfax, the body of the church, which was a complete reconstruction of 1820, being removed at the close of the century, in the course of street-widening. Some of the modern churches are on sites of early dedication. The church of All Saints in High Street was rebuilt in 1 706-1 708 from the design of Dean Aldrich, and is a good classical example. Beneath several buildings in this part of the city the crypts of earlier halls or other buildings remain. In the suburb of Cowley are remains, including the chapel, of the hospital of St Bartholomew, originally a foundation for lepers (1126). The village church at Iffley, not far beyond the eastern outskirts of the city, with its ornate west end, tower and chancel, is one of the most notable small Norman churches in England. Of modern city buildings, the only one of special note is the town hall (1 893-1 897), which has a striking frontage upon St Aldate's Street.

" The Chancellor, Masters and Scholars of the University of Oxford " form a corporate body, within which the colleges are so many individual corporations. The university was governed by statutes of its own making, which were Un,yers 'ty codified and brought out of the confusion into which c ° nstlta '

they had fallen in the course of centuries in 1636, during anrf

Laud's chancellorship. A commission was appointed to inquire fully into the condition of the university in 1850; rattoa –

admlnis-

it reported in 1852, and in 1854 the constitution was amended by the Oxford University Act. In 1876 another commission was appointed, and in 1877 the Universities of Oxford and Cambridge Act was passed.

This act provided for the appointment of com- missioners who (1882) made statutes for each college, excepting Hertford, Keble and Lincoln, the first and second of which are modern foundations, while the third is governed under statutes of 1855. The highest officer of the university is the chancellor, who is elected by the members of convocation, holds office for life, and is generally a distinguished member of the university. He does not take an active part in the details of administration, delegating this to the vice-chancellor, who is, therefore, practically the head. He is nominated annually by the chancellor, and must be the head of a college. He appoints four pro-vice-chancellors, also heads of colleges, to exercise his authority in case of necessity. The high steward is appointed for life, with the duty of trying grave criminal cases when the accused is a resident member of the university. Two proctors are appointed annually by two of the colleges in rotation; their special duty is a disciplinary surveillance over members of the university in statu pupillari when these are not within the jurisdiction of their colleges. They are assisted by four pro-proctors. The principal duty of the public orator is that of presenting those who are to receive an honorary master's degree, and of making speeches in the name of the university on ceremonial occasions. The registrar acts as the recorder of the various administrative bodies of the university, and the secretary to the Board of Faculties has similar duties with regard to these boards, his work being closely associated with that of the registrar. The chancellor's court exercises civil jurisdiction in cases in which one of the parties is a resident member of the university. The university returns two members (burgesses) to parliament, the privilege dating from 1604.

The Hebdomadal 1 Council consists of the chancellor, vice- chancellor, immediate ex-vice-chancellor and proctors as official members, and of eighteen other members (heads of houses, pro- fessors, &c.) elected for terms of six years by the congregation of the university. The council takes the initiative in promulgating,

1 From Greek e/JSoˆas, the number seven; the Hebdomadal Board instituted in 1631 was appointed to hold a weekly meeting.

discussing and submitting to Convocation all the legislation of the university. The Ancient House of Congregation consists of " regents," i.e. doctors and masters of arts for two years after the term in which they take their degrees, professors, heads of colleges and other

resident officers, &c. The house thus includes all those who are concerned with education and discipline in the university, but it now has practically no functions beyond the granting of degrees. It lost its wider powers under the act 011854, when the Congregation of the university was created. This body, which includes besides certain officials all members of Convocation who have resided for a fixed period within one mile and a half of Carfax, approves or amends legislation submitted by the Hebdomadal Council previously to its submission to Convocation; it also has considerable powers in the election of the various administrative boards. The House of Convocation consists of all masters of arts and doctors of the higher faculties who have their names on the university books, and has the final control over all acts and business of the university. There are boards of curators for the Bodleian Library, the university chest and other institutions, delegates of the common university fund, the museum and the press, for extension teaching, local examinations and other similar purposes, visitors for the Ashmolean Museum and university galleries, and many other administrative bodies. There are boards for the following faculties: theology, law, medicine, natural science and arts (including literae humaniores, oriental languages and modern history). Among the numerous professorships and readerships in the various subjects of study, the oldest foundation is the Margaret professorship of divinity, founded in 1502 by Margaret, countess of Richmond and mother of Henry VII. This was followed by the five Regius professorships of divinity, civil law, medicine, Hebrew and Greek, founded by Henry VIII. in 1546.

The colleges, as already seen, consist of a head, whose title varies in different colleges, fellows (who form the governing body) and scholars. To these are to be added the commoners, who are not ” on the foundation,” i.e. those who either receive no emoluments, or hold exhibitions which do not (generally) entitle them to rank with the scholars. The college officer who is immediately concerned with the disciplinary surveillance of members of the college in statu pupillari is the dean (except at Christ Church). Each undergraduate (this term covering all who have not yet proceeded to a degree) is, as regards his studies, under the immediate supervision of one of the fellows as tutor. The university terms are four — Michaelmas (which begins the academic year, and is therefore the term in which the majority of undergraduates begin residence), Hilary or Lent, Easter and Trinity. The last two run consecutively without in- terval, and for certain purposes count as one ; they are kept by three weeks’ residence in each, while the two first are kept by six weeks’ residence in each, though the terms properly speaking are longer. The examinations

required to be passed in order to obtain the first or bachelor's degree may be summarized thus: — (a) Responsions, usually taken very early in the course of study. Exemption is in many cases granted when a candidate has passed a certificate examination held by university examiners at the school where he has been educated, (b) First public examination or School of Moderations, usually taken after four or six terms, (c) Second public examination or final school (this in the case of literae humani- ores is commonly called " Greats ") usually takes place at the end of the fourth year of residence. " Pass " schools and " honour " schools are distinguished; in the latter candidates are grouped in classes according to merit. No further examination or other exercise is required for the degree of master of arts. Among the numerous scholarships and prizes offered by the university (as distinct from the colleges) a few of the most noted may be mentioned — the Craven and the Ireland classical scholarships on the foundation respectively of John, Lord Craven (d. 1648), who also founded the travelling fellowships which bear his name for the study of antiquities, and of John Ireland, dean of Westminster (1825) ; the scholarship com- memorating Edward, earl of Derby (chancellor 1 852-1 869); the law scholarship commemorating John, first earl of Eldon; the chancellor's prizes in Latin verse and English prose (initiated by the earl of Lichfield, chancellor 1 762-1 772) and in Latin prose (by Lord Grenville, 1809); the Newdigate prize for English verse, founded by Sir Roger Newdigate (1806) ; the Gaisford prizes in Greek verse and prose (1856), commemorating Thomas Gaisford, dean of Christ Church; the Arnold historical essay (1850), com- memorating Thomas Arnold, headmaster of Rugby school; and the theological foundations of Edward Bouverie Pusey and Edward Ellerton, fellow of Magdalen. University scholarships, such as those mentioned, are awarded to persons who are already members of the university (who must in some cases already have taken a degree) ; they thus differ from college scholarships, which are generally open to persons who have not yet matriculated. The Rhodes scholarships (see Rhodes, Cecil) stand alone. They are an adaptation of the college scholarship to a special purpose, but are not in the award of any one college. Arrangements exist whereby members of the universities of Cambridge or Dublin may be " in- corporated " as members of Oxford University; and whereby the period of necessary academical residence at Oxford University is reduced in the case of students from " affiliated " colleges within the United Kingdom. Special provisions are also made in the case of

students from any foreign university and from certain colonial and Indian universities. The number of persons who matriculate at Oxford University is about 850 annually.

The principal social functions in the university take place in ” Eights’ Week,” when, during the summer term (Easter and Trinity), the college eight-oared bumping races are held, and also, more especially, in ” Commemoration Week.” at the close of the same term, when the university ceremonies connected with the commemoration of benefactors, the conferring of degrees honoris causa, &c, are held, and balls are given in some of the colleges.

The city of Oxford (as distinct from the university) returns one member to parliament, having lost its second member under the Redistribution Act of 1885, before which date it had been entirely disfranchised for a year owing to bribery at the election of 1 881. The municipal government is in the hands of a mayor, 15 aldermen (including 3 from the university) and 45 councillors (9 from the university). Area, 4676 acres.

Authorities. — See the Oxford University Calendar (annually) and the Oxford Historical Register, Oxford. The Oxford Historical Society has issued various works dealing with the history. In the ” College History ” series, London, the story of each college forms a volume by a member of the foundation. The principal earlier authority is Anthony a Wood (q.v.). See also James Ingram (pre- sident of Trinity, 1824-1850), Memorials of Oxford (Oxford, 1837); A. Lang, Oxford (London, 1885); H. C. Maxwell Lyte, History of the University of Oxford to 1530 (London, 1886); Hon. G. C. Brodrick, History of the University of Oxford in ” Epochs of Church History” series (London, 1886) ; C. W. Boase, Oxford, in ” Historic Towns ” series (London, 1887) ; Oxford and Oxford Life, ed. J. Wells (London, 1892). (0. J. R. H.)

OXFORD, a village in Butler county, Ohio, U.S.A., about 40 m. N.W. of Cincinnati. Pop. (1900) 2009; (1910) 2017. Oxford is served by the Cincinnati, Hamilton & Dayton railway. It is the seat of Miami University (co-educational; chartered in 1809, opened as a grammar school in 1818, and organized as a college in 1824), which had 40 instructors and 1076 students in 1909. At Oxford also are the Oxford College for Women, chartered in 1906, an outgrowth, after various changes of name, of the Oxford Female Academy (1839); and the Western College for Women (chartered in 1904), an outgrowth of the Western Female Seminary (opened in 1855). The first settlement on the site was made about 1800.

OXFORD, PROVISIONS OF, the articles constituting a preliminary scheme of reform enacted by a parliament which met at Oxford (England) on the nth of June 1258. King Henry III. had promised on

the 2nd of May that the state of his realm should be rectified and reformed by twenty-four counsellors who were to meet at Oxford for this purpose five weeks later. Twelve of these counsellors were chosen by the king, and twelve by the earls and barons. When the parliament met each twelve of these twenty-four chose two from the other twelve, and this committee of four was empowered, subject to the approval of the whole body, to elect a king's council of fifteen members. The twenty-four then provided that the new council should meet three times a year in parliaments to which twelve com- missioners were to be summoned to discuss the affairs of the realm on behalf of the whole community. Another body of twenty-four was appointed to treat of an aid, which was probably the aid which had been demanded earlier in the year. On the 22nd of June the king appointed new wardens of some of the castles which were then in the custody of his Poitevin half- brothers and their friends, and on the same day he gave directions that the twenty-four should proceed with the work of reform, and the committee of four with the election of the council of fifteen. Meanwhile it was provided that the sheriffs and the three great officers of state were to hold office for a year only, and to render accounts at the expiration of their terms of office. On the 24th of August in pursuance of a provision by the parliament the king directed four knights in each county to inquire into the trespasses and wrongs which had been committed by sheriffs, bailiffs and other officials. For many of the grievances of the barons the Oxford parliament provided no remedy, and they were only partly redressed by the Provisions of Westminster in the autumn of 1259. The king declared his adhesion to the Provisions of Oxford on the 18th of October by proclamations in English, French and Latin, but in 1261, having obtained a papal dispensation from his oath of observance, he entirely repudiated them. The barons, however, insisted on his obligation

to observe the provisions, and the dispute was eventually referred to the arbitration of Louis IX. of France, who formally annulled them on the 23rd of January 1264, but expressly declared that his decision was not to invalidate the privileges, liberties and laudable customs of the realm of England, which had existed before the time of the provisions.

No official record of the Provisions of Oxford has been preserved, and our knowledge of them is chiefly derived from a series of notes and extracts entered in the Annals of Burton Abbey, which are probably neither exhaustive nor in correct order. See the Annates monastics,

vol. i. (Burton), edited by H. R. Luard for the Rolls series; Patent Rolls, Henry III. (printed text); Foedera (Record Commission edition) ; W. Stubbs, Constitutional History and Select Charters, and Charles B6mont, Simon de Montfort (1884).

OXFORDIAN, in geology, the name given to a series of strata in the middle Oolites which occur between the Corallian beds and the Cornbrash; the division is now taken to include the Oxford Clay with the underlying Callovian stage (q.v.). The argillaceous beds were called ” Clunch Clay and Shale ” by William Smith (1815-1816); in 1818 W. Buckland described them under the unwieldy title ” Oxford, Forest or Fen Clay.” The term Oxfordian was introduced by d’Orbigny in 1844. The name is derived from the English county of Oxford, where the beds are well developed, but they crop out almost continuously from Dorsetshire to the coast of Yorkshire, generally forming low, broad valleys. They are well exposed at Wey- mouth, Oxford, Bedford, Peterborough, and in the cliffs at Scar- borough, Red Cliff and Gristhorpe Bay. Rocks of this age are found also in Uig and Skye.

The Oxford Clay is usually bluish or greenish-grey in colour, weathering brown or yellow; in the lower portions it is somewhat more shaly. The beds frequently tend to be calcareous and bituminous, while in places there is a considerable amount of lignite. Septaria of large size are common, they have been cut and polished at Radipole and Melbury Osmund in Dorsetshire, where they are known as Melbury marble or ” turtle-stones “; they were used to form table-tops, &c. In Yorkshire the Oxford Clay is usually a grey sandy shale. In the central and southern English counties the Oxford Clay is divisible as follows : —

Upper zone of (Clays with septaria and ironstone nodules. Clays with

Cardtoceras cordaium \ pyritized fossils (subzone of Quensledtoceras fjunberti).

Lower zone of (Shales with pyritized fossils (subzone of Cosmoceras Jason).

The upper zone contains also Gryphaea dilatata (large forms), Serpula vertebralis, Belemnites haslatus, Aspidoceras perarmatum, Cardioceras vertebrate. The lower zone yields Reineckia anceps, Peltoceras athleta, Quenstedtoceras Mariae, Cosmoceras Jason, Cerithium muricatum, and a small form of Gryphaea dilatata. The remains of fishes and saurian reptues have been found. The Oxford Clay is dug for brick-making at Weymouth, Trowbridge, Chippen- ham, Oxford, Bedford,

Peterborough and Fletton.

The ” Oxfordian ” of the continent of Europe is divided according to A. de Lapparent into an upper (Argovian) and a lower (Neuvizyen) substage. In the former he includes part of the English Coralline Oolite and in the latter the lower Calcareous Grit, while a portion of the lower Oxford Clay is placed in the Divesian or upper substage of the Callovian. In north-west Germany the Oxford Clay is re- presented by the Hersumer beds. Most of the European formations on this horizon are clays and marls with occasional limestone and ironstone beds.

See Jurassic, Callovian, Corallian. (J. A. H.)

OXFORDSHIRE (or Oxon), an inland county of England, bounded N.E. by Northamptonshire, N.W? by Warwickshire, W. by Gloucestershire, S.S.W. and S.E. by Berkshire, and E. by Buckinghamshire; area 755-7 sq. m. The county lies almost wholly in the basin of the upper Thames. This river forms its southern boundary for 71 m., from Kelmscot near Lechlade (Gloucestershire) to Remenham below Henley-on-Thames, excepting for very short distances at two points near Oxford. The main stream is the boundary line, but from Oxford upward the river often sends out branches through the flat water- meadows. The principal tributaries joining the Thames on the Oxfordshire side do not in any case rise within the county, but have the greater part of their courses through it.

These tributaries are as follows, pursuing the main river down- wards. (1) The Windrush, rising in Gloucestershire, follows a narrow and pleasant valley as far as Witney, after which it meanders in several branches through rich flat country, to join the Thames at Newbridge. (2) The Evenlode, also rising in Gloucestershire, forms the western county boundary for a short distance, and follows

a similar but more beautiful valley to the Thames below Eynsham. From the north it receives the Glyme, which joins it on the confines of Blenheim Park, where the woodland scenery is of peculiar rich- ness. (3) The Cherwell, rising in Northamptonshire, forms some 10 m. of the eastern boundary, and with a straight southerly course joins the Thames at Oxford. From the east it receives the Ray, which drains the flat tract of Ot Moor. (4) The Thame, rising in Buckinghamshire, runs south-west and west, forming 6 m. of the eastern boundary, after which it turns south to join the Thames near Dorchester. Above the point of junction the Thames is often called the Isis. Lastly, a small part of the north-eastern boundary is formed by the Great Ouse (which discharges into the North Sea), here a very slight stream, some

of whose head-feeders rise within Oxfordshire.

The low hills which lie south of the Windrush, and those between it and the Evenlode (which attain a greater height) are foothills of the Cotteswold range, the greater part of which lies in Gloucestershire. Between the Windrush and Evenlode they are clothed with the remaining woods of Wychwood Forest, one of the ancient forests of England, which was a royal preserve from the time of John, and was disafforested in 1862. Its extent was 3735 acres of forest proper. The hills continued north of the Evenlode (but not under the name of Cotteswold) at an average elevation over 500 ft. The range terminates at Edge Hill, just outside the county in Warwickshire. The hills bordering the Cherwell basin on the east are of slight elevation, until, running east from Oxford into Buckinghamshire, a considerable line of heights is found north of the Thame valley, reaching 560 ft. in Shotover hill, overlooking Oxford. Across the south-east of the county stretches the bold line of the Chiltern Hills, running N.E. and S.W. On the western brow, Nettlebed Common, an extensive plateau, reaches at some points nearly 700 ft. of altitude. The district was probably once covered with forest, and there are still many fine beeches, oaks and ash trees. William Camden in his survey of the British Isles (1586) mentions forests as a particular feature of Oxfordshire scenery, and there are traces still left of natural woodland in various parts of the lower country.

The Thames flows through a deep gap from about Goring downwards, between the Chilterns and the Berkshire Downs. Here, as above at Nuneham and other points, the sylvan scenery is fine, and Henley and Goring are favourite riverside resorts on the Oxfordshire shore. The western feeders of the Thames and Cherwell have much rich woodland in their narrow valleys, and the sequestered village of Great Tew, on a tributary of the Cherwell river, may be singled out as having a situation of exceptional beauty.

Geology.— The influence of the rocky substratum upon the char- acter of the scenery and soil is clearly marked. It is sufficient to point, on the one hand, to the dry chalky upland of the Chiltern Hills and the oolitic limestone hills in the north-west, or the Corn- brash with its rich, fertile soil ; and, on the other hand, to the dreary scenery of the Oxford Clay land with its cold, unproductive soil. Cretaceous rocks occupy the south-eastern corner of the county; Jurassic rocks prevail over the remainder. The general dip is towards the south-east, and the strike of the strata is S.W.-N.E. ; therefore in passing from south to north, beds are traversed which are successively lower and older. The Chiltern Hills, with a strong scarp facing the north-west, are formed of

Chalk, the Lower Chalfc at the foot and the hard Chalk rock at the summit; from the top of the hills the Upper Chalk-with-Flints descends steadily towaros the Thames. Here and there, as at Shiplake and Nettlebed, outliers of Tertiary clays rest upon it. The Upper Greensand forms a low feature at the foot of the Chalk hills; this is succeeded by the Gault, with an outcrop varying from 4 m. to Ij m. wide between Dor- chester and Sydenham; it is a pale blue clay, dug for bricks at Culham. The Lower Greensand appears from beneath the Gault at Culham and Nuneham Courtney and in outliers north of Cuddes- don. The Kimmeridge clay, in the grass-covered vales between Sandford and Waterperry, is separated from the Lower Greensand by the Portland limestone and Portland sands and by the thin Purbeck beds; it is dug for bricks at Headington. Both Portland and Purbeck beds may be observed in Shotover hill; the Portland limestone is quarried at Garsington. The Coral Rag.with calcareous grit at the base, is a shelly, coral-bearing limestone, traceable from Sandford to Wheatley; it has been extensively quarried at Heading- ton hill. North-west of the last-named formation a broad outcrop of Oxford Clay crosses the county; while this is mostly under pasture, the next lower formation, the Cornbrash, a brownish rubbly limestone, gives rise to a loose brown soil very suitable for the cultivation of wheat. Exposures of Cornbrash occur at Norton

Bridge, Woodstock and Shipton ; it forms a broad plateau between Middleton Stoney and Bicester. Inliers also lie in the Oxford Clay plain at Islip, Charlton, Merton and Black Horse Hill. Wychwood Forest has given its name to the ” Forest Marble,” an inconstant series of limestones which thin out eastward and become argillaceous. The Great Oolite limestones, with the ” Stonesfield Slate ” at the base and occasional marls, form the higher ground in the north- west. An excellent freestone is quarried at Tainton and Milton. The Inferior Oolite series of sands and limestones forms the Rollright Ridge and caps Shenlow and Epwell hills; it also reaches down to Chipping Norton and eastward to Steeple Aston. The three divisions of the Lias are represented in the N.W. of the county. The most important is the middle member with marlstone, which, being a hard calcareous bed at the top, forms an elevated ridge along the limit of the outcrop. The marlstone is quarried for building stone at Hornton, and for road metal in many places, and, as it contains a considerable amount of iron oxide, it has been extensively worked for iron at Adderbury, Fawler and elsewhere. The Upper Lias clays occur mostly as

unimportant outliers. The Lower Lias clays have been exposed by the Evenlode near Charlbury and by the Cherwell in the upper part of its valley. A hard shelly limestone called Banbury marble occurs in this part of the Lias. Glacial drift is sparingly scattered over the south-western part of the county, but is more plentiful in the north-eastern portion. Valley gravels are associated with the main stream courses and gravel, clay-with- flints and brick earth rest upon much of the chalk slope. Coal Measures have been proved at a depth of about 1200 ft. near Burford. Climate and Agriculture. — The climate is healthy and generally dry except in the low ground bordering the Thames, as at Oxford ; but polder than the other southern districts of England, especially in the bleak and exposed regions of the Chil terns. Crops are later in the uplands than in more northerly situations at a lower elevation. In the northern districts there is a strong yet friable loam, well adapted for all kinds of crops. The centre of the county is occupied for the most part by a good friable but not so rich soil, formed of decomposed sandstone, chalk and limestone. A large district in the south-east is occupied by the chalk of the Chiltern Hills, partly wooded, partly arable, and partly used as sheep-walks. The re-mainder of the county is occupied by a variety of miscellaneous soils ranging from coarse sand to heavy tenacious clay, and occa- sionally very fertile. Nearly seven-eighths of the area of the county, a high proportion, is under cultivation. The acreage under grain crops is nearly equally divided between barley, oats and wheat. There is a considerable acreage under beans. More than half the total acreage under green crops is occupied by turnips, and vetches and tares are also largely grown. Along the smaller streams there are very rich meadows for grazing, but those on the Thames and Cherwell are subject to floods. The dairy system prevails in many places, but the milk is manufactured into butter, little cheese being made. The improved shorthorn is the most common breed, but Alderney and Devonshire cows are largely kept. Of sheep, Southdowns are kept on the lower grounds, and Leicesters and Cotteswolds on the hills. Pigs are extensively reared, the county being famous for its brawn.

Manufactures. — Blankets are manufactured at Witney, and tweed, girths and horsecloths at Chipping Norton. There are paper mills at Shiplake, Sandford-on-Thames, Wolvercot and Eynsham, using water power, as do the blanket works and many mills on the tributary streams of the Thames. Agricultural implements and portable engines are made at Banbury, and gloves at Woodstock, the last a very ancient industry. Banbury has been long celebrated for the manufacture of a peculiar cake. Some iron ore is raised (from the middle Lias), and the quarrie.s and clays for brick- making are im- portant, as already

indicated. A large number of women and girls are employed in several of the towns and villages in the lace manu- facture.

Communications. — The northern line of the Great Western railway, leaving the main line at Didcot Junction in Berkshire, runs north through Oxfordshire by the Cherwell valley. Oxford is the junction for the Worcester line, running north-west by the Evenlode valley, with branches from Chipping Norton Junction into Gloucestershire (Cheltenham), and across the north-west of the county to the northern line at King's Sutton. From Oxford also the East Gloucester line serves Witney and the upper Thames. Another Great Western line, fron Maidenhead and London, enters the county on the east, has a branch to Watlington, serves the town of Thame, and runs to Oxford. The Great Central railway has a branch from its main line at Woodford in Northamptonshire to Banbury, the north and south expresses using the Great Western route south- ward. Branches of the London and North Western railway from Bletchley terminate at Oxford and Banbury. As regards water- communications, the Thames is navigable for large launches to Oxford, and for barges over the whole of its Oxfordshire course. None of its tributaries in this county is commercially navigable. The Oxford Canal, opened in 1790, follows the Cherwell north from Oxford and ultimately connects with the Grand Junction and Warwick canals.

Population and Administration. — The area of the ancient county is 483,626 acres, with a population in 1891 of 185,240

and in 1901 of 181,120. The area of the administrative county is 480,687 acres. The municipal boroughs are Banbury (pop. 12,968), Chipping Norton (3780), Henley-on-Thames (5984), Oxford, a city and the county town (49,336) and Woodstock (1684). The urban districts are Bicester (3023), Caversham (6580), Thame (2911), Wheatley (872), Witney (3574). Bampton (1167) and Burford (1146) in the west, and Watlington (1154) in the south-east, are the other principal country towns. The county is in the Oxford circuit, arid assizes are held at Oxford. It has one court of quarter-sessions, and is divided into n petty sessional divisions. The borough of Banbury and the city of Oxford have separate courts of quarter-sessions and commissions of the peace, and the borough of Henley-on-Thames has a separate commission of the peace. The total number of civil parishes in 304. Oxfordshire is in the diocese of Oxford, and contains 244 ecclesiastical parishes or districts, wholly or in part. The ancient county is divided (since 1885) into three parliamentary divisions: Banbury or northern, Woodstock or mid, and Henley or southern, each returning one member. It also includes part of the parliamentary

borough of Oxford, returning one member, in addition to which the university of Oxford returns two members.

Education. — On account of the famous university of Oxford and other educational institutions there, the county as regards education holds as high a position as any in England. In connexion with the university there is a day training college for schoolmasters, and there is also in Oxford a residential training college for school- mistresses (diocesan), which takes day students. There is a training college for schoolmasters in the dioceses of Oxford and Gloucester, at Culham. At Cuddesdon, where is the palace of the bishops of Oxford, there is a theological college, opened in 1854. At Bloxham is the large grammar school of All Saints, and there are several boys' schools in Oxford.

History. — The origin of the county of Oxford is somewhat uncertain; like other divisions of the Mercian kingdom, the older boundaries were entirely wiped out, and the district was renamed after the principal town. The boundaries, except for the southern one, which is formed by the Thames, are artificial. There are fourteen hundreds in Oxfordshire, among them being five of the Chiltern hundreds. The jurisdiction over these five belonged to the manor of Benson, and in 1199 to Robert de Hare- court, a name which is still to be found in the county in the Harcourts of Stanton -Harcourt and Nuneham. The county includes small portions of Berkshire and Buckinghamshire, which lie in the hundreds of Bampton and Ploughley respectively. There has been little change in the county boundary; but acts of William IV. and Victoria slightly increased its area.

The district was overrun in the 6th century by the victorious West Saxons, who took Benson and Eynsham, as may be seen in the Saxon Chronicle for 571. In the 7th century the Mercians held all the northern border of the Thames, and during the 8th century this district twice changed hands, falling to Wessex after the battle of Burford, and to Mercia after a battle at Benson. As part of the Mercian kingdom it was included in the diocese of Lincoln. A bishopric had been established at Dorchester as early as 634, when Birinus, the apostle of Wessex, was given an episcopal seat there, but when a bishop was established at Winchester this bishopric seems to have come to an end. Before the Mercian conquest in 777, Oxfordshire was in the diocese of Sherborne. In 873 the juris- diction of Dorchester reached to the Humber, and when the Danes were converted it extended over Leicestershire and Lincolnshire, Oxfordshire forming about an eighth of the diocese. At the Conquest there was no alteration, but in 1092 the seat was transferred to Lincoln. In 1542 a bishopric of Osney and Thame was established, taking its title from

Oxford, the last abbot of Osney being appointed to it. In 1546 the existing bishopric of Oxford was established. The ecclesiastical boundaries remain as they were when archdeacons were first appointed— the county and archdeaconry being conterminous — and the county being almost entirely in the diocese of Oxford. The Danes overran the county during the nth century; Thurkell's army burnt Oxford in 1010, and the combined armies of Sweyn and Olaf crossed Watling Street and ravaged the district, Oxford and

Winchester submitting to them. In 1018 Danes and English- men chose Eadgar's law at an assembly in Oxford, and in 1036, on Canute's death, his son Harold was chosen king. Here also took place the stormy meeting following the assembly (gemot) at Northampton, in which Harold allowed Tostig to be outlawed and Morkere to be chosen earl in his place, thus preparing the way for his own downfall and for rlie Norman Conquest. The destruction of houses in Oxford recorded in the Domesday Survey may possibly be accounted for by the ravages of the rebel army of Eadwine and Morkere on this occasion, there being no undisputed mention of a siege by William. Large possessions in the county fell to the Conqueror, and also to his rapacious kinsman, Odo, bishop of Winchester. The bishop of Lincoln also had extensive lands therein, while the abbeys of Abingdon, Osney and Godstow, with other religious houses, held much land in the county. Among lay tenants in chief, Robert D'Oili, heir of Wigod of Wallingford, held many manors and houses in Oxford, of which town he was governor. The importance of Oxford was already well established; the shire moot there is mentioned in Canute's Oxford laws, and it was undoubtedly the seat of the county court from the first, the castle being the county gaol. The principal historical events between this period and the Civil War belong less to the history of the county than to that of the city of Oxford (q.v.). The dissolution of the monasteries, though it affected the county greatly, caused no general disturbance.

When King Charles I. won the first battle of the Civil War at Edgehill (23rd of October 1642), Oxford at once became the material and moral stronghold of the royalist cause. Every manor house in the district became an advanced work, and from Banbury in the north to Marlborough in the west and Reading in the south the walled towns formed an outer line of defence. For the campaign of 1643 the role of this strong position was to be the detention of the main parliamentary

army until theroyalists from the north and the west could come into line on either hand, after which the united royal forces were to close upon London on all sides, and in the operations of that year Oxfordshire successfully performed its allotted functions. No serious breach was made in the line of defence, and more than once, notably at Chalgrove Field (18th of June 1643), Prince Rupert's cavalry struck hard and successfully. In the campaign of Newbury which followed, the parliamentary troops under Essex passed through north Oxfordshire on their way to the relief of Gloucester, and many confused skirmishes took place between them and Rupert's men; and when the campaign closed with the virtual defeat of the royalists, the fortresses of the county offered them a refuge which Essex was powerless to disturb. The following campaign witnessed a change in Charles' strategy. Realizing his numerical weakness he abandoned the idea of an envelop- ment, and decided to use Oxfordshire as the stronghold from which he could strike in all directions. The commanding situation of the city itself prevented any serious attempt at investment by dividing the enemy's forces, but material wants made it impossible for Charles to maintain permanently his central position. Plans were continually resolved upon and cancelled on both sides, and eventually Essex headed for the south-west, leaving Waller to face the king alone. The battle of Cropredy Bridge followed (29th of Jan.), and the victorious king turned south to pursue and capture Essex at Lostwithiel in Cornwall. In the remaining operations of 1644 Oxfordshire again served as a refuge and as a base (Newbury and Donnington) . With the appearance on the scene of Cromwell and the New Model army a fresh interest arose. Having started from Windsor on the 20th of April 1645, the future Protector carried out a daring cavalry raid. He caught and scattered the royalists unawares at Islip; then he pursued the fugitives to Bletchington and terrified the governor into surrendering. He swept right round Oxford, fought again at Bampton, and finally rejoined his chief, Fairfax, in Berkshire. A few days later Charles again marched away northwards; while Fairfax was ordered to besiege Oxford. In spite of the difficulties of the besiegers Charles was compelled to turn back to relieve the city, and the consequent xx. 14

delay led to the campaign and disaster of Naseby. Yet even after Naseby the actual position of Oxfordshire was practically un- shaken. It is true that Abingdon with its parliamentary garrison was a standing menace, but the districts east of the Cherwell and Thames, and the triangle bounded by Oxford, Faringdon and Banbury, still retained its importance, till early in 1646 the enemy closed from all sides on the last stronghold of royalism. Stow-on-the-Wold witnessed the final

battle of the war. On the gth of May Banbury surrendered, and two days later Oxford itself was closely invested. On the 24th of June the city capitu- lated, and three days later Wallingford, the last place to give in, followed its example.

The war left the county in an exceedingly impoverished condition. Its prosperity had steadily declined since the early 14th century, when it had been second in prosperity in the kingdom, owing its wealth largely to its well-watered pastures, which bred sheep whose wool was famous all over England, and to its good supply of water power. Salt is mentioned as a product of the county in Domesday Book. Various small industries grew up, such as plush-making at Banbury, leather works at Bampton and Burford, gloves at Woodstock, and malt at Henley. Glass was made at Benson and Stokenchurch in the reign of Henry VI., and the wool trade continued, though not in so flourishing a state, Witney retaining its fame in blanket- making. The pestilence of 1349, the conversion of arable into pasture land, and the enclosure of common land in the early 16th century had led to agricultural depression and discontent. In 1830 the enclosure of Otmoor led to serious riots, in which the people gathered in Oxford at St Giles' fair joined. The county was represented in parliament in 1289 by two members.

Antiquities. — The remains of castles are scanty. The majority of them were probably built for defence in the civil strife of Stephen's reign (1100-1135), and were not maintained after order was restored. Considerable portions of the Norman Oxford Castle survive, however, while there are slighter remains of the castle at Bampton, the seat of Aylmer de Valence in 13 13. Among remains of former mansions there may be noted the 14th century Greys Court near Henley-on-Thames, Minster Lovell, on the Windrush above Witney, and Rycote, between Thame and Oxford. Minster Lovell, the extensive ruins of which make an exquisite picture by the river-side, was the seat of Francis, Lord Lovel, who, being the son of a Lancastrian father, incurred the hatred of that party by'serving Richard III., and afterwards assisted the cause of Lambert Simnel, mysteri- ously disappearing after the battle of Stoke. The remains of Rycote (partly incorporated with a farmhouse) are of fine Elizabethan brick, and in the chapel attached to the manor there is remarkable Jacobean woodwork, the entire fittings of the church, including the canopied pews and altar-table, being of this period. Here Elizabeth was kept in 1554, before her accession, and afterwards resided as queen. Of ancient mansions still inhabited, the finest is Broughton Castle near Banbury, dating from 1301. Others are Shirburn Castle, begun in 1377, but mainly Perpendicular of the next century; Stanton Har- court, dating from 1450, with a gatehouse of

1540, a vast kitchen, and Pope's Tower, named from the poet, who stayed here more than once. Mapledurham, on the Thames above Reading, is a fine Tudor mansion of brick; and Water Eaton, on the Cher- well above Oxford, is a singularly perfect Jacobean house of stone, with a chapel of the same period resembling pure Per- pendicular. Of other mansions in the county Blenheim Palace, near Woodstock, must be mentioned. The former Hoi ton House (now replaced by a Georgian building), near Wheatley, was the scene in 1646 of the wedding of Ireton, the soldier of Cromwell, with his leader's daughter Bridget.

The influence of such a centre of learning as the university was naturally very great upon the ecclesiastical history of the neighbourhood. A large number of monastic foundations arose, such as those of Augustinian canons at Bicester, Cavers- ham, Cold Norton, Dorchester, Osney (a magnificent foundation just outside the walls of Oxford) and Wroxton; of Cistercians,

at Bruern and Thame; of Benedictines, at Cogges, Eynsham, Milton; of Mathurins, at Nuffield; of Gilbertines, at Clatter- cote; of Templars, at Sandford-on-Thames. There was at Gosford one of the only two preceptories of female Templars in England. Of all these, excepting the abbey church at Dor- chester, remains are scanty. A few domestic buildings remain at Studley; the boundary walls still stand of Godstow Nunnery on the Thames, the retreat and burial-place of Rosamund Clifford or " Fair Rosamund," the object of Henry II. 's famous court- ship; and there are traces of Rewley Abbey within Oxford.

In ecclesiastical architecture Oxfordshire, apart from Oxford itself, is remarkably rich, but there is no dominant style, nearly all the churches being of mixed dates. In fact, of the most important churches only Iffley, Adderbury and Minster Lovell need be taken as types of a single style. Iffley, picturesquely placed above the Thames I m. S. of Oxford, is one of the finest examples of pure Norman in England, with a highly ornate west front. Adderbury, 4 m. S. of Banbury, is a great cruciform Decorated church with a massive central tower and spire. Minster Lovell, also cruciform, is pure Perpendicular; its central tower is supported, with beautiful and unusual effect, on four detached piers. For the rest, one feature common to several is to be noticed. The short ungainly spire of Oxford cathedral was among the earliest, if not the first, constructed in England, and served as a model from which

were probably developed the splendid central spires of the great churches at Witney, Bampton, Shipton-under-Wychwood and Bradwell. There are also three fine spires in the north : Bloxham, Adderbury and King's Sutton (across the border in Northamptonshire), which are locally proverbial as typifying length, strength and beauty. Blox- ham church, mainly Decorated, with Norman portions and a remarkable Early English west front, is one of the largest and most beautiful in the county. In the west Burford (Norman and later) is noteworthy, and in the porch of the fine Norman church of Langford is seen the rare feature of a crucifix with the figure cloaked. At South Leigh are remarkable mural paintings of the 15th century. About 5 m. N. of Oxford there are Kidlington (Decorated) with a beautiful needle-like Perpendicular spire, and Islip, which, as the birthplace of Edward the Confessor, retains a connexion with his Abbey of Westminster, the Dean and Chapter of which are lords of the manor and patrons of the living. In the south-east, Dorchester Abbey, with its nave of transitional Norman, has a curious De- corated Jesse window, the tracery representing the genealogical tree of the patrjarch. At Cuddesdon there is another large cruciform church, Norman and later. Ewelme church (Perpendicular) is remarkable for the tomb of Alice, Duchess of Suffolk (1475), gorgeous with tracery and gilded canopy, and that of Sir Thomas Chaucer (1434), ornamented with enamelled coats of arms. Here William de la Pole, Duke of Suffolk, founded in 1436 the picturesque hospital and free school still standing.

Authorities. — The Natural History of Oxfordshire (Oxford, 1677, 2nd ed. 1705); Shelton, Engraved Illustrations of the principal Antiquities of Oxfordshire, from drawings by T. Mackenzie (Oxford, 1823); Sir T. Phillips, Oxfordshire Pedigrees (Evesham, 1825); J. M. Davenport, Lords Lieutenant and High Sheriffs of Oxford, 1086 (Oxford, 1868), and Oxfordshire Annals (Oxford, 1869).

OXIDE, in chemistry, a binary compound of oxygen and other elements. In general, oxides are the most important compounds with which the chemist has to deal, a study of their composition and properties permitting a valuable comparative investigation of the elements. It is possible to bring about the direct com- bination of oxygen with most of the elements (the presence of traces of water vapour is generally necessary according to the researches of H. B. Baker), and when this is not so, indirect methods are available, except with bromine and fluorine (and also with the so-called inert gases — argon, helium, &c), which so far have yielded no oxides. Most of the elements combine with oxygen in several proportions, for example nitrogen has five oxides: N 2 0, NO, N 2 3 , N0 2) N 2 5 ; for classificatory purposes, however, it is advantageous to assign a typical

oxide to each element, which, in general, is the highest having a basic or acid character. Thus in Group I. of the periodic system, the typical oxide is M 2 0, of Group II. MO, of Group III. M 2 3 , of Group IV. M0 2 , of Group V. M 2 6 , of Group VI. M0 3 .

Five species of oxides may be distinguished: (1) basic oxides, (2) acidic oxides, (3) neutral oxides, (4) peroxides, (5) mixed anhy- drides and salts. Basic oxides combine with acids or acidic oxides to form salts; similarly acidic oxides combine with basic oxides to form salts also. The former are more usually yielded by the metals (some metals, however, form oxides belonging to the other groups), whilst the latter are usually associated with the non-metals. An oxide may be both acidic and basic, i.e. combine with bases as well as acids ; this is the case with elements occurring at the transi-

tion between basigenic and oxygenic elements in the periodic classi- fication, e.g. aluminium and zinc. Neutral oxides combine neither with acids nor bases to give salts nor with water to give a base or acid. A typical member is nitric oxide; carbon monoxide and nitrous oxide may also be put in this class, but it must be remembered that these oxides may be regarded, in some measure at least, as the anhydrides of formic and hyponitrous acid, although, at the same time, it is impossible to obtain these acids by simple hydration of these oxides. Peroxides may in most cases be defined as oxides containing more oxygen than the typical oxide. The failure of this definition is seen in the case of lead dioxide, which is certainly a peroxide in properties, but it is also the typical oxide of Group IV. to which lead belongs. All peroxides have oxidizing properties. Peroxides may be basic or acidic. Some basic oxides yield hydro- gen peroxide with acids, others yield oxygen (these also liberate chlorine from hydrochloric acid), and may combine with lower acidic oxides to form salts of the normal basic oxide with the higher acidic oxide. Examples are Ba0 2 +H 2 S04 = BaS04+H 2 2 ; 2Mn0 2 +2H 2 S04 = 2MnS0 4 +2H 2 0+0 2 ; Mn0 2 +4HCl = MnCl 2 + 2H 2 0+C1 2 ; Pb0 2 +S0 2 = PbS0 4 {i.e. PbO+S0 3). Two species of basic peroxides may be distinguished: (1) the superoxides or peroxidates, containing the oxygen atoms in a chain, e.g.

■ i

Na-O-O-Na, O-Ba-O, which yield hydrogen peroxide with acids; and (2) the polyoxides, having the oxygen atoms doubly linked to the metallic atom, e.g. 0:Mn: 0,0:Pb: O, and giving oxygen with sulphuric acid, and chlorine with hydrochloric. L. Marino (Zeit. anorg. Chem., 1907, 56, p. 233) pointed out that manganese and lead dioxide

behaved differently with sulphur dioxide, the former giving dithionate and the latter sulphate, and suggested the following

formulae: 0:Mn:0, O-Pb! 0, as explaining this difference. A simpler explanation is that the manganese dioxide first gives a normal sulphite which rearranges to dithionate, thus: Mn0 2 +2S0 2 = Mn(S0 3) 2 — >MnS 2 06, whilst the lead dioxide gives a basic sulphite which rearranges to sulphate, thus: PbO+S0 2 = PbOS03— >PbS04. Acidic peroxides combine with basic oxides to form ” per ” salts, and by loss of oxygen yield the acidic oxide typical of the element. Mixed anhydrides are oxides, which yield with water two acids, or are salts composed of a basic and acidic oxide of the same metal. Examples of mixed anhydrides are C10 2 and N0 2 , which give chlorous and chloric acid, and nitrous and nitric acid: 2Cl0 2 + H 2 = HC10 2 +HC10 3 , 2N0 2 +H 2 = HN0 2 +HN0 3 ; and of mixed salts Pb 2 3 and Pb 3 04, which may be regarded as lead meta- and ortho-plumbate: PbO-Pb0 2 , 2Pb0-Pb0 2 .

Oxidation and Reduction. — In the narrow sense ” oxidation ” may be regarded as the combination of a substance with oxygen, and conversely, “reduction” as the abstraction of oxygen; in the wider sense oxidation includes not merely the addition of oxygen, but also of other electro-negative elements or groups, or the removal of hydrogen or an electro-positive element or group. In inorganic chemistry oxidation is associated in many cases with an increase in the active valency. Ignoring processes of oxidation or reduction simply brought about by heat or some other form of energy, we may regard an oxidizing agent as a substance having a strong affinity for electro-positive atoms or groups, and a reducing agent as having a strong affinity for electro-negative atoms or groups; in the actual processes the oxidizing agent suffers reduction and the reducing agent oxidation.

Many substances undergo simultaneous oxidation and reduction when treated in a particular manner; this is known as self- or auto-oxidation. For example, on boiling an aqueous solution of a hypochlorite, a chlorate and a chloride results, part of the original salt being oxidized and part reduced: 3Na0Cl = NaC10 3 +2NaCl. Similarly phosphorous and hypophosphorous acids give phosphoric acid and phosphine, whilst nitrous acid gives nitric acid and nitric oxide: 4H 3 P0 3 = 3H 3 P04+PH 3 ; 2H 3 P0 2 = H 3 P0 4 +PH 3 ; 3HN0 2 = HN0 3 +2NO-t-H 2 0. In organic chemistry, a celebrated example is Cannizzaro’s reaction wherein an aromatic aldehyde gives an acid and an alcohol: 2C 6 H5CHO+H 2 = C6H5C0 2 H-t-C 6 H 6 CH 2 OH.

The important oxidizing agents include: oxygen, ozone, per- oxides, the halogens chlorine and bromine, oxyacids such as nitric and those of chlorine, bromine and iodine, and also chromic and permanganic acid. The important reducing agents include hydrogen, hydrides such as those of iodine, sulphur, phosphorus, &c, carbon, many metals, potassium, sodium, aluminium, magnesium, &c, salts of lower oxyacids, lower salts of metals and lower oxides.

OXIMES, in organic chemistry, compounds containing the grouping > C : N • OH, derived from aldehydes and ketones by condensing them with hydroxylamine. Those derived from aldehydes are known as aldoximes, those from ketones as ketoximes. They were first prepared by V. Meyer in 1882 (Ber., 1882, 15, pp. 1324, 1525, 2778). They are either colour- less liquids, which boil without decomposition, or crystalline solids; and are both basic and acidic in character. On reduction by sodium amalgam in glacial acetic acid solution they yield primary amines. They are hydrolysed by dilute mineral acids

yielding hydroxylamine and the parent aldehyde or ketone. The aldoximes are converted by the action of dehydrating agents into nitriles: RCH : NOH-ˆRC i N + H 2 0. The ket- oximes by the action of acetyl chloride undergo a peculiar intra- molecular re-arrangement known as the Beckmann trans- formation (E. Beckmann, Ber., 1886, 19, p. 989; 1887, 20, p. 2580), yielding as final products an acid- amide or anilide, thus: RC(:N-OH)R'ˆ > RC(OH):NR'- > RCONHR'. As regards the constitution of the oximes, two possibilities exist, /NH namely > C : NOH, or > C< ■ , and the first of these is presumably

correct, since on alkylation and subsequent hydrolysis an alkyl hydroxylamine of the type NH 2 OR is obtained, and consequently it is to be presumed that in the alkylated oxime, the alkyl group is attached to oxygen, and the oxime itself therefore contains the hydroxyl group. It is to be noted that the oximes of aromatic aldehydes and of unsymmetrical aromatic ketones fiequently exist in isomeric forms. This isomerism is explained by the Hantzsch Werner hypothesis (Ber., 1890, 23, p. 11) in which the assumption is made that the three valencies of the nitrogen atom do not lie in the same plane. Thus in the case of the simple aldoximes two con-

RC-H R-C-H

figurations are possible, namely: •• and ■• , the former,

N-OH HON where the H atom and OH group are contiguous, being known as yyrc-aldoximes and the latter as the o»ti-aldoximes. The syn-ald- oximes or treatment with acetyl chloride readily lose water and yield nitriles ; the anti-aldoximes as a rule are acetylated and do not yield nitriles. The isomerism of the oximes of unsymmetrical ketones is explained in the same manner, and their configuration is determined by an application of the Beckmann transformation (see Ber., 1891, 24, p. 13); thus:

~ > R-C(OH): NR'- > R-CONHR'(R'andOH, "syw"). N-OH

•• RN : C(OH)R'^RNH-COR'(RandOH,"i > r,,"). HON

Aldoximes are generally obtained by the action of hydroxylamine hydrochloride on the aldehyde in presence of sodium carbonate; the oxime being then usually extracted from the solution by ether. They may also be prepared by the reduction of primary nitro com- pounds with stannous chloride and concentrated hydrochloric acid ; by the reduction of unsaturated nitro compounds with aluminium amalgam or zinc dust in the presence of dilute acetic acid (L. Bouve- ault, Comptes rendus, 1902, 134, p. 1 145) : IfcC:CHN0 2 — > R 2 C: CH-NHOH— > R 2 CH-CH : NOH, and by the action of alkyl iodideson the sodium salt of nitro-hydroxylamine (A. Angeli, Rend. Acad. d. Lincei, 1905, (5), 14, ii. p. 411), the cycle of reactions probably being as follows:

•N0 2 NHOH > HN0 2 -r-HNO;HNO-r-RI- > HI + RNO

(CH 3 CH 2 NO— > CH 3 CH: N-OH).

Formaldoxime, CH 2 : NOH, was obtained by W. R. Dunstan (Jour. Chem. Soc, 1898, 73, p. 352) as a colourless liquid by the addition of hydroxylamine hydrochloride to an aqueous solution of formaldehyde in the presence of sodium carbonate; the resulting solution was extracted with ether and the oxime hydrochloride precipitated by gaseous hydrochloric acid, the precipitate being then dissolved in water, the solution exactly neutralized and distilled. It boils at 83-85 C. and burns with a green coloured flame. It is readily transformed into a solid polymer, probably (CH 2 :NOH) 3 . In the absence of water, it forms salts of the type (CH 2 : NOH) 3 HCl with acids. It behaves as a powerful reducing agent, and on hydro lysis with dilute mineral acids is decomposed into formaldehyde and hydroxylamine, together with some formic acid and ammonia, the amount of each

product formed varying with temperature, time of reaction, amount of water present, &c. This latter reaction is probably due to some of the oxime existing in the form of the isomeric formamide HCO-NH 2 . Acetyl- and benzoyl-formaldoxime are derivatives of the threefold polymeric form. The acetyl com- pound on reduction yields two of its nitrogen atoms in the form of ammonia and the third in the form of methylamine.

Acetaldoxime, CH 3 CH: NOH, crystallizes in needles which melt at 47 C. On continued fusion the melting point gradually sinks to about 13° C, probably owing to conversion into a polymeric form.

Chloraloxime, CC1 3 CH: NOH, is obtained when one molecular proportion of chloral hydrate is warmed with four molecular pro- portions of hydroxylamine hydrochloride and a little water. It crystallizes in prisms which melt at 39 C. A chloral hvdroxylamine, CCU-CHOH-NHOH, melting at 98° C. is obtained “by allowing a mixture of one molecular proportion of chloral hydrate with two molecular proportions of hydroxylamine hydrochloride and one of sodium carbonate to stand for some time in a desiccator.

Clyoxime, HON:CH-CH:NOH, obtained from glyoxal and hydroxylamine, or by boiling amidothiazole with excess of hydroxy- lamine hydrochloride and water, melts at 178° C. and is readily soluble in hot water.

Succinic aldehyde dioxime, HON:CH-CH 2 -CH 2 -CH:NOH, is obtained by boiling an alcoholic solution of pyrrol with hydroxylamine hydrochloride and anhydrous sodium carbonate (G. Ciamician, Ber., 1884, 17, p. 534). It melts at 173° C. ; and on reduction with sodium in alcoholic solution yields tetramethylene diamine. A boiling solution of caustic potash hydrolyses it to ammonia and succinic acid.

Benzaldoximes. — The o-oxime (benz-are

1588).

Ketoximes are usually rather more difficult to prepare than ald- oximes, and generally require the presence of a fairly concentrated alkaline solution. They may also be prepared by the reduction of pseudo-nitrols (R. Scholl, Ber., 1896, 29, p. 87), the reaction probably being :

RR:C(N0 2)NOˆRR:C:(NHOH) 2 - > RR:C:NOH + NH 2 OH.

Acetoxime, (CH 3) 2 C:NOH, melts at 58-39 ° C. and is readily soluble in water. Its sodium salt is obtained by the action of sodamide on the oxime, in presence of benzene (A. W. Titherley, Jour. Chem. Soc, 1897, 71, p. 461).

Mesityl oxime, (CH 3) 2 C : CH-C(: NOH)CH 3 , exists in two modifica- tions. The /3-form is obtained by the direct action of hydroxylamine hydrochloride on mesityl oxide, the hydrochloride so formed being decomposed by sodium carbonate. It crystallizes in plates which melt at 48-49 C. and boil at 92° C. (9 mm.). When boiled for some time with caustic soda, it is converted into the oily a-oxime, which boils at 83-84 ° C. (9 mm.). Both forms are volatile in steam. The a-oxime, on long continued boiling with a concentrated solution of a caustic alkali, is partially decomposed with formation of some acetone and acetoxime (C. Harries, Ber., 1898, 31, pp. 1381, 1808; 1899, 32, p. 1331). By the diiect action of hydroxylamine on a methyl alcohol solution of mesityl oxide in the presence of sodium methylate a hydioxylamino- ketone, diacetone hydroxylamine, (CH s) 2 C(NHOH)-CH 2 COCH 3 ,is formed. In a similar mannerphorone gives rise to triacetone hydroxylamine, CO :[CH 2 -C(CH S) 2] 2 :NOH.

Acetophenoneoxime, C 6 H 6 -C(:NOH)-CH 3 , melts at 59 C. In glacial acetic acid solution, on the addition of concentrated sulphuric acid, it is converted into acetanilide. Benzophenone oxime, C e H 6 C (:NOH)C 6 H s , exists only in one modification which melts at 140 C. ; whereas the unsymmetrical benzophenones each yield two oximes. O. Wallach (Ann., 1900, 312, p. 171) has shown that the saturated cyclic ketones yield oximes which by an application of the Beckmann reaction are converted into isoximes, and these latter on hydrolysis with dilute mineral acids are transformed into acyclic amino-acids ; thus from cyclohexanone, e-amidocaproic acid (e-leucine) may be obtained : —

/CHrCHax /CH 2 -CH 2 -CO

CH 2 < >C:NOH->CH 2 <

X CH 2 -CH 2 / X CH 2 -CH 2 -NH

/CHrCHj-COzH

‘\CH 2 -CH 2 NH 2 An ingenious application of the fact that oximes easily lose the elements of water and form nitriles was used by A. Wohl (Ber., 1893, 26, p. 730) in the ” breaking down ” of thesugars. Glucose oxime on warming with acetic anhydride is simultaneously

acetylated and dehydrated, yielding an acetylated gluconitrile, which when warmed with ammoniacal silver nitrate loses hydrocyanic acid and is transformed into an acetyl pentose. The pentose is then obtained from the acetylated compound by successive tieatment with ammonia and dilute acids : — •

CH 2 OH-(CHOH) 3 -CHOH-CH: NOH- > CH 2 OH-(CHOH) 3 –

CHOH-CN-p > CH 2 OH(CHOH) 3 -CHO.

In order to arrive at the configuration of the stereoisomeric ket- oximes, A. Hantzsch (Ber., 1891, 24, p. 13) has made use of the Beck- mann reaction, whereby they are converted into acid-amides. Thus, with the tolylphenylketoximes, one yields the anilide of toluic acid and the other the toluidide of benzoic acid, the former necessitating the presence of the phenyl and hydroxyi radicals in the syn position and the latter the tolyl and hydroxyl radicals in the syn position, thus:

CH 3 .CeH 4 .C-CeH 6 _^ ^^0^^.

N-OH Syra-phenyltolylketoxime

CHs-CeHˆC-CeHs

• -> CH 3 C 6 H 4 NHCOC 6 H 6

HO-N

A ra/i-tolylphenylketoxime In the case of the aldoximes, that one which most readily loses the elements of water on dehydration is assumed to contain its hydroxyl radical adjacent to the movable hydrogen atom and is designated the syn-compound.

On the oxyamido-oximes see H. Ley, Ber., 1898, 31, p. 2126; G. Schroeter, Ber., 1900, 33, p. 1975.

-> CH 2 :

\2Q >

oxus

Sources.

OXUS, or Amu Darya, one of the great rivers of Central Asia. Prior to the meeting of the commissions appointed for the deter- mination of the Russo- Afghan boundary in 1885, no very accurate geographical

knowledge of the upper Oxus regions existed, and the course of the river itself was but roughly mapped. Russian explorers and natives of India trained for geographical reconnaissance, and employed in connexion with the great trigonometrical survey of India, had done so much towards clearing away the mists which enveloped the actual course of the river, that all the primary affluents were known, although their relative value was misunderstood, but the nature of the districts which bordered the river in Afghan Turkestan was so imperfectly mapped as to give rise to considerable political complication in framing the boundary agreement between Great Britain and Russia. From Lake Victoria (Sor-Kul) in the Pamirs, which was originally reckoned as the true source of the river, to Khamiab, on the edge of the Andkhui district of Afghan Turkestan, for a distance of about 680 m., the Oxus forms the boundary between Afghanistan and Russia. For another 550 m. below Khamiab it follows an open and sluggish course till it is lost in the Sea of Aral, being spanned at Charjui, 150 m. below Khamiab, by the wooden bridge which carries the Russian railway from Merv to Samarkand. The level of Lake Victoria is 13,400 ft. above sea. At Khamiab the river is probably rather less than 500 ft.

For many years a lively geographical controversy circled about the sources of the Oxus, and the discussion derived some political significance from the fact that the true source, wherever it might be found, was claimed as a point in the Russo- Afghan boundary. The final survey of the Pamir region (wherein the heads of all the chief tributaries of the river lay hidden), by the Pamir boundary commission of 1895 established the follow- ing topographical facts in connexion with this question. The elevated mountain chain which is now called the Nicolas range, which divides the Great from the Little Pamir, is a region of vast glaciers and snow-fields, from which the lakes lying immediately north and south derive the greater part of their water-supply. On the north the principal glacial tributary of Lake Victoria forms, within the folds of the gigantic spurs of the Nicolas mountains, a series of smaller lakes, or lakelets, before joining the great lake itself. On the south a similar stream starting farther east, called Burgutai (denoting the position of a difficult and dangerous pass across the range) sweeps downwards towards Lake Chakmaktin, the lake of the Little Pamir, which is some 400 ft. lower than Victoria. But at the foot of the mountain this stream bifurcates in the swamps which lie to the west of Chak- maktin, and part of its waters find their way eastwards into the lake, and part flow away westwards into the Ab-i-Panja, which joins the Pamir river from Lake Victoria at Kala Panja. This at any rate is the action of the Burgutai stream during

certain seasons of the year, so that the glaciers and snowfields of the Nicolas range may be regarded as the chief fountain-head of at least two of the upper tributaries of the Oxus, namely, the Aksu (or Murghab) and the Pamir river, and as contributing largely to a third, the Ab-i-Panja. Neither Lake Victoria nor Lake Chakmaktin derives any very large contributions from glacial sources other than those of the Nicolas range. It is possible that there may be warm springs on the bed of Lake Victoria, as such springs are of frequent occurrence in the Pamirs; but there is no indication of them in the Chakmaktin basin, and the latter lake must be regarded rather as an incident in the course of the Aksu — a widening of the river channel in the midst of this high- level, glacier-formed valley — than as the fountain-head of the infant stream. There are indications that the bed of Lake Victoria, as weiJ as that of Chakmaktin, is rapidly silting, and that the shores of the latter are gradually receding farther from the foot of the hills. The glacial origin of the Pamir valleys is everywhere apparent in their terrace formations and the erratic blocks and boulders that lie scattered about their surface. It is probable that the lakes themselves are evidence of (geologically) a comparatively recent deliverance from the thraldom of the ice coveiing, which has worn and rounded the lower ridges into the smooth outlines of undulating downs.

Another important source of the river (considered by Curzon to be the chief source) is to be found in the enormous glaciers which lie about the upper or main branch of the Ab-i-Panja (called the Ab-i-Wakhjir or Wakhan), which rises under the mountains enclosing the head of the Taghdumbash Pamirs. Although the superficial area of glacial ice from which the Ab-i- Wakhjir derives the greater part of its volume is not equal to that found on the Nicolas range, it is quite impossible to frame any estimate of comparative depth or bulk, or to separate the volume of its contributions at any time from those which, combined, derive their origin from the Nicolas range. If the Aksu (or Murghab) and the Pamir river from Lake Victoria are to be considered in the light of independent tributaries, it is probable that the. Ab-i-Panja contributes as large a volume of glacial flood to the Oxus as either of them.

From the point where the rivers of the Great and Little Pamirs join their forces at Kala Panja to Ishkashim, at the elbow of the great bend of the Oxus northwards, the river valley has Surveys been surveyed by Woodthorpe; and the northern slopes ”

of the Hindu Kush, which near Ishkashim extend in slopes of barely 10 m. in length from the main watershed to the river banks, have been carefully mapped. These slopes represent the extent of Afghan

territory which exists north of the Hindu Kush between Kala Panja and Ishkashim. From Ishkashim northwards the river passes through the narrow rock-bound valleys of Shignan and Roshan ere it sweeps north and west through the mountains and defiles of Darwaz. By the terms of the boundary agreement with Russia this part of the river now parts Badakshan and Darwaz from the districts of Roshan, Shignan, and Bokhara, which formerly maintained an uncertain claim over a part of the territory on the left bank of the river. All this part of the Oxus, until the river once again emerges from the Bokhara hills into the open plains bordering Badakshan on the north, falls within the area of Russian surveys, with which a junction from India has been effected both on the Pamirs and in Turkestan.

At Langar Kisht, a little to the east of the Oxus bend, there is a small Russian post of observation. About 50 m. north of the bend, where the Suchan or Ghund joins the Oxus from the Russian Alichur Pamir, there is another and larger post called p os t s on Charog. On the left bank of the river the Afghans main- ttle Oxos tain a frontier post at the fort of Kala Bar Panja. A road will connect Charog with the Alichur Pamir, following the general course of the Ghund stream, a road which will form a valuable link in the chajp of communications between Bokhara and Sarikol. Eighty-five miles north of Ishkashim, at Kala Wamar, the river which rises in the Little Pamir, and which is called Aksu, Murghab, or Bartang, joins the Oxus from the east. It is on this river that the Russian outpost, Murghabi (or Pamirski), is situated, at an elevation of 12,150 ft. above the sea. Fort Murghabi is con- nected by a good military road with Osh. At this point the measure- ment of the comparative lengths of the chief Pamir tributaries of the Oxus is as follows : —

To the head of the Aksu at Lake Chakmaktin . . 260 miles.

To the head of the most easterlv tributary of Lake

Victoria, in the Great Pamir, about . . . 230 ,,

To the glacial sources of the Ab-i-Wakhjir, about . 230 ,,

For 120 m. the two latter are united in the main stream of the Oxus, the volume of which has been further increased by the united forces of the Ghund and Shakhdara draining the Alichur Pamir and the heights of Shignan.

The narrow cramped valley of the river between Ishkashim and Kala Wamar is hedged in on the west by a long ridge flanking the highlands

of Badakshan ; on the east the buttresses and Nature of spurs of the Shignan mountains (of which the strike is ˆ e q xus transverse to the direction of the river and more or less valley. parallel to that of the main Hindu Kush watershed) overhang its channel like a wall, and afford but little room either for cultivation or for the maintenance of a practicable road. Yet the lower elevation (for this part of the Oxus stream is not more than about 7000 ft. above sea-level) and comparatively mild climate give opportunities to the industrious Tajik population for successful agriculture, of which they are not slow to avail them- selves, and a track exists on the left bank of the river to Kala Bar Panja opposite the Ghund (or Suchan) debouchment, which, is practicable for mules. There are no bridges, and the transit of the river from bank to bank can only be effected by the use of inflated skins. Beyond the Bartang (or Murghab) confluence the valley narrows, and the difficulties of the river route increase. Between Kala Wamar (6580 ft.) and Kala Khum (4400 ft.), where the Oxus again bends southwards, its course to the north-west is almost at right angles to the general strike of the Darwaz mountains, which is from north-east to south-west, following the usual conformation of all this part of high Asia. Thus its chief affluents from the north- east, the Wanj and the Yaz Ghulam, drain valleys which are com- paratively open, and which are said to be splendidly fertile. At

Kala Khum the river is 480 ft. wide, narrowing to 350 ft. in the narrowest gorge. Its level varies with the obstructions formed by ice, falling as much as 28 ft. when its upper channels are blocked.

The climate of eastern Bokhara and Darwaz is delightful in

summer, and Dr Regel writes of its Alpine scenery and flora in terms

of enthusiastic admiration. In the valleys of the Waksh

rf o’* and the Surkhab to the north of Darwaz, which form an Vcti’ important part of the province of Karategin, maple, ash, auctions. j, awtnornj pistachio, and juniper grow freely in the mountain forests, and beetroot, kohl rabi, and other vegetables are widely cultivated. About the cliffs and precipices of the Panja valley near Kala Khum the wild vine, cerasus, and pomegranate are to be found, and the plane tree and mulberry flourish in groups near the villages. Here also, amongst other plants, the sunflower de- corates village gardens. The

houses are built of stone and mortar, and above the thatched straw roof which surmounts the double- storeyed buildings the square water-tower rises gracefully. Every house possesses its staircase, its well, and cisterns for irrigation; and on the whole the Aryan Tajiks of this northern section of the Oxus valley seem to be well provided with most of the comforts, if not the luxuries, of life. Their language is the language of Bokhara and Samarkand. Bokharan supremacy was re-established in 1878, when Kala Khum was occupied by Bokharan troops. Since then the right bank of the river has been politically divided from the left, and the latter now belongs to Afghanistan.

From Kala Khum, which fort about marks the most northerly point of the great bend of the Oxus round Badakshan, the river follows a south-westerly course for another 50 m. through a close mountainous region ere it widens into the more open valley to the south of Kolab. It now becomes a river of the plains from which the mountains on either side stand back.

The topography of Darwaz south of the river is not accurately known, but at least one considerable stream of some 60 m. in length drains to the north-east, parallel to the general strike of Da U raz . the mountain system into the transverse course of the Affluents. q xus< w hich it joins nearly opposite to the lateral valleys of Yaz Ghulam and Wanj. This stream is called Pangi-Shiwa, or Shiwa, but not much is known about it. Another of about equal length, starting from the same central water-parting of this mountain block, and included within the Oxus bend, follows a trans- verse direction at almost right angles to the Shiwa, and joins the Oxus valley near its debouchment into the more open Kolab plains, where the course of the Oxus has again assumed a direction parallel to the mountain strike. All that we know about this river (which is called the Ragh or Sadda) is that towards its junction with the Oxus it cuts through successive mountain ridges, which renders its course impracticable as a roadway. It is necessary to avoid the river, and to pass by mountain tracks which surmount a series of local spurs or offshoots from the central plateau, in order to reach the Oxus. The existence of this route, which traverses the Darwaz mountains from east to west, cutting off the northern bend of the Oxus, and connecting those easterly routes which intersect the Pamirs by means of the Ghund and Shakhdara (and which con- centrate about Lake Shiwa) with Kolab in eastern Bokhara, is important. (See Badakshan.)

From about the point where the Oxus commences to separate the Bokharan province of Kolab from the comparatively open Afghan districts of Rustak and Kataghan, the channel of the Karate- river is no

longer confined within walls of mountains *.Jj . of volcanic and schistose formation. The Kolab and the Affluents. Surkhab (or Waksh) flow into it in broad muddy streams from the highlands of Karateghin, and the river at once commences to adopt an uncertain channel wherever the out- stretched arms of the hills fail to confine it within definite limits. It divides its waters, splitting into many channels, leaving broad central islands; and as the width increases, and the depth during dry seasons diminishes, opportunities for fords become comparatively frequent. Between Kolab and Pata Kesar, immediately north of the Turkestan capital of Mazar-i-Sharif , there are at least three well- known ” guzars ” or fords, and there are probably more. Besides the great muddy affluents from Karateghin on the north, the Kaba- dian, the Surkhan, and the Darbant are all of them very considerable tributaries from Bokhara. The last of the three is the river on which the well-known trade centre of Shirabad is built, some 20 m. north of the river. Near the junction of the Surkhan with the Oxus are the ruins of the ancient city of Termez, on the northern or Bokharan bank, and the ferry at Pata Kesar (not far from the ruins of an old bridge) is the connecting link between Bokhara and Mazar hereabouts. A Russian branch railway is said to have been recently built from Samarkand to Termez.

From the south two very remarkable affluents of the Oxus join their streams to the main river between Kolab and the Mazar crossings. The Kokcha and the Khanabad (or Kunduz) Badak- are tne (:wo g rea ˆ r ; V ers of Badakshan. The valley of AH? t tne Kokcha leads directly from the Oxus to Faizabad, the uen s. ca pjj a i f Badakshan, and its head is close above Ishkashim at the southern elbow of the great Oxus bend, a low pass of only 9500 ft. dividing its waters from those of the main river. This undoubtedly was a section of the great central trade route of Asia,

Channel of the Oxus.

Cultiva- tion.

which once connected Ferghana and Herat with Kashgar and China. (See Badakshan.) Both these rivers tap the northern slopes of the Hindu Kush, and claim their sources in the unmapped mountain wilderness of Kafiristan. The Khanabad, or Kunduz, is also called locally the Aksarai. All the rivers of Central Asia are known by several names. To the west of the Kunduz no rivers find their way through the southern banks of the Oxus. Throughout the plains of Afghan Turkestan the drainage from the southern hills is arrested and lost in the desert sands.

The only island of any size in the bed of the river is the island of Paighambar, a little below the ruins of Termez. The inhabitants of this island, and of a smaller one in the neighbourhood called Zarshoi, wash for gold in the bed of the river.

At Airatan, a little above the Pata Kesar ferry, there are ruins, as also at Khisht Tapa (where the road from Kabadian to Tash- kurghan leaves the river) and at Kalukh Tapa. At Khisht Tapa there is a tradition of a bridge having once existed.

The Oxus river, as seen in flood at this part of its course, is an imposing stream. It is rarely less than 1000 yards wide, and in some places it is fully a mile across. Its winter channel may be estimated at from two-thirds to three-fourths of its flood channel, except where it is confined within narrow limits by a rocky bed, as at Kilif, where its un- varying width is only 540 yards. The average strength of the current in flood is about 4 m. per hour, varying from 2\ to 5 m. The left bank of the Oxus above Kilif is, as a rule, low and flat, with reed swamps bordering the stream and a strip of jungle between the reeds and the edge of the elevated sandy desert. The jungle is chiefly tamarisk and padah (willow). Swamp deer, pheasants, and occasionally tigers are found in it. The right bank is generally higher, drier, more fertile and more populated than the left.

A wide belt of blown sand (or Chul), sprinkled with saxaul jungle, separates the swamps on the south side of the river from the cultivated plains of Afghan Turkestan; but in places, notably for about 12 m. above Khamiab, where the Russo-Afghan boundary touches the river, through the districts which are best known by the name of Khwaja Salar, and again in a less degree for 50 m. above the ferry at Kilif, a very successful war has been waged by the agricultural Turkman (of the Ersari tribes) against the en- croaching sand-waves of the desert; and a strip of riverain soil averaging about a mile in width has been reclaimed and cultivated by irrigation. The cultivation, supported by canals drawn from the Oxus, the heads of which are constantly being destroyed by flood and again renewed, is of a very high order. Wheat and barley spread in broad crops over many square miles of rich soil ; the fields are intersected by narrow little stone- walled lanes, bright with way- side flowers, amongst which the poppy and the purple thistle of Badghis are predominant; the houses are neatly built of stone, and stand scattered about the landscape in single homesteads, substantial and comfortable; and the spreading willow and the mulberry offer a most grateful shade to the wayfarer in summer time, when the heat is often insupportable. The fiery blasts of summer, furnace-heated over the red-hot Kizil Kum, are hardly less to

be feared than the ice-cold shamshir (or north-western blizzard) of winter, which freezes men when it finds them in the open desert, and frequently destroys whole caravans.

The principle on which the Oxus ferries are worked is peculiar to those regions. Large flat-bottomed boats are towed across the river by small horses attached to an outrigger projecting beyond the gunwale by means of a surcingle or bellyband. They are thus partially supported in the water whilst they swim. The horses are guided from the boat, and a twenty- or thirty-foot barge with a heavy load of men and goods will be towed across the river at Kilif (where,, as already stated, the width of the river is between 500 and 600 yards only) with ease by two of these animals. The Kilif ferry is on the direct high-road between Samarkand and Akcha. It is perhaps the best-used ferry on the Oxus.

Khwaja Salar derives some historical significance from the fact that it presented a substantial difficulty to the settlement of the Russo-Afghan boundary, in which it was assigned by agreement as the point of junction between that boundary and the Khwaja Oxus. It had been defined in the agreement as a ” post ” Salar . on the river banks, and had been so described by Burnes in his writings some fifty years previously. But no post such as that indicated could be discovered. There was a district of that name extending from Khamiab to the neighbourhood of Kilif, and at the Kilif end of the district was a ziarat sacred to the Khwaja who bore the name. It was only after long inquiry amongst local cultivators and landowners that, about 2 m. below the ziarat, and nearly opposite to the site of the present Karkin bazaar, the position of a lost ferry was identified, which had once been marked by a riverside hamlet called by the name of the saint. The ferry had long dis- appeared, and with it a considerable slice of the riverside alluvial soil, which had been washed into the stream by the action of floods. The post had, in fact, subsided to the bottom of the river, but the consequences of its disappearance had been both far-reaching and expensive.

Below Khamiab, to its final disappearance in the Aral Sea, the great river rolls in silent majesty through a vast expanse of sand and

desert. Under Russian auspices a considerable strip of alluvial soil on the left bank has been brought under cultivation, measuring Lower 4 or 5 m. in width, and there is more cultivation on Oxus *^ e b an ks of the Oxus now than there is in the Merv oasis

itself, but it is confined to the immediate neighbourhood of the river, for no affluents of any considerable size exist. The river is navigable below Charjui, and takes its place as an important unit in the general scheme of Russian frontier communications. There is now a regular steamer service, twice a week in summer and once a week in winter, as far as Pata Kasar. The steamers are flat- bottomed paddle boats drawing 3 ft-

An important feature in connexion with the course of the Oxus

is the discussion that has arisen with regard to its former debouch-

, . ment into the Caspian Sea. On this point much recent

Uhth" evidence has been collected, and it appears certain that

/Ira/ Sea there was a time in the post-Pliocene Age when a long

gulf of the Caspian Sea protruded eastwards nearly as far as the longitude of Merv, covering the Kara Kum sands, but not the Kara Kum plateau to the north of the sands, which is separated from the sands by a distinct sea beach. At the same time another branch of the same gulf protruded northwards in the direction of the Aral, probably as far as the Sary Kamish depression, which lies to the west of the Khivan delta of the Oxus, separated from it by wide beds of loess, clays and gravel, covering rocks of an unknown age. The Murghab river and the Hari Rud, which terminate in the oases of Merv and Sarakhs, almost certainly penetrated to the gulf of the Kara Kum, but the question whether the Oxus was ever deflected so as to enter the gulf with the Murghab cannot be said to be answered decisively at present. The former connexion between the Caspian and Aral by means of the gulf now represented by the Sary Kamish depression seems to be admitted by Russian scientists, nor would there appear to be much doubt about the connexion between the Khivan oasis and the northern extremity of the Sary Kamish. In this discussion the names of Kaulbars, Lessar, Annenkov, Konshin and other Russian geographers are conspicuous. The general conclusions are ably summed up by P. Kropotkin in the September number of the Journal of the Royal Geographical Society for 1898.

History. — In the most remote ages to which written history carries

us, the regions on both sides of the Oxus were subject to the Persian monarchy. Of their populations Herodotus mentions the Bactrians, Chorasmians, Sogdians and Sacae as contributing their contingents to the armies of the great king Darius. The Oxus figures in Persian romantic history as the limit between Iran and Turan, but the substratum of settled population to the north as well as the south was probably of Iranian lineage. The valley is connected with many early Magian traditions, according to which Zoroaster dwelt at Balkh, where, in the 7th century B.C., his proselytizing efforts first came into operation. Buddhism eventually spread widely over the Oxus countries, and almost entirely displaced the religion of Zoroaster in its very cradle. The Chinese traveller Hsuen Tsang, who passed through the country in a.d. 630-644, found Termez, Khulm, Balkh, and above ail Bamian, amply pro- vided with monasteries, stupas and colossal images, which are the striking characteristics of prevalent Buddhism; even the Pamir highlands had their monasteries.

Christianity penetrated to Khorasan and Bactria at an early date; episcopal sees are said to have existed at Merv and Samarkand in the 4th and 5th centuries, and Cosmas (c. 545) testifies to the spread of Christianity among the Bactrians and Huns.

Bactria was long a province of the empire which Alexander the Great left to his successors, but the Greek historians give very little information of the Oxus basin and its inhabitants. About 250 B.C. Diodotus, the ” governor of the thousand cities of Bactria,” declared himself king, simultaneously with the revolt of Arsaces which laid the foundation of the Parthian monarchy. The Graeco-Bactrian dominion was overwhelmed entirely about 126 B.C. by the Yue-chi (q.v., , a numerous people who had been driven westwards from their settlements on the borders of China by the Hiungnu (q.v.). From the Yue-chi arose, about the Christian era, the great Indo-Scythian dominion which extended across the Hindu Kush southwards, over Afghanistan and Sind. The history of the next five centuries is a blank. In 571 the Haiathalah (Ephthalites, q.v.) of the Oxus, who are supposed to be descendants of the Yue-chi, were shattered by an invasion of the Turkish khakan; and in the following century the Chinese pilgrim Hsuen Tsang found the former empire of the Haiathalah

broken up into a great number of small states, all acknowledging the supremacy of the Turkish khakan, and several having names identical with those which still exist. The whole group of states he calls Tukhara, by which name in the form Tokharistan, or by that of Haiathalah, the country continued for centuries to be known to the

Mahommedans. At the time of his pilgrimage Chinese influence had passed into Tokharistan and Transoxiana. Yazdeged, the last of the Sassanid kings of Persia, who died in 651, when defeated and hard pressed by the Moslems, invoked the aid of China; the Chinese emperor, Taitsung, issued an edict organizing the whole country from Ferghana to the borders of Persia into three Chinese administrative districts, with 126 military cantonments, an organization which, however, probably only existed on paper.

In 7 1 1-7 1 2 Mahommedan troops were conducted by Kotaiba, the governor of Khorasan, into the province of Khwarizm (Khiva), after subjugating which they advanced on Bokhara and Samarkand, the ancient Sogdiana, and are said to have even reached Ferghana and Kashgar, but no occupation then ensued. In 1016-1025 the government of Khwarizm was bestowed by Sultan Mahmud of Ghazni upon Altuntash, one of his most distinguished generals.

Tokharistan in general formed a part successively of the empires of the Sassanid dynasty (terminated a.d. 999), of the Ghaznevid dynasty, of the Seljuk princes of Persia and of Khorasan, of the Ghori or Shansabanya kings, and of the sultans of Khwarizm. The last dynasty ended with Sultan Jalal-ud-din, during whose reign (1221-1231) a division of the Mogul army of Jenghiz Khan first invaded Khwarizm, while the khan himself was besieging Bamian; Jalal-ud-din, deserted by most of his troops, retired to Ghazni, where he was pursued by Jenghiz Khan, and again retreating towards Hindustan was overtaken and driven across the Indus.

The commencement of the 16th century was marked by the rise of the Uzbeg rule in Turkestan. The Uzbegs were no one race, but an aggregation of fragments from Turks, Mongols and all the great tribes constituting the hosts of Jenghiz and Batu. They held Kunduz, Balkh, Khwarizm and Khorasan, and for a time Badakshan also; but Badakshan was soon won by the emperor Baber, and in 1529 was bestowed on his cousin Suleiman, who by 1555 had established his rule over much of the region between the Oxus and the Hindu Kush. The Mogul emperors of India occasionally interfered in these provinces, notably Shah Jahan in 1646; but, finding the difficulty of maintaining so distant a frontier, they abandoned it to the Uzbeg princes. About 1765 the wazir of Ahmad Shah Abdali of Kabul invaded Badakshan, and from that time until now the domination of the countries on the south bank of the Oxus from Wakhan to Balkh has been a matter of frequent struggles between Afghans and Uzbegs.

The Uzbeg rule in Turkestan has during the last fifty years been

rapidly dwindling before the growth of Russian power. In 1863 Russia invaded the Khokand territory, taking in rapid succession the cities of Turkestan, Chimkent and Tashkend. In 1866 Khojend was taken, the power of Khokand was com- pletely crushed, a portion was incorporated in the new Russian province of Turkestan, while the remainder was left to be administered by a native chief almost as a Russian feudatory; the same year the Bokharians were defeated at Irdjar. In 1867 an army assembled by the amir of Bokhara was attacked and dispersed by the Russians, who in 1868 entered Samarkand, and became virtually rulers of Bokhara. In 1873 Khiva was invaded, and as much of the khanate as lay on the right bank of the Oxus was incorporated into the Russian empire, a portion being afterwards made over to Bokhara. Russia acquired the right of the free navigation of the Oxus throughout its entire course, on the borders of both Khiva and Bokhara. The ad- ministration of the whole of the states on the right bank of the Oxus, down to the Russian boundary line at Ichka Yar, is now in the hands of Bokhara, including Karateghin — which the Russians have transferred to it from Khokand — and Darwaz at the entrance to the Pamir highlands.

Authorities. — Although much has been written of late years about the sources of- the Oxus within the region of the Pamirs, there is very little to be found in the writings of geographers of modern date descriptive of that part of its course which separates Darwaz and Afghan Turkestan from Bokhara, and that little is chiefly in the pages of reports and gazettes, &c, which are not avail- able to the public. The following authorities may be consulted: The Report of the Pamir Boundary Commission of 1895, published at Calcutta (1897); Dr A. Regel, “Journey in Karateghin and Darwaz,” InvesHa, Russian Geog. Soc, vol. xiii. (1882) ; translation, vol. iv. Proc. R.G.S.; Michell, “Regions of the Upper Oxus,” vol. vi. Proc. R.G.S. (1884); Griesbach, ” Geological Field Notes,” No. 3, Afghan Boundary Commission (1885); C. Yate, Northern Afghanistan (London, 1888); Curzon, “The Pamirs,” vol. viii. Jour. R.G.S. (1896); Kropotkin, “Old Beds of the Oxus,” Jour. R.G.S. (September 1898); Cobbold, Innermost Asia (London, 1900). To the above may be added the Reports of the Russo-Afghan Boun- dary Commission of 1884-1885, and that of Lockhart’s Mission in 1885, and the Indian Survey Reports. (T. H. H.*)

OXYGEN (symbol O, atomic weight 16), a non-metallic chemical element. It was apparently first obtained in 1727 by Stephen Hales by

strongly heating minium, but he does' not seem to have recognized that he had obtained a new element, and the first published description of its properties was due to J. Priestley in 1774, who obtained the gas by igniting mercuric oxide, and gave it the name " dephlogisticated air." K. W. Scheele, working independently, also announced in 1775 the discovery of this element which he called " empyreal air " (Crells' Annalen, 1785, 2, pp. 229, 291). A. L. Lavoisier repeated Priestley's experiments and named the gas " oxygen " (from Gr. 6£i>s, sour, yevv&u, I produce) to denote that in a large number of cases, the products formed by the combustion of substances in the gas were of an acid character. Oxygen occurs naturally as one of the chief constituents of the atmosphere, and in combination with other elements it is found in very large quantities; it constitutes approximately eight-ninths by weight of water and nearly one-half by weight of the rocks composing the earth's crust. It is also disengaged by growing vegetation, plants possessing the power of absorbing carbon dioxide, assimilating the carbon and rejecting the oxygen. Oxygen may be prepared by heating mercuric oxide; by strongly heating manganese dioxide and many other peroxides; by heating the oxides of precious metals; and by heating many oxy-acids and oxy-salts to high temperatures, for example, nitric acid, sulphuric acid, nitre, lead nitrate, zinc sulphate, potassium chlorate, &c. Potassium chlorate is generally used and the reaction is acceler- ated and carried out at a lower temperature by previously mixing the salt with about one-third of its weight of manganese dioxide, which acts as a catalytic agent. The actual decomposi- tion of the chlorate is not settled definitely; the following equa- tions give the results obtained by P. F. Frankland and Dingwall (Ckem. News, 1887, 55, p. 67): — at a moderate heat: 8KC10 3 = 5KCIO4-I-3KCI+2O2, succeeded by the following reactions as the temperature increases: 2KC10 3 = KC104-f-KCl+02 and 2KC10 3 = 2KCl+30 2 (see also F. Teed, ibid., 1887, 55, p. 91; H. N. Warren, ibid., 1888, 58, p. 247; W. H. Sodeau, Proc. Chem. Soc, 1901, 17, p. 149). It may also be obtained by heating manganese dioxide or potassium bichromate or potassium permanganate with sulphuric acid; by the action of cobalt salts or manganese dioxide on a solution of bleaching powder (Th. Fleitmann, Ann., 1865, 134, p. 64); by the action of a ferrous or manganous salt with a salt of cobalt, nickel or copper on bleaching powder (G. F. Jaubert, Ger. pat. 157171); by passing chlorine into milk of lime (C. Winkler, Jour, prakt. Chem., 1866, 98, p. 340); by the action of chlorine on steam at a bright red heat; by the decomposition of hydrogen peroxide by bleaching powder, manganese dioxide, potassium ferricyanide in alkaline solution, or potassium permanganate in acid solution; by heating barium peroxide with an

aqueous solution of potassium ferricyanide (G. Kassner, Zeit. angew. Chem., 1890, p. 448) Ba02 + 2K 3 Fe(CN) 6 = Ba[FeK 3 (CN) 6] 2 + 0 2 ; by the decomposi- tion of sodium and potassium peroxides with a solution of potassium permanganate in the presence of a trace of nickel salts (G. F. Jaubert, Comptes rendus, 1902, 134, p. 778).

Numerous methods have been devised -for the manufacture of oxygen. The more important ate as follows: by decomposing strongly heated sulphuric acid in the presence of a contact substance; by heating an intimate mixture of one part of sodium nitrate with two parts of zinc oxide (T. H. Pepper, Dingier ‘s Jour., 1863, 167, p. 39): 2ZnO + 4NaN0 3 = 2Zn(ONa)2 + 2N2 + 502; by the use of cuprous chloride which when mixed with clay and sand, moistened with water and heated in a current of air at 100-200° C. yields an oxychloride, which latter yields oxygen when heated to 400° C (A. Mallet, Comptes rendus, 1867, 64, p. 226; 1868, 66, p. 349); by the electrolysis of solutions of sodium hydroxide, using nickel electrodes; by heating calcium plumbate (obtained from litharge and calcium carbonate) in a current of carbon dioxide (G. Kassner, Monit. Scient., 1890, pp. 503, 614); and from air by the process of Tessie du Motay {Ding. Jour., 1870, 196, p. 230), in which air is drawn over a heated mixture of manganese dioxide and sodium hydroxide, the sodium manganate so formed being then heated to about 450° C. in a current of steam, the following reversible reaction taking place: 4NaOH-r-2Mn0 2 + 02 < ˆ2Na 2 Mn04 + 2H 2 0. Oxygen is largely prepared by Brin's process {Mim. soc. des Ingin. civ., 1881, p. 450) in which barium monoxide is heated in a current of air, forming the dioxide, which when the retorts are exhausted yields up oxygen and leaves a residue of monoxide; but this method is now being superseded, its place being taken by the fractional distillation of liquid air {The Times, Engin. Suppl., April 14, 1909, p. 13) as carried out by the Linde method (Eng. Pat. 14111; 1902).

Oxygen is a colourless, odourless and tasteless gas. It is somewhat heavier than air, its specific gravity being 1-10523 (A. Leduc, Comptes rendus, 1896, 123, p. 805). It is slightly soluble in water and more so in alcohol. It also dissolves quite readily in some molten metals, especially silver. Oxygen does not burn, but is the greatest supporter of combustion known, nearly all the other elements combining with it under suitable conditions (cf. Oxide). These reactions, however, do not take place if the substances are absolutely dry. Thus H. B. Baker {Proc. Chem. Soc, 1902, 18, p. 40) has shown that perfectly dry oxygen and hydrogen will not combine even at a temperature of iooo° C. It is the only gas capable of supporting respiration. For the properties of liquid oxygen see Liquid Gases.

It is found, more especially in the case of organic compounds, that if a substance which oxidizes readily at ordinary temperature be mixed with another which is not capable of such oxidation, then both are oxidized simultaneously, the amount of oxygen used being shared equally between them; or in some cases when the substance is spontaneously oxidized an equivalent amount of oxygen is con- verted into ozone or hydrogen peroxide. This phenomenon was first noticed by C. F. Schonbein {Jour, prakt. Chem., 1 858-1 868), who found that on oxidizing lead in the presence of sulphuric acid, the same quantity of oxygen is used to form lead oxide as is converted into hydrogen peroxide. In a similar manner M. Traube {Ber., 1882-1893) found that when zinc is oxidized in presence of water equivalent quantities of zinc hydroxide and hydrogen peroxide are formed at first, thus: $Zn + H_2O + O_2 = ZnO + H_2O_2$, followed by $ZnO + H_2 = Zn(OH)_2$, $Zn + H_2O_2 = Zn(OH)_2$. The oxygen uniting with the substance undergoing oxidation is generally known as ” bound oxygen,” whilst that which is transformed into ozone or hydrogen peroxide is usually called ” active oxygen.” C. Engler {Ber., 1897, 30, p. 1669) calls the substance which undergoes oxidation the ” autoxidizer ” and the substance which unites with the active oxygen the ” acceptor ” ; in the oxidation of metals he expresses results as: $M + O_2 = MO_2$, followed by MOj-ˆM-O+O, and if water be present, $O + H_2 = H_2O_2$. Various theories have been developed in order to account for these phenomena. Schonbein {loc. cit.) assumed that the ordinary oxygen molecule is decomposed into two parts which carry electrical charges of opposite kinds, the one with the positive charge being called antozone ” and the other carrying the negative charge being called ” ozone,” one variety being pre- ferentially used up by the oxidizing compound or element and the other for the secondary reaction. J. H. Van’t Hoff {Zeit. phys. Chem., 1895, 16, p. 411) is of the opinion that the oxygen molecule is to a certain extent ionized and that the ions of one kind are pre- ferably used by the oxidizing compound. Traube {loc. cit.), on the other hand, concludes that the oxygen molecule enters into action as a whole and that on the oxidation of metals, hydrogen peroxide and the oxide of the metal are the primary products of the reaction. A. Bach {Comptes rendus,_ 1897, 124, p. 2) considers that the first stage in the reaction consists in the production of a peroxide which

then interacts with water to form hydrogen peroxide (see also W. Manchot, Ann., 1901, 314, p. 177; 1902, 325, p. 95).

Oxygen is a member of the sixth group in the periodic classifica- tion, and consequently possesses a maximum valency of six. In most cases it behaves as a divalent element, but it may also be quadrivalent. A. v. Baeyer and V. Villiger (Ber., 1901, 34, pp. 2679, 3612) showed that many organic compounds (ethers, alcohols, aldehydes, ketones, &c.) behave towards acids, particularly the more complex acids, very much like bases and yield crystallized salts in which quadrivalent oxygen must be assumed as the basic element. These salts are considered to be derived from the hypothetical base OH 3 -OH, oxonium. hydroxide (compare sulphonium salts). Further see J. Schmidt, " Uber die basischen Eigenschaften des Sauerstoffs " (Berlin, 1904). Baeyer and Villiger assume for the configuration of

the salts of carbonyl compounds the arrangement > C : O <ˆv. whilst

J. W. Bruhl and P. W. Walden point out from the physico-chemical standpoint that in water and hydrogen peroxide the oxygen atom is probably quadrivalent.

The atomic weight of oxygen is now generally taken as 16, and as such is used as the standard by which the atomic weights of the other elements are determined, owing to the fact that most elements combine with oxygen more readily than with hydrogen (see Ele- ment).

Oxygen is widely used in medical practice as well as in surgery. Inhalations of the gas are of service in pneumonia, bronchitis, heart disease, asthma, angina and other conditions accompanied by cyanosis and dyspnoea. They often avert death from asphyxia, or render the end less distressing. Oxygen is also administered in chloroform poisoning, and in threatened death from the inhalation of coal gas or nitrous oxides. It is of value in cyanide and opium poisoning and in the resuscitation of the apparently drowned. The mode of administration is by an inhaler attached to an inhalation bag, which serves to break the force with which the oxygen issues from the cylinders in which it is sold in a compressed form. It can be administered pure or mixed with air as required. If given in too great quantity a temporary condition of apnoea (cessation of breath- ing) is produced, the blood being fully charged with the gas. Oxygen may be applied locally as a disinfectant to foul and diseased surfaces by the use of the peroxide of hydrogen, which readily parts with its oxygen; a solution of hydrogen peroxide therefore forms a valuable spray in diphtheria, tonsillitis, laryngeal tuberculosis and ozaena. It can also be used with advantage in inoperable uterine cancer, favus and lupus, and as an injection in gonorrhoea and suppurative conditions of the

ear. It relieves the pain of wasp and bee stings. Internally hydrogen peroxide is used in various diseased conditions of the gastro-intestinal tract, such as dyspepsia, diarrhoea and enteric fever. The B.P. preparation Liquor Hydrogenii Peroxidi dose i to 2 drs. is synonymous with the Aqua Hydrogenii Dioxidi of the U.S. P. and the ten- volume solution termed eau oxygenee in France. It is customary to use oxygen in combination with chloro- form, or nitrous oxide in order to produce insensibility to pain (see Anaesthetics).

OXYHYDROGEN FLAME, the flame attending the combustion of hydrogen and oxygen, and characterized by a very high temperature. Hydrogen gas readily burns in oxygen or air with the formation of water. The quantity of heat evolved, according to Julius Thomsen, is 34,116 calories for each gram of hydrogen burned. This heat-disturbance is quite independent of the mode in which the process is conducted; but the tempera- ture of the flame is dependent on the circumstances under which the process takes place. It obviously attains its maximum in the case of the firing of pure ” oxyhydrogen ” gas (a mixture of hydrogen with exactly half its volume of oxygen, the quantity it combines with in becoming water, German Knall-gas). It becomes less when the ” oxyhydrogen ” is mixed with excess of one or the other of the two reacting gases, or an inert gas such as nitrogen, because in any such case the same amount of heat spreads over a larger quantity of matter. Many forms of oxyhydrogen lamps have been invented, but the explosive nature of the gaseous mixture rendered them all more or less dangerous. It acquired considerable application in platinum works, this metal being only fusible in the oxyhydrogen flame and the electric furnace; and also for the production of limelight, as in optical (magic) lanterns. But these applications are being superseded by the electric furnace, and electric light.

OYAMA, IWAO, Prince (1842-), Japanese field-marshal, was born in Satsuma. He was a nephew of Saigo, with whom his elder brother sided in the Satsuma insurrection of 1877, but he nevertheless remained loyal to the imperial cause and com- manded a brigade against the insurgents. When war broke out between China and Japan in 1894, he was appointed commander-

in-chief of the second Japanese army corps, which, landing on the Liaotung Peninsula, carried Port Arthur by storm, and, subsequently crossing to Shantung, captured the fortress of Wei-hai-wei. For these services he received the title of marquess, and, three years later, he became field-marshal. When (1904) his country became embroiled in war with Russia, he was appointed commander-in-chief of the

Japanese armies in Man- churia, and in the sequel of Japan's victory the mikado bestowed on him (1907) the rank of prince. He received the British Order of Merit in 1906.

OYER AND TERMINER, the Anglo-French name, meaning " to hear and determine," for one of the commissions by which a judge of assize sits (see Assize). By the commission of oyer and terminer the commissioners (in practice the judges of assize, though other persons are named with them in the commission) are commanded to make diligent inquiry into all treasons, felonies and misdemeanours whatever committed in the counties specified in the commission, and to hear and determine the same according to law. The inquiry is by means of the grand jury; after the grand jury has found the bills submitted to it, the commissioners proceed " to hear and determine " by means of the petty jury. The words oyer and terminer are also used to denote the court which has jurisdiction to try offences within the limits to which the commission of oyer and terminer extends.

By the Treason Act 1708 the crown has power to issue com- missions of oyer and terminer in Scotland for the trial of treason and misprision of treason. Three of the lords of justiciary must be in any such commission. An indictment for either of the offences mentioned may be removed by certiorari from the court of oyer and terminer into the court of justiciary.

In the United States oyer and terminer is the name given to courts of criminal jurisdiction in some states, e.g. New York, New Jersey, Pennsylvania, and Georgia.

OYSTER. The use of this name in the vernacular is equivalent to that of Ostrea (Lat. from Gr. oarpeov, oyster, so called from its shell, oareov, bone, shell) in zoological nomenclature; there are no genera so similar to Ostrea as to be confounded with it in ordinary language. Ostrea is a genus of Lamellibranch Molluscs. The degeneration produced by sedentary habits in all lamellibranchs has in the oyster reached its most advanced stage. The valves of the shell are closed by a single large adductor muscle, the anterior adductor being absent. The muscular projection of the ventral surface called the foot, whose various modifications characterize the different classes of Mollusca, is almost entirely aborted. The two valves of the shell are unequal in size, and of different shape; the left valve is larger, thicker and more convex, and on it the animal rests in its natural state. This valve, in the young oyster, is attached to some object on the sea-bottom; in the adult it is sometimes attached, sometimes free. The right valve is flat, and smaller and thinner than the left. In a corresponding manner the

right side of the animal's body is somewhat less developed than the left, and to this extent there is a departure from the bilateral symmetry characteristic of Lamellibranchs.

The organization of the oyster, as compared with that of a typical lamellibranch such as Anodon (see Lamellibranchia), is brought about by the reduction of the anterior part of the body accompanying the loss of the anterior adductor, and the enlargement of the posterior region. The pedal ganglia and auditory organs have disappeared with the foot, at all events have never been detected; the cerebral ganglia are very minute, while the parieto-splanchnic are well developed, and constitute the principal part of the nervous system.

According to Spengel, the pair of ganglia near the mouth, variously called labial or cerebral, represent the cerebral pair and pleural pair of a gastropod combined, and the parieto- splanchnic pair correspond to the visceral ganglia, the com- missure which connects them with the cerebro-pleural represent- ing the visceral commissure. Each of the visceral ganglia is connected or combined with an olfactory ganglion underlying an area of specialized epithelium, which constitutes the olfactory organ, the osphradium. The heart and pericardial chamber in the oyster lie along the anterior face of the adductor muscle,

almost perpendicular to the direction of the gills, with which in Anodon they are parallel. In Anodon and the majority of lamellibranchs the ventricle surrounds the intestine; in the oyster the two are quite independent, the intestine passing above the pericardium. The renal organs of the oyster were dis- covered by Hoek to agree in their morphological relations with those of other lamellibranchs.

The generative organs of the oyster consist of a system of branching cavities on each side of the body lying immediately beneath the surface. All the cavities of a side are ultimately in communication with an efferent duct opening on the surface of the body a little above the line of attachment of the gills. The genital opening on each side is situated in a depression of the surface into which the renal organ also opens. The genital products are derived from the cells which line the cavities of the genital organs. The researches of Hoek have shown that in the same oyster the genital organs at one time produce ova, at another spermatozoa, and that consequently the oyster does not

fertilize itself. How many times the alternation of sex may take place in a season is not known. It must be borne in mind that in what follows the species of the European coasts, Ostrea edulis, is under consideration. The ova are fertilized in the genital duct, and before their escape have undergone the earliest stages of segmentation. After escaping from the genital aperture they find their way into the infra-branchial part of the mantle cavity of the parent, probably by passing through the supra- branchial chamber to the posterior extremity of the gills, and then being conducted by the inhalent current caused by the cilia of the gills into the infra-branchial chamber. In the latter they accumulate, being held together and fastened to the gills by a white viscid secretion. The mass of ova thus contained in the oyster is spoken of by oyster fishers as “white spat,” and an oyster containing them is said to be ” sick.” While in this position the ova go through the earlier stages of development. At the end of a fortnight the white spat has become dark- coloured from the appearance of coloured patches in the develop- ing embryos. The embryos having then reached the condition of ” trochospheres ” escape from the mantle cavity and swim about freely near the surface of the water among the multitude of other creatures, larval and adult, which swarm there. The larvae are extremely minute, about yiˆr in. long and of glassy transparency, except in one or two spots which are dark brown. From the trochosphere stage the free larvae pass into that of ” veligers.” How long they remain free is not known; Huxley kept them in a glass vessel in this condition for a week. Ulti- mately they sink to the bottom and fix themselves to shells, stones or other objects, and rapidly take on the appearance of minute oysters, forming white disks jV in. in diameter. The appearance of these minute oysters constitutes what the fisher men call a ” fall of spat.” The experiment by which Hoek conclusively proved the change of sex in the oyster was as follows. In an oyster containing white spat microscopic examination of the genital organs shows nothing but a few unexpelled ova. An oyster in this condition was kept in an aquarium by itself for a fortnight, and after that period its genital organs were found to contain multitudes of spermatozoa in all stages of development.

The breeding season of the European oyster lasts from May to September. The rate of growth of the young oyster is, roughly speaking, an inch of diameter in a year, but after it has attained a breadth of 3 in. its growth is much slower. Professor Mobius is of opinion that oysters over twenty years of age are rare, and that most of the adult Schleswig oysters are seven to ten years old.

The development of the American oyster, O. virginiana, and of the Portuguese oyster, 0. angulata, is very similar to that of 0. edulis,

except that there is no period of incubation within the mantle cavity of the parent in the case of these two species. Hence it is that so-called artificial fertilization is possible; that is to say, fertilization will take place when ripe eggs and milt are artificially pressed from the oysters and allowed to fall into a vessel of sea-water. But if it is possible to procure a supply of spat from the American oyster by keeping the swarms of larvae

in confinement, it ought to be possible in the case of the European oyster. All that would be necessary would be to take a number of mature oysters containing white spat and lay them down in tanks till the larvae escape. This would be merely carrying oyster culture a step farther back, and instead of collecting the newly fixed oysters, to obtain the free larvae in numbers and so insure a fall of spat independently of the uncertainty of natural conditions. This method has been tried several times in England, in Holland and in France, but always without permanent success.

Natural beds of oysters occur on stony and shelly bottoms at depths varying from 3 to 20 fathoms. In nature the beds are liable to variations, and, although Huxley was somewhat sceptical on this point, it seems that they are easily brought into an unproductive condition by over-dredging. Oysters do not flourish in water containing less than 3% salt; and hence they are absent from the Baltic. The chief enemies of oysters are the dog-whelk, Purpura lapillus, and the whelk-tingle, Murex erinaceus, which bore through the shells. Starfishes devour large numbers; they are able to pull the valves of the shell apart and then to digest the body of the oyster by their everted stomach. Cliona, the boring sponge, destroys the shells and so injures the oyster; the boring annelid Leucodore also excavates the shell.

The wandering life of the larvae makes it uncerain whether any of the progeny of a given oyster-bed will settle within its area and so keep up its numbers. It is known from the history of the Liimf jord beds that the larvae may settle 5 m. from their place of birth.

The genus Ostrea has a world-wide distribution, in tropical and temperate seas; seventy species have been distinguished. Its nearest allies are Pinna among living forms, Eligmus among fossils. For the so-called pearl-oyster see Pearl.

Oyster Industry. — Oysters are more valuable than any other single product of the fisheries, and in at least twenty-five countries are an important factor in the food-supply. The approximate value of the

world's oyster crop approaches £4,000,000 annually, representing over 30,000,000 bushels, or nearly 10 billion oysters. Not less than 150,000 persons are engaged in the industry, and the total number dependent thereon is fully half a million. The following table shows in general terms the yearly oyster product of the world: —

Country.

Bushels.

Value.

United States

Canada ….

Great Britain and Ireland

France

Holland ….

Italy

Other European countries Asia, Africa and Oceania .

Total .

26,853,760

134,140

113,700

3,260,190

100,000

68,750

29,930

275,000

£2,533,481

43,405

154,722

716,778

84,400

44,000

40,250

in ,400

30,835,470

£3,728,436

United States. — The oyster is the chief fishery product in the United States. The states which lead in the quantity of oysters taken are Maryland, Virginia, New York, New Jersey and Connecti- cut ; the annual value of the output in each of these is over $ 1 ,000,000. Other states with important oyster interests are Rhode Island, North Carolina, Louisiana and California. The oyster fisheries give employment to over 56,000 fishermen, who man 4000 vessels, valued at $4,000,000, and 23,000 boats, valued at $1,470,000; the value of the 11,000 dredges and 37,000 tongs, rakes and other appliances used is $365,000. The quantity of oysters taken in 1898 was 26,853,760 bushels, with a value of $12,667,405. The output of cultivated oysters in 1899 was about 9,800,000 bushels, worth

$8,700,000.

Canada. — Oyster banks of some importance exist in the Gulf of St Lawrence and on the coast of British Columbia. All of the grounds have suffered depletion, and cultural methods to maintain the supply have been instituted. The oyster output of the Dominion has never exceeded 200,000 bushels in a single year, and in 1898 was 134,140 bushels, valued at $217,024.

United Kingdom. — The natural oyster beds of Great Britain and Ireland have been among the most valuable of the fishery resources, and British oysters have been famous from time immemorial. The most important oyster region is the Thames estuary, the site of extensive planting operations. The present supply is largely from cultivated grounds. Important oyster-producing centres are

Whitstable, Colchester and Brightlingsea. The oysters landed on the coasts of England and Wales in 1898 numbered 35,809,000, valued at £122,320, and in 1899, 38,978,000, valued at £143,841. The Scottish fishery has its centre at Inveraray and Ballantrae, and in 1905 yielded 218,000 oysters, valued at £865. Public oyster grounds of Ireland in 1903 produced 2,532,800 oysters, valued at £5030. The fishery is most extensive at Wicklow, Queenstown, Ballyheige, Galway and Moville. Planting is carried on in seven counties; the oysters taken from cultivated beds in 1903 numbered 2,687,500 oysters, valued at £5420.

France. — The industry owes its importance to the attention given to oyster cultivation. In the fishery on public grounds in 1896 only 6370 fishermen were engaged, employing 1627 vessels and boats, valued at 1,473,449 francs, and apparatus worth 211,495 francs, while only 13,127,217 kilograms of oysters were taken, or about 320,000 bushels, valued at 414,830 francs. In the parks, claires and reservoirs the private culture of oysters has attained great perfection. Fully 40,000 men, women and children are em- ployee!, and the output in 1896 was 1,536,417,968 oysters, worth 17,537,778 francs. The principal centre is Arcachpn.

Oyster Culture. — The oyster industry has passed from the hands of the fisherman into those of the oyster culturist. The oyster being sedentary, except for a few days in the earliest stages of its existence, is easily exterminated in any given locality; since, although it may not be possible for the fishermen to rake up from the bottom every individual, wholesale methods of capture soon result in covering up or otherwise destroying the oyster banks or reefs, as the communities of oysters are technically termed. The main difference between the oyster industry of America and that of Europe lies in the fact that in Europe the native beds have long since been practically de- stroyed, perhaps not more than 6 or 7 % of the oysters of Europe passing from the native beds directly into the hands of the consumer. It is probable that 60 to 75% are reared from the spat in artificial parks, the remainder having been laid down for a time to increase in size and flavour in shoal waters along the coasts. In the United States, on the other hand, from 30 to 40% are carried from the native beds directly to market. The oyster fishery is everywhere, except in localities where the natural beds are nearly exhausted, carried on in the most reck- less manner, and in all directions oyster grounds are becoming deteriorated, and in some cases have been entirely destroyed. At present the oyster is one of the cheapest articles of diet in the United

States; and, though it can hardly be expected that the price of American oysters will always remain so low, still, taking into consideration the great wealth of the natural beds along the entire Atlantic coast, it seems certain that a moderate amount of protection would keep the price of seed oysters far below European rates, and that the immense stretches of sub- merged land especially suited for oyster planting may be utilized and made to produce an abundant harvest at much less cost than that which accompanies the complicated system of culture in vogue in France and Holland.

The simplest form of oyster culture is the preservation of the natural oyster-beds. Upon this, in fact, depends the whole future of the industry, since it is not probable that any system of artificial breeding can be devised which will render it possible to keep up a supply without at least occasional recourse to seed oysters produced under natural conditions. It is the opinion of almost all who have studied the subject that any natural bed may in time be destroyed by overfishing (perhaps not by removing all the oysters, but by breaking up the colonies, and delivering over the territory which they once occupied to other kinds of animals), by burying the breeding oysters, by covering up the projections suitable for the reception of spat, and by breaking down, through the action of heavy dredges, the ridges which are especially fitted to be seats of the colonies. 1 The

1 Even Huxley, the most ardent of all opponents of fishery legislation, while denying that oyster-beds had been permanently annihilated by dredging, practically admitted that a bed may be reduced to such a condition that the oyster will only be able to recover its former state by a long struggle with its enemies and competition — in fact that it must re-establish itself much in the same way as they have acquired possession of new grounds in Jutland, a process which, according to his own statement, occupied thirty years (Lecture at the Royal Institution, May nth, 1883, printed with additions in the English Illustrated Magazine, i. pp. 47-55,

112-121).

immense oyster-beds in Pocomoke Sound, Maryland, have practically been destroyed by over-dredging, and many of the other beds of the United States are seriously damaged. The same is doubtless true of all the beds of Europe. It has also been demonstrated that under proper restriction great quantities of mature oysters, and seed oysters as well, may be taken from any region of natural oyster-beds without injurious effects. Parallel cases in agriculture and forestry will occur to every one. Mobius, in his most admirable essay Die Auster und Die Austern-

wirthschaft, has pointed out the proper means of preserving natural beds, declaring that, if the average profit from a bed of oysters is to remain permanently the same, a sufficient number of mother oysters must be left in it, so as not to diminish the capacity of maturing. He further shows that the productive capacity of a bed can only be maintained in one of two ways: (1) by diminishing the causes which destroy the young oysters, in which case the number of breeding oysters may safely be decreased; this, however, is practicable only under such favour- able conditions as occur at Arcachon, where the beds may be kept under the constant control of the oyster-culturist; (2) by regulating the fishing on the natural beds in such a manner as to make them produce permanently the highest possible average quantity of oysters. Since the annual increase of half-grown oysters is estimated by him to be four hundred and twenty-one to every thousand full-grown oysters, he claims that not more than 42 % of these latter ought to be taken from a bed during a year.

The Schleswig-Holstein oyster-beds are the property of the state, and are leased to a company whose interest it is to preserve their productiveness. The French beds are also kept under government control. Not so the beds of Great Britain and America, which are as a general rule open to all comers, 1 except when some close-time regulation is in force. Huxley has illus- trated the futility of ” close-time ” in his remark that the prohibition of taking oysters from an oyster-bed during four months of the year is not the slightest security against its being stripped clean during the other eight months. ” Suppose,” he continues, ” that in a country infested by wolves, you have a flock of sheep, keeping the wolves off during the lambing season will not afford much protection if you withdraw shepherd and dogs during the rest of the year.” The old close-time laws were abolished in England in 1866, and returned to in 1876, but no results can be traced to the action of parliament in either case. Huxley’s conclusions as regards the future of the oyster industry in Great Britain are doubtless just as applicable to other countries— that the only hope for the oyster consumer lies in the encouragement of oyster-culture, and in the develop- ment of some means of breeding oysters under such conditions that the spat shall be safely deposited. Oyster culture can evidently be carried on only by private enterprise, and the problem for legislation to solve is how to give such rights of pro- perty upon those shores which are favourable to oyster culture as may encourage competent persons to invest their money in that undertaking. Such property right should undoubtedly be extended to natural beds, or else an area of natural spawning territory should be kept under constant control and surveillance by government, for the

purpose of maintaining an adequate supply of seed oysters.

The extension of the area of the natural beds is the second step in oyster culture. As is well known to zoologists, and as has been very lucidly set forth by Mobius, the location of oyster banks is sharply defined by absolute physical conditions. Within certain definite limits of depth, temperature and salinity, the only requirement is a suitable place for attachment. Oysters cannot thrive where the ground is composed of moving sand or where mud is deposited; consequently, since the size and number of these places are very limited, only a very small percentage of the young oysters can find a resting-place, and the remainder perish. Mobius estimates that for every oyster brought to

1 Connecticut has greatly benefited its oyster industry by giving to oyster-culturists a fee simple title to the lands under control by them.

market from the Holstein banks, 1,045,000 are destroyed or die. By putting down suitable ” cultch ” or ” stools ” immense quantities of the wandering fry may be induced to settle, and are thus saved. As a rule the natural beds occupy most of the suitable space in their own vicinity. Unoccupied territory may, however, be prepared for the reception of new beds, by spreading sand, gravel and shells over muddy bottoms, or, indeed, beds may be kept up in locations for permanent natural beds, by putting down mature oysters and cultch just before the time of breeding, thus giving the young a chance to fix themselves before the currents and enemies have had time to accomplish much in the way of destruction.

The collection of oyster spat upon artificial stools has been practised from time immemorial. As early as the 7th century, and probably before, the Romans practised a kind of oyster culture in Lake Avernus, which still survives to the present day in Lake Fusaro. Piles of rocks are made on the muddy bottoms of these salt-water lakes, and around these are arranged circles of stakes, to which are often attached bundles of twigs. Breeding oysters are piled upon the rookeries, and their young become attached to the stakes and twigs provided for their reception, where they are allowed to remain until ready for use, when they are plucked off and sent to the market. A similar though ruder device is used in the Poquonock river in Connecti- cut. Birch trees are thrown into the water near a natural bed of oysters, and the trunks and twigs become covered with spat; the trees are then dragged out upon the shore by oxen, and the young fry are broken off and laid

down in the shallows to increase in size. In 1858 the methods of the Italian lakes were repeated at St Brieuc under the direction of Professor P. Coste, and from these experiments the art of artificial breeding as practised in France has been developed. There is, however, a marked distinction between oyster-culture and oyster-breeding.

In considering the oyster-culture in France it is necessary to distinguish the centres of production from the centres of rearing or fattening. The chief centres or regions of oyster production are two, (1) Arcachon, (2) Brittany. The basin of Arcachon has an area of about 38,000 acres at high water, and only about 15,000 acres are under water at low tide. The water is Salter than the sea. At the beginning of the 19th century there were only natural oyster beds in the basin, and these produced 75 million oysters per annum. But in the middle of the century the natural beds had been almost exhausted and the system of government control, letting ” parks ” to private tenants, and artificial cultivation was instituted. Certain beds in the basin are reserved and kept under government control. Cultch is placed upon them every year, and gathering of oysters upon them is allowed only at intervals of two or more years, when the authority thinks they are sufficiently stocked to permit of it. These beds supply spat for the private cultivators. The latter collect the spat on tiles: these are made of earthenware and concave on one side. One of the most important points in the system is the coating of the tiles with lime. It is necessary to detach the young oysters from the tiles when they are nearly a year old (detroquage) : this could not be done without destroying the oysters if they were attached directly to the surface of the tile. The coating of lime or mortar is soft and brittle, and consequently the young oysters can easily be detached with a stout knife. The method of liming the tiles (chaulage) consists in dipping them into a liquid mixture of lime and water. Sometimes lime only is used, sometimes equal quantities of lime and sand, or lime and mud. Often it is necessary to repeat the dipping, and for the second coat hydraulic lime may be employed.

The tiles coated with lime are set out on the shore near the low- water mark of spring tides, at the beginning of the spatting season. This is earlier in the south of France than in England : at Arcachon the collectors are put in position about the middle of June. Various methods are adopted for keeping the tiles in place and for arranging them in the position most favourable to the collection of spat. At Arcachon they are arranged in piles each layer being transverse to the one below, so that the space formed by the concavity of the tile is kept open. A wooden frame-work often surrounds the heap of tiles to

prevent them being scattered by the waves.

In the following season, about April, the young oysters, then from I to 1 in. in diameter, are separated or detroques. They may then be placed in oyster cases (caisses ostreophiles) or in shallow ponds (claires) made on the fore-shore. The cases are about 8 in. deep, made with a wooden frame-work, and galvanized wire netting top and bottom, the lid being hinged. These cases about 8 ft. by 4 ft. in dimensions are fixed on the fore-shore by means of short posts driven into the ground, so that they are raised about 9 in. or I ft. from the latter. The young oysters grow rapidly in these

cases, and have to be thinned out as they grow larger. When they have been in the boxes a year they are large enough to be placed in the claires or simply scattered along the fore-shore.

In Brittany the chief seat of oyster production is the gulf of Morbihan, where the estuaries of numerous small rivers Furnish fore-shores suitable to the industry. Here the prevalence of mud is one of the chief obstacles, and for this reason the tile-collectors are usually fastened together by wire and suspended to posts (tuiles en bouquets). The collectors are not set out before the middle of July. The natural beds from which the supply of spat is derived are reserved, but apparently are insufficiently protected, so that much poaching goes on.

These two regions of production, Arcachon and Morbihan supply young oysters for ” relaying,” i.e. rearing, not only to numerous places on the coast of France, but also to England, Ireland and elsewhere. Among rearing districts Marennes and La Tremblade are specially celebrated on account of the extensive system of claires or oyster ponds, in which the green oysters so much prized in Paris are produced. The irrigation of the claires is entirely under control, and the claires undergo a special preparation for the pro- duction of the green oysters, whose colour seems to be derived from a species of Diatom which abounds in the claires.

In Holland the French system of oyster-culture is followed in the estuary of the Scheldt, with some modifications in detail. The tiles used are flat and heavy, and are placed on the foreshores in an oblique position resting on their edges and against each other. The tiles with the young oysters on them are placed in enclosures during the winter, and detroquage is carried out in the following summer.

In England the use of tiles has been tried on various occasions, in Cornwall on the river Fal, at Hayling Island and in Essex, but has

nowhere become permanently established. The reasons for this are that the fall of spat is not usually very abundant, and the kind of labour required cannot be obtained at a sufficiently cheap rate. In many places oysters are simply imported from France and Holland and laid down to grow, or are obtained by dredging from open grounds. At Whitstable most of the stock is thus obtained, but cultch (i.e. dead shells) is here and elsewhere scattered over the ground to serve for the attachment of spat. The use of cultch as collector is a very ancient practice in England, and is still almost universally maintained. In the estuaries of Essex there are many private or semi-private oyster fisheries, where the method of culture is to dredge up the oysters in autumn and place them in' pits, where they are sorted out, and the suitable ones are selected for the market. Just before the close season the young oysters and all the rest that remain are scattered over the beds again, with quantities of cultch, and in many cases the fishery is maintained by the local fall of spat, without importation.. In some places where the ground is suitable cultch is spread over the foreshores also to collect spat. The genuine English " native " is produced in its greatest perfection in the Essex fisheries, and is probably the highest priced oyster in the world.

In addition to the literature quoted see also the following: Rap- port sur les recherches concernant I'huitre et V ostreiculture publii par la Commission de la Societe N&erlandaise de Zoologie (Leiden, 1883-1884); P. Brocchi, Traite de V ostreiculture (Paris, 1883); Bashford Dean, European Oyster Culture, Bulletin U.S. Fish Commission, vol. x. for 1890, vol. xi. for 1891 ; J. T. Cunningham, Report of the Lecturer on Fishery Subjects, in Report of Technical Instruction Committee of Cornwall (1899, 1900). (G. B. G. ; J. T. C.)

OYSTER BAY, a township of Nassau (formerly of Queens) county, New York, on Long Island, about 25 m. E.N.E. of Long Island City. Pop. (1890) 13,870, (1900) 16,334; (ˆio census) 21,802. The township reaches from N. to S. across the island (here about 20 m. wide) in the shape of a rough wedge, the larger end being on Long Island Sound at the N.; on the northern shore is the tripartite Oyster Bay, whose western arm is Mill Neck creek, whose central branch is Oyster Bay harbor, and whose easternmost arm, called Cold Spring harbor, separates the township of Oyster Bay from the township of Huntington. On the south side of the township is South Oyster bay, immedi- ately east of the main body of the Great South bay; and between South Oyster Bay and the ocean lie several island beaches, the smaller and northernmost ones being marshy, and the southern, Jones or Seaford beach, being sandy and having on the ocean side the Zach's inlet and Jones Beach life-saving stations. The township is

served by four branches of the Long Island railway; the Oyster Bay branch of the north shore to the village of Sea Cliff (incorporated in 1883; pop. 1910, 1694), on the E. side of Hempstead harbor, to Glen Cove, a large unincorporated village, immediately N.E. of Sea Cliff, to Locust Valley and to Mill Neck farther E., and to the village of Oyster Bay, the terminus of the branch, on Oyster Bay harbor; the Wading

River branch to Hicksville and to Syosset; a third branch to Farmingdale, which also has direct communication by railway with Hicksville; and the Montauk division to Massapequa, in the south-western part of the township on Massapequa Lake and Massapequa Creek, which empties into South Oyster Bay. The villages served by the railway are the only important settlements; those on the hilly north shore are residential. To the north of the village of Oyster Bay, on a long peninsular beach called Centre Island, are the headquarters of the Sea- wanhaka Yacht Club; and to the east of the same village, especially on Cove Neck, between Oyster Bay Harbor and Cold Spring Harbor, are many summer residences with fine grounds. Massapequa, on the south shore, is a residential summer resort. The villages of Hicksville and Farmingdale are rural; the former has many Ger.nan settlers. Jericho, N.E. of Hicksville, is a stronghold of the Hicksite Quakers, who are mostly wealthy landowners. In Locust Valley is Friends' Academy (1876), a secondary school for boys and girls. There are a few truck farms in the township, potatoes, cabbages and cucumbers for pickling being the principal crops; " Oyster Bay asparagus " was once a famous crop. Oysters are cultivated on the Sound Shore and there are clam beds in Oyster Bay and South Oyster Bay. In the village of Glen Cove there is a large leather-belting factory.

David Pieterssen de Vries, in his Voyages from Holland to America, makes the first mention of Oyster Bay Harbor, which he explored in June 1639. In the same month Matthew Sinder- land (or Sunderland) bought from James Forrett, deputy of William Alexander, earl of Stirling, " two little necks of land, the one upon the east side of Oyster Bay Harbor "; but Sinder- land made no settlement. A settlement from Lynn, Mass., was attempted in 1640 but was prevented by Governor William Kieft. By the treaty signed at Hartford, Connecticut, on the 29th of September 1650 by the Commissioners of the United colonies of New England and those of New Netherland all land east of the west side of Oyster Bay was granted to the English, and all land west to the Dutch; but the Dutch placed Oyster Bay, according to a letter of Pieter

Stuyvesant written in 1659, two and a half leagues farther east than the New Englanders did. In 1653 an Indian deed granted land at Oyster Bay to Peter Wright and others of Salem and Sandwich, Mass., who made a permanent settlement here; in 1663 another sale was made to Captain John Underbill (d. 1672), who first went to Long Island about 1653, when he led a force which fought the only important engagement ever fought with the Indians on Long Island, in which the colonists destroyed the fortification at Fort Neck near the present Massapequa, of Tackapousha, chief of the Massapequas, an Algonquian tribe, whose name meant ” great pond.” Oyster Bay was for a time closely connected politically with New Haven, but in 1664 with the remainder of Long Island it came under the New York govern- ment of Richard Nicolls, to whose success Underhill had largely contributed by undermining Dutch influence on Long Island. In 1689 a Friends’ meeting-house was built at Jericho, the home of Elias Hicks, near the present Hicksville, the site of which was owned by his family and which was named in his honour; and the Dutch built their first church in Oyster Bay in 1732. The harbour of Oyster Bay was a famous smuggling place at the close of the 17th century, when there was a customs house here. The first settlement on the ” south side ” of the township was made about 1693, when the Massapequa Indians sold 6000 acres at Fort Neck to Thomas Townsend, and his son-in-law Thomas Jones (1665-1713), who had fought for James II. at Boyne and Aghrim, who became a high sheriff of Queen’s county in 1704, and who was the founder of the family of Jones and Floyd- Jones, whose seat was Tryon Hall (built at South Oyster Bay, now Massapequa, in 1770); Thomas Jones (1731-1792), grand- son of the first Thomas Jones, was a prominent Loyalist during the War of Independence and wrote a valuable History of New York during the Revolutionary War, first published in 1879.

OYSTER-CATCHER, a bird’s name which does not seem to occur in books until 1731, when M. Catesby (Nat. Hist. Carolina, i. p. 85) used it for a species which he observed to be abundant

on the oyster-banks left bare at low water in the rivers of Carolina, and believed to feed principally upon those molluscs. In 1776 T. Pennant applied the name to the allied British species, which he and for nearly two hundred years many other English writers had called the ” Sea-Pie.” The change, in spite of the misnomer — for, whatever may be the case elsewhere, in England the bird does not feed upon oysters — met with general approval, and the new name has, at least in books, almost wholly replaced what seems to have been the older one. 1 The Oyster-catcher of Europe is the Haematopus 2 ostralegus or Linnaeus, belonging to the group now called Limicolae, and is

generally included in the family Charadriidae; though some writers have placed it in one of its own, Haematopodidae, chiefly on account of its peculiar bill — a long thin wedge, ending in a vertical edge. Its feet also are much more fleshy than are generally seen in the Plover family. In its strongly-contrasted plumage of black and white, with a coral-coloured bill, the Oyster-catcher is one of the most conspicuous birds of the European coasts, and in many parts is still very common. It is nearly always seen paired, though the pairs collect in prodigious flocks; and, when these are broken up, its shrill but musical cry of " tu-lup," " tu-lup," somewhat pettishly repeated, helps to draw attention to it. Its wariness, however, is very marvellous, and even at the breeding-season, when most birds throw off their shyness, it is not easily approached within ordinary gunshot distance. The hen-bird commonly lays three clay-coloured eggs, blotched with black, in a very slight hollow on the ground not far from the sea. As incubation goes on the hollow is somewhat deepened, and perhaps some haulm is added to its edge, so that at last a very fair nest is the result. The young, as in all Limicolae, are at first clothed in down, so mottled in colour as closely to resemble the shingle to which, if they be not hatched upon it, they are almost imme- diately taken by their parents, and there, on the slightest alarm, they squat close to elude observation. This species occurs on the British coasts (very seldom straying inland) all the year round; but there is some reason to think that those we have in winter are natives of more northern latitudes, while our home- bred birds leave us. It ranges from Iceland to the shores of the Red Sea, and lives chiefly on marine worms, Crustacea and such molluscs as it is able to obtain. It is commonly supposed to be capable of prizing limpets from their rock, and of opening the shells of mussels; but, though undoubtedly it feeds on both, further evidence as to the way in which it procures them is desirable. J. E. Harting informed the present writer that the bird seems to lay its head sideways on the ground, and then, grasping the limpet's shell close to the rock between the mandibles, use them as scissor-blades to cut off the mollusc from its sticking-place. The Oyster-catcher is not highly esteemed as a bird for the table.

Differing from this species in the possession of a longer bill, in having much less white on its back, in the paler colour of its mantle, and in a few other points, is the ordinary American species, with at least three races, Haematopus palliatus. Except that its call-note, judging from description, is unlike that of the European bird, the habits of the two seem to be perfectly similar; and the same may be said indeed of all the other species. The Falkland Islands are frequented by a third, H. leucopus, very similar to the first, but with a black wing-lining and

paler legs, while the Australian Region possesses a fourth, H. longirostris, with a very long bill as its name intimates, and no white on its

1 It seems, however, very possible, judging from its equivalents in other European languages, such as the Frisian Oestervisscher, the German Augsterman, Austernfischer, and the like, that the name " Oyster-catcher " may have been not a colonial invention but indigenous to the mother-country, though it had not found its way into print before. The French Huttrier, however, appears to be a word coined by Brisson. " Sea-Pie " has its analogues in the French Pie-de-Mer, the German Meerelster, Seeelster, and so forth.

2 Whether it be the Haematopus, whose name is found in some editions of Pliny (lib. x. cap. 47) is at best doubtful. Other editions have Himantopus; but Hardouin prefers the former reading. Both words have passed into modern ornithology, the latter as the generic name of the Stilt (q.v.) ; and some writers have blended the two in the strange and impossible compound Haemantopus.

primaries. China, Japan and possibly eastern Asia in general have an Oyster-catcher which seems to be intermediate between the last and the first. This has received the name of H. osculans; but doubts have been expressed as to its deserving specific recognition. Then we have a group of species in which the plumage is wholly or almost wholly black, and among them only do we find birds that fulfil the implication of the scientific name of the genus by having feet that may be called blood-red. H. niger, which frequents both coasts of the northern Pacific, has, it is true, yellow legs, but towards the extremity of South America its place is taken by H. ater, in which they are bright red, and this bird is further remarkable for its laterally com- pressed and much upturned bill. The South African H. capensis has also scarlet legs; but in the otherwise very similar bird of Australia and New Zealand, H. unicolor, these members are of a pale brick-colour. (A. N.)

OYSTERMOUTH, or The Mumbles, an urban district and seaside resort in the Gower division of Glamorganshire, south Wales, situated on the western bend of Swansea Bay, 45 m. S.W. of Swansea, with which it is connected by the steam-tramway of the Swansea and Mumbles Railway Company, constructed in 1804. The London and North-Western railway has also a station at Mumbles Road, 25 m. N. of

Oystermouth. Pop. (1901) 4461. The castle, which belongs to the duke of Beaufort as lord of the seigniory of Gower, is an imposing ruin, nobly situated on a rocky knoll overlooking the bay. Its great hall and chapel with their traceried Gothic windows are fairly well preserved. The earliest structure (probably only a ” peel ” tower), built in the opening years of the 12th century, probably by Maurice de Londres, was destroyed by the Welsh in 1215. The early English features of the square keep indicate that it was soon rebuilt, by one of the De Breos lords (see Gower). In 1284 Edward I. stayed here two days as the guest of William de Breos, and from that time on it became the chief residence in Gower of the lords seignior and subsequently of their stewards, and their chancery was located here till its abolition in 1535. The parish church, which has an embattled tower, was restored in i860, when fragments of Roman tesselated pavement were found in various parts of the churchyard. Roman coins were also found in the village in 1822 and 1837— all indicating that there had been a small settlement here in Roman times. The name of the castle appears in the Welsh chronicles as Ystum Llwynarth, which, by the elision of the penultimate, was probably changed by false analogy into Oystermouth — the bay being noted for its oyster beds. Its church is mentioned in the cartulary of Gloucester (1141) as Ostrenuwe.

The village itself is straggling and uninteresting, but the high ground between it and the pretty bays of Langland and Caswell on the southern side of the headland fronting the open channel is dotted with well-built villas and commands magnificent views. The headland terminates in two rocky islands, which to sailors coming up the channel would appear like the breasts of ” mammals,” whence the comparatively modern name, The Mumbles, is supposed to be derived. On the outer of these rocks is a lighthouse erected in 1794 and maintained by the Swansea Harbour Trust. The district is rapidly increasing in popularity as a seaside resort. A pier was erected by the Mumbles Railway Company at a cost of £12,000 in 1898. The fishing industry, once prosperous, has much diminished in importance, but there are still oyster-beds in the bay.

OZANAM, ANTOINE FREDERIC (1813-1853), French scholar, was born at Milan on the 23rd of April 1813. His family, which was of Jewish extraction, had been settled in the Lyonnais for many centuries, and had reached distinction in the third genera- tion before Frederic through Jacques Ozanam (1640-17 17), an eminent mathematician. Ozanam’s father, Antoine, served in the armies of the republic, but betook himself, on the advent of the empire, to trade, teaching, and finally medicine. The boy was brought up at Lyons and was strongly influenced by one of his masters, the Abbe Noirot. His

conservative and religious instincts showed themselves early, and he published a pamphlet against Saint-Simonianism in 1831, which attracted the attention

of Lamartine. In the following year he was sent to study law at Paris, where he fell in with the Ampere family, and through them with Chateaubriand, Lacordaire, Montalembert, and other leaders of the neo-Catholic movement. Whilst still a student he took up journalism and contributed considerably to Bailly's Tribune catholique, which became (November 1, 1833) L'uni- vers. In conjunction with other young men he founded in May 1833 the celebrated charitable society of St Vincent de Paul, which numbered before his death upwards of two thousand members. He received the degree of doctor of law in 1836, and in 1838 that of doctor of letters with a thesis on Dante, which was the beginning of one of his best-known books. A year later he was appointed to a professorship of commercial law at Lyons, and in 1840 assistant professor of foreign literature at the Sorbonne. He married in June 1841, and visited Italy on his wedding tour. At Fauriel's death in 1844 he succeeded to the full professorship of foreign literature. The short remainder of his life was extremely busy with his professorial duties, his extensive literary occupations, and the work, which he still continued, of district-visiting as a member of the society of St Vincent de Paul. During the revolution of 1848, of which he took an unduly sanguine view, he once more turned journalist for a short time in the Ere nouvelle and other papers. He travelled extensively, and was in England at the time of the Exhibition of 185 1. His naturally weak constitution fell a prey to consumption, which he hoped to cure by visiting Italy, but he died on his return at Marseilles on the 8th of September 1853.

Ozanam was the leading historical and literary critic in the neo-Catholic movement in France during the first half of the 19th century. He was more learned, more sincere, and more logical than Chateaubriand; less of a political partisan and less of a literary sentimentalist than Montalembert. In contem- porary movements he was an earnest and conscientious advocate of Catholic democracy and socialism and of the view that the church should adapt itself to the changed political conditions consequent to the Revolution. In his writings he dwelt upon important contributions of historical Christianity, and main- tained especially that, in continuing the work of the Caesars, the Catholic church had been the most potent factor in civilizing the invading barbarians and in organizing the life of the middle ages. He confessed that his object was " to prove the contrary thesis to Gibbon's," and, although any historian who begins with the desire to prove a thesis is quite sure to go more or less wrong, Ozanam

no doubt administered a healthful antidote to the prevalent notion, particularly amongst English-speaking peoples, that the Catholic church had done far more to enslave than to elevate the human mind. His knowledge of medieval literature and his appreciative sympathy with medieval life admirably qualified him for his work, and his scholarly attainments are still highly esteemed.

His works were published in eleven volumes (Paris, 1862-1865). They include Deux chanceliers d'Angleterre, Bacon de Verulam et Saint Thomas de Cantorbery (Paris, 1836); Dante et la philosophie catholique au Xllleme siecle (Paris, 1839; 2n d e d-, enlarged 1845); Etudes germaniques (2 vols., Paris, 1847-1849), translated by A. C. Glyn as tlistory of Civilization in the Fifth Century (London, 1868); Documents inedits pcur servir a Vhisloire de Vltalie depuis le VIII"" siecle jusqu'.au XlPme (Paris, 1 850) ; Les poctes franciscains en Italie au Xllle'ne siecle (Paris, 1852). His letters have been partially translated into English by A. Coates (London, 1886).

There are French lives of Ozanam by his brother, C. A. Ozanam (Paris, 1882); Mme. E. Humbert (Paris, 1880); C. Huit (Paris, 1882); M. de Lambel (Paris, 1887); L. Curnier (Paris, 1888); and B. Faulquier (Paris, 1903). German lives by F. X. Karker (Pader- born, 1867) and E. Hardy (Mainz, 1878); and an interesting English biography by Miss K. O'Meara (Edinburgh, 1867; 2nd ed'., London, 1878). (C. H. Ha.)

OZIERI, a town of Sardinia in the province of Sassari, from which it is 34 m. E.S.E. by rail. Pop. (1901) 9555. It is situated 1280 ft. above sea-level on a steep slope, but faces north, and so is not very healthy. In the centre of the town is a square with a fine fountain of 1594. The cathedral was restored in 1848; it is the seat of the diocese of Bisarcio. The former cathedral of this diocese lies some distance to the N.W.; it is a fine Romanesque building of the 12th and 13th centuries. The district of Ozieri

is famous for its butter — the only butter made in Sardinia — cheese and other pastoral products; cattle are also bred here.

See D. Scano, Storia dell' arte in Sardegna dal xi. al xiv. secolo (Cagliari-Sassari, 1907), p. 200.

OZOKERITE, or Ozocerite (Gr. 6feii>, to emit odour, and Kt)p6s, wax), mineral wax, a combustible mineral, which may be designated

as crude native paraffin (q.v.), found in many localities in varying degrees of purity. Specimens have been obtained from Scotland, Northumberland and Wales, as well as from about thirty different countries. Of these occurrences the ozokerite of the island of Tcheleken, near Baku, and the deposits of Utah, U.S.A., deserve mention, though the last-named have been largely worked out. The sole sources of commercial supply are in Galicia, at Boryslaw, Dzwiniacz and Starunia, though the mineral is found at other points on both flanks of the Carpathians. Ozokerite-deposits are believed to have originated in much the same way as mineral veins, the slow evaporation and oxidation of petroleum having resulted in the deposition of its dissolved paraffin in the fissures and crevices previously occupied by the liquid. As found native, ozokerite varies from a very soft wax to a black mass as hard as gypsum. Its specific gravity ranges from -85 to -95, and its melting point from 58 to ioo° C. It is soluble in ether, petroleum, benzene, turpentine, chloroform, carbon bisulphide, &c. Galician ozokerite varies in colour from light yellow to dark brown, and frequently appears green owing to dichroism. It usually melts at 62 C. Chemically, ozokerite consists of a mixture of various hydrocarbons, containing 85-7 % by weight of carbon and 14-3% of hydrogen.

The mining of ozokerite was formerly carried on in Galicia by means of hand-labour, but in the modern ozokerite mines owned by the Boryslaw Actien Gesellschaft and the Galizische Kreditbank, the workings of which extend to a depth of 200 metres, and 225 metres respectively, electrical power is employed for hauling, pumping and ventilating. In these mines there are the usual main shafts and galleries, the ozokerite being reached by levels driven along the strike of the deposit. The wax, as it reaches the surface, varies in purity, and, in new workings especially, only hand-picking is needed to separate the pure material. In other cases much earthy matter is mixed with the material, and then the rock or shale having been eliminated by hand-picking, the ” wax-stone ” is boiled with water in large coppers, when the pure wax rises to the surface. This is again melted without water, and the impurities are skimmed off, the material being then run into slightly conical cylindrical moulds and thus made into blocks for the market. The crude ozokerite is refined by treatment first with Nordhausen oil of vitriol, and subsequently with charcoal, when the ceresine or cerasin of commerce is obtained. The refined ozokerite or ceresine, which usually has a melting-point of 6i° to 78° C, is largely used as an adulterant of beeswax, and is frequently coloured artificially to resemble that product in appearance.

On distillation in a current of superheated steam, ozokerite yields a

candle-making material resembling the paraffin obtained from petroleum and shale-oil but of higher melting-point, and therefore of greater value if the candles made from it are to be used in hot climates. There are also obtained in the distillation light oils and a product resembling vaseline (q.v.). The residue in the stills consists of a hard, black, waxy substance, which in admixture with india-rubber is employed under the name of okonite as anelectrical insulator. From the residue a form of the material known as heel-ball, used to impart a polished surface to the heels and soles of boots, is also manufactured.

According to published statistics, the output of crude ozokerite in Galicia in 1906 and 1907 was as follows:

District.	1906. Metric Tons.	1907. Metric Tons.
Boryslaw . .	2,205	2,240
Dzwiniacz .	260	270
Starunia . .	210	135 (B. R.)

OZONE, allotropic oxygen, 3 . The first recorded observations of the substance are due to Van Marum (1785), who found that oxygen gas through which a stream of electric sparks had been passed, tarnished mercury and emitted a peculiar smell. In 1840 C. F. Schonbein (Pogg. Ann. 50, p. 616) showed that this substance was also present in the oxygen liberated during the electrolysis of acidulated water, and gave it the name ozone (Gr. 6£eiv, to smell). Ozone mixed with an excess of oxygen is obtained by submitting dry oxygen to the silent electric discharge [at the temperature of liquid air, E. Briner and E. Durand (Comptes rendus, 1907, 145, p. 1272) obtained a 90% yield]; by the action of fluorine on water at o° C. (H. Moissan, Comptes rendus, 1899, 129, p. 570); by the action of concentrated sulphuric acid or barium peroxide or on other peroxides and salts of peracids (A. v. Baeyer and V. Villiger, Ber. 1901, 34, p. 355); by passing oxygen over some heated metallic oxides, and by distilling potassium per-manganate with concentrated sulphuric acid in vacuo. It is also formed during many processes of slow oxidation. For a description of the various forms of ozonizers used on the large scale see N. Otto, Rev. gen. de chemie pure et appliquee, 1900, ii. p. 405; W. Elworthy, Elekt. Zeits., 1904, ii. p. 1), and H. Guilleminot (Comptes rendus, 1903, 136, p. 1653). Ozone is also produced by the action of cathode and ultra-violet rays on oxygen. These methods of preparation give an

ozone diluted with a considerable amount of unaltered oxygen; A. Ladenburg (Ber. 1898, 31, pp. 2508, 2830) succeeded in liquefy- ing ozonized oxygen with liquid air and then by fractional evaporation obtained a liquid containing between 80 and 90% of ozone.

Ozone is a colourless gas which possesses a characteristic smell. When strongly cooled it condenses to an indigo blue liquid which is extremely explosive (see Liquid Gases). In ozonizing oxygen the volume of the gas diminishes, but if the gas be heated to about 300 C, it returns to its original volume and is found to be nothing but oxygen. The same change of ozone into oxygen may be brought about by contact with platinum black and other substances. Ozone is only very slightly soluble in water. It is a most powerful oxidizing agent, which rapidly attacks organic matter (hence in preparing the gas, rubber connexions must not be used, since they are instantly destroyed), bleaches vegetable colouring matters and acts rapidly on most metals. It liberates iodine from solutions of potassium iodide, the reaction in neutral solution proceeding thus: $3 + 2KI + H_2 = 2 + I_2 + 2KHO$, whilst in acid solution the decomposition takes the following course: $4O_3 + 10HI = 5I_2 + H_2O_2 + 4H_2O + 3O_2$ (A. Ladenburg, Ber. 1901, 34, p. 1184). Ozone is decomposed by some metallic oxides, with regeneration of oxygen. It combines with many unsaturated carbon com- pounds to form ozonides (C. Harries, Ber. 1904, 37, pp. 839 et seq.).

The constitution of ozone has been determined by J. L. Soret (Ann. chint. phys., 1866 [4], 7, p. 113; 1868 [4], 13, p. 257), who showed that the diminution in volume when ozone is absorbed from ozonized oxygen by means of oil of turpentine is twice as great as the increase in volume observed when ozone is recon- verted into oxygen on heating. This points to the gas possessing the molecular formula O_3. Confirmation was obtained by com- paring the rate of diffusion of ozone with that of chlorine, which gave 24-8 as the value for the density of ozone, consequently the molecular formula must be 3 (cf. B. C. Brodie, Phil. Trans., 1872, pt. ii. p. 43 5). More recently A. Ladenburg (Ber. 1901, 34, p. 631) has obtained as a mean value for the molecular weight the number 47-78, which corresponds with the above molecular formula. Ozone is used largely for sterilizing water.

P— PACATUS DREPANIUS

43 1.

PThe sixteenth letter of the English alphabet, the fifteenth in the Latin and the sixteenth in the Greek alphabet, the latter in its ordinary form

having the symbol for x before o. In the Phoenician alphabet, from which the Western alphabets are directly or indirectly derived, its shape, written from right to left, is 1. In the Greek alphabet, when written from left to right, it takes the form P or n , the second form being much rarer in inscriptions than the first. Only very rarely and only in inscriptions of the 7th and 6th centuries B.C. are rounded forms P, fl found. In Italy the Etruscan and Umbrian form 1 (written from right to left), though more angular than the Phoenician symbol, resembles it more closely than it does the Greek. The earliest Roman form — on the inscription found in the Forum in 1899 — is Greek in shape 1, though the second leg is barely visible. The Oscan n is identical with the rarer Greek form. As time goes on the Roman form becomes more and more rounded P, but not till Imperial times is the semicircle completed so as to form the symbol in the shape which it still retains P. The Semitic name PS became in Greek iret, and has in the course of ages changed but little. The sound of p throughout has been that of the breached labial stop, as in the English pin. At the end of English words like lip the breath is audible after the consonant, so that the sound is rather that of the ancient Greek cj>, i.e. p-h, not /, as is ordinarily now pronounced. This sound is found initially also in some dialects of English, as in the Irish pronunciation of pig as p-hig. For a remarkable interchange between p and qu sounds which is found in many languages, see under Q. (P. Gi.)

PAARL, a town of the Cape Province, South Africa, 36 m. by rail E.N.E. of Cape Town. Pop. (1904), 11,293. The town is situated on the west bank of the Berg river, some 400 ft. above the sea. It stands on the coast plain near the foot of the Drakenstein mountains. West of the town the Paarl Berg rises from the plain. The berg is crowned by three great granite boulders, known as the Paarl, Britannia and Gordon Rock. The town is beautifully situated amid gardens, orange groves and vineyards. The chief public buildings are the two Dutch Reformed churches, the old church being a good specimen of colonial Dutch architecture, with gables, curves and thatched roof. Paarl is a thriving agricultural and viticultural centre, among its industries being the manufacture of wine and brandy, wagon and carriage building and harness making. South-east of the town are granite quarries. The wines produced in the district are among the best in South Africa, ranking second only to those of Constantia.

The Paarl is one of the oldest European towns in South Africa. It dates from 1687, the site for the new settlement being chosen by the governor, Simon van der Stell. It was named Paarl by the first settlers from the fancied resemblance of one of the bou'ders on the top of the hill, when glistening in the sun, to a gigantic pearl. Shortly afterwards

several of the Huguenots who had sought refuge at the Cape after the revocation of the edict of Nantes were placed in the new settlement. The present inhabitants are largely descended from these Huguenots.

PABIANICE, a town of Russian Poland, in the government of Piotrkow, 30 m. N.W. of the town of Piotrkow, and 10 m. S.S.W. from Lodz railway station. Pop. (1897), 18,251. It lies amidst extensive forests round the head-waters of the Ner, which were the hunting-grounds of the Polish kings. It has woollen, cloth and paper mills, and manufactures agricultural implements.

PABNA, or Pubna, a town and district of British India, in the Rajshahi division of Eastern Bengal and Assam. The town is situated on the river Ichhamati, near the old bed of the Ganges. Pop. (1901), 18,424. The district of Pabna has an area of 1839 sq. m. Pop (1901), 1,420,461, showing an increase of 4-8% in the decade. It is bordered along its entire east face by the main stream of the Brahmaputra or Jamuna, and along its south-west

face by the Ganges or Padma. It is entirely of alluvial origin, the silt of the annual inundations overlying strata of clay on sand. Apart from the two great bordering rivers, it is inter- sected by countless water-channels of varying magnitude, so that during the rainy season every village is accessible by boat and by boat only. Almost the whole area is one green rice-field, the uniform level being broken only by clumps of bamboos and fruit-trees, which conceal the village sites. The district is a modern creation of British rule, being first formed out of Rajshahi district in 1832, and possesses no history of its own. The two staple crops are rice and jute. Sirajganj, on the Brahmaputra, is the largest mart for jute in Bengal. The Eastern Bengal railway cuts across the south-west corner of the district to Sara, where a bridge crosses the Ganges. The district was affected by the earthquake of the 12th of June 1897, which was most severely felt at Sirajganj.

PABST, FREDERICK (1836-1904), American brewer, was born at Nicholausreith, in Saxony, on the 28th of March 1836. In 1848 he emigrated with his parents to Chicago. There he became, first a waiter in an hotel, then a cabin-boy on a Lake Michigan steamer, and eventually captain of one of these vessels. In this last capacity he made the acquaintance of a German, Philip Best, the owner of a small but prosperous brewery at Milwaukee, and married his daughter. In 1862 Pabst was taken into partnership in his father-in-law’s brewery, and set himself to work to study the details of the business. After obtaining a thorough mastery of the art of brewing, Pabst turned his attention to extending the market for the beer, and before long had

raised the output of the Best brewery to 100,000 barrels a year. The brewery was eventually converted into a public company, and its capital repeatedly increased in order to cope with the continually increasing trade.

PACA, the Brazilian name for a large, heavily-built, short- tailed rodent mammal, easily recognized by its spotted fur. This rodent, Coelogenys (or Agouti) paca, together with one or two other tropical American species, represents a genus near akin to the agoutis and included in the family Caviidae. Pacas may be distinguished from agoutis by their heavier and more compact build, the longitudinal rows of light spots on the fur, the five-toed hind-feet, and the peculiar structure of the skull, in which the cheek-bones are expanded to form large capsules on the sides of the face, each enclosing a cavity opening on the side of the cheek. Their habits are very similar to those of agoutis, but when pursued they invariably take to the water. The young, of which seldom more than one is produced at a birth, remain in the burrows for several months. The flesh is eaten in Brazil. Males may be distinguished from females by the skull, in which the outer surface of the cheek-bones is roughened in the former and smooth in the latter sex. The paca-rana (Dinomys branicki), from the highlands of Peru, differs, among other features, by its well-developed tail and the arrangement of the spots. (See Rodentia.)

PACATUS DREPANIUS, LATINUS (or Latinius), one of the Latin panegyrists, flourished at the end of the 4th century a.d. He probably came from Aginnum (Agen), in the south of France, in the territory of the Nitiobriges, and received his education in the rhetorical school of Burdigala (Bordeaux). He was the contemporary and intimate friend of Ausonius, who dedicated two of his minor works to Pacatus, and describes him as the greatest Latin poet after Virgil. Pacatus attained the rank of proconsul of Africa (a.d. 390) and held a confidential position at the imperial court. He is the author of an extant speech (ed. E. Bahrens in Panegyrici latini, 1874, No. 12) delivered in the senate house at Rome (389) in honour of Theodosius I. It contains an account of the life and deeds of the emperor, the special subject of congratulation being the complete defeat oi the usurper Maximus. The speech is one of the best of it*

kind. Though not altogether free from exaggeration and flattery, it is marked by considerable dignity and self-restraint, and is thus more

important as an historical document than similar productions. The style is vivid, the language elegant but comparatively simple, exhibiting familiarity with the best classical literature. The writer of the panegyric must be dis- tinguished from Drepanius Florus, deacon of Lyons (c. 850), author of some Christian poems and prose theological works.

See M. Schanz Geschichte der romischen Litteratur (1904), iv. i.

PACCHIA, GIROLAMO DEL, and PACCHIAROTTO (or

Pacchiarotti), JACOPO, two painters of the Sienese school. One or other of them produced some good pictures, which used to pass as the performance of Perugino; reclaimed from Perugino, they were assigned to Pacchiarotto; now it is sufficiently settled that the good works are by G. del Pacchia, while nothing of Pacchiarotto's own doing transcends mediocrity. The mythical Pacchiarotto who worked actively at Fontainebleau has no authenticity.

Girolamo del Pacchia, son of a Hungarian cannon-founder, was born, probably in Siena, in 1477. Having joined a turbulent club named the Bardotti he disappeared from Siena in 1535, when the club was dispersed, and nothing of a later date is known about him. His most celebrated work is a fresco of the "Nativity of the Virgin," in the chapel of S Bernardino, Siena, graceful and tender, with a certain artificiality. Another renowned fresco, in the church of S Caterina, represents that saint on her visit to St Agnes of Montepulciano, who, having just expired, raises her foot by miracle. In the National Gallery of London there is a " Virgin and Child." The forms of G. del Pacchia are fuller than those of Perugino (his principal model of style appears to have been in reality Franciabigio) ; the drawing is not always unexceptionable; the female heads have sweetness and beauty of feature, and some of the colouring has noticeable force.

Pacchiarotto was born in Siena in 1474. In 1530 he took part in the conspiracy of the Libertini and Popolani, and in 1534 he joined the Bardotti. He had to hide for his life in 1535, and was concealed by the Observantine fathers in a tomb in the church of S Giovanni. He was stuffed in close to a new-buried corpse, and got covered with vermin and dreadfully exhausted by the close of the second day. After a while he resumed work; he was exiled in 1 539, but recalled in the following year, and in that year or soon afterwards he died. Among the few extant works with which he is still credited is an " Assumption ef the Virgin," in the Carmine of Siena. Other works rather dubiously attributed to him are in Siena, Buonconvento, Florence, Rome and

London.

PACE, RICHARD (c. 1482-1536), English diplomatist, was educated at Winchester under Thomas Langton, at Padua, at Bologna, and probably at Oxford. In 1509 he went with Cardinal Christopher Bainbridge, archbishop of York, to Rome, where he won the esteem of Pope Leo X., who advised Henry VIII. to take him into his service. The English king did so, and in 1515 Pace became his secretary and in 1516 a secretary of state. In 1515 Wolsey sent him to urge the Swiss to attack France, and in 1519 he went to Germany to discuss with the electors the impending election to the imperial throne. He was made dean of St Paul's in 1519, and was also dean of Exeter and dean of Salisbury. He was present at the Field of the Cloth of Gold in 1520, and in 1521 he went to Venice with the object of winning the support of the republic for Wolsey, who was anxious at this time to become pope. At the end of 1526 he was recalled to England, and he died in 1536. His chief literary work was Defruclu (Basel, 1517).

PACE (through O. Fr. pas, from Lat. passus, step, properly the stretch of the leg in walking, from pandere, to stretch), one movement of the leg in walking; hence used of the amount of ground covered by each single movement, or generally of the speed at which anything moves. The word is also used of a measure of distance, taken from the position of one foot to that of the other in making a single " pace," i.e. from 2! ft. (the

military pace) to 1 yard. The Roman passus was reckoned from the position of the back foot at the beginning of the pace to the position of the same foot at the end of the movement, i.e. 5 Roman feet, 58-1 English inches, hence the Roman mile, mille passus =1646 yards.

For pacing in horse-racing see Horse- racing.

PACHE, JEAN NICOLAS (1746-1823), French politician, was born in Paris, of Swiss parentage, the son of the concierge of the hotel of Marshal de Castries. He became tutor to the marshal's children, and subsequently first secretary at the ministry of marine, head of supplies (munitionnaire general des vivres), and comptroller of the king's household. After spending several years in Switzerland with his family, he returned to France at the beginning of the Revolution. He was employed successively at the ministries of the interior and of war, and waS appointed on the 20th of September 1793 third deputy suppliant of Paris by the Luxembourg section. Thus brought into notice, he was made minister of war in the following October. Pache was a Girondist himself, but aroused their hostility by his

incompetence. He was supported, however, by Marat, and when he was super- seded in the ministry of war by Beurnonville (Feb. 4, 1794) he was chosen mayor by the Parisians. In that capacity he contributed to the fall of the Girondists, but his relations with Hebert and Chaumette, and with the enemies of Robespierre led to his arrest on the 10th of May 1794. He owed his safety only to the amnesty of the 25th of October 1795. After acting as commissary to the civil hospitals of Paris in 1799, he retired from public life, and died at Thin-le-Moutier on the 18th of November 1823.

See L. Pierquin, Memoires sur Pache ((Charleville, 1900).

PACHECO, FRANCISCO (1571-1654), Spanish painter and art historian, was born at Seville in 1571. Favourable specimens of his style are to be se%n in the Madrid picture gallery, and also in two churches at Alcala de Guadaira near Seville. He attained great popularity, and about the beginning of the 17 th century opened an academy of painting which was largely attended. Of his pupils by far the most distinguished was Velazquez, who afterwards became his son-in-law. From about 1625 he gave up painting and betook himself to literary society and pursuits; the most important of his works in this department is a treatise on the art of painting (Arte de la pintura: su antigue- dad y grandeza, 1649), which is of considerable value for the information it contains on matters relating to Spanish art. He died in 1654.

PACHISI (Hindu pachis, twenty-five), the national table-game of India. In the palace of Akbar at Fatehpur Sikri the court of the zenana is divided into red and white squares, representing a pachisi-board, and here Akbar played the game with his courtiers, employing sixteen young slaves from his harem as living pieces. This was also done by the emperors of Delhi in their palace of Agra. A pachisi-board, which is usually em- broidered on cloth, is marked with a cross of squares, each limb consisting of three rows of 8 squares, placed around a centre square. The outer rows each have ornaments on the fourth square from the end and the middle rows one on the end square, these ornamented squares forming ” castles,” in which pieces are safe from capture. The castles are so placed that from the centre square, or ” home,” whence all pieces start going down the middle row and back on the outside and then to the end of the next limb, will be exactly 25 squares, whence the name. Four players, generally two on a side, take part. The pieces, of which each player has four, are coloured yellow, green, red and black, and are entered, one at a time, from the centre and move down the middle row, then round the entire board and up the middle row again to the home square. The moves are regulated by

six cowrie shells, which are thrown by hand down a slight incline. The throws indicate the number of squares a piece may move, as well as whether the player shall have a ” grace,” without which no piece, if taken, may be re-entered. A piece may be taken if another piece lands on the same square, unless the square be a castle. The object of each side is to

get all eight pieces round and home before the opponents can do so.

See Games, Ancient and Oriental, by E. Falkner (London, 1892).

PACHMANN, VLADIMIR DE (1848-), Russian pianist, was born at Odessa, where his father was a professor at the university. He was educated in music at Vienna, and from 1869 to 1882 only rarely performed in public, being engaged in the meanwhile in assiduous study. He then obtained the greatest success, particularly as a player of Chopin, his brilliance of execution and rendering being no less remarkable than the playfulness of his platform manner.

PACHMARHI, a hill-station and sanatorium for British troops in the Central Provinces of India. Pop. (1901), 3020, rising to double that number in the season. It is situated at a height of 3500 ft. on a plateau of the Satpura hills in Hoshangabad district, 32 m. by road from Piparia station on the Great Indian Peninsula railway. Though not free from fever in the hot season, it affords the best available retreat for the Central Provinces.

PACHOMIUS, ST (292-346), Egyptian monk, the founder of Christian cenobitical life, was born, probably in 292, at Esna in Upper Egypt, of heathen parents. He served as a conscript in one of Constantine’s campaigns, and on his return became a Christian (314); he at once went to live an eremitical life near Dendera by the Nile, putting himself under the guidance of an aged hermit. After three or four years he was called (by an angel, says the legend) to establish a monastery of cenobites, or monks living in common (see Monasticism, § 4). Pachomius spent his life in organizing and directing the great order he had created, which at his death included nine monasteries with some three thousand monks and a nunnery. The order was called Tabennesiot, from Tabennisi, near Dendera, the site of the first monastery. The most vivid account of the life and primitive rule is that given by Palladius in the Lausiac History, as witnessed by him (c.

410). Difficulties arose between Pachomius and the neighbouring bishops, which had to be composed at a synod at Esna. But St Athanasius was his firm friend and visited his monastery c. 330 and at a later period. Pachomius died (probably) in 346.

The best modern work on Pachomius is by P. Ladeuze, Le Ceno- bitisme pakhomien (1898). There have been differences of opinion in regard to the dates; those given above are Ladeuze's, now commonly accepted. The priority of the Greek Life of Pachomius over the Coptic may be said to be established ; the historical charac- ter and value of this life are now fully recognized. A good ana- lysis of all the literature is supplied in Herzog's Realencyklopddie (ed. 3). (E. C. B.)

PACHUCA, a city of Mexico and capital of the state of Hidalgo, 55 m. direct and 68 m. by rail N.N.E. of the city of Mexico. Pop. (1900), 37,487. Pachuca's railway connexions include the Mexican, the Hidalgo and the Mexican Oriental, besides which it has 5 m. of tramway line. The town stands in a valley of an inland range of the Sierra Madre Oriental, at an elevation over 8000 ft. above the sea, and in the midst of several very rich mineral districts — Atatonileo el Chico, Capula, Potosi, Real del Monte, Santa Rosa and Tepenene. It is said that some of these silver mines were known to the Indians before the discovery of America. Pachuca has some fine modern edifices, among which are the palace of justice, a scientific and literary institute, a school of mines and metallurgy, founded in 1877, a meteorological observatory and a public library. Mining is the chief occupation of its inhabitants, of whom about 7000 are employed underground. Electric power is derived from the Regla Falls, in the vicinity. The city's industrial establishments include smelting works and a large number of reduction works, among which are some of the largest and most important in the republic. It was here that Bartolome de Medina discovered the " patio " process of reducing silver ores with quicksilver in 1557, and his old hacienda de beneficio is still to be seen. Pachuca was founded in 1534, some time after the mines were discovered. Here Pedro Romero de Terreros made the fortune in 1739 that enabled him to present a man-of-war to Spain and gain the title of Count of Regla. Pachuca was sacked in 1812, and so keen

was the desire to possess its sources of wealth, in common with other mining towns, that mining operations were partially suspended for a time and the mines were greatly damaged. In 1824 the Real del Monte mines were sold to an English company and became the centre of a remarkable mining specula- tion — the company ruining itself with lavish expenditures and discontinuing work in 1848. The mines in 1909 belonged to an American company.

PACHYMERES, GEORGIUS (1242-c. 1310), Byzantine histo- rian and miscellaneous writer, was born at Nicaea, in Bithynia, where his father had taken refuge after the capture of Con- stantinople by the Latins in 1204. On their expulsion by Michael Palaeologus in 1261 Pachymeres settled in Constanti- nople, studied law, entered the church, and subsequently became chief advocate of the church (irpaireKSiKos) and chief justice of the imperial court (SiKauxbiiKaˆ) . His literary activity was considerable, his most important work being a Byzantine history in 13 books, in continuation of that of Georgius Acropo- lita from 1261 (or rather 1255) to 1308, containing the history of the reigns of Michael and Andronicus Palaeologi. He was also the author of rhetorical exercises on hackneyed sophistical themes; of a Quadrivium (Arithmetic, Music, Geometry, Astro- nomy), valuable for the history of music and astronomy in the middle ages; a general sketch of Aristotelian philosophy; a paraphrase of the speeches and letters of Dionysius Areopagita; poems, including an autobiography; and a description of the Augusteum, the column erected by Justinian in the church of St Sophia to commemorate his victories over the Persians.

The History has been edited by I. Bekker (1835) in the Corpus scriptorum hist, byzantinae, also in J. P. Migne, Patrologia graeca. cxliii., cxliv. ; for editions of the minor works see C. Krumbacher, Geschichte der byzantinischen Litteratur (1897).

PACIFIC BLOCKADE, a term invented by Hautefeuille, the French writer on International Maritime Law, to describe a blockade exercised by a great power for the purpose of bringing pressure to bear on a weaker state without actual war. That it is an act of violence, and therefore in the nature of war, is undeni- able, seeing that it can only be employed as a measure of coercion by maritime powers able to bring into action such vastly superior forces to those the resisting state can dispose of that resistance is out of the question. In this respect it is an act of war, and any attempt to exercise it against a power strong enough to resist would be a commencement of hostilities, and at once bring into play the rights and duties affecting neutrals. On the other hand, the object and justification of a pacific blockade being to avoid war, that is general hostilities and disturbance of inter- national traffic with the state against which the operation is carried on, rights of war cannot consistently be exercised against ships belonging to other states than those concerned. And yet, if neutrals were not to be affected by it, the coercive effect of such a blockade might be completely lost. Recent practice has been to limit interference with them to the extent barely neces- sary to carry out the purpose of the blockading powers. 1

It is usual to refer to the intervention of France, England and Russia in Turkish affairs in 1827 as the first occasion on which the coercive value of pacific blockades was put to the test. Neutral vessels were not affected by it. This was followed by a number of other coercive measures described in the textbooks as pacific blockades. The first case, however, in which the operation was really a blockade, unaccompanied by hostilities, and which therefore can be properly called a ” pacific blockade,” was that which in 1837 Great Britain exercised against New Granada. A British subject and consul of the name of Russell was accused of stabbing a native of the country in a street brawl. He was arrested, and after being kept in detention for some months he was tried for the unlawful carrying of arms and

1 There is always the alternative of making the blockade an act of war. This was done in 1902-3, when Great Britain, Germany and Italy proclaimed a blockade of certain ports of Venezuela and the mouths of the Orinoco. The blockade in this case was not pacific, but was war with all its consequences for belligerents and neutrals (see Foreign Office notice in London Gazette of December

20, 1902).

sentenced to six years’ imprisonment. The British government resented this treatment as ” not only cruel and unjust towards Mr Russell, but disrespectful towards the British nation,” and demanded the dismissal of the officials implicated and £1000 damages ” as some compensation for the cruel injuries which had been inflicted upon Mr Russell” (State Papers, 1837-1838ˆ. 183). The New Granada government refused to comply with these demands, and the British representative, acting upon his instructions, called in the assistance of the West Indian fleet, but observed in his communication to the British naval officer in command that it was desirable to avoid hostilities, and to endeavour to bring about the desired result by a strict blockade only. This seems to be the first occasion on which it had occurred to anybody that a blockade without war might serve the purpose of war. This precedent was shortly afterwards followed by another somewhat similar case, in which from the 16th of April to the 28th of November 1838 the French government blockaded the Mexican ports, to coerce the Mexican government into accept- ance of certain demands on behalf of French subjects who had suffered injury to their persons and damage to their property through insufficient protection by the

Mexican authorities.

The blockade of Buenos Aires and the Argentine coast from the 28th of March 1838 to the 7th of November 1840 by the French fleet, a coercive measure consequent upon vexatious laws affect- ing foreign residents in the Argentine Republic, seems to have been the first case in which the operation was notified to the different representatives of foreign states. This notification was given in Paris, and at Buenos Aires, and to every ship approaching the blockaded places. This precedent of notifica- tion was, a few years later (1845), followed in another blockade against the same country by Great Britain and France, and in one in 1842 and 1844 by Great Britain against the port of Grey- town in Nicaragua. In 1850 Great Britain blockaded the ports of Greece in order to compel the Hellenic government to give satisfaction in the Don Pacifico case. Don Pacifico, a British subject, claimed £32,000 as damages for unprovoked pillage of his house by an Athenian mob. Greek vessels only were seized, and these were only sequestered. Greek vessels bona fide carry- ing cargoes belonging to foreigners were allowed to enter the blockaded ports.

Before the next case of blockade which can be described as “pacific” occurred came the Declaration of Paris (April 15, 1856), requiring that ” blockades in order to be binding must be effective; that is to say, maintained by a force sufficient really to prevent access to the coast of the enemy.”

Some ill-defined measures of blockade followed, such as that of i860, when Victor Emmanuel, then king of Sardinia, joined the revolutionary government of Naples in blockading ports in Sicily, then held by the king of Naples, without any rupture of pacific relations between the two governments; that of 1862, in which Great Britain blockaded the port of Rio de Janeiro, to exact redress for pillage of an English vessel by the local popula- tion, at the same time declaring that she continued to be on friendly terms with the emperor of Brazil; and that in 1880, when a demonstration was made before the port of Dulcigno by a fleet of British, German, French, Austrian, Russian and Italian men-of-war, to compel the Turkish government to carry out the treaty conceding this town to Montenegro, and it was announced that if the town was not given up by the Turkish forces it would be blockaded.

The blockade which first gave rise to serious theoretical discussion on the subject was that instituted by France in 1884 in Chinese waters. On the 20th of October 1884 Admiral Courbet declared a blockade of all the ports and roadsteads between certain specified points of the

island of Formosa. The British government protested that Admiral Coubert had not enough ships to render the blockade effective, and that it was therefore a violation of one of the articles of the Declaration of Paris of 1856; moreover, that the French government could only interfere with neutral vessels violating the blockade if there was a state of war. If a state of war existed, England as a neutral was bound to close her coaling stations to belligerents. The

British government held that in the circumstances France was waging war and not entitled to combine the rights of peace and warfare for her own benefit. Since then pacific blockades have only been exercised by the great powers as a joint measure in their common interest, which has also been that of peace; and in this respect the term is taking a new signification in accordance with the ordinary sense of the word ” pacific.”

In 1886 Greece was blockaded by Great Britain, Austria, Germany, Italy and Russia, to prevent her from engaging in war with Turkey, and thus forcing the powers to define their attitude towards the latter power. The instructions given to the British commander were to detain every ship under the Greek flag coming out of or entering any of the blockaded ports or harbours, or communicating with any ports within the limit blockaded; but if any parts of the cargo on board of such ships belonged to any subject or citizen of any foreign power other than Greece, and other than Austria, Germany, Italy and Russia, and had been shipped before notification of the blockade or after such notification, but under a charter made before the notifica- tion, such ship was not to be detained.

On the blockade of Crete in 1897 it was notified that ” the admirals in command of the British, Austro-Hungarian, French, German, Italian, and Russian naval forces” had decided to. put the island of Crete in a state of blockade, that ” the blockade would be general for all ships under the Greek flag,” and that ” ships of the six powers or neutral powers may enter into the ports occupied by the powers and land their merchandise, but only if it is not for the Greek troops or the interior of the island,” and that ” these ships may be visited by the ships of the inter- national fleets.”

Since the adoption of the Hague Convention of 1907 respecting the limitation of the employment of force for the recovery of contract debts, the contracting powers are under agreement ” not to have recourse to armed force for the recovery of contract debts claimed from the government of one country by the govern- ment of another country as being due to its nationals, ” unless ” the debtor state

refuses or neglects to reply to an offer of arbitration, or after accepting the offer, prevents any compromis from being agreed on, or after the arbitration fails to submit to the award" (Art. 1). Though this does not affect pacific blockades in principle, it supersedes them in practice by a new procedure for some of the cases in which they have hitherto been employed. (T. Ba.)

PACIFIC OCEAN, the largest division of the hydrosphere, lying between Asia and Australia and North and South America. It is nearly landlocked to the N., communicating with the Arctic Ocean only by Bering Strait, which is 36 m. wide and of small depth. The southern boundary is generally regarded as the parallel of 40 S., but sometimes the part of the great Southern Ocean (40 to 66J° S.) between the meridians passing through South Cape in Tasmania and Cape Horn is included. The north to south distance from Bering Strait to the Antarctic circle is 9300 m., and the Pacific attains its greatest breadth, 10,000 m., at the equator. The coasts of the Pacific are of varied contour. The American coasts are for the most part mountainous and unbroken, the chief indentation being the Gulf of California; but the general type is departed from in the extreme north and south, the southern coast of South America consisting of bays and fjords with scattered islands, while the coast of Alaska is similarly broken in the south and becomes low and swampy towards the north. The coast of Australia is high and unbroken; there are no inlets of considerable size, although the small openings include some of the finest harbours in the world, as Moreton Bay and Port Jackson. The Asiatic coasts are for the most part low and irregular, and a number of seas are more or less completely enclosed and cut off from communi- cation with the open ocean. Bering Sea is bounded by the Alaskan Peninsula and the chain of the Aleutian Islands; the sea of Okhotsk is enclosed by the peninsula of Kamchatka and the Kurile Islands; the Sea of Japan is shut off by Sakhalin Island, the Japanese Islands and the peninsula of Korea; the Yellow Sea is an opening between the coast of China and Korea;

the China Sea lies between the Asiatic continent and the island of Formosa, the Philippine group, Palawan and Borneo. Amongst the islands of the Malay Archipelago are a number of enclosed areas — the Sulu, Celebes, Java, Banda and Arafura seas. The Arafura Sea extends eastwards to Torres Strait, and beyond the strait is the Coral Sea, bounded by New Guinea, the islands of Melanesia and north-

eastern Australia.

The area and volume of the Pacific Ocean and its seas, with the mean depths calculated therefrom, are given in the article Ocean. _ The Pacific Ocean has one and three-quarter times the

Extent. area o £ t jj e Atlantic — the next largest division of the hydrosphere — and has more than double its volume of water. Its area is greater than the whole land surface of the globe, and the volume of its waters is six times that of all the land above sea- level. The total land area draining to the Pacific is estimated by Murray at 7,500,000 sq. m., or little more than one-fourth of the area draining to the Atlantic. The American rivers draining to the Pacific, except the Yukon, Columbia and Colorado, are unim- portant. The chief Asiatic rivers are the Amur, the Hwang-ho and the Yangtsze-kiang: none of which enters the open Pacific directly. Hence the proportion of purely oceanic area to the total area is greater in the Pacific than in the Atlantic, the supply of detritus being smaller, and terrigenous deposits are not borne so far from land.

The bed of the Pacific is not naturally divided into physical regions, but for descriptive purposes the parts of the area lying _ … , east and west of 150 W. are conveniently dealt with 2ˆ d ° separately. The eastern region is characterized by great uniformity of depth; the 2000-fathom line keeps close to the American coast except off the Isthmus of Panama, whence an ill-defined ridge of less than 2000 fathoms runs south-westwards, and again off the coast of South America in about 40 S., where a similar bank runs west and unites with the former. The bank then continues south to the Antarctic Ocean, in about 120 W. Practically the whole of the north-east Pacific is therefore more than 2000 fathoms deep, and the south-east has two roughly triangular spaces, including the greater part of the area, between 2000 and 3000 fathoms. Notwithstanding this great average depth, the ” deeps ” or areas over 3000 fathoms are small in number and extent. Five small deeps are recognized along a line close to the coast of South America and parallel to it, in the depression enclosed by the two banks mentioned — they extend from about 12° to 30° S. — and are named, from north to south, Milne-Edwards deep, Kriimmel deep, Bartholomew deep, Richards deep and Haeckel deep. In the north-east the deeps are again few and small, but they are quite irregularly distributed, and not near the land. East of 150 W. the Pacific has few islands; the oceanic islands are volcanic, and coral formations are of course scanty. The most important group is the Galapagos Islands.

The western Pacific is in complete contrast to th% part just described.

Depths of less than 2000 fathoms occur continuously on a bank extending from south-eastern Asia, on which stands the Malay Archipelago. This bank continues southwards to the Antarctic Ocean, expanding into a plateau on which Australia stands, and a branch runs eastwards and then southwards from the north-east of Australia through New Zealand. The most considerable areas ov;r 3000 fathoms are the Aldrich deep, an irregu- lar triangle nearly as large as Australia, situated to the east of New Zealand, in which a sounding of 5155 fathoms was obtained by H.M.S. ” Penguin,” near the Tonga Islands: and the Tuscarora deep, a long, narrow trough running immediately to the east of Kamchatka, the Kurile Islands and Japan. A long strip within the Tuscarora deep forms the largest continuous area with a depth greater than 4000 fathoms. All the rest of the western Pacific is a region of quite irregular contour. The average depth varies from 1500 to 2500 fathoms, and from this level innumerable volcanic ridges and peaks rise almost or quite to the surface, their summits for the most part occupied by atolls and reefs of coral formation, while interspersed with these are depressions, mostly of small area, among which the deepest soundings recorded have been obtained. The United States telegraph ship ” Nero,” while surveying for a cable between Hawaii and the Philippines, sounded in 1900 the greatest depth yet known between Midway Islands and Guam (12° 43′ N., 145° 49′ E.) in 5269 fathoms, or almost exactly 6 m.

The following table, showing the area of the floor of the Pacific (to 40 S.) and the volume of water at different levels, is due to Sir J. Murray: —

Fathoms.

Areas.

Volume.

(sq. m.)

(cub. m.)

O-IOO

3.379,700

6,128,500

100-500

1.753.450

23,348.350

500-1000

1,707,650

28,323,700

1000-2000

6,902,550

52,628,500

2000-3000

39,621,550

32,545,400

3000-4000

2,164,150

1.357,900

over 4000

94.850 55.623,900

70,600

144,402,950

So far as our knowledge goes, the present contours of the open Pacific Ocean are almost as they were in Palaeozoic times, and in the intervening ages changes of level and form have been slight. There is no reason to suppose that any considerable part of the vast area now covered by the waters of the Pacific has ever been exposed as dry land. Hence the Pacific basin may be regarded as a stable and homogeneous geographical unit, clearly marked off round nearly all its margin by steep sharp slopes, extending in places through the whole known range of elevation above sea-level and of depression below it — from the Cordilleras of South America to the island chains of Siberia and Australia. (See Ocean.)

The deeper parts of the bed of the Pacific are covered by deposits of red clay, which occupies an area estimated at no less than 105,672,000 sq. kilometres, or three-fifths of the _ ,. whole. Over a large part of the central Pacific, far pos s ‘ removed from any possible land-influences or deposits of ooze, the red-clay region is characterized by the occurrence of manganese, which gives the clay a chocolate colour, and manganese nodules are found in vast numbers, along with sharks’ teeth and the ear-bones and other bones of whales. Radiolarian ooze is found in the central Pacific in a region between 15° N. to 10° S. and 140 E. to 150 W., occurring in seven distinct localities, and covering an area of about 3,007,000 sq. kilometres. The ” Challenger ” discovered an area of radiolarian ooze between 7°-i2° N. and I47°-I52° W., and another in 2 c -io° S., 152 “-153° W. Between these two areas, almost on the equator, a strip of globigerina ooze was found, corresponding to the zone of globigerina in the equatorial region of the Atlantic. Globigerina ooze covers considerable areas in the intermediate depths of the west and south Pacific — west of New Zealand, and along the parallel of 40° S., between 8o°-98° W. and I50°-ii8° W. — but this deposit is not known in the north- eastern part of the basin. The total area covered by it is esti- mated at 38,332,000 sq. kilometres — about two-thirds of that in the Atlantic. Pteropod ooze occurs only in the neighbourhood of Fiji and other islands of the western Pacific, passing up into fine coral sands and mud. Diatom ooze has been found in detached areas between the Philippine and Mariana islands, and near the Aleutian and Galapagos groups, forming an exception to the general rule of its occurrence only in high latitudes. All the enclosed seas are occupied by characteristic terrigenous deposits.

Partly on account of its great extent, and partly because there is no wide opening to the Arctic regions, the normal wind circulation is on the whole less modified in the North Pacific than in _. the Atlantic, except in the west, where the south-west j eoro ” monsoon of southern Asia controls the prevailing winds, osy ‘ its influence extending eastwards to 145 E., near the Ladrones, and southwards to the equator. In the South Pacific the north- west monsoon of Australia affects a belt running east of New Guinea to the Solomon Islands. In the east the north-east trade-belt extends between 5° and 25 N. ; the south-east trade crosses the equator, and its mean southern limit is 25 ° S. The trade- winds are generally weaker and less persistent in the Pacific than in the Atlantic, and the intervening belt of equatorial calms is broader. Except in the east of the Pacific, the south-east trade is only fully developed during the southern winter; at other seasons the regular trade-belt is cut across from north-west to south-east by a

band twenty to thirty degrees wide, in which the trades alternate with winds from north-east and north, and with calms, the calms prevailing chiefly at the boundary of the monsoon region (5 N.-I5° S., 160 “-185 E.). This area, in which the south-east trade is interrupted, includes the Fiji, Navigator and Society groups, and the Paumdtus. In the Marquesas group the trade-wind is constant. Within the southern monsoon region there is a gradual transition to the north- west monsoon of New Guinea in low latitudes, and in higher latitudes to the north-east wind of the Queensland coast. The great warming and abundant rainfall of the island regions of the western Pacific, and the low temperature of the surface water in the east, cause a displacement of the southern tropical maximum of pressure to the east; hence we have a permanent “South Pacific anticyclone” close to the coast of South America. The characteristic feature of the south-western Pacific is therefore the relatively low pressure and the existence of a true monsoon region in the middle of the trade- wind belt. It is to be noted that the climate of the islands of the Pacific becomes more and more healthy the farther they are from the monsoon region. The island regions of the Pacific are every- where characterized by uniform high air-temperatures; the mean annual range varies from 1° to 9° F., with extremes of 24° to 27 °, and the diurnal range from 9° to 16°. In the monsoon region relative humidity is high, viz. 80 to 90%. The rainfall is abundant; in the western island groups there is no well-marked rainy season, but over the whole region the greater part of the rainfall takes place during the southern summer, even as far north as Hawaii. In the trade-wind region we find the characteristic heavy rainfall on the weather sides of the islands, and a shorter rainy season at the season of highest sun on the lee side. Buchan describes the island-studded portion of the western Pacific as the most extensive region of the gbbe characterized by an unusually heavy rainfall. Beyond the tropical high-pressure belt, the winds of the North Pacific are under the control of an area of low pressure, which, however, attains neither the size nor the intensity of the ” Iceland ” depression in the north

Atlantic. The result is that north-westerly winds, which in winter are exceedingly dry and cold, blow over the western or Asiatic area; westerly winds prevail in the centre, and south-westerly and southerly winds off the American coast. In the southern hemisphere there is a transition to the low-pressure belt encircling the Southern Ocean, in which westerly and north-westerly winds continue all the year round.

The distribution of temperature in the waters of the Pacific Ocean has been fully investigated, so far as is possible with the existing

Temperature.

observations, by G. Schott. At the surface an extensive

‘ area of maximum temperature (over 20 C.) occurs over 10° on each side of the equator to the west of the ocean. On the eastern side temperature falls to 22° on the equator and is slightly higher to N. and S. In the North Pacific, beyond lat. 40 , the surface is generally warmer on the E. than on the W., but this con- dition is, on the whole, reversed in corresponding southern latitudes. In the intermediate levels, down to depths not exceeding 1000 metres, a remarkable distribution appears. A narrow strip of cold water runs along the equator, widest to the east and narrowing westward, and separates two areas of maximum which have their greatest intensity in the western part of the ocean, and have their central portions in higher latitudes as depth increases, apparently tending constantly to a position in about latitude 30° to 35 N. and S. A comparison of this distribution with that of atmospheric pressure is of great interest. High temperature in the depth may be taken to mean descending water, just as high atmospheric pressure means descending air, and hence it would seem that the slow vertical movement of water in the Pacific reproduces to some extent the phenomena of the ” doldrums ” and ” horse latitudes,” with this difference, that the centres of maximum intensity lie off the east of the land instead of the west as in the case of the continents. The isothermal lines, in fact, suggest that in the vast area of the Pacific something corresponding to the ” planetary circulation “is estab- lished, further investigation of which may be of extreme value in relation to current inquiries concerning the upper air. In the greater depths temperature is extraordinarily uniform, 80% of the existing observations falling within the limits of 1-6° C. and 1-9° C. In the enclosed seas of the western Pacific, temperature usually falls till a depth corresponding to that of the summit of the barriers which isolate them from the open ocean is reached, and below that point temperature is uniform to the bottom. In the Sulu Sea, for example, a temperature of 10-3° C. Is reached at 400 fathoms, and this remains constant to the bottom in 2500 fathoms.

The surface waters of the North Pacific are relatively fresh, the salinity being on the whole much lower than in the other great Salinity. oceans. The saltest waters are found along a belt extend- ing westwards from the American coast on the Tropic of Cancer to 160 E., then turning southwards to the equator. North of this salinity

diminishes steadily, especially to the north-west, the Sea of Okhotsk showing the lowest salinity observed in any part of the globe. South and east of the axis mentioned salinity becomes less to just north of the equator, where it increases again, and the saltest waters of the whole Pacific are found, as we should expect, in the south-east trade-wind region, the maximum occurring in about 18 S. and 120° W. South of the Tropic of Capricorn the isohalines run nearly east and west, salinity diminishing quickly to the Southern Ocean. The bottom waters have almost uniformly a salinity of 34-8 per mille, corresponding closely with the bottom waters of the South Atlantic, but fresher than those of the North Atlantic.

The surface currents of the Pacific have not been studied in the same detail as those of the Atlantic, and their seasonal variations Circulation. are little known except in the monsoon regions. Speak- ‘ ing generally, however, it may be said that they are for the most part under the direct control of the prevailing winds. The North Equatorial Current is due to the action of the north-east trades. It splits into two parts east of the Philippines, one division flowing northwards as the Kuro Siwo or Black Stream, the analogue of the Gulf Stream, to feed a drift circulation which follows the winds of the North Pacific, and finally forms the Cali- fornian Current flowing southwards along the American coast. Part of this rejoins the North Equatorial Current, and part probably forms the variable Mexican Current, which follows the coasts of Mexico and California close to the land. • The Equatorial Counter- Current flowing eastwards is largely assisted during the latter half of the year by the south-west monsoon, and from July to October the south-west winds prevailing east of 150° E. further strengthen the current, but later in the year the easterly winds weaken or even destroy it. The South Equatorial Current is produced by the south- east trades, and is more vigorous than its northern counterpart. On reaching the western Pacific part of this current passes south- wards, east of New Zealand, and again east of Australia, as the East Australian Current, part northwards to join the Equatorial Counter-Current, and during the north-east monsoon part makes its way through the China Sea towards the Indian Ocean. During the south-west monsoon this last branch is reversed, and the surface waters of the China Sea probably unite with the Kuro Siwo. Between the Kuro Siwo and the Asiatic coast a band of cold water, with a slight movement to the southward, known as the Oya Siwo, forms the analogue of the ” Cold Wall ” of the Atlantic In the higher

latitudes of the South Pacific the surface movement forms part of the west wind-drift of the Roaring Forties. On the west coast of South America the cold waters of the Humboldt or Peruvian Current

corresponding to the Benguela Current of the South Atlantic, make their way northwards, ultimately joining the South Equatorial Current. The surface circulation of the Pacific is, on the whole, less active than that of the Atlantic. The centres of the rotational movement are marked by ” Sargasso Seas ” in the north and south basins, but they are of small extent compared with the Sargasso Sea of the North Atlantic. From the known peculiarities of the distri- bution of temperature, it is probable that definite circulation of water is in the Pacific confined to levels very near the surface, except in the region of the Kuro Siwo, and possibly also in parts of the Peruvian Current. The only movement in the depths is the slow creep of ice-cold water northwards along the bottom from the Southern Ocean; but this is more marked, and apparently penetrates farther north, than in the Atlantic.

See Reports of expeditions of the U.S.S. ” Albatross ” and ” Thetis,” 1888-1892; A. Agassiz, Expedition to the Tropical Pacific, 1899-1900, 1904-1905; H.M.S. “Challenger,” 1873-1876; ” Egeria ” 1888- 1889 and 1899; ” Elisabeth,” 1877; ” Gazelle,” 1875-1876; ” Planet,” 1906; ” Penguin,” 1891-1903; ” Tuscarora,” 1873-1874; ” Vettor Pisani,” 1884; ” Vitraz,” 1887-1888; also observations of surveying and cable ships, and special papers in the Annalen der Hydrographie (for distribution of temperature see G. Schott, p. 2, 1910).

(H. N. D.)

Islands or the Pacific Ocean

Up to a certain point, the islands of the Pacific fall into an obvious classification, partly physical, partly political. In the west there is the great looped chain which fringes the east coast of Asia, and with it encloses the series of seas which form parts of the ocean. The north of the chain, from the Kuriles to Formosa, belongs to the empire of Japan; southward it is continued by the Philippines (belonging to the United States of America) which link it with the vast archipelago between the Pacific and Indian oceans, to which the name Malay Archipelago is commonly applied. As the loop of the Kuriles depends from the southern extremity of Kamchatka, so from the east of the same peninsula another loop extends across the northern part of the ocean to Alaska, and helps to demarcate the Bering Sea; this chain is distinctly broken to the east of the Commander Islands, but is practically continuous thereafter under the name of the Aleutian Islands. Islands form a much less important feature of the American Pacific coast than of the Asiatic; between 48 N. and 38 S. there are practically none, and to the north and south of these parallels

respectively the islands, though large and numerous, are purely continental, lying close under the mainland, enclosing no seas, and forming no separate political units. South-eastward of the Malay Archipelago lies ” the largest island and the smallest continent,” Australia; eastward of the archipelago, New Guinea, the largest island if Australia be regarded as a continent only. With Australia may be associated the islands lying close under its coasts, including Tasmania. Next follow the two great islands and attendant islets of New Zealand.

There now remains a vast number of small islands which lie chiefly (but not entirely) within an area which may be defined as extending from the Philippines, New Guinea and Australia to 130 W., and from tropic to tropic. These islands fall principally into a number of groups clearly enough defined to be well seen on a map of small scale; they are moreover divided, as will be shown, into three main divisions; but whereas they have enough characteristics in Common to render a general view of them desirable, there is no well-recognized name to cover them all. The name Polynesia was formerly taken to do so, but belongs properly to one of the three main divisions, to which the name Eastern Polynesia was otherwise given; Oceania and Oceanica are variants of another term which has been used for the same purpose, though by no means generally. Moreover usage varies slightly as regards the limits of the three main divisions, but the accompanying table shows the most usual classification, naming the principal groups within each, and distributing them according to the powers to which they are subject.

The following islands may be classified as oceanic, but not with any of the three main divisions: the Bonin Islands, north of the Marianas, belonging to Japan; Lord Howe and Norfolk. Islands (to

New South Wales) ; Easter Island (to Chile) ; the Galapagos Islands (to Eeuador). In an area to be denned roughly as lying about the Tropic of Cancer, between Hawaii and the Bonin Islands, there are scattered a few small islands and reefs, of most of which the position, if not the existence, is doubtful. Such are Patrocinio (about 28 30′ N., 177° 18′ E.) and Ganges (39 47′ N., 154 15′ E.), among others which appear on most maps. Marcus Island, in 23° 10′ N., 154° E., was annexed by Japan in 1899 with a view to its becoming a cable station.

The following paragraphs review the oceanic islands generally, and

are therefore concerned almost entirely with the central and mid-western parts of the ocean. It is impossible to estimate the total number of the islands; an atoll, for instance, which may

slate in the Marquesas, which afford a type of the extinct volcanic islands, as does Tahiti. In other areas, however, there is still volcanic activity, and in many cases volcanoes to which only tradition attributes eruptions can hardly be classified as extinct. Hawaii contains the celebrated active crater of Kilauea. In Tonga, in the New Hebrides, and in the long chain of the Solomons and the Bismarck Archipelago there is much activity. Submarine vents sometimes break forth, locally raising the level of the sea-bottom, or even forming temporary islands or shoals. Earthquakes are not uncommon in the volcanic areas. Most of the volcanic islands are lofty in propor- tion to their size. The peaks or sharp cones in which they

Islands of the Pacific Ocean

Melanesia.

Area, sq. m.

Pop.

Micronesia.

Area, sq. m.

Pop.

Polynesia.

Area, sq. m.

Pop.

To Great Britain.

Fiji . . . . Louisiade Archip. Santa Cruz Island Solomon Islands (part) . . .

7,435 850 380

12,800

121,000 5,000 5.000

135,000

Gilbert Island

166

30,000

America Islands Cook Islands 1 . Ellice Islands . Manihiki Islands Niue . . . Phoenix Islands Pitcairn

Tokelau Islands Tonga Islands.

260

in

14 12

36

16

2

7 385

300

6,200

2,400

1,000

4,000

60

170

500

19,000

Total, British

21,465

266,000

166

30,000

843

33.630

To United States of America .

Guam ….

200

9,000

Hawaii Samoa (part) .

6,651 95

154,000 6,000

Total, U.S.A

—

—

200

9,000

6,746

160,000

To France .

Loyalty Island New Caledonia .

1,050 6,450

20,000 52,000

Mamuesas Islands Pamiotu Archip. Society Islands Tubuai Islands Wallis Archip.

490 364 637

no

40

4.300 5.000 18,500 2,000 4.500

Total, French

7.500

72,000

—

—

1,641

34.300

To Germany.

Bismarck Archip. Solomon Islands (part) . . .

20,000 4,200

188,000 45.000

Caroline Islands . Mariana Islands

(excl. Guam) Marshall Islands . Pelew Islands .

380

245 160

175

36,000

2,500

15,000

3,100

Samoa (part) .

985

33,000

Total, German …..

24,200

233,000

960

56,600

985

33,000

New Hebrides 2 .

5,106

50,600

Total . .

Melanesia .

58,271

62 1 ,600

Micronesia

1,326

95,600

Polynesia .

IQ.2I5

260,930

The above figures give a total land area for the whole region of 69,561 sq. m., with a population of 978,130; but they are for the most

part merely approximate.

be divided into a large number of islets, often bears a single name. The number of names of islands and separate groups in the Index to the Islands of the Pacific (W. T. Brigham), which covers the limited area under notice, is about 2650, exclusive of alternative names. Of these, it may be mentioned, there is a vast number, owing in some cases to divergence of spelling in the representation of native names, in others to European dis- coverers naming islands (sometimes twice or thrice successively) of which the native names subsequently came into use also.

The islands may be divided broadly into volcanic and coral islands, thougn the physiography of many islands is imperfectly known. There are ancient rocks, however, in New Caledonia, which has a geological affinity with New Zealand; old sedimen- tary rocks are known in New Pomerania, besides granite and porphyry, and slates, sandstone and chalk occur in Fiji, as well as young volcanic rocks. Along with these, similarly, hornblende and diabase occur in the Pelew Islands and gneiss and mica

1 These are dependencies of New Zealand, as are also the follow- ing islands and groups which lie apart from the main Polynesian clusters, nearer New Zealand itself: Antipodes Islands, Auckland Islands, Bounty Islands, Campbell Islands, Chatham Islands, Kermadec Islands.

2 Under British and French influence jointly.

frequently culminate, combined with the rich characteristic vegetation, are the principal features which have led all travellers to extol the beauty of the islands.

In the central and western Pacific the northern and southern limits of the occurrence of reef-forming corals are approximately 30 N. and 30° S. It may be added that this belt narrows greatly towards the east, mainly from the south, in sympathy with the northward flow of cold water off the coast of South America. But apart from this the limits are seen to accord fairly closely with the geographical definition of the area under consideration. Here the broad distinction has been drawn between volcanic and coral islands; but this requires amplifica- tion, both because the coral islands follow more than one type, and because the work of corals is in many cases associated with the volcanic islands in the form of fringing or barrier reefs. As to the distribution of coral reefs within the Pacific area, in Micronesia the northern Marianas (volcanic) are without reefs, which, however, are well

developed in the south. The Pelew islands have extensive reefs, and the Caroline, Marshall and Gilbert islands are almost entirely coral. In Melanesia, as has been seen, the volcanic type predominates. Coral reefs occur round many of the islands (e.g. the Louisiade and Admiralty

groups, New Caledonia and Fiji), but in some cases they are wholly absent or nearly so (e.g. the eastern Solomon Islands and the New Hebrides). Of the Polynesian Islands, the Hawaiian chain presents the type of a volcanic group through which coral reefs are not equally distributed. The main island of Hawaii and Maui at the east end are practically without reefs; which, however, are abundant farther west. Round the volcanic Marquesas Islands, again, coral is scanty, but the Society Islands, Samoa and Tonga have extensive reefs. The various minor groups to the north of these (Ellice, Phoenix, Union, Manihiki and the America Islands) are coral islands. Christmas, one of the last-named, is reputed to be the largest lagoon island in the Pacific. The Paumotu Archipelago is the most extensive of the coral groups.

The coral islands are generally of the form well known under the name of atoll, rising but slightly above sea-level, flat, and generally of annular form, enclosing a lagoon. Often, as has been said, the atoll is divided into a number of islets, but in some smaller atolls the ring is complete, and the sea-water gains access beneath the surface of the reef to the lagoon within, where it is sometimes seen to spout up at the rise of the tide. Besides the atolls there is a type of island which has been called the elevated coral island. The Loyalty Islands exhibit this type, in which former reefs appear as low cliffs, elevated above the sea, and separated from it by a level coastal tract. The island of Mare shows evidence of three such elevations, three distinct cliffs alternating with level tracts. For the much debated question as to the conditions under which atolls and reefs are formed, see Coral Reefs. As to the local distribution of reefs, it has been maintained that in the case of active volcanic islands which have no reefs, their absence is due to subterranean heat. The contour of the sea-bed, however, has been shown to influence this distribution, the continuation of the slope of a steep shore beneath the sea being adverse to their formation, whereas on a gentler slope they may be formed.

Flora. — In considering the flora of the islands it is necessary to distinguish between the rich vegetation of the fertile volcanic islands

and the poor vegetation of the coral islands. Those plants which are widely distributed are generally found to be propagated from seeds which can easily be carried by the wind or by ocean currents, or form the food of migratory birds. The tropical Asiatic element predominates on the low lands; types characteristic of Australia and New Zealand occur principally on the upper parts of the high islands. In Hawaii there are instances of American elements. In the volcanic islands a distinction may be observed between the windward and leeward flanks, the moister windward slopes being the more richly clothed. But almost everywhere the vegetation serves to smooth the contours of the rugged hills, ferns, mosses and shrubs growing wherever their roots can cling, and leaving only the steepest crags uncovered to form, as in Tahiti, a striking con- trast. The flora is estimated to include 15 % of ferns, but they form only the most important group among many plants of beautiful foliage, such as draceanas and crotons. Flowering plants are numerous, and the natives often (as in Hawaii) greatly appreciate flowers, which thus add a feature to the picturesqueness of island- life, though they do not usually grow in great profusion. Fruits are abundant, though indigenous fruits are few; the majority have been introduced by missionaries and others. Oranges are often

Clentiful, also pine-apples, guavas, custard-apples, mangoes and ananas. These last are of special importance, and the best kind, the Chinese banana, is said to have sprung from a plant given to the missionary John Williams, and cultivated in Samoa. The natives live Very largely on vegetable food, among the most important plants which supply them being the taro, yam, banana, bread-fruit, arrow-root, pandanus and coco-nut. The last constitutes a valuable article of commerce in the form of copra, from which palm oil is expressed ; the natives make use of this oil in made dishes, and also of the soft half-green kernel and the coco-nut “milk,” the clear liquid within the nut. Their well-known drink, kava, is made from a variety of pepper-plant. The most characteristic trees are the coco-nut palm, pandanus and mangrove. The low coral islands suffer frequently from drought ; their soil is sandy and unproductive, and in some cases the natives attempt cultivation by excavating trenches and fertilizing them with vegetable and other refuse.

Fauna. — The indigenous fauna of the islands is exceedingly poor in mammals, which are represented mainly by rats and bats. Pigs have been held to be indigenous on some islands, but were doubtless introduced by early navigators. Cattle and horses, where intro- duced, are found to degenerate rather rapidly unless the supply of fresh stock is kept up. Birds are more numerous than mammals,

among the most Important kinds being the pigeons and doves, especially the fruit eating pigeons. Megapodes are found in the Solomon Islands, the New rtebrides. Samoa, Tonga, the Carolines and the Marianas. The remarkable dtdunr.ulus occurs in Samoa, and after the introduction of cats and rats, which preyed upon it, was compelled to change its habits dwelling in trees, instead of on the ground. Insect life is ricn in northern Melanesia; in southern Melanesia it is less so; in Fiji numerous kinds of insects occur, while individual numbers are small. In the rest of the islands the insect fauna is poor. But if this is true of the land fauna as a whole, especially on the atoils, where it consists mainly of a few birds, lizards and insects, the opposite is the case with the marine fauna. Fish are exceedingly abundant, especially in the lagoons of atolls, and form an important article of food supply for the natives, who are generally expert fishermen. The fish fauna of the islands is especially noted for the gorgeous colouring of many of the species. Among marine mammals, the dugong occurs in the parts about New Guinea and the Caroline Islands. Various sorts of whale are found, and the whaling industry reached the height of its importance about the middle of the 19th century In considering the marine fauna the remarkable palolo or balolo should be mentioned. This annelid propagates its kind by rising to the surface and dividing itself. The occurrence of this process can be predicted exactly for one day, before sunrise, in October and November, and as both the worm and the fish which prey on it are appreciated by the natives as food the occasions of its appearance are of great importance to them.

History. — Not long after the death of Columbus, and when the Portuguese traders, working from the west, had hardly reached the confines of the Malay Archipelago, the Spaniard Vasco Nunez de Balboa crossed America at its narrowest part and discovered the great ocean to the west of it (1513). The belief in the short and direct westward passage from Europe to the East Indies was thus shaken, but it was still held that some passage was to be found, and in 1519-1521 Fernao de Magalhaes (Magellan) made the famous voyage in which he discovered the strait which bears his name. Sailing thence north-westward for many weeks, over a sea so calm that he named it El Mar pacifico, he sighted only two' small islands. These may have been Puka Puka of the Tuamotu Archipelago and Flint Island; but it may be stated here that the identification of islands sighted by the early explorers is often a matter of conjecture, and that therefore some islands of which the definite discovery must be dated much later had in fact been seen by Europeans at this early period. In this narrative the familiar names of islands are used, irrespective of whether they were given by the first or later discoverers, or are native names.

Magellan reached the ” Ladrones ” (Marianas) in 1521, and voyaged thence to the Philippines, where he was killed in a local war. In 1 522-1 524 various voyages of discovery were made on the west coast of America, partly in the hope of finding a strait connecting the two oceans to the region of the central isthmus. In 1 525-1 527 Garcia Jofre de Loyasa sailed to the Moluccas, but, like Magellan, missed the bulk of the oceanic islands. About this time, however, the Portuguese sighted the north coast of New Guinea. Fuller knowledge of this coast was acquired by Alvaro de Saavedra (1527-1529), and among later voyages those of Ruy Lopez de Villalobos (1 542-1 545) and Miguel Lopez de Legaspi (1 564-1 565) should be mentioned. These, however, like others of the period, did not greatly extend the knowledge of the Pacific islands, for the course between the Spanish American and Asiatic possessions did not lead voyagers among the more exten- sive archipelagoes. For the same reason the British and Dutch fleets which sailed with the object of harrying the Spaniards, under Sir Francis Drake (1 577-1 580), Thomas Cavendish (1586-1593) and Oliver van Noort (1598-1601), were not, as regards the Pacific, of prime geographical importance. But the theory of the existence of a great southern continent was now also attracting voyagers. Alvaro Mendana de Neyra, after cross- ing a vast extent of ocean from Peru and sighting only one island, probably in the Ellice group, reached the Solomon Islands. In 1 595-1 596 he made a second voyage, and though he did not again reach these islands, the development of which was his objective, he discovered the Marquesas Islands, and afterwards Santa Cruz, where, having attempted to found a settlement, he died. Thereafter his pilot, Pedro Fernandez de Quiros, set out with the remainder of the company to make for the Philippines, and on

the way discovered Ponape of the Caroline Islands, some of which group, however, had been known to the Portuguese as early as 1527. Quiros returned to Europe, and, obtaining command of a fleet, made a voyage in 1605-1607 during which he observed some of the Paumotu and Society Islands, and later discovered the small Duff group of the Santa Cruz Islands, passing thence to the main island of the New Hebrides, which he hailed as his objective, the southern continent. One of his commanders, Luis Vaes de Torres, struck off to the north-west, coasted along the south of the Louisiade Archipelago and New Guinea, traversed the strait which bears his name between New Guinea and Australia, and reached the Philippines. In 1615-1617 two Dutchmen, Jacob Lemaire and Willem Cornells’ Schouten, having in

view both the discovery of the southern continent and the possibility of establishing relations with the East Indies from the east, took a course which brought them to the north part of the Paumotu Archipelago, thence to part of the Tonga chain, and ultimately to New Pomerania, after which they reached the East Indies. In 1642-1643 Abel Tasman, working from the east, discovered Van Diemen's Land (Tasmania) and the west coast of New Zealand, subsequently reaching the Tonga Islands. Now for a while the tide of discovery slackened. Towards the close of the century the buccaneers extended their activity to the Pacific, but naturally added little to general knowledge. William Dampier, however, making various voyages in 1690-1705, explored the coasts of Australia and New Guinea, and at the opening of the century both the French and the Dutch showed some activity. The Dutchman Jacob Roggeveen, in the course of a voyage round the world in 1721-1722, crossed the Pacific from east to west, and discovered Easter Island, some of the northern islands of the Paumotu Archipelago, and (as is generally supposed) a part of the Samoan group. The voyage of Commodore George (afterwards Lord) Anson in 1 740- 1744 was for purposes rather of war than of exploration, and Commodore John Byron's voyage in 1765 had little result beyond gaining some additional knowledge of the Paumotu Archipelago.

It is about this time that what may be called the period of rediscovery set in fully. In the ensuing account a constant repetition of the names of the main archipelagoes will be found ; it may of course be assumed that each successive voyager added something to the knowledge of them, but on the other hand, as has been said, islands were often rediscovered and renamed in cases where later voyagers took no account of the work of their predecessors, or where the earlier voyagers were unable clearly to define the positions of their discoveries. Moreover, rivalry between contemporary explorers of different nationalities sometimes caused them to ignore each other's work, and added to the confusion of nomenclature among the islands.

In 1767 Samuel Wallis worked through the central part of the Paumotus, and visited Tahiti and the Marianas, while his companion Philip Carteret discovered Pitcairn, and visited Santa Cruz, the Solomons and New Pomerania. The French were now taking a share in the work of discovery, and in 1768 Louis Antoine de Bougainville sailed by way of the central Paumotus, the Society Islands, Samoa, the northern New Hebrides, the south coast of New Guinea and the Louisiade and Bismarck archipelagoes. The next voyages in chronological order are those of the celebrated Captain James Cook (g.v.). Within the limits of the area under notice, his first voyage (1769) included visits to Tahiti and the Society group generally, to

New Zealand and to the east coast of Australia, his second (1 773-1 774) to New Zealand, the Paumotu Archipelago, the Society Islands, Tonga and subsequently Easter Island, the Marquesas and the New Hebrides; and his third (1777-1778) to Tonga, the Cook or Norway group, and the Hawaiian Islands, of which, even if they were previously known to the Spaniards, he may be called the discoverer, and where he was subsequently killed. In 1786 Jean Francois Galoup de La Perouse, in the course of the famous voyage from which he never returned, visited Easter Island, Samoa and Tonga. The still more famous voyage of William Bligh of the "■ Bounty " (1788) was followed by that of Captain Edwards of the " Pandora " (1791), who in the course of his

search for Bligh discovered Rotumah and other islands. The Hawaiian Islands came v within the purview of George Vancouver, following the course of Cook in 1791. In 1792-1793 Joseph Antoine d'Entrecasteaux, searching for traces of La Perouse, ranged the islands west of Tonga. In 1797 Captain J. Wilson of the missionary ship " Duff " visited the Society group, Fiji, Tonga and the Marquesas, and added to the knowledge of the Paumotu and Caroline Islands. Another power entered on the field of exploration when the Russians sent Adam Ivan Krusenstern to the Pacific (1803). He was followed by Otto von Kotzebue (1816) and Fabian Gottlieb von Bellingshausen (1819-1821). The work of these three was carried out princi- pally in the easternmost part of Polynesia. In 1818-1819 the French navigator Louis Claude Desaulses de Freycinet ranged from New Guinea through the Marianas to Hawaii. Two of his countrymen followed him in 1823-1829 — Louis Isidore Duperrey and Dumont d'Urville. Kotzebue made a second voyage, accom- panied by scientists, in 1823-1826. In 1826—1828 Frederick William Beechey was at work in the middle parts of the ocean, and Feodor Petrovich Count Liitke, the Russian circumnavigator, in the northern. In 1834 Dr Debell Bennett made scientific researches in the Society, Hawaiian and Marquesas Islands, in 1835 Captain Robert Fitzroy was accompanied by Charles Darwin, and in 1836 sqq., Abel Aubert du Petit-Thouars was carrying on the work of the French in the Pacific. During his voyage of 1837-1840, Dumont d'Urville was again in Polynesia, working westward from the Paumotu and Marquesas Islands by Fiji and the Solomon, Loyalty and Louisiade groups to New Guinea. In 1839 sqq. the first important American expedition was made under Charles Wilkes, who covered a great extent of the ocean from Hawaii to Tonga, Fiji and New Zealand. Among later British explorers may be mentioned Captain J. Elphinstone Erskine (1849) and Captain H. M. Denham, and several impor- tant voyages for scientific research were made in the second

half of the 19th century, including one from Austria under Captain Wiillerstorf Urbair (1858), and one from Italy in the vessel “Magenta” (1865-1868), which was accompanied by the scientist Dr Enrico Giglioli. The celebrated voyage of H.M.S. “Challenger” (1874-1875) and those of the American vessels ” Tuscarora ” (1873-1876) and ” Albatross ” (1888-1892) may complete the tale.

Whalers, sealers and traders followed in the wake of explorers, the traders dealing chiefly in copra, trepang, pearls, tortoiseshell, &c. The first actual settlers in the islands, were largely men of bad character — deserting sailors, escapers from the penal settle- ments in Australia and others. It is not to be supposed that there were no orderly colonists, but that the natives suffered much at the hands of Europeans and Americans is only too clear. The class of traders who made a living by disreputable means and attempted to keep a monopoly of the island on which they settled, became notorious under the name of ” beach- combers,” and for each of the many dark chapters in Polynesian history there must have been many more unwritten. The kidnapping of natives for the South American and Australian labour markets was common. It cannot be denied that there has been actual deterioration of the native races, and elimination in their numbers, consequent upon contact with Europeans and Americans (see further, Polynesia). The romantic character of island-history has perhaps, however, tended to emphasize its dark side, and it is well to turn from it to recognize the work of the missionaries, who found in the Pacific one of their most extensive and important fields of labour, and have exercised not only a moral, but also a profound political influence in the islands since the London Missionary Society first established its agents in Tahiti in 1797. Many of them, moreover, have added greatly to the scientific knowledge of the islands and their inhabitants. The imposition of strict rules of life upon the natives was income instances carried too far; in others their conversion to Chris- tianity was little more than nominal, but cases of this sort are overshadowed bv the fine work of William Ellis and John Williams (c. 181 8) and many of their successors.

The discovery of sandalwood in Fiji in 1804, and the estab- lishment of a trade therein, made that group a centre of interest

in the early modern history of the Fai£c islands. Moreover the London Missionary Society, havinjovorked westward from its headquarters in

Tahiti to Tonga as early as 1797, founded a settlement in Fiji in 1835. Meanwhile the white traders in Fiji had played an intimate part in the internal political affairs of the group, and in 1858 King Thakombau, being threatened with reprisals by the American consul on account of certain losses of property which he had sustained, asked for British protection, but did not obtain it. The British, however, were paramount among the white population, and as by 1870 not only American, but also German influence was extending through the islands (the first German government vessel visited Fiji in 1872), annexation was urged on Great Britain by Australia and New Zealand. Meanwhile the labour traffic, which had been initiated, so far as the Pacific islands were concerned, by an unsuccessful attempt in 1847 to employ New Hebridean labourers on a settlement near the present township of Eden in New South Wales, had attained considerable proportions, had been improperly exploited and, as already indicated, had led the natives to retaliation, sometimes without discernment, a notorious example of this (as was generally considered) being the murder of Bishop Patteson in 1871. In 1872 an act was passed by the British government to regulate the labour traffic; Fiji was annexed in 1874, and in 1875 another act established the post of the British high commissioner.

In 1842 the French had formally annexed the Marquesas Islands; and subsequently extended their sphere, as shown in the table at the outset of this article, both in the east of Polynesia and in the south of Melanesia. In some of the island-groups independent native states were recognized for some time by the powers, as in the case of Hawaii, which, after the deposition of the queen in 1893 and the proclamation of a republic in 1894, was annexed to the United States of America only in 1898, or, again, in the case of Tonga, which provided a curious example of the subordination of a native organization to unauthorized foreign influence. The partition of Polynesia was completed in 1899, when Samoa was divided between Germany and the United States. In Micronesia, since the discoveries of the early Spanish navigators, the Carolines, Mariana and Pelew Islands had been recognized as Spanish territory until 1885, when Germany began to establish herself in the first-named group. Spain had never occupied this group, but protested against the German action, and Pope Leo XIII. as arbitrator awarded the Carolines to her. Thereafter Spain made attempts at occupation, but serious conflicts with the natives ensued, and in 1899 the islands were sold to Germany, which thus became the predomi- nating power in Micronesia. When Germany acquired the Bismarck Archipelago in Melanesia the introduction of German names (New Pomerania, Neu Pommern, for

New Britain; Neu Mecklenburg for New Ireland; Neu Langenburg for the Duke of York Group, &c.) met with no little protest as contrary to precedent and international etiquette. The provision for the joint influence of Great Britain and France over the New Hebrides (1906) brought these islands into some prominence owing to the hostile criticism directed against the British government both in Australia and at home. The partition of the Pacific islands never led to any serious friction between the powers, though the acquisition of Hawaii was attempted by Britain, France and Japan before the United States annexed the group, and the negotiations as to Samoa threatened trouble for a while. There were occasional native risings, as in Samoa (where, however, the fighting was rather in the nature of civil warfare), the French possessions in eastern Polynesia, and the New Hebrides, apart from attacks on individual settlers or visitors, which have occurred here and there from the earliest period of exploration.

Administration. — Of the British possessions among the islands of the Pacific, Fiji is a colony, and its governor is also high commis- sioner for the western Pacific. In this capacity, assisted by deputies and resident commissioners, he exercises jurisdiction over all the islands except Fiji and those islands which are attached to New Zealand and New South Wales. Some of the islands (e.g. Tonga) are native states under British protection. Pitcairn, in accordance

with its peculiar conditions of settlement, has a peculiar system of local government. The New Hebrides are under a mixed British and French commission. The Hawaiian Islands forma territory of the United States of America and are administered as such ; Guam is a naval station, as is Tutuila of the Samoan Islands, where the com- mandant exercises the functions of governor. New Caledonia is a French colony under a governor; the more easterly French islands are grouped together under the title of the French Establishments in Oceania, and are administered by a governor, privy council, administrative council, &c, Papeete in Tahiti being the capital. The seat of government of the German protectorate of Kaiser Wilhelm's Land (New Guinea) is Herbertshohe in the Bismarck Archipelago. The administrative area includes the German Solomon Islands and the Caroline, Pelew and Mariana Islands, which are divided into three administrative groups — the eastern Carolines, western Carolines and Marianas. The Marshall Islands form a " district " (Bezirk) within the same administrative area. The German Samoan Islands are under an imperial governor.

Races. — In the oceanic islands of the Pacific three different peoples occur, who have been called Melanesians, Polynesians and Micros

nesians. 1 These form themselves naturally into two broad but very distinct divisions — the dark and brown races; the first division being represented by the Melanesians, and the Polynesians and Micronesians together forming the second. The Melanesians, sometimes called Papuans {q.v,, the Malay name for the natives of New Guinea, the headquarters of the race), are physically negroid in type, nearly black, with crisp curly hair, flat noses and thick lips. In all essentials they agree with the African type: such variations as there are, for example, the more developed eyebrow ridges, narrower, often prominent nose, and somewhat higher narrower skull, obviously owing their existence to crossing with the Malay or the Polynesian races. The oceanic black peoples must thus be regarded as having a connexion more or less remote with the African negroes. Whether the two families have a common ancestor in the negritos of Malaysia and the Indian archipelago, or whether Papuan and Negrito are alike branches of an aboriginal African race, is a problem yet to be solved. But if their origin is unknown, there is little doubt that the Melanesians were the earliest occupants of the oceanic world, possibly reaching it from Malaysia. They undoubtedly constitute the oldest ethnic stock sometimes modified on the spot by crossings with migratory peoples (Malays, Poly- nesians); sometimes, as in the eastern Pacific, giving way entirely before the invaders. The traditions of many of the Polynesian islanders refer to a black indigenous race which occupied their islands when their ancestors arrived, and the black woolly-haired Papuan type is not only found to-day in Melanesia proper, but traces of it occur throughout Polynesia and Micronesia. That the oceanic blacks form one family there can be no doubt, and it is evidence of the immensely remote date at which their dispersion began that they have a multitude of languages often unintelligible except locally, and an extraordinary variety of insular customs : differentia- tions which must have needed centuries to be effected. Furthermore the Rev. R. H. Codrington (Melanesian Languages) has adduced evidence to prove that Melanesia is the most primitive form of the oceanic stock-language, and that both Malays and Polynesians speak later dialects of this archaic form of speech. The Melanesians then, must be regarded as the aborigines of Oceania. How they came to occupy the region it is impossible to say. Evidence exists as to the migrations of the brown races; but there is nothing to explain how the blacks came to inhabit the isolated Pacific islands. In this connexion it is a curious fact, and one which deepens the mystery, that, unlike the Polynesian peoples, who are all born sailors, the blacks are singularly unskilful seamen.

The second ethnic division, the Polynesian-Micronesian races, represents a far later migration and occupation of the Pacific islands.

It has been urged that these brown peoples sprang from one stock with the Malays and the Malagasy of Madagascar; and that they represent this parent stock better than the Malays who have been much modified by crossings. But linguistic and physical evidence are against this theory. It is practically certain that the Poly- nesians at least are an older race than the Malays and their sub- families. The view which has received most general acceptance is that they represent a branch of the Caucasic division of mankind who migrated at a remote period possibly in Neolithic times from the Asiatic mainland travelling by way of the Malay Archipelago and gradually colonizing the eastern Pacific. The Polynesians, who, as represented by such groups as the Samoans and Marquesas islanders, are the physical equal of Europeans, are of a light brown colour, tall, well-proportioned, with regular and often beautiful features. Such an explanation of the Polynesian's origin does not preclude a relation-ship with the Malays. It is most probable that the two stocks have Asiatic ancestors in common, though the Polynesians remain to- day, what they must have always been in remote times, a distinct race. Of their sub-division, the Micronesians, the same cannot be said. They are undoubtedly a very hybrid race, owing this charac- teristic to their geographical position in the area where the dominat- ing races of the Pacific, Malays, Polynesians, Melanesians, Japanese

1 From these the three main divisions of the islands are named Polynesia, Melanesia, Micronesia (q.v.).

and Chinese, may be said to converge. Careful investigations have supported the theory that Micronesia was peopled largely from the Philippines or some portion of the Malay Archipelago at a much later period than the Polynesian migration. The Micronesians then are probably of Malay stock much modified by early Poly- nesian crossings, and probably, within historic times, by Papuan and even Japanese and Chinese migrations. While their general physique approximates to the Polynesian type, they are often characterized by a stunted form and a dark complexion.

In this review of the inhabitants of the Pacific islands an imaginary ethnological line has been drawn round it so as to include none but the branches of the two great divisions. But on the borders of the region, often without real boundary lines, are grouped other peoples, the true Malays, the Indonesians or pre-Malays with the Negritos to

the westward and the Australians, who are generally admitted to be a distinct race. Of these races detailed information will be found under their several headings.

Prehistoric Remains. — One of the most obscure questions with which the ethnologist has to deal is that of the prehistoric remains which occur in different and widely separated parts of the oceanic region. The most remarkable of these are on Easter Island, where immense platforms built of dressed stone without mortar are found, together with stone images. Similar remains have been found on Pitcairn Island. Cn the island of Tongatabu in the Tonga group, there is a monument of great stone blocks which must have been brought thither by sea. In some of the Caroline Islands, again, there are extensive remains of stone buildings, and in the Marianas stone monuments occur. No native traditions assign origin to these remains, nor has any complete explanation of their existence been offered.

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PACK, OTTO VON (c. 1480-1537), German conspirator, studied at the university of Leipzig, and obtained a responsible position under George, duke of Saxony, which he lost owing to his dishonesty. In 1528 he revealed to Philip, landgrave of Hesse, the details of a scheme agreed upon in Breslau by the archduke Ferdinand, afterwards the emperor Ferdinand I., and other influential princes, to conquer Hungary for Ferdinand and then to attack the reformers in Germany. Pack was sent

to Hungary to concert joint measures with John Zapolya, the opponent of Ferdinand in that country; but John, elector of Saxony, advised that the associates of Ferdinand should be asked to explain their conduct, and Pack's revelations were discovered to be false, the copy of the treaty which he had shown to Philip proving to be a forgery. For some time Pack lived the life of a fugitive, finally reaching the Netherlands, where he was seized at the request of Duke George. Examined under torture he admitted the forgery, and the government of the Netherlands passed sentence of death, which was carried out on the 8th of February 153 7. This affair has given rise to an acute controversy as to whether Philip of Hesse was himself deceived by Pack, or was. his assistant in concocting the scheme. See W. Schomburgk, Die Packschen Handel (Leipzig, 1882) ; H. Schwarz, Landgraf Philipp von Hessen und die Packschen Handel (Leipzig,

1881) ; St Ehses, Geschichte der Packschen Handel (Freiburg, 1 881) and Landgraf Philipp von Hessen und Otto von Pack (Freiburg, 1886); and L. von Ranke, Deutsche Geschichte im Zeitalter der Reformation (Leipzig, 1882).

PACK (apparently from the root pak-, paq-, seen in Lat. pangere, to fasten; cf. " compact "), primarily a bundle or parcel of goods securely wrapped and fastened for transport. The word, in this sense, is chiefly used of the bundles carried by pedlars. It was in early use, according to the New English Dictionary, in the wool trade, and may have been introduced from the Netherlands. As a measure of weight or quantity the term has been in use, chiefly locally, for various commodities, e.g. of wool, 240 lb, of gold-leaf 20 books of 25 leaves each. In a transferred sense, a " pack " is a collection or gathering of persons, animals or things; and the verb means generally to gather together in a compact body. " Pack-ice " is the floating ice which covers wide areas in the polar seas, broken into large pieces which are driven (packed) together by wind and current so as to form practically a continuous sheet. " Packet," a small parcel, a diminutive of " pack," was first confined in meaning to a parcel of despatches carried by a post, especially the state despatches or "mail"; and "packet" properly " packet-boat," was the name given to the vessels which carried these state despatches.

PACKER, ASA (1805-1879), American capitalist, was born in Mystic, Connecticut, on the 29th of December 1805. In 1822 he became a carpenter's apprentice at Brooklyn, Susquehanna county, Pennsylvania. He worked as a carpenter in New York City for a time and then in Springville, Pennsylvania, but in 1833 settled at Mauch Chunk, in the Lehigh Valley, where he became the owner of a canal-boat (carrying coal to Philadelphia), and then established the firm of A. & R. W. Packer, which built canal-boats and locks for the Lehigh Coal & Navigation Company, probably the first through shippers to New York. He urged upon the Coal & Navigation Company the advantage of a steam railway as a coal carrier, but the project was not then considered feasible. In 1851 the majority of the stock of the Delaware, Lehigh, Schuylkill & Susquehanna Railroad Company (incorporated in 1846), which became the Lehigh Valley Railroad Company in January 1853, came into his control, and between November 1852 and September 1855 a railway line was built for the Company, largely by Packer's personal credit, from Mauch Chunk to Easton. He built railways connecting the main line with coal-mines in Luzerne and Schuylkill counties; and he planned and built the extension (completed in 1868) of the line into the Susquehanna Valley and thence into New York state to connect at Waverly with the Erie

railway. Packer also took an active part in politics. In 1841 and 1842 he was a member of the Pennsylvania House of Representatives; in 1843-1848 was county judge of Carbon county; in 1853-1857 was a Democratic member of the national House of Representatives; and in 1869 was the Democratic candidate for the governorship of Pennsylvania. In 1865 he gave $500,000 and 60 acres (after- wards increased to 115 acres) in South Bethlehem, Pennsylvania, for a technical school for the professions represented in the development of the Lehigh Valley; Lehigh University was chartered in 1866, and its main building, Packer Hall, was completed in 1869; he erected a library building in 1877 as a

memorial to his daughter, Mrs Lucy Packer Linderman; and his will bequeathed $1,500,000 as an endowment for the univer- sity and $500,000 to the university library, and gave the univer- sity an interest (nearly one third) in his estate when finally distributed. He died in Philadelphia on the 17th of May 1879. The Packer Memorial Church (Protestant Episcopal) on the Lehigh University campus, given by his daughter, Mrs Mary Packer Cummings, was dedicated on the 13th of October 1887. PACORUS, a Parthian name, borne by two Parthian princes.

1. Pacorus, son of Orodes I., was, after the battle of Carrhae, sent by his father into Syria at the head of an army in 52 B.C. The prince was still very young, and the real leader was Osaces. He was defeated and killed by C. Cassius, and soon after Pacorus was recalled by his father, because one of the satraps had rebelled and proclaimed him king (Dio Cass. xl. 28 sqq.; Justin xlii. 4; cf. Cicero, ad Fam. xv. 1; ad Att. vi. 1. 14). Father and son were reconciled, but the war against the Romans was always deferred. In the autumn of 45 Pacorus and the Arabic chieftain Alchaudonius came to the help of Q. Caecilius Bassus, who had rebelled against Caesar in Syria; but Pacorus soon returned, as his troops were unable to operate in the winter (Cic. ad Att. xiv. 9. 3; Dio Cass, xlvii. 27). At last in 40 B.C. the Roman fugitive Titus Labienus induced Orodes to send a great army under the command of Pacorus against the Roman provinces. Pacorus conquered the whole of Syria and Phoenicia with the exception of Tyre, and invaded Palestine, where he plundered Jerusalem, deposed Hyrcanus, and made his nephew Antigonus king (Dio Cass, xlviii. 24 sqq. ; Joseph. Ant. xiv. 13 ; Tac. Hist. v. 9). Mean- while Labienus occupied Cilicia and the southern parts of Asia Minor down to the Carian coast (Dio Cass,

xlviii. 26; Strabo xiv. 660). But in 39 P. Ventidius Bassus, the general of Mark Antony, drove him back into Cilicia, where he was killed, defeated the Parthians in Syria (Dio Cass, xlviii. 39 sqq.) and at last beat Pacorus at Gindarus (in northern Syria), on the 9th of June 38, the anniversary of the battle of Carrhae. Pacorus himself was slain in the battle, which effectually stopped the Parthian conquests west of the Euphrates (Dio Cass. xlix. 19 seq.; Justin xlii. 4; Plut. Anton. 24; Strabo xvi. 751; Velleius ii. 78; cf. Horace, Od. iii. 6, 9).

2. Pacorus, Parthian king, only mentioned by Dio Cass, lxviii. 17; Arrian, ap. Suid. s.v. u>vryri\, according to whom he sold the kingdom of Osroene :o Abgar VII. ; and Ammianus Marcellinus xxiii. 6. 23, who mentions that he enlarged Ctesiphon and built its walls. But from his numerous dated coins we learn that he was on the throne, with interruptions, from a.d. 78-95. He always calls himself Arsaces Pacorus. This mention of his proper name, together with the royal name Arsaces, shows that his kingdom was disputed by rivals. Two of them we know from coins— Vologaeses II., who appears from 77-79 and again from 111-146, and Artabanus III. in 80 and 81. Pacorus may have died about 105; he was succeeded by his brother Osroes. (Ed. M.)

PACUVIUS, MARCUS (c. 220-130 B.C.), Roman tragic poet, was the nephew and pupil of Ennius, by whom Roman tragedy was first raised to a position of influence and dignity. In the interval between the death of Ennius (169) and the advent of Accius, the youngest and most productive of the tragic poets, he alone maintained the continuity of the serious drama, and perpetuated the character first imparted to it by Ennius. Like Ennius he probably belonged to an Oscan stock, and was born at Brundusium, which had become a Roman colony in 244. Hence he never attained to that perfect idiomatic purity of style, which was the special glory of the early writers of comedy, Naevius and Plautus. Pacuvius obtained distinction also as a painter; and the elder Pliny (Nat. Hist. xxxv. 19) mentions a work of his in the temple of Hercules in the Forum boarium. He was less productive as a poet than either Ennius or Accius; and we hear of only about twelve of his plays, founded on Greek subjects (among them the Antiope, Teucer, Armorum Judicium, Dulorestes, Chryses, Niptra, &c, most of them on subjects con- nected with the Trojan cycle), and one praetexta (Paulus) written in connexion with the victory of Lucius Aemilius Paulus at Pydna

(168), as the Clastidium of Naevius and the Ambracia of Ennius were written in commemoration of great military successes. He continued to write tragedies till the age of eighty, when he exhibited a play in

the same year as Accius, who was then thirty years of age. He retired to Tarentum for the last years of his life, and a story is told by Gellius (xiii. 2) of his being visited there by Accius on his way to Asia, who read his Atreus to him. The story is probably, like that of the visit of the young Terence to the veteran Caecilius, due to the invention of later gram- marians; but it is invented in accordance wtih the traditionary criticism (Horace, Epp. ii. 1. 54-55) of the distinction between the two poets, the older being characterized rather by cultivated accomplishment (doctus), the younger by vigour and animation (altus). Pacuvius's epitaph, said to have been composed by himself, is quoted by Aulus Gellius (i. 24), with a tribute of admiration to its " modesty, simplicity and fine serious spirit ": Adulescens, tam etsi properas, te hoc saxum rogat Ut sese aspicias, deinde quod scriptum 'st legas. Hie sunt poetae Pacuvi Marci sita Ossa. Hoc volebam nescius ne esses. Vale.

Cicero, who frequently quotes from him with great admiration, appears (De Optimo genere oratorum, i.) to rank him first among the Roman tragic poets, as Ennius among the epic, and Caecilius among the comic poets.

The fragments of Pacuvius quoted by Cicero in illustration or enforcement of his own ethical teaching appeal, by the forti- tude, dignity, and magnanimity of the sentiment expressed in them, to what was noblest in the Roman temperament. They are inspired also by a fervid and steadfast glow of spirit and reveal a gentleness and humanity of sentiment blended with the severe gravity of the original Roman character. So far too as the Romans were capable of taking interest in speculative questions, the tragic poets contributed to stimulate curiosity on such subjects, and they anticipated Lucretius in using the conclusions of speculative philosophy as well as of common sense to assail some of the prevailing forms of superstition. Among the passages quoted from Pacuvius are several which indicate a taste both for physical and ethical speculation, and others which expose the pretensions of religious imposture. These poets aided also in developing that capacity which the Roman language subsequently displayed of being an organ of oratory, history and moral disquisition. The literary language of Rome was in process of formation during the 2nd century B.C., and it was in the latter part of this century that the series of great Roman orators, with whose spirit Roman tragedy has a strong affinity, begins. But the new creative effort in language was accompanied by considerable crudeness of execution, and the novel word-formations and varieties of inflexion introduced by Pacuvius exposed him to the ridicule of the satirist Lucilius, and, long afterwards, to that of his imitator Persius. But, notwith- standing the attempt to introduce an alien element into the Roman language, which proved incompatible with its natural genius, and his own failure to attain the idiomatic purity of Naevius, Plautus or Terence, the fragments of his dramas are sufficient to prove the service which he rendered to the formation of the literary language of Rome as well as to the culture and character of his contemporaries.

Fragments in O. Ribbeck, Fragmenta scaenicae romanorum poesis (1897), vol. i. ; see also his Romische Tragodie (1875) ; L. Miiller, De Pacuvii fabulis (1889) ; W. S. Teuffel, Caecilius Statius, Pacuvius, A.ttius, Afranius (1858); and Mommsen, History of Rome, bk. iv. ch. 13.

PAD. (1) Probably from the same root as ” pod,” the husk or seed-covering in certain plants, a term used in various con- nexions, the

sense being derived from that of a soft cushion, or cushion-like combination used either for protective purposes or as stuffing or stiffening. In zoology, it is particularly used of the fleshy elastic protuberances on the sole of the foot of many animals such as the cat and dog, the camel, &c. ; and of the similar cushion beneath the toes of a bird's foot or of the tarsal cushion of an insect. In sporting phraseology the whole paw of a fox or other beast of chase is called the " pad." A special technical use, somewhat difficult to connect with the above meanings, is

for the socket of a brace or for the handle of such tools as a key- hole saw. (2) The canting word " pad," now surviving in such words as " footpad," a highway robber, or " pad horse," a roadster riding-horse with an easy action, is the same as " path," adapted directly from the Low Ger. form pad, a track or road. (3) There is an old English dialect word for a frog (Scottish and North) or a toad, more familiar in the diminutive " paddock " (cf. Hamlet, iii. 4, 189; Macbeth, i. 1, 9). This is found in many Teutonic languages, cf. Dan. padde, Du. pad, &c. The diminu- tive is to be distinguished from " paddock," a small enclosed plot of pasture land, an altered form of " parrock," 0. Eng. pearroc. (See Park.)

PADDING, the term in textile manufacture used for the stiffening of various garments. The most useful and flexible material for this purpose is hair cloth, but this is too expensive to be used for the padding of cheap clothing. Hence many kinds of fibrous material are employed for the same purpose. Hair, cotton, flax, tow, jute and paper are used, alone and in com- bination. The fabrics are first woven, and then starched to obtain the necessary degree of stiffness and flexibility.

PADDINGTON, a municipality of Cumberland county, New South Wales, Australia, 3 m. S.E. of and suburban to Sydney. It is a busy industrial suburb, devoted to brewing, tanning, soap-boiling and various other manufactures. The town hall is one of the finest in the colony, and there is an excellent free library. Paddington returns one member to parliament. Pop.

(1901), 22,034.

PADDINGTON, a north-western metropolitan borough of London,

England, bounded E. by Hampstead and Marylebone, S. by the city of Westminster, and W. by Kensington, and extending N. to the boundary of the county of London. Pop. (1901), 143,976. The best houses are found in the streets and squares of Bayswater, in the south-west, neighbouring to Kensington Gardens (a small part of which is in the borough) and to Hyde Park, farther east, while in the north-east are broad avenues and ” mansions ” of residential flats. Bayswater Road, skirting the park and gardens, forms part of the southern boundary of the borough; Edgware Road forms the eastern; from this Harrow Road branches north-west, Bishop’s Road and Westbourne Grove form a thoroughfare westward, and Queen’s Road, Bayswater, leads south from there to Bayswater Road. The name of Paddington finds no place in Domesday — it may have been included in the manor of Tyburn — and the land belonged to the Abbey of Westminster at an early date. It was granted to the see of London by Edward VI. In the 18th century the picturesque rural scenery attracted artists, and even in the middle of the 19th the open country was reached within the confines of the present borough, which now contains no traces of antiquity. Bayswater is said to take its name from Baynard, a Norman, who after the Conquest held land here and had a castle by the Thames not far above the Tower of London, whence a ward of the city is called Castle Baynard. Many springs flowed forth here; the stream called Westbourne was near at hand, and water was formerly supplied hence to London. In the borough are the Paddington and the Queen’s Park technical institutes; St. Mary’s Hospital, Praed Street, with medical school; and Paddington Green children’s hospital. The terminus of the Great Western railway, facing Praed Street, is called Paddington Station. The parliamentary borough of Paddington has north and south divisions, each returning one member. The borough council consists of a mayor, 10 aldermen and 60 councillors. Area, 1356-1 acres.

PADDLE. (1) A verb, meaning to splash, dabble or play about in water with the feet or hands. (2) A species of oar, with a broad flat blade and short handle, used without a rowlock for propelling canoes or other lightly-built craft (see Canoe). (3) A small spade-like implement, apparently first used to clear a ploughshare from clods of earth. The verb seems to be a frequentative form of ” pad,” to walk, cognate with ” path,” or of “pat,” to strike gently, an onomatopoeic word; it may have been influenced by the Fr. patrouiller, in much the same sense. The verb may have given rise to “paddle,” an oar, an easy transition

in sense; but the New English Dictionary identifies this with the word for a small spade, which occurs earlier than the verb, and seems to have no connexion in sense with it. The implement was known in the

17th and 18th centuries also as ” spaddle,” a diminutive of ” spade,” but ” paddle ” occurs in this sense as early as 1407. The term ” paddle ” has been applied to many objects and implements resembling the oar in its broad-bladed end: e.g. a shovel used in mixing materials in glass-making, in brick-making, &c, and also to the float-boards in the paddle-wheel of a steamboat or the wheel of a water- mill.

PADERBORN (Lat. Paderae Fontes, i.e. the springs of the Pader), a town and episcopal see of Germany, in the Prussian province of Westphalia, 63 m. N.E. from Dortmund on the railway to Berlin via Altenbeken. Pop. (1903), 26,468, of whom about 80% are Roman Catholics. It derives its name from the springs of the Pader, a small affluent of the Lippe, which rise in the town under the cathedral to the number of nearly 200, and with such force as to drive several mills within a few yards of their source. A large part of the town has been rebuilt since a great fire of 1875. The most prominent of half-a-dozen churches is the Roman Catholic cathedral, the western part of which dates from the nth, the central part from the 12th, and the eastern part from the 13th century; it was restored in 1 89 1- 1 893. Among other treasures it contains the silver coffin of St Liborius, a substitute for one which was coined into dollars in 1622 by Christian of Brunswick, the celebrated freebooter. The chapel of St Bartholomew, although externally insignificant, dates from the earlier part of the nth century, and is counted among the most interesting buildings in Westphalia; it was restored in 1852. The Jesuit church and the Protestant Abding- hofkirche are also interesting. The town hall is a picturesque edifice of the 13th century; it was partly rebuilt in the 16th, and was restored in the 19th century. Paderborn formerly possessed a university, founded in 1614, with faculties of theology and philosophy, but this was closed in 1819. The manufactures of the town include railway plant, glass, soap, tobacco and beer; and there is a trade in grain, cattle, fruit and wool.

Paderborn owes its early development to Charlemagne, who held a diet here in 777 and made it the seat of a bishop a few years later. The Saxon emperors also held diets in the city, which about the year 1000 was surrounded with walls. It joined the Hanseatic League, obtained many of the privileges of a free Imperial town, and endeavoured to assert its independence of the bishop. The citizens gladly accepted the reformed doctrines, but the supremacy of the older faith was restored in 1604 by Bishop Theodore von Fiirstenberg, who forcibly took possession of the city. It underwent the same fate at the hands of Chris- tian of Brunswick during the Thirty Years’ War. The bishopric of Paderborn formed part of the arch-diocese of Mainz, and its bishop became a prince of the empire about noo. Some of the bishops were

men of great activity, and the bishopric attained a certain measure of importance in North Germany, in spite of ravages during the Thirty Years' War and the Seven Years' War. It was secularized in 1803 and was given to Prussia, and after losing it for a few years that country regained it by the settlement of 1815. The last bishop was Franz Egon von Fiirstenberg (d. 1825). The bishopric had an area of nearly 1000 sq. m. and a population of about 100,000. A new bishopric of Paderborn, with ecclesiastical authority only, was established in 182 1.

See W. Richter, Geschichte ier Stadt Paderborn (Paderborn, 1 899-1903); A. Hiibinger, Die Verfassung der Stadt Paderborn im Mittelaller (Miinster, 1899) ; and J. Freisen, Die Universitdt Paderborn (Paderborn, 1898). For the history of the bishopric see W. F. Giefers, Die Anfdnge des Bistums Paderborn (Paderborn, i860) ; L. A. T. Holscher, Die altere Diozese Paderborn (Paderborn, 1886); the Urkunden des Bistums Paderborn, edited by R. Wilmans (Miinster 1874-1880); and W. Richter, Studien und Quellen zur Paderborner Geschichte (Paderborn, 1893),

PADEREWSKI, IGNACE JAN (i860-), Polish pianist and composer, was born in Podolia, a province of Russian Poland. He studied music chiefly at Warsaw, Berlin and

Vienna, where he was a pupil of Theodor Leschetizky (b. 1830), the pianist and composer. He made his first public appearance in Vienna in 1887, in Paris in 1889, and in London in 1890, his brilliant playing created a furore which went to almost extrava- gant lengths of admiration; and his triumphs were repeated in America in 1891. His name at once became synonymous with the highest pitch of pianoforte playing, and society was at his feet. In 1899 he married Baroness de Rosen, and after 1900 he appeared but little in public; but he became better known as a composer, chiefly of pieces for his own instrument. In 1901 his opera Manru was performed at Dresden.

PADIHAM, an urban district in the Clitheroe parliamentary division of Lancashire, England, 3 m. W. by N. of Burnley by the Lancashire and Yorkshire railway. Pop. (1901), 12,205. It lies in a wild and dreary district on the precipitous banks of the Calder. It possesses large cotton mills, and quarries and coal- mines are worked in the immediate neighbourhood. The church of St Leonard, founded before

1451, was frequently altered before it was rebuilt in 1 866-1 868 in the Perpendicular style. Padiham in 1251 was a manor in the possession of Edmund de Lacy.

PADILLA, JUAN LOPEZ DE, insurrectionary leader in the ” guerra de las comunidades ” in which the commons of Castile made a futile stand against the arbitrary policy of Charles V. and his Flemish ministers, was the eldest son of the commendator of Castile, and was born in Toledo towards the close of the 15th century. After the cities, by their deputies assembled at Avila, had vainly demanded the king’s return, due regard for the rights of the cortes, and economical administration, to be entrusted to the hands of Spaniards, it was resolved to resort to force, and the ” holy junta ” was formed, with Padilla at its head. An attempt was first made to establish a national government in the name of the imbecile Joanna, who was then residing at Tordesillas; with this view they took possession of her person, seized upon the treasury books, archives, and seals of the kingdom, and stripped Adrian of his regency. But the junta soon alienated the nobility by the boldness with which it asserted democracy and total abolition of privilege, while it courted defeat in the field by appointing to the supreme command of its forces not Padilla but Don Pedro de Giron, who had no recommendation but his high birth. After the army of the nobility had recaptured Tordesillas, Padilla did something to retrieve the loss by taking Torrelobaton and some other towns. But the junta, which was not fully in accord with its ablest leader, neutralized this advantage by granting an armistice; when hostilities were resumed the commons were completely defeated near Villalar (April 23, 1521), and Padilla, who had been taken prisoner, was publicly executed on the following day. His wife, Dona Maria Pacheco de Padilla, bravely defended Toledo against the royal troops for six months afterwards, but ultimately was compelled to take refuge in Portugal.

See Sandoval, Historia de Carlos V. (Pamplona, 1681); E. Arm- strong, The Empew Charles V. (1902); A. Rodriquez Villa, Juana la Loca (Madrid, 1892) ; and Pero Mejia, Comunidades de Castilla, in the Biblioteca de autores espanoles of Rivadeneyra, vol. xxi.

PADISHAH, the Turkish form of the Persian padshah, a title — equivalent to ” lord king ” — of the reigning sovereign. Though strictly applied in the East to the shahs of Persia, it was also used of the Great Moguls or Tatar emperors of Delhi, and hence it is now used by the natives of British India of the British sovereign as emperor of India. In Europe it is applied to the sultan of Turkey. The Persian padshah is from pati, lord, master, and shah, king. It is now generally

considered to have no etymological connexion with ” pasha ” (q.v.).

PADSTOW, a small seaport and market town in the St Austell parliamentary division of Cornwall, England, on a branch of the London & South Western railway. Pop. of urban district (1901), 1566. It lies near the north coast, on the west shore, and 2 m. from the mouth of the estuary of the river Camel, a picturesque inlet which from Padstow Bay penetrates 6 m. into the land. The church of St Petrock, with a massive roodstone in the churchyard, is mainly Perpendicular, with an Early

English tower. Within are an ancient font, a canopied piscina, and a fine timber roof over the nave and aisles. Other interest- ing churches in the locality are those of St Petrock Minor, St Minver, St Michael, St Constantine, and, most remarkable of all, St Enodock’s. This building, erected in the 15th century amid the barren dunes bordering the east shore of the estuary near its mouth, in place of a more ancient oratory, was long buried beneath drifts of sand. From a little distance only the weather-beaten spire can be seen. A Norman font remains from the older foundation. A monastery formerly stood on the high ground west of Padstow, and according to tradition was founded by St Petrock in the 6th and razed by the Danes in the 10th century. Its site is occupied by Prideaux Place, an Elizabethan mansion, which contains among other valuable pictures Van Dyck’s portrait of Queen Henrietta Maria. Pentine Point shelters Padstow Bay on the north-east, but the approach to the estuary is dangerous during north-westerly gales. Pad- stow, nevertheless, is a valuable harbour of refuge, although the river channel is narrow and much silted. Dredging, however, is prosecuted, the sand being sent inland, being useful as a manure through the carbonate of lime with which it is impreg- nated. The Padstow Harbour Association (1829) is devoted to the rescue of ships in distress, making no claims for salvage beyond the sums necessary for its maintenance. Padstow has fisheries and shipyards and some agricultural trade.

Padstow (Aldestowe 1273, Patrikstowe 1326, Patrestowe 1346) and St Ives are the only two tolerably safe harbours on the north coast of Cornwall. To this circumstance they both owed their selection for early settlement. St Petrock, who has been called the patron saint of Cornwall, is said to have landed here and also to have died here in the 6th century. At the time of the Domesday survey Bodmin, which treasured the saint’s remains, had become the chief centre of religious influence. Padstow is not mentioned in that record. It was included in the bishop of Exeter’s manor of Pawton, which had been annexed to the see of Crediton upon its formation by Edward the Elder in 909.

Padstow was plundered by the Danes in 981. Until then it is said to have possessed a monastery, which thereupon was transferred to Bodmin. Two manors of Padstow are mentioned later — the prior of Bodmin's manor, which included the rectory, and a manor which passed from the Bonvilles to the Greys, marquesses of Dorset, both of which were eventually acquired by the family of Prideaux. From the letters patent addressed to the bailiffs of Padstow demanding the survey and delivery of ships for foreign service, the appointment of a king's butler for the port, and the frequent recourse which was had to the king's courts for the settlement of disputes of shipping, Padstow appears to have been a port of considerable repute in the r4th century. Its affairs were entrusted to a reeve or bailiff acting in conjunction with the principal men of the town. In 1540 Leland, without sufficient reason, credits Athelstan with the bestowal of such privileges as it then enjoyed, and describes it as a parish full of fishermen and Irishmen. Forty years later Norden describes it as an incorporation and market town. Carew in 1602 states that it had lately purchased a corporation and derived great profit from its trade with Ireland. Some steps towards incorporation were doubtless taken, but it is remarkable that no traces of its municipal character are discoverable in any subsequent records. A prescriptive market is held on Saturdays; two fairs of like nature have disappeared.

PADUA (Lat. Patavium ; Ital. Padova), a city of northern Italy, on the river Bacchiglione, 25 rn. W. of Venice and 18 m. S.E. of Vicenza, with a population of 82,283. The city is picturesque, with arcaded streets, and many bridges crossing the various branches of the Bacchiglione, which once surrounded the ancient walls. The Palazzo della Ragione, with its great hall on the upper floor, is reputed to have the largest roof un- supported by columns in Europe; the hall is nearly rectangular, its length 267ˆ ft., its breadth 89 ft., and its height 78 ft.; the walls are covered with symbolical paintings in fresco ; the building stands upon arches, and the upper storey is surrounded by an open loggia, not unlike that which surrounds the basilica of

Vicenza; the Palazzo was begun in 1172 and finished in 1219; in 1306 Fra Giovanni, an Augustinian friar, covered the whole with one roof; originally there were three roofs, spanning the three chambers into which the hall was at first divided; the internal partition walls remained till the fire of 1420, when the Venetian architects who undertook the restoration removed them, throw- ing all three

compartments into one and forming the present great hall. In the Piazza dei Signori is the beautiful loggia called the Gran Guardia, begun in 1493 and finished in 1526, and close by is the Palazzo del Capitanio, the residence of the Venetian governors, with its great door, the work of Falconetto of Verona, 1532. The most famous of the Paduan churches is the basilica dedicated to Saint Anthony, commonly called II Santo ; the bones of the saint rest in a chapel richly ornamented with carved marbles, the work of various artists, among them of Sansovino and Falconetto; the basilica was begun about the year 1230 and completed in the following century; tradition says that the building was designed by Niccola Pisano; it is covered by seven cupolas, two of them pyramidal. On the piazza in front of the church is Donatello's magnificent equestrian statue of Erasmo da Narni, the Venetian general (1438-1441). The Eremitani is an Augustinian church of the 13th century, distinguished as containing the tombs of Jacopo (1324) and Ubertino (1345) da Carrara, lords of Padua, and for the chapel of SS James and Christopher, illustrated by Mantegna's frescoes. Close by the Eremitani is the small church of the Annunziata, known as the Madonna dell' Arena, whose inner walls are entirely covered with paintings by Giotto. Padua has long been famous for its university, founded by Frederick II. in 1238. Under the rule of Venice the university was governed by a board of three patricians, called the Riformatori dello Studio di Padova. The list of professors and alumni is long and illustrious, containing, among others, the names of Bembo, Sperone Speroni, Veselius, Acquapendente, Galileo, Pomponazzi, Pole, Scaliger, Tasso and Sobieski. The place of Padua in the history of art is nearly as important as its place in the history of learning. The presence of the university attracted many distinguished artists, as Giotto, Lippo Lippi and DonateOo; and for native art there was the school of Squarcione (1394-1474), whence issued the great Mantegna (1431-1506). The industry of Padua has greatly developed in modern times. Corn and saw mills, dis- tilleries, chemical factories, breweries, candle-works, ink-works, foundries, agricultural machine and automobile works, have been established and are flourishing. The trade of the district has grown to such an extent that Padua has become the central market for the whole of Venetia.

Padua claims to be the oldest city in north Italy; the inhabi- tants pretend to a fabulous descent from the Trojan Antenor, whose relics they recognized in a large stone sarcophagus ex- humed in the year 1274. Their real origin is involved in that obscurity which conceals the ethnography of the earliest settlers in the Venetian plain. Padua early became a populous and thriving city, thanks to its excellent breed of horses and the wool of its sheep. Its men fought for the

Romans at Cannae, and the city became so powerful that it was reported able to raise two hundred thousand fighting men. Abano in the neigh- bourhood was made illustrious by the birth of Livy, and Padua was the native place of Valerius Flaccus, Asconius Pedianus and Thrasea Paetus. Padua, in common with north-eastern Italy, suffered severely from the invasion of the Huns under Attila (452). It then passed under the Gothic kings Odoacer and Theodoric, but made submission to the Greeks in 540. The city was seized again by the Goths under Totila, and again restored to the Eastern Empire by Narses in 568. Following the course of events common to most cities of north-eastern Italy, the history of Padua falls under eight heads: (1) the Lombard rule, (2) the Frankish rule, (3) the period of the bishops, (4) the emergence of the commune, (5) the period of the despots, (6) the period of Venetian supremacy, (7) the period of Austrian supremacy, and finally (8) the period of united Italy. (1) Under the Lombards the city of Padua rose in revolt (601) against Agilulph, the Lombard king, and after suffering a long

and bloody siege was stormed and burned by him. The city did not easily recover from this blow, and Padua was still weak when the Franks succeeded the Lombards as masters of north Italy. (2) At the Diet of Aix-la-Chapelle (828) the duchy and march of Friuli, in which Padua lay, was divided into four counties, one of which took its title from that city. (3) During the period of episcopal supremacy Padua does not appear to have been either very important or very active. The general tendency of its policy throughout the war of investitures was Imperial and not Roman; and its bishops were, for the most part, Germans. (4) But under the surface two important movements were taking place. At the beginning of the nth century the citizens estab- lished a constitution, composed of a general council or legislative assembly and a credenza or executive; and during the next century they were engaged in wars with Venice and Vicenza for the right of water-way on the Bacchiglione and the Brenta— so that, on the one hand, the city grew in power and self- reliance, while, on the other, the great families of Camposam- piero, D'Este and Da Romano began to emerge and to divide the Paduan district between them. The citizens, in order to protect their liberties, were obliged to elect a podesta, and their choice fell first on one of the D'Este family (c. 1175). The temporary success of the Lombard league helped to strengthen the towns; but their ineradicable jealousy of one another soon reduced them to weakness again, so that in 1236 Frederick II. found little difficulty in establishing his vicar Ezzelino da Romano in Padua and the neighbouring cities, where he practised fright- ful cruelties on the inhabitants. When Ezzelino met his death, in 1259,

Padua enjoyed a brief period of rest and prosperity: the university flourished; the basilica of the saint was begun; the Paduans became masters of Vicenza. But this advance brought them into dangerous proximity to Can Grande della Scala, lord of Verona, to whom they had to yield in 1311. (5) As a reward for freeing the city from the Scalas, Jacopo da Carrara was elected lord of Padua in 13 18. From that date till 1405, with the exception of two years (1388-1390) when Gian Galeazzo Visconti held the town, nine members of the Carrara family succeeded one another as lords of the city. It was a long period of restlessness, for the Carraresi were constantly at war; they were finally extinguished between the growing power of the Visconti and of Venice. (6) Padua passed under Venetian rule in 1405, and so remained, with a brief interval during the wars of the League of Cambray, till the fall of the republic in 1797. The city was governed by two Venetian nobles, a podesta for civil and a captain for military affairs; each of these was elected for sixteen months. Under these governors the great and small councils continued to discharge municipal business and to administer the Paduan law, contained in the statutes of r276 and 1362. The treasury was managed by two chamber- lains; and every five years the Paduans sent one of their nobles to reside as nuncio in Venice, and to watch the interests of his native town. (7 and 8) After the fall of the Venetian republic the history of Padua follows the history of Venice during the periods of French and Austrian supremacy. In 1866 the battle of Koniggratz gave Italy the opportunity to shake off the last of the Austrian yoke, when Venetia, and with Venetia Padua, became part of the united Italian kingdom.

See ” Chronicon patavinum,” in L. A. Muratori’ sAntiquitates itali- cae medii aevi, vol. iv. (Milan, 1738);” Rolandinc “and ” Monaco padovano ” (Muratori’s Annali d’ Italia, vol. viii., Venice, 1790; Cor- tusiorum historia,” ibid. vol. xii. ; Gattari, ” Istoria padovana,” ibid, vol. xvii. ; Vergerius, ” Vitae carrariensium principum,” ibid. vol. xvi.) ; G. Verci, Storia della Marca Trevigiana (Venice, 1786); Abate G. Gennari, Annali di Padova (Padua) ; G. Cittadella, Storia della dotninazione carrarese (Padua, 1842); P. Litta, Famiglie celebri, s.v. ” Carraresi ” (1825-1835) ; C.Cantu, Illustrazione grande d—l Lombardo- Veneto (Milan, 1857); 6. Gonzati, La Basilica di Sant’ Antonio di Padova (Padua, 1853). (H. F. B.)

PADUCAH, a city and the county-seat of McCracken county, Kentucky, U.S.A., at the confluence of the Tennessee river with the Ohio, about 12 m. below the mouth of the Cumberland, and about 50 m. E. by N. of Cairo, Illinois. Pop. (1890), 12,70?; (1900), 1ˆ,44°) of whom 5814 were negroes and 516 were foreign- born; (1910 census) 22,760. It is

served by three branches of

the Illinois Central railroad by a branch of the Nashville Chatta- nooga & St Louis railway (of which it is the terminus), and by steamboat lines to Pittsburg, Louisville, St Louis, New Orleans, Nashville, Chattanooga, and other river ports. Paducah is in a rich agricultural region, and its wholesale trade is probably greater than that of any other city of the state except Louisville. Its trade is largely in groceries, whisky, tobacco, hardware, grain and live stock, vegetables and lumber. It is a large loose- leaf tobacco market, and is a headquarters for tow boats carrying coal down the Mississippi. The Illinois Central and the Nash- ville, Chattanooga & St Louis railways have repair shops here; and there are numerous manufactures, -the value of the factory products increasing from $2,976,931 in 1900 to $4,443,223 in 1905, or 49-3%. Paducah (said to have been named in honour of an Indian chief who lived in the vicinity and of whom there is a statue in the city) was settled in 182 1, was laid out in 1827, was incorporated as a town in 1830, and was chartered as a city in 1856. The city was occupied by General U. S. Grant the 5th of September 1861; on the 25th of March 1864 it was entered by a Confederate force under General Nathan B. Forrest, who, however, was unable to capture the fortifications and imme- diately withdrew.

7 PAEAN (Gr. Ihu&v, epic Ilatijwi'), in Homer (II. v. 401, 899), the physician of the gods. In other writers the word is a mere epithet of Apollo (q.v.) in his capacity as a god of healing (cf. laTpdfiavTLs ov \ios), but it is not known whether Paean was originally a separate deity or merely an aspect of Apollo. Homer leaves the question unanswered; Hesiod (cf. schol. Horn. Od. iv. 432) definitely separates the two, and in later poetry Paean is invoked independently as a health god. It is equally difficult to discover the relation between Paean or Paeon in the sense of " healer " and Paean in the sense of " song." Farnell refers to the ancient association between the healing craft and the sing- ing of spells, and says that it is impossible to decide which is the original sense. At all events the meaning of " healer " gradually gave place to that of " hymn," from the phrase 'I17 Ratals. Such songs were originally addressed to Apollo (cf. the Homeric Hymn to Apollo 272, and notes in ed. by Sikes and Allen), and afterwards to other gods, Dionysus, Helios, Asclepius. About the 4th century the paean became merely a formula of adulation; its object was either to implore protection against disease and misfortune, or to offer thanks

after such protection had been rendered. Its connexion with Apollo as the slayer of the python led to its association with battle and victory; hence it became the custom for a paean to be sung by an army on the march and before entering into battle, when a fleet left the harbour, and also after a victory had been won. The most famous paeans are those of Bacchylides (q.v.) and Pindar (q.v.). Paeans were sung at the festivals of Apollo (especially the Hyacinthia), at banquets, and later even at public funerals. In later times they were addressed not only to the gods, but to human beings. In this manner the Rhodians celebrated Ptolemy I. of Egypt, the Samians Lysander of Sparta, the Athenians Demetrius, the Delphians Craterus of Macedon. The word ” paean ” is now used in the sense of any song of joy or triumph.

See A. Fairbanks, ‘A Study of the Greek Paean,” No. xii. of Cornell Studies in Classical Philology (New York, 1900) ; L. R. Farnell, Cults of the Greek States.

PAELIGNI, a people of ancient Italy, first mentioned as a member of a confederacy which included the Marsi, Marrucini and Vestini (qq.v.), with which the Romans came into conflict in the second Samnite War, 325 B.C. (Liv. viii. 29). On the submission of the Samnites they all came into alliance with Rome in 305-302 B.C. (Liv. ix. 45, x. 3, and Diod. xx. 101), the Paelignians having fought hard (Diod. xx. 90) against even this degree of subjection. Each of them was an independent unit, and in none was there any town or community politically separate from the tribe as a whole. Thus the Vestini issued coins in the 3rd century; each of them appears in the list of the allies in the Social War (Appian, B.C. i. 39, with J. Beloch, Dcr ilalische Bund unter rbmisther Hegtmonie, p. 51). How purely Italic in sentiment these communities of the mountain country

remained appears from the choice of the mountain fortress of Corfinium as the rebel capital. It was renamed Vitellio, the Oscan form of Italia, a name which appears, written in Oscan alphabet, on the coins struck there in 90 B.C. (see R. S. Conway, The Italic Dialects, p. 216).

The inscriptions we possess are enough to show that the dialect spoken by these tribes was substantially the same from the northern boundary of the Frentani to some place in the upper Aternus valley not far from Amiternum (mod. Aquila), and that this dialect closely resembled the Oscan of Lucania and Samnium, though presenting some peculiarities of its own, which warrant, perhaps, the use of the name North Oscan. The clearest of these is the use of postpositions, as in Vestine Poimunie-n, ” in templo Pomonali “; pritrom-e, i.e. in

proximunt, ” on to what lies before you.” Others are the sibilation of consonantal i and the assibilation of di to some sound like that of English ,; (de- noted by 3 in the local variety of Latin alphabet), as in vidadu, ” viamdo,” i.e. “ad-viam”; Musesa = ~Lkt. Mussedia ; and the loss of d (in pronunciation) in the ablative, as in aetatu firata fertlid (i.e. aetate fertili finita) , where the contrast of the last with the other two forms shows that the d was an archaism still occasionally used in writing. The last sentence of the inter esting epitaph from which this phrase is taken may be quoted as a specimen of the dialect ; the stone was found in Pentima, the ancient Corfinium, and the very perfect style of the Latin alpha- bet in which it is written shows that it cannot well be earlier than the last century B.C.: ” Eite uus pritrome pacris, puus ecic lexe lifar,” ” ite vos porro pacati (cum bona pace), qui hoc scriptum (hbar, 3rd decl. neut.) legistis.” The form lexe (2nd plur. perf. indie.) is closely parallel to the inflection of the same person in Sanskrit and of quite unique linguistic interest.

The name Paezigni may belong to the NO-class of Ethnica (see Sabini), but the difference that it has no vowel before the suffix suggests that it may rather be parallel with the suffix of Lat. privignus. If it has any connexion with Lat. paelex, ” concubine,” it is conceivable that it meant ” half- breeds,” and was a name coined in contempt by the conquering Sabines, who turned the tonta Maronca into the community of the Marrucini (q.v.). But, when unsupported by direct evi- dence, even the most tempting etymology is an unsafe guide. For the history of the Paeligni after 90 B.C. see the references given in C. I. L. ix. 290 (Sulmo, esp. Ovid, e.g. Fasti, iv. 79, Amor. ii. 16; Florus ii. 9; Caes., B.C., i. 15) and 296 (Corfinium, e.g. Diod. Sic. xxxvii. 2, 4, Caes., B.C., i. 15). None of the Latin inscriptions of the district need be older than Sulla, but some of them both in language and script show the style of his period (e.g. 3087, 3137); and, on the other hand, as several of the native inscriptions, which are all in the Latin alphabet, show the normal letters of the Ciceronian period, there is little doubt that, for religious and private purposes at least, the Paelignian dialect lasted down to the middle of the 1st century

B.C.

Paelignian and this group of inscriptions generally form a most important link in the chain of the Italic dialects, as without them the transition from Oscan to Umbrian would be completely lost. The unique collection of inscriptions and antiquities of Pentima and the museum at Sulmona were both created by the late Professor Antonio de Nino, whose brilliant gifts and unsparing devotion to the antiquities of his native district rescued every single Paelignian

monument that we possess.

For further details and the text of the inscriptions, the place- names, &c.. see R. S. Conway, The Italic Dialects, pp. 235 sqq., and the earlier authorities there cited. (R. S. C.)

PAEONIA, in ancient geography, the land of the Paeonians, the boundaries of which, like the early history of its inhabitants, are very obscure. The Paeonians are regarded as descendants of the Phrygians of Asia Minor, large numbers of whom in early times crossed over to Europe. According to the national legend (Herodotus v. 16;, they were Teucrian colonists from Troy, and Homei (Iliad, ii. 848) speaks of Paeonians from the Axius fighting on the side of their Trojan kinsmen. Before the reign

of Darius Hystaspes, they had made their way as far east as Perinthus in Thrace on the Propontis. At one time all Mygdonia, together with Crestonlce, was subject to them. When Xerxes crossed Chalcidice on his way to Therma (Thessalonica) he is said to have marched ” through Paeonian territory.” They occupied the entire valley of the Axius (Vardar) as far inland as Stobi, the valleys to the east of it as far as the Strymon (Struma), and the country round Astibus and the river of the same name, with the water of which they anointed their kings. Emathia, the district between the Haliacmon (Bistritza) and Axius, was once called Paeonia; and Pieria and Pelagonia were inhabited by Paeonians. In consequence of the growth of Macedonian power, and under pressure from their Thracian neighbours, their territory was considerably diminished, and in historical times was limited to the N. of Macedonia from Illyria to the Strymon. The chief town and seat of the kings was Bylazora (Veles, Kuprolu on the Axius); in the Roman period, Stobi (Pusto- Gradsko). The Paeonians included several independent tribes, all later united under the rule of a single king. Little is known of their manners and customs. They adopted the cult of Dionysus, known amongst them as Dyalus or Dryalus, and Herodotus (iv. 33) mentions that the Thracian and Paeonian women offered sacrifice to Queen Artemis (probably Bendis). They worshipped the sun in the form of a small round disk fixed on the top of a pole. A passage in Athenaeus (ix. p. 398) seems to indicate the affinity of their language with Mysian. They drank barley beer and various decoctions made from plants and herbs. The country was rich in gold and a bituminous kind of wood (or stone, which burst into a blaze when in

contact with water) called otivos (or airivos). The women were famous for their industry. In this connexion Herodotus (v. 1 2) tells the story that Darius, having seen at Sardis a beautiful Paeonian woman carrying a pitcher on her head, leading a horse to drink, and spinning flax, all at the same time, inquired who she was. Having been informed that she was a Paeonian, he sent instructions to Megabyzus, commander in Thrace, to deport two tribes of the nation without delay to Asia. At the time of the Persian invasion, the Paeonians on the lower Strymon had lost, while those in the north maintained, their independence. They frequently made inroads into Macedonian territory, until they were finally subdued by Philip, who permitted them to retain their government by kings. The daughter of Audoleon, one of these kings, was the wife of Pyrrhus, king of Epirus, and Alexander the Great wished to bestow the hand of his sister Cynane upon Langarus, who had shown himself loyal to Philip. An inscription, discovered in 1877 at Olympia on the base of a statue, states that it was set up by the community of the Paeonians in honour of their king and founder “Dropion. Another king, whose name appears as Lyppeius on a fragment of an inscription found at Athens relating to a treaty of alliance is no doubt identical with the Lycceius or Lycpeius of Paeonian coins (see B. V. Head, Historia numorum, 1887, p. 207). In 280 the Gallic invaders under Brennus ravaged the land of the Paeonians, who, being further hard pressed by the Dardani, had no alternative but to join the Macedonians, whose downfall they shared. After the Roman conquest, Paeonia east and west of the Axius formed the second and third districts respectively of Macedonia (Livy xlv. 29). Under Diocletian Paeonia and Pelagonia formed a province called Macedonia secunda or salutaris, belonging to the prefecture of Illyricum .

See W. Tomaschek, ” Die alten Thraker ” in Sitzungsberichte der k. Akad. der Wissenschaften, xxviii. (Vienna, 1893); H. F. O. Abel, Makedonien vor Kbnig Philipp (Leipzig, 1847) ; C. O. Miiller, Dber die Wohnsitze, die Abstammung und die dltere Geschichte des makedonischen Volkes (Berlin, 1825); T. Desdevises-u-Dezert, Geographie ancienne de la Macidoine (Paris, 1863); see also Macedonia.

PAEONIUS, of Mende in Thrace, a Greek sculptor of the latter part of the 5th century. The statement of Pausanias that he executed one of the pediments of the temple of Zeus at Olympia is rejected by critics. But we possess an important work of Paeonius in the Victory found in the German excava- tions at Olympia, and set up, according to the most probable view, in memory of the battle of Sphacteria (see Greek Aet,

fig. 36). It bears the inscription ” Dedicated to Olympian Zeus by the Messenians and Naupactians as a tithe of the spoil of their enemies. Paeonius of Mende made the statue, and was a successful competitor in the construction of the gable-figures for the temple.” The gable figures last mentioned were doubt- less gilt victories of bronze which stood on the gable, not in it. Pausanias seems to have misunderstood the phrase as implying that Paeonius made one of the pedimental groups.

PAEON Y (botanically Paeonia; Nat. ord. Ranunculaceae q.v.) a genus of plants remarkable for their large and gorgeous flowers. There are two distinct sets, one the strong-growing herbaceous kind, with fleshy roots and annual stems, derived mainly from Paeonia albiflora and P. officinalis; the other called the tree paeony, stiff-growing plants with half-woody permanent stems, which have sprung from the Chinese P. Moutan.

The herbaceous paeonies usually grow from 2 to 3 ft. in height, and have large much-divided leaves, and ample flowers of varied and attractive colours, and of a globular form in the double varieties which are those most prized in gardens. They usually blossom in May and June, and as ornaments for large beds in pleasure grounds, and for the front parts of shrubberies, few flowers equal them in gorgeous effect. A good moist loamy soil suits them best, and a moderate supply of manure is beneficial. They are impatient of frequent transplantings or repeated divisions for purposes of propagation, but when necessary they may be multiplied by this means, early in autumn, care being taken that a sound bud is attached to each portion of the tuberous roots.

The older varieties of P. albiflora include Candida, festa, fragrans, Humei, Reevesii, rubescens, vestalis, Whilleyi, &c; those of P. officinalis embrace albicans, anemoniflora, Baxteri, blanda, rosea, Sabini, &c. The garden varieties of modern times are, however, still more beautiful, the flowers being in many instances delicately tinted with more than one colour, such as buff with bronzy centre, carmine with yellowish centre, rose with orange centre, white tinted with rose, &c.

The Siberian P. tenuifolia, with finely cut leaves and crimson flowers, is a graceful border plant, and its double-flowered variety is perhaps the most elegant of its race.

The Moutans or tree paeonies are remarkable for their sub- shrubby habit, forming vigorous plants sometimes attaining a height of 6 to 8

ft., and producing in May magnificent flowers which vary in colour from white to lilac, purple magenta, violet and rose. These are produced on the young shoots, which naturally bud forth early in the spring, and are in consequence liable in bleak localities, unless protected, to be cut off by spring frosts. They require to be thoroughly ripened in summer, and therefore a hot season and a dryish situation are desirable for their well-being; and they require perfect rest during winter. Small plants with a single stem, if well matured so as to ensure their blossoming, make very attractive plants when forced. They are increased by grafting in late summer or autumn on the roots of the herbaceous paeonies.

The yellow-flowered tree .paeony (P. lutea) was introduced from China in 1887, but is still very rare. There are hundreds of names given to the colour variations of both the herbacepus and tree paeonies, but as these have only a fleeting interest it is better to consult current catalogues for the latest types.

PAER, FERDINANDO (1771-1839), Italian musical composer, was born at Parma on the 1st of June 1771. He studied the theory of music under the violinist Ghiretti, a pupil of the Conservatoire della Pieta de' Turchini at Naples. His first opera, La Locanda de' vagebondi, was published when he was only sixteen; others rapidly followed, and his name was soon famous throughout Italy. In 1797 he went to Vienna, where his wife, the singer Riecardi, had obtained an engagement at the opera; here he produced a series of operas, including his La Camilla ossia il Solteraneo (1799) and his Achille (1801). In 1803 he was appointed composer to the court theatre at Dresden, where his wife was also engaged as a singer, and in 1804 the life appointment of H of kapellmeister was bestowed upon him by the elector. At Dresden he produced, inter alia, II Sargino (1803),

an opera which obtained a wide popularity, and Leonora (1804), based on the same story as Beethoven's Fidelio. In 1807 Napoleon while in Dresden took a- fancy to him, and took him with him to Warsaw and Paris at a salary ot 28,000 francs. In 181 2 he succeeded Spontini as conductor of the Italian opera in Paris. This post he retained at the Restoration, receiving also the posts of chamber composer to the king and conductor of the private orchestra of the duke of Orleans. In 1823 he retired from the Italian opera in favour of Rossini. In 183 1 he was elected a member of the Academy, and in

1832 was appointed conductor of his orchestra by King Louis Philippe. He died on the 3rd of May 1839.

Paer wrote in all 43 operas, in the Italian style of Paesiello and Cimarosa. His other works, which include nine religious compositions, “thirteen cantatas, and a short list of orchestral and chamber pieces, are of little importance; in any case the superficial quality of his compositions was such as to secure him popularity while he lived and after his death oblivion.

See R. Eitner, Quetten-Lexikon (Leipzig, 1902), vii. 277, sqq., where a list of his works is given.

PAESTUM (Gr. HoaeiSuvia; mod. Pesto), an ancient Greek city in Lucania, near the sea, with a railway station 24 m. S.E. of Salerno, 5 m. S. of the river Silarus (Salso) . It is said by Strabo (v. 251) to have been founded by Troezenian and Achaean colonists from the still older colony of Sybaris, on the Gulf of Tarentum; this probably happened not later than about 600 B.C. Herodotus (i. 167) speaks of it as being already a flourishing city in about 540 B.C., when the neighbouring city of Velia was founded. For many years the city maintained its independence, though surrounded by the hostile native inhabitants of Lucania. Autonomous coins were struck, of which many specimens now exist (see Numismatics). After long struggles the city fell into the hands of the Lucanians (who nevertheless did not expel the Greek colonists) and in 273 B.C. it became a Latin colony under the Roman rule, the name being changed to the Latin form Paestum. It successfully resisted the attacks of Hannibal; and it is noteworthy that it continued to strike copper coins even under Augustus and Tiberius. The neighbourhood was then healthy, highly cultivated, and celebrated for its flowers; the ” twice blooming roses of Paestum ” are mentioned by Virgil (Geor. iv. 118), Ovid {Met. xv. 708), Martial (iv. 41, 10; vi. 80, 6), and other Latin poets. Its present deserted and malarious state is probably owing to the silting up of the mouth of the Silarus, which has overflowed its bed, and converted the plain into unproductive marshy ground. Herds of buffaloes, and the few peasants who watch them, are now the only occupants of this once thickly populated and garden-like region. In 871 Paestum was sacked and partly destroyed by Saracen invaders; in the nth century it was further dismantled by Robert Guiscard, and in the 16th century was finally deserted.

The ruins of Posidonia are among the most interesting of the Hellenic world. The earliest temple in Paestum, the so- called Basilica, must in point of style be associated with the temples D and F at Selinus, and

is. therefore to be dated about 570-554 B.C. 1 It is a building of unique plan, with nine columns in the front and eighteen at the sides, 4I ft. in diameter. A line of columns runs down the centre of the cella. The columns have marked entasis, and the flutings end in a semicircle, above which is generally a torus (always present in the so-called temple of Ceres). The capitals are remarkable, inasmuch as the necking immediately below the echinus is decorated with a band of leaves, the arrangement of which varies in different cases. The columns and the architraves upon them are well preserved, but there is nothing above the frieze existing, and the cella wall has entirely disappeared. Next in point of date comes the so-called temple of Ceres, a hexastyle peripteros, which may be dated after 540 B.C. The columns are all standing, and the west and part of the east pediment are still in situ; but of the cella, again, nothing is

1 The dating adopted in the present article, which is in absolute contradiction to that given in the previous edition of this work, is that given by R. Koldewey and O. Puchstein, Die griechischen Tempel in Unteritalien und Sicilien (Berlin, 1899), 11-35.

left. The capitals are like those of the Basilica, but the details are differently worked out. In front of this temple stood a sacrificial altar as long as the temple itself.

The most famous of the temples of Paestum, the so-called temple of Neptune, comes next in point of date (about 420 B.C.). It is a hexastyle peripteros with fourteen columns on each side, and is remarkably well-preserved, both pediments and the epistyle at the sides being still in situ. No traces of the decora- tion of the pediments and metopes have been preserved. The cella, the outer walls of which have to a great extent disappeared, has two internal rows of seven columns 4-§- ft. in diameter, upon which rests a simple epistyle, supporting a row of smaller columns, so that the interior of the cella was in two storeys.

The Temple of Peace is a building of the Roman period of the 2nd century B.C., with six Doric columns on the front, eight on the sides and none at the back; it was excavated in 1830 and is now entirely covered up. Traces of a Roman theatre and amphitheatre (?) have also been found. The circuit of the town walls, well built of squared blocks of travertine, and 16 ft. thick, of the Greek period, is almost entire; they are about 3 m. in circumference, enclosing an irregular, roughly rectangular area. There were four gates, that on the east with a single arched opening being well-preserved. Outside the north gate is a street of tombs, in some of which were found arms, vases and fine mural

paintings (now in the Naples Museum).

The following table gives the chief dimensions of the four temples described above in feet : —

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(T. As.)

PAEZ, JOSfi ANTONIO (1790-1873), Venezuelan president, was born of Indian parents near Acarigua in the province of Barinas on the i3th- of June 1790. He came to the front in the war of independence against Spain, and his military career, which began about 1810, was

distinguished by the defeat of the Spanish forces at Mata de la Miel (18 15), at Montecal and throughout the province of Apure (1816), and at Puerto Cabello (1823). In 1829 he furthered the secession of Venezuela from the republic of Colombia, and he became its first president (1830-1834). He was again president in 1839-1843, and dictator in 1846; but soon afterwards headed a revolution against his successor and was thrown into prison. In 1850 he was released and left the country, but in 1858 he returned, and in i860 was made minister to the United States. A year afterwards he again returned and made himself dictator, but in 1863 was overthrown and exiled. He died in New York on the 6th of May 1873.

His autobiography was published at New York in 1 867-1 869, and his son Ramon Paez wrote Public Life of J. A. Paez (1864). An Apoteosis by Guzman Blanco was published at Paris in 1889.

PAEZ, PEDRO (1564-1622), Jesuit missionary to Abyssinia, was born at Olmedo in Old Castile in 1564. Having entered the Society of Jesus, he was set apart for foreign mission service, and sent to Goa in 1588. Within a year he and a fellow mis- sionary were dispatched from that place to Abyssinia to act as spiritual directors to the Portuguese residents. On his way thither, he fell into the hands of pirates at Dhofar and was sent to Sanaa, capital of the Yemen, where he was detained

for seven years by the pasha as a slave. Having been redeemed by his order in 1596, he spent some years in mission work on the west coast of India, and it was not until 1603 that he again set out for Abyssinia, and landed at the port of Massawa. At the headquarters of his order, in Fremona, he soon acquired the two chief dialects of the country, translated a catechism, and set about the education of some Abyssinian children. He also established a reputation as a preacher, and having been sum- moned to court, succeeded in vanquishing the native priests and in converting Za-Denghel, the negus, who wrote to the pope and the king of Spain for more missionaries, an act of zeal which involved him in civil war with the Abyssinian priests (who dreaded the influence of Paez) and ultimately cost him his life (Oct. 1604). Paez, who is said to have been the first European to visit the source of the Blue Nile, died of fever in 1622.

In addition to the translation of the Catechism, Paez is supposed to be

the author of a treatise De Abyssinorum erroribus and a history of Ethiopia (ed. C. Beccari in Rerum aethiopicarum scriptores occidentales inediti a saeculo XVI. ad XIX. (1905).

See A. de Backer, Bibliotheque de la Compagriie de JSsus (ed. C. Sommervogel) vi. (1895); W. D. Cooley in Bulletin de la sociM de geographie (1872), 6th series, vol. iii.

PAGAN, a town and former capital, in Myingyan district, Upper Burma, 92 m. S.W. of Mandalay. It was founded by King Pyinbya in 847, and remained the capital until the extinc- tion of the dynasty in 1298. Pagan itself is now a mere village, but hundreds of pagodas in various stages of decay meet the eye in every direction. The majority of them were built by King Anawra-hta, who overcame the Peguan king, Manuha of Thaton. It was Anawra-hta who introduced the Buddhist religion in Upper Burma, and who carried off nearly the whole Thaton population to build the pagodas at Pagan on the model of the Thaton originals. Many of these are of the highest architectural interest, besides being in themselves most imposing structures. Pagan is still a popular place of Buddhist pilgrimage, and a museum has been built for the exhibition of antiquities found in the neighbourhood. The population in 1901 was 6254.

PAGAN (Lat. paganus, of or belonging to a pagus, a canton, county district, village, commune), a heathen, one who worships a false god or false gods, or one who belongs to a race or nation which practises idolatrous rites and professes polytheism. In its early application paganus was applied by the Christian Church to those who refused to believe in the one true God, and still followed the Greek, Roman and other ancient faiths. It thus of course excluded Jews. In the middle ages, at the time of the crusades and later, “pagan” and’ ” paynim ” (O. Fr. paenime, Late Lat. paganismus, heathenism or heathen lands) were particularly applied to Mahommedans, and sometimes to Jews. A special significance attaches to the word when applied to one who adopts that attitude of cultured indifference to, or negation of, the various theistic systems of religion which was taken by so many of the educated and aristocratic classes in the ancient Hellenic and Roman world.

It has long been accepted that the application of the name paganus, villager, to non-Christians was due to the fact that it was in the rural districts that the old faiths lingered. This explanation assumes that the use of paganus in this sense arose after the establishment of Christianity as the religion generally accepted in the urban as opposed to the rural districts, and it is usually stated that an edict of the

emperor Valentinian of 368 dealing with the religio paganorum {Cod. Theod. xvi. 2) contains the first documentary use of the word in this secondary sense. It has now been shown that the use can be traced much earlier. Tertullian (c. 202; De corona militis, xi.), says ” Apud hunc (Christum) tarn miles est paganus fidelis quam paganus est miles infidelis.” This gives the clue to the true explanation. In classical Latin paganus is frequently found in contradistinc- tion to miles or armatus (cf. especially Tac. Hist. i. 53; ii. 14, 88; iii. 24, 43, 77), where the opposition is between a regular enrolled soldier and the raw half-armed rustics who sometimes formed a rude militia in Roman wars, or, more widely, between a soldier and a civilian. Thus the Christians who prided them- selves on being ” soldiers of Christ ” (milites) could rightly term

the non-Christians pagani. See also Gibbon, Decline and Fall of the Roman Empire (ed. Bury, 1896), ch. xxi. note ad fin.

PAGANINI, NICOLO (1 784-1840), Italian virtuoso on the violin, was born at Genoa on the 18th of February 1784. His father Antonio, a clever amateur, who was in the shipping business, taught him the violin at a very early age, and he had further lessons from the maestro di cappella of the cathedral of San Lorenzo. He first appeared in public at Genoa in 1793, with triumphant success. In 1795 he visited Parma for the purpose of taking lessons from Alessandro Rolla, who, however, said that he had nothing to teach him. On returning home, he studied more diligently than ever, practising single passages for ten hours at a time, and publishing compositions so difficult that he alone could play them. His first professional tour, through the cities of Lombardy, was made with his father in 1797. For some years he led a chequered career; he gambled at cards, and had to pawn his violin; and between 1801 and 1804 he lived in retirement, in Tuscany, with a noble lady who was in love with him. In 1805 however he started on a tour through Europe, astonishing the world with his matchless performances, and especially with his unprecedented playing on the fourth string alone. The princess of Lucca and Piombo, Napoleon’s sister, made him her musical director, and he became a prominent figure at the court where his caprices and audacities were a by- word. He abandoned this in 1813, and visited Bologna, Milan, and other cities, gaining further fame by his extraordinary virtuosity. In Venice, in 1815, he began a liaison with Antonia Bianchi, a dancer, which lasted till 1828; and by her he had a son Achillino, born in 1826. Meanwhile the world rang with his praises. In 1827 the pope honoured him with the Order of the Golden Spur; and, in the

following year, he extended his travels to Germany, beginning with Vienna, where he created a profound sensation. He first appeared in Paris in 183 1; and on the 3rd of June in that year he played in London at the King's Theatre. His visit to England was preluded by the most romantic stories. He was described as a political victim who had been immured for twenty years in a dungeon, where he played all day long upon an old broken violin with one string, and thus gained his wonderful mechanical dexterity. The result of this and other foolish reports was that he could not walk the streets without being mobbed. He charged what for that time were enormous fees; and his net profits in England alone, during his six years of absence from his own country, amounted to some £17,000. In 1832 he returned to Italy, and bought a villa near Parma. In 1833 he spent the winter in Paris, and in 1834 Berlioz com- posed for him his beautiful symphony, Harold en Italie. He was than at the zenith of his fame; but his health, long since ruined by excessive study, declined rapidly. In 1838 he suffered serious losses in Paris through the failure of the " Casino Paganini," a gambling-house which was refused a licence. The disasters of this year increased his malady — laryngeal phthisis — ■ and, after much suffering, he died at Nice on the 17 th of May 1840. His will left a fortune of £80,000 to his son Achillino; and he bequeathed one of his violins, a fine Joseph Guarnerius, given him in early life by a kind French merchant, to the munici- pality of Genoa, who preserve it as one of their treasures. Paganini's style was impressive and passionate to the last degree. His cantabile passages moved his audience to tears, while his tours de force were so astonishing that a Viennese amateur publicly declared that he had seen the devil assisting him. His name stands in history as that of the most extraordi- nary executant ever known on the violin; and in spite of greater artists or no less remarkable later virtuosi, this reputation will remain with Paganini as the inaugurator of an epoch. He was the first to show what could be done by brilliance of tech- nique, and his compositions were directed to that end. He was an undeniable genius, and it may be added that he behaved and looked like one, with his tall, emaciated figure and long black hair.

There are numerous lives of Paganini ; see the article and bibliography in Grove's Dictionary of Music.

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PAGE, THOMAS NELSON (1853-), American author, was born at Oakland Plantation, Hanover county, Virginia, on the 23rd of April 1853, the great-grandson of Thomas Nelson (1738-1789) and of John Page (1744-1808), both governors of Virginia, the former being a signer of the Declaration of Independence. After a course at Washington and Lee Univer- sity (1869-1872) he graduated in law at the university of Virginia (1874), and practised, chiefly in Richmond, until 1893, when he removed to Washington, D. C, and devoted himself to writing and lecturing. In 1884 he had published in the Century Magazine " Marse Chan," a tale of life in Virginia during the Civil War, which immediately attracted attention. He wrote other stories of negro life and character (" Meh Lady," " Unc' Edinburg's Drowndin'," and " Ole 'Stracted"), which, with two others, were published in 1887 with the title In Ole Virginia, perhaps his most characteristic book. This was followed by Befo' de War (1888), dialect poems, written with Armistead Churchill Gordon (b. 1855); On Newfound River (1891); The Old South (1891), social and political essays; Elsket and Other Stories (1892); The Burial of the Guns (1894); Pastime Stories (1894); The Old Gentleman of the Black Stock (1897); Social Life in Old Virginia before the War (1897); Two Prisoners (1898); Red Rock (1898), a novel of the Reconstruction period; Gordon Keith (1903); The Negro: the Southerner's Problem (1904); Bred in the Bone and Other Stories (1904); The Coast of Bohemia (1906), poems; The Old Dominion: Her Making and her Manners (1907), a collection of essays; Under the Crust (1907), stories; Robert E. Lee, the Southerner (1908); John Marvel, Assistant (1909), a novel; and various books for children. He is at his best in those short stories in which, through negro character and dialect, he pictures the life of the Virginia gentry, especially as it centred about the mutual devotion of master and servant.

PAGE, WILLIAM (1811-1885), American artist, was born at Albany, New York, on the 3rd of January 1811. He studied for the ministry at the Andover Theological Seminary in 1828- 1830 and in later life became a Swedenborgian. He received his training in art from S. F. B. Morse and in the schools of the National Academy of Design, and in 1836 became a National Academician. From 1849 to i860, he lived in Rome, where he painted portraits of his friends Robert and Elizabeth Browning. The first collection of Lowell's Poems (1843) was dedicated to Page, who was also a friend of W. W. Story. In 1871-1873 he was president of the National Academy of Design. He died at Tottenville, Staten Island, New York, on the 1st of October 1885. Besides numerous portraits he painted " Farragut at the Battle of Mobile," belonging to the Tsar of Russia; a " Holy Family," in the Boston

Athenaeum; and ” The Young Merchants,” at the Pennsylvania Academy of the Fine Arts, Philadelphia. He modelled and painted several portraits of Shakespeare, based on the Becker ” death mask.” He wrote A New Geometrical Method of Measuring the Human Figure (i860).

PAGE. (1) A term used of a boy, lad or young male person in various capacities, positions or offices. The etymology is doubtful; the word is common to the Romanic languages; cf. 0. Fr. and Span, page, Port, pagem, Ital. paggio. The Med. Lat. pagius has been commonly referred to Gr. ircuSlov, diminutive of irais, boy, but the connexion is extremely doubtful. Others refer the word to the pueri paedagogiani, young slaves trained to become paedagogi (Gr. TrcuSayuyol) , or tutors to young boys attending school. Under the empire, numbers of such youths were attached to the imperial household for the purposes of ceremonial attendance on state occasions, thus occupying much the same position as that of the pages of a royal or noble household in medieval and modern times. In fact the term paedagogiani became equivalent to pueri honorarii, qui in palatio ministerio principis militabant (so Du Cange, Glossarium, s.v.). Littr6 refers pagius to pagensis, i.e. rustic, belonging to the country districts (pagus), and adduces from this the fact that the pagii were not necessarily boys or youths; and quotes from Claude Fauchet (1 530-1601) the statement (Lib. I. Orig. milit. cap. i.) that up to the time of

Charles VI. (1368-1403) and Charles VII. (1403-1461) ” le mot de Page …. sembloit etre seulement donne a de viles personnes, comme a garcons de pied.” Skeat (Etym. Diet.) points out that the form of the word in Portuguese, pagem, indicates the derivation from pagensis. The word ” page ” was applied in English to a boy or youth who was employed as an assistant to an older servant, acting as it were as an apprentice and learning his duties. In present usage the chief applications are: (a) to a boy or lad, generally wearing livery, and sometimes styled a ” buttons,” who is employed as a domestic servant; and (b) to a young boy who, dressed in fancy costume, forms part of the bridal procession at weddings. The word is also used © as the title of various officials of different rank in royal and other households; thus in the British royal household there are pages of honour, a page of the chambers, pages of the presence, and pages of the back stairs. These, no doubt, descend from the pueri paedagogiani of the Roman imperial household through the young persons of noble or gentle birth, who, during the middle and later ages, served in the household of royal and noble persons, and received a training to fit them for their future position in society. In the times of chivalry the ” page ” was one who served a knight and was trained to knighthood, and

ranked next to a squire. (See Knighthood and Valet.)

(2) In the sense of one side of a leaf of printed or written matter, the word is derived through Fr. from Lat. pagina (pangere, to fasten).

PAGEANT, in its most general sense a show or spectacle; the more specific meanings are involved in the etymology of the word and its connexion with the history of the early mystery plays (see Drama). In its early forms, dating from the 14th century, the word is pagyn or pagen, the excrescent / or d, as in " tyrant," " ancient," not appearing till later. The Med. Lat. equivalent is pagina, and this, or at least the root from which it is formed, must be taken as the source. The senses, however, in which the word is used, viz. stage, platform, or scene played on a stage, are not those of the classical Lat. pagina, a page of a book, nor do they apparently occur in the medieval Latin of any language other than English. Further, it is not clear which meaning comes first, platform or scene. If the last, then " scene," i.e. a division of a play, might develop out of " page " of a book. If not, then pagina is a fresh formation from the root pag of pangere, to fix or fasten, the word meaning a fastened framework of wood forming a stage or platform; cf. the classical use of compago, structure. Others take pagina as a translation of Gr. irijyixa, platform, stage, a word from the same root pag-. Du Cange (Glossarium) quotes a use in Med. Lat. of pegma in this sense, Machina lignea in qua statuae collocabantur, and Cotgrave gives " Pegmate, a stage or frame whereon pageants be set or carried."

As has been said, " pageant " is first found in the sense of a scene, a division or part of a play or of the platform on which such scene was played in the medieval drama. Thus we read of Queen Margaret in 1457 that at Coventry she saw " alle the pagentes pleyde save domesday which myght not be pleyde for lak of day," and in the accounts of the Smiths' gild al Coventry for 1450, five pence is paid " to bring the pagenf into gosford-stret." A clear idea of what these stages wer« like when the mystery plays became processional (processus) that is, were acted on separate platforms moving along a street is seen in Archdeacon Roger's contemporary account of th Chester plays about the end of the 16th century. " The mane of these playes weare, every company had his pagiant, or parte which pageants weare a high scafolde with 2 rowmes, a highe! and a lower, upon 4 wheeles " (T. Sharp, Dissertation on tl Pageants or Mysteries at Coventry, 1825, which contains mos of the early references to the word) . The movable platform, filler- with emblematic or allegorical figures, naturally played an im portant part in processional shows with no dialogue or dramatii action. An instance (1432) of the

practice and the use of th word is found in the Munimenta gildhallae londiniensis (ed Riley), ” Parabatur machina in cujus medio stabal

gigas mirae magnitudinis …. ex utroque latere … in eadem pagina erigebantur duo animalia vocata antelops.” At Anne Boleyn’s coronation, June 1, 1533, one “pageant” con- tained figures of Apollo and the Muses, another represented a castle, with ” a heavenly roof and under it upon a green was a root or stock, whereout sprang a multitude of white and red roses ” (Arber, English Gamer, ii. 47, quoted in the New English Dictionary). Such ” pageants ” formed a feature, in a somewhat degraded shape, in the annual lord mayor’s show in London. The development in meaning from ” moving platform ” to that of a ” processional spectacle ” or ” show ” is obvious.

The 20th century has seen in England what may in some respects be looked on as a revival but in general as a new depar- ture in the shape of semi-dramatic spectacles illustrative of the history of a town or locality; to such spectacles the name of ” Pageant ” has been appropriately given. Coventry in its procession in commemoration of Lady Godiva’s traditional exploit, has since 1678 illustrated an incident, however mythical, in the history of the town, and many of the ancient cities of the continent of Europe, as Siena, Bruges, Nuremberg, &c, have had, and still have, at intervals a procession of persons in the costumes of various periods, and of figures emblematical of the towns’ associations and history. The modern pageant is far removed from a mere procession in dumb show, however bright with colour and interesting from an historical or artistic point of view such may be made. It consists of a series of scenes, representing historical events directly connected with the town or locality in which the pageant takes place. These are accompanied by appropriate dialogue, speeches, songs, &c, and with music and dances. The effect is naturally much heightened by the place of the performance, more particularly if this is the actual site of some of the scenes depicted, as at the Winchester Pageant (1908) where the background was formed by the ruins of Wolvesey Castle. The Sherborne pageant of 1005 was the first of the series of pageants. In 1907 and 1908 they became very numerous; of these the principal may be mentioned, those at Oxford, Bury St Edmunds in 1907; at Winchester, Chelsea, Dover and Pevensey in 1908; and that of the English Church at Fulham Palace 1909, a peculiarly interesting

example of a pageant connected with an institution and not a locality.

The artistic success of a pageant depends on the beauty or historic interest of its site, the skilful choice of episodes and dramatic incidents, the grouping and massing of colour, and the appropriateness of the dialogue, speeches and incidental music. It is here that the skill and talent of the writer, designer or director of the pageant find scope. The name of the dramatist Louis N. Parker (b. 1852), the author of the Sherborne pageant, the earliest and one of the most successful, must always be asso- ciated with the movement, of which he was the originator.

More important, perhaps, than the aesthetic pleasure given is the educational effect produced not only on the spectators but also on the performers. The essence of the pageant is that all who take part are residents in the place and locality, that the costumes and accessories should be made locally, and that all classes and all ages should share in a common enthusiasm for the bringing back in the most vivid form the past history, often forgotten, in which all should feel they have an equal and common part. (C. We.)

PAGET, SIR JAMES, Bart. (1814-1899), British surgeon, born at Yarmouth on the nth of January 1814, was the son of a brewer and shipowner. He was one of a large family, and his brother Sir George Paget (1800-1892), who became regius professor of physic at Cambridge in 1872, also had a distinguished career in medicine and was made a K.C.B. He attended a day-school in Yarmouth, and afterwards was destined for the navy; but this plan was given up, and at the age of sixteen he was apprenticed to a general practitioner, whom he served for four and a half years, during which time he gave his leisure hours to botanizing, and made a great collection of the flora of East Norfolk. At the end of his apprenticeship he published

with one of his brothers a very careful Sketch of the Natural History of Yarmouth and its Neighbourhood. In October 1834 he entered as a student at St Bartholomew's Hospital. Medical students in those days were left very much to themselves; there was no close supervision of their work, but it is probable that Paget gained rather than lost by having to fight his own way. He swept the board of prizes in 1835, and again in 1836; and in his first winter session he detected the presence of the Trichina spiralis, a minute parasite that infests the muscles of the human body. 1 In May 1836 he passed his examination at the Royal College of Surgeons, and became qualified to practise. The next seven years (1836-1843) were spent in London lodgings, and were a time of poverty, for he made only £15 a year by practice, and

his father, having failed in business, could not give him any help. He managed to keep himself by writing for the medical journals, and preparing the catalogues of the hospital museum and of the pathological museum of the Royal College of Surgeons. In 1836 he had been made curator of the hospital museum, and in 1838 demonstrator of morbid anatomy at the hospital; but his advancement there was hindered by the privileges of the hospital apprentices, and by the fact that he had been too poor to afford a house-surgeoncy, or even a dresser- ship. In 1841 he was made surgeon to the Finsbury Dispensary; but this appointment did not give him any experience in the graver operations of surgery. In 1843 he was appointed lecturer on general anatomy (microscopic anatomy) and physiology at the hospital, and warden of the hospital college then founded. For the next eight years he lived within the walls of the hospital, in charge of about thirty students resident in the little college. Besides his lectures and his superintendence of the resident students, he had to enter all new students, to advise them how to work, and to manage the finances and the general affairs of the school. Thus he was constantly occupied with the business of the school, and often passed a week, or more, without going outside the hospital gates. In 1844 he married Lydia, youngest daughter of the Rev. Henry North. In 1847 he was appointed an assistant-surgeon to the hospital, and Arris and Gale professor at the College of Surgeons. He held this professor- ship for six years and each year gave six lectures in surgical pathology. (The first edition of these lectures, which were the chief scientific work of his life, was published in 1853 as Lectures on Surgical Pathology.) In 1851 he was elected a Fellow of the Royal Society. In October 1851 he resigned the wardenship of the hospital. He had now become known as a great physiologist and pathologist: he had done for pathology in England what R. Virchow had done in Germany; but he had hardly begun to get into practice, and he had kept himself poor that he might pay his share of his father's debts — a task that it took him fourteen years to fulfil.

It is probable that no famous surgeon, nofeven John Hunter, ever founded his practice deeper in science than Paget did, or waited longer for his work to come back to him. In physiology he had mastered the chief English, French, German, Dutch and Italian literature of the subject, and by incessant study and microscope work had put himself level with the most advanced knowledge of his time; so that it was said of him by R. Owen, in 1851, that he had his choice, either to be the first physiologist in Europe, or to have the first surgical practice in London, with a baronetcy. His physiological lectures at St Bartholomew's Hospital were the chief cause of the rise

in the fortunes of its school, which in 1843 had gone down to a low point. In pathology his work was even more important. He fills the place in pathology that had been left empty by Hunter's death in 1793 — the time of transition from Hunter's teaching,

1 This discovery is usually credited to R. Owen (q.v.). The facts appear to be as follows: Paget was a first-year's student, and, by means of a pocket lens, found in the dissecting-room that the specks in the infected muscles were parasitic worms and not, as previously thought, spicules of bone. Thomas Wormal 1, the senior demonstra- tor, who was no pathologist, sent a piece of the same muscle to Owen, who authoritatively pronounced the specks to be parasites and gave them their scientific name. It is probable that Owen did not realize that Paget had already made the discovery, and it was naturally associated with the name of the professor.

which for all its greatness was hindered by want of the modern microscope, to the pathology and bacteriology of the present day. It is Paget's greatest achievement that he made pathology dependent, in everything, on the use of the microscope — especially the pathology of tumours. He and Virchow may truly be called the founders of modern pathology; they stand together, Paget's Lectures on Surgical Pathology and Virchow's Cellular- Pathologic When Paget, in 1851, began practice near Cavendish Square, he had still to wait a few years more for success in professional life. The "turn of the tide" came about 1854 or 1855; and in 1858 he was appointed surgeon extraordinary to Queen Victoria, and in 1863 surgeon in ordinary to the prince of Wales. He had for many years the largest and most arduous surgical practice in London. His day's work was seldom less than sixteen or seventeen hours. Cases sent to him for final judgment, with especial frequency, were those of tumours, and of all kinds of disease of the bones and joints, and all " neurotic " cases having symptoms of surgical disease. His supremacy lay rather in the science than in the art of surgery, but his name is associated also with certain great practical advances. He discovered the disease of the breast and the disease of the bones (osteitis deformans) which are called after his name; and he was the first at the hospital to urge enucleation of the tumour, instead of amputation of the limb, in cases of myeloid sarcoma.

In 1871 he nearly died from infection at a post mortem examination,

and, to lighten the weight of his work, was obliged to resign his surgeoncy to the hospital. In this same year he received the honour of a baronetcy. In 1875 he was president of the Royal College of Surgeons, and in 1877 Hunterian orator. In 1878 he gave up operating, but for eight or ten years longer he still had a very heavy con- sulting practice. In 1881 he was president of the Inter- national Medical Congress held in London; in 1880 he gave, at Cambridge, a memorable address on " Elemental Pathology," setting forth the likeness of certain diseases of plants and trees to those of the human body. Besides shorter writings he also published Clinical Lectures and Essays (1st ed. 1875) and Studies of Old Case-books (1891). In 1883, on the death of Sir George Jessel, he was appointed vice-chancellor of the university of London. In 1889 he was appointed a member of the royal commission on vaccination. He died in London on the 30th of December 1899, in his eighty-fifth year. Sir James Paget had the gift of eloquence, and was one of the most careful and most delightful speakers of his time. He had a natural and unaffected pleasure in society, and he loved music. He possessed the rare gift of ability to turn swiftly from work to play; enjoying his holidays like a schoolboy, easily moved to laughter, keen to get the maximun of happiness out of very ordinary amuse- ments, emotional in spite of incessant self-restraint, vigorous in spite of constant overwork. In him a certain light-hearted enjoyment was combined with the utmost reserve, unfailing religious faith, and the most scrupulous honour. He was all his life profoundly indifferent toward politics, both national and medical; his ideal was the unity of science and practice in the professional life. (S. P.)

PAGET OF BEAUDESERT, WILLIAM PAGET, ist Baron (1506-1563), English statesman, son of William Paget, one of the serjeants-at-mace of the city of London, was born in London in 1506, and was educated at St Paul's School, and at Trinity Hall, Cambridge, proceeding afterwards to the university of Paris. Probably through the influence of Stephen Gardiner, who had early befriended Paget, he was employed by Henry VIII. in several important diplomatic missions; in 1532 he was appointed clerk of the signet and soon afterwards of the privy council. He became secretary to Queen Anne of Cleves in 1539, and in 1543 he was sworn of the privy council and appointed secretary of state, in which position Henry VIII. in his later years relied much on his advice, appointing him one of the council to act during the minority of Edward VI. Paget at first vigorously supported the protector Somerset, while counselling a moderation which Somerset did not always observe. In 1 547 he was made comptroller of the king's house-

hold, chancellor of the duchy of Lancaster, and a knight of the Garter; and in 1549 he was summoned by writ to the House of Lords as Baron Paget de Beaudesert. About the same time he obtained extensive grants of lands, including Cannock Chase and Burton Abbey in Staffordshire, and in London the residence . of the bishops of Exeter, afterwards known successively as Lincoln House and Essex House, on the site now occupied by the Outer Temple in the Strand. He also obtained Beaudesert in Staffordshire, which is still the chief seat of the Paget family. Paget shared Somerset's disgrace, being committed to the Tower in 1551 and degraded from the Order of the Garter in the following year, besides suffering a heavy fine by the Star Chamber for having profited at the expense of the Crown in his administration of the duchy of Lancaster. He was, however, restored to the king's favour in 1553, and was one of the twenty- six peers who signed Edward's settlement of the crown on Lady Jane Grey in June of that year. He made his peace with Queen Mary, who reinstated him as a knight of the Garter and in the privy council in 1553, and appointed him lord privy seal in 1556. On the accession of Elizabeth in 1558 Paget retired from public life, and died on the 9th, of June 1563.

By his wife Anne Preston he had four sons, the two eldest of whom, Henry (d. 1 568) and Thomas, succeeded in turn to the peer- age. The youngest son, Charles Paget (d. 161 2), was a well-known Catholic conspirator against Queen Elizabeth, in the position of secretary to Archbishop James Beaton, the ambassador of Mary Queen of Scots in Paris; although at times he also played the part of a spy and forwarded information to Walsingham and Cecil. Thomas, 3rd Baron Paget of Beaudesert (c. 1540-1589), a zealous Roman Catholic, was.suspected of complicity in Charles's plots and was attainted in 1587. But the peerage was restored in 1604 to his son William (1572-1629), 4th Lord Paget, whose son William, the 5th lord (1609-1678), fought for Charles I. at Edgehill. William, the 6th lord (1637-1713), a supporter of the Revolution of 1688, was ambassador at Vienna from 1689 to 1693, and later at Constantinople, having much to do with bringing about the important treaty of Carlowitz in 1 699. Henry, the 7th baron (c. 1665-1743), was raised to the peerage during his father's lifetime as Baron Burton in 1712, being one of the twelve peers created by the Tory ministry to secure a majority in the House of Lords, and was created earl of Uxbridge in 17 14. His only son, Thomas Catesby Paget, the author of an Essay on Human Life (1734) and other writings, died in January 1742 before his father, leaving a son Henry (1719-1769), who became 2nd earl of Uxbridge. At the latter's death the earldom of Uxbridge and barony of Burton became extinct, the older barony of Paget of Beaudesert passing to his

cousin Henry Bayly (1744-1812), heir general of the first baron, who in 1784 was created earl of Uxbridge. His second son, Sir Arthur Paget (1771-1840), was an eminent diplomatist during the Napoleonic wars, Sir Edward Paget (1775-1849), the fourth son, served under Sir John Moore in the Peninsula, and was afterwards second in command under Sir Arthur Wellesley; the fifth, Sir Charles Paget (1778-1839), served with distinction in the navy, and rose to the rank of vice-admiral. The eldest son Henry William, 2nd earl of Uxbridge (1768-1854), was in 1815 created marquess of Anglesey (q.v.).

PAGHMAN, a small district of Afghanistan to the west of Kabul, lying under the Paghman branch of the Hindu Kush range. It is exceedingly picturesque, the villages clinging to the sides of the mountain glens from which water is drawn for irrigation; and excellent fruit is grown.

PAGODA (Port, pagode, a word introduced in the 16th century by the early Portuguese adventurers in India, reproducing phonetically some native word, possibly Pers. but-kadah, a house for an idol, or some form of Sansk. bhagavat, divine, holy), an Eastern term for a temple, especially a building of a pyramid shape common in India and the Far East and devoted to sacred purposes; in Buddhist countries, notably China, the name of a many-sided tower in which are kept holy relics. More loosely ” pagoda ” is used in the East to signify any non-Christian or non-Mussulman place of worship. Pagoda or

pagod was also the name given to a gold (occasionally also silver) coin, of about the value of seven shillings, at one time current in southern India. From this meaning is derived the expression ” the pagoda tree,” as synonymous with the ” wealth of the Indies,” whence the phrase to ” shake the pagoda tree.” There is a real tree, the Plumieria acuminata, bearing the name. It grows in India, and is of a small and graceful shape, and bears yellow and white flowers tinged with red.

PAHARI (properly Pahari, the language of the mountains), 3. general name applied to the Indo- Aryan languages or dialects spoken in the lower ranges of the Himalaya from Nepal in the east, to Chamba of the Punjab in the west. These forms of speech fall into three groups — an eastern, consisting of the various dialects of Khas-kura, the language of Nepal; a central, spoken in the north of the United Provinces, in Kumaon and Garhwal; and a western, spoken in the

country round Simla and in Chamba. In Nepal, Khas-kura is the language only of the Aryan population, the mother tongue of most of the inhabitants being some form or other of Tibeto-Burman speech (see Tibeto-Burman Languages), not Indo-Aryan. As may be expected, Khas-kura is mainly differentiated from Central Pahari through its being affected, both in grammar and vocabulary, by Tibeto-Burman idioms. The speakers of Central and Western Pahari have not been brought into close association with Tibeto-Burmans, and their language is therefore purely Aryan.

Khas-kura, as its speakers themselves call it, passes under various names. The English generally call it Nepali or Naipall {i.e. the language of Nepal), which is a misnomer, for it is not ihe principal form of speech used in that country. Moreover, the Nepalese employ a corruption of this very word to indicate what is really the main language of the country, viz. the Tibeto- Burman Newari. Khas-kura is also called Gorkhali, or the lan- guage of the Gurkhas, and Pahari or Parbatiya, the language of the mountains. The number of speakers is not known, no census sver having been taken of Nepal; but in British India 143,721 were recorded in the census of 1001, most of whom were soldiers in, or others connected with, the British Gurkha regiments.

Central Pahari includes three dialects — Garhwall, spoken mainly in Garhwal and the country round the hill station of Mussoorie; Jaunsarl, spoken in the Jaunsar tract of Dehra Dun; and Kumaunl, spoken in Kumaun, including the country round the hill station of Naini Tal. In 1901 the number of speakers was 1,270,931.

Western Pahari includes a great number of dialects. In the Simla Hill states alone no less than twenty-two, of which the most important are Sirmaurl and Keonthali (the dialect of Simla itself), were recorded at the last census. To these may be added Chambiall and Churahl of the state of Chamba, Mandeali of the state of Mandl, Gadl of Chamba and Kangra, Kuluhi of Kulu and others. In 1901 the total number of speakers was 1,710,029.

The southern face of the Himalaya has from time immemorial been occupied by two classes of people. In the first place there is an Indo-Chinese overflow from Tibet in the north. Most of these tribes speak Indo-Chinese languages of the Tibeto-Burman family, while a few have abandoned their ancestral speech and now employ broken half-Aryan dialects. The other class consists of the great tribe of Khasas or Khasiyas, Aryan in origin, the ~Ka.aioi.oi the Greek geographers. Who these people originally were, and how they entered India, are

questions which have been more than once discussed without arriving at any very definite conclusion. 1 They are frequently mentioned in Sanskrit literature, were a thorn in the side of the rulers of Kashmir, and have occupied the lower Himalayas for many centuries. Nothing positive is known about their language, which they have long abandoned. Judging from the relics of it which appear in modern Pahari, it is probable that it belonged to the

1 See ch. iv. of vol. ii. of R. T. Atkinson's Himalayan Districts of the North-Western Provinces of India, forming vol. xiof the" Gazet- teer of the North-Western Provinces" (Allahabad, 1884), and the Archaeological Survey of India, xiv. 125 sqq. (Calcutta, 1882).

same group as Kashmiri, Lahnda and Sindhi. They spread slowly from west to east, and are traditionally said to have reached Nepal in the early part of the 12th century a.d.

In the central and western Pahari tracts local traditions assert that from very early times there was constant communica- tion with Rajputana and with the great kingdom of Kanauj in the Gangetic Doab. A succession of immigrants, the tide of which was materially increased at a later period by the pressure of the Mussulman invasion of India, entered the country, and founded several dynasties, some of which survive to the present day. These Rajputs intermarried with the Khasa inhabitants of their new home, and gave their rank to the descendants of these mixed unions. With the pride of birth these new-born Rajputs inherited the language of their fathers, and thus the tongue of the ruling class, and subsequently of the whole population of this portion of the Himalaya, became a form of Rajasthani, the language spoken in distant Rajputana.

The Rajput occupation of Nepal is of later date. In the early part of the 16th century a number of Rajputs of Udaipur in Rajputana, being oppressed by the Mussulmans, fled north and settled in Garhwal, Kumaon, and western Nepal. In a.d. 15 59 a party of these conquered the small state of Gurkha, which lay about 70 m. north-west of Katmandu, the present capital of Nepal. In 1768 Prithwi Narayan Shah, the then Rajput ruler of Gurkha, made himself master of the whole of Nepal and founded the present Gurkhali dynasty of that country. His successors extended their rule westwards over Kumaon and Garhwal, and as far as the Simla Hill states. The inhabitants of Nepal included not only Aryan Khasas, but also, as has been said, a number of Tibeto-Burman tribes. The Rajputs of Gurkha could not impose their language upon these as they did upon the Khasas, but, owing to its being the tongue of the ruling race, it ultimately became

generally understood and employed as the lingua franca of this polyglot country. Although the language of the Khasas has disappeared, the tribe is still numerically the most important Aryan one in this part of the Himalaya, and it hence gave its name to its newly adopted speech, which is at the present day locally known as ” Khas-kura.”

In the manner described above the Aryan language of the whole Pahari area is now a form of Rajasthani, exhibiting at the same time traces of the old Khasa language which it superseded, and also in Nepal of the Tibeto-Burman forms of speech by which it is surrounded. (For information regarding Rajasthani the reader is referred to the articles Indo-Aryan Languages; Prakrit; and Gujarati.)

Khas-kura shows most traces of Tibeto-Burman influence. The gender of nouns is purely sexual, and, although there is an oblique case derived from Rajasthani, it is so often confounded with the nominative, that in the singular number either can be employed for the other. Both these are due to Tibeto-Burman influence, but the non-Aryan idiom is most prominent in the use of the verb. There is an indefinite tense referring to present, past or future time accord- ing to the context, formed by suffixing the verb substantive to the root of the main verb, exactly as in some of the neighbouring Tibeto- Burman languages. There is a complete impersonal honorific con- jugation which reminds one strongly of Tibetan, and, in colloquial speech, as in that tongue, the subject of any tense of a transitive verb, not only of a tense derived from the past participle, is put into the agent case.

in Eastern and Central Pahari the verb substantive is formed f rorn the root ach, as in both Rajasthani and Kashmiri. In Rajas- thani. its present tense, being derived from the Sanskrit present rcchami, I go, does not change for gender. But in Pahari and Kash- miri it must be derived from the rare Sanskrit particle *x,cchitas, gone, for in these languages it is a participial tense and does ‘change according to the gender of the subject. Thus, in the singular we have : — ■

Khas-kura.

Kumauni.

Kashmiri.

Masc.

Fem.

Masc.

Fem.

Masc.

Fem.

I am ….

Thou art . . . He is .

chu

chas

cha

chu ches che

chit chai ch

chu chi chi

chus

chukh

ckuh

ches

chekh

cheh

Here we have a relic of the old Khasa language, which, as has been said, seems to have been related to Kashmiri. Other relics of Khasa,

again agreeing with north-vestem India, are the tendency to shorten long vowels, the practice of ep>‘nthesis, or the modification of a vowel by the one which follows in the next syllable, and the frequent occur- rence of disaspiration. Thus, Khas siknu, Kumauni sikno, but Hindi sikhna, to learn; Kumaun! yeso, plural yasa, of this kind.

Regarding Western Pahari materials are not so complete. The speakers are not brought into contact with Tibeto-Burman languages, and hence we find no trace of the**. But the signs of the influence of north-western languages are, as> might be expected, still more apparent than farther east. In some dialects epenthesis is in full swing, as in (Churahl) kh&ta, eating, fem. khaiti. Very interesting is the mixed origin of the postpositions defining the various cases. Thus, while that of the genitive is generally the Rajasthani ro, that of the dative continually points to the west. Sometimes it is the Sindhi khe (see Sindhi). At other times it is jo, where is here a locative of the base of the Sindhi genitive postposition jo. In all Indo-Aryan languages, the dative postposition is by origin the locative of some genitive one. In vocabulary, Western Pahari often employs, for the more common ideas, words which can most readily be connected with the north-western and Pisaca groups. (See Indo-Aryan Languages.)

Literature.— Khas-kura has a small literature which has grown up in recent years. We may mention the Birsikka, an anonymous collection of folk-tales, and a Ramayana by Bhanu Bhafta. There are also several translations from Sanskrit. Of late years local scholars have done a good deal towards creating an interest in Central Pahari. Special mention may be made of Ganga Datt Upreti's Proverbs and Folklore of Kumaun and Garhwal (Lodiana, 1894) ; the same author's Dialects of the Kumaun Division (Almora, 1900); and Jwala Datt Joshi's translation of Dandin's Sanskrit DaSa Kumara Carita (Almora, 1892). A local poet who lived about a century ago, Gumani Kavi by name, was the author of verses written in a peculiar style, and now much admired. Each verse consists of four lines, the first three being in Sanskrit, and the fourth a Hindi or Kumauni proverb. A collection of these, edited by Rewa Datt Upreti, was published in the Indian Antiquary for 1909 (pp. 177 seq.) under the title of Gumani-niti. Western Pahari has no literature. Portions of the Bible have been translated into Khas-kura (under the name of " Nepali "), Kumauni, Garhwali, Jaunsari and Chambiali.

Authorities. — S. H. Kellogg's Hindi Grammar (2nd ed., London, 1893) includes both Eastern and Central Pahari in its survey. For Khas see also A. Turnbull, Nepali, i. e. Gorkhali or Parbate Grammar (Darjeeling, 1904), and G. A. Grierson, " A Specimen of the Khas or NaipalT Language," in the Zeitschrift der deutschen morgenlandtschen Gesellschaft (1907), lxi. 659 seq. There is no authority dealing with Western Pahari as a whole. A. H. Diack's work, The Kulu Dialect of Hindi (Lahore, 1896), may be consulted for Kuluhi. See also T. Grahame Bailey's Languages of the Northern Himalayas (Royal Asiatic Society, London, 1908). Vol. ix., pt. iv., of the Linguistic Survey of

India contains full particulars of all the Pahari dialects in great detail. (G. A. Gr.)

PAHLAVl, or Pehlevi, the name given by the followers of Zoroaster to the character in which are written the ancient translations of their sacred books and some other works which they preserve (see Persia: Language). The name can be traced back for many centuries; the great epic poet Firdousi (second half of the 10th Christian century) repeatedly speaks of Pahlavl books as the sources of his narratives, and he tells us among other things that in the time of the first Khosrau (Chosroes I., A.D. 531-579) the Pahlavl character alone was used in Persia. 1 The learned Ibn Mokaffa' (8th century) calls Pahlavi one of the languages of Persia, and seems to imply that it was an official language. 2 We cannot determine what characters, perhaps also dialects, were called Pahlavl before the Arab period. It is most suitable to confine the word, as is now generally done, to designate a kind of writing — not only that of the Pahlavl books, but of all inscriptions on stone and metal which use similar characters and are written on essentially the same principles as these books.

At first sight the Pahlavl books present the strangest spectacle of mixture of speech. Purely Semitic (Aramaic) words — and these not only nouns and verbs, but numerals, particles, demon- strative and even personal pronouns — stand side by side with Persian vocables. Often, however, the Semitic words are compounded in a way quite unsemitic, or have Persian termi- nations. As read by the modern Zoroastrians, there are also

1 We cannot assume, however, that the poet had a clear idea of what Pahlavi was.

2 The passage, in which useful facts are mixed up with strange notions, is given abridged in Fihrist, p. 13, more fully by Yakut, iii. 925, but most fully and accurately in the unprinted Mafatih al-'olum.

many words which are neither Semitic nor Persian; but it is soon seen that this traditional pronunciation is untrustworthy. The character is cursive and very ambiguous, so that, for exam- ple, there is but one sign for n, u, and r, and one for y, d, and g, this has led to mistakes in the received pronunciation, which for many words can be shown to have been at one time more correct than it is now. But apart from such blunders there remain phenomena which could never have appeared in a real language; and the hot strife which raged till recently as to whether Pahlavl is Semitic or Persian has been closed by the discovery that it is merely a way of writing Persian in which the

Persian words are partly represented — to the eye, not to the eai" — by their Semitic equivalents. This view, the development of which began with Westergaard (Zendavesta, p. 20, note), is in full accordance with the true and ancient tradition. Thus Ibn Mokaffa', who translated many Pahlavi books into Arabic, tells us that the Persians had about one thousand words which they wrote otherwise than they were pronounced in Persian. 3 For bread he says they wrote lhma, i.e. the Aramaic lahma, but they pronounced nan, which is the common Persian word for bread. Similarly bsra, the Aramaic besrd, flesh, was pro- nounced as the Persian gosht. We still possess a glossary which actually gives the Pahlavl writing with its Persian pronunciation. This glossary, which besides Aramaic words contains also a variety of Persian words disguised in antique forms, or by errors due to the contracted style of writing, exists in various shapes, all of which, in spite of their corruptions, go back to the work which the statement of Ibn Mokaffa' had in view. 4 Thus the Persians did the same thing on a much larger scale, as when in English we write £ (libra) and pronounce " pound " or write & or & (et) and pronounce " and." No system was followed in the choice of Semitic forms. Sometimes a noun was written in its status absolutus, sometimes the emphatic d was added, and this was sometimes written as n sometimes as n. One verb was written in the perfect, another in the imperfect. Even various dialects were laid under contribution. The Semitic signs by which Persian synonyms were distinguished are sometimes quite arbitrary. Thus in Persian khwesh and khwat both mean " self "; the former is written NrshH (nafsha or najsheh), the latter BNTShH with the preposition bk prefixed. Personal pronouns are expressed in the dative (i.e. with prepositional / prefixed), thus lk (lakh) for tu, " thou," lnh (land) for amd, " we." Sometimes the same Semitic sign stands for two distinct Persian words that happen to agree in sound; thus because hand is Aramaic for " this," hna represents not only Persian e, " this," but also the interjection e, i. e. " O " as pre- fixed to a vocative. Sometimes for clearness a Persian termina- tion is added to a Semitic word; thus, to distinguish between the two words for father, pit and pitar, the former is written ab and the latter abitr. The Persian form is, however, not seldom used, even where there is a quite well-known Semitic ideogram. 5

These difficulties of reading mostly disappear when the ideographic nature of the writing is recognized. We do not always know what Semitic word supplied some ambiguous group of letters (e. g. pun for pa, "to," or ht for agar, "if"); but we always can tell the Persian word — which is the one important thing — though not always the exact pronunciation of it in that older stage of the language which the

extant Pahlavi works belong to. In Pahlavi, for example, the word for ” female” is written matak, an ancient form which afterwards passed through mddkak into mddha. But it was a mistake of later ages to fancy that because this was so the sign T also meant D,

3 Fihrist, p. 14, line 13 seq., cf. line 4 seq. The former passage was first cited by Quatremere, Jour. As. (1835), i. 256, and discussed by Clermont-Ganneau, ibid. (1866), i. 430. The expressions it uses are not always clear; perhaps the author of the Fihrist has condensed somewhat.

4 Editions by HoshangjI, Jamaspji Asa and M. Haug (Bombay, 1870), and by C. Salemann (Leiden, 1878). See also J. Olshausen, ” Zur Wiirdigung der Pahlavi-glossare ” in Kuhn’s Zeit. f. vergl. Sprforsch., N.F., vi. 521 seq.

6 For examples of various peculiarities see the notes to Noldeke’s translation of the story of Artakhshlr i Papakan (Gottingen, 1879),

and so to write T for D in many cases, especially in foreign proper names. That a word is written in an older form than that which is pronounced is a phenomenon common to many languages whose literature covers a long period. So in English we still write, though we do not pronounce, the guttural in through, and write laugh when we pronounce laf.

Much graver difficulties arise from the cursive nature of the characters already alluded to. There are some groups which may theoretically be read in hundreds of ways; the same little sign may be », «’, n\ *\ ft, “, nj i and the n too may be either h or kh.

In older times there was still some little distinction between letters that are now quite identical in form, but even the Egyptian fragments of Pahlavi writing of the 7th century show on the whole the same type as our MSS. The practical inconveniences to those who knew the language were not so great as they may seem; the Arabs also long used an equally ambiguous character without availing themselves of the dia- critical points which had been devised long before.

Modern MSS., following Arabic models, introduce diacritical points from time to time, and often incorrectly. These give little help, however, in comparison with the so-called Pazand or transcription of

Pahlavi texts, as they are to be spoken, in the character in which the Avestd itself is written, and which is quite clear and has all vowels as well as consonants. The transcription is not philologically accurate; the language is often modernized, but not uniformly so. Pazand MSS. present dialectical variations according to the taste or intelligence of authors and copyists, and all have many false readings. For us, however, they are of the greatest use. To get a conception of Pahlavi one cannot do better than read the Minoi-Khiradh in the Pahlavi with constant reference to the Pazand. 1 Critical labour is still required to give an approximate reproduction of the author's own pronunciation of what he wrote.

The coins of the later Sassanid kings, of the princes of Tabar- istan, and of some governors in the earlier Arab period, exhibit an alphabet very similar to Pahlavi MSS. On the older coins the several letters are more clearly distinguished, and in good specimens of well-struck coins of the oldest Sassanians almost every letter can be recognized with certainty. The same holds good for the inscriptions on gems and other small monuments of the early Sassanian period; but the clearest of all are the rock inscriptions of the Sassanians in the 3rd and 4th centuries, though in the 4th century a tendency to cursive forms begins to appear. Only r and v are always quite alike. The character of the language and the system of writing is essentially the same on coins, gems and rocks as in MSS. — pure Persian, in part strangely disguised in a Semitic garb. In details there are many differences between the Pahlavi of inscriptions and the books. Persian endings added to words written in Semitic form are much less common in the former, so that the person and number of a verb are often not to be made out. There are also orthographic variations; e.g. long a in Persian forms is always expressed in book-PahlavI, but not always in inscriptions. The unfamiliar contents of some of these inscriptions, their limited number, their bad preservation, and the imperfect way in which some of the most important of them have been puhlished 2 leave many things still obscure in these monuments of Persian kings; but they have done much to clear up both great and small points in the history of Pahlavi. 3

Some of the oldest Sassanian inscriptions are accompanied by a text belonging to the same system of writing, but with many variations in detail, 4 and an alphabet which, though derived

1 The Book of the Mainyo-i-Khard in the Original Pahlavi, ed. by Fr. Ch. Andreas (Kiel, 1882) ; idem, The Pazand and Sanskrit Texts, by E. W. West (Stuttgart and London, 1871).

2 See especially the great work of F. Stolze, Persepolis (2 vols., Berlin, 1882). It was De Sacy who began the decipherment of the inscriptions.

3 Thus we now know that the ligature in book- Pahlavi which means ” in,” the original letters of which could not be made out, is for rn, ” between.” It is to be read andar.

4 Thus pus, ” son,” is written ‘-n instead of irn; pish, ” before,” is written nncnp, but in the usual Pahlavi it is ‘l’O = ‘J‘5ˆ.

from the same source with the other Pahlavi alphabets (the old Aramaic), has quite different forms. This character is also found on some gems and seals. It has been called Chaldaeo- Pahlavi, &c. Olshausen tries to make it probable that this was the writing of Media and the other that of Persia. The Persian dialect in both sets of inscriptions is identical or nearly so. 5

The name Pahlavi means Parthian, Pahlav being the regular Persian transformation of the older Parthava. 6 This fact points to the conclusion that the system of writing was developed in Parthian times, when the great nobles, the Pahlavans, ruled and Media was their main seat, ” the Pahlav country.” Other linguistic, graphical and historical indications point the same way; but it is still far from clear how the system was developed. We know, indeed, that even under the Achaemenids Aramaic writing and speech were employed far beyond the Aramaic lands, even in official documents and on coins. The Iranians had no convenient character, and might borrow the Aramaic letters as naturally as they subsequently borrowed those of the Arabs. But this does not explain the strange practice of writing Semitic words in place of so many Persian words which were to be read as Persian. It cannot be the invention of an individual, for in that case the system would have been more consistently worked out, and the appearance of two or more kinds of Pahlavi side by side at the beginning of the Sassanian period would be inexplicable. But we may remember that the Aramaic character first came to the Iranians from the region of the lower Euphrates and Tigris, where the complicated cuneiform character arose, and where it held its ground long after better ways of writing were known. In later antiquity probably very few Persians could read and write. All kinds of strange things are conceivable in an Eastern character confined to a narrow circle. Of the facts at least there is no doubt.

The Pahlavi literature embraces the translations of the holy books of the Zoroastrians, dating probably from the 6th century, and certain other religious books, especially the Minoi-Khiradh and the

Bundahish. 7 The Bundahish dates from the Arab period. Zoroastrian priests continued to write the old language as a dead tongue and to use the old character long after the victory of a new empire, a new religion, a new form of the language (New Persian), and a new character. There was once a not quite inconsiderable profane literature, of which a good deal is preserved in Arabic or New Persian versions or reproductions, particularly in historical books about the time before Islam. 8 Very little profane literature still exists in Pahlavi; the romance of Ardashlr has been mentioned above.

See E. W. West's " Pahlavi Literature," in Geiger and Kuhn's Grundriss der iranischen Philologie 41896), vol. ii. ; "The Extent, Language and Age of Pahlavi Literature " in Sitzungsber. der k. Akad. der wiss. Phil. u. hist. Klasse (Munich, 1888), pp. 399-443 and his Pahlavi Texts in Sacred Books of the East (1880-1897). The difficult study of Pahlavi is made more difficult by the corrupt state of our copies, due to ignorant and careless scribes.

Of glossaries, that of West (Bombay and London, 1874) is to be recommended; the large Pahlavi, Gujarat! and English lexicon of Jamaspji Dastur Minocheherji (Bombay and London, 1877-1882) is very full, but has numerous false or uncertain forms, and must be used with much caution. (Th. N.)

PAIGNTON, a seaside resort in the Torquay parliamentary division of Devonshire, England, on Tor Bay, 2J m. S.W. of Torquay, on the Great Western railway. Pop. of urban district (1901), 8385. The church of St John is mainly Perpendicular,

5 What the Fihrist (p. 13 seq.) has about various forms of Persian writing certainly refers in part at least to the species of Pahlavi. But the statements are hardly all reliable, and in the lack of trust- worthy specimens little can be made of them.

6 This was finally proved by Olshausen, following earlier scholars; see J. Olshausen, Parthava und Pahlav, Mada und Mah (Berlin, 1877, and in the Monatsb. of the Academy).

7 Translations ed. by F. Spiegel (i860), the Bundahish by N. L.

Westergaard (Copenhagen, 1851) and F. lusti (Leipzig, 1868); other

Pahlavi books by Spiegel and Haug, by Hoshangji, and other Indian

Parsees.

ˆ 8 One other book, the stories of Kalilag and Damnag, in a Syriac

. version from the Pahlavi, the latter taken from the Sanskrit.

but has a late Norman doorway, and contains a carved and painted pulpit, and in the Kirkham chapel several interesting monuments of the Kirkham family, and a beautiful though damaged stone screen. Among other buildings and institutions are a novitiate of Marist Fathers, a science and art school, a pier with pavilion and concert rooms, and a yacht club. Little remains of an old palace of the bishops of Exeter apart from the 14th-century Bible Tower. Its last tenant was Bishop Miles Coverdale, who in 1535 published the first English translation of the whole Bible. The town owes its popularity to a firm expanse of sand, good bathing facilities, and a temperate climate.

PAIL, a bucket, a vessel for carrying water, milk or other liquids, made of wood or metal 01 other material, varying in size, and usually of a circular shape and somewhat wider at the top than the bottom. The word is of somewhat obscure origin. The present form points to the O. Eng. paegel, but the sense, that of a small wine-measure, a gill, is difficult to connect with the present one. The earlier forms of the word in Mid. Eng. spell the word payle, paille, and this rather points to a connexion with O. Fr. paelle, payelle, a small pan or flat dish, from Lat. patella, diminutive of patera, dish. The sense here also presents diffi- culties, ” pail ” in English being always a deep vessel.

PAILLERON, EDOUARD JULES HENRI (1834-1899), French poet and dramatist, was born in Paris on the 17th of September 1834. He was educated for the bar, but after pleading a single case he entered the first dragoon regiment and served for two years. With the artist J. A. Beauce he travelled for some time in northern Africa, and soon after his return to Paris in i860 he produced a volume of satires, Les Parasites, and a one-act piece, Le Parasite, which was represented at the Odeon. He married in 1862 the daughter of Francois Buloz, thus obtaining a share in the proprietorship of the Revue des deux mondes. In 1869 he produced at the Gymnase theatre Les Faux manages, a four- act comedy depending for its interest on the pathetic devotion of the Magdalene of the story. L’Etincelle (1879), a brilliant one-act comedy, secured another success, and in 1881 with Le Monde ou Von s’ennuie Pailleron produced one of the most strikingly successful pieces of the period. The play ridiculed contemporary academic

society, and was filled with transparent allusions to well-known people. None of his subsequent efforts achieved so great a success. Pailleron was elected to the French Academy in 1882, and died on the 20th of April 1899.

PAIMPOL, a fishing port of western France, in the department of C6tes-du-Nord, 27I m. N.N.W. of St Brieuc by road. Pop. (1906), 2340. Paimpol is well known for its association with the Icelandic cod-fisheries, for which it annually equips a large fleet. Steam sawing and boat-building are carried on; grain, &c, is exported; imports include coal and timber. A tribunal of commerce and a school of navigation are among the public institutions.

PAIN (from Lat. poena, Gr. volvr], penalty, that which must be paid: O. Fr. peine), a term used loosely (1) for the psycho- logical state, which may be generally described as ” unpleasant- ness,” arising, e.g. from the contemplation of a catastrophe or of moral turpitude, and (2) for physical (or psycho-physical) suffer- ing, a specific sensation localized in a particular part of the body. The term is used in both senses as the opposite of ” pleasure,” though it is doubtful whether the antithesis between physical and psychical pleasure can be equally well attested. The investigation of the pleasure-pain phenomena of consciousness has taken a prominent place in psychological and ethical specula- tion, the terms ” hedonics ” and ” algedonics ” (a \yr]5Lov, pain of body or mind) being coined to express different aspects of the subject. So in aesthetics attempts have been made to assign to pain a specific psychological function as tending to increase pleasure by contrast (so Fechner): pain, e.g. is a necessary ele- ment in the tragic. Scientists have experimented elaborately with a view to the precise localization of pain-sensations, and ” pain-maps ” can be drawn showing the exact situation of what are known as ” pain-spots.” For such experiments instruments known as ” aesthesiometers ” and ” algometers ” have been devised. The great variety of painful sensations —

throbbing, dull, acute, intermittent, stabbing — led to the conclusion among earlier investigators that pains differ in quality. It is, however, generally agreed that all pain is qualitatively the same, though subject to temporal and intensive modification. (See Psychology; Aesthetics; Nervous System; Sym- pathetic System.)

PAIN, BARRY (1867-), English humorous writer, was

educated at Cambridge, and became a prominent contributor to The Granta. James Payn inserted his story, ” The Hundred Gates,” in the

Cornhill Magazine in 1889, and shortly afterwards he became a contributor to Punch and the Speaker, and joined the staffs of the Daily Chronicle and Black and White. His works include: In a Canadian Canoe (1891); papers reprinted from The Granta; Playthings and Parodies (1892); The Kindness of the Celestial (1894); The Octave of Claudius (1897); Eliza (1900); Another English Woman's Love Letters (1901), &c. As a writer of parody and lightly humorous stories his name has become widely known.

PAINE, ROBERT TREAT (1731-1814), American politician, a signer of the Declaration of Independence, was born in Boston, Massachusetts, on the nth of March 1731. He graduated at Harvard in 1749, and was admitted to the bar in 1759. In 1768 he was a delegate to the provincial convention which was called to meet in Boston, and conducted the prosecution of Captain Thomas Preston and his men for their share in the famous " Boston Massacre " of the 5th of March 1770., He served in the Massachusetts General Court in 1773-1774, in the Provincial Congress in 17 74-1 7 7 5, and in the Continental Congress in 1774- 1778, and was speaker of the Massachusetts House of Represen- tatives in 1777, a member of the executive council in 1779, a member of the committee which drafted the constitution of 1780, attorney-general of the state from 1777 to 1790, and a judge of the state supreme court from 1790 to 1804. He died in Boston on the nth of May 18 14.

See John Sanderson, Biography of the Signers of the Declaration of Independence (Philadelphia, 1823), vol. ii.

His son, Robert Treat Paine (1 773-181 1), who was christened Thomas but in 1801 took the name of his father and of an elder brother who died without issue in i794,was a poet of some repute, but his verses have long been forgotten. His best known pro- ductions are Adams and Liberty, a once popular song written in 1798, The Invention of Letters (1795), and The Ruling Passion, the Harvard Phi Beta Kappa poem of 1797.

His Works in Verse and Prose (Boston, 1812) contains a bio- graphical sketch.

PAINE, THOMAS (1737-1809), English author, was born at Thetford, Norfolk, on the 29th of January 1737, the son of a Quaker staymaker. After several years at sea and after trying various occupations on land, Paine took up his father's trade in London, where he supplemented his meagre grammar school education by attending science lectures. He succeeded in 1762 in gaining an appointment in the excise, but was

discharged for neglect of duty in 1765. Three years later, however, he received another appointment, at Lewes in Sussex. He took a vigorous share in the debates of a local Whig club, and in 1772′ he wrote a pamphlet embodying the grievances of excisemen and supporting their demands for an increase of pay. In 1774 he was dismissed the service for absence without leave — in order to escape his creditors.

A meeting with Benjamin Franklin in London was the turning point in his life. Franklin provided him with letters to his son- in-law, Richard Bache, and many of the leaders in the colonies' resistance to the mother country, then at an acute stage. Paine sailed for America in 1774. Bache introduced him to Robert Aitkin, whose Pennsylvania Magazine he helped found and edited for eighteen months. On the 9th of January 1776 Paine published a pamphlet entitled Common Sense, a telling array of arguments for separation and for the establishment of a republic. His argument was that independence was the only consistent line to pursue, that " it must come to that some time or other "; that it would only be more difficult the more it was delayed, and that independence was the surest road to union. Written

in simple convincing language, it was read everywhere, and the open movement to independence dates from its publication. Washington said that it " worked a powerful change in the minds of many men." Leaders in the New York Provincial Congress considered the advisability of answering it, but came to the conclusion that it was unanswerable. When war was declared, and fortune at first went against the colonists, Paine, who was then serving with General Greene as volunteer aide-de-camp, wrote the first of a series of influential tracts called The Crisis, of which the opening words, " These are the times that try men's souls," became a battle-cry. Paine's [services were recognized by an appointment to be secretary of the commission sent by Congress to treat with the Indians, and a few months later to be secretary of the Congressional committee of foreign affairs. In 1779, however, he committed an indiscretion that brought him into trouble. He published information gained from his official position, and was compelled to resign. He was afterwards clerk of the Pennsylvania legislature, and accom- panied John Laurens during his mission to France. His services were eventually recognized by the state of New York by a grant of an estate at New Rochelle, and from Pennsylvania and, at Washington's suggestion, from Congress he received considerable gifts of money.

In 1787 he sailed for Europe with the model of an iron bridge he had designed. This was publicly exhibited in Paris and London, and attracted great crowds. In England he determined to ” open the eyes of the people to the madness and stupidity of the government.” His first efforts in the Prospects on the Rubicon (1787) were directed against Pitt’s war policy, and to- wards securing friendly relations with France. When Burke’s Reflections on the Revolution in France appeared, in 1790, Paine at once wrote his answer, The Rights of Man. The first part appeared on the 13th of March 1791, and had an enormous circulation before the government took alarm and endeavoured to suppress it, thereby exciting intense curiosity to see it, even at the risk of heavy penalties. Those who know the book only by hearsay as the work of a furious incendiary will be surprised at the dignity, force and temperance of the style; it was the circumstances that made it inflammatory. Pitt ” used to say,” according to Lady Hester Stanhope, ” that Tom Paine was quite in the right, but then he would add, ‘ What am I to do? As things are, if I were to encourage Tom Paine’s opinions we should have a bloody revolution.’ ” Paine was indicted for treason in May 1792, but before the trial came off he was elected by the department of Calais to the French convention, and escaped into France, followed by a sentence of outlawry. The first years that he spent in France form a curious episode in his life. He was enthusiastically received, but as he knew little of the language translations of his speeches had to be read for him. He was bold enough to speak and vote for the ” detention of Louis during the war and his perpetual banishment after- wards,” and he pointed out that the execution of the king would alienate American sympathy. He incurred the suspicion of Robespierre, was thrown into prison, and escaped the guillotine by an accident. Before his arrest he had completed the first part of the Age of Reason, the publication of which made an instant change in his position on both sides of the Atlantic, the indignation in the United States being as strong as in England. The Age of Reason can now be estimated calmly. It was written from the point of view of a Quaker who did not believe in revealed religion, but who held that ” all religions are in their nature mild and benign ” when not associated with political systems. Inter- mixed with the coarse unceremonious ridicule of what he con- sidered superstition and bad faith are many passages of earnest and even lofty eloquence in favour of a pure morality founded on natural religion. The work in short — a second part, written .during his ten months’ imprisonment, was published after his release — represents the deism of the 18th century in the hands of a rough, ready, passionate controversialist.

At the downfall of Robespierre Paine was restored to his seat in the

convention, and served until it adjourned in October 1795. In 1796 he published a long letter to Washington,

attacking his military reputation and his presidential policy with inexcusable bitterness. In 1802 Paine sailed for America, but while his services in behalf of the colonies were gratefully remembered, his Age of Reason and his attack on Washington had alienated many of his friends. He died in New York on the 8th of June 1809, and was buried at New Rochelle, but his body was in 1819 removed to England by William Cobbett.

See the biography by Moncure D. Conway (1892).

PAINESVILLE, a city and the county-seat of Lake county, Ohio, U.S.A., on the Grand River, 3 m. S. of Lake Erie and about 30 m. N.E. of Cleveland. Pop. (1900) 5024, of whom 499 were foreign-born and 179 negroes; (1910) 5501. It is served by the Lake Shore & Michigan Southern, the New York, Chicago & St Louis and the Baltimore & Ohio railways, and by electric lines to Cleveland, Fairport and Ashtabula. It is the seat of Lake Erie College (non-sectarian, for women), the successor of Willoughby Seminary (1847), whose buildings at Willoughby, Ohio, were burned in 1856; the college was opened as the Lake Erie Female Seminary in 1859, and became Lake Erie College and Seminary in 1898 and Lake Erie College in 1908. Painesville is situated in a farming and fruit-growing country, and also has some manufactures. Three miles north, on Lake Erie, is the village of Fairport (pop. in 1900, 2073), with a good harbour and coal and ore docks. The municipality owns and operates its waterworks and street-lighting plants. Painesville was founded in 1800-1802 by settlers from Connecticut and New York, conspicuous among whom was General Edward Paine (1746- 1841), an officer from Connecticut in the War of Independence; it was incorporated asa village in 1832, and became a cityin 1902 under the new Ohio municipal code.

PAINTER-WORK, in the building trade. When work is painted one or both of two distinct ends is achieved, namely the preservation and the coloration of the material painted. The compounds used for painting — taking the word as meaning a thin protective or decorative coat — are very numerous, inclu- ding oil-paint of many kinds, distemper, whitewash, tar; but the word ” paint ” is usually confined to a mixture of oil and pigment, together with other materials which possess properties necessary to enable the paint to dry hard and opaque. Oil paints are made up of four parts — the base, the vehicle, the solvent and the driers. Pigment may be added to these to obtain a paint of any desired colour.

There are several bases for oil paint, those most commonly used for building work being white lead, red lead, zinc white and oxide of iron. White lead is by far the commonest of bases for paint. When pure it consists of about 75% carbonate of lead and about 25% of lead hydrate. It is mixed with 6 or 7% by weight of pure linseed oil, and in this form is supplied to the painter. Sulphate of baryta is the chief adulterant used in the manufacture of white lead. White lead has greater covering properties and is more durable than the other bases. It should therefore always be used in external painting. Paints having white lead for a base darken with age, and become discoloured when exposed to the fumes of sulphuretted hydrogen, which exists to a greater or less extent in the air of all large towns. Zinc white, an oxide of zinc, is of a purer white colour than white lead. It is lighter, and does not possess the same durability or covering power. It is, however, useful in internal decoration, as it retains its colour well, even when subjected to the action of gases. Red lead is a lead oxide. It is used chiefly in the priming coat and as a base for some red paints. Like white lead, it is in- jured if exposed tc acids or impure air, which cause discoloration and'decay. Oxide of iron is used chiefly as a base in paints used for covering iron-work, the theory being that no destructive galvanic action can be set up, as might be the case with lead paint when used on iron. A variety of red pigments are made from oxide of iron, varying in hue from a pale to a deep brownish-red. They are quite permanent, and may be used under any conditions.

The vehicle is a liquid in which the particles of the base are held in suspension, enabling a thin coat of paint to be formed, uniform in colour and consistency, and which on drying forms

a kind of skin over the surface to which it is applied. For oil paint the vehicles used are oils; for distemper water is employed.

The oils used as vehicles are chiefly linseed oil, raw and boiled, and poppy-seed oil. Nut oils are occasionally used for inferior work because they are much cheaper. Linseed oil, the one most commonly used, is obtained from the seeds of the flax by warming it and squeezing out the oil under hydraulic pressure. The resultant, which is of a transparent amber colour, is known as " raw " oil. It is used principally in interiors for light, bright colours, drying somewhat slowly and giving a firm elastic coat. The oil improves by keeping, and

is sometimes ” refined ” with acids or alkalies. ” Boiled ” oil is the raw oil heated with driers, such as litharge or red lead, to a temperature from 350 to 500° F., at which it is maintained for three or four hours. It is thick and much darker in colour than the raw oil, drying much more quickly, with a coat hard and glossy but less elastic than that produced by raw oil. Poppy-seed oil is expressed from the seeds of the poppy plant. It does not possess the tenacity and quick- drying powers of boiled linseed oil, but being of a very light colour it is used for delicate colours.

Turpentine is used as a solvent, diluent, or ” thinner,” to bring the paint to a proper consistency so as to allow it to be spread in a thin even coat. When a flat dull surface is desired, turpentine alone is used with the base and the oil is omitted. The best turpentine comes from the pine forests of America. French turpentine is next in quality. Russian turpentine is the cheapest, and has usually a strong and unpleasant odour that renders it objectionable to work with. In consequence of the high price of turpentine of good quality, and the increasing difficulty of obtaining it, substitutes are coming into general use.

” Driers ” are substances usually added to paint to hasten the process of oxidation, i.e. the drying, of the oil. Some pigments possess this quality, as red lead and white lead. The most notable driers are litharge, sugar of lead, patent driers, sulphate of zinc and manganese dioxide. Liquid driers, such as terebene, are also in use. Litharge, an oxide of lead, is in most general use. Sugar of lead is used, ground in oil, for light tints. Sul- phate of zinc and manganese driers are used for paints in which zinc white is the base, which would be injured by lead driers.

” Pigments ” are preparations of metallic, earthy or animal origin mixed into paint to give it colour. For oil paint they are usually ground in oil; for distemper they are sold as a finely ground powder. The ordinary pigments are white lead, zinc white, umbers, siennas, ochres, chromes, Venetian red, Indian red, lamp black, bone black, vegetable black, ultramarine, Prussian blue, vermilion, red lead, oxide of iron, lakes and Vandyke brown.

The term ” enamel paint ” was first given to a compound of zinc white, petrol and resin, which possessed on drying a hard glossy surface. The name is now applied to any coloured paint of this nature. Quick-drying enamels are spirit varnishes ground with the desired pigment. For slow-drying enamels oil varnishes form the vehicle.

Woodwork is often treated with a thin transparent-coloured liquid which changes the colour of the work without hiding the grain of the wood, and if the latter is good a very fine result is obtained. Sometimes the stain is produced by the combination of two or more chemicals applied separately, or soluble pigments may be mixed with a transparent vehicle and applied in the usual way. The vehicles for the pigments vary considerably, and include water, methylated spirit, size, turpentine and clear raw linseed oil.

Varnish is made by dissolving certain gums in linseed oil, turpentine, spirit or water. They give a transparent protective coat to painted and stained surfaces or to wall-paper or plain woodwork. Varnishes usually dry with a very smooth, hard and shiny surface, but ” flat ” or ” dead ” surfaces which are without gloss may be obtained with special varnish.

The gums used for hard-wearing or carriage varnishes, such as those to be exposed to the weather and frequently cleaned and polished, are amber, copal and gum anime. Amber is a yellow transparent or clouded gum found on the coasts of the

Baltic, and particularly in Prussia. It makes a hard, durable and slow-drying varnish which does not darken with age. Copal gum is brought from the West India Islands and also from the East Indies. It makes the most durable varnish, and being tough and hard is generally used for external work. Gum anime, is a variety of copal found in the sandy soil of the East Indies. It is hard, durable and quick-drying, but unless the varnish is carefully made it is liable to crack. Varnishes for inside work, or cabinet varnishes, are made with a variety of resins dissolved in linseed oil and turpentine. The resultant gives a hard, lustrous surface, somewhat less durable than that of carriage varnishes. Turpentine varnishes are made from soft gums, such as dammar, common resin and mastic; they are light in colour, cheap and not very durable. Lacquers or spirit varnishes are made from very soft gums, such as shellac and sandarach, dissolved in methylated spirit. They are used for internal work, drying quickly, and becoming hard and very brilliant. Surfaces formed with such varnishes are liable to chip easily and scale off. Oil paint is very much improved by the addition of some varnish; it causes it to dry harder and more quickly and with a fine lustrous surface.

The driers used for varnish are generally acetate of lead or litharge. An excess of driers makes the varnish less durable and causes cracking.

There are many kinds of French polishes, mixed in different ways, but most are composed of shellac and sandarach dissolved in spirit. It is applied to the perfectly smooth surface of hard woods with a pad of flannel or wadding wrapped in linen, and well rubbed in with a circular motion.

A dull polish is procured by rubbing beeswax into the wood. It must be thoroughly rubbed in, a little turpentine being added as a lubricant when the rubber works stiffly.

If paint were applied over the bare knots of new wood it would be destroyed, or at least discoloured, by the exudation of resin from the knots. For the purpose of obviating this the knots are covered with two coats of a preparation called ” knotting,” made by dissolving shellac in methylated spirit.

Putty is required for stopping nail-holes and small crevices and irregularities in woodwork. It is made of powdered whiting and linseed oil mixed together and kneaded into a stiff paste. For light work ” hard stopping,” made of white lead and whiting, should be employed.

The tools and appliances of the painter are mixing pots, paint kettles to hold the colour for the painter at work, strainer, palette knife, scraping knife, hacking, stopping and chisel knives, the hammer, sponge, pumice, blow-lamp for burning off, and a variety of brushes, such as the duster, the ground brush, the tool, the distemper brush, the fitch and camel-hair pencil for picking out small parts and lines, the sable and flogger for gilding, the stippler; for grained work several steel graining combs with coarse and fine teeth, graining brush of hogs’ hair, pencil over- grainer, and other special shaped brushes used to obtain the peculiar characteristics of different woods. It is absolutely necessary for good work to use brushes of a fine quality, and although expensive at first cost, they are undoubtedly cheapest in wear.

Workmanship. — New woodwork requires to be knotted, primed, stopped, and in addition painted with three or four coats of oil colour. The priming coat is a thin coat of white lead, red lead and driers mixed with linseed oil and turpentine. Work should always be primed before the stopping is done. The second or ” lead ” coat is composed mainly of turpentine, linseed oil and white lead. The third coat is the ground for the finishing colour, and is made of white lead and linseed oil and turpentine, with enough pigment to bring it to a tint approaching the finish- ing colour. The remaining coat or coats is of

similar composi- tion. A ” flatting ” coat is made of white lead and turpentine with the desired pigment. One pound of colour will cover 4 sq. yds. in the first coat and 6 sq. yds. in the additional coat.

Graining. — Graining is understood among painters to be the imitating of the several different species of ornamental woods, as satinwood, rosewood, mahogany, oak and others. After

the necessary coats of paint have been put’ on to the wood a ground is then laid of the required tint and left to dry. The painter then prepares small quantities of the same colour with a little brown, and boiled oil and turpentine, and, having mixed this, spreads it over some small part of his work. The flat hogs’ hair brushes being dipped in the liquid and drawn down the newly-laid colour, the shades and grainings are produced. To obtain the mottled appearance the camels’ hair pencils are applied, and when completed the work is left to dry, and afterwards covered by a coat or two of good copal varnish. Imitation wainscot requires the use of combs of various degrees of fineness to obtain the grain (whence the process is called combing by some persons), and the flower is got by wiping off the colour with a piece of rag. When dry it is over-grained to obtain a more complete representation of the natural wood, and then varnished. If the work be done in water-colour and not in oil, beer grounds to act as a drier are mixed with the colour; this sets it ready for varnishing. A ” patent graining machine,” a sort of roller with a pattern upon it, is often used.

Marbling. — Marbling is the imitation of real marbles and granites, some of which are represented by splashing on the carefully prepared ground, which should have been painted and often rubbed and polished to obtain an even surface; others have to be painted in colours, and then well varnished.

Painting on Plaster Work. — Plastering should never be painted until it is thoroughly dry. Portland cement is best left for a year or two before being painted. Plaster work not previously painted will require four or five coats, Portland cement five or six. If plastered work is required to be painted immediately, it should be executed in Keene’s or Parian cement (see Plaster Work). A great deal more paint is of course absorbed by plaster than by wood, just as wood absorbs more than iron.

Painting on Iron. — Iron and steel work should receive a coat of oxide paint at the manufacturer's works; additional coats are added after erection. All rust should be previously removed by means of wire brushes and paraffin or turpentine. The best paints for external iron work are composed of oxide of iron and red lead, mixed with linseed oil.

The following is an extract from the building by-laws of the municipality of Johannesburg: —

" All structural metal work shall be thoroughly cleaned from scale and rust before painting. Faying surfaces in riveted work shall be painted before putting them together. All surfaces of steel or iron work inaccessible after erection shall be protected as far as possible either by coating them with ' Smith's ' or other approved bituminous composition, or by filling the spaces which they enclose with lime concrete."

Repainting Old Work. — Before beginning to repaint work of any description it must be thoroughly cleaned. If the surface is in good condition it will be sufficient to scrub down with good soap and water and afterwards sponge and wipe dry. If the work has become rough it will often be necessary to use pumice stone to facilitate the operation of cleaning. The pumice should be cut or rubbed to a flat surface and vigorously applied with plenty of clean water. It' is essential that the work should be quite dry before any paint is applied. If the old surface is much cracked and blistered no amount of rubbing with pumice will enable the workman to obtain a good ground for the new coats, and it will be necessary to remove the old paint entirely. For this purpose painters most frequently use a paint burner or torch which burns paraffin oil under air pressure. This causes the paint to soften and blister under the heat, in which state it is readily scraped off by a blunt knife. The old-fashioned grate filled with charcoal held close to the surface by means of a long handle is now not often used. There has recently been a considerable increase in the use of chemical paint removers in paste or liquid form; as a rule these contain some alkali, such as lime or caustic soda. The prepara- tion is brushed on to the paint required to be removed, and in the course of from ten minutes to half an hour the paint becomes so soft that it can readily be scraped off.

Blistering and Cracking. — The blistering of painted surfaces may be caused in several ways. If on iron, it may be the result of a particle of rust which, not having been removed in the pro- cess of cleaning, has increased in size and loosened the paint. If on plaster, a particle of

unslaked lime may have ” blown,” with a similar result. On wood, blistering is usually caused by painting upon a wet surface or upon unseasoned wood. Blisters may also be caused by the use of too much oil in paint exposed to heat, or the application of one coat upon another before the latter is properly dry. To prevent blistering a method that has been tried with good results is to apply two coats of water paint (washable distemper) and follow by two coats of oil colour or varnish. Cracking is caused by the use of too much oil in the under coats and too little in the top coats.

Distemper. — New plaster-work must be quite dry before dis- temper is applied. The work should be stopped (that is, any irregularities filled up with plaster of Paris mixed with whiting and water to a paste) and then rubbed perfectly smooth with glass paper. Clairecole, a solution of thin size and whiting, is then applied to render the plaster non-absorbent, and this is followed by distemper of the desired colour. Distemper is made by soaking whiting in clean water to a creamy consistency. To this is added size which has been previously warmed, and the pigment required to colour the mixture; the whole is then well stirred and strained to remove any lumps. Many patent wash- able distempers under fancy names are now on the market in the form of paste or powder, which simply require to be mixed with water to be ready for use. If applied to woodwork distemper is apt to flake off.

The ” one-knot ” brush for cornices and other mouldings and the ” two-knot ” and ” brass-bound ” brushes for flat surfaces are usually employed for distempering and whitewashing.

A granular surface is produced by stippling or dabbing the surface with a stiff bristled brush specially made for this purpose.

Gilding, &°c. — Very rich effects may be produced both in external and internal decorations by the judicious use of overlays of gold or silver. In their application, however, it must always be borne in mind that they are metals, not paints, and they should only be used in positions such as would be appropriate for the actual metals. ” Dutch metal ” and other imitations cost about one-third of the price of genuine gilding, and require to be protected from oxidization by a coat of lacquer. Gold leaf is affixed with gold size or other adhesive preparations. The best and most durable work is oil gilding, which involves less labour, and results in a richer appearance than other methods. The work is usually primed first of all with a solution of boiled linseed oil and white lead, and then covered with a fine glutinous composition called gold size, on which, when it is nearly

dry, the gold leaf is laid in narrow strips with a fine brush, and pressed down with a pad of cotton-wool held in the fingers. As the slips must be made to overlap each other slightly to ensure the complete covering of the whole surface, the loose edges will remain unattached, to be afterwards struck off with a large sable or camel-hair brush. The joints, if the work be skilfully executed, will be invisible. For burnished gilding the work must be covered with various coats of gluten, plaster and bole, which last is mixed with gold size to secure the adhesion of the leaf.

Authorities.— A. C. Wright, M.A., B.Sc, .Simple Methods for Testing Painters' Materials; Professor A. H. Church, Colour; Ellis A. Davidson, House Painting, Graining, Marbling and Sign Writing ; W. J. Pearce, Painting and Decorating; A. S. Jennings, Paint and Colour Mixing; G. H. Hurst, F.C.S., Painters, Colours, Oils and Varnishes. (J. Bt.)

PAINTING, in art, the action of laying colour on a surface, or the representing of objects by the laying of colour on a surface. It is with painting in the last sense, considered as one of the fine arts, that this article deals. In the first sense, in so far as painting is a part of the builder's and decorator's trade it is treated above under the heading Painter- Work. The verb " to paint " is derived through Fr. peindre (peint, the past participle, was possibly the earliest part adopted, as is suggested

in the New English Dictionary), from Lat. pingere, to paint. From the past participle pictus comes pictura, picture, and from the root pig, pigment. The ultimate meaning of the root is probably to decorate, adorn, and is seen in Gr. ttoik£Xos, many- coloured, variegated.

In Part I. of this article, after a brief notice of the general character of the art and an account of its earliest manifestations, a sketch is given of the course of its development from the ancient Egyptian period to modern times. (An account, by countries, of recent schools of painting will be found as an appendix at the end of Part III.) The point of view chosen is that of the relation of painting to nature, and it is shown how the art, beginning with the delineation of contour, passes on through stages when the effort is to render the truth of solid form, to the final period when, in the 17th century, the presentment of space, or nature in all her extent and variety, becomes the subject of representation. Certain special forms of painting charac- teristic of modern times, such as portraiture, genre painting, landscape, still-life, &c, are briefly discussed.

Part II. consists in tables of names and dates intended to afford a conspectus of the different historical schools of painting from the 1 2th century a.d. downwards.

Part III. is devoted to a comprehensive treatment of the different technical processes of painting in vogue in ancient and modern times.

Authorities. — There is one elaborate general treatise on the whole art of painting in all its branches and connexions. It is by Paillot de Montabert, and was published in Paris (1 829-1 850). It is entitled Traite complet de la peinture, and is in nine sub- stantial volumes,

with an additional volume of plates. It begins with establishing the value of rules for the art, and giving a diction- ary of terms, lists of artists and works of art, &c. Vols. ii. and iii. give the history of the art in ancient, medieval and modern times. Vols, iv., v., vi. and vii. contain discussions on choice of subjects, design, composition, &c. ; on proportions, anatomy, expression, drapery; on geometry, perspective, light and shade, and colour. In vol. viii., pp. 1-285 deal with colour, aerial perspective and exe- cution ; pp. 285-503 take up the different kinds of painting, history, portrait, landscape, genre, &c. ; and pp. 503-661 are devoted to materials and processes, which subject is continued through vol. ix. To encaustic painting 125 pages are given, and 100 to painting in oil. A long discussion on painting grounds and pigments follows, while other processes of painting, in tempera, water-colour, enamel, mosaic, &c, are more briefly treated in about 200 pages, while the work ends with a notice of various artistic impedimenta. Vol. i., it should be said, contains on 70 pages a complete synopsis of the contents of the successive volumes. The best general History of Painting is that by Woltmann and Woermann (Eng. trans., London, 1880, &c), but it does not go beyond the 16th century a.d. See also the separate articles on China {Art), Japan (Art), Egypt (Art), Greek Art, Roman Art, &c.

For the Italian schools of painting may be consulted : Crowe and Cavalcaselle, History of Painting in Italy (2nd ed., London, 1902, &c). The original edition was published in London under the titles History of Painting in Italy (3 vols., 1 864-1 866), and History of Painting in North Italy (2 vols., 1 871), Venturi, Sloria dell' arte italiana (Milan, 1901, &c).

For the German: Janitschek, Geschichte der deutscken Malerei (Berlin, 1890).

For the Early Flemish : Crowe and Cavalcaselle, The Early Flemish Painters (2nd ed., London, 1872); Wurzbach, Nieder- landisches Kiinstlet ■-Lexicon (Vienna and Leipzig, 1906, &c); Weale, Hubert and John van Eyck (London, 1907).

For the Dutch : Wurzbach ; Bode, Studien zur Geschichte der Holldndischen Malerei (Braunschweig, 1883) and Rembrandt und seine Zeitgenossen (Leipzig, 1906) ; Havard, The Dutch School of "'ainting (trans., London, 1885).

For the French: Lady Dilke, French Painters of the Eighteenth Century (London, 1899); D. C. Thomson, The Barbizon School.

For the English : Redgrave, A Century of Painters of the English School (London, 1890).

For the Scottish: W. D. McKay, R.S.A., The Scottish School of Painting (London, 1906).

For the American : J. C. Van Dyke (ed.), History of American Art (New York, 1903, &c.) ; S. Isham, A History of American Painting (N. Y., 1905).

The modern schools generally are treated fully, with copious bibliographical references, by Richard Muther, The History of Modern Painting (2nd ed., Eng. trans., London, 1907).

Part I. — A Sketch of the Development of the Art §1. Constituents and General Character. — If we trace back to the parent stock the various branches that support the luxuriant

modern growth of the graphic art, we see that this parent stock is in its origin twofold. Painting begins on the one side in outline delineation and on the other in the spreading of a coloured coating over a surface. In both cases the motive is at first utilitarian, or, at any rate, non-artistic. In the first the primary motive is to convey information. It has been noticed of certain savages that if one of them wants to convey to a companion the impression of a particular animal or object, he will draw with his finger in the air the outline of some characteristic feature by which it may be known, and if this do not avail he will sketch the same with a pointed stick upon the ground. It is but a step from this to delineation on some portable tablet that retains what is scratched or drawn upon it, and in this act a monument of the graphic art has come into being.

In the other case there are various motives of a non-aesthetic kind that lead to the covering of a surface with a coat of another substance. The human body, the first object of interest to man, is tender and is sensitive to cold. Wood, one of the earliest building materials and the one material for any sort of boat- building, is subject, especially when exposed to moisture, to decay. Again, the early vessel of clay, of neolithic date, because imperfectly burned, is porous. Now the properties of certain substances suitable for adhesive coatings on anything that needed protection or reinforcement would soon be noticed. Unctuous and oily substances like animal fat, mixed with ashes or some such material, are smeared by some savages on their bodies to keep them warm in cold regions and to defend them against insect bites in the tropics. Wax and resin and pitch, liquefied by the

heat of the sun or by fire, would lend themselves readily for the coating of wood with a substance impervious to moisture. Vitreous glazes, first no doubt the result of accident, fused over the surface of the primitive clay vessel would give it the required impermeability. This is no more art than the mere delineation which is the other source of painting, but it begins to take on itself an aesthetic character when colour plays a part in it. There are physiological reasons why the colour red exercises an exciting influence, and strong colours generally, like glittering surfaces, make an aesthetic appeal. In prehistoric times the flesh was sometimes stripped from the skeleton of a corpse and the bones rubbed with red earth or ruddle,' while the same easily procured colouring substance is used to decorate the person or the implement of the savage. In this sensibility to colour we find a second and distinct origin of the art of painting.

What a perspective does a glance back at the development of painting afford! Painting, an art that on a flat surface can suggest to illusion the presence of solid forms with length, breadth and thickness; that on the area of a few square inches can convey the impression of the vast spaces of the universe, and carry the eye from receding plane to plane till the persons or objects that people them grow too minute for the eye to discern; painting that can deck the world in Elysian brightness or veil it in the gloom cf the Crucifixion, that intoxicates the senses with its revelation of beauty, or magician-like withdraws the veil from the mysterious complexity of nature; the art that can exhibit all this, and yet can suggest a hundredfold more than it can show, and by a line, a shade, a touch, can stir within us " thoughts that do often lie too deep for tears " — this Painting, the most fasci- nating, because most illusive in its nature, of all the arts of form, is in its first origin at. one time a mere display to attract attention, as if one should cry out " See here!" and at another time a prosaic answer to a prosaic question about some natural object, " What is it like?" The coat or streak or dab of colour, the informing outline, are not in themselves aesthetic products. The former becomes artistic when the element of arrangement or pattern is introduced. There is arrangement when the shape and size of the mark or marks have a studied relation to those of the surface on which they are displayed; there is pattern when they are combined among themselves so that while distinct and contrasted they yet present the appearance of a unity. Again, the delineation, serving at first a purpose of use, is not in itself artistic, and it is a difficult question in aesthetic whether any representation of nature that aims only at resemblance really

comes into the domain of art. It is of course acknowledged that a mere prosaically literal likeness of a natural object is not a work of art ; but when the representation is of such a kind as to bring out the character of the object with discrimination and emphasis, to give the soul of it, as it were, and not the mere lineaments, then, logically or illogically, art claims it as its child. In the strict sense the delineation only becomes artistic when there is present the element of beauty in arrangement or composition. The insight and sympathy just referred to are qualities rather intellectual than artistic, and the really artistic element would be the tasteful fitting of the representation to the space within which it is dis- played, and the harmonious relations of the lines or masses or tones or colours that it presents to the eye. In other words, in artistic delineation there will be united elements drawn from both the sources above indicated. The representation of nature will be present, and so will also a decorative effect produced by a pleasing combination of forms and lines.

§ 2. Limitations of the Meaning of the word Painting. — If delineation take on itself a decorative character, so too decora- tion, relying at first on a pleasing arrangement of mere lines or patches that have in themselves no significance, soon goes on to impart to these the similitude, more or less exact, of natural objects. Here we arrive at a distinction which must be drawn at the outset so as duly to limit the field which this survey of painting has to cover. The distinction is that between orna- mental or, in a narrow sense, decorative painting on the one side, and painting proper on the other. In the first, the forms em- ployed have either in themselves no significance or have a resemblance to nature that is only distant or conventional. In painting proper the imitation of nature is more advanced and is of greater importance than the decorative effect to the eye. It is not only present but preponderant, while in ornamental work the representative element is distinctly subordinate to the decorative effect. In Greek vase decoration the conventional floral forms, or the mannered animal figures that follow each other monotonously round vases of the ” Oriental” style, belong to the domain of ornament, while the human forms, say, on the earliest red-figured vases, while displayed in pleasing patterns and in studied relation to the shape and structure of the vessel, exhibit so much variety and so great an effort on the part of the artist to achieve similitude to nature, that they claim a place for themselves in the annals of the painter’s art.

A further limitation is also necessary at the outset. Pictorial designs may be produced without the equipment of the painter proper; that is to say, without the use of pigments or coloured substances in thin films rubbed on to or attached by a binding material upon a surface. They may be executed by setting together coloured pieces of some hard substance in the form of Mosaic (q.v.); by interweaving dyed threads of wool, linen or silk into a textile web to produce Tapestry {q.v.) or Embroidery (q.v.); by inlaying into each other strips of wood of different colours in the work called Tarsia or Marquetry (q.v.) ; by fusing different coloured vitreous pastes into contiguous cavities, as in Enamelling (see Enamel); or by framing together variously shaped pieces of transparent coloured glass into the stained glass window (see Glass, Stained).

These special methods of producing pictorial effects, in so far as the technical processes they involve are concerned, are excluded from view in this article and are dealt with under their own headings. Only at those periods when pictorial design was exclusively or especially represented by work in these forms will the results of these decorative processes be brought in to illustrate the general character of the painting of the time. For example, in the 5th and 6th Christian centuries the art of painting is mainly represented by the mosaics in the churches at Rome and Ravenna, and these must be included from the point of view of design in any review of painting, though as examples of mosaic technique and style they are treated in an article apart. Greek vase painting, again, is a special subject (see Greek Art and Ceramics), yet the designs on early Greek vases are the only extant monuments that illustrate for us the early stages of the development of classical painting as a whole. It will be

understood therefore that in this article the word ” painting ” means the spreading of thin films of colouring matter over surfaces to which they are made by different means to adhere, and it will only be taken in a wider sense in certain exceptional cases just indicated.

§ 3. Importance in the Art of the Representation of Nature. — If we regard painting as a whole, the imitation of nature may be established as its most distinctive characteristic and the guiding principle of its development. It must at the same time be under- stood that in the advanced criticism of painting, as it is formulated in modern times, no distinction is allowed among the different elements that go to make up a perfect production of the art. In such a production the idea, the form, the execution, the elements of representation and of beauty, and the individual expression of the artist in his handiwork, are essentially one, and none of them can be imagined as really existing without the

others. It is not the case of a thought, envisaged pictorially, and deliber- ately clothed in an artistic dress, but of a thought that would have no existence save in so far as it is expressible in paint. This is the modern truth of the art, and the importance of the principle here involved will be illustrated in a later section, but it must be borne in mind that the painting to which this principle applies is a creation of comparatively modern times. As in music so in painting, it has been reserved for recent epochs to manifest the full capabilities of the art. Whereas the arts of architecture and sculpture, though they have found in the modern era new fields to conquer, yet grew to their full stature in ancient Hellas, those of music and painting remained almost in their infancy till the Renaissance. It was only in the 16th and 17th centuries that painters obtained such a mastery on the one hand over the forms of nature, and on the other over an adequate technique, that they were able to create works in which truth and beauty are one and the artistic speech exactly expresses the artistic idea. For this the painter had to command the whole resources of the science of perspective, linear and aerial, and all the technical capabilities of the many-sided processes of oil-paint. Till that stage in the development of the art was reached work was always on one side or another tentative and imperfect, but all through these long periods of endeavour there is one constant feature, and this is the effort of the artist to attain to truth in the representation of nature. No matter what was the character of his task or the material equipment of which he disposed, this ideal was for ever before his eyes, and hence it is that in the relation of the painter's work to nature we find that permanent feature which makes the development of the art from first to last a unity.

§ 4. General Scheme of the Development of the Art. — From this point of view, that of the relation of the work of the painter to nature, we may make a rough division of the whole history of the art into four main periods.

The first embraces the efforts of the older Oriental peoples, best represented by the painting of the Egyptians; the second includes the classical and medieval epochs up to the beginning of the 15th century; the third, the 15th and 16th centuries; and the fourth the time from the beginning of the 17th century onwards.

In the first period the endeavour is after truth of contour, in the second and third after truth of form, in the fourth after truth of space.

The Egyptian artist was satisfied if he could render with accuracy, and with proper emphasis on what is characteristic, the silhouettes of things in nature regarded as little more than flat objects cut out

against a light background. The Greek and the medieval artist realized that objects had three dimensions, and that it was possible on a flat surface to give an indication of the thickness of anything, that is of its depth away from the spectator, as well as its length and breadth, but they cannot be said to have fully succeeded in the difficult task they set them- selves. For this there was needful an efficient knowledge of perspective, and this the 15th century brought with it. During the 15th century the painter fully succeeds in mastering the representation of the third dimension, and during the next he exercises the power thus acquired in perfect freedom, producing some of the most convincing and masterly presentments of solid

forms upon a flat surface that the art has to show. During this period, however, and to a more partial extent even in the earlier classical epoch, efforts were being made to widen the horizon of the art and to embrace within the scope of its representations not only solid objects in themselves, but such objects as a whole in space, in due relation .to each other and to the universe at large. It was reserved, however, for the masters of the 17th century perfectly to realize this ideal of the art, and in their hands painting as an art of representation is widened out to its fullest possible limits, and the whole of nature in all its aspects becomes for the first time the subject of the picture.

§ 5. The Place of Classical Painting in the Development of the Art. — This limitation of classical painting to the representation of form may be challenged, for some hold that Greek artists not only attempted but succeeded in the task of portraying objects in space in due relation to each other and to the system of things as a whole, and that the scope of their work was as extended as that of the Italian painter of the 16th century. The view taken in this article will presently be justified, but a word may be said here as to Greek painting in general and its relation to sculpture. The main arguments in favour of the more exalted view of this phase of the art are partly based on general considerations, and partly on the existence of some examples which seem to show the artist grappling with the problems of space. The general argument, that because Greek sculptors achieved, so much, we must assume that the painters brought their art to the same level, is of no weight, because it has been already pointed out that painting and music are not in their development parallel to sculpture and architecture.

Nothing, moreover, is really proved by the facts that painting was held by the ancients in higher estimation than its sister art, and that the painters gained great wealth and fame. Painting is a more attractive, more popular art than sculpture. It represents nature by a sort of trick or illusion, whereas sculpture with its three dimensions is more a matter of course. It is a puzzle how the object or scene, with its colours as well as its forms, can be made to appear on a few square inches of flat surface, and the artist who has the secret of the illusion is at once a man of mark. In Greece this was specially the case, because painting there made its appearance rather later than sculpture and so was from the first more conspicuous. Hence literary writers, when they refer to the arts generally, quote a painter rather than a sculptor. The people observed the painters, and these naturally made the most of themselves and of their art. The stories of the wealth and ostentation of some of these show that there was an atmosphere of rSclame about the painters that must have affected the popular estimate, in an aesthetic sense, of their work. Then, too, popular criticism of painting has no standard. To the passer-by who watches the pavement artist, the result of his operations seems nature itself. ” Better than I saw not who saw the truth,” writes Dante {Purg. xii. 68) of incised outlines on a pavement, that cannot go very far in natural similitude. Vasari, though a trained artist, writes as if they ” vied with nature ” of certain works that, though ex- cellent for their day, do not approach the modern type. We think ourselves that Raphael’s babies are like nature till we see Correg- gio’s, and that Venetian Venuses are ” real flesh and blood ” till that of Velazquez comes to prove them paint. The fact is that the expression ” true to nature ” is a relative one, and very little weight should be given to a merely popular or literary judgment on a question of the kind. Hence we must not assume that because ancient painting was extravagantly praised by those who knew no other, it therefore covered all the field of the art.

§ 6. The Earliest Representative Art.— Naturalistic design of a very effective kind appears at a very early stage of human development, and is practised among the most primitive races of the actual world, such as the Australians, the Bushmen of South Africa and the Eskimo. Of the existence of such art different explanations have been offered, some finding for the representations of natural objects motives of a religious or magical kind, while others are content to see in them the expression of a simple artistic delight in the imitation of objects of interest. The extraordinary merit, within certain limits, of

this early naturalistic work can be accounted for on sociological lines. As Grosse has put it {The Beginnings of Art, p. 198), ” Power of observation and skill with the hand are the qualities demanded for

primitive naturalistic pictorial art, and the faculty of observation and handiness of execution are at the same time the two indispensable requisites for the primitive hunter life. Primitive pictorial art, with its peculiar characteristics, thus appears fully comprehensible to us as an aesthetic exercise of two faculties which the struggle for existence has developed and improved among the primitive peoples." So far as concerns the power of seizing and rendering the characteristics of natural objects, some of the earliest examples of representative art in the world are among the best. The objects are animals, because these were the only ones that interested the early hunter, but tens of thousands of years ago the Palaeolithic cave-dwellers of western France drew and carved the mammoth, the reindeer, the antelope, and the horse, with astonishing skill and spirit.

Fig. 6, Plate III., shows the famous sketch of a mammoth made by a prehistoric hunter and artist of western France. The tusks, the trunk, the little eye, the forehead, and especially the shaggy fell of the long-haired elephant, are all effectively rendered.

Figs, i, 2 and 3, Plate I., show three examples of the marvel- lous series of prehistoric carvings and incised drawings, from the caves of southern France, published by the late Edouard Piette. We note especially the remarkable effort to portray a stag turning its head, and the close observation displayed in the representation of the action of a running buck.

Even more striking are the Palaeolithic paintings discovered in the cave of Altamira at Santillane, near Santander in Spain. These are less ancient than the carvings and sketches mentioned above, but they date from a time when what is now Great Britain was not yet divided from the continent by the Channel, when the climate of southern Europe was still cold, and when animals now extinct — such as the European bison — were still common. These paintings, boldly sketched in three colours, may be reckoned as some 50,000 years old. They display the same power of correct observation and artistic skill as the earlier carvings. Notice in the remarkable examples given on Plate II. the black patches on the bison's winter coat and the red colour of the hide where, with the progress of the spring, he has got rid of the long hair from the more prominent parts of his body by rubbing himself against the rocks. The impressionist character of some of these sketches is doubtless partly due to the action of time; but note how, in the case of the great boar, the artist has represented the action of the legs in running as well as standing in much the same way as might be done in a rapid sketch by a modern painter. The mystery of these astounding paintings is increased by the fact that they are found

in a cave to which no daylight has ever penetrated, sometimes in places almost inaccessible to sight or reach, and that they are surrounded by symbols of which none can read the meaning (see the two lozenges in fig. 3, Plate I.).

Palaeolithic art is, however, a phenomenon remote and isolated, and in the history of painting its main interest is to show how ancient is the striving of man after the accurate and spirited representation of nature. Modern savages on about the same plane of civilization do the same work, though not with equal artistic deftness, and Grosse reproduces(/o<;.«7., ch.vii.)some characteristic designs of Australians and Bushmen. Some of these are of single figures, but there are also " large associated groups of men and animals with the landscapes around them." The pictures consist in outlines engraved or scratched on stone or wood or on previously blackened surfaces of hide, generally, though not always, giving profile views, and are sometimes filled in with flat tints of colour. There is no perspective, except to this extent, that objects intended to appear distant are sometimes made smaller than near ones. In the extended scenes the figures and objects are dispersed over the field, without any arrangement on planes or artistic composition, but each is delineated with spirit and. in essential features with accuracy.

It is a remarkable fact, but one easily explained, that when man advances from the hunter stage to a more settled agricultural life

PAINTING

Plate I.

Figs, i, 2— HEADS OF CHAMOIS, &c, ENGRAVED ON THE TINES OF AN ANTLER. (From the Cave of Gourdan, Haute-Garoxxe, Franxe.)

Fig. 3— STAGS AND SALMON. THE ORIGINALS ARE ENGRAVED ROUND AN ANTLER ABOUT AN INCH

IN DIAMETER. (From the Grotto of Lortet,. Hautes-Pyrenees, France.)

PREHISTORIC INCISED DRAWINGS OF ANIMALS.

XX ‘ 46 °- Reproduced from fciouard Pietle’s Van pendant I’Sgt du renns (Paris, 1907). By permission.

PAINTING

Plate II.

Fig. 5, The First Example of a Huos.

Reproduced by kind permission of the authors and putlishers of “La Coverne d’ Altamira.”

REDUCED FACSIMILES OF PAINTINGS OF THE PALAEOLITHIC AGE FROM THE CAVE OF ALTAMIRA TN SPAIN

PAINTING

Plate n.

Fig. 5. The Finest Example of a IJison.

Reproduced by kind permission of She authors and pullishers of “La Caverne d’ Altamira.”

REDUCED FACSIMILES OF PAINTINGS OF THE PALAEOLITHIC AGE FROM THE CAVE OF ALTAMIRA IN SPAIN

these spontaneous naturalistic drawings no longer appear. Neolithic man shows a marked advance on the capacity of his Palaeolithic predecessors in all the useful arts of life: his tools, his pottery, his weapons; but as an artist he was beyond com- parison inferior. His attempts to draw men and beasts resulted in no more than conventional symbols, such as an intelligent child might scribble; of the Palaeolithic man’s taste for design, as shown in the carved work of the caves, or of his power of reproducing nature, there is not a sign. Keenness of observation and deftness of hand are no longer developed, because no longer needed for the purposes of existence, and representative art almost dies out, to be, however, revived at a further stage of civilization. At this further stage the sociological motive of art is commemoration. It is in connexion with the tomb, the temple and the palace that in early but still fully organized communities art finds its field of operations. Such communities we find in ancient Egypt and Babylonia, while similar phenomena showed themselves in old Oriental lands, such as India and China.

§ 7. The Painting of Contour: Egypt and Babylonia. — In ancient Egypt we find this graphic delineation of natural objects, so

spontaneous and free among the hunter tribes, reduced to a system and carried out with certain well-established conventions. The chief of these was the almost universal envisagement in profile of the subject to be represented. Only in the case of subsidiary figures might a front or a back view or a three-quarter face be essayed. To bring the human figure into profile it was conventionalized, as fig. 7, Plate III., will show. The subject is an Egyptian of high rank, accompanied by his wife and son, fowling in the marshes of the Delta. It is part of a wall-painting from a tomb at Thebes dating about 1500 B.C. The head, it will be seen, is in profile, but the eye is drawn full-face. The shoulders are shown in front view, though by the outline of the breast, with its nipple, on the figure's right, and by the position far to the right of the navel, an indication is given that the view here is three-quarters. At the hips the figure is again in profile, and this is the position also of the legs. It will be observed that the two feet have the big toe on the same side, a device to escape the necessity of drawing the four toes as seen in the outside view of a foot. As a rule the action of these figures is made as clear as possible, and they are grouped in such a way that each is clearly seen, so that a crowd is shown either by a number of parallel outlines each a little in advance of the other suggesting a row seen in slight obliquity, or else by parallel rows of figures on lines one above the other. Animals are treated in the same way in profile, save that oxen will show the two horns, asses the two ears, as in front view, and the legs are arranged so that all are seen.

Within these narrow limits the Egyptian artist achieved extra-ordinary success in the truthful rendering of nature as expressed in the contours of figures and objects. If the human form be always conventionalized to the required flatness, the draughts- man is keen to seize every chance of securing variety. He fastens on the distinctive traits of different races with the zeal of a modern ethnologist, and in the case of royal personages he achieves success in individual portraiture. Though he could not render varieties of facial expression, he made the action of the limbs express all it could. The traditional Egyptian gravity did not exclude humour, and some good caricatures have been preserved. Egyptian drawing of animals, especially birds (see fig. 7, Plate III.), has in its way never been surpassed, and the specific points of beasts are as keenly noted as the racial characteristics of human beings. Animals, domestic or wild, are given with their particu- lar gait or pose or expression, and the accent is always laid on those features that give the suggestion of strength or swiftness or lithe agility which marks the species. The precision of draw- ing is just as great in the case of lifeless objects, and any set of early, carefully-executed, hieroglyphic signs will give evidence of an

eye and hand trained to perfection in the simpler tasks of the graphic art.

The representation of scenes, as distinct from single figures or groups, was not wholly beyond the Egyptian artist's horizon. His most ambitious attempts are the great battle-scenes of the period of the New Empire, when a Sˆti or a Rameses is seen

driving before him a host of routed foemen. The king in his chariot with the rearing horses is firmly rendered in the severe conventional style, but the crowd of fugitives, on a comparatively minute scale, are not arranged in the original clear fashion in parallel rows, but are tumbled about in extraordinary confusion all over the field, though always on the one flat plane. By another convention objects that cannot be given in profile are sometimes shown in ground plan. Thus a tank with trees round it will be drawn square in plan and the trees will be exhibited as if laid out flat on the ground, pointing on each side outwards from the tank.

In Babylonia and Assyria the mud-brick walls of palaces were coated with thin stucco, and this was in the interior some- times painted, but few fragments of the work remain. On the exterior considerable use was made of decorative bands and panels of enamelled tiles, in which figure subjects were promi- nent, as we learn by the passage from Ezek. xxiii., about " men pourtrayed upon the wall, the images of the Chaldeans pour- trayed with vermilion." The best idea of Assyrian graphic design is gained from the slabs carved in very low relief, which contain annalistic records of the acts of the king and his people in war and peace. The human figure is treated here in a less conventional scheme, but at the same time with less variety and in a less spirited and interesting fashion than in Egypt. Of animals far fewer species are shown, but in the portrayal of the nobler beasts, notably the horse, the lion and the mastiff, there is an element of true grandeur that we seldom find in Egyptian design. Furthermore, the carver of the reliefs had a better idea of giving the impression of a scene than his brother of the Nileland, and in his representations of armies marching and fighting he introduces rivers, hills, trees, groups of buildings and the like, all of course delineated without perspective, but in far truer and more telling fashion than is the case with the scenes from the campaigns of Egyptian conquerors.

§ 8. Painting in Pre-hisloric Greece. — A new chapter in the history of ancient painting was opened by the discovery of relics of the art in the palaces and tombs of the Mycenaean period on the coasts ahd islands of the Aegean. The charming naturalistic representations of marine

plants and animals on the painted vases are quite unlike anything which later Greek art has to offer, and exhibit a decorative taste that reminds us a little of the Japanese. What we are concerned with, however, are rather the examples of wall-painting in plaster found at Tiryns and Mycenae and in Crete. Of the former the first to attract notice was the well-known bull from Tiryns, represented in profile and in action, and accompanied by a human figure; but of far greater importance, because foreshadowing an advance in the pictorial art, are certain wall-paintings discovered more recently by Dr Evans at Cnossos in Crete. The question is not of the single figures in the usual profile view, like the already celebrated ” Cup-bearer,” however important these may be from the historical side, but of the so-called ” miniature ” wall- paintings that are now preserved in the museum at Candia, in which figures on a small scale are represented not singly but in crowds and in combination with buildings and landscape features that seem to carry us forward to far more advanced stages of the art of painting. To borrow a few sentences horn Dr Arthur Evans’s account of them on their first discovery {Annual of British School at Athens, vi. 46): “A special characteristic of these designs is the outline drawing in fine dark lines. This outline drawing is at the same time combined with a kind of artistic shorthand brought about by the simple process of introducing patches of reddish brown or of white on which groups belonging to one or other sex are thus delineated. In this way the respective flesh-tints of a series of men or women are given with a single sweep of the brush, their limbs and features being subsequently outlined on the background thus obtained.” There is here, it is true, no perspective, but there is a distinct effort to give the general effect of objects in a mass, which cor- responds curiously with the modern development of the art of painting called ” impressionism.”

§ 9. The Painting of Form: Ancient Greece and Italy. — As

is well known, this early civilization in the Greek world of the second millenium B.C. was almost completely swept away, probably by the political cataclysm of about 1000 B.C. known as the Dorian Migration. Hellenic art proper, in its historical continuity, represents a new start altogether and the beginnings of it need not be sought earlier than about 800 to 700 B.C. The art of painting had then completely lost

touch with the graceful naturalism and with the broad generalization of the ” Aegean ” period, and is represented by figure designs on the so-called ” geometric ” or ” Dipylon ” vases of the most primitive kind. For a long time Greek painting is chiefly represented by work on the vases, but that this may be regarded as in the strict sense painting is shown by the fact that tablets or panels (pinakes) that would certainly be called pictures were being painted at the same time by the same technical methods, and in some cases by the same craftsman, as the vases. As Klein remarks (Euphro- nios, 2 p. 252), ” the most ancient material for Greek painting is clay in the form of the vase as well as of the pinax.” Now we find in Pliny’s account of the beginnings of Greek painting (Nat. Hist. xxxv. 15 seq.) certain stages indicated in the develop- ment of technique, and we are able to illustrate these stages from vases which correspond more or less in their chronological order with the succession of the stages in Pliny. The correspondence is not exact, and there are difficulties in the way of interpreting the statements from the monuments, but the two are certainly to be brought into connexion. According to Pliny the order of development seems to be (1) outlines; (2) [a] outlines filled in with flat tints, or [b] outlines with linear inner markings but no colour. Outline drawing is obviously always the first stage in the graphic art regarded as delineation, not decoration. The flat tints without inner markings are found on ” Dipylon ” vases of 800-700 B.C., and as for the inner markings, though there is a difficulty in the exact interpretation of Pliny’s words, yet inner markings in the form of lines scratched on these silhouettes make their appearance very early. Two further stages are indicated by Pliny as the introduction of a red colour and the distinction between male and female figures by a painter named Eumarus of Athens. This would be by the use of white, which with red, an oxide of iron, appears on vases of about 600 B.C. Eumarus is also said to have ” ventured to imitate all kinds of figures,” and we cannot fail here to be reminded of the marvellous Francois vase at Florence (fig. 8, Plate III.) of the first half of the 6th century, which is of large size and is decorated with a wealth of figure designs from mythological sources that are among the most remarkable productions of the graphic art in existence. Human figures and animals are there displayed in an extra- ordinary variety of poses and illustrating all kinds of scenes, and the execution shows a firmness of hand and patience in the rendering of details to which no praise can do justice. The inner markings are rendered by lines with the most scrupulous care and finish. Cimon of Cleonae is said to have followed Eumarus with certain improvements which are of the utmost significance for the future of the art in Greece. He is said to have introduced four innovations: (a) ” Catagrapha,” which Pliny explains as ” profile

figures” but which must mean some- thing more than this, seeing that profiles had been in use from the first. ” Foreshortenings ” is a possible and an intelligible rendering which moreover corresponds with what is further ascribed to him; (b) the representation of ” countenances in different positions, looking backwards or upwards or down- wards.” The other improvements, in giving © the details of anatomy and (d) ” the wrinkles and folds of drapery,” are not of so much importance as such advance is normal and necessary. The introduction of foreshortened views is the matter of real moment, for this is the point at which Greek painting parts company with the older oriental traditions, and enters on a course of its own which leads directly to all the modern developments of the art.

The words of Pliny explaining the term ” catagrapha H can be aptly illustrated from the vase paintings connected with the name of Epictetus. Epictetus was the leading figure among a company of Athenian vase decorators of the last decades of the 6th

century B.C. and the beginning of the 5th, who usher in the period of the most gifted and original masters of the craft. Their work is marked by efforts to give to the human figure a vigour and expres- siveness it had never before attained, and to gain their end they essay all sorts of novel and difficult problems in drawing. In con- nexion with Pliny’s words, Klein remarks (Euphronios, p. 47) that on their vases ” the running figures look behind them; those that are jumping, revelling or fighting look up ; the lifting or bending ones look down.” Some of the best vases decorated by this set of artists, who are the first to use the so-called ” red- figured ” technique instead of painting as the older masters had done in black on red, are for qualities of strength, variety and animation unequalled by any of their successors of the later periods, yet it is significant of the whole character of this ancient painting that they are always conspicuously more successful with profiles and objects in an upright plane at right angles to the line of sight than with any forms which involve foreshorten- ing or perspective. They are masters of contour but are still struggling for the full command over form, and it is noteworthy that the generation of these greatest of the vase-painters had passed away before these difficulties of foreshortening had been conquered.

We have now followed on the vases the development of Greek painting up to about the time of the Persian wars, and it must be noted that in other forms, as on terra-cotta tablets or pinakes, on the flat edges of sarcophagi in the same material, and occa- sionally on marble slabs or stelae, the same technical character- istics are to be observed. Of painting on a monumental scale Greece proper has

hitherto shown no trace, yet at this very juncture, in the decades immediately after the Persian wars, there suddenly makes his appearance one of the greatest repre- sentatives of monumental wall-painting known to the annals of the art. This is Polygnotus, who, with some worthy associates, displayed on the walls of public buildings at Athens and at Delphi a series of noble compositions on a large scale that won the admiration of the whole Hellenic community.

To find any remains of mural painting that may seem to lead up to Polygnotus and his school we have to pass beyond the bounds of Greece proper into Italy, where, alike in the Greek and Etruscan cities and also at Rome, painting in this form was practised from an early date. Pliny mentions paintings at Ardea older than the city of Rome, and some very ancient ones at Caere. Two sets of early paintings, not actually on walls but on terra-cotta slabs meant for the coating of walls, have come to light in recent times at Cervetri, the ancient Caere, some of which, in the British Museum, were dated by the late A. S. Murray at about 600 B.C. (Journal of Hellenic Studies, x. 243), while others in the Louvre may be about half a century later. True wall-paintings, of possibly a still earlier date and certainly of more primitive design, were found in the Campana tomb at Veii (Dennis, Etruria, ch. i.). The paintings from Caere are executed on a white or yellowish ” slip ” in a few simple colours, and exhibit single figures in a frieze-like arrange- ment with little attempt at action and none at grouping. The flesh of the women is left the colour of the white ground, that of the men is painted a ruddy hue. To the 6th, and first half of the 5th century, belong wall-paintings in Italian tombs, which, whether in Greek cities or in Etruscan, show distinct signs of Hellenic influence. Some of these wall-paintings (Antike Denkmaler, ii., Taf. 41-43) show considerable liveliness in colour- ing and in action, and a freedom and gaiety in female costume that remind us of what we read about the painting of Polygnotus (q.v.). The place of this great painter in the general history of the graphic art is given to him for his ethical greatness and the austere beauty of his single figures, which ancient writers extol. All we have to do here is fix his place in the development’ of painting by noting the stage at which he had arrived in the representation of nature.

The wall-paintings of Polygnotus and his school must have exhibited a large number of figures powerfully characterized in action and expression, not in a confused mass nor summarized as at Cnossus, nor grouped together as in a modern composition,

Plate III.

Fig. 6. -PREHISTORIC DRAWING OF A MAMMOTH.

Photo, Aiinari.

Fig. io.— ZEUS AND HERA.

POMPEIAN WALL PAINTING.

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P/ioto, If. yt . Mansctt & Co.

Fig. 7.— EGYPTIAN FOWLING IN THE DELTA.

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Plioto, AUnari.

Fig. 8.— FRANCOIS VASE. Florence.

Photo, W. A . Mansell & Co.

Fig. h.— HEROD’S BIRTHDAY FEAST.

WALL PAINTING IN CATHEDRAL AT BRUNSWICK.

Plate IV.

PAINTING

ion of Braun, Climent&Co., Dornach (Alsace) and Paris.

Fig. i2.— THE MARIES AT THE SEPULCHRE, HUBERT VAN EYCK (?). (28 X 35.)

Photo, AlinaH,

Fig. 13.— HEROD’S BIRTHDAY FEAST, GIOTTO.

DEVELOPMENT]

PAINTING

nor yet arranged in formal rows one above the other, but distributed at different levels on the one plane of the picture, the levels being distinguished by summary indications of a landscape setting. Parts of some of the figures were hidden by risings of the ground. The general effect is probably represented by the paintings on the vase in the Louvre shown in fig. 9, one side of which exhibits the destruction of the children of Niobe, and the other the Argonauts. Simplicity in design and ethical dignity in the single forms are here unmistakable.

It is probable that Polygnotus had not fully mastered the difficulties of foreshortening with which the early ” red-figure ” masters were struggling, but later designs both on vases and else- where do show that in the 4th century at any rate these had been

Fig. 9. — Vase painting in the Louvre, illustrating the

overcome. The drawing on the so-called Ficoronian Cista, and on the best of the Greek mirror-backs, may be instanced. The ancients recognized that in the latter part of the 5th century B.C. painting made a great technical advance, so that all that had gone before seemed archaic, while for the first time ” the gates of art” were opened and the perfect masters entered in. The advance is in the direction of the representation not of form only but of space, and seems from literary notices to have implied a considerable acquaintance with perspective science. The locus classicus, one of great importance, is in Vitruvius. In the preface to his seventh book he writes of Agatharcus, a painter who flourished at Athens in the middle and third quarter of the 5th century, that he executed a scene-painting for Aeschylus, and wrote a treatise upon it which inspired the philosophers Democritus and Anaxagoras to take up the subject, and to show scientifically from the constitution of the eye and the direction of rays of light how it was possible in scenic paintings to give sure images of objects otherwise hard to fix correctly, so that when such objects were figured on an upright plane at right-angles to the line of sight some should appear to recede and others to come forwards. It would not be easy to summarize more aptly the functions of perspective, and if philosophers of the eminence of those just mentioned worked out these rules and placed them at the disposal of the artists, the transition from ancient to modern painting should have been accomplished in the 5th century B.C.,

instead of just two thousand years afterwards! So far however as the existing evidence enables us to judge, this was not actually the case, and in spite of Agatharcus and the philosophers, painting pursued the even tenor of its way within the compara- tively narrow limits set for

it by the genius of ancient art (see Greek Art). It may be admitted that in many artistic qualities it was beyond praise. In beauty, in grace of line, in composition, we can imagine works of Apelles, of Zeuxis, of Protogenes, excelling even the efforts of the Italian painters, or only matched by the finest designs of a Raphael or a Leonardo. In the small encaustic pictures of a Pausias there may have been all the rich- ness and force we admire in a Chardin or a Monticelli. We may even concede that the Greek artist tried at times to transcend the natural limits of his art, and to represent various planes of space in perspective, as in the landscape scenes from the Odyssey, or in figure compositions such as the " Alexander and Darius at Issus," preserved to us in a mosaic, or the " Battle-piece " by Aristides that contained a hundred combatants. The facts, however, remain, first that the Greek pictures about which we chiefly read were of single figures, or subjects of a very limited and compact order with little variety of planes; and second, that the existing remains of ancient painting are so full of mistakes in perspective that the representation of distance cannot have been a matter to which the artists had really set themselves. The monumental evidence available on the last point is sufficient to override arguments to the contrary that may be built up on literary notices. No competent artist, or even

teacher of drawing, who examines what is left of ancient painting, can fail to see that the problem of representing correctly the third dimension of space, though it may have been attacked, had certainly not been solved. It is of no avail to urge that these remains are not from the hands of the great artists but of mere decorators. In modern times the mere decora- tor, if he had passed through a school of art, would be as far above such childish blunders as a Royal Academician. We have only to consider dispassionately the photographic reproductions from ancient paintings (Herr- mann, Denkmdler der Malerei des &c.) to see that the perspective researches of the philosophers had not resulted in a general comprehension among the artists of the science of receding planes. For example, in the famous wall-painting of " Zeus and Hera on Mount Ida " in the House of the Tragic Poet at Pompeii, the feet of the standing figure of the goddess are nearer to the spectator than the seat of her lord, but the upper part of her form is away on the farther side of him (see fig. 10, Plate III.). No one who could draw at all would be capable now of such a mistake. In interiors the perspective of the rafters of a roof, of a table, a stool, a throne, is in most cases faulty; and the scale of the figures seems often to be determined rather by their relative importance in the scene than by their position on the planes of the picture. In the Pompeian landscape-piece of " Paris on Mount Ida " (Herrmann, No.

8) there is no sense of the relative proportions of objects, and a cow in the foreground is much smaller than Paris, who is a long way back in the composition.

It is an additional confirmation of this view to find early Christian and early medieval painting confined to the representa- tion of the few near objects, which the older Oriental artists had all along envisaged. If classical painters had really revolu- tionized design, as it was actually revolutionized in the 15th century of our era, and had followed out to their logical conse- quence the innovations of Agatharcus, we may be sure that the

style of Polygnotus, Altertums, Munich

1906,

influence of these innovations would not have been wholly lost even in the general decline of the arts at the break-up of the Roman Empire of the West. In any case, the influence would have survived in Byzantine art, where there was no such cataclysm. Yet we fail to see in the numerous pictorial minia- tures from the 5th century onwards, or in the mosaics or the wall-paintings of the same epoch, any more effective grasp of the facts of the third dimension of space than was possessed by the pre-classical Egyptian.

All through the middle ages, therefore, the facts concerning painting with which we are here concerned remain the same, and the art appears almost exclusively concerned with the few selected objects and the single plane. The representation is at most of form and not of space.

§ 10. Early Christian and Early Medieval Painting. — The extant remains of early Christian painting may be considered under three heads: (1) the wall-paintings in the catacombs; (2) the pictorial decorations in books; (3) the mosaic pictures on the walls of the churches. (1) The first are in themselves of little importance, but are of historical interest as a link of con- nexion between the wall-painting of classical times and the more distinctively Christian forms of the art. They are slightly executed and on a small scale, the earliest, as being more near to classical models, are artistically the best. (2) That form

of painting devoted to the decoration and illustration of books belongs more to the art of ornament than to painting proper (see Illuminated MSS. and Illustration). (3) Early Chris- tian mosaics are noble monuments of the graphic art, and are its best representatives during the centuries from the 5th to the 8th. A dignified simplicity in design suits their large scale and architectural setting, and the aim of the artist is to present in forms of epic grandeur the personages of the sacred narratives. They are shown as in repose or engaged in some typical but simple action ; the backgrounds being as a rule plain blue or gold and the accessories of the simplest possible descrip- tion. The finest Christian mosaic is also the earliest. It is in the apse of S. Pudentiana, Rome, and displays Christ enthroned as teacher with the Apostles seated on each side of Him. It may date from the 4th century. Next to this the best examples are at Ravenna, in the tomb of Galla Placidia, the Baptistery, S. Apollinare Nuovo and S. Vitale, dating from the 5th and 6th centuries. The picture in the baptistery of the ” Baptism of Christ ” is the most artistic piece of composition and pictorial effect, and next to this comes the ” Good Shepherd ” of the tomb of Galla Placidia. The finest single figures are those of the white-robed saints between the windows of the nave of S. Apollinare Nuovo, and the most popular representations are the two processions of male and female saints lower down on the same walls. The famous mosaics in S. Vitale depicting Justinian and Theodora with courtiers in attendance, though historically interesting, are designed in a wooden fashion, and later mosaics at Palermo, Venice, Rome and other places are as a rule rather decorative than pictorial. Where the costly material of glass mosaic was not available, the churches of this period would show mural paintings on plaster of much the same design and artistic character, though comparatively ineffective.

In monumental painting the interval between the early Christian mosaics and mural pictures and the revival of the 13 th century is filled by a series of wall and ceiling paintings of Carolingian, Romanesque and early Gothic date, in Italy, Germany and England. The earliest of which account need be taken are those in the recently excavated church of S. Maria Antiqua by the Forum at Rome (Rushworth, in Papers of the British School at Rome, vol. i., London, 1902), where there is a complete and, on the whole, well-preserved series consisting for the most part in single figures and simply composed scenes. Most of the work can be dated to the time of Pope John VII. at the beginning of the 8th century. Its style shows a mixture of Byzantine motives with elements that are native to Rome. It must be remembered that at the time Rome was strongly under Byzantine influence. Passing over some more frag- mentary specimens, we may

refer next to several series of mural

paintings in and near the island of Reichenau at the western end of the lake of Constance, where a school of painting flourished in the latter part of the 10th century. The work here is quite as good as anything Italy has to show, and represents a native German style, based on early Christian tradition, with very little dependence on Byzantine models. The most interesting piece is the ” Last Judgment” in the church of St George at Oberzell on Reichenau, where, in a very simple but dignified and effective form, we find the earliest existing representation of this standard theme of later medieval monumental art (F. X. Kraus, Wandge- mdlde der St Georgskirche zu Oberzell auf der Insel Reichenau, Freiburg-i.-Br., 1884).

About a hundred years later, in the latter part of the nth century, a mural painting of the same theme was executed in the church of S. Angelo in Formis near Capua in southern Italy, the style of which shows a mixture of Latin and Byzantine elements (F. X. Kraus, Die Wandgemalde von S. Angelo in Formis, Berlin, 1893).

To the middle of the 12th century belongs one of the most complete and interesting cycles of medieval wall-decoration, the display of a series of figures and scenes illustrating the eleventh chapter of Hebrews, in the chapter-house of the now secularized monastery of Brauweiler, near Cologne, in the Rhineland. Here the pictorial effect is simple, but the decora- tive treatment in regard to the filling of the spaces and the lines of composition is excellent. The design is Romanesque in its severity (E. Aus’m Weerth, Wandmalereien des Mitlelalters in den Rheinlanden, Leipzig 1S79). Romanesque also, but exhibiting an increase in animation and expressiveness, is the painting of the flat ceiling of the nave of the fine church of St Michael at Hildesheim. In the general decorative effect, the distribution of the subjects in the spaces, the blending of figures and orna- ment, the work, the main subject of which is the Tree of Jesse, is a masterpiece. Two nude figures of Adam and Eve are for the period remarkable productions. The date is the close of the 12th century.

Succeeding examples show unmistakable signs of the approach of the Gothic period. In the wall-paintings of the nuns’ choir of the church of Gurk in Carinthia, a certain grace and tenderness begin to make themselves felt, and the same impression we gain from the extensive cycle in the choir of the cathedral of Bruns- wick, from the first decades of the 13th century. The picture of Herod’s birthday feast is typical of the style of German painting of the time; there is nothing about it in the least rude or tentative. It is neither childish nor

barbarous, but very accomplished in a conventional style that is exactly suited from the decorative point of view to a mural painting. The story is told effectively but in quaint fashion, and several incidents of it are shown in the same composition. There is no attempt to represent the third dimension of space, nor to give the perspective setting of the scene, but the drawing is easy and true and expressive. The studied grace in the bend of certain figures and the lively expressions of the faces are traits which prefigure Gothic art (see fig. n, Plate III.).

Distinctively Gothic in their feeling were the wall-paintings in the chapel at Ramersdorf, opposite Bonn, dating from the beginning of the 14th century. They are only preserved in copies, but these enable us to see with what grace and feeling the slender figures were designed, how near to Angelico's came the tender angels making music where the virgin is receiving her celestial crown (E. Aus'm Weerth, loc. cit.). From the end of the 14th century, Castle Runkelstein, near Botzen in Tirol, has preserved an extensive cycle of secular wall-paintings, much repainted, but of unique interest as giving an idea how a medieval residence of the kind might be adorned. The style is of native growth and no influence from south of the Alps is to be discerned (Janitschek, Geschichte der deutschen Malerei, Berlin, 1890, 198 seq.). Technically speaking, all these mural paintings consist in little more than outlines filled in with flat tints, neither modelling of the forms nor perspective effect in the setting is attempted, but the work so far as it goes is wholly satisfactory. There is no coarseness of execution nor anything in the forms,

PAINTING

Plate V.

fto, A!

Fig. 14.-PEACE, LORENZETTI

Siena.

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Fig. 16. -BATTLE OF S. EGIDIO, UCCELLO. (72 X .25.) National Gallery, London.

Photo, Alinari

Fig. 15.— THE EXPFLSION FROM EDEN MASACCTO.

Photo. Ranfslacntf,

Fig. 17.— MARTYRDOM OF S. SEBAS- TIAN, POLLAIUOLO. (114×79*.) National Gallery, London.

Photo, Alinari.

Fig. 18.— THE DREAM OF CON- STANTINE, PIERO DELLA FKANCESCA. Arezzo.

BURIAL OF S. FINA, GHIRLANDAJO. S, Gemignano.

PlATE VI.

PAINTING

B,p,

n of Braun, Clement & Co , Dornach (Alsace) and Paris.

Fig. 20.— DANCE OF THE MUSES, MANTEGNA.

(64 X 77-) Louvre.

Photo, Anderson.

FiG. 21.-

-ALTARPIECE AT MURANO, BELLINI.' Figures almost Life-size.

gestures or expressions that offends the eye. The colours are bright and pure, the decorative effect often charming.

In the matter of panel paintings on wood, we have the inter- esting notice in Bede that Abbot Benedict of Wearmouth at the end of the 7th century brought from Italy portable pictures on wooden panels for the decoration .of his church, part of which still remains. The style of the painting on these, it has recently been noticed, would resemble the existing wall-paintings of the beginning of the 8th century in S. Maria Antiqua in Rome, already referred to. Movable panel pictures in the form of representations of the Madonna and Child were produced

in immense numbers at Byzantium and were imported largely into Italy, where they became of importance in connexion with the revival of painting in the 13th century. As a rule, however, paintings on panel were not movable but were attached to a screen, a door, or similar structure of wood consisting in framing and panels. This form of decoration is of special importance as it is really the origin of the modern picture. The painted panel, which at first forms an integral part of an architecturally designed structure of wood, gradually comes to attract to itself more and more importance, till it finally issues from its original setting and, emancipated from all relations to its surroundings, claims attention to itself as an independent work of art.

Painted panels in an architectural setting were used for the decoration of altar-fronts or antependia, of altar-backs or, as they are commonly called, altar-pieces, choir-screens, doors of presses and the like; or again for ceilings. There was painting also on the large wooden crucifixes displayed in churches, where a picture of Christ on the Cross might take the place of the more life-like carved image. In Italy painted panels were used as decoration of furniture, notably of the large carved chests or cassoni so common at the epoch of the Renaissance.

Examples of early medieval date do not appear to have survived. In Germany, where, as has been noticed, the arts in the nth and 12th centuries stood at a higher level than in Italy or elsewhere in the west, certain antependia or altar-fronts from Soest in Westphalia of the 12th century are said to be the earliest known examples of German panel painting. One is preserved in the museum at Berlin. A little later the number of such panels introduced as part of the decoration of altar-backs, generally with folding doors, becomes very great. Painted panels as part of the decoration of screens are preserved in the choir at Cologne from the middle of the 14th century. In Italy the painted crucifix shared popular favour with the imported or imitated Byzantine Madonna-panels. A good example of the early painted altar-screen is preserved in Westminster Abbey.

Later, in the 15th century, the painted panel, generally with a single figure of a saint, becomes a common part of the carved, painted and gilded chancel screen in English churches, and many specimens are still to be seen, especially in East Anglia.

§ 11. Beginnings of the Picture: German and Early Flemish Panel Painting. — From the decorative panels introduced into wooden screen-work was developed in Germany and Flanders the picture proper, the mural painting passing out of use owing to the prevalence

in the north of Gothic architecture, which does not admit of wall spaces for the display of pictures, but substi- tutes as a form of painting the stained-glass window. In Italy, where Gothic was treated as a plaything, the wall spaces were never sacrificed, and in the development of the art the mural picture took the lead, the painted panel remaining on the whole of secondary importance.

Priority in this development of the picture is claimed in Germany for the school of Prague, where a gild of painters was founded in 1348, but the first northern school of painting that influenced other schools and plays a part in the history of painting as a whole is the so-called school of Cologne, where painters such as Meister Wilhelm and Hermann Wynrich achieved reputation in the 14th century, and produced as their successor in the 15th Stephan Lochner, author of the so-called ” Dombild ” in the cathedral, and of the ” Virgin of the Priests' Seminary.” A little later than the earliest Cologne masters appears Hubert van Eyck, born near Maestricht at no great distance from the

Rhineland capital, who with his younger brother, Jan, heads the Early Flemish school of painting. Hubert is one of the great names in the history of the art, and is chiefly responsible for the altar-piece of the ” Adoration of the Lamb ” at Ghent, the most important masterpiece of the northern schools before the 17th century, and the earliest monument of the then newly developed art of oil painting. Table No. I. in Part II. of this article gives the names of the ehief successors of the Van Eycks, and the school ends with the life and work of Quintin Matsys of Antwerp; in the first quarter of the 16th century. The spirit of the early Cologne school, and in the main of that of Flanders, is idyllic and devotional, but the artists of the latter school achieve extraordinary force and precision in their representation of the facts of nature. They are, moreover, the first painters of land- scape, for in their hands the gold background of the medieval panels yields place to a rendering of natural scenery and of effects of distance, minute in details and fresh and delightful in feeling. The famous picture ascribed by some to Hubert van Eyck in the collection of Sir Francis Cook at Richmond is a good example. The subject is the ” Three Maries at the Sepulchre,” and the background is a wonderful view of a city intended for Jerusalem (see fig. 12, Plate IV.).

In Germany, on the other hand, the tendency of the 15th century was towards a rather crude realism in details, to which the higher artistic qualities of beauty and devotional sentiment were often sacrificed. This is a new phenomenon in the history of the art. In the older Oriental, the classical and the medieval phases of painting, though

there is a constant effort to portray the truth of nature, yet the decorative instinct in the artist, his feeling for pattern, was a controlling element in the work, and the representation was conventionalized into a form that satisfied the ideal of beauty current at the time. Jan van Eyck was matter-of-fact in his realism, but avoided ugliness, whereas in Germany in the 15th and 16th centuries we find action and expression exaggerated to contortion and grimace, and all artistic qualities sacrificed to a mistaken idea of force. German art was, however, saved by the appearance of some artists of great genius who more than made up for the national insensibility to beauty by their earnestness and truth. Martin Schongauer of Colmar learnt his art from the painters of the Flemish Nether- lands, and imbibed something of the feeling for beauty which the successors of Hubert van Eyck had never wholly lost. After Schongauer German art culminates at Nuremberg in the person of Albrecht Diirer, and a little later in that of Hans Holbein the younger. Contemporary with Diirer, Mathias Grunewald of Colmar exhibits a dramatic power in his creations that compensates for their exaggerated realism, and Bartholo- maus Bruyn, of Cologne, prefigures the future success of the northern schools in portraiture. In Germany, however, the wars of religion in the 16th century checked the further growth of a national art. Holbein's migration to England is a significant sign of this, and German art in this phase of it may be said to come to an end in the person of Adam Elsheimer of Frankfort, who introduced German painting at Rome about the year 1600.

In the Netherlands the early religious school ends, as we have seen, with Quintin Matsys, and the next generation of Flemish painters for the most part practise their art in Italy, and import Italian fashions into the painting of their own country. From the ranks of these so-called Italiahizers, in the Flanders of the 1 6th century proceeds a little later the commanding personality of Rubens.

§12. The Rise of Schools of Painting. — -The expression "school of painting" has more than once been used; what is the meaning of it? The history of painting has hitherto been treated in the article as a development that proceeded according to a natural law of evolution in independence of individuals. In painting, however, as in all the higher operations of the arts, the initiative of the individual counts for much, and the action and reaction on each other of individuals, and those groups of individuals whom common aims and practice draw together into schools, make up for us a good part of the interest of the historical study of painting. At certain periods this particular

interest has been lacking. In ancient Egypt, for example, and among the older Oriental peoples generally, schools of paint- ing in the modern sense did not exist, for the arts were carried on on traditional lines and owed little, so far as records tell, to individual initiative. In ancient Greece, on the contrary, we find ourselves at once in an atmosphere of names and achieve- ments which give all the glamour of personal and biographical interest to the story of art. In the early Christian and early medieval periods, we return again to a time when the arts were practised in the same impersonal fashion as in the oldest days, but with the later medieval epoch we emerge once more into an era where the artist of genius, with his experiments and triumphs, his rivals and followers, is in the forefront of interest; when history is enlivened with anecdote, and takes light and shade from the changing fortunes of individuals.

There is a danger lest the human interest of such a period may lead us to forget the larger movements, impersonal and almost cosmic, which are all the time carrying these individuals and groups forward on their destined course. The history of painting cannot be understood if it be reduced to a notice, however full, of separate ” schools” or to a series of biographies, fascinating as these may be made, of individual artists. Hence in what follows it is still the main course of the development of the art in its relation to nature that will be kept in view, while the information about names and dates and mutual relations of artists and schools, which is in its own way equally important, will be furnished in the tables constituting Part II. of this article.

What has just been said will prepare the reader for the fact that the first schools of painting here mentioned are those of Germany and Flanders, not those of Italy, though the latter are more important as well as actually prior in point of time.

§ 13. The Gothic Movement and the Proto-Renaissance, in their Influence on Painting north and south of the Alps. — The revival of the arts of sculpture and painting in the Italy of the last part of the 13th century was an event of capital importance, not only for that country but for the west at large. Its impor- tance has, however, been exaggerated, when it has been said to imply the rediscovery of the arts after a period in which they had suffered an entire eclipse. So far as Italy is concerned, both sculpture and painting had in the previous period sunk to a level so low that they could hardly be said to exist,

but at the same epoch in lands north of the Alps they were producing works of considerable merit. Romanesque wall-painting of the 1 2th century, as represented in some Rhineland churches and cloisters, is immeasurably better than anything of the same period south of the Alps. In the g.rts of construction and ornament the lead remained for a long time with the northern peoples, and in every branch of decorative work with the excep- tion of mosaic the craftsmanship of Germany and France surpassed anything that native Italian workmen could produce. By the middle of the 12th century the intellectual and social activity of the French people was accompanied by an artistic movement that created the most complex and beautiful archi- tectural monuments that the world has seen. The adornment of the great French Gothic cathedral was as artistically perfect as its fabric was noble. Eor one, at any rate, of the effects at which the painter aims, that of glowing and sumptuous colour, nothing can surpass the stained-glass windows of the Gothic churches, while the exteriors of the same buildings were enriched with hundreds of statues of monumental dignity endowed with a grace and expressiveness that reflect the spirit of the age.

The Gothic age in France was characterized by humanity, tenderness and the love of nature, and there are few epochs in human history the spirit of which is to us more congenial. The 1 2 th century, which witnessed the growth of the various elements of culture that combined to give the age its ultimate character, saw also a movement of revival in another sphere. The reference is to what has been aptly termed a ” Proto-Renaissance,” the characteristic of which was a fresh interest in surviving remains of classical antiquity. In more than one region of the west, where these remains were specially in evidence, this interest

manifested itself, and the earliest sign of it was in Provence, the highly Romanized part of southern Gaul known par excellence as the ” Provincia.” To this is due the remarkable development of decorative sculpture in the first decades of the 12th century, which gave to that region the storied portals of St Gilles, and of St Trophime at Aries. Somewhat later, in the early part of the 13th, those portions of southern Italy under the direct rule of the emperor Frederick II. presented a similar phenomenon that has been fully discussed by M. Bertaux in his L ‘Art dans I’ltalie mtridionale (Paris, 1904). There were other centres of this same movement, and a recent writer enumerates no fewer than seven. The Gothic movement proper depended in no degree on the study of the antique, and in art the ornamental forms which express its spirit are naturalistic, not classical, while the fine figure sculpture above referred to is quite independent of ancient models, which hardly existed in the central regions of France where

the Gothic movement had its being. Still the proto- Renaissance can be associated with it as another phase of the same awakening of intellectual life that marked the 1 2th century. Provence took the lead in the literary revival of the time, and the artistic movement that followed on this was influenced by the fact of the existence in those regions of abundant remains of classical art.

The Gothic movement was essentially northern in its origin, and its influence radiated from the lie de France. What has been described as the idyllic grace, the tenderness, that mark the works of the early Cologne school, and to some extent those of the early Flemings, were Gothic in their origin, while the feeling for nature in landscape that characterizes van Eyck, and the general tendency towards a realistic apprehension of the facts of things, may also be put down to the quickening of both thought and sympathy due to the Gothic movement. Hence it is that the northern schools of painting are noticed before the Italian because they were nearer to the source of the common inspiration. All the lands of the West, however, exhibit, each in its own special forms, the same stir of a new intellectual, religious and artistic life. In Italy we meet with the same phenomena as in France, a proto-Renaissance, first in southern Italy and then, as we shall presently see, at Rome and at Pisa, and a religious and intellectual movement on Gothic lines that was embodied in the attractive personality of St Francis of Assisi. Francis was as perfect an embodiment of the Gothic temper as St Louis himself, and in his romantic enthusiasm, his tenderness, his humanity is in spirit more French than Italian.

§ 14. The Rise of the Italian Schools of Painting. — The revival of the arts in Italy in the latter part of the 13th century was the outcome of the two movements just noticed. The art of Niccola Pisano is now recognized as a phase of the proto-Renaissance of southern Italy, whence his family was derived. It represents a distinct advance on the revived classical sculpture of Provence or Campania because Niccola's artistic personality was a strong one, and he gives to his work the impress of the individual of genius. Throughout its history Italian art depends for its excellence on this personal element, and Niccola's achievement is epoch-making because of his personal vigour, not because he reinvented a lost art. Towards the end of the 13th century, painting began to show the results of the same renewed study of antique models, and here again the revival is connected with the names of gifted individuals. Among these the most note- worthy are the Roman Pietro Cavallini and Duccio di Buonin- segna of Siena. The condition of painting in Italy in late medieval days has already been indicated. Cavallini and Duccio now produce, in two standard forms of

the art, the mural painting of the ” Last Judgment ” and the enthroned Madonna with angels — works characterized by good taste, by largeness and suavity of treatment, and by an execution which, if still somewhat primitive and laboured, at any rate aims at beauty of form and colour. The recently uncovered fresco of the Last Judgment by Cavallini, executed about 1293 on the western wall of S. Cecilia in Trastevere at Rome, is classical in feeling and represents an immense advance on the older rendering of the same subject in S. Angelo in Formis (see § 10). The vast

enthroned Madonna in the Rucellai chapel of S. Maria Novella at Florence, ascribed by Vasari to Cimabue, is now assigned by many to Duccio of Siena, and presents similar attractive qualities. Cimabue, a Florentine contemporary of Cavallini and Duccio, is famed in story as the chief representative of the painting of this period, but we possess no certain works from his hand except his mosaic at Pisa. His style would probably correspond to that of the painters just mentioned. His chief importance for our purpose resides in the fact that he was the teacher of the Florentine Giotto.

If the artists just referred to represent a revived classicism rather than a fresh and independent study of nature, Giotto is essentially a creation of the Gothic movement and his close association with the Franciscan cycle of ideas brings this fact into clearer relief. Giotto is in no way dependent on the study of the antique, but relies on his own steady and penetrating out- look upon man and upon nature. He is Gothic in his humanity, his sympathy, his love of truth, and he incorporates in his own person many of the most pleasing qualities of Gothic art as it had already manifested itself in France, while by the force of his own individual genius he raises these qualities to a higher level of artistic expression.

In the work of Giotto painting begins to enter on its modern era. The demonstrative element permanently takes the pre- eminence over the more decorative element we have called pattern-making. Though the pattern is always present, the elements of it become of increasing value in themselves as representations of nature, and the tendency henceforward for a couple of centuries is to exaggerate their importance so that the general decorative effect becomes subordinate.

Giotto's greatness depends on the gift he possessed for holding the balance even among opposed artistic qualities. If he was interesting and convincing as a narrator, he had a fine eye at the same time for composition and balanced his masses with unerring tact. Neither he nor any of the Florentine frescoists had much sense of colour, and at this stage of the development of painting compositions of light and shade were not thought of, but in line and mass he pleases the eye as much as he satisfies the mind by his clear statement of the meaning and intention of his figures and groups.

In putting these together he is careful above all things to make them tell their story, and primitive as he is in technique he is as accomplished in this art as Raphael himself. Moreover, he holds the balance between the tendency, always so strong among his countrymen as among the Germans, to over-emphasis of action and expression, and the grace and self-restraint which are among the most precious of artistic qualities. He never sacrifices beauty to force, nor on the other hand does he allow his sense of grace of line to weaken the telling effect of action or grouping. A good example of his style, and one interesting also from the comparative standpoint, is his fresco of " Herod's Birthday Feast " in S. Croce at Florence (fig. 13, Plate IV.). We contrast it with the earlier wall-painting of the same subject in the cathedral at Brunswick (fig. n,PlateIII.). Giotto has reduced the number of actors to the minimum necessary for an effective presentation of the scene, but has charged each figure with meaning and presented the ensemble with a due regard for space as well as merely for form. The flatness of the older work has already been exchanged for an effective, if not yet fully correct, rendering of planes. The justice of the actions and expressions will at once strike the observer.

The Florentine school as a whole looks to Giotto as its head, because he embodies all the characteristics that made it great; but at the same time the artists that came after him in most cases failed by over-emphasis of the demonstrative element, and sacrificed beauty and sentiment to vigour, and realism. The school as a whole is markedly intellectual, and as a result is at times prosaic, from which fault Giotto himself was saved by his Gothic tenderness and romance. His personality was so outstanding that it dominated the school for nearly a century. The " Giotteschi " is a name given to a number of Florentine painters whose labours cover the rest of the 14th century

among whom only one, Andrea di Cione, called Orcagna, lifted himself to any real eminence.

At Siena the Gothic movement made itself felt in the next artistic generation after that of Duccio. Its chief representative was Simone Martini. With him Sienese art takes upon itself a character contrasting markedly with the Florentine. It is on the demonstrative side less intellectual, less vigorous, less secular; and a dreamy melancholy, a tenderness that is a little sentimental, take the place of the alertness and force with which the personages in Florentine frescoes are endued. On the other hand, in decorative feeling, especially in regard to colour, Sienese painting surpasses that of the Florentines. Simone was followed by a number of artists who answered to the Florentine " Giotteschi " and carry on the style through the century, but as Florence produces an Orcagna, so at Siena about the middle of the 14th century there appear in the brothers Lorenzetti two artists of exceptional vigour, who carry art into new fields. Ambrogio Lorenzetti, the younger of the brothers, is specially represented by some frescoes in the Public Palace at Siena of a symbolical and didactic kind, representing Good and Bad Government, from which is selected a figure representing Peace (fig. 14, Plate V.). Sienese sentiment is here very apparent. Simone Martini's masterpiece had been a great religious fresco of an edifying kind on the wall of the chapel, and now in the rooms devoted to the secular business of the city Lorenzetti covers the walls with four large compositions on the subject named.

The painters of the Sienese school were on the whole faithful to the style indicated, and later on in the century they extend the boundaries of their school by spreading its influence into the hill country of Umbria. In the cities of this region Taddeo di Bartoli, one of the best of the followers of Simone, worked about the end of the century, and early Umbrian art in consequence exhibits the same devotional character, the same dreaminess, the same grace and decorative charm, that are at home in Siena.

Elsewhere in Italy the art of the 14th century represents a general advance beyond the old medieval standard, but no out- standing personality made its appearance and there was nothing that can be strictly termed a revival. At Rome, where on the foundation of the noble design of Cavallini there might have been reared a promising artistic structure, the removal early in the 14th century of the papal court to Avignon in France led to a cessation of all effort.

§ 15. The Fifteenth Century, and its Influence on the Develop- ment of Painting at Florence. — We come now to what was indicated in § 4 as the third of the main periods into which the history of painting may be divided. It is that in which, by the aid of the new agency of

perspective, truth of form was for the first time perfectly mastered, and an advance was made in the rendering of the truth of space.

The opening of the 1 5th century in Italy is the most important epoch in the whole history of painting, for it was the real begin- ning of the modern era, Here Florence, the first home of Renais- sance culture, unmistakably assumes the lead, and the new era is again opened by the agency of an individual of genius. The father of modern painting is the Florentine Masaccio. He not only advanced the art in those qualities in which Giotto had already made it great, but pointed the way towards the repre- sentation of the third dimension of objects and of space as a whole which had for so long been almost ignored. His short life course, for he died before he was thirty, only allowed him to execute one work of the first importance, the frescoes in the Brancacci chapel of the Carmine at Florence. There in the ” Tribute Money ” he told the story with all Giotto’s force and directness, but with an added power in the creation of exalted types of human character, and in the presentation of solid shapes that seem to live before us. In the ” Expulsion from Eden ” he rose to greater heights. ‘ In the whole range of demonstrative art no more convincing, more moving, figures have ever been created than those of our first parents, Adam veiling his face in his hands, Eve throwing back her head and wailing aloud in agony, while in the foreshortened form of the angel that hovers above we

discern the whole future development of the art for a century to come (see fig. 15, Plate V.). . Above all qualities in Masaccio’s work we are impressed with the simplicity and the ease of the work. The youthful artist possessed a reserve of power that, had he lived, would have carried him at one bound to heights that it took his actual successors in the school well nigh a century to climb.

The 15th century at Florence presents to us the picture of a progressive advance on the technical side of art, in the course of which various problems were attacked and one by one van- quished, till the form of painting in the style recognized in the school was finally perfected, and was then handed on to the great masters of expression, such as Raphael and Michelangelo, who used it as the obedient instrument of their wills. The efforts of the artists were inspired by a new intellectual and social movement of which this

century was the scene. If the Gothic movement in the 14th century had inspired Giotto and Simone Martini, now it was the revived study of the antique, the true Renaissance, that was behind all the technical struggles of the artists. Painting was not, however, directly and immediately affected by the study of antique models. This was only one symptom of a general stir of intellectual life that is called by the apt term ” humanism.” In the early Gothic epoch the move- ment had been also in the direction of humanity, that is to say, of softness in manners and of the amenities and graces of life, but it wa_ also a strictly religious movement. Now, in the 15th century, the inspiration of thought was rather pagan than Christian, and men were going back to the ideas and institutions of the antique world as a substitute for those which the Church had provided for thirty generations. The direct influence of these studies on art was chiefly felt in the case of architecture, which they practically transformed. Sculpture was influenced to a lesser degree, and painting least of all. It was not till the century was pretty far advanced that classical subjects of a mythological kind were adopted by artists like Botticelli and Piero di Cosimo, the first figures borrowed from the antique world being those of republican worthies displayed for purposes of public edification.

The elements which the humanistic movement contributed to Florentine art are the following: (1) The scientific study of perspective in all its branches, linear and aerial, including the science of shadows. (2) Anatomy, the study of the nude form both at rest and in action. (3) Truth of fact in details in animate and inanimate subjects. (4) The technique of oil painting. It must be observed that in this work the Florentines were joined by certain painters of Umbria, who were not satisfied with the Umbro-Sienese tradition already spoken of, but allied themselves with the leaders of the advance who were fighting under the banner of Masaccio.

Of the studies mentioned above by far the most important was that of perspective. Anatomy and realism in details only represented an advance along the lines painting had been already following. The new technique of oil painting, though of immense importance in connexion with the art as a whole, affected the Florentines comparatively little. Their favourite form of painting was the mural picture, not the self-contained panel or canvas for which the oil medium was specially designed, and for mural work fresco remained always supreme (see Part III., §35). In this mural work the introduction of scientific perspec- tive effected something like a transformation. The essence of the work from the decorative point of view had been its flatness. It was primarily pattern-making, and nature had been represented by contours which stood for objects without giving them their full

dimensions. When the artist began to introduce Varying planes of distance and to gain relief by light and shade, there was at once a change in the relation of the picture to the wall. It no longer agreed in its flatness with the facts of the surface, of which it formed the enrichment, but opposed these by its suggestion of depth and distance. Hence while painting as a whole advanced enormously through this effort after the truth of space, yet decorative quality in this particular form of the art propor^ tionately suffered.

The study of perspective owed much to the architect and scholar Brunellesco, one of the oldest as well as ablest of the men in whom the new movement of the 15th century was embodied. Brunellesco taught all he knew to Masaccio, for whose genius he felt strong admiration; but the artist in whom the result of the new study is most obvious is Paolo Uccello, a painter of much power, who was born as early as 1397. Uccello, as extant works testify, sometimes composed pictures mainly with a view to the perspective effects for which they furnished the opportunity. See fig. i6 ; Plate V., where in a fresco of a cavalry skirmish he has drawn in foreshortened view the figure of a warrior prone on the ground, as well as various weapons and other objects under the feet of the horses. A fresco of ” The Flood ” at Florence is even more naive in its parade of the painter’s newly won skill in perspective science. The intarsists, or workers in inlaid woods, who were very numerous in Florence, also adopted perspective motives for their designs, and these testify to the fascination of the study during all the last part of the century and the beginning of the next.

The advance in anatomical studies may be illustrated in the person of Antonio Pollaiuolo. Masaccio had been as great in this department of the painter’s craft as in any other; and in the Adam and Eve of the ” Expulsion,” and the famous nudes shown in the fresco of ” Peter Baptizing,” he had given the truth of action and expression as few have been able to render it ; but in the matter of scientific accuracy in detail more anatomical study was needful, and to this men like Pollaiuolo now devoted themselves. Pollaiuolo’s ” Martyrdom of St Sebastian,” in the London National Gallery, is a very notable illustration of the efforts which a conscientious and able Florentine of the period would make to master these problems of the scientific side of art. (See fig. 17, Plate V.)

On the whole, however, of the men of this group it was not a Florentine but the Umbrian Piero de’ Franceschi that represents the greatest achievement on the formal side of art. His theoreti- cal studies were profound. He wrote a treatise on perspective,

representing an advance on the previous treatment of the science by Alberti; and to this study of linear perspective Piero united those of aerial perspective and the science of shadows. A fresco of his at Arezzo entitled the ” Dream of Constantine ” is epoch-making in presenting a night effect into the midst of which a bolt of celestial radiance is hurled, the incidence of which on the objects of the various planes of the picture has been care- fully observed and accurately reproduced. (See fig. 18, Plate V.)

Piero handed on his scientific accomplishments to a pupil, also an Umbrian of Florentine sympathies, Luca Signorelli of Cortona. He achieved still greater success than Pollaiuolo in the rendering of the nude form in action, but more conspicuously than any others of this group he sacrificed beauty to truth, and the nudes in his great series of frescoes on the Last Things at Orvieto are anatomized like Scorchis, and are in colour and texture positively repellent. Luca’s work is, however, of his- torical importance as leading on to that of Michelangelo.

A great power in the Florentine school of the 15 th century was Andrea del Castagno, an artist with much of the vigour, the feeling for the monumental, of Masaccio, but without Masaccio’s saving gift of suavity of treatment. He is best represented by some single figures representing Florentine worthies, whom he has painted as if they were statues in niches. They formed part of the decoration of a villa, and are noteworthy as wholly secular in subject. There is a massiveness about the forms which shows how thoroughly the 15th century Florentines were mastering the representation of solid objects in all their three dimensions. Other painters attracted attention at the time for their realistic treatment of details. Vasari singles out Alessio Baldovinetti.

The importance for art of the Florentine school of the 15th century resides in these efforts for the perfecting of painting on the formal side, which its representatives were themselves making and were inspiring in others. The general historian of the art will dwell rather on this aspect of the work of the school than on the numerous attractive features it offers to the

PAINTING

Plate VII.

Fig. 23-THE PRESENTATION IN THE TEMPLE, TITIAN, (.38 × 310.) Academy, Venice,

Tlate VIII.

PAINTING

yhoto, Anderson.

Fig. 26.— CHARLES V., TITIAN. (133×110.) Madrid. Fig.ˆV-GEORGE GYSIS, HOLBEIN. (384×33.) Berlin.

DEVELOPMENT]

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superficial observer. The Fra Angelicos, the Filippo Lippis, the Benozzo Gozzolis, the Botticellis, the Filippino Lippis of the century express pleasantly in their work various phases of feeling, devotional, idyllic or pensive, and enjoy a proportionate popularity among the lovers of pictures. Exigencies of space preclude anything more than a mention of their names, but a sentence or two must be given to a painter of the last half of the century who represents better than any other the perfection of the monumental style in fresco painting. This painter is Ghirlandajo, to whom is ascribed a characteristic saying. When disturbed in hours of work about some domestic affair he exclaimed: ” Trouble me not about these household matters; now that I begin to comprehend the method of this art I would fain they gave me to paint the whole circuit of the walls of Florence with stories.” Ghirlandajo was entering into the heritage of technical knowledge and skill that had been labor- iously acquired by his countrymen and their Umbrian comrades since the beginning of the century, and he spread himself upon the plastered walls of Tuscan churches with easy copiousness, in works which give us a better idea than any others of the time of how much can be accomplished in a form of art of the kind by sound tradition and a businesslike system of operation.

The mural painting of Ghirlandajo represents in its perfection one important phase of the art. It was still decorative in the sense that lime colour-washes were the natural finish of the lime plaster on the wall, and that these washes were arranged in a colour-pattern pleasing to the eye. The demonstrative element, that is, the significance of these patches of colour as represent- ations of nature, was however in the eyes of both painter and public the matter of primary importance, and similitude was now carried as far as knowledge of anatomy and linear perspective rendered possible. Objects were rendered in their three dimensions and were properly set on their planes and

surrounded with suitable accessories, while aerial perspective was only drawn on to give a general sense of space without the eye being attracted too far into the distance. As a specimen of the monumental style nothing can be better than Ghirlandajo's fresco of the " Burial of S. Fina " at S. Gimignano in Tuscany (see fig. 19, Plate V.). We note with what architectural feeling the composition is balanced, how simple and monumental is the effect.

§ 16. The Fifteenth Century in the other Italian Schools. — It has been already noticed that the painting of the 14th century in the Umbrian cities was inspired by that of Siena. Through the 15th century the Umbrian school developed on the same lines. Its artists were as a whole content to express the placid religious sentiment with which the Sienese had inspired them, and advanced in technical matters almost unconsciously, or at any rate without making the pronounced efforts of the Floren- tines. While Piero de' Franceschi and Luca Signorelli vied with the most ardent spirits among the Florentines in grappling with the formal problems of the art, their countrymen generally preserved the old flatness of effect, the quiet poses, the devout expressions of the older school. This Umbro-Sienese art pro- duced in the latter part of the century the typical Umbrian painter Perugino, whose chief importance in the history of his art is the fact that he was the teacher of Raphael.

An Umbrian who united the suavity of style and feeling for beauty of the Peruginesques with a daring and scientific mastery that were Florentine was Piero de' Franceschi's pupil, Melozzo da Forli. His historical importance largely resides in the fact that he was the first master of the so-called Roman school. As was noticed before in connexion with the early Roman master, Pietro Cavallini, the development of a native Roman school was checked by the departure of the papal court to France for the best part of a century. After the return, when affairs had been set in order, the popes began to gather round them artists to carry out various extensive commissions, such as the decoration of the wˆlls of the newly-erected palace chapel of the Vatican, called from its founder the Sistine. These artists were not native Romans but Florentines and Umbrians, and among them was Melozzo da Forli, who by taking up his

residence permanently at Rome became the founder of the Roman school, that was afterwards adorned by names like those of Raphael and Michelangelo.

In the story of the development of Italian painting Melozzo occupies an important place. He carried further the notion of a perspective

treatment of the figure that was started by Masaccio's angel of the " Expulsion," and preceded Correggio in the device of representing a celestial event as it would appear to a spectator who was looking up at it from below.

On the whole, the three Umbrians, Piero de' Franceschi, with his two pupils Luca, Signorelli and Melozzo, are the most important figures in the central Italian art of the formative period. There is one other artist in another part of Italy whose personality bulks more largely than even theirs, and who, like them a disciple of the Florentines, excelled the Florentines in science and power, and this is the Paduan Mantegna.

We are introduced now to the painters of north Italy. Their general character differs from that of the Umbro-Sienese school in that their work is somewhat hard and sombre, and wanting in the naivete and tenderness of the masters who originally drew their inspiration from Simone Martini. Giotto had spent some time and accomplished some of his best work at Padua in the earliest years of the 14th century, but his influence had not lasted. Florentine art, in the more advanced form it wore in the first half of the 15th century, was again brought to it by Donatello and Paolo Uccello, who were at work there shortly before 1450. At that time Andrea Mantegna was receiving his first education from a painter, or rather impresario, named Francesco Squarcione, who directed his attention to antique models. Mantegna learnt from Donatello a statuesque feeling for form, and from Uccello a scientific interest in perspective, while, acting on the stimulus of his first teacher, he devoted him- self to personal study, of the remains of antique sculpture which were common in the Roman cities of north Italy. Mantegna built up his art on a scientific basis, but he knew how to inspire the form with a soul. His own personality was one of the strongest that we meet with in the annals of Italian art, and he stamped this on all he accomplished. No figures stand more firmly than Mantegna's, none have a more plastic fullness, in none are details of accoutrement or folds of drapery more clearly seen and rendered. The study of antique remains supplied him with a store of classical details that he uses with extraordinary accuracy and effectiveness in his representations of a Roman triumph, at Hampton Court. Ancient art invested, too, with a certain austere beauty his forms of women or children, and in classical nudes there is a firmness of modelling, a suppleness in movement, that we look for in vain among the Florentines. Fig. 20, Plate VI., which shows a dance of the Muses with Venus and Vulcan, is typical. Mantegna was not only a great person- ality, but he exercised a powerful and wide-reaching influence upon all the art of north Italy, including that of Venice. His perspective

studies led him in the same direction as Melozzo da Forli, and in some decorative paintings in the Camera degli Sposi at Mantua he pointed out the way that was afterwards to be followed by Correggio.

Mantegna's relations with the school of Venice introduce us to the most important and interesting of all the Italian schools save that of Florence. Venetian painting occupies a position by itself that corresponds with the place and history of the city that gave it birth. The connexions of Venice were not with the rest of Italy, but rather with the East and with Germany. Commercially speaking, she was the emporium of trade with both. Into her markets streamed the wealth of the Orient, and from her markets this was transferred across the Alps to cities like Nuremberg. From Germany had come a certain Gothic element into Venetian architecture in the 14th century, and a little later an influence of the same kind began to affect Venetian painting. Up to that time Venice had depended for her painters on the East, and had imported Byzantine Madonna pictures, and called in Byzantine mosaic-workers to adorn the walls and roof of her metropolitan church. The first sign of native activity is to be found at Murano, where,

in the first half of the 15th century, a German, Justus of Allemagna, worked in partnership with a Muranese family. A little later a stranger from another quarter executes important commissions in the city of the lagoons. This was an Umbrian, Gentile da Fabriano, who possessed the suavity and tenderness of his school.

The natural tendency of Venetian taste, nourished for cen- turies on opulent Oriental stuffs, on gold and gems, ran in the direction of what was soft and pleasing to the sense. The northern Gothic and the Umbrian influences corresponded with this and flattered the natural tendency of the people. For the proper development of Venetian painting some element of Florentine strength and science was absolutely necessary, and this was imparted to the Venetian school by Mantegna through the medium of the Bellini.

The Bellini were a Venetian family of painters, of whom the father was originally an assistant to Gentile da Fabriano, but lived for a while at Padua, where his daughter Nicolosia became the wife of

Mantegna. With the two Bellini sons, Gentile and Giovanni, Mantegna became very intimate, and a mutual influence was exercised that was greatly to the benefit of all. Mantegna softened a little what has been termed his ” iron style,” through the assimilation of some of the suavity and feeling for beauty and colour that were engrained in the Venetians, while on the other hand Mantegna imparted some of his own stern- ness and his Florentine science to his brothers-in-law, of whom the younger, Giovanni, was the formative master of the later Venetian school.

§ 17. The Painting of the Sixteenth Century: the Mastery of Form. — If we examine a drawing of the human figure by Raphael, Michelangelo, or Correggio, and compare it with the finest examples of Greek figure design on the vases, we note at once that to the ancient artist the form presented itself as a sil- houette, and he had to put constraint on himself to realize its depth ; whereas the moderns, so to say, think in the third dimen- sion of space and every touch of their pencil presupposes it. The lovely ” Aphrodite riding on a Swan,” on the large Greek kylix in the British Museum, is posed in an impossible position between the wing of the creature and its body, where there would be no space for her to sit. The lines of her figure are exquisite, but she is pure contour, not form. In a Raphael nude the strokes of the chalk come forward from the back, bringing with them into relief the rounded limb which grows into plastic fullness before our eyes. Whether the parts recede or approach, or sway from side to side, the impression on the eye is equally clear and convincing. The lines do not merely limit a surface but caress the shape and model it by their very direction and comparative force into relief. In other words, these 16th-century masters for the first time perfectly realize the aim which was before the eyes of the Greeks; and Raphael, whojn grace and truth and composition may have been only the peer of Apelles, probably surpassed his great predecessor in this easy and instinctive rendering of objects in their solidity.

In so far as the work of these masters of the culminating period, in its relation to nature, is of this character it needs no further analysis, and attention should rather be directed to those elements in Italian design of the 16th-century which have a special interest for the after development of the art.

Not only was form mastered as a matter of drawing, but relief was indicated by a subtle treatment of light and shade. Foreshortening as a matter of drawing requires to be accom- panied by correct modulation of tone and colour, for as the form ‘in question recedes from the eye, changes of the most delicate kind in the illumination and hue of the

parts present themselves for record and reproduction. The artist who first achieved mastery in these refinements of chiaroscuro was Leonardo da Vinci, while Correggio as a colourist added to Leonardesque modelling an equally delicate rendering of the modulation of local colour in relation to the incidence of light, and the greater or less distance of each part from the eye. This represented a great advance in the rendering of natural truth, and prepared the way for the masters of the 17th century. It is not only by

linear perspective, or the progressive diminution in size of objects as they recede, that the effect of space and distance can be compassed. This depends more on what artists know as ” tone ” or ” values,” that is, on the gradual degradation of the intensity of light and shadow, and the diminishing saturation of colours, or, as we may express it in a word that is not however quite adequate, aerial perspective. That which Leonardo and Correggio had accomplished in the modelling, lighting and tinting of the single form in space had to be applied by succeeding artists to space as a whole, and this was the work. not of the 16th but of the 17th century, and not of Italians but of the masters of the Netherlands and of Spain.

§ 18. The Contribution of Venice. — Before we enter upon this fourth period of the development of the art, something must be said of an all-important contribution that painting owes to the masters of Venice.

The reference is not only to Venetian colouring. This was partly, as we have seen, the result of the temperament and circumstances of the people, and we may ascribe also to the peculiar position of the city another Venetian characteristic. There is at Venice a sense of openness and space, and the artists seem anxious on their canvases to convey the same impression of a large entourage. The landscape background, which we have already found on early Flemish panels, becomes a feature of the pictures of the Venetians, but these avoid the meticulous detail of the Flemings and treat their spaces in a broader and simpler fashion. An indispensable condition however for the rich and varied effects of colour shown on Venetian canvases was the possession by the painters of an adequate technique. In the third part of this article an account is given of the change in technical methods due, not so much to the introduction of the oil medium by the Van Eycks, as to the exploitation at Venice of the unsuspected resources which that medium could be made to afford. Giovanni Bellini, not Hubert van Eyck, is really the primal painter in oil, because he was the first to manipulate it with freedom, and to play off against each other, the various effects of opaque and transparent pigment. His noble picture at Murano, representing the Doge Barbarigo adoring the Madonna,

represents his art at its best (see fig. 21, Plate VI.).

Bellini rendered possible the painters of the culminating period of Venetian art, Giorgione, Titian, Tintoretto, with others hardly less great. Giorgione was the first who made the art, as an art of paint not merely of design, speak to the soul. His melting outlines and the crisp clean touches that wake the piece to life; his glowing hues and the pearly neutrals that give them repose and quality; the intimate appeal of his dreamy faces, his refined but voluptuous forms, and the large freedom of his spaces of sky and distance, all combine to impress us with a sense of the poetry and mystery of creation that we derive from the works of no other extant painter. The ” Concert ” of the Louvre, fig. 22, Plate VII. is typically Giorgionesque.

Tintoretto, more intellectually profound, more passionate, writes for us his message in his stormy brush-strokes, now shaking us with terror, now lifting our souls on the wings of his imagination; but with him as with the younger master it is always the painter who speaks, and always in the terms of colour and texture and handling. Lastly, between the two, unapproachable in his majestic calm, stands Titian. Combining the poetry of Giorgione with much of Tintoretto’s depth and passion, he is the first, and still perhaps the greatest, of the supreme masters of the painter’s art. His masterpiece is the great “Presentation” of the Venice Academy, fig. 23, Plate VII. Painting, it is true, has to advance in its development beyond the ideals of Titian’s century, but it loses on the ethical side more than on the technical side it wins, and without the Venetians the world would have never known the full possi- bilities of the art that began so simply and at so early a stage of human civilization.

§ 19. The Fourth Period: the Realization of the Truth of Space. Changed Relation of Painting to Nature. — By the 17th century the development of painting had passed through all its stages, and the picture was no longer a mere silhouette or a transcript

of objects against a flat background, but rather an enchanted mirror of the world, in which might be reflected space beyond space in infinite recession. With this transformation of the picture there was connected a complete change in the relation of the artist to nature. Throughout

all the earlier epochs of the art that painter had concerned himself not with nature as a whole, but with certain selected aspects of nature that furnished him with his recognized subjects. These subjects were selected on account of their intrinsic beauty or importance, and as representing intrinsic worth they claimed to be delineated in the clearest and most substantial fashion. In the 17th century, not only was the world as a whole brought within the artist's view, but it presented itself as worthy in every part of his most reverent attention. In other words the art of the 17th century, and of the modern epoch in general, is democratic, and refuses to acknowledge that difference in artistic value among the aspects of nature which was at the basis of the essentially aristocratic art of the Greeks and Italians. It does not follow that selection is of any less importance .in modern painting than it was of old; the change is that the basis of selec- tion is not now a fixed intrinsic gradation amongst objects, but rather a variable difference dependent not on the object itself but on certain accidents of its position and lighting. The artist still demands that nature shall inspire him with her beauty, but he has learned that this beauty is so widely diffused that he may find it anywhere. It was a profound saying of John Constable that there is nothing ugly in nature, for, as he explained it, let the actual form and character of an object be what it would, the angle at which it might be viewed, and the effect upon it of light and colour, could always make it beautiful. It is when objects and groups of objects have taken on themselves this pictorial beauty, which only the artistically trained eye can discern, that the modern painter finds himself in the presence of his " subject," and he knows that this magical play of beauty may appear in the most casual and unlikely places, in mean and squalid corners, and upon the most ordinary objects of daily life. Sometimes it will be a heap of litter, sometimes a maiden's face, that will be touched with this pictorial charm. Things to the common eye most beautiful may be barren of it, while it may touch and glorify a clod.

The artist who was the first to demonstrate convincingly this principle of modern painting was Rembrandt. With Rembrandt the actual intrinsic character of the object before him was of small concern. Beauty was with him a matter of surface effect that depended on the combined influence of the actual local colour and superficial modelling of objects, with the passing condition of their lighting, and the greater or less clearness of the air through which they were seen. Behind the effect produced in this fortuitous fashion the object in itself vanished, so to say, from view. It was appearance that was important, not reality. Rembrandt's art was related essentially not to things as they were but as they seemed. The artists of the 15th

century, whose careful delineation of objects gives them the title of the earliest realists, portrayed these objects in precise analytical fashion each for itself. More advanced painters regarded them not only in themselves but in their artistic relations as combining beauties of form and colour that together made up a pictorial effect. Rembrandt in his later work attended to the pictorial effect alone and practically annulled the objects, by reducing them to pure tone and colour. Things are not there at all, but only the semblance or effect or ” impres- sion ” of things. Breadth is in this way combined with the most delicate variety, and a new form of painting, now called ” impressionism,” has come into being.

To give back nature just as she is seen, in a purely pictorial aspect, is the final achievement of the painter’s craft, but as the differences of tone and colour on which pictorial beauty depends are extremely subtle, so it is only by a skill of touch that seems Kke the most accomplished sleight of hand that the required illusion can be produced, and in this way the actual handling of the brush assumes in modern painting an importance which in the old days it never possessed. The effect is produced not by

definite statements of form and colour, but by what Sir Charles Eastlake termed ” the judicious unfinish of a consummate workman,” through which ” the flat surface is transformed into space.” Frans Hals of Haarlem, who was born in 1580, was perhaps the first to reveal the artistic possibilities of a free suggestive handling in oil paint, and Van Dyck is said to have marvelled how Hals was able to sketch in a portrait ” with single strokes of the brush, each in the right place, without altering them and without fusing them together.” In the wonderful late Velazquez at Vienna, the portrait of the Infant Philipp Prosper as a child of two years old, the white drapery, the minute fingers, the delicate baby face from which look out great eyes of darkest blue, are all indicated with touches so loosely thrown upon the canvas that seen near by they are all confusion — yet the life and truth are in them, and at the proper focal distance nature herself is before us. The touches combine to give the forms, the local colours, the depth, the solidity of nature, while at the same time the chief impression they convey is that of the opalescent play of changing tones and hues which, eluding the limitations of definite contours, make up to the painter’s eye the chief beauty of the external world. Moreover it will be understood that this realization of the truth of space, which is the distinguishing quality of modern painting, does not mean that the artist is always to be rendering large views of sky and plain. The gift of setting objects in space, so that the atmosphere plays about them, and their relations of tone to their surroundings are

absolutely correct and convincing, is shown just as well in a group of things close at hand as in a wide land- scape. The backgrounds in the pictures by Velazquez of ” The Surrender of Breda ” and ” Don Balthazar Carlos ” at Madrid are magnificent in their limitless suggestion of the free spaces of earth and sky, but the artist’s power in this respect is just as effectively shown in the creation of space in the interiors of ” The Maids of Honour ” and the ” Spinners,” and the skill with which he brings away the hand of the sitter from his white robe, in the ” Innocent X.” of the Doria Palace at Rome. The fact is that the scale on which the modern painter works, and the nature of his subjects, make no difference in the essential char- acter of the result. A very few square feet of canvas were sufficient for Ruysdael to convey in his ” Haarlem from the Dunes ” the most sublime impression of infinity; and a Dutch interior by De Hooch gives us just as much feeling of air and distance as one of the vast panoramic landscapes of De Koningk or Rubens.

§ 20. Impressionism. — The term “impressionism,” much heard in artistic discussions of to-day, is said to date from a certain exhibition in Paris in 1871, in the catalogue of which the word was often used; a picture being called Impression de mon pot- d-feu, or Impression d’un chat qui se promene, &c. An influential critic summed up these impressions, and dubbed the exhibition ” Salon des Impressionistes ” (Muther, Modem Painting, 1896, ii. 718). It is a mistake however to suppose that the style of painting denoted by this term is an invention of the day, for, in so far as it is practised seriously and with adequate artistic powers, it is essentially the same style as that of some of the greatest 17th-century masters, such as Rembrandt and Velazquez. Modern investigation into the reasons of things has provided the system with a scientific basis and justification, and we can see that it really corresponds with the experimentally determined facts of human vision. The act of ” seeing ” may mean one or two different things. We may (1) allow our glance to travel leisurely over the field of vision, viewing the objects one by one, and forming a clear picture to ourselves of each in turn; or (2) we may try to take in the whole field of vision at a glance, ignoring the special objects and trying to frame before ourselves a sort of summary representation of the whole; or again, (3) we may choose a single point in the field of vision, and focus on that our attention, allowing the surrounding objects to group themselves in an indistinct general mass. We can look at nature in any one of these three ways ; each is as legitimate as the others ; but since in most ordinary cases we look at things in order to gain information about them, our vision is usually of the first or

analytical kind, in which we fix the objects successively, noting each by each their individual characteristics. As the object of painting is to reproduce what is seen as we see it, so in the majority of cases painting corresponds to this, our usual way, of viewing nature. That is to say, all painters of the early schools, and the majority of painters at all times, represent nature in a way that answers to this analytical vision. The treatment of groups of objects in the mass, though, as we have seen, occasionally essayed even in ancient times (see §§ 8, 9), does not become the painter's ideal till the 17th century. We find then, and we find here and there through all the later periods of the art, efforts on the part of the artist to reproduce the effect of vision of the other two kinds, to show how objects look when regarded all together and not one by one, or how they look when we focus our attention on one of them but notice at the same time how all the others that are in the field of vision group them- selves round in a penumbra, in which they are seen and yet not seen. The special developments of impressionistic art in recent times in France and England are dealt with in the article on Impressionism (see also the appendix to this article on Recent Schools of Painting), but it is mentioned here as a style of paint- ing that is the logical outcome of the evolution of the art which has been traced from the earliest times to the 17th century. For the particular pictorial beauty, on which the modern painter trains his eye, is largely a beauty of relation, and depends on the mutual effect on each other of the elements in a group. Unless these are looked at in the mass their pictorial quality will be entirely missed. This word on impressionism, as corre- sponding to certain ways of looking at nature, is accordingly a necessary adjunct to the critique of modern painting since the 17th century.

§ 21. Painting in the Modern Schools.— -The history of the art has been presented here as an evolution, the ultimate outcome of which was the impressionist painting of 17th-century masters such as Rembrandt and Velazquez. In this form of painting the artist is only concerned with those aspects of nature which give him the sense of pictorial beauty in tone and colour, and these aspects he reproduces on his canvas, not as a mere mirror would, but touched, pervaded, transfigured by his own artistic personality. It does not follow however that these particular ideals of the art have inspired modern painters as a body. No one who visits the picture exhibitions of the day, or even our galleries of older art, will fail to note that a good deal

of modern painting since the 17th century has been academic and conventional, or prosaically natural, or merely popular in its appeal. With work of this kind we are not concerned, and accordingly, in the table (VIII.) which follows in Part II. of the article, the names with few exceptions are those of artists who embody the maturer pictorial aims that have been under discussion.

Of the schools of the 17th century that of Spain, owing much to the so-called Italian " naturalists," produced the incomparable Velazquez with one or two notable contempor- aries, and later on in the 18th century the interesting figure of Goya; while the influence of Velazquez on Whistler and other painters of to-day is a more important fact connected with the school than the recent appearance in it of brilliant technical executants such as Fortuny.

The schools of Flanders and of France are closely connected, and both owe much to Italian influence. The land of Italy, rather than any works of Italian painters, has been the inspira- tion of the so-called classical landscapists, among whom the Lorrainer Claude and the French Poussin take the rank of captains of a goodly band of followers. In figure painting the Venetians inspire Rubens, and Raphael stands at the head of the academic draughtsmen and composers of " historical " pieces who have been especially numerous in France. Rubens and Raphael together formed Le Bran in the days of Louis XIV., David and Delaroche in the two succeeding centuries, and the modern decorative figure painters, such as Baudry, whose works adorn the public buildings of France. Flemish influence is also strong in the French painting in a gallant vein of the 18th century

from the serious and beautiful art of Watteau (fig. 24, Plate VIII.) to the slighter productions of a Fragonard. Van Dyck, another Fleming of genius, is largely responsible for the British portrait- ure of the 1 8th century, which is affiliated to him through Kneller and Sir Peter Lely. There is something of the courtly elegance of Van Dyck in the beautiful Gainsborough at Edinburgh representing the Hon. Mrs Graham (fig. 25, Plate VIII.). On the whole, though the representative masters of these two schools are original, or at any rate personal, in technique, they are in their attitude towards nature largely dependent on the traditions established in the great Italian schools of figure-painting of the 1 6th century. The contrast when we turn from France and Flanders to Holland is extraordinary. This country produced at the close of the 16th century and in the first half of the 17th a body of painters who owed no direct debt at all to Italy, and, so far as appears, would have been what they were had Titian and Raphael and Michelangelo never existed. They took advantage, it is true, of the

mastery over nature and over the material apparatus .of painting which had been won for the world by the Italians of the 15th and 16th centuries, but there their debt to the peninsula ended, and in their outlook upon nature they were entirely original.

The Dutch school is indeed an epitome of the art in its modern phase, and all that has been said of this applies with special force to the painting of Holland. Democratic in choice of subject, subtle in observation of tone and atmosphere, refined in colour, free and yet precise in execution, sensitive to every charm of texture and handling, the Dutch painter of the first half of the 17th century represents the most varied and the most finished accomplishment in paint that any school can show. Such work as he perfected could not fail to exercise a powerful effect on later art, and accordingly we find a current of influence flowing from Holland through the whole course of modern painting, side by side with the more copious tide that had its fountain-head in Italy. Hogarth and Chardin and Morland in the 18th century, the Norwich painters and Constable in the 19th, with the French Barbizon landscapists who look to the last as their head, all owe an incalculable debt to the sincere and simple but masterly art of the countrymen of Rembrandt.

§ 22. The Different Kinds of Painting represented in the Modem Schools. — The fact that the Dutch painters have left us master- pieces in so many different walks of painting, makes it con- venient that we should add here some brief notes on characteristic modern phases of the art on which they stamped the impress of their genius. The normal subject for the artist, as we have seen, up to the 17th century, was the figure-subject, generally in some connexion with religion. The Egyptian portrayed the men and women of his time, but the pictures, through their connexion with the sepulchre, had a quasi-religious significance. The Assyrian chronicled the acts of semi-divine kings. Greek artists, whether sculptors or painters, were in the majority of cases occupied with the doings of gods and heroes. Christian art, up to the 16th century, was almost exclusively devoted to religious themes. In all this art, as well as in the more secular figure-painting of the modern schools, the personages represented, with their doings and surroundings, were of intrinsic importance, and the portrayal of them was in a measure an act of service and of honour. Portraiture is differentiated from this kind of subject-picture through stages which it would be interesting to trace, but the portrait, though secular, is always treated in such a way as to exalt or dignify the sitter. Another kind of figure-piece, also differentiated by degrees from the subject-picture of the loftier kind, is the so-called Genre Painting, in which the human actors and their goings-on are in themselves indifferent, trivial,

or mean and even repellent; and in which, accordingly, intrinsic interest of subject has disappeared to be replaced by an artistic interest of a different kind. Landscape, in modern times so important a branch of painting, is also an outcome of the traditional figure-piece, for at first it is nothing but a background to a scene in which human figures are prominent. Marine Painting is a branch of landscape art differentiated from this, but supplied at first in the same way with figure-interest.

The origin of Animal Painting is to be sought partly in figure-pieces, where, as in Egypt and Assyria, animals play a part in scenes of human life, and partly in landscapes, in which cattle, &c, are introduced to enliven the foreground. The Hunting Picture, combining a treatment of figures and animals in action with landscape of a picturesque character, gives an artist like Rubens a welcome opportunity, and the picture of Dead Game may be regarded as its offshoot. This brings us to the important class of Still-Life Painting, the relation of which to the figure-piece can be traced through the genre picture and the portrait. As a natural scene in the background, so on the nearer planes, a judiciously chosen group of accessory objects adds life and interest to the representation of a personage or scene from human life. Later on these objects, when regarded with the eyes of an artist fully opened to the beauty of the world, become in themselves fit for artistic, aye, even ideal, treatment; and a Vollon will by the magic of his art make the interior of a huge and polished copper caldron look as grand as if it were the very vault of heaven itself.

§ 23. Portraiture. — Attention has already been called in § 7 to the skill of the Egyptian artist in marking differences of species and race in animals and men. In the case of personages of special distinction, notably kings, individual lineaments were portrayed with the same freshness, the same accent of truth. There is less of this power among the artists of Assyria. The naturalism of Cretan and Mycenaean art is so striking that we should expect to find portraiture represented among its remains, and this term may be fairly applied to the gold masks that covered the faces of bodies in the tombs opened by Dr Schliemann. In early (historical) Greek art some archaic vases show representations of named personages of the day, such as King Arkesilas of Cyrene, that may fall under the same heading, and

portraiture was no doubt attempted in the early painted tombstones. The ideal character of Greek art however kept portraiture in the background till the later period after Alex- ander the Great, whose effigy limned by Apelles was one of the most famous pictures in antiquity. Our collections of works of classical art have been recently enriched by a series of actual painted portraits of men and women of the late classical period, executed on mummy cases in Egypt, and discovered in Graeco- Egyptian cemeteries. &n attempt has been made by comparison with coins to identify some of the personage? represented with members of the Ptolemaic house, including the famous Cleopatra, but it is safer to regard them, with Flinders Petrie, as portraits of ordinary men and women of the earliest centuries a.d. Tech- nically they are of the highest interest, as will be noticed in § 42. From the artistic point of view one notes their variety, their life-like character, and the pleasing impression of the human person- ality which some of them afford. There are specimens in the London National Gallery and British Museum.

During the early Christian and early medieval periods por- traits always existed. The effigies of rulers appeared, for example, on their coins, and there are some creditable attempts at portraiture on Anglo-Saxon pieces of money. In painting we find the most continuous series in the illuminated MSS. where they occur in the so-called dedicatory pictures, in MSS. intended for royal or distinguished persons, where the patron is shown seated in state and perhaps receiving the volume. The object here, as Woltmann says, ” always appears to be to give a true portrait of the exalted personage himself ” (Hist, of Painting, Eng. trans., i. 212). Julia Anicia, grand- daughter of Valentinus III., in the 6th century; the Carolingian emperor, Lothair, in the 9th; the Byzantine emperors, Basil II. in the 10th, and Nikephoros Botaniates in the nth, &c, appear in this fashion. Some famous mosaic pictures in S. Vitale, Ravenna, contain effigies of Justinian, Theodora, and the Ravennese bishop, Maximian. In very many medieval works of art a small portrait of the donor or the artist makes its appearance as an accessory.

With the rise of schools of painting in the 14th and 15th centuries, especially in the north, the portrait begins to assume greater prominence. The living personage of the day not only

figures as donor, but takes his place in the picture itself as one of the actors in the sacred or historical scene which is portrayed. A good deal of misplaced ingenuity has been expended in older and more modern days in identifying by guess-work historical figures in old pictures, but there is no doubt that such were often introduced. Dante and some of

his famous contemporaries make their appearance in a fresco ascribed to Giotto in the chapel of the Bargello at Florence. One is willing to see the face and form of the great Masaccio in the St Thomas with the red cloak, on the right of the group, in the fresco of the Tribute Money (see § 15). Diirer certainly paints himself as one of the Magi in his picture in the Uffizi. In Italy Ghirlandajo (see § 15) carried to an extreme this fashion, and thereby unduly secularized his biblical representations. The portrait proper, as an independent artistic creation, comes into vogue in the course of the 15th century both north and south of the Alps, and Jan van Eyck, Memlinc, and Diirer are in this department in advance of the Florentines, for whereas the latter almost confine themselves to flat profiles, Van Eyck introduces the three-quarter face view, which represents an improvement in the rendering of form. Mantegna and Antonello da Messina portray with great firmness, and to Uccello is ascribed an interesting series of heads of his contemporaries. It is Gentile and Giovanni Bellini however who may be regarded as the fathers of modern portrait painting. Venetian art was always more secular in spirit than that of the rest of Italy, and Venetian portraits were abundant. Those by Gentile Bellini of the Sultan Mahomet II., and by Giovanni of the Doge Loredano are specially famous. Vasari in his notice of the Bellini says that the Venetian palaces were full of family portraits going back sometimes to the fourth generation. Some of the finest portraits in the world are the work of the great Venetians of the 16th century, for they combine pictorial quality with an air of easy greatness which later painters find it hard to impart to their creations. Though greatly damaged, Titian's equestrian portrait of Charles V. at Madrid (fig. 26, Plate VIII.) is one of the very finest of existing works of the kind. It is somewhat remarkable that of the other Italian painters who executed portraits the most successful was the idealist Raphael, whose papal portraits of Julius II. and Leo X. are masterpieces of firm and accurate delineation. Leonardo's " Monna Lisa " is a study rather than a portrait proper.

The realistic vein, which, as we have seen, runs through northern painting, explains to some extent the extraordinary merit in portraiture of Holbein, who represents the culmination of the efforts in this direction of masters like Jan van Eyck and Diirer. Holbein is one of the greatest delineators that ever lived, and in many of his portraits he not only presents his sitter in life-like fashion, but he surrounds him with accessory objects, painted in an analytical spirit, but with a truthfulness that has seldom been equalled. The portrait of Georg Gysis at Berlin represents this side of Holbein's art at its best (fig. 27, Plate VIII.) . Some fine portraits by Italianizing Flemings such as Antonio Moro (see Table I.) bring us to the notable masters in

portraiture of the 17th century. All the schools of the period were great in this phase of the art, but it flourished more espe- cially in Holland, where political events had developed in the people self-reliance and a strong sense of individuality. As a consequence the Dutch men and women of the period from about 1575 to 1675 were incessantly having their portraits painted, either singly or in groups. The so-called ” corporation picture ” was a feature of the times. This had for its subject some group of individuals associated as members of a company or board or military mess. Such works are almost incredibly numerous in Holland, and their artistic evolution is interesting to trace. The earlier ones of the 16th century are merely collections of single portraits each treated for itself, the link of connexion between the various members of the group being quite arbitrary. Later on efforts, that were ultimately successful, were made to group the portraits .into a single composition so that the picture became an artistic whole. Frans Hals of Haarlem, one of the most brilliant painters of the impressionist school that he did much to found, achieved remarkable success in the artistic

grouping of a number of portraits, so that each should have the desired prominence while yet the effect of the whole was that of a unity. His masterpieces in this department in the town- hall at Haarlem have never been equalled.

As portraitists the other great 17th-century masters fall into two sets, Rembrandt and Velazquez contrasting with Rubens and his pupil Van Dyck. The portraits of the two former are individualized studies in which the sitter has been envisaged in an artistic aspect, retaining his personality though sublimated to a harmonious display of tone and colour. The Flemings are more conventional, and representing rather the type than the individual, are disposed to sacrifice the individuality of the sitter to their predetermined scheme of beauty. Both Velazquez and Rubens have left portraits of Isabel de Bourbon, first wife of Philip IV. of Spain, but whereas the Spaniard’s version gives us an uncomely face but one full of character, that of the Fleming shows us merely the big-eyed buxom wench we are accustomed to meet on all his canvases. Rembrandt was much less careful than Velazquez or Holbein or Hals to preserve the individuality of the sitter. He did not however, like the Flemings, convention- alize to a type, but worked each piece

into an artistic study of tone, colour and texture, in the course of which he might deal somewhat cavalierly with the actual facts of the piece of nature before him. The result, though incomparable in its artistic strength, may sometimes, in comparison with a Velazquez, seem laboured, but there is one Rembrandt portrait, that of Jan Six at Amsterdam, that is painted as directly as a Hals, and with the subtilty of a Velazquez, while it possesses a richness of pictorial quality in which Rembrandt surpasses all his ancient or modern compeers (see fig. 28, Plate IX.).

In the 1 8th century, though France produced some good limners and Spain Goya, yet on the whole England was the home of the best portraiture. Van Dyck had been in the service of Charles I., and foreign representatives of his style carried on afterwards the tradition of his essentially courtly art, but there existed at the same time a line of native British portraitists of whom the latest and best was Hogarth. One special form of portraiture, the miniature (q.v.), has been characteristically English throughout. The greater English and Scottish portraitists of the latter part of the 18th century, headed by Reynolds, owed much to Van Dyck, and their work was of a pronounced pictorial character. Every portrait, that is to say, was before everything beautiful as a work of art. Detail, either of features or dress, was not insisted on; and the effort was rather to generalize than to accentuate characteristic points. In a word, while the artist recognized the claims of the facts before him to adequate portrayal, he endeavoured to fuse all the elements of the piece into one lovely artistic unity, and in so doing he secured in his work the predominant quality of breadth. This style, handed on to painters of less power, died out in the first half of the 19th century in attenuated productions, in which harmony became emptiness. To this has suc- ceeded in Britain, still the home of the best European portraiture, a more modern style, the dominant notes of which have been truth and force. While the older school was seen at its best when dealing with the softer forms of the female sex .and of youth, these moderns excelled in the delineation of character in strongly-marked male heads, and some of them could hardly succeed wth a woman’s portrait. The fine appreciation of character in portraiture shown by Sir John Watson Gordon about the middle of the 19th century marked the beginning of this forcible style of the later Victorian period, a style suited to an age of keen intellectual activity, of science and of matter- of-fact. More recently still, with the rapid development in certain circles of a taste for the life of fashion and pleasure, the portrait of the showily-dressed lady has come again into vogue, and if any special influence is here to be discerned it may be traced to Paris.

§ 24. Genre Painting. The term ” genre ” is elliptical — it stands for genre has, and means the ” low style,” or the style in which there is no grandeur of subject or scale. A genre piece is a picture of a scene of ordinary human life without

any religious or historical significance, and though it makes its appearance earlier, it was in the Netherland schools of the first half of the 17 th century that it was established as a canonical form of the art. In Egypt we have seen that the subjects from human life have almost always a quasi-religious character, and the earliest examples of genre may be certain designs on early black-figured vases of the 6th century B.C. in Greece. Genre painting proper was introduced at a later period in Greece, and attracted special attention because of its contrast to the general spirit of classical art. It had a special name about which there is some difficulty but which seems to denote the same as genre has. In early Christian and early medieval painting genre can hardly be recognized, but it makes its appearance in some of the later illuminated MSS. and becomes more common, especially north of the Alps, in the 15th century. It really begins in the treatment in a secular spirit of scenes from the sacred story. These scenes, in Italy, but still more among the prosaic artists of the north, were made more life-like and inter- esting when they were furnished with personages and accessories drawn from the present world. Real people of the day were as we have just seen introduced as actors in the scriptural events, and in the same way all the objects and accessories in the picture were portrayed from existing models. It was easy sometimes for the spectator to forget that he was looking at biblical characters and at saints and to take the scene from the standpoint of actuality. Rembrandt, one of whose chief titles to fame is derived from his religious pictures, often treats a Holy Family as if it were a mere domestic group of his own day. It was a change sure to come when the religious signifi- cance was abandoned, and the persons and objects reduced to the terms of ordinary life. This of course represented a break with a very long established tradition, and it was only by degrees, and in Germany and Flanders rather than in Italy, that the change was brought about. Thus for example, St Eloi, the patron of goldsmiths, might be portrayed as saint, but also as artificer with the impedimenta of the craft about him. The next stage, represented by a charming picture by Quintin Matsys at Paris, shows us a goldsmith, no longer a saint, but busy with the same picturesque accessories (fig. 29, Plate IX.) . He has however his wife by his side and she is reading a missal which preserves to the piece a faint religious odour. Afterwards all religious suggestion is dropped, and we have the familiar goldsmith or money changer in his everyday

surround- ings, of which northern painting has furnished us with so many examples.

Genre painting, however, is something a little more special than is here implied. The term must not be made to cover all figure-pieces from ordinary life. There are pictures by the late Italian ” naturalists ” of this kind; Caravaggio’s ” Card Players ” at Dresden is a familiar example. These are too large in scale to come under this heading, and the same applies to the bodegones or pictures of kitchens and shops full of pots and pans and eatables, which, largely influenced by the Italian pictures just noticed, were common in Spain in the early days of Velazquez. Nor again are the large and showy subject pictures, which constitute the popular items in the catalogues of Burlington House and the Salon, to be classed as ” genre.” The genre picture, as represented by its acknow- ledged masters, is small in scale, as suits the nature of its subject, but is studied in every part and finished with the most fastidious care. The particular incident or phase of life por- trayed is as a rule of little intrinsic importance, and only serves to bring figures together with some variety of pose and expression and to motive their surroundings. It is rarely that the masters of genre charge their pictures with satiric or didactic purpose. Jan Steen in Holland and Hogarth in England are the excep- tions that prove the rule. The interest is in the main an artistic one, and depends on the nice observance of relations of tone and colour, and a free and yet at the same time precise touch. All these qualities combine to lend to the typical genres picture an intimitS, a sympathetic charm, that gives the masters of the style a firm hold on our affections. Probably the most

PAINTING

Plate IX.

Photo t Bruekmatm.

Fig. aft.— JAN SIX, REMBRANDT. Six Collection, Amsterdam.

Photo , Hanftfamgl.

Fig. 30.— A SINGING PARTY, BROUWER. (16 × 21.) Munich.

By permission of Braun, Clement & Co., Dornoch {Alsace’) and Paris.

Fig. 29.— LE BANQUIER ET SA FEMME, QUINTIN MATSYS. (28J x 27.) Louvre.

Phelo, Hanfstaengl.

Fig. 31— HAARLEM, FROM THE DUNES, RUYSDAEL. (20×24.) Hague.

Photo, Hanfstamsl.

Fig. 32.— CROSSING THE BROOK, TURNER. (76×65.) National Gallery, London.

Plate X.

PAINTING

By permission of Braun, Clement & Co., Dornoch (Alsace) and Paris.

I-”’.. 33-— STILL LIFE, CHARDIN. (74×50.) Louvre.

Photo, Anderson.

Fig. 36.— THE THREE GRACES, BOTTICELLI.

Florence.

i’ftofo, Anderson.

Fig. 34— FIGURE OF ADAM, MICHELANGELO. Rome.

excellent painters of genre are Terborch, Metsu and Brouwer, the two first painters of the life of the upper classes, the last of peasant existence in some of its most unlovely aspects. The pictures of Brouwer are among the most instructive documents of modern painting. They are all small pictures and nearly all exhibit nothing but two or three boors drinking, fighting, or otherwise characteristically employed, but the artist’s feeling for colour and tone, and above all his inimitable touch, has raised each to the rank of a masterpiece. He is best represented in the Munich Pinacotek, from which has been selected fig. 30, Plate IX. Hardly less admirable are Teniers in Flanders; De Hooch, Ver Meer of Delft, Jan Steen, A. van Ostade, in Holland, while in more modern times Hogarth, Chardin, Sir David Wilkie, Meissonier, and a host of others carry the tradition of the work down to our own day (see Table VIII.). . Greuze may have the doubtful honour of having invented the sentimental figure- piece from

ordinary life that delights the non-artistic spectator j in our modern exhibitions.

I § 25. Landscape and Marine Painting. This is one of the ‘ most important and interesting of the forms of painting that belong especially to modern times. It is true that there is sufficient landscape in ancient art to furnish matter for a sub- stantial book (Woermann, Die Landschaft in der Kunst der alien Volker, Munich, 1876), and the extant remains of Pompeian and Roman wall-painting contain a very fair proportion of works that may be brought under this heading. By far the most important examples are the half-dozen or so of pictures forming a series of illustrations of the Odyssey, that were found on the Esquiline at Rome in 1848, and are now in the Vatican library. As we shall see it to be the case with the landscapes of the late medieval period, these have all figure subjects on the nearer planes to which the landscape proper forms a background, but the latter is far more important than the figures. In some of these Odyssey landscapes there is a feeling after space and atmospheric effect, and in a few cases an almost modern treatment of light and shade, which give the works a prominent place among ancient productions which seem to prefigure the later developments of the art. In the rendering of landscape detail, especially in the matter of trees, nothing in antique art equals the pictures of a garden painted on the four walls of a room in the villa of Livia at Prima Porta near Rome. They are reproduced in Antike Denkmaler (Berlin, 1887, &c). These may be the actual work of a painter of the Augustan age named Ludius or Studius, who is praised by Pliny (Hist. Nat. xxxv. 116) for having introduced a style of wall decoration in which ” villas, harbours, landscape, gardens, sacred groves, woods, hills, fish-ponds, straits, streams and shores, any scene in short that took his fancy ” were depicted in lively and facile fashion. Pompeian wall paintings exhibit many pieces of the kind, and we find the same style illustrated in the low reliefs in modelled stucco, of which the specimens found near the Villa Farnesina, and now in the Terme Museum at Rome, are the best known.

In medieval painting landscape was practically reduced to a few typical objects, buildings, rocks, trees, clouds, &c, which stood for natural scenery. Occasionally however in the MSS. these objects are grouped in pictorial fashion, as in a Byzantine Psalter of the 10th century in the National Library at Paris. The beginning of the 15th century may be reckoned as the time when the modern development of landscape art had its origin, and Masaccio here, as in other walks of painting, takes the lead. Throughout the century the landscape background, always in strict subordination to the figure interest, is a common feature of Flemish and Italian pictures, but, in the latter

especially, the forms of natural objects are very conventional, and the impression produced on the city-loving Tuscan or Paduan of the time by mountain scenery is shown by the fact that rocks are commonly shown not only as perpendicular but overhanging. Titian is the first painter who, as mountain-bred, depicts the soaring peaks with real knowledge and affection (see the distance in fig. 22, Plate VII.), and the Venetians are the first to paint landscape with some breadth and sense of spaciousness, while, as we have seen, the Flemings, from Hubert

van Eyck downwards, distinguish themselves by their minute rendering of details, in which they were followed later on by Diirer, who was fond of landscape, and by Altdorfer. Of Diirer indeed it has been said that some of his landscape sketches in water-colour are the first examples in which a natural scene is painted for its own sake alone. Some of the northern artists of the ” Italianizing ” school of the 16th century, such as Patinir, whom Diirer, about 1520, calls ” Joachim the good landscape painter,” Paul Bril later in the century, and Adam Elsheimer, who worked at Rome about 1600, with several of their contemporaries, must not be omitted in any sketch of the history of the art. South of the Alps, the late Italian Salvator Rosa treats the wilder aspects of nature with some imaginative power, and his work, as well as the scenery of his native land, had an influence in the rapid development of land- scape art in the 17th century, which was in part worked out in the peninsula. What is known as ” classical landscape ” was perfected in the 17th century, and its most notable masters were the Lorrainer Claude Gelee and the French Poussin and Dughet, while the Italianizing Dutch painters Both and Berchem modify the style in accordance with the greater naturalism of their countrymen.

The landscapes of Claude are characteristic productions of the 17th century, because they convey as their primary impression that of space and atmosphere. The compositions, in which a few motivesˆuch as rounded masses of foliage are constantly repeated, are conventional; and there is little effort after naturalism or variety in detail; but the pictures are full of art, and reproduce in telling fashion some of the larger and grander aspects of the material creation. There are generally figures in the foreground, and these are often taken from classical fables or from scripture, but instead of the landscape, as in older Italian art, being a background to the figures, these last come in merely to enliven and give interest to the scenery. The style, in spite of a certain conventionality which offends some modern writers on art, has lived on, and was represented in our own country by Richard Wilson, the contemporary of Reynolds; and in some of his work,

notably in the Liber Studiorum, by Turner. Even Corot, though so individual a painter, owes something to the tradition of classical landscape.

The prevailing tendency of modem landscape art, especially in more recent times, has been in the direction of naturalism. Here the masters of the Dutch school have produced the canonical works that exercise a perennial influence, and they were preceded by certain northern masters such as the elder Breughel, whose ” Autumn ” at Vienna has true poetry; Savary, Roghman, and Hercules Seghers. Several of the Dutch masters, even before the time of Rembrandt, excelled in the truthful rendering of the scenes and objects of their own simple but eminently paintable country; but it was Rembrandt, with his pupil de Koningk and his rival in this department Jacob Ruysdael, who were the first to show how a perfectly natural and unconventional rendering of a stretch of country under a broad expanse of sky might be raised by poetry and ideal feeling to the rank of one of the world’s masterpieces of painting. Great as was Rembrandt in what Bode has called ” the landscape of feeling,” the ” Haarlem from the Dunes ” of Ruysdael (fig. 31, Plate IX.) with some others of this artist’s acknowledged successes, surpass even his achievement.

Nearer our own time Constable caught the spirit of the best Dutch landscapists, and in robust naturalism, controlled by art and elevated to the ideal region by greatness of spirit, he became a worthy successor of the masters just named, while on the other side he furnished inspiration to the French painters of the so-called Barbizon school, and through them to many of the present-day painters in Holland and in Scotland.

To fix the place of J. M. W. Turner in landscape art is not easy, for the range of his powers was so vast that he covered the whole field of nature and united in his own person the classical and naturalistic schools. The special merits of each of these phases of the art are united in this artist’s ” Crossing the Brook ” in the National Gallery, that is probably the most

perfect landscape in the world (fig. 32, Plate IX.). In a good dear of Turner’s later work there was a certain theatrical strain, and at times

even a garishness in colour, while his intense idealism led him to strive after effects beyond the reach of human art. We may however put out of view everything in Turner's tmvre to which reasonable exception may on these grounds be taken, and there will still remain a body of work which for extent, variety, truth and artistic taste is like the British fleet among the navies of the world.

Among Turner's chief titles to honour is the fact that he portrayed the sea in all its moods with a knowledge and sympathy that give him a place alone among painters of marine. Marine painting began among the Greeks, who were fond of the sea, and the " Odyssey " and other classical land- scapes are stronger on this side than the landscapes of the Tuscans or Umbrians, who cared as little for the ocean as for the mountains. The Venetians did less for the sea in their paintings than might have been expected, and in northern art not much was accomplished till the latter part of the 16th century, when the long line of the marine painters of Holland is opened by Hendrick Cornelius Vroom, who found a worthy theme for his art in the defeat of the Spanish Armada. Simon de Vlieger of Rotterdam, who was born about the beginning of the 1 7th century, was the master of W. Vandevelde the younger (1633-1707), who has never been equalled for his truthful repre- sentation of calm seas and shipping. He painted innumerable pictures of the sea-fights of the time between the English and the Dutch, those representing the victories of the Dutch being in Holland, while at Hampton Court the English are triumphant. There are exquisite artistic qualities in the painting of Vande- velde, who is reckoned the canonical master in this branch of art; but the few sea-pieces by Ruysdael, especially the " Dykes " of the Louvre, and the " Stormy Sea " at Berlin, exhibit the element under far more imaginative aspects. Besides Turner there are many British artists of modern days who have won fame in this branch of art that is naturally attractive to islanders.

§ 26. Animal Painting. — In all early schools of representative art from the time of the cave-dwellers downwards, the artist has done better with animals than with the human figure, and there is no epoch of the art at which the portrayal of animals has not flourished. (On Egyptian and Assyrian animals see § 7.) In Greece the representations of animals on coins are so varied and so excellent that we may be sure that the praise given to the pictures of the same creatures by contem- porary artists is not overdrawn. In northern art animals have always played an important part, and the motives of medieval decoration are largely drawn from this source, while beast symbolism brings them into vogue in connexion with religious themes. In Italian and early Flemish and German art animals are as a rule only accessories, though

some artists in all these schools take special delight in them; and when, early in the 17th century, they begin to take the chief place, the motive is often found in Paradise, where Adam and Eve lord it over the animal creation. If De Vlieger and Ruysdael are the first to show the sea in agitation, Rubens may have the same credit for revealing the passion and power of the animal nature in the violent actions of the combat or the chase. In this his contemporary Frans Snyders (1579-1657), and after Snyders Jan Fyt, specialized, and the first named is generally placed at the head of animal painters proper.

In Holland, in the 17th century, the animal nature presented itself under the more contemplative aspect of the ruminants in the lush water-meadows. True to their principle of doing every- thing they attempt in the best possible way, the Dutch paint horses (Cuyp, Wouwerman) and cattle (Cuyp, Adrian Vande- velde, Paul Potter) with canonical perfection, while Hondekoeter delineates live cocks and hens, and Weenix dead hares and moor-fowl, in a way that makes us feel that the last word on such themes has been spoken. There is a large white turkey by Hondekoeter in which the truth of mass and of texture in the full soft plumage is combined with a delicacy in the detail of

the airy filaments, that is the despair of the most accomplished modern executant.

But animals have been treated more nobly than when shown in Flemish agitation or in Dutch phlegmatic calm. Leonardo da Vinci was specially famed for his horses, which he may have treated with something of the majesty of Pheidias. Diirer has a magnificent horse in the ” Knight and Death,” but this is studied from the Colleoni monument. Nearer our own time the painter of Napoleonic France, Gericault, gave a fine reading of the equine nature. Rembrandt’s drawings of lions are notable features in his work, and in our own day in France and England the lion and other great beasts have been treated with true imaginative power.

§ 27. Still-Life Painting. — Like portraiture and landscape, the painting of objects on near planes, or as it is called still-life painting, is gradually differentiated from the figure-piece which was supreme in the early, and has been the staple product in all, the schools. Just as is the case with the other subsidiary branches of painting, it appears, though only as a by-product, in the history of ancient classical painting, passes practically out of existence in medieval times, begins to come to a knowledge of itself in the 15th and 16th centuries, and attains canonicity in the Dutch school of the first half of the 17th

century. Still- life may be called the characteristic form of painting of the modern world, because ‘ the intrinsic worth of the objects represented is a matter of complete indifference when compared with their artistic treatment in tone, colour and texture. By virtue of this treatment it has been noted (§§ 19, 20) that a study of a group of ordinary objects, when seen and depicted by a Rembrandt, may have all the essential qualities of the highest manifestations of the art. There is no finer Rembrandt for pictorial quality than the picture in the Louvre representing the carcase of a flayed ox in a flesher’s booth. As illustrating the principle of modern painting this form of the graphic art has a value and importance which in itself it could hardly claim. It is needless to repeat in this connexion what has been said on modern painting in general, and it will suffice here to indicate briefly the history of this particular phase of the art.

The way was prepared for it as has been noticed by the minute and forcible rendering of accessory objects in the figure- pieces and portraits of the early Flemish masters, of Diirer, and above all of Holbein. The painting of flower and fruit pieces without figure interest by Jan Breughel the younger, who was born in 1601, represents a stage onward, and contemporary with him were several other Dutch and Flemish specialists in this department, among whom Jan David de Heem, born 1603, and the rather older Willem Klaasz Heda may be mentioned. Their subjects sometimes took the form of a luncheon table with vessels, plate, fruit and other eatables; at other times of groups of costly vessels of gold, silver and glass, of of articles used in art or science, such as musical instruments and the like; and it is especially to be noted that the handling stops always short of any illusive reproduction of the actual textures of the objects, while at the same time the differing surfaces of stuffs and metal and glass, of smooth-rinded apples and gnarled lemons, are all most justly rendered. In some of these pieces we realize the beauty of what Sir Charles Eastlake has called the ” combination of solidity of execution with vivacity and grace of handling, the elasticity of surface which depends on the due balance of sharpness and softness, the vigorous touch and the delicate marking — all subservient to the truth of model- ling.” In this form of painting the French 18th-century artist Chardin, whose impasto was fuller, whose colouring more juicy than those of the Dutch, has achieved imperishable fame (see fig- 35, Plate X.); and the modern French, who understand better than others the technical business of painting, have carried on the fine tradition which has culminated in the work of Vollon. The Germans have also painted still-life to good result, but the comparative weakness in technique of British painters has kept them in this department rather in the back-

ground.

SCHOOLS OF PAINTING]

PAINTING

Part II., §28. — Schools of Painting

4-79

[In the folio wing Tables are included the main f ac t s in the history of Painting since about a . d . 1 000, with the artists of the first, second and third rank in their schools and periods. The relative importance of the artists is shown by the size of the capitals in which their names are printed. Facts and names of minor importance have in the interest of clearness been excluded. The names are given as commonly used, and where they differ from the headings of the separate biographical articles identification can be made by the Index. Words indicating localities are in italics.]

1000

to

uoo

1150

to

1300

1350

MEDIEVAL PAINTING &

I.

ITS OFFSHOOTS NORTH OF THE ALPS.

From about 1 1 50 to

[From the Carolingian period till the Xllth century Germany is the chief European centre of artistic production. 1300 France takes the lead. Italy is in the background till about 1250.]

\ Romanesque Wall and Panel Painting, Reichenau, Brauweiler, Brunswick, Hildesheim, Soest, &c. I Romanesque Sculpture, Hildesheim, Brunswick, Wechselburg, Freiberg i. S., &c.

f THE GOTHIC MOVEMENT IN CENTRAL FRANCE FROM . 11.50.

(Gothic decorative Sculpture, Stained Glass, Ivories, MS. Illuminations, &c.

I Qualities in the work – : — Refinement, Tenderness of Feeling, Love of Nature.

ITALY.

(For Comparison.)

5. Angela in Formis, wall paintings of c. 1 100.

Byzantine panels imported. Prot o- Renaissance,

c. 1 200-1300.

GOTHIC INFLUENCE ON NORTHERN PAINTING. Wall and Panel Paintings at Ramersdorf, Cologne, Westminster, &c. THE EARLIEST NORTHERN SCHOOLS. GERMANY.

Gothic characteristics in

GIOTTO,

1267-1337.

Early Religious Schools (Gothic). Prague, from c. 1348. Cologne, MEISTER WILHELM, fl. C 1360.

HOLLAND.

FLANDERS.

HUBERT & JAN van EYCK. fl. c. 1380-1440.

HERMANN WYNRICH, fl. C 1400. STEPHAN LOCHNER (Dombild, c. 144°)

German Realism begins.

MARTIN SCHONGAUER (Colmar), c. 1450-

1488. Influenced by Van der Wcyden.

BARTH. ZEITBLOM (W«),C. 145O-C. I520. HANS HOLBEIN THE ELDER (A Ugsburg) , d. 1524,

Adoration of the Lamb, Ghent, 1432. ROGER van der WEYDEN, 1 399-1464 (in Italy,

1449).

DIERICK BOUTS (Haarlem), I40o(?)-I47 5. (Perhaps author of the ” Lieversberg Passion.”) PETRUS CRISTUS, C. I4IO-I472.

HANS MEMLINC, c 1430-1494.

HUGO VAN DER GOES, c. 1435-I482. GERARD DAVID (Oudewater), c. 1450-1523.

150C

MASACCIO, 1402-1429. Age of humanism begins.

1500

ALBRECHT DURER

{Nuremberg’), 1471-1528. LUCAS CRANACH, 1472-1553-

HANS BURGKMAIR, 1473”! S3 1 –

MATHIAS GRUNEWALD, c. 1475-c. 1530.

BARTH. BRUYN, c. 1493-c I555-. Painter of Portraits.

HANS HOLBEIN, 1497-1543. England

his headquarters, 1526-1543.

ADAM ELSHEIMER, 1578-1620. Influential at

Rome c. 1 Goo.

LUCAS van LBYDEN {Leiden). 1494-1533.

JAN SCHOREEL, ˆ95-1562 {Alkmaar).

MARTEN VAN HEEMSKERK

(Haarlem), 1498-1574.

QUINTIN MATSYS (Antwerp), c. 1466-1530.

JOACHIM de patinir, d. c. 1524. \ Landscape

breughelthe elder, c. 1525-1570. \ and The BREUGHEL Family.) Genre.

M ABUSE (JAN GOSSART),CI472-C.I533. FRANS FLORIS (DE VRIENDT) c. I52O- I570-

Figures

ANTONIO MORO, c. 1S12-C. 1575. Portraits.

PAUL bril, 1554-1626. Landscape.

RAPHAEL, d. 1520. The High Renaissance.

TITIAN, d. U76.

TINTORETTO,

1518-1594.

German painting proper almost dies out in the XVI Ith and early XVIIIth

centuries.

For the Dutch School of theXVIIth century, see Table VII.

PETER PAUL RUBENS, b. 1577. For the Flemish School as headed by Rubens, see Table VIII.

For later Italian Paint- ing, see Table VI..

II. THE PROTO-RENAISSANCE AND THE REVIVAL OF ART IN ITALY.

1200

CONDITION OF THE ART OF PAINTING IN ITALY BEFORE THE REVIVAL.

Wall Paintings of poor style, with hard black outlines, devoid of any feeling for beauty or truth to nature.

Panel Paintings, chiefly inthe form of Enthroned Madonnasof Byzantine type, heavy but dignified ;and painted Crucifixes; repulsive in

aspect, with exaggeration of physical suffering, black outlines, green shadows, hatched lights.

[Best Italian Sculpture, e.g. by Antellami at Parma, c. 1 200, greatly inferior to contemporary work in France.]

1250

REVIVAL FIRST SEEN IN SCULPTURE. NICCOLA PISANO inspired by the Proto- Renaissance of Southern Italy; his pulpit at Pisa, 1260.

REVIVAL OF PAINTING UNDER THE INFLUENCE OF THE PROTO-RENAISSANCE.

At ROME, pietro cavallini “Last Judgment” at S. Cecilia, Rome, c. 1293; at SIENA, DUCCIO DI BUONINSEGNA, c. 1255-c. 1315, (probably) Ruccellai Madonna at Florence, and Madonna at Siena; at FLORENCE, CIMABUE, teacher of Giotto.

1300

III.

GOTHIC INFLUENCE ON THE ITALIAN REVIVAL.

[Gothic Naturalism, Expressiveness, and Feeling in the Sculpture of Giovanni Pisano and Andrea Pisano.]

FLORENCE.

GIOTTO, 1267-1337, great in composition and in natural and dramatic treatment 01 sacred themes.

Painting carried on on traditional lines by the Giottesques to the end of the century. At Florence painters' company founded 1340.

TADDEO GADDI, STEFANO, MASO DI BANCO, BERNARDO DADDI,

ANDREA ORCAGNA, agnolo gaddi, spinello aretino,

GIOVANNI DA MILANO, ANDREA DI FIRENZE, STARNINA, &C.

SIENA.

SIMONE MARTINI, c 1283-1344, exhibits the pensive sweetness that marks Sienese painting. At Siena painters' company founded 1355. Sienese school preserves throughout its tender and devout feeling, and decorative charm.

LIPPO MEMMI, BARTOLO DI FREDI, ANDREA VANNI.

taddeo bartoli influences art in Umbria. THE LORENZETTI, d. c. 1348. Painters of dramatic power. CONTEMPORARY PAINTING IN OTHER PARTS OF ITALY. Revival hardly begins in XlVth century. Best work done by allegretto di nuzio of Fairiano and altichiero of Verona. FRA ANGELICO DA FIESOLE, 1387-14S5, sums up the purely religious art of the Gothic period.

Q

1300

IV.

ITALIAN SCHOOLS OF THE FIFTEENTH CENTURY UNDER THE INFLUENCE OF THE RENAISSANCE. Painting advances at Florence,

declines at Siena. Other Italian schools begin to develop.

MASOLINO DA

Teacher of

FLORENCE.

PANICALE,

1383-C. 1440

MASACCIO, 1402-1429. Great as Giotto, with added knowledge and unique sense of the monumental in painting.

filippo lippi, 1406-1469. Idyllic charm. SANDRO BOTTICELLI, 1444-1510. Sentiment and beauty. Treats classical subjects.

filtppino lippi, 1460-1505. Grace, classical details.

benozzo gozzoli, 1424-1498. Copious in detail. cosiuo rosselli, piero di cosimo.

PAOLO UCCELLOj j£2Z devotee of Perspective'

AND. DEL CASTAGNO, C. I3go-I457. Vigour. DOM. veneziano, c. i40o-(?) 1461, tries oil-paint? ALESSIO BALDOVINETTI, 1427-1499, realist.

ANT. POLLAIUOLO H22 Anatomy, nude, oil.

1498

ANDREA DEL VERROCCHIO, 1435-1488.

Great in sculpture. Teacher of Leonardo. DOM. DEL GHIRLANDAJO, 1449-1494.

Master of monumental style in fresco.

FRA BARTOLOMMEO, iˆZS] „ , .

1 51 7 I Perfection of art on the [formal side.

Li*- 5

AND. DEL SARTO :

1487

SIENA.

TADDEO BARTOLI

1363-1422.

DOM. DI BARTOLO

SANO DI PIETRO

MAT. DI GIOVANNI

FRAN. DI GIORGIO, &C, &C.

carry art through the century on the same lines as in the XlVth cent.

Decline of Sienese Art.

UMBRIA.

GENTILE DA FABRIANO,

c. 1370-c. 1450. Visits Venice and Florence.

NICCOLO ALUNNO.

BENEDETTO BONFIGLI.

FIORENZO DI LORENZO.

B. CAPORALI,

&C, &C

Exhibit Umbrian suavity on Sienese lines. No progress.

All these fore- runners of the great masters.

1S00

PIERO DE' FRANCESCHI c. 1416-1492, teacher of

MELOZZO da FORLI, iJ3§,

1494

and of

LUCA SIGNORELLI. Hii.

1524

Realists of Florentine type. Progressive.

GIOVANNI SANZIO, d. I494.

Father of Raphael.

PIETRO PERTJGINO, 1446-1524. Raphael's master.

NORTH ITALY.

VERONA. VITTORE PISANO, d. I456.

1400

Finest Italian medalist.

PADUA. Native art begins with the

school of FRANCESCO SQUARCTONE, 1394-1474.

Classical remains studied.

[DONATELLO & UCCELLO

Work at padva, c. 1445.] From all these proceeds

AND. MANTEGNA, H3I.

1506

Studies Tuscan Art and influences Venetian.

VWENZA. MONTAGNA, I475-1523.

FERRARA.

COSIMO TURA, d. C I496.

LORENZO COSTA, I460-1535

BOLOGNA.

FRANC. FRANCIA,

1450-1517.

VENICE.

[gentile da fabriano

Works at Venice, c. 1422.]

School of MURANO,

influenced from Germany,

and

the vivarini flourish,

c. 1440-c. 1500.

CARLO CRIVELLI,

d. c. 1493.

ANTONELLO da MESSINA,

c. 1430-1479-

In Venice, 1475-6.

Oil painting introduced,

c 1473-

CIMA DA CONEGLIANO,

d. c. 1508.

VITTORE CARPACCIO,

d. c. 1522.

THE BELLINI, Associated with Mantegna, JACOPO d.

GENTILE, GIOVANNI,

■ 1470,

1507

■■■ 1430

1516

1500

1550

THE GREAT ITALIAN MASTERS OF THE SIXTEENTH CENTURY.!

FLORENCE.

LEONARDO DA VINCI, f^-.

At Milan 1482-1499. ” Last Supper” finished c. 1497.

MICHELANGELO BUONARROTI

1475-1504-

Sistine Chapel ceiling painted 1508-1512. ” Last Judgment,” c. 1540. Dome of St. Peter’s, c. 1560. SEBASTIANO DEL PIOMBO, I485-1547.

UMBRIA.

PERUGINO, SANZio.

RAFFAEL SANZIO,

1483-1520.

Umbrian period to 1504.

Florentine period, 1 504-1 508.

Roman period, 1508-1520.

GIOVANNI DA CDINE.

GIORGIO VASARI, 1511-1574.

Wrote lives of the artists.

The Michelangelesque affects Italian

design in general.

Age of the mannerists.

GTULIO ROMANO, 1492-1546.

PERINO DEL VAGA,

&C, &C

Followers of Raphael.

NORTH ITALY.

MILAN.

BERNARDINO LUINI, ‘—— — ■ Influenced by Leonardo

PARMA,

CORREGGIO, ˆ21

PARMIGIANO, I504-I540.

BRESCIA. MORETTO, C I498-1554.

BEROAMO. MORONI, C. I5JO-I578.

VENICE. GIOVANNI BELLINI.

GIORGIONE,

LORENZO LOTTO, C

1510

1480-c. 1556.

PALMA VECCHIO, c. 1480-1528. TITIAN,

died 1576, born 1476 (?) or some years later (?).

First dated work, 1507. Tribute Money,” c. 1508/Diirerat Venice, 1506). Peter Martyr,” 1530, influenced by Michelangelo. “Presentation in Temple,” 1540.

PAUL VERONESE, 1528-1588. TINTORETTO, 1518-1594. ” Paradise v begun, 1588.

1500

1550

SCHOOLS OF PAINTING]

PAINTING

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1600

VI. THE LATER PHASES OF ITALIAN PAINTING.

Eclectics. BOLOGNA SCHOOL. THE CARACCI, ˆj~, ludovico, agostino, annibale.

Naturalists.

CARAVAGGIO, 1569-1609.

VENICE (continued).

PARIS EORDONE, SCHIAVONE,

THE BASSANI, THE BON1FAZI, &C, &C,

all die before the end of XVIth century. PADOVANINO, 1590-1650.

GU1DO RENI, 1575-1642; DOMENICHINO, 1581-1641. BARBIERI (GCERCINO), 1591-1666; SASSOFERRATO, 1605-1685.

RIBERA (Spaniard), 1588-1653. Strong light and shade.

SALVATOR ROSA, 1615-1673. Landscape.

G. B. tiepolo, 1692-1769. Decorative style. CANALETTO, 1697-1768. Views of Venice. LONGHI, 1702-1762; GUARDI, 1712-1793.

VII.

1600

1700

THE DUTCH SCHOOL OF THE SEVENTEENTH CENTURY.

Artists of native type. Italianizers.

Portraitists and Painters of Corporation Pictures. g. honthorst,

1590-1656.

MIEREVELT, 1567-1641; RAVESTEYN, C. 1572-1657; DE KEYSER, 1596-1667. PIETER LASTMAN, 1583-1633.

REMBRANDT, 1606

FRANS HALS, J333; 1669; VAN DER HELST, 1613-1670.

pGERARD DOU, JAN VICTOR, GERBRANDT VAN DEN EECKHOUT, CAREL FABRITIUS, AART DE GELDER, FERD. BOL, GOVERT FLINCK,

NICOLAS MAAS, Italianize after

1650.

ik”

(Poetic.)

IDE HOOCH; VER MEER OF DELFT

c

(Aristocratic.) G. TERBORCH.

(Rustic.) A. VAN OSTADE.

5-

G. METSU.

I. VAN OSTADE.

(Satiric.) JAN STEEN.

(Cavalier.) P. WOUWERMAN.J

. fP. DE KON1NGK.

■si*

(Early Iandscapists, born before 1600.))

rDE heem; heda. (Still life.) ejj J M. DE hondekoeter. (Poultry.) S3] JAN WEENIX. (Dead game.)

Ljan van huysum. (Flowers.)

I ESAJAS VAN DF. VELDE, J. VAN GOYEN.

3 AERT VAN DER neer. (Night scenes, moonlight.) (_RUYSDAEL, hobbema, wynants.

(Cattle and Landscape.) A. CUYP; A. van DE velde; PAUL POTTER.

(Marine painters.) SIMON DE vlieger; W. VAN DE VELDE;

L. BACKHUYSEN.

(Architecture.)

JAN VAN DER HEYDEN.

JAN BOTH S-S-

NICOLAES BERCHEM 3

K. DU JARDIN.

(Painters of the Decline.)

VAN MIERIS, C. NETSCHER, ADRIAN VAN DER WERFF.

-1600

8 ..

HOLLAND.

1580, HALS, 1666.

VIII. CONSPECTUS OF THE MODERN SCHOOLS SINCE 1600.

ITALY.

FLANDERS.

RUBENS, ˆ I ‘ 1640

The Venetians.

Naturalists.

Landscapists.

The Florentines.

RAPHAEL. Figure Painters.

SPAIN.

RIBERA. I

1700

REMBRANDT, ^-

‘ 1069

Dutch School of Portrait, Landscape, Genre,

See TABLE VII above.

VAN DYCK, f|22.

TENIERS. SNYDERS; BROUWER.

LELY. I

I FRANCE.

POUSSIN, i£24. ■ 1665

CLAUDE, i£22.

I 1682 Age of

DUGHET, 1613-1675- LOUIS XIV.

(GASPAR POUSSIN). LE ^^

1619-1690.

VELAZQUEZ,

1599-1660.

1617, MURILLO, 1682.

-1700

GERMANY. I

chodowiecki, 1726-1801.

RAPHAEL MENGS, iH?. ■ 1779

BRITAIN.

HOGARTH, iSSl. kneller. 1764 ■

iH3, REYNOLDS, GAINSBOROUGH, i2§| •792 1 1 1788

ROMNEY, RAEBURN.

1785, WILKIE, 1841.

1684, WATTEAU, 1721.

BOUCHER. PATER, FRAGONARD.

CHARDIN,

1699-1779-

GREUZE, 1725-1805.

GOYA,£§.

L

1784, CORNELIUS, 1867. 1789, OVERBECK, 1869. 1805, KAULBACH, 1874.

fRETHEL, 1816-1859

Norwich School. 1714, wilson, 1782

TURNER, iZ25

1851

1776, CONSTABLE, 1837

Rom

anticistsl bocklin.

im- J cists 1 B °”<

Water Colour School.

Pre-Raphaelites.

WATTS.

I COROT,

1796

I ‘I.875-

1814, MILLET, 1875. 1 I I

Barbizon School.

1748, DAVID, 1825.

INGRES. I

DELAROCHE.

I

LAURENS, &C.

r

DIAZ. MONTICELLI. I

*gg. DELACROIX

1900

Modern Dutch, maris, &c; Glasgow School.

XX. 16

r

AMERICA.

Rom- ‘ Vanti- cists

Sentimental Genre. Impressionists. WHISTLER,

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PAINTING

[TECHNIQUE

Part III. — The Technique of Painting

§ 29. The Materials of Painting— -Painting begins, as we have seen, on the one side in outline delineation, on the other in the spreading of a coating of colour on a surface. For both these the material apparatus is ready at hand. Drawing may have begun merely with lines in the air, but lasting designs were soon produced either by indenting or marking any soft substance by a hard point, or by rubbing away a comparatively soft substance, such as a pointed piece of burnt wood, oh a rough surface of harder grain. Almost all the materials in use for drawing are of primitive origin. Charcoal, coloured earths and soft stones are natural or easily procured. Our plumbago was inown to Pliny (xxxiv. 18) and to Cennino (ch. 34), but it was not in common use till modern times. The black-lead pencil is first described as a novelty in 1565 (Quellenschriften edition of Cennino, p. 143). A metal point. of ordinary lead or tin was used in medieval MSS. for drawing lines on parchment, or on a wooden surface previously whitened with chalk (Theo- philus, II. ch. xvii.). Silver-point drawing is only a refinement on this. The metal point is dragged over a surface of wood or parchment that has been grounded with finely powdered bone-dust, or, as in modern times, with a wash of Chinese white (Cennino, ch. 6 seq.; Church, 292), and through the actual abrasion of the metal leaves a dark line in its track. Pliny knows the technique (xxxiii. 08). When a coloured fluid was at hand a pointed stick might be used to draw lines with it, but a primitive pen would soon be made from a split reed or the wing-feather of a bird.

The coating of one substance by another of which the colour is regarded from the aesthetic standpoint is the second source of the art of painting. To manipulate the coating substance so that it will lie evenly; to spread it by suitable mechanical means; and to secure its continued adherence when duly laid, are by no means difficult. Nature provides coloured juices of vegetable or of animal origin, and it has been suggested that the blood of the slain quarry or foeman smeared by the victor over his person was the first pigment. To imitate these by mixing powdered earths or other tinted substances in water is a very simple process. Certain reeds, the fibres of which spread out in water, were used as paint-brushes in ancient Egypt. A natural hare's-foot is still employed in theatrical circles to lay on a certain kind of pigment, and no great ingenuity would be required on the part of the hunter for the manufacture of a brush from the hair or bristles of the slain beast. In the matter of securing the adhesion of the coating thus spread, nature would again be the guide. Many animal and vegetable products are sticky and ultimately dry hard, while heat or moisture thins them to convenient fluidity. Great heat makes mineral

substances liquid that harden when cold. Hence binding materials offer themselves in considerable abundance, and they are of so great importance in the painter's art that they form the basis of current classifications of the different kinds of painting.

§ 30. The Surfaces covered by the Painter. — Many important questions connected with the technique of painting depend on the nature of surfaces; for the covering coat — though from the present point of view only of interest aesthetically — may, as we have seen, originally serve a utilitarian purpose. The surface in question may be classed as follows: the human body; implements, vessels, weapons, articles of dress; objects of furniture, including books; boats and ships; walls and other parts of buildings; panels and other surfaces prepared especially or entirely to be painted on.

The differences among these from the present point of view are obvious. The body could not suitably be covered with a substance impervious to air and moisture; the coatings of a clay vessel and of a boat should on the other hand make them waterproof. The materials used in building often require protection from the weather. The painting on the prepared panel needs to resist time and any special influence due to location or climate. All such considerations are prior to the questions of colour, design, or aesthetic effect generally, in these

coatings; and on them depend the binding materials, or media, with which the colouring substances are applied. The case of one particular surface much employed for pictorial display is exceptional. This is the wallˆ-plaster so abundantly used for clothing an unsightly, rough, or perishable building material, like rubble or crude brick. This function it performs perfectly when left of its natural white or greyish hue, but its plain unbroken surface has seemed to demand some relief through colouring or a pattern, and the recognition of this led to one of the most important branches of the art, mural painting. Now lime-plaster, if painted on while it is still wet, retains upon its surface after it has dried the pigments used, although these have not been mixed with any binding material. On all other surfaces the pigments are mixed with some binding material, and on the character of this the kind of painting depends. There is thus a primary distinction between the process just referred to and all others. In the former, pigments, mixed only with water, are laid on while the plaster is wet, and from this " freshness " of the ground the process is called by an Italian term, painting " a fresco " or " on the fresh," though in ordinary parlance the word " fresco " has come to be used as a noun, as when we speak of the " frescoes " of Giotto. Furthermore, as " fresco " is the wall-

painter's process par excellence the word is unfortunately often employed inaccurately for any mural picture, though this may have been executed by quite a different process. In contradistinction to painting " a fresco " all other processes are properly described by the Italian term " a tem- pera," meaning " with a mixture." The word is used as a noun in the sense of a substance mixed with another; but it is to be regarded as the imperative of the verb temperare, which both in Latin and Italian means " to divide or proportion duly," " to qualify by mixing," and generally " to regulate." Tempera means strictly " mix," just as " recipe," also employed as a substantive, is an imperative meaning " take." In ordi- nary parlance, however, the word tempera is confined to a certain class of binding materials to the exclusion of others, so that the more general term " media " is the best to employ in the present connexion. We go on, therefore, to consider these various media in relation to different surfaces and conditions.

§ 31. Binding Materials, or Media. — The fundamental dis- tinction among media is their solubility or non-solubility in water, though, as will be seen presently, some possess both these qualities. The non-soluble media are (1) of mineral, (2) of vegetable origin. (1) Of the former kind are all vitreous pastes or pottery glazes, with which imperishable coloured surfaces or designs are produced on glazed tiles used in the decoration of buildings, on ceramic products, and in all processes of enamelling. Silicate of potash, employed to fix pigments on to mural surfaces of plaster in the so-called " stereochrome " or " water-glass " processes of wall painting (see § 37), is another mineral medium, so too is paraffin wax. In the process called (unscientifically) " fresco secco," in which the painting is on dry plaster, lime is used as a binding material for the colours. Its action here is a chemical one (see § 36). (2) Non-soluble vegetable media are drying oils, resins, waxes (including paraffin wax, which is really mineral). In ancient times wax, and to some small extent also resins, were used as a protection against moisture, as in shipbuilding and some forms of wall-painting. Resins have always remained, but wax gradually went out of use in the earlier Christian centuries, and was replaced by the new medium, not used in classical times, of drying oil. In northern lands the desire to protect painted surfaces from the moisture of the air led to a more extensive use of oils and resins than in Italy; and it was in the Netherlands that in the 15th century oil media were for the first time adopted in the regular practice of painting, which they have dominated ever since.

The soluble media are of animal and vegetable origin. Egg, yolk or white, or both combined, is the chief of the former. Next in importance are size, gained by boiling down shreds of parchment, and

fish glue. Egg is the chief medium in what is specially known as ” tempera ” painting, while for the painting

commonly called distemper or ” gouache,” of which scene- painting is typical, size is used. Milk, ox-gall, casein and other substances are also employed. Of soluble vegetable media the most used are gums of various kinds. These are common ” temperas ” or tempera media, and, with glycerin or honey, form the usual binding material in what is called ” water- colour ” painting. Wine, vinegar, the milk of fig-shoots, &c, also occur in old recipes.

Attention must be drawn to the fact that substances can be prepared for use in painting that unite soluble and insoluble media, but can be diluted with water. These substances are known as ” emulsions.” A wax emulsion, which is also called ” saponified wax,” can be made by boiling wax in a solution of potash [in the proportions 100 bleached wax, 10 potash, 250 distilled water (Berger, Beitrage, i. 100)] till the wax is melted. When the solution has cooled it can be diluted with cold water. An admixture of oil is also possible. This, accord- ing to Berger, is what Pliny and-Vitruvius (vii. 9, 3) call ” Punic wax,” a material of importance in ancient painting.

An oil emulsion can be made by mixing drying oil with water through the intermediary of gum or yolk of egg. An intimate mechanical compound, not a chemical one, is thus effected, and the mixture can be diluted with water. If gum arabic be used the result is a ” lean ” emulsion of a milky- white colour, if yolk of egg a ” fat ” emulsion of a yellowish tint. When these wax or oil emulsions are dry they have the waterproof character of their non-soluble constituents.

Lastly, it must be noticed that certain substances used in the graphic arts — some of which possess in themselves a certain unctuousness — can be, as it were, rubbed into a suitably rpugh- ened, and at the same time yielding, ground, to which they will adhere, though loosely, without binding material. This is the case with charcoal, chalks and pencil. The same property is imparted by a little gum or starch to soft coloured chalks, with which is executed the kind of work called ” pastel.” These are now also made up with an oleaginous medium and are known as ” oil pastels.” Pictures can be carried out in ordinary or

in oil pastels, and the work should rank as a kind of painting. The coloured films, rubbed off from the sticks of soft chalk on a suitably rough and sometimes tinted paper, are artistic in their texture and capable of producing very beautiful effects of colour. Professor Church notes also that the colours laid on in this fashion seem peculiarly durable (Chemistry, p. 293).

§ 32. The Processes of Painting: Preliminary Note. — These will be discussed from the point of view of the media employed, but certain departures from strict logical arrangement will be convenient. Thus, different processes of monumental painting on walls may be brought together though distinct media are employed. Tempera and early oil practice cannot be separated.

Painting by the use of vitreous glazes fused by heat may be noticed first, as the process comes within the scope of the article, though it-has generally been applied in a purely decorative spirit, so as to be a branch of the art of ornament rather than strictly speaking of painting (see § 2).

In painting processes proper fresco takes the lead. It is in its theory the simplest of all, and at the same time it has produced some of the most splendid results recorded in the annals of the art. With the fresco process may be grouped for the sake of convenience other methods of wall-painting, which share with it at any rate some of its characteristics.

One of these subsidiary methods of wall-painting is that known as the wax process or ” encaustic,” used in ancient times and revived in our own. Painting in wax, not specially on walls, was an important technique among the ancient Greeks, and the consideration of it introduces some difficult archaeological questions, at which space will not allow more than a glance. The wax used in the process, softened or melted by heat or driven by fire into the painting ground — whence the name ” encaustic ” or ” burning in ” — is really a tempera or binding material, and we are brought here to the important subject of tempera painting in general. It will have to be noticed in this connexion what were the chief binding materials used in the so-named

technique in different lands at the various stages of the art, and what conditions were imposed on the artist by the nature of his materials. Lastly, there is the all-important process in which the binding materials are oils and varnishes, a process to which attaches so much historical and artistic interest, while a form of tempera painting that has been specially developed in modern times, that known as water-

colour, may claim a concluding word.

§ 33. Historical Use of the Various Processes of Painting. — The extent and nature of the employment of these processes at different periods may have here a brief notice.

Tempera painting has had a far longer history and more extended use than any other. The Spaniard Pacheco, the father-in-law and teacher of Velazquez, remarks on the venera- tion due to tempera because it had its birthday with art itself, and was the process in which the famous ancient artists accom- plished such marvels. In the matter of antiquity, painting with vitreous glazes is its only rival: glazed tiles formed, in fact, the chief polychrome decoration for the exteriors of the palaces of Mesopotamia, and were used also in Egypt; but all the wall-paintings in ancient Egypt and Babylonia and My- cenaean Greece, all the mummy cases and papyrus rolls in the first-named country are executed in tempera, and the same is true of the wall-paintings in Italian tombs. In Greece Proper paintings on terra-cotta fixed by fire were very common in the period before the Persian wars. When monumental wall-painting came to the front just after that event it was almost certainly in tempera rather than in fresco that Polygnotus and his companions executed their masterpieces. It has been doubted whether these artists painted directly on plaster or on wooden panels fixed to the wall, but the discovery in Greece of genuine mural paintings of the Mycenaean period has set these doubts at rest. In Italy tomb-paintings actually on plaster exist from the 6th century B.C. The earlier panel painters of the 5th and 4th centuries B.C. also used tempera processes, though their exact media are not recorded. About the time of Alexander there seems to have been felt a demand for a style of painting in which could be obtained greater depth and brilliancy of colouring, with corresponding force in relief, than was possible in the traditional tempera; and this led to painting in a wax medium with which abundance of ” body ” could be secured. There are many puzzling questions con- nected with this ancient encaustic, but the discovery in recent years of actual specimens of the work, in the form of portraits on the late Egyptian mummy cases of the first centuries a.d. have assisted the study. Meanwhile a new technique to have been in process of evolution for use on walls, for the fresco process, in a complete or modified form, was certainly in use among the Romans.

The history of the fresco process, as will presently be seen, is somewhat puzzling. Vitruvius and Pliny knew it, and it is mentioned in the Mount Athos Handbook, which incorporates the technical traditions of the art of the Eastern Empire; it appears also to have

been in use in the Christian catacombs, but was not practised by the wall painters who adorned the early medieval churches south and north of the Alps. The difficulties of the process, and another reason to be noticed directly, may have led to its partial disuse in the West, but we find it again coming into vogue in Italy in the 13th and 14th centuries. In the early Christian centuries its place was taken in the monumental decoration of walls by marble inlays, and especially by glass mosaic, which is in itself an important form of wall-painting and may have put painting on plaster, and with it the fresco process, into the shade; notice will however presently be taken of a theory that seeks to establish a close technical connexion between mosaic work and the fresco painting, which, on the decline in the later medieval period of mosaic, came forward again into prominence.

The tempera processes were accordingly in vogue in early medieval times for wall-paintings (except to some extent in the East), for portable panels, and on parchment for the decoration and illustration of manuscripts. Meanwhile the

use of drying oils as painting media was coming to be known, and both on plaster and on wood these were to some extent employed through the later medieval period, though without seriously challenging the supremacy of tempera. From the beginning of the 1 5th century, however, oil painting rose rapidly in estimation, and from the end of that century to our own time it has practically dominated the art. Wall-painting in fresco continued to be practised till the last part of the 18th century, and has been revived and supplemented by various other monumental processes in the 19th, but even for mural work the oil medium has proved itself a convenient substitute. Water-colour painting in its present form is essentially an art of the last hundred years. The old tempera processes have been partly revived in our own time for picture-painting, but the chief modern use of tempera is in scene-painting, where it is more commonly called ” distemper.”

§ 34. Painting with Coloured Vitreous Pastes. — There is no single work that deals with the whole subject of this material and its different uses in transparent or opaque form in the arts, but details will be found in the special articles where these uses are described.

(See Ceramics; Mosaic; Enamel; Glass, stained.) On the subject of the substances and processes employed in the colouring of the various vitreous pastes informa- tion will be found in H. H. Cunynghame's Art Enamelling on Metals (2nd ed., London, 1906, ch. vi.), but the subject is a large and highly technical one.

Coloured vitreous pastes are among the most valuable materials at the command of the decorative artists, and are employed in numerous techniques, as for example for the glazes of ceramic products including wall or floor tiles; for painted glass windows; for glass mosaic, and for all kinds of work in enamels. The vitreous paste is tinged in the mass with various metallic oxides, one of the finest colours being a ruby red obtained from gold. Silver gives yellow, copper a blue green, cobalt blue, chromium green, nickel brown, manganese violet, and so on. Tin in any form has the curious property of making the vitreous paste opaque. It should be understood that though the vitreous substance and the metallic oxides are essentially the same in all these processes, yet the preparation of the coloured pastes has to be specially conditioned in accordance with the particular technique in view. There are generally various ways of produc- ing reds and blues and greens, &c, from oxides of different metals. The material is generally lustrous, and it admits of a great variety in colours, some of which are highly saturated and beautiful. It is on the lustre and colour of the substance, rather than on the pictorial designs that can be produced by its aid, that its artistic value depends; but though this implies that it comes under the heading " Ornament " rather than " Painting," yet in certain forms and at particular periods it has been the chief medium for the production of pictorial results, and must accordingly have here a brief notice. . The difference between opaque and transparent coloured glass is the basis of a division among the arts that employ the material. If it be kept transparent the finest possible effect is obtained in the stained-glass window, where the colours are seen by transmitted light. The stained-glass window came into general use in the early Gothic period, and was a substitute for the wall-paintings which had been common in the Roman- esque churches of the nth and 12th centuries. Hence it is a form, and a very sumptuous and beautiful form, of the art of mural painting, representing that art in the later medieval buildings north of the Alps. In Italy, where the practice of wall-painting continued without a break from early medieval to Renaissance times, the stained-glass window was not a national form of art.

The most effective use of opaque coloured vitreous pastes is in ceramics (pottery) and in glass mosaic. The terra-cotta plaque, or tile-painted with designs in glazes of the kind was, as we have seen (§ 7),

one of the chief forms of exterior mural decoration in ancient Mesopotamia. The best existing examples were found not long ago on the site of the ancient Susa (” Shushan the palace ” of Scripture) and are now in the Louvre. Human

figures, animals, and ornaments, are represented not only in lively colours but also in relief; that is to say, each separate glaze brick had its surface, measuring about 12 in. by 9 in., modelled as well as painted for the exact place it had to occupy in the design. On these bricks there are formed small ridges in relief intended to keep the different liquid glazes apart before they were fixed by vitrifaction in the kiln. Chemical analysis has shown that the yellow colour is an antimoniat of lead, the white is oxide of tin, similar to the well-known opaque white glaze used by the Delia Robbia in Italy, the blues and greens are probably oxides of copper, the red a sub-oxide of copper (Semper, Der Stil, i. 332). This same region of the world has remained through all time a great centre for the production of coloured glazed tiles, but the use of ” Persian,” ” Moresque,” and other decorated plaques has been more ornamental than pictorial.

Glazed pottery only comes occasionally within the survey of the historian of painting. It does so in ancient Greece, because the earlier stages of the development of Greek painting can only be followed in this material; it does so, too, in a sense, in Italian faience and in some Oriental products, but these hardly fall within our view. The Greek vase was covered with a black glaze of extreme thinness and hardness, the composition of which is not known. Figure designs were painted in this on the natural clay of the vessel (see fig. 3, Plate IV.), or it was used for a background, the design being left the colour of the clay. Other colours, especially a red (oxide of iron) and white, were also employed to diversify the design and emphasize details, and these were also fixed by firing. A special kind of Greek vase was the so-called ” polychrome lekuthos,” a small upright vessel, the clay of which was covered with a white ” slip ” on which figure designs were painted in lively tints. The technique is not quite understood, but the colours were certainly fired. There is an article on ” The Technical History of White Lecythi ” in the American Journal of Archaeology for 1907; the processes are no 1- ., however, analysed.

In glass mosaic thin solid slabs of coloured vitreous pastes are broken up into little cubes of \ in. to § in. in size and set in some suitable cement. The artist works from a coloured drawing and selects his cubes accordingly. Any number of shades of all hues can be obtained, and the modern mosaic workers of Italy boast that they dispose of some 25,000 different tints. As it is of the essence of the work to be

simple and monumental in effect, a limited palette is all that is needed; and the mosaics recently executed in St Paul's in London are done in about thirty colours. The worker should have at hand appliances to cut to shape any particular cube wanted for a special detail.

The ancients used the art, and the finest existing ancient picture is in a mosaic, not indeed of glass pastes, but of coloured marbles. This is the famous " Battle of Issus " found at Pompeii. Glass mosaic came in under the early Roman Empire, but its chief use was in early Christian times, when it was the chief material for mural decoration of a pictorial kind. Ravenna is the place where this form of painting is most instructively represented, and the 5th and 6th centuries a.d. are the times of its greatest glory. At Rome and Constantinople there is fine early work, while that at Venice and Palermo is later. In the earliest and best examples the design is very simple, and a few monumental forms of epic dignity, against a flat background commonly of dark blue, represents the persons and scenes of the sacred narratives. The effect of colour is always sumptuous. Gold, especially for the backgrounds, is in later work freely employed.

The subject of enamel work forms the theme of a separate article. Here it need only be said that pictures can be produced by painting on a ground, generally of metal, with coloured vitreous pastes that are afterwards fixed by fusing. Limoges in France has been the great centre of the art, but enamelling loses in artistic value when a too exclusively pictorial result is aimed at.

§ 35. Fresco Painting. — Vitruvius {Be Architectural bk. vii. chs. 2, 3; age of Augustus), Mount Athos Handbook (Hermeneia, chs. 54 seq. ; date uncertain but based on early tradition) ; Cennino

Cennini (Trattato della pittura, chs. 67 seq., ed. Milanesi, 1859; Eng. trans, by Christiana J. Herringham, Lond., 1899); Leon Battista Alberti (De re aedificatoria, bk. vi. ch. 9; early and mid- dle 15th century); Vasari (Opere, ed. Milanesi, i. 181; middle of 16th century) — all refer in general terms to the fresco process, as one generally understood in their times. Armenini (Dei veri precetti della pittura; Ravenna, 1587), and Palomino {El Museo pictorico; Madrid, 1715-1724), give more

detailed accounts of the actual technical procedure, of which they had preserved the tradition. Much information of the highest value and interest was collected at the time when, in the forties of the 19th century, the project for the decoration in fresco of the new English Houses of Parliament was under discussion. This is contained in various communications by Sir Charles Eastlake, Mr Charles Heath Wilson, and others, printed with the suc- cessive Reports of the Commissioners on the Fine Arts from 1842 onwards. The experience obtained in the revived modern work in fresco by Cornelius, Hess, and other German artists encouraged by King Ludwig I. of Bavaria, which began at Rome in the second decade of the 19th century, was also drawn upon for the purpose of these Reports. A useful compendium was issued at the time by W. B. Sarsfield Taylor, A Manual of Fresco and Encaustic Painting (Lond., 1843). F. G. Cremei'sVollstandige Anleitung zur Fresco-Malerei (Diisseldorf, 1891), may also be mentioned as a recent manual. The chemistry of the process is well explained by Professor Church in his Chemistry of Paints and Paintings.

The fresco process is generally regarded as a method for the production of a picture. It is better to look upon it in the first place as a colour-finish to plaster-work. What it produces is a coloured surface of a certain quality of texture and a high degree of permanence, and it is a secondary matter that this coloured surface may be so diversified as to result in a pattern or a picture.

We do not know among what people the discovery was first made that a wash of liquid pigment over a freshly laid surface of lime plaster remained permanently incorporated with it when all was dry, and added to it great beauty of colour and texture. The Egyptians, the Assyrians, the Phoenicians, the Mycenaean and later Greeks, the ancient Italians — all made extensive use of plaster as a coating to brickwork or masonry, but when they coloured it this was done after it was dry and with the use of some binding material or tempera.

The earliest notice of the fresco technique that we have in extant literature is contained in the third chapter of the seventh book of Vitruvius, and it is there treated as a familiar, well- understood procedure, the last stage in the construction and finish of a wall. Pliny also in several passages of his Natural History treats the technique as a matter of common knowledge. In Vitruvius the processes of plastering albaria opera are first described (vii. 2, 3), and it is provided that after the rough cast, trullissatio, there are to follow three coats of plaster made of lime and sand, each one laid on when the one below is begin- ning to dry, and then three of plaster in which the place of the sand is

taken by marble dust, at first coarse, then finer, and in the uppermost coat of all in finest powder. It might now be

(1) finished with a plain face, but one brought up to such an exquisite surface that it would shine like a mirror (chs. 3, 9); or

(2) with stamped ornaments in relief or figure designs modelled up by hand; or (3) it might be completed with a coat of colour, and this would be applied by the fresco process, for which Pliny uses the formula udo illinere, ” to paint upon the wet.” The reason why the pigments mixed with water only, without any gum or binding material, adhere when dry to the plaster is a chemical one. It was first clearly formulated by Otto Donner von Richter in connexion with researches he made on the Pompeian wall-paintings and published in 1868 as an appendix to Helbig’s Campanische Wandgemalde. He demonstrated that when limestone is burnt into lime all the carbonic acid is driven out of it. When this lime is ” slaked ” by being drenched with water it drinks this in greedily and the resultant paste becomes saturated with an aqueous solution of hydrate of lime. When

this paste is mixed with sand or marble dust and laid on to the wall in the form of plaster this hydrate of lime in solution rises to the surface, and when the wet pigment is applied to this the liquid hydrate of lime or lime water, to use Professor Church’s phrasing, ” diffuses into the paint, soaks it through and through, and gradually takes up carbonic acid from the air, thus producing carbonate of lime, which acts as the binding material ” (Church, p. 278). It is a mistake to speak of the pigment ” sinking into the wet plaster.” It remains as a fact upon the surface, but it is fixed there in a sort of crystalline skin of carbonate of lime — the element originally banished when the lime was burned — that has now re-formed on the surface of the plaster. This crystalline skin gives a certain metallic lustre to the surface of a fresco painting, and is sufficient to protect the colours from the action of external moisture, though on the other hand there are many causes chemical and physical that may contribute to their decay. If, however, proper care has been taken through- out, and conditions remain favourable, the fresco painting is quite permanent, and as Vitruvius says (vii. 3, 7), ” the colours, when they have been carefully laid upon the wet plaster, do not lose their lustre but remain as they are in perpetuity … so that a plaster surface that has been properly finished does not become rough through time, nor can the colours be rubbed off, that is unless they have been carelessly applied or on a surface that has lost its moisture.”

In the passage from which these words are taken Vitruvius gives

useful hints as to the aesthetics of the fresco technique. Italian writers on the subject, such as Vasari, are generally so taken up with the pictorial design represented on the wall that the more essential characteristics of the process in itself are lost sight of. To Vitruvius the work is coloured plaster, not a picture on plaster, and he shows how important it is that the plaster should be finished with a fine surface of gleaming white so as to light up the transparent film of colour that clothes it. It is the result of such care in classical times that a surface of Pompeian plastering, self-tinted ” a fresco,” is beautiful without there being any question of pattern or design.

This beauty and polish of Pompeian, and generally of ancient Roman plaster, has recently been made the ground for calling in question the view accepted for a generation past that it was merely lime plaster painted on ” a fresco,” and for substituting a totally different technical hypothesis. The reference is to the treatment of ancient wall-painting generally in the first part of Berger’s Beitrage (2nd ed., 1904, pp. 58 seq.). This writer denies that the well-known classical wall-paintings in question are frescoes, and evolves with great ingenuity a wholly new theory of this branch of ancient technique. It is his view that the plaster was prepared by a special process in which wax largely figured and which corresponds to, and indeed survives in, the so-called ” stucco-lustro ” of the modern Italians.

The process in question is described by L. B. Alberti (De re aedificatoria, vi. 9), who says that when the plaster wall surface has been carefully smoothed it must be anointed with a mixture of wax, resin and oil, which is to be driven in by heat, and then polished till the surface shines like a mirror. This is a classical process referred to by Vitruvius under the name ” ganosis,” as applied to the nude parts of marble statues, possibly to tone down the cold whiteness of the material. Now Vitruvius, and Pliny, who probably follows him, do as a fact prescribe this same process for use on plaster, but only in the one special case of a wall painted ” a fresco ” with vermilion, which was not supposed to resist the action of the light unless ” kicked up,” in this way with a coating of this ” Punic ” or saponified wax. Neither writer gives any hint that the process was applied to plaster surfaces generally, or that the lustre of these was depen- dent on a wax polish, and Vitruvius’s description is so clear that if wax had been in use he would certainly have said so.

Vitruvius prescribes so many successive coats of plaster, each one put on before the last was dry, and on the wet uppermost coat the colouring is laid. How can we with any reason sub- stitute for this a method in which the plaster has to be made quite dry and then treated

with quite a different material and

process? Furthermore, Berger holds the astonishing theory that on the self-coloured surfaces of Pompeian and Roman plastered walls the colour was not applied, as in the fresco process, to the surface of the final coat, but was mixed up with the actual material of the intonaco so that this was a coat of coloured plaster. This is of course a matter susceptible of ocular proof, but the actual fragments of ancient coloured stucco referred to by Berger afford a very slender support to the hypothesis, whereas everyone who, like the present writer, possesses such fragments can satisfy himself that in almost every case the colour coat is confined to the surface. The writer has a frag- ment of such stucco from Rome, coloured with vermilion, and here there is clear evidence that some substance has soaked into the plaster to the depth of an eighth of an inch, as would be the case in the ” ganosis ” of Vitruvius. The part thus affected is yellowish and harder than the rest of the plaster. A careful chemical analysis, kindly made for the purpose of this article by Principal Laurie of Edinburgh shows that, although the small quantity of the material available makes it impossible to attain certainty, yet the substance may possibly be wax with the slight admixture of some greasy substance. On the other hand all the writer’s other specimens show the colour laid on to all appearance ” a fresco.” The evidence of the coloured plaster in the house of about the 2nd century B.C. on Delos is wholly against Berger’s view. The writer has many specimens of this, and they are all without exception coloured only on the surface. It is true that there are certain difficulties connected with Pompeian fresco practice, but the description of the process as a wet process in Vitruvius and Pliny is so absolutely unmis- takable that Berger’s theory must without hesitation be rejected.

The history of the fresco technique remains at the same time obscure. Here again Berger offers an interesting sugges- tion which cannot be passed over in silence. If the Pompeian technique, as he believes, be a wax process on dry plaster, followed by some form of tempera, how did the fresco technique, which is known both in East and West in the later medieval period, take its rise? The early medieval age was not a time when a difficult and monumental technique of the kind is likely to have been evolved, but Berger most ingeniously connects it with

that of mosaic work. In mosaic the wall surface is at first rough plastered and a second and comparatively thin coat of cement is laid over it to receive and retain the cubes of coloured glass, only so much cement being laid each morning as the worker wu/ cover with his tesserae before night. It was the practice sometimes to sketch in water-colours on the freshly laid patch of cement the design which was to be reproduced in mosaic, and Berger points to the incontestable fact if this sketch were allowed to remain without being covered with the cubes it would really be a painting in fresco. This is the way he thinks that the frescoe practice actually began, and the period would be that of the decline of mosaic work in the West as the middle ages advanced.

In spite of the attractiveness of these suggestions, we must reaffirm the view of this article that the testimony of Vitruvius is conclusive for the knowledge by the Romans of the early empire of the fresco technique. Why we do not find evidence of it far earlier cannot be determined, but it is worth noting that the success of the process depends on the plaster holding the moisture for a sufficient time, and this it can only do if it be pretty thick. In ancient Egypt and Mesopotamia, for example, the plaster used as painting ground was very thin, and especially in those hot climates would never have lent itself to fresco treatment. On the other side, the decline, and perhaps temporary extinction, of the technique in the early middle ages may be reasonably explained by the general condition of the arts after the break-up of the Roman Empire of the West.

To return now to the technical questions from which this histori- cal digression took its rise, it will be easily seen that the process of painting in fresco must be a rapid one, for it must be completed before the plaster has had time to dry. Hence only a certain portion of the work in hand is undertaken at a time, and only

so much of the final coat of plaster, called by the Italians intonaco is laid by the plasterer as will correspond to the amount the artist has laid out for himself in the time allowed him by the condition of the plaster. At the end of this time the plaster not painted on is cut away round the outline of the work already finished, and when operations are recommenced a fresh patch is laid on and joined up as neatly as possible to the old. In the making of. these joints the ancient plasterer seems to have been more expert than the Italians of the Renaissance, and the seams are often pretty apparent in frescoes of the 15th and 16th centu- ries, so that they can be discerned in a good photograph. When they can be followed, they furnish information which it is often interesting to possess as to the amount that has been executed in a

single day's work. Judging by this test, Mr Heath Wilson, in his Life of Michelangelo, computed that on the vault of the Sistine Michelangelo could paint a nude figure considerably above life size in two working days, the workmanship being perfect in every part. The colossal nude figures of young men on the cornice of the vault at most occupied four days each. The " Adam " (fig 34, Plate X.). was painted in four or perhaps in three. A day was generally occupied by the head of such figures, which were about 10 ft. high. Raphael, or rather his pupils, it is thus calculated, painted the Incendio del Borgo, containing about 350 sq. ft., in about forty days, the group of the young man carrying his father occupying three. The group of the Three Graces in the Villa Farnesina took five days at most. Luini, a most accomplished executant, could paint " more than an entire figure, the size of life, in one day " (Second Report, p. 37). It has been noticed as one of the diffi- culties about the Pompeian frescoes, that joints hardly occur, or at any rate that larger surfaces of plaster were covered by the painter at a single time than was the case among Renaissance artists, and a conjectural explanation has been offered based on the fact that the ancient plaster ground, laid on in many successive coats while in each case the previous one was still humid, was thicker and would hold more moisture than the more modern intonaco, and would accordingly allow the artist longer time in which tc carry out his work. Alberti, Armenini, and Palomino only contemplate one or two thin coats over the original rough cast, while Cornelius and his associates, who revived the process early in the 19th century, speak of an intonaco over the rough cast only about a quarter of an inch thick. A piece of plaster ground from Raphael's Loggie in the Vatican was found to be quite thin, and Donner calculated that the ancient grounds were on an average 3 in. thick, the modern only a little over 1 in. On such grounds work had necessarily to be finished within the day, and Cennino expressly says (ch. 67): " Consider how much you can paint in a day; for whatever you cover with plaster you must finish the same day." Hence almost invariably in Italian fresco practice every join means a new day's work. At Pompeii the plaster, it is thought, might have remained damp over night. In the Mount Athos Handbook tow was to be mixed with the plaster, undoubtedly to retard its drying.

This necessarily rapid execution gives to well-handled frescoes a simplicity and look of directness in technique that are of the essence of the aesthetic effect of this form of the art. Hence Vasari is right when he extols the process in the words, " of all the ways in which painters work, wall-painting is the finest and most masterly, since it consists in doing upon a single day that which in other methods may be accomplished in several by going over again what has been done. .

. . there are many of our craft who do well enough in other kinds of work, as for example in oil or tempera, but fail in this, for this is in truth the most manly, the safest, and most solid of all ways of painting. Therefore let those who seek to work upon the wall, paint with a manly touch upon the fresh plaster, and avoid returning to it when it is dry ” {Opere, ed. Milanesi, i. 181).

The process gives the artist another advantage in that his painting, being executed in the very material of the surface itself, seems essentially a part of the watt. It is lime painting on a lime ground, and fabric and enrichment are one. Thif

can be noted in the Sola del Constantino in the Vatican at Rome, one of the stanze or suite of rooms decorated by Raphael and his associates. There are two figures here painted on the walls in oil, and though there is a certain depth and rich- ness of effect secured in this medium, they are too obviously something added as an afterthought, while the figures in fresco seem an integral part of the wall.

Work of this kind, finished in each part at a sitting, is what the Italians call buon fresco or ” true fresco,” and it has always been, as it was with Vitruvius, the ideal of the art, but at many periods the painters have had to rely largely on retouches and reinforcements after the plaster was dry. Cennino devotes the 67th chapter of his Trattato to a description of the process, and expressly tells us that the method he recommends is the one traditional in the school of Giotto, of which he himself was a direct scion. He is fully alive to the importance of doing as much as possible while the ground is wet, for ” to paint on the fresh — that is, a fixed portion on each day — is the best and most permanent way of laying on the colour, and the pleasantest method of painting “;’ but an ordinary artist of the early part of the 15th century had not sufficient skill to do all that was required at the one moment. Observations made on the works executed by various Italian masters from the 14th to the 16th century show great varieties in this matter of retouching, but the subject need not be dwelt on as it involves no principle. Every painter of worthy ambition, who had entered into the spirit of his craft, would desire to do all he could ” on the fresh,” and would be satisfied with, and indeed glory in, the conditions and limitations of the noble technique. Masaccio, even at the beginning of

the 15th century, is remarkable for the amount of fine pictorial effect he secured without reliance on retouching. It was second-rate artists, like Pinturicchio, who delighted to furbish up their mural pictures with stucco reliefs and gilding and to add touches of more brilliant pigments than could be used in the wet process. Giotto, Masaccio, Ghirlandajo, Michelangelo, Luini, are amonp the frescanti proper, who represent the true ideals of the crafi.

The following notes upon the methods of the work are derived partly from observation of extant works and partly from the older treatises, but reference has also been made to modern practice in Germany and Italy, as information derived from this last source may be found useful by those who are disposed to-day to make essays in the process.

To avoid loss of time it is essential that the necessary drawing should all be accomplished beforehand. Pozzo, a painter and writer of the end of the 17th century says, ” everyone knows that before beginning to paint it is necessary to prepare a drawing and well-studied coloured sketch, both of which are to be kept at hand in painting the fresco, so as not to have any other thought than that of the execution ” (First Report, p. 35). In Cennino’s time it seems to have been the practice to square out the work full size from the sketch on to the surface of the rough cast before the intonaco was laid. This at any rate enabled the artist to see how his work as a whole would come in relation to the space provided for it, but the actual intonaco had to be laid piece by piece over this general sketch and the drawing of each portion repeated on the new surface. In the palmy days of Italian painting, however, as well as in modern times, the design has been drawn out on a full-sized cartoon, and this cartoon, or a tracing from it, has been transferred piece by piece to the freshly laid intonaco on which the painting is about to be executed. The drawing may be nailed against the wall, and the outlines passed over with a blunt-pointed stylus of some hard material, that by dinting the paper impresses on the yielding plaster a line sufficient to guide the painter in his work; or the outlines of the cartoon may be pricked and “pounced ” with a little bag of red or black powder that will leave a dotted outline on the wall.

The preparation of the intonaco itself is however a matter for much care. The lime should be prepared from a stone that is as far as possible pure carbonate of lime — the travertine of Tivoli, recommended by Vasari, is perfect for the purpose — and after it is burnt should be slaked with water and thoroughly macerated so that the lumps are all completely broken up. The slaked lime, of the consistency of a stiff paste, or as it is termed “putty,” must be kept

covered in from the air for a considerable period that varies according to different authorities from eight to twelve months to as many years. All experts, from Vitruvius downwards, are agreed on the necessity for this, but the exact scientific reason therefor does not seem to be quite clear. One advantage of the keeping is that the lime hydrate may take up a certain amount

of carbonic acid, though not too much, from the air. Church says that, ” not more than one-third or at most two-fifths of the lime should be converted into the carbonate ” (p. 19); but Faraday (Fifth Report, p. 25) was of opinion that through lapse of time there was brought about a molecular change that divided the par- ticles more thoroughly and gave the lime a finer texture so as to mix better with the pigments. At any rate, when Cornelius and his associates started the modern fresco revival at Rome, in 1815, an old workman who had been employed under Raphael Mengs directed their attention to this tradition, and they used lime that had been kept in a slaked condition, but still caustic — that is, still deprived of most of its carbonic acid, for twelve years! For mixing the plaster the proportions of lime to sand or marble dust vary ; Cennino gives two of sand to one of ” rich ” or caustic lime, but the Germans used three of sand to one of lime. Whatever its exact constitution, the intonaco has to be carefully laid each morning over that part of the rough cast, previously well wetted, that corresponds to the amount laid out for the day’s work. Contrary to the prescription of Vitruvius and Pompeian practice, which favours a polished surface, the moderns prefer a slight roughness or “tooth on the intonaco. Painting should not begin, so Cornelius advised (First Report, p. 24), till ” the surface is in such a state that it will barely receive the impression of the finger, but not so wet as to be in danger of being stirred up by the brush.”

The pigments are ready mixed in little pots, on a tin palette with a rim round the edge, or on a table, and in old Italian practice each colour was compounded in three shades — dark, middle and light. The water should be boiled or distilled, or should be rain- water; for spring-water often contains carbonate of lime that would derange the chemistry of the process. Again, on account of the chemical action that takes place during the process, the pigments have to be carefully selected. The palette of the fresco painter is indeed a very restricced one, and this is another reason of the broad and simple effect of the work. Practically speaking only the earth colours, such as the ochres raw or burned, can be used with safety; even the white has to be pure white lime (in Italian, bianco San- Giovanni), since lead white used in oil painting (Italian, biacca) is inadmissible. Vegetable and animal pigments are as a rule ex- cluded, ” very few colours of organic origin

withstanding the de- composing action of lime ” (Church, p. 280). The brushes are of hog-bristles or otter-hair or sable, and have to be rather long in the _ hair. Round ones are recommended. According to early Italian practice, the painter would first outline the figures or objects, already drawn on the plaster, with a long-haired brush dipped in red ochre, and would then, e.g. in the case of the faces, lay in broadly with terre verte the shadows under the brows, below the nostrils, and round the chin, and bring down and fuse into these shadows the darkest of the three flesh-tints, with a dexter- ous_ blending of the wet pigments upon a surface that preserves their dampness. On the other side these half-tones are now modelled up into the lighter hues of the flesh. White may then be used in decided touches for the high lights, and the details of the eyes, mouth and other features put in without too much searching after accidents of local colour. Modern frescoists have found that ” the tints first applied sink in and look faint, so that it is necessary sometimes to go over the surface repeatedly with the same colour before the full effect is gained ” (First Report, p. 24), but it is well to allow in each case some minutes to elapse before touching any spot a second time. For the hair the Italians would make three tints suffice, the high lights again following with white. The draperies are broadly treated. After the whole has been laid in, in monochrome, with the green pigment, the folds would be marked out with the deepest of the three tints for shadow, and these shadows united by the middle tint. Lastly the lighter parts are painted up and finally reinforced with white. The work needs to be deftly touched, for too much handling of one spot may destroy the fresh- ness of the tints and even rub up the ground. It is not necessary (as moderns have sometimes supposed) to put touch beside touch, never going twice over the same ground. So long as the pigments and the surface are wet the tints may be laid one over the other or fused at will, and may be ” loaded ” in some parts and in others thinly spread, the one essential being that a fresh and crisp effect shall not be lost. The wetness of the ground will always secure a certain softness in all touches, even those that give the strong high-lights, and so important is it that the plaster should not begin to dry, that it should be sprinkled if necessary with fresh water. The characteristic softness of the touches laid on ” a fresco ” is the more apparent when they are compared with those strokes of reinforcement which may be put on “a tempera ” after the work is dry. Armenini says that the shadows may be finished and deep- ened by hatching, as in a drawing, with black and lake laid on with a soft brush with a medium of gum, size, or white and yolk of egg diluted with vinegar. Such retouches are always hard and ” wiry,” and are as much as possible to be avoided.

As examples of execution in fresco no works are better than those of Luini. He painted rapidly and thinly, securing thereby a transparency of effect that did not however preclude richness. Heath Wilson indeed says of his painting that ” it may be

compared to that of Rubens; it is juicy, transparent, and clear; ... his execution is light and graceful.” No sounder model could be taken for modern work. The high-water mark of achievement in fresco painting was however reached by a greater than Luini — by Michelangelo in his painting of the Sistine Chapel roof. Considering that since his boyhood he had had no practical experience of the fresco process, and refused the commission as long as he could because he was not a painter but a sculptor, Buonarroti’s technical success in the manipulation of the difficult process is still more astounding than the aesthetic result of the work as a creation of imaginative genius. He had to paint for the most part lying on his back in a sort of cradle, and working with his arms above his head, and had no skilled assistants; yet there is no quality in the work that strikes us more than its freshness and air of easy mastery, as if the artist were playing with his task. The fusion of the lights and shadows through the most delicate half-tones is accomplished in that melting fashion for which the Italians used the term sfumato or ” misty,” while at the same time the touches are crisp and firm, the accent here and there decided; and the artist’s incomparable mastery of form gives a massive solidity to the whole (see fig. 34, Plate X.)

In our own times and in English-speaking circles the fresco process has been discredited owing to the comparative failure of the experiments connected with the Houses of Parliament. On the condition of the frescoes there, as well as on that of the pictures in various other media, a series of Memoranda were made by Professor Church, and a select committee of the House of Lords took evidence on the subject as late as December 1906. Most of the frescoes executed in the forties and fifties of the 19th century had got into a deplorable state; but Church’s belief was that the main cause of the decay was the sulphurous acid with which, owing to the consumption of coal and gas, the air of London is so highly charged. The action of this acid — a million tons of which are said to be belched out into the London atmosphere in every year — turns the carbonate of lime which forms

the surface of the fresco into a sulphate, and it ceases to retain its binding power over the pigments. ” ” The chemical change,” he reports, ” is accompanied by a mechanical expansion which causes a disruption of the ground and is the main cause of the destruction of the painting.” It is a remarkable fact, however, that one of the frescoes in question, Sir John Tenniel’s ” St Cecilia,” completed in 1850, painted very thinly and on a smooth surface, lasted well, and opposed ” a considerable measure of successful resistance for nearly half a century on the part of a pure fresco to the hostile influence of the London atmosphere ” (Church, Memorandum, iv. 1896).

Abroad, experience was more favourable. The earliest frescoes of the modern revival — those by Cornelius and his associates from the Casa Bartholdy at Rome — are in a fairly good state in the National Gallery at Berlin. Such too is the condition of Cornelius’s large fresco in the Ludwigskirche at Munich. The best modern frescoes, from the artistic point of view, in all Europe are those of about 1850 by Alfred Rethel in the town-hall at Aix-la-Chapelle, and they are well preserved. The exterior frescoes on the Pinacotek at Munich have on the other hand mostly perished; but the climate of that city is severe in winter, and nothing else was really to be expected. We must not expect carbonate of lime to resist atmospheric influences which affect to a greater or less degree all mineral substances.

§ 36. Fresco-Secco. — (See Charles Heath Wilson, in appendix to Second Report of the Commissioners on the Fine Arts, London, 1843, p. 40; Church, Chemistry of Paints and Painting, 1901, p.

278).

The process called ” fresco-secco ” is a method of lime painting on a plaster surface that has been allowed to dry. It is described by Theophilus in the Schedula of about a.d. i 100; and Mr Charles Heath Wilson in 1843 wrote of it as ” extensively used in Italy at present and with great success.” It is of course obvious that paintings must often be executed on walls the plastering of which is already dry, and on which the true fresco process is imprac-

ticable. Some kind of painting in tempera is thus needful, and ” fresco-secco ” uses for this the lime that is the very constituent of the plaster. The process is thoroughly to drench the dry surface of the plaster the night before with water with which a little lime or baryta water has been mixed, and to renew the wetting the next morning. The artist then fixes up his cartoon, pounces the outlines, and sets to work to paint with the same pigments as used in buon fresco mixed with lime

or baryta water or with a little slaked lime. If the wall become too dry a syringe is used to wet it. The directions given by Theophilus (i. 15) correspond with this modern practice. ” When figures or representations of other things,” he says, “are to be delineated on a dry wall, it must be forthwith moistened with water till it is thoroughly wet. On this wet ground all the colours must be laid that are required, and they must be all mixed with lime, and will dry with the wall so that they adhere to it.” Mr C. H. Wilson praises the work for its convenience, economy, and ease of execution, and notes that ” for ornament it is a better method than real fresco, as in the latter art it is quite impossible to make the joinings at outlines owing to the complicated forms of orna- ments,” but says that ” it is in every important respect an inferior art to real fresco. Paintings executed in this mode are ever heavy and opaque, whereas fresco is light and transparent.” He declares also for its durability, but Professor Church states what seems obvious, that ” the fixation of the pigments … is less complete ” than in real fresco though depending on the same chemical conditions(Second Report, 1843, P- 4°; Chemistry, p. 279).

§ 37. Stereochromy or Water-Glass Painting. — (See Chemisch-technische Bibliothek, Band lxxviii., Die Miner al-Malerei, von A. Keim, Wien, &c, 1881; Rev. J. A. Rivington in Journal of the Society of Arts, No. 1630, Feb. 15, 1884; Mrs Lea Merritt and Professor Roberts Austin in Journal of the Society of Arts, No. 2246, Dec. 6, 1895; F. G. Cremer, Beitrdge zur Technik der Monumental-Malverfahren, Diisseldorf, 1895).

Akin to ” fresco-secco,” in that a mineral agent is used to secure the adhesion of the colouring matter to the plaster, is the process known as stereochromy or water-glass painting. It is not a traditional process, but an outcome of comparatively modern chemical research, and is not yet a century old. It is based on the properties of the substance called water-glass, a silicate of potassium or of soda, perfected by the German chemist Von Fuchs about 1825. A process of painting called ” stereochromy ” was soon after evolved, in which pigments of the same kind as those used in fresco, mixed only with distilled water and laid on a prepared plaster ground, were afterwards fixed and securely locked up by being drenched with this sub- stance, which is equivalent to a soluble glass. Some of the mural paintings in the Houses of Parliament, notably those by Maclise, were executed in this process. Improvements were more recently effected in the process with which the names of Keim and Reck- nagel of Munich are connected, and in this form it has been used a good deal in Germany in the last quarter of the 19th century both in interiors and in the open air. For example, in 1881 Professor Schraudolph of Munich painted in this process the

front of the H6tel Bellevue in that city. This improved water- glass painting was introduced to notice in England in a paper read before the Society of Arts by the Rev. J. A. Rivington on the 13th of February 1884, and printed in the Journal of the society, No. 1630. A more recent description is contained in F. G. Cremer's Beitrdge.

The recipe for the preparation of the actual medium is as follows: 15 parts pounded quartzsand, 10 parts refined potash, 1 part powdered charcoal are mixed together and fused for 6 to 8 hours in a glass furnace. The resultant mass when cold is reduced to powder and boiled for 3 or 4 hours in an iron vessel with distilled water till it dissolves and yields a heavy syrupy liquor of strongly alkaline reaction. This can be diluted with water, and in the process is applied hot.

The ground is very carefully prepared, and over a thoroughly sound and dry backing a thin coat of plaster is laid, composed of only 1 part lime to 5 or 8 parts selected sand and pounded marble with a slight admixture of infusorial earth. The object is to obtain a homogeneous porous ground that can be thoroughly permeated with the solution, and to help to secure this the intonaco when dry

is sprayed with hydrofluo-silicic acid to dissolve away the crystalline skin of carbonate of lime formed on the surface and to "open the pores " of the plaster. The surface of the painting ground, which is left with a decided " tooth " upon it, is then well soaked with the solution, and when dry will be found " hard but perfectly absorbent and ready for painting."

The pigments consist in the usual ochres and earths; chrome reds, greens, and yellows ; Naples yellow (antimoniate of lead) ; cobalt blue and green; and artificial ultramarine; terre verte, &c, with zinc white or baryta white.

It is important however to note, that the pigments (which can be supplied by Messrs Schirmer, late Faulstich, of Munich, and many other firms) are mixed with various substances so as to render uniform the action upon them of the fixing solution and neutralize the action of its alkalies. The operations of painting, in which only distilled water is used with the colours, are easy and admit of considerable

freedom. ” Every variety of treatment is possible, and the method adapts itself to any individual style of painting.” The work can be left and resumed at will. After the painting is dry there comes the all-important final process of fixing with the water-glass solution. This is sprayed on in a hot state by means of a special apparatus, and the process is repeated till the wall can absorb no more, the idea being that the substance will pene- trate right through to the wall, and when set will bind pigments, intonaco, rough plastering and wall into one hard mass of silicate that will be impervious to moisture or any injurious agencies. The last paragraph of the official account of the Keim process issued in 1883 for the guidance of those contemplating mural work runs as follows: ” The fixing of the picture is accomplished by means of a hot solution of potash water-glass, thrown against the surface by means of a spray-producing machine in the form of a very fine spray. This fixing done, by several repetitions of the process, a solution of carbonate of ammonia is finally applied to the surface. The carbonate of potash, which is thus quickly formed, is removed by repeated washings with distilled water. Then the picture is dried by a moderate artificial heat. Finally a solution of paraffin in benzene may be used to enrich the colours and further preserve the painting from adverse influences.”

§ 38. Spirit Fresco or the ” Gambier Parry ” Process, with modifications by Professor Church. — (See Spirit Fresco Painting: an Account of the Process, by T. Gambier Parry, London, 1883; Church, Chemistry of Paints and Painting, 288 seq.).

This process is also one of quite modern origin, but in Great Britain, at any rate, it is now very popular. Mr Gambier Parry, who invented and first put it into practice, claims for it that it ” is not the mere addition of one or more medium to the many already known, but a system, complete from the first preparation of a wall to the last touch of the artist,” and that the advantages it offers are” (1) durability (the principal materials being all but imperishable); (2) power to resist external damp and changes of temperature; (3) luminous effect; (4) a dead surface; (5) freedom from all chemical action on colours.”

The theory of the process is much the same as that of stereo- chromy, the drenching of the ground with a solution that forms at the same time the medium of the pigments, so that the whole forms when dry a homogeneous mass. The solution or medium is however not a mineral one, but a combination of oils, varnishes and wax, the use of which makes the process nearly akin to that of oil painting. The objection to the use of oil painting proper on walls is the shininess of effect characteristic of that system, which is in mural work especially to be

avoided, and ” spirit fresco ” aims at the elimination of the oleaginous element and the substitution of wax which gives the “matt ” surface desired.

Mr Gambier Parry directs a carefully laid intonaco of ordinary plaster suitable for fresco on a dry backing, ” the one primary necessity ” being that the intonaco ” should be left with its natural surface, its porous quality being absolutely essential. All smooth- ing process or ‘ floating ‘ with plaster of Paris destroys this quality. All cements must be avoided.” When dry the surface of the wall must be well saturated with the medium, for which the following is the recipe: pure white wax 4 oz. by weight; elemi resin 2 oz. by weight dissolved in 2 oz. of rectified turpentine; oil of spike lavender 8 oz. by measure ; copal varnish about 20 oz. by measure. These ingredients are melted and boiled together by a process described in his paper, and when used for the wall the medium is diluted in one and a half its bulk of good turpentine. With this diluted solution the wall is well soaked, and the directions continue, ” after a few days left for evaporation, mix equal quantities of pure white lead in powder and of gilder’s whitening in. the medium slightly diluted with about a third of turpentine, and paint the surface thickly, and when sufficiently evaporated to bear a second coat, add it as thickly as a brush can lay it. This when dry, for

which two or three weeks may be required, produces a perfect surface ” both white and absorbent.

The pigments, which are practically the same as those used in oil painting, must be ground in dry powder in the undiluted medium, and when prepared can be kept in tubes like oil colours. Solid painting with a good deal of body is recommended and pure oil of spike is freely used as painting medium. Pure spike oil may also be washed over the ground before painting ” to melt the surface (hence the name Spirit Fresco) and prepare it to incorporate the colours painted into it.” The spike oil is ” the one common solvent of all the materials; . . . the moment the painter’s brush touches the surface (already softened, if necessary, for the day’s work) it opens to receive the colours, and on the rapid evaporation of the spike oil it closes them in, and thus the work is done.” The oil of spike lavender, it may be noticed, is an essential oil prepared from Lavandula spica.

Professor Church has suggested improvement in the composition of the medium by eliminating the ” doubtful constituents ” elemi resin and bees’-wax and substituting paraffin wax, one of the safest of materials, dissolved in non-resinifiable oil of turpentine. This is mixed as before with copal varnish and used in the same way and with the

same or better results as Mr Gambier Parry's medium.

§ 39. Oil Processes of Wall Painting. — The use of the oil medium for painting on plaster in medieval days opens up a much debated subject on which a word will be said in connexion with oil painting in general. In the later Renaissance period in Italy it came into limited use, and Leonardo essayed it in an imperfect form and with disastrous result in his " Last Supper " at Milan. Other artists, notably Sebastiano del Piombo, were more successful, and Vasari, who experimented in the technique, gives his readers recipes for the preparation of the plaster ground. This with Cennino (ch. 90) had consisted in a coat of size or diluted egg-tempera mixed with milk of fig-shoots, but later on there was substituted for this several coats of hot boiled linseed oil. This was still in common use in the 16th century, but Vasari himself had evolved a better recipe which he gives us in the 8th chapter of his " Introduction " to Painting. Over undercoatings of ordinary plaster he lays a stucco composed of equal parts of lime, pounded brick, and scales of iron mixed with white of egg and linseed oil. This is then grounded with white oil toned down with a mixture of red and yellow easily drying pigments, and on this the painting is executed.

In Edinburgh and other places Mrs Traquair has recently carried out wall paintings on dry plaster with oil colours much thinned with turpentine. The ground is prepared with several coats of white oil paint, and the finished work is finally varnished with the best copal carriage varnish.

In most cases oil painting intended for mural decoration has been executed on canvas, to be afterwards attached to the wall. This is the case more especially in France, and also in America at the Boston public library and other places. The effort here is to get rid of the shiny effect of oil painting proper by eliminating as far as practicable the oil. As this however serves as the binding material of the pigments the procedure is a risky one. To suppress the oil and to secure a " matt " surface MrE. A. Abbey employed at Boston and elsewhere, as a medium for painting with ordinary oil colours, wax dissolved in spike oil and turpentine. In France Puvis de Chavannes used some preparation to secure a matt effect in his fine decorative oil painting on canvas.

§ 40. Tempera Painting on Walls.— This is a very ancient and widely diffused technique, but the processes of it do not differ in principle from those of panel painting in the same method. It is accordingly dealt with under tempera painting in general

(§ 43).

§ 41. Encaustic Painting on Walls. — (See Schultze-Naumburg, Die Technik der Malerei, p. 1 22 seq. ; Paillot de Montabert, Traite complet de la peinture, vol. ix.).

It has been already mentioned that wax is employed in modern mural painting in order to secure a matt surface. Many pictures have been carried out within the last century on walls in a regular wax medium that may or may not represent an ancient process. Hippolyte Flandrin executed his series of mural pictures in St Vincent de Paul and St Germain des Pres in Paris in a process worked out by Paillot de Montabert. Wax dissolved in turpen- tine or oil of spike is the main constituent of the medium with which the wall is saturated and the colours ground. Heat is used to drive the wax into the plaster.

A German recipe prepared by Andreas Miiller in Dusseldorf has been used for mural paintings in the National Gallery, Berlin.

In this one part virgin wax is dissolved in two parts turpentine with a few drops of boiled linseed oil. The pigments are ground in boiled linseed oil with the addition of this medium. The plaster ground, well dried, is soaked with hot boiled linseed oil diluted with an equal quantity of turpentine. It is then grounded with several coats of oil paint for a priming and smoothed with pumice stone. The painting can be executed in a thin water colour technique or with a full body, and dries lighter than when wet and with a dead surface.

§ 42. Encaustic Painting in general in Ancient and Modern Times. — (See Cros and Henry, L' Encaustique et les autres procedes de la peinture chez les anciens, Paris, 1884; Flinders-Petrie, Hawara, &c, London, 1889; O. Donner v. Richter, Uber Tech- nisches in der Malerei der Alien, Munich, 1885; Berger, Beitrdge zur Entwickelungs-Geschichte der Maltechnik, ii. 185 seq.; Munich,

1904).

Although in modern mural painting wax is employed to secure a matt surface, in ancient times it appears to have been valued rather from the depth and intensity it lent to colours when it was polished. It there

represented an attempt to secure the same force and pictorial quality which in modern times are gained by the use of the oil medium. We are told of it by the ancients that it was a slow and troublesome process, and the name of it, meaning ” burning in,” shows that the inconvenience of a heating apparatus was inseparable from it; yet it seems at the same time to have been a generally accepted technique, and Greek writers from Anacreon to Procopius treat. ” wax ” as the standard material for the painter. Nay more, hardly a day now passes with- out every one of us bearing testimony in the words he uses to the importance of the technique in antiquity. The Etymologicum magnum of the 12th century makes the process stand for painting generally (kyKtKavˆvri-kfyaypafyriixkvri), and the name ” encaustic ” came to be applied not only to painting but also to sumptuous calligraphy. Then it was applied to writing in general, and the name still survives in the Italian inchiostro and our own familiar ” ink ” (Eastlake, Materials, i. 151).

The technique of ancient encaustic has given rise to much discussion which till recently was carried on chiefly on a literary basis. Fresh material has been contributed by the discovery, in the eighties of the 19th century, in Egypt of a series of portraits on mummy cases, executed for the most part in a wax process, and dating probably from the first two or three centuries a.d. Previous to this discovery there was little material of a monu- mental kind, though what appears to be the painting apparatus of a Gallo-Roman artist in encaustic was found in 1847 at St Medard-des-Pres in La Vendee, and has been often figured. It should be stated at the outset that the modern process of dissolving wax in turpentine or an essential oil like oil of spike was not known to the ancients, who however knew how to mix resinous substances with it, as in the case of ship-painting (Pliny xi. 16; Dioscorides i. 98). They also saponified wax by boiling it with potash so as to form what was called ” Punic wax ” (Pliny xxi. 84 seq.), and this emulsion may be reduced with water, and at the same time combines with oil and with size, gum, egg and other temperas.. Wax, Pliny says, may be coloured and used for painting — ad edendas similitudines (loc. cit.); but as the name ” encaustic ” implies, and as we gather from another of Pliny’s phrases, ceris pingere ac picturam inurere (xxxv. 122), heat was an essential part of the process. Hence the material must have been employed as a rule in a more or less solid form and liquefied each time for use, and not in the form of a diluted solution or emulsion which could be made serviceable cold. It is true that Punic wax mixed with a little oil is prescribed by Vitruvius (vii. 9, 3) as a solution for covering and locking up from the air a coat of the changeable pigment vermilion laid on a wall (see § 35), but the

solution is used hot and driven in by application of a heating apparatus.

The accounts of the technique furnished to us by Pliny can be brought into connexion with the actual remains, and Berger and others have succeeded fairly well in imitating these by processes evolved from the ancient notices. It is unfortunate that the most important passage of Pliny (xxxv. 149) appears corrupt. It runs in the received text as follows: Encausto pingendi duo fuere antiquitus genera, cera et in ebore cestro, id est

vericulo, donee classes pingi coepere. Hoc tertium accessit resolutis igni ceris penicillo utendi, quae piclura navibus nee sole nee sale ventisve corrumpitur. Here three kinds of encaustic painting are mentioned, two old and one new (the comparative chronology of the processes need not come into question) , and in the two last cases the distinction is that between two instruments of painting, the cestrum and the penicillus or brush. It is natural to sug- gest that instead of the word cera, which, as wax is the material common to all encaustic processes, need not have been introduced and on manuscript authority may be suspected, some word for a third instrument of painting should be restored. Berger, with some philological likelihood, conjectures the word cauterio, which means properly a ” branding-iron,” but which he believes to be a sort of hollowed spatula or spoon with a large and a small end by which melted waxes of different colours might be taken up, laid on a ground, such as a wooden panel, and manipulated in a soft state as pictorial effect required. Instru- ments of the kind were found in the Gallo-Roman tomb in La Vendee. The second kind of painting with the cestrum or vericulum was on ivory and must have been on a minute scale. The “cestrum” was certainly a tool of corresponding size, and some have seen in it a sort of point or graver, such as that with which the incised outlines were made on the figured ivory plaques in the Kertch room at St Petersburg (see below) ; others a small lancet- shaped spatula like the tools that sculptors employ for working on plaster. The brush, with which melted waxes could be laid on in washes, as was the case on ships, needs no explanation.

An examination of the portraits from the mummy cases (see fig. 35) makes it quite clear that the brush was used with coloured melted waxes to paint in, in sketchy fashion, the draperies and possibly to underpaint the flesh and hair, while the flesh was executed in a more pastos style, with waxes in a soft condition laid on and manipulated with some spatula- like instrument, which we may if (From a photograph by W. A. Mansell

we like call ” cauterium ” or & Co)

“cestrum.” The marks of such FlG ” 35-Mummy of Artem.- a tool are on several of the heads unmistakably in evidence, and may be seen in specimens in the London National Gallery. There is a difference of opinion however as wax. Donner von Richter holds that the wax was “Punic,” i.e. a kind of emulsion, and was blended with oil and resinous balsams ‘so as to be transformed into a soft paste which could be manipulated cold with the spatula. Heat for “burning in ” {picturam inurere) he thinks was afterwards applied, with the effect of slightly fusing and blending the coloured waxes that had been in this way worked into a picture. Berger, on the other hand, believes that the coloured wax pastes were manipu- lated hot with the ” cauterium,” which would be maintained in a heated condition, and that there was no subsequent process of “burning in.” Flinders Petrie is of opinion that, even in the

such FlG – 3 5—

dorus with painted portrait,

inscribed ” O Artemidorus,

Farewell.” About A.D. 200

(Brit. Mus.).

to the constitution of the

case of the washes laid on with the brush, pure melted wax was employed and not a compound or emulsion, such as is generally assumed. Berger believes in a mixture of wax, oil and resin.

It is interesting to note that the distinguished modern painter, Arnold Bocklin, executed his picture of ” Sappho ” in coloured pastes composed of copal resin, turpentine and wax, manipu- lated with a curved spatula, and that he applied heat to fuse slightly the impasto. He believed he obtained in this way a brilliancy not to be compassed with oils.

The nature of the ” cestron ” technique on ivory is not known. The only existing artistic designs in ivory are executed by engraved lines, and these are sometimes filled in with coloured pastes. Exquisite work in this style exists in the Hermitage at St Petersburg, and there are examples in other museums, but this can hardly be termed encaustic painting. A better idea of the laboriously executed miniature portraits of which Pliny tells us can be gained from the small medallion portraits modelled in coloured wax that were common at the Renaissance period and are still executed to-day. In these however the smaller details are put in with the brush and pigment.

It is known from the evidence of the Erechtheum inscription that \the encaustic process was employed for the painting of ornamental patterns on architectural features of marble buildings, but there is still considerable doubt as to the technique employed in such forms of decorative painting as the colouring of the white plaster that covered the surfaces of stonework on monumental buildings in inferior materials. Polychrome ornament on terra- cotta for architectural embellishment may have been fixed by the glaze as in ordinary vase painting, but Pliny says that Agrippa figulinum opus encausto pinxit in his Thermae (xxxvi. 189). The technique of the polychrome lecuthi and of the polychrome terra-cotta statuary is not certain.

The later history of wax painting after the fall of the Western Empire is of interest in connexion with the evolution of the painter’s technique as a whole. Its possible relation to oil painting will be noticed later on. Here it is enough to note that the so-called Lucca MS. of the 8th century mentions the mingling of wax with colours, and the Byzantine Mount Athos Handbook, recording probably the practice of the nth century, gives a recipe for an emulsion of partly saponified wax with size as a painting medium. A recipe of the 15th century quoted by Mrs Merrifield from the MSS. of Le Begue gives a similar compo- sition that can be thinned with water and used to temper all sorts of colours.

§ 43. TemPera Painting. [Cennino’s Trattato, in the English edition with terminal essays by Mrs Herringham (London, 1899), is the best work to consult on the subject. The Society of Painters in Tempera published in 1907 a volume of Papers on the subject. F. Lloyd’s Practical Guide to Scene Painting and Painting in Distemper (London, 1879), is chiefly about the painting of thea- trical scenery, and this subject is also dealt with in articles by William Telbin in the Magazine of Art (1889), pp. 92, 195.]

The binding substances used in the tempera processes may be classed

as follows: (1) Size, preferably that made from boiling down cuttings of parchment. Fish-glue, gum, especially gum tragacanth and gum arable (the Senegal gum of commerce); glycerin, honey, milk, wine, beer, &c. (2) Eggs, in the form of (i) the yolk alone, (ii) the white alone, (iii) the whole contents of the egg beaten up, (iv) the same with the addition of the milk or sap of young shoots of the fig-tree, (v) the contents of the egg with the addition of about the same quantity of vinegar [(iv) was used in the south, (v) north of the Alps]. (3) Emulsions, in which wax or oil is mingled with substances which bring about the possibility of diluting the mixture with water. Thus oil can be made to unite mechanically (not chemically) with water by the interposition either of gum or of the yolk of egg.

Of these materials it may be noted that a size or gum tempera is always soluble in water, and is moreover always of a rather thin consistency. The latter applies also to white of egg. On the other hand the yolk of an egg makes a medium of greater body, and modern artists, especially in Germany, have painted in it with a full impasto . The yolk of egg or the whole egg slightly

beaten up may be used to temper powdered pigments without any dilution by means of water, and the stiffest body can in this way be obtained. The medieval artists seem however always to have painted with egg thinly, diluting the yolk with about an equal quantity of water. Their panels show this, and we can argue the same from the number of successive coats of paint prescribed by Cennino and other writers. The former (ch. 165) mentions seven or eight or ten coats of colours tempered with yolk alone, that must have been well thinned with water. This point will be returned to later on. The yolk of egg is really itself an emulsion as it contains about 30% of oil or fatty matter, though in its fluid state it combines readily with water. ” Egg yolk,” writes Professor Church {Chemistry, p. 74), “must be regarded as essentially an oil medium. As it dries the oil hardens,” and ultimately becomes a substance not unlike leather that is quite impervious to moisture. Hence while size tempera when dry yields to water egg tempera will resist it. Sir William Richmond gave a proof of this in evidence before a committee of the House of Lords in November 1906, describing how he had exposed a piece of plaster painted with yolk of egg medium to all weathers for six months on the roof of a church and found it at the end perfectly intact. As to the milk of young fig-shoots,, it is interesting to know from Principal Laurie (” Pigments and Vehicles of the Old Masters,” in Journal of the Society of Arts, Jan. 15, 1892, p. 172) that “fig-tree belongs to the same family as the india-rubber tree, and its juice contains caout- chouc.” He says, ” doubtless the mixture of albumen and caoutchouc would

make a very tough and protective medium.”

With regard to the historical use of these different media, the medieval Italians used almost exclusively the yolk of egg medium, and this is also the favourite tempera of the moderns. In fact in Italy the word ” tempera,” as used by Vasari and other writers, generally means the egg medium. On the other hand size or gum was more common north of the Alps. It is in most cases very difficult to decide what temperas were in vogue in different regions and at the various epochs of the art, and the following must not be taken for more than an approximate statement of the facts. As far as it is known, the binding material in ancient Egypt was for the most part size, while Greek influence from about 600 B.C. onwards may have led to the use of wax emulsion (Punic wax). For paintings on mummy cases, and on papyrus scrolls, the medium may have been size or gum. Professor Flinders Petrie says it was acacia gum. The wall paintings of ancient Mesopotamia as well as those of India and the farther East generally were all in tempera, and it is noteworthy that recipes and technical practices of the East and of the West seem to be curiously alike. The exact media used are doubtful. The same doubt exists with regard to the exact processes of wall and panel painting in tempera in ancient Greece and Italy, in the East, in Byzantine times, and in the early middle ages both north and south of the Alps. The materials and processes mentioned by Pliny or in the various technical handbooks are on the wbo’e clearly established, but it is very difficult to say in particular cases what was the actual technique employed. Any certainty in this matter must be based on the results not only of superficial examination but of analysis, and the very small quantities of the materials that can be placed at the disposal of the chemist make it often impossible to arrive at a satisfactory diagnosis.

A story in Pliny (xxxv. 102) shows that the Greek panel painters, when not ” encaustae,” used a water tempera, but whether size or egg was its main constituent we do not know. Apelles is said to have covered his finished panels with a thin coat of what Pliny calls ” atramentum,” which may have been a white of egg varnish, for spirit varnishes were not known in antiquity (Berger i. and ii. 183), and the Greeks do not seem to have used drying oils nor varnishes made with these. Byzantine panel painting, according to the Mount Athos Handbook, was executed as a rule in an egg tempera (Berger iii. 75), and this technique was followed later on in Italy. For Greek and Etruscan (Italian) wall-paintings of the pagan period; for late Roman wall-paintings north of the Alps, and for Romanesque and Gothic wall-paintings,

we have to choose amongst the theories of size or egg tempera, wax tempera (emulsion), and the lime painting in ” fresco secco ” described by Theophilus. When we come to the panel painting from the 12th to the 15th century we are on surer ground. For the north we have the technical directions of Theophilus, for the south those of Cennino. Theophilus (i. ch. xxvii.) prescribes a tempera of gum from the cherry tree, and, with some pigments, white of egg. The finished panel was to be covered with an oil varnish (vernition). Cennino prescribes a tempera of the yolk of egg alone, half and half with the pigments, which have been finely ground in water and are very liquid, so that there might be in the ultimate compound about as much water as egg. A tempera of the whole egg with the milk of fig-shoots he recom- mends, not for panels, but for retouching fresco-work on the wall when it is dry. Tempera panels painted with egg yolk are, like the gum tempera panels of Theophilus, to be varnished with vernice liquida (oil varnish). In these media were executed all the fine tempera panels of the early Italian and early German schools of the 15th century, and these represent a limited, but within its bounds a very perfect and interesting, form of the painter’s art.

A word or two may be said here about the various subsidiary processes connected with 14th and 15th century panel painting, which are of great interest as showing the conscientious, and indeed devotional spirit in which the operations were carried out. At the outset of his Traitato Cennino gives a list of the processes the panel painter has to go through, and in subsequent chapters he describes minutely each of these. The artist must ” know how to grind colours, to use glue, to fasten the linen on the panel, to prime with gesso, to scrape and smooth the gesso, to make reliefs in gesso, to put on bole, to gild, to burnish, to mix temperas, to lay on grounding colours, to transfer by pouncing through pricked lines, to sharpen lines with the stylus, to indent with little patterns, to carve, to colour, to ornament the panel, and finally to varnish it.” The preliminary operations, before the artificer actually begins _ to ” colour ” or paint, will take him six years to learn, and it requires with Cennino half a hundred chapters to describe them. The wooden panel is carefully compacted and linen is glued down over its face, and over this is laid, in many successive coats, a gesso ground of slaked plaster of Paris mixed with size, with which composition raised ornaments, such as the nimbi of

saints, &c, can be modelled. Both these and the flat parts of the panel are scraped and smoothed till they are like ivory. The design of the picture is then drawn out on the panel, and the outlines sharpened up with the utmost precision. The gilding of the background and of the carved woodwork in which the panel is set now follows. Armenian bole, ground finely with white of egg diluted with water, is spread over tKe gesso and carefully burnished as a ground for water gilding with white of egg. The gold is then burnished till it appears almost dark (in the shadow) from its own refulgence. The delicate indented patterns which are so charming on the gilded grounds of the painted panels on East Anglian screens, such as that at Southwold, are stamped with little punches, and Cennino says this is one of the most beautiful parts of the art. In the actual painting, which is on the non-gilded part of the panel, the utmost attention is paid to the ornamentation of brocaded draperies, in which gold is used as a ground and is made to show in parts, while glazes of pigment mixed with drying oil are also used. Directions for painting the flesh, which is to be done after the draperies and background, are precise. There is an under-painting in a mono- chrome of terra verte and white, and over this in successive coats of great thinness the flesh-tints are spread, every tint being laid in its right position on the face, the darkest flesh-tint being shaded down to the terra verte and softened off in a tender sfumato manner. Many coats are superimposed, but the green ground is still to remain slightly visible. At the last the lightest flesh-tint is used to obtain the reliefs and the high lights are touched in in white. The outlines are sharpened up with red mixed with black. The varnishing process should be delayed for at least a year, and the varnish, which was evidently thick, is to be spread by the fingers over the painted surfaces, care being taken not to let the varnish go over the gold ground. This should be done if possible in the sun, but Cennino says that if the varnish be boiled it will dry without being placed in the sun.

The process thus described is not what we should call, in the modern sense, painting, for the precision and conventionality of the work and the great importance given to subsidiary details are quite opposed to the spirit of the art since the 16th century. Never- theless, the naive simplicity of the design and the exquisiteˆ delicacy of the finish have an unfailing charm. We feel, as Cennino says, that the artist has loved and delighted in his work, and regarded his patient manipulation as a religious act. A modern artist in tempera specially praises the old work for its ” breadth, trans- parency and purity of colour,” qualities ” owing to the gradual

bringing forward of the picture from a simple outline of extreme

beauty." " This outline is never lost; its beautifully opposed and harmonizing lines and masses are retained to the end, even strengthened and accentuated, giving great distinctness at a distance, even when not actually visible. A perfectly modulated monochrome of light and shade fills the outline, apparent through the overlaid glory of colour, over which again is thrown a veil of atmosphere, a refulgence of light, a suggestibn of palpitating space " (Mrs Herringham's Cennino, p. 218). A difficulty in the technique is the rapid drying of the medium, that prevents the fusing of the colours together in the impasto, which is possible in oil painting. Woltmann {History of Painting, Eng. trans, i. 406) thought that in the north honey was mixed with the white of egg or size to prevent too rapid drying, and he wrote, " this method rendered possible a liquid and softly gradated handling, and though the Italian variety of tempera allowed greater depth in the shadows, the northern gave on the whole greater brightness." In Italy, owing to the rapid drying of the egg-yolk, modelling was often secured by hatching, which is not so pleasing in its effect as the other method of superimposing thin coats of paint one over the other till the proper effect of shading is secured. One notable quality of tempera is its transparency, which is referred to by Cennino when he says that the original under-painting of terra verte is never to be wholly obliterated.

The well-known group of the " Three Graces," from Botticelli's large panel of the " Allegory of Spring," at Florence, gives the quality of tempera painting very aptly (see fig. 36, Plate X.). There is a Society of Painters in Tempera in London, and some artists are enthusiastic in their admiration of the process for its purity, sincerity and permanence.

Under the heading " tempera " should be noticed another style of painting with a water-medium that is executed as a rule on a large scale and in a comparatively slight fashion. Painting for the purposes of temporary decoration on canvas or wood, so much used in the Italian cities of the Renaissance period, is of this kind. Large cartoons in colour for mural pictures or tapestry, of which Raphael's cartoons are the most famous examples, are other ex- amples; while in modern times the technique is chiefly employed in theatrical scene painting. The pigments are tempered with size or gum, and body is given to them by whitening, pipe-clay or similar substance. Work executed in this medium dries much lighter than when it is put on, and to execute it effectively, as in the case of stage scenery, requires much skill and practice. " In the study of the art of distemper painting a source of considerable embarrassment to the inexperienced eye is that the colours when wet present such a different appearance to what they do

when dry.” So writes F. Lloyds, but W. Telbin, though he recognizes this difficulty, extols the process. ” A splendid material dis- temper! For atmosphere unequalled, and for strength as powerful as oil, in half an hour you can do with it that which in water or oil would take one or two days!” The English word “distemper” and the French ” gouache ” are commonly applied to this style of broad summary painting in body-colour. ” Distemper” to English ears suggests house-decoration, ” tempera ” the work of the artist.

§ 44. Oil Painting. — (See Eastlake, Materials for a History of Oil Painting (London, 1847); Merimee, De la peinture a I’huile (Paris, 1830); Berger, Beitrage zur Enlwicklungs-Geschkhte der Maltechnik, esp. iii. 221 sqq., and iv. (Munich, 1897), &c; Dalbon, Les Origines de la peinture a I’huile (Paris, 1904); Ludwig, fiber die Grundsatze der Oelmalerei (Leipzig, 1876); Lessing, Uber das Alter der Oelmalerei, 1774.)

Oil painting is an art rather of the north than of the south and east, for its development was undoubtedly furthered by the demand for moisture-resisting media in comparatively damp climates, and, moreover, the drying oils on which the technique depends were but sparingly prepared in lands where olive oil, which does not dry, was a staple product.

Certain vegetable oils dry naturally in the air by a process of oxydization, and this drying or hardening is not accompanied by any considerable shrinking, nor by any change of colour; so that oil and substances mixed with it do not alter in volume nor in appearance as a consequence of the drying process. There may be a slow subsequent alteration in the direction of darkening or becoming more yellow; but this is another matter. Among these oils the most important is linseed oil extracted from the seeds of the flax plant, poppy oil from the seeds of the opium poppy, and nut oil from the kernels of the common walnut. With these oils, generally linseed, ordinary tube colours used by painters in oil are prepared, and oil varnishes, also used by artists, are made by dissolving in them* certain resins. Their natural drying qualities can be greatly aided by subjecting them to heat, and

also by mingling with them chemical substances known as ” dryers,”

of which certain salts of lead and zinc are the most familiar. How far back in antiquity such oils and their proper- ties were known is doubtful. Certain varnishes are used in Egypt on mummy cases of the New Empire and on other surfaces, and, though some of these are soluble in water, others resist it, and may be made with drying oils or essential oils, though the art of distilling these last cannot be traced back in Egypt earlier than the Roman imperial period. (See Berthelot, La Chimie au moyen dge, i. 138 (Paris, 1893). When Pliny tells us (xiv. 123) that all resins are soluble in oil, we might think he was contem- plating a varnish of the modern kind. Elsewhere, however (xxiv. 34), he prescribes such a solution as a sort of emollient ointment for wounds, so it is clear that the oil he has in view is non-drying olive oil that would not make a varnish. In two passages of his Natural History (xv. 24-32, xxiii. 79-96) Pliny discourses at length on various oils, but does not refer to their drying properties. There is really no direct evidence of the use among the Greeks and Romans of drying oils and oil varnishes, though a recent writer (Cremer, Untersuchungen iiber den Beginn der Oelmalerei, Diiss., 1899) has searched for it with desperate eagerness. The chief purpose of painting for which such materials would have been in demand is the painting of ships, but this we know was carried out in the equally waterproof medium of wax, with which resin or pitch was commingled by heat. The earliest mention of the use of a drying oil in a process connected with painting is in the medical writer Aetius, of the beginning of the 6th century a.d., who says that nut oil dries and forms a protective varnish over gilding or encaustic painting. From this time onwards the use of drying oils and varnishes in painting processes is well established. The Lucca MS. of the 8th or 9th century a.d. gives a receipe for a transparent varnish composed of linseed oil and resin. In the Mount Atkos Handbook ” peseri,“or boiled linseed oil, appears in common use, and with resin is made into a varnish. In the same treatise also we find a clear description of oil painting in the modern sense; but since the dates of the various portions of the Handbook are uncertain, we may refer rather to Theophilus (about a.d. iioo), who indicates the same process with equal clearness. The passages in Theophilus (i. chs. xx. and xxvi.-xxviii.) are of the first importance for the history of oil painting. He directs the artificer to take the colours he wishes to apply, to grind them carefully without water in oil of linseed prepared as he describes in ch. xx., and to paint therewith flesh and drapery, beasts or birds or foliage, just as he pleases. All kinds of pigments can be ground in the oil and used on wooden panels, for the work must be put out in the sun to dry. It is noteworthy that Theophilus (ch. xxvii.) seems to confine this method of painting to movable works (on panel, in opere ligneo, in his tanlum

rebus quae sole siccari possunt) that can be carried out into the sun, but in ch. xxv. of the more or less contemporary third book of Heraclius (Vienna Quellenschriften, No. iv.) oil-paint may be dried either in the sun or by artificial heat. Heraclius, moreover, knows how to mix dryers (oxide of lead) with his oil, a device with which Theophilus is not acquainted. Hence to the latter the defect of the medium was its slow drying, and Theophilus recommends as a quicker process the gum tempera already described. In any case, whether the painting be in oil or tempera, the finished panel must be varnished in the sun with ” vernition ” (ch. xxi.), a varnish compounded by heat of linseed oil and a gum, which is probably sandarac resin. The Mount Athos Handbook, § 53, describes practically the same technique, but indicates it as specially used for flesh, the inference being that the draperies were painted in tempera or with wax. It is worth noting that the well-known ” black Madonnas,” common in Italy as well as in the lands of the Greek Church, may be thus explained. They are Byzantine icons in which the flesh has been painted in oil and the draperies in another technique. The oil has darkened with age, while the tempera parts have remained in contrast comparatively fresh. Some of them are probably the earliest oil paintings extant.

Oil painting accordingly, though in an unsatisfactory form,

is established at least as early as a.d. iioo. What had been its previous history? Here it is necessary to take note of the interesting suggestion of Berger, that it was gradually evolved in the early Christian centuries from the then declining encaustic technique of classical times. We learn from Dioscorides, who dates rather later than the time of Augustus, that resin was mixed with wax for the painting of ships, and when drying oils came into use they would make with wax and resin a medium requiring less heat to make it fluid than wax alone, and one therefore more convenient for the brush-form of encaustic. Berger suspects the presence of such a medium in some of the mummy-case portraits, and points for confirmation to the chemical analysis of some pigments found in the grave of a painter at Heme St Hubert in Belgium of about the time of Constantine the Great (i. and ii. 230 seq.). One part wax with two to three parts drying (nut) oil he finds by experiment a serviceable medium. Out of this changing wax-technique he thinks there proceeded the use of drying oils and resins as media in independence of wax. If we hesitate in the meantime to regard this as more than a hypothesis, it is yet worthy of atten- tion, for any hypothesis that suggests a plausible connexion between phenomena the origin and relations of which are so obscure deserves a friendly reception.

The Trattato of Cennino Cennini represents two or three centuries of advance on the Schedula of Theophilus, and about contemporary with it is the so-called Strassburg MS., which gives a view of German practice just as the Trattato does of Italian. This MS., attention to which was first called by Eastlake {Materials, i. 126 seq.), contains a remarkable recipe for preparing ” oil for the colours.” Linseed or hempseed or old nut oil is to be boiled with certain dryers, of which white copperas (sulphate of zinc) is one. This, when bleached in the sun, ” will acquire a thick consistence, and also become as transparent as a fine crystal. And this oil dries very fast, and makes all colours beautifully clear and glossy besides. All painters are not acquainted with it: from its excellence it is called oleum preciosum, since half an ounce is well worth a shilling, and with this oil all colours are to be ground and tempered,” while as a final process a few drops of varnish are to be added. The MS. probably dates rather before than after 1400.

Cennino’s treatise, written a little later, gives avowedly the recipes and processes traditional in the school of Giotto throughout the 14th century. He begins his account of oil painting with the remark that it was an art much practised by the ” Germans,” thus bearing out what was said at the com- mencement of this section. He proceeds (chs. 90-94) to describe an oil technique for walls and for panels that sounds quite effective and modern. Linseed oil is to be bleached in the sun and mixed with liquid varnish in the proportion of an ounce of varnish to a pound of oil, and in this medium all colours are to be ground. ” When you would paint a drapery with the three gradations,” Cennino proceeds, ” divide the tints and place them each in its position with yourbrush of squirrel hair, fusing one colour with another so that the pigments are thickly laid. Then wait certain days, come again and see how the paint covers, and repaint where needful. And in this way paint flesh or anything you please, and likewise mountains, trees and anything else.” In other chapters Cennino recom- mends certain portions of a painting in tempera to be put in in oil, and nowhere does he give a hint that the work in oil gave any trouble through its unwillingness to dry. His medium appears, however, to have been thick, and perhaps somewhat viscous (ch. 92). This combination of oil paint and tempera on the same piece is a matter, as we shall presently see, of some significance.

In the De re aedificatoria of L. B. Alberti (written about 1450), vi. 9, there is a mention of ” a new discovery of laying on colours with oil of linseed so that they resist for ever all injuries from weather and climate,” which may have some reference to so-called ” German ” practice.

The next Italian writer who says anything to the purpose is

Filarete, who wrote a long treatise on architecture and the arts of design about 1464. It is published in the Vienna Quellen- schriften, neue Folge, No. III. Like Cennino, Filarete (loc. cit. p. 641) speaks of oil painting as specially practised in ” Germany,” and says it is a fine art when anyone knows how to compass it. The medium is oil of linseed. ” But is not this very thick?” he imagines some one objecting. ” Yes, but there is a way of thinning it; I do not quite know how; but it will be stood out in a vessel and clarify itself. I understand however that there is a quicker way of managing this — but let this pass, and let us go on to the method of painting.” Filarete’s evident uncertainty about a process, which may be that of the Strassburg MS. for producing oleum preciosum, and his reference to “Germany,” inclines us to look elsewhere than to Italy for knowledge about the oil technique. As a fact the evidence of the recipe books is borne out remarkably by that of other records which show that a great deal of oil painting of one kind or another went on in northern lands from the 13th century onwards. These records are partly in the form of accounts, showing large quan* tities of oil and resins furnished for the use of painters engaged in extensive works of decoration; and partly in the form of contracts for executing pictures ” in good oil colours.” It is true that oil might be merely employed in mordants for gilding or in varnishes, and for oil painting merely in house-decorator fashion over wood, or for colouring statues and reliefs in stone; nevertheless, with a use of proper critical methods, it has been possible for M. Dalbon and others to establish incontestably the employment in artistic wall and panel-painting of drying oils and varnishes before the 15th century, both north and, to a lesser extent, south of the Alps. These passages have been too often quoted to be cited here. (See Eastlake, Materials, p. 46 seq.; Berger, Beitrage iii. 206 seq., &c.) The earliest of the accounts, an English one, is dated 1 239 : ” The king (Henry III.) to his treasurer and chamberlains. Pay from our treasury to Odo the goldsmith and Edward his son one hundred and seven- teen shillings and tenpence for oil, sandarac resin, and colours bought, and for pictures executed in the Queen’s Chamber at Westminster.” Another, about 1275 {temp. Edward I.) runs: ” To Robert King, for one cartload of charcoal for drying the painting in the King’s Chamber, Ills VHId.” In Flanders in 1304 there is an account (Dalbon, p. 43) : ” Pour 10 los

d’oile acatee pour /aire destrempe as couleurs,” in 1373-1374 one for XIII libvres d’oile de linnis a faire couleurs ” (p. 45). This was for the use of a certain painter Loys, who executed mural compositions of which some of the subjects are recorded. In the matter of contracts, Dalbon (p. 52) prints one of 1320 pre- scribing figure and landscape subjects, to be executed ” en la meilleur maniere que U pourront estre faites en painlure,” and concluding, ” et seront loutes ces choses faites a huille,” and he points convincingly to such wording as a proof that the work here under consideration must be regarded as artistic figure-painting and not mere house decoration. Lastly, just before 1400, the painter Jehan Malouel receives in 1399 oil with colours for ” la peinture de plusieurs tables et tableaux d’autel,” for the Carthusian convent of Champmol near Dijon, which proves the use of oil for panel as well as for mural painting.

The further question about the survival of actual remains of work of the class just noticed is a very difficult one. There seems no reason why all this mural and panel work in oil of the 14th century should have perished, unless the medium was faulty, and, as is natural, many attempts have been made to identify extant examples as representing these early phases of the oil technique. Mural work we need not perhaps expect to find, for we know from the later experience of the Italians of the 1 6th century that it was difficult even then to find a safe method for oil painting on plaster. With panels preservation would be more likely, and it is always possible that some datable work of the kind may be identified that will carry the monumental history of oil painting back into the 14th century. An exhi- bition of early English painted panels was held in 1896 in the rooms of the Society of Antiquaries of London, and some good judges believed at the time that certain 14th-century panels from

St Michael at Plea, Norwich, were in oil, but this cannot be regarded as established.

If such then be the early history of oil painting, what attitude are we to adopt in face of the famous statement by Vasari that the technique was the invention of the Flemish painter Van Eyck in the year 1410? The statement was first made in the 21st chapter of Vasari’s Introduction to his Lives of the Artists (1550), and runs as follows: ” Fu una bellissima inventione, ed un gran’ commoditd all’ arte della pittura, il trovare il colorito a olio. Di die fu primo inventore in Fiandra Giovanni da Bruggia (Jan van Eyck). In the life of Antonello da Messina, in the same edition, Vasari dresses up the bare fact he here relates, and gives it the personal anecdotal turn that accords with his literary methods. Here the ” invention ” follows on the incident of

the splitting of a tempera panel varnished in oil, that according to traditional practice Van Eyck had put out in the sun to dry. This artist then turned his attention to devising some means for avoiding such mischances for the future, and, in Vasari's words, " being not less dissatisfied with the varnish than with the process of tempera painting, he began to devise means for preparing a kind of varnish which should dry in the shade, so as to avoid having to place his pictures in the sun. Having made experiments with many things both pure and mixed together, he at last found that linseed and nut oil, among the many which he had tested, were more drying than all the rest. These, therefore, boiled with other mixtures of his, made him the varnish which he had long desired." This varnish Vasari goes on to say he mixed with the colours and found that it " lit up the colours so powerfully that it gave a gloss of itself," without any after-coat of varnish.

Such is the famous passage in Vasari that has probably given rise to more controversy than any similar statement in the litera- ture of the arts. The question is, in what did the " invention " of the Van Eycks, Hubert and Jan his younger brother, consist? and the first answer that would occur to anyone knowing alike the earlier history of the oil medium and Vasari's anecdotal predilections is the answer " There was no invention at all." The drying properties of linseed and nut oil and the way to increase these had long been known, as had also the preparation of sandarac oil-varnish, as well as a colourless (spirit?) varnish of which there is mention in accounts prior to the 15th century (Dalbon, p. 93). The mixing of varnish with oil for a medium was also known, and indeed the oleum preciosum may be the real " invention " of which Alberti and Filarete had only vaguely heard, and of which the Van Eycks later on received the credit. The epitaphs for the tombs of the two Van Eycks make no mention of such a feat as Vasari ascribes to them, and it is quite open to anyone to take up the position that it was no improvement in technique that brought to the Van Eycks their fame in connexion with oil painting, but rather an artistic improvement that consisted in using a traditional process to execute pictures which in design, finish, beauty and glow of colour far surpassed every- thing previously produced in the northern schools. Pliny writes of the works of a Greek painter of about 400 B.C. that they were the first that had the power " to rivet the gaze of the spectator," and in like manner we may say of the " Adoration of the Lamb " by the Van Eycks, the titular firstfruits of the oil painter's technique, that it impressed the world of its time so mightily through its artistic power and beauty as to elevate to a sort of mystic importance the very method in which the paints were mixed. There is

much force in this view, but at the same time it is impossible to deny to the Van Eycks the credit of technical improvements. For one thing, an artist who has an exceptional feeling for colour, texture and delicacy of finish will certainly pay special attention to his technical media; for another, the Van Eycks had a reputation long before Vasari's time for researches into these media. In 1456, fifteen years after the death of the younger brother, Bartolommeo Facio, of Spezzia, wrote a tract De viris illustribus in which he speaks of a certain " Joannus Gallicus," who can be identified as Jan van Eyck, as specially " learned in those arts which contributed to the making of a picture, and was on that account credited

with the discovery of many things in the properties of colours, which he had learned from ancient traditions recorded by Pliny and other writers." Filarete (c. 1464) also knew of the repute of Jan van Eyck in connexion with the oil technique. Hence we may credit the Van Eycks with certain technical improvements on traditional practices and preparations in the oil technique, though these can hardly be termed " inventions," while their artistic achievement was great enough to force into prominence whatever in the technical department they had accomplished.

Another and a more important question remains behind: What was, in fact, the practice in the matter of oil painting in vogue before the Van Eycks, altered or at any rate perfected by them and their successors, and in general use up to the time of Vasari; and how was it related to the older more widely diffused painting " a tempera " ?

It is indisputable that the oil painting of the Van Eycks and the early Flemish school, together with that of the Florentines and Umbrians, and indeed of all the Italians up to Vasari's time, save the Venetians, Correggio, and some other north Italians, does not greatly differ in artistic effect, nor, as far as can be judged, in handling, from earlier or contemporary temperas. For example, at Venice in the 15 th century, Crivelli paints always in tempera, Cima in oils, but the character of their surface is almost the same, and if anything the tempera is richer in effect than the oil. The contrary is no doubt the case with the tempera " Madonna with the Violet " in the Priests' Seminary at Cologne when compared with the somewhat later " Dombild," also by

Stephan Lochner, which is believed to be painted in oils, but the two are still in technical character very nearly akin. The fact is that tempera panels were usually coated with an oil varnish, necessarily of a somewhat warm tint, and we could hardly expect to distinguish them from oil pictures painted in or covered by varnish, unless there were a difference in the handling of the pigments. The method of handling appears however to be on the whole the same, and there are many who believe that in all essentials it is the same. Tempera panels, as we have learned from Cennino, were not only varnished but in parts might be painted in oils (ch. 143), and it is one view of the technique of the early Flemings that it was only an over-painting in oils over a preparation in tempera. Berger is of the opinion that the process was something between the two, that is to say, that it was oil tempera, the medium being an emulsion of oil and water through the intermediary of a gum. Such a medium would, as he points out (Beitrdge, iii. 247 seq.), combine the thinness and limpidity in manipulation characteristic of a water tempera with the property of drying hard and impervious to moisture. This is of course only a theory. Of far more weight is the suggestion made by Principal Laurie, of Edinburgh, who has carried on for years a series of careful experiments in the various pigments and media employed in oil painting. As one result of these experiments he has found that the ordinary drying oils and oil varnishes do not, as used to be assumed, ” lock up ” or completely cover and protect pigments so as to prevent the access of moisture and the gases of the atmosphere, but that this function is far more effec- tively performed by hard pine-balsams, such as Canada balsam, dissolved in an essential oil and so made into a varnish or painting medium. In pictures by Van Eyck Principal Laurie has detected what he believes to be the use of pigments of a notoriously fugitive character, and he is convinced that the most effectual medium for preserving these in the condition in which they have come down to us would be a natural pine-balsam, with probably a small proportion of drying oil; he suggests therefore that the introduction of these ingredients may be the real secret of the Van Eyck technique. There is as yet no proof that the Van Eycks really used such a medium, though it is a preparation possible at their time, and when thinned by a process of emulsification with egg, as Dr Laurie suggests, would be a serviceable one; but they and the other early oil painters certainly used a method, and in all probability media, that did not differ greatly as regards manipulation from those in vogue in tempera.

From the aesthetic point of view therefore we have to regard early oil painting as only another form of the older tempera,

expressing exactly the same artistic ideals and dominated by the same view of the relation of art to nature. To Vasari the artistic advantage of the oil medium was, first, its convenience, and, next, the depth and brilliancy it lent to the colours, which he says it ” kindled,” while at the same time it lent itself to a soft fusing of tints in manipulation, so that artists could give to their figures in this technique the greatest charm and beauty combined with a force that made them seem to stand out in relief from the panel. Such a description applies very justly to work like that of the Van Eycks in the ” Adoration of the Lamb,” or the later panels of Antonello da Messina, who, according to Vasari’s often- repeated story, introduced the Flemish system of oil-painting into Venice. The description does not however apply to the freer, more sweeping, more passionate handling of the brush by the greatest of the Venetians such as Titian or Veronese, and still less to the oil painting of 17th-century masters like Rubens or Rembrandt or Velazquez. It is quite clear that whatever improvements in oil technique were due to the early Flemings, oil painting in the modern sense owes still more to the Venetians, who first taught the world the full artistic possibilities of the process. Giovanni Bellini, whose noble altarpiece in S. Pietro at Murano may be called, in a phrase once applied to another of his pictures, ” the canon of Venetian art,” is probably entitled to be called the father of modern oil painting. Beginning as a painter in tempera and adopting the new process about 1475, Bellini was able so far to master the new medium that he handed it on with all its possibilities indicated to Giorgione, Palma and Titian. That Venetian oil painting however, with all its brilliancy and freedom, was a child of the older tempera technique is shown by its characteristic method, which consisted in an under-paint- ing in dead colour, over which were superimposed the transparent glazes that secured the characteristic Venetian richness of colour- ing. Now all the recent writers on the Van Eyck technique agree that, whatever were the exact media employed, the tempera tradition, and perhaps the tempera vehicles, were maintained for the underpainting. In the old tempera-panel technique of Cennino there was a monochrome underpainting in a greenish pigment, over which the flesh tints were spread in thin layers so as never completely to obliterate the ground. Such an under- painting in a few simple colours, black, white and red, was employed by Titian and others of the Venetians, and over it were laid the rich juicy transparent pigments, till ” little by little he would have covered with real living flesh these first abstracts of his intention ” (Boschini). There is some evidence that in many cases these underpaintings were in tempera, which would have the advantage of drying more quickly than under- paintings in oil, and Boschini (Le Ricche minere della pittura veneziana, 1674) expressly says that the

blues in Venetian paintings, e.g. by Veronese, were painted often a guazzo. There was a reason, however, why the Venetians would alter the traditional practice of the Flemish forerunners. The latter were almost entirely panel painters, while the Venetians used canvas. Now certain media, like the hard pine-balsams which Dr Laurie thinks were the basis of the Van Eyck medium, are suitable for the immovable surfaces of a well-grounded panel, but would be liable to crack on canvas which is more or less yielding. Hence the tougher oil vehicles were in advanced Venetian painting exclusively employed. This distinction between the thin transparent pigments and those of an opaque body, which is as old as oil painting in any form, becomes in the hands of Bellini and the later Venetians the fundamental principle of the technique. The full advantage of this thinness and transparency is gained by the use of the pigments in question as ” glazes ” over a previously laid solid impasto. This impasto may be modelled up in monochrome or in any desired tints chosen to work in with the colours of the superimposed glazes. Effects of colour of great depth and bril- liancy may thus be obtained, and after the glaze has been floated over the surface a touch of the thumb, where the underpainting is loaded and lights are required, will so far thin it as to let the underlying colour show through and blend with the deeper tint of the glaze in the shadows. Thus in the noble Veronese in

the London National Gallery, called the ” Consecration of St Nicholas,” the kneeling figure of the saint is robed in green with sleeves of golden orange. This latter colour is evidently carried through as underpainting over the whole draped portions of the figure, the green being then floated over and so manipulated that the golden tint shows through in parts and gives the high lights on the folds.

Again the relation of the two kinds of pigment may be reversed, and the full-bodied ones mixed with white may be struck into a previously laid transparent tint. The practice of painting into a wet glaze or rubbing was especially characteristic of the later Flemings, with Rubens at their head, and this again, though a polar opposite to that of the Venetians, is also derived from the earlier tempera, or modified tempera, techniques. The older tempera panels, when finished, were, as we have seen, covered with a coating of oil varnish generally of a warm golden hue, and in some parts they were, as Cennino tells us,

glazed with trans- parent oil paint. Now Van Mander tells us in the introduction to his Schilderboek of 1604, verse 17, that the older Flemish and German oil painters, Van Eyck, Diirer and others, were accus- tomed, over a slightly painted monochrome of water-colour in which the drawing was carefully made out, to lay a thin coat of semi-transparent flesh tint in oil, through which the under- painting was still visible, and to use this as the ground for their subsequent operations. In the fully matured practice of Rubens this thin glaze became a complete painting of the shadows in rubbings of deep rich transparent oily pigment, into which the half-tones and the lights were painted while it was still wet. Descamps, in his Vie des peintres flamands (Paris, 1753), describes Rubens's method of laying in his shadows without any use of white, which he called the poison of this part of the picture, and then painting into them with solid pigment to secure modelling by touches laid boldly side by side, and afterwards tenderly fused by the brush. Over this preparation the artist would return with the few decided strokes which are the distinctive signs-manual of the great master. The characteristic advantages of this method of work are, first, breadth, and second, speed. The under tint, often of a rich soft umber or brown, being spread equally over the canvas makes its presence felt throughout, although all sorts of colours and textures may be painted into it. Hence the whole preserves a unity of effect that is highly pictorial. Further, as the whole beauty of the work depends on the skill of hand by which the solid pigment is partly sunk into the glaze at the shadow side, while it comes out drier and stronger in the lights, and as this must be done rightly at once or not at all, the process under a hand like that of Rubens is a singularly rapid one. Exquisite are the effects thus gained when the under tint is allowed to peep through here and there, blending with the solid touches to produce the subtlest effects of tone and colour.

Of these two distinct and indeed contrasted methods of handling oil pigment, with solid or with transparent under- painting, that of the Flemings has had most effect on later practice. The technique dominated on the whole the French school of the 18th century, and has had a good deal of influence on the painting of Scotland. In general, however, the oil painting of the 17th and succeeding centuries has not been bound by any distinctive rules and methods. Artists have felt themselves free, perhaps to an undue extent, in their choice of media, and it must be admitted that very good results have been achieved by the use of the simplest vehicles that have been known throughout the whole history of the art. If Rembrandt begins in the Flemish technique, Velazquez uses at first solid under- paintings of

a somewhat heavy kind, but when these masters attain to full command of their media they paint apparently without any special system, obtaining the results they desired, now by one process and now again by another, but always working in a free untrammelled spirit, and treating the materials in the spirit of a master rather than of a slave. In modern painting generally we can no longer speak of established processes and methods of work, for every artist claims the right to experi- ment at his will, and to produce his result in the way that suits

his own individuality and the special nature of the task before him.

§ 45. Wafer – Colour Painting. — (Cosmo Monkhouse, The Earlier English Water-Colour Painters, 2nd ed., London, 1897; Redgrave, A Century of Painters; and Hamerton, The Graphic Arts, contain chapters on this subject.)

Water-colour painting, as has been said, is only a particular form of tempera, in which the pigments are mixed with gum to make them adhere, and often with honey or glycerin to prevent them drying too fast. The surface operated on is for the most part paper, though ” miniature ” painting is in water- colour on ivory. The technique was in use for the illustrated papyrus rolls in ancient Egypt, and the illuminated MSS. of the medieval period. As a rule the pigments used in the MSS. were mixed with white and were opaque or ” body ” colours, while water-colour painting in the modern sense is mostly trans- parent, though the body-colour technique is also employed. There is no historical connexion between the water-colour painting on the vellum of medieval MSS. and the modern practice. Modern water-colour painting is a development rather from the drawings, which the painters from the 15th to the 17th century were constantly executing in the most varied media. Among the processes employed was the reinforcement of an outline drawing with the pen by means of a slight wash of the same colour, generally a brown. In these so-called pen-and- wash drawings artists like Rembrandt were fond of recording their impressions of nature, and the water-colour picture was evolved through the gradual development in importance of the wash as distinct from the line, and by the gradual addition to it of colour. It is true that we find some of the old masters occasionally executing fully-tinted water-colour drawings quite in a modern spirit. There are landscape studies in body-colour of this kind by Diirer and by Rubens. These are, however, of the nature of accidents, and the real development of the tech- nique did not begin till the 18th century, when it was worked out, for the most part in England, by artists of whom the most important were Paul Sandby and John Robert Cozens,

who flourished during the latter half of the 18th century. First the wash, which had been originally quite flat, and a mere adjunct to the pen outline, received a certain amount of modelling, and the advance was quickly made to a complete monochrome in which the firm outline still played an important part. The element of colour was first introduced in the form of neutral tints, a transparent wash of cool grey being used for the sky and distance, and a comparatively warm tint of brown for the foreground. ” The progress of English water-colour,” writes Mr Monkhouse, ” was from monochrome through neutral tint to full colour.” Cozens produced some beautiful atmospheric effects with these neutral tints, though the rendering of nature was only conventional, but it was reserved for the second genera- tion of English water-colour artists to develop the full resources of the technique. This generation is represented centrally by Thomas Girtin (1775-1802) and J. M. W. Turner (1775-1851), the latter of whom is by far the greatest representative of the art that has hitherto appeared. To Girtin, who died young and whose genius, like that of Masaccio, developed early, is due the distinction of creating water-colour painting as an art dealing with the tones and colours of nature as they had been dealt with in the older media. W. H. Pyne, a contemporary water-colour artist who also wrote on the art, says of Girtin that he ” prepared his drawings on the same principle which had hitherto been confined to painting in oil, namely, laying in the object upon his paper with the local colour, and shading the same with the individual tint of its own shadow. Previous to the practice of Turner and Girtin, drawings were shaded first entirely through, whatever their component parts — houses, cattle, trees, mountains, foregrounds, middle-ground and dis- tances, all with black or grey, and these objects were after- wards stained or tinted, enriched or finished, as is now the custom to colour prints. It was the new practice, introduced by these distinguished artists, that acquired for designs in water-colours upon paper the title of paintings.”

Girtin ” opened the gates of the art ” and Turner entered in. If the palette of the former was still restricted, Turner exhausted all the resources of the colour box, and moreover enriched the art by adding to the traditional transparent washes the effects to be gained from the use of body colour. Body colours, how- ever, were not only laid on by Turner with the solid impasto of the medieval illuminations. He was

an adept at dragging thin films of them over a tinted ground so as to secure the subtle colour effects which can also be won in pastel. It would be useless to attempt any account of the technical methods of Turner or of the more modern practitioners in the art, for as in modern oil painting so here, each artist feels at liberty to adopt any media and processes which seem to promise the result he has in view. The varieties of paper used in modern water-colour practice are very numerous, and the idiosyncrasy of each artist expresses itself in the way he will manipulate his ground; superinduce one over the other his transparent washes; load with solid body colour; sponge or scratch the paper, or adopt any of the hundred devices in which modern practice of painting is so rife. (G. B. B.)

General Authorities on Technique. — Hamertqn, The Graphic Arts: A Treatise on the Varieties of Drawing, Painting and Engraving (London, 1882), a work combining technical and artistic informa- tion, is the best single book on this subject. More archaeological is Berger, Beitrdge zur Entwickelungs-Geschichte der Maltechnih (Munich, 1897-1904; partly in second editions. The last part is yet to come). The series Quellenschriften fiir Kunstgeschichte und Kunsttecknik des Mittelalters und der Renaissance (Vienna, various dates from 1871) contains many publications of much value, among them being, i., Cennino Cennini, Das Buch von der Kunst, German trans, of the Trattato, with note by Ilg; vii., Theophilus, Schedula diversarum artium, Ger. trans, by Ilg. Cennino's Trattato has also been edited in English by Mrs Herringham (London, 1899). Mrs Merrifield, Ancient Practice of Painting (2 vols., London, 1849), and Sir Charles Eastlake, Materials for a History of Oil Painting (2 vols., 1849 and 1869), are valuable standard works. Information as to Byzantine processes is to be found in the Mount Athos Handbook in " Manuel d'iconographia chretienne grecque et latine," by Didron the elder (Paris, 1845). Church, The Chemistry of Paints and Painting (3rd ed., London,i90l), is by far the best book on its subject. Vasari on Technique, trans, by Miss Maclehose and edited with commentary by Baldwin Brown (London, 1907), contains a good deal of information. Paul Schultze-Naumburg, Die Technik der Malerei (Leipzig, no date) ; Vibert, La Science de la peinture (Paris, 1890), may also be mentioned.

Recent Schools of Painting British.

At the beginning of the last quarter of the 19th century British art was held to be in a vigorous and authoritative position. During the years immediately preceding it had been developing with regularity and had displayed a vitality which seemed to be full of promise. It was supported by a large array of capable workers; it had gained the

widest recognition from the public; and it was curiously free from those internal conflicts which diminish the strength of an appeal for popular apprecia- tion. There were then few sharp divergences or subdivisions of an important kind. The leadership of the Royal Academy was generally conceded, and its relations with the mass of outside artists were little wanting in cordiality. One of the chief reasons for this understanding was that at this time an almost unprecedented approval was enjoyed by nearly all classes of painters. Picture-collecting had become a general fashion, and even the youngest workers received encouragement directly they gave evidence of a reasonable share of capacity. The demand was equal to the supply; and though the number of men who were adopting the artistic profession was rapidly increasing, there seemed little danger of over-production. Pictorial art had established upon all sorts of people a hold too strong, as it seemed, to be affected by change of fashion. All pointed in the direction of a permanent prosperity.

Subsequent events provided a curious commentary on the anticipations which were reasonable enough in 1875. That year is now seen to have been, not the beginning of an era of unexampled success for British pictorial art, but rather the culminating point of preceding activity. During the period which has succeeded we have witnessed a rapid decline in the

popular interest in picture-painting and a marked alteration in the conditions under which artists have had to work. In the place of the former sympathy between the public and the producers, there grew up something which almost approached indifference to their best and sincerest efforts. Simultaneously there developed a great amount of internal dissension and of antagonism between different sections of the art community. As an effect of these two causes, a new set of circumstances came into existence, and the aspect of the British school under- went a radical change. Many art workers found other ways of using their energies. The slackening of the popular demand inclined them to experiment, and to test forms of practice which formerly were not accorded serious attention, and it led to the formation of detached hostile groups of artists always ready to contend over details of technical procedure. Restlessness became the dominant characteristic of the British school, along with some intolerance of the popular lack of sympathy.

The first sign of the coming change appeared very soon after 1875. The right of the Royal Academy to define and direct the policy of the British school was disputed in 1877, when the Grosvenor Gallery was started ” with the arosvenor intention of giving special advantages of

exhibition Gallery to artists of established reputation, some of whom Academy. have previously been imperfectly known to the public." This exhibition gallery was designed not so much as a rival to the Academy, as to provide a place where could be collected the works of those men who did not care to make their appeal to the public through the medium of a large and hetero- geneous exhibition. As a rallying place for the few unusual painters, standing apart from their fellows in conviction and method, it had good reason for existence; and that it was not regarded at Burlington House as a rival was proved by the fact that among the contributors to the first exhibition were included Sir Francis Grant, the President of the Royal Academy, and such artists as Leighton, Millais, G. F. Watts, Alma-Tadema, G. D. Leslie and E. J. Poynter, who were at the time Academicians or Associates. With them, however, appeared such men as Burne- Jones, Holman Hunt, Walter Crane, W. B. Richmond and J. McN. Whistler, who had not heretofore obtained the publicity to which they were entitled by the exceptional quality and intention of their work. There was doubtless some sugges- tion that the Academy was not keeping touch with the more important art movements, for shortly after the opening of the Grosvenor Gallery there began that attack upon the official art leaders which has been one of the most noteworthy incidents in recent art history in Great Britain. The initial stage of this conflict ended about 1886, when the vehemence of the attack had been weakened, partly by the withdrawal of some of the more prominent " outsiders," who had meanwhile been elected into the Academy, and partly by the formation of smaller societies, which afforded the more " advanced " of the younger men the opportunities which they desired for the exposition of their views. In a modified form, however, the antagonism between the Academy and the outsiders has continued. The various protesting art association continues to work in most matters independently of one another, with the common belief that the dominant influence of Burlington House is not exercised entirely as it should be for the promotion of the best interests of British art, and that it maintains tradition as against the development of individualism and a " new style."

The agitation in all branches of art effort was not entirely without result even inside Burlington House. Some of the older academic views were modified, and changes seriously discussed, which formerly would have been rejected as opposed to all the traditions of the society. Its calmness under attack, and its ostentatious disregard of the demands made upon it by the younger and more strenuous outsiders, have veiled a great deal of shrewd observation of passing events. It may be said that the Academy has known when to break up an

organization in which it recognized a possible source of danger, by selecting the ablest leaders of the opposition to fill vacancies in its own ranks; it has given places on its walls to the works of those

reformers who were not unwilling to be represented in the annual exhibitions; and it has, without seeming to yield to clamour, responded perceptibly to the pressure of professional opinion. In so doing, though it has not checked the progress of the changing fashion by which the popular liking for pictorial art has been diverted into other channels, it has kept its hold upon the public, and has not to any appreciable extent weakened its position of authority.

It is doubtful whether a more definite participation by the Academy in the controversies of the period would have been of Changed anv use as a means °f prolonging the former good Conditions relations between artists and the collectors of works of British of art. The change is the result of something more ‘*’*• than the failure of one art society to fulfil its entire

mission. The steady falling off in the demand for modern pictures has been due to a combination of causes which have been powerful enough to alter nearly all the conditions under which British painters have to work. For example, the older collectors, who had for some years anterior to 1875 bought up eagerly most of the more important canvases which came within their reach, could find no more room in their galleries for further additions; a’gain, artists, with the idea of profiting to the utmost by the keenness of the competition among the buyers, had forced up their prices to the highest limits. But the most active of all causes was that the younger generation of collectors did not show the same inclination that had swayed their predecessors to limit their attention to modern pictorial art. They turned more and more from pictures to other forms of artistic effort. They built themselves houses in which the possibility of hanging large canvases was not contemplated, and they began to call upon the craftsman and the decorator to supply them with what was necessary for the adornment of their homes. At first this modification in the popular taste was scarcely perceptible, but with every successive year it became more marked in its effect.

Latterly more money has been spent by one class of collectors upon pictures than was available even in the best of the times which have passed away; but this lavish expenditure has been devoted not to the acquisition of works by modern men, but to the purchase of examples of the old masters. Herein may often be recognized the wish to become possessed of objects which have a fictitious value in consequence of their rarity, or which are ” sound investments.” Evidence of the existence of this spirit among collectors is seen in the prevailing eagerness to acquire works which inadequately represent some famous master, or are even ascribed to him on grounds not always credible. The productions of minor men, such as Henry Morland, who had never been ranked among the masters, have received an amount of attention quite out of proportion to what merits they possess, if only they can be proved to be scarce examples, or historically notorious. All this implies in the creed of the art patron a change which has necessarily reacted on living painters and on the conditions of their art production.

These, then, are the conclusions to which we are led by a comparison of the movements which affected the British school

between 1875 and the beginning of the 20th century. ‘To a wide appreciation of all types of pictorial art succeeded a grudging and careless estimate of the value of the bulk of artistic endeavour. Only a few branches of production are still encouraged by anything approaching an efficient demand. Portraiture is the mainstay of the majority of the figure painters; it has never lost its popularity, and may be said to have maintained satisfactorily its hold upon all classes of society, for the desire to possess personal records is very general and is independent of any art fashion. It has persisted through all the changes of view which have been increasingly active in recent years. Episodical art, illustrating sentimental

motives or incidents with some touch of dramatic , A rf* action, has remained popular, because it has some

degree of literary interest; but imaginative works and pictures which have been produced chiefly as expressions of an

Portraiture. ,

original regard for nature, or of some unusual conviction as to technical details, have found comparatively few admirers. The designers, however, and the workers in the decorative arts have found opportunities which formerly were denied to them. They have had

more scope for the display J-™ raiive of their ingenuity and more inducement to exercise their powers of invention. A vigorous and influential school of design developed which promised to evolve work of originality and excellence. British designers gained a hearing abroad, and earned emphatic approval in countries where a sound decora- tive tradition had been maintained for centuries.

The one dominant influence, that of the Pre-Raphaelite Brotherhood, which in the ‘fifties was altering the whole com- plexion of British art, had begun to wane early in Wane of the ‘seventies, and it was rapidly being replaced pre- by another scarcely less distinctive. The younger #f p * ae/ ” rf generation of artists had wearied, even before 1875, /?/ seo / of the pre-Raphaelite precision, and were impatient French of the restrictions imposed upon their freedom of to/frKuice. technical expression by a method of practice which required laborious application and unquestioning obedience to a rather formal code of regulations. They yearned for greater freedom and boldness, and for a better chance of asserting their individual capacities. So they gave way to a strong reaction against the creed of their immediate predecessors, and cut themselves deliberately adrift.

With the craving of young artists for new forms of technique came also the idea that the ” old-master traditions ” were opposed to the exact interpretation of nature, and were based too much upon convention to be adapted for the needs of men who believed that absolute realism was the one thing worth aiming at in picture-production. So Paris instead of Rome became the educational centre. There was to British students, dissatisfied with the half-hearted and imperfect systems of teaching with which they were tantalized at home, a peculiarly exhilarating atmosphere in the French studios — an amount of enthusiasm and a love of art for its own sake without parallel elsewhere. They saw in operation principles which led by the right sequence of stages to sure and certain results. In these circumstances they allowed their sympathies with French methods to become rather exaggerated, and were somewhat reckless in their adoption of both the good and bad qualities of so attractive a school.

At first the results of this breaking away from all the older educational customs were not wholly satisfactory. British students came back from France better craftsmen, stronger and sounder draughtsmen, more skilful manipulators, and with an infinitely more correct appreciation of refinements of tone- management than they had ever possessed before; but they brought back also a disproportionate amount of French manner- ism and a number of affectations which sat awkwardly upon them. In the first flush of their conversion they went

further than was wise or necessary, for they changed their motives as well as their methods. The quietness of subject and reserve of manner which had been hitherto eminently characteristic of the British school were abandoned for foreign sensationalism and exaggeration of effect. An affectation of extreme vivacity, a liking for theatrical suggestion, even an inclination towards coarse presentation of unpleasant incidents from modern life — all of which could be found in the paintings of the French artists who were then recognized as leaders — must be noted as importations from the Paris studios. They were the source of a distinct degeneration in the artistic taste, and they introduced into British pictorial practice certain unnatural tendencies. Scarcely less evident was the depreciation in the instinctive colour-sense of British painters, which was brought about by the adoption of the French habit of regarding strict accuracy of tone-relation as the one important thing to aim at. Before this there had been a preference for rich and sumptuous har- monies and for chromatic effects which were rather compromises with, than exact renderings of, nature; but. as the foreign influence grew more active, these pleasant adaptations, inspired

by a sensuous love of colour for its own sake, were abandoned for more scientific statements. The colder and cruder tone- studies of the modern Frenchman became the models upon which the younger artists based themselves, and the standards against which they measured their own success. ” Actuality ” was gained, but much of the poetry, the delicacy, and the subtle charm which had distinguished British colourists were lost.

For some while there was a danger that the art of Great Britain might become- hybrid, with the French strain predomi- Daager of nating. So many students had succumbed to the the French fascination of a system of training which seemed to Influence. SU ppiy them with a perfect equipment on all points, that they were inclined to despise not only the educational methods of their own country, but also the inherent charac- teristics of British taste. The result was that the exhibitions were full of pictures which presented English people and English landscape in a purely arbitrary and artificial manner, strictly in accordance with a French convention which was out of sympathy with British instincts, and indeed, with British facts. Ultimately a

discreet middle course was found between the extreme application of the science of the French art schools and the comparative irresponsibility in technical matters which had so long existed in the British Isles. In the careers of men like Stanhope Forbes, H. S. Tuke, Frank Bramley, and other prominent members of the school, many illustrations are pro- vided of the way in which this readjustment has been effected. Their pictures, if taken in a sufficiently long sequence, summarize instructively the course of the movement which became active about 1875. They prove how valuable the interposition of France has been in the matter of artistic education, and how much Englishmen have improved in their understanding of the technique of painting.

One noteworthy outcome of the triumph of common sense over fanaticism must be mentioned. Now that the exact Weakening relation which French teaching should bear to British of the thought has been adjusted, an inclination to revive F .”.f cb the more typical of the forms of pictorial expression

which have had their vogue in the past is becoming increasingly evident. Picturesque domesticity is taking the place of theatrical sensation, the cfesire to select and represent what is more than ordinarily beautiful is ousting the former preference for what was brutal and ugly, the effort to please is once again stronger than the intention to surprise or shock the art lover. Even the Pre-Raphaelite theories and practices are being reconstructed, and quite a considerable group of young artists has sprung up who are avowed believers in the principles which were advocated so strenuously in 1850.

To French intervention can be ascribed the rise and progress of several movements which have had results of more than Groups ordinary moment. There was a few years ago much within the banding together of men who believed strongly in ?f’ Us * the importance of asserting plainly their belief in

the doctrines to which they had been converted abroad; and as a consequence ot this desire for an offensive and defensive association, many detached groups were formed within the boundaries of the British school. Each of these groups had some peculiar tenet, and each one had a small orbit of its own in which it revolved, without concerning itself overmuch about what might be going on outside. Roughly, there were three classes into which the more thoughtful British artists could then be divided. One included those men who were in the main French in sympathy and manner; another consisted

of those who were not insensible to the value of the foreign training, but yet did not wish to surrender entirely their faith in the British tradition; and the third, and smallest, was made up of a few individuals who were independent of all assistance from without, and had sufficient force of character to ignore what was going on in the art world. In this third class there was practi- cally no common point of view: each man chose his own direction and followed it as he thought best, and each one was prepared to stand or fall by the opinion which he had formed as to the true

function of the painter. Necessarily, in such a gathering there were several notable personalities who may fairly be reckoned among the best of English modern masters.

Perhaps the most conspicuous of the groups was the gathering of painters who established themselves in the Cornish village of Newlyn (q.v.). This group— ” The Newlyn School,” as Tne Newlvn it was called — was afterwards much modified, and school. many of its most cherished beliefs were considerably altered. In its beginning it was essentially French in atmo- sphere, and advocated not only strict adherence to realism in choice and treatment of subject, but also the subordination of colour to tone-gradation, and the observance of certain technical details, such as the exclusive use of flat brushes and the laying on of pigments in square touches. The colony was formed, as it were, in stages; and as the school is to be reckoned in the future history of the British school, the order in which the adherents arrived may here be set on record. Edwin Harris came first, and was joined by Walter Langley. Then, in the following order, came Ralph Todd, L. Suthers,.Fred Hall, Frank Bramley and T. C. Gotch, and Percy Craft and Stanhope Forbes together. H. Detmold and Chevallier Tayler next arrived; then Miss Elizabeth Armstrong (Mrs Stanhope Forbes), F. Bourdillon, W. Fortescue and Norman Garstin. Ayerst Ingram, H. S. Tuke, H. Martin and F. Millard were later visitors. Stanhope Forbes (b. 1857) was trained at the Lambeth School and at the Royal Academy, and afterwards in Bonnat’s studio in Paris. His best known pictures are ” A Fish Sale on a Cornish Beach ” (1885), ” Soldiers .and Sailors ” (1891), ” Forging the Anchor ” (1892), and ” The Smithy ” (1895). He was elected A.R.A. in 1892, and became full Member in 1910. Frank Bramley (b. 1867) studied art in the Lincoln School of Art and at Antwerp. He gained much popularity by his pictures, ” A Hopeless Dawn ” (1888), ” For of such is the Kingdom of Heaven ” (1891), and ” After the Storm ” (1896), and was elected an Associate in 1894. Of ‘ate years he had made a very definite departure from the technical methods which he followed in his earlier period. T. C. Gotch (b. 1854) had a varied art training, for he worked at the Slade School, then at

Antwerp, and finally in Paris under Jean Paul Laurens. He did not long remain faithful to the Newlyn creed, but diverged about 1890 into a kind of decorative symbolism, and for some years devoted himself entirely to pictures of this type. The other men who must be ranked as supporters of the school adhered closely enough to the principles which were exemplified in the works of the leaders of the movement. They were faithful realists, sincere observers of the facts of the life with which they were brought in contact, and quite earnest in their efforts to paint what they saw, without modification or idealization.

Another group which received its inspiration directly from France was the Impressionist school (see Impressionism). This group never had any distinct organization like that of fhelm- the French Soci6t6 des Impressionistes, but among the preS slonlst members of it there was a general agreement on points sc noo ˆ of procedure. They basecf themselves, more or less, upon prominent French artists like Manet, Renoir, Pissarro, and Claude Monet, and owed not a little to the example of J. A. M'N. Whistler, whose own art may be said to be in a great measure a product of Paris. One of the fundamental principles of their practice was the subdivision of colour masses into their component parts, and the rendering of gradated tints by the juxtaposition of touches of pure colour upon the canvas, rather than by attempting to match them by previously mixing them on the palette. In pictures so painted greater luminosity and more subtlety of aerial effects can be obtained. The works of the British Impressionists have been seen mostly in the exhibitions of the New English Art Club. This society was founded in 1885 by a number Tne New of young artists who wished for facilities for exhibition English which they felt were denied to them in the other Art CIub- galleries. It drew the greater number of its earlier supporters from the men who had been trained in foreign schools, and a complete list of the contributors to its exhibitions includes the names of many of the best known of the younger painters. It was the meeting-place of numerous groups which advocated one or other of the new creeds, for among its members or exhibitors have been P. Wilson Steer, Fred Brown, J. S. Sargent (?.».), Solomon J. Solomon, Stanhope Forbes, T. C. Gotch, Frank Bramley, Arthur Hacker, Francis Bate, Moffat Lindner, J. L. Henry, W. W. Russell, George Thomson, Arthur Tomson, Henry Tonks, C. W. Furse, R. Anning Bell, Walter Osborne, Laurence Housman, J. J. Shannon, W. L. Wyllie, H. S. Tuke, Maurice Greiffenhagen, G. P. Jacomb Hood, Alfred Parsons, Alfred East, J. Buxton Knight, C. H. Shannon, Mark Fisher, Walter Sickert, W. Strang, Frank Short, Edward Stott, Mortimer Menpes, Alfred Hartley, William Stott, J. R. Reid, Mouat Loudan, T. B.

Kennington, H. Muhrman, A. D. Peppercorn, George Clausen and J. A. M'N. Whistler, and a number of the Scottish artists, like J. Lavery, J. Guthrie, George Henry, James Paterson, A. Roche, E. A. Walton, J. E. Christie and E. A. Hornel. A number of the men who have been more or less actively identified with it have been elected members of the Royal Academy, so that it may fairly claim to have exercised a definite influence upon the tendencies of modern art. It has certainly

done much to prove the extent of the foreign influence upon the British school.

In its wider sense the Impressionist school may be said to include now all those students of nature who strive for the representation of broad effects rather than minute details, who look at the subject before them largely and comprehensively, and ignore all minor matters which would be likely to interfere with the simplicity of the pictorial rendering. To it can be assigned a number of artists who have never adopted, or have definitely abandoned, the prismatic analysis of colour advocated by the French Impres- sionists. These men were headed by J. A. M'N. Whistler (§.!>.), born in America in 1834, and trained in Paris under Gleyre. His pictures have always been remarkable for their beauty of colour combina- tion, and for their sensitive management of subtleties of tone. They gained for the artist a place among the chief modern executants, and have attracted to him a host of followers. Other notable painters who have places in the school are Mark Fisher, an American landscape painter who studied for a while in Gleyre's studio, one of the ablest interpreters in England of effects of sun- light and breezy atmosphere; A. D. Peppercorn, a pupil of Ger6me, who makes landscape a medium for the expression of a dignified sense of design and a carefully simplified appreciation of contrasts of tone; and P. Wilson Steer, an artist whoˆbegan as a follower of Monet, and based upon his training in the Ecole des Beaux Arts a style of his own, which he displays effectively in both landscapes and figure pictures.

The International Society of Sculptors, Painters, and Gravers, inaugurated in 1898,. although not by its nature confined to British _. art and artists, who compose little more than half of

The Inter- ˆ e e l ec t rate, has its home in London. It succeeds in national j tg j,j ect f se tting before the British public the most e y ‘ modern and eccentric expressions of the art of the chief European countries. Its exhibitions are striking and the con- tributions for the most part serious and interesting; but while the freedom of the artist is insisted on it is doubtful if the more exag- gerated displays by rebellious painters and sculptors have had much influence on the native school. The presidents have been J. A. M’N. Whistler and Auguste Rodin, and the vice-presidents John Lavery and William Strang: these personalities, considered along with their views and their vigour, sufficiently indicate the spirit and the politics of the society.

Generally speaking, the very large class of artists who fell only

to a limited extent under the spell of French teaching includes

most of the figure and landscape men and practically

Pi”t e w h°’ e °f tne portrait painters. In all sections of

” ers ‘ figure painting individual workers in improved techni- cal methods have appeared, but most of them have gradually’ lost their distinguishing peculiarities of manner, and have year by year assimilated themselves more closely to their less advanced brethren. The section in which their energetic propagandism has been most effective is certainly that of imaginative composition. A definite mark has been made there by men like S. J. Solomon (b. i860; A.R.A. 1896; R.A. 1906),, trained at the Royal Academy, the Munich Academy and the Ecole des Beaux Arts in Paris, and widely known by such pictures as ” Samson ” (1887), ” The Judgment of Paris” (1890) and the “Birth of Love” (1895); and Arthur Hacker (b. 1858; A.R.A. 1894; R.A. 1910), educated at the Academy and in Bonnat’s studio, and the painter of a con- siderable series of semi-historical and symbolical canvases. They exercised a considerable influence upon their contemporaries, and introduced some new elements into the later practice of the school. At the same time admirably effective work has been done in this section and others by many painters who have kept much more closely in touch with the older type of aesthetic belief, and have not associated themselves openly with any of the newer movements. Among the more prominent of these figure painters there are, or have been, some excellent craftsmen, whose con- tributions to the record of native British art can be accepted as full of permanent interest. In the school of historical incident good work was done by Sir John Gilbert (1817-1897; R.A. 1876), a robust and ingenious

illustrator of romantic motives, with a never-failing capacity for picturesque invention; John Pettie (1839-1893; R.A. 1873), a fine colourist and a clever manipulator, whose scenes from the life of past centuries were full of rare vitality; P. H. Calderon (1833-1898; R.A. 1867), a graceful and sincere artist not wanting in originality; and H. Stacy Marks (1829-1898; R.A. 1879), who treated medieval motives with a touch of real humour. Besides these, there are Sir J. D. Linton (b. 1840), who has produced noteworthy compositions in oil and water colours; Frank Dicksee (b. 1853; A.R.A. 1881; R.A. 1891), who has gained wide popularity by pictures in which romance and sentiment are combined in equal proportions; A. C. Gow (b. 1848; R.A. 1881), whose “Cromwell at Dunbar” (1886), “Flight of James II. after the Battle of the Boyne ” (1888), and ” Crossing the Bidassoa ” (1896) may be noted as typical examples of his performance; J. Seymour Lucas (b. 1849; A.R.A. 1886; R.A. 1898), trained at the Royal Academy Schools, and a brilliant painter of what may be called the by-play of history; W. Dendy Sadler (b. 1854), trained partly in London and partly at Dusseldorf, and well known by his quaintly humorous renderings

of the lighter side of life in the olden times ; G. H. Boughton (born in England, but educated first in America and afterwards in Paris; A.R.A. 1879; R.A. 1896), a specialist in paintings of old and modern Dutch subjects; the Hon. John Collier (b. 1850), trained at the Slade School, at Munich, and in Paris, and a capable painter both of the nude figure and of costume; and Edwin A. Abbey, an American (b. 1852), educated at the Pennsylvania Academy of the Fine Arts. Abbey came to England in 1876 with a great reputation as an illustrator, and did not begin to exhibit oil pictures until 1890; he was elected an Academician in 1898. Then there are to be noted classicists like Lord Leighton, Sir L. Alma-Tadema, and Sir E. J. Pointer’s students of the East like Frederick Goodall (b. 1822; A.R.A. 1853; R.A. 1863; d. 1904), and idealists like Sir W. B. Richmond, K.C.B.; R.A. 1895 — all of whom have done much to uphold the reputation of the British school for strength of accomplishment and variety of motive.

The painters of sentiment have in the main adhered closely to the tradition which has been handed down through successive generations. Among these may be noted Marcus Stone „ (b. 1840), elected an Academician in 1887, an original ™nters of artist whose dainty; fancies are familiar to students of s ^” timeaU modern art. His pictures nearly all appeared in the exhibitions of the Royal Academy. Another popular artist is G. D. Leslie (b. 1835), elected an Associate in 1868 and an Academician in 1876, who has been responsible for a number of domestic old-world subject- pictures remarkable for

freshness of treatment and delicacy of feeling. The list may also be held to include Henry Woods (b. 1846; A.R.A. 1882; R.A. 1893), and since 1877 a painter of scenes from Venetian life; R. W. Macbeth (b. 1848; A.R.A. 1883; R.A. 1903), whose elegant treatment of rustic subjects displays a very attractive individuality. Among the painters of sentiment should also be included Sir Luke Fildes.(b. 1844), educated at the South Kensington and Royal Academy Schools, elected an Academician in 1887, the painter of such famous pictures as ” The Casual Ward ” (1874), ” The Widower ” (1876), ” The Return of the Penitent ” (1879), and ” The Doctor ” (1892); and Sir Hubert von Herkomer, C.V.O. (b. 1849; A.R.A. 1879; R-A. 1890; knighted 1907), famous not only by his many memorable can- vases and by his extraordinary versatility in the arts, but also as a teacher and a leader in a number of educational movements.

Not many military pictures of high merit have been produced during the period. The artists, indeed, who occupy themselves with this class of art are not numerous, and they mostly devote their energies to illustrative pictures p , fP’ rather than to large canvases. Lady Butler (nee Ha ”’ tla 8- Elizabeth Thompson), whose ” Roll Call,” exhibited in 1874, brought her instant popularity, continued to paint subjects of the same type, among which ” Quatre Bras ” (1875), ” The Defence of Rorke’s Drift ” (1881), ” The Camel Corps ” (1891) and ” The Dawn of Waterloo ” (1895) are perhaps the most worthy of record. Ernest Crofts (b. 1847; A.R.A. 1878; R.A. 1896), trained in London and Dusseldorf, has taken a prominent position by such pictures as “Napoleon at Ligny ” (1875), “Napoleon leaving Moscow” (1887), “The Capture of a French Battery by the 53rd Regiment at Waterloo ” (1896), and by many similar representations of historical battles. Occasional pictures have come also from A. C. Gow, R. Caton Woodville, W. B. Wollen, J. P. Beadle, John Charlton, and a few more men who are better known by their work in other directions.

The number of artists who have devoted the greater part of their energies to portraiture has been steadily on the increase. Most of the men who have taken definite rank among„ rf .. the figure painters have made reputations by their ° ˆa ” Bre • portraits also, but there are many others who have kept almost exclusively to this branch of practice. Into the first division come such noted artists as Sir John Millais, Sir E. J. Poynter, G. F. Watts, Sir Luke Fildes, Sir Hubert von Herkomer, Sir L. Alma-Tadema, Sir W. B. Richmond, Seymour Lucas, the Hon. John Collier, S. J. Solomon, Arthur Hacker, Sir W. Q. Orchardson, J. A. M’N. Whistler, Frank Dicksee, Stanhope Forbes, Frank Bramley, H. S. Tuke, T. C. Gotch, P. W. Steer, John Bacon and Frank Holl. In the second must be reckoned J. S. Sargent (A.R.A. 1894;

R.A. 1897), an American citizen (b. 1856), a pupil of Carolus Duran, who after 1885 was recognized as one of the most brilliant painters of the day; J. J. Shannon, also an American (b. 1862), trained at the South Kensington School, and elected an Associate in 1897, a graceful and accomplished artist, with a sound technical method and a delightful sense of style ; A. S. Cope (b. 1857), trained in Paris, and elected an Associate in 1899, who carries on soundly the better traditions of the British school; James Sant (b. 1820), elected an Academician in 1870, a strong favourite of the public throughout a long career; W. W. Ouless (b. 1848; A.R.A. 1877; R.A. 1881), trained in the Royal Academy Schools, an industrious and prolific worker; H. T. Wells (b. 1828; A.R.A. 1866; R.A. 1870), trained in London and Paris, who produced a long series of portraits and portrait groups, and many miniatures; W. Llewellyn (b. i860), educated at the South Kensington Schools and in Cormon's studio in Paris, an able draughtsman and a thorough executant; C. W. Furse (q.v.), trained

first in the Slade School under Professor Legros and afterwards in Paris, whose early death removed a master of his art ; and others like Walter Osborne, Richard Jack, Glyn Philpot and Gerald Kelly. In the class of figure painters, who are individual in their work, and owe little or nothing to the suggestions of foreign teachers, a number of artists can be enumerated who have in common little besides a sincere desire to express their personal conviction ..... . in their own way. Among them are some of the

v " most distinguished of modern artists, who stand out Painters as * e unquestioned chiefs of the school. Sir John Millais occupies a place in this group by virtue of his admirable pictorial work, and with him are W. Holman Hunt, Dante Gabriel Rossetti, G. F. Watts, Sir Edward Burne- Jones, Albert Moore and Ford Madox Brown, each one of whom may be regarded as a leader. There are also J. M. Strudwick (b. 1849), R. Spencer Stanhope (d. 1908) and Evelyn de Morgan, followers of Burne-Jones, and J. W. Waterhouse (A.R.A. 1885; R.A. 1895), in many ways the most original and inspired of English imaginative painters; and, again, M. Greiffenhagen, F. Cayley Robinson and Mrs Swynnerton. Into this class come also the decorative painters, Walter Crane _ ., (b. 1845), a prolific illustrator and picture-painter and

Decorative t j lg p ro(j ucer f an extraordinary amount of work in Painters. a jj branches f decoration; Frank Brangwyn, whose pictures and designs are marked by fine qualities of execution and by much sumptuousness of colour; and several others, like H. J. Draper, Harold Speed, R. Anning Bell, Gerald Moira and G. Spencer Watson. As a branch of the decorative school, a small group of artists who have revived the practice of tempera-painting must also be noted. It includes Mrs Adrian Stokes, J. D. Batten, J. E. Southall, Arthur Gaskin, and a few others with well-marked decorative tendencies.

During recent years a movement has begun which apparently aims at the revival of Pre-Raphaelitism. It is headed by a few young artists, whose methods show a mingling Thejvew together of the precision of the 19th-century Pre- „ ” ... Raphaelites and a kind of decorative formality. The School e most influential of the artists concerned in the formation of this new school is J. Byam Shaw (b. 1872), whose originality and quaintness of fancy give to his pictures a more than ordinary degree of persuasiveness. A strong colourist and an able draughtsman, he possesses in a high degree the faculty of imaginative expression, allied with humour that never degenerates into farce. His strongest preference is for symbolical subjects which embody some moral lesson. Other prominent members of the group are F. Cadogan Cowper (A.R.A. 1907) and Miss Eleanor Fortescue- Brickdale, who is in manner much like Byam Shaw, but yet does not sink her individuality in mere imitative effort.

The painters of landscapes and sea-pictures have for the most part been little affected by the unrest which has caused so many new departures in figure-work. A love of nature has Landscape a [wa y S been one of the best British characteristics, a n ers. anc j ˆ j lag p rove(j itself to be strong enough to keep those artists who seek their inspiration out of doors from falling to any great extent under the control of particular technical fashions. Therefore there is in the school of ” open-air ” painting little evidence of any change in point of view, or of the growth of any modern feeling at variance with that by which masters of landscape were swayed a century or more ago. Impressionism has gained a few adherents, and the French Barbizon school — itself created in response to a suggestion from England — has reacted upon a section of the younger artists. But, on the whole, in this branch of art the British school has gained in power and confidence, without surrendering that sturdy independence which in the past produced such momentous results. The absence of any common convention, or of any set pattern of landscape which would lead to uniformity of effort, has left the students of nature free to express themselves in a personal way. The most devout believers in

the value of French training, and in the infallibility of the dogmas which emanate from the Paris studios, have not, except in rare instances, demanded any radical remodelling of the British landscape school on French lines, as local conditions affecting the practice of this branch of art make impossible all drastic alterations. Most workers in the front rank can claim to be judged on individual merits, and not as members of a particular coterie. Still, it is convenient to divide the members of the landscape school into such classes as realists, romanticists and subjective painters of landscape.

Among the most notable of the first class are H. W. B. Davis (b. 1883; A.R.A. 1873; R.A. 1877), the painter of a long series of „ .. .. dainty scenes which suggest happily the charm of L * d ane rura ‘ England; Peter Graham, elected an Academician

” sc in 1 88 1, who has alternated for the greater part of his working life between Scottish moorland subjects, with cattle wandering on bare hillsides and pictures of coast scenery, with sea-gulls perched on dark rocks; David Murray (b. 1849; A.R.A. 1891 ; R.A. 1905), an artist whose career has been marked by consistent effort to interpret nature’s suggestions with dignity and intelligence; Sir Ernest A. Waterlow (b. 1850; A.R.A. 1890; R.A. 1903), trained in the Royal Academy and afterwards President of the Royal Society of Painters in Water-Colours, a graceful painter, with a tender colour feeling and an excellent technical style; Yeend

King (b. 1855), trained partly in England, and partly in Paris under Bonnat and Cormon, a sound craftsman who made a reputation by landscapes in which are introduced groups of figures on a fairly important scale; Alfred Parsons (b. 1847), elected an Associate in 1897, who paints rich river scenery with careful regard for actuality and with much minuteness and exquisiteness of detail, especially in the rendering of flowers; and Frank Walton (b. 1840), who chooses, as a rule, landscape motives which enable him to display unusual

Cowers of accurate draughtsmanship. To the same class of realists elonged Vicat Cole, R.A.; Birket Foster, J. W. Oakes, A.R.A.; Keeley Halswelle, and perhaps Alfred W. Hunt, though in his case realism was tempered by a delicate poetic imagination.

The romanticists and pastoral painters have in many cases been perceptibly affected by the example of the Barbizon school, but they owe much to such famous Englishmen as Cecil Lawson, John Linnell (both of whom died in 1882), George > < f antlc Mason (A.R.A. 1868; d. 1872) and Frederick Walker „ , . (A.R.A. 1871; d. 1875). The

most prominent later Pastoral member of the group is, perhaps, Sir Alfred East a " ers ' (b. 1849), trained first in the Glasgow School of Art and after- wards in Paris, elected an Associate in 1899, a painter endowed with an exceptional faculty for suggesting the poetry of nature and with an admirable sense of decorative arrangement; but there are, besides, Leslie Thomson (b. 1851), whose art is especially sound and sincere; J. Aumonier, a pastoral painter with very refined appreciation of subtleties of aerial colour; C. W. Wyllie, a painter of delicate vision and charm of presentation; J. S. Hill, whose sombre landscapes are distinguished in design and impressive in their depth of tone; R. W. Allan (b. 1852), who uses a robust technical method with equal skill in landscapes and coast sub- jects; J. Buxton Knight (b. 1842; d. 1908), a vigorous manipulator, with a liking for rich harmonies and low tones; Joseph Knight (b. 1838; d. 1909), whose well drawn and broadly painted pictures in oil and water-colour have been for many years appreciated by lovers of unaffected nature; Lionel P. Smythe (A.R.A. 1898), a colourist who handles exquisitely the most delicate atmo- spheric effects and is unusually successful in his rendering of diffused daylight; J. W. North (A.R.A. in 1893), a painter of fanciful landscapes in which definition of form is subordinated to modulations of decorative colour ; Claude Hayes, who studied in the Royal Academy Schools, and carried on the tradition established by David Cox and his contemporaries; J. L. Pickering, a lover of dramatic light-and-shade contrasts and a student of romantic moun- tain scenery; A. D. Peppercorn, who gives breadth and dignity with sombre colour and delicate gradation of tone; Adrian Stokes (b. 1854; A.R.A. 1910) and M. Ridley Corbet (who died in 1902, only a few months after his election as an Associate of the Royal Academy), a classicist in landscape, in whose pictures can be perceived a definite reflection of the teaching of Professor Costa, the Italian master. There must also be noted, as leaders among the pastoral painters, George Clausen (b. 1852), trained first in the South Kensington School and afterwards in Paris under Bouguereau and Robert- Fleury, and elected an Associate in 1895 and R.A. in 1908, who began as a strict realist and afterwards developed into a rustic idealist; H. H. La Thangue, trained in the Royal Academy Schools and in Paris, elected an Associate in 1898, an artist of amazing technical vigour and an uncompromising interpreter of rural subjects; Edward Stott (A.R.A. 1906), trained in Paris under Carolus Duran and Cabanel, who paints delicately the more poetic aspects of the life of the fields; J. Arnesby Brown (b. 1866; A.R.A. 1903) ; Oliver Hall, Albert Goodwin, A. Friedenson and others.

The painters of landscape subjectively considered, who conventionalize nature with the idea of giving to their pictures a kind of

sentimental as distinguished from emotional sug- hlecil gestion, are most strikingly represented by B. W. ° ulr ‘^ ct ve Leader _ (b. 1831), trained in the Worcester School Lanasca P e – of Design and in the Royal Academy Schools, and elected an Academician in 1898. He became a strong favourite of the public, and his academic and precise technical methods were widely admired by the many people who are not satisfied with unaffected transcriptions of natural scenes and of the passion of nature.

In marine painting no one has appeared to rival Henry Moore, perhaps the greatest student of wave-forms the world has seen; but good work has been done by the late Edwin „ . Hayes, an Irish painter, whose powers showed no sign „ ‘. “. e of failure up to his death in 1904, after some half- an ng ‘ century of continuous labour; W. L. Wyllie (b. 1851 ; A.R.A. 1889; R.A. 1907), trained in the Royal Academv Schools, who paints sea and shipping with intelligent understanding; T. Somerscales, a self- taught artist, with an intimate knowledge of the ocean derived from long actual experience as a sailor; and especially C. Napier Hemy (b. 1841; A.R.A. 1898 ;_ R.A. 1910), trained at the Antwerp Academy and in the studio of Baron Leys, a powerful manipulator, with a preference for the dramatic aspects of his subject. J. C. Hook (d. 1907), retained into old age the subtle qualities which made his pictures notable among the best productions of the British school. Mention must be made of John Brett (1830-1902; A.R.A. 1881), the one Pre-Raphaelite sea painter, and Hamilton Macallum

(1 841-1896), who painted rippling water in bright sunlight with delightful delicacy and charm of manner.

The school of animal painting is a small one, and includes only a few of marked ability. The chief members include Briton Riviere, (b. 1840; A.R.A. 1878; R.A. 1881), one of the most imaginative and inventive of living artists; J. M. Swan (1847-1910; A.R.A. 1894; R.A. 1905), trained first at Lambeth, and afterwards in Paris . under Gerfime and Fremiet, a skilful manipulator and a Painting, sensitive draughtsman, and especially remarkable for his

intimate understanding of animal character, mainly of the felidoe (see also Sculpture) ; J.T. Nettleship (1841-1902), trained chiefly in the

Slade School, whose studies of the greater beasts of prey are admirably sincere and well painted; Miss Lucy Kemp- Welch (b. 1869), trained in the Herkomer School at Bushey, who paints horses with unusual power; and John Charlton (b. 1849), trained in the South Kensington School, also well known by his pictures of horses and dogs.

There are local schools which claim attention because of the value of their contributions to the aggregation of British art. _„„ . The most active of these belong to the Scottish school, Schools. tne centres of Glasgow, Edinburgh, and Aberdeen,

which have produced some of the most distinguished British artists. The Royal Academy of London, indeed, with most of the other leading art societies, has been largely recruited from Scotland. There have been added to its modern roll the names of W. Q. Orchardson. Peter Graham, J. MacWhirter, J. Pettie, Erskine Nichol, T. Faed, David Murray, Colin Hunter, R. W. Macbeth, D. Farquharson, J. Farquharson, George Henry: all of them painters of well-established reputation; and there are many other well-known Scottish artists who have made London their headquarters, like Arthur Melville, a portrait and subject- painter and a masterly water-colourist ; E. A. Walton, who is equally successful with portraits, landscapes, and decorative com- positions; J. Coutts-Michie, who alternates between portraiture and landscapes of admirable quality; John Lorimer, who has exhibited a number of excellent subject-pictures and many fine portraits; T. Graham, an unaffected painter of sentiment, and a good colourist; Grosvenor Thomas, known best by his freely handled and expressive landscapes; T. Austen Brown, who paints semi-decorative pastorals with unusual vigour of statement; John Lavery, who has taken rank amongst the best of recent portrait painters; and Robert Brough, another portrait painter of vigour, with a subtle sense of colour, whose early and tragic death cut short a promising career. The most notable of the men who remained in Scotland include Alexander Roche, whose remarkable capacity has brought him many successes in portraiture, figure compositions, and decorative paintings on a large scale ; W. Y. MacGregor, a leader of the school of landscape painters, fine in style and a master of effect ; D. Y. Cameron, an admirable oil-painter and a famous etcher ; and Sir James Guthrie, P.R.S.A. well known for his excellent portraits; James Paterson, R. B. Nisbet and Robert Noble, all landscape painters of marked originality and sound technical method; W. McTaggart (d. 1910), the brilliant impressionist; E. A. Hornel and W. Hole, decorative painters who have produced many canvases remarkable for robust originality and rare breadth of treatment; W. Mouncey, a landscape painter who united the dignity of the Barbizon

school with a typically Scottish freedom of expression; and Sir George Reid, ex-P.R.S.A., one of the ablest and most distinguished of portrait painters.

The water-colour painters can fairly be said to have kept unchanged the essential qualities of their particular form of practice.

They have departed scarcely at all from the executive Colour, methods which have been recognized as correct for

nearly a century, but they have amplified them and have adapted them to a greater range of accomplishment, developing, it may be added, the " blottesque " or the accidental manner suggestive of summary decision. Latterly water-colour painting has come to rival oils in its application to all sorts of subjects ; and it is used now with absolute freedom by a very large number of skilful artists. Many of the men who have done the best work in this medium are known as oil painters of the highest rank; and among living workers the same capacity to excel in either mode of expression is by no means uncommon. There have been in recent times such masters as Sir John Gilbert, Sir E. Burne-Jones, Ford Madox Brown, Dante Gabriel Rossetti, A. W. Hunt, fl. G. Hine, Henry Moore, Albert Moore, C. E. Holloway, and perhaps should be included E. M. Wimperis, whose water-colours are at least as worthy of admiration as their oil pictures. As water-colourists, much credit is due to Sir E. J. Poynter for his landscapes, portraits, and figure drawings; Sir L. Alma-Tadema for his minutely detailed classic subjects; Sir J. D. Linton for his historical and romantic compositions; Sir E. A. Waterlow for his delicately expressive landscapes; Sir Hubert von Herkomer for his admirably handled figure subjects ; George Clausen for pastorals charming in sentiment and distinguished by fine qualities of colour; J. Aumonier, A. D. Peppercorn, J. S. Hill, J. W. North, Leslie Thomson, Frank Walton and R. W. Allan for landscapes of special excellence; E. J. Gregory (d. 1909), and Cadogan Cowper, for figure compositions painted with amazing sureness of touch; Alfred Parsons for land-scapes and flower studies; J. R. Reid, W. L. Wyllie, E. Hayes and

C. N. Hemy for sea and coast pictures; R. W. Macbeth, Claude Hayes and Lionel Smythe for rustic scenes with figures in the open air; J. M. Swan for paintings of animals; and G. H. Boughton for costume subjects and delicately poetic fancies. Besides, there is a long list of noteworthy painters whose reputations have been chiefly or entirely made by their successful management of water- colour, and into this list come Birket Foster, the head of the old- fashioned school of dainty rusticity ; Carl Haag, a wonderful manipu- lator, who occupied himself

almost exclusively with Eastern subjects ; Thomas Collier, A. W. Weedon, H. B. Brabazon, G. A. Fripp, P. J. Naftel, G. P. Boyce, Albert Goodwin, R. Thome- Waite, F. G. Cotman, Harry Hine, Clarence Whaite and Bernard Evans, whose landscapes show thorough understanding of nature and distinctive individuality of method ; Mrs Allingham, an artist of exquisite refinement, whose idealizations of country life have a more than ordinary degree of merit; Clara Montalba, an able painter of impressions of Venice; Kate Greenaway, unrivalled as an interpreter of the graces of child- hood, and endowed with the rarest originality; Mrs Stanhope Forbes, an accomplished executant of well-imagined romantic motives; and J. R. Weguelin, one of the most facile and expressive painters of fantastic figure subjects. By the aid of these artists, and many others of at least equal ability, such as J. Crawhall, J. Pater- son, R. Little, Edwin Alexander, Arthur Rackham and J. Walter West, traditions worthy of all respect have been maintained sincerely and with intelligent discrimination; and to their efforts has been accorded a larger measure of popular support than is bestowed upon any_ other form of pictorial production.

See Richard Muther, History of Modern Painting (Eng. ed., 1895); R. de la Sizeranne, English Contemporary Art (Eng. ed., ”” ; Ernest Chesneau, The English School of Painting (2nd Eng.

ed., 1885); Clement and Hutton, Artists of the 19th Century (Boston, U.S.A., 1885); David Martin and F. Newbery, The Glasgow School of Painting (1897); W. D. McKay, R.S.A., The Scottish School of Painting (London, 1906); E. Pinnington, George Paul Chalmers and the Art of his Time (1896); Gleeson White, The Master Painters of Britain (1897); E. T. Cook, A Popular Handbook to the National Gallery, vol. ii. (1901) ; J. E. Hodgson, R.A., Fifty Years of British Art (1887) ; A. G. Temple, Painting in the Queen’s Reign (1897) ; Cosmo Monkhouse, British Contemporary Artists (1899); G. R. Redgrave, •History of Water-Colour Painting in England 1750-188Q (1889). Also the Transactions of the National Association for the Advance- ment of Art (Liverpool, 1888; Edinburgh, 1889; and Birmingham, 1890); the magazines devoted to the arts; and the principal reviews, such as ” English Art in the Victorian Age ” {Quarterly Review, January 1898). The Year’s Art (1879-1910; ed. A. C. R. Carter) is an invaluable annual publication fully and accurately chronicling the art institutions and art movements in Great Britain. ‘ (M. H. S.)

France

The period between 1870 and the opening of the 20th century was singularly important in the history of France, and conse- quently of

her art. The internal life of the people developed on new lines with a vigour that left a deep mark on the outcome of mental effort. Literature was foremost in this new movement. The novels of Balzac, Zola, Flaubert, the brothers de Goncourt, Daudet, Guy de Maupassant and the plays of Alexandre Dumas fils, filled as they are with the scientific spirit and social atmo- sphere of the time, opened the eyes of the young generation to appreciation of the visible beauty and the spiritual poetry of the world around them, and helped them to view it with more attentive eyes, more insight and more emotion. The aim of art was also to emancipate itself, by the growing efforts of independent artists, from the slavery of tradition, and to devote itself to a more personal contemplation and knowledge of contem- porary life under every aspect. Modern French art tends to become more and more the art of the people — a mixture of naturalism and poetry, deriving its inspiration, by preference, from the world of the working man; no longer appealing only to a restricted and more or less fastidious public, but, on the contrary, adapting its aesthetic or moral teaching to popular apprehension. The whole past was not, of course, wiped out. The younger generation had to learn and profit by the lessons taught by their great precursors. To understand the true character of this recent development of French art it is needful, therefore, to glance at the past.

We need not dwell on the individual authorities who constitute the official hierarchy of the contemporary French school; these masters belong for the most part, by the date of their best work, to a former generation. Starting in many cases from very opposite points, but reconciled and united by time, they carried on, during the last quarter of the 19th century, with more or less distinction, the inevitable evolution of their personal gifts.

We still see the works of some of the staunch Romanticists: Jean Gigoux (d. 1892), Robert-Fleury (d. 1890), Jules Dupre (d. 1889), Lami (d. 1890), Cabat (d. 1893) and Isabey (d. 1886); and with these, though they did not follow quite the same road, may be named Francais (d. 1897) and Charles Jacque (d. 1894). Next to them, Meissonier (d. 1891) crowded into the last twenty years of his life a mass of work which, for the most part, enhanced his fame; and Rosa Bonheur (d. 1899), working in retirement up to the age of seventy-seven, went on her accustomed way unmoved by external changes. Hebert, Harpignies, Ziem and Paul Flandrin survived. Among the generation which grew up under the Second Empire we find men of great intelligence and distinction; some, like Alexandre Cabanel (1824-1889), by pictures of historical genre, in a somewhat insipid and conven- tional style, but more particularly by female portraits, firm in flesh-painting and aristocratic in feeling; others, like Paul Baudry (1828-1886, q.v.), whose large decorative works, with their pure and lofty elegance, secured him lasting fame, and whose allegorical compositions were particularly remarkable; not less so his portraits, at first vivid, glowing and golden, but at the end of his life, under the influence of the new atmosphere, cooler in tone, but more eager, nervous and restless in feeling. Leon Ger&me (b. 1824, q.v.) was the originator, during the Second Empire, of the neo-Greek idea, an Orientalist and painter of historic genre, whose somewhat arid instinct for archaeological precision and finish developed to better ends in sculpture during later years. William Bouguereau (b. 1825, q.v.) painted symbolical and allegorical subjects in a sentimental style. Jules Lefebvre (b. 1836) had a brilliant career as a portrait painter, combined, in his earlier years, with admirable studies of the nude. These were followed by Benjamin Constant (d. 1902), a clever painter of past ages in the East and of modern Oriental life, who latterly directed his powers of vigorous and rapid brushwork to portrait-painting; Fernand Cormon, the inventive chronicler of primeval Gaul, and a solid and learned portrait painter; Aime Morot, a man of versatile gifts, a painter of portraits full of life and ease. These formed the heart of the Institut. On the other hand, we find a group who betray a close affinity with the realist party — rejecting, like them, tradition at second-hand, though returning for direct teaching to some of the great masters: Leon Bonnat (b. 1833), educated in Spain, and

preserving through a long series of official portraits an evident worship of the great realists of that nation; and again, under the same influence, Jean Paul Laurens (b. 1837), who has infused some return of vitality into historical painting by his clear and individual conceptions and realistic treatment. Jean Jacques Henner (b. 1829, q.v.), standing even more apart, lived in a Correggio- like dream of pale nude forms in dim landscape scenery; his love of exquisite texture, and his unvarying sense of beauty, with his refined dilettantism, link him on each side to the great groups of realists and idealists.

About the middle of the 19th century, after the vehement disputes between the partisans of line and the votaries of colour, otherwise the Classic and the Romantic schools, when a younger generation was resting from these follies, exhausted, weary, devoid even of any fine technique, two groups slowly formed on the opposite sides of the horizon — seers or dreamers, both protesting in different ways against the collapse of the French school, and against the alleged indifference and sceptical eclecti- cism of the painters who were regarded as the leaders. This was a revolt from the academic and conservative tradition. One was the group of original and nature-loving painters, keen and devoted observers of men and things, the realists, made illustrious by the three great personalities of Corot (q.v.), Millet (q.v.) and Courbet (q.v.), the real originators of French contemporary art. The other was the group of men of imagination, the idealists, who, in the pursuit of perfect beauty and an ideal moral standard, reverted to the dissimilar visions of Delacroix and Ingres, the ideals of rhythm as opposed to harmony, of style versus passion, which Theodore Chasseriau had endeavoured to combine. Round Puvis de Chavannes (q.v.) and Gustave Moreau (q.v.) we find a group of .artists who, in spite of the fascination exerted

of their intelligence by the great works of the old masters, especially the early Florentines and Venetians, would not accept the old technique, but strove to record in splendid imagery the wonders of the spiritual life, or claimed, by studying contem- porary individuals, to reveal the psychology of modern minds. Among them were Gustave Ricard (1821-1873), whose portraits, suggesting the mystical charm sometimes of Leonardo and sometimes of Rembrandt, are full of deep unuttered vitality; Elie Delaunay (1828-1891), serious and expressive in his heroic compositions, keen and striking in his portraits; Eugene Fromentin (1820-1876), acute but subtle and silvery, a man of elegant mind, the writer of Les Maitres d ‘autrefois, of Sahel and of Le Sahara, the discoverer — artistically — of Algeria. And round the loud and showy individuality of Courbet — healthy, nevertheless, and inspiring

— a group was gathered of men less judicious, but more stirring, more truculent, thoroughly original, but not less reverent to the old masters than they were defiant of contemporary authorities. They were even more ardent for a strong technique, but the masters who attracted them were the Dutch, the Flemish, the Venetians, who, like themselves, had aimed at recording the life of their day. Among these was Francois Bonvin (1817-1887), who, following Granet, carried on the evolution of a subdivision of genre, the study of domestic interiors. This Drolling, too, had done, early in the 19th century, his predecessors in France being Chardin and Le Nain. This class of subjects has not merely absorbed all genre-painting, but has become a very important factor in the presentment of modern life. Bonvin painted asylums, convent-life, studios, laboratories and schools. Alphonse Legros (q.v.), painter, sculptor and etcher, who settled in London, was of the same school, though independent in his individuality, celebrating with his brush and etching-needle the life of the poor and humble, and even of the vagabond and beggar. There were also Bracquemond, the reviver of the craft of etching; Fantin-Latour, the painter of highly romantic Wagnerian dreams, figure compositions grouped after the Dutch manner, and flower- pieces not surpassed in his day. Ribot, again, and Vollon, daring and dashing in their handling of the brush; Guillaume Regamey, one of the few military painters gifted with the epic sense; and even Carolus Duran, who, after painting ” Murdered ” (in the Lille Museum), combined with the professional duties of an official teacher a brilliant career as a portrait painter. A later member of this group, attracted to it by student friendship in the little drawing-school which under Lecoq de Boisbaudran competed in a modest way with the Ecole des Beaux Arts, was J. C. Cazin, well known afterwards as a pronounced idealist. Finally, there was Manet, a connecting link between the realists and the impressionists. These two radiant focuses of imagina tion and of observation respectively were to be seen still intact during the later period, as represented by the most energetic of the masters who upheld them.

After the catastrophe of 1870, French art appeared to be reawakened by the disasters of the country; and at the great exhibition in Vienna in 1873 Count Andrassy exclaimed to L6on Bonnat, ” After such a terrible crisis you are up again, and victorious ! ” Immense energy prevailed in the studios, and money poured into France in consequence. The output increased rapidly, and at the same time study became more strenuous, and ambition grew bolder and more manly. Renewed activity stirred in the public academies, and a crowd of foreign students came to learn. Two great facts give a characteristic

stamp to this new revival of French art: I. In the class of imaginative painting, the renewed impulse towards monumental or decorative work. II. In the class of nature studies, the growth of land- scape painting, which developed along two parallel lines- Impressionism; and III. the ” Open-air ” school.

I. Decoration. — In decorative painting two men were the soul of the movement: Puvis de Chavannes and Philippe de Chenne- vieres Pointel. As we look back on the last years of the Second Empire we see decorative painting sunk in profound lethargy. After Delacroix, Chasseriau and Hippolyte Flandrin, and the completion of the great works in the Palais Bourbon, the Senate

House, the Cour des Comptes and a few churches — St Sulpice, St Vincent de Paul and St Germain des Pres — no serious attempts had been made in this direction. Excepting in the Hotel de Ville, where Cabanel was winning his first laurels, and in the Opera House, a work that was progressing in silence, a few chapels only were decorated with paintings in the manner of easel pictures. But two famous exceptions led to a decorative revival : Puvis de Chavannes’s splendid scheme of decoration at Amiens (all, with the exception of the last composition, which is dated 1882, executed without break between 1861 and 1867), and his work at Marseilles and at Poitiers; Baudry, with his ceiling in the Opera House, begun in 1866 but not shown to the public till 1874. There was also a movement for reviving French taste in the industrial arts by following the example of systematic teaching set by some foreign countries, more particu- larly by England. Decorative painting felt the same impulse. Philippe de Chennevieres, curator of the Luxembourg Gallery and directeur des Beaux Arts (from 1874 till 1879), determined to encourage it by setting up a great rivalry between the most distinguished painters, like that which had stimulated the zeal of the artists of the Italian Renaissance. Taking up the task already attempted by Chenavard under the Republic of 1848, but abandoned in consequence of political changes, M. de Chennevieres commissioned a select number of artists to decorate the walls of the Pantheon. The panels were to record certain events in the history of France, with due regard to the sacred character of the building. Twelve of the most noted painters were named, with a liberal breadth of selection so as to include the

most dissimilar styles : Millet and Meissonier, of whom one refused and the other did not carry out the work; Cabanel and Puvis de Chavannes. The last-named was the first to begin, in 1878, and he too was the painter who put the crowning end to this great work in 1898. His pictures of the ” Childhood of Ste Genevieve ” (the patron saint of Paris), simple, full of feeling and of innocent charm, appropriate to a popular legend, with their airy Parisian landscape under a pallid sky, made a deep impression. Thenceforward Puvis de Chavannes had a constantly growing influence over younger men. His magnificent work at Amiens, ” Ludus pro Patria ” (1881-1882), at Lyons and at Rouen, in the Sorbonne and the Hotel de Ville, for the Public Library at Boston, U.S.A., and on to his last composition, ” The Old Age of Ste Genevieve,” upheld to the end of the 19th century the sense of lofty purpose in decorative painting. Besides the Pantheon, which gave the first impetus to the movement, Philippe de Chennevieres found other buildings to be decorated: the Luxembourg, the Palace of the Legion of Honour and that of the Council of State. The paintings in the Palais de Justice, the Sorbonne, the Hotel de Ville, the College of Pharmacy, the Natural History Museum, the Opera Comique, and many more, bear witness to this grand revival of mural painting. Every kind of talent was employed — historical painters, portrait painters, painters of allegory, of fancy scenes, of real life and of landscape. Among the most important were: J. P. Laurens and Benjamin Constant, Bonnat and Carolus Duran, Cormon and Humbert, Joseph Blanc and L. Olivier Merson, Roll and Gervex, Besnard and Carriere, Harpignies and Pointelin, Raphael Collin and Henri Martin.

II. Impressionism. — In 1874 common cause was made by a group of artists drawn together by sympathetic views and a craving for independence. Various in their tastes, they concen- trated from every point of the compass to protest, like their precursors the realists, against the narrow views of academic teaching. Some had romantic proclivities, as the Dutchman Jongkindt, who played an important part in founding this group; others were followers of Daubigny, of Corotorof Millet; some came from the realistic party, whose influence and effort this new set was to carry on. Among these, Edouard Manet (1832-1883) holds a leading place; indeed, his influence, in spite of — or perhaps as a result of — much abuse, extended beyond his circle even so far as to affect academic teaching itself. He was first a pupil of Couture, and then, after Courbot, his real masters were the Spaniards — Velasquez, El Greco and Goya — all of whom

he closely studied at the beginning of his career; but he soon felt the influence of Millet and of Corot. With a keen power of observation, he refined and lightened his style, striving for a subtle rendering of the

exact relations of tone and values in light and atmosphere. With him, forming the original group, as represented by the Caillebotte collection in the Luxembourg, we find some landscape painters: Claude Monet, the painter of pure- daylight, and the artist who by the title of one of his pictures, ” An Impression,” gave rise to the designation accepted by the group; Camille Pissarro, who at one time carried to an extreme the principle of dotting with pure tints, known as pointillisme, or dotwork; Sisley, Cezanne and others. Among those who by preference studied the human figure were Edgard Degas (q.v.) and Auguste Renoir. After long and violent antagonism, such as had already greeted the earlier innovators, these painters, in spite of many protests, were officially recog- nized both at the Luxembourg and at the great Exhibition of 1900. Their aims have been various, some painting Man and some Nature. In the former case they claim to have gone back to the principle of the greatest artists and tried to record the life of their own time. Manet, Degas and Renoir have shown us aspects of city or vulgar life which had been left to genre-painting or caricature, but which they have represented with the charm of pathos, or with the bitter irony of their own mood, frank transcripts of life with a feeling for style. For those who painted the scenery of nature there was an even wider field. They brought to their work a new visual sense, released from the cling- ing memories of past art ; they endeavoured to fix the transient effects of moving life, changing under the subtlest and most fugitive effects of light and atmosphere, and the play of what may be called the elements of motion — sunshine, air and clouds — caring less for the exact transcript of motionless objects, which had hitherto been almost exclusively studied, such as the soil, trees and rocks, the inanimate features of the landscape. They introduced a fresh lightness of key, which had been too sub- servient to the relations of values; they discovered for their ends a new class of subjects essentially modern: towns, streets, railway stations, factories, coal-mines, ironworks and smoke, which they represent with an intelligent adaptation of Japanese art, taking new and audacious points of view, constantly varying the position of their horizon. This is indeed the very acme of naturalism, the last possible stage of modern landscape, covering the whole field of observation, doubling back to the starting-point of imagination. Notwithstanding — or because of — the outcry, of these views, peculiarities and tendencies soon penetrated schools and studios. Three artists in particular became conspicuous among the most individual and most independent spirits: Besnard, who had taken the Grand Prix de Rome, and carried to the highest pitch his inexhaustible and charming fancy in studies of the figure under the most unexpected play of light; Carriere, a pupil of Cabanel, who sought and found in mysterious gloom the softened

spirit of the humble, the warm caress of motherhood; and Raffaelli, a pupil of Gerome, who brought to light the unrecognized picturesqueness of the lowest depths of humanity.

III. The ” Plein-air,” or Open-air, School. — The same causes explain the rise of the particular class of work thus commonly designated. Between Millet and Courbet, both redolent of the romantic and naturalistic influences of their time, though apart from them, stands an artist who had some share in establishing the continuity of the line of painters who combined figure- painting with landscape. This is Jules Breton (b. 1827, q.v.). More supple than his fellows, less harsh and less wilful, caring more for form and charm, he found it easier to treat ” masses,” and contributed to diffuse a taste for the artistic presentment and glorification of field labour. He was the chief link between a past style and Jules Bastien-Lepage (1848-1884, q.v.), who was in fact the founder of the school of open-air painting, a compromise between the academic manner and the new revolutionary ideas, a sort of academic continuation of the naturalistic evolu- tion, which therefore exerted considerable influence on contem- porary art. As a pupil of Cabanel and the Academy schools,

enamoured of rustic life, he absorbed at an early stage, though not without hesitation, the love of atmospheric effects character- istic of Corot and of Manet. In his open-air heads and rural scenes he is seen as a conscientious nature worshipper, accurate and sincere, and, like Millet, imbued with a touch of mysticism which becomes even more evident in his immediate pupils. Round him there arose a little galaxy of painters, some more faithful to tradition, some followers of the best innovators, who firmly tread this path of light and modern life. These are Butin, Duez and Renouf, Roll and Gervex, Dagnan-Bouveret, Friant, Adolphe and Victor Binet and many more.

Immediately after the Exhibition of 1889 an event took place which was not without effect on the progress of French art. This was the schism in the Salon. The audacious work of the Societe Nationale des Beaux Arts, which left anything that the Impressionists could do far behind, had accustomed the eyes of the public to the most daring attempts, while the numerous contributions of foreigners, especially from the north, where art aimed solely at a direct presentment of daily

life, was a fresh encouragement to the study of modern conditions and of the lower classes. But, at the same time, the encroachment on space at the Exhibition (where no limit of number was imposed) by mere studies, hastened the reaction against the extravagances of the degenerate followers of Courbet, Manet and Bastien- Lepage. Remonstrances arose against their perverse and narrow-minded devotion to ” truth,” or rather to minute exactitude, their pedantry and affectation of documentation; sometimes derived from some old colourists who had not re- nounced their former ideal, sometimes from younger men impelled unconsciously by literature, which had as usual pre- ceded art in the revolt. The protest was seen, too, in a modified treatment of landscape, which took on the warmer colours of sunset, and in a choice of religious subjects, such as a pardon, or a funeral, or a ceremonial benediction, and generally of more human and more pathetic scenes.

Bastien-Lepage, like his great precursor Millet, bore within him the germs of a reaction against the movement he had helped to promote. Dagnan-Bouveret, who began by painting ” Sitting for a Photograph ” (now at Lyons) and ” An Accident,” after painting ” Le Pain benit,” ended with ” The Pilgrims to Emmaus ” and ” The Last Supper.” Friant, again, produced scenes of woe, ” All Saints’ Day ” and ” Grief ” ; and their younger successors, Henri Royer, Adler, Duvent and others, who adhered to this tradition, accommodated it to a more modern ideal, with more vivid colouring and more dramatic composition.

Still, this normal development could have no perceptible effect in modifying the purpose of painting. More was needed. A strong craving for imaginative work was very generally felt, and was revealing itself not merely in France but in Belgium, Scotland, America and Germany. This tendency ere long resulted in groups forming round certain well-known figures. Thus a group of refined dreamers, of poetic dilettanti and harmonious colourists, assembled under the leading of Henri Martin (a strange but attractive visionary, a pupil of Jean Paul Laurens and direct heir to Puvis de Chavannes, from whom he had much sound teaching) and of Aman-Jean, who had appeared at the same time, starting, but with more reserve, in the same direction. Some of this younger group affected no specific aim; the others, the larger number, leant towards contemporary life, which they endeavoured to depict, especially its aspirations and — according to the modern expression now in France of common usage — its ” state of soul ” typified by melody of line and the eloquent language of harmonies. Among them should be named, as exhibitors in the salons and in the great Exhibition of 1900, Ernest Laurent, Ridel and Hippolyte Fournier, M. and Mme H. Duhem, Le Sidaner, Paul Steck,

&c. On the other hand, a second group had formed of sturdy and fervent naturalistic painters, in some ways resembling the school of 1855 of which mention has been made; young and bold, sometimes over-bold, enthusiastic and emotional, and bent on giving expression to the life of their own day, especially among the people, not merely

recording its exterior aspects but epitomizing its meaning by broad and strong synthetical compositions. At their head stood Cottet, who combined in himself the romantic fire and the feeling for orchestrated colour of Delacroix with the incisive realism and bold handling of Courbet; next, and very near to him, but more objective in his treatment, Lucien Simon, a manly painter and rich colourist. Both by preference painted heroic or pathetic scenes from the life of Breton mariners. After them came Rene Menard, a more lyrical artist, whose classical themes and land- scape carried us back to Poussin and Dauchez, Prinet, Wery, &c.

Foreign influences had meanwhile proved stimulating to the new tendencies in art. Sympathy with the populace derived added impulse from the works of the Belgian painters Constantin Meunier, Leon Frederic and Struys; a taste for strong and expressive colouring was diffused by certain American artists, pupils of Whistler, and yet more by a busy group of young Scotsmen favourably welcomed in Paris. But the most unfore- seen result of this reactionary movement was a sudden reversion to tradition. The cry of the realists of every shade had been for ” Nature ! ” The newcomers raised the opposition cry of ” The Old Masters! ” And in their name a protest was made against the narrowness of the documentary school of art, a demand for some loftier scheme of conventionality, and for a fuller expression of life, with its complex aspirations and visions. The spirit of English Pre-Raphaelitism made its way in France by the medium of translations from the English poets Shelley, Rossetti and Swinburne, and the work of their followers Stephane Mallarme and Le Sar Peladan; it gave rise to a little artificial impetus, which was furthered by the simultaneous but transient rage for the works of Burne-Jones, which were exhibited with his consent in some of the salons, and by the importation of William Morris’s principles of decoration. The outcome was a few small groups of symbolists, the most famous being that of the Rose »J« Croix, organized by Le Sar Peladan; then there was Henri Martin, and the little coterie of exhibitors attracted by a dealer, the late M. le Bare de Bouttiville, in which Cottet was for a short time entangled. But few interesting names are to be identified: Dulac (d. 1899), who became known chiefly for his mystical lithographs in colour; Maurice Denis and Bonnard, whose decorative compositions, with their refined and har- monious colouring, are not devoid of charm; Vuillard, &c. But it

was in the school and studio of Gustave Moreau (1826-1898, q.v.) that the fire of idealism burned most hotly. This excep- tional man and rare painter, locked up in his solitude, endeavoured, by a thorough and intelligent assimilation of all the traditions of the past, to find and create for himself a new tongue — rich, nervous, eloquent, strong and resplendent — in which to give utterance to the loftiest dreams that haunt the modern soul. He revived every old myth and rejuvenated every antique symbol, to represent in wonderful imagery all the serene magnificence and all the terrible struggles of the moral side of man, which he had explored to its lowest depths and most heroic heights in man and woman, in poetry and in death. Being appointed, towards the end of his life, to a professorship in the Ecole des Beaux Arts, he regarded his duties as a real apostleship, and his teaching soon spread from his lecture-room and studio to those of the other masters. His own work, though hardly known to his pupils at the time, at first influenced their style; but, especially after his death, they were quickly disgusted with their own detestable imitation of subjects on which the master had set the stamp of his great individuality; they deserted the fabulous world of the Greek Olympus and the wonderful gardens of the Bible, to devote them to a passionate expression of modern life. Desvallieres, indeed, remained conspicuous in his original manner; Sabatte, Maxence, Beronneau, Besson and many more happily worked out their way on other lines.

In trying to draw up the balance-sheet of French art at the beginning of the 20th century, it were vain to try to enter its work under the old-world headings of History, Genre, Por- traits, Landscape. All the streams had burst their channels, all the currents mingled. Historical painting, reinstated for a

time by Puvis de Chavannes and J. P. Laurens, in which Benjamin Constant and Cormon also distinguished themselves, had but a few adherents who tried to maintain its dignity, either in combination with landscape, like M. Tattegrain, or with the ineffectual aid of archaeology, like M. Rochegrosse. At certain times, especially just after 1870, the memory of the war gave birth to a special genre of military subjects, under the distin- guished guidance of Meissonier (q.v.), and the peculiar talents of Alphonse de Neuville (q.v.), of Detaille (q.v.) and Protais. This phase of contemporary history being

exhausted, gave way to pictures of military manoeuvres, or colonial wars and incidents in recent history; it latterly went through a revival under a demand for subjects from the Empire and the Revolution, in consequence of the publication of many memoirs of those times. Side by side with " history," religious art formerly flourished greatly; indeed, next to mythology, it was always dear to the Academy. Apart from the subjects set for academical competi- tions, there was only one little revival of any interest in this kind. This was a sort of neo-evangelical offshoot, akin to the literature and stress of religious discussion; and its leader, a man of feeling rather than conviction, was J. C. Cazin (d. 1901). Like Puvis de Chavannes, and under the influence of Corot and Millet, of Hobbema, and yet more of Rembrandt, he attempted to renew the vitality of history and legend by the added charm of landscape and the introduction of more human, more living and more modern, elements into the figures and accessories. Following him, a little group developed this movement to extravagance. The recognized leader at the beginning of the 20th century was Dagnan-Bouveret.

Through mythology and allegory we are brought back to real life. No one now thinks in France of seeking any pretext for displaying the nude beauty of woman. Henner, perhaps, and Fantin-Latour, were the last to cherish a belief in Venus and Artemis, in naiads and nymphs. Painters go direct to the point nowadays; when they paint the nude, it is apart from abstract fancies, and under realistic aspects. They are content with the model. It is the living female. The whole motor force of the time lies in the expression, under various aspects, of real life. This it is which has given such a soaring flight to the two most primitive forms of the study of life, landscape and portraiture. Portraits have in fact adopted every style that can possibly be imagined: homely or fashionable, singly or in groups, by the fire or out of doors, in some familiar attitude and the surroundings of daily life, analytically precise, or synthetically broad, a literal transcript or a bold epitome of facts. As to landscape, no class of painting has been busier, more alive or more productive. It has overflowed into every other channel of art, giving them new spirit and a new life. It has led the van in every struggle and won every victory. Never was army more numerous or more various than that of the landscape painters, nor more independent. All the traditions find representatives among them, from Paul Flandrin to Rene Menard. Naturalists, impressionists, open-air painters, learned in analysis or potent in invention. We need only name Harpignies, broadly decorative; Pointelin, thoughtful and austere; and Cazin, grave and tender, to give a general idea of the strength of the school.

Every quarter of the land has its painters: the north and the south, Provence and Auvergne, Brittany, dear to the young generation of colourists, the East, Algeria, Tunis — all contribute to form a French school of landscape, very living and daring, of which, as successors of Fromentin and Guillaumet, must be named Dinet, Marius Perret, Paul Leroy and Girardot. But it is more especially in the association of man and nature, in painting simple folk and their struggle for life amid their natural surroundings or by their homely hearth, in the glorification of humble toil, that the latest French art finds its most characteristic ideal life. (L. Be.)

Belgium Belgium fills a great place in the realm of art; and while its painters show a preference for simple subjects, their technique

is broad, rich and sound, the outcome of a fine tradition. Since 1855 international critics have been struck by the unity of effect produced by the works of the Belgian school, as expressed more especially by similarities of handling and colour. For the things which distinguish all Belgian painters, even in their most un- pictorial divagations, are a strong sense of contrast or harmony of colouring, a free, bold style of brushwork, and a preference for rich and solid painting. It is the tradition of the old Flemish school. It would be more correct, indeed, to say traditions; for the modifications of each tendency, inevitably reviving when the success of another has exhausted itself, constantly show a reversion either to the domestic ” Primitives ” (or, as we might say, Pre-Raphaelites) of the Bruges school, or to the ” decora- tive ” painters of the later time at Antwerp, and no veneer of modern taste will ever succeed in masking this traditional perennial groundwork. In this way the prevailing authority of the French painter Louis David may be accounted for; as acknowledged at Brussels at the beginning of the 19th century, it was a reaction in antagonism to the heavy and flabby work of the late Antwerp school, an unconscious reversion perhaps to the finish and minuteness of the early painters of Bruges. Indeed, in France, Ingres, himself David’s most devoted disciple, was reproached with trying to revive the Gothic art of Jean de Bruges. Then, when David’s followers produced only coJd and feeble work, Wappers arose to restore the methods of another tradition, for which he secured a conspicuous triumph. Classical tinsel made way, indeed, for romantic tinsel. The new art was as conventional as the old, but it had the advantage of being adaptable to the taste for show and splendour which characterizes the nation, and it also admitted the presentment of certain historical personages who survived in the memory of the people. The inevitable reaction from this theatrical art, with its affectation of noble sentiments, was to brutal realism. Baron Henri Leys (q.v.) initiated it, and the crudity of his style gave rise to a

belief in a systematic purpose of supplanting the Latin tradition by Germanic sentimentality. Leys's archaic realism was transformed at Brussels into a realism of observation and modern thought, in the painting of Charles de Groux. The influence of Leys on this artist was merely superficial; for though he, too, affected painful subjects, it was because they appealed to his compassion. The principle represented by de Groux was destined to pioneer the school in a better way; at the same time, from another side the authority of Courbet, the French realist, who had been for some time in Brussels, and that of the great landscape painters of the Fontainebleau school, had suggested to artists a more attentive study of nature and a remarkable reversion in technique to bolder and firmer handling. At this time, among other remarkable men, Alfred Stevens appeared on the scene, the finished artist of whom Camille Lemonnier truly said that he was " of the race of great painters, and, like them, careful of finish " — that in him " the eye, the hand and the brain all co-operated for the mysterious elabora- tion " of impasto, colour and chiaroscuro, and " the least touch was an operation of the mind." A brief period ensued during which the greater number of Belgian artists were carried away by the material charms of brushwork and paint. The striving after brilliant efforts of colour which had characterized the painters of the last generation then gave way to a devout study of values; and at the same time it is to be noted that in Belgium, as in France, landscape painters were the first to discover the possibility of giving new life to the interpretation of nature by simplicity and sincerity of expression. They tried to render their exact sensations; and we saw, as has been said, " an increasingly predominant revelation of instinctive feeling in all classes of painting." Artists took an impartial interest in all they saw, and the endeavour to paint well eliminated the hope of expressing a high ideal; they now sought only to utter in a work of art the impression made on them by an external fact; and, too often, the strength of the effort degenerated into brutality.

These new influences, which, in spite of the conservative school, had by degrees modified the aspect of Belgian art in

general, led to the formation at Brussels of an association under the name of the Free Society of Fine Arts. This group of painters had a marked influence on the development of the school, and hand in hand

with the pupils of Portaels — a teacher of sober methods, caring more for sound practice than for theories — it encouraged not merely the expression of deep and domestic feeling which we find in the works of Leys and de Groux, but also the endeavour to paint nature in the broad light of open air. The example of the Free Society found imitators; various artistic groups were formed to organize exhibitions where new works could be seen and studied irrespective of the influence of dealers, or of the conservatism of the authorities which was increasingly conspicuous in the official galleries; till what had at first been regarded as a mere audacious and fantastic demonstration assumed the dignity of respectable effort. The ” Cercle des Vingt ” (” The Twenty Club “) also exerted a marked influence. By introducing into its exhibitions works by the greatest foreign artists it released Belgian art from the uniformity which some too patriotic theorists would fain have imposed. The famous ” principle of individuality in art ” was asserted there in a really remarkable manner, for side by side with the experiments of painters bent on producing certain effects of light hung the works of men who clung to literary or abstract subjects. Other groups, again, were formed on the same lines; but then came the inevitable reaction from these elaborations of quivering light and subtle expression, pushed, as it seemed, to an extreme. The youngest generation of Brussels painters, in .revolt against the lights and ultra-refinements of their immediate predecessors, seem to take pleasure in a return to gums and bitumen, and to seek the violent effects so dear to the romantic painters of a past time.

Brussels is the real centre of art in Belgium. Antwerp, the home of Rubens, is resting on the memory of past glories, after vainly trying to uphold the ideal formerly held in honour by Flemish painters. And yet, so great is the prestige of this ancient reputation, that Antwerp even now attracts artists from every land, and more especially the dealers who go thither to buy pictures as a common form of merchandise. At Ghent the wonderful energy of the authorities who get up the triennial exhibitions makes these the most interesting provincial shows of their kind; other towns, as Liege, Tournay, Namur, Mons and Spa also have periodical exhibitions.

From 1830, in the early days of the Belgian school of painting, we may observe a tendency to seek for the fullest qualities of colour, with delicate gradations of light and shade. In this Wappers led the way. At a time when his teachers in the Antwerp Academy would recognize nothing but the heavy brown tones of old paintings, he was already representing the transparent shadows of natural daylight. But heroic and sentimental romanticism was already making way for the serious expression of domestic and popular feeling, and thenceforward the

prominence assumed by genre, and yet more by landscape, led to a deeper and more direct study of the various aspects of nature. At the same time a special sense of colour was the leading characteristic of the artists of the time, and it was truly said that ” the ambition to be a fine painter was stronger than the desire for scrupulous exactitude.” Artists evidently aimed, in the first place, at a solid impasto and glowing colour; an under- tone, ruddy and golden, gleamed through the paler and more real hues of the over-painting. In this way we may certainly recognize the influence of the French colourists of Courbet’s time; just as we may trace the influence of the grey tone prevalent in Manet’s day in the effort to paint with more simple truth and fewer tricks of recipe, which became evident when the ” Free Society ” was founded at Brussels, and the pupils from Portaels’s studio came to the front. Among the artists who were then working the following must be named (with their best works in the Brussels Gallery) : Alfred Stevens (g.t>.), an incomparably charming painter, characterized by exquisite harmony of colour and marvellous dexterity with the brush. In the Brussels Gallery are his ” The Lady in Pink,” ” The Studio,” “The Widow,” “A Painter and his Model,” and ” The Lady-Bird.” Joseph Stevens, his brother, a master-painter of dogs, broad in his draughtsmanship, and painting in strong touches of colour, is represented by ” The Dog-Market,” ” Brussels — Morning,” “A Dog before a Mirror”; Henri de Braekeleer, the nephew and pupil of Leys, a fine painter of interiors, in warm and golden tones, by ” The Geographer,” ” A Farm — Interior,” ” A Shop ” ; Lievin de VVinne, a portrait painter, sober in style and refined in execution, by “Leopold I., King of the Belgians”; Florent Willems, archaic and elegant, by ” The Wedding Dress “;

Eugene Smits, a refined colourist, always working with the thought of Venice in his mind, by ” The Procession of the Seasons “; Louis Dubois, a powerful colourist with a full brush, striving to resemble Courbet, by ” Storks,” ” Fish ” ; Alfred Verwee, a fine animal painter, with special love for a sheeny silkiness of texture, by ” The Estuary of the Scheldt,” ” The Fair Land of Flanders,” ” A Zeeland Team ” • Alfred Verhaeren, a pupil of L. Dubois, by some “Interiors”; Fehcien Rops, an extraordinary artist, precise in drawing, sensual and incisive, by ” A Parisienne ” ; Felix ter Linden, a restless, refined nature, always trying new subtleties of the brush and palette-knife, by ” Captives.” Amongst other painters may be named Camille van Camp, Gustave de Jonghe, Franz Verhas, and his brother Jan Verhas, the painter of the popular ” School Feast ” in the Brussels Gallery; and Jan van Beers, the clever painter of female coquet- tishness, represented by pictures in the Antwerp Gallery.

As landscape painters, the chief are: Hippolyte Boulenger, a refined draughtsman and a delicate colourist, represented in the Brussels Gallery by ” View of Dinant,” ” The Avenue of Old Hornbeams at Tervueren,” “The Meuse at Hastiere “; Alfred de Knyff , noble and elegant, by ” The Marl Pit,” “A Heath — Campine ” ; Joseph Coosemans, by “A Marsh — Campine”; Jules Montigny, by ” Wet Weather “; Alph. Asselbergs, by ” A Marsh— Campine.” There are also Xavier and C6sar de Cock, painters in light gay tones of colour; Gustave Den Duyts, a lover of melancholy twilight, represented in the same gallery by “A Winter Evening”; Mme Marie Collart, a seeker after the more melancholy and concentrated impressions of nature, by “The Old Orchard”; and Baron Jules Goethals.

Of the Antwerp school, Francois Lamoriniere, archaic and minute, has in the Brussels Gallery his ” View from Edeghem,” and there is also Theodore Verstraete, sentimental, or frenzied.

As marine painters: Paul Jean Clays, who delights in vivid effects of colour, is represented at Brussels by ” The Antwerp Roadstead,” “Calm on the Scheldt”; Louis Artan, who prefers dark and powerful effects, by ” The North Sea,” besides Robert Mols, A. Bouvier, and Lemayeur.

As painters of town scenery may be named F. Stroobant, a draughtsman rather than a painter, who is represented in the Brussels Gallery by ” The Grande Place at Brussels,” and J. B. Van More, a colourist chiefly, by ” The Cathedral at Belem.”

The flower painter, Jean Robie, has in the Brussels Gallery ” Flowers and Fruit.”

Jean Portaels, the painter of ” A Box at the Theatre,” at Budapest, is represented in the Brussels Gallery by ” The Daughter of Sion Insulted”; Emile Wauters, a master of free and solid brushwork, equally skilledin portraiture, historical composition and decorative portrait painting, by “The Madness of Hugo van der Goes”; Edouard Agneessens, a genuine painter, with breadth of vision and facile execution, by portraits; Andre Hennebicq, a painter of his- torical subjects, by ” Labourers in the Campagna, Rome “; Isidore Verheyden, a landscapist and portrait painter, by ” Woodcutters “; Eugene Verdyen and Emile Charlet should be mentioned, and the landscape painter Henri van der Hecht, whose ” On the Sand- hills ” is in the Brussels Gallery.

The principal landscape painters of what is known as the ” neutral tint ” school (l’£cole du gm) are: Theodore Baron, faith- ful to the sterner

features of Belgian scenery, represented in the Brussels Gallery by ” A Winter Scene — Condroz “; Adrien Joseph Heymans, a careful student of singular effects of light, by ” Spring- time”; Jacques Rosseels, a painter of the cheerful brightness of the Flemish country, by ” A Heath,” besides Isidore Meyers and Florent Crabeels.

Some figure painters who may be added to this group are: Charles Hermans, whose picture ” Dawn ” (Brussels Gallery), exhibited in 1875, betrays the ascendancy of the principles upheld by the Free Society of Fine Arts; Jean de la Hoese, who has since made portraits his special line; Emile Sacr6; Leon Philippet, repre- sented in the Brussels Gallery by ” The Murdered Man “; and Jan Stobbaerts, a masterly painter, powerful but coarse, by ” A Farm — Interior.”

Three more artists were destined to greater fame: Constantin Meunier, a highly respected artist, equally a painter and a sculptor, known as the Millet of the Flemish workman, who has depicted with noble feeling his admiration and pity for one contemporary state of the human race, and who is represented in the Brussels Gallery by “The Peasants’ War”; Xavier Mellery, who tries to express in works of high artistic merit the inner life of men and things, and personifications of thought, by “A Drawing”; and Alexandre Struys, a strong and clever painter, expressing his sympathy with poverty and misfortune in works of remarkable ability.

Besides these, Charles Verlat, a powerful and skilled artist, painted a vast variety of subjects; his teaching was influential in the Antwerp Academy. In the Brussels Gallery he is represented by ” Godfrey de Bouillon at the Siege of Jerusalem,” ” A Flock of Sheep attacked by an Eagle”; Alfred Cluysenaar, whose aim is to produce decorative work on an enormous scale, by “Canossa”; Albrecht de Vriendt, by ” Homage done to Charles V. as a Child “; Juliaan de Vriendt, by “A Christmas Carol”; Victor Lagye, by

” The Witch.” Franz Vinck, Wilhelm Geets, Karl Ooms, and P. van der Ouderaa, endeavour to perpetuate, while softening down, the style of historical painting so definitely formulated by Leys. Finally, Joseph Stallaert, a painter of classical subjects, is represented in the Brussels Gallery by “The Death of Dido.” Eugene Devaux, a remarkable

draughtsman, should also be named.

Works by all those artists were to be seen in the Historical Exhibition of Belgian Art at Brussels, 1880. Camille Lemonnier, in his History of the Fine Arts in Belgium, discussed this Exhibition very fully, pointing out three distinct periods in the history of the century. The first, romantic, literary and artificial, extended from 1830 till nearly 1850; the second was a period of transition, domestic in feeling, gradually developing to realism in the course of about twenty years; the third began in the 'seventies, a time of careful study, especially in landscape. This was followed by the beginning of a fourth period, characterized by a freer sense of light and atmosphere.

Apart from the exclusive tendency, inevitable under bureaucratic administration, the mere arrangement on an antiquated plan of the great academic salons was unsuited to the display of works intended to represent individual feeling or peculiarities of pictorial treatment. Hence it was that a great many painters came to prefer smaller and more eclectic shows, leading to the fashion, which still persists, of exhibitions by clubs or associations. The Fine Arts Club at Brussels had long since afforded opportunities for showing the pictures of the Society Libre, founded in 1868, which were condemned by the authorities as tending to " revolu- tionize " art. After this, two associations of young painters were formed at Brussels with a view to organizing their own exhibitions.

The " Chrysatide " Club was founded in 1875, and the " Essor " (the " Soaring ") Club in 1876. In 1882, however, the Essor obtained leave to open their exhibition in a room in the Palais des Beaux Arts at Brussels. This tolerance was all the more appreciated by the younger party because a new departure was in course of development, again a modification in the effort to represent light in painting. The " neutral tint " school had given way to the school of " whiteness "; a luminous effect was to be sought by a free use of brilliant colour with a very full brush. But ere long this method proved unsatisfactory, and attention was now turned towards a "sincerer and acuter perception of local values"; and again the influence of certain French painters was brought to bear — those of the group headed by C. Monet, preparing for that of the French painter G. Seurat, the first who carried into practice the systematic decomposition of colour by the process known as pointillisme (the intimate juxtaposition of dots of colour). In 1884, in consequence of a division in the Essor Club, the " XX " Club was founded, who, though thus limiting their number, reserved the right of " issuing yearly invitations, and thus testifying the sympathy they felt with the most independent artists of Belgium and with those

foreign painters with whom they had the most pronounced affinity." For ten years the exhibitions of the " XX," whose careful and artistic arrangements were in themselves admir- able, were the fount in Belgium of discussions on art. The limit of its existence to ten years was determined when the club was formed; but as it was desirable that the principle of liberty in art should still be held in honour, M. Octave Maus, the secretary of the " XX " Club, organized the exhibitions of the Libre esthetique in and since 1894. Other clubs had been formed in Brussels: the Fine Art Society in 1891 and the " Furrow " (le Sillon) in 1893. In 1894 another breach in the Essor Club, which, growing very weak, was soon to disappear — as the " Art Union " and the Voorwaerts Club had done — led to the formation of the Society " for Art " {pour Vart); and in 1896 a party of that club established a salon of idealist art which favoured an exaggeration of the intellectual tendency already begun in the exhibitions of the " XX." Subsequently, in the exhibitions of the Sillon and of the Labeur Clubs (founded in 1898) a reaction set in, in favour of heavy brown tones and ponderous composition. At Antwerp the influence of the local societies — the " Als Ik Kan," the Independent Art Club, and the " XIII " — was less sensibly felt ; it was, however, enough to confirm certain waverers in the direction of purely disinterested effort.

It would be impossible to classify into definite groups those painters whose first distinctive appearance was subsequent to the Historical Exhibition in 1880. Only an approximate grouping can be attempted by assigning each to the association in whose exhibitions he made the best display of what he aimed at expressing. Thus it was chiefly in the rooms of the Essor Club that works were shown by the following : L. Frederic, a remarkable painter, combin- ing wonderful facility of execution with a sincerely simple sentiment of homely pathos, represented at the Brussels Gallery by " Chalk Sellers " ; E. Hoeterickx, a painter of crowds in the streets and parks ; F. Seghers, a pleasing colourist, who had made flower-painting his speciality; two animal painters, F. van Leemputten, " Return from Work " (Brussels Gallery), and E. van Damme-Sylva, as well as the marine painter, A. Marcette. The landscape painters include J. de Greet, almost brutal in style, " The Pool at Rouge-Cioitre " (Brussels Gallery), C. Wolles, and flamesse. L. Houyoux, F. Halkett, L. Herbo are known for their portraits. And there are E. van Gelder, J. Mayne, A. Crespin, a learned decorative painter and E. Duyck, a graceful draughtsman, " A Dream " (Brussels Gallery). As

designers may be named A. Heins, a clever illustrator, and A. Lynen, of a thoroughly Brussels type, keenly observant and satirical.

At the exhibitions of the ” XX ” were pictures by the following: Fernand Khnopff (” Memories,” a pastel, in Brussels Gallery), an admirer of the refined domesticity of English contemporary art, and of mystical art, as represented by Gustave Moreau; H. van der Velde, a well-known exponent of the new methods in applied art; J. Ensor, a whimsical nature, loving strange combinations of colour and inconsequent fancies (Brussels Gallery: “The Lamp Man “) ; Th. van Rysselberghe, a clever painter, especially in the technique of dot painting (pointillisme) ; W. Schlobach, a remarkable colourist of uncertain tendencies; Henry de Groux, son of Ch. de Groux, a seer of visions represented in violent tones and workman- ship ; G. Vogels, a painter of thaw and rain ; G. van Strydoneck, R. Wytsman, J. Delvin, F. Charlet, Mile A. Boch, all of whom have striven to bring light into their pictures ; W. Finch and G. Lemmen.

To the triennial salons, to the exhibitions of the ” Artistic ” clubs, to the House of Art (Maison a” art), at Brussels, and to the various Antwerp clubs, the following have contributed: F. Courtens, Ros- seels’s brilliant pupil, an astonishing painter with a heavy impasto (Brussels Gallery: ” Coming out of Church “) ; J. de Lalaing, full of lofty aims, but showing in his painting the qualities of a sculptor (Brussels Gallery: ” A Prehistoric Hunter “) ; E. Claus, a lover of bright colour, and a genuine landscape painter (Brussels Gallery: ” A Flock on the Road “) ; A. Baertsoen, who delights in the quiet corners of old Flemish towns; H. Evenepoel, a fine artist whose premature death deprived the Belgian school of a highly distin- guished personality (Brussels Gallery : ” Child at Play “) ; G. Vanaise, a painter of huge historical subjects; Ch. Mertens, a refined artist; E. Motte, an interesting painter with a love of archaic methods (Brussels Gallery: ” A Girl’s Head “) ; A. Leveque, an accomplished draughtsman with a distinctive touch; L. Wolles, an admirable draughtsman; J. Leempoels, elaborate and minute; H. Richir, a portrait painter; J. van den Eeckhout, a clever pupil of Verheyden; J. Rosier, a skilful follower of Verlat; L. Abry, a painter of military subjects; E. Carpentier, E. Vanhove, Luyten and Desmeth.

Essentially of the Antwerp School are F. van Kuyck, P. Verhaert, de Jans, and Brunin of Ghent, Ch. Doudelet, C. Montald and van Biesbroeck.

There is a group of artists at Liege whose sincerity and high technical qualities have been recognized : A. Donnay, A. Rassenfosse, E. Berchmans, F. Marechal, Dewitte. Of lady painters: Mmes E. Beernaert, L. Heger and J. Wytsman paint landscape; Mmes B. Art, A. Ronner, G. Meunier and M. De Bievre paint flowers. Mmes A.

d'Anethan, Lambert de Rothschild, M. Philippson, H. Calais and M. A. Marcotte paint figures and portraits.

The chief exhibitors at the Societe pour Vart have been A. Ciamberlani, a painter of large decorative compositions in subdued tones; H. Ottevaere, a painter of night or twilight landscapes; O. Coppens, R. Janssens and A. Hannotiau, who study old houses, deserted churches and dead cities; F. Baes, an excellent pupil of Frederic Fabry, 0. and J. Dierickx, painters of decorative figures; H. Meunier, an ingeniously decorative draughtsman; J. Delville, founder of the salons of idealist art.

Leading exhibitors at the Voorwaerts Club have been E. Laermans, a strange artist, as it were a Daumier with anchylose joints, but a colourist (Brussels Gallery: "A Flemish Peasant "); V. Gilsoul, a clever pupil of Courtens (Brussels Gallery: " The Kennel ") ; J. du Jardin, the writer of L , Art flamand, an important critical work illustrated by J. Middeleer.

Contributors to the exhibitions of the Sillon Club comprise G. M. Stevens, P. Verdussen, P. Matthieu, J. Gouweloos, Bastien, Blieck, Wagemans and Smeers ; and V. Mignot, ingenious in designing posters.

At the exhibitions of water-colours have been seen the works of Huberti, F. Binge, V. Uytterschaut, Stacquet and H. Cassiers, who work with light washes or a clever use of body colour ; Hagemans, who paints with broad washes; Delaunois, the painter of mysterious interiors; Th. Lybaert, minute in his brushwork; M. Romberg and Titz, correct draughtsmen.

Since 1870 several important works of decorative painting in public buildings have been carried out in Belgium. Guffens, Swerts and Pauwels have succumbed to the influences of German art, often cold and stiff; A. and J. Devriendt, V. Lagye, W. Geets and Van der Ouderaa have followed more or less in the footsteps of Leys. J. Stallaert has cleverly revived a classic style. Emile Wauters and A. Hennebicq have adopted the traditions of Historical Painting; and so too have L. Gallait, A. Cluysenaar, J. de Lalaing and A. Bourland, though with a more decorative sense of conception and treatment. But of all these works, certainly the most remark- able in its artistic and intelligent fitness is that of M. Delbeke, in the market-hall at Ypres.

See Camille Lemonnier, Histoire des arts en Belgique; A. J. Wauters, La Peinture flamande; J. du Jardin, V Art flamand.

(F. K.*)

Holland

The entire Impressionist movement of the end of the 19th century failed to exercise the slightest influence upon the Dutch. They are only modern in so far as they again resort to the

classics of their Fatherland. For a whole generation Josef Israels was at the head of Dutch art. Born in 1827 at Groningen, the son of a money-changer, he walked every day in his early years, with a linen money-bag under his arm, to the great banking house of Mesdag, a son of which became later the famous marine painter. During his student days in Amsterdam he lived in the Ghetto, in the house of a poor but orthodox Jewish family. He hungered in Paris, and was derided as a Jew in the Delaroche school there. Such were the experiences of life that formed his character. In Zantvoort, the little fishing village close to Haarlem, he made a similar discovery to that which Millet had already made at Barbizon. In the solitude of the remote village he discovered that not only in the pages of history, but also in everyday life, there are tragedies. Having at first only painted historical subjects, he now began to depict the hard struggle of the seafaring man, and the joys and griefs of the poor. He commenced the long series of pictures that for thirty years and more occupied the place of honour in all Dutch exhibitions. They do not contain a story that can be rendered into words; they only tell the tale of everyday life. Old women, with rough, toil-worn hands and good-natured wrinkled faces, sit comfortably at the stove. Weatherbeaten seamen wade through the water, splashed by the waves as they drag along the heavy anchors. A peasant child learns how to walk by the aid of a little cart. Again, the dawning light falls softly upon a peaceful deathbed, on which an old woman has just breathed her last. A sad and resigned melancholy characterizes and pervades all his works. His toilers do not stand up straight; they are broken, without hope, and humble, and accomplish their appointed task without pleasure and without interest. He paints human beings upon whom the oppressions of centuries are resting; eyes that neither gaze on the present nor into the future, but back on to the long, painful past. A Jew, bearing the Ghetto yet in his bosom, is talking to us; and in his painting of the

lowly and oppressed he recounts the story of his own youth and the history of his own race.

The younger painters have divided Israels' subjects among them. Each has his own little field, which he tills and cultivates • with industry and good sense; and paints one picture, to be repeated again and again during his lifetime. Christoph Birschop, born in Friesland, settled as an artist in the land of his birth, where the national costumes are so picturesque, with golden chains, lace caps and silver embroidered bodices. As in de Hoogh's pictures, the golden light streams through the window upon the floor, upon deep crimson table-covers; and upon a few silent human beings, whose lives are passed in dreamy monotony. Gerk Henkes paints the fogs of the canals, with boats gliding peacefully along. Albert Neuhuys selects simple family scenes, in cosy rooms with the sunlight peeping stealthily through the windows. Adolf Cortz, a pupil of Israels, loves the pale vapour of autumn, grey-green plains and dusty country roads, with silvery thistles and pale yellow flowers. The landscape painters, also, have more in common with the old Dutch classic masters than with the Parisian Impressionists. There, on the hill, Rembrandt's windmill slowly flaps its wings; there Potter's cows ruminate solemnly as they lie on the grass. There are no coruscation and dazzling brightness, only the grey-brownish mellowness that Van Goyen affected. Anton Mauve, Jacob Maris and Willem Maris (d. 19 10), are the best known landscape men. Others are Mesdag, de Haas, Apol, Klinkenberg, Bastert, Blommers, de Kock, Bosboom, Ten Kate, du Chattel, Ter Meulen, Sande-Bakhuyzen. They all paint Dutch coast scenery, Dutch fields, and Dutch cattle, in excellent keeping with the old-master school, and with phlegmatic repose.

A few of the younger masters introduced a certain amount of movement into this distinguished, though somewhat somni- ferous, excellence. Breitner and Isaak Israels seem to belong rather to Manet's school than to that of Holland. The " suburb " pictures of W. Tholen, the flat landscapes bathed in light by Paul Joseph Gabriel, and Jan Veth's and Havermann's im- pressionistic portraits prove that, even among the Dutch, there are artists who experiment. Jan Toorop has even attained

the proud distinction of being the enfant terrible of modern exhibitions, and his works appear to belong rather to the art of the old Assyrians than to the 19th century. But those who will endeavour to enter into their artistic spirit will soon discover that Toorop is deserving of more than a mere shrug of the shoulder; they will find that he is a great painter, who indepen- dently pursues original aims.

At the present time all criticism of art is determined by the “line.” All caprices and whims of the ” line ” are now ridden as much to death, and with the same enthusiasm, as were formerly those of ” light.” Toorop occupies one of the first places among those whose only aim consists in allowing the ” line ” to talk and make music. His astonishing power of physical expression may be noted. With what simple means, for example, he renders in his picture of the ” Sphinx ” all phases of hysterical desire; in that of ” The Three Brides ” nunlike resignation, chaste devotion and unbridled voluptuousness. If his mastery over gesture, the glance of the eye, be remarked — how each feature, each movement of the hand and head, each raising and closing of the eyelid, exactly expresses what it is intended to express — Toorop’s pictures will no more be scoffed at than those of Giotto, but he will be recognized as one of the greatest masters of the ” line ” that the 19th century produced.

See Max Rooses, Dutch Painters of the Nineteenth Century (Eng. ed., London, 1898-1901). (R.Mr.)

Germany

The German school of painting, like that of France, entered on a new phase after the Franco-German War of 1870. An empire had been built up of the agglomeration of separate states. Germany needed no longer to gaze back admiringly at older and greater epochs. The historical painter became neglected. Not the heroic deeds of the past, but the political glories of the new empire were to be immortalized. This transition is particularly noticeable in the work of Adolf von Menzel. At the time of political stagnation he had recorded on his canvas the glories of Prussia in the past. Now that the present had achieved an importance of its own, he painted “The Coronation of King William at Konigsberg” and “King William’s Departure for the Army “; and ultimately he became the painter of popular subjects. The motley throng in the streets had a special fascination for him, and he loved to draw the crowd pushing its eager way to listen to a band on the promenade, in the market, at the doors of a theatre, or the windows of a cafe. He discovered the poetry of the builder’s yard and the workshop. In the ” Moderne Cyklopen ” (iron- works), painted in 1876, he left a monumental mark in the history of German art; for in this picture he depicts a simple incident in daily life, without any attempt at genre; and this was indeed the characteristic of his work for the next few years. Humorous anecdote, as represented by Knaus (b. 1829), Vautier (1829- 1898), Defregger (b. 1835) and Griitzner (b. 1846), found little acceptance. Serious representations of modern life were required; resort was made to all the expedients of the great

painters, and the ‘seventies were years of artistic study for Germany. Every great colourist in the past was thoroughly studied and his secrets discovered. In Germany, Wilhelm Leibl (b. 1844), holds the same prominent place that Courbet does in France. Leibl, like Courbet, (q.v.), showed that the task of painting is not to narrate, but to depict by the most convincing means at its disposal. He even went farther than Courbet in close scrutiny of nature. With loving patience he strove to translate into colour everything that his keen eye observed: he studied nature with the devotion of the medieval artist. No feeling, strictly speaking, is discernible in his work. His greatest pictures are only of quiet life, with human accessories, and his painful accuracy divests his pictures of poetry. But when he first appeared, he was necessary. His painting of ” Three Peasant Women in Church ” is a grand documentary work of that period, whose first aim was to conquer the picturesque. Leibl taught artists to study detail, to master the secrets of flower, leaf and stalk.

A great number of pupils were encouraged by him to gain such a thorough mastery of every detail of technique as to be enabled to paint pictures that were thoroughly good in workman- ship, irrespective of genre or anecdote. Among these, W. Trubner (b. 1851) stands pre-eminently as a painter. His works during the ‘seventies are among the best painting done at Munich during that period; they are full and rich in colour, broad and bold in their treatment of the subject. A contem- porary of his was Bruno Piglhein (b. 1848), a German Chaplin in this Courbet group, not heavy and matter-of-fact, but bold and witty. He revived the art of pastel painting and pointed the way to a new style in panoramic and decorative painting, whilst infusing beauty and grace into all his works.

The movement in applied arts which began at this time is also important. The revival of the German Empire led to a renaissance in German taste. The ” old German dwelling- rooms,” which now became the fashion, could only be hung with pictures in keeping with the style of the old masters, and this entailed a closer study and imitation of their works than had hitherto been customary. Wilhelm Diez (b. 1839) at the head of the group, was as well acquainted with the epoch from Durer and Holbein to Ostade and Rembrandt as any art historian. In Harburger (b. 1846) Adrian Brouwer lived once more; and in Lofftz

(b. 1845) Quintin Matsys. Claus Meyer (b. 1846) imitated all the artistic tricks of Pieter de Hooch and Van der Neer of Delft. Holbein's costume studies were at first models for Fritz August Kaulbach (b. 1850). Later, he extended his studies to Dolci and Van Dyck, to Watteau and Gainsborough. Adolf Lier (1827-1882) applied the beauty of tone beloved by the old masters to landscape, Von Lenbach's works show the zenith of old-master talent in Germany. He had educated himself as a copyist of classical masterpieces, and passed through a schooling in the study of old masters such as none of his contem- poraries had enjoyed. The copies which, as a young man, he made for Count Schack in Italy and Spain are among the best the brush has ever accomplished. Titian and Rubens, Velazquez and Giorgione, were imitated by him with equal success. In like manner he gave to his own works their distinguished old- master charm. More than all other painters of historical subjects, Lenbach enjoys the distinction of having been the historian of his epoch. He gave the great men of the era of the emperor William I. the form in which they will live in German history, and beauty of colour is blended in all these pictures with their brilliant evidence of thought. The aspirations of a whole generation to restore the technique of the old masters found their realization in Lenbach.

Such was the position of things when there was imported from France the desire to paint light and sun. It was argued that the views which the old masters held concerning colour were in glaring contradiction to what the eye actually saw. The old masters, it was said, paid particular attention to the conditions of light and shade under which they did their work. The golden character of the Italian Renaissance was traceable to the old cathedrals lighted by stained-glass windows. The light and shade of the Netherlands were in keeping with the light and shadow of the artists' studios lighted by little panes, and due partly to the fact that their pictures were intended to hang in dreamy, brown panelled chambers. But was this golden or brown light suitable for the 19th century? Were we not illogical, when for the sake of reproducing the tones of the old masters, we darkened our studios and. shut out the daylight by coloured glass windows and heavy curtains? Was not light one of the greatest acquisi- tions of recent times? When the Dutch painted the world used only little panes of glass. Now the daylight streamed into our rooms through great white sheets of crystal. When our grandfathers lived there were only candles and oil lamps. Now we had gas and electric light. Instead of imitating the old masters, let us paint the colouristic charms that were unknown to them. Let us do honour to the new marvels of colour. With such arguments as were advanced in France, did artists in Germany adopt

the plein-air and abandon older methods; and a development like that which took place in France after

the days of Manet ensued in Germany also. Daylight, which had so long been kept down, was now to be reproduced as clear and bright. After the art of painting strong effects full of day- light had been grappled with, other and more difficult problems of light effects were attempted. After the full blaze of sunshine had been successfully reproduced, such effects as the haze of early morning, the sultry vaporous atmosphere of the thunder- storm, the mysterious night, the blue-grey dawn, the delicate colours of variegated Chinese lanterns, the scintillation of gas and lamplight, and the dreamy twilight in the interior were dealt with.

Max Liebermann (b. 1849) was the first to join the new de- parture. In Paris he had learnt technique. Holland, the country of fogs, inspired him with the love for atmospheric effects, and its scenes of simple life provided him with many subjects. Perhaps the ” Net Menders ” in the Hamburg Kunsthalle is most typical of Liebermann’s art. Frank Skarbina (b. 1849), who was the second to join the new movement in Berlin, pro- ceeded to studies of twilight and artificial light effects.

Hans Herrman (b. 1858), who settled himself on quays and ports; Hugo Volgel, who endeavoured to utilize scenes from contemporary life for decorative pictures; and the two landscape painters, Ludwig Dettmann (b. 1865) and Walther Leistikow (b. 1865), are other representatives of modern Berlin, art. Carls- ruhe, in the ‘eighties, produced some modern pictures of great merit, when Gustav Schonleber (b. 1851) and Herrmann Baisch (b. 1846) showed daintily conceived pictures of Dutch landscapes. In later years Count Leopold Kalckreuth (b. 1855), whose powerfully conceived representations of peasant life belong to the best productions of German realism, and Victor Weishaupt (b. 1848), the animal painter, removed thence to Stuttgart, the residence also of Otto Reiniger (b. 1863), a landscape painter of great originality. At Dresden we find Gotthard Kuehl (b. 1850), long domiciled in Paris, who was one of the first to accept Manet’s teaching. In North Germany, Worpswede became a German Barbizon; Ende (b. i860), Vogeler, and Vinnen (b. 1863) also worked there. In Weimar, two landscape painters of great refinement must be mentioned — Theodor Hagen (b. 1842) and Gleichen-Russwurm (b. 1866). As far back as ” the ‘seventies they rendered ploughed fields, hills enveloped in thin vapour at sunrise, waving fields of corn, and apple trees in full bloom trembling in the rays of the evening glow with a delicate understanding of natural effects.

But Munich still remains the headquarters of German art, which is there the first of all interests and pervades all circles. Almost all those who are working in other German towns receive in that city their inspirations and have indeed remained its citizens in heart. The international exhibitions have given a great European tone and impulse to creative work. Among the elders, Albert von Keller (b. 1841) has perhaps the greatest originality. He is one of those who practised the art of the brush as long ago as the ‘seventies, and painted, not for the sake of historical subjects or for genre, but for the sole love of his art. He painted everything, never restricted himself to any fixed programme, and never became trivial. He is perhaps in Germany the only painter of female portraits who has caught in his pictures a little of the charm that betrays itself in the expression and movements of the modern woman. In the works of Freiherr von Habermann (b. 1849) this refinement of senti- ment, as expressed in colour, is combined with a still more decided shade of eccentricity. Already in his ” Child of Sorrow,” which hangs in the National Gallery at Berlin, he struck that painful chord that always remained his favourite. However different the subjects he has painted, a morbid note pervades them all.

In Heinrich Ziigel (b. 1850), the Munich school possesses an animal painter who rivals the great Frenchmen in original power. Ludwig Dill (b. 1848), whom one must still count as ” Dachauer,” in spite of his migration to Carlsruhe, had for some time past been famous as a painter of Venice, the lagoons and Chioggia, when the impressionist movement became for him the starting- point of a new development. He strove for still brighter light,

tried to realize the most subtle shades of colour, and raised himself from a painter of natural impressions to free and poetical lyricism. Arthur Langhammer (b. 1855), Ludwig Herterich, Leo Samberger (b. 1851), Hans von Bartels (b. 1856), Wilhelm Keller- Reutlinger (b. 1854), Beno Becker, Louis Corinth (b. 1858), Max Slevogt, are others that may be mentioned among the later Munich artists.

Fritz von Uhde (b. 1848) occupies a peculiar position as being the first to apply the principles of naturalism to religious art. Immediately before him, Eduard von Gebhardt (b. 1838) had gone back to the

angular style of the old northern masters, that of Roger van der Weyden and Albert Diirer, believing he could draw the old Biblical events closer to present times by relating them in Luther's language and representing them as taking place in the most powerful epoch of German ecclesi- astical history. Now that historical paintings had been dis- possessed by modern and contemporary subjects, it followed also that scenes from the life of Christ had to be laid in modern times. "I do not assert that only the commonplace occurrences of everyday life can be painted. If the historical past be painted, it should be represented in human garb corresponding to the life we see about us, in the surroundings of our own country, peopled with the people moving before our very eyes, just as if the drama had only been enacted the previous evening." Thus wrote Bastien-Lepage in 1879, when creating his " Jeanne d'Arc," and in this sense did Uhde paint. But besides the charm of feeling expressed in the subtlest hues, there is also the charm of the noble line.

At the time when, in England, Rossetti and Burne-Jones, and, in France, Puvis de Chavannes and Gustave Moreau, stepped into the foreground, in Germany Feuerbach (1829-1880), Marees (1837-1887), Thoma (b. 1839), and Bocklin (1827-1901) were discovered. Feuerbach's life was one series of privations and disappointments. His " Banquet of Plato," " Song of Spring," " Iphigenia " and " Pieta," and his " Medea " and " Battle of the Amazons, " met with but scant recognition on their appearance. To some they appeared to lack sentiment, to others they were " not sufficiently German." When he died in Venice in 1880, he had become a stranger to his contemporaries. But posterity accorded him the laurel that his own age had denied him. Just those points in his pictures to which exception had been taken during his lifetime, the great solemn restfulness of his colouring and the calm dignity of his contours, made him appear contemporary.

Hans von Marees fulfilled a similar mission in the sphere of decorative art; his, likewise, was a talent that was not discovered until after his death. He is most in touch with Puvis de Qiavannes. But the result was different. Puvis was recognized on his first appearance. Marees never had a chance of revealing his real strength. He was only 28 years of age when he first went to Rome; there in 1873, he was commissioned to paint some pictures for the walls of the Zoological Station at Naples. After that time, nothing more was heard of him until 1891, when four years after his death the works he had left behind him were ex- hibited and presented to the gallery of Schleissheim. The value of these works of art must not be sought in their technique. The art of Puvis rests on a firm realistic foundation, but Marees had finished his

studies of nature too prematurely for the correct- ness of his drawing. In spite of this defect, they encourage as well as excite, owing to the principle which underlies them, and which they share in equal degree with those of Puvis. Like Puvis, Marees repudiated all illuminating efforts whereby forms might be brought into relief. He only retained what was intrinsically essential, the large lines in nature, as well as those of the human frame.

Next to these artists stands Hans Thoma, like one of the great masters of Diirer's time. In Marees and Feuerbach's works there is the solemn grandeur of the fresco; in those of Thoma there is nothing of Southern loveliness, but something of the homeliness of the old German art of woodcut; nay, something philistine, rustic, patriarchal — the simplicity of heart and childlike innocence that entrance us in German folklore,

in the pointings of Moritz von Schwind (1804-1871) and Ludwig Richter (1803-1884). He had grown up at Bernau, a small village of the Black Forest. Blossoming fruit-trees and silver brooks, green meadows and solitary peasants' cottages, silent valleys and warm summer evenings, grazing cattle and the cackle of the farmyard, all lived in his memory when he went to Weimar to study the painter's art. This pious faith- fulness to the home of his birth and touching affection for the scenes of his childhood pervade all his art and are its leading feature. Even when depicting classical subjects, the mytho- logical marvels of the ocean and centaurs, Thoma still remains the simple-hearted German, who, like Cranach, conceives antiquity as a romantic fairy tale, as the legendary period of chivalry.

Whether it be correct to place Bocklin (q.v.) in the same category with these painters, or whether he has a right to a separate place, posterity may decide. The great art of the old masters has weighed heavily upon the development of that of our own age. Even the idealists, who have been mentioned, trace their pedigree back to the old masters. However modern in conception, they are to all intents and purposes " old " as regards the form they employed to express their modern ideas. Bocklin has no ancestor in the history of art; no stroke of his brush reminds us of a leader. No one can think of tracing him back to the Academy of Dusseldorf, to Lessing, or Schorner, as his first teacher. Even less can he be called an imitator of the old masters. His works are the result of nature in her different aspects; they have not their origin in literary or histori- cal suggestion. The catalogue of his conceptions, of landscape in varying moods, is inexhaustible. But landscape does not suffice to express his resources. Knights on the quest for adventure, Saracens storming flaming citadels, Tritons

chasing the daughters of Neptune in the billowy waves; such were the subjects which appealed to him. He endowed all fanciful beings that people the atmosphere, that live in the trees, on lonely rocks, or that move and have their being in the slimy bottom of the sea, with body and soul, and placed a second world at the side of the world of actuality. Yet this universe of phantasy was too narrow for the master mind. If it be asked who created on the continent of Europe the most fervid religious paintings of the 19th century; who alone exhausted the entire scale of sensations, from the placidity of repose to the sublimity of hero- ism, from the gayest laughter to tragedy; who possessed the most solemn and most serious language of form and, at the same time, the greatest poetry of colour — the name of Bocklin will most probably form the answer.

These masters were for their younger brethren the pioneers into a new world of art. It was momentous for the painter's art that in Germany, no less than in England and France, a new movement at this time set in — the so-called " arts and crafts." Hitherto the various branches of art had followed different courses. The most beautiful paintings were often hung in surroundings grievously lacking in taste. Now arose the ambition to make the room itself a work of art. The picture, as such, now no more stands in the foreground, but the different arts strive together to form a single piece of art. The picture is regarded as merely a decorative accessory.

Among the younger painters still to be mentioned, Max Klinger (b. 1857) is perhaps the most brilliant. He had begun with the etching-needle, and by its aid gave us entire novels, crisp little dramas of everyday life. But this realism was only a preliminary phase enabling him to pass on to a great independent art of form. His great picture, " Christ in Olympus," combines beauty of form with deep philosophical meaning. Ibsen in 1873, in his Emperor and Galilean, talked of a " third realm," combining heathen beauty with Christian profundity. Klinger's " Christ in Olympus " strikes the beholder as the realization of this idea. Stuck (b. 1863) shares with him the Hellenic serenity of form, the classical simplicity. Apart from this, his pictures are thoroughly different. It might almost be said " Klinger is the Nazarene who stepped into Olympus " ; the thoughtful, deep son of the North who carries profound physical

problems into the beauty-loving Hellenic worship of the senses. Stuck's art is, also, almost classical in its insensi- bility and petrified coldness. In his first picture (1880) " The Guardian of Paradise " he painted a slim wiry angel, who, like Donatello's " St George," in calm confidence and self-assurance points the sword before him. And similar rigid figures standing erect in steadiness— always portraits of himself — recur again and again in his works. Even his religious pictures — the " Pieta " and " The Crucifixion " — are, in reality, antique. One would seek in vain in them for the piety of the old masters or the Germanic fervour of Uhde. Grand in style and line, firm, solemn, serious in arrangement, they are yet hard and cold in conception.

Ludwig von Hoffmann (b. 1861) stands next to him, a gentle, dreamy German. In Stuck's work everything is strong and rugged: here all is soft and round. There the massiveness of sculpture and stiff heraldic lines: here all dissolved into variegated fairy tales, glowing harmonies. However classical he may appear, yet it is only the old yearning of the Germani for Hesperia — the song of Mignon — that rings throughout his works; the longing to emerge from the mist and the fog into the light, from the humdrum of everyday life into the remote fabulous world of fairydom, the longing to escape from sin and attain perfect innocence.

There are numerous others deserving of mention besides those already discussed. Josef Sattler (d. 1867), Melchior Lechter (b. 1871), and Otto Greiner (b. 1869), and likewise those who, such as Von Berlepsch (b. 1852) and Otto Eckmann (b. 1865), devoted their energies again to " applied art."

See R. Muther, The History of Modern Painting (London, 1895); Deutsche s Kilnstler-Lexikon der Gegenwart in biographischen Skizzen (Leipzig, 1898); Mrs de la Mazeliere, La Peinture allemande au XIX' siecle (Paris, 1900). (R. Mr.)

Austria-Hungary

In Austria the influence of Makart (1840-1884) was predomi- nant in the school of painting during the last quarter of the 19th century. He personified the classical expression of an epoch, when a long period of colour-blindness was followed by an intoxication of colour. Whilst Piloty's ambition stopped short at the presentation of correct historical pictures, his pupil, Makart felt himself a real painter. He does not interpret either deep thought or historical events, nor does he group his pictures together to suit the views of the art student. His work is

essentially that of a colourist. Whatever his subject may be, whether he depicts ” The Plague in Florence,” ” The Nuptials of Caterina Cornaro,” ” The Triumphal Entry of Charles V.,” ” The Bark of Cleopatra,” or ” The Five Senses,” ” The Chase of Diana,” or ” The Chase of the Amazons,” his pictures are romances of brilliant dresses and human flesh. A few studies of the nude and sketches of colour, in which he merely touched the notes that were to be combined into chords, were the sole preliminaries he required for his historical paintings. Draperies, jewels, and voluptuous female forms, flowers, fruit, fishes and marble — everything that is full of life and sensuous emotion, and shines and glitters, he heaps together into gorgeous still-life. And because by this picturesque sensuousness he restored to Austrian art a long-lost national peculiarity, his appearance on the scene was as epoch-making as if some strong power had shifted the centre of gravity of all current views and ideas.

In estimating Makart, however, we must not dwell on his pictures alone. He did more than merely paint — he lived them. Almost prematurely he dreamed the beautiful dream which in later days came nearer realization, that no art can exist apart from life — that life itself must be made an art. His studio, not without reason, was called his most beautiful work of art. Whithersoever his travels led him — ‘to Granada, Algiers, or Cairo : — he made extensive purchases, and refreshed his eye with the luscious splendour of rich silks and the soft lustrous hues of velvets. He made collections of carved ivory and Egyptian mummies, Gobelins, armour and weapons, old chests, antique sculpture, golden brocades with glittering embroideries, encrusted coverlets and the precious textures of the East,

columns, pictures, trophies of all ages and all climes. He scattered money broadcast in striving to realize his dream of beauty — to pass one night, one hour, in the world of Rubens, so bright in colour, so princely in splendour.

Uniting as he did these artistic qualities in his own person — not only because he was a painter, but because in no other besides did the great yearning for aesthetic culture find such powerful utterance — Makart exercised an influence in Austria far transcending the actual sphere of the painter’s art. An intense fascination went forth from the little man with the black beard and penetrating glance. At that time Makart dominated not merely Viennese art, but likewise the whole cultured life of the capital. Not only the Makart hat and the Makart bouquet made their pilgrimage through the world, he became also the motive power in all intellectual spheres. When Charlotte Wolter acted Cleopatra or Messalina on the stage, she not only wore dresses

specially sketched for her by Makart, but she also spoke in Makart's style, just as Hamerling wrote in it. A veritable Makart fever had, indeed, taken possession of Vienna. No other painter of the 19th century was so popular, the life of none other was surrounded by such princely sumptuousness. The scene when, during the festivals of 1879, he headed the procession of artists past the imperial box, mounted on a white steed glittering with gold, the Rubens hat with white feathers on his head, amidst the boisterous acclamations of the populace, is unique in the modern history of art. It is the greatest homage that a Philistine century ever offered an artist.

The life of August von Pettenkofen (1821-1889), who should, after Makart, be accounted the greatest Austrian painter of the last quarter of the 19th century, was passed much more modestly and serenely. He had grown up on one of his father's estates in Galicia, and had been a cavalry officer before becoming a painter. His place in Austria is that of Menzel in Germany. With Pettenkofen a new style appeared. The representation of modern subjects now began to take the place of historical painting, which had for so long a time been the ruling taste; not in the sense of the old-fashioned genre picture, but in that of artistic refined painting. Here, again, the distinctive Austrian note can be easily recognized. Pettenkofen's people are lazy.j and yawn. All is contemplative and peaceful, full of dreamy, sleepy repose.

But neither Pettenkofen nor Makart has found followers. The great movement which, originating with Manet, took place in other centres of art, passed Austria by without leaving a trace. Hans Canon (b. 1829), who in his pictures transported the characters of the " Griinderzeit " to Venice of bygone days, and reproduced them as Venetian nobles and ladies of quality, is also a painter of note. So likewise is Rudolf Alt (b. 1812ˆ, still active with the brush in 1902, a refined painter in water- colours, who reproduces the beauties of Old Vienna in his subtle architectural sketches. Leopold Karl Muller (1834-1892), who had lived in Cairo with Makart, found his sphere of art in the variegated world of the Nile, and his ethnographical exactness, combined with his delicate colouring, made him for a long while much in request as a painter of Oriental scenes, and a popular illustrator of Egyptological works. Emil Schindler was a great landscape painter, who often rose from faithful interpretation of nature to an almost heroic height. Heinrich von Angeli (b. 1840), again, furnished— as he continued to do — the European courts with his representative pictures, combining refined conception with smooth elegant technique. These are the only artists who during the 'eighties rose above local mediocrity. After Makart died in 1884, the sun of Austrian art seemed to have set. Stagnation reigned supreme.

Only since the ” Secession ” from the old Society of Artists (Kunstlergenossenschaft), which took place in 1896, has the former artistic life recommenced in Vienna. Theodor von Hermann, long domiciled in Paris, was the gifted initiator of the new movement, and succeeded in rousing a storm of discontent among the rising school of Viennese artists. They found a literary champion in their hero’s father, who pleaded in eloquent language for a new Austrian culture. In November 1898 the

Secessionists opened their first exhibition in a building erected by Josef Olbriick on the Wienerzeil. At first the importance of these exhibitions lay almost exclusively in the fact that the Viennese were thus given an opportunity of making acquaintance with the famous foreign masters, Puvis de Chavannes, Segantini, Besnard, Brangwyn, Meunier, Khnopff, Henri Martin, Vischer, who had until then been practically unknown in Austria, so that the public only then realized the inferiority of their country- men’s artistic work. Thus while acquainting the Viennese public with the strivings of European art, the Secession endeavoured at the same time to produce, in rivalry with foreigners, works of equal artistic merit. Leading foreign masters now joined the movement, and Vienna, which had so long stood aside, through inability to be represented worthily at interna- tional exhibitions, became once more a factor in contemporary European art.

Among the painters of the Secession, Gustav Klint possesses, perhaps, the most powerful original talent. Refined portraits, subtle landscapes and decorative pictures, painted for the Tumba Palace and for the Vienna Hof Museum, first brought his name before the world. But he became famous in conse- quence of the controversy which arose around his picture ” Philosophy.” He had been commissioned to paint the large ceiling piece for the ” aula ” of the Vienna University, and instead of selecting a classical subject he essayed an independent work. The heavens open; golden and silvery stars twinkle; sparks of light gleam; masses of green cloud and vapour form clusters; naked human forms float about; a fiery head, crowned with laurel, gazes on the scene with large, serious eyes. Science climbs down to the sources of Truth: yet Truth always remains the inscrutable Sphinx. Klint paid the penalty of his bold originality by his work remaining dark and incomprehensible to most people. It has, notwithstanding, an

historical importance for Austria corresponding to that which similar works of Besnard have for France. It embodies the first attempt to place monu- mental painting upon a purely colouristic basis, and to portray allegorical subjects as pure visions of colour. After Klint, Josef Engelhart (b. 1864) is deserving of notice. He is the true painter of Viennese life. On his first appearance his art was centred in his native place, and was strong in local colour, which wai lacking in refinement. To acquire subtlety, he studied the great foreign masters and became a clever juggler with the brush, showing as much dexterity as any of them. Yet this virtuosity meant, in his case, only a good schooling, which should enable him to return with improved means to those subjects best suited to his talent. His works are artistic, but at the same time distinctly local.

Carl Moll (b. 1861) understands how to render with equal skill the play of light in a room and that of the sunbeams upon the fresh green grass. The rural pictures of Rist produce a fresh, cool and sunny effect upon the eye; like a refreshing draught from a cool mountain spring — a piece of Norway on Austrian soil. Zettel's landscapes are almost too markedly Swiss in colour and conception. Julius von Kollmann worked a long time in Paris and London, and acquired, in intercourse with the great foreign painters — notably Carriere and Watts — an exquisitely refined taste, an almost hyperaesthetical sense for discreetly toned-down colour and for the music of the line. In Friedrich Konig, M. von Schwind's romantic vein is revived. Even the simplest scenes from nature appear under his hand as enchanted groves whispering secrets. Everything is true and, at the same time, dreamy and mysterious. The mythical beings of old German legends — dragons and enchanted princesses — peer through the forest thicket. Ernst Nowak (b. 1851), compared with him, is a sturdy painter, who knows his business well. He sings no delicate lyric' When one stands close by, his pictures appear like masonry — like reliefs. Seen from a distance, the blotches of colour unite into large powerful forms. Bernatzik understands how to interpret with great subtlety twilight moods — moonshine struggling with the light of street lamps, or with the dawn. Ticky followed Henri Martin in painting solemn forest pictures. Ferdinand Andre leans towards xx. 17

the austere power of Millet. He tells us in his work of labour in the fields, of bronzed faces and hands callous with toil; and especially must his charcoal drawings be mentioned, in which the colour overlays the fprms like light vapour, and which, small as they are, have a sculptural effect. Auchentelier-ˆ- known for his female studies — and Hanisch and Otto Friedrich (b. 1862), refined and subtle as landscape painters, must also be mentioned.

In rivalry with the Secession, the ” Kiinstlergenossenschaft “■ has taken a fresh upward flight. Among figure painters, Delug, Goltz (b. 1857), Hirschl and Veith are conspicuous; but still greater fascination is exercised by landscape painters such as Amesadan, Charlemont, &c, whose works show Austrian art in its most amiable aspect. Apart from Austrians proper, there are also representatives of the other nationalities which compose ” the monarchy of many tongues.” Bohemia takes the lead with a celebrity of European reputation — Gabriel Max (b. 1840), who, although of Piloty’s school and residing in Munich, never repudiated his Bohemian origin. The days of his youth were passed in Prague; and Prague, the medieval, with its narrow winding alleys, is the most mysterious of all Austrian cities, enveloped in the breath of old memories and bygone legends. From this soil Max drew the mysterious fragrance that char acterizes his pictures. His earliest work, the ” Female Martyr on the Cross ” (1867), struck that sweetly painful, half-torment- ing, half-enchanting keynote that has since remained distinc- tively his. Commonplace historical painting received at Max’s hands an entirely new nuance. The morbidness of the mortuary and the lunatic asylum, interspersed with spectres— something perverse, unnatural and heartrending — this is the true note of his art. His martyrs are never men — only delicate girls and helpless women. His colouring corresponds to his subjects. The sensations his pictures produce are akin to those which the sight of a beautiful girl lying in a mortuary, or the prison scene in Faust enacted in real life, might be expected to excite. He even applies the results of hypnotism and spiritualism to Biblical characters. In many of his pictures refinement in the selection of effects is missing. By over-production Max has himself vulgarized his art. Yet, despite his manner of depicting the mysteries of the realms of shadows, and the intrusion of the spirit- world into realism, he remains, a modern master. A new province-ˆthe spectral— was opened up by him to art.

Hans Schwaiger is the real raconteur of Bohemian legends. He, likewise, passed his youth in a small Bohemian village, over which old memories still brooded. In Hradec, places upon which the gallows had stood were still pointed out. The lonely corridors and passages of the ruined castle were haunted by the shades of its old possessors. This is the mood that led Schwaiger to legend-painting. But underlying his fairy tales there are the gallows or the alchemy of Faust. The landscape with its gloomy skies, the wooden huts, turrets, dwarfed trees — such are ever the accompaniments of his figures.

Of the younger generation of painters, Emil Orlick (b. 1870) seems to be the most versatile. Having acquired technique in Paris and Munich, he practically discovered Old Prague to the world of art. The dark

little alleys of the ancient town, swarming with life compressed within their narrow compass, fascinated him. In order to retain and convey all the impressions that crowded in upon him in such superabundant plenitude, he learned how to use the knife of the wood-carver, the needle of the etcher, and the pencil of the lithographer. His studio more resembles the workshop of a printer than the atelier of a painter. In the field of lithography he has attained remarkable results. Orlick has also made his own everything that can be learned from the Japanese. Besides these masters, Albert Hynais, the creator of decorative pictures almost Parisian in conception, must be mentioned. The landscape painters Wickener, Jansa, Slavicek, and Hudecek relate, in gentle melancholy tones of colour, the atmosphere and solitude of the wide plains of Bohemia.

In Poland, painting has its home at Cracow. Down to the year 1893 Johann Matejko was living there, in the capacity

of director of the Academy. His pictures are remarkable for their originality and almost brutal force, and differ very widely from the conventional productions of historical painters. At the close of the 19th century Axentowicz, Olga Hojnanska, Mehoffer, Stanislawski and Wyotkowski attracted attention. Although apparently laying much less stress on their Polish nationality than their Russian countrymen, their works proclaim the soul of the Polish nation, with its chivalrous gallantry and mute resigned grief, in a much purer form.

Hungary in the spring of 1900 lost him whom it revered as the greatest of its painters — Michael Munkacsy. Long before his death his brush had become idle. To the younger generation, which seeks different aims, his name has become almost synony- mous with a wrongly-conceived old-masterly coloration, and with sensation painting and hollowness. ” The Last Day of the Condemned Prisoner,” his first youthful picture, contained the programme of his art. Then came ” The Last Moments- of Mozart,” and ” Milton dictating Paradise Lost.” These titles summon up before our eyes a period of all that is false in eclectic art, dominated by Delaroche and Piloty. Even the

simple subjects of the Gospel were treated by Munkacsy in Piloty's meretricious style. " Christ before Pilate," "Ecce Homo," " The Crucifixion " — all these are gala representations, costume get-up, and, to that extent, a pious lie. But when we condemn the faults of his period, his personal merit must not be forgotten. When he first came to the fore, ostentation of feeling was the fashion. Munkacsy is, in this respect, the genuine son of the period. He was not one of those who are strong enough to swim against the stream. Instead of raising others to his level, he descended to theirs. But he has the merit of having painted spectacular scenes, such as the period demanded, with genuine artistic power. Like Rahl, Ribot, Roybet and Makart, he was a mattre-peintre, a born genius with the brush. Von Uhde and Liebermann were disciples of his school. And if these two painters have left that period behind them, and if independent natural sight has followed upon the imitation of the old masters, it is Munkacsy who enabled them to take the leap. (R. Mr.)

Italy

Modern Italy has produced one artist who towers over all the others, Giovanni Segantini (q.v.). Segantini owes as little to his period of study in Milan as Millet did to his sojourn at Delaroche's school. Both derived from their teachers a complete mastery of technique, and as soon as they were in possession of all the aids to art, they discarded them in order to begin afresh. Each painted what he had painted as a youth. They dwelt far from the busy world — Millet in Barbizon, Segantini at Val d' Albola, 5000 feet above the sea-level. They are equally closely allied in art. Millet, who rejected all the artifice of embellishment and perceived only beauty in things as they are, learned to see in the human body a heroic grandeur, in the movements of peasants a majestic rhythm, which none before him had discovered. Although representing peasants, his works resemble sacred pictures, so grand are they in their sublime solemn simplicity. The same is true of Segantini's works. Like Millet, he found his vocation in observing the life of poor, humble people, and the rough grandeur of nature, at all seasons and all hours. As there is in Millet's, so also is there in Segan- tini's work a primitive, almost classical, simplicity of execution corresponding to the simplicity of the subjects treated. His pictures, with their cold silvery colouring, remind us of the wax-painting of old times and of the mosaic style of the middle ages. They are made up of small scintillating strokes; they are stony and look hard like steel. This technique alone, which touches in principle but not in effect, that of the pointillistes, permitted of his rendering what he wished to render, the stony crags of Alpine scenery, the thin scintillating air, the firm steel- like outlines. Finally, he passed from

realistic subjects to thoughtful, Biblical and symbolical works. His “Annuncia- tion,” the ” Divine Youth,” and the ” Massacre of the Innocents ” were products of an art that had abandoned the firm ground

of naturalism and aimed at conquering supernatural worlds. This new aim he was unable to realize. He left the ” Panorama of the Engadine,” intended for the Paris Exhibition, in an unfinished state behind him. He died in his 42nd year, his head full of plans for the future. Modern Italy lost in him its greatest artist, and the history of art one of the rare geniuses.

Few. words will suffice for the other Italian painters. The soil that had yielded down to Tiepolo’s days such an abundant harvest was apparently in need of rest during the 19th century. At the Paris Exhibition of 1867 About called Italy ” the tomb of art,” and indeed until quite recent times Italian painting has had the character of mere pretty saleable goods. Francesco Vinea, Tito Conti, and Federigo Andreotti painted with tireless activity sleek drapery pictures, with Renaissance lords and smiling Renaissance ladies in them. Apart from such subjects, the comic, genre or anecdote ruled the fashion — somewhat coarse in colour and of a merrier tendency than is suitable for pictures of good taste. It was not until nearly the end of the 19th century that there was an increase in the number of painters who aim at real achievement. At the Paris Exhibition of iooo only Detti’s ” Chest ” and Signorini’s ” Cardinal ” pictures reminded one of the comedy subjects formerly in vogue. The younger masters employ neither ” drapery-mummeries ” nor spicy anecdote. They paint the Italian country people with refined artistic discernment, though scarcely with the naturalism of northern nations. Apparently the calm, serious, ascetic, austere art initiated by Millet is foreign to the nature of this volatile, colour-loving people. Southern fire and delight in brilliant hues are especially characteristic of the Neapolitans. A tangle of baldacchinos, priests and choir boys, peasants making obeisance and kneeling during the passing of the Host, weddings, horse-races and country festivals, everything spark- ling with colour and glowing in Neapolitan sunlight — such are the contents of Paolo Michetti’s, Vincenzo Capri’s, and Edoardo Dalbono’s pictures. But Michetti, from being an adherent of this glittering art, has found his way to the monumental style. The Venetians acknowledge and honour as their leader Giacomo Favretto, who died very young. He painted drapery pictures, like most artists of the ‘eighties, but they were never lacka- daisical, never commonplace. The Venice of Canaletto and Goldoni, the magic city surrounded by the glamour of bygone splendour, rose again under Favretto’s hands to fairylike radiance.

The older masters, Signorini, Tito Tommasi, Dall ‘oca Branca, who depict the Piedmontese landscape, the light on the lagoons, and the colour charm of Venetian streets with so refined a touch, have numerous followers, whose pictures likewise testify to the seriousness that again took possession of Italian painters after a long period of purely commercial artistic industry. Side by side with these native Italians two others must be mentioned, who occupy an important place as interpreters of Parisian elegance and French art-history. Giuseppe de Nittis (born in Naples; died in Paris 1884) was principally known by his representations of French street life. The figures that enlivened his pictures were as full of charm as his rendering of atmospheric effects was refined. Giovanni Boldini, a Ferrarese living in Paris, also painted street scenes, full of throbbing life. But he excelled, besides, as a portrait-painter of ladies and children. He realized the aim of the Parisian Impressionists, which was to render life, and not merely mute repose. He understood in a masterly fashion how to catch the rapid move- ment of the head, the fleetest expression, the sparkling of the eye, a pretty gesture. From his pictures posterity will learn as much about the sensuous life of the 19th century as Greuze has told us about that of the 18th.

Among those who have been the leaders of modern Italian art, not already mentioned, are Domenico Morelli, Giovanni Costa, landscape painter; Sartorio, an Italian Pre-Raphaelite; Pasini, painter of the East; Muzzioli, a follower of Alma- Tadema; Barabino, historical painter; and most striking and original of all, Monticelli, whose glow of colours was often

obtained, not only by palette-knife painting, but by squeezing the colour straight from the tubes on to the canvas.

See Ashton R. Willard, History of Modern Italian Art (London, 1898). (R- Mr.)

Spain and Portugal

Modern Spanish painting began with Mariano Fortuny (q.v.), who, dying as long ago as 1874, nevertheless left his mark even on the following generation of artists. During his residence in Paris in 1866 he had been strongly influenced by Meissonier, and subsequently

selected similar subjects — scenes in 18th- century costume. In Fortuny, however, the French painter's elaborate finish is associated with something more intense and vivid, indicative of the southern Latin temperament. He collected in his studio in Rome the most artistic examples of medieval industry. The objects among which he lived he also painted with incisive spirit as a setting for elegant figures from the world of Watteau and of Goya, which are thrown into his pictures with amazing dash and sparkle; and this love of dazzling kaleidoscopic variety has animated his successors. Academic teaching tries to encourage historical painting. Hence, since the 'seventies, the chief paintings produced in Spain have been huge historical works, which have made the round of European exhibitions and then been collected in the Gallery of Modern Art at Madrid. There may be seen " The Mad Queen Juana," by Pradillt ; " The Conversion of the Duke of Gandia," by Moreno Carbonero; " The Bell of Huesca," by Casado; " The Last Day of Numantia," by Vera; " Ines de Castro," by Cabello.

It is possible, of course, to discern in the love of the horrible displayed in these pictures an element of the national character, for in the land of bull-fights even painting turns to murder and sudden death, poison and the rope. However, at least we must admit the great power revealed, and recognize the audacious colouring. But in point of fact these works are only variants on those executed in France from the time of Delaroche to Jean Paul Laurens, and tell their story in the style that was current in Parisian studios in the 'sixties. What is called the national garb of Spain is mainly the cast-off fashion of Paris. After all this magniloquent work Fortuny's rococo became the rage. The same painters who had produced the great historical pictures were now content to take up a brilliant and dazzling miniature style; either, like Fortuny himself, using small and motley figures in baroque subjects, or adapting the modern national life of Spain to the rococo style.

Here again we observe the acrobatic dexterity with which the painters, Pradilla especially, use the brush. But here again there is nothing essentially new — only a repetition of what Fortuny had already done twenty years before. The Spanish school, therefore, presented a very old-fashioned aspect at the Paris Exhibition of 1900. The pictures shown there were mostly wild or emotional. Bedouins fighting, an antique quadriga flying past, the inhabitants of Pompeii hastily en- deavouring to escape from the lava torrent, Don Quixote's Rosinante hanging to the sail of the windmill, and the terrors of the Day of Judgment were the subjects; Alvarez Dumont, Benlliure y Gil, Ulpiano Checa, Manuel Ramirez Ibafiez and Moreno Carbonero were the painters. Among the huge canvases, a number of small pictures, things of no importance, were scattered, which showed only a genre-

like wit. Spain is a somewhat barren land in modern art. There painting, although active, is blind to life and to the treasures of art which lie un- heeded in the road. Only one artist, Agrasot, during the ‘seventies painted pictures of Spanish low life of great sincerity; and much later two young painters appeared who energetically threw themselves into the modern movement. One was Sorolla y Bastida, by whom there is a large fishing picture in the Luxembourg, which in its stern gravity might be the work of a Northern painter; the other was Ignacio Zuloaga, in whom Goya seems to live again. Old women, girls of the people, and cocottes especially, he has painted with admirable spirit and with breadth. Spain, which has taken so little part in the great move- ment since Manet’s time, only repeating in old-fashioned guise things which are falsely regarded as national, seems at last to

possess in Zuloaga an artist at once modern and genuinely national.

Portugal took an almost lower place in the Paris Exhibition. For whereas the historical Spanish school has endeavoured to be modern to some extent, at least in colour, the Portuguese cling to the blue-plush and red-velvet splendours of Delaroche in all their crudity. Weak pictures of monks and of visions are produced in numbers, together with genre pictures depicting the popular life of Portugal, spiced to the taste of the tourist. There are the younger men who aim at availing themselves of the efforts of the open-air painters; but even as followers of the Parisians they only say now what the French were saying long •years ago through Bastien-Lepage, Puvis de Chavannes and Adrien Dumont. There is always a Frenchman behind the Portuguese, who guides his brush and sets his model. The only painter formed in the school is Carlos Reis, whose vast canvas ” Sunset ” has much in common with the first huge peasant pictures painted in Germany by Count Kalckreuth. One painter there is, however, who is quite independent and wholly Portu- guese, a worthy successor of the great old masters of his native land, and this is Columbano, whose portraits of actors have a spark of the genius which inspired the works of Velazquez and Goya.

See A. G. Temple, Modern Spanish Painting (1908). (R. Mr.)

Denmark Denmark resembles Holland in this: that in both, nature presents little luxury of emphasized colour or accentuated majesty of form. Broad flats are everywhere to be seen — vague, almost indefinable, in outline. Danish art is as demure and staid as the Danish landscape. As in Holland, the painters make no bold experiments, attempt no pretentious subjects, no rich colouring, nothing sportive or light. Like the Dutch, the Danes are somewhat sluggishly tranquil,

loving dim twilight and the swirling mist. But Denmark is a leaner land than Holland, less moist and more thinly inhabited, so that its art lacks the comfortable self-satisfied character of Dutch art. It betrays rather a tremulous longing, a pleasing melancholy and delight in dreams, a trembling dread of contact with coarse and stern reality. It was only for a time, early in the 'seventies, that a touch of cosmopolitanism affected Danish art. The phase of grandiose historical painting and anecdotic genre was experienced there, as in every other country. In Karl Bloch (b. 1834), Denmark had a historical painter in some respects parallel with the German Piloty; in Axel Helsted (b. 1847), a genre painter reminding us of Ludwig Knaus. The two artists Laurits Tuxen (b. 1853) and Peter Kroyer (b. 1851), who are most nearly allied to Manet and Bastien-Lepage, have a sort of elegance that is almost Parisian. Kroyer, especially, has bold inventiveness and amazing skill. Open-air effects and twilight moods, the glare of sunshine and artificial light, he has painted with equal mastery. In portraiture, too, he stands alone. The two large pictures in which he recorded a " Meeting of the Committee of the Copenhagen Exhibition, 1887," and a" Meeting of the Copenhagen Academy of Sciences," are modern works which in power of expression may almost compare with those of Frans Hals. Such versatility and facile elegance are to be found in no other Danish painter. At the period of historic painting it was significant that next to Bloch, the cosmopolitan, came Kristian Zahrtmann (b. 1843), who painted scenes from the life of Eleonora Christina, a Danish heroine (daughter of Christian IV.), with the utmost simplicity, and without any emotional or theatrical pathos. This touching feeling for home and country is the keynote of Danish art. The Dane has now no sentiment but that of home; his country, once so powerful, has become but a small one, and has lost its political importance. Hence he clings to the little that is left to him with melancholy tenderness. Viggo Johansen (b. 1851), with his gentle dreaminess, is the best representative of modern Danish home-life. He shows us dark sitting-rooms, where a quiet party has met around the tea-table. " An Evening at Home," " The Christmas Tree," " Grandmother's Birthday," are typical subjects, and all have the same fresh and fragrant

charm. He is also one of the best Danish landscape painters. The silvery atmosphere and sad, mysterious stillness of the island-realm

rest on Johansen's pictures. Not less satisfactory in their little world are the rest: Holsoe (b. 1866), Lauritz Ring (b. 1854), Haslund, Syberg (b. 1862), Irminger (b. 1850), and listed paint the pleasant life of Copenhagen. In Skagen, a fishing town at the extreme end of Jutland, we find painters of sea life: Michael Ancher (b. 1849), Anna Ancher (b. 1859), and C. Locher (b. 1851). The landscape painters Viggo Pederson (b. 1854), Philipsen (b. 1840), Julius Paulsen (b. i860), Johan Rohde (b. 1856) have made their home in the villages round Copenhagen. Each has his own individuality and sees nature with his own eyes, and yet in all we find the same sober tone, the same gentle, tearful melancholy. The new Idealism has, however, been discernible in Denmark. Joakim Skovgaard (b. 1856), with his " Christ among the Dead " and " Pool of Bethesda," is trying to endow Denmark with a monumental type of art. Harald Slott-Moller (b. 1864) and J. F. Willumsen (b. 1863) affect a highly symbolical style. But even more than these painters, who aim at reproducing ancient folk-tales through the medium of modern mysticism, two others claim our attention, by the infusion into the old tradition of a very modern view of beauty approaching that of Whistler and of Carriere: one is Ejnar Nielsen, whose portraits have a peculiar, refined strain of gentle Danish melancholy; the other, V. Ham- mershoj, who has an exquisite sense of tone, and paints the magical effect of light in half-darkened rooms. Among the more noteworthy portrait painters, Aug. Jerndorff and Otto Bache should be included; and among the more decorative artists, L. Frolich; while Hans Tegner may be considered the greatest illustrator of his day. (R. Mr.)

Sweden

There is as great a difference between Danish and Swedish art as between Copenhagen and Stockholm. Copenhagen is a homely provincial town and life is confined to home circles. In Stockholm we find the whirl of life and all the elegance of a capital. It has been styled the Paris of the North, and its art also wears this cosmopolitan aspect. Diisseldorf, where in the 'sixties most painters studied their art, appeared to latter-day artists too provincial. Munich and, to a still greater extent, Paris became their " Alma Mater," Salmson (1843-1894) and Hagborg (b. 1852), who were first initiated into naturalism in Paris, adopted this city for a domicile. They paint the fishermen of Brittany and the peasants of Picardy; and even when appar- ently interpreting Sweden, they only clothe their Parisian models in a Swedish garb. Those who returned to Stockholm turned their Parisian art into a Swedish art, but they have remained cosmopolitan until this day. Whilst there is something prosy and homely about Danish art, that of Sweden displays nervous elegance

and cosmopolitan polish. Simplicity is in her eyes humdrum ; she prefers light and brilliant notes. There, a natural- ness and simplicity allows us to forget the difficulties of the brush: here, we chiefly receive the impression of a cleverly solved problem. There, the greatest moderation in colour, a soft all-pervading grey: here, a cunning play with delicate tones and gradations — a striving to render the most difficult effects of light with obedient hand. This tendency is particularly marked in the case of the landscape painters: Per Ekstrom (b. 1844), Niels Kreuger (b. 1858), Karl Nordstr6m (b. 1865), Prince Eugen of Sweden (b. 1855), Axel Sjoberg Wallander (b. 1862), and Wahlberg (b. 1864). Nature in Sweden has not the idyllic softness, the veiled elegiac character, it displays in Denmark. It is more coquettish, southern and French, and the painters regard it also with French eyes.

As a painter of animals, Bruno Liljefors (b. i860) created a sensation by his surprising pictures. Whatever his subjects —quails, capercailzies, dogs, hares, magpies or thrushes — he has caught the fleetest motions and the most transitory effects of light with the cleverness of a Japanese. With this exception, the Swedish painters cannot be classified according to ” subjects.” They are ” virtuosi,” calling every technical aspect of art their own- -as well in fresco as in portrait painting. Oscar Bjorek

(b. 1860), Ernst Josephson (b. 1851), Georg Pauli (b. 1855), Richard Bergh (b. i8s8),HannaHirsch now Pauli (b. 1864) are the best-known names. Carl Larsson’s (b. 1853) decorative panneaux fascinate by their easy lightness and coquettish grace of execution. AnderZorn(b. i860), with his dazzling virtuosity, is as typical of Swedish as the prosaic simplicity of Johansen is of Danish art. His marine pictures, with their undulating waves and naked forms bathed in light, belong to the most surprising examples of the cleverness with which modern art can stereotype quivering motions; and the same boldness in handling his subjects, which triumphs over difficulties, makes his ” interiors,” his portraits and etchings, objects of admiration to every painter’s eye. In his ” Dance before the Window ” all is vivacity and motion. His portrait of a ” Peasant Woman ” is a powerful harmony of sparkling yellow-red tones of colour. Besides these older masters who cleave to the most dazzling light effects, there are the younger artists of the school of Carl Larsson, who aspire more to decorative effects on a grander scale. Gustav Fjalstad (b. 1868) exhibited a picture in the Paris Exhibition of 1900 that stood out like mosaic among its sur- roundings. And great similarity in method has Hermann Normann, who, as a landscape painter, also imitates the classic style. (R. Mr.)

Norway

We enter a new world when in picture-galleries we pass to the Norwegian from the Swedish section. From the great city we are transported to nature, solemn and solitary, into a land of silence, where a rude, sparse population, a race of fishermen, snatches a scanty sustenance from the sea. The Norwegians also contributed for a time to the international market in Works of art. They sent mainly genre pictures telling of the manners and customs of their country, or landscapes depicting the phenomena of Northern scenery. Adolf Tidemand (1814-1876) introduced his countrymen — the peasants and fishermen of the Northern coast — to the European public. We are introduced to Norwegian Christmas customs, accompany the Norseman on his nocturnal fishing expeditions, join the ” Brudefaerd ” across the Hardanger fjord, sit as disciples at the feet of the Norwegian sacristan. Ferdinand Fagerlin (b. 1825) and Hans Dahl are two other painters who, educated at Diisseldorf and settled in Germany, introduced the style of Knaus and Vautier to Norwegian art circles. Knud Badde (1808-1879), Hans Gude (b. 1825), Niels Bj6rnsen Moller, Morten-Muller (b. 1828), Ludvig Munthe (1843-1896), and Adelsten Normann (b. 1848) are known as excellent landscape painters, who have faithfully portrayed the majestic mountain scenery and black pine forests of their native land, the cliffs that enclose the fjords, and the sparkling snowfields of the land of the midnight sun. But the time when actuality had to be well seasoned, and every picture was bound to have a spice of genre or the attraction of something out of the common to make it palatable, is past and gone. As early as the ‘sixties Bjornson was president of a Norwegian society which made it its chief business to wage war against the shallow conventionalities of the Diisseldorf school. Ibsen was vice-president. In the works of the more modern artists there is not a single trace of Diisseldorf influence. Especially in the ‘eighties, when naturalism was at its zenith, we find the Norwegians its boldest devotees. They portrayed life as they found it, without embellishment; they did not trouble about plastic elegance, but painted the land of their home and its people in a direct, rough-hewn style. Like the people we meet in the North, giants with stalwart iron frames, callous hands, and sun-burnt faces, with their sou’westers and blue blouses, who resemble sons of a bygone heroic age, have the painters them selves — notably Niels Gustav Wentzel (b. 1859), Svend J6rgen- sen (b. 1861), Kolstoe (b. i860), Christian Krohg- — something primitive in the directness, in, one might almost say, the bar- barous brutality with which they approach their subjects. They preferred the most glaring effects of plein-air; they revelled in ail the hues of the rainbow.

But these very uncouth fellows, who treated the figures in their

pictures with such rough directness, painted even in those

days landscapes with great refinement; not the midnight sun and the precipitous cliffs of the fjords, by which foreigners were sought to be impressed, but austere, simple nature, as it lies in deathlike and spectral repose — lonely meres, whose surface is unruffled by the keel of any boat, where no human being is visible, where no sound is audible; the hour of twilight, when the sun has disappeared behind the mountains, and all is chill and drear; the winter, when an icy blast sweeps over the crisp snow- fields; the spring, almost like winter, with its bare branches and its thin young shoots. Such were their themes, and painters like Amaldus Nilsen (b. 1838), Eilif Petersen (b. 1852), Christian Skredsvig (b. 1854), Fritz Thaulow (b. 1848), and Gerhard Munthe (b. 1849) arrested public attention by their exhibition of pictures of this character.

Latterly these painters have become more civilized, and have emancipated themselves from their early uncouthness. Jorgensen, Krohg, Kolstoe, Soot, Gustav Wentzel, no longer paint those herculean sailors and fishermen, those pictures of giants that formerly gave to Norwegian exhibitions their peculiar character. Elegance has taken possession of the Norwegian palette. This transformation began with Fritz Thaulow, and indeed his art threatened to relp.pse somewhat into routine, and even the ripples of his waters to sparkle somewhat coquettishly. Borgen (b. 1852), Hennig (b. 1871), Hjerlow (b. 1863), and Stenersen (K 1862) were gifted recruits of the ranks of Norwegian painters, whilst Halfdan Strom (b. 1863), who depicts rays of light issuing from silent windows and streaming and quivering over solitary landscapes, dark blue streams and ponds, nocturnal skies, variegated female dresses, contrasting as spots of colour with dark green meadows, has a delicacy in colouring that recalls Cazin. Gerhard Munthe, who, as we have seen, first made a name by his delicate vernal scenery, has turned his attention to the classical side of art; and, finally Erik Werensk- jold (b. 1855), who was also first known by his landscapes and scenes of country life, afterwards gained success as an illustrator of Norwegian folk-lore. (R. Mr.)

Russia

Until late in the 10th century modern Russian painting was unknown to western Europe. What had been seen of it in international exhibitions showed the traditions of primitive European art, with a distinct vein of barbarism. In the early ‘fifties, painters were less bent on art than on political agitation ; they used the brush as a means of propaganda in favour of some political idea. Peroff showed us the miserable Condition of the serfs, the wastefulness and profligacy of the nobility. Vereschagin made himself the advocate of the soldier, painting the horrors of war long before the tsar’s manifesto preached universal disarmament. Art suffered from this praiseworthy misapplication; many pictures were painted, but very few rose to the level of modern achievement in point of technique. It was only by the St Petersburg art journal Mir Iskustwa, and by a small exhibition arranged at Munich in 1892 by a group of Russian landscape painters, that it was realized that a younger Russian school had arisen, fully equipped with the methods of modern technique, and depicting Russian life with the stamp of individuality. At the Paris Exhibition of 1900 the productions of this young Russian school were seen with surprise. A florescence similiar to that which literature displayed in Pushkin, Dostoievsky and Tolstoy seemed to be beginning for Russian painting. Some of these young painters rushed into art with unbridled zest, painting with primitive force and boldness. They produced historical pictures, almost barbaric but of striking force; representations of the life of the people full of deep and hopeless gloom; the poor driven by the police and huddled together in dull indifference; the popes tramping across the lonely steppes, prayer-book in hand; peasants muttering prayers before a crucifix. There is great pathos in ” The Karamasow Brothers,” or ” The Power of Darkness.” At the same time we feel that a long-inherited tradition pervades all Russia. We find a characteristic ecclesiastical art, far removed from the productions of the fin de siecle, in which the rigid tradition of the Byzantines of the 3rd century still survives.

And, finally, there are landscapes almost Danish in their bloodless, dreamy tenderness. Among the historical painters Ehas Repin is the most impressive. In his pictures, “Ivan the Cruel,” “The Cossacks’ Reply to the Sultan,” and “The Miracle of Saint Nicholas,” may be seen — what is so rare in historical painting — genuine purpose and style. Terror is rendered with Shakespearean power; the boldness with which he has recon- stituted the past, and the power of pictorial psychology which has enabled him to give new life to his figures, are equally striking in ” Sowing on the Volga ” and ” The Village Pro-cession.” He was the first to paint subjects of contemporary life, and the work, while thoroughly Russian, has high technical qualities —

the sense of oppression, subjection and gloom is all- pervading. But he does not ” point the moral,” as Peroff did; he paints simply but sympathetically what he sees, and this lends his pictures something of the resigned melancholy of Russian songs. Even more impressive than Repin is Philippe Maliavine. He had rendered peasants, stalwart figures of powerful build; and, in a picture called ” Laughter,” Macbeth-like women, wrapped in rags of fiery red, are thrown on the canvas with astonishing power. Among religious painters Victor Vasnezov, the powerful decorator of the dome in the church of St Vladimir at Kiev, is the most distinguished figure. These paintings seem to have been executed in the very spirit of the Russian church; blazing with gold, they depend for much of their effect upon barbaric splendour. But Vasnezov has painted other things: ” The Scythians,” fighting with lance and battle-axe; horsemen making their way across the pathless steppe; and woods and landscapes pervaded by romantic charm, the home of the spirits of Russian legend. Next to Vasnezov is Michael Nesterov, a painter also of monks and saints, but as different from him as Zurbaran from the mosaic workers of Venice; and Valentin Serov, powerful in portraiture and fascinating in his landscape. It is to be remarked that although these artists are austere and unpolished in their figure-painting, they paint landscape with delicate refinement.

Schischkin and Vassiliev were the first to paint their native land in all simplicity, and it is in landscape that Russian art at the present time still shows its most pleasing work. Savrassov depicts tender spring effects; Kuindshi light birch-copses full of quivering light; Sudkovski interprets the solemn majesty of the sea; Albert Benois paints in water-colour delicate’ Finnish scenery; Apollinaris Vasnezov has recorded the dismal wastes of Siberia, its dark plains and endless primeval forest, with powerful simplicity.

A special province in Russian art must be assigned to the Poles. It is difficult indeed to share to the full the admiration felt in Warsaw for the Polish painters. It is there firmly believed that Poland has a school of its own, owing nothing to Russia, Austria or Germany; an art which embodies all the chivalry and all the suffering of that land. The accessories are Polish, and so are the costumes. Jan Chelminski, Wojcliech Gerson, Constantine Gorski, Apolonius Kendzrierski, Joseph Ryszkievicz and Roman Szvoinicki are the principal artists. We see in their pictures a great deal of fighting, a great deal of weeping; but what there is peculiar to the Poles in the expression or technique of their works it is hard to discover.

Finland, on the other hand, is thoroughly modern. Belonging by

descent to Sweden rather than to Russia, its painters' views of art also resemble those of the " Parisians of the North." They display no ungoverned power, but rather supple elegance. The play of light and the caprice of sunshine are rendered with much subtlety. Albert Edelfeldt is the most versatile artist of the group; Axel Gallen, at first naturalistic, developed into a decorative artist of fine style; Eero Jaernefelt charms with his airy studies and brilliant landscapes. Magnus Enckell, Pekka Halonen and Victor Vesterholm sustain the school with work remarkable for sober and tasteful feeling. (R. Mr.)

Balkan States Until quite recent times the Balkan States had no part at all in the history of art. But at the Paris Exhibition of 1900 it was noted with surprise that even in south-eastern EutQpe

there was a certain pulsation of new life. And there were also signs that painting in the Balkans, which hitherto had appeared only as a reflex of Paris and Munich art, would ere long assume a definite national character. At this Exhibition Bulgaria seemed to be the most backward of all, its painters still represent- ing the manners and customs of their country in the style of the illustrated papers. Market-places are seen, where women with golden chains, half-nude boys and old Jews are moving about; or cemeteries, with orthodox clergy praying and women sobbing; military pageants, wine harvests and horse fairs, old men performing the national dance, and topers jesting with brown-eyed girls. Such are the subjects that Anton Mittoff, Raymund Ulrich and Jaroslav Vesin paint. More original is Mvkuicka. In his most important work he represented the late princess of Bulgaria sitting on a throne, solemn and stately, in the background. mosaics rich in gild, tall slim lilies at her side. In his other pictures he painted Biblical landscapes, battlefields wrapped in sulphurous smoke, and old Rabbis — all with a certain uncouth barbaric power. The Bulgarian painters have not as yet arrived at the aesthetic phase. One of the best among them, who paints delicate pale green landscapes, is Charalampi Ilieff ; and Nicholas Michailoff, at Munich, has executed pictures, representing nymphs, that arrest attention by their delicate tone and their beautiful colouring.

Quite modern was the effect of the small Croatian-Slavonic Gallery in the Exhibition. Looking at the pictures there, the visitor might imagine

himself on the banks of the Seine rather than in the East. The French saying, ” Faire des Whistler, faire des Dagnan, faire des Carriere,” is eminently applicable to their work. Vlaho Bukovak, Nicola Mask, Csiks and Medovic all paint very modern pictures, and in excellent taste, only it is surprising to find upon them Croatian and not Parisian signatures.

Precisely the same judgment must be passed with regard to Rumania. Most of the painters live in Paris or Munich, have sought their inspiration at the feet of the advanced masters there, and paint, as pupils of these masters, pictures just as good in taste, just as cosmopolitan and equally devoid of char- acter. Irene Deschly, a pupil of Carriere, illustrates the songs of Francois Coppee; Verona Gargouromin is devoted to the pale symbolism of Dagnan-Bouveret. Nicolas Grant paints bright landscapes, with apple trees with their pink blossoms, like Darnoye. Nicolas Gropeano appears as the double of Aman- Jean, with his female heads and pictures from fairy tales. Olga Koruca studied under Puvis de Chavannes, and painted Cleo- patra quite in the tone of her master. A landscape by A. Segall was the only work that appeared to be really Rumanian, representing thatched huts.

Servia is in striking contrast to Rumania. No trace of modern influence has penetrated to her. There historical painting, such as was in vogue in France and Germany a generation ago, is the order of the day. Risto Voucanovitch paints his scenes from Servian history in brown; Paul Ivanovitch his in greyish plein-air. But in spite of this pate painting, the latter’s works have no modern effect— as little as the sharply-drawn small landscapes of his brother Svatislav Ivanovitch. (R. Mr.)

United States

The history of painting in the United States practically began with the ioth century. The earlier years of the nation were devoted to establishing government, subduing the land and the aborigines, building a commonwealth out of primeval nature; and naturally enough the aesthetic things of life received not too much consideration. In Colonial times the graphic arts existed, to be sure, but in a feeble way. Painting was made up of portraits of prominent people; only an occasional artist was disposed towards historical pictures; but the total result added little to the sum of art or to the tale of history. The first artist of importance was J. S. Copley (1737-1815), with whom painting in America really began. Benjamin West (1738-1820) belongs in the same period, though he spent most of his life in England, and finally became President of the Royal Academy.

As a painter he is not to be ranked so high as Copley. In the early part of the 19th century two men, John Trumbull (1756-

1843), a historical painter of importance, and Gilbert Stuart (1755-1828), a pre-eminent portrait painter, were the leaders; and after them came John Vanderlyn (1776-1852), Washington Allston (1770-1843),. Rembrandt Peale (1787-1860), J. W. Jarvis (1780-1834), Thomas Sully (born in England, 1783-1872) — men of importance in their day. The style of all this early art was modelled upon that of the British school, and indeed most of the men had studied in England under the mastership of West, Lawrence and others. The middle or second period of painting in the United States began with the landscape work of Thomas Doughty (1793-1856) and Thomas Cole (1801-1848). It was not a refined or cultivated work, for the men were in great measure self-taught, but at least it was original and distinctly American. In subject and in spirit it was perhaps too panoramic and pompous; but in the hands of A. B. Durand (1796-1886), J. F. Kensett (1818-1872) and F. E. Church (1826-1900), it was modified in scale and improved in technique.

A group of painters called the Hudson River school finally emerged. To this school some of the strongest landscape painters in the United States owe their inspiration, though in almost every case there has been the modifying influence of foreign study. Contemporary with Cole came the portrait painters Chester Harding (1792-1866), C. L. Elliott (1812-1868), Henry Inman (1801-1846), William Page (1811-1885), G. P. A. Healy (1813-1894), Daniel Huntington and W. S. Mount (1807- 1868), one of the earliest genre painters. Foreign art had been followed to good advantage by most of these painters, and as a result some excellent portraits were produced. The excellence of the work was not, however, appreciated by the public generally because art knowledge was not at that time a public possession. Little was required of the portrait painter beyond a recognizable likeness. A little later the teachings of the Dusseldorf school began to have an influence upon American art through Leutze (1816-1868), who was a German pupil of Lessing, and went to America to paint historical scenes from the War of Independence. But the foreign influence of the time to make the most impression came from France in 1855 with two American pupils of Couture — W. M. Hunt (1824-1879) and Thomas Hicks (1823-1890). Hunt had also been a pupil of Millet at Barbizon, and was the real introducer of the Barbizon painters to the American people. After his return to Boston his teaching and example had much weight in moulding artistic opinion. He, more than any other, turned the rising generation of painters towards the Paris schools. Contemporary with Hunt and following him were a number of

painters, some self-taught and some schooled in Europe, who brought American art to a high standard of excellence. George Fuller (1822-1884), Eastman Johnson, Elihu Vedder, produced work of much merit; and John La Farge and Winslow Homer were unquestionably the foremost painters in the United States at the opening of the 20th century. In landscape the three strongest men have passed away — A. H. Wyant, George Inness, and Homer Martin. Swain Gifford, Edward Gay, Thomas Moran, Jervis McEntee, Albert Bierstadt, are other landscape painters of note who belonged to the middle period and reflected the traditions of the Hudson River school to some extent. With the Centennial Exhibition at Philadelphia in 1876 a widespread and momentous movement in American art began to shape itself. The display of pictures at Philadelphia, the national prosperity, and the sudden development of the wealth of the United States had doubtless much to do with it. Many young men from all parts of the country took up the study of art and began going abroad for instruction in the schools at Munich, and, later, at Paris. Before 1880 some of them had returned to the United States and founded schools and societies of art, like the Art Students' League and the Society of American Artists. The movement spread to the Western cities, and in a few years museums and art schools began to appear in all the prominent towns, and a national interest in art was awakened. After 1870 the predominant influence, as regards technical training, was French. Many students still go to Paris to complete their studies, though there is a large body of accomplished painters teaching in the home schools, with satisfactory results as regards

the work of their pupils. From their French training, many of the American artists have been charged with echoing Parisian art; and the charge is partly true. They have accepted French methods because they think them the best, but their subjects and motives are sufficiently original.

Under separate biographical headings a number of modern American artists are noticed. Some of the greatest Americans however can hardly be said to belong to any American school. James McNeill Whistler, though American-born, is an example of the modern man without a country. E. A. Abbey, John S. Sargent, Mark Fisher and J. J. Shannon are American only by birth. They became resident in London and must be regarded as cosmopolitan in their methods and themes. This may be said with equal truth of many painters resident in Paris

and else- where on the Continent. However good as art it may be, there is nothing distinctively American about the work of W. T. Dannat, Alexander Harrison, George Hitchcock, Gari Melchers, C. S. Pearce, E. L. Weeks, J. L. Stewart and Walter Gay. If they owe allegiance to any centre or city, it is to Paris rather than to New York.

During the last quarter of the 19th century much effort and money were devoted to the establishment of institutions like the Metropolitan Museum in New York, the Carnegie Museum at Pittsburg, and the Art Institute in Chicago. Every city of importance in the United States now has its gallery of paintings. Schools of technical training and societies of artists likewise exist wherever there are important galleries. Exhibitions during the winter season and at great national expositions give abundant opportunity for rising talent to display itself; and, in addition, there has been a growing public patronage of painting, as shown by the extensive mural decorations in the Congressional Library building at Washington, in the Boston Public Library, in many colleges and churches, in courts of justice, in the recep- tion-rooms of large hotels, in theatres and elsewhere.

(J. C. van D.)

PAISIELLO (or Paesieixo), GIOVANNI (1741-1816), Italian musical composer, was born at Tarento on the 9th of May 1741. The beauty of his voice attracted so much attention that in 1754 he was removed from the Jesuit college at Tarento to the Conservatorio di S. Onofrio at Naples, where he studied under Durante, and in process of time rose to the position of assistant master. For the theatre of the Conservatorio, which he left in 1763, he wrote some intermezzi, one of which attracted so much notice that he was invited to write two operas, La Pupilla and II Mondo al Rovescio, for Bologna, and a third, II Marchese di Tulipano, for Rome. His reputation being now firmly established, he settled for some years at Naples, where, notwith- standing the popularity of Piccini, Cimarosa and Guglielmi, of whose triumphs he was bitterly jealous, he produced a series of highly successful operas, one of which, L'Idolo cinese, made a deep impression upon the Neapolitan public. In 1772 he began to write church music, and composed a requiem for Gennara Borbone. In the same year he married Cecilia Pallini, with whom he lived in continued happiness. In 1776 Paisiello was invited by the. empress Catherine II. to St Petersburg, where he remained for eight years, producing, among other charming works, his masterpiece, II Barbiere di Siviglia, which soon attained a European reputation. The fate of this delightful opera marks an epoch in the history of Italian art; for with it the gentle suavity cultivated by the masters of the 18th century died out

to make room for the dazzling brilliancy of a later period. When, in 1816, Rossini set the same libretto to music, under the title of Almaviva, it was hissed from the stage; but it made its way, nevertheless, and under its changed title, 77 Barbiere, is now acknowledged as Rossini's greatest work, while Paisiello's opera is consigned to oblivion — a strange instance of poetical vengeance, since Paisiello himself had many years previously endeavoured to eclipse the fame of Pergolesi by resetting the libretto of his famous intermezzo, La Serva padrona.

Paisiello quitted Russia in 1784, and, after producing II Re Teodoro at Vienna, entered the service of Ferdinand IV. at Naples, where he composed many of his best operas, including

Nina and La Molinara. After many vicissitudes, resulting from political and dynastic changes, he was invited to Paris (1802) by Napoleon, whose favour he had won five years previously by a march composed for the funeral of General Hoche. Napoleon treated him munificently, while cruelly neglecting two far greater composers, Cherubini and Mehul, to whom the new favourite transferred the hatred he had formerly borne to Cimarosa, Guglielmi and Piccini. Paisiello conducted the music of the court in the Tuileries with a stipend of 10,000 francs and 4800 for lodging, but he entirely failed to conciliate the Parisian public, who received his opera Proserpine so coldly that, in 1803, he requested and with some difficulty obtained permission to return to Italy, upon the plea of his wife's ill health. On his arrival at Naples Paisiello was reinstated in his former appoint- ments by Joseph Bonaparte and Murat, but he had taxed his genius beyond its strength, and was unable to meet the demands now made upon it for new ideas. His prospects, too, were precarious. The power of the Bonaparte family was tottering to its fall; and Paisiello's fortunes fell with it. The death of his wife in 181 5 tried him severely. His health failed rapidly, and constitutional jealousy of the popularity of others was a source of worry and vexation. He died on the 5th of June 1816.

Paisiello's operas (of which he is known to have composed 94) abound with melodies, the graceful beauty of which is still warmly appreciated. Perhaps the best known of these airs is the famous " Nel cor phi " from La Molinara,, immortalized by Beethoven's delightful variations. His church music was very voluminous, comprising eight masses, besides many smaller works; he also produced fifty-one instrumental compositions and many detached pieces. MS. scores of many of his operas were presented to the library of the British Museum by Dragonetti.

The library of the Gerolamini at Naples possesses an interesting MS. compilation recording Paisiello's opinions on contemporary composers, and exhibiting him as a somewhat severe critic, especially of the work of Pergolesi. His Life has been written by F. Schizze (Milan, 1833).

PAISLEY, CLAUD HAMILTON, Lord (e. 1543-1622), Scot- tish politician, was a younger son of the 2nd earl of Arran. In 1 s S3 he received the lands of the abbey of Paisley, and in 1568 he aided Mary Queen of Scots to escape from Lochleven castle, afterwards fighting for her at the battle of Langside. His estates having been forfeited on account of these proceedings, Hamilton was concerned in the murder of the regent Murray in 1570, and also in that of the regent Lennox in the following year; but in 1573 he recovered his estates. Then in 1579 the council decided to arrest Claud and his brother John (afterwards 1 st marquess of Hamilton) and to punish them for their past misdeeds; but the brothers escaped to England, where Elizabeth used them as pawns in the diplomatic game, and later Claud lived for a short time in France. Returning to Scotland in 1586 and mixing again in politics, Hamilton sought to reconcile James VI. with his mother; he was in communication with Philip II. of Spain in the interests of Mary and the Roman Catholic religion, and neither the failure of Anthony Babington's plot nor even the defeat of the Spanish Armada put an end to these intrigues. In 1589 some of his letters were seized and he suffered a short imprisonment, after which he practically dis- appeared from public fife. Hamilton, who was created a Scottish baron as Lord Paisley in 1587, was insane during his concluding years. His eldest son James was created earl of Abercorn (q.v.) in 1606.

PAISLEY, a municipal and police burgh of Renfrewshire, Scotland, on the White Cart, 3 m. from its junction with the Clyde, 7 m. W. by S. of Glasgow by the Glasgow & South- Western and Caledonian railways. Pop. (1891), 66,425; (1901) 79,363. In 1 79 1 the river, which bisects the town, was made navigable for vessels of 50 tons and further deepened a century later. It is crossed by several bridges — including the Abercorn, St James's and the Abbey Bridges — and two railway viaducts. The old town, on the west bank of the stream, contains most of the principal warehouses and mills; the new town, begun towards the end of the 18th century, occupies much of the level ground

that once formed the domains of the abbey. To the munificence of its

citizens the town owes many of its finest public buildings. Opposite to the abbey church (see below) stands the town hall (1879-1882), which originated in a bequest by Geofge Aitken Clark (1823-1873), and was completed by his relatives, the thread manufacturers of Anchor Mills. The new county build- ings (1891) possess a handsome council hall, and the castellated municipal buildings (1818-1821) were the former county buildings; the sheriff court house (1885) in St James Street, and the free library and museum (including a picture gallery) at the head of High Street, were erected (1869-1872) by Sir Peter Coats (1808- 1890). In Oakshaw Street stands the observatory (1883), the gift of Thomas Coats (1809-1883). Besides numerous board schools, the educational establishments include the John Neilson Endowed Institute (1852) on Oakshaw Hill, the grammar school (founded, 1576; rebuilt, 1864), and the academy for secondary education, and the technical college, in George Street. Among charitable institutions are the Royal Alexandra Infirmary, the Victoria Eye Infirmary (presented by Provost Mackenzie in 1899), the burgh asylum at Riccartsbar, the Abbey Poorhouse (including hospital and lunatic wards), the fever hospital and reception house, the Infectious Diseases Hospital and the Gleniffer Home for Incurables. The Thomas Coats Memorial Church, belonging to the Baptist body, erected by the Coats family from designs by H. J. Blanc, R.S.A., is one of the finest modern ecclesiastical structures in Scotland. It is an Early English and Decorated cruciform building of red sandstone, with a tower surmounted by a beautiful open-work crown. Of parks and open spaces there are in the south, Brodie Park (22 acres), presented in 1871 by Robert Brodie; towards the north Fountain Gardens (75 acres), the gift of Thomas Coats and named from the handsome iron fountain standing in the centre; in the north-west, St James Park (40 acres), with a race- course (racing dates from 1620, when the earl of Abercorn and the Town Council gave silver bells for the prize) ; Dunn Square and the old quarry grounds converted and adorned; and Moss Plantation beyond the north-western boundary. There are the cemeteries at Hawkhead and at the west side of the town. Under the Reform Act of 1832 the burgh returns one member to Parliament. The town is governed by a council, with provost and bailies, and owns the gas and water supplies and the electric lighting. In the abbey precincts are statues to the poet Robert Tannahill (1774-1810) and Alexander Wilson (1766-1813), the American ornithologist, both of whom were born in Paisley, and, elsewhere, to Robert Burns, George Aitkin Clark, Thomas Coats and Sir Peter Coats.

Paisley has been an important manufacturing centre since the beginning of the 18th century, but the earlier linen, lawn and silk-

gauze industries have become extinct, and even the famous Paisley shawls (imitation cashmere), the sale of which at one time exceeded £1,000,000 yearly in value, have ceased to be woven. The manufacture of linen thread, introduced about 1720 by Christian Shaw, daughter of the laird of Bargarran, gave way in 1812 to that of cotton thread, which has since grown' to be the leading industry of the town. The Ferguslie mills (J; & P. Coats) and Anchor mills (Clark & Company) are now the dominant factors in the combination that controls the greater part of the thread trade of the world and together employ 10,000 hands. Other thriving industries include bleaching, dyeing, calico-printing, weaving (carpets, shawls, tartans), engineering, tanning, iron and brass founding, brewing, dis- tilling, and the making of starch, cornflour, soap, marmalade and other preserves, besides some shipbuilding in the yards on the left bank of the White Cart.

The abbey was founded in n 63 as a Cluniac monastery by Walter Fitzalan, first High Steward of Scotland, the ancestor of the Scottish royal family of Stuart, and dedicated to the Virgin, St James, St Milburga of Much Wenlock in Shropshire (whence came the first monks) and St Mirinus (St Mirren), the patron-saint of Paisley, who is supposed to have been a con- temporary of St Columba. The monastery became an abbey in '12 19, was destroyed by the English under Aymer de Valence,

earl of Pembroke, in 1307, and rebuilt in the latter half of the 14th century, the Stuarts endowing it lavishly. At the Reformation (1561) the fabric was greatly injured by the 5th earl of Glencairn and the Protestants, who dismantled the altar, stripped the church of images and relics, and are even alleged to have burnt it. About the same date the central spire, 300 ft. high, built during the abbacy of John Hamilton (1511-1571), afterwards archbishop of St Andrews, collapsed, demolishing the choir and north transept. In 1553 Lord Claud Hamilton, then a boy of ten, was made abbot, and the abbacy and monastery were erected into a temporal lordship in his favour in 1587. The abbey lands, after passing from his son the earl of Abercorn to the earl of Angus and then to Lord Dundonald, were purchased in 1764 by the 8th earl of Abercorn, who intended makuig the abbey his residence, but let the ground for building purposes. The abbey church originally consisted of a nave, choir without aisles, and transepts. The nave, in the Transitional and Decorated styles, with a rich mid-Pointed triforium of broad round arches, has been restored, and used as the parish church since 1862. The graceful west front has a deeply recessed Early Pointed doorway, surmounted by traceried windows and, above these, by a handsome Decorated stained-glass window of

fire lights. Of the choir only the foundations remain to indicate its extent; at the east end stood the high altar before which Robert III. Was interred in 1406. Over his grave a monument to the memory of the Royal House of Stuart was placed here by Queen Victoria (1888). The restored north transept has a window of remarkable beauty. The south transept contains St Mirren's chapel (founded in 1499), which is also called the " Sounding Aisle " from its echo. The chapel contains the tombs of abbot John Hamilton and of the children of the 1st lord Paisley, and the recumbent effigy of Marjory, daughter of Robert Bruce, who married Walter, the Steward, and was killed while hunting at Knock Hill between Renfrew and Paisley (13 16).

About 3 m. S. of Paisley are the pleasant braes of Gleniffer, sung by Tannahill, and 2! m. S.E., occupying a hill on the -left bank of the Leven, stand the ruins of Crookston Castle. The castle is at least as old as the 12th century and belonged to Robert de Croc, who witnessed the charter of the foundation of Paisley Abbey. In the following century it passed into the possession of a branch of the Stewarts, who retained it until the murder of Darnley (1567). Afterwards it changed hands several times, but was finally acquired from the Montrose family by Sir John Maxwell of Pollok.

The Romans effected a settlement in Paisley in A.D. 84, and built a fort called Vanduara on the high ground (Oakshaw Hill) to the west of the White Cart. The place seems to have been first known as Paslet or Passeleth, and was assigned along with certain lands in Renfrewshire to Walter Fitzalan, founder of the abbey. The village grew up round the abbey, and by the 15th century had become sufficiently important to excite the jealousy of the neighbouring burgh of Renfrew. To protect it from molestation Abbot Schaw (or Shaw) induced James IV., a frequent visitor, to erect it into a burgh of barony in 1488, a charter which gave it the right to return a member to the Scots parliament.

See Chartulary of the Monastery of Paisley, published by the Maitland Club (1832); J. Cameron Lees, The Abbey of Paisley (1878); Swan, Description of the Town and Abbey of Paisley (1835); and Robert Brown, History of Paisley (1886).

PAITA, or Payta, a seaport of northern Peru, chief town of the province of Paita in the department of Piura. Pop. (1906 estimate), 3800. The town has one of the best natural harbours of the Peruvian coast, is a port of call for the regular mail steamers between Valparaiso and Panama, and is the port of the departmental capital, Piura, with which it is connected by a railway 60 m. long. It is also the Pacific terminus of the railway across the Andes to Puerto Limon,

on the Maranon, or upper Amazon. Paita faces on the bay of Paita, and is sheltered from southerly winds by a headland called Punta Paita and by a large hill called the Silla de Paita. The water

supply is brought from the river Chira (17 m. distant). The exports include cotton, tobacco, petroleum, cattle, hides and straw hats. Paita dates from the early years of the Spanish Conquest, and was a prosperous port in colonial times. It was nearly destroyed by Lord Anson's fleet in 1741.

PAJOL, CLAUDE PIERRE, Count (1 772-1844), French cavalry general, was born at Besancon. The son of an advocate, he was intended to follow his father's profession, but the events of 1789 turned his mind in another direction. Joining the battalion of Besancon, he took part in the political events of that year, and in 1701 went to the army of the Upper Rhine with a volunteer battalion. He took part in the campaign of 1792 and was one of the stormers at Hochheim (1793). From Custine's staff he was transferred to that of Kleber, with whom he took part in the Sambre and Rhine Campaigns (1794-96). After serving with Hoche and Massena in Germany and Switzer- land (1797-99), Pajol took a cavalry command under Moreau for the campaign on the upper Rhine. In the short years of peace Pajol, now colonel, was successively envoy to the Batavian Republic, and delegate at Napoleon's coronation. In 1805, the emperor employed him with the light cavalry. He distin- guished himself at Austerlitz, and, after serving for a short time in Italy, he rejoined the grande armte as a general of brigade, in time to take part in the campaign of Friedland. Next year (1808) he was made a baron of the Empire. In 1809 he served on the Danube, and in the Russian War of 181 2 led a division, and afterwards a corps, of cavalry. He survived fehe retreat, but his health was so broken that he retired to his native town of Besanjon for a time. He was back again in active service, however, in time to be present at Dresden, at which battle he played a conspicuous part. In 1814 he commanded a corps of all arms in the Seine Valley. On the fall of Napoleon, Pajol gave in his adhesion to the Restoration government, but he rejoined his old master immediately upon his return to France. His (I) corps of cavalry played a prominent part in the campaign of 1815, both at Ligny and in the advance on the Wavre under Grouchy. On receiving the news of Waterloo, Pajol disengaged his command, and by a skilful retreat brought it safe and unbeaten to Paris. There he and his men played an active part in the actions which ended the war. The Bourbons, on their return, dismissed him, though this treatment was not, compared to that meted out to Ney and others,

excessively harsh. In 1830 he took part in the overthrow of Charles X. He suppressed, sternly and vigorously, ententes in Paris in 1831 and 1832, 1834 and 1839. A general, and a peer of France, he was put on the retired list in 1842, and died two years later.

His son, Count Charles Paul Victor Pajol (1821-1891), entered the army and had reached the rank of general of division when he was involved in the catastrophe of Metz (1870). He retired in 1877. Besides being a good soldier, he was a sculptor of some merit, who executed statues of his father and of Napoleon, and he wrote a life of his father and a history of the wars under Louis XV. (Paris 1881-1891).

See Count C. P. V. Pajol: Pajol general en chef (Paris, 1874); Thomas, Les Grands cavaliers du premier empire (Paris, 1892) ; and Choppin, in the Journal des sciences militaires (1890).

PAJOU, AUGUSTIN (1730-1809), French sculptor, was born in Paris on the 19th of September 1730. At eighteen he won the Prix de Rome; at thirty he exhibited his Pluton tenant Cerbere enchdini (now in the Louvre). His portrait busts of Buff on and of Madame Du Barry (1773), and his statuette of Bossuet (all in the Louvre), are amongst his best works. When B. Poyet constructed the Fontaine des Innocents from the earlier edifice of P. Lescot (see Goujon) Pajou provided a number of new figures for the work. Mention should also be made of his bust of Carlin Bertinazzi (1763) at the Comedie Francaise, and the monument of Marie Leczinska, queen of Poland (in the Salon of 1769). Pajou died in Paris on the 8th of May 1809.

PAKHOI, or Peihai, a city and treaty port of China, in the west of the province of Kwang-tung, situated on a bay of the Gulf of Tong-king, formed by the peninsula running south-west from Lien-dhow, in 21° 30′ N,, 109 10′ E. Pop. about 25,000.

Dating only from about 1820-1830, and at first little better than a nest of pirates, Pakhoi rapidly grew into commercial import- ance, owing partly to the complete freedom which it enjoyed from taxation, and partly to the diversion of trade produced by the T’ai-p’ing rebellion. The establishment of a Chinese custom- house and the opening of the ports of Hanoi and Haiphong for a time threatened to injure its prospects; but, foreign trade being permitted in 1876-1877, it began in 1879 to be regularly visited by foreign steamers. The Chinese town stands on the peninsula and faces due north. From the bluff, on which

all the foreign community lives, a partly cultivated plain extends. Liquid indigo, sugar, aniseed and aniseed oil, cassia-lignea and cassia oil, cuttle-fish and hides are the chief exports. With Macao especially an extensive junk trade is carried on. A large number of the inhabitants engage in fishing and fish-curing. The preparation of dried fish is a speciality of Pakhoi, the fish being exported to Hong Kong.

PAKINGTON, the name of a famous English Worcestershire family, now represented by the barony of Hampton. Sir John Pakington (d. 1560) was a successful lawyer and a favourite at court, and Henry VIII. enriched him with estates, including that of Westwood in Worcestershire. His grandnephew and heir, Sir John Pakington (1549-1625), was another prominent courtier, Queen Elizabeth's " lusty Pakington," famous for his magnificence of living. His son John (1600-1624) was created a baronet in 1620. His son, Sir John, the second baronet (1620ˆ 1680), played an active part on the royalist side in the troubles of the Great Rebellion and the Commonwealth, and was taken prisoner at Worcester in 1651; Lady Dorothy, his wife (d. 1679), daughter of the lord keeper Thomas Coventry, was famous for her learning, and was long credited with the authorship of The Whole Duty of Man (1658), which has more recently been attributed to Richard Allestree (q.v.). Their grandson, Sir John, the 4th baronet (1671-1727) was a pronounced high Tory and was very prominent in political life; for long he was regarded as the original of Addison's Sir Roger de Coverley, but the reasons for this supposition are now regarded as inadequate. The baronetcy became extinct with the death of Sir John Pakington, the 8th baronet, in January 1830, but it was revived in 1846 for his maternal nephew and heir, John Somerset Pakington (1 799-1880), whose name was originally Russell. Born on the 20th of February 1799 and educated at Eton and at Oriel College, Oxford, Pakington had a long career as an active and industrious Conservative politician, being member of parlia- ment for Droitwich from 1837 to 1874. He was secretary for war and the colonies in 1852; first lord of the admiralty in 1858- 1859 and again in 1866-1867; and secretary of state for war it 1867-1868. In 1874 he was created Baron Hampton, and he died in London on the 9th of April 1880. From 1875 until his death Hampton was chief civil service commissioner. In 1906 his grandson Herbert Stuart (b. 1883) became 4th baron Hampton. It is interesting to note that in 1529 Henry VIII. granted Sir John Pakington the right of wearing his hat in the royal presence.

PAKOKKU, a district in the Minbu division of Upper Burma,, lying west of the Irrawaddy river and south of Mandalay, with the line of the Chin hills as a general boundary on the west. It has an area of

6210 sq. m. and a population (1901) of 356,489. The part of the district along the Irrawaddy and Chindwin rivers is alluvial. Beyond this, however, the country rises gradually to the low Shinmadaung and Tangyi ridges, where it is very arid. To the westward there is a rapid drop to the well- watered valley of the Yaw River, and then a rise over broken, dry country before the valleys of the Myit-tha and M6n rivers are reached. The principal products are millet, sesamum and sugar produced from toddy-palms in the riverain districts, which also grow rice, grain, peas and beans. Tobacco and vegetables are also produced in some quantity, and maize is grown largely for the sake of the husk, which is used for native cheroot-wrappers, under the name of yawpet. The Yenangyat oil-fields, which produce quantities of petroleum, are in the south of the district, and iron used to be worked in a small way. There are 1151 sq. m. of reserved forests in -the

district. A good deal of teak arid cutch is worked out. The cutch of the Yaw country is particularly esteemed. The average rainfall does not exceed 35 in. annually, and in many places water has to be carted for miles. West of the P6ndaung ridge, however, under the Chin hills, the rainfall exceeds 50 inches. The heat in May and June is very great, and the thermometer rises considerably above 100° F. in the shade.

The great majority of the population is Burmese, but in Yaw there is a peculiar race called Taungthas, who claim to be quite distinct from both Burmese and Chins. In 1901 the Taungthas numbered 5700.

The headquarters town, Pakokku, stands on the right bank of the Irrawaddy, and has grown into importance since the British occupation. It is the great boat-building centre of Upper Burma. The population in 1901 was 19,456. It may be described as the emporium of the trade of the Chindwin and. Yaw river valleys. The steamers of the Irrawaddy Flotilla Company call here regularly, and it is the starting-point for the vessels plying on the Chindwin.

PAL, KRISTO DAS (1839-1884), Indian publicist, was born in Calcutta in 1839, of the Teli or oil-man's caste, which ranks low in the Hindu social hierarchy. He received an English education at the Oriental Seminary and the Hindu Metropolitan College, and at an early age devoted himself to journalism. In 1861 he was appointed assistant secretary (and afterwards secretary) to the British Indian Association, a board of Bengal landlords, which numbered among its members

some of the most cultured men of the day. At about the same time he became editor of the Hindu Patriot, originally started in 1853 and conducted with ability and zeal by Harish Chandra Mukerji until his death in 1 86 1. This journal having been transferred by a trust deed to some members of the British Indian Association, it henceforth became to some extent an organ of that body. Thus Kristo Das Pal had rare opportunities for proving his abilities and independence during an eventful career of twenty-two years. In 1863 he was appointed justice of the peace and municipal commissioner of Calcutta. In 1872 he was made a member of the Bengal legislative council, where his practical good sense and moderation were much appreciated by successive lieutenant- governors. His opposition, however, to the Calcutta Municipal Bill of 1876, which first recognized the elective system, was attributed to his prejudice in favour of the ” classes “against the “masses.” In 1878 he received the decoration of CLE. In 1883 he was appointed a member of the viceroy’s legislative council. In the discussions on the Rent Bill, which came up for consideration before the council, Kristo Das Pal, as secretary to the British Indian Association, necessarily took the side of the landlords. He died on the 24th of July 1884. Speaking after his death, Lord Ripon said: ” By this melancholy event we have lost from among us a colleague of distinguished ability, from whom we had on all occasions received assistance, of which I readily acknowledge the value. ... Mr Kristo Das Pal owed the honourable position to which he had attained to his own exertions. His intellectual attainments were of a high order, his rhetorical gifts were acknowledged by all who heard him, and were enhanced when addressing this council by his thorough mastery over the English language.” A full length statue of him was unveiled by Lord Elgin at Calcutta in 1894.

See N. N. Ghose, Kristo Das Pal, a Study (Calcutta, 1887).

PALACE (Lat. Palatium, the name given by Augustus to his residence on the Palatine Hill), primarily the residence of a sovereign or prince, but in England, Spain and France extended to the residence of a bishop, and in the latter country to buildings appropriated to the public service, such as courts of justice, &c. In Italy the name is given to royal residences, to public buildings, and to such large mansions as in France are either known as ckdleaux if in the country, or hStels if in Paris.

The earliest palaces in Egypt are those built in the rear of the Temple of Karnak by Thothmes III. and near the Temple of Medinet Habu, both in Thebes; the earliest in Greece are those at Cnossus and Phaestus in Crete (c. 1500 B.C.), and at Tiryns in the citadel (c. 1200

B.C.). The most remarkable series are those

erected by the Assyrians at Nimroud, Koyunjik and Khorsabad (859-667 B.C.), which were followed by the Persian palaces at Persepolis and Susa; the Parthian palaces at Al Hadhr and Diarbekr; and the Sassanian palaces of Serbistan, Firuzabad and Ctesiphon. The only palace known of the late Greek style is that found at Palatitza in Macedonia. Gf the Roman period there are many examples, beginning with those on the Palatine Hill commenced by Augustus, continued and added to by his successors, Tiberius, Caligula, Domitian, Hadrian and Septimus Severus, which covered an area of over 1,000,000 sq. ft. The villa of Hadrian was virtually an immense palace, the buildings of which extended over 7 m. in length; of more modest propor- tions are the palace of Diocletian at Spalato and a fine example at Treves in Germany. The palace of the Hebdomon at Con- stantinople, and a fragment at Ravenna of Theodoric's work, are all that remain of Byzantine palaces. Of Romanesque work the only examples are those at Gelnhausen built by Barbarossa, and the Wartburg in Germany. In the Gothic style in Italy, the best known examples are the ducal palace at Venice, and the Palazzi Vecchio and del Podesta (Bargello) at Florence; in France, the palace of the popes at Avignon, and the episcopal palaces of Beauvais, Laon, Poitiers and Lisieux; in England, the bishops' palaces of Wells, Norwich, Lincoln, portions of Edward the Confessor's palace at Westminster, and Wolsey's palace at Hampton Court; while such great country mansions as the " castles " of Alnwick, Kenilworth, Warwick, Rochester, Raglan and Stokesay, or Haddon Hall, come in the, same category though the name is not employed. Belonging to the Mahommedan style are the palaces of the Alhambra and the Alcazar in Spain. Of the Renaissance period, numerous palaces exist in every country, the more important examples in Italy being those of the Vatican, the Quirinal and the Cancellaria, in Rome; the Caprarola near Rome; the palace of Caserta near Naples; the Pitti at Florence; the Palazzo del Te at Mantua; the court and eastern portion of the ducal palace of Venice, and the numerous examples of the Grand Canal; in France, the Louvre, the Tuileries (destroyed), and the Luxembourg, in Paris; Versailles and St Germain-en-Laye; and the chateaux of la Rochefoucauld, Fontainebleau, Chambord, Blois, Amboise, Chenonceaux and other palaces on the Loire; in Germany, the castle of Heidelberg, and the Zwinger palace at Dresden; in Spain, the palace of Charles V. at Grenada, the Escorial and the palace of Madrid; in England, the palace of Whitehall by Inigo Jones, of which only the banqueting hall was built, Windsor Castle, Blenheim, Chatsworth, Hampton Court; and in Scotland, the palaces of Holyrood and Linlithgow.

PALACIO VALDfeS, ARMANDO (1853-), Spanish novelist and critic, was born at Entralgo, in the province of Asturias, on the 4th of October 1853. His first writings were printed in the Revista Europea. These were pungent essays, remarkable for independent judgment and refined humour, and found so much favour with the public that the young beginner was soon ap- pointed editor of the Revista. The best of his critical work is collected in Los Oradores del Ateneo (1878), Los Novelistas espanoles (1878), Nuevo viaje al Parnaso and La Literatura en 1881 (1882), this last being written in collaboration with Leopoldo Alas. In 1 88 1 he published a novel, El Senorito Octavio, which shows an uncommon power of observation, and the promise of better things to come. In Marta y Maria (1883), a portrayal of the struggle between religious vocation and earthly passion, some- what in the manner of Valera, Palacio Valdes achieved a very popular triumph which placed him in the first rank of contem-, porary Spanish novelists. El Idilio de un enfermo (1884), a most interesting fragment of autobiography, has scarcely met with the recognition which it deserves: perhaps because the pathos of the story is too unadorned. The publication of Pereda's Sotileza is doubtless responsible for the conception of Josl (1885), in which Palacio Valdes gives a realistic picture of the manners and customs of seafaring folk, creates the two convincing characters whom he names Jose and Leonarda, and embellishes the whole with passages of animated description barely inferior to the finest penned by Pereda himself. The

emotional imagination of the writer expressed itself anew in the charming story Riverita (1886), one of whose attractive characters develops into the heroine of Maximina (1887); and from Maximina, in its turn, is taken the novice who figures as a professed nun among the personages of La Hermana San Sulpicio (1889), in which the love-passages between Zeferino Sanjurjo and Gloria Bermudez are set off with elaborate, romantic descriptions of Seville. El Cuarto poder (1888) is, as its name implies, concerned with the details, not always edifying, of journalistic life. Two novels issued in 1892, La Espuma and La Fe, were enthusiastically praised in foreign countries, but in Spain their reception was cold. The explanation is to be found in the fact that the first of these books is an avowed satire on the Spanish aristocracy, and that the second was construed into an attack upon the Roman Catholic Church. During the acrimonious discussion which followed the publication of La Espuma, it was frequently asserted that the artist had improvised a fantastic caricature of originals whom he

had never seen; yet as the characters in Coloma's Pequeneces are painted in darker tones, and as the very critics who were foremost in charging Palacio Valdes with incompetence and ignorance are almost unanimous in praising Coloma's fidelity, it is manifest that the indictment against La Espuma cannot be maintained. Subse- quently Palacio Valdes returned to his earlier and better manner in Los Majos de Cddiz (1896) and in La Algeria del Capitdn Ribot (1899). In these novels, and still more in Tristdn, 6 el pesimismo (1906), he frees himself from the reproach of undue submission to French influences. In any case he takes a prominent place in modern Spanish literature as a keen analyst of emotion and a sympathetic, delicate, humorous observer. (J. F.-K.)

PALACKt, FRANTISEK [Francis] (1798-1876), Czech historian and politician, was born on the 14th of June 1798 at Hodslavice (Hotzendorf) in Moravia. His ancestors had been members of the community of the Bohemian Brethren, and had secretly maintained their Protestant belief throughout the period of religious persecution, eventually giving their adherence to the Augsburg confession as approximate to their original faith. Palacky's father was a schoolmaster and a man of some learning. The son was sent in 181 2 to the Protestant gymnasium at Pressburg, where he came in contact with the philologist Safafik and became a zealous student of the Slav languages. After some years spent in private teaching Palacky. settled in 1823 at Prague. Here he found a warm friend in Dobrovsky, whose good relations with the Austrian authorities shielded him from the hostility shown by the government to students of Slav subjects. Dobrovsky introduced him to Count Sternberg and his brother Francis, both of whom took an enthusiastic interest in Bohemian history. Count Francis was the principal founder of the Society of the Bohemian Museum, devoted to the collection of documents bearing on Bohemian history, with the object of reawakening national sentiment by the study of the national records. Public interest in the movement was stimulated in 1825 by the new Journal of the Bohemian Museum (Casopis leskiho Mused) of which Palacky was the first editor. The journal was at first published in Czech and German, and the Czech edition survived to become the most important literary organ of Bohemia. Palacky had received a modest appointment as archi- vist to Count Sternberg and in 1829 the Bohemian estates sought to confer on him the title of historiographer of Bohemia, with a small salary, but it was ten years before the consent of the Vien- nese authorities was obtained. Meanwhile the estates, with the tardy assent of Vienna, had undertaken to pay the expenses of publishing Palacky's capital work, The History of the Bohemian People (s vols., 1836-1867). This book,

which comes down to the year 1526 and the extinction of Czech independence, was founded on laborious research in the local archives of Bohemia and in the libraries of the chief cities of Europe, and remains the stan- dard authority. The first volume was printed in German in 1836, and subsequently translated into Czech. The publication of the work was hindered by the police-censorship, which was especially active in criticizing his account of the Hussite move- ment. Palacky, though entirely national and Protestant in

his sympathies, was careful to avoid an uncritical approbation of the Reformers' methods, but his statements were held by the authorities to be dangerous to the Catholic faith. He was therefore compelled to make excisions from his narrative and to accept as integral parts of his work passages interpolated by the censors. After the abolition of the police-censorship in 1848 he published a new edition, completed in 1876, restoring the original form of the work. The fairest and most considerable of Palacky's antagonists in the controversy aroused by his narrative of the early reformation in Bohemia was Baron Helfert, who received a brief from Vienna to write his Hus und Hieronymus (1853) to counteract the impression made by Palacky's History. K. A. K. Hofler, a German professor of history at Prague, edited the historical authorities for the period in a similar sense in his Geschichte der hussitischen Bewegung in Bohmen. Palacky replied in his Geschichte des Hussitenthumes und Professor Loffler (Prague, 1868) and Zur bohmischen Geschichtschreibung (Prague, 1871).

The revolution of 1848 forced the historian into practical politics. He was deputed to the Reichstag which sat at Kromerice (Kremsier) in the autumn of that year, and was a member of the Slav congress at Prague. He refused to take part in the preliminary parliament consisting of 500 former deputies to the diet, which met at Frankfort, on the ground that as a Czech he had no interest in German affairs. He was at this time in favour of a strong Austrian empire, which should consist of a federation of the southern German and the Slav states, allowing of the retention of their individual rights. These views met with some degree of consideration at Vienna, and Palacky was even offered a portfolio in the Pillersdorf cabinet. The collapse of the federal idea and the definite triumph of the party of reaction in 1852 led to his retirement from politics. After the liberal concessions of i860 and 1861, however, he became a life member of the Austrian senate. His views met with small support from the assembly, and with the exception of a short period after the decree of September 1871, by which the emperor raised hopes for Bohemian self-govern- ment, he ceased to appear in the senate from 1861 onwards. In the Bohemian Landtag he became the acknowledged leader of the nationalist-federal

party. He sought the establishment of a Czech kingdom which should include Bohemia, Moravia and Silesia, and in his zeal for Czech autonomy he even entered into an alliance with the Conservative nobility and with the extreme Catholics. He attended the Panslavist congress at Moscow in 1867. He died at Prague on the 26th of May 1876.

Among his more important smaller historical works are: Wiirdi- gung der alten bohmischen Geschichtschreiber (Prague, 1830), dealing with authors of many of whose works were then inaccessible to Czech students; Archiv lesky (6 vols., Prague, 1840-1872) ; Vrkund- liche Beitrdge zur Geschichte des Hussitenkriegs (2 vols., Prague, 1872-1874); Documenta magistri Johannis Hus vitam, doctrinam, causam . . . illustrantia (Prague, 1869). With Safarik he wrote Anfange der bohmischen Dichtkunst (Pressburg, 1818) and Die altesten Denkmaler der bohmischen Sprache (Prague, 1840). Three volumes of his Czech articles and essays were published as Radhost (3 vols., Prague, 1871-1873). For accounts of Palacky see an article by Saint Rene Taillandier in the Revue des deux mondes (April, 1855) ; Count Liitzow, Lectures on the Historians of Bohemia (London, 1905).

PALADIN (Lat. palatinus), strictly a courtier, a member of a royal household, one connected with a palace. From being applied to the famous twelve peers of Charlemagne, the word became a general term in romance for knights of great prowess.

PALAEMON, QUINTUS REMMIUS, Roman grammarian, a native of Vicentia, lived in the reigns of Tiberius and Claudius. From Suetonius {De grammaticis, 23) we learn that he was originally a slave who obtained his freedom and taught grammar at Rome. Though a man of profligate and arrogant character, he enjoyed a great reputation as a teacher; Quintilian and Persius are said to have been his pupils. His lost Ars (Juvenal, vii. 215), a aystem of grammar much used in his own time and largely drawn upon by later grammarians, contained rules for correct diction, illustrative quotations and treated of barbarisms and solecisms (Juvenal vi. 452). An extant Ars grammatica (discovered by Jovianus Pontanus in the 15th century) and

other unimportant treatises on similar subjects have been wrongly

ascribed to him.

See C. Marschall, De Remmii Palaeinonis libris grammaiicis (1887); ” Latin Grammar in the First Century ” by H. Nettleship in Journal of Philology , vol. xv. (1886) ; J. E. Sandys, Hist, of Classical Scholarship (2nd ed., 1906).

PALAEOBOTANY. In the present article the subject of vegetable palaeontology is treated from a botanical point of view. The science of botany is concerned with the vegetable kingdom as a whole, and not merely with the flora now living. The remains of the plants of former periods, which have come down to us in the fossilized state, are almost always fragmentary, and often imperfectly preserved; but their investigation is of the utmost importance to the botanist, as affording the only direct evidence of the past history of vegetable organisms. Since the publication of the Origin of Species the general accep- tance of the doctrine of evolution has given a vastly increased significance to palaeontological data. The determination of the course of descent has now become the ultimate problem for the systematist: this is an historical question, and the historical documents available are the remains of the ancient organisms preserved in the rocks. The palaeobotanist thus endeavours to trace the history of plants in the past, with the hope of throwing light on their natural affinities and on the origin of the various groups. His investigations must embrace not only the compara- tive morphology and anatomy of fossil plants, but also their distribution over the earth’s surface at different periods — a part of the subject which, besides its direct biological interest, has obvious bearings on ancient climatology and geography.

Preservation. — Before considering the results of palaeobotanical research, some account must be given of the way in which the evidence is presented, or, in other words, of the modes of preservation of vegetable remains. These fall under two main heads. On the one hand, there is the mode of preservation which gives rise to casts, moulds and generally impressions, exhibiting the superficial features of the specimen. The great majority of vegetable fossils are of this kind, and the term incrustation is used as a general term to cover all such methods of fossilization; On the other hand, there are specimens in which the tissues of the plant have been permeated by some mineral in solution, which, subsequently setting hard, has fixed and preserved the internal structure, often with astonishing perfection of detail. This second method of fossilization is termed petrifaction. In the case of incrustation the whole substance of the fossilized specimen — e.g., a stem of Sigillaria — may be replaced by mineral matter, such as sandstone or shale, giving a cast of the whole, on the outer

surface of which the external markings, such as the bases of leaves and the scars left by their fall, are visible in their natural form. Usually the original organic substance remains as a thin carbonaceous layer forming the surface of the cast, but some- times it has entirely disappeared. The surrounding matrix will of course show the mould of the cast, with its elevations and depressions reversed. In the case of thin, flat organs such as leaves, the whole organ may be spread out in the plane of stratification, leaving its impress on the overlying and underlying layers. Here there has not necessarily been any replacement of organic by inorganic material ; the whole leaf, for example, may remain, though reduced to a carbonaceous film. In such carbonaceous impression not only are the form and markings, such as venation, perfectly pre- served, but something of the actual structure may remain. The cuticularized epidermis, especially, is often thus preserved, and may be removed by the use of appropriate reagents and examined microscopically. If sporangia and spores are present they also may persist in a perfectly recognizable form, and in fact much of our knowledge of the fructification of fossil Ferns and similar plants has been derived from specimens of this kind.

In many cases internal casts have been formed, some large cavity, such as a fistular pith, having become filled with mineral substance, which has taken the impress of the surrounding structures, such as the wood. The common casts of Calamites are of this nature, representing the form of the hollow medulla, and hearing on their surface the print of the nodal constrictions and of the ridges and furrows on the inner surface of the wood. The whole organic subr stance may have been removed, or may persist merely as a thin carbonaceous layer. Mistakes have often arisen from confusing these medullary casts with those of the stem as a whole.

Although some information as to minute structure may often be gleaned from the carbonaceous coating of impressions, the fossils preserved by petrifaction are the main source of our knowledge of the structural characters of ancient plants. The chemical bodies which have played the most important part as agents of petrifaction are silicic acid and calcium carbonate, though other substances, such as magnesium carbonate, calcium sulphate and ferric oxide have also been concerned, either as the chief constituents of petrifac-

tions, or mixed with other bodies. A large number of the most important remains of plants with structure preserved are silicious; this is the case, for example, with the famous French Permo-Carbon- iferous fossils of St Etienne, Autun, &c, which in the hands of Brongniart, Renault and others have yielded such brilliant scientific

results. At a more recent horizon, the silicified specimens of the Mesozoic Gymnosperms from Great Britain, France, and especially North America, are no less important. Calcified specimens are especially characteristic of the British Carboniferous formation; their preservation is equally perfect with that of the silicified fossils, and their investigation by Witham, Binney, Williamson and others has proved no less fertile. In the Coal Measures of England and of certain German and Austrian districts {e.g. Langendreer in West- phalia; Ostrau in Moravia), calcareous nodules, crowded with vegetable fragments of every kind, occur in certain mines embedded in the substance of the coal and representing its raw material in a petrified condition. Even the most delicate tissues, such as cambium and phloem, the endosperm of seeds, or the formative tissue of the growing-point, are frequently preserved cell for cell, both in calcareous and silicious material. As a rule, the petrified remains, all-important for the revelation of structure, are fragmen- tary, and give little idea of the habit or external characters of the plants from which they were derived. Hence they must be brought into relation with the specimens preserved as casts or impressions, in order to gain a better conception of the plant as a whole. This is often a difficult task, and generally the fragmentary nature of practically all vegetable fossils is the chief hindrance to their in- vestigation. Owing to this, it has become the common practice of palaeobotanists to give distinct generic names to detached parts of plants which may even have belonged to one and the same species. Thus the roots of Sigillaria are called Stigmaria, detached leaves Sigillariophyllum, and the fructifications Sigillariostrobus; the name Sigillaria applies to the stem, which, however, when old and partly decorticated has been called Syringodendron, while its woody cylinder has often been described under the name Diploxylon. This naming of portions of plants, however objectionable, is often not to be avoided; for detached organs constantly have to be de- scribed long before their relation to other parts is established — which, indeed, may never be accomplished. For example, the form and structure of Stigmaria have long been well known; but it is seldom possible to determine whether a given Stigmaria belonged to Sigillaria, Lepidodendron or some other genus. The correct piecing together of the fragmentary remains is one of the first problems of the palaeobotanist, and the gradual disappearance of superfluous names affords a fair measure of the progress of his science. The recent advance of fossil botany has depended in a very great degree on the study of petrified specimens with their structure preserved ; so far, at least, as the older strata are con- cerned, it is, as a rule, only with the help of specimens showing structure that any safe conclusions as to the affinities of fossil plants

can be arrived at.

The subject of coal (q.v.) is treated elsewhere. Here it need only be said that the masses of vegetable substance, more or less carbonized and chemically altered, of which coal is composed, frequently contain cells and fragments of tissue in a condition recognizable under the microscope, as for example spores (some- times present in great quantities), elements of the wood, fibres of the bark, &c. These remnants, however, though interesting as revealing something of the sources of coal, are too fragmentary and imperfect to be of any botanical importance. In lignite, on the other hand, the organized structure is sometimes excellently preserved. In the Wealden of Belgium, for example, specimens of Ferns and Coniferae occur, in the form of lignite, which can be sectioned, like recent plants, with a razor, and exhibit an almost unaltered structure.

I. — Palaeozoic

The present section is concerned with the botany of the Palaeozoic age, from the oldest rocks in which vegetable remains have been found up to the close of the Permian period. The Glossopteris flora of India and the southern hemisphere, the age of which has been disputed, but is now regarded as for the most part Permo-Carboniferous, is, however, dealt with in the succeed- ing section, in connexion with the Mesozoic floras. The various groups of plants represented in the Palaeozoic rocks will first be considered in systematic order, after which some account will be given of the succession and distribution of the various floras during the period.

In dealing with the plants of such remote epochs, the relative importance of the various groups, so far as they are known to us, is naturally very different from that which they assume at the present day. There is no evidence that the Angiospermous flowering plants, now the dominant class, existed during the Palaeozoic period; they do not appear till far on in the Mesozoic epoch, and their earlier history is as yet entirely unknown. On the other hand, fern-like seed-plants, known as Pteridosperms,

and Gymnosperms belonging almost entirely to families now extinct, were abundant, while the Pteridophyta attained a development

exceeding anything that they can now show. Among the lower classes of plants we have scarcely any know- ledge of Palaeozoic Bryophyta; Fungi were probably abundant, but their remains give us little information; while, even among the Algae, which are better represented, well characterized specimens are scanty.

With few exceptions, the remains of Palaeozoic Algae are of comparatively little botanical interest. A vast number of ” species ” have been described, but, as has been said, ” by far the Algae. greater number of the supposed fossil Algae have no

claim to be regarded as authentic records of this class of Thallo- phytes ” (Seward, 1898). The investigations of Nathorst, William- son and others have shown that a very large proportion of the casts and impressions attributed to Algae had in all probability a totally different origin. Some represent the tracks or burrows of worms, crustaceans or other animals; others, the course of rills of water on a sandy or muddy shore; others, again, the marks left on the bottom by bodies drifted along by the waves. In cases of doubt, evidence may be obtained from traces of organic structure, from the presence of carbonaceous matter, or, as Zeiller has pointed out, by the remains of animals such as Bryozoa being attached to the cast, showing that it represents a solid body and not a mere cavity or furrow. , Evidence from traces of organization is alone conclusive ; the’ presence of carbonaceous matter, though a useful indication, may be deceptive, for the organic substance may have been derived from other sources than the body which left the im- pression. The mere external form of the supposed Algae is rarely so characteristic as to afford satisfactory evidence of their nature. Some of the better-attested examples, among which are a few of considerable interest, may now be considered. Of Cyanophyceae, as we should expect, the Palaeozoic remains are very doubtful. Gloioconis, found by Renault in a coprolite of Permian age, was regarded by him as a Cyanophycean allied to Gloeocapsa; this may be so, but the argument drawn from the absence of nuclei, con- sidering the extreme rarity of recognizable nuclei even in the best preserved fossil tissues, can hardly be taken seriously. Girvanella, found in Cambrian, Ordovician and Silurian rocks, as well as in later deposits, appears to have played a part in the origination of oolitic rock-structure. It consists of minute interwoven tubular filaments, and has been variously interpreted as possibly repre- senting the sheaths of a Cyanophycean Alga, and as constituting a Siphoneous thallus of the type of the Codieae. The non-cellular order Siphoneae is fairly well represented in Palaeozoic strata, especially by calcareous verticillate forms referable to the family Dasycladeae; the separate tubular joints of the articulated thallus, bearing the prints of the whorled branches,

are sometimes cylindrical (Arthroporella, Vermiporella, &c), sometimes oval (Sycidium) or spherical (Cyclocrinus). These forms, and others like them, go back to the Silurian and Ordovician; while Gyroporella, from the Permian, is another fairly characteristic Siphoneous type. There can be no doubt that the verticillate Siphoneae, a group much isolated among recent organisms, are among the most ancient families of plants. The gigantic Nematophycus, to be described below, has been regarded as having Siphoneous affinities. Little trace of Confervaceae has been found; Confervites chantransioides, apparently consisting of branched cellular filaments, may perhaps represent a Cambrian Confervoid. Cladiscothallus, from the Culm of Russia, in which the filaments are united to form hemispherical or globular tufts, has been compared by Renault to a Chaetophora. This is one of the somewhat doubtful Algae occurring in boghead coal or torbanite, a carbonaceous rock the nature of which has been much disputed, in the law courts as well as in scientific literature. The boghead of Scotland, Autun and New South Wales is regarded by Renault and Bertrand as mainly composed of gelatinous Algae (Pila and Reinschia), having a hollow, saccate thallus formed of a single layer of cells. It may appear surprising that a body containing 65% of carbon should be so largely made up of gelatinous Algae in a comparatively little altered condition, but the material is rich in bitumen, which seems to have replaced the water con- tained in the organisms when alive. It has recently been stated, however, that the supposed Algae are in reality the megaspores of Vascular Cryptogams. Scarcely anything is known of Palaeozoic Florideae ; Solenopora, ranging from the Ordovician to the Jurassic, resembles, in the structure of its thallus, with definite zones of growth, Corallinaceae such as Lithothamnion, and may probably be of the same nature. A branched filamentous organism from the Lower Carboniferous of Scotland, described by Kidston under the name of Bythotrephis •worstoniensis, shows some remains of cellular structure, and may probably be a true Alga, resembling some of the filamentous Florideae in habit.

Apart from the multitude of supposed fossil Algae described as ” Fucoids ” but usually not of Algal nature, and never presenting determinable characters, very little remains that can be referred to Palaeozoic Brown Algae. The most striking of all fossil Algae, however, Nematophycus, may possibly be a Phaeophycean. The first species of the genus, Nematophycus Logani, was discovered

by Dawson in 1856 in the Lower and Middle Devonian of Canada, and was described by him as a Conifer under the name of Prototaxites. Carruthers, however, in 1872 established its Algal nature, and gave it

the more appropriate name of Nematophycus. In N. Logani the stem, which is found in a silicified state, may be as much as 3 ft. in diameter. The tissue is made up of large, unseptate, occasionally branching tubes, with an undulating vertical course, among which much smaller tubes are irregularly interwoven. Radially placed gaps in the tissue (at first errone- ously interpreted as medullary rays, but subsequently more aptly compared to the air-spaces of large Algae) contain very sparse hyphae, which here branch more freely than elsewhere. The conˆ centric rings of growth, which form a characteristic feature, are due to periodic variations in the size of the larger tubes. Transverse septa have occasionally, but rarely, been detected in the smaller hyphae. Penhallow maintains that these smaller tubes arise as branches from the larger, but other observers have failed to confirm this, In N. Storriei, from the Silurian (Wenlock) of South Wales, described by Barber, there is no sharp differentiation of the two kinds of tubes; they are rarely observed to branch, except in the gaps, which in this species are not radially directed. In N. Ortoni (Penhallow), from the Devonian of Canada, the tubes are quite uniform, and there are no spaces or concentric rings. The tubes- have their cavity dilated at intervals, and Penhallow has therefore compared them with the trumpet-hyphae of Laminariaceae, but no transverse septa are anywhere visible. Several other species have been described. Carruthers compared the usually non-cellular struc- ture of Nematophycus with that of Siphoneae such as Halimeda, while recognizing the points of resemblance to Laminariaceae (e.g. Lessonia) in the dimensions of the stem and its concentric rings of growth. Later writers, influenced by the occasional occurrence of transverse walls in the smaller hyphae, have laid more stress on Laminariaceous affinities. The existence of these gigantic Algae in Palaeozoic times, attested by such well-preserved specimens, is a fact of great interest, though their systematic position is still' an open question. Pachytheca, a spherical organism, usually about the size of a small pea, found in rocks of Silurian and Devonian age, has been much investigated and discussed, without any decisive light having been thrown on its nature. It was once regarded as connected with Nematophycus (with which it sometimes occurs in association), possibly as its fructification. For this view, however, there is no evidence, though the tissues of the two fossils are somewhat similar. Pachytheca is formed of cellular filaments resembling those of a Cladophora, irregularly interwoven in the central region, radiating towards the periphery, and often forked. In one case the spherical thallus was found seated in a cup-like receptacle. There can be little doubt of the Algal nature of the fossil, but beyond this it is impossible at present to carry its determination.

On the whole, it cannot be said that the Palaeozoic remains have as yet thrown much light on the evolution of the Algae, though we may not be prepared to maintain, with Zeiller, that plants of this class appear never to have assumed a form very different from that which they present at the present day.

The first evidence for the existence of Palaeozoic Bacteria was obtained in 1879 by Van Tieghem, who found, that in silicified vegetable remains from the Coal Measures of St Etienne «> -, / ‘ the cellulose membranes showed traces of subjection to ” acte ™ butyric fermentation, such as is produced at the present day by Bacillus Amylobacter ;‘he also claimed to have detected the organism itself. Since that time a number of fossil Bacteria, mainly from Palaeozoic strata, have been described by Renault, occurring in all kinds of fossilized vegetable and animal debris. The supposed Micrococci present little that is characteristic; the more definite, rod-like form of the Bacilli offers a better means of recognition, though far from an infallible one ; in a few cases dark granules, suggestive of endospores, have been found within the rods. On the whole, the occurrence of Bacteria in Palaeozoic times — so probable a priori — may be taken as established, though the attempt to discriminate species among them is probably futile.

Fungi were no doubt abundant among Palaeozoic vegetation. In examining the tissues of fossil plants of that epoch nothing is more common than to meet with mycelial hyphae in punri

and among the cells; in many cases the hyphae are ““Wfc

septate, showing that the higher Fungi (Mycomycetes), as distinguished from the more algoid Phycomycetes, already existed. An endophytic Fungus referred to the latter group (Peronosporites antiquarius , W. Smith) bears very definite terminal, or intercalary, spherical vesicles, which may probably be regarded as reproductive organs — either oogonia or sporangia. A minute Fungus bearing sporangia, found by Renault in the wood of a Lepidodendron, and named by him Oochytrium, Lepidodendri, is referred with much probability to the Chytridineae. Conceptacles contaning Spores, and strongly suggesting the Chytridineous Fungus UrophlyettSi have recently been found, in petrified material, on the leaves of an Alethopteris, which appears to have undergone decay before fossilization set in. Small spores, almost certainly those of Fungi, are very common in the petrified tissues of Palaeozoic plants. Spherical sacs, bearing forked spines, described by Williamson under the name of Zygosporites,. are frequent, usually in an isolated state*

Bryophyta.

Professor Seward, however, has found a Zygosporites in situ, terminating an apparently fungal hypha : he suggests a possible comparison with the mould Mucor. Bodies closely resembling the perithecia of Sphaeriaceous Fungi have often been observed on impressions of Palaeozoic plants, and may probably belong to the group indicated. Professor F. E. Weiss has obtained interesting evidence that the symbiotic association between roots and Fungi, known as ” Mycorhiza,” already occurred among Carboniferous plants. The few and incomplete data which we at present possess as to Palaeozoic Fungi do not as yet justify any inferences as to the evolution of these plants. The writer is not aware of any evidence for the occurrence of Palaeozoic Lichens.

The important class of the Bryophyta, which, on theoretical grounds, is commonly regarded as more primitive than the Pteridophyta, is as yet scarcely represented among known fossils of Palaeozoic age. In the Lower Carboniferous of Scotland Mr Kidston has found several specimens of a large dichotomous thallus, with a very distinct midrib ; the specimens, referred to the provisional genus Thallites,. much resemble the larger thalloid Liverworts. Similar fossils have been described from still older rocks. In one or two cases Palaeozoic plants, resembling the true Mosses in habit, have been discovered; the best example is the Musettes polytrichaceus of Renault and Zeiller, from the Coal Measures of Commentry. In the absence, howevei, both of reproductive organs and of anatomical structure, it cannot be said that there is at present conclusive evidence for the existence of either Hepaticae or Musci in Palaeozoic times.

Our knowledge of the Vascular Cryptograms of the Palaeozoic period, though recent discoveries have somewhat reduced their relative importance, is still more extensive than of any dophyta. other class of plants, and in fact it is here that the evidence of Palaeontology first becomes of essential importance -to the botanist. They extend back through the Devonian, possibly to the Silurian system, but the systematic summary now to be given is based primarily on the rich materials afforded by the Carboniferous and Permian formations, from which our detailed knowledge of Palaeozoic plants has been chiefly

derived.

In addition to the three classes, Equisetales, Lycopodiales and Filicales, under which recent Pteridophytes naturally group themselves, a fourth class, Sphenophyllales, existed in Palaeozoic times, clearly related to the Horsetails and more remotely to the Ferns and perhaps the Club-mosses, but with peculiarities of its own demanding an independent position. We further find that, whereas the Ferns of the present day form a well-defined and even isolated class, this was not the case at the time when the primary rocks were deposited. A great group of Palaeozoic fossils, showing evident affinity to Ferns, has proved to consist of seed-bearing plants allied to Gymnosperms, especially Cycads. This important class of plants will be described at the beginning of the Spermophyta under the name Pteridospermeae. The arrangement which we shall adopt for the Palaeozoic Pterido- phyta is therefore as follows : —

I. Equisetales. II. Sphenophyllales.

III. Lycopodiales. IV. Filicales.

We must bear in mind that throughout the Palaeozoic period, and indeed far beyond it, vascular plants, so far as the existing evidence shows, were represented only by the Pteridophyta, Pteridosperms and Gymnosperms. Although the history of the Angiosperms may probably go much further back than present records show, there is no reason to suppose that they were present, as such, amongst the Palaeozoic vegetation. Con- sequently, the Pteridophytes, Gymnosperms and their allies had the field to themselves, so far as regards the higher plants, and filled places in nature which have now for the most part been seized on by families of more modern origin. Hence it is not surprising to find that the early Vascular Cryptograms were, beyond comparison, more varied and more highly organized than their displaced and often degraded successors. It is among the fossils of the Palaeozoic rocks that we first learn the possibilities of Pteridophytic organization.

I. Equisetales. — This class, represented in the recent flora by the single genus Equisetum, with about twenty species, was

one of the dominant groups of plants in Carboniferous times. The Calamarieae, now known to have been the chief Palaeozoic representatives of the Horsetail stock, attained the dimensions of trees, reaching, according to Grand' Eury, a height of from 30 to 60 metres, and showed in all respects a higher and more varied organization than their recent successors.

Their remains occur in three principal forms of preservation. (1) carbonaceous impressions of the leafy branches, the fructifi- cations and other parts; (2) casts of the stem; these are usually internal, or medullary casts, as described above. Around the cast the organic tissues may be represented by a carbonaceous layer, on the outer surface of which the external features, such as the remains of leaves, can sometimes be traced. More usually, however, the carbonaceous film is thin, and merely shows the impress of the medullary cast within; (3) petrified specimens of all parts — stem, roots, leaves and fructifications — showing the internal structure, more or less perfectly preserved. The correlation of these various remains presents considerable difficulties. Casts surrounded by wood, with its structure preserved, have sometimes been found, and have established their true relations. The position of the branches is shown both on casts and in petrified specimens, and has helped in their identification, while the petrified remains some- times show enough of the external characters to allow of their correlation with impressions. Fructifications have often been found in connexion with leafy shoots, and the anatomical structure of the axis in sterile and fertile specimens has proved a valuable means of identification.

In habit the Calamarieae appear to have borne, on the whole, a general resemblance to the recent Equisetaceae, in spite of their enormously greater bulk. The leaves were constantly in whorls, and were usually of comparatively small size and of simple form. In the oldest known Calamarian, however, Archaeocalamites (Devonian and Lower Carboniferous), the leaves were repeatedly forked. There is evidence that in some, at least, of the Calamarieae the leaves of each verticil Were united at the base to form a sheath. The free lamina, however, was always considerably more developed than in the recent family; in form it was usually linear or narrowly lanceolate. Different genera have been founded on leaf-bearing branches of Calamarieae; apart from Archaeocalamites, already mentioned, and Autophyllites (Grand' Eury), in both of which the leaves were dichotomous, we have Annularia, Asterophyllites and Calamocladus (in Grand' Eury's limited sense), with simple leaves. In some species of Annularia the extremely delicate ultimate twigs, bearing whorls of small lanceolate leaves, give a characteristic habit, suggesting that they may have belonged to herbaceous plants; other Annulariae, however, have been traced with certainty into connexion with the stems of large Calamites. In Astero- phyllites, the generic distinction of which from Annularia is not always clear, the narrow linear leaves are in crowded whorls, and the ultimate branches distichously arranged; in the Calamocladus of Grand' Eury — characteristic of the Upper Coal Measures — the

whorls are more remote, and the twigs polystichous in arrange- ment. In all these groups a leaf-sheath has been recognized.

The distribution of the branches on the main stem shows considerable variations, on which genera or sub-genera have been founded by C. E. Weiss. In Archaeocalamites, which certainly deserves generic rank, the branches may occur on every node, but only in certain parts of the stem; the ribs of successive inter- nodes do not alternate, but are continuous, indicating that the leaves were superposed. Using Calamites as a generic name for all those Calamarian stems in which the ribs alternate at the nodes, we have, on Weiss's system, the following sub-genera: Stylocalam- ites, branches rare and irregularly arranged; Calamitina, branches in regular verticils, limited to certain nodes, which surmount specially short internodes; Eucalamites, branches present on every node. These distinctions can be recognized on petrified specimens, as well as on the casts, but their taxonomic value is somewhat doubtful. In many Calamites there is evidence that the aerial stem sprang from a horizontal rhizome, as in the common species C. (Stylocalamites) Suckowi; in other specimens the aerial stem has an independent, rooting base.

The anatomical structure of all parts of the plant is now known, in various Calamarieae, thanks more especially to the work of Williamson in England and of Renault in France. The stem has a structure which may be briefly characterized as that of an Equisetum with secondary growth in thickness (fig. 1, Plate). The usually fistular pith is surrounded by a ring of collateral vascular bundle, (see Anatomy of Plants, and Pteridophyta), each of which, with rare exceptions, has an intercellular canal at its inner edge, containing the disorganized spiral tracheae, just as in the recent genus. The cortex is often preserved; in certain cases it was strengthened by hypodermal strands of fibres, as in Equisetum. It is only in the rare cases where a very young twig is preserved that the primary structure of the stem is found unaltered. In all the larger specimens a broad zone of wood, with its elements in radial series, had been added. This secondary wood, in the true Calamites (Arthropitys, Goeppert), has a simple structure com- parable to that of the simplest Coniferous woods; it is made up

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entirely of radial bands of tracheides interspersed with medullary rays. The pitting of the tracheides is more or less scalariform in character, and is limited to the radial walls. In favourable cases remains of the cambium are found on the outer border of the wood, and phloem is also present in the normal position, though it does not seem to have attained any considerable thickness. In the old stems the primary cortex was replaced by periderm, giving rise to a thick mass of bark. The above description applies to the stems of Catamites in the narrower sense (Arthropitys of the French authors), to which the specimens from the British Coal Measures mostly belong. Archaeocalamites appears to have had a similar structure, but in some specimens from the Lower Carbon- iferous of Burntisland, provisionally named Protocalamites petty- curensis, centripetal wood was present in the stem. In Calamoden- dron (Upper Coal Measures) the wood has a more complex structure than in Calamites, the principal rays including radial tracts of fibrous tissue, in addition to the usual parenchyma. Arthrodendron (Lower Coal Measures) approaches Calamodendron in this respect. The longitudinal course of the vascular bundles and their relation to the leaves in Calamarieae generally followed the Equisetum type, though more variable and sometimes more complex. The attach- ment of the branches was immediately above the node, and usually between two foliar traces, as in the recent genus. Where the structure of the leaves is preserved it proves to be of an extremely simple type; the narrow lamina is

traversed by a single vascular bundle, separated by a sheath from the surrounding palisade- parenchyma. Stomata of the same structure as in Equisetum have been detected in the epidermis.

The roots (formerly described as a separate genus, Astromyelon) were borne directly on the nodes, not on short lateral branches as in Equisetum. They are of similar structure in all known Cala- marieae, the main roots having a large pith, while the rootlets had little or none. The structure is in all respects that typical of roots, as shown by the centripetal primary wood, and the alternation of xylem and phloem groups observable in exceptionally favourable young specimens. A striking feature is the presence of large, radiating intercellular cavities in the cortex, suggesting an aquatic habit. The young roots show a double endodermis, just as in the recent Equisetum.

A considerable number of Calamarian fructifications are known, preserved, some as carbonaceous impressions, others as petrified specimens, exhibiting the internal structure. In many cases the cones have been found in connexion with branches bearing characteristic Calamarian foliage. Almost all strobili of the Calamarieae are constructed on the same general lines as those of Equisetum, with which some agree exactly; in most, however, the organization was more complex, the complexity consisting in the intercalation of whorls of sterile bracts, between those of the sporangiophores. In several cases heterospory. unknown among recent Equisetaceae, has been demonstrated in their Palaeozoic representatives.

Four main types of structure may be distinguished among Calamarian strobili.

1. Calamostachys, Schimper. Here the whorls of peltate spor- angiophores alternate regularly with those of sterile bracts, the

former being inserted on the axis midway between the latter (fig. 2). The sporangiophores, which are usually half as numerous in each verticil as the bracts, have the same form as in Equisetum, but each bears four sporangia only. The spores are frequently found to be still united in tetrads. In some species, e.g. the British C. Binneyana, numerous specimens have been examined and only one kind of spore observed ; here, then, there is a strong pre- sumption that the species was homosporous. In other cases, how- ever, e.g. C. Casheana, Will., two sp kinds of spore occur, in different sporangia, but on the same strobilus and even on the same sporangiophore. The megaspores, of which there are ,, _ ., , , 7 ” i->- many in the megasporangium, have

Fig. 2.— Calamostachys D.a- a diaraeter about % h £ e times tha t of grammatic .longitudinal sec- the m i croS pores. The abortion of Uon of the cone, showing certain which is known

the axis (ax) bearing alter- have taken kce both ; n the homo . nate whorls of bracts (br) sporous C . Binneyana and in the and peltate sporangiophores me gasporangia of C. Casheana, may (sp) with their sporangia 1 throw some light on the origin of the (:m). The upturned tips of heterosporous condition. The bracts the bracts are only shown were some times coherent in their in every alternate vertical. Iower part (eg . c Binneyana), some-

times free (e.g. C. Ludwigi); in all cases their free extremities formed a protection to the fertile whori above. In some continental species (e.g. C. Grand' Euryi, Ren.) radial membranous plates hung down from each verticil of bracts, forming compartments in which the subjacent sporangio-

phores were enclosed. The anatomy of the axis is essentially similar to that of a young Calamarian twig, with some variations in detail. Strobili of the Calamostachys type occur in connexion both with Annularia and Asterophyllites foliage.

2. Palaeostachya, Weiss. Here, as in the previous genus, sterile and fertile verticils are ranged alternately on the axis of the cone. The main difference is that in Palaeostachya the sporangiophores, instead of standing midway between the whorls of bracts, are inserted immediately above them, springing, as it were, from the axil of the sterile verticil (fig. 3, A). This singular arrangement has suggested doubts as to the correctness of the current inter- pretation of the Equisetaceous sporangiophore as a modified leaf

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(After Renault Scott, Studies.)

FIG. 3.

A, Palaeostachya. Diagrammatic longitudinal section of cone, showing the axis (ax) bearing the bracts (br) with peltate sporangio- phores (sp) springing from their axils ; sm, sporangia.

B, Archaeocalamites. Part of cone, showing the axis (ax) bearing peltate sporangiophores (sp) without bracts; sm, sporangia.

(cf. Cheirostrobus below). In most other respects the two genera agree; there is evidence for the occurrence of heterospory in some strobili referred to Palaeostachya. The anatomy of the axis is that of a young branch of a Calamite. According to Grand' Eury, the Palaeostachya fructification was most commonly associated with Asterophyllites foliage. The external aspect of a Palaeostachya is shown in fig. 4 (Plate).

3. Equisetum type of strobilus. In certain cases the strobili of Palaeozoic Calamarieae appear to have had essentially the same organization as in the recent genus, the axis bearing sporangio- phores only, without intercalated bracts. It is remarkable that fructifications apparently of this kind have been found by Renault in close association with the most ancient of the Calamarieae — Archaeocalamites. In these strobili the peltate scales, like the vegetative leaves of the plant, are in superposed verticils; each appears to have borne four sporangia (fig. 3, B). Other cones, however, namely, those known as Pothocttes, have also been at- tributed on good grounds to the genus Archaeocalamites; they are long strobili, constricted at intervals, and it is probable that the succession of fertile sporangiophores was interrupted here and there by the intercalation of sterile bracts, which may also have been present, at long intervals, in Renault's species. Cones from the Middle Coal Measures, described by Kidston under the name of Equisetum Hemingwayi,. but probably belonging to one of the Calamarieae, bear a striking external resemblance to those of a recent Equisetum.

4. Cingularia, Weiss. This form of strobilus, from the Coal Measures of Germany, is imperfectly known, and its relation to Calamarieae not beyond doubt. In the lax strobili the sporangio- phores, which are not peltate, but strap-shaped, were borne, as C. E. Weiss first showed, immediately below the verticils of bracts, the position thus being the reverse of that in Palaeostachya.

The Palaeozoic Calamarieae, though so far surpassing recent Equisetaceae, both in stature and complexity of organization, clearly belonged to the same class of Vascular Cryptogams. There is no satisfactory evidence for attributing Phanerogamic

affinities to any members of the group, and the view, of which Williamson was the chief advocate, that they form a homo- geneous Cryptogamic family, is now fully established.

II. Sphenophyllales. — The class of Sphenophyllales, as known to us at present, is of limited extent, embracing the two genera Sphenophyllum and Cheirostrobus, which may serve as types of two families within the class. The characters of Sphenophyllum are known with some completeness, while our knowledge of Cheirostrobus is confined to the fructification; the former will therefore be described first.

1. Sphenophyllum. — The genus Sphenophyllum, of which a number of species have been described, ranging probably from the Middle Devonian, through the Carboniferous, to the Permian or even the Lower Triassic, consisted of herbaceous plants of moderate dimensions. The long, slender stems, somewhat tumid at the nodes, were ribbed, the ribs running continuously through the nodes, a fact correlated with the superposition of the whorlecl leaves, the number of which in each verticil was some multiple of 3, and usually 6. In the species on which the genus was founded the leaves, as the generic name implies, are cuneate and entire, or toothed on their anterior margin ; * in other cases they are deeply divided by dichotomy into narrow segments, or the whorl consists of a larger number (up to 30) of apparently simple, linear leaves, which may represent the segments of a smaller number. The different forms of leaf may occur on the same plant, the deeply divided foliage often characterizing the main stem, while the cuneate leaves were borne on lateral shoots. A comparison, formerly suggested, with the two forms of leaf in Batrachian Ranunculi has not proved to hold good; the idea of an aquatic habit is contradicted by the anatomical structure, and the hypo- thesis that the plants were of scandent growth is more probable. The species of Sphenophyllum have a graceful appearance, which has been compared with that of the trailing Galiums of hedgerows. Branches sprang from the nodes, though perhaps not truly axillary in position. The cones, more or less sharply differentiated, termin- ated certain of the branches.

The anatomy of the stem of Sphenophyllum, investigated by Renault, Williamson and others, is highly characteristic {fig. 5, Plate). The stem is. traversed by a single stele, with solid wood, without pith; the primary xylem is triangular in section, the spiral elements forming one or two groups at each angle, while the phloem occupied the bays, so that the structure resembles that of a triarch root. Two leaf-trace

bundles started from each angle of the stele, and forked, in passing through the cortex, to supply the veins of

the leaf, or its subdivisions. The cortex was deeply furrowed on its outer surface. The primary structure is only found unaltered in the youngest stems; secondary growth by means of a cambium set in very early, xylem being formed internally and phloem externally in a perfectly normal manner. At the same time a deep-seated periderm arose, by which the primary cortex was soon entirely cut off. The secondary wood in the Lower Carboniferous species, S. insigne, has scalariform tracheides, and is traversed by regular medullary rays, but in the forms from later horizons the tracheides are reticu- lately pitted, and the rays are for the most part replaced by a network of xylem-parenchyma. There are no recent stems with a structure quite like that of Sphenophyllum; so far as the primary structure is concerned, Fig. 6. – Sphenophyllum ˆ e . r Rarest approach is among the .• t->:„„.~, f „„ :„ Psiloteae, with which other characters

Dawsoni. Diagram of cone in

longitudinal section.

ax, Axis.

br, Bracts.

sp, Sporangiophores, each

indicate some affinity; the base of the stem in Psilotum forms some secon- dary wood. The diarch roots of a Sphenophyllum have been described by Renault, who has also investigated bearing a sporangium, the leaves; they were strongly con- sm – . structed mechanically, and traversed

br , Whorl of bracts in surface by slender vascular bundles branching view, dichotomously.

Fructification. — Williamson thoroughly worked out, in petrified specimens, the organization of a cone which he named Bowmanites Dawsoni; it was subsequently demonstrated by Zeiller that this fructification belonged to a Sphenophyllum, the cones of the well-known species 5. cuneifolium having a practically identical structure. The type of fructification described by Williamson and now named Sphenophyllum Dawsoni consists of long cylindrical cones, in External habit not unlike those of some Calamarieae. The axis,

1 In 5. speciosum the leaves in a whorl were of unequal size.

which in structure resembles the vegetative stem in its primary condition, bears numerous verticils” of bracts, those of each verticil being coherent in their lower part, so as to form a disc or cup, from the margin of which the free limbs of the bracts arise. The spor- angia, which are about twice as numerous as the bracts, are seated singly on pedicels or sporangiophores springing from the upper surface of the bract-verticil, near its insertion on the axis (fig. 6). As a rule two sporangiophores belong to each bract. The sporangium is attached to the enlarged distal end of its pedicel, from which it hangs down, so as to suggest an anatropous ovule on its funiculus. Dehiscence appears to have taken place at the free end of the sporangium; the spores are numerous, and, so far as observed, of one kind only. Each sporangiophore is traversed throughout its length by a vascular bundle connected with that which supplies the subtending bract. This form of fructification appears, from Zeiller’s researches, to have been common to several species of Sphenophyllum, but others show important differences. Thus Bowmanites Romeri, a fructification fully investigated by Solms-Laubach, differs from S. Dawsoni in the fact that each sporangiophore bears two sporangia, attached to a distal expansion approaching the peltate scale of the Equisetales. It is thus proved that the sporangiophore is not a mere sporangial stalk, but a dis- tinct organ, in all probability representing a ventral lobe of the subtending bract. The recently discovered species, Sphenophyllum fertile, while resembling Bowmanites Romeri in its peltate, bispor- angiate sporangiophores, is peculiar in the fact that both dorsal and ventral lobes of the sporophyll were fertile, dividing in a palmate manner into several branches, each of which constitutes a spor- angiophore. Thus the sterile bracts of other species are here re- placed by sporangium-bearing organs. In Sphenophyllum majus, where the cones are less sharply defined, the forked bract bears a group of four sporangia at the bifurcations, but their mode of insertion has not yet been made out.

2. Cheirostrobeae. — The family Cheirostrobeae is only known from the petrified fructification {Cheirostrobus pettycurensis) derived from the Lower Carboniferous of Burntisland in Scotland. The excellence of the preservation of the specimens has rendered it possible to investigate the complex structure in detail. The cone is of large size — 3-5 cm. in diameter; the stout axis bears numerous whorls of compound sporophylls, the members of successive verticils being superposed. The sporophylls, of which there are eleven or

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(Scott, Studies.)

Fig. 7. — Cheirostrobus. Diagram of cone, the upper part in transverse, the lower in longitudinal section. In the transverse section six sporophylls, each showing three segments, are represented. Sp.a, Section through sterile seg- /, Peltate expansions of sporan-

ments. giophores.

Sp.b, Section through sporangio- sm, Sporangia.

phores. v.b. Vascular bundles.

st, Laminae of sterile segments. cy, Stele of axis {A x).

In the longitudinal section the corresponding parts are shown.

twelve in a whorl, are each composed of six segments, three being inferior or dorsal, and three superior or ventral. The dorsal segments are sterile, corresponding to the bracts of Sphe- nophyllum Dawsoni, while the ventral segments constitute pel- tate sporangioohores, each bearing four sporangia, just as in a

Calamarian fructification (fig. 7). The great length and slender

Croportions of the segments give the cone a peculiar character, ut the relations of position appear to leave no doubt as to the homologies with the fructification of Sphenophylleae ; as regards the sporangiophores, Bowmanites Rbmeri occupies exactly the middle place between S. Dawsoni and Cheirostrobus. The axis of the cone in Cheirostrobus contains a polyarch stele, with solid wood, from the angles of which vascular bundles pass out, dividing in the cortex, to supply the various segments of the sporophylls. In the peduncle of the strobilus secondary tissues are formed. While the anatomy has a somewhat Lycopodiaceous character, the arrangement of the appendages is altogether that of the Spheno- phylleae; at the same time Calamarian affinities are indicated by the characters of the sporangiophores and sporangia.

The Sphenophyllales as a whole are best regarded as a synthetic

group, combining certain ‘characters of the Ferns and Lycopods with those of the Equisetales, while showing marked peculiarities of their own. Among existing plants their nearest affinities would appear to be with Psiloteae, as indicated not merely by the anatomy, but much more strongly by the way in which the sporangia are borne. There is good reason to believe that the ventral synangium of the Psiloteae corresponds to the ventral sporangiophore with its sporangia in the Sphenophyllales. Professor Thomas of Auckland, New Zealand, has brought forward some interesting variations in Tmesipteris which appear to afford additional support to this view.

Pseudobornia. — Professor Nathorst has described a remarkable Devonian plant, Pseudobornia ursina (from Bear Island, in the Arctic Ocean), which shows affinity both with the Equisetales and Sphenophyllales. The stem is articulated and branched, attaining a diameter of about 10 cm. The smaller branches bear the whorled leaves, probably four in each verticil. The leaves are highly compound, dividing dichotomously into several leaflets, each of which is deeply pinnatifid, with fine segments. When found detached these leaves were taken for the fronds of a Fern. The fructification consists of long, lax spikes, with whorled sporo- phylls; indications of megaspores have been detected in the sporangia. The discoverer makes this plant the type of a new class, the Pseudoborniales. At present only the external characters are known.

III. Lycopodiales. — In Palaeozoic ages the Lycopods formed one of the dominant groups of plants, remarkable alike for the number of species and for the great stature which many of them attained. The best known of the Palaeozoic Lycopods were trees, reaching 100 ft. or more in height, but side by side with these gigantic representatives of the class, small herbaceous Club-mosses, resembling those of the present day, also occurred. Broadly speaking, the Palaeozoic Lycopods, whatever their dimensions, show a general agreement in habit and structure with our living forms, though often attaining a much higher grade of organization. We will first take the arborescent Lycopods, as in every respect the more important group. They may all be classed under the one family Lepidodendreae, which is here taken to include Sigillaria.

Lepidodendreae. — The genus Lepidodendron, with very numerous species, ranging from the Devonian to the Permian, consisted of trees, with a tall upright shaft, bearing a dense crown of dicho- tomous branches, clothed with simple narrow leaves, ranged in

some complex spiral phyllotaxis. In some cases the foliage is preserved

in situ; more often, however, especially in the main stem and larger branches, the leaves had been shed, leaving behind them their scars and persistent bases, on which the characteristic sculpturing of the Lepidodendroid surface depends. The cones, often of large size, were either terminal on the'smaller twigs, or, it is alleged, borne laterally on special branches of con- siderable dimensions. At its base the main stem terminated in dichotomous roots or rhizophores, bearing numer- ous rootlets. To these underground organs the name Stigmaria is applied ; they are not clearly distinguishable from the corresponding parts of Sigillaria. The numerous described species of Lepidodendron are founded on the peculiarities of the leaf- cushions and scars, as shown on casts or impressions of the stem. The usually crowded leaf - cushions are spirally arranged, and present

(After Stur. Scott, Studies.) Fig. 8. — Leaf-baseof a Lepi- dodendron. Scar left by the leaf. Print of vascularbundle. p,p, Parichnos. I, Ligule.

a,a, Superficial prints below scar.

s.c

v.b

no obvious orthostichies, thus differing from those of Sigillaria. Each leaf -cushion is slightly prominent ; towards its upper end is the diamond-shaped or triangular scar left by the fall of the actual leaf (fig. 8). On the scar are three, prints, the central one alone representing the vascular bundle, while the lateral prints {parichnos) mark the position of merely parenchymatous strands. In the median line, immediately above the leaf-scar, is a print representing the ligule, or rather the pit in which it was seated. On the flanks of the cushion, below the scar, are two superficial prints, perhaps comparable to lenticels. In the genus Lepidpphloios the leaf-cushions are more prominent than in Lepidodendron, and their greatest diameter is in the transverse direction ; on the older stems the leaf-scar lies towards the lower side of the cushion. The genus Bothrodendron, going back to the Upper Devonian, differs from Lepidodendron in its minute leaf-scars and the absence of leaf-cushions, the scars being flush with the smooth surface of the Stem. In the Lower Carboniferous of central Russia beds of coal occur consisting of the cuticles of a Bothrodendron, which are not fossilized, but retain the consistency and chemical composition of similar tissues in recent plants.

The anatomy of Lepidodendron and its immediate allies is now well

known in a number of species; the Carboniferous rocks of Great Britain are especially rich in petrified specimens, which formed the subject of Williamson's extensive investigations. The stem is in all cases monostelic ; in most of the forms the central cylinder underwent secondary growth, and the distinction between primary and secondary wood is very sharply marked. In L. Harcourtii, however, the species earliest investigated (by Witham, 1833, and Brongniart, 1837), and in one or two other species, no secondary wood has yet been found. The primary wood of Lepidodendron forms a continuous cylinder, not broken up into distinct bundles; its development was clearly centripetal, the spiral elements forming more or less prominent peripheral groups. In the larger stems of most species there was a central pith, but in certain of the smaller branches, and throughout the stem in some species (L. rhodumnense, L. selaginoides), the wood was solid. A single leaf-trace, usually collateral in structure, passed out into each leaf. The primary structure of the stem was thus of a simple Lycopodiaceous type, resembling on a larger scale what we find in the upright stem of Selaginella spinosa. In most species {e.g. L. selaginoides, L. Wunschianum, L. Veltheimianum) secondary growth in thickness took place, and secondary wood was added,

(Scott, Studies.) Fig. 9.— Lepidodendron Veltheimianum. Transverse section of stem-

p, Pith, almost destroyed. ph, Phloem and pericycle.

x, Zone of primary wood. br, Stele of a branch.

px, Protoxylem. pd, Periderm.

x 2 , Secondary wood. l.b, Leaf-bases.

The primary cortex between stele and periderm has perished. (X4J.I

in the centrifugal direction, showing -a regular radial arrangement, with medullary rays between the series of tracheides (fig. 9). The tissue thus formed often attained a considerable thickness. While

primary phloem can be recognized with certainty in favourable cases, tne question of the formation of secondary phloem by the cambium is

not yet fully cleared up. In the Lepidodendron fuli- ginosum of Williamson, shown by its leaf-bases to have been a Lepidophloios, the secondary wood is very irregular, and consists largely of parenchyma. The same is the case in Lepidodendron obovatum, one of the few species in which both external and internal characters are known. The occurrence of secondary growth in these plants, demonstrated by Williamson's researches, is a point of great interest. Some analogy among recent Lycopods is afforded by the stem of Isoetes, and by the base of the stem in Selaginella spinosa; in the fossils the process was of a more normal type, but some of its details need further investigation. The cortex, often sharply differentiated into sclerotic and parenchymatous zones, is bordered externally by the persistent leaf-bases. The development of periderm was a constant feature, and this tissue attained a great thickness, consisting chiefly of a phelloderm, produced on the inner side of the formative layer, and no doubt subserving a mechanical function.

The structure of a Bothrodendron has recently been investigated and proves to be identical with that of the petrified stem which Williamson named Lepidodendron mundum. The anatomy is of the usual medullate Lepidodendroid type; no secondary growth has yet been detected in the stem.

The most interesting point in the structure of the leaf-base is the presence of a ligule, like that of Isoetes or Selaginella, which was seated in a deep pit, opening on the upper surface of the cushion, just above the insertion of the lamina. The latter shows marked xerophytic adaptations; the single vascular bundle was surrounded by a sheath of short tracheides, and the stomata were sheltered in two deep furrows of the lower surface.

The cones of Lepidodendron and its immediate allies are for the most part grouped under the name Lepidostrobus. These cones, varying from an inch to a foot in length, according to the species, were borne either on the ordinary twigs, or, as was conjectured, on the special branches (Ulodendron and Halonia) above referred to. In Ulodendron the large circular, distichously arranged prints were supposed to have been formed by the pressure of the bases of sessile cones, though this interpretation of the scars is open to doubt, and it is now more probable that they bore deciduous vegetative branches; in the Halonial branches characteristic of the genus Lepidophloios the tubercles may perhaps mark the points of insertion of pedunculate strobili. The organization of Lepido- strobus is essentially that of a Lycopodiaceous cone. The axis, which in anatomical structure resembles a vegetative twig, bears numerous spirally arranged

sporophylls, each of which carries a

single large sporangium on its upper surface (fig. 10). The sporophyll, usually almost horizontal in position, has an upturned lamina beyond the sporangium, and a shorter dorsal lobe, so that the form of the whole is somewhat peltate. A ligule is present immediately below the lamina, its position showing that the whole of the elongated horizontal pedicel on which the spor- angium is seated corresponds to the short base of a Fig. io.— Lepidostrobus. Diagram of vegetative leaf. The spor- cone, in longitudinal section. angia, usually of very large

ax, Axis, bearing the sporophylls (sph), size compared with those of on each of which a sporangium most recent Lycopods, have (sm) is seated. a palisade-like outer wall,

Ig, Ligule. and contain either an im-

The upper sporangia contain numer- mense number of minute ous microspores; in each of the lower spores or a very small number sporangia four megaspores are shown, of exceedingly large spores

(fig. io). It is very doubtful whether any homosporous Lepidostrobi existed, but there is reason to believe that here, as in the closely allied Lepidocarpon, micro- sporangia and megasporangia were in some cases borne on different strobili. In other species (e.g. in the cone attributed to the Lower Carboniferous Lepidodendron Veltheimianum) the arrangement was that usual in Selaginella, the microsporangia occurring above and the megasporangia below in the same strobilus (diagram, fig. io). The genus Spencerites (Lower Coal Measures) differs from Lepido- strobus mainly in the insertion of the sporangium, which, instead of being attached along the whole upper surface of the sporophyll, was connected with an outgrowth on its upper surface by a small neck of tissue towards the distal end. The spores of this genus are curiously winged, and intermediate in size between the micro- spores and megaspores of Lepidostrobus; the question of homospory or heterospory is not yet decided. The cones of Bothrodendron and another form named Mesostrobus are in some respects intermediate between Lepidostrobus and Spencerites. A more important devi- ation from ordinary Lepidostroboid structure is shown by the

genus Lepidocarpon, from the English Coal Measures and the Lower Carboniferous of Scotland. In this fructification the organiza- tion is at first altogether that of a Lepidostrobus; in each megasporangium, however, only a single megaspore came to matu- rity, occupying

almost the whole of the sporangial cavity (see fig. 12), but accompanied by the re- mains of its three abortive sister cells. An integu- ment grew up from the superior surface of the sporophyll, completely en- veloping the sporangium, except for a narrow cre- vice left open along the top. In favourable cases the prothallus is found preserved, within the functional megaspore or em- bryo-sac, and the whole appearance, especially as Via. 11. —Lepidocarpon Lomaxii.T)ˆ- seen in a section tangential grammat ; c sec tion of ” seed ” in plane to the strobilus, is then % angential to th e pare nt strobilus. remarkably seed-like (see , _ . ,.

diagram, fig. 11). The *?”• sporophyll. seed-like body was de- v . b < \ ts vascular bundle, tached as a whole from the *• integument, cone, and in this con- m > Micropylar crevice, dition was known for many c > „ as .? – , years under the name of sm ‘ Wall of sporangium. _ Cardiocarpon anomalum, m £< Membrane of functional mega- having been wrongly identi- s P or |;' „ whlch ls filled bv the fied with a true Gymno- prothallus, pr. spermous seed so named by Carruthers. The analogies with a seed_ are obvious; the chief difference is in the micropyle, which is not tubular, but forms a long crevice, running in a direction radial to the strobilus. Lepidocarpon affords a striking instance of homoplastic modifi- cation, for there is no reason to suppose that the Lycopods were on the line of descent of any existing Spermophyta. In a male cone, probably belonging to Lepidocarpon Lomaxi, the microspor- angia are provided with incomplete integuments.

Another case of a ” seed-bearing ” Lycopod has lately been discovered by Miss Benson in Miadesmia membranacea, a slender Selaginella-like plant from the Lower Coal Measures of Lancashire. The female fructification is in the form of a rather lax strobilus. Each sporophyll bears a megasporangium, attached to its upper surface at the proximal end, con- taining a single large megaspore (fig. 13). The megasporangium is enclosed in an integument, which completely envelopes it, leaving only a narrow micropyle at the distal end (fig. 13). The long ten- tacles of the integument may have served to facilitate pollination. The seed-like character of the organ is even more striking in Miadesmia than in Lepidocarpon. There seems to be no near affinity between these genera in which the seed-habit must have arisen independently.

Sigillaria. — The great genus Sigillaria, even richer in ” species ” than Lepido- Lomaxii. Sporangium and dendron, ranges throughout the Carbon- sporophyll before deve- iferous, but has not yet been detected lopment of integument, in earlier rocks. The Sigillariae, like the (X

about 12.) Lepidodendra, were large trees, but must C u, Lateral cushions on have differed from those of the previous sporophyll. group in habit, for they appear to have VOj Vascular bundle, branched sparingly or not at all, the w p Palisade layer of spor- lofty upright shaft terminating, like angium-wall. some modern Xanthorrhaea, in a great wj Inner layer of wall sheaf of long, grass-like leaves. The a> ‘ – strobili _ were stalked, and borne on ˆg, the main stem, among the leaves. The roots, or at least their functional repre- sentatives, resembled those of Lepidodendron _

character of Sigillaria lies in the arrangement of the leaf-scars, which form conspicuous vertical series on the surface of the stem.

(Scott, Studies.) Fig. 12. — Lepidocarpon

Base of sporangium. Membrane of mega- spore or embryo-sac.

The chief distinctive

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In one great division of the genus — the Eusigillariae — -the stems are ribbed, each rib bearing a vertical row of leaf-scars; the ribbed Sigillariae were formerly divided into two sub-genera — Rhytidolepis,

(After Weiss. Scott, Studies.)

“(From a drawing by Mrs D. H. Scott Scott, Studies.)

Fig. 13. — Miadesmia membranacea. Radial longitudinal section of seed-like organ. (X about 30.) I, Lamina of sporophyll. Ig, Ligules.

vb, Vascular bundle. sm, Sporangium-wall.

v, Velum or integument. m, Membrane of megaspore.

t, Tentacles, with the scars on each rib rather widely spaced, and Favularia, where they are approximated and separated by transverse furrows,

each rib thus consisting ‘\ } \ \ I , of a series of contiguous

leaf-bases. This dis- tinction, however, has proved to have no con-

stant taxonomic value, for both arrangements may occur on different parts of the same speci- men. The species with- out ribs — Subsigillariae Lq — were in like manner ‘ ~ grouped under the two V.b sub-genera Clathraria and Leiodermaria; in the former each scar is seated on a prominent cushion, while in the latter the surface of the stem (as in Bothroden- dron) is perfectly smooth. Here also the distinction has proved not to hold good, S. Brardi, for Fig. 14. — Sigillaria Brardi. Part of sur- example, showing both face of stem, showing five leaf-scars, conditions on the same (X 1 5.) stem. AH these names,

vb, Print of vascular bundle. however, are still in use

pa, Parichnos. as descriptive terms.

Ig, Ligule. Generally, the Eusigil-

lariae are characteristic of the older Carboniferous strata, the Subsigillariae of the Upper Coal Measures and Permian. The leaf- scars throughout the genus show essentially the same prints as in Lepidodendron, differing only in details, and here also a ligule was present (fig. 14).

The anatomy of Sigillaria is not so well known as that of Lepido- dendron, for specimens showing structure are comparatively rare, a fact which may be correlated with the infrequency of branching in the genus. The structure of a Clathrarian Sigillaria (5. Menardi), from the Permian of Autun, was accurately described by Brong- niart as long ago as 1839, and a similar species, 5. spinulosa (= 5. Brardi) was investigated by Renault in 1875, but it was long before we had any trustworthy data for the anatomy of the ribbed forms. This gap in our knowledge has now been filled up, owing to Bertrand’s investigation of a specimen referred by him to S. elongata, followed by the detailed researches of Kidston and Arber on Sigillaria elegans, scutellata and mamillaris. The structure of the ribbed Sigillariae, as at present known, essentially resembles that of a medullate Lepidodendron, though the ring of primary wood is narrower. Its outer margin is crenulated, the leaf-traces being given off from the middle of each bay. Secondary wood was formed in abundance, precisely as in most species of Lepidodendron In the Subsigillarian species 5. Menardi the primary wood is broken up into distinct bundles, while in S. spinulosa their separation is sometimes incomplete. The secondary cortex or periderm attained a great development, and in some cases shows considerable differen- tiation. On the whole, the anatomy of Sigillaria is closely related to that of the preceding group, and in fact a

continuous series can be traced from the anatomically simplest species of Lepidodendron to the most modified Sigillariae. The leaves of Sigillaria are in some cases almost identical in structure with those of lepidodendron,

but in certain species (S. scutellata and 5. mamillaris) there is evidence that they were of the Sigillariopsis type, the leaf being traversed by t.wo parallel vascular strands, derived from the bifurcation of the leaf-trace.

The nature of the fructification of Sigillaria was first satisfactorily determined in 1884 by Zeiller, who found the characteristic Sigillarian leaf-scars on the peduncles of certain large strobili (Sigillariostrobus). The cones, of which several species have been described, bear a strong general resemblance to Lepidostrobus, differing somewhat in the form of the sporophylls and some other details. The megaspores (reaching 2 mm. or more in diameter) were found lying loose on the sporophylls by Zeiller; the sporangia containing them were first observed by Kidston, in a species from the Coal Measures of Yorkshire. That the cones were heterosporous there can be no doubt, though little is known as yet of the microsporangia. The discovery of Sigillariostrobus, which was the fructification of Subsigillariae as well as of the ribbed species, has finally determined the question of the affinities of the genus, once keenly discussed; Sigillaria is now clearly proved to have been a genus of hetero- sporous Lycopods, with the closest affinities to Lepidodendron.

Stigmaria. — On present evidence there is no satisfactory dis- tinction to be drawn between the subterranean organs of Sigil- laria and those of Lepidodendron and its immediate allies, though some progress in the identification of special forms of Stigmaria has recently been made. These organs, to which the name Stig maria was given by Brongniart, have been found in connexion with the upright stems both of Sigillaria and Lepidodendron. In the Coal Measures they commonly occur in the underclay beneath the coal-seams. Complete specimens of the stumps show that from the base of the aerial stem four Stigmarian branches were given off, which took a horizontal or obliquely descending course, forking at least twice. These main Stigmarian axes may be 2 to 3 ft. in diameter at the base, and 30 or 40 ft. in length. Their surface is studded with the characteristic scars of their appendages or rootlets, which radiated in all directions into the mud. Petrified •specimens of the main Stigmaria are frequent, and those of its rootlets extraordinarily abundant. The two parts are very different in structure: in the main axis, as shown in the common Coal Measure form Stigmaria, ficoides, the centre was occupied by the pith, which

was surrounded by a zone of wood, centrifugally developed throughout. In other species, however, the centripetal primary xylem is represented. Phloem, surrounding the wood, is recognizable in good specimens; in the cortex the main feature is the great development of periderm. The rootlets, which branched by dichotomy, contain a slender monarch stele exactly like that in the roots of Isoetes and some Selaginellae at the present day; they possessed, however, a complex absorptive apparatus, consist- ing of lateral strands of xylem, connecting the stele with tracheal plates in the outer cortex. The morphology of Stigmaria has been much discussed; possibly the main axes, which do not agree per- fectly either with rhizomes or roots, may best be regarded as comparable with the rhizophores of Selaginellae; they have also been compared with the embryonic stem, or protocorm, of certain species of Lycopodium; the homologies of the appendages with the roots of recent Lycopods appear manifest. It has been maintained by some palaeobotanists that the aerial stems of Sigillaria arose as buds on a creeping rhizome, but the evidence for this conclusion is as yet unconvincing.

Lycopoditeae. — Under this name are included the fossil Lycopods of herbaceous habit, which occur occasionally, from the Devonian onwards. One such plant, Miadesmia, has already been referred to, as one of the seed-bearing Lycopods. In some Lycopoditeae the leaves were all of one kind, while others were heterophyllous, like most species of Selaginella. The genus Selaginellites, Zeiller, is now used to include those forms in which the fructification has proved to be heterosporous. In Selaginellites Suissei there was a definite strobilus bearing both micro- and megasporangia; in each of the latter from 16 to 24 megaspores were contained; in Selaginel- lites primaevus, however, the number of megaspores was only 4, and the resemblance to a recent Selaginella was thus complete. Selaginellites elongates, another heterosporous species, is remarkable for having no differentiated strobilus, a condition not known in the recent genus. The antiquity of the Selaginella type indicates that this group had no direct connexion with the Lepidodendreae, but sprang from a distinct and equally ancient herbaceous stock. There is, however, some evidence that Isoetes, which in several respects agrees more nearly with the Lepidodendreae, may actually represent their last degenerate survivors (see Pleuromeia, in §11., Mesozoic). No homosporous Lycopoditeae have as yet been recognized.

IV. Filicales.—Oi all Vascular Cryptogams the Ferns have best maintained their position down to the present day. Until recently it has been supposed that the class was well represented in the Palaeozoic period, and, indeed, that it was relatively, and perhaps

absolutely far richer in species even than in the recent flora. Within the last few years, however, the position has completely changed, and the majority of the supposed Palaeozoic

Ferns are now commonly regarded as more probably seed-bearing plants, a conclusion for which, in certain cases, there is already convincing evidence. The great majority of specimens of fossil fern-like plants are preserved in the form of carbonaceous impressions of fronds, often of remarkable perfection and beauty. The characters shown by such specimens, however, when, as is usually the case, they are in the barren state, are notoriously unstable, or of small taxonomic value, among recent .plants. Hence palaeobotanists have found it necessary to adopt a purely artificial system of classification, based on form and venation of the frond, in the absence of adequate data for a more natural grouping. The well-known form-genera Pecopteris, Spheno- pteris, Odontopteris, &c, are of this provisional nature. The majority of these fronds have now fallen under suspicion and can no longer be accepted as those of Ferns; the indications often point to their having belonged to fern-like Spermophyta, as will be shown below.

It has thus become very difficult to decide what Palaeozoic plants should still be referred to the Filices. The fructifications by themselves are not necessarily decisive, for in certain cases the supposed sporangia of Marattiaceous Ferns have turned out to be in reality the microsporangia or pollen-sacs of seed-bearing plants (Pteridosperms) . It is, however, probable that a con- siderable group of true Ferns, allied to Marattiaceae, existed in Palaeozoic times, side by side with simpler forms. In one respect the fronds of many Palaeozoic Ferns and Pteridosperms we're peculiar, namely, in the presence on their rachis, and at the base of their pinnae, of anomalous leaflets, often totally different in form and venation from the ordinary pinnules. These curious' appendages (Aphlebiae), at first regarded as parasitic growths, have been compared with the feathery outgrowths which occur on the rachis in the Cyatheaceous genus Hemitelia, and with the anomalous pinnules found in certain species of Gleickenia, at the points of bifurcation of the frond.

Marattiaceae. — A considerable number of the Palaeozoic fern-like

plants show indications — more or less decisive — of Marattiaceous affinities; some account of this group will first be given. The reference of these ferns to the family Marattiaceae, so restricted in the recent flora, rests, of course, primarily on evidence drawn from the fructifications. Typically Marattiaceous sori, consisting of exannulate sporangia united to form synangia, are frequent, and are almost always found on fronds with the character of Pecopteris, large, repeatedly pinnate leaves, resembling those of Cyatheaceae or some species of Nephrodium. In certain cases the anatomical structure of these leaves is known, and found to agree generally with that of recent coriaceous fern-fronds. The petiole was usually traversed by a single vascular bundle, hippocrepiform in section — a marked point of difference from the more complex petioles of recent Marattiaceae. There is evidence that in many cases these Pecopteroid fronds belonged to arborescent plants, the stems on which they were borne reaching a height of as much as 60 ft. These stems, known as Megaphytum when the leaves were in two rows, and as Caulopteris in the case of polystichous arrange- ment, are frequent, especially in the Permian of the Continent; when petrified, so that their internal structure is preserved, the name Psaronius is employed. The structure is often a complex one, the central region containing an elaborate system of numerous anastomosing steles, accompanied by sclerenchyma ; the cortex is permeated or coated by a multitude of adventitious roots, forming a thick envelope to the stem. The whole structure bears a general resemblance to that of recent Marattiaceae, though differing in detail. We will now describe some of the fructifications, which are grouped under generic names of their own; these genera, as having a more natural basis, tend to supersede the artificial groups founded on vegetative characters. The genus Asterotheca includes a number of Ferns, chiefly of Coal Measure age, with fronds of the Pecopteris type. The sori, or synangia, ranged in two series on the under-side of the fertile pinnules, are circular, each consisting of 3 to 6 sporangia, attached to a central receptacle and partly united to each other (fig. 15, A); the sporangia separated when mature, dehiscing by a ventral slit. Stur's genus Hawlea (fig. 15, H), characterized by the separation of the sporangia, may only re- present an advanced stage of an Asterotheca. In Ptychocarpus the fusion of the sporangia to form the synangium was much more complete; Scolecopteris resembles Asterotheca, but each synangium is stalked. In all these genera there is an obvious similarity to the synangia of Kaulfussia, while in some respects Marattia or Danaea is approached. In another Pecopteroid genus, Sturiella, the synangia resemble those of Asterotheca, but each sporangium is provided with a band of enlarged cells of the nature of an annulus (fig. 15, D). As a similar

differentiation, though less marked,

appears in the recent genus Angiopteris, the presumption is in favour of the Marattiaceous affinities of Sturiella, which also shows some relation to the genus Corynepteris (see below, Botryopterideae) . In the genus Danaeites, from the Coal Measures of the Saar, the synangia are much like those of the recent Danaea, each sporangium opening by an apical pore. In the Grand' Eurya of Stur the spor- angia appear to have been free from each other, as in Angiopteris. On the whole there is thus good evidence for the frequency of Marattiaceae in the Palaeozoic period, though the possibility that the fructifications may really represent the microsporangia of fern-like spermophytes must always be borne in mind. In a certain number of genera the reference to Marattiaceae is much more doubtful. In Dactylotheca, for example (fig. 15, C), a Pecopteroid

(After various authors. Scott, Studies.) Fig. 15. — Group of Palaeozoic fructifications of Ferns or Pteridosperms. _ A, Asterotheca. I, Pinnule bearing 8 synangia. 2, Synangium in side view. 3, In section, magnified.

B, Renaultia. 1, Fertile pinnule, nat. size. 2, Sporangium, enlarged.

C, Dactylotheca, as in B.

D, Sturiella. Section of pinnule and synangium. a, Vascular bundle; c, hairs; b, d, annulus, magnified.

E, Oligocarpia. Sorus in surface-view, magnified.

F, Crossotheca. Fertile pinnule, bearing several tufts of micro-sporangia, magnified.

G, Senftenbergia. Group of annulate sporangia, magnified. H, Hawlea. Synangium after dehiscence, magnified.

J, Umatopteris. I, Part of fertile pinna, nat. size. 2, Sporangia, showing apical pores, magnified.

Of the above, A, D, E, G and H, probably belong to true Ferns; F is the male fructification of a Pteridosperm {Lyginodendron) ■ the rest are of doubtful nature.

genus, ranging throughout the Carboniferous, the elongated spor-angia individually resemble those of Marattiaceae, but they are completely isolated, the characteristic grouping in sori being absent ;

the same remark applies to the Sphenopteroid Renaultia of Zeiller (fig- ‘Si B); the foliage of Sphenopteris , one of the most extensive of Palaeozoic frond-genera, with many different types of fructifica- tion, resembled that of various species of Asplenium or Davallia. In many fern-like plants of this period the fronds were dimorphic, the fertile leaves or pinnae having a form quite different from that of the vegetative portions. This was the case in Umatopteris (Kidston), with Sphenopteroid sterile foliage; the sporangia, borne on the filiform pinnules of the fertile rachis, appear to have dehisced by an apical pore (fig 15, J). The magnificent Devonian Fern Archaeopteris Ubernica, with a somewhat Adiantiform habit, bore special fertile pinnae; the fructification is still imperfectly under- stood, but the presence of stipules, observed by Kidston, has been adduced in support of Marattiaceous affinities. In all these cases there is reason to suspect that the plants may have been Pterido- sperms, rather than Ferns.

Other Families.— The Marattiaceae are the only recent family of Ferns which can be supposed to have existed in anything like its present form in Palaeozoic times. Of other recent orders the indications are meagre and dubious, and there can be no doubt that a large proportion of Ferns from the older rocks (in so far as they were Ferns at all) belonged to families quite distinct from any which we recognize in the flora of our own day. Little or nothing is known of Palaeozoic Ophioglossaceae. Certain fructifications have been referred to Gleicheniaceae (Oligocarpia, fig. 15, E), Schizaeaceae {Senftenbergia, fig. 15, G), Hymenophyllaceae and Osmundaceae, and on good grounds, so far as the external characters of the sporangia are concerned ; our knowledge of most of the Ferns in question is, however, far too incomplete to justify us in asserting that they actually belonged to the families indicated. In the case of the Osmundaceae there is good evidence, from anatomical char- acters, for tracing the family back to the Palaeozoic; their oldest members show a distinct relationship to the Botryopterideae, de- scribed in the next paragraph. Numerous more or less isolated fern-sporangia occur in the petrified material of the Carboniferous formation; the presence of an annulus is a frequent character among these specimens, while synangic sori are rare; it is thus certain that families remote from the Marattiaceae were abundantly represented during this period.

Botryopterideae. — The family Botryopterideae, first discovered by Renault, stands out with striking clearness among the Palaeozoic » Ferns, and differs widely from any

group now in existence. The Botry- opterideae are chiefly known from petrified specimens; in the genus Botryopteris and certain species of Zygopteris we have a fairly complete knowledge of all parts of the plant. The type-genus Botryopteris, repre- sented in the Permo-Carboniferous of France and in both the Lower and Upper Carboniferous of Great Britain, had a rhizome, with a very simple monostelic structure, bearing spirally arranged compound leaves, with lobed pinnules, probably of a somewhat fleshy texture. In the French species, B. forensis, the plant was covered with characteristic jointed B, Single sporangium, in hairs, which have served to identify transverse section, showing t jj e various organs on which they annulus on both sides, occur . The sporangia were large pyri- magnified. form sacs, shortly stalked, and borne

in tufts on the branches of the fertile rachis, which developed no lamina. Each sporangium had, on one side only, a longitudinal or slightly oblique annulus, several cells in width; the numerous spores were all of the same size; certain differences among them, which have been interpreted as indicating heterospory, have now proved to depend merely on the state of preservation. The genus Zygopteris, of which numerous Carboniferous and Permian species are known, likewise had a monostelic stem, but the structure of its vascular cylinder was somewhat complex, resembling that of the most highly differentiated Hymenophyllaceae, with which some species of Zygopteris also agreed in the presence of axillary shoots. There is eyidence that the stem in some species was a climbing one; the pinnate leaves, arranged on the stem in a two-fifths spiral, were dimorphic, the sterile fronds resembling some forms of

(After Renault.)

Fig. 16. — Zygopteris pinnata. A, Group of sporangia, in surface view.

(From a drawing by Mrs D. H. Scott. Scott, Studies.) . Fig. 17. — Stauropteris oldhamia. Three sporangia borne on branchlets of the rachis. In A the stomium (st) or place of dehiscence is shown. B is cut tangentially. In C, p is the palisade tissue of the rachis. (X about 35.)

Sphenopteris. The petioles have a somewhat complex structure, the bundle often having, in transverse section, the form of an H ; it has been proposed to subdivide the genus on the details of

the petiolar structure. It is characteristic of Zygopteris and its near allies that two rows of pinnae were borne on each side of the rachis, at least in the fertile fronds. On the fertile rachis the sporangia were borne in tufts, much as in the preceding genus; they were still larger, reaching 2-5 mm. in length, and had a multi- seriate annulus, extending, however, to both sides of the sporangium (see fig. 16, A and B). In Stauropteris, a genus showing some affinity with Zygopteris, the branched rachis of the fertile frond terminates in fine branchlets, each bearing a single, spherical sporangium, without any differentiated annulus (fig. 17). The spores in the sporangia have been found in a germinating condition; the stages of germination correspond closely with those observed in recent homosporous ferns (fig. 18). This fact strongly confirms the conclusion, drawn from morphological and anatomical characters, that the Botryopterideae were true Ferns. The genus Corynepteris of Baily is interesting from the fact that its sporangia, while individually similar to those of Zygopteris, were grouped in sori or synangia, resembling those of an Asterotheca. The family Botryopterideae appears to have included a number of other genera, though in most cases the evidence from vegetative structure is alone available. The genus Diplolabis of Renault, shows much in common with Zygopteris as regards anatomical structure, but resembles Corynepteris in possessing a synangic fructification. The genus Asterochlaena of Corda with a deeply- lobed stele, goes back to the Devonian. The family as a whole is of great interest, as presenting points of contact with various recent orders, especially Hymenophyllaceae, Osmundaceae and Ophioglossaceae; the group appears to have been a synthetic one, belonging to a primitive stock (the Primofilices of Arber) from which the later Fern families may have sprung.

A number of genera of Palaeozoic ” fern-fronds ” have been described, of the fructification of which nothing is known. This is the case, for example, with Diplotmema, a genus only differing from Sphenopteris in the dichotomy of the primary pinnae, and with Mariopteris, which bears a similar relation to Pecopteris. The same holds good of the Pecopteroid Ferns included under Callipteris and Callipteridium. In such cases, as will be explained below, there is a strong presumption that the fronds were not those of Ferns, but of seed-bearing plants of the new class Pteridospermeae.

On the present evidence it appears that the class Filicales was well represented in the Palaeozoic flora, though by no means so dominant as was formerly supposed. The simpler Ferns (Primofilices) of the period are for the most part referred to the remarkable family Botryopterideae, a group very distinct from

— C

(From a drawing by Mr L. A. Boodle. Scott, Studies.) Fig. 18. — Stauropteris oldhamia. Four germinating spores from the interior of a sporangium. All four are putting out rhizoids. In C, lying horizontally, an additional cell has been cut off between rhizoid and spore. (X 335)

any of the more modern families, though showing analogies with them in various directions. On the other hand there was the far more complex Marattiaceous type, strikingly similar in both vegetative and reproductive characters to the recent members of the family. Although doubts have lately been cast on the authenticity of Palaeozoic Marattiaceae owing to the difficulty in distinguishing between their fructifications and the pollen- bearing organs of Pteridosperms, the anatomical evidence (stem of Psaronius) strongly confirms the opinion that a considerable group of these Ferns existed.

Spermopkyla. — The Pteridospermeae, for which Potoni6's name Cycadofilices is still sometimes used, include all the fern-like plants which, on the evidence available, appear to

have been reproduced by means of seeds. The cases in which such evidence is decisive are but few, namely, Lyginodendron

oldhamium, Neuropteris helerophylla, Pecopteris Pluck- spermeae. enet h Aneimites fertilis and Aneimites tenuijolius. In

the first-named plant the structure, both of the vege- tative and reproductive organs, is known, and the evidence, from comparison and association, is sufficiently strong. In the other cases there is direct proof of continuity between seed and plant, but only the external characters are known. In a great number of forms, amounting to a majority of the Palaeozoic plants of fern-like habit, the indirect evidence is in favour of their having possessed seeds. We will begin with the Lyginodendreae, a group in which the anatomical characters indicated a systematic position between Perns and Cycads, long before the reproductive organs were discovered.

Lyginodendreae. — Of the genus Heterangium, which still stands very near the true Ferns, several species are known, the oldest

(After Williamson. Scott, Studies.) Fig. 19. — Heterangium Grievii. Restoration of Stem, shown partly

in transverse and longitudinal section, partly in surface view. *, Priniary wood. hy, Hypoderma.

x 2 , Secondary wood. l.t, l.t, Leaf-traces.

p.c, Phloem and pericycle. r, Adventitious root. Several c, Cortex. leaf-bases are shown.

being H. Grievii, of Williamson, from the Lower Carboniferous of Scotland. This plant had a long, somewhat slender, ridged stem, the ridges corresponding to the decurrent bases of the spirally arranged leaves (fig. 19). The specimens on which the genus was founded are petrified, showing structure rather than habit, but conclusive evidence has now been obtained that the foliage of H. Grievii was of the type of Sphenopteris (Diplotmema) elegans (fig. 20), and was thus in appearance altogether that of a Fern, with somewhat the habit of an Asplenium. The stem has a single stele, resembling in general primary structure that of one of the simpler species of Gleichenia; there is no pith, the wood extending to the centre of the stele. The leaf-traces, where they traverse the cortex, have the structure of the foliar bundles in Cycads, for they are of the collateral type, and their xylem is mesarch, the spiral elements lying in the interior of the ligneous strand. The leaf-traces can be distinguished as distinct strands at the periphery of the stele, as shown in fig. 21. Most of the specimens had formed a zone of secondary wood and phloem resembling the corresponding tissues in a recent Cycad; the similarity extended to minute histological details, as is shown especially in H. tiliaeoides, a Coal Measures species, where the preservation is remarkably perfect. The cortex was strongly constructed mechanically; in addition to the strands of fibres at the periphery, horizontal plates of stone-cells were present in the inner cortex, giving both stem and petiole a transversely striated appearance, which has served to identify the different parts of the plant, even in the carbonized condition (cf. figs. 19 and 20). The single vascular bundle which traversed the petiole and its branches was concentric, the leaves resembling those of Ferns in structure as well as in habit. Heter- angium shows, on the whole, a decided preponderance of Filicinean vegetative characters, though in the leaf-traces and the secondary tissues the Cycads are approached. The organs of reproduction are not yet known, though there is a probability that an associated seed allied to Lagenostoma (see below) belonged to Heterangium. In the Coal Measure genus Megaloxylan, of Seward, which in

structure bears a general resemblance to Heterangium, the primary Wood consists for the most part of short wide tracheides; probably,

(After Stur. Scott, Studies.)

Fig. 20. — Sphenopteris elegans (foliage of Heterangium Grievii).

Part of frond, (f nat. size.)

as the secondary tissues increased, it had become superfluous for

conducting purposes, and was adapted rather for water-storage.

In the genus Lyginodendron, of which L. oldhamium, from the

M*

(Scott, Studies.)

Fig. 21. — Heterangium Grievii. Part of the stele of the stem in transverse section, showing a primary xylem-strand and adjacent tissues (X 135.)

px, Protoxylem of strand. c.p, Conjunctive tissue.

x, Centripetal. x 2 , Secondary wood.

x 1 . Centrifugal primary wood. cb, Cambium.

mx, Part of the internal wood. ph?, Phloem.

Coal Measures, is now the best-known of all Palaeozoic plants,' the central wood has disappeared altogether and is replaced by pith; the primary wood is only represented in the leaf-trace strands, which form a ring of distinct collateral bundles around the pith;

(From a model after Oliver.) Fig. 23. — Lagenostoma Lomaxii (the seed of Lyginodendron). Restoration of a seed, enclosed in the lobed cupule, which bears numerous glands. (X about 15.)

thus the " medullate-monostelic " structure characteristic of the higher

plants was already attained. The individual bundles, however, have the same structure as in Heterangium, and agree

(From a photograph. Scott, Studies.)

Fig. 24. — Capitate gland on the cupule of Lagenostoma Lomaxii.

(X 70.) closely with the foliar bundles of Cycads. The secondary tissues, which are highly developed, are also of a Cycadean character (fig. 22, Plate). The vegetative organs of the plant are very completely known; the foliage has proved to be that of a Spheno- pteris, identical with the species long known under the name of S. Hitninghausi. Apart from the important advance shown in the anatomy of the stem, Lyginodendron agrees structurally with Heterangium. There is reason to believe that Lyginodendron old- hamium was a climbing plant comparable in some respects to such recent Ferns as DavaUia aculeata. The roots were at first like those of Marattiaceae but grew in thickness like the roots of Gymnosperms.

The first definite evidence of the mode of reproduction of Lyginodendron oldhamium was due to F. W. Oliver, who in 1903 identified the seed, Lagenostoma Lomaxii, by means of_ the glands on its cupule, which agree exactly with those on the associated leaves and stems of the plant (cf. figs. 24 and 25). No similar glands are known on any other Palaeozoic plant. Lagenostoma Lomaxii is a small barrel-shaped seed (5-5 by 4-25 mm. when mature) .enclosed in a husk or cupule, which completely enveloped it when young, but was ultimately open (figs. 23 and 26 and fig. 27 from another species). The seed was stalked, and there is an exact agreement in structure between the vascular strands of the stalk and cupule of the seed, and those of the rachis and leaflets of Lyginodendron, thus con- firming the evidence from the glands. The seed itself is of a Cycadean type, and radially symmetrical. The single integument is united to the nucellus, except at the top, and is traversed by about nine vascular strands. In the apex of the nucellus, as in most Palaeozoic seeds and in recent Cycads, a pollen-chamber, for the reception of the pollen-grains or microspores, is excavated (fig. 26). In Lagenostoma the pollen-chamber has a peculiar

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(From a photograph. Scott, Studies.)

Fig. 25. — Capitate Gland on the Petiole of Lyginodendron

oldhamium. (X 70.)

structure, a solid column of tissue rising up in the middle, leaving only a narrow annular crevice, in which pollen-grains are found. The neck of the flask-shaped pollen-chamber projected a little from the micropyle and no doubt received the pollen directly. The seed, which need not be described in further detail, was a highly organized structure, showing little trace of the cryptogamic megasporangium from which we must suppose it to have been derived. From the structure of the seed-bearing stalk, and from the analogy of the similar form Lagenostoma Sinclairi (fig. 27) it appears that the seed was borne on a leaf, or part of a leaf, reduced to a branched rachis.

The male organs of Lyginodendron were discovered by Kidston, a year or two after the seeds were identified. They are of the type known as Crossolheca, formerly regarded as a Marattiaceous fructi- fication. The genus is characterized by the arrangement of the sporangia, which hang down from the lower surface of the little oval fertile leaflets, the whole resembling an epaulet with its fringe (fig. 15, F; fig. 28). In the case of Lyginodendron the Crosso- theca occurs in connexion with the vegetative parts of the frond. Each fertile pinnule bore six, or rarely seven fusiform microspor- angia, described as bilocular' not improbably each may represent a synangium The microspores are tetrahedral. This is the first case in which the pollen-bearing organs of a Pteridosperm have been identified with certainty

It will be seen that, while the seeds of Lyginodendron were of an

advanced Cycadean type, the microsporangiate organs were more like those of a Fern, the reproductive organs thus showing the same combination of characters which appears in the vegetative

A, Micropylar region.

B, Body of seed.

C, Chalazal region. _jj D, Stalk.

c, Cupule, surrounding seed.

vb, Vascular bundles of stalk, cupule and integument.

cp, ” Canopy,” or water- _*» reservoir, at top of

‘”’ integument.

pc, Cavity of pollen- chamber.

cc, Central column.

ape, Aperture of pollen- chamber.

(After Oliver. Scott, Studies.)

Fig. 26. — Lagenosloma Lomaxii. Diagram of seed in median longitudinal section, structure. The family Calamopityeae, allied anatomically to Lygino- dendreae, is of Devonian and Lower Carboniferous age. ; Cycadoxyleae.—A few Coal Measure and Permian stems (Cycad- oxylon and Ptychoxylon) resemble Lyginodendron in the general character of their tissues, but show a marked reduction of the

primary wood, together with an extensive development of anomalous wood and bast around the pith, a peculiarity which appears as an individual variation in some specimens of Lyginodendron oldhamium. It is probable that these stems belonged to plants with the fructification and foliage of Cycads, taking that group in the widest sense. It is only quite at the close of the Palaeozoic period that Cycads begin to appear. The Lygino- dendreae type of structure, how- ever, appears to have formed the transition not only to the Cycadales, but also to the ex- tinct family Cordaiteae, the characteristic Palaeozoic Gym- nosperms (see p. 107).

Medulloseae. — In some re- spects the most remarkable family of the Cycad-fern alliance is that of the Medul- loseae.seed-bearing plants often of great size, with a fern-like foliage, and a singularly com-
(After Arber. Scott, Studies.) plex anatomical structure with-

Fig. 27.— Lagenosloma Smclairt. outparallelamongrecentplants. Two seeds, enclosed in lobed cupules Some of the Medulloseae must arid borne on branches of the rachis. have had a habit not unlike (X 5-) that of tree-ferns, with com-

pound leaves of enormous dimensions, belonging to various frond-genera — especially, as has now been proved, to Alethopteris and Neuropteris ; these are among the most abundant of the Car-

boniferous fronds commonly attributed to Ferns, and extend back to the Devonian. In habit some species of Alethopteris resembled the recent Angiopteris, While the Neuropteris foliage may be compared with that of an Osmunda. The Medullosa stems have been found chiefly in the Permo-Carboniferous • of France and Germany, Dut a Coal Measures species (M. anglica) has been discovered in Lancashire. The great anatomical charac- teristic of the stem of the Medulloseae is its polystelic structure with secondary development of wood and bast around each stele. In M. anglica, the simplest species known, the steles are uniform,

and usually only three in number; the structure of the stem is essentially that of a polystelic Ileterangium. In the Permo-Carboniferous species, such as M. slellata and M. Leuckarti, the arrangement is more complicated, the steles showing a differentia- tion into a central and a peri- pheral system ; the secondary growth was extensive and un- equal, usually attaining its maxi- mum on the outer side of the peripheral steles. In certain cases the structure was further complicated by the appearance of extrafascicular zones exterior to the whole stelar system. The spirally arranged petioles (Myeloxylon) were of great size, and their decurrent bases clothed the surface of the stem; their structure is closely similar to that s< "*"-) of recent Cycadean petioles; in fact, the leaves generally, like

(From a sketch after Kidston. Scott,

28. — Crossotheca Honing- hausi, the male fructification of thVs'eor5towg7ria & at'the"*present Lyginodendron. Fertile leaflets, day, while fern-like in habit, bearing sporangia, and sterile were Cycadean in structure. In leaflets on the rachis of the same the case of Medullosa anglica we * ea '- ' X 2 -)

have an almost complete knowledge of the vegetative organs — stem, leaf and root; Cycadean characters no doubt predominate, but the primary organization of the stem was that of a polystelic Fern. In the new genus Sutcliffia, also from the Coal Measures of Lancashire, the stem had a single, large central stele, from which smaller strands were given off, forming a kind of network, which gave rise to the numerous concentric leaf-traces which entered the

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(After Kidston. Scott, Studies.)

Fig. 29. — Neuropteris heterophylla. Seed, attached to a branch of

the rachis bearing two vegetative leaflets. (X 2.) petioles. This plant may be regarded as anatomically the most primitive of the Medulloseae.

In one member of the Medulloseae, there is direct evidence of reproduction by seeds, for in Neuropteris heterophylla Kidston has demonstrated that large seeds, of the size of a hazel-nut, were borne on the frond (fig. 29). In this case the internal structure is not known, but another seed, Trigonocarpus Parkinsoni, associated with, and probably belonging to, the Alethopterid species, Medullosa anglica, occurs in the petrified condition and has been fully investi- gated. This is a large seed, with a very long micropyle; it has a beaked pollen-chamber, and a complex integument made up of hard and fleshy layers, closely resembling the seed of a modern Cycad; the nucellus, however, was free from the integument, each

having its own vascular system. Various other seeds of the same type are known, and in a great number of instances Grand’ Eury has found the fronds of Neuropterideae (Medulloseae) in close asso- ciation with

definite species of seeds, so there can be little doubt that the whole family was seed-bearing. Very little is known at present of the male organs. Some authors have been so much impressed by the similarity of this extinct family to the Cycads, that they have regarded them as being on the direct line of descent of the latter group ; it is more probable, however, that they formed a short divergent phylum, distinct, though not remote, from the Cycadean- stock.

Pecopterideae. — It has now been established that the form-genus Pecopteris, once regarded as representing the typical Marattiaceous foliage, was in part made up of seed-bearing plants. In 1905 Grand' Eury discovered the seeds of Pecopteris Pluckeneti, an Upper Coal Measure species, attached, in immense numbers, to the fronds, which are but little modified as compared with the ordinary vegetative foliage. The seeds are flat and winged, closely resembling those of some Cordaiteae (see below). Another form of fructification, compared to the sori of Dicksonia, appears to represent the male organs. There is reason to believe that other species of Pecopteris and similar genera, (CalUpteris and Mariopteris) bore seeds, though the artificial group Pecopterideae probably also includes the fronds of true Marattiaceous Ferns.

Aneitniteae. — The genus Aneimiies, resembling the Maidenhair Ferns in habit, has now been transferred to the Pteridosperms, the seeds having been discovered in 1904 by David White. In A.fertilis, from the Pottsville beds (Millstone Grit) of West Virginia, the rhomboidal seeds, flattened and winged like those of Cordaiteae, are borne terminally on the lateral pinnae of a frond, which else- where bears the characteristic cuneiform leaflets. Continuity be- tween seeds and frond was also demonstrated in another species, A. tenuifolius. The allied genus Eremopteris occurs in association with seeds of a similar platyspermic type.

The Pteridosperms, of which only a few examples have been considered, evidently constituted a group of vast extent in Palaeozoic times. In a large majority of the Fern-like fossils of that period the evidence is in favour of reproduction by seeds, rather than by the cryptogamic methods of the true Ferns. The class, though clearly allied to the typical Gymnosperms, may be kept distinct for the present on account of the relatively primitive characters shown in the anatomy and morphology, and may be provisionally denned as follows: plants resembling Ferns in habit and in many anatomical characters, but bearing seeds of a Cycadean type; seeds and microsporangia borne on fronds only slightly modified as compared with the vegetative leaves.

Gymnospermous remains are common in Palaeozoic strata from the Devonian onwards. The investigations of the last _ quarter of the 19th century established that these sperms'. earlv representatives of the class did not, as a rule, belong to any of its existing families, but formed for the most part a distinct group, that of the Cordaitales, which has long since died out. Specimens of true Cycads or Conifers are rare or doubtful until we come to the latest Palaeozoic rocks. Our knowledge of the Cordaiteae (the typical family of the class Cordaitales) is chiefly due to the French investigators, Grand' Eury and Renault, who successfully brought into connexion the various fragmentary remains, and made known their exact structure.

Cordaitales. — The discovery of the fossil trunks and of their rooted bases has shown that the Cordaiteae were large trees, reaching 30 metres or more in height ; the lofty shaft bore a dense crown of branches, clothed with long simple leaves, spirally arranged. Fig. 30, founded on one of Grand' Eury's restorations, gives an idea of the habit of a tree of the genus Dorycordaites, characterized by its lanceolate acute leaves; in the typical Cordaites they were of a blunter shape, while in Poacordaites they were narrow and grass- like. The leaves as a rule far exceeded in size those of any of the Coniferae, attaining in some species a length of a metre. Of living genera, Agathis (to which the Kauri Pine of New Zealand belongs) probably comes nearest to the extinct family in habit, though at a long interval. The stem resembled that of Cycads in having a large pith, sometimes as much as 4 in. in diameter; the wood, however, was dense, and had the structure of that of an Araucarian Conifer; specimens of the wood have accordingly been commonly referred to the genus Araucarioxylon, and at one time the idea prevailed that wood of this type indicated actual affinity with Araucarieae. Other characters, however, prove that the Cordaiteae were remote from that family, and the name Araucarioxylon is best limited to wood from later horizons, where a near relationship to Araucarieae is more probable. 1 In some cases the external

1 Endlicher's name Dadoxylon is conveniently used for Palaeozoic specimens of the kind in question when nothing beyond the wood-structure is known.

tissues of the Cordaitean stem are well preserved; the cortex possessed a system of hypodermal strands of fibres, comparable to those found in the Lyginodendreae. In most cases the leaf-traces passed out from the stem in pairs, as in the recent Ginkgo; dividing up further as they entered the leaf-base. In many Cordaiteae the pith was discoid, i.e. fistular and partitioned by frequent diaphragms, as in some species

of Pinus and other plants at the present day. The curious, transversely-ribbed fossils known as Sternbergia or Artisia have proved to be casts of the medullary cavity of Cor- daiteae; their true nature was first demonstrated by Williamson in 1850. In those stems which have been referred with certainty to the Cordaiteae there is no centripetal wood; the spiral elements are adjacent to the pith, as in a recent Conifer or Cycad; certain stems, however, are known which connect this type of structure with that of the Lyginodendreae; this, for example, is the case in the Permian genus Poroxylon, investigated by Bertrand and Renault, which in general structure has much in common with Cordaiteae, but possesses strands of primary wood, mainly centripetal, at the

(After Grand' Eury, modified. Scott, Studies.)

Fig. 30. — Dorycordaites. Restoration, showing roots, trunk and branches bearing long lanceolate leaves and fructifications. The trunk is shown too short.

boundary of the pith, as in the case in Lyginodendron. Stems (Mesoxylon) intermediate in structure between Poroxylon and Cordaites have lately been discovered in the English Coal Measures. Corresponding strands of primary xylem have been observed in stems of the genus Pitys (Witham), of Lower Carboniferous age, which consisted of large trees, probably closely allied to Cordaites. There appears, in fact, so far as stem-structure is concerned, to have been no sharp break between the typical Palaeozoic Gymno- sperms and pronounced Pteridosperms such as Lyginodendron.

The long, parallel-veined leaves of the Cordaiteae, which were commonly referred to Monocotyledons before their structure or connexion with other parts of the plant was known, have been shown by Renault to have essentially the same anatomy as a single leaflet of a Cycad such as Zamia. The vascular bundles, in particular, show precisely the characteristic collateral mesarch or exarch structure which is so constant in the recent family (see Anatomy of Plants). In fact, if the foliage alone were taken into account, the Cordaiteae might be described as simple-leaved Cycads. The reproductive organs, however, show that the two groups were.

in reality very distinct. Both male and female inflorescences . have frequently been found in connexion with leaf-bearing branches (see restoration, fig. 30). The inflorescence is usually a spike bearing lateral cones or catkins, arranged sometimes distichously, sometimes in a spiral order. The investigation of silicified specimens has, in the hands of Renault, yielded striking results. A longitudinal section of a male Cordaianthus (the name applied to isolated fructifications) is shown in fig. 31, A, Plate. The organ figured is one of the catkins (about a centimetre in length) which were borne laterally on the spike. Some of the stamens are inserted between the bracts, in an apparently axillary position, while others are grouped about the apex of the axis. Each stamen consists of a long filament, bearing several erect, cylindrical pollen-sacs at its summit (cf. fig. 31, B, Plate). Some of the pollen-sacs had dehisced, while others still retained their pollen. The stamens are probably best compared with those of Ginkgo, but they have also been interpreted as corresponding to the male ” flowers ” of the Gnetaceae. In any case the morphology of the male Cordaitean fructification is clearly very remote from that of any of the Cycads or

(All after Renault.)

Fig. 32. — Cordaianthus.

A, C. Williamsoni. Part of longitudinal section of 9 catkin; a, axis, showing v. bundles in tangential section; br, bracts; d, short axillary shoot, bearing a bracteole and a terminal ovule; i, integu- ment; n, nucellus of ovule ; ov, another ovule seen from the outside. (X about 10.)

B, C. Grand’ Euryi. Nucellus of an ovule; p.c, pollen-chamber; s, canal leading to p.c; p, pollen-grains in p.c; p’, do. in canal. (X about 30.)

C, C. Grand’ Euryi. Lower part of canal, enlarged; 0, cavity of canal, surrounded by a sheath of cells, dilated towards the bottom of canal, in which a large pollen-grain is caught ; ex, exterior of pollen- grain; in, internal group of prothallial or antheridial cells. (X 150.)

D, Cycadinocarpus augustodunensis. Upper part of seed, in longi- tudinal section; i, integument; mi, micropyle; n, remains of nucellus; p.c, pollen-chamber (containing pollen-grains), with its canal extending up to the micropyle; pr, part of prothallus; ar, archegonia. All figures magnified.

true Coniferae, though some resemblance to the stamens of Arau-

carieae may be traced. The female inflorescences vary considerably in organization; in some species the axis of the spike bears solitary ovules, each accompanied by a few bracts, while in others the lateral appendages are catkins, each containing from two to several ovules. In the catkin shown in longitudinal section in fig. 32, A, it appears that each ovule was borne terminally, on an extremely short axillary shoot, as in Taxus among recent Gymnosperms. The ovule con- sists of an integument (regarded by some writers as double) en- closing the nucellus. In the upper part of the nucellus is a cavity or pollen-chamber, with a narrow canal leading into it, precisely as in the ovules of Stangeria or other Cycads at the present day (fig. 32, B). Within the pollen-chamber, and in the canal, pollen- grains are found, agreeing with those in the anthers, but usually of larger size (fig. 32, C). It was in this case that Renault first

made the exceedingly interesting discovery that each pollen-grain contains a group of cells, presumably representing an antheridium (fig. 32, C). Recent observations have completely confirmed Renault's interpretation of the facts, on which some doubt had been cast. In the isolated seeds of Cordaitales and Pteridosperms, pollen-grains are often found within the pollen-chamber, and the pericellular structure of these pollen-grains has been repeatedly demonstrated. In the light of our present knowledge of Ginkgo and the Cycads, there can scarcely be a doubt that spermatozoids were formed in the cells of the antheridium of the Cordaitean pollen-grain and that of other Palaeozoic Spermophyta; the antheri- dium is much more developed than in any recent Gymnosperm, and it may be doubted whether any pollen-tube was formed. The morphology of the female inflorescence of Cordaiteae has not yet been cleared up, but Taxus and Ginkgo among recent plants appear to offer the nearest analogies. Much further investigation will be needed before the homologies between Cordaitean cones and the fructifications of the higher Cryptogams can be established. Anatomically the connexion of the family with the Pteridosperms (and through them, presumably, with some primitive group of Ferns) seems clear, but we have as yet no indications of the stages in the evolution of their reproductive organs. The class Cordaitales extends back to the Devonian, and it must be borne in mind that our knowledge of their fructifications is practically limited to representatives from the latest Palaeozoic horizons.

Isolated fossil seeds are common in the Carboniferous and Permian strata; in all cases they are of the orthotropous type, and resemble the seeds of Cycads or Ginkgo more nearly than those of any other living plants. Their internal structure is sometimes admirably preserved, so that the endosperm with its archegonia is clearly shown (fig. 32, D). It

is a curious fact that in no case has an embryo been found in any of these seeds; probably fertilization took place after they were shed, and was followed immediately by germination. There is good evidence that many of the seeds belonged to Cordaitales, especially those seeds which had a flattened form, such as Cardiocarpus, Cycadinocarpus, Samaropsis, &c. Seeds of this kind have been found in connexion with the Cordai- anthus inflorescences; the winged seeds of Samaropsis, borne on long pedicels, are attributed by Grand' Eury to the genus Dorycordaites. Many other forms of seed, and especially those which show radial symmetry, as for example Trigonocarpus, Stephanospermum and Lagenostoma belonged, as we have seen, to some of the plants grouped under Pteridospermeae, though other Pteridosperms had flattened seeds not as yet distinguishable from those of Cordaitales. The abundance and variety of Palaeozoic seeds, still so often of undetermined nature, indicate the vast extent of the spermophytic flora of that period.

The modern Gymnospermous orders have but few authentic representatives in Palaeozoic rocks. The history of the Ginkgoales will be found in the Mesozoic section of this article (see also Gymnosperms); their nearest Palaeozoic representatives "were probably members of the Cordaitales, an extinct stock with which the Ginkgoaceae are closely connected " (Seward). Remains referable to Cycadophyta, so extraordinarily abundant in the suc- ceeding period, are scanty. The curious genus Dolerophyllum (Saporta) may be mentioned in this connexion. This genus, from the Permo-Carboniferous of Autun, is represented by large, fleshy, reniform leaves or leaflets, with radiating dichotomous venation; the vascular bundles have in all respects the structure of those in the leaves of Cycads or Cordaiteae. The male sporophylls are similar in form to the vegetative leaves, but smaller; sunk in their paren- chyma are numerous tubular loculi, containing large pollen-grains, which are pericellular like those of Cordaites ; the female fructifica- tion had not yet been identified with certainty. The curious male sporophylls may perhaps be remotely comparable to those recently discovered in Mesozoic Cycadophyta, of the group Bennettiteae. Some leaves of Cycadean habit (e.g. Pterophyllum, Sphenozamites) occur in the Coal Measures and Permian, and it is possible that the obscure Coal Measure genus Noeggerathia may have Cycadean affinities. A fructification from the Permian of Autun, named Cycadospadix milleryensis by Renault, appears to belong to this family.

Now that the numerous specimens of wood formerly referred to Coniferae are known to have belonged to distinct orders, but few true Palaeozoic Conifers remain to be considered. The most important are

the upper Coal Measure or Permian genera Walchia, Ullmannia and Pagiophyllum, all of which resembled certain Araucarieae in habit. In the case of Walchia there is some evidence as to the fructifications, which in one species (W. filiciformis) appear to be comparable to female Araucarian cones. There are also some anatomical points of agreement with that family. It is probable, however, that under the same generic name very heterogeneous plants have been confounded. In the case of Ullmannia the anatomical structure of the leaf, investigated by Solms-Laubach, proves at any rate that the tree was Coniferous.

There is no proof of the existence of Gnetaceae in Palaeozoic times. The very remarkable plumose seeds described by Renault under the name Gnetopsis are of uncertain affinity, but have much in common with Lagenostoma, the seed of Lyginodendron.

Succession of Floras.

Our knowledge of vegetation older than the Carboniferous is still far too scanty for any satisfactory history of the Palaeozoic Floras to be even attempted; a few, however, of the facts may be advantageously tecapitulated in chronological order.

No recognizable plant-remains, if we accept one or two doubtful Algal specimens, have so far been yielded by the Cambrian. From the Ordovician and Silurian, however, a certain number of authentic remains of Algae (among many more that are questionable) have been investigated; they are for the most part either verticillate Siphonae, or the large — possibly Laminariaceous— Algae named Nematophycus, with the problem- atical but perhaps allied Pachytheca. The evidence for terrestrial Silurian vegetation is still dubious; apart from some obscure North American specimens, the true nature of which is not established, Potonie' has described well-characterized Pterido- phytes (such as the fern-like Sphenopteridium and Bothrodendron among Lycopods) from supposed Silurian strata in North Germany; the horizon, however, appears to be open to much doubt, and the specimens agree so nearly with some from the Lower Carboniferous as to render their Silurian age difficult of credence. The high development of the terrestrial flora in Devonian times' renders it

probable that land-plants existed far back in the Silurian ages, or still earlier. Even in the Lower Devonian, Ferns and Lepidodendreae have been recognized; the Middle and Upper Devonian beds contain a flora in which all the chief groups of Carboniferous plants are already represented. Considering the comparative meagreness of the Devonian record, we can scarcely doubt that the vegetation of that period, if adequately known, would prove to have been practically as rich as that of the succeeding age. Among Devonian plants, Equisetales, including not only Archaeocalamites, but forms referred to Asterophyllites and Annularia, occur; Sphenophyllum is known from Devonian strata in North America and Bear Island, and Pseudobornia from the latter; Lycopods are repre- sented by Bothrodendron and Lepidodendron; a typical Lepido- strobus, with structure preserved, has lately been found in the Upper Devonian of Kentucky. Fern-like plants such as Sphenopterideae, Archaeopteris and Aneimites, with occasional arborescent Pecopterideae, are frequent; many of the genera, including Alelhopleris, Neuropteris and Megalopteris, probably belonged, not to true Ferns, but to Pteridosperms; although our knowledge of internal structure is still comparatively scanty, there is evidence to prove that such plants were already present, as for example, the genus Calamopitys. The presence of Cordaitean leaves indicates that Gymnosperms of high organization already existed, a striking fact, showing the immense .anti- quity of this class compared with the angiospermous flowering plants.

Any detailed account of the horizons of Carboniferous plants would carry us much too far. For our present purpose we may divide the formation into Lower Carboniferous and Lower and Upper Coal Measures. In the Lower Carboniferous (Culm of Continental authors) many Devonian types survive — e.g. Archaeocalamites, Bothrodendron, Archaeopteris, Megalopteris, &c. Among fern-like fronds Diplotmema and Rhacopteris are characteristic. Some of the Lepidodendreae appear to approach SigUlariae in external characters. Sphenophylleae are still rare; it is to this horizon that the isolated type Cheirostrobus belongs. Many specimens with structure preserved are known from the Lower Carboniferous, and among them Pteridosperms (Heteranguim, Calamopitys, Cladoxylon, Protopitys) are well represented, if we may judge by the anatomical characters. Of Gymnosperms we have Cordaitean leaves, and the stems known as Pitys, which probably belonged to the same family.

The Lower Coal Measures (Westphalian) have an enormously rich flora, embracing most of the types referred to in our system- atic description. Calamarieae with the Arthropitys type of stem-structure abound, and Sphenophylleae are now well represented.

Bothrodendron still survives, but Lepidodendron, Lepidophloios, and the ribbed SigUlariae are the characteristic Lycopods. The heterogeneous ” Ferns ” grouped under Spheno-

pterideae are especially abundant. Ferns of the genera referred to Marattiaceae are common, but arborescent stems of the Psaronius type are still comparatively rare. Numerous fronds such as Alethopteris Neuropteris, Mariopteris, &c, belonged to Pteridosperms, of which specimens showing structure are fre- quent in certain beds. Cordaites, Dorycordaites and many stems of the Mesoxylon type represent Gymnosperms; the seeds of Pteridosperms and Cordaiteae begin to be common. The Upper Coal Measures (Stephanian) are characterized among the Calamarieae, now more than ever abundant, by the prevalence of the Calamodendreae; new species of Sphenophyllum make their appearance; among the Lycopods, Lepidodendron and its immediate allies diminish, and smooth-barked Sigillariae are the characteristic representatives. ” Ferns ” and Pteridosperms are even more strongly represented than before, and this is the age in which the supposed Marattiaceous tree-ferns reached their maximum development. Among Pteridosperms it is the family Medulloseae which is especially characteristic. Cordaiteae still increase, and Gymnospermous seeds become extraordinarily abundant. In the Upper Coal Measures the first Cycadophyta and Coniferae make their appearance. The Permian, so far at least as its lower beds are concerned, shows little change from the Stephanian; Conifers of the Walchia type are especially characteristic. The remarkable Permo-Carboniferous flora of India and the southern hemisphere is described in the next section of this article. During the earlier part of the Carboni- ferous epoch the vegetation of the world appears to have been remarkably uniform; while the deposition of the Coal Measures, however, was in progress, a differentiation of floral regions began. The sketch given above extends, for the later periods, to the vegetation of the northern hemisphere only.

Authorities. — Potoni6, Lehrbuch der Pflanzenpalaontologie (Berlin, 1899) ; Renault, Cours de botanique fossile, vols, i.-iv. (Paris, 1881-1885) ; Scott, Studies in Fossil Botany (2nd ed., London, 1 908-1909) ; ” The present Position of Palaeozoic’ Botany,” in Pro- gressus rei botanicae, Band I. (Jena, 1907) ; Seward, Fossil Plants (in course of publication), vol. i. (Cambridge, 1898), vol. ii. (1910); Solms-Laubach, Introduction to Fossil Botany (Oxford, 1892) ; Zeiller, Elements de paUobotanique (Paris, 1900). In these general works references to all important memoirs will be found.

, \ (D. H. S.)

II. — Mesozoic

The period dealt with in this section does not strictly corre- spond with that which it is customary to include within the limits of the Mesozoic system. The Mesozoic era, as defined in geological textbooks, includes the Triassic, Jurassic and Cretaceous epochs; but from the point of view of the evolution of plants and the succession of floras, this division is not the most natural or most convenient. Our aim is not simply to give a summary of the most striking botanical features of the several floras that have left traces in the sedimentary rocks, but rather to attempt to follow the different phases in the development of the vegetation of the world, as expressed in the contrasts exhibited by a comparison of the vegetation of the Coal period forests with that of the succeeding Mesozoic era up to the close of the Wealden period.

Towards the close of the Palaeozoic era, as represented by the Upper Carboniferous and Permian plant-bearing strata, the vegetation of the northern hemisphere and that of several regions in the southern hemisphere, consisted of numerous types of Vascular Cryptogams, with some members of the Gymno- spermae, and several genera referred to the Pteridospermae and Cycadofilices (see section I. Palaeozoic). In the succeeding Permian period the vegetation retained for the most part the same general character; some of the Carboniferous genera died put, and a few new types made their appearance. The Upper Carboniferous and Permian plants may be grouped together as constituting a Permo-Carboniferous flora characterized by an abundance of arborescent Vascular Cryptogams and of an extinct class of plants to which the name Pteridosperms has recently been assigned — plants exhibiting a combination of Cycadean and filicinean characters and distinguished by the production of true gymnospermous seeds of a complex type. This flora had a wide distribution in North America, Europe and parts of

Asia; it extended to China and to the Zambesi region of tropical Africa (Map A, I. and II.).

On the other hand, the plant-beds of the Permo-Carboniferous age in South Africa, South America, India and Australia demon- strate the existence of a widely distributed vegetation Piora° P e S wn ˆ cn agrees in age with the Upper Carboniferous and Permian vegetation of the

north, but differs from it to such an extent as to constitute a distinct flora. We must begin by briefly considering this southern Palaeozoic province if we would trace the Mesozoic floras to their origin, and obtain a connected view of the vegetation of the globe as it existed in late Palaeozoic times and at the beginning of the succeeding era.

In Australia, South America and South Africa a few plants have been found which agree closely with Lower Carboniferous types of the northern hemisphere. In New South Wales, for example, we have such genera as Rhacopteris and Lepidodendron represented by species very similar to those recorded from Lower Carboniferous or Culm rocks in Germany, Austria, England, Spitzbergen, North and South America and elsewhere. It is, in short, clear that the Culm flora, as we know it in the northern hemisphere, existed in the extreme south, and it is probable that during the earlier part of the Carboniferous period the vegetation of the world was uniform in character. We may possibly go a step farther, and assume that the climatic conditions under which the Culm plants of the Arctic regions flourished were not very different from those which prevailed in Europe, Asia, Chile and South Australia. From strata in New South Wales overlying Devonian and Lower Carboniferous rocks certain plants were discovered in the early part of the 19th century which were compared with European Jurassic genera, and for several years it was believed that these plant-beds belonged to the Mesozoic period. These supposed Mesozoic plants include certain genera which are of special interest. Foremost among these is the genus Glossopteris (fig. 1), applied by Brongniart in 1828 to sub-lanceolate or tongue-shaped leaves from India and Australia,

Fig. I. — Glossopteris frond, with portion enlarged to show the venation (Natural size = 36 cm. in length.) From Lower Gondwana rocks of India.

which have generally been regarded as the fronds of ferns characterized by a central midrib giving off lateral veins which repeatedly anastomose and form a network, like that in the leaves of Antrophyum, an existing member of the Polypodiaceae. The stems, long known from Australia and India as Vertebraria, have in recent years been proved to be the rhizomes of Glossopteris. It is only recently that undoubted sporangia have been found in clo. e association with Glossopteris leaves. The genus possessed small broadly oval or triangular leaves in addition to the large fronds like that shown in fig. I ; it was with the smaller leaves that Mr Arber discovered sporangia exhibiting certain points of resemblance to the micro- sporangia of modern Cycads. We cannot as yet say whether these bodies represent a somewhat unusual type of fern sporangium or whether they are

microsporangia: if the latter supposition is correct the plant must have been heterosporous ; but we are still without evidence on this point. Associated with Glossopteris occurs another fern, Gangamopteris, usually recognized by the absence of a well marked midrib, though this character does not always afford a satisfactory distinguishing feature. In view of recent discoveries which have demonstrated the Pteridosperm nature of many supposed ferns of Palaeozoic age, we must admit the possi- bility that the term fern as applied to Glossopteris and Gangamopteris may be incorrect. An Equisetaceous plant, which Brongniart named Phyllotheca in 1828, is another member of the same flora; this type bears a close resemblance to Equisetum in the long internodes and the whorled leaves encircling the nodes, but differs in the looser leaf-sheaths and in the long spreading filiform leaf-segments, as also in the structure of the cones. Phyllotheca has been recognized in. ; Europe in strata of Palaeozoic age, and Professor Zeiller has discovered a new species— P. Rallii — in Upper Carboniferous rocks in Asta Minor (Map A, VII.), which points to a close agreement between-this genus and the well-known Palaeozoic Annuluria..::.Phyllatheca-Bccurs:. also in Jurassic rocks in Italvand in Siberian strata originally; described as Jurassic, but which Aeiller has shown, are ho doubt of Permian age. Some examples, of this genUs,' "described by Efheridge ffom Permo-Carboni- ferous beds in New South Wales, =

taceous genus Cingularid from the Coal Measures of Germany. Other genera characteristic of this southern flora are mentioned later. The extraordinary abundance of Glossopteris in Permo- Carboniferous rocks of Australia, and in strata of the same age in India and South Africa, gave rise to the term " Glossopteris flora " for the assemblage of plants obtained from ˆsouthern hemisphere rocks overlying beds containing Devonian and Lower Carboniferous fossils. The Glossopteris flora of Australia occurs in certain regions in association with deposits which are now recognized as true boulder- beds, formed during widespread glacial conditions. In India the same flora occurs in a thick series of fresh-water sediments, known as the Lower Gondwana system, including basal boulder-beds like those of Australia. Similar glacial deposits occur also in South America, and members of the Glossopteris flora have been discovered in Brazil and elsewhere. In South Africa, Glossopteris, Gangamo- pteris and other genera, identical with those from Australia and India, are abundantly represented, and here again, as in India and South America, the plants are found in association with extensive deposits of undoubted glacial origin. To state the case in a few words: there is in South Africa, South

America, Australia and India an extensive series of sediments containing Glossopteris, Gangamopteris and other genera, and including beds full of ice- scratched boulders. These strata are homotaxial with Permo- Carboniferous rocks in Europe and North America, as determined by the order of succession of the rocks, and by the occurrence of typical Palaeozoic shells in associated marine deposits. The most important evidence on which this conclusion is based is afforded by the occurrence of European forms of Carboniferous shells in marine strata in New South Wales, which are intercalated between Coal Measures containing members of the Glossopteris flora, and by the discovery of similar shells, many of which are identical with the Australian species, in strata in the north-west of India and in Afghanistan, forming part of a thick series of marine beds known as the Salt Range group. This group of sediments in the extra- peninsular area of India includes a basal boulder-bed, referred on convincing evidence to the same geological horizon as the glacial deposits of the Indian peninsula (Talchir boulder-beds), South Africa (Eeca boulder-beds), Australia and Tasmania (Bacchus Marsh boulder-beds, &c), and South America, which are asso- ciated with Glossopteris-bearing strata. We have a flora of wide distribution in South Africa, South America, Borneo, Australia, Tasmania and India which is clearly of Permo- Carboniferous age, but which differs in its composition from the flora of the same age in other parts of the world. This flora appears to have abruptly succeeded an older flora in Australia and elsewhere, which was precisely similar to that of Lower Carboniferous age in the northern hemisphere. The frequent occurrence of ice-formed deposits at the base of the beds in which Glossopteris and other genera make their appearance, almost necessitates the conclusion that the change in the character of the vegetation was con- nected with a lowering of temperature and the prevalence of glacial conditions over a wide area in India and the southern hemisphere. There can be little doubt that the Indian Lower Gondwana rocks, in which the boulder-beds and the Glossopteris flora occur, must be regarded as belonging to a vast continental area of which remnants are preserved in Australia, South Africa and South America. This continental area has been described as ” Gondwana Land,” a tract of enormous extent occupying an area, part of which has since given place to a southern ocean, while detached masses persist as portions of more modern continents, which have enabled us to read in their fossil plants and ice-scratched boulders the records of a lost continent in which the Mesozoic vegetation of the northern hemisphere had its birth. Of the rocks of this southern continent those of the Indian Gondwana system are the richest in fossil plants; the most prominent types recorded from these Permo-Carboniferous strata

are Glossopteris, Gangamo- pteris, species referred to Sphenopteris, Pecopteris, Macrotaeniopteris and other Ferns; Schizoneura (fig. 2) and Phyllotheca among the Equisetales, Naeggerathiopsis and Euryphyllum, probably members of the Cordaitales (q.v. in section I. Palaeozoic) ; Glossozamites and Pterophyllum among the Cycadales, and various vegetative shoots recalling those of the coniferous genus Voltzia, a well-known Permian and Triassic plant of northern latitudes. The genera Lepidodendron, Sigillaria, Stigmaria, or Catamites, which played so great a share in the vegetation of the same age in the northern hemisphere, have not been recognized among the Palaeozoic forms of India, but examples of Sigillaria, Lepidodendron and Bothrodendron are known to have existed in South Africa in the Permo-Carboniferous era.

We may next inquire what types occur in the Glossopteris flora agreeing more or less closely with members of the rich Permo-Carboniferous vegetation of the north. The genus Sphenophyllum, abundant in the Coal Measures and Permian rocks of Europe and America, is represented by a single species recorded from India, Sphenophyllum speciosum (fig. 3), and a doubtful species from South Africa; Annularia, another common northern genus, is recorded from Australia, and the closely allied Phyllotheca constitutes another link between the two Permo-Carboniferous floras. The genus Cordaites may be compared, and indeed is probably identical with, certain forrfls. recorded from India, South America, South Africa

and Australia. While a few similar or even identical types may be recognized in both floras, there can be no doubt that, during a considerable period subsequent to that represented by the Lower Carboniferous or Culm rocks, there existed two distinct floras, one of which had its headquarters in the northern hemisphere, while the other flourished in a vast continental area in the south. Recent discoveries have shown that representatives of the_ two floras coexisted in certain regions ; there was, in fact, a dovetailing between

strata in Europe. In theTongking area, therefore, a flora existed during the Rhaetic period consisting in part of genera which are abundant in the older Glossopteris beds of the southland in part of well- known constituents of European Rhaetip floras. A characteristic member of

the southern botanical province, Schizoneura gondwan-

I ensis (fig. 2) of India, is represented also by a closely allied if not an identical species — 5. paradoxa — in the Lower Trias (Bunter)

I sandstones of the Vosges Mountains, . associated with European

I, II.

Map A— Gi— G 6 ,

plants of the northern

in the Zambesi district

&c:

Upper Carboniferous hemisphere facies and in China.

III. Rhaetic flora of Tpngking (Glossopteris

associated with northern types).

IV. Carboniferous plants (prov. Kansu).

V. Glossopteris, &c, in Permian rocks in prov. Vologda, the northern and southern botanical provinces. In 1895 Professor Zeiller described several plants from the province of Rio Grande do Sul in South America (Map A, G 2), including a few typical members of the Glossopteris flora associated with a European species, Lepido- phloios laricinus, one of the characteristic types of the Coal period, and with certain ferns resembling some species from European Permian rocks. A similar association was found also in Argentine rocks by Kurtz (Map A, Gi), and from South Africa Sigillaria Brardi, Psygmo- phyllum, Bothrodendron and other northern types are recorded in company with Glosso- pteris, Glangamopteris and Naeggerathiopsis. The Coal-bearing strata which occupy a considerable area in China (Map A, II.), contain abundant samples of a vegetation which appears to have agreed in their main features with the Permo-Carboniferous floras ‘ of the northern hemisphere. In his account of some plants from the Coal Measures of Kansu (Map A, IV.) Dr Krasser has drawn attention to the apparent identity of certain leaf fragments with those of Naeggerathiopsis Hislopi, a typical member of the Glossopteris flora; but this plant, so far as the evidence of vegetative leaves may be of value, differs in no essential respects from certain species of a European genus Cordaites. A com paratively rich fossil flora was

described in 1882 from Tongking (Map A, 1 1 1 . by Professor Zeiller — and this author has recently made important additions to his original account — which demonstrates an admixture of Glossopteris types with others which were recognized as identical with plants characteristic of Rhaetic

Glossopteris Flora.

VI. Permian (Pechora valley). VII. Upper Carboniferous (Herakleion). ■ VIII. Rhaetic (Honduras).

IX. Lower Jurassic, Upper Gondwana (Argentine). X. Rhaetic (Persia). XI. Triassic — Cretaceous.

species which do not occur in the Glossopteris flora. Another plant found in .the Vosges sandstones — Neuropteridium grandifolium — is also closely allied to species of the same ” fern ” recorded from the

(After Feistmantel.) Fig. 2. — Schizon- eura gondwanensis , from Lower Gond- wana rocks, India.

(After Feistmantel.) A.

B.

Fig. 3. — Sphenophyllum speciosum. From Lower Gondwana

rocks, India.

A. nat. size. B. leaflet enlarged.

Lower Gondwana strata of India (fig. 4), South America and South Africa. These two instances — the Tongking beds of Rhaetic age and the Bunter sandstones of the Vosges 1 — afford evidence of a

(After Feistmantel.)

Fig. 4. — Neuropteri- dium validwn. From Lower Gondwana rocks, India.

northern extension of Glossopteris types and their association with

European species. In 1898 an important discovery was made by Professor Amalitzky, which carries us a step further in our search for a connexion between the northern and southern floras. Amalitzky found in beds of Upper Permian age in the pro- vince of Vologda (Russia) (Map A, V.) species of Glossopteris and Naeggerathi- opsis typical members of the Glossopteris flora, associated with species of the ferns Taeniopteris, Callipteris and Sphenopteris, a striking instance of a commingling in the far north of the northern hemisphere Permian species with migrants from " Gondwana Land." This association of types clearly points to a penetration of representatives of the Glossopteris flora to the north of Europe towards the close of the Permian period. Evidence ot the same northern extension is supplied by floras described by Schmalhausen from Permian rocks in the Pechora valley (Map A, VI.), the Siberian genus Rhip- tozamites being very similar to, and pro- bably generically identical with, Naegger- athiopsis of the Glossopteris flora. The Permo – Carboniferous beds of South Africa, India and Australia are succeeded by other plant-bearing strata, containing numerous species agreeing closely with members of the Rhaetic and Jurassic floras of the northern hemisphere. These post-Permian floras, as represented by the Upper Gondwana beds of India and corresponding strata in Australia, South Africa, and South America, differ but slightly from the northern floras, and point to a uniformity in the Rhaetic and Jurassic vegetation which is in contrast to the existence of two botanical provinces during the latter part of the Palaeozoic period. A few plants described by Potonie from German and Portuguese East Africa demonstrate the occurrence of Glossopteris and a few other genera, referred to a Permo-Triassic horizon, in a region slightly to the north of Tete in the Zambesi district (Map A, I.), where typical European plants agreeing with Upper Carboniferous types were discovered several years ago, and described by Zeiller in 1882 and 1901. The existence of Upper Gondwana plants, resembling Jurassic species from the Rajmahal beds of India, has been demon- strated in the Argentine by Dr Kurtz.

Having seen how the Glossopteris flora of the south gradually spread to the north in the Permian period, we may now take a

brief survey of the succession of floras in the northern Floras?
hemisphere, which have left traces in Mesozoic

rocks of North America, Europe and Asia. Our knowledge of the Triassic vegetation is far from extensive; this is no doubt due in part to the fact that the conditions under which the Triassic rocks were deposited were not favourable to the existence of a luxuriant vegetation. Moreover, the Triassic rocks of southern Europe and other

regions are typical marine sediments. The Bunter sandstones of the Vosges have afforded several species of Lower Triassic plants; these include the Equisetaceous genus Schizoneura — a member also of the Glossopteris flora — bipinnate fern fronds referred to the genus Anomopteris, another fern, described originally as Neuropteris grandifolia, which agrees very closely with a southern hemisphere type (Neuropteridium validum, fig. 4), some large Equisetaceous stems apparently identical, except in size, with modern Horse- tails. With these occur several Conifers, among others Vollzia heterophylla and some twigs referred to the genus Albertia, bearing large leaves like those of Agathis australis and some of the Araucarias, also a few representatives of the Cycadales. Among plants from Lower Triassic strata there are a few which form connecting links with the older Permo-Carboniferous flora; of these we have a species, described by Blanckenhon as Sigillaria oculina, which may be correctly referred to that genus, although an inspection of a plaster-cast of the type-specimen in the Berlin Bergakademie left some doubt as to the sufficiency of the evidence for adopting the generic name Sigillaria. Another Triassic genus, Pleuromeia, is of interest as exhibiting, on the one hand, a striking resemblance to the recent genus Isoetes, from which it differs in its much larger stem, and on the other as

agreeing fairly closely with the Palaeozoic genera Lepidodendron and Sigillaria. There is, however, a marked difference, as regards the floras as a whole, between the uppermost Palaeozoic flora of the northern hemisphere and such species as have been recorded from Lower Triassic beds. There is evidence of a distinct break in the succession of the northern floras which is not apparent between the Permian and Trias floras of the south. Passing over the few known species of plants from the middle Trias (Muschelkalk) to the more abundant and more widely spread Upper Triassic species as recorded from Germany, Austria, Switzerland, North America and elsewhere, we find a vegetation characterized chiefly by an abundance of Ferns and Cycads, exhibiting the same general facies as that of the suc- ceeding Rhaetic and Lower Jurassic floras. Among Cycads may be mentioned species of Pterophyllum (e.g. P. Jaegeri), represented by large pinnate fronds not unlike those of existing species of Zamia, some Equisetaceous plants and numerous Ferns which may be referred to such families as Gleicheniaceae, Dipteridinae and Matonineae. Representatives of the Gink- goales constitute characteristic members of the later Triassic floras, and these, with other types, carry us on without any break in continuity to the Rhaetic floras of Scania, Germany, Asia, Chile, Tonkin and Honduras (Map A, VIII.), and to the Jurassic and Wealden floras of many regions in both the north and south hemispheres. A

comparative view of the plants found in various parts of the world, in beds ranging from the Upper Tria's to the top of the Jurassic system, reveals a striking uni- formity in the vegetation both in northern and southern lati- tudes during this long succession of ages. The Palaeozoic types are barely represented; the arborescent Vascular Cryptogams have been replaced by Cycads, Ginkgoales and Conifers as the dominant classes, while Ferns continue to hold their own. No undoubted Angiosperms have yet been found below the Cretaceous system. From the close of the Permian period, which marks the limit of the Upper Palaeozoic floras, to the period immediately preceding the apparently sudden appearance of Angiosperms, we have a succession of floras differing from one another in certain minor details, but linked together by the possession of many characters in common. It is impossible to consider in detail this long period in the history of plant-evolu- tion, but we may briefly pass in review the most striking features of the vegetation as exhibited in the dominant types of the various classes of plants. Fragments of a Jurassic flora have recently been discovered by Dr Andersson, a member of Norden- skiold's Antarctic expedition, in Louis. Philippe Land in lat. 63 15′ S. Among other well-known Jurassic genera Nathorst has identified the following: Equisetites, Cladophlebis, Todites, Tkinnfeldia, Otozamites, Williamsonia pecten, Araucarites. The discovery of this Antarctic flora is a further demonstration of the world-wide distribution of a uniform Jurassic flora.

Under the head of Algae there is little of primary importance to record, but it is of interest to notice the occurrence of certain forms which throw light on the antiquity of existing families ..

of Algae. Species referred on good evidence to the A, * fle – Charophyta are represented by a few Casts of oogonia and stem fragments, found in Jurassic and Wealden beds, which bear a striking resemblance to existing species. There is some evidence for the occurrence of similar Chara "fruits" in middle Triassic rocks; some doubtful fossils from the much older Devonian rocks have also been quoted as possible examples of the Charophyta. The oldest known Diatoms are represented by some specimens found entangled in the spicules of a Liassic sponge, and identified by Rothpletz as species of the recent genus Pyxtdicula. The calcareous Siphoneae are represented by several forms, identified as species of Diplopora, Triploporella, Neomeris and other genera, from strata ranging from the lower Trias limestones of Tirol to the Cretaceous rocks of Mexico and elsewhere. It is probable that the Jurassic Goniolina, described from French localities, and other genera which need not be men- tioned, may also be reckoned among the Mesozoic Siphoneae. A genus Zonatrichiles,

compared with species of Cyanopnyceae, has been described as a Calcareous alga from Liassic limestones of Silesia.

The geological history of Mosses and Liverworts is at present very incomplete, and founded on few and generally unsatisfactory fragments. It is hardly too much to say that no Rrrnnhv , M absolutely trustworthy examples of Mosses have so far ”””“vw been found in Mesozoic strata. Of Liverworts there are a lew species, such as Palaeohepatica Rostafinskii from the Lower Jurassic

rocks of Cracow, Marchantites erectus from the Inferior Oolite rocks of Yorkshire, and M. Zeilleri from the Wealden beds of Sussex. These fossil Hepaticae are unfortunately founded only on sterile fragments, and placed in the Liverworts on the strength of their resemblance to the thallus of Marchantia and other recent genera.

The Palaeozoic Catamites were succeeded in the Triassic period by large Equisetites, differing, so far as we know, in no essential _ . respect from existing Equisetums. The large stems

Equ se- represented by casts of Triassic age, Equisetites arenaceus taceae. anc j t ner species, probably possessed the power of secondary growth in thickness; the cones were of the modern type, and the rhizomes occasionally formed large underground tubers like those frequently met with in Equisetum arvense, E. sylvaticum and other species. Equisetites Muensteri is a characteristic and fairly widely spread Rhaetic and Liassic species, having a com- paratively slender stem, with leaf-sheaths consisting of a few broad and short leaf-segments. Equisetites columnaris, a common fossil in the Jurassic plant -beds of the Yorkshire coast, represents another type with relatively stout and occasionally branched vegetative shoots, bearing leaf-sheaths very like those of Equisetum maximum and other Horsetails. In the Wealden strata more slender forms have been found — e.g. Equisetites Burchardti and E. Lyelli — in England, Germany, Portugal, Japan and elsewhere, differing still less in dimensions from modern species. Of other Equisetales there are Schizoneurd and Phyllotheca; the former first appears in Lower Gondwana rocks as a member of the Glossoptens flora, migrating at a later epoch into Europe, where it is represented by a Triassic species. The latter genus

ranges from Upper Carboni- ferous to Jurassic rocks; it occurs in India, Australia, and elsewhere in the ” Gondwana Land ” vegetation, as well as in Palaeozoic rocks of Asia Minor, in Permian rocks ot Siberia, and in Jurassic plant-beds of Italy. This genus, like the allied Catamites, appears to have possessed cones of more than one type; but we know little of the structure of these Mesozoic Equisetaceous genera as compared with our much more complete knowledge of Calamites and Archaeo- calamites. (See section I., Palaeozoic.)

Reference has already been made to Sigillaria oculina and to the genus Pleuromeia. Palaeobotanical literature contains several records of species of Lycopodites and Selaginellites ; Lycopo- near iy a n f them are sterile fragments, bearing a more diales. Qr j egg c] ose resemblance to living Club-Mosses and Selaginellas, but lacking the more important reproductive organs. Nathorst has recently described a new type of lycopodiaceous cone, Lycostrobus Scotti, from Rhaetic rocks of Scania, from which he obtained both megaspores and microspores. An investigation by Miss Sollas of a plant long known from Rhaetic rocks in the Severn valley as Naiadita acuminata has shown that this genus is in all probability a small lycopodiaceous plant, and neither a Moss nor a Monocotyledon, as some writers have supposed. One of the best- known European species is Lycopodites falcatus, originally described by Lindley and Hutton from the Inferior Oolite of Yorkshire.

Among the large number of Mesozoic Ferns there are several species founded on sterile fronds which possess but little interest _… . from a botanical standpoint. Some plants, again, have

ca “ been referred by certain authors to Ferns, while others have relegated them to the Cycads. As examples of these doubtful forms may be mentioned Thinnfeldia, characteristic of Rhaetic and Lower Jurassic rocks; Dichopteris, represented by some exceptionally fine Jurassic specimens, described by Zigno, from Italy; and Ctenis, a genus chiefly from Jurassic beds, founded on pinnate fronds like those of Zamia and other Cycads, with linear pinnae characterized by anastomosing veins. Plants referred to Schimper’s genus Lomatopteris and to Cycadopteris of Zigno afford instances of the difficulty of distinguishing between the foliage of Ferns and Cycads. The close resemblance between specimens from @B||l M Jurassic rocks placed in one or other of

§sllˆˆ\i8?SE§?3′ ” ie s rt ‘ n, ‘ nl Thinnfeldui, Dichopteris, ˆfesSJiˆlKiiPˆˆv Cycadiiplerh, &c, illustrates the ˆ■■■■MHHKMla Unsatisfactory custom of founding new names on imperfect fronds. It

is of interest to note that some leaf-fragments recently found in Permian rocks of Kansas, and placed in a new geilus Glenopteris, are hardly distinguishable from specimens of Jurassic and Rhaetic age referred to Thinnfeldia and other Mesozoic genera. The difficulty of distinguishing between Ferns and Cycads is a necessary conse- quence of the common origin of these two ~Q — ”” ” ~ classes; in Palaeozoic times the Cycado- _ filicies and Pteridospermae (see section I.,

. _ ˆ.V 5, 5- . Palaeozoic) played a prominent part,

A, (Xozamites Beam. an(j even amon g recent Cycads and Ferns

o, U. Bunburyanus. we st ;n xe a f ew indications of their close

Inferior Oolite, England, relationship. There is reason to believe that compound or generalized types — partly Ferns and partly

Cycads — persisted into the Mesozoic era; but without more ana- tomical knowledge than we at present possess, it is impossible to do more than to point to a few indications afforded by external, and to a slight extent by internal structure, of the survival of Cycado- filicinean types. The genus Otozamites, which it is customary and probably correct to include in the Cycadales, is represented by certain species, such as Otozamites Beani (fig. 5, A), a characteristic Yorkshire fossil of Jurassic age, which in the form of the frond, bearing broad and relatively short pinnae, exhibits a striking agreement with the sterile portions of the fronds of Aneimia rotundifolia, a member of the fern family Schizaeaceae. Again, another species of the same genus, 0. Bunburyanus (fig. 5, B), suggests a comparison with fern fronds like that of the recent species Nephrolepis Duffi. The scaly ramenta which occur in abundance on the leaf-stalk bases of fossil Cycads constitute another fern-character surviving in Mesozoic Cyca- dales. Without a fuller knowledge of internal structure and of the reproductive organs, we are compelled to speak of some of the Mesozoic plants as possibly Ferns or possibly Cycads, and not refer- able with certainty to one or other class. It has been found useful in some cases to examine microscopically the thin film of coal that often covers the pinnae of fossil fronds, in order to determine the form of the epidermal cells which may be preserved in the carbon- ized cuticle; rectilinear epidermal cell -walls are usually considered characteristic of Cycads, while cells with undulating walls are more likely to belong to Ferns. This distinction does not, however, afford a safe guide; the epidermal cells of some ferns, e.g. Angiopteris, have straight walls, and occasionally the surface cells of a Cycadean leaf-segment exhibit a fern-like character. Leaving out of account the numerous sterile fronds

which cannot be certainly referred to particular families of Ferns, there are several genera which bear evidence in their sori, and to some extent in the form of the leaf, of their relationship to existing types.

The abundance of Palaeozoic plants with sporangia and sori of the Marattiaceous type is in striking contrast to the scarcity of Mesozoic ferns which can be reasonably included in the „ Marattiaceae. One of the few forms so far recorded Karat- is that known as Marattia Muensteri from Rhaetic ttaceae. localities in Europe and Asia. Some species included in the genus Danaeites or Danaeopsis from Jurassic rocks of Poland, Austria and Switzerland may possibly be closely allied to the recent tropical genus Danaea. Of the Ophioglossaceae there are no satisfactory examples; one of the few fossils compared with a recent species, Ophioglossum palmatum, was described several years ago from Triassic rocks under the name Cheiropteris, but the resemblance is one of external form only, and practically valueless as a taxonomic criterion. It would appear that the eusporangiate Ferns suddenly sank to very subordinate position after the Palaeozoic era.

The Osmundaceae, represented by a few forms of Palaeozoic age, played a more prominent part in the Mesozoic floras. A species described by Schenk from Rhaetic rocks of Franconia as _ Acrostichites princeps is hardly distinguishable from

Fig. 6. — Cladophlebis denticulata. Inferior Oolite, England.

Schlzae-

the leaves of Todites, a genus which may often be recognized by the broad and relatively short bluntly-terminated pinnules. The Jurassic species Cladophlebis deniiculata (fig. 6), recorded from several European localities, as well as from North America, Japan, China, Australia, India and Persia, affords an instance of a common type of bipinnatr frond similar to Todites Williamsoni, which has been included in the Polypodiaceae ; but such meagre evidence of the soral characters as we possess also points to a comparison with the recent fern Todea barbara. Our knowledge of the anatomy of fossil Osmundaceae has recently been considerably extended by Kidston and Gwynne-Vaughan. (For references, see Seward, Fossil Plants, vol. ii.,

1910.)

The Schizaeaceae include a widely spread species, originally named Pecopteris exilis, and subsequently placed in a new genus, Klukia (fig. 7), which is characterized by tripinnate fronds with short linear ultimate segments, bearing a single row of sporangia with an apical annulus (” monangic sori ” of Prantl) on either side of the midrib. This type occurs in Rhaetic

and Lower Jurassic rocks of England, the Arctic regions, Japan and elsewhere. Rujfor- dia Goepperti, a Wealden type, and probably a member of the Schizaeaceae, has been re- corded from England, Belgium, and other European countries, and Japan.

The Gleicheniaceae appear to have been represented by Triassic species in North America and Europe, and more abundantly in Jurassic, Weal- den, or Lower Cretaceous rocks in Belgium, Greenland, Poland 5 and elsewhere. Some excep-

Fig. 7 .— Klukia exilis. ^^ P”” foments of

„ ‘ . , , rhizomes have been found by Dr

1-3 Sporangia enlarged c Bommer of Brusse l s in some

4, Sing e fertile pinnule slightly Wealden deposits at Hainaut

enlarged. _ in Be i gium . but t h ese have not

5, Fragment of pinna. . ^ fu „ described . The

Inferior Oolite, England. dichotomously-branched fronds

of the type represented by several recent species of Gleichenia, e.g. . . G. dichotoma, &c, are abundant in Lower Cretaceous

aietchen- p i ant _i,eds of Greenland, and suggest that in the latter aceae. p ar(. Q £ t ^ e M esozo ; c period the Gleicheniaceae held a position in the vegetation of the far north similar to that which they now occupy in the southern tropics of India and other regions. The recent Malayan genus Matonia (Map B, Matonia), represented by two species, M. pectinata and M. sarmentosa, is clearly a survival

in southern latitudes of a family which occupied Matonl- an important neae. place in the

vegetation of the Rhaetic Jurassic and Wealden periods. The genera La- copteris and Matonidium &%£ < $ j&*!*^-^fMffld^'"Sl{ ^' ^ ma y ^

e cited as

Swf JW^^K^^^^ ^ tne two most important

•P* mpK ‘«*■ SSsWw ! —^ types, both as regards

eiMB”. ■ H!H»»sa \—>i geographical and geo

logical range, of this Mesozoic family; these ferns are recorded from England, France, Bel- gium, Germany, Austria, Portugal, Poland and Italy (Map B, Mi), also from Greenland (Map B, M 2), Spitsbergen (Map B, M 3), and Persia (Map B, M 4). From the southern Hemisphere, on the other hand, we know of one or two fragments only which can reasonably be referred to the Matonineae (Map B, Ms), a fact which may point to a northern origin for this family with its two surviving species almost confined to the Malayan region.

The recent genus, Dipteris, with its four existing species, occurring chiefly in the Indo-Malayan region (Map B, Dipteris), is also a modern survival of several Mesozoic types represented Dlpterl- ky suc j 1 genera as Dictyophyllum (fig. 9), Hausmannia dlaae. and £ am pi pi er { s t which were abundant during the

Rhaetic and Jurassic periods in England, Germany, Sweden and

B

Fig. 8. — Matonidium Goepperti.

A, Summit of petiole.

B, Fertile pinnules.

Inferior Oolite, England.

(After Schenk.)

Fig. 9. — Dictyophyllum. Rhaetic rocks of Europe and Asia.

elsewhere in Europe (Map B, D). Important additions to our knowledge of the fertile leaves and rhizomes of certain Rhaetic species of Dictyophyllum and other genera have recently been made by Professor Nathorst of Stockholm, and Professor Richter of Quedlinburg has made a thorough investigation of the vegetative organs of Hausmannia, a genus possibly identical with Protorhipis, which is abundant in Lower Cretaceous and other strata in various European localities. The Dip- teridinae are represented also by species from

Mesozoic rocks of Persia (Map B, D 2), Green- land (Map B, D 3), North America (D4), South America (D 6) and China (D 6).

The Cyatheaceae constitute another family of leptospor- angiate Ferns which had several &** > ”> *- representatives in ceae < Mesozoic floras. The numer- ous species of fronds from Jurassic and Wealden rocks of North America and Europe referred to Thyrsopleris, a recent monotypic genus con- fined to Juan Fernandez, are in the majority of cases founded on sterile leaves, and of little or no botanical value. On the other hand, there are several fossil Ferns of Juras- sic age possessing cup-like sori like those of Thyrsopleris and other Cyatheaceous Ferns, which indicate a wide Mesozoic distribution for this family. Among Jurassic species which should probably be classed as Cyatheaceae, Coniopteris hymenophylloides is recorded from England, France, Russia, Poland, Bornholm, Italy, the Arctic regions, North America, Japan, China, Australia and India. A few tree-ferns which may be included in this family — : such as Protopteris — have been described from Wealden and Lower Cretaceous rocks of England, Germany and Austria. It is by no means easy in dealing with fossil ferns to distinguish between certain Polypodiaceae — such as species of Davallia — and members of the Cyatheaceae.

It is a striking fact that among the numerous Mesozoic Ferns there are comparatively few that can with good reason be referred to the Polypodiaceae, a family which plays so dominant _ . a r61e at the present day. The frequent occurrence of 00 jZ ceal , such names as Asplenium, Adiantum, Davallia, and other Polypodiaceous genera in lists of fossil ferns is thoroughly misleading. There are, indeed, a certain number of species which show traces of sori like those of modern species of A splenium and other genera, but in most cases the names of recent ferns have been used on insufficient grounds. The Wealden and Jurassic genus, Onychicpsis of England, Portugal, Belgium, Germany, Japan, South Africa and Australia, bears a close resemblance to the recent Onychium (Cryptogamme). Other Jurassic Ferns described by Raciborski from Poland suggest a comparison with Davallia. The resemblance of the sporocarp-like bodies — discovered by Nathorst in association with Rhaetic Sagenopteris leaves, and more recently figured by Halle under a new generic name (Hydropter- angium) — to the sporocarps of Marsilia is ah argument in favour of including Sagenopteris in the Hydropterideae. The majority of the specimens included in the genus Cladophlebis, the Mesozoic representative of the Palaeozoic Pecopteris type of frond, are known only in a sterile condition, and cannot be assigned to their family position. A Wealden plant, Weichselia Manlelli, is worthy of mention as a species of very wide geographical distribution, and one of the

most characteristic members of the Wealden flora. This type is distinguished by its large bipinnate fronds bearing long and narrow pinnae with close-set pinnules, characterized by the anastomosing secondary veins. No traces of sori have so far been found on the fronds. Similarly, the genus Sagenopteris, characterized by a habit like that of Marsilia, and represented by fronds consisting of a few spreading broadly oval or narrow segments, with anastomosing veins, borne on the apex of a common petiole, is abundant in'rocks ranging from the Rhaetic to the Wealden, but has not so far been satisfactorily placed. The evidence adduced by Nathorst and some other writers is, however, not convincing; until we find well-preserved sporocarps in connection with vege- tative fronds we prefer to keep an open mind as regards the position of Sagenopteris.

The abundance of Cycadean plants is one of the most striking features of Mesozoic floras. In most cases we have only the evidence of sterile fronds, and this is necessarily unsatisfactory; cycaiales. but the occurrence of numerous stems and fertile shoots demonstrates the wealth of Cycadean plants in many parts of the world, more particularly during the Jurassic and Wealden periods. From Palaeozoic rocks a few fronds have been described, such as Pterophyllum Fayoli, P. Combrayi, Plagiozamites and

Sphenozamites, chiefly from French localities, which are referred to I fronds, which there is good reason to refer to the Cycadales in the Cycads because of their similarity to the pinnate fronds of Upper Triassic, Rhaetic, Jurassic and Wealden rocks in India modern Cycadaceae. In the succeeding Triassic system Cycadean I Australia, Japan, China and elsewhere in the southern hemisphere'

Map B. — Mi-M 6 , D, G, Distribution of the Matonineae, Dipteridinae,Ginkgoales. Di-D„, Distribution of the Dipteridinae. G 6 (Jurassic) ; G« (Cretaceous-Tertiary) ;

Gi-Gij, Distribution of the Ginkgoales G 6 (Jurassic and Tertiary); Gu (Tertiary, Alaska) ;

during the Mesozoic and Tertiary Periods. Gi (Trias-Tertiary) ; G2, G3 (Rhaetic-Jurassic) ; G4 (Tertiary, Sakhalin I.);

plants become much more abundant, especially in the Keuper period , from Rhaetic rocks a still greater number of types have been recorded, among which may be mentioned Nilssonia (fig. 10), Anomozamites, Pterophyllum, Otozamites, Cycadiles (fig. 11). The species of Nilssonia shown in fig. 10 (N. compta) is a characteristic member of the Jurassis flora, practically identical with a form from Rhaetic rocks described as Nilssonia polymorpha. The large frond of Cycadites represented in fig. II (C. Saportae) is from the Wealden strata of Sussex, and possibly identical with Cycadiles tenuisectus from Portugal. In addition to these genera there are others, such as Ctenozamites, Ctenis, and Podozamites, the position of which is less certain. Ctenozamites occurs chiefly in the Rhaetic coal-bearing beds of Scania, and has been found also in the Liassic clays of

G7 (Jurassic) ; G 8 (Rhaetic-Jurassic); G 9 (Trias- Rhaetic) ; G10 (Rhaetic, Chile) ; Gu (Trias) ;

Gu (Cretaceous-Tertiary) ;

G15 (Jurassic) ;

Gie (Jurassic, Spitsbergen) ;

G17 (Jurassic, Franz Josef Land).

Fig. 10. — Nilssonia compta. Inferior Oolite, England.

Dorsetshire and in the Inferior Oolite beds of Yorkshire, as well as in Rhaetic strata in Persia and elsewhere; it is characterized by its bipinnate fronds, and may be compared with the recent Australian genus Bowenia — peculiar among living Cycads in having bipinnate fronds. Ctenis has been incorrectly placed among the ferns by some authors, on account of the occurrence of supposed sporangia on its pinnae; but there is reason to believe that these so-called sporangia are probably nothing more than prominent papillose cells of the epidermis. Podozamites (fig. 12) is usually considered to be a Cycad, but the broad pinnae (or leaves) and their arrangement on the axis suggests a possible relationship with the southern coniferous genus Agathis, represented by the Kauri pine and other recent species. The considerable variation in the size of the pinnae of Podozamites, as represented by species from the Jurassic rocks in the Arctic regions and various European localities, recalls the variation in length and breadth of the leaves of Agathis. With regard to the distinguishing features and the distribution of the numerous Cycadean leaves of Mesozoic age, the most striking fact is the abundance of

as well in North America, Greenland, and other Arctic lands and throughout Europe. It is noteworthy that Tertiary plant-beds have yielded hardly any specimens that can be recognized as Cycads.

A more important ques- tion is, What knowledge have we of the repro- ductive organs and stems of these fossil Cycads?

Cycadean stems have re- cently been found in great abund- ance in Jurassic and possibly higher strata (in Wyoming, South Dakota, and other parts of the United States. Cycadean stems have been found also in the upper- most Jurassic, Wealden and Lower Cretaceous rocks of England, India and other parts of the world.

An example of an Indian Cycadean stem from Upper Gondwana rocks is represented _ in fig. 13; the surface of the trunk is covered with persistent bases (fig. 13, A) of the fronds known as Ptilophyttum cutchense, which are practically the same as the European species Williamsonia pecten (fig. 17). In a section of the stem (fig. 13, B) a large

pith is seen to occupy the axial region,

and this is surrounded by a zone of

secondary wood, which appears to differ

from the characteristic wood of modern

Cycads (see Gymnosferms) in having

a more compact structure. It is in- Fig. ii.— Cycadites Sapor-

teresting to find that G. R. Wieland of toe'.- Wealden, England.

Yale University has noticed in some of the Cycadean stems from the Black hills of Dakota and Wyoming that the wood appears to possess a similar structure, differing in its narrower medullary rays from the wood of modern Cycads. The lozenge-shaped areas external to the axis of the stem represent the sections of petioles, some of which are shown in fig. 13, A, attached to the stem. The majority of Mesozoic stems agree in external appearance with those of recent species of Encephalartos, Macrozamia, and some other genera; the trunk is encased in a mass of persistent petiole-bases separated from one another by a dense felt or packing of scaly ramenta. The structure of the leaf-stalks is like that of modern

B

Fig. 12. — Podozamites Fig. 13. — Cycadean stem,

lanceolatus. Inferior Oolite, from Upper Gondwana rocks,

England. India. A, Surface view; B,

Transverse section of stem.

Cycads, but the ramenta, instead of having the form of long uni-cellular hairs like those on the petioles and bud-scales of existing species are exactly like the paleae or ramental scales characteristic of the majority of ferns. This fern-like character affords an inter- esting survival of the close relationship between Cycads and Ferns. Some

examples of Jurassic Cycadean stems from Wyoming are characterized by an unusually rich development of ramental scales; the ramenta from the old leaf -bases form an almost complete covering over the surface of the trunk. Professor Lester Ward

has instituted a new generic name, Cy codetta, for these woolly forms. In a few cases the fossil stems show no trace of any lateral flowering shoots, and in that respect agree with modern forms: an instance of this is afforded by a large Cycadean trunk discovered some years ago in one of the Portland quarries, and named Cycadeoidea gigan- tea (fig. 14). In this stem the flowers may have been terminal, as in exist- ing Cycads. As a rule, however, the fossil stems show a marked difference from modern forms in the possession of lateral shoots given off from the axils of leaves, and terminating in a flower of complex structure containing numerous orthotropous seeds. These reproductive shoots differ in many important respects from the flowers of recent Cycads, and chiefly on this account it is customary to include the plants in a separate genus, Bennett- ites, and in a separate , group — the Bennettitales — distinct from that of the Cycadales including the existing Cycads. The best preserved specimens of the true Bennettiles type so far described are from the Lower Green- sand and Wealden of England, and from Upper Mesozoic strata in North America, Italy and France. A study of the anatomical structure of the 14. — Cycadeoidea vegetative stem, which on the whole

figantea. Portland rocks, is very similar to that of recent England. Cycads (fig. 15, 1 and 2), reveals

certain characters which are not met The chief distinguishing feature is in recent species (see Gvmnosperms)

Fig.

with in modern Cycads. afforded by the leaf -traces;

these pursue a somewhat complicated course as they pass from the petiole towards the vascular cylinder of the stem, but in Bennettites the vascular bundles from the leaves followed a more direct course through the cortex of the stem (fig. 15, 3). Among existing types the genus Macrozamia appears to show the nearest approach to this simpler structure of the leaf-traces. In a Floridan species of Zamia the leaf-traces are described as characterized by a more direct course from the stele of the stem to the leaves than in most modern genera, thus agreeing more closely with the extinct Bennettites. The typical Bennettites female flower (fig. 15, 4 and 7), as investigated in English.

French, Italian, and American specimens, may be briefly described as a short lateral shoot or peduncle, arising in a leaf-axil and terminating in a bluntly rounded apex, bearing numerous linear bracts enclosing a central group of appendages, some of which consist of slender pedicels traversed by a vascular strand and bearing a single terminal ovule enclosed in an integument, which forms a distal canal or micropyle. Associated with these seminiferous pedicels occur sterile appendages consisting of slender stalks, terminating in distal expansions, which form a fleshy covering over the surface of the flower, leaving small apertures immediately above the migropyles for the entrance of the pollen-grains. It has been suggested by some authors that the almost complete investment of the small Bennettites seeds by the surrounding swollen ends of the interseminal scales (fig. 15, 7) represents an approach to the angio- spermous ovary. In Bennettites the ovules are left exposed at the apex, but they are by no means so distinctly gymnospermous as in recent Cycads and Conifers. The seeds have in some cases been preserved in wonderful perfection, enabling one to make out the structure of the embryo, with its bluntly conical radicle and two fleshy cotyledons filling the exalbuminous seed (fig. 15, 11).

Our knowledge of the reproductive organs of the Bennettitaceae has until recently been confined to the female flowers, as described by Carruthers, Solms-Laubach, Lignier, and others. The fortunate discovery of several hundred Cycadean stems in the United States, of Lower Cretaceous and Upper Jurassic age, has supplied abundant material which has lately been investigated and is still receiving attention at the hands of Mr Wieland. This investigator has already published a well-illustrated account of his discoveries, which give valuable information as to the morphology of the male organs, and lead us to expect additional results in the future of the greatest importance and interest. On some of the American stems flowers have been found, borne at the apex of lateral shoots, which possess fully developed male organs consisting of sporangia with spores (pollen-grains), surrounding a conical central receptacle bearing numerous small and probably functionless or immature ovules (fig. 15, 10). The structure of this type of flower may be briefly described as follows. In shape and size the flower is similar to that long known as the female flower of Bennettites and William- sonia. A number of hairy linear bracts enclose the whole ; internal to these occur 12 to 20 crowded pinnate leaves (sporophylls), with their apical portions bent over towards the axis of the flower, the bases of the petioles being fused laterally into a disk surrounding the base of the conical receptacle. Numerous pairs of pinnules are attached to the rachis of each

sporophyll, and the larger pinnules bear 20 to 30 synangia (sori or plurilocular sporangia) (fig. 15, 8 and 9). The synangia consist of a stout wall composed of thick-walled cells, succeeded by a layer of more delicate and smaller elements; and internal to the wall occur two rows of sporangial loculi containing microspores. When the synangia are ripe dehiscence takes place alonga median line between the two rows of loculi. In size, position, arrangement, and manner of dehiscence the sporangia bear a striking resemblance to those of Marattia and Danaea among recent Marattiaceae. The most important point elucidated by this discovery is the very close correspondence of the male organs of the Bennettites flower with the sporophylls and synangia of Marattiaceous ferns — a further relic of the common origin of Cycads and Ferns. It remains to be seen if the ovuliferous cone in the centre of the flower represents simply a functionless gynoecium, as in Welwitschia and abnormal cones of certain Coniferae, or if the flowers were hermaphrodite, with both male and female organs fully developed. We have a combination in the same flower of stalked ovules, the structure of which has already been described, and interseminal scales constituting a complex gynoecium, which exhibits in certain features an approach to the angiospermous type, and differs in structure from other Gymnosperm flowers, associated with male organs constructed on a plan almost identical with that of the sporophylls in Marattiaceae. In many of the flowers de- scribed by Mr Wieland the structure is identical in essential features with that of the female flowers of Bennettites Gibsonianus described by Carruthers and by Solms-Laubach, and with that of a French Liassic species described by Lignier: the whole consists of a convex receptacle bearing mature seeds at the tips of pedicels associated with interseminal scales (fig. 15, 7) as already described. Mr Wieland's researches have, however, demonstrated the existence in flowers of this type of the remains of a disk at the base of the receptacle, between the receptacle and the surrounding bract*, to which staminate leaves were originally attached. The flowers hither- to regarded as female were in some cases at least hermaphrodite.

but the male organs had been thrown off before the complete development of the gynoecium. This fact suggests the possibility that the flowers described by Mr Wieland, in which the male organs are mature and the gynoecium is composed of very short and immature

ovuliferous stalks and interseminal scales, are not essentially distinct from those which have lost the staminate leaves

Fig. 15.

1 , Bennettites stem : portion of transverse section of stem ; a, vascular

cylinder; b, leaf-traces; c, pith; d, cortex.

2, Bennettites stem, tangential section; e, flower-peduncles.

3, Bennettites stem, leaf-traces attached to the vascular cylinder and

passing as simple strands through the cortex; d, cortex.

4, Williamsonia, Wealden, England.

5, Young leaf of Bennettites.

6, Ramenta of Bennettites in transverse section.

7, Bennettites, female flower in longitudinal section; /, apex of

peduncle; g, bracts (shown in surface view in 4); h, seeds and seminiferous pedicels; i, interseminal scales.

8, Bennettites, synangium of male flower, showing line of dehiscence,

k, and microspores, I.

9, Synangium, in transverse section, showing sporangial groups,

m, and microspores, I.

10, Bennettites flower in vertical section, showing the central female

portion, n, two sporophylls bearing synangia (male), 0, and hairy bracts, g.

11, Bennettites seed in longitudinal section, showing the dicoty-

ledonous embryo; p, cotyledons; r, radicle; s, testa. (1-3, after Carruthers; 5, 8, 9 and 10, after Wieland; 7, after Scott;

II, after Solms-Laubach.) and possess mature seeds. It is probable that the flowers of Bennettites were normally hermaphrodite, and they may have been markedly protandrous. We cannot decide at present whether the gynoecium in a flower, such as that represented in fig. 15,

7, has partially aborted or whether it would have matured later after the fall of the male organs.

It is clear that Bennettites differed in many essential respects from the few modern survivors of the Cycadophyta. Fossil flowers of a type more like that of modern Cycads are few in number, and it is not by any means certain that all of those described as Cycadean flowers and seeds were borne by plants which should be included in the Cycadophyta; a few female flowers have been described from Rhaetic rocks of Scania and elsewhere under the name Zamio- strobus — these consist of an axis with slender pedicels or carpophylls given off at a wide angle and bearing two ovules at the distal end ; the structure is in fact similar to that of a Zamia female flower, in which the internodes of the peduncle have been elongated so as to give a looser arrangement to the carpels. It has been suggested

that one at least of the flowers, that originally described by Mr Carruthers from the Inferior Oolite of Yorkshire as Beania gracilis, may have been borne by a member of the Ginkgoales. From Jurassic rocks of France and Italy a few imperfect specimens have been described as carpels of Cycads, like those of the recent genus Cycas (see Gymnos perms) ; while a few of these may have been correctly identified, an inspection of some of the original examples in the Paris collections leads one to express the opinion that others are too imperfect to determine. Pinnate fronds of the Cycas type, characterized by the presence of a midrib and no lateral veins in the linear pinnae, are recorded from Rhaetic rocks of Germany, from Wealden strata in England (fig. 11) and Portugal, and from Liassic beds in Dorsetshire. One large specimen is figured by Heer from Lower Cretaceous rocks of Greenland, and by the side of the frond is shown a carpel with lateral ovules, as in the female flower of Cycas; but an examination of the type-specimen in the Copenhagen Museum led the present writer to regard this supposed carpel as valueless. Professor Nathorst, as the result of a more recent examination of Heer's specimen, found that the segments of the frond are characterized by the presence of two parallel veins instead of a single midrib, with a row of stomata between them; for this type of Cycadean leaf he proposed the generic name Pseudo- cycas. Another well-known Cycadean genus is Williamsonia, so named by Mr Carruthers in 1870, and now applied to certain pinnate fronds — e.g. those pre- viously described as Za- mites gigas (fig. 16), and others known under such names as Pterophyllum or Ptilophyllum pecten, &c, both common Jurassic species — as well as to stems bearing peduncles with terminal oval flowers, similar in form to those of Bennettites. There is good evidence for supporting Professor Williamson's con- clusions as to the

organic connexion between the flowers, originally de- scribed from Inferior Oolite rocks of Yorkshire and sub- sequently named Williamsonia (fig. 15, 4), and the fronds of Zamites gigas, now known as Williamsonia gigas (fig. 16). There can be little doubt that the majority of the Cycadean fronds of Jurassic and Wealden age, which are nearly always found de- tached from the rest of the plant, were borne on stems of the Bennettites type. Williamson was the first to express the opinion that the Bennettitean flowers known as Williamsonia were borne on the trunks which terminated in a crown of pinnate fronds Fig. 16. — Frond of Williamsonia gigas. of the type long known as Inferior Oolite, England.

Zamites gigas; this view

was regarded by Saporta and others as incorrect, and the nature of the Bennettitean foliage was left an open question. A re-examina- tion of the English material in the museums of Paris and else- where has confirmed Williamson's conclusions. Mr Wieland has also described young bipinnate fronds, very like those of recent species of Zamia and Encephalartos , attached to a Bennettites stem, and exhibiting the vernation characters of many recent Cycads (fig. 15, 5). In Williamsonia the stem bore comparativelv long fertile shoots, which, in contrast to those of Bennettites, pro- jected several inches beyond the surface of the main trunk, and terminated in a flower which appears to have resembled those of the true Bennettites. Nathorst has recently described specimens of Williamsonia from the Jurassic rocks of Whitby with micro- Sporophylls like those of Wieland's species. Williamsonia occurs in the Upper Gondwana rocks of India; it is recorded also from strata ranging from the Rhaetic to the Lower Cretaceous period in England, Portugal, Sweden, Bornholm, Greenland, Italy and North America. Professor Nathorst has described another type of stem from the Rhaetic beds of Scania. It consists of a comparatively small and repeatedly forked axis bearing in each fork a flower; the flowers, which are regarded as male and female, appear to be similar to those of Bennettites. The leaves, borne on the regions between the false dichotomies, are those of A nomozamites minor, a type of Cycadean frond originally determined

and Wealden age, but an abundance of fossil wood (Araucarioxylon)

from Jurassic and Cretaceous strata in Europe, North America, Madagascar and elsewhere agreeing with that of recent Araucarieae, . – - – c A _ Ho „ ick

by Brongniart. The flowers, or some of them, were originally described by Nathorst as Williamsonia angustifoiia. This form of stem, of a habit entirely different from that of recent Cycads and

extinct Bennettites, points to the existence in the Mesozoic era of in addition to several well-preserved female flowers, another type of Gymnosperm allied to the Bennettitales of the Jurassic and Cretaceous periods by its flowers, but possessing a distinctive character in its vegetative organs. There is no doubt that the Cycadophyta, using the term suggested by Nathorst in 1902, was repre- sented in the Mesozoic period by several distinct families or classes which played a dominant part in the floras of the world before the advent of the Angiosperms. In addition to the bisporangiate reproductive shoots of Bennettites, distinguished by many important features from the flowers of recent Cycads, a few specimens of flowers have been discovered exhibiting a much closer resemblance to those of existing Cycads, e.g. Andros- trobus Balduini from Bathonian rocks of France ; Zamites familiaris, described many years ago by Corda, from Lower Cretaceous rocks of Bohemia, and Androstrobus Nathorsti, from Wealden beds in Sussex. The majority of the species were, however, characterized by flowers of a different type known as Bennettites and Williamsonia.

The living Maidenhair-tree (Ginkgo biloba) (see Gym- NOSperms) remains, like Matonia and Dipteris, among

the ferns, as an isolated relic in the midst Glakgoales. of recent vegetation. In Rhaetic, Jurassic

and Wealden floras, the Ginkgoales were exceedingly abundant (Map B, G1-G17) ; in addition to leaves agreeing almost exactly with those of the recent species (fig. 18), there are others separated as a distinct genus, Baiera (fig. 18, G), characterized by the greater number and narrower form of the segments, which may be best compared with such leaves as those of the recent fern Actiniopteris and of certain species of Schizaea. Male flowers, like those of Ginkgo biloba, but usually characterized by a rather larger number of oval pollen-sacs on the stamens, have been found in England, Germany, Siberia and elsewhere in association with Ginkgo and Baiera foliage. The occasional occurrence of three or even four pollen-sacs on the stamens of the recent species affords a still closer agreement between the extinct and living types. Seeds like those of Ginkgo biloba have also

been recorded as fossils in Jurassic rocks, and it is possible that the type of flower known as Beania, from the Inferior Oolite rocks of Yorkshire, may have been borne by Ginkgo or Baiera.

Fig. 17. — Fronds of Williamsonia pecten.

The regions from which satisfactory examples of Ginkgoales (Baiera or Ginkgo) have been recorded are shown in Map B (G1-G17). Both Tertiary and Mesozoic localities are indicated in the map.

An adequate account of fossil Mesozoic Conifers is impossible within the limits of this article. Coniferous twigs are very common

in Mesozoic strata, but in most cases we are compelled Coniferales. to refer them to provisional genera\ as the evidence of

vegetative shoots alone is not sufficient to enable us to determine their position within the Coniferae. There are, however, several forms which it is reasonable to include in the Araucarieae; that this family was to the fore in the vegetation of the Jurassic period is unquestionable. We have not merely the striking resemblance of vegetative shoots to those of recent species of Araucaria and Agathis, e.g. species of Nageiopsis, abundantly represented in the Upper Jurassic beds of the Potomac area in North America, species of Pagiophyllum and other genera of Jurassic

Fig. 18. — Leaves of Ginkgoales.

A, Ginkgodium, Japan (Jurassic).

B, C, D, E, F, H, Ginkgo leaves. — B, from Franz Josef Land (Jurassic); C, Greenland (Lower Cretaceous) ; D, Siberia (Jurassic) ; E, Germany (Wealden); F, England (Jurassic); H, China (Rhaetic).

G, Baiera leaf, Inferior Oolite, England.

(A, after Yokoyama; B, after Nathorst; C, D, after Heer; E. after Schenh; H, after Krasser. All the figures j nat. size.)

and E. C. Jeffrey have recently shown that some Lower Cretaceous specimens of the well-known genus Brachyphyllum obtained from Staten Island, N.Y., possess wood of the Araucarian type. This genus has long been known as a common and widely spread Jurassic and Cretaceous conifer, but owing to the absence of petrified speci- mens and of well-preserved cones, it has been impossible to refer it to a definite position in the Coniferales. It is now clear that some at least

of the species of Brachyphyllum must be referred to the Araucarieae. In a recently published paper Seward and Ford have given a general account of the Araucarieae, recent and extinct, to which reference may be made for further details as to the geological history of this ancient section of the Coniferales. Some of the fossils referred to the genus Kaidocarpon, and originally described as monocotyledonous inflorescences, are undoubted Araucarian cones; other cones of the same type have been placed in the genus Cycadeostrobus and referred to Cycads. Araucarites Iludlestoni, described by Mr Carruthers from the Coralline Oolite rocks of Malton in Yorkshire; Araucarites sphaerocarpa from the Inferior Oolite of Somerset; also another cone found in the North- ampton Sands, which is probably specifically identical with A. Iludlestoni, and named by Carruthers Kaidocarpon ooliticum, afford good illustrations of British Araucarian flowers. A flower of a rather different type, Pseudaraucaria major, exhibiting in the occurrence of two seeds in each scale an approach to the cones of Abietineae, has been described by Professor Fliche from Lower Cretaceous rocks of Argonne. The well-known Whitby jet of Upper Liassic age appears to have been formed to a large extent from Araucarian wood. Among the more abundant Conifers of Jurassic age may be mentioned such genera as Thuytes and Cupres- sites, which agree in their vegetative characters with members of the Cupressineae, but our knowledge of the cones is far from satis- factory. Many of the small female flowers borne on shoots with foliage of the Cupressus type consist of spirally disposed and not verticillate scales, e.g. Thuytes expansus, a common Jurassic species. Fossil wood, described under the name Cupressinoxylon, has been recorded from several Mesozoic horizons in Europe and elsewhere, but this term has been employed in a wide sense as a designation for a type of structure met with not only in the Cupressineae, but. in members of other families of Coniferae. The Abietineae do not appear to have played a prominent part before the Wealden period ; various older species, e.g. Rhaetic specimens from Scania, are recorded, but it is not until we come to the Upper Jurassic and Wealden periods that this modern family was abundantly repre- sented. Fossil wood of the Pinites type (Pityoxylon) has been described from England, France, Germany, Sweden, Spitsbergen, North America and elsewhere; some of the best British examples have been obtained from the so-called Pine-raft, the remains of water-logged and petrified wood of Lower Greensand age, seen at low water near Brook Point in the Isle of Wight. Well-preserved Abietineous female flowers have been obtained from the Wealden rocks of England and Belgium, e.g. Pinites. Dunkeri, P. Solmsi, &c. ; specimens of seeds and vegetative shoots are recorded also from Spitsbergen and other regions. Hollick and Jeffrey have

recently added to our knowledge of the anatomy of Cretaceous

species of Pinus, and Miss Stopes and Dr Fujii have made im- portant contributions on the structure of Cretaceous plants from Japan. Cones of Lower Cretaceous age have been described by Fliche from Argonne, which bear a close resemblance to the female flowers of recent species of Cedrus. The two surviving species of Sequoia afford an illustration of the persistence of an old type, but unfortunately most of the Mesozoic species referred to this genus do not possess sufficiently perfect cones to confirm their identifica- tion as examples of Sequoia. Some of the best examples of cones and twigs referred to Sequoia are those described by Heer from Cretaceous rocks of Greenland, and Professor D. P. Penhallow of Montreal has described the anatomical structure of the stem of Sequoia Langsdorfii, a Tertiary species occurring in Europe and North America.

There are a few points suggested by a general survey of the Mesozoic floras, which may be briefly touched on in conclusion. In following the progress of plant-life through those periods in the history of the earth of which records are left in ancient sedi- ments, seams of coal or old land-surfaces, we recognize at certain stages a want of continuity between the floras of successive ages. The imperfection of the geological record, considered from the point of view of evolution, has been rendered familiar by Darwin's remarkable chapter in the Origin of Species. Breaks in the chain of life, as represented by gaps in the blurred and incomplete documents afforded by fragmentary fossils, are a necessary consequence of the general plan of geological evolution; they mark missing chapters rather than sudden breaks in an evolu- tionary series. On the other hand, a study of the plant-life of past ages tends to the conviction that too much stress may be laid on the imperfection of the geological record as a factor in the interpretation of palaeontological data. The doctrine of Uniformitarianism, as propounded by Lyell, served to establish geology on a firmer and more rational basis than it had previously possessed; but latterly the tendency has been to modify the Lyellian view by an admission of the probability of a more intense action of groups of forces at certain stages of the earth's history. As a definite instance a short review may be given of the evidence of palaeobotanical records as regards their bearing on plant-evolution.

Starting with the Permo-Carboniferous vegetation, and omitting for the moment the Glossopteris flora, we find a comparatively homogeneous flora of wide geographical range, consisting to a large extent of arborescent lycopods, calamites, and other vascular cryptogams, plants which occupied a place comparable with that of Gymnosperms and Angiosperms in our modern forests; with these were other types of the greatest phylogenetic importance, which serve as finger-posts pointing to lines of evolution of which we have but the faintest signs among existing plants. Other types, again, which may be referred to the Gymnosperms, played a not unimportant part in the Palaeozoic vegetation. No conclusive proof has so far been adduced of the existence in those days of the Cycads, nor is there more than partial evidence of the occurrence of genera which can be placed with confidence in any of the existing families of Conifers. There are, moreover, no facts furnished by fossil plants in support of the view that Angiosperms were represented either in the low-lying forests or on the slopes of the mountains of the Coal period. Passing higher up the geological series, we find but scanty records of the vegetation that existed during the closing ages of the Permian period, and of the plants which witnessed the beginning of the Triassic period we have to be content with the most fragmentary relics. It is in rocks of Upper Triassic and Rhaetic age that abundant remains of rich floras are met with, and an examination of the general features of the vegetation reveals a striking contrast between the Lower Mesozoic plants and those of the Palaeozoic period. Arborescent Pteridophytes are barely represented, and such dominant types as Lepidodendron, Sigillaria, Calamites and Sphenophyllum have practically ceased to exist; Cycads and Conifers have assumed the leading r61e, and the still luxuriant fern vegetation has put on a different aspect. This description applies almost equally to the floras of the succeeding Jurassic and Wealden periods. The change to this newer type of vegetation was no doubt less sudden than it appears as read from palaeobotanical records, but the transition period between the Palaeozoic type of vegetation and that which flourished in the Lower Mesozoic

era, and continued to the close of the Wealden age, was probably characterized by rapid or almost sudden changes. In the southern hemisphere the Glossopteris flora succeeded a Lower Carboniferous vegetation with a rapidity similar to that which marked the passage in the north from Palaeozoic to Mesozoic floras. This apparently rapid alteration in the character of the southern vegetation took place at an earlier period than that which witnessed the transformation in the northern hemisphere. The appearance of a new type of vegetation in India and the southern hemisphere was probably connected with a

widespread lowering of temperature, to which reference has already been made. It was from this Glossopteris flora that several types gradually migrated across the equator, where they formed part of the vegetation of more northern regions. The difference between the Glossopteris flora and those which have left traces in the Upper Gondwana rocks of India, in the Wianamatta and Hawkesbury beds of Australia, and in the Stormberg series of South Africa is much less marked than that between the Permo- Carboniferous flora of the northern hemisphere and the succeed- ing Mesozoic vegetation. In other words, the change took place at an earlier period in the south than in the north. To return to the northern hemisphere, it is clear that the Wealden flora, as represented by plants recorded from England, France, Belgium, Portugal, Russia, Germany and other European regions, as also from Japan and elsewhere, carries on, with minor differences, the fades of the older Jurassic floras. It was at the close of the Wealden period that a second evolutionary wave swept over the vegetation of the world. This change is most strikingly illus- trated by the inrush of Angiosperms, in the equally marked decrease in the Cycads, and in the altered character of the ferns. It would appear that in this case the new influence, supplied by the advent of Angiosperms, had its origin in the north. Unfor- tunately, our knowledge of the later floras in the southern hemi- sphere is very incomplete, but a similar transformation appears to have characterized the vegetation south of the equator. As to the nature of the chief factors concerned in the two revolts tions in the vegetable kingdom, if it is admissible to use so strong a term, only a guess can be hazarded. Physical conditions no doubt played an important part, but whatever cause may have had the greatest share in disturbing the equilibrium of evolu- tionary forces, it would seem that the apparently sudden appearance of Cycads and other types at the close of the Palaeo- zoic period made a widespread and sudden impression on the whole character of the vegetation. At a later stage — in post- Wealden days — it was the appearance of Angiosperms, probably in northern latitudes, that formed the chief motive power in accelerating the transition in the fades of plant-life from that which marked what we have called the Mesozoic floras, to the vegetation of the Upper Cretaceous and Tertiary periods. With the advent of Angiosperms began, as the late marquis of Saporta expressed it, ” Une revolution, ainsi rapide dans sa marche qu’universelle dans ses effets.” From the floras of the Tertiary age we pass by gradual stages to those which charac- terize the present phase of evolutionary progress. Among modern floras we find here and there isolated types, such as Ginkgo, Sequoia, Matonia, Dipteris and the Cycads, persisting as more successful survivals which have held their own through the course of

ages; these plants remain as vestiges from a remote past, and as links connecting the vegetation of to-day with that of the Mesozoic era.

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III. — Tertiary After the Wealden period, and before the deposition of the lowest strata of the Chalk, so remarkable a change takes place in the character of the vegetation that this break

Cretlceous must be taken as ' botanicall y> the transition point re ceous, f rom a Secondary to a Tertiary flora. A flora consisting entirely, with a single doubtful exception, of Gymnosperms and Cryptogams gives piace to one containing many flowering plants; and these increase so rapidly that before long they seem to have crowded out many of the earlier types, and to have themselves become the dominant forms. Not only do Angiosperms suddenly become dominant in all known plant- bearing deposits of Upper Cretaceous age, but strangely enough the earliest found seem to belong to living orders, and commonly have been referred to existing genera. From Cretaceous times onwards local distribution may change; yet the successive floras can be analysed in the same way as, and compared with, the living floras of different regions. World-wide floras, such as seem to characterize some of the older periods, have ceased to be, and plants are distributed more markedly according to geographical provinces and in climatic zones. This being the case, it will be most convenient to discuss the Tertiary floras in successive order of appearance, since the main interest no longer lies in the occurrence of strange extinct plants or of transitional forms connecting orders now completely isolated.

The accurate correlation in time of the various scattered plant-bearing deposits is a matter of considerable difficulty, for plant-remains are preserved principally in lacustrine strata laid down in separate basins of small extent. This it is obvious must commonly be the case, as most leaves and fruits are not calcu- lated to drift far in the sea without injury or in abundance; nor are they likely as a rule to be associated with marine organisms. Deposits containing marine fossils can be compared even when widely separated, for the ocean is continuous and many marine species are world-wide. Plants, on the other hand, like land and fresh-water animals, occupied areas which may or may not have been continuous. Therefore, without a knowledge of the physical geography of any particular period, we

cannot know whether like or unlike floras might be expected in neighbouring areas during that period. If, however, we discover plant-bearing strata interstratified with deposits containing marine fossils, we can fix the period to which the plants belong, and may be able to correlate them in distinct areas, even though the floras be unlike. This clear stratigraphical evidence is, however, so rarely found that much uncertainty still remains as to the true age of several of the floras now to be described.

In rocks approximately equivalent to the Lower Greensand of England, or slightly earlier, Angiosperms make their first appearance; but as the only strata of this age in Britain are of marine origin, we have to turn to other countries for the evidence.

Fig. 1. — Alismacites primaevus.

The earliest Angiosperm yet found in Europe is a single mono-cotyledonous leaf of doubtful affinities, named by Saporta Alismacites primaevus (fig. 1), and found in the Valenginian strata of Portugal. These deposits seem to be equivalent to British Wealden rocks, though in the latter, even in their upper part, no trace of Angiosperms has been discovered. No other undoubted Angio- sperm has yet been discovered in Europe in strata of this age, but Heer records a poplar-like leaf from Urgonian strata, a stage newer than the Valenginian, in Greenland, and Saporta has described from strata of the same date in Portugal a Euphorbiaceous plant apparently closely allied to the living Phyllanthus and named by him Choffatia Francheti (fig. 2). We must turn to North America for a fuller knowledge of the earlist flowering-plants.

In S. Dakota a remarkable series has been discovered, lying unmistakably between marine Upper Jurassic rocks below and Upper Cretaceous above. There has been a certain amount of confusion as to the exact strata in which cretaceous. the plants occur, but this has now been cleared up by the researches of Lester F. Ward, who has shown how the Secondary flora gives place to one of Tertiary character.

The lower strata — i.e. those most allied to the Jurassic — contain only Gymnosperms and Cryptogams. The next division (Dakota No. 2 of Meek and Hayden) contains Gymnosperms and Ferns of Neocomian types, or even of Neocomian species; but mingled with these occur a few dicotyle- donous leaves belonging to four genera. The specimens are very fragmentary, and all that can be said is that one of the forms may be allied to oak, another to fig, a third to Sapindus, and the

fourth may perhaps be near to elm. The ” Potomac Formation ” of Virginia and Maryland is doubtless also mainly of Neocomian age, for though it rests unconformably on much older strata, the successive floras found in it are so allied to those of S. Dakota as to leave little doubt as to the general homotaxis of the series. Lester Ward re- cords no fewer than 737 distinct forms, consisting chiefly of Ferns, Cycads, Conifers and Dicotyledons,

the Ferns and Cycads being con- , .

fined mainly to the Older Potomac, Fig. 2— Choffatia Francheti. while the Dicotyledons are principally represented in the Newer Potomac, though occurring more rarely even down to the base of the series. Six successive stages have been defined in the Potomac formation. The Mount Vernon beds, which occur about the middle of the series, have as yet yielded only a small number of species, though these include the most interesting early Angiosperms. Among them are recorded a Casuarina, a leaf of Sagittaria (which however, as observed by Zeiller, may belong to Smilax) , two species of poplar-like leaves with remarkably cordate bases, Menispermites (possibly a water-lily) and Celastrophyllum (perhaps allied to Celastrus). Proteophyllum, found in the same bed, and also in the Infra-Cretaceous of Portugal, seems to have belonged to a Protea- ceous plant, though only leaves without fruits have yet been discovered in deposits of this early date. Whatever doubt may be left as to the exact botanical position of these early Lower Cretaceous Angiosperms, it is clear that both Monocotyledons and Dicotyledons are represented by several types of leaves, and that the flora ex- tended over wide areas in North America and Greenland, and is found again at a few points in Europe. There is yet no clear evidence either of climatic zones or of the existence of geographical provinces during this period.

The next strata, the Aquila Creek series, contain a well-marked dicotyledonous flora, in which both the form and nervation of the leaves begin to approximate to those of recent times. The leading characteristic of this Middle Potomac flora is the proportion of Dicotyledons. Notwithstanding this apparent passage-bed, there is a marked difference between the Older and the Newer Potomac floras, very few species passing from the one to the other. Only 15 out of 405 plants in the older series occur in the beds above

though already more than 350 species have been determined from this newer series. The plants from the Amboy Clays, which form the most important division of the Newer Potomac series and were monographed in 1895 by J. S. Newberry, seem to belong to the commencement of the Upper Cretaceous period. It is remarkable that nearly 80% of the species are Dicotyledons, and that no Monocotyledons have been found. The mere enumeration of the genera will indicate how close the flowering plants are to living forms. Newberry records Juglans, Myrica (7 species), Populus, Salix (5 species), Quercus, Planera, Ficus (3 species), Persoonia and another extinct Proteaceous genus named Proteoides, Magnolia (7 species), Liriodendron (4 species), Menispermites, Laurus and allied plants, Sassafras (3 species), Cinnamomum, Primus, Hymenaea, Dalbergia, Bauhinia, Caesalpinia, Fontainea, Colutea and other Leguminosae, Ilex, Celastrus, Celastrophyllum (10 species), Acer, Rhamnites, Paliurus, Cissites, Tiliaephyllum, Passiflora, Eucalyptus (5 species), Hedera, Aralia (8 species), Cornophyllum, Andromeda (4 species), Myrsine, Sapotacites, Diospyros, Acerates, Viburnum and various genera of uncertain affinities. The points that suggest themselves with regard to this flora are, that it includes a fair representation of the existing orders of warm-temperate deciduous trees; that the more primitive types — such as the Amentaceae — do not appear to preponderate to a greater extent than they do in the existing temperate flora; that the assemblage somewhat suggests American affinities; and that when we take into account deficient collecting, local conditions, and the non-preservation of succulent

Elants, there is no reason for saying that certain other orders must ave been absent. The great rarity of Monocotyledons is a common characteristic of fossil floras known only, as this one is, from leaves principally belonging to deciduous trees. With regard to suggested American affinities, it must be borne in mind that the Neocomian Angiosperms are little known except in America and in Greenland, and that we therefore cannot yet say whether families now mainly American were not formerly of world-wide distribution. We know that this was the case with some, such as Liriodendron; and in Eucalyptus we see the converse, where a genus formerly American is now confined to a far distant region. The Neocomian flora has been collected from an area extending over about 30 of latitude; but there is little evidence of any corresponding climatic change. We cannot yet say, however, that the deposits are exactly con- temporaneous, and the great climatic variations that have taken place in the northern hemisphere during the existence of our living flora should make us

hesitate to correlate too minutely from the evidence of plants alone.

The highest division of the Dakota series (known as Dakota No. 1) which lies immediately beneath Upper Cretaceous strata with marine fossils, contains a flora so like that of the Tertiary deposits that only the clearest geological evidence has been con- sidered sufficient to prove that Heer was wrong when he spoke of the plants as Miocene. These highest plant-bearing strata rest, according to Lester Ward, somewhat unconformably on the Dakota No. 2; they show also a marked difference in the included plants. The genera of Dicotyledons represented are Quercus, Sassafras, Platanus, Celastrophyllum, Cissites, Viburnites.

In the central parts of North America the lacustrine plant-bearing deposits are of enormous thickness, the Dakota series being followed by marine Cretaceous strata known as the Colorado and Montana groups, and these being succeeded conformably by a thousand feet or more of lacustrine shales, sandstones and coal-seams, belonging to the Laramie series. This also contains occasional marine Upper Cretaceous fossils, as well as reptiles of Cretaceous types. An extensive literature has grown up relating to these Laramie strata, for owing to the Tertiary aspect of the contained plants, geologists were slow to recognize that they could be truly contemporaneous and interbedded with others yielding Cretaceous animals. In addition to this, the earlier writers included in the Laramie series many deposits now known to be of later date and truly Tertiary, and the process of separation is even now only partially completed. It will be safest in these circumstances to accept as our guide to the true Laramie flora the carefully compiled ” Catalogue ” of F. H. Knowlton. According to this catalogue, the true Laramie flora includes about 250 species, more than half of which are deciduous forest trees, herbaceous Dicotyledons, Monocotyledons and Cryptogams, all being but poorly represented. Among the few Monocotyledons are leaves and fruits of palms, and traces of grasses and sedges. The Dicotyledons include several water-lilies, a somewhat doubtful Trapa, and many genera of forest trees still common in America. The genera best represented are Ficus (21 species), Quercus (16 species), Populus (11 species), Rhamnus (9 species), Platanus (8 species), Viburnum (7 species), Magnolia (6 species), Cornus (5 species), Cinnamomum (5 species), Juglans (4 species), Acer (4 species), Salix (4 species), Aralia (3 species), Rhus (3 species), Sequoia (3 species). Of trees now extinct in America,. Eucalyptus and Ginkgo are perhaps the most noticeable. So large a proportion of the trees still belongs to the flora of North America that one is apt to overlook the fact that among the more specialized plants some of the largest American orders, such as the Compositae, are still missing from strata

belonging to the Cretaceous period.

The imperfection and want of continuity of the records in Europe have made it necessary in dealing with the Cretaceous floras for us to give the first place to America. But it is now advisable to return to Europe, where cretaceous Upper Cretaceous plants are not uncommon, and the position of the deposits in the Cretaceous series can often be fixed accurately by their close association with marine strata belonging to definite subdivisions. As these divisions of Cretaceous time will have to be referred to more than once, it will be useful to tabulate them, thus showing which plant-beds seem to be referable to each, and what are the British strata of like age. It has not yet been found possible so closely to correlate the strata of Europe with those of America, where distance has allowed geographical differences in both fauna and flora to come into play; therefore, beyond the references to Lower or Upper Cretaceous, no classification of the American Cretaceous strata has here been given. In Europe the most commonly accepted divisions of the Cretaceous period are as follows: —

England. France, &c.

Wanting Danian

Upper Chalk Senonian

Middle Chalk Turonian

Lower Chalk) „ .

Upper Green-sand \ Cenomaman

Gault Albian

Aptian Lower Green-sand Valenginian

Urgonian Wealden Neocomian

In the continental classification the deposits from the Gault downwards are grouped as Lower Cretaceous; but in Great Britain there is a strong break below the Gault and none above; and the Gault is therefore classed as Upper Cretaceous. The limits of the divisions in other places do not correspond, the British and continental strata often being so unlike that it is almost impossible to compare them. The doubt as to the exact British equivalent of the Valenginian strata of Portugal, which yield the earliest Dicotyledon, has already been alluded to. The plant-bearing deposits next in age, which have yielded

Angiosperms, appear to belong to the Cenomanian, though from Westphalia a few species belonging to the Cryptogams and Gymnosperms, found in deposits correlated with the Gault, have been described by Hosius and von der Marck.

In Great Britain the whole of the Upper Cretaceous strata are of marine origin, and have yielded no land-plants beyond a few fir-cones, drift-wood and rare Dicotyledonous leaves in the Lower Chalk. Most of the deposits which have yielded Angiosperms of Cretaceous age in central Europe correspond in age with the English Upper Chalk (Senonian), but a small Cenomanian flora has been collected from the Unter Quader in Moravia. Heer described from this deposit at Moletein 13 genera, of which 7 are still living, containing 18 species, viz. : I fern, 4 Conifers, 1 palm, 2 figs, 1 Cred- neria, 2 laurels, 1 Aralia, 1 Chondrophyllum (of uncertain affinities), 2 magnolias, 2 species of Myrtaceae and a species of walnut. Saxony yields from strata of this period at Niederschoena 42 species, de- scribed by Ettingshausen. This small flora is most remarkable, for no fewer than 6 genera, containing 8 species, are referred to the Proteaceae. The Cen- omanian flora of Bohemia is larger and equally pecu- liar. Among the Dicotyle- dons described by Velenov- sky are the following : Cred- neria (5 species), Araliaceae (17 species), Proteaceae (8 species), Myrica (2 species), Ficus (5 species), Quercus (2 species) , Magnoliaceae (5 species) , . Bombaceae (3 species), Laurineae (2 species), Ebenaceae (2 species), Ver benaceae, Combretaceae, Sapindaceae (2 species), Camelliaceae, Ampelideae, Mimoseae, p IG $ —Credneria triacuminata. Caesalpinieae (5 species), .

Eucalyptus (2 species), Pisonia, Phillyrea, Rhus, Prunus, Bignoma,

Laurus, Salix, Benfhamia. To this list Bayer adds Aristolochia. The Cenomanian flora of central Europe appears to be a sub- tropical one, with marked approaches to the living flora of Australia. The majority of its Dicotyledons belong to existing genera, but one of the most prolific and characteristic Cretaceous forms is Cred- neria (Fig. 3), a genus of doubtful affinities, which has been compared by different authors to the poplars; planes, limes and other orders.

The Cretaceous plant-beds of Westphalia include both Upper and

Lower Senonian, the two floras being very distinct. Hosius and von der Marck describe, for instance, 12 species of oak from the Upper and 6 from the Lower strata, but no species is common to the two. The same occurs with the figs, with 3 species above and 8 below. The 6 species of Credneria are all confined to the older deposits. In fact, not a single Dicotyledon is common to these two closely allied divisions of the Cretaceous series; a circumstance not easy to explain, when we see how well the oaks and figs are represented in each. Four species of Dewalquea, a ranunculaceous genus allied to the hellebore, make their appearance in the Upper Senonian of Westphalia, other species occurring at Aix-la-Chapelle in deposits of about the same age. The Senonian flora of the last- named place, and that of Maestricht, are still only imperfectly known. It is unnecessary to trace the variations of the Upper Cretaceous flora from point to point; but the discoveries within the Arctic circle have been so surprising that attention must again be called to them. Besides the Lower Cretaceous plants already mentioned, Heer has described from Greenland a flora of Ceno- manian age, and another belonging to the Senonian. The Ceno- manian strata have yielded already 177 species, the different groups being represented in these proportions: Cryptogams, 37, 30 of which are Ferns ; Cycads, 8 ; Conifers, 27 ; Monocotyledons, 8 ; Ape- talous Dicotyledons, 31 ; other Dicotyledons, 66. The Senonian strata have yielded 118 species, 21 of which are Cryptogams, II Conifers, 5 Monocotyledons, 75 Dicotyledons. Forest trees, especially oaks, are plentiful, and many of the species are identical with those found in Cretaceous deposits in more southern latitudes. Both of these floras suggest, however, that the climate of Greenland was some- what colder than that of Westphalia, though scarcely colder than warm-temperate.

The Cretaceous deposits just described are followed by a series of Tertiary formations, but in Europe the continuity between Cretaceous and Tertiary is not quite complete. The Tertiary formations have been assigned to six periods; these are termed — • Paleocene, Eocene, Oligocene, Miocene, Pliocene, Pleistocene, and each has its own botanical peculiarities.

During the Paleocene period the plants were not markedly different from those of the Upper Cretaceous. Its flora is still but imperfectly known, for we are dependent on two p/afl

The plant-bearing marls of Gelinden, near Liege, contain the debris of a Paleocene forest. The trees seemed to have flourished on neighbouring chalky heights. The most abundant species of this forest were the oaks and chestnuts, of which a dozen have been collected;

laurels, Viburnum, ivy, several Aralias, Dewalquea, a Thuja and several Ferns may be added. This flora is compared by Saporta and Marion with that of southern Japan. Other de- posits of this age in France have furnished plants of a more varied aspect, including myrtles, araucarias, a bamboo and several fan- leaved palms. Saporta points out the presence in these Paleocene deposits of certain types common, on the one hand, to the American Tertiary strata between the Missouri and the Rocky Mountains, and on the other, to the Tertiary flora of Greenland. The Paleocene deposits of Great Britain are of marine origin, and only yield pine- cones and fragments of Osmunda.

The British Eocene and Oligocene strata yield so large a flora, and contain plant-beds belonging to so many different stages, that it is unfortunate we have still no monograph on the subject, the one commenced by Ettingshausen ■Bocene *t*d and Gardner in 1870 having reached no farther than fa“*; the Ferns and Gymnosperms. This deficiency Britain. makes it impossible to deal adequately with the British Eocene plants, most of the material being either unpublished or needing re-examination.

In the earliest Eocene plant-beds, in the Woolwich and Reading series, a small but interesting flora is found, which suggests a tem-

Eerate climate less warm than that of earlier or of later periods, eaves of planes are abundant, and among the plants recorded are twofigs, a laurel, a Robinia, a Grevillea and a palm. Ferns are scarce, Ettingshausen and Gardner recording only Aneimia subcretacea and Pteris (?) Prestwichii. _ The only Gymnosperms determined are Libocedrus adpressa, which is close to L. decurrens of the Yosemite, and Taxodium europaeum. A few plants have been found in the next stage, the Oldhaven beds, and among these are fig and cinnamon; Gardner considers the plants to point to subtropical conditions. The London Clay has yielded a large number of plants, but most of the species are represented by fruits alone, not by leaves. This circumstance makes it difficult to compare the flora with that of other formations, for not only is it uncertain which leaves and fruits belong to the same plant, but there is the additional source of doubt, that different elements of the same flora may be represented at different localities. Of some plants only the de- ciduous leaves are likely to be preserved, whilst other succulent- leaved forms will only be known from their woody fruits. Among the 200 plants of the London Clay are no Ferns, but 6 genera of Gymnosperms — viz. Cattitris (2 species), Sequoia, Athrotaxis (?) Ginkgo, Podocarpus, Pinus; and several genera of palms, of which the tropical Nipa is the most abundant and most

characteristic, among the others being fan-palms of the genera Sabal and Chamae- rops. The Dicotyledons need further study. Among the fruits Ettingshausen records Quercus, Liquidambar , Laurus, Nyssa, Diospyros, Symplocos, Magnolia, Victoria, Hightea, Sapindus, Cupania, Eugenia, Eucalyptus, Amygdalus; he suggests that the fruits of the London Clay of Sheppey may belong to the same plants as the leaves found at Alum Bay in the Isle of Wight.

The next stage is represented by the Lower Bagshot leaf-beds of Alum Bay. These pipeclays yield a varied flora, Ettingshausen recording 274 species, belonging to 116 genera and 63 families. Gardner, however, is unable to reconcile this estimated richness with our knowledge of the flora, and surmises that fossil plants from other localities must have been inadvertently included. He considers the flora to be the most tropical of any that has so far been studied in the northern hemisphere. Its most conspicuous plants are Ficus Bowerbankii, Aralia primigenia, Comptonia acutiloba, Dryandra Bunburyi, Cassia Ungeri and the fruits of Caesalpinia. The floras which it chiefly resembles are first, that of Monte Bolca, and second, that of the Gres du Soissonais, which latter Gardner thinks may be of the same age, and not earlier, as is generally supposed. The total number of species found at Aluni Bay, according to this author, is only about 50 or 60.

To the Bagshot Sand succeeds the thick mass of sands with intercalated plant-beds seen in Bournemouth cliffs. Each bed yields peculiar forms, the total number of species amounting to many hundred, most of them differing from those occurring in the strata below. The plants suggest a comparison of the climate and forests with those of the Malay Archipelago and tropical America. At one place we find drifted fruits of Nipa, at another Hightea and Anona. Other beds yield principally palms, willows, laurels, Eucalyptus or Ferns; but there are no Cycads. As showing the richness of this flora, we may mention that in the only orders which have yet been monographed, Ferns are represented by 17 species and Gymnosperms by 10, though these are not the groups best represented. Gardner speaks of the Bournemouth flora as appearing to consist principally of trees or hard-wooded shrubs, comparatively few remains of the herbaceous vegetation being preserved. The higher Eocene strata of England — those above the Bournemouth Beds — are of marine origin, and yield only drifted fruits, principally fir-cones.

In the volcanic districts of the south-west of Scotland and the north-east of Ireland plant-beds are found intercalated between the lava-flows. These also, like the lignites of Bovey Tracey, have been referred to the Miocene period, on the supposed evidence of the plants; but

more recent discoveries by Gardner tend to throw doubt on this allocation, and suggest that, though of various ages, the first-formed of these deposits may date back to early Eocene times. The flora found in Mull points distinctly to temperate conditions; but it is not yet clear whether this indicates a different period from the subtropical flora of the south of England, or whether the difference depends on latitude or local conditions. The plants include a Fern, Onoclea hebridica, close to a living American form; four Gymnosperms belonging to the genera Cryptomeria, Ginkgo,

Fig. 4. — MacClin- iockia trinervata.

Taxus and Podocarpus; Dicotyledons of about 30 species, several of which have been figured. Among the Dicotyledons may be mentioned Platanus, Acer (?), Quercus (?), Viburnum, Alnus, Magnolia, Corylus (?), Castanea (?), Zizyphus, Populus and the nettle- like Boehmeria antiqua. The absence cf the so-called cinnamon-leaves and the Smilaceae, which always enter into the composition of Middle Eocene and Oligocene floras, is notice- able. The Irish strata yield two ferns; 7 Gymnosperms, Cupressus, Cryptomeria, Taxus, Podocarpus, Pinus (2 species), Tsuga; and leaves of about 25 Dicotyledons. The most abundant leaf, according to Gardner, does not seem distinct from Celastrophyllum Benedeni, of the Paleocene strata of Gelinden ; a water- lily, Nelumbium Buchii, occurs also in Oligo- cene beds on the Continent; the species of MacClintockia (fig. 4) is found both in the Arctic floras and at Gelinden. Among the other plants are an alder, an oak and a doubtful cinnamon.

Leaving these Scottish and Irish deposits of doubtful age, we find in the Hampshire Basin a thick series of fluviatile, lacustrine and marine deposits undoubtedly of Lower and Middle Oligocene date. Their flora is still a singularly poor one, though plants have been obtained at many different levels; they perhaps indicate a somewhat cooler climate than that of the Bournemouth series. Among the more abundant plants are nucules of several species of Chara, and drifted fruits and seeds of water-lilies, of Folliculites (now generally referred to Stratiotes) and of Limno- carpus (allied to Potamogeton) ; there is little else mixed with these. Other seams are full of the twigs and cones of Athrotaxis, a Conifer now confined to Tasmania. Ferns are

repre- sented by Gleichenia, Lygodium and Chryso- dium Lanzaeanum, which last has a very wide range in time; Monocotyledons, by a Sabal and a feather-palm, as well as by the two aquatic genera above mentioned; Gymnosperms, by the extinct araucarian genus Dolio- strobus, by rare pine-cones, and by Athrotaxis. Dicotyledonous leaves are not plentiful, the genera recorded being Andromeda, Cinnamomum, Zizyphus, Rhus, Viburnum.

The lignite deposits and pipe-clays of Bovey Tracey in Devon, referred by Heer and Pengelly to the Miocene period, were con- sidered by Gardner to be of the same age as the Bournemouth beds (Middle Eocene). Recent researches show, however, that Heer's view was more nearly correct. The flora of Bovey is like that of the lignite of the Wetterau, which is either highest Oligocene or lowest Miocene. Several species of Nyssa are common to the two districts, as are a climbing palm, two vines, a magnolia, &c. The common tree at Bovey is Sequoia Couttsiae, which probably grew in profusion in the sheltered valleys of Dartmoor, close to the lake. . Above these strata in Great Britain there is a complete break, no species of plant ranging upwards into the next fossiliferous division.

Space will not allow us to deal with the numerous scattered deposits which have yielded Tertiary plants. It will be more to the purpose to take distant areas, where the order of the strata is clear, and compare the succession of the floras with Southern" t ' lat met w ˆ m other geographical regions and in France. other latitudes. For this study it will be most convenient to take next south and central France, for in that area can be found a series of plant-bearing strata in which is preserved a nearly continuous history of the vegetation from Upper Eocene down to Pliocene. The account is taken mainly from the writings of Saporta.

The gypsum-deposit of Upper Eocene date at Aix in Provence commences this series, and is remarkable for the variety and perfect preservation of its organic remains. Among its Gymnosperms are numerous Cupressineae of African affinity belonging to the genera Callitris and Widdringtonia, and a juniper close to one indigenous in Greece. Fan-palms, several species of dragon-tree and a banana, like one living in Abyssinia, represent the more peculiar Mono- cotyledons. Among the noticeable Dicotyledons are the Myricaceae, Proteaceae, Laurineae, Bombax, the Judas-tree, Acacia, Ailanthus, while the most plentiful forms are the Araliaceae. Willows and poplars, with a few other plants of more temperate regions, are found rarely at Aix, and seemingly point to casual introduction from surrounding mountains.

In a general way, spiny plants, with stiff branches and dry and coriaceous leaves, dominate the

flora, as they now do in Central Africa, to which region on the whole Saporta considers the flora to be most allied.

The succeeding Oligocene flora appears to be more characterized by a gradual replacement of the Eocene species by allied fcrms, than by any marked change in the assemblage or in the climatic conditions. It forms a perfectly gradual transition to the still newer Miocene period, the newer species slowly appearing and increasing in number. Saporta considers that in central and southern Europe the alternate dry and moist heat of the Eocene period gave place to a climate more equally and more universally humid, and that these conditions continued without material change into the succeeding Miocene stage. Among the types of vegetation which make their appearance in Europe during the Oligocene period may be mentioned the Conifers Libocedrus salicornioides, several species of Chamaecyparis and Sequoia, Taxodium distichum and Glyptostrobus europaeus. The palms include Sabal haeringiana, S. major and Flabellaria. Among the Myricaceae several specie's of Comptonia are common. These new-comers are all of American type. Aquatic plants, especially water-lilies, are abundant and varied ; the soil-dry Callitris and Widdringtonia become scarce.

Though we do not propose to deal with the other European localities for Eocene and Oligocene plants, there is one district to which attention should be drawn, on account of the exceptional state of preservation of the specimens. ˆ a "u Sta On the Baltic shores of Prussia there is found a quantity of amber, containing remains of insects and plants. This is derived from strata of Oligocene age, and is particularly valuable because it preserves perfectly various soft parts of the plants, which are usually lost in fossil specimens. The tissues, in fact, are preserved just as they would be in. Canada balsam. The amber yields such things as fallen flowers, perfect catkins of oak, pollen grains and fungi. It enables us to determine accurately orders and genera which otherwise are unknown in the fossil state, and it thus aids us in forming a truer idea of the flora of the period than can be formed at any locality where the harder parts alone are recognizable. No doubt this amber flora is still imperfectly known, but it is valuable as giving a good idea of the vegetation, during Oligocene times, of a mixed wood of pine and oak, in which there is a mixture of herbaceous and woody plants, such as would now be found under similar conditions.

The plants of which the floral organs or perfect fruits are pre- served

include _ the amber-bearing Pinus succinifera, Smilax, Phoenix, the spike of an aroid, 11 species of oak, 2 of chestnut, a beech, Urticaceae, 2 cinnamons and Trianthera among the Lauraceae, representatives of the Cistaceae, Ternstroemiaceae, Dilleniaceae (3 species of Hibbertia), Geraniaceae (Geranium and Er odium), Oxalidaceae, Acer, Celastraceae, Olacaceae, Pittosporaceae, Ilex (2 species), Euphorbiaceae, Umbelliferae (Chaerophyllum) , Saxifragaceae (3 genera), Hamamelidaceae, Rosaceae, Connaraceae, Ericaceae (Andromeda and Clethra), Myrsinaceae (3 species), Rubiaceae, Sambucus (2 species), Santalaceae, Loranthaceae (3 species). We here discover for the first time various living families and genera, but there is still a noticeable absence of many of our most prolific existing groups. Whether this deficiency is accidental or real time will show.

The Miocene flora, which succeeds to that just described, is well represented in Europe; but till recently there has been an unfortunate tendency to refer Tertiary floras of all dates to the Miocene period, unless the geological position of the strata was so clear as obviously to forbid this assignment. Thus plant-beds in the basalt of Scotland and Ireland were called Miocene; and in the Arctic regions and in North America even plant-beds of Upper Cretaceous age were referred to the same period. The reason for this was that some of the first Tertiary floras to be examined were certainly Miocene, and, when these plants had been studied, it was considered that somewhat similar assemblages found elsewhere in deposits of doubtful geological age must also be Miocene. For a long time it was not recognized that changes in the marine fauna, on which our geological classification mainly depends, correspond scarcely at all with changes in the land plants. It was not suspected, or the fact was ignored, that the break between Cretaceous and Tertiary — made so conspicuous by striking changes in the aquatic animals — had little or no importance in botanical history. It was not realized that an Upper Cretaceous flora needed critical examination to distinguish it from one of Miocene age, and that the two periods were not characterized by a

sweeping change of generic type, such as took place among the marine invertebrates. It may appear absurd to a geologist that any one could mistake a Cretaceous flora for one of Miocene date, since the marine animals are completely different and the differences are

striking. In the case of the plants, however, the Tertiary generic types in large part appeared in Upper Cretaceous times. Few or no extinct types are to be found in these older strata — there is nothing among the plants equivalent to the unmistakably extinct Ammonites, Belemnites, and a hundred other groups, and we only meet with constant variations in the same genus or family, these variations having seldom any obvious relation to phylogeny.

The Miocene period is unrepresented by any deposits in Great Britain, unless the Bovey lignite should belong to its earliest stage; we will therefore commence with the best known region — that of central Europe and especially of Switzerland, whence a prolific flora has been collected and described by Oswald Heer. The Miocene lacustrine deposits are contained in a number of silted-up lake- basins, which were successively formed and obliterated during the uprise of the Alps and the continuous folding and bending of the earth's crust which was so striking a feature of the period. These undulations tended to transform valleys into chains of lakes, into which the plants and animals of the surrounding area fell or were washed. We thus find preserved in the Upper Miocene lacustrine deposits of Switzerland a larger flora than is known from any other period of similar length ; in fact, an analysis of its composition suggests that the Miocene flora of Switzerland must have been both larger and more varied than that now living in the same country. The best known locality for the Upper Miocene plants is Oemngen, on the Lake of Constance, where have been collected nearly 500 species of plants, the total number of Miocene plants found in Switzerland being stated to be now over 900. Among the characteristics of this Miocene flora are the large number of families represented, the marked increase in the deciduous-leaved plants, the gradual decrease in the number of palms and of tropical plants, and the replacement of these latter by Mediterranean or North American forms. According to Heer, the tropical forms in the Swiss Miocene agree rather with Asiatic types, while the subtropical and temperate plants are allied to forms now living in the temperate zone in North America. Of the 920 species described by Heer, 114 are Cryptogams and 806 flowering plants. Mosses are extremely rare, Heer only describing 3 species. Vascular Cryptogams still include one or two large horsetails with stems over an inch thick, and also 37 species of Fern, amongst the most interesting of which are 5 species belonging to the climbing Lygo- dium, a genus now living in Java. The number of Ferns is just equal to that now found in Switzerland. Cycads are only repre- sented by fragments of two species, and this seems to be the last appearance of Cycads in Europe. The Coniferae include no fewer than 94 species of Cupressineae and 17 of

Abietineae,_ including several species of Sequoia. Monocotyledons form one-sixth of the known Miocene flora, 25 of them being grasses and 39 sedges; but most of these need further study, and are very insufficiently char- acterized. Heer records one species of rice and four of millet Most of the other Monocotyledons call for little remark, though among them is an Iris, a Bromelia and a ginger. Smilax, as in earlier times, was common. Palms, referred to 11 species, are found, though they seem to have decreased in abundance; of them 7 are fan-palms, the others including Phoenicites — a torm allied to the date — and a trailing palm, Calamopsis, allied to the canes and rattans. Among the Dicotyledons, the Leguminosae take the first place with 131 species, including Acacia, Caesalpinia and Cassia, each represented by several forms. The occurrence of 90 species of Amentaceae shows that, as the climate became less tropical, the relative proportion of this group to the total flora increased. Evergreen oaks are a marked characteristic of the period, more than half the Swiss species being allied to living American forms. Fig-trees referred to 17 species occur, all with undivided leathery leaves; one is close to the banyan, another to the indiarubber-treeT' The Laurineae were plentiful, and include various true laurels, camphor-trees, cinnamon, Persea and Sassafras. The Proteaceae, according to Heer, are still common, the Australian genera Hakea, Dryandra, Grevillea and Banksia, being represented. Amongst gamopetalous plants several of our largest living families, including Campanulaceae, Labiatae, Solanaceae and Primulaceae, are still missing; and of Boragineae, Scrophularineae, Gentianeae and Caprifoliaceae there are only faint and doubtful indications. The Compositae are represented by isolated fruits of various species. Twining lianas are met with in a species of Bignonia; Umbelliferae Ranunculaceae and Cruciferae, are represented by a few fruits. These families, however, do not appear to have had anything like their present importance in the temperate flora, though, as they are mainly herbaceous plants with fruits of moderate hardness, they may havS decayed and left no trace. The American Liriodendron still flourished in Europe. Water-lilies of the genera Nymphaea and Nelumbium occur. Maples were still plentiful, 20 species

having been described. Rosaceae are rare, Crataegus, Prunus and Amygdalus, being the only genera recorded. It is obvious that many of these Swiss Miocene plants will need more close study before their specific characters, or even their generic position, can be accepted as thoroughly made out; still, this will not affect the general composition of the flora, with its large proportion of de- ciduous trees and evergreens, and its noticeable deficiency in many of our largest living families.

From Europe it will be convenient to pass to a distant region of similar latitude, so that we may see to what extent botanical provinces existed in Eocene and Oligocene times. It Tertiary so happens that the interior of temperate North ofNorth America is almost the only region outside Europe in America. which a series of plant-bearing strata give a connected history of these periods, and in which the plants have been collected and studied. It is unfortunately still very difficult to correlate even approximately the strata on the two sides of the Atlantic, and there is great doubt as to what strata belong to each division of the Tertiary period even in different parts of North America. This difficulty will disappear as the strata become better known; but at present each of the silted-up lakes has to be studied separ- ately, for we cannot expect so close a correspondence, in their faunas and floras as is found in the more crowded and smaller basins in central Europe.

Perhaps the most striking characteristic of the Tertiary floras of North America, as distinguished from those of Europe, is the greater continuity in their history and greater connexion with the existing flora of the same regions. This difference is readily ex- plained when we remember that in Europe the main barriers which stop migration, such as the Alps and the Mediterranean, run east and west, while in America the only barriers of any importance run north and south. In consequence of this peculiarity, climatic or orographic changes in Europe tend to drive animals and plants into a cul de sac, from which there is no escape; but in America similar climatic waves merely cause the species alternately to retreat and advance. This difficulty in migration is probably the reason why the existing European flora is so poor in large-fruited trees compared with what it was in Miocene times or with the existing flora of North America. In America the contrast between the Eocene forests and those now living is much less striking, and this fact has led to the wrong assumption that the present American flora had its origin in the American continent. Such a conclusion is by no means warranted by the facts, for in Tertiary times, as we have seen, the European flora had a distinctly ” American ” facies. Therefore the so-called American forms may have originated in the Old World, or more probably, as Saporta suggests, in the polar regions, whence they were driven by the increase of cold southwards into Europe and into America. The American Tertiary flora is so large, and the geology of the deposits is so intricate, that it is out of the question to discuss them more fully within the limits of this article. We may point out, however, that the early Tertiary floras seem to indicate a much closer connexion and a greater community of species than is found between the existing plants of Europe and America. Or, rather, we should perhaps say that ancient floras suggest recent

dispersal from the place of origin, and less time in which to vary and become modified by the loss of different groups in the two continents. Geographical provinces are certainly indicated by the Eocene flora of Europe and America, but these are less marked than those now existing.

If we turn to a more isolated region, like Australia, we find a Lower Eocene flora distinctly related to the existing flora of Australia and not to that of other continents. Australasia had then as now a peculiar flora of its own, though the former wide dispersal of the Proteaceae and Myrtaceae, and also the large number of Amentaceae then found in Australia, make the Eocene plants of Europe and Australia much less unlike than are the present floras.

Within the Arctic circle a large number of Tertiary plants have been collected. These were described by Heer, who referred them to the Miocene period; he recognized, Arctic in fact, two periods during which Angiosperms Regions. flourished within the Arctic regions, the one Upper Cretaceous, the other Miocene. To this view of the Miocene age of the plant-bearing strata in Greenland and Spitsbergen there are serious objections, which we will again refer to when the flora has been described.

The Tertiary flora of Greenland is of great interest, from the extremely high latitude at which the plants flourished, thirty of the species having been collected so far north as lat. 8l°. Taking first this most northerly locality, in Grinnell Land, we find the flora

to comprise 2 horsetails, 11 Conifers (including the living Pinus Abies), 2 grasses, a sedge, 2 poplars, a willow, 2 birches, 2 hazels, an elm, a Viburnum, a water-lily, and a lime. Such an assemblage at the present day would suggest a latitude quite 25 farther south ; but it shows decidedly colder conditions than any of the European Eocene, Oligocene, or Miocene strata. From lat. 78 in Spitsbergen Heer records 136 species of fossil plants. More to the south, at Disco Island in lat. 70 , the Tertiary wood seem to have been principally composed of planes and Sequoias; but a large number of other genera occur, the total number of plants already recorded being 137. From various parts of Greenland they now amount to at least 280. Among the plants from

Disco, more than a quarter are also found in the Miocene of central Europe. The plants of Disco include, besides the plane and Sequoia, such warm-temperate trees as Ginkgo, oak, beech, poplar, maple, walnut, lime and magnolia. If these different deposits are contemporaneous, as is not improbable, there is a distinct change in the flora as we move farther from the pole, which suggests that difference of latitude then as now was accompanied by a difference in the flora. But if this process is continuous from latitude to latitude, then we ought not to look for a flora of equivalent age in the warm-temperate Miocene deposits of central Europe, but should rather expect to find that the temperate plants of Greenland were contemporaneous with a tropical flora in central Europe. As Mr Starkie Gardner has pointed out, it does not seem reasonable to assume that the same flora could have ranged then through 40 of latitude; it is more probable that an Eocene temperate flora found in the Arctic regions travelled south- wards as the climate became cooler, till it became the Miocene temperate flora of central Europe. Mr Gardner suggests, therefore, that the plant-beds of Greenland and Spitsbergen represent the period of greatest heat, and are therefore wrongly referred to the Miocene. At present the evidence is scarcely sufficient to decide the question, for if this view is right, we ought to find within the Arctic circle truly Arctic floras equivalent to the cool Lower Eocene and Miocene periods; but these have not yet been met with.

A steady decrease of temperature marked the Pliocene period throughout Europe, and gradually brought the climatic con- _„ ditions into correspondence with those now existing,

till towards the end of the period neither climate nor physical geography differed greatly from those now existing. Concurrently with this change, the tropical and extinct forms disappeared, and the flora approached more and more nearly to that now existing in the districts where the fossil plants are found, though in the older deposits, at any rate, the geographical distribution still differed considerably from that now met with. At last, in the latest Pliocene strata (often called ” pre-Glacial “) we find a flora consisting almost entirely of existing species belonging to the Palaearctic regions, and nearly all still living in the country where the fossils are found. This flora, however, is associated with a fauna of large mammals, the majority of which are extinct.

The plants of the Older Pliocene period are unknown in Great Britain, and little known throughout Europe except in central France and the Mediterranean region. The forests of central France during this epoch showed, according to Saporta, a singular admixture of living European

species, with trees now characteristic of the Canary Isles and of North America. For instance, of the living species found at Meximieux, near Lyons, one is American, eight at least belong to the Canaries (six being characteristic of those islands), two are Asiatic, and ten still live in Europe. Taking into account, however, the closest living allies of the fossil plants, we find about equal affinities with the floras of Europe, America, and Asia. There is also a decided resemblance to the earlier Miocene flora. Among the more interesting plants of this deposit may be mentioned Torreya nucifera, now Japanese; an evergreen oak close to the common Quercus Ilex; Laurus canariensis, Apollonias canariensis, Per sea carolinensis, and Ilex canariensis ; Daphne pontica (a plant of Asia Minor) ; a species of box, scarcely differing from the English, and a bamboo. To this epoch, or perhaps to a stage slightly later, and not to the Newer Pliocene period, as is generally supposed, should probably be referred the lignite deposits of the Val d'Arno. This lignite and the accompanying leaf-bearing clays underlie and are apparently older than the strata with Newer Pliocene mammals and mollusca. The only mammal actually associated with the plants appears to be a species of tapir, a genus which in Europe seems to be characteristically Miocene and Older Pliocene. The plants of the Val d'Arno have been described by Ristori; they consist mainly of deciduous trees, a large proportion of which are known Miocene and early Pliocene forms, nearly all of them being extinct. A markedly upland character is given to the flora of this valley through the abundance of pines (9 species) and oaks (16 species) which it contains; but this peculiarity is readily accounted for by the steep slopes of the Apennines, which everywhere surround and dominate the old lake-basin. Among the other noticeable

plants may be mentioned Betula (3 species), Alnus (2 species), Carpinus, Fagus (4 species), Salix (4 species), Populus (2 species), Platanus, Liquidambar, Planera, Ulmus (2 species), Ficus (2 species), Persoonia, Laurus (5 species), Per sea, Sassafras, Cinnamomum (5 species), Oreodaphne, Diospyros (2 species), Andromeda, Magnolia, Acer (3 species), Sapindus, Celastrus (2 species), Ilex (4 species), Rhamnus (3 species), Juglans (5 species), Carya (2 species), Rhus, Myrtus, Crataegus, Prunus, Cassia (3 species). These plants suggest a colder climate than that indicated by the plants of Meximieux — they might, therefore, be thought to belong to a later period. The difference, however, is probably fully accounted for when we take into consideration the biting winds still felt in spring in the valley of the Arno, and the probable large admixture of plants washed down from the mountains above. Somewhat later Pliocene deposits in the Val d'Arno, as well as the tuffs associated with the Pliocene volcanoes

in central France, yield plants of a more familiar type, a considerable proportion of them still living in the Mediterranean region, though some are only now found at distant localities, and others are extinct. The flora, however, is essentially Palaearctic, American and Australian types having disappeared.

A somewhat later Pliocene flora is represented by the plants found at Tegelen, near Venloo, on the borders of the Netherlands and Germany. This deposit is of especial interest for the light it throws on the origin of the existing flora of Britain. The Tegelen plants are mainly north European; but there occur others of central and south Europe, and various exotic and extinct forms, nearly all of which, however, belong to the Palaearctic region, though some may now be confined to widely separated pacts of it. For instance, Pterocarya caucasica does not grow nearer than the Caucasus, where it is associated with the wild vine — also found at Tegelen; Magnolia Kobus is confined to the north island of Japan; another species of Magnolia cannot be identified and may be extinct. An extinct water-lily, Euryale limburgensis, belongs to a monotypic genus now confined to Assam and China; an extinct sedge, Dulichium vespiforme, belongs to a genus only living in America, though the only living species once flourished also in Denmark; an extinct species of water-aloe (Stratiotes elegans) makes a third genus, repre- sented only by a single living species, which was evidently better represented in Pliocene times. A large proportion of the plants, however, may still be found living in Holland and Britain; but there is a singular scarcity of Composites, though this order is fairly well represented in British strata of slightly later date.

The latest Pliocene, or pre-Glacial, flora of northern Europe is best known from the Cromer Forest-bed of Norfolk and Suffolk, a fluvio-marine deposit which lies beneath the whole of the Glacial deposits of these counties, and passes downwards into the Crag, many of the animals actually associated with the plants being characteristic Pliocene species which seem immediately afterwards to have been exterminated by the increasing cold. The plants contained in the Cromer Forest-bed, of which about 150 species have now been determined, fall mainly into two groups — the forest-trees, and marsh and aquatic plants. We know little or nothing at present of the upland plants, or of those of dry or chalky soils. Forest trees are well represented ; they are, in fact, better known than in any of the later English deposits. We find the living British species of Rhamnus, maple, sloe, hawthorn, apple, white-beam, guelder-rose, cornel, elm, birch, alder, hornbeam, hazel, oak, beech, willow, yew and pine, and also the spruce. This is an assemblage that could not well be found under conditions differing greatly from those now holding in Norfolk; there

is an absence of both Arctic and south European plants. The variety of trees shows that the climate was mild and moist. Among the herbaceous plants we find, mingled with a number that still live in Norfolk, Hypecoum procumbens, the water-chestnut (Trapa natans), and Najas minor, none of which is now British.

On the Norfolk coast another thin plant-bed occurs locally above the Forest-bed and immediately beneath the Boulder Clay. This deposit shows no trace of forest-trees, but it is full of remains of Arctic mosses, and of the dwarf willow and birch ; in short, it yields the flora now found within the Arctic circle.

The incoming of the Glacial epoch does not appear to have been accompanied by any acclimatization of the Dlants— the species belonging to temperate Europe were locally „. . . exterminated, and Arctic forms took their places. The same Arctic flora reappears in deposits immediately above the highest Boulder Clay, deposits formed after the ice had passed away. These fossil Arctic plants have now been found as far south as Bovey Tracey in Devonshire, where Pengelly and Heer discovered the bear-berry and dwarf birch; London, where also Betula nana occurs; and at Deuben in Saxony, which lies nearly as far south as lat. 50°, but has yielded to Professor Nathorst's researches several Arctic species of willow and saxifrage. The cold period, however, was not continuous, for both in Great Britain and on the continent of Europe, as well as in Canada, it was broken by the recurrence of a milder

climate and the reappearance of a flora almost identical with that now living in the same regions. This " inter-Glacial " flora, though so like that now found in the district, has inter- esting peculiarities. In England, for instance, it includes Acer monspessulanum, a southern maple which does not now extend nearer than central Europe, and Cotoneaster Pyracantka; also Najas graminea and N. minor, both southern forms not now native of Britain. Brassenia peltata, a water-lily found in the warmer regions almost throughout the world, except in Europe, occurs abundantly in north Germany, but not in Great Britain. Similar inter- Glacial deposits in Tirol contain leaves of Rhodo- dendron ponticum.

Space will not permit us to enter into any full discussion of the recurrence of Glacial and inter-Glacial periods and the influence they

may have had on the flora. It is evident, how- ever, that if climatic alternations, such as those just described, are part of the normal routine that has gone on through all geological periods, and are not merely confined to the latest, then such changes must evidently have had great influence on the evolution and geographical distribution both of species and of floras. Whether this was so is a question still to be decided, for in dealing with extinct floras it is difficult to decide, except in the most general way, to what climatic conditions they point. We seem to find indications of long-period climatic oscillations in Tertiary times, but none of the sudden invasion of an Arctic flora, like that which occurred during more recent times. It should not be forgotten, however, that an Arctic flora is mainly distinguishable from a temperate one by its poverty and dwarfed vegetation, its deciduous leaves and small fruits, rather than by the occurrence of any characteristic genera or families. Care f ul and long-continued study would therefore be needed before we could say of any extinct dwarfed flora that it included only plants which could withstand Arctic conditions.

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PALAEOGRAPHY (Gr. 7ra\ai6s, ancient, and ypaew, to write), the science of ancient handwriting acquired from study of surviving examples. While epigraphy is the science which deals with inscriptions (q.v.) engraved on stone or metal or other enduring material as memorials for future ages, palaeography takes cognisance of writings of a literary, economic, or legal nature written generally with stile,

reed or pen, on tablets, rolls or codices. The boundary, however, between the two sciences is not always to be exactly defined. The fact that an inscription occurs upon a hard material in a fixed position does not neces- sarily bring it under the head of epigraphy. Such specimens of writing as the graffiti or wall-scribblings of Pompeii and ancient Rome belong as much to the one science as to the other; for they neither occupy the position of inscriptions set up with special design as epigraphical monuments, nor are they the movable written documents with which we connect the idea of palaeography. But such exceptions only slightly affect the broad distinction just specified.

The scope of this article is to trace the history of Greek and Latin palaeography from the earliest written documents in those languages which have survived. In Greek palaeography we have a subject which is self-contained. The Greek charac- ter, in its pure form, was used for one language only; but the universal study of that language throughout Europe and the wide diffusion of its literature have been the cause of the accumulation of Greek MSS. in every centre of learning. The field of Latin palaeography is much wider, for the Roman alphabet has made its way into every country of western Europe, and the study of its various developments and changes is essential for a proper understanding of the character which, we write.

Handwriting, like every other art, has its different phases of growth, perfection and decay. A particular form of writing is gradually developed, then takes a finished or calligraphic style and becomes the hand of its period, then deteriorates, breaks up and disappears, or only drags on an artificial exis- tence, being meanwhile superseded by another style which, either developed from the older hand or introduced independently, runs the same course, and in its turn is displaced by a younger rival. Thus in the history of Greek writing we see the literary uncial hand passing from early forms into the calligraphic stage, and then driven out by the minuscule, which again goes through a series of important changes. In Latin, the literary capital and uncial hands give place to the smaller character; and this, after running its course and developing national characteristics in the different countries of the West, deteriorates and is super- seded almost universally by the Italian hand of the Renaissance.

Bearing in mind these natural changes, it is evident that a style of writing, once developed, is best at the period when it is in general use, and that the oldest examples of that period are the simplest, in which vigour and naturalness of handwriting are predominant. On the other hand, the fine execution of a MS. after the best period of the style has passed cannot conceal deterioration. The imitative nature of the

calligraphy is detected both by the general impression on the eye, and by uncertainty and inconsistencies in the forms of letters. It is from a failure to keep in mind the natural laws of develop- ment and change that early dates, to which they have no title, have been given to imitative MSS.; and, on the other

hand, even very ancient examples have been post-dated in an incredible manner.

Down to the time of the introduction of printing, writing ran in two lines — the natural cursive, and the set bobk-hand which was evolved from it. Cursive writing was essential for the ordinary business of life. MSS. written in the set book-hand filled the place now occupied by printed books, the writing being regular, the lines generally kept even by ruling or other guides, and the texts provided with regular margins. The set book-hand disappeared before the printing press; cursive writing necessarily remains.

In the study of handwriting it is difficult to exaggerate the great and enduring influence which the character of the material employed for receiving the script has had upon the formation of the written letters. The original use of clay by the Babylonians and Assyrians as their writing material was the primary cause of the wedge-shaped symbols which were produced by the natural process of puncturing so stiff and sluggish a substance. The clinging waxen surface of the tablets of the Greeks and Romans superinduced a broken and discon- nected style of writing. The comparatively frail surface of papyrus called for a light touch and slenderly built charac- ters. With the introduction of the smooth and hard-surfaced vellum, firmer and heavier letters, with marked contrasts of fine and thick strokes, became possible, and thence became the fashion. In the task which lies before us we shall have to deal mainly with MSS. written on the two very different materials, papyrus and vellum, and we shall find to how great an extent the general character and the detailed development of Greek and Latin writing, particularly for literary purposes, has been affected by the two materials.

The history of the ancient papyrus roll and of its successor, the medieval vellum codex, and the particulars of the mechanical

arrangement of texts and other details appertaining to the evolution of the written book are described in the article Manuscript. In the present article our attention is confined to the history of the script.

The papyrus period of our subject, as regards literary works, ranges generally from the end of the 4th century B.C. to the 4th century of our era, when the papyrus roll as the vehicle for literature was superseded by the vellum codex. The vellum period extends from the 4th century to the 15th century, when the rise of the art of printing was the doom of the written book. Yet it must not be imagined that there is a hard and fast line separating the papyrus period from the vellum period. In the early centuries of our era there was a transitional period when the use of the two materials overlapped. The employment of vellum for literary purposes began tentatively quite at the beginning of that era; nor did the use of papyrus absolutely cease with the 4th century. But that century marks definitely the period when the change had become generally accepted.

In the case of non-literary documents, written in cursive hands, the papyrus period covers a still wider field. These docu- ments range from the 3rd century B.C. down to the 7th century, and a certain number of examples even extend into the 8th century. The survival of cursive papyrus documents in large numbers is due to the fact that they are chiefly written in Egypt, where papyrus was the common writing material and where climatic conditions ensured their preservation. On the other hand, early cursive documents on vellum are scarce, for it must be borne in mind that, even allowing for the loss of such documents attributable to the perishable nature of that material in the humid climates of Europe, papyrus and waxen tablets were also the usual writing materials of the Greeks and Romans. The importance of the survival of Greek cursive papyri to so late a period is very great, for it enables us to trace the development of the Greek literary minuscule handwriting of the 9th century in a direct line from the cursive script of the papyri centuries earlier.

Greek Writing. I. — The Papyri In no branch of our subject has so great a development been

effected since about 1875 as in that of the palaeography of Greek papyri. Before that time our knowledge was very limited. The material was comparatively meagre; and, though its increase was certainly only a matter of time, yet the most sanguine would hardly have dared to foretell the remarkable abundance of documents which the excavations of a few years would bring to light.

The history of Greek writing on papyrus can now be followed with more or less fullness of material for a thousand years. Actual dated examples range from the late years of the 4th century B.C. to the 7th century a.d. We have a fair knowledge of the leading features of the writing of the 3rd and 2nd centuries B.C.; a less perfect acquaintance with those of the 1st century B.C. For the first four centuries of the Christian era there is a fairly continuous series of documents; of the 5th century only, a few examples have as yet been recovered, but there is an abundance of material for the 6th and early 7th centuries. Thus it will be seen that, while for some periods we may be justified in drawing certain conclusions and laying down certain rules, for others we are still in an imperfect state of knowledge. But our knowledge will no doubt almost yearly become more exact, as fresh material is brought to light from the excavations which are now continually proceeding; and those periods in which the lack of papyri breaks the chain of evidence will sooner or later be as fully represented as the rest. The material certainly lies buried in the sands; it is our misfortune that the exact sites have not yet been struck.

The first discovery of Greek papyri was made in Europe in 1752, when the excavations on the site of Herculaneum yielded a number of charred rolls, which proved to be of a literary character. All subsequent discoveries we owe to Egypt; and it is to be observed that the papyri which are found in that country have come down to us under different conditions. Some, generally of a literary nature, were carefully deposited with the bodies of their owners in the tomb with the express intention of being preserved; hence such MSS. in several instances have come to our hands in fairly perfect condition. On the other hand, by far the larger number of those recently brought to light have been found on the sites of towns and villages, particularly in the district of the Fayum, where they had been either accidentally lost or purposely thrown aside as of no value, or had even been used tip as material for other purposes besides their original one. These are consequently for the most part in an imperfect and even fragmentary condition, although not a few of them have proved to be of the highest palaeographical and literary importance.

The date of the first find of Greek papyri in Egypt was in 1778, when some forty or fifty rolls were discovered by some native diggers, who, however, kept only one of them. After this scarcely anything appeared until the year 1820, when was found on the site of the Serapeum at Memphis, as it was reported, a group of documents of the 2nd century B.C. Then followed a fruitful period, when several important literary papyri were secured: in 1821, the Bankes Homer, containing the last book of the Iliad; in 1847, the roll containing the Lycophron and other

orations of Hypereides; in 1849 and 1850, the Harris Homer, bk. xviii. of the Iliad, and a MS. of bks. ii.-iv.; and, in 1856, the Funeral Oration of Hypereides.

But the great bulk of the Greek papyri from Egypt is the result of excavations undertaken during the last quarter of the 19th century and dow 1 to the present day. Within this time four very impor'ant discoveries of documents in large quantities have taken place. In 1877 a great mass of papyri was found on the site of Arsinoe in the Fayum, being chiefly of a non- literary nature, and unfortunately in a very fragmentary state ; they are also late in date, being of the Byzantine period. The greater number passed into the possession of the Archduke Rainer, I nd are now at Vienna; the rest are divided between London, Oxford, Paris and Berlin. After an interval this find was followed by the recovery in 1892, in the same neigh- bourhood, and chiefly on the site of a village named Socnopaei Nesus, of an extensive series of documents of the Roman period,

ranging from the ist century to the middle of the 3rd century. These papyri, being of an earlier date and in better condition than the Arsinoite collection, are consequently of greater palaeographical value. Most of them are now in Berlin; many are in the British Museum; and some are at Vienna, Geneva and elsewhere. The third and fourth great finds, and the most important of all, were made by Messrs Grenfell and Hunt when excavating, in the seasons 1896-1897 and 1005-1906, for the Egypt Exploration Fund, at Behnesa, the ancient Oxyrhynchus. Thousands of papyri were here recovered, including, among the non-literary material, a number of rolls in good condition, and comprising also a great store of fragments of literary works, among which occur the now well-known " Logia," or " Sayings of Our Lord," and fragments of the Scriptures, and in some instances of not inconsiderable portions of the writings of various classical authors. This great collection ranges in date from the 2nd century B.C. to the 7th century a.d.; but in what proportion the documents fall to the several centuries cannot be determined until the series of volumes in which they are to be described for the Graeco-Roman branch of the Egypt Exploration Fund shall have made some substantial progress.

These four great collections of miscellaneous documents have been

supplemented by finds of other groups, which fit into them and serve to make more complete the chronological series. Such are the correspondence of a Roman officer named Abinnaeus, of the middle of the 4th century, shared between the British Museum and the library of Geneva in the year 1892; a miscellaneous collection, ranging from the 2nd century B.C. to the 3rd or 4th century a.d., acquired for the Egypt Explora- tion Fund and published by that society (Fayum Towns and their Papyri, 1900); another collection obtained for the same society from the cartonnage of mummy-cases dating back to the 3rd century B.C. (The Hibeh Papyri, 1906); and a series recovered from excavations at Tebtunis for the University of California {The Tebtunis Papyri, 1902, 1906), generally of the 2nd century B.C. But of these lesser groups by far the most interesting is that which Mr Flinders Petrie extracted, in 1 889-1 890, from a set of mummy-cases found in the necropolis of the village of Gurob in the Fayum. In the manufacture of these coffins numbers of inscribed papyri had been employed. The fragments thus recovered proved to be some of the most valuable documents for the history of Greek palaeography hitherto found, supplying us with examples of writing of the 3rd century B.C. in fairly ample numbers, and thus carrying back our fuller knowledge of the subject to a period which up to that time had remained almost a blank. Besides miscel- laneous documents, there are included the remains of registers of wills entered up from time to time by different scribes, and thus affording a variety of handwritings for study-; and, further, the value of the collection is enhanced by the presence of fragments of the Phaedo and Laches of Plato, and of the lost Antiope of Euripides and of other classical works.

The last decade of the 19th century was also distinguished by the recovery of several literary works of the first importance, inscribed on papyri which had been deposited with the dead, and had thus remained in a fairly perfect condition. In 1889 the trustees of the British Museum acquired a copy of the lost ‘Adrivaluv HoXirela of Aristotle — a papyrus of the mimes of the poet Herodas, and a portion of the oration of Hypereides against Philippides; and in 1896 they had the further good fortune to secure a papyrus containing considerable portions of the odes of Bacchylides, the contemporary of Pindar. And to the series of the orations of Hypereides the Louvre was enabled to add, in 1892, a MS. of the greater part of the oration against Athenogenes.

But the most valuable discovery, from a palaeographical point of view, took place in the present century. In 1902 a papyrus roll containing the greater portion of the Persae, a lyrical composition of Timotheus of Miletus, was found at Abusir, near Memphis, and is now

at Berlin. It is written in a large hand of a style which had hitherto been known from a document at Vienna entitled the ” Curse of Artemisia,” and

assigned to the early part of the 3rd century B.C.; and from one or two other insignificant scraps. The new papyrus, how- ever, appears to be even older, and may certainly be placed in the later years of the 4th century B.C.: the most ancient extant literary MS. in the Greek tongue. The ascription of this papyrus to the 4th century B.C. has received confirmation from the welcome discovery, in 1906, at Elephantine, of a document (a marriage contract) of the year 31 1-3 10 B.C., which is written in the same style of book-hand characters (Aegypt. Urkunden d. kgl. Museen in Berlin, Elephantine Papyri, 1907). Of quite recent date also is the recovery of a con- siderable part of a commentary on the Theaetetus of Plato, written in a fine uncial hand of the 2nd century, now in Berlin. Considerable fragments also of the Paeans of Pindar of the ist or 2nd century; a papyrus containing an historical work attributed to Theopompus or Cratippus, perhaps of the early 3rd century; a copy of Plato’s Symposium of the same period; and a portion of the Panegyricus of Isocrates, written in an uncial hand of the 2nd century, are printed in Part V. of the Oxyrhynchus Papyri. Further, many leaves of a papyrus codex containing fragments of four comedies of Menander were found in 1905 at Kom Ishkaou, the ancient Aphroditopolis. The recovery of so many great classical works within a few years may be accepted as an earnest of further finds of the same nature, now that excavations are being carried on systematically in Egypt.

From a study of the material thus placed at our disposal certain conclusions have been arrived at which satisfy us that the periodical changes which passed over the character of Greek writing as practised in Egypt coincide pretty nearly with the changes in the political administration of the country. The period of the rule of the Ptolemies from 323 to 30 B.C. has, in general, its own style of writing, which we recognize as the Ptolemaic; the period of Roman supremacy, beginning with the conquest of Augustus and ending with the reorganization of the empire by Diocletian in a.d. 284, is accompanied by a characteristic Roman hand; and with the change of administra- tion which placed Egypt under the Byzantine division of the empire, and lasted down to the time of the Arab conquest in a.d. 640, there is a corresponding change to the Byzantine class of writing. These changes must obviously be attributed to the influence of the official handwritings of the time. A change of government naturally led to a change of the officials employed, and with the change of officials would naturally follow a change in the style of production of official

documents. In illustration of this view, it is enough to call to mind the instances of such variations to be met with in the history of the palaeography of medieval Europe, due in the same way to political causes. It is interesting, too, to observe that in our own time the teaching in schools of a particular type of handwriting which finds favour in clerical examinations for the public service has not been without its influence on the general handwriting of the people.

Classifying, then, the writing of the papyri into the three groups — the Ptolemaic, the Roman, and the Byzantine — the next step is to determine, by a closer examination of the documents, the changes which characterize the several centuries traversed by those groups. In doing this, we cannot apply the exact terms which are employed in describing the MSS. of the middle ages. We have to do with writing which has not yet been cast into the formal literary moulds of the later times; and it has therefore been found necessary, as well as convenient, to divide the papyri simply into two series, representative of their contents and not of their style of production — namely literary papyri and non-literary papyri. Neither series, however, it is to be remembered, has a style of writing peculiar to itself. While the extant literary works are, as a rule, written with more or less formality, no doubt by professional scribes for the book- market, not a few of even the more valuable of them are copies in the ordinary cursive hands of the day. Conversely, while we find non-literary documents generally written in ordinary cursive hands, whether by official scribes or by private individuals, yet occasionally we meet with one produced in the formal style more proper to literary examples. Again, while applying to

particular letters in papyri such technical terms as capitals, or uncials, or minuscules, we cannot convey by those terms the exact ideas which we convey when thus describing the individual letters of medieval manuscripts. For the letters of the papyrus period were not cast in finished moulds, while the uncial writing and the minuscule writing of the middle ages were settled literary hands. As will presently be seen, the early medieval uncial hand of the vellum codices de- veloped directly from the literary writing of the papyri; the minuscule book-hand of the 9th century was a new type moulded from the cursive into a fixed literary style.

Necessarily, the non-literary papyri are much more numerous than the literary documents, and present a much greater variety of handwriting, being in fact the result of the daily trans- actions of ordinary life; and how very widespread was the know- ledge of writing among the Greek-speaking population of Egypt is sufficiently testified by the surviving examples, coming as they do from the hands of all sorts and conditions of men. We will first examine these specimens of the current handwriting of the day before passing to the review of the more or less artificial book-writing of the literary papyri.

Non-Literary, Cursive, Hands. — As already stated, the oldest material for the study of Greek cursive writing is chiefly con- tributed by the papyri discovered at Gurob. Among them are not only the fragments of official registers, which have been mentioned, but also a variety of miscellaneous documents relating to private affairs, and in various hands of the 3rd century and early 2nd century B.C. The non-literary cursive papyri bear actual dates ranging from 270 to 186 B.C. But the discovery (1906) of papyri at Elephantine takes our dated series of cursive documents back to 285-284 B.C.; and in this collection also is the oldest dated Greek document yet found — the marriage contract of the year 31 1-3 10 B.C., already mentioned. In this instance, however, the writing is not cursive, but of the literary type.

The leading characteristic of Greek cursive writing of the 3rd century B.C. is its strength and facility. While it may not compare with some later styles in the precise formation of particular letters, yet its freedom and spontaneous air lend it a particular charm and please the eye, very much in the same way that a scholar's practised and unconscious handwriting of a good type is more attractive than the more exact formality of a clerk's hand. The letters generally are widely spread and shallow, and, particularly in the official hands, they are linked together with horizontal connecting strokes to such an extent that the text has almost the appearance of depending from a continuous horizontal line. The extreme shallowness or flatness of many of the letters is very striking. A significant indication of the antiquity of Greek cursive writing is found in connexion with the letter alpha, which is, even at this early period, in one of its forms reduced to a mere angle or wedge.

A few lines from an official order (fig. 1) of the year 250 B.C. will serve to convey an idea of the trained cursive style of this century: —

T'C'T" fM t\ )*- o c -rrcc &c l c "T° I roˆcˆrM c err

Fig. 1. — Official Order, 250 B.C.

•t

(— e« roirovxov Kai tjjs—

t — T€Tpa Kai (IKOCTTjS

— deis tois dqaavpois «r — — Tfrpa km &.Ko<7Trjs —

OVLKOV KCU TOW epTJfiO

— opayiaapjevos airco —) As a contrast to this excellent hand, we give a facsimile of a section from a roughly written letter from a land steward to his employer, of about the same date: —

Fig. 2. — Letter of a Land Steward, 3rd century B.C.

(ex« dvvis y expiyca/ijjj'

He Kai wapa Bweus apra

/3as 5 KpiBoTTvpwv avrov

errayyekofievov xai iXotijm>v

ovtos yivvxTKz 5e Kai on.

u5a)p eicaaTos wv opuv rqv

a/xireXov vTevopjevr]v irporepov) Here there is none of the linking of the letters which is seen in the other example: every letter stands distinct. But while the individual letters are clumsily written, the same laws govern their formation as in the other document. The shallow, wide-spread mu, the cursive nu, the small theta, omikron, and rho, are repeated. Here also is seen the tau, with its horizontal stroke confined to the left of the vertical instead of crossing it, and the undeveloped omega, which has the appearance of being clipped — both forms being characteristic of the 3rd century B.C. The trained clerical hands of the 2nd century B.C. (fig. 3) differ generally from those of the earlier century in a more perfect and less cursive formation, the older shallow type gradually disappearing, and the linking of letters by horizontal strokes being less continuous. But the Ptolemaic character marks the handwriting well through the century; and it is only towards the close of that period and as the next century is entered, that the hand begins to give way and to lose altogether its linked style and the peculiar crispness of the strokes which give it its distinctive appearance. The cursive hand in its best style (e.g. N. el Extr. pis.

xxviii., xxix.) is very graceful and exact: — ■

Fig. 3. — Petition, 163-162 B.C.

(v < £ VfMdV T)HLV XPWG1“‘f OjUWCl

evXafiaav irpoopu > fievui > ijpwv 8e)

Towards the end of the Ptolemaic period material greatly fails. There are very few extant cursive documents between the years 80 and 20 B.C. But marks of decadence already appear in the examples of: the beginning of the 1st century B.C. The general character of the writing become*’ slacker, and the forms of individual letters are less exact. These imper- fections prepare us for the great change which was to follow.

With the Roman period comes roundness of style, in strong contrast to the stiffness and rigid linking of the Ptolemaic hand. Curves take the place of straight strokes in the individual letters, and even ligatures are formed in pliant sweeps of the pen. This transition from the stiff to the flexible finds some- thing of a parallel in the development of the curving and flexible English charterhand of the 14th century from the rigid hand of the 13th century; following, it would seem, the natural law

of relaxation. Roundness of style, then, is characteristic of Greek cursive writing in the papyri of the first three centuries of the Christian era, however much individual hands, or groups of hands, might vary among themselves.

A specimen (fig. 4) of cursive writing of the general Roman type is selected from a papyrus (Brit. Mus. No. cxxxi.) which is of more than usual interest, as it is on the verso side of the rolls of which it is composed that the text of Aristotle’s Constitution of Athens has been transcribed. It contains the farming accounts of the bfailiff of Epimachus, son of Polydeuces, the owner of an estate in the nome of Hermopolis in the 9th and 10th years of the reign of Vespasian, that is a.d. 78-79: —

Fig. 4. — Farm Accounts, a.d. 78-79. (erovs €vhtKarov a —

ovtoiramavov oeftacTOV — Savavai rov /iijcos x — to 5t avrov ein^axov e —)

In the second half of the 1st century two styles of handwriting predominate in the cursive papyri. There is the clear and flowing hand, which may be termed the ordinary working hand; and there is also a small and very cursive style which appears in private correspondence and in legal contracts. The 2nd century follows on the same lines as the 1st century; but with the 3rd century decadence sets in; the writing begins to slope, and grows larger and rougher and tends to exaggeration. This exaggeration of the writing of the later Roman period leads the way to the pedantic exaggeration and formalism characteristic of the Byzantine period. In this period the general style of writing is on a larger scale than in the Roman; exaggeration in the size of certain letters marks the progress of the 4th century. Material is wanting for full illustration of the changes effected in the 5th century; but the papyri of the 6th century show a further advance in formalism, the common style being upright and compressed and full of flour- ishes. In the 7th century the hand assumes a sloping style, which always seems to accompany decadence, and grows very irregular and straggling. A specimen of the fully developed Byzantine hand of a legal type is here shown in a few lines from a lease of a farm (fig. 5) in the 6th century (Brit. Mus. pap. cxiii-3): —

/yj

yvuA)

Fig. 5. — Lease of a Farm, 6th century.

(— s avrcov rov Suauou e — — s km avrqs kol tK rcav — — oitlvw fxtfyq rpua ko. — ■

— 0) TO, TTpOS T1\V KaXXltp

—01 rqv decriv tov v —) In the long range covered by the Greek papyri the formation of individual letters necessarily varied under different influences; but in not a few instances the original shapes were remarkably maintained. From those which thus remained conservative it is rash to attempt to draw conclusions as to the precise age of the several documents in which they occur. On the other hand, there are some which at certain periods adopted shapes which were in vogue for a limited time and then disappeared, never to be resumed. Such forms can very properly be regarded as sure guides to the

palaeographer in assigning dates. We may therefore take a brief survey of the Greek cursive alphabet of the papyri and note some of the peculiarities of individual letters. The incipient form of the alpha which gradually developed into the minuscule letter of the middle ages may be traced back to the Ptolemaic documents of the 2nd century B.C., but the more cursive letter, which was a simple acute angle, representing only two of the three strokes of which the primitive letter was com- posed, was characteristic of the 3rd century B.C., and seems to have gone out of use within the Ptolemaic period. The develop- ment of the cursive beta is interesting. At the very beginning we find two forms in use: the primitive capital letter and a cursive shape somewhat resembling a small n, being in fact an imperfectly written B in which the bows are slurred. This form lasted through the Ptolemaic period. Then arose the natural tendency to reverse the strokes and to form the letter on the principle of «; but still the capital letter also continued in use, so that through the Roman and Byzantine periods the M-shape and the B-shape run on side by side. Analogously the letter kappa, formed on somewhat the same lines as the beta, runs a similar course in developing a cursive w-shaped form by the side of the primitive capital. Delta remained fairly true to its primitive form until the Byzantine period, when the elongation of the head into a flourish led on to the minuscule letter which is familiar to us in the medieval and modern alphabet. Epsilon, the most frequently recurring letter in Greek texts, departs less from its original rounded uncial form that might have been expected. Frequent and varied as its cursive formations are, yet the original shape is seldom quite disguised, the variations almost in all instances arising from the devices of the scribe to dispose swiftly and conveniently of the cross-bar by incorporating it with the rest of the letter. The tendency to curtail the second vertical limb of eta, leading eventually to the A-shape, is in evidence from the first. But in the development of this letter we have one of the instances of temporary forms which lasted only within a fixed period. In the 1st century, side by side with the more usual form, there appears a modification of it, somewhat resembling the contemporary upsilon, consisting of a shallow horizontal curve with a vertical limb slightly turned in at the foot,“0. Its development from the original H is evident: the first vertical limb is slurred, and survives only in the beginning of the hori- zontal curve, while the cross-bar and the second vertical are combined in the rest of the letter. This form was in general use from the middle of the 1st to the middle of the 2nd century, becoming less common after about a.d. 160, and practically dis- appearing about a.d. 200. The letters formed wholly or in part by circles or loops, theta, omikron, rho, phi, in the earlier centuries have such circles or loops of a small size. Just as

there is an analogy between beta and kappa in their developments, as already noticed, so also do mu and pi advance on somewhat similar lines. From the earliest time there is a resemblance between the broad shallow forms of the two letters in the 3rd century B.C., and particularly when they adopt the form of a convex ■ stroke the likeness is very close; and again, in both Roman and Byzantine periods an «-shaped development appears among the forms of both letters. There is also one phase in the development of sigma which affords a useful criterion fot

fixing the date of documents within a fixed limit of time. In the Ptolemaic period the letter, always of the C-f° rm > is upright, with a flattened horizontal head; in the Roman period a tendency- sets in to curve the head, and in the course of the 1st century, by the side of the old stiffer form of the letter, another more cursive one appears, in which the head is drawn down more and more in a curve, C C- This form is in common use from the latter part of the 1st century to the beginning of the 3rd century. The cursive form of tau, in which the horizontal stroke is kept to the left of the vertical limb, without crossing it, is one of the early shapes of the letter. The formation of the letter Xi in three distinct horizontal strokes is characteristic of the Ptolemaic period, as distinguished from the later type of letter in which the bars are more or less connected. Lastly', the early Ptolemaic form of the co-shaped omega is noticeable from having its second curve undeveloped, the letter having the appearance of being clipped.

Literary Hands. — Literary papyri written in book-hands, distinct from the cursive writing which has been under considera- tion (and in which literary works were also occasionally written), may be divided into two classes: those which were produced by skilled scribes, and therefore presumably for the market, and those which were written less elegantly, but still in a literary hand, and were probably copied by or for scholars for their own use.

Standing at the head of all, and holding that rank as the only literary papyrus of any extent which may be placed in the 4th century B.C., is the famous lyrical work of Timotheus of Miletus, entitled the Persae, which has already been referred to and of which a section of a few lines is here reproduced: —

n< f 1 rjArrrNATf caa rF*FA/*/s/£v*-Kn*Ar'<

f < r° N^rNrAAr AAr/i

AAM tt rAAA-AAtfrAT rNYrfMtNTfTpA*

Fig. 6. — The Persae of Timotheus, late 4th century B.C.

(— fxa aTO St Kv/iaivco — • — v aeipuxi re vats eXX — — r€ t)fiav vtuiv woSva — — aj-ovaip. irvpos St atBa — ■ — s otovoivto. St 0X717 — — a a fi es eWaSa i)ya.v — — yvwt p.tv rerpao —)

The hand, as will be seen, is rather heavy and irregular, but written with facility and strength, and, though the papyrus, perhaps, is not to be classed among the calligraphic productions for the book market, it must rank as a well- written example of the literary script of the time. Capital forms of letters which afterwards assumed the rounded shapes known as uncial are here conspicuous. The exactly formed alpha, the square epsilon with projecting head-stroke, the irregular sigma, the small theta and omikron are to be remarked. Indeed, the only letter which departs essentially from the lapidary character of the alphabet is the omega, here a half-cursive form but still retaining the principle of the structure of the old horse-shoe letter and quite distinct from the co-shape which was soon to be developed. Of this type of writing are also the two non-literary documents already mentioned above, viz. the ” Curse of Artemisia ” at Vienna, and the marriage contract of the year 311-310 B.C., found at Elephantine. In the latter the sigma appears in the rounded uncial form.

By rare good fortune important literary fragments were recovered in the Gurob collection, which yielded the most

ancient dated cursive documents of the 3rd century B.C., so that, almost from the beginning, we start with coeval specimens of both the cursive and of the book-hand, and we are in a position to compare the two styles on equal terms, and thus approxi- mately to date the literary papyri. Palaeographically, this is a matter of the first importance; for while cursive documents, from their nature, in most instances bear actual dates, the periods of literary examples have chiefly to be decided by comparison, and often by conjecture.

The literary fragments from Gurob fall into the two groups just indicated, MSS. written for sale and scholars’ copies. Of the former are some considerable portions of two works, the Phaedo of Plato and the lost Antiope of Euripides. Both are written in carefully formed characters of a small type, but of the two the Phaedo is the better

executed. As the cursive frag- ments among which they were found date back to before the middle of the 3rd century B.C., it is reasonable to place these literary remains also about the same period. Their survival is a particularly interesting fact in the history of Greek palaeo- graphy, for in them we have specimens of literary rolls which may be fairly assumed to differ very little in appearance from the manuscripts contemporary with the great classical authors of Greece. Indeed, the Phaedo was probably written within a hundred years of the death of the author.

In the facsimile (fig. 7) of a few lines from this papyrus here placed before the reader, the characteristics of the Ptolemaic cursive hand are also to some extent to be observed in the formal book-hand : —

Af rrt»AlKA|AafojTr«»A(rtAfAl

Fig. 7.— The Phaedo of Plato, 3rd century B.C.

(— 6cu wioTtvuv Se /j.r]Stvi. aXXcot)

The general breadth of the square letters, the smallness of the letters composed of circles and loops, and the particular formation ‘of such letters as pi and the clipped omega, are repeated. But the approach also of many of the letters to the lapidary capital forms, like those in the papyrus of Timotheus, is to be remarked, such as the precisely shaped alpha, and the epsilon in many instances made square with a long head-stroke. This mixture of forms seems to indicate an advance in the development of the book-hand of the 3rd century B.C., as contrasted with the archaic style of the older Timotheus.

Of the 2nd century b.c. there are extant only two papyri of literary works written in the formal book-hand, and both are now preserved in the Louvre. The one, a dialectical treatise containing quotations from classical authors, has long been known. The other is the oration of Hypereides against Atheno- genes, which is an acquisition of comparatively recent date. The dialectical treatise must belong to the first half of the century, as there is on the verso side of the papyrus writing subsequently added in the year 160 B.C. The period of the Hypereides cannot be so closely defined; but the existence on the verso of later demotic writing, said to be of the Ptolemaic time, affords a limit, and the MS. has been accordingly placed in the second half of the century. While the writing of the earlier papyrus is of a light and rather sloping character, that of the Hypereides is firm and square and upright.

Passing to the 1st century B.C., the papyri which have been recovered from the ashes of Herculaneum come into account.

Many of them, the texts of which are of a philosophical nature, are written in literary hands, and are conjectured to have possibly formed part of the library of their author, the philo- sopher Philodemus; they are therefore placed about the middle of the century. To the same time are assigned the remains pf a roll containing the oration of

Hypereides against Philippides and the third Epistle of Demosthenes (Brit. Mus. papp. cxxxiii., csxxiv.). But the most important addition to the period is the handsomely written papyrus containing the poems of Bacchylides (fig. 8), which retains in the forms of the letters much of the character of the Ptolemaic style, although for other reasons -it can hardly be placed earlier than about the middle of the century: —

n>p~t pow • t -trxˆ>f *!•” >GZTrp■<"'fc>ˆ , -” (oˆfixM

Fig. 8. — Bacchylides, 1st century B.C. fceipas avTtivw irpos airyas vnruKeos at\iov racva Svuravoio Xveriras irap(j>povos e&yayttv dvau 8e rot. ukogi /3ous af iryas oivLKoTpvxWi)

With the latter half of the 1st century B.C. we quit the Ptolemaic period and pass to the consideration of the literary papyri of the Roman period; and it is especially in this latter period that our extended knowledge, acquired from recent discoveries, has led to the modification of views formerly held with regard to the dates to be attributed to certain important literary MSS. As in the case of non-literary documents, the literary writing of the Roman period differs from that of the Ptolemaic in adopting rounded forms and greater uniformity in the size of the letters.

Just on the threshold of the Roman period, near the end of the 1st century B.C., stands a fragmentary papyrus of the last two books of the Iliad, now in the British Museum (pap. cxxviii.), which is of sufficient extent to be noted. Then, emerging on the Christian era, we come upon a fine surviving specimen of literary writing, which we have satisfactory reason for placing near the beginning of the 1st century. It is a fragment of the third book of the Odyssey (fig. 9), the writing of which closely resembles that of an official document (Brit. Mus. pap. cccliv.) which happens to be written in a formal literary hand, and which from internal evidence can be dated within a few years of the close of theist century B.C. There can be no hesitation, there- fore, in grouping the Odyssey with that document. The contrast between the round Roman style and the stiff and firm Ptolemaic hands is here well shown in the facsimiles from this papyrus (fig. 9) and the Phaedo and Bacchylides: —

m iA.ec exxoi Arem xcajlaxoh

XCˆX\ Y 4 Af-A UT3JT) WTeci N A

ickpnAAiuojcˆˆe yXxm y

AN ˆerYNH TXDll tl-ClTO w K kx

Gratis \ a eh.o y c r Xf r? e e xn K ap

€C Xi CICA.I UN

Fig. g. — The Odyssey, beginning of 1st century.

(iraiSes efioi aye TˆXe/uaxw —

£eu£a0 v apuar (ryoires iva —

ws ead 01 8 apa rov /uaXa /US'— –

xapiraXtpxos 5 ef eu£cw v

av 8e ywri rafieq airov /ecu —

apa re

av 8 apa rrjXe/xaxos irepi/caX —

irap 8 apa vtaropi&iji ireiaur

es 8ipov 8 avtflaivt kol rjv — In a similar style of writing are two fragments of Hesiodic poems recently published, with facsimiles, in the Sitzungsberichte (1900, p. 839) of the Berlin Academy. The earliest of the two, now at Strassburg, may be assigned to the first half of the 1st century; the other, at Berlin, appears to be of the 2nd century.

At this point two MSS. come into the series, in regard to which there is now held to be reason for revising views formerly entertained. The papyrus known as the Harris Homer (Brit. Mus. pap. cvii.), containing portions of the eighteenth book of the Iliad, which was formerly placed in the 1st century B.C., it is thought should be now brought down to a later date, and should be rather assigned to the 1st century of the Christian era. The great papyrus, too, of Hypereides, containing his orations against Demosthenes and for Lycophron and Euxenip- pus, which has been commonly placed also in the 1st century B.C., and by some even earlier, is now adjudged to belong to the latter part of the 1st century a.d.

Within the 1st century also is placed a papyrus of great literary interest, containing the mimes of the Alexandrian writer Herodas, which was discovered a few years ago and is now in the British Museum. The writing of this MS. differs from the usual type of literary hand, being a rough and ill- formed uncial, inscribed on narrow, and

therefore inexpensive, papyrus; and if the roll were written for the market, it was a cheap copy, if indeed it was not made for private use. Of the same period is a papyrus of Isocrates, De pace (Brit. Mus. pap. exxxii.), written in two hands, the one more clerical than the other; arid two papyri of Homer, Iliad, iii.-iv. (Brit. Mus. pap. exxxvi.), and Iliad, xiii.-xiv. (Brit. Mus. pap. deexxxii.), the first in a rough uneducated hand, but the latter a fine specimen of uncial writing. To about this period also is the Oxyrhynchus Pindar to be attributed, that is to the close of the 1st or beginning of the 2nd century. Then follows another famous papyrus, the Bankes Homer, containing the last book of the Iliad, which belongs to the 2nd century and is also written in a careful style of uncial writing. To these is'to be added the beautiful papyrus at Berlin, containing a commentary on the Theaetetus of Plato, written in delicately formed uncials of excellent type of the 2nd century; and of the same age is the Panegyricus of Isocrates from Oxyrhynchus, in a round uncial hand. Three important papyri of the Iliad, written in large round uncials, of the 2nd century, are noticed below.

With regard to the later literary works on papyrus that have been recovered, the period which they occupy is somewhat uncertain. The following are, however, placed in the 3rd century, during which a sloping literary hand seems to have been developed, curiously anticipating a similar change which took place in the course of development of the uncial writing of the vellum MSS., the upright hand of the 4th to 6th centuries being followed by a sloping hand in the 7th and 8th centuries: a MS., now in the British Museum, of portions of bks. ii.-iv. of the Iliad, written on eighteen leaves of papyrus, put together in book-form, but inscribed on only one side; on the verso of some of the leaves is a short grammatical treatise attributed to Tryphon: portion of Iliad v., among the Oxyrhynchus papyri (No. cexxiii.): a fragment of Plato's Laws (Ox. pap. xxiii.): a papyrus of Isocrates, in Nicockm, now at Marseilles: a frag- ment of Ezekiel, in book-form, in the Bodleian Library: a fragment of the " Shepherd " of Hermas at Berlin: and a fragment of Julius Africanus, the Hellenica of Theopompus or Cratippus, and the Symposium of Plato, all found at Oxyrhynchus.

Of the 3rd century also are some fragments which are palaeo-

graphically of interest, as they are written neither in the recognized literary hand nor in simple cursive, but in cursive characters moulded and adapted in a set form for literary use — thus anticipating the early stages of the development of the minuscule book-hand of the 9th century from the cursive writing of that time.

With the 3rd century the literary hand on papyrus appears to lose most of its importance. We are within measurable distance of the age of vellum, and of the formal uncial writing of the vellum MSS. which is found in some existing examples of the 4th century and in more abundant numbers of the 5th century. We have now to see how the connexion can be estab- lished between the literary handwriting of the papyri and the firmer and heavier literary uncial writing of the vellum codices. The literary hands on papyrus which have been reviewed above are distinctly of the style inscribed with a light touch most suitable to the comparatively frail material of papyrus. In the Bankes Homer, however, one may detect some indication of the fullness that characterizes the vellum uncial writing. But it now appears that a larger and rounder hand was also employed on papyrus at least as early as the 1st century. In proof of this we are able to cite a non-literary document (fig. 10) bearing an actual date, which happens to be written in characters that, exclusive of certain Jess formally-made letters, are of a large uncial literary type. This writing, though not actually of the finished style familiar to us in the early vellum MSS., yet resembles it so generally that it may be assumed, almost as a certainty, that there was in the 1st century a full literary uncial hand formed on this pattern, which was the direct ancestor of the vellum uncial. The tendency to employ at this period a calligraphic style, as seen in the fragments, of the Odyssey and one of the Hesiodic poems mentioned above, supports this assumption. The document now referred to is a deed of sale written in the seventh year of Domitian, a.d. 88 (Brit. Mus. pap. cxli.). The letters still retaining a cursive element are alpha, upsilon, and in some instances epsilon.

£ m rTTOAeM

sjcoi <

xroTn e6secoc oocercu

eTerii nrˆ.cp ji m ATTOTttc

TTorTTee-e« (ˆaaicom

Fig. 10.— Deed of Sale, a.d. 88.

(— ev irroXejucuSi evepye — — £ui:i km ij tovtov yvv —

V TOV TidetlK 0 > S «TW—

—ereKvypafyriv oko ttjs —

— avrov wedea e\auav —) As evidence in support of this view that the uncial hand of the vellum MSS. is to be traced back to the period of the document just quoted, we have the important papyrus found by Mr Flinders Petrie at Hawara in Egypt, and now in the Bodleian Library, which contains a portion of the second book of the Iliad. The writing is of the large uncial type under consideration; and there is now full reason for assigning it to the 2nd century at latest. Before the discovery of the document of the year 88 there was nothing to give a clue to the real period of the Homer; and now the date which has been suggested is corroborated by a fragment of papyrus from Oxyrhynchus inscribed with some lines from the same book of the Iliad (fig. 11) in the same large uncial type (Ox. Pap. vol. i. no. 20, pi. v.). In this latter instance there can be no question of the early date of the writing as on the verso of the papyrus accounts of the end of the 2nd century or of the beginning of the 3rd century have been subsequently added. Yet a third example of the same character has more recently been found at Tebtunis (Tebt. Pap. vol. ii. no. 265,

pi. i.): again a considerable fragment of the second book of the Iliad.
: < »i

Thus, then, in the 1st and 2nd centuries there was in use a large uncial hand which was evidently the forerunner of the literary uncial hand of the early vellum codices. It is also to be noted that the literary examples just mentioned are MSS. of Homer; and hence one is tempted to suggest that, as in the production of sumptuous copies on papyrus of a work of such universal popularity and veneration as the Iliad this large and handsome uncial was specially employed, so also the use of a

aw rACDCcxnoAycrrep

OCAKi KPCHJUAlhJeTCDO GlCe CD KOCU.HCAJULGNO

Fig. 11. — The Iliad, 2nd century.

(— asv y\t£(raa ToKvairtp —

— os avqp at\x iveroi o —

— uadca KOGiMjaaiavo —) similar type for the early vellum copies of the sacred text of the Scriptures naturally followed.

Greek Writing. II.— The Vellum Codices Uncial Writing. — It has been shown above how a round uncial hand had been developing in Greek writing on papyrus during the early centuries of the Christian era, and how even as early as the 2nd century a well-formed uncial script was in use, at least for sumptuous copies of so great and popular an author as Homer. We have now to describe the uncial hand as it appears in Greek MSS. written on vellum. This harder and firmer and smoother material afforded to the scribes better scope for a calligraphic style hardly possible on papyrus. With the ascendancy of the vellum codex as the vehicle for literature, the characters received the fixed and settled forms to which the name of uncial is more exactly attached than to the fluctuating letters of the early papyri. The term uncial has been borrowed from the nomenclature of Latin palaeography 1 and applied to Greek writing of the larger type, to distinguish it from the minuscule or smaller character which succeeded it in vellum MSS. of the 9th century. In Latin majuscule writing there exist both capitals and uncials, each class distinct, In Greek MSS. pure capital-letter writing was never employed (except occasionally for ornamental titles at a late time) . As distin- guished from the square capitals of inscriptions, Greek uncial writing has certain rounded letters, as a, e, c, w, modifica- tions in others, and some letters extending above or below the line.

It is not probable that vellum codices were in ordinary use earlier than the 4th century; and it is in codices of thatage that the handsome calligraphic uncial above referred to was developed. A few years ago the 4th century was the earliest limit to which palaeographers had dared to carry back any ancient vellum codex inscribed in uncials. But the recovery of the Homeric papyri written in the large uncials of the 2nd century has led to a revision of former views on the date of one early vellum MS. in particular. This MS. is the fragmentary Homer of the Ambrosian Library at Milan, consisting of some fifty pieces of vellum cut out of the original codex for the sake of the pictures which they contain; and all of the text that has survived is that which happened to be on the back of the pictures. The Ambrosian Homer has hitherto been generally placed in the 5th century, and the difference of the style of the writing from that of the usual calligraphic type of uncial MSS. of that time, which had been remarked, was thought rather to indicate inferiority in age. But the similarity of the character of the writing (taller and more slender than is usual in vellum codices) to that of the large uncials of the papyrus Homers of the 2nd century from Hawara and Oxyrhynchus and Tebtunis is so striking that the 1

St Jerome's often quoted words, " uncialibus, ut vulgo aiunt, litteris " in his preface to the book of Job, have never been explained satisfactorily. Of the character referred to as " uncial " there is no question ; but the derivation of the term is not settled.

Ambrosian Homer must be classed with them. Hence it is now held that that MS. may certainly be as early as the 3rd century. But, as that century was still within the period when papyrus was the general vehicle for Greek literature, it may be asked why that material should not in this instance also have been used. The answer may fairly be ventured that vellum was certainly a better material to receive the illustrative paintings, and on that account was employed. The Ambrosian Homer may therefore be regarded as a most interesting link between the papyrus uncial of the 2nd century and the vellum uncial of the 4th and 5th centuries.

With the introduction, then, of vellum as the general writing material, the uncial characters entered on a new phase. The light touch and delicate forms so characteristic of calligraphy on papyrus gave place to a rounder and stronger hand, in which the contrast of fine hair-lines and thickened down-strokes adds so conspicuously to the beauty of the writing of early MSS. on vellum. And here it may be remarked, with respect to the attribution to particular periods of these early examples, that we are not altogether on firm ground. Internal evidence, such, for example, as the presence of the Eusebian Canons in a MS. of the Gospel, assists us in fixing a limit of age, but when there is no such support the dating of these early MSS. must be more or less conjectural. It is not till the beginning of the 6th century that we meet with an uncial MS. which can be approximately dated ; and, taking this as a standard of comparison, we are enabled to distinguish those which undoubtedly have the appearance of greater age and to arrange them in some sort of chronological order. But these codices are too few in number to afford material in sufficient quantity for training the eye by familiarity with a variety of hands of any one period — the only method which can give entirely trustworthy results.

Among the earliest examples of vellum uncial MSS. are the three famous codices of the Bible. Of these, the most ancient, the Codex Vaticanus, is probably of the 4th century. The writing must, in its

original condition, have been very perfect as a specimen of penmanship; but nearly the whole of the text has been traced over by a later hand, perhaps in the 10th or nth century, and only such words or letters as were rejected as readings have been left untouched. Written in triple columns, in letters of uniform size, without enlarged initial letters to mark even the beginnings of books, the MS. has all the simplicity of extreme antiquity {Pal. Soc. pi. 104). The Codex Sinaiticus {Pal. Soc. pi. 105) has also the same marks of age, and is judged by its discoverer, Tischendorf, to be even more ancient than the Vatican MS. In this, however, a comparison of the writing of the two MSS. leads to the conclusion that he was mistaken. The writing of the Codex Sinaiticus is not so pure as that of the other MS., and, if that is a criterion of age, the Vatican MS. holds the first place. In one particular the Codex Sinaiticus has been thought to approach in form to its possible archetype on papyrus. It is written with four columns to a page, the open book thus presenting eight columns in sequence, and recalling the long line of columns on an open roll. With regard to such general outward resemblances between the later papyrus literary rolls and the early vellum uncial MSS., we may cite such papyri as the Berlin commentary on the Theaeletus of Plato of the 2nd century and the Oxyrhynchus fragment of Julius Africanus of the 3rd century as forerunners of the style in which the two great codices here mentioned were cast.

The Codex Alexandrinus (fig. 12) is placed in the middle of the 5th century. Here we have an advance on the style of the other two codices. The MS. is written in double columns only, and enlarged letters stand at the beginning of paragraphs. But yet the writing is generally more elegant than that of the Codex Sinaiticus. Examining these MSS. with a view to ascertain the rules which guided the scribes in their work, we find simplicity and regularity the leading features; the round letters formed in symmetrical curves; t and C, &c, finishing off in a hair-line sometimes thickened at the end into a dot; horizontal strokes fine, those of 6 , H, and being either in the middle or high in the letter; the base of A and the cross-stroke

of II also fine, and, as a rule, kept within the limits of the letters and not projecting beyond. Here also may be noticed the occurrence in the Codex Alexandrinus of Coptic forms of letters {e.g. ˆ/JJULj

TeKNUJNCOYTrerrrrxTtJYM

TAceMxvHeeuKxevuceˆii > »-• NexKROMeNxnoTovni-c

Fig. 12. — The Bible (Cod. Alex.), 5th century.

{t&cvuv aov xepiirttTow

ras a > aXi)dfia notices evro

\r\v eXafiofiev wko rov 7r[ar]p[o]s). — 2 John 4.

To the 5th century may also belong the palimpsest MS. of the Bible, known from the upper text as the Codex Ephraemi, at Paris (ed. Tischendorf, 1845), and the Octateueh (Codex Sarravianus), whose extant leaves are divided between Paris, Leiden and St Petersburg — both of which MSS. are probably of Egyptian origin. Perhaps of the end of the 5th or beginning of the 6th century is the illustrated Genesis of the Cottonian Library, now unfortunately reduced to fragments by fire, but once the finest example of its kind {Cat. Anc. MSS. i. pi. 8). And to about the same time belong the Dio Cassius of the Vatican (Silvestre, pi. 60) and the Pentateuch of the Bibliothdque Nationale (ibid. pi. 61).

In the writing of uncial MSS. of the 6th century there is a marked degeneration. The letters, though still round, are generally of a larger character, more heavily formed, and not so compactly written as in the preceding century. Horizontal strokes {e.g. in A, II, T) are lengthened and finished off with heavy points or finials. The earliest example of this period which has to be noticed is the Dioscorides- of Vienna (fig. 13), which is of particular value for the study of the palaeography of early vellum MSS. It is the first uncial example to which an approximate date can be given. There is good evidence to show that it was written early in the 6th century for Juliana Anicia, daughter of Flavius Anicius Olybrius, emperor of the West in 472. Here we already notice^ the characteristics of uncial writings of the 6th century, to which reference has been

iXTTpOMHKHVPOJMXTi

YTCDHGNTeTMHm

TrAeoyAjiTHXH KM. ^

eXONTAITOAXACe^”

eMTarrrepK^epei

Fig. 13. — Dioscorides, early 6th century.

(— ia irponrjKr) xf M t iaTI –

— [ajurau VTeT/j/qTai

— [xaliradov Surrjicri nai

— exovro. xoXXos e a > [v]

— ev to) TrepKJxpa.) made. To this century also belong the palimpsest Homer under a Syriac text in the British Museum {Cat. Anc. MSS., i. pi. 9) ; its companion volume, used by the same Syrian scribe, in which are fragments of St Luke's Gospel (ibid., pi. 10); the Dublin palimpsest fragments of St Matthew and Isaiah (T. K. Abbot, Par Palimpsest, Dubl.), written in Egypt; the fragments of the Pauline Epistles from Mount Athos, some of which are at Paris and others at Moscow (Silvestre, pis. 63, 64; Sabas, pi. A), of which, however, the writing has been disfigured by retracing at a later period; the Gospels (Cod. N) written in silver and gold on purple vellum, whose leaves are scattered in London (Cott. MS., Titus C. xv.), Rome, Vienna, St Petersburg, and its native home, Patmos; the fragmentary Eusebian Canons written on gilt vellum and highly ornamented, theˆsole remains

of some sumptuous volume (Cat. Anc. MSS. i. pi. 11); the Coislin Octateuch (Silvestre, pi. 65); the Genesis of Vienna, (ind the Codex Rossanensis, and the recently recovered Codex Sinopensis of the Gospels, instances of the very few early illustrated MSS. which have survived. Of the same period is the Codex Marchalianus of the Prophets, which, written in Egypt, follows in its style the Coptic form of uncial.

Reference may here be made to certain early bilingual Graeco + Latin uncial MSS., written in the 6th and 7th centuries, which, however, have rather to be studied apart, or in connexion with Latin palaeography; for the Greek letters of these MSS. run more or less upon the lines of the Latin forms. The best known of these examples are the Codex-Bezae of the New Testament, at Cambridge (Pal. Soc. pis. 14, 15), and the Codex Claromontanus of the Pauline Epistles, at Paris (Pal. Soc. pis. 63, 64), attributed to the 6th or 7th century; and the Laudian MS. of the Acts of the Apostles (Pal. Soc. pi. 80) of the 7th century. To these may be added the Harleian Glossary (Cat. Anc. MSS. i. pi. 'tjj); also of the 7th century. A later example, of the 8th century,

is the Graeco-Latin Psalter, at Paris, MS. Coislin 186 (Omdrit, Foes, des plus anciens MSS. grecs, pi. vii.).

An offshoot of early Greek uncial writing on vellum is seen in the Moeso-Gothic alphabet which Ulfilas constructed for the use of his ; countrymeti in the 4th century, mainly from the Greek letters. Of the few extant remains of Gothic MSS. the oldest and most perfect is the Codex Argenteus of the Gospels, at Upsala, of the 6th century (Pal. Soc. pi. 118), written in characters which compare with purely written Greek MSS. of the same period. Other Gothic fragments appear in the sloping uncial hand seen in Greek MSS. of the 7th and following centuries.

About the year 6co Greek uncial writing passes into a new stage. We leave the period of the round and enter on that of the oval character. The letters t , 0, 0> 0> instead of being symmetrically formed on the lines of a circle, are made oval; and other letters are laterally compressed into a narrow shape. In the 7th century also the writing begins to slope to the right, and accents are introduced and afterwards systematically applied. This slanting style of uncials continues in use through the 8th and gth and into the 10th centuries, becoming heavier as time goes on. In this class of writing there is again the same dearth of dated MSS. as in the round uncial, to serve as standards for the assignment of dates. We have to reach the 9th century before finding a single dated MS. in this kind of writing. It is true that sloping Greek uncial writing is found in a few scattered notes and glosses in Syriac MSS. which bear actual dates in the 7th century, and they are so far useful as showing that this hand was firmly established at that time; but they do not afford sufficient material in quantity to be of really practical use for comparison (see the tables of alphabets in Gardthausen's Griech. Palaog.). Of more value are a few palimpsest fragments of the Elements of Euclid and of Gospel Lectionaries which occur also in the Syriac collection in the British Museum, and are written in the 7th and 8th centuries. There is also in the Vatican a MS. (Reg. 886) of the Theodosian code, which can be assigned with fair accuracy to the close of the 7th century (Gardth. Gr. Pal. p. 158), which, however, being calligraphically written, retains some of the earlier rounder forms. This MS. may be taken as an example of transitional style. In the fragment of a mathematical treatise (fig. 14) from Bobio, form- ing part of a MS. rewritten in the 8th century and assignable to the previous century, the slanting writing is fully developed. The formation of the letters is good, and conveys the impression that the scribe was writing a hand quite natural to him : —

n f 0C T)ka t'Tt wp Ay tfyx*/* f c T(f

Fig. 14. — Matheniat. Treatise, 7th century.

(irpwrlov] n[ev] y[ap] tclvtIos] arepeov (Txtnlaros] xpos rt nertupov ei > x«P«Tep —)

It should be also noticed that in this MS. — a secular one —

there are numerous abbreviations (Wattenbach, Script, gr. specim. tab. 8). An important document of this time is also the fragment of papyrus in the Imperial Library at Vienna, which bears the signatures of bishops and others to the acts of the Council of Constantinople of 680. Some of the signatures are in slanting uncials (Wattenb., Script, gr. specim., tabb. 12, 13; Gardth., Gr. Pal. tab. 1). Of the 8th century is the collection of hymns (Brit. Mus., Add. MS. 26, 113) written without breathings or accents (Cat. Anc. MSS. i. pi. 14). To the same century belongs the Codex Marcianus, the Venetian MS. of the Old Testament, which is marked with breathings and accents. The plate reproduced from this MS. (Wattenb., Script, gr. specim., tab. 9) contains in the second column a few lines written in round uncials, but in such a laboured style that nothing could more clearly prove the discontinuance of that form of writing as an ordinary hand. In the middle of the 9th century at length we find a MS. with a date in the Psalter of Bishop Uspensky of the year 862 (Wattenb. Script, gr. specim., tab. 10). A little later in date is the MS. of Gregory of Nazianzus, written between 867 and 886 (Silvestre, pi. 71); and at the end, of the 9th or beginning of the 10th century stands a lectionary in the Harleian collection (Cat. Anc. MSS. i. pi. 17). A valuable series of examples is also given by Omont (Facsimiles des plus anc. MSS. grecs. de la Bibl. Nat.). But by this time minuscule writing was well established, and the use of the more inconvenient uncial was henceforth almost entirely confined to church-service books. Owing to this limitation uncial writing now underwent a further calligraphic change. As the 10th century advances the sloping characters by degrees became more upright, and with this resumption of their old position they begin in the next century to cast off the compressed formation and again become rounder. All this is simply the result of calligraphic imitation. Bibles and service-books have always been the MSS. in particular on which finely formed writing has been lavished; and it was but natural that, when a style of writing fell into general disuse, its continuance, where it did continue, should become more and more traditional, and a work of copying rather than of writing. In the 10th century there are a few examples bearing dates. There are facsimiles from three of them, viz. a copy of the Gospels (fig. 15), in the Vatican, of 949 (New Pal. Soc. pi. 105), the Curzon Lectionary of 980, and the Harleian Lectionary of 995 (Pal. Soc. pis. 154, 26, 27).

The Bodleian commentary on the Psalter (D. 4, 1) is likewise of great palaeo- graphic value, being written partly in uncials and partly in minuscules of the middle of the 10th century (Gardth., Gr. Pal. p. 159, tab. 2, col. 4). This late form of uncial writing appears to have lasted to about the middle of the 1 2th century. (Omont. Facs. pi. xxii.). From it was formed the Slavonic writing in use at the present day: —

—» * v

y

Fig. 15. — The Gospels (Vatican), a.d. 949. (Xeywv + K.[vpi]t iav Bektjs' dvvaaal /ue Kada pLcrat. + Kal hurdvas Tt)v x e V < *' rpparo olvtov 6 l[i]o-ov]s Xtycav) Under the head of late uncial writing must be classed a few bilingual Graeco-Latin MSS. which have survived, written in a

bastard kind of uncial in the west of Europe. This writing follows, wherever the shapes of the letters permit, the formation of corresponding Latin characters— the purely Greek forms being imitated in a clumsy fashion. Such MSS. are the Codex Augiensis of Trinity College, Cambridge, of the end of the 9th century {Pal. Soc. pi. 127) and the Psalter of St Nicholas of Cusa (pi. 128) and the Codex. Sangallensis and Boernerianus of the 10th century (pi. 179). The same imitative characters are used in quotations of Greek words in Latin MSS. of the same periods.

Minuscule Writing.— The beautifully formed minuscule book- hand, which practically superseded the uncial book-hand in the 9th century, did not spring into existence all at once. Its formation had been the work of centuries. It was the direct descendant of the cursive Greek writing of the papyri. It has been shown above, in tracing the progress of the non-literary, cursive writing on papyrus, how the original forms of the letters of the Greek alphabet went through various modifications, always tending towards the creation of the forms which eventu- ally settled down into the recognized minuscules or small letters of the middle ages and modern times. The development of these modifications is apparent from the first; but it was in the Byzan- tine period especially that the changes became more marked and more rapid. All the minuscule forms, as we know them in medieval

literature, had been practically evolved by the end of the 5th century, and in the course of the next two hundred years those forms became more and more confirmed. In the large formal cursive writing of the documents of the 6th and 7th centuries we can pick out the minuscule alphabet in the rough. It only needed to be cast in a calligraphic mould to become the bookJiand minuscule, the later development of which we have now to trace. This calligraphic mould seems to have been found in the imperial chancery, from whence issued documents written in a fine round minuscule hand on an ample scale, as appears from one or two rare surviving ex- amples attributed to the 8th and 9th centuries (see the facsimile of an imperial letter, dated variously a.d. 756 or 839, in Watten- bach, Script, graec. specim., pis. xiv., xv., and in Omont, Facs. des plus anc. MSS. grecs. pis. xxvi., xxvii. ; and Brit. Mus. papyrus xxxii.). The fine hand only needed to be reduced in scale to become the caligraphic minuscule book-hand of the vellum MSS.

Thus, then, in the 9th century, the minuscule book-hand cameinto general use for literature, and, with the finely prepared vellum of the time ready to receive it, it assumed under the pens of expert calligraphers the requisite cast, upright, regular and symmetrical, which renders it in its earliest stages one of the most beautiful forms of writing ever created.

Greek MSS. written in minuscules have been classed as follow : (1) codices vetustissimi, of the 9th century and to the middle of the 10th century; (2) vetusti, from the middle of . the 10th to the middle of the 1.3th century; (3) recentiores, from the middle of the 13th century to the fall of Constantinople, 1453; (4) novelli, all after that date.

Of dated minuscule MSS. there is a not inconsiderable number scattered among the different libraries of Europe. Gardthausen (Gr. Pal. 344 seq.) gives a list of some thousand, ending at a.d. 1500. But, as might be expected, the majority belong to the later classes. 1 Of the 9th century there are not ten which actually bear dates and of these all but one belong to the latter- half of the century. In the 10th century, however, the number rises to nearly fifty, in the nth to more than a hundred.

In the period of codices vetustissimi the minuscule hand is distinguished by its simplicity and purity. The period has been well described as the classic age of minuscules. The letters are symmetrically formed; the writing is compact and upright, or has even a slight tendency to slope to the left. In a word, the beauty of this class of minuscule writing is unsurpassed. But in addition to these

general characteristics there are special

1 In Omont's Facs. des MSS. grecs datSs de la Bibl. Nat. will be found a useful list of upwards of 300 facsimiles of dated Greek MSS. (including uncials).

distinctions which belong to it. The minuscule character is maintained intact, without intrusion of larger or uncial-formed letters. With its cessation as the ordinary literary hand the uncial character had not died out. We have seen that it was still used for liturgical books. It likewise continued to survive in a modified or half-uncial form for scholia, rubrics, titles, and special purposes — as, for : example, in the Bodleian Euclid (fig. 16) — in minuscule written MSS. of the 9th and 10th centuries. These uses of the older character sufficed to keep it in remem- brance, and it is therefore not a matter for surprise that some of its forms should reappear and commingle with the simple minuscule. This afterwards actually took place. But in the period now under consideration, when the minuscule had been cast into a new mould, and was, so to say, in the full vigour of youth, extraneous forms were rigorously excluded.

«lrtcr»'TT»y JvlN'CT VTpi Y"°*y »H ^"H

*T< >-» Ol\AN t TV * CD trˆ-WTOJcrˆ-pˆ-AJTir' Tˆarare tod p ˆp Ky_fry a»|i "Ttrp t 0-ˆ0ˆ1″

f*M

iAˆ

TvyAAa-y o jrn*j . nxrpo o-*ˆ

Fig. 16.— Euclid (Oxford), a.d. 888,

(caroTwv OMN STT rpcyoivuv em— deroC 'iao vipV °P< * ta ti to. xptOMN STT" S)o-Te[ai]raffT{peai to. diro twv upyjfiivuv 7rpicr/ j&T[«j'] — va. iarovipri Tvyx

The breathings also of this class are rectangular, in unison with the careful and deliberate character of the writing; and there is but slight, if any, separation of the words. In addition, as far as has hitherto been observed, the letters run above, or stand upon, the ruled lines, and do not depend from them as at a later period. The exact time at which this latter mechanical change took place cannot be named; like other changes it would natur- ally establish itself by usage. But at least in

the middle of the 10th century it seems to have been in use. In the Bodleian MS. of Basil's homilies of 953 a.d. (Pal. Soc. pi. 82) the new method is followed; and if we are to accept the date of the 9th century ascribed to a MS. in the Ambrosian Library at Milan (Wattenb., Script, gr. specim., tab. 17), in which the ruled lines run above the writing, the practice was yet earlier. Certain scribal peculiarities, however, about the MS. make us hesitate to place it so early. In the Laurentian Herodotus (W and V., Exempla, tab. 31), which belongs to the 10th century, sometimes the one, sometimes the other system is followed in different parts of the volume; and the same peculiarity happens in the MS. of Gregory of Nazianzus of a.d. 972 in the British Museum (Pal. Soc.pl. 2.5; Exempla, tab. 7). The second half of the 10th century therefore appears to be a period of transition in this respect.

The earliest dated example of codices vetustissimi is the copy of the Gospels belonging to Bishop Uspensky, written in the year 835. A facsimile is given by Gardthausen (Beitrage) and repeated in the Exempla (tab. 1). Better specimens have been photographed from the Oxford Euclid of a.d. 888 (Pal. Soc. pis. 65, 66; Exempla, tab. 2) from a MS. of Saints' Lives at Paris of a.d. 890 (Omont, Facs. des MSS. gr. dates, pi. 1), and from the Oxford Plato (fig. 17) of a.d. 895 (Pal. Soc. pi. 81; Exempla, tab. 3). Sabas (Specim. Palaeography, has also given two facsimiles from MSS. of 880 and 899.

Of dated examples of the first half of the 10th century about a dozen facsimiles are available.

After the middle of the 10th century we enter on the period of the codices vetusti, in which the writing becomes gradually

less compact. The letters, so to say, open their ranks; and, from this circumstance alone, MSS. of the second half of the century may generally be distinguished from those fifty years earlier. But alterations also take place in the shapes of the letters. Side by side with the purely minuscule forms those of the uncial begin to reappear, the cause of which innovation has already been explained. These uncial forms first show

ltrukrrˆ*ji- 6c*fi pKao ituxnnu \i ouuVvi e»crBDLt&6xufr(ix»rr6pop: rm*jJUp£}latu>: "p etc &ta erf .to >%*u f> cfp wtpxi 3 •« 6 io"*

ˆ (lie TttTrroO . QtUxtlTD 6 p o p cr ptuUTo

Fig. 17.— Plato (Oxford), a. D. 895.

(— f/^X]Xe« irapa <£iX^8ou hkxtodai vvvl.

— [afi4>]icfirjTeLV. eav jj.-q aoi Kara vovv fy

— [(TvyKea\ai.](acTuijie6a itcaTepov; ttovv jxav otv:

— [etjcoi (jyijai. t6 xaipeu' iraai. £6iiois. ;

— [6]cra tov y'tvovs karl tovtov wva.' eon fir] TO.VTO.. &XX& rd <{>pov(?v. ko.1 to

— [ra] tovtcov av %vyytvr)' So^av re 60) themselves at the end of the line, the point at which most changes first gained a footing, but by degrees they work back into the text, and at length become recognized members of the minuscule characters. In the nth and 12th centuries they are well established, and become more and more prominent by the large or stilted forms which they assume. The change, however, in the general character of the writing of this class of codices velush is very gradual, uniformity and evenness being well main- tained, especially in church books. On the other hand, a lighter and more cursive kind of minuscule is found contemporaneously in MSS. generally of a secular nature. In this hand many of the classical MSS. of the 10th or nth centuries are written, as the MS. of Aeschylus and Sophocles, the Odyssey and the Apollonius Rhodius of the Laurentian Library at Florence, the Anthologia Palatina of Heidelberg and Paris, the Hippocrates of Venice (Exempla, tabb. 32-36, 38, 40), the Aristophanes of Ravenna (Wattenb., Script, gr. specim., tab. 26), the Strabo of Paris (Omont, Foes, des plus anc. MSS. grecs, pi. 40), a Demos- thenes (fig. 18) at Florence (Pal. Soc. ii. pi. 88, 89), &c. In a facsimile from a Plutarch at Venice (Exempla, tab. 44), the scribe is seen to change from the formal to the more cursive hand. This style of writing is distinguishable by its light and graceful character from the current writing into which the minuscule degenerated at a later time. .

» /. ,1 .' –

Fig. 18.— Demosthenes (Florence), early nth century. (avtXeiv Set \erfbvru>v r'iv&v W[k\av] — 7rp6x«pos X670S. ojs apa. ko.1 Trap' — X'ayada tlpyaapiivoi rwh. ovS[evds] — X'd707njr& einypafifiaTOi kv — rovd' vftiv bvayvcixrerai. t6 'fKl[ypafiixa\ — rdv \6yov u> &v5pts adrjvaioi.)

The gradual rounding of the rectangular breathings takes place in this period. In the nth century the smooth breathing, which would most readily lend itself to this modification, first appears in the new form. In the course of the 12th century both breathings have lost the old square shape; and about the same time contractions become more numerous, having been at first confined to the end of the line.

When the period of codices recentiores commences, the Greek

U.*AV4»0TUP . . _ ....

js V

Fig. 19.— The Odyssey, 13th century. Vq a\vas otl Ipov ivUriaas rdv 0X177771/ wj apa (JMV-riaas ivbnov TTpos yovva KaOeˆero 5oi;Xix«?os) minuscule hand undergoes extensive changes. , The contrast between MSS. of the 13th century and those of a hundred years earlier is very marked. In the later examples the hand is generally more straggling,. there is a greater number of exaggerated forms of letters, and marks of contraction and accents are dashed on more freely. There is altogether a sense of greater activity and haste. The increasing demand for books created a larger supply. Greater freedom and more variety appear in the examples of this class, together with an increasing use of liga- tures and contractions. The general introduction of paper likewise assisted to break up the formal minuscule hand. To this rougher material a rougher style of writing was suited. Through the 14th and 15th centuries the decline of the set minuscule rapidly advances. The writing becomes even more involved and intricate, marks of contraction and accents are combined with the letters in a single action of the pen, and the general result is the production of a thoroughly cursive hand. In some respects, however, the change was not so rapid. Church books were still ordinarily written on vellum, which, as it became scarcer in the market (owing to the injury done to the trade by the competition of paper), was supplied from ancient codices which lay ready to hand on the shelves of libraries; and in these liturgical MSS. the more formal style of the minuscule was still maintained. In the 14th century there even appears a partial renaissance in the writing of Church MSS., modelled to some extent on the lines of the writing of the 12th century. The resemblance, however, is only superficial; for no writer can entirely disguise the character of the writing of his own time. And lastly there was yet another check upon the absolute disintegration of the minuscule book-hand in the 15th century exercised by the professional scribes who worked in Italy, and who in their calligraphical productions reverted again to the older style. The influence of the

Renaissance is evident in many of the MSS. of the Italian Greeks, which served as models for the first Greek printing types.

The Greek minuscule book-hand had, then, by the end of the 15th century, become a cursive hand, from which the modern current hand is directly derived. We last saw the ancient cursive in use in the documents prior to the formation of the set minuscule book-hand, and no doubt it continued in use concur- rently with the book-hand. But, as the latter passed through the transformations which have been traced, and gradually assumed a more current style, it may not unreasonably be sup- posed that it absorbed the cursive hand of the period, and with it whatever elements may have survived of the old cursive hand.

Latin Writing. I.— The Roman Cursive The course of Latin palaeography runs on the same lines as that of Greek palaeography. In regard to the former, as in regard to the latter, the documents fall into two main divisions: those which are written in the ordinary cursive hand of everyday life, and those which are written in the formal book-hand of literature. But Latin palaeography covers a wider ground than Greek. Greek writing being limited to the expression of the one

language of a single people has a comparatively narrow and simple career. On the other hand, the Latin alphabet, having been adopted by the nations of western Europe, underwent many transformations in the course of development of the national handwritings of the different peoples, and consequently had a wide and varied career. But in one respect Latin palaeography is at a disadvantage as compared with the sister branch. As we have seen, Greek documents are extant dating back to the 4th century B.C., and the development of Greek writing can be fairly well illustrated by a series of examples of the succeeding centuries. There is no such series of Latin documents available to afford us the means of tracing the growth of Latin Writing to the same remote period. No Latin document, either of a literary or of a non-literary character, has yet been recovered which can be placed with certainty earlier than the Christian era. Egypt, while giving up hundreds and thousands of docu- ments in Greek, has hitherto yielded but little in Latin, even of the 1st century, and little too of the next following centuries. Indeed, for our knowledge of Latin

writing of the 1st century we still have to depend chiefly upon the results of excavations at Pompeii and Herculaneum and in the Roman catacombs, upon the wall-scribblings which have been laid bare, and upon the waxen tablets and the few papyri which have thence been recovered.

At the time when we come into touch with the first extant examples of Roman writing, we find a few instances of a literary or book-hand as well as a fairly extensive variety of cursive hands. It will be convenient in the first place to examine the Roman cursive writing during the early centuries of our era. Then, for the moment suspending further research in this branch of our subject, we shall proceed to describe the literary script and to trace the development of the large form of book-hand, or majus- cule writing, in its two divisions of capitals and uncials, and of the intermediate styles composed of a mixture of large and small letters, or consisting of a blend of the two classes of letters which has received the name" of half-uncial. Then we shall turn to follow the development of the national hands, when it will be necessary to come into touch again with the Roman cursive, whence the western continental scripts were derived; and so we shall proceed to the formation of the minuscule writing of the middle ages.

The materials for the study of the early Roman cursive hand have been found in the wall-scribblings, or graffiti, of Pompeii and Herculaneum and Rome (collected in the Corp. inscr. lat. vol. iv.); in the series of 127 libelli or waxen tablets, con- sisting of perscripiiones and other deeds connected with sales by auction and tax receipts discovered in the house of the banker L. Caecilius Jucundus at Pompeii, and bearing dates of a.d. 15, 27, and 53-62 (published in C.I.L. iv., supplement); in a few scattered papyri from Egypt; and in a set of four-and- twenty waxen tablets bearing dates ranging from a.d. 131 to 167, which were found in ancient mining works in the neigh- bourhood of Alburnus Major (the modern Verespatak) in Dacia (C. /. L. iii.).

It will have been observed that in the case of the above documents there are three different kinds of material on which they have been inscribed: the plaster surface of walls, the waxen coatings of tablets, and the smooth surface of papyrus. The two former may be classed together as being of a nature which would offer a certain resistance to the free movement of the stilus; while in the case of papyrus the writing-reed or pen would run without impediment. Hence, in writing on the former materials there was a natural tendency to form the letters in disconnected strokes, to make them upright or even inclined

to the left, and to employ vertical strokes in preference. The three following specimens from the graffiti and the two sets of tablets will demonstrate the conservative character of this kind of writing, covering as they do about a century and a half. This conservativeness may suggest the probability that the hand seen in the graffiti and the Pompeian tablets had not changed very materially from that practised a century or more earlier, and that it is practically the hand in which the Roman classical

writers composed their works. When examining the alphabet of this early Roman cursive hand, we find (as we found in' the early Greek cursive) the first beginnings of the minuscule writing of the middle ages. The slurring of the strokes, whereby the bows of the capital letters were lost and their more exact forms

LU.4

•\Y\e

Fig. 20.— -Wall inscription, ist century.

■• . (cehsio est nam. noster .,'■,.

magna Habet pecuni [am]).

Fig. 21. — Pompeian Tablet, a.d. 59.

(quinquaginta nummos nurhmo libellas quinque ex reliquis ob f ullonica . . . anni L. Verarii Hupsaei et Albuci Justi d.v.i.d. solut.)

Fig. 22.— Dacian Tablet, A.d. 167.

(descriptum et recognitum factum ex Iibello — erat Alb[urno] maipri ad statione Resculi in quo sol- id quod i[nfraˆ s[criptum] est)

modified, led the way to the gradual development of the small letters. With regard to the particular forms of letters employed in the waxen tablets, compare the tables in Corp. inscr, lat:, vols, iii., iv. The letter A is formed by a main stroke supporting an oblique stroke above it and the cross bar is either omitted; or is indicated by a small vertical stroke dropping, as it were, out of the letter.

The main stroke of B dwindles to a slight curve, and the two bows are transformed into a long bent stroke so that the letter takes the shape of a stilted a or of a d. The D is chiefly likethe uncial 6; the E is generally represented by the old form || found in inscriptions and in

the Faliscan alphabet. In the modified form of G the first outline of the fiat-headed g of later times appears; H, by losing half of its second upright limb in trie haste of writing, comes near to being the small h. In the Pompeian tablets M has the four-stroke : form |]||. as in the graffiti? in the Dacian tablets it is a rustic capital, sometimes almost an uncial “• The hastily written is formed by two stroke’s both convex, almost like a. As to the general character of the writing, it is close and compressed, and has an inclination to the left. There is also much combination or linking together, of letters {Corp. inscr. lat. iii. tab . A) . These peculiarities may, in some measure, be ascribed to the material and, to the confined space at the command of the writer. The same character of, cursive writing has also been found on a few tiles and potsherds inscribed with alphabets or short sentences — the exercises of children at school (Corp. inscr. lat. iii. 962).

In writing with the pen upon the smooth and unresisting surface of papyrus, the scribe would naturally write a more fluent hand. The disjointed writing of the graffiti and the tablets was changed for one which gradually became more consecutive and which naturally tended in course of time to

slope to the right in the effort to be more current and to write letters in connexion without lifting the pen. One of the earliest available examples of Latin writing on papyrus to which an approximate date can be assigned is a fragment at Berlin con- taining portions of speeches delivered in the senate, said to be of the reign of Claudius, a.d. 41-54 (Steffens, Lat: Pal. taf. 101). The writing, though still somewhat restrained and admitting but little linking of the letters, is yet of a more flowing character than that of the contemporary tablets and graffiti.

We have to pass into the second century before finding the most perfect Latin document on papyrus as yet discovered (fig. 23). This is now in the British Museum, and records the

for// 0ˆ4 irˆ, jnxK.\ eˆ~> ˆ Ki \i-\jrCjsri erf o-<-f>-

Fig. 23.— Sale of a slave, a.d. 166.

(— et si quis eum puerum — cerit simplam pecuniam — te dare

stipulatus est Fabul — Julius Priscus id fide sua ■• — C. Julius Antiochus mani —)

purchase of a slave-boy by an officer in the Roman fleet of Misenum stationed on the Syrian coast, a.d. 166 (Pal. Soc. i. 190; Archaeologia liv. p. 433). The writing of the body of the document is in a formal cursive, generally of the same formation as the inscriptions on the Dacian waxen tablets of the 2nd century, as will be seen from the accompanying facsimile of a few lines (fig. 23).

With this example of legal handwriting of the 2nd century it is interesting to compare two specimens of more ordinary cursive in different styles found in private letters of about the same time. The first (fig. 24) is taken from a fragmentary letter of the year 167 (Grenfell and Hunt, Greek Papyri, 2nd series, cviii.) and is a typical example of a hurried style.

Fig. 24. — Letter, a.d. 167.

(Octobrium ad Puluinos ad— interueniente Minucium — et Apuleium nepotem scribaw — nonis Octobris imp. Uero ter —)

The second (fig. 25) is from a letter written by one Aurelius Archelaus to Julius Domitius, tribunus militum, recommending a friend named Theon, of the 2nd century (Oxyrhynchws Papyri, i., xxxii.), an instance apparently of slow and imperfect penman- ship, every letter painfully and separately formed, yet not in the detached strokes characteristic of the writing of the graffiti and the tablets.

In the examples above we recognize practically the same alphabet as in the graffiti and tablets, but with certain excep- tions, particularly in the shape of the letter E, which is either normal or written very cursively as an acute-angled tick, and in the reversion of other letters to the more normal capital forms.

There is not sufficient material to trace step by step the de- velopment of the Roman cursive hand between the 2nd and the 5th centuries; but still, with the few scattered examples at hand, there seems to be reason for conjecture that Latin writing on papyrus passed through phases not very dissimilar to those of Greek writing on the same material. For, when we emerge

from the 3rd century, we find an enlarged flowing hand, as in the Latin translation of the fables of Babrius in a fragmentary papyrus of the Amherst collection (No. xxvi.), ascribed to the 3rd or 4th century, and in a letter of recommendation from an

I,

‘ˆaa rill / r/WV 1 * rcoMM w

Oa iˆa* 1 yaw* / wm

7,/AA TH>fO*Q 1/rAM/TVA

Fig. 25. — Letter, 2nd century.

(Jam tibi et pristine commen daueram Theonem amicum meum et mod[o qu]oque puto domine ut eum ant oculos habeas tanquam me est e nim tales omo ut ametur a te)

Egyptian official of the 4th century, now at Strassburg (Archiv. fur Papyrusforschung, iii. 2. 168); the handwriting of the latter recalling the large style of the Greek cursive of the Byzantine period (fig. 26). That there should be an affinity between the writing of Greek and that of Latin papyri emanating from Egypt is naturally to be expected.

Fig. 26. — Letter of recommendation, 4th century.

(Cum in omnibus bonis benigni[tas] — ■ etiam scholasticos et maxime qui — [hono]rificentiae tuae traduntur quod —)

This example shows what an immense advance had by this time been made in the formation of the minuscule hand, and but little more is required for its completion. It is to be noted, however, that the peculiar old form of letter B with the loop on the left still persists. But only a short time was now needed to bring this letter also in a new shape into line with the other members of the growing minuscule alphabet.

At this point must be noticed a very interesting and important class of the Roman cursive hand which stands apart from the general line of development. This is the official hand of the Roman Chancery, which is unfortunately represented by only two fragmentary papyri of the 5th century (fig. 27), and proves to be a curious moulding of the cursive in a calligraphic style, in which, however, the same characters appear as in other Roman cursive documents, if somewhat disguised. The papyri contain portions of two rescripts addressed to Egyptian officials, and are said to have been found at Phile and Elephantine. Both documents are in the same hand; and the fragments are divided between the libraries of Paris and Leiden. For a time the writing remained undeciphered, and Champollion-Figeac, while publishing a facsimile (Charles et MSS. sur papyrus, 1840, pi. 14), had to confess

that he was unable to read it. Massmann, however, with the experience gained in his work upon the waxed tablets, succeeded without much difficulty in reading the fragment at Leiden (Libellus aurarius, p. 147), and was

followed by M. de Wailly, who published the whole of the fragments (Mint, de Vlnstitut (1842), xv. 399). Later, Momm- sen and Jaff6 have dealt with the text of the documents (Jahrbuch des. gem. dent. Rechts (1863), vi. 398), and compared in a table the forms of the letters with those of the Dacian tablets.

Fig. 27. — Deed of the Imperial Chancery, 5th~century. (portionem ipsi debitam resarcire nee ullum precatorem ex instrumento)

The characters are large, the line of writing being about three-fourths of an inch deep, and the heads and tails of the long letters are flourished; but the even slope of the strokes imparts to the writing a certain uniform and graceful appearance. As to the actual shape of the letters, as will be seen from the reduced facsimile here given, there maybe recognized in many of them only a more current form of those which have been de- scribed above. The A and R may be distinguished by noticing the different angle at which the top strokes are applied; the B, to suit the requirements of the more current style, is no longer the closed rf-shaped letter of the tablets, but is open at the bow and more nearly resembles a reversed b; the tall letters/, h, I, and long $ have developed loops; O and s-shaped U are very small, and written high in the line. The letters which seem to differ essentially from those of the tablets are E, M, N. The first of these is probably explained correctly by Jaffe as a develop- ment of the earlier || quickly written and looped, and may be compared with the tick-shaped letter noticed above. The M and N have been compared with the minusqule forms of the Greek mu and nu, as though the latter had been adopted; but they may with better reason be explained as merely cursive forms of the Latin capitals M and N. That this hand should have retained so much of the older formation of the Roman cursive is no doubt to be attributed to the fact of its being an official style of writing which would conform to tradition.

To continue the development which we saw attained in the letter of

the 4th century above (fig. 26) we turn to the docu- ments on papyrus from Ravenna, Naples, and other places in Italy, which date from the 5th century and are written in a looser and more straggling hand (fig. 28). Examples of this hand will be found in largest numbers in Marini's work specially treating of these documents (/ papiri diplomatici) , and also in the publications of Mabillon (De re diplomatica) Champollion- Figeac (Chartes et MSS. sur papyrus), Massmann (Urkunden in Neapel und Arezzo), Gloria (Paleografia), as well as in Facs. of Ancient Charters in the British Museum, pt. iv., 1878, Nos. 45, 46, and in the Facsimiles of the Palaeographical Society.

wfmw,

Fig. 28. — Deed of Sale (Ravenna), a.d. 572. (huius splendedissimae urbis)

The letter a has now lost all trace of the capital; it is the open tt-shaped minuscule, developed from the looped uncial (£>«, ˆ0; the b, throwing off the loop or curve on the left which gave it the appearance of d, has at length developed one on the right, and appears in the form familiar in modern writing; minuscule m, n, and u are fully formed (the last never joining a following letter, and thus always distinguishable from a) ; p, q, and r approach to the long minuscules, and s, having acquired an incipient tag, has taken the form 7 which it keeps long after.

This form of writing was widely used, and was not confined to legal documents. It is found in grammatical works, as in

the second hand of the palimpsest MS. of Licinianus (Cat. Anc. MSS., pt. ii., pis. 1, 2) of the 6th century, and in such volumes as the Josephus of the Ambrosian Library of the 7th century (Pal. Soc. pi. 59), and in the St Avitus of the 6th century and other MSS. written in France. It is indeed only natural to suppose that this, the most convenient, because cursive, hand, should have been employed for ordinary working MSS. which were in daily use. That so few of such MSS. should have sur- vived is no doubt owing to the destruction of the greater number by the wear and tear to which they were subjected.

Latin Writing. II. — Literary Hands

We have now to return to the 1st century, the date from which we started in the investigation of the Roman cursive writing, and take up

the thread of the history of the book-hand of literature, a few rare examples of which have survived from the ruins of Herculaneum. That a Roman book-hand existed at a still earlier period is quite certain. The analogy of the survival of very ancient examples of a Greek literary hand is a sufficient proof; and it is a mere truism to say that as soon as there was a literature, there was likewise a book-hand for its vehicle. No work could be submitted for sale in the market that was not written in a style legible to all. Neatly written copies were essential, and the creation of a formal kind of writing fitted for the purpose naturally resulted. Such formal script must, however, be always more or less artificial as com- pared with the natural current hand of the time, and there must always be an antagonism between the two styles of script; and, as we have seen in Greek palaeography, the book-hand is always subject to the invading influence of the natural hand.

Capital Writing. — Among the Herculaneum fragmentary papyri, then, we find our earliest examples of the Roman liter- ary hand, which must be earlier than a.d. 79, the year. of the destruction of the city; and those examples prove to us that the usual literary hand was written in capital letters. Of these letters there are two kinds — the square and the rustic. Square capitals may be defined as those which have their horizontal lines at right angles with the vertical strokes; rustic letters are not less accurately formed, nor, as their title would seem to imply, are they rough in character, but, being without the exact finish of the square letters, and being more readily written, they have the appearance of greater simplicity. In capital writing the letters are hot all of equal height; F and L, and in the rustic sometimes others, as B and R, overtop the rest. In the rustic alphabet the forms are generally lighter and more slender, with short horizontal strokes more or less oblique and wavy. Both styles of capital' writing were obviously borrowed from the lapidary alphabets employed under the empire. Both styles were used for public notices inscribed on the walls of Pompeii and other places. But it has been observed that scribes with a natural conservatism would perpetuate a style some time longer in books than it might be used in inscriptions. We should therefore be prepared to allow for this in ascribing a date to a capital written MS., which might resemble an inscrip- tion older by a century or more. Rustic capitals, on account of their more convenient shape, came into more, general use; and the greater number of the early MSS.

The literary fragments of papyrus from Herculaneum are written generally in rustic capitals, either of the firm, solid character used in inscriptions, or of the lighter style employed in the fragments of a poem on the battle of Actium (fig. 29). As this poem is the earliest

literary work in Latin, of any extent, written in the book-hand, a specimen of the writing is here given. Its period must necessarily he between the year 31 B.C. the date of the battle and a.d. 79; and therefore we may place it at least early in the 1st century.

That the rustic capital hand was generally adopted for finely written literary MSS. from the period of our earliest examples onwards through the centuries immediately following may be

assumed from the fact of that character being found so widely in favour when we come down to the period of the vellum MSS. Unfortunately no examples have survived to fill the gap between the first century and the oldest of the vellum codices written in rustic capitals of the 4th century. Of the three great MSS. of Virgil preserved in the Vatican Library, which are written in

IKK£& aˆTQV f'/VJXr-

Fig. 29. — Poem on the Battle of Actium, early 1st century, (praeberetque suae — qualis ad instahtis — signa tubae classesq — est facies ea visa loci—)

this character, the first in date is that known as the Schedae Vaticanae (Exempla, tab. 13; Pal. Soc pi. 116, 117), a MS. famous for its series of well-finished illustrative paintings in classical style; it is ascribed to the 4th century. The other two MSS. are known as the Codex Romanus and the Codex Palatinus (Exempla, tab. 11, 12; Pal. Soc. pL 113-115), and are now generally assigned to the 5th century. All three MSS. no doubt must always have been regarded as choice works; and the large scale of the writing employed, particularly in the case of the Romanus and the Palatinus, and the consequently magnificent size of the MSS. when complete, must indicate an unusual importance attaching to them. They were editions de luxe of the great Roman poet. The writing of the Codex Palatinus (Fig. 30) especially is most exact, and is manifestly modelled on the best type of the rustic hand as seen in the inscriptions.

If5UIV\QVfWClilTiAVM5UO!JlOUUC06l
WilAAillAiQirtOiliitOiCJUIiUtOIOlU

Fig. 30. — Virgil (Cod. Palatinus) 5th century.

(Testaturque deos iterum se ad proelia cogi Bis iam Italos hostis haec altera foedera)

In assigning dates to the earliest MSS. of capital-writing, one feels the greatest hesitation, none of them bearing any internal evidence to assist the process. It is not indeed until the close of the 5th century that we reach firm ground — the Medicean Virgil of Florence having in it sufficient proof of having been written before the year 494. The writing is in delicately- formed letters, rather more spaced out than in the earlier exam- ples (Exempla, tab. 10; Pal. Soc. pi. 86). Another ancient MS. in rustic capitals is the Codex Bembinus of Terence of the 4th or 5th century (Exempla, tab. 8, 9; Pal. Soc, pi. 135), a volume which is also of particular interest on account of its marginal annotations, written in an early form of small hand. Among palimpsests the most notable is that of the Cicero In Verrem of the Vatican (Exempla, tab. 4).

Of vellum MSS. in square capitals the examples are not so early as those in the rustic character. Portions of a MS. of Virgil in the square letter are preserved in the Vatican, and other leaves of the same are at Berlin (Exempla, tab. 14). Each page, however, begins with a large coloured initial, a style of ornament- ation which is never found in the very earliest MSS. The date assigned to this MS. is therefore the end of the 4th century. In very similar writing, but not quite so exact, are some fragments of another MS. of Virgil in the library of St Gall, probably of a rather later time (Exempla, tab. 14a; Pal. Soc, pi. 208).

In the 6th century capital-writing enters on its period of decadence, and the examples of it become imitative. Of this period is the Paris Prudentius (Exempla, tab. 15; Pal. Soc. pis. 29, 30) in rustic letters modelled on the old pattern of early

inscriptions, but with a very different result from that obtained by the early scribes. A comparison of this volume with such MSS. as the Codex Romanus and the Codex Palatinus shows the later date of the Prudentius in its widespread writing and in certain inconsistencies in forms. Of the 7th century is the Turin Sedulius (Exempla, tab. 16), a MS. in which uncial writing also appears — the rough and misshapen letters being evidences of the cessation, of capital writing as a hand in common use. The latest imitative example of an entire MS. in rustic capitals is in the Utrecht Psalter, written in triple columns and copied, to all appearance, from an ancient example, and illustrated with pen drawings. This MS. may be assigned to the beginning of the 9th

century. If there were no other internal evidence of late date in the MS. the mixture of uncial letters with the capitals would decide it. In the Psalter of St Augustine's Canterbury, in the Cottonian Library (Pal. Soc. pi. 19; Cat. Anc. MSS. ii. pis. 12, 13), some leaves at the beginning are written in this imitative style early in the 8th century; and again it is found in the Benedictional of Bishop Aethelwold (Pal. Soc. pi. 143) of the 10th century. In the sumptuous MSS. of the Carlovingian school it was continually used; and it survived for such purposes as titles and colophons for some centuries, usually in a degenerate form of the rustic letters.

Uncial Writing. — There was also another majuscule form of writing, besides capitals, employed as a literary book-hand at an early date, but not coeval with the early period of capital writing. This second book-hand was the so-called Uncial hand, a modification of the capital form of writing, in which the square angles of the original letters were rounded off and certain new curved shapes were introduced, the characteristic letters of the uncial alphabet being a, b, €, b, ro. The origin of some of these rounded letters may be traced in certain forms of the Roman cursive letters of the graffiti and the tablets. But a considerable length of time elapsed before the fully developed uncial alphabet was evolved from these incipient forms. In fact it is only in the vellum MSS. that we first find the firmly written literary uncial hand in perfect form. No doubt the new material, vellum, with its smooth hard surface, immediately afforded the means for the calligraphic perfection with which we find the uncial writing inscribed in these codices.

Frorn the occurrence of isolated uncial forms in inscriptions, the actual period of growth of the finished literary hand has been determined to lie between the later part of the 2nd century and the 4th century. Uncial letters are especially prevalent in Rom an- African inscriptions of the 3rd century; but certain letters of the uncial alphabet are not as yet therein matured; minuscule forms of a few letters, particularly b and d, are employed. The discovery also, at Oxyrhynchus, of a fragmentary papyrus of the 3rd century, containing a portion of an epitome of Livy, presents us with an example of the uncial hand in progress of formation for literary purposes, the text being composed mainly of letters of the uncial type, but including a certain proportion of letters, as b, d, m, r, of the minuscule or small character. At length in the 4th century, as already stated, the perfected uncial literary alphabet is found in the vellum codices.

There are still extant a very large number of Latin uncial MSS., a proof of the wide use of this form of literary writing in the early middle

ages.

The Exempla of Zangemeisfer and Wattenbach, so often quoted above, contains a series of facsimiles which illustrate its progress through its career. The letter ro has been adopted by the editors as a test letter, in the earlier forms of which the last limb is not curved or turned in. The letter € also in its earlier and purer form has the cross stroke placed high. But, as in every style of writing, when once developed, the earliest examples are the best, being written with a free hand and natural stroke. The Gospels of Vercelli (Exempla, tab. 20), said to have been written by the hand of Eusebius himself, and which may indeed be of his time, is one of the most ancient uncial MSS. Its narrow columns and pure forms of letters have the stamp of antiquity. To the 4th century also is assigned the palimpsest Cicero De republica in the Vatican (Exempla, tab. 17; Pal. Soc.

pi. 160), a MS. written in fine large characters of the best type; and a very ancient fragment of a commentary on an ante-Hiero- nymian text, in three columns, has also survived at Fulda (Exempla, tab. 21). Among the uncial MSS. of the 5th century of which good photographic facsimiles are available are the two famous codices of Livy, at Vienna (fig. 31) and Paris (Exempla, tab. 18, 19; Pal. Soc. pi. 31, 32, 183).

IxmTI Bll UAqUACISN o M.NUA.SAeCUlAJUSBo
NAOriNAfUˆOSieNiSAr

Fig. 31. — Livy (Vienna MS.), 5th century.

(lam tibi ilia quae igno rantia saecularis bo na opinatur ostendam)

To distinguish between uncial MSS. of the 5th and 6th centuries is not very easy, for the character of the writing changes but little, and is free from sign of weakness or wavering. It may, however, be noticed that in MSS. which are assigned to the latter century there is rather less compactness, and occasionally, as the century advances, there is a slight tendency to artificiality.

When the 7th century is reached there is every evidence that uncial writing has entered on a new stage. The letters are more roughly and carelessly formed, and the compactness of the earlier style is

altogether wanting. From this time down to the age of Charlemagne there is a continual deterioration, the writing of the 8th century being altogether misshapen. A more exact but imitative hand was, however, at the same time em- ployed, when occasion required, for the production of calli- graphic MSS., such as Biblical and liturgical books. Under the encouragement given by Charlemagne to such works, splendid uncial volumes were written in ornamental style, often in gold, several of which have survived to this day.

Mixed and Half-uncial Writing. — It is obvious that the majus- cule styles of literary writing, viz. the square capital, the rustic capital and the uncial, were of too elaborate and too stately a character to serve all the many requirements of literature. The capital hands, as we have seen, appear to have been employed, at least in many instances, for codices produced on a grand scale, and presumably for special occasions; and if the uncial hand had a longer and wider career, yet in this case also there must often have been a sense that the employment of this fine character gave a special importance and value to the MS. It is not improbable that the survival of so large a number of uncial MSS. is due to the special care thai; they received at the hands of their owners. Other more manageable styles of writing were necessary, and concurrently with the majuscule hands other forms were developing. The hand which bears the name of Half-uncial was finally evolved, and had itself an important career as a book-hand as well as exercising a large influence on the medieval minuscule hand of literature.

From the first, as we have seen in the case of the graffiti and the tablets, a mingling of capital forms and minuscule forms was prevalent in the non-literary style of writing. There are indications that the same mingling of the two streams was allowed in writing of a literary character. It appears in a rudimentary state in a papyrus fragment from Herculaneum (Exempla, tab. 2 b) ; and it appears in the epitome of Livy of the 3rd century found at Oxyrhynchus, in which minuscule letters are interspersed among the uncial text. From the regularity and ease with which this MS. is written, it is to be assumed that the mixed hand was ordinarily practised at that time. It is often employed for marginal notes in the early vellum codices. It is used for the text of the Verona Gaius (Exempla, tab. 24) of the 5th century, in which, besides the ordinary uncial shapes, d is also found as a minuscule, r as the transitional r, and j as the tall letter v. Again, in the uncial Florentine Pandects of the 6th century appears a hand which contains a large admix- ture of minuscule forms (Exempla, tab. 54). From these and other instances it is seen that in uncial MSS. of a secular nature,

as in works relating to law and grammar, the scribe did not feel himself restricted to a uniform use of the larger letters, as he would be in producing a church book or calligraphic MS.

But the mixed hand, although partaking something of the nature of the Half-uncial hand, was not actually that form of writing. The Half-uncial hand was not only a mingling of uncial and minuscule forms, but also a blending of them, the uncial element yielding more or less to the minuscule influence, while the minuscule element was reacted upon by the uncial sentiment of roundness and sweeping curves. In its full develop- ment the Half-uncial, or Roman Half-uncial as it is also called, were it not lor a few lingering pure uncial forms, might equally well be described as a large-type minuscule hand. It has, in fact, been sometimes styled the pre-Carolingian minuscule. An early form of this writing is found in the papyrus fragment of Sallust's Catiline, perhaps of the early 5th century, recently recovered at Oxyrhynchus. In vellum codices of the 5th, 6th and 7th centuries Half-uncial writing of a very fine type is not uncommon. It is used for the marginal scholia of the Bembine Terence, of the 5th century. The MS. of the Fasti consulares, at Verona, brought down to 494 a.d. (Exempla, tab. 30), is also in this hand. But the earliest MS. of this class to which a more approximate date can be given is the Hilary of St Peter's at Rome (fig. 32), which was written in or before the year 509 or 510 (Exempla, tab, 52; Pal. Soc. pi. 136); the next is the Sul- picius Severus of Verona, of 517 (Exempla, tab. 32); and of the year 569 is a beautifully written MS. at Monte Cassino containing a Biblical commentary (Exempla, tab. 3).

6jpi ncopini clmu m 1 m Nocehlfei ˆomNONcuJfˆiuilocˆqmcog
ˆurloNeiiaftetMotNrnsflefti

Fig. 32. — St Hilary, a.d. 509-510. (episcopi manum innocente[m] — [linjguam non ad falsiloquium coeg[isti]— nationem. anterioris sententi[ae] —)

Other examples, of which good facsimiles may be consulted, are the Corbie MS. of Canons, at Paris (Exempla, tab, 41, 42), the St Severianus at Milan (Pal. Soc. pi. 161, 162), the Ashburn- ham St Augustine (Pal. Soc. ii. 9), and the Paris St Augustine (New. Pal. Soc. pi. 80), of the 6th century; and the Cologne MS. of Canons (Exempla, tab. 44), and the Josephus (Pal. Soc. pi. 138) and St Ambrose (Pal. Soc. pi. 137) of Milan, of the 6th or 7 th century.

The influence which the Half-uncial literary hand exercised upon the minuscule book-writing of the 7th and 8th centuries may be traced in greater or less degree in the continental MSS. of that period. We shall

find that it formed the basis for the beautiful national handwritings of Ireland and Britain; and it played an important part in the Carolingian reform of the book- hand of the Frankish Empire.

Latin Writing. III. — The National Hands We have now to follow the rise and development of the national handwritings of western Europe, all of which were derived from the Roman hand, but from different phases of it. While the Roman Empire was the central power controlling its colonies and conquests, the Roman handwriting, however far apart might be the several countries in which it was current, remained practically one and the same. But, when the empire was broken up and when independent nationalities arose upon its ruins and advanced upon independent paths of civilization, the handwriting inherited from Rome gradually assumed dis- tinctive characters and took the complexions of the several countries, unless from some accident the continuity of the effects of the Roman occupation was disturbed, as it was in Britain by the Saxon invasion. On the continent of western Europe, in Italy, in Spain, in Gaul, the Roman cursive hand had become the common form of writing, and it remained the framework on which the national hands of those countries developed. Thus

grew the Lombardic hand of Italy, the Visigothic hand of Spain, and the Merovingian and, later, the Carolingian hand of the Frankish Empire. The earliest charters of the three national divisions, written in cursive hands directly descending from the Roman cursive, and dating generally from the 7th century, still remained related in their general style. It was in the book-hands, elaborated from the cursive character, that the lines of national demarcation became more clearly denned, although naturally there occur also many examples in mixed styles which it is difficult to assign to one or another country.

Lombardic Writing. — The national handwriting of Italy did not follow one and the same lines of development throughout the peninsula. In ordinary documents the cursive hand which is seen in the Ravenna deeds, the direct descendant of the Roman cursive, continued in use, growing, in course of time, more and more intricate and difficult to read, the earliest examples, down to the middle of the 9th century, being in the large straggling character of their prototype.

The illegible scrawl into which the hand finally degenerated in notarial instruments of southern Italy was at length suppressed by order of Frederick II. (a. d. 1210-1250). But at an early date the Lombardic book-hand was being formed out of this material. In northern Italy new influences were brought into action by Charlemagne's conquest, the independent growth of the native hand was checked, and a mixed style in which the Merovingian type was interwoven with the Italian was produced, to which the name of Franco-Lombardic has been given (see below, fig. 39). But in the Lombardic duchies of the south the native Lombardic book-hand had an unimpeded growth. In such centres as the monasteries of Monte Cassino near Naples and La Cava near Salerno, it took in the 9th century a very exact

ttcˆc tur'ˆtSf ttlumxttcebioaj*:

Fig. 33. — Exultat roll (Lombardic, 12th century). ([H]ec nox est de qua scriptum est Et nox ut dies illuminabitur)

and uniform shape. From this date the attention which it received as a calligraphic form of writing, accompanied with accessory ornamentation of initial letters, brought it to a high state of perfection in the nth century, when by the peculiar treatment of the letters, they assume that strong contrast of light and heavy strokes which when exaggerated, as it finally became, received the name of broken Lombardic. This style of hand lasted to the 13th century.

Papal Documents. — A word must be said in this place regard- ing the independent development of the hands used in the papal

» rt-OfrtPf

py» «:)«£— 1 A-iyo** »< >

tTB4-Crt«in

jopB4-crl< >

Fig. 34. — Bull of Pope John VIII. (much reduced, a.d. 876). (Dei genetricis mariae filib — haec igitur omnia quae huius praecepti)

chancery, that great centre which had so wide an influence by setting the pattern for the handsome round-hand writing which became so characteristic of the Italian script. Specimens of a special style of writing, founded on the Lombardic and called littera romana (fig. 34) are to be seen in the early papal docu- ments on papyrus dating from

the latter part of the 8th century. In the earliest examples it appears on a large scale, and has rounded forms and sweeping strokes of a very bold character. Derived from the official Roman hand, it has certain letters

peculiar to itself, such as the letter a made almost like a Greek co, / in the form of a loop, and e as a circle with a knot at the top.

This hand may be followed in examples from a.d. 788 through the 9th century (Facs. de charles et diplomes, 1866; Ch. Figeac, Chartes et doc. sur papyrus, i-xii. ; Letronne, Diplom. merov. mtat., pi. 48. In a bull of Silvester II., dated in 999 (Bibl. I'Ec des chartes, vol. xxxvii.), we find the hand becoming less round; and at the end of the next century, under Urban II. , in 1097 (Mabillon, De re dipt, suppl. p. 115) and 1098 (Sickel, Mon. graph, v. 4), 'it is in a curious angular style, which, however, then disappears. During the nth and 12th centuries the imperial chancery hand was also used for papal documents,; and was in turn displaced by the exact and calligraphic papal Italian hand of the later middle ages.

Visigothic Writing. — The Visigothic writing of Spain ran a course of development not unlike that of the Lombardic. In the cursive hand attributed to the 7th century the Roman cursive has undergone little change in form; but another century developed a most distinctive character. In the 8th century appears the set book-hand in an even and not difficult character, marked by breadth of style and a good firm stroke. This style is maintained through the 9th century with little change, except that there is a growing tendency to calligraphy. In the 10th century the writing deteriorates; the letters are not so uniform, and, when calligraphically written, are generally thinner in stroke. The same changes which are discernible in all the hand-writings of western Europe in the nth century are also to be traced in the Visigothic hand — particularly as regards the rather rigid character which it assumes. It continued in use down to the beginning of the 12th century. Perhaps the most characteristic letter of the book-hand is the g-shaped g. The following specimens (figs. 35, 36) illustrate the Visigothic as written in a large heavy hand of the 9th century {Cat. Anc. MSS. ii. Plate 37), and in a calligraphic example of 1109 (Pal. Soc. Plate 48). t

Fig. 35. — Prayers, 9th century, (tibi dulcedine proxi morum et dignita te operum perfectoru«)

fuafura Apffofum **-fcbjp**,a»fLoˆj

d1tfJw

DUDuur’ ufaudjuo ffucau ±»L2bdfUa>

Fig. 36. — Beatus on the Apocalypse, a.d. 1109. (patrum et profe/ arum et sanctorum et aposfolorwm que gemitibus et tormenta desiderii sui habuit usquequo fructum ex plebe sua)

Merovingian. — The early writing of the Frankish Empire, to which the title of Merovingian has been applied, had a wider range than the other two national hands already described. It had a long career both for diplomatic and literary purposes. In this writing, as it appears in documents, we see that the Roman cursive is subjected to a lateral pressure, so that the letters received a curiously cramped appearance, while the heads and tails are exaggerated to inordinate length.

Facsimiles of this hand, as used in the royal and imperial chan- ceries, are to be found scattered in various works; but a complete course of Merovingian diplomatic writing may be best studied in Letronne’s Diplomata, and in the Kaiserurkunden of Professors Sybel and Sickel. In the earliest documents, commencing in the 7th century and continuing to the middle of the 8tb

century, the character is large and at first not so intricate as it becomes later in this period. The writing then grows into a more regular form, and in the 9th century a small hand is estab- lished, which, however, still retains the exaggerated heads and tails of letters. The direct course of this chancery hand may then be followed in the imperial documents, which from the

Fig. 37. — Merovingian diploma, a.d. 679-680.

(dedit in respunsis eo quod ipsa — de annus triginta et uno inter ipso — — ondam semper tenuerant et possiderant si —)

second half of the 9th century are written in a hand more set and evidently influenced by the Carolingian minuscule. This form of writing, still accompanied by the lengthened strokes already referred to, continued in force, subject, however, to the varying changes which affected it in common with other hands, into the 12 th century. Its

influence was felt as well in France as in Germany and Italy, and certain of its charac- teristics also appear in the court-hand which the Normans brought with them into England.

The book-hand immediately derived from the early Mero- vingian diplomatic hand is seen in MSS. of the 7th and 8th centuries in a very neatly written but not very easy hand (Cat. Anc. MSS. ii. Plates 29, 30; Arndt, Schrifttaf. 28).

dcˆmsˆnuwfosˆ

Fig. 38. — St Gregory's Moralia, 7th century. Merovingian Writing, 7th century.

(— dam intra sinurri sarec/ae eclesiae quasi uicinos ad —

positos increpant. Saepe uero arrogantes — — dem quam tenent arrogantiam se fugire osten —)

But other varieties of the literary hand as written in France are seen to be more closely allied to the Roman cursive. The earliest example is found in the papyrus fragments of writings of St Avitus and St Augustine of the 6th century (£tudes paUogr. sur des papyrus du VI me siecle, Geneva, 1866); and other later MSS. by their diversity of writing show a development indepen- dent of the cursive hand of the Merovingian charters. It is among these MSS. that those examples already referred to occur which more nearly resemble the Lombardic type.

kicm f&Junum ftindfin fiuum\JTiiewn off

Fig. 30. — Ecclesiastical Canons (Franco-Lombardic), 8th century.

(propter unitatem salua propriaetate na — non sub una substantia conuenientes, neque — — itam sed unum eundem filium. Unicum deum)

The uncial and half-uncial hands had also their influence in the evolution of these Merovingian book-hands; and the mixture of so many different forms accounts for the variety to be found in the examples of the 7th and 8th centuries. In the Notice sur un MS. Mirovingien d'Eugyppus (1875) and the Notice sur un MS. Mirovingien de la Bill. d'£pinal (1878), Delisle has

given many valuable facsimiles in illustration of the different hands in these two MSS. of the early part of the 8th century. See also Exempla

Codd. Lat. (tab. 57), and autotypes in Cat. anc. MSS: ii. There was, however, through all this period a general progress towards a settled minuscule writing which only required a master-hand to fix it in a purified and calligraphic form. How this was effected will be described below, after disposing of the early national writing of our own islands.

Irish Writing. — The early history of the palaeography of the British Isles stands apart from that of the continental schools. As was noticed above, the Roman handwriting which was used by the Roman settlers in Britain and was imparted by them to the native Britons was swept out of existence when the Saxon invasion abruptly destroyed the continuity of Roman civiliza- tion in these islands. Britain had to wait a long time for the reappearance of Roman writing in the country; but it was destined to reappear, though in a different phase, in book-form, not in cursive form; and not directly, but through another channel. That channel was Ireland.

It is evident that the civilization and learning which accom- panied the establishment of an ancient Church in Ireland could not exist without a written literature. The Roman mission- aries would certainly in the first place have imported copies of the Gospels and other books, and it cannot be doubted that through intercourse with England the Irish would obtain con- tinental MSS. in sufficient numbers to serve as models for their scribes. From geographical and political conditions, however, no continuous intimacy with foreign countries was possible; and we are consequently prepared to find a form of writing borrowed in the first instance from a foreign school, but developed under an independent national system. In Ireland we have an instance how conservative writing may become, and how it will hand on old forms of letters from one generation to another when there is no exterior influence to act upon it. After once obtaining its models, the Irish school of .writing was left to work out its own ideas, and continued to follow one direct line for centuries. The subsequent English conquest had no effect upon the national handwriting. Both peoples in the island pursued their own course. In MSS. in the Irish language the Irish character of writing was naturally employed; and the liturgical books produced in Irish monasteries by Irish monks were written in the same way. The grants and other deeds of the English settlers were, on the other hand, drawn up by English scribes in their then national writing. The Irish handwriting went on in its even uninterrupted course; and its consequent unchanging form makes it so difficult a matter to assign accurate dates to Irish MSS.

The early Irish handwriting is of two classes — the round and the

pointed. The round hand is found in the earliest examples; the pointed hand, which also was developed at an early period became the general hand of the country, and survives in the native writing of the present day. Of the earliest surviving MSS. written in Ireland none are found to be in pure uncial letters. That uncial MSS. were introduced into the country by the early missionaries can hardly be doubted, if we consider that that character was so commonly employed as a bookhand, and especially for sacred texts. Nor is it impossible that Irish scribes may have practised this hand. The copy of the Gospels in uncials, found in the tomb of St Kilian, and preserved at Wurzburg, has been quoted as an instance of Irish uncial. The writing, however, is the ordinary uncial, and bears no marks of Irish nationality (Exempla, tab. 58). The most ancient examples are in half -uncial letters, so similar in character to the continental half-uncial MSS. of Roman type noticed above, that there can be no hesitation in deriving the Irish from the Roman writing. We have only to compare the Irish MSS. of the round type with the continental MSS. to be convinced of the identity of their styles of writing. There are unfortunately no means of ascertaining the exact period when this style of hand was first adopted in Ireland. Among the very earliest surviving exam- ples none bears a fixed date; and it is impossible to accept the traditional ascription of certain of them to particular saints oif

Ireland, as St Patrick and St Columba. Such traditions are notoriously unstable ground upon which to take up a position. But an examination of certain examples will enable the palaeo- grapher to arrive at certain conclusions. In Trinity College, Dublin, is preserved a fragmentary copy of the Gospels (Nat. MSS. Ireland, i. pi. ii.) vaguely assigned to a period from the 5th to the 7th century, and written in a round half-uncial hand closely resembling the continental hand, but bearing the general impress of its Irish origin. This MS. may perhaps be of the early part of the 7th century.

adftt < *cfeiMTur*t*erpoMcf

FlG. 40. — Gospels, 7th century, (ad ille deintus respondens [dicit, No]li mihi molestus esse, iam osti[um clausum] est et pueri in cubiculo mecum [sunt])

Again, the Psalter (Nat. MSS. Ireland, i. pis. iii., iv.) tradi- tionally ascribed to St Columba (d. 597), and perhaps of the 7th century, is a calligraphic specimen of the same kind of writing. The earliest examples of the continental half-uncial date back, as has been seen above, to the 5th century. Now the likeness between the earliest foreign and Irish MSS. forbids us to assume anything like collateral descent from a common and remote stock. Two different national hands, although derived from the same source, would not independently develop in the same way, and it may accordingly be granted that the point of contact, or the period at which the Irish scribes copied and adopted the Roman half-uncial, was not very long, comparatively, before the date of the now earliest surviving examples. This would take us back at least to the 6th century, in which period there is sufficient evidence of literary activity in Ireland. The beauti- ful Irish calligraphy, ornamented with designs of marvellous intricacy and brilliant colouring, which is seen in full vigour at the end of the 7th century, indicates no small amount of labour bestowed upon the cultivation of writing as an ornamental art. It is indeed surprising that such excellence was so quickly developed. The Book of Kells has been justly acknowledged as the culminating example of Irish calligraphy (Nat. MSS. Ire- land, i. pis. vii.-xvii.; Pal. Soc. pis. 55, 56). The text is written in the large solid half-uncial hand which is again seen in the Gospels of St Chad at Lichfield (Pal. Soc. pis. 20, 21, 35), and, in a smaller form, in the English-written Lindisfarne Gospels (see below). Having arrived at the calligraphic excellence just referred to, the round hand appears to have been soon afterwards superseded, for general use, by the pointed; for the character of the large half-uncial writing of the Gospels of MacRegol, of about the year 800 (Nat. MSS. Ireland, i. pis. xxii.-xxiv.; Pal. Soc. pis. 90, 91), shows a very great deterioration from the vigorous writing of the Book of Kells, indicative of want of practice.

Traces of the existence of the pointed hand are early. It is found in a fully developed stage in the Book of Kells itself (Pal. Soc. pi. 88). This form of writing, which may be termed the cursive hand of Ireland, differs in its origin from the national cursive hands of the Continent. In the latter the old Roman cursive has been shown to be the foundation. The Irish pointed hand, on the contrary, had nothing to do with the Roman cursive, but was simply a modification of the round hand, using the same forms of letters, but subjecting them to a lateral compression and drawing their limbs into points or hair-lines. As this process is found developed in the Book of Kells, its beginning may be fairly assigned to as early a time as the first half of the 7th century; but for positive date there is the same uncertainty as in regard to the

first beginning of the round hand. The Book of Dimma (Nat. MSS. Ireland, i. pis. xviii., xix.) has been attributed to a scribe of about a.d. 650; but it appears rather to be of the 8th century, if we may judge by the analogy of English MSS. written in a similar hand. It is not in fact until *ve reach the period of the Book of Armagh (Nat. MSS. Ireland, pis. xxv.-xxix.), a MS. containing books of the New Testament

and other matter, and written by Ferdomnach, a scribe who died in the year 844, that we are on safe ground. Here is clearly a pointed hand of the early part of the 9th century, very similar to the English pointed hand of Mercian charters of the same time. The MS. of the Gospels of MacDurnan, in the Lambeth Library (Nat. MSS. Ireland, i. pis. xxx., xxxi.) is an example of writing of the end of the 9th or beginning of the 10th century, showing a tendency to become more narrow and cramped. But coming down to the MSS. of the nth or 12th centuries we find a change. The pointed hand by this time has become moulded into the angular and stereotyped form peculiar to Irish MSS. of the later middle ages. From the 12th to the 15th centuries there is a very gradual change. Indeed, a carefully written MS. of late date may very well pass for an example older by a century or more. A book of hymns of the nth or 12th century (Nat. MSS. Ireland, i. pis. xxxii.-xxxvi.) may be referred to as a good typical specimen of the Irish hand of that period; and the Gospels of Maelbrighte, of a.d. 1138 (Nat. MSS. Ireland, i. pis. xl.-xlii.; Pal. Soc. pi. 212), as a calligraphic one.

In Irish MSS. of the later period, the ink is black, and the vellum, as a general rule, is coarse and discoloured, a defect which may be attributed to inexperience in the art of preparing the skins and to the effects of climate.

When a school of writing attained to the perfection which marked that of Ireland at an early date, so far in advance of other countries, it naturally followed that its influence should be felt beyond it own borders. How the influence of the Irish school asserted itself in England will be presently discussed. But on the Continent also Irish monks carried their civilizing power into different countries, and continued their native style of writing in the monasteries which they founded. At such centres as Luxeuil in France, Wurzburg in Germany, St Gall in Switzerland, and Bobbio in Italy, they were as busy in the pro- duction of MSS. as they had been at home. At first such MSS.. were no doubt as distinctly Irish in their character as if written in Ireland itself; but, after a time, as the bonds of connexion with that country were weakened, the form of writing would become rather traditional, and lose the elasticity of a native hand. As the national styles also which were practised around them became more perfected,

the writing of the Irish houses would in turn be reacted on; and it is thus that the later MSS. produced in those houses can be distinguished. Archaic forms are tradi- tionally retained, but the spirit of the hand dies and the writing becomes merely imitative.

English Writing. — In England there were two sources whence a national hand could be derived. From St Columba's founda- tion in Iona the Irish monks established monasteries in the northern parts of Britain; and in the year 635 the Irish mis- sionary Aidan founded the see of Lindisfarne or Holy Isle, where there was established a school of writing destined to become famous. In the south of England the Roman missionaries had also brought into the country their own style of writing direct from Rome, and taught it in the newly founded monasteries. But their writing never became a national hand. Such a MS. as the Canterbury Psalter in the Cottonian Library (Pal. Soc. pi. 18) shows what could be done by English scribes in imitation of Roman uncials; and the existence of so few early charters in the same letters (Facs. of Anc. Charters, pt. i., Nos. 1, 2, 7), among the large number which have survived, goes to prove how limited was the influence of that form of writing. The famous MS. of the Bible known as the Codex Amiatinus, now at Florence, which was written in uncials at Jarrow in Northum- bria, about the year 700, was almost certainly the work of foreign scribes. On the other hand, the Irish style made progress throughout England, and was adopted as the national hand, developing in course of time certain local peculiarities, and lasting as a distinct form of writing down to the time of the Norman Conquest. But, while English scribes at first copied their Irish models with faithful exactness, they soon learned to give to their writing the stamp of a national character, and imparted to it the elegance and strength which individualized the English hand for many centuries to come.

As in Ireland, so here we have to follow the course of the round hand as distinct from the pointed character. The earliest and most beautiful MS. of the former class is the Lindisfarne Gospels (fig. 41) or " Durham Book " in the Cottonian Library {Pal. Soc. pis. 3-6, 22; Cat. Anc. MSS. pt. ii. pis. 8-1 1), said to have been written by Eadfrith, bishop of Lindisfarne, about the year 700. The text is in very exactly formed half- uncials, differing but slightly from the same characters in Irish MSS., and is glossed in the Northumbrian dialect by Aldred, a

writer of the 10th century.

ran mTObs quoin can ipsi posioekuutr-

Fig. 41. — Lindisfarne Gospels, c. a.d. 700. (regnum caelorum. Beati mites quoniam ipsi posidebunt.

ric heof na eadge bidon da milde torton

MSS. in the same solid half-uncial hand are still to be seen in the Chapter Library of Durham, this style of writing having been practised more especially in the north of England. But in addition to this calligraphic book-writing, there was also a lighter form of the round letters which was used for less sump- tuous MSS. or for more ordinary occasions. Specimens of this hand are found in the Durham Cassiodorus {Pal. Soc. pi. 164), in the Canterbury Gospels {Pal. Soc. pi. 7; Cat. Anc. MSS. pt. ii., pis. 17, 18), the Epinal Glossary (£. Eng. Text Soc), and in a few charters {Facs. Anc. Charters, pt. i., 15; ii., 2, 3; Pal. Soc. 10), one of which, of a.d. 778, written in Wessex, is interesting as showing the extension of the round hand to the southern parts of England. The examples here enumerated are of the 8th and 9th centuries — the earlier ones being written in a free natural hand, and those of later date bearing evidence of decadence. Indeed the round hand was being rapidly dis- placed by the more convenient pointed hand, which was in full use in England in the middle of the 8th century. How late, however, the more calligraphic round hand could be continued under favouring circumstances is seen in the Liber Vitae or list of benefactors of Durham {Cat. Anc. MSS. pt. ii., pi. 25; Pal. Soc. pi. 238), the writing of which would, from its beautiful execution, be taken for that of the 8th century, did not internal evidence prove it to be of about the year 840.

The pointed hand ran its course through the 8th, 9th, and 10th centuries, until English writing came under the influence of the foreign minuscule. The leading characteristics of this hand in the 8th century are regularity and breadth in the formation of the letters and a calligraphic contrast of heavy and light strokes —the hand being then at its best. In the 9th century there is greater lateral compression, although regularity and correct formation are maintained. But in the 10th century there are signs of decadence. New forms are introduced, and there is a disposition to be imitative. A test letter of this latter century is found in the letter a with obliquely cut top, Q.

The course of the progressive changes in the pointed hand may be followed in the Facsimiles of Ancient Charters in the British Museum

and in the Facsimiles of Anglo-Saxon MSS. of the Rolls Series. The charters reproduced in these works have survived in sufficient numbers to enable us not only to form a fairly accurate knowledge of the criteria of their age, but also to recognize local peculiarities of writing. The Mercian scribes appear to have been very excellent penmen, writing a very graceful hand with much delicate play in the strokes. On the other hanc 1 the writing of Wessex was heavier and more straggling and is in such strong contrast to the Mercian hand that Us examples may be easily detected with a little practice. Turning to books in which the pointed hand was employed, a very beauti- ful specimen, of the 8th century, is a copy of Bede's Ecclesiastical

History (fig. 42) in the University Library at Cambridge {Pal. Soc. pis. 139, 140), which has in a marked degree that breadth of style which has been referred to. Not much later is another copy of the same work in the Cottonian Library {Pal. Soc. pi. 141; Cat. Anc. MSS. pt. ii., pi. 19), from which the following facsimile is taken.

Fig. 42. — Bede, 8th century.

(tus sui tempora gerebat.

Uir uenerabilis oidiluuald, qui multis

annis in monasterio qwod Aicitur Inhry)

For an example of the beginning of the 9th century, a MS. of miscellanea, of a.d. 811-814, also in the Cottonian Library, may be referred to {Pal. Soc. pi. 165; Cat. Anc. MSS. pt. ii. Plate 24); and a very interesting MS. written in the Wessex style is the Digby MS. 63 of the middle of the century {Pal. Soc. pi. 168). As seen in the charters, the pointed writing of the 10th century assumes generally a larger size, and is rather more artificial and calligraphic. A very beautiful example of the book-hand of this period is found in the volume known as the Durham Ritual {Pal. Soc. pi. 240), which, owing to the care bestowed on the writing and the archaism of the style, might at first sight pass for a MS. of higher antiquity.

In the latter part of the 10th century the foreign set minuscule hand began to make its way into England, consequent on increased intercourse with the Continent and political changes which followed. In the charters we find the foreign and native hands on the same page: the body of the document, in Latin, in Carolingian minuscules; the boundaries of the land conveyed, in the English hand. The same practice was followed in books. The charter (in book form) of King

Eadgar to New Minster, Winchester, a.d. 966 {Pal. Soc. pis. 46, 47), the Benedic- tional of Bishop ˆEthelwold of Winchester (pis. 142, 144) before a.d. 984, and the MS. of the Office of the Cross, • a.d. 101 2-1020 (pi. 60), also written in Winchester, are all examples of the use of the foreign minuscule for Latin. The change also which the national hand underwent at this period may certainly be attributed to this foreign influence. The pointed hand, strictly so-called, is replaced by a rounder or rather square character, with lengthened strokes above and below the line.

ttuman fiepeej4iif maegx* peapD flieortDoˆ

Fig. 43. — Chronicle, nth century, (manan he was his msega. sceard freonda ge fylled on folcstede beslsegen set secge. and his sunu forlaet. on waelstowe wundum'forgrunden.)

This style of writing becomes the ordinary English hand down to the time of the Norman Conquest. That event extinguished the national hand for official purposes — it disappears from charters; and the already established use of the Carolingian minuscule in Latin MSS. completed its exclusion as the hand- writing of the learned. It cannot, however, be doubted that it still lingered in those parts of the country where foreign influence did not at once penetrate, and that Englishmen still continued to write their own language in their own style of writing. But that the earlier distinctive national hand was soon overpowered by foreign teaching is evident in English MSS. of the 1 2th century, the writing of which is of the foreign type, although the English letter thorn, >, survived and continued in use down to the 15th century, when it was transformed to y.

Latin Writing. IV. — The Caeolingian Reform and the Medieval Minuscule Hand It has been stated above that in the Merovingian MSS. of the 8th century there was evident progress towards a settled minu- scule book-hand which only required a master hand to fix it in a purified and calligraphic form. This was effected under Charlemagne, in whose reign the revival of learning naturally led to a reform in handwriting. An ordinance of the year 789 required the revision of Church books; and a more correct orthography and style of writing was the consequence. The abbey of St Martin of Tours was one of the principal centres from whence the reformation of the book-hand spread. Here, from the year 796 to 804, Alcuin of York presided as abbot; and it was specially under his direction that the Carolingian minuscule writing took the simple and graceful form which was gradually adopted to the exclusion of' all other hands. In carrying out this reformation we may well assume that Alcuin brought to bear the results of the training which he had received in his youth in the English school of writing, which had attained to such proficiency, and that he was also beneficially influenced by the fine examples of the Lombard school which he had seen in Italy. In the new Carolingian minuscule all the uncouthness of the later Merovingian hand disappears, and the simpler forms of many of the letters found in the old Roman half-uncial and minuscule hands are adopted. The character of Carolingian writing through the 9th and early part of the 10th century is one of general uniformity, with a contrast of light and heavy strokes, the limbs of tall letters being clubbed or thickened at the head by pressure on the pen. As to charac- teristic letters (fig. 44) the a, following the old type, is, in the 9th century, still frequently open, in the form of u; the bows of g are open, the letter somewhat resembling the numeral 3; and there is little turning of the ends of letters, as m and n.

Jlcc* per-frm Art cem Coniu'rcrnxxvccm.JCJvUxi emm
eKGcxjˆcffb&axr~xio(pu.{co efbr- pAr-idr

Juxtfmfibum ercmoc + biCnorricn cm Cvnrri

Fig. 44. — Gospels, 9th century.

(accipere mariam coniugera tuam'quod

enim ex ea nascetur de spiritu sancto est. Pariet

autem filium et uocabis nomen eius Ieswm)

In the 10th century the clubbing of the tall letters becomes less

pronounced, and the writing generally assumes, so to say, a thinner appearance. But a great change is noticeable in the writing of the nth century. By this time the Carolingian minuscule may be said to have put off its archaic form and to develop into the more modern character of small letter. It takes a more finished and accurate and more upright form, the individual letters being drawn with much exactness, and gener- ally on a rather larger scale than before. This style continues to improve, and is reduced to a still more exact form of calligraphy in the 12th century, which for absolute beauty of writing is unsurpassed. In England especially (fig. 45) the writing of this century is particularly fine.

cutof c&anmnM Maddlcwc fitter afamuroiUi c& vdletfcantibttf fc

Fig. 45. — Leviticus, a.d. 1176. (— culos cum aruinulis suis adoleuit super altare uitulum cum pelle et carnibus et fimo cremans extra castra sicut preceper&t dominus)

As, however, the demand for written works increased, the fine

round-hand of the 12th century could not be maintained.

Economy of material became necessary, and a smaller hand

with more frequent contractions was the result. The larger and

xx. 19

more distinct writing of the nth and 12th centuries is now replaced by a more cramped though still distinct hand, in which the letters are more linked together by connecting strokes, and are more laterally compressed. This style of writing is characteristic of the 13th century. But, while the book-hand of this period is a great advance upon that of a hundred years earlier, there is no tendency to a cursive style. Every letter is clearly formed, and generally on the old shapes. The particular letters which show weakness are those made of a succession of vertical strokes, as m, n, u. The new method of connecting these strokes, by turning the ends and running on, made the distinction of such letters difficult, as, for example, in such a word as minimi. The ambiguity thus arising was partly obviated by the use of a small oblique stroke over the letter i, which, to mark the double letter, had been introduced as early as the nth century. The dot on the letter came into fashion in the 14th century.

Fig. 46. — Bible, 13th century. (Eligite hodie quod placet cui seruire potissimum debeatis. Vtrum diis quibus seruierunt patres uestri in

mesopotamia, an diis amoreor«« in quorum terra. haiitatis. Ego autem et doxaus mea seruiemus domino Respow- ditqo« populus et ait, Absit a nobis ut relinq«am«i domiuum) In MSS. of the 14th century minuscule writing becomes slacker, and the consistency of formation of letters falters. There is a tendency to write more cursively and without raising the pen, as may be seen in the form of the letter a, of which the character- istic shape at this time is B., with both bows closed, in contrast with the earlier a. In this century, however, the hand still remains fairly stiff and upright. In the 15th century it becomes very angular and more and more cursive, but is at first kept within bounds. In the course of the century, however, it grows more slack and deformed, and the letters become continually more cursive and misshapen. An exception, however, to this disintegration of minuscule writing in the later centuries is to be observed in church books. In these the old set hand of the 1 2th and 13th centuries was imitated and continued to be the liturgical style of writing.

It is impossible to describe within limited space, and without the aid of plentiful illustrations, all the varieties of handwriting which were developed in the different countries of western Europe, where the Carolingian minuscule was finally adopted to the exclusion of the earlier national hands. In each country, however, it acquired, in a greater or less degree, an individual national stamp which can generally be recognized and which serves to distinguish MSS. written in different localities. A broad line of distinction may be drawn between the writing of northern and southern Europe from the 12th to the 15th century. In the earlier part of this period the MSS. of England, northern France and the Netherlands are closely connected. Indeed, in the 12th and 13th centuries it is not always easy to decide as to which of the three countries a particular MS. may belong. As a rule, perhaps, English MSS. are written with more sense of gracefulness; those of the Netherlands in darker ink. From the latter part of the 13th century, however, national character begins to assert itself more distinctly. In southern Europe the influence of the Italian school of writing is.manifest in the MSS. of the south of France in the 13th and 14th centuries, and also, though later, in those of Spain. That elegant roundness of letter which the Italian scribes seem to have inherited from the bold characters of the early papal chancery, and more recently from Lombardic models, was generally adopted in the book-hand of those districts. It is especially noticeable in calligraphic specimens, as in church books — the writing of Spanish MSS. in this style being distinguished by the blackness of the ink. The medieval minuscule writing of Germany stands apart. It never attained to the beauty of the hands of either the north o*

the south which have been just noticed; and from its ruggedness and slow development German MSS. have the appearance of being older than they really are. The writing has also very commonly a certain slope in the letters which compares unfavour- ably with the upright and elegant hands of other countries. In western Europe generally the minuscule hand thus nationalized ran its course down to the time of the invention of printing, when the so-called black letter, or set hand of the 15th century in Germany and other countries, furnished models for the types. But in Italy, with the revival of learning, a more refined taste set in in the production of MSS., and scribes went back to an earlier time in search of a better standard of writing. Hence, in the first quarter of the 15th century, MSS. written on the lines of the Italian hand of the early 12th century begin to appear, and become continually more numerous. This revived hand was brought to perfection soon after the middle of the century, just at the right moment to be adopted by the early Italian printers, and to be perpetuated by them in their types.

English Cursive Charier-Hands. — It must also not be forgotten that by the side of the book-hand of the later middle ages there was the cursive hand of everyday use. This is represented in abundance in the large mass of charters and legal or domestic documents which remains. Some notice has already been taken of the development of the national cursive hands in the earliest times. From the 12th century downwards these hands settled into well defined and distinct styles peculiar to different countries, and passed through systematic changes which can be recognized as characteristic of particular periods. But, while the cursive hand thus followed out its own course, it was still subject to the same laws of change which governed the book-hand; and the letters of the two styles did not differ at any period in their organic formation. Confining our attention to the charter- hand, or court-hard, practised in England, a few specimens may be taken to show the principal changes which it developed. In the 1 2th century the official hand which had been introduced after the Norman Conquest is characterized by exaggeration in the strokes above and below the line, a legacy of the old Roman cursive, as already noted. There is also a tendency to form the tops of tall vertical strokes, as in b, h, I, with a notch or cleft. The letters are well made and vigorous, though often rugged.

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Fig. 47. — Charter of Stephen, a.d. 1136-1139.

(et ministm et omnibus fidelibas suis Francis et

Regine uxoris mee et Eustachii filii

mei dedi et concessi ecclesie Beate Marie)

As the century advances, the long limbs are brought into better proportion; and early in the 13th century a very delicate fine-stroked hand comes into use, the cleaving of the tops being now a regular system, and the branches formed by the cleft falling in a curve on either side. This style remains the writing of the reigns of John and Henry III.

Fig. 48. — Charter of Henry III., a.d. 1259.

(uniuersis presentes litteras inspecturis sal«fem. Nouentis quod — — ford et Essexie et Constabularium Anglie et WilWmwm de Fortibtts — ad iurandum in animam nostrum in presencia nostra de pace)

Towards the latter part of the 13th century the letters grow rounder; there is generally more contrast of light and heavy

strokes; and the cleft tops begin, as it were, to shed the branch on the left.

pens, ntm »rm mwotSt ouftroccflc flfl«cie|m«2C anitmcmc

Fig. 49. — Charter of Edward I., a.d. 1303. (More cum pertinentiis in mora que vocatwr Inkelesmore continentem — se in longitudine per medium more illius ab uno capite — Abbas et Conuentus aliquando tenueruwt et quam prefatus Co —)

In the 14th century the changes thus introduced make further progress, and the round letters and single-branched vertical strokes become normal through the first half of the century. Then, however, the regular formation begins to give way and angularity sets in. Thus in the reign of Richard II. we have a hand presenting a mixture of round and angular elements — ■ the letters retain their breadth but lose their curves. Hence, by further decadence, results the angular hand of the 15th century, at first compact, but afterwards straggling

and ill-formed.

<$»eeJf|W

Fig. 50. — English Charter, a.d. 1457. (and fully to be endid, payinge yerely the seid — successours in hand halfe yere afore that is — next suyinge xxiij. s; iiij. d. by evene porciouns.)

In concluding these remarks on the medieval cursive English writing, it is only necessary to remind the reader that the modern English cursive hand owes its origin to the general introduction into the west of the fine round Italian cursive hand of the 16th century — one of the notable legacies bequeathed to us by the wonderful age of the Renaissance.

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The application of photographic processes to the reproduction of entire MSS. has received great impetus during the last few years, and will certainly be widely extended in the future. Many of the most ancient biblical and other MSS. have been thus reproduced; the librarians of the university of Leiden are issuing a great series comprising several of the oldest classical MSS.; and under the auspices of the pope and the Italian government famous MSS. in the Vatican and other libraries in Italy are being published by this method; not to mention the issue of various individual MSS. by other corporate bodies or private persons. (E. M. T.)

PALAEOLITHIC (Gr. iraKam, old, and Wos, stone), in anthro- pology, the characteristic epithet of the Drift or early Stone Age when Man shared the possession of Europe with the mammoth, the cave-bear, the woolly-haired rhinoceros and other extinct

animals. The epoch is characterized by flint implements of the rudest type and never polished. The fully authenticated remains of palaeolithic man are few, and discoveries are confined to certain areas, e.g. France and north Italy. The reason is that interment appears not to have been practised by the river-drift hunters, and the only bones likely to be found would be those accidentally preserved in caves or rock-shelters. The first actual find of a palaeolithic implement was that of a rudely fashioned flint in a sandbank at Menchecourt in 1841 by Boucher de Perthes. Further discoveries have resulted in the division of the Palaeolithic Age into various epochs or sequences according to the faunas associated with the implements or the localities where found. One classification makes three divisions for the epoch, characterized respectively by the existence of the cave- bear, the mammoth and reindeer; another, two, marked by the prevalence of the mammoth and reindeer respectively. These divisions are, however, unsatisfactory, as the fauna relied on as characteristic must have existed synchronously. The four epochs or culture-sequences of G. de Mortillet have met with the most general acceptance. They are called from the places in France where the most typical finds of palaeolithic remains have been made — Chellian from Chelles, a few miles east of Paris; Mousterian from the cave of Moustier on the river Vez&re, Dordogne; Solutrian from the cave at Solutr6 near Macon; and Madelenian from the rocky shelter of La Madeleine, Dordogne.

PALAEOLOGUS, a Byzantine family name which first appears in history about the middle of the nth century, when George Palaeologus is mentioned among the prominent supporters of Nicephorus Botaniates, and afterwards as having helped to raise Alexius I. Comnenus to the throne in 1081; he is also noted for his brave defence of Durazzo against the Normans in that year. Michael Palaeologus, probably his son, was sent by Manuel II. Comnenus into Italy as ambassador to the court of Frederick I. in n 54; in the following year he took part in the campaign against William of Sicily, and died at Bari in 1155. A son or brother of Michael, named George, received from the emperor Manuel the title of Sebastos, and was entrusted with several important missions; it is uncertain whether he ought to be identified with the George Palaeologus who took part in the conspiracy which dethroned Isaac Angelus in favour of Alexius Angelus in 1195. Andronicus Palaeologus Comnenus was Great Domestic under Theodore Lascaris and John Vatatzes; his eldest son by Irene Palaeologina, Michael (q.v.), became the eighth emperor of that name in 1260, and was in turn followed by his son Andronicus II. (1282-1328). Michael, the son of Andronicus, and associated with him in the empire, died in 1320, but left a son, Andronicus III., who reigned from 1328 to 1341; John VI. (1355-1391), Manuel II. (1391-1425) and John VII. (1425-1448) then followed in lineal succession; Constantine XI. or XII., the last emperor of the East (1448-1453), was the younger brother of John VII. Other brothers were Demetrius, prince of the Morea until 1460, and Thomas, prince of Achaia, who died at Rome in 1465. A daughter of Thomas, Zoe by name, married Ivan III. of Russia. A younger branch of the Palaeologi held the principality of Monferrat from 1305 to 1533, when it became extinct.

See Roman Empire, Later, and articles on the separate rulers.

PALAEONTOLOGY (Gr. 7raXtw6s, ancient, neut. pi. SVra, beings, and \oyia, discourse, science), the science of extinct forms of life. Like many other natural sciences, this study dawned among the Greeks. It was retarded and took false directions until the revival of learning in Italy. It became established as a distinct branch in the beginning of the 19th century, and some- what later received the appellation ” palaeontology,” which was given independently by De Blainville and by Fischer von Waldheim about 1834. In recent years the science of vegetable palaeontology has been given the distinct name of Paleobotany (q.v.), so that ” palaeontology ” among biologists mainly refers to zoology; but historically the two cannot be disconnected.

Palaeontology both borrows from and sheds light upon geology and

other branches of the physical history of the earth,

each of which, such as palaeogeography or palaeometeorology, is the more fascinating because of the large element of the un- known, the need for constructive imagination, the appeal to other branches of biological and physical investigation for supplementary evidence, and the necessity of constant compari- son with the present aspects of nature. The task of the palae- ontologist thus begins with the appearance of life on the globe, and ends in close relation to the studies of the archaeologist and historian as well as of the zoologist and botanist. That wealth of evidence which the zoologist enjoys, including environment in all its aspects and anatomy in its perfection of organs and tissues, the palaeontologist finds partially or wholly destroyed, and his highest art is that of complete restoration of both the past forms and past environments of life (see Plates I. and II.; figs, i, 2, 3, 4, 5). The degree of accuracy in such anatomical and physiographic restorations from relatively imperfect evidence will always represent the state of the science and the degree of its approach toward being exact or complete. Progress in the science also depends upon the pursuit of palae- ontology as zoology and not as geology, because it was a mere accident of birth which connected palaeontology so closely with geology.

In order to illustrate the grateful services which palaeontology through restoration may render to the related earth sciences let us imagine a vast continent of the past wholly unknown in its physical features, elevation, climate, configuration, but richly represented by fossil remains. All the fossil plants and animals of every kind are brought from this continent into a great museum; the latitude, longitude and relative elevation of each specimen are precisely recorded; a corps of investigators, having the most exact and thorough training in zoology and botany, and gifted with imagination, will soon begin to restore the geographic and physiographic outlines of the continent, its fresh, brackish and salt-water confines, its seas, rivers and lakes, its forests, uplands, plains, meadows and swamps, also to a certain extent the cosmic relations of this continent, the amount and duration of its sunshine, as well as something of the chemical constitution of its atmosphere and the waters of its rivers and seas; they will trace the progressive changes which took place in the outlines of the continent and its surrounding oceans, following the invasions of the land by the sea and the re-emergence of the land and

retreatal of the seashore; they will outline the shoals and deeps of its border seas, and trace the barriers which pre- vented intermingling of the inhabitants of the various provinces of the continent and the surrounding seas. From a study of remains of themollusca, brachiopoda and other marine organisms they will determine the shallow water (littoral) and deep water (abyssal) regions of the surrounding oceans, and the clear or muddy, salt, brackish or fresh character of its inland and marginal seas; and even the physical conditions of the open sea at the time will be ascertained.

In such manner Johannes Walther (Die Fauna der Solnhofener Flatten Kalke Bionomisch betrachtet. Festschrift zum 7oten Geburtstage von Ernst Haeckel, 1904) has restored the condi- tions existing in the lagoons and atoll reefs of the Jurassic sea of Solnhofen in Bavaria; he has traced the process of gradual accumulation of the coral mud now constituting the fine litho- graphic stones in the inter-reef region, and has recognized the periodic laying bare of the mud surfaces thus formed; he has determined the winds which carried the dust particles from the not far distant land and brought the insects from the adjacent Jurassic forests. Finally the presence of the flying lizards (Fterydactylus, Rhamphorhynchus) and the ancient birds (Archaeopteryx) is determined from remains in a most wonderful state of preservation in these ancient deposits.

Still another example of restoration, relating to the surface of a continent, may be cited. It has been discovered that at the beginning of the Eocene the lake of Rilly occupied a vast area east of the present site of Paris; a water-course fell there in cascades, and Munier-Chalmas has reconstructed all the details of that singular locality; plants which loved moist places, such zsMarchanlia, Asplenium, the covered banks overshadowed by

lindens, laurels, magnolias and palms; there also were found the vine and the ivy; mosses (Fontinalis) and Char a sheltered the crayfish (Astacus); insects and even flowers have left their delicate impressions in the travertine which formed the borders of this lake. The Oligocene lake basin of Florissant, Colorado, has been reconstructed similarly by Samuel Hubbard Scudder and T. D. A. Cockerell, including the plants of its shores, the insects which lived upon them, the fluctuations of its level, and many other characteristics of this extinct water body, now in the heart of the arid region of the Rocky Mountains.

Such restorations are possible because of the intimate fitness of animals and plants to their environment, and because such fitness has distinguished certain forms of life from the Cambrian to the present

time; the species have altogether changed, but the laws governing the life of certain kinds of organisms have remained exactly the same for the whole period of time assigned to the duration of life; in fact, we read the conditions of the past in a mirror of adaptation, often sadly tarnished and incomplete owing to breaks in the palaeontological record, but constantly becoming more polished by discoveries which increase the understanding of life and its all-pervading relations to the non-life. Therefore adaptation is the central principle of modern palaeontology in its most comprehensive sense.

This conception of the science and its possibilities is the result of very gradual advances since the beginning of the 19th century in what is known as the method of palaeontology. The history of this science, like that of all physical sciences, covers two parallel lines of development which have acted and reacted upon each other — namely, progress in exploration, research and discovery, and progress in philosophic interpretation. Progress in these two lines is by no means uniform; while, for example, palaeontology enjoyed a sudden advance early in the 19th century through the discoveries and researches of Cuvier, guided by his genius as a comparative anatomist, it was checked by his failure as a natural philosopher. The great philosophical impulse was that given by Darwin in 1859 through his demon- stration of the theory of descent, which gave tremendous zest to the search for pedigrees (phylogeny) of the existing and extinct types of animal and plant life. In future the philosophic method of palaeontology must continue to advance step by step with exploration; it would be a reproach to later generations if they did not progress as far beyond the philosophic status of Cuvier, Owen and even of Huxley and Cope, as the new materials represent an advance upon the material opportunities which came to them through exploration.

To set forth how best to do our thinking, rather than to follow the triumphs achieved in any particular line of exploration, and to present the point we have now reached in the method or principles of palaeontology, is the chief purpose of this article. The illustrations will be drawn both from vertebrate and invertebrate palaeontology. In the latter branch the author is wholly indebted to Professor Amadeus W. Grabau of Columbia University. The subject will be treated in its biological aspects, because the relations of palaeontology to historical and strati- graphic geology are more appropriately considered under the article Geology. See also, for botany, the article Palaeo- botany. We may first trace in outline the history of the birth of palaeontological ideas, from the time of their first adum- bration. But for full details reference must be made to the treatises on the history of the science cited in the bibliography at the end of the article.

I. — First Historic Period

The scientific recognition of fossils as connected with the past history of the earth, from Aristotle (384-322 B.C.) to the beginning of the igth century, in connexion with the rise of comparative anatomy and geology. — The dawn of the science covers the first observation of facts and the rudiments of true interpretation. Among the Greeks, Aristotle (384-322 B.C.) Xenophon (430-357 B.C.) and Strabo (63 b.c.-a.d. 24) knew of the existence of fossils and surmised in a crude way their relation to earth history. Similar prophetic views are found among certain Roman

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Plate I.

Fig. i. — An ichthyosaur (T. quadriscissus) containing in the body cavity the partially preserved skeletons of seven young, proving that the young of the animal developed within the maternal body and were brought forth alive; i.e. that the ichthyosaur was a viviparous animal. (Specimen presented to the American Museum of Natural History bv the Royal Museum of Stuttgart through Professor Eberhard Fraas.)

Fig. 2.— A hypothetical pictorial restoration of the mother ichthyosaur accompanied by five of its newly born young, from the information furnished by actual fossils.

(From a drawing by Charles R. K flight made under the direction of Professor Osborn.)

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Fig. 3- — One of the most perfect of the many specimens discovered an

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Materials for the Restoration of Ichlhyosaurs. — This plate illustrates the exceptional opportunity afforded the palaeontologist through the

remarkably preserved remains of Ichthyosaurs in the quarries of Holzmaden near Stuttgart, Wiirttemberg, excavated for many years by Herr Bernard Hauff. (Illustrations reproduced by permission from specimens in the American Museum of Natural History, New York.)

Plate II.

PALAEONTOLOGY

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Fig. 4. -SKELETON OF ALLOSAURES.

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Fir,. 5.— RESTORATION OF ALLOSAURUS. Materials for the Restoration of Dinosaurs.— Carnivorous dinosaur (Allosaurus) of the Upper Jurassic period of North America, an ani- mal closely related to the Megalosaurus type of England. The skeleton (fig. 4) was found nearly complete in the beds of the Morrison formation L pper Jurassic of central \ yoming, U.S.A. Near it was discovered the posterior portion of the skeleton of a riant herbivorous dinosaur (Broniosaurus Marsh). It was observed that ten of the caudal vertebra of the latter skeleton bore tooth marks and grooves corresponding exactly with the sharp pointed teeth in the jaw of the carnivorous dinosaur. This proved that the great herbivorous dinosaur had been preyed upon by its smaller carnivorous contemporary. Teeth of the carnivorous dinosaur scattered among the bones oi the herbivorous dinosaur completed the line of circumstantial evidence. Upon this testimony the restoration (fig. 5) of the Megalosaur has been drawn by Charles R. Knight under the direction of Professor Osborn. •■ S

(Originals reproduced by permission of the American Museum of Natural History.)

PALAEONTOLOGY

writers. The pioneers of the science in the 16th and 17th cen- turies put forth anticipations of some of the well-known modern principles, often followed by recantations, through deference to prevailing religious or traditional beliefs. There were the retarding influences of the Mosaic account of sudden creation, and the belief that fossils represented relics of a universal deluge. There were crude medieval notions that fossils were ” freaks ” or ” sports ” of nature (lusus naturae), or that they represented failures of a creative force within the earth (a notion of Greek and Arabic origin), or that larger and smaller fossils represented the remains of races of giants or of pygmies (the mythical idea).

As early as the middle of the 1 5th century Leonardo da Vinci (1432-1519) recognized in seashells as well as in the teeth of marine fishes proofs of ancient sea-levels on what are now the summits of the Apennines. Successive observers in Italy, notably Fracastoro (1483-1553), Fabio Colonna (1567-1640 or 1650) and Nicolaus Steno (1638-c. 1687), a Danish anatomist, professor in Padua, advanced the still embryonic science and set forth the principle of comparison of fossil with living forms. Near the end of the 17th century Martin Lister (1638-1712), examining the Mesozoic shell types of England, recognized the great similarity as well as the differences between these and modern species, and insisted on the need of close comparison of fossil and living shells, yet he clung to the old view that fossils were sports of nature. In Italy, where shells of the sub-Apennine formations were discovered in the extensive quarrying for the fortifications of cities, the close similarity between these Tertiary and the modern species soon led to the established recognition of their organic origin. In England Robert Hooke (1635-1703) held to the theory of extinction of fossil forms, and advanced the two most fertile ideas of deriving from fossils a chronology, or series of time intervals in the earth’s history, and of primary changes of climate, to account for the former existence of tropical species in England.

The 1 8th century witnessed the development of these sugges- tions and the birth of many additional theories. Sir A. Geikie assigns high rank to Jean Etienne Guettard (1715-1786) for his treatises on fossils, although admitting that he had no clear idea of the sequence of formations. The theory of successive formations was soundly developing in the treatises of John Woodward (1665-1728) in England, of Antonio Vallisnieri (1661-1730) in Italy, and of Johann Gottlob Lehmann (d. 1767) in Germany, who distinguished between the primary, or unfos- siliferous, and secondary or fossiliferous, formations. The begin- nings of palaeogeography followed those of palaeometeorology. The Italian geologist Soldani distinguished (1758)

between the fossil fauna of the deep sea and of the shore-lines. In the same year Johann Gesner (1 709-1 790) set forth the theory of a great period of time, which he estimated at 80,000 years, for the eleva- tion of the shell-bearing levels of the Apennines to their present height above the sea. The brilliant French naturalist Georges Louis Leclerc, comte de Buffon (1707-1788), in Les Epoques de la nature, included in his vast speculations the theory of alternate submergence and emergence of the continents. Abraham Gottlob Werner (17 50-1 8 17), the famous exponent of the aqueous theory of earth formation, observed in successive geological formations the gradual approach to the forms of existing species.

II. — Second Historic Period

Invertebrate palaeontology founded by Lamarck, vertebrate palaeontology by Cuvier. Palaeontology connected with compara- tive anatomy by Cuvier. Invertebrate fossils employed for the definite division of all the great periods of time. — Although pre-evolutionary, this was the heroic period of the science, extending from the close of the 18th century to the publication of Darwin's Origin of Species in 1859. Among the pioneers of this period were the vertebrate zoologists and comparative anatomists Peter Simon Pallas, Pieter Camper and Johann Friedrich Blumenbach. Pallas (1 741-181 1) in his great journey (1 768-1 774) through Siberia discovered the vast deposits of extinct mammoths and rhinoceroses. Camper (1722-1789) contrasted (1777) the

Pleistocene and recent species of elephants and Blumenbach (1752-1840) separated (1780) the mammoth from the existing species as Elephas primigenius. In 1793 Thomas Pennant (17 26-1 798) distinguished the American mastodon as Elephas americanus.

Political troubles and the dominating influence of Werner's speculations checked palaeontology in Germany, while under the leadership of Lamarck and Cuvier France came to the fore. J. B. Lamarck (1744-1829) was the founder of invertebrate palaeontology. The treatise which laid the foundation for all subsequent invertebrate palaeontology was his memoir, Sur les fossiles des environs- de Paris . . . (1802-1806). Beginning in 1793 he boldly advocated evolution, and further elaborated five great principles — namely, the method of comparison of extinct and existing forms, the broad sequence of formations and succession of epochs, the correlation of geological horizons by means of fossils, the climatic or environmental changes as influencing the development of species, the inheritance of the bodily modifications caused by change of habit and habitat. As a natural

philosopher he radically opposed Cuvier and was distinctly a precursor of uniformitarianism, advocating the hypothesis of slow changes and variations, both in living forms and in their environment. His speculations on phylogeny, or the descent of invertebrates and vertebrates, were, however, most fantastic and bore no relation to palaeontological evidence.

It is most interesting to note that William Smith (1 769-1839), now known as the ” father of historical geology,” was born in the same year as Cuvier. Observing for himself (1794-1800) the stratigraphic value of fossils, he began to distinguish the great Mesozoic formations of England (1801). Cuvier (1769- 1832) is famous as the founder of vertebrate palaeontology, and with Alexandre Brongniart (1770-1847) as the author of the first exact contribution to stratigraphic geology. Early trained as a comparative anatomist, the discovery of Upper Eocene mammals in the gypsum quarries of Montmartre found him fully prepared (1798), and in 18 12 appeared his Recherches sur les ossemens fossiles, brilliantly written and constituting the foundation of the modern study of the extinct vertebrates. Invulnerable in exact anatomical description and comparison, he failed in all his philosophical generalizations, even in those strictly within the domain of anatomy. His famous ” law of correlation’,” which by its apparent brilliancy added enormously to his prestige, is not supported by modern philosophical ana- tomy, and his services to stratigraphy were diminished by his generalizations as to a succession of sudden extinctions and renovations of life. His joint memoirs with Brongniart, Essai sur la geographie mineralogique des environs de Paris avec une carte gdognostique et des coupes de terrain (1808) and Description geo- logique des environs de Paris (1835) were based on the wonderful succession of Tertiary faunas in the rocks of the Paris basin. In Cuvier’s defence Charles Deperet maintains that the extreme theory of successive extinctions followed by a succession of creations is attributable to Cuvier’s followers rather than to the master himself. Deperet points also that we owe to Cuvier the first clear expression of the idea of the increasing organic per- fection of all forms of life from the lower to the higher horizons, and that, while he believed that extinctions were due to sudden revolutions on the surface of the earth, he also set forth the pregnant ideas that the renewals of animal life were by migration from other regions unknown, and that these migrations were favoured by alternate elevations and depressions which formed various land routes between great continents and islands. Thus Cuvier, following Buffon, clearly anticipated the modern doctrine of faunal migrations. His reactionary and retarding ideas as a special creationist and his advocacy of the cataclysmic theory of

change exerted a baneful influence until overthrown by the uniformitarianism of James Hutton (1726-1797) and Charles Lyell (1 797-1875) and the evolutionism of Darwin.

The chief contributions of Cuvier's great philosophical opponent, fitienne Geoffroy St Hilaire (1772-1844), are to be found in his maintenance with Lamarck of the doctrine of the mutability of species. In this connexion he developed his

special theory of saltations, or of sudden modifications of structure through changes of environment, especially through the direct influences of temperature and atmosphere. He clearly set forth also the phenomena of analogous or parallel adaptation.

It was Alcide Dessalines d'Orbigny (1802-1857) who pushed to an extreme Cuvier's ideas of the fixity of species and of successive extinctions, and finally developed the wild hypothesis of twenty-seven distinct creations. While these views were current in France, exaggerating and surpassing the thought of Cuvier, they were strongly opposed in Germany by such authors as Ernst Friedrich von Schlotheim (1764-1832) and Heinrich Georg Bronn (1800-1862); and the latter demonstrated that certain species actually pass from one formation to another.

In the meantime the foundations of palaeobotany were being laid (1804) by Ernst Friedrich von Schlotheim (1764-1832), (1811) by Kaspar Maria Sternberg (1761-1838) and (1838) by Theophile Brongniart (1801-1876).

Following Cuvier's Recherches sur les ossemens fossiles, the rich succession of Tertiary mammalian life was gradually revealed to France through the explorations and descriptions of such authors as Croizet, Jobert, de Christol, Eymar, Pomel and Lartet, during a period of rather dry, systematic work, which included, however, the broader generalizations of Henri Marie Ducrotay de Blainville (1778-1850), and culminated in the comprehensive treatises on Tertiary palaeontology of Paul Gervais (1816-1879). Extending the knowledge of the extinct mammals of Germany, the principal contributors were Georg August Goldfuss (1 782-1848), Georg Friedrich von Jaegar (1785-1866), Felix F. Plieninger (1807-1873) and Johann Jacob Kaup (1803-1873). As Cuvier founded the palaeontology of mammals and

reptiles, so Louis Agassiz's epoch-making works Recherches sur les poissons fossiles (1833-1845) laid the secure foundations of palaeichthyology, and were followed by Christian Heinrich Pander's (1794-1865) classic memoirs on the fossil fishes of Russia. In philosophy Agassiz was distinctly a disciple of Cuvier and supporter of the doctrine of special creation, and to a more limited extent of cataclysmic extinctions. Animals of the next higher order, the amphibians of the coal measures and the Permian, were first comprehensively treated in the masterly memoirs of Christian Erich Herrnann von Meyer (1801-1869) beginning in 1829, especially in his Beitrage zur Pelrefactenkunde (1829-1830) and his Zur Fauna 'der Vorwelt (4 vols., 1845-1860). Successive discoveries gradually revealed the world of extinct Reptilia; in 182 1 Charles Konig (1784-1851), the first keeper of the mineralogical collection in the British Museum, described Ichthyosaurus from the Jurassic; in the same year William Daniel Conybeare (1 787-1857) described Plesiosaurus; and a year later (1822) Mosasaurus; in 1824 William Buckland described the great carnivorous dinosaur Megalosaurus; while Gideon Algernon Mantell (1790-1852) in 1848 announced the discovery of Iguanodon. Some of the fossil Reptilia of France were made known through St Hilaire's .researches on the Crocodilia (183 1), and those of J. A. Deslong- champs (1794-1867) and his son on the teleosaurs, or long- snouted crocodiles. Materials accumulated far more rapidly, however, than the power of generalization and classification. Able as von Meyer was, his classification of the Reptilia failed because based upon the single adaptive characters of foot structure. The reptiles awaited a great classifier, and such a one appeared in England in the person of Sir Richard Owen (1804-1892), the direct successor of Cuvier and a comparative anatomist of the first rank. Non-committal as regards evolu- tion, he vastly broadened the field of vertebrate palaeontology by his descriptions of the extinct fauna of England, of South America (including especially the great edentates revealed by the voyage of the " Beagle "), of Australia (the ancient and modern marsupials) and of New Zealand (the great struthious birds). His contributions on the Mesozoic reptiles of Great Britain culminated in his complete rearrangement and classifi- cation of this group, one of his greatest services to palaeontology. Meanwhile the researches of Hugh Falconer (1808-1865) and of Proby Thomas Cautley (1802-1871) in the sub-Himalayas

brought to light the marvellous fauna of the Siwalik hills of India, published in Fauna antiqua Sivalensis (London, 1845) and in the volumes of Falconer's individual researches. The ancient life of the Atlantic border of North America was also becoming known through

the work of the pioneer vertebrate palaeontologists Thomas Jefferson (1743-1826), Richard Harlan (1796-1843), Jeffries Wyman (1814-1874) and Joseph Leidy (1823-1891). This was followed by the revelation of the vast ancient life of the western half of the American continent, which was destined to revolutionize the science. The master works of Joseph Leidy began with the first-fruits of western exploration in 1847 and extended through a series of grand memoirs, culmina- ting in 1874. Leidy adhered strictly to Cuvier's exact descriptive methods, and while an evolutionist and recognizing clearly the genetic relationships of the horses and other groups, he never indulged in speculation.

The history of invertebrate palaeontology during the second period is more closely connected with the rise of historic geology and stratigraphy, especially with the settlement of the great and minor time divisions of the earth's history. The path- breaking works of Lamarck were soon followed by the monu- mental treatise of Gerard Paul Deshayes (1795-1875) entitled Descriptions des coquilles fossiles des environs de Paris (1824- 1837), the first of a series of great contributions by this and other authors. These and other early monographs on the Tertiary shells of the Paris basin, of the environs of Bordeaux, and of the sub-Apennine formations of Italy, brought out the striking distinctness of these faunas from each other and from other molluscan faunas. Recognition of this threefold character led Deshayes to establish a threefold division of the Tertiary based on the percentage of molluscs belonging to types now living found in each. To these divisions Lyell gave in 1833 the names Eocene, Miocene and Pliocene.

James Hutton (1726-1797) had set forth (1788) the principle that during all geological time there has been no essential change in the character of events, and that uniformity of law is perfectly consistent with mutability in the results. Lyell marshalled all the observations he could collect in support of this principle, teaching that the present is the key to the past, and arraying all obtainable evidence against the cataclysmic theories of Cuvier. He thus exerted a potent influence on palaeontology through his persistent advocacy of uniformi- tarianism, a doctrine with which Lamarck should also be credited. As among the vertebrates, materials were accumulating rapidly for the great generalizations which were to follow in the third period. De Blainville added to the knowledge of the shells of the Paris basin; Giovanni Battista Brocchi (1 772-1826) in 1814, and Luigi Bellardi (1818-1889) and Giovanni Michelotti (born r8i2) in 1840, described the Pliocene molluscs of the sub- Apennine formation of Italy; from Germany and Austria appeared the epoch-making works of Heinrich Ernst Beyrich

(1815-1896) and of Moritz Hoernes (1815-1868).

We shall pass over here the labours of Adam Sedgwick (1785-1873) and Sir Roderick Murchison (1792-1871) in the Palaeozoic of England, which because of their close relation to stratigraphy more properly concern geology; but must mention the grand contributions of Joachim Barrande (1799-1883), published in his Systeme silurien du centre de la Boheme, the first volume of which appeared in 1852. While establishing the historic divisions of the Silurian in Bohemia, Barrande also propounded his famous theory of ” colonies,” by which he attempted to explain the aberrant occurrence of strata con- taining animals of a more advanced stage among strata containing earlier and more primitive faunas; his assumption was that the second fauna had migrated from an unknown neighbouring region. It is proved that the specific instances on which Barrande’s generalizations were founded were due to his misinterpretation of the overturned and faulted strata, but his conception of the simultaneous existence of two faunas, one of more ancient and one of more modern type, and of their alternation in a given area, was based on sound philosophical principles and has been confirmed by more recent work.

The greatest generalization of this second period, however, was that partly prepared for by d’Orbigny, as will be more fully explained later in this article, and clearly expressed by Agassiz — namely, the law of repetition of ancestral stages of life in the course of the successive stages of individual development. This law of recapitulation, subsequently termed the ” biogenetic law ” by Ernest Haeckel, was the greatest philosophic contri- bution of this period, and proved to be not only one of the bulwarks of the evolution theory but one of the most important principles in the method of palaeontology.

On the whole, as in the case of vertebrate palaeontology, the pre-Darwinian period of invertebrate palaeontology was one of rather dry systematic description, in which, however, the applications of the science gradually extended to many regions of the world and to all divisions of the kingdom of invertebrates.

III. — Third Historic Period

Beginning with the publication of Darwin’s great works, ” Narrative of the Surveying Voyages of H.M.S. ‘Adventure ‘ and ‘ Beagle ‘ ” (1839),

and ” On the Origin of Species by Means of Natural Selection” (1859). — A review of the two first classic works of Charles Robert Darwin (1809-188 2) and of their influence proves that he was the founder of modern palaeon- tology. Principles of descent and other applications of uniformi- tarianism which had been struggling for expression in the writings of Lamarck, St Hilaire and de Blainville here found their true interpretation, because the geological succession, the rise, the migrations, the extinctions, were all connected with the grand central idea of evolution from primordial forms.

A close study of the exact modes of evolution and of the philosophy of evolution is the distinguishing feature of this period. It appears from comparison of the work in the two great divisions of vertebrate and invertebrate palaeontology made for the first time in this article that in accuracy of observa- tion and in close philosophical analysis of facts the students of invertebrate palaeontology led the way. This was due to the much greater completeness and abundance of material afforded among invertebrate fossils, and it was manifested in the demon- stration of two great principles or laws: first, the law of recapitu- lation, which is found in its most ideal expression in the shells of invertebrates; second, in the law of direct genetic succession through very gradual modification. It is singular that the second law is still ignored by many zoologists. Both laws were of paramount importance, as direcr evidence of Darwin’s theory of descent, which, it will De remembered, was at the time regarded merely as an hypcthesis. Nevertheless, the tracing of phylogeny, or direct lines of descent, suddenly began to attract far more interest than the naming and description of species.

The Law of Recapitulation. Acceleration. Retardation. — This law, that in the stages of growth of individual development (ontogeny) , an animal repeats the stages of its ancestral evolution (phylogeny) was, as we have stated, anticipated by d’Orbigny. He recognized the fact that the shells of molluscs, which grow by successive additions, preserve unchanged the whole series of stages of their individual development, 30 that each shell of a Cretaceous ammonite, for example, represents five stages of progressive modification as follows: the first is the periode embryonnaire, during which the shell is smooth; the second and third represent periods of elaboration and ornamentation; the fourth is a period of initial degeneration; the fifth and last a period of degeneration when ornamentation becomes obsolete and the exterior smooth again, as in the young. D’Orbigny, being a special creationist, failed to recognize the bearing of these individual stages on evolution. Alpheus Hyatt (1838- 1902) was the first to discover (1866) that these changes in the form of the

ammonite shell agreed closely with those which had been passed through in the ancestral history of the ammonites. In an epoch-making essay, On the Parallelism between the Different stages of Life in the individual and those in the entire group of the Molluscous Order Tetrabranchiata (1866), and in a number of subsequent memoirs, among which Genesis of the Arielidae (1889)

and Phylogeny of an Acquired Characteristic (1894) should be mentioned, he laid the foundations, by methods of the most exact analysis, for all future recapitulation work of invertebrate palaeontologists. He showed that from each individual shell of an ammonite the entire ancestral series may be reconstructed, and that, while the earlier shell-whorls retain the characters of the adults of preceding.members of the series, a shell in its own adult stage adds a new character, which in turn becomes the pre-adult character of the types which will succeed it; finally, that this comparison between the revolutions of the life of an individual and the life of the entire order of ammonites is wonder- fully harmonious and precise. Moreover, the last stages of individual life are prophetic not only of future rising and progressing derivatives, but in the case of senile individuals of future declining and degradational series.

Thus the recapitulation law, which had been built up indepen- dently from the observations and speculations on vertebrates by Lorenz Ofen (1779-1851), Johann Friedrich Meckel (1781-1833), St Hilaire, Karl Ernst von Baer (1792-1876) and others, and had been applied (1842-1843) by Karl Vogt (1817-1895) and Agassiz, in their respective fields of observation, to comparison of indi- vidual stages with the adults of the same group in preceding geological periods, furnished the key to the determination of the ancestry of the invertebrates generally.

Hyatt went further and demonstrated that ancestral characters are passed through by successive descendants at a more and more accelerated rate in each generation, thus giving time for the appearance of new characters in the adult. His ” law of acceleration ” together with the complementary ” law of retardation,” or the slowing up in the development of certain characters (first propounded by E. D. Cope), was also a philo-

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(From the American Naturalist.)

Fig. 6.

sophic contribution of the first importance (see fig. 6 and Plate III., fig. 7).

In the same year, 1866, Franz Martin Hilgendorf (1839-) studied the shells of Planorbis from the Miocene lake basin underlying the present village of Steinheim in Wiirttemberg, and introduced the method of examination of large numbers of individual specimens, a method which has become of prime importance in the science. He discovered the actual transmu- tations in direct genetic series of species on the successive deposition levels of the old lake basin. This study of direct genetic series marked another great advance, and became possible in invertebrate palaeontology long before it was introduced among the vertebrates. Hyatt, in a re-examination of the Steinheim deposits, proved that successive modifications occur at the same level as well as in vertical succession. Melchior Neumayr (1845-1890) and C. M. Paul similarly demonstrated genetic series of Paludina (Vivipara) in the Pliocene lakes of Slavonia (1875).

The Mutations of Waagen. Orthogenesis. — In 1869 Wilhelm Heinrich Waagen (1841-1900) entered the field with the study of Ammonites subradiatus. He proposed the term ” mutations ” for the minute progressive changes of single characters in definite directions as observed in successive stratigraphic levels. Even when seen in minute features only he recognized them as constant progressive characters or ” chronologic varieties ” in

contrast with contemporaneous or ” geographic varieties,” which he considered inconstant and of slight systematic value. More recent analysis has shown, however, that certain modifica- tions observed within the same stratigraphic level are really grades of mutations which show divergences comparable to those found in successive levels. The collective term ” muta- tion,” as now employed by

palaeontologists, signifies a type modified to a slight degree in one or more of its characters along a progressive or definite line of phyletic development. The term ” mutation ” also applies to a single new character and for distinction 1 may be known as ” the mutation of Waagen.” This definitely directed evolution, or development in a few determinable directions, has since been termed ” orthogenetic evolution,” and is recognized by all workers in invertebrate palaeontology and phylogeny as fundamental because the facts of invertebrate palaeontology admit of no other interpretation.

Among the many who followed the method of attack first outlined by Hyatt, or who independently discovered his method, only a few can be mentioned here — namely, Waagen (1869), Neumayr (1871), Wurttemberger (1880), Branco (1880), Mojsisovics (1882), Buckman (1887), Karpinsky (1889), Jackson (1890), Beecher (1890), Perrin-Smith (1897), Clarke (1898) and Grabau (1904). Melchior Neumayr, the great Austrian palaeontologist, especially extended the philosophic foundations of modern invertebrate palaeontology, and traced a number of continuous genetic series (formenreihe) in successive horizons. He also demonstrated that mutations have this special or distinctive character, that they repeat in the same direction without oscillation or retrogression. He expressed great reserve as to the causes of these mutations. He was the first to attempt a comprehensive treatment of all invertebrates from the genetic point of view; but unfortunately his great work, entitled Die Stamme des Thierreichs (Vienna and Prague, 1889), was uncompleted.

The absolute agreement in the results independently obtained by these various investigators, the interpretation of individual development as the guide to phyletic development, the demonstration of continuous genetic series, each mutation falling into its proper place and all showing a definite direction, constitute contributions to biological philosophy of the first importance, which have been little known or appreciated by zoologists because of their publication in monographs of very special character.

Vertebrate Palaeontology after Darwin. — The impulse which Darwin gave to vertebrate palaeontology was immediate and unbounded, finding expression especially in the writings of Thomas Henry Huxley (1825-1895) in England, of Jean Albert Gaudry (b. 1827) in France, in America of Edward Drinker Cope (1840-1897) and Othniel Charles Marsh (1831-1899). Fine examples of the spirit of the period as applied to extinct Mammalia are Gaudry’s Animaux fossiles et geologic de V Attique (1862) on the Upper Miocene fauna of Pikermi near Athens, and the remarkable memoirs of Vladimir Onufrievich

Kowalevsky (1842-1883), published in 1873. These works swept aside the dry traditional fossil lore which had been accumulating in France and Germany. They breathed the new spirit of the recognition of adaptation and descent. In 1867-1872 Milne Edwards published his memoirs en the Miocene birds of central France. Huxley's development of the method of palaeontology should be studied in his collected memoirs {Scientific Memoirs of Thomas Henry Huxley, 4 vols., 1898). In Kowalevsky's Versuch einer natiir- lichen Classification der Fossilen Hufthiere (1873) we find a model union of detailed inductive study with theory and working hypothesis. All these writers attacked the problem of descent, and published preliminary phylogenies of such animals as the horse, rhinoceros and elephant, which time has proved to be of only general value and not at all comparable to the exact phylogenetic series which were being established by invertebrate palaeontologists. Phyletic gaps began to be filled in this general way, however, by discovery, especially through remarkable

1 The Dutch botanist, De Vries, has employed the term in another sense, to mean a slight jump or saltation.

discoveries in North America by Leidy, Cope and Marsh, and the ensuing phylogenies gave enormous prestige to palaeontology.

Cope's philosophic contributions to palaeontology began in 1868 (see essays in The Origin of the Fittest, New York, 1887, and The Primary Factors of Organic Evolution, Chicago, 1896) with the independent discovery and demonstration among verte- brates of the laws of acceleration and retardation. To the law of " recapitulation " he unfortunately applied Hyatt's term " parallelism," a term which is used now in another sense. He especially pointed out the laws of the " extinction of the specialized " and " survival of the non-specialized " forms of life, and challenged Darwin's principle of selection as an explana- tion of the origin of adaptations by saying that the " survival of the fittest " does not explain the " origin of the fittest." He personally sought to demonstrate such origin, first, in the existence of a specific internal growth force, which he termed bathmic force, and second in the direct inheritance of acquired mechanical modifications of the teeth and feet. He thus re- vived Lamarck's views and helped to found the so-called neo- Lamarckian school in America. To this school A. Hyatt, W. H. Dall and many other invertebrate palaeontologists subscribed.

History of Discovery. Vertebrates. — In discovery the theatre of interest has shifted from continent to continent, often in a sensational

manner. After a long period of gradual revelation of the ancient life of Europe, extending eastward to Greece, eastern Asia and to Australia, attention became centred on North America, especially on Rocky Mountain exploration. New and unheard-of orders of amphibians, reptiles and mammals came to the surface of knowledge, revolutionizing thought, demonstrating the evolution theory, and solving some of the most important problems of descent. Especially noteworthy was the discovery of birds with teeth both in Europe (Archaeopteryx) and in North America (Hesperornis), of Eocene stages in the history of the horse, and of the giant dkiosauria of the Jurassic and Cretaceous in North America. Then the stage of novelty suddenly shifted to South America, where after the pioneer labours of Darwin, Owen and Burmeister, the field of our knowledge was suddenly and vastly extended by explorations by the brothers Ameghino (Carlos and Florentino). We were in the midst of more thorough examination of the ancient world of Patagonia, of the Pampean region and of its submerged sister continent Antarctica, when the scene shifted to North Africa through the discoveries of Hugh J. L. Beadnell and Charles W. Andrews. These latter discoveries supply us with the ancestry of the elephants and many other forms. They round out our knowledge of Tertiary history, but leave the •problems of the Cretaceous mammals and of their relations to Tertiary mammals still unsolved. Similarly, the Mesozoic reptiles have been traced successively to various parts of the world from France, Germany, England, to North America and South America, to Australia and New Zealand and to northern Russia, from Cretaceous times back into the Permian, and by latest reports into the Carboniferous.

Discovery of Invertebrates. — The most striking feature of exploration for invertebrates, next to the world-wide extent to which exploration has been carried on and results applied, is the early appearance of life. Until comparatively recent times the molluscs were considered as appearing on the limits of the Cambrian and Ordovician; but Charles D. Walcott has described a tiny lamellibranch (Modioloides) from the inferior Cambrian, and he reports the gastropod (?) genus Chuaria from the pre- Cambrian. Cephalopod molluscs have been traced back to the straight-shelled nautiloids of the genus Volborthella, while true ammonites have been found in the inferior. Permian of the Conti- nent and by American palaeontologists in the true coal measures. Similarly, early forms of the crustacean sub-class Merostomata have been traced to the pre-Cambrian of North America.

Recent discoveries of vertebrates are of the same significance, the most primitive fishes being traced to the Ordovician or base of the Silurian, 2 which proves that we shall discover more

2 Professor Bashford Dean doubts the fish characters of these Ordovic Rocky Mountain forms. Freeh admits their fish character but considers the rocks infaulted Devonic.

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Plate III.

This series of feet represents the evolutionary succession from the Eocene Hypohippus (i) to the modern Equus (6) seen in front and in side view. The top bone is the OS calcis, or hock bone, to which the tendon Achilles is attached. The bottom bone is the terminal phalanx which is inserted in the heart of the hoof.

Equus caballus.

Modern horse.

- Miocene.

3 4 5 6

Fig. 7.— LAW OF ACCELERATION AND RETARDATION ILLUSTRATED IN THE EVOLUTION OF THE HIND FEET OF THE HORSE.

(From photos lent by the American Museum of Natural History.) XX. 584,

Lower Eocene (Wind river for- mation). (Wasatch

for- mation).

Fig. 8.— TEN STAGES IN THE EVOLU- TION OF THE SECOND UPPER MOLAR TOOTH OF THE RIGHT SIDE, ARRANGED ACCORDING TO GEOLOGICAL LEVEL.

(Nos. 1 -Q from “American Equidae”)

Plate IV.

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ancient chordates in the Cambrian or even pre-Cambrian. Thus all recent discovery tends to carry the centres of origin and of dispersal of all animal types farther and farther back in geological time.

IV. — Relations of Palaeontology to Other Physical Earth Sciences

Geology and Palaeophysiography. — Fossils are not absolute timekeepers, because we have little idea of the rate of evolution; they are only relative timekeepers, which enable us to check off the period of deposition of one formation with that of another. Huxley questioned the time value of fossils, but recent research has tended to show that identity of species and of mutations is, on the whole, a guide to synchroneity, though the general range of vertebrate and invertebrate life as well as of plant life is generally necessary for the establishment of approximate synchronism. Since fossils afford an immediate and generally a decisive clue to the mode of deposition of rocks, whether marine, lacustrine, fluviatile, flood plain or aeolian, they lead us naturally into palaeophysiography. Instances of marine and lacustrine analysis have been cited above. The analysis of continental faunas into those inhabiting rivers, lowlands, forests, plains or uplands, affords a key to physiographic con- ditions all through the Tertiary. For example, the famous bone-beds of the Oligocene of South Dakota have been analysed by W. D. Matthew, and are shown to contain fluviatile or channel beds with water and river-living forms, and neighbouring flood-plain sediments containing remains of plains-living forms. Thus we may complete the former physiographic picture of a vast flood plain east of the Rocky Mountains, traversed by slowly meandering streams.

As already intimated, our knowledge of palaeometeorology, or of past climates, is derivable chiefly from fossils. Suggested two centuries ago by Robert Hooke, this use of fossils has in the hands of Barrande, Neumayr, the marquis de Saporta (1895), Oswald Heer (1800-1883), and an army of followers developed into a sub-science of vast importance and interest. It is true that a great variety of evidence is afforded by the composition of the rocks, that glaciers have left their traces in glacial scratch- ings and transported boulders, also that proofs of arid or semi- arid conditions are found in the reddish colour of rocks in certain portions of the Palaeozoic, Trias and Eocene; but fossils afford the most precise and conclusive evidence as to the past history of climate, because of the fact that adaptations to temperature have remained constant for millions of years. All conclusions derived from the various forms of animal and plant life should be scrutinized closely and compared. The brilliant theories of the palaeobotanist, Oswald Heer, as to the extension of a sub-tropical climate to Europe

and even to extreme northern latitudes in Tertiary time, which have appealed to the imagina- tion and found their way so widely into literature, are now challenged by J. W. Gregory {Climatic Variations, their Extent and Causes, International Geological Congress, Mexico, 1906), who holds that the extent of climatic changes in past times has been greatly exaggerated.

It is to palaeogeography and zoogeography in their reciprocal relations that palaeontology has rendered the most unique services. Geographers are practically helpless as historians, and problems of the former elevation and distribution of the land and sea masses depend for their solution chiefly upon the palaeontologist. With good reason geographers have given reluctant consent to some of the bold restorations of ancient continental outlines by palaeontologists ; yet some of the greatest achievements of recent science have been in this field. The concurrence of botanical (Hooker, 1847), zoological, and finally of palaeontological evidence for the reconstruction of the continent of Antarctica, is one of the greatest triumphs of biological investigation. To the evidence advanced by a great number of authors comes the clinching testimony of the existence of a number of varieties of Australian marsupials in Patagonia, as originally discovered by Ameghino and more exactly described by members of the Princeton Patagonian expedition staff; while

the fossil shells of the Eocene of Patagonia as analysed by Ortmann give evidence of the existence of a continuous shore- line, or at least of shallow-water areas, between Australia, New Zealand and South America. This line of hypothesis and demonstration is typical of the palaeogeographic methods generally — namely, that vertebrate palaeontologists, impressed by the sudden appearance of extinct forms of continental life, demand land connexion or migration tracts from common centres of origin and dispersal, while the invertebrate palaeon- tologist alone is able to restore ancient coast-lines and determine the extent and width of these tracts. Thus has been built up a distinct and most important branch. The great contributors to the palaeogeography of Europe are Neumayr and Eduard Suess (b. 1831), followed by Freeh, Canu, de Lapparent and others. Neumayr was the first to attempt to restore the grander earth outlines of the earth as a whole in Jurassic times. Suess outlined the ancient relations of Africa and Asia through his ” Gondwana Land,” a land mass practically identical with the ” Lemuria ” of zoologists. South American palaeogeography has been traced by von Ihring into a northern land mass, ” Archelenis,” and a southern mass, ” Archiplata,” the latter at times united with an antarctic continent. Following the pioneer studies of Dana, the American palaeontologists and strato- graphers

Bailey Willis, John M. Clarke, Charles Schuchert and others have re-entered the study of the Palaeozoic geography of the North American continent with work of astonishing precision.

Zoogeography. — Closely connected with palaeogeography is zoogeography, the animal distribution of past periods. The science of zoogeography, founded by Humboldt, Edward Forbes, Huxley, P. L. Sclater, Alfred Russel Wallace and others, largely upon the present distribution of animal life, is now encountering through palaeontology a new and fascinating series of problems. In brief, it must connect living distribution with distribution in past time, and develop a system which will be in harmony with the main facts of zoology and palaeontology. The theory of past migrations from continent to continent, suggested by Cuvier to explain the replacement of the animal life which had become extinct through sudden geologic changes, was prophetic of one of the chief features of modern method — namely, the tracing of migrations. With this has been connected the theory of " centres of origin " or of the geographic regions where the chief characters of great groups have been established. Among invertebrates Barrande's doctrine of centres of origin was applied by Hyatt to the genesis of the Arietidae (1889); after studying thousands of individuals from the principal deposits of Europe he decided that the cradles of the various branches of this family were the basins of the C6te d'Or and southern Germany. Ortmann has traced the centre of dispersal of the fresh-water Crawfish genera Cambarus, Potamobius and Cambaroides to eastern Asia, where their common ancestors lived in Cretaceous time. Similarly, among vertebrates the method of restoring past centres of origin, largely originating with Edward Forbes, has developed into a most distinct and important branch of historical work. This branch of the science has reached the highest development in its application to the history of the extinct mammalia of the Tertiary through the original work of Cope and Henri Filhol, which has been brought to a much higher degree of exactness recently through the studies of H. F. Osborn, Charles Dep6ret, W. D. Matthew and H. G. Stehlin.

V. — Relations of Palaeontology to other Zoological Methods

Systematic Zoology. — It is obvious that the Linnaean binomial terminology and its subsequent trinomial refinement for species, sub-species, and varieties was adapted to express the differences between animals as they exist to-day, distributed contemporane- ously over the surface of the earth, and that it is wholly inadapted to express either the minute gradations of successive generic series or the branchings of a genetically connected chain of life. Such gradations, termed " mutations " by Waagen, are distinguished, as observed, in single

characters; they are the

nuances, or grades of difference, which are the more gradual the more finely we dissect the geologic column, while the terms species, sub-species and variety are generally based upon a sum of changes in several characters. Thus palaeontology has brought to light an entirely new nomenclatural problem, which can only be solved by resolutely adopting an entirely different principle.

which is essentially based on a theory of interrupted or dis-continuous characters, is inapplicable.

Embryology and Ontogeny. — In following the discovery of the law of recapitulation among palaeontologists we have clearly stated the chief contribution of palaeontology to the science of ontogeny — namely, the correspondences and differences between

THE EVOLUTION OF THE HORSE.

Formations in Western United Stales and Characteristic Type of Horse in Each

Fore Foot

Hind Foot

Teeth

Equus

Protohippus

Mesohippus

Protorohippus

Hyracolherium (Eohippus)

One Toe

Splints of 2 “-‘and ♦Lˆ digits

One Toe

Splints of 2”-” and 4*digits

O

$ Th ree T oes

Side toes i , not touching the ground

Th ree To es Side toes i i not touching the ground

—2.

Three Toes

Side toes touching the ground; splint of 5’- fc digit

Three Toes

Side toes touching the ground

Four Toes

Short- pa Crowned VffiJ without

Cement

F our Toe s

Splint of i- digit

Three Toes

, Splint of 5-digit.

Hypothetical Ancestors with Five Toes on Each Foot and Teeth like those of Monkeys etc.

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Fig. 9.

This revolution may be accomplished by adding the term ” mutation ascending ” or ” mutation descending ” for the minute steps of transformation, and the term phylum, as employed in Germany, for the minor and major branches of genetic series. Bit by bit mutations are added to each other in different single characters until a sum or degree of mutations is reached which no zoologist would hesitate to

place in a separate species or in a separate genus.

The minute gradations observed by Hyatt, Waagen and all invertebrate palaeontologists, in the hard parts (shells) of molluscs, &c, are analogous to the equally minute gradations observed by vertebrate palaeontologists in the hard parts of rep- tiles and mammals. The mutations of Waagen may possibly, in fact, prove to be identical with the ” definite variations ” or ” rectigradations ” observed by Osborn in the teeth of mammals. For example, in the grinders of Eocene horses (see Plate III., fig. 8 ; also fig. 9) in a lower horizon a cusp is adumbrated in shadowy form, in a slightly higher horizon it is visible, in a still higher horizon it is full-grown; and we honour this final stage by assign- ing to the animal which bears it a new specific name. When a number of such characters accumulate, we further honour them by assigning a new generic name. This is exactly the nomen- clature system laid down by Owen, Cope, Marsh and others, although established without any understanding of the law of mutation. But besides the innumerable characters which are visible and measurable; there are probably thousands which we cannot measure or which have not been discovered, since every part of the organism enjoys its gradual and independent evolution. In the face of the continuous series of characters and types revealed by palaeontology, the Linnaean terminology,

the individual order of development and the ancestral order of evolution. The mutual relations of palaeontology and embryo- logy and comparative anatomy as means of determining the ancestry of animals are most interesting. In tracing the phylogeny, or ancestral history of organs, palaeontology affords the only absolute criterion on the successive evolution of organs in time as well as of (progressive) evolution in form. From comparative anatomy alone it is possible to arrange a series of living forms which, although structurally a convincing array because placed in a graded series, may be, nevertheless, in an order inverse to that of the actual historical succession. The most marked case of such inversion in comparative anatomy is that of Carl Gegenbaur (1826-1003), who in arranging the fins of fishes in support of his theory that the fin of the Australian lung-fish (Ceratodus) was the most primitive (or Archipterygium) , placed as the primordial type a fin which palaeontology has proved to be one of the latest types if not the last. It is equally true that palaeontological evidence has frequently failed where we most sorely needed it. The student must therefore resort to what may be called a tripod of evidence, derived from the available facts of embryology, comparative anatomy and palaeontology.

VI. — The Palaeontologist as Historian

The modes of change among animals, and methods of analysing them. — As historian the palaeontologist always has before him as one of his most fascinating problems phylogeny, or the restoration of the great tree of animal descent. Were the geologic record complete he would be able to trace the ancestry of man and of all other animals back to their very beginnings

in the primordial protoplasm. Dealing with interrupted evidence, however, it becomes necessary to exercise the closest analysis and synthesis as part of his general art as a restorer.

The most fundamental distinction in analysis is that which must be made between homogeny, or true hereditary resemblance, and those multiple forms of adaptive resemblance which are variously known as cases of ” analogy,” ” parallelism,” ” con- vergence ” and ” homoplasy.” Of these two kinds of genetic and adaptive resemblance, homogeny is the warp composed of the vertical, hereditary strands, which connect animals with their ancestors and their successors, while analogy is the woof, composed of the horizontal strands which tie animals together by their superficial resemblances. This wide distinction between similarity of descent and similarity of adaptation applies to every organ, to all groups of organs, to animals as a whole, and to all groups of animals. It is the old distinction between homology and analogy on a grand scale.

Analogy, in its power of transforming unlike and unrelated animals or unlike and unrelated parts of animals into likeness, has done such miracles that the inference of kinship is often almost irresistible. During the past century it was and even now is the very ” will-o’-the-wisp ” of evolution, always tending to lead the phylogenist astray. It is the first characteristic of analogy that it is superficial. Thus the shark, the ichthyosaur,

(After a drawing by Charles R. Knight, made under the direction of Professor Osborn.)

Fig. 10. — Analogous or convergent evolution in Fish, Reptile and Mammal.

The external similarity in the fore paddle and back fin of these three

marine animals is absolute, although they are totally unrelated to each other, and have a totally different internal or skeletal structure. It is one of the most striking cases known of the law of analagous evolution.

A, Shark (Lamna cornubica), with long lobe of tail upturned.

B, Ichthyosaur {Ichthyosaurus quadricissus), with fin-like paddles,

long lobe of tail down-turned.

C, Dolphin (Sotalia fluviatilis) , with horizontal tail, fin or fluke.

and the dolphin (fig. 10) superficially resemble each other, but if the outer form be removed this resemblance proves to be a mere veneer of adaptation, because their internal skeletal parts are as radically different as are their genetic relations, founded on heredity. Analogy also produces equally remarkable internal or skeletal transformations. The ingenuity of nature, however, in adapting animals is not infinite, because the same devices are repeatedly employed by her to accomplish the same adaptive ends whether in fishes, reptiles, birds or mammals; thus she has repeated herself at least twenty-four times in the evolution of long-snouted rapacious swimming types of animals. The grandest application of analogy is that observed in the adaptations of groups of animals evolving on different continents, by which their various divisions tend to mimic those on other continents. Thus the collective fauna of ancient South America

mimics the independently evolved collective fauna of North America, the collective fauna of modern Australia mimics the collective fauna of the Lower Eocene of North America. Exactly the same principles have developed on even a vaster scale among the Invertebrata. Among the ammonites of the Jurassic and Cretaceous periods types occur which in their external appearance so closely resemble each other that they could be taken for members of a single series, and not infrequently have been taken for species of the same genus and even for the same species; but their early stages of development and, in fact, their entire individual history prove them to be distinct and not infrequently to belong to widely separated genetic series.

Homogeny, in contrast, the ” special homology ” of Owen, is the supreme test of kinship or of hereditary relationship, and thus the basis of all sound reasoning in phylogeny. The two joints of the thumb, for example, are homogenous throughout the whole series of the pentadactylate, or fjyo-fingered animals, from the most primitive

amphibian to ma3.

The conclusion is that the sum of homogenous parts, which may be similar or dissimilar in external form according to their similarity or diversity of function, and the recognition of former similarities of adaptation (see below) are the true bases for the critical determination of kinship and phylogeny.

Adaptation and the Independent Evolution of Parts.— Step by step there have been established in palaeontology a number of laws relating to the evolution of the parts of animals which closely coincide with similar laws discovered by zoologists. All are contained in the broad generalization that every part of an animal, however minute, has its separate and independent basis in the hereditary substance of the germ cells from which it is derived and may enjoy consequently a separate and independent history. The consequences of this principle when applied to the adaptations of animals bring us to the very antithesis of Cuvier's supposed " law of correlation," for we find that, while the end results of adaptation are such that all parts of an animal conspire to make the whole adaptive, there is no fixed correlation either in the form or rate of development of parts, and that it is therefore impossible for the palaeontologist to predict the anatomy of an unknown animal from one of its parts only, unless the animal happens to belong to a type generally familiar. For example, among the land vertebrates the feet (associated with the structure of the limbs and trunk) may take one of many lines of adaptation to different media or habitat, either aquatic, terrestrial, arboreal or aerial; while the teeth (associated with the structure of the skull and jaws) also may take one of many lines of adaptation to* different kinds of food, whether herbivorous, insectivorous or carnivorous. Through this independent adaptation of different parts to their specific ends there have arisen among vertebrates an almost unlimited number of combinations of foot and tooth structure, the possibilities of which are illustrated in the accom- panying diagram (see fig. n; also Plate III., fig. 8). As instances of such combinations, some of the (probably herbivorous) Eocene monkeys with arboreal limbs have teeth so difficult to distinguish from those of the herbivorous ground-living Eocene horses with cursorial limbs that at first in France and also in America they were both classed with the hoofed animals. Again, directly opposed to Cuvier's principle, we have discovered carnivores with hoofs, such as Mesonyx, and herbivores with sloth-like claws, such as Chalicotherium. This latter animal is closely related to one which Cuvier termed Pangolin gigantesque, and had he restored it according to his " law of correlation " he would have pictured a giant " scaly anteater," a type as wide as the poles from the actual form of

Chalicotherium, which in body, limbs and teeth is a modified ungulate herbivore, related remotely to the tapirs. In its. claws alone does it resemble the giant sloths.

This independence of adaptation applies to every detail of structure; the six cusps of a grinding tooth may all evolve alike, or each may evolve independently and differently. Independent evolution of parts is well shown among invertebrates, where the shell of an ammonite, for example, may change markedly in form without a corresponding change in suture, or vice versa.

Similarly, there is no correlation in the rate of evolution either of adjoining or of separated parts; the middle digit of the foot of the three-toed horse is accelerated in development, while the lateral digits on either side are retarded. Many examples might be cited among invertebrates also.

ADAPTIVE TYPES OF LIMBS AND FEET

VOLANT

FOSSORIAL

ARBOREAL

Short-limbed, plantigrade,] AMBULATORY pentadactyl, unguicu- 1- OR

late Stem J TERRESTRIAL

NATATORIAL Amphibious

CURSORIAL Digitigrade

Aquatic

Unguligrade

ADAPTIVE TYPES OF TEETH OMNIVOROUS

[Fish CARNIVOROUSˆ Flesh

V | Carrion

Grass Herb HERBIVOROUS < | Shrub Fruit Root

M YRM ECOPHAGOUS Dentition reduced

Stem INSECTIVOROUS Law of the Independent Adaptive Evolution of Parts.

Fig. II. — Diagram demonstrating that there are an indefinite number of combinations of various adaptive types of limbs and feet with various adaptive types of teeth, and that there is no fixed law of correlation between the two series of adaptations.

All these principles are consistent with Francis Galton's law of particulate inheritance in heredity, and with the modern doctrine of " unity of characters " held by students of Mendelian phenomena.

Sudden versus Gradual Evolution of Parts. — There is a broad and most interesting analogy between the evolution of parts of animals and of groups of animals studied as a whole. Thus we observe persistent organs and persistent types of animals, analogous organs and analogous types of animals, and this analogy applies still further to the rival and more or less contra- dictory hypotheses of the sudden as distinguished from the gradual appearance of new parts or organs of animals, and the sudden appearance of new types of animals. The first exponent of the theory of sudden appearance of new parts and new types, to our knowledge, was Geoffroy St Hilaire, who suggested saltatory evolution through the direct action of the environ- ment on development, as explaining the abrupt transitions in the Mesozoic Crocodilia and the origin of the birds from the reptiles.

Waagen's law of mutationˆ or the appearance of new parts or organs so gradually that they can be perceived only by following them through : iccessive geologic time stages, appears to be directly contradictory to the saltation principle; it is cer- tainly one of the most firmly established principles of palae- ontology, and it constitutes the contribution par excellence of this branch of zoology to the law of evolution, since it is obvious that it could not possibly have been deduced from comparison of

living animals but only through the long perspective gained by comparison of animals succeeding each other in time. The essence of Waagen's law is orthogenesis, or evolution in a definite direction, and, if there does exist an internal hereditary principle controlling such orthogenetic evolution, there does not appear to be any essential contradiction between its gradual operation in the " mutations of

Waagen ” and its occasional hurried operation in the ” mutations of de Vries,” which are by their definition discontinuous or saltatory (Osborn, 1907).

VII. — Modes of Change in Animals as a Whole or in Groups of Animals, and Methods of Analysing Them.

1. Origin from Primitive or Stem Forms. — As already observed, the same principles apply to groups of animals as to organs and groups of organs; an organ originates in a primitive and un- specialized stage, a group of animals originates in a primitive or stem form. It was early perceived by Huxley, Cope and many others that Cuvier’s broad belief in a universal progression was erroneous, and there developed the distinction between ” per- sistent primitive types ” (Huxley) and ” progressive types.” The theoretical existence of primitive or stem forms was clearly perceived by Darwin, but the steps by which the stem form might be restored were first clearly enunciated by Huxley in 1880 (” On the Application of Evolution to the Arrangement of the Vertebrata and more particularly of the Mammalia,” Scient. Mem. iv. 457) namely, by sharp separation of the primary or stem characters from the secondary or adaptive characters in all the known descendants or branches of a theoretical original form. The sum of the primitive characters approximately restores the primitive form; and the gaps in palaeontological evidence are supplied by analysis of the available zoological, embryological and anatomical evidence. Thus Huxley, with true prophetic instinct, found that the sum of primitive characters of all the higher placental mammals points to a stem form of a generalized insectivore type, a prophecy which has been fully confirmed by the latest research. On the other hand, Huxley’s summation of the primitive characters of all the mammals led him to an amphibian stem type, a prophecy which has proved faulty because based on erroneous analysis and comparison. More or less independently, Huxley, Kowalevsky and Cope restored the stem ancestor of the hoofed animals, or ungulates, a restoration which has been nearly fulfilled by the discovery, in 1873, of the generalized type Phenacodus of northern Wyoming. Similar anticipations and verifications among the invertebrates have been made by Hyatt, Beecher, Jackson and others.

In certain cases the character stem forms actually survive in unspecialized types. Thus the analysis of George Baur of the ancestral form of the lizards, mosasaurs, dinosaurs, crocodiles and phytosaurs led both to the generalized Palaeohatteria of the Permian and indirectly to the surviving Tuatera lizard of New Zealand.

2. Adaptations to Alternations of Habitat. Law of Irreversi- bility of Evolution. — In the long vicissitudes of time- and proces- sion of continental changes, animals have been subjected to alternations of habitat either through their own migrations or through the " migration of the environment itself," to employ Van den Broeck's epigrammatic description of the profound and sometimes sudden environmental changes which may take place in a single locality. The traces of alternations of adaptations corresponding to these alternations of habitat are recorded both in palaeontology and anatomy, although often after the obscure analogy of the earlier and later writings of a palimpsest. Huxley in 1880 briefly suggested the arboreal origin, or primordial tree- habitat of all the marsupials, a suggestion abundantly confirmed by the detailed studies of Dollo and of Bensley, according to which we may imagine the marsupials to have passed through (1) a former terrestrial phase, followed by (2) a primary arboreal phase — illustrated in the tree phalangers — followed by (3) a secondary terrestrial phase — illustrated in the kangaroos and wallabies — followed by (4) a secondary arboreal phase — illus- trated in the tree kangaroos. Louis Dollo especially has

contributed most brilliant discussions of the theory of alter- nations of habitat as applied to the interpretation of the anatomy of the marsupials, of many kinds of fishes, of such reptiles as the herbivorous dinosaurs of the Upper Cretaceous. He has applied the theory with especial ingenuity to the interpretation of the circular bony plates in the carapace of the aberrant leather-back sea-turtles (Sphargidae) by prefacing an initial land phase, in which the typical armature of land tortoises was acquired, a first marine or pelagic phase, in which this armature was lost, a third littoral or seashore phase, in which a new poly- gonal armature was acquired, and a fourth resumed or secondary marine phase, in which this polygonal armature began to degenerate.

Each of these alternate life phases may leave some profound modification, which is partially obscured but seldom wholly lost; thus the tracing of the evidences of former adaptations is of great importance in phylogenetic study.

A very important evolutionary principle is that in such secondary returns to primary phases lost organs are never recovered, but new organs are acquired; hence the force of Dollo's dictum that evolution

is irreversible from the point of view of structure, while frequently reversible, or recurrent, in point of view of the conditions of environment and adaptation.

3. Adaptive Radiations of Groups, Continental and Local. — Starting with the stem forms the descendants of which have passed through either persistent or changed habitats, we reach the underlying idea of the branching law of Lamarck or the law of divergence of Darwin, and find it perhaps most clearly ex- pressed in the words “adaptive radiation” (Osborn), which convey the idea of radii in many directions. Among extinct Tertiary mammals we can actually trace the giving off of these radii in all directions, for taking advantage of every possibility to secure food, to escape enemies and to reproduce kind; further, among such well-known quadrupeds as the horses, rhinoceroses and titanotheres, the modifications involved in these radiations can be clearly traced. Thus the history of continental life presents a picture of contemporaneous radiations in different parts of the world and of a succession of radiations in the same parts. We observe the contemporaneous and largely independent radiations of the hoofed animals in South America, in Africa and in the great ancient continent comprising Europe, Asia and North America; we observe the Cretaceous radiation of hoofed animals in the northern hemisphere, followed by a second radiation of hoofed animals in the same region, in some cases one surviving spur of an old radiation becoming the centre of a new one. As a rule, the larger the geographic theatre the grander the radia- tion. Successive discoveries have revealed certain grand centres, such as (1) the marsupial radiation of Australia, (2) the little- known Cretaceous radiation of placental mammals in the northern hemisphere, which was probably connected in part with the peopling of South America, (3) the Tertiary placental radiation in the northern hemisphere, partly connected with Africa, (4) the main Tertiary radiation in South America. Each of these radiations produced a greater or less number of analogous groups, and while originally independent the animals thus evolving as autochthonous types finally mingled together as migrant or invading types. We are thus working out gradually the separate contributions of the land masses of North America, South America, Europe, Asia, Africa, and of Australia to the mammalian fauna of the world, a result which can be obtained through palaeontology only.

4. Adaptive Local Radiation. — On a smaller scale are the local adaptive radiations which occur through segregation of habit and local isolation in the same general geographic region wherever physiographic and climatic differences are sufficient to produce local differences in food supply or other local factors of change. This local

divergence may proceed as rapidly as through wide geographical segregation or isolation. This principle has been demonstrated recently among Tertiary rhinoceroses and titano- theres, in which remains of four or five genetic series in the same geologic deposits have been discovered. We have proof that in the Upper Miocene of Colorado there existed a forest -living horse,

or more persistent primitive type, which was contemporaneous with and is found in the same deposits with the plains-living horse (Neohipparion) of the most advanced or specialized desert type (see Plate IV., figs. 12, 13, 14, 15). In times of drought these animals undoubtedly resorted to the same water-courses for drink, and thus their fossilized remains are found associated.

5. The Law of Polypkyletic Evolution. The Sequence of Phyla or Genetic Series. — There results from continental and local adaptive radiations the presence in the same geographical region of numerous distinct lines in a given group of animals. The polyphyletic law was early demonstrated among invertebrates by Neumayr (1889) when he showed that the ammonite genus Phylloceras follows not one but five distinct lines of evolu- tion of unequal duration. The brachiopods, generally classed collectively as Spirifer mucronatus, follow at least five distinct lines of evolution in the Middle Devonian of North America, while more than twenty divergent lines have been observed by Grabau among the species of the gastropod genus Fusus in Tertiary and recent times. Vertebrate palaeontologists were slow to grasp this principle; while the early speculative phyto- genies of the horse of Huxley and Marsh, for example, were mostly displayed monophyletically, or in single lines of descent, it is now recognized that the horses which were placed by Marsh in a single series are really to be ranged in a great number of contemporaneous but separate series, each but partially known, and that the direct phylum which leads to the modern horse has become a matter of far more difficult search. As early as 1862 Gaudry set forth this very polyphyletic principle in his tabular phylogenies, but failed to carry it to its logical application. It is now applied throughout the Vertebrata of both Mesozoic and Cenozoic times. Among marine Mesozoic reptiles, each of the groups broadly known as ichthyosaurs, plesiosaurs, mosasaurs and crocodiles were polyphyletic in a marked degree. Among land animals striking illustrations of this local polyphyletic law are found in the existence of seven or eight contemporary series of rhinoceroses, five or six contemporary series of horses, and an equally numerous contemporary series of American' Miocene and Pliocene camels; in short, the polyphyletic condition is the rule rather than the exception. It is displayed to-day among the

antelopes and to a limited degree among the zebras and rhinoceroses of Africa, a continent which exhibits a survival of the Miocene and Pliocene conditions of the northern hemisphere.

6. Development of Analogous Progressive and Retrogressive Groups.—Because of the repetition of analogous physiographic and climatic conditions in regions widely separated both in time and in space, we discover that continental and local adaptive radiations result in the creation of analogous groups of radii among all the vertebrates and invertebrates. Illustrations of this law were set forth by Cope as early as 1861 (see " Origin of Genera," reprinted in the Origin of the Fittest, pp. 95-106) in pointing out the extraordinary parallelisms between unrelated groups of amphibians, reptiles and mammals. In the Jurassic period there were no less than six orders of reptiles which independently abandoned terrestrial life and acquired more or less perfect adaptation to sea life. Nature, limited in her resources for adaptation, fashioned so many of these animals in like form that we have learned only recently to distinguish similarities cf analogous habit from the similitudes of real kinship. From whatever order of Mammalia or Reptilia an animal may be derived, prolonged aquatic adaptation will model its outer, and finally its inner, structure according to certain advantageous designs. The requirements of an elongate body moving through the resistant medium of water are met by the evolution of similar entrant and exit curves, and the bodies of most swiftly moving aquatic animals evolve into forms resembling the hulls of modern sailing yachts (Bashford Dean). We owe especially to Willy Kukenthal, Eberhard Fraas, S.W. Williston and R. C. Osburn a summary of those modifications of form to which aquatic life invariably leads.

The law of analogy also operates in retrogression. A. Smith Woodward has observed that the decline of many groups of

fishes is heralded by the tendency to assume elongate and finally eel-shaped forms, as seen independently, for example, among the declining Acanthodians or palaeozoic sharks, among the modern crossopterygian Polypterus and Calamoichthys of the Nile, in the modern dipneustan Lepidosiren and Protopterus, in the Triassic chondrostean Bdonorhynchus, as well as in the bow-fin {Amid) and the garpike {Lepidosteus) . ■

Among invertebrates similar analogous groups also develop. This is especially marked in retrogressive, though also well- known in progressive series. The loss of the power to coil, observed in the terminals of many declining series of gastropods from the Cambrian to the present time, and the similar loss of power among Natiloidea and Ammonoidea of many genetic series, as well as the ostraean form assumed by various declining series of pelecypods and by some brachiopods, may be cited as examples.

7. Periods of Gradual Evolution of Groups. — It is certainly a very striking fact that wherever we have been able to trace genetic series, either of invertebrates or vertebrates, in closely sequent geological horizons, or life zones, we find strong proof of evolution through extremely gradual mutation simultaneously affecting many parts of each organism, as set forth above. This proof has been reached quite independently by a very large number of observers studying a still greater variety of animals. Such diverse organisms as brachiopods, ammonites, horses and rhinoceroses absolutely conform to this law in all those rare localities where we have been able to observe closely sequent stages. The inference is almost irresistible that the law of gradual transformation through minute continuous change is by far the most universal; but many palaeontologists as well as zoologists and botanists hold a contrary opinion.

8. Periods of Rapid Evolution uf Groups. — The above law of gradual evolution is perfectly consistent with a second principle, namely, that at certain times evolution is much more rapid than at others, and that organisms are accelerated or retarded in development in a manner broadly analogous to the acceleration or retardation of separate organs. Thus H. S. Williams observes {Geological Biology, p. 268) that the evolution of those funda- mental characters which mark differences between separate classes, orders, sub-orders, and even families of organisms, took place in relatively short periods of time. Among the brachiopods the chief expansion of each type is at a relatively early period in their life-history. Hyatt (1883) observed of the ammonites that each group originated suddenly and spread out with great rapidity. Deperet notes that the genus Neumayria, an ammonite of the Kimmeridgian, suddenly branches out into an “explosion” of forms. Deperet also observes the contrast between periods of quiescence and limited variability and periods of sudden efflorescence. A. Smith Woodward (” Relations of Palaeontology to Biology,” Annals and Mag. Natural Hist., 1906ˆ.317) notes that the fundamental advances in the growth of fish life have always been sudden, beginning with excessive vigour at the end of long periods of apparent stagnation; while each advance has been marked by the

fixed and definite acquisition of some new anatomical character or ” expression point,” a term first used by Cope. One of the causes of these sudden advances is un- doubtedly to be found in the acquisition of a new and extremely useful character. Thus the perfect jaw and the perfect pair of lateral fins when first acquired among the fishes favoured a very rapid and for a time unchecked development. It by no means follows, however, from this incontrovertible evidence that the acquisition either of the jaw or of the lateral fins had not been in itself an extremely gradual process.

Thus both invertebrate and vertebrate palaeontologists have reached independently the conclusion that the evolution of groups is not continuously at a uniform rate, but that there are, especially in the beginnings of new phyla or at the time of acquisition of new organs, sudden variations in the rate of evolu- tion which have been termed variously ” rhythmic,” “pulsating,” ” efflorescent,” “intermittent ” and even ” explosive ” (Deperet).

This varying rate of evolution has (illogically, we believe) been compared with and advanced in support of the ” mutation law

of De Vries,“or the theory of saltatory evolution, which we may next consider.

9. Hypothesis of the Sudden Appearance of New Parts or Organs. — The rarity of really continuous series has naturally led palaeontologists to support the hypothesis of brusque tran- sitions of structure. As we have seen, this hypothesis was fathered by Geoffroy St Hilaire in 1830 from his studies of Meso- zoic Crocodilia, was sustained by Haldemann, and quite recently has been revived by such eminent palaeontologists as Louis Dollo and A. Smith Woodward. The evidence for it is not to be confused with that for the law of rapid efflorescence of groups just considered. It should be remembered that palaeontology is the most unfavourable field of all for observation and demon- stration of sudden saltations or mutations of character, because of the limited materials available for comparison and the rarity of genetic series. It should be borne in mind, first, that wherever a new animal suddenly appears or a new character suddenly arises in a fossil horizon we must consider whether such appear- ance maybe due to the non-discovery of transitional links with older forms, or to the sudden invasion of a new type or new organ which has gradually evolved elsewhere. The rapid variation of certain groups of animals or the acceleration of certain organs is also not evidence of the sudden appearance of new adaptive characters. Such sudden appearances may be demonstrated possibly in zoology and embryology but never can be

demon- strated by palaeontology, because of the incompleteness of the geological record.

10. Decline or Senescence of Groups. — Periods of gradual evolution and of efflorescence may be followed by stationary or senescent conditions. In his history of the Arietidae Hyatt points out that toward the close of the Cretaceous this entire group of ammonites appears to have been affected with some malady; the unrolled forms multiply, the septa are simplified, the ornamentation becomes heavy, thick, and finally disappears in the adult; the entire group ends by dying out and leaving no descendants. This is not due to environmental conditions solely, because senescent branches of normal progressive groups are found in all geologic horizons, beginning, for gastropods, in the Lower Cambrian. Among the ammonites the loss of power to coil the shell is one feature of racial old age, and in others old age is accompanied by closer coiling and loss of surface orna- mentation, such as spines, ribs, spirals; while in other forms an arresting of variability precedes extinction. Thus Williams has observed that if we find a species breeding perfectly true we can conceive it to have reached the end of its racial life period. Brocchi and Daniel Rosa (1899) have developed the hypothesis of the progressive reduction of variability. Such decline is by no means a universal law of life, however, because among many of the continental vertebrates at least we observe extinctions repeatedly occurring during the expression of maximum varia- bility. Whereas among many ammonites and gastropods smooth ness of the shell, following upon an ornamental youthful condition, is generally a symptom of decline, among many other invertebrates and vertebrates, as C. E. Beecher (1856-1905) has pointed out (1898), many animals possessing hard parts tend toward the close of their racial history to produce a superfluity of dead matter, which accumulates in the form of spines among invertebrates, and of horns among the land vertebrates, reaching a maximum when the animals are really on the down-grade of development.

n. The Extinction of Groups. — We have seen that different lines vary in vitality and in longevity, that from the earliest times senescent branches are given off, that different lines vary in the rate of evolution, that extinction is often heralded by symptoms of racial old age, which, however, vary widely in different groups. In general we find an analogy between the development of groups and of organs; we discover that each phyletic branch of certain organisms traverses a geologic career comparable to the life of an individual, that we may often distinguish, especially among invertebrates, a phase of youth, a phase of maturity, a phase of senility or degeneration fore- shadowing *be extinctir-ii of a type.

Internal causes of extinction are to be found in exaggeration of body size, in the hypertrophy or over-specialization of certain organs, in the irreversibility of evolution, and possibly, although this has not been demonstrated, in a progressive reduction of variability. In a full analysis of this problem of internal and external causes in relation to the Tertiary Mammalia, If. F. Osborn (" Causes of Extinction of the Mammalia," Amer. Natur- alist, 1906, pp. 769-795, 829-859) finds that foremost in the long series of causes which lead to extinction are the grander environ- mental changes, • such as physiographic changes, diminished or contracted land areas, substitution of insular for continental conditions; changes of climate and secular lowering of temperature accompanied by deforestation and checking of the food supply; changes influencing the mating period as well' as fertility; changes causing increased humidity, which in turn favours enemies among insect life. Similarly secular elevations of temperature, either accompanied by moisture or desiccation, by increasing droughts or by disturbance of the balance of nature, have been followed by great waves of extinction of the Mammalia. In the sphere of living environment, the varied evolution of plant life, the periods of forestation and deforestation, the introduction of deleterious plants simultaneously with harsh conditions of life and enforced migration, as well as of mechanically dangerous plants, are among the well-ascertained causes of diminution and extinction. The evolution of insect life in driving animals from feeding ranges and in the spread of disease probably has been a prime cause of extinction. Food competition among mammals, especially intensified on islands, and the introduction of Carnivora constitute another class of causes. Great waves of extinction have followed the long periods of the slow evolution of relatively inadaptive types of tooth and foot structure, as first demon- strated by Waldemar Kowalevsky; thus mammals are repeatedly observed in a cul-de-sac of structure from which there is no escape in an adaptive direction. Among still other causes are great bulk, which proves fatal under certain new conditions; rela- tively slow breeding; extreme specialization and development of dominant organs, such as horns and tusks, on which for a time selection centres to the detriment of more useful characters. Little proof is afforded among the mammals of extinction through arrested evolution or through the limiting of variation, although such laws undoubtedly exist. One of the chief deductions is that there are special dangers in numerical diminu- tion of herds, which may arise from a chief or original cause and be followed b}' a conspiracy of other causes which

are cumu- lative in effect. This survey of the phenomena of extinction in one great class of animals certainly establishes the existence of an almost infinite variety of causes, some of which are internal, some external in origin, operating on animals of different kinds.

VIII.— Underlying Biological Principles as they

APPEAR TO THE PALAEONTOLOGIST

It follows from the above brief summary that palaeontology affords a distinct and highly suggestive field of purely biological research; that is, of the causes of evolution underlying the observ- able modes which we have been describing. The net result of observation is not favourable to the essentially Darwinian view that the adaptive arises out of the fortuitous by selection, but is rather favourable to the hypothesis of the existence of some quite unknown intrinsic law of life which we are at present totally unable to comprehend or even conceive. We have shown that the direct observation of the origin of new characters in palaeontology brings them within that domain of natural law and order to which the evolution of the physical universe con- forms. The nature of this law, which, upon the whole, appears to be purposive or teleological in its operations, is- altogether a mystery which may or may not be illumined by future research. In other words, the origin, or first appearance of new characters, which is the essence of evolution, is an orderly process so far as the vertebrate and invertebrate palaeontologist observes it. The selection of organisms through the crucial test of fitness and the shaping of the organic world is an orderly process when contemplated on a grand scale, but of another kind; here the

test of fitness is supreme. The only inkling, of possible underlying principles in this orderly process is that there appears to be in respect to certain characters a potentiality or a predisposition through hereditary kinship to evolve in certain definite directions. Yet there is strong evidence against the existence of any law in the nature of an internal perfecting tendency which would operate independently of external conditions. In other words, a balance appears to be always sustained between the internal (hereditary and ontogenetic) and the external (environmental and selectional) factors of evolution.

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1847-1860); of Charles Lyell in his Principles of Geology. A clear narrative of the work of many of the earlier contributors is found in Founders of Geology, by Sir Archibald Geikie (London, 1897- 1905). The most comprehensive and up-to-date reference work on the history of geology and palaeontology is Geschichte der Geologie und Paldontologie, by Karl Alfred von Zittel (Munich and Leipzig, 1899), the final life-work of this great authority, translated into English in part by Maria M. Ogilvie-Gordon, entitled "History of Geology and Palaeontology to the end of the 19th Century." The succession of life from the earliest times as it was known at the close of the last century was treated by the same author in his Handbuch der Paldontologie (5 vols., Munich and Leipzig, 1876-1893). Abbre- viated editions of this work have appeared from the author, Grund- zilge der Paldontologie (Palaeozoologie) (Munich and Leipzig, 1895, 2nd ed., 1903), and in English form in Charles R. Eastman's Text- Book of Palaeontology (1900-1902). A classic but unfinished work describing the methods of invertebrate palaeontology is Die Stdmme des Thierreichs (Vienna, 1889), by Melchior Neumayr. In France admirable recent works are Elements de Paleontologie, by Felix Bernard (Paris, 1895), and the still more recent philosophical treatise by Charles Dep6ret, Les Transformations du monde animal (Paris, 1907). Huxley's researches, and especially his share in the development of the philosophy of palaeontology, will be found in his essays, The Scientific Memoirs of Thomas Henry Huxley (4 vols., London, 1898-1902). The whole subject is treated systematically in Nicholson and Lydekker's A Manual of Palaeontology (2 vols., Edinburgh and London, 1889), and A. Smith Woodward's Outlines of Vertebrate Palaeontology (Cambridge, 1898).

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In preparing the present article the author has drawn freely on his own addresses: see H. F. Osborn, " The Rise of the Mammalia in North

America ” {Proc. Amer. Assn. Adv. Science, vol. xlii., !893), ” Ten Years’ Progress in the Mammalian Palaeontology of North America ” {Comptes rendus du 6 e Congres intern, de zoologie, session de Bern, 1904), ” The Present Problems of Palaeontology ” (Address before Section of Zool. International Congress of Arts and Science, St Louis, Sept. 1904), ” The Causes of Extinction of Mammalia ” {Amer. Naturalist, xl. 769-795, 829-859, 1906).

(H. F. O.)

PALAEOSPONDYLUS, a small fish-like organism, of which the skeleton is found fossil in the Middle Old Red Sandstone

From British Museum Guide to Fossil Reptiles and Fishes, by permission of the Trustees. Palaeospondylus gunni, restored by Dr R. H. Traquair. (Nearly twice nat. size.)

of Achanarras, near Thurso, Caithness. It was thus named (Gr. ancient vertebra) by Dr R. H. Traquair in 1890, in allusion to its well-developed vertebral rings; and its structure was

studied in detail in 1903 by Professor and Miss Sollas, who succeeded in making enlarged models of the fossil in wax. The skeleton as preserved is carbonized, and indicates an eel- shaped animal from 3 to 5 cm., in length. The skull, which must have consisted of hardened cartilage, exhibits pairs of nasal and auditory capsules, with a gill-apparatus below its hinder part, but no indications of ordinary jaws. The anterior opening of the brain-case is surrounded by a ring of hard cirri. A pair of ” post-branchial plates ” projects backwards from the head. The vertebral axis shows a series of broad rings, with distinct neural arches, but no ribs. Towards the end of the body both neural and haemal arches are continued into forked radial cartilages, which support a median fin. There are no traces either of paired fins or of dermal armour. The affinities of Palaeospondylus are doubtful, but it is probably related to the contemporaneous armoured Ostracoderms.

References. — R. H. Traquair, paper in Proc. Roy. Phys. Soc. Edin., xii. 312, (1894); W. J. Sollas and I. B. J. Sollas, paper in Phil. Trans. Roy. Soc. (1903 B.). (A. S. Wo.)

PALAEOTHERIUM (i.e. ancient animal), a name applied by Cuvier to the remains of ungulate mammals recalling tapirs in general

appearance, from the Lower Oligocene gypsum quarries of Paris. These were the first indications of the

(From the Paris gypsum.)

Restoration of Palaeotherium magnum. (About i nat. size.)

occurrence in the fossil state of perissoclactyle ungulates allied to the horse, although it was long before the relationship was recognized. The palaeotheres, which range in size from that of a pig to that of a small rhinoceros, are now regarded as repre- senting a family, Palaeotheriidae, nearly related to the horse- tribe, and having, in fact, probably originated from the same ancestral stock, namely, Hyracotherium of the Lower Eocene (see Equidae). The connecting link with Hyracotherium was formed by Pachynolophus (Propalaeotherium) , and the line apparently terminated in Paloplotherium, which is also Oligocene. Representatives of the family occur in many parts of Europe, but the typical genus is unknown in North America, where, however, other forms occur.

Although palaeotheres resemble tapirs in general appearance, they differ in having only three toes on the fore as well as on the hind foot. The dentition normally comprises the typical series of 44 teeth, although in some instances the first premolar is wanting. The cheek-teeth are short-crowned, generally with no cement, the upper molars having a W-shaped outer wall, from which proceed two oblique transverse crests, while the lower ones carry two crescents. Unlike the early horses, the later premolars are as complex as the molars; and although there is a well-marked gap between the canine and the premolars, there is only a very short one between the former and the incisors. The orbit is completely open behind. In other respects the palaeo- theres resemble the ancestral horses. They were, however, essentially marsh-dwelling animals, and exhibit no tendency to the cursorial type of limb so characteristic of the horse-line. They were, in fact, essentially inadaptive creatures, and hence rapidly died eut. (R.L.*)

PALAEOZOIC ERA, in geology, the oldest of the great time divisions in which organic remains have left any clear record. The three broad divisions — Palaeozoic, Mesozoic, Cainozoic —

which are employed by geologists to mark three stages in the development of life on the earth, are based primarily upon the fossil contents of the strata which, at one point or another, have been continuously forming since the very earliest times. The precise line in

the ” record of the rocks ” where the chronicle of the Palaeozoic era closes and that of the Mesozoic era opens— as in more recent historical documents — is a matter for editorial caprice. The early geologists took the most natural dividing lines that came within their knowledge, namely, the line of change in general petrological characters, e.g. the ” Transition Series ” (Uber gangs gebirge) , the name given to rocks approximately of Palaeozoic age by A. G. Werner because they exhibited a transi- tional stage between the older crystalline rocks and the younger non-crystalline; later in Germany these same rocks were said to have been formed in the ” Kohlenperiode ” by H. G. Bronn and others, while in England H. T. de la Beche classed them as a Carbonaceous and Greywacke group. Finally, the divisional time separating the Palaeozoic record from that of the Mesozoic was made to coincide with a great natural break or unconformity of the strata. This was the most obvious course, for where such a break occurred there would be the most marked differences between the fossils found below and those found above the physical discordance. The divisions in the fossil record having been thus established, they must for convenience remain, but their artificiality cannot be too strongly emphasized, for the broad stratigraphical gaps and lithological groups which made the divisions sharp and clear to the earlier geologists are proved to be absent in other regions, and fossils which were formerly deemed characteristic of the Palaeozoic era are found in some places to commingle with forms of strongly marked Mesozoic type. In short, the record is more nearly complete than was originally supposed.

The Palaeozoic or Primary era is divided into the following periods or epochs: Cambrian, Ordovician, Silurian, Devonian, Carboniferous and Permian. The fact that, fossils found in the rocks of the three earlier epochs — Cambrian, Ordovician, Silurian —have features in common, as distinguished from those in the three later epochs has led certain authors to divide this era into an earlier, Protozoic (Proterozoic) and a later Deuterozoic time. The rocks of Palaeozoic age are mainly sandy and muddy sediments with a considerable development of limestone in places. These sediments have been altered to shales, slates, quartzites, &c, and frequently they are found in a highly meta- morphosed condition; in eastern North America, however, and in north-east Europe they still maintain their horizontality and primitive texture over large areas. The fossils of the earlier Palaeozoic rocks are characterized by the abundance of trilobites, graptolites, brachiopods, and the absence of all vertebrates except in the upper strata; the later rocks of the era are distinguished by the absence of graptolites, the gradual failing of the trilobites, the continued predominance of

brachiopods and tabulate corals, the abundance of crinoids and the rapid development of placoderm and heterocercal ganoid fishes and amphibians. The land plants were all cryptogams, Lepidodendron, Sigillaria, followed by Conifers and Cycads. It is obvious from the advanced stage of development of the organisms found in the earliest of these Palaeozoic rocks that the beginnings of life must go much farther back, and indeed organic remains have been found in rocks older than the Cambrian; for convenience, therefore, the base of the Cambrian is usually placed at the zone of the trilobite Olenellus. (J.A.H.)

PALAEPHATUS, the author of a small extant treatise, entitled Uepl ‘AttIcttuv (On ” Incredible Things “). It consists of a series of rationalizing explanations of Greek legends, without any attempt at arrangement or plan, and is probably an epitome, composed in the Byzantine age, of some larger work, perhaps the Avaeis tuv hvBikSis dpqukvuiv, mentioned by Sui’das as the work of a grammarian of Egypt or Athens. Suidas himself ascribes a IlepJ ‘hnrlaroiv, in five books, to Palaephatus of Paros or Priene. The author was perhaps a contemporary of Euhemerus (3rd century B.C.). Suldas mentions two other writers of the name: (1) an epic poet of Athens, who lived before the time of

Homer; (2) an historian of Abydus, an intimate friend of Aristotle.

See edition by N. Festa, in Mythographi graeci (1902), in the Teubner series, with valuable prolegomena supplementary to Intorno all’ opuscolo di Palefato de incredibilibus (1890), by the same writer.

PALAESTRA (Gr. ■Kakaiarpa) , the name apparently applied by the Greeks to two kinds of places used for gymnastic and athletic exercises. In the one case it seems confined to the places where boys and youths received a general gymnastic training, in the other to a part of a gymnasium where the athletae, the competitors in the public games,, were trained in wrestling (TraXaiuv, to wrestle) and boxing. The boys’ palaestrae were private institutions and generally bore the name of the manager or of the founder; thus at Athens there was a palaestra of Taureas (Plato, Charmides). The Romans used the terms gymnasium and palaestra indiscriminately for any place where gymnastic exercises were carried on.

PALAFOX DE MENDOZA, JUAN DE (1600-1659), Spanish bishop, was born in Aragon. He was appointed in 1839 bishop of Angelopolis (Puebla de los Angeles) in Mexico, and there honourably distinguished himself by his efforts to protect the natives from Spanish cruelty, forbidding any methods of con- version other than persuasion. In this he met with the uncom- promising hostility of the Jesuits, whom in 1647 he laid under an interdict. He twice, in 1647 and 1649, laid a formal complaint against them at Rome. The pope, however, refused to approve his censures, and all he could obtain was a brief from Innocent X. (May 14, 1648), commanding the Jesuits to respect the episcopal jurisdiction. In 1653 the Jesuits succeeded in securing his trans- lation to the little see of Osma in Old Castile. In 1694 Charles II. of Spain petitioned for his canonization; but though this passed through the preliminary stages, securing for Palafox the title of " Venerable," it was ultimately defeated, under Pius VI., by the intervention of the Jesuits.

See Antonio Gonzalez de Resende, Vie de Palafox (French trans., Paris, 1690).

PALAFOX Y MELZI, JOSE DE (1780-1847), duke of Sara- gossa, was the youngest son of an old Aragonese family. Brought up at the Spanish court, he entered the guards at an early age, and in 1808 as a sub-lieutenant accompanied P'erdinand to Bayonne; but after vainly attempting, in company with others, to secure Ferdinand's escape, he fled to Spain, and after a short period of retirement placed himself at the head of the patriot movement in Aragon. He was proclaimed by the populace governor of Saragossa and captain-general of Aragon (May 25, 1808). Despite the want of money and of regular troops, he lost no time in declaring war against the French, who had already overrun the neighbouring provinces of Catalonia and Navarre, and soon afterwards the attack he had provoked began. Saragossa as a fortress was both antiquated in design and scantily provided with munitions and supplies, and the defences resisted but a short time. But it was at that point that the real resistance began. A week's street fighting made the assailants masters of half the town, but Palafox's brother succeeded in forcing a passage into the city with 3000 troops. Stimulated by the appeals of Palafox and of the fierce and resolute demagogues who ruled the mob, the inhabitants resolved to contest possession of the remaining quarters of Saragossa inch by inch, and if necessary to retire to the suburb across the Ebro, destroying the bridge. The struggle, which was prolonged for nine days longer, resulted in the withdrawal of the French (Aug. 14), after a siege which had lasted 61 days in all. Palafox then attempted a short campaign in the open country, but when Napoleon's own army entered Spain, and

destroyed one hostile army after another in a few weeks, Palafox was forced back into Saragossa, where he sustained a still more memorable second siege. This ended, after three months, in the fall of the town, or rather the cessation of resistance, for the town was in ruins and a pestilence had swept away many thousands of the defenders. Palafox himself, suffering from the epidemic, fell into the hands of the French and was kept

prisoner at Vincennes until December 1813. In June 1814 he was confirmed in the office of captain-general of Aragon, but soon afterwards withdrew from it, and ceased to take part in public affairs. From 1820 to 1823 he commanded the royal guard of King Ferdinand, but, taking the side of the Constitution in the civil troubles which followed, he was stripped of all his honours and offices by the king, whose restoration by French bayonets was the triumph of reaction and absolutism. Palafox remained in retirement for many years. He received the title of duke of Saragossa from Queen Maria Christine. From 1836 he took part in military and political affairs as captain-general of Aragon and a senator. He died at Madrid on the 15th of February 1847.

A biographical notice of Palafox appeared in the Spanish trans- lation of Thiers's Hist, des consulates de I'empire, bv P. de Madrago. For the two sieges of Saragossa, see C. W. C. Oman, Peninsular War, vol. i.; this account is both more accurate and more just than Napier's.

PALAMAS, GREGORIUS (c. 1296-1359), Greek mystic and chief apologist of the Hesychasts iq.v.), belonged to a dis- tinguished Anatolian family, and his father held an important position at Constantinople. Palamas at an early age retired to Mt Athos, where he became acquainted with the mystical theories of the Hesychasts. In 1326 he went to Skete near Beroea, where he spent some years in isolation in a cell specially built for him. His health having broken down, he returned to Mt Athos, bub, finding little relief, removed to Thessalonica. About this time Barlaam, the Calabrian monk, began his attacks upon the monks of Athos, and Palamas came forward as their champion. In 1341 and 1351 he took part in the two synods at Constantinople, which definitively secured the victory of the Palamites. During the civil war between John Cantacuzene and the Palaeologi, Palamas was imprisoned. After Cantacuzene's victory in 1347, Palamas was released and appointed arch- bishop of Thessalonica; being refused admittance by the inhabitants, he retired to the island of Lemnos, but subsequently obtained his see. Palamas endeavoured to justify the mysticism of the Hesychasts on dogmatic grounds. The chief objects of his attack were Barlaam, Gregorius

Acindynus and Nicephorus Gregoras.

Palamas was a prolific writer, but only a few of his works have been published, most of which will be found in J. P. Migne, Patro- logia graeca (cl., cli.). They consist of polemics against the Latins and their doctrine of the Procession of the Holy Ghost ; Hesychastic writings ; homilies ; a life of St Peter (a monk of Athos) ; a rhetorical essay Prosopopeia (ed. A. Jahn, 1884), containing the accusations brought against the body by the soul, the defence made by the body, and the final pronouncement of the judges in favour of the ‘ body, on the ground that its sins are the result of inadequate teaching.

See the historical works of John Cantacuzene and Nicephorus Gregoras, the Vita Palamae by Philotheus, and the encomium by Nilus (both patriarchs of Constantinople); also C. Krumbacher, Geschichte der byzantinischen Litteratur (1897).

PALAMAU, a district of British India, in the Chota-Nagpur division of Bengal. It was formed out of Lohardaga, in 1894, and takes its name from a former state or chiefship. The administrative headquarters are at Daltonganj: pop. (1901), 5837. It consists of the lower spurs of the Chota-Nagpur plateau, sloping north to the valley of the Son. Area 4914 sq. m.; pop. (1901), 619,600, showing an increase of 3*8% in the decade; average density, 126 persons per sq. m., being the lowest in all Bengal. Palamau suffered severely from drought in 1897. A branch of the East Indian railway from the Son valley to the valuable coalfield near Daltonganj was opened in 1902. The only articles of export are jungle produce, such as lac and tussur silk. The forests are unprofitable.

See Palamau District Gazetteer (Calcutta, 1907).

PALAMCOTTAH, a town of British India, in the Tinnevelly district of Madras, on the opposite bank of the Tambraparni river to Tinnevelly town, with which it shares a station on ‘the South Indian railway, 444 m. south of Madras. Pop. (1901), 39,545. It is the administrative headquarters of the district, and also the chief centre of Christian missions in south India. Among many educational institutions may be mentioned the Sarah Tucker College for Women, founded in 1895.

PALAMEDES, in Greek legend, son of Nauplius king of Euboea, one of the heroes of the Trojan War, belonging to the post-Homeric cycle of legends. During the siege of Troy, Aga- memnon, Diomedes and Odysseus (who had been detected by Palamedes in an attempt to escape going to Troy by shamming madness) caused a letter containing money and purporting to come from Priam to be concealed in his tent. They then accused Palamedes of treasonable correspondence with the enemy, and he was ordered to be stoned to death. His father exacted a fearful vengeance from the Greeks on their way home, by placing false lights on the promontory of Caphareus. The story of Palamedes was first handled in the Cypria of Stasinus, and formed the subject of lost plays by Aeschylus (Palamedes), Sophocles (Nauplius), Euripides (Palamedes), of which seme fragments remain. Sophists and rhetoricians, such as Gorgias and Alcidamas, amused themselves by writing declamations in favour of or against him. Palamedes was regarded as the inventor of the alphabet, lighthouses, weights and measures, dice, backgammon and the discus.

See Euripides, Orestes, 432 and schol. ; Ovid, Metam. xiii. 56; Servius on Virgil, Aeneid, ii. 82, and Nettleship's note in Conington's edition; Philostratus, Heroica, 11 ; Euripides, Frag. 581 ; for different versions of his death see Dictys Cretensis ii. 15; Pausanias ii. 20, 3;x. 31, 2; Dares Phrygius, 28; monograph by O. Jahn (Hamburg, 1836).

PALANPUR, a native state of India, in the Gujarat division of Bombay, on the southern border of Rajputana. Area, 1766 sq. m.; pop. (1901), 222,627, showing a decrease of 19 % in the decade. The country is mountainous, with much forest towards the north, but undulating and open in the south and east. The principal rivers are the Saraswati and Banas. The estimated gross revenue is £50,000; tribute to the gaekwar of Baroda, £2564. The chief, whose title is diwan, is an Afghan by descent. The state is traversed by the main line of the Rajputana-Malwa railway, and contains the British cantonment of Deesa. Wheat, rice and sugar-cane are the chief products. The state has suffered severely of recent years from plague. The town of Palanpur is a railway junction for Deesa, 18 m. distant. Pop. (1901),

17,799-

Palanpur also gives its name to a political agency, or collection

of native states; total area, 6393 sq. m.; pop. (1901), 467,271, showing a decrease of 28 % in the decade, due to the effects of famine.

PALANQUIN (pronounced palankeen, s. form in which it is sometimes spelled), a covered litter used in India and other Eastern countries. It is usually some eight feet long by four feet in width and depth, fitted with movable blinds or shutters, and slung on poles carried by four bearers. Indian and Chinese women of rank always travelled in palanquim, and they were largely used by European residents in India before the railways. The norimono of Japan and the kiaotsu of China differ from the Indian palanquin only in the method of attaching the poles to the body of the conveyance. The word came into European use through Port, palanquim, which represents an East Indian word seen in several forms, e.g. Malay and Javanese palangki, Hindostani palki, Pali pallanko, &c, all in the sense of litter, couch, bed. The Sansk. paryanka, couch, bed, the source of all these words, is derived from pari, round, about, and anka, hook. The New English Dictionary points out the curious resemblance of these words with the Latin- use of phalanga (Gr. <£&Xa7£) for a bearing or carrying pole, whence the Span. palanca and palanquino, a bearer.

PALATE (Lat. palatum, possibly from the root of pascere, to feed), the roof of the mouth in man and vertebrate animals. The palate is divided into two parts, the anterior bony ” hard palate ” (see Mouth), and the posterior fleshy ” solt palate ” (see Pharynx). For the malformation consisting in a longi- tudinal fissure in the roof of the mouth, see Cleft Palate.

PALATINATE (Ger. Pfalz), a name given generally to any district ruled by a count palatine, but particularly to a district of Germany, a province of the kingdom of Bavaria, lying west of the Rhine. It is bounded on the N. by the Prussian Rhine province and the Hessian province of Rhein-Hessen; on the E.

by Baden, from which it is separated by the Rhine; on the S. by the imperial province of Alsace-Lorraine, from which it is divided by the Lauter; and on the W. by the administrative districts of Trier and Coblenz, belonging to the Prussian Rhine province. It has an area of 2288 sq. m., and a population (1905) of 885,280, showing a density of 386-9 to the square mile. As regards religion, the inhabitants are fairly equally distributed into Roman Catholics and Protestants.

The rivers in this fertile tract of country are the Rhine, Lauter, Queich, Speirbach, Glan and Blies. The Vosges, and their continuation the Hardt, run through the land from south to north and divide it into, the fertile and mild plain of the Rhine, together with the slope of the Hardt range, on the east, and the rather inclement district on the west, which, running between the Saarbriick carboniferous mountains and

the northern spurs of the Hardt range, ends in a porphyrous cluster of hills, the highest point of which is the Donnersberg (2254 ft.). The country on the east side and on the slopes of the Hardt yield a number of the most varied products, such as wine, fruit, corn, vegetables, flax and tobacco. Cattle are reared in great quantity and are of excellent quality. The mines yield iron, coal, quicksilver and salt. The industries are very active, especially in iron, machinery, paper, chemicals, shoes, woollen goods, beer, leather and tobacco. The province is well served by railway communication and, for purposes of administration, is divided into the following 16 districts: Bergzabern, Diirkheim, Frankenthal, Germersheim, Homburg, Kaisers- lautern, Kirchheimbolanden, Kusel, Landau, Ludwigshafen, Neustadt, Pirmasens, Rockenhausen, St Ingbert, Spires and Zweibriicken. Spires (Speyer) is the seat of government, and the chief industrial centres are Ludwigshafen on the Rhine, which is the principal river port, Landau, and Neustadt, the seat of the wine trade.

See A. Becker, Die Pfalz und die Pfalzer (Leipzig, 1857); Mehlis, Fahrten durch die Pfalz (Augsburg, 1877); Kranz, Handbuch der Pfalz (Spires, 1902) ; Hensen, Pfalzfiihrer (Neustadt, 1905) ; and Naher, Die Burgen der rheinischen Pfalz (Strassburg, 1887).

History. — The count palatine of the Rhine was a royal official who is first mentioned in the 10th century. The first count was Hermann I., who ruled from 945 to 996, and although the office was ‘not hereditary it appears to have been held mainly by his descendants until the death of Count Hermann III. in n 55. These counts had gradually extended their powers, had obtained the right of advocacy over the archbishop of Trier and the bishopric of Juliers, and ruled various isolated districts along the Rhine. In n 55 the German king, Frederick I., appointed his step-brother Conrad as count palatine. Conrad took up his residence at the castle of Juttenbuhel, near Heidelberg, which became the capital of the Palatinate. In 1195 Conrad was succeeded by his son-in-law Henry, son of Henry the Lion, duke of Saxony, who was a loyal supporter of the emperor Henry VI. After the latter’s death in 1197 he assisted his own brother Otto, afterwards the emperor Otto IV., in his attempts to gain the German throne. Otto refused to reward Henry for this support, so in 1204 he assisted his rival, the German king Philip, but returned to Otto’s side v after Philip’s murder in 1208. In 1 21 1 Henry abdicated in favour of his son Henry, who died in’ 1 2 14, when the Palatinate was given by the German king Frederick II. to Otto, the infant son of Louis I., duke of Bavaria, a member of the Wittelsbach family, who was betrothed to Agnes, sister of the late count, Henry. The break-up of the duchy of Franconia had increased the influence of the count palatine of the

Rhine, and the importance of his position among the princes of the empire is shown by Roger of Hoveden, who, writing of the election to the German throne in n 98, singles out four princes as chief electors, among whom is the count palatine of the Rhine. In the Sachsenspiegel, a collection of German laws which was written before 1235, the count is given as the butler (dapifer) of the emperor, the first place among the lay electors.

The Palatinate was ruled by Louis of Bavaria on behalf of his son until 1228, when it passed to Otto who ruled until his death in 1253. Otto's possessions were soon afterwards divided,

and his elder son Louis II. received the Palatinate and Upper Bavaria. Louis died in 1294 when these districts passed to his son Rudolph I. (d. 13 19), and subsequently to his grandson Louis, afterwards the emperor Louis IV. By the Treaty of Pavia in 1329, Louis granted the Palatinate to his nephews Rudolph II. and Rupert I., who received from him at the same time a portion of the duchy of Upper Bavaria, which was called the upper Palatinate to distinguish it from the Rhenish, or lower Palatinate. Rudolph died in 1353, after which Rupert ruled alone until his death in 1390. In 1355 he had sold a portion of the upper Palatinate to the emperor Charles IV., but by various purchases he increased the area of the Rhenish Palatinate. His successor was his nephew Rupert II., who bought from the German king Wenceslaus a portion of the territory that his uncle had sold to Charles IV. He died in 1398 and was succeeded by his son Rupert III. In 1400 Rupert was elected German king, and when he died in 1410 his posses- sions were divided among his four sons: the eldest, Louis III., received the Rhenish Palatinate proper; the second son, John, obtained the upper Palatinate; while the outlying districts of Zweibrucken and Simmern passed to Stephen, and that of Mosbach to Otto.

When the possessions of the house of Wittelsbach were divided in 1255 and the branches of Bavaria and the Palatinate were founded, a dispute arose over the exercise of the electoral vote, and the question was not settled until in 1356 the Golden Bull bestowed the privilege upon the count palatine of the Rhine, who exercised it until 1623. The part played by Count Frederick V., titular king of Bohemia, during the Thirty Years' War induced the emperor Ferdinand II. to deprive him of his vote and to transfer it to the duke of Bavaria, Maximilian I. By the

Peace of Westphalia in 1648 an eighth electorate was created for the count palatine, to which was added the office of treasurer. In 1777, however, the count resumed the ancient position of his family in the electoral college, and regained the office of steward which he retained until the formal dissolution of the empire in 1806.

To return to the history of the Palatinate as divided into four parts among the sons of the German king Rupert in 1410. John, the second of these brothers, died in 1443, and his son Christopher, having become king of Denmark in 1446, did not inherit the upper Palatinate, which was again united with the Rhenish Palatinate. Otto, the son of Otto (d. 1461), Rupert's fourth son, who had obtained Mosbach, died without sons in 1499, and this line became extinct, leaving only the two remaining lines with interests in the Rhenish Palatinate. After Rupert's death this was governed by his eldest son, the elector Louis III. (d. 1436), and then by the latter's sons, Louis IV. (d. 1449) and Frederick I. The elector Frederick, called the Victorious, was one of the foremost princes of his time. His nephew and successor, the elector Philip, carried on a war for the possession of the duchy of Bavaria-Landshut, which had been bequeathed to his son Rupert (d. 1504), but, when in 1507 an end was put to this struggle, Rupert's son, Otto Henry, only received Neuburg and Sulzbach. Louis V. and then Frederick II. succeeded Philip, but both died without sons and Otto Henry became elector. He too died without sons in 1559, when the senior branch became, extinct, leaving only the branch descended from Rupert's third son, Stephen.

Already on Stephen's death in 1439 this family had been divided into two branches, those of Simmern and of Zwei- brucken, and in 1514 the latter branch had been divided into the lines of Zweibrucken proper and of Veldentz. It was Frederick, count palatine of Simmern, who succeeded to the Palatinate on Otto Henry's death, becoming the elector Frederick III. The new elector, a keen but not a very bigoted Calvinist, was one of the most active of the Protestant princes. His son and successor, Louis VI. (d. 1583), was a Lutheran, but another son, John Casimir, who ruled the electorate on behalf of his young nephew, Frederick IV., from 1583 to 1592, gave every encouragement to the Calvinists. A similar line of action was followed by Frederick IV. himself after 1592.

He was the founder and head of the Evangelical Union estab- lished to combat the aggressive tendencies of the Roman Catholics. His son, the elector Frederick V., accepted the throne of Bohemia and thus brought on the Thirty Years' War. He was quickly driven from that country, and his own electorate was devastated by the Bavarians and

Spaniards. At the peace of Westphalia in 1648 the Palatinate was restored to Frederick's son, Charles Louis, but it was shorn of the upper Palatinate, which Bavaria retained as the prize of war.

Scarcely had the Palatinate begun to recover when it was attacked by Louis XIV. For six years (1673-79) the electo- rate was devastated by the French troops, and even after the Treaty of Nijmwegen it suffered from the aggressive policy of Louis. In August 1680 the elector Charles Louis died, and when his son and successor, Charles, followed him to the grave five years later the ruling family became extinct in the senior line. Mention has already been made of a division of this family into two lines after 1459, and of a further division of the Zweibrucken line in 1514, when again two lines were founded. The junior of these, that of Veldentz, became extinct in 1694, but the senior, that of Zweibrucken proper, was still very flourishing. Under Count Wolfgang (d. 1569) it had pur- chased Sulzbach and Neuburg in 1557, and in the person of his grandson, Wolfgang William (d. 1653) it had secured the coveted duchies of Juliers and Berg. It was Philip William of Neuburg, the son of Wolfgang William, who became elector palatine in succession to Charles in 1685.

The French king's brother, Philip, duke of Orleans, had married Charlotte Elizabeth, a sister of the late elector Charles, and consequently the French king claimed a part of Charles's lands in 1680. His troops took Heidelberg and devastated the Palatinate, while Philip William took refuge in Vienna, where he died in 1690. Then in 1697, by the Treaty of Ryswick, Louis abandoned his claim in return for a sum of money. Just before this date the Palatinate began to be disturbed by troubles about religion. The great majority of the inhabitants were Protestants, but the family which succeeded in 1685 belonged to the Roman Catholic Church. Philip > William, however, gave equal rights to all his subjects, but under his son and successor, the elector John William, the Protestants were deprived of various civil rights until the intervention of Prussia and of Brunswick in 1705 gave them some redress. The next elector, a brother of the last one, was Charles Philip, who removed his capital from Heidelberg to Mannheim in 1720. He died without male issue in December 1742. His successor was his kinsman, Charles Theodore, count palatine of Sulzbach, a cadet of the Zweibriicken-Neuburg line, and now with the exception of one or two small pieces the whole of the Palatinate was united under one ruler. Charles Theodore was a prince of refined and educated tastes and during his long reign his country enjoyed prosperity. In 1777 on the extinction of the other branch of the house of Wittelsbach, he became elector of Bavaria, and the Palatinate was henceforward united with Bavaria, the elector's capital being Munich.

Charles Theodore died without legitimate sons in 1799, and his successor was Maximilian Joseph, a member of the Birkenfeld branch of the Zweibrucken family, who later became king of Bavaria as Maximilian I.

In 1802 the elector was obliged to cede the portion of the Palatinate lying on the left bank of the Rhine to France, and other portions to Baden and to Hesse-Darmstadt. Much of this, however, was regained in 1815, and since that date the Palatinate has formed part of the kingdom of Bavaria.

See Widder, Versuch einer vollstandigen geographisch-historischen Besckreibung der Kurfurstlichen Pfalz (Frankfort, 1 786-1 788); L. Hausser, Geschichte der Rheinischen Pfalz (Heidelberg, 1845); Nebenius, Geschichte der Pfalz (Heidelberg, 1874) ; Giimbe!, Geschichte der protestantischen Kirche der Pfalz (Kaiserslauterri, 1885) ; the Regesten der Pfalzgrafen am Kliein, 1214-1508, edited by Koch and Wille (Innsbruck, 1894); and Wild, Bilderatlas zur badisch-pfdlzischen Geschichte (Heidelberg, 1904).

PALATINE (from Lat. pdlatium, a palace,) pertaining to the palace and therefore to the emperor, king or other sovereign

ruler. In the later Roman Empire certain officials attending on the emperor, or discharging other duties at his court, were called palatini; from the time of Constantine the Great the term was also applied to the soldiers stationed in or around the capital to distinguish them from those stationed on the frontier of the empire. In the East Roman Empire the word was used to designate officials concerned with the administration of the finances and the imperial lands.

This use of the word palatine was adopted by the Frankish kings of the Merovingian dynasty. They employed a high official, the comes palatinus, who at first assisted the king in his judicial duties and at a later date discharged many of these himself. Other counts palatine were employed on military and administrative work, and the system was maintained by the Carolingian sovereigns. The word paladin, used to describe the followers of Charlemagne, is a variant of palatine. A Frankish capitulary of 882 and Hincmar, archbishop of Reims, writing about the same time, testify to the extent to which the judicial work of the Frankish Empire had passed into their hands, and one grant of

power was followed by another. Instead of remaining near the person of the king, some of the counts palatine were sent to various parts of his empire to act as judges and governors, the districts ruled by them being called palatinates. Being in a special sense the representatives of the sovereign they were entrusted with more extended power than the ordinary counts. Thus comes the later and more general use of the word palatine, its application as an adjective to persons entrusted with special powers and also to the districts over which these powers were exercised. By Henry the Fowler and especially by Otto the Great, they were sent into all parts of the country to support the royal authority by checking the independent tendencies of the great tribal dukes. We hear of a count palatine in Saxony, and of others in Lorraine, in Bavaria and in Swabia, their duties being to administer the royal estates in these duchies. The count palatine in Bavaria, an office held by the family of Wittelsbach, became duke of this land, the lower title being then merged in the higher one; and with one other exception the German counts palatine soon became insignificant, although, the office having become hereditary, Pfalzgrafen were in existence until the dissolution of the Holy Roman Empire in 1806. The exception was the count palatine of the Rhine, who became one of the four lay electors and the most important lay official of the empire. In the empire the word count palatine was also used to designate the officials who assisted the emperor to exercise the rights which were reserved for his personal consideration. They were called comiles palatini caesarii, or comites sacri palatii; in German, Hofpfalzgrafen.

From Germany the term palatine passed into England and Scotland, into Hungary and Poland. It appears in England about the end of the nth century, being applied by Ordericus Vitalis, to Odo, bishop of Bayeux and earl of Kent. The word palatine came in England to be applied to the earls, or rulers, of certain counties, men who enjoyed exceptional powers. Their exceptional position is thus described by Stubbs (Const. Hist. vol. i.) : They were ” earldoms in which the earls were endowed with the superiority of whole counties, so that all the landholders held .feudally of them, in which they received the whole profits of the courts and exercised all the regalia or royal rights, nominated the sheriffs, held their own councils and acted as independent princes except in the owing of homage and fealty to the king.” The most important of the counties palatine were Durham and Chester, the bishop of the one and the earl of the other receiving special privileges from William I. Chester had its own parliament, consisting of barons of the county, and was not represented in the national assembly until 1541, while it retained some of its special privileges until 1830. The bishop of Durham retained temporal

jurisdiction over the county until 1836. Lancashire was made a county, or duchy, palatine in 1351, and kept some of its special judicial privileges until 1873. Thus for several centuries the king's writs did not run in these three palatine counties, and at the

present day Lancashire and Durham have their own courts of chancery. Owing to the ambiguous application of the word palatine to Odo of Bayeux, it is doubtful whether Kent was ever a palatine county; if so, it was one only for a few years during the nth century. Other palatine counties, which only retained their exceptional position for a short time, were Shropshire, the Isle of Ely, Hexhamshire in Northumbria, and Pembroke- shire in Wales. In Ireland there were palatine districts, aad the seven original earldoms of Scotland occupied positions some- what analogous to that of the English palatine counties.

In Hungary the important office of palatine (Magyar Nddor) owes its inception to St Stephen. At first the head of the judicial system, the palatine undertook other duties, and became after the king the most important person in the realm. At one time he was chosen by the king from among four candidates named by the Diet. Under the later Habsburg rulers of Hungary the office was several times held by a member of this family, one of the palatines being the archduke Joseph. The office was abolished after the revolution of 1848.

In Poland the governors of the provinces of the kingdom were called palatines, and the provinces were sometimes called palatinates.

In America certain districts colonized by English settlers were treated as palatine provinces. In 1632 Cecilius Calvert, 2nd Lord Baltimore, received a charter from Charles I. giving him palatine rights in Maryland. In 1639 Sir Ferdinando Gorges, the lord of Maine, obtained one granting him as large and ample prerogatives as were enjoyed by the bishop of Durham. Carolina was another instance of a palatine province.

In addition to the authorities mentioned, see R. Schroder, Lehrbuch der deutschen Rechtsgeschichle (Leipzig, 1902) ; C. Pfaff, Geschichte des Pfalzgrafenamtes (Halle, 1847); G. T. Lapsley, The County Palatine of Durham (New York, 1900), and D. J. Medley, English Constitutional History (1907). (A. W. H.*)

PALATKA, a city and the county-seat of Putnam county, Florida, U.S.A., in the N.E. part of the state, on the W. bank of the St John's river, about 100 m. from its mouth, and at the head of deep-water

navigation. Pop. (1905) 3950; (1910) 3779. Palatka is served by the Georgia Southern & Florida (of which it is the southern terminal), the Atlantic Coast Line, and the Florida East Coast railways, and also has connexion by water with Baltimore, New York and Boston. Palatka is situated in a rich agricultural, orange-growing and timber region, for which it is the distributing centre. Large quantities of cypress lumber are shipped from Palatka. Palatka was incorpo- rated as a town in 1853, and in 1872 was chartered as a city.

PALAVER (an adaptation of Port, palavra, a word or speech; Ital. parola; Fr. parole, from the Low Lat. parabola, a parable, story, talk; Gr. xapa/3oX?7, literally “comparison”; the Low Lat. parabolare, ” to talk,” gives Fr. parler, ” to speak,” whence ” parley,” ” parliament,” &c), the name used by the Portuguese traders on the African coast for their conversations and bargain- ing with the natives. It was introduced into English in the 1 8th century through English sailors frequenting the Guinea coast. It has now passed into general use among the negroes of West and West Central Africa for any conference, either among themselves or with foreigners. From the amount of unnecessary talk characteristic of such meetings with natives, the word is used of any idle or cajoling talk.

PALAWARAM, a town of British India, in Chingleput district, Madras, n m. S. of Madras city, with a station on the South Indian railway; pop. (1901), 6416. Formerly called the presi- dency cantonment, as containing the native garrison for Madras city, it is now a depot for native infantry and the residence of European pensioners. There are several tanneries.

PALAZZOLO ACREIDE, a town of Sicily, in the province of Syracuse, 28 m. by road W. of it, 2285 ft. above sea-level. Pop. (1901), 14,840. The town occupies the site of the ancient Acrae, founded by Syracuse about 664 B.C. It followed in the main the fortunes of the mother city. In the treaty between the Romans and Hiero II. in 263 B.C. it was assigned to the latter.

The ancient city lay on the hill above the modern town, the

approach to it being defended by quarries, in which tombs of all periods have been discovered. The auditorium of the small theatre is well preserved, though nothing of the stage remains. Close to it are

ruins of other buildings, which bear, without justification, the names Naumachia, Odeum (perhaps a bath establishment) and Palace of Hiero. The water supply was obtained by subterranean aqueducts. In the cliffs of the Monte Pineta to the south are other tomb chambers, and to the south again are the curious bas-reliefs called Santoni or Santicelli, mutilated in the 19th century by a peasant proprietor, which appear to be sepulchral also. Near here too is the necropolis of the Acrocoro della Torre, where many sarcophagi have been found. Five miles north lies Buscemi, near which a sacred grotto has been discovered; and also a church cut in the rock and surrounded by a cemetery. 1

See G. Judica, Antichitd, di Acre (Messina, 1819). (Baron Judica's collection of antiquities was dispersed after his death.) J. Schu- bring, Jahrbuchfiir Philologie, Suppl. IV., 662-672.

PALE (through Fr. pal, from Lat. palus, a stake, for paglus, from the stem pag- of pangere, to fix; " pole " is from the same original source), a stake, particularly one of a closely set series driven into the ground to form the defensive work known as a " palisade "; also one of the lighter laths or strips of wood set vertically and fastened to a horizontal rail to form a " paling." Used as an historical term, a pale is a district marked off from the surrounding country by a different system of government and law or by definite boundaries. The best known of these districts was the " English Pale " in Ireland, dating from the reign of Henry II., although the word " pale " was not used in this connexion until the latter part of the 14th century. The Pale varied considerably, according to the strength or weakness of the English authorities, and in the time of Henry VIII. was bounded by a line drawn from Dundalk to Kells, thence to Naas, and from Naas E. to Dalkey, embracing, that is, part of the modern counties of Dublin, Louth, Meath, and Kildare. The Pale existed until the complete subjugation of Ireland under Elizabeth; the use of the word is frequent in Tudor times. There was an " English Pale " or " Calais Pale " also in France until 1558, extending from Gravelines to Wissant, and for a short time under the Tudors an English Pale in Scotland.

In heraldry a " pale " is a band placed vertically in the centre of a shield, hence " in pale " or " to impale " is used of the marshalling of two coats side by side on a shield divided

vertically.

" Pale," in the sense of colourless, whitish, of a shade of colour lighter than the normal, is derived through O. Fr. palle, mod. pdle, from Lat.

pallidas, pallor, pallere; and in that of a baker's shovel, or " peel " as it is sometimes called, from Lat. pala, spade, probably connected with the root of pandere, to spread out.

PALEARIO, AONIO (c. 1500-1570), Italian humanist and reformer, was born about 1500 at Veroli, in the Roman Campagna. Other forms of his name are Antonio Delia Paglia, A. Degli Pagliaricci. In 1520 he went to Rome, where he entered the brilliant literary circle of Leo X. When Charles of Bourbon stormed Rome in 1527 Paleario went first to Perugia and then to Siena, where he settled as a teacher. In 1536 his didactic poem in Latin hexameters, De immortalitale animarum, was published at Lyons. It is divided into three books, the first containing his proofs of the divine existence, and the remaining two the theological and philosophical arguments for immortality based on that postulate. The whole concludes with a rhetorical description of the occurrences of the Second Advent. In 1542 a tract, written by him and entitled Delia Pienezza, sufficienza, el satisfazione della passione di Christo, or Libellus de morle Christi, was made by the Inquisition the basis of a charge of heresy, from which, however, he successfully defended himself. In Siena he wrote his Actio in pontifices romanos el eorum asseclas, a vigorous indictment, in twenty "testimonia," against what he now believed to be the fundamental error of the Roman Church in subordinating Scripture to tradition, as well as against various particular doctrines, such as that of

1 P. Orsi in Notizie degli Scavi (1899), 452-471; Romische Quartal-schrift (1898), 624-631.

purgatory; it was not, however, printed until after his death (Leipzig, 1606). In 1546 he accepted a professorial chair at Lucca, which he exchanged in 1555 for that of Greek and Latin literature at Milan. Here about 1566 his enemies renewed their activity, and in 1567 he was formally accused by Fra Angelo the inquisitor of Milan. He was tried at Rome, condemned to death in October 1569, and executed in July 1570.

An edition of his works (Ant. Palearii Verulani Opera), including four books of Epistolae and twelve Orationes besides the De im~ mortalitate, was published at Lyons in 1552 ; this was followed by two others, at Basel, and several after his death, the fullest being that of Amsterdam, 1696. A work, entitled Benefizio di Cristo (" The Benefit of Christ's Death "), has been attributed to Paleario on insufficient grounds. Lives by Gurlitt (Hamburg, 1805) ; Young (2 vols., London, i860) ; Bonnet (Paris, 1862).

PALENCIA, an inland province of Spain, one of the eight into which Old Castile was divided in 1833; bounded on the N. by Santander, E. by Burgos, S. by Valladolid, and W. by Valladolid and Leon. Pop. (1900), 192,472; area, 3256 sq. m. The surface of the province slopes gradually S. to the Duero (Douro) valley. The principal rivers are the Pisuerga and the Carrion, which unite at Duenas and flow into the Duero at Valladolid. The chief tributaries of the Pisuerga within the province are the Arlanzon, the Burejo, the Cioza, and the united streams of the Buedo and Abanades; the Carrion is joined on the right by the Cueza. The north is traversed by the Cantabrian Mountains, the highest summit being the culminating point of the Sierra del Brezo (6355 ft.). There are extensive forests in this region and the valleys afford good pasturage. The remainder of Palencia, the " Tierra de Campos," belongs to the great Castilian table-land. In the south is a marsh or lake, known as La Laguna de la Nava. The mountainous district abounds in minerals, but only coal and small quantities of copper are worked. The province is crossed in the south-east by the trunk railway connecting Madrid with France via Irun, while the line to Santander traverses it throughout from north to south; there are also railways from the city of Palencia to Leon, and across the north from Mataporquera in Santander to La Robla in Leon. A branch of the Santander line gives access to the Orbo coal-fields. The main highways are good; the other roads often bad. The Canal de Castilla, begun in 1753, and completed in 1832, connects Alar del Rey with Valladolid. Wheat and other cereals, vegetables, hemp and flax are extensively grown, except in the mountainous districts. Flour and wine are made in large quantities, and there are manufactures of linen and woollen stuffs, oil, porcelain, leather, paper and rugs. Palencia rugs are in great demand through- out Spain. The only town with more than 5000 inhabitants is Palencia (q.v.).

For the history, inhabitants, &c, see Castile.

PALENCIA, an episcopal city, and the capital of the Spanish province of Palencia; on the left bank of the river Carrion, on the Canal de Castilla, at the junction of railways from Leon and Santander, and 7 m. N. by W. of Venta de Bafios on the Madrid-Irun line. Pop. (1900), 15,94°- Palencia is built in the midst of the level plains called the Tierra de Campos, 2690 ft. above sea-level. Three bridges across the Carrion afford access to the modern suburbs on the right bank. The older and by far the more important part of the city is protected on the west by the river; on the other sides the old machicolated walls, 36 ft. high by 9 ft. in thickness, are in fairly good preservation, and beautified by alamedas or promenades, which were laid out in 1778. The cathedral was begun in 1321, finished in 1504, and dedicated to

St Antolin; it is a large building in the later and florid Gothic style of Spain. The site was previously occupied by a church erected by Sancho III. of Navarre and Castile (1026-1035) over the cave of St Antolin, which is still shown. The cathedral contains some valuable paintings, old Flemish tapestry, and beautiful carved woodwork and stonework. The church of San Miguel is a good and fairly well-preserved example of 13th-century work; that of San Francisco, of the same date, is inferior and has suffered more from modernization. The

hospital of San Lazaro is said to date in part from the time of the Cid (q.v.), who here married Ximena in 1074.

Much has been done for education. Palencia has also hospitals, a foundling refuge, barracks and a bull-ring. Local industries include iron-founding, and the making of rugs, alcohol, leather, soap, porcelain, linen, cotton, wool, machinery and matches.

Palencia, the Pallantia of Strabo and Ptolemy, was the chief town of the Vaccaei. Its history during the Gothic and Moorish periods is obscure; but it was a Castilian town of some importance in the 12th and 13th centuries. The university founded here in 1208 by Alphonso IX. was removed in 1239 to Salamanca.

PALENQUE, the modern name of a deserted city in Mexico, in the narrow valley of the Otolum, in the north part of the state of Chiapas, 80 m. S. of the Gulf port of Carmen. About 36 m. away, on the left bank of the Usumacinta river, stand the ruins of Men-che or Lorillard city. The original name of Palenque has been lost, and its present name is taken from the neighbour- ing village, Santo Domingo del Palenque. Unlike the dead cities of the Yucatan plains, Palenque is surrounded by wooded hills and overgrown by tropical vegetation.

There is less stone carving on the exterior walls, door jambs and pillars of the buildings than on those of the Yucatan Penin- sula; this is due to the harder and more uneven character of the limestone. Probably owing to the same cause, there is less cut stone in the walls, the Palenque builders using plaster to obtain smooth surfaces. There is, however, considerable carving on the interior walls, the best specimens being on the tablets, affixed to the walls with plaster. Modelling in stucco was exten- sively used. A few terra-cotta images have been found. Paint and coloured washes were liberally used to

cover plastered surfaces and for ornamentation, and paints seem to have been used to bind plastered surfaces. The Palenque builders apparently used nothing but stone tools in their work.

The so-called Great Palace consists of a group of detached buildings, apparently ten in number, standing on two platforms of different elevations. Some of the interior structures and the detached one on the lower southern terrace are in a fair state of preservation. The plan of construction shows three parallel walls enclosing two corridors covered with the peculiar pointed arches or vaults characteristic of Palenque. The buildings appear to have been erected at different periods. A square tower rises from a central part of the platform to a height of about 40 ft., divided into a solid masonry base and three storeys connected by interior stairways. The Temple of Inscriptions, one of the largest and best preserved, is distin- guished chiefly for its tablets, which contain only hieroglyphics. Sculptured slabs form balustrades to the steps leading up to the temple, and its exterior is ornamented with figures in stucco, the outer faces of the four pillars in front having life-size figures of women with children in their arms. The small Temple of Beau Relief stands on a narrow ledge of rock against the steep slope of the mountain. Its most important feature is a large stucco bas-relief, occupying a central position on the back wall of the sanctuary. It consists of a single figure, seated on a throne, beautifully modelled both in form, drapery and ornaments, with the face turned to one side and the arms out- stretched, and is reproduced by H. H. Bancroft. The temples on the east side of the Otolum are distinguished by tall narrow vaults, perforated by numerous square openings giving the appearance of coarse lattice work. The Temple of the Sun stands upon a comparatively low pyramidal foundation. The interior consists of the usual pair of vaulted corridors. The sacred tablet on the back wall of the sanctuary is carved in low relief in limestone, and consists of two figures, apparently a priest and his assistant making offerings. There are rows of hiero- glyphics on the sides and over the central design. The Temple of the Cross is a larger structure of similar design and construc- tion. The tablet belonging to this temple has excited contro- versy, because the design contains a representation of a Latin cross. The Temple of the Cerro, called that of the Cross No. 2, because its tablet is very similar to that just mentioned,

stands back against the slope of the mountain, and is in great part a ruin. (For history and further details see Central America; § Archaeology.)

PALERMO (Greek, Ua.vopiJ.os; Latin, Panhormus, Panormus), a city

of Sicily, capital of a province of the same name, in the kingdom of Italy, and the see of an archbishop. Pop. (1906), town “264,036, commune 323,747. The city stands in the N.W. of the island, on a small bay looking E., the coast forming the chord of a semicircle of mountains which hem in the campagna of Palermo, called the Conca d’Oro. The most striking point is the mountain of Hiercte, now called Pellegrino (from the grotto of Santa Rosalia, a favourite place of pilgrimage) at the N. of this semicircle; at the S.E. is the promontory of Zaffarano, on which stood Soluntum (q.v.).

A neolithic settlement and necropolis were discovered in 1897 at the foot of Monte Pellegrino, on the N.E. side (E. Salinas in Notizie degli Scavi, 1907, 307). Palermo has been commonly thought to be an original Phoenician settlement of unknown date (though its true Phoenician name is unknown), but Holm (Archivio storio siciliano, 1880, iv. 421) has suggested that the settlement was originally Greek. 1 There is no record of any Greek colonies in that part of Sicily, and Panormus certainly was Phoenician as far back as history can carry us. According to Thucydides (vi. 2), as the Greeks colonized the E. of the island, the Phoenicians withdrew to the N.W., and concentrated themselves at Panormus, Motye, and Soluntum. Like the other Phoenician colonies in the west, Panormus came under the power of Carthage, and became the head of the Carthaginian dominion in Sicily. As such it became the centre of that strife between Europe and Africa, between Aryan and Semitic man, in its later stages between Christendom and Islam, which forms the great interest of Sicilian history. As the Semitic head of Sicily, it stands opposed to Syracuse, the Greek head. Under the Carthaginian it was the head of the Semitic part of Sicily; when, under the Saracen all Sicily came under Semitic rule, it was the chief seat of that rule. It was thrice won for Europe, by Greek, Roman and Norman conquerors — in 276 B.C. by the Epirot king Pyrrhus, in 254 B.C. by the Roman consuls Aulus Atilius and Gnaeus Cornelius Scipio, and in a.d. 107 1 by Robert Guiscard and his brother Roger, the first count of Sicily. After the conquest by Pyrrhus the city was soon recovered by Carthage, but this first Greek occupation was the beginning of a connexion with western Greece and its islands which was revived under various forms in later times. After the Roman conquest an attempt to recover the city for Carthage was made in 250 B.C., which led only to a great Roman victory (see Punic Wars), Later, in the First Punic War, Hamilcar Barca was encamped for three years on Hiercte or Pellegrino, but the Roman possession of the city was not disturbed. Panor- mus received the privileges of autonomy and immunity from taxation. It seems probable that at the end of the republic the coinage for the west of Sicily was struck here

(Mommsen, Rom. Munzwesen, 665). A colony was sent here by Augustus, and the place remained of considerable importance, though inferior to Catana. A fortunate chance has preserved to us a large number of the inscriptions set up in the Forum (Mommsen, Corpus inscr. lat. x. 752). The town was taken by the Vandal Genseric in a.d. .440. It afterwards became a part of the East- Gothic dominion, and was recovered for the empire by Belisarius in 535. It again remained a Roman possession for exactly three hundred years, till it was taken by the Saracens in 835. Panormus now became the Moslem capital. In 1062 the Pisan fleet broke through the chain of the harbour and carried off much spoil, which was spent on the building of the great church of Pisa. After the Norman conquest the city remained for a short time in the hands of the dukes of Apulia. But in 1093 half the city was ceded to Count Roger, and in n 22 the rest was ceded to the second Roger. When he took the kingly title in 1 130 it became ” Prima sedes, corona regis, et regni caput.”

1 The coins bearing the name of rone are no longer assigned to Panormus; but certain coins with the name p* (Ziz; about 410 B.C.) belong to it.

During the Norman reigns Palermo was the main centre of Sicilian history, especially during the disturbances in the reign of William the Bad (1154-1166). The emperor Henry VI. entered Palermo in 1 194, and it was the chief scene of his cruelties. In 1198 his son Frederick, afterwards emperor, was crowned there. After his death Palermo was for a moment a commonwealth. It passed under the dominion of Charles of Anjou in 1266. In tbs next year, when the greater part of Sicily revolted on behalf of Conradin, Palermo was one of the few towns which was held for Charles; but the famous Vespers of 1282 put an

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end to the Angevin dominion. From that time Palermo shared in the many changes of the Sicilian kingdom. In 1535 Charles V. landed there on his return from Tunis. The last kings crowned at Palermo were Victor Amadeus of Savoy, in 1713, and Charles III. of Bourbon, in 1735. The loss of Naples by the Bourbons in 1798, and again in 1806, made Palermo once more the seat of a separate Sicilian kingdom. The city rose against Bourbon rule in 1820 and in 1848. In

i860 came the final deliverance, at the hands of Garibaldi; but with it came also the yet fuller loss of the position of Palermo as the capital of a kingdom of Sicily.

Site. — The original city was built on a tongue of land between two inlets of the sea. There is no doubt that the present main street, the Cassaro (Roman caslrum, Arabic Kasr), Via Marmorea or Via Toledo (Via Vittorio Emmanuele), represents the line of the ancient town, with water on each side of it. Another

peninsula with one side to the open sea, meeting as it were the main city at right angles, formed in Polybius's time the Neapolis, or new town, in Saracen times Khalesa, a name which still survives in that of Calsa. But the two ancient harbours have been dried up; the two peninsulas have met; the long street has been extended to the present coast-line; a small inlet, called the Cala, alone represents the old haven. The city kept its ancient shape till after the time of the Norman kings. The old state of things fully explains the name Havop/ws.

There are not many early remains in Palermo. The Phoeni- cian and Greek antiquities in the museum do not belong to the city itself. The earliest existing buildings date from the time of the Norman kings, whose palaces and churches were built in the Saracenic and Byzantine styles prevalent in the island. Of Saracen works actually belonging to the time of Saracen occupation there are no whole buildings remaining, but many inscriptions and a good many columns, often inscribed with passages from the Koran, which have been used up again in later buildings, specially in the porch of the metropolitan church, This last was built by Archbishop Walter (fl. 11 70) — an English- man sent by Henry II. of England as tutor to William II. of Sicily — and consecrated in 1185, on the site of an ancient basilica, which on the Saracen conquest became a mosque, and on the Norman conquest became a church again, first of the Greek and then of the Latin rite. What remains of Walter's building is a rich example of the Christian-Saracen style, disfigured, un- fortunately, by the addition of a totally unsuitable dome by Ferinando Fuga in 1781-1801. This church contains the tombs of the emperor Frederick II. and his parents — massive sarcophagi of red porphyry with canopies above them — and also the royal throne, higher than that of the archbishop: for the king of Sicily, as hereditary legate of the see of Rome, was the higher ecclesi- astical officer of the two. But far the best example of the style is the chapel of the king's palace (cappella palatina), at the west end of the city. This is earlier than Walter's church, being the work of King Roger in 1143. The wonderful mosaics, the wooden roof, elaborately fretted and painted, and the marble incrustation of the lower part of

the walls and the floor are very fine. Of the palace itself the greater part was rebuilt and added in Spanish times, but there are some other parts of Roger's work left, specially the hall called Sala Normanna.

Alongside of the churches of this Christian-Saracen type, there is another class which follows the Byzantine type. Of these the most perfect is the very small church of San Cataldo. But the best, much altered, but now largely restored to its former state, is the adjoining church of La Martorana, the work of George of Antioch, King Roger's admiral. This is rich with mosaics, among them the portraits of the king and the founder. Both these and the royal chapel have several small cupolas, and there is a still greater display in that way in the church of San Giovanni degli Eremiti, which it is hard to believe never was a mosque. It is the only church in Palermo with a bell-tower, itself crowned with a cupola.

Most of these buildings are witnesses in different ways to the peculiar position of Palermo in the 12th century as the " city of the threefold tongue," Greek, Arabic, and Latin. King Roger's sun dial in the palace is commemorated in all three, and it is to be noticed that the three inscriptions do not translate one another. In private inscriptions a fourth tongue, the Hebrew, is also often found. For in Palermo under the Norman kings Christians of both rites, Mahommedans and Jews were all allowed to flourish after their several fashions. In Saracen times there was a Slavonic quarter on the southern side of the city, and there is still a colony of United Greeks, or more strictly Albanians.

The series of Christian-Saracen buildings is continued in the country houses of the kings which surround the city, La Favara and Mimnerno, the works of Roger, and the better known Ziza and Cuba, the works severally of William the Bad and William the Good. The Saracenic architecture and Arabic inscriptions of these buildings have often caused them to be taken for works of the ancient ameers; but the inscriptions oi

themselves prove their date. All these buildings are the genuine work of Sicilian art, the art which had grown up in the island through the presence of the two most civilized races of the age, the Greek and the Saracen. Later in the 12th century the Cistercians brought in a type of church which, without any great change of mere style, has a very different effect, a high choir taking in some sort the place of the

cupola. The greatest example of this is the neighbouring metropolitan church of Monreale (q.v.); more closely connected with Palermo is the church of San Spirito, outside the city on the south side, the scene of the Vespers.

Domestic and civil buildings from the 12th century to the 15th abound in Palermo, and they present several types of genuine national art, quite unlike anything in Italy. Of palaces the finest is perhaps the massive Palazzo Chiaramonte, now used as the courts of justice, erected subsequently to 1307. One of the halls has interesting paintings of 1377-1380 on its wooden ceiling; and in the upper storey of the court is a splendid three-light Gothic window. The later houses employ a very flat arch, the use of which goes on in some of the houses and smaller churches of the Renaissance. S. Maria della Catena may be taken as an especially good example. But the general aspect of the streets is later still, dating from mere Spanish times. Still many of the houses are stately in their way, with remarkable heavy balconies. The most striking point in the city is the central space at the crossing of the main streets, called the Quattro Cantoni. Two of the four are formed by the ancient Via Marmorea, but the Via Macqueda, which supplies the other two, was cut through a mass of small streets in Spanish times.

The city walls are now to a great extent removed. Of the gates only two remain, the Porta Nuova and the Porta Felice; both are fine examples of the baroque style, the former was erected in 1584 to commemorate the return of Charles V. fifty years earlier, the latter in 1582. Outside the walls new quarters have sprung up of recent years, and the Teatro Massimo and the Politeama Garibaldi; the former (begun by G. B. Basile and completed by his son in 1897) has room for 3200 spectators and is the largest in Italy.

The museum of Palermo, the richest in the island, has been transferred from the university to the former monastery of the Filippini. Among the most important are the objects from prehistoric tombs and the architectural fragments from Selinus, including several metopes with reliefs, which are of great impor- tance as illustrating the development of Greek sculpture. None of the numerous Greek vases and terra-cottas is quite of the first class, though the collection is important. The bronzes are few, but include the famous ram from Syracuse. There is also the Casuccini collections of Etruscan sarcophagi, sepulchral urns and pottery. Almost the only classical antiquities from Palermo itself are Latin inscriptions of the imperial period, and two large coloured mosaics with figures found in the Piazza Vittoria in front of the royal palace in 1869: in 1906 excavations in the same square led to the

discovery of a large private house, apparently of the 2nd or 3rd century a.d., to which these mosaics no doubt belonged. Of greater local interest are the medieval and Renaissance sculptures from Palermo itself, a large picture gallery, and an extensive collection of Sicilian majolica, &c.

The university, founded in 1779, rose to importance in recent years (from 300 students in 1872 to 1495 in 1897), but has slightly lost in numbers since. The city wears a prosperous and busy appearance. The Marina, or esplanade at the south of the town, affords a fine sea front with a view of the bay; near it are beautiful public gardens. In the immediate neigh- bourhood of the city are the oldest church in or near Palermo, the Lepers' church, founded by the first conqueror or deliverer, Count Roger, and the bridge over the forsaken stream of the Oreto, built in King Roger's day by the admiral George. There are also some later medieval houses and towers of some impor- tance. These all lie on to the south of the city, towards the hill called Monte Griffone (Griffon-Greek), and the Giant's Cave, which has furnished rich stores for the palaeontologist. On

the other side, towards Pellegrino, is the new harbour of Palermo, round which a new quarter has sprung up, including a yard capable of building ships up to 475 ft. in length, and a dry dock for vessels up to 563 ft.

The steamship traffic at Palermo in 1906 amounted to 2035 vessels, with a total tonnage of 2,403,851 tons. Palermo is one of the two headquarters (the other being Genoa) of the Navigazione Generate Italiana, the chief Italian steamship company. The principal imports were 36,567 tons of timber (a large increase on the normal figures), 21,401 1 tons of wheat and 151,360 tons of coal; while the chief exports were 116,400 gallons of wine, 37,835 tons of sumach and 122,023 tons of oranges and lemons. Finding most of its valuable rates hypothecated to the meeting of old debts, the municipality of Palermo has embarked upon municipal owner- ship and trading in various directions.

The plain of Palermo is very fertile, and well watered by springs and streams, of the latter of which the Oreto is the chief. It is planted with orange and lemon groves, the products of which are largely exported, and with many palm-trees, the fruit of which, however, does not attain maturity. It also contains many villas of the wealthy inhabitants of Palermo, among the most beautiful of which is La Favorita, at the foot of Monte Pellegrino on the west, belonging to the Crown.

Authorities — Besides works dealing with Sicily generally, the established local work on Palermo is Descrizione di Palermo antico, by Salvatore Morso (2nd ed., Palermo, 1827). Modern research and criticism have been applied in Die mitteldlterliche Kunst in Palermo, by Anton Springer (Bonn, 1869); Historische Topographie von Panormus, by Julius Schubring (Liibeck, 1870); Studii di storia palermitana, by Adolf Holm (Palermo, 1880). See also ” The Normans in Palermo,” in the third series of Historical Essays, by E. A. Freeman (London, 1879). The description of Palermo in the second volume of Gselfel’s guide-book, Unter-Italien und Sicilien (Leipzig), leaves nothing to wish for. Various articles in the Archivio storico siciliano and the series of Documenti per servire alia storia della Sicilia, both published by the Societa siciliana per la storia patria, may also be consulted. (E. A. F. ; T. As.)

PALES, an old Italian goddess of flocks and shepherds. The festival called Parilia (less correctly Palilia) was celebrated in her honour at Rome and in the country on the 21st of April. In this festival Pales was invoked to grant protection and increase to flocks and herds; the shepherds entreated forgiveness for any unintentional profanation of holy places of which their flocks might have been guilty, and leaped three times across bonfires of hay and straw (Ovid, Fasti, iv. 731-805). The Parilia was not only a herdsmen’s festival, but was regarded as the birthday celebration of Rome, which was supposed to have been founded on the same day. Pales plays a very sub- ordinate part in the religion of Rome, even the sex of the divinity being uncertain. A male Pales was sometimes spoken of, corresponding in some respects to Pan; the female Pales was associated with Vesta and Anna Perenna.

PALESTINE, a geographical name of rather loose application. Etymological strictness would require it to denote exclusively the narrow strip of coast-land once occupied by the Philistines, from whose name it is derived. It is, however, conventionally used as a name for the territory which, in the Old Testament, is claimed as the inheritance of the pre-exilic Hebrews; thus it may be said generally to denote the southern third of the province of Syria. Except in the west, where the country is bordered by the Mediterranean Sea, the limit of this territory cannot be laid down on the map as a definite line. The modern subdivisions under the jurisdiction of the Ottoman Empire are in no sense conterminous with those of antiquity, and hence do not afford a boundary by which Palestine can be separated exactly from the rest of Syria in the north, or from the Sinaitic and Arabian deserts in the south and east; nor are the records of ancient boundaries sufficiently full and definite to make possible the complete demarcation of the country. Even the convention above referred to is

inexact: it includes the Philistine territory, claimed but never settled by the Hebrews, and excludes the outlying parts of the large area claimed in Num. xxxiv. as the Hebrew possession (from the ” River of Egypt ” to Hamath). However, the Hebrews themselves have preserved, in the

1 The figures for 1905 (40,005 tons, almost entirely from Russia) were abnormally high, while those for 1906 are correspondingly below the average.

proverbial expression ” from Dan to Beersheba ” (Judg. xx. i, &c), an indication of the normal north-and-south limits of their land; and in denning the area of the country under discussion it is this indication which is generally followed.

Taking as a guide the natural features most nearly correspond- ing to these outlying points, we may describe Palestine as the strip of land extending along the eastern shore of the Mediter- ranean Sea from the mouth of the Litany or Kasimiya River (33° 20′ N.) southward to the mouth of the Wadi Ghuzza; the latter joins the sea in 31° 28′ N., a short distance south of Gaza, and runs thence in a south-easterly direction so as to include on its northern side the site of Beersheba. Eastward there is no such definite border. The River Jordan, it is true, marks a line of delimitation between Western and Eastern Palestine; but it is practically impossible to say where the latter ends and the Arabian desert begins. Perhaps the line of the pilgrim road from Damascus to Mecca is the most convenient possible boundary. The total length of the region is about 140 m.; its breadth west of the Jordan ranges from about 23 m. in the north to about 80 m. in the south. According to the English engineers who surveyed the country on behalf of the Pales- tine Exploration Fund, the area of this part of the country is about 6040 sq. m. East of the Jordan, owing to the want of a proper survey, no figures so definite as these are available. The limits adopted are from the south border of Hermon to the mouth of the Mojib (Arnon), a distance of about 140 m.: the whole area has been calculated to be about 3800 sq. m. The territory of Palestine, Eastern and Western, is thus equal to rather more than one-sixth the size of England.

There is no ancient geographical term that covers all this area. Till the period of the Roman occupation it was subdivided into independent provinces or kingdoms, different at different times (such as Philistia, Canaan, Judah, Israel, Bashan, &c), but never united under one collective designation. The exten- sion of the name of Palestine beyond the limits of Philistia proper is not older than the Byzantine Period.

Physical Features. — Notwithstanding its small size, Palestine presents a variety of geographical detail so unusual as to be in itself sufficient to mark it out as a country of _ especial interest. The bordering regions, moreover, are as varied in character as is the country itself — sea to the west, a mountainous and sandy desert to the south, a lofty steppe plateau to the east, and the great masses of Lebanon to the north. In describing the general physical features of the country, the most significant point to notice is that (though it falls westward to the sea and rises eastward to an elevated plain) the rise from west to east is not continuous, but is sharply interrupted by the deep fissure of the Ghor or Jordan valley ; which, running from north to south — for the greater part of its length depressed below sea-level — forms a division in the country of both physical and political importance. In this respect the function of the river Jordan in Palestine offers a strange contrast, often remarked upon, to that of the Nile in Egypt. The former is of no use for irrigation, except in the immediate neigh- bourhood of its banks, and is a barrier to cross which involves the labour of a considerable ascent at any point except its most northern section. The latter is at once the great fertilizer and the great highway of the country which it serves.

Western Palestine is a region intersected by groups of mountain peaks and ranges, forming a southern extension of the Lebanon system and running southward till they finally lose themselves in the desert. The watershed of this system is so placed that from two-thirds to three-fourths of the country is on its western side. This fact, taken in connexion with the great depth of the depres- sion of the Ghor below the Mediterranean — already 682 ft. at the Sea of Galilee— has a peculiar effect on the configuration of the country. On the west side the slope is gradual, especially in the broad plain that skirts the coast for the greater part cf its length; on the east side it is steep — precipitous indeed, towards the southern end — and intersected by valleys worn to a tremendous depth by the force of the torrents that once ran down them.

This territory of Western Palestine divides naturally into two longitudinal strips — the maritime plain and the mountain region.

These it will be convenient to consider separately.

I. The Maritime Plain, which, with a few interruptions, extends along the Mediterranean coast from Lebanon to Egypt, is a strip of land of remarkable fertility. It is formed of raised beaches and sea-beds, ranging from the Pliocene period downwards, and resting on Upper Eocene sandstone. It varies greatly in width. At the mouth of the Kasimiya it is some 4 m. across, and this breadth it maintains to a short distance south of Tyre, where it suddenly narrows; until, at Ras el-Abiad, it has been necessary to

cut a passage in the precipitous face of the cliff to allow the coast-road to be carried past it. This ancient work is the well-known " Ladder of Tyre." South of this promontory the plain begins to widen again; on the. latitude of Acre (Akka), from which this part of the plain takes its name, it is from 4 to 5 m. across; while farther south, at Haifa, it is of still greater width, and opens into the extensive Merj Ibn 'Amir (Plain of Esdraelon) by which almost the whole of Western Palestine is intersected. South of Haifa the promontory of Carmel once more effaces the plain; here the passage along the coast is barely 200 yds. in width. At 'Athlit, 9 m. to the south, it is about 2 m. ; from this point it expands uni- formly to about 20 m., which is the breadth at the latitude of Ascalon. South of this it is shut in and broken up by groups of low hills. From the Kasimiya southwards the maritime plain- is crossed by numerous river-beds, with a few exceptions winter torrents only. Among the perennial streams may be mentioned the Na'aman, south of Acre; the Mukatta' Kishon, at Haifa; the Nahr ez-Zerka, sometimes called the Crocodile River — so named from the crocodiles still occasionally to be seen in it; the Nahr el-Falik; the 'Aujeb a few miles north of Jaffa and the Nahr Rubin. The surface of the plain rises gradually from the coast inland to an altitude of about 200 ft. It is here and there diversified by smal' hills.

II. The Mountain Region, the great plain of Esdraelon, which forms what from the earliest times has been recognized to be the easiest entrance to the interior of the country, cuts abruptly through the mountain system, and so divides it into two groups. Each of these may be subdivided into two regions presenting their own special peculiarities.

a. The Galilean Mountains, north of the plain of Esdraelon, fall into two regions, divided by a line joining Acre with the north end of the Sea of Galilee. The northern region (Upper Galilee) is virtually an outlier of the Lebanon Mountains. At the north end is an elevated plateau, draining into the Kasimiya. The mountains are intersected by

a complex system of valleys, of which some thirty run down to the Mediterranean. The face toward the Jordan valley is lofty and steep. The highest point is Jebel Jermak, 3934 ft. above the sea; about iˆ, on the eastern and northern sides, are lofty plateaus. The region is fruitful, and in places well wooded ; it is beyond question the most picturesque part of Palestine. The southern region (Lower Galilee) shows somewhat different characteristics. It consists of chains of comparatively low hills, for the greater part running east and west, enclosing a number of elevated plains. The principal of these plains is El-Buttauf, a tract 400 to 500 ft. above sea-level, enclosed within hills 1700 ft. high and measuring 9 m. east to west and 2 m. north" to south. It is marshy at its eastern end and very fertile. This is the plain of Zebulun or Asochis, of antiquity. The plain of Tur'an, south- east of El-Buttauf, is smaller, but equally fertile. Among the principal mountains of this district may be named Jebel Tur'an, 1774 ft. and Jebel et-Tur (Tabor) 1843 ft.; the latter is an isolated mass of regular shape which commands the plain of Esdraelon. Eastward the country falls to the level of the Ghor by a succession of steps, among which the lava-covered Sahel el-Ahma may be mentioned, which lies west of the cliffs overhanging the Sea of Galilee. The chief valleys of this region are the Nahr Na'aman and its branches, which runs into the sea south of Acre, and the Wadi Mukatta", or Kishon, which joins the sea at Haifa. On the east may be mentioned the Wadi er-Rubadiya, Wadi el-Hamam and Wadi Fajjas, flowing into the Sea of Galilee or else into the Jordan.

b. The great plain of Esdraelon is one of the most important and striking of the natural features of Western Palestine. It is a large triangle, having its corners at Jenin, Jebel et-Tur, and the outlet of the Wadi Mukatta', by which last it communicates with the sea-coast. On the south-west it is bounded by the range of hills that terminates in the spur of Carmel. The modern name, as above-mentioned, is Merj Ibn 'Amir (" the meadow-land of the son of 'Amir ") ; in ancient times it was known as the Valley of Jezreel, of which name Esdraelon is a Greek corruption; and by another name (Har-Magedon) derived from that of the impor- tant town of Megiddo— it is referred to symbolically in Rev. xvi. 16. It is the great highway, and also the great battlefield, of Palestine. At the village of Afuleh its altitude is 260 ft. above the sea-level. In winter it is swampy, and in places almost impassable. The fertility of this region is proverbial. There are several small subsidiary plains that extend from it both north and south into the surrounding mountain region; of these we need only mention a broad valley running north-eastwards between Jebel Duhi, a range 15 m. long and 1690 ft. high, on the one side, and Mt Tabor and the hills

of Nazareth on the other side. East of the watershed are a number of valleys running to the Ghor; the most remarkable of these are the Wadi el-Bireh and the Wadi Jalud, the latter containing the river that flows from the fine spring called ‘Ain Jalud.

c. The second of the divisions into which we have grouped the mountain system lies south of the plain of Esdraelon. This is divisible into the districts of Samaria and Judaea. In the first of these the mountain ranges are complex, appearing to radiate from a centre at which lies Merj el-Ghuruk, a small plain about 4 m. east to west and 2 m. north to south. This plain has no outlet and is marshy in the rainy season. Connected with it are other small plains unnecessary to enumerate. For the greater part the

principal mountains are near the watershed; they include Jebel Fuku’a (Gilboa), a range that forms the watershed at the eastern extremity of the plain of Esdraelon. The range of Carmel (highest point 1810 ft.) must also be included in this district ; it runs from the

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‘Ain =s= Spring

central point above mentioned — though interrupted by many passes — to the end of the promontory which makes the harbour of Haifa, at its foot, the best on the Palestine coast. The highest mountains in the Samaria district are, however, in the neighbour- hood of Nablus (Shechem). They include the rugged bare mass of Gerizim (2849 ft.), the smoother cactus-clad cone of Ebal (3077), and farther south Tell

‘Asur (3318) at which point begins the

Judaean range. On the eastern side of the watershed the most important feature is perhaps the great valley system that connects the Mukhnah (the plain south of Nablus) with the Ghor — be- ginning with the impressive Wadi Bilan and proceeding through the important and abundantly watered Wadi Far’a. Tell ‘Asur stands a short distance north of Beitein (Bethel). South of it is the long zigzag range known as Jebel el-Kuds, named from Jerusalem (el-Kuds) the chief town built upon it. The highest point is Neby Samwil (Mizpah), 2935 ft. above the sea, north of Jerusalem. This city itself stands at an altitude of 2500_ ft. To the south of it begins the subdivision of the Judaean mountains now known as Jebel el-Khalil, from Hebron (el-Khalil), which stands in an elevated basin some 500 ft. above the altitude of Jerusalem; it is here that the Judaean Mountains attain their greatest height. South of Hebron the ridge gradually be- comes lower, and finally breaks up and loses itself in the southern desert.

On the west side of the watershed the mountainous district extends about half way to the sea, broken by deep valleys and passes. Among these the most im- portant are the Wadi Selman (Valley of Aijalon) which seems to have been the principal route to Jerusalem in ancient times; the Wadi Isma’in south of this, along which runs the modern carriage road from Jaffa to Jerusalem ; and the Wadi es-Surar, a higher section of the bed of the Nahr Rubin, along which now runs the railway line; farther to the south we may mention the Wadi es-Sunt, which opens up the country from Tell es-Safi (Gath?) eastward.

Between the mountainous country of Judaea and the maritime plain is an un- dulating region anciently known as the Shephelah. It is composed of horizontal strata of limestone, forming groups of hills intersected by a network of small and fertile valleys. In this region, which is of great historical importance, are the re- mains of many ancient cities. The ad- jacent part of the maritime plain is com- posed of a rich, light brown loamy soil. Although cultivated with most primitive appliances, and with little or no attempt at irrigation or artificial fertilization, the average yield is eight- to twelve-fold annually. This part of the plain is (in European nomenclature) divided into two at about the latitude of Jaffa, that to the north being the plain of Sarona (Sharon), the southern half being the plain of the Philistines.

On the east side of the watershed the ground slopes rapidly from its height of 2500 ft. above sea-level to a maximum depth of 1300 ft. below sea-level, within a distance of about 20 m. It is a waste,

destitute of water and with but scanty vegetation. It has never been brought into cultivation; but in the first Christian centuries the caves in its valleys were the chosen refuge of Christian monasticism. It descends to the level of the Ghor by terraces, deeply cut through by profound ravines such as the Wadi es-Suweinit, Wadi Kelt, Wadi ed-Dabr, Wadi en-Nar (Kedron) and Wadi el ‘Areijeh.

The southern district, which includes the white marl region of Beersheba, was in ancient times called the Negeb. It is a wide steppe region which (though it contains many remains of ancient towns and settle- ments, and was evidently at one time a terri- tory of great importance) is now almost en- tirely inhabited by nomads. It should, however, be mentioned that the Turkish government has developed a town at Beersheba, under the jurisdiction of a Kaimmakam (lieutenant-governor), since the beginning of the 20th century.

The Ghor or Jordan valley is treated in a separate article (see Jordan). There has been no systematic survey of Eastern Palestine such as was carried out in Western Palestine between 1875 and 1880

by the officers of the Palestine Exploration Fund. A good deal of work has been done by individual travellers, but the material for a full description of its physical character is as yet lacking. Two great rivers, the Yarmuk (Hieromax) and the Zerka (Jabbok), divide Eastern Palestine into three sections, namely Hauran (Bashan, q.v.) with the Jaulan west of it ; Jebel Ajlun (Gilead, q.v.) ; and the Belk’a (the southern portion of Gilead and the ancient territory of the tribe of Reuben). The latter extends southward to the Mojib, which, as we have already seen, is the southern boundary of Eastern Palestine.

It is a matter of dispute whether Hauran should be included within Palestine proper, accepting its definition as the ” ancient Hebrew territory.” It is a large volcanic region, entirely covered with lava and other igneous rocks. Two remarkable rows of these run in lines from north to south, through the region of the Jaulan parallel to the Ghor, and from a long distance are conspicuous features in the landscape. The soil is fertile, and there are many remains of ancient wealth and civilization scattered over its surface. South of the Yarmuk the formation is Cretaceous, Hauran basalt being found only in the eastern

portion. That region is much more mountainous than Hauran. South of the Zerka the country culminates in Jebel ‘Osha, a peak of Jebel Jil’ad (” the mountain of Gilead “), 3596 ft. high. From this point southward the country assumes the appearance which is familiar to those who have visited Jerusalem — an elevated plateau, bounded on the west by the pre- cipitous cliffs known as the mountains of Moab, with but a few peaks, such as Jebel Shihan (2781 ft.) and Jebel Neba (Nebo, 2643 ft.), con- spicuous above the level of the ridge by reason of superior height.

Geology. — The oldest rocks consist of gneiss and schist, penetrated by dikes and bosses of granite, syenite, porphyry and other in- trusive rocks. All of these are pre-Carboniferous in age and most of them probably belong to the Archean period. They are gener- ally concealed by later deposits, but are exposed to view along the eastern margin of the Wadi Araba, at the foot of the plateau of Edom. Similar rocks occur also at one or two places in the desert of et-Tih, while towards the south they attain a greater extension, forming nearly the whole of Sinai and of the hills on the east side of the Gulf of Akaba. These ancient rocks, which form the foundation of the country, are overlaid unconformable by a series of conglomerates and sandstones, generally unfossiliferous and often red or purple in colour, very similar in character to the Nubian sandstone of Upper Egypt. In the midst . of this series there is an inconstant band of fossiliferous limestone, which has been found in the Wadi Nasb and at other places on the southern border of et-Tih, and also along the western escarpment of the Edom plateau. The fossils include Syringopora, Zaphrentis, Productus, Spirifer, &c, and belong to the Carboniferous. The sandstone which lies below the limestone is also, no doubt, of Carboniferous age; but the sandstone above is conformably over- laid by Upper Cretaceous beds and is generally referred to the Lower Cretaceous. No unconformity, however, has yet been detected anywhere in the sandstone series, and in the absence of fossils the upper sandstone may represent any period from the Carboniferous to the Cretaceous. The Upper Cretaceous is repre- sented by limestones with bands of chert, and contains Ammonites, Baculites, Hippurites and other fossils. It covers by far the greater part of Palestine, capping the table-lands of Moab and Edom, and forming most of the high land between the Jordan and the Mediterranean. It is overlaid towards the west by similar limestones, which contain nummulites and belong to the Eocene period; and these are followed near the coast by the calcareous sandstone of Philistia, which is referred by Hull to the Upper Eocene. Lava flows of basic character, belonging to the Tertiary period, cover extensive areas in Jaulan and Hauran; and smaller patches occur in

the land of Moab and also west of the Jordan, especially near the Sea of Gennesareth. Of Recent deposits the most interesting are the raised beaches near the coast and the terraces of the Jordan-Araba depression. The latter indicate that at one period nearly the whole of this depression was filled with water up to a level somewhat above that of the Mediterranean.

The geological structure of the country is very simple in its broad features, but of exceptional interest. In general the stratified deposits lie nearly flat and in regular conformable succession, the lowest resting upon the floor of ancient crystalline rocks. There is, however, a slight dip towards the west, so that the newest deposits lie near the coast. Moreover, along the eastern side of the Jordan- Araba valley there is a great fault, and on the eastern side of this fault the whole series of rocks stands at a much higher level than on the west. Consequently, west of the Jordan almost the whole country is formed of the newer beds (Upper Cretaceous and later), while east of the Jordan the older rocks, sometimes down to the Archean floor, are exposed at the foot of the plateau. The western margin of the valley is possibly defined by another fault which has not yet been detected; but in any case it is clear that the great depression owes its extraordinary depth to faulting. A line of depressions of similar character has been traced by E. Suess as far south as Lake Nyasa. 1

‘See Lortet, La Mer Morte (Paris, 1877); E. Hull, Mount Seir, Sinai and Western Palestine (London, 1885) ; and Memoir on the

Climate. — Palestine belongs to the sub-tropical zone: at the summer solstice the sun is ten degrees south of the zenith. The length of the day ranges from ten to fourteen hours. The great variety of altitude and of surface characteristics gives rise to a considerable number of local climatic peculiarities. On the maritime-plain the mean annual temperature is 70° F., the normal extremes being about 50 to about 90°. The harvest ripens about a fortnight earlier than among the mountains. Citrons and oranges flourish, as do melons and palms: the latter do not fruit abundantly, but this is less the fault of climate than of carelessness in fertilization. The rainfall is rather lower than among the mountains. In the mountainous regions the mean annual temperature is about 62 , but there is a great range of variation. In winter there are often several degrees of frost, though snow very rarely lies for more than a day or two. In summer the thermometer occasionally registers as much as 100° in the shade, or even a degree or two more: this however is exceptional, and 8o°-90° is a more normal maximum for the year. The rainfall is about 28 in., sometimes less, and in exceptional years as much as 10 in. in excess of this figure

has been registered. The vine, fig and olive grow well in this region. The climate of the Ghor, again, is different. Here the thermometer may rise as high as 130°. The rainfall is scanty, but as no civilized person inhabits the southern end of the Jordan valley throughout the year, and it has hitherto proved impossible to establish self-registering instruments, no systematic meteorological observations have been taken. In Eastern Palestine there is even a greater range of temperature; the loftier heights are covered in winter with snow. The thermometer may range within twenty-four hours from freezing-point to 8o°.

The rainy season begins about the end of November, usually with a heavy thunderstorm: the rain at this part of the year is the ” former rain ” of the Old Testament. The earth, baked hard by the summer heat, is thus softened, and ploughing begins at once. The wettest month, as indicated by meteorological obser- vation, is January; February is second to it, and December third; March is also a very wet month. In April the rains come to an end (the ” latter rains “) and the winter crops receive their final fertilization. The winter crops (barley and wheat) are harvested from April to June. The summer crops (millet, sesame, figs, melons, grapes, olives, &c.) are fertilized by the heavy ” dews ” which are one of the most remarkable climatic features of the country and to a large extent atone for the total lack of rain for one half the year. These crops are harvested from August to October.

Water Supply. — Notwithstanding the long drought, it must not be supposed that Palestine is a waterless country, except in certain districts. There are very few spots from which a spring of some sort is not accessible. Perennial streams are, and in the recent geological ages always have been, rare in the country. The whole face of the land is pitted with ancient cisterns; indeed, many hillsides and fields are on that account most dangerous to walk over by night, except for those who are thoroughly familiar with the landmarks. These cisterns are bell-shaped or bottle-shaped excavations, with a narrow circular shaft in the top, hollowed in the rock and lined with cement. Besides these, more ambitious works are to be found, all now more or less ruined, in various parts of the country (see Aqueducts: Ancient). Such are the aqueducts, of which remains exist at Jericho, Caesarea and other places east and west of the Jordan; but especially must be mentioned the enormous reservoirs known as Solomon’s Pools, in a valley between Jerusalem and Hebron, by which the former city was supplied with water through an elaborate system of conduits. Many of these aqueducts, as well as countless numbers of now leaky cisterns, could with but little trouble be brought into use again, and would greatly enhance the fertility of the country. The most abundant

springs in Palestine are the sources of the Jordan at Banias and at TeH el-Kadi. A considerable number of springs in the country are brackish, being impregnated with chemicals of various kinds or (when near a town) with sewage. The latter is the case of the Virgin's Fountain (Ain Umm ed-Daraj), which is the only natural source of water in the neighbourhood of Jerusalem.

Hot springs are found in various parts of the country, especially at El-Hamma, about 1 m. south of Tiberias, where the water has a temperature of 140 F. This is still used for curative purposes, as it was in the days of Herod, but it is neglected and dirty. The spring of the Zerka Ma'in (Calirrhoe) has a temperature of 142° F. There are also hot sulphur springs on the west side of the Dead Sea. Those of El-Hamma, below Gadara, are from 104° to 120 F. in temperature.

Fauna. — It has been calculated that about 595 different species of vertebrate animals are recorded or still to be found in Palestine — about 1 13 being mammals (including a few now extinct), 348 birds (including 30 species peculiar to the country), 91 reptiles and 43 fishes. Of the invertebrata the number is unknown, but it must be enormous. The most important domestic animals are the sheep and the goat; the breed of oxen is small and poor. The camel, the horse and the donkey are the draught animals ; the flesh of the first

Geology and Geography of Arabia Petraea, Palestine and adjoining Districts (London, 1886).

is eaten by the poorer classes, as is also occasionally that of the second. The dogs, which prowl in large numbers round the streets of towns and villages, are scarcely domesticated; much the same is true of the cats. Wild cats, cheetahs and leopards are found, but they are now rare, especially the latter. The lion, which inhabited the country in the time of the Hebrews, is now extinct. The most important wild animals are the hyena, wolf (now compara- tively rare), fox and jackal. Bats, various species of rodents, and gazelles are very common, as is the ibex in the valleys of the Dead Sea. Among the most characteristic birds may be mentioned eagles, vultures, owls, partridges, bee-eaters and hoopoes ; singing birds are on the whole uncommon.. Snakes — many of them venomous — are numerous, and

there are many varieties of lizards. The crocodile is seen (but now very rarely) in the Nahr ez-Zerka. Scorpions and large spiders are a universal pest.

Flora. — The flora of Palestine has a considerable range and variety, owing to the variation in local climatic conditions. In the Jordan valley the vegetation has a semi-tropical character, consonant with the great heat, which here is normal. The coast-plain has another type, i.e. the ordinary vegetation of the Mediterranean littoral. In the mountains the flora is, naturally, scantier than in these two more favoured regions, but even here there is a rich variety. In all parts of the country the contrast between the landscape in early spring and later, when the cessation of rains and the increase of heat has burnt up the vegetation, is very remarkable.

Population.- — The inhabitants of Palestine are composed of a large number of elements, differing widely in ethnological affinities, language and religion. It may be interesting to men- tion, as an illustration of their heterogeneousness, that early in the 20th century a list of no less than fifty languages, spoken in Jerusalem as vernaculars, was there drawn up by a party of men whose various official positions enabled them to possess accurate information on the subject. 1 It is therefore no easy task to write concisely and at the same time with sufficient fullness on the ethnology of Palestine.

There are two classes into which the population of Palestine can be divided — the nomadic and the sedentary. The former is especially characteristic of Eastern Palestine, though Western Palestine also contains its full share. The pure Arab origin of the Bedouins is recognized in common conversation in the country, the word ” Arab ” being almost restricted to denote these wanderers, and seldom applied to the dwellers in towns and villages. It should be mentioned that there is another, entirely independent, nomad race, the despised Nowar, who correspond to the gipsies or tinkers of European countries. These people live under the poorest conditions, by doing smith’s work; they speak among themselves a Romani dialect, much contaminated with Arabic in its vocabulary.

The sedentary population of the country villages — the fellahin, or agriculturists — is, on the whole, comparatively unmixed; but traces of various intrusive strains assert themselves. It is by no means unreasonable to suppose that there is a funda- mental Canaanite element in this population: the ” hewers of wood and drawers of water ” often remain undisturbed through successive occupations of a land; and there is a remark- able correspondence of type between many of

the modern fellahin and skeletons of ancient inhabitants which have been recovered in the course of excavation. New elements no doubt came in under the Assyrian, Persian and Roman dominations, and in more recent times there has been much contamination. The spread of Islam introduced a very considerable Neo- Arabian infusion. Those from southern Arabia were known as the Yaman tribe, those from northern Arabia the Kais (Qais). These two divisions absorbed the previous peasant population, and still nominally exist; down to the middle of the 19th century they were a fruitful source of quarrels and of bloodshed. The two great clans were further subdivided into families, but these minor divisions are also being gradually broken down. In the 19th century the short-lived Egyptian government introduced into the population an element from that country which still persists in the villages. These newcomers have not been completely assimilated with the villagers among whom they

1 This list was intentionally made as exhaustive as possible, and included some languages (such as Welsh) spoken by one or two individual residents only. But even if, by omitting these accidental items, the list be reduced to thirty, a sufficient number will be left to indicate the cosmopolitan character of the city.

have found a home; the latter despise them, and discourage intermarriage.

Some of the larger villages — notably Bethlehem — which have always been leavened by Christianity, and with the develop- ment of industry have become comparatively prosperous, show tangible results of these happier circumstances in a higher standard of physique among the men and of personal appearance among the women. It is not uncommon in popular writings to attribute this superiority to a crusader strain — a theory which no one can possibly countenance who knows what miserable degenerates the half-breed descendants of the crusaders rapidly became, as a result of their immoral life and their ignorance of the sanitary precautions necessary in a trying climate.

The population of the larger towns is of a much more complex nature. In each there is primarily a large Arab element, consisting for the greater part of members of important and wealthy families. Thus, in Jerusalem, much of the local influence is in the hands of the families of El-Khalidi, El- Husseini and one or two others, who derive their descent from the heroes of the early days of Islam. The Turkish element is small, consisting exclusively of officials sent individually from Constantinople. There are very large contingents from the

Mediterranean countries, especially Armenia, Greece and Italy, principally engaged in trade. The extraordinary development of Jewish colonization has since 1870 effected a revolution in the balance of population in some parts of the country, notably in Jerusalem. There are few residents in the country from the more eastern parts of Asia — if we except the Turkoman settle- ments in the Jaulan, a number of Persians, and a fairly large Afghan colony that since 1905 has established itself in Jaffa. The Mutawileh (Motawila), who form the majority of the inhabitants of the villages north-west of Galilee, are probably long-settled immigrants from Persia. Some tribes of Kurds live in tents and huts near Lake Huleh. If the inmates of the count- less monastic establishments be excluded, comparatively few from northern or western Europe will remain: the German " Templar " colonies being perhaps the most important. There must also be mentioned a Bosnian colony established at Caesarea Palestina, and the Circassian settlements placed in certain centres of Eastern Palestine by the Turkish government in order to keep a restraint on the Bedouin: the latter are also found in Galilee. There was formerly a large Sudanese and Algerian element in the population of some of the large towns, but these have been much reduced in numbers since the beginning of the 20th century: the Algerians however still maintain themselves in parts of Galilee.

The most interesting of all the non-Arab communities in the country, however, is without doubt the Samaritan sect in Nablus (Shechem) ; a gradually disappearing body, which has maintained an independent existence from the time when they were first settled by the Assyrians to occupy the land left waste by the captivity of the kingdom of Israel.

The total population of the country is roughly estimated at 650,000, but no authentic official census exists from which satisfactory information on this point is obtainable. Some two-thirds of this number are Moslems, the rest Christians of various sects, and Jews. The largest town in Palestine is Jerusalem, estimated to contain a population of about 60,000. The other towns of above 10,000 inhabitants are Jaffa (45,000), Gaza (35,000), Safed (30,000), Nablus (25,000), Kerak (20,000), Hebron (18,500), Es-Salt (15,000), Acre (11,000), Nazareth (n,oco).

The above remarks apply to the permanent population. They would be incomplete without a passing word on the non-permanent elements which at certain seasons of the year are in the principal centres the most conspicuous. Especially in winter and early spring crowds of European and American tourists, Russian pilgrims and Bokharan devotees jostle one another in the streets in picturesque incongruity.

Political Divisions. — Under the Ottoman jurisdiction Palestine has no independent existence. West of the Jordan, and to about half-way between Nablus and Jerusalem, is the southern portion of

the vilayet or province of Beirut. South of this point is the sanjak 1 of Jerusalem, to which Nazareth with its immediate neighbourhood is added, so as to bring all the principal ” Holy Places ” under one jurisdiction. East of the Jordan the country forms part of the large vilayet of Syria, whose centre is at Damascus.

Communications. — Until 1892 communication through the country was entirely by caravan, and this primitive method is still followed over the greater part of its area. On the 26th of September of that year a railway between Jaffa and Jerusalem, with five intermediate stations, was opened, and has much facilitated transit between the coast and the mountains of Judaea. A railway from Haifa to Damascus was opened in 1905; it runs across the Plain of Esdraelon, enters the Ghor at Beisan, then, turning northwards, impinges on the Sea of Galilee at Samakh, and runs up the valley of the Yarmuk to join, at ed-Der’a, the line of the third railway. This was undertaken in 1901 to connect Damascus with Mecca; in 1906 it was finished as far as Ma’an, and in 1908 the section to Medina was completed. Carriage-roads also began to be constructed during the last decade of the 19th century. They are on the whole carelessly made and maintained, and are liable to go badly and more or less permanently out of repair in heavy rain. Of completed roads the most important are from Jaffa to Haifa, Jaffa to Nablus, Jaffa to Jerusalem, Jaffa to Gaza; Jerusalem to Jericho, Jerusalem to Bethlehem with a branch to Hebron, Jerusalem to Khan Labban — ultimately to be extended to Nablus; and Gaza to Beersheba. Other roads have been begun in Galilee (e.g. Haifa to Tiberias and to Jenin) ; but in this respect the northern province is far behind the southern. For the rest there is a network of tracks, all practically impassable by wheeled vehicles, extending over the country and connecting the towns and villages one with another.

Industries. — There are no mines and few manufactures of importance in Palestine: the country is entirely agricultural. Although the processes are primitive and improvements are discouraged, both by the policy of the government and by an indolence and suspiciousness

of innovation natural to the people themselves, fine crops of cereals are yielded, especially in the large wheat-lands of Hauran. Besides wheat, the following crops are to a greater or less extent cultivated — barley, millet, sesame, maize, beans, peas, lentils, kursenni (a species of vetch used as camel-food) and, in some parts of the country, tobacco. The agriculturist has many enemies to contend with, the tax-gatherer being perhaps the most deadly; and drought, earthquakes, rats and locusts have at all periods been responsible for barren years.

The fruit trade is very considerable. The value of the oranges exported from Jaffa in 1906 was £162,000; this amount increases annually, and of course in addition a considerable quantity is retained for home consumption. Besides these are grown melons, mulberries, bananas, apricots, quinces, walnuts, lemons and citron. The culture of the vine — formerly an important staple, as is proved by the countless ancient wine-presses scattered over the rocky hillsides of the whole country — fell to some extent into desuetude, no doubt owing to the Moslem prohibition of wine-drinking. It is, however, rapidly returning to favour, principally under Jewish auspices, and numerous vineyards now exist at different centres. All over the country are olive-trees, the fruit and oil of which are a staple product of the country; the trade is however hampered by an excessive tax on trees, which not only discourages plantation, but has the unfortunate effect of encouraging destruction. Other fruit trees are abundant, though less so than those we have men- tioned: such are pomegranates, pears, almonds, peaches, and, in the warmer part of the country, palms. Apples are few and poor in quality. The kharrub (carob) is common and yields a fruit eaten by the poorer classes. 2 Of ordinary table vegetables a considerable quantity and variety are grown: such are the cabbage, cauliflower, solanum (egg-plant), cucumber, hibiscus (bamieh), lettuce, carrot, artichoke, &c. The potato is also grown in considerable quantities.

Beside the agricultural there is a considerable pastoral industry, though it is principally confined to production for home consump- tion. Sheep and goats are bred throughout the country; but the breeding of the beasts of burden (donkeys, horses, camels) is chiefly in the hands of the Bedouin.

Of the manufactures the following call for mention: pottery (at Gaza, Ramleh and Jerusalem) ; soap (from olive oil, principally at Nablus) ; we may perhaps also extend the term to include the collecting of salt (from the Dead Sea). This last is a government monopoly, but illicit manufacture and smuggling are highly organized. Some of the minor industries, such as bee-keeping, are

fjractised with success by a few individuals. Other industries of ess importance are basket-making, weaving, and silk and cotton

1 A sanjak is usually a subordinate division of a vilayet, but that of Jerusalem has been independent ever since the Crimean War. This change was made on account of the trouble involved in referring all complications (arising from questions relating to the political standing of the holy places) to the superior officials of Beirut or Damascus, as had formerly been necessary.

2 Sometimes imagined to be the ” locusts ” eaten by John the Baptist, on which account the tree is often called the locust-tree. But it was the insect which John used to eat ; it is still eaten by the fellahin.

manufacture. Stone-quarrying has been fostered since 1900 by the great development of building at Jerusalem and other places. Wine is manufactured by several of the German and Jewish colonies, and by some of the monastic establishments. Regular industrial work is however handicapped by competition with the tourist trade in its several branches — acting as guides and camp servants, manu- facture and sale of ” souvenirs ” (carved toys and trinkets in mother- of-pearl and olive-wood, forged antiquities and the like), and the analogous trade in objets de piete (rosaries, crosses, crude religious pictures, &c.) for pilgrims. Travellers in the country squander their money recklessly, and these trades, at once easy and lucrative, are thus fatally attractive to the indolent Syrian and prejudicial to the best interests of the country. (R. A. S. M.)

History I. — Old Testament History.

Palestine is essentially a land of small divisions, and its configuration does not fit it to form a separate entity; it ” has never belonged to one nation and probably never will.” 3 Its position gives the key to its history. Along the west coast ran the great road for traders and for the campaigns which have made the land famous. The seaports (more especially in Syria, including Phoenicia), were well known to the pirates, traders and sea-powers of the Levant. The southernmost, Gaza, was joined by a road to the mixed peoples of the Egyptian Delta, and was also the port of the Arabian caravans. Arabia, in its turn, opens out into both Babylonia and Palestine, and a familiar route skirted the desert east of the Jordan into Syria to Damascus and Hamath. Damascus is closely connected with Galilee and Gilead, and has always been in contact with Mesopotamia, Assyria, Asia Minor and Armenia. Thus Pales- tine lay at the gate of Arabia and Egypt, and at the tail end of a number of small states stretching up into Asia Minor;

it was encircled by the famous ancient civilizations of Babylonia, Assyria, South Arabia and Egypt, of the Hittites of Asia Minor, and of the Aegean peoples. Consequently its history cannot be isolated from that of the surrounding lands. Recent research in bringing to light considerable portions of long-forgotten ages is revolutionizing those impressions which were based upon the Old Testament — the sacred writings of a small fraction of this great area; and a broad survey of the vicissitudes of this area furnishes a truer perspective of the few centuries which concern the biblical student. 4 The history of the Israelites is only one aspect of the history of Palestine, and this is part of the history of a very closely interrelated portion of a world sharing many similar forms of thought and custom. It will be necessary here to approach the subject from a point of view which is less familiar to the biblical student, and to treat Palestine not merely as the land of the Bible, but as a land which has played a part in history for certainly more than 4000 years. The close of Old Testament history (the book of Nehemiah) in the Persian age forms a convenient division between ancient Palestine and the career of the land under non-oriental influence during the Greek and Roman ages. It also marks the culmination of a lengthy historical and religious development in the establish- ment of Judaism and its inveterate rival Samaritanism. The most important data bearing upon the first great period are given elsewhere in this work, and it is proposed to offer here a more general survey. 6

To the prehistoric ages belong the palaeolithic and neolithic flints, from the distribution of which an attempt might be made to give a synthetic sketch of early Palestinian man. 6 A burial cave at Gezer has revealed the existence ˆf˜°“J” z of a race of slight build and stature, muscular, S ° ry ‘

with elongated crania, and thick and heavy skull-bones. The

3 G. A. Smith, Hist. Geog. of the Holy Land, p. 58. This and the author’s art. ” Trade and Commerce,” Ency. Bib. vol. iv., and his Jerusalem (London, 1907), are invaluable for the relation between Palestinian geography and history. For the wider geographical relations, see especially D. G. Hogarth, Nearer East (London, 1902).

4 See especially the writings of H. Winckler, in the 3rd ed. of Schrader’s Keilinschriften und das Alte Test. (Berlin, 1903); his Religionsgeschichtlicher u. geschichtlicher Orient (1906), &c.

6 See the articles on the surrounding countries and peoples, and, for the biblical traditions, art. Jews.

6 See H. Vincent, Canaan d'aprks V exploration rScente (Paris, 1907), pp. 374 sqq., also pp. 392-426.

people lived in caves or rude huts, and had domesticated animals (sheep, cow, pig, goat), the bones of which they fashioned into various implements. Physically they are quite distinct from the normal type, also found at Gezer, which was taller, of stronger build, with well-developed skulls, and is akin both to the Sinaitic and Palestinian type illustrated upon Egyptian monuments from c. 3000 B.C., and to the modern native. 1 The study of Oriental ethnology in the light of history is still very incomplete, but the regular trend of events points to a mixture of races from the south (the home of the Semites) and the north. At what period Palestine first became the " Semitic " land, which it has always remained, is uncertain; nor can one decide whether the characteristic megalithic monuments, especially to the east of the Jordan, are due to the first wave which introduced the Semitic (Canaanite) dialect and the place-names. At all events during the last centuries of the third millennium B.C., remarkable for the high state of civilization in Babylonia, Egypt and Crete, Palestine shares in the active life and intercourse of the age; and while its fertile fields are visited by Egypt, Babylonia (under Gimil-Sin, Gudea and Sargon) claims some supremacy over the west as far as the Mediterranean.

A more definite stage is reached in the period of the Hyksos (c. 1700), the invaders of Egypt, whose Asiatic origin is sug- gested inter alia by the proper-names which include sˆeˆnty. "Jacob" and " Anath " as deities. 2 After their expulsion it is very significant to find that Egypt forthwith enters upon a series of campaigns in Palestine and Syria as far as the Euphrates, and its successes over 3. district whose political fate was bound up with Assyria and Asia Miner laid the foundation of a policy which became tradition al. Apart from rather disconnected details which belong propeiiy to the history of Babylonia and Egypt, it is not until about the 16th qentury b.c. that Palestine appears in the clear light of history, and henceforth its course can be traced with some sort oi con- tinuity. Of fundamental importance are the Amarna cuneiform tablets discovered in 1887, containing some of the jwljtical correspondence between Western Asia and Egypt lor a few years of the reigns of Amenophis III. and IV. (c. 1414- I3i»). 3 The first

Babylonian dynasty, now well known for its Kham- murabi, belonged to the past, but the cuneiform script and language are still used among the Hittites of Asia Minor (centring at Boghaz-keui) and the kings of Syria and Palestine. Egypt itself was now passing from its greatness, and the Hittites (q.v.) — the term is open to some criticism — were its rivals for the possession of the intervening lands. Peoples (apparently Iranian) of Hittite connexion from the powerful state of Mitanni (Northern Syria and Mesopotamia) had already left their mark as far south as Jerusalem, as may be inferred from the personal names, 4 and to the intercourse with (apparently) Aegean culture revealed by excavation, the letters add references to mercenaries and bands from Meluhha (viz. Arabia), Mesopotamia and the Levant. The diminutive cities of this cosmopolitan Palestine were ruled by kings, not necessarily of the native stock; some were appointed — and even anointed — by the Egyptian king, and the small extent of these city-states is obvious from the references to the kings of such near-lying sites as Jerusalem, Gezer, Ashkelon and Lachish. Torn by mutual jealousy and intrigue, and forming little confederations among

1 For fuller treatment of the data see R. A. S. Macalister's complete memoir of the Gezer excavations.

a Reference may be made to Ed. Meyer's admirable survey of Oriental history down to this age, Gesch. d. Allertums (Berlin, 1909), also to f. H. Breasted, Hist, of Egypt (London, 1906), bks. i.-iv. ; and L. W. King, Hist, of Bab. and Ass vol. i. (London, 1910;. Some knowledge of the culture, religion, history and interrelations over the area of which Palestine formed part is indispensable for any careful study of the ages upon which we tiow enter.

3 See the admirable edition by J. A. Knudtzon, with full notes by O. Weber (Leipzig, 1907-1910). For their bearing on Palestine, s£e especially P. Dhorme, Rev. biblique (1908), pp. 500-519; (1909),

PP- 5°-73. 368-385. • „

1 Dhorme, op. cit. (1909), pp. 60 sqq.; H. R. Hall, Proc. Soc. 3ibl. Arch. (1909), xxxi. 233 seq.; Weber, op. cit, p. 1088 seq.; tf. A. H. Sayce, Arch, of Cuneiform Inscr. (1907), pp. 193 sqq.

themselves, they were united by their common recognition of the Egyptian suzerain, their court of appeal, or in some short- lived attempt to withstand him. Apart from Jerusalem and a few towns on the coast, the real weight lay to the north, and especially in the state of Amor. 5 It is an age of internal dis- organization and of heavy

pressure by land and by sea from Northern Syria and Asia Minor. The land seethes with excite- ment, and Palestine, wavering between allegiance to Egypt and intrigues with the great movements at its north, is unable to take any independent line of action. The letters vividly describe the approach of the enemy, and, in appealing to Egypt, abound in protestations of loyalty, complaints of the disloyalty of other kings and excuses for the writers' suspicious conduct. Of exceptional interest are the letters from Jerusalem describing the hostility of the maritime coast and the disturbances of the Habiru (" allies "), a name which, though often equated with that of the Hebrews, may have no ethnological or historical significance. 6 But Egypt "was unable to help the loyalists, even ancient Mitanni lost its political independence, and the supremacy of the Hittites was assured. The history of the age illustrated by the Amarna letters is continued in the tablets found at Bogha^-keui, the capital of the old Hittite Empire. 7 Subsequent Egyptian evidence records that Seti I. (c. 1320) of the XlXth Dynasty led an expedition into Palestine, but struggles with the Hittites continued until Rameses II. (c. 1300) concluded with them an elaborate treaty which left him little more than Palestine. Even this province was with difficulty maintained: the disturbances in the Levant and in Asia Minor (which belong to Aegean and Hittite history) and the revival of Assyria were reshaping the political history of Western Asia.

Under Rameses III. (<;. 1 200-1 169) we may recognize another age of disorganization in Palestine, in the movements with which the Philistines {q.v.) were concerned. Nevertheless, Egypt seems to have enjoved a fresh spell of extended supremacy, and Rameses apparently succeeded in recovering Palestine and some part of Syria. But it was the close of a lengthy period during which Egypt had endeavoured to keep Palestine detached from Asia, and Palestine had realized the significance of a powerful empire at its south-western border. Somewhat later Tiglath-Pileser (c. 1 100) pushed the limits of Assyrian suzerainty westwards over the lands formerly held by the great Hittite Empire. It is at this age, when the external evidence becomes extremely fragmentary, that new political movements were inaugurated and new confederations of states sprang into existence. Palestine had been politically part of Egypt or of the Hittite Empire; we now reach the stage where it becomes more closely identified with Israelite history.

Palestine had not as yet been absorbed by any of the great powers with whose history and culture it had been so closely bound up for so many centuries. In the " Amarna" age the little kings had a certain measure of inde- period!"""" pendence, provided they guarded the

royal caravan routes, paid tribute, refrained from conspiracy, and generally supported their suzerain and his agents. However profound the influence of Babylonia may have been, excavation has discovered comparatively few specific traces of it. Although cuneiform was used, the Palestinian letters show that the native language, as in the case of earlier proper-names, was most nearly akin to the later “Canaanite” (Hebrew, Moabite and Phoenician). In view of the relations subsisting among Pales- tine, Mitanni and the Hittites, it is evident that Babylonian

6 Amor (Ass. Amurru, Bibl. Amorite), lay, north of Lebanon and behind Phoenicia; but the term fluctuates (Weber, op. cit., 1 132 sqq.). See art. Amorites, and A. T. Clay, Amurru (Phila- delphia, 1909).

6 See H. Winckler, Altor. Forschung. (1902), iii. 22; W. M. Miiller in I. Benzina;er, Heb. Archdol. (1907), p. 445; B. Eerdmans, Alttest. Stud. (1908), ii. 5l sqq.; Dhorme, op. cit. (1909), pp. 677 sqq. The movement of the Habiru cannot be isolated from that represented in other letters (where the enemy are not described by this term), and their steps do not agree with those of the invading Israelites in the book of Joshua (q.v.).

7 H. Winckler, Mitteil. d. deutschen Oritnt-Gesell. z. Berlin (1907) No. 35; cf. J. Garstang, Land of Hittites (London, 1910), 326 sqq.

influence could have entered indirectly; and until one can determine how much is specifically Babylonian the analogies and parallels cannot be made the ground for sweeping assertions. The influence of a superior power upon the culture of a people cannot of course be denied; but history proves that it depends upon the resemblance between the two peoples and their respective levels of thought, and that it is not necessarily either deep or lasting. A better case might be made for Egypt; yet notwithstanding the presence of its colonies, the cult of its gods, the erection of temples or shrines, and the numerous traces of intercourse exposed by excavation, Palestine was Asiatic rather than Egyptian. Indeed Asiatic influence made itself felt in Egypt before the Hyksos age, and later, and more strongly, during the XVIIIth and following Dynasties, and deities of Syro-Palestinian fame

(Resheph, Baal, Anath, the Baalath of Byblos, Kadesh, Astarte) found a hospitable welcome. On the whole, there was everywhere a common foundation of culture and thought, with local, tribal and national develop- ments; and it is useful to observe the striking similarity of religious phraseology throughout the Semitic sources, and its similarity with the ideas in the Egyptian texts. And this becomes more instructive when comparison is made between cuneiform or Egyptian sources extending over many centuries and particular groups of evidence (Amarna letters, Canaanite and Aramaean inscriptions, the Old Testament and later Jewish literature to the Talmud), and pursued to the customs and beliefs of the same area to-day. The result is to emphasize (a) the inveterate and indissoluble connexion between religious, social and political life, (b) the differences between the ordinary current religious conceptions and specific positive developments of them, and © the vicissitudes of these particular growths in their relation to history. 1

There is reason to believe that the religion of Palestine in the Amarna age was no inchoate or inarticulate belief; like the material culture it had passed through the elementary stages and was a fully sstablished though not, perhaps, a very advanced organism. There were doubtless then, as later, numerous local deities, closely connected with local districts, differing perhaps in name, but the centre of similar ideas as regards their relations to their worshippers. Com- mercial and political intercourse had also brought a knowledge of other deities, who were worth venerating, or who were the survivors of a former supremacy, or whose recognition was enforced. It is particularly interesting to find in the Amarna letters that the supremacy of Egypt meant also that of the national god, and the loyal Palestinian kings acknowledge that their land belonged to Egypt's king and god. In accordance with what is now known to be a very widespread belief, the kingship was a semi-divine function, and the Pharaoh was the incarnation of Amon-Re. This would bring a greater coherence of worship among the chaos of local cults. The petty kings naturally recognize the identity of the Pharaoh, and they hail him as their god and identify him with the heads of their own pantheon. Thus he is called — in the cuneiform letters — their Shamash or their Addu. The former, the sun-deity, god of justice, &c, was already well known, to judge from Palestinian place-names (Beth-Shemesh, &c). The latter, storm or weather god, or, in another aspect, god of rain and therefore of fertility, is specifically West Asiatic, and may be equated with Hadad and Ramman (see below). He is presumably the Baal who is associated with thunder and lightning, and with the bull, and who was familiar to the Egyptians of the XlXth and XXth Dynasties in the adulations of their divine king.

He is probably also ” the lord of the gods ” (the head of a pantheon) invoked in a private cuneiform tablet unearthed at Taanach. 2 Besides these gods, and others whose fame may be inferred (Dagon,

1 Much confusion can be and has been caused by disregarding’ (ft) and by supposing that the appearance of similar elements of thought or custom implied the presence of similar more complete organisms {e.g. totemism, astral religion, jurisprudence). Cf. p. 182, n. 4.

2 See, most recently, Ungnad’s translation in H. Gressmann, Ausgrabungen in Pal. u. d. A. T. (Tubingen, 1908), p. ig seq. The title ” lord of heaven ” — whether the Sun or Addu, there was a

Nebo, Nergal, &c), there were the closely-related goddesses Ashira and Ishtar-Astarte (the Old Testament Asherah and Ashtoreth). Possibly the name Yahweh (see Jehovah) had already entered Palestine, but it is not prominent, and if, as in the case of certain other deities, the extension of the name and cult went hand-in-hand with political circumstances, these must be sought in the problems of the Hebrew monarchy. 3

At an age when there were no great external empires to control Palestine the Hebrew monarchy arose and claimed a premier place amid its neighbours (c. 1000). How the small Rise of the rival districts with their petty kings were united Hebrew into a kingdom under a single head is a disputed Monarchy. question; the stages from the half-Hittite, half -Egyptian land to the independent Hebrew state with its national god are an unsolved problem. Biblical tradition quite plausibly represents a mighty invasion of tribes who had come from Southern Palestine and Northern Arabia (Elath, Ezion-geber) — but primarily from Egypt — and, after a series of national ” judges,” established the kingship. But no place can be found for this conquest, as it is described, either before the ” Amarna ” age (the date, following 1 Kings vi. 1) or about the time of Rameses II. and Mineptah (see Exod. i. n); and if the latter king (c. 1244) records the subjugation of the people (? or land) ” Israel,” the complicated history of names does not guarantee the absolute identity of this ” Israel ” either with the pure Israelite tribes which invaded the land or with the intermixed people after this event (see Jews: §§ 6-8). Whatever may have been the extent of this invasion and the sequel, the rise and persistence of an inde- pendent Palestinian kingdom was an event which concerned the neighbouring states. Its stability and the necessary furtherance of commerce, usual among Oriental kings, depended upon the attitude of the maritime coast (Philistia and Phoenicia), Edom, Moab, Ammon, Gilead and the Syrian states; and the biblical and external records for

the next four centuries (to 586) fre- quently illustrate situations growing out of this interrelation. The evidence of the course of these crucial years is unequal and often sadly fragmentary, and is more conveniently noticed in connexion with the biblical history (see Jews: §§ 0-17). A conspicuous feature is the difficulty of maintaining this single monarchy, which, however it originated, speedily became two rival states (Judah and Israel). These are separated by a very ambiguous frontier, and have their geographical and political links to the south and north respectively. The balance of power moves now to Israel and now to Judah, and tendencies to internal disintegration are illustrated by the dynastic changes in Israel and by the revolts and intrigues in both states. As the power of the surrounding empires revived, these entered again into Palestinian history. As regards Egypt, apart from a few references in biblical history (e.g. to its interference in Philistia and friendliness to Judah, see Philistine), the chief event was the great invasion by Sheshonk (Shishak) in the latter part of the 10th century; but although it appears to be an isolated campaign, contact with Egypt, to judge from the archaeological results of the excavations, was never intermittent. The next definite stage is the dynasty of the Israelite Omri (q.v.), to whom is ascribed the founding of the city of Samaria. The dynasty lasted nearly half a century, and is contemporary with the expansion of Phoenicia, and presumably therefore with some prominence of the south maritime coast. The royal houses of Phoenicia, Israel and Judah were united by inter-marriage, and the last two by joint undertakings in trade and war (note also 1 Kings ix. 26 seq.). Meanwhile Assyria was gradually establishing itself westwards, and a remarkable confederation of the heirs of the old Hittite kingdom, ” kings of the land of Hatti ” (the Assyrian term „ˆ™*rf a . for the Hittites) was formed to oppose it. Southern Asia Minor, Phoenicia, Ammon, the Syrian Desert and Israel (under Omri’s son ” Ahab the Israelite “) sent their troops to support Damascus which, in spite of the repeated efforts of

tendency to identify them — was perhaps known in Palestine, as it certainly was in Egypt and among the Hittites.

3 See S. A. Cook, Expositor, Aug. 1910, pp. m-127.

Shalmaneser, 1 was evidently able to hold its own from 854 to 839.

The anti-Assyrian alliance was, as often in west Asia, a temporary one, and the inveterate rivalries of the small states are illustrated, in a striking manner, in the downfall of Omri's dynasty and the rise of that of Jehu (842-c. 745); in the bitter onslaughts of Damascus upon Israel, leading nearly to its annihilation; in an unsuccessful attack upon the king of Hamath by Damascus, Cilicia and small states in north Syria; in an Israelite expedition against Judah and Jerusalem (2 Kings xiv. 13 seq.); and finally in the recovery and extension of Israelite, power — perhaps to Damascus — under Jeroboam II. In such vicissitudes as these Palestinian history proceeds upon a much larger scale than the national biblical records relate, and the external evidence is of the greatest importance for the light it throws upon the varying situations. Syria could control the situation, and it in turn was influenced by the ambitions of Assyria, to whose advantage it was when the small states were rent by mutual suspicion and hostility. It is possible, too, that, as the states did not scruple to take advantage of the difficulties of their rivals, Assyria played a more prominent part in keeping these jealousies alive than the evidence actually states. Moreover, in the light of these moves and counter- moves one must interpret the isolated or incomplete narratives of Hebrew history. 2 The repeated blows of Assyria did not pre- vent the necessity of fresh expeditions, and later, Adad-Nirari III. (812-783) claims as tributary the land of Hatti, Amor, Tyre, Sidon, "the land of Omri " (Israel), Edom and Philistia. Israel at the death of Jeroboam was rent by divided factions, whereas Judah (under Uzziah) has now become a powerful kingdom, controlling both Philistia and the Edomite port of Elath on the gulf of 'Akaba. The dependence of Judaean sovereignty upon these districts was inevitable; the resources of Jerusalem obviously did not rely upon the small district of Judah alone. If Ammon also was tributary (2 Chron. xxvi. 8, xxvii.), dealings with Israel and perhaps Damascus could probably be inferred.

A new period begins with Tiglath-Pileser IV. (745-728): pro- and anti-Assyrian parties now make themselves felt, and Predotnl- when north Syria was taken in 738, Tyre, Sidon, nance of Damascus (under Rezin), "Samaria" (under Assyria. Menahem) and a queen of Aribi were among the tribu- taries. It is possible that Judah (under Uzziah and Jotham) had come to an understanding with Assyria; at all events Ahaz was at once encircled by fierce attacks, and was only saved by Tiglath-Pileser's campaign against Philistia, north Israel and Damascus. With the siege and fall of Damascus (733-32) Assyria gained the north, and its supremacy was recognized by the tribes of the Syrian desert and Arabia (Aribi, Tema, Sheba). In 722 Samaria, though under an Assyrian vassal (Hoshea the last king), joined with

Philistia in revolt; in 720 it was allied with Gaza and Damascus, and the persistence of unrest is evident when Sargon in 715 found it necessary to transport into Samaria various peoples of the desert. Judah itself was next involved in an anti-Assyrian league (with Edom, Moab and Philistia), but apparently submitted in time; nevertheless a decade later (701), after the change of dynasty in Assyria, it participated in a great but unsuccessful effort from Phoenicia to Philistia to shake off the yoke, and suffered disastrously. 3 With the crushing blows upon Syria and Samaria the centre of interest moves southwards and the history is influenced by Assyria's rival Babylonia (under Marduk-baladan and his successors), by north Arabia and by Egypt. Henceforth there is little Samarian history, and of Judah, for nearly a century, few political events are recorded (Jews: § 16). Judah was under Assyrian supremacy, and, although it was in- volved with Arabians in the revolt planned by Babylonia

1 Recently found to be the third of that name (H. W. Hogg, The Interpreter, 1910, p. 329).

2 So e.g. in references to Ammon, Damascus and Hamath, and in Judaean relations with Phifetia, Moab and Edom.

3 See art. Hezekiah. A recently published inscription of Sen- nacherib (of 694 B.C.) mentions enslaved peoples from Philistia and Tyre, but does not name Judah.

(against Assurbanipal), it appears to have been generally quiescent.

At this stage disturbances, now by Aramaean tribes, now by Arabia, combine with the new rise of Egypt and the weakness of Assyria to mark a turning-point in the world's history. Psammetichus (Psamtek) I. (663-609) with

Revival ot Egypt.

his Greeks, Carians, Ionians and soldiers from Pales- tine and Syria, re-established once more an Egyptian Empire, and replaced the fluctuating relations between Palestine and the small dynasts of the Delta by a settled policy. Trading intercommunication in the Levant and the constant passage to and fro of merchants brought Egypt to the front, and, in an age of archaic revival, the effort was made to re-establish the ancient supremacy over Palestine and Syria. The precise meaning of these changes for Palestinian history and life can only incompletely be perceived, and even the significance of the great Scythian invasion and of the greater movements with which it was

connected is uncertain (see Scythia). At all events, Egypt (under Necho, 609-593) prepared to take advantage of the decay of Assyria, and marched into Asia. Judah (under Josiah) was overthrown at Megiddo, where about nine centuries previously the victory of Tethmoses (Thutmose) III. had made Egypt supreme over Palestine and Syria. But Egypt was now at once confronted by the Neo-Babylonian or Chaldean Empire (under Nabopolassar), which, after annihilating Assyria with the help of the Medians, naturally claimed a right to the Mediterranean coast-lands. The defeat of Necho by Nebuchad- rezzar at Carchemish (605) is one of the world-famous battles.

Although Syria and Palestine now became Babylonian, this revival of the Egyptian Empire aroused hopes in Judah of deliverance and led to revolts (under Jehoiachin and Zedekiah), in which Judah was apparently not jZ^" alone. 4 They culminated in the fall of this kingdom in 586. Henceforth the history of Palestine is disconnected and fragmentary, and the few known events of political importance are isolated and can be supplemented only by infer- ences from the movements of Egypt, Philistia or Phoenicia, or from the Old Testament. According to the Chaldean Nabonidus (553) all the kings from Gaza to the Euphrates assisted in his buildings, and the Chaldean policy generally appears to have been favourable towards faithful vassals. Cyrus meanwhile was rising to lead the Persians against Media. After a career of success he captured Babylonia (553) and forth- with claimed, in his famous inscription, the submission of Amor. For the next 200 years Palestine remained part of the new Persian Empire which, with all its ramifications on land and on sea, embraced the civilized world from the Himalayas to the Levant, until the advent of Alexander the Great (see Jews: § 19). Very gradually the face of history underwent a complete change. Egypt had resumed its earlier connexions with the Levantine heirs of the ancient Aegeans, the old empires of the Nearer East had practically exhausted themselves, and Palestine passed into the fresh life and thought of the Greeks. (See below, p. 617.)

In any consideration of the internal conditions in Palestine it must be observed that there is a continuity of thought, custom and culture which is independent of political changes internal and vicissitudes of names. With the establishment Conditions. of an independent monarchy Palestine did not enter Northern into a new world. Whatever internal changes n " eaces – ensued between the " Amarna " age and 1000 B.C., they have not left their mark upon the course of culture illustrated by the excavations. These still indicate communication with Egypt and the north (Syria, Asia Minor; Assyria

and the Levant not excluded), and even when a novel culture presents itself, as in certain graves at Gezer, the affinities are with Cyprus and Asia Minor (Caria) of about the nth or 10th century. 5 The use of

4 Cf. Jer. xxvii. 2 seq., and the history of the Egyptian Hophra (Apries, 588-569).

6 At present it is difficult as regards Palestine to distinguish Aegean influence (direct and indirect) from that of Asia Minor generally. Only after the old Cretan (Minoan) culture had passed its zenith and was already decadent does it suddenly appear in Cyprus (H. R. Hall, Proc. Soc. Bibl. Arch. xxxi. 227).

iron came in about this time, perhaps from the north, and biblical history (r Kings x. 28 seq., see the commentaries) even ascribes to Solomon the import of horses from Kue and Musri (Cilicia and Cappadocia). The cuneiform script, which continued in Egypt during the XlXth and XXth Dynasties, was perhaps still used in Palestine; it was doubtless familiar at least during the Assyrian supremacy. But in the meanwhile the ” North Semitic ” alphabet appears (from 850) with almost identical forms in extreme north Syria (e.g. Sam’al), in Cyprus, Gezer, Alphabet anc ˆ * n Moab. The type is very closely related to

the oldest European (Etruscan) forms, and, in a less degree, to the ” South Semitic” (old Minaean and Sabaean); and since it at once begins (c. 700) to develop along separate paths (Canaanite and Aramaean), it may be inferred that the common ancestor was not of long derivation. This alphabet stands in contrast to the old varying types of the Aegean and Asia Minor area and can hardly be of local origin. Under what historical circumstances it was first distributed over Palestine and Syria is uncertain; it is a plausible conjecture that once more the north is responsible. 1 Too little is known of the north as a factor in Palestinian development to allow hasty infer- ences, but it is certainly noteworthy, at all events, that the names Amor and Hatti appear to move downwards, and that ” Hittite ” is applied to Palestine and Philistia by the Assyrians, and to Hebion in the Old Testament, and that Ezekiel (xvi. 3) calls Canaanite Jerusalem the offspring of an Amorite and a Hittite. It is to be observed, however, that the meaning of geographical and ethnical terms for culture in general must be

properly tested — the term ” Phoenician ” is a conspicuous case in point. Thus, in north Syria the art has Assyrian and Hittite affinities, but is provincial and sometimes rough. Some of the personal names are foreign and find analogues in Asia Minor; but even as the Philistines appear in biblical history as a” Semitic “people, so inscriptions from north Syria (c. 800-700) are in Canaanite and early Aramaean dialects, and are in entire agreement with ” Semitic ” thought and ideas. The deities too generally bear familiar names. In Sam’al the kings Panammu and Q-r-1 have non-Semitic names (Carian), but the gods include The Gods Hadad, El (God par excellence), Resheph and the

Sun-deity. In Hamath we meet with the Baal of Heaven, Sun and Moon deities, gods of heaven and earth, and others. A god ” Most High ” (‘elyon) was perhaps already known in Hamath. 2 The ” Baal of Heaven,” reminiscent of the Egyptian title ” lord of heaven,” given long before to Resheph, appears in the pantheon of Tyre (c. 677). The reference here is probably to the inveterate Hadad who, in his Aramaean form Ramman (Rimmon), is found in Palestine. Among the Hebrews, Yahweh, some of whose features associate him with thunder, lightning and storm, and with the gifts of the earth, has now become the national god, like the Mo’abite Chemosh or the Ammonite Milcolm. (For the Edomite gods, see Edom.) The name is known in the form Ya’u in north Syria (8th century), and, so far as the Israelite kings are con- cerned, appears first in the family of Ahab. No images of Yahweh or of earlier Canaanite deities have been unearthed; but images belong to a relatively advanced stage in the development of religion, and the aniconic stage may be repre- sented by the sacred pillars and posts, by the small models of heads of bulls, and by the evidence for calf-cults in the Old Testament. 3 Yahweh was by no means the only god. Inter-

1 On the points of contact with old Cretan and Anatolian scripts see A. J. Evans, Scripta Minoa (Oxford, 1909), p. 80 sqq. The persistence of evidence for the importance of Aegean and Asia Minor (” Hittite “) peoplesin the study of Palestine and surrounding lands is one of the most interesting features of recent discovery. Cf. H. Hogarth, Ionia and the East (Oxford, 1909), pp. 64 sqq.; E. Meyer, Gesch. d. Altertums, i. §§ 490, 523.

2 So Dhorme interprets the place-name £/>(light oi)-hi-le-e-ni {Rev. Sibl. 1910, p. 67).

3 See Calf, Golden, and note the representation of a calf at er-Rumman (Ramman = Hadad) in east Jordan (Gressmann P- 35)- It is obvious

that the strict injunctions in Exod. xx. 4, Deut. iv. 16 sqq., 23, 25, and other references to idolatry, are the outcome of a reaction against images.

course and alliance introduced the cults of Chemosh, Milcom, the Baal of Tyre and the Astarte of Sidon. Excavation has brought to light figurines of the Egyptian Osiris, Isis, Ptah, Anubis and especially Bes. Assyrian conquest and domination in- fluenced the cults at all events outside Judah and Israel, and when Sargon sent skilled men to teach ” the fear of God and the king ” (cyl. inscr. 72-74) the spread of Assyrian religious ideas among the Hebrews themselves is to be expected. Certainly about 600 the Queen of Heaven, who has Assyrian traits, was a favourite object of veneration (Jer. vii. 18, xliv. 17-19, 25); yet already a century earlier the goddess ” Ishtar of heaven ” was worshipped by a desert tribe (see Ishmael), and the titles ” lady of heaven,” ” bride of the king of heaven,” had been applied centuries before to west Asiatic goddesses (Anath, Kadesh, Ashira, &c). Although no goddess is associated with the national god Yahweh, female deities abounded, as is amply shown by the numerous plaques of the great mother-goddess found in course of excavation. The picture which the evidence furnishes is as fundamental for our conception of Palestine during the monarchies as were the Amarna tablets for the age before they arose. The external evidence does not point to any intervening hiatus, and the archaeological data from the excavations do not reveal any dislocation of earlier conditions; earlier forms have simply developed and the evolution is a pro- gressive one. Down to and at the time of the Assyrian supremacy, Palestine in religion and history was merely part of the greater area of mingled peoples sharing the same charac- teristics of custom and belief. This does not mean of course that the religion had no ethical traits — ethical motives are frequently found in the old Oriental religions — but they were bound up with certain naturalistic conceptions of the relation between deities and men, and herein lay their weakness. 4

In the age of the Assyrian supremacy Palestine entered upon a series of changes, lasting for about three centuries (from about 740), which were of the greatest significance for its internal development. The sweeping conquests ˆZ qa ? 1 ot , of Assyria were ” as critical for religious as for civil Domination. history.” 6 The brutal methods of warfare, the cruel treatment of vanquished districts or cities, and the redistribution of bodies of inhabitants, broke the old bonds uniting deities, people and land. The framework of society was shattered, communal life and religion were disorganized. As the flood poured

over Syria and flowed south, Israel (Samaria) suffered grievously, and the gaps caused by war and deportation were filled up by the introduction of new settlers by Sargon, and by his successors in the 7th century. Unfortunately, there is very little evidence in the biblical history for the sub- sequent career of Samaria, but it is clear that the old Israel of the dynasties of Omri and Jehu received crushing blows. The fact that among the new settlers were desert tribes, suggests the introduction, not merely of a simpler culture, but also of simpler groups of ideas. In the nature of the case, as time elapsed the new population must have taken root as securely as — one must conclude — the invading Israelites had done some centuries earlier. As a matter of fact the prophets Jeremiah and Ezekiel by no means regarded the population lying to the north of Judah as strangers, and the latter in turn were ready to share the Judaean distress at the fall of Jerusalem (Jer. xli. 5), and in later years offered to assist in rebuilding Yahweh's temple. Indeed, since the Samaritans subsequently accepted the Pentateuch, and claimed to inherit the ancestral traditions of the Israelite tribes, it is of no little value in the study of Palestinian history to observe the manner in which this people of singularly mixed origin so thoroughly assimilated itself to the land and at first was virtually a Jewish sect. But Samaria was not the only land to suffer. Judah, towards the close of the 8th century, was obviously very closely bound up with Philistia, Edom and Egypt; and this and Hezekiah's dealings with the anti-Assyrian party at Ekron do not indicate that any feeling of national exclusiveness, or any abhorrence of the

4 W. R. Smith, Rel. of the Semites (London, 1894), p. 58. 6 Ibid. p. 35 ; cf. pp. 65, 77 sqq., 358.

" uncircumcised Philistines " predominated. From the descrip- tion of Sennacherib's invasion it is clear that social and economic conditions must have been seriously, perhaps radically disturbed, 1 and the quiescence of Judah during the next few decades implies an internal weakness and a submission to Assyrian supremacy. During the 7th century new movements were coming from Arabia, and tribes growing ever more restless made an invasion east of the Jordan through Edom, Moab and Ammon. Although they were repulsed, this awakening of a land which has so often fed Palestine and Syria, when viewed with the increasing weakness of Assyria, and subsequent vicissitudes in the

history of the Edomites, Nabataeans and East Jordan tribes, forbids us to treat the invasion as an isolated raid. 2 Later, the fall of the Judaean kingdom and the deportation of the leading classes brought a new social upheaval. The land was not denuded, and the fact that ” some scores of thousands of Jews remained in Judah through all the period of the exile,” 3 even though they were ” the poorest of the land,” revolutionizes ordinary notions of this period. (See Jews: § 18). But the Judaean historians have successfully concealed the course of events, although, as has long been recognized, there was some movement laaugura- upwards from the south of Judah of groups closely tion of related to Edomite and kindred peoples of South ˆf w dlil Palestine and Northern Arabia. The immigrants, ‘ like the new occupants of Samaria, gradually assimilated themselves to the new soil; but the circumstances can hardly be recovered, and even the relations between Judah and Samaria can only be inferred. In the latter part of the 6th century we find some restoration, some revival of the old monarchy in the person of Zerubbabel (520 B.C.); but again the course of events is problematical (Jews, § 20) . 4 Not until the middle of the 5th century do the biblical records (book of Nehemiah) furnish a foundation for any reconstruction. Here Jerusalem is in sore distress and in urgent need of reorganization. Zerubbabel’s age is of the past, and any attempt to revive political aspirations is considered detrimental to the interests of the surrounding peoples and of the Persian Empire. Scattered evidence suggests that the Edomites were responsible for a new catastrophe. Amid internal and external difficulties Nehemiah proceeds to repair religious and social abuses, and there is an important return of exiles from Babylonia. The ruling classes are related partly to the southern groups already mentioned and partly to Samaria; but the kingship of old is replaced by a high-priest, and, under the influence of Babylonian Jews of the strictest principles, a breach was made between Judah and Samaria which has never been healed (Jews: § 21 seq.). Biblical history itself recognizes in the times of Artaxerxes, Nehemiah and Ezra the commencement of a new era, and although only too much remains obscure we have in these centuries a series of vicissitudes which separate the old Palestine of Egyptian, Hittite, Babylonian and Assyrian supremacy from the land which was about to enter the circle of Greek and Roman civilization. This division, it may be added, also seems to leave its mark upon the lengthy archaeological history of Palestine from the earliest times to the Byzantine age. There is a certain poverty and decadence of art, a certain simplicity of civilization and a decline in the shape and decoration of pottery which seems to exhibit signs of derivation from skin prototypes elsewhere associated with desert peoples. This phase comes at a stage which severs the earlier phases (including the ”

Amarna ” age) from those which are very closely connected

1 See G. A. Smith, Jerusalem, ii. 160, 196 seq.

2 See L. B. Paton, Early Hist, of Syria and Pal. (London, 1902), p. 269 j Winckler, Keilinschr. u. das A.T., p. 151.

8 G.‘A. Smith, Jerusalem, ii. 269.

4 On ordinary historical grounds it is probable that there was a political reorganization and a welding of the diverse elements throughout the land (j. A. Montgomery, The Samaritans, Philadelphia, 1907; p. 62 seq.). There is internal literary support for this in the criticism of Deuteronomy (which appears to have in view a comprehensive Israel and Judah at this period), and of various passages evidently earlier than Nehemiah’s time (see R. H. Kennett, Journ. of Theol, Stud., 1905, pp. 175-181; 1906, pp. 486, 498).

with Seleucid and later times. Its appearance has been asso- ciated with the invasion of the Israelites or with the establish- ment of the independent monarchy, but on very inadequate grounds; and since it has been independently placed at the latter part of the monarchy, its historical explanation may presumably be found in that break in the career of Palestine when peoples were changed and new organizations slowly grew up. 6 The great significance of these vicissitudes for the course of internal conditions in Palestine is evident when it is observed that the subsequent cleavage between Judah and Simaria, not earlier than the 5th century, presupposes an antecedent common foundation which, in view of the history of the monarchies, can hardly be earlier than the 7th century. These centuries represent an age which the Jewish historians have partly ignored (as regards Samaria) and partly obscured (as regards the return from exile and the reconstruction of Judah) ; but since this age stands at the head of an historical develop- ment which leads on to Christianity and Rabbinical Judaism, it is necessary to turn from Palestine as a land in order to notice more particularly certain features of the Old Testament upon which the foregoing evidence directly bears.

The Old Testament is essentially a Palestinian, an Oriental, work and is entirely in accord with Oriental thought and custom. 6 Yet, in its characteristic religion and legislation there are essential spiritual and ethical R e nsion. peculiarities which give it a uniqueness and a perma- nent value, the reality of which becomes more impressive when the Old Testament is viewed, not merely from a Christian or a Jewish teleology, but in the light of ancient, medieval and modern

Palestine. The ideas which characterize the Old Testament are planted upon lower levels of thought, and they appear in different aspects (legal, prophetical, historical) and with certain developments both within its pages and in sub- sequent literature. To ignore or to obscure the features which are opposed to these ideas would be to ignore the witness of external evidence and to obscure the old Testament itself. The books were compiled and preserved for definite aims, and their teaching is directed now to the needs of the people as a whole— as in the ever popular stories of Genesis — now to the inculcation of the lessons of the past, and now to matters of ritual. They are addressed to a people whose mental processes and philosophy were primitive; and since teaching, in order to be communicable, must adapt itself to current beliefs of God, man and nature — and the inveterate conservatism of man must be born in mind — the trend of ideas must not be confused with the average standard of thought. 7 The teaching was not necessarily presented in the form of an over-elaborated moral lesson, but was associated with conceptions familiar to the land; and when these conceptions are examined from the anthropo- logical standpoint, they are found to contain much that is strange and even abhorrent to modern convictions of a purely spiritual deity. There are moreover many traces of conflicting ideas and ideals, of cruder beliefs and customs, and of attempts to remove or elevate them. In Genesis and elsewhere there are examples of popular thought which have not the character- istic spirit of the prophets, and which, it is clear, could only gradually be purified. The notion of a Yahweh scarcely less limited in power than man, the naive views of supernatural beings and their nearness to man, and the persistence of features which stand relatively low in the scale of mental culture, only serve to enhance the reality of the spirit which inspired the endeavour to reform. There were rites and customs which only after lapse of time were considered iniquitous. Magical practices and forms of sacred prostitution and human sacrifice were familiar, and the denunciations of the prophets and the

6 For the late date, see F. Petrie, Tell-el-Hesy (1891), p. 47 seq., and Bliss and Macalister, Excavations in Palestine (1902), pp. 72, 74, 101, 124; and, for the suggestion in the text, S. A. Cook, Expositor, (Aug. 1909), pp. 104-114.

‘ See, e.g., E. Sellin, Alttest. Relig. im Rahmen derandern altoriental- ischen (Leipzig, 1908).

7 On the characteristics of primitive thought, see G. F. Stout, Manual of Psychology (London, 1907), Bk. IV., especially pp. 574-579.

lawgivers show very vividly the persistence of what was current religion but was hostile to their teaching. 1 There is an astonishing boisterousness (cf. Lam. ii. 7), joviality and sensualism, all in striking contrast to the austerity of nomad asceticism. There is a ferocity and fanaticism which manifests itself in the belief that war was a sacred campaign of deity against deity. Even if the account of the ” ban ” (utter destruction) at the Israelite conquest be unhistorical, it represents current ideas (cf. Josh. vi. 17 seq.; 1 Sam. xv. 3; 2 Kings xv. 16; 2 Chron. xxv. 12 seq.), and implies imperfect views of the Godhead at a more advanced stage of religion and morality. There are conflicting ideas of death and the dead, and among them the belief in the very human feelings and needs of the dead and in their influence for good or evil. 2 Moreover, the proximity of burial-place and sanctuary and the belief in the kindly care of the famous dead for their descendants reflect ” primitive ” and persisting ideas which find their Places. parallel in the holy tombs of religious or secular heroes in modern Palestine, and exemplify the firmness of the link uniting local groups with local numens. ” The permanence of religion at holy places in the East ” 3 is one of the most important features in the relation between popular and national religion. The local centres will survive political and historical vicissitudes and the changes of national cults and sects, and may outlive the national deities. The supernatural beings may change their name and may vary externally under Greek, Roman, Mahommedan or Christian influence; but their relation to the local groups remains essen- tially the same, although there is no regression to earlier organic connexions. The inveterate local, one may perhaps say immediate, powers are felt to be nearer at hand than the national deity, who is more closely bound up with the changing national fortunes and with current philosophy. These smaller deities are, as it were, telluric, and the territory of each is virtually henotheistic — as also its traditions — and even as to-day the saints or patrons enjoy a more real veneration among the peasants than does the Allah of the orthodox, the long-estab- lished worship of the ancient local beings always hampered the reformers of Yahwism (cf. Jer. ii. 28, xi. 13). 4 Whether they could be regarded as so many manifestations of a single deity or as really distinct entities, there were at all events similar and well understood relations between each and its group; and although the cult was nature- worship and was attended with a licentiousness which drew forth the denuncia- tions of the prophets, this is only one

aspect of the local deity's place in the religious conceptions of his circle. The excavations (at Gezer, Megiddo, Jericho, &c.) indicate a persisting gross and cruel idolatry, utterly opposed to the demands of the law and the prophets. 5 Jerusalem and the surrounding district have ominous heathen associations. 6 Jerusalem itself lay off 'See generally E. Meyer, Gesch. d. Altertums (Berlin, 1909), i. §§ 342 sqq. Ceremonial licentiousness was perhaps of northern origin (Meyer § 345), and as a preliminary to marriage seems to have been known not only in Assyria (Herod, i. 199), but also in Palestine ("a law of the Amorites"; Test, of Judah, ed. R. H. Charles, xxii. 2) ; cf. E. S. Hartland, Anthropol. Essays . . . E. B. Tylor (Oxford, 1907), pp. 189-202. (For miscellaneous material see J. G. Frazer, ibid. pp. 101-174: "Folk-lore in the Old Testament.")

2 See P. Torge, Seelenglaube u. Unsterblichkeitshoffnung im Alten Test. (Leipzig, 1909).

3 The title of an instructive essay by Sir W. M. Ramsay in the Expositor, Nov. 1906, pp. 454 sqq. The whole subject involves also the various forms and developments of hero- and saint-cults, on which cf. E. Lucius, Anfdnge d. Heiligenkultus, &c. (Tubingen, 1904) ; P. Saintyves, Saints successeurs des dieux (Paris, 1907)

4 On the old Baals of Palestine, see H. P. Smith, in O. T. and Semitic Studies in Memory of W. R. Harper (Chicago, 1908), i. 35-64. For the persistence of the " high places," see G. F. Moore, Ency. Bib. arts. " High Place," " Idolatry and Primitive Religion."

6 Vincent, Canaan, p. 204; cf. S. R. Driver, Modem Research as illustrating the Bible (London, 1909), pp. 60 sqq., 90.

8 Viz. the shrines of Chemosh, Moloch, Baal of Tyre and Astarte of Sidon (1 Kings xi. 1-8; 2 Kings xi. 18, xxii;.); the valley of Hinnom (see J. A. Montgomery, Journ. Bibl. Lit. xxvii. i. 24-47) ; and the place-names Anathoth (" Anaths"), Nob (Nebo?), Beth- ninib, Beth-shemesh. The name Jerusalem may be compounded

the main line of intercourse and one may look for a certain con-servatism in its famous Temple. Temples, shrines and holy places were no novelty in Palestine, and the in- Jerusalem auguration of the great centre of Judaism is ascribed and the to Solomon the son of the great conqueror David. Tew P Ie – Phoenician aid was enlisted to build it, and the Egyptian analogies to the construction accord with the known influence of Egypt upon Phoenician art. It is the dwelling-place of the deity, the centre of the nation and of the national hopes; the fall of the

Temple follows after Yahweh left it, it is rebuilt and he returns (Zech. yiii. 3). The Temple is merely part of the royal palace and the government buildings (cf. Ezek. xliii. 7 seq.), and this is as significant as the king's position in its management. It is in keeping with the old conceptions of the divine kingship, which, though they survive only in isolated biblical references, live on in the ideals of the Messianic king and his kingdom and in the post-exilic high priest. 7 The Temple is built, ornamented and furnished on lines which are quite incompatible with a spiritual religion, Mythical features abound in the cherubim and seraphim, the pillars of Jachin and Boaz, the mysterious Nehushtan, the bronze-sea and the lavers. These agree with the more or less clear allusions in the Old Testament to myths of creation, Eden, deluge, mountain of gods, Titanic folk, world-dragons, heavenly hosts, &c, and also with the unearthed seals, tablets, altars, &c. representing mythical ideas. The ideas occur in varying forms from Egypt to Babylonia and point to a considerable body of thought, which is not less impressive when one takes into account the instances in the Old Testament where myths have been rationalized, elevated, or otherwise re- moved from their older forms (e.g. the story of the birth of Moses, accounts of creation and deluge, &c), or when one observes the subsequent uncompromising objection to a display of artistic meaning, implying that it aroused definite conceptions. To reinterpret all these features as mere symbols, the lumber of ancient days, is to avoid the problem of their introduction into the , Temple, and to assume an advance of popular thought which is not confirmed by the retention and fresh developments of the old ideas both in the pseudepigraphical literature and in the literature of Rabbinical Judaism. 8 The horses of the sun- god (2 Kings xxiii. n), too, belong to a group of ideas which may perhaps be associated with the plan of the Temple and with the old hymn of dedication (1 Kings viii. 12 seq.). At all events, when one considers the Babylonian-Assyrian conceptions of Shamash as the supreme and righteous judge, god of truth and justice, or the monotheism of Amenophis IV. and his fine hymn to the sun-god, it is certain that a corresponding Palestinian deity would not necessarily be without ethical and elevated associations. 9 In short, the place which the Temple held in

with that of a deity (Winckler, Keil. u. A.T. 224 seq.; G. A. Smith, Jerusalem, ii. 25 seq.), and the deity Sedek is curiously associated with the names of the Jerusalem priests Zadok, Jehozadak (cf. Melchizedek of Salem, Gen. xiv.), and the kings Adonizedek and Zedekiah. The strange character of the names of the first kings in Israel and Judah (Saul, David and Solomon), noticed already by A. H. Sayce {Modern Review, 1884, pp. 158-169), cannot easily be

explained.

7 See A. B. Davidson, Theol. of 0. T. (Edinburgh, 1904), p. 9; J. G. Frazer, Adonis, Attis and Osiris (London, 1907), pp. 12 sqq., 401. Cf. the title ” The Anointed of Yahweh,” the simile ” as a messenger (angel) of Yahweh ” (2 Sam. xiv. 17, xix. 27), and the idea of the kingas the embodiment of his people’s safety (2 Sam. xxi. 17; Lam. iy. 20). This absence of the deification of the king is characteristic of biblical religion which recognizes Yahweh as the only king; see H. Gressmann, Vr sprung d. israel.-jiid. Eschatologie (Gottingen, 1905), pp. 250 sqq.

8 For examples of the persistence of the interrelated ideas — whether of astral significance or not is another question — see A. Jeremias, Babylon im Neuen Test. (Leipzig, 1905), Das Alte Test, im Lichte d. Alten Orients (1906) ; E. Bischoff, Bab. Astrales im Wellbilde d, Thalmud u. Midrasch (1907).

9 Cf . for an excellent example of Oriental religious thought, the fine Babylonian hymn to Ishtar {i.e. Astarte)- L. W. King, Seven Tablets of Creation (London, 1907), pp. 222-237, and the specimens in R. W. Rogers, Rd of Bab. and Ass. in its Relations to Israel (London 1908), pp. 142-184. On ethical conceptions of heathen deities, see I. King, Development of Religion (New York, 1910), pp. 268-286.

religious thought (cf. especially Isaiah), the character of the reforms ascribed to Josiah (2 Kings xxiii.), the pictures drawn by Jeremiah and Ezekiel, and the latter’s condemnation of the half-Hittite, half-Amorite capital, combine with the events of later history to prove that the religion of the national sanctuary must not be too narrowly estimated from the denunciations of more spiritual minds or from a priori views of the inevitable concomitants of either henotheism or mono- theism or of a lofty ethical teaching.

There is indeed a development, but it is none the less note- worthy that the post-exilic priestly ritual preserves in the Post-exilic worship of the universal and only God Yahweh, Develop- rites, practices and ideas which can be understood meals. on [y m j-jjg jjght f other nature-religions, especially that of Babylonia, with which there are striking parallels. 1 For example, the ephod, an object of divination, is

still retained, but it is now restricted to the high-priest; and his position as head of a theocratic state, and his ceremonial dress with its heathenish associations presuppose a past monarchy. 2 Clad in almost barbaric splendour (cf. Ecclus. xlv., 1., and Jos. Ant. iii. 7, &c.) he embodies the glory of the worshipping body like the kings of old, and sometimes plays as important a part in the later political history. The priestly system, as represented in the Pentateuch, is not fitted for the desert, where its initiation is ascribed, but on independent internal critical grounds belongs to the post-exilic age, where it stands at the head of further developments. It is the adaptation of the prophets' conceptions of Yahweh to old religious ideas, the building up of new concep- tions upon an old basis, a fusion " between old heathen notions and prophetic ideas," and " this fusion is characteristic of the entire priestly law." 3 The priestly religion bound together the community in a way that alone preserved Jewish mono- theism; it stands at the head of a long, unintermittent history, and it is to be viewed, not so rnuch as the climax of Old Testa- ment religion, but as one of a series of inseparable stages. In concentrating the religious observances of the people upon Jerusalem, its Temple and its priesthood, it became less spon- taneous, and its services more remote from ordinary life. It left room for rival schools and sects, both within and without the priestly circles, and for continued development of the older and non-priestly thought. These reacted upon this institutional religion, which readapted and reinterpreted itself from time to time, and when they did not help to build up another theology (as in Christianity), they ended by assuming too rigid and unprogressive a shape (see Qaraites), or, breaking away from long-tried convention, became a mysticism with mixed results (see Kabbalah). While these vicissitudes take us away from Palestine, the course of native religious thought is very significant for its relation to the earlier stages. Although the national God was at once a transcendent ruler of the universe and also near at hand to man, the unconscious religious feeling found an outlet, not only in the splendid worship at Jerusalem, but in the more immediate intercessors, divine agencies, and the like; and when Judaism left its native soil the local supernatural beings revived — as characteristically as when the old place- names threw off their Greek dress — and they still survive, under a veneer of Mahommedanism, as the modern representatives of the Baals of the distant past. 4

1 The presence of parallels also in South Arabian and Phoenician cults suggests that the old Palestinian ritual was in general agree- ment with the Oriental religions. Specific influence on the part of Babylonia is not excluded; but the absence of striking points of agreement in

other portions of the Old Testament may not be due to anything else than the particular character of the circles to which they belonged.

2 See C. Westphal, Jahwes Wohnstatten (Giessen, 1908), pp. 137 sqq. A. Jeremias, Hilprecht Anniversary Volume (1910), pp. 223-242, and art. Costume: Oriental.

- C. G. Montefiore, in the Hibbert Lectures, 1892, p. 320, cf. p. 322 (" [the] marriage of heathen practice and monotheistic use is one of the oddest and saddest features of the whole priestly code "), cf. also p. 411, and, in general, Lectures vi.-ix.

4 See Clermont-Canneau, Pal. Explor. Fund, Quart. Statem. (i875) > PP- 20 9 s qq-; C. R. Conder, Tent Work in Palestine (London, 1878), ii. 218 sqq.; j. G. Frazer, op. cit.. p. 71, &c. ; H. Gressmann,

The uniqueness of the Old Testament religion is stamped upon the Mosaic legislation, which combines in archaic manner ritual, ethical and civil enactments. As a whole, ByWfca/ the economic conditions implied are pastoral and LaWm agricultural, and are relatively primitive; and the general rudimentary character of the legal ideas appears in the death penalty for the goring ox (Exod. xxi. 28), resort to ordeal (Num. v. n-31), and in the treatment of murder, family, marriage, slaves and property. The use of writing is once contemplated (the " bill of divorce," Deut. xxiv. 3), but not in ordinary business ; oaths and symbols are used instead of written contracts, and the commercial law is notably scanty. The simplicity of the legislation is also manifest in the land-system in Lev. xxv., which implies a fresh beginning and not a readjust- ment of earlier laws. In property succession there is a feeling of tribal aloofness which would not be Evolution. favourable to a central authority; and in fact the legal machinery is rude, and the carrying out of the law depends not so much upon courts and officials as upon religious considerations. If there is a supreme court, it is priestly (Deut. xvii. 8-13), and the legislation is bound up with the worship of Yahweh, who avenges wrong. This legislation appears as that of the Israelites, newly escaped from bondage in Egypt, joined by an ethical covenant-relation with Yahweh, and waiting in the desert to enter and conquer the land of their ancestors. But it is remarkable that, although within the Old Testament itself there are certain different backgrounds, important variations and developments of law, these are relatively insignificant when we consider the profound changes from the i5th-i3th centuries (apparent by the period of the conquest) to the close of Old Testament history. Yet, the conditions in Palestine during the monarchies reveal grave and complex social problems, marked class distinctions, and

constant intercourse and commer- cial enterprise. There was no place for tribal exclusiveness, and the upkeep of a monarchy (including the Temple) and the occasional payment of tribute would require duly appointed officials and a central body. The pentateuchal laws relating to women belong to the country rather than to town life (note the picture of feminine luxury in Isa. iii. 16 sqq. ; cf. Amos iv. 1-3). In general the pentateuchal legislation as a whole presupposes an undeveloped state of society, and would have been inadequate if not partly obsolete or unintelligible during the monarchies. 5 But more elaborate legal usages had long been known outside Palestine, and, to judge from the Talmud and the Syrian law- code (c. 5th century a.d.), long prevailed. Oriental law is primitive or advanced according to the social conditions, with the result that antiquity of ideas is no criterion of date, and modern desert custom is more archaic than the great code of the Babylonian king Khammurabi jˆ a ˆ °" a " (c. 2000 B.C.). Common law is merely part of the national life, and where it is implicated with religion there is no uniformity over an area comprising different groups of people. In such a case there is resort to a controlling authority, whether self-imposed (like the divine Pharaoh of the Amarna age), or mutually agreed (as Mahomet and the Arabian clans). 6 It cannot be definitely said that the old Babylonian code was in force in Palestine. On the other hand, it is known that it was being diligently copied by Assur-bani-paPs scribes (7th century B.C.), and in view of the circumstances of the Assyrian domina- tion, it is probable that, so far as Palestinian economic conditions permitted, a legislation more progressive than the Pentateuch

Paldstinas Erdgeruch in der Israel. Relig. (Berlin, 1909), pp. 16 sqq. In the above, and in other respects also, a survey of the history of Palestine suggests the necessity of modifying that " biological " treatment of the development of thought which pays insufficient attention to the persistence of the representatives of different stages by the side of or after the disappearance of the higher stages ; see I. King, op. cit., pp. 204 sqq.

6 Cf. J.-M. Lagrange, Hist. Crit. and the 0. T. (London, 1905), p. 176; H. M. Wiener, The Churchman (1908), p. 23]

6 See W. R. Smith, Rel. of Semites, p. 70, who compares the judicial authority of Moses. Note also the British Indian legislation imposed upon the various castes and creeds each with their peculiar rites and customs.

OLD TESTAMENT HISTORY]

was in use. The discovery at Gezer of Assyrian contract- tablets (651 and 648 B.C.) — one relating to the sale of land by a certain Nethaniah — at least suggests the prevalence of Assyrian custom, and this is confirmed by the technical business methods illustrated in Jer. xxxii. Moreover, among the Jewish families settled in the 5th century B.C. in Egypt (Elephantine) and Babylonia (Nippur), the Babylonian-Assyrian principles are in vogue, and the presumption that they were not unfamiliar in Palestine is strengthened further by the otherwise unac- countable appearance of Baby Ionian- Assyrian elements later in the Talmudic law. The denunciations in the prophetical writings of gross injustice, oppression and maladministration seem to presuppose definite laws, which either were ignored or which fell with severity upon the poor and unfortunate. They point to a considerable amount of written law, which was evidently class-legislation of an oppressive character. 1 The Babylonian code is essentially class-legislation, and from the point of view of the idealism of the Old Testament prophets, which raises the rights of humanity above everything else, the steps which the code takes to safeguard the rights of property (slaves included therein) would naturally seem harsh. The code also regulates wages and prices, and shows a certain humanity towards debtors; and here any failure to carry out these laws would obviously be denounced. While the code, according to its own lights, aims Prophets at strict justice rather than charity, the Old Testa- aadtbe ment has reforming aims, and the religious, legislative taB '* and social ideals are characterized by the insistence

upon a lofty moral and ethical standard. These ideals are more religious than democratic. The appeal of the prophets, " is not for better institutions but for better men, not for the abolition of aristocratic privileges but for an honest and godly use of them." 2 The writers have in view a people with individual and collective rights and responsibilities, united by feelings of the deepest loyalty and kindliness and by common adherence to their only God. There is a marked growth of refinement and of ideas of morality, and a condemnation of the shameless vice and oppression which went on amid a punctilious and splendid worship. It is extremely significant that between the teaching of the prophetical writings and the spirit of the Mosaic legislation there is an unmistakable bond. The Mosaic law, in its reforming aspect, is characterized by the denunciation of heathenism and heathenish usages which belong to the old religion. There is an insistence upon individual responsibility (Deut. xxiv. 16; 2

Kings xiv. 6; cf. Jer. xxxi. 29 seq.; Ezek. xviii., xxxiii.), the more noteworthy when one considers the tenacity of the savage talio and its retention, though with some modifications, in the Babylonian code. There is a tendency to mitigate slavery, and the law of fugitive slaves is a particularly instructive innovation (Deut. xxiii. 15 seq., subsequently confined to the slave from outside). Corporal punishment is kept within limits (xxv. 3), but its very existence points to state-life rather than to the desert. Some attempt is made to diminish the destructiveness of war (xx. 10-20), but the passage is a remarkable illustration of a barbarous age. The endeavour is also made to improve the monarchy of the future (xvii. 14 sqq.), but mainly on religious grounds, in order to diminish foreign intercourse. Noteworthy, again, is the appeal to religious and ethical considerations in order to prevent injustice to the widow and fatherless and to unhappy debtors; statutory laws are either unknown, or, more probably, are presupposed. The pentateuchal legislation as a . c . .whole is placed at the very beginning of Israelite Problems. ‘ national history. Amid constant periods of apostasy two epoch-making events stand out: (a) the redis- covery of the Book of the Law (Deuteronomy is meant) in the time of Josiah (2 Kings xxii.) followed by a reform of sundry religious abuses dating from the foundation of the temple, and (b) the promulgation by Ezra of the Law of Yahweh, the law of Moses (Ezra. vii. 10, 14; Neh. viii. 1), in the age of Nehemiah, at the very close of biblical history. This legislation, endorsing

1 O. C. Whitehouse, Century Bible, on Isa. x. 1 seq.

2 See W. R. Smith, Old Test, in the Jew. Church (London, 1892), PP-348. 35° seq.

(in certain well-defined portions) priestly authority, excludes a monarchy and stands at the head of a lengthy development in the way of expansion and interpretation. Its true place in biblical history has been the problem of generations of scholars, 3 and the discovery (Dec. 1901-Jan. 1902) of the Babylonian code has brought new problems of relationship and of external influences. Although on various grounds there is a strong probability that the code of Khammurabi must have been known in Palestine at some period, the Old Testament does not manifest such traces of the influence as might have been expected. Pentateuchal law is relatively unprogressive, it is marked by a characteristic simplicity, and by a spirit of reform, and the persisting primitive social conditions implied do not harmonize with other internal and external data. The existence of other laws, however, is to be presupposed, and there appear to be cases where the Babylonian

code lies in the background. An indepen- dent authority concludes that ” the co-existing likeness and differences argue for an independent recension of ancient custom deeply influenced by Babylonian law.” 4 The questions are involved with the reforming spirit in biblical religion and history. On literary-historical grounds the Pentateuch in its present fohn is post-exilic, posterior to the old monarchies and to the ideals of the earlier prophetical writings. The laws are (a) partly contem- porary collections (chiefly of a ritual and ceremonial character) and (b) partly collections of older and different origin, though now in post-exilic frames. /-The antiquity of certain principles and details is undeniable — as also in the Talmud — but since one must start from the organic connexions of the composite sources, the problems necessitate proper attention to the relation between the stages in the literary growth (working backwards) and the vicissitudes which culminate in the post- exilic age. The simplicity of the legislation (traditionally associated with Moab and Sinai and with Kadesh in South Palestine), the humanitarian and reforming spirit, the condem- nation of abuses and customs are features which, in view of the background and scope of Deuteronomy, can hardly be severed from the internal events which connect Palestine of the Assyrian supremacy with the time of Nehemiah. 5

The introduction, spread and prominence of the name Yahweh, the development of conceptions concerning his nature, his supremacy over other gods and the lofty monotheism character which denied a plurality of gods, are questions of o. T. which, like the biblical legislative ideas, cannot be Hlstor y- adequately examined within the narrow compass of the Old Testament alone.

The biblical history is a “canonical” history which looks back to the patriarchs, the exodus from Egypt, the law-giving and the covenant with Yahweh at Sinai, the conquest of Palestine by the Israelite tribes, the monarchy, the rival kingdoms, the fall and exile of the northern tribes, and, later, of the southern (Judah), and the reconstructions of judah in the times of Cyrus, Darius and Artaxerxes. It is the first known example of continuous historical writing (Genesis to Kings, Chronicles-Ezra- Nehemiah), and represents a deliberate effort to go back from

3 See Bible: Old Test. Criticism; Jews, §§ 16, 23.

4 C. H. W. Johns, Hastings’s Diet. Bible, v. 611 seq., who points out that the intrusion of priestly power into the law courts is a recru- descence under changed conditions of a state of things from which the Babylonian code shows an emancipation nearly complete. The view

formerly maintained by the present writer {Laws of Moses and Code of Hammurabi, 1903, pp. 204 sqq., 279 seq., &c.) relied upon the difference between the exilic or post-exilic sources which unambiguously reflect Babylonian and related ideas, and the absence in other biblical sources of the features which an earlier compre- hensive Babylonian influence would have produced, and it incor- rectly assumed that the explanation might be found in the ordinary reconstructions of Israelite history. Cf. above, p. 182, n. 1.

6 On the later history of the canonical law (Mishnah, Gemara, &c.) see Talmud. The Talmud embodies law, which is related to the Babylonian code not only in content but also sometimes in spirit; see L. N. Dembitz, Jew. Quart. Rev. xix. (1906), pp. 109 sqq. For the efforts of the Rabbis to improve the legal principles in Galilee in the 2nd and 3rd centuries A.D., see A. Buchler, Publication No. I, Jews' College, London. With the removal of Judaism from Palestine and internal social changes the archaic primitive law re- appeared, now influenced, however, by Mahommedan legislation.

the days when the Judaeans separated from the Samaritans to the very beginning of the world. A characteristic tone per- vades the history, even of the antediluvian age, from the creation i)f Adam; or rather, the history of the earliest times has been written under its influence. It reveals itself in the days of the Patriarchs, before the " Amarna " age — or rather in the narra- tives relating to these remote ancestors. It will be perceived ihat an objective attitude to the subjective writings must be adopted, the starting-point is the writings themselves and not individual preconceptions of the authentic history which they embody. Although there are various points of contact with Palestinian external history, there is a failure to deal with some • events of obvious importance, and an emphasis upon others which are less conspicuous in any broad survey of the land. There are numerous conflicting details which unite to prove that various sources have been used, and that the structure of the compilation is a very intricate one, the steps in its growth being extremely obscure. 1 In studying the internal peculiarities and the different circles of thought involved, it is found that they often imply written traditions which have a perspective different from that in which they are now placed. As regards the pre- monarchical period, some evidence points to a

settlement Pre- (apparently from Aramaean localities) of the patri-

Monarchlcal archs, and of Israel (Jacob) and his sons, i.e. the Period. « children of Israel.” It ignores a descent into Egypt and the subsequent invasion. 2 The parallel account in the book of Joshua of the entrance of the ” children of Israel ” is, in its present form, the sequel to the journey of the people along the east of Edom and Moab after the escape from Egypt, and after a sojourn at Kadesh (Exodus-Deuteronomy). But other evidence also points to an entrance from Kadesh into Judah, and associates the kin of Moses, Kenites, Calebites and others. Thus, the tradition of a residence in Egypt, implied also in the stories of Joseph, has certainly become the ” canonical ” view, but the recollection was not shared by all the mixed peoples of Palestine; and to this difference of historical background in the traditions must be added divergent traditions of the earlier population. Traditions, oral and written, with widely differing standpoints have been brought together and merged. Moreover, the elaborate account of the vast invasion and conquest, the expulsion, extermination and subjugation of earlier inhabitants, and the occupation of cities and fields, combine to form a picture which cannot be placed in Palestine during the i5th-i2th centuries. It must not be denied that the recollection of some invasion may have been greatly idealized by late writers, but it happens that there were important immi- grations and internal movements in the 8th-6th centuries, that is to say, immediately preceding the post-exilic age, when this composite account in the Pentateuch and Joshua reached its present form. An enormous gap severs the pre-monarchical period from this age, and while the tribal schemes and tribal tradi- tions can hardly be traced during the monarchies, the inclusion of Judah among the ” sons ” of Israel would not have originated when Judah and Israel were rival kingdoms. Yet the tribes survive in post-exilic literature and their traditions develop henceforth in Jubilees, Testament of the XII Patriarchs, &c. During the changes from the 8th century onwards a non- monarchical constitution naturally prevailed, first in the north and then in the south, and while in the north the mingled peoples of Samaria came to regard themselves as Israelite, the southern portion, the tribe of Judah, proves in i Chron. ii. & iv. to be largely of half-Edomite blood. A common ground previous to the Samaritan schism is ignored; it is found only in the period before the rival kingdoms. The political history of these

1 In the art. Jews, §§ 1-24, the biblical history is taken as the foundation, and the internal historical difficulties are noticed from stage to stage. In the present state of biblical historical criticism this plan seemed more advisable than any attempt to reconstruct the

history; the necessity for some reconstruction will, however, be clear to the reader on the grounds of both the internal intricacies and the external evidence.

2 See, in the first instance, E. Meyer (and B. Luther), Die Israel- uen und ihre Nachbarstamme (Halle, 1906) ; also art. Genesis.

monarchies in the book of Kings is singularly slight considering the extensive body of tradition which may be pre-supposed, e.g. for the reigns of Jeroboam II. and Uzziah, or which may be inferred from the evidence for different r ˆ e Darchles sources dealing with other periods. The scanty political data In the annalistic notices of the north kingdom are supplemented by more detailed narratives of a few years leading up to the rise of the last dynasty, that of Jehu. The historical problems involved point to a loss of perspective (Jews, §11), and the particular interest in the stories of Elijah and Elisha in an historical work suggests that the political records passed through the hands of communities whose interest lay in these figures. Old tradition suggests the ” schools of the prophets ” at Jericho, Gilgal and Bethel, and in fact the proximity of these places, especially Bethel, to Judaean soil may be connected with the friendly and sometimes markedly favourable attitude to Judah in these narratives. The rise of the kingdom of Israel under Saul is treated at length, but more prominence is given to the influence of the prophet Samuel; and not only is Saul’s history written from a didactic and prophetical standpoint (cf. similarly Ahab), but the great hero and ruler is handled locally as a petty king at Gibeah in Benjamin. The interest of the narratives clings around north Judah and Benjamin, and more attention is given to the rise of the Judaean dynasty, the hostility of Saul, and the romantic friendship between his son Jonathan and the young David of Bethlehem. The history of the northern and southern kingdoms is handled separately in Kings; but in Samuel the rise of each is closely interwoven, and to the greater glory of David. The account of his steps contains details touching Judah and its relation to Israel which cannot be reconciled with certain traditions of Saul and the Ephraimite Joshua. It combines amid diverse material a hero of Bethlehem and rival of Saul with the idea of a conqueror of this district; it introduces peculiar traditions of the ark and sanctuary, and it associates David with Hebron, Calebites and the wilderness of Paran. 3 The bookˆs of Samuel and Kings have become, in process of compilation, the natural sequel to the preceding books, but the conflicting features and the perplexing differences of standpoint recur elsewhere, and the relationship between them suggests that similar causes have been operative upon the compilation. The history of Judah is, broadly speaking, that of the Davidic dynasty and the

Temple, and it begins at the time of the first king of the rival north. Care is taken to record the transference of secular power and of Yahweh's favour from Saul to David, and David accomplishes more successfully or on a larger scale the achieve- ments ascribed to Saul. The religious superiority of Jerusalem over the idolatrous north and over the " high places " is the main theme, and with it is the supremacy of the native Zadokite priests of Jerusalem over others (e.g. of Shiloh), who are connected with the desert traditions. The political history is relatively slight and uneven, and the framework is rehandled in Chronicles upon more developed lines and from a later ecclesiastical stand- point, which suggests that many traditions of the monarchy were extant in a late dress. Both books represent the same general trend of political events, even where the " canonical " representation is most open to criticism. Chronicles, with the book of Ezra and Nehemiah, makes a continuity chronicles— between the old Judah which fell in 586 and the Ezra- return (time of Cyrus), the rebuilding of the temple Nehemll >l>. (Darius), and the reorganization associated with Nehemiah and Ezra (Artaxerxes) Historical material after 586 is scanty in the extreme, and, apart from the records of Nehemiah and a few other passages, the interest lies in the religious history of the communities and reformers who returned from Babylonia. The late and composite book of Chronicles places at the head of the Israelite divisions, which ignore the exodus (1 Chron. vii. 3 Whence the theory that David was of S. Judaean or S. Pales- tinian origin (Marquart, Winckler, Cheyne, Ency. Bib. cols. 1020, 26i3 seq.), and, also, that he knit together the southern non- judaean clans (see David, Judah). But it is preferable to recognize different traditions of distinct origin and to inquire what genuine elements of history each may contain.

14, 20-24), a Judah consisting of fragments of an older stock replenished with families of South Palestinian, Edomite and North Arabian affinity. This half-Edomite population, recognizable also in Benjamin, manifests its presence in the official lists, and more especially in the ecclesiastical bodies inaugurated by David, from whose time the supremacy of this Judah is dated. The historical framework contains traditions of the reconstruc- tion and repair of temple and cult, of the hostility of southern peoples and their allies, and of conflicts between king and priests. This retrospect of the

Judaean kingdom must be taken with the following books, where the crucial features are (a) the presence (;. 444) of an aristocracy, partly (at all events) of half-Edomite affinity, before the return of any important body of exiles (Neh. iii.) ; (5) the gaps in the history between the fall of Samaria (722) and Jerusalem (586) to the rise of the hierocracy, and © the relation between the hints of renewed political activity in Zerubbabel's time, when the Temple was rebuilt (c. 520-516), and the mysterious catastrophe (with perhaps another disaster to the Temple), probably due to Edom, which is implied in the book of Nehemiah (c. 444). (See Jews, § 22.) These data lead to the fundamental problem of Old Testament history. Since 1870 (Wellhausen's De gentibus . . . Judaeis) it has been recognized that 1 Chron. ii. and iv. accord with certain details in 1 Samuel, and appear to refer to a half-Edomite Judah in David's time (c. 1000 B.C.). 1 More recently E. Meyer, on the basis of a larger induction, has pointed out the relation of this Judah to a large group of Edomite or Edomite-Ishmaelite tribes. 2 The stories in Genesis represent a southern treatment of Palestinian tradition, with local and southern versions of legends and myths, and with interests which could only belong to the south. 3 It has long been perceived that Kadesh in South Palestine was connected with a law-giving and with some separate movement into Judah of clans associated with the family of Moses, Caleb, Kenites, &c. (see Exodus, The). With this it is natural to con- nect the transmission and presence in the Old Testament of specifically Kenite tradition, of the " southern " stories in Genesis, and of the stories of Levi. 4 The rise of this new Judah is generally attributed to David, but the southern clans remain independent for some five centuries, only moving a few miles nearer Jerusalem; and this vast interval severs the old half- Edomite or Arabian Judah from the sequel — the association of such names as Korah, Ethan and Heman with temple-psalms and psalmody. 5 It has long been agreed that biblical religion and history are indebted in some way to groups connected with Edom and North Arabia, and repeated endeavours have been made to explain the evidence in its bearing upon this lengthy period. 6 The problem, it is here suggested, is in the first instance a literary one — the literary treatment by southern groups, who have become Israelite, of a lengthy period of history. When the whole body of evidence is viewed comprehensively, it would seem that there was some movement northwards of semi-Edomite blood, tradition and literature, the date of which may be placed during the internal disorganization of Palestine, and presumably in the 6th century. Such a movement is in keeping with the course of Palestinian history from the traditional entrance of the Israelite tribes to the relatively recent migration of the tribe 1 " The population of South Judah was of half-Arab origin " (W.

R. Smith, Old Test. Jew. Church, p. 279).

2 Meyer and Luther, op. cit., p. 446, et passim.

3 So especially Meyer and Luther, op. cit. ; cf . also H. Gressmann, Zeit. f. alt-test. Wissens. (1910), p. 28 seq. Note also the view that the grand book of Job (q.v.) has an Edomite background.

4 A. R. Gordon, Early Trad, of Gen. (London, 1907), pp. 74, 188; Meyer, op. cit., pp. 83, 85 (on the Levites); Gressmann, loc. cit.; S. A. Cook, Arner. Journ. of Theol. (1909), pp. 382 sqq. See Genesis, Levites, and Jews, § 20.

5 On the names, see Genealogy: Biblical; Levites, § 2, end, and Ency. Bib. col. 1665 seq.

6 W. R. Harper (Amos and Hosea, 1905, p. liv.) observes: ” Every year since the work of W. R. Smith brings Israel into closer relation- ship with Arabia”; cf. also N. Schmidt’s conclusions (Hibbert Journal, 1908, p. 342), and the Jerahmeelite theory of T. K. Cheyne, who writes (Decline and Fall of the Kingdom of Judah, Londor 1908, p. xxxvii.) ” . . . by far the greater part of the extant literary monuments of ancient Israel are precisely those monuments whose producers were most preoccupied by N. Arabia.”

of ‘Amr. 7 In the Old Testament popular feeling knows of two phases: Edom, the more powerful brother of Jacob (or Israel) — both could share in the traditions of Abraham, Isaac and Jacob — and the hatred of the treacherous Edom in the prophetical writings. Earlier phases have not survived, and the last-mentioned is relatively late, 8 after the southern influence had left itself upon history, legend, the Temple and the ecclesiastical bodies. On these grounds, then, it would seem that among the vicissitudes of the 8th and following centuries may be placed a movement of the greatest importance for Israelite history and for the growth of the Old Testament, one, however, which has been reshaped and supplemented (in the account of the Exodus and Invasion) and deliberately suppressed or ignored in the history of the age (viz. in Ezra-Nehemiah).

The unanimous recognition on the part of all biblical scholars that the Old Testament cannot be taken as it stands as a trust- worthy account of the history with which it deals, necessitates a hypothesis or, it may be, a series of cˆfLi ° hypotheses, which shall enable one to approach the more detailed study of its history and religion. The curious and popular tradition that Ezra rewrote the Old Testament (2 Esd. xiv.),

the concessions of conservative scholars, and even the view that the Hebrew text is too uncertain for literary criticism, indicate that the starting-point of inquiry must be the present form of the writings. The necessary work of literary analysis reached its most definite stage in the now famous hypothesis of Graf (1865-1866) and especially Wellhausen (1878), which was made more widely known to English readers, directly and indirectly through W. Robertson Smith, in the 9th edition of this Encyclopaedia. 9 The work of literary criticism and its application to biblical history and religion passed into a new stage as external evidence accumulated, and, more particularly since 1900, the problems have assumed new shapes. The tendency has been to assign more of the Old Testament, in its present form, to the Persian age and later; and also to work upon lines which are influenced sometimes by the close agreement with Oriental conditions generally and sometimes by the very striking divergences. It is the merit of Hugo Winckler especially to have lifted biblical study out of the somewhat narrow lines upon which it had usually proceeded, but, at the time of writing (1910), Old Testament criticism still awaits a sound reconciliation of the admitted internal intricacies and of the external evidence for Palestine and that larger area of which it forms part. Upon the convergence of the manifold lines of investigation rest all reconstructions, all methodical studies of biblical religion, law and prophecy, and all endeavours to place the various develop- ments in an adequate historical framework.

The preliminary hypotheses, it would seem, must be both literary and historical. The varied standpoints (historical, social, legal, religious, &c.) combine with the fragmentary character pˆi/ˆaary of much of the evidence to suggest that the literature tj yoot i. es ?l has passed through different circles, with excision or revision of older material, and with the incorporation of other material, sometimes of older origin and of independent literary growth. Consequently, one is restricted in the first instance to such literature as survives and in the form which the last editors or compilers gave it. Different views as regards history (e.g. invasions, tribal movements, rival kingdoms) and religion (e.g. the Yahweh of Kadesh, Sinai, Jerusalem, &c), and different priestly, prophetical and popular ideas are only to be expected, consider- ing the character of Palestinian population. Hence to weave the data into a single historical outline or into an orderly evolution of thought is to overlook the probability of bona

7 J. Dfssard, Rev. Bibl., 1905, pp. 410-425. Some S. Pal. revolt is also reflected shortly before the rise of the Jehu dynasty (Jews, §11). A few centuries later, the Edomites (Idumaeans) were again closely connected with the Jews; an Idumaean dynasty — that of the Herods

— ruled in Judah, and once more there must have been a considerable amount of intermixture.

8 Cf . R. H. Kennett, Journ. Theol. Stud. (1906), p. 487; Camb. Bibl. Essays (ed. Swete), p. 117. For an Edomite' invasion between 586 and the Greek period, see also H. Winckler, Altor. Forsch. (1900), pp. 428 sqq., 455.

9 Especially Wellhausen's articles, " Pentateuch," " Israel," " Moab,"andW. R.Smith's large series including" Bible,"" David," " Decalogue," " Judges," " Kings," " Levites," " Messiah," " Priest," " Prophet," " Psalms," &c.

fide divergences of tradition and to assume that more rudi- mentary or primitive thought was excluded by the admitted develop- ment of religious-social ideals. The oldest nucleus of historical tradition appears to belong to Samaria, but it has been adjusted to other standpoints or interests, which are apparently connected partly with the half-Edomite and partly with the old indi- genous Judaean stock. 1 Genesis-Kings (incomplete; some further material in Jeremiah) and the later Chronicles — Nehemiah are in their present form posterior to Nehemialvs time. Unfortunately the events of his age are shrouded in obscurity, but one can recognize the return of exiles from Babylon to Jerusalem and its environs — now half-Edomite — and various internal rivalries which culminate in the Samaritan schism. 2 The ecclesiastical rivalries have left their mark in the Pentateuch and (the later) Chronicles, and the Samaritan secession appears to have coloured even the book of Kings. These sources then are " post-exilic," and the elimination of material first composed in that age leaves historical, legal and other material which was obviously in circulation (so, e.g., the non-priestly portions of Genesis). 3 The relatively earlier group of books is now the result of two complicated and contin- uous redactions, " Deuteronomic " (Deut.-Kings) and " Priestly " (Genesis-Joshua, with traces in the following books). The former is exceptionally intricate, being in its various aspects distinctly earlier, and in parts even later than the " priestly." Its standpoint, too, varies, the phases being now northern or wider Israelite, now half-Edomite or Judaean, and now anti-Samarian.

Moreover, there is a late incorporation of literature, sometimes untouched by and sometimes merely approximating to ” Deuteronomic ” language or thought. How very late the historical books are in their present text or form may be seen from the Septuagint version of Joshua, Samuel and Kings, and from their internal literary struc- ture, which suggests that only at the last stages of compilation were they brought into their present shape. 4 The result as a whole tends to show that the ” canonical ” history belongs to the last literary vicissitudes, and that similar influences (which have not affected every book in the same manner) have been at work throughout.

The history of the past is viewed from rather different positions which, on the whole, are subsequent to the relatively recent changes _ . . that gave birth to new organizations in Samaria and tr’dl- Judah. Consequently, in “addition to the ordinary require- or i ram- ments f historical criticism, biblical study has to take into account the intricate composite character of the sources and the background of these positions. It is the criticism of sources which have both a literary and an historical compositeness. Not only are the standpoints of local interest (Samaria, Benjamin, Judah and the half-Edomite Judah being involved), but there are remarkable developments in the ecclesiastical bodies (Zadokites of Jerusalem, country and half-Edomite priests, Aaronites) which have influenced both the writing and the revision of the sources (see Levites). Yet it is noteworthy that the traditions are usually reshaped, readjusted or reinterpreted, and are not replaced by entirely new ones. Thus, the Samaritans claim the traditions of the land; the Chronicler traces the connexion between ” pre-exilic ” and ” post-exilic ” Judaeans, ignoring and obscuring intervening events; the south Palestinian cycle of tradition is adapted to the history of a descent into and an exodus from Egypt; Zadokite priests are enrolled as Aaronites, and the hierarchical traditions

1 A Samarian (or Ephraimite or N. Israelite) nucleus may be recognized in the books of Joshua-Kings; see the articles on these books, Jews, § 6; cf. Meyer, pp. 478 n. 2, 486 seq., and K. Lincke, Samaria u. seine Propheten (1903), p. 24. These preserve old poetical literature (Judg. v., 2 Sam. i.), stories of conquest and settlement, and they connect with the liturgy in Deut, xxvii. Joshua’s covenant at Shechem and the Shechemite covenant-god (cf. Kennett, Journ. Theol. Stud., 1906, pp. 495 sqq.;. Lincke, op. cit., p. 89. W. Erbt, Die Hebrder (1906), pp. 27 sqq.; Meyer and Luther, pp. 542 sqq., 550 seq.). _ .

2 There seems to be both political and religious animosity, but it is not certain that Josephus is wrong in placing the schism at the close of the Persian period; see, on this point, j. Marquart, Isr. u. Jild. Gesch.

(1896), p. 57 seq.; C. Steuernagel, Theolog. Stud. u. Krit. (1909), p. 5; G. Jahn, Bucher Esra u. Nehemia (Leiden, 1909), pp. 173-176; C. C. Torrey, Ezra Studies (Chicago, 1910), pp. 321 sqjj. Old priestly rivalries between Cutha and Babylon may explain why the mixed Samaritans became known as Cuthaeans; according to the prevailing theory their predecessors, the “ten tribes “had been exiled in the 8th century.

3 The term ” post-exilic ” is applied to literature and history after the return of exiles and the religious reconstruction of Judah. This, on the traditional view, would be in 537, if there were then any prominent return. Failing this, one must descend to the time of Nehemiah, which the biblical history itself regards as epoch-making. The tendency to make the exile an abrupt and complete change in life is based upon the theory underlying Chronicles-Nehemiah and is misleading (see Torrey, op. cit. pp. 287 sqq., &c).

”’ Cf. the ” Deuteronomic ” form of Samuel, and the depend- ence of the literary growth of Genesis and the account of the exodus and invasion of Palestine upon the ” southern ” cycle of tradition.

reveal stages of orderly and active development in order to authorize the changing standpoints of different periods and circles. 6 This feature recurs in later Palestinian literature (see Midrash, Talmud) where there are later forms of thought and tradition, some elements of which although often of older origin, are almost or entirely wanting in the Old Testament. Much that would otherwise be unintelligible becomes more clear when one realizes the readiness with which settlers adopt the traditional belief and custorn of a land, and the psychological fact that teaching must be relevant and must satisfy the primary religious feelings and aspirations, that it must not be at entire variance with current beliefs, but must represent the older beliefs in a new form. Any comparison of the treatment of biblical figures or events in the later literature will illustrate the retention of certain old details, the appearance of new ones, and an organic connexion which is everywhere in accordance with contemporary thought and teaching. If this raises the presumption that even the oldest and most isolated biblical evidence may rest upon still older authority, it shows also that the fuller details and context cannot be confidently recovered, and that earlier forms would accord with earlier Palestinian belief. 6 Hence, although records may be most untrustworthy in their present form or connexion, one cannot necessarily deny that a romance may presuppose a reality of history or that it may preserve the fact of an event even at the period to which it is ascribed {e.g. Abraham and Amraphel in Gen.’ xiv. ; the invasions before 1000 B.C., &c). But in all

such cases the present form of the material may be more profitably used for the study of the historical or religious conceptions of its age. At the same time, the complexity of the vicissitudes of traditions, exemplified in modern Palestine itself, cannot be ignored. 7 Finally, biblical history is an intentional and reasoned arrangement of material, based upon composite sources, for religious and didactic purposes. Regarded as an historical work there is a remarkable absence of proportion, and a loss of perspective in the relation between antediluvian, patriarchal, Mosaic and later periods. From the literary-critical results, however, it is not so much the history of consecutive periods as the account of consecutive periods by compilers who are not far removed from one another as regards dates, but differ in standpoints. There was, in one case, a retrospect which did not include the deluge, and in another the patriarchs were actual settlers, a descent into Egypt and subsequent exodus being ignored; moreover, the standpoints of those who did not go into exile and of those who did and returned would naturally differ. In weaving the sources together the compilers had some acquaintance of course with past history, but on the whole it manifests itself only slightly (see Jews, § 24), and the complete chronological system belongs to the latest stage. Investigation must concern itself not with what was possibly or probably known, but with what is actually presented. The fact remains that when accepted tradition conflicts with more reliable evidence it stands upon a level by itself ; 8 and it- is certain that a compilation based upon the knowledge which modern research — whether in the exact sciences or in history — has gained would have neither meaning for nor influence upon the people whom it was desired to instruct. A considerable amount of earlier history and literature has been lost, and it is probable that the traditions of the origins of the composite Israelites, as they are now preserved, embody evidence belonging to the nearer events of the 8th-6th centuries. The history of these centuries is of fundamental importance in any attempt to ” reconstruct ” biblical history. 9 The fall of Samaria and Judah was a literary as well as a political catastrophe, and precisely how much earlier material has been

6 Cf. S. A. Cook, Critical Notes on Old Testament History (1907), pp. 62 seq., 67, 75 sqq., 112 seq.

6 This applies also to the prophetical writings, the study of which is complicated by their use of past history to give point to later ideas and by the recurrence in history of somewhat similar events. As regards the situations which presuppose the ruin of Jerusalem and a return of exiles, the obscure events after the time of Zerubbabel cannot be left out of account. (See Jews, §§ 14, 17 [p. 282], 22 n. 5, and art.

Zephaniah.)

7 Note the rapid growth and embellishment of tradition, the inextricable interweaving of fact and fiction, the circumstantial or rationalized stories of imaginary beings, the supernatural or mythical stories of thoroughly historical persons, the absolute loss of perspective, and a reliance not upon the merits of a tradition but upon the authority with which it is associated.

8 Cf. the remarkable Arabian stories of their predecessors, or the mingling of accurate and inaccurate data in Manetho and Ctesias.

9 The evidence for Jewish colonies at Elephantine in Upper Egypt (5th century B.C.) has opened up new paths for inquiry. According to some scholars it is probable that they were descended from the soldiers settled by Psamtek I. (7th century), and not only are they in touch with Judah and Samaria, but in Psamtek's time an effort was made by the Asiatic and other mercenaries to escape into Ethiopia (J. H. Breasted, Eg. hist. doc. iv. 506 seq.). It is already suggested that allusions to a sojourn in Egypt may refer, not to the remote times of Jacob and Moses but to the circumstances of the 7th century; see C. Steuernagel, op. cit. pp. 7-12; E. Meyer, Sitzungs- berichte of the Berlin Academy, June 1908, p. 655, n. 1.

preserved is a problem in itself. It is very noteworthy, however, that, while no care was taken to preserve the history of the Chaldean and Persian Empires — and consequently tlie most confused ideas subsequently arose — the days of the Assyrian supremacy leave a much clearer imprint (cf. even the apocryphal book of Tobit). It may perhaps be no mere chance that with the dynasties of Omri and Jehu the historical continuity is more firm, that older forms of prophetical narrative are preserved (the times from Ahab to Jehu), and that to the reign of the great Jeroboam (first half of the 8th century), the canonical writers have ascribed the earliest of the extant prophetical writings (Amos and Hosea).

External evidence for Palestine, in emphasizing the necessity for a reconsideration of the serious difficulties in the Old Testament, and in illustrating at once its agreement and still more Summary. p er pi e xing disagreement with contemporary conditions, furnishes a more striking proof of its uniqueness and of its permanent value. The Old Testament preserves traces of forgotten^ history and legend, of strange Oriental mythology, and the remains of a semi-heathenish past. ” Canonical ” history, legislation and religion assumed their present forms, and, while the earlier stages can cnly incompletely be traced, the book stands at the head of subsequent literature, paving the way for Christianity and Rabbini- cal Judaism, and influencing the growth of Mahommedanism. In leaving the land of its birth it has been taken as a whole, and for many centuries has been regarded as an infallible record of divinely granted knowledge and of divinely shaped history. During what is relatively a very brief period deeper inquiry and newer knowledge have forced a slow, painful but steady readjustment of religious convictions. While the ideals and teaching of the Old Testament have always struck a responsive chord, scientific knowledge of the evolution of man, of the world’s history and of man’s place in the universe, constantly reveals the difference between the value of the old Oriental legacy for its influence upon the development of mankind and the unessential character of that which has had inevitably to be relinquished. Yet, wonderful as the Old Testament has ever seemed to past generations, it becomes far more profound a phenomenon when it is viewed, not in its own perspective of the unity of history — from the time of Adam, but in the history of

Palestine and of the old Oriental area. It enshrines the result_ of certain influences, the teaching of certain truths, and the acquisition of new conceptions of the relations between man and man, and man and God. Man's primary religious feeling seeks to bring him into association with the events and persons of his race, and that which in the Old Testament appears most perishable, most defective, and which suffers most under critical inquiry, was necessary in order to adapt new teaching to the commonly accepted beliefs of a bygone and primitive people. 1 The place of the Old Testament in the general education of the world is at the close of one era and at the beginning of another. After a lengthy development in the history of the human race a definite stage seems to have been reached about 5000 B.C., which step by step led on to those great ancient cultures (Egyptian, Aegean, Babylonian) which surrounded Pales- tine. 2 These have influenced all subsequent civilization, and it was impossible that ancient Palestine could have been isolated from contemporary thought and history. After reaching an astonishing height (roughly 2500-1500 B.C.) these civilizing powers slowly decayed, and we reach the middle of the first millennium B.C. — the age which is associated with the " Deutero-Isaiah " (Isa. xl.-lv.), with Cyrus and Zoroaster, with Buddha and Confucius, and with Phocylides and Socrates. 3 This age, which comes midway between the second Egyptian dynasty (c. 3000 B.C.) and the present day, connects the decline of the old Oriental empires with the rise of the Persians, Greeks and Romans. In both Babylonia and Egypt it was an age of revival, but there was no longer any vitality in the old soil. In Palestine, on the other hand, the downfall of the old monarchies and the infusion of new blood gave fresh life to the land. There had indeed been previous immigrations, but the passage from the desert into the midst of Palestinian culture led to the adoption of the old semi-heathenism of the land, a declension, and a descent from the relative simplicity of tribal life. 4 Now, however, the political conditions were favourable, and for a time Palestine could work out its own development. In these vicissitudes which led to the growth of the Old Testament, in its preservation among a devoted people, and in the results which have ensued down to to-day, itis impossible not to believe that the history of the past, with its manifold evolutions of thought and action, points the way to the religion of the future. (S. A. C.)

1 Cf. P. Gardner, Hist. View of New Test. (1904) 26, 44, sqq.

2 See Meyer's interesting remarks, Gesch. d. Alt. i. §§ 592 sqq.

3 Cf. A. P. Stanley, Jewish Church (1865), Lectures xlv. seq.; A. Jeremias, Monoth. Stromungen (Leipzig, 1904), p. 43 seq. Among the

developments in Greek thought of this period, especially interesting for the Old Testament is the teaching associated with Phocylides of Miletus; see Lincke, Samaria, pp. 47 seq.

4 Cf. G. A. Smith, Hist. Geog. pp. 85 sqq., also the Arab historian Ibn KhaldOn on the effects of civilization upon Arab tribes (see e.g. R. A. Nicholson, Lit. Hist, of the Arabs [London, 1907], pp. 439 sqq.)

II. — From Alexander the Great to A.D. 70.

After the taking of Tyre Alexander decided to advance upon Egypt. With the exception of Gaza, the whole of Syria Palaes- tine (as it was called) had made its submission. That — in summary form — is the narrative of the thˆareat. Greek historian Arrian {Anabasis, ii. 25). Apart from the facts contained in this statement, the phraseology is of some importance, as the district of ” Palestinian Syria ” clearly includes more than the territory of the Philistines, which the adjective properly denotes (Josephus, Antiquities, i. 6, 2, xiii. v. 10). From the military point of view — and Arrian drew upon the memoirs of two of Alexander’s lieutenants — the significant thing was that not merely was the coast route from Tyre to Gaza open, but also there was no danger of a flank attack as the expeditionary force proceeded. Palestinian Syria, in fact, is here synonymous with what is commonly called Palestine. Similarly Josephus quotes from Herodotus the statement that the Syiians in Palestine are circumcised and profess to have learned the practice from the Egyptians (C. Apionem, i. 22, §§ 169, 171, Niese); and he comments that the Jews are the only inhabitants of Palestine who do so. These two examples of the wider use of the adjective and noun seem to testify to the forgotten predominance of the Philistines in the land of Canaan.

But, in spite of the statement and silence of Arrian, Jewish tradition, as reported by Josephus (Ant. xi. 8, 3 sqq.), represents the high priest at Jerusalem as refusing Alexander’s offered alliance and request for supplies. The Samaritans — the Jews ignored in their records all other inhabitants of Palestine — courted his favour, but the Jews kept faith with Darius so long as he lived. Consequently a visit to Jerusalem is interpolated in the journey from Tyre to Gaza; and, Alexander, contrary to all expectation, is made to respect the . high priest’s passive resistance. He had seen his figure in a dream; and so he sacrificed to God according to his direction, inspected the book of Daniel, and gave them — and at their request the Jews of Babylon and Media — leave, to follow their own laws. The Samaritans were prompt to claim like privileges, but were forced to confess that, though they were Hebrews, they were called the Sidonians of Shechem and were

not Jews. The whole story seems to be merely a dramatic setting of the fact that in the new age inaugurated by Alexander the Jews enjoyed religious liberty. The Samaritans are the villains of the piece. But it is possible that Palestinian Jews accompanied the expedition as guides or exerted their influence with Jews of the Dispersion on behalf of Alexander.

It appears from this tradition that the Jews of Palestine occupied little more than Jerusalem. There were kings of Syria in the train of Alexander who thought he was mad when he bowed before the high priest. We may draw the inference that they formed an insignificant item in the population of a small province of the Persian Empire, and yet doubt whether they did actually refuse — alone of all the inhabitants of Palestine — to submit to the conqueror of the whole. At any rate they came into line with the rest of Syria and were included in the province of Coele-Syria, which extended from the Taurus and Lebanon range to Egypt. The province was entrusted first of all to Parmenio (Curtius iv. 1, 4) and by him handed over to Andromachus (Curtius iv. 5, 9). In 331 B.C. the Samaritans rebelled and burned Andromachus alive (Curtius iv. 8, 9): Alexander came up from Egypt, punished the rebels, and settled Macedonians in their city. The loyalty of the Jews he rewarded by granting them Samaritan territory free of tribute — according to a statement attributed by Josephus (c. Apionem, ii. § 43, Niese) to Hecataeus.

After the death of Alexander (323 B.C.) Ptolemy Lagi, who became satrap and then king of Egypt by right of conquest (Diodorus xviii. 39), invaded Coele-Syria in 320 B.C. Then or after the battle of Gaza in 312 B.C. Ptolemy was opposed by the Jews and entered Jerusalem by taking advan- tage of the Sabbath rest (Agatharchides ap. Jos. c. Apionem i. 22, §§ 209 seq.; cf. Ant. xii. i, 1). Whenever this occupation

took place, Ptolemy became master of Palestine in 312 B.C., and though, as Josephus complains, he may have disgraced his title, Soter, by momentary severity at the outset, later he created in the minds of the Jews the impression that in Palestine or in Egypt he was — in deed as well as in name — their preserver. Since 315 B.C. Palestine had been occupied by the forces of Antigonus. Ptolemy's successful

forward movement was undertaken by the advice of Seleucus (Diodorus xix. 80 sqq.), who followed it up by regaining possession of Babylonia. So the Seleucid era began in 312 B.C. (cf. Maccabees, i. 10) and the dynasty of Seleucus justified the ” prophecy ” of Daniel (xi. 2) : ” And the king of the south (Ptolemy) shall be strong, but one of his captains (Seleucus) shall be strong above him and have dominion ” (see Seleucid Dynasty).

Abandoned by his captain and future rival, Seleucus, Ptolemy retired and left Palestine to Antigonus for ten years. In 302 B.C., by terms of his alliance with Seleucus, Lysimachus and Cassander, he set out with a considerable force and subdued all the cities of Coele-Syria (Diodorus xx. 113): A rumour of the defeat of his allies sent him back from the siege of Sidon into Egypt, and in the partition of the empire, which followed their victory over Antigonus at Issus, he was ignored. But when Seleucus came to claim Palestine as part of his share, he found his old chief Ptolemy • in possession and retired under protest. From 301 B.c-198 B.C. Palestine remained, with short interruptions, in the hands of the Ptolemies.

Of Palestine, as it was during this century of Egyptian domination, there is much to be learned from the traditions, reported by Josephus {Ant. xii. 4), in which the o/roblah. career of Joseph, the son of Tobiah, is glorified as the means whereby the national misfortunes were rectified. This Joseph was the nephew of Onias, son of Simon the Righteous, and high priest. Onias is described — in order to enhance the glory of Joseph — as a man of small intelligence and deficient in wealth. In consequence of this deficiency he failed to pay the tribute due from the people to Ptolemy, as his fathers had done, and is set down by Josephus as a miser who cared nothing for the protest of Ptolemy’s special ambassador. Considering the character of Joseph as it was revealed by prosperity, one is tempted to find other explanations of his conduct than avarice. It is clearly indicated that the Jews as a whole were poor, and it is admitted that Onias was not wealthy. Perhaps it was the Sabbatical year, when no tribute was due. Perhaps Onias would not draw upon the sacred treasure in order to pay tribute to Ptolemy. In any case Joseph borrowed money from his friends in Samaria; and this point in the story proves that the Jews were supposed to have dealings with the Samari- tans at the time and could require of them the last proof of friendship. Armed with his borrowed money, Joseph betook himself to Egypt; and there outbid the magnates of Syria when the taxes of the province were put up to auction. He had gained the ear of the king by entertaining his ambassador, and the representatives of the cities — the Greek cities of Syria — were discomfited. The king gave him troops and he borrowed

more money from the king's friends. When he began to collect taxes he was met with refusal and insult at Ascalon and at Scythopolis, but he executed the chief men of each city and sent their goods to the king. Warned by these examples, the Syrians opened their gates to him and paid their taxes. For twenty- two years he held his office and was to all intents and purposes governor of Syria, Phoenicia and Samaria — "A good man" (Josephus calls him) " and a man of mind, who rescued the people of the Jews from poverty and weakness, and set them on the way to comparative splendour " {Ant. xii. 4, 10).

The story illustrates the rise of a wealthy class among the Jews of Palestine, to whom the tolerant and distant rule of the Ptolemies afforded wider opportunities. At the beginning it is said that the Samaritans were prosperous and persecuted the Jews, but this Jewish hero embracing his opportunities reversed the situation and presumably paid the tribute due from the Jews by exacting more from the non- Jewish inhabitants of his province. He is a type of the Jews who embraced the Greek way of life

as it was lived at Alexandria; but his influence in Palestine was insidious rather than actively subversive of Judaism. It was different when the Jews who wished to be men of the world took their Hellenism from the Seleucid court and courted the favour of Antiochus Epiphanes.

Halfway through this century (249 B.C.) the desultory warfare between Egypt and the Seleucid power came to a temporary end (Dan. xi. 6). Ptolemy II. Philadelphus gave his daughter Berenice with a great dowry to Antiochus II. Theos. When Ptolemy died (247 B.C.), Antiochus' divorced wife Laodice was restored to favour, and Antiochus died suddenly in order that she might regain her power. Berenice and her son were likewise removed from the path of her son Seleucus. In the vain hope of protecting his sister Berenice, the new king of Egypt, Ptolemy III. Eugeretes I., invaded the Seleucid territory, " entered the fortress of the king of the north " (Dan. xi. 7 sqq.), and only returned — laden with spoils, images captured from Egypt by Cambyses, and captives (Jerome on Daniel/oc. cit.) — to put down a domestic rebellion. Seleucis reconquered northern Syria without much difficulty (Justin xxxvii. 2, 1), but on an attempt to seize Palestine he was signally defeated by Ptolemy (Justin xxvii. 2, 4).

In 223 B.C. Antiochus III. the Great came to the throne of the Seleucid Empire and set about extending its boundaries in different directions. His first attempt on Palestine (221 B.C.) failed; the second succeeded by the C hu°'ui. treachery of Ptolemy's lieutenant, who had been

recalled to Alexandria in consequence of his successful resistance to the earlier invasion. But in spite of this assistance the conquest of Coele-Syria was not quickly achieved; and when Antiochus advanced in 218 B.C. he was opposed by the Egyptians on land and sea. Nevertheless he made his way into Palestine, planted garrisons at Philoteria on the Sea of Galilee and Scytho- polis, and finally stormed Rabbath-ammon (Philadelphia) which was held by partisans of Egypt. Early in 217 B.C. Ptolemy Philopater led his forces towards Raphia, which with Gaza was now in the hands of Antiochus, and drove the invaders back. The great multitude was given into his hand, but he was not to be strengthened permanently by his triumph (Dan. xi. n sqq.). Polybius describes his triumphal progress (v. 86) : ” All the cities vied with one another in returning to their allegiance. The inhabitants of those parts are always ready to accommodate themselves to the situation of the moment and prompt to pay the courtesies required by the occasion. And in this case it was natural enough because of their deep-seated affection for the royal house of Alexandria.”

When Ptolemy Philopater died in 205 B.C., Antiochus and Philip of Macedon, his nominal friends, made a secret compact for the division of his possessions outside Egypt. The time had come of which Daniel (xi. 13 sqq.) says: ” The king of the north shall return after certain years with a great army and with much riches. And in those times there shall many stand up against the king of the south; also the robbers of thy people shall exalt themselves to establish the vision; but they shall fall.” Palestine was apparently allotted to Antiochus and he came to take it, while Philip created a diversion in Thrace and Asia Minor. Already he had allies among the Jews and, if Daniel is to be trusted, there were other Jews who rose up to shake off the yoke of foreign supremacy, Seleucid or Egyptian, and sue- ceeded only in rendering the triumph of Antiochus easier of achievement. But in the year 200 B.C. Rome intervened with an embassy, which declared war upon Philip and directed Antiochus and Ptolemy to make peace (Polyb. xvi. 27). And in 198 B.C. Antiochus heard that Scopas, Ptolemy’s hired commander-in-chief had retaken Coele-Syria (Polyb. xvi. 39) and had subdued the nation of the Jews in the winter. For these sufficient reasons Antiochus hurried back and defeated Scopas at Paneas, which was known later as Caesarea Philippi (Polyb. xvi. 18 seq.). After his victory he took formal possession of Batanaea, Samaria, Abila and Gadara; ” and after a little the Jews who dwelt round about the shrine called Jerusalem came over to him ” (Polyb. xvi. 39). Only Gaza withstood him, as it withstood Alexander; and Polybius (xvi. 40) pauses to

praise their fidelity to Ptolemy. The siege of Gaza was famous; but in the end the city was taken by storm, and Antiochus, secure at last of the province, which his ancestors had so long coveted, was at peace with Ptolemy, as the Roman embassy directed. From Palestine Antiochus turned to the Greek cities of Asia Minor, and by 196 B.C. he was in Thrace. There he was confronted by the ambassadors of Rome, who expressed their surprise at his actions. Antiochus replied that he was recovering the territory won by Seleucus his ancestor, and inquired by what right did the Romans dispute with him about the free cities in Asia (Polyb. xviii. 33 seq.). The conference was

and Rome. broken off b y a faIse re P ort of Ptolemy's death, but ' war between Rome and Antiochus was clearly inevit- able — and Antiochus was joined by Hannibal. After much diplomacy, Antiochus advanced into Greece and Rome declared war upon him in 191 B.C. (Livy xxxvi. 1). He was defeated on the seas and driven first out of Greece and then out of Asia Minor. His army was practically destroyed at Magnesia, and he was forced to accept the terms of peace, which the Romans had offered and he had refused before the battle. By the peace of Apamea (188 B.C.) he abandoned all territory beyond the Taurus and agreed to pay the whole cost of the war. He had stood in the beauteous land — the land of Israel — with destruction in his hand. He had made agreement with Ptolemy. He had turned his face unto the isles and had taken many. But now a commander had put an end to his defiance and had even returned his reproach unto him (Dan. xi. 16-18). After Magnesia men said " King Antiochus the Great was " (Appian, Syr. 37); and the by-word was soon justified in fact, for he plundered a temple of Bel at Elymais to replenish his exhausted treasury and met the fitting punishment from the gods at the hands of the inhabitants (Diodorus xxix. 15). He stumbled and fell and was not found (Dan. xi. 19).

The need which drove Antiochus to this sacrilege rested heavily upon his successor Seleucus IV. (reigned 187-175 B.C.). The indemnity had still to be paid and Daniel ˆeucus designates Seleucus as " one that shall cause an exactor to pass through the glory of the kingdom " (xi. 20). A tradition preserved in 2 Mace. iii. describes the attempt of Heliodorus, the Seleucid prime minister, to plunder the temple at Jerusalem. The holy city lay in perfect peace and the laws were very

well kept because of the piety of Onias the high priest. But one Simon, a Benjamite, who had become guardian of the temple, quarrelled with Onias about the city market, and reported to the governor of Coele-Syria and Phoenicia that the treasury was full of untold sums of money. The priests and people besought Heliodorus to leave this sacred treasure untouched, but he persisted and — in answer to their prayers — was overthrown by a horse with a terrible rider and scourged by two youths. Onias, fearful of the consequences, offered a sacrifice for his restoration, and the two youths appeared to him with the message that he was restored for the sake of Onias. The description of the previous tranquillity may be exaggerated, though it is clear that the Jews, like the other inhabitants of Palestine, must have been left very much to themselves; but the enmity between the adherents of Simon and the pious Jews, who supported and venerated Onias, seems to be a necessary precondition of the state of affairs soon to be revealed. There were already Jews who wished to make terms with their overlord at all costs.

When Antiochus IV. Epiphanes (175-164 B.C.) succeeded to the throne, Jason — whose name betrays a leaning towards Aatlo-Hellenism — the brother of Onias, offered the king chus IV. a bribe for the high-priesthood and another for leave and Jason. to conver t Jerusalem into a Greek city (2 Mace. iv. 7 sqq.). Antiochus had spent his youth at Rome as a hostage, and the death of Seleucus found him filling the office of war minister" at Athens. The Hellenistic Jews were, therefore, his natural allies, and allies were very necessary to him if he was to establish himself in Syria. Onias had proceeded to.Antioch to explain the disorder and bloodshed due to Jason's followers, and so Jason, high priest of the Jews by grace of Antiochus,

had his way. The existing privileges, which the Jews owed to their ambassador to Rome, were thrust aside. In defiance of the law a gymnasium was set up under the shadow of the citadel. The young men of the upper classes assumed the Greek hat, and were banded together into a gild of ephebi on the Greek model. In fact Jason established in Jerusalem the institutions which Strabo expressly describes as visible signs of the Greek way of life — " gymnasia and associations of ephebi and clans and Greek names borne by Romans " (v. p. 264, referring to Neapolis) — and that on his own initiative. The party who wished to make a covenant with the heathen (1 Mace. i. n sqq.) were in the majority; and so far and so long as they were in the ascendant Antiochus was rid of his chief danger in Palestine, the debatable land between Syria and Egypt. At first Egypt was well disposed to him, as Cleopatra his sister was regent. But she died in 173 B.C.

The struggle for the possession of Palestine began in 170 B.C., when Rome was preoccupied with the war against Perseus of Macedonia. Antiochus sent an ambassador to Rome to protest that Ptolemy, contrary to all law and equity, was attacking him (Pclyb. xxvii. 17). In self defence, therefore, Antiochus advanced through Palestine and defeated the Egyptian army near Pelusium on the frontier. At the news the young king, Ptolemy Philometor, fled by sea, only to fall into his uncle's hands; but his younger brother, Ptolemy Euergetes II., was proclaimed king by the people of Alexandria (Polyb. xxix. 8). Thus Antiochus entered Egypt as the champion of the rightful king and laid siege to Alexandria, which was held by the usurper. When he abandoned the siege and returned to Syria, Philometor, whom he had established at Memphis, was reconciled with his brother, being convinced of his protector's duplicity by the fact that he left a Syrian garrison in Pelusium. In 168 B.C. Antiochus returned and found that the pretext for his presence there was gone. Moreover the defeat of Perseus at Pydna set Rome free to take a strong line in Egypt. As he approached Alexandria Antiochus met the Roman ambassador, and, after a brief attempt at evasion, accepted his ultimatum on the spot. He evacuated Egypt and returned home cowed (Dan. xi. 30; cf. Polyb. xxix. n). Later he could attend the celebration of the Roman triumph over Macedonia, and surpass it by a festival at Antioch in honour of his conquest of Egypt (Polyb. xxxi. 3-5) ; but the loss of Pelusium made it imperative that he should be sure of Palestine. His friends the Hellenizing Jews had split up into factions. Menelaus, the brother of Simon the Benjamite, had bought the high-priesthood over the head of Jason, who fled into the country of the Ammonites, in 172 B.C. (2 Mace, iv. 23 sqq.). To secure his position (for he was not even of the priestly tribe) Menelaus persuaded the deputy of Antiochus, who was dealing with a revolt at Tarsus, to put Onias to death. Antiochus, on his return, had his deputy executed and wept for the dead Onias. But Menelaus managed to retain his position, and his accusers were put to death. Antiochus could pity Onias, who had been tempted from the sanctuary at Daphne, but he needed an ally in Jerusalem — and money. Then, during the first or second invasion of Egypt, Jason, hearing that Antiochus was dead, returned suddenly and massacred all the followers of Menelaus who did not take refuge in the citadel. He had some claim to the loyalty of such pious Jews as remained, because he was of the tribe of Levi — in spite of the means he, like Menelaus, had employed to get the high-priesthood. His temporary success reveals the strength of the party who wished to adopt the Greek way of life without consenting to the complete substitution of the authority of Antiochus for the prescriptions of the Mosaic Law. It was also a warning to Antiochus, who returned to exact a bloody vengeance and

to loot the Temple (169 or 168 B.C.). After the evacuation of Egypt, Antiochus followed out the policy which Jason had suggested to him at the first. Jerusalem was suddenly occupied by one of his captains, and a garrison was planted in a new fortress on ff e fl en i smi Mount Zion. Then to coerce the Jews into con- formity, the Law was outraged in the Holy Place. The worship of Zeus Olympius replaced the worship of Yahweh, and swine

were offered as in the Eleusinian mysteries. At the same time the Samaritan temple at Shechem was made over to Zeus Xenius: it is probable that the Samaritans were, like the Jews, divided into two parties. The practice of Judaism was prohibited by a royal edict (1 Mace. i. 41-63; 2 Mace, vi.-vii. 42), and some of the Jews died rather than disobey the law of Moses. It is legitimate to suppose that this attitude would have surprised Antiochus if he had heard of it. His Jewish friends, first Jason and then Menelaus, had been enlightened enough to throw off their prejudices, and, so far as he could know, they represented the majority of the Jews. Zeus was for him the supreme god of the Greek pantheon, and the syncretism, which he suggested for the sake of uniformity in his empire, assuredly involved no indignity to the only God of the Jews. At Athens Antiochus began to build a vast temple of Zeus Olympius, in place of one begun by Peisistratus; but it was only finished by Hadrian in a.d. 130. Zeus Olympius was figured on his coins, and he erected a statue of Zeus Olympius in the Temple of Apollo at Daphne. More, he identified himself — Epiphanes, God Manifest — with Zeus, ‘ when he magnified himself above all other gods (Dan. xi. 37). To the minority of strict Jews he was therefore ” the abomination of desolation standing where he ought not “; but the majority he carried with him and, when he was dying (165 B.C.) during his eastern campaigns, he wrote to the loyal Jews as their fellow citizen and general, exhorting them to preserve their present goodwill towards him and his son, on the ground that his son would continue his policy in gentleness and kindness, and so maintain friendly relations with them (2 Mace. ix.).

For the Jews who still deserved the name the policy of Antiochus wore a very different aspect. Many of them became

martyrs for the Law, and for a time none would Revolt. raise his hand

to defend himself on the Sabbath if

at all. No record remains of the success of the Athenian missionary whom Antiochus sent to preach the new Catholicism; but the soldiers at any rate did their work thoroughly. At last a priestly family at a village called Modein committed themselves to active resistance; and, when they suspended the Sabbath law for purposes of self defence, they were joined by the Hasidaeans (Assidaeans), who seem to have been the spiritual ancestors of the Pharisees. The situation was plain enough: unless the particular law of the Sabbath was suspended there would soon have been none to keep the Law at all in Palestine. Jerusalem had apostatized, but the country so far as it was populated by Jews was faithful. Under Judas Maccabeus the outlaws wandered up and down re-establishing by force their proscribed religion. In 165 B.C. they attained their end, the regent of Syria conceded the measure of toleration they required with the approval of Rome; and in 164 B.C. the temple was purged of its desecration. But Judas did not lay down his arms, and added to his resources by rescuing the Jews of Galilee and Gilead and settling them in Judaea (1 Mace. v.). The Nabataean Arabs and the Greeks of Scythopolis befriended them, but the province generally was hostile. In spite of their hostility Judas more than held his own until the regent defeated him at Bethzachariah. The rebels were driven back on Mount Zion and were there besieged (163 B.C.). The rumour of a pretender to the throne saved them from destruction, and they capitulated, exchanging the strongholds they had for their lives. At any rate the time of compulsory fusion with the Greeks was ended once for all. In 162 B.C. Demetrius, the son of Seleucus, escaped from Rome and Was proclaimed king. Like Antiochus Epiphanes, who also had spent his youth as a hostage in Rome, he was inclined to listen to the Hellenizing Jews, whom he found assembled in full force at Antioch, and to support them against Judas, who was now supreme in Judaea. But he dealt more Akimus. surj tly with them: instead of a pagan missionary he

sent them Alcimus, a legitimate high-priest, who de- tached the Hasidaeans from Judas. Indeed, Alcimus and his company did more mischief among the Israelites than the heathen (1 Mace. vii. 23) and Judas took vengeance upon those who deserted from him. Nicanor was appointed governor and prevailed upon

Judas to settle down like an ordinary citizen. But Alcimus com- plained to the king and Judas fled just in time to escape being sent to Antioch as a prisoner. In the battle of Adasa, which soon followed, Nicanor was defeated and his forces annihilated, thanks to the Jews who came out from all the villages of Judaea (1 Mace. vii. 46). At this

point (161 B.C.) Judas sent an embassy to Rome and an alliance was concluded (1 Mace, viii.), too late to save Judas from the determined and victorious attack of Demetrius. The death of Judas at Elasa left the field open to the apostates, and his followers were reduced to the level of roving brigands. The Syrian general made fruitless attempts to capture them, and build forts in Judaea whose garrisons should harass Israel (1 Mace. ix. 50-53), but Jonathan and Simon, brothers of Judas, found their power increase until Jonathan ruled at Michmash as judge and destroyed the godless out of Israel (1 Mace. ix. 73).

In 153 B.C. there appeared another of the series of pretenders to the Syrian throne, to whose rivalry Jonathan, and Simon after him, owed the position they acquired for themselves and their nation. Jonathan was recog- an asimon. nized as the head of the Jews, and his prestige and power were such that the charges of the Hellenizing Jews received scant attention. As the years went on he became Strategus and the Syrian garrisons were withdrawn from all the strongholds except Jerusalem and Bethzur. In 147 B.C. he defeated the governor of Coele-Syria in another civil war and received Ekron as his personal reward — as it was said in the name of the prophet Zachariah (ix. 7), ” and Ekron shall be as a Jebusite.” The king for whom he fought was defeated; but his successor acceded to the demands of Jonathan, added three districts of Samaria to Judaea and freed the whole from tribute. The next king confirmed this and appointed Simon military commander of the district stretching from Tyre to Egypt. So with Syrian as well as Jewish troops the brothers set about subduing Palestine; and Jonathan sent ambassadors in the name of the high-priest and people of the Jews to Rome and Sparta. In spite of the treacherous murder of Jonathan by the Syrian general, the prosperity of the Jews was more than maintained by Simon. The port of Joppa, which was already occupied by a Jewish garrison, was cleared of its inhabitants and populated by Jews. Finally, in 141 B.C., the new era began: the yoke of the heathen was taken away from Israel and Simon was declared high-priest and general and ruler of the Jews for ever until there should arise a faithful prophet (1 Mace. xiii. 41, xiv. 41).

In 135 B.C. the political ambitions of the Jews were rudely checked: a new king of Syria, Antiochus Sidetes, resented their encroachments at Joppa and Gazara and drove them back into Jerusalem. In 134 famine compelled John hyrcanus. Hyrcanus, who had succeeded his father Simon, to a belated compliance with the king’s demands. The Jews laid down their arms, dismantled Jerusalem, and agreed to pay rent for Joppa and Gazara. But in 129 B.C. Antiochus died fighting in the East and for sixty-five years the Jews enjoyed indepen- dence. John Hyrcanus was not slow to take advantage of his opportunities. He

conquered the Samaritans and destroyed the temple on Mount Gerizim. He subdued the Edomites and compelled them to become Jews. Soon after his death his sons stormed Samaria, which Alexander the Great had colonized with Macedonian soldiers, and razed it to the ground. Judas Aristo- bulus, who succeeded and was the first of the Hasmonaeans, called himself king and followed his father's example by com- pelling the Ituraeans to become Jews, and so creating the Galilee of New Testament times. In this case, as in that of the Edomites, it is natural to suppose that there existed already a nucleus of professing Jews which made the wholesale conversion possible. By this time (103 B.C.) it was clear that the Hasmonaeans were — from the point of view of a purist — practically indistinguish- able from the Hellenizers whom Judas had opposed so keenly, except that they did not abandon the formal observances of Judaism, ajid even enforced them upon foreigners. Conse- quently the Jews were divided into two parties — Pharisees and Sadducees — of whom the Pharisees cared only for doing or

Pompey.

enduring the will of God as revealed in Scripture or in the events of history. This division bore bitter fruit in the reign of Pharisees Alexander Jannaeus (104-78 B.C.), who by a standing and army achieved a territorial expansion which was little

Sadducees. t0 t i, e m j n(j f t jj e Pharisees. At first his attack upon Ptolemais brought him into conflict with Egypt, in which he was worsted, but the Jewish general who commanded the Egyptian army persuaded the queen to evacuate Palestine. Then he turned to the country east of the Jordan, and then to Philistia. Later he was utterly defeated by a king of Arabians and fled to Jerusalem, only to find that the Pharisees had raised his people against him and would only be satisfied by his death. The rebels' appeal to the Seleucid governor of part of Syria (88 B.C.) caused a revulsion in his favour, and finally he made peace by more than Roman methods. Aretas, the Arabian king, pressed him hard on the south and the east, but he was able to make some conquests still on the east of the Jordan. In spite of his quarrel with the Pharisees, he seems to have offered the cities he conquered the choice between Judaism and destruction (Jos. Ant. xiii. 15, 4). .

Under Alexandra, his widow (78-69 B.C.), the Pharisees ruled the Jews and no expansion of the kingdom was attempted. It was threatened by Tigranes, king of Armenia, who then held the Syrian Empire, but a bribe and the imminence of the Romans (Jos. Ant. xiii. 16, 4; War i. 5, 3) saved it. At her death a civil war began between her sons, which left the

way open for Rome. Pompey's lieutenant Scaurus

entered Syria in 65 B.C., after the final defeat of Mithradates, and Pompey soon followed to take command of the situation. Three parties pleaded before him, the repre- sentatives of the rival kings and a deputation from the people who wished to obey no king, but only the priests of their God (Jos. Ant. xiv. 3, 2.) Pompey finally decided in favour of Hyrca- nus, and entered Jerusalem by the aid of his party. The adherents of Aristobulus seized and held the temple mount against the Romans, but on the Day of Atonement of the year 63 B.C. their position was stormed and the priests were cut down at the altars (Jos. Ant. xiv. 4, 2 — 4; War i. 7). Hyrcanus was left as high-priest — not king of the Jews — and his territory was curtailed. The coast towns and the Decapolis, together with Samaria and Scythopolis, were incorporated in the new Roman province of Syria.

In 61 B.C. Pompey celebrated the third of a series of triumphs over Africa, Europe and Asia, and in his train, among the prisoners of war, was Aristobulus, king of Judaea. Palestine meanwhile remained quiet until 57 B.C., when Alexander, the son of Aristobulus, escaped from his Roman captivity and attempted to make himself master of his father's kingdom. Aulus Gabinius, the new proconsul of Syria, defeated his hastily gathered forces, besieged him in one of the fortresses he had managed to acquire, and induced him to abandon his attempt in return for his life. The impotence of Hyrcanus was so obvious that Gabinius proceeded to deprive him of all political power by dividing the country into five cantons, having Jerusa- lem, Gazara, Amathus, Jericho, and Sepphoris, as their capitals. Other raids, headed by Aristobulus, or his son, or his adherent Peitholaus, disturbed Palestine during the interval between 57 and 51 B.C. and served to create a prejudice against the Jews in the mind of their masters. But with the civil wars which began in 49 B.C. there came opportunities which Hyrcanus, at the instance of Antipater, used to ingratiate himself with Caesar. Once more, as in the days of Simon, the suzerain power was divided against itself, and, though Rome was as strong as the Seleucids had been weak, Caesar was grateful. For timely help in the Egyptian War of 47 B.C. Hyrcanus was rewarded by the title of Ethnarch, and Antipater with the Roman citizen- ship and the office of

procurator of Judaea. The sons of Antipater became deputies for their father; and it appears that Galilee, which was entrusted to Herod, fell within his jurisdiction.

The power of this Idumaean family provoked popular tierods risings and Antipater was poisoned. But Herod held

his ground as governor of Coele-Syria and retained the favour of Cassius and Mark Antony in turn, despite the

complaints of the Jewish nobility. In 42 B.C., however, the tyrant of Tyre encroached upon Galilean territory and in 40 B.C. Herod had to fly for his life before the Parthians. Even as a landless fugitive Herod could count upon Roman support. At the instance of Mark Antony, and with the assent of Octavian, the senate declared him king of Judaea, and after two years' fighting he made his title good. Antigonus, whom the Parthians had set upon his throne, was beheaded by his Roman allies (37 B.C.). As king of the Jews (37-4 B.C.) Herod was completely subject and eagerly subservient to his Roman masters. In 34 B.C. (for example) or earlier, Mark Antony gave Cleopatra the whole of Phoenicia and the coast of the Philistines south of Eleuthesus, with the exception only of Tyre and Sidon, part of the Arabian territory and the district of Jericho. Herod acquiesced and leased Jericho, the most fertile part of his kingdom, from Cleopatra. In the war between Antony and Octavian Cleopatra prevented Herod from joining Antony and so left him free to pay court to Octavian after Actium (31 B.C.). A year later Octavian restored to the Jewish kingdom Jericho, Gadara, Hippos, Samaria, Gaza, Anthedon, Joppa and Straton's Tower (Caesarea) . Secure of his position, Herod began to build temples and palaces and whole cities up and down Palestine as visible embodiments of the Greek civilization which was to distinguish the Roman Empire from barbarian lands. A sedulous courtier, he was rewarded with the confidence of Augustus, who ordered the procurators of Syria to do nothing without taking his advice. But with the establishment of (relatively) universal peace Pales- tine ceased to be a factor in general history. Herod the Great enlarged his borders and fostered the Greek civilization of the cities under his sway. After his death his kingdom was dis- membered and gradually came under the direct rule of Rome. Herod Agrippa (a.d. 41-44) revived the glories of the reign of Alexandra and won the favour of the Pharisees; but his attempt to form a confederacy of client-princes was nipped in the bud. .Even the war which ended with the destruction of Jerusalem in a.d. 70, and the rebellion under Hadrian, which led to the edict forbidding the Jews to enter Jerusalem, are matters proper to the history of the Jews.

References to authorities other than Josephus are given in the course of the article; his Antiquities and War are the chief source for the period. All modern authorities are given by Schiirer.

(J- H. A. H.) III. — From A.D. 70 to the Present Day.

Owing to the peculiar conditions of the land and the varied interests involved in it, the later history may best be treated in four sections. In the first the general political history will be set forth; in the second a sketch will be given of the cult of the ” holy places “; the third will contain some particulars regarding the history of modern colonization by foreigners, which, while it has not affected the political status of the country, has produced very considerable modifications in its population and life; and the fourth will consist of a brief notice of the progress of exploration and scientific research whereby our knowledge of the past and the present of the land has been systematized.

1. Political History from A.D. 70. — The destruction of Jerusalem was followed by the dispersal of the Jews, of whom till then it had been the religious and political centre. The first seat of the sanhedrin was at Jamnia (Yebna), oi spers i oa , where the Rabbinic system began to be formulated. This extraordinary spiritual tyranny, for it seems little else, acquired a wonderful hold and exercised a singularly uniting power over the scattered nation. The sharp contrasts between its compulsory religious observances and those of the rest of the world prevented such an absorption of the Jewish people into the Roman Empire as had caused the disappearance of the ten tribes of Israel by their merging with the Assyrians.

It would appear that at first, after the destruction of the city, no specially repressive measures were contemplated by the conquering Romans, who rather attempted to reconcile the Jews to their subject state by a leniency which had proved successful in the case of other tribes brought by conquest within the empire.

But they had reckoned without the isolating influence of Rab- binism. Here and there small insurrections took place, in themselves easily suppressed, but showing the Romars that they had a turbulent and troublesome people to deal with. At last Hadrian determined to stamp out this aggressive Jewish nationalism. He issued an edict forbidding

the reading of the law, the observance of the Sabbath, and the rite of circumcision; and determined to convert the still half -ruined Jerusalem into a Roman colony.

The consequence .of this edict was the meteor-like outbreak of Bar-Cochebas (q.v.) a.d. 132-135. The origin of this person

and the history of his rise to power are unknown.

Nor is it certain whether he himself at first made

Bar- Cochebas.

a personal claim to be the promised Messiah; but it was his recognition as such by the distinguished Rabbi Akiba, then the most influential Jew alive, which placed him in the command of the insurrection, with 200,000 men at his command. Jerusalem was captured, as well as a large number of strongholds and villages throughout the country. Julius Severus, sent with an immense army by Hadrian, came to quell the insurrection. He recaptured Jerusalem, at the siege of which Bar-Cochebas himself was slain. The rebels fled to Bether — the modern Bittir, near Jerusalem, where the fortress garrisoned by them still remains, under the name Khurbet el-Yahud, or ” Ruin of the Jews ” — and were there defeated and slaughtered in a sanguinary encounter. It is said that as many as 580,000 men were slain! Hadrian then turned Jerusalem into a Roman colony, changed its name to Aelia Capitolina, built a temple of Jupiter on the site of the Jewish temple and (it is alleged) a temple of Venus on the site of the Holy Sepulchre, and forbade any Jew, on pain of death, to appear within sight of the city.

This disaster was the death-blow to hopes of a Jewish national independence, and the leaders of the people devoted R bbi ic themselves thenceforth to legal and religious study Schools. m tne Rabbinical schools, which from a.d. 135 (the year of the suppression of the revolt) onwards developed in various towns in the hitherto despised province of Galilee. Shefa ‘Amr (Shafram), Sha’arah (Shaaraim) and espe- cially Tubariya (Tiberias) became centres of this learning: and the remains of synagogues of the 2nd or 3rd century which still exist in Galilee attest the strength of Judaism in that district during the years following the abortive attempt of Bar-Cochebas.

Palestine thus continued directly under Roman rule. In a.d. 105, under Trajan, Cornelius Palma added Gilead and Moab to the empire. In 295

Auranitis, Batanea and Trachonitis were added to the province.

The pilgrimage of the Empress Helena properly belongs to the second section into which we have divided this history; we therefore pass it over for the present. The conversion of Constantine to Christianity — or rather the profession of Chris- tianity by Constantine — seemed likely to result in another Jewish persecution, foreshadowed by severe repressive edicts. This, however, was averted by the emperor's death.

The progress of the corrupt Christianity of the empire of Byzantium was checked for a while under Julian the Apostate, who, among other indications of his opposition to Christianity, rescinded the edicts against the Jews on his coming to the throne in 361, and gave orders for the restoration of the Jewish temple. The latter work was interrupted almost as soon as begun by an extraordinary phenomenon — the outburst of flames and loud detonations, easily explained at the time as a divine judgment on this direct attempt to falsify the prophecy of Christ. It has been ingeniously suggested in this more scientific generation that the explosion was due to the ignition of some forgotten store of oil or naphtha, such as was said to have been stored in the temple (2 Mace. i. 19-23, 36), and similar to a store discovered, with less disastrous consequences, in another part of the city early in the 19th century. 1

On the partition of the empire in a.d. 395 Palestine naturally fell to the share of the emperor of the East. From this onward for more than two hundred years there is a period

1 See Palestine Expl. Fund Quarterly Statement, 1902, p. 389.

of comparative quiet in Palestine, with no external political

interference. The country was nominally Christian; the only

history it displays being that of the development

of pilgrimage and of the cult of holy places and of Empire*.'

relics, varied by occasional persecutions of the Jews.

The elaborate building operations of Justinian (527-565) must

not be forgotten. The " Golden Gate " of the Temple area

and part of the church which is now the El-Aksa Mosque at

Jerusalem, are due to him.

Not till 611 do we find any event of importance in the uninteresting record of Byzantine sovereignty. But this and the following years were signalized by a series of catastrophes of the first magnitude. Chosroes II. osroes “• (g.v.), king of Persia, made an inroad into Syria; joined by the Jews, anxious to revenge their misfortunes, he swept over the country, carrying plunder and destruction wherever he went. Monasteries and churches were burnt and sacked, and Jerusalem was taken; the Holy Sepulchre church was destroyed and its treasures carried off; the other churches were likewise razed to the ground; the patriarch was taken prisoner. It is alleged that 90,000 persons were massacred. Thus for a time the province of Syria with Palestine was lost to the empire of Byzantium.

The Emperor Heraclius reconquered the lost territory in 629. But his triumph was short-lived. A more formidable enemy was already on the way, and the final wresting of Syria from the feeble relics of the Roman Empire was imminent.

The separate tribal units of Arabia, more or less impotent when divided and at war with one another, received for the first time an indissoluble bond of union from the prophet Mahomet, whose perfect knowledge of fsˆ m ° f human nature (at least of Arab human nature) enabled him to formulate a religious system that was calculated to command an enthusiastic acceptance by the tribes to which it was primarily addressed. His successor, Abu Bekr, called on the tribes of Arabia to unite and to capture the fertile province of Syria from the Christians. Heraclius had not sufficient time to prepare to meet this new foe, and was defeated in his first engagement with Abu Bekr. (For the general history of this period see Caliphate). The latter seized Bostra and proceeded to march to Damascus. He died, however, before carrying out his design (a.d. 634), and was succeeded by Omar, who, after a siege of seventy days entered the city. Other towns fell in turn, such as Caesarea, Sebusteh (Samaria), Nablus (Shechem), Lydd, Jaffa.

Meanwhile Heraclius was not idle. He» collected a huge army and in 636 marched against the Arabs. The latter retreated to the Yarmuk River, where the Byzantines met them. Betrayed, it is said, by a Christian who had suffered personal wrongs at the hands of certain of the Byzantine generals, the army of Heraclius was utterly defeated, and with it fell the Byzantine Empire in Syria and Palestine.

After this victory Omar’s army marched against Jerusalem, which

after a feeble resistance capitulated. The terms of peace, though on the whole moderate, were of a galling and humiliating nature, being ingeniously contrived to make the Christians ever conscious of their own inferiority. Restrictions in church-building, in dress, in the use of beasts of burden, in social intercourse with Moslems, and in the use of bells and of the sign of the cross were enforced. When these terms were agreed upon and signed Omar, under the leadership of the Christian patriarch Sophronius, visited the Holy Rock (the prayer-place of David and the site of the Jewish temple). This he found to be defiled with filth, spread upon it by the Christians in despite of the Jews. Omar and his followers in person cleaned it, and established the place of prayer which, though later rebuilt, has borne his name ever since.

Dissensions and rivalries soon broke out among the Moslem leaders, and in 661 Moawiya, the first caliph of the Omayyad dynasty, transferred the seat of the caliphate from Mecca to Damascus, where it remained till the Abbasids seized the sovereignty and transferred it to Bagdad

Omar.

FROM A.D. 70]

PALESTINE

623

(750). Rivals sprang up from time to time. In 684 Caliph Abdalmalik (‘Abd el-Melek), in order to weaken the prestige of Mecca, set himself to beautify the holy shrine of Jerusalem, and built the Kubbet es-Sakhrah, or Dome of the Rock, which still remains one of the most beautiful buildings in the world (Caliphate: B 5). In 831 the Church of the Holy Sepulchre was restored; but about a hundred years later it was again destroyed as a result of the revolt of the Carmathians (q.v.), who in 929 pillaged Mecca. This produced a Moslem exodus to Jerusalem, with the consequence mentioned. The Carmathian revolt, one of the first of the great splits in the Moslem world, was followed by others: in 936 Egypt declared its independence, under a line of caliphs which claimed descent from Fatima, daughter of the prophet (see Fatimites); and in 996 Hakim Bi-amrillah mounted the Egyptian throne. This madman caused the church of the Holy Sepulchre to be entirely destroyed: and giving himself out to be the incarnation of Deity, his cult was founded by two Persians, Darazi and Hamza ibn Ah, in the Lebanon; where among the Druses it still persists (see

Druses).

The contentions between the Abbasid and Fatimite caliphs continued till 1072, when Palestine suffered its next invasion. This was that of the Seljuk Turkomans from Khorasan. On behalf of their king, the Khwarizmian general Atsiz invaded Palestine and captured Jerusalem and Damascus, and then marched on Egypt to carry out his original purpose of de- stroying the Fatimites. The Egyptians, however, repulsed the invaders and drove them back, retaking the captured Syrian cities.

The sufferings of the Christians and the desecrations of their sacred buildings during these troubled times created wide-spread indignation through the west : and this indignation was inflamed

into fury by Peter the Hermit, a native of Picardy, Crusades. wno m ear ly UIe na d been a soldier. In 1093 he

went in pilgrimage to Jerusalem, and in his wrath at the miseries of the pilgrims he returned to Europe and preached the duty of the Church to rescue the ” holy places ” from the infidel. The Church responded, and under Peter’s leadership a motley crowd, principally of French origin, set out in 1096 for the Holy Land. Others-, under better general- ship, followed; but of the 600,000 that started from their homes only about 40,000 succeeded in reaching Jerusalem, ill-discipline, famine and battles by the way having reduced their ranks. They captured Jerusalem, however, in July 1099, and the leader of the assault, Godfrey of Boulogne, was made king of Jerusalem.

So was founded the Latin kingdom of Jerusalem, whose history is one of the most painful ever penned (see Crusades).

It is a record of almost unredeemed ” envy, hatred, Kingdom. anc ˆ malice,” and of vice with its consequent diseases,

all rendered the more repulsive in that its transactions were carried on in the name of religion. For 88 turbulent years this feudal kingdom was imposed on the country, and then it disappeared as suddenly as it came, leaving no trace but the ruins of castles and churches, a few place-names, and an undying hereditary hatred of Christianity among the native population.

The abortive Second Crusade (1147), led by the kings of France and Germany, came to aid the rapidly weakening Latin kingdom after their failure to hold Edessa against Nureddin, the ruler of northern Syria.

In 1 1 73 Nureddin died, and his kingdom was seized by Saladin (Salah ed-Din), a man of Kurdish origin, who had previously distinguished himself by capturing Egypt in company with Shirkuh, the general of Nureddin. Saladin almost immediately set himself to drive the Franks from the country. The Frankish king was the boy Baldwin IV., who had paid for the errors of his fathers by being afflicted with leprosy. After being defeated by Saladin at Banias, the Franks were compelled to make a treaty with the Moslem leader. The treaty was broken, and Saladin proceeded to take action. The wretched leper king meanwhile died, his successor, Baldwin V. also a young boy,

was poisoned, and the kingdom passed to the worthless Guy de Lusignan, who in the following year (1187) was crushed by Saladin at the battle of Hattin, which restored the whole of Palestine to the Moslems.

The Third Crusade (1189) to recover Jerusalem was led by Frederick I. of Germany. Acre was captured, but quarrels among the chiefs of the expedition made the enterprise ineffective. It was in this crusade that Richard Coeur-de-lion was especially distinguished among the Frankish warriors.

Saladin died in n 93. In n 98 and 1204 took place the Fourth and Fifth Crusades — mere expeditions, as abortive as the third. And as though it were foreordained that no element of horror should be wanting from the history of the crusades, in 1212 there took place one of the most ghastly tragedies that has ever happened in the world— the Crusade of the Children. Fifty thousand boys and girls were persuaded by some pestilent dreamers that their childish innocence would effect what their immoral fathers had failed to accomplish, and so left their homes on an expedition to capture the Holy Land. The vast majority never returned; the happiest of them were ship- wrecked and drowned in the Mediterranean. This event is of some historical importance in that it indicates how obvious to their contemporaries was the evil character of those engaged in the more serious expeditions. 1

The other four crusades which took place from time to time down to 1272 are of no special importance, though there is a certain amount of interest in the fact that after the sixth crusade, in 1229, emperor Frederick II. was permitted to occupy Jerusalem for ten years. But a new element, the Mongolians of Central Asia, now bursts in on the scene. The tribes from east of the Caspian had conquered Persia in 12 18. They were driven westward by pressure of the Tatars, and in 1228 had been called by the ruler of Damascus to his aid. In 1240, however,

they transferred their alliance to the sultan of Egypt, and pillaged Northern Syria. Driven downward through Galilee they seized Jerusalem, massacred its inhabitants and plundered its churches. They then marched on to Gaza, where the Egyptians joined them, and together inflicted a crushing defeat on the Christians and Moslems of Syria, for once compelled to unite by the common danger. The Khwarizmians and Egyptians afterwards quar- relled, and the former were compelled to retire, leaving Palestine under the rule of the Mameluke 2 sultans of Egypt. Shortly afterwards however, another Central Asiatic invasion — that of the Tatar tribes, took place. Under their leader Hulagu these tribes came by way of Bagdad, which they captured in 1258, and in 1260 they attacked and captured Damascus and ravaged Syria. Bibars (Beibars, Baibars), general of the Egyptian sultan Kotuz, met and drove them back; and having murdered his master, became sultan in his stead. He then proceeded to attack and destroy the relics of Christian posses- sion in Palestine. One after another — Caesarea, Safed, Jaffa, Antioch — they fell, leaving at last Acre (Akka) only. Bibars died in 1277, and in 1291 Acre itself was captured by Khatel son of Kala'un, who thus put a final end to Frankish domination.

During the 14th century there is little of interest in the history of Palestine. The Christians made efforts to creep back to their former possessions and churches were rebuilt in Jerusalem, Bethlehem and Nazareth; but another devastation was the result of the ferocious inroads of the Mongolian Timur (Tamerlane) in 1400.

The last stage of the history of Palestine was reached in 1516, when the war between the Ottoman sultan and the Mamelukes of Egypt resulted in the transference of the country to the dominion of the Turks. This change of rulers Dominion. did not produce much change in the administration or condition of the country. Local governors were appointed from headquarters: revenues were annually sent to Constan- tinople: various public works were undertaken, such as the

1 This story is probably the historic basis of the legend of the " Pied Piper of Hamelin."

2 The Mamelukes were originally military slaves, who in Egypt succeeded in seizing the supreme power. See Egypt: History (Moslem period).

rebuilding of the walls of Jerusalem by Suleiman the Magnificent (J 537) : but on the whole Palestine ceases for nearly three hundred years from this point to have a history, save the dreary record of the sanguinary quarrels of local sheiks and of oppression of the peasants by the various government officials. Few names or events stand out in the history of this period: perhaps the most interesting personality is that of the Druse prince Fakhr ud-Din (1595-1634), whose expulsion of the Arabs from the coast as far south as Acre and establishment of his own kingdom, in defiance of Ottoman authority — to say nothing of his dilettante cultivation of art, the result of a temporary sojourn in Italy — • make him worth a passing notice. The German botanist, Leonhard Rauwolf (d. 1596 or 1606), who visited Palestine in 1575, has left a vivid description of the difficulties that then beset even so simple a journey as that from Jaffa to Jerusalem. The former town he found in ruins. A safe conduct had to be obtained from the governor of Ramleh before the party could proceed. At Yazur they were stopped by an official who extorted heavy blackmail on the ground that the sultan had given him charge of the ” holy places ” and had forbidden him to admit anyone to them without payment (!). Further on they had a scuffle with certain ” Arabians “; and at last, after successfully accomplishing the passage of the ” rough and stony ” road that led to Jerusalem, they were obliged to dismount before the gate of the city till they should receive license from the governor to enter.

Towards the close of the 18th century a chief of the family of Zaidan, named Dhaher el-Amir, rose to power in Acre. To El-Jazzar. ˆ m ˆd from Egypt an Albanian slave named Ahmed, who (from the expertness with which he had been wont to carry out his master’s orders to get rid of inconvenient rivals) bore the surname el-Jazzar, ” the butcher.” He had, however, incurred punishment for refusing to obey a command of his master, Mahommed Bey, and so took refuge with the Palestinian sheik. After five years Mahommed Bey died and el-Jazzar returned to Egypt. Dhaher revolted against the- Turkish government and el-Jazzar was commis- sioned to quell the rising; his long residence with Dhaher having given him knowledge which marked him out as the most suitable for the purpose. He was successful in his enterprise, and was installed as governor in. Dhaher’s place. He was a man of barbaric aesthetic tastes, and Acre owes some of its public buildings to him: but he was also capricious and tyrannical, and well lived up to his surname. Till 1791 the French had had factories and business establishments at Acre; 1 el-Jazzar ordered them in that year summarily to leave the town. In 1798 Napoleon, returning from his unsuccessful attempt at founding an empire on the

Nile, came to stir up a Syrian rising against the Turkish authorities. He attacked el-Jazzar in Acre, after capturing Jaffa, Ramleh and Lydd. A detachment of troops was sent under General Jean Baptiste Kleber across the plain of Esdraelon to take Nazareth and Tiberias, and defeated the Arabs between Fuleh and Afuleh. Napoleon was however compelled by the English to raise the siege. El-Jazzar died in 1806 and was succeeded by his milder adopted son, Suleiman, who on his death in 1814 was followed by the fanatic Abdullah. This bigoted Moslem caused the Jewish secretary of his office to be murdered. The Jew had anticipated just such an event, and had secretly arranged that after his death an inventory of Abdullah's property should fall into the hands of the government — knowing that the latter had claims on the estates of el-Jazzar and Suleiman. The government accordingly pressed their claims: Abdullah refused to pay and was besieged in Acre. He called for the intervention of Mehemet Ali, governor of Egypt; the latter settled the dispute, but Abdullah then refused to discharge the claims of Mehemet Ali. The latter accordingly sent 20,000 men under the command of his son Ibrahim Pasha, who besieged Acre in 1 83 1 and entered and plundered it. So began the short- lived Egyptian domination of Palestine. Mehemet Ali proved

1 When . this French colony was established is uncertain ; Maundrell found them there at the end of the 17th century.

no less a tyrannical master than the Turks and the sheiks; the country revolted in 1834, but the insurrection was quelled. In 1840 Lebanon revolted; and in the same year the Turks, with the aid of France, England and Austria, regained Palestine and expelled the Egyptian governor.

From 1840 onwards the Ottoman government gradually strengthened its hold on Palestine. The power of the local sheiks was step by step reduced, till it at last became evanescent — to the unmixed advantage of the whole history. country; and the increase of European interests has led to the establishment of consulates and vice-consulates of the great powers in Jerusalem and in the ports.

The battle of religions still continued. In 1847 the dispute in the Church of the Nativity at Bethlehem about the right to mark with a star the birthplace of Christ became one of the prime causes of the Crimean war. In i860 occurred a sudden anti- Christian outbreak in Damascus and the Lebanon, in which 14,000 Christians were massacred. On the other hand it may be mentioned that on the 30th of June 1855 the cross was for the first time since the crusades borne aloft through the streets of Jerusalem on the occasion of the visit of a

European prince; and that in 1858 the sacred area of the Haramesh-Sherif — the mosque on the site of the Temple of Jerusalem — was for the first time thrown open to Christian visitors. The latter half of the 19th century is mainly occupied with the record of a very remarkable process of colonization and settlement — French and Russian monastic and other establishments, some of them semi-religious and semi-political; German colonies; fanatical American communities; Jewish agricultural settlements — all, so to speak, ” nibbling ” at the country, and each so intent upon gaining a step on its rivals as to be forgetful of the gathering storm. For in the background of all is the vast peninsula of Arabia, which at long intervals fills with its wild, untamable humanity to a point beyond which it cannot support them. This has been the origin of the long succession of Semitic waves — Babylonian, Assyrian, Canaanite, Hebrew, Nabataean, Moslem— that have flowed over Mesopotamia and Palestine; there is every reason to suppose that they will be followed by others, and that the Arab will remain master at the end, as he was in the beginning. ‘ ;

In 1896 Herzl (q.v.) issued his proposal for the establishment of a Jewish state in Palestine and in 1898 he came to the country to investigate its possibilities. The same year was signalized by the picturesque visit of the German emperor, William II., which gave a great stimulus to German interests in the Holy Land.

In 1902 Palestine was devastated by a severe epidemic of cholera. In 1906 arose a dispute between the British and Turkish governments about the boundary between Turkish and Egyptian territory, as the Turks had interfered with some of the landmarks. A joint commission was appointed, which marked out the boundary from Rafah, about midway between Gaza and El-Arish, in an almost straight line S.S.W. to Tabah in 29 30′ on the west side of the gulf of Akaba. A map of the boundary will be found in the Geographical Journal (1907), xxix. 88.

2. The Holy Places. — To the vast majority of civilized humanity, Jewish, Christian and Moslem, the religious interest of the associations of Palestine predominates over every other, and at all ages has attracted pilgrims to its shrines. We need not here do more than allude to the centralization of Jewish ideas and aspirations in Jerusalem, especially in the holy rock on which tradition (and probably textual corruption) have placed the scene of Abraham’s sacrifice of Isaac, and over which the Most Holy Place of the Temple stood. The same associations are those of the Moslem, whose religion has so strangely absorbed the prophets and traditions of the older faiths. Other shrines, such as the alleged tomb of Moses, and the mosque of Hebron over the cave of Machpelah, are the centres of Moslem pilgrimage. Christianity

is however responsible for the greatest development of the cult of holy places, and it is to the sacred shrines of Christendom that we propose to confine our attention.

There is no evidence that the earliest Christians were imbued tvith the archaeological spirit that interested itself in sites which the Risen Lord had vacated. The site of Golgotha and of the the Holy Sepulchre, of the manger or of the home at Bethany, were to them of no special moment in comparison with the one all-important fact that ” Christ was risen.” It was not till the clear-cut impress of the events of Christ’s life, death and resurrection had with the lapse of years faded from human recollection, that there arose a desire to ” seek the living among the dead.” The story begins with Helena, mother of Constantine the Great, who became fired with zeal to fix definitely the spots where the great events of Christianity had taken place, and in a.d. 326 visited Palestine for the purpose. Helena’s pilgrimage was, as might be expected, Sepulchre attended with complete success. The True Cross was discovered; and by excavation conducted under Constantine’s auspices, the Holy Sepulchre, ” contrary to all expectation ” as Eusebius naively says, was discovered also (see Jerusalem; and Sepulchre, The Holy). The seed thus sown rapidly germinated and multiplied. The stream of pilgrimage to the Holy Land began immediately, and has been flowing ever since. Onwards from a.d. 33$, when an anonymous pilgrim from Bordeaux visited the ” holy places ” and left a succinct account of his route and of the sights which came under his notice, we possess a continuous chain of testimony written by pilgrims relating what they heard and saw.

It is a pathetic record. No site, no legend, is too impossible for the unquestioning faith of these simple-minded men and women. And by comparing one record with another, we can follow the multiplication of ” holy places,” and sometimes can even see them being shifted from one spot to another, as the centuries pass. Not one of these devout souls had any shadow of suspicion that, except natural features (such as the Mount of Olives, the Jordan, Ebal, Gerizim, &c.) and possibly a very few individual sites (such as Jacob’s well at Shechem), there was not a single spot in the whole elaborate system that could show even the flimsiest evidence of authenticity! The growth and development of ” holy sites ” can best be illustrated, in an article like the present, by a

few figures. The account of the ” holy places ” seen in Palestine by the Bordeaux pilgrim, just mentioned, occupies twelve pages in the translation of the Palestine Pilgrims’ Text Society (in whose publications the records of these early travellers can most conveniently be studied): and those twelve pages may be reduced to seven or eight as they are printed with wide margins, and have many footnotes added by the editor. On the other hand the ex- periences and observations of Felix Fabri, a Dominican monk who came to Palestine about a.d. 1480, occupies in the same series two large volumes of over 600 pages each ! 1

This process of development has been illustrated in our own time — a single instance will suffice. In the so-called ” Via Dolorosa ” is a cave which was opened and planned about 1870. It subsequently became closed and forgotten, houses covering its entrance. In 1906 it was re-opened, the houses being cleared away, and a hospice for Greek pilgrims erected in place of them. During these works some local archaeologists attempted to pene- trate the cave but were driven away by the labourers with curses. At last the hospice was finished and the cave opened for inspection. A pair of stocks was then shown beautifully cut in the rock, where no stocks appeared in the plan of 1870; with a crude painting suspended on the wall above, blasphem- ously representing the Messiah confined in them ! 2

The Franciscans were nominated custodians cf the ” holy places ” by Pope Gregory IX. in 1230. Certain sites have, however, always been held by the Oriental sects, and since 1808, when the Holy Sepulchre church was destroyed by fire, the number of these has greatly increased. Indeed the 19th

1 This comparison is made in full realization of the fact that the Bordeaux record is a dry catalogue, and that Fabri ‘s work is swelled by the miscellaneous gossip and ” padding ” which makes it one of the most delightful books ever written in the middle ages.

2 See the exposure in the Revue Biblique (the organ of the Dominican 6chool of St Stephen at Jerusalem) for 1907.

century was disgraced, in Palestine, by a feverish ” scramble ” for sacred sites, in which the most rudimentary ethics of Christianity were forgotten in the all-mastering desire to oust rival sects and orders. Bribery, fraud, even violence, have in turn been employed to serve the end in view: and churches, chapels and monasteries, most of -them in the worst architectural taste, have sprung up like mushrooms over the surface of the country, and are perpetuating the memory of pseudo-

sanctuaries which from every point of view were best relegated to oblivion. The zeal and self-sacrificing devotion which some of these establishments, and their inmates, display, and their noble labours on behalf of the country, its people and its history throw into yet more painful relief the actions and attitudes of some of their fellow-Christians.

The authenticity of the ” holy places ” was first attacked seriously in the 18th century by a bookseller of Altona named Korte; and since he led the way, a steady fire of criticism has been poured at this huge mass of invention. The process of manu- facturing new sites, however, continues unchecked. Even the Protestant churches are not exempt from blame in the matter; a small tomb near the Damascus Gate of Jerusalem has been fixed upon by a number of English enthusiasts as the true ” Holy Sepulchre,” an identification for which there is nothing to be said. The monasteries of the Roman communion and their residents were under French protection until the disturbance between Greek and Franciscan monks in the Holy Sepulchre church (Nov. 4, 1901), which arose over the question as to the right to sweep a certain flight of stairs. Stones and other weapons were freely used, and several of the combatants and bystanders were seriously injured. As one result of the subsequent investiga- tions, Latin monks of other countries were assigned to the protection of the consuls of those countries.

3. Colonization. — Down to the time of Mehemet Ali the only foreigners permanently resident in the country were the members of various monastic orders, and a few traders, such as the French merchants of Acre. The first protestant missionaries (those under the London Society for the Promotion of Christianity among the Jews), settled in Jerusalem in 1823; to them is due the inception of the trade in olive-wood articles, invented for the support of their converts. In 1 846-1 848 a remarkable religious brotherhood (the Bruderhaus, founded by Spittler of Basel) settled in Jerusalem: it was originally intended to be a settle- ment of celibate mechanics that would form a nucleus of mission work to evangelize the world. One of this community was Dr C. Schick, who lived over 50 years in Jerusalem, and made many valuable contributions to its archaeology. In 1849 came the first of several examples that have appeared in Palestine from time to time of that curious product of American religious life — a community of dupes or visionaries led by a prophet or prophetess with claims to divine guidance. The leader in this case was one Mrs Minor, who. came to prepare the land for the expected Second Advent. Her followers quarrelled and separated in 1853. This event is of importance, as it had much to do with the remarkable development

of Jewish colonization which is a special feature of the latter part of the history of the 19th century in Palestine. For Mrs Minor, having an interest in the Jewish people, was befriended by Sir Moses Montefiore; after her death her property was placed in charge of a Jew, and later passed into the hands of the Alliance Israelite Universelle. This body in 1870 established an agricultural colony for Jews on the road from Jaffa to Jerusalem (" Mikweh Israel ").

Another visionary American colony, led by a certain Adams, came in 1866. They brought with them framed houses from America, which are still standing at Jaffa. But the Adamsites suffered from disease and poverty, and lost heart in a couple of years: returning to America, they sold their property to a German community, the Tempelgemeinde, a Unitarian sect led by Messrs Hoffmann and Hardegg who established themselves in Jaffa in 1868. Unlike the ill-fated American communities, these hardy Wiirttemberg peasants have flourished in Palestine, and their three colonies—at Jaffa, Haifa, and Jerusalem—are the most important European communities now in the country

Since 1870 there has been a steady development of Jewish immigration, consisting principally of refugees from countries where anti-Semitism is an important element in politics. Baron de Rothschild has invested large sums in Jewish colonies, but at the commencement of the present century he handed over their administration to the Jewish Colonization Association. Time alone can show how far these colonies are likely to be permanently successful, or how the subtly enervating influence of the climate will affect later generations.

4. Exploration. — Previous to the 19th century the turbulent condition of the country made exploration difficult, and, off the beaten track, impossible. There are many books written by early pilgrims and by more secular travellers who visited the country, which — when they are not devoted to the setting forth of valueless traditions, as is too often the case — give very useful and interesting pictures of the conditions of life and of travel in the country. Scientific exploration does not begin before Edward Robinson, an American clergyman, who, after devoting many years to study to fit himself for the work, made a series of journeys through the country, and under the title of Biblical Researches in Palestine (1841-1856) published his itineraries and observations. His work is marred by the hastiness of his visits and consequent superficiality of his descriptions of sites, and by some rash

and untenable identifi- cations: but it is at once a standard and the foundation of all subsequent topographical work in the country. He was worthily followed by Titus Tobler, who in 1853 and later years published volumes abounding in exact observation; and by V. Guerin, whose Description giographique, historique, et archeologique de la Palestine, in 7 vols. (1868-1880), contains an extraordinary mass of material collected in personal travel through the country.

In 1864 was founded the Palestine Exploration Fund, under the auspices of which an ordnance survey map of the country was completed (published 1881), and accompanied by volumes containing memoirs on the topography, orography, hydro- graphy, archaeology, fauna and flora, and other details. A similar work east of the Jordan was begun but (1882) stopped by the Ottoman government. The same society initiated the scientific exploration of the mounds of Palestine. In 1891 it excavated Tell el-Hesi (Lachish); in 1 896-1 898 the south wall of Jerusalem; in 1898-1900 Tell es-Safi (Gath) and some smaller mounds in the Shephelah; all under the direction of Dr F. J. Bliss. In 1902 it began the excavation of Gezer under the direction of R. A. S. Macalister (see Gezer).

The example thus set has been followed by French, German and American explorers. The Deutscher Falastina-Verein was founded in 1878, and under its auspices important surveys have been carried out, especially those of G. Schumacher east of the Jordan; Tell el-Mutesellim (Megiddo) has also been excavated. The Austrian Dr E. Sellin, working independently, has excavated Tell Ta'nuk (Taanach), and in 1907 began work upon the mount of Jericho. An admirable biblical and archaeological school, under the control of the Dominican order, exists at Jerusalem; and German and American archaeological institutions, educa- tional in purpose, are also there established. Valuable work in exploration is annually done by the directors of these schools and by their pupils. Under this head we must not omit to mention A. Musil's investigations of some remote parts of Eastern Palestine, and R. E. Brunnow's great survey of Petra, with part of Moab and Edom.

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(R. A. S. M.)

PALESTINE, a city and the county-seat of Anderson county, Texas, U.S.A., about 90 m. E. by N. of Waco. Pop. (1910 cen- sus) 10,482. It is served by two lines of the International & Great Northern railway, and by the Texas State railway. Palestine is the trade centre of a district which produces cotton, timber, fruit (especially peaches), an excellent grade of wrapper tobacco, petroleum, iron-ore and salt. It has various manu- factures, including cotton gins, cotton-seed oil, cigars, lumber and brick. Its factory products were valued at $735,162 in 1905. About 2 m. south-west of Palestine a settlement (the first in the present Anderson county) was made in 1837, and there Fort Houston, a stockade fort, was built to protect the settlers from the Indians. Palestine was laid out and was

made the county-seat in 1846; it was chartered as a city in 1875, and rechartered in 1905. In 1909 it adopted a commission government.

PALESTRINA, GIOVANNI PIERLUIGI DA (1526-1594), Italian composer, was born in Palestrina (the ancient Praeneste) at the foot of the Sabine mountains, in 1526. The various versions of his name make an interesting record. He appears as Palestina, Pellestrino, Gio. Palestina, Gianetto Palestrina, Gianetto da Palestrina, Gian Pierl. de Palestrina, Joh. Petrus Aloisius, Jo. Petraloys, Gianetto, Giov. Prenestini, Joannes Praenestinus, Joannes Petraloysius Prenestinus.

Palestrina seems to have been at Rome from 1540 to 1544, when he studied possibly under Gaudio Mell, but not under Goudimel as has erroneously been assumed. On the 12th of June 1547 he married Lucrezia de Goris. In 1551, by favour of Pope Julius III., he was elected Magister Cappellae and Magis- ter Puerorum at the Cappella Giulia, S. Pietro in Vaticano, with a salary of six scudi per month, and a house. Three years later he published his First Book of Masses, dedicated to Pope Julius III., and beginning with the missa ” Ecce sacerdos magnus.” On the 13th of January 1555, Palestrina was enrolled, by com- mand of Pope Julius III., among the singers of the Cappella Sistina. This honour involved the resignation of his office at the Cappella Giulia, which was accordingly bestowed upon his friend Animuccia. But the legality of the new appointment was disputed on the ground that Palestrina was married, and the father of four children, his wife, Lucrezia, being still alive; and, though, for the moment, the pope’s will was law, the case assumed a different complexion after his death, which took place only five weeks

afterwards. The next pope, Marcellus II., was succeeded after a reign of 23 days, by Paul IV.; and within less than a year (July 30, 1555) that stern reformer dismissed Palestrina, together with two other married singers, A. Ferrabosco and Bari, with a consolatory pension of six scudi per month to each. This cruel disappointment caused Palestrina a dangerous illness; but in October 1555 he was appointed maestro di cappella at the Lateran, without forfeiting his pension; and in February 1561 he exchanged this preferment for a similar one, with an allowance of 16 scudi per month, at Santa Maria Maggiore.

Palestrina remained in office at this celebrated basilica for ten years, and to this period is assigned an important chapter in the history of music. Many circumstantial details of this chapter are undoubtedly legends, due to the pious imagination of Baini and others. In 1562 the council of Trent censured the prevalent style of ecclesiastical music with extreme severity. In 1564 Pope Pius IV. commissioned eight cardinals to investi- gate the causes of complaint; and these proved to be so well founded that it was seriously proposed to forbid the use of all music in the services of the. Church, except unisonous and un-accompanied plain-chant. In these circumstances Palestrina is said to have been invited by two of the most active members of the commission to come to the rescue. He accordingly submitted three masses to Cardinal Carlo Borromeo for approval. These were privately rehearsed, in presence of the commissioners, at the palace of Cardinal Vitellozzi; and the judges were unani- mous in deciding that the third mass fulfilled, in the highest possible degree, all the conditions demanded. The private trial took place in June 1565, and on the 19th of that month the mass was publicly sung at the Sistine Chapel, in presence of Pope Pius IV., who compared its music to that heard by St John in his vision of the New Jerusalem. Parvi transcribed it, for the library of the choir, in characters of extraordinary size and beauty; and Palestrina was appointed by the pope composer to the Sistine Chapel, an office created expressly in his honour and confirmed to him by seven later pontiffs, though with the very insufficient honorarium of three scudi per month, in addition to the six which formed his pension.

In 1567 this mass was printed in Palestrina's Liber secundus missarum. The volume was dedicated to Philip II. of Spain, but the mass was called the Missa Papae Marcelli. This title, clearly given in honour of the short-lived pope Marcellus II.,

has given rise to an absurd story, told by Pellegrini and others, to the effect that the mass was composed by Pope Marcellus I., martyred early in the 4th century, and was only discovered by Palestrina. Of

course in the 4th century such music was inconceivable. The Missa Papae Marcelli is now almost certainly known to have been composed in 1562, two years before Paul IV.'s commission. Its ineffable beauty had often been described in glowing terms by those who heard it in the Sistine Chapel, but it was only first heard in England in 1882, when the Bach choir, consisting of 200 unaccompanied voices, sang it at St James's Hall, under the direction of Mr Otto Goldschmidt.

Upon the death of Animuccia in 1571 Palestrina was re-elected to his appointment at the Cappella Giulia. He also succeeded Animuccia as maestro di cappella at the oratory of Philip Neri; but these appointments were far from lucrative, and he still remained a very poor man. A letter of thanks for 100 scudi, written on the 21st of March 1579 to the duke of Mantua, illustrates this situation. In 1580 he was much distressed by the death of his wife; and the loss of three promising sons, Angelo, Ridolfo and Silla, left him with one child only — Igino — a very unworthy descendant. In February 1581 he married the rich widow Virginia Dormuli. In 1586 Pope Sixtus V. wished to appoint him maestro to the pontifical choir, as suc cessor to Antonio Boccapadule, then about to resign, and commissioned Boccapadule to prepare the choir for the change. Boccapadule, however, managed so clumsily that Palestrina was accused of having meanly plotted for his own advancement. The Pope was very angry, and punished the calumniators very severely; but Palestrina lost the appointment. These troubles, however, did not hinder his work, which he continued without intermission until the 2nd of February 1594, when he breathed his last in the arms of his friend, Filippo Neri. (W. S. R.)

In the articles, Music, Counterpoint, Contrapuntal Forms, Harmony, Mass, Motet, and that portion of Instrumentation which deals with vocal music, the reader will find information as to many features of Palestrina's style and its relation to that of the 16th century in general. So simple are the materials of 16th-century music, and so close its limitations, that the difference between great and small artists, and still more the difference between one great artist and another, can be detected only by long and familiar experience. A great artist, working within limits so narrow and yet so natural, is fortunately apt to give us exceptional opportunities for acquiring the right kind of experience of his art, since his genius becomes far more prolific than a genius with a wider field for its energies. Yet all 16th-century masters seem to be illuminated by the infallibility of the normal musical technique of their time. This technique is no longer so familiar to us that its euphony and vivid tone can fail to impress us wherever we meet it. There is probably no respectable school piece of the 16th century, which, if pro- perly performed in a Roman Catholic church, would be

quickly distinguishable by ear from the style of Palestrina. But when we find that every addition to our acquaintance with Palestrina's works is an acquisition, not to our notions of the progressive possibilities of 16th-century music, but to our whole sense of style, we may then recognize that we are in the presence of one of the greatest artists of all time.

Palestrina's work has many styles. Within its narrow range there can be no such glaring contrasts as those of the " three styles " of Beethoven; yet the distinctions are as real as they are delicate. His early, or Flemish style, was apt to lead him into the notorious Flemish disregard of proportion. Yet in some of his greatest works, such as the Missa brevis, we find un- mistakably Flemish features so idealized as to produce breadth of phrase (Missa brevis, Agnus Dei), remarkably modern firm- ness of form (ibid, second Kyrie), and close canonic sequence carried to surprising length resulting in natural unexpectedness of harmony and subtle swing of cross rhythm (Amen of Credo).

If we find it convenient to divide Palestrina's work roughly into three types, we shall be able to take the Missa Papae Mar- celli as the crowning representative of his second style. It probably is his greatest work; at all events it continues to make

that impression whenever it is read after a long course of his other works; yet there are many masses, too numerous to men- tion, which cannot easily be considered inferior to it. Indeed F. X. Haberl, the editor of the complete critical edition of Palestrina's works, prefers the Missa Ecce ego Joannes, first published by him in the 24th volume of that edition in 1887.

Palestrina-scholars will hardly think us singular for placing on the same plane as the Missa Papae Marcelli at least 16 out of Palestrina's 94 extant masses: Missa brevis, bk. 3, no. 3; Dies sanctificatus, bk. 6, no. 1; Dilexi quoniam, bk. 6, no. 5; O admirabile commercium, bk. 8, no. 3; Dum complerentur, bk. 8, no. 5; Vent sponsa Christi, bk. 9, no. 2; Quinti toni, bk. 10, no. 5; Octavi toni, bk. 11, no. 4; Alma Redemptoris, bk. 11, no. 5; Ascendo ad Patrem, bk. 12, no. 3; Tu es Petrus, bk. 12, no. 5; Hodie Christus natus , est, bk. 13, no. 2; Beatus Laurentius, bk. 14, vol. 3; Assumpta est Maria, bk. 14, no. 5; Tu es Petrus, bk. 15, no. s; Ecce ego Joannes, bk. 15, no. 6.

The third and most distinctive phase of Palestrina's style is that in which he relies entirely upon the beauty of simple masses of harmony without any polyphonic elaboration whatever. Sometimes, as in his four-part litanies, this simplicity is mainly a practical necessity; but it is more often used for the purpose of his profoundest expressions of sacramental or penitential devotion, as for instance in the motet Fralres ego enim accepi, the Stabat Mater and the first, really the latest, book of Lamentations.

Besides these three main styles there are numerous cross- currents. There is the interaction between the madrigal and ecclesiastical style, which Palestrina sometimes contrives to show without confusion or degradation, as in the mass Vestiva i colli. There is the style of the madrigali spirituali, including Le Vergine of Petrarca; which again distinguishes itself into a broader and a slighter manner. And there is lastly an astounding absorption of the wildest freaks of Flemish ingenuity into the loftiest polyphonic ecclesiastical style; the great example of which is the Missa L 'Homme arm?-, a work much maligned by writers who know only its title and the part played by its secular theme in medieval music.

The works published in Palestrina's lifetime naturally contain a large proportion of his earlier compositions. After his death the publication of his works continued for some years. We are apt to read the musical history of the 17th century in the light of the works of its composers. But a somewhat different view of that time is suggested by the continual pouring out by influential publishers of posthumous works of Palestrina, in far greater quantities than Palestrina had either the influence or resource to publish in his lifetime. We regard the 1 7th-century monodists as triumphant iconoclasts; but it was not until their primitive efforts had been buried beneath the entirely new arts to which they led, that the style of Palestrina ceased to be upheld as the one artistic ideal. Moreover the posthumous works of Palestrina belong almost entirely to his latest and finest period; so that a study of Palestrina confined to the works which he himself was able to publish gives no adequate idea of the proportion which his greater works bear to the rest. It was not, then, the rise of monody that crowded 16th-century art out into a long oblivion. On the contrary, the Palestrina tradition was the one thing which gave 17th-century composers a practical basis for their technical training. Only in the 18th century did the new art, before coming to maturity under Bach and Handel, reduce the Palestrina style to a dead language.

In the middle of the 19th century that dead language revived in a renascence which has steadily spread throughout Europe. The Musica

divina of Canon K. Proske of Regensburg, begun in 1853, was perhaps the first decisive step towards the restoration of Roman Catholic church music. The St Cecilia Verein, with Dr F. X. Haberl as its president, has carried on the publication and use of such music with the greatest energy in every civilized country. The difficulties of reintroducing it in its native home, Italy, were so enormous that it is arguable that they might not yet have been surmounted but for the adoption of less purely artistic methods by Don Lorenzo Perosi, who succeeded in crowding the Italian churches by the performance

of compositions written in an artless manner which, by its mere negation of display, was fitted to produce upon unsophisticated listeners such devout impressions as might gradually wean them from the taste for theatrical modern church music. The pope's fiat has now inculcated the use of Gregorian and 16th-century church music as far as possible in all Roman Catholic churches, and the effect has been astonishing. Within eighteen months of Pius X.'s decree on church music, the choir of Cologne Cathe- dral, previously far less accustomed to a pure polyphonic style than most German Protestant choirs, at Easter of 1905 gave a very satisfactory performance of the Missa Papae Marcelli. The influence of what is henceforth an inevitable and continual familiarity of Palestrina's style, at least among Roman Catholics, cannot fail to have the profoundest effect upon modern musical culture.

Palestrina's works, as contained in the complete edition pub- lished by Breitkopf and Hartel, comprise 256 motets in 7 vols., the last two consisting largely of pieces hitherto unpub- lished, with one or two wrongly or doubtfully ascribed to Palestrina; 15 books of masses, of which only 6 were published in Palestrina's lifetime, the 7th being incompletely projected by him, and the . 14th and 15th first collected by Haberl in 1887 and 1888; 3 books of magnificats, on all the customary tones; 1 vol. of hymns;

1 vol. (2 books) of offertories for the whole year; a volume containing 3 books of litanies and several 12-part motets; 3 books of lamentations; a very large volume of madrigals containing

2 early books and 30 later madrigals collected from mixed publica- tions; 2 books of Madrigali spirituali, and 4 vols, of miscellaneous works, newly discoveied, imperfectly preserved and doubtful. The fourth book of motets is not, like the first three, a collection of works written at different times, but a single scheme, being a setting of the Song of Solomon; and the fifth volume is, like the offertories, designed for use throughout the church year.

(D. F. T.)

PALETTE (the Fr. diminutive of pale, spade, blade of an oar, from Lat. pala, spade, baker's shovel or peel; cf. pandere, to spread), a term applied to many objects which are flat and thin, and specifically to a thin tablet made of wood, porcelain, or other material on which artists place .their colours. The term is also used of the shallow box, with partitions for the different coloured tesserae, used by mosaic workers. By trans- ference the colours which an individual artist employs are known as his " palette." The " palette-knife " is a thin flexible knife used for arranging the colours on the palette, &c, and also for the application of colour on the canvas in large masses.

PALEY, FREDERICK APTHORP (1815-1888), English classical scholar, was born at Easingwold in Yorkshire on the 14th of January 1815. He was the grandson of William Paley, and was educated at Shrewsbury school and St John's College, Cambridge (B.A. 1838). His conversion to Roman Catholicism forced him to leave Cambridge in 1846, but he returned in i860 and resumed his work as " coach," until in 1874 he was appointed professor of classical literature at the newly founded Roman Catholic University at Kensington. This institution was closed in 1877 for lack of funds, and Paley removed to Boscombe, where he died on the 8th of December 1888. His most important editions are: Aeschylus, with Latin notes (1844-1847), the work by which he first attracted attention; Aeschylus (4th ed., 1879), Euripides (2nd ed., 1872), Hesiod (2nd ed., 1883), Homer's Iliad (2nd ed., 1884), Sophocles, Philoctetes, Electra, Trachiniae, Ajax (1880) — all with English commentary and forming part of the Bibliotheca classica; select private orations of Demosthenes (3rd ed., 1896-1898); Theocritus (2nd ed., 1869), with brief Latin notes, one of the best of his minor works. He possessed considerable knowledge of architecture, and published a Manual of Gothic Architecture (1846) and Manual of Gothic Mouldings (6th ed., 1902).

PALEY, WILLIAM (1743-1805), English divine and philo- sopher, was born at Peterborough. He was educated at Giggles- wick school, of which his father was head master, and at Christ's College, Cambridge. He graduated in 1763 as senior wrangler, became fellow in 1766, and in 1768 tutor of his college. He lectured on Clarke, Butler and Locke, and also delivered a systematic course on moral philosophy, which subsequently formed the basis of his well-known treatise. The subscription

controversy was then agitating the university, and Paley published an anonymous Defence of a pamphlet in which Bishop Law had advocated the retrenchment and simplification of the Thirty-nine Articles; he did not, however, sign the petition (called the ” Feathers ” petition from being drawn up at a meeting at the Feathers tavern) for a relaxation of the terms of subscription. In 1776 Paley was presented to the rectory of Musgrave in Westmorland, supplemented at the end of the year by the vicarage of Dalston, and presently exchanged for that of Appleby. In 17S2 he became archdeacon of Carlisle. At the suggestion of his friend John Law (son of Edward Law, bishop of Carlisle and formerly his colleague at Cam- bridge), Paley published (1785) his lectures, revised and enlarged, under the title of The Principles of Moral and Political Philosophy. The book at once became the ethical text-book of the University of Cambridge, and passed through fifteen editions in the author’s lifetime. He strenuously supported the abolition of the slave trade, and in 1789 wrote a paper on the subject. The Principles was fol- lowed in 1790 by his first essay in the field of Christian apolo- getics, Horae Paulinae, or the Truth of the Scripture History of St Paul evinced by a Comparison of the Epistles which bear his Name with the Acts of the Apostles and with one another, probably the most original of its author’s works. It was followed in 1794 by the celebrated View of the Evidences of Christianity. Paley’s latitudinarian views are said to have debarred him from the highest positions in the Church. But for his services in defence of the faith the bishop of London gave him a stall in St Paul’s; the bishop of Lincoln made him subdean of that cathedral, and the bishop of Durham conferred upon him the rectory of Bishopwearmouth. During the remainder of his life his time was divided between Bishopwearmouth and Lincoln. In 1802 he published Natural Theology, or Evidences of the Existence and Attributes of the Deity collected from the Appearances of Nature, his last, and, in some respects, his most remarkable book. In this he endeavoured, as he says in the dedication to the bishop of Durham, to repair in the study his deficiencies in the church. He died on the 25th of May

1803.

In the dedication just referred to, Paley claims a systematic unity for his works. It is true that ” they have been written in an order the very reverse of that in which they ought to be read ” ; nevertheless the Natural Theology forms ” the completion of a regular and comprehensive design.” The truth of this will be apparent if it is considered that the Moral and Political Philosophy admittedly

embodies two presuppositions : (1) that ” God Almighty wills and wishes the happiness of His creatures,” and (2) that adequate motives must be supplied to virtue by a system of future rewards and punishments. Now the second presupposition depends, according to Paley, on the credibility of the Christian religion (which he treats almost exclusively as the revelation of these ” new sanctions ” of morality). The Evidences and the Horae Paulinae were intended as a demonstration of this credibility. The argument of these books, however, depends in turn upon the assumption of a benevolent Creator desirous of communicating with His creatures for their good ; and the Natural Theology, by applying the argument from design to prove the existence of such a Deity, becomes the foundation of the argumentative edifice.

In his Natural Theology Paley has adapted with consummate skill the argument which Ray (1691) and Derham (171 1) and Nieuwentyt 1 (1730) had already made familiar to Englishmen. ” For my part,” he says, ” I take my stand in human anatomy “; and what he everywhere insists upon is ” the necessity, in each particular case, of an intelligent designing mind for the contriving and determining of the forms which organized bodies bear.” This is the whole argument, and the book consists of a mass of well-

1 Bernard Nieuwentyt (1654-1718) was a Dutch disciple of Descartes, whose work, Regt gebruik der Werelt Beschouwingen, published in 1716, was translated into English in 1730 by J. Chamber- layne under the title of The Religious Philosopher. A charge of wholesale plagiarism from this book was brought against JPaley in the Athenaeum for 1848. Paley refers several times to Nieuwentyt, who uses the famous illustration of the watch. But the illustration is not peculiar to Nieuwentyt, and had been appropriated by many others before Paley. The germ of the idea is to be found in Cicero, De natura deorum, ii. 34 (see Hallam, Literature of Europe, ii. 385, note.) In the case of a writer whose chief merit is the way in which he has worked up existing material, a general charge of plagiarism is almost irrelevant.

chosen instances marshalled in support of it. But by placing Paley’s facts in a new light, the theory of evolution has deprived his argument of its force, so far as it applies the idea of special contrivance to individual organs or to species.

The Evidences of Christianity is mainly a condensation of Bishop Douglas’s Criterion and Lardner’s Credibility of the Gospel History. But the task is so judiciously performed that it would probably be

difficult to get a more effective statement of the external evidences of Christianity than Paley has here presented. His idea of revelation depends upon the same mechanical conception of the relation of God to the world which dominates his Natural Theology; and he seeks to prove the divine origin of Christianity by isolating it from the general history of mankind, whereas later writers find their chief argument in the continuity of the process of revelation.

The face of the world has changed so greatly since Paley's day that we are apt to do less than justice to his undoubted merits. He is nowhere original, and nowhere profound, but his strong reasoning power, his faculty of clear arrangement and forcible statement, place him in the first rank of expositors and advocates. He masses his arguments, it has been said, with a general's eye. His style is perfectly perspicuous, and its " strong home-touch " compensates for what is lacking in elasticity and grace. Paley displays little or no spirituality of feeling; but this is a matter in which one age is apt to misjudge another, and Paley was at least practically benevolent and conscientiously attentive to his parish duties. The active part he took in advocating the abolition of the slave-trade is evidence of a wider power of sympathy. His un-conquerable cheerfulness becomes itself almost religious in the last chapters oi the Natural Theology, considering that they were written during the intervals of relief from the painful complaint which finally proved fatal to him.

For his life, see Public Character s(i%02) ;Aikin's General Biography, vii. (1808); Lives, by G. W. Meadley (1809) and his son Edmund Paley, prefixed to the 1825 edition of his works; Leslie Stephen in Dictionary of National Biography; Quarterly Review, ii. (Aug. 1809), ix. (July 1813). On Paley as a theologian and philosopher, see Leslie Stephen, English Thought in the Eighteenth Century, i. 405 seq., ii. 121 seq.; R. Buddensieg, in Herzog-Hauck's Realencyklopadie fur protestanlische Theologie, xiv. (1904). See also Ethics.

PALFREY, JOHN GORHAM (1796-1881), American historian, was born in Boston, Massachusetts, on the 2nd of May 1796. He graduated at Harvard, 1815, and became a Unitarian minister, being pastor of the Brattle Square church, Boston, 1818-1831. He was professor of sacred literature in the Harvard divinity school, 1 830-1 839. Entering politics, he was secretary of state of Massachusetts, 1844-1847; a representative in Congress, 1847- 1849; and postmaster of Boston, 1861-1867. He was editor of the North American Review, 1835-1843. As a writer he is best known by his History of New England to the revolutionary war, in five volumes, of which the first appeared in 1859 and the last pos- thumously in 1890. He died at Cambridge,

Massachusetts, on the 26th of April 1881.

PALFREY, a riding-horse, particularly' one of smaller and lighter type than the war-horse, the " destrier " (Med. Lat. dextrarius, because led by the right hand till used), which was only ridden in battle or tournament. The palfrey was thus used on the march, &c, and also as a lady's riding-horse. " Palfrey " came into English through the O. Fr. palejrei, one of the numerous forms which the word took in its descent from the Late Lat. paraveredus, a hybrid word from Gr. irapa, in the sense of extra, and veredus, a post-horse, probably a Celtic word, for one who draws a rheda or carriage. The form parafredus gives the Mod. Ger. Pferd, horse, through the O.H.G. pfarifrid.

PALGHAT, a town of British India, in the Malabar district of Madras, on the Madras railway. Pop. (1901), 44,177. As the key to Travancore and Malabar from the East, it was formerly of considerable strategic importance. The fort fell into British hands in 1768, and subsequently formed the basis of many of the operations against Tippoo, which terminated in the storming of Seringapatam. The easy ascent by the Palghat Pass, formerly covered with teak forests, supplies the great route from the west coast to the interior. The municipality manages the Victoria college.

PALGRAVE, SIR FRANCIS (1788-1861), English historian, was the son of Meyer Cohen, a Jewish stockbroker, and was born in London in July 1788. He was educated privately and was so precocious a boy as to translate a Latin version of the Battle of the Frogs and Mice into French in 1 796, which was published by his father in 1797. In 1803 Palgrave was articled

to a firm of solicitors, but was called to the bar at the Middle Temple in 1827. On his marriage in 1823 with Elizabeth, daughter of Dawson Turner of Great Yarmouth, he had become a Christian, and had changed his name to Palgrave, the maiden name of his wife's mother. His work as a barrister was chiefly concerned with pedigree cases before the House of Lords. He edited for the Record Commission Parliamentary Writs (London, 1827-1834); Rotuli curiae regis (London, 1835); The antient kalendars and inventories of the treasury of his majesty's exchequer (London, 1836); and Documents and records illustrating the history of Scotland (London, 1837), which contains an elaborate intro- duction. In 1831 he published his History

of England, Anglo- Saxon Period, later editions of which were published as History of the Anglo-Saxons; in 1832, his Rise and Progress of the English Commonwealth, pronounced by Freeman a ” memorable book “; and in 1834 his Essay upon the original authority of the king’s council. In 1832 he was knighted, and after serving as one of the municipal corporations commissioners, became deputy-keeper of the public records in 1838, holding this office until his death at Hampstead on the 6th of July 1861. Palgrave’s most important work is his History of Normandy and England, which appeared in four volumes (London 1851-1864), and deals with the history of the two countries down to nor.

He also wrote Truths and Fictions of the Middle Ages (London, 1837, and again 1844); The Lord and the Vassal (London, 1844); and Handbook for Travellers in Northern Italy (London, 1842, and subsequent editions).

Palgrave’s four sons were: Francis Turner Palgrave (q.v.), sometime professor of poetry at Oxford; William Gifford Pal- grave; Sir Robert Harry Inglis Palgrave (b. 1827), an authority upon banking and economics generally; and Sir Reginald Francis Douce Palgrave.

William Gifford Palgrave (1826-1888) went to India as a soldier after a brilliant career at Charterhouse School and Trinity College, Oxford; but, having become a Roman Catholic, he was ordained priest and served as a Jesuit missionary in India, Syria, and Arabia. Forsaking the priesthood about 1864, he was employed as a diplomatist by the British govern- ment in Egypt, Asia Minor, the West Indies, and Bulgaria, being appointed resident minister in Uruguay in 1884; he died at Montevideo on the 30th of September 1888. He wrote a romance, Hermann Agha (London, 1872), A Narrative of a Year’s Journey through Central and Eastern Arabia (London, 1865), Essays on Eastern Questions (London, 1872), and other works.

Sir Reginald Palgrave (1820-1904) became a solicitor in 1851; but two years later was appointed a clerk in the House of Commons, becoming clerk of the House on the retirement of Sir Erskine May in 1886. He was made a K.C.B. in 1892, retired from his office in 1900, and died at Salisbury on the 13th of July 1904. Sir Reginald wrote The Chairman’s Handbook; The House of Commons: Illustrations of its History and Practice (London, 1869); and Cromwell: an appreciation based on contem- porary evidence (London, 1890). He also assisted to edit the tenth edition of Erskine May’s Law, Privileges, Proceedings and Usage of Parliament (London, 1896).

PALGRAVE, FRANCIS TURNER (1824-1897), English critic and poet, eldest son of Sir Francis Palgrave, the historian, was born at Great Yarmouth, on the 28th of September 1824. His childhood was spent at Yarmouth and at his father's house in Hampstead. At fourteen he was sent as a day-boy to Charter- house; and in 1843, having in the meanwhile travelled exten- sively in Italy and other parts of the continent, he proceeded to Oxford, having won a scholarship at Balliol. In 1846 he interrupted his university career to serve as assistant private secretary to Gladstone, but returned, to Oxford the next year, and took a first class in Literae Humaniores. From 1847 to 1862 he was fellow of Exeter College, and in 1849 entered the Education Department at Whitehall. In 1850 he accepted the vice-principalship of Kneller Hall Training College at Twicken- ham. There he came into contact with Tennyson, arid laid the foundation of a lifelong friendship. When the training college was abandoned, Palgrave returned to Whitehall in 1855, becoming

examiner in the Education Department, and eventually assistant secretary. He married, in 1862, Cecil Grenville Milnes, daughter of James Milnes-Gaskell. In 1884 he resigned his position at the Education Department, and in the following year succeeded John Campbell Shairp as professor of poetry at Oxford. He died in London on the 24th of October 1897, and was buried in the cemetery on Barnes Common. Palgrave published both criticism and poetry, but his work as a critic was by far the more important. His Visions of England (1880- 1881) has dignity and lucidity, but little of the " natural magic " which the greatest of his predecessors in the Oxford chair considered rightly to be the test of inspiration. His last volume of poetry, Amenophis, appeared in 1892. On the other hand, his criticism was always marked by fine and sensitive tact, quick intuitive perception, and generally sound judgment. His Handbook to the Fine Arts Collection, International Exhibition, 1862, and his Essays on Art (1866), though not free from dogmatism and over-emphasis, were sincere contributions to art criticism, full of striking judgments strikingly expressed. His Landscape in Poetry (1897) showed wide knowledge and critical appreciation of one of the most attractive aspects of poetic interpretation. But Palgrave's principal contribution to the development of literary taste was contained in his Golden Treasury of English Songs and Lyrics (i86r), an anthology of the best poetry in the language constructed upon a plan sound and spacious, and followed out with a delicacy of feeling which could scarcely be surpassed. Palgrave followed it with a Treasury of Sacred Song (1889), and a second series of the Golden Treasury (1897), including the work of later poets, but in neither of these was quite the same exquisiteness

of judgment preserved. Among his other works were The Passionate Pilgrim (1858), a volume of selections from Herrick entitled Chrysomela (1877), a memoir of Clough (1862) and a critical essay on Scott (1866) prefixed to an edition of his poems.

See Gwenllian F. Palgrave, F. T. Palgrave (1899).

PALI, the language used in daily intercourse between cultured people in the north of India from the 7th century B.C. It con- tinued to be used throughout India and its confines as a literary language for about a thousand years, and is still, though in a continually decreasing degree, the literary language of Burma, Siam, and Ceylon. Two factors combined to give Pali its importance as one of the few great literary languages of the world: the one political, the other religious. The political factor was the rise during the 7th century B.C. of the Kosala power. Previous to this the Aryan settlements, along the three routes they followed in their penetration into India, had remained isolated, independent and small communities. Their language bore the same relation to the Vedic speech as the various Italian dialects bore to Latin. The welding together of the great Kosala kingdom, more than twice the size of England, in the very centre of the settled country, led insensibly but irresistibly to the establishment of a standard of speech, and the standard followed was the language used at the court at Savatthi in the Nepalese hills, the capital of Kosala. When Gotama the Buddha, himself a Kosalan by birth, determined on the use, for the propagation of his religious reforms, of the living tongue of the people, he and his followers naturally made full use of the advantages already gained by the form of speech current through the wide extent of his own country. A result followed somewhat similar to the effect, on the German language, of the Lutheran reformation. When, in the generations after the Buddha's death, his disciples compiled the documents of the faith, the form they adopted became dominant. But local varieties of speech continued to eixst.

The etymology of the word Pali is uncertain. It probably means " row, line, canon," and is used, in its exact technical sense, of the language of the canon, containing the documents of the Buddhist faith. But when Pali first became known to Europeans it was already used also, by those who wrote in Pali, of the language of the later writings, which bear the same relation to the standard literary Pali of the canonical texts as medieval

does to classical Latin. A further extension of the meaning in which the word Pah was used followed in a very suggestive way. The first book edited by a European in Pali was the Mahivarfisa, or Great Chronicle of Ceylon, published there in 1837 by Tumour, then colonial secretary in the island. James Prinsep was then devoting his rare genius to the decipherment of the early inscriptions of northern India, especially those of Asoka in the 3rd century B.C. He derived the greatest assis- tance from Tumour's work not only in historical information, but also as regards the forms of words and grammatical inflexions. The resemblance, was so close that Prinsep called the alphabet he was deciphering the Pah alphabet, and the language expressed in it he called the Pali language. This was so nearly correct that the usage has been followed by other European scholars, and is being increasingly adopted. It receives the support of Mahanama, the author of the Great Chronicle, who wrote in Ceylon in the 5th century a.d. He says (p. 253, ed. Tumour) that Buddhaghosa translated the commentaries, then existing only in Sinhalese, into Pali. The name here used by the chronicler for Pali is " the MagadhI tongue," by which expression is meant, not exactly the language spoken in Magadha, but the language in use at the court of Asoka, king of Kosala and Magadha. With this use of the word, philologically inexact, but historically quite defensible, may be compared the use of the word English, which is not exactly the language of the Angles, or of the word French, which is not exactly the language of the Franks. The question of Pali becomes therefore three- fold: Pali before the canon, the canon, and the writings subsequent to the canon. The present writer has suggested that the word Pali should be reserved for the language of the canon, and other words used for the earlier and later forms of it ; ' but the usage generally followed is so convenient that there is little likelihood of the suggestion being followed. The threefold division will therefore be here adhered to.

For the history of Pali before the canonical books were composed we have no direct evidence. None of the pre-Buddhistic sites have as yet been excavated; and, with one doubtful exception, no inscriptions older than the texts have as yet been found. We have to argue back from the state cf things revealed in the texts, of various dates from 450-250 B.C., and in the inscriptions from that date onwards. The inscriptions have now been subjected .to a very full critical and philological analysis in Professor Otto Franke's Pali und Sanskrit (Strassburg, 1902). He shows that in the 3rd century B.C. the language used throughout northern India was practically one, and that it was derived directly from the speech of the Vedic Aryans, retaining many Vedic forms lost in the later classical Sanskrit. His list of such forms is

much more complete than that given by Childers in the introduction to his Dictionary of the Pali Language. The particular form of this general speech which was used as the lingua franca, the Hindustani of the period, was the form in use in Kosala. Franke also shows that there were local peculiarities in small matters of spelling and inflexion, and that the particular form of the language used in and about the Avanti district, of which the capital was Ujjeni (a celebrated pre-Buddhistic city), was the basis of the language used in the sacred texts as we now have them. Long ago Westergaard, Rhys Davids and Ernst Kuhn, 2 had made the same suggestion, mainly on historical grounds, Mahinda, who took the texts to Ceylon, having been born at Vedisa in that district. The careful and. complete collection, by Franke, of the philological evidence at present available, has raised this hypothesis into a practical cer- tainty. The inscriptions are at present scattered through a number of learned periodicals; a complete list of all those that can be ap- proximately dated between the 3rd century B.C. and the 2nd century A.D. is given in the first chapter of Franke s book. M. E. Senart has collected in his Inscriptions de Piyadasi (Paris, 1 881-1886) those inscriptions of Asoka which were known up to the date of his work, subjecting them to a careful analysis, and providing an index to the words occurring in them. What is greatly needed is a new edition of this work including the Asoka inscriptions discovered during the last twenty years, and a similar edition of the other inscriptions. The whole of the Pali inscriptions so far discovered might fill somewhat more than a hundred pages of text. An out- line of the history of the Pali alphabet has been given, with illus- trations and references to the authorities, in Rhy* Davids's Buddhist India, pp. 107-140.

1 Journal of the Royal Asiatic Society (1903), p. 398.

2 Westergaard, tlber den dltesten Zeitraum der indischen Geschichte, p. 87; Rhys Davids, Transactions of the Philological Society (1875), p. 70; Kuhn, Beitrage zur Pali Grammatik, 7-9.

The canonical texts are divided into three collections called Pitakas, i.e. baskets. This figure of speech refers, not to a basket or box in which things can be stored, but to the baskets, used in India in excavations, as a means of handing on the earth from one worker to another. The first Pitaka contains , the Vinaya — that is, Rules of the Order; the second the Suttas, giving the doctrine, and the third the Abhidhamma, analytical exercises in the psychological system on which the doctrine is based. These have now nearly all, mainly through the work of the Pali Text Society, been published in Pali.

The Vinaya was edited in 5 vols, by H. Oldenberg ; and the more important parts of it have been translated into English by Rhys Davids and Oldenberg in their Vinaya Texts.

The Sutta Pitaka consists of five Nikayas, four principal and one supplementary. The four principal ones have been published for the Pali Text Society, and some volumes have been translated into English or German. These four Nikayas, sixteen volumes in all, are the main authorities for the doctrines of early Buddhism. The fifth Nikaya is a miscellaneous collection of treatises, mostly very short, on a variety of subjects. It contains lyrical and ballad poetry, specimens of early exegesis and commentary, lives of the saints, collections of edifying anecdotes and of the now well-known Jatakas or Birth Stories. Of these, eleven volumes had by 1910 been edited for the Pali Text Society by various scholars, the Jatakas and two other treatises had appeared elsewhere, and two works (one a selection of lives of distinguished early Buddhists, and the other an ancient commentary), were still in MS.

Of the seven treatises contained in the Abhidhamma Pitaka five, and one-third of the sixth, had by 1910 been published by the Pali Text Society; and one, the Dhamma Sangani, had been translated by Mrs Rhys Davids. A description of the contents of all these books in the canon is given in Rhys Davids's American Lectures, pp. 44-86.

A certain amount of progress has been made in the historical criticism of these books. Out of the twenty-nine works con- tained in the three Pitakas only one claims to have an author. That one is theKatha Vatthu, ascribed to Tissa the son of Moggali, 3 who presided over the third council held under Asoka. It is the latest book of the third Pitaka. All the rest of the canonical works grew up in the schools of the Order, and most of them appear to contain documents, or passages, of different dates. In his masterly analysis of the Vinaya, in the introduction to his edition of the text, Professor Oldenberg has shown that there are at least three strata in the existing presentation of the Rules of the Order, the oldest portions going back probably to the time of the Buddha himself. Professor Rhys Davids has put forward similar views with respect to the Jatakas and the Sutta Nipata in his Buddhist India, and with respect to the Nikayas in general in the introduction to his Dialogues of the Buddha. And Professor Windisch has discussed the legends of the tempta- tion in his Mara und Buddha, and those relating to the Buddha's birth in his Buddha's Geburt. It seems probable that the Vinaya and the four Nikayas were put substantially into the shape in which we now have them before the council at Vesali, a hundred years after the Buddha's death; that slight

alterations and additions were made in them, and the miscellaneous Nikaya and the Abhidhamma books completed, at various times down to the third council under Asoka; and that the canon was then considered closed. No evidence has yet been found of any alterations made, after that time, in Ceylon; but there were probably before that time, in India, other books, now lost, and other recensions of some of the above.

Of classical Pali in northern India subsequent to the canon there is but little evidence. Three works only have survived. These are the Milinda-panha, edited by V. Trenckner, and translated by Rhys Davids under the title Questions of King Milinda; the Netti Pakarana, edited by E. Hardy for the Pali Text Society in 1902; and the Petaka Upadesa. The former belongs to the north-west, the others to the centre of India, and all three may be dated vaguely in the first or second centuries a.d. The first, a religious romance of remarkable interest, may owe its preservation to the charm of. its style, the others to the accident that they were attributed by mistake to a famous apostle. In any case they are the sole survivors of what must

3 No doubt identical with Upagupta, the teacher of Asoka (cf.' Vincent Smith, Early History of India, 2nd ed., 1908, and refs.).

have been a vast and varied literature. Professor Takakusu has shown the possibility of several complete books belonging to it being still extant in Chinese translations, 1 and we may yet hope to recover original fragments in central Asia, Tibet, or Nepal.

At p. 66 of the Gandha Vamsa, a modern catalogue of Pali books and authors, written in Pali, there is given a list of ten authors who wrote Pah books in India, probably southern India. We may conclude that these books are still extant in Burma, where the catalogue was drawn up. Two only of these ten authors are otherwise known. The first is Dhammapala, who wrote in Kancipura, the modern Conjevaram in south India, in the 5th century of our era. His principal work is a series of commentaries on five of the lyrical anthologies included in the miscellaneous Nikaya. Three of these have been published by the Pah Text Society ; and Professor E. Hardy has discussed in the Zeitschrift der deutschen morgenidndischen Gesellschaft (1897), pp. 105-127, all that is kncrwn about him. Dhammapala wrote also a commentary on the Netti mentioned above. The second is

Buddhadatta, who wrote the Jinalankara in the 5th century a.d. It has been edited and translated by Professor J. Gray. It is a poem, of no great interest, on the life of the Buddha.

The whole of these Pali books composed in India have been lost there. They have been preserved for us by the unbroken succession of Pali scholars in Ceylon and Burma. These scholars (most of them members of the Buddhist Order, but many of them laymen) not only copied and recopied the Indian Pali books, but wrote a very large number themselves. We are thus beginning to know something of the history of this literature. Two departments have been subjected to critical study: the Ceylon chronicles by Professor W. Geiger in his Maha-vamsa und Dipavamsa, and the earlier grammatical works by Professor O. Franke in two articles in the Journal of the Pali Text Society for 1903, and in his Geschichte und Kritik der einheimischen Pali Grammatik. Dr Forchhammer in his Jardine Prize Essay, and Dr Mabel Bode in the introduction to her edition of the Sasana-vamsa, have collected many details as to the Pah literature in Burma.

The results of these investigations show that in Ceylon from the 3rd century B.C. onwards there has been a continuous succession of teachers and scholars. Many of them lived in the various viharas or residences situate throughout the island; but the main centre of intellectual effort, down to the 8th century, was the Maha Vihara, the Great Minster, at Anwradha- pura. This was, in fact, a great university. Authors refer, in the prefaces to their books, to the Great Minster as the source of their knowledge. And to it students flocked from all parts of India. The most famous of these was Buddhaghosa, from Behar in North India, who studied at the Minster in the 5th century a.d., and wrote there all his well-known works. Two volumes only of these, out of about twenty still extant in MS., have been edited for the Pali Text Society. About a century before this the Dipa-vamsa, or Island Chronicle, had been com- posed in Pali verse so indifferent that it is apparently the work of a beginner in Pali composition. No work written in Pali in Ceylon at a date older than this has been discovered yet. It would seem that up to the 4th century of our era the Sinhalese had written exclusively in their own tongue; that is to say that for six centuries they had studied and understood Pali as a dead language without using it as a means of literary expression. In Burma, on the other hand, where Pali was probably intro- duced from Ceylon, no writings in Pali can be dated before the nth century of our era. Of the history of Pali in Siam very little is known. There have been good Pali scholars there since late medieval times. A very excellent edition of the twenty- seven canonical books has been recently printed there, and there exist in our European libraries a number of Pali MSS.

written in Siam,

It would be too early to attempt any estimate of the value

of this secondary Pali literature. Only a few volumes, out of

several hundreds known to be extant in MS., have yet been

published. But the department of the chronicles, the only

1 Journal of the Pali Text Society (1905). PP- 7*. 86.

one so far at all adequately treated, has thrown so much light on many points of the history of India that we may reasonably expect results equally valuable from the publication and study of the remainder. The works on religion and philosophy especi- ally will be of as much service for the history of ideas in these later periods as the publication of the canonical books has already been for the earlier period to which they refer. The Pali books written in Ceylon, Burma and Siam will be our best and oldest, and in many respects our only, authorities for the sociology and politics, the literature and the religion, of thefr respective countries.

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Jardine Prize Essay (ˆRangoon, 1885) ; Dr Mabel Bode, S&sana- vamsa (London, 1897) (J. W. R. D.)

PALIKAO, CHARLES GOILLAUME MARIE APPOLLINAIRE ANTOINE COUSIN MONTAUBAN, Comte de (1796 1878), French general and statesman, was born in Paris on the 24th of June 1796. As a cavalry officer young Montauban saw much service in Algeria, but he was still only a colonel when in 1847 ne effected the capture of Abd- el-Kader. After rising to the rank of general of division and commanding the province of Constantine, he was appointed in 1858 to a command at home, and at the close of 1859 was selected to lead the French troops in the joint French and British expedition to China. His conduct of the operations did not escape criticism, but in 1862 he received from Napoleon III. the title of comte de Palikao (from the action of that name) ; he had already been made a senator. The allegation that he had acquired a vast fortune by the plunder of the Pekin summer palace seems to have been without . foundation. In 1865 he was appointed to the command of the IV. army corps at Lyons, in the training of which he displayed exceptional energy and administrative capacity. In 1870 he was not given a command in the field, but after the opening disasters had shaken the Ollivier ministry he was entrusted by the empress-regent with the portfolio of war, and became president of the council (Aug. 10). He at once, with great success, reorganized the military resources ol the nation. He claimed to have raised Marshal MacMahon's force at Chalons to 140,000 men, to have created three new army corps, 33 new regiments and 100,000 gardes mobiles, and to have brought the defences of the capital to a state of efficiency — all this in twenty-four days. He con- ceived the idea of sending the army of Chalons to raise the blockade of Metz. The scheme depended on a precision and rapidity of which the army of Chalons was no longer capable, and ended with the disaster of Sedan. After the capitulation of the emperor the dictatorship was offered to Palikao, but he refused to desert the empire, and proposed to establish a council of national defence, with himself as " lieutenant-general of government." Before a decision was made, the chamber was invaded by the mob, and Palikao fled to Belgium. In 1871 he appeared before the parliamentary commission of inquiry, and in the same year established Un Ministere de la guerre de vingt- quatre jours. He died at Versailles on the 8th of January 1878.

PALIMPSEST. The custom of removing writing from the surface of the

material on which it had been inscribed, and thus preparing that surface for the reception of another text, has been practised from early times. The term palimpsest (from Gr. iraXiv, again, and ˆdw, I scrape) is used by Catullus, apparently with reference to papyrus; by Cicero, in a passage wherein he is evidently speaking of waxen tablets; and by Plutarch, when he narrates that Plato compared Dionysius to a fiifiKlov ira\ln\prjMSS. which were actually scraped or rubbed, and which were, therefore, composed of a material of sufficient strength to bear the process. In the first instance, then, it might be applied to waxen tablets; secondly, to vellum books. There are still to be seen, among the surviving waxen tablets, some which contain traces of an earlier writing under a fresh layer of wax. Papyrus could not be scraped or rubbed; the writing was- washed from it with the sponge. This, however, could not be so thoroughly done as to leave a perfectly clean surface, and the material was accord- ingly only used a second time for documents of an ephemeral or common nature. To apply, therefore, the title of palimpsest to a MS. of this substance was not strictly correct; the fact that it was so applied proves that the term was a common expression. Traces of earlier writing are very rarely to be detected in extant papyri. Indeed, the supply of that material must have been so abundant that it was hardly necessary to go to the trouble of preparing a papyrus, already used, for a second writing.

In the early period of palimpsests, vellum MSS. were no doubt also washed rather than scraped. The original surface of the material, at all events, was not so thoroughly defaced as was afterwards the case. In course of time, by atmospheric action or other chemical causes, the original writing would to some extent reappear; and it is thus that so many of the capital and uncial palimpsests have been successfully deciphered. In the later middle ages the surface of the vellum was scraped away and the writing with it. The reading of the later examples is therefore very difficult or altogether impossible. Besides actual rasure, various recipes for effacing the writing have been found,- such as to soften the surface with milk and meal, and then to rub with pumice. In the case of such a process being used, total obliteration must almost inevitably have been the result. To intensify the traces of the original writing, when such exist, various chemical reagents have been tried with more or less success. The old method of smearing the vellum with tincture of gall restored the writing, but did irreparable damage by blackening the surface, and, as the stain grew darker in course of time, by rendering the text altogether illegible. Of modern reagents the most harmless appears to be hydrosulphate of ammonia; but this also must be used with caution.

The primary cause of the destruction of vellum MSS. by wilful

obliteration was, it need hardly be said, the dearth of material. In the case of Greek MSS., so great was the consumption of old codices for the sake of the material, that a synodal decree of the year 691 forbade the destruction of MSS. of the Scriptures or the church fathers — imperfect or injured volumes excepted. The decline of the vellum trade also on the introduction of paper caused a scarcity which was only to be made good by recourse to material already once used. Vast destruction of the broad quartos of the early centuries of our era took place in the period which followed the fall of the Roman Empire. The most valuable Latin palimpsests are accordingly found in the volumes which were remade from the 7th to the 9th centuries, a period during which the large volumes referred to must have been still fairly numerous. Late Latin palimpsests rarely yield anything of value. It has been remarked that no entire work has been found in any instance in the original text of a palimpsest, but that portions of many works have been taken to make up a single volume. These facts prove that scribes were indis-

criminate in supplying themselves with materia! from any old volumes that happened to be at hand.

An enumeration of the different palimpsests of value is -slot here possible (see Wattenbach, Schriftwesen, 3rd ed., pp. 299-317); but a few may be mentioned of which facsimiles are accessible. The MS. in the BibliothSque Nationale, Paris, known as the Codex Ephraemi, containing portions of the Old and New Testaments in Greek, attributed to the 5th century, is covered with works of Ephraem Syrus in a hand of the 12th century (ed. Tischendorf, 1843, 1845). Among the Syriac MSS. obtained from the Nitrian desert in Egypt, and now deposited in the British Museum, some important Greek texts have been recovered. A volume containing a work of Severus of Antioch of the beginning of the 9th century is written on palimpsest leaves taken from MSS. of the Iliad of Homer and the Gospel of St Luke, both of the 6th century (Cat. Anc. MSS. vol. i., pis. 9, 10), and the Elements of Euclid of the 7th or 8th century. To the same collection belongs the double palimpsest, in which a text of St John Chrysostom, in Syriac, of the 9th or 10th century, covers a Latin grammatical treatise in a cursive hand of the 6th century, which in its turn has displaced the Latin annals of the historian Granius Licinianus, of the 5th century (Cat. Anc. MSS. ii., pis. 1, 2). Among Latin palimpsests also may be noticed those which have been reproduced in the Exempla of Zangemeister and Wattenbach. These are — the Ambrosian Plautus, in rustic capitals, of the 4th or 5th century, re-written with portions of the Bible in the 9th century (pi. 6) ; the Cicero De republica of the Vatican, in uncials, of the 4th century, covered by St Augustine on the

Psalms, of the 7th century (pi. 17; Pal. Soc, pi. 160) ; the Codex Theodosianus of Turin, of the 5th or 6th century (pi. 25); the Fasti Consulares of Verona, of A.D. 486 (pi. 29); and the Arian fragment of the Vatican, of the 5th century (pi. 31). Most of these originally belonged to the monastery of Bobbio, a fact which gives some indication of the great literary wealth of that house. By using skill and judgment, with a favour- ing light, photography may be often made a useful agent in the decipherment of obscure palimpsest texts. (E. M. T.)

PALINDROME (Gr. ira\iv, again, a.nd 8 pdfios, a course), a verse or sentence which runs the same when read either backwards or forwards. Such is the verse —

Roma tibi subito motibus ibit amor; or

Signa te, signa, temere me tangis et angis; or

vtyov fooftrinoiTa fii] ixbvav otyiv.

Some have refined upon the palindrome, and composed verses each word of which is the same read backwards as forwards: for instance, that of Camden —

Odo tenet mulum, madidam mappam tenet Anna, Anna tenet mappam madidam, mulum tenet Odo.

The following is still more complicated, as reading in four ways — upwards and downwards as well as backwards and forwards: —

s a t o R

A R E P O TENET OPERA ROTAS

PALINGENESIS (Gr. iraXiv, again, yevecns, becoming, birth), a term used in philosophy, theology and biology. In philosophy it denotes in its broadest sense the theory (e.g. of the Pytha- goreans) that the human soul does not die with the body but is ” born again ” in new incarnations. It is thus the equivalent of metempsychosis (q.v.). The term has a narrower and more specific use in the system of Schopenhauer, who applies it to his doctrine that the will does not die but manifests itself afresh in new individuals. He thus repudiates the primitive metem- psychosis doctrine which maintains the reincarnation of the par- ticular soul. The word ” palingenesis ” or rather ” palingenesia ” may be traced back to the Stoics, who used the term for the continual re-creation of the universe by the Demiurgus

(Creator) after its absorption into himself. Similarly Philo speaks of, Noah and his sons as leaders of a ” renovation ” or ” re-birth ” of the earth. Josephus uses the term of the national restoration of the Jews, Plutarch of the transmigration of souls, and Cicero of his own return from exile. In the New Testament the properly theological sense of spiritual regeneration is found, though the word itself occurs only twice: and it is used by the church fathers, e.g. for the rite of baptism or for the state of repentance. In modern biology (e.g. Haeckel and Fritz Mtiller)

“palingenesis” has been used for the exact reproduction of ancestral features by inheritance, as opposed to ” kenogenesis ” (Gr. naivos new), in which the inherited characteristics are modified by environment.

PALISSY, BERNARD (1510-1589), French potter (see Cera- mics), is said to have been born about 1510, either at Saintes or Agen, but both date and locality are uncertain. It has been stated, on insufficient authority, that his father was a glass-painter and that he served as his father’s apprentice. He tells us that he was apprenticed to a glass-painter and that he also acquired in his youth the elements of land-surveying. At the end of his apprenticeship he followed the general custom and became a travelling workman; acquiring fresh knowledge in many parts of France and the Low Countries, perhaps even in the Rhine Provinces of Germany and in Italy.

About 1539 it appears that he returned to his native district and, having married, took up his abode at Saintes. How he lived during the first years of his married life we have little record except when he tells us, in his autobiography, that he practised the arts of a portrait-painter, glass-painter and land- surveyor as a means of livelihood. It is known for instance that he was commissioned to survey and prepare a plan of the salt marshes in the neighbourhood of Saintes when the council of Francis I. determined to establish a salt tax in the Saintonge. It is not quite clear, from his own account, whether it was during his Wanderjahr or after he settled at Saintes that he was shown a white enamelled cup which caused him such surprise that he determined to spend his life — to use his own expressive phrase ” like a man who gropes in the dark ” — in order to discover the secrets of its manufacture. Most writers have supposed that this piece of fine white pottery was a piece of the enamelled majolica of Italy, but such

a theory will hardly bear examination. In Palissy's time pottery covered with beautiful white tin-enamel was manufactured at many centres in Italy, Spain, Germany and the South of France, and it is inconceivable that a man so travelled and so acute should not have been well acquainted with its appearance and properties. What is much more likely is that Palissy saw, among the treasures of some nobleman, a specimen of Chinese porcelain, then one of the wonders of the European world, and, knowing nothing of its nature, substance or manufacture, he set himself to work to discover the secrets for himself. At the neighbouring village of La Chapelle-des-Pots he mastered the rudiments of peasant pottery as it was practised in the 16th century. Other equip- ment he had none, except such indefinite information as he presumably had acquired during his travels of the manufacture of European tin-enamelled pottery.

For nearly sixteen years Palissy laboured on in these wild endeavours, through a succession of utter failures, working with the utmost diligency and constancy but, for the most part, without a gleam of hope. The story is a most tragic one; for at times he and his family were reduced to the bitterest poverty; he burned his furniture and even, it is said, the floor boards of his house to feed the fires of his furnaces; sustaining meanwhile the reproaches of his wife, who, with her little family clamouring for food, evidently regarded these proceedings as little short of insanity. All these struggles and failures are most faithfully recorded by Palissy himself in one of the simplest and most interesting pieces of autobiography ever written. The tragedy of it all is that Palissy not only failed to discover the secret of Chinese porcelain, which we assume him to have been searching for, but that when he did succeed in .making the special type of pottery that will always be associated with his name it should have been inferior in artistic merit to the contemporary produc- tions of Spain and Italy. His first successes can only have been a superior kind of " peasant pottery " decorated with modelled or applied reliefs coloured naturalistically with glazes and enamels. These works had already attracted attention locally when, in 1548, the constable de Montmorency was sent into the Saintonge to suppress the revolution there. Montmorency protected the potter and found him employment in decorating with his glazed terra-cottas the chateau d'Ecouen. The

patronage of such an influential noble soon brought Palissy into fame at the French court, and although he was an avowed Protestant, he was protected by these nobles from the ordin-' ances of the parliament of Bordeaux when, in 1562, the property of all the Protestants in this district was seized. Palissy's workshops and kilns were destroyed, but he himself was saved, and, by the interposition of the all-powerful

constable, he was appointed ” inventor of rustic pottery to the king and the queen-mother”; about 1563, under royal protection, he was allowed to establish a fresh pottery works in Paris in the vicinity of the royal palace of the Louvre. The site of his kilns indeed became afterwards a portion of the gardens of the Tuileries. For about twenty-five years from this date Palissy lived and worked in Paris. He appears to have been a personal favourite of Catherine de’Medicis, and of her sons, in spite of his profession of the reformed religion.

Working for the court, his productions passed through many phases, for besides continuing his ” rustic figulines ” he made a large number of dishes and plaques ornamented with scriptural or mythological subjects in relief, and in many cases he appears to have made reproductions of the pewter dishes of Francois Briot and other metal workers of the period. During this period too he gave several series of public lectures on natural history — the entrance fee being one crown, a large fee for those days — in which he poured forth all the ideas of his fecund mind. His ideas of springs and underground waters were far in advance of the general knowledge of his time, and he was one of the first men in Europe to enunciate the correct theory of fossils. 1

The close of Palissy’s life was quite in keeping with his active and stormy youth. Like Ambroise Pare, and some other notable men of his time, he was protected against ecclesiastical persecution by the court and some of the great nobles, but in the fanatical outburst of 1588 he was thrown into the Bastille, and although Henry III. offered him his freedom if he would recant, Palissy refused to save his life on any such terms. He was condemned to death when nearly eighty years of age, but he died in one of the dungeons of the Bastille in 1589.

Palissy’s Pottery. — The technique of the various wares he made shows their derivation from the ordinary peasant pottery of the period, though Palissy’s productions are, of course, vastly superior to anything of their kind previously made in Europe. It appears almost certain that he never used the potter’s wheel, as all his best known pieces have evidently been pressed into a mould and then finished by modelling or by the application of ornament moulded in relief. His most characteristic produc- tions are the large plates, ewers, oval dishes and vases to which he applied realistic figures of reptiles, fish, shells, plants and other objects. This is, however, not the work of an artist, but

Rustic Plate by Palissy.

that of a highly gifted naturalist at the dawn of modern science, who

delighted to copy, with faithful accuracy, all the details of reptiles, fishes, plants or shells. We may be sure that his fossil shells were not forgotten, and it has been suggested, with great probability, that these pieces of Palissy's were only

manufactured after his removal to Paris, as the shells are always well-known forms from the Eocene deposits of the Paris basin. Casts from these objects were fixed on to a metal dish or vase of the shape required, and a fresh cast of the whole formed a mould from which Palissy could reproduce many articles of the same kind. The various parts of each piece were painted in realistic colours, or as nearly so as could be reached by the pigments Palissy was able to discover and prepare. These colours were mostly various shades of blue from indigo to ultra- marine, some rather vivid greens, several tints of browns and greys, and, more rarely, yellow. A careful examination of the most authentic Palissy productions shows that they excel in the sharpness of their modelling, in a perfect neatness of manu- facture and, above all, in the subdued richness of their general tone of colour. The crude greens, bright purples and yellows are only found in the works of his imitators; whilst in the marbled colours on the backs of the dishes Palissy's work is soft and well fused, in the imitations it is generally dry, even harsh and uneven. Other pieces, such as dishes and plaques, were orna- mented by figure subjects treated after the same fashion, generally scriptural scenes or subjects from classical mythology, copied, in many cases, from works in sculpture by contemporary artists.

Another class of designs used by Palissy were plates, tazze and the like, with geometrical patterns moulded in relief and pierced through, forming a sort of open network. Perhaps the most successful, as works of art, were those plates and ewers which Palissy moulded in exact facsimile of the rich and delicate works in pewter for which Francois Briot and other Swiss metal-workers were so celebrated. These are in very slight relief, executed with cameo-like finish, and are mostly of good design belonging to the school of metal-working developed by the Italian goldsmiths of the 16th century. Palissy's ceramic reproductions of these metal plates were not improved by the colours with which he picked out the designs.

Some few enamelled earthenware statuettes, full of vigour and expression, have been attributed to Palissy; but it is doubtful whether

he ever worked in the round. On the whole his productions cannot be assigned a high rank as works of art, though they have always been highly valued, and in the 17th century attempts were made, both at Delft and Lambeth, to adapt his ” rustic ” dishes with the reliefs of animals and human figures. These imitations are very blunt in modelling and coarsely painted. They are generally marked on the back in blue with initials and a date — showing them to be honest adaptations to a different medium, not attempts at forgery such as have been produced during the last fifty years or so. One of the first signs of the revival of old French faience, a movement that was in great activity between 1840 and 1870, was the appearance of copies of Palissy’s ” Bestiole ” dishes, made with great skill and success by Avisseau of Tours, and after- wards by Pull of Paris. Though both these men produced original works of their own, collectors have had great cause to regret the excellence of their copies, for many of the best, being unmarked, have found their way into good collections. The well-known potter, Barbizet, who set out to make ” Palissys ” for the million, flooded France for a time with rude copies that ought never to have deceived anyone.

The best collections of Palissy’s ware are those in the museums of the Louvre, the H6tel Cluny, and Sevres; and in England that in the Victoria and Albert Museum, together with a few choice specimens in the British Museum and in the Wallace Collection.

As an author, Palissy was undoubtedly more successful than as a potter. A very high position amongst French writers is assigned to him by Lamartine (B. Palissy, 8vo., Paris, 1852). He wrote with vigour and simplicity on a great variety of subjects, such as agriculture, natural philosophy, religion, and especially in his L’Art de terre, where he gives an account of his processes and how he discovered them.

See Morley, Life of Palissy (1855) ; Marryat, Pottery (1850, pp. 31 seq.); A. Dumesnil, B. Palissy, le potier de terre (1851); A. Tain- turier, Terres kmaillees de Palissy (1863); Delecluze, B. Palissy (1838); Enjubault, L’Art ceramique de B. Palissy (1858); Audiat, Etude sur la vie . . . de B. Palissy (1868) ; H. Delange, Monographie de Voeuvre de B. Palissy (1862). For Palissy as a Huguenot, see Rossignol, Des Protestantes illustres, No. iv. (1861). The best English account of Palissy as a potter is that given by M. L. Solon, the most distinguished pottery-artist of the 19th century, in his History and Description of the Old French Faience (1903). (W. B.*)

PALITANA, a native state of India in the Kathiawar agency of the Bombay presidency. Area, 289 sq. m.; pop. (1901),

52,856, showing a decrease of 15% in the decade. The chief is a Gohel Rajput, with the title of Thakur Sahib. Gross revenue, £4.2,000; tribute jointly to the gaekwar of Baroda and the nawab of Junagarh, £700. The capital of the state is Palitana; pop. 12,800. Above the town to the west rises the hill of Satrunja, sacred to the Jains. On this hill, which is truly a city of temples, all the peculiarities of Jain architecture are found in a marked degree. Some of the temples are as old as the nth century, and they are spread over the intervening period down to the present. The hill is visited by crowds of pilgrims every year.

See J. Burgess, Notes of a Visit to Satrunjaya Hill (Bombay, 1869).

PALK STRAITS, the channel lying between the mainland of India and the island of Ceylon. It is named after Robert Palk, governor of Madras (1755-1763). The straits lie north of the line of reefs called Adam's Bridge, while the Gulf of Manaar lies south of it. The two channels are connected by the Pamban passage.

PALL, a word the various meanings of which can be traced to the Latin word pallium, that is, a piece of cloth used either as a covering or as a garment. In the last sense the pallium was the l/xaTiov, the square or oblong-shaped outer garment of the Greeks. In the sense of a garment the English usage of " pall " is confined to the ecclesiastical vestment (see Pallium) and to the supertunica or dalmatic, the pallium regale or imperial mantle, one of the principal coronation vestments of British sovereigns. The heraldic bearing known as a " pall " takes the form of the Y of the ecclesiastical vestment. The chief applications of the word, in the sense of a covering, are to an altar frontal, to a linen cloth used to veil the chalice in the Catholic service of the Eucharist, and to a heavy black, purple or white covering for a coffin or hearse. The livery companies of London possessed sumptuous state palls for the funerals of their members, of which some are still in existence. The Merchant Taylors' company have two examples of Italian workmanship. The so-called " Walworth pall " of the Fishmongers' company probably dates from the 16th century. The Vintners' pall is of cloth of gold and purple velvet, with a figure of St Martin of Tours, the company's/patron saint.

An entirely different word is " to pall," to become or make stale, insipid or tasteless, hence to cease to interest from constant repetition ; this is a shortened form of " appal " (O. Fr. appallir, to become pale; Lat. pallidus).

PALLA, Pala, or Impala, the native name of a red South African

antelope of the size of a fallow-deer, characterized by the large black lyrate horns of the bucks, and the presence in both sexes of a pair of glands on the back of the hind feet bearing a tuft of black hairs. On the east side the palla (Aepyceros melampus) ranges as far north as the southern Sudan; but in Angola it is replaced by a species or race (Ae. petersi) with a black ” blaze ” down the face. Pallas associate in large herds on open country in the neighbourhood of water. (See Antelope.) >

PALLADIAN, the term given in English architecture to one of the phases of the Italian Renaissance, introduced into England in 1620 by Inigo Jones, a great admirer of the works of Andrea Palladio (q.v.). In 1716, Richard Boyle, 3rd earl of Burlington, who also admired the works of Palladio, copied some of them, the front of old Burlington House being more or less a reproduction of the Palazzo Porto at Vicenza, and the villa at Chiswick a copy of the Villa Capua near Vicenza. It is probably due to Lord Burlington that the title Palladian is the designation for the Italian style as practised in England. In 1862 Sir Gilbert Scott’s Gothic design for the new government offices was rejected and Lord Palmerston selected in preference the Palladian style. In France and America, Barozzi Vignole (1507-1573), another Italian architect, holds a similar position as the chief authority on the Italian Renaissance. •

PALLADIO, ANDREA (15 18-1580), Italian architect, was born in Vicenza on the 30th of November 1518. The works of Vitruvius and Alberti were studied by him at an early period, and his student life was spent in Rome, where he was taken by

his patron Count Trissino. In 1547 he returned to Vicenza, where he designed a very large number of fine buildings — among the chief being the Palazzo della Ragione, with two storeys of open arcades of the Tuscan and Ionic orders, and the Bar- barano, Porti and Chieregati palaces. Most of these buildings look better on paper than in reality, as they are mainly built of brick, covered with stucco, now in a very dilapidated con- dition; but this does not affect the merit of their design, as Palladio intended them to have been executed in stone. Pope Paul III. sent for him to Rome to report upon the state of St Peter’s. In Venice, too, Palladio built many stately churches and palaces, such as S. Giorgio Maggiore, the Capuchin church, and some large palaces on the Grand Canal. His last great work was the Teatro

Olimpico at Vicenza, which was finished, though not altogether after the original design, by his pupil and fellow citizen Scamozzi.

In addition to his town buildings Palladio designed many country villas in various parts of northern Italy. The villa of Capra is perhaps the finest of these, and has frequently been imitated. Palladio was a great student of classical literature, and published in 1575 an edition of Caesar's Commentaries with notes. His / quattro libri dell' architettura, first published at Venice in 1570, has passed into countless editions, and been translated into every European language. The original edition is a small folio, richly illustrated with well-executed full-page woodcuts of plans, elevations, and details of buildings — chiefly either ancient Roman temples or else palaces designed and built by himself. Among many others, an edition with notes was published in England by Inigo Jones, most of whose works; and especially the palace of Whitehall, of which only the banqueting room remains, owed much to Palladio's inspira- tion. The style adopted and partially invented by Palladio expressed a kind of revolt against the extreme licence both of composition and ornament into which the architecture of his time had fallen. He was fascinated by the stateliness and pro- portion of the buildings of ancient Rome, and did not reflect that reproductions of these, however great their archaeological accuracy, could not but be lifeless and unsuited to the wants of the 16th century. Palladio's carefully measured drawings of ancient buildings are now of great value, as in many cases the buildings have altogether or in part ceased to exist.

Authorities. — Montanari, Vita di Andrea Palladio (1 749) ; Rigato, Osservazioni sopra Andrea Palladio (181 1); Magrini, Memorie intorno la vita di Andrea Palladio (1845); Milizia, Memorie degli architetti, ii. 35-54 (1781); Syraonds, Renaissance in Italy — Fine Arts, pp. 94-99; Zanella, Vita di Andrea Palladio (Milan, 1880); Barichella, Vita di Andrea Palladio (Lonigo, 1880).

PALLADIUM (Gr. iraWadwv) , an archaic wooden image (i-bavov) of Pallas Athena, preserved in the citadel of Troy as a pledge of the safety of the city. It represented the goddess, standing in the stiff archaic style, holding a spear in her right hand, in her left a distaff and spindle or a shield. According to Apollodorus (iii, 12, 3) it was made by order of Athena, and was intended as an image of Pallas, the daughter of Triton, whom she had accidentally slain, Pallas and Athena being thus regarded as two distinct beings. It was said that Zeus threw it down from heaven when Ilus was founding the city of Ilium, Odysseus and Diomedes carried it off from the temple of Athena, and thus made the capture of Troy possible. According to

some accounts, there was a second Palladium at Troy, which was taken to Italy by Aeneas and kept in the temple of Vesta at Rome. Many cities in Greece and Italy claimed to possess the genuine Trojan Palladium. Its theft is a frequent subject in Greek art, especially of the earlier time.

PALLADIUM [symbol Pd, atomic weight 106-7 (0 = i6)], in chemistry, a metallic element associated with the platinum group. It is found in platinum ores, and also in the native condition and associated with gold and silver in Brazilian gold-bearing sand. Many methods have been devised for the isolation of the metal from platinum ore. R. Bunsen {Ann., 1868, 146, p. 265), after removing most of the platinum as ammonium platinochloride, precipitates the residual metals of the group by iron; the resulting precipitate is then heated

with ammonium chloride and evaporated with fuming nitric acid, the residue taken up in water, and the palladium precipi- tated as potassium palladium chloride. This is purified by dissolving it in hot water and evaporating the solution with oxalic acid, taking up the residue in potassium chloride, and filtering off any potassium platinochloride formed. The filtrate deposits potassium palladium chloride, which on heating in a current of hydrogen leaves a residue of the metal. Roessler (Zeit. f. ckemie, 1866, p. 175) precipitates both platinum and palladium as double chlorides, the resulting mixed chlorides being reduced to the metals by ignition in hydrogen, taken up in aqua regia, the solution neutralized, and the palladium precipitated by mercuric cyanide. See also T. Wilm (Ber., 1880, 13, p. 1108; 1881, 14, p. 629; 1882, 15, p. 241) on its separation as pallados- ammine chloride, and Cox (Phil. Mag., 1843, 23, p. 16) on the separation of palladium from Brazilian gold sand. Pure palladium may be obtained by the reduction of the double chloride (NH 4) 2 PdCl 4 in a current of hydrogen, or of palladious chloride with formic acid.

It is a ductile metal of silvery lustre, with a specific gravity of 11-97 (° °C.). It is the most easily fusible of the metals of the platinum group, its melting-point being about 1 530-1 550 C. (L. Holborn and F. Henning, Sitzb. Akad. Berlin, 1905, p. 311). It readily distils when heated in the electric furnace. Its mean specific heat between 0° and t °C. is 0-0582 + o-ooooiot (J. Violle, Comptes renins, 1879, 89, p. 702). Palladium finds application in the form of alloys for astronomical instruments, in dentistry, and in the construction of springs and movements of clocks. Native palladium is dimorphous. It is soluble in nitric acid, more especially if the acid contains oxides of

nitrogen, and when obtained in the finely divided condition by reduction of its salts, it is to some extent soluble in hydrochloric acid. It also dissolves in boiling concentrated sulphuric acid and in hydriodic acid. It oxidizes when fused with caustic alkalis. It combines with fluorine and with chlorine at a dull red heat, but not with iodine, whilst bromine has scarcely any action on the metal. It combines with sulphur directly, and according to T. Wilm (Ber., 1882, 15, p. 2225) forms the oxide PdsO, when heated in a current of air.

Two series of salts are known, namely, palladious salts and palladic salts, corresponding to the two oxides PdO and PdC > 2. Of these the palladious salts only are stable, the palladic salts readily passing into the palladious form on boiling with water. The palladium compounds show a complete analogy with the corresponding platinum salts. All the salts of the metal when heated decompose and leave a residue of the metal; the metal may also be obtained from solutions of the salts by the addition of zinc, iron, formic acid, phosphorus and hot alcohol. Sulphuretted hydrogen gives with palladium salts a precipitate of palladium sulphide which is insoluble in ammonium sulphide; mercuric chloride gives the characteristic yellowish precipitate of palladious chloride, and potassium iodide the black palladious iodide which dissolves on addition of excess of the precipitant. These two latter reactions may be used for the recognition of palladium, as may also the behaviour of the salts with ammonia, this reagent giving a brown precipitate, which turns to a red shade, and is soluble in a large excess of the precipitant to a clear solution, from which by adding hydrochloric acid a yellow precipitate of palladosammine chloride, Pd(NH s) 2 Cl2, is obtained. Palladium is permeable to hydrogen at a temperature of 240° C. and upwards. It absorbs hydrogen and other gases, the heat of occlusion being 4640 calories per gram of hydrogen. The occluded hydrogen is strongly bound to the metal, only traces of the gas being given off on standing in vacuo, but it is easily removed when heated to 100° C. T. Graham {Phil. Mag., 1 866-1 869) was of the opinion that the occluded hydrogen underwent great condensation and behaved as a quasi-metal (to which he gave the name ” hydrogenium “), forming an alloy with the palladium; but L. Troost and P. Hautefeuille (Ann. chim. phys., 1874, (5) 2, p. 279) considered that a definite compound of com- position Pd2H was formed. The more recent work of C. Hoitsema (Zeit. phys. chim., 1895, 17, p. 1) however, appears to disprove the formation of a definite compound (see also J. Dewar, Phil. Mag., 1874, (4) 47, pp. 324, 342). A palladium hydride was obtained by Graham by the reduction of palladious sulphate with sodium hypophosphite. It is an unstable black powder, which readily loses hydrogen at 0° C. C. Paal and J.

Gerum (Ber., 1908, 41, p. 818) have shown that- when palladium black is suspended in water one volume of the metal combines with 1204 volumes of hydrogen, or in the atomic proportion Pd/H = l/-98.

Palladious oxide, PdO, is a black powder formed by heating spongy palladium to a dull red heat in a current of oxygen or by gentle ignition of the nitrate. It is insoluble in acids, is easily reduced, and decomposes when heated. Palladic oxide, Pd0 2 , is obtained in the hydrated condition, Pd0 2 »H 2 0, by the action of ozone on palladious chloride; by the electrolytic oxidation of palladi ous nitrate in slightly acid solution (L. Wohler) ; and by the action of caustic potash on potassium palladio-chloride, the liquid being neutralized with acetic acid (I. Bellucci, Zeit. anorg. Chem., 1905, 47, p. 287). It is a dark red or brown coloured powder, which loses oxygen on heating. When boiled with water it passes into the lower oxide. It is an energetic oxidizing agent, and when freshly prepared is soluble in dilute mineral acids. A hydrated form of the monoxide, PdO-»H 2 0, is obtained by hydrolyzing a faintly acid solution of the nitrate (L. Wohler, Zeit. anorg. Chem., 1905, 46, P- 323), or by the action of a slight excess of caustic soda on the double chloride K 2 PdCl6. It is a dark brown powder which loses its water of hydration when dried in air, and in the dry condition is difficultly soluble in acids. By the electrolytic oxidation of palladious nitrate L. Wchler and F. Martin (lb., 1908, 57, p. 398), obtained a hydrated oxide, Pd 2 3 -raH 2 0, as a dark brown powder which dissolves in hydrochloric acid, forming an unstable chloride.

Palladious chloride, PdCl 2 , is obtained as a deliquescent crystalline mass when spongy palladium is heated to dull redness in a current of dry chlorine. A hydrated form, of composition PdCl 2 -2H 2 0, results on dissolving palladium in aqua regia, containing only a small proportion of nitric acid. It crystallizes from water as a reddish-brown solid. It absorbs hydrogen and is easily reduced. It combines with carbon monoxide to form compounds of com- position PdCl 2 -2CO; 2PdCl 2 -3CO; PdCl 2 CO (E. Fink, Comptes Rendus, 1898, 126, p. 646), and can be used for the determination of the amount of carbon monoxide in air (Potain and R. Drouin, lb., 1898, 126, p. 938). On treatment with dry ammonia gas it yields palladodiammine chloride, Pd(NH 3) 1 Cl 2 . Palladious chloride combines with hydroxylamine to form the compounds Pd(NH 3 0)4CI 2 and Pd(NH 3 0) 2 Cl 2 . The first results from the action of hydroxyl amine on the chloride in the

presence of sodium carbonate, and may be isolated as the free base. The other is thrown down as a yellow granular precipitate when a small quantity of dilute hydro- chloric acid is added to the base, Pd(NH 3 0)4(OH) 2 (S. Feisel and A. Nowak, Ann., 1907, 351, p. 439). The chloride PdCl 4 is only known in acid solution, and is obtained when palladium is dissolved in aqua regia or when palladic oxide is dissolved in concentrated hydrochloric acid. The solution is brown in colour and gradually loses chlorine, being converted into palladious chloride. Both chlorides combine with many other metallic chlorides to form characteristic double salts, the double, potassium salts having the formulae KˆPdCU and K 2 PdCl6. The former may be prepared by adding an excess of potassium chloride to palladious chloride, or by boiling KˆPdCU with a large excess of water. It crystallizes in prisms which are readily soluble in water but are practically insoluble in absolute alcohol. It is decomposed by direct heating, and also by heating in a current of hydrogen. The latter compound is formed when chlorine is passed into a warm aqueous solution of the former or by dissolving palladium in aqua regia and saturating the solution with potassium chloride. It crystallizes in scarlet octahedra which darken on heating, and decompose when strongly heated. It is slightly soluble in cold water, but dissolves in warm dilute hydrochloric acid. When boiled with alcohol it is reduced to the metallic condition.

The subsulphide, Pd 2 S, is obtained as a hard, green coloured mass when palladosammine chloride is fused with sulphur or when the sulphide PdS is fused with sulphur and ammonium chloride. It loses sulphur slowly when heated and is insoluble in acids. Pal- ladious sulphide, PdS, is obtained by precipitation of the corres- ponding salts with sulphuretted hydrogen, or by the action of dry sulphuretted hydrogen gas on palladosammine chloride. As pre- pared in the dry way it is a hard, blue coloured, insoluble mass, but if obtained by precipitation is of a brownish-black colour and is soluble in nitric acid. When heated in air it oxidizes to a basic sulphate. The disulphide, PdS 2 , is a brownish-black crystalline powder which is formed when the double ammonium palladium chloride (NH4) 2 PdCl 6 is heated to redness with caustic soda and sulphur. It combines with the alkaline sulphides. It gradually loses sulphur on heating, and is easily soluble in aqua regia. A sulphide of composition PdjSa has been described (R. Schneider, Pogg. Ann., 1873, 148, p. 625).

Palladium sulphate, PdS0 4 -2H 2 0, is obtained by dissolving the oxide in sulphuric acid, or by the action of nitric and sulphuric acids on the metal. It forms a reddish-brown, deliquescent, crystalline mass, and is easily soluble in water, but in the presence of a large excess of water yields a basic sulphate. Palladium nitrate, Pd(N0 3) 2 ,

crystallizes in brownish-yellow deliquescent prisms and is obtained by dissolving the metal in nitric acid. It is very soluble in_ water, and its aqueous solution decomposes on boiling, with precipitation of a basic nitrate. Palladium cyanide, Pd(CN) 2 , is obtained as a yellowish precipitate when palladium chloride is precipitated by mercuric cyanide. It is insoluble in water, and on heating decomposes into palladium and cyanogen. It is soluble in solutions of the alkaline cyanides, with formation

of double cyanides of the type K 2 Pd(CN)4. On account of ita insolubility and its stability it is useful for the separation of palla- dium from the other metals of the platinum group.

The palladium salts combine with ammonia to form characteristic compounds, which may be grouped into two main divisions: (1) the palladammines (palladosammines) of type [Pd(NH 3) 2 X 2], and (2) the palladodiammines [Pd(NH 3)4]X 2 . The palladosammines are obtained by adding a large excess of ammonia to the palladious salts, the resulting clear solution being then precipitated by the mineral acid corresponding to the salt used. This method of pre- paration serves well for the chloride, from which other salts may be obtained by double decomposition. These salts are fairly stable, and are red, yellow or orange in colour. The palladodiammine salts are mostly colourless, and are not very stable; acids convert them into the palladosammines, and they lose two molecules of ammonia very easily. They are formed by the action of a large excess of ammonia on the palladious salts or on the corresponding palladosammine salts in the presence of water.

Numerous determinations of the atomic weight of palladium have been made, the values obtained varying from 105-7 to 107-249 (see Amer. Chem. Jour., 1899, .21, p. 943; Ann., 1905, 341, p. 235; Jour. Chem. Soc, 1894, 65, p. 20). The International Commission on Atomic Weights, 1909, recount several new determinations: Haas (Dissertation, Erlangen, 1908) from reduction of palladosam- mine bromide obtained the value 106-7 ; Kemmerer (Thesis, Penn- sylvania, 1908), from reduction of the corresponding chloride and cyanide obtains a mean value of 106-434; whilst A. Gutbier and his collaborators, from analyses of palladosammine chloride and bromide, obtained the values 106-64 ±0-03 an d 106-65 =*=o-02 from the chloride, and 106-655 from the bromide (Jour. pr. chem., 1909, ii. 79, pp. 235, 457).

PALLADIUS, RUTILIUS TAURUS AEMILIANUS, a Roman author of the 4th century a.d. He wrote a poem on agriculture (J)e re rustica) in

fourteen books, the material being derived from Columella and other earlier writers. The work is con- veniently arranged, but far inferior in every other respect to that of Columella.

There is a modern German edition by Schmitt (Leipzig, 1898).

PALLANZA, a small industrial town and summer and winter resort of the province of Novara, Piedmont, Italy, 659 ft. above sea-level. Pop. (1001), 4619 (town); 5247 (commune). It occupies a position of great natural beauty, on a promontory on the W. of Lago Maggiore, with a semicircle of mountains behind and the lake and Borromean Islands in front, 62 m. N. of Novara direct. The annual mean temperature is 55° Fahr.; January, 37-1°, July, 74 . There is a fine botanical garden.

PALLAS, PETER SIMON (1741-1811), German naturalist and traveller, was born in Berlin on the 22nd of September 1 741, the son of Simon Pallas, surgeon in the Prussian army and professor of surgery in Berlin. He was intended for the medical profession, and studied at the universities of Berlin, Halle, Gbttingen and Leiden. He early displayed a strong leaning towards natural history. In 1761 he went to England, where for a year he devoted himself to a thorough study of the collections and to a geological investigation of part of the coast; and at the age of twenty-three he was elected a foreign member of the Royal Society. He then spent some time in Holland, and the results of his investigations appeared at the Hague in 1766 in his Elerichus Zoophytomm and Miscellanea Zoologica, and in 1767-1804 in his Spicilegia Zoologica (Berlin). In 1768 he accepted the invitation of the empress Catharine II. to fill the professorship of natural history in the Imperial Academy of Science, St Petersburg, and in the same year he was appointed naturalist to a scientific expedition through Russia and Siberia, the immediate object of which was the observation of the transit of -Venus in 1769. In this leisurely journey Pallas went by Kasan to the Caspian, spent some time among the Kalmucks, crossed the Urals to Tobolsk, visited the Altai mountains, traced the Irtish to Kolyvan, went on to Tomsk and the Yenisei, crossed Lake Baikal, and extended his journey to the frontiers of China. Few explorations have been so fruitful as this six years' journey. The leading results were given in his Reisen durch verschiedene Provinzen des rtissischen Reichs (3 vols., St Petersburg, 1771-1776), richly illustrated with coloured plates. A French translation in 1788-1793, in 8 vols., with 9 vols, of plates, contained, in addition to the narrative, the natural history results of the expedition; and an English trans- lation in three volumes appeared in 1812. As special results

of this great journey may be mentioned Sammlungen historischer Nachrichten iiber die mongolischen Volkerschajten (2 vols., St Petersburg, 1776-1802); Novae species quadrupedum, 1778- 1779; Pallas's contributions to the dictionary of languages of the Russian empire, 17 86-1 7 89; Icones insectorum, praesertim Rossiae Siberiaeque peculiarium, 1781-1806; Zoographia rosso- asiatica (3 vols., 183 1); besides many special papers in the Transactions of the academies of St Petersburg and Berlin. The empress bought Pallas's natural history collections for 20,000 roubles, 5000 more than he asked for them, and allowed him to keep them for life. He spent a considerable time in 1 793-1 794 in visiting the southern provinces of Russia, and was so greatly attracted by the Crimea that he determined to take up his residence there. The empress gave him a large estate at Simpheropol and 10,000 roubles to assist in equipping a house. Though disappointed with the Crimea as a place of residence, Pallas continued to live there, devoted to constant research, especially in botany, till the death of his second wife in 1810, when he removed to Berlin, where he died on the 8th of September 181 1. The results of his journey in southern Russia were given in his Bemerkungen auf einer Reise durch die siidlichen Statthalterschaften des russischen Reichs (Leipzig, 1799- 1801; English translation by Blagdon, vols, v.viii. of Modem Discoveries, 1802, and another in 2 vols., 1812). Pallas also edited and contributed to Neue nordische Beitrage zur physi kal schen Erd- und Volkerbeschreibung, Naturgeschichte, und Oekonomie (1781-1796), published Ittustrationes plantarum imperfecte vel nondum cognitarum (Leipzig, 1803), and con- tributed to Buffon's Natural History a paper on the formation of mountains.

See the essay of Rudolphi in the Transactions of the Berlin Academy for 1812 ; Cuvier's Eloge in his Recueil des iloges historiques, vol. ii.; and the Life in Jardine's Naturalists' Library, vol. iv. (Edin., 1843).

PALLAVICINO, FERRANTE (1618-1644), Italian writer of pasquinades, a member of the old Italian family of the Palla- vicini, was born at Piacenza in 1618. He received a good education at Padua and elsewhere, and early in life entered the Augustinian order, residing chiefly in Venice. For a year he accompanied Ottavio Piccolomini, duke of Amalfi, in his German campaigns as field chaplain, and shortly after his return he published a number of clever but exceedingly scurri- lous satires on the Roman curia and on the powerful house of the Barberini, which was so keenly resented at Rome that a price was set on his head. A Frenchman, Charles de Breche, decoyed him from Venice to the neighbourhood of Avignon,

and there betrayed him. After fourteen months' imprisonment he was beheaded at Avignon on the 6th of March, 1644.

His Opere permesse was pub- lished at Venice in 1655, but being,

as may be imagined, inferior in scurrility and grossness (Palla- vicino's specialities), are much less prized by the curious than the Opere scelte (Geneva, 1660), which were more than once reprinted in Holland, and were translated into German in 1663.

PALLAVICINO (or Pallavicini), PIETRO SFORZA (1607- 1667), Italian cardinal and historian, son of the Marquis Ales- sandro Pallavicino of Parma, was born at Rome in 1607. Having taken holy orders in 1630, and joined the Society of Jesus in 1638, he successively taught philosophy and theology in the Collegium Romanum; as professor of theology he was a member of the congregation appointed by Innocent X. to investigate the Jansenist heresy. In 1659 he was made a cardinal by Alexander VII. He died at Rome on the 5th of June 1667. Pallavicino is chiefly known by his history of the council of Trent, written

in Italian, and published at Rome in two folio volumes in 1656- 1657 (2nd ed., considerably modified, in 1666). In this he continued the task begun by Terenzio Alciati, who had been commissioned by Urban VIII. to correct and supersede the very damaging work of Sarpi on the same subject. Alciati and Pallavicino had access to many important sources from the use of which Sarpi had been precluded; the contending parties, however, are far from agreed as to the completeness of the refutation. The work was translated into Latin by a Jesuit named Giattinus (Antwerp, 1670-1673). There is a good edition of the original by Zaccharia (6 vols., Faenza, 1792-1799). It was translated into German by Klitsche in 1835-1837. He also wrote a life of Alexander VII. and a tragedy {Ermenegildo, 1644), &c.

His collected Opere were published in Rome in 1844-1848.

PALLIUM or Pall (derived, so far as the name is concerned, from the Roman pallium or palla, a woollen cloak), an ecclesi- astical vestment in the Roman Catholic Church, originally peculiar to the pope, but for many centuries past bestowed by him on all metropolitans, primates and archbishops as a symbol of the jurisdiction delegated to them by the Holy See. The pallium, in its present form, is a narrow band, " three fingers broad," woven of white lamb's wool, with a loop in the centre resting on the shoulders over the che uble, and two dependent lappets, before and behind; so that when seen from front or back the

ornament resembles the letter Y. It is decorated with six purple crosses, one on each tail and four on the loop, is doubled on the left shoulder, and is garnished, back and front, with three jewelled gold pins. The two latter characteristics seem to be survivals of the time when the Roman pallium, like the Greek iijuxpbpwv was a simple scarf doubled and pinned on the left shoulder.

The origin of the pallium as an ecclesiastical vestment is lost in antiquity. The theory that explains it in connexion with the figure of the Good Shepherd carrying the lamb on his shoulders, so common in early Christian art, is obviously an explanation a posteriori. The ceremonial connected with the preparation of the pallium and its bestowal upon the pope at his coronation, however, suggests some such symbolism. The lambs whose wool is destined for the making, of the pallia are solemnly presented at the altar by the nuns of the convent of St Agnes at

(Drawn by Father J. Braun, and reproduced from his Die liturgische Gewandung by permission of B. Herder.) Illustration of the Development of the Pallium.

Rome at mass on St Agnes' day, during the singing of the Agnus Dei. They are received by the canons of the Lateran church and handed over by them to the apostolic subdeacons, by whom they are put out to pasture till the time of shearing. The pallia fashioned of their wool by the nuns are carried by the subdeacons to St Peter's, where they are placed by the canons on the bodies of St Peter and St Paul, under the high altar, for a night, then committed to the subdeacons for safe custody. A pallium thus consecrated is placed by the archdeacon over the shoulders of the pope at his coronation, with the words " Receive the pallium," i.e. the plenitude of the pontifical office, " to the glory of God, and of the most glorious Virgin His Mother, and of the blessed apostles St Peter and St Paul, and of the Holy Roman Church."

The elaborate ceremonial might suggest an effort to symbolize the command ” Feed My lambs!” given to St Peter and its transference to Peter’s successors. Some such idea underlies the developed ceremonial; but the pallium itself was in its origin no more than an ensign of the episcopal dignity, as it remains in the East, where — under the name of wixo4 > 6piov (cDyuos, shoulder, kpeiv, to carry) — it is worn by all bishops. More- over, whatever symbolism may be evolved from the lambs’ wool is vitiated, so far as origins are concerned, by the fact that the papal pallia were at one time made of white linen (see Johannes Diaconus, Vita S. Gregorii M. lib. IV. cap. 8, pallium ejus bysso candente contextum) }

The right to wear the pallium seems, in the first instance, to have been conceded by the popes merely as a mark of honour. The first recorded example of the bestowal of the pallium by the popes is the grant of Pope Symmachus in 513 to Caesarius of Aries, as papal vicar. By the time of Gregory I. it was given not only to vicars but as a mark of honour to distinguish bishops, and it is still conferred on the bishops of Autun, Bam- berg, Dol, Lucca, Ostia, Pavia and Verona. St Boniface caused a reforming synod, between 840 and 850, to decree that in future all metropolitans must seek their pallium at Rome (see Boniface’s letter to Cuthbert, 78, Monumenta Germaniae, epis- tolae, III.); and though this rule was not universally followed even until the 13th century, it is now uncanonical for an arch- bishop to exercise the functions proper to his office until the pallium has been received. Every archbishop must apply for it, personally or by depu||t, within three months after his conse- cration, and it is buried: with him at his death (see Archbishop). The pallium is never granted until after payment of consider- able dues. This payment, originally supposed to be voluntary, became one of the great abuses of the papacy, especially during the period of the Renaissance, and it was the large amount (raised largely by indulgences) which was paid by Albert, arch- bishop of Mainz, to the papacy that roused Luther to protest. Though the pallium is thus a vestment distinctive of bishops having metropolitan jurisdiction, it may only be worn by them within their jurisdiction, and then only on certain solemn occa- sions. The pope alone has the right to wear everywhere and at all times a vestment which is held to symbolize the plenitude of ecclesiastical power.

See P. Hinschius, Kirchenrecht, II. 23 sqq. ; Gresar, ” Das romische

Pallium und die altesten liturgischen Scharpen ” (in Festschrift zum elfhundertjdhrigen Jubilaum des campo santo in Rom, Freiburg, 1897); Du Cange, Glossarium s.v. “Pallium”; Joseph Braun, Die liturgische Gewandung im Occident und Orient (Freiburg-i-B.,

1907).

PALL-MALL, an obsolete English game of French origin, called in France paille-maille (from palla, ball, and malleus, mallet). Sir Robert Dallington, in his Method for Travel (1598), says: ” Among all the exercises of France, I prefer none before the Paille-Maille.” James I., in his Basilikon doron, recom- mended it as a proper game for Prince Henry, and it was actually introduced into England in the reign of Charles I., or perhaps a few years earlier. Thomas Blount’s Glossographia (ed. 1670) describes it as follows: ” Pale Maille, a game wherein a round bowle is with a mallet struck through a high arch of iron (stand- ing at either end of an alley), which he that can do at the fewest blows, or at the number agreed on, wins. This game was hereto- fore used in the long’alley near St James’s, and vulgarly called Pell-Mell.” The pronunciation here described as ” vulgar ” afterwards became classic. A mallet and balls used in the game were found in 1845 and are now in the British Museum. The mallet resembles that used in croquet, but its head is curved and its ends sloped towards the shaft. The balls are of boxwood and about one foot in circumference. Pepys describes the alley as of hard sand ” dressed with powdered cockle-shells.” The length of the alley varied, that at St James’s being about 800 yds. Some alleys had side walls.

1 Father Joseph Braun, S.J., holds that the pallium, unlike other vestments, had a liturgical origin, and that it was akin to the scarves of office worn by priests and priestesses in pagan rites. See Die pontificalen Gewdnder des Abendlandes, p. 174 (Freiburg-i-B. i8 9 8>.

PALLONE (Italian for ” large ball,” from palla, ball), the national ball game of Italy. It is descended, as are all other court games, such as tennis and pelota, from the two ball games played by the Romans, in one of which a large inflated ball, called follis, was used. The other, probably the immediate ancestor of pallone, wae played with a smaller ball; the pila. Pallone was played in Tuscany as early as the 14th century, and is still very popular in northern and central Italy. It is played in a court (sferisterio) , usually 100 yds. long and 17 yds. wide. A white line crosses the middle of the court, which is bounded on one side by a high wall, the spectators sitting round the other three sides, usually protected by wire screens. One end of the court is called

the battuta and the other the ribtattuta. At the end of the battuta is placed a spring-board, upon which stands the player who receives the service. The implements of the game are the pallone (ball) and the bracciale (bat). The pallone is an inflated ball covered with leather, about 4I in. in diameter. The bracciale is an oak gauntlet, tubular in shape, and covered with long spike-like protuberances. It weighs between five and six pounds and is provided with a grip for the hand. The game is played by two sides — blues and reds — of three men each, the battitore (batter), spalla (back) and terzino (third). At the beginning of a game the battitore stands on the spring-board and receives the ball thrown to him on the bound by a seventh player, the mandarino, who does duty for both sides.. The batter may ignore the ball until it comes to him to his liking, when he runs down the spring-board and strikes it with his bracciale over the centre line towards his opponents. The game then proceeds until a player fails to return the ball correctly, or hits it out of bounds, or it touches his person. This counts a point for the adversary. Four points make a game, counting 15, 30, 40 and 50.

See II Giuoco del pallone, by G. Franceschini (Milan, 1903).

PALM, JOHANN PHILIPP (1768-1806), German bookseller, a victim of Napoleonic tyranny in Germany, was born at Schorn- dorf, in Wiirttemberg, on the 17th of November 1768. Having been apprenticed to his uncle, the publisher Johann Jakob Palm (1750-1826), in Erlangen, he married the daughter of the bookseller Stein in Nuremberg, and in course of time became proprietor of his father-in-law's business. In the spring of 1806 the firm of Stein sent to the bookselling establishment of Stage in Augsburg a pamphlet (presumably written by Philipp Christian Yelin in Ansbach) entitled Deutschland in seiner tiefen Erniedrigung (" Germany in her deep humiliation "), which strongly attacked Napoleon and the behaviour of the French troops in Bavaria. Napoleon, on being apprised of the violent attack made upon his regime and failing to discover the actual author, had Palm arrested and handed over to a military commission at Braunau on the Bavarian- Austrian frontier, with peremptory instructions to try and execute the prisoner within twenty-four hours. Palm was denied the right of defence, and after a mock trial on the 25th of August 1806 he was shot on the following day. A life-size bronze statue was erected to his memory in Braunau in 1866, and on the centenary of his death numerous patriotic meetings were held in Bavaria.

See F. Schultheis, Johann Philipp Palm (Nuremberg, i860); and J. Rackl, Der niirnberger Buchhandler Johann Philipp Palm (Nuremberg,

1906).

PALM (Lat. palma, Gr. xaXcyn?) , originally the flat of the hand, in which sense it is still used; from this sense the word was transferred as a name of the trees described below. The emblematic use of the word (= prize, honour) represents a further transference from the employment of the palm-leaves as symbols of victory.

The Palms {Palmaceae) have been termed the princes of the vegetable kingdom. Neither the anatomy of their stems nor the conformation of their flowers, however, entitles them to any such high position in the vegetable hierarchy. Their stems are not more complicated in structure than those of the common butcher's broom {Ruscus); their flowers are for the most part as simple as those of a rush {J uncus). The order Palmaceae

is characterized among monocotyledonous plants by the pre- sence of an unbranched stem bearing a tuft of leaves at the

extremity only, or with the leaves scattered; these leaves, often gigantic in.size, being usually firm in texture and branching in a pinnate or palmate fashion. The flowers are borne on simple or branch- ing spikes, very generally protected by a spathe or spathes, and each consists typically of a perianth of six greenish, somewhat inconspicuous segments in two rows, with six sta- mens, or pistil of 1-3 carpels, each with a single ovule and a succulent or dry fruit, never dehiscent (fig. 1, A and B). The seed consists almost ex- clusively of endosperm or albumen in a cavity in which is lodged the rela- tively very minute embryo (fig. 1, C). These are the general characteristics by which this very well-defined order may be discriminated, but, in a group containing considerably more than a thousand species, deviations from the general plan of structure occur with some frequency. As the characteristic appearances of palms depend to a large extent upon these modifications, some of the more important among them may briefly be noticed.

Taking the stem first, we may mention that it is in very many palms relatively tall, erect, unbranched. regularly cylindrical,

FlG.l.A.B. — Floral diagrams of a Palm

(Chamaerops humilis). A, male flower. B, female-flower. C, Upper

portion of Coco-nut seed,

showing e, embryo, embedded

in a, endosperm.

Fig. 2. — Daemonorops Draco (a Rattan Palm). 1, Young shoot much reduced. 2, Part of stem bearing male inflorescence. 3, Part of female inflorescence. 4, The same bearing ripe fruits.

or dilated below so as to form an elongated cone, either smooth, or covered with the projecting remnants of the former leaves, or

marked with circular scars indicating the position of those leaves which have now fallen away. It varies in diameter from the thickness of a reed (as in Chamaedorea) to a sturdy pillar-like structure as seen in the date-palm, Palmyra palm (fig. 7) or Talipot. In other cases the very slender stem is prostrate, or

(After Bentley and Trimen, Medicinal Plants, by permission of Messrs J. & A. Churchill.)

Fig. 3. — Areca Palm {Areca Catechu).

1, Tree, very much reduced. 5, Male flower opened by removal

2, Part of leaf. of a petal.

3, Portion of inflorescence with 6, Fruit.

male flowers above, female 7, 8, Same cut across.and length – (larger) below. wise, p, Fibrous pericarp;

4, Petal of a male flower. en, ruminated endosperm ; e,

embryo.

scandent by means of formidable hooked prickles which, by enabling the plant to support itself on the branches of neigh- bouring trees, also permit the stem to grow to a very great length and so to expose the foliage to the light and air above the tree- tops of the dense forests these palms grow in, as in the genus Calamus, the Rattan or Cane palms. In some few instances the trunk, or that portion of it which is above ground, is so short that the plant is in a loose way called ” stemless ” or ” acaulescent,” as in Geonoma, and as happens sometimes in the only species found in a wild state in Europe, Chamaerops humilis. The vegetable ivory (Phytelephas) of equatorial

America has a very short thick stem bearing a tall cluster of leaves which appears to rise from the ground. In many species the trunk is covered with a dense network of stiff fibres, often compacted together at the free ends into spines. This fibrous material, which is so valuable for cordage, consists of the fibrous tissue of the leaf- stalk, which in these cases persists after the decay of the softer portions. It is very characteristic of some palms to produce from the base of the stem a series of adventitious roots which gradually thrust themselves into the soil and serve to steady the tree and prevent its overthrow by the wind. The underground stem of some species, e.g. of Calamus, is a rhizome, or root-stock, lengthen- ing in a more or less horizontal manner by the development of the terminal bud, and sending up lateral branches like suckers from the root-stock, which form dense thickets of cane-like stems. The branching of the stem above ground is unusual, except in the case of the Doum palm of Egypt (Hyphaene), where the stem forks, often repeatedly; this is due to the development of a branch to an equal strength with the main stem. In other

cases branching, when present, is probably the result of some injury to the terminal bud at the top of the stem, in consequence of which buds sprout out from below the apex.

The internal structure of the stem does not differ fundamentally from that -of a typical monocotyledonous stem, the taller, harder trunks owing their hardness not only to the fibrous or woody skeleton but also to the fact that, as growth goes on, the originally soft cellular ground tissue through which the fibres run becomes hardened by the deposit of woody matter within the cells, so that ultimately the cellular portions become as hard as the woody fibrous tissue.

The leaves of palms are either arranged at more or less distant intervals along the stem, as in the canes {Calamus, Daemonorops, fig. 2, &c), or are approximated in tufts at the end of the stem, thus forming those noble crowns of foliage (figs. 5, 6, 7) which are so closely associated with the general idea of a palm. In the young condition, while still unfolded, these leaves, with the succulent end of the stem from which they arise, form ” the cabbage,” which in some species is highly esteemed as an article of food.

The adult leaf very generally presents a sheathing base taper- ing upwards into the stalk or petiole, and this again bearing the lamina or

blade. The sheath and the petiole very often bear stout spines, as in the rattan palms (see fig. 2) ; and when, in course of time, the upper parts of the leaf decay and fall off, the base of the leaf-stalk and sheath often remain, either entirely or in their fibrous portions only, which latter constitute the investment to the stem already mentioned. In size the leaves vary within very

wide limits, some being only a few inches in extent, while those of the noble Caryota may be measured in tens of feet. In form the leaves of palms are very rarely simple ; usually they are more or less divided, sometimes, as in Caryota, extremely so. In species of Geonqma, Versckaffeltia and some others, the leaf splits into two divisions at the apex and not elsewhere; but more usually the leaves branch regularly in a palmate fashion as in the fan – palms Latania, Sabal, &c, or in a pinnate fashion as in the feather-palms, Areca (fig. 3), Kentia, Calamus, Daemonorops (fig. 2), &c. The form of the segments is generally more or less linear, but a very distinct appearance is given by the broad wedge-shaped leaflets of such palms as Caryota, Martinezia or Mauritia. These forms run one into another by transitional gradations; and even in the same palm the form of the leaf is often very different at different stages of its growth, so that it is a difficult matter to name correctly seedling or juvenile palms in the condition in which we generally meet with them in the nurseries, or even to foresee what the future development of the plant is likely to be. Like the other parts of the plant, the leaves are sometimes invested with hairs or spines; and, in some instances, as in the magnificent Ceroxylon andicola, the under surface is of a glaucous white or bluish colour, from a coating of wax.

The inflorescence of palms consists generally of a fleshy spike, either simple or much branched, studded with numerous, sometimes extremely numerous, flowers, and enveloped by one or more sheathing bracts called ” spathes ” (fig. 5). These parts may be small, or they may attain relatively enormous dimensions, hanging down from amid the crown of foliage like huge tresses, and adding greatly to the noble effect of the leaves. In some cases, as in the Talipot palm, the tree only flowers once; it grows for many years until it has become a large tree then develops a huge inflorescence, and after the fruit has ripened, dies.

The individual flowers are usually small (figs. 3, 6), greenish and insignificant; their general structure has been mentioned already. Modifications from the typical structure arise from difference of

1,

Fig. 4. Fruit of date-palm {Phoenix dactylifera) , nat. size. 2, Same cut lengthwise showing

seed s. Borassus (fig. 7), Chamaerops,

texture, and specially from suppression of parts, in consequence of which the flowers are very generally unisexual (figs. I, 3, 6), though the flowers of the two sexes are generally produced on the same tree (monoecious), not indeed always in the same season, for a tree in

Fig. 5. — Acrocomia sclerocarpa, much reduced. sp, Spathe enveloping the fruits, 3, The same cut lengthwise, shown on a larger scale in 1. m, Fibrous mesocarp; en,

2, A fruit. hard endocarp; s, seed.

one year may produce all male flowers and in the next all female flowers. Sometimes the flowers are modified by an increase in the number of parts; thus the usually six stamens may be represented by i2to 24 or even by hundreds. The carpels are usually three in number, and more or less combined ; but they may be free, and their number may be reduced to two or even one. In any case each carpel contains but a single ovule.

Owing to the sexual arrangements before mentioned, the pollen has to be transported by the agency of the wind or of insects to the female flowers. This is facilitated sometimes by the elastic move- ments of the stamens and anthers, which liberate the pollen so freely at certain times that travellers speak of the date-palms of Egypt {Phoenix dactylifera) being at daybreak hidden in a mist of pollen grains. In other cases fertilization is effected by the agency of man, who removes the male flowers and scatters the pollen over the fruit-bearing trees. This practice has been followed in the case of the date from time immemorial ; and it afforded one of the earliest and most irrefragable proofs by means of which the sexuality of plants was finally established. In the course of ripening of the fruit two of the carpels with their ovules may become absorbed, as in the coco-nut, the fruit of which contains only one seed though the three carpels are indicated by the three longitudinal sutures and by the presence of three germ-pores on the hard endocarp.

The fruit is various in form, size and character ; sometimes, as in the common date (fig. 4) it is a berry with a fleshy rind enclosing a hard stony kernel, the true seed; the fruit of Areca (fig. 3) is similar;

sometimes it is a kind of drupe as in Acrccomia (fig. 5), or the coco-nut, Cocos nucifera, where the fibrous central portion investing the hard shell corresponds to the fleshy portion of a plum or cherry, while the shell or nut corresponds to the stone of stone-fruits, the seed being the kernel. In Borassus the three seeds are each enclosed in a separate chamber formed by the stony endocarp (fig. 7). Sometimes, as in the species of Metroxylon (fig. 6), Raphia, Daemonorops (fig. 2), &c, the fruit is covered with hard, pointed, reflexed shining scales, which give it a very remarkable appearance.

The seeds show a corresponding variety in size and shape, but

always consist of a mass of endosperm, in which is embedded a relatively very minute embryo (figs. 1, 3, 6). The hard stone of the date is the endosperm, the white oily flesh of the coco-nut is the same substance in a softer condition; the so-called ” vegetable ivory ” is derived from the endosperm of Phytelephas. In some genera the inner seed coat becomes thickened along the course of the vascular bundles and growing into the endosperm produces the characteristic appearance in section known as ruminate — this is well shown in the Areca nut (fig. 3).

Fig. 6. — Sago Palm (Metroxylon Sagus).

1, Apex of leaf. 6, Fruit. ,

2, Branchlet of fruiting spadix. 7, Fruit cut lengthwise, showing

3, Branchlet of male inflorescence. seed s and the minute em-

4, Spike of male flowers. bryo e which is embedded in

5, Same cut lengthwise. a horny endosperm.

, The order contains 132 genera with about 1100 species mainly tropical, but with some representatives in warm temperate regions. Chamaerops humilis is a native of the Mediterranean region, and the date-palm yields fruit in southern Europe, as far north as 38° N. latitude. In eastern Asia the Palms, like other tropical families, extend along the coast reaching Korea and the south of Japan. In America a

few small genera occur in the southern United States and California; and in South America the southern limit is reached in the Chilean genus Jubaea (the Chile coco-nut) at 37 S. latitude. The great centres of distribution are tropical America and tropical Asia; tropical Africa contains only n genera, though some of the species, like the Doum palm (Hyphaene thebaica) and the Deleb or Palmyra palm (Borassus flabellifer) have a wide distribution. With three exceptions Old and New World forms are distinct— the coco-nut (Cocos nucifera) is widely distributed on the coasts of tropical Africa, in India and the South Seas, the other species of the genus are confined to the western hemisphere. The oil palm (Elaeis guineensis) is a native of west tropical Africa, the other species of the genus is tropical American. Raphia has also species in both tropical Africa and tropical America.

The 132 genera of the order are ranged under seven tribes, distinguished by the nature of the foliage, the sexual condi- tions of the flower, the character of the seed, the position of the raphe, &c. Other characters serving to distinguish the minor groups are afforded by the habit, the position of the spathes, the ” aestivation ” of the flower, the nature of the stigma, the ovary, fruit, &c.

It is impossible to overestimate the utility of palms. They furnish food, shelter, clothing, timber, fuel, building materials,

sticks, fibre, paper, starch, sugar, oil, wax, wine, tannin, dyeing materials, resin and a host of minor products, which render them most valuable to the natives and to tropical agriculturists. The Coco-nut palm, Cocos nucifera, and the Date palm, Phoenix dactyli- fera, have been treated under separate headings. Sugar and liquids capable of becoming fermented are produced by Caryota wrens.

Fig. 7. — Palmyra Palm (Borassus flabellifer), a female tree.

1, Portion of female inflorescence showing young fruits.

2, Fruit cut across showing the three seeds, all much reduced.

Cocos nucifera, Borassus flabellifer, Rhapis vinifera, Arenga sacchari- fera, Phoenix silvestris, Mauritia vinifera, &c. Starch is procured in abundance from the stem of the Sago palm, Metroxylon (fig. 6) and others. The fleshy mesocarp of the fruit of Elaeis guineensis of western tropical Africa yields, when crushed and boiled, ” palm oil.” Coco-nut oil is extracted from the oily endosperm of the coco- nut. Wax is exuded from the stem of Ceroxylon andicola and Copernicia cerifera. A variety of ” dragon’s blood, ” a resin ; is procured from

Daemonorops Draco and other species. Edible fruits are yielded by the date, the staple food of some districts of northern Africa. The coco-nut is a source of wealth to its possessors ; and many of the species, e.g. Areca sapida (Cabbage-palm and others), are valued for their " cabbage " ; but, as this is the terminal bud whose removal causes the destruction of the tree, this is a wasteful article of diet unless care be taken by judicious planting to avert the annihilation of the supplies. The famous " coco de mer," or double coco-nut, whose floating nuts are the objects of so many legends and superstitions, is known to science as Lodoicea seychel- larum. The tree is peculiar to the Seychelles, where it is used for many useful purposes. Its fruit is like a huge plum, containing a stone or nut like two coco-nuts (in their husks) united together. These illustrations must suffice to indicate the numerous economic uses of palms.

The only species that can be cultivated in the open air in England, and then only under exceptionally favourable circumstances, are the European Fan palm, Chamaerops humilis, the Chusan palm, Trachycarpus Fortunei, &c, and the Chilean Jubaea spectabilis. The date palm is commonly planted along the Mediterranean coast. There are several low growing palms, such as Rhapis flabelliformis, Chamaerops humilis, &c, which are suited for ordinary green-house culture, and many of which, from the thick texture of their leaves, are enabled to resist the dry and often gas-laden atmosphere of living rooms.

PALJIA, JACOPO (c. 1480-1528), Italian painter of the Venetian school, was born at Serinalta near Bergamo, towards 1480, and died at the age of forty-eight in July 1528. He is currently named Palma Vecchio (Old Palma) to distinguish him from Palma Giovane, his grand-nephew, a much inferior painter. His grandfather's name was Negretto. He is reputed to have been a companion and competitor of Lorenzo Lotto, and to some extent a pupil of Titian, after arriving in Venice early in the

16th century; he may also have been the master of Bonifazio. His earlier works betray the influence of the Bellini; but modifying his style from the study of Giorgione and Titian, Palma took high rank among those painters of the distinctively Venetian type who remain a little below the leading masters. For richness of colour he is hardly to be surpassed; but neither in invention nor vigorous draughtsmanship

does he often attain any peculiar excellence. A face frequently seen in his pictures is that of his (so-called) daughter Violante, of whom Titian was said to be enamoured. Two works by Palma are more particularly celebrated. The first is a composition of six paintings in the Venetian church of S. Maria Formosa, with St Barbara in the centre, under the dead Christ, and to right and left SS. Dominic, Sebastian, John Baptist and Anthony. The second work is in the Dresden Gallery, representing three sisters seated in the open air; it is frequently named ” The Three Graces.” A third fine work, discovered in Venice in 1900, is a portrait supposed to represent Violante. Other leading examples are: the ” Last Supper,” in S. Maria Mater Domini;a ” Madonna,” in the church of S. Stefano in Vicenza; the ” Epiphany,” in the Brera of Milan; the ” Holy Family, with a young shepherd adoring,” in the Louvre; ” St Stephen and other Saints,” ” Christ and the Widow of Nain,” and the ” Assumption of the Virgin,” in the Academy of Venice; and “Christ at Emmaus,” in the Pitti Gallery. The beautiful portrait of the National Gallery, London, with a back-ground of foliage, originally described as ” Ariosto” and as by Titian, and now reascribed to that master, was for some years assumed to be an unknown poet by Palma Vecchio. It is cer- tainly much more like the work of Titian than of Palma. In 1907 the Staedel Institute in Frankfort acquired an important work by Palma Vecchio, identified by its director as an illustration of Ovid’s second Metamorphosis, and named ” Jupiter and Calisto.”

Palma’s grand-nephew, Palma Giovane, was also named Jacopo (1544 to about 1626). His works belong to the decline of Venetian art. (W. M. R.)

PALMA, or Palma de Mallorca, the capital of the Spanish province of the Balearic Islands, the residence of a captain- general, an episcopal see, and a flourishing seaport, situated 135 m. S.S.E. of Barcelona, on the south-west coast of Majorca, at the head of the fine Bay of Palma, which stretches inland for about 10 m. between Capes CalaFiguera and Regana. Pop. (1900), 63,937, including a colony of Jews converted to Christianity (Chuetas). Palma is the meeting place of all the highways in the island, and the terminus of the railway to Inca, Manacor, and Alcudia. The ramparts, which enclose the city on all sides except towards the port (where they were demolished in 1872), have a circuit of a little more than 4 m. Though begun in 1562, they were not finished till 1836. Palma underwent considerable change in the 19th century, and the fine old-world Moorish char- acter of the place suffered accordingly. The more conspicuous buildings are the cathedral, the exchange, the royal palace, now occupied by the captain-general, and the law courts, the episcopal palace, a handsome

late Renaissance building (1616), the general hospital (1456), the town-house (end of the 16th century), the picture gallery, and the college. The church of San Francisco is interesting for the tomb of Raimon Lull, a native of Palma. The cathedral was erected and dedicated to the Virgin by King James I. of Aragon as he sailed to the conquest of Majorca; but, though founded in 1230, it was not finished till 1601. The older and more interesting portions are the royal chapel (1232), with the marble sarcophagus of James II. (d. 13 n) which was erected here in 1779; and the south front with the elaborately-sculptured doorway known as del mirador (1389). The exchange (lonja), a Gothic building begun in 1426, excited the admiration of the emperor Charles V. Palma has a seminary founded in 1700, a collection of archives dating from the 14th century, a school and museum of fine arts, a nautical school and an institute founded in 1836 to replace the old university (1503).

The harbour, formed by a mole constructed to a length of 387 yds. in the 14th century and afterwards extended to more than 650 yds., has been greatly improved since 1875 by dredging

and a further addition to the mole of 136 yds. Previously it was not accessible to vessels drawing more than 18 ft. Palma has frequent and regular communication by steamer with Barcelona, Valencia and Alicante. Puertopf, about 2 m. south- west of the city, was once a good harbour, but is now fit only for small craft. Palma has a thriving trade in grain, wine, oil, almonds, fruit, vegetables, silk, foodstuffs and livestock. There are manufactures of alcohol, liqueurs, chocolate, starch, sugar, preserves, flour, soap, leather, earthenware, glass, matches, paper, linen, woollen goods and rugs.

Palma probably owes, if not its existence, at least its name (symbolized on the Roman coins by a palm branch), to Metellus Balearicus, who in 123 B.C. settled three thousand Roman and Spanish colonists on the island. The bishopric dates from the 14th century. About 1 m. south-west of Palma is the castle of Bellver or Belbez, the ancient residence of the kings of Majorca. Miramar, the beautiful country seat of the archduke Ludwig Salvator of Austria, is 12 m. north of Palma.

PALMA, or San Miguel de la Palma, a Spanish island in the Atlantic Ocean, forming part of the Canary Islands (q.v.). Pop. (1900), 41,994; area 280 sq. m. Palma is 26 m. long, with an extreme breadth of 16 m. It lies 67 m. W.N.W. of Teneriffe. It is traversed from north to south by a chain of mountains, the highest of which is 7900 ft. above sea-level. At the broadest part is a crater 9 m. in diameter, known as the

Caldera {i.e. cauldron). The bottom of the crater has an elevation of 2300 ft., and it is overhung by peaks that rise more than 5000 ft. above it. Palma contains several mineral springs, but there is great want of fresh water. The only stream which is never dried up is that which issues from the Caldera. In 1677 an eruption, preceded by an earthquake, took place from a volcano at the southern extremity of the island, and much damage was done. Santa Cruz de la Palma (pop. 7024) on the eastern coast is the principal town. The anchorage is good.

PALM BEACH, a winter resort on the east coast of Florida, U.S.A., in Palm Beach county, about 264 m. S. of St Augustine; served by the Florida East Coast railway. It is situated on a peninsula (about 30 m. long and 1 m. wide) separated from the mainland by Lake Worth, an arm of the Atlantic Ocean, and derives its name from the groves of coco-nut palms which fringe the lake. The coco-nut was introduced here by chance, through the wrecking, off the coast, in January 1879, of a coco-nut-laden Spanish vessel. The Gulf Stream is within about 1 m. of the shore, and the climate is mild and equable, the winter tempera- ture normally ranging between 70 and 75 F. On the Atlantic is the Breakers, a large hotel, and facing Lake Worth is the Royal Poinciana, the largest hotel in the southern states. Palm Beach has few permanent residents and is not incorporated. On the mainland just across the lake is the city of West Palm Beach (pop. in 1905, 1280; 1910, 1743), a pleasure resort and the county-seat of Palm Beach county (created in 1909).

PALM-CIVET, or Paradoxure, the name of the members of the civet-like genus Paradoxurus, represented by several species mainly from south-east Asia. (See Carnivora.) Palm-civets are mostly about the size of the domestic cat, or rather larger, chiefly arboreal in habits, with dark uniform, spotted or striped fur. The common Indian palm-civet (P. niger) ranges through- out India, wherever there are trees, frequently taking up its abodes in roof-thatch. Its diet consists of small mammals and reptiles, birds and their eggs, fruit and vegetables. From four to six young are brought forth at a litter, and are easily tamed. Other species are the Ceylonese P. aureus, the brown P. jerdoni, the Himalayan P. grayi and the Malayan P. Herma- phroditus. The small-toothed palm-civets, from the Malay Archipelago, Sumatra and Java, have been separated from the typical group to form the genus Arctogale. In Africa the group is represented by two species of Nandinia, which show several primitive characters.

PALMELLA, a town of Portugal, in the district of Lisbon (formerly included in the province of Estremadura) ; at the north- eastern

extremity of the Serra da Arrabida, and on the Lisbon- Setubal railway. Pop. (1900), inclusive of the neighbouring

village of Marateca, 11,478. Palmella is an ancient and picturesque town, still surrounded by massive but ruined walls and dominated by a medieval castle. Viticulture, market- gardening and fruit-farming are important local industries. Palmella was taken from the Moors in 1147 by Alphonso I. (Affonso Henriques), and entrusted in 1186 to the knights of Santiago. The title ” duke of Palmella ” dates from 1834, when it was conferred on the statesman Pedro de Sousa-Holstein, count of Palmella (1781-1850).

PALMER, SIR CHARLES MARK, Bart. (1822-1907), English shipbuilder, was born at South Shields on the 3rd of November 1822. His father, originally the captain of a whaler, removed in 1828 to Newcastle-on-Tyne, where he conducted a ship- owning and ship-broking business. Charles Palmer at the age of fifteen entered a shipping business in that town, whence, after six months, he went to Marseilles, where his father had procured him a post in a large commercial house, at the same time entrust- ing him with the local agency of his own business. After two years’ experience at Marseilles he entered his father’s business at Newcastle, and in 1842 he became a partner. His business capacity attracted the attention of a leading local colliery owner, and he was appointed manager of the Marley Hill colliery in which he became a partner in 1846. Subsequently he was made one of the managers of the associated collieries north and south of the Tyne owned by Lord Ravensworth, Lord Wharncliffe, the marquess of Bute, and Lord Strathmore, and in due course he gradually purchased these properties out of the profits of the Marley Hill colliery. Simultaneously he greatly developed the then recently-established coke trade, obtaining the coke contracts for several of the large English and continental railways. About 1850 the question of coal-transport to the London market became a serious question for north country colliery proprietors. Palmer therefore built, largely according to his own plans, the ” John Bowes,” the first iron screw-collier, and several other steam-colliers, in a yard established by him at Jarrow, then a small Tyneside village. He then purchased iron-mines in York- shire, and erected along the Tyne at Jarrow large shipbuilding yards, blast-furnaces, steel-works, rolling-mills and engine- works, fitted on the most elaborate scale. The firm produced war-ships as well as merchant vessels, and their system of rolling

armour plates, introduced in 1856, was generally adopted by other builders. In 1865 he turned the business into Palmer's Shipbuilding and Iron Company, Limited. In 1886 his services in connexion with the settlement of the costly dispute between British ship-owners and the Suez Canal Company (of which he was then a director) were rewarded with a baronetcy. He died in London on the 4th of June 1907.

PALMER, EDWARD HENRY (1840-1882), English orientalist, the son of a private schoolmaster, was born at Cambridge, on the 7th of August T840. He was educated at the Perse School, and as a schoolboy showed the characteristic bent of his mind by picking up the Romany tongue and a great familiarity with the life of the gipsies. From school he was sent to London as a clerk in the city. Palmer disliked this life, and varied it by learning French and Italian, mainly by frequenting the society of foreigners wherever he could find it. In 1859 he returned to Cambridge, apparently dying of consumption. He had an almost miraculous recovery, and in i860, while he was thinking of a new start in life, fell in with Sayyid Abdallah, teacher of Hindustani at Cambridge, under whose influence he began his Oriental studies. He matriculated at St John's College in November 1863, and in 1867 was elected a fellow on account of his attainments as an orientalist, especially in Persian and Hindustani. During his residence at St John's he catalogued the Persian, Arabic and Turkish manuscripts in the university library, and in the libraries of King's and Trinity. In 1867 he published a treatise on Oriental Mysticism, based on the Maksad-i-Aksa of Aziz ibn Mohammad Nafasl. He was engaged in 1869 to join the survey of Sinai, undertaken by the Palestine Exploration Fund, and followed up this work in the next year by exploring the desert of El-Tih in company with Charles Drake (1846-1874). They completed this journey on foot and without escort, making friends

among the Bedouin, to whom Palmer was known as " Abdallah Effendi." After a visit to the Lebanon and to Damascus, where he made the acquaintance of Sir Richard Burton, then consul there, he returned to England in 1870 by way of Constanti- nople and Vienna. At Vienna he met Arminius Vambery. The results of this expedition appeared in the Desert of the Exodus (1871); in a report published in the journal of the Palestine Exploration Fund (1871); and in an article on the Secret Sects of Syria in the Quarterly Review (1873). In the close of the year 187 1 he became Lord Almoner's Professor of Arabic at Cambridge, married, and settled down to teaching. His salary was small, and his affairs were further complicated by the long illness of his wife, who died in 1878. In 1881, two years after his second marriage, he left Cambridge, and joined the staff of the Standard

newspaper to write on non-political subjects. He was called to the English bar in 1874, and early in 1882 he was asked by the government to go to the East and assist the Egyptian expedition by his influence over the Arabs of the desert El-Tih. He was instructed, apparently, to prevent the Arab sheikhs from joining the Egyptian rebels and to secure their non-interference with the Suez Canal. He went to Gaza, without an escort made his way safely through the desert to Suez — an exploit of singular boldness — and was highly successful in his negotiations with the Bedouin. He was appointed interpreter-in-chief to the force in Egypt, and from Suez he was again sent into the desert with Captain William John Gill and Flag-Lieutenant Harold Charrington to procure camels and gain the allegiance of the sheikhs by considerable presents of money. On this journey he and his companions were led into an ambush and murdered (August 1882). Their remains, recovered after the war by the efforts of Sir Charles (then Colonel) Warren, now lie in St Paul's Cathedral.

Palmer's highest qualities appeared in his travels, especially in the heroic adventures of his last journeys. His brilliant scholarship is displayed rather in the works he wrote in Persian and other Eastern languages than in his English books, which were generally written under pressure. His scholarship was wholly Eastern in character, and lacked the critical qualities of the modern school of Oriental learning in Europe. All his works show a great linguistic range and very versatile talent; but he left no permanent literary monument worthy of his powers. His chief writings are The Desert of the Exodus (1871), Poems of Beha ed Din (Ar. and Eng., 1876-1877), Arabic Grammar (1874), History of Jerusalem (1871), by Besantand Palmer — the latter wrote the part taken from Arabic sources; Persian Dictionary (1876) and English and Persian Dictionary (posthumous, 1883); translation of the Koran (1880) for the Sacred Books of the East series, a spirited but not very accurate rendering. He also did good service in editing the Name Lists of the Palestine Exploration.

PALMER, ERASTUS DOW (1817-1904), American sculptor, was born at Pompey, New York, on the 2nd of April 181 7. In his leisure moments as a carpenter he started by carving portraits in cameo, and then began to model in clay with much success. Among his works are: " The White Captive " (1858) in the Metropolitan Museum of Art, New York; "Peace in Bondage" (1863); " Angel at the Sepulchre " (1865), Albany, New York; a bronze statue of Chancellor Robert R. Livingston (1874), in Statuary Hall, Capitol, Washington; and many portrait busts. He died in Albany on the 9th of March 1904. His son, Walter Launt Palmer (b. 1854), who studied art under Carolus-Duran in Paris,

became a member of the National Academy of Design (1897)', and is best known for his painting of snow scenes.

PALMER, GEORGE (1818-1897), British biscuit-manufacturer, was born on the 18th of January 1 818, at Long Sutton, Somerset- shire, where his family had been yeomen-farmers for several generations. The Palmers were Quakers, and George Palmer was educated at the school of the Society of Friends at Sidcot, Somersetshire. About 1832 he was apprenticed to a miller and confectioner at Taunton, and in 1841, in conjunction with Thomas Huntley, set up as a biscuit-manufacturer at Reading. By the application of steam-machinery to biscuit-manufacture the firm of Huntley & Palmer in a comparatively short time built up a very large business, of which on the death of Huntley in 1857 George Palmer and his two brothers, Samuel and William Isaac Palmerˆ became proprietors. In the same year George

Palmer was elected mayor of Reading, and from 1878-1885 he was Libera) member of Parliament for the town. He died at Reading, to which he had been a most generous benefactor, on the 19th of August 1897. His sons, George William Palmer (b. i85r) and Sir Walter Palmer (b. 1858), displayed a like munifi- cence, particularly in connexion with University College, Reading. George William Palmer, besides being mayor of Reading, represented the town in Parliament as a Liberal. Sir Walter Palmer, who was created a baronet in 1904, became Conservative member for Salisbury in 1900.

PALMER, JOHN McAULEY (181 7-1900), American soldier and political leader, was born at Eagle Creek, Kentucky, on the 13th of September 1817. In 1831 his family removed to Illinois, and in 1839 he was admitted to the bar in that state He was a member of the state constitutional convention of 1847. In 1852-1855 he was a Democratic member of the state Senate, but joined the Republican party upon its organization and became one of its leaders in Illinois. He was a delegate to the Republican national convention in 1856 and a Republican presidential elector in i860. In 1861 he was a delegate to the peace conven- tion in Washington. During the Civil War he served in the Union army, rising from the rank of colonel to that of major-general in the volunteer service and taking part in the capture of New Madrid and Island No. 10, in the battles of Stone River and Chickamauga, and, under Thomas, in the Atlanta campaign. He was governor of Illinois from 1869 to 1873. In 1872 he joined the Liberal-

Republicans, and eventually returned to the Democratic party. In 1891-1897 he was a Democratic member of the United States Senate. In 1896 he was nominated for the presidency, by the ” Gold-Democrats,” but received no electoral votes. He died at Springfield, Illinois, on the 25th of September

1900.

See The Personal Recollections of John M. Palmer — The Story of an Earnest Life, published posthumously in 1901.

PALMER, RAY (1808-1887), American clergyman and hymn- writer, was born in Little Compton, Rhode Island, on the 12th of November 1808. He graduated at Yale College in 1830, and in 1832 was licensed to preach by the New Haven West Associ- ation of Congregational Ministers. In 1835-1850 he was pastor of the Central Congregational Church of Bath, Maine, and in 1850-1866 of the First Congregational Church of Albany, New York; and from 1866 to 1878 was corresponding secretary of the American Congregational Union. He died on the 29th of March 1887 in Newark, New Jersey, where, from 1881 to 1884 he had been assistant pastor of the Belleville Avenue Congregational Church. His most widely known hymn, beginning ” My faith looks up to Thee, Thou Lamb of Calvary,” was written in 1830, was set to the tune ” Olivet ” by Lowell Mason, and has been translated into many languages; his hymn beginning “Jesus, these eyes have never seen ” (1858) is also well-known.

Among the hymns translated by him are those beginning: “O Christ, our King, Creator, Lord ” (by Gregory the Great) ; ” Come Holy Ghost in love ” (by Robert II. of France) ; ” Jesus, thou Joy of loving hearts ” (by Bernard of Clairvaux) ; and ” O, Bread to pilgrims given” (from the Latin). Other hymns(some of them translations from Latin) and poems were collected in his Complete Poetical Works (1876), followed in 1880 by Voices of Hope and Gladness. He also Wrote Spiritual Improvement (1839), republished in 1851 as Closet Hours; Hints on the Formation of Religious Opinions (i860), and Earnest Words on True Success in Life (1873).

PALMER, SAMUEL (1805-1881), English landscape painter and etcher, was born in London on the 27th of January 1805. He was delicate as a child, but in 1819 he exhibited both at the Royal Academy and the British Institution; and shortly after- wards he became intimate with John Linnell, who introduced him to Varley, Mulready, and, above all, to William Blake, whose strange and mystic genius had the most powerful effect on Palmer’s art. An illness led to a residence of seven

years at Shoreham in Kent, and the characteristics of the scenery of the district are constantly recurrent in his works. Among the more important productions of this time are the ” Bright Cloud ” and the “Skylark,” paintings in oil, which was Palmer’s usual medium in earlier life. In 1839 he married a daughter of Linnell. The

wedding tour was to Italy, where he spent over two years in study. Returning to London, he was in 1843 elected an associate and in 1854 a full member of the Society of Painters in Water Colours, a method to which he afterwards adhered in his painted work. His productions are distinguished by an excellent com- mand over the forms of landscape, and by mastery of rich, glowing and potent colouring. Among the best and most important paintings executed by Palmer during his later years was a noble series of illustrations to Milton’s L’ Allegro and II Penseroso. In 1853 the artist was elected a member of the English Etching Club. Considering his reputation and success in this department of art, his plates are few in number. Their virtues are not those of a rapid and vivid sketch; they aim rather at truth and completeness of tonality, and embody many of the characteristics of other modes of engraving — of mezzotint, of line, and of woodcut. Readily accessible and sufficiently representative plates maybe studied in the “Early Ploughman,” in Etching and Etchers (1st ed.), and the “Herdsman’s Cottage,” in the third edition of the same work. In 1861 Palmer removed to Reigate, where he died on the 24th of May 1881. One of his latest efforts was the production of a series of etchings to illustrate his English metrical version of Virgil’s Eclogues, which was published in 1883, illustrated with reproductions of the artist’s water-colours and with etchings, of which most were completed by his son, A. H. Palmer.

PALMER, a township of Hampden county, Massachusetts, U.S.A. Pop. (1910 U.S. census) 8610. It has an area of about 31 sq. m. of broken hill country. Its chief village, also named Palmer, about 15 m. east of Springfield, is on the Chicopee river, is served by the Boston & Albany and the Central Vermont railways, and by an electric line to Springfield, and has varied manufactures; the other villages are Thorndike, Bondsville, and Three Rivers. The principal manufactures are cotton goods, carpets and wire goods. Palmer was originally settled in 1716, but received a notable accession of population from a large Scotch-Irish colony which went from Ulster to Boston in 1 7 1 8. Their settlement was followed, apparently, by immigration from Ireland in 1727. In 1752 the plantation was incorporated as a ” district,” and under a general state law of 1775 gained the legal rights of a township. Palmer was a centre of disaffection in the time of the Shays Rebellion.

See T. H. Temple. History of the Town of Palmer . . . 17 16-1889 (Palmer, 1889).

PALMER, a pilgrim who as a sign or token that he had made pilgrimage to Palestine carried a palm-branch attached to his staff, or more frequently a cross made of two strips of palm-leaf fastened to his hat. The word is frequently used as synonymous with ” pilgrim ” (see Pilgrimage). The name ” palmer ” or ” palmer-worm ” is often given to many kinds of hairy cater- pillars, specifically to that of the destructive tineid moth, Ypsilophus pometella. The name is either due to the English use of ” palm ” for the blossom or catkin of the willow-tree, to which the caterpillars bear some resemblance, or to the wandering pilgrim-like habits of such caterpillars. Artificial flies used in angling, covered with bristling hairs, are known also as ” palmers ” or ” hackles.”

PALMERSTON, HENRY JOHN TEMPLE, 3 rd Viscount (1784- 1865), English statesman, was born at Broadlands, near Romsey, Hants, on the 20th of October 1784. The Irish branch of the Temple family, from which Lord Palmerston descended, was Very distantly related to the great English house of the same name, but these Irish Temples were not. without distinction. In the reign of Elizabeth they had furnished a secretary to Sir Philip Sidney and to Essex in Sir William Temple (1 555-1627),, after- wards provost of Trinity College, Dublin, whose son, Sir John Temple (1600-1677), was master of the rolls in Ireland. The latter’s son, Sir William Temple (q.v.), figured as one of the ablest diplomatists of the age. From his younger brother, Sir John Temple (1632-1704), who was speaker of the Irish House of Commons, Lord Palmerston descended. The eldest son of the speaker, Henry, 1st Viscount Palmerston (c. 1673-1757), was created a peer of; Ireland on the 12th of March 1723, and was

tucceeded by his grandson, Henry the second viscount (1739- 1802), who married Miss Mary Mee (d. 1805), a lady celebrated for her beauty.

The 2nd viscount’s eldest son, Henry John, is mentioned by Lady Elliot in her correspondence as a boy of singular vivacity and energy. These qualities adhered to him through life, and he had scarcely left Harrow, at the age of eighteen, when the death of his father (April 17, 1802) raised him to the Irish peerage. It was no doubt owing to his

birth and connexions, but still more to his own talents and character, that Lord Palmerston was thrown at a very early age into the full stream of political and official life. Before he was four-and-twenty he had stood two contested elections for the university of Cambridge, at which he was defeated, and he entered parliament for a pocket-borough, Newtown, Isle of Wight, in June 1807. Through the interest of his guardians Lord Malmesbury and Lord Chichester, the duke of Portland made him one of the junior lords of the Admiralty on the formation of his administration in 1807. A few months later he delivered his maiden speech in the House of Commons in defence of the expedition against Copenhagen, which he conceived to be justified by the known designs of Napo- leon on the Danish court. This speech was so successful that when Perceval formed his government in 1809, he proposed to this young man of five-and-twenty to take the chancellorship of the exchequer. Lord Palmerston, however, preferred the less important office of secretary-at-war, charged exclusively with the financial business of the army, without a seat in the cabinet, and in this position he remained, without any signs of an ambitious temperament or of great political abilities, for twenty years (1800-1828). During the whole of that ‘period Lord Palmerston was chiefly known as a man of fashion, and a subordinate minister without influence on the general policy of the cabinets he served. Some of the most humorous poetical pieces in the New Whig Guide were from his pen, and he was entirely devoted, like his friends Peel and Croker, to the Tory party of that day. Lord Palmerston never was a Whig, still less a Radical; he was a statesman of the old English aristocratic type, liberal in his sentiments, favourable to the march of progress, but entirely opposed to the claims of democratic government.

In the later years of Lord Liverpool’s administration, after the death of Lord Londonderry in 1822, strong dissensions existed in the cabinet. The Liberal section of the government was gaining ground. Canning became foreign minister and leader of the House of Commons. Huskisson began to advocate and apply the doctrines of free trade. Roman Catholic emancipation was made an open question. Although Lord Palmerston was not in the cabinet, he cordially supported the measures of Canning and his friends. Upon the death of Lord Liverpool, Canning was called to the head of affairs; the Tories, including Peel, withdrew their support, and an alliance was formed between the Liberal members of the late ministry and the Whigs. In this combination the chancellorship of the exchequer was first offered to Lord Palmerston, who accepted it, but this appointment was frustrated by the king’s intrigue with Herries, and Palmerston was content to remain secretary-at-war with a seat in the cabinet, which

he now entered for the first time. The Canning adminis- tration ended in four months by the death of its. illustrious chief, and was succeeded by the feeble ministry of Lord Goderich, which barely survived the year. But the ” Canningites,” as they were termed, remained, and the duke of Wellington hastened to include Palmerston, Huskisson, Charles Grant, Lamb (Lord Melbourne) and Dudley in his government. A dispute between the duke and Huskisson soon led to the resignation of that minister, and his friends felt bound to share his fate. In the spring of 1828 Palmerston found himself in opposition. From that moment he appears to have directed his attention closely to foreign affairs; indeed he had already urged on the duke of Wellington a more active interference in the affairs of Greece; he had made several visits to Paris, where he foresaw with great accuracy the impending revolution; and on the 1st of June 1820 he made his first great speech on foreign affairs. Lord Palmer- ston was no orator; his language was unstudied, and his delivery

somewhat embarrassed; but he generally, found words to say the right thing at the right time, and to address the House of Commons in the language best adapted to the capacity and the temper of his audience. An attempt was made by the duke of Wellington in September 1830 to induce Palmerston to re-enter the cabinet,which he refused to do without Lord Lansdowne and Lord Grey, and from that time forward he may be said to have associated his political fortunes with those of the Whig party. It was therefore natural that Lord Grey should place the depart- ment of foreign affairs in his hands upon the formation of the great ministry of 1830, and Palmerston entered with zeal on the duties of an office over which he continued to exert his powerful influence, both in and out of office, for twenty years.

The revolution of July 1830 had just given a strong shock to the existing settlement of Europe. The kingdom of the Nether- lands was rent asunder by the Belgian revolution; Portugal was the scene of civil war; the Spanish succession was about to open and place an infant princess on the throne. Poland was in arms against Russia, and the northern powers formed a closer alliance, threatening to the peace and the liberties of Europe. In presence of these varied dangers, Lord Palmerston was prepared to act with spirit and resolution, and the result was a notable achievement of his diplomacy. The king of the Netherlands had appealed to the powers who had placed him on the throne to maintain his rights; and a conference assembled accordingly in London to settle the question, which involved the independence of Belgium and the security of England. On the one hand, the northern powers were anxious to defend the king of Holland; on the other hand a party in France aspired to annex the Belgian provinces. The policy of

the British government was a close alliance with France, but an alliance based on the principle that no interests were to be promoted at variance with the just rights of others, or which could give to any other nation well-founded cause of jealousy. If the northern powers supported the king of Holland by force, they would encounter the resistance of France and England united in arms, if France sought to annex Belgium she would forfeit the alliance of England, and find herself opposed by the whole continent of Europe. In the end the policy of England prevailed; numerous difficulties, both great and small, were overcome by the conterence, although on the verge of war, peace was maintained; and Prince Leopold of Saxe-Coburg was placed upon the throne of Belgium.

In 1833 and 1834 the youthful queens Donna Maria of Portugal and Isabella of Spain were the representatives and the hope of the constitutional party in those countries — assailed and hard pressed by their absolutist kinsmen Don Miguel and Don Carlos, who were the representatives of the male line of succession. Lord Palmerston conceived and executed the plan of a quadruple alliance of the constitutional states of the West to serve as a counterpoise to the northern alliance. A treaty for the pacifica- tion of the Peninsula was signed in London on the 22nd of April 1834; and, although the struggle was somewhat prolonged in Spain, it accomplished its object. France, however, had been a reluctant party to this treaty. She never executed her share in it with zeal or fidelity. Louis Philippe was accused of secretly favouring the Carlists, and he positively refused to be a party to direct interference in Spain. It is probable that the hesitation of the French court on this question was one of the causes of the extreme personal hostility Lord Palmerston never ceased to show towards the king of the French down to the end of his life, if indeed that sentiment had not taken its origin at a much earlier period. Nevertheless, at this same time (June 1834) Lord Palmerston wrote that ” Paris is the pivot of my foreign policy.” M. Thiers was at that time in office. Unfortunately these differences, growing out of the opposite policies of the two countries at the court of Madrid, increased in each succeeding year; and a constant but sterile rivalry was kept up, which ended in results more or less humiliating and injurious to both nations.

The affairs of the East interested Lord Palmerston in the highest degree. During the Greek War of Independence he had strenuously supported the claims of the Hellenes against the

“Turks and the execution of the Treaty of London. But from 1830 the defence of the Ottoman Empire became one of the cardinal objects of his policy. He believed in the regeneration of Turkey. ” All that we hear,” he wrote to Bulwer (Lord Dalling), ” about the decay of the Turkish Empire, and its being a dead body or a sapless trunk, and so forth, is pure unadulterated nonsense.” The two great aims he had in view were to prevent the establishment of Russia on the Bosporus and of France on the Nile, and he regarded the maintenance of the authority of the Porte as the chief barrier against both these aggressions. Against Russia he had long maintained a suspicious and hostile attitude. He was a party to the publication of the ” Portfolio ” in 1834, and to the mission of the ” Vixen ” to force the blockade of Circassia about the same time. He regarded the treaty of Unkiar Skelessi which Russia extorted from the Porte in 1832, when she came to the relief of the sultan after the battle of Konieh, with great jealousy; and, when the power of Mehemet Ali in Egypt appeared to threaten the existence of the Ottoman dynasty, he succeeded in effecting a combination of all the powers, who signed the celebrated collective note of the 27th of July 1839, pledging them to maintain the independence and integrity of the Turkish Empire as a security for the peace of Europe. On two former occasions, in 1833 and in 1835, the policy of Lord Palmerston, who proposed to afford material aid to the Porte against the pasha of Egypt, was overruled by the cabinet; and again, in 1839, when Baron Brunnow first proposed the active interference of Russia and England, the offer was rejected. But in 1840 Lord Palmerston returned to the charge and prevailed. The moment was critical, for Mehemet Ali had occupied Syria and won the battle of Nezib against the Turkish forces, and on the 1st of July 1839 the sultan Mohammed expired. The Egyptian forces occupied Syria, and threatened Turkey; and Lord Ponsonby, then British ambassador at Constantinople, vehemently urged the necessity of crushing so formidable a rebellion against the Ottoman power. But France, though her ambassador had signed the collective note in the previous year, declined to be a party to measures of coercion against the pasha of Egypt. Palmerston, irritated at her Egyptian policy, flung himself into the arms of the northern powers, and the treaty of the 15th of July 1840 was signed in London without the knowledge or concurrence of France. This measure was not taken without great hesitation, and strong opposition on the part of several members of the British cabinet. Lord Palmerston himself declared in a letter to Lord Melbourne that he should quit the ministry if his policy was not adopted; and he carried his point. The bombardment of Beirut, the fall

of Acre, and the total collapse of the boasted power of Mehemet Ali followed in rapid succession, and before the close of the year Lord Palmerston's policy, which had convulsed and terrified Europe, was triumphant, and the author of it was regarded;.as one of the most powerful statesmen of the age. At the same time, though acting with Russia in the Levant, the British government engaged in the affairs of Afghanistan to defeat her intrigues'in Central Asia, and a contest with China was terminated by the conquest of Chusan, afterwards exchanged for the island of Hong-Kong.

Within a few months Lord Melbourne's administration came to an end (1841), and Lord Palmerston remained for five years out of office. The crisis was past, but the change which took place by the substitution of M. Guizot for M. Thiers in France, and of Lord Aberdeen for Lord Palmerston in England, was a fortunate event for the peace of the world. Lord Palmerston had adopted the opinion that peace with France was not to be relied on, and indeed that war between the two countries was sooner or later inevitable. Lord Aberdeen and M. Guizot inaugurated a different policy; by mutual confidence and friendly offices they entirely succeeded in restoring the most cordial understanding between the two governments, and the irritation which Lord Palmerston had inflamed gradually subsided. During the administration of Sir Robert Peel, Lord Palmerston led a retired life, but he attacked with characteristic bitterness the Ashburton treaty with the United States, which closed

successfully some other questions he had long kept open. In all these transactions, whilst full justice must be done to the force and patriotic vigour which Lord Palmerston brought to bear on the questions he took in hand, it was but too apparent that he imported into them an amount of passion, of personal animosity, and imperious language which rendered him in the eyes of the queen and of his colleagues a dangerous minister. On this ground, when Lord John Russell attempted, in December 1845, to form a ministry, the combination failed because Lord Grey refused to join a government in which Lord Palmerston should resume the direction of foreign affairs. A few months later, however, this difficulty was surmounted; the Whigs returned to power, and Palmerston to the foreign office (July 1846), with a strong assurance that Lord John Russell should exercise a strict control over his proceedings. A few days sufficed to show how vain was this expectation. The French government regarded the appointment of Palmerston as a certain sign of renewed hostilities, and they availed themselves of a despatch in which Palmerston had put forward the name of a Coburg prince as a candidate for the hand of the young queen of Spain, as a justification for a departure from the

engagements entered into between M. Guizot and Lord Aberdeen. However little the conduct of the French government in this transaction of the Spanish marriages can be vindicated, it is certain that it originated in the belief that in Palmerston France had a restless and subtle enemy. The efforts of the British minister to defeat the French marriages of the Spanish princesses, by an appeal to the treaty of Utrecht and the other powers of Europe, were wholly unsuccessful; France won the game, though with no small loss of honourable reputation.

The revolution of 1848 spread like a conflagration through Europe, and shook every throne on the Continent except those of Russia, Spain, and Belgium. Palmerston sympathized, or was supposed to sympathize, openly with the revolutionary party abroad. No state was regarded by him with more aversion than Austria. Yet his opposition to Austria was chiefly based upon her occupation of great part of Italy and her Italian policy, for Palmerston maintained that the existence of Austria as a great power north of the Alps was an essential element in the system of Europe. Antipathies and sympathies had a large share in the political views of Lord Palmerston, and his sympathies had ever been passionately awakened by the cause of Italian independence. He supported the Sicilians against the king of Naples, and even allowed arms to be sent them from the arsenal at Woolwich; and, although he had endeavoured to restrain the king of Sardinia from his rash attack on the superior forces of Austria, he obtained for him a reduction of the penalty of defeat. Austria, weakened by the revolution, sent an envoy to London to request the mediation of England, based on a large cession of Italian territory; Lord Palmerston rejected the terms he might have obtained for Piedmont. Ere long the reaction came; this straw-fire of revolution burnt itself out in a couple of years. In Hungary the civil war, which had thundered at the gates of Vienna, was brought to a close by Russian interven- tion. Prince Schwarzenberg assumed the government of the empire with dictatorial power; and, in spite of what Palmerston termed his ” judicious bottle-holding,” the movement he had encouraged and applauded, but to which he could give no material aid, was everywhere subdued. The British government, or at least Palmerston as its representative, was regarded with suspicion and resentment by every power in Europe, except the French republic; and even that was shortly afterwards to be alienated by Palmerston’s attack on Greece.

This state of things was regarded with the utmost annoyance by the British court and by most of the British ministers. Palmerston ha.d on many occasions taken important steps without their knowledge, which they disapproved. Over the Foreign Office he asserted and exercised

an arbitrary dominion, which the feeble efforts of the premier could not control. The queen and the prince consort (see Victoria, Queen) did not conceal their indignation at the position in which he had placed them with all the other courts of Europe. When Kossuth, the

Hungarian leader, landed in England, Palmerston proposed to receive him at Broadlands, a design which was only prevented by a peremptory vote of the cabinet; and in 1850 he took advantage of Don Pacifico's very questionable claims on the Hellenic government to organize an attack on the little kingdom of Greece. 1 Greece being a state under the joint protection of three powers, Russia and France protested against its coercion by the British fleet, and the French ambassador temporarily left London, which promptly led to the termination of the affair. But it was taken up in parliament with great warmth. After a memorable debate (June 17), Palmerston's policy was condemned by a vote of the House of Lords. The House of Commons was moved by Roebuck to reverse the sentence, which it did (June 29) by a majority of 46, after having heard from Palmerston the most eloquent and powerful speech ever delivered by him, in which he sought to vindicate, not only his claims on the Greek government for Don Pacifico, but his entire administration of foreign affairs. It was in this speech, which lasted five hours, that Palmerston made the well-known declaration that a British subject — " Civis Romanus sum " — ought everywhere to be protected by the strong arm of the British government against injustice and wrong. Yet, notwithstanding this parliamentary triumph, there were not a few of his own colleagues and supporters who condemned the spirit in which the foreign relations of the Crown were carried on; and in that same year the queen addressed a minute to the prime minister in which she recorded her dissatisfaction at the manner in which Lord Palmerston evaded the obligation to sub- mit his measures for the royal sanction as failing in sincerity to the Crown. This minute was communicated to Palmerston, who did not resign upon it. These various circumstances, and many more, had given rise to distrust and uneasiness in the cabinet, and these feelings reached their climax when Palmerston, on the occurrence of the coup d'etat by which Louis Napoleon made himself master of France, expressed to the French ambassador in London, without the concurrence of his colleagues, his personal approval of that act. Upon this Lord John Russell advised his dismissal from office (Dec. 1851). Palmerston speedily avenged himself by turning out the government on a militia bill; but although he survived for many years,

and twice filled the highest office in the state, his career as foreign minister ended for ever,, and he returned to the foreign office no more. Indeed, he assured Lord Aberdeen, in 1853, that he did not wish to resume the seals of that department. Not- withstanding the zeal and ability which he had invariably displayed as foreign minister, it had long been felt by his col- leagues that his eager and frequent interference in the affairs of foreign countries, his imperious temper, the extreme acerbity of his language abroad, of which there are ample proofs in his published correspondence, and the evasions and artifices he employed to carry his points at home, rendered him a dangerous representative of the foreign interests of the country. But the lesson of his dismissal was not altogether lost on him. Although his great reputation was chiefly earned as a foreign minister, it may be said that the last ten years of his life, in which he filled other offices, were not the least useful or dignified portion of his career.

Upon the formation of the cabinet of 1853, which was com- posed by the junction of the surviving followers of Sir Robert Peel with the Whigs, under the earl of Aberdeen, Lord Palmerston accepted with the best possible grace the office of secretary of state for the home office, nor was he ever chargeable with the slightest attempt to undermine that Government. At one moment he withdrew from it, because Lord John Russell per- sisted in presenting a project of reform which appeared to him entirely out of season; and he advocated, with reason, measures

1 David Pacifico (1784-1854) was a Portuguese Jew, born a British subject at Gibraltar. He became a merchant at Athens, and in 1847 his house was burnt down in an anti-Semitic riot. Pacifico brought an action, laying the damages at £26,000. At the same time George Finlay, the historian, was urging his own grievances against the Greek government, and as both claims were repudiated Palmer

of greater energy on the approach of war, which might possibly, if they had been adopted, have averted the contest with Russia. As the difficulties of the Crimean campaign increased, it was not Lord Palmerston but Lord John Russell who broke up the government by refusing to meet Roebuck's motion of inquiry. Palmerston remained faithful and loyal to his colleagues in the hour of danger. Upon the resignation of Lord Aberdeen and the duke of Newcastle, the general sentiment of the House of Commons and the country called Palmerston to the head of affairs, and he entered, on the 5th of February 1855, upon the high office, which he retained, with one short interval, to the day of his death. Palmerston was in the seventy-first year of his life when he became prime minister of England.

A series of fortunate events followed his accession to power. In March 1855 the death of the emperor Nicholas removed his chief antagonist. In September Sevastopol was taken. The administration of the British army was reformed by a consolida- tion of offices. In the following spring peace was signed in Paris. Never since Pitt had a minister enjoyed a greater, share of popularity and power, and, unlike Pitt, Palmerston had the prestige of victory in war. He was assailed in parliament by the eloquence of Gladstone, the sarcasms of Disraeli, and the animosity of the Manchester Radicals, but the country was with him. Defeated by a hostile combination of parties in the House of Commons on the question of the Chinese war in 1857 and the alleged insult to the British flag in the seizure of the lorcha " Arrow," he dissolved parliament and appealed to the nation. The result was the utter defeat of the extreme Radical party and the return of a more compact Liberal majority. The great events of the succeeding years, the Indian Mutiny, and the invasion of Italy by Napoleon III., belong rather to the general history of the times than to the life of Palmerston; but it was fortunate that a strong and able government was at the head of affairs. Lord Derby's second administration of 1858 lasted but a single year, Palmerston having casually been defeated on a measure for removing conspiracies to murder abroad from the class of misdemeanour to that of felony, which was introduced in consequence of Orsini's attempt on the life of the emperor of the French. But in June 1859 Palmerston returned to power, and it was on this occasion that he proposed to Cobden, one of his most constant opponents, to take office, and on the refusal of that gentleman Milner Gibson was appointed to the board of trade, although he had been the prime mover of the defeat of the government on the Conspiracy Bill. Palmerston had learnt by experience that it was wiser to conciliate an opponent than to attempt to crush him, and that the imperious tone he had sometimes adopted in the House of Commons, and his supposed obsequiousness to the emperor of the French, were the causes of the temporary reverse he had sustained. Although Palmerston approved the objects of the French invasion of Italy in so far as they went to establish Italian independence, the annexation of Savoy and Nice to France was an incident which revived his old suspicions of the good faith of the French emperor. About this time he expressed to the duke of Somerset his conviction that Napoleon III. "had at the bottom of his heart a deep and unextinguishable desire to humble and punish England," and that war with France was a contingency to be provided against. The unprotected con- dition of the principal British fortresses and arsenals had long attracted his attention, and he succeeded in inducing the House of Commons to vote nine millions for the fortification of those important points.

In 1856 the projects for cutting a navigable canal through the Isthmus of Suez was brought forward by M. de Lesseps, and resisted by Palmerston with all the weight he could bring to bear against it. He did not foresee the advantages to be derived by British commerce from this great work, and he was strongly opposed to the establishment of a powerful French company on the soil of Egypt. The concession of land to the company was reduced by his intervention, but in other respects the work proceeded and was accomplished. It may here be

ston took them up. Eventually Pacifico received a substantial sum. I mentioned, as a remarkable instance of his foresight, that

Palmerston told Lord Malmesbury, on his accession to the foreign office in 1858, that the chief reason of his opposition to the canal was this: he believed that, if the canal was made and proved successful, Great Britain, as the first mercantile state, and that most closely connected with the East, would be the power most interested in it; that England would therefore be drawn irresistibly into a more direct interference in Egypt, which it was desirable to avoid because England had already enough upon her hands, and because intervention might lead to a rupture with France. He therefore preferred that no such line of communication should be opened.

Upon the outbreak of the American Civil War in 1861, Lord Palmerston acknowledged that it was the duty of the British government to stand aloof from the fray; but his own opinion led him rather to desire than to avert the rupture of the Union, which might have been the result of a refusal on the part of England and France to recognize a blockade of the Southern ports, which was notoriously imperfect, and extremely prejudicial to the interests of Europe. The cabinet was not of this opinion, and, although the belligerent rights of the South were promptly recognized, the neutrality of the Government was strictly observed. When, however, the Southern envoys were taken by force from the ” Trent,” a British packet, Palmerston did not hesitate a moment to insist upon a full and complete reparation for so gross an infraction of international law. But the difficulty with the American government over the ” Alabama ” and other vessels, fitted out in British ports to help the Southern cause, was only settled at last (see Alabama Arbitration) by an award extremely onerous to England.

The last transaction in which Palmerston engaged arose out of the attack by the Germanic Confederation, and its leading states Austria and Prussia, on the kingdom of Denmark and the duchies of Schleswig and Holstein. There was but one feeling in the British public and the nation as to the dishonest character of that unprovoked aggression, and it was foreseen that Austria would ere long have reason to repent her share in it. Palmerston endeavoured to induce France and Russia to concur with England in maintaining the Treaty of London, which had guaranteed the integrity of* the Danish dominions. But those powers, for reasons of their own, stood aloof, and the conference held in London in 1864 was without effect. A proposal to send the British fleet into the Baltic was overruled, and the result was that Denmark was left to her own resources against her formidable opponents. In the following year, on the 18th of October 1865, Lord Palmerston expired at Brocket Hall, after a short illness, in the eighty-first year of his age. His remains were laid in Westminster Abbey.

Although there was much in the official life of Lord Palmerston which inspired distrust and alarm to men of a less ardent and contentious temperament, he had a lofty conception of the strength and the duties of England, he was the irreconcilable enemy of slavery, injustice and oppression, and he laboured with inexhaustible energy for the dignity and security of the Empire. In private life his gaiety, his buoyancy, his high breeding, made even his political opponents forget their differences; and even the warmest altercations on public affairs were merged in his large hospitality and cordial social relations. In this respect he was aided with consummate ability by the tact and grace of Lady Palmerston, the widow of the 5th Earl Cowper, whom he married at the close of 1839. and who died in 1869. She devoted herself with enthusiasm to all her husband's interests and pursuits, and she made his house the most attractive centre of society in London, if not in Europe. They had no children, and the title became extinct, the property descending to Lady Palmerston's second son by Earl Cowper, W. F. Cowper-Temple, afterwards Baron Mount Temple, and then to her grandson Evelyn Ashley (1836-1907) son of her daughter, who married the 7th earl of Shaftesbury — who was Lord Palmerston's private secretary from 1858 to 1865.

The Life of Lord Palmerston, by Lord Dalling (2 vols., 1870), with valuable selections from the minister's autobiographical diaries and private correspondence, only came down to 1847, and was

completed by Evelyn Ashley (vol. iii., 1874 ; iv., v., 1876). The whole was re-edited by Mr Ashley, in two volumes (1879),, the standard biography. The Life by Lloyd Sanders (1888) is an excellent shorter

work.

PALMERSTON, the chief town of the Northern Territory of South Australia, in Palmerston county, on the E. shore of Port Darwin, 2000 m. direct N.N.W. of Adelaide. The town stands 60 ft. above the level of the sea, by which it is almost surrounded. There are a government house, a town hall, and an experimental nursery garden. Palmerston has a magnificent harbour, accessible to ocean-going vessels, and the jetty is connected by rail with Playford, 146 m. distant. Cool breezes blow almost continuously throughout the year. The mean annual rainfall is 62-21 in. Pop. (1901), 1973, mostly Chinese.

PALMETTO, in botany, a popular name for Sabal Palmetto, the Palmetto palm, a native of the southern United States, especially in Florida. It has an erect stem, 20 to 80 ft. high and deeply cut fan-shaped leaves, 5 to 8 ft. long; the fruit is a black drupe i to \ in. long. The trunks make good piles for wharves, &c, as the wood resists the attacks of borers; the leaves are used for thatching. The palm is grown as a pot-plant in greenhouses..

PALMISTRY, (from ” palmist,” one who studies the palm, and the Teutonic affix ry signifying ” art “; also called Chiromancy, from x«‘Pi the hand, and namda, divination). The desire to learn what the future has in store is nearly as old as the sense of responsibility in mankind, and has been the parent of many empirical systems of fortune-telling, which profess to afford positive knowledge whereby the affairs of life may be regulated, and the dangers of failure foretold. Most of these systems come into the category of occult pursuits, as they are the interpretations of phenomena on the ground of fanciful presumptions, by an appeal to unreal or at least unverifiable influences and relations.

One of the oldest of this large family of predictive systems is that of palmistry, whereby the various irregularities and flexion-folds of the skin of the hand are interpreted as being associated with mental or moral dispositions and powers, as well as with the current of future events in the life of the indi- vidual. How far back in prehistoric times this system has been practised it is impossible to say, but in China it is said to have existed 3000 years before Christ, 1 and in Greek literature it is treated even in the most ancient writings as well-known belief. Thomas Blackwell 2 has collected some Homeric references: a work by Melampus of Alexandria is extant in several versions. Polemon, Aristotle and Adamantius may also be named as having dealt with the subject; as also have the medical writers of Greece and Rome — Hippocrates, Galen and Paulus Aegineta, and in later times the Arabian commentators on these authors. From references which can

be gathered from patristic writings it is abundantly evident that the belief in the mystical meaning of marks on the ” organ of organs ” was a part of the popular philosophy of their times.

After the invention of printing a very considerable mass of literature concerning this subject was produced during the 16th and 17th centuries. Praetorius, in his Ludicrum chiro- manticum (Jena, 1661) 3 has collected the titles of 77. Other works are quoted by Fulleborn and Horst, and by writers on the history of philosophy and magic; altogether about 98 books on the subject published before 1700 are at present accessible. There is not very much variety among these treat- ises, one of the earliest, valuable on account of its rarity, is the block-book by Hartlieb, Die Kunst Ciromantia,* published at Augsburg about 1470 (probably, but it bears no imprint of place or date). In this there are colossal figures of hands, each of which has its regions marked out by inscriptions. Few of these works are of sufficient interest to require mention.

1 Giles, in Contemporary Review (1905).

2 Proofs of the Inquiry into the Life and Writings of Homer, p. 330 (London, 1736).

3 This book is worthy of note on account of the quaint and sarcastic humour of its numerous acrostic verses.

4 There is a copy in the Rylands Library, Manchester. See also Dibdin’s Bibliographical Decameron (1817), i. 143.

The best are those by Pompeius,Robert Fludd, John de Indagine, Taisnierus, Baptista dalla Porta, S. Cardan, Goclenius, Codes, Frolich, Summer, Rothmann, Ingebert, Pomponius Gauricus, and Tricassus Mantuanus. There are also early Hebrew works, of which one by Gedaliah is extant. An Indian literature is also said to exist. Some of these authors attempt to separate the physiognomical part of the subject (Chirognomia) from the astrological (Chiromantia) ; see especially Caspar Schott in Magia naturalis universalis, Bamberg, 1677. Since the middle of the 19th century, in spite of the enactments of laws in Britain and elsewhere against the practice, there has been a recrudescence of belief in palmistry, and a new literature has grown up differing little in essence from the older. The more important books of this series are K. G. Carus, Uber Grund u. Bedeutung der ver-

schiedenen Formen der Hand, 1846; Landsberg, Die Handteller •(Posen,i86i); Adolf Desbarolles, Les Mysleres de la main (1859); C. S. D'Arpentigny, Chirognomie, la science de la main (1865), of which an English version has been published by Heron Allen in 1886; G. Z. Gessmann, Katechismus der Handlesekunst (Berlin, 1889); Czyriszi, Die Deutung der Handlinien (Dresden, 1893); R. Beamish, The Psychonomy of the Hand (1865); Frith and Allen, The Science of Palmistry (1883); Cotton, Palmistry and its practical uses (1890). Some of the older writers appealed to Scripture as supporting their systems, especially the texts Exod. xiii. 16; Job xxxvii. 7; and Prov. iii. 16. A considerable amount of literature pro and con was devoted to this controversy in the 17th and 18th centuries.

At the present day palmistry is practised in nearly all parts of China. The criteria of judgment used there are referred to in the article by Professor H. A. Giles, already quoted. It is also extensively practised in India, especially by one caste of Brahmins, the Joshi. In Syria and Egypt the palmist can be seen plying his trade at the cafes; and among the Arabs there are chiromantists who are consulted as to the probable success of enterprises. It is probably from their original Indian home that the traditional dukkeripen (fortune-telling) of the gipsies has been derived.

This system of divination has the charm of simplicity and definiteness, as an application of the " doctrine of signatures " which formed so extensive an element in the occult writings of the past six centuries. In the course of ages every detail has been brought under a formal set of rules, which only need mechanical application. There have been in past times con- siderable divergences in the practice, but at present there is a fairly uniform system in vogue. One school lays special stress on the general shape and outline of the hand. Corvaeus enumerates 70 varieties, Pamphilus cuts them down to 6, John de Indagine to 27, and Tricassus Mantuanus raises them to 80. The characters of softness or hardness, dryness or moisture, &c, are taken account of in these classifications. The lines of cardinal importance are (1) the rasceta or cross sulci, which isolate the hand from the forearm at the wrist, and which are the flexion folds between the looser forearm skin and that tied down to the fascia above the level of the anterior annular ligament. (2) The line which isolates the ball of the thumb, where the skin ceases to be tied to the front of the palmar fascia, is called the line of life. (3) A line starting above the head of the second metacarpal bone and crossing the hand to the middle of its ulnar border is the line of the head. (4) The transverse line below this which passes from the ulnar border a little above the level of the head of the fifth metacarpal and ends somewhere about the root of the

index finger is the line of the heart. (5) The vertical line descending from the middle of the wrist to end about the base of the middle finger is the line of fortune. (6) The oblique line which begins at the wrist end of the line of life and descends towards the ulnar end of the line of the head is the line of the liver.

These lines isolate certain swellings or monticuli, the largest of which is (1) the ball of the thumb, called the mountain of Venus; (2) that at the base of the index finger is the mountain of Jupiter; (3) at the root of the middle finger is the mountain of Saturn, while those at the bases of ring and little finger are

respectively the mountains of the (4) Sun and (5) of Mercury. Above the mountain of Mercury, and between the fines of head and heart is (6) the mountain of Mars, and above the line of the heart is (7) the mountain of the Moon. The relative sizes of these mountains have assigned to them their definite correla- tions with characters: the 1st with charity, love, libertinage; the 2nd with religiosity, ambition, love of honour, pride, super- stition; the 3rd with wisdom, good fortune, prudence, or when deficient improvidence, ignorance, failure; the 4th when large makes for success, celebrity, intelligence, audacity, when small meanness or love of obscurity; the 5th indicates love of know- ledge, industry, aptitude for commerce, and in its extreme forms on the one hand love of gain and dishonesty, on the other slackness and laziness. The 6th is related to degrees of courage, resolution, rashness or timidity; the 7th indicates sensitiveness, morality, good conduct, or immorality, overbearing temper and self-will.

The swellings on the palmar faces of the phalanges of the several fingers are also indicative, the 1st and 2nd of the thumb respectively, of the logical faculty and of the will; the 1st, 2nd and 3rd of the index finger, of materialism, law and order, idealism; those of the middle finger, humanity, system, intel- ligence; of the ring finger, truth, economy, energy; and of the little finger, goodness, prudence, reflectiveness.

Over and above these there are other marks, crosses, triangles, &c, of which more than a hundred have been described and figured by different authors, each with its interpretation; and in addition the back of the hand has its ridges. The Chinese combine podoscopy with chiromancy.

To the anatomist the roughnesses of the palm are of consider- able interest. The folds are so disposed that the thick skin shall be capable of bending in grasping, while at the same time it requires to be tightly

bound down to the skeleton of the hand, else the slipping of the skin would lead to insecurity of prehension, as the quilting or buttoning down of the covers of furniture by upholsterers keeps them from slipping. For this purpose the skin is tied by connecting fibres of white fibrillar tissue to the deep layer of the dermis along the lateral and lower edges of the palmar fascia and to the sheaths of the flexor tendons. The folds, therefore, which are disposed for the purpose of making the grasp secure, vary with the relative lengths of the metacarpal bones, with the mutual relations of the sheaths of the tendons, and the edge of the palmar fascia, somewhat also with the insertion of the palmaris brevis muscle. The sulci are empha- sized because the subcutaneous fat, which is copious in order to pad the skin for the purpose of firmness of holding, being restricted to the intervals between the lines along which the skin is tied down, makes these intervals project, and these are the monticuli. The swelling of the mountain of Venus is simply the indication of the size of the muscles of the ball of the thumb, and can be increased by their exercise. Similarly the hypothenar muscles for the little finger underlie the three ulnar marginal mountains, the sizes of which depend on their development and on the prominence of the pisiform bone.

That these purely mechanical arrangements have any psychic, occult or predictive meaning is a fantastic imagination, which seems to have a peculiar attraction for certain types of mind, and as there can be no fundamental hypothesis of correlation, its discussion does not He within the province of reason.

(A. Ma.)

PALMITIC ACID, w-Hexadecylic Acid, CH 3 (CH2)i4C0 2 H, an organic acid found as a glyceride, palmitin, in all animal fats, and partly as glyceride and partly uncombined in palm oil. The cetyl ester is spermaceti, and the myricyl ester is largely present in beeswax. It is most conveniently obtained from olive oil, after removal of the oleic acid (q.v.), or from Japanese beeswax, which is its glyceride. Artificially it may be prepared by heating cetyl alcohol with soda lime to 270° or by fusing oleic acid with potassium hydrate.

PALM SUNDAY (Dominica palmarum), the Sunday before Easter, so called from the custom, still observed in the Roman Catholic Church, of blessing palm branches and carrying them in

procession in commemoration of Christ's triumphal entry into Jerusalem. In the Western Church, Palm Sunday is counted as the first day of Holy Week, and its ceremonies usher in the series of services, culminating in those of Good Friday, which commemorate the Passion of the Lord.

The ceremonies on Palm Sunday as celebrated now in the Roman Catholic Church are divided in three distinct parts: (1) The solemn blessing of the palms, (2) the procession, (3) the mass.

Branches of palm, olive or sprouting willow (hence in England known as " palm ") having been placed before the altar, or at the Epistle side, after Terce and the sprinkling of holy water, the priest, either in a purple cope or an alb without chasuble, proceeds to bless them. The ceremony begins with the singing by the choir of the anthem Hosanna Filio David; the collect follows; then the singing of a lesson from Exodus xv. by the subdeacon; then the Gradual, reciting antiphonally the conspiracy of the chief priests and Pharisees, and concluding with Christ's prayer on Mt Olivet; then the Gospel, sung by the deacon in the ordinary way, followed by a " continuation of the Holy Gospel " (Matt. xxi. and sqq.). After this the priest blesses the palms in a series of prayers, that those who receive them " may be protected in soul and body," and that " into whatever place they may be brought the inhabitants of that place may obtain Thy benediction : and all adversity being removed, &c." The priest then sprinkles the palms thrice with holy water, saying the prayer Asperges me, &c, and also incenses them thrice. The principal of the clergy present tlien approaches and gives a palm to the celebrant, who then, in his turn, distributes the branches, first to the principal of the clergy, then to the deacon and sub- deacon, and to the other clergy in order of rank, and lastly to the laity, all of whom receive the palms kneeling, and kiss the palm and the hand of the celebrant. During the distribution antiphons are sung.

The deacon now turns to the people and says Procedamus in pace, and the procession begins. It is headed by a thurifer carrying a smoking thurible; then comes the sub-deacon carrying the cross between two acolytes with lighted tapers; the clergy next in order, the celebrant coming last with the deacon on his left, all carrying branches and singing antiphonally, so long as the procession lasts, the account of the entry into Jerusalem, ending with " Benedictus qui venit in nomine Domini: Hosanna in excelsis." On returning to the church, two or four singers enter first and close the doors, then, turning towards the procession outside, sing the first two verses of the hymn " Gloria, laus et honor," those outside repeating them, and so on till the hymn

is finished. This done, the subdeacon strikes the door with the staff of the cross, when it is immediately opened, and the procession enters singing. The mass that follows, characterized by all the outward signs of sorrow proper to Passion Week, is in striking contrast with the joyous triumph of the procession.

In the Orthodox Eastern Church Palm Sunday (KvpiaKJi or toprfi twv /3cucov, eoprr) fia'iocfropos, or 17 /3ai'o < £6pos) is not included in Holy Week, but is regarded as a joyous festival commem- orating Christ's triumphal entry into Jerusalem. There is no longer a procession; but the palms (in Russia willow twigs) are blessed, and are held by the worshippers during the service.

The earliest extant account of a liturgical celebration of Palm Sunday is that given in the Peregrinatio Silviae (Eleutkeriae) * which dates from the 4th century and contains a detailed account of the Holy Week ceremonies at Jerusalem by a Spanish lady of rank: —

The actual festival began at one o'clock with a service in the church on the Mount of Olives; at three o'clock clergy and people went in procession, singing hymns, to the scene of the Ascension ; two hours of prayer, singing and reading of appropriate Scriptures followed, until, at five o'clock the reading of the passage from the Gospel telling how " the children with olive branches and palms goto meet the Lord, and cry: ' Blessed is he that cometh in the name of the Lord ' " gave the signal for the crowd to break up, and, carrying branches of olive and palm, to conduct the bishop, in eo typo quo tunc Dominus deductus est? with cries of " Blessed is he that cometh in the name of the Lord!" to the Church of the Resurrection in Jerusalem, where a further service was held.

This celebration would seem to have been long established at Jerusalem, and there is evidence that in the 4th and 5th centuries it had already been copied in other parts of the East. In the West, however, it was not introduced until much later. To Pope Leo I. (d. 461) the present Dominica paimarum was

1 The text is published among the appendices to Duchesne's Origines du culte Chretien (2nd ed., 1898), p. 486, " Procession du soir."

2 Drews takes this to mean " riding on an ass."

known as Dominica passionis, Passion Sunday, and the Western Church treated it as a day, not of rejoicing, but of mourning. The earliest record in the West of the blessing of the palms and the

subsequent procession is the liber ordinum of the West Gothic Church (published by Ferotin, Paris, 1904, pp. 178 sqc,.), which dates from the 6th century; this shows plainly that the ceremonial of the procession had been borrowed from Jerusalem. As to how far, and at what period, it became common there is very little evidence. For England, the earliest record is the mention by Aldhelm, bishop of Sherborne (d. 709), in his De laudibus virginitatis (cap. 30, Migne Patrol. Lat. 89, p. 128), of a sacrosancla paimarum solemnitas, which probably means a procession, since he speaks of the Benedictus qui venit, he, being sung antiphonally. As the middle ages advanced the procession became more and more popular and increasingly a dramatic representation of the triumphal progress of Christ, the bishop riding on an ass or horse, as in the East. 3 Flowers, too, were blessed, as well as palms and willow, and carried in the procession (hence the names pascha floridum, dominica florum et ramorum, les pdques fleuries) .

The origin of the ceremony of blessing the palms is more obscure. It is not essential to the dramatic character of the celebration and for centuries seems to have formed no usual part of it. Herr Drews {Realencyklop. XXI. p. 417, 40-60) ascribes to it an entirely separate and pagan origin. It is significant that olive and willow should have been chosen for benediction together with, or as substitutes for palm, and that an exorcizing power should have been ascribed to the consecrated branches: they were to heal disease, ward off devils, protect the houses where they were set up against lightning and fire, and the fields where they were planted against hail and storms. _ But healing power had been ascribed to the olive in pagan antiquity, and in the same way the willow had from time immemorial been credited by the Teutonic peoples with the possession of protective qualities. It was natural that olive and willow should have been chosen for the Palm Sunday ceremony, for they are the earliest trees to bud in the spring; their consecration, however, may be explained by the intention to Christianize a pagan belief, and it is easy to see how their mystic virtues came in this way to be ascribed to the palm also. When and where the custom first arose is unknown.

Of the reformed churches, the Church of England alone includes Palm Sunday in the Holy Week celebrations. The blessing of the palms and the procession were, however, abolished at the Reformation, and the name ” Palm Sunday,” though it survives in popular usage, is not mentioned in the Book of Common Prayer. The intention of the compilers of the Prayer-book seems to have been to restore the ” Sunday next before Easter,” as it is styled, to its earlier Western character of Passion Sunday, the second lesson at matins (Matt, xxvt

5) and the special collect, Epistle (Phil. ii. 5) and Gospel (Matt, xxvii. 1) at the celebration of Holy Communion all dwelling on the humiliation and passion of Christ, with no reference to the triumphal entry into Jerusalem. The modern revival, in certain churches of an ” advanced ” type, of the ceremonies of blessing the palms and carrying them in procession has no official warrant, and is therefore without any significance as illustrating the authoritative point of view of the Church of England.

Of the Lutheran churches only that of Brandenburg seems to have kept the Palm Sunday procession for a while. This was prescribed by the Church order (Kirckenordnung) of 1540, but without the ceremony of blessing the palms; it was abolished by the revised Church order of 1572.

See the article “Palmsonntag” in Wetzer und Welte, Kirchen- lexikon (2nd ed.), ix. 1319 sqq.; article ” Woche, grosse,” by Drews in Herzog-Hauck, Realencyklopadie (3rd ed., Leipzig, 1908), xxi. 415; Wiepen, Palmsonntags prozessionen und Palmesel (Bonn, 1903); L. Duchesne, Origines du culte Chretien (2nd ed., Paris, 1898), p. 237. For ceremonies anciently observed in England on Palm Sunday see M. E. C. Walcott, Sacred Archaeology (1868) and J. Brand, Popular antiquities (ed. 1870).

PALMYRA, the Greek and Latin name of a famous city of the East, now a mere collection of Arab hovels, but still an object of interest on account of its wonderful ruins. In 2 Chron.

3 For curious instances of the part played by the ass in medieval church festivals see the article Fools, Feast of.

viii. 4, and in thp native inscriptions, it is called Tadmor, and this is the name by which it is known among the Arabs at the present day (Tadmur, Tudmur). 1 The site of Palmyra lies 150 m. N.E. of Damascus and five days’ camel journey from the Euphrates, in an oasis of the Syrian desert, 1,300 ft. above sea-level. At this point the great trade routes met in ancient times, the one crossing from the Phoenician ports to the Persian Gulf, the other coming up from Petra and south Arabia.

The earliest mention of Palmyra is in 2 Chron. viii. 4, where Solomon is said to have built “Tadmor in the wilderness”; 1 Kings ix. 18,

however, from which the Chronicler derived his statement, reads " Tamar " in the Hebrew text, with " Tadmor " in the Hebrew margin; there can be no doubt that the text is right and refers to Tamar in the land of Judah (Ezek. xlvii. 19; xlviii. 28). The Chronicler, we must suppose, altered the name because Tadmor was a city more familiar and renowned in his day, or possibly because he wished to increase the extent of Solomon's kingdom. The date of the Chronicler may be placed about 300 B.C., so Palmyra must have been in existence long before then. There is reason to believe that before the 6th century B.C. the caravans reached Damascus without coming near the oasis of Tadmor; probably, therefore, we may connect the origin of the city with the gradual forward movement of the nomad Arabs which followed on the overthrow of the ancient nationalities of Syria by the Babylonian Empire (6th century B.C.). The Arabian tribes began to take possession of the partly cultivated lands east of Canaan, became masters of the Eastern trade, gradually acquired settled habits, and learned to speak and write in Aramaic, the language which was most widely current throughout the region west of the Euphrates in the time of the Persian Empire (6th~4th century B.C.). It is not till much later that Palmyra first appears in Western literature. We learn from Appian (Bell. civ. v. 9) that in 42-41 B.C. the city was rich enough to excite the cupidity of M. Antonius (Mark Antony), while the population was not too large to save itself by timely flight. The series of native inscriptions, written in Aramaic, begins a few years after; the earliest bears the date 304 of the Seleucid era, i.e. 9 B.C. (Cooke, North-Semitic Inscriptions No. 141 = Vogiie, Syrie Cenlrale No. 300); by this time Palmyra had become an important trade-post between the Roman and the Parthian states. Its characteristic civilization grew out of a mixture of various elements, Arabic, Aramaic, Greek and Roman. The bulk of the population was of Arab race, and though Aramaic was used as the written language, in common intercourse Arabic had by no means disappeared. The proper names and the names of deities, while partly Aramaic, are also in part unmistakably Arabic: it is suggestive that a purely Arabic term (fakd, NSI. No. 136) was used for the septs into which the citizens were divided.

Originally an Arab settlement, the oasis was transformed in the course of time from a mere halting-place for caravans to a city of the first rank. The true Arab despises agriculture; but the pursuit of commerce, the organization and conduct of trading caravans, cannot be carried on without widespread connexions of blood and hospitality between the merchant and the leading sheiks on the route. An Arabian merchant city is thus necessarily aristocratic, and its chiefs can hardly be other than pure Arabs of good blood. Palmyra also possessed the

character of a religious centre, with the worship of the Sun- god dominating that of inferior deities.

The chief luxuries of the ancient world, silks, jewels, pearls, perfumes, incense and the like, were drawn from India, China and southern Arabia. Pliny (N. H. xii. 41) reckons the yearly import of these wares into Rome at not less than three-quarters of a million of English money. The trade followed two routes:

1 How the name Palmyra arose is obscure. The Greek for a palm is 4x>ivi.%, and the Greek ending yra could not have been affixed to the Latin palma. Schultens (Vita Sal., Index geogr.) cites Tatmur as a variant of the Arabic name; this might mean “abound ing in palms ” (from the root tamar) ; otherwise Tadmor may have been originally an Assyrian name. See Lagarde, Bildung der Nomina, p. 125 n.

one by the Red Sea, Egypt and Alexandria, the other from the Persian Gulf through the Syro-Arabian desert. The latter, when the Nabataean kingdom of Petra (q.v.) came to an end (a.d. 105), passed into the hands of the Palmyrene merchants. Their caravans (avvobiai) travelled right across the desert to the great entrepots on the Euphrates, Vologesias, about 55 m. south- east of Babylon, or Forath or Charax close to the Persian Gulf (NSI. Nos. 113-115). The trade was enormously profitable, not only to the merchants but to the town, which levied a rigorous duty on all exports and imports; ‘at the same time formidable risks had to be faced both from the desert-tribes and from the Parthians, and successfully to plan or convoy a great caravan came to be looked upon as a distinguished service to the state, often recognized by public monuments erected by ” council and people ” or by the merchants interested in the venture. These monuments, a conspicuous feature of Palmyrene archi- tecture, took the form of statues placed on brackets projecting from the upper part of the pillars which lined the principal thoroughfares. Thus arose, beside minor streets, the imposing central avenue which, starting from a triumphal arch near the great temple of the Sun, formed the main axis of the city from south-east to north-west for a length of 1240 yards, and at one time consisted of not less than 750 columns of rosy- white limestone, each 55 ft. high.

Local industries do not seem to have been important. One of the chief of them was the production of salt from the deposits of the desert; 2 another was no doubt the manufacture of leather; the inscriptions mention also a powerful gild of workers in gold and silver (NSI. No. 126); but Palmyra was not an industrial town, and the exacting fiscal system which drew profit even out of the bare necessaries of life —

such as water, oil, wheat, salt, wine, straw, wool, skins (see Tariff ii. b, NSI. pp. 315 sqq.) — must have weighed heavily upon the artisan class. The prominent townsmen were engaged in the organiza- tion and even the personal conduct of caravans, the discharge of public offices such as those of strategos, secretary, guardian of the wells, president of the banquets of Bel, chief of the market (see NSI. Nos. 114, 115, 121, 122), sometimes the victualling of a Roman expedition. The capable performance of these functions, which often involved considerable pecuniary sacrifices, ensured public esteem, honorary inscriptions and statues; and to these honours the head of a great house was careful to add the glory of a splendid tomb, consecrated as the " long home " (lit. " house of eternity," cf. Eccles. xii. 5) of himself, his sons and his sons' sons for ever. These tombs, which lie outside the city and overtook it from the surrounding hills, a feature characteristically Arabic, remain the most interesting monu- ments of Palmyra. Some are lofty towers containing sepulchral chambers in stories; 3 ethers are house-like buildings with a single chamber and a richly ornamented portico; the sides of these chambers within are adorned with the names and sculptured portraits of the dead. As a rule the buildings of Palmyra do not possess any architectural individuality, but these tombs are an exception. The style of all the ruins is late classic and highly ornate, but without refinement.

The rise of Palmyra to a position of political importance may be dated from the time when the Romans established themselves on the Syrian coast. As early as the first imperial period the city must have admitted the suzerainty of Rome, for decrees respecting its custom-dues were issued by Germanicus (a.d. 17-19) and Cn. Domitius Corbulo (a.d. 57-66). At the same time the city had by no means surrendered its independence, for even in the days of Vespasian (a.d. 69-79) the distinctive

2 " The soil of this marsh [east of Palmyra] is so impregnated with salt that a trench or pit sunk in it becomes filled in a short time with concentrated brine, the water of which evaporates in the intense sunshine and leaves an incrustation of excellent salt." Post, Narrative of a Second Journey to Palmyra in Pal. Expl. Fund's Qtly. St. (1892), p. 324.

3 One of these tomb-towers, called Kasr eth-Thuniyeh, is m ft. high, 3_3i ft. square at the base, 25 ft. 8 in. square above the_ base- ment ; it contains six stories and places for 480 bodies. Opposite the entrance within is a hall with recesses for coffins and a richly panelled selling ; underneath is an immense vault.

position of Palmyra as an intermediate state between the two great powers of Rome and Parthia was recognized and carefully watched. The splendid period of Palmyra (a.d. 130-270), to which the greater part of the inscribed monuments belong, started from the overthrow of Petra (a.d. 105), which left Palmyra without a competitor for the Eastern trade. Hadrian treated the city with special favour, and on the occasion of his visit in a.d. 130, granted it the name of Hadriana Palmyra (tdth wnn NSI. p. 322). Under the same emperor the customs were revised and a new tariff promulgated (April, a.d. 137), cancelling the loose system of taxation ” by custom ” which formerly had prevailed. 1 The great fiscal inscription, which still remains where it was set up, gives the fullest picture of the life and commerce cf the city. The government was vested in the council (jSouXij) and people (Srj/ws), and admin- istered by civil officers with Greek titles, the proedros (president), the grammateus (secretary), the archons, syndics and dekaprotoi (a fiscal council of ten), following the model of a Greek muni- cipality under the Roman Empire. At a later date, probably under Septimius Severus or Caracalla (beginning of 3rd century), Palmyra received the Jus italicum and the status of a colony; the executive officials of the council and people were called strategoi, equivalent to the Roman duumviri (NSI. Nos. 121, 127); and Palmyrenes who became Roman citizens began to take Roman names, usually Septimius or Julius Aurelius, in addition to their native names.

It was the Parthian wars of the 3rd century which brought Palmyra to the front, and for a brief period raised her to an almost dazzling position as mistress of the Roman East. A new career of ambition was opened to her citizens in the Roman honours that rewarded services to the imperial armies during their frequent expeditions in the East. One house which was thus distinguished had risen to a leading place in the city and before long played no small part in the world’s history. Its members, as we learn from the inscriptions, prefixed to their Semitic names the Roman gentilicium of Septimius, which shows that they received the citizenship under Septimius Severus (a.d. 193-211), presumably in recognition of their services in connexion with his Parthian expedition. In the next generation Septimius Odainath or Gdenathus, son of Hairan, had attained the rank of Roman senator ((TuykXtjtikos, Vogue No. 21, NSI. p. 285 «.). conferred no doubt when Alexander Severus visited Palmyra in a.d. 230-231; his son again, Septimius Hairan, seems to have been the first of the family to receive the title of Ras Tadmor (” chief of Tadmor “) in addition to his

Roman rank (NSI. No. 125); while his son — the relationship, though nowhere stated, is practically certain — the famous Septimius Odainath, commonly known as Odenathus (q.v.), the husband of Zenobia, received even higher rank, the consular dignity (inraTiKos) which is given him in an inscription dated a.d. 258, in the reign of Valerian (NSI. No. 126). The East was then agitated by the advance of the Parthian Empire under the Sassanidae, and the Palmyrenes, in spite of their Roman honours and their Roman civilization, which did not really go much below the surface, were by no means prepared to commit them- selves altogether to the Reman side. 2 But Parthian ambitions made it necessary for the Palmyrenes to choose one side or other, and their choice leaned towards Rome, both because they dreaded interference with their religious freedom and because the Roman emperor was further off than the Persian king. In the contests which followed there can be no doubt that the Palmyrene princes cherished the idea of an independent empire of their own, though they never threw over their alle- giance to the Roman suzerain until the closing act of the drama. Their opportunity came with the disaster which befell the Roman army under Valerian (q.v.) at Edessa, a disaster, says

1 The full text, both Greek and Palmyrene, with an English translation, is given in NSI, pp. 313-340. The tariff should be compared with the Greek Tariff of Coptos A.D 90 (Flinders Petrie, Koptos, pp. 27 sqq.) and the Latin Tariff of Zarai (Corp. inscr. lat. viii. 4508).

2 For the general history of the Period see Persia: History, A. §.viii„ ” The Sassanian Empire.”

Mommsen, which had nearly the same significance for the Roman East as the victory of the’ Goths at the mouth of the Danube and the fall of Decius; the emperor was captured (a.d. 260) and died in captivity. The Persians swept victoriously over Asia Minor and North Syria; not however without resist- ance on the part of Odenathus, who inflicted considerable losses on the bands returning home from the pillage of Antioch. It was prcbably not long after this that Odenathus, with a keen eye for his advantage, made an attempt to attach himself to Shapur I. (q.v.) the Persian king; 3 his gifts and letters, however, were contemptuously rejected, and from that time, as it seems, he threw himself warmly into the Roman cause. After the captivity and death of Valerian, Gallienus succeeded to a merely nominal rule in the East, and was too careless and self-indulgent to take any active measures to recover the lost provinces. Thereupon the two leading generals of the Roman army, Macrianus and Callistus, renounced their allegiance and

pro- claimed the two sons of the former as emperors (a.d. 261). During the crisis Odenathus remained loyal to Gallienus, and was rewarded for his fidelity by the grant of a position without parallel under ordinary circumstances; as hereditary prince of Palmyra he was appointed dux Orientis, a sort of vice-emperor for the East (a.d. 262). He started promptly upon the work of recovery. With his Palmyrene troops, 4 strengthened by what was left of the Roman army corps, he took the offensive against Shapur, defeated him at Ctesiphon, and in a series of brilliant engagements won back the East for Rome. During his absence at the wars, we learn from the inscriptions (a.d. 262-267) that Palmyra was administered by his deputy Septi- mius Worod, " procurator ducenarius of Caesar our lord," also styled " commandant," as being Odenathus' viceroy (apyairerris, NSI. Nos. 127-129). Then in the zenith of his success Odenathus was assassinated at Homs (Emesa) along with his eldest son Herodes (a.d. 266-267). The fortunes of Palmyra now passed into the vigorous hands of Zenobia (q.v.), who had been actively supporting her husband in his policy. Zenobia seems to have ruled on hehalf of her young son Wahab-allath or Athenodorus as the name is Graecized, who counts the years of his reign from the date of his father's death. Under Odenathus Palmyra ha,d extended her sway over Syria and Arabia, perhaps also over Armenia, Cilicia and Cappadocia; but now the troops of Zenobia, numbering it is said 70,000, proceeded to occupy Egypt ; the Romans under Probus resisted vigorously but without avail, and by the beginning of A.D. 270, when Aurelian succeeded Claudius as emperor, Wahab-allath was governing Egypt with the title of " king." His coins of 270 struck at Alexandria bear the legend v(ir) c(onsularis) R(omanorum) im(perator) d(ux) R(omanorum) and display his head beside that of Aurelian, but the latter alone is styled Augustus. Meanwhile the Palmyrenes were pushing their influence not only in Egypt but in Asia Minor; they contrived to establish garrisons as far west as Ancyra and even Chalcedon opposite Byzantium, while still professing to act under the terms of the joint rule conferred by Gallienus. Then in the course of the year a.d. 270-271 came the inevitable and open breach. In Palmyra Zenobia is still called " queen " (fiaa'iXicraa, NSI. No. 131; cf. Wadd. 2628), but in distant quarters, such as Egypt, she and her son claim the dignity of Augustus;

3 Petrus Patricius. Fragtn. hist, graec. iv. 187.

4 The Palmyrene archers were especially famous. Appian mentions them in cennexion with M. Antony's raid in 41 B.C. (Bell, civ. v. 9)._ Later on a contingent served with the Roman army in Africa, Britain, Italy, Hungary, where grave-stones with Palmyrene and Latin inscriptions have been found; see Lidzbarski, Nordsem. epigr. p. 481

seq. ; Ephemeris, ii. 92 (a Latin inscription of the time of Marcus Aurelius), and NSI. p. 312. The South Shields inscription, now in the Free Library of the town, was found in the neighbouring Roman camp; it is given in NSI. p. 250. The Palmyrene soldier who set it up was no doubt an archer. Jewish tradition had reason to remember these formidable Palmyrenes in the Roman armies; according to the Talmud 80,000 of them assisted at the destruction of the first temple, 8000 at that of the second ! Talm. Jerus. Taanith, fol. 68 a, Midrash Ekha, ii. 2. For other references to Palmyra (called Tarmod) in the Talmud see Neubauer Giogr. du Talm. 301 sqq.

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PALNI HILLS— PALO ALTO

Wahab-allath(5th year)begins to issue coins at Alexandria without the head of Aurelian and bearing the imperial title; and Zenobia's coins bear the same. It was at this time (a.d. 271) that the two chief Palmyrene generals Zabda and Zabbai, set up a statue to the deceased Odenathus and gave him the sounding designa- tion of " king of kings and restorer of the whole city " (NSI. No. 130). These assumptions marked a definite rejection of all allegiance to Rome. Aurelian, the true Augustus, quickly grasped the situation, and took strenuous measures to deal with it. At the close of a.d. 270 Probus brought back Egypt into the empire, not without a considerable struggle; then in 271 Aurelian made preparations for a great campaign against the seat of the mischief itself. He approached by way of Cappadocia, where he reduced the Palmyrene garrisons, and thence through Cilicia he entered Syria. At Antioch the Palmyrene forces under Zabda attempted to resist his advances, but they were compelled to fall back upon the great route which leads from Antioch through Emesa (mod. Horns) to their native city. At Emesa the Palmyrenes were defeated in a stiffly contested battle. At length Aurelian arrived before the walls of Palmyra, which was captured probably in the spring of a.d. 272. In accordance with the judicious policy which he had observed in Asia Minor and at Antioch, he granted full pardon to the citizens; only the chief officials and advisers were put to death; Zenobia and her son were captured and reserved for his triumph when he returned to Rome. But the final stage in the conquest of the city was yet to come. A few months later, in the autumn of 272 — the latest inscription is dated August 272 (Vogue, No. 116) — the Palmyrenes revolted, killed the Roman garrison quartered in the city, and proclaimed one Antiochus as their chief. Aurelian heard of it just when he had crossed the Hellespont on his way home. He returned instantly before any one expected him, and took the city by surprise. Palmyra was destroyed

and the population put to the sword. Aurelian restored the walls and the great Temple of the Sun (a.d. 273); but the city never recovered its splendour or importance.

Language. — The language spoken at Palmyra was a dialect of western Aramaic, and belongs to the same group as Nabataean and the Aramaic spoken in Egypt. In some important points, however, the dialect was related to the eastern Aramaic or Syrian (e.g. the plur. ending in e' ; the dropping of the final I of the pronominal suffix third pers. sing. with. nouns, and of the final u of the third pers. pi. of the verb; the infin. ending w, &c). But the relation to western Aramaic is closer; specially characteristic are the following features: the imperf. beginning with y, not as in Syriac and the eastern dialects with » or /; the plur. ending -ayya' ; the forms of the demonstrative pronouns, &c. As the bulk of the population was of Arab race, it is not surprising that many of the proper names are Arabic and that several Arabic words occur in the inscriptions. The technical terms of municipal government are mostly Greek, transliterated into Palmyrene; a few Latin words occur, of course in Aramaic forms. For further characteristics of the dialect see Noldeke, ZDMG. xxiv. 85-109. The writing is a modified form of the old Aramaic character, and especially interesting because it repre- sents almost the last stage through which the ancient alphabet passed before it developed into the Hebrew square character.

The names of the months were the same as those used by the Nabataeans, Syrians and later Jews, viz. the Babylonian. The calendar was the Syro-Macedonian, a solar, as distinct from the primitive lunar, calendar, which Roman influence disseminated throughout Syria; it was practically a reproduction of the Julian calendar. Dates were reckoned by the Seleucid era, which began in October 312 B.C.

Religion. — The religion of Palmyra did not differ in essentials from that of the north Syrians and the Arab tribes of the eastern desert. The chief god of the Palmyrenes was a solar deity, called Samas or Shamash (" sun "), or Bel, or Malak-bel, 1 whose great temple is still the most imposing feature among the ruins of Palmyra. Both Bel and Malak-bel were of Babylonian origin. Sometimes asso- ciated with the Sun-god was 'Agli-bol the Moon-god who is repre- sented as a young Roman warrior with a large crescent attached to his shoulders (Rom. 1, and Vogue pi. xii. No. 141). The great goddess of the Aramaeans, 'Athar-'atheh, in Greek Atargatis

1 Transcribed MaXax/SijXos, Malagbelus, &c, and in the Palm, inscr. given in NSI., p. 268, translated Sol sanctissimus ; he was further

identified with Z«is. Malak-bel has been explained as “messenger of Bel”; but more probably Malak is the common Babylonian epithet malik given to various gods, and means “counsellor”; Malak-bel will then be the sun as the visible representative of Bel.

(q.v.), and Allath, the chief goddess of the ancient Arabs, were also worshipped at Palmyra. Another deity whose name occurs in votive inscriptions, is Baal-shamim, i.e. ” B of the heavens,” =ZiOs niywTos mpabvios, sometimes called “lord of eternity,” but he was not included among the national gods of Palmyra, so far as we know, though he probably had a temple there. Another interesting divine name, lately discovered, is that of a distinctly Arabic deity ” She’a-alqflm the good and bountiful god who does not drink wine ” (NSI. No. 140 B); the name means ” he who accompanies, the pro- tector of, the people ” — the divine patron of the caravan. A common formula in Palmyrene dedications runs ” To him whose name is blessed for ever, the good and the compassionate ” ; out of reverence the name of the deity was not pronounced; was it Bel or Malak-bel? It is worth noticing that this epithet like ” lord of eternity ” (or, ” of the world “), has a distinctly Jewish character. Altogether about 22 names of gods are found in Palmyrene; some of them, however, only occur in compound proper names.

After its overthrow by Aurelian, Palmyra was partially revived as a military station by Diocletian (end of 3rd century A.D.), as we learn from a Latin inscription found on the site. Before this time Christianity had made its way into the oasis, for among the fathers present at the Council of Nicaea (a.d. 325) was Marinus bishop of Palmyra. The names of two other bishops of the 5th and 6th centuries have come down to us. About a.d. 400, Palmyra was the station of the first Ulyrian legion (Not. dign. i. 85, ed. Bock- ing) ; Justinian in 527 furnished it with an aqueduct, and built the wall of which the ruins still remain (Procopius, De aedif, ii. 11). At the Moslem conquest of Syria, Palmyra capitulated to Khalid (see Caliphate) without embracing Islam (Baladson [Baladhuri], III seq. ; Yaqut, i. 831). The town became a Moslem fortress and received a considerable Arab colony; for in the reign of Merwan II. (A.H. 127-132) it sent a thousand Kalbite horsemen to aid the revolt of Emesa, to the district of which it is reckoned by the Arabic geographers. The rebellion was sternly suppressed and the walls of the city destroyed (Ibn al-Athir, A.H. 127, ed. Tornberg V., 249; cf. Frag. hist. ar. 139, Ibn Wadih, ii. 230). In this connexion Yaqu£ tells a curious story of the opening of one of the tombs by the caliph, which in spite of fabulous incidents, recalling the legend of Roderic the Goth, shows some traces of local knowledge. The ruins of Palmyra greatly interested the Arabs, and are

commemorated in several poems quoted by Yaqflt and others; they are referred to by the early poet Nabigha as proofs of the might of Solomon and his sovereignty over their builders the Jinn (Derenbourg, Journ. As. xii. 269) — a legend which must have come from the Jews, who either clung to the ruins after the great overthrow or returned in the time of Diocletian. References to Palmyra in later times have been collected by Quatremere, Sultans Mamlouks, ii. pt. 1. p. 255 seq. All but annihilated by earthquake in the nth century, it recovered considerable prosperity; when Benjamin of Tudela visited the city, which was still called Tadmor, he found 2000 Jews within the walls (12th century). It was still a wealthy place as late as the 14th century; but in the general decline of the East, and owing to changes in the trade routes, it sunk at length to a poor group of hovels gathered in the courtyard of the Temple of the Sun. The ruins first became known to Europe through the visit of Dr William Halifax of Aleppo in 1 691 ; his Relation of a voyage to Tadmor has been printed from his autograph in the Pal. Explor. Fund's Quarterly Statement for 1890. Halifax not only took measurements, but copied 18 Greek and 4 Palmyrene texts. The architecture was carefully studied by Wood and Dawkins in 1751, whose splendid folio (The Ruins of Palmyra, London, 1753) also gave copies of inscriptions. But the epigraphie wealth of Palmyra was first opened to study by the collections of Waddington (vol. iii.) and De Vogue (La Syrie cenlrale) made in 1861-1862. Since that time the most valuable document which has come to light is the great fiscal inscription discovered in 1882 by Prince Abamelek Lazarew.

See also A. D. Mordtmann, Sitzungsb. of the Munich Acad. (1875) ; Sachau, ZDMG. xxxv. 728 sqq. ; D. H. Miiller, Palm. Inschr. (1898); J. Mordtmann Palmyrenisches (1899); Clermont-Ganneau, Etudes d'arch. or. i., Receuil. d'arch. or. iii., v., vii. ; Lidzbarski, Ephemeris, i. and ii. ; Sobernheim, Palm. Inschr. (1905). The Repertoire d'epigr, sem. contains the new texts which have been published since 1900. For the coins von Sallet's Fiirsten von Palmyra (1866) must be read with his later essay in the Numl Zeitschr. ii. 31 sqq. (1870). Critical discussions of the history will be found in Schiller, Gesch. d. Rbmischen Kaiserzeit., i. 2 Teil (1883), pp. 823 sqq. and 857 sqq., and Mommsen, Provinces of the Roman Empire, (Eng. trans., 1886), pp. 92 sqq. (G. A. C.*)

PALNI HILLS, a range of hills in south India, in the Madura district of Madras. They are an offshoot from the Western Ghats, and, while distinct from the adjacent Anamalai Hills, form part of the same system. They contain the hill station of Kodaikanal (7200 ft.), which has a milder and more equable climate than Ootacamund in the

Nilgiri Hills. There is some coffee cultivation on the lower slopes.

PALO ALTO, a city of Santa Clara county, California, U.S.A., between two of the coast ranges, about 28 m. S. of San Francisco,

and about 18 m. from the sea. Pop. (ioio) 4486. It is served by the coast division of the Southern Pacific railway, and is the railway station for Leland Stanford Jr. University (q.v.), which is about 1 m. south-west of the city. At Menlo Park is St Patrick's Theological Seminary (Roman Catholic). By all real estate deeds the sale of intoxicating liquors is for ever prohibited in the city; and an act of the state legislature in 1909 prohibited the sale of intoxicating liquor within 1 J m. of the grounds of the university. The name (Sp. " tall tree '•') was derived from a solitary redwood-tree standing in the outskirts of the city. Palo Alto was laid out in 1891, but had no real existence before 1893. It was incorporated as a town in 1894, having previously been a part of Mayfield township; in 1909 it was chartered as a city. Palo Alto suffered severely in the earthquake of 1906.

PALOMINO DE CASTRO Y VELASCO, ACISCLO ANTONIO (1653-1726), Spanish painter and writer on art, was born of good family at Bujalance, near Cordoba, in 1653, and studied philo- sophy, theology and law at that capital, receiving also lessons in painting from Valdes Leal, who visited Cordoba in 1672, and afterwards from Alfaro (1675). After taking minor orders he removed to Madrid in 1678, where he associated with Alfaro, Coello and Carefio, and executed some indifferent frescoes. He soon afterwards married a lady of rank, and, having been appointed alcalde of the mesta, was himself ennobled; and in 1688 he was appointed painter to the king. He visited Valencia in 1697, and remained there three or four years, again devoting himself with but poor success to fresco painting. Between 1705 and 1 715 he resided for considerable periods at Salamanca, Granada and Cordoba; in the latter year the first volume of his work on art appeared in Madrid. After the death of his wife in 1725 Palomino took priest's orders. He died on the ijth of August 1726.

His work, in 3 vols, folio (1715-1724), entitled El Museo pictorico y escala optica, consists of three parts, of which the first two, on the theory and practice of the art of painting, are without interest or value; the third, with the subtitle El Parnaso espanol pintoresco

laureado, is a mine of important biographical material relating to Spanish artists, which, notwithstanding its faulty style, has procured for the author the not altogether undeserved honour of being called the ” Spanish Vasari.” It was partially translated into English in 1739; an abridgment of the original (Las Vidas de los pinlores y estatuarios espanoles) was published in London in 1742, and after- wards appeared in a French translation in 1749. A German version was published at Dresden in 1781, and a reprint of the entire work at Madrid in 1797.

PALTOCK, ROBERT (1697-1767), English writer, the only son of Thomas Paltock of St James’s, Westminster, was born in 1697. He became an attorney and lived for some time in Clement’s Inn, whence he removed, before 1759, to Back Lane, Lambeth. He married Anna Skinner, through whom his son, also named Robert, inherited a small property at Ryme Intrinseca, Dorset. There Robert Paltock, who died in London on the 20th of March 1767, was buried. Paltock owes his fame to his romantic Life and Adventures of Peter Wilkins (1751), which excited the admiration of men like Coleridge, Southey, Charles Lamb, Sir Walter Scott and Leigh Hunt. It has been several times reprinted, notably with an introduction by Mr A. H. Bullen in 1884. It was translated into French (1763) and into German (1767).

PALUDAN-MULLER, FREDERIK (1809-1876), Danish poet, was the third son of Jens Paludan-Muller, from 1830 to 1845 bishop of Aarhus, and born at Kjerteminde in Funen, on the 7th of February 1809. In 18 19 his father was transferred to Odense, and Frederik began to attend the Latin school there. In 1828 he passed to the university of Copenhagen. In 1832 he opened his poetical career with Four Romances, and a romantic comedy entitled Kjmrlighed ved hoffet (“Love at Court”). This enjoyed a considerable success, and was succeeded in 1833 by Dandserinden (” The Dancing Girl “). Paludan-Muller was accepted by criticism without a struggle, and few writers have excited less hostility than he. He was not, however, well inspired in his lyrical drama of Amor and Psyche in 1834 nor in his Oriental tale of Zuleimas flugt (” Zuleima’s Flight “) in 1835, in each of which he was too vividly influenced by Byron. But he

regained all that he had lost by his two volumes of poems in 1836 and 1838. From 1838 to 1840 Paludan-Muller was making the grand tour in Europe and his genius greatly expanded; in Italy he wrote Venus, a lyrical poem of extreme beauty. In the same year, 1841, he began to publish a great work on which he had long been engaged, and which he did not conclude until 1848; this was Adam Homo, a narrative epic, satirical, modern and descriptive,into which Paludan-Muller

wove all his variegated impressions of Denmark and of love. This remains the typical classic of Danish poetical literature. In 1844 he composed three enchanting idylls, Dryadens bryllup (" The Dryad's Wedding ") Tithon (" Tithonus ") and Abels dod (" The Death of Abel "). From 1850 a certain decline in the poet's physical energy became manifest and he wrote less. His majestic drama of Kaianus belongs to 1854. Then for seven years he kept silence. Para- diset ("Paradise") 1861; and Benedikt fra Nurcia ("Benedict of Nurcia ") 1861; bear evidence of malady, both physical and mental. Paludan-Muller wrote considerably after this, but never recovered his early raptures, except in the very latest of all his poems, the enchanting welcome to death, entitled Adonis. The poet lived a very retired life, first in Copenhagen, then for many years in a cottage on the outskirts of the royal park of Fredens- borg, and finally in a house in Ny Adelgade, Copenhagen, where he died on the 27th of December 1876. (E. G.)

PALWAL, a town of British India, in Gurgaon district, Punjab. Pop. (1901), 12,830. It is a place of great antiquity, supposed to figure in the earliest Aryan traditions under the name of Apelava, part of the Pandava kingdom of Indraprastha. Its importance is mainly historical, but it is a centre for the cotton trade of the neighbourhood, having a station on the Delhi-Agra branch of the Great Indian Peninsula railway.

PAMIERS; a town of south-western France, capital of an arron- dissement in the department of Ariege, 40 m. S. by E. of Toulouse on the railway to Foix. Pop. (1906), town, 7728; commune, 10,449. Pamiers is the seat of a bishopric dating from the end of the 13th century. The cathedral (chiefly of the 1 7th century) with an octagonal Gothic tower, is a bizarre mixture of the Graeco- Roman and Gothic styles; the church of Notre-Dame du Camp (17th and 18th centuries) is noticeable for its crenelated and machicolated facade of the 14th century. Pamiers has a sub- prefecture, a tribunal of first instance, a communal college and a school of commerce and industry. Iron and steel of excellent quality, chains and carriage-springs are among its products. It has also tanneries and wool, flour, paper and saw mills, brickworks and lime-kilns, and commerce in grain, flour, fodder, fruit and vegetables. There are stone quarries and nursery gardens in the vicinity, and the white wine of the district is well known.

Pamiers was originally a castle built in the beginning of the 1 2th century by Roger II., count of Foix, on lands belonging to the abbey of St Antonin de Fredelas. The abbots of St Antonin, and afterwards the bishops, shared the authority over the town with the counts. This gave rise to numerous disputes between monks, counts, sovereigns, bishops

and the consuls of the town. Pamiers was sacked by Jean de Foix in i486, again during the religious wars, when the abbey of St Antonin was destroyed, and finally, in 1628, by Henry II. of Bourbon prince of Conde.

PAMIRS, a mountainous region of central Asia, lying on the north-west border of India. Since 1875 the Pamirs have probably been the best explored region in High Asia. Not only have many travellers of many nationalities directed their steps towards the Bam-i-dunya (" the Roof of the World ") in search of adventure or of scientific information, but the government surveys of Russia and India have met in these high altitudes, and there effected a connexion which will help to solve many of the geodetic problems which beset the superficial survey of Asia. Since Wood first discovered a source of the Oxus in Lake Victoria in 1837, and left us a somewhat erroneous conception of the physiography of the Pamirs, the gradual approach of Russia from the north stimulated the processes of exploration from the side of India. Native explorers from India first began to be

busy in the Pamirs about i860, and continued their investiga- tions for the following fifteen years. In 1874 the mission of Sir D. Forsyth to Yarkand led to the first systematic geographical exploitation of the Pamir country. In 1885 Ney Elias made his famous journey across the Pamirs from east to west, identifying the Rang Kul as the Dragon Lake of Chinese geographers — a distinction which has also been claimed by some geographers for Lake Victoria. Then Lockhart and Woodthorpe in 1886 passed along the Wakhan tributary of the Oxus from its head to Ishkashim in Badakshan, and completed an enduring record of most excellent geographical research. Bonvalot in 1887, Littledale in 1888, Cumberland, Bower and Dauvergne, followed by Younghusband in succeeding years, extending to 1890; Dunmore in 1892 and Sven Hedin in 1894-1895, have all contributed more or less to Pamir geography; but the honours of successful inquiry in those high altitudes still fall to Lord Curzon, whose researches in 1894 led to a singularly clear and comprehensive description of Pamir geography, as well as to the best map compilation that till then had existed. Meanwhile Russian explorers and Russian topographers had been equally busy from the north. The famous soldier Skobelev was probably the first European to visit the Great Kara Kul. He was followed by scientific missions systematically organized by the Russian government. In 1883 Putiata's mission started south. Grom-

chevsky was hard at work from 1888 to 1892. Yanov began again in 1891, after a short spell of rest, and has left his mark as a permanent record in the valley of Sarhad (or Wakhan) , between the Baroghil pass and Bozai Gumbaz. Finally, in 1895, the Russian mission under General Shveikovsky met the British mission under General Gerard on the banks of Lake Victoria, and from that point to the Chinese frontier eastward demarcated the line which thereafter was to divide Russian from British interests in highest Asia. Since then other travellers have visited the Pamirs, but the junction of the Russian and British surveys (the latter based on triangulation carried across the Hindu Kush from India) disposes of any further claim to the honours of geographical exploration.

Our estimate of the extent of Pamir conformation depends much on the significance of the word Pamir. If we accept the Persian derivation of the term (which is advanced formation, “ty Curzon as being perhaps the most plausible), pai-mir, or ” the foot of mountain peaks,” we have a definition which is by no means an inapt illustration of the actual facts of configuration. It has been too often assumed that the plateau of Tibet and the uplands of the Pamirs are analogous in physiography, and that they merge into each other. This is hardly the case. Littledale points out (R. G. S. Joum., vol. vii.) that the high-level valleys of glacial formation which distinguish the Pamirs have no real counterpart in the Chang or plains of Tibet. The latter are 2000 ft. higher; they are intersected by narrow ranges, and are drained by no rivers of importance. They form a region of salt lakes and stagnant marshes, relieved by wide flat spaces of open plateau country. The absence of any vegetation beyond grass or scrub is a striking feature common to both Pamir and Chang, but there the resemblance ceases, and the physical conformation of mountain and valley to the east and to the west of the upper sources of the Zarafshan is radically distinct.

The axis, or backbone, of Pamir formation is the great meridional mountain chain of Sarikol — the ancient Taurus of tradition and history — on which stands the highest Pamirs. peak north of the Himalaya, the Muztagh Ata (25,000 ft.). This chain divides off the high-level sources of the Oxus on the west from the streams which sweep downwards into the Turkestan depression of Kashgar on the east. There are the true Pamirs {i.e. valleys reaching up in long slopes to the foot of mountain peaks) on either side, and the Pamirs on the west differ in some essential respects from those on the east. On the west the following are generally recognized as distinct Pamirs: (1) the Great Pamir, of which the dominant feature is Lake Victoria; (2) the Little Pamir, separated from the Great Pamir on the north by what is now known as the Nicolas

range; (3) the Pamir-i- Wakhan, which is the narrow trough of the Wakhan tributary of the Oxus, the term Pamir applying to its upper reaches only; (4) the Alichur— the Pamir of the Yeshil Kul and Ghund — immediately to the north of the Great Pamir; (5) the Sarez Pamir, which forms the valley of the Murghab river, which has here found its way round the east of the Great Pamir and the Alichur from the Little Pamir, and now makes westwards for the Oxus. This branch was considered by many geographers as the main Oxus stream, and Lake Chakmaktin, at its head, was by them regarded as the Oxus source. At the foot of the Sarez Pamir stands the most advanced Russian out-post of Murghabi. To the north-east of the Alichur are the Rang Kul and the Kara Kul (or Kargosh) Pamirs. Rang Kul LaKe occupies a central basin or depression; but the Kara Kul drains away north-eastwards through the Sarikol (as the latter, bending westwards, merges into the Trans-Alai) to Kashgar and the Turkestan plains. Similar characteristics distinguish all these Pamirs. They are hemmed in and separated by snow- capped mountain peaks and ridges, which are seamed with glaciers terminating in moraines and shingle slopes at the base of the foot-hills. Long sweeps of grassy upland bestrewn with boulders lead from the stream beds up to the snowfields, yellow, grey or vivid green, according to the season and the measure of sunlight, fold upon fold in interminable succession, their bleak monotony being only relieved by the grace of flowers for a short space durlng.the summer months.

To the east of the Sarikol chain is the Taghdumbash Pamir, which claims many of the characteristics of the western Pamirs at its upper or western extremity, where the Karachukar, which drains it, is a comparatively small stream. But where the Karachukar, joining forces with the Khunjerab, stretches out northwards for a comparatively straight run to Tashkurghan, dividing asunder the two parallel ranges of Sarikol and Kandar, which together form the Sarikol chain, the appellation Pamir can hardly be maintained. This is the richest portion of the Sarikol province. Here are stone-built houses collected in scattered detachments, with a spread of cultivation reaching down to the river. Here are water-mills and many permanent appliances of civilization suited to the lower altitude (11,500 ft., the average height of the upper Pamirs being about 13,000), and here we are no longer near the sources of the river at the foot of the mountain peaks. One other so-called Pamir exists to the east of Sarikol, separated therefrom by the eastern range (the Kandar) of the Sarikol, which is known as Mariom or Mariong. But this Pamir is situated nowhere near the sources of the Zaraf- shan or Raskam river, which it borders, and possesses little in common with the Pamirs of the west. The Mariom

Pamir defines the western extremity of the Kuen Lun, which stretches east- wards for 250 m. before it becomes the political boundary of northern Tibet.

The Muztagh chain, which holds within its grasp the mightiest system of glaciers in the world, forms a junction with the Sarikol at the head of the Taghdumbash, where also another great system (tnaL of the Hindu Kush) has its eastern roots. The ~. political boundary between the extreme north of the M„ z tairb Kashmir dependencies and the extreme south of Chinese chain and Turkestan is carried by the Zarafshan or Raskam river jˆaraJtoram which runs parallel to the Muztagh at its northern foot ˆtension. (iU valley dividing the Muztagh from the Kuen Lun), to a point in about 79° 20′ E., where it is transferred to the watershed of the .Kuen Lun. Within the limits of these partially explored highlands, lying between the Pamirs and the Tibetan table-land, exact geographical definition is impossible. But we may follow Godwm-Austen in accepting the main chain of the Muztagh as merging into the central mountain system of the Tibetan Chang, its axis being defined and divided by the transverse stream of the Shyok at its westward bend, whilst the Karakoram range, in which the Shyok rises, is a subsidiary northern branch. The pass over the Karakoram (18,500 ft.) is the most formidable obstacle on the main trade route between Leh and Kashgar.

The Taghdumbash Pamir occupies a geographical position of some political significance. One important pass (the Beyik, 15,100 ft.) leads from the Russian Pamirs into Sarikol across its TheTash- northern border. A second pass (the Wakhjir, 16,150ft.) ˆ umDa l a ” connects the head of the Wakhan valley of Afghanistan p am tr. with the Sarikol province across its western head, whilst ‘

a third (the Kilik, 15,600 ft.) leads into the head of the Hunza river

and opens a difficult and dangerous route to Gilgit. The Tagh- dumbash is claimed both by China and Kanjut (or Hunza), and there is consequently an open boundary question at this corner of the Pamirs. From Lake Victoria of the Great Pamir the northern boundary of that extended strip of Afghanistan which reaches out to the hf»d „ . of the Taghdumbash from Badakshan north of the Hindu Boundary jˆush is to be traced: westwards, in the Lake Victoria Russia and auent ° t ˆ ie Oxus; an d eastwards, on the Nicolas Afxhan- ran Sˆ> dividing the

Great and Little Pamirs, till it over- feten. ” looks a point on the Aksu (or Murghab) river in about

74 40′ E. Here it diverges southwards to the Sarikol chain, north of Taghdumbash. This eastward extension w&» laid down by the Pamir Boundary Commission of 1895. All the head of the Little Pamir, with the Wakhan valley, is consequently Afghan territory, but no military posts have been established so far. The Alichur, Rang Kul, Kargosh (Kara Kul) and Sarez are Russian Pamirs. The Mariom Pamir is Chinese.

The Wakhan glaciers under the Wakhjir water-parting, Lake Chakmaktin near the sources of the Aksu, and Lake Victoria of the rl , . Great Pamir have all been claimed as indicating the uiaciai true source f the Oxus. But detailed examination of theˆus their hydrographical conditions proves that neither of the ‘ two lakes, Victoria (13,400 ft.) or Chakmaktin (13,020 ft..), can justly be regarded as sources, both of them being derived from the same mighty system of glacial snowfields on the summit of the Nicolas range. Both may be regarded as incidents in the course of glacial streams (incidents which are diminishing in volume day by day), rather than original springs or sources. The same glacial beds of the Nicolas range send down tributary waters tˆ> the Panja or Wakhan river, below its junction with the ice stream from Wakhjir, and thus it becomes impossible to decide whether the glaciers of the Wakhjir or the glaciers of Nicolas should be regarded as effecting the most important contribution to the main stream. There is evidence also that glacial moraine formations from time to time may have largely affected the catchment area of these tribu- tary streams. It would be as rash to assert that from Lake Victoria no waters could ever have issued with an eastward flow as it would be to state that from Chakmaktin none ever flow westwards _ The measure of the veracity of Chinese pilgrims and geographers in the early centuries of our era must not be balanced on such points as these.

There is no evidence that the Pamirs were ever the support of

permanent settlements. The few mud-built buildings which once

Pooulation ex isted at Chakmaktin and at Langar only decide

d Ethno- recent occupation which could hardly have possessed a

\ ” . ” permanent character, and the few shrines and domed

tombs which are scattered here and there about the empty desolation

of the Pamir slopes are all of them of recent construction. The nomadic population which seeks pasturage during the summer months in these dreary altitudes is entirely Kirghiz, arid we may take it for granted that it will soon be entirely Russian. The non-Russian population during the summer of 1895 could not have amounted to more than a few hundred souls — occupying a few encampments in the Little Pamir and in the Tagh- dumbash. The total population of the Russian Pamirs has been reckoned at 250 ” kibitkas,” or 1500 souls. There is no ethno- graphical distinction to be traced between the Kirghiz of the Alichur Pamir and the Kirghiz of the Taghdumbash.

The Kirghiz are Sunni Mahommedans by faith, but amongst them there are curious survivals of an ancient ritual of which the

origin is to be traced to those Nestorian Christian Evidences commun ities of Central Asia which existed in the otthe . t middle ages. A Christian bishopric existed at Yankand r-fZ ., in Marco Polo’s time, and is supposed to have survived Christian {or anot her century (1350). The last Gurkhan of the bymoois. – Kara Khitai Empire in the early part of the 13th century (the legendary Prester John) was a member of a Christian tribe called Naiman, which is one of the four chief tribal divisions mentioned by Ney Elias. The Naiman tribe claim kinship with the Kipchaks. It is curious that the same survival of Christian ceremonial should be found amongst the Sarikoli, a Shiah people of Aryan descent akin to the Tajiks of Badakshan, as may be traced amongst the Kirghiz. Christian symbols have been discovered in the southern towns of Chinese Turkestan by Sven Hedin.

The total area of the Pamir country may be estimated as about 150 m. long by 150 m. broad, of which about one-tenth is grass

pasture land and the rest mountainous. All of it once h p ; f° rme d P art °f the ancient kingdom of Bolor, itself a the Pamirs. surv ; va i f the yet more ancient empire of the Yue-chi, Tokharistan; and across it, in spite of its bleak inhospitality, there have been one or two recognized trade routes from east to west throughout all ages. The most important commercially

was that which passed north-west via Tashkurghan

and Rang Kul, from Chinese Turkestan to the khanates

north of the Oxus; but the route via Tashkurghan and Lake Victoria to Badakshan was also well trodden. The great pilgrim route of Buddhist days was that which connects the ancient Buddhist cities of the Takla

Makan in Chinese Turkestan with Chitral (Kashkar), by the Baroghil Pass across the Hindu Kush. This was but one link in a chain of devout peregrination

Trade Routes.

which stretched from China to India, and which included every intervening Buddhist centre of note which existed in the early centuries of our era.

For six or seven months of the year (November to April) the Pamirs are covered with snow, the lakes are frozen, and the passes nearly impracticable. The mean temperature during c ,. . the month of January recorded by Russian observers otthe at the Murghabi — or Pamirski — post is -13° F. In Pamirs July this rises to 62° F., the elevation of the station being 12,150 ft. During the spring and summer months the prevalence of fierce cutting winds, which are shaped by the conformation of the valleys into blasts as through a funnel, following the strike of the valleys either up or down, makes travelling painful and existence in camp most unpleasant. In the absence of wind the summer atmosphere is often bright and exhilarating, but there is a constant tendency to sudden squalls of wind and rain, which pass as quickly as they gather. The most settled record of the Pamir Boundary Commission of 1895 lasted from the 19th of August to the nth of September, the maximum temperature being recorded at 77 on the 21st of August at Kizil Rabat (12,570 ft.) ; and yet on the 16th of August snow had fallen to the depth of 6 in. and the Beyik Pass was blocked. There were indications that monsoon influences extended as far north at least as the Great Pamir, and a definite analogy was established between the record of barometric pressure on the Pamirs and that of the outer ranges of the Himalaya.

Authorities. — Captain J. Wood, A Journey to the Source of the Oxus (new ed., London, 1872), Report of the Forsyth Mission (Cal- cutta, 1875); Colonel T. E. Gordon, The Roof of the World (London, 1876); Pitman (trans.), Through the Heart of Asia (London, 1889); Earl of Dunmore, The Pamirs (London, 1893) ; Major Cumberland, Sport on the Pamirs (London, 1895); Hon. G. N. Curzon, “The Pamirs and the Source of the Oxus,” R. G. S. Journ., vol. viii.; Report of the Proceedings of the Pamir Boundary Commission (Cal- cutta, 1897). (T. H. H.*)

PAMPA, LA, a territory of the southern pampa region of Argentina, bounded N.’ by Mendoza, San Luis and Cordoba, E. by Buenos Aires, S. by the territory of Rio Negro, from which it is separated by the river

Colorado, and W. by Mendoza. Pop. (1904, official estimate), 52,150. It belongs geographically to the southern part of the great Argentine pampas, from which its name is derived, but in reality only a part of its surface belongs to the plain region. The western and southern part (perhaps the larger) is much broken by hills, swamps and sandy wastes, with occasional stretches of wooded country. The western half is crossed by a broad depression, extending from Mendoza south- east to an intersection with the valley of the Colorado, which ■ was once the outlet of the closed drainage basin occupied by the provinces of Mendoza, San Juan and San Luis. This depression is partially filled with swamps and lakes, into which flow the rivers Atuel and Salado. An obscure continuation of these rivers, called the Chadi-leubu, flows south-east from the great swamps into the large lake of Urrelauquen, about 60 m. north of the Colorado. There are a great number of lakes in La Pampa, especially in the south-east. The eastern half is described as fertile and well adapted for grazing, although the rainfall is very light. Since the closing years of the 19th century there has been a large emigration of stock-raisers and agriculturists into La Pampa, and the territory has become an important producer of cattle and sheep, wheat, Indian corn, linseed, barley and alfalfa. The climate is excessively dry, and the temperature ranges from the severe frosts of winter to an extreme of 104 F. in summer. Strong, constant winds are characteristic of this region. Railways have been extended into the territory from Buenos Aires and Bahia Blanca, the latter being the nearest seaport. There is connexion also with the Transandine railway line on the north. The capital is General Acha (pop. about 2000 in 1905), and the only other places of importance are Santa Rosa de Toay and Victorica, both small, uninteresting ” camp ” villages.

PAMPAS (Span. La Pampa, from a Quichua word signifying a level open space or terrace), an extensive plain of Argentina, extending from the Rio Colorado north to the Gran Chaco, and from the foothills of the Andes east to the Parana and Atlantic coast. 1 It consists of a great calcareo-argillaceous sheet, once

1 There are other pampas in South America, such as the Pampas de Aullagas, in Bolivia, the Pampas del Sacramento between the Huallaga and Ucayali rivers in eastern Peru, and others less well known, but when the word Pampas is used alone the great Argentine plain is meant.

the bed of an ancient sea, covered on the west by shingle and sand, and on the east by deposits of estuaiy silt of irregular thickness brought down from the northern highlands. Its western and northern limits, formed by the foothills and talus slopes of the Andes, and by the south of the great forested depression of the Gran Chaco, cannot be accurately defined, but its area is estimated at 200,000 to 300,000 sq. m. Its greatest breadth is across the south, between the 36th and 37th parallels, and its least in the north, where the eastern ranges of the Andes project deeply into its north-western angle. Its surface is broken in the north-west by the sierras of Tucuman, Catamarca, San Luis and Cordoba, the latter rising from the midst of the plain, and by some small isolated sierras and hills on the south. It has a gradual slope from north-west to south-east, from an elevation above sea-level of 2320 ft. at Mendoza to 20 ft. at Buenos Aires on the La Plata — the distance across (between Mendoza and Buenos Aires) being about 635 m. There are other slight irregularities in its surface, such as the longitudinal depression on the west, the saline, arid depression west of the Cordoba sierras, the Mar de Chiquita depression N.E. of Cordoba, and some smaller areas elsewhere. Apart from these the plain appears perfectly level. The east, which is humid, fertile and grassy, has no natural arboreal growth, except in the vicinity of Cordoba and in the north, where algarrobas and some of the Chaco species are to be found. In the extreme south some species of low, thorny bushes cover considerable areas in the vicinity of the hill-ranges, otherwise the plain is destitute of native trees. Since the arrival of Europeans several species have been introduced successfully, such as the eucalyptus, poplar, par also (Melia Azedarach), peach, willow, ombti (Pircunia) and others.

The distinctive vegetation of the grassy pampas is the tall, coarse-leaved ” pampas grass ” (Gynerium argenteum) whose feathery spikes often reach a height of eight or nine feet. It covers large areas to the exclusion of all other species except the trefoils and herbs that grow between its tussocks. The natural grasses of the pampas are popularly divided into pasta dura (hard pasturage), which includes the large, tussock-forming species, and pasta molle (soft pasturage), the tender undergrowth. Since the advent of Europeans other forage plants have been introduced, the most successful and profitable being alfalfa or lucerne {Medicago sativa), which is widely cultivated both for hay and for green pasturage for the fattening of market stock.

West of this region is a dry, sandy, semi-barren plain, called the ” sterile pampas.” It has large saline areas, brackish streams and lakes, and immense sandy deserts, and in singular contrast to the fertile, treeless region of the east it supports large areas of stunted trees and

thorny bushes. Most prominent in this hardy but unattractive growth is the ” chanar ” (Gurliaca or Gourliaca decorticans) , which is characteristic of the whole area, and led Professor Griesbach to suggest the substitution of ” formacion del chanar ” for ” formacion del monte,” the designation adopted by botanists for this particular region. The chanar is thorny and of low, irregular growth, and furnishes a strong durable wood and a sweet fruit.

The grassy plains are well watered by streams flowing to the Parana, La Plata and coast, though some of these are brackish. There are large saline areas in northern Santa Fe, Santiago del Estero and Cordoba provinces, and throughout the greater part of the pampean plain wells cannot be sunk lower than 18 or 20 ft. without encountering brackish water. On the sterile pampas these conditions are still more common, the drainage southward through the Desaguadero and Salado being charged with saline matter. There are many saline lakes scattered over the pampas, the largest being the Mar de Chiquita, and Lake Porongos in Cordoba, the great swamps and lagoon on the lower Salado in Mendoza, and Lake Bebedero in San Juan.

The fauna of the pampas is limited to comparatively few species, all of which are found beyond its limits, also. These include the vizcacha (Lagoslomus trichodactylus) , Patagonian hare (Dolichotis patagonica), coypu (Myopotamus coypu), cui (Cavia australis), tuco-tuco {Ctenomys magellanica) , jaguar (Felis onca), puma (Felts con-color), grass-cat (resembling FeHs catus), wood-cat (Felis geoffroyi),

a fox-like dog (Felis pajeros, Azara), aguara (akin to Cams jubatus), skunk, weasel (Galictis barbara), deer (Cerviis campestris), four species of armadillo, and two of the opossum. . Hudson considers the burrowing vizcacha, or biscacha, the most characteristic denizen of the pampas, though the large yellow opossum (Didelphys crassi-caudata) seems to be singularly adapted to life on the level grassy plain. The avifauna is apparently richer, owing to migration. Hudson enumerates 18 species of storks, ibises, herons, spoon-bills and flamingoes, 20 species of ducks, geese and swans, 10 or 12 of the rallines, including the graceful ypicaha or dancing bird, and 25 of the Limicolae (13 of which are visitors from North America). Land birds are not numerous. Vultures and hawks are common, and there are a few owls, the best known of which is the ” minera ” (Geositta cunicularia), which inhabits the burrow of the vizcacha. Among other species of land birds, some 40 in number, are the military starling (Stumella), whose red breast makes it a conspicuous object on the pampas, the white-banded mocking-bird, the chakar or ” crested screamer ” (Chauna chavarria), the tinamou, and the rhea, or South

American ostrich. There are two species of the tinamou— the rufous and spotted — which are called partridges and are often hunted with snares by horsemen. The rhea, once very numerous, is now found farther inland than formerly, and is steadily diminishing in number.

Civilized occupation is working many changes in the character and appearance of the pampas. The first change was in the introduction of cattle and horses. Cattle were pastured on the open pampas and were guarded by men called gauchos or mestizos, who became cele- brated for their horsemanship, their hardihood and their lawlessness. Attention was then turned to sheep-breeding, which developed another and better type of plainsmen — the Irish and Scotch shepherds. Then followed the extensive cultivation of cereals, forage crops, &c, which led to the general use of fences, the employ ment of immigrant labourers, largely Italian and Spanish, the building of railways and the growth of ” camp ” towns. The pi’cturesque gaucho is slowly disappearing in the eastern provinces, and the herds and flocks are being driven farther inland. The rural population of the pampas is still sparse and the estancias are very large.

See W. H. Hudson, The Naturalist in La Plata (London, 1895); Charles Darwin, Voyage of the Beagle (London, 1839 and 1889); and Richardo Napp, La republica argentina (Buenos Aires, 1876.; also in German).

PAMPERO, the cold south-west wind which blows over the great plains of southern Argentina. The term is somewhat loosely applied to any strong south-west wind in that region, but more strictly to a rain squall or thunderstorm arising suddenly in the prevailing currents from north and north-east. Pamperos are experienced at Buenos Aires on an average about a dozen times in the year, chiefly during October, November and January.

PAMPHILUS (1st century A.D.), a Greek grammarian, of the school of Aristarchus. He was the author of a comprehensive lexicon, in 95 books, of foreign or obscure words (y\S)TTat. f/roi Ae&w), the idea of which was credited to another grammarian, Zopyrion, himself the compiler of the first four books. The work itself is lost, but an epitome by Diogenianus (2nd century) formed the basis of the lexicon of Hesychius. A similar compila- tion, called Aeiju&p (” meadow “; cf. the Praia of Suetonius) from its varied contents, dealing chiefly with mythological marvels, was probably a supplement to the lexicon, although some scholars identify them. Pamphilus was one of the chief authorities used by Athenaeus in the Deipnosophists. Suidas assigns to another Pamphilus, simply described as ” a philo- sopher,” a number of works, some of which were probably by Pamphilus the

grammarian.

See G. Thilo in Ersch and Gruber's Allgemeine Encyclopddie, M. Schmidt, appendix to his edition of Hesychius, (1862) vol. iv. ; A. Westermann in Pauly's Real-encyclopddie (1848).

PAMPHILUS, an eminent promoter of learning in the early church, is said to have been born, of good family, in Phoenicia (Berytus?) in the latter half of the 3rd century. After studying at Alexandria under Pierius, the disciple of Origen, he was ordained presbyter at Caesarea in Palestine. There he estab- lished a theological school, and warmly encouraged students; he also founded, or at least largely extended, the great library to which Eusebius and Jerome were afterwards so much indebted. He was very zealous in the transcription and distribution of copies of Scripture and of the works of various Christian writers, especially of Origen; the copy of the complete works of the last-named in the library of Caesarea was chiefly in the handwriting

of Pamphilus himself. At the outbreak of the persecution under Maximin, Pamphilus was thrown into prison (a.d. 307) and there, along with his attached friend and pupil Eusebius (sometimes distinguished as Eusebius Pamphili), he composed an Apology for Origen, in five books, to which a sixth was after- wards added by Eusebius. He was put to death in 309 by Firmilian, prefect of Caesarea.

Only the first book of the Apology of Pamphilus is extant, and that but in an imperfect Latin translation by Rufinus. It is printed in Lommatzsch's edition of Origen, vol. xxiv., and in Routh, Rel. sac. 'v. 339 (cf. iii. 487,500, fragments). Photius (Codex 118) gives a short survey of the whole. Jerome mentions Letters to friends, and there may have been other works. Eusebius' memoir of Pamphilus has not survived. See E. Preuschen in Herzog-Hauck's Real- encyhlopadie, and A. Harnack, Altchristl. Litteraturgesch. I. 543.

PAMPHILUS, a Greek painter of the 4th century, of the school of Sicyon. He was an academic artist, noted for accurate drawing, and obtained such a reputation that not only could he charge his pupils great sums, but he was also successful in introducing drawing in Greece as a necessary part of liberal education.

PAMPHLETS. The earliest appearance of the word is in the

Philobiblon (1344) of Richard de Bury, who speaks of ” panfle- tos exiguos ” (ch. viii.). In English we have ” this leud pamflet” {Test, of Love, bk. iii.), Occleve’s “Though that this pamfilet ” (Reg. of Pr. 2060), Lydgate’s ” Whiche is a paunflet” (Minor Poems. 180) and Caxton’s “paunflettis and bookys ” (Book of Eneydos, 1490, Prologue). In all these examples pamphlet is used to indicate the extent of the production, and in contradistinction to book. A short codicil in a will of 1495 is called “this pampelet” (Test. Ebor. iv. 26). In the 17th century the word was used for single plays, poems, newspapers and news letters (Murray’s New English Diet. vii. 410).

Not till the 1 8th century did pamphlet begin to assume its modern meaning of prose controversial tract. ” Pamphlet ” and ” pamphletaire ” are of comparatively recent introduction into French from the English, and generally indicate fugitive criticism of a more severe, not to say libellous, character than with us. The derivation of the word is a subject of contention among etymologists. The supposed origin from the amatory poem of ” Pamphilus,” and a certain Pamphila, an author of the 1 st century, may be dismissed as fanciful. The experts are also undecided as to what is actually understood by a pam- phlet. Some bibliographers apply the term to everything, except periodicals, of quarto size and under, if not more than fifty pages, while others would limit its application to two or three sheets of printed matter which have first appeared in an unbound condition. These are merely physical peculiarities, and include academical dissertations, chap- books and broad- sides, which from thei” special subjects belong to a separate class from the pamphlet proper. As regards its literary character- istics, the chief notes of a pamphlet are brevity and spontaneity. It has a distinct aim, and relates to some matter of current interest, whether personal, religious, political or literary. UsuaDy intended to support a particular line of argument, it may be descriptive, controversial, didactic or satirical. It is not so much a class, as a form of literature, and from its ephe- meral character represents the changeful currents of public opinion more closely than the bulky volume published after the formation of that opinion. The history of pamphlets being the entire record of popular feeling, all that is necessary here is to briefly indicate the chief families of political and religious pamphlets which have exercised marked influence, and more particularly in those countries — England and France— where pamphlets have made so large a figure in influencing thoughts and events. It is difficult to point out much in ancient literature which precisely answers to our modern view of the pamphlet. The libelli famosi of the Romans were simply abusive pasqui- nades. Some of the small treatises of Lucian, the lost Anti-Cato

of Caesar, Seneca's Apocolocyntosis written against Claudius, Julian's Kaicrapes fj avˆbaiov and 'Amox'KOs »} nicovuryoiv, from their general application, just escape the charge oi being mere satires, and may therefore claim to rank as early specimens of the pamphlet.

At the end of the 14th century the Lollard doctrines were widely circulated by means of the tracts and leaflets of Wyclif and his followers. The Ploughman's Prayer and Lanthorne of Light, which appeared about the time of Oldcastlf's martyrdom, were extremely popular, and similar brief vernacular pieces became so common that it was thought necessary in 1418 to enact that persons in authority should search out and apprehend all persons owning English books. The printers of the 15th century produced many controversial tractates, and Caxton and Wynkin de Worde printed in the lesser form. It was in France that the printing-press first began to supply reading for the Common people. During the last twenty years of the 15th century there arose an extensive popular literature of farces, tales in verse and prose, satires, almanacs, &c, extending to a few leaves apiece, and circulated by the itinerant booksellers still known as colporteurs. These folk-books soon spread from France to Italy and Spain, and were introduced into England at the beginning of the 16th century, doubtless from the same quarter, as most of our early chap-books are translations or adaptations from the French. Another form of literature even more transient was the broadside, or single sheet printed on one side only, which appears to have flourished principally in England, but which had been in use from the first invention of printing for papal indulgences, royal proclamations and similar documents. Throughout western Europe, about the middle of the 16th century, the broadside made a consider- able figure in times of political agitation. In England it was chiefly used for ballads, which soon became so extremely popular that during the first ten years of the reign of Eliza- beth the names of no less than forty ballad printers appear in the Stationers' registers.

The humanist movement at the beginning of the 16th century produced the famous Epistolae obscurorum virorum, and the leading spirits of the Reformation period — Erasmus, Hutten, Luther, Melanchthon, Francowitz, Vergerio, Curio and Calvin — found in tracts a ready method of widely circulating their opinions. The course of ecclesiastical events was precipitated in England by the Supplicacyon for the Beggars (1528) of Simon Fish, answered by Sir Thomas More's Supplycacion of Poor Soulys. In the time of Edward VI. brief tracts were largely used as a propagandist instrument in favour of the Reformed religion. The licensing of the press by Mary greatly hindered the production of this kind of literature. From about 1570

there came an unceasing flow of Puritan pamphlets, of which more than forty were reprinted under the title of A parte of a register (London, Waldegrave, 4to). In 1584 was published a tract entitled A briefe and plaine Declaration concerning the desires of all those faithful ministers that have and do seeke for the discipline and reformation of the Church of Englande, believed to have been written by W. Fulke D.D. Against this John Bridges, dean of Sarum, preached at Paul's Cross, and expanded his sermon into what he called A defence of the government established in the church of England (1587), which gave rise to Oh read over D. John Bridges .... Printed at the cost and charges of M. Mar prelate gentleman (1588), which first gave the name to the famous Martin Marprelate tracts, whose titles sufficiently indicate their opposition to priestly orders and episcopacy. Bishop Cooper's Admonition to the People of England (1589) came next, followed on the other side by Hay any worke for Cooper ... by Martin the Metropoli tane, and by others from both parties to the number of about thirty-two. The controversy lasted ten years, and ended in the discomfiture of the Puritans and the seizure of their secret press. The writers on the Marprelate side are generally supposed to have been Penry, Throgmorton, Udal and Fenner, and their opponents Bishop Cooper, John Lilly and Nash.

As early as the middle of the 16th century we find ballads of news ; and in the reigns of Elizabeth and James I. small pamphlets, translated from the German and French, and known as " news- books," were circulated by the so-called " Mercury-women." These were the immediate predecessors of weekly newspapers, and continued to the end of the 17th century. A proclamation

was issued by Charles II., on the 12th of May 1680, " for suppressing the printing and publishing of unlicensed news-books and pamphlets of news."

In the 17th century pamphlets began to contribute more than ever to the formation of public opinion. Nearly one hundred were written by or about the restless John Lilburne, but still more numerous were those of the undaunted Prynne, who him- self published above one hundred and sixty, besides many weighty folios and quartos. Charles I. found energetic suppor- ters in Peter Heylin and Sir Roger L'Estrange, the latter noted for the coarseness of his pen. The most distinguished pamphle teer of the period was John Milton, who began his career in

this direction by five anti-episcopal tracts (1641-1642) during the Smectymnuus quarrel. In 1643 his wife's desertion caused him to publish anonymously Doctrine and discipline of divorce, followed by several others on the same subject. He printed Of Education; to Mr. Samuel Hartlib in 1644, and, unlicensed and unregistered, his famous Areopagitica — a speech for the liberty of unlicensed printing. He defended the trial and execu- tion of the king in Tenure of kings and magistrates (1648). The Eikon Basilike dispute was conducted with more ponderous weapons than the kind we are now discussing. When Monk held supreme power Milton addressed to him The present means of a free commonwealth and Readie and easie way (1660), both pleading for a commonwealth in preference to a monarchy. John Goodwin, the author of Obstructors of Justice (1649), John Phillipps, the nephew of Milton, and Abiezer Coppe were violent and prolific partisan writers, the last-named specially known for his extreme Presbyterian principles. The tract Killing no murder (1657), aimed at Cromwell, and attributed to Colonel Titus or Colonel Sexby, excited more attention than any other political effusion of the time. The history of the Civil War period is told day by day in the well-known collection made by George Thomason the bookseller, now preserved in the British Museum. It includes pamphlets, books, newspapers and MSS. relating to the Civil War, the Commonwealth and Restoration, and numbers 22,255 pieces ranging from 1640 to 1661, and is bound in 2008 volumes. Each article was dated by Thomason at the time of acquisition. William Miller was another bookseller famous for his collection of pamphlets (1600-1710), which were catalogued by Tooker. William Laycock printed a Proposal for raising a fund for buying them up for the nation.

The Catholic controversy during the reign of James II. gave rise to a multitude of books and pamphlets, which have been described by Peck {Catalogue, 1735) and by Jones {Catalogue, Chetham Society, 2 vols., 1859-1865). Politics were naturally the chief feature of the floating literature connected with the Revolution of 1688. The political tracts of Lord Halifax are interesting both in matter and manner. He wrote The character of a trimmer (1688), circulated in MS. as early as 1685. About the middle of the reign Defoe was introduced to William III., and produced the first of his pamphlets on occasional conformity. He issued in 1697 his two defences of standing armies in support of the government, and published sets of tracts on the partition treaty, the union with Scotland, and many other subjects. His Shortest Way with the Dissenters (1702) placed him in the pillory.

Under Queen Anne pamphlets arrived at a remarkable degree of importance. Never before or since has this method of publication been

used by such masters of thought and language. Political writing of any degree of authority was almost entirely confined to pamphlets. If the Whigs were able to command the services of Addison and Steele, the Tories fought with the terrible pen of Swift. Second in power if not in literary ability were Bolingbroke, Somers, Atterbury, Prior and Pulteney. The government viewed with a jealous eye the free use of this powerful instrument, and St John seized upon fourteen book-sellers and publishers in one day for " libels " upon the adminis-tration (see Annals of Queen Anne, Oct. 23, 1711). In 1712 a duty was laid upon newspapers and pamphlets, displeasing all parties, and soon falling into disuse. Bishop Hoadly's

sermon on the kingdom of Christ (17 17), denying that there was any such thing as a visible Church of Christ, occasioned the Bangorian controversy, which produced nearly two hundred pamphlets. Soon after this period party-writing declined from its comparatively high standard and fell into meaner and venal hands. Underˆ George III. Bute took Dr Shebbeare from Newgate in order to employ his pen. The court party received the support of a few able pamphlets, among which may be men- tioned The consideration of the German War against the policy of Pitt, and The prerogative droit de Roy (1764) vindicating the prerogative. We must not forget that although Samuel Johnson was a pensioned scribe he has for an excuse that his political tracts are his worst performances. Edmund Burke, on the other hand, has produced in this form some of his most valued writings. The troubles in America and the union between Ireland and Great Britain are subjects which are abundantly illustrated in pamphlet literature.

Early in the 19th century the rise of the quarterly reviews threw open a new channel of publicity to those who had pre- viously used pamphlets to spread their opinions, and later on the rapid growth of monthly magazines and weekly reviews afforded controversialists a much moie certain and extensive circulation than they could ensure by an isolated publication. Although pamphlets are no longer the sole or most important factor of public opinion, the minor literature of great events is never likely to be entirely confined to periodicals. The following topics, which might be largely increased in number, have each been discussed by a multitude of pamphlets, most of which, however, are likely to have been hopeless aspirants for a more certain means of preservation: the Bullion Question (1810), the Poor Laws (1828-1834), Tracts for the Times and the ensuing controversy (1833-1845), Dr Hampden (1836), the Canadian Revolt (1837-1838), the Corn Laws (1 841-1848), Gorham Contro- versy (1849-1850), Crimean War and Indian Mutiny (1854-1859), Schleswig-Holstein (1 863-1 864), Ireland (1868-1869), the Franco- German War, with

Dame Europa's School and its imitators (1870-1871), Vaticanism, occasioned by Mr Gladstone's Vatican Decrees (1874), the Eastern Question (1877-1880), the Irish Land Laws (1880-1882), Ireland and Home Rule (1885-1886), South African War (1899-1902) and Tariff Reform (1903).

France. — The activity of the French press in putting forth small tracts in favour of the Reformed religion caused the Sor- bonne in 1523 to petition the king to abolish the diabolical art of printing. Even one or two sheets of printed matter were found too cumbersome, and single leaves or placards were issued in such numbers that they were the subject of a special edict on the 28th of September 1553. An ordonnance of February 1566 was specially directed against libellous pamphlets and those who wrote, printed or even possessed them. The rivalry between Francis I. and Charles V. gave rise to many political pamphlets, and under Francis II. the Guises were attacked by similar means. Fr. Hotman directed his Epistre envoiee au tygre de France against the Cardinal de Lorraine. The Valois and Henry III. in particular were severely handled in Les Hermaphro- dites {c. 1605), which was followed by a long series of imitations. Between Francis I. and Charles IX. the general tone of the pamphlet-literature was grave and pedantic. From the latter period to the death of Henry IV. it became more cruel and dangerous.

The Satyre Menipp6e (1594), one of the most perfect models of the pamphlet in the language, did infinite harm to the League. The pamphlets against the Jesuits were many and violent. Pere Richeome defended the order in Chasse du renard Pasquier (1603), the latter person being their vigorous opponent £tienne Pasquier. On the death of the king the country was filled with appeals for revenge against the Jesuits for his murder; the best known of them was the Anti-Coton (161 1), generally attributed to C6sar de Plaix. During the regency of Mary de' Medici the pamphlet changed its severer form to a more facetious type. In spite of the danger of such proceed- ing under the uncompromising ministry of Richelieu, there was no lack of libels upon him, which were even in most instances printed in France. These largely increased during the Fronde, but it was Mazarin who was the subject of more of this literature than any other historical

personage. It has been calculated that from the Parisian press alone there came sufficient Mazarinades to fill 150 quarto volumes each of

400 pages. Eight hundred were published during the siege of Paris (Feb. 8 to March II, 1649). A collection of satirical pieces was entitled Tableau du gouvernement de Richelieu, Mazarin, Fouquet, et Colbert (1693). Pamphlets dealing with the amours of the king and his courtiers were in vogue in the time of Louis XIV., the most caustic of them being the Carte geographique de la cour (1668) of Bussy-Rabutin. lhe presses of Holland and the Low Countries teemed with tracts against Colbert, Le Tellier, Louvois and Pere Lachaise. The first of the ever-memorable Provinciates appeared on the 23rd of January 1656, under the title of Lettre de Louis de Montalte a un provincial de ses amis, and the remaining eighteen came out at regular intervals during the next fifteen months. They excited extraordinary attention throughout Europe. The Jesuit replies were feeble and ineffectual. John Law and the schemes of the bubble period caused much popular raillery. During the long reign of Louis XV. the distinguished names of Voltaire, Rousseau, Montesquieu, Diderot, D'Alembert, D'Holbach, Helvetius and Beaumarchais must be added to the list of writers in this class.

The preliminary struggle between the parliament and the Crown gave rise to hundreds of pamphlets, which grew still more numerous as the Revolution approached Linguet and Mirabeau began their appeals to the people. Camille Desmoulins came into notice as a publicist during the. elections for the states-general ; but perhaps the piece which caused the most sensation was the Qu'est ce que le Tiers Ittat (1789) of the Abbe Sieyes. The Domine salvum fac regem and Pange lingua- (1789) were two royalist brochures of unsavoury memory. The queen was the subject of vile attack and indiscreet defence (see H. d'Almeras, Marie Antoinette et les pamphlets, 1907). The financial disorders of 1790 occasioned the Effets des assignats sur le prix du pain of Dupont de Nemours; Necker was attacked in the Criminelle Neckerologie of Marat; and the Vrai miroir de la noblesse dragged the titled names of France through the mire. The massacre of the Champ de Mars, the death of Mirabeau, and the flight of the king in 1791, the noyades of Lyons and the crime of Charlotte Corday in 1793, and the terrible winter of 1794 have each their respective pamphlet literature, more or less violent in tone. Perhaps the most complete collection of French revolutionary pamphlets is that in the Bibliotheque Nationale; the British Museum possesses a wonderful collection formed by John Wilson Croker. Under the consulate and the empire the only writers of note who ventured to seek this method of appealing to the world were Mme de Stael, B. Constant and Chateaubriand. The royalist reaction in 1816 was the cause of the Petition of Paul Louis Courier, the first of those brilliant pro- ductions of a master of the art. He gained the

distinction of judicial procedure with his Simple Discours in 1821, and published in 1824 his last political work, Le Pamphlet des pamphlets, the most eloquent justification of the pamphlet ever penned. The Memoire a con- suiter of Montlosier attacked the growing power of the Congregation. The year 1827 saw an augmentation of severity in the press laws and the establishment of the censure. The opposition also increased in power and activity, but found its greatest support in the songs of Beranger and the journalism of Mignet, Thiers and Carrel. M. de Comenin was the chief pamphleteer of the reign of Louis Philippe. The events of 1848 gave birth to a number of pamphlets, chiefly pale copies of the more virile writings of the first revolution. Among the few men of power Louis Veuillot was the Pere Duchesne of the Clericals and Victor Hugo the Camille Desmoulins or Marat of the Republicans. After 1852 there was no lack of venal apologies of the coup d'etat. The second empire suffered from many bitter attacks, among which may be mentioned the Lettre sur I'histoire de France (1861) of the Due dAumale, Propos de Labienus (1865) of Rogeard, Dialogue aux enfers (1864) of Maurice Joly and Ferry's Comptes fantastiques d'Haussmann (1868). In more recent times the Panama prosecutions and the Dreyfus case gave occasion to an immense pamphlet literature.

Germany. — In Germany, the cradle of printing, the pamphlet (Flugschrift) was soon a recognized and popular vehicle of thought, and the fierce religious controversies of the Reformation period afforded a unique opportunity for its use. The employ- ment of the pamphlet in this connexion was characteristic of the new age. In coarse and violent language the pamphlets appealed directly to the people, whose sympathy the leaders of the opposing parties were most anxious to secure, and their issue on an enormous scale was undoubtedly one of the most potent influences in rousing the German people against the pope and the Roman Catholic Church. In general their tone was extremely intemperate, and they formed, as one authority has described those of a century later, " a mass of panegyric, admoni- tion, invective, controversy and scurrility." Luther was one of the earliest and most effective writers of the polemical pamphlet. His adherents quickly followed his example, and his opponents also were not slow to avail themselves of a weapon which was

proving itself so powerful. So intense at this time did this pamphlet war become that Erasmus wrote " apud Germanos, vix quicquam vendibile est praeter Lutherana ae anti Lutherana."

A remarkable feature was the coarseness of many of these pamphlets. No sense of decency or propriety restrained their writers in dealing

either with sacred or with secular subjects, and this attracted the notice of the imperial authorities, who were also alarmed by the remarkable growth of disorder, attributable in part at least to the wide circulation of pamphlet literature. Accordingly the issue of libellous pamphlets was forbidden by order of the diet of Nuremberg in 1524, and again by the diets of Spires in 1529, of Augsburg in 1530 and of Regensburg in 1541, while in 1589 the emperor Rudolph II. fulminated against them.

The usual method of selling these pamphlets was by means of hawkers. J. Janssen (History of the German People, Eng. trans., vol. iii.) says these men ” went about in swarms offering pamphlets, caricatures and lampoons for sale; in the larger towns vendors of every description of printed matter jostled each other in the street.”

The controversies of the earlier period of the Thirty Years’ War, when this struggle was German rather than international, produced a second flood of pamphlets, which possessed the same characteristics as the earlier one. In the disturbed years also which preceded the actual outbreak of war attempts were made in pamphlets to justify almost every action, however unjust or dishonourable, while at the same time those who held different opinions were mercilessly and scurrilously attacked. The leading German princes were among the foremost to use pamphlets in this connexion, especially perhaps Maximilian of Bavaria and Christian of Anhalt.

Literature.— An excellent catalogue by W. Oldys of the pam- phlets in the Harleian Library is added to the loth volume of the edition of the Miscellany by T. Park; and in the Biblioteca volante di G. Cinelli (2nd ed., 4 vols. 4to, 1734-1747) may be seen a bibliography of pamphlet-literature, chiefly Italian and Latin, with notes. See also Cat. of the three collections of books, pamphlets, &c. , in the British Museum on the French Rev., 1899; Cat. of the Thomason books, pamphlets &c, 1908, 2 vols. A few of the more representative collections of pamphlets in English may be mentioned. These are. The Phenix (2 vols. 8vo, 1707); Morgan’s Phoenix britannicus (4to, 1732); Bishop Edmund Gibson’s Preservative against Popery (3 vols, folio, 1738, new ed., 18 vols. sm. 8vo, 1848-1849), consisting chiefly of the anti-Catholic discourses of James II. ‘s time; The Harleian Miscellany (8 vols. 4to, 1 744-1 753; new ed. by T. Park, 10 vols. 4to, 1808-1813, containing 600 to 700 pieces illustrative of English history, from the library of Edward Harley, earl of Oxford) ; Collection of scarce and valuable tracts [known as Lord Somers’ Tracts] (16 parts 4to, 1748-1752, 2nd ed. by Sir W. Scott, 13 vols. 4to, 1809-1815), also full of matter for English historyˆ The Pamphleteer (29 vols. 8vo,

1813-1828), containing the best pamphlets of that day; and Arthur Waugh, The Pamphlet Library (4 vols. 8vo, 1 897-1 898), giving examples of political, religious and literary pamphlets from Wyclif to Newman, with historical essays.

For the derivation of the word pamphlet consult Skeat's Etymo- logical Diet.; Pegge's Anonymiana; Notes and Queries, 3rd series, vol. iv. pp. 315, 379, 462, 482, vol. v. pp. 167, 290; 6th series, vol. ii. p. 156; 7th series, vol. vi. pp. 261, 432; Murray's New English Diet. vol. vii. The general history of the subject may be traced in M. Davies, Icon libellorum (1715); W. Oldys, "History of the Origin of Pamphlets," in Morgan's Phoenix Brit, and Nichols's Lit. Anecdotes; Dr Johnson's Introduction to the Harleian Miscellany; D'lsraeli, Amenities of Literature; Revue des deux mondes (April 1, 1846); Irish Quart. Review, vii. 267; Edinburgh Review (Oct. 1855); Quarterly Review (April 1908); The Library, new series, vol i. 298; Ruth's Ancient Ballads and Broadsides (Philobiblon Soc.) ; W. Mas- kell, Martin-Marprelate Controversy (1845); E. Arber, Sketch of Marprelate Controversy (1895) ; W. Pierce, Hist. Introd. to the Mar- prelate Tracts (1908) ; T. Jones, Cat. of collection of tracts for and against Popery — the whole of Peck's lists and his references (Chetham Soc, 1856-1865); Blakey's Hist, of Political Literature; Andrews, Hist, of British Journalism; Larousse, Grand Diet. Universel; Nodier, Sur la liberie de la presse; Leber, De L'etat reel de la presse (1834); Moreau, Bibliographie des mazarinades (1850-1851); Bulletin du Bibliophile Beige (1859-1862); Nisard, Hist, des livres populaires (1854) ; A. Germond de Lavigne, Des Pamphlets de la fin de V empire, &c. 1814-1817, Catalogue (Paris, 1879); Paris, Bibl. nationale, catalogue des Factums, etc., anterieurs d, 1790, by A. Corda, Paris, 1890; A. Maire, Repertoire des theses de doctorates lettres des universiles francaises 1810-1900 (Paris, 1903); and the annual Catalogue des Theses et Ecrits .Academtques (Hachette) 1885-1910. For German academical dissertations see G. Fock, Catalogus disserta- tionum philologicorum classicarum (Leipzig, 1894), and many special catalogues by Klussmann (1889-1903), Kukula (1892-1893), Milkan (for Bonn, 1818-1885), Pretzsch (for Breslau, 1811-1885) and others. For Dutch pamphlets see L. D. Petit, Bibliotheck van nederlandsche Pamfletten (2 vols. 4to, Hague, 1 882-1 884); and W. P. C. Knuttel, Catalogus van de Pamfletten Verzameling berustende in de K. Bibliotheck 1486-1795 (5 parts 4to, Hague, 1889- I 9°5)- ■ For methods of dealing with pamphlets in libraries, see various articles in Library Journal (1880, 1887, 1889, 1894). (H. R. T.)

PAMPHYLIA, in ancient geography, the region in the south of Asia Minor, between Lycia and Cilicia, extending from the Mediterranean to Mt Taurus. It was bounded on the N. by Pisidia and was therefore a country of small extent, having a coast-line of only about 75 m. with a breadth of about 30 m. There can be little doubt that the Pamphylians and Pisidians were the same people, though the former had received colonies from Greece and other lands, and from this cause, combined with the greater fertility of their territory, had become more civilized than their neighbours in the interior. But the distinction between the two seems to have been established at an early period. Herodotus, who does not mention the Pisidians, enumerates the Pamphylians among the nations of Asia Minor, while Ephorus mentions them both, correctly including the one among the nations on the coast, the other among those of the interior. The early Pamphylians, like the Lycians, had an alphabet of their own, partly Greek, partly " Asianic," which a few inscriptions on marble and coins preserve. Under the Roman administration the term Pamphylia was extended so as to include Pisidia and the whole tract up to the frontiers of Phrygia and Lycaonia, and in this wider sense it is employed by Ptolemy.

Pamphylia consists almost entirely of a plain, extending from the slopes of Taurus to the sea, but this plain, though presenting an unbroken level to the eye, does not all consist of alluvial deposits, but is formed in part of travertine. " The rivers pouring out of the caverns at the base of the Lycian and Pisidian ranges of the Taurus come forth from their subterranean courses charged with carbonate of lime, and are continually adding to the Pamphylian plain. They build up natural aqueducts of limestone, and after flowing for a time on these elevated beds burst their walls and take a new course. Consequently it is very difficult to reconcile the accounts of this district, as trans- mitted by ancient authors, with its present aspect and the distribution of the streams which water it. By the sea-side in the west of the district the travertine forms cliffs from 20 to 80 ft. high " (Forbes's Lycia, ii. 188). Strabo describes a river which he terms Catarractes as a large stream falling with a great noise over a lofty cliff. This is the cataract near Adalia. East of Adalia is the Cestrus, and beyond that again the Eurymedon, both of which were considerable streams, navigable in antiquity for some little distance from the sea. Near the mouth of the latter was a lake called Caprias, mentioned by Strabo; but it is now a mere salt marsh.

The chief towns on the coast are: Olbia, the first town in Pamphylia, near the Lycian frontier; Attalia (q.v.); and Side (q.v.). On a hill above

the Eurymedon stood Aspendus (q.v.) and above the river Cestrus was Perga (q.v.). Between the two rivers, but somewhat farther inland, stood Sylleum, a strong fortress, which even ventured to defy the arms of Alexander. These towns are not known to have been Greek colonies; but the foundation of Aspendus was traditionally ascribed to the Argives, and Side was said to be a colony from Cyme in Aeolis. The legend related by Herodotus and Strabo, which ascribed the origin of the Pamphylians to a colony led into their country by Amphilochus and Calchas after the Trojan War, is merely a characteristic myth. The coins of Aspendus, though of Greek character, bear legends in a barbarous dialect; and probably the Pamphylians were of Asiatic origin and mixed race. They became largely hellenized in Roman times, and have left magnificent memorials of their civilization at Perga, Aspendus and Side. The district is now largely peopled with recent settlers from Greece, Crete and the Balkans.

The Pamphylians are first mentioned among the nations subdued by the Mermnad kings of Lydia, and afterwards passed in succession under the dominion of the Persian and Macedonian monarchs. After the defeat of Antiochus III. in 190 B.C. they were included among the provinces annexed by the Romans to the dominions of Eumenes of Pergamum; but somewhat later they joined with the Pisidians and Cilicians in piratical ravages, and Side became the chief centre and slave inart of these freebooters. Pamphylia was for a short time included in

the dominions of Amyntas, king of Galatia, but after his death lapsed into a district of a Roman province, and its name is not again mentioned in history.

See C. Lanckomiski, Les Villes de la Pamphylie el de la Pisidie (1890). (D. G. H.)

PAMPLONA, or Pampeluna, the capital of the Spanish province of Navarre, and an episcopal see; situated 1378 ft. above sea-level, on the left bank of the Arga, a tributary of the Ebro. Pop. (1900), 28,886. Pamplona has a station on the Ebro railway connecting Alsasua with Saragossa. From its position it has always been the principal fortress of Navarre. The old outworks have been partly demolished and replaced by modern forts, while suburbs have grown up round the inner walls and bastions. The citadel, south-west of the city, was constructed by order of Philip II. (1 556-1 598), and was modelled on that of Antwerp. The streets of the city are regular and broad; there are three fine squares or plazas. The most attrac- tive of these is the

arcaded Plaza del Castillo, flanked by the hall of the provincial council and by the theatre. The cathedral is a late Gothic structure begun in 1397 by Charles III. (El Noble) of Navarre, who is buried within its walls; of the older Roman- esque cathedral only a small portion of the cloisters remains. The fine interior is remarkable for the peculiar structure of its apse, and for the choir-stalls carved in English oak by Miguel Ancheta, a native artist (1530). The principal facade is Corinthian, from designs of Ventura Rodriguez (1783). The same architect designed the superb aqueduct by which the city is supplied with water from Monte Francoa, some nine miles off. The beautiful cloisters on the south side of the cathedral, and the chapter-house beyond them, as well as the old churches of San Saturnino (Gothic) and San Nicolas (Romanesque), are also of interest to the student of architecture. There are also the bull-ring, capable of accommodating 8006 spectators, the pelota court (el Trinquete) and several parks or gardens. The city is well provided with schools for both sexes; it has also a large hospital.

Pamplona has a flourishing agricultural trade, besides manu- factures of cloth, linen stuffs, flour, soap, leather, cards, paper, earthenware, iron and nails. The yearly fair in connexion with the feast of San Fermin (July 7), the patron saint of the city, attracts a large concourse from all parts of northern Spain.

Originally a town of the Vascones, Pamplona was rebuilt in 68 B.C. by Pompey the Great, whence the name Pompaelo or Pompelo (Strabo). It was captured by Euric the Goth in 466 and by the Franks under Childebert in 542; it was dismantled by Charlemagne in 778, but repulsed the emir of Saragossa in 907. In the 14th century it was greatly strengthened and beautified by Charles III., who built a citadel on the site now occupied by the Plaza de Toros and by the Basilica de S. Ignacio, the church marking the spot where Ignatius de Loyola received his wound in defending the place against Andre de Foix in 1 52 1. From 1808 it was occupied by the French until taken by Wellington in 1813. In the Carlist War of 1836-40 it was held by the Cristinos, and in 1875-76 it was more than once attacked, but never taken, by the Carlists.

PAN (” pasturer “), in Greek mythology, son of Hermes and one of the daughters of Dryops (” oak-man “), or of Zeus and the nymph Callisto, god of shepherds, flocks and forests. He is not mentioned in Homer or Hesiod. The most poetical account of his birth and life is given in the so-called Homeric hymn To Pan. He was born with horns, a goat’s beard and feet and a tail, his person being completely covered with hair. His mother was so alarmed at his appearance that she fled; but

Hermes took him to Olympus, where he became the favourite of the gods, especially Dionysus. His life and characteristics are typical of the old shepherds and goatherds. He was essentially a rustic god," a wood-spirit conceived in the form of a goat," living in woods and caves, and traversing the tops of the mountains; he protected and gave fertility to flocks; he hunted and fished; and sported and danced with the mountain nymphs. A lover of music, he invented the shepherd's pipe, said to have been made from the reed into which the nymph Syrinx was transformed

when fleeing from his embraces (Ovid, Metam. i. 691 sqq.). With a kind of trumpet formed out of a shell he terrified the Titans in their fight with the Olympian gods. By his unexpected appearance he sometimes inspires men with sudden terror — hence the expression " panic " fear. Like other spirits of the woods and fields, he possesses the power of inspiration and prophecy, in which he is said to have instructed Apollo. As a nature-god he was brought into connexion with Cybele and Dionysus, the latter of whom, he accompanied on his Indian expedition. Associated with Pan is a number of Panisci, male and female forest imps, his wives and children, who send evil dreams and apparitions to terrify mankind. His original home was Arcadia; his cult was introduced into Athens at the time of the battle of Marathon, when he promised his assistance against the Persians if the Athenians in return would worship him. A cave was consecrated to him on the north side of the Acropolis, where he was annually honoured with a sacrifice and a torch- race (Herodotus vi. 105). In later times, by a misinterpretation of his name (or from the identification of the Greek god with the ram-headed Egyptian god Chnum, the creator of the world), he was pantheistically conceived as the universal god (to ttolv). The pine and oak were sacred to him, and his offerings were goats, lambs, cows, new wine, honey and milk. The Romans identified him with Inuus and Faunus.

In art Pan is represented in two different aspects. Sometimes he has goat's feet and horns, curly hair and a long beard, half animal, half man; sometimes he is a handsome youth, with long flowing hair, only characterized by horns just beginning ,to grow, the shepherd's crook and pipe. In bas-reliefs he is often shown presiding over the dances of nymphs, whom he is sometimes pursuing in a state of intoxication. He has furnished some of the attributes of the ordinary conception of the devil. The story (alluded to by Milton, Rabelais, Mrs Browning and

Schiller) of the pilot Thamus, who, sailing near the island of Paxi in the time of Tiberius, was commanded by a mighty voice to proclaim that ” Pan is dead,” is found in Plutarch (De orac. defectu, 17). As this story coincided with the birth (or crucifixion) of Christ it was thought to herald the end of the old world and the beginning of the new. According to Roscher (in Neue Jahrbucher fiir Philologie, 1892) it was of Egyptian origin, the name Thamus being connected with Thmouis, a town in the neighbourhood of Mendes, distinguished for the worship of the ram; according to Herodotus (ii. 46), in Egyptian the goat and Pan were both called Mendes. S. Reinach suggests that the words uttered by the ” voice ” were &anovs, Qa/iovs, Travˆtyas, Tedv-nne (” Tammuz, Tammuz, the all-great, is dead “), and that it was merely the lament for the ” great Tammuz ” or Adonis (see L. R. Farnell in The Year’s Work in Classical Studies,

1907).

See W. Gebhard, Panhultus (Brunswick, 1872); P. Wetzel, De Jove et Pane dis arcadicis (Breslau, 1873); W. Immerwahr, Kulte et Mythen Arkadiens (1891), vol. i., and V. Berard, De I'Origine des cultes arcadiens (1894), who endeavour to show that Pan is a sun- god {a.v, (paiva) ; articles by W. H. Roscher in Lexikon der Mythologie and by J. A. Hild in Daremberg and Saglio's Dictionnaire des Anti- quiles-; E. E. Sikes in Classical Review (1895), ix. 70; O. Gruppe, Griechische Mythologie (1906), vol. ii.

PAN (common in various forms to many Teutonic languages, cf. Ger. Pfanne; it is generally taken to be an early adaptation in a shortened form of Lat. patina, shallow bowl or dish, from patere, to lie open), a term applied to various sorts of open, flat, shallow vessels. Its application has been greatly extended by analogy, e.g. to the upper part of the skull; to variously shaped objects capable of retaining substances, such as that part of the lock in early firearms which held the priming (whence the expression " flash in the pan," for a premature and futile effort); or the circular metal dish in which gold is separated from gravel, earth, &c, by shaking or washing (whence the phrase " to pan out," to obtain a good result). Small ice-floes are also called " pans," and the name is given to a hard substratum of soil which acts as a floor to the surface soil and is usually impervious to water. For " pan " or " pane " in architecture see Half- timber Work.

The Hindostani pan is the betel-leaf, which, mixed with areca-nut, lime, &c, is chewed by the natives of the East Indies.

The common prefix " pan," signifying universal, all-embracing .(Gr. xas, all), is often combined with the names of races, nationalities and religions, conveying an aspiration for the political or spiritual union of all the units of the nation or creed; familiar examples are Pan-Slavonic, Pan-German, Pan-Islamism, Pan-Anglican, Pan-American.

PANA, a city of Christian county, Illinois, U.S.A., in the central part of the state. Pop. (1900) 5530 (727 being foreign- born); (1910) 6055. It is served by the Baltimore & Ohio Southwestern, the Cleveland, Cincinnati, Chicago & St Louis, the Illinois Central and the Chicago & Eastern Illinois railways. It is in the Illinois coal region, and coal-mining is the most important industry; the city is also a shipping point for hay and grain grown in the vicinity. Pana was incorporated in 1857, and was reincorporated in 1877. Its name is said to be a corrupted form of " Pani " (Pawnee), the name of a tribe of Indians.

PANACEA (Gr. vavaKeia, all-healing, from iras, all, and aKuoSai., to

heal), a universal remedy, or cure for all diseases, a term applied in the middle ages to a mythical herb supposed to possess this quality. Many herbs have had the power of curing all diseases attributed to them, and have hence had the name of ” all-heal ” ; such have been, among others, the mistletoe, the woundwort (Stachys palustris), the yarrow or milfoil, and the great valerian.

PANACHE, a French word adapted from Ital. pennachio, Lat. penna, feather, for a plume of feathers on a helmet or hat; the ” panache ” should be properly distinguished from the ” plume,” as being a large cluster of feathers fixed on the top of the helmet and flowing over it, the ” plume ” being a single feather at the side or front. The word ” panache ” is often used figuratively in French of a flamboyant piece of ornamentation, a ” purple patch ” in literature, or any exaggerated form of decoration.

PANAENUS, brother of Pheidias, a Greek painter who worked in conjunction with Polygnotus and Micon at Athens. He also painted the marble sides of the throne of the statue of Zeus erected by his brother at Olympia.

PANAETIUS (c. 185-180 to 110-108 B.C.), Greek Stoic philo- sopher, belonged to a Rhodian family, but was probably educated partly in Pergamum under Crates of Mallus and after- wards in Athens, where he attended the lectures of Diogenes the Babylonian, Critolaus and Carneades. He subsequently went to Rome, where he became the friend of Laelius and of Scipio the Younger. He lived as a guest in the house of the latter, and accompanied him on his mission to Egypt and Asia (143 or 141). He returned with Scipio to Rome, where he did much to intro- duce Stoic doctrines and Greek philosophy. He had a number of distinguished Romans as pupils, amongst them Q. Mucius Scaevola the augur and Q. Aelius Tubero. After the murder of Scipio in 129, he resided by turns in Athens and Rome, but chiefly in Athens, where he succeeded Antipater of Tarsus as head of the Stoic school. The right of citizenship was offered him by the Athenians, but he refused it. His chief pupil in philosophy was Posidonius of Apamea. In his teaching he laid stress on ethics; and his most important works, of which only insignificant fragments are preserved, were on this subject. They are as follow: Hepl tov koJ(H)kovtos (On Duty), in three books, the original of the first two books of Cicero’s De qfficiis; Hepl irpovoias (On Providence), used by Cicero in his De divin- atione (ii.) and probably in part of the second book of the De Deorum natura; a political treatise (perhaps called Hepi TroXiTtK’ijs), used by Cicero in his De republica; Hept evdv/xias (On Cheerfulness); Hepl alpectwv (On Philosophical Schools); a letter to Q. Aelius Tubero, De dolore

patiendo (Cicero, De finibus, iv. 9, 23).

Edition of the fragments by H. N. Fowler (Bonn, 1885), and in F. van Lynden's monograph (Leiden, 1802). See also A. Schmekel, Die Philosophie der mittleren Stoa (1892); F. Susemihl, Geschichte der griechischen Litteratur in der Alexandrinerzeit (1892), ii. 63-80; E. Zeller, " Beitrage zur Kenntniss des Stoikers Panatius " in Commentationes philologae in honor em Th. Mommseni (1877); on the use

made of him by Cicero, R. Hirzel, Untersuchungen tu Ciceros philosophischen Schriften (1877-1883). For his importance in the Stoic succession and his philosophy generally, see Stoics.

PANAMA, a Central American republic, occupying the Isthmus of Panama, and lying approximately between 7 15′ and 9 39′ N. and between 77 15′ and 83 30′ W. It is bounded N. by the Caribbean Sea, E. by Colombia, of which it was formerly a part, S. by the Gulf (or Bay) of Panama, an arm of the Pacific, and W. by Costa Rica. Its area is estimated at from 31,300 to 33,800 sq. m.; its greatest width is 118 m. and its greatest length 430 m.; its land frontier is only about 350 m., but on the Caribbean it has a coast of 478 m. and on the Pacific a coast of 767 m. ■_ f-

Physical Features. — The Isthmus of Panama, coextensive with the republic, is the whole neck of land between the Ameri- can continents; in another use the term " Isthmus of Panama " is applied to the narrow crossing between the cities of Colon and Panama, the other narrow crossings, further east, being the Isthmus of San Bias (31 m.) and the Isthmus of Darien (46 m.). The use of the term " Isthmus of Panama " to include the whole country is becoming more common. The Caribbean coast-line is concave, the Pacific deeply convex. The Mosquito Gulf is to the N.W., the Gulf of Darien to the N.E., and on the N. coast are several bays. Almirante Bay, near the Costa Rican boundary, is 2-13 m. wide, with many islands and good anchorage, protected by Columbus Island, about 8 m. long; immediately east of it, and connected with it, is Chiriqui lagoon (area about320sq.nl.), 32m. long, 1 2 m. wide at the widest point, with a maximum depth of 1 20 ft.,protectedontheseaside by Chiriqui Archipelago ; immediately east of Colon, at the narrowest part of the isthmus, is the Gulf of San Bias, 20 m. long and 10 m. wide, protected by a peninsula and by the Mulatas Archipelago — low, sandy islands stretching about 80 m.

along the coast — and having the excellent harbour of Mandinga in the south-west; still farther east is Caledonia Bay with another good harbour. On the north coast there are about 630 islands with a total area of about 150 sq. m. The Pacific coast is deeply indented by the Gulf of Panama, which is 100 m. wide between Cape Garachine and Cape Malo, and has the Bay of Parita (20 m. wide at its mouth) on its west side, north of Cape Malo, and the Gulf of San Miguel (15 m. wide at its mouth) on its east side, north of Cape Garachine. Darien Harbour, formed by the Tuira and Savannah rivers, is a part of the Gulf of San Miguel and is 11 m. long, 2-4 m. wide, and nearly landlocked. In the Gulf of Panama there are 16 large and about 100 smaller islands (the Pearl Islands), with a total area of 450 sq. m., the largest being Rey cr San Miguel (15 m. long and 7 m. wide), and San Jose (25 sq. m.); both are well wooded. West of the Gulf of Panama and separated from it by Azuero Peninsula is the Gulf of Montijo, 20 m. long and 14 m. wide at its mouth, across which stretches Cebaco Island, 135 m. long and 3 m. wide ; west of Cebaco is Coiba, the largest island of the republic, 21 m. long and 4-12 m. wide.

The country has no lakes; the apparent exceptions are the artifi- cial lakes, Bohio (or Gatun) and Sosa, of the Canal Zone. There are a few swamps, especially on the northern shore. But the drainage is good; about 150 streams empty into the Caribbean and some 325 into the Pacific. In the eastern part are three complicated drainage systems of rivers very largely tidal. The largest is that of the Tuira (formerly called Rio Darien), whose headwaters ar& near the Caribbean and which empties into the Pacific in the Gulf of San Miguel. The Chepo (or Bayano) also is a digitate system with a drainage area reaching from the Caribbean to the Pacific; it is navigable for about 120 m. by small boats. The Chagres flows from a source near the Pacific south-west and then north to the Caribbean ; is a little more than 100 m. long and is navigable for about half that distance; it varies greatly in depth, sometimes rising 35 ft. in 24 hours (at Gamboa), and drains about 1000 sq. m. West of these three rivers are simpler and comparatively unimportant river systems, risir.g near the centre of the isthmus. Orographically the country is remarkable. The ” exceedingly irregularly rounded, low-pointed mountains and hills covered by dense forests ” (Hill) are Antillean, not Andean, and lie at right angles to the axes of the systems of North and South America. The only regular ranges in Panama are in the extreme western part where the Costa Rica divide continues into Panama, and, immediately south of this and parallel \o it, the Cordillera of San Bias, or Sierra de Chiriqui, where the highest peaks are Chiriqui (11,265 ft-) an d, on the Costa Rican

boundary, Pico Blanco (11,740 ft.) and Rovalo (7020 ft.) ; there are two passes, 3600 and 4000 ft. high respectively. On the eastern boundary of the republic is the Serrania del Darien, an Andean range, partly in Colombia. The rough country between contains the following so-called ” Sierras,” which are not really ranges: in Veragua province, Sierra de Veragua, with Santiago (9275 ft.) near the Chiriqui range, and Santa Maria (4600 ft.), immediately north of the city of Santa Fe; in Los Santos province (Azuero Peninsula), bold hills rising 3000 ft., and in Panama province, the much-broken Sierra de Panama, which has a maximum height of 1700 ft. and a minimum, at the Culebra Pass, of 290 ft., the lowest point, except the interoceanic water-parting in Nicaragua, which is 153 ft., in the western continental system. There have been no active volcanoes since the Pliocene Tertiary time, but the country is still subject to dangerous earthquakes. There are a few plains, like that of David, in Chiriqui province, but irregular surface is normal ; and this irregularity is the result of very heavy rains with a consequent extremely developed drainage system cutting river valleys down nearly to the sea-level, and of marine erosion, as may be seen by the bold and rugged islands, notably those in the Gulf of Panama. It is improbable that there has been any connexion by water between the two oceans here since Tertiary time.

Climate. — The mean temperature varies little throughout the republic, being about 80° F. : at Colon, where 68° is a low and 95° a high temperature, the mean is 79-1°; at Panama the mean is 8o-6 . But this difference is not the usual one: normally the Caribbean coast is a degree or two warmer than the Pacific coast. There is a wet and a dry season; in the former, from the middle of April to the middle of December, there falls (in heavy, short rains) about 85% of the total annual precipitation, and south-east winds prevail. The north-east wind prevails in the dry season, which is dusty and bracing. The rainfall at Colon on the north coast varies from 85 to 155 in., with 123 as the mean; at Gamboa in the interior it varies from 75 to 140 in., with 92 as the mean; and at Panama on the south coast it varies between 47 and 90 (rarely 104 in.), the mean being 67 in.

Natural Resources. — Gold is mined to a small extent; the most productive mines are about Darien and in Code province. Copper has been found between the Plain of David and Bocas del Toro. There are valuable deposits of coal near Bocas del Toro and Golfo Dulce. There are important salt mines near Agua Dulce on Parita Bay. Iron is found in several parts of the Isthmus. Mineral springs are common, especially near former volcanoes.

_ There are valuable vegetable dye-stuffs, medicinal plants (espe-

cially sarsaparilla, copaiba and ipecacuanha), cabinet and building timber (mahogany, &c), india-rubber, tropical fruits (especially bananas), and various palms; fish are economically important— the name Panama is said to have meant in an Indian dialect ” rich in fish “—and on the Pacific coast, oysters and pearl ” oysters ” {Meleagrina californica) — the headquarters of the pearl fishery is the city of San Miguel on the largest of the Pearl Islands, and Coiba Island. There is little agriculture, though the soil is rich and fertile; bananas (occupying about one-half the area under cultivation and grown especially in the north-west), coffee (also grown especially on the Costa Rican border in Chiriqui province), cacao (growing wild in Bocas del Toro province), tobacco, and cereals are the largest crops. Stock-raising is favoured by the excellent grazing lands; blooded cattle are imported for breeding.

Soap and chocolate are manufactured in Panama City. Tobacco and salt manufactures are government monopolies. Sugar re- fineries are projected. In the canal zone there are great shops for the manufacture and repair of machinery.

Commerce and Communications. — The principal ports are Colon, Panama 1 and Bocas del Toro, the last being a banana-shipping port. In 1908 the country’s imports were valued at $7,806,811 (vegetable products, $1,879,297; agricultural products, $1,258,900; textiles, $1,187,802; mineral products, $788,069; and wines and liquors, $675,703; the textiles mainly from Great Britain, all other imports largely from the United States) ; and the exports were valued at $1,757,135 (including vegetable products, mostly bananas, $ T > 539. 395. animal products, $135,207, and mineral products, $79,620), of which $1,587,217 was the value of goods shipped to the United States, $113,038 of goods to Great Britain, and $34,495 to Germany. Besides bananas the largest exports are hides, rubber, coco-nuts, limes, native curios and quaqua bark. Transportation along the rivers from point to point on either coast is easy. The Panama railway, the only one in the country, is 47! m. long, and runs between Colon and Panama; it was made possible by the rush of gold-miners across the isthmus in the years immediately after 1 849 ; was financed by the New York house of Howland & Aspinwall — Aspinwall (later Colon) was named in honour of the junior member, William Henry Aspinwall, (1807-1875) — and was completed in February 1855 at an expense of $7,500,000. It was purchased by De Lesseps’s Compagnie Universelle de Canal Interoceaniaue de Panama for $25,500,000: and, with the other holdings of the French company, 68,869 shares (more than 97 % of the total) passed to the

1 Christobal, the port of Colon, and Balboa, the port of Panama, lie within the Canal Zone and are under the jurisdiction of the United States.

United States government. The line of railway is very nearly that of the canal, and the work of the railway engineers was of great value to the French engineers of the canal. There are several telegraphic and telephone systems; a wireless telegraph station at Colon; and telegraphic cables from Colon and Panama which, with a connecting cable across the isthmus, give an ” all-cable ” service to South America, to the United States and to Europe. There are two old wagon roads from Panama City, one, now little used, north to Porto Bello, and the other (called the royal road) 17 m. north-west to Cruces at the head of navigation on the Chagres River. Other roads are mere rough trails.

Inhabitants and Towns. — The population in 1909 was about 361,000. The inhabitants exhibit various degrees of admixture of Indian, negro and Spa nish blood, with an increasing proportion of foreigners. The Indians are most numerous in the western part. The negroes, largely from Jamaica and the other West Indies, came in large numbers to work on the canal. The Spanish was the race that stood for civilization before North American influence became strong. Many Spanish peasants, Italians and Greeks came in to work on the canal, but this is not a permanent population. As elsewhere in Spanish America, there has been German colonization, notably in Code province, where a large tropical estate was established in 1894.

The principal cities in Panama are: Colon (q.v.), at the Caribbean end of the canal; Panama (g.v.), at the Pacific end of the canal, and near it, in the Canal Zone, the cities of Balboa and Ancon; Bocasdel Toro (pop. about 4000), capital of the province of the same name, in the north-western corner of the country, with a large trade in bananas and good fishing in the bay; Porto Bello (pop. about 3000), formerly an important commercial city, in Colon province, on Porto Bello Bay, where Columbus established the colony of Nombre de Dios in 1502 — the present city was founded in 1584, was often captured by the English (notably by Admiral Edward Vernon in 1753), and by buccaneers, and is the terminus of an old paved road to Panama, whence gold was brought to Porto Bello for shipment; Chagres (pop. about 2500) , also in Colon province, formerly an impor- tant port,

and now a fishing place; Agua Dulce, formerly called Trinidad (pop. about 2000), in Code province, on Parita Bay, the centre of the salt industry ; and San Miguel, on an island of the same name in the Gulf of Panama, the principal pearl fishery. The larger inland cities are : “Ciudad de David (pop. about 8000), the capital of Chiriqui, 12 m. from the Pacific, 60 m. east of the Costa Rican boundary, with a trade in cattle; Los Santos (pop. about 7200), the capital of Los Santos province ; Santiago de Veragua (pop. about 7000), 300 ft. above the sea, with various manufactories, gold, silver and copper mines, and mineral springs and baths near the city; Las Tablas (pop. about 6500) and Pese (pop. about 5600) in Los Santos province; Penomene (pop. about 3000), on the river of that name in Code province (of which it is the capital), with a trade in straw hats, tobacco, cacao, coffee, cotton, rubber, cedar and cattle; and in the Canal Zone Gorgona (3000) and Obispo (2500), each with an American colony.

Administration. — By the constitution promulgated on the 13th of February 1904 the government is a highly centralized republic. All male citizens over 21 years of age have the right to vote, except those under judicial interdiction and those judicially inhabilitated by reason of crime. The president, who must be at least 35 years old, is elected by popular vote for four years, is ineligible to succeed himself and appoints cabinet members (secretaries of foreign affairs, government and justice, treasury, interior [” fomento “] and public instruction); five supreme court judges (who decide on the constitutionality of a bill vetoed by the president on constitutional grounds — their action, if favourable to the constitutionality of such a bill, makes the president’s signature mandatory); diplomatic repre- sentatives; and the governors (annually) of the provinces, who are responsible only to him. The president’s salary is $18,000 a year. There is no vice-president, but the National Assembly elects every two years three designados, the first of whom would succeed the president if he should die. The National Assembly is a single chamber, whose deputies (each at least 25 years old) are elected for four years by popular vote on the basis of 1 to every 10,000 inhabitants (or fraction over 5000); it meets biennially; by a two-thirds vote it may pass any bill over the president’s veto — the president has five or ten days, according to the length of the bill, in which to veto any act of the legislature. At the head of the judidary is the Supreme Court already referred to; the superior court and the circuit courts are com- posed of judges appointed for four years by the members of

the Supreme Court. The municipal court justices are appointed by the Supreme Court judges for one year.

The seven provinces, restoring an old administrative division, are : Panama, with most of the territory east of the canal and a little (on the Pacific side) west of the canal ; Colon, on either side of the canal, along the Caribbean; Code, west and south; Los Santos, farther west and south, on the Azuero Peninsula, west of the Gulf; Veraguas, to the north-west, crossing to the Mosquito Gulf; and Chiriqui, farthest west, on the Pacific, and Bocas del Toro on the Caribbean. The provinces are divided into municipal districts (distritos municipales) , each of which has a municipal legislature {consejo municipal), popularly elected for two years, and an alcalde, who is the agent of the governor of the province and is appointed annually. By the treaty of the 18th of November 1908 Panama ceded to the United States the " Canal Zone," a strip of land reaching 5 m. on either side of the canal and including certain inlands in the Gulf of Panama ; from this cession were excluded the cities of Colon and Panama, over which the United States received jurisdiction only as regards sanitation and water-supply.

Education. — The system of public education dates from the independence of Panama only and has not been developed. But primary instruction has been greatly improved; there is a school of arts and trades at the capital, in which there are endowed scholarships for pupils from different provinces; a normal school has been established to train teachers for the Indians; high schools and training schools have been opened; and the government pays the expenses of several students in Europe.

Coinage and Finance. — In June 1904, under the terms of an agreement with the American Secretary of War, Panama adopted the gold standard with the balboa, equivalent to an American gold dollar, as the unit; and promised to keep in a bank in the United States a deposit of American money equal to 15 % of its issue of fractional silver currency, which is limited to four and a half million balboas. This_ agreement put an end to the fluctuations of the paper currency previously used. Currency of Panama is legal tender in the Canal Zone, and that of the United States in the Republic of Panama.

The republic has no debt : it refused to accept responsibility for a part of the Colombian debt ; and it has no standing army. On the 30th of June 1908 the total cash assets of the government were $7,860,697, of which $6,000,000 was invested in New York City real estate, and more than $1 ,500,000 was in deposits in New York. In the six months ending with that date the receipts were $1,259,574 (largely from import and-export duties, and taxes on liquors, tobacco, matches, coffee, opium, salt, steamship companies and money changers), and the cash balance for the six months was $105,307.

History. — The Isthmus of Panama was probably visited by Alonso de Ojeda in 1499. In 1 501 Rodrigo Bastidas coasted along from the Gulf of Venezuela to the present Porto Bello. Colum- bus in 1502 coasted along from Almirante Bay to Porto Bello Bay, where he planted a colony (Nombre de Dios) in November; the Indians destroyed it almost immediately; it was re-estab- lished in 1510, by Diego de Nicuessa, governor of the newly established province of Castilla del Oro, which included what is now Nicaragua, Costa Rica and Panama. In 1510 Martin Fernandez de Enciso, following Alonso de Ojeda to the New World, took the survivors of Ojeda's colony of Nueva Andalucia (near the present Cartagena and east of Panama) and founded on the Tuira river the colony of Santa Maria la Antigua del Darien (commonly called Darien). An insurrection against Enciso in December 15 10 put in command Vasco Nunez de Balboa, who had accompanied Rodrigo cTe Bastidas in the voyage of 1501. In September 15 13 Nunez crossed the isthmus and (on the 25th or 26th) discovered the Pacific. Immediately afterwards he was succeeded by Pedro Arias de Avila, by whom Nueva Andalucia and Castilla del Oro were united in 15 14 under the name of Tierra Firma, and who founded in 15 19 the city of Panama, now the oldest European settlement on the mainland in America. The portage between the two oceans was of great commercial importance, especially in the 16th century, when treasure from Peru (and treasure was the raison d'Ure- of the Spanish settlements in Panama) was carried across the isthmus from Panama City. A Scotch settlement under letters patent from the Scotch Parliament was made by William Paterson (q.v.) in 1698 on the site of the present Porto Escoces (in the north- eastern part of the republic), but in 1700 the Spanish authorities expelled the few settlers still there. Panama was a part of the viceroy alty of New Granada created in 17 18, and in 1819 became a part of the independent nation of Colombia and in 183 1 of New Granada, from which in 1841 Panama and Veragua provinces seceded as the state (short-lived) of the Isthmus of Panama.

The constitution of the Granadine Confederation of 1853 gave the states the right to withdraw, and in 1857 Panama 1 again seceded, soon to return. When Nunez in 1885 disregarded the constitution of 1863, which made the component states severally sovereign, he was strongly opposed by the people of Panama, who had no actual representation in the convention which made the constitution of 1886, an instrument allowing Panama (which it made a department and not

a state) no local government. The large expenditures of the French canal company made the department singularly alluring to corrupt officials of the central government, and Panama suffered severely before the liquidation of the company in 1889. There were risings in 1895 and in 1898-1902, the latter ceasing with American interposition^ The treaty of the United States in 1846 with New Granada, granting transportation facilities on the Isthmus to the United States, then preparing for war with Mexico, and guaranteeing on the part of the United States the sovereignty of New Granada in the Isthmus, has been considered the first step toward the establishment of an American protectorate over the Isthmus. In 1901 by the negotiation of the Hay-Pauncefote Treaty it became possible for the United States alone to build and control an interoceanic canal. The Hay-Herran Treaty of January 1903, providing that the United States take over the Panama Canal was not ratified by the Colombian Congress, possibly because it was hoped that settlement might be delayed until the concession to the company expired, and that then the payment from the United States would come directly to the Colombian government; and the Congress, which had been specially called for the purpose — there was no regular legislative government in Bogota in 1898-1903 — adjourned on the 31st of October. Three days later, on the 3rd of November, the independence of Panama was declared. Commander John F. Hubbard of the United States gunboat " Nashville " at Colon forbade the transportation of Colombian troops across the Isthmus, and landed 42 marines to prevent the occupation of Colon by the Colombian force; the diplomatic excuse for his action was that by the treaty of 1846 the United States had promised to keep the Isthmus open, and that a civil war would have closed it. On the 7th of November Panama was virtually recognized by the United States, when her diplomatic representa- tive was received; and on the 18th of November a treaty was signed between the United States and Panama, ceding to the United States the " Canal Zone," for which and for the canal concession the United States promised to pay $10,000,000 immediately and $250,000 annually as rental, the first payment to be made nine years after the ratification of the treaty. On the 4th of January 1904, two months after the declaration of independence, a constitutional assembly was elected, which met on the rsth of January, adopted the constitution described above, and chose as president Manuel Amador Guerrero (1834- 1909). He was succeeded in October 1908 by Domingo de Obaldia. In 1905 a treaty was made with Costa Rica for the demarcation of the boundary line between the two countries.

See Henri Pensa, La Republique et le Canal de Panama (Paris, 1906),

devoted mainly to the question of international law; Valdes, Geografia del istmo de Panama (New York, 1905) ; R. T. Hill, ” The Geological History of the Isthmus of Panama and Portions of Porto Rico ” (1898), vol. 28, pp. 151-285, of the Bulletin of the Museum of Comparative Zoology of Harvard College; E. J. Cattell (ed.), Panama (Philadelphia, 1905), being pt. i, § 27 of the Foreign Commer- cial Guide of the Philadelphia Commercial Museum ; and the publica- tions on Panama of the International Bureau of American Republics.

PANAMA, the capital and the chief Pacific port of the republic of Panama, and the capital of the province of the same name, in the south-central part of the country, at the head of the Gulf of Panama, and at the south terminus of the Panama railway, 475 m. from Colon, and of the Panama Canal. Pop. (1910), about 30,000, of whom nearly one-half were foreign-born or of foreign parentage. Panama is served by regular steamers to San Francisco, Yokohama and other Pacific ports. The city

1 The state of Panama, with boundaries nearly corresponding to those of the present republic, and including the province of Panama and other provinces, was created in 1855 by legislative enactment.

is built on a rocky peninsula jutting out to the east, near the mouth of the Rio Grande and at the foot of Mt Ancon (560 ft.). The harbour is good and is enclosed at the south by several rugged islands, the largest being Perico and Flamenco (belonging to the United States) and Taboga (935 ft.), which is a place of country residence for wealthy citizens. The main streets run north and south and are cut by the Avenida Central; nearly all the streets are narrow and crooked. The principal squares are Cathedral, Santa Ana, Bolivar and Lesseps. The city proper is almost entirely enclosed by the remains of a great granite wall (built in 1673, when the new city was established), on the top of which on the side facing the sea is Las Bovedas promenade. The public buildings include the cathedral (1760), the government palace, the municipal palace, the episcopal palace, the church of Santa Ana, a national theatre, a school of arts and trades, a foreign hospital, the former administration building of the Canal Company, Santo Tomas Hospital, the pesthouse of Punta Mala and various asylums. The houses are mostly of stone, with red tile roofs, two or three storeys high, built in the Spanish style around central patios, or courts, and with balconies projecting far over the narrow streets; in such houses the lowest floor is often rented to a poorer family. There are dwellings above most of the shops. The streets are lighted with electricity; and there are electric street railways and telephones in the city. The water supply and drainage systems were introduced by the United States

govern- ment, which controls the sanitation of the city, but has no other jurisdiction over it. Two miles inland is Ancon, in the Canal Zone, in which are the hospitals of the Isthmian Canal Commission and the largest hotel on the isthmus. The city of Panama was formerly a stronghold of yellow fever and malaria, which American sanitary measures have practically eradicated. Panama has had an important trade: its imports, about twice as valuable as its exports, include cotton goods, haberdashery, coal, flour, silk goods and rice; the most valuable exports are gold, india-rubber, mother of pearl and coccTboIo wood. As Balboa (3 m. west of the city, connected with it by railway, and formerly called La Boca), the port of Panama and the actual terminus of the canal, is in the Canal Zone and is a port under the jurisdiction of the United States, the commercial future of Panama is dependent upon American tariffs and the degree to which Panama and Balboa may be identified. At Balboa there are three wharves, one 985 ft. long and another 1000 ft. long, but their capacity is so insufficient that lighterage is still necessary. In the city there is one small dock which can be used only at full tide. Small vessels may coal at Naos, an island in the Gulf of Panama, which is owned by the United States. Soap and chocolate are manufactured. Founded in T519 by Pedro Arias de Avila, Panama is the oldest European town on the mainland of America. In the 16th century the city was the strongest Spanish fortress in the New World, excepting Cartagena, and gold and silver were brought hither by ship from Peru and were carried across the Isthmus to Chagres, but as Spain's fleets even in the Pacific were more and more often attacked in the 17th century, Panama became less important, though it was still the chief Spanish port on the Pacific. In 1671 the city was destroyed by Henry Morgan, the buccaneer; it was rebuilt in 1673 by Alfonzo Mercado de Villacorta about five miles west of the old site and nearer the roadstead. The city has often been visited by earth- quakes. In the city in June 1826 the Panama Congress met (see Pan-American Conferences).

PANAMA CANAL. When he crossed the Atlantic, the object Columbus had in view was to find a western passage from Europe to Cathay. It was with the greatest reluctance, and only after a generation of unremitting toil that the explorers who succeeded him became convinced that the American continent was continuous, and formed a barrier of enormous extent to the passage of vessels. The question of cutting a canal through this barrier at some suitable point was immediately raised. In 1550 the Portuguese navigator Antonio Galvao published a book to demonstrate that a canal could be cut at Tehuantepec,

Nicaragua, Panama or Darien, and in 1551 the Spanish historian F. L. de Gomara submitted a memorial to Philip II. urging in forcible language that the work be undertaken without delay. But the project was opposed by the Spanish Government, who had now concluded that a monopoly of communication with their possessions in the New World was of more importance than a passage by sea to Cathay. It even discouraged the improve- ment of the communications by land. To seek or make known any better route than the one from Porto Bello to Panama was forbidden under penalty of death. For more than two centuries no serious steps were taken towards the construction of the canal, if exception be made of William Paterson's disas- trous Darien scheme in 1698. In 1771 the Spanish government, having changed its policy, ordered a survey for a canal at Tehuantepec, and finding that line impracticable, ordered surveys in 1779 at Nicaragua, but political disturbances in Europe soon prevented further action. In 1808 the isthmus was examined by Alexander von Humboldt, who pointed out the lines which he considered worthy of study. After the Central American republics acquired their independence in 1823, there was a decided increase of interest in the canal question. In 1825 the Republic of the Centre, having received applica- tions for concessions from citizens of Great Britain, and also from citizens of the United States, made overtures to the United States for aid in constructing a canal, but they resulted in nothing. In 1830 a concession was granted to a Dutch corporation under the special patronage of the king of the Netherlands to construct a canal through Nicaragua, but the revolution and the separ- ation of Belgium from Holland followed, and the scheme fell through. Subsequently numerous concessions were granted to citizens of the United States, France and Belgium, both for the Nicaragua and the Panama lines, but with the exception of the concession of 1878 for Panama and that of 1887 for Nicaragua, no work of construction was done under any of them.

Knowledge of the topography of the isthmus was extremely vague until the great increase of travel due to the discovery of gold in California in 1848 rendered improved communications a necessity. A railroad at Panama and a canal at Nicaragua were both projected. Instrumental surveys for the former in 1849, and for the latter in 1850, were made by American engineers, and, with some small exceptions, were the first accurate surveys made up to that time. The work done resulted in geographical knowledge sufficient to eliminate from considera- tion all but the following routes: (1) Nicaragua; (2) Panama; (3) San Bias; (4) Caledonia Bay; (5) Darien; (6) Atrato river,

of which last there were four variants, the Tuyra, the Truando, the Napipi and the Bojaya. In 1866, in response to an inquiry from Congress, Admiral Charles H. Davis, U.S. Navy, reported that " there does not exist in the libraries of the world the means of determining even approximately the most practicable route for a ship canal across the American isthmus." To clear up the subject, the United States government sent out, between 1870 and 1875, a series of expeditions under officers of the navy, by whom all of the above routes were examined. The result was to show that the only lines by which a tunnel could be avoided were the Panama and the Nicaragua lines; and in 1876 a United States Commission reported that the Nicaragua route possessed greater advantages and offered fewer difficulties than any other. At Panama the isthmus is narrower than at any other point except San Bias, its width in a straight line being only 35 m. and the height of the continental divide is only 300 ft., which is higher than the Nicaragua summit, but less than half the height on any other route. At Nicaragua the distance is greater, being about 156 m. in a straight line, but more than one third is covered by Lake Nicaragua, a sheet of fresh water with an area of about 3000 sq. m. and a maximum depth of over 200 ft., the surface being about 105 ft. above sea-level. Lake Nicaragua is connected with the Atlantic by a navigable river, the San Juan, and is separated from the Pacific by the continental divide, which is about 160 ft. above sea-level. At Nicaragua only a canal with locks is feasible, but at Panama a sea-level canal is a physical possibility.

By the Clayton-Bulwer Treaty of 1850 with Great Britain, by the treaty of 1846 with New Granada (Colombia), Article XXXV., and by the treaty of 1867 with Nicaragua, Article XV., the United States guaranteed that the projected canal, whether the Panama or the Nicaraguan, should be neutral, and, furthermore, that it be used and enjoyed upon equal terms by the citizens of both countries in each case. A modification of the Clayton-Bulwer Treaty being necessary to enable the United States to build the canal, a treaty making such modifica- tions, but preserving the principle of neutrality, known as the Hay-Pauncefote Treaty, was negotiated with Great Britain in 1900; it was amended by the United States Senate, and the amendments not proving acceptable to Great Britain, the treaty lapsed in March 1901. A new treaty, however, was negotiated in the autumn, and accepted in December by the U.S. Senate.

The completion of the Suez Canal in 1869, and its subsequent success as a commercial enterprise, drew, attention more forcibly than ever to the American isthmus. In 1876 an association entitled " Societe Civile Internationale du Canal Interoceanique " was organized in Paris to

make surveys and explorations for a ship canal. An expedition under the direction of Lieut. L. N. B. Wyse, an officer of the French navy, was sent to the isthmus to examine the Panama line. In May 1878 Lieut. Wyse, in the name of the association, obtained a concession from the Colombian government, commonly known as the Wyse Concession. This is the concession under which work upon the Panama Canal has been prosecuted. Its first holders did" no work of construction.

In May 1879 an International Congress composed of 135 delegates from various nations — some from Great Britain, United States and Germany, but the majority pjrst from France — was convened in Paris under the Panama auspices of Ferdinand de Lesseps, to consider the Company. best situation for, and the plan of, a canal. After a session of two weeks the Congress decided that the canal should be at the sea-level, and at Panama. Immediately after the adjournment of the Congress the Panama Canal Company was organized under a general law of France, with Lesseps as presi- dent, and it purchased the Wyse Concession at the price of 10,000,000 francs. An attempt to float this company in August 1879 failed, but a second attempt, made in December 1880, was fully successful, 6,000,000 shares of 500 francs each being sold. The next two years were demoted to surveys and examinations and preliminary work upon the canal. The plan adopted was for a sea-level canal having a depth of 29J ft. and bottom width of 72 ft., involving excavation estimated at 157,000,000, cub. yds. The cost was estimated by Lesseps in 1880 at 658,000,000 francs, and the time required at eight years. The terminus on the Atlantic side was fixed by the anchorage at Colon, and that on the Pacific side by the anchorage at Panama. Leaving Colon, the canal was to pass through low ground by a direct line for a distance of 6 m. to Gatun, where it intersected the valley of the Chagres river; pass up that valley for a distance of 21 m. to Obispo, where it left the Chagres and ascended the valley of a tributary, the Cumacho; cut through the watershed at Culebra, and thence descend by the valley of the Rio Grande to Panama Bay. Its total length from deep water in the Atlantic to deep water in the Pacific was about 47 m. It was laid out in such a way as to give easy curvature everywhere; the sharpest curve, of which there was but one, had a radius of 6200 ft., four others had a radius of 8200 ft., and all others had a radius of 9800 ft. or more. To secure this it was necessary to select a point for crossing the watershed where the height was somewhat greater than that of the lowest pass. The line was essentially the same as that followed by the Panama railroad, the concession for which granted a monopoly of that route; the Wyse Concession, therefore, was applicable only upon condition that the

canal company could come to an amicable agreement with the railroad company.

The principal difficulties to be encountered in carrying out this plan consisted in the enormous dimensions of the cut to be made at Culebra, and in the control of the Chagres river, the valley of which

is occupied by the canal for a large part of its length. This stream is of torrential character, its discharge varying from a minimum of about 350 cub. ft. to a maximum of over 100,000 cub. ft. per second. It rose at Gamboa on the 1st of December 1890, i8f ft. in twelve hours, its volume increasing from 15,600 cub. ft. to 57,800 cub. ft. per second at the same time; and similar violent changes are not un- common. To admit a stream of this character to the canal would be an intolerable nuisance to navigation unless space could be pro- vided for its waters to spread out. For a canal with locks the remedy is simple, but for a sea-level canal the problem is much more difficult, and no satisfactory solution of the question was ever reached under the Lesseps plan.

Work under this plan continued until the latter part of 1887, the management being characterized by a degree of extravagance and corruption rarely if ever equalled in the history of the world. By that time it had become evident that the canal could not be com- pleted at the sea-level with the resources of time and money then available. The plan was accordingly changed to one including locks, and work was pushed on with vigour until 1889, when the company, becoming bankrupt, was dissolved by a judgment of the Tribunal Civil de la Seine, dated the 4th of February 1889, a liqui- dator being appointed by the court to take charge of its affairs. One of the more important duties assigned to this official was to keep the property together and the concession alive, with a view to the formation of a new company for the completion of the canal. He gradually reduced the number of men employed, and finally suspended the works on the 15th of May 1889. He then proceeded to satisfy himself that the canal project was feasible, a question about which the failure of the company had caused grave doubts, and to this end caused an inquiry to be held by a commission of French and foreign engineers. This commission reported on the 9th of May 1890 that a canal with locks, for which they submitted a plan, could be built in eight years at a cost of 580,000,000 francs for the works, which sum should be increased to 900,000,000 francs to include administration and financing. They

reported that the plant in hand was in good condition and would probably suffice for finishing the canal, and they estimated the value of the work done and of the plant in hand at 450,000,000 francs.

The time within which the canal was to be completed under the Wyse Concession having nearly expired, the liquidator sought and obtained from the Colombian government an extension of ten years. Twice subsequently the time was extended by the Colombian government, the date ultimately fixed for the completion of the canal being the 31st of October 1910. For each of these extensions the Colombian government exacted heavy subsidies.

The liquidator finally secured the organization of a new company on the 20th of October 1894. The old company and the liquidator had raised by the sale of stock and bonds the sum of 1,271,682,637 francs. The securities issued to raise this money had a par value of 2,245,151,200 francs, held by about 200,000 persons. In all about 72,000,000 cub. yds. had been excavated, and an enormous quantity of machinery and other plant had been purchased and transported to the isthmus at an estimated cost of 150,000,000 francs. Nearly all of the stock of the Panama railroad — 68,534 of the 70,000 shares existing — also had been purchased, at a cost of 93,268,186 francs.

The new company was regularly organized under French law, and was recognized by the Colombian government. It Second was technically a private corporation, but the great Panama number of persons interested in the securities of the Company. ˆ company, and the special legislation of the French Chambers, gave it a semi-national character. By the law of the 8th of June 1888, all machinery and tools used in the work must be of French manufacture, and raw material must be of French origin. Its capital stock consisted of 650,000 shares of 100 francs each, of which 50,000 shares belonged to Colombia. It succeeded to all the rights of the old company in the concessions, works, lands, buildings, plant, maps, drawings, &c, and shares of the Panama railroad. For the contingency that the canal should not be completed, special conditions were made as to the Panama railroad shares. These were to revert to the liquidator, but the company had the privilege of purchasing them for 20,000,000 francs in cash and half the net annual profits of the road. The Panama railroad retained its separate organization as an American corporation.

Immediately after its organization in 1894 the new company took possession of the property (except the Panama railroad shares, which were held in trust for its benefit), and proceeded to make a new study of the entire subject of the canal in its engineering and commercial

aspects. It resumed the work of excavation, with

a moderate number of men sufficient to comply with the terms of the concession, in a part of the line — the Emperador and Culebra cuts — where such excavation must contribute to the enterprise if completed under any plan. By the middle of 1895, about 2000 men had been collected, and since that time the work progressed continuously, the number of workmen varying between 1900 and 3600. The amount of material excavated to the end of 1899 was about 5,000,000 cubic yards. The amount expended to the 30th of June 1899 was about 35,000,000 francs, besides about 6,500,000 francs advanced to the Panama Railroad Company for building a pier at La Boca.

The charter provided for the appointment by the company and the liquidator of a special engineering commission of five members, to report upon the work done and the conclusions to be drawn therefrom, this report to be rendered when the amounts expended by the new company should have reached about one-half its capital. The report was to be made public, and a special meeting of the stockholders was then to be held to determine whether or not the canal should be completed, and to provide ways and means. The time for this report and special meeting arrived in 1898. In the meanwhile the company had called to its aid a technical com- mittee composed of fourteen engineers, European and American, some of them among the most eminent in their profession. After a study of all the data available, and of such additional surveys and examinations as it considered should be made, this committee rendered an elaborate report dated the 16th of November 1898. This report was referred to the statutory commission of five, who reported in 1899 that the canal could be built according to that project within the limits of time and money estimated. The special meeting of stockholders was called immediately after the regular annual meeting of the 30th of December 1899. It is understood that the liquidator (who held about one-fourth the stock) refused to take part in it, and that no conclusions were reached as to the expediency of completing the canal or as to providing ways and means. The engineering questions had been solved to the satis- faction of the company, but the financial questions had been made extremely difficult, if not insoluble, by the appearance of the United States government in the field as a probable builder of an isthmian canal. The company continued to conduct its operations in a provisional way, without appealing to the public for capital.

The plan adopted by the company involved two levels above the sea-level — one of them an artificial lake to be created by a dam at Bohio, to be reached from the Atlantic by a flight of two locks, and the other,

the summit-level, to be reached by another flight of two locks from the preceding. The summit-level was to have its surface at high water 102 ft. above the sea, and to be supplied with water by a feeder leading from an artificial reservoir to be con- structed at Alajuela in the upper Chagres valley; the ascent on the Pacific side to be likewise by four locks. The canal was to have a depth of 29J ft. and a bottom width of about 98 ft., with an increased width in certain specified parts. Its general plan was the same as that adopted by the old company. The locks were to be double, or twin locks, the chambers to have a serviceable length in the clear of 738 ft., with a width of 82 ft. and a depth of 32 ft. 10 in., with lifts varying from 20 to 33 ft., according to situation and stage of water. The time required to build the canal was estimated at ten years, and its cost at 525,000,000 francs for the works, not including administration and financing.

The occupation of the Panama route by Europeans, and the prospect of a canal there under foreign control, was not a pleasing spectacle to the people of the United Nicaragua States. The favour with which the Nicaragua Scheme. route had been considered since 1876 began to assume a partisan character, and the movement to construct a canal on that line to assume a practical shape. In 1884 a treaty, known as the Frelinghuysen-Zarala Treaty, was negoti- ated with Nicaragua, by the terms of which the United States Government was to build the canal without cost to Nicaragua, and after completion it was to be owned and managed jointly by the two governments. The treaty was submitted to the United States Senate, and in the vote for ratification, on the 29th of January 1885, received thirty-two votes in its favour against twenty-three. The necessary two-thirds vote not having been obtained, the treaty was not ratified, and a change of administration occurring soon afterwards, it was withdrawn from further consideration. This failure led to the formation in New York by private citizens in 1886 of the Nicaragua Canal Association,for the purpose of obtaining the necessary concessions, making surveys, laying out the route, and organizing such corporations as should be required to construct the canal.. They obtained a concession from Nicaragua in April 1887, and: one from Costa Rica in August 1888, and sent parties to survey the canal. An act for the incorporation of an association to

be known as the Maritime Canal Company of Nicaragua passed Congress and was approved on the 20th of February 1889, and on the 4th of May 1889 the company was organized. It took over the

concessions and, acting through a construction company, began work upon the canal in June 1889. Operations upon a moderate scale and mainly of a preliminary character were continued until 1893, when the financial disturbances of that period drove the construction company into bankruptcy and compelled a suspension of the work. It has not since been resumed. At that time the canal had been excavated to a depth of 17 ft. and a width of 280 ft. for a distance of about 3000 ft. inland from Grey town; the canal line had been cleared of timber for a distance of about 20 m.; a railroad had been constructed for a distance of about n m. inland from Grey town; a pier had been built for the improvement of Greytown harbour and other works undertaken. In all, about $4,500,000 had been expended.

Congress continued to take an interest in the enterprise, and in 1895 provided for a board of engineers to inquire into the possibility, permanence, and cost of the canal as projected by the Maritime Canal Company. The report of this board, dated April 1895, severely criticized the plans and estimates of the company, and led to the appointment in 1897 of another board, to make additional surveys and examinations, and to prepare new plans and estimates. The second board recommended some radical changes in the plans, and especially in the estimates, but its report was not completed when the revival of the Panama scheme attracted the attention of Congress, and led to the creation in 1899 of the Isthmian Canal Commission. In the meanwhile the property of the Maritime Canal Company has become nearly worthless through decay, and its concession has been declared forfeited by the Nicaraguan government.

The interest of the United States in an isthmian canal was not essentially different from that of other maritime nations Isthmian down to about the middle of the 19th century, but Canal Com- it assumed great strength when California was mission, acquired, and it has steadily grown as the impor- tance of the Pacific States has developed. In 1848 and again in 1884, treaties were negotiated with Nicaragua authoriz- ing the United States to build the canal, but in neither case was the treaty ratified. The Spanish War of 1898 gave a tremendous impetus to popular interest in the matter, and it seemed an article of the national faith that the canal must be built, and, furthermore, that it must be under American control. To the American people the canal appears to be not merely a business enterprise from which a direct revenue is to be obtained, but rather a means of unifying and strengthening their national political interests, and of developing their industries, particularly in the Pacific States; in short, a means essential to their national growth. The Isthmian Canal Commission created by Congress in 1899 to examine all practicable

routes, and to report which was the most practicable and most feasible for a canal under the control, management and ownership of the United States, reported that there was no route which did not present greater disadvantages than those of Panama and Nicaragua. It recommended that the canal at Panama have a depth of 35 ft. and a bottom width 150 ft., the locks to be double, the lock chambers to have a length 740 ft., width 84 ft. and depth 35 ft. in the clear. The cost of a canal with these dimensions, built essentially upon the French plans, was estimated at $156,378,258. A plan, however, was recommended in which the height of the Bohio dam was increased about 20 ft., the level of Lake Bohio raised by that amount, the lake made the summit-level, and the Alajuela dam omitted. The cost upon this plan was estimated at $143,971,127.

According to the plan recommended by the Commission for Nicaragua the line began at Greytown on the Caribbean Sea, where an artificial harbour was to be constructed and follow the valley of the San Juan for 100 m. to Lake Nicara- gua; thence across the lake about 70 m. to the mouth of Las Lajas river; then up the valley of that stream through the .watershed, and down the valley of the Rio Grande, 17 m. to

Brito on the Pacific, where also an artificial harbour was to be constructed. The distance from ocean to ocean is 187 m. About midway between the lake and the Caribbean the San Juan receives its most important affluent, the San Carlos, and undergoes a radical change in character. Above the junction it is a clear water stream, capable of improvement by locks and dams. Below, it is choked with sand, and not available for slack-water navigation. A dam across the San Juan above the mouth of the San Carlos was to maintain the water of the river above that point on a level with the lake. The line of the canal occupied essentially the bed of the river from the lake to the dam; from the dam to the Caribbean it followed the left bank of the river, keeping at a safe distance from it, and occasion- ally cutting through a high projecting ridge. The lake and the river above the dam constitute the summit-level, which would have varied in height at different seasons from 104 to no ft. above mean sea-level. It would have been reached from the Caribbean side by five locks, the first having a lift of 36% ft., and the others a uniform lift of i8| ft. each, making a total lift of noj ft. from low tide in the Caribbean to high tide in the lake. From the Pacific side the summit would have been reached by four locks having a uniform lift of 285 ft. each, or a total lift of 114 ft. from low tide in the Pacific to high tide in the lake. The time required to build the canal was estimated at ten years, and its cost at $200,540,000.

The report of the commission, transmitted to Congress at the end of 1900, ended thus: —

The Panama Canal, after completion, would be shorter, have fewer locks and less curvature than the Nicaragua Canal. The measure of these advantages is the time required for a vessel to pass through, which is estimated for an average ship at 12 hours for Panama and 33 hours for Nicaragua. On the other hand, the distance from San Francisco to New York is 377 m., to New Orleans 579 m. and to Liverpool 386 m. greater via Panama than via Nicaragua. The time required to pass over these dis- tances being greater than the difference in the time of transit through the canals, the Nicaragua line, after completion, would be somewhat the more advantageous of the two to the United States, notwithstanding the greater cost of maintaining the longer canal.

The government of Colombia, in which lies the Panama Canal, has granted an exclusive concession, which still has many years to run. It is not free to grant the necessary rights to the United States, except upon condition that an agreement be reached with the New Panama Canal Company. The Commission believes that such agreement is impracticable. So far as can be ascertained, the company is not willing to sell its franchise, but will allow the United_ States to become the owner of part of its stock. The Commission considers such an arrangement inadmissible. The Governments of Nicaragua and Costa Rica, on the other hand, are untrammelled by concessions, and are free to grant to the United States such privileges as may be mutually agreed upon.

In view of all the facts, and particularly in view of all the diffi- culties of obtaining the necessary rights, privileges and franchises on the Panama route, and assuming that Nicaragua and Costa Rica recognize the value of the canal to themselves, and are pre- pared to grant concessions on terms which are reasonable and acceptable to the United States, the Commission is of the opinion that ” the most practicable and feasible route for ” an isthmian canal, to be ” under the control, management and ownership of the United States,” is that known as the Nicaragua route.

This report caused the New Panama Canal Company to view the question of selling its property in a new light, and in the spring of 1901 it obtained permission from the Panama Colombian government to dispose of it to the United Route States. It showed itself, however, somewhat reluc- adopted. tant to name a price to the Canal Commission, and it was not till January 1902 that it definitely offered

to accept $40,000,000. In consequence of this offer, the commission in a supplementary report issued on the 18th of January 1902 reversed the conclusion it had stated in its main report, and advised the adoption of the Panama route, with purchase of the works, &c, of the French company. A few days previous to this report the Hepburn bill authorizing the Nicaragua canal at a cost of $180,000,000, had been carried in the House of Representatives by a large majority, but when it reached the Senate an amendment — the so-called Spooner bill — was moved and finally became law on the 28th of June 1902. This authorized the president to acquire

all the property of the Panama Canal Company, including not less than 68,869 shares of the Panama Railroad Company, for a sum not exceeding $40,000,000, and to obtain from Colombia perpetual control of a strip of land 6 m. wide; while if he failed to come to terms with the company and with Colombia in a reasonable time and on reasonable terms, he was by treaty to obtain from Costa Rica and Nicaragua the terri- tory necessary for the Nicaragua canal.

Negotiations were forthwith opened with Colombia, and ultimately a treaty (the Hay-Herran treaty) was signed in Declaration January 1903. The Colombian Senate, however, of Panama refused ratification, and it seemed as if the Panama independ- scheme would have to be abandoned when the ""*• complexion of affairs was changed by Panama

revolting from Colombia and declaring itself independent in November 1903. Within a month the new republic, by the Hay-Bunau-Varilla treaty, granted the United States the use, occupation and control of a strip of land 10 m. wide for the purposes of the canal. A few days after the ratification of this treaty by the United States Senate in February 1904 — the concession of the French company having been purchased — a commission was appointed to undertake the organization and management of the enterprise, and in June Mr J. F. Wallace was chosen chief engineer. Work was begun without delay, but the commission's methods of administration and control soon proved unsatisfactory, and in April 1905 it was reorganized, three of its members being constituted an executive committee which was to be at Panama continuously. Shortly afterwards, at the end of June, Mr Wallace resigned his position as chief engineer and was succeeded by Mr John F. Stevens.

In connexion with the reorganization of the commission a board of consulting engineers, five being nominated by European Construe-governments, was appointed in June 1905 tp consider Hon the question, which so far had not been settled,

Problems, whether the canal should be made at sea-level, without locks (at least except tidal regulating locks at or near the Pacific terminus), or should rise to some elevation above sea-level, with locks. The board reported in January 1906. The majority (eight members out of thirteen) declared in favour of a sea-level canal as the only plan ” giving reasonable assurance of safe and uninterrupted navigation “; and they considered that such a canal could be constructed in twelve or , thirteen years’ time, that the cost would be less than $250,000,000, and that it would endure for all time. The minority recommended a lock canal, rising to an elevation of 85 ft. above mean sea-level, on the grounds that it would cost about $100,000,000 less than the proposed sea-level canal, that it could be built in much less time, that it would afford a better navigation, that it would be adequate for all its uses for a longer time, and that it could be enlarged if need should arise with greater facility and less cost. The chief engineer, Mr Stevens, also favoured the lock or high-level scheme for the reasons, among others, that it would’provide as safe and a quicker passage for ships, and therefore would be of greater capacity; that it would provide, beyond question, the best solution of the vital problem how safely to care for the flood waters of the Chagres and other streams, that provision was made for enlarging its capacity to almost any extent at very much less expense of time and money than could be provided for by any sea-level plan; that its cost of operation, maintenance and fixed charges would be very much less than those of any sea-level canal; and that the time and cost of its construction would be not more than one-half that of a canal of the sea-level type. These conflicting reports were then submitted to the Isthmian Canal Commission for consideration, with the result that on the 5th of February, it reported, one member only dissenting, in favour of the lock canal recommended by the minority of the board of consulting engineers. Finally this plan was adopted by Congress in June 1906. Later in the same year tenders were invited from contractors who were prepared to undertake the construction of the canal. These were opened in January 1907, but none of them was regarded as entirely satisfactory, and

President Roosevelt decided that it would be best for the govern- ment to continue the work, which was placed under the more immediate control of the U.S.A. Corps of Engineers. At the same time the Isthmian Canal Commission was reorganized, Major G. W. Goethals, of the Corps of Engineers, becoming engineer in chief and chairman, in succession to Mr J. F. Stevens who, after succeeding Mr T. P. Shonts as chairman, himself resigned on the 1st of April.

The following are the leading particulars of the canal, the course of which is shown on the accompanying map. The length from deep water in the Atlantic to deep water in the Pacific will be about 50 m., or, since the distance from deep water to the shore-line is about 4! m. in Limon Bay and about 5 m. at Panama, approximately 40J m. from shore to shore. The summit level, regulated between 82 and 87 ft. above sea-level, will extend for 31J m. from a large earth dam at Gatun to a smaller one at Pedro Miguel, and is to be reached by a flight of 3 locks at the former point. The Gatun dam will be 7200 ft. long along the crest including the spillway, will have a maximum width at its base of 2000 ft., and will be uni- formly 100 ft. wide at its top, which will rise 115 ft. above sea- level. The lake (Lake Gatun) enclosed by these dams will be 1641 sq. m. in area, and will constitute a reservoir for receiving the floods of the Chagres and other rivers as well as for supplying water for lockage. A smaller lake (Lake Miraflores), with a surface elevation of 55 ft. and an area of about 2 sq. m. will extend from a lock at Pedro Miguel to Miraflores, where the valley of the Rio Grande is to be closed by an earth dam on the west and a con- crete dam with spillway on the east, and the canal is to descend to sea-level by a flight of two locks. All the locks are to be in duplicate, each being no ft. wide with a usable length of 1000 ft. divided by a middle gate. The channel leading from deep water in the Caribbean sea to Gatun will be about 7 m. long and 500 ft. broad, increasing to 1000 ft. from a pc5int 4000 ft. north of the locks in order to form a waiting basin for ships. From Gatun locks, 0-6 m. in length, the channel is to be 1000 ft. or more in width for a dis- tance of nearly 16 m. to San Pablo. Thence it narrows first to 800 ft., and then for a short distance to 700 ft., for 3ˆ m. to mile 27 near Juan Grande, and to 500 ft. for 4 J m. from Juan Grande to Obispo (mile 3ii). From this point through the Culebra cut to Pedro Miguel lock, it will be only 300 ft. wide, but will widen again to 500 ft. through Miraflores lake, l| m. long, to Miraflores locks, the total length of which including approaches will be nearly a mile, and will thence maintain the same width for the remaining 8 m. to deep water on the Pacific. The minimum bottom width of the canal will thus be 300 ft., the average being 649 ft., while the minimum depth will be 41 ft.

In 1909 it was estimated that the construction of the canal would be completed by the ist of January 1915, and that the total cost to the United States would not exceed $375,000,000 including $50,000,000 paid to the French Canal Company and the Republic of Panama, $7,382,000 for civil administration, and $20,053,000 for sanitation. The last was one of the most necessary expenditures of all, since without it disease would have greatly retarded the work or perhaps prevented it altogether.

See W. F. Johnson, Four Centuries of the Panama Canal (New York, 1906) ; Report of the Board of Consulting Engineers for the Panama Canal (Washington, 1906) ; Annual Reports of the Isthmian Canal Commission (Washington) ; Vaughan Cornish, The Panama Canal and its Makers (London, 1909).

PAN-AMERICAN CONFERENCES. At intervals delegates from the independent countries of North, Central and South America have met in the interests of peace and for the improve- ment of commercial relations and for the discussion of various other matters of common interest. A movement for some form of union among the Spanish colonies of Central and South America was inaugurated by Simon Bolivar while those colonies were still fighting for independence from Spain, and in 1825 the United States, which in May 1822 had recognized their independence and in December 1823 . had promulgated the Monroe Doctrine, was invited by the governments of Mexico and Colombia to send commissioners to a congress to be held at Panama in the following year. Henry Clay, the secretary of state, hoped the congress might be the means of establishing a league of American republics under the hegemony of the United States, and under his influence President J. Q. Adams accepted the invitation, giving notice however that the com- missioners from the United States would not be authorized to act in any way inconsistent with the neutral attitude of their country toward Spain and her revolting colonies. The principal objects of the Spanish-Americans in calling the congress were, in fact, to form a league of states to resist Spain or any other

European power that might attempt to interfere in America and to consider the expediency of freeing Cuba and Porto Rico from Spanish rule; but in his message to the Senate asking that body to approve his appointment of commissioners Adams declared that his object in appointing them was to manifest a friendly interest in the young republics, give them some advice, promote commercial reciprocity, obtain from the congress satisfactory definitions of the terms ” blockade ” and ” neutral rights ” and encourage religious liberty. In

the Senate the pro- posed mission provoked a spirited attack on the administration. Some senators feared that it might be the means of dragging the United States into entangling alliances; others charged that the President had construed the Monroe Doctrine as a pledge to the southern republics that if the powers of Europe joined Spain against them the United States' would come to their assistance with arms and men; and a few from the slave- holding states wished to have nothing to do with the republics because they proposed to make Cuba and Porto Rico independent and liberate the slaves on those islands. The Senate finally, after a delay of more than ten weeks, confirmed the appointments. There was further delay in the House of Representatives, which was asked to make an appropriation for the mission; one of the commissioners, Richard C. Anderson (1788-1826), died on the way (at Cartagena, July 24), and when the other, John Sergeant (1779-1852), reached Panama the congress, consisting of representatives from Colombia, Guatemala, Mexico and Peru, had met (June 22), concluded and signed a " treaty of union, league and perpetual confederation " and adjourned to meet again at Tacubaya, near the City of Mexico. The governments of Guatemala, Mexico and Peru refused to ratify the treaty and the Panama congress or conference was a failure. The meeting at Tacubaya was never held.

Mexico proposed another conference in 1831, and repeated the proposal. in 1838, 1839 and 1840, but each time without result. In December 1847, while Mexico and the United States were at war, a conference of representatives from Bolivia, Chile, Ecuador, New Granada and Peru met at Lima, gave the other American republics the privilege of joining in its deliberations or becoming parties to its agreements, continued to deliberate until the ist of March 1848, and concluded a treaty of confedera- tion, a treaty of commerce and navigation, a postal treaty and a consular convention; but with the exception of the ratifi- cation of the consular convention by New Granada its work was rejected. Representatives from Peru, Chile and Ecuador met at Santiago in September 1856 and signed the " Continental Treaty " designed to promote the union of the Latin-American republics, but expressing hostility toward the United States as a consequence of the filibustering expeditions of William Walker (1824-1860); it never became effective. In response to an invitation from the government of Peru to each of the Latin-American countries, representatives from Guatemala, Colombia, Venezuela, Ecuador, Peru, Bolivia and Argentina met in a conference at Lima in November 1864 to form a " Union." Colombia was opposed to extending the invitation to the United States lest that country should " embarrass the action of the Congress "; the conference itself accomplished little. In 1877-1878

jurists from Peru, Bolivia, Cuba, Chile, Ecuador, Honduras, Argentina, Venezuela and Costa Rica met at Lima and concluded a treaty of extradition and a treaty on private international law, and Uruguay and Guatemala agreed to adhere to them. War among the South American states prevented the holding of a conference which had been called by the government of Colombia to meet at Panama in September 1881 and of another which had been called by the government of the United States to meet at Washington in November 1882. In 1888-1889 jurists from Argentina, Bolivia, Brazil, Chile, Paraguay, Peru and Uruguay met at Montevideo and concluded treaties on international civil law, international commercial law, international penal law, international law of procedure, literary and artistic property, trade-marks and patents, several of which were subsequently ratified by the South American countries.

In May 1888 the Congress of the United States had passed an Act authorizing the President to invite the several Latin- American governments to a conference in Washington to consider measures for preserving the peace, the formation of a customs union, the establishment of better communication between ports, the adoption of a common silver coin, a uniform system of weights, measures, patent-rights, copyrights and trade-marks, the subject of sanitation of ships and quarantine, &c. All the governments except Santo Domingo accepted the invitation and this conference is commonly known as the first Pan- American Conference. It met on the 2nd of October 1889, was presided over by James G. Blaine, the American secretary of state, who had been instrumental in having the conference called, and continued its sessions until the 19th of April 1890. A majority of its members voted for compulsory arbitration, and recommendations were made relating to reciprocity treaties, customs regulations, port duties, the free navigation of American rivers, sanitary regulations, a monetary union, weights and measures, patents and trade-marks, an international American bank, an intercontinental railway, the extradition of criminals, and several other matters. Nothing came of its recommen- dations, however, except the establishment in Washington of an International Bureau of American Republics for the collection and publication of information relating to the commerce, products, laws and customs of the countries represented. At the suggestion of President McKinley the government of Mexico called the second Pan-American Conference to meet at the City of Mexico on the 22nd of October 1901. There was a full representation and the

sessions were continued until the 31st of January 1902. The chief subject of discussion was arbitration, and after much wrangling between those who insisted upon compulsory arbitration and those opposed to it a majority of the delegations signed a project whereby their countries should become parties to the Hague conventions of 1899, which provide for voluntary arbitration. At the same time ten delegations signed a project for a treaty providing for compulsory arbitration. The conference also approved a project for a treaty whereby controversies arising from pecuniary claims of individuals of one country against the government of another should be sub- mitted to the arbitration court established by the Hague con- vention. The conference ratified a resolution of the first con- ference recommending the construction of complementary lines of the proposed Pan-American railway.

At this conference, too, the International Bureau of American Republics was organized under a governing board of diplomatists with the secretary of state of the United States as chairman; it was directed to publish a monthly bulletin, and in several other respects was made a more important institution. Its governing board was directed to arrange for the third Pan- American Conference, and this body was in session at Rio de Janeiro from the 21st of July to the 26th of August 1906. Delegates attended from the United States, Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, San Domingo, Ecuador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Salvador and Uruguay; Haiti and Venezuela were not represented. The secretary of state of the United States, Elihu Root, though not a delegate, addressed the con- ference. The subjects considered were much the same as thos'e at the two preceding conferences. With respect to arbitration this conference passed a resolution that the delegates from the American republics to the second conference at the Hague be instructed to endeavour to secure there " the celebration of a general arbitration convention so effective and definite that, meriting the approval of the civilized world, it shall be accepted and put in force by every nation." With respect to copyrights, patents and trademarks this conference re-affirmed the con- ventions of the second conference, with some modifications; with respect to naturalization it recommended that whenever a native of one country who has been naturalized in another again takes up his residence in his native country without intending to return to his adopted country he should be con- sidered as having reassumed his original citizenship; and with

respect to the forcible collection of public debts to which the " Drago Doctrine " x is opposed, the conference recommended that " the Governments represented therein consider the point of inviting the

Second Peace Conference at the Hague to con- sider the question of the compulsory collection of public debts, and, in general, means tending to diminish between nations conflicts having an exclusively pecuniary origin." The fourth Conference met in Buenos Aires in July-August 1910, agreed to submit to arbitration such money claims as cannot be amicably settled by diplomacy, and renamed the Bureau the Bureau of Pan- American Union. 2

The first Pan-American scientific congress met at Santiago, Chile, on the 25th of December 1908 for the consideration of distinctly American problems. It continued in session until the 5th of January 1909, and resolved that a second congress for the same purpose should meet at Washington in 1912.

See International American Conference, Reports and Recommenda- tions (Washington, 1890), and especially the Historical Appendix.

PANATHENAEA, the oldest and most important of the Athenian festivals. It was originally a religious celebration, founded by Erechtheus (Erich thonius), in honour of Athena Polias, the patron goddess of the city. It is said that when Theseus united the whole land under one government he made the festival of the city-goddess common to the entire country, and changed the older name Athenaea to Panathenaea (Plutarch, Theseus, 24). The union (Synoecism) itself was celebrated by a distinct festival, called Synoecia or Synoecesia, which had no connexion with the Panathenaea. In addition to the religious rites there is said to have been a chariot race from the earliest times, in which Erechtheus himself won the prize. Considerable alterations were introduced into the proceedings by Peisistratus (q.v.) and his sons. It is probable that the distinction of Greater and Lesser Panathenaea dates from this period, the latter being a shorter and simpler festival held every year. Every fourth year the festival was celebrated with peculiar magnificence; gymnastic sports were added to the horse races; and there is little doubt that Peisistratus aimed at making the penteteric Panathenaea the great Ionian festival in rivalry to the Dorian Olympia. THe penteteric festival was celebrated in the third year of each Olympiad. The annual festival, probably held on the 28th and 29th of Hecatombaeon (about the middle of August), consisted solely of the sacrifices and rites proper to this season in the cult of Athena. One of these rites originally consisted in carrying a new peplus (the state robe of Athena) through the streets to the Acropolis to clothe the ancient carved image of the goddess, a ceremonial known in other cities and represented by the writer of the Iliad (vi. 87) as being in use at Troy; but it is probable that this rite was afterwards restricted to the great

penteteric festival. The peplus was a costly, saffron-coloured garment, embroidered with scenes from the battle between the gods and giants, in which Athena had taken part. At least as early as the 3rd century B.C. the custom was introduced of spreading the peplus like a sail on the mast of a ship, which was rolled on a machine in the procession. Even the religious rites were celebrated with much greater splendour at the Greater Panathenaea. The whole empire shared in the great sacrifice; every colony and every subject state sent a deputation and sacrificial animals. On the great day of the feast there was a procession of the priests, the sacrificial assistants of every kind, the representatives of every part of the empire with their victims, of the cavalry, in short of the population of Attica and

1 So named from a note (1902) directed by Dr Don Louis Maria Drago, the Argentine minister of foreign affairs, to the Argentine diplomatic representative at Washington at the time of the diffi- culties of Venezuela incident to the collection of debts owed to foreigners by that country.

2 The Bureau is supported by contributions, varying in amount according to population, of the twenty-one American republics, Andrew Carnegie contributed $750,000 and the various republics $250,000 for the erection of a permanent home for the Bureau in Washington. The Bureau has a library of some 15,000 volumes, and publishes numerous handbooks, pamphlets and maps, in addition to its monthly Bulletins. Its executive head is a director, chosen by the Governing Board.

great part of its dependencies. After the presentation of the peplus, the hecatomb was sacrificed. The subject of the frieze of the Parthenon is an idealized treatment of this great procession. The festival which had been beautified by Peisistratus was made still more imposing under the rule of Pericles. He intro- duced a regular musical contest in place of the old recitations of the rhapsodes, which were an old standing accompaniment of the festival. This contest took place in the Odeum, originally built for this purpose by Pericles himself. The order of the agones from this time onwards was — first the musical, then the gymnastic, then the equestrian contest. Many kinds of contest, such as the chariot race of the apobatai (said to have been introduced by Erechtheus), which were not in use at Olympia, were practised in Athens. Apobates was the name given to the companion of the

charioteer, who showed his skill by leaping out of the chariot and up again while the horses were going at full speed. There were in addition several minor contests: the Pyrrhic, or war dance, celebrating tne victory of Athena over the giants; the Euandria, whereby a certain number of men, distinguished for height, strength and beauty, were chosen as leaders of the procession; the Lampadedromia, or torch-race; the Naumachia (Regatta), which took place on the last day of the festival. The proceedings were under the super- intendence of ten athlothetae, one from each tribe, the lesser Panathenaea being managed by hieropoei. In the musical contests, a golden crown was given as first prize; in the sports, a garland of leaves from the sacred olive trees of Athena, and vases filled with oil from the same. Many specimens of these Panathenaic vases have been found; on one side is the figure of Athena, on the other a design showing the nature of the com- petition in which they were given as prizes. The season of the festival was the 24th to the 29th of Hecatombaeon, and the great day was the 28th.

See A. Mommsen, Feste der Stadt Athen (1898) ; A. Michaelis, Der Parthenon (1871), with full bibliography; P. Stengel, Die griechischen Kultusaltertiimer (1898) ; L. C. Purser in Smith's Diction- ary of Antiquities (3rd ed., 1891); L. R. Farnell, 'Cults of the Greek States; also article Athena and works quoted.

PANCH MAHALS (= Five Districts), a 'district of British India, in the northern division of Bombay. Area, 1606 sq. m., pop. (1901), 261,020, showing a decrease of 17% in the decade, owing to famine. The administrative headquarters are at Godhra, pop. (1901), 20,915. Though including Champaner, the old Hindu capital of Gujarat, now a ruin, this tract has no history of its own. It became British territory as recently as 1 86 1, by a transfer from Sindhia; and it is the only district of Bombay proper that is administered on the non-regulation system, the collector being also political agent for Rewa Kantha. It consists of two separate parts, divided by the territory of a native state. The south-western portion is for the most part a level plain of rich soil; while the northern, although it com- prises some fertile valleys, is generally rugged, undulating and barren, with but little cultivation. The mineral products com- prise sandstone, granite and other kinds of building stone. Mining for manganese on a large scale has been begun by a European firm, and the iron and lead ores may possibly become profitable. Only recently has any attempt been made to con- serve the extensive forest tracts, and consequently little timber of any size is to be found. The principal crops are maize, millets, rice, pulse and oilseeds; there are manufactures of lac bracelets and lacquered toys; the chief export is timber. Both portions of the district

are crossed by the branch of the Bombay and Baroda railway from Anand, through Godhra and Dohad, to Ratlam; and a chord line, opened in 1904, runs from Godhra to Baroda city. The district suffered very severely from the famine of 1899-1900.

PANCREAS (Gr. irav, all; Kpeas, flesh), or sweetbread, in anatomy, the elongated, tongue-shaped, digestive gland, of a pinkish colour, which lies across the posterior wall of the abdomen about the level of the first lumbar vertebra behind, and of the transpyloric plane in front (see Anatomy: Superficial and Artis- tic). Its right end is only a little to the right of the mid line

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of the abdomen and is curved down, round the superior med- enteric vessels, into the form of a C”™. This hook-like right end is known as the head of the pancreas, and its curvature is adapted to the concavity of the duodenum (see fig.) The first inch of the straight limb is narrower from above downward than the rest and forms the neck. This part lies just in front of the beginning of the portal vein, just below the pyloric opening of the stomach and just above the superior mesenteric vessels. The next three or four inches of the pancreas, to the left of the neck, form the body and this part lies in front of the left kidney and adrenal body, while it helps to form the posterior wall of the ” stomach chamber ” (see Alimentary Canal). At its left extremity the body tapers to form the tail, which usually touches the spleen (see Ductless Glands) just below the hilum, and above the basal triangle of that viscus where the splenic flexure of the colon is situated. On the upper border of the body, a little to the left of the mid line of the abdomen, is a convexity or hump, which is known as the tuber omentale of the pancreas, and touches the elevation (bearing the same name) on the liver.

The pancreas is altogether behind the peritoneum. In its greater part it is covered in front by the lesser sac (see Coelom and Serous Membranes), but the lower part of the front of the head and the very narrow lower surface of the body are in contact with the greater sac. There is one main duct of the pancreas, which is sometimes known as the duct of Wirsung; it is thin- walled and white, and runs the whole length of the organ nearer the back than the front. As it reaches the head it turns downward and opens into the second part of the duodenum, joining the common bile duct while they are both piercing the walls of the gut. A smaller accessory pancreatic duct is found, which communicates with the main duct and usually opens into the duodenum about three- quarters of an inch above the papilla of the

latter. It drains the lower part of the head, and either crosses or communicates with the duct of Wirsung to reach its opening (see A. M. Schirmer, Beitrag zur Geschichte und Anat. des Pancreas, Basel, 1893).

The pancreas has no real capsule, but is divided up into lobules, which are merely held together by their ducts and by loose areolar tissue; the glands of which these lobules are made up are of the acino-tubular variety (see Epithelial Tissues). Small groups of epithelium-like cells without ducts (Islets of Langerhans) occur among the glandular tissue and are characteristic of the pancreas. In cases of diabetes they sometimes degenerate. In the centre of each acinus of the main glandular tissue of the pancreas are often found spindle-shaped cells (centro-acinar cells of Langerhans). For details of microscopic structure see Essentials of Histology, by E. A. Schafer (London, 1907).

Embryology. — The pancreas is developed, by three diverticula, from that part of the foregut which will later form the duodenum. Of these diverticula the left ventral disappears early, 1 but the right ventral, which is really an outgrowth from the lower part of the common bile duct, forms the head of the pancreas. The body and tail are formed from the dorsal diverticulum, and the two parts, at first separate, join one another so that the ducts communi- cate, and eventually the ventral one takes almost all the secretion of the gland to the intestine, while that part of the dorsal one which is nearest the duodenum atrophies and forms the duct of Santorini. The main pancreatic duct (of Wirsung) is therefore formed partly by the ventral and partly by the dorsal diverticulum. As trie diverticula grow they give off lateral branches, which branch again and again until the terminal buds form the acini of the gland. At first the pancreas grows upward, behind the stomach, between the two layers of the dorsal mesogastrium (see Coelom and Serous Membranes), but when the stomach and duodenum turn over to the right, the gland becomes horizontal and the open- ing of the right ventral diverticulum becomes more dorsal. Later, by the unequal growth of the duodenal walls, it comes to enter the gut on its left side where the papilla is permanently situated. After the turning over of the pancreas to the right the peritoneum is absorbed from its dorsal aspect. The islets of Langerhans are now regarded as portions of the glandular epithelium which have been isolated by the invasion and growth round them of mesenchyme (see Quain's Anatomy, vol. i., 1908).

Comparative' Anatomy. — In the Acrania (Amphioxus) no repre- sentative of a pancreas has been found, but in the Cyclostomata (hags and lampreys) there is a small lobular gland opening into the bile duct

which probably represents it. In the Elasmobra'nchs (sharks and rays) there is a definite compact pancreas of consider- able size. In the Teleostomi, which include the true bony fish (Teleostei), the sturgeon and Polyterus, the pancreas is sometimes

1 N. W. Ingalls has shown (Archiv. f. mik. Anat. und Entwickl. Bd. 70, 1907), that in a human embryo of 4-9 mm. the two ventral buds persist and join one another below the liver bud.

a compact gland and sometimes diffuse between the layers of the mesentery; at other times it is so surrounded by the liver as to be difficult to find.

Among the Dipnoi (mud fish), Protopterus has it embedded in the walls of the stomach and intestine.

The Amphibia have a definite compact pancreas which lies in the U-shaped loop between the stomach and duodenum, and is massed round the bile duct. In the Reptilia there are some- times several ducts, as in the crocodile and the water tortoise (Emys), and this arrangement is also found in birds (the pigeon, for instance, has three ducts opening into the duodenum at very different levels). In mammals the gland is usually compact, though

into the pancreas is of some medico-legal importance as being a cause of death. The condition is rarely recognized in time for operative interference. Acute haemorrhagic pancreatitis is a Com- bination of inflammation with haemorrhage in which the pancreas is found enlarged and infiltrated with blood. Violent pain, vowit- ing and collapse, are the chief features as is also the case in pancreatic abscess in which the abscess may be single or multiple. In the latter case operation has been followed by recovery. Haemorrhagic inflammation has been followed by gangrene of the pancreas, which usually terminates fatally. In two remarkable cases; however, reported by Chiari recovery followed on the discharge per rectum of the necrosed pancreas. Chronic pancreatitis is said by

Aorta

jFossa for Spigelian lobe" Kight phrenic. Vessels

Vena cava Hepatic vein iHepatic artery\

\ \

(Esophagus,.

Coronary artery Diaphragm*- Left suprarenal capsule

Splenic artery. / Kidney’

ofpancreas}

rfaceofspJesS

From Ambrose Birmingham, Cunningham’s Text Book of Anatomy.

Fig. i. — The Viscera and Vessels on the Posterior Abdominal Wall. The stomach, liver and most of the intestines have been removed. The peritoneum has been preserved on the right kidney, and the fossa for the Spigelian lobe. In taking out the liver, the vena cava was left behind. The stomach-bed is well shown. (From a body hardened by chromic- acid injections.) ”’*

sometimes, as in the rabbit, it is diffuse. It usually has two ducts, as in man, though in many animals, such as the ox, sheep and goat, only^one persists. When there is only one duct it may open with the common bile duct, e.g. sheep and cat, or may be very far away as in the ox and rabbit. (F. G. P.)

Diseases of the pancreas. — As the pancreas plays an important part in the physiology of digestion much attention has of late been paid to the question of its secretions. In sclerosis, atrophy, acute and chronic inflammatory changes and new growths in the pancreas an absence or lessening of its secretion may be evident. Haemorrhage

Mayo Robson to occur in connexion with the symptoms of catarrhal jaundice, which he suggests is due to the pressure on the common duct by the swollen pancreatic tissue. The organ is enlarged and very hard, and the symptoms are pain, dyspepsia, jaundice, loss of weight and the presence of fat in the stools. This latter sign is common to all forms of pancreatic disease. In connexion with all pancreatic diseases small yellowish patches are found in the pan- creatic tissue, masentery, omentum and abdominal fatty tissue generally, and the tissues appear to be studded with whitish areas often not larger than a pin’s head. The condition, which was

first observed by Balser, has been termed ” fat-necrosis.” The pancreas like other organs, is subject to the occurrence of new growths, tumours and cysts, syphilis and tuberculosis.

PANDA (Aelurus fulgens) , a carnivorous mammal of the family Procyonidae (see Carnivora). This animal, rather larger than a cat, ranges from the eastern Himalaya to north-west China. In the former area it is found at heights of from 7000 to 12,000 ft. above the sea, among rocks and trees, and chiefly feeds on fruits and other vegetable substances. Its fur is of a remarkably rich reddish-brown colour, darker below; the face is white, with the exception of a vertical stripe of red from just above the eye to the gape; there are several pale rings on the tail, the tip of which is black.

PANDARUS, in Greek legend, son of Lycaon, a Lycian, one of the heroes of the Trojan war. He is not an important figure in Homer. He breaks the truce between the Trojans and the Greeks by treacherously wounding Menelaus with an arrow, and finally he is slain by Diomedes (Homer, Iliad, ii. 827, iv. 88, V. 290). In medieval romance he became a prominent figure in the tale of Troilus and Cressida. He encouraged the amour between the Trojan prince and his niece Cressida; and the word ” pander ” has passed into modern language as the common title of a lovers’ go-between in the worst sense.

PANDECTS (Lat. pandecta, adapted from Gr. iravdeKTr]s, all-containing), a name given to a compendium or digest of Roman law compiled by order of the emperor Justinian in the 6th century (a.d. 530-533). The pandects were divided into fifty books, each book containing several titles, divided into laws, and the laws into several parts or paragraphs. The number of jurists from whose works extracts were made is thirty-nine, but the writings of Ulpian and Paulus make up quite half the work. The work was declared to be the sole source of non- statute law: commentaries on the compilation were forbidden, or even the citing of the original works of the jurists for the explaining of ambiguities in the text. See Justinian; and Roman Law.

PANDERMA (Gr. Panormus), a town of Asia Minor, on the south shore of the Sea cf Marmora, near the site of Cyzicus. It has a trade in cereals, cotton, opium, valonia and boracite and is connected by a

carriage road with Balikisri. Pop. 10,000 (7000 Moslems).

PANDHARPUR, a town of British India, in Sholapur district of Bombay, on the right bank of the river Bhima, 38 m. W. of Sholapur town. Pop. (1901), 32,405. Pandharpur is the most popular place of pilgrimage in the Deccan, its celebrated temple being dedicated to Vithoba, a form of Vishnu. Three assem- blages are held annually. In 1906 a light railway was opened to Pandharpur from Barsi Road on the Great Indian Peninsula railway.

PANDORA (the ” All-giving “) in Greek mythology, according to Hesiod (Theog. 570-612) the first woman. After Prometheus had stolen fire from heaven and bestowed it upon mortals Zeus determined to counteract this blessing. He accordingly com- missioned Hephaestus to fashion a woman out of earth, upon whom the gods bestowed their choicest gifts. Hephaestus ‘ gave her a human voice, Aphrodite beauty and powers of seduction, Hermes cunning and the art of flattery. Zeus gave her a jar (widos), the so-called ” Pandora’s box ” (see below), containing all kinds of misery and evil, and sent her, thus equipped, to Epimetheus, who, forgetting the warning of his brother Prometheus to accept no present from Zeus, made her his wife. Pandora afterwards opened the jar, from which all manner of evils flew out over the earth (for parallels in other countries, see Frazer’s Pausanias, ii. 320). Hope alone remained at the bottom, the lid having been shut down before she escaped. (Hesiod, W. and D. 54-105). According to a later story, the jar contained, not evils, but blessings, which would have been preserved for the human race, had they not been lost through the opening of the jar out of curiosity by man himself (Babrius, Fab. 58).

See J. E. Harrison, ” Pandora’s Box,” in Journal of Hellenic Studies, xx. (1900), in which the opening of the jar is explained as

an aetiological myth based on the Athenian festival of the Pithoigia (part of the Anthesteria, a.v.), and P. Gardner, ” A new Pandora vase ” (xxi., ibid., 1901). Pandora is only another form of the Earth goddess, who is conceived as releasing evil spirits from the wLOos, which served the purpose of a grave (cf. the removal of the lapis manalis from the mundus, a circular pit at Rome supposed to be the opening to the world below, on three days in the year, whereby an opportunity of revisiting earth was afforded the dead). See also O. Gruppe, Griechisclte Mythologie (1906), i. 94.

PANDUA, a ruined city in Malda district of Eastern Bengal and Assam, once a Mahommedan capital. It is situated 7 m. N.E. of Malda, and about 20 m. from the other great ruined city of Gaur (q.v), from which

it was largely built. It was probably originally an outpost of Gaur, and grew in import- ance as Gaur became unhealthy. In a.d. 1353 Haji Shams; uddin Ilyas, the first independent king of Bengal, transferred his capital from Gaur to Pandua; but the time of its prosperity was short, and in a.d. 1453 the capital was transferred back to Gaur. Its only celebrated building is the Adina Mosque, which was described by James Fergusson as the finest example of Pathan architecture in existence. This great mosque was built by Sikandar Shah in 1369 (see Indian Architecture). Pandua now, like Gaur, is almost entirely given over to the jungle.

PANDULPH [Pandolfo] (d. 1226), Roman ecclesiastical politician, papal legate to England and bishop of Norwich, was born in Rome, and first came to England in 121 1, when he was commissioned by Innocent III. to negotiate with King John. Obtaining no satisfactory concessions, he is said to have pro- duced the papal sentence of excommunication in the very presence of the king. In May 12 13 he again visited England to receive the king's submission. The ceremony took place at Dover, and on the following day John, of his own motion, formally surrendered England to the representative of Rome to receive it again as a papal fief. Pandulph repaid this act of humility by using every means to avert the threatened French invasion of England. For nearly a year he was superseded by the cardinal-legate Nicholas of Tusculum; but returning in 1 21 5 was present at the conference of Runnymede, when the great charter was signed. He rendered valuable aid to John who rewarded him with the see of Norwich. The arrival of the cardinal-legate Gualo (12 16) relegated Pandulph to a secondary position; but after Gualo's departure (1218) he came forward once more. As representing the pope he claimed a control over Hubert de Burgh and the other ministers of the young Henry III.; and his correspondence shows that he inter- fered in every department of the administration. His arrogance was tolerated while the regency was still in need of papal assist- ance; but in 1221 Hubert de Burgh and the primate Stephen Langton successfully moved the pope to recall Pandulph and to send no other legate a latere in his place. Pandulph retained the see of Norwich, but from this time drops out of English politics. He died in Rome on the 16th of September 1226 but his body was taken to Norwich for burial.

See W. Shirley, Royal and Other Historical Letters (" Rolls series ") vol. i.; Miss K. Norgate, John Lackland (1902); W. Stubbs, Con- stitutional History (1897) vol. i.

PANDURA (tanboura, tanbur, tambora, mandore, pandore, bandora, bandoer, &c), an ancient oriental stringed instrument, a member of

the lute family, having a long neck, a highly- vaulted back, and originally two or three strings plucked by the fingers. There were in antiquity at least two distinct varieties of pandura, or tanbur. (1) The more or less pear- shaped type used in Assyria and Persia and introduced by way of Asia Minor into Greece, whence it passed to the Roman Empire. In this type the body, when the graceful inward curves which led up gradually from base to neck were replaced by a more sloping outline, approximated to an elongated triangle with the corners rounded off* (2) The oval type, a favourite instrument of the Egyptians, also found in ancient Persia and among the Arabs of North Africa, who introduced it into Spain. Our definite knowledge of the pandura is derived from the treatise on music by Farabi, 1 the Arab scholar who flourished 1 See Michael Casiri, Bibl. Arab. Jlisp., i. 347.

in the 10th century. He mentions two kinds of tanburs, devo- ting to each a chapter, i.e. the tanbur of Khorasan, the Persian type, and the tanbur of Bagdad, the Assyrian variety; these differ in form, in length, and in the arrangement of the frets. Unfortunately, Farabi does not describe the shape of the body, being more concerned with the musical scale and compass of the instrument; but means of identification are supplied by ancient monuments. There is a tanbur on an Assyrian bas- relief of the reign of Assur-nasir-pal, c. 880 B.C. (British Museum), on a slab illustrating camp life; the musician is playing on a pear-shaped tanbur with a very long slender neck, which would have served for two strings at the most, while two men, dis- guised in the skins of wild beasts, are dancing in front of him.

There were in Farabi's day five frets at least, whereas on the tanbur of Khorasan there were no fewer than eighteen, which extended for half the length of the instrument. Five of these frets were fixed or invariable in position, the thirteen others being interpolated between them. The fixed frets, counting from the nut, gave an interval of one tone to the first, of a fourth to the second, of a fifth to the third, of an octave to the fourth, and of a major ninth to the fifth, thus providing a suc- cession of fourths and fifths. The additional frets were placed between these, so that the octaves generally contained seventeen intervals of one-third tone each. The two principal accordances for the tanbur of Khorasan were the marriage when the strings, were in unison, and the lute or accordance in fourths. Farabi mentions a tail- piece or zoba'iba, to which the strings, generally two in number but sometimes three, were attached; they rested on a bridge provided with

as many notches as there were strings. In the tanbur of Khorasan they were wound round pegs placed opposite each other in the two sides of the head, as in the modern violin.

Pollux 1 states that the pandura was invented by the Assyrians or Egyptians, and had three strings. Theodore Reinach 2 is of opinion that pandura was a generic term for instruments of the lute type during the Roman and Alexandrine periods. This may be the case, but from the modern standpoint we cannot in our classification afford to disregard the invariable characteristics observed in the modern, no less than in the ancient and medieval, tanburs or panduras.

To be able to identify the pandura it is as well to bear in mind the distinctive features of other instruments with which it might be confounded. The tanbur had a long neck resembling a section of a cylinder and a highly vaulted back, and its strings were plucked. In the rebab the neck was wanting or at best rudi- mentary, consisting of the gradual narrowing of the body towards the head, and during the middle ages in Europe, as rebec, it was always a bowed instrument. The early lutes had larger bodies than tanburs, the neck was short compared to the length of the body, the head was generally bent back at right angles, and the convex was not so deeply vaulted as that of the tanbur. The barbiton or bass lute had a long neck also, but wider, to take six, seven, or even nine strings, and from the back or profile view the general appearance was what, is known as boat-shaped.

Under the Romans the pandura had become somewhat modified : the long neck was preserved but was made wider to take four strings, and the body was either oval 3 or slightly broader at the base, but without the inward curves of the pear-shaped instruments. A striking example of the former is to be seen among the marbles of the Townley Collection at the British Museum on a bas-relief illustrating the marriage feast of Eros and Psyche, a Roman sculp- ture assigned to c. 150 B.C. This example is of great value to the archaeology of music, for the instrument can be studied in full and in profile. The arrangement of the four pegs in the back of the head is Oriental.

The Persians had a six-stringed tanbur, 4 which they distinguished

1 Onomasticon, iv. 60.

2 See Daremberg and Saglio, Diet, des antiquites grecques et romaines, article ” Lyre,” p. 1450; also Revue des etudes grecques, viii. 371, &c, with illustrations, some of which the present writer would prefer to classify as early lutes, owing to the absence of the

characteristic long neck of the tanburs.

3 This instrument resembles the oval tanburs represented in the miniatures of musicians in the CantigSs di Santa Maria (13th century) having two strings, and on each side a group of three very small, round sound-holes, probably of Moorish origin. The MS. is numberea J. b. 2 in the Escorial; the miniatures are reproduced in J. F. Riano's Critical and Biogr. Notes on early Spanish Music (London, 1887).

4 In the miniatures. of the Cantigas there are oval tanburs with

as the scheschta, 5 whereas a three-stringed variety was known as the schrud.

The tanbur survived during the middle ages and as late as the 1 8th century; it may be traced in the musical documents of several countries. In England the name of pandura or bandoer was given to an instrument with wire strings having no characteristic structural feature in common with the ancient tanbur but resembling the cittern (?.».). The bandoer had a flat back and sound-board joined by ribs having a wavy outline. A smaller size of the same instru- ment was called orphoreon, and a larger and wider penorcon: these are described and figured by Praetorius, 6 who suggests that this instrument, invented in England as bandoer, is probably similar to the Greek iravSovpa. This bandora, we learn from an entry in Sir Philip Leycester's 7 index to his commonplace book of 1575, was invented by " John Rose dwellinge in Bridewell anno 4to Elizabeth, ™ho left a sonne farre exceedinge himself in makinge instruments. '

A 17th-century French MS. (Add. 30342, fol. 144) in the British Museum, containing drawings of musical instruments, gives the tambora, not the English hybrid, but a true descendant of the ancient Oriental tanbur, with nine strings, a rose sound-hole and seven frets; the French writer erroneously states that it is similar to the cistre (cittern). Filippo Bonanni 8 gives an illustration of the same kind of instrument, with ten strings in five pairs of unisons, and calls it pandura. (K. S.)

PANE (Ft. pan, Lat. pannus, a cloth, garment), originally a piece of cloth, especially one of a number of pieces of cloth or other material joined to form one piece for a garment; the word is thus also applied to the " slashes " in the material of a dress made to show a rich lining or the colour of a lining when different from the outer side of the garment. In this sense the word only survives in English in " counterpane," an outer coverlet for a bed. " Pane " is used frequently

for the flat side of anything, especially in diamond-cutting of the sides to the ” table ” of a brilliant, or to the faces of a bolt nut or hammer-head. The most common use of the word now is that of a piece of glass filling a compartment in a window. In architecture the word is also applied to a bay of a window, compartment of a partition, side of a tower, turret, &c. (See Bay and Half-timber Work.)

PANEGYRIC, strictly a formal public speech delivered in high praise of a person or thing, and generally high studied or undiscriminating eulogy. It is derived from ira.vt]yvpinbs (a speech) ” fit for a general assembly ” (iraviiyvpt.s, panegyris). In Athens such speeches were delivered at national festivals or games, with the object of rousing the citizens to emulate the glorious deeds gf their ancestors. The most famous are the Olympiacus of Gorgias, the Olympiacus of Lysias, and the Panegyricus and Panathenaicus (neither of them, however, actually delivered) of Isocrates. Funeral orations, such as the famous speech put into the mouth of Pericles by Thucydides, also partook of the nature of panegyrics. The Romans confined the panegyric to the living, and reserved the funeral oration exclusively for the dead. The most celebrated example of a Latin panegyric {panegyricus) is that delivered by the younger Pliny (a.d. 100) in the senate on the occasion of his assumption of the consulship, containing a somewhat fulsome eulogy of Trajan. Towards the end of the 3rd and during the 4th century, as a result of the orientalizing of the Imperial court by Diocletian, it became customary to celebrate as a matter of course the superhuman virtues and achievements of the reigning emperor. Twelve speeches of the kind (Pliny’s included), eight of them by famous Gallic rhetoricians (Claudius Mamertinus, Eumenius, Nazarius, Drepanius Pacatus) and three of anonymous author- ship, have been collected under the title of Panegyrici veteres lalini (ed. E. Bahrens, 1874). Speaking generally, they are characterized by a stilted, affected style and a tone of gross adulation. There are extant similar orations by Ausonius,

six or seven strings, one played by a Moor; both have the tail- piece in the form of a crescent.

6 See Hammer von Purgstall on the ” Seven Seas,” in Jahrbucher der Literatur, xxxvi. 290 (Vienna, 1826).

6 Syntagma musicum (Wolfenbuttel, 1618), pi. xvii. and ch. 28,, 63; reprint in Publik. d. Ges. f. Musikjorschung (Berlin, 1884), Jahrgang XII.

7 See Dr F. J. Furnivall’s edition of Captain Cox or Robert Lane- ham’s

letter, Ballad Society (London, 1871), p. 67.

8 See Gabinetto armonico, ch. 49, pi. 97 (Rome, 1722).

Symmachus and Ennodius, and panegyrics in verse by Claudian, Merobaudes, Priscian, Corippus and others.

See C. G. Heyne, ” Censura xii. panegyricorum veterum,” in his Opuscula academica (1812), vi. 80-118; H. Riihl, De xii panegyricis latinis (progr. Greifswald, 1868) ; R. Pichin, Les Derniers ecrivains profanes (Paris, 1906).

PANEL (O. Fr. panel, mod. panneau, piece of cloth, from Med. Lat. pannellus, diminutive of pannus, cloth), a piece of cloth, slip of parchment, or portion of a surface of wood or stone enclosed in a compartment. In the first sense the word survives in the use of ” panel ” or ” pannel ” for the cloth-stuffed lining of a saddle. From the slip of parchment on which the list of jurymen is drawn up by the sheriff, ” panel ” in English law is applied to a jury, who are; thus said to be ” empanelled.” In Scots law the word is used of the indictment, and of the person or persons named in the indictment; ” panel ” is thus the equivalent of the English ” prisoner at the bar.” In building and architecture (Fr. panneau; Ital. quadretto, formello; Ger. Feld) ” panel ” is properly used of the piece of wood framed within the stiles and rails of a door, filling up the aperture; but it is often applied both to the whole square frame and the sinking itself, and also to the ranges of sunken compartments in cornices, corbel tables, groined vaults, ceilings, &c. In Norman work these recesses are generally shallow, and more of the nature of arcades. In Early English work the square panels are ornamented with quatrefoils, cusped circles, &c, and the larger panels are often deeply recessed, and form niches with trefoil heads and sometimes canopies. In the Decorated style the cusping and other enrichments of panels become more elaborate, and they are often filled with shields, foliages, and sometimes figures. Towards the end of this period the walls of important buildings were often entirely covered with long or square panels, trie former frequently forming niches with statues. The use of panels in this way became very common in Per- pendicular work, the wall frequently being entirely covered with long, short and square panels, which latter are fre- quently richly cusped, and filled with every species of ornament, as shields, bosses of foliage, portcullis, lilies, Tudor roses, &c. Wooden

panellings very much resembled those of stone, except in the Tudor period, when the panels were enriched by a varied design, imitating the plaits of a piece of linen or a napkin folded in a great number of parallel lines. This is generally called the linen pattern. Wooden ceilings, which are very common, are composed of thin oak boards nailed to the rafters, collars, &c, and divided into panels by oak mouldings fixed on them, with carved bosses at the intersections.

PANENTHEISM, the name given by K. C. F. Krause (q.v.) to his philosophic theory. Krause held that all existence is one great unity, which he called Wesen (Essence). This Essence is God, and includes within itself the finite unities of man, reason and nature. God therefore includes the world in “Timself and extends beyond it. The theory is a conciliation of Theism and Pantheism.

PANGOLIN, the Malay name for one of the species of the scaly anteaters, which belong to the order Edentata (q.v.), and typify the family Manidae and the genus Manis. These animals, which might be taken for reptiles rather than mammals, are found in the warmer parts of Asia and throughout Africa. Pangolins range from 1 to 3 ft. in length, exclusive of the tail, which may be much shorter than or nearly twice the length of the rest of the animal. Their legs are short, so that the body is only a few inches off the ground; the ears are very small; and the tongue is long and worm-like, and used to capture ants. Their most striking character, however, is the coat of broad overlapping horny scales, which cover the whole animal, with the exception of the under surface of the body, and in some species the lower part of the tip of the tail. Besides the scales there are generally, especially in the Indian species, a number of isolated hairs, which grow between the scales, and are scattered over the soft and flexible skin of the belly. There are five toes on each foot, the claws on the first toe rudimentary, but the others, especially the third of the forefoot, long, curved, and

laterally compressed. In walking the fore-claws are turned backwards and inwards, so that the weight of the animal rests on the back and outer surfaces, and the points are thus kept from becoming blunted. The skull is long, smooth and rounded, with imperfect zygomatic arches, no teeth of any sort, and, as in other ant-eating mammals, with the bony palate extending unusually far backwards towards the throat. The lower jaw consists of a pair of thin rod-like bones, welded to each other at the chin, and rather loosely attached to the skull by a joint which, instead of being horizontal, is tilted up at an angle of 45 , the outwardly-twisted condyles articulating with the inner surfaces of the long glenoid processes in a manner unique among mammals. The

genus Manis, which contains all the pangolins, may be

White-bellied Pangolin (Manis tricuspis).

conveniently divided into two groups, distinguished by geo- graphical distribution and certain convenient, though not highly important, external characters. The Asiatic pangolins are characterized by having the central series of body-scales continued to the extreme end of the tail, by having many iso- lated hairs growing between the scales of the back, and by their small external ears. They all have a small naked spot beneath the tip of the tail, which is said to be of service as an organ of touch. There are three species: viz. Manis javanica, ranging from Burma, through the Malay Peninsula and Java, to Borneo; M. aurita, found in China, Formosa and Nepal; and the Indian Pangolin, M . pentadactyla, distributed over the whole of India and Ceylon. The African species have the central series of scales suddenly interrupted and breaking into two at a point about 2 or 3 in. from the tip of the tail; they have no hair between the scales, and no external ears. The following four species belong to this group: the long-tailed pangolin (M. macrura), with a tail nearly twice as long as its body, and con- taining as many as forty-six caudal vertebrae, nearly the largest number known among Mammals; the white-bellied pangolin (M. tricuspis), closely allied to the last, but with longer three- lobed scales, and white belly hairs; and the short-tailed and giant pangolins (M. temmincki and gigantea), both of which have the tail covered entirely with scales. Those species with a naked patch on the under side of the tail can climb trees. The four species of the second group are found in West Africa, although some extend into south and eastern equatorial Africa.

(O. T.;R. L.*) PANIN, NIKITA IVANOVICH, Count (1718-1783), Russian statesman, was born at Danzig on the 18th of September 1718. He passed his childhood at Pernau, where his father was commandant. In 1740 he entered the army, and rumour had it that he was one of the favourites of the empress Elizabeth. In 1747 he was accredited to Copenhagen as Russian minister,

but a few months later was transferred to Stockholm, where for the next twelve years he played a conspicuous part as the chief opponent of the French party. It is said that during his residence in Sweden Panin, who certainly had a strong speculative bent, conceived a

fondness for constitutional forms of government. Politically he was a pupil of Alexis Bestuzhev; consequently, when in the middle ‘fifties Russia suddenly turned Francophil instead of Francophobe, Panin’s position became extremely difficult. However, he found a friend in Bestuzhev’s supplanter, Michael Vorontsov, and when in 1760 he was unexpectedly appointed the governor of the little grand duke Paul, his influence was assured. He was on Catherine’s side during the revolution of 1762, but his jealousy of the influence which the Orlovs seemed likely to obtain over the new empress predisposed him to favour the proclamation of his ward the grand duke Paul as emperor, with Catherine as regent only.

To circumscribe the influence of the ruling favourites he next suggested the formation of a cabinet council of six or eight ministers, through whom all the business of the state was to be transacted; but Catherine, suspecting in the skilfully presented novelty a subtle attempt to limit her power, rejected it after some hesitation. Nevertheless Panin continued to be indis- pensable. He owed his influence partly to the fact that he was the governor of Paul, who was greatly attached to him; partly to the peculiar circumstances in which Catherine had mounted the throne; and partly to his knowledge of foreign affairs. Although acting as minister of foreign affairs he was never made chancellor; but he was the political mentor of Catherine during the first eighteen years of her reign. Panin was the inventor of the famous ” Northern Accord,” which aimed at opposing a combination of Russia, Prussia, Poland, Sweden, and perhaps Great Britain, against the Bourbon-Habsburg League. Such an attempt to bind together nations with such different aims and characters was doomed to failure. Great Britain, for instance, could never be persuaded that it was as much in her interests as in the interests of Russia to subsidize the anti- French party in Sweden. Yet the idea of the ” Northern Accord,” though never quite realized, had important political consequences and influenced the policy of Russia for many years. It explains, too, Panin’s strange tenderness towards Poland. For a long time he could not endure the thought of destroying her, because he regarded her as an indispensable member of his “Accord,” wherein she was to supply the place of Austria, whom circum- stances had temporarily detached from the Russian alliance. Poland, Panin opined, would be especially useful in case ot Oriental combinations. All the diplomatic questions concern- ing Russia from 1762 to 1783 are intimately associated with the name of Panin. It was only when the impossibility of realizing the ” Northern Accord ” became patent that his in- fluence began to wane, and Russia sacrificed millions of roubles fruitlessly in the endeavour to carry out his pet scheme.

After 1772, when Gustavus III. upset Panin's plans in Sweden, Panin, whose policy hitherto had been at least original and inde- pendent, became more and more subservient to Frederick II. of Prussia. As to Poland, his views differed widely from the views of both Frederick and Catherine. He seriously guaranteed the integrity of Polish territory, after placing Stanislaus II. on the throne, in order that Poland, undivided and as strong as circumstances would permit, might be drawn wholly within the orbit of Russia. But he did not foresee the complications which were likely to arise from Russia's interference in the domestic affairs of Poland. Thus the confederation of Bar, and the Turkish War thereupon ensuing, took him completely by surprise and considerably weakened his position. He was forced to acquiesce in the first partition of Poland, and when Russia came off third best, Gregory Orlov declared in the council that the minister who had signed such a partition treaty was worthy of death. Panin further incensed Catherine by meddling with the marriage arrangements of the grand duke Paul and by advocating a closer alliance with Prussia, whereas the empress was beginning to incline more and more towards

Austria. Nevertheless, even after the second marriage of Paul Panin maintained all his old influence over his pupil, who, like himself, was now a warm admirer of the king of Prussia. There are even traditions from this period of an actual conspiracy of Panin and Paul against the empress. As the Austrian influ- ence increased Panin found a fresh enemy in Joseph II., and the efforts of the old statesman to prevent a matrimonial alliance between the Russian and Austrian courts determined Catherine to get rid of a counsellor of whom, for some mysterious reason, she was secretly afraid. The circumstances of his disgrace are complicated and obscure. The final rupture seems to have arisen on the question of the declaration of " the armed neutrality of the North;" but we know that Potemkin and the English am- bassador, James Harris (afterwards 1st earl of Malmesbury), were both working against him some time before that. In May 1781 Panin was dismissed. He died in Italy on the 31st of March 1783. Panin was one of the most learned, accomplished and courteous Russians of his day. Catherine called him " her encyclopaedia." The earl of Buckinghamshire declared him to be the most amiable negotiator he had ever met. He was also of a most humane disposition and a friend of Liberal insti- tutions. As to his honesty and kindness of heart there were never two opinions. By nature a sybarite, he took care to have the best cook in the capital, and women had for him an irresistible attraction, though he was never married.

See anonymous Life of Count N.- 1. Panin (Rus. ; St Petersburg, 1787); Political correspondence (Rus. and Fr.), Collections of Russian Histor.

Society, vol. ix. (St Petersburg, 1872); V. A. Bilbasov, Geschichte Katharina II. (Berlin, 1891-1893)^. Bruckner, Materials for the Biography of Count Panin (Rus. ; St Petersburg, 1888).

(R. N. B.)

PANIPAT, a town of British India, in Karnal district of the Punjab, 53 m – N. of Delhi by rail. Pop. (1901), 26,914. The town is of great antiquity, dating back to ther great war of the Mahdbhdrata between the Pandavas and Kaurava brethren, when it formed one of the tracts demanded by Yudisthira from Duryodhana as the price of peace. In modern times, the plains of Panipat thrice formed the scene of decisive battles which sealed the fate of upper India — in 1526, when Baber completely defeated the imperial forces; in 1556, when his grandson, Akbar, on the same battlefield, conquered Himu, the Hindu general of the Afghan Adil Shah, thus a second time establishing the Mogul power; and finally, on the 7th of January 1761, when Ahmad Shah Durani shattered the Mahratta confederacy. The neighbourhood is a favourite manoeuvring ground for British camps of instruction. The modern town stands near the old bank of the Jumna, on high ground composed of the debris of earlier buildings. It is a centre of trade, and has manufactures of cotton cloth, metal-ware and glass. There are factories for ginning and pressing cotton.

PANIZZI, SIR ANTHONY (1797-1879), English librarian, was born at Brescello, in the duchy of Modena, Italy, on the 16th of September 1797. After taking his degree at the university of Parma, Antonio Panizzi became an advocate. A fervent patriot, he was implicated in the movement set on foot in 1821 to overturn the government of his native duchy, and in October of that year barely escaped arrest by a precipitate flight. He first established himself at Lugano, where he published an anonymous and now excessively rare pamphlet, generally known as / Processi di Rubiera, an exposure of the monstrous injustice and illegalities of the Modenese government's proceedings against suspected persons. Expelled from Switzerland at the joint instance of Austria, France and Sardinia, he came to England in May 1823, in a state bordering upon destitution. His countryman, Ugo Foscolo, provided him with introductions to William Roscoe and Dr William Shepherd, a Unitarian minister in Liverpool, and he earned a living for some time by giving Italian lessons. Roscoe introduced him to Brougham, by whose influence he was made, in 1828, professor of Italian at University College, London. His chair was almost a sinecure; but his abilities rapidly gained him a footing in London; and in 1831 Brougham, then lord chancellor, used his ex officio position as a principal trustee of the British Museum to obtain

the post of an extra assistant librarian of the Printed Book department. At the same time he was working at his edition of Boiardo's Orlando innamorato. Boiardo's fame had been eclipsed for three centuries by the adaptation of Berni; and it is highly to the honour of Panizzi to have redeemed him from oblivion and restored to Italy one of the very best of her narrative poets. His edition of the Orlando innamorato and the Orlando furioso was published between 1830 and 1834, prefaced by a valuable essay on the influence of Celtic legends on medieval romance. In 1835 he edited Boiardo's minor poems, and was about the same time engaged in preparing a catalogue of the library of the Royal Society.

The unsatisfactory condition and illiberal management of the British Museum had long excited discontent, and at length a trivial circumstance led to the appointment of a parliamen- tary committee, which sat throughout the sessions of 1835-1836, and probed the condition of the institution very thoroughly. Panizzi's principal contributions to its inquiries with regard to the library were an enormous mass of statistics respecting foreign libraries, and some admirable evidence on the catalogue of printed books then in contemplation. In 1837 he was appointed keeper of printed books. The entire collection, except the King's Library, had to be removed from Montague House to the new building, the reading-room service had to be reorganized, rules for the new printed catalogue had to be prepared, and the catalogue itself undertaken. All these tasks were successfully accomplished; but, although the rules of cataloguing devised by Panizzi and his assistants have become the basis of subsequent work, progress of the catalogue itself was slow. The first volume, comprising letter A, was published in 1841, and from that time, although the catalogue was continued and com- pleted in MS., no attempt was made to print any more until 1881. The chief cause of this comparative failure was inju- dicious interference with Panizzi, occasioned by the impatience of the trustees and the public. Panizzi's appointment, as that of a foreigner, had from the first been highly unpopular. He gradually broke down opposition, partly by his social influence, but far more by the sterling merits of his administration and his constant efforts to improve the library. The most remarkable of these was his report, printed in 1845, upon the museum's extraordinary deficiencies in general literature, which ultimately

procured the increase of the annual grant for the purchase of books to £10,000. His friendship with Thomas Grenville (1755- 1846) led to the nation being enriched by the bequest of the unique Grenville library, valued even then at £50,000. In 1847-1849 a royal commission sat to inquire into the general state of the museum, and Panizzi was the centre of the pro- ceedings. His administration, fiercely attacked from many quarters; was triumphantly vindicated in every point. Panizzi immediately became by far the most influential official in the museum, though he did not actually succeed to the principal librarianship until 1856. It was thus as merely keeper of printed books that he conceived and carried out the achievement by which he is probably best remembered — the erection of the new library and reading-room. Purchases had been discouraged from lack of room in which to deposit the books. Panizzi cast his eye on the empty quadrangle enclosed by 'the museum buildings, and conceived the daring idea of occupying it with a central cupola too distant, and adjacent galleries too low, to obstruct the inner windows of the original edifice. The cupola was to cover three hundred readers, the galleries to provide storage for a million of books. The original design, sketched by Panizzi's own hand on the 18th of April 1852, was submitted to the trustees on the 5th of May; in May 1854 the necessary expenditure was sanctioned by parliament, and the building was opened in May 1857. Its construction had involved a multitude of ingenious arrangements, all of which had been con- trived or inspected by Panizzi, who had a genius for minute detail and a gift for mechanical invention.

Panizzi succeeded Sir Henry Ellis as principal librarian in March 1856. During his tenure of this post a great improvement was effected in the condition of the museum

staff by the recognition of the institution as a branch of the civil service, and the decision was taken to remove the natural history collections to Kensington. Of this questionable measure Panizzi was a warm advocate; he was heartily glad to be rid of the naturalists. He had small love for science and its professors, and, as his friend Macaulay said, " would at any time have given three mammoths for one Aldus." Many important additions to the collections were made during his administration, especially the Temple bequest of antiquities, and the Halicarnassean sculptures discovered at Budrun (Halicar- nassus) by C. T. Newton. Panizzi retired in July 1866, but continued to interest himself actively in the affairs of the museum until his death, on the 8th of April 1879. He had been created a K.C.B. in 1869.

Panizzi had become a naturalized Englishman, but his devo- tion to the British Museum was rivalled by his devotion to his native land, and his personal influence with English Liberal statesmen enabled him often to promote her cause. Through- out the revolutionary movements of 1848-1849, and again during the campaign of 1859 and the subsequent transactions due to the union of Naples to the kingdom of upper Italy, Panizzi was in constant communication with the Italian patriots and their confidential representative with the English ministers. He laboured, according to circumstances, now to excite, now to mitigate, the English jealousy of France; now to moderate their apprehensions of revolutionary excesses; now to secure en- couragement or connivance for Garibaldi. The letters addressed to him by patriotic Italians, edited by his literary executor and biographer, L. Fagan, alone compose a thick volume. He was charitable to his exiled countrymen in England, and, chiefly at his own expense, equipped a steamer, which was lost at sea, to rescue the Neapolitan prisoners of state on the island of Santo Stefano. His services were recognized by the offer of a senator- ship and of the direction of public instruction in Italy; these offers he declined, though in his latter years he frequently visited the land of his birth.

His administrative faculty was extraordinary: to the widest grasp he united the minutest attention to matters of detail. By introducing great ideas into the management of the museum he not only redeemed it from being a mere show-place, but raised the standard of library administration all over England. His moral character was the counterpart of his intellectual: he was warm-hearted and magnanimous; extreme in love and hate — a formidable enemy, but a devoted friend. His intimate friends included Lord Palmerston, Gladstone, Roscoe, Grenville, Macaulay, Lord Langdale and his family, Rutherfurd (lord advocate), and, above all perhaps, Francis Haywood, the translator of Kant. His most celebrated friendship, however, is that with Prosper Merim6e, who, having begun by seeking to enlist his influence with the English government on behalf of Napoleon III., discovered a congeniality of tastes which produced a delightful correspondence. Merimee's part has been published by Fagan; Panizzi's perished in the conflagration kindled by the Paris commune.

See Fagan, Life of Sir Anthony Panizzi (Lon/, 1880). (R. G.)

PANJABI (properly Panjabi), the language of the Central Punjab (properly Panjab). It is spoken by over 71,000,000 people between (approximately speaking) the 77th and 74th degrees of east longitude. The vernacular of this tract was originally an old form of the modern Lahnda, a member of the outer group of Indo- Aryan languages (q.v.),

but it has been overlaid by the expansion of the midland Sauraseni Prakrit (see Prakrit) to its east, and now belongs to the intermediate group, possessing most of the characteristics of the midland language, with occasional traces of the old outer basis which become more and more prominent as we go westwards. At the 74th degree of east longitude we find it merging into the modern Lahnda. The language is fully described in the article Hindostani.

PANJDEH, or Penjdeh, a village of Russian Turkestan, rendered famous by " the Panjdeh scare " of 1885. It is situated on the east side of the Kushk river near its junction with the

Murghab at Pul-i-Khishti. In March 1885 when the Russo- Afghan Boundary Commission should have been engaged in settling the boundary-line, this portion of it was in dispute between the Afghans and the Russians. A part of the Afghan force was encamped on the west bank of the Kushk, and on the 29th of March General Komarov sent an ultimatum demanding their withdrawal. On their refusal the Russians attacked them at 3 a.m. on the 30th of March and drove them across the Pul-i- Khishti Bridge with a loss of some 600 men. The incident nearly give rise to war between England and Russia; but the amir Abdur-Rahman, who was present at the Rawalpindi conference with Lord Dufferin at the time, affected to regard the matter as a mere frontier scuffle. The border-line subse- quently laid down gives to Russia the corner between the Kushk and Murghab rivers as far as Maruchak on the Murghab, and the Kushk post has now become the frontier post of the Russian army of occupation.

PANNA, or Punna, a native state of Central India, in the Bundelkhand agency. Area, 2492 sq. m.; pop. (1901), 192,986, showing a decrease of 19% in the preceding decade due to famine; tribute £33,000. The chief, whose title is maharaja, is a rajput of the Bundela clan, descended from Chhatar Sal, the champion of the independence of Bundelkhand in the 18th century. The maharaja Lokpal Singh died in 1898, leaving an only son, Madho Singh, who, in 1902, was found guilty by a special commission on the charge of poisoning his uncle, and was deposed. The diamond mines, for which the state was formerly famous, are now scarcely profitable. There are no railways, but one or two good roads. The town of Panna is 62 m. S. of Banda. Pop. (1901), 11,346. It has a fine modern palace and several handsome temples and shrines.

PANNAGE (O. Fr. pasnage, from Med. Lat. pasnagium, pasnaticum for pastionaticum, pascio; pascere, to feed), an English legal term for the feeding of swine in a wood or forest, hence used of a right or privilege to do this. The word is also used generally of the food, such as acorns, beech-mast, &c, on which the swine feed.

PANNIER (Fr. panier, Lat. panarium, a basket for carrying bread, panis), a basket for carrying *bread or other provisions; more especially a broad, fiat basket, generally slung in pairs across a mule, pony or ass for transport. The term has also been applied to an overskirt in a woman's dress attached to the back of the bodice and draped so as to give a " bunchy " appearance. At various times in the history of costume this appearance has been produced by a framework of padded whalebone, steel, &c, used to support the dress, such frameworks being known as " panniers." At the Inns of Court, London, there was formerly an official known as a " pannier man," whose duties were concerned with procuring provisions at market, blowing the horn before meals, &c. The office has been in many of the inns long obsolete, and was formally abolished at the Inner Temple in 1900. At the Inner Temple the robed waiters in hall have been called " panniers," and apparently were in some way connected with the officer above mentioned, but the proper duties of the two were in no way identical.

PANNONIA, in ancient geography a country bounded north and east by the Danube, conterminous westward with Noricum and upper Italy, and southward with Dalmatia and upper Moesia. It thus corresponds to the south-western part of Hungary, with portions of lower Austria, Styria, Carniola, Croatia, and Slavonia. Its original inhabitants (Pannonii, sometimes called Paeonii by the Greeks) were probably of Illyrian race. From the 4th century B.C. it was invaded by various Celtic tribes, probably survivors of the hosts of Brennus, the chief of whom were the Carni, Scordisci and Taurisci. Little is heard of Pannonia until 35 B.C., when its inhabitants, having taken up arms in support of the Dalmatians, were attacked by Augustus, who conquered and occupied Siscia (Sissek). The country was not, however, definitely subdued until 9 B.C., when it was incorporated with Illyria, the frontier of which was thus extended as far as the Danube. In a.d. 7 the Pannonians, with the Dalmatians and other Illyrian tribes, revolted, and. were

overcome by Tiberius and Germanicus, after a hard-fought campaign which lasted for two years. In a.d. 10 Pannonia was organized as a separate province — according to A. W. Zumpt (Studia romana), not till a.d. 20; at least, when the three, legions stationed there mutinied

after the death of Augustus (a.d. 14), Junius Blaesus is spoken of by Tacitus {Annals, i. 16) as legate of Pannonia and commander of the legions. The proximity of dangerous barbarian tribes (Quadi, Marcomanni) necessitated the presence of a large number of troops (seven legions in later times), and numerous fortresses were built on the bank of the Danube. Some time between the years 102 and 107, which marked the termination of the first and second Dacian wars, Trajan divided the province into Pannonia superior [f] tow), the western, and inferior (17 KctTco),the eastern portion. According to Ptolemy, these divisions were separated by a line drawn from Arrabona (Raab) in the north to Servitium (Gradiska) in the south; later, the boundary was placed farther east. The whole country was sometimes called the Pannonias (Pannoniae). Pannonia, superior was under the consular legate, who had formerly administered the single province, and had three legions under his control : Pannonia inferior at first under a praetorian legate with a single legion as garrison, after Marcus Aurelius under a consular legate, still with only one legion. The frontier on the Danube was protected by the establishment of the two colonies Aelia Mursia (Esse) and Aelia Aquincum (Alt-Ofen, modern Buda) by Hadrian.

Under Diocletian a fourfold division of the country was made. Pannonia inferior was divided into (1) Valeria (so called from Diocletian's daughter, the wife of Galerius), extending along the Danube from Altinum (Mohacs) to Brigetio (O-Szony), and (2) Pannonia secunda, round about Sirmium (Mitrovitz) at the meeting of the valleys of the Save, Drave, and Danube. Pannonia superior was divided into (3) Pannonia prima, its northern, and (4) Savia (also called Pannonia ripariensis) , its southern part. Valeria and Pannonia prima were under a praeses and a dux; Pannonia secunda under a consularis and a dux; Savia under a dux and, later a corrector. In the middle of the 5th century Pannonia was ceded to the Huns by Theodosius II., and after the death of Attila successively passed into the hands of the Ostrogoths, Longobards (Lombards), and Avars.

The inhabitants of Pannonia are described as brave and warlike, but cruel and treacherous. Except in the mountainous districts, the country was fairly productive, especially after the great forests had been cleared by Probus and Galerius. Before that time timber had been one of its most important exports. Its chief agricultural products were oats and barley, from which the inhabitants brewed a kind of beer named sabaea. Vines and olive-trees were little cultivated, the former having been first introduced in the neighbourhood of Sirmium by Probus. Saliunca (Celtic, nard) was a common growth, as in Noricum. Pannonia was also famous for its breed of hunting-dogs.

Although no mention is made of its mineral wealth by the ancients, it is probable that it contained iron and silver mines. Its chief rivers were the Dravus (Drave), Savus (Save), and Arrabo (Raab), in addition to the Danuvius (less correctly, Danubius), into which the first three rivers flow.

The native settlements consisted of pagi (cantons) containing a number of vici (villages), the majority of the large towns being of Roman origin. In Upper Pannonia were Vindobona (Vienna), probably founded by Vespasian; Carnuntum (q.v., Petronell); Arrabona (Raab), a considerable military station; Brigetio; Savaria or Sabaria (Stein-am-Anger), founded by Claudius, a frequent residence of the later emperors, and capital of Pannonia prima; Poetovio (Pettau); Siscia, a place of great importance down to the end of the empire; Emona (Laibach), later assigned to Italy; Nauportus (Ober-Laibach). In Lower Pannonia were Sirmium, first mentioned in a.d. 6, also a frequent residence of the later emperors; Sopianae (Fiinfkirchen) , seat of the praeses of Valeria, and an important place at the meeting of five roads; Aquincum, the residence of the dux of Valeria, the seat of legio iy adjutrix.

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See J. Marquardt, Rdmische.Staatsverwa.Uung, i. (2nded., 1881), 291 ; Corpus inscriptionum latinarum, iii. 415; G. Zippel, Die romische Herrschaft in IUyrien (Leipzig, 1877) ; Mommsen, Provinces of the Roman Empire (Eng. trans.), i- 22, 38; A. Forbiger, Handbuch der alten Geographic von Europa (Hamburg, 1877); article in Smith's Dictionary of Greek and Roman Geography, ii. (1873) ; Ptolemy, ii. 15, 16; Pliny, Nat. Hist. ii. 28; Strabo vii. 313; Dio Cassius xlix. 34-38, liv. 31-34, lv. 28-32; Veil Pat. ii. no.

PANOPLY, a complete suit of armour. The word represents the Gr. TrawjrXia (iras, all, and &ir\a, arms), the full armour of a hoplite or heavy-armed soldier, i.e. the shield, breastplate, helmet and greaves, together with the sword and lance. As applied to armour of a later date, " panoply " did not come into use till the end of the 16th and beginning of the 17th century, and was then used of the complete suits Of plate-armour covering the whole body. The figurative use of the word is chiefly due to the phrase 17 iravow\la tov Qeov, " the whole armour of God " (Eph. vi. 11).

PANORAMA (Gr. irav, all, and opa.ua, view), the name given

originally to a pictorial representation of the whole view visible from one point by an observer who in turning round looks successively to all points of the horizon. In an ordinary picture only a small part of the objects visible from one point is included, far less being generally given than the eye of the observer can take in whilst stationary. The drawing is in this case made by projecting the objects to be represented from the point occupied by the eye on a plane. If a greater part of a landscape has to be represented, it becomes more convenient for the artist to suppose himself surrounded by a cylindrical surface in whose centre he stands, and to project the landscape from this position on the cylinder. In a panorama such a cylinder, originally of about 60 ft., but now extending to upwards of 130 ft. diameter, is covered with an accurate representation in colours of a land- scape, so that an observer standing in the centre of the cylinder sees the picture like an actual landscape in nature completely surround him in all directions. This gives an effect of great reality to the picture, which is skilfully aided in various ways. The observer stands on a platform representing, say, the flat roof of a house, and the space between this platform and the picture is covered with real objects which gradually blend into the picture itself. The picture is lighted from above, but a roof is spread over the central platform so that no light but that reflected from the picture reaches the eye. To make this light appear the more brilliant, the passages and staircase which lead the spectator to the platform are kept nearly dark. These panoramas, suggested by a German architectural painter named Breisig, were first executed by Robert Barker, an Edinburgh artist, who exhibited one in Edinburgh in 1788, representing a view of that city. A view of London and views of sea fights and battles of the Napoleonic wars followed, Panoramas gained less favour on the continent of Europe, until, after the Franco-German War, a panorama of the siege of Paris was exhibited in Paris. Since then some notable panoramas have been on view in the cities of Europe and America.

The name panorama, or panoramic view, is also given to drawings of views from mountain peaks or other points of view, such as are found in many hotels in the Alps, or, ˆn a smaller scale, in guide-books to Switzerland and other mountainous districts. In photography a panoramic camera is one which enables a wide picture to be taken.

PANPSYCHISM (Gr. tt&v, all; \pvxv, soul), a philosophical term applied to any theory of nature which recognizes the existence of a psychical element throughout the objective world. In such theories not only animals and plants but even the smallest particles of matter are regarded as having some rudimentary kind of sensation or ” soul,” which plays the same part in relation to their objective activities or

modifications as the soul does in the case of human beings. Such theories are the modern scientific or semi-scientific counterparts of the primitive animism of savage races, and may be compared with the hylozoism of the Greek physicists. In modern times the chief exponents of panpsychist views are Thomas Carlyle,

Fechner and Paulsen: a similar idea lay at the root of the physical theories of the Stoics.

PANSY, or Heartsease. This flower has been so long cultivated that its source is a matter of uncertainty. As we now see it, it is a purely artificial production, differing considerably from any wild plant known. It is generally supposed to be merely a cultivated form of Viola tricolor (see Violet), a corn- field weed, while others assert it to be the result of hybridiza- tion between V. tricolor and other species such as V. altaica, V. grandifiora, &c. Some experiments of M. Carriere go to show that seeds of the wild V. tricolor will produce forms so like those of the cultivated pansy that it is reasonable to assume that that flower has originated from the wild plant by continuous selection. The changes that have been effected from the wild type are,

Wild Pansy {Viola tricolor), about half nat. size.

1, Stamen, with spur. 3, Transverse section of same.

2, Pistil, after fertilization, cut 1-3 enlarged, lengthwise, showing the numer- ous parietally attached ovules.

however, more striking to the eye than really fundamental. Increase in size, an alteration in form, by virtue of which the narrow oblong petals are converted into circular ones, and variations in the intensity and distribution of the colour — these are the changes that have been wrought by continued selection, while the more essential parts of the flower have been relatively unaffected. The modern varieties of the pansy consist of the show varieties, and the fancy varieties, obtained from Belgium, and now very much improved. Show varieties are subdivided according to the colour of the flowers into selfs, white grounds and yellow grounds. The fancy or Belgian pansies have various colours blended, and the petals are blotched, streaked or edged. The bedding varieties, known as violas or tufted pansies, have been raised by crossing the pale-blue Viola cornula, and also V. lutea, with the show pansies. They are hardier than the true pansies and are free-blooming sorts marked rather by effectiveness of colour in the mass than by quality in the individual flower; they are extremely useful in spring and summer flower-gardening.

The pansy flourishes in well enriched garden soil, in an open but coo! situation, a loamy soil being preferable. Cow-dung is the best manure on a light soil. The established sorts are increased by cuttings, whilst seeds are sown to procure novelties. The cuttings, which should consist by preference of the smaller non-flowering growths from the base of the plant, may be inserted early in Sep- tember, in sandy soil, under a hand-light or in boxes under glass, and

as soon as rooted should be removed to a fresh bed of fine sandy soil. The seeds may be sown in July, August or September. The bed may be prepared early in September, to be in readiness for planting, by being well manured with cow-dung and trenched up to a depth of 2 ft. The plants should be planted in rows at about a foot apart. In spring they should be mulched with half-rotten manure, and the shoots as they lengthen should be pegged down into this enriched surface to induce the fonmation of new roots. If the blooms show signs of exhaustion by the inconstancy of their colour or marking, all the flowers should be picked off, and this top-dressing and pegging- down process performed in a thorough manner, watering in dry weather, and keeping as cool as possible. Successional beds may be put in about February, the young plants being struck later, and wintered in cold frames. The fancy pansies require similar treatment, but are generally of a more. vigorous constitution.

When grown in pots in a cold frame, about half a dozen shoots filling out a 6-in. pot, pansies are very handsome decorative objects. The cuttings should be struck early in August, and the plants shifted into their blooming-pots by the middle of October; a rich open loamy compost is necessary to success, and they must be kept free of aphides. Both the potted plants and those grown in the open beds benefit by the use of liquid manure.

PANTAENUS, head of the catechetical school at Alexandria, c. a.d. 180-200, known chiefly as having been the master of Clement, who succeeded him, and of Alexander, bishop of Jerusalem. Clement speaks of him as the ” Sicilian bee,” but of his birth and death nothing is known. Eusebius and Jerome speak of him as having been, originally at least, a Stoic, and as having been sent, on account of his zeal and learning, as a mis- sionary to ” India.” There is some reason to think that this means the Malabar coast. There was a considerable intercourse between south India and the east Mediterranean at the

time, and Christian thought possibly did something to mould the great system of Tamil philosophy known as the Saiva Siddhanta. Pantaenus ” expounded the treasures of divine doctrine both orally and in writing,” but only a few brief reminiscences of his teaching are extant (see Routh, Rel. sac. i. 375-383). Lightfoot suggests that the conclusion of the well-known Epistle to Diog- netus, chs. 11, 12, may be the work of Pantaenus. Clement thought highly of his abilities, and Origen appeals to his authority in connexion with the inclusion of philosophy in the theological course.

PANTALOON (Ital. pantalone), a character in the old Italian popular comedy, said to represent a Venetian, from the favourite Venetian saint San Pantaleone, and transferred from it to pantomime (q.v.). The Italian pantaloon was always a silly old man with spectacles and wearing slippers, and his character was maintained in pantomime and has also made his name a synonym for a tottering dotard, as in Shakespeare’s As You Like It (11. vii. 158). From the Venetian usage the word “panta- loon ” (whence ” pants “) has aiso been given to certain forms of garment for the legs, the exact meaning varying at different times.

PANTECHNICON, an invented word, from Gr. iras, all, and tcxvlkos, of or belonging to the arts (rexvac), originally used as the name of a bazaar in which all kinds of artistic work was sold; it was established in Motcomb Street, Belgrave Square, London, early in the 19th century, but failed and was turned into a furniture depository, in which sense the word has now passed into general usage. The large vans used for removing furniture are hence known as pantechnicon vans or pantech- nicons simply.

PANTELLERIA, or Pantalaria (ancient Cossyra l),z,ia. island in the Mediterranean, 62 m. S. by W. of the south-western extremity of Sicily, and 44 m. E. of the African coast, belonging to the Sicilian province of Trapani. Pop. (1901), 8683. It is entirely of volcanic origin, and about 45 sq. m. in area; the highest point, an extinct crater, is 2743 ft. above sea-level. Hot mineral springs and ebullitions of steam still testify to the presence of volcanic activity. The island is fertile, but lacks fresh water. The principal town (pop. about 3000) is on the north-west, upon the only harbour (only fit for small steamers), which is fortified. There is also a penal colony here. The island can be reached by steamer from Trapani, and lies close to the main route from east to west through the Mediterranean. In 1905 about 300,000 1 The name is Semitic, but its meaning is uncertain.

gallons of wine (mostly sweet wine), and 1900 tons of dried raisins, to

the value of £34,720, were exported.

On the west coast, 2 m. south-east of the harbour, a neolithic village was situated, with a rampart of small blocks of obsidian, about 25 ft. high, 35 ft. wide at the base, and 16 at the top, upon the undefended eastern side: within it remains of huts were found, with pottery, tools of obsidian, &c. The objects dis- covered are in the museum at Syracuse. To the south-east, in the district known as the Cunelie, are a large number of tombs, known as sesi, similar in character to the nuraghi of Sardinia, though of smaller size, consisting of round or elliptical towers with sepulchral chambers in them, built of rough blocks of lava. Fifty-seven of them can still be traced. The largest is an ellipse of about 60 by 66 ft., but most of the sesi have a diameter of 20-2 5 ft. only. The identical character of the pottery found in the sesi with that found in the prehistoric village proves that the former are the tombs of the inhabitants of the latter. This population came from Africa, not from Sicily, and was of Iberian or Ibero-Ligurian stock. After a considerable interval, during which the island probably remained uninhabited, the Cartha- ginians took possession of it (no doubt owing to its importance as a station on the way to Sicily) probably about the beginning of the 7th century B.C., occupying as their acropolis the twin hill of San Marco and Sta Teresa, 1 m. south of the town of Pantelleria, where there are considerable remains of walls in rectangular blocks of masonry, and also of a number of cisterns. Punic tombs have also been discovered, and the votive terra-cottas of a small sanctuary of the Punic period were found near the north coast.

The Romans occupied the island as the Fasti Triumphales record in 255 B.C., lost it again the next year, and recovered it in 217 B.C. Under the Empire it served as a place of banishment for prominent persons and members of the imperial family. The town enjoyed municipal rights. In 700 the Christian population was annihilated by the Arabs, from whom the island was taken in 1 1 23 by Roger of Sicily. In 13 n a Spanish fleet, under the command of Requesens, won a considerable victory here, and his family became princes of Pantelleria until 1553, when the town was sacked by the Turks.

See Orsi, ” Pantelleria ” (in Monumenti dei Lincei 1899, ‘ x – 193-284). (T. As.)

PANTHEISM (Gr. irav, all, debs, god), the doctrine which identifies the universe with God, or God with the universe. 2 The term ” pantheist ” was apparently first used by John Toland in 1705, and it was at once adopted by French and English writers. Though the term

is thus of recent origin, the system of thought or attitude of mind for which it stands may be traced back both in European and in Eastern philosophy to a very early stage. At the same time pantheism almost necessarily presupposes a more concrete and less sophisticated conception of God and the universe. It presents itself historically as an intellectual revolt against the difficulties involved in the presupposition of theistic and polytheistic systems, and in philosophy as an attempt to solve the dualism of the one and the many, unity and difference, thought and extension. Thus the pious Hindu, confronted by the impossibility of obtaining perfect knowledge by the senses or by reason, finds his sole perfection in the contemplation of twe infinite (Brahma). In Greece the idea of a fundamental unity behind the plurality of phenomena was present, though vaguely, in the minds of the early physicists (see Ionian School), but the first thinker who focussed the problem clearly was Xeno- phanes. Unlike the Hindu, Xenophanes inclined to pantheism as a protest against the anthropomorphic polytheism of the time, which seemed to him improperly to exalt one of the many modes of finite existence into the place of the Infinite. Thus Xenophanes for the first time postulates a supreme God whose

2 Strictly, pantheism is to identify the universe with God, while the term ” pancosmism” (irav, nbanos, the universe) has frequently been used for the identification of God with the universe. For practical purposes this refinement is of small value, the two ideas being aspects of the same thing; cf. A. M. Fairbairn, Studies in Philos. Relig. Hist. (1877), p. 392. Both ” Atheism ” (q.v.) and ” Acosmism ” are used as contradictories.

characteristic is primarily the negation of the Finite. A similar metaphysic from a different starting-point is found in Heraclitus, .who postulates behind the perpetually changing universe of phenomena a One which remains. This attitude towards existence, expressing itself in different phraseology, has been prominent to a greater or less degree since Xenophanes and Heraclitus. Thus the metaphysic of Plato finds reality only in the ” Idea,” of which all phenomena are merely imperfect copies. Neoplatonism (and especially Plotinus) adopted a similar atti- tude. The Stoics, with the supreme object of giving to human life a definite unity and purpose, made the individual a part of the universe and sought to obliterate all differences. The uni- verse to them is a manifestation of divine reason, while all things come from

and return to (the odds avw koltu) the TTvaifxa. Scairvpov, the ultimate matter. The same problems in a different context confronted the monotheistic religions of Judaism and Chris- tianity. We find Philo Judaeus endeavouring to free the concept of the Old Testament Yahweh from anthropomorphic character- istics and finite determinations. But though Philo sees the difficulties of the orthodox Judaism he cannot accept pantheism or mysticism so far as to give up the personality of God (see Logos).

With Neoplatonism we enter upon a somewhat different though closely allied attitude of mind. To Plotinus God lies beyond sense and imagination: all the theologian can do is to point the way in which the thinker must travel. Though the spirit and the language of Plotinus is closely allied to that of pantheism, the result of his thinking is not pantheism but mysticism. This may be briefly illustrated by a comparison with the greatest of modern pantheists, Spinoza. To him God is the immanent principle of the universe — ” Deus sive Natura.” On the principle that everything which is determined (finite) is ” negated ” (” determinatio est negatio “), God, the ultimate reality must be entirely undetermined. To explain the universe Spinoza proceeds to argue that God, though undetermined ah extra, is capable of infinite self-determination. Thus God, the causa sui, manifests himself in an infinite multiplicity of particular modes. Spinoza is, therefore, both pantheist and pancosmist: God exists only as realized in the cosmos: the cosmos exists only as a manifestation of God. Plotinus, on the other hand, cannot admit any realization or manifestation of the Infinite: God is necessarily above the world — he has no attributes, and is unthinkable. Such a view is not pantheism but mysticism (q.v.), and should be compared with the theology of Oriental races.

The semi-Oriental mysticism of the Neoplatonists and the Logos doctrines of the Stoics alike influence early Christian doctrine, and the pantheistic view is found frequently in medieval theology (e.g. in Erigena, Meister Eckhardt, Jakob Boehme). The Arabic scholar Averroes gave Aristotle to western Europe in a pantheistic garb, and thus influenced medieval scientists. So Bruno constructed a personified nature, and the scientific and humanistic era began. The pantheism of Spinoza, com- bining as it did the religious and the scientific points of view, had a wide influence upon thought and culture. Schelling (in his Identity-philosophy) and Hegel both carried on the panthe- istic tradition, which after Hegel broke up into two lines of thought, the one pantheistic the other atheistic.

From the religious point of view there are two main problems. The

first is to establish any real relation between the individual and God without destroying personality and with it the whole idea of human responsibility and free will: the second is to explain the infinity of God without destroying his personality. In what, seise can God be outside the world (see Deism): in what sense m it (pantheism) ? The great objection to pantheism is that, th mgh ostensibly it magnifies the Creator and gets rid of the difficult dualism of Creator and Creation, it tends prac- tically to deny his existence in any practical intelligible sense.

See, further, Theism; Deism; Atheism; Absolute.

PANTHEON (Lat. pantheum or pantheon; Gr. T6.vdei.ov, all- holy, from7ras, all, and Beds god), the name of two buildings in

Rome and Paris respectively; more generally, the name of any building in which as a mark of honour the bodies of the nation's famous men are buried, or " memorials " or monuments to them are placed. Thus Westminster Abbey is sometimes styled the British " Pantheon," and the rotunda in the Escorial where the kings of Spain are buried also bears the name. Near Regensburg (q.v.) is the pantheon of German worthies, known as the Valhalla. The first building to which the name was given was that built in Rome in 27 B.C. by Agrippa; it was burned later and the existing building was erected in the reign of Hadrian; since a.d. 609 it has been a Christian church, S Maria Rotunda. It was the Paris building that gave rise to the generic use of the term for a building where a nation's illustrious dead rest. The Pantheon in Paris was the church built in the classical style by Soufflot; it was begun in 1764 and consecrated to the patroness of the city, Sainte Genevieve. At the Revolution it was secularized under the name of Le Pantheon, and dedicated to the great men of the nation. It was reconsecrated in 1828 for worship, was again secularized in 1830, was once more a place of worship from 185 1 to 1870, and was then a third time secularized. On the entablature is inscribed the words Aux Grandes Hommes La Palrie Reconnais- sante. The decree of 1885 finally established the building for the purpose for which the name now stands.

PANTHER, another name for the leopard (q.v.), also used in America as the name of the puma (q.v.). The word is an adap- tation of Lat. panthera; Gr. iravd-qp, the supposed derivation of which from ttSs, all, and Qr\p, animal, gave rise to many tales and fables in medieval bestiaries and later scientific works. The panther was supposed to be a distinct animal from the pardus, pard, the leopard, to which also many legends were attached. In modern times a distinction had been

unscientifi- cally drawn between a larger type of leopard to which the name panther was given, and a smaller and more graceful specimen.

PANTIN, a town of northern France in the department of Seine, on the Canal d'Ourcq, adjoining the fortifications of Paris on the north-east. Pop. (1906), 32,604. The manufacture of boilers, railway wagons, machinery, oil, glass, chemicals, polish and perfumery, and the operations of dye-works, foundries and distilleries, represent some of the varied branches of its industrial activity. There is also a state-manufactory of tobacco.

PANTOGRAPH, or Pantagraph (from the Greek iravra, all, and ypaav, to write), an instrument for making a reduced, an enlarged, or an exact copy of a plane figure.

In its commonest form it consists of two long arms, AB and AC (fig. 1), jointed together at A, and two short arms, FD and FE, jointed together at F and with the long arms at D and E; FD is made exactly equal to AE and FE to AD, so that ADFE is a parallelo- gram whatever the angle at A. The instrument is supported parallel to the paper on castors, on which it moves freely- A tube is usually fixed vertically at c, near the ex- (tremity of the long arm AC, and similar tubes are mounted on plates which slide along the short arms BD and FD; they are intended to hold either the axle pin on a weighted fulcrum round which the instrument turns, or a steel pointer, or a pencil, interchangeably. When the centres of the tubes are exactly in a straight line, as on the dotted line bfc, the small triangle bfD will always be similar to the large triangle bcA ; and then, if the fulcrum is placed under b, the pencil at /, and the pointer at c, when the instrument is moved round the fulcrum as a pivot, the pencil and the pointer will move parallel to each other through distances which will be respectively in the proportion of bf to be ; thus the pencil at / draws a reduced copy of the map under the pointer at c ; if the pencil and the pointer were interchanged an enlarged copy would be drawn; if the fulcrum and pencil were interchanged, and the sliders set for / to bisect be, the map would be copied exactly. Lines are engraved on the arms BD and FD, to indicate the positions to which the sliders must be set for the ratios 5, f. . ., which are commonly required.

The square pantograph of Adrian Gavard consists of two graduated arms which are pivoted on a plain bar and connected by a graduated bar sliding between them throughout their entire length, to be set

Fig. i.

at any required distance from the plain bar; a sliding plate carrying a vertical tube, to hold either the axle of the fulcrum, the pencil, or the pointer, is mounted on one of the arms and on a prolongation of the plain bar beyond the other arm, and also on the graduated connecting bar ; and an additional arm is provided by means of which reductions below or enlargements above the scales given on the instrument can be readily effected.

The eidograph (Gr. eTSos, form) is designed to supersede the pantograph, which is somewhat unsteady, having several supports and joints. It is composed of three graduated bars, one of which is held over a fulcruna and carries the others, which are lighter, one at each extremity. The three bars are movable from end to end in box-sockets, each having an index and a vernier in contact with the graduated scale. The box-socket of the principal bar turns round the vertical axle of the fulcrum; that of each side bar is attached to a vertical axle, which also carries a grooved wheel of large diameter and turns in a collar at either end of the principal bar. The two wheels are of exactly the same diameter and are connected by a steel band fitting tightly into the grooves, so that they always turn together through identical arcs; thus the side bars over which they are respectively mounted, when once set parallel, turn with them and always remain parallel. A pointer is held at the end of one of the side bars and a pencil at the diagonally opposite end of the other. The bars may be readily set by their graduated scales to positions in which the distances of the pencil and the pointer from the fulcrum will always be in the ratio of the given and the required map scales.

Numerous other modifications have been proposed from time to time; many forms are described in G. Pellehn's Der Pantograph (Berlin, 1903).

PANTOMIME, a term which has been employed in different senses at different times in the history of the drama. Of the Roman pantomimus, a spectacular kind of play in which the functions of the actor were confined to gesticulation and dancing, while occasional music was sung by a chorus or behind the scenes, some account is given under Drama. In Roman usage the term was applied both to the actor of this kind of play and to the play itself; less logically, we also use the term to signify the method of the actor when confined to gesticulation. His- torically speaking, so far as the Western drama is

concerned there is no intrinsic difference between the Roman pantomimus and the modern ” ballet of action,” except that the latter is accompanied by instrumental music only, and that the per- sonages appearing in it are not usually masked. The English ” dumb-show,” though fulfilling a special purpose of its own, was likewise in the true sense of the word pantomimic. The modern pantomime, as the word is still used, more especially in connexion with the English stage, signifies a dramatic enter- tainment in which the action is carried on with the help of spectacle, music and dancing, and in which the performance of M»at action or of its adjuncts is conducted by certain conventional characters, originally derived from Italian “masked comedy,” itself an adaptation of the fabulae Aiellanae of ancient Italy. Were it not for this addition, it would be difficult to define modern pantomime so as to distinguish it from the masque; and the least rational of English dramatic species would have to be regarded as essentially identical with another to which English literature owes some of its choicest fruit.

The contributory elements which modern pantomime contains very speedily, though in varying proportions and manifold combinations, introduced themselves into the modern drama as it had been called into life by the Renaissance. In Italy the transition was almost imperceptible from the pastoral drama to the opera; on the Spanish stage ballets with allegorical figures and military spectacles were known towards the close of the 1 6th century; in France ballets were introduced in the days of Marie de’ Medici, and the popularity of the opera was fully established in the earlier part of the reign of Louis XIV. The history of these elements need not be pursued here, but there if a special ingredient in modern pantomime of which something more has to be said. From the latter part of the 16th century (Henry III. in 1596, sought to divert the dreaded states-general at Blois by means of the celebrated Italian com- pany of the Gelosi) professional Italian comedy (commedia dell’ arte, called commedia all’ improviso only because of the skill with which the schemes of its plays were filled up by improvisation) had found its way to Paris with its merry company of characters,

partly corresponding to the favourite types of regular comedy both ancient and modern, but largely borrowed from the new species of masked comedy — so called from its action being carried on by certain typical figures in masks — said to have been invented earlier in the same century by Angelo Beolco (Ruzzante) of Padua. These types, local in origin, included Pantalone the Venetian merchant, who survives in the uncommercial Pantaloon, the Bolognese Dottore. The Zannis (Giovannis) were the do- mestic servants in this species of

comedy, and included among other varieties the Arlecchino. This is by far the most interest- ing of these types, and by far the best discussed. The Arlecchino was formerly supposed to have been, like the rest, of Italian origin. The very remarkable contribution (cited below) of Dr Otto Driesen to the literature of folk-lore as well as to that of the stage seems however to establish the conclusion (to which earlier conjectures pointed) that the word Harlequin or Herlequin is of French origin, and that the dramatic figure of Harlequin is an evolution from the popular tradition of the harlekin-folk, mentioned about the end of the nth century by the Norman Ordericus Vitalis. The ” damned souls ” of legend became the comic demons of later centuries, the croque-sots with the devil’s mask; they left the impress of their likeness on the hell-mouth of the religious drama, but were gradually humanized as a favourite type of the Parisian popular street-masques (charivaris) of the 14th and 15th centuries. Italian literature contains only a single passage before, the end of the 16th century which can be brought into any connexion with this type — the alichino (cat’s back) of canto xxi. of the Inferno. The French harle-quin was, however, easily adopted into the family of Italian comedy, where he may, like his costume, 1 have been associated with early national traditions, and where he continued to diverge from his fellow Zannis of the stolid sort, the Scapin of French comedy-farce. From the time of the performances in France of the celebrated Fedeli company, which played there at intervals from the beginning to the middle of the 17th century onwards, performing in a court ballet in 1636, Tristran Martinelli had been its harlequin, and the character thus preceded that of the Parisian favourite Trivelin, whose name Cardinal de Retz was fond of applying to Cardinal Mazarin. There can be no pretence here of pursuing the French harlequin through his later develop- ments in the various species of the comic drama, including that of the marionettes, or of examining the history of his supersession by Pierrot and of his ultimate extinction.

Students of French comedy, and of Moliere in particular, are aware of the influence of the Italian players upon the progress of French comedy, and upon the works of its incomparable master. In other countries, where the favourite types of Italian popular comedy had been less generally seen or were unknown, popular comic figures such as the English fools and clowns, the German Hanswurst, or the Dutch Pickelhering, were ready to renew themselves in any and every fashion which preserved to them the gross salt favoured by their patrons. Indeed, in Germany, where the term pantomime was not used, a rude form of dramatic buffoonery, corresponding to the coarser sides of the modern English species so-called, long flourished,

and threw back for centuries the progress of the regular drama. The banishment of Hanswurst from the German stage was formally proclaimed by the famous actress Caroline Neuber at Leipzig in a play composed for the purpose in 1737. After being at last suppressed, it found a commendable substitute in the modern Zauberposse, the more genial Vienna counterpart of the Paris f eerie and the modern English extravaganza.

In England, where the masque was only quite exceptionally revived after the Restoration, the love of spectacle and other frivolous allurements was at first mainly met by the various forms of dramatic entertainment which went by the name of ” opera.” In the preface to Albion and Albanius (1685), Dryden gives a definition of opera which would fairly apply to modern extravaganza, or to modern pantomime with the harlequinade

1 The traditional costume of the ancient Roman mimi included the centunculus or variegated (harlequin’s) jacket, the shaven head, the sooty face and the unshod feet.

left out. Character-dancing was, however, at the same time largely introduced into regular comedy; and, as the theatres vied with one another in seeking quocunque modo to gain the favour of the public, the English stage was fully prepared for the innovation which awaited it. Curiously enough, the long-lived but cumbrous growth called pantomime in England owes its immediate origin to the beginnings of a dramatic species which has artistically furnished congenial delight to nearly two centuries of Frenchmen. Of the early history of vaudeville it must here suffice to say that the unprivileged actors, at the fairs, who had borrowed some of the favourite character-types of Italian popular comedy, after eluding prohibitions against the use by them of dialogue and song, were at last allowed to setup a comic opera of their own. About the second quarter of the 18th century, before these performers were incorporated with the Italians, the light kind of dramatic entertainment combining pantomime proper with dialogue and song enjoyed high favour with the French and their visitors during this period of peace. The vaudeville was cultivated by Le Sage and other writers of mark,, though it did not conquer an enduring place in dramatic litera- ture till rather later, when it had, moreover, been completely nationalized by the extension of the Italian types.

It was this popular species of entertainment which, under the name of pantomime, was transplanted to England before in France it had attained to any fixed form, or could claim for its productions any place in dramatic literature. Colley Cibber mentions as the first example, followed by ” that Succession of monstrous< Medlies," a piece on the story of Mars and Venus, which was still in dumb-show; for he describes it as " form'd into a connected Presentation of Dances in Character, wherein the Passions were so happily expressed, and the whole Story so intelligibly told, by a mute Narration of Gesture only, that even thinking Spectators allow'd it both a pleasing and a rational Entertainment." There is nothing to show that Harlequin and his companions figured in this piece. Genest, who has no record of it, dates the period when such entertainments first came into vogue in England about 1723. In that year the pantomime of Harlequin Dr Faustus had been produced at Drury Lane — its author being John Thurmond, a dancing master, who afterwards (in 1727) published a grotesque entertainment called The Miser, or Wagner and Abericock (a copy of this is in the Dyce Library). Hereupon, in December 1723, John Rich (1692-1761), then lessee of the theatre in Lincoln's Inn Fields, produced there as a rival pantomime The Necromancer, or History of Dr Faustus, no doubt, says Genest, " gotten up with superior splendour." He had as early as 1717 been connected with the production of a piece called Harlequin Executed, and there seem traces of similar entertainments as far back as the year 1 700. But it was the inspiriting influence of French example and the keen rivalry between the London houses, which in 1723 really established pantomime on the English stage. Rich was at the time fighting a difficult battle against Drury Lane, and his pantomimes at Lincoln's Inn Fields, and afterwards at Covent Garden, were extraordinarily successful. He was himself an inimitable harlequin, and from Garrick's lines in his honour it appears that his acting consisted of " frolic gestures " without words. The favourite Drury Lane harlequin was Pinkethman (Pope's " poor Pinky ") ; readers of the Taller (No. 188) will remember the ironical nicety with which his merits are weighed against those of his competitor Bullock at the other house. Colley Cibber, when described by Pope as " mount- ing the wind on grinning dragons " briskly denied having in his own person or otherwise encouraged such fooleries; in his Apology, however, he enters into an elaborate defence of himself for having allowed himself to be forced into countenancing the " gin-shops of the stage," pleading that he was justified by necessity, as Henry IV. was in changing his religion. Another butt of Pope's, Lewis Theobald, was himself the author of more than one pantomime; their titles already run in the familiar fashion, e.g. A Dramatick Entertainment, catt'd Harlequin a Sorcerer,

with the Loves of Pluto and Proserpine (1725; the " book of the words," as it may be called, is in the Dyce Library). In

another early pantomime (also in the Dyce Library) called Perseus and Andromeda, with the Rape of Colombine, or The Flying Lovers, there are five ” interludes, three serious and two comic.” This is precisely in the manner of Fielding’s dramatic squib against pantomimes, Tumble-down Dick, or Phaeton in the Suds, first acted in 1744, and ironically dedicated to ” Mr John Lun,” the name that Rich chose to assume as harlequin. It is a capital bit of burlesque, which seems to have been directly suggested by Pritchard’s Fall of Phaeton, produced in 1736.

There seems no need to pursue further the history of English pantomime in detail. ” Things of this nature are above criticism,” as Mr Machine, the ” composer ” of Phaeton, says in Fielding’s piece. The attempt was made more than once to free the stage from the incubus of entertainments to which the public persisted in flocking; in vain Colley Cibber at first laid down the rule of never giving a pantomime together with a good play; in vain his son Theophilus after him advised the return of part of the entrance money to those who would leave the house before the pantomime began. ” It may be questioned,” says the chronicler, ” if there was a demand for the return of £20 in ten years.” Pantomime carried everything before it when there were several theatres in London, and a dearth of high dramatic talent prevailed in all; and, allowing for occasional counter- attractions of a not very dissimilar nature, pantomime continued to flourish after the Licensing Act of 1737 had restricted the number of London play-houses, and after Garrick’s star had risen on the theatrical horizon. He was himself obliged to satisfy the public appetite, and to disoblige the admirers of his art, in deference to the drama’s most imperious patrons— the public at large.

In France an attempt was made by Noverre (q.v.) to restore pantomime proper to the stage as an independent species, by treating mythological subjects seriously in artificial ballets. This attempt, which of course could not prove permanently successful, met in England also with great applause. In an anonymous tract of the year 1789 in the Dyce Library, attributed by Dyce to Archdeacon Nares (the author of the Glossary), Noverre’s pantomime or ballet Cupid and Psyche is commended as of very extraordinary merit in the choice and execution of the subject. It seems to have been without words. The writer of the tract states that ” very lately the serious pantomime has made a new advance in this country, and has gained establish- ment in an English theatre “; but he leaves it an open question whether the grand ballet of Medea and Jason (apparently pro- duced a few years

earlier, for a burlesque on the subject came out in i78i)was the first complete performance of the kind produced in England. He also notes The Death of Captain Cook, adapted from the Parisian stage, as possessing considerable dramatic merit, and exhibiting ” a pleasing picture of savage customs and manners.”

To conclude, the chief difference between the earlier and later forms of English pantomime seems to lie in the fact that in the earlier Harlequin pervaded the action, appearing in the comic scenes which alternated throughout the piece with the serious which formed the backbone of the story. Columbine (originally in Italian comedy Harlequin’s daughter) was generally a village maiden courted by her adventurous lover, whom village con- stables pursued, thus performing the laborious part of the police- man of the modern harlequinade. The brilliant scenic effects were of course accumulated, instead of upon the transformation scene, upon the last scene of all, which in modern pantomime follows upon the shadowy chase of the characters called the rally. The commanding influence of the clown, to whom pantaloon is attached as friend, flatterer and foil, seems to be of compara- tively modern growth; the most famous of his craft was un- doubtedly Joseph Grimaldi (1779-1837). His memory is above all connected with the famous pantomime of Mother Goose, produced at Covent Garden in 1806. The older British type of Christmas pantomime, which kept its place in London till the ‘seventies, has been preserved from oblivion in Thackeray’s Sketches and Travels in London. The species is not yet wholly I extinct; but, by degrees, the rise of the music-halls and the

popularity of a new type of music-hall performer influenced the character of the show which was given under the name of a Christmas pantomime at the theatres, and it became more of a burlesque ” variety entertainment,” dovetailed into a fairy play and with the ” harlequinade ” part (which had formed the closing scene of the older sort) sometimes omitted. The word had really lost its meaning. The thing itself survived rather in such occasional appearances of the Pierrot ” drama without words ” as charmed London playgoers in the early ‘nineties in such pieces as L’ Enfant prodigue.

Authorities. — For a general survey see K. F. F. Flogel, Geschichte des Grotesk-Komischen, revised ed. by F. W. Eveling (1867); A. Pougin, Dictionnaire historique et pittoresque du thedtre (Paris, 1885). As to

the commedia dell' arte, masked, comedy, in Italy and France, and their influence on French regular comedy, see L. Moland, Moli'ere et la comedie italienne (2nd ed., Paris, 1867) ; and O. Driesen's remarkable study, Der Ursprung des Harlekin (Berlin, 1904). As to the German Hanswurst and Hanswurstiaden, see G. Gervinus, Geschichte der deutschen Dichtung, vol. iii. (Leipzig, 1853) ; E. Devrient, Gesch. der deutschen Schauspielkunst, vol. ii. (Leip- zig, 1848);. and as to the German Harlequin, Lessing's Hamburgische Dramaturgie, no. 18 (1767), and the reference there to Justus Moser's Harlekin oder Vertheidigung des Grmesk-Komischen (1761). As to English pantomime, see Genest, Account of the English Stage (10 vols., Bath, 1832), especially vol. iii.; Dibdin, Complete History of the Stage (5 vols., London, 1800), especially vols, ii., iv., and v.; Apology for the Life of Colley Cibber, ed. R. W. Lowe (2 vols., London, 1889) : P. Fitzgerald, Life of Garrick (2 vols., London, 1868).

(A. W.W.)

PANTdN, a town of north-western Spain, in the province of Lugo; in a mountainous district, watered by the rivers Mino and Cabe. Pop. (1900), 12,988. Livestock is extensively reared, and large quantities of wheat, wine, oats and potatoes are produced. The other industries are distilling and linen manufacture. The nearest railway station is 6 m. east, at Montforte.

PANTRY (O. Fr. paneterie; Med. Lat. panetaria,.a. bread-shop, from panis, bread), originally a room in a house used for the storage of bread, hence " panter " or " pantler," an officer of a household in charge of the bread and stores. In the royal house- hold of England the office was merged in that of butler. At coronations the office of " panneter " was held by the lord of the manor of Kibworth Beauchamp; it was his duty to carry the salt-cellar and carving-knives to the royal table, and he kept these as his fee. The last holder of the office was Ambrose Dudley, son of John, duke of Northumberland, at Elizabeth's coronation. At his death the manor reverted to the Crown. " Pantry " was early widened in meaning to include a room in a house used for the storing of all kinds of food, and is now restricted to the butler's or parlourmaid's room, where plate, china, glass, &c, for. the use of the table is kept, and duties in connexion with the serving of the table are performed.

PANTUN (Pantoum), a form of verse of Malay origin. An imitation of the form has been adopted in French and also in English verse, where it is known as " pantoum." The Malay pantun is a quatrain, the first and third and the second and fourth lines of which rhyme. The

peculiarity of the verse-form resides in the fact that the first two lines have as a rule no actual connexion, in so far as meaning is concerned, with the two last, or with one another, and have for their raison d'etre a means of supplying rhymes for the concluding lines. For instance: —

Senudoh kayu di-rimba Benang karap ber-simpul piileh: Sunggoh dudok ber-tindek riba, Jangan di-harap kata-kan buleh.

The rhododendron is a wood of the jungle,

The strings within the frame-work of the loom are in a tangled

knot. It is true that I sit on thy lap,

But do not therefore cherish the hope that thou canst take any other liberty.

Here, it will be seen, the first two lines have no meaning, though according to the Malayan mind, on occasion, these " rhyme-making " lines are held to contain some obscure, symbolical reference to those which follow them. The Malay is not exacting with regard to the correctness of his rhymes,

and to his ear rimba and riba rhyme as exactly as piileh and buleh. It should also be noted that in the above example, as is not infrequently the case with the Malay pantun, there is a similar attempt at rhyme between the initial words of the lines as well as between the word with which they conclude, senudoh and sunggoh, benang and jangan, and karap and harap all rhyming to the Malayan ear There are large numbers of well-known pantun with which practically all Malays are acquainted, much as the commoner proverbs are familiar to us all, and it is not an infrequent practice in conversation for the first line of a pantun — viz.: one of the two lines to which no real meaning attaches — to be quoted alone, the audience being supposed to possess the necessary knowledge to fit on the remaining lines for himself and thus to discover the significance of the allusion. Among cultured Malays, more especially those living in the neighbourhood of the raja's court, new pantun are constantly being composed, many of them being of a highly topical character, and these improvisa- tions are quoted from man to man until they become current like the old, well-known verses, though within a far more restricted area. Often too, the pantun is used in love-making, but they are then usually composed for the exclusive use of the author and for the delectation of his lady-loves, and do not find their way into, the public stock of verses. " Capping " pantun is also a not uncommon pastime, and many Malays will continue such

con- tests for hours without once repeating the same verse, and often' improvising quatrains when their stock threatens to become exhausted. When this game is played by skilled versifiers, the pantun last quoted, and very frequently the second line thereof, is used as the tag on to which to hang the succeeding verse.

The " pantoum " as a form of verse was introduced into French by Victor Hugo in Les Orientates (1829). It was also practised by Theodore de Banville and Leconte de Lisle. Austin Dobson's In Town is an example of its use, in a lighter manner, in English. In the French and English imitation the verse form is in four-line stanzas, the second and fourth line of each verse forming the first and third of the next, and so on to the last stanza, where the first and third line of the first stanza form the second and fourth line. (H. Cl.)

PANYASIS (more correctly, Panyassis), of Halicarnassus, Greek epic poet, uncle or cousin of Herodotus, flourished about 470 B.C. He was put to death by the tyrant Lygdamis (c. 454). His chief poems were the Heracleias in 14 books, describing the adventures of Heracles in various parts of the world, and the Ionica in elegiacs, giving an account of the founding and settle- ment of the Ionic colonies in Asia Minor. Although not much esteemed in his own time, which was unfavourable to epic poetry, he was highly thought of by later critics, some of whom assigned him the next place to Homer (see Quintilian, Inst. oral. x. 1. 54). The few extant fragments show beauty and fullness of expression, and harmonious rhythm.

Fragments in G. Kinkel, Epic. poet, fragmenla (1877), ed. separ- ately by J. P. Tzschirner (1842); F. P. Funcke, De Panyasidis vita (1837) ; R. Krausse, De Panyasside (1891).

PAOLI, CESARE (1840-1902), Italian historian and palaeo- grapher, son of senator Baldassare Paoli, was born and educated in Florence. At the age of twenty-one he was given an appoint- ment in the record office of his native city; from 1865 to 1871 he was attached to the Archives of Sienna, but eventually returned to Florence. In 1874 he was appointed first professor of palaeo- graphy and diplomatics at the Istituto di Studii Superiori in Florence, where he continued to work at the interpretation of MSS. In 1887 he became editor of the Archivio storico italiano, to which he himself contributed numerous articles. His works consist of a large number of historical essays, studies on palaeo- graphy, transcriptions of state and other papers, reviews, &c.

See C. Lupi, " Cesare Paoli," in the Archivio storico italiano, vol. xxix. (1902), with a complete list of his works.

PAOLI, PASQUALE (1725-1807), Corsican general and patriot, was born at Stretta in the parish of Rostino. He was the son of Giacinto Paoli, who had led the Corsican rebels against Genoese tyranny. Pasquale followed his father into exile,

serving with distinction in the Neapolitan army; on his return to Corsica (q.v.) he was chosen commander-in-chief of the rebel forces, and after a series of successful actions he drove the Genoese from the whole island except a few coast towns. He then set to work to reorganize the government, introducing many useful reforms, and he founded a university at Corte. In 1767 he wrested the island of Capraia from the Genoese, who, despairing of ever being able to subjugate Corsica, again sold their rights over it to France. For two years Paoli fought desperately against the new invaders, until in 1769 he was de- feated by vastly superior forces under Count de Vaux, and obliged to take refuge in England. In 1789 he went to Paris with the permission of the constituent assembly, and was afterwards sent back to Corsica with the rank of lieutenant-general. Disgusted with the excesses of the revolutionary government and having been accused of treason by the Convention, he summoned a consulta, or assembly, at Corte in 1793, with himself as president and formally seceded from France. He then offered the suze- rainty of the island to the British government, but finding no support in that quarter, he was forced to go into exile once more, and Corsica became a French department. He retired to London in 1796, when he obtained a pension; he died on the 5th of February 1807.

See Boswell's Life of Johnson, and his Account of Corsica and Memoirs of P. Paoh (1768); N. Tommaseo, " Letteredi Pasquale de Paoli " (in Archivio storico italiano, 1st series, vol. xi.), and Delia Corsica, &c. (ibid., nuova serie, vol. xi., parte ii.) ; Pompei, De L'etat de la Corse (Paris, 1821) ; Giovanni Livi, Lettere inedite di Pasquale Paoli" (in Arch. stor. ital., 5th series, vols. v. and vi.) ; Bartoli, Historia di Pascal Paoli (Bastia, 1891) ; Lencisa, P. Paoli e la guerra d'indipen- denza della Corsica (Milano, 1890); and Comte de Buttafuoco, Frag- ments pour servir a I'histoire de la Corse de 1764 d. 1769 (Bastia, 1859).

PAPACY 1 (a term formed on the analogy of " abbacy" from Lat. papa, pope; cf. Fr. papaute on the analogy of royautS. Florence of Worcester, a.d. 1044, quoted by Du Cange s.v. Papa, has the Latin form papatia; the New Eng. Diet, quotes Gower, Conf. i. 258, as the earliest instance

of the word Papacie), the name most commonly applied to the office and position of the bishop or pope of Rome, in respect both of the ecclesiastical and temporal authority claimed by him, i.e. as successor of St Peter and Vicar of Christ, over the Catholic Church, and as sovereign of the former papal states. (See Pope and Roman Catholic Church.)

I. — From the Origins to 1087. The Christian community at Rome, founded, apparently, in the time of the emperor Claudius (41-54), at once assumed great The importance, as is clearly attested by the Epistle to

Primitive the Romans (58). It received later the visit of Paul Roman while a prisoner, and, according to a tradition which Church, j s now but little disputed, that of the apostle Peter. Peter died there, in 64, without doubt, among the Christians whom Nero had put to death as guilty of the burning of Rome. Paul's career was also terminated at Rome by martyrdom. Other places had been honoured by the presence and preaching of these great leaders of new-born Christianity; but it is at Rome that they had borne witness to the Gospel by the shedding of their blood; there they were buried, and their tombs were known and honoured. These facts rendered the Roman Church in the highest degree sacred. About the time that Peter and Paul died in Rome the primitive centre of Christianity — that is to say, Jerusalem — was disappearing amidst the disaster of the war of the Roman Empire with the Jews. Moreover, the Church of Jerusalem, narrowed by Jewish Christian particularism, was hardly qualified to remain the metropolis of Christianity, which was gradually gaining ground in the Graeco-Roman world. The true centre of this world was the capital of the Empire; the transference was. consequently accepted as natural at an early

1 This article is a general history in outline of the papacy itself. Special periods, or aspects are dealt with in fuller detail elsewhere, e.g._ in the biographical notices of the various popes, or in such articles as Church History ; Roman Catholic Church ; Investi- tures; Canon Law; Ecclesiastical Jurisdiction; Ultramon- tanism ; or the articles on the various ecclesiastical councils.

date. The idea that the Roman Church is at the head of the other Churches, and has towards them certain duties consequent on this position, is expressed in various ways, with more or less clearness, in writings such as those of Clemens Romanus, Ignatius of Antioch and Hermas. In the 2nd century all Christendom flocked to Rome; there was a constant stream of people — bishops from distant parts,

apologists or heresiarchs. All that was done or taught in Rome was immediately echoed through all the other Churches; Irenaeus and Tertullian constantly lay stress upon the tradition of the Roman Church, which in those very early days was almost without rivals, save in Asia, where there were a number of flourishing Churches, also apostolic in origin, forming a compact group and conscious of their dignity. The great reception given to Polycarp on his visit to Rome in a.d. 155 and the attitude of St Irenaeus show that on the whole the traditions of Rome and of Asia harmonized quite well. They came into conflict, however (c. a.d. 190), on the question of the celebration of the festival of Easter. The bishop of Rome, Victor, desired his colleagues in the various parts of the Empire to form them- selves into councils to inquire into this matter. The invitation was accepted by all; and, the con- Authority of sultation resulting in favour of the Roman usage, the Roman Victor thought fit to exclude the recalcitrant Churches Blso °P s – of Asia from the Catholic communion. His conduct in this dispute, though its severity may have been open to criticism, 2 indicates a very definite conception on his part of his authority over the universal Church. In the 3rd century the same position was maintained, and the heads of the Roman Church continued to speak with the greatest authority. We find cases of their intervention in the ecclesiastical affairs of Alexandria, of the East, of Africa, Gaul and Spain. Though the manner in which they wielded their authority sometimes meets with criticism (Irenaeus, Cyprian, Firmilianus), the principle of it is never questioned. However, as time went on, certain Churches became powerful centres of Christianity, and even when they did not come into conflict with her, their very existence tended to diminish the prestige of the Roman Church.

After the period of the persecutions had passed by, the great ecclesiastical capitals Carthage, Alexandria, Antioch and Constantinople, as secondary centres of organization centrifugal and administration, drew to themselves and kept in Forces in their hands a share in ecclesiastical affairs. It -was the Catholic only under quite exceptional circumstances that any Cnurcn – need was felt for oecumenical decisions. Further, the direction of affairs, both ordinary and extraordinary, tended to pass from the bishops to the state, which was now christianized. The Eastern Church had soon de facto as its head the Eastern emperors. Henceforth it receded more and more from the influence of the Roman Church, and this centrifugal movement was greatly helped by the fact that the Roman Church, having ceased to know the Greek language, found herself practically excluded from the world of Greek Christianity.

In the West also centrifugal forces made themselves felt. After Cyprian

the African episcopate, in proportion as it per- fected its organization, seemed to feel less and less the need for close relations with the apostolic see. In the 4th century the Donatist party was in open schism; the orthodox party had the upper hand in the time of Aurelius and Augustine; the regular meeting of the councils further increased the corporate cohesion of the African Episcopal body. From them sprang a code of ecclesiastical laws and a whole judicial organization. With this organization, under the popes Zosimus, Boniface and Celestine the Roman Church came into conflict on somewhat trivial grounds, and was, on the whole, being worsted in the struggle, when the Vandal invasion of Africa took place, and for nearly a century to come the Catholic communities were subjected to very hard treatment. The revival which took place under Byzantine rule (6th and 7th centuries) was of little importance;

2 Victor's conduct in this matter was not approved by a number of bishops (including Irenaeus), who protested against it (a.vTurapaKe \e{iovTai) in the interests of peace and Christian love (Eusebius, Hist. eccl. v. 24). — [Ed.]

but the autonomy which had been denied them under Aurelius was maintained to the end, that is to say, up till the Mahommedan conquest.

During the 4th century it is to be noticed that, generally speaking, the Roman Church played a comparatively insignificant The Roman P art m the West. From the time of popes Damasus Church la and Siricius various affairs were referred to Rome the 4th from Africa, Spain or Gaul. The popes were asked Century. tQ gj yg decisions, an(j j n answer to those demands drew up their first decretals. However, side by side with the Roman see was that of Milan, which was also the capital of the Western Empire. From time to tine it seemed as if Milan would become to Rome what Constantinople was to Alexandria. However, any danger that menaced the prestige of Rome disappeared when the emperor Honorius removed the imperial residence to Ravenna, and still more so when the Western emperors were replaced in the north of Italy by barbarian sovereigns, who were Arians.

In Spain, Gaul, Brittany and the provinces of the Danube, similar political changes took place. When orthodox Christianity The Church had gained the upper hand beyond the Alps and the in the Pyrenees, the episcopate of those countries grouped Teutonic itself, as it had done in the East, around the Kingdoms, sovereigns. In Spain was produced a fairly strong religious centralization around the Visigothic king and the metro- politan of Toledo. In Gaul there was no chief metropolitan; but the king's court became, even sooner than that of Spain, the centre of episcopal affairs. The Britons and Irish, whose remote- ness made them free from restriction, developed still more decided individuality. In short, the workings of all the Western episcopates, from Africa to the ocean, the Rhine and the Danube, lay outside the ordinary influence of the Roman see. All of them, Restriction even down to the metropolitan sees of Milan and of the Aquileia, practised a certain degree of autonomy, and Papal i n the 6th century this developed into what is called Authority. the Schism of the Three Chapters. With the excep- tion of this schism, these episcopates were by no means in op- position to the Holy See. They always kept up relations of some kind, especially by means of pilgrimages, and it was admitted that in any disputes which might arise with the Eastern Church the pope had the right to speak as representative of the whole of the Western Church. He was, moreover, the only bishop of a great see — for Carthage had practically ceased to count — who was at that time a subject of the Roman emperor.

This was the situation when St Gregory was elected pope in 590. We may add that in peninsular Italy, which was most clearly under his ecclesiastical jurisdiction, the Lombards had spread havoc and ruin; so that nearly ninety bishoprics had been suppressed, either temporarily or definitively. The pope could act directly only on the bishoprics of the coast districts or the islands. Beyond this limited circle he had to act by means of diplomatic channels, through the governments of the Lombards, Franks and Visigoths. On the Byzantine side his hands were less tied; but here he had to reckon with the theory of the five patriarchates which had been a force since Justinian. According to Byzantine ideas, the Church was governed — under the supreme authority, of course, of the emperor — by the five patriarchs of Rome, Constantinople, Alexandria, Antioch and Jerusalem. Rome had for a long time opposed this division, but, since some kind of division was necessary, had put forward the idea of the three sees of St Peter — Rome, Alexandria and Antioch — those of Constantinople and Jerusalem being set aside, as resulting from later usurpations. But the last named were just the most important ; in fact the only ones which counted at all, since the monophysite secession had reduced the

number of the orthodox in Syria and Egypt practically to nothing. This dissidence Islam was to complete, and by actually suppressing the patriarchate of Jerusalem to reduce Byzantine Christendom to the two patriarchates of Rome and Constantinople.

There was no comparison between the two from the point of view of the East. The new Rome, where the emperor reigned, prevailed over the old, which was practically abandoned to the

barbarians. She was still by courtesy given the precedence, but that was all; the council in Trullo (692) even claimed to impose reforms on her. When Rome, abandoned by the Rome and distant emperors, was placed under the protection of Constaw the Franks (754), relations between her and the Greek tin °P ,e ‘ Church became gradually more rare, the chief occasions being the question of the images in the* 8th century, the quarrel between Photius and Ignatius in the 9th, the affairs of the four marriages of the emperor Leo VI. and of the patriarch Theo- phylact in the 10th. On these different occasions the pope, ignored in ordinary times, was made use of by the Byzantine government to ratify measures which it had found necessary to adopt in opposition to the opinion of the Greek episcopate.

These relations were obviously very different from those which had been observed originally, and it would be an injustice to the Roman Church to take them as typical of her relations with other Christian bodies. She had done all she could to defend her former position. Towards the end of the 4th century, when southern Illyricum (Macedonia, Greece, Crete) was passing under the authority of the Eastern emperor, she tried to keep him within her ecclesiastical obedience by creating the vicariate of Theosa- lonica. Pope Zosimus (417) made trial of a similar organization in the hope of attaching the churches of the Gauls more closely to himself. It was also he who began the struggle against the autonomy of Africa. But it was all without effect. From the 6th century onwards the apostolic vicars of Aries and Thessa- lonica were merely the titular holders of pontifical honours, with no real authority over those who were nominally under their jurisdiction.

It was Gregory I. who, though with no premeditated intention, was the first to break this circle of autonomous or dissident Churches which was restricting the influences of the Gregory apostolic see. As the result of the missions sent to the Great, England by him and his successors there arose a s °°-604. church which, in spite of certain Irish elements, was and remained Roman in origin, and, above all, spirit and tendency. In it the traditions of old culture and religious learning

imported from Rome, where they had almost ceased to bear any fruit, found a new soil, in which they flourished. Theodore, Wilfrid, Benedict Biscop, Bede, Boniface, Ecgbert, Alcuin, revived the fire of learn- ing, which was almost extinct, and by their aid enlightenment was carried to the Continent, to decadent Gaul and barbarian Germany. The Churches of England and Germany, founded, far from all traditions of autonomy, by Roman legates, tendered their obedience voluntarily. In Gaul there was no hostility to the Holy See, but on the contrary a profound veneration for the great Christian sanctuary of the West. The Carolingian princes, when Boniface pointed them towards Rome, followed him without their clergy offering any resistance on grounds of principle. The question of reform having arisen, from the apo- stolic see alone could its fulfilment be expected, since in it, with the succession of St Peter, were preserved the most august traditions of Christianity.

The surprising thing is that, although Rome was then included within the empire of the Franks, so that the popes were afforded special opportunities for activity, they showed for the most part no eagerness to strengthen their authority over the clergy beyond the Alps. Appeals and other matters of detail were referred to them more often than under the Merovingians. They gave answers to such questions as were submitted to them; the machinery moved when set in motion from outside; but the popes did not attempt to interfere on their own initiative. The Frankish Church was directed, in fact, by the government of Charlemagne and Louis the Pious. When this failed, as hap- pened during the wars and partitions which followed the death of Louis, the fate of thisChurch, with no effective head and under no regular direction, was very uncertain. It was then that a clerk who saw that there was but an uncertain prospect of help from the pope of his time, conceived V te J e P ? , ? e the shrewd idea of appealing to the popes of the past, so as to exhort the contemporary generation through the mouth of former popes, from Clement to Gregory. This design was

realized in the celebrated forgery known as the ” False Decretals ” (see Decretals).

Hardly were they in circulation throughout the Frankish Empire when

it happened that a pope, Nicholas I., was elected w who was animated by the same spirit as that which

•9S8-467. ” k ac * inspired them. There was no lack of oppor- tunities for intervening in the affairs not only of the Western but of the Eastern Church, and he seized upon them with great decision. He staunchly supported the patri- arch Ignatius against his rival, Photius, at Constantinople; he upheld the rights of Teutberga, who had been repudiated by her husband, Lothair II. of Lorraine, against that prince and his brother, the emperor Louis II. ; and he combated Hincmar, the powerful metropolitan of Reims. It was in the course of this last dispute that the False Decretals found their way to Rome. Nicholas received them with some reserve; he refrained from giving them his sanction, and only borrowed from them what they had already borrowed from authentic texts, but in general he took up the same attitude as the forger had ascribed to his remote predecessors. The language of his successors, Andrian II. and John VIII., still shows some trace of the energy and pride of Nicholas. But the circumstances were becoming difficult. Europe was being split up under the influence of feudalism; Christendom was assailed by the barbarians, Norse- men, Saracens and Huns; at Rome the papacy was passing into the power of the local aristocracy, with whom after Otto I. it was disputed from time to time by the sovereigns of Germany. It was still being held in strict subjection by the latter when, towards the end of the nth century, Hildebrand (Gregory VII.) undertook its enfranchisement and began the war of the investitures (q.v.), from which the papacy was to issue with such an extraordinary renewal of its vitality.

In Eastern Christendom the papacy was at this period an almost forgotten institution, whose pretensions were always Schism of niet by the combined opposition of the imperial Bast and authority, which was still preponderant in the West. Byzantine Church, and the authority of the patri-

archate of Constantinople, around which centred all that survived of Christianity in those regions. To complete the situation, a formal rupture had occurred in 1054 between the patriarch Michael Cerularius and Pope Leo IX.

In the West, Rome and her sanctuaries had always been held in the highest veneration, and the pilgrimage to Rome was General stu ˆ tne most important in the West. The pope, Position of as officiating in these holiest of all sanctuaries, the Papacy as guardian of the tombs of St Peter and St Paul in Theory. an£ j ˆ inheritor of their rank, their rights, and their traditions, was the greatest ecclesiastical figure and the highest religious authority in the West. The greatest princeˆ bowed before him; it was he who consecrated the emperor. In virtue of the

spurious donation of Constantine, forged at Rome in the time of Charlemagne, which was at first circulated in obscurity, but ended by gaining universal credit, it was believed that the first Christian emperor, in withdrawing to Constantinople, had bestowed on the pope all the provinces of the Western Empire, and that in consequence all sovereignty in the West, even that of the emperor, was derived from ponti- fical concessions. From all points of view, both religious and political, the pope was thus the greatest man of the West, the ideal head of all Christendom.

When it was necessary to account for this position, theologians quoted the text of the Gospels, where St Peter is represented as the rock on which the Church is built, the pastor of the sheep and lambs of the Lord, the doorkeeper of the kingdom of heaven. The statements made in the New Testament about St Peter were applied without hesitation to all the popes, considered as his successors, the inheritors of his see (Petri sedes) and of all his prerogatives. This idea, moreover, that the bishops of Rome were the successors of St Peter was expressed very early — as far back as the 2nd century. Whatever may be said as to its historical value, it symbolizes very well the great authority of the Roman Church in the early days of Christianity; an

authority which was then administered by the bishops of Rome, and came to be more and more identified with them. The councils were also quoted, and especially that of Nicaea, which does not itself mention the question, but certain texts of which contained the famous gloss: Ecclesia romana semper habuit primatum. But this proof was rather insufficient, as indeed it was felt to be, and, in any case, nothing could be deduced from it save a kind of precedence in honour, which was never con- tested even by the Greeks. The Gospel and unbroken tradition offered a better argument.

In his capacity as head of the church, ” and president of the Christian agape,” as St Ignatius of Antioch would have said, the pope was considered to be the supreme president and moderator of the oecumenical assemblies. When the episcopate met in council the bishop of Rome had to be at its head. No decisions of a general nature, whether dogmatic or disciplinary, could be made without his consent. The appeal from all patriarchal or conciliary judgments was to him; and on those occasions when he had to depose bishops of the highest standing, notably those of Alexandria and Constantinople, his judgments were carried into effect. During the religious struggles between the East and West he was on a few occasions condemned (by the Eastern council of Sardica, by Dioscorus, by Photius) ; but the sentences were not carried out, and were even, as in the case of

Dioscorus, considered and punished as sacrilegious attacks. In the West the principle, ” prima sedes a nemine judicatur,” was always recognized and applied.

In ordinary practice this theoretically wide authority had only a limited application. The apostolic see hardly ever interfered in the government of the local Churches, practical Save in its own metropolitan province, it took no Applies* part in the nomination of bishops; the provincial tionsotthe or regional councils were held without its authori- Theor y- zation; their judgments and regulations were carried out without any suggestion that they should be ratified by Rome. It is only after the False Decretals that we meet with the idea that a bishop cannot be deposed and his place filled without the consent of the pope. And it should be noticed that this idea was put forward, not by the pope with th<* object of increas- ing his power, but by the opinion of the Church with a view to defending the bishops against unjust sentences, and especially those inspired by the secular authority.

It was admitted, however, throughout the whole Church that the Holy See had an appellate jurisdiction, and recourse was had to it on occasion. At the council of Sardica (343) an attempt had been made to regulate the procedure in these appeals, by recognizing as the right of the pope the reversing of judgments, and the appointment of fresh judges. In practice, appeals to the pope, when they involved the annulling of a judgment, were judged by the pope in person.

But the intervention of the Holy See in the ecclesiastical affairs of the West, which resulted from these appeals, was only of a limited, sporadic and occasional nature. Nothing could have been more removed from a centralized administration than the condition in which matters stood with regard to this point. The pope was the head of the Church, but he exercised his authority only intermittently. When he did exercise it, it was far more frequently at the request of bishops or princes, or of the faithful, than of his own initiative. Nor had any adminis- trative body for the supreme government of the Church ever been organized. The old Roman clergy, the deacons and priests of the church at Rome (presbyteri incardinati, cardinales) formed the pope’s council, and when necessary his tribunal; to them were usually added the bishops of the neighbourhood. The body of ecclesiastical notaries served as the staff of the chancery.

The Roman Church had from a very early date possessed considerable wealth. Long before Constantine we find her employing it in aid of the most distant churches, ferritoriai as far afield as Cappadocia and

Arabia. Her real Possessions property, confiscated under Diocletian, was restored of <*< > Holy by Constantine, and since then had been continually See- increased by gifts and bequests. In the 4th and 5th centuries,

the Roman Church possessed property in all parts of the empire; but gradually, whether because the confiscations of the barbarian emperors had curtailed its extent, or because the popes had made efforts to concentrate it nearer to themselves, the property of the Holy See came to be confined almost entirely to Italy. In the time of St Gregory there subsisted only what lay in Byzantine Italy, the Lombards having confiscated the property of the Church as well as the imperial domains. During the quarrels between the papacy and the Byzantine Empire her domains in lower Italy and Sicily also disappeared as time went on, and the territorial possessions of the Roman Church were concentrated in the neighbourhood .of Rome.

It was then, towards the middle of the 8th century, that the pope, who already exercised a great influence over the Beginnings government of the city and province of Rome, otthe defending her peacefully and with difficulty against Temporal the advancing Lombard conquests, saw that he Power. was f orce(j) short of the protection of the Greek Empire, to put himself under the protection of the Frankish princes. Thus there arose a kind of sovereignty, disputed, it is true, by Constantinople, but which succeeded in main- taining itself. Rome, together with such of the Byzantine territories as still subsisted in her neighbourhood, was considered as a domain sacred to the apostle Peter, and entrusted to the administration of his successor, the pope. To it were added the exarchate of Ravenna and a few other districts of central Italy, which had been recently conquered by the Lombards and retaken by the Frankish kings Pippin and Charlemagne. Such was the foundation of the papal state.

The higher places in the government were occupied by the clergy, who for matters of detail made use of the civil and military officials who had carried on the administration under the Byzantine rule. But these lay officials could not long be content with a subordinate position, and hence arose incessant friction, which called for constant intervention on the part of the Frankish sovereigns. In 824 a kind of

protectorate was organized, and serious guarantees were conceded to the lay aristocracy.

Shortly afterwards, in the partition of the Carolingian Empire, Italy passed under the rule of a prince of its own, Louis II., who, with the title of emperor, made his authority felt in political matters. Shortly after his death (875) fresh upheavals reduced to nothing the power of the Carolingian princes; the clergy of Rome found itself without a protector, exposed to the animosity of the lay aristocracy. The authority of the pontificate was seriously impaired by these circumstances. One of the great families of Rome, that of the vestamrius Theophylact, took possession of the temporal authority, and succeeded in influencing the papal elections. After Theophylact the power passed to his daughter Marozia, a woman of the most debased character; then to her son Alberic, a serious-minded prince; and then to Alberic's son Octavius, who from " prince of the Romans " became pope (John XII.) when yet a mere boy. After Marozia and Alberic and the rest another branch of the same family, the Crescentii, exercised the temporal powers of the Holy See; and after them the same regime was continued by the counts of Tusculum, who were sprung from the same stock, which sometimes provided the Roman Church with the most unlikely and least honourable pontiffs.

The pope, like all the bishops, was chosen by means of election, in which both the clergy and the laity took part. The latter

r,. a, . were represented in the most essential functions Election of r , *, . . , . ,. . . .

the Popes. °* tne election by the aristocracy: at first by the senate, and later by the exercitus romanus, or rather of its staff, composed of Byzantine officers. It was the latter which gave rise to the feudal aristocracy which we see appear- ing under the Carolingians. The new pope was chosen by the principal members of the clergy and nobles, and then set before the assembled people, who gave their decision by acclamation; and this acclamation was accepted as the vote of the assembly of the faithful. The pope-elect was then put in possession of the episcopal house, and after waiting till the next Sunday his consecration was proceeded with. This ceremony was at first

celebrated in the Lateran, but from Byzantine times onwards it took place at St Peter's. It was also under the Byzantine regime that the condition was imposed that the pope should not be consecrated until the emperor had ratified his election. This had. not been required under the old Latin emperors nor under the Gothic kings, and it

disappeared of its own accord with the Byzantine regime. It was revived, however, by the emperor Louis the Pious, much to the disgust of the Romans, who resisted on several occasions. The Roman ” princes ” or ” senators ” in the 10th century went still further: it was they who actually nominated the pope. The same was the case with the Saxon emperors (Otto I., II. and III.), and in the nth century of the lords of Tusculum, the latter nominating them- selves and choosing members of their own family for the pontificate. When the emperor Henry III. (1046) put an end to this oppression it was only to substitute another. The popes of Tusculum did, at least, belong to the country, while the German kings chose bishops from the other side of the Alps. Such was the state of affairs up to the time of Hildebrand.

The entry of Hildebrand into the counsels of the papacy marks the beginning of a great change in this institution. He cannot, however, claim the honour of having opened Thetnitie- the way which he impelled his predecessors to follow brandine even before following it himself. All good Christians Retorm – were calling for reform; bishops, princes, and monks were in agreement on this point when they spoke or acted according to their convictions. Many of them had tried to effect something; but these isolated efforts were often countermined by incompati- ble aims, and had produced no serious results. It is in the supreme head of the Church that the movement ought to have found its origin’ and inspiration. There was no dispute as to his possessing the authority in spiritual matters necessary to impose reform and overbear the resistance which might arise; no one was better qualified than he to treat with the holders of the temporal power and obtain the support which was necessary from them. The Fathers of the Church had repeated times without number that the priesthood stands above even the supreme secular authority; the Bible was full of stories most aptly illustrating this theory; nobody questioned that, within the Church, the pope was the Vicar of Christ, and that, as such, his powers were unlimited; as proof positive could be cited councils and decretals — whether authentic or spurious; at any rate all authorized by long usage and taken as received autho- rities. It only remained to take possession of this incontestable power and use it with firmness and consistency. The example of Nicholas I., two centuries before, had shown the position which a pope could occupy in Christendom; but for a long time past the man had come short of the institution, the workman of fiis tool. Under Leo IX. (1048-1054) the pope suddenly came forward as the active and indefatigable champion of reform; simony and incontinence of the clergy were attacked by the one most qualified to purify the Church of them. Henceforth the way was open, and it became clear that, given

good popes, the reform movement might be carried into effect. The choice of the pope was then subject to the pleasure of the sovereign of Germany, against whom the Roman feudal lords, devoted as they were to the old abuses, were in constant revolt. In the midst of the frequent changes of pope which went on during these years, and the political vicissitudes of Italy, Hildebrand took such measures as enabled him to checkmate the opposition of the Roman barons by turning against them, now the armed force of the Normans, now the influence of the German king. 1

*On the 5th of April 1058, six days after the death of Pope Stephen X., John, bishop of Velletri, the nominee of the Roman nobles, was enthroned as Pope Benedict X. Hildebrand set up Gerard, bishop of Florence, as a rival candidate, won over a part of the Romans to his cause, and secured the support of the empress regent Agnes at the Diet of Augsburg in June. Gerard was elected pope at Siena (as Nicholas II., q.v.) by those cardinals who had fled from Rome on the elevation of Benedict X. A synod was held at Sutri, at which the powerful Godfrey, duke of Lorraine and Spoleto, and margrave of Tuscany, and the chancellor Wibert were present. Measures were here concerted against Pope Benedict, who was driven out of Rome in January 1059, Nicholas II. being

Side by side with the general movement towards reform, he had set before himself the object of freeing the papacy, not only from its temporal oppressors but also from its protectors. He was successful at the council of 1059, the pontifical election was placed out of reach of the schemes of the local feudal lords and restored to the heads of the clergy; certain reservations were made with regard to those rights which the Holy See was considered to have conceded personally to Henry of Germany (the young king Henry IV., son of the emperor Henry III.), but nothing more. At the election of Alexander II. (1061-1073) — a rival to whom was for a long time supported by the German king — and even at the election of Hildebrand, this rule had its effect. Henceforth the elections remained entirely free from those secular influences which had hitherto been so oppressive. In 1073 Hildebrand was raised to the pontifical throne by the acclamation of the people of Rome, under the name of Gregory VII.

The work of reform was now in a good way; the freedom of the pontifical elections had been assured, which gave some Gregory promise that the struggle against abuses would be VII., conducted successfully. All that now remained

1053-1085. was t g on following wisely and firmly the way that had already been opened. But this attitude was not likely to appeal to the exuberant energy of the new pope. Hitherto he had had to reckon with obstacles more powerful than those which were now left for him to conquer, and, what was more, with the fact that his authority depended upon the will of others. But now that his hands were no longer tied, he could' act freely. The choice of the pope had been almost entirely removed from the sphere of secular influence, and especially from that of the German king. Gregory claimed that the same condition should apply to bishops, and these were the grounds of the dispute about investitures — a dispute which could find no solution, for it was impossible for the Teutonic sovereigns to renounce all interest in a matter of such importance in the workings of their state. Since the time of Clovis the German sovereigns had never ceased to intervene in such matters. But this question soon fell into the background. Gregory's contention was that the secular sovereigns should be entirely in the power of the head of the Church, and that he' should be able to advance them or dispossess them at will, according to the estimate which he formed of their conduct. A terrible struggle arose between these obviously exorbitant demands and the resistance which they provoked. Its details cannot be described in this place (see Investitures); we need only say that this ill-fated quarrel was not calculated to advance the reform movement, but rather to impede it, and, further, that it ended in failure. Gregory died far away from Rome, upon which he had brought incalculable evils; and not only Rome, but the papacy itself had to pay the penalty for the want of moderation of the pope. Great indeed was the difference between the state in which he received it and that in which he left it. We must not, however, let this mislead us. This struggle between spiritual and secular powers, owing to the tremendous sensation which it created throughout Christendom, showed the nations that at the head of the Church there was a great force for justice, always able to combat iniquity and oppression, and sometimes to defeat them, however powerful the evil and the tyrants might seem. The scene at Canossa, which had at the moment a merely relative importance, remained in the memories of men as a symbol which was hateful or comforting, according to the point of view from which it was considered. As to Gregory's political pretensions, zealous theorists were quick to transform them into legal principles; and though his immediate

successors, some- what deafened by the disturbance which they had aroused, seem to have neglected them at first, they were handed on to more distant heirs and reappeared in future struggles.

Gregory himself, in his last moments, seems to have felt that it was impossible to maintain them, for Didier, abbot of Monte- regularly enthroned on the 24th of the same month. A synod assembled at the Lateran in April passed the famous new regulations for the elections to the papacy. (See Conclave and Lateran Councils.) — [Ed.]

Cassino (Victor III., 1086-1087), whom he nominated as his successor, was well known for his moderation. It was no longer a question of continuing the policy of Gregory VII., but of saving the work of Hildebrand. (L. D.*)

II. — Period from 1087 to 1305.

Gregory VII. had clearly revealed to , the world the broad lines of the religious and political programme of the medieval papacy, and had begun to put it into execution, the Work To reform the Church in every grade and purge 0/ Gregory the priesthood in order to shield it from feudal Vl1 – influences and from the domination of lay sovereignties; to convert the Church thus regenerated, spiritualized, and detached from the world, into an organism which would be submissive to the absolute authority of the papal see, and to concentrate, at Rome all its energies and jurisdictions; to establish the supremacy of the Roman see over all the Christian Churches, and win over to the Roman Church the Churches of the Byzantine Empire, Africa and Asia; to establish the temporal domain of St Peter, not only by taking possession of Rome and Italy, but also by placing all the crowns of Europe under the supreme sovereignty of the popes, or even in direct vassalage to them; and, finally, to maintain unity of faith in Christendom and defend it against the attacks of unbelievers, Mussulmans, heretics and pagans — these were the main features of his scheme. The task, however, was so gigantic that after 150 years of strenuous effort, at the period which may be considered as the apogee of its power, that is, in the first half of the 13th century, the papacy had attained only incomplete results. At several points the work remained unfinished, for decadence followed close upon the moment of extreme greatness. It is more particularly in the part of this programme that relates to the internal policy of the papacy, to the subjection of the Church to the Curia, and to the intensive concentration of the ecclesi- astical forces in the hands of the leader of Christendom, that Gregory went farthest in the execution of his plan and approached nearest the goal. For the rest, so formidable were the

external obstacles that, without theoretically renouncing his claims, he was unable to realize them in practice in a manner satisfactory to himself.

In order to give a clear idea of the vicissitudes through which the papal institution passed between the years 1087 and 1305 and to show the measure of its success or failure at different stages in its course, it is convenient to divide this section into four periods.

1. Period from Urban II. to Calixtus II. (1087-1124). — Gregory VII. ‘s immediate successors accomplished the most pressing work by liberating the Church from feudal subjection, either by force or by diplomacy. This to88-i099. was, indeed, the indispensable condition of its internal and external progress. The great figure of this period is unquestionably the French Cluniac Urban II., who led the Hildebrandine reformation with more vehemence than Gregory himself and was the originator of the crusades. Never through- out the middle ages was pope more energetic, impetuous or uncompromising. His inflexible will informed the movement directed against the enemy within, against the simoniacal prelate and the princely usurper of the rights of the Church, and pre- scribed the movement against the enemy without, against the infidel who held the Holy Sepulchre. Urban set his hand to reforms from which his predecessor Gregory had recoiled. He simultaneously excommunicated several sovereigns and merci- lessly persecuted the archbishops and bishops who were hostile to reform. He took no pains to temper the zeal of his legates, but incited them to the struggle, and, not content with pro- hibiting lay investiture and simony, expressly forbade prelates and even priests to pay homage to the civil power. Distrusting the secular clergy, who were wholly sunk in the world, he looked to the regular clergy for support, tbe church , and thus led the papacy into that course which it continued to pursue after his death. Henceforth the monk was to be the docile instrument of the wishes of Rome, to be

opposed to the official priesthood according to Rome’s needs. Urban was the first to proclaim with emphasis the necessity of a close association of the Curia with the religious orders, and this he made the essential basis of the theocratic government. As the originator of the first crusade, Urban is entitled to the honour of the idea and its

execution. There is no doubt that he wished to satisfy the complaints that emanated

from the Christians dwelling in Jerusalem and Crusade. ˆ rom t ˆ le pilgrims to the Holy Sepulchre, but it is

no less certain that he was disturbed by the fears aroused throughout the Latin world by the recrudescence of Mussulman invasions, and particularly by the victory won by the Almoravides over the Christian army at Zalaca (1086). The progress of these African Mussulmans, into Spain and their incessant piracies in Italy were perhaps the occasional cause that determined Urban II. to work upon the imagination of the infidels by an expedition into Syria. The papacy of that time believed in the political unity of Islam, in a solidarity — which did not exist — among the Mussulmans of Asia Minor, Syria, Egypt and the Barbary coasts; and if it waited until the year 1095 to carry out this project, it was because the conflict with the Germanic Empire prevented the earlier realization of its dream. The essential reason of Urban II. 's action, and consequently the true cause of the crusade, was the ambition of the pope to unite with Rome and the Roman Church the Churches of Jerusalem, Antioch, Alexandria and even Constantinople, which the Greek schism had rendered independent. This thought had already crossed the minds of Leo IX. and Gregory VII., but circumstances had never allowed them to put it into execution. Armed by the reformation with a moral authority which made it possible to concentrate the forces of the West under the supreme direction of the Church and its leaders, Urban II. addressed himself with his customary decision to the execution of this enormous enterprise. With him, as with all his successors, the idea of a collective expedition of Europe for the recovery of the Holy Places was always associated with the sanguine hope of extinguishing the schism at Constantinople, its very centre, by the substitution of a Latin for a Byzantine domination. Of these two objects, he was only to realize the former; but the crusade may well be said to have been his own work. He created it and preached it ; he organized it, dominated it, and constantly supervised it. He was ever ready to act, either personally or through his delegates, and never ceased to be the effective leader of all the feudal soldiers he enrolled under the banner of the Holy See. He corresponded regularly with his legates and with the military leaders, who kept him accurately informed of the position of the troops and the pro- gress of the operations. He acted as intermediary between the soldiers of Christ and their brothers who remained in Europe, announcing successes, organizing fresh expeditions, and spurring the laggards to take the road to Jerusalem.

The vast conflict aroused by the Hildebrandine reformation, and particularly the investiture quarrel, continued under the Settlement three successors of Urban II. ; but with them it of the assumed a different character, and a tendency arose investiture to terminate it by other means. The violence and Quarrel. (ji sorc i ers provoked by the struggle brought about a reaction, which was organized by certain prelates who advocated a policy of conciliation, such as the Frenchman Ivo, bishop of Chartres (c. 1040-1116). These conciliatory prelates were sincere supporters of the reformation, and combated simony, the marriage or concubinage of priests, and the immorality of sovereigns with the same conviction as the most ardent followers of Gregory VII. and Urban II. ; but they held that the intimate union of Church and State was indispensable to the social order, and that the rights of kings should be respected as well as the rights of priests. The text they preached was harmony between the priesthood and the state. Dividing what the irrecon- cilables of the Hildebrandine party considered as an indissoluble whole, they made a sharp distinction between the property of the Church and the Church itself, between the political and territorial power of the bishops and their religious authority,

and between the feudal investiture which confers lands and jurisdiction and the spiritual investiture which confers ecclesi- astical rights. This doctrine gradually rallied all moderate minds, and finally inspired the directors of Christendom in Rome itself. It explains the new attitude of Paschal II. and Calixtus II., who were both sincere reformers, but who sought in a policy of compromise the solution of the difficult problem of the relations of Church and State.

History has not done sufficient justice to the Italian monk Paschal II., who was the equal of Urban in private virtues,

personal disinterestedness, and religious conviction,

. Paschal II

but was surpassed by him in ardour and rigidity iggg.ms. ”

of conduct. Altered circumstances and tendencies of opinion called for a policy of conciliation. In France, Paschal granted absolution to Philip I. — who had many times been anathematized by his predecessors — and reconciled him solemnly with the Church, on the sole condition that he should swear to renounce his adulterous marriage. The pope could be under no delusion as to the value of this oath, which indeed was not kept; he merely regularized formally a

state of affairs which the intractable Urban II. himself had never been able to prevent. As for the French question of the investitures, it was settled apparently without any treaty being expressly drawn up between the parties. The kings of France contem- porary with Paschal II. ceased to practice spiritual investiture, or even to receive feudal homage from the bishops. They did not, however, renounce all intervention or all profit in the nominations to prelacies, but their intervention was no longer exhibited under the forms which the Hildebrandine party held to be illegal. In England, Paschal II. put an end to the long quarrel between the royal government and Anselm of Canterbury by accepting the Concordat of London (1107). The crown in England also abandoned investiture by the pastoral staff and ring, but, more fortunate than in France, retained the right of receiving feudal homage from the episcopate. As for Ger- many, the Emperor Henry V. wrung from the pope, by a display of force at Rome, concessions which provoked the indignant clamours of the most ardent reformers in France and* Italy. It must not, however, be forgotten that, in the negotiations at Sutri, Paschal had pride and independence enough to propose to the emperor the only solution of the conflict that was entirely logical and essentially Christian, namely, the renunciation by the Church of its temporal power and the renunciation by the lay lords of all intervention in elections and investitures — in other words, the absolute separation of the priesthood and the state. The idea was contrary to the whole evolution of medieval Catholicism, and the German bishops were the first to repudiate it. At all events, it is certain that Paschal II. prepared the way for the Concordat of Worms. On the other hand, with more acuteness than his predecessors, he realized that the papacy could not sustain the struggle against Germany unless it could rely upon the support of another Christian kingdom of the West; and he concluded with Philip I. of France Alliance and Louis the Fat, at the Council of Troyes (1107), w«A an alliance which was for more than a century the F rance – salvation of the court of Rome. It is from this time that we find the popes in moments of crisis transporting them- selves to Capetian territory, installing their governments and convening their councils there, and from that place of refuge fulminating with impunity against the internal and external foe. Without sacrificing the essential principles of the reforma- tion, Paschal II. practised a policy of peace and reaction in every way contrary to that of the two preceding popes, and it was through him that the struggle was once more placed upon the religious basis. He refused to retain Hugo, bishop of Die (d. 1 1 06), as legate; like Urban and Gregory, he gave or confirmed monastic privileges without the protection he granted to the monks assuming a character of hostility towards the episcopate;

and, finally, he gave an impulse to the reformation of the chapters, and, unlike Urban II., maintained the rights of the canons against the claims of the abbots.

Guy, the archbishop of Vienne, who had been one of the

keenest to disavow the policy of Paschal II., was obliged to continue it when he assumed the tiara under the name of Calixtus II. By the Concordat of Worms, which he M9-H24. 1 ‘ s ig nec i with the Emperor Henry V. in 1122, the investiture was divided between the ecclesiastical and the lay powers, the emperor investing with the sceptre, the pope with the pastoral staff and ring. The work did honour to the perseverance and ability of Calixtus, but it was merely the application of the ideas of Paschal II. and Ivo of Chartres. The understanding, however, between the two contracting parties was very far from being clear and complete, as each party still sought to attain its own aim by spreading in the Christian world divergent interpretations of the concordat and widely-differing plans for reducing it to its final form. And, again, if this transaction settled the investiture question, it did not solve the problem of the reconciliation of the universal power of the popes with the claims of the emperors to the govern- ment of Europe; and the conflict subsisted — slumbering, it is true, but ever ready to awake under other forms. Nevertheless, the two great Christian agitations directed by the papacy at the end of the nth century and the beginning of the 12th — the reformation and the crusade — were of capital importance for the foundation of the immense religious monarchy that had its centre in Rome; and it is from this period that the papal monarchy actually dates.

The entry of the Christians into Jerusalem produced an extraordinary effect upon the faithful of the West. In it they Effect of the saw tri e most manifest, sign of the divine protection Latin and of the supernatural power of the pope, the

Conquest of supreme director of the expedition. At its inception Jerusalem. the Latul kingdom of the Holy Land was within a little of becoming an ecclesiastical principality, ruled by a patriarch under the authority of the pope. Daimbert, the first patriarch of Jerusalem, was convinced that the Roman Church alone could be sovereign of the new

state, and attempted to compel Godfrey of Bouillon to hand over to him by a solemn agreement the town and citadel of Jerusalem, and also Jaffa. The clergy, indeed, received a large share; but the government of the Latin principality remained lay and military, the only form of government possible for a colony surrounded by perils and camped in a hostile country. Not only was the result of the crusade extremely favourable to the extension of the Roman power, but throughout the middle ages the papacy never ceased to derive almost incalculable political and financial advantages from the agitation produced by the preachers and the crusading expeditions. The mere fact of the crusaders being placed under the special protection of the Church and the pope, and loaded with privileges, freed them from the jurisdiction, and even, up to a certain point, from the lordship of their natural masters, to become the almost direct subjects of the papacy; and the common law was then practically suspended for the benefit of the Church and the leader who represented it.

As for the reformation, which under Urban II. and his immediate successors was aimed not only at the episcopate Subordlna. ˆ ut a ˆ s0 at trie ca pi tu l ar y bodies and monastic Hon of the clergy, it, too, could but tend to a consider- Episcopate able extension of the authority of the successors of

5SonareA PaiSt Peter ‘ for St struck an irremediable blow at onarc y. ˆ anc i e nt Christian hierarchy. The first manifest result of the change was the weakening of the metropolitans. The visible symptom of this decadence of the archiepiscopal power was the growing frequency during the Hildebrandine conflict of episcopal confirmations and consecrations made by the popes themselves or their legates. From an active instru- ment of the religious society, the archiepiscopate degenerated into a purely formal power; while the episcopate itself, which the sincere reformers wished to liberate and purge in order to strengthen it, emerged from the crisis sensibly weakened as well as ameliorated. The episcopate, while it gained in intelligence and morality, lost a part of its independence. It was raised above feudalism only to be abased before the two directing forces of the reformation, the papacy and the religious orders.

To place itself in a better posture for combating the simoniacal and concubinary prelates, the court of Rome had had to multiply exemptions and accelerate the movement which impelled the monks to make themselves independent of the bishops. Even in the cities, the seat’s of the episcopal power, the reformation encouraged the attempts at revolt or autonomy which tended everywhere to diminish

that power. The cathedral chapters took advantage of this situation to oppose their jurisdiction to that of the bishops, and to encroach on their prerogatives. When war was declared on the schismatic prelates, the reforming popes supported the canons, and, unconsciously or not, helped them to form themselves into privileged bodies living their own lives and affecting to recognize the court of Rome as their only superior authority. Other adversaries of the episcopate, the burgesses and the petty nobles dwelling in the city, also profited by these frequent changes of bishops, and the disorders that ensued. It was the monarchy of the bishops of Rome that naturally benefited by these attacks on the aristocratic principle represented by the high prelacies in the Church. By drawing to their side all the forces of the ecclesiastical body to combat feudalism, Urban II. and his successors, with their monks and legates, changed the constitution of that body, and changed it to their own advantage. The new situation of these popes and the growth of their authority were also manifested in the material organization of their administration and chancery. Under Urban II. the formulary of the papal bulls began to crystallize, and the letters amassed in the papal offices were differentiated clearly into great and little bulls, according to their style, arrangement and signs of validation. Under Paschal II. the type of the leaden seal affixed to the bulls (representing the heads of the apostles Peter and Paul) was fixed, and the use of Roman minuscule finally substituted for that of the Lombard script.

2. Period from Honorius II. to Celestine III. (1124-1198). — After the reformation and the crusade the papal monarchy existed, and the next step was to consolidate and extend it. This task fell to the popes of the 12th century. Two of them in particular — the two who had the longest reigns— viz. Innocent II. and Alexander III., achieved the widest extension of the power entrusted to them, and in many respects their pontificates may be regarded as a preparation for and adumbration of the pontifi- cate of Innocent III. This period, however, is characterized not only by the thoroughgoing development of the authority of the Holy See, but also by the severe struggle the popes had to sustain against the hostile forces that were opposed to their conquests or to the mere exercise of what they regarded as their right.

In the secular contest, Germany and the imperialist preten- sions of its leaders were invariably the principal The Papacy obstacle. Until the accession of Adrian IV., how- and the ever, there had been considerable periods of tran- German quillity, years even of unbroken peace and alliance mperors – with the Germanic power. Under Honorius II. the empire, represented by Lothair III. of Supplinburg, yielded to the papacy, and Lothair, who was elected by the clergy and

protected by the legates, begged the pope to /^”nso ” confirm his election. Before his coronation he had renounced the right, so jealously guarded by Henry V., of assist ing in the election of bishops and abbots, and he even undertook to refrain from exacting homage from the prelates and to content himself with fealty. This undertaking, however, did not prevent him from bringing all his influence to bear upon the ecclesiastical nominations. When the schism of 1130 broke out he endea- voured to procure the cancellation of the clauses of the Concordat of Worms and to recover lay investiture by way of compen- sation for the support he had given to Innocent II., one of the competing popes. This scheme, however, was frustrated by the firmness of Innocent and St Bernard, and Lothair had to resign himself to the zealous conservation of the privileges granted to the Empire by the terms of the concordat. The ardour he had displayed in securing the recognition of Innocent and defending him against his enemies, particularly the anti-pope

Anacletus and the kingdom of the Two Sicilies, involved him in a course which was not precisely favourable to the imperial rights. Innocent II. was the virtual master of this U3(MI43. “monarch, whose championship of the papacy brought not the smallest advantage, not even that of being crowned emperor with the habitual ceremonial at the place consecrated by tradition. It may even be maintained that his elevation was due solely to his personal claims. This was a victory for Rome, and it was repeated in the case of the first Hohenstaufen, Conrad III., who owed his elevation (1138) mainly to the princes of the Church and the legate of Inno- cent II., by whom he was crowned. He also had to submit to the consequences of his origin on the occasion of a double election not foreseen by the Concordat of Worms, when he was forced to admit the necessity of appeal to Rome and to acknowledge the supremacy of the papal decision. The situation changed Eugenias in 1152, under Eugenius III., when Frederick ///., Barbarossa was elected German king. He notified

U45-U53. }jj s election to the pope, but did not seek the pope’s approval. None the less, Eugenius III. felicitated the new sovereign on his election, and even signed the treaty of Constance with him (1153)- The pope had need of Frederick to defend him against the revolted Romans and to help him to recover his temporal power, which had

been gravely com- promised. Anastasius IV. pursued the same policy, and Aaasta- summoned the German to Rome (1154). Frederick, sius IV., however, was determined to keep the seat of the 1153-1154, Empire for himself, to dispute Italy with the pope, and to oppose the divine right of kings to the divine right of priests. When he had taken Lombardy (1158) and had had the principles of the imperial supremacy pro- claimed by his jurists at the diet of Roncaglia, the court of Rome realized that war was inevitable, and two ener- getic popes, Adrian IV, and Alexander III., reso- *ist4is»" lutelv sustained the struggle, the latter for nearly twenty years. Victims of the communal claims at Rome, they constituted themselves the champions of similar claims in northern Italy, and their alliance with the Lombard communes ultimately led to success. In his duel with Barba- Aiexan- rossa, Alexander III., one of the greatest of medieval der ill., popes, displayed extraordinary courage, address and U59-U81. perseverance. Although it must be admitted that the tenacity of the Lombard republics contributed powerfully to the pope's victory, and that the triumph of the Milanese at Legnano (n 76) was the determining cause of Frederick's submission at Venice, yet we must not exaggerate the importance of the solemn act by which Barbarossa, kneeling before his conqueror, recognized the spiritual supremacy of the Holy See, and swore fidelity and respect to it. In its final form, the truce of Venice was not only not unfavourable secularly to the Empire, but even granted it very extensive advantages. Nor must it be forgotten that,' in the eyes of contemporaries, the scene at Venice had none of that humiliating character which later historians have attributed to it.

This was not the only success gained by Alexander III. over lay sovereigns. The conflict of the priesthood with the kingdoms Alexander and nations that were tending to aggrandize them- ///. and selves by transcending the religious limits of the Henry ii. medieval theocracy took place on another theatre. of England. The affair of Thomas Becket (q.v.) involved the papacy in a quarrel with the powerful monarchy of the Angevins, whose representative, Henry II., was master of England and of the half of France. Alexander's diplomatic skill and moral authority, reinforced by the Capetian alliance and the revulsion of feeling caused by the murder of Becket, enabled him to force the despotic Henry to yield, and even to do penance at the tomb of the martyr. The Plantagenet abjured the Constitutions of Clarendon, recognized the rights of the pope over the Church of England, and augmented the privileges and domains of the archbishopric of Canterbury. Although Becket was a man of narrow sympathies and by no means of liberal views, he had died for the

liberties of his caste, and the aureole

that surrounded him enhanced the prestige and ascendancy of the papacy.

Unfortunately for the papacy, the successors of Alexander III. lacked vigour, and their pontificates were too brief to allow them to pursue a strong policy against the Germanic ThePapacy imperialism. Never were the leaders of the Church and the in such jeopardy as during the reign of Barbarossa's Emperor son, Henry VI. This vigorous despot, whose ambi- Henry v,% tions were not all chimerical, had succeeded where his prede- cessors, including Frederick, had failed. His marriage with the heiress of the old Norman kings had made him master of Sicily and the duchy of Apulia and Calabria, and he succeeded in conquering and retaining almost all the remainder of the peninsula. Under Celestine III. the papal state was surrounded on every side by German soldiers, and but for the premature death of the emperor, whom Abbot Joachim of Floris called the " hammer of the world," the temporal power of the popes might perhaps have been annihilated.

The Norman kingdom, which had conquered Sicily and southern Italy at the end of the- nth century, was almost as grave a source of anxiety to the popes of this period. Not only was its very existence an obstacle to the andthe* 1 * spread of their temporal power in the peninsula, Norman but it frequently acted in concert with the pope's Kingdom enemies and thwarted the papal policy. The jf a /y"* attempts of Honorius II. (n 28) and Innocent II. (1139) to wrest Apulia and Calabria from King Roger II., and Adrian IV.'s war with William I. (n 56), were one and all unsuccessful; and the papacy had to content itself with the vassalage and tribute of the Normans, and allowed them to organize the ecclesiastical government of their domains in their own fashion, to limit the right of appeal to Rome, and to curtail the power of the Roman legates. At this period, moreover, the " Norman Question " was intimately connected with the " Eastern Question." The Norman adventurers in possession of Palermo and Naples perpetually tended to look for their aggrandizement to the Byzantine Empire. In the interests of their temporal dominion, the 12th-century popes could not suffer an Italian power to dominate on the other side of the Adriatic and instal itself at Constantinople. This contingency explains the vacillating and illogical character of the papal diplomacy with regard to the Byzantine problem, and, inter alia, the opposition of Eugenius III. in 1150 to Roger II. 's projected crusade, which was directed towards the conquest of the Greek state. The popes were under the constant sway of two contrary influence's — on the one hand, the seducing pros- pect of subduing the Eastern

Church and triumphing over the schism, and, on the other, the apprehension of seeing the Normans of Sicily, their competitors in Italy, increasing their already formidable power by successful expeditions into the Balkan Peninsula. Dread of the Normans, too, explains the singular attitude of the Curia towards the Comneni, of whom it was alternately the enemy and the protector or ally.

But, as regards its temporal aims on Italy, the most incon- venient and tenacious, if not the most dangerous, adversary of the 12th-century papacy was the Roman commune. Since the middle of the 12th century the party of Tne Papacy municipal autonomy and, indeed, the whole of the commune European middle classes, who wished to shake off of Rome. the feudal yoke and secure independence, had been ranged against the successor of St Peter. The first symptoms of resistance were exhibited under Innocent II. (1142), who was unable to stem the growing revolution or prevent the establish- ment of a Roman senate sitting in the Capitol. The strength of classical reminiscence and the instinct of liberty were rein- forced by the support given to communal aspirations by the popular agitator and dangerous tribune, Arnold of Brescia (q.v.), whose theories arrived at an opportune Brescia. moment to encourage the revolted commons. He denied the power of clerks to possess fiefs, and allowed them only religious authority and tithes; The successors of Innocent II. were even less successful in maintaining their supremacy in

Rome. Lucius II., when called upon to renounce all his regalian rights, fell mortally wounded in an attempt to drive the auto- nomists by force from the Capitol (1145). Under Eugenius III. the Romans sacked and destroyed the houses of the clerks and cardinals, besieged St Peter's and the Lateran, and massacred the pilgrims. The pope was forced to fly with the Sacred College, to escape the necessity of recognizing the commune, and thus left the field free to Arnold of Brescia (1145). On his return to Rome," Eugenius had to treat with his rebel subjects and to acknowledge the senate they had elected, but he was unable to procure the expulsion of the agitator. The more energetic Adrian IV. refused to truckle to the municipality, placed it under an interdict (1155), and allied himself with Frederick Barbarossa to quell an insurrection which respected the rights of emperors no more than the rights of popes. From the moment that

Arnold of Brescia, absorbed in his chimerical project of reviving the ancient Roman republic, disregarded the imperial power and neglected to shelter himself behind the German in his conflict with the priesthood, his failure was certain and his fate foredoomed. He was hanged and burned, probably in pursuance of the secret agreement between the pope and the emperor; and Adrian IV. was reconciled with the Romans (1156). The commune, however, subsisted, and was on several occasions strong enough to eject the masters who were distasteful to it. Unfortunately for Alexander III. the Roman question was complicated during his pontificate with the des- perate struggle with the Empire. The populace of the Tiber welcomed and expelled him with equal enthusiasm, and when his body was brought back from exile, the mob went before the cortege and threw mud and stones upon the funeral litter. All obeyed the pontiff of Rome — save Rome itself. Lucius III., who was pope for four years (1181-1185), remained in Rome four months, while Urban III. and Gregory VIII. never entered the city. At length the two parties grew weary of this state of revolution, and a regime of conciliation, the fruit of mutual concessions, was established under Clement III. By the act of 1 188, the fundamental charter of the Roman commune, the people recognized the supremacy of the pope over the senate and the town, while the pope on his part sanctioned the legal existence of the commune and of its government and assemblies. Inasmuch as Clement was compelled to make terms with this new power which had established itself against him in the very centre of his dominion, the victory may fairly be said to have rested with the commune.

Although, among other obstacles, the popes of the 12th century had experienced some difficulty in subduing the inhabitants Develop- °^ tne c ‘ tv > wmcn w as the seat and centre of the meat of the Christian world, their monarchy did not cease to Centralized gain in authority, solidity and prestige, and the work Orgamza- f centralization, which was gradually making them masters of the whole ecclesiastical organism, was ac- complished steadily and without serious interruption. If Rome expelled them, they always found a sure refuge in France, where Alexander III. carried on his government for several years; and the whole of Europe acknowledged their immense power. Under Honorius II. the custom prevailed of substituting legates a latere, simple priests or deacons of the Curia, for the regionary delegates, who had grown too independent; and that excellent instrument of rule, the Roman legate, carried the papal will into the remotest courts of Europe. The episcopate and the great monastic prelacies continued to lose their independence, as was shown by Honorius II. deputing a cardinal to Monte Cassino to elect

an abbot of his choosing. The progress of the Roman power was especially manifested under Innocent II., who had triumphed over the schism, and was supported by the Empire and by Bernard of Clairvaux, the first moral authority of his time. He suspended an archbishop of Sens (1136) who had neglected to take into consideration the appeal to Rome, sum- moned an archbishop of Milan to Rome to receive the pallium from the pope's hands, lavished exemptions, and extended the right of appeal to such abnormal lengths that a Byzantine ambassador is reported to have exclaimed to Lothair III.,

" Your Pope Innocent is not a bishop, but an emperor." When the universal Church assembled at the second Lateran Council (1130), this leader of religion declared to the bishops that he was the absolute master of Christendom. " Ye know," he said, " that Rome is the capital of the world, that ye hold your dignities of the Roman pontiff as a vassal holds his fiefs of his sovereign, and that ye cannot retain them without his assent." Under Eugenius III., a Cistercian monk who was scarcely equal to his task, the papal absolutism grew sensibly weaker, and if we may credit the testimony of the usually well- informed German chronicler, Otto of Freising, there arose in the college of cardinals a kind of • fermentation which was exceedingly disquieting for the personal power of the leader of the Church. In the case of a difference of opinion between Eugenius and the Sacred College, Otto relates that the cardinals addressed to the pope this astounding protest: " Thou must know that it is by us thou hast been raised to the supreme dignity. We are the hinges {cardines) upon which the universal Church rests and moves. It is through us that from a private person thou hast become the father of all Christians. It is, then, no longer to thyself but rather to us that thou belongest hence- forth. Thou must not sacrifice to private and recent friendships the traditional affections of the papacy. Perforce thou must consult before everything the general interest of Christendom, and must consider it an obligation of thine office to respect the opinions of the highest dignitaries of the court of Rome." If we admit that the cardinals of Eugenius III. succeeded in restricting the omnipotence of their master for their own ends, it must invariably have been the Curia that dictated its wishes to the Church and to Europe. The papacy, however, recovered its ascendancy during the pontificate of Alexander III., and seemed more powerful than ever. The recently created royalties sought from the papacy the conservation of their titles and the bene- diction of their crowns, and placed themselves voluntarily in its vassalage. The practice of the nomination of bishops by the Curia and of papal recommendation to prebends and benefices of every kind

grew daily more general, and the number of appeals to Rome and exemptions granted to abbeys and even to simple churches increased continually. The third Lateran Council (n 79) was a triumph for the leader of the Church. At that council wise and urgent measures were taken against the abuses that discredited the priesthood, but the principle of appeals and exemptions and the question of the increasing abuse of the power wielded by the Roman legates remained untouched. The treatise on canon law known as the Decretum Gratiani, which was compiled towards the middle of the 12th century and had an enduring and far-reaching effect (see Canon Law), merely gave theoretical sanction to the existing situation in the Church. It propagated doctrines in favour of the power of the Holy See, established the superiority of the popes over the councils, and gave legal force to their decretals. According to its author, ” they (the popes) are above all the laws of the Church, and can use them according to their wish; they alone judge and cannot be judged.”

It was by its constant reliance en monachism that the papacy of the 1 2th century had attained this result, and the popes of that period were especially fortunate in having for their champion the monk St Bernard, whose ‘£%£™°f admirable qualities enabled him to dominate public clairvaux. opinion. St Bernard completed the reformation, combated heresy, and by his immense moral ascendancy gained victories by which Rome benefited. As instances of his more direct services, he put an end to the schism of 1130 and attached Italy and the world to the side of Innocent III. Although he had saved the papal institution from one of the gravest perils it had ever encountered, the cardinals, the court of Rome and Innocent himself could not easily pardon him for being what he had become — a private person more powerful in the Church than the pope and the bishops, and holding that power by his personal prestige. He incurred their special reproaches by his condemnation of the irresistible evolution which impelled Rome to desire exclusive dominion over Catholic Europe and to devote

Encroach ments.

her attention to earthly things. He did not condemn the temporal power of the popes in plain terms, but both his writings and his

conduct proved that that power was in his opinion diffi- cult to reconcile with the spiritual mission of the papacy, and was, moreover, a menace to the future of the institution. (See Bernard, Saint.)

At the very moment when the papacy thus attained omni- potence, symptoms of discontent and opposition arose. The bishops resisted centralization. Archbishop Hildebert tothePapal ˆ Tours protested to Honorius II. against the Exactions appeals to Rome, while others complained of the and exactions of the legates, or, like John of Salisbury,

animadverted upon the excessive powers of the bureaucracy at the Lateran. In the councils strange speeches were heard from the mouths of laymen, who were beginning to carry to extreme lengths the spirit of independence with regard to Rome. When a question arose at Toulouse in 1 1 60 as to the best means of settling the papal schism, this audacious statement was made before the kings of France and England: ” That the best course was to side with neither of the two popes; that the apostolic see had been ever a burden to the princes; that advantage must be taken of the schism to throw off the yoke; and that, while awaiting the death of one of the competitors, the authority of the bishops was sufficient in France and England alike for the government of the churches.” The ecclesiastics themselves, however, were the first to denounce the abuses at Rome. The treatises of Gerhoh of Reichersberg (1093-1169) abound in trenchant attacks upon the greed and venality of the Curia, the arrogance and extortion of the legates, the abuse of exemptions and appeals, and the German policy of Adrian IV. and Alexander III. In his efforts to make the papal institution entirely worthy of its mission St Bernard himself did not shrink from presenting to the papacy ” the mirror in which it could recognize its deformities.” In common with all enlightened opinion, he complained bitterly of the excessive multiplication of exemptions, of the exaggerated extension of appeals to Rome, of the luxury of the Roman court, of the venality of the cardinals, and of the injury done to the traditional hierarchy by the very extent of the papal power, which was calculated to turn the strongest head. In St Bernard’s treatise De consider atione, addressed to Pope Eugenius III., the papacy receives as many reprimands and attacks as it does marks of affection and friendly counsel. To warn Eugenius against pride, Bernard reminds him in biblical terms that an insensate sovereign on a throne resembles ” an ape upon a housetop,” and that the dignity with which he is invested does not prevent him from being a man, that is, ” a being, naked, poor, miserable, made for toil and not for honours.” To his thinking, poison and the dagger were less to be feared by the pope than the lust of power. Ambition and cupidity were the source of

the most deplorable abuses in the Roman Church. The cardinals, said Bernard, were satraps who put pomp before the truth. He was at a loss to justify the unheard-of luxury of the Roman court. ” I do not find,” he said, ” that St Peter ever appeared in public- loaded with gold and jewels, clad in silk, mounted on a white mule, surrounded by soldiers and followed by a brilliant retinue. In the glitter that environs thee, rather wouldst thou be taken for the successor of Constantine than for the successor of Peter.” Rome, however, had greater dangers to cope with than the indignant reproofs of her friends the monks, and the opposition Growth of of the bishops, who were displeased at the spectacle Heretical of their authority waning day by day. It was at Sects. this period that the Catholic edifice of the middle

ages began to be shaken by the boldness of philosophical specula- tion as applied to theological studies and also by the growth of heresy. Hitherto more tolerant of heresy than the local authorities, the papacy now felt compelled to take defensive measures against it, and especially against Albigensianism, which had made great strides in the south of France since the middle of the 12th century. Innocent II., Eugenius III. and Alexander III. excommunicated the sectaries of Languedoc and their abettors, Alexander even sending armed missions to

hunt them down and punish them. But the preaching of the papal legates, even when supported by military demonstrations, had no effect; and the Albigensian question, together with other questions vital for the future of the papacy, remained unsettled and more formidable than ever when Innocent III. was elected.

3. Period from Innocent III. to Alexander IV. {ugS-1261). — Under the pontificates of Innocent III. and his five immediate successors the Roman monarchy seemed to have innocent reached the pinnacle of its moral prestige, religious M-> H°8- authority and temporal power, and this development ,216m \ was due in great measure to Innocent III. himself. Between the perhaps excessive admiration of Innocent’s biographer, Friedrich von Hurter,and the cooler estimate of a later historian, Felix Rocquain, who, after taking into consideration Innocent’s political mistakes, lack of foresight and numerous disappoint- ments and failures, concludes that his reputation has been much exaggerated, it is possible to steer a middle course and form a judgment that is at once impartial and conformable to the historical facts. Innocent was an eminent jurist and canonist, and never ceased to use his immense power in the service of the law. Indeed, a great part of his life was passed in hearing pleadings and pronouncing judgments, and few sovereigns have ever worked so industriously or

shown such solicitude for the impartial exercise of their judicial functions. It is difficult to comprehend Innocent's extraordinary activity. Over and above the weight of political affairs, he bore resolutely for eighteen years the overwhelming burden of the presidency of a tribunal before which the whole of Europe came to plead. To him, also, in his capacity of theologian, the whole of Europe submitted every obscure, delicate or controverted question, whether legal problem or case of conscience. This, undoubtedly, was the part of his task that Innocent preferred, and it was to this, as well as to his much overrated moral and theological treatises, that he owed his enormous contemporary prestige. As a statesman, he certainly committed grave faults — through excess of diplomatic subtlety, lack of forethought, and sometimes even through ingenuousness; but it must with justice be admitted that, in spite of his reputation for pugnacity and obstinacy, he never failed, either by temperament or on principle, to exhaust every peaceful expedient in settling questions. He was averse from violence, and never resorted to bellicose acts or to the employment of force save in the last extremity. If his policy miscarried in several quarters it was eminently successful in others; and if we consider the sum of his efforts to achieve the programme of the medieval papacy, it cannot be denied that the extent of his rule and the profound influence he exerted on his times entitle him to be regarded as the most perfect type of medieval pope and one of the most powerful figures in history.

A superficial glance at Innocent's correspondence is sufficient to convince us that he was pre-eminently concerned for the reformation and moral welfare of the Church, and The Pourtb was animated by the best intentions for the re-estab- Lateran lishment in the ecclesiastical body of order, peace and Council, respect for the hierarchy. This was one of the prin- 12t5 ' cipal objects of his activity, and this important side of his work received decisive sanction by the promulgation of the decrees of the fourth Lateran Council (1215). At this council almost all the questions at issue related to reform, and many give evi- dence of great breadth of mind, as well as of a very acute sense of contemporary necessities. Innocent's letters, however, not only reveal that superior wisdom which can take into account practical needs and relax severity of principle at the right moment, as well as that spirit of tolerance and equity which is opposed to the excess of zeal and intellectual narrowness of subordinates, but they also prove that, in the internal govern- ment of the Church, he was bent on gathering into his hands all the motive threads, and that he stretched the absolutist tradition to its furthest limits, intervening in the most trifling acts in the lives of the clergy, and regarding it as an obligation

of his office to act and think for all. The heretic peril, which increased during his pontificate, forced him to take decisive measures against the Albigenses in the south of France, but

before proscribing them he spent ten years (1 198-1208) in endeavouring to convert the misbelievers, and history should not Tne forget the pacific character of these early efforts. It

Alblgenslaawas because they did not succeed that necessity and Crusades t jj e violence of human passions subsequently forced him into a course of action which he had not chosen and which led him further than he wished to go. When he was compelled to decree the Albigensian crusade he endeavoured more than once to discontinue the work, which had become perverted, and to curb the crusading ardour of Simon de Montfort. Failing in his attempt to maintain the religious character of the crusade, he wished to prevent it from ending secularly in its extreme consequence and logical outcome. On several occasions he defended the cause of moderation and justice against the fanatical crusaders, but he never had the energy to make it prevail. It is very doubtful whether this was possible, and an impartial historian must take into account the insuperable difficulties encountered by the medieval popes in their efforts to stem the flood of fanaticism.

It was more particularly in the definitive constitution of the temporal and political power of the papacy, in the extension of Papal what may be called Roman imperialism, that chance

imperialism favoured his efforts and enabled him to pursue his under conquests farthest. This imperialism was undoubt-

innocentm. e(jj y Q £ a s p ec £ a j nature; it rested on moral authority and political and financial power rather than on material and military strength. But it is no less certain that Innocent attempted to subject the kings of Europe by making them his tributaries and vassals. He wished to acquire the mastery of souls by unifying the faith and centralizing the priesthood, but he also aspired to possess temporal supremacy, if not as direct owner, at least as suzerain, over all the national crowns, and thus to realize the idea with which he was penetrated and which he himself expressed clearly. He wished to be at once pope and emperor, leader of religion and universal sovereign.

And, in fact, he exercised or claimed suzerain rights, together with the political and pecuniary advantages accruing, over the greater number of the lay sovereigns of his time. He was more or less effectively the supreme temporal chief of the kingdom of Sicily and Naples, Sardinia, the states of the Iberian peninsula (Castile, Leon, Navarre and Portugal), Aragon (which, under Peter II., was the type of vassal and tributary kingdom of the Roman power), the Scandinavian states, the kingdom of Hungary, the Slav states of Bohemia, Poland, Servia, Bosnia and Bulgaria, and the Christian states founded in Syria by the crusaders of the 1 2th century. The success of Roman imperialism was particularly remarkable in England, where Innocent was confronted by one of the principal potentates of the West, by the heir of the power that had been founded by two statesmen of the first rank, William the Conqueror and Henry II. In Richard I. and John he had exceptionally authoritative adversaries; but after one of the fiercest wars ever waged by the civil power against the Church, Innocent at length gained over John the most complete victory that has ever been won by a religious potentate over a temporal sovereign, and constrained him to innocent ill. make complete submission. In 12 13 the pope and John of became not only the nominal suzerain but, de faclo England. anc j fa j ure ˆ t jj e veritable sovereign of England, and during the last years of John and the first years of Henry III. he governed England effectively by his legates. This was the most striking success of Innocent's diplomacy and the culminating point of his secular work.

The papacy, however, encountered serious obstacles, at first at the very centre of the papal empire, at Rome, where the pope had to contend with the party of communal autonomy for ten years before being able to secure the mastery at Rome. His innocentm., immense authority narrowly escaped destruction Rome and but a stone's-throw from the Lateran palace; but Italy. the victory finally rested with him, since the Roman

people could not dispense with the Roman Church, to which it owed its existence. Reared in the nurture of the pope, the populace of the Tiber renounced its stormy liberty in 1209,

and accepted the peace and order that a beneficent master gave; but when Innocent attempted to extend to the whole of Italy the regime of paternal subjection that had been so successful at Rome, the difficulties of the enterprise surpassed the powers even of a leader of religion. He succeeded in imposing his will on the nobles and communes in the patrimony of St Peter, and, as guardian of Henry VI. 's son Frederick, was for some time able to conduct the government of

the kingdom of the Two Sicilies, but in his claims on the rest of Italy the failure of the temporal power was manifest. He was unable, either by diplomacy or force of arms, to make Italian unity redound to the exclusive benefit of the Holy See. Nor was his failure due to lack of activity or energy, but rather to the insuperable obstacles in his path — the physical configuration of Italy, and, above all, the invincible repugnance of the Italian municipalities to submit to the mastery of a religious power.

As far as the Empire was concerned, chance at first favoured Innocent. For ten years a Germany weakened and divided by the rivalry of Philip of Swabia and Ottoof Brunswick innocentm. left his hands free to act in Italy, and his pontificate and the marks a period of comparative quiet in the ardent Em P' re – conflict between pope and emperor which continued throughout the middle ages. Not until 1210, when Otto of Brunswick turned against the pope to whom he owed his crown, was Innocent compelled to open hostilities; and the struggle ended in a victory for the Curia. Frederick II., the new emperor created by Innocent, began by handing over his country to Rome and sacrificing the rights of the Empire to the union of the two great authorities of the' Christian world. In his dealings with Frederick, Innocent experienced grievous vicissitudes and disappointments, but finally became master of the situation. One nation only — the France of Philip Augustus — was able to remain outside the Roman vassalage. There is not a word, in the documents concerning the relations of Philip Augustus with Rome, from which we may conclude that the Capetian crown submitted, or that the papacy wished to impose upon it the effective suzerainty of thq Holy See. Innocent III. had been able to encroach on France at one point only, when the Albigen- sian crusade had enabled him to exercise over the southern fiefs conquered by Simon de Montfort a political and secular supremacy in the form of collections of moneys. Finally, Innocent III. was more fortunate than his predecessors, and, if he did not succeed in carrying out his projected crusade and recovering the Holy Places, he at least benefited by the Franco- Venetian expedition of 1202. Europe refused to take any direct action against the Mussulman, but Latin feudalism, i, a t/„ con- assembled at Venice, diverted the crusade by an act quest of Con- of formal disobedience, marched on Constantinople, s 'antinopie. seized the Greek Empire and founded a Latin Empire in its place; and Innocent had to accept the fait accompli. Though con- demning it on principle, he turned it to the interests of the Roman Church as well as of the universal Church. With joy and pride he welcomed the Byzantine East into the circle of vassal peoples and kingdoms of Rome bound politically to the see of

St Peter, and with the same emotions beheld the patri- archate of Constantinople at last recognize Roman supremacy. But from this enormous increase of territory and influence arose a whole series of new and difficult problems. The court of Rome had to substitute for the old Greek hierarchy a hierarchy of Latin bishops; to force the remaining Greek clergy to practise the beliefs and rites of the Roman religion and bow to the supremacy of the pope; to maintain in the Greco-Latin Eastern Church the necessary order, morality and subordination; to defend it against the greed and violence of the nobles and barons who had founded the Latin Empire; and to compel the leaders of the new empire to submit to the apostolic power and execute its commands. In his endeavours to carry out the whole of this programme, Innocent III. met with insuperable obstacles and many disappointments. On the one hand, the Greeks were unwilling to abandon their religion and national cult, and scarcely recognized the ecclesiastical supremacy of the papacy. On the other hand, the upstart Latin emperors, far from proving

submissive and humble tools, assumed with the purple the habits and pretensions of the sovereigns they had dispossessed. Nevertheless, Innocent left his successors a much Vaster and more stable political dominion than that which he had received from his predecessors, since it comprised both East and West; and his five immediate successors were able to preserve this ascendancy. They even extended the limits of Roman imperial- ism by converting the pagans of the Baltic to Christianity, and further reinforced the work of ecclesiastical centralization by enlisting in their service 3 force which had recently come into existence and was rapidly becoming popular — the mendicant orders, and notably the Dominicans and Franciscans. The The Friars Roman power was also increased by the formation and the of the universities — privileged corporations of Universities. mas ters and students, which escaped the local power of the bishop and his chancellor only to place themselves under the direction and supervision of the Holy See. Mistress of the entire Christian organism, Rome thus gained control of inter- national education, and the mendicant monks who formed her devoted militia lost no time in monopolizing the professorial chairs. Although the ecclesiastical monarchy continued to gain strength, the successors of Innocent III. made less use than he of their immense power. Under Gregory IX.

(1227- 1241) and Innocent IV. (1 243-1 254) the conflict between the priesthood and the Empire was revived by the enigmatic Frederick II., the polyglot and lettered emperor, the friend of Saracens, the despot who, in youth styled ” king of priests,” in later years personified ideas that were directly opposed to the medieval theocracy; and the struggle lasted nearly thirty years. The Hohenstaufen succumbed to it, and the papacy itself received a terrible shock, which shook its vast empire to the foundations.

Nevertheless, the first half of the 13th century may be regarded as the” grand epoch of medieval papal history. Supreme in Culmination Europe, the papacy gathered into a body of doctrine of the Pupal the decisions given in virtue of its enormous de facto Power. power, and promulgated its collected decrees and oracula to form the immutable law of the Christian world. Innocent III., Honorius III. and Gregory IX. employed their jurists to collect the most important of their rulings, and Gregory’s decrees became the definitive repository of the canon law. Besides making laws for the Christendom of the present and the future, these popes employed themselves in giving a more regular form to their principal administrative organ, the offices of the Curia. The development of the Roman chancery is also a characteristic sign of the evolution that was taking place. From the time of Innocent III. the usages of the apostolic scribes become transformed into precise rules, which for the most part remained in force until the 15th century.

4. Period from Urban IV. to Benedict XI. (1261-1305). — This period comprises 13 pontificates, all of short duration (three or four years at the most, and some only a few months)., with the exception of that of Boniface VIII., who was pope for nine years. This accidental fact constitutes a prime difference in favour of the preceding period, in which there were only five pontiffs during the first sixty years of the 13th century. Towards the end of the 13th century the directors of the Christian world occupied the throne of St Peter for too short a time to be able to make their personal views prevail or to execute their political projects at leisure after ripe meditation. Whatever the merit of a Gregory X. or a Nicholas III., the brevity of their pontifi- cates prevented any one of these ephemeral sovereigns from being a great pope.

But other and far more important differences characterize this period. Although there was no theoretical restriction to influence of the temporal supremacy and religious power of the the Power papacy, certain historical facts of great importance of France, contributed to the fatal diminution of their extent. The first of these was the

preponderance of the French monarchy and nation in Europe. Founded by the conquests of Philip Augustus and Louis VIII. and legitimated and extended by the policy and moral influence of the crowned saint, Louis IX.,

the French monarchy enjoyed undisputed supremacy at the end of the 13th century and the beginning of the 14th; and this hegemony of France was manifested, not only by the extension of the direct power exercised by the French kings over all the neighbouring nationalities, but also by the establishment of Capetian dynasties in the kingdom of the Two Sicilies and in Hungary. From this time the sovereign of Rome, like other sovereigns, had to submit to French influence. But, whereas the pope was sometimes compelled to become the instrument of the policy of the kings of France or the adventurers of their race, “he was often able to utilize this new and pervading force for the realization of his own designs, although he endeavoured from time to time, but without enduring success, to shake off the overwhelming yoke of the French. In short, it was in the sphere of French interests much more than in that of the general interests of Latin Christendom that the activities of these popes were exerted. The fact of many of the popes being of French birth and France the field of their diplomacy shows that the supreme pontificate was already becoming French in character. This change was a prelude to the more or less complete subjection of the papacy to French influence which took place in the following century at the period of the ” Babylonish Captivity,” the violent reaction personified by Boniface VIII. affording but a brief respite in this irresistible evolution. It was the French- man Urban IV. (1261-1264) who called Charles of Anjou into Italy to combat the last heirs of Frederick II. and thus paved the way for the establishment of the Angevin dynasty on the throne of Naples. Under Clement IV. (1 265-1 268) an agreement was concluded by which Sicily was handed over to the brother of St Louis, and the victories of Benevento (1266) and Taglia- cozzo (1267) assured the triumph of the Guelph party and enabled the Angevins to plant themselves definitely on Neapolitan soil. Conradin’s tragic and inevitable end closed the last act of the secular struggle between the Holy See and the Empire. Haunted by the recollection of that formidable conflict and lulled in the security of the Great Interregnum, which was to render Germany long powerless, the papacy thought merely of the support that France could give, and paid no heed to the dangers threatened by the extension of Charles of Anjou’s monarchy in central and northern Italy. The Visconti Gregory X. (1271-1276) made an attempt to bring about a reaction against the tendency which had influenced his two immediate predecessors. He placed himself outside the theatre of French influence, and occupied

himself solely with the task of giving to the papal monarchy that character of universality and political superiority which had made the greatness of an Alexander III. or an Innocent III. He opposed the aggrandizing projects of the Angevins, intervened in Germany with a view to terminating the Great Interregnum, and sought a necessary counterpoise to Capetian predominance in an alliance with Rudolph of Habsburg, who had become an emperor without imperilling the papacy. The Orsini Nicholas III. pursued the same policy with regard to the independence and greatness of the Roman See, but died too soon for the cause he upheld, and, at his death in 1280, the inevitable current revived with overpowering force. His successor, Martin IV. (1281-1285), a prelate of Champagne, brother of several councillors of the king of France, prebendary at Rouen and Tours, and one of the most zealous in favour of the canonization of Louis IX., ascended the papal throne under the auspices of Charles of Anjou, and undertook the government of the Church with the sole intention of further- ing in every way the interests of the country of his birth. A Frenchman before everything, he abased the papal power to such an extent as to excite the indignation of his contemporaries, often slavishly subordinating it to the exigencies of the domestic and foreign policy of the Angevins at Naples and the reigning house at Paris. But he was prevented from carrying out this policy by an unforeseen blow, the Sicilian Vespers (March 1282), an event important both in itself and in its results. By rejecting the Capetian sovereign that Rome wished to thrust upon it to deliver it from the dynasty of Aragon, the little island of Sicily arrested the progress of French imperialism, ruined the vast

projects of Charles of Anjou, and liberated the papacy in its own despite from a subjection that perverted and shook its power. Honorius IV. (1285-1287) and Nicholas IV. (1288-1292) were able to act with greater dignity and independence than their predecessors. Though remaining leagued with the Angevins in southern Italy, they dared to look to Germany and Rudolph of Habsburg to help them in their efforts to add to the papal dominion a part of northern Italy and, in particular, Tuscany. But they still continued to desire the restoration of the Angevin dynasty in Sicily and to assist the designs of France on Aragon by preaching a crusade against the masters of Barcelona and Palermo. The hopes of the Curia were frustrated by the resistance of the Aragonese and Sicilians, and Charles of Valois, to

whom the Curia eventually destined the crown of Aragon, had to resign it for that of Constantinople, which he also failed to secure.

Boniface VIII. himself at the beginning of his pontificate yielded to the current, and, like his predecessors, adapted his external policy to the pretensions and interests of fioJˆfwiˆ ,lL ˆ e S rea t Capetian house, which, like all his prede- cessors, he at first countenanced. In spite of his instincts for dominion and the ardour of his temperament, he made no attempt to shake off the French yoke, and did not decide on hostilities with France until Philip the Fair and his legists attempted to change the character of the kingship, emphasized its lay tendencies, and exerted themselves to gratify the desire for political and financial independence which was shared by the French nation and many other European peoples. The war which ensued between the pope and the king of France ended in the complete defeat of the papacy, which was reduced to impotence (1303), and though the storm ceased during the

a 1., „» „ nine months' pontificate of Benedict XL, the See of Subjection r . . '.....

oithe St Peter recovered neither its normal equilibrium

Papacy to nor its traditional character. The accession of the France. £ rst Avignon pope, Clement V., marks the final subjection of the papal power to the Capetian government, the inevitable result of the European situation created in the preceding century.

In other respects the papacy of this period found itself in a very inferior situation to that which it had occupied under Innocent III. and the popes of the first half of the 13th century. The fall of the Latin Empire and the retaking of Constantinople by the Palaeologi freed a great part of the Eastern world from the political and religious direction of Rome, and this fact necessarily engaged the diplomacy of Urban IV. and his suc- cessors in an entirely different direction. To them the Eastern problem presented a less complex aspect. There could no longer be any serious question of a collective expedition of Europe for the recovery of the Holy Places. The ingenuous faith of a Louis IX. was alone capable of giving rise to two crusades organized privately and without the influence or even the approval of the pope. Although all these popes, and Gregory X. especially, never ceased theoretically to urge the Christian world to the crusade, they were actuated by the desire of remaining faithful to tradition, and more particularly by the political and financial advantages accruing to the Holy See from the preaching and the crusading expeditions. The European state of mind no longer lent itself to such enterprises, and,

moreover, under such brief pontificates, the attenuated Roman power could not expect to succeed where Innocent III. himself had failed. The main preoccupation of all these popes was how best to repair the injury “done to orthodox Europe and to Rome by the destruction of the Latin Empire. Several of them thought of restoring the lost empire by force, and thus giving a pendant

to the fourth crusade; but the Curia finally realized Lyons, 1274. t ne enormous difficulties of such a project, and con- Reiations vinced themselves that the only practical solution of with the tˆ difficulty was to come to an understanding with Church. tne Palaeologi and realize pacifically the long-dreamed

union of the Greek and Latin Churches. The nego- tiations begun by Urban IV. and continued more or less actively by his successors were at last concluded in 1274. by Gregory X.

The Council of Lyons proclaimed the union, which was destined to be effective for a few years at least and to be prolonged precariously in the midst of unfavourable circumstances. The Greek mind was opposed to the union; the acquiescence of the Byzantine emperors was but an ephemeral expedient of their foreign policy; and the peace between the Latins and Greeks settled on Byzantine soil could not endure for long. The principal obstacle, however, was the incompatibility of the popes’ Byzantine and Italian policies. The popes were in favour of Charles of Anjou and his dynasty, but Charles was hostile to the union of the two Churches, since it was his intention to seize the Byzantine Empire and substitute himself for the Palaeologi. Almost all the successors of Urban IV. were compelled to exert their diplomacy against the aggrandizing aims of the man they had themselves installed in southern Italy, and to protect the Greek emperor, with whom they were negotiating the religious question. On several occasions between the years i27r and 1273 the Angevins of Naples, who had great influence in Achaea and Albania and were solidly supported by their allies in the Balkan Peninsula, nearly carried out their project; and in 1274 the opposition of Charles of Anjou came near to compromising the operations of the council of Lyons and ruining the work of Gregory X. The papacy, however, held its ground, and Nicholas III., the worthy continuer of Gregory, succeeded in preserving the union and triumphing over the Angevin power. The Angevins took their revenge under Martin IV., who was a stanch supporter of the French. Three weeks after his coronation Martin excommuni- cated the Greek emperor and all his subjects, and allied himself with Charles of Anjou and the Venetians to compass his downfall. In this case, too, the Sicilian Vespers was the rock on which

the hopes and pretensions of the sovereign of Naples suffered shipwreck. After Martin's death the last popes of the 13th century, and notably Boniface VIII., in vain thought to find in another Capetian, Charles of Valois, the man who was to re-establish the Latin dominion at Byzantium. But the East was lost; the union of 1274 was quickly dissolved; and the reconciliation of the two Churches again entered into the category of chimeras.

During this period the papal institution, considered in its internal development, already showed symptoms of decadence. The diminution of religious faith and sacerdotal prestige shook it to its very foundations. The p a °p a y C y, * * growth of the lay spirit continued to manifest itself among the burgesses of the towns as well as among the feudal princes and sovereigns. The social factors of communism and nationalism, against which Innocent III. and his successors had struggled, became more powerful and more hostile to theocratic domination. That a sovereign like St Louis should be able to associate himself officially with the feudalism of his realm to repress abuses of church juris- diction; that a contemporary of Philip the Fair, the lawyer Pierre Dubois, should dare to suggest the secularization of ecclesiastical property and the conversion of the clergy into a class of functionaries paid out of the royal treasury; and that Philip the Fair, the adversary of Boniface VIII., should be able to rely in his conflict with the leader of the Church on the popular consent obtained at a meeting of the Three Estates of France — all point to a singular demoralization of the sentiments and principles on which were based the whole power of the pontiff of Rome and the entire organization of medieval Catholicism. Both by its attitude and by its governmental acts, the papacy of the later 13th century itself contributed to increase the discredit and disaffection from which it suffered. Under Urban IV. and his successors the great moral and religious sovereignty of former times became a purely bureaucratic monarchy , in which the main preoccupation of the governors appeared to be the financial exploitation of Christendom. In the registers of these popes, which are now being actively investigated and published, dispensations (licences to violate the laws of the Church); indulgences; imposts levied with increasing regularity on uni- versal Christendom and, in particular, on the clerks; the

settlement of questions relating to church debts; the granting of lucrative benefices to Roman functionaries; the divers processes by which the Curia acquired the immediate disposal of monastic, capitulary and episcopal revenues — in short, all financial matters are of the first importance. It was in the 14th century more especially that the Apostolic Chamber spread the net of its fiscal administration wider and wider over Christian Europe; but at the close of the 13th century all the preliminary measures had been taken to procure for the papal treasury its enormous and permanent resources. The continued efforts of the popes to drain Christian gold to Rome were limited only by the fiscal pretensions of the lay sovereigns, and it was this financial rivalry that gave rise to the inevitable conflict between Boniface VIII. and Philip the Fair.

By thus devoting itself to material interests, the papacy contemporary with the last Capetians lost its moral greatness Abuse of and fell in the opinion of the peoples; and it did the Papal itself no less injury by the abnormal extension of Power. (-he bounds of its absolutism. By its exaggerated methods of centralization the papal monarchy had absorbed within itself all the living forces of the religious world and suppressed all the liberties in which the Church of old had lived. The subjection of the secular clergy was complete, while the episcopate retained no shadow of its independence. The decree of Clement IV. (1266), empowering the papacy to dispose of all vacant bishoprics at the court of Rome, merely sanctioned a usage that had long been established. But the control exercised by the Roman Curia over the episcopate had been realized by many other means. It was seldom that an episcopal election took place without a division in the chapter, in which resided the electoral right. In such an event, the competitors appealed to the Holy See and abdicated their right, either voluntarily or under coercion, in manibus papae, while the pope took possession of the vacant see. Nominations directly made by the court of Rome, especially in the case of dioceses long vacant, became increasingly numerous. The principle of election by canons was repeatedly violated, and threatened to disappear; and at the end of the 13th century the spectacle was common of prelates, whether nominated or confirmed by the pope, entitling themselves ” bishops by the grace of the Holy See.” The custom in force required bishops established by papal authority to take an oath of fidelity to the pope and the Roman Church, and this oath bound them in a particular fashion to the Curia. Those bishops, however, who had been elected under normal conditions, conformably to the old law, were deprived of the essential parts of their legitimate authority. They lost, for example, their jurisdiction, which they were’ seldom able to exercise in their own

names, but in almost every case as commissaries delegated by the apostolic authority.

The regular clergy, who were almost wholly sheltered from the power of the diocesan bishops, found themselves, even more than the secular priesthood, in a state of complete depen- dence on the Curia. The papacy of this period continually intervened in the internal affairs of the monasteries. Not only did the monks continue to seek from the papacy the confirmation of their privileges and property, but they also referred almost all their disputes to the arbitration of the pope. Their elections gave rise to innumerable lawsuits, which all terminated at the court of Rome, and in most cases it was the pope himself who designated the monks to fill vacant posts in the abbeys. Thus the pope became the great ecclesiastical elector as well as the universal judge and supreme legislator. On this extreme concentration of the Christian power was employed throughout Europe an army of official agents or officious adherents of the Holy See, who were animated by an irrepressible zeal for the aggrandizement of the papacy. These officials originally consisted of an obedient and devoted militia of mendicant friars, both Franciscans and Dominicans, who took their orders from Rome alone, and whose efforts the papacy otimulated by lavishing exemptions, privileges, and full sacer- dotal powers. Subsequently they were represented by the

apostolic notaries, who were charged to exercise throughout Christendom the gracious jurisdiction of the leaders of the Church and to preside over the most important acts in the private lives of the faithful. These tools of Rome, both clerks and laymen, continued to increase in every diocese. They were not invested with their office until they had been examined by a papal chaplain, or sometimes even by the vice-chancellor of the Curia.

The sovereign direction of this enormous monarchy belonged to the pope alone, who was assisted in important affairs by the advice and collaboration of the College of Cardinals, who had become the sole electors to the papacy. Towards the close of the 13th century the necessity arose for an express ruling on the question of the exercise of this electoral right. In 1274 Gregory X., completing the measures taken by Alexander III. in the 12th century, promulgated the celebrated constitution by which the cardinal-electors were shut up in conclave and, in the event of their not having designated the new pope within three days, were constrained to perform their duty by a pro gressive reduction of their food-allowance (see Conclave). But at the head of this vast body there existed a constant tendency which was opposed to the absorption of all the power by a single and

unbridled will.- In the last years of this period fresh signs appeared of a reaction that emanated from the Sacred College itself. The cardinal-electors endeavoured to derive from their electoral power a right of control over the acts of the pope elect. In 1294, and again in 1303, they laid themselves under an obligation, previously to the election, to subscribe to the political engagements which each promised rigorously to observe in the event of his becoming pope. In general, these engagements bore upon the limitation of the number of cardinals, the prohibition to nominate new ones without previous notification to the Sacred College, the sharing between the cardinals and the pope of certain revenues specified by a bull of Nicholas IV., and the obligatory consultation of the con- sistories for the principal acts of the temporal and spiritual government. It is conceivable that a pope of Boniface VIII. ‘s temperament would not submit kindly to any restriction of the discretionary power with which he was invested by tradition, and he endeavoured to make the cardinals dependent on him and even to dispense with their services as far as possible, only assembling them in consistory in cases of extreme necessity. This tendency of the Sacred College to convert the Roman Church into a constitutional monarchy, in which it should itself play the part of parliament, was a sufficiently grave symptom of the progress of the new spirit. But throughout the ecclesi- astical society traditional bonds were loosened and anarchy was rife, and this at the very moment when the enemies of the priesthood and its leaders redoubled their attack. In fine, the decadence of the papal institution manifested itself in an irremediable manner when it had accomplished no more than the half of its task. The growth of national kingdoms, the anti-clerical tendencies of the emancipated middle classes, the competition of lay imperialisms, and all the other elements of resistance which had been encountered by the papacy in its progress and had at first tended only to shackle it, now pre- sented an insurmountable barrier. The papacy was weakened by its contest with these adverse elements, and it was through its failure to triumph over them that its dream of European dominion, both temporal and spiritual, entered but very incompletely into the field of realities.. (A. Lu.)

777. — Period from 1305 to 1590.

The accession of the Gascon Clement V. in 1305 marks the beginning of a new era in the history of the papacy; for this pope, formerly archbishop of Bordeaux, remained clemeat v. in France, without once crossing the threshold of 1305-1314. the Eternal City. Clement’s motive for this reso- Settlement lution was his fear that the independence of the a

exercised on him by the French king Philip the Fair. In March 1309, Clement V. transferred his residence to Avignon, a town which at that time belonged to the king of Naples, but was sur- rounded by the countship of Venaissin, which as early as 1228 had passed into the possession of the Roman See. Clement V. remained at Avignon till the day of his death, so that with him begins the so-called Babylonian Exile of the popes. Through this, and his excessive subservience to Philip the Fair, his reign proved the reverse of salutary to the Church. The pope's subservience was above all conspicuous in his attitude towards the proceedings brought against the order of the Temple, which was dissolved by the council of Vienne (see Templars). His possession of Ferrara involved Clement in a violent struggle with the republic of Venice, in which he was ultimately victorious.

His successor John XXII. a native of Cahors, was elected as the result of very stormy negotiations, after a two years'

vacancy of the see (13 16). Like his predecessor 1316-1334.' ne fixed his permanent residence at Avignon, where

he had formerly been bishop. But while Clement V. had contented himself with the hospitality of the Dominican monastery at Avignon, John XXII. installed himself with great state in the episcopal palace, hard by the cathedral. Character of The essential features of this new epoch in the the Avignon history of the papacy, beginning with the two popes Papacy mentioned, are intimately connected with this lasting separation from the traditional seat of the papacy, and from Italian soil in general: a separation which reduced the head of the Church to a fatal dependence on the French kings. Themselves Frenchmen, and surrounded by a College of Cardinals in which the French element predominated, the popes gave to their ecclesiastical administration a certain French character, till they stood in mere and more danger of serving purely national interests, in cases where the obligations of their office demanded complete impartiality. And thus the prestige of the papacy was sensibly diminished by the view, to which the jealousy of the nations soon gave currency, that the supreme dignity of the Church was simply a convenient tool for French statecraft. The accusation might not always be supported by facts, but it tended to shake popular confidence in the head of the

universal Church, and to inspire other countries with the feeling of a national opposition to an ecclesiastical regime now entirely Gallicized. The consequent loosening of the ties between the individual provinces of the Church and the Apostolic See, combined with the capricious policy of the court at Avignon, which often regarded nothing but personal and family interests, accelerated the decay of the ecclesiastical organism, and justified the most dismal forebodings for the future. To crown all, the feud between Church and Empire broke out again with unprecedented violence. The most prominent leaders of the opposition to the papacy, whether ecclesiastical or political, joined forces with the German king, Louis of Bavaria, and offered him their aid against John XXII. The clerical opposition was led by the very popular the Papacy." 'and influential Minorites who were at that time engaged in a remarkably bitter controversy with the pope as to the practical interpretation of the idea of evangelical poverty. Their influence can be clearly traced in the appeal to a general council, issued by Louis in 1324 at Sachsenhausen near Frankfort-on-the-Main. This document, which confused the political problem with the theological, was bound to envenom the quarrel between emperor and pope beyond all remedy. Side by side with the Minorites, the spokesmen of the specifically political opposition to the papacy were the Parisian professors, Marsilius of Padua and John of Jandun, the composers of the " Defender of the Peace " (defensor pacts). In conjunction with the Minorites and the Ghibellines of Italy, Marsilius succeeded in enticing Louis to the fateful expedition to Rome and the revolutionary actions of 1328. The conferring of the imperial crown by the Roman populace, the deposition of the pope by the same body, and the election of an anti-pope in the person of the Minorite Pietro

da Corvara, translated into acts the doctrines of the defensor pads. The struggle, which still further aggravated the depen- dence of the pope on France, was waged on both sides with the utmost bitterness, and the end was not in sight when John XXII. died, full of years, on the 4th of December 1334.

Even the following pope, Benedict XII., a man of the strictest morality, failed, in spite of his mild and pacific disposition, to adjust the conflict with Louis of Bavaria and the eccentric Fraticelli. King Philip VI. and the car- 1334-1342, ' dinals of the French party worked energetically against the projected peace with Louis; and Benedict was not endowed with sufficient strength of will to carry through his designs in the teeth of their opposition. He failed, equally, to stifle the first beginnings of the war between France and England; but it is at least to his honour that he exerted his whole influence in the cause of peace.

His efforts in the direction of reform, moreover, deserve recognition. In Avignon he began to erect himself a suitable residence, which, with considerable additions by later popes, developed into the celebrated papal castle of Avignon. This enormous edifice, founded on the cathedral rock, is an extra- ordinary mixture of castle and convent, palace and fortress. It was Benedict XII. also who elevated the doctrine of the beatific vision of the saints into a dogma.

Benedict XII. was again succeeded, in 1342, by a Frenchman from the south, Pierre Roger de Beaufort, who was born in the castle of Maumont, in the diocese of Limoges. He assumed the title of Clement VI. In contrast with 1342-1332.' his peace-loving predecessor, and in accordance with his own more energetic character, he pursued with decision and success the traditions of John XXII. in his dealings with Louis of Bavaria. With great dexterity he turned the feud between the houses of Luxemburg and Wittelsbach to the destruction of Louis; and the death-struggle between the two seemed about to break out, when Louis met his untimely end. To all appearances the victory of the papacy was decisive: but it was a Pyrrhic victory, as events were quickly to prove. In Rome there ensued, during the pontificate of Clement, the revolutions of the visionary Cola di Rienzo (q.v.) who restored the old republic, though not for long. By his purchase of Avignon, and the creation of numerous French cardinals, the pope consolidated the close connexion of the Roman Church with France: but the interests of that Church suffered severely through the riches and patronage which Clement lavished on his relatives, and through the princely luxury of his court. His generosity — which degenerated into prodigality — compelled him to open fresh sources of revenue; and in this he succeeded, though not without serious detriment to the interests of the Church.

It was fortunate for the Church that Clement VI. was followed by a man of an entirely different temperament — Innocent VI. This strict and upright pope appears to have taken Benedict XII. for his example. He undertook, fijˆmg™ though not with complete success, a reformation of ecclesiastical abuses; and it was he who assisted in restoring the Empire at last to some measure of stability. But the culmina ting glory of his reign was the restoration of the almost ruined papal dominion in Italy, by means of the highly-gifted Cardinal Albornoz. The restoration of the Apostolic See to its original and proper seat was now possible; and the need for such a step was the more pressing, since residence in the castle at Avignon had become extremely precarious, owing to the ever-increasing confusion of French affairs. Innocent VI., in fact, entertained the thought of visiting Rome; but age and illness prevented his doing so.

The intention of Innocent was put into execution by his successor — the learned and pious Urban V. Two events of the first magnitude make his reign one of the most memorable in the century. The first of these was ˆ362-1370. the return to Rome. This was an object which the emperor Charles IV. had prosecuted with all his energies; which alone could revive the languishing reputation of the papacy,

by withdrawing it from the turmoils of the Anglo-French War, and bring within the bounds of possibility the much-needed Temporary reformation in ecclesiastical affairs. In 1367 it Return to became an accomplished fact. Turning a deaf ear Rome. t0 jjjg remonstrances of the French king and the French cardinals, the pope quitted Avignon on the 13 th of April 1367; and on the 16th of October he entered Rome, now completely fallen to ruin. The ensuing year, after his return to the Eternal City, witnessed the second great landmark in the reign of Urban V. — the Roman expedition of Charles IV., and the renewal of amicable relations between the Empire and the Church. Unfortunately, the pope failed to deal satisfactorily with the highly complicated situation in Italy; and the result was that, on the 27th of September 1370, he returned to Avignon, where he died on the following iqth of December.

It was the opinion of Petrarch that, had Urban remained in Rome, he would have been entitled to rank with the most distinguished men of his era; and, if we discount this single act of weakness, he must be classed as one of the noblest and best of popes. Especial credit is due to his struggles against the moral corruptions of the day, though they proved inadequate to eliminate all traces of the prevalent disorders.

Gregory XI., though equally distinguished for his erudition and pure morals, his piety, modesty and wisdom, was fated to

pay dearly for the weakness of his predecessor in 1370ˆ1378. “abandoning Rome so early. He lived to see the

national spirit of Italy thoroughly aroused against a papacy turned French. The disastrous error of almost ex- clusively appointing Provencals, foreigners ignorant of both the country and the people, to the government of the Papal States, now found a terrible Nemesis: and there came a national upheaval, such as Italy had not yet witnessed.

The feud between Italian and Frenchman broke out in a violent form; and it was in vain that St Catherine of Siena proffered her mediation in the bloody strife betwixt the pope and the Floren- tine republic. The letters that she addressed to the pontiff, on this and other occasions, are documents, which are, perhaps, unique in their kind, and of great literary beauty. It was also St Catherine who prevailed on Gregory XI. to return to Definite Rome. On the 13th of September 1376 he left Return to Avignon; on the 17th of January 1377 he made his Rome. entry into the city of St Peter. Thus ended the exile in France; but it left an evil legacy in the schism under Gregory's successor. Gregory, the last pope whom France has given to the Church, died on the 27th of March 1378, after taking measures to ensure a speedy and unanimous election for his successor.

The conclave, which took place in Rome, for the first time for 75 years, resulted in the election of Bartolomeo Prignano

(April 8, 1378), who took the name of Pope Urban VI. 1378-1389. Canonically the election was perfectly valid; 1 so

that the only popes, to be regarded as legitimate, are the successors of Urban. It is true that his election was imme- diately impugned by the cardinals on frivolous grounds; but the responsibility for this rests, partially at least, with the pope himself, whose reckless and inconsiderate zeal for reform was bound to excite a revolution among the worldly cardinals still yearning for the fleshpots of Avignon. This revolution could already be foreseen with tolerable certainty, when Urban embroiled himself even with his political friends — the queen of Naples and her husband, Duke Otto of Brunswick. Similarly, he quarrelled with Count Onorato Gaetano of Fondi. The cardinals, excited to the highest pitch of irritation, now knew where they could look for support. Thirteen of them assembled at Anagni, and thence, on the 9th of August, issued a passionate manifesto, announcing the invalidity of Urban's election, on Election ot the ground that it had been forced upon the conclave Ami-pope by the Roman populace. As soon as the rebellious clement ˆ'-cardinals were further assured of the protection of the French king, Charles V., they elected, with the tacit consent af the three Italian cardinals, Robert of Geneva as anti-pope 1 See Pastor, Geschichte der Pdpste, !., 121.

(Fondi, Sept. 20). Robert assumed the style of Clement VII.;

and thus. Christendom was brought face to face with the worst

misfortune conceivable— ˆthe Great Schism (1378-1417).

The chief responsibility for this rests with the worldly

College of Cardinals, who were longing to return to France,

and thence drew their inspiration. This college _. _ . r ,.1. a • -j 1 • i_ \ TheOreat

was a creation of the Avignon period; which must schism.

therefore, in the last resort, be considered respon- sible for this appalling calamity. Severe censure, moreover, attaches to Charles V., of France. There may be room for dispute, as to the extent to which the king's share in the schism was due to the instigation of the revolted cardinals; there can be not the slightest doubt that his attitude was the decisive factor in perpetuating and widening the breach. The anti-pope was recognized not only by Charles of France, but by the princes of the Empire dependent on him, by Scotland and Savoy, and finally by the Spanish dominions and Portugal. On the other hand, the emperor Charles IV. and his son Wenceslaus, the greater part of the Empire, England, Hungary, Poland, Denmark, Norway and Sweden, together with the majority of the Italian states^- Naples excepted — remained loyal to the pope. Urban, in fact — who meanwhile had created a new College of Cardinals with members of different nationalities — enjoyed one great advantage; his rival failed to hold his own in Italy, with which country the actual decision virtually lay. Unfortunately, in the time that followed, Urban was guilty of the grossest errors, pursuing his personal interests, and sacrificing, all too soon, that universal point of view which ought to have governed his policy. The struggle against his powerful neighbour on the frontier, Queen Joanna of Naples, rapidly became his one guiding motive; and thus he was led into a perfect labyrinth of blunders. He excommunicated the queen as a stiff-necked adherent of the French anti-pope, and in 1381 conferred Naples on the ambitious Charles of Durazzo, with whom he was soon inextricably embroiled; while, a little later, he fell out with his new College of Cardinals. On the 15th of October 1389, he died, with few to lament him.

After the death of Urban VI., fourteen cardinals of his obedience assembled, and after long negotiations elected . the scion of a noble Neapolitan family, Cardinal Pietro Tomacelli (Nov. 2, 1389). The title which .he took l389 _ l404 /' was that of Boniface IX. The new pope— a man of high moral character, great sagacity, eloquence, and of a kindly disposition — at once instituted an entirely different policy from that pursued by his predecessor. This was especially the case in his treatment of Naples. In May 1390 Ladislaus, the son of Charles of

Durazzo, who had been assassinated in the February of 1386, received the royal crown at the hands of a papal legate. To his cause Boniface IX. closely attached himself; and his support of the king against the Angevins cost him enormous sums, without which Ladislaus could not have secured his victory over the French claimant. By these means, the schism was averted from Italy, and Naples won for the Roman obedience. The situation in the papal state, which Boniface found in the greatest confusion, was at the outset far more difficult to deal with. But here also he attained in time a considerable measure of success, although the methods employed were scarcely above criticism. His greatest success, however, was gained in the Eternal City itself; for he contrived, after many vicissitudes, to induce the Romans to annul their republican constitution and acknowledge the papal supremacy, even in municipal matters.

To give this supremacy a firmer basis, Boniface fortified the Vatican and the Capitol, and restored the castle of St Angelo — which had previously been used as a quarry — providing it with walls and battlements, and erecting a tower in the centre. This castle, indeed, yielded a safe shelter to the pope in January 1400, when the Colonnas made their attempt to surprise Rome. However, the adventure failed; and by the aid of Ladislaus, the castles of the Colonnas in the vicinity of Rome were destroyed. In 1401 this powerful family made its submission, accepting the favourable terms which the pope had had the good sense to

offer. Henceforward quiet prevailed, and Boniface ruled as a stern master in Rome. But he was soon confronted with an extremely dangerous enemy, in the person of Duke Gian Galeazzo Visconti of Milan, who was aiming at the sovereignty of all Italy. In July 1402 he made himself master of Bologna; and his death in September of the same year was a stroke of good fortune for the pope. Bologna was now recovered for the Church (Sept. 2, 1403), and soon afterwards Perugia also surrendered.

Thus Boniface IX., as a secular prince, occupies an important position; but as pope his activity must be unfavourably judged. Even if Dietrich of Niem frequently painted him too black, there is no question that the means which Boniface employed to fill the papal treasury seriously

impaired the prestige of the highest spiritual office and the reverence due to it. His nepotism, again, casts a dark shadow over his memory: but most regret- table of all was his indifference towards the ending of the schism. Yet it should be borne in mind, that, when Clement VII. died suddenly on the 16th of September 1394, and the Avignon cardinals immediately elected the Spaniard Pedro de Luna as anti-pope (under the title of Benedict XIII.), Boniface IX. was left face to face with an extraordinarily skilful, adroit, and unscrupulous antagonist.

On the death of Boniface (Oct. 1, 1404), the Roman cardinals once more elected a Neapolitan, Cosimo dei Migliorati, who, at Innocent the age of 65, assumed the name of Innocent VII. vii., 1404- Innocent, who was animated by a great love for the ,406 ‘ sciences and all the arts of peace, enjoyed only a brief

pontificate, but his reign is not without importance, if only as an example of the generous patronage which the papacy — even in its darkest days — has lavished on literature and science. Significant also is the foothold gained at this time in the Curia itself by the humanists — Poggio, Bruni and others. The appointment of these skilled humanist writers to the Chancery was a consequence of the difficult conditions of the time. The crisis which the Catholic Church underwent, during this terrible epoch, was the greatest in all her history: for while everything was thrown into the utmost confusion by the life and death struggles of the rival popes, while the ecclesiastical revenues and emoluments were used almost exclusively for the reward of partisan service, while everywhere the worldliness of the clergy had reached its highest pitch, heretical movements, by which the whole order of the Church was threatened with overthrow, were gaining strength in England, France, Italy. Germany and especially in Bohemia.

The crisis came to a head in the pontificate of Gregory XII. This pope, so distinguished in many respects, owed his election Gregory mainly to the circumstance that he was considered xii., 1406- a zealous champion of the restoration of unity within ua ‘ the Church: and he displayed, in fact, during the

earlier portion of his reign, an exalted enthusiasm for this great task. Later his attitude changed; and the protracted negotia- tions for a conference with Benedict XIII. remained fruitless. The result of this change in the attitude of Gregory was the formation of a strong malcontent party in the College of Cardinals; to counteract whose influence, the pope — faithless to the conditions attached to his

election — resorted to the plan of creating new members. Stormy discussions at Lucca followed; but they failed to prevent Gregory from nominat- ing four fresh cardinals (May 9, 1408). The sequel was that seven of the cardinals attached to Gregory's Roman Curia withdrew to Pisa.

At the same period, the relations of Benedict XIII. with France suffered a significant modification. In that country, Benedict it became more and more manifest that Benedict xiii. and had no genuine desire to heal the schism in the France. Church, in spite of the ardent zeal for union which he had displayed immediately before and after his election. In May 1408 France withdrew from his obedience; and it was not long before French policy succeeded in,effecting a reconcilia- tion and understanding between the cardinals of Benedict XIII. and those who had seceded from Gregory XII. Precisely as I

if the Holy See were vacant, the cardinals began to act as the actual rulers of the Church, and issued formal invitations to a council to be opened at Pisa on the Feast of the Annunciation (March 25) 1409. Both popes pˆ,. c attempted to foil the disaffected cardinals by convening councils of their own; but their efforts were doomed to failure.

On the other hand, the council of the cardinals — though, by the strict rules of canonical law, its convocation was abso- lutely illegal — attained the utmost importance. But these rules, and, in fact, the whole Catholic doctrine of the primacy were almost entirely obscured by the schism. Scholars like Langenstein, Gerson and Zabarella, evolved a new theory as to ecumenical councils, which from the point of view of Roman Catholic principles must be described as revolutionary. At the synod of the dissident cardinals, assembled at Pisa, views of this type were in the ascendant; and, although protests were not lacking, the necessities of the time served as a pretext for ignoring all objections.

That the council was merely a tool in the hands of the ambitious and adroit Baldassare Cossa, was a fact unsuspected by its members who were animated by a fiery enthusiasm for the re-establishment of ecclesiastical unity; nor did they pause to reflect that an action against both popes could not possibly be lawful. Since whole universities and numerous scholars had pronounced in favour of the new theories, the Pisan synod dismissed all canonical scruples, and unhesitatingly laid claim to authority over both popes, one of whom was necessarily the legitimate pope. It was in vain that Carlo di Malatesta, a stanch adherent of Gregory, sought at the eleventh hour to negotiate a

compromise between Gregory and the synod. It was in vain that this cultured prince, imbued with the principles of humanism, represented to the cardinals that this new path would lead quickly to the goal, but that this goal could not be unity but a triple schism. The council declared that it was canonically convened, ecumenical, and representative of the whole Catholic Church; then proceeded immediately to the trial and deposition of Benedict XIII. and Gregory XII. The synod grounded its procedure against the rival popes on a fact, ostensibly patent to all, but actually believed by none— that they were both supporters of the schism, and not merely this, but heretics in the truest and fullest sense of the word, since their attitude had impugned and subverted the article of faith concerning the one Holy, Catholic and Apostolic Church. On the ground of this extremely dubious declaration, designed to compensate for the absence of any authentic and firm foundation in ecclesiastical law, the Pisan assembly on the 5th of June announced the deposition of Gregory XII. and Benedict XIII., as manifest heretics and partisans of the schism. Alexander The next step was to elect a new pope; and on the v.,U09-26th of June 1409 the choice fell on the venerable l4m ‘ cardinal-archbishop of Milan, the Greek Petros Filargis, who assumed the title of Alexander V.

The premature and futile character of these drastic and violent proceedings at Pisa was only too speedily evident. The powerful following which Gregory enjoyed in Italy and Germany, and Benedict in Spain and Scotland, ought to have shown from the very first that a simple decree of deposition could never suffice to overthrow the two popes. Thus, as the sentence of Pisa found recognition in France and England, as well as in many parts of Germany and Italy, the synod, which was to secure the restoration of unity, proved only the cause for worse confusion — instead of two, there were now three popes.

Alexander V., the pope of the council, died on the 3rd of May 1410. The cardinals at once elected his successor — Baldassare Cossa, who took the name of John XXIII. Of all the consequences of the disastrous Pisan council, 1410,1415. ” the election of this man was the most unfortunate. True, it cannot be demonstrated that all the fearful accusations afterwards levelled at John XXIII. were based on fact: but it is certain that this cunning politician was so far infected with

the corruption of his age that he was not in the least degree fitted to fulfil the requirements of the supreme ecclesiastical dignity. From him the welfare of the Church had nothing to hope. All eyes were consequently turned to the energetic German king, Sigismund, who was inspired by the best motives, and who succeeded in surmounting the formidable Constance, obstacles which barred the way to an ecumenical ‘ council. It was mainly due to Sigismund’s inde- fatigable and magnificent activity, that the council of Constance met and was so numerously attended. It is remarkable how fortune seemed to assist his efforts. The capture of Rome by King Ladislaus of Naples had compelled John XXIII. to take refuge in Florence (June 1413), where that dangerous guest received a not very friendly welcome. Since John’s most immediate need was now protection and assistance against his terrible opponent Ladislaus, he sent, towards the close of August 1413, Cardinals Chalant and Francesco Zabarella, together with the celebrated Greek Manuel Chrysoloras, to King Sigismund, and commissioned them to determine the time and place of the forthcoming council. The agreement was soon concluded. On the 9th of December John XXIII. signed the bull convening the council at Constance, and pledged his word to appear there in person. He might have hoped that his share in convening the synod would give him a certain right to regulate its proceedings, and that, by the aid of his numerous Italian prelates, he would be able to influence it more or less according to his views. But in this he was greatly deceived. So soon as he realized the true position of affairs he attempted to break up the council by his flight to Schaffhausen (March 20-21, 1415) — a project in which he would doubtless have succeeded but for the sagacity and energy of Sigismund.

In spite of everything, the excitement in Constance was unbounded. In the midst of the confusion, which reigned supreme in the council, the upper hand was gained by that party which held that the only method by which the schism could be ended and a reformation of ecclesiastical discipline ensured was a drastic limitation of the papal privileges. The limitation was to be effected by the general council: con- sequently, the pope must be brought under the jurisdiction of that council, and — in the opinion of many — remain under its jurisdiction for all time. Thus, in the third, fourth and fifth general sessions it was enacted, with characteristic precipitation, that an ecumenical council could not be dissolved or set aside by the pope, without its consent : the corollary to which was, that the present council, notwithstanding the flight of John XXIIL, continued to exist in the full possession of its powers, and that, in matters pertaining to belief and the eradication of schism, all men — even the pope — were

bound to obey the general council, whose authority extended over all Christians, including the pope himself.

By these decrees — which created as the supreme authority within the Church a power which had not been appointed as such by Christ 1 — the members of the council of Constance sought to give'their position a theoretical basis before proceeding to independent action against the pope. But these declarations as to the superiority of an ecumenical council never attained legal validity, in spite of their defence by Pierre d'Ailly and Gerson. Emanating from an assembly without a head, which could not possibly be an ecumenical council without the assent of one of the popes (of whom one was necessarily the legitimate pope) — enacted, in opposition to the cardinals, by a majority of persons for the most part unqualified, and in a fashion which Deposition was thus distinctly different from that of the old of John councils — they can only be regarded as a coup de XXIII. main, a last resort in the universal confusion. On the 20th of May the council deposed John XXIIL

The legitimate pope, Gregory XII. , now consented to resign, but under strict reservation of the legality of his pontificate.

1 Here of course the author speaks of the papal supremacy and not of papal infallibility in matters of faith and morals — a doc- trine which was formally declared a dogma of the Church only at the Vatican council in 1870. — [Ed.]

By consenting to this, the synod indirectly acknowledged that its previous sessions had not possessed an ecumenical charac- ter, and also that Gregory's predecessors, up to Resignation Urban VI., had been legitimate popes. In presence of Gregory of the council, reconstituted by Gregory, Malatesta XI1 ' announced the resignation of the latter; and the grateful assembly appointed Gregory legatus a latere to the marches of Ancona — a dignity which he was not destined to enjoy for long, as he died on the 18th of October 1417. (See Constance, Council of.)

From the abdication of Gregory XII. to the election of Martin V., the Apostolic See was vacant ; and the council, newly convened and authorized by the legitimate pope vacancy of before his resignation, conducted the government of the Holy the Church. After the condemnation and burning of See * John Huss (q.v.), the reformation of the Church, both in its head and members, claimed the main attention of the fathers of the council. Among the many difficulties which beset the question, not the least obvious was the length of time

during which the Church must remain without a ruler, if — as Sigismund and the German nation demanded — the papal election were deferred till the completion of the internal reforms. The result was decided by the policy of the cardinals, who since May 141 7 had openly devoted their whole energies to the accelera- tion of that election; and union was preserved by means of a compromise arranged by Bishop Henry of Winchester, the uncle of the English king. The terms of the agreement were that a synodal decree should give an absolute assurance that the work of reformation would be taken in hand immediately after the election; reforms, on which all the nations were already united, were to be published before the election; and the mode of the papal election itself was to be determined by deputies. When the last-named condition had been fulfilled on the 28th of October the conclave began, on the 8th of November 141 7, in the Kaufhaus of Constance; and, no later than St Martin's day, the cardinal-deacon Oddo Colonna was elected Pope Martin V.

With the accession of Martin V. unity was at last restored to the Church, and contemporary Christendom gave way to transports of joy. Any secular power — a 1417.1431. bitter opponent of the papacy admits — would have succumbed in the schism: but so wonderful was the organization of the spiritual empire, and so indestructible the conception of the papacy itself, that this (the deepest of all cleavages) served only to prove its indivisibility (Gregorovius, Geschichle Roms vi.). Martin V. appeared to possess every quality which could enable him to represent the universal Church with strength and dignity. In order to maintain his independence, he ener- getically repudiated all proposals that he should establish his residence in France or Germany, and once more took up his abode in Rome. On the 30th of September 1420 he made his entry into the almost completely ruinous town. To repair the ravages of neglect, and, more especially, to restore the decayed churches, Martin at once expended large sums; while, later, he engaged famous artists, like Gentile da Fabriano and Masaccio, and encouraged all forms of art by every means within his power. Numerous humanists were appointed to the Chancery, and the Romans were loud in their praise of the papal regime. But he was not content with laying the foundations for the renovation of the Eternal City: he was the architect who rebuilt the papal monarchy, which the schism had reduced to the verge of dis- solution. To this difficult problem he brought remarkable skill and aptness, energy and ability. His temporal sovereignty he attempted to strengthen through his family connexions, and magnificent provision in general was made for the members of his house.

Nor was the activity of Martin V. less successful in political than in ecclesiastical reform, which latter included the com- bating of the Fraticelli, the amendment of the clergy, the encouragement of piety by the regulation of feast-days, the recommendation of increased devotion to the sacrament of the altar, and the strengthening of the conception of the Church

by the great jubilee of 1423. At the same time the crowning reward of his labours was the effacing of the last traces of the schism. He prosecuted successfully the conflict with the adherents of Benedict XIII., who, till the day of his death 1 clung to the remnants of his usurped authority (see Benedict XIII.). An attempt on the part of Alphonso V. of Aragon to renew the schism failed; and, in 1429, the Spaniard was compelled to give up his anti-pope, Clement VIII. Count John of Armagnac, whom Martin had excommunicated as a protector of schismatics, was also driven to make submission. Martin rendered the greatest service by his admission of a whole series of distinguished men into the College of Cardinals; but he was less fortunate in his struggles against Hussitism. His death took place on the 20th of February 143 1, and the inscription on his grave — still preserved in the Lateran church — styles him ” the felicity of his age” (lemporum suorum felicitas).

The Colonna pope was followed by the strict, moral and pious Gabriel Condulmaro, under the title of Eugenius IV. Buzealasrv.ˆ is P°nti nc a te was not altogether happy. At the very 1431-U47 ‘first, his violent and premature measures against the and the Colonna family, which had received such unbounded Council of f avour f rom his predecessor, embroiled him in a sanguinary feud. Far worse, however, were the conflicts which Eugenius had to support against the Council of Basel — already dissolved on the 18th of December 1431. At the beginning, indeed, a reconciliation between the pope and council was effected by Sigismund who, on the 31st of May 1433, was crowned emperor at Rome. But, as early as the 29th of May 1434 a revolution broke out in Rome, which, on the 4th of June, drove the pope in flight to Florence; where he was obliged to remain, while Giovanni Vitelleschi restored order in the papal state.

The migration of Eugenius IV. to Florence was of extreme importance;

for this town was the real home of the new art, and the intellectual focus of all the humanistic movements in Italy. At Florence the pope came into closer contact with the humanists, and to this circumstance is due the gradual dominance which they attained in the Roman Curia — a domi- nance which, both in itself, and even more because of the frankly pagan leanings of many in that party, was bound to awaken serious misgivings.

The Italian troubles, which had entailed the exile of Eugenius IV., were still insignificant in comparison with those conjured up by the fanatics of the Council in Basel. The decrees enacted by that body made deep inroads on the rights of the Holy See; and the conflict increased in violence. On the 31st of July 1437 the fathers of Basel summoned Eugenius IV. to appear before their tribunal. The pope retorted on the 18th of September by transferring the scene of the council to Ferrara — afterwards to Florence. There, in July 1439, the union with the Greeks was effected: but it remained simply a paper agreement. On the 25th of June 1439 the synod — which had already pronounced sentence of heresy on Eugenius IV., by reason of his obstinate disobedience to the assembly of the Church — formally deposed him; and, on the 5th of November, a rival pontiff was elected in the person of the ambitious Amadeus of Savoy, who now took the

AaU-pope. titIe of Felix V – (See BASEL, COUNCIL OF, and

Felix V.) Thus the assembly of Christendom at Basel had resulted, not in the reformation of the Church, but in a new schism! This, in fact, was an inevitable sequel to the attempt to overthrow the monarchical constitution of the Church. The anti-pope — the last in the history of the papacy — made no headway, although the council invested him with the power of levying annates to a greater extent than had ever been claimed by the Roman Curia.

The crime of this new schism was soon to be expiated by its perpetrators. The disinclination of sovereigns and peoples to a division, of the disastrous consequences of which the West had only lately had plentiful experiences, was so pronounced that

1 May 23, 1423 : vide the Chronicle of Martin de AlpartU, edited by Ehrle (1906).

the violent proceeding of the Basel fathers alienated from them the sympathies of nearly all who, till then, had leaned to theii side. While

the prestige of the schismatics waned, Eugenius IV. gained new friends; and on the 28th of September 1443 hi» reconciliation with Alphonso of Naples enabled him to return to Rome. In consequence of the absence of the pope, the Eternal City was once more little better than a ruin; and the work of restoration was immediately begun by Eugenius.

During the chaos of the schism, France and Germany had adopted a semi-schismatic attitude: the former by the Pragmatic Sanction of Bourges (June 7, 1438); the latter by a declaration of neutrality in March 1438. The efforts of Aeneas Silvius Piccolomini brought matters into a channel more favourable to the Holy See; and an understanding with Germany was reached. This consummation was soon followed by the death of Eugenius (Feb. 23, 1447). No apter estimate of his character can be found than the words of Aeneas Silvius himself: “He was a great-hearted man; but his chief error was that he was a stranger to moderation, and regulated his actions, not by his ability, but by his wishes.” From the charge of nepotism he was entirely exempt; and, to the present day, the purity of his life has never been impugned even by the voice of faction. He was a father to the poor and sick, in the highest sense of the word; and he left behind him an enduring monument in his amendment and regeneration, first of the religious orders, then of the clergyˆ Again, the patronage which he showed to art and artists was of the greatest importance. All that could be done in that cause, during this stormy epoch, was done by Eugenius. It was by his commission that Filarete prepared the still-extant bronzework of St Peter’s, and the Chapel of the Holy Sacrament in the Vatican was painted by Fiesole.

On the death of Eugenius IV. the situation was menacing enough, but, to the surprise and joy of all, Tomaso Parentu- celli, cardinal of Bologna, was elected without disturbance, as Pope Nicholas V. With him the Christian Renaissance ascended the papal throne. He was the son of a 1447.145s. ‘ physician from Sarzana, who was not too well endowed with the gifts of fortune; and the boy, with all his talents, could only prosecute his studies at great personal sacrifices. He was possessed of a deep-seated enthusiasm for science and art, of a sincerely pious and idealistic temperament, and of an ardent love for the Church. After his ordination, his great learning and stainless life led him to office after office in the Church, each higher and more influential than the last. Not only did he love the studies of the humanist, but he himself was a Christian humanist. Yet among all his far-reaching plans for the encouragement of art and science, Nicholas V. had always the well-being of the Church primarily in view; and the highest goal of his pontificate, which inaugurated the Maecena- tian

era of the popedom, was to ennoble that Church by the works of intellect and art. It is astonishing to contemplate how much he achieved, during his brief reign, in the cause of the Renaissance in both art and literature. True, his designs were even greater, but his term of government was too short to allow of their actual execution. A simply gigantic plan was drawn out, with the assistance of the celebrated Alberti, for the reconstruction of the Leonine City, the Vatican and St Peter's. The rebuilding of the last-named was rendered advisable by the precarious condition of the structure, but stopped short in the early stages. In the Vatican, however, Fiesole completed the noble frescoes, from the lives of St Stephen and St Lawrence, which are still preserved to us. Nicholas, again, lent the pro- tection and encouragement of his powerful arm to science as well as art, till the papal court became a veritable domain of the Muses. He supported all scientific enterprises with unlimited generosity, and the most famous savants of all countries flocked to Rome. Yet it is surprising — and scarcely excusable — that Nicholas, while selecting the men whom he considered necessary for his literary work, passed over much which ought to have aroused grave suspicion in his mind. Thus the active human- istic life, called into existence by the enthusiasm of the pope, was not without its dark side. Quite apart from the fact that

Rome became the scene of a chronique scandahuse among these scholars, there was something unnatural in the predominance of the humanists in the Curia.

The fostering care of the science-loving pope extended also to the field of ecclesiastical literature; and the greatest impor- tance attaches to the energy he developed as a collector of manuscripts and books. His agents travelled as far as Prussia, and even into the East. All this activity served to enrich the Vatican library, the foundation of which is for Nicholas V. an abiding title to fame. In political and ecclesiastical affairs he similarly manifested great vigour; and his extraordinarily pacific disposition did more than anything else towards diminishing the difficulties with which he had to contend on his entry upon office. An agreement was very quickly concluded with King Alphonso of Naples. In the Empire the affairs of the Church were

ameliorated — though not so quickly — by the Concordat of Vienna (1448). The Council of Basel was compelled to dissolve, and the anti-pope Felix V. to abdicate: and, though even after the termination of the synod men like Jacob of Jiiterbogk (q.v.) were found to champion ecclesiastical parlia- mentarianism and the more advanced ideas of Basel, they were confronted, on the other hand, by an array of redoubtable controversialists, who entered the lists to defend, both in speech and writing, the privileges of the Apostolic See. Among these, Torquemada, Rodericus Sancius de Arevalo, Capistrano and Piero del Monte were especially active for the restoration of the papacy. Fortunate as Nicholas was in the haute politique of the Church, he was equally so in his efforts to re-establish and maintain peace in Rome and the papal state. In Poland, Bohemia, Hungary, Bosnia and Croatia — even in Cyprus itself — he was zealous for the peace of the Church.

The long-hoped cessation of civil war within the Church had now come, and Nicholas considered that the event could

. . not better be celebrated than by the proclamation of 1450. a universal jubilee — an announcement which evoked

a thrill of joy in the whole of Christendom. A special point of attaction in this jubilee of 1450 was the canonization of Bernardino of Siena; and, in spite of the plague which broke out in Rome, the celebrations ran a brilliant course.

It was the wish of the pope that the jubilee should be followed by a revival of religious life in all Christian countries. To put this project into execution, the Church opened her ” treasuries of grace,” connected with the jubilee dispensation, for the peculiar benefit of those nations that had suffered most from the turmoils of the last few decades, or were prevented from visiting the Eternal City. Nicholas of Cusa was nominated legate for Germany, and began the work of reformation by travelling through every province in Germany dispensing blessings. It was under Nicholas V. that the last imperial coronation was solemnized at Rome. There is a touch of tragedy in the fact that, in the following year, the pope saw his temporal sovereignty — even his life — threatened by a con- spiracy hatched among the adherents of the pseudo-humanism. The prime mover in the plot, Stefano Porcaro, was executed. Nicholas had scarcely recovered from the shock, when news came of the capture of Constantinople by the Turks; and his efforts to unite the Christian powers against the Moslem failed. This darkened the evening of his life, and he died in the night of the 24-25th of March 1455. From the universal standpoint of history the significance of Nicholas’s pontificate lies in the fact that

he put himself at the head of the artistic and literary Renaissance. By this means he introduced a new epoch in the history of the papacy and of civilization: Rome, the centre of ecclesiastical life, was now to become the centre of literature and art.

The short reign of the Spaniard, Alphonso de Borgia, as

Pope Calixtus III., is' almost completely filled by his heroic

r. ., 1 ,1, efforts to arm Christendom for the common defence

Calixtus III., .

1455-1458. against Islam. Unfortunately all the warnings

and admonitions of the pope fell on deaf ears,

though he himself parted with his mitre and plate in order

to equip a fleet against the Turks: The Mahommedans, indeed,

were severely punished at Belgrade (1456), and in the sea-

fight of Metelino (1457): but the indolence of the European princes, who failed to push home the victory, rendered the success abortive. Bitterly disillusioned, Calixtus died on the 14th of August 1458. His memory would be stainless but for the deep shadow cast on it by the advancement which he conferred upon his relatives.

When Aeneas Sylvius Piccolomini was elected pope as Pius II. the papal throne was ascended by a man whose name was famous as poet, historian, humanist and statesman, and whose far-seeing eye and exact knowledge of uss-Hm. affairs seemed peculiarly to fit him for his position. On the other hand, the troubled and not impeccable past of the new pontiff was bound to excite some misgiving; while, •at the same time, severe bodily suffering had brought old age on a man of but 53 years. In spite of his infirmity and the brief duration of his reign, Pius II. accomplished much for the restoration of the prestige and authority of the Holy See. His indefatigable activity on behalf of Western civilization, now threatened with extinction by the Ottomans, excites admiiation and adds an undying lustre to his memory. If we except the Eastern question, Pius II. was principally exercised by the opposition to papal authority which was gaining ground in Germany and France. In the former country the movement was headed by the worldly archbishop-elector Diether of Mainz; 1 in the latter by Louis XL, who played the autocrat in ecclesiasti- cal matters. In full

consciousness of his high-priestly dignity he set his face against these and all similar attempts; and his zeal and firmness in defending the authority and rights of the Holy See against the attacks of the conciliar and national parties within the Church deserve double recognition, in view of the eminently difficult circumstances of that period. Nor did he shrink from excursions in the direction of reform, now become an imperative necessity. His attempt to reunite Bohemia with the Church was destined to failure; but the one great aim of the pope during his whole reign was the organization of a gigantic crusade — a project which showed a correct appreciation of the danger with which the Church and the West in general were menaced by the Crescent. It is profoundly affecting to contemplate this man, a mere wreck from gout, shrinking from no fatigue, no labour, and no personal sacrifices; disregarding the obstacles and difficulties thrown in his way by cardinals and temporal princes, whose fatal infatuation refused to see the peril which hung above them all; recurring time after time, with all his intellect and energy, to the realization of his scheme; and finally adopting the high-hearted resolve of placing himself at the head of the crusade. Tortured by bodily, and still more by mental suffering, the old pope reached Ancona. There he was struck down by fever; and on the 15th of August 1464 death had released him from all his afflictions — a tragic close which has thrown a halo round his memory. In the sphere of art he left an enduring monument in the Renaissance town of Pienza which he built.

The humanist Pius II. was succeeded by a splendour-loving Venetian, Pietro Barbo, the nephew of Eugenius IV., who is known as Pope Paul II. With his accession the situation altered; for he no longer made the Turkish tˆAidn War the centre of his whole activity, as both his immediate predecessors had done. Nevertheless, he was far from indifferent to the Ottoman danger. Paul took energetic measures against the principle of the absolute supremacy of the state as maintained by the Venetians and by Louis XL of France; while in Bohemia he ordered the deposition of George Podebrad (Dec. 1466). The widely diffused view that this pope was an enemy of science and culture is unfounded. It may be traced back to Platina, who, resenting his arrest, avenged himself by a biographical caricature. What the pope actually sought to combat by his dissolution of the Roman Academy

1 Diether von Isenburg (1412-1463), second son of Count Diether of Isenburg- Budingen; rector of the university of Erfurt, 1434: archbishop of Mainz, 1459. He led the movement for a reform of the Empire and the opposition to the papal encroachments, sup- porting the theory of church government enunciated at Constance and Basel

and condemned in Pius II. ‘s bull Execrabilis. — [Ed.]

was simply the non-Christian tendency of the Renaissance, standing as it did on a purely pagan basis — ” the stench of heathendom,” as Dante described it. In other respects Paul II. encouraged men of learning and the art of printing, and built the magnificent palace of San Marco, in which he established a noble collection of artistic treasures.

The long pontificate of the Franciscan Francesco della Rovere, ■ under the title of Pope Sixtus IV., displays striking contrasts of light and shade; and with him, begins 1471-1484″ t ‘ le ser i es ˚f tne so-called ” political popes.” It remains a lamentable fact that Sixtus IV. frequently subordinated the Father of Christendom to the Italian prince, that he passed all bounds in the preferment of his own family, and in many ways deviated into all too worldly courses. The decay of ecclesiastical discipline grew to alarming propor- tions under Sixtus. During his reign crying abuses continued and grew in spite of certain reforms.

The nepotism in which the pope indulged is especially inex- cusable. His feud with Lorenzo de’ Medici culminated in the Pazzi conspiracy, the tragic sequel to which was the assassination of Giuliano de’ Medici (April 26, 1478). That the pope himself was guiltless of any share in that atrocious deed is beyond dispute; but it is deeply to be regretted that his name plays a part in the history of this conspiracy. Sixtus was far from blind to the Turkish peril, but here also he was hampered by the indifference of the secular powers. Again, the close of his reign was marked by the wars against Ferrara and Naples, and subsequently against Venice and the Colonnas; and these drove the question of a crusade completely into the background. In the affairs of the Church he favoured the mendicant orders, and declared against the cruel and unjust proceedings of the Spanish Inquisition. His nominations to the cardinalate were not happy. The College of Cardinals, and the Curia in general, grew more and more infected with worldliness during his pontificate. On the other side, however, the pope did splendid service to art and science, while to men of letters he allowed incredible freedom. The Vatican library was enriched and thrown open for public use, Platina — the historian of the popes— receiving the post of

librarian. The city of Rome was transfigured. At the papal order there arose the Ponte Sisto, the hospital of San Spirito, Santa Maria del popolo, Santa Maria della pace, and finally the Sistine Chapel, for the decoration of which the most famous Tuscan and Umbrian artists were summoned to Rome. This fresco-cycle, with its numerous allusions to contemporary history, is still preserved, and forms the noblest monument of the Rovere pope.

The reign of Innocent VIII. is mainly occupied by his troubles with the faithless Ferdinand of Naples. These sprang from his innocent participation in the War of the Barons; but to this Viu., 1484- the pope was absolutely compelled. Innocent's bull i* 92 – concerning witchcraft (Dec. 5, 1484) has brought upon

him many attacks. But this bull contains no sort of dogmatic decision on the nature of sorcery. The very form of the bull, which merely sums up the various items of information that had reached the pope, is enough to prove that the decree was not intended to bind anyone to belief in such things. Moreover the bull contained no essentially new regulations as to witchcraft. It is absurd to make this docu- ment responsible for the introduction of the bloody persecution of witches; for, according to the Sachsenspiegel, the civil law already punished sorcery with death. The action of Inno- cent VIII. was simply limited to defining the jurisdiction of the inquisitors with regard to magic. The bull merely authorized, in cases of sorcery, the procedure of the canonical inquisition, which was conducted exclusively by spiritual judges and differed entirely from that of the later witch-trials. Even if the bull encouraged the persecution of witches, in so far as it encouraged the inquisitors to take earnest action, there is still no valid ground for the accusation that Innocent VIII. introduced the trial of witches and must bear the responsibility for the terrible misery which was afterwards brought on humanity by that institution.

During the last three decades of the 15th century the Roman Curia, and the College of Cardinals in particular, became increasingly worldly. This explains how on the Alexander death of Innocent VIII. (July 25, 1492), simoniacal VI., 1492- intrigues succeeded in procuring the election of ,503, Cardinal Rodrigo Borgia, a man of the most abandoned morals, who did not change his mode of life when he ascended the throne as Pope Alexander VI. The beginning of his reign was not un- promising; but all too soon that nepotism began which attained its height under this Spanish pope, and dominated his whole pontificate. A long series of scandals resulted. The cardinals opposed to Alexander, headed by Giuliano della Rovere, found protection and support with Charles VIII. of France, who laid claim to Naples. In

prosecution of this design the king appeared in Italy in the autumn of 1494, pursued his triumphant march through Lombardy and Tuscany, and, on the 31st of December, entered. Rome. Charles had the word reform perpetually on his lips; but it could deceive none who were acquainted with the man. At first he threatened Alexander with deposition: but on the 15th of January 1495 an agreement was concluded between pope and king.

While the French were marching on Naples there arose a hostile coalition which compelled them to beat a hasty retreat — the Holy League of March 1495. AH their conquests were lost; and the pope now determined to chastise the Orsini family, whose treachery had thrown him into the hands of the French. The project miscarried, and on the 25th of January 1497 the papal forces were defeated.

In June occurred the mysterious assassination of the duke of Gandia, which appeared for a while to mark the turning- point in Alexander's life. For some time he entertained serious thoughts of reformation; but the matter was first postponed and then forgotten. The last state now became worse than the first, as Alexander fell more and more under the spell of the infamous Cesare Borgia. One scandal followed hard on the other, and opposition naturally sprang up. Unfortunately, Savonarola, the head of that opposition, transgressed all bounds in his well- meant zeal. He refused to yield the pope that obedience to which he was doubly pledged as a priest and the member of an order. Even after his excommunication (May 12, 1497) he continued to exercise the functions of his office, under the shelter of the secular arm. In the end he demanded a council for the deposition of the pope. His fall soon followed, when he had lost all ground in Florence; and his execution on the 23rd of May 1498 freed Alexander from a formidable enemy (see Savonarola). From the Catholic standpoint Savonarola must certainly be condemned: mainly because he completely forgot the doctrine of the Church that the sinful and vicious life of superiors, including the pope, is not competent to abrogate their jurisdiction.

After the death of Charles VIII. Alexander entered into an agreement and alliance with his successor Louis XII. The fruits of this compact were reaped by Cesare Borgia, who resigned his cardinal's hat, became duke of Valentinois, annihil- ated the minor nobles of the papal state, and made himself the true dictator of Rome. His soaring plans were destroyed by the death of Alexander VI., who met his end on the 18th of August 1 503 by the Roman fever — not by poison.

The only bright pages in the dark chapter of Alexander's popedom are his efforts on behalf of the Turkish War (1499-1502), his activity for

the diffusion of Christianity in America, and his judicial awards (May 3-4, 1493) on the question of the colonial empires of Spain and Portugal, by which he avoided a bloody war. It is folly to speak of a donation of lands which did not belong to the pope, or to maintain that the freedom of the Americans was extinguished by the decision of Alexander VI. The expression ” donation ” simply referred to what had already been won under just title: the decree contained a deed of gift, but it was an adjustment between the powers concerned and the other European princes, not a parcelling out of the New World and its inhabitants. The monarchs on whom the privilegium was conferred received a right of priority with

respect to the provinces first discovered by them. Precisely as to-day inventions are guarded by patents, and literary and artistic creations by the law of copyright, so, at that period, the papal ball and the protection of the Roman Church were an effective means for ensuring that a country should reap where she had sown and should maintain the territory she had discovered and conquered by arduous efforts; while other claimants, with predatory designs, were warned back by the ecclesiastical censorship. In the Vatican the memory of Alexander VI. is still perpetuated by the Appartamenta Borgia, decorated by Pinturicchio with magnificent frescoes, and since restored by Leo XIII.

The short reign of the noble Pius III. (Sept. 22-Oct. 18, 1503) witnessed the violent end of Cesare Borgia’s dominion. As early as the 1st of November Cardinal Giuliano 1603. ” della Rovere was elected by the conclave as Julius II. He was one of those personalities in which everything transcends the ordinary scale. He was endowed with great force of will, indomitable courage, extra- ordinary acumen, heroic constancy and a discrimi- 1S03-1S13 natm S instinct for everything beautiful. A nature formed on great broad lines — a man of spontaneous impulses carrying away others as he himself was carried away, a genuine Latin in the whole of his being — he belongs to those imposing figures of the Italian Renaissance whose character is summarized in contemporary literature by the word terribile, which is best translated “extraordinary” or ” magnificent.”

As cardinal Julius II. had been the adversary of Alexander VI., as pope he stood equally in diametrical opposition to his predecessor. The

Borgia's foremost thought had been for his family; Julius devoted his effort to the. Church and the papacy. His chief idea was to revive the world-dominion of the popedom, but first to secure the independence and prestige of the Holy See on the basis of a firmly established and independent territorial sovereignty. Thus two problems presented themselves: the restoration of the papal state, which had been reduced to chaos by the Borgias; and the liberation of the Holy See from the onerous dependence on France — in other words, the expulsion of the French " barbarians " from Italy. His solution of the first problem entitles Julius II. to rank with Innocent III. and Cardinal Albornoz as the third founder of the papal state. His active prosecution of the second task made the Rovere pope, in the eyes of Italian patriots, the hero of the century. At the beginning of the struggle Julius had to endure many a hard blow; but his courage never failed — or, at most, but for a moment — even after the French victory at Ravenna, on Easter Sunday 1512. In the end the Swiss saved the Holy See; and, when Julius died the power of France had been broken in Italy, although the power of Spain had taken its place.

The conflict with France led to a schism in the College of Cardinals, which resulted in the concttiabidum of Pisa. Julius adroitly checkmated the cardinals by convening a general council, which was held in the Lateran. This assembly was also designed to deal with the question of reform, when the pope was summoned from this world (Feb. 20-21, 1513). Of his ecclesiastical achievements the bull against simony at papal elections deserves the most honourable mention. Again, by his restoration of the papal state, after the frightful era of the Borgias, Julius became the saviour of the papal power. But this does not exhaust his significance; he was, at the same time, the renewer of the papal Maecenate in the domain of art. It is to his lasting praise that he took into his service the three greatest artistic geniuses of the time — Bramante, Michelangelo and Raphael — and entrusted them with congenial tasks. Bramante drew out the plan for the new cathedral of St Peter and the reconstruction of the Vatican. On the 18th of April 1506 the foundation-stone of the new St Peter's was laid; 120 years later, on the 18th of November 1626, Urban VIII. consecrated the new cathedral of the world, on which twenty popes had laboured, in conjunction with the first architects of the day, modifying in many points the grandiose

original design of Bramante, and receiving the contributions of every Christian land.

St Peter's, indeed, is a monument of the history of art, not merely within these 120 years from the zenith of the Renaissance till the

transition into Baroque — from Bramante, The new Raphael, Michelangelo, to Madema and Bernini — st Peter's but down to the 19th century, in which Canova and the and Thorwaldsen erected there the last great papal ' Vatlcaa ' monuments. But a still more striking period of art is represented by the Vatican, with its antique collections, the Sistine and the Stanze. Here, too, we are everywhere confronted with the name of Julius II. It was he who inaugurated the collection of ancient statues in the Belvedere, and caused the wonderful roof of the Sistine Chapel to be painted by Michelangelo (cf. Steinmann, Die sixtin. Kapelle II., 1905). Simultaneously, on the commission of the pope, Raphael decorated the Vatican with frescoes glorifying the Church and the papacy. In the Camera della Segnatura he depicted the four intellectual powers — theology, philosophy, poetry and law. In the Stanza d'Eliodoro Julius II. was visibly extolled as the Head of the Church, sure at all times of the aid of Heaven. 1

As so often occurs in the history of the papacy, Julius II. was followed by a man of an entirely different type — Leo X. Though not yet 37 years of age, Giovanni de' Medici, distinguished for his generosity, mildness and isi3-iszu courtesy, was elevated to the pontifical chair by the adroit manoeuvres of the younger cardinals. His policy — though officially he declared his intention of following in the steps of his predecessor — was at first extremely reserved. His ambition was to play the role of peacemaker, and his conciliatory policy achieved many successes. Thus, in the very first year of his reign, he removed the schism which had broken out under Julius II. As a statesman Leo X. often walked by very crooked paths; but the reproach that he allowed his policy to be swayed exclusively by his family interests is unjustified. It may be admitted that he clung to his native Florence and to his family with warm affection; but the really decisive factor which governed his attitude throughout was his anxiety for the temporal and spiritual independence of the Holy See. The conquest of Milan by the French led to a personal interview at Bologna, where the " Concordat " with France was concluded. This document annulled the Pragmatic Sanction of Bourges, with its schismatic tendencies, but at the same time confirmed the preponderating influence of the king upon the Gallican Church — a concession which in spite of its many dubious aspects at least made the sovereign the natural defender of the Church and gave him the strongest motive for remaining Catholic. The war for the duchy of Urbino (1 516-17) entailed disastrous consequences, as from it dates the complete disorganization of papal finance. It was, moreover, a contributing cause of the conspiracy of Cardinal Petrucci, 2 the suppression of which was followed (July, 1517) by the creation of 31 new cardinals in one day. This — the

greatest of recorded creations — turned the scale once and for all in favour of the papal authority and against the cardinals. The efforts of Leo to promote a crusade, which fall mainly in the years 1517 and 1518, deserve all recogni- tion, but very various opinions have been held as to the attitude of the pope towards the Imperial election consequent on the death of Maximilian I. The fundamental motive for his pro- ceedings at that period was not nepotistic tendencies— which doubtless played their part, but only a secondary one — but his anxiety for the moral and temporal independence of the Holy See. For this reason Leo, from the very first, entertained no genuine desire for the selection either of Charles V. or Francis I. of France. By playing off one against the other he succeeded in holding both in suspense, and induced them to conclude agreements safeguarding the pope and the Medici. Of the two,

1 The closer connexion of these frescoes with contemporary history was first elucidated by Pastor, in his Geschichte der Papste, vol. iii., which also contains the most complete account of the reign ot this the second Rovere pope. — [Ed.]

2 Alfonso Petrucci (d. 1517), a Sienese. He was degraded from the cardinalate by Leo X.— -[Ed.]

the French king appeared the less dangerous, and the result was that Leo championed his cause with all his energies. Not till the eleventh hour, when the election of the Habsburg, to whom he was entirely opposed, was seen to be certain did he give way. He thus at least avoided an open rupture with the new emperor — a rupture which would have been all the more perilous on account of the religious revolution now imminent in Germany. There the great secession from Rome was brought about by Martin Luther: but, in spite of his striking personality, the upheaval which was destined to shatter the unity of the Western Church was not his undivided work. True, he was the most powerful agent in the destruction of the existing order; but, in reality, he merely put the match to a pile of inflammable materials which had been collecting for centuries (see Reformation). A main cause of the cleavage in Germany was the position of ecclesiastical affairs, which — though by no means hopeless — yet stood in urgent need of emendation, and, combined with this, the deeply resented

financial system of the Curia. Thus Luther assumed the leadership of a national opposition, and appeared as the champion who was to undertake the much-needed reform of abuses which clamoured for redress. The occasion for the schism was given by the conflict with regard to indulgences, in the course of which Luther was not content to attack actual grievances, but assailed the Catholic doctrine itself. In June 15 18 the canonical pro- ceedings against Luther were begun in Rome; but, owing to political influences, only slow progress was made. It was not till the 15th of June 1520 that his new theology was con- demned by the bull Exsurge, and Luther himself threatened with excommunication — a penalty which was only enforced owing to his refusal to submit, on the 3rd of January 1521.

The state of Germany, together with the unwise behaviour of Francis I., compelled Leo X. to side with Charles V. against the French king; and the united forces of the empire and papacy had achieved the most brilliant success in upper Italy, when Leo died unexpectedly, on the 1st of December 1521. The character of the first Medician pope shows a peculiar mixture of noble and ignoble qualities. With an insatiable love of pleasure he combined a certain external piety and a magnificent generosity in his charities. His financial administration was disastrous, and led simply to bankruptcy. On music, hunt- ing, expensive feasts and theatrical performances money was squandered, while, with unexampled optimism the pope was blind to the deadly earnestness of the times.

Leo's name is generally associated with the idea of the Medicean era as a golden age of science and art. This con- ception is only partially justified. The reputation of a greater Maecenas — ascribed to him by his eulogists — dwindles before a sober, critical contemplation, and his undeniable merits are by no means equal to those which fame has assigned to him. The love of science and literature, which animated the son of Lorenzo the Magnificent, frequently took the shape of literary dilettantism. In many respects the brilliance of this long and often vaunted Maecenate of Leo X. is more apparent than real. There are times when it irresistibly conveys the im- pression of dazzling fireworks of which nothing remains but the memory. The genuine significance of Leo lies rather in the stimulus which he gave. From this point of view his deserts are undoubtedly great; and for that reason he possesses an indefeasible right to a certain share in the renown of the papacy as a civilizing agent of the highest rank.

As a patron of art Leo occupies a more exalted plane. In this domain the first place must be assigned to the splendid achievements of Raphael, whom the pope entrusted with new and comprehensive

commissions — the Stanza dell' inceiidio, the Logge, and the tapestry-cartoons, the originals of the last named being now in London. But, though illuminated by the rays of art, and loaded with the exuberant panegyrics of humanists and poets, the reign of the first Medicean pontiff, by its unbounded devotion to purely secular tendencies and its comparative neglect of the Church herself proved disastrous for the See of St Peter.

By a wonderful dispensation the successor to this scion of the Medici was Adrian VI. — a man who saw his noblest task, not in an artistic Maecenate, nor in the prosecution . of political designs, but in the reform of the Church 1S22.I523'.' in all its members. Careless of the glories of Renaissance art, a stranger to all worldly instincts, the earnest Netherlander inscribed on his banner the healing of the moral ulcers, the restoration of unity to the Church — especially in Germany — and the preservation of the West from the Turkish danger. How clearly he read the causes of religious decadence, how deeply he himself was convinced of the need of trenchant reform, is best shown by his instructions to Chieregati, his nuncio to Germany, in which he laid the axe to the root of the tree with unheard-of freedom. Unfortunately, it was all in vain. Luther and his adherents overwhelmed the noble pope with unmeasured abuse. The two great rivals, Francis I. and Charles V., were deaf to his admonitions to make common cause against the Turks. The intrigues of Cardinal Soderini led- to a breach with France and drove Adrian into the arms of the Imperial league. Soon afterwards, on the 14th of September 1523, he died. Long misunderstood and slandered, Adrian VI., the last German pope, is now by all parties ranked among the most revered and most worthy of the popes. No one now denies that he was one of those exceptional men, who without self- seeking spend their lives in the service of a cause and fight bravely against the stream of corruption. Even though, in his all too brief pontificate, he failed to attain any definite results, he at least fulfilled the first condition of any cure by laying bare the seat of disease, gave an important impetus to the cause of the reform of the Church, and laid down the principles on which this was afterwards carried through. His activity, in fact, will always remain one of the brightest chapters in the history of the papacy.

Under Leo X. Cardinal Giulio de' Medici, the cousin of that pope, had already exercised a decisive influence upon Catholic policy; and the tiara now fell to his lot. Clement element VII. — so the new pontiff styled himself — was soon vu„ 1523- to discover the weight of the crown which . he had ,S34 ' gained. The international situation was the most difficult imagin- able, and altogether beyond the powers of the timorous, vacillat- ing and irresolute Medician pope. His

determination to stand aloof from the great duel between Francis I. and Charles V. failed him at the first trial. He had not enough courage and perspicacity to await in patience the result of the race between France and Germany for the- duchy of Milan — a contest which was decided at Pavia (Feb. 24, 1525). The haughty victors found Clement on the side of their opponent, and he was forced into an alliance with the emperor (April 1, 1525). The overweening arrogance of the Spaniards soon drove the pope back into the ranks of their enemies. On the 22nd of May 1526 Clement acceded to the League of Cognac, and joined the Italians in their struggle against the Spanish supremacy. This step he was destined bitterly to repent. The tempest descended on the pope and on Rome with a violence which cannot be paralleled, even in the days of Alaric and Genseric, or of the Norman Robert Guiscard. On the 6th of May 1527 the Eternal City was stormed by the Imperial troops and subjected to appalling devastation in the famous sack. Clement was detained for seven months a prisoner in the castle of St Angelo. He then went into exile at Orvieto and Viterbo, and only on the 6th of October 1528 returned to his desolate residence. After the fall of the French dominion in Italy he made his peace with the emperor at Barcelona (June 20, 1529); in return for which he received the assistance of Charles in re-establishing the rule of the Medici in Florence. During the Italian turmoil the schism in Germany had made such alarming progress that it now proved impossible to bridge the chasm. With regard to the question of a council the pope was so obsessed by doubts and fears that he was unable to advance a single step; nor, till the day of his death could he break off his pitiful vacillation between Charles V. and Francis I. While large portions of Germany were lost to the Church the revolt from Rome proceeded apace in Switzerland

and the Scandinavian countries. To add to the disasters, the divorce of Henry VIII. led to the English schism. Whether another head of the Church could have prevented the defection of England is of course an idle question. But Clement VII. was far from possessing the qualities which would have enabled him to show a bold front to the ambitious Cardinal Wolsey and the masterful and passionate Henry VIII. At the death of Clement (Sept. 25, 1534), the complete disruption of the Church seemed inevitable.

When all seemed lost salvation was near. Even in the reign of the two Medici popes the way which was to lead to better things had been silently paved within the Church. Under Leo X. himself there had been formed in Rome, in the Oratory of the Divine Love, a body of excellent men of strictly Catholic sentiments. It was by members of this Oratory — especially St Gaetano di Tiene. Carafa (later Paul IV.), and the great bishop of Verona, Giberti— that the foundations of the Catholic reformation were laid. Under Clement VII. the establishment of new religious orders — Theatines, Somascians, Barnabites and Capuchins — had sown the seeds of a new life in the ancient Church. The harvest was reaped during the long pontificate

of the Farnese pope, Paul III. With his accession ˆ534-1549 devotion to religion and the Church began to regain

their old mastery. True, Paul III. was not a representative of the Catholic reformation, in the full sense of the words. In many points, especially his great nepotism — • witness the promotion of the worthless Pier Luigi Farnese — he remained, even as pope, a true child of the Renaissance period in which he had risen to greatness. Nevertheless he possessed the necessary adaptability and acumen to enable him to do justice to the demands of the new age, which imperatively demanded that the interests of the Church should be the first consideration. Thus, in the course of his long reign he did valuable work in the cause of the Catholic reformation and prepared the way for the Catholic restoration. It was he who regenerated the College of Cardinals by leavening it with men of ability, who took in hand the reform of the Curia, confirmed the Jesuit Order, and finally brought the Council of Trent into existence (Sessions I.-X. of the council, first period, 1545-1549). In order to check the progress of Protestantism in Italy Paul III. founded the Congregation of the Inquisition (1542). Political differences, and the transference of the council to Bologna in 1547, brought the pope into sharp collision with the emperor, who now attempted by means of the Interim to regulate the religious affairs of Germany according to his wishes ■ — but in vain. The disobedience of his favourite Ottavio hastened the death of the old pope (Nov. 10, 1549).

Under the Farnese pope art enjoyed an Indian summer. The most important work for which he was responsible is the ” Last Judgment ” of Michelangelo in the Sistine Chapel. In 1547 Michelangelo was further entrusted with the superintendence of the reconstruction of St Peter’s. He utilized his power by rejecting the innovations of Antonio da Sangallo, saved the plan of Bramante, and left behind him sufficient drawings to serve the completion of the famous cupola.

Titian painted Paul's portrait, and Guglielmo della Porta cast the bronze statue which now adorns his grave in St Peter's.

After a protracted conclave Giovanni Maria del Monte was elected, on the 7th of February 1550, as Pope Julius III. He

submitted to the emperor's demands and again con- 1550-1555. vene d the council (Sessions XI.-XVL, second period),

but was obliged to suspend it on the 22nd of April 1552, in consequence of the war between Charles V. and Maurice of Saxony. From this time onwards the pope failed to exhibit requisite energy. In his beautiful villa before the Porta del Popolo he sought to banish political and ecclesiastical anxieties from his mind. Yet even now he was not wholly inactive. The religious affairs of England especially engaged his attention; and the nomination of Cardinal Pole as his legate to that country, on the death of Edward VI. (1553), was an extremely adroit step. That the measure was fruitless was not the fault of Julius III., who died on the 23rd of March 1555.

The feeble r6gime of Julius had made it evident that a pope of another type was necessary if the papal see were to preserve the moral and political influence which it had regained under Paul III. On the 10th of April 1555, after a conclave which lasted five days, the reform party secured

Marcellas II., 1555.

Plus IV.,

1559-1565.

the election of the distinguished Marcellus II Unfortunately, on the 1st of May, an attack of apoplexy cut short the life of this pope, who seemed peculiarly adapted for the reformation of the Church.

On the 23rd of May 1555 Gian Pietro Carafa, the strictest of the strict, was elected as his successor, under the title of Paul IV. Though already 79 years of age, he was animated by the fiery zeal of youth, and he employed the most drastic methods for executing the necessary reforms anc combating the advance of Protestantism. Always an opponent jgg S . ls 'Jg of the Spaniards, Paul IV., in the most violent and impolitic fashion, declared against the Habsburgs. The conflict with the Colonna was soon followed by the war with Spain, which, in spite of the French alliance, ended so disastrously, in 1557, that the pope henceforward devoted himself exclusively to ecclesiastical

affairs. The sequel was the end of the nepotism and the relentless prosecution of reform within the Church. Protestantism was successfully eradicated in Italy; but the pope failed to prevent the secession of England. After his death the rigour of the Inquisition gave rise to an insurrection in Rome. The Venetian ambassador says of Paul IV. that, although all feared his strictness, all venerated his learning and wisdom.

The reaction against the iron administration of Paul IV. explains the fact that, after his decease, a more worldly- minded pope was again elected in the person of Cardinal Giovanni Angelo de' Medici — Pius IV. In striking contrast to his predecessor he favoured the Habsburga. A suit was instituted against the Carafa, and Cardinal Carafa was even executed. To his own rela- tives, however, Pius IV. accorded no great influence, the advancement of his distinguished nephew, Carlo Borromeo {q.v.)' being singularly fortunate for the Church. The most important act of his reign was the reassembling of the Council of Trent (Sessions XVII.-XXV., third period, 1562-1563). It was an impressive moment, when, on the 4th of December 1563, the great ecumenical synod of the Church came to a close. Till the last it was obliged to contend with the most formidable difficulties: yet it succeeded in effecting many notable reforms and in illuminating and crystallizing the distinctive doctrines of Catholicism. The breach with the Protestant Reformation was now final, and all Catholics felt themselves once more united and brought into intimate connexion with the centre of unity at Rome (see Trent, Council of).

The three great successors of Pius IV. inaugurate the heroic age of the Catholic reformation and restoration. All three were of humble extraction, and sprang from the people in the full sense of the phrase. Pius V., 15ˆ-1572 formerly Michele Ghisleri and a member of the Dominican Order observed even as pope the strictest rules of the brotherhood, and was already regarded as a saint by his contemporaries. For Rome, in especial, he completed the task of reform. The Curia, once so corrupt, was completely meta- morphosed, and once more became a rallying point for men of stainless character, so that it produced a profound impression even on non-Catholics; while the original methods of St Philip Neri had a profound influence on the reform of popular morals. In the rest of Italy also Pius V. put into execution the reforma- tory decrees of Trent. In 1 566 he gave publicity to the Triden- tine catechism; in 1568 he introduced the amended Roman breviary; everywhere he insisted on strict monastic discipline, and the compulsory residence of bishops within their sees. At the same period Carlo Borromeo made his diocese of Milan the model of a reformed bishopric. The pope supported Mary Stuart with

money; his troops assisted Charles IX. of France against the Huguenots; and he lent his aid to Philip II. against the Calvinists of the Netherlands. But his greatest joy was that he succeeded where Pius II. had failed, despite all his efforts,

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by bringing to a head an enterprise against the Turks — then masters of the Mediterranean. He negotiated an alliance between the Venetians and Spaniards, contributed ships and soldiers, and secured the election of Don John of Austria to the supreme command. He was privileged to survive the victory of the Christians at Lepanto; but on the 1st of May in the following year he died, as piously as he had lived. The last pope to be canonized, his pontificate marks the zenith of the Catholic reformation.

The renewed vigour which this internal reformation had infused into the Church was now manifest in its external effects; and Pius V., the pope of reform, was followed by the popes of the Catholic restoration. These, without intermitting the work of reformation, endeavoured by every means to further the outward expansion of Catholicism. On the one hand missions were despatched to America, India, China and Japan: on the other, a strenuous attempt was made to reannex the conquests of Protestantism. In a word, the age of the Catholic restoration was beginning — a movement which has been mis- named the counter Reformation. In this period, the newly created religious orders were the right arm of the papacy, especially the Jesuits and the Capuchins. In place of the earlier supineness, the battle was now joined all along the line. Every- where, in Germany and France, in Switzerland and the Low Countries, in Poland and Hungary, efforts were made to check the current of Protestantism and to re-establish the orthodox faith. This activity extended to wider and wider areas, and enterprises were even set on foot to regain England, Sweden and Russia for the Church. This universal outburst of energy for the restoration of Catholicism, which only came to a standstill in the middle of the 17th century, found one of its Gregory most zealous promotors in Ugo Boncompagni — Xiu., Pope Gregory XIII. Though not of an ascetic

1572-1585. na t urej he followed unswervingly in the path of his predecessors by consecrating his energies to the translation of the

reformatory decrees into practice. At the same time he showed himself anxious to further the cause of ecclesi- astical instruction and Catholic science. He created a special Congregation to deal with episcopal affairs, and organized the Congregation of the Index, instituted by Pius V, On behalf of the diffusion of Catholicism throughout the world he spared no efforts; and wherever he was able he supported the great restoration. He was especially active in the erection and encouragement of educational institutions. In Rome he founded the splendid College of the Jesuits; and he patronized the Collegium Germanicum of St Ignatius; while, at the same time, he found means for the endowment of English and Irish colleges. In fact, his generosity for the cause of education was so unbounded that he found himself in financial difficulties. ; Gregory did good service, moreover, by his reform of the calendar which bears his name, by his emended edition of the Corpus juris canonici and by the creation of nunciatures. That he celebrated the night of St Bartholomew was due to the fact , that, according to his information, the step was a last resort to ensure the preservation of the royal family and the Catholic religion from the attacks of the revolutionary Huguenots. In his political enterprises he was less fortunate. He proved unable to devise a common plan of action on the part of the Catholic princes against Elizabeth of England and the Turks; while he was also powerless to check the spread of brigandage in the papal state.

On the death of Gregory XIII. , Felice Peretti, cardinal of Montalto, a member of the Franciscan order, ascended the Apostolic throne as Sixtus V. (April 1585-August 1585-1590. I 5 QO)- His first task was the extirpation of the bandits and the restoration of order within the papal state. In the course of a year the drastic measures of this born ruler made this state the safest country in Europe. He introduced a strictly ordered administration, encouraged the sciences, and enlarged the Vatican library, housing it in a i splendid building erected for the purpose in the Vatican itself. He was an active patron of agriculture and commerce: he even

interested himself in the draining of the Pontine marshes. The financial system he almost completely reorganized. With a boldness worthy of Julius II., he devised the most gigantic schemes for the annihilation of the Turkish Empire and the conquest of Egypt and Palestine. Elizabeth of England he wished to restore to the Roman obedience either by conversion or by force; but these projects were shattered by the destruction of the Spanish Armada. Down to his death the pope kept a vigilant eye on the troubles in France. Here his great object was to save France for the Catholic religion, and, as far as possible, to secure her position as a power of the first rank. To this

fundamental axiom of his policy he remained faithful throughout all vicissitudes.

In Rome itself Sixtus displayed extraordinary activity. The Pincian, the Esquiline, and the south-easterly part of the Caelian hills received essentially their present form by the creation of the Via Sistina, Felice, delle Quattro Fontane, di Sta Croce in Gerusalemme, &c; by the buildings at Sta Maria Maggiore, the Villa Montalto, the reconstruction of the Lateran, and the aqueduct of the Felice, which partially utilized the Alexandrina and cost upwards of 300,000 scudi. The erection of the obelisks of the Vatican, the Lateran, the Piazza del Popolo and the square behind the tribune of Sta Maria Maggiore lent a lustre to Rome which no other city in the world could rival. The columns of Trajan and Antoninus were restored and bedecked with gilded statues of the Apostles; nor was this the only case in which the high-minded pope made the monuments of antiquity subservient to Christian ideas. His principal architect was Domenico Fontana, who, in conjunction with Guglielmo della Porta, completed the uniquely beautiful cupola of St Peter's which had already been designed by Michelangelo in a detailed model. In Santa Maria Maggiore the pope erected the noble Sistine Chapel, in which he was laid to rest. Indeed, the monu- mental character of Rome dates from this era. The organizing activity of Sixtus V. was not, however, restricted to the Eternal City, but extended to the whole administration of the Church. The number of cardinals was fixed at seventy — six bishops, fifty priests and fourteen deacons. In 1588 followed the new regula- tions with respect to the Roman Congregations, which hence- forth were to be fifteen in, number. Thus the pope laid the foundations of that wonderful and silent engine of universal government by which Rome still rules the Catholics of every land on the face of the globe.

When we reflect that all this was achieved in a single pontifi- cate of but five years' duration, the energy of Sixtus V. appears simply astounding. He was, without doubt, by far the most important of the post-Tridentine popes, and his latest biographer might well say that he died overweighted with services to the Church and to humanity. (L. v. P.)

IV- — Period from 1590 to 1870.

The history of the papacy from 1590 to 1870 falls into four main periods: (1) 1590-1648; territorial expansion, definitely checked by the peace of Westphalia; (2) 1648-1789; waning prestige, financial embarrassments, futile reforms; (3) 1780- 1814; revolution and Napoleonic reorganization; (4) 1814-1870; restoration and

centralization.

1. 1590-1648. The keynote of the counter Reformation had been struck by the popes who immediately preceded this period. They sought to reconquer Europe for the Roman Catholic Church. In the overthrow of the Spanish Armada they had already received a great defeat; with the Peace of Westphalia the Catholic advance was baffled. Sixtus V. was succeeded in rapid succession by three popes: Urban VII., who died on the 27th of September 1590, after a papacy of only 12 days; Gregory XIV. (Dec. 1590 to Oct. 1591); Innocent IX. (Oct. to Dec. 1591).

The first noteworthy pontiff of the period was Clement VIII,, who gained a vast advantage by allying the papacy with the rising power of France. Since 1559 the popes had clement been without exception in favour of Spain, which, vui„ firmly possessed of Milan on the north and of Naples 1592-1605.

on the south, held the States of the Church as in a vice, and thereby dominated the politics of the peninsula. After Henry IV. had taken Paris at the price of a mass, it became possible for the popes to play off the Bourbons against the Habsburgs; but the transfer of favour was made so gradually that the opposition of the papacy to Spain did not become open till just before Clement VIII. passed off the stage. His successor, Leo XI., undisguisedly French in sympathy, reigned but

twenty-seven days — a sorry return for the 300,000 1605. ” ducats which his election is rumoured to have cost

Henry IV. Under Paul V. Rome was successful in some minor negotiations with Savoy, Genoa, Tuscany and Naples; but Venice, under the leadership of Paolo Sarpi (?.».), proved

unbending under ban and interdict: the state K05-I621. defiantly upheld its sovereign rights, kept most of the

clergy at their posts, and expelled the recalcitrant Jesuits. When peace was arranged through French mediation in 1607 the papacy had lost greatly in prestige: it was evident that the once terrible interdict was antiquated, wherefore it has never since been employed against the

entire territory of a state.

During the second and third decades of the 17th century the most coveted bit of Italian soil was the Valtelline. If Spain could gain this Alpine valley her territories would touch those of Austria, so that the Habsburgs north of the Alps could send troops to the aid of their Spanish cousins against Venice, and Spain in turn could help to subdue the Protestant princes of Ger- many in the Thirty Years' War (1618-1648). From the Grisons, who favoured France and Venice, Spain seized the Valtelline in 1620, incidentally uprooting heresy there by the massacre of six hundred Protestants. Paul V. repeatedly lamented that he was unable to oppose such Spanish aggressions without extend- ing protection to heretics. This scruple was, however, not shared by his successor, Gregory XV., who secured ˆ2f˚i623 tne consent ˚f tne powers to the occupation of the

Valtelline by papal troops, a diplomatic victory destined, however, to lead ere long to humiliation. Gregory's brief but notable pontificate marks nevertheless the high- tide of the counter Reformation. Not for generations had the prospects for the ultimate annihilation of Protestantism been brighter. In the Empire the collapse of the Bohemian revolt led ultimately to the merciless repression of the Evangelicals The in Bohemia (1627), and in the hereditary lands of

Counter- Austria (1628), as well as to the transference of the Reformation. electoral dignity from the Calvinistic elector of the Palatinate to the staunchly Catholic Maximilian of Bavaria. In France the Huguenots were shorn of almost all their military power, a process completed by the fall of La Rochelle in 1628. In Holland the expiration of the Twelve Years' Truce in 162 r forced the Dutch Protestants once more to gird on the sword. England, meanwhile, was isolated from her co-religionists. King James I., who had coquetted twenty years previously with Clement VIII., and then had avenged the Gunpowder Plot (1605) by the most stringent regulation of his Roman Catholic subjects, was now dazzled by the project of the Spanish marriage. The royal dupe was the last man in the world to check the advance of the papacy. That service to Protestantism was performed by Catholic powers jealous of the preponderance of the Habsburgs. In view of these antipathies the treaty of 1627 between France, Spain and the pope is but an episode: instruc- tive, however, in that the project, originated apparently by the pope, provided that England should be dismembered, and that Ireland should be treated as a papal fief. The true tendency of affairs manifested itself in 1629, when the emperor Ferdinand II. (1619-1637), at the zenith of his fortunes, forced the Protestant princes of Germany to restore to the Roman

hierarchy all the ecclesiastical territories they had secularized during the past seventy-four years. Then France, freed from the fear of domestic enemies, arose to help the heretics to harry the house of Habsburg. Arranging a truce between Poland and Sweden, she unleashed Gustavus Adolphus. Thus by diplomacy as well as by force of arms Catholic France made possible the continued

existence oi a Protestant Germany, and helped to create the balance of power between Catholic, Lutheran and Reformed within the Empire, that, crystallized in the Peace of Westphalia, fixed the religious boundaries of central Europe for upwards of two centuries.

If it was Richelieu and not the pope who was the real arbiter of destinies from 1624 to 1642, Urban VIII. was usually content. In Italy he supported France against Spain in the controversy over the succession to Mantua (1627- 1623-1644." 163 1). In the Empire he manifested his antipathy to the overshadowing Habsburgs by plotting for a time to carry the next imperial election in favour of Bavaria. He is said to have rejoiced privately over Swedish victories, and certainly it was unerring instinct which told him that the great European conflict was no longer religious but dynastic. Anti-Spanish to the core, he became the greatest papal militarist since Julius II.; but Tuscany, Modena and Venice checkmated him in his ambitious attempt to conquer the duchy of Parma. Like most of the papal armies of the last three centuries, Urban's troops, distinguished themselves by wretched strategy, cowardice in rank and file, and a Fabian avoidance of fighting which, discreet as it may be in the field of diplomacy, has invariably failed to save Rome on the field of battle.

The States of the Church were enlarged during this period by the reversion of two important fiefs — namely, Ferrara (1598) and Urbino (1631). Increase of territory, so far from filling the papal treasury, but postponed for states"^ the moment the progressive pauperization of the people. After annexation, the city of Ferrara sank rapidly from her perhaps artificial prosperity to the dead level, losing two-thirds of her population in the process. The financial difficulties of Italy were due to many causes, notably to a shifting of trade routes; but those of the papal states seem caused chiefly by misgovernment. Militarism may account for much of the tremendous deficit under Urban VIII.; but the real cancer was nepotism. The disease was inherent in the body politic. Each pope, confronted by the spectre of „ ,. feudal anarchy, felt he could rely truly only on those utterly dependent on himself; consequently he raised his own relations to wealth and influence. This method had helped the House of Valois to consolidate its power; but what was tonic for a dynasty was death to a state whose headship was

elective. The relations of one pope became the enemies of the next; and each pontiff governed at the expense of his successors. Under Clement VIII. the Aldobrandini, more splendidly under Paul V. the Borghesi, with canny haste under the short-lived Gregory XV. the Lodovisi, with unparalleled rapacity Urban's Barberini enriched themselves from a chronically depleted treasury. To raise money offices were systematically sold, and issue after issue of the two kinds of monti-securities, which may be roughly described as government bonds and as life annuities, was marketed at ruinous rates. More than a score of years after the Barberini had dropped the reins of power Alexander VII. said they alone had burdened the state with the payment of 483,000 scudi of annual interest, a tremendous item in a budget where the income was perhaps but 2,000,000. For a while interest charges consumed 85 % of the income of the government. Skilful refunding postponed the day of evil, but cash on hand was too often a temptation to plunder. The financial woes of the next period, which is one of decline, were largely the legacy of this age of glory.

The common people, as always, had to pay. The farming of exorbitant taxes, coupled as it was too often with dishonest concessions to the tax farmer, made the over-burdened peas- antry drink the doubly bitter cup of exploitation and injustice. Economic distress increased the number of highway robberies, these in turn lamed commercial intercourse.

The tale of these glories, with their attendant woes, does not exhaust the history of the papacy. Not as diplomatists, not as governors, but as successive heads of a spiritual kingdom, did the popes win their grandest triumphs. At a time when the non- Catholic theologians were chiefly small fry, bent on

petty or sulphurous polemics, great Jesuit teachers like Bellar- mine (d. 1621) laid siege to the very foundations of the Coatrover- Protestant citadel. These thinkers performed for sialaad the unity of the faith in France and in the Missionary Catholic states of Germany services of transcendent Triumphs. mer j t; exceeding far in importance those of their flourishing allies, the Inquisitions of Spain, Italy, and of the Spanish Netherlands (see Inquisition). But the most funda- mental spiritual progress of the papacy was made by its

devoted missionaries. While the majority of Protestant leaders left the conversion of the heathen to some remote and inscrutable interposition of Providence, the Jesuits, Franciscans, Dominicans and kindred orders were busily engaged in making Roman Catholics of the nations brought by Oriental commerce or American colonial enterprise into contact with Spain, Portugal and France. Though many of the spectacular triumphs of the cross in Asia and Africa proved to be evanescent, nevertheless South America stands the impressive memorial of the greatest forward movement in the history of the papacy: a solidly Roman continent.

2. 1648-1789. From the close of the Thirty Years' War to the outbreak of the French Revolution the papacy suffered abroad waning political prestige; at home, progressive financial embarrassment accompanied by a series of inadequate govern- mental reforms; and in the world at large, gradual diminution of reverence for spiritual authority. From slow beginnings these factors kept gaining momentum until they compassed the overthrow of the mighty order of the Jesuits, and culminated in the revolutionary spoliation of the Church.

At the election of Innocent X. (1644-1655) the favour of the Curia was transferred from France, where it had rested for over

forty years, to the House of Habsburg, where it Relations, remained, save for the brief reign of Clement IX.

(1667-1669), for half a century. The era of tension with France coincides with the earlier years of Louis XIV. (1643-17 1 5); its main causes were the Jansenist and the Gallican controversies (see Jansenism and Gallic anism). The French crown was willing to sacrifice the Jansenists, who disturbed that dead level of uniformity so grateful to autocrats; but Gallicanism touched its very prerogatives, and was Jansenism a point of honour which could never be abandoned Qalllcanlsm. outright. The regalia controversy, which broke – out in 1673, led up to the classic declaration of the Gallican clergy of 1682; and, when aggravated by a conflict over the immunity of the palace of the French ambassador at Rome, resulted in 1688 in the suspension of diplomatic relations with Innocent XL, the imprisonment of the papal nuncio, and the seizure of Avignon and the Venaissin. So pronounced an enemy of French preponderance did Innocent become that he approved the League of Augsburg, and was not sorry to see the Catholic James II., whom he considered a tool of Louis, thrust from the throne of England by the Protestant William of Orange. Fear of the coalition, however, led the Grand Monarch to make peace with Innocent XII. (1691-1700). The good relations with

France were but a truce, for the Bourbon powers became so mighty in the 18th century that they practically ignored the territorial interests of the papacy. Thus Clement XL (1700- 1721), who espoused the losing Habsburg side in the War of the Spanish Succession, saw his nuncio excluded from the negotia- tions leading to the Peace of Utrecht, while the lay signatories disposed of Sicily in defiance of his alleged overlordship. Simi- larly Clement XII. (1 730-1 740) looked on impotently when the sudden Bourbon conquest of Naples in the War of the Polish Succession set at nought his claims to feudal sovereignty, and established Tannucci as minister of justice, a position in which for forty-three years he regulated the relations of church and (state after a method most repugnant to Rome. No better fared Clement's medieval rights to Parma; nor could the saga- cious and popular Benedict XIV. (1740-17 58), who refused to press obsolete claims, either keep the foreign armies in the War of the Austrian Succession from trespassing on the States of the Church or prevent the ignoring at the Peace of Aix-la-

Chapelle of the papal overlordship over Parma and Piacenza. In fact, since the doctrinaire protest of Innocent X. against the, Peace of Westphalia, at almost every important settlement of European boundaries the popes had been ignored or other- wise snubbed. Not for two centuries had the political prestige of the papacy been lower. Moreover, a feeling of revulsion against the Jesuits was sweeping over western Europe: they were accused of being the incarnation of the most baneful prin- ciples, political, intellectual, moral; and though Clement XIII. (1758-1769) protected them against the pressure of the Bourbon courts, his successor Clement XIV. 1"%™*'°" (1769-1774) was forced in 1773 to disband the j esu it s , army of the Black Pope (see Jesuits). The sacri- fice of these trusted soldiers failed however to sate the thirst of the new age. Pius VI. (1 775-1 799), was treated with scant respect by his neighbours. Naples refused him tribute; Joseph II. of Austria politely but resolutely introduced funda- mental Gallican reforms (" Josephism "); in 1786 at the Synod of Pistoia (q.v.) Joseph's brother Leopold urged similar prin- ciples on Tuscany, while in Germany the very archbishops were conspiring by the Punctation of Ems to aggrandize themselves like true Febronians, at the expense of the pope (see Febronian- ism). These aggressions of monarchy and the episcopate were rendered vain, outside the Habsburg dominions, by the revolu- tion; and to the Habsburg dominions the clerical revolution of 1790 caused the loss of what is to-day Belgium. However, the deluge which shattered the opposition to Rome in the great national churches submerged for a time the papacy itself.

In the States of the Church, during the first part of the period the

outstanding feature in the history of the Temporal Power is the overthrow of nepotism; in the second, a dull conflict with debt. The chief enemies of nepotism ™^ VII. (1655-1667), who dignified church. the secretaryship of state and gave it its present pre-eminence by refusing to deliver it up to one of his relations; and Innocent XII. (1691-1700), whose bull Romanum decet ponti- ficem ordered that no pope should make more than one nephew cardinal, and should not grant him an income over twelve thousand scudi. Thus by 1700 nepotistic plunder had practi- cally ceased, and with the exception of the magnificent pecula- tions of Cardinal Coscia under Benedict XIII. (1724-1730), the central administration of finance has been usually considered honest. Nepotism, however, still left its scars upon the body politic, shown in the progressive decay of agriculture in the Campagna, causing Rome to starve in the midst of fertile but untilled nepotistic latifundia. The fight against the legacy of debt was slower and more dreary. One pope, Innocent XL (1676-1789), threatened at first with bankruptcy, managed to leave a surplus; but this condition, the product of severe economy and oppressive taxation, could not be maintained. In the 1 8th century it became necessary to resort to fiscal measures which were often harmful. Thus Clement XL, at war with Austria in 1708, debased the currency; Clement XII. (1 730-1 740) issued paper money and set up a government lottery, excom- municating all subjects who put their money into the lotteries of Genoa or Naples; Benedict XIV. (1740-1758) found stamped paper a failure; and Clement XIII. (1758-1769) made a forced loan. The stoppage of payments from Bourbon countries during the Jesuit struggle brought the annual deficit to nearly 500,000 scudi. Under Pius VI. (1775-1799) the emission of paper money, followed by an unsuccessful attempt to market government securities, produced a panic. By 1783 the taxes had been farmed for years in advance and the treasury was in desperate straits. Retrenchment often cut to the bone; wise reforms shattered on the inexperience or corruption of officials. Grand attempts to increase the national wealth usually cost the government more in fixed charges of interest than they yielded in rentals or taxes. The States of the Church, like France, were on the brink of bankruptcy. From this dis- grace they were saved by a more imminent catastrophe — the Revolution.

The revolt against spiritual authority belongs rather to the

history of modern thought than to that of the papacy. The

,*.n + ...i Renaissance and Protestantism had their effect in

Intellectual , , _ ,. , ...

Movement producing that Enlightenment which swept over

against the western Europe in the 18th century. Although Papacy. Descartes died in 1650 in the communion of the Church, his philosophy contained seeds of revolt; and the sensualism of Locke, popularized in Italy by Genovesi, pre- pared the way for revolution. In an age when Voltaire preached toleration and the great penologist Beccaria attacked the death-penalty and torture, in the States of the Church heretics were still liable to torture, the relapsed to capital punishment; and in a backward country like Spain the single reign of Philip V. (1700-1746) had witnessed the burning of over a thousand heretics. If ecclesiastical authority fostered what was commonly regarded as intolerant obscurantism, to be enlightened meant to be prepared in spirit for that reform which soon developed into the Revolution.

3. 1789-1814. In the decade previous to the outbreak of the French Revolution the foreign policy of Pius VI. had been The Papacy directed chiefly against decentralization, while his and the chief aim at home was to avoid bankruptcy by in- Revoiution. creas j n g his income. From 1789 on the French situation absorbed his attention. France, like the States of the Church, was facing financial ruin; but France did what the government of priests could not: namely, saved the day by the confiscation and sale of ecclesiastical property. It was not the aim of the Constituent Assembly to pauperize or annihilate the Church; it purposed to reorganize it on a juster basis. These reforms, embodied in the Civil Constitution of the Clergy, were part of the new Fundamental Law of the kingdom. The majority of the priests and bishops refused to swear assent to what they held to be an invasion of the divine right of the hierarchy, and after some months of unfortunate indecision Pius VI. (1 7 7 5-1 799) formally condemned it. Thence- forward France treated the papacy as an inimical power. The sullen toleration of the non-juring priests changed into sanguinary persecution. The harrying was halted in 1795; and soon after the directory had been succeeded by the consulate, the Catholic religion was re-established by the concordat of 1801. From 1790 on, however,

the rising power of France had been directed against Rome. In September 1791 France annexed Avignon and the Venaissin, thus removing for ever that territorial pawn with whose threatened ioss the French monarchs had for centuries disciplined their popes. In 1793 Hugon de Bassville (q.v.), a diplomatic agent of France, was murdered at Rome, a deed not avenged until the Italian victories of Bonaparte. In the peace of Tolentino (Feb. 1797) the pope surrendered his claims to Avignon, the Venaissin, Bologna, Ferrara and the Romagna; he also promised to disband his worthless army, to yield up certain treasures of art, and to pay a large indemnity. Bona- parte believed that after these losses the temporal power would collapse of its own weight; but so peaceful a solution was not to be. During republican agitation at Rome the French general Duphot was killed, a French army advanced on the city, and carried the aged pontiff a prisoner of war to Valence in 1800-1823. Dauphine, where he died on the 29th of August 1799. His successor Pius VII., elected at Venice on the 14th of the following March, soon entered Rome and began his reign auspiciously by appointing as secretary of state Ercole Consalvi (q.v.), the greatest papal diplomatist of the 19th century. The political juncture was favourable for a reconciliation with France. In the concordat of 1801 the papacy recognized the validity of the sales of Church property, and still further reduced the number of dioceses; it provided that the government should appoint and support the archbishops and bishops, but that the pope should confirm them; and France recognized the temporal power, though shorn of Ferrara, Bologna and the Romagna. The supplementary Organic Articles of April 1802, however, centralized the administration of the Church in the hands of the First Consul; and some of these one-sided regulations

Concordat of 1801.

were considered by Rome to be minute and oppressive; nevertheless, the Napoleonic arrangements remained in force, with but brief exceptions, till the year 1905. The indignation of the pope and his advisers was not deep enough to prevent the ratification in 1803 of a somewhat similar concordat for the Italian Republic. In 1804 Pius consented to anoint Napoleon emperor, thus casting over a conquered crown the halo of legitimacy. The era of good feeling was, however, soon ended by friction, which arose at a number of points. At length, in 1809, Napoleon annexed the papal states; and Pius, who excommunicated the invaders of his territory, was removed to France. The captive was, however, by no means powerless; by refusing canonical institution to the French bishops he involved the ecclesiastical system of Napoleon in inextricable confusion. After the return from Moscow the emperor negoti- ated with his prisoner a new

and more exacting concordat, but two months later the repentant pope abrogated this treaty and declared all the official acts of the new French bishops to be invalid. By this time Napoleon was tottering to his fall; shortly before the catastrophe of Elba he allowed the pope to return to the States of the Church. Pius entered Rome amid great rejoicing on the 24th of May 1814, a day which marks the beginning of a new era in the history of the papacy. In September of the same year, by the bull Sollicitudo omnium ecclesiarum, he reconstituted the Society of Jesus.

Though the relations with France dominated the papal policy during the revolutionary period, the affairs of Germany received no small share of attention. The peace of Luneville (1801) established the French boundary at the Rhine; and the German princes who thereby lost lands west of the river were indemnified by the secularization of ecclesiastical Secalariza- territories to the east. The scheme of readjust- tions of ment, known as the Enactment of the Delegates of t803 ‘ the Empire (Reichsdeputationshauptschluss) of 1803, secularized practically all the ecclesiastical states of Germany. Thus at one stroke there was broken the age-long direct political power of the hierarchy in the Holy Roman Empire; and the ultimate heir of the bulk of these lands was Protestant Prussia.

4. 1814-1870. The foreign policy of the papacy so long as conducted by Consalvi, or in his spirit, was supremely successful. From 1814 to 1830 Europe witnessed the restoration The Papacy of legitimate monarchy. The once exiled dynasties and the conscientiously re-established the legitimate Church, R ˆtoration. and both conservative powers made common cause against revolutionary tendencies. Throughout Europe the govern- ing classes regarded this ” union of throne and altar ” as axiomatic. For the pope, as eldest legitimate sovereign and protagonist against the Revolution, Consalvi obtained from the Congress of Vienna the restitution of the States of the Church in practically their full extent. By concluding concordats with all the important Catholic powers save Austria he made it possible to crush Jansenism, Febronianism and Gallicanism. By bulls of circumscription, issued after consultation with various Protestant states of Germany, he rearranged their Catholic dioceses and readjusted ecclesiastical incomes. By unfailing tact he gained the good will of Great Britain, where before him no cardinal had set foot for two centuries, and secured that friendly understanding between the British government and the Vatican which has since proved so valuable to Rome. After Consalvi’s retirement, Leo XII. (1823-1829) continued his policy and secured further advantageous concordats. In the sixteen months’ reign of Pius VIII. (1829-1830) came the achievement of Catholic

emancipation in England and the Revolution of 1830; and the pope departed from the principle of legitimacy by recognizing Louis Philippe as king of the French. The pontificate of Gregory XVI. (1831-1846) was singularly infelicitous. The controversy with Prussia about the education of children of whose parents but one was Roman Catholic led to the imprisonment of Droste-Vischering, archbishop of Cologne, and later of Dunin, archbishop of Gnesen-Posen; but the accession of the royal romanticist Frederick William IV. in 1840 brought a pacific reversal of the Prussian policy, sometimes

judged more benevolent than wise. In France agitation was directed chiefly against the Jesuits, active in the movement to displace ancient local catechisms and liturgies by the Roman texts, to enroll the laity in Roman confraternities, and to in- duce the bishops to visit Rome more frequently. To check this ultramontane propaganda the government secured from the papacy in 1845 the promise to close the Jesuit houses and novitiates in France.

In Italy, however, lay the chief obstacles to the success of all papal undertakings. The revolution of 1830, though somewhat tardily felt in the States of the Church, compelled Gregory to rest his rule on foreign bayonets. In return he was obliged to lend an ear to the proposals of France, and above all to those of Austria. This meant opposition to all schemes for the unifica- tion of Italy. In 181 5 the Italian peninsula had been divided into seven small states. Besides the government of the pope there were three kingdoms: Sardinia, Lombardo-Venetia and Naples; and three duchies: Parma, Modena, Tuscany. To these regions the Napoleonic regime had given a certain measure of unity; but Metternich, dominant after 1815, held Italy to be merely a geographical term. To its unification Austria was the chief obstacle; she owned Lombardo-Venetia; she controlled the three duchies, whose rulers were Austrian princes; and she upheld the autocracy of the king of Naples and that of the pope against all revolutionary movements. To the Italian patriot the papacy seemed in league with the oppressor. The pope sacrificed the national aspirations of his subjects to his inter- national relations as head of the Church; and he sacrificed their craving for liberty to the alliance with autocracy on which rested the continued existence of the temporal power. The ■ dual position of the pope, as supreme head of the Church on earth and as a minor Italian

prince, was destined to break down through its inherent contradiction; it was the task of Pius IX. to postpone the catastrophe.

The reign of Pius IX. falls into three distinct parts. Until driven from Rome by the republican agitation of 1848 he was a popular idol, open to liberal political views. From 1846-1878 k* s return in 1850 to 1870 he was the reactionary ruler -of territories menaced by the movement for Italian unity, and sustained only by French bayonets; yet he was interested primarily in pointing out to an often incredulous world that most of the vaunted, intellectual and religious progress of the 19th century was but pestilent error,' properly to be condemned by himself as the infallible vicegerent of God. The third division of his career, from the loss of the temporal power to his death, inaugurates a new period for the papacy.

At the outset of his reign he faced a crisis. It was clear that he could not continue the repressive tactics of his predecessor. The Papacy Italy and Europe were astir with the Liberal agitation, and Italian which in 1848 culminated in the series of revolutions Unity. by which the settlement of 1815 was destined to be profoundly modified. Liberal churchmen in Italy, while rejecting Mazzini's dream of a republic, had evolved projects for attaining national unity while preserving the temporal power. The exiled abbe Vincenzo Gioberti championed an Italian confederacy under the presidency of the pope; hand in hand with the unity of the nation should go the unity of the faith. In allusion to medieval partisans of the papacy this theory was dubbed Neo-Guelphism. Towards such a solution Pius IX. was at first not unfavourably inclined, but the revolu- tion of 1848 cured him of his Liberal leanings. In November of that year he fled in disguise from his capital to Gaeta, in the kingdom of Naples, and when French arms had made feasible his restoration to Rome in April 1850 he returned in a temper of stubborn resistance to all reform; henceforth he was no longer open to the influence of men of the type of Rossi or Rosmini, but took the inspiration of his policy from Cardinal Antonelli and the Jesuits. The same pope who had signalized his acces- sion by carrying out a certain number of Liberal reforms set his name in 1864 to the famous Syllabus, which was in effect a declaration of war by the papacy against the leading principles of modern civilization (see Syllabus).

As from 1849 to 1870 the fate of the papacy was determined not so much by domestic conditions, which, save for certain slight ameliorations, were those of the preceding reigns, as by foreign politics, it is necessary to consider the relations of Rome with each of the powers in turn; and in so doing one must trace not merely the

negotiations of kings and popes, but must seek to understand also the aims' of parliamentary parties, which from 1848 on increasingly determine ecclesiastical legislation.

The chief ally of the papacy from 1849 to 1870 was France. The policy which made Louis Napoleon dictator forced him into mortal conflict with the republican parties; and Louis Napo- the price of the parliamentary support of the Catholic leonand the majority was high. Even before Napoleon's elec- Paoac y- tion as president, Falloux, the Catholic leader, had promised to secure intervention in favour of the dispossessed pope. Napoleon, however, could not forget that as a young man he himself had vainly fought to obtain from Gregory XVI. those liberties which Pius IX. still refused to grant; he therefore essayed diplomacy, not arms. Nevertheless, to forestall the rescue of the pope by Austrian troops, he sent, in August 1849, an army corps under Oudinot to Civita Vecchia. By heading off reactionary Austria Napoleon hoped to conciliate the French Liberals; by helping the pope, to satisfy the Catholics; by concessions to be wrung both from Pius and from the Roman triumvirs, to achieve a bloodless victory. As neither party yielded, Oudinot listened to his Catholic advisers, attacked Rome, with which the French Republic was technically at peace — and was roundly repulsed by Garibaldi. To relieve their inglorious predicament the ministry hurried the Liberal diplomatist, Ferdinand de Lesseps, to Rome to prevent further conflict. At the moment when Lesseps had secured the signing of a treaty with the Roman Republic permitting peaceful occupation of the city by the French army, he was peremptorily recalled and Oudinot was as unexpectedly ordered to take the city by storm. This amazing reversal of policy was procured by the intrigues of Catholic diplomatists and German French Jesuits, conveyed to Paris by Prince de la Tour Capture of d'Auvergne. For the honour of the army and the Home. ■ Church republican France thereupon destroyed the Roman republic. Napoleon lost 1200 in dead and wounded, actually secured not a single reform on which he had insisted, and drew, upon himself the fateful obligation to mount perpetual guard over the Vatican. As the catspaw of clerical reaction he had also to acquiesce in that " Roman campaign at home " that resulted in the Falloux Act of 1850, which in the name of liberty of education put the university in bondage Napoleon in. to the archbishops, militated against lay teachers and the in secondary and primary schools, and set them Papacy. under clerical control, made it ominously easy for members of religious congregations to become instructors of youth, and cut the nerve of the communal school system. That education was delivered up to the Church was partly the result of the terror inspired in the middle

classes by the socialistic upheavals of 1848. The bourgeoisie sought the support of the clergy, and irreligion became as unfashionable among them as it had been among the nobility after 1793. Religion was thought to be part of a fashionable education, and the training of girls came almost exclusively into the hands of the religious orders and congregations. So long as the alliance of the autocratic empire and the clergy lasted (1852-1860), intellectual reaction reigned; the university professorships cf history and philosophy were suppressed. This alliance of the empire with the clergy was shaken by the Italian War of 1859, which resulted in the loss by the pope of two-thirds of his territories. Napoleon was evidently returning to the traditions of his youth, and in the September Convention of 1864 it looked as if he would abandon Rome to its manifest destiny. This solution was spoiled by the impatience of Garibaldi and the supineness of the Romans them- selves. In 1867 Napoleon made himself once more guardian of the Holy See; but the wonders wrought by the new French chassepots at the battle of Mentana cost the friendship of Italy. Thereafter Napoleon was blindly staggering to his fall. He

aimed at honour in upholding the pope, in driving the Austrian tyrant from Italy, in attacking Prussia. The Austrian support on which he relied confidently in 1870 proved delusive, for he could obtain nothing from Austria unless he had Italy with him, and nothing from Italy without the evacuation of Rome. Even after the war with Prussia had actually broken out he refused Italian aid at the price of the abandonment of the city, a step which he nevertheless reversed hurriedly twenty days too late. With Napoleon fell the temporal power; but the French hier- archy still kept his gifts in the shape of the congregations, the pro-Catholic colonial policy, and a certain control of education. Of these privileges the Church was to be deprived a generation later. The Third Republic can never forget that it was to the support of the temporal sovereignty of the pope that Napoleon III. owed his empire and France her deepest humiliation.

On the withdrawal of the French garrison Rome was occupied by the troops of Victor Emmanuel. This monarch had always Italian Oc- been a thorn in the side of the papacy. Under him cupatlon of Sardinia had adopted the Siccardi Laws of 1850, Rome. w hich had taken away the right of asylum and the jurisdiction of the Church over its own clergy.

His reputa- tion for sacrilege, increased five years later by the abolition of many monasteries, became notorious when the formation of the kingdom of Italy (1861) took away all the dominions of the pope except the patrimony of Peter, thereby reducing the papal provinces from twenty to five, and their population from over 3,000,000 to about 685,000. This act was followed in 1867 by the confiscation of church property, and on the 20th of September 1870 by the triumphant seizure of Rome.

If France was the right arm and Italy the scourge of the papacy under Pius IX., the Spanish-speaking countries were its The Papacy obedient tools. Torn by civil wars, their harassed and the rulers sought papal recognition at a cost which Spanish more experienced governments would have refused. States. Thug Isabe u a jj_ f Spain in the concordat of 1851 confirmed the exclusive privileges of the Roman religion and gave the control of all education to the Church; but after the Revolution of 1868 Spain departed for the first time from the principle of the unity of the faith by establishing liberty of worship, which was, however, a dead letter. On the Spanish model concordats were arranged with various Central and South American republics, perhaps the most ironclad being that concluded with Ecuador in 1862 (abrogated 1878).

Among the more stable governments of Europe reaction in favour of conservatism and religion after 1848 was used by Concordat clerical parties to obtain concordats more systematic with and thoroughgoing than had been concluded even

Austria, a f ter jg I4 Austria, for instance, although long the political mainstay of the papacy, had never abandoned the broad lines of ecclesiastical policy laid down by Joseph II.; but the young Francis Joseph, seeking the aid of Rome in curbing heterogeneous nationalities, in 1855 negotiated a concordat whose paragraphs regarding the censorship, educa- tion and marriage were far- reaching. It was, moreover, the first document of the sort in which a first-class power recognized that the rights of the Church are based upon ” divine institution and canon law,” not upon governmental concession. Violated by the Liberal constitution of 1867, which granted religious liberty, depotentiated by laws setting up lay jurisdiction over matrimonial cases and state control of education, it was abrogated . in 1870 by Austria, who alleged that the proclamation of papal infallibility had so altered the status of one of the contracting parties that the agreement was void.

Passing over Portugal, the remaining European state which is Roman

Catholic is Belgium. Torn from Austria by the Belgium clerical revolution of 1790, after many vicissitudes it was united in 1815 with Holland and placed under the rule of the Protestant William I., king of the United Nether- lands. The constitutional guarantee of religious liberty had from the outset been resisted by the powerful and resolute priest- hood, supported by numerous sympathizers among the nobility. As the arbitrary king alienated the Liberal Catholics, who were

still more or less under the spell of the. French Revolution, the Catholic provinces took advantage of the upheavals of 1830 to form the independent kingdom of Belgium. Its Fundamental Law of 183 1, conceived in the spirit of the English Whigs, and later imitated in the European countries, granted liberty of worship and of education. Strangely enough, this liberty meant increase of power for the Clericals; for besides putting an end to stringent state interference in the education of future priests, it made possible a free and far-reaching Catholic school system whose crown was the episcopally controlled university of Louvain (1834). The Education Act of 1842 led to the formation of the Liberal party, whose bond of union was resistance to clericalism, whose watchword was the ” independence of the civil power.” The Catholics and Liberals were alternately in control until 1894, when the tenfold enlargement of the electorate broke down the Liberal party completely. The chief theme of contention, developed through many a noteworthy phase, has been the question of schools. In the half-century from 1830 to 1880 the cloisters likewise prospered and multiplied fivefold. The result of this evolution is that Belgium is to-day the most staunchly Catholic land north of the Alps.

In Holland, as in Belgium, the education question has been uppermost. Here, even after 183 1 the Roman Catholics con- stituted three-eighths of the population. Allied with „ .. the Liberals against the orthodox Protestants, who were threatening religious liberty, the Catholics assisted in 1857 to establish a system of non-sectarian state schools, where attend- ance is not obligatory nor instruction gratuitous. Changing front, in 1868, in league with the orthodox, they tried to make these denominational; but as the Liberals defeated their attempt, they founded schools of their own.

In the non-Catholic countries of Europe during the reign of Pius IX., and in fact during the whole 19th century, the impor- tant gains of Rome were in strategic position rather other non- than in numbers. The spread of toleration, which Catholic always favours minorities, broke down between 1845 c ˚ aatrles – and 1873 the Lutheran exclusiveness of Norway, Denmark and Sweden; but as yet the

Catholics form a disappearing fraction of the population. In European Russia, as a result of the partitions of Poland under Catherine II. (1762-1796), about one-tenth of the people are Roman Catholics. The Ruthenians had united with Rome at Brest in 1596, forming a group of Uniates distinct from the Poles, who belonged to the Latin rite. In spite of the assurances of Catherine, Russia has repeatedly persecuted the Ruthenian Uniates, in order to incorporate them into the Holy Orthodox Church; and she has occasionally taken drastic measures against the Poles, particu- larly after the revolts of 1830 and 1863. After more than a century of repression in 1905 the Edict of Toleration brought some relief.

The remarkable extension of the Catholic hierarchy by Pius IX. into Protestant lands, legally possible because of toleration, was in some cases made practicable because of immigration. Though this factor was perhaps not prominent in the case of Holland (1853) or Scotland (1878) it was Irish immigration which made it feasible in England (1850). For a time the Roman propaganda in England, which drew to itself High Churchmen like Newman and Manning, was viewed with apprehension; but though the Roman Catholic Church has grown greatly in influence in the country, the number of its adherents, in proportion to the growth of population, has not very greatly increased.

In the United States of America, however, the Catholic population has increased by leaps and bounds through immigra- tion. The famines of the ‘forties, with their subsequent political and economic difficulties, transferred to America millions of the Irish, whose genius for organization in politics has not fallen short of their zeal for religion. The German-speaking immi- grants have also had a creditable share in the work of church extension, but the Italians have manifested no marked ardour for their faith. The losses. in transplantation have been huge, but it is impossible to estimate them accurately, for even the

current figures for the Catholic population are based on detailed estimates rather than on an actual count.

Summing up the history of the papacy from the Congress of Vienna to the fall of the temporal power, one finds statistical gains in Protestant

countries offset perhaps by relative losses in Catholic lands, both largely due to the closely related forces of toleration and immigration. While the hold of the popes on the States of the Church was constantly weakening, their power over the domestic policies of foreign governments was increasing; and the transition from autocracy to parliamentary rule accelerated this process, at least in non-Catholic territories. The unparalleled spread of ultramontane ideas (see Ultra-montanism) brought about a centralization of authority at Rome such as would have appalled the 18th century. This centralization was, however, for the time not so much legal as doctrinal. In 1854 Pius IX. by his sole authority estab- lished a dogma (see Immaculate Conception); and the infallibility implied in this act was openly acknowledged in 1870 by the Council of the Vatican (see Vatican Council and Infallibility). Thus were the spiritual prerogatives of the papacy exalted in the very summer that the temporal power was brought low. (W. W. R.*)

V. — Period from 1870 to igoo.

The few months that elapsed between the 18th of July 1870 and the 18th of January 1871 witnessed four events that have been fraught with more consequence to the papacy than any- thing else that had affected that institution for the past three centuries. They were as follows: (1) The proclamation of the Infallibility of the Pope on the 18th of July 1870; (2) the fall of the Napoleonic empire and the establishment of the third French republic on the 4th of September 1870; (3) the occupation of Rome by the Italian forces on the 20th of September 1870, resulting in the incorporation of the remaining states of the Church in the kingdom of Italy; and (4) the foundation of the German Empire by the proclamation, on the 18th of January 187 1, of the king of Prussia as hereditary German emperor. These changes, which so greatly disturbed the current of all European relations, could not fail to react upon the papal policy in various ways. They brought its existing tendencies into greater relief, set before it new aims and diverted it into new channels. Essential modifications could not, of course, be at once effected or even indicated in a power whose life-blood is tradition, and whose main strength has always lain in calmly abiding the issue of events and in temporizing. The eight years that Pius IX. was permitted to see after the loss of his temporalities entirely harmonize with this character. The veil that hides the negotiations which, during the closing months of the Franco-German War, were carried on between Bismarck and the pope, through the agency of Cardinal Bonnhose, has not yet been lifted, and perhaps never will be. According to Bismarck P r i nce Bismarck's own account of the matter, as and the given in his Gedanken und Erinnerungen, these Temporal

negotiations were initiated by the chancellor, who, Power. between the 5th and 9th of November 1870, enter- tained pourparlers with Archbishop Ledochowski-on the question of the territorial interests of the pope. The chancellor, acting, as he himself says, in the spirit of the adage, ” one hand washes the other,” proposed to that prelate that the pope should give earnest of the relations subsisting between him and Germany by influencing the French clergy in the direction of the con- clusion of peace. The cool reception his endeavours met with, both at the hands of the French ecclesiastics as well as in Rome, satisfied Bismarck ” that the papal hierarchy lacked either the power or the good will to afford Germany assistance of sufficient value to make it worth while giving umbrage to both the German Protestants and the Italian national party, and risking a reaction of the latter upon the future relations between the two countries, which would be the inevitable result were Germany openly to espouse the papal cause in Rome.” These utterances are eminently characteristic. They show how far Bismarck was (even at the close of 1870) from

comprehending the traditional policy of the papacy towards Germany and German interests, and how little he conceived it possible to employ the relations between the future empire and the Vatican as a point of departure for a successful and con- sistent ecclesiastical policy. Rome, in a certain sense, showed itself possessed of far greater foresight. The German politicians and the Prussian diplomatists accredited to Rome had worked too openly at undermining the papal hierarchy, and had veiled their sympathies for Piedmont far too lightly to lead the Vatican to expect, after the 20th of September 1870, a genuine and firm intervention on the part of Prussia on behalf of the temporal power of the Holy See. To satisfy the demands of Bismarck in November 1870 would have cost the Vatican more than it would ever have gained. It could neither afford to trifle with the sympathies of the French Catholics nor to interrupt the progress of those elements, which would naturally be a thorn in the side of the young German Empire, thus undo Bismarck’s work, and restore the Vatican policy to its pristine strength and vigour. It was soon to be perceived how carefully the Curia had made its calculations.

The address of the Catholic deputies to the emperor William in Versailles on the 18th of February 187 1, pleading for the restoration of the States of the Church and the temporal sove- reignty of the pope, and for the reconstitution of the Catholic group formed in the Prussian Landtag in i860 as the Centrum or Centre Party in the new Reichstag (April 1871), must not be regarded as the origin but rather the immediate occasion of the Kulturkampf. The congratulations which the pope sent to the emperor William on receiving the announcement

of the establishment of the German Empire (March 6, 1871) were a last exchange of civilities, and the abolition of the Catholic department in the Prussian ministry of public worship (July 8, 1 871) quickly followed, together with the appointment of Falk as Kultusminister (Jan. 22, 1872), and the School Inspection Law of the 9th of February 1872.

On the 30th of January Bismarck took the opportunity of inveighing against the formation of the sectarian Centrum as being ” one of the most monstrous phenomena in the world of politics,” and he left no room for doubt ˆ m Ka t Hur ” in the minds of his hearers that he regarded the leadership of Windthorst as constituting, in his eyes, a peril to the national unity. In his Memoirs (ii. 126) he declares that the Kulturkampf was mainly initiated by him as a Polish question. This declaration, in view of the development of affairs, must appear as strange as the chancellor’s confession {Memoirs, ii. 129 seq.) that he endeavoured to persuade the emperor of the advantage of having a. nuncio accredited to Berlin (in lieu of the Catholic department of public worship). The refusal of the emperor William to entertain this project shows that in such matters his judgment was more correct than that of his counsellor, and the incident proves that the latter had anything but a clear insight into the historical position. He was drifting about with no higher aim than a ” hand-to-mouth ” policy, whilst the Holy See could feel the superiority with which the consciousness of centuries of tradition had endowed it, and took full advantage of the mistakes of its opponent. The chancellor never realized the gravity of the onslaught which, with his Kulturkampf, he was making upon the conscience and liberty of his Catholic fellow citizens. He dealt with the great question at issue from the standpoint of the diplomatist, rather than from that of the statesman well versed in ecclesiastical history and possessing an insight into what it implies; and by his violent, inconsiderate action he unwittingly drove into the ranks of Ultramontanism the moderate elements of the Catholic population. This conflict, moreover, brought Ultramontanism the enormous advantage that, even after the abolition of the May Laws, it had still left to it a well-disciplined press, an admirable organization, and a network of interests and interested parties; and all these combined to make the Centrum the strongest and the most influential political party in Germany for the remainder of the 19th century. Owing to these circumstances, the rise and further development of the

Kulturkampf were viewed in Jesuit and Vatican circles with feelings of the utmost complacency.

The purely ecclesiastical policy of Pius IX. was guided by the earnest desire to see the doctrine of Papal Infallibility brought to universal recognition. The definition of the Immaculate Conception (1854) and the proclamation of the Syllabus (1864) were finger-posts pointing the way to the Council of 1870. The pope had been persuaded that the proclamation of the new dogma would be effected without difficulty and without discus- sion; and when the pronouncement actually met with opposition, he was both surprised and embittered. For a moment the idea was entertained of giving way to the opposition and deferring a decision in the matter, or, in the manner of the fathers in the Council of Trent, adjourning it to the Greek kalends. But the party that needed for its purposes an infallible pope readily ■ persuaded Pius IX. that if the council broke up without arriving at a decision favourable to the papacy, this would be tanta- mount to a serious defeat of the Holy See and an open victory for the Gallican system. The consequence was the bull Pastor aetemus, which Pius IX. issued on the 15th of July. This did not by any means represent all the demands of the Jesuits, and it was couched in terms which appeared not unacceptable to the majority of the Catholics. The fact that the bishops were prepared to forego their opposition was not unknown in Rome. It was anticipated by the authorities. But in Germany, as also in France, the waves of anti-Infallibility were rolling so high, that the further development of events was viewed with no small concern. Under normal conditions, the situation could not fail to terminate favourably for the Vatican. That the Kulturkampf had followed so rapidly upon the war was the greatest piece of good fortune that could have befallen the Holy See. The war demanded both in Germany and France the sacrifice of all available energy and public spirit; while the Kulturkampf, by bringing into relief the question of the external existence of the Church, thrust all internal dogmatic interests and problems completely into the background. The egregious blunder in the May Laws was the punitive clauses directed against the inferior clergy. Instead of enlisting them as friends, the Prussian government contrived by wild and wanton persecution to make them its enemies. The open protection it accorded to the Old Catholic movement contributed in no small measure to estrange those influential elements which, whilst favouring the suppression of Ultramontane tendencies, desired no schism in the Church, and viewed with horror the idea of a National Church in Bismarck's sense (see Old Catholics). Thus we find that the bitter years of the Kulturkampf extricated the Vatican from

one of the most difficult situations in which it had ever been placed. Pius IX. could now fold his hands, so far as the future was concerned. It is well known that he fed on inspirations, and expected each day the advent of some supernatural occurrence which should bring about the triumph of the Church. In this frame of mind, on the 24th of June 1872, he addressed the German Leseverein, and referred to the stone that would soon fall from on high and crush the feet of the Colossus. Yet the stone has not fallen from the summit of the holy hill, and the Colossus of the German Empire has not crumbled into dust, which is more than can be said for the pope's inspirations, which led him to expect the sudden withdrawal of the Italians from Rome, and a solution of the Roman question in the sense inspired by his visionary policy. The Holy See directed all its energies towards the solution of the problem; in the event of its proving to be insoluble, it would take care that it should remain a festering sore in the body of the monarchy. (For the Kulturkampf see further Germany: History.)

The documents of the Vatican Council which have been published since 1870 leave no room for doubt that the procla- mation of Papal Infallibility was intended to be followed by a further declaration, to the effect that the doctrine of the temporal power of the pope should be regarded as a revealed article of faith; yet the advantage and necessity of the temporal power were not to be regarded as a revealed dogma properly speaking, but as a truth guaranteed by the doctrinal body of the Holy

Church. These articles, contained in the 5th Scheme, and zealously championed by the sectaries of the Jesuit order, reveal the immediate object for which the council of 1869-1870 was convened. The resolutions were devised to save the situation, in view of the impending loss of the temporalities. No one could expect that Pius IX. would recognize the annexa- tion of Rome by Italy. Rome, even in the 19th century, had been a spectator of many changes in the political world. It had seen more than one kingdom rise and fall. No wonder, then, that the Vatican, confronted by a new Italy, observed The Papacy a passive and expectant attitude, and sanctioned no and the new jot or tittle that could infringe its rights or be U' lia " interpreted as a renunciation of its temporal sove- "B aom – reignty. It was quite in keeping that Pius IX. availed himself to the full of the (for him) convenient clauses of the Italian Law of Guarantees (May 13, 187 1), while refusing the civil list of three and a quarter million lire provided for his use, and inhibiting Italian Catholics from participating in the elections to the House of Deputies {nb elettori ne eletti). 1 This step was regarded in Italy as a natural one. Although the Liberal record of the pope was a thing of the past, and his policy had, since Gaeta,

become firmly identified with the reactionary policy of Antonelli, yet the early years of his pontificate were in such lively recollection as to allow of Pius IX. ‘s appearing to some extent in the light of a national hero. And rightly; for he had always had a warm heart for Italy; and had it not been for the anti-ecclesi- astical policy of the house of Piedmont, he would not, in the ‘sixties, have been wholly averse from reconciliation. The hitherto unpublished correspondence of the pope with Victor Emmanuel contains remarkable proofs in support of this contention, and a further corroboration can also be preceived in the conciliatory attitude of Pius IX. on the death of the king.

Pius died on the 7th of February 1878, only a few weeks later than his opponent. He had long passed the traditional years of Peter’s pontificate, had reigned longer than any previous wearer of the tiara, and had seen some brilliant days; — days of illusory glory. On his death he left the Church shaken to its very foundations, and in feud with almost every government. In Italy the Holy See was surrounded by a hostile force, whose ” prisoner ” the lord of the Vatican declared himself to be. In Spain and Portugal, and also in Belgium, a Liberalism inimical to the Church was in power. Prussia, together with other German states, was in arms against pope and episcopate. In France the Conservative Monarchical party had just shown its inability to preserve the Crown, whilst the Republic had anchored itself firmly by denouncing the clergy as its enemy. There was hardly a sovereign or a government in Christendom against which Pius IX. had not either protested or against which he had not openly declared war. Such was the heritage that devolved upon Leo XIII. on his election on the 20th of February 1878.

Leo XIII. brought to his new dignity many qualities that caused his election to be sympathetically received. In contrast to his predecessor, he was a man of slow and calm deliberation, and it was natural to suppose that he tsfS-1903. was little, if at all, accessible to impulses of the moment or to the persuasions of his entourage. He was endowed with a certain scholastic erudition, and enjoyed the reputation of being a good Latinist. As nuncio in Brussels he had become acquainted with the trans-Alpine world, and had been initiated into the working of the machinery of modern politics and modern parliamentary government. The fact that he had for so long been absent from Rome afforded ground for the belief that he was not inclined to identify himself with any of the parties at the Vatican court. These were the considerations that had caused

1 By the Law of Guarantees the pope was recognized as an independent sovereign, with jurisdiction over his own palaces and

their extensive precincts and the right to receive diplomatic representatives accredited to him. He also received the right to appoint bishops, who — except in Rome and the suburbicarian districts— were to be Italian subjects; and, with a significant exception, the exequatur, placet regium, and every form of government permission for the publication and execution of acts of ecclesiastical authority were abolished. (See also Italy : History.)

the Moderates in the Sacred College to fix their eyes upon him. The appointment of Franchi as secretary of state was a bid for peace that was viewed by the Irreconcilables with ill-disguised vexation. The following years of Leo XIII.'s pontificate only tended to increase their dissatisfaction. The first care of the new pope was to pave the way for the restoration of peace with Russia and the German Empire, and it was owing to his patience, persistence and energy that these efforts for peace were crowned with success. In the case of Germany he made many concessions which appeared to the Zelanti to be excessive, and made even still greater ones to France and Russia, to the great distress of the Poles. But at last Leo XIII. could Diplomatist. k°ast not only of having re-established diplomatic relations with most of the powers, but also of having entered into a convention with the great powers of the North, which accorded him, in conjunction with the three emperors, a leading position as champion of the conservative interests of humanity. How proud Leo XIII. was of his importance in this position is shown by the beautiful encyclical, De civitalum constitutione Christiana (" Immortale Dei " of Nov. 1, 1885), in which he adopted the strongest attitude against the principle of the sovereignty of the people {ex Us autem Pontificum prce- scriptis Mud omnino intelligi necesse est, ortum publicce potestalis a Deo ipso, non a multitudine repeti posse), refuting the notion that the principle of public power emanates from the will of the people alone (principatum non esse nisi populi voluntatem) , and absolutely rejecting the sovereignty of the people as such. But this attitude was adopted by Leo XIII. not as an end but as a means. The real aims of his rule were disclosed in the second phase of his pontificate.

At its very commencement, the pope in his first encyclical (Easter 1878) proclaimed the necessity of a temporal hierarchy. This was at the time regarded merely as a formality imposed by circumstances,

and one not to be seriously entertained; but it became more and more evident that the recovery of the tempor- alities was the real mainspring of Leo's whole policy. In the negotiations with Germany, it was clearly seen that it was from that side that the pope expected intervention in favour of resti- tution; and, according to all appearances, Bismarck did for a while keep alive these representations, though with more tact than candour. After peace had been concluded, Leo, by the agency of Galimberti, reminded the chancellor of the settlement of the Roman question. Bismarck replied that he was " un- aware of the existence of any such question." The two visits paid by Emperor William II. to the Vatican could not fail to remove any doubts in the mind of the pope as to the fact that Germany did not dream of giving him back Rome. The Austro-German-Italian triple alliance was a dire blow to his expectations, and Crispi's policy with its irritating and galling pin-pricks caused the cup to overflow.

Thus slowly, but yet deliberately, between 1887 and 1893, a transformation took place in Leo's spirit and policy, and with LeoXin.andti wa s brought about one of the most momentous the French changes in the attitude of the Church towards the Republic problems of the times and their impelling forces. A rapprochement with France inevitably entailed not only an alliance with modern democracy, but also a recognition of its principles and aims. In Rome there was no room for both pope and king. The note of the pope to Rampolla of the 8th of October 1895, in consequence of the celebrations on the 20th of September, declared, in terms more decided than any that had until then been uttered, that the papacy required a territorial sovereignty in order to ensure its full independence, and that its interests were therefore incompatible with the existence of the kingdom of Italy as then constituted. The inevitable consequences ensued. Italy regarded the pope more than ever as a foe within its walls; and the policy of the pope, as regards Italy, aimed at replacing the kingdom by one or more republics, in which the temporal power should, in some form or other, find a place. But the continuance of the Republic in'Paris was a condition precedent to the establishment of a republic in Rome, and the first had no chance of existence if the democracy in France did not remain

in power. The result was the policy of the Ralliement. Instruc- tions were given to the French Catholics to break with monarchi- cal principles, and both externally and internally to cleave to the Republic as representing the best form of constitutional government. In carrying out the r6gime of Rampolla, which was, in every respect, a bad imitation of that of Antonelli, the Vatican left no stone unturned

in its attempt to coerce the conscience of the French royalists; it did not even stop at dis- honour, as was evidenced by the case of the unhappy Mgr d'Hulst, who, in order to evade the censorship of his pamphlet on Old Testament criticism, had to abandon both his king and his principles, only to die in exile of a broken heart. The case was characteristic of the whole Catholic monarchical party, which, owing to the pope's interference in French politics, became dis- integrated and dissolved, a fate that was all the more painful seeing that the Ralliement failed to influence the course of events. The " atheistic " Republic did not for one moment think of putting on sackcloth, or even of giving the Church a single proof of esteem and sympathy.

In one respect it was impossible for the papacy to continue on the path it had taken. In his first encyclical, Leo XIII. • had sounded the clarion for battle against the Social The Pope Democracy; his encyclical Novarum rerum en- andSocial deavoured to show the means to be employed, Democracy. mainly in view of the condition of things in Belgium, for solving the social question on Christian lines. But the Christian Democracy, which, starting in Belgium and France, had now extended its activity to Italy, Austria and Germany, and was striving to arrive at this solution, degenerated everywhere into a political party. The leaders of this party came into close contact with the Social Democrats, and their relations became so cordial that Social Democracy everywhere declared the " Democratic Chretienne " to be its forerunner and pioneer. The electioneering alliances, which were everywhere in vogue, but particularly in Germany, between the Catholics and popular party and the Social Democrats, throw a lurid light upon the character of a movement that certainly went far beyond the intentions of the pope, but which it was now difficult to undo or to hold in check. For it is the essence of the matter that there were further considerations going far beyond the Roman question and forcing the Curia to adhere to the sovereignty of the people.

The external rehabilitation of the Church had become, in many points, a, fait accompli, but, internally, events had not kept pace with it. Catholic romanticism had withered An eaai i on away in France, as it had in Germany.- " Liberal of the Catholicism," which was its offspring, had died with Educated Montalembert, after being placed under a ban by 2J£ˆ e Rome. The national religious movement, associated in Italy with the great names of Rosmini and Gioberti, had similarly been disavowed and crushed. The development of the last decade of the 19th century had clearly shown that the educated bourgeoisie, the tiers (tat, in whose hands the supreme power had since 1848 become vested throughout Europe, was either entirely lost to the Church or, at all events, indifferent to what were called

Ultramontane tendencies. The educated bourgeoisie, which controls the fields of politics, science, finance, administration, art and literature, does not trouble itself about that great spiritual universal monarchy which Rome, as heir of the Caesars, claimed for the Vatican, and to which the Curia of to-day still clings. This bourgeoisie and the modern state that it upholds stand and fall with the motion of a constitutional state, whose magna carta is municipal and spiritual liberty, institutions with which the ideas of the Curia are in direct conflict. The more the hope of being able to regain these middle classes of society disappeared, the more decidedly did the Curia perceive that it must seek the support and the regeneration of its power in the steadily growing democracy, and endeavour through the medium of universal suffrage to secure the influence which this new alliance was able to offer.

The pontificate of Leo XIII. in its first phase aimed at pre- serving a certain balance of power. Whilst not openly repelling

the tendencies of the Jesuits, Leo yet showed himself well disposed towards, and even amenable to, views of a diametri- Tbe p apacy cally opposite kind; and as soon as the Vatican and the threw itself into the arms of France, and bade fare- Modem we u to the idea of a national Italy, the policy cf Democracy. e q U iijb r j urn had to be abandoned. The second phase in Leo's policy could only be accomplished with the aid of the Jesuits, or rather, it required the submission of the ecclesiastical hierarchy to the mandates of the Society of Jesus. The further consequence was that all aspirations were subjected to the thraldom of the Church. The pontificate of Leo XIII. is distinguished by the great number of persecutions, prosecutions and injuries inflicted upon Catholic savants, from the prosecution of Antonio Rosmini down to the proscription directed against the heads of the American Church. Episodes, such as the protection so long extended to the Leo Taxil affair, and to the revelations of Diana Vaughan (the object of which last was to bring Italian freemasonry and its ostensible work, the unity of Italy, into discredit), together with the attitude of the Ultra- montane press in the Dreyfus affair, and later towards England, the invigoration of political agitation by the Lourdes celebration and by anti-Semitism, were all manifestations that could not raise the " system " in the estimation of the cultured and civilized

world. Perhaps even more dangerous was the employment of the whole ecclesiastical organization, and of Catholicism generally, for political purposes.

No one will be so foolish or so unjust as to hold Leo XIII. responsible for the excesses committed by the subordinate departments of his government, in disclosing prosecuting and sometimes even fraudulently misrepresenting his aims and ends. But all these details, upon which it is not necessary to dwell, are overshadowed beyond all doubt by the one great fact that the ecclesiastical regime had not only taken under its wing the solution of social questions, but also claimed that political action was within the proper scope of the Church, and, moreover, arrogated to itself the right of interfering by means of " Direc- tives " with the political life of nations. This was nothing new, for as early as 1215 the English barons protested against it. But the weakening of the papacy had allowed this claim to lapse for centuries. To have revived it, and to have carried it out as far as is possible, was the work of Leo XIII.

It would be both presumptuous and premature to pass a final verdict upon the value and success of a policy to which, whatever else be said, must be accorded a certain meed of praise for its daring. Even in 1892 Spiiller, in his essay upon Lamennais, pointed out how the latest evolution of Catholicism was taking the course indicated by Lamennais in his Livre du peuple (iStf) , and how the hermit of " La Chetiaie," who departed this life in bitter strife with Rome, declared himself to be the actual precursor of modern Christian Socialism. He hinted that the work of Leo XIII. was, in his eyes, merely a new attempt to build up afresh the theocracy of the middle ages upon the ruins of the old monarchies, utilizing to this end the inexperience of the young and easily beguiled democracies of the dawning 20th century. To comprehend these views aright, we must first remember that what in the first half of the 19th century, and also in the days of Lamennais, was understood by Democracy was not coincident with the meaning of this expression as it was afterwards used, and as the Christian Socialists understood it. Down to 1848, and even still later, " Democracy " was used to cover the whole mass of the people, pre-eminently represented by the broad strata of the bourgeoisie; in 1900 the Democratic party itself meant by this term the rule of the labouring class organized as a nation, which, by its numerical superiority, thrust aside all other classes, including the bourgeoisie, and excluded them from participation in its rule. In like manner it would be erroneous to confuse the sense of the expression as it obtains on the continent of Europe with what is under- stood under this term in England and America. In this latter case the term " Democracy," as

applied to the historical development of Great Britain and the United States, denotes a constitutional state in which every citizen has rights

proportionate to his energy and intelligence. The socialistic idea, with which the ” Democratic Chretienne ” had identified itself both in France and Belgium, regards numbers as the centre of gravity of the whole state organism. As a matter of fact it recognizes as actual citizens only the labourer, or, in other words, the proletariat.

On surveying the situation, certain weak points in the policy of the Vatican under Leo XIII. were manifest even to a con- temporary observer. They might be summed up as follows:

(1) An unmistakable decline of religious fervour in church life.

(2) The intensifying and nurturing of all the passions and questionable practices which are so easily encouraged by practical politics, and are incompatible in almost all points with the priestly office. (3) An ever-increasing displacement of all the refined, educated and nobler elements of society by such as are rude and uncultured, by what, in fact, may be styled the ecclesi- astical ” Trottori.” (4) The naturally resulting paralysis of intelligence and scientific research, which the Church either proscribed or only sullenly tolerated. (5) The increasing decay and waxing corruption of the Romance nations, and the fostering of that diseased state of things which displayed itself in France in so many instances, such as the Dreyfus case, the anti-Semitic movement, and the campaign for and against the Assumptionists and their newspaper, the Croix. (6) The increasing estrange- ment of German and Anglo-Saxon feeling. As against these, noteworthy reasons might be urged in favour of the new development. It might well be maintained that the faults just enumerated were only cankers inseparable from every new and great movement, and that these excrescences would disappear in course of time, and the whole movement enter upon a more tranquil path. Moreover, in the industrial districts of Germany, for example, the Christian industrial movement, supported by Protestants and Catholics alike, had achieved considerable results, and proved a serviceable means of combating the seductions of Socialism. Finally, the Church had reminded the wealthy classes of their duties to the sick and toilers, and by making the social question its own it had gone a long way towards permeating all social and political conditions with the spirit of Christianity. (F. X. K.)

VI. — Period from igoo to igio.

On the 3rd of March 1903 Leo XIII. celebrated his Jubilee with more

than ordinary splendour, the occasion bringing him rich tributes of respect from all parts of the world, Catholic and non-Catholic; on the 20th of July following he died. The succession was expected to fall to Leo's secretary of state, Cardinal Rampolla; but he was credited with having inspired the French sympathies of the late pope; Austria exercised its right of veto (see Conclave, ad fin.), and on the 8th of August, Giuseppe Sarto, who as cardinal patriarch of Venice had shown a friendly disposition towards the Italian government, was elected pope. He took as his secretary of state Cardinal Raphael Merry del Val, a Spaniard of English birth and educa- tion, well versed in diplomacy, but of well-known ultramontane tendencies. The new pope was known to be no politician, but a simple and saintly priest, and in some quarters there were hopes that the attitude of the papacy towards the Italian kingdom might now be changed. But the name he assumed, Pius X., was significant; and, even had he had the will, it was soon clear that he had not the power to make any material departure from the policy of the first " prisoner of the Vatican." What was even more important, the new regime at the Vatican soon made itself felt in the relations of the Holy See with the world of modern thought and with the modern conception of the state.

The new pope's motto, it is said, was " to establish all things in Christ " (instaurare omnia in Christo) ; and since, ex hypothesi, he himself was Christ's vicar on earth, the working out of this principle meant in effect the extension and consolidation of the papal authority and, as far as possible, an end to the com- promises by means of which the - papacy had sought to make friends of the Mammon of unrighteousness. It was this spirit which informed such decrees as that on " mixed marriages "

(Ne temere) of 1907, which widened still further the social gulf between Catholics and Protestants (see Marriage: Canon Law), or the refusal to allow the French bishops to accept the Associa- tions Law passed by the French government after the denuncia- tion of the concordat and the separation of Church and State (see France: History): better that the Church in France should sink into more than apostolic poverty than that a tittle of the rights of the Holy See should be surrendered. Above all it was this spirit that breathed through every line of the famous encyclical, Pascendi gregis, directed against

the ” Modernists ” (see Roman Catholic Church: History), which denounced with bitter scorn and irony those so-called Catholics who dared to attempt to reconcile the doctrine of the Church with the results of modern science, and who, presumptuously disregarding the authority of the Holy See, maintained ” the absurd doctrine that would make of the laity the factor of progress in the Church.” That under Pius X. the papacy had abandoned none of its pretensions to dominate consciences, not of Catholics only, was again proved in 1910 when, at the very moment when the pope was praising the English people for the spirit of tolerance which led the British government to introduce a bill to alter the form of the Declaration made by the sovereign on his accession into a form inoffensive to Roman Catholics, he was remonstrating with the government of Spain for abrogating the law forbidding the Spanish dissident churches to display publicly the symbols of the Christian faith or to conduct their services otherwise than semi-privately.

In pursuance of the task of strengthening the Holy See, the Vatican policy under Pius X. was not merely one of defiance

towards supposed hostile forces within and without Reforms. tne Church; it was also strenuous in pushing on the

work of internal organization and reform. In 1904 a commission of cardinals was appointed to undertake the stupen- dous task of codifying the canon law (see Canon Law), and in

1908 an extensive reorganization of the Curia was PUisT.’” carr i ec > out ; m order to conform its machinery more

nearly to present-day needs (see Curia Romana). In taking England, the United States and other non-Catholic states from under the care of the Congregation of the Propaganda, the pope raised the status of the Roman Catholic Church in those countries. All these changes tended to consolidating the centralized authority of the papacy. Other reforms were of a different character. One of the earliest acts of the new pontifi- cate was to forbid the use in the services of the Church of any music later than Palestrina, a drastic order justified by the extreme degradation into which church music had fallen in Italy, but in general honoured rather in the spirit than in the letter. More important was the appointment in 1907 of a commission, under the presidency of Abbot Gasquet, to attempt the restoration of the pure text of the Vulgate as St Jerome wrote it.

Such activities might well be taken as proof that the papacy at the

outset of the 20th century possessed a vigour which it was Causes of the ˆ ar from possessing a hundred years earlier. Under Revival of Pius VI. and Pius VII. the papacy had reached the the Papacy. i owes t depths of spiritual and political impotence since the Reformation, and the belief was even widespread that the prisoner of Fontainebleau would be the last of the long line of St Peter's successors. This weakness was due not to attacks from without — for orthodox Protestantism had long since lost its aggressive force — but to disruptive tendencies within the Church; the Enlightenment of the 18th century had sapped the foundations of the faith among the world of intellect and fashion; the development of Gallicanism and Febronianism threatened to leave the Holy See but a shadowy pre-eminence over a series of national churches, and even to obliterate the frontier line between Catholicism and Protestantism. It was the Revolution, which at one moment seemed finally to have engulfed the papacy, which in fact preserved it; Febronianism, as a force to be seriously reckoned with, perished in the downfall of the ecclesiastical principalities of the old Empire; Gallicanism perished with the constitutional Church in France, and its

principles fell into discredit with a generation which associated it with the Revolution and its excesses. In the reaction that followed the chaos of the Revolutionary epoch men turned to the papacy as alone giving a foothold of authority in a confused and quaking world. The Romantic movement helped, with its idealization of a past but vaguely realized and imperfectly understood, and Chateaubriand heralded in the Catholic reaction with his Ginie du Christianisme (1801) a brilliant if superficial attack on the encyclopaedists and their neo-Paganism, and a glorification of the Christian Church as supreme not only in the regions of faith and morals, but also in those of intellect and art. More weighty was the Du Pape of Joseph de Maistre (1819), closely reasoned and fortified with a wealth of learning, which had an enormous influence upon all those who thought that they saw in the union of " altar and throne " the palladium of society. The Holy Empire was dead, in spite of the pope's protest at Vienna against the failure to restore " the centre of political unity "; Joseph de Maistre's idea was to set up the Holy See in its place. To many minds the papacy thus came to represent a unifying principle, as opposed to the disruptive tendencies of Liberalism and Nationalism, and the papal monarchy came to be surrounded with a new halo, as in some sort realizing that ideal of a " federation of the world " after which the age was dimly feeling.

So far as politics are concerned this sentiment was practically confined to certain classes, which saw their traditional advantages threatened

by the revolutionary tendencies of the The Papacy times; and the alliance between the throne and the and Modern altar, by confusing the interests of the papacy with Thou sbt. those of political parties, tended — as Leo XIII. had the wit to realize — to involve the fate of the one with that of the other, as in France. Far stronger was the appeal made by the authori- tative attitude of the papacy to all those who were disturbed by the scientific spirit of the age: the ceaseless questioning of all the foundations on which faith and morality had been supposed to rest. Biblical criticism, by throwing doubt on the infallibility of the Scriptures, was undermining the traditional foundation of orthodox Protestantism, and most of the Protestant Churches, divided between antagonistic tendencies, were ceasing to speak with a certain voice. To logical but timid minds, like that of J. H. Newman, which could not be content with a compromise with truth, but feared to face ultimate realities, the rigidly authoritative attitude of Rome made an irresistible appeal. The process, maybe, from the point of view of those outside, was to make a mental wilderness and call it peace; but from the papal point of view it had a double advantage: it attracted those in search of religious certainty, it facilitated the maintenance of its hold over the Catholic democracy. The methods by which it has sought to maintain this hold are criticized in the article Ultramontanism.

There can also be little doubt — though the Curia itself would not admit it — that the spiritual power of the papacy has been greatly increased by the loss of the temporal power, fhe Loss of The pope is no longer a petty Italian prince who, in the Temporal order to preserve his dominions, was necessarily Pon ‘ er – involved in the tangle of European diplomacy; he is the monarch of a vast, admirably organized, spiritual world-empire, and when — as must needs happen — the overlapping of the spiritual and temporal spheres brings him into conflict with a secular power, his diplomacy is backed, wherever Catholic sentiment is strong, by a force which the secular power has much difficulty in resisting; for in spiritual matters (and the term covers a wide field) the Catholic, however loyal to his country he may be, must obey God, whose vicegerent is the pope, rather than man. Even Bismarck, in the end, had to ” go to Canossa.”

It is, indeed, possible to exaggerate this power. The fact that the Vatican presents a great force hostile to and obstructive of certain characteristic tendencies of modern life and thought has necessarily raised up a powerful opposition even in countries traditionally Catholic. France no longer deserves the title of eldest daughter of the Church ; the Catholicism of Italy is largely superficial; even Spain has shown signs of restiveness. On the

other hand, the great opportunity now open to the papacy on its spiritual side, is proved by the growing respect in which it has been held since 1870 in the English-speaking countries, where Roman Catholics are in a minority and their Church is in no sense established. Without doubt, opinion has been influenced in these countries by the fact that Rome has not been sufficiently strong to exercise any disturbing influence on the general course of national affairs, while in both its conspicuous members set a high example of private and civic conduct.

(W. A. P.)

List of the Pontiffs of the Roman Church. *

Date of Election or Consecration.

c. 41 c. 67 c. 79 c. 91

C.I 00

c.109 c.i 19

?I28

c.138 c.142

ci 57

168

177

c.190 c.202

218

222

230

235 (21 xi, ord.)

236

251 (hi. el.)

253 el.

254 (12 v ?, el.) 257 viii

259 22 vii, el, 269 5 i, el. 275 c. 5 i 283 17 xii 296 30 vi 307 el.

309 iv, el.

310 2 vii 3H 31 i

336 18 i

337 6 11, el. 352 22 v 366 ix 384 xii 398 xi-xii

402

417 18 iii, cs.

418 28 xii 422 c. 10 ix 432 3J..V” 440 viii, el. 461 12 xi, cs. 468 25 ii, cs.

4 8 3

492 I iii, cs. 496 c. 24 xi. cs. 498 22 xi 514 20 vii, cs. 523 13 viii 526 12 vii, cs. 530 17 ix, el. 532 31 xii, cs.

535 3 vi, cs.

536 8 vi, cs.

537 29 111, cs. 555 P- 7 vi, cs. 560 14 vii, cs. 574 3 vi, cs. 578 27 xi, cs. 590 3 ix, cs. 604 13 ix, cs.

607 19 ii, cs.

608 15 ix, cs. 615 19 x, cs. 619 23 xii, cs. 625 3 xi, cs.

Date of Death

B. Petrus

29 vi, c.

65-67

S. Linus

23 ix,

c. 79

S. Cletus (Anencletus)

26 iv,

c. 91

S. Clemens I

23 xi,

c. 100

S. Evaristus

26 X,

c. 109

S. Alexander

3 v,

c. 119

S. Sixtus (Xystus)

6 iv,

c. 126

S. Telesphorus

5i.

137

S. Hyginus

11 i,

142

S. Pius

11 vii,

c. 156

S. Anicetus

17 iv,

167

S. Soter

22 iv,

c. 176

S. Eleutherus

26 v,

189

S. Victor I.

20 iv,

C. 202

S. Zephyrinus

26 viii,

217

S. Calixtus I.

14 x,

222

S. Urbanus I.

25 v,

230

S. Pontianus

res. 28 ix,

235

S. Anterus

\ 3i.

236

S. Fabianus

20 1,

250

S. Cornelius

14 ix,

253

S. Lucius

5 «>..

254

S. Stephanus I.

2 viii,

257

S. Sixtus (Xystus) II. –

‘ 6 viii,

258

S. Dionysius

26 xii,

268

S. Felix

30 xii,

274

S. Eutychianus

8 xii,

283

S. Gaius

22 iv,

296

S. Marcellinus

(? 25 x)

, 304

S. Marcellus

I5i.

309

S. Eusebius

• 17 Vlll,

309

S. Melchiades (Miltiades) ■

Iii,

3H

S. Sylvester

31 xii,

335

S. Marcus

7x,

336

S. Julius :

■ 12 iv,

352

S. Liberius

24 ix,

366

S. Damasus

10 xii,

384

S. Siricius

26 xi,

398

S. Anastasius I. t Wt. anno

401-2

S. Innocentius I.

12 iii,

417

S. Zosimus

26 xii,

418

S. Bonifacius I.

‘ 4 ix,

422

S. Coelestinus I.

f c. 26 vii,

432

S. Sixtus III.

18 viii,

440

S. Leo I.

10 xi,

461

S. Kilarus

21 ii,

468

S. Simplicius

2 iii,

483

S. Felix III.

t c. 25 ii,

492

S. Gelasius

t 19 xi,

496

S. Anastasius II. t

et sep. 19 xi,

498

S. Symmachus t el

sepult. 19 vii,

5H

S. Hormisdas t

sepult. 7 viii,

523

S. Joannes I.

t 18 V,

526

S. Felix IV.

sepel. 12 x (?) 530

Bonifacius II. t

sepul. 17 x,

532

Joannes II.

sepel. 27 v,

535

S. Agapetus I.

t 22 iv,

536

S. Silverius, exul \ sepel. 20 vi,

c 538

Vigilus Pelagius I.

t 7 vi,

555

t 3 “i.

560

Joannes III. t sepel. 13 vii,

573

Benedictus I.

t 31 vii,

578

Pelagius II.

t sepel. 6 ii,

59°

S. Gregorius I.

‘ sepel. 12 iii,

604

Sabinianus

t 22 ii,

606

Bonifacius III.

sepel. 12 xi,

607

S. Bonifacius IV.

sepel. 25 v,

615

S. Deusdedit

sepel. 8 xi,

618

Bonifacius V.

sepel. 25 x,

625

Honorius ˆ

sepe

I. 12 x,

638

Date of Election or Consecration.

640 28 v, cs. 640 25 xii, cs. 642 24 xi, cs. 649 vi-vii, cs. 654 10 viii, cs. 657 30 vii, cs. 672 II iv, cs. 676 2 xi, cs. 678 vi-vii, cs. 682 17 viii, cs.

684 26 vi, cs.

685 23 vii, cs.

686 21 x, cs.

687 x-xii, el. 701 30 x, cs. 705 I iii, cs. 708 18 i (?) 708 25 iii, cs. 715 19 v, cs. 731 II ii, el. 741 3 xii, cs. 752 iii, el. 752 ex. iii, el. 757 29 v, cs.

767 5 vii, cs.

768 7 viii, cs. 772 I ii, el. 795 26 xii, el.

816 vi, el.

817 25 i, cs. 824 v-vi

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827 ex. ann. 844 i _ 847 10 IV, cs. 855 29 ix, cs. 858 24 iv, cs. 867 14 xii, cs. 872 14 xii 882 c. xii

884 c. v, el.

885 c. ix, el. 891 c. ix

896 c. 23 v, el.

896 a. 11 vi,intrus

897 vii, cs.

897 c. xi

898 c. vi, cs. 900 6-26 vii 903 c. viii

903 c. x

904 29 i, cs. 911 c. ix, cs.

913 c. xi, cs.

914 15 v, cs.

928 c. vii, cs.

929 c. ii. cs. 931 c. iii, cs. 936 a. 9 i, cs.

939 a. 19 vii, cons. 942 a. 1 1 xi, cons. 946 c. iv 955 c. xi, cs.

963 4 xii, el.

964 v, el.

965 I x, cs.

973 19 i. cs.

974 x

983 ex. ann.

984

985 I IX, cs.

996 3 v, cs.

999 in. iv, cs. 1003 13 vi, cs. 1003 25 xii, cs. 1009 p. 20 vi, cs. 1012 22 vi, cs. 1024 24vi-i5vii,cs. 1033 i, cs.

1045 I v, intr.

1046 25 xii, cs.

1048 17 vii, cs.

1049 12 ii, cs. 1055 13 iv, cs.

1057 2 viii, el.

1058 5 iv, el.

J_

Date of Death.

Severinus Joannes IV. Theodoras I. S. Martinus S. Eugenius I. S. Vitalianus Adeodatus Donus S. Agatho S. Leo II. S. Benedictus II. Joannes V. Conon S. Sergius I. Joannes VI. Joannes VII. Sisinnius Constantinus I. S. Gregorius II. S. Gregorius III. S. Zacharias Stephanus II. Stephanus III. S. Paulus I. Constantinus II. Stephanus IV Hadrianus I. S. Leo III. Stephanus V. S. Paschalis I. Eugenius II. Valentinus Gregorius IV. Sergius II. S. Leo IV. Benedictus III. S. Nicolaus I. Hadrianus II. Joannes VIII. Marinus I. Hadrianus III. Stephanus VI. Formosus Bonifacius VI. Stephanus VI. (VII.) Romanus Theodorus II. Joannes IX. Benedictus IV. Leo V.

Christophorus Sergius III. Anastasius IIL Lando Joannes X. Leo VI.

Stephanus VIII Joannes XI. Leo VI. (VII.) Stephanus IX.

Marinus II.

Agapetus II.

Joannes XII.

Leo VIII.

Benedict V.

Joannes XIII.

Benedict VI.

Benedictus VII.

Joannes XIV.

Bonifacius VII.

Joannes XV.

Gregorius V.

Sylvester II. (Gerbert)

Joannes XVII. (Sicco)

Joannes XVIII.

Sergius IV.

Benedict VIII.

Joannes XIX.

Benedictus IX

Gregorius VI.

Clemens II.

Damasus II.

S. Leo IX.

Victor II.

Stephanus X.

Benedict X.

” sepel. 2 viii, ” sepel. 12 x, ” sepel. 14 v, t exul 16 ix, sepel. 3 vi, sepel. 27 i, sepel. 16 vi, sep. II iv, sep. 10 i, sep. 3 vii, sep. 8 v, t 2 viii, sepel. 22 ix, sepel. 8 ix, ‘ sepel. 10-1 1 i, t sep. 18 x, f sep. 7 ii,

t 9jy.

f sepel. 1 1 ii. f sep. 29 xi, Lf sep. 15 iii, f ex. iii, t sep. 26 iv, t 28 vi, depos. 6 viii, t iH, t 25 xii, t sep. 12 vi, f24i, t c. 14 v, t viii, t ex. ann.

27 i, 17 vii, 7 iv, I3xi, t c. 1 xii, 15 xii, c. v,

c. viii-ix, c. ix, 23 v, t c. 6 vi, amot. f vii, f c. xi, t post 20 dies

t vii, t viii, t c ix, amot. i, \P 4ix, t c. xi, t c. v, t in carcere

t c – “ > t 15 i”. t i, t vii, t c – x, t c. iv, t c. 8 xi, (amot. 4 xii, 963) t 14 v

111,

6 ix, vii, x,

u.

exul

.t f occis.

t —,.. f occis. 20 viii,

. t yii >

f in. iv, ii, 12 v, 7 xii, vi, ■• 16-22 vi, 7 iv, i, resignat. I v, resignat. 20 xii, 9x, 9 vni, 19 iv, ” 28 vii, 29 iii,

expuls.

640 642 649 655 657 672 676 678 681 683 685 686 687 701

705 707 708 715 731 741 752 752 757 767 768

772

795 816 817 824 827 827 844 847 855 858 867 872 882 884 885 891 896 896 897 897

900 903 903 904 911

913 914 929 929

93i

936 939 942 946

955 ,964

965 965 972 974 983 984

985 996

999 1003 1003 1009 1012 1024 1033 1045 1046 1047 1048 1054

1057 1058 1059

1 As recorded in the registers of the Roman Church Ifrom P. B. Gams, Series episcoporum Romanae ecclesiaej.

PAPACY

723

Date of Election or Consecration.

1059 24 1, cs. 1061 I x, el. 1073 22 iv, el. 1086 24 v, el. 1088 12 iii, el. 1099 13 viii, el.

1 1 18 24 i, el.

1 1 19 2 ii, el.

1 124 15-16 xii, el. 1 1 30 14 ii, el.

1 143 26 ix, el.

1 1 44 12 iii, el.

1 145 15 ii, el.

1 153 12 vii, cs.

1154 4 xii, el. 1 1 59 7 ix, el. 1 181 1 ix

1 185 25 xi 1187 21 x, el. 1 187 19 xii, el. 1 191 30 iii, el. 1 198 8 i 1216 18 vii 1227 19 iii 1241 x 1243 25 vi 1254 25 xii 1261 29 viii 1265 5 ii 1271 1 ix 1276 23 ii cs. 1276 12 vii, el.

1276 13 ix

1277 25 xi 1281 22 ii 1285 2 iv 1288 15 ii 1294 5 vii

1294 24 xii 1303 22 x 1305 5 vi 1316 7 viii 1334 20 xii 1342 7 v, el. 1352 18 xii 1362 28 x 1370 30 xii 1378 8 iv 1378 20 ix 1394 28 ix

1389 2 xi 1404 17 x 1406 2 xii

1409 26 vi

1410 17 v

1417

H3I

1447

H55

1458 1464

, 1471

I 1484

1492 1503 1503 1513 1522

1523 1534 1550 1555 1555 1559 1566 1572 1585 1590

I590

1591 1592 1605

II xi 3 iii 6 iii

8 iv 19 viii 31 viii

9 viii

24 viii 11 viii

22 ix 1 xi 15 iii

9i 19 xi 13 x

8 ii

9 iv

23 V

25 xii 17 i, cs.

26 v

1 v, cs. 15 ix. el. 5 xii 29 x, el. 3° i. el. I iv, el.

Date of Death.

27 vn, 21 iv, 25 v, 16 ix, 29 vii, 21 i, 29 i,

Nicolaus II.

Alexander II.

S. Gregorius VII.

Victor III.

Urbanus II.

Paschalis II.

Gelasius II.

Calixtus II.

Honorius II.

Innocentius II.

Coelestinus II.

Lucius II.

Eugenius III.

Anastasius IV.

Hadrianus IV.

Alexander III.

Lucius III.

Urbanus III.

Gregorius VIII.

Clemens III.

Coelestinus III.

Innocentius III.

Honorius III.

Gregorius IX.

Coelestinus IV.

Innocentius IV.

Alexander IV.

Urbanus IV.

Clemens IV.

Gregorius X.

Innocentius V.

Hadrianus V.

Joannes XXI.

Nicolaus III.

Martinus IV.

Honorius IV.

Nicolaus IV.

S. Coelestinus V. (f 19 v, 1296)

res. 13 xii, Bonifacius VIII. f 11 x,

Benedictus XI. ” 7 vii,

Clemens V. f 20 iv,

Joannes XXII. 4 xii,

Benedictus XII. ■ 25 iv,

Clemens VI. 6 xii,

Innocentius VI. f 12 ix,

Urbanus V. ‘19 xii,

Gregorius XI. ■ 27 iii,

Urbanus VI. f 15 x,

Clemens VII. antipapa Aven. f 16 ix, Benedict XIII. (amot 26 vii)

1417 f 23 v, Bonifacius IX. fix,

Innocentius VII. f 6 xi,

1061 1073 1085 1087 1099 1118 1119

I3-I4 XU,II24

14 11,

24 ix, 8 iii,

15”.

8 vii, 3 xii,

1 ix, 30 viii,

25 xi,

20 x,

17 xii, iii,

8 i, _

16 vii,

18 iii,

21 viii, 17-18 xi, 13 xii, 25 v,

2 x. 29 xi, 11 i,

22 vi,

17 viii, ” 16 v,

22 viii, 28 iii,

3 iv,

4 iv,

Gregorius XII.

Alexander V. Joannes XXIII.

Martinus V. Eugenius IV. Nicolaus V. Calixtus III. Pius II. Paulus II. Sixtus IV. Innocentius VIII. Alexander VI. Pius III. Julius II. LeoX.

Hadrianus VI. Clemens VII. Paulus III. Julius III. Marcellus II. Paulus IV. Pius IV. S. Pius V. Gregorius XIII. Sixtus V. Urbanus VII. Gregorius XIV. Innocentius IX. Clemens VIII. Leo XI.

(t 1419) resignat.

(t 22 xi 1419) amot.

t

4 vii, 3 v,

24 V,

20 ii,

23 ji,

24 iii, 6 viii,

15 viii,

‘ 28 vii_,

12 viii,

25 vii, 18 viii, 18 x,

21 ii ;

I xii,

14 ix, 25 ix, 10 xi,

23 i”, 30 iv, 18 viii,

9 xii,

1 v, 10 iv, 27 viii, 27 ix,

15 x, 30 xii,

5 i”, 27 iv.

1 130

1 143

1 144

1 145

1 153

1 154 1159 1181 1185 1187 1187 1191 1198 1216 1227 1241 1241

1254 1261 1264 1268 1276 1276 1276 1277 1280 1285 1287 1292

1294 1303 1304 1314 1334 1342 1352 1362 1370 1378 1389 1394

1423]

1404 1406

1415 1410

1415 143 1 1447 1455 1458 1464 1471 1484 1492 1503 1503 1513 1521

1523 1534 1549 1555 1555 1559 1565 1572 1585 1590 1590 1591 1591 1605 1605

Date of Election or Consecration.

1605 162 1 1623 1644

1655 1667 1670 1676 1689 1691 1700 1721 1724 1730 1740 1758 1769

1775 1800 1823 1829 1831 1846 1877 1903

, el

16 v, el. 9ii

6 viii, el. 15 ix

7 iv

20 vi 29 iv

21 ix 6x 12 vii 23 xi,

8 v 29 v 12 vii

17 viii 6 vii 19 v

IS" 14 iii 28 ix 31 iii 2 ii 16 v . vi, el 4 viii,

Date of Death,

, el. , el.

Paulus V. Gregorius XV. Urbanus VIII. Innocentius X. Alexander VII. Clemens IX. Clemens X. Innocentius XI. Alexander VIII. Innocentius XII. Clemens XI. Innocentius XIII. Benedictus XIII. Clemens XII. Benedictus XIV. Clemens XIII. Clemens XIV. Pius VI. Pius VII. Leo XII. Pius VIII. Gregorius XVI. Pius IX. Leo XIII. Pius X.

28 i,

8 vii,

29 vii,

7i, 22 v,

9 xii, 22 vii, 12 vii,

1 ii, 27 ix,

19 iii,

7 iii,

21 ii, 6 ii,

3 v,

2 ii,

22 ix,

29 viii,

20 viii, 10 ii,

30 xi, I vi,

3 vi, 20 vii,

1621 1623

1644

1655 1667 1669 1676 1689 1691 1700 1721 1724 1730 1740 1758 1769 1774 1799 1823 1829 1830 1846 1877 1903

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(b) From 1124 to iiq8. — Monographs dealing expressly with the

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(c) From 1198 to 1261. — On the pontificate of Innocent III. in general, see F. von Hurter, Geschichte Papst Innocenz III. (3rd and 2nd ed., 4 vols., Hamburg, 1841-1844); and A. Luchaire, Innocent III., Rome et I'ltalie (2nd ed., Paris, 1905), Innocent III. la croisade des albigeois (Paris, 1905), Innocent III., la papaute et Vempire (Paris, 1906), Innocent III., la question d'orient (Paris, 1906), and Innocent III., les royautis vassales du Saint-Siege (Pans, 1908). Cf. E. Winkelmann, Philipp von Schwaben und Otto IV. von Braun- schweig (2 vols., Leipzig, 1873-1878); W. Norden, Das Papsttum und Byzanz (Berlin, 1903), a considerable part of which is devoted to Innocent III. ; E. Gerland, Geschichte des lateinischen Kaiserreiches von Konstantinopel (Homburg, 1905); R. Davidsohn, Philipp II. August von Frankreich und Ingeborg (Stuttgart, 1888) ; R. Schwemer, Innocenz III. und die deutsche Kirche wdhrend des Thronstreites von 1 198-1208 (Strassburg, 1882); Else Giitschow, Innocenz III. und England (Munich, 1904) ; and many other detailed monographs. The pontificate of Honorius III. is dealt with by J. Clausen in his Papst Honorius III. (Bonn, 1895), and his registers have been pub- lished by P. Pressutti (3 vols., Rome, 1884 and 1888-1895). On Gregory IX., see J. Felten, Papst Gregor IX. (Freiburg i. Br., 1886); P. Balan, Storia di Gregorio IX. e dei suoi tempi (3 vols., Modena, 1872-1873); and J. Marx, Die vita Gregorii IX. (Berlin, 1889). The publication of the registers of this pope was begun by L. Auvray in the Bibliotheque des icoles de Rome et d'Athenes (Paris, 1890 et seq.). On Innocent IV., see E. Berger, St Louis et Innocent IV. (Paris, 1893); E. Winkelmann, Kaiser Friedrich II. (2 vols., Leipzig, 1889-1897); P. Aldinger, Die Neubesetzung der deutschen Bistiimer unter Papst Innocenz IV. (Leipzig, 1901); and C. Rodenberg, Innocenz IV. und das Konigreich Sizilien (Halle, 1892). The publication of the registers of Innocent IV. was under- taken by Elie Berger (1881 et seq.), and those of Alexander IV. by J. de Loye, A. Coulon and C. Bourel de la Ronciere (1895 et seq.). As the history of the later Hohenstaufens is intimately bound up with that of the contemporary popes, mention must be made of F. W. Schirrmacher, Die letzten Hohenstaufen (Gottingen, 1871); A. Karst, Geschichte Manfreds vom Ende ,Friedrichs II. bis zu seiner Kronung (Berlin, 1897) ; and K. Hampe, Geschichte Konradins von

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PAPEETE, the capital of the Pacific island of Tahiti, and the chief port and trading centre, and the seat of government of the French

establishments in Oceania. Pop. 4280 (2500 French). The town, lying on the north-west coast of the island, on a beautiful harbour entered by two passages through the protect- ing reef, and backed by five mountains, is French in character as far as concerns the richer quarters. It has a cathedral, barracks and arsenal, government buildings and a botanical garden. The Chinese quarter and the picturesque native market contrast strongly with the European settlement. Of the entrances to the harbour, which is of fair extent and depth, that of Papeete has about seven fathoms depth; that of Taunoa is shallower, though wider and more convenient.

PAPENBURG, a town in the Prussian province of Hanover, 27 m. by rail S. by W. of Emden, and near the right bank of the Ems, with which it is connected by a canal 3 m. long. Pop. (1905), 7673. It lies in the centre of extensive moors and in appearance resembles a Dutch town. The industries include shipbuilding, oil and glass mills, and manufactures of chemicals, cement, nickel goods and machinery. It is a very prosperous port and its trade, carried on mainly by water, is mostly in the agricultural produce of the extensive moors and pasture lands which lie around it. Papenburg was founded in 1675 and became a town in i860.

PAPER (Fr. papier, from Lat. papyrus), the general name for the substance commonly used for writing upon, or for wrapping things in. The origin and early history of paper as a writing material are involved in much obscurity. The art of making it from fibrous matter appears to have been practised by the Chinese at a very distant period. Different writers have traced

it back to the 2nd century B.C. But, however remote its age may have been in eastern Asia, paper first became available for the rest of the world in the middle of the 8th century. In 751 the Arabs, who had occupied Samarkand early in the century, were attacked there by Chinese. The invasion was repelled by the Arab governor, who in the pursuit, it is related, captured certain prisoners who were skilled in paper-making and who imparted their knowledge to their new masters. Hence began the Arabian manufacture, which rapidly spread to all parts of the Arab dominions. The extent to which it was adopted for literary purposes is proved by the comparatively large number of early Arabic MSS. on paper which have been preserved dating from the 9th century. 1

There has existed a not inconsiderable difficulty in regard to the material of which the Arab paper was composed. In Europe it has been referred to by old writers as charta bombycina, gossypina,

cuttunea, xylina, damascena and serica. The last title seems to have been derived from its glossy and silken appearance; the title damascena merely points to its great central emporium, Damascus. But the other terms indicate an idea, which has been persistent, that the paper manufactured by the Arabs was composed of the wool from the cotton-plant, reduced to a pulp according to the method attributed to the Chinese; and it had been generally accepted that the distinction between Oriental paper and European paper lay in the fact that the former was a cotton-paper and the latter a rag-paper. But this theory has been disturbed by recent investigations, which have shown that the material of the Arab paper was itself substantially linen. It seems that the Arabs, and the skilled Persian workmen whom they employed, at once resorted to flax, which grows abundantly in Khorasan, as their principal material, afterwards also making use of rags, supplemented, as the demand grew, with any vegetable fibre that would serve; and that cotton, if used at all, was used very sparingly. Still there remain the old titles charta bombycina, &c, to be explained; and an ingenious solution has been offered that the term charta bombycina, or xˆ/rˆs Po/jfivKiuos, is an erroneous reading of charta bambycina, or xapT77sj3ajii|6Wj'os, paper manufactured at the Syrian town of Bambyce or /3a/uj3uK?j, the Arab Mambidsch (Karabacek in Mittheilungen aus der Sammlung der Papyrus Erzherzog Rainer, ii.iii. 87, iv. 117). Without accepting this as an altogether sufficient explanation of so widely used a term as the medieval charta bombycina, and passing from the question of material to other differences, paper of Oriental manufacture in the middle ages was usually distin guished by its stout substance and glossy surface, and was devoid of water-marks, the employment of which became universal in the European factories. Besides the titles referred to above, paper also received the names of charta and papyrus, transferred to it from the Egyptian writing material manufactured from the papyrus plant (see Papyrus) .

It was probably first brought into Greece through trade with Asia, and thence transmitted to neighbouring countries. Theo- philus presbyter, writing in the 12th century [Schedula diver- sarum artium, i. 23), refers to it under the name of Greek parchment, pergamena graeca. There is a record of the use of

1 A few of the earliest dated examples may be instanced. The Gharibu 'l-Haidth, a treatise on the rare and curious words in the sayings of Mahomet and his companions, written in the year 866, is probably one of the oldest paper MSS. in existence {Pal. Soc. Orient. Ser. pi. 6). It is preserved in the University Library of Leiden. _ A treatise by an Arabian physician on the nourishment of the different members of the

body, of the year 960, is the oldest dated Arabic MS. on paper in the British Museum (Or. MS. 2600; PaL Soc, pi. 96). The Bodleian Library possesses a MS. of the Didwnu ‘l-Adab, a grammatical work of A.D. 974, of particular interest as having been written at Samarkand on paper presumably made at that seat of the first Arab manufacture (Pal. Soc. pi. 60). Other early examples are two MSS. at Paris, of the years 969 (Fonds arabe, suppl., 952) and 980 {Fonds arabe, 55); a volume of poems written at Baghdad, A.D. 990, now at Leipzig, and the Gospel of St Luke, A.D. 993, in the Vatican Library {Pal. Soc, pis. 7, 21). In the great collection of Syriac MSS., which were obtained from the Nitrian desert in Egypt and are now in the British Museum, there are many volumes written on paper of the 10th century. The two oldest dated examples, however, are not earlier than a.d. 1075 and 1084.

paper by the empress Irene at the end of the nth or beginning of the 1 2th century, in her rules for the nuns of Constantinople. It does not appear, however, to have been very extensively used in Greece before the middle of the 13th century, for, with one doubtful exception, there are no extant Greek MSS. on paper which bear date prior to that period.

The manufacture of paper in Europe was first established by the Moors in Spain in the middle of the 1 2th century, the head- quarters of the industry being Xativa, Valencia and Toledo. But on the fall of the Moorish power the manufacture, passing into the hands of the less skilled Christians, declined in the quality of its production. In Italy also the art of paper-making was no doubt established through the Arab occupation of Sicily. But the paper which was made both there and in Spain, was in the first instance of the Oriental quality. In the laws of Alphonso of 1263 it is referred to as cloth parchment, a term which well describes its stout substance. The first mention of rag-paper occurs in the tract of Peter, abbot of Cluny (a.d. 11 22-1 150), adversus Judaeos, cap. 5, where, among the various kinds of books, he refers to such as are written on material made ” ex rasuris veterum pannorum.”

A few words may here be said respecting MSS. written in Euro- pean countries on Oriental paper or paper made in the Oriental fashion. Several which have been quoted as early instances have proved, on further examination, to be nothing but vellum. The ancient fragments of the Gospel of St Mark, preserved at Venice, which were stated by Maffei to be of paper, by Mont- faucon of papyrus, and by the Benedictines of bark, are in fact written on skin. The oldest recorded document on paper was a deed of King Roger of Sicily, of the year 1102; and there are others of Sicilian kings, of the 12th century. A Visigothic paper MS. of the 1 2th century from Silos near Burgos is now in the Bibliotheque Nationale, Paris. A notarial register on paper, at Geneva, dates from 1154. The oldest known imperial deed on the same material is a charter of Frederick II. to the nuns of Goess in Styria, of the year 1228, now at Vienna. In 1231, however, the same emperor forbade further use of paper for public documents, which were in future to be inscribed on vellum. Transcripts of imperial acts of Frederick II. about a.d. 1241 are at Naples. In Venice the Liber plegiorum, the entries in which begin with the year 1223, is made of rough paper; and similarly the registers of the Council of Ten, beginning in 1325, and the register of the emperor Henry VII. (1308-1313) preserved at Turin, are also written on a like substance. In the British Museum there is an older example in a MS. (Arundel

268) which contains some astronomical treatises written on an excellent paper in an Italian hand of the first half of the 13th century. The autograph MS. of Albert de Beham, 1238-1255, at Munich, is on paper. In the Public Record Office there is a letter on paper from Raymond, son of Raymond, duke of Narbonne and count of Toulouse, to Henry III. of England, written within the years 1216-1222. The letters addressed from Castile to Edward I., in 1279 and following years (Pauli in Bericht, Berl. Akad., 1854), are instances of Spanish-made paper; and other specimens in existence prove that in this latter country a rough kind of charta bombycina was manufactured to a comparatively late date.

In Italy the first place which appears to have become a great centre of the paper-making industry was Fabriano in the marqui- sate of Ancona, where mills were first set up in 1276, and which rose into importance on the decline of the manufacture in Spain. The earliest known water-marks in paper from this factory are of the years 1293 and 1294. The jurist Bartolo, in his treatise De insigniis et armis, refers to the excellent paper made there in the middle of the 14th century, an encomium which will be supported by those who have had occasion to examine the extant MSS. on Italian paper of that period. In 1340 a factory was established at Padua; another arose later at Treviso; and others followed in the territories of Florence, Bologna, Parma, Milan, Venice and other districts. From the factories of northern Italy the wants of southern Germany were supplied as late as the 15th century. As an instance the case of Gorlitz

has been cited, which drew its paper from Milan and Venice for the half century between 1376 and 1426. But in Germany also factories were rapidly founded. The earliestˆ are said to have been set up between Cologne and Mainz, and in Mainz itself about 1320. At Nuremberg Ulman Stromer established a mill in 1390, with the aid of Italian workmen. Other places of early manufacture were Ratisbon and Augsburg. Western Germany, as well as the Netherlands and England, is said to have obtained paper at first from France and Burgundy through the markets of Bruges, Antwerp' and Cologne. France owed the establish- ment of her first paper-mills to Spain, whence we are told the art of paper-making was introduced, as early as the year 1189, into the district of Herault. At a later period, in 1406, among the accounts of the church of Troyes, paper-mills appear as molins a toile. The development of the trade in France must have been very rapid. And with the progress of manufacture in France that of the Netherlands also grew.

In the second half of the 14th, century the use of paper for all literary

purposes had become well established in all western Europe; and in the course of the 15th century it gradually superseded vellum. In MSS. of this latter period it is not unusual to find a mixture of vellum and paper, a vellum sheet forming the outer, or the outer and inner, leaves of a quire while the rest are of paper.

With regard to the early use of paper in England, there is evidence that at the beginning of the 14th century it was a not uncommon material, particularly for registers and accounts. Under the year 13 10, the records of Merton College, Oxford, show that paper was purchased " pro registro," which Professor Rogers (Hist. Agricul. and Prices, i. 644) is of opinion was pro- bably paper of the same character as that of the Bordeaux customs register in the Public Record Office, which date from the first year of Edward II. The college register referred to, which was probably used for entering the books that the fellows borrowed from the library, has perished. There is, however, in the British Museum a paper MS. (Add. 31,223), written in England, of even earliem date than the one recorded in the Merton archives. This is a register of the hustings court of Lyme Regis, the entries in which begin in the year 1309. The paper, of a rough manu- facture, is similar to the kind which was used in Spain. It may have been imported direct from that country or from Bordeaux; and a seaport town on the south coast of England is exactly the place where such early relics might be looked for. Professor Rogers also mentions an early specimen of paper in the archives of Merton College, on which is written a bill of the year 1332; and some leaves of water-marked paper of 1333 exist in the Harleian collection. Only a few years later in date is the first of the registers of the King's Hall at Cambridge, a series of which, on paper, is preserved in the library of Trinity College. Of the middle of the 14th century also are many municipal books and records. The knowledge, however, which we have of the history of paper-making in England is extremely scanty. The first maker whose name is known is John Tate, who is said to have set up a mill in Hertford early in the 16th century; and Sir John Spilman, Queen Elizabeth's jeweller, erected a paper-mill at Dartford, and in 1 589 obtained a licence for ten years to make all sorts of white writing-paper and to gather, for the purpose, all manner of linen rags, scrolls or scraps of parchment, old fishing nets, &c. (Dunkin, Hist, of Dartford, 305; Harl. MS. 2296, f. 124 6). But it is incredible that no paper was made in the country before the time of the Tudors. The comparatively cheap rates at which it was sold in the 15th century in inland towns seem to afford ground for assuming that there was at that time a native industry in this commodity.

As far as the prices have been observed at which different kinds of paper were sold in England, it has been found that in I 35S~i3S6 the

price of a quire of small folio paper was 5d., both in Oxford and London. In the 15th century the average price seems to have ranged from 3d. to 4d. for the quire, and from 3s. 4d. to 4s. for the ream. At the beginning of the 16th century the price fell to 2d. or 3d. the quire, and to 3s. or 3s. 6d. the ream; but in the second half of the century, owing to the debasement

of the coinage, it rose, in common with all other commodities, to nearly 4d. the quire, and to rather more than 5s. the ream. The relatively higher price of the ream in this last period, as compared with that of the quire, seems to imply a more extensive use of the material which enabled the trader to dispose of broken bulk more quickly than formerly, and so to sell by the quire at a comparatively cheap rate.

Brown paper appears in entries of 1570-1571, and was sold in bundles at 2s. to 2s. 46.. Blotting paper is apparently of even earlier date, being mentioned under the year 1465. It was a coarse, grey, unsized paper, fragments of which have been found among the leaves of 15th-century accounts, where it had been left after being used for blotting. Early in the 16th century blotting-paper must have been in ordinary use, fo'r it is referred to in W. Horman's Vulgaria, 1 519 (p. 80 b): " Blottyng papyr serveth to drye weete wryttynge, lest there be made blottis or blurris "; and early in the next century " charta bibula " is mentioned in the Pinacotheca (i. 175) of Nidus Erythraeus. It is remarkable that, in spite of the comparatively early date of this invention, sand continued generally in use, and even at the present day continues in several countries in fairly common use as an ink absorbent.

A study of the various water-marks has yielded some results in tracing the different channels in which the paper trade of different countries flowed. Experience also of the different kinds of paper and a knowledge of the water-marks (the earliest of which is of about the year 1282) aid the student in fixing nearly exact periods of undated documents. European paper of the 14th century may generally be recognized by its firm texture, its stoutness, and the large size of its wires. The water-marks are usually simple in design; and, being the result of the impress of thick wires, they are therefore strongly

marked. In the course of the 15th century the texture gradually becomes finer and the water-marks more elaborate. While the old subjects of the latter are still continued in use, they are more neatly outlined, and, particularly in Italian paper, they are frequently enclosed in circles. The practice of inserting the full name of the maker in the water-mark came into fashion early in the 16th century. But it is interesting to know that for a very brief period in the 14th century, from about 1307 to 1320, the practice actually obtained at Fabriano, but was then abandoned in favour of simple initial letters, which had already been used even in the 13th century. The date of manufacture appears first in the water-marks of paper made in 1545. The variety of subjects of water-marks is most extensive. Animals, birds, fishes, heads, flowers, domestic and warlike implements, armorial bearings, &c, are found from the earliest times. Some of these, such as armorial bearings, and national, provincial or personal cogni- zances, as the imperial crown, the crossed keys or the cardinal's hat, can be attributed to particular countries or districts; and the wide dissemination of the paper bearing these marks in different countries serves to prove how large and international was the paper trade in the 14th and 15th centuries.

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Paper Manufacture In the modern sense " paper " may best be described as a more <}r less thin tissue composed of any fibrous material, whose

individual fibres, first separated by mechanical action, are then deposited and felted together on wire cloth while suspended in water (see Fibres). The main constituent in the structure of all plants is the fibre or cellulose which forms the casing or walls of the different cells; it is trie woody portion of the plant freed from all foreign substances, and forms, so to speak, the skeleton of vegetable fibre to the amount of 75 to 78%. Its forms and com- binations are extremely varied, but it always consists of the same chemical elements, carbon, hydrogen and oxygen, and in the same proportions. It is the object of the paper-maker to eliminate the glutinous, resinous, siliceous and other intercellular matters and to produce the fibre as pure and as strong as possible. Linen and cotton rags, having already undergone a process of manufacture, consist of almost pure fibres with the addition of fatty and colouring matters which can be got rid of by simple boiling under a low pressure of steam with a weak alkaline solution; but the substitutes for rags, esparto, wood, straw, &c, being used as they come from the soil, contain all the intercellular matter in its original form, which has to be dissolved by strong chemical treatment under a high temperature. The vegetable fibre or cellulose, being of a tougher and stronger nature, is untouched by the action of caustic soda (which is the chemical generally employed for the purpose), unless the treatment be carried too far, whilst animal fibres or other organic matters are rendered soluble or destroyed by it. The cellulose, after its resolution by chemical treatment, is still impregnated with insoluble colouring matters, which have to be eliminated or destroyed by treatment with a solution of chlorine or bleaching- powder. The object of the paper-maker in treating any one particular fibre is to carry the action of the dissolving and bleach- ing agents just so far as to obtain the fibre as free from impurities and as white in colour as is desired. The usefulness of a plant for a good white paper depends upon the strength and elasticity of its fibres, upon the proportion of cellular tissue contained in them, and upon the ease with which this can be freed from the encrusting and intercellular matters. Although experiments had previously been made with many fibrous materials, paper was made in Europe, until the middle of the 19th century, almost entirely from rags, either linen or cotton. At that period other fibres began to be adopted as substitutes, due in part, no doubt, to insufficient supply of rags for the increasing consumption of paper, and to the consequent rise in price. The most important of these substitutes are esparto-grass, wood and straw, and these, together with flax (linen), hemp, jute and cotton rags, form the principal raw material for the manufacture of paper.

Paper was first entirely made by hand, sheet by sheet, but in 1798 the

invention of the paper machine by Louis Robert, a clerk »in the employ of Messrs Didot, of the Essonne Paper Mills in France, gave a new impetus to the industry. The inven- tion was introduced into England by Henry Fourdrinier (1766- 1854), the proprietor of a mill at Dartford in Kent. He secured the assistance of Bryan Donkin (1768-1855), an engineer, and after much toil and perseverance, attended with great expense, for which he received no recompense, succeeded in 1803 in erect- ing a machine at Frogmore, Herts, which worked comparatively well. This machine, by the subsequent improvements of Dickin- son, Causon, Crompton and others, has been brought to the state of perfection in which it now stands. It embraces a multitude of most ingenious and delicate operations, and produces in a few minutes, and in one continuous process from the prepared pulp, sheets of paper ready for use. Machine-made paper has now gradually supplanted that made by hand for all except special purposes, such as bank-note, ledger, drawing and other high-class papers — in one word, in cases where great durability is the chief requisite.

The various uses to which paper is put in the present day are multitudinous, but the main classes may be grouped into four: (1) writing and drawing papers; (2) printing and news- papers; (3) wrapping papers; (4) tissue and cigarette papers.

The process of paper manufacture consists of two main divi- sions: (1) the treatment of the raw material, including clean- ing, dusting, boiling, washing, bleaching and reducing to pulp;

(2) the methods by which the prepared pulp or fibres are converted into paper ready for the market; this is paper-making proper, and includes the operations of beating, sizing, colouring, making the sheet or web, surfacing, cutting, &c.

Rags arrive at the mill from the rag merchants, either roughly K>rted into grades or mixed in quality and material, and the first „ process is to free them from sand, dust and other im-

Kags. purities. To effect this they are usually passed in

bulk through an ordinary revolving duster. They are then sorted into

grades, and cut to a workable size about four inches square. For the best work, hand-cutting, done by women, is still preferred, but it is expensive and good machines have now been designed for this purpose. After further thrashing and dusting, the rags are ready for boiling, the object of which is not only to get rid of the dirt still remaining in them and to remove some of the colouring matter, but also to decompose a particular glutinous substance which would impair the flexibility of the fibres and render chem too harsh and stiff for readily making into paper. Various forms of vessels are used for boiling, but usually they are made to revolve by means of suitable gearing, and are either cylindrical or spherical (fig. 1).

Fig. 1. — Revolving Spherical Rag Boiler.

In these the rags are boiled with an alkaline solution under a low steam pressure for six to twelve hours. The next step is that of washing and ” breaking in,” which takes place in an engine called the ” breaker.” This (fig. 2) is an oblong shallow vessel or trough with rounded ends and dished bottom, usually about 13 ft. long by 6 ft. wide, by about 2 ft. 6 in. in depth, but the size varies greatly. It is partly divided along the centre by a partition or mid-feather,” and furnished with a heavy cast-iron roll fitted round its circumference with knives or bars of steel in bunnies or clumps. Underneath the roll and fixed in the bottom of the trough is the ” plate,” consisting of a number of parallel steel bars bedded in a wooden frame. The roll can be raised or lowered on the plate so as to increase or diminish, as desired, the cutting action of the bars and plate on the material. The duty of the roll is to cut and tease out the rags, and also to act as a lifter to cause the stuff to circulate round the trough. The breaker is half filled with water and packed with the boiled rags; an ample supply of clean water is run into the engine for washing the rags, the dirty water being withdrawn by the ” drum-washer,” a holiow cylinder fitted with Duckets and covered with fine wire-cloth. During the washing process the roll is gradually lowered on the plate to tease out the rags into their original fibres; this operation takes from two to four hours. As soon as all signs of the textile nature of the material are destroyed, the washing water is turned off, the drum-washer lifted, and a solution of chlorine or bleach is run in to bring the pulp up to the degree of whiteness desired, after which the rag ” half- stuff,” as it is now called, is emptied into steeps or drainers, where it is stored ready for use.

In treating esparto (the use of which for paper- making is almost confined to Great Britain) the object is to free it from all encrusting _ . and intercellular matter. To effect this it is digested Bsparto. w j tn a

stron g so l u tion of caustic soda under a high temperature, in boilers which are almost invariably stationary. The most usual form is that known as Sinclair's patent (fig. 3). This boiler is constructed of wrought-iron or steel plates, and holds from 2\ to 3 tons of grass. It is charged through the opening at the top A, and the boiled material taken out from a door B at the side; the grass rests on a false bottom of perforated plates C, through which the liquor drains, and by means of two " vomiting " pipes,

D, D, at the sides of the boiler, connecting the space at the bottom with a similar space at the top, a continuous circulation of steam and liquor is maintained through the grass. The steam pressure is kept up to 30 to 40 lb per sq. in. for three or four hours; then the strong liquor or lye, which contains all the resinous and inter- cellular matters dissolved by the action of the caustic soda, is run off and stored in tanks for subsequent recovery of the soda, while the grass is taken to the " potcher " or washing engine. In con- struction and working this is similar to the breaking engine used for rags; in it the grass is reduced to pulp, and washed for about twenty minutes to free it from the traces of soda liquor remaining

Elevation

Plan

Fig. 2. — Rag-breaking Engine.

after the partial washing in the boiler. As soon as the wash water is running clear it is shut off, and the necessary quantity of a solution of bleaching powder or chlorine (averaging about 6 to 8% on the raw material) is run into the potcher, and the contents are heated by steam to a temperature of about 90 F. After about four to six hours the bleaching is complete, the drum-washer is let down, fresh water run into the potcher, and the grass washed to free it from all traces of chlorine, an operation generally assisted by the use of a little antichlor or hyposulphite of soda. The esparto, as shipped in bales from the Spanish or African fields, is mixed with roots, weeds and other impurities; and as most of these do not boil or bleach as rapidly as the esparto they would, if not taken out of the pulp, show up in the finished paper as specks and spots. To get rid of them the esparto pulp when washed and bleached is run from the potcher into storage chests, from which it is pumped over a long, narrow serpentine settling table or " sand-table," made of wood and fitted with divisions, or " weirs," behind which the heavy impurities or weeds fall to the bottom and are caught. The pulp is next passed over what is known as

a ” presse-p&te ” (fig. 4) or ” half-stuff ” machine, very similar to the wet end of a paper machine, consisting of strainers fitted with coarse-cut strainer plates, a short wire and a pair of couch and press rolls. The pulp is drawn by suction through the strainers, which keep back the finer impurities that have passed the sand-table, and then flows on to the wire-cloth in the form of a thick web of pulp. After p? 00 ‘ng through the couch and press rolls, the pulp leaves the machine with about 70 % of moisture, and is ready for the beating engine, the first operation of paper-making proper. This is the usual process, though various modifications are introduced in different mills and for different purposes.

Most kinds of straw can be utilized for making into paper, the varieties generally used being rye, oat, wheat and barley ; of these, the two former are the most important, as they give straw the largest yield in fibre. Germany and France are the two principal users of straw, which closely resembles esparto in its chemical constitution, and is reduced to a pulp by a somewhat similar process.

Scandinavia, Germany, the United States and Canada are the countries which mainly use wood as a material for paper-making.

owing to their possession of large forest areas. They also export large quantities of wood-pulp to other countries. In Europe the Scotch fir (Pinus sylvestris), the spruce (Picea excelsa), Wood. t jj g p pi ar (Populus alba) and the aspen (Populus tremula), are the timbers principally employed; and in America the black spruce {Picea nigra), the hemlock (Tsuga canadensis), the poplar (Populus grandidentata) and the aspen (Populus tremuloides) . Two kinds of wood-pulp are used for paper manufacture, one prepared mechanically and the other chemically. The former is obtained by disintegrating the wood entirely by machinery without the use of chemicals, and is, as may readily be understood, a very inferior P“‘p. In the manufacture of chemical wood-pulp, very great

about seven or eight hours, in a simllai manner to esparto and straw, though it requires much severer treatment. The steam pressure vanes from 90 ft to as much as 1 50 lb per sq. in., and the amount of soda required is about 16% of Na2

Hot Water Pipe

SECTION.

) Liquor Pipe. Steam Pipe Colt Water Pipo

ELEVATION

Waste Pip*

-i' l '» , ^*^«^^vs^ S'f , i»f^^^^*w^^y»^^

Fig. 3. — Sinclair Esparto Boiler.

advances have been made since 1880, and wood-pulp has grown to be one of the most important fibres for paper-making purposes. Two methods are in use, known respectively as the soda or alkaline process, and the sulphite or acid process, according as soda or sulphur (or rather sulphurous acid) forms the base of the reagent employed. Trees of medium age are usually selected, varying from seventy to eighty years' growth and running from 8 to 12 in. in diameter. They are felled in winter and reach the mill in logs about 4 ft. long. After being freed from bark and the knots taken out by machinery, the logs are cut into small cubical chips about J to I in. in size by a revolving cutter. The chips are then bruised by being passed between two heavy iron rolls to allow the boiling solution thoroughly to penetrate them, and are conveyed to the boilers over a screen of coarse wire-cloth, which separates out the fine sawdust as well as any dirt or sand. In the soda process the wood is boiled in large revolving or upright stationary boilers for

Francke, Ritter-Kellner, Mitscherlich, and Partington. The sub- sequent operations, in both the acid and alkaline processes of washing, bleaching and straining the pulp, are all very similar to those described for esparto. Wood-pulp produced by the sulphite process differs in a marked degree from that made by the soda process; the fibre in the former case is harsher and stronger, and papers made from it are characterized by their hardness and trans- parency, whereas those made from soda pulp are softer and more mellow, corresponding in some way to the difference between linen and cotton fibres. Each class of pulp is largely used, both alone and mixed with other materials.

Within recent years important modifications and improvements have been adopted in the preparation of esparto and wood half- stuff with a view to reduce the cost of manufacture and save waste of material.

From the boiler to the beater the process becomes a continuous one, so that the prepared pulp requires practically no

Fig. 4. — ” Presse-Pate,” or Half-stuff Machine.

Elevation

handling till it is made into finished paper at the end of the machine ; this effects a considerable saving in cost of labour and reduces the waste of material incidental to a series of disconnected operations. From the potcher or breaking engine the esparto or wood pulp is discharged, by means of a patent circulator or pump, into the first of a series of upright bleaching towers. These towers (fig. 5) are built up of wrought-iron rods and a special kind of cement. They are usually about 16 ft. high in the parallel by 8| ft. in diameter; the bottom of the tower is conical and connected to a powerful circulator or pump, which discharges the pulp into the top of the tower and causes thereby a continuous circulation

and a thorough mixing of the pulp and bleach. A special ‘II form of concentrator is fixed I on the top of the first tower, §1 which reduces the water in the pulp as it leaves the 1| potcher to the minimum I quantity necessary for per- ˆ feet circulation in the tower; by this means a considerable saving is effected in the quantity of bleach required. 1 After the necessary concen- | tration of the pulp in No. I Is tower, the bleaching liquor is added and the circulator at I the foot of the tower put in motion. A two-way valve in the discharge pipe allows the pulp to pass on to tower No. 2, and so on through the series. The circulator in each tower is only put in working for a short time once in every hour and there is never more than one circu- lator working in the series at one time. There is no manual labour in working the pro- | cess, perfect cleanliness, and a great saving in power over the old process. Each tower will hold about two tons of dry pulp. When the pulp is fully bleached in the last tower of the series, fresh water is run into it, and a second concentrator, similar to the one on the first tower, is put in motion and washes out all traces of the bleach in about 25 to 30 minutes. These concentrators effect also another purpose, taking to some extent the place of the presse-pate machine for removing roots, weeds and other impurities.

From the last tower and concentrator the bleached pulp is pumped through a line of pipes to the beaters, valves being fixed in the line of pipes to discharge into whichever beater is desired. These beaters are constructed in tower-form like the bleach- ers, the roll and plate being fixed on the top of the tower and the circulation effected in the same way as in the Mason, Scott and" Co., Ltd. bleachers. Fig. 5 shows plan

tr.^. * rv,, _* th,,,, i.:,,,, ^,,a ' and elevation of such an Fig. 5.-Esparto Bleaching and arrangenleilt of beaters and Beating Plant. bleachers arranged in series.

The beaters are made to hold each about 1500 lb of dry paper and a series of four of these can make from 55 to 60 tons of paper per week.

immmmmmmmimmmmMmmmummiiMi/im MSi

Fibres like jute, hemp, manila, &c, are chiefly used for the manufacture of coarse papers where strength is of more importance than appearance, such as wrapping-papers, paper for telegraph- forms, &c. The boiling processes for them are similar to those used for esparto and straw.

The alkaline liquors in which rags, esparto and other paper- making materials had been boiled were formerly run into the nearest water-course; but now, partly because it is insisted upon in England by the Rivers Pollution Acts, f££overy and partly because the recovery of the soda can be made remunerative, all these liquors are preserved and the soda they contain utilized. One of the best and most economical of the simple recovery plants is that invented by Porion, a French distiller, and named after him. This consists of an evaporating chamber A, on the floor of which a few inches of the liquid to be evaporated rest. By the action of fanners B, B revolving at a high speed and dipping into the liquid, it is thrown up in a fine spray through which the heated gases pass to the chimney. After being concentrated in the evaoorating chamber the liquid flows into the incinerating furnaces C,C, where the remaining water is driven off by the heat of the fire D, and the mass afterwards ignited to_ drive off the_ carbonaceous matter. A considerable feature in this evaporator is Menzies and Davis's patent smell chamber E, a chamber filled with masonry in which the strongly-smelling gases from the incinerating furnace are allowed to remain at a red heat for a short time. After being recovered, the soda, in the form of crude carbonate, is lixiviated and re-causticized by boiling with milk of lime.

Porion's method is open, however, to the objection that the whole of

the sulphur in the coal employed for the furnaces finds its way into the recovered soda, and forms sulphur compounds, thus reducing the value of the ash for boiling purposes; in addition, a considerable amount of soda is volatilized during the evaporation. By the application of the system of multiple-effect evaporation to the recovery of waste liquors these drawbacks disappear, and an important change has been made in the soda-recovery plant of the paper-mill. This system of multiple-effect evaporation, originally introduced by M. Rillieux, was perfected by the invention of Homer T. Yaryan, of Toledo, Ohio, U.S.A. This type may here be taken for description, though other types of evaporator are now also employed, notably the ordinary vertical tube multiple effect evapor- ator as used for concentrating sugar liquors. The Yaryan evapor- ator was originally applied in the United States to the concentration of the waste alkaline liquors of paper-mills; it then came into extensive use for the manufacture and refining of sugar, the pro- duction of glucose and a variety of other purposes. The principle of multiple-effect evaporation is to utilize the latent heat of a vapour given off from a liquid under a certain pressure to vaporize a further quantity of the liquid under a pressure maintained by mechanical means below that of the first. The essential feature which dis- tinguishes the Yaryan evaporator consists in the boiling of the liquor to be treated while it is passing through a series of tubes, which constitute a coil and are heated externally by steam or vapour. The quantity of liquor entering the coil is so controlled that it is only permitted partially to fill the tubes, and thus leaves room for the instantaneous liberation of the vapour and its free escape. 1 As the liquor descends from tube to tube it becomes concentrated and reduced in volume until it ultimately passes into a ” separator,” where it impinges on a plate or disk, which causes a complete separation of the vapour and liquid; each then passes on to the next ” effect,” the liquid through the second coil of tubes and the vapour to the chamber enclosing them. This combination of a series of tubes, or coil, and separator constitutes a vessel or ” effect,” and the evaporator consists of a series, usually three or more, of these vessels, one above the other (fig. 7). The vital feature, it will be understood, is therefore that the latent, heat of the original steam, after per- forming its function in the first effect, is passed on to the second and then to the third or more effects, in each of which an equal amount of work is done before passing to the final condenser, where a vacuum is maintained. Thus, if the total temperature be divided three times, the result is a triple-effect, _ if four times, a quadruple-effect. Taking an evaporation of 10 lb of water per pound of coal, a single-effect apparatus will evaporate 10 lb of water, a

MJ/HnM/MMM/W/tMtWMtMMHMmtHMMWMM/tt»M//M/tW> >/ tW.

Fig. 6. — Porion Evaporator.

1 In England, it should be stated, it is found that both for paper liquors and other liquors equally good evapora- tion results are obtained and the tubes kept cleaner by keeping them under a head of liquor, i.e. the liquor is fed into the bottom row of tubes and has to ascend row by row to the top row ; from which it flows to the separator.

MANUFACTURE]

PAPER

73 1

double-effect 20 lb, a triple-effect 30 ft, and so on. 1 The liquor to be concentrated is pumped from the storage tanks to the top or first effect of the Yaryan apparatus through a series of multiple-effect heaters, corresponding to the number of effects in the machine, by means of which the liquor is heated to as near the boiling point as possible of the liquor in the tubes of the first effect.

The Mirriees Watson Co., Ltd.

Fig. 7. — The Yaryan Patent Multiple Effect Evaporator.

Live steam is introduced into the chamber surrounding the tubes of the first effect, and from the separator of the last effect the concentrated liquor is pumped to the incinerator.

Any form of incinerating hearth can be used in conjunction with the multiple-effect evaporator, but one very suitable to the con- tinuous work of, and the high degree of concentration produced by, the Yaryan machine is that known as the Warren rotary furnace. This consists of a revolving iron cylinder lined with brick, about 12 ft. long by 10 ft. in diameter. The lining being 6 in. thicker at the inlet 2 than at the discharge, the interior of the furnace is conical in form so that the ash gradually works forward and is eventually discharged fully burnt into trucks for storage, or on a travelling band, and so carried automatically to the dissolving or lixiviating tanks. The strong liquor runs in at one end in a slow continuous stream ; by the rotation of the hearth the burning mass is carried up the sides and drops through the flame again to the bottom, much in the same manner as rags do in a

revolving duster. In this way all the labour required to stir the ash of the ordinary hearth is dispensed with, and the burning material comes con- tinuously in close contact with the flame, a complete and thorough combustion being the result. The fire-box is situated at the delivery end of the furnace, and is mounted on trucks 3 so that it can be run back when cleaning or repairing the brickwork. The waste heat is utilized in raising steam in a steam boiler set behind the furnace, and often in keeping the thick liquor hot after leaving the evaporator and before entering the rotary furnace.

Paper-making proper from prepared pulp, whether of rags, esparto, wood or other raw material, may be said to] begin with the operation technically known as ” beating ” which is

1 The figures given here are theoretical rather than actual. In practice a double effect is not capable of evaporating twice as much with 1 lb of coal as a single-effect, owing to loss’ of efficiency through radiation, &c.

2 This was the original Warren principle, but has largely been abandoned in favour of a parallel brick lining throughout; the ash gradually works forward and is discharged as described.

3 A later method is to build the fire-box on the descending side of the rotary furnace, while a specially constructed door and ash discharge shoot are provided at the ascending side, which gives access to the inside of the furnace and provides all the other essentials without the loss of heat which resulted from the portable fire-box, due to leakage between the box and the rotary furnace proper.

carried out in one of the various forms of beating engine or ” Hollander.” The object of the beater is to reduce the fibres to suitable lengths and also to beat or bruise them

Beating,

and carry the water necessary to felt them together on the wire-

into a stiff pulp of sufficient consistency to absorb

Plao

-Total /5′ 4″ Floor Space –

Elevation

Masson, Scott & Co., Ltd.

Fig. 8. — Taylor's Patent Beater.

cloth of the paper-machine. This operation is one of the most important and most delicate processes in the manufacture, requiring experience, skill and careful manipulation. Not only does every class of fibre demand its own special treatment, but this treatment has to be modified and varied in each case to suit the qualities and substances of the papers to be made from it.

Although there are now in use a great many forms of beating engine, they are all, more or less, modifications of the original Hollander, which in its essential details differs little from the breaking engine already described. There are usually more bars in the roll and plate than in the breaker; the bars of the plate are set at a slight angle to the fly-bars of the roll to act as shears in a similar manner to a pair of scissors. Bars and plates of bronze are frequently used for the higher grades of paper to avoid rust and dirt and to produce a softer and less violent action on the fibres. The time required for the beating process varies from 3 to 4 hours up to 10 and 12 and even more. Beating engines fitted with mechanical circulation by pumps or otherwise have been extensively adopted, more particularly for working esparto and the other substitutes for rags. Fig. 8 shows one of these beaters, known as the Taylor beater; the roll and plate are fixed above the trough of the beater, which has no partition or mid-feather, and from the lower end a powerful circulator or pump circulates the pulp through the beater and discharges it through a pipe in a continuous stream in front of the roll. In the pipe is fixed a two-way valve, so that when the beating operation is complete the finished pulp can be run into the stuff-chests of the paper machine. The advantages of this form of beater are that a quicker and more thorough cir- culation of the pulp takes place than when the roll has to do the double duty of making the pulp travel and beating it up at the same time, and thus tends to reduce the time of the operation. Also more bars can be fixed in the roll, increasing its effect on the pulp, and less power is required than when the roll revolves in the middle of the stuff as in the ordinary form of beater.

Beating engines of quite a different construction are now largely used in American mills, and also to some extent in Great Britain. These are known as " refiners," and the most important forms are the Jordan and Kingsland beaters (so called from the names of the inventors), or modifications of them.

The first (fig. 9) consists of a conical plug or roll fixed on a_ shaft and revolving at a high rate of speed within an outer casing of corresponding shape; both the plug and the casing are furnished with steel bars parallel with the shaft, but set at slightly different angles, taking the place of the bars in the roll and plate of th9 ordinary beater. This conical plug or roll can be moved in either direction parallel to its axis and by this means the cutting acti&fl

of the two sets ol bars can be increased or reduced. The pulp flows into the top of the beater at the smaller end of the cone through a box provided with an arrangement for regulating the flow and passes out through an opening in the casing at the other end. The roll or plug revolves at from 350 to 400 revolutions per minute, and requires a power to drive it of from 25 to 40 h.p.,

Jhflow

Fig. 9. — Jordan Beater.

according to the work to be done, and one engine is capable of passing as much as 1000 lb weight of dry pulp per hour. The Kingsland beater consists of a circular box or casing, on both inside faces of which are fixed a number of knives or bars of steel or bronze ; inside the case is a revolving disk of metal fitted on both sides with corresponding and similar bars. The contact between the revolving and stationary bars can be regulated, as in the Jordan engine, to give the required amount of beating action on the pulp. The refiner is essentially a finishing process as an adjunct to the beating process proper. The advantages to be derived from its use are a considerable saving in the time occupied in beating and the production of a more uniform and evenly divided pulp, par- ticularly where a mixture of different fibres is used. By the use of the refiner the time occupied in the beater can be reduced by nearly one-half, the half-beaten pulp passing through the refiner from the beater on its way to the paper-machine. It is not, however, generally employed for the best kinds of paper.

During the operation of beating various materials and chemicals are added to the pulp for the purposes of sizing, loading, colouring, &c. Papers for writing and most of those for printing purposes must be

rendered non-absorbent of ink or other liquid applied to them. To effect this some form of animal or vegetable size or glue must be applied to the paper, either as a coating on the finished web or sheet, or mixed with the pulp in the beating engine. The former, called “tub-sizing” will be described later; the latter which is known as ” engine-sizing ” consists in filling up the inter- stices of the fibres with a chemical precipitate of finely-divided resin, which, when dried and heated on the cylinders of the paper- machine, possesses the property of being with difficulty wetted with water. Except in the very best qualities of paper, it is usual to add to the pulp a certain quantity of cheap loading material, such as china-clay or kaolin, or pearl-hardening, a chemically precipitated form of sulphate of lime. The addition of such loading material to a moderate extent, say 10 to 15%, is not entirely in the nature of an adulterant, as it serves to close up the pores of the paper, and for ordinary writing, printing and lithographic papers renders the material softer, enabling it to take a much better and more even surface or glaze. But if added in excess it is detri- mental to the strength and hardness of the sheet. Most materials, however well bleached, have a more or less yellowish tinge ; to produce the desired white shade in the paper certain quantities of red and blue in the form of pigments or dyes must be added to the pulp. The blues usually employed are ultramarine, smalts and the aniline blues, while the red dyes are generally preparations of either cochineal or the aniline dyes. Other colours are required in the manufacture of papers of different tints, and with one or two exceptions they must be mixed with the pulp in the beater.

There are two distinct processes of producing the finished paper from the pulp, known respectively as “hand-made” Paper and ” machine-made.” The expense of manu- Machlne. facture of hand-made paper and the consequent high price render it too costly for ordinary use; the entire process on the machine occupies a few minutes, while in the ordinary state of the weather it could not be done by hand in less than a week.

A brief description of the hand-made process will suffice and it will at the same time facilitate the right comprehension of

the machine process. Only the finest qualities of rags are used for hand-made paper; and the preparation of the half -stuff is the same as that already described under treatment of rags. The pulp after being prepared in the beating engine is run into

Fig. 10.

large chests from which the vat is supplied; before reaching this it is strained as on the paper-machine (see below). The sheet of paper is made on a mould of fine wire-cloth with a removable frame of wood to keep the pulp from running off, extending slightly above the surface of the mould, called the ” deckel.” To form the sheet, the paper-maker dips the mould into a vat (see fig. 10) containing the prepared pulp, lifting up just so much as will make a sheet of the required thickness; as soon as the

Fig. 11. — Mould and Deckel for hand-made paper.

mould is removed from the vat, the water begins to drain through the wire-cloth and to leave the fibres on the surface in the form of a coherent sheet, the felting or intertwining being assisted by a lateral motion or ” shake ” given to the mould by the workman; the movable deckel is then taken off, and the mould is given to another workman, called the ” coucher,” who turns it over and presses it against a felt, by this means transferring or ” couching ” the sheet from the wire to the felt. A number of the sheets thus formed are piled one above another alternately with pieces of felt, and the whole is subjected to strong pressure to expel the water; the felts are then removed and the sheets are again pressed and dried, when they are ready for sizing. Any pattern or name required in the sheet is obtained by making the wire-cloth mould in such a way that it is slightly raised in those parts where the pattern is needed (fig. 11); consequently less pulp lodges there and the paper is proportion- ately thinner, thus showing the exact counterpart of the pattern on the mould; such are known as ” watermarks.” The expense of manufacturing paper in this way is very much greater than by machinery; but the gain in strength, partly owing to the time allowed to the fibres to knit together, and partly to the free expansion and contraction permitted them in drying, still maintains a steady demand for this class of paper.

The paper-machine (fig. 12) consists essentially of an endless mould of fine wire-cloth on which the pulp flows and on which a continuous sheet of paper is formed; the sheet then passes through a series of press rolls and over a number of steam-heated cylinders until it is dry. From the beating engines, the pulp is emptied

into storage tanks or stuff-chests, fitted with revolving arms or agitators; from these the pulp is pumped into a long upright supply box at a higher level, called the stuff box, which communicates with the sand trap or table by means of a regulating valve. With the pulp a certain amount of water is allowed to flow on to the sand trap so as to dilute it sufficiently to form on the wire-cloth of

WET END

face of a rapidly-revotviiig disk driven by a pair of speed-cones, so that the speed of the shake can be altered. The object of this shake is to interlace the fibres together, but it also assists in keeping the water from passing through the wire too rapidly before the paper has been properly formed. Most machines have two suction- boxes with the ” dandy-roll ” revolving between them on the top

!A

Fig. 12. — Paper-Making Machine.

the paper-machine. The sand trap consists of an elevated table in which is sunk a shallow serpentine channel lined on the bottom with rough felt and divided throughout its length by a number of small strips of wood, behind which the impurities collect as the pulp flows over them on its way to the strainers.

The strainers are made of plates of brass or some hard and durable composition with fine parallel slits cut in them, through which the

fibres pass, all knots and improperly divided portions Straining. rema i n j n g behind; the pulp is made to pass through them by the rapid vibration of the plates themselves or by a strong suction underneath them, or sometimes by a combination of the two. From the strainers the pulp flows into a long wooden box or trough, of the same width as the paper machine, called the ” breast-box,” and thence on to the wire-cloth. The wire consists of a continuous woven brass cloth, supported horizontally by

small brass rolls, called ” tube-rolls,” carried on a Forming f rame; it is usually 40 to 50 ft. long and is stretched the Sheet. tight over two rolls, one at each end of the frame, called respectively the ” breast-roll ” and the ” lower-couch roll.” The ordinary gauge for the wire-cloth is 66 meshes to the inch for writings and printings; finer wires are sometimes used, however, up to 80 to the inch; for lower grades the

mesh is coarser. The water, mixed with the pulp, flows From the wire-cloth by gravitation along the lines of contact between it and the tube-rolls; this water, which contains a considerable percentage of fibre, especially from finely beaten pulps, drops into a flat copper or wooden tray, from which it flows into a tank and is pumped up with the water for diluting the pulp so that none of it shall be wasted. From the tube-rolls the wire conveys the pulp over a pair of suction-boxes for extracting the remaining water from the web. The width of the web of paper is determined by two continuous straps of vulcan- ized rubber about l| in. square, one on each side of the wire, called the “deckel-straps”; the distance between these straps can be increased or diminished; they serve to guide the pulp from the

Fig. 13. — Dandy-roll. moment it spreads on the wire until it arrives at the first suction- box, where the web is sufficiently dry to retain its edges. The frame of the machine from the breast-roll to the first Shake. suction-box is hung on a pair of strong hinges, and is capable of a slight horizontal motion imparted by a horizontal connecting-rod, one end of which is eccentrically keyed on to the

of the pulp (so called because it can be made to give to the papas any desired water-marking). The ” dandy-roll ” (fig. 13) is a light skeleton cylinder covered with wire-cloth on which small pieces of wire are soldered representing the watermark Wa ‘^ r ‘ to be reproduced in the paper. From the last suction- ma ‘* m Z box the half-dried sheet of pulp passes between the VL ucn i„ ” couch-rolls,” so called from the corresponding operation *

of couching in hand-made paper, which, by pressing out most of the remaining moisture, impart sufficient consistency to the paper t8 enable it to leave the wire ; both rolls are covered with a felt jacket, and the top one is provided with levers and weights to increase or diminish the pressure on the web. The paper is now fully formed, and is next carried by means of endless fe\ts Pre J slBg between two and sometimes three pairs of press-rolls an < 1 Drying, to extract the remaining moisture, and to obliterate as much as possible the impression of the wire-cloth from the under-side of the web. The web of paper is finally dried by passing it over a series. of hollow steam-heated drying cylinders driven one from the other by gearing. The slower and more gradual the drying process the better, as the change on the fibres of the web due to the rapid contraction in drying is thereby not so excessive, and the heat required at one time is not so great nor so likely to damage the quality of the paper; the heating surface should therefore be a« large as possible, and a great number of cylinders is required now that .the machines are driven at high speeds.

The cylinders are so placed that both surfaces of the web are alternately in contact with the heating surface. All the cylinders, except the first two of three with which the moist paper comes in contact and where tht greatest evaporation occurs, are encased by continuous travelling felts. The drying cylinders are generally divided into two seta between which is placed a pair of highly polished chilled iron rolla heated By steam, called " nip-rolls," or " smoothers," the purpose, of which is to flatten or smooth the surface of the paper while in a partially dry condition. Before being reeled up at the end of the machine the web of paper is passed through two „ or more sets of " calenders," according to the degree burtac * n X' of surface or smoothness required. These calenders consist of a vertical stack of chilled iron rolls, generally five in number, revolving one upon another, and one or more of which are bored and heated by steam; pressure can be applied to the stack as required by means of levers and screws. The web of paper is now wound up in long reels at the end of the machine.

Paper-machines are now usually driven by two separate steam engines. The first, running at a constant speed, drives the strainers, pumps, shake motion, &c, while the second, working the paper-machine, varies in speed according to the rate at which it requires

to be driven. The power consumed by the two engines will average from 40 to 100 h.p. The drying cylinders of the paper-machine form a convenient and economical condenser for the two steam- engines, and it is customary to exhaust the driving engine into the drying cylinders and utilize the latent heat in the steam for drying the paper, supplementing the supply when necessary with live steam. The speed of the machine has frequentiy to be altered while in motion. An alteration of a few feet per minute can be effected by changing the driving-speed of the steam-engine governor; for a greater change the machine must be stopped and other driving- wheels substituted. Arrangements are made in the driving-gear by which the various parts of the machine can be slightly altered in speed relatively to one another, to allow for the varying con- traction or expansion of the paper web for different kinds and thicknesses of paper. The average speed of a paper-machine on fine writing-papers of medium weight is from 60 to 90 ft. per minute, but for printing-papers, newspapers, fkc,

the machine is driven from 120 up to as much as 300 and 400 ft. per minute. The width of machines varies greatly in different mills, from about 60 in. to as much as 150 in. wide. Mills running on higher classes of papers as a rule use narrow machines, as these make a closer and more even sheet of paper than wider ones. On fine writing-papers an average machine will make from 20 to 40 tons per week, while for common printing and newspapers the weekly output will amount to 50 to 70 tons.

All hand-made papers, and many of the best classes of machine- made papers, instead of being sized in the beater with a preparation of resin are what is called ” tub-sized,” that is, coated Tub-sizing. w j (.[1 a solution of gelatin. Such papers, when machine- made, are reeled off the machine straight from the drying cylinders in the rough state. The web is then led slowly through a tub or vat containing a heated solution of animal glue or gelatin mixed with a certain amount of alum; after passing through a pair of brass rolls to squeeze out the superfluous size, the web is reeled up again and allowed to remain for some time for the size to set. The paper is then led by means of continuous travelling tapes over a long series of open skeleton drums, about 4 ft. in diameter, inside

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Fig. 14. — Super-calender.

The bottom roll and the 3rd, 6th, 8th and 10th rolls, all reckoned from the bottom, are made of highly polished chilled cast-iron; the others of highly compressed paper.

which revolve fans for creating a circulation of hot air; rows of steam-pipes underneath the line of drums furnish the heat for drying. Slow and gradual drying is essential to this process to get the full benefit of the sizing properties of the gelatin. In hand-made papers, the sheets are passed by handfuls of three or five on an endless felt through the gelatin solution and between a pair of rolls, and then slowly dried on rope lines or ” tribbles ” in a steam-heated and well-ventilated loft.

The cheaper kinds of paper are glazed on the paper-machine in the calenders as before described. For the better class or very highly-glazed papers and those that are tub-sized, a _. . subsequent glazing process is required ; this is effected „ * es . ° by sheet or plate-glazing and by super-calendering or aurfac/ W web-glazing. The plate-glazing process is adopted mainly for the best grades of writing-papers, as it gives a smoother, higher and more permanent gloss than has yet been

imitated by the roll-calender. In this method each sheet is placed by hand between two zinc or copper plates until a pile of sheets and plates has been formed sufficient to make a handful for passing through the glazing-rolls; this handful of about two quires or 48 sheets of paper, is then passed backwards and forwards between two chilled-iron rolls gearing together. A considerable pressure can be brought to bear upon the top roll by levers and weights, or by a pair of screws; the pressure on the rolls, and the number of times the handful is passed through, are varied according to the amount of gloss required on the paper. The super-calender (see fig. 14) is used to imitate, the plate-glazed surface, partly as a matter of economy in cost, but principally for the high surfaces required on papers for books and periodicals to show up wood-cuts and photographic illustrations. It usually consists of a stack of chilled cast-iron rolls, alternating with rolls of compressed cotton or paper so that the web at each nip is between cotton and iron; it will be seen from the illustration that there are two cotton rolls together in the stack for the purpose of reversing the action on the paper and so making both sides alike; pressure is applied to the rolls at the top by compound levers and weights or screws. A very high surface can be quickly given to paper by friction with the assistance of heat; the process is known as ” burnishing,” and is used mostly for envelope papers and wrappings where one surface only of the web is required to be glazed. It is produced by the friction of a chilled-iron roll on one of cotton or paper, the ratio of the revolutions being as 4 to 5; steam is admitted to the burnishing iron roll.

At the end of the 19th century a large and increasing demand sprang up for papers embossed with a special pattern, such as linen-finish, &c. ; these are used principally for fancy writing- papers, programmes, menu-cards, &c. This embossing is effected usually on the plate-glazing machine, in the- case of linen and similar finishes by enclosing each sheet of paper between two pieces of linen or other suitable material to give the desired texture or pattern on the surface of the sheet. Each sheet of paper with its two pieces of cloth is placed between zinc plates and passed backwards and forwards between the rolls of the machine as in plate-glazing.

Except for special purposes, such for example as for use in a continuous printing-machine, paper is usually sent from the mill in the form of sheets. A number of reels of paper is „ hung on spindles between two upright frames to feed n *’

the cutting-machine (see fig. 15): the various webs of paper are drawn forward together through two small rollers, and ripped into widths of

the required size by means of a number of pairs of circular knives or ” slitters “; they then pass between another pair of rollers, and over a long dead-knife fixed across the cutting-machine, on which they are cut into sheets by another transverse knife fastened to a revolving drum and acting with the dead-knife like a large pair of shears. The cut sheets then fall upon an endless travelling felt, from which they are stacked in piles by boys. It is often necessary, as in the case of water-marked papers, that the sheets should be cut with great exactness so that the designs shall appear

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Fig. 15-

-Reel Paper Cutter.

in the centre of the sheet; the ordinary cutter cannot be relied upon for this purpose and in its place a machine called a ” single- sheet cutter ” is used. In this cutter only one web of paper is cut at a time; between the circular slitters and the transverse knives is placed a measuring-drum, which receives an oscillating motion and can be adjusted by suitable mechanism to draw the exact amount of paper forward for the length of sheet required.

All that now remains to be done before the paper is ready for the market is overhauling or sheeting. This operation consists in sorting out all speckled, spotted or damaged sheets, or sheets of

different shades of colour, &c; this entails considerable time and expense as each sheet has to be passed in review separately. This sorting is usually performed by women. Papers are Sheeting. ag a fu j e sortec j mto t h ree different qualities, known in the trade respectively as ” perfect,” ” retree ” and ” broke “; the best of the defective sheets form the second quality ” retree, a term derived from the French word retirer (to draw out), and are sold at a reduced price; sheets that are torn or damaged or too badly marked to pass for the third quality ” broke,” are returned to the mill to be repulped as waste paper.

Paper is sold in sheets of different sizes and is made up into reams

containing from 480 to 516 sheets; these sizes Sizes of correspond to different trade names, such for example Paper. as foolscap, post, demy, royal, &c; the following are the ordinary sizes: —

Writing Papers.

Pott . . . . ■ Foolscap Double foolscap Foolscap and third Foolscap and half Pinched post . Small post . Large post . Double large post Medium.

Inches. 12* X 15 13I X i6i l6| X 26| I3i X 22 i3i X 2 4 i Hi X 18J i5i X 19 i6i X21 21 X 33 18 X 23

Drawing and Book Papers.

Demy. Medium . Royal

Super-royal . Imperial Elephant Double elephant Colombier Atlas _. . , Antiquarian

Inches. I5§ X 20 I7i X 22§ 19 X 24 19I X 27

22 X 30

23 X28 26J X 40 235 X 34i 26 X34 31 X 53

Printing Papers.

Demy

Double demy .

Quad demy

Double foolscap

Royal

Double royal .

Double crown .

Quad crown

Imperial

Inches. i7j X 22J 22i X 35 35 X45 X27 X25 X40 X30 X40 X30

With the enormously increased production of paper and the great reduction in price within recent years, it has been found that the " science " of paper-making has scarcely oToualHy advanced with the same rapid strides as the art itself. Although a sheet of paper made to-day differs little as a fabric from the papers of earlier epochs, the introduc- tion of new and cheaper forms of vegetable fibres and the auxiliary methods of treating them have caused a great change in the quality, strength and lasting power of the manufactured article. The undue introduction of excessive quantities of mechanical or ground wood-pulp in the period 18 70- 1880 into the cheaper qualities of printing-papers, particularly in Germany, first drew attention to this matter, since it was noticed that books printed on paper in which much of this material had been used soon began to discolour and turn brown where exposed to the air or light, and after a time the paper became brittle. This important question began to be scientifically investigated in Germany about the year 1885 by the Imperial Testing Institution in Berlin. A scheme of testing papers has been formulated and officially adopted by which the chemical and physical properties of different papers are compared and brought to numerical expression. The result of these investigations has been the fixing of certain standards of quality for papers intended for different purposes. These qualities are grouped and defined under such heads as the following : —

‘ Strength, expressed in terms of the weight or strain which the paper will support.

Elasticity and texture, measured by elongation under strain and resistance to crumpling or rubbing.

Bulk, expressed in the precise terms of specific gravity or weight per unit of volume.

Article.

Imports.

Exports.

Weight.

Value.

Weight.

Value.

Straw- and millboards . . . .

Rags, linen and cotton …. Esparto and other vegetable fibres Wood-pulp—

· —

Tons.

268,036

11,494 164,381

443.911

20,039 202,523

282,098 192,756

697,416

£

3,917,954 621,293 1,134,568

5.673.815

206,151 738,834

2,396,856 915.491

4.257,332

Tons.

87,055

122,909

(including other paper making materials.)

£

2,342,420

752,739

Of not less importance are the qualities which belong to paper as a

chemical substance or mixture, which are: (1) its actual composition; (2) the liability 1 to change under whatever con- ditions of storage and use it may be subjected to. For all papers to be used for any permanent purpose these physical and chemical qualities must ultimately rank as regulating the consumption and production of papers.

In England and Wales in 1907 there were 207 mills, using 409 machines and 99 vats for hand-made paper; in Scotland, 59 mills and in machines; in Ireland, 7 mills and n machines. A rough estimate of the amount of capital embarked in the industry may be formed on. the basis that average mills would represent from £20,000 to £30,000 and upwards per machine.

The table at foot of page shows the amounts and values of the British imports and exports of paper and paper-making materials in 1907.

Authorities. — Arnot, ” Technology of the Paper-trade,” Cantor Lectures, Society of Arts (London, 1877) ; Clapper- ton, Practical Paper-Making (London, 1894); Cross and Bevan, Report on Indian Fibres and Fibrous Substances (London, 1887); id., Cellulose (London, 1895-1905) ; id., A Text-Book of Paper- Making (London, 1888); Clayton Beadle, Chapters on Paper-Making (London); Davis, The Manufacture of Paper (Phila- delphia, 1886); Dropisch, Die Papier Machine (Brunswick, 1878); id., Papier- fabrikation (with atlas) (Weimar, 1881); Griffin and Little. The Chemistry of Paper-making (New York, 1894); Herzberg, Papier- .prufung (Berlin, 1888; Eng. trans, by P. N. Evans, London); id., Mikroskopische Untersuchung des Papiers (Berlin, 1887); Hof- mann, Handbuch der Papier-fabrikation (Berlin, 1897); Hoyer, Fabrication des Papiers (Brunswick, 1886); Indian government, Report on the Manufacture of Paper and Paper Pulp in Burtnah (London, 1906); Schubert, Die Cellulose-fabrikation (Berlin, 1897); id., Die Praxis der Papierfabrikation (Berlin, 1898); id., Die Holz- stoff-oder Holzschliff-fabrihation (Berlin, 1898); Sindall, Paper Technology (London, 1904-1905); “Report of the Committee on the Deterioration of Paper,” Society of Arts (London, 1898); Wyatt, ” Paper- making,” Proc. Inst. C. E., lxxix. (London, 1885); id., ” Sizing Paper with Rosin,” Proc. Inst. C.E., xci. (London, 1887) ; Paper-Makers’ Monthly Journal (London, since 1872) ; Faper- Trade Journal (New York, since 1872); Papier-Zeitung (Berlin, since 1876). (J. W. W.)

India Paper. — This name is given to a very thin and light but tough and opaque kind of paper, sometimes used for printing books — especially Bibles — of which it is desirable to reduce the bulk and

weight as far as possible without impairing their durability or diminishing their type. The name was originally given in England, about the middle of the 18th century, to a soft absorbent paper of a pale buff shade, imported from China, where it was made by hand on a paper-making frame generally similar to that used in Europe. The name probably originated in the prevailing tendency, down to the end of the 18th century, to describe as ” Indian ” anything which came from the Far East (cf. Indian ink). This so-called India paper was used for printing the earliest and finest impressions of engravings, hence known as ” India proofs.”

The name of India paper is now chiefly associated with European (especially British) machine-made, thin, opaque printing papers used in the highest class of book-printing. In 1841 an Oxford graduate brought home from the Far East a small quantity of extremely thin paper, which was manifestly more opaque and tough, for its weight, than any paper then made in Europe. He presented it to the Oxford University Press, and in 1842 Thomas Combe, printer to the University, used it for 24 copies of the smallest Bible then in existence — Dia- mond 24mo. These books were scarcely a third of the usual thickness, and were regarded with great interest; one was presented to Queen Victoria, and the rest to other persons. Combe tried

in vain to trace the source of this paper. In 1874 a copy of this Bible fell into the hands of Henry Frowde, and experi- ments were instituted at the Oxford University paper-mills at Wolvercote with the object of producing similar paper. On the 24th of August 1875 an impression of the Bible, similar in all respects to that of 1842, was placed on sale by the Oxford University Press. The feat of compression was regarded as astounding, the demand was enormous, and in a very short time 250,000 copies of this ” Oxford India paper Bible ” had been sold. Many other editions of the Bible, besides other books, were printed on the Oxford India paper, and the marvels of compression accomplished by its use created great interest at the Paris Exhibition of 1900. Its strength was as remarkable as its lightness; volumes of 1500 pages were suspended for several months by a single leaf, as thin as tissue, and when they were examined at the close of the exhibition, it was found that the leaf had not started, the paper had not stretched, and the volume closed as well as ever. The paper, when subjected to severe rubbing, instead of breaking into holes like ordinary printing paper, assumed a texture resembling chamois leather, and a strip 3 in.

wide was found able to support a weight of 28 lb without yielding.

The success of the Oxford India paper led to similar experiments by other manufacturers, and there were in 1910 nine mills (two each in England, GermanyandItaly,oneeachinFrance,Hollandand Belgium) in which India paper was being produced. India paper is mostly made upon a Fourdrinier machine in continuous lengths, in contra-distinction to a hand-made paper, which cannot be made of a greater size than the frame employed in its production. The material used in its manufacture is chiefly rag, with entire freedom from mechanical wood pulp. The opacity of modern India paper, so remarkable in view of the thinness of the sheet, is mainly due to the admixture of a large proportion of mineral matter which is retained by the fibres. The extraordinary properties of this paper are due, not to the use of special ingredients, but to the peculiar care neces- sary in the treatment of the fibres, which are specially ” beaten “in the beating engine, so as to give strength to the paper, and a capacity for retaining a large percentage of mineral matter. The advantage gained by the use of India paper is the diminution of the weight and bulk of a volume — usually to about one-third of those involved by the use of good ordinary printing paper — without any alteration in the size and legibility of its type and without any loss of opacity, which is an absolute necessity in all papers used for high-class book printing to prevent the type showing through. (W. E. G. F.)

PAPHLAGONIA, an ancient district of Asia Minor, situated on the Euxine Sea between Bithynia and Pontus, separated from Galatia by a prolongation to the east of the Bithynian Olympus. According to Strabo, the river Parthenius formed the western limit of the region, which was bounded on the east by the Halys. Although the Paphlagonians play scarcely any part in history, they were one of the most ancient nations of Asia Minor (Iliad, ii. 851). They are mentioned by Herodotus among the races conquered by Croesus, and they sent an important contingent to the army of Xerxes in 480 B.C. Xenophon speaks of them as being governed by a prince of their own, without any reference to the neighbouring satraps, a freedom due, perhaps, to the nature of the country, with its lofty mountain ranges and difficult passes. At a later period Paphlagonia passed under the Macedonian kings, and after the death of Alexander the Great it was assigned, together with Cappadocia and Mysia to Eumenes. It continued, however, to be governed by native princes until it was absorbed by the encroaching power of Pontus. The rulers of that dynasty became masters of the greater part of Paphlagonia as early as the reign of Mithradates III. (302- 266 B.C.), but it was not till that of Pharnaces I. that Sinope fell into their hands (183 B.C.). From this time the whole

province was incorporated with the kingdom of Pontus until the fall of the great Mithradates (65 B.C.). Pompey united the coast districts of Paphlagonia with the province of Bithynia, but left the interior of the country under the native princes, until the dynasty became extinct and the whole country was incorporated in the Roman empire. All these rulers appear to have borne the name of Pylaemenes, as a token that they claimed descent from the chieftain of that name who figures in the Iliad as leader of the Paphlagonians. Under the Roman

Empire Paphlagonia, with the greater part of Pontus, was united into one province with Bithynia, as we find to have been the case in the time of the younger Pliny; but the name was still retained by geographers, though its boundaries are not distinctly defined by Ptolemy. It reappears as a separate province in the 5th century (Hierocles, Synced, c. 33).

The ethnic relations of the Paphlagonians are very uncertain. It seems perhaps most probable that they belonged to the same race as the Cappadocians, who held the adjoining province of Pontus, and were undoubtedly a Semitic race. Their language, however, would appear from Strabo to have been distinct. Equally obscure is the relation between the Paphlagonians and the Eneti or Heneti (mentioned in connexion with them in the Homeric catalogue) who were supposed in antiquity to be the ancestors of the Veneti, who dwelt at the head of the Adriatic. But no trace is found in historical times of any tribe of that name in Asia Minor.

The greater part of Paphlagonia is. a rugged mountainous country, but it contains fertile valleys, and produces great abundance of fruit. The mountains are clothed with dense forests, which are conspicuous for the quantity of boxwood which they furnish. Hence its coasts were from an early period occupied by Greek colonies, among which the flourishing city of Sinope, founded from Miletus about 630 B.C., stood pre-eminent. Amastris, a few miles east of the Parthenius, became important under the Macedonian monarchs; while Amisus, a colony of Sinope, situated a short distance east of the Halys, and therefore not strictly in Paphlagonia as defined by Strabo, rose to be almost a rival of its parent city. The most considerable towns of the interior were Gangra, in ancient times the capital of the Paphla- gonian kings, afterwards called Germanicopolis, situated near the frontier of Galatia, and Pompeiopolis, in the valley of the Amnias (a tributary of the Halys), near which were extensive mines of the mineral called by Strabo sandarake (red arsenic), which was largely exported from Sinope.

See Hommaire de Hell, Voyage en Turquie (Paris, 1854-1860); W. J. Hamilton, Researches (London, 1842); W. M. Ramsay, Hist. Geog. of Asia Minor (London, 1890).

PAPHOS, an ancient city and sanctuary on the west coast of Cyprus. The sanctuary and older town (Palaepaphos) lie at Kouklia, about 20 m. west of Limasol, about a mile inland on the left bank of the Diorizo River (anc. Bocarus), the mouth of which formed its harbour. New Paphos (Papho or Baffo), which had already superseded Old Paphos in Roman times, lies 10 m. farther west, and 1 m. south of modern Ktima, at the other end of a fertile coast-plain. Paphos was believed to have been founded either by the Arcadian Agapenor, returning from the Trojan War (c. 1180 B.C.), or by his reputed contem- porary Cinyras, whose clan retained royal privileges down to the Ptolemaic conquest of Cyprus in 295 B.C., and held the Paphian priesthood till the Roman occupation in 58 B.C. The town certainly dates back to the close of the Mycenaean Bronze age, and had a king Eteandros among the allies of Assur-bani-pal of Assyria in 668 B.C. 1 A iater king of the same name is commemorated by two inscribed bracelets of gold now in the Metropolitan Museum of New York. In Hellenic times the kingdom of Paphos was only second to Salamis in extent and influence, and bordered on those of Soli and Curium.

Paphos owes its ancient fame to the cult of the ” Paphian goddess” (17 Ha4 > laTa.vacr

1 E. Schrader, Abh. k. Preuss. Ak. Wiss. (1879), PP- 3 I- 36; Sitzb. k. Preuss. Ak. Wiss. (1890), pp. 337-344. ”

2 Athan. c. graecos, 10. On all these cults see J. G. Frazer, Adonis, Attis, Osiris (London, 1906).

3 Herod, i. 105; see further Astakte, Aphrodite.

4 Oberhummer, Die Insel Cypern (Munich, 1903), pp. 108-110.

shown in this city. She was worshipped, under the form of a conical stone, in an open-air sanctuary of the usual Cypriote type (not unlike those of Mycenaean Greece), the general form of which is known from representations on late gems, and on Roman imperial coins; 1 its ground plan was discovered by excavations in 1888. 2 It suffered repeatedly from earthquakes, and was rebuilt more than once; in

Roman times it consisted of an open court, irregularly quadrangular, with porticos asd chambers on three sides, and a gateway through them on the east. The position of the sacred stone, and the interpretation of many details shown on the gems and coins, remain uncertain. South of the main court He the remains of what may be either an earlier temple, or the traditional tomb of Cinyras, almost wholly destroyed except its west wall of gigantic stone slabs.

After the foundation of New Paphos and the extinction of the Cinyrad and Ptolemaic dynasties, the importance of the Old Town declined rapidly. Though restored by Augustus and renamed Sebaste, after the great earthquake of 15 B.C., and visited in state by Titus before his Jewish War in 70 B.C., it was ruinous and desolate by Jerome's time 3 ; but the prestige of its priest -kings partly lingers in the exceptional privileges of the patriarch of the Cypriote Church (see Cvprus, Church of).

New Paphos became the administrative capital of the whole island in Ptolemaic and Roman days, as well as the head of one of the four Roman districts; it was also a flourishing commercial city in the time of Strabo, and famous for its oil, and for " diamonds " of medicinal power. There was a festal procession thence annually to the ancient temple. In a.d. 960 it was attacked and destroyed by the Saracens. The site shows a Roman theatre, amphitheatre, temple and other ruins, with part of the city wall, and the moles of the Roman harbour, with a ruined Greek cathedral and other medieval buildings. Outside the walls lies another columnar building. Some rock tombs hard by may be of earlier than Roman date.

See W. H. Engel, Kypros (Berlin, 1841) (classical allusions) ; M. R. James and others, Journ. Hellenic Studies, ix. 147 sqq. (history and archaeology); G. F. Hill, Brit. Mus. Cat. Coins of Cyprus (London, 1904) (coins) ; art. " Aphrodite " in Roscher's Lexicon der gr. u. rbm. Mythologie; also works cited in footnotes, and article Cyprus.

(J. L. M.)

PAPIAS, of Hierapolis in Phrygia, one of the " Apostolic Fathers " (q.v.). His Exposition of the Lord's Oracles, the prime early authority as to the Gospels of Matthew and Mark (see Gospels), is known only through fragments in later writers, chiefly Eusebius of Caesarea (H. E. iii. 39). The latter had a bias against Papias on account of the influence which his work had in perpetuating, through Irenaeus and others, belief in a millennial reign of Christ upon earth. He calls him a man of small mental capacity, who took the figurative language of

apostolic traditions for literal fact. This may have been so to some degree; but Papias (whose name itself denotes that he was of the native Phrygian stock, and who shared the enthusi- astic religious temper characteristic of Phrygia, see Montanism) was nearer in spirit to the actual Christianity of the sub-apostolic age, especially in western Asia, than Eusebius realized. In Papias's circle the exceptional in connexion with Christianity seemed quite normal. Eusebius quotes from him the resurrec- tion of a dead person 4 in the experience of " Philip the Apostle " — who had resided in Hierapolis, and from whose daughters Papias derived the story— and also the drinking of poison (" when put to the te,st by the unbelievers," says Philip of Side, by "Justus, surnamed Barsabbas ") without ill effect. 6 Papias

1 G. F. Hill, Brit. Mus. Cat. Coins of Cyprus (London, 1904), pis. xv.-xviii. (coins of Paphos), pi. xxvi. (other coins and gems).

2 M. R. James, E. A. Gardner, and others, Journ. Hellenic Studies, ix. 334. 147 sqq.

8 Dio Cass. liv. 23, 7; Strabo 683; Tac. Hist. 2, 2 sqq.; Jerome, Vit. Hilarionis. For the " Paphian Diamonds " (Pliny, Nat. Hist. xxxvii. 58), see E. Oberhummer, loc. cit., p. 185. For the fame of Paphian oil see Horn. Od. viii. 362 sqq. ; Hymn Aphr. 58 sqq. ; Isidore, Origines, xvii. 7, 64.

_ 4 " The mother of Manaim " (cf. Acts xiii. 1), according to the citation in Philip of Side.

6 Perhaps this is the basis of a clause in the secondary ending to Mark's Gospel (xvi. 18).

also believed a revolting story as to the supernatural swelling of the body of Judas Iscariot. But if he was credulous of marvels, he was careful to insist on good evidence for what he accepted as Christ's own teaching, in the face of current unauthorized views. Papias was also a pioneer in the habit, later so general, of taking the work of the Six Days (Hexaemeron) and the account of Paradise as referring mystically to Christ and His Church (so says Anastasius of Sinai).

About his date, which is important in connexion with his witness, there is some doubt. Setting aside the exploded tradition that he was martyred along with Polycarp (c. a.d. I 55) > we have the witness of Irenaeus that he was " a com- panion (eratpos) of Polycarp," who was born not later than a.d. 69. We may waive his other statement that

Papias was ” a hearer of John,” owing to the possibility of a false inference in this case. But the fact that Irenaeus thought of him as Polycarp’s contemporary and ” a man of the old time ” (apxaios avi)p), together with the affinity between the religious tendencies described in Papias’s Preface (as quoted by Eusebius) and those reflected in the Epistles of Polycarp and Ignatius, all point to his having flourished in the first quarter of the 2nd century. Indeed, Eusebius, who deals with him along with Clement and Ignatius (rather than Polycarp) under the reign of Trajan, and before referring at all to Hadrian’s reign (a.d. 117-138), suggests that he wrote 6 about a.d. 115. It has been usual, however, to assign to his work a date c. 130-140, or even later. No fact is known inconsistent with c. 60-135 as the period of Papias’s life. Eusebius (iii. 36) calls him ” bishop ” of Hierapolis, but whether with good ground is uncertain.

Papias uses the term ” the Elders,” or Fathers of the Christian community, to describe the original witnesses to Christ’s teaching, i.e. his personal disciples in particular. It was their traditions as to the purport of that teaching which he was concerned to preserve. But to Irenaeus the term came to mean the primitive custodians of tradition derived from these, such as Papias and his contemporaries, whose traditions Papias committed to writing. Not a few such traditions Irenaeus has embodied in his work Against Heresies, so preserving in some cases the substance of Papias’s Exposition (see Lightfoot, Apostolic Fathers, 1891, for these, as for all texts bearing on Papias).

See articles in the Diet, of Christian Biog., Diet, of Christ and the Gospels, and Hauck’s Realencyklopadie, xiv., in all of which further references will be found. (J. V. B.)

PAPIER MACHll (French for mashed or pulped paper), a term embracing numerous manufactures in which paper pulp is employed, pressed and moulded into various forms other than uniform sheets. The art has long been practised in the East. Persian papier mache has long been noted, and in Kashmir under the name of kar-i-kalamdani, or pen-tray work, the manufacture of small painted boxes, trays and cases of papier mache is a characteristic industry. In Japan articles are made by gluing together a number of sheets of paper, when in a damp condition, upon moulds. China also produces elegant papier mache articles. About the middle of the 18th century papier mache work came into prominence in Europe in the form of trays, boxes and other small domestic articles, japanned and ornamented in imitation of Oriental manufactures of the same class, or of lacquered wood; and contemporaneously papier mache snuff-boxes ornamented in vernis Martin came into favour. In 1772 Henry Clay of Birmingham patented

a method of preparing this material, which he used for coach-building, for door and other panels, and for many furniture and structural purposes. In 1845 the application of the material to internal architectural decoration was patented by C. F. Bielefeld of London, and for this purpose it has come into exten- sive use. Under the name of carton pierre a substance which is essentially papier mache is also largely employed as a substitute

6 See further Diet, of Christ and the Gospels, s.v. The supposition that Philip of Side implies a date under Hadrian is a mistake. For the later date, see J. B. Lightfoot, Essays on ” Supernatural Religion ” (1889), pp. 142-216.

for plaster in the moulded ornaments of roofs and walls, and the ordinary roofing felts, too, are very closely allied in their com-position to papier mache. Under the name of ceramic papier mache, architectural enrichments are also made of a composition derived from paper pulp, resin, glue, a drying oil and acetate of lead. Among the other articles for which the substance is used may be enumerated masks, dolls’ heads and other toys, anatomical and botanical models, artists’ lay figures, milliners’ and clothiers’ blocks, mirror and picture-frames, tubes, &c.

The materials for the commoner classes of work are old waste and scrap paper, repulped and mixed with a strong size of glue and paste. To this very often are added large quantities of ground chalk, clay and Sne sand, so that the preparation is little more than a plaster held together by the fibrous pulp. Wood pulp (from Sweden) is now largely used for making papier machfi. For the finest class of work Clay’s original method is retained. It consists of soaking several sheets of a specially made paper in a strong size of paste and glue, pasting these together, and pressing them in the mould of the article to be made. The moulded mass is dried in a stove, and, if necessary, further similar layers of paper are added, till the required thickness is attained. The dried object is hardened by dipping in oil, after which it is variously trimmed and prepared for japanning and ornamentation. For very delicate relief ornaments, a pulp of scrap paper is prepared, which after drying is ground to powder mixed with paste and a proportion of potash, all of which are thoroughly incorporated into a fine smooth

stiff paste. The numer- ous processes by which surface decoration is applied to papier mSche differ in no way from the application of like ornamentation to other surfaces. Papier mach6 for its weight is an exceedingly tough, strong, durable substance, possessed of some elasticity, little subject to warp or fracture, and unaffected by damp.

See L. E. And6s, Die Fabrikation der Papiermachg- und Papier- stoff-Waaren (Vienna, 1900); A. Winzer, Die Bereitung und Beniitz- wng der Papiermache und dhnlicher Kompositionen (4th ed., Weimar,

1907).

PAPIN, DENIS (1647-c. 1712), French physicist, one of the inventors of the steam-engine, was a native of Blois, where he was born on the 22nd of August 1647. In 1661 or 1662 he entered upon the study of medicine at the university of Angers, where he graduated in 1669. Some time prior to 1674 he removed to Paris and assisted Christiaan Huygens in his experi- ments with the air-pump, the results of which {Experiences du Vuide) were published at Paris in that year, and also in the form of five papers by Huygens and Papin jointly, in the Philosophical Transactions for 1675. Shortly after the publication of the Experiences, Papin, who had crossed to London, was hospitably received by Robert Boyle, whom he assisted in his laboratory and with his writings. About this time also he introduced into the air-pump the improvement of making it with double barrels, and replacing by the two valves the turncock hitherto used; he is said, moreover, to have been the first to use the plate and receiver. Subsequently he invented the condensing-pump, and in 1680 he was admitted, on Boyle's nomination, to the Royal Society. In the previous year he had exhibited to the society his famous " steam digester, or engine for softening bones," afterwards described in a tract published at Paris and entitled La Maniere d'amollir les os et de faire couire toutes sorles de viandes en fort pen de terns et d peu defrais, avec unt description de la marmite, ses propriites et ses usages. This device consisted of a vessel provided with a tightly fitting lid, so that under pressure its contents could be raised to a high temperature; a safety valve was used, for the first time, to guard against an excessive rise in the pressure. After further experiments with the digester he accepted an invitation to Venice to take part in the work of the recently founded Academy of the Philosophical and Mathematical Sciences; here he remained until 1684, when he returned to London and received from the Royal Society an appointment as " temporary curator of experiments," with a small salary. In this capacity he carried on numerous and varied investigations. He discovered a siphon acting in the same manner as the " sipho wirtembergicus " {Phil. Tr., 1685),

and also constructed a model of an engine for raising water from a river by means of pumps worked by a water-wheel driven by the current. In November 1687 he was appointed to the chair of mathematics in the university of Marburg, and here he remained until 1696, when he removed to Cassel. From the

time of his settlement in Germany he carried on an active correspondence with Huygens and Leibnitz, which is still preserved, and in one of his letters to Leibnitz, in 1698, he mentions that he is engaged on a machine for raising water to a great height by the force of fire; in a later communication he speaks also of a little carriage he had constructed to be propelled by this force. Again in 1702 he wrote about a steam " ballista," which he anticipated would " promptly compel France to make an enduring peace." In 1705 Leibnitz sent Papin a sketch of Thomas Savery's engine for raising water, and this stimulated' him to further exertions, which resulted two years afterwards in the publication of the Ars nova ad aquam ignis adtniniculo efficacissime elevandam (Cassel, 1707), in which his high-pressure boiler and its applications are described (see Steam Engine). In 1707 he resolved to quit Cassel for London, and on the 24th of September of that year he sailed with his family from Cassel in an ingeniously constructed boat, propelled by paddle-wheels, to be worked by the crew, with which he apparently expected to reach the mouth of the Weser. At Munden, however, the vessel was confiscated at the instance of the boatmen, who objected to the invasion of their exclusive privileges in the Weser navigation. Papin, on his arrival in London, found himself without resources and almost without friends; applica- tions through Sir Hans Sloane to the Royal Society for grants of money were made in vain, and he died in total obscurity, probably about the beginning of 17 12. His name is attached to the principal street of his native town, Blois, were also he is commemorated by a bronze statue.

The published writings of Papin, besides those already referred to, consist for the most part of a larg& number of papers, principally on hydraulics and pneumatics, contributed to the Journal des savans, the Nouvelles de la republique des le'.tres, the Philosophical Transactions, and the Acta eruditorum; many of them were collected by himself into a Fasciculus dissertationum (Marburg, 1695), of which he published also a translation into French, Recueil de diverses pieces touchant quelques nouvelles machines (Cassel, 1695). His correspon- dence with Leibnitz and Huygens, along with a biography, was published by Dr Ernst Gerland {Leibnizens und Huygens Brief- wechsel mit Papin, nebst der Biographie Papins (Berlin, 1881). See also L. de la Saussaye and E. Pean, La Vie et les ouvrages de Denis Papin (Paris, 1869) ; and

Baron Ernout, Denis Papin, sa vie et ses ouvrages (4th. ed., if “”’

PAPINEAU, LOUIS JOSEPH (1786-1871), Canadian rebel and politician, son of Joseph Papineau, royal notary and member of the house of Assembly of Lower Canada, was born at Montreal on the 7th of October 1786. He was educated at the seminary of Quebec, where he developed the gift of declamatory and persuasive oratory. He was called to the bar of Lower Canada on the 19th of May 1810. On the 18th of June 1808 he was elected a member of the House of Assembly of the province of Lower Canada, for the county of Kent. In 181-5 he became speaker of the house, being already recognized as the leader of the French Canadian party. At this time there were many grievances in the country which demanded redress; but each faction was more inclined to insist upon the exercise of its special rights than to fulfil its common responsibilities. In December 1820 Lord Dalhousie, governor of Lower Canada, appointed Papineau a member of the executive council; but Papineau, finding himself without real influence on the council, resigned in January 1823. In that year he went to England to protest on behalf of the French Canadians against the projected union of Upper and Lower Canada, a mission in which he was successful. Never- theless his opposition to the gpvernment became more and more pronounced, till in 1827 Lord Dalhousie refused to confirm his appointment to the speakership, and resigned his governorship when the house persisted in its choice. The aim of the French Canadian opposition at this time was to obtain financial and also constitutional reforms. Matters came to a head when ‘the legislative assembly of Lower Canada refused supplies and Papineau arranged for concerted action with William Lyon Mackenzie, the leader of the reform party in Upper Canada. In 1835 Lord Gosford, the new governor of Lower Canada, was instructed by the cabinet in London to inquire into the alleged grievances of the French Canadians. But the attitude

of the opposition remained no less hostile than before, and in March 1837 the governor was authorized to reject the demand for constitutional reform and to apply public funds in his control to the purposes of government. In June a warning proclamation by the governor was answered by a series of violent speeches by Papineau, who in August was deprived of his commission in the militia.

Papineau had formerly professed a deep reverence for British

institutions, and he had acquired a theoretical knowledge of the constitution, but he did not possess the qualities of a statesman, and consequently in his determination to apply the strict letter of the constitution he overlooked those elements and compensating forces and powers which through custom and usage had been incorporated in British institutions, and had given them permanence. In his earlier career he had voiced the aspirations of a section of the people at a time when it appeared to them that their national existence was threatened. In the course of time party strife became more bitter; real issues were lost sight of; and Papineau, falling in with the views of one O'Callaghan, who distrusted everything British, became an annexationist. Realizing that his cause was not advanced by persuasive eloquence, he adopted a threatening attitude which caused men of sober judgment to waver in their allegiance. These men he denounced as traitors; but a band of youthful enthusiasts encouraged their leader in his revolutionary course. The bishop of Montreal and of Quebec, and a large number of the citizens, protested, but nothing less than bloodshed would satisfy the misguided patriots. On the 23rd of October 1837 a meeting of delegates from the six counties of Lower Canada was held at St Charles, at which resistance to the government by force of arms was decided upon, and in which Papineau took part. In November preparations were made for a general stampede at Montreal, and on the 7th of the month Papineau's house was sacked and a fight took place between the " con- stitutionals " and the "sons of liberty." Towards the middle of November Colonel Gore was commanded to effect the arrest of Papineau and his principal adherents on a charge of high treason. A few hundred armed men had assembled at Saint Denis to resist the troops, and early on the morning of the 22nd of November hostilities commenced, which were maintained for several hours and resulted in many casualties. On the eve of the fray Papineau sought safety in flight, followed by the leading spirits of the movement. On the 1st of December 1837 a proclamation was issued, declaring Papineau a rebel, and placing a price upon his head. He had found shelter in the United States, where he remained in safety throughout the whole period of the fighting. The rebellion broke out afresh in the autumn of 1838, but it was soon repressed. Those taken in open rebellion were deported by Lord Durham to save them from the scaffold; and although 90 were condemned to death only 12 were executed.

Attempts have been made to transfer the responsibility for the act of violence to O'Callaghan and other prominent leaders in the revolt; but Papineau's own words, " The patriots of this city would have avenged the massacre but they were so poor and so badly organized that they

were not fit to meet the regular troops," prove that he did not discountenance recourse to arms. Writing of the events of 1837 in the year 1848 he said: " The smallest success at Montreal or Toronto would have induced the American government, in spite of its president, to support the movement." It would thus seem that he was intriguing to bring about intervention by the United States with a view to annexation; and as the independence of the French Canadian race, which he professed to desire, could not have been achieved under the constitution of the American republic, it is inconsistent to regard his services to his fellow-countrymen as those of a true patriot. Papineau, in. pursuing towards the end a policy of blind passion, over-looked real grievances, and prevented remedial action. After the rebellion relief was accorded because the obstacle was removed, and it is evident that a broad-minded statesman, or a skilful diplomat, would have accomplished more for French

Canada than the fiery eloquence and dubious methods of a leader who plunged his followers into the throes of war, and deserted them at the supreme moment. From 1839 till 1847 Papineau lived in Paris. In the latter year an amnesty was granted to those who had participated in the rebellion in Canada; and, although in June 1838 Lord Durham had issued a pro- clamation threatening Papineau with death if he returned to Canada, he was now admitted to the benefit of the amnesty. On his return to Canada, when the two provinces were now united, he became a member of the lower house and continued to take part in public life, demanding " the independence of Canada, for the Canadians need never expect justice from England, and to submit to her would be an eternal disgrace." He unsuccessfully agitated for the re-division of upper and lower Canada, and in 1854 retired into private life. He died at Montebello, in the province of Quebec, on the 24th of Septem- ber 1871.

See L. O. David, Les Deux Papineau; Fennings Taylor, Louis Joseph Papineau (Montreal, 1865); Alfred De Celles, Papineau- Cartier (Toronto, 1906); H. J. Morgan, Sketches of Celebrated Cana- dians (Quebec, 1862); Rose's Cyclopaedia of Canadian Biography Annual Register, 1 836-1 837 ; Sir Spencer Walpole, History of England (5 vols., London, 1878-1886), vol. iii. (A. G. D.)

PAPINIAN (Aemilius Papinianus) , Roman jurist, was magister libellorum and afterwards praetorian prefect under Septimius Severus. He was an intimate friend of the emperor, whom he accompanied to Britain, and before his death Severus specially commended his two sons to his charge. Papinian tried to keep peace between the brothers, but with no better result than to excite the hatred of Caracalla, to

which he fell a victim in the general slaughter of Geta's friends which followed the fratricide of a.d. 212. The details are variously related, and have undergone legendary embellishment, but the murdel of Papinian, which took place under Caracalla 's own eyes, was one of the most disgraceful crimes of that tyrant. Little more is known about Papinian. He was perhaps a Syrian by birth, for he is said to have been a kinsman of Severus's second wife, Julia Domna; that he studied law with Severus under Scaevola is asserted in an interpolated passage in Spartian {Caracal, c. 8). • Papinian's place and work as a jurist are discussed under Roman Law.

PAPPENHEIM, GOTTFRIED HEINRICH, Count or (1594- 1632), imperial field marshal in the Thirty Years' War, was born on the 29th of May 1594 at the little town of Pappenheim on the Altmtihl, now in Bavaria, the seat of a free lordship of the empire, from which the ancient family to which he belonged derived its name. 1 He was educated at Altdorf and at Tubingen, and subsequently travelled in southern and central Europe, mastering the various languages, and seeking knightly adventures. His stay in these countries led him eventually to adopt the Roman Catholic faith (1614), to which he devoted the rest of his life. At the outbreak of the great war he abandoned the legal and diplomatic career on which he had embarked, and in his zeal for the faith took service in Poland and afterwards under the Catholic League. He soon became a lieutenant-colonel, and displayed brilliant courage at the battle of the White Hill near Prague (Nov. 8, 1620), where he was left for dead on the field. In the following year he fought against Mansfeld in western

1 The family of Pappenheim is of great antiquity. In the 12th century they were known as the "marshals of Kalatin (Kalden)"; in the 13th they first appear as counts and marshals of Pappenheim, their right to the hereditary marshalship of the empire being con- firmed to them by the emperor Louis IV. in 1334. After the Golden Bull of 1355 they held both marshalship and castle of Pappen- heim as fiefs of the Saxon electorate. In the 17th century the family was represented by several lines: those of Pappenheim (which held the margraviate of Stiihlingen till 1635), Treutlingen and Aletzheim, and the older branches (dating from the 13th and 14th centuries) of the marshals of Biberach and of Rechberg- Wertingen-Hohenreichen. Gottfried Heinrich, who belonged to the Treutlingen branch, was the only one of this ancient and widely- ramified family to attain great distinction, though many other mem- bers of it played a strenuous, if subordinate, part in the history of Germany. The family, mediatized under Bavaria in 1806, survives now only in the descendants of the Aletzheim branch.

Germany, and in 1623 became colonel of a regiment of cuirassiers, afterwards the famous ” Pappenheimers.” In the same year, as an ardent friend of Spain, the ally of his sovereign and the champion of his faith, he raised troops for the Italian war and served with the Spaniards in Lombardy and the Grisons. It was his long and heroic defence of the post of Riva on the Lake of Garda which first brought him conspicuously to the front. In 1626 Maximilian of Bavaria, the head of the League, recalled him to Germany and entrusted him with the suppression of a dangerous insurrection which had broken out in Upper Austria. Pappenheim swiftly carried out his task, encountering a most desperate resistance, but always successful; and in a few weeks he had crushed the rebellion with ruthless severity (actions of Efferdingen, Gmiinden, Vocklabruck and Wolfsegg, i5th~30th November 1626). After this he served with Tilly against King Christian IV. of Denmark, and besieged and took Wolfenbuttel. His hope of obtaining the sovereignty and possessions of the evicted prince was, after a long intrigue, definitely disappointed. In 1628 he was made a count of the empire. The siege and storm of Magdeburg followed, and Pappenheim, like Tilly, has been accused of the most savage cruelty in this transaction. But it is known that, disappointed of Wolfenbuttel, Pappenheim desired the profitable sovereignty of Magdeburg, and it can hardly be maintained that he deliberately destroyed a prospective source of wealth. At any rate, the sack of Magdeburg was not more discreditable than that of most other towns taken by storm in the 17th century. From the military point of view Pappenheim’s conduct was excellent; his measures were skilful, and his personal valour, as always, conspicuous. So much could not be said of his tactics at the battle of Breitenfeld, the loss of which was not a little due to the impetuous cavalry general, who was never so happy as when leading a great charge of horse. The retreat of the imperialists from the lost field he covered, however, with care and skill, and subsequently he won great glory by his operations on the lower Rhine and the Weser in rear of the victorious army of Gustavus Adolphus. Much- needed reinforcements for the king of Sweden were thus detained in front of Pappenheim’s small and newly-raised force in the north. His operations were far-ranging and his restless activity dominated the country from Stade to Cassel, and from Hildes- heim to Maastricht. Being now a field marshal in the imperial service, he was recalled to join Wallenstein, and assisted the generalissimo in Saxony

against the Swedes; but was again despatched towards Cologne and the lower Rhine. In his absence a great battle became imminent, and Pappenheim was hurriedly recalled. He appeared with his horsemen in the midst of the battle of Liitzen (Nov. 6th-i6th, 1632). His furious attack was for the moment successful. As Rupert at Marston Moor sought Cromwell as his worthiest opponent, so now Pappenheim sought Gustavus. At about the same time as the king was killed, Pappenheim received a mortal wound in another part of the field. He died on the following day in the Pleissenburg at Leipzig.

See Kriegsschriften von baierischen Officieren I. II. V. (Munich, 1820) ; Hess, Gottfried Heinrich Graf zu Pappenheim (Leipzig, 1855) ; Ersch and Griiber, Allgem. Encyklopadie, III. 11 (Leipzig, 1838); Wittich, in Allgem. deutsche Biographie, Band 25 (Leipzig, 1887), and works there quoted.

PAPPUS OF ALEXANDRIA, Greek geometer, flourished about the end of the 3rd century a.d. In a period of general stagnation in mathematical studies, he stands out as a remark- able exception. How far he was above his contemporaries, how little appreciated or understood by them, is shown by the absence of references to him in other Greek writers, and by the fact that his work had no effect in arresting the decay of mathe- matical science. In this respect the fate of Pappus strikingly resembles that of Diophantus. In his Collection, Pappus gives no indication of the date of the authors whose treatises he makes use of, or of the time at which he himself wrote. If we had no other information than can be derived from his work, we should only know that he was later than Claudius Ptolemy whom he often quotes. Suidas states that he was of the same

age as Theon of Alexandria, who wrote commentaries on Ptolemy's great work, the Syntaxis mathematica, and flourished in the reign of Theodosius I. (a.d. 370-395). Suidas says also that Pappus wrote a commentary upon the same work of Ptolemy. But it would seem incredible that two contem- poraries should have at the same time and in the same style composed commentaries upon one and the same work, and yet neither should have been mentioned by the other, whether as friend or opponent. It is more probable that Pappus's com- mentary was written long before Theon's, but was largely assimilated by the latter, and that Suidas, through failure to disconnect the two commentaries, assigned a like date to both. A different date is given by the marginal notes to a 10th-century MS., where it is stated, in connexion with the reign of Diocletian (a.d. 284-305), that Pappus wrote during that period; and in the absence of any other testimony it seems best to accept the date indicated by the scholiast.

The great work of Pappus, in eight books and entitled (rvvayosyi] or Collection, we possess only in an incomplete form, the first book being lost, and the rest having suffered considerably. Suidas enumerates other works of Pappus as follows: XcopoypaLa oUovneviKij, els to. rkacapa. /3t/3Xia ttjs Hro\e,ucuov juey&Aj/s avvraˆews monvrnxa, Torafiovs tovs ‘a> Aipvri, bveipoKpiriKh. The question of Pappus’s commentary on Ptolemy’s work is dis- cussed by Hultsch, Pappi collectio (Berlin, 1878), vol. iii. p. xiii. seq. Pappus himself refers to another commentary of his own on the ‘AfaXij/i.ua of Diodorus, of whom nothing is known. He also wrote commentaries on Euclid’s Elements (of which fragments are preserved in Proclus and the Scholia, while that on the tenth Book has been found in an Arabic MS.), and on Ptolemy’s ‘ApfioviKa.

The characteristics of Pappus’s Collection are that it contains an account, systematically arranged, of the most important results obtained by his predecessors, and, secondly, notes explanatory of, or extending, previous discoveries. These discoveries form, in fact, a text upon which Pappus enlarges discursively. Very valuable are the systematic intro- ductions to the various books which set forth clearly in outline the contents and the general scope of the subjects to be treated. From these introductions we are able to judge of the style of Pappus’s writing, which is excellent and even elegant the moment he is free from the shackles of mathematical formulae and expressions. At the same time, his characteristic exactness makes his collection a most admirable substitute for the texts of the many valuable treatises of earlier mathematicians of which time has deprived us. We proceed to summarize briefly the contents of that portion of the Collection which has survived, mentioning separately certain propositions which seem to be among the most important.

We can only conjecture that the lost book i., as well as book ii., was concerned with arithmetic, book iii. being clearly introduced as beginning a new subject.

The whole of book ii. (the former part of which is lost, the existing fragment beginning in the middle of the 14th proposition) related to a system of multiplication due to Apollonius of Perga. On this subject see Nesselmann, Algebra der Griechen (Berlin, 1842), pp. 125-134; and M. Cantor, Gesch. d. Math, i. 2 331.

Book iii. contains geometrical problems, plane and solid. It may be divided into five sections: (1) On the famous problem of finding two mean proportionals between two given lines, which arose from that of duplicating the cube, reduced by Hippocrates to the former. Pappus

gives several solutions of this problem, including a method of making successive approximations to the solution, the significance of which he apparently failed to appreciate ; he adds his own solution of the more general problem of finding geometrically the side of a cube whose content is in any given ratio to that of a given one. (2) On the arithmetic, geometric and har- monic means between two straight lines, and the problem of represent- ing all three in one and the same geometrical figure. This serves as an introduction to a general theory of means, of which Pappus distinguishes ten kinds, and gives a table representing examples of each in whole numbers. (3) On a curious problem suggested by Eucl. i. 21. (4) On the inscribing of each of the five regular poly- hedra in a sphere. (5) An addition by a later writer on another solution of the first problem of the book.

Of book iv. the title and preface have been lost, so that the pro- gramme has to be gathered from the book itself. At the beginning

is the well-known generalization of Eucl. i. 47, then follow various theorems on the circle, leading up to the problem of the construction of a circle which shall circumscribe three given circles, touching each other two and two. This and several other propositions on contact, e.g. cases of circles touching one another and inscribed in the figure made of three semicircles and known as op/3j;Xos (shoe- maker's knife) form the first division of the book. Pappus turns then to a consideration of certain properties of Archimedes's spiral, the conchoid of Nicomedes (already mentioned in book i. as supplying a method of doubling the cube), and the curve discovered most probably by Hippias of Elis about 420 B.C., and known by the name ij TcrpaTwctfoixro, or quadratrix. Proposition 30 describes the con- struction of a curve of double curvature called by Pappus the helix on a sphere; it is described by a point moving uniformly along the arc of a great circle, which itself turns about its diameter uniformly, the point describing a quadrant and the great circle a complete revolution in the same time. The area of the surface included between this curve and its base is found — the first known instance of a quadrature of a curved surface. The rest of the book treats of the trisection of an angle, and the solution of more general problems of the same kind by means of the quadratrix and spiral. In one solution of the former problem is the first recorded use of the property of a conic (a hyperbola) with reference to the focus and directrix.

In book v., after an interesting preface concerning regular poly- gons, and containing remarks upon the hexagonal form of the cells of honeycombs, Pappus addresses himself to the comparison of the areas of different plane figures which have all the same peri- meter (following Zenodorus's treatise on this subject), and of the volumes of different solid figures which have all the same superficial area, and, lastly, a comparison of the five regular solids of Plato. Incidentally Pappus describes the thirteen other polyhedra bounded by equilateral and equiangular but not similar polygons, discovered by Archimedes, and finds, by a method recalling that of Archimedes, the surface and volume of a sphere.

According to the preface, book vi. is intended to resolve difficulties occurring in the so-called /uicpds A.oTpovono{iiitvos. It accordingly comments on the Sphaerica of Theodosius, the Moving Sphere of Autolycus, Theodosius's book on Day and Night, the treatise of Aristarchus On the Size and Distances of the Sun and Moon, and Euclid's Optics and Phaenomena.

The preface of book vii. explains the terms analysis and synthesis, and the distinction between theorem and problem. Pappus then enumerates works of Euclid, Apollonius, Aristaeus and Eratos- thenes, thirty-three books in all, the substance of which he intends to give, with the lemmas necessary for their elucidation. With the mention of the Porisms of Euclid we have an account of the rela- tion of porism to theorem and problem. In the same preface is included (a) the famous problem known by Pappus's name, often enunciated thus: Having given a number of straight lines, to find the geometric locus of a pcint such that the lengths of the perpendiculars upon, or (more generally) the lines drawn from it obliquely at given inclinations to, the given lines satisfy the condition that the product of certain of them may bear a constant ratio to the product of the remain- ing ones; (Pappus does not express it in this form but by means of composition of ratios, saying that if the ratio is given which is com- pounded of the ratios of pairs — one of one set and one of another — of the lines so drawn, and of the ratio of the odd one, if any, to a given straight line, the point will lie on a curve given in position) ; (b) the theorems which were rediscovered by and named after Paul Guldin, but appear to have been discovered by Pappus himself. Book vii. contains also (1), under the head of the de determinata sectione of Apollonius, lemmas which, closely examined, are seen to be cases of the involution of six points; (2) important lemmas on the Porisms of Euclid (see Porism) ; (3) a lemma upon the Surface Loci of Euclid which states that the locus of a point such that its distance from a given point bears a constant ratio to its distance from a given straight line is a conic, and is followed by

proofs that the conic is a parabola, ellipse, or hyperbola according as the constant ratio is equal to, less than or greater than 1 (the first recorded proofs of the properties, which do not appear in Apollonius).

Lastly, book viii. treats principally of mechanics, the properties of the centre of gravity, and some mechanical powers. Interspersed are some questions of pure geometry. Proposition 14 shows how to draw an ellipse through five given points, and Prop. 15 gives a simple construction for the axes of an ellipse when a pair of conjugate diameters are given.

Authorities. — Of the whole work of Pappus the best edition is that of Hultsch, bearing the title Pappi alexandrini collectionis quae supersunt e libris manuscriptis edidit latina interpretatione et commentariis instruxit Fridericus Hultsch (Berlin, 1 876-1 878). Previously the entire collection had been published only in a Latin translation, Pappi alexandrini mathematical collectiones a Federico Commandino Urbinate in latinum conversae et commentariis illustratae (Pesaro, 1588) (reprinted at Venice, 1589, and Pesaro, 1602). A second (inferior) edition of this work was published by Carolus Manolessius.

Of books which contain parts of Pappus's work, or treat inciden- tally of it, we may mention the following titles : (I) Pappi alexandrini collectiones mathematical nunc primum graece edidit Herm. Jos. Eisen-

mann, libri quinti pars altera (Parisiis, 1824). (2) Pappi alexandrini secundi libri mathematicae collectionis fragmenlum e codice MS. edidit latinum fecit notisque illustravit Johannes Wallis (Oxonii, 1688). (3) Apollonii pergaei de sectione rationis libri duo ex arabico MSu latine versi, accedunt eiusdem de sectione spatii libri duo restituti, praemittitur Pappi alexandrini praefatio ad VII mum collectionis mathematicae, nunc primum graece edita : cum lemmatibus eiusdem Pappi ad hos Apollonii libros, opera et studio Edmundi Halley (Oxonii. 1706). (4) Der Sammlung des Pappus von Alexandrien siebentes und achtes Buch griechisch und deutsch, published by C. I. Gerhardt, Halle, 1871. (5) The portions relating to Apollonius are reprinted in Heiberg's Apollonius, ii. 101 sqq. (T. L. H.)

PAPUANS (Malay papuwah or puwah-puwah, "frizzled," " woolly-haired," in reference to their characteristic hair- dressing), the name given to the people of New Guinea and the other islands of Melanesia. The pure Papuan seems to be confined to the north-western part of New Guinea, and possibly the interior. But Papuans of mixed blood

are found throughout the island (unless the Karons be of Negrito stock), and from Flores in the west to Fiji in the east. The ethnological affinities of the Papuans have not been satisfactorily settled. Physically they are negroid in type, and while tribes allied to the Papuans have been traced through Timor, Flores and the highlands of the Malay Peninsula to the Deccan of India, these*" Oriental negroes," as they have been called, have many curious resem- blances with some East African tribes. Besides the appearance of the hair, the raised cicatrices, the belief in omens and sorcery, the practices for testing the courage of youths, &c, they are equally rude, merry and boisterous, but amenable to discipline, and with decided artistic tastes and faculty. Several of the above practices are common to the Australians, who, though generally inferior, have many points of resemblance (osteological and other) with Papuans, to whom the extinct Tasmanians were still more closely allied. It may be that from an indigenous Negrito stock of the Indian archipelago both negroes and Papuans sprang, and that the latter are an original cross between the Negrito and the immigrating Caucasian who passed eastward to found the great Polynesian race. 1

The typical Papuan is distinctly tall, far exceeding the average Malay height, and is seldom shorter, often taller, than the European. He is strongly built, somewhat "spur-heeled." He varies in colour from a sooty-brown to a black, little less intense than that of the darkest negro. He has a small dolicho- cephalous head, prominent nose somewhat curved and high but depressed at the tip, high narrow forehead with projecting brows, oval face and dark eyes. The jaw projects and the lips are full. His hair is black and frizzly, worn generally in a mop, often of large dimensions, but sometimes worked into plaits with grease or mud. On some islands the men collect their hair into small bunches, and carefully bind each bunch round with fine vegetable fibre from the roots up to within about two inches from the end. Dr Turner 2 gives a good description of this process. He once counted the bunches on a young man's head, and found nearly seven hundred. There is usually little hair on the face, but chest, legs and fore-arms are generally hirsute, the hair short and crisp.

The constitution of society is everywhere simple. The

1 Huxley believed that the Papuans were more closely allied to the negroes of Africa than any other race. Later scientists have endeavoured to identify the Papuans with the Negritos of the Philippines and the Semangs of the Malay Peninsula. Alfred Russel Wallace pronounced against this hypothesis in an appendix to his Malay Archipelago (1883 ed., p. 602), where he observes that " the

black, woolly-haired races of the Philippines and the Malay Peninsula . . , have little affinity or resemblance to the Papuans. Dr A. B. Meyer, who spent several years in the Malay Archipelago and New Guinea, developed a contrary conclusion in his Die Negritos der Philippinen (1878), holding that the Negritos and Papuans are identical, and that possibly, or even probably, the former are an offshoot of the latter, like some other Polynesian islanders. A. C. Haddon, discussing, in Nature (September 1899), a later paper by Dr Meyer in English on the same subject (The Distribution of the Negritos, Dresden, 1899), practically adopted Meyer's views, after an independent examination of numerous skulls. As to how the Papuans, who are the aborigines of New Guinea, may have peopled other and much more distant islands, information is lacking.

8 Nineteen Years in Polynesia, pp. 77, 78.

Spirit- worship.

people live in village communities whose members appear to be more or less inter-related. There are no priests and no heredi- tary chiefs, though among the more advanced tribes rank is hereditary. Totemistic clans have been observed in Torres strait, and on the Finsch and west coasts. Chiefship is quite unrecognized, except on the Keriwina Islands. Possessions, such as gardens, houses, pigs, &c, belong to individuals and not to the community, and pass to the owner's heirs, who differ in relationship in different districts. The land within certain boundaries belongs to the tribe, but a member may take posses- sion of any unappropriated portion. There are certain degrees of relationship within which a man may not marry. In some districts he may not marry into his own village, or into his mother's tribe; in others he may select a wife from certain tribes only. Payment, or a present, is always made for a wife to her father, brother or guardian (who is generally her maternal uncle). Presents are also often made to the bride. Polygamy is practised, but not frequently, and from the wife (or wives) there comes no opposition. The child belongs sometimes to the mother's, sometimes to the father's tribe. The Papuan woman, who is, as a rule, more modest than the Polynesian, is the household drudge, and does the greater part of the outdoor work, but the man assists in clearing new gardens and in digging and planting the soil.

In western New Guinea, according to the Dutch missionaries, there is

a vague notion of a universal spirit, practically represented by several malevolent powers, as Manoin, the most powerful, who resides in the woods; Narwoje, in the clouds, above the trees, a sort of Erl-K6nig who carries off children; Faknik, in the rocks by the sea, who raises storms. As a protection against these the people construct — having first with much ceremony chosen a tree for the purpose — certain rude images called karwars, each representing a recently dead progenitor, whose spirit is then invoked to occupy the image and protect them against their enemies and give success to their undertakings. The karwar is about a foot high, with head dis- proportionately large; the male figures are sometimes represented with a spear and shield, the female holding a snake. They observe omens, have magicians and rain-makers, and sometimes resort to ordeal to discover a crime. Temples (so called) are found in the north and west, built like the houses, but larger, the_ piles being carved into figures, and the roof-beams and other prominent points decorated with representations of crocodiles or lizards, coarse human figures, and other grotesque ornamentation; but their use is not clear. Neither temples nor images (except small figures worn as amulets) occur among the people of the south-east ; but they have a great dread of departed spirits, especially' those of the hostile inland tribes, and of a being called Vata, who causes disease and death.

All Papuans believe that within them resides an invisible other self, or spirit, which may occasionally leave the body in the hours of sleep and after death hovers for some period at least round the scenes of its embodied life. This ghost acquires supernatural powers, which at any time it may return to exercise inimically to relations or acquaintances who offend it. In the dark, and in the depths of forests or mountains, malevolent — never embodied — spirits love to be abroad. These are the spirits which, taking up their abode in a village, cause disease and death ; and to escape from such attacks the inhabitants may fly the village for good, and, by dwelling scattered in the recesses of the forest for a time before choosing a new site, they hope to throw their enemy off their trail. Spirits of evil, but not of good, therefore require to be propitiated. The powers of nature — thunder, lightning and storm, all supposed to be caused by evil and angry spirits — are held in the greatest dread. Under the category of religious observances may perhaps come those held previously to the departure of the great trading or lakatoi fleet: their taboo-proclaiming customs, their ceremonial and sacred initiation ceremonies for boys and girls on reaching puberty, when masks are worn and the " bull-roarer " swung, as also the harvest festivals, at which great trophies of the produce of field and_ forest are erected, preparatory to a big feast enlivened with

music and dancing. In the north and north-east of New Guinea ancestor- worship is widely practised. Amulets are worn to ensure success in buying, selling, hunting, fishing and in war, as well as for protection against evil. Circumcision is practised in some regions. Although some of the coast peoples are nominally Mahommedans, and some few converts to Christianity have been made, the vast majority of Papuans remain pagan.

The dead are disposed of in various ways. The spirit is supposed not to leave the body immediately, and a corpse is either buried for a time, and then disinterred and the bones cleaned and deposited in or near the deceased's dwelling or in some distant cave; or the body is exposed on a platform or dried over a fire, and the mummy keot for a few years. Sometimes the head, oftener the jaw-bone

and portions of the skeleton are preserved as relics. Little houses are frequently erected over the grave as a habitation for the spirit. Soon after death food is offered to the departed — with an infant a calabash of its mother's milk — and that he may have no wants, his earthly possessions, after being broken, are laid near his resting- place. A path through the jungle from the grave to the sea is often made so that the spirit may bathe. A widow must shave her head, smear her body with black and the exudations of the corpse, and wear mourning for a long time. The dead are referred to by some roundabout phrase, never by name, for this might have the dangerous result of bringing back the spirit. These dwell chiefly in the moon, and are particularly active at full moon. The houses which they haunt, and beneath or near which their bodies are buried, are deserted from time to time, especially by a newly-married couple or by women before child-birth.

Yams, taro and sweet potatoes constitute in some districts the main food of the people, while in others sago is the staple diet. Forest fruits and vegetables are also eaten. Maize „ .

and rice — which are not indigenous — are eagerly sought °° ‘

after. The Papuan varies his vegetable diet with the flesh of the wild pig, wallabi and other small animals, which are hunted with dogs. Birds are snared or limed. Fish abound at many parts of the coast, and are taken by lines, or speared at night by torch- light, or netted, or a river is dammed and the fish stupefied with the root of a milletia. Turtle and dugong are caught. The kima, a great mussel weighing (without shell) 20 to 30 ft, and other shell- fish, are eaten, as are also dogs, flying foxes, lizards, beetles and all kinds of insects. Food is cooked in various ways. Cooking-pots, made at various parts of the

coast, form one of the great exchanges for sago ; but where such vessels do not reach, food is cooked by the women on the embers, done up in leaves, or in holes in the ground over heated stones. The sexes eat apart. In the interior salt is difficult to get, and sea-water, which is carried inland in hollow bamboos, is used in cooking in place of it. Salt, too, is obtained from the ashes of wood saturated by sea-water. In the Fly River region, kava, prepared from Piper methysticum, is drunk without any of the ceremonial importance associated with it in Polynesia. As a rule the Papuans have no intoxicating drink and do not know the art of fermenting palm-sap or cane-juice. Tobacco is indigenous in some parts, and is smoked everywhere, except on the north-east coast and on the islands, where its use is quite unknown. In some few districts a species of clay is eaten.

The male Papuan is usually naked save for a loin-cloth made of the bark of the Hibiscus, Broussonetia and other plants, or a girdle of leaves. In the more civilized parts cotton garments „. . are used. Papuans have usually a great dislike to ° ag rain and carry a mat of pandanus leaves as a protection ornaments. against it. Except in one or two localities (on the north-east and west), the women are invariably decently clothed. The Papuan loves personal adornment and loses no chance of dressing himself up. His chief home-made ornaments are necklaces, armlets and ear-rings of shells, teeth or fibre, and cassowary, cockatoo, or bird of paradise feathers — the last two, or a flower, are worn through the septum qf the nose. With his head encircled by a coronet of dogs teeth, and covered with a network cap or piece of bark-cloth, the septum of the nose transfixed by a pencil of bone or shell, and perhaps a shell or fibre armlet or two, the Papuan is in complete everyday attire. On festal occasions he decks his well-forked-out and dyed hair with feathers and flowers, and sticks others in his ear-lobe holes and under his armlets; while a warrior will have ovula shells and various bones of his victims dangling from ringlets of his hair, or fixed to his armbands or girdle. The Papuan comb is characteristic. This is a long piece of bamboo split at one end into prongs, while the other projects beyond the forehead sometimes two feet or more, and into it are stuck the bright feathers of parrots and other birds. The fairer tribes at the east end tattoo, no definite meaning apparently being attached to the pattern, for they welcome suggestions from Manchester. For the women it is simply a decoration. Men are not tattooed till they have killed some one. Raised cicatrices usually take the place of tattooing with the darker races. Rosenberg says the scars on the breast and arms register the number of sea-voyages made.

The Papuans build excellent canoes and other boats, and in some districts there are professional boat-builders of great skill, the best craft coming from East Cape and the Louisiades. These g oa< _ boats are either plain dug-outs, with or without out- building. riggers, or regularly built by planks tightly laced and °'

well caulked to an' excavated keel. The most remarkable of their vessels is the " lakatoi," composed of several capacious dug-outs, each nearly 50 ft. long, which are strongly lashed together to a width of some 24 ft., decked and fitted with two masts, each carrying a huge mat sail picturesquely fashioned. On the deck high crates are built for the reception of some thousands of pieces of pottery for conveyance annually to the Fly River district to exchange for sago. Papuans are very fond of music, using Pan-pipes, a Jew's harp of the Papuans' own fabrication, and the flute ; on occasions Music. of ceremony the drum only is used — this instrument being always open at one end and tapped by the fingers. To the accompani- ment of the drum, dancing — as a rhythmic but stationary movement

of the feet or an evolutionary march — almost invariably goes, but rarely singing. All sorts of jingling sounds also are music to the ear, especially the clattering in time of strings of beans in their dry shells, and so these and other rattles are found attached to the drum, leg-bands and many of the utensils, implements and weapons.

Nearly all Papuan houses are built in Malay fashion on piles, and this not only on the coast but on the hillsides. In the north, the Houses east anc * south-west of the island immense communal ' houses (morong) are met with. Some of these are between 500 and 700 ft. in length, with a rounded, boat-shaped roof thatched with palm-branches, and looking inside, when undivided, like dark tunnels. In some districts the natives live together in one of these giant structures, which are divided into compartments. Communal dwellings on a much smaller scale occur at Meroka, east of the Astrolabe mountains. As a rule elsewhere each family has its independent dwelling. On the north coast the houses are not built on piles; the walls, of bamboo or palm branches, are very low, and the projecting roof nearly reaches the ground; a barrier at the entrance keeps out pigs and dogs. A sort of table or bench stands outside, used by the men only, for meals and for the subsequent siesta. In east New Guinea sometimes the houses are two-storeyed, the lower part being used for stores. The ordinary house

is 60 to 70 ft. long with a passage down the centre, and stands on a platform or veranda raised on piles, with the ridge-pole projecting consider- ably at the gables so that the roof may cover it at each end. Under this shade the inmates spend much of their time; here their meals, which are cooked on the ground beneath the house, are served. The furniture consists of earthen bowls, drinking-cups, wooden neck-rests, spoons, &c, artistically carved, mats, plaited baskets and boxes. The pottery is moulded and fire-baked. In a few districts villages are built at a short distance off the shore, as a protection against raids by the inland tribes. The interior villages are frequently situated on hill crests, or on top of steep- faced rocks as difficult of access as possible, whence a clear view all round can be had. Where such natural defences are wanting the village is protected by high palisades and by fighting platforms on trees commanding its approaches. The " dobbos," or tree- houses, built in high trees, are more or less peculiar to British New Guinea. On the north-east coast many of the villages are tastefully kept, their whole area being clean swept, nicely sanded, and planted with ornamental shrubs, and have in their centre little square palaver places laid with flat stones, each with an erect stone pillar as a back-rest. Excellent suspension bridges span some of the larger rivers, made of interlaced rattan ropes secured to trees on opposite banks, so very similar to those seen in Sumatra as to suggest some Malay influence.

Papuan weapons are the bow and arrow (in the Fly River region, the north and north-east coasts) ; a beheading knife of a sharp seg- Weaooas meni – °^ bamboo; a shafted stone club — rayed, disk- p ‘ shaped or ball-headed (in use all over the island) ; spears of various forms, pointed and barbed; the spear-thrower (on the Finsch coast) ; and hardwood clubs and shields, widely differing in pattern and ornamentation with the district of their manufacture. The Papuan bow is rather short, the arrows barbed and tipped with cassowary or human bone. The Papuans are mostly ignorant of iron, but work skilfully with axes of stone or tridacna shell and bone chisels, cutting down trees 20 in. in diameter. Two men working on a tree trunk, one making a cut with the adze lengthwise and the otner chopping off the piece across, will soon hollow out a large canoe. Every man has a stone axe, each village generally owning a large one. Their knives are of bamboo hardened by fire. In digging they use the pointed stick. In British New Guinea alone is the man- catcher (a rattan loop at the end of a handle with a pith spike pro- jecting into it) met with. In the D'Entrecasteaux Islands the sling is in use. For war the natives smear themselves in grotesque fashion with lime or ochres, and in some parts hold in their teeth against the chin a face-like mask, supposed to

strike terror into the foe, against whom they advance warily (if not timidly), yelling and blowing their war-trumpets. The war canoe (which is a long, narrow dug-out outrigger, capable of holding twenty-eight men) is only a transport, for they never fight in it. The conch-shell is the trumpet of alarm and call to arms. The vendetta — resulting, when success- ful, in the bringing back the head of the slain as a trophy to be set up as a house ornament — is widely practised. The eastern tribes salute by squeezing simultaneously the nose and stomach, and both there and on the north coast friendship is ratified by sacrificing a dog. In other places they wave green branches, and on the south coast, pour water over their heads, a custom noticed by Cook at Mallicolo (New Hebrides). Among other pets they keep little pigs, which the women suckle.

The Papuan numerals extend usually to 5 only. In Astrolabe Bay the limit is 6; with the more degraded tribes it is 3, or, as in Torres straits, they have names only for 1 and 2 ; 3 is 2 + 1.

Language. — The Papuan languages or dialects are very numerous, owing, doubtless, to the perpetual intertribal hostility which has fostered isolation. In grammatical structure there is considerable resemblance between these dialects, but the verbal differences have J become great. Several dialects are sometimes found on one island. I The following are some broad characteristics of the Papuan I

languages. Consonants are freely used, some of the consonantal sounds being difficult to represent by Roman characters. Many of the syllables are closed. There does not appear to be any difference between the definite and the indefinite article, except in Fiji. Nouns are divided into two classes, one of which takes a pronominal suffix, while the other never takes such a suffix. The principle of this division appears to be a near or remote connexion between the possessor and-the thing possessed. Those things which belong to a person, as the parts of his body, &c, take the pronominal suffix; a thing possessed merely for use would not take it. Thus, in Fijian the word luve means either a son or a daughter — one 9 own child, and it takes the possessive pronoun suffixed, as luvena; but the word ngone, a child, but not necessarily one's own child, takes the posses- sive pronoun before it, as nona ngone, his child, i.e. his to look after or bring up. Gender is only sexual. Many words are used indis- criminately, as nouns, adjectives or verbs, without change; but sometimes a noun is indicated by its termination. In most of the languages there are no changes in nouns to form the plural, but an added numeral indicates number. Case is shown by particles, which precede the nouns. Adjectives follow their substantives. Pronouns are numerous, and the

personal pronoun includes four numbers—singular, dual, trinal and general plural, also inclusive and exclusive. Almost any word may be made into a verb by using with it a verbal particle. The difference in the verbal particles in the different languages is very great. In the verbs there are causative, intensive or frequentative, and reciprocal forms.

See R. H. Codrington, The Melanesians (1891), Melanesian Languages (1885); B. Hagen, Unter den Papuas (Wiesbaden, 1899); G. von der Gabelentz and A. B. Meyer, Beitrage zur Kenntniss der melanesischen, &c, Sprachen (Leipzig, 1882); A. B. Meyer and R. Parkinson, Album von Papua Typen (Dresden, 1894); F. S. A. de Clercq, Ethnographische Beschrifving van de West-en Noordhust van N. N. G. (Leiden, 1893); A. C. Haddon, Decorative Art of British New Guinea (Dublin, 1894).

PAPYRUS, the paper reed, the Cyperus Papyrus of Linnaeus, in ancient times widely cultivated in the Delta of Egypt, where it was used for various purposes, and especially as a writing material. The plant is now extinct in Lower Egypt, but is found in the Upper Nile regions and in Abyssinia. Theo- phrastus (Hist, plant, iv. 10) states that it likewise grew in Syria; and, according to Pliny, it was also a native plant of the Niger and Euphrates. Its Greek title irarvpos, Lat. papyrus, appears to be of Egyptian origin. By Herodotus it is always called / SJjSXos. The first accurate description of the plant is given by Theophrastus, from whom we learn that it grew in shallows of 2 cubits (about 3 ft.) or less, its main root being of the thickness of a man's wrist and 10 cubits in length. From this root, which lay horizontally, smaller roots pushed down into the mud, and the stern of the plant sprang up to the height of 4 cubits, being triangular and tapering in form. The tufted head or umbel is likened by Pliny to a thyrsus.

The various uses to which the papyrus plant was applied are also enumerated by Theophrastus. Of the head nothing could be made but garlands for the shrines of the gods; but the wood of the root was employed in the manufacture of different utensils as well as for fuel. Of the stem of the plant were made boats, sails, mats, cloth, cords, and, above all, writing materials. Its pith was also a common article of food, and was eaten both cooked and in its natural state. Herodotus, too, notices its consumption as food (ii. 92), and incidentally mentions that it provided the material of which the priests' sandals were made (ii. 37). He likewise refers to the use of byblus as tow for caulking the seams of ships; and the statement of Theophrastus that King Antigonus made the rigging of his fleet of the same material is illustrated by the ship's cable, ottXov (HvfSXivov, wherewith the doors were fastened

when Ulysses slew the suitors in his hall (Odyss. xxi. 390). That the plant was itself used also as the principal material in the construction of light skiffs- suitable for the navigation of the pools and shallows of the Nile, and even of the river itself, is shown by sculptures of the fourth dynasty, in which men are represented building a boat with stems cut from a neighbouring plantation of papyrus (Lepsius. Denkm. ii. 12). It is to boats of this description that Isaiah probably refers in the ” vessels of bulrushes upon the waters ” (xviii. 2). If the Hebrew gomer (ipj) also is to be identified with the Egyptian papyrus, something may be said in favour of the tradition that the bulrushes of which the ark was composed in which the infant Moses was laid were in fact papyrus. But

it seems hardly credible that the Cyperus papyrus could have sufficed for the many uses to which it is said to have been applied and we may conclude that several plants of the genus Cyperus were comprehended under the head of byblus or papyrus — an opinion which is supported by the words of Strabo, who mentions both inferior and superior qualities. The Cyperus dives is still

grown in Egypt, and is used to this day for many of the purposes named by ancient writers.

The widespread use throughout the ancient world of the writing material manufactured from the papyrus plant is attested by early writers, and by documents and sculptures. Papyrus rolls are represented in ancient Egyptian wall-paintings; and extant examples of the rolls themselves are sufficiently numerous. The most ancient Egyptian papyrus now known contains accounts of the reign of King Assa (35 8 °-3536 B.C.): The earliest literary papyrus is that known, from the name of its former owner, as the Prisse papyrus, and now preserved at Paris, containing a work composed in the reign of a king of the fifth dynasty, and computed to be itself of the age of upwards of 2500 years B.C. The papyri discovered in Egypt have often been found in tombs, and in the hands, or swathed with the bodies, of mummies. The ritual of the dead is most fre- quently the subject. Besides the ritual and religious rolls, there are the hieratic, civil and literary documents, and the demotic and enchorial papyri, relating generally to sales of property. Coptic papyri mainly contain Biblical or religious texts or monastic deeds. Papyrus was also known to the Assyrians, who called it ” the reed of Egypt.”

The early use of Papyrus among the Greeks is proved by the reference of- Herodotus (v. 58) to its introduction among the Ionian Greeks, who gave it the name of Hupdkpai, ” skins,” the material to which they had already been accustomed. In Athens it was doubtless in use for literary as well as for other purposes as early as the 5th century B.C. An inscription relating to the rebuilding of the Erechtheum in 407 B.C. records the purchase of two papyrus rolls, to be used for the fair copy of the rough accounts. The very large number of classical and other Greek papyri, of the Ptolemaic and later periods, “which have been recovered in Egypt, are noticed in the article on Palaeography. The rolls found in the ruins of Herculaneum contain generally the less interesting works of writers of the Epicurean school.

Papyrus also made its way into Italy, but at how early a period there is nothing to show. It may be presumed, however, that from the very first it was employed as the vehicle for Roman literature. Under the Empire its use must have been extensive, for not only was it required for the production of books, but it was universally employed for domestic purposes, correspondence and legal documents. So indispensable did it

become that it is reported that in the reign of Tiberius, owing to the scarcity and dearness of the material caused by a failure of the papyrus crop, there was a danger of the ordinary business of life being deranged (Pliny, N.H. xiii. 13).

The account which Pliny {N.H. xiii. 11-13) has transmitted to us of the manufacture of the writing material from the papyrus plant should be taken strictly to refer to the process followed in his own time; but, with some differences in details, the same general method of treatment had doubtlessly been practised from time immemorial. His text, however, is so confused, both from obscurity of style and from corruptions in the MSS., that there is much difference of opinion as to the meaning of many words and phrases employed in his narrative, and their application in particular points of detail. In one important particular, however, affecting the primary construction of the material, there can no longer be any doubt. The old idea that it was made from layers or pellicules growing between the rind and a central stalk has been abandoned, as it has been proved that the plant, like other reeds, contains only a cellular pith within the rind. The stem was in fact cut into longitudinal strips for the purpose of being converted into the writing material, those from the centre of the plant being the broadest and most valuable. The strips (inae, philyrae), which were cut with a sharp knife or some such instrument, were laid on a board side by side to the required width, thus forming a layer

(scheda), across which another layer of shorter strips was laid at right angles. The two layers thus ” woven ” — Pliny uses the word texere in de- scribing this part of the process — formed a sheet (plagula or net), which was then soaked in water of the Nile. The mention of a particular water has caused trouble to the commentators. Some have supposed that certain chemical properties of which the Nile water was possessed acted as a glue or cement to cause the two layers to adhere ; others, with more reason, that glutinous matter contained in the material itself was solved by the action of water, whether from the Nile or any other source ; and others again read in Pliny’s words an implication that a paste was actually used. The sheet was finally hammered and dried in the sun. Any rough- ness was levelled by polishing with ivory or a smooth shell. But the material was also subject to other defects, such as moisture lurking between the layers, which might be detected by strokes of the mallet; spots or stains; and spongy strips (taeniae), in which the ink would run and spoil the sheet. When such faults occurred, the papyrus must be re-made. To form a roll the several sheets KoXXˆuara, were joined together with paste (glue being too hard), but not more than twenty sheets in a roll (scapus). As, however, there are still extant rolls consisting of more than the prescribed number of sheets, either the reading of vicenae is corrupt, or the number was not constant in all times. The scapus seems to have been a standard length of papyrus, as sold by the stationers. The best sheet formed the first or outside sheet of the roll, and the others were joined on in order of quality, so that the worst sheets were in the centre of the roll. This arrangement was adopted, not for the purpose of fraudulently selling bad material under cover of the better exterior, but in order that the outside of the roll should be composed of that which would best stand wear and tear. Besides, in case of the entire roll not being filled with the text, the unused and inferior sheets at the end could be better spared, and so might be cut off.

The different kinds of papyrus writing material and their dimen- sions are also enumerated by Pliny. The best quality, formed from the middle and broadest strips of the plant, was originally named hieratica, but afterwards, in flattery of the emperor Augustus, it was called, after him, Augusta; and the charta Livia, or second quality, was so named in honour of his wife. The hieratica thus descended to the third rank. The first two were 13 digiti, or about 9 i in. in width; the hieratica, 11 digiti or 8 in. Next came the charta amphitheatrica, named after the principal place of its manu- facture, the amphitheatre of Alexandria, of 9 digiti or 6J in. wide. The charta Fanniana appears to have been a kind of papyrus worked up from the amphitheatrica, which by flattening and other methods was increased in width by an inch, in the factory of a certain Fannius at Rome. The Saitica, which took its name from the city of Sais, and was probably of 8 digiti or 5f in., was of a common description. The Taeniotica, named apparently from the place of its manufacture, a tongue of land (jaivia) near Alex- andria, was sold by weight, and was of uncertain width, perhaps from 4§ to 5 in. And lastly there was the common packing-paper, the charta emporetica, of 6 digiti or 4§ in. Isidore (Etymol. vi. 10) mentions yet another kind, the Corneliana, first made under C. Cornelius Gallus, prefect of Egypt, which, however, may have been the same as the amphitheatrica or Fanniana. The name of the man who had incurred the anger of Augustus may have been suppressed by the same influence that expunged the episode of Gallus from the Fourth Georgic (Birt, Antik. Buchwesen, p. 250). In the reign of the emperor Claudius also another kind was intro- duced and entitled Claudia. It had been found by experience that the charta Augusta was, from its fineness and porous nature, ill suited for literary use ; it was accordingly reserved for correspon- dence only, and for other purposes was replaced by the new paper.

The charta Claudia was made from a composition of the first and second qualities, the Augusta and the Livia, a layer of the former being backed with one of the latter; and the sheet was increased to nearly a foot in width. The largest of all, however, was the macrocollon, probably of good quality and equal to the hieratic, and a cubit or nearly 18 in. wide. It was used by Cicero (Ep. ad Attic, xiii. 25 ; xvi. 3). The width, however, proved inconvenient, and the broad sheet was liable to injury by tearing.

An examination of extant papyri has had the result of proving that sheets of large size, measuring about 12 in., were sometimes used. A large class of examples run to 10 in., others to 8 in., while the smaller sizes range from 4 to 6 in.

An interesting question arises as to the accuracy of the different measurements given by Pliny. His figures regarding the width of the different kinds of papyri have generally been understood to concern the width (or height) of the rolls, as distinguished from their length. It has, however, been observed that in practice the width of extant rolls does not tally in any satisfactory degree with Pliny's measurements; and a more plausible explanation has been offered (Birt, Antik. Buchwesen, pp. 251 seq.) that the breadth (not height) of the individual sheets of which the rolls are composed is referred to.

The first sheet of a roll was named irpwri/coXXov; the last, t

Papyrus was cultivated and manufactured for writing material by the Arabs in Egypt down to the time when the grow- ing industry of paper in the 8th and 9th centuries rendered it no longer a necessity (see Paper). It seems to have entirely given place to paper in the 10th century. Varro's statement, repeated by Pliny, that papyrus was first made in Alexander's time, should probably be taken to mean that its manufacture, which till then had been a government monopoly, was relieved from all restrictions. It is not probable, however, that it was ever manufactured from the native plant anywhere but in Egypt. At Rome there was certainly some kind of industry in papyrus, the charta Fanniana, already referred to, being an instance in illustration. But it seems probable that this industry was confined to the re-making of material imported into Italy, as in the case of the charta Claudia. This second manu- facture, however, is thought to have been detrimental to the papyrus, as it would then have been in a dried condition requiring artificial aids, such as a more liberal use of gum or paste, in the process. The more brittle condition of the Latin papyri found at Herculaneum has been instanced as the evil result of this re-making of the material.

As to cultivation of the plant in Europe, according to Strabo the Romans obtained the papyrus plant from Lake Trasimene and other lakes of Etruria, but this statement is unsupported by any other ancient authority. At a later period, however, a papyrus was cultivated in Sicily, which has been identified by Parlatore with the Syrian variety (Cyperus syriacus), far ex- ceeding in height the Egyptian plant, and having a more drooping head. It grew in the east and south of the island, where it was introduced during the Arab occupation. It

was seen in the 10th century, by the Arab traveller Ibn-Haukal, in the neighbourhood of Palermo, where it throve luxuriantly in the pools of the Papireto, a stream to which it lent its name. From it paper was made for the sultan's use. But in the r3th century it began to fail, and in 1591 the drying up of the Papireto caused the extinction of the plant in that district. It is still to be seen at Syracuse, but it was probably transplanted thither at a later time, and reared only as a curiosity, as there'is no notice of it to be found previous to 1674. It is with this Syracusan plant that some attempts have been made in modern times to manufacture a writing material similar to ancient papyrus.

Even after the introduction of vellum as the ordinary vehicle for literature papyrus still continued to some extent in use outside Egypt, and was not entirely superseded until a late date. It ceased, however, to be used for books sooner than for docu- ments. In the 5th century St Augustine apologizes for sending a letter written on vellum instead of the more usual substance, papyrus (Ep. xv.); and Cassiodorus (Varr. xi. 38), writing in the 6th century, indulges in a high-flown panegyric on the plant and its value. Of medieval literary Greek papyri very few relics have survived, but of documents coming down to the 8th and 9th centuries an increasing number is being brought to light among the discoveries in Egypt.

Medieval Latin MSS. on papyrus in book form are still extant in different libraries of Europe, viz.: the Homilies of St Avitus, of the 6th century, at Paris; Sermons and Epistles of St Augustine, of the 6th or 7th century, at Paris and Geneva; works of Hilary, of the 6th century, at Vienna; fragments of the Digests, of the 6th century, at Pommersfeld; the Antiquities of Josephus, of the 7th century, at Milan; Isidore, De contemptu mundt, of the 7th century, at St Gall ; and the Register of the Church of Ravenna, of the 10th century, at Munich. The employment of this material in Italy for legal purposes is sufficiently i'lustrated by the large number of documents in Latin which were preserved at Ravenna, and date from the 5th to the loth century. In the papal chancery it was used at an early date, evidence of its presence there being found in the biography of Gregory I. But of the extant papal deeds the earliest to which an authentic date can be attached is a bull of Adrian I. of the year 788, while the latest appears to be one of 1022. There is evidence to show that in the loth century papyrus was used, to the exclusion of other materials, in papal deeds. In France it was a common writing substance in the 6th century (Gregory of Tours, Hist. Franc, v. 5). Of the Merovingian period there are still extant several papyrus deeds, the earliest of the year 625, the latest of 692. Under Charlemagne and his successors it was not used.

By the 12th century the manufacture of papyrus had entirely ceased, as appears from a note by Eustathius in his commentary on the Odyssey, xxi. 390.

Authorities. — Melch. Guilandino's commentary on the chapters of Pliny relating to papyrus, Papyrus, hoc est commentarius, &c. (Venice, 1372) ; Montfaucon, " Dissertation sur la plante appellee Papyrus," in the Memoires de Vacademie des inscriptions (1725)1 pp. 592-608 ; T. C. Tychsen, " De chartae papyraceae in Europa per medium aevum usu," in the Comment. Soc. Reg. Scient. GotUn- gensis (1820), pp. 141-208; Dureau de la Malle, " Memoire sur le papyrus," in the Mint, de Vinstilut (1851), pp. 140-183 ; P. Parlatore,

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PAR (Lat. par, equal), technically a commercial and banking term. N When stocks, shares, &c, are purchasable at the price originally paid for them or at their nominal or face value they are said to be at par. When the purchase price is higher than the face value, they are above par, or at a premium; when below face value, they are below par, or at a discount. Par of exchange is the amount of money in the currency of one country which is equivalent to the same amount in the terms of another, both currencies being of the same metal and of a fixed standard -of weight and purity. (See Exchange.)

PARA, or Grao ParA, a northern state of Brazil, bounded N. by the three Guianas and the Atlantic, E. by the Atlantic and the states of Maranhao and Goyaz, 1 S. by Goyaz and Matto Grosso and W. by Amazonas. It is the third largest state of the republic, having an area of 443,922 sq. m.; pop. (1890), 328,455, (1900), 445,356. The Amazon valley has its outlet to the ocean through the central part of the state, the outlet, or neck, being comparatively narrow and the territory on both sides rising to the level of the ancient plateau that covered this part of the continent. In the north is the Guiana plateau, sometimes called Brazilian Guiana, which is " blanketed " and made semi- arid by the mountain ranges on the Brazil-Guiana frontier. In

the south the country rises in forested terraces and is broken by escarpments caused by the erosion of the northern slope of the great central plateau of Brazil. With the exception of the

Guiana highlands, and some grassy plains on the island of Marajo and in some other places, the state is densely forested, and its lowest levels are covered with a network of rivers, lakes and connecting channels.

The rivers of the state may be grouped under three general systems: the Amazon and its tributaries, the Tocantins and its tributaries and the rivers flowing direct to the Atlantic. The Amazon crosses the state in a general E.N.E. direction for about 500 m. Its channels, tributaries, furos (arms), igarapis (creeks, or literally, ” canoe paths “), by-channels and reservoir lakes form an extremely complicated hydrographic system. From the north seven large tributaries are received — the Jamunda (which forms the boundary line with Amazonas), Trombetas, Maecuru, Jauary, Parti, Jary and Anauera-pucu. The first is, strictly speaking, a tributary cf the Trombetas, though several furos connect with the Amazon before its main channel opens into the Trombetas. All these rivers have their sources on the Guiana highlands within the limits of the state, and flow southward to the Amazon over numerous rapids and falls, with comparatively short navigable channels before entering the great river. From the south two great tributaries are received — the Tapajos and Xingu — both having their sources outside the state (see Amazon). The Para estuary, usually called the Para river, belongs to the Tocantins, although popularly described as a mouth of the Amazon. Very little Amazon water passes through it except in times of flood. It is connected with the Amazon by navigable tidal furos, in which the current is hardly perceptible. The estuary is about 200 m. long and 5 to 30 m. wide, and receives the waters of a large number of streams, the largest of which is the Guama and its chief tributary, the Capim. A number of small rivers discharge into the Atlantic north and south of the Amazon, the largest of which are the Gurupy, which forms the boundary line with Maranhao, the Araguary, which drains a large area of the eastern slope of the Guiana highlands, and the Oyapok, which forms the boundary line with French Guiana.

Lying across the mouth of the Amazon and dividing it into three channels are the islands of Caviana and Mexiana, the first 47 m. and the second 27 m. in length, north-west to south-east, both traversed by

the equator, and both devoted to cattle- raising. Somewhat different in character is the island of Marajo, or Joannes, which lies between the Amazon and Para, estuary. It is 162 m. long by 99 m. wide, and its area is about 15,000 sq. m. This island is only partly alluvial in character, a considerable area on its eastern and southern sides having the same geological formation as the neighbouring mainland. The larger part, the north-western, belongs to the flood-plains of the Amazon, being covered with swamps, forests and open meadows, and subject to annual inundations. There are several towns and villages on the island, and stock-raising, now in a state of decadence, has long been its principal industry. Of interest to archaeologists is the largest of its several lakes, called Arary, in the centre of which is a small island celebrated for its Indian antiquities, chiefly pottery. On the Atlantic coast the principal island is Maraca (lat. 2° N.), 26 m. long by 20 m. wide, which lies, in' part, off the entrance to the Amapa river.

Para is crossed by the equator, and its climate is wholly tropical, but there is a wide variation in temperature and rainfall. In general, it is hot and dry on the Guiana plateau, and hot and humid throughout the forested region. In the latter, there are two recognized seasons, wet and dry, which differ only in the amount of rainfall, a strictly dry season being unknown. The trade winds, which blow up the Amazon with much force, moderate the heat and make healthy most of the settlements on the great river itself; but the settlements along its tributaries, which are not swept by these winds, are afflicted with malaria. The population is concentrated at widely separated points on the coast and navigable rivers, except on Marajo island, where open country and pastoral pursuits have opened up inland districts. The principal occupation is the collecting and marketing of forest products such as rubber (from Hevea brasiliensis) , gutta-percha, or balata (Mimusops data), Brazil

nuts {Bertholetia excelsis), sarsaparilla (Smilax), cumaru or tonka beans {Dipterix odorata), copaiba (Copaifera officin- arum), guar and (Paulinia sorbilis), cravo (an aromatic bark of Dicypellium caryophillatum) and many others. In earlier days cotton, sugar-cane, rice, tobacco, cacao and even coffee were cultivated, but the demand for rubber caused their abandonment in most places. Cacao (Theobroma cacao) is still widely culti- vated, as also mandioca (Manihot utilissima) in some localities. Para produces many kinds of fruits — the orange, banana, abrico, cajii, abacate (alligator pear), mango, sapotilha, fructa de Conde, grape, &c, besides a large number hardly known beyond the Amazon valley. The pastoral industries were once important in Para, especially on the islands of Marajo, Caviana and Mexiana, and included the rearing of horses, cattle, and sheep. At

present little is done in these industries, and the people depend upon importation for draft animals and fresh meat. There remain a few cattle ranges on Maraj6 and other islands, but the industry is apparently losing ground. Mining receives some attention on the Atlantic slope of the Guiana plateau, where gold washings of no great importance have been found in the Counani and other streams. There are no manufactures in the state outside the city of Para (q.v.).

Transportation depends wholly on river craft, the one railway of the state, the Para & Braganca, not being able to meet expenses from its traffic receipts. The capital of the state is Para, or Belem do Para, and its history is largely that of this city. Other important towns are Alemaquer (pop. about 1500; of the municipio in 1890, 7539), on a by-channel of the Amazon; Breves (mun. 12,593 in 1890), a river port in the south-west part of Marajo, on a channel connecting the Amazon with the Pari estuary; Braganca (mun. 16,046 in 1890), a small town in one of the few agricultural districts of the state, 147 m. by rail north-east of Para, on the river Caete, near the coast; Obidos (about 1000; mun. 12,666 in 1890), on the north bank of the Amazon at a point called the Pauxis narrows, a little over 1 m. wide, attractively situated on a hillside in a healthful locality; and Santarem (12,062 in 1890), on the right bank of the Tapajos, 2\ m. from the Amazon, dating from 1661, and the most prosperous and populous town between Para, and Manaos.

PARA (officially Belem; sometimes Belem do Para), a city and port of Brazil, capital of the state of Para, and the see of a bishop, on a point of land formed by the entrance of the Guama river into the Para (86 m. from the Atlantic), in i° 28′ S., 48 28′ W. Pop. of the city and rural districts of the municipality (1890), 50,064; (1900, estimate), 100,000. There is a large Portuguese contingent in the population, and the foreign element, engaged in trade and transportation, is also important. The Indian admixture is strongly apparent in the Amazon valley and is noticeable in Para. A small railway, built by the state, runs north-eastward in the direction of Braganca (112 m.), on the sea-coast. The Guama, river is enlarged at its mouth to form an estuary called the bay of Guajara, partially shut off from the Para by several islands and forming the anchorage of the port, and the Para is the estuary mouth of the Tocantins river. The Para, is about 20 m. wide here.

The city is built on an alluvial forested plain only a few feet above the level of the river, and its streets usually end at the margin of the impenetrable forest. The climate is hot and humid, but the temperature and diurnal changes are remarkably uniform throughout

the year. The annual rainfall, according to Professor M. F. Draenert, is 70 in. (Reclus says 120 in.), of which 56 in. are credited to the rainy season (January to June). H. W. Bates gives the average temperature at 8i° F., the minimum at 73 , and the maximum (2 p.m.) at 89 to 94 . These favourable climatic conditions tend to make the city healthy, but through defective drainage, insanitary habits and surroundings, and improper diet the death-rate is high. The plan of the city is regular and, owing to the density of the forest, it has no outlying suburbs. The streets are usually narrow, Straight and well paved. Among the many public squares and gardens the largest are the Praca Caetano Brandao, with 3

statue of the bishop of that name; the Praca da Independencia, surrounded by government buildings and having an elaborate monument to General Gurjao; the Praga Visconde do Rio Branco, with a statue of Jose da Gama Melchior; the Praga de Baptista Campos, with artificial cascades, lake, island and winding paths; the Praca da Republica, with a monument representing the Republic; and the Praca de Prudente Moraes, named in honour of the first civilian president of Brazil. Another public outdoor resort is the Bosque, a tract of forest on the outskirts of the city. The public buildings and institutions are in great part relics of an older regime. The great cruciform cathedral, on the Praca Caetano Brandao, dates from the middle of the 18th century. In the vicinity, facing on the Praca da Independencia, are the government and municipal palaces — built by order of Pombal (c. 1766), when Portugal contemplated the creation of a great empire on the Amazon. The bishop's palace and epis- copal seminary, near the cathedral, were once the Jesuits' college, and the custom-house on the water-front was once the convent and church of the Mercenarios. One of the most notable buildings of the city is the Theatro da Paz (Peace Theatre), which faces upon the Praca da Republica and was built by the government during the second empire. Other noteworthy buildings are the Caridade hospital, the Misericordia hospital (known as the " Santa Casa "), the military barracks occupying another old convent, and the Castello fort, a relic of colonial days. Para has a number of schools and colleges, public and private, of secondary grade, such as the Ateneo Paranense, Instituto Lauro Sodre and Lyceu Benjamin Constant. There is an exceptionally fine museum (Museu Goeldi), with important collections in anthropology, ethnology, zoology and botany, drawn from the Amazon valley. The private dwellings are chiefly of the Portuguese one-storey type, with red tile

roofs and thick walls of broken stone and mortar, generally plastered outside but sometimes covered with blue and white Lisbon tiles.

Para is the entrepot for the Amazon valley and the principal commercial city of northern Brazil. It is the headquarters of the Amazon Navigation Company, which owns a fleet of 40 river steamers, of 500 to 900 tons, and sends them up the Amazon to the Peruvian frontier, and up all the large tributaries where trading settlements have been established. Two or three coastwise companies also make regular calls at this port, and several transatlantic lines afford regular communication with Lisbon, Liverpool, Hamburg and New York. The port is accessible to large steamers, but those of light draft only can lie alongside the quays, the larger being obliged to anchor some distance out. Extensive port improvements have been under- taken. The exports of Para, include rubber, cacao, Brazil nuts and a large number of minor products, such as isinglass, palm fibre, fine woods, tonka beans, deerskins, balsam copaiba, annatto, and other forest products.

Para was founded in 1615 by Francisco Caldeira de Castello- Branco, who commanded a small expedition from Maranhao sent thither to secure possession of the country for Portugal and drive out the Dutch and English traders. The settlement, which he named Nossa Senhora de Belem (Our Lady of Bethle- hem), grew to be one of the most turbulent and ungovernable towns of Brazil. Rivalry with Maranhao, the capital of the Amazon dependencies, slave-hunting, and bitter controversies with the Jesuits who sought to protect the Indians from this traffic, combined to cause agitation. In 1641 it had a population of only 400, but it had four monasteries and was already largely interested in the Indian slave traffic. In 1652 the Para territory was made a separate capilania, with the town of Para as the capital, but it was reannexed to Maranhao in 1654. The final separation occurred in 1772, and Para, again became the capital, continuing as such through all the political changes that have since occurred. The bishopric of Para, dates from 1723. The popular movement in Portugal in 1820 in favour of a constitution and parliament (Cortes) had its echo in Para, where in 1821 the populace and garrison joined in creating a government of their own and in sending a deputation to Lisbon. The declaration of Brazilian independence of 1822 and creation of an empire

under Dom Pedro I. was not accepted by Para, partly because of its influential Portuguese population, and partly through jealousy of Rio de Janeiro as the centre of political power. In 1823 a naval expedition under Lord Cochrane, then in the service of Brazil, took possession of

Maranhao, from which place the small brig ” Dom Miguel ” under the command of Captain John Grenfell was sent to Para. This officer conveyed the impression that the whole fleet was behind him, and on the 15th of August the junta governativa organized in the preceding year surrendered its authority and Para became part of the newly created Brazilian empire. An uprising against the new government soon occurred, which resulted in the arrest of the insurgents, the execution of their leaders, and the incarceration of 253 prisoners in the hold of a small vessel, where all but four died from suffocation before morning. Conspiracies and revolts followed, and in 1835 an outbreak of the worse elements, made up chiefly of Indians and half-breeds, occurred, known as the ” Revolugao da Cabanagem,” which was chiefly directed against the Portuguese, and then against the Freemasons. All whites were compelled to leave the city and take refuge on neighbouring islands. The Indians and half-breeds obtained the mastery, under the leadership of Antonio and Francisco Vinagres and Eduardo Angelim, and plunged the city and neighbouring towns into a state of anarchy, the population being reduced from 25,000 to 15,000. The revolt was overcome in 1836, but the city did not recover from its effects until 1848. But the opening of the Amazon to foreign trade in 1867 greatly increased the importance of the city, and its growth has gone forward steadily since that event. (A. J. L.)

PARABLE (Gr. irapaˆo\r\, a comparison or similitude), originally the name given by Greek rhetoricians to a literary illustration avowedly introduced as such. In late Greek it came to mean a fictitious narrative or allegory (generally some- thing that might naturally occur) by which moral or spiritual relations are typically set forth, as in the New Testament. The parable differˆ from the apologue in the inherent probability of the story itself, and in excluding animals or inanimate creatures from passing out of their natural sphere and assuming the powers of man, but it resembles it in the essential qualities of brevity and definiteness, and also in its Eastern origin. There are many beautiful examples of the parable in the Old Testament, that of Nathan, for instance, in 2 Sam. xii. 1-9, that of the woman of Tekoah in 2 Sam. xiv. 1-13, and others in the Prophets.

PARABOLA, a plane curve of the second degree. It may be defined as a section of a right circular cone by a plane parallel to a tangent plane to the cone, or as the locus of a point which moves so that its distances from a fixed point and a fixed line are equal. It is therefore a conic section having its eccentricity equal to unity. The parabola is the curve described by a projec- tile which moves in a non-resisting medium under the influence of gravity (see Mechanics). The general relations between the parabola, ellipse and hyperbola are treated in

the articles Geometry, Analytical, and Conic Sections; and various projective properties are demonstrated in the article Geometry, Projective. Here only the specific properties of the parabola will be given.

The form of the curve is shown in fig. 1, where P is a point on the curve equidistant from the fixed line AB, known as the directrix, and the fixed point F known as the focus. The line CD passing through the focus and perpendicular to the directrix is the axis or principal diameter, and meets the curve in the vertex G. The line FL perpendicular to the axis, and passing through the focus, is the semilatus rectum, the latus rectum being the focal chord parallel fo the directrix. Any line parallel to the axis is a diameter, and the parameter of any diameter is measured by the focal chord drawn

Fig. 1.

parallel to the tangent at the vertex of the diameter and is equal

to four times the focal distance of the vertex. To construct the parabola when the focus and directrix are given, draw the axis CD and bisect CF at G, which gives the vertex. Any number of points on the parabola are obtained by taking any point E on the directrix, joining EG and EF and drawing FP so that the angles PFE and DFE are equal. Then EG produced meets FP in a point on the curve. By joining the points so obtained the parabola may be described. A mechanical construction, when the same conditions are given, consists in taking a rigid bar ABC bent at right angles at B (fig. 2), and fastening a string of length BC to C c and F. Then if a pencil be placed along BC so as to keep the string taut, and the limb AB be slid along the directrix, the

. pencil will trace out the parabola.

Properties which may be readily de- Fig. 2. duced by euclidian methods from the

definition include the following: the tangent at any point bisects the angle between the focal distance and the perpendicular on the directrix and is equally inclined to the focal distance and the axis; tangents at the extremities of a focal chord intersect at right angles on the directrix, and as a corollary we have that the locus of the intersection of tangents at right angles is the directrix; the

circumcircle of a triangle circumscribing a parabola passes through the focus; the sub- tangent is equal to twice the abscissa of the point of contact; the subnormal is constant and equals the semilatus rectum; and the radius of curvature at a point P is 2 (FP)»/<* 5 where a is the semilatus rectum and FP the focal distance of P.

A fundamental property of the curve is that the line at infinity is a tangent (see Geometry, Projective), and it follows that the centre and the second real focus and directrix are at infinity. It also follows that a line half-way between a point and its polar and parallel to the latter touches the parabola, and therefore the lines joining the middle points of the sides of a self-conjugate triangle form a circumscribing triangle, and also that the nine- point circle of a self-conjugate triangle passes through the focus. The orthocentre of a triangle .circumscribing a parabola is on the directrix; a deduction from this theorem is that the centre of the circumcircle of a self-conjugate triangle is on the directrix (" Steiner's Theorem ").

In the article Geometry, Analytical, it is shown that the general equation of the second degree represents a parabola when the highest terms form a perfect square. A0a(rtfc This is the analytical expression of the projective property that the line at infinity is a tangent. The simplest equation to the parabola is that which is referred to its axis and the tangent at the vertex as the axes of co-ordinates, when it assumes the form y l =\ax where 2a — semilatus rectum; this may be deduced directly from the definition. An equation of similar form is obtained when the axes of co-ordinates are any diameter and the tangent at the vertex. The equations to the tangent and normal at the point x'y' are yy'=2a(x+x >) and 2a(y— y)+y'(x— x') = o, and may be obtained by general methods (see Geometry, Analytical, and Infinitesimal Calculus). More convenient forms in terms of a single para- meter are deduced by substituting x' = am 1 , y' = 2am (for on eliminating m between these relations the equation to the parabola is obtained). The tangent then becomes my=x+am? and the normal y=mx+2am— am 3 . The envelope of this last equation is 2jay 1 =4. (x— 2a) 3 , which shows that the evolute of a parabola is a semi-cubical parabola (see below Higher Orders). The cartesian equation to_a parabola which touches the co- ordinate axes is Vax+Vby=i, and the polar equation when the focus is the pole and the axis the initial line is r cos 2 0/2 = a.

The equation to a parabola in triangular co-ordinates is gener- ally derived by expressing the condition that the line at infinity is a tangent in the equation to the general conic. For example, in trilinear co-ordinates, the equation to the general conic circumscribing the

triangle of reference is lj3y+mya.+na& = o; for this to be a parabola the line aa + 6/3 + cy = o must be a tangent. Expressing this condition we obtain

Via* Vmbˆ Vrac=oasthe relation which must hold between the co-efficients of the above equation and the sides of the triangle of reference for the equation to represent a jsarabola. Similarly, the conditions for the inscribed conic V la+V w/8+V ny = to be a parabola is lbc+mca+nab = o, and the conic for which the triangle of reference is self-conjugate ld 1 +mfi' i +ny i =c is a 2 mn--b' i nl--cHm=o. The various forms in areal co-ordinates may be derived from the above by substituting \a for /, /j.b for m and vc for n, or directly by expressing the condition for tangency of the line x--y--z=o to the conic expressed in areal co- ordinates. In tangential (p, q, r) co-ordinates the inscribed and circumscribed conies take the forms \qr--/j,rp+vpq=o and VKp+jV n J rV vr =0; these are parabolas when \ +ii+v = 6 and V\±V(i ± Vi'=o respectively.

The length of a parabolic aic can be obtained by the methods of the infinitesimal calculus; the curve is directly quadrable, the area of any portion between two ordinates being two thirds of the circumscribing parallelogram. The pedal equation with the focus as origin is p 2 = ar; the first positive pedal for the vertex is the cissoid (q.v.) and for the focus the directrix. (See Infinitesimal Calculus.)

References. — Geometrical constructions of the parabola are to be found in T. H. Eagles' Plane Curves (1885). See the bibliography to the articles Conic Sections; Geometry, Analytical; and Geometry, Projective.

In the geometry of plane curves, the term parabola is often used to denote the curves given by the general equation a m x" = y +n , thus ax = y t is the quadratic or Apollonian parabola; a 2 x=y 3 is the cubic parabola, a z x=-f is orders. the biquadratic parabola; semi parabolas have the general equation ax n ~~ 1 =y n , thus ax 2 = y 3 is the semicubical parabola and ax 3 =y* the semibiquadratic parabola. These curves were investigated by Rene Descartes, Sir Isaac Newton, Colin Maclaurin and others. Here we shall treat only the more important forms.

The cartesian parabola is a cubic curve which is also known as the trident of Newton on account of its three-pronged form. Its equation is xy = ax 3 +bx 2 --cx+d 1 and it consists of two legs asymptotic to the axis of y and two parabolic legs (fig. 3). The simplest form is axy —x 3 — a 3 , in this case the serpentine position shown in the figure

degenerates into a point of inflexion. Descartes used the curve to solve sextic equations by determining its inter- sections with a circle; mechanical constructions were given by Descartes {Geometry, lib. 3) and Maclaurin (Organica geometrica).

The cubic parabola (fig. 4) is a cubic curve having the equation y = ax 3 +bx t -^-cx J rd. It consists of two parabolic branches tending in opposite directions. John Wallis utilized the intersec- tions of this curve with a right line to solve cubic equations, and Edmund Halley solved sextic equations with the aid of a circle.

Diverging parabolas are cubic curves given by the equation y 2 = ax 3 +bx i 4-cx+d. Newton discussed the five forms which arise from the relations of the roots of the cubic equation. When all the

■e-

Fig. 3.

Fig. 4.

Fig. 5.

roots are real and unequal the curve consists of a closed oval and a parabolic branch (fig. 5). As the two lesstr roots are made more and more equal the oval shrinks in size and ultimately becomes a real conjugate point, and the curve, the equation of which is y 2 = (x— ay(x — b) (in which a>b) consists of this point and a bell-like branch resembling the right-hand member of fig. 5. If two roots are imaginary the equation is y'- — (x 1 +a 2) (x — b) and the curve resembles the parabolic branch , as in the preceding case. This is some- times termed the campanijorm (or bell-shaped) parabola. If the two greater roots are equal the equation is y 2 = (x — a) (* — fc) 2 (in which a

curve to be rectified. This was accomplished in 1657 by Neil in England, and in 1659 by Heinrich van Haureat in Holland. Newton showed that all the five varieties of the diverging parabolas may be exhibited as plane sections of the solid of revolution of the semi-cubical parabola. A plane oblique to the axis and passing below the vertex gives the first variety; if it passes through the vertex,

Fig. 6. Fig. 7.

the second form ; if above the vertex and oblique or parallel to the axis, the third form ; if below the vertex and touching the surface, the fourth form, and if the plane contains the axis, the fifth form results (see Curve).

The biquadratic parabola has, in its most general form, the equa- tion y = ax i +bx* + cx i --dx + e, and consists of a serpentinous and two parabolic branches (fig. 8). If all the roots of the quartic in

Fig. 8. Fig. 9. _ Fig. 10.

- are equal the curve assumes the form shown in fig. 9, the axis of x being a double tangent. If the two middle rooti are equal, fig. 10 results. Other forms which correspond to other relations between the roots can be readily deduced from the most general form. (See Curve; and Geometry, Analytical.)

PARACELSUS (c. 1490-1541), the famous German physician of the 1 6th century, was probably born near Einsiedeln, in the canton Schwyz, in 1490 or 1491 according to some, or 1493 according to others. His father, the natural son of a grand- master of the Teutonic order, was Wilhelm Bombast von Hohenheim, who had a hard struggle to make a subsistence as a physician. His mother was superintendent of the hospital at Einsiedeln, a post she relinquished upon her marriage. Paracelsus's name was Theophrastus Bombast von Hohenheim; for the names Philippus and Aureolus which are sometimes added good authority is wanting, and the epithet Paracelsus, like some similar compounds, was probably one of his own making, and was meant to denote his superiority to Celsus.

Of the early years of Paracelsus's life hardly anything is known. His father was his first teacher, and took pains to instruct him in all the learning of the time, especially in medicine. Doubtless Paracelsus learned rapidly what was put before him, but he seems at a comparatively early age to have questioned the value of what he was expected to acquire, and to have soon struck out ways for himself. At the age of sixteen he entered the university of Basel, but probably soon abandoned the studies therein pursued. He next went to J. Trithemius, the abbot of Sponheim and afterwards of Wtirzburg, under whom he prosecuted chemical researches. Trithemius is the reputed author of some obscure tracts on the great elixir, and as there was no other chemistry going Paracelsus would have to devote himself to the reiterated operations so characteristic of the notions of that time. But the confection of the stone of the philosophers was too remote a possibility to gratify the fiery spirit of a youth like

Paracelsus, eager to make what he knew, or could learn, at once available for practical medicine. So he left school chemistry as he had forsaken university culture, and started for the mines in Tirol owned by the wealthy family of the Fuggers. The sort of know- ledge he got there pleased him much more. There at least he was in contact with reality. The struggle with nature before the precious metals could be made of use impressed upon him more and more the importance of actual personal observation. He saw all the mechanical difficulties that had to be overcome in mining; he learned the nature and succession of rocks, the physical properties of minerals, ores and metals; he got a notion of mineral waters; he was an eyewitness of the accidents which befel the miners, and studied the diseases which attacked them; he had proof that positive knowledge of nature was not to be got in schools and universities, but only by going to nature her- self, and to those who were constantly engaged with her. Hence came Paracelsus's peculiar mode of study. He attached no

value to mere scholarship; scholastic disputations he utterly ignored and despised — and especially the discussions on medical topics, which turned more upon theories and definitions than upon actual practice. He therefore went wandering over a great part of Europe to learn all that he could. In so doing he was one of the first physicians of modern times to profit by a mode of study which is now reckoned indispensable. The book of nature, he affirmed, is that which the physician must read, and to do so he must walk over the leaves. The humours and passions and diseases of different nations are different, and the physician must go among the nations if he will be master of his art; the more he knows of other nations, the better he will understand his own. And the commentary of his own and succeeding centuries upon these very extreme views is that Paracelsus was no scholar, but an ignorant vagabond. He himself, however, valued his method and his knowledge very differently, and argued that he knew what his predecessors were ignorant of, because he had been taught in no human school. " Whence have I all my secrets, out of what writers and authors? Ask rather how the beasts have learned their arts. If nature can instruct irrational animals, can it not much more men?" In this new school discovered by Paracelsus, and since attended with the happiest results by many others, he remained for about ten years. He had acquired great stores of facts, which it was impossible for him to have reduced to order, but which gave him an unquestion- able superiority to his contemporaries. So in 1526 or 1527, on his return to Basel, he was appointed town physician, and shortly afterwards he gave a course of lectures on medicine in the university. Unfortunately for him, the lectures broke away from tradition. They were in German,

not in Latin; they were expositions of his own experience, of his own views, of his own methods of curing, adapted to the diseases that afflicted the Germans in the year 1527, and they were not commentaries on the text of Galen or Avicenna. They attacked, not only these great authorities, but the German graduates who followed them and disputed about them in 1527. They criticized in no measured terms the current medicine of the time, and exposed the practical ignorance, the pomposity, and the greed of those who practised it.

The truth of Paracelsus's doctrines was apparently confirmed by his success in curing or mitigating diseases for which the regular physicians could do nothing. For about a couple of years his reputation and practice increased to a surprising extent. But at the end of that time people began to recover themselves. Paracelsus had burst upon the schools with such novel views and methods, with such irresistible criticism, that all opposition was at first crushed flat. Gradually the sea began to rise. His enemies watched for slips and failures; the physicians maintained that he had no degree, and insisted that he should give proof of his qualifications. Moreover, he had fi. pharmaceutical system of his own which did not harmonize with the commercial arrangements of the apothecaries, and he not only did not use up their drugs like the Galenists, but, in the exercise of his functions as town physician, he urged the authorities to keep a sharp eye on the purity of their wares, upon their knowledge of their art, and upon their transactions with their friends the physicians. The growing jealousy and enmity culminated in a dispute with Canon Cornelius von Lichtenfels, who, having called in Paracelsus after other physicians had given up his case, refused to pay the fee he had promised in the event of cure; and, as the judges, to their discredit, sided with the canon, Paracelsus had no alternative but to tell them his opinion of the whole case and of their notions of justice. So little doubt left he on the subject that his friends judged it prudent for him to leave Basel at once, as it had been resolved to punish him for the attack on the authorities of which he had been guilty. He departed in such haste that he carried nothing with him, and some chemical apparatus and other property were taken charge of by J. Oporinus (1507-1568), his pupil and amanuensis. He went first to Esslingen, where he remained for a brief period, but had soon to leave from absolute want. Then began his wander- ing life, the course of which can be traced by the dates of his

various writings. He thus visited in succession Colmar, Nurem- berg, Appenzell, Zurich, Pfaffers, Augsburg, Villach, Meran, Middelheim and other places, seldom staying a twelvemonth in any of them. In this way he spent some dozen years, till 1541, when he was invited by Archbishop Ernst to settle at Salzburg, under his protection. After his endless tossing about, this seemed a promise and place of repose. It proved, however, to be the complete and final rest that he found, for after a few months he died, on the 24th of September. The cause of his death, like most other details in his history, is uncertain. His enemies asserted that he died in a low tavern in consequence of a drunken debauch of some days' duration. Others maintain that he was thrown down a steep place by some emissaries either of the physicians or of the apothecaries, both of whom he had during his life most grievously harassed. He was buried in the churchyard of St Sebastian, but in 1752 his bones were removed to the porch of the church, and a monument of reddish-white marble was erected to his memory.

The first book by Paracelsus was printed at Augsburg in 1529. It is entitled Practica D. Theophrasti Paracelsi, gemacht auff Europen, and forms a small quarto pamphlet of five leaves. Prior to this, in 1526-1527, appeared a programme of the lectures he intended to deliver at Basel, but this' can hardly be reckoned a specific work. During his lifetime fourteen works and editions were published, and thereafter, between 1542 and 1845, there were at least two hundred and thirty-four separate publications according to Mook's enumeration. The first collected edition was made by Johann Huser in German. It was printed at Basel in 1589-1591, in eleven volumes quarto, and is the best of all the editions. Huser did not employ the early printed copies only, but collected all the manu- scripts which he could procure, and used them also in forming his text. The only drawback is that rather than omit anything which Paracelsus may have composed, he has gone to the opposite extreme and included writings with which it is pretty certain Paracelsus had nothing to do. The second collected German edition is in four volumes folio, 1603-1605. Parallel with it in 1603 the first collected Latin edition was made by Palthenius. It is in eleven volumes quarto, and was completed in 1605. Again, in 1616-1618 appeared a reissue of the folio German edition of 1603, and finally in 1658 came the Geneva Latin version, in three volumes folio, edited by Bitiskius.

The works were originally composed in Swiss-German, a vigorous speech which Paracelsus wielded with unmistakable power. The Latin versions were made or edited by Adam von Bodenstein, Gerard Dorn, Michael Toxites. and Oporinus, about the middle of the 1 6th century. A few translations into other languages exist, as of the Chirurgia

magna and some other works into French, and of one or two into Dutch, Italian and even Arabic. The trans- lations into English amount to about a dozen, dating mostly from the middle of the 17th century. The original editions of Paracelsus's works are getting less and less common; even the English versions are among the rarest of their class. Over and above the numerous editions, there is a bulky literature of an explanatory and contro- versial character, for which the world is indebted to Paracelsus's followers and enemies. A good deal of it is taken up with a defence of chemical, or, they were called, " spagyric," medicines against the attacks of the supporters of the Galenic pharmacopoeia.

The aim of all Paracelsus's writing is to promote the progress of medicine, and he endeavours to put before physicians a grand ideal of their profession. In his attempts he takes the widest view of medicine. He bases it on the general relationship which man bears to nature as a whole; he cannot divorce the life of man from that of the universe; he cannot think of disease otherwise than as a phase of life. He is compelled, therefore, to rest his medical practice upon general theories of the present state of things; his medical system — if there is such a thing — is an adaptation of his cosmogony. It is this latter which has been the stumbling-block to many past critics of Paracelsus, and unless its character is remembered it will be the same to others in the future. Dissatisfied with the Aristotelianism of his time, Paracelsus turned with greater expecta- tion to the Neoplatonism which was reviving. His eagerness to understand the relationship of man to the universe led him to the Kabbala, where these mysteries seemed to be explained, and from these unsubstantial materials he constructed, so far as it can be understood, his visionary philosophy. Interwoven with it, however, were the results of his own personal experience and work in natural history and chemical pharmacy and practical medicine, unfettered by any speculative generalizations, and so shrewd an observer as Paracelsus was must have often felt that his philosophy and his experience did not agree with one another.

Some of his doctrines are alluded to in the article Medicine (a.v.), and it would serve no purpose to give even a brief sketch of his views, seeing that their influence has passed entirely away, and that they are of interest only in their place in a general history of medicine and philosophy. Defective, however, as they may have

been, and unfounded in fact, his kabbalistic doctrines led him to trace the dependence of the human body upon outer nature for its sustenance and cure. The doctrine of signatures, the supposed connexion of every part of the little world of man with a correspond-

ing part of the great world of nature, was a fanciful and false exaggeration of this doctrine, but the idea carried in its train that of specifics. This led to the search for these, which were not to be found in the bewildering and untested mixtures of the Galenic prescriptions. Paracelsus had seen how bodies were purified and intensified by chemical operations, and he thought if plants and minerals could be made to yield their active principles it would surely be better to employ these than the crude and unprepared originals. He had besides arrived by some kind of intuition at the conclusion that the operations in the body were of a chemical character, and that when disordered they were to be put right by counter operations of the same kind. It may be claimed for Paracelsus that he embraced within the idea of chemical action something more than the alchemists did. Whether or not he believed in the philosopher's elixir is of very little consequence. If he did, he was like the rest of his age; but he troubled himself very little, if at all, about it. He did believe in the immediate use for therapeutics of the salts and other preparations which his practical skill enabled him to make. Technically he was not a chemist ; he did not concern himself either with the composition of his compounds or with an explanation of what occurred in their making. If he could get potent drugs to cure disease he was content, and he worked very hard in an empirical way to make them. That he found out some new compounds is certain ; but not one great and marked discovery can be ascribed to him. Probably, therefore, his positive services are to be summed up in this wide application of chemical ideas to pharmacy and thera- peutics ; his indirect and possibly greater services are to be found in the stimulus, the revolutionary stimulus, of his ideas about method and general theory. It is most difficult to appreciate aright this man of fervid imagination, of powerful and persistent convictions, of unbated honesty and love of truth, of keen insight into the errors (as he thought them) of his time, of a merciless will to lay bare these errors and to reform the abuses to which they gave rise, who in an instant offends us by his boasting, his grossness, his want of self-respect. It is a problem how to reconcile his ignorance, his weak- ness, his superstition, his crude notions, his erroneous observations, his ridiculous influences and theories, with his grasp of method, his lofty views of the true scope of medicine, his lucid statements, his incisive and epigrammatic criticisms of men and motives.

See Marx, Zur Wurdigung des Theophrastus von Hohenheim (Gottingen, 1842); Mook, Theophrastus Paracelsus, eine kritische Studie (Wiirzburg, 1876) ; Hartman, Life of P. T.Paracelsus (London, 1887) ; Schubert und Sudhoff, Paracelsus- Forschungen (Frankfurt a.M., 1 887-1 889); Sudhoff, Versuch einer Kritik dsr Echtheit der

Paracelsischen Schriften (Berlin, 1894) ; Waite, The Hermetic and Alchemical Writings of Paracelsus (London, 1894).

PARACHUTE (from Ital. par are, to shield, protect; cf. ” parasol,” ” parapet,” and Fr. chute, a fall), an instrument more or less resembling a large umbrella, which by the resistance it offers to the air enables an aeronaut attached to it to descend safely from a balloon or flying machine in the air. The principle of the parachute is so simple that the idea must have occurred to persons in all ages. Simon de la Loubere (1642-17 29), in his History of Siam (Paris, 1691), tells of a person who frequently diverted the court by the prodigious leaps he used to take, having two parachutes or umbrellas fastened to his girdle. In 1 783 Sebastien Lenormand practically demonstrated the efficiency of a parachute by descending from the tower of Montpellier observatory; but he merely regarded it as a useful means whereby to escape from fire. To J. P. Blanchard (17 53-1 809) is due the idea of using it as an adjunct to the balloon. As early as 1785 he had constructed a parachute to which was attached a basket. In this he placed a dog, which descended safely to the ground when the parachute was released from a balloon at a considerable elevation. It is stated that he descended himself from a balloon in a parachute in 1793; but, owing to some defect in its construction he fell too rapidly, and broke his leg. Andre Jacques Garnerin (1769-1823) was the first person who successfully descended from a balloon in a parachute, and he repeated this experiment so often that he may be said to have first demonstrated the practicability of using the machine, though his elder brother, J. B. O. Garnerin (1766-1849), also claimed a share in the merit of perfecting it. In 1793 he was taken prisoner at Marchiennes, and while in captivity at Bude (Budapest) thought out the means of descending from a balloon by means of a parachute. His first public experiment was made on the 22nd of October 1797. He ascended from the park of Monceau, at Paris, and at the height of about ij m. he

leleased the parachute, which was attached to the balloon in place of a car; the balloon, relieved suddenly of so great a weight, rose very rapidly till it burst, while the parachute descended very fast, making violent oscillations all the way. Garnerin, however, reached the earth in safety. He repeated his parachute experiment in England on the 21st of September 1802. The parachute was dome-shaped, and bore a resemblance to a large

umbrella (fig. 1). The case or dome was made of white canvas, and was 23 ft. in diameter. At the top was a truck or round piece of wood 10 in. in diameter, with a hole in its centre, fastened to the canvas by 3 2 short pieces of tape. The parachute was suspended from a hoop attached to the netting of the balloon, and below it was placed a Fig. i — Parachute (Garnerin type). cylindrical basket, 4 ft. high and 2j ft. in diameter, which contained the aeronaut. The ascent took place at about six o'clock from North Audley Street, London; and at a height of about (it is believed) Sooo ft. Garnerin separated the parachute from the balloon. For a few seconds his fate seemed certain, as the parachute retained the collapsed state in which it had originally ascended and fell very rapidly. It suddenly, however, expanded, and the rapidity of its descent was at once checked, though oscillations were so violent that the car, which was suspended 20 ft. below, was sometimes on a level with the rest of the apparatus. Some accounts state that these oscillations increased, others that they decreased as the parachute descended; the latter seems the more probable. It came to the ground in a field at the back of St Pancras Church, the descent having occupied rather more than ten minutes. Garnerin was hurt a little by the violence with which the basket containing him struck the earth; but a few cuts and a slight nausea represented all the ill effects of his fall. A few years later, Jordaki Kuparento, a Polish aeronaut, made real use of a parachute. He ascended from Warsaw on the 24th of July 1808, in a fire-balloon, which, at a considerable elevation, took fire; but he was able to effect his descent in safety by means of his parachute.

The next experiment made with a parachute resulted in the death of Robert Cocking, who is early as 1814 had become interested in the subject. The great defect of Garnerin's umbrella-shaped parachute had been its violent oscillation during descent, and Cocking considered that if the parachute were made of a conical form (vertex downwards) the whole of this oscillation would be avoided; and if it were made of sufficient size there would be resistance enough to check too rapid a descent. He therefore constructed . a parachute on this

principle (fig. 2), the radius of which at its widest part was about 17 ft. It was stated in the public an- nouncements previous to the experiment that the whole weighed 223 lb; but from the evidence at the inquest it appeared that the weight must have been over 400 lb exclusive of Cocking's weight,which was 177 lb. On the 24th of July 1837, the Nassau balloon, with Charles

Fig. 2.— Cocking's Parachute. Green > the aeronaut, and

Edward Spencer, a solici- tor, in the car, and having suspended below it the parachute,

in the car of which was Cocking, rose from Vauxhall Gardens, London, at twenty-five minutes to eight in the evening. A good deal of difficulty was experienced in rising to a suitable height, partly in consequence of the resistance to the air offered by the expanded parachute, and partly owing to its weight. Cocking wished the height to be 8000 ft. ; but when the balloon reached the height of 5000 ft., nearly over Greenwich, Green called out to Cocking that he should be unable to ascend to the requisite height if the parachute was to descend in daylight. Cocking accordingly let slip the catch which was to liberate him from the balloon. The parachute for a few seconds descended very rapidly, but still evenly, until suddenly the upper rim seemed to give way and the whole apparatus collapsed (taking a form resembling an umbrella turned inside out, and nearly closed), and the machine descended with great rapidity, oscil- lating very much. When about 200 or 300 ft. from the ground the basket became disengaged from the remnant of the para- chute, and Cocking was found in a field at Lee, literally dashed to pieces.

Many objections were made to the form of Cocking's parachute; but there is little doubt that had it been constructed of sufficient strength, and perhaps of somewhat larger size, it would have answered its purpose. John Wise (1808-1879), the American aeronaut, made some experiments on parachutes of both forms (Garnerin's and Cocking's), and found that the latter always were much more steady, descending generally in a spiral curve.

A descending balloon half-full of gas either does rise, or can with a little management be made to rise, to the top of the netting and take the form of a parachute, thus materially lessening the rapidity of descent. Wise, in fact, having noticed this, once purposely exploded his balloon when at a considerable altitude, and the resistance offered to the air by the envelope of the balloon was sufficient to enable him to reach the ground without injury. In more recent times the use of the parachute has become fairly common, but a good many serious accidents have occurred.

PARADE (Fr. parade, an adaptation from Ital. parata; cf. Span, parada, from Lat. parare, to prepare, equip, furnish), a word of which the principal meanings are display, show, a military gathering of troops for a specific purpose, an assembly of people for a promenade, the place where the troops assemble, and a road or street where people may walk. In the military sense, a " parade " is a mustering of troops

on the parade-ground for drill, for inspection, for the delivery of special orders, or for other purposes, either at regular stated hours or on special occasions.

PARADISE (Gr. 1rap6.8e1.aos), the name of a supernatural locality reserved for God and for chosen men, which occurs in the Greek Bible, both for the earthly ” garden ” of Eden (see Eden), and for the heavenly ” garden,” where true Israelites after death see the face of God (4 Esdras viii. 52; Luke xxiii. 43; 2 Cor. xii. 4; Rev. ii. 7). The Hebrew pardes (Dins), to which irapkbaoos corresponds, occurs thrice in the Old Testament in late books, in the general sense of ” park, grove “; it is derived somewhat hazardously from the Zend pairidaiza, an enclosure (once only in the Avesta), though another word (Vara) is used in the account of the mythical enclosure of Yima (see Deluge). But what interests us most is not the name, but the conception and its imaginative vehicle. The conception is the original godlikeness of human nature, and the necessity of expecting a closer union between God and man in the future than is possible at present. The imaginative form which this concep- tion takes is that before the present condition arose man dwelt near to God in God’s own mountain home, and that when the mischief wrought by ” the serpent ” has been undone, man — or more strictly the true Israel — shall once more be admitted to his old privilege. According to the fullest Old Testament account (Ezek. xxviii. 12-19; see Adam), the holy mountain was in a definite earthly region, and certainly it was appropriate for worshippers of Yahweh that it should be so (1 Kings xx. 23, 28). But there are traces in that account itself as well as in Gen. ii. that an earlier belief placed the divine

home in heaven. Similarly the Zoroastrians speak of their Paradise-mountain Alburz both as heavenly and as earthly {Bundahish, xx. i, with West’s note). It appears that originally the Hebrew Paradise-mountain was placed in heaven, but that afterwards it was transferred to earth. It was of stupendous size; indeed, properly it was the earth itself. 1 Later on each Semitic people may have chosen its own mountain, recognizing, however, perhaps, that in primeval times it was of vaster dimensions than at present, just as the Jews believed that in the next age the ” mountain of Yahweh’s house ” would become far larger (Isa. ii. 2 = Mic. iv. 1; Ezek. xl. 2; Zech. xiv. 10; Rev. xxi. 10) ; compare the idealization of the earthly Alburz of the Iranians ” in revelation ” {Bund. v. 3, viii. 2, xii. 1-8).

We now return to the accounts in Ezek. xxviii. and Gen. ii. The references in the former to the precious stones and to the ” stones of fire ” may be grouped with the references in Enoch (xviii. 6-8, xxiv.) to seven supernatural mountains each com- posed of a different beautiful stone, and with the throne of God on the seventh. These mountains are to be connected with the seven planets, each of which was symbolized by a different metal, or at least colour. 2 Ezekiel’s mountain therefore has come to earth from heaven. And a similar result follows if we group the four rivers of Paradise in Gen. ii. with the phrase so often applied to Canaan, ” flowing with milk and honey ” (Exod. iii. 8; Num. xiii. 27, &c). For this descriptive phrase is evidently mythical, 3 and refers to the belief in the four rivers of the heavenly Paradise which ” poured honey and milk, oil and wine” {Slavonic Enoch, viii. 5; cf. Vision of Paul, xxiii.). In fact, the four rivers originally flowed in heavenly soil, and only when the mountain of Elohim was transferred to this lower earth could mythological geographers think of determining their earthly course, and whether Havilah, or Cush, or Canaan, or Babylonia, was irrigated by one or another of them. But what happened to Paradise when the affrighted human pair left it ? One view (see Eth. Enoch, xxxii. 2, 3, lx. 8, lxxvii. 3, 4, &c.) was that its site was in some nameless, inaccessible region, still guarded by ” the serpents and the cherubim ” {Eth. Enochs xx. 7), and that in the next age its gates would be opened, and the threatening sword (Gen. iii. 24) put away by the Messianic priest-king {Testaments of the Twelve Patriarchs, Levi, 18). This agrees with the story in Gen. ii., iii., except that the original narrator knew the site of the garden. It is a sufficiently reasonable view, for if Paradise lay in some definite earthly region, and if no one knows ” the paths of Paradise ” (4 Esdras iv. 7), it would seem that it must have ceased to exist visibly. This idea appears to be implied by those Jewish writers, who, especially after the fall of Jerusalem (a.d. 70), dwelt so much on the hope of the heavenly Paradise, reviving, partly under emotional pressure and partly as the result of a fresh influx of mythology, the old myth of a celestial garden of God. To notice only a few leading passages. In Apoc. Bar. iv. 3 it appears to be stated that when Adam transgressed, the vision of the city of God and the possession of Paradise were removed from him, and similarly the stress laid in 4 Esdras iv. 7, vi. 2, vii. (36), 53, viii. 52, on the heavenly Paradise seems to show that no earthly one was supposed to exist. 4 Beautiful, indeed, is the use made of that form of belief in these passages, with which we may group Rev. xxi. 1, xxii. 5, where, as in 4 Esdras viii. 52, Paradise and the city of God are combined.

Some strange disclosures on this subject are made by the Slavonic

Enoch (c. viii.; cf. xlii. 3), according to which there are two Paradises. The former is in the third heaven, which explains the well-known saying of St Paul in 2 Cor. xii. 2, 4;

1 It was the Babylonian ” mountain of the lands,” which meant not only mother earth, but the earth imagined to exist within the heaven; cf. Jeremias, Alao, pp. II, 12, 28, and Jastrow, Religion of Bab. and Ass., p. 558.

2 See Zimmern, K.A.T. (3), pp. 616 sqq.

- See also I Esdras ii. 19. This explains Joel iv. 18; Isa. Iv. I (wine and milk). See also Yasna, xlix. 5 {Zendavesta) ; and cf. Cheyne, Ency. Bib., col. 2104, and especially Usener, Rheinisches Museum, lvii. 177-192.

- The statement in Gen. iii. 24 comes from a form of the story in which the ” garden ” was sot geographically localized.

the latter is conventionally called the Paradise of Eden. In fact, the belief in an earthly Paradise never wholly died. Medieval writers loved it. The mountain of Purgatory in Dante’s poem is ” crowned by the delicious shades of the terrestrial Paradise.”

See further The Apocalypse of Baruch and The Ethiopic and the Slavonic Enoch, both edited by R. H. Charles; also Kautzsch’s Apocrypha, and Volz, Judische Eschatologie (1903), pp. 374-8, whose full references are most useful. On the Biblical references, cf. Gunkel, Genesis (2), pp. 21-35; Cheyne, Ency. Bib., “Paradise”; and on Babylonian views, Jeremias, ” Holle und Paradies ” (in Der alte Orient). The Mahommedan’s Paradise is a sensuous trans- formation of the Jewish; see especially Koran, Sura lv., and note the phrase ” gardens of Firdaus,” Koran, xviii. 107. For the Koran and the Zoroastrian books see the Sacred Books of the East (Oxford Series). The doorkeeper of the mountain-Paradise of the Parsees is the Amshaspand Vohu-mano {Vendidad, xix. 31). (T. K. C.)

PARADOS (Fr. = back cover), a term used in fortification, expressing a work the purpose of which is to cover the defenders of a line of trenches or parapet from reverse fire, i.e. fire from the rear.

PARADOX (Gr. ira/>&, beyond, contrary to, S6£a, opinion), a proposition or statement which appears to be at variance with generally-received opinion, or which apparently is self-contra- dictory, absurd or untrue, but either contains a concealed truth or may on examination be proved to be true. A ” paradox ” has been compared

with a ” paralogism ” (iropa, X670S, reason), as that which is contrary to opinion only and not contrary to reason, but it is frequently used in the sense of that which is really absurd or untrue.

PARAFFIN, the name given to a mineral wax and oil, and also used as a generic name of a particular series of hydro- carbons.

Commercial Paraffin. — Refined commercial paraffin is a white or bluish-white, translucent, waxy solid substance, of lamina- crystalline structure, devoid of taste and smell, and charac- terized by chemical indifference. It consists of about 85% of carbon and 15% of hydrogen. Although the credit of having first (in 1830) investigated the properties of solid paraffin, obtained from wood-tar, belongs to Karl Reichenbach, the existence of paraffin in petroleum had been more or less hazily known for some time previous. In 1809 Fuchs found solid hydrocarbons in the Tegernsee oils, and in 1819 Buchner separated them from these oils in comparative purity. By the latter they were described as ” mountain-fats,” and they were identified with paraffin in 183 s by von Kobel. Reichen- bach described the results of a series of experiments on the reactions between various substances and paraffin, and on account of the inert nature of the material gave to it its present name (from the Lat. parum, too little, and affinitas, affinity) ; he expressly stated that the accent should fall on the second ” a,” but usage has transferred it to the first.

Paraffin was obtained by Laurent in 1830 by the distillation of bituminous schist, and in 1835 by Dumas from coal-tar; but the product appears to have been regarded only as a curiosity, and Lord Playfair has stated that prior to 1850 he never saw a piece of more than one ounce in weight. Paraffin is asserted to have been made for sale by Reichenbach’s process from wood-tar by John Thorn, of Birkacre, before 1835. In 1833 Laurent suggested the working of the Autun shale, and products manufactured from this material were exhibited by Selligue in

1839.

According to F. H. Storer, the credit of having first placed the manufacture of paraffin on a commercial basis is deservedly given to Selligue, whose patent specifications, both in France and England, sufficiently clearly show that his processes of distilling bituminous schist, &c, and of purifying the distillate, had reached considerable perfection prior to 1845. In its present form, however, the paraffin or shale-oil industry owes its existence to Dr James Young. In 1830 he appMed for his celebrated patent (No. 13,292) ” for obtaining

paraffine oil, or an oil containing paraffine, and paraffine from bituminous coals ” by slow distillation. The process was extensively carried out in the United States under licence from Young,

until crude petroleum was produced in that country in such abundance, and at so low a cost, that the distillation of bitu- minous minerals became unprofitable. The highly bituminous Boghead coal, or Torbanehill mineral, which yielded 120 to 130 gallons of crude oil per ton, was worked out in 1862, and since then the Scottish mineral oils and paraffin have been obtained from the bituminous shales of the coal-measures, the amount of such shale raised in Great Britain in 1907 being 2,690,028 tons.

The following list represents an attempt to assign a geological age to the various occurrences of oil-shale and similar substances throughout the world : —

Oil-Shales

Geological System. Locality.

Miocene France (Vagnas), Servia.

Eocene Brazil.

Cretaceous Syria, Montana, New Zealand.

Neocomian . . . . . Spain.

Jurassic Dorset, Wurttemberg.

Permian France (Autun, &c).

Carboniferous Scotland, Yorkshire, Stafford,

Flint, France, Nova Scotia.

Kerosene-Shale Permo-Carboniferous . . . Queensland, New South Wales,

Tasmania.

Tar-Lignite

Miocene Moravia, Lower Austria, Bavaria.

Rhenish Prussia, Hesse, Saxony. Oligocene Bohemia, Tirol.

Oil-Shale. — The oil-shale of Scotland is dark grey or black, and has a laminated or horny fracture. Its specific gravity is about 1-75, and 20 cub. ft. of it weigh rather less than a ton. The richer kinds yield about 30 gallons of oil per ton of shale, and in some cases as much as 40 gallons, but the higher yield is usually obtained at the expense of the solid paraffin and of the quality of the heavy oils. The inferior shales yield about 18 gallons of oil, but a much larger amount of sulphate of ammonia. The oil consists chiefly of members of the paraffin and olefine series, and thus differs essentially from that obtained from true coal-shales, in which the hydrocarbons of the benzene group are largely represented.

A full account of the Scotch shale-oil industry, as the most important and typical, will be given later, the corresponding industries in other countries and districts being dealt with first.

In addition to the Carboniferous oil-shales of Flint and Stafford, the Kimmeridge shale, a bluish-grey slaty clay, con- taining thin beds of highly bituminous shale, occurs in Dorset- shire, and t has from time to time attracted attention as a possible source of shale-oil products. The so-called ” Kerosene- shale ” of New South Wales has been extensively mined, and the industry is now being developed by the Commonwealth Oil Corporation, Ltd. The French shale-oil industry is much older than that of Scotland, but has made far less progress, the amount of shale distilled in 1897 being 200,000 tons, as compared with 2,259,000 tons in Scotland. The shales of New Zealand have never been extensively worked, the production having decreased instead of increased. Oil-shale of good quality occurs in Servia, and has been found to yield from 43ˆ to 543 gallons of oil per ton. The production of mineral oils and paraffin by the dis- tillation of lignite is carried on in Saxony, the mineral worked being a peculiar earthy lignite, occurring within a small portion of the Saxon-Thuringian brown-coal formation. Other occur- rences of this mineral have been indicated in the list of localities above.

The Shale-Oil Industry of Scotland. — The modern development of the shale-oil industry of Scotland dates from the commence- ment of Robert Bell’s works at Broxburn in 1862.

The oil-shales are found in the Calciferous Sandstone series, lying between the Carboniferous Limestone and the Old Red Sandstone.

They occur at several points in the belt of Carbon- iferous rocks across the centre of Scotland, for the most part in small synclinal basins, the largest of which is that at Pent- land, where the levels are 2 m. long, without important faults. Mining is carried on, where the seams are over 4 ft. thick, by the “pillar and stall” system; seams under 4 ft. are

worked by the ” longwall ” system. The shale is blasted down by gunpowder, and passed over a i-in. riddle, the smalls being left underground. Before being retorted the shale is passed through a toothed breaker, which reduces it to flat pieces 6 in. square. These fall into a shoot, and thence into iron tubs of 10 to 25 cwt. capacity, which run on rails to the tops of the retorts.

The retorts in which the shale is distilled have undergone considerable variation and improvement since the foundation of the industry. Originally horizontal retorts, like those used in the manufacture of coal-gas, were employed, and the heavy oils and paraffin were burned as fuel. When the latter product became valuable vertical retorts were adopted, as the solid hydrocarbons undergo less dissociation under thsse conditions. Steam was employed to carry the oil vapours from the retort. The earliest form of vertical retort was circular (2 ft. in diameter) or oval (2 ft. by 1 ft. 4 in.) and 8 or 10 ft. long. Six or eight of these were grouped together, and the heating was so effected that the bottoms of the retorts were at the highest temperature. They were charged by means of hoppers at the top, the exhausted shale being withdrawn through a water-seal every hour and fresh added, whence this is known as the ” continuous system.”

In the first Henderson retort (1873) the spent shale was used as fuel. The retorts, which were oblong in cross-section, were arranged in groups of four, and had a capacity of 18 cwt. They were charged in rotation, as follows: when a sufficient temperature had been attained in the chamber containing them, one retort was charged from the top, and in four hours the one diagonally opposite to it was charged. After eight hours the one next to the first was charged, and after twelve hours the fourth. Up to the sixteenth hour only ordinary fuel was used in the furnace, but the spent shale from the first retort was then discharged into it. The other retorts were similarly discharged in the above order at intervals of four hours, each being at once recharged. The shale was black when discharged, but soon glowed brightly. Owing to the small amount of carbon in the spent shale, only a slow draught was kept up. The outlet for the oil vapours was at the lower and less heated end of the retorts, and steam, which had been superheated by passage through pipes arranged along one side of the retort chamber, was blown in copiously through pipes to aid in the

uniform heating of the shale and to continuously remove the oil vapours, dissociation from overheating being thus minimized. It was believed that a temperature of about 8oo° F. produced the best results. This retort was worked on what is known as the ” intermittent system.”

The Pentland Composite retort (1882) and the later Henderson type (1889) were both continuous-working and gas-heated, the second being a modification of the first, designed with a view to obtaining a larger yield of sulphate of ammonia without detriment to the crude oil. In both the upper part of the retort was of cast iron and the lower of fire-clay. The upper portion was heated to a temperature of about 900° F. whilst the lower was maintained at about 1300 F. The charge in the retort gradually travelled down, owing to the periodical removal of spent shale at the bottom, and the descent was so regulated that no shale passed into the highly-heated part until it had parted with the oil it was capable of yielding. The shale, however, still contained nitrogen, which in the presence of steam produced ammonia at the higher temperature.

The three classes of retorts now employed in the distillation of shale in the Scottish oil-works are covered by the following patents : —

1. In use at Pumpherston, Dalmeny and Oakbank — No. 8371 of 1894; No. 7 1 13 of 1895; No. 4249 of 1897.

2. In use by Young’s Paraffin Light and Mineral Oil Company, Ltd. — No. 13,665 of 1897; No. 15,238 of 1899.

3. In use by the Broxburn Oil Company, Ltd. — No. 26,647 of 1901. The objects of the invention for which patent No. 8371 of 1894

was granted to Bryson (of Pumpherston Oil Works), Jones (of Dalmeny Oil Works), and Fraser (of Pumpherston Oil Company, Ltd.), are described in the specification as “to so construct the retorts and provide them with means whereby fluxing or dandering of the substance being heated is prevented in the retorts: also to effect an intermittent, continuous, or nearly so, movement within the retort.” In order to carry out these objects, the bottom of the

retort is provided with a disk or table to support the material within the retort. Above the table there is a revolving arm or scraper, by the

action of which a portion of the material is continuously swept off the table and discharged into the hopper below. The column of material within the retort is thus caused to move down- wards, and the tendency of the material to flux or dander is thereby prevented or reduced. In order to pulverize the material before reaching the hopper, teeth may be formed upon the lower part of the retort and upon the table, and the revolving scraper may be similarly toothed. A short revolving worm or screw may be sub- stituted for the table or scraper. As a modification, the table may be made convex and provided on each side with rocking-arms connected together above the table by a cross-arm or scraper.

The principal object of the invention for which patent No. 71 13 of 1895 was granted to the same applicants is stated to be such arrangement of the parts of the retort as results in the retort, after being heated and started, requiring ” practically no fuel to keep it going, owing to the great amount of heat generated in the retort by means of the effectual decomposition of the carbon contained in the waste material by means of one or more jets of steam (which may be superheated) being passed into the retort as near the outlet or discharge-door of the retort as possible, thus utilizing all, or nearly all, the heat contained in the waste material within the retort, thus saving labour, time and expense, as well as wear and tear of the retort.”

The object of the invention for which patent No. 4249 of 1897 was granted to Bryson is stated to be ” to so construct the hoppers of the retorts that one or more retorts can be drawn or discharged through one door, and also to provide simple and efficient means for operating the said door.”

Patent No. 13,665 of 1897 was granted to William Young and John Fyfe for an invention the objects of which are described in the specification in the following words: “To reduce labour, save fuel, and increase the products, and to enable existing but worn- out retorts that have been erected in accordance with the above invention to be economically replaced upon existing foundations by similar retorts, provided with improved and enlarged multiple hoppers for the reception of the shale to pass through the retorts, and also enlarged chambers for the reception of the ash or exhausted shale; the retorts being provided with mechanical arrangements for the continuous passage of the fresh shale into them from the multiple hopper, and the continuous discharge of the ash or spent shale into the receiving chamber. Those improved mechanical alterations in the structure of the retorts greatly reduce the manual labour, enabling most of the work to be done during the day, the multiple hopper and spent-shale

chamber being of such dimensions as will supply fresh shale and receive the spent shale during the night-shift, the only labour then required being the supervision, regulating tem- perature of the retorts, and seeing that the mechanical arrangements are working properly."

The multiple hoppers are constructed of mild steel plates with flat bottoms to which the retorts are bolted by flanges, the steel bottoms admitting of the differential expansion, to which the retorts are subject, taking place without damage to the retorts or hoppers. To ensure the shale regularly passing from the hoppers to the retorts, each hopper is provided with a rocking-shaft to which are attached rods or chains hanging into the mouths of the retorts, these rods or chains being thus made to rise or fall. The spent shale receiving-chambers at the lower end of each retort are of greatly enlarged size, and the lower end of each retort is provided with a mechanical device for the continuous discharge of the spent shale into these chambers. The improvements are stated to be specially applicable to retorts of the Young and Beilby (Pentland) type.

Patent No. 15,238 of 1899 was obtained by the same inventors for improvements designed to obviate objections found to attach to retorts constructed on the ordinary Young and Beilby system. In the use of such retorts, composed of an upper metallic section and a lower fire-brick section, with chambers or hoppers at their upper ends, these upper ends became gradually filled up with hard carbon- aceous matter, and this necessitated the periodical stopping of the working to have such matter removed. Moreover, the shale residues became fluxed and fixed to the walls of the lower section of the retorts. The residues were further liable to pass through the retort in an imperfectly exhausted condition, and to pass more quickly down the front or side of the retort next the discharging door. It was also found that when air and steam were used difficulties arose in regulating the quantities and proportions of steam and air used to burn the carbon out of the shale residues while preventing obstructions due to fluxing of the residues. To overcome these drawbacks each retort is composed of four sections, viz. a hopper redistillation chamber at the top, a metallic section, a fire-brick chamber, and a combustion chamber of large capacity at the bottom. The combustion chamber is not externally heated, but receives the spent shale from the retort in a red-hot condition, and the further supply of heat in this chamber is wholly due to the burning of the carbon by the introduced air and steam, the danger of the fluxing and fixing of the shale residue to the walls of the chamber being thus minimized. To successfully burn the carbon remaining in the shale residue when it reaches the combustion chamber, so as to obtain the maximum yield of ammonia, careful

regulation of the quantity and

proportions of the air and steam is necessary, and a special device is provided for this.

The important construction of retorts for which patent No. 26,647 of 1901 was granted to N. M. Henderson of the Broxburn Oil Works, relates to such retorts as are described in the same inventor's previous patent, No. 6726 of 1889. The patentee dispenses with the chamber or space between the upper and lower retorts, the upper cast-iron retorts being carried direct on the upper end of the lower brick retorts, thus forming practically one continuous retort from top to bottom; and instead of one toothed roller being employed for the purpose of withdrawing the exhausted residue, a pair of toothed rollers is used for each retort. This improved construction is stated to give " better and larger results with less labour and expense in working and for repairs."

The vapour from these retorts, amounting to about 3000 cub. ft. per ton, is partially condensed by being passed through 70 to 100 vertical 4-in. pipes, whose lower ends fit into a chest. About one-third of the vapour is condensed, the liquid, consisting of about 75% of ammoniacal liquor and 25% of crude oil, flowing into a separating tank, whence the two products are separately withdrawn for further treatment. Part of the uncondensed gas is sometimes purified and used for illuminating purposes, when it gives a light of about 25 candle-power. The remainder is used as fuel, usually after compression or scrubbing to remove all condensable vapours.

Crude shale-oil is of dark green colour, has a specific gravity o-86o to 0-890, and as at present manufactured, with the newer forms of retorts, has a setting point of about 90° F. It contains from 70 to 80% of members of the paraffin and olefine series, together with bases of the pyridine series, and some cresols and phenols. Beilby states that average Scotch shale-oil con- tains from i- 16 to i-4S% of nitrogen, mainly removable by sulphuric acid of specific gravity 1-220, and mostly remaining in the pitchy residues left on distillation. The lightest dis- tillate, known as naphtha, contains from 60 to 70% of defines and other hydrocarbons acted upon by fuming nitric acid, and the lubricating oils consist mainly of olefines. The paraffin wax chiefly distils over with the oil of specific gravity above 0-840.

In the refining of crude shale-oil, the greatest care is exercised to prevent dissociation of the paraffin, large volumes of super- heated steam being passed into the still, through a perforated pipe, at a

pressure of from 10 to 40 lb, to facilitate distillation at the lowest possible temperature. The original system of intermittent distillation is now employed only at the works of Young's Company. The stills have cast-iron bottoms and malleable-iron upper parts, their former capacity being 1200 to 1400 gallons, but those now made usually holding 2000 to 2500 gallons. Each still has its own water-condenser, the flow of water being regulated according to the nature of the distillate. The usual condensing surface is 230 ft. of 4-in. pipe. The process now in general practice is, with slight varia- tions, the Henderson system of continuous distillation (patent No. 13,014 of 1885). It consists of a primary wagon-still, connected with two side-stills, which are further connected with pot-shaped coking-stills. The oil is heated in feed-heaters by the gases evolved from the hottest still before passing into the first still, where the temperature is so regulated as to drive off only naphtha up to about 0-760 specific gravity. The heavier portion of the oil passes to the other stills, the outermost receiving the heaviest only.

In both these systems the naphtha is collected separately, while the remainder of the distillate, known as " once-run oil," is condensed without fractionation. This " once-run oil " is treated with sulphuric acid and alkali at a temperature of ioo° F. in agitators of varying construction — some being horizontal cylinders with a shaft carrying paddles, while others take the form of vertical cylindrical tanks with egg-shaped bottoms — in which agitation is produced by means of compressed air. The loss of oil during the agitation is estimated at 1-5 to 2-0 %.

The oil is next fractionated, either by the intermittent or the continuous system. After the most volatile fractions have distilled off, steam is blown in through a pipe at the bottom of the still. In many cases the distillate, with a density up to

0-770, constitutes the crude naphtha, and that up to a density of 0-850 the burning oil. The remainder of the distillate, which solidifies at common temperatures, consists chiefly of lubricating oils and paraffin. These three fractions are delivered from the condensers into separate tanks. Although the crude- oil stills of Henderson may be employed for the continuous distillation of the once-run or other oils obtained in the process of refining, the inventor prefers another form of apparatus which he patented in 1883 (No. 540), and this is now

generally used. This consists of three horizontal cylindrical stills, 7 ft. in diameter and 19 ft. in length. The oil enters through a pipe which passes through one end of the still and discharges at the opposite end, while the outlet-pipe is fitted below the inlet-pipe at the bottom of the end through which the latter passes, inlet and discharge being thus as far as possible from each other. The oil circulates as in the crude-oil stills. The burning oil is next treated with acid and alkali, and subsequently again fractionally distilled, the heavier portion yielding paraffin scale, while the residues are redistilled. The final chemical purification of the burning oil resembles that last referred to, but only half the quantity of acid is employed. The lighter products of these distillations form the crude shale naphtha, which is treated with acid and alkali, and redistilled, when the lightest fractions constitute the Scotch " gasoline " of commerce, and the re- mainder is known as " naphtha."

The solid paraffin, which is known in its crude state as paraffin scale, was formerly produced from the heavy oil obtained in the first, second and third distillations, that from the first giving " hard scale," while those from the second and third gave " soft scale." The hard scale was crystallized out in shallow tanks, and the contained oil driven out by compression of the paraffin in filter bags. Soft scale was obtained by refrigeration, cooled revolving drums being caused to dip into trays con- taining the oil, when the paraffin adhered to the drums and was scraped off by a mechanical contrivance. Later improved appliances have aimed at the slow cooling of oil in bulk, whereby large crystals of paraffin are produced. Several processes have been invented, the most generally used being that patented by Henderson (No. 0557 of 1884). His cooler consists of a jacketed trough having a curved bottom, and divided into a series of transverse casings by metal disks, each consisting of two thin plates bolted together, but with a space between, in which, as also in the jacket surrounding the trough, cold brine is circulated. The paraffin crystallizes on the cold surfaces, from which it is constantly removed by scrapers, so that successive portions of the oil are cooled. The solid paraffin accumulates in a well or channel, where it is stirred up by rotary arms, so that it may be readily drawn away by a pump to the filter-press, whereby the solid paraffin is freed from oil. In the improved process of cooling employed at the works of the Oakbank Oil Company the oil to be cooled is pumped through coils submerged in the expressed oil from the filter-presses into the inner space of vertical coolers formed of two cast-iron tubes, and thence direct to the filter-presses. In the inner chamber of the coolers are fitted revolving scrapers, while in the outer annular space compressed ammonia is expanded.

The crude paraffin is then refined, for which purpose the ” naphtha treatment ” was formerly employed, but this has now given place almost ■ entirely to the “sweating process.” In the former the paraffin is dissolved in naphtha and then crystallized out. The sweating process consists in heating the crude wax to such a temperature that the softer portions are melted and flow away with the oil. In the process patented by N. M. Henderson (Nos. 1291 of 1887 and n, 799 of 1891), a chamber, 52 ft. by 13 ft. by 10 ft. high, heated by steam-pipes, and provided with large doors and ventilators for cooling, is fitted with a number of superimposed trays, 21 ft. by 6 ft. by 6 in. deep. These rest on transverse heating pipes, and each tray has a diaphragm of wire gauze. The bottoms communicate with short pipes fitted with swivel nozzles, worked on a vertical shaft. The diaphragms are covered with | in. of water, and the crude paraffin is melted and pumped through charging-pipes

on to its surface. When the paraffin has solidified, the water is drawn off, leaving the cake resting on the gauze. Doors and ventilators are then closed, and the chamber is heated, where- upon the liquefied impurities are drained off until the outflowing paraffin sets on a thermometer bulb at 130 F. The remainder is melted and decolorized by agitation with finely powdered charcoal. The charcoal is mainly separated by subsidence, and the paraffin drawn off into filters, whence, freed from the suspended charcoal, it runs into moulds, and is thus formed into cakes of suitable size for packing. The lubricating oils are refined by the use of sulphuric acid and alkali, substantially in the same manner as the burning oils.

The following table shows the average yield, in 1895, of the various commercial products from crude shale-oil at two of the principal Scottish refineries. The percentages are, however, often varied to suit market requirements: — –

Young’s Paraffin Light and Mineral Oil Co.

%

Gasoline and naphtha 6-09

Burning oils 31-84

Intermediate and heavy oils 23-97

Paraffin scale I3‘53

Total 75-43

Loss 24-57

Broxburn Oil Co.

Naphtha

Burning oil 30-0

Gas oil 9-0

Lubricating oil

Paraffin

Loss

100-00

% 3-0

39 -o

18-0

io-o

30-0

100-0

From the ammoniacal liquor the ammonia is driven off by the application of heat in stills, the evolved vapour being conducted into ” cracker-boxes,” which are now usually of circular form, from 5 to 8 in. in diameter, and 6 to 12 in. in depth. In these boxes the ammonia is brought into contact with sulphuric acid of about 50 Tw., and is thus converted into sulphate. Wilton’s form of cracker-box, which is now generally in use, is provided with an arrangement for the automatic discharge on to a drying table of the sulphate of ammonia as it is deposited in the well of the box, and the process is worked continuously. For the heating of the ammoniacal liquor the ordinary horizontal boiler-stills formerly used have been superseded by ” column-” stills, in which the liquor is exposed over a large area, as it passes from top to bottom of the still, to the action of a current of steam. (B. R.)

Paraffin, in chemistry, the generic name given to the hydro- carbons of the general formula CH2„+2. Many of these hydrocarbons exist as

naturally occurring products, the lower (gaseous) members of the series being met with as exhalations from decaying organic matter, or issuing from fissures in the earth; and the higher members of the series occur in petroleum (chiefly American) and ozokerite. They may be synthetized by reducing the alkyl halides (preferably the iodides) with nascent hydrogen, using either sodium amalgam, zinc and hydrochloric acid, concentrated hydriodic acid (Berthelot, Jour. prak. Chem. 1868, 104, p. 103), aluminium amalgam (H. Wislicenus, ibid., 1896 (2), 54) or the zinc-copper couple (J. H. Gladstone and A. Tribe, Ber., 1873, 6, p. 202 seq.) as reducing agents.

They may also be derived from alkyl halides by heating to 120ˆ140* with aluminium chloride in the proportion of three molecules of alkyl halide to one molecule of aluminium chloride (B. Kohnlein, Ber., 1883, 16, p. 560) ; by heating with zinc and water to 150-160° C. (E. Frank- land, Ann., 1849, 71, p. 203; 1850, 74, p. 41), 2 RI + 2Zn + 2H 2 = 2RH + ZnI 2 -t-Zn(OH) 2 ; by conversion into zinc alkyls, which are then decomposed by water, ZnR 2 + 2H 2 = 2 RH + Zn(OH) 2 ; by conversion into the Grignard reagent with metallic magnesium and decomposition of this either by water, dilute acids or preferably ammonium chloride (J. Houben, Ber., 1905, 38, p. 3019), RMgI + H 2 = RH + Mgl(OH); by the action of potassium hydride (H. Moissan, Comptes renins, 1902, 134, p. 389); and by the action

of sodium, in absolute ether solution (A. Wurtz, Ann. chim. phys., 1855 (3), 44, p. 275), 2RI + 2Na = R-R-T-2NaI. They may also be obtained by the reduction of the higher fatty acids with hydriodic acid (F. Krafft, Ber., 1882, 15, pp. 1687, 1711), CnH 2 „02 + 6HI = CnH2« + 2 + 2H20 + 3l2; by the conversion of ketones into ketone chlorides by the action of phosphorus pentachloride, these being then reduced by hydriodic acid,

(C»H2ˆ|-i)2 CO 7 (CnH2m + l)2CCi2 7 (C»H2n4.i)2CH2 ;

by the reduction of unsaturated hydrocarbons with hydrogen in the presence of a ” contact ” substance, such, for example, as reduced nickel, copper, iron or cobalt (P. Sabatier and J. B. Senderens, Ann. chim. phys., 1905 [8], 4, pp. 319, 433); by the elimination of carbon dioxide from the fattv acids on heating their salts with soda- lime or baryta, CHsCOjNa + NaOHˆCHi + NajCOs, or by heating their barium salts with sodium methylate in vacuo (I. Mai, Ber., 1889, 22, p. 2133);

by the electrolysis of the fatty acids (H. Kolbe, Ann., 1849, 69, p. 257), 2C 2 H402 = C2H 6 +2C02+H20; and by the action of the zinc alkyls on the ketone chlorides, (CH 3)2CCl2+ Zn(CH 3) 2 = C 6 H 12 +ZnCl2.

The principal members of the series are shown in the following table : —

Name.

Formula.

Melting- point.

Boiling- point,

Normal Butane . Isobutane Normal Pentane . Secondary Pentane Tertiary Pentane

Tridecane Tetradecane . Pentadecane . Hexadecane . Heptadecane . Octadecane . Nonadecane .

Heneicosane .

Tricosane Tetracosane . Hexacosane . Hentriacontane . Dotriacontane Pentatriacontane . Dimyricyl . .

CH 4 C2H» C3H8 C4H10

,,

C6H12

». »)

C0H14 C7H16 CsHi8 C9H20 C10H22 C11H24 C12H26 C13H28 C14H30 C15H32 C16H34 CnHse C18H38 C19H40 C20H42 C21H44 C22H46 C23H48 C24H50 C26H54 C3iHe4 C82H«8 C36H72 CeoHi22

-184°

-172-1°

-45°

~K

~ 31

-26-5°

-12° -6-2°

+10° +18°

+22° +28°

+32° +37° +40° +44° +48°

+ 5I o +58° +68° +70-5°

+ 75\

+ 102°

— 164° (760 mm.) -84-1° (749..) -44-5°

+ 1*

+36-3° +30-4°

+ 9 .

+69°

98-99° 125-126°

^°°

173-4°

196°

214-216°

234°

252°

270°

287°

170° (15 mm.)

317°

330°

205° (15 mm.)

215° (.. ..) 224° („ „)

234° (.. ..) 243° (.. ..)

302° (15 mm.) 331° .. ,.) 331° (.. „)

The lowest members of the series are gases at ordinary tem- perature; those of carbon content C 6 to C15 are colourless liquids, and the higher members from Ci 6 onwards are crystalline solids. The highest members only volatilize without decom- position when distilled under diminished pressure. They are not soluble in water, although the lower and middle members of the series are readily soluble in alcohol and ether, the solubility, however, decreasing with increase of molecular weight, so that the highest members of the series are almost insoluble in these solvents. The specific gravity increases with the molecular weight but always remains below that of water; The paraffins are characterized by their great inertness towards most chemical reagents. Fuming sulphuric acid converts the middle and higher members of the series into sulphonic acids and dissolves the lower members (R. A. Worstall, Amer. Chetn. Journ., 1898, 20, p. 664). Dilute nitric acid, when heated with the paraffins in a tube, converts them into secondary and tertiary nitro- derivatives (M. Konowalow, Ber., 1895, 28, p. 1852), whilst long boiling with strong nitric acid or nitro-sulphuric acid converts the middle and higher members of the series partly into primary mono- and di-nitro compounds and partly oxidizes them to carbonic, acetic, oxalic and succinic acids (Worstall, ibid., 20, p. 202; 21, p. 211). Fuming nitric acid only reacts slowly with the normal paraffins at ordinary temperature, but with those containing a tertiary carbon atom the reaction

is very energetic, oxidation products (fatty acids and dibasic acids) and a small quantity of polynitro compounds are obtained (W. Markownikow, Centralblatt, 1899, 1, p. 1064; Ber., 1899, 32, p. 1441). Chlorine reacts with the paraffins, readily sub- stituting hydrogen. Isomeric hydrocarbons in this series first appear with butane, the number increasing rapidly as the complexity of the molecule increases. For a means of deter- mining the number of isomers see E. Cayley, Ber., 1875, 8, p.1056; F. Hermann, Ber., 1898,

31, p. 91.

For Methane see Marsh Gas. Ethane, C 2 H6, occurs in crude petroleum. It may be prepared by the general methods given above; by heating mercury ethyl with concentrated sulphuric acid (C. Schorlemmer, Ann., 1864, 132, p. 234) ; or by heating acetic anhydride with barium peroxide (P. Schiitzenberger, Zeit.fur Chemie, 1865, p. 703), 2(CH 3 CO)20+Ba02 = C2H 6 + Ba(C 2 H 3 02)2+2C02. It is a colourless gas which can be liquefied at 4° C. by a pressure of 46 atmospheres. By slow combustion it yields first water and acetaldehyde, which then oxidizes to oxides of carbon and water (W. A. Bone; see Flame), whilst in ozonized air at 100° it gives ethyl alcohol, together with acetaldehyde and traces of formaldehyde (Bone, Proc. Chem. Sec, 1904, 29, p. 127).

■Dimyricyl (hexacontane) , CeoHm, is prepared by fusing myricyl iodide with sodium (C. Hell and C. Hagele, Ber., 1889, 22, p. 502). It is only very slightly soluble in alcohol and ether.

PARAGON, a term for that which is a model of excellence or pattern of perfection, hence some person or thing which has no equal. The word was adopted from the O. Fr. paragon, Mod. parangon, Ital. paragone and Span, paragon. The Spanish has usually been taken as the source, and the word explained as from the prepositional phrase para con, in comparison with. But the word first appears in Italian, meaning a ” touchstone.” The Italian word may be connected with the Gr. irapaKovav, to sharpen by the use of a whetstone (a/covr;). The term has been used in several technical applications, e.g. in printing, of a large style of type between ” great primer ” and ” double pica,” now usually called ” two-line long primer “; of a diamond weighing more than 100 carats; and formerly of a fabric used for hangings in the 17th and 18th centuries.

PARAGRAPH, a term for a section or division of written or printed matter, which, as beginning a new subject, marking a break in the subject, &c, is signified by beginning the section on a new line set back or indented; also by the symbol, now^l, a reversed P, formerly (J or t), to mark such a division. The Gr. irapaypaifos (irapa and yp&faiv, to write alongside or beside) was used of the short horizontal line or stroke which marked a line in a MS. where such a division occurs; and irapaypacjyl] of a marginal note, also the division so marked. The word ” paragraph,” besides these technical typographical meanings, is also applied to the separate numbered sections in an affidavit or other legal document, or in a statute, &c, and in journalism to a short item of news or brief notice of events.

PARAGUAY, an inland republic of South America, between 20 16′ 14″ and 26° 31′ S. and 54° 37′ and 62° W. It is bounded on the N.W. by Bolivia, N. and E. by Brazil, S.E., S. and W. by Argentina. Pop. (1905 estimate), 631,347, including 50,000 Iguassu Indians; area, about 97,700 sq. m.

By the treaty of 1872 the Brazilian frontier was drawn up the Parana from the mouth of the Iguassu or Y-Guazu (25° 30′ S.) to the Salto Grande or Great Cataract of La Guayra (24 7’), thence west along the watershed of the Sierra de Maracayu, north along the Sierra de Ambaya to the sources of the Apa, and down that stream to its junction with the Paraguay. The Buenos Aires treaty of the 3rd of February 1876 fixed the frontier between Argentina and Paraguay, and assigned to Paraguay the portion of the Gran Chaco between Rio Verde and Bahia Negra; the appropriation of the portion between Rio Verde and the Pilcomayo was submitted to the arbitration of the president of the United States, who in 1878 assigned it to Paraguay. The frontier line towards Bolivia has long been in dispute.

Physical Features. — The river Paraguay, running from north to south, divides the republic into two sections, the eastern section, or Paraguay Oriental, being the most important. The

western section forms part of the great plain called the Gran Chaco (see Argentina), and is to a large extent unexplored. Paraguay proper, or the country between the Paraguay and the Parana, is traversed from north to south by a broad irregular belt of highlands, which are known as the Cordillera Ambaya, Cordillera Urucury, &c, but partake rather of the character of plateaus, and form a continuation and outwork of the great interior plateau of Brazil. The elevation nowhere much exceeds 2200 ft. On the western side these highlands terminate with a more or less sharply denned edge, the country sloping gradually up to their bases in gentle undula- tions with open, ill-defined valleys; on the eastern side they send out broad spurs enclosing deep-cut valleys, and the whole country retains more of an upland character. The tributaries that flow westward to the Paraguay are conse- quently to some extent navigable, while those that run eastward to the Parana are interrupted by rapids and falls, often of a formidable description. The Pilcomayo, the largest western tributary of the Paraguay, and an important frontier river, is only navigable in its upper and lower reaches. From the Asuncion plateau southwards,

near the confluence of the Paraguay and Parana, there is a vast stretch of marshy country, draining partly into the Ypoa lagoon, amd smaller tracts of the same character are found in other parts of the lowlands, especially in the valley of the Paraguay. Many parts of the country sloping to the Parana are nearly covered with dense forest, and have been left in possession of the sparsely scattered native tribes. But the country sloping to the Paraguay, and comprising the greater part of the settled districts, is, in keeping with its proximity to the vast plains of Argentina, grassy and open, though the hills are usually covered with forest and clumps of trees are frequent in the lowlands. Except in the marshy regions and along the rivers, the soil is dry, porous and sandy.

Geology. — Little is known of the geology of Paraguay. A large part of the area is covered by Quaternary deposits, which com- pletely conceal the solid foundation on which they rest. The hills and plateaus appear to be composed chiefly of the same sand- stone series which in the Brazilian province of Rio Grande do Sul contains seams of coal, with plant remains similar to those of the Karharbari series of India (Permian or Upper Carboniferous). It is probable, also, that the Palaeozoic rocks of Matto Grosso extent! into the northern part of the country.

Minerals. — The gold mines said to have been concealed by the Jesuits may have had no existence; and though iron was worked by F. S. Lopez at Ibicuy (70 m. south-east of Asuncion), and native copper, oxide of manganese, marbles, lime and salt have been found, the real wealth of the country consists rather in the variety and value of its vegetable products.

Climate and Fauna. — The year in Paraguay is divided into two seasons — ” summer,” lasting from October to March, and ” winter,” from April to September. December, January and February are generally the hottest months, and May, June, July and August the coldest. The mean temperature for the year seems to be about 75° or 76°; for summer 81°, for winter 71°. The annual rainfall is about 46 in., fairly well distributed throughout the year, though the heaviest precipitation occurs in August, September and October. The prevailing winds blow from the north or south. The south wind is dry, cool and invigorating, and banishes mos- quitoes for a time ; the north wind is hot, moist and relaxing. Violent wind storms generally come from the south.

The fauna of Paraguay proper is practically the same as that of Brazil. Caymans, water-nogs (capinchos), several kinds of deer (Cervus

paludosus the largest), ounces, opossums, armadillos, vampires, the American ostrich, the ibis, the jabiru, various species popularly called partridges, the pato real or royal duck, the Pala- tnedea cornuta, parrots and parakeets, are among the more notable forms. Insect life is peculiarly abundant; the red stump-like ant-hills are a feature in every landscape, and bees used to be kept in all the mission villages.

Population. — The great majority of the inhabitants are of Indian (Guarani) descent, with very slight traces of foreign blood. Civilization has not made much progress, and the habits of the people are more primitive than those in the more advanced neighbouring republics. As a general rule the Para- guayans are indolent, especially the men. Climatic conditions obviate the necessity of any superfluity of clothing. A cotton chemise, and a white mania wrapped in Moorish fashion over

head and body, constitute the dress of the women; a cotton shirt and trousers that of the men. Boots and shoes are worn only by the upper classes. Goitre and leprosy are the only endemic diseases; but the natives, being underfed, are prone to diarrhoea and dyspepsia. The common language of the country is Guarani, although in a few districts Tupi is spoken. The country people as a rule understand a little Spanish, if living near any trading centre. ” New Australia ” is a pastoral and agricultural settlement, originally founded in 1893 by immigrants from Australia as an experiment in communism. The colony failed at first, and was reconstituted in 1894. The settlers numbered 161 in 1908. Immigration is on a small scale (1024 in 1908), but tends to increase; it is encouraged by the govern- ment, which seeks to divert to Paraguay some portion of the Italian labour immigrant into Brazil and Argentina. In 1908 the total foreign population numbered about 18,000, half of whom were natives of Argentina. The principal towns are Asuncion, the capital (pop. 1905, 60,259), Villa Rica (25,000), Concepcion (15,000) and Villa del Pilar (10,000); these are described in separate articles. Encarnacion on the Parana has a large transit trade.

Government. — The constitution of the republic was voted by a constituent assembly on the 25th of November 1870. Legis- lative power is vested in a Congress consisting of a Senate and a Chamber of Deputies, elected by universal manhood suffrage in the proportion of one senator for every 12,000 inhabitants and one deputy for every 6000. Every member of Congress receives a salary of about £200. The head of the executive is the president, chosen by an electoral college for four years, and only re-eligible after eight consecutive years. He is aided by a cabinet of five ministers, responsible to Congress. Should

he die during his term, or otherwise become unable to fulfil his duties, the president is succeeded by the vice-president (similarly elected), who is ex officio chairman of the Senate. The highest judicial authority is the Supreme Court, which is empowered to decide upon the constitutional validity of acts passed by Congress; its three members are appointed for four years by Congress, subject to the approval of the president. There are five courts of appeal, and inferior tribunals in all the large towns. The civil and criminal codes at Argentina have been adopted, almost without change. For purposes of local administration the republic is divided into 23 counties (partidos), which are subdivided into communes.

Religion and Instruction. — Roman Catholicism is the established religion, but the constitution guarantees full liberty to all other creeds. Asuncion, the only bishopric in the state, is in the archi- episcopal province of Buenos Aires. Education is backward and was long neglected. By law it is free and compulsory, but in some districts the attendance of many children is impossible. In 1907 there were 554 primary schools with 41,000 pupils.

Defence. — In 1908 the standing army, including cavalry, infantry and artillery, numbered about 1 150 men; and there were five government steamers used for transport and revenue purposes.

Finance. — The financial situation of Paraguay has been a source of anxiety for many years. In 1885, after interest had been unpaid for 11 years on bonds amounting to £1,505,400, an agreement was made for the issue of new scrip to the value of £850,000 in quittance of all claims for capital and arrears of interest, certain public lands being also ceded to the bondholders as compensation. In 1895 an arrangement was made for a reduction of the rate of interest, for the funding of the arrears, and for the creation of a sinking fund. The government were unable to meet their obligations under the new contract, and in 1898 the outstanding amount had risen to £99

The revenue is derived mainly from import duties, and the most important branches of expenditure are the salaries of public officials, the army, public instruction and debt. The estimated revenue and expenditure for the three years 1906-1908 are shown in the following table: —

1906

1907

1908

Revenue Expenditure

£452,812

454,564

£635,000

677,982

£599,828

506,502

The budget for 1906 remained in force in 1907 and 1908.

Industry. — The principal industries are the cultivation and preparation of yerba mate (Paraguayan tea), cattle- farming, fruit-growing, tobacco-planting and timber-cutting. Yerba mate, classi- fied as Ilex Paraguay ensis, is a shrub. The leaves are stripped, withered, rolled and sorted, then packed in sacks and exported, chiefly to Argentina. Paraguayan tea is used in place of the ordinary tea or coffee in many parts of South America. Medical experts state that the beverage infused from the leaves has a stimulating effect, and is also slightly diuretic. The total amount exported from Paraguay in 1908 was 4133 tons. The majority of the yerbales (tea plantations) were formerly the property of the government, but have been acquired by private enterprise. An important feature about yerba mate is the small expense necessary for its production, and the cheap rate, notwithstanding the high tariff on its importation, at which it can be placed on the Argentine market as compared with ordinary tea or Brazilian coffee.

The cattle industry comes next in importance. The number of animals was estimated at 5,500,000 on the 31st of December 1908; an increase of about 45% since the census of 1899, The animals are small, but Durham and Hereford bulls have been introduced from Argentina to improve the breed. The increase in the herds has caused the owners of saladero establishments in Argentina and Uruguay to try the working of factories in Paraguay for the pre- paration of tasajo (jerked beef)

and the manufacture of extract of meat. Both grasses and climate “are against sheep-farming on a large scale.

Oranges are exported to Buenos Aires, Rosario and Montevideo, and are largely used for fattening hogs. The orange groves are often uncultivated, but yield abundantly; 10,700,000 dozens of oranges were exported in 1908. Pineapples are also exported, and sugar-cane, cotton, coffee and ramie are cultivated. Tobacco, although of inferior quality, is grown to a considerable extent; the quantity exported rose from about 35 tons in 1900 to 5014 tons in 1908. Tobacco is chiefly exported to Germany. The staple diet of the Paraguayans is still, as when the Spaniards first came, maize and mandioca (the chief ingredient in the excellent chipa or Paraguayan bread), varied, it may be, with the seeds of the Victoria regia, whose magnificent blossoms are the great feature of several of the lakes and rivers.

The forests abound in such timber as quebracho, cedar, curupey, lapacho and urundey. Some of these, such as the lapacho and quebracho, are of rare excellence and durability, as is shown by the wonderful state of preservation in which the woodwork of early Jesuit churches still remains. Fifteen plants are known to furnish dyes, and eight are sources of fibre — the caraguatay especially being employed in the manufacture of the exquisite nanduty or spider web lace of the natives. Rum, sugar, bricks, leather, furniture and extract of meat are manufactured.

Commerce. — The commercial situation of Paraguay has improved in consequence of the investment of foreign capital in industrial enterprise. The principal articles imported are textiles, hardware, wines, rice, flour, canned goods and general provisions; the exports are yerba mate, hides, hair, dried meat, wood, oranges, tobacco. Most of the export trade is with Buenos Aires or Montevideo. The values for the five years 1904-1908 were: —

1904

1905

1906

1907

1908

Imports Exports

£713.146

639,252

£935.703

566,602

£1,253,439

539,028

£i,572,255

647,222

£814,591

773.419

Of the imports into Paraguay, 29% came from Germany in 1908, 21 % from the United Kingdom and 19% from Argentina.

Communications. — Numerous ocean-going liners, most of which fly the Brazilian or the Argentine flag, ply on the Paraguay and the Parana; smaller vessels ascend the tributary streams, which are also utilized for floating lumber down to the ports. Out of 1320 ships which entered Asuncion in 1908 and 1 184 which cleared, none was of British or United States nationality. The Brazilian Lloyd S S Co. provides direct and regular communication between Asuncion and New York. The only railway in the republic is the Paraguay Central which was open in 1906 between Asuncion and Pirapo (154 m.). The completion of the line to Encarnacion was then undertaken (1906-1911), a train-ferry across the Parana affording connexion with Posadas. These extensions, and the alteration of gauge to that of the Argentine North-Eastern, were carried out mainly at the cost of the Argentine government, which acquired a controlling interest in the Paraguay Central. They were intended to shorten the journey between Buenos Aires and Asuncion from 5 days to 36 hours. There are some fairly good wagon roads, and the government appropriates annually a con- siderable sum for their extension.

Post and Telegraph. — Paraguay entered the Universal Postal

Union in 1884. Telegraph lines connect Asuncion with other towns, and two cables put the republic in communication with the rest of the

world by way of Corrientes and Posadas.

Money and Credit. — The banks open for business in 1904 were the Mercantile Bank, the Territorial Bank, the Bank of Los Rios & Co., and the Agricultural Bank: the last named has a capital of £207,590, advanced by the government, and lends money to the agricultural and industrial classes. The Paraguayan Bank, with a capital of £600,000, was opened in 1905, and the state bank (Banco de la Republica), with a total authorized capital of £4,000,000, was opened on the 30th of June 1908. The Conversioii Office, which is authorized to sell or lend gold, receives a fixed revenue of £30,000 from certain import and export dues; it was reorganized in 1903 for the administration of the public debt. In the same year the gold and silver coinage of Paraguay were legally standardized as identical with those of Argentina (5 gold dollars or pesos = £1) ; but paper money is about the only circulating medium, and gold com- mands a high premium (1600% in December 1908). The normal value of the paper or currency dollar is about 4s. 8d. (For pur- poses of conversion the gold dollar has been taken at 5 = £1 through- out this article, and the currency dollar at 50 = £1.)

Weights and Measures.— -The metric system is officially adopted, but the weights in common use are the tonelada (2025 lb), the quintal (101-4 R>), the arroba (25-35 R>). the libra (1-014 R>) and the onza (-0616 lb). The unit for liquid measure is the cuarta (•1665 gallon); for dry measure the almud (-66 bushel) and fanega (ij bushels). The land measures are the legua (2-689 m) the sino (69J sq. yds.), and the legua cuadrada (i2j sq. m.).

History. — In 1527 Sebastian Cabot reached Paraguay and built a fort called Santo Espiritu. Asuncion was founded on the 15th of August 1 S3 5 by Juan de Ayolas, and his successor, Martinez de Irala, determined to make it the capital of the Spanish possessions east of the Andes. From this centre Spanish adventurers pushed east to La Guayra, beyond the Parana, and west into the Gran Chaco; and before long vast numbers of the less warlike natives were reduced to serfdom. The name Paraguay was applied not only to the country between the Paraguay and the Parana, but to the whole Spanish territory, which now comprises parts of Brazil, Uruguay and the Argentine provinces of Buenos Aires, Entre Rios, Corrientes, Misiones, and part of Santa Fe. It was not till 1620 that Paraguay proper and Rio de la Plata or Buenos Aires were separated as distinct governments, and they were both dependent on the vice-royalty of Peru till 1776, when Buenos Aires was erected into a vice- royalty, and Paraguay placed under its jurisdiction. The first Christian missions in Paraguay

were established by the Franciscans — Armenta, Lebron, Solano (who was afterwards canonized as the ” Apostle of Paraguay “) and Bolanos — between 1542 and 1560; but neither they nor the first Jesuit missionaries, Salonio, Field and Ortega, were allowed to make their enterprise a permanent success. This fell to the lot of the second band of Jesuits, Cataldino, Mazeta and Lorenzana, who began work in 1605. Though they succeeded in establishing a kind of imperium in imperio, and were allowed to drill the natives to the use of arms, the Jesuits never controlled the government of Paraguay; indeed they had nearly as often to defend themselves from the hostility of the governor and bishop at Asuncion as from the invasions of the Paulistas or Portuguese settlers of Sao Paulo. It was only by the powerful assistance of Zabala, governor of Buenos Aires, that the anti-Jesuit and quasi-national party which had been formed under Antequera was crushed in 1735. In. 1750, however, Ferdinand VI. of Spain ceded to the Portu- guese, in exchange for the fortified village of Colonia del Sacra- mento (Uruguay), both the district of La Guayra and a territory of some 20,000 sq. m. east of the Uruguay. The Jesuits resisted the transference, and it was only after several engage- ments that they were defeated by the combined forces of Spain and Portugal. The treaty was revoked by Spain in 1761, but the missions never recovered their prosperity, and the Jesuits were finally expelled in 1769. In 1811 Paraguay declared itself independent of Spain; by 1814 it was a despotism in the hands of Dr J. G. R. Francia (q.v.). On Francia’s death, in 1840, the chief power passed to his nephew, Carlos Antonio Lopez (q.v.), who in 1862 was succeeded by his son Francisco Solano Lopez. In 1864 a dispute arose between the younger Lopez and the Brazilian government, and Lopez marched an army through Argentine territory to invade southern Brazil,

This act induced the governments of Brazil, Uruguay and Argentina to combine for the purpose of suppressing Lopez. The invasion of Paraguay then took place, and a struggle involving an enormous sacrifice of life and treasure lasted for five years, only coming to a close when the Paraguayan forces were totally defeated and Lopez was killed at the battle of Aquidaban on the ist of March 1870. During this warfare every male Paraguayan capable of bearing arms was forced to fight, whole regiments being formed of boys of from 12 to 15 years of age. Even women were used as beasts of burden to carry ammunition and stores, and when no longer capable of work were left to die by the roadside or murdered to avoid any ill consequences occurring from

their capture. When the war broke out the population of Paraguay was 1,337,439; when hostilities ceased it consisted of 28,746 men, 106,254 women above 15 years of age, and 86,079 children. During the retreat of the Paraguayans the dictator ordered every town and village passed through to be razed to the ground, and every living animal for which no use could be found to be slaughtered. When the end came the country and people were in a state of absolute prostration.

After the death of Lopez the government was administered by a triumvirate consisting of Cirilo Rivarola, Carlos Loizaga and Jose Diaz de Bedoza, until, in November 1870, the present constitution was formulated. The policy of Brazil was for a time directed towards the annexation of Paraguay; the debt due to Brazil on account of the war was assessed at £40,000,000, a sum which Paraguay could never hope to pay; and it was not until 1876 that the Brazilian army of occupation was wholly withdrawn. But the rivalry between Brazil and Argentina, and the necessity of maintaining the balance of power among the South American republics, enabled Paraguay to remain independent. No violent constitutional change took place after 1870, though there have been spasmodic outbreaks of revolu- tion, as in 1881, in 1894, in 1898, in December 1904 — when a somewhat serious civil war was ended by the peace of Pilco- mayo — in July 1908 and in September 1909. None of these disturbances deeply or permanently affected the welfare of the republic, nor were all of them accompanied by bloodshed. Under the presidency of J. B. Egusquiza (1894-1898) the boundary dispute with Bolivia became acute; but war was averted, largely owing to the success of the revolution, which forced the president to resign. The main interest of recent Paraguayan history is economic rather than political. In that history the gradual development of commerce, the financial reforms in 1895, and the extension of the Paraguay Central railway after 1906, were events of far greater importance than any political movement which took place between 1870 and 1910.

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PARAHYBA (Parahiba or Parahyba do Norte), a state of north-eastern Brazil, bounded N. by Rio Grande do Norte, E. by the Atlantic, S. by Pernambuco, and W. by Ceara. Pop.

(1890), 457,232; (1900), 490,784. Area, 28,854 sq, m. It consists of a narrow coastal zone, 30 to 40 m. wide, along the seaboard, behind which the country rises sharply to a highland region forming part of the great central plateau of Brazil. The long, dry season (April to October), together with occasional devastating droughts (seccas) lasting two or more years, prevents the development of forests and damages the agricultural and pastoral industries of the state. There is only one river of importance, \he Parahyba do Norte, which crosses the southern part of the state from west to east with a course of about 240 m. The state is poorly watered and covered with a scanty vegetation suitable for pasturage only. Stock-raising is favoured by the existence of a bromeliaceous plant, called mecambira, which is sufficiently juicy to satisfy the thirst of the animals. On the low lands and along some of the river valleys agriculture is the chief occupation of the people; cotton and sugar are largely produced and some tobacco is grown. The exports include hides, skins, cotton, sugar and tobacco. Rubber of the Ceara type is also found and forms an item among the smaller exports. The eastern extremity of the state is served by a railway originally called the Conde d'Eu railway but now forming part of the Great Western of Brazil system, which runs westward and northward from Parahyba to Independencia (72 m.), where it connects with the extension of the Natal and Nova Cruz line, and a branch runs southward to Pilar, 15 m. from its junction and 46 m. from Parahyba. Another small branch runs westward from the station of Mulungu to

Alag6a Grande (14 m.). The capital is Parahyba (q.v.), and other important towns, with the populations (in 1890) of their municipalities, which include large rural districts and sometimes several other towns, are: Arcia (26,590); Bananeiras (20,058); Campina Grande (21,475); Guarabira (26,625); Mananguape (20,754); Pilar (10,133, town); Pombal (12,804); and Souza (11,135).

Parahyba formed part of the original grant, known as the capitania of Itamaraca, from the Portuguese crown to Pero Lopes de Souza. It was not settled until 1584, when a fort was erected near the present port of Cabedello under the name of Sao Filippe.

PARAHYBA (Parahyba do Norte), a city and port of Brazil, capital of Parahyba state, on the right bank of the Parahyba do Norte river, n m. above its mouth and 65 m. N. of Recife. Pop. (1890), 18,645, including several suburbs and Cabedello; (1908, estimate), 30,000. Parahyba is the starting- point of the Conde d'Eu railway, now a part of the Great Western of Brazil system, which includes a main line to Independencia, where it connects with the Natal & Nova Cruz line of Rio Grande do Norte, and a branch to Cabedello. The entrance to the Parahyba do Norte River being obstructed by a stone reef and sand bars, only vessels drawing less than 14 ft. can effect an entrance. The " Varadouro," as the lower part of the city is called, is built on the margin of the river and is devoted principally to commerce. Behind this is a low hill on whose northern slope and broad summit the upper city is built, and a tramway line runs to the suburb of Trincheira. There are some good public buildings, including the parish church (matriz) of N.S. das Neves, the old Franciscan convent and church, the government palace, and the treasury. There are a normal school, a lyceum, a national gymnasium, and a school for marine apprentices. Parahyba was founded in 1585. It was called Frederickstadt by the Dutch, who occupied the Franciscan convent as a government house, and Felippea in honour of the king of Spain when the Dutch were expelled. Its original name was resumed on the separation (1640) of Portugal and her colonies from Spanish rule.

PARAHYBA DO SUL, a river of Brazil, having its source on the campos of Bocaina, on the northern slope of the Serra do Mar in the western part of the state of Sao Paulo, and flowing at first south-westerly and then after a horse-shoe curve in the vicinity of Jacarehy in a general E.N.E. direction to the Atlantic in lat. 21° 38′ S. Its upper course for a distance of 80 m., or to the confluence of the Parahybuna, is known as the Para- hytinga. The navigable channel from Sao Fidelis to the

Atlantic is 54 m. long, and the total length of the river, including the Parabytinga, is 540 m. Its source is about 4920 ft. above sea-level. The Parahyba passes through a fertile, long-settled country, a part of which was for many years the principal coffee-producing region of Brazil. Its lower course passes through the rich alluvial sugar-producing district of Campos. Among the towns on the Parahyba are Campos, Sao Fidelis, Parahyba do Sul, Juiz de Fora, Barra do Pirahy (railway junction), Rezende, Queluz and Lorena.

PARALDEHYDE, in medicine, a clear colourless liquid (for the chemistry see Aldehydes), soluble in 1 in 10 of water and freely in alcohol. Paraldehyde is a powerful hypnotic, giving a refreshing quiet sleep which is not followed by unpleasant after effects. As it does not depress the heart when used in medicinal doses, it may be given to patients suffering from cardiac disease. It is much used to produce sleep in the insane. As it is largely excreted by the lungs it may be found useful in bronchial asthma. When taken continuously the drug soon loses its power as a hypnotic. Its unpleasant taste usually prevents the formation of a paraldehyde habit, but it occasionally occurs with symptoms resembling delirium tremens. When taken in an overdose paraldehyde kills by producing respiratory failure.

PARALLAX (Gr. 7rapaAX

Solar Parallax. — The problem of the distance of the sun has always been regarded as the fundamental one of celestial measurement. The difficulties in the way of solving it are very great, and up to the present time the best authorities are not agreed as to the result, the effect of half a century of research having been merely to reduce the uncertainty within continually narrower limits. The mutations of opinion on the subject during the last fifty years have been remarkable. Up to about the middle of the 19th century it was supposed that transits of Venus across the disk of the sun afforded the most trustworthy method of making the determination in question; and when Encke in 1824 published his classic discussion of the transits of 1 761 and 1769, it was supposed that we must wait until the transits of 1874 and 1882 had been observed and discussed before any further light would be thrown on the subject. The parallax 8-5776″ found by Encke was therefore accepted without question, and was employed in the Nautical Almanac from 1834 to 1869. Doubt was first thrown on the accuracy of this number by an announcement from Hansen in 1862 that the observed parallactic inequality of the moon was irreconcilable with the accepted value of the solar parallax, and

indicated the much larger value 8-97”. This result was soon apparently confirmed by several other researches founded both on theory and observa- tion, and so strong did the evidence appear to be that the value 8-95″ was used in the Nautical Almanac from 1870 to 1881. The most remarkable feature of the discussion since 1862 is that the successive examinations of the subject have led to a con- tinually diminishing value, so that at the present time it seems possible that the actual parallax of the sun is almost as near to the old value of Encke as to that which first replaced it. The value of 8-848”, determined by S. Newcomb, was used from 1882 to 1900; and since then the value 8-8o” has been employed, having been adopted at a Paris conference in 1896. 1

Five fundamentally different methods of determining the distance of the sun have been worked out and applied. They are as follows: —

I. That of direct measurement. — From the measures of the parallax of either Venus or Mars the parallax of the sun can 1 R. S. Ball, Spherical Astronomy, p. 303.

be immediately derived, because the ratios of distances in the s<31ar system are known with the last degree of Methods at precision. Transits of Venus and observations of Determiaa- various kinds on Mars are all to be included in this Uo". class.

II. The second method is in principle extremely simple, consisting merely in multiplying the observed velocity of light by the time which it takes light to travel from the sun to the earth. The velocity is now well determined; the difficulty is to determine the time of passage.

III. The third method is through the determination of the mass of the earth relative to that of the sun. In astronomical practice the masses of the planets are commonly expressed as fractions of the mass of the sun, the latter being taken as unity. When we know the mass of the earth in gravitational measure, its product by the denominator of the fraction just mentioned gives the mass of the sun in gravitational measure. From this the distance of the sun can be at once determined by a funda- mental equation of planetary motion.

IV. The fourth method is through the parallactic inequality in the moon’s motion. For the relation of this inequality to the solar parallax see Moon.

V. The fifth method consists in observing the displacement in the direction of the sun, or of one of the nearer planets, due to the motion

of the earth round the common centre of gravity of the earth and moon. It requires a precise knowledge of the moon's mass. The uncertainty of this mass impairs the accuracy of the method.

I. To begin with the results of the first method. The transits of Venus observed in 1874 and 1882 might be expected to hold a leading place in the discussion. No purely astronomical enterprise was ever carried out on so v*”^ so large a scale or at so great an expenditure of money and labour as was devoted to the observations of these transits, and for several years before their occurrence the astronomers of every leading nation were busy in discussing methods of obser- vation and working out the multifarious details necessary to their successful application. In the preceding century reliance was placed entirely on the observed moments at which Venus entered upon or left the limb of the sun, but in 1874 it was possible to determine the relative positions of Venus and the sun during the whole course of the transit. Two methods were devised. One was to use a heliometer to measure the distance between the limbs of Venus and the sun during the whole time that the planet was seen projected on the solar disk, and the other was to take photographs of the sun during the period of the transit and subsequently measure the negatives. The Germans laid the greatest stress on measures with the heliometer; the Americans, English, and French on the photo- graphic method. These four nations sent out well-equipped expeditions to various quarters of the globe, both in 1874 and 1882, to make the required observations; but when the results were discussed they were found to be extremely unsatisfactory. It had been supposed that, with the greatly improved telescopes of modern times, contact observations could be made with much greater precision than in 1761 and 1769, yet, for some reason which it is not easy to explain completely, the modern observa- tions were but little better than the older ones. Discrepancies difficult to account for were found among the estimates of even the best observers. The photographs led to no more definite result than the observations of contacts, except perhaps those taken by the Americans, who had adopted a more complete system than the Europeans; but even these were by no means satisfactory. Nor did the measures made by the Germans with heliometers come out any better. By the American photographs the distances between the centres of Venus and the sun, and the angles between the line adjoining the centres and the meridian, could be separately measured and a separate result for the parallax derived from each. The results were: — Transit 0/1874: Distances; par. =8-888’. J ‘^ Pos. angles; „ =8-873”.

Transit 0/1882: Dirtancea; ,. ‘ -*«73; J Pos. angles; „ =8-772”.

The German measures with the heliometer gave apparently concordant results, as follows: —

Transit of 1874: par. =8-876 “. Transit of 1882: „ =8-879”.

The combined result from both these methods is 8-857”, while the combination of all the contact observations made by all the parties gave the much smaller result, 8-794”. Had the internal contacts alone been used, which many astronomers would have considered the proper course, the result would have been

8-776”.

In 1877 Sir David Gill organized an expedition to the island of Ascension to observe the parallax of Mars with the heliometer. By measurements giving the position of Mars among Parallaxes t ‘ le neighbouring stars in the morning and evening, ‘ the effect of parallax could be obtained as well as by observing from two different stations; in fact the rotation of the earth carried the observer himself round a parallel of latitude, so that the comparison of his own morning and evening observations could be used as if they had been made at different stations. The result was 8-78”. The failure of the method based on transits of Venus led to an international effort carried out on the initiative of Sir David Gill to measure the parallax by observations on those minor planets which approach nearest the earth. The scheme of observations was organized on an extended scale. The three bodies chosen for observation were: Victoria (June 10 to Aug. 26, 1889); Iris (Oct. 12 to Dec. 10, 1888); and Sappho (Sept. 18 to Oct. 25, 1888). The distances of these bodies at the times of opposition were somewhat less than unity, though more than twice as great as that of Mars in 1877. The drawback of greater distance was, however, in Gill’s opinion, more than compensated by the accuracy with which the observations could be made. The instruments used were heliometers, the construction and use of which had been greatly improved, largely through the efforts of Gill himself. The planets in question appeared in the telescope as star-like objects which could be compared with the stars with much greater accuracy than a planetary disk like that of Mars, the apparent form of which was changed by its varying phase, due to the different directions of the sun’s illumination. These observations were worked up and discussed by Gill with great elaboration in the Annals of the Cape Observatory, vols. vi. and vii. The results were for the solar parallax tt: —

From Victoria, t = 8-8oi “ ± 0-006*. „ Sappho, w = 8-798” = fco-oii”. „ Iris, t = 8-8i2* ± o-oo9”.

The general mean result was 8 • 802 “. From the meridian observations of the same planets made for the purpose of controlling the elements of motion of the planets Auwers found ir = 8-8o6”.

In 1898 the remarkable minor planet Eros was discovered, which, on those rare occasions when in opposition near perihelion, would approach the earth to a distance of 0-16. On these occasions the actual parallax would be six times greater than that of the sun, and could therefore be measured with much greater precision than in the case of any other planet. Such an approach had occurred in 1892, but the planet was not then discovered. At the opposition of 1900-1901 the minimum distance was 0-32, much less than that of any other planet. Advantage was taken of the occasion to make photographic measures for parallax at various points of the earth on a very large scale. Owing to the difficulties inherent in determining the position of so faint an object among a great number of stars, the results have taken about ten years to work out. The photographic right ascensions gave the values 8-8o” + 0007″ ±_ 00027″ (Hinks) and 8-8o” + 0-0067″ + 0-0025″ (Perrine); the micrometric observations gave the value 8-806 “ + 0-004 (Hinks). 1

II. The velocity of light (g.v.) has been measured with all the precision necessary for the purpose. The latest result is 299,860 kilometres per second, with a probable error of perhaps 30 kilometres — that is, about the ten-thousandth part of the quantity itself. This degree of precision is far beyond any we

1 Mon. Not. R.A.S. (May 1909,) p. 544; ibid. (June 1910), p. 588.

can hope to reach in the solar parallax. The other element which enters into consideration is the time required for light to pass from the sun to the earth. Here no such precision can be attained. Both direct and indirect methods are available. The direct method consists in observing the times of some momentary or rapidly varying celestial phenomenon, as it appears when seen from opposite points of the earth’s orbit. The only phenomena of the sort available are eclipses of Jupiter’s satellites, especially of the first. Unfortunately these eclipses are not sudden but slowly changing phenomena, so that they cannot be observed without an error of at least several seconds, and not infrequently important fractions of a minute. As the entire time required for light to pass over the radius of the earth’s orbit is only about 500 seconds, this error is fatal to the method. The indirect method is based upon the observed constant of aberration or the displacement of the stars due to the earth’s motion. The minuteness of this displacement, about 20-50”, makes its precise determination an

extremely difficult matter. The most careful determinations are affected by systematic errors arising from those diurnal and annual changes of tempera- ture, the effect of which cannot be wholly eliminated in astro- nomical observation; and the recently discovered variation of latitude has introduced a new element of uncertainty into the determination. In consequence of it, the values formerly found were systematically too small by an amount which even now it is difficult to estimate with precision. Struve's classic number, universally accepted during the second half of the 19th century, was 20-445". Serious doubt was first cast upon its accuracy by the observations of Nyren with the same instrument during the years 1880-1882, but on a much larger number of stars. His result, from his observations alone, was 20-52"; and taking into account the other Puikowa results, he concluded the most probable value to be 20-492". In 1895 Chandler, from a general discussion of all the observations, derived the value of 20-50". Since then, two elaborate series of observations made with the zenith telescope for the purpose of determining the variation of latitude and the constant of aberration have been carried on by Professor C. L. Doolittle at the Flower Observatory near Philadelphia, and Professor J. K. Rees and his assistants at the observatory of Columbia University, New York. Each of these works is self-consistent and seemingly trustworthy, but there is a difference between the two which it is difficult to account for. Rees's result is 20-47"; Doolittle's, from 20-46″ to 20-56". This last value agrees very closely with a determination made by Gill at the Cape of Good Hope, and most other recent determina- tions give values exceeding 20-50". On the whole it is probable that the value exceeds 20-50"; and so far as the results of direct observation are concerned may, for the present, be fixed at 20-52". The corresponding value of the solar parallax is 8-782". In addition to the doubt thrown on this result by the discrepancy between various determinations of the constant of aberration, it is sometimes doubted whether the latter constant necessarily expresses with entire precision the ratio of the velocity of the earth to the velocity of light. While the theory that it does seems highly probable, it cannot be regarded as absolutely certain.

III. The combined mass of the earth and moon admits of being determined by its effect in changing the position of the plane of the orbit of Venus. The motion of the node of this plane is found with great exactness from observa- £ art ft, tions of the transits of Venus. So exact is the latter determination that, were there no weak point in the subsequent parts of the process, this method would give far the most certain result for the solar parallax. Its weak point is that the apparent

motion of the node depends partly upon the motion of the ecliptic, which cannot be determined with equal precision. The derivation of the distance of the sun by it is of such interest from its simplicity that we shall show the computation.

From the observed motion of the node of Venus, as shown by the four transits of 1761, 1769, 1874 and 1882, is found

Mass of sun

Mass of (earth + moon) =-

332600

762

PARALLELISM— PARALYSIS

In gravitational units of mass, based on the metre and second as units of length and time,

Log. earth's mass = 14-60052 ,, moon's „ = 12-6895. The sum of the corresponding numbers multiplied by 332600 gives

Log. sun's mass = 20- 12773. Putting a for the mean distance of the earth from the sun, and n for its mean motion in one second, we use the fundamental equation

a% 2 = M +M', Mo being the sun's mass, and M' the combined masses of the earth and moon, which are, however, too small to affect the result. For the mean motion of the earth in one second in circular measure, we have

the denominator of the fraction being the number of seconds in the sidereal year. Then, from the formula

3 = Mo = [2Q-I2773]

» 2 — I5"598i4 we find

Log. a in metres = 1 1-17653

Log. equat. rad. © 6-80470

Sine O 's eq. hor. par. 5-62817 Sun's eq. hor. par. 8-762".

IV. The determination of the solar parallax through the parallactic

inequality of the moon's motion also involves two

elements — one of observation, the other of purely Moon" °
mathematical theory. The inequality in question

has its greatest negative value near the time of the moon's first quarter, and the greatest positive value near the third quarter. Meridian observations of the moon have been heretofore made by observing the transit of its illuminated limb. At first quarter its first limb is illuminated; at third quarter, its second limb. In each case the results of the observa- tions may be systematically in error, not only from the uncertain diameter of the moon, but in a still greater degree from the varying effect of irradiation and the personal equation of the observers. The theoretical element is the ratio of the parallactic inequality to the solar parallax. The determination of this ratio is one of the most difficult problems in the lunar theory. Accepting the definitive result of the researches of E. W. Brown the value of the solar parallax derived by this method is about

8-773"-

V. The fifth method is, as we have said, the most uncertain Motion of of all; it will therefore suffice to quote the result. Earth. which is

ir = 8-8l8". The following may be taken as the most probable values of the solar parallax, as derived independently by the five methods we have described : —

From measures of parallax . 8-802″

„ velocity of light . . 8-781″

,, mass of the earth . . 8-762″

„ par. ineq. of moon . . 8773″

„ lunar equation . . 8'8i8″

The question of the possible or probable error of these results is one on which there is a marked divergence of opinion among investigators. Probably no general agreement could now be reached on a statement more definite than this; the last result may be left out of consideration, and the value of the solar parallax is probably contained between the limits 8-77″ and 8- 80." The most likely distance of the sun may be stated in round numbers as 93,000,000 miles. (S. N.)

PARALLELISM, PSYCHOPHYSICAL, in pyschology, the theory that the conscious and nervous processes vary concomi- tantly whether or not there be any causal connexion between them; in other words ” that modifications of consciousness emerge contemporaneously with corresponding modifications of nervous process ” (Stout). The theory is the third possible alternative in considering the relation between mind and body, the others being interaction and one-sided action (e.g. materialism). It should be observed that this theory is merely a statement, not an explanation. (See Psychology.)

b’m

Watt’s Parallel Motion.

PARALLEL MOTION, a form of link-work invented by James Watt, and used in steam-engines (see Steam-Engine, § 88), to connect the head of the piston rod, moving up and down in a vertical path, with the end of the beam, moving in the arc of a circle. An ordinary form is shown diagrammatically in figure. MN is the path in 1

which the piston-rod head, or crosshead, as it is often called, is to be guided. AB C is the middle line of half the beam, C being the fixed centre about which the beam oscillates. A link BD con- nects a point in the beam with a radius link ED, which oscillates about a fixed centre at E. A point P in BD, taken so that BP : DP :: EN : CM, move in a path which coincides very closely with the straight line MPN. Any other point F in the line CP or CP produced is made to copy this motion by means of the links AF and FG, parallel to BD and AC. In the ordinary application of the parallel motion a point such as F is the point of attach- ment of the piston-rod, and P is used to drive a pump-rod. Other points in the line CP produced are occasionally made use of by adding other links parallel to AC and BD.

Watt’s linkage gives no more than an approximation to straight-line motion, but in a well-designed example the amount of deviation need not exceed one four-thousandth of the length of stroke. It was for long believed that the production of an exact straight-line motion by pure linkage was impossible, until the problem was solved by the invention of the Peaucellier cell. (See also Mechanics: Applied Mechanics, §§’ 77, 78.)

PARALLELS, in siegecraft, a term used to express the trenches drawn by besiegers in a generally parallel direction to the front of a fortress chosen for attack. Parallels are employed along with ” zigzag approaches ” in the ” formal attack ” or siege proper. They are traced

in short zigzag lengths (the prolongation of each length falling clear of the hostile works), in order to avoid enfilade; but their obliquity is of course made as slight as is consistent with due protection in order to save time and labour. The ” first parallel ” is opened at a convenient distance from the fortress, by numerous working parties, who dig (under cover of night) a continuous line of entrenchments facing the point or points of attack. Zigzags are next dug to the rear (when necessary) to give sheltered access to the parallel, and from this new zigzags are pushed out towards the defenders, to be connected by a ” second parallel,” and so on until finally a parallel is made sufficiently close to the fortress to permit of an assault- over the open, the parallels becoming stronger and more solid as they approach to closer range. This system of parallels provides, within range of the defenders’ weapons, shelter in which the besieger can safely mass men and material for the prosecution of the attack. Parallels and approaches are constructed either by ordinary ” trench work,” executed simultaneously by a large number of men strung out along the intended line, or by ” sapping ” in which one trained ” sapper,” as it were, burrows a trench in the required direction, others following him to widen and improve the work.

PARALUS and SALAMINIA, the name of two ancient Athenian triremes used for sacred embassies, the conveyance of despatches and tribute money, the transportation of state crimi- nals, and as flagships in time of war. It is probable that a third vessel of the same kind (called Delia) was used exclusively for Delian embassies, although it has been identified by some with the Salaminia.

PARALYSIS, or Palsy (from Gr. TapdXveiv, to relax; Wyclifie has palesy, and another old form of the word is parlesy), a term which in its wider acceptation indicates abolition of motor, sensory, sensorial or vaso-motor functions, but in medical nomenclature is usually restricted to the loss or impairment of voluntary muscular power. Paralysis is to be regarded rather as a symptom than a disease per se; it may arise (1) from injury

or disease of nervous and muscular structures, and is then termed organic paralysis; or (2) from purely dynamic disturbances in the nervous structures of the brain which preside over voluntary movement. The latter is functional motor paralysis, a symptom common in certain neuroses, especially hysteria. For general paralysis

of the insane, see Insanity.

Whether the loss of motor power be functional or organic in origin, it may be generalized in all the muscles of the body, or localized to one or many. The different forms of paralysis of the voluntary muscles which may arise from organic disease can be understood by a consideration of the motor path of voluntary impulses from brain to muscle. There are two neural segments in this path, an upper cerebral and a lower spinal; the former has its departure platform in the brain and its terminus in the whole of the anterior grey matter of the spinal cord, whence issues the lower spinal segment of the motor path to the muscles. The nerve fibres of the upper cerebral segment are prolongations of the large psycho-motor cells; the nerve fibres of the lower segment are prolongations by the anterior roots and motor nerves of the large cells in the grey matter of the cord. Disease or destruction of any part of the upper cerebral segment will give rise to loss of voluntary power, for the influence of the mind on the muscles is removed in proportion to the destruction of this efferent path (see diagram in Neuropathology). Disease or destruction of the lower spinal segment causes not only loss of voluntary power but an atrophy of the muscles themselves. Paralysis may therefore be divided into three great groups: (1) loss of voluntary power without muscular wasting except from disuse, and without electrical changes in the muscles due to injury or disease of the upper cerebral segment of the motor path of volition; (2) loss of muscular power with wasting and electrical changes in the muscles due to disease or injury of the lower spinal segment formed by the cells of the grey matter of the spinal cord, the anterior roots and the peripheral motor nerves; (3) primary wasting of the muscles.

The more common forms of paralysis will now be described.

1. Hemiplegia, or paralysis affecting one side of the body, is a frequent result of apoplexy (q.v.); there is loss of motion of the tongue, face, trunk and extremities on the side of the body opposite the lesion in the brain. In a case of severe complete hemiplegia both arm and leg are powerless; the face is paralysed chiefly in the lower part, while the upper part moves almost as well as on the unparalysed side, and the eye can be shut at will, unlike peripheral facial paralysis (Bell's palsy). The tongue when protruded deviates towards the paralysed side, and the muscles of mastication contract equally in ordinary action, although difficulty arises in eating, from food accumulating between the cheek and gums on the paralysed side. Speech is thick and indistinct, and when there is right-sided hemiplegia in a right-handed person, there may be associated various forms of aphasia {q.v.),

because the speech centres are in the left hemisphere of the brain. Some muscles are completely paralysed, others are merely weakened, while others, e.g. the trunk muscles, are apparently unaffected. In many cases of even complete hemiplegia, improvement, especially in children, takes place after a few weeks or months, and is generally first indicated by return of movement in the muscles which are habitually associated in their action with those of the opposite unparalysed side; thus, movement of the leg returns first at the hip and knee joints, and of the arm at the shoulder and elbow, although the hand may remain motionless. The recovery however in the majority of cases is only partial, and the sufferer of hemiplegia is left with a permanent weakness of one side of the body, often associated with contracture and rigidity, giving rise to a characteristic gait and attitude. The patient in walking leans to the sound side and swings round the affected leg from the hip, the inner side of the toe of the boot scraping the ground as it is raised and advanced. The arm is adducted at the shoulder, flexed at the elbow, wrist and fingers, and resists all attempts at extension. According to the part of the brain damaged variations of paralytic symptoms may arise; thus occasionally

the paralysis may be limited more or less to the face, the arm or the leg. In such case it is termed a monoplegia, a condition sometimes arising from cerebral tumour. Occasionally the face is paralysed on one side and the arm and leg on the other side ; this condition is termed alternate hemiplegia, which is due to the fact that the disease has damaged the motor path from the brain to the leg and arm before it has crossed over to the opposite side, whereas the path to the face muscles is damaged after it has crossed. In rare cases both leg, arm and face on one side may be paralysed — triplegia; or all four limbs — bilateral hemi- plegia. Infantile spastic paralysis, infantile diplegia, or as it is sometimes called Little's disease, is a birth palsy caused by injury from protracted labour, the use of forceps or other causes. The symptoms are generally not observed until long after birth. Convulsions are common, and the child is unable to sit up or walk long after the age at which it should do so.

Paraplegia is a term applied to paralysis of the lower extremi- ties; there are many causes, but in the great majority of instances it arises from a local or general disease or injury of the spinal cord. A localized transverse myelitis will interrupt the motor and sensory paths which connect the brain with the spinal grey matter below the lesion, and when the destruction is com- plete, motor and sensory paralysis in all the structures below the injury results; thus fracture, dislocation and disease of the spinal column {e.g. tubercular caries, syphilitic disease

of the membranes, localized tumours and haemorrhages) may cause compression and inflammatory softening, and the result is paralysis of the voluntary muscles, loss of sensation, loss of control over the bowel and bladder, and a great tendency to the development cf bed-sores. The muscles do not waste except from disuse, nor undergo electrical changes unless the disease affects extensively the spinal grey matter or roots as well as the cerebral path. When it does so, as in the case of acute spreading myelitis, the symptoms are usually more severe and the outlook is more grave.

In cases of focal myelitis from injury or disease, recovery may take place and the return of power and sensation may occur to such an extent that the patient is able to walk long distances; this happy termination in cases of localized disease or injury of the spinal cord often takes place by keeping the patient on his back in bed, daily practising massage and passive movements, and so managing the case as to avoid bedsores and septic inflam- mation of the bladder — the two dangerous complications which are liable to arise.

2. Paralysis may result from acute inflammatory affections of the spinal cord involving the grey and white matter — myelitis (see Neuropathology).

Infantile or Essential Paralysis. — This is a form of spinal paralysis occurring with frequency in young children; in Scan- dinavian countries the disease is prevalent and sometimes assumes an epidemic form, whereby one is led to believe that it is due to an infective organism. The names infantile and essential paralysis were given before the true nature of the disease in the spinal cord was known; precisely the same affection may occasionally occur, however, in adults, and then it is termed adult spinal paralysis. The medical name for this disease is acute anterior poliomyelitis (Gr. irdXios, grey, and / weXos, marrow), because the anterior grey matter of the spinal cord is the seat of acute inflammation, and destruction of the spinal motor nerve path to the muscles. The extent of the spinal grey matter affected and the degree of destruction of the motor nerve elements which ensues determine the extent and permanency of the paralysis. The term atrophic spinal paralysis is some- times employed as indicating the permanent wasting of muscles that results.

Infantile paralysis often commences suddenly, and the paralysis may not be observed until a few days have elapsed ; the earliest symptoms noticeable are fever, convulsions and sometimes vomiting; and, if the child is old enough, it may complain of pains or numbness or tingling in the limb or limbs which are subsequently found to be paralysed. It

is character- istic, however, of the disease that there is no loss of sensation

in the paralysed limb. The whole of the limb is not necessarily paralysed, often it is only a group of muscles, and even if the paralysis affects both legs or the arm and leg on one side, it generally fails in the uniform distribution of the previously described paraplegia or hemiplegia. The affected muscles rapidly waste and become flaccid, the electrical reactions change, and finally the muscles may cease to respond to electrical stimu- lation whether of the continuous or interrupted current. In the less severe cases (and they are the most common) only a group of muscles undergo complete paralysis and atrophy, and there is always hope of some return of power in a paralysed limb. Associated with the withered condition of the limb due to the muscular atrophy is an enfeebled circulation, rendering the limb cold, blue and livid; the nutrition of the bones and other parts is involved, so that a limb paralysed in early infancy does not grow and is shorter than its fellow. Deformities arise, some the result of simply failing muscular support; others due to permanent changes in the position of the limbs, for example clubfoot. There is absence of bladder and bowel troubles, and bedsores do not occur; the disease itself is rarely, if ever, fatal. About a month after the onset of the disease local treatment of the atrophied muscles should be commenced, and every effort should be made by massage, by suitable positions and passive movements to promote the circulation and prevent deformities in the affected limbs. Should these measures fail, surgical aid should be sought.

Sub-acute and chronic forms of atrophic and spinal paralysis have been described, but some of them were undoubtedly cases of peripheral neuritis.

Wasting Palsy. Progressive Muscular Atrophy. — This is a chronic disease characterized by slow and insidious weakness and wasting of groups of muscles due to disease of the anterior spinal grey matter. It begins mostly in adult life between 25 and 45 years of age, and affects males more than females. In the majority of cases it commences in the upper extremities, and the small muscles of the hand are especially liable to be affected. The palmar eminences of the thumb and little finger, owing to the wasting of the muscles, gradually disappear, and a flat ape-like hand is the result; in extreme cases all the small muscles

of the hand are atrophied, and a claw-like hand is the result. The muscles which are next most liable to atrophy are those of the shoulder and upper arm, and the atrophy may thence spread to the muscles of the neck and trunk, and the intercostals and even the diaphragm may be affected, causing serious difficulties of respiration. The lower extremities are less often and later affected by wasting. This disease generally runs a slow and progressive course; it may however be years before it spreads from the hand to the arm, and a period of arrest may occur before other muscles become involved. A characteristic feature of the disease is fibrillary twitching of the wasting muscles. The electrical excitability of the muscles is diminished rather than changed, except where the wasting is very extreme, when a partial reaction of degeneration may be obtained. Sensation is unaffected, as the disease is limited to the motor cells of the anterior grey matter (see Neuropathology). There is no affection of the bowel or bladder. Death usually occurs from intercurrent diseases, e.g. bronchitis, pneumonia, or broncho-pneumonia. Some patients die owing to failure of the respiratory muscles; others from the disease spreading to the medulla oblongata (the bulb of the brain) and causing bulbar paralysis. The chronic morbid process leading to decay and destruction of the spinal motor cells which is the essential pathological feature of this disease is generally accompanied, and sometimes preceded, by degeneration of the path of volun- tary impulses from the brain. It is then called amyotrophic 'lateral sclerosis, a rapid form of progressive muscular atrophy.

Bulbar Paralysis. — A number of different morbid conditions may give rise to a group of symptoms, the principal features of which are paralysis of the muscles concerned in speech, swallowing, phonation and mastication. These symptoms may arise suddenly from vascular lesions or inflammatory processes, which involve the nuclei of origin of the cranial nerves supplying

the muscles of the tongue, lips, pharynx and larynx. But there is also a slow degenerative insidious progressive bulbar paralysis affecting both sexes pretty equally; it came on between 40 to 60 years of age, and the cause is unknown. Slight indistinct- ness of speech, especially in the utterance of consonants requiring the elevation of the tip of the tongue to the dental arch and palate, is usually the first symptom. Later the explosive lip sounds are indistinctly uttered; simultaneously, owing to paralysis of the soft palate, the speech becomes nasal in character and sooner or later, associated with this difficulty of speech, there is a difficulty of swallowing, partly because the tongue is unable to convey the food to the back of the mouth, and it accumulates between the cheeks and gums. Moreover the pharyngeal muscles are

unable to seize the food and start the process of swallowing on account of the paralysis of the soft palate; liquids are apt to regurgitate through the nostrils, the patient must therefore be nourished with soft semi-solid food. As the disease proceeds, the difficulty of speech and swallowing is increased by the affection of the laryngeal muscles; the pitch of the voice is lowered and the glottis is imperfectly closed during deglutition; there is consequently a tendency for liquids and food to pass into the larynx and set up fits of coughing, which, however, are ineffectual. Later the muscles of mastica- tion are affected and the disease may extend to the respiratory centre, giving rise to attacks of dyspnoea. The intellectual faculties are as a rule unimpaired, although the facial expression and the curious emotional mobility of the countenance, with a tendency of the patient to burst into tears or laughter, would suggest weak-mindedness. Whilst the lower half of the face is strikingly affected, the upper half retains its normal expression and power of movement. This disease is usually rapidly fatal, since it affects the vital centres, and liability to broncho pneumonia excited by the entrance of food into the air passages is also a constant danger in the later stages.

Bulbar Paralysis without Anatomical Change. — This condition is also termed ” myasthenia gravis “; it differs from acute and chronic bulbar disease by the absence of muscular atrophy, by normal electrical excitability of the muscles, by a marked development of the paralysis by fatigue, and by considerable remissions of the symptoms. The bulbar symptoms are the most prominent, but all voluntary muscles are more or less affected, especially the eye-muscles. It is a rare disease affecting both sexes equally at almost any age, the causes and pathology of which are unknown.

3. Paralysis resulting from disease or injury of the motor path to the muscles in the peripheral nervous system.

Neuritis. — Paralysis may arise in a muscle, a group of muscles, a whole limb, the lower extremities, or there may be a generalized paralysis of voluntary muscles as a result of neuritis. A typical example of neuritis giving rise to paralysis owing to inflammatory swelling and compression is afforded by the facial nerve; this purely motor nerve as it passes out of the skull through a narrow bony passage is easily compressed and its function interfered with, causing a paralysis of the whole of one side of the face and Bell’s Palsy. Exposure to a cold draught in a person with rheumatic diathesis is a frequent cause. As an example of simple mechanical compression producing paralysis, crutch palsy may be cited; it is the result of continuous compression cf the musculo-spiral nerve as it winds round

the bone of the upper arm.

Lead poisoning may give rise to a localized neuritis affecting the posterior inter-osseous nerve, especially in painters and in those whose occupations necessitate excessive use of the extensors of the forearm; the result is wrist drop or lead palsy.

Sciatica is a painful inflammatory condition of the sciatic nerve, in which there may be weakness of the muscles; but inability to move the limb is more on account of the pain it causes than on account of paralysis of the muscles. Exposure to cold and wet, e.g. sitting on a damp seat, may lead to sciatica in a gouty or rheumatic person.

Multiple neuritis is a painful generalized inflammation of the peripheral nervous system and arises in many toxic conditions

of the blood; among the most important are lead, arsenic and chronic alcohol poisoning. It also occurs in diabetes, diph- theria, beri-beri and other conditions (see Neuropathology). A short description of the commonest form will be given. It occurs in chronic alcoholism and especially in women, and is most frequently due to a combination of a septic absorption from some internal disease and the abuse of alcohol. In a marked case the patient may suffer from paraplegia, but it is distinguished from the paraplegia of spinal disease by the fact that there is loss of control of the sphincters only when there is associated dementia, and that instead of the limbs being insensible they are extremely painful on deep pressure. There is wasting of the muscles, and electrical changes in them; frequently there is anaesthesia and analgesia of the skin, which takes a stocking-like distribution. In severe cases the upper limbs may be affected, and all the muscles of the body are more or less liable to be paralysed — even the heart may suffer. The mental condition in such a severe case is usually quite characteristic; there is delirium, the patient is the subject of hallucinations and delusions; there is loss of knowledge of time and place, and illusions of personal identity. A constant symptom is the loss of memory of recent events, while those of early life are easily recollected.

Paralyses — termed medically muscular dystrophies — may arise from a primary atrophy of muscle apparently independent of any discoverable change in the nervous system, but due to a congenital

developmental defect of the muscles. Heredity plays an important part in the incidence of these diseases, members of the same family being affected with the same type of disease, and at the same period of life. There may be a tendency in a family to the affection of one sex and not the other; on the other hand, children of both sexes may suffer in the same family. It is curious that the majority of cases are males, and that it is transmitted by women who are not themselves its subjects. Many different clinical types have been described based upon the age of onset, the groups of muscles first affected, and the presence or absence of apparent hypertrophy; they are however all varieties of one affection, and in a case where there is an apparent enlargement of muscles there is really atrophy of the contractile muscle fibres and overgrowth of fat and interstitial fibrous tissue; consequently this form of the disease is called pseudo-hypertrophic paralysis.

The muscular dystrophies may be divided into two groups according to the period of life in which the malady manifests itself: (1) Those occurring in childhood; (2) those occurring in youth or adult life. In the first group the muscles may be atrophied or apparently hypertrophied. A progressive atrophy of muscles associated with progressive weakness and various disabilities of movement is soon recognized in the relation of cause and effect; but the parents whose first child looks like an infant Hercules, with abnormally large calves and buttocks, cannot for some time appreciate any connexion of this condition with a muscular weakness which is manifested in various ways. The child stands with its feet widely separated; it waddles along rather than walks; it falls easily and rises with difficulty, having to use the hands to push against the floor; it then rests one hand on the knee, and then the other hand on the other knee, and climbs, as it were, up its own thighs in order to assume the erect posture. In this pseudo-hypertrophic form of paralysis the outlook is very grave, and there is little hope of the patient reaching adult life.

Paralysis agitans, Shaking Palsy or Parkinson's Disease is a chronic progressive disease of the nervous system occurring late in life, and characterized by weakness, tremors and stiffness of the muscles associated with a peculiar attitude and gait. The first sign of the disease is weakness followed by tremor of one hand; this consists of continuous movements of the thumb and forefinger as in rolling a pill, or of movements of the hand like beating a tom-tom; then the other hand is affected, and later there is tremor at the ankle. In some cases there is a continual nodding movement of the head. These tremors are at the rate of five per second and cease during sleep. The

attitude and gait are very characteristic; the head is bent forward, and

the patient in beginning to walk takes slow steps, which soon become short and quick as if he were running after his centre of gravity. The intellect is clear and in marked contrast to the mask-like expression. This disease lasts for years, and but little can be done in the way of treatment, except passive movements of the limb to prevent contracture.

Treatment. — There are certain general principles in the treatment of all forms of paralysis which may be summarized as follows.

I. Rest in bed and attention to the vital functions of the body, the heart's action, the respiratory functions, nutrition and excretion. The pulse is the best guide to the administration of drugs and stimulants. As regards the respiratory function, one of the dangers of paralysis is an intercurrent pneumonia — sometimes unavoidable, often due, however, to attempts to give nourishment to a patient in an insensible state, with the result that some of the fluid enters the bronchial tubes, when either the reflex protective coughing is not excited or is ineffectual. Attention to the bowels and bladder is most important. A purge at the onset of paralysis is indicated when the pulse is full and of high tension, and the regular action of the bowels is necessary in all conditions. Retention of urine should be carefully avoided, if necessary by the passing of a catheter, but too much emphasis cannot be laid upon the importance of adopting aseptic precautions to avoid infection of the bladder. Daily inspection of the back should be made of all paralysed patients, and precautions taken to keep the skin of all parts exposed to pres- sure clean ; the back should be laved with eau-de-Cologne or spirit to harden the skin. Any sign of a red spot on the back or buttock of the paralysed side should be a warning note of the possibility of a bedsore; zinc powder or ointment should be applied and the effect of pressure on the part be removed if possible by change of posture and by the use of a water-bed. It is important to cover all warm bottles with flannel, for owing to insensibility large blisters, which heal with difficulty, may result. In cases of paraplegia the legs should be covered with warm woollen hand-knitted stockings, and a cradle employed to protect the feet from the continuous weight of the bed-clothes, a fruitful source of foot drop.

2. As soon as the acute symptoms have passed off passive move- ment and massage may be employed with advantage; in some cases electrical treatment is indicated; but as a rule, especially in children, electrical treatment offers the disadvantage of being painful and not accomplishing more than can be effected by massage and passive movements. When the passive movements are being made the patient should be instructed by the operator to will the movement which he is

performing, and thus try to re-establish the connexion of the brain with the muscles through the point of interruption or by a new path if that is not possible.

(F. W. Mo.) i

PARAMARIBO, the capital of Dutch Guiana or Surinam (see Guiana), in 5 44′ 30″ N., 55° 12′ 54″ W., 20 m. from the sea on the right bank of the Surinam, here a tidal river nearly a mile broad and 18 ft. deep. Pop. (1905), 33,821. Built on a plateau about 16 ft. above low-water level, Paramaribo is well-drained, clean and in general healthy. The straight canals running at right angles to the river, the broad, straight tree- planted streets, the spacious squares, and the solid plain public buildings would not be unworthy of a town in the Netherlands.

The Indian village of Paramaribo became the site of a French settlement probably in 1640, and in 1650 it was made the capital of the colony by Lord Willoughby of Parham. In 1683 it was still only a ” cluster of twenty-seven dwellings, more than half of them grog-shops,” but by 1790 it counted’ more than a thousand houses. The town was partly burned down in 1821,, and again in 1832.

PARAMECIUM, 0. F. Muller, (often misspelt Paramaecium, Paramoecium), a genus of aspirotrochous ciliate Infusoria (q.v.), characterized by its slipper-like shape, common in infusions, especially when they contain a little animal matter. It has two dorsal contractile vacuoles, each receiving the mouths of five radiating canals from the inner layer of the ectosarc, and a large ovoid meganucleus, and one or two micronuclei. From its abundance, the ease with which it can be cultivated and observed, its relatively simple structure and adequately large size (jˆz m -)> ˆ i s most frequently selected for elementary study and demonstration, as well as for purposes of research.

PARAMENT (Fr. parement, from Late Lat. paramentum, adornment, parare, to prepare, equip), a term applied by ancient writers to the hangings or ornaments of a room of state.

PARAMOUNT (Anglo-Fr. paramont, up above, par a mont, up or on top of the mountain), superior, supreme, holding the highest authority, or being of the greatest importance. The word was first used, as a term of feudal law, of the lord, the ” lord paramount,” who

held his fief from no superior lord, and was thus opposed to ” mesne lord,” one who held from a superior. To those who held their fiefs from one who was not a ” lord paramount ” was given the correlative term ” paravail,” par d val, in the valley. The word was confused by English lawyers with ” avail,” help, assistance, profit, and applied io the actual working tenant of the land, the lowest tenant or occupier.

PARANA, a state of southern Brazil, bounded N. by Sao Paulo, E. by the Atlantic, S. by Santa Catharina and the republic of Argentina, and W. by Matto Grosso and the republic of Paraguay, with the Parana river as its western boundary line. Area, 85,451 sq. m.; pop. (1890), 240,491; (1900), 327,136. It includes two dissimilar regions — a narrow coastal zone, thickly wooded, swampy, and semi-tropical in character, and a high plateau (2500 to 3000 ft.) whose precipitous, deeply eroded eastern escarpments are known as the Serra do Mar, or Serra do Cubatao. The southern part of the state is densely forested and has large tracts of Paraguay tea {Ilex paraguayensis) , known in Brazil as herva male”, or matte. The plateau slopes west- ward to the Parana river, is well watered and moderately fertile, and has a remarkably uniform climate of a mild temperate character. The larger rivers of the state comprise the Parana- panema and its tributaries the Cinza and Tibagy, the Ivahy, Piquiry, Jejuy-guassu, and the Iguassu with its principal tributary the Rio Negro. The Paranapanema and a small tributary, the Itarare, form the boundary line with Sao Paulo west of the Serra do Mar, and the Iguassu and Negro, the boundary line with Santa Catharina and Argentina — both streams having their sources in the Serra do Mar and flowing westward to the Parana. The other streams have shorter courses, and all are obstructed by falls and rapids. Twenty miles above the mouth of the Iguassu are the Iguassu Falls, 215 ft. high, broken into twenty or more falls separated by rocks and islands, and surrounded by a wild, unsettled and wooded country. The falls are reached by occasional light-draught steamers on the Parana between Posadas (Argentina) and the mouth of the Iguassu, and thence by canoe to the vicinity of the falls. The surface of the plateau is undulating and the greater part is ad- apted to agricultural and pastoral purposes. There are two railway systems — the Paranagua to Curityba (60 m.) with an extension to Ponta Grossa (118 m.) and branches to Rio Negro (55 m.), Porto Amazonas (6 m.) and Antonina (10 m.); and the Sao Paulo & Rio Grande, which crosses the state from north- east to south-west from Porto Uniao da Victoria, on the Iguassu, to a junction with the Sorocabana line of Sao Paulo at Itarare. The upper Parana is navigable between the Guayra, or Sete Quedas, and the Urubu-punga Falls. The chief export of Parana is Paraguay tea (a forest product). There is a large foreign element in the

population owing to the immigrant colonies established on the uplands, and considerable progress has been made in small farming and education. Besides the capital, Curityba, the principal towns are Paranagua; Antonina, at the head of the Bay of Paranagua, with a population of 7739 in 1890; Campo Largo, 20 m. west of Curityba (pop. 10,642 in 1890); Castro, N.N.W. of the capital on the Sao Paulo & Rio Grande line (pop. of the municipio, 10,319 in 1890); and Ponta Grossa (pop. of municipio, 4774 in 1890), north-west of Curityba at the junction of the two railway systems of the state.

Parana was settled by gold prospectors from Sao Paulo and formed part of that captaincy and province down to 1853, when it was made an independent province. The first missions of the Jesuits on the Parana were situated just above the Guayra Falls in this state and had reached a highly prosperous condition when the Indian slave hunters of Sao Paulo (called Mamelucos) compelled them to leave their settlements and emigrate in mass to what is now the Argentine territory of Misiones. The ruins of their principal mission, known as Ciudad Real, are overgrown with forest.

PARANA, a city and port of Argentina, capital of the province of Entre Rios, and the see of a bishopric, situated on the left bank of the Parana river, 410 m. by navigable channels (about 240 m. direct) N.W. of Buenos Aires. Pop. (1895), 24,261; (1904, estimate), 27,000. The city occupies a gently rolling site 120 ft. above the river and about 2 m. from its riverside port of Bajada Grande, with which it is connected by railway, tramway and highway. It is classed as a seaport, and ocean-going vessels of not over 12 ft. draught can ascend to Bajada. There is also a daily ferry service across the river to Santa Fe (7 m. distant), which is connected by railway with Rosario and Buenos Aires. Parana is also the western terminus of a provincial railway system, which connects with Concepcion and Concordia, on the Uruguay river, and with other important towns of the province. The mean annual temperature is about 66° F. and the climate is bracing and healthful. Its port of Bajada Grande, on the river shore below the bluffs, has the custom-house and a fine wharf for the accommodation of the Entre Rios railway and river craft. Parana was founded in 1730 by colonists from Santa Fe and was at first known as Bajada (a landing place). It was made the capital of the province by General Mansilla in 1821 (Concepcion had pre- viously been the capital), but in 1861 General Urquiza restored the seat of government to Concepcion, where it remained until 1882, when Parana again became the capital. Parana was also the capital of the Argentine Confederation from 1852 to 1861. r

PARANAGUA, a seaport of the state of Parana, Brazil, on the southern shore of the Bay of Paranagua, about 9 m. from the bar of the main channel. Pop. of the municipality (1890), 11,794, of which a little more than one half belonged to the town. v Paranagua is the principal port of the state, and is a port of call for steamers in the coastwise trade. It is the coastal terminus of a railway running to Curityba, the capital (69 m.), with exten- sions to other inland towns and a branch to Antonina, at the head of the bay, io| m. west of Paranagua by water. Its exports consist chiefly of mate, or Paraguay tea. The town was founded in 1560.

The Bay of Paranagua opens into the Atlantic in lat. 25 32′ S. through three channels and extends westward from the bar about 19 m. It is irregular in outline, receives the waters of a large number of small streams, and is comparatively shallow. Light-draught steamers can ascend to Antonina at the head of the bay. The broad entrance to the bay, which is the gateway to the state of Parana is nearly filled by the large Ilha do Mel (Honey Island) on which stands an antiquated fort commanding the only practicable channel.

PARANDHAR, a hill fort of British India, in Poona district, Bombay, 4472 ft. above the sea, 20 m. S.E. of Poona: pop. (1901), 944. It figures repeatedly in the rising of Sivaji against the Mahommedans, and was the favourite stronghold of the Peshwas whenever the unwalled city of Poona was threatened. It gave its name to a treaty with the Mahrattas, signed in 1776 but never carried into effect. It is now utilized as a sanatorium for British soldiers.

PARANOIA (Gr. irapa, beyond, and voeiv, to understand), a chronic mental disease, of which systematized delusions with or without hallucinations of the senses are the prominent characteristics. The delusions may take the form of ideas of persecution or of grandeur and ambition; these may exist separately or run concurrently in the same individual, or they may become transformed in the course of the patient's life from a persecutory to an ambitious character. The disease may begin during adolescence, but the great majority of the subjects manifest no symptoms of the affection until full adult life.

The prominent and distinguishing symptom of paranoia is the delusion which is gradually organized out of a mass of original but erroneous beliefs or convictions until it forms an integral part of the ordinary mental processes of the subject and becomes fused with his personality. This slow process of the growth of a false idea is technically known as " systematization,"

and the resulting delusion is then said to be ” systema- tized.” As such delusions are coherently formed there is no manifest mental confusion in their expression. Notwith- standing the fixity of the delusion it is subject in some cases to transformation which permits of the gradual substitution of delusions of grandeur for delusions of persecution. It happens also that periods of remission from the influence of the delusion may occur from time to time in individual cases, and it may even happen, though very rarely, that the delusion may permanently disappear.

It is necessary to point out that there is undoubtedly what may be called a paranoiac mental constitution, in which delusions may appear without becoming fixed or in which they may never appear. The characteristics of this type of mind are credulity, a tendency to mysticism and a certain aloofness from reality, combined, as the case may be, with timidity and suspicion or with vanity and pride. On such a soil it is easy to understand that, given the necessary circumstances, a systematized delusional insanity may develop.

The term paranoia appears to have been first applied by R. von Krafft-Ebing in 1879 to all forms of systematized delusional insanity. Werner in 1889 suggested its generic use to supplant Wahnsinn and Verrilcktheit, the German equivalents of mental states which originally meant, respectively, the delusional insanity of ambition and the delusional insanity of persecution — terms which had become hopelessly confused owing to divergences in the published descriptions of various authors.

The rapid development of clinical study has now resulted in the isolation of a comparatively small group of diseases to which the term is applied and the relegation of other groups bearing more or less marked resemblances to it to their proper categories. Thus, for example, it had formerly been held that acute paranoia was frequently a curable disease. It is now proved that the so-called acute forms were not true paranoias, many of them being transitory phases of E. Kraepelin’s dementia praecox, others being terminal conditions of acute melancholia, of acute confusional insanity, or even protracted cases of delirium tremens. While it removes from the paranoia group innumerable phases of delusional insanity met with in patients labouring under secon- dary dementia as a result of alcoholism or acute insanity, such a statement does not exclude patients who may

have had, during their previous life, one or more attacks of some acute mental disease, such as mania, for the paranoiac mental constitution may be, though rarely, subject to other forms of neurosis. Attempts have been made to base a differential diagnosis of paranoia upon the presence or absence of a morbid emotional element in the mind of the subjects, with the object of referring to the group only such cases as manifest a purely intellectual disorder of mind. Though in some cases of the disease the mental symptoms may, at the time of observation, be of a purely intellectual nature, the further back the history of any case is traced the greater is the evidence of the influence of preceding emotional disturbances in moulding the intellectual peculiarities. Indeed it may be said that the fundamental emotions of vanity or pride and of fear or suspicion are the groundwork of the disease. We are justified therefore in ascribing the intellectual aberrations which are manifested by delusions, in part at least, to the preponderating influence of morbid emotions which alter the perceptive and aperceptive processes upon which depend the normal relation of the human mind to its environment. Although, generally speaking, paranoiacs manifest marked intellectual clearness and a certain amount of determination of character in the exposition of their symptoms and in their manner of reacting under the influence of their delusions, there is, without any doubt, an element of original abnormality in their mental constitution. Such a mental constitution is particularly subject to emotional dis- turbances which find a favourable field of operation in an innate mysticism allied with credulity which is impervious to the rational appeal of the intellect. In those respects the paranoiac presents an exaggeration of, and a departure from, the psychical

constitution of normal individuals, who, while subject both to emotion and to mystic thought, retain the power of correcting any tendency to the predominance of these mental qualities by an appeal to reality. It is just here that the paranoiac fails, and in this failure lies the key to the pathological condition. For the present the question as to whether this defect is congenital or acquired owing to some superimposed pathological condition cannot be answered. However that may be, it is frequently ascertained from the testimony of friends and relatives that the patients have always been regarded as ” queer,” strange, and different from other people in their modes of thought. It is usually stated that nervous or mental diseases occur in the family histories of over 50% of the subjects of this affection.

Paranoia is classified for clinical purposes according to the form of delusion which the patients exhibit. Thus there are described the Persecutory, the Litigious, the Ambitious and the Amatory types. It

will be observed that these divisions depend upon the prevalence of the primary emotions of fear or suspicion, pride or vanity and love.

According to V. Magnan, the course of paranoia is progressive, and each individual passes through the stages of persecution and ambition successively. Many authorities accept Magnan's description, which has now attained to the distinction of a classic, but it is objected to by others on the ground that many cases commence with delusions of ambition and manifest the same symptoms unchanged during their whole life, while other patients suffering from delusions of persecution never develop the ambitious form of the disease. Against these arguments Magnan and his disciples assert that the relative duration of the stages and the relative intensity of the symptoms vary widely; that in the first instance the persecutory stage may be so short or so indefinite in its symptoms as to escape obser- vation; and that in the second instance the persecutory stage may be so prolonged as within the short compass of a human life to preclude the possibility of the development of an ambitious stage. As however there exist types of the disease which, admittedly, do not conform to Magnan's progressive form it will be more convenient to adopt the ordinary description here.

1. Persecutory Paranoia. — This form is characterized by delusions of persecution with hallucinations of a painful and distressing character. In predisposed persons there is often observed an anomaly of character dating from early life. The subjects are of a retiring disposition, generally studious, though not brilliant or successful workers. They prefer solitude to the society of their fellows and are apt to be introspective, self- analyticai or given to unusual modes of thought or literary pursuits. Towards the commencement of the insanity the patients become gloomy, preoccupied and irritable. Suspicions regarding the attitude of others take possession of their minds, and they ultimately come to suspect the conduct of their nearest relatives. The conversations of friends are supposed by the patient to be interlarded with phrases which, on examination, he believes to contain hidden meanings, and the newspapers appear to abound in veiled references to him. A stray word, a look, a gesture, a smile, a cough, a shrug of the shoulders on the part of a stranger are apt to be misinterpreted and brooded over. The extraordinary prevalence of this imagined con- spiracy may lead the patient to regard himself as a person of great importance, and may result in the formation of delusions of ambition which intermingle themselves with the general conceptions of persecution, or which may wholly supplant the persecutory insanity.

At this juncture, however, it generally happens that hallucina- tions begin to appear. These, in the great majority of instances, are auditory and usually commence with indefinite noises in the ears, such as ringing sounds, hissing or whistling. Gradu- ally they assume a more definite form until isolated words and ultimately formed sentence are distinctly heard. There is great diversity in the completeness of the verbal hallucinations in different patients. Some patients never experience more than the subjective annoyance of isolated words generally

of an insulting character, while others are compelled to listen to regular dialogues carried on by unknown voices concerning thernselves. A not uncommon form of verbal hallucination is formulated in the complaint of the patients that ” all their thoughts are read and proclaimed aloud.” Even more than the enforced listening to verbal hallucinations this ” thought read- ing ” distresses the patient and often leads him to acts of violence, for the privacy of his inmost thoughts is, he believes, desecrated, and he often feels helpless and desperate at a condition from which there is no possible escape.

Though some of the subjects do not develop any other form of hallucination, it is unfortunately the lot of others to suffer, in addition, from hallucinations of taste, smell or touch. The misinterpretation of subjective sensations in these sense organs leads to the formulation of delusions of poisoning, of being subjected to the influence of noxious gases or powders, or of being acted on by agencies such as electricity. Such are the persons who take their food to chemists for analysis; who complain to the police that people are acting upon them inju- riously; who hermetically seal every crevice that admits air to their bedrooms to prevent the entrance of poisonous fumes; or who place glass castors between the feet of their beds and the floor with the object of insulating electric currents. Such patients obtain little sleep; some of them indeed remain awake all night — for the symptoms are usually worse at night— and have to be content with such snatches of sleep as they are able to obtain at odd times during the day. It is obvious that a person tormented and distracted in the way described may at any moment lose self-control and become a danger to the com- munity. But perhaps the most distressing and most distracting of all hallucinations are those which for want of a better name are termed ” sexual.” The subjects of these hallucinations, both male and female,

under the belief that improper liberties are taken with them, are more clamant and threatening than any other class of paranoiac.

During the course of a disease so distressing in its symptoms the patient's suspicions as to the authors of his persecution vary much in indefiniteness. He often never fixes the direct blame upon any individual, but refers to his persecutors as "they" or a "society," or some corporate body such as " lawyers," " priests " or " freemasons." It not infrequently happens however, that suspicions gradually converge upon some individual or that from an early stage of the disease the patient has, generally under the influence of hallucinations, fixed the origin of his trouble upon one or two persons. When this takes place the matter is always serious from the point of view of physical danger to the inculpated person, especially if the patient is of a violent or vindictive disposition.

The persecutory type of the disease may persist for an indefi- nite period — even for twenty or thirty years — without any change except for the important fact that remissions in the intensity of the symptoms occur from time to time. These remissions may be so marked as to give rise to the belief that the patient has recovered, but in true paranoia this is hardly ever the case, and sooner or later the persecution begins again in all its former intensity.

2. Ambitious Paranoia. — After a long period of persecution a change in the symptoms may set in, in some cases, and the intensity of the hallucinations may become modified. At the same time delusions of grandeur begin to appear, at first faintly, but gradually they increase in force until they ultimately supplant the delusions of persecution. At the same time the hallucinations of a disagreeable nature fade away and are replaced by auditory hallucinations conformable to the new delusions of grandeur. Undoubtedly, however, this form of paranoia may commence, so far as can be observed, with delusions of grandeur, in which case there is seldom or never a transformation of the personality or of the delusions from grandeur to persecution, although delusions of persecution may engraft themselves or run side by side with the predomi- nant ambitious delusions.

The emotional basis of ambitious paranoia is pride, and every

phase of human vanity and aspiration is represented in the delusions of the patients. There is moreover considerably less logical acumen displayed in the explanations of their beliefs by such patients than in the case of the subjects of persecution. Many of them affect to be the descendants of historical person- ages without any regard for accurate

genealogical detail. They have no compunction in disowning their' natural parents or explaining that they have been " changed in their cradles " in order to account for the fact that they are of exalted or even of royal birth. Dominated by such beliefs paranoiacs have been known to travel all over the world in search of confirmation of their delusions. It is people of this kind who drop into the ears of confiding strangers vague hints as to their exalted origin and kindred, and who make desperate and occasionally alarming attempts to force their way into the presence of princes and rulers. The sphere of religion affords an endless field for the ambitious paranoiacs and some of them may even aspire to divine authority, but as a rule the true paranoiac does not lose touch with earth. The more extravagant delusions of persons who call themselves by divine names and assume omnipotent attributes are usually found in patients who have passed through acute attacks of insanity such as mania or dementia praecox and are mentally enfeebled.

A not uncommon form of paranoia combining both ambition and persecution is where the subject believes that he is a man of unbounded wealth or power, of the rights to which he is, however, deprived by the machinations of his enemies. These patients frequently obtain the knowledge on which they base their delusions through auditory hallucinations. They are often so troublesome, threatening and persistent in their deter- mination to obtain redress for their imagined wrongs, that they have to be forcibly detained in asylums in the public interest.

On the whole, however, the ambitious paranoiac is not trouble- some, but calm, dignified, self-possessed, and reserved on the subject of his delusions. He is usually capable of reasoning as correctly and of performing work as efficiently as ordinary people. Many of them, however, while living in society are liable to give expression to their delusions under the influence of excitement, or to behave so strangely and unconventionally on unsuitable occasions as to render their seclusion either necessary or highly desirable.

3. Amatory Paranoia. — A distinguishing feature of this form of paranoia is that the subjects are chivalrous and idealistic in their love. Some of them believe that they have been " mystically " married to a person of the opposite sex usually in a prominent social position. The fact that they may have never spoken to or perhaps never seen the person in question is immaterial. The conviction that their love is reciprocated and the relationship understood by the other party is unshakable, and is usually based upon suppositions that to a normal mind would appear either trivial or wholly unreal. The object of

affection, if not mythical or of too exalted a position to be approached, is not infrequently persecuted by the admirer, who” takes every opportunity of obtruding personally or by letter the evidences of an ardent adoration. The situation thus created can easily become complicated and embarrassing before it is realized that the persistent wooer is insane.

The failure of their schemes or repeated repulses may, in the case of some patients, originate delusions of persecution directed, not against the object of affection, but against those who are supposed to have conspired to prevent the success of the patient’s desires. Under the influence of these delusions of persecution the patient may lose self-control and resort to violence against his supposed persecutors.

The subjects of this form of paranoia are in the majority of instances unmarried women well advanced in years who have led irreproachable lives, or men of a romantic disposition who have lived their mental lives more in the realm of chimeras than in the region of real facts. The delusions in this form of paranoia are never accompanied by hallucinations.

Closely allied, if not identical with amatory paranoia, is the form in which jealousy forms the basis of morbid suspicions

with or without definite delusions. The subject is usually poor in mental resource, but proud, vindictive and suspicious. It is eminently a condition which arises spontaneously in certain persons whose mental constitution is of the paranoiac type, i.e. persons who are naturally credulous, mystical and suspicious. The subjects are extraordinarily assiduous in watching the objects of their jealousy, whether husbands, wives or sweethearts. Their conduct in this respect is fertile in producing domestic dispeace and unhappiness, and in the case of unmarried persons in creating complicated or delicate situations. It not infre- quently happens, just as in the case of the class of amatory paranoiacs, that delusions of persecution establish themselves, usually directed towards persons who are believed to have secured the affections of the object of jealousy. The disease then follows the ordinary course of the insanity of persecution but usually without hallucinations of the senses. The subjects are highly dangerous and violent. Under the influence of their delusions murder and even mutilation may be resorted to by the male, and poisoning or

vitriol-throwing by the female subjects.

4. Litigious Paranoia {paranoia querulans). — The clinical form of litigious paranoia presents uniform characteristic features which are recognized in every civilized community. The basic emotion is vanity, but added to that is a strong element both of acquisitiveness and avarice. Moreover the subjects are, as regards character, persistent, opinionative and stubborn. When these qualities are superadded to a mind of the paranoiac type, which as has been pointed out, is more influenced by the passions or emotions than by ordinary rational considerations, it can readily be appreciated that the subjects are capable of creating difficulties and anxieties which sooner or later may lead to their forcible seclusion in the interests of social order.

It is important to observe that the rights such people lay claim to or the wrongs they complain of may not necessarily be imaginary. But, whether imaginary or real, the statement of their case is always made to rest upon some foundation of fact, and is moreover presented, if not with ability, at any rate with forensic skill and plausibility. As the litigants are persons of one idea, and only capable of* seeing one side of the case — their own — and as they are actuated by convictions which preclude feelings of delicacy or diffidence, they ultimately succeed in obtaining a hearing in a court of law under circumstances which would have discouraged any normal individual. Once in the law courts their doom is sealed. Neither the loss of the case nor the payment of heavy expenses have any effect in dishearten- ing the litigant, who carries his suit from court to court until the methods of legal appeal are exhausted. The suit may be raised again and again on some side issue, or some different legal action may be initiated. In spite of the alienation of the sympathy of his relations and the advice of his friends and lawyers the paranoiac continues his futile litigation in the firm belief that he is only defending himself from fraud or seeking to regain his just rights. After exhausting his means and perhaps those of his family and finding himself unable to continue to litigate to the same advantage as formerly, delusions of persecution begin to establish themselves. He accuses the judges of corruption, the lawyers of being in the pay of his enemies and imagines the existence of a conspiracy to prevent him from obtaining justice. One of two things usually happens at this stage. Though well versed in legal procedure he may one day lose self-control and resort to threats of violence. He is then probably arrested and may on examination be found insane and committed to an asylum. Another not uncommon result is that finding himself non-suited in a court of law he commits a technical assault upon, it may be, some high legal functionary, or on some person in a prominent social position, with the object of

securing an opportunity of directing public attention to his grievances. The only result is, as in the former instance, his medical certification and incarceration.

Paranoia is generally a hopeless affection from the point of view of recovery. From what has been stated regarding its genesis and slow development it is apparent that no form of xx. 25

ordinary medical treatment can be of the least avail in modifying its symptoms. The best that can be done in the interests of the patients is to place them in surroundings where they can be shielded from infl”=nces which aggravate their delusions and in other respects to make their unfortunate lot as pleasant and as easy to endure as possible.

As has been frequently stated, the subjects of most forms of paranoia are liable to commit crime, usually of violence, which may lead to their being tried for assault or murder. The ques- tion of their responsibility before the law is therefore one of the first importance (see also Insanity: Law). The famous case of McNaghten, tried in 1843 for the murder of Mr Drummond, private secretary to Sir Robert Peel, is, in this connexion, highly important, for McNaghten was a typical paranoiac labouring under delusions of persecution, and his case formed the basis of the famous deliverance of the judges in the House of Lords, in the same year, on the general question of criminal responsi- bility in insanity. Answer 4 of the judges’ deliverance contains the following statement of law: If “he labours under such partial delusion only and is not in other respects insane we think he must be considered in the same situation as to responsi- bility as if the facts to which the delusion exists were real. For example, if under the influence of his delusion he supposes another man to be in the act of attempting to take away his life, and he kills that man, as he supposes, in self-defence, he would be exempt from punishment. If his delusion was that the deceased had inflicted a serious injury to his character and fortune, and he killed him in revenge for such supposed injury, he would be liable to punishment.”

In considering this deliverance it must be remembered that it was given under the influence of the enormous public interest created by the McNaghten trial. It has also to be remembered that in a criminal court the term responsibility means liability to legal punishment. The dictum laid down in answer 4 is open to several objections. (1) It is based upon the erroneous assumption that a person may be insane on one point and sane on every other. This is a loose popular fallacy for which there is no foundation in clinical medicine. The systematizatioh

of a delusion involves, as has been pointed out, the whole personality and affects emotion, intellect and conduct. The human mind is not divided into mutually exclusive compart- ments, but is one indivisible whole liable to be profoundly modified in its relation to its environment according to the emotional strength of the predominant morbid concepts. (2) It does not take into account the pathological diminution of the power of self-control. The influence of continued delusions of persecution, especially if accompanied by painful hallucina- tions, undermines the power of self-control and tends ultimately to reduce the subject towards the condition of an automaton which reacts reflexly and blindly to the impulse of the moment (3) The opinion is further at fault in so far as it assumes that the test of responsibility rests upon the knowledge of right and wrong, which implies the power to do right and to avoid wrong, an assumption which is very far from the truth when applied to the insane. The number of insane criminals who possess no theoretical knowledge of right and wrong is very few indeed, so few that for practical purposes they may be disregarded.

The true paranoiac is a person of an anomalous mental constitution apart from his insanity; although he may to out- ward appearances be able, on occasion, to converse or to act rationally, the moment he is dominated by his delusions he becomes not partially but wholly insane; when in addition his mind is distracted by ideas of persecution or hallucinations, or both, he becomes potentially capable of committing crime, not because of any inherent vicious propensity but in virtue of his insanity. There is therefore no middle course, from the medical point of view, in respect to the criminal responsibility of the subjects of paranoia; they are all insane wholly, not partially, and should only be dealt with as persons of unsound mind.

See Bianchi Textbook of Insanity (Eng. trans., 1906); Clouston, Mental Diseases (6th ed.) ; Krafft-Ebing, Textbook of Insanity (American trans., 1904); Kraepelin, Psychiatrie (6th ed., Leipzig,

1899); Magnan, Le Delire chronique (Paris, 1890); Stewart Paton, Psychiatry (Philadelphia, 1905); Percy Smith, “Paranoia,” in Journ. of Mental Science (1904), p. 607. (J. Mn.)

PARAPET (Ital. parapetto, Fr. parapet, from para, imperative of Ital. porare, to cover, defend, and petto, breast, Lat. pectus; the German word is Brustwehr), a dwarf wall along the edge of a roof, or round a lead flat, terrace walk, &c, to prevent persons from falling over, and as a protection to the defenders in case of a siege. Parapets are either plain, embattled, perfor- ated or panelled. The last two are found in all styles except the Romanesque. Plain parapets are simply portions of the wall generally overhanging a little, with a coping at the top and corbel table below. Embattled parapets are sometimes pan lied, but oftener pierced for the discharge of arrows, &c. Perforated parapets are pierced in various devices — as circles, trefoils, quatrefoils and other designs — so that the light is seen through. Panelled parapets are those ornamented by a series of panels, either oblong or square, and more or less enriched, but are not perforated. These are common in the Decorated and Perpendicular periods.

PARAPHERNALIA (Lat. paraphernalia, sc. bona, from Gr. Tapafepva; irapa, beside, and fepvy, dower), a term originally of Roman law, signifying all the property which a married woman who was sui juris held apart from her dower (dos). A husband could not deal with such except with his wife's consent. Modern systems of law, which are based on the Roman, mainly follow the same principle, and the word preserves its old meaning. In English and Scottish law the term is confined to articles of jewelry, dress and other purely personal things, for the law relating to which, see Husband and Wife. The word is also used in a general sense of accessories, external equipment, cumbersome or showy trappings.

PARAPHRASE (Gr. irapaQpacns, from irapa < £pdfew, to relate something in different words, irapa, beside, and 4 > pa$eu >, speak, tell), a rendering into other words of a passage in prose or verse, giving the sense in a fuller, simpler or clearer fashion, also a free translation or adaptation of a passage in a foreign language. The term is specifically used in the Scottish and other Presby- terian churches of metrical versions for singing of certain passages of the Bible.

PARASCENIUM (Gr. irapacwriviov), in a Greek theatre, the wall on either side of the stage, reaching from the back wall ((7/OJV17) to the orchestra.

PARASITE (From Gr. irapa., beside, fftros food), literally " mess-mate," a term originally conveying no idea of reproach or contempt, as in later times. The early parasites may be divided into two classes, religious and civil. The former were assistants of the priests, their chief duty being to collect the corn dues which were contributed by

the farmers of the temple lands or which came in from other sources (Athenaeus vi. 235; Pollux vi. 35). Considerable obscurity exists as to their other functions, but they seem to have been charged with providing food for the visitors to the temples, with the care of certain offerings, and with the arrangement of the sacrificial banquets. In Attica the parasites appear to have been confined to certain demes (Acharnae, Diomeia), and were appointed by the demes to which the temples belonged. The ” civil ” parasites were a class of persons who received invitations to dine in the prytaneum and subsequently in the tholos) as distinguished from those who had the right to dine there ex officio. An entirely different meaning (” sponger “) became attached to the word from the character introduced into the Middle and New Comedy, first by Alexis, and firmly established by Diphilus. The chief object of this class of parasites was a good dinner, for which they were ready to submit to almost any humiliation. Numerous examples occur in the comedies of Plautus; and Alciphron and Athenaeus (vi. 236 sqq.) give instances of the insults they had to put up with at the hands of both host and guests. Some of them played the part of professional jesters (like the later buffoons and court fools), and kept collections of witticisms ready for use at their patrons' table ; others relied upon flattery, others again condescended to the most degrading devices (Plutarch, De adulatore, 23: De educatione puerorum, 17). The

term parasite, from meaning a ” hanger-on,” has been trans- ferred to any living creature which lives on another one.

See Juvenal v. 170 with J. E. B. Mayor's note, and the exhaustive article by M..H. Meier in Ersch and Gruber's AllgemeineEncyclopddie.

PARASITIC DISEASES. It has long been recognized that various specific pathological conditions are due to the presence and action of parasites (see Parasitism) in the human body, but in recent years the part played in the causation of the so-called infective diseases by various members of the Schizo- mycetes — fission fungi— and by Protozoan and other animal parasites has been more widely and more thoroughly investigated (see Bacteriology). The knowledge gained has not only modified our conception of the pathology of these diseases, but has had a most important influence upon our methods of treat- ment of sufferers, both as individuals and. as members of com- munities. For clinical and other details of the diseases mentioned in the following classification, see the separate articles on them; the present article is concerned mainly with important modern discoveries as regards aetiology and pathology. In certain cases indeed the aetiology is still obscure. Thus, according to Guarnieri, and Councilman & Calkins, there is associated with vaccinia and with

small-pox a Protozoan parasite, Cytoryctes variolae, Guar. This parasite is described as present in the cytoplasm of the stratified epithelium of the skin and mucous membranes in cases of vaccinia, but in the nuclei of the same cells in cases of variola or small-pox, whilst it is suggested that there may be a third phase of existence, not yet demonstrated, in which it occurs as minute spores or germs which are very readily carried in dust and by air currents from point to point. In certain other conditions, such as mumps, dengue, epidemic dropsy, oriental sore — with which the Leishman-Donovan bodies (Helcosoma tropicum, Wright) are supposed to be closely associated (see also Kdla-dzar below) — verruga, framboesia or yaws— with which is commonly associated a spirochaete (Castellani) and a special micrococcus (Pierez, Nicholls) — and beri-beri, the disease may be the result of the action of specific micro-organisms, though as yet it has not been possible to demonstrate any aetiologica relationship between any micro- organisms found and the special disease. Such diseases as haemoglobinuric fever or black-water fever, which are also presumably parasitic diseases, are probably associated directly with malaria; this supposition is the more probable in that both of these are recognized as occurring specially in those patients who have been weakened by malaria.

The following classification is based partly upon the biological relations of the parasites and partly on the pathological pheno- mena of individual diseases: —

A. — Diseases due to Vegetable Parasites.

I. — TO SCHIZOMYCETES, BACTERIA OR FlSSION FUNGI.

I. Caused by the Pyogenetic Micrococci. Suppuration and Septicaemia. Erysipelas.

Infective Endocarditis.

Gonorrhoea.

2. Caused by Specific Bacilli. (a) Acute Infective Fevers. Cholera. 1 » Infective Meningitis.

Typhoid Fever. Influenza.

Malta Fever. Yellow Fever and Weil's Disease.

Relapsing Fever. Diphtheria.

Plague. Tetanus.

Pneumonia.

(b) More Chrontclnfective Diseases (tissue parasites). Tuberculosis. Glanders. Leprosy.

II. — To Higher Vegetable Parasites. Actinomycosis, Madura Foot, Aspergillosis and other Mycoses.

B. — Diseases due to Animal Parasites.' I. — To Protozoa. Malaria." Kala-azar.

Amoebic Dysentery. Tsetse-fly Disease.

Haemoglobinuric Fever. Sleeping Sickness.

Syphilis.

II. — To other Animal Parasites. Filariasis, &c.

PARASITIC DISEASES

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FlC. I. — Spirochacta pallida of Schaudinn (Spironcma pallidum), the organism found in the early sores of syphilis; stained by Cicmsa's stain. X looodiam.

■ 2. — Preparation of the Glanders bacillus (B. mallei), from a. 13-hours' IBNBD culture. X iooo diam.

■ y — Negri bodies (red with blue points) in and around the nerve cells of the cornu ammonis of a dog suffering from rabies.

X Boo diam.

■ 4. — Staphylococcus pyogenes aureus from a 1 2-hours' agar culture. X 1000 diam.

■ 5. — Malaria. Life cycle, in the blood, of the Tertian malarial parasite commencing with the small amoebulae and passing through

the spore-bearing stages. X 1000 diam. " 6. — Section of eland from a puinca-piR inoculated with the Glanders bacillus (B. mallei). X 1000 diam. " 7. — Leishman-Donovan bodies found in the scraping made from the cut surface of the spleen from a case of Kala-Azar. X 1000

diain. " 8. — Branched hyphal thrixids of the Ray fungus (Actinomyces, clubbed through thickening of the sheath.) X 1000 diam,

■ 9. — The Trypanosoma Gambicnsc, seen in a blood film taken from a case of sleeping sickness. X '000 diam.

PARASITIC DISEASES

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FlG, I. — Spiroehaeta pallida of Schaudinn (Spironcma pallidum), the organism found in the early sores of syphilis; stained by Ciemsa's

stain. X looodiam. ” 2. — Preparation of the Glanders bacillus (B. mallei), from a 12-hours' agar-agar culture. X iooo diam. ” 3. — Negri bodies (red with blue points) in and around the nerve cells of the cornu ammonis of a dog suffcrinB from rabies.

X Boo diam. ” 4. — Staphylococcus pyogenes aureus from a J 2-hours' agar culture. X iooo diam. ” 5.— Malaria. Life cycle, in the blood, of the Tertian malarial parasite commencing with the small amoebulae and passing through

the spore-bearing stages. X iooo diam.

■ 0. — Section of eland from a guinea-pig inoculated with the Glanders bacillus (B, mallei). X iooo diam.

■ 7. — Leishman-Donovan bodies found in the scraping made from the cut surface of the spleen from a case of Kala-Azar. X iooo

diam. * 8. — Braneliixl liyphal threads of the Ray fungus (Actinomyces, clubbed through thickenitiR of the sheath.) X iooo diam. ” 9. — The Trypanosoma Gambiense, seen in a blood film taken from a case of sleeping sickness. X iooo diam.

PARASITIC DISEASES

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C. — Infective Diseases in which an organism has been found, but has

not finally been connected with the disease.

Hydrophobia. Scarlet Fever.

D. — Infective Diseases not yet proved to be due to micro-organisms.

Small-pox. Mumps.

Typhus Fever. Measles

Whooping Cough, &c.

A. — Diseases due to Vegetable Pai'asites.

I. — TO SCHIZOMYCETES, BACTERIA OE FlSSION FUNGI.

i. Caused by the Pyogenetic Micrococci.

Suppuration and Septicaemia. — It is now recognized that although nitrate of silver, turpentine, castor oil, perchloride of mercury and certain other chemical substances are capable of producing suppuration, the most common causes of this condition are undoubtedly the so-called pus-producing bacteria. Of these perhaps the most important are the staphylococci (cocci arranged like bunches of grapes), streptococci (cocci arranged in chains), and pneumococci, though certain other organisms not usually associated with pus-formation are undoubtedly capable of setting up this condition, e.g. Bacillus pyocyaneus, Bacillus coli communis, and the typhoid bacillus. These organisms (the products of which, by chemical irritation, stimulate the leucocytes to emigration) bring about the death and digestion of the tissues and fluids (which no longer " clot ") with which they come in contact, pus (matter) being thus formed: this accumulates in the tissues, in the serous cavities, or even on mucous surfaces; septicaemia or blood-poisoning, secondary infection of tissues and organs at a distance from the original site of infection, or pyaemia, with the formation of secondary abscesses, may thus be set up.

In septicaemia the pus-forming organisms grow at the seat of introduction, and produce special poisons or toxins, which, absorbed into the biood, give rise to symptoms of fever. From the point of introduction, however, the organisms may be swept away either by the lymph or by the blood, and carried to positions in which they set up further inflammatory or suppurative changes. In the streptococcal inflammations spreading by the lymph channels appears to be specially pre- valent. In the blood the organisms, if in small numbers,

are usually destroyed by the plasma, which has a powerful bactericidal action; should they escape, however, they are carried without multiplication into the capillaries of the general circulation, of the lung, or of the liver, where, being stopped, they may give rise to a second focus of infection, especially if at the point of impaction the vitality of the tissues is in any way lowered. Unless the blood is very much impoverished, its bactericidal action is usually sufficiently powerful to bring about the destruction of anything but comparatively large masses of pyogenetic organisms. This bactericidal power, however, may be lost ; in such case the pus-forming organisms may actually multiply, a general haemic infection resulting. Should micro-organisms be conveyed by the veins to the heart, and there be deposited on an injured valve, an infective endocarditis is the result; from such a deposit numerous organisms may be continuously poured into the circulation. Simple thrombi or clots may also become infected with micro-organisms. Frag- ments of these, washed away, may form septic plugs in the vessels and give rise to abscesses at the points where they become impacted. A distinction must be drawn between sapraemia and septicaemia. In sapraemia the toxic products of saprophytic organisms are absorbed from a gangrenous or necrotic mass, from an ulcerating surface, or from a large surface on which saprophytic organisms are living and feeding on dead tissues: for example, we may have such a condition in the clots that sometimes remain after childbirth on the inner surface of the wall of the womb. So long as no micro-organisms follow the toxins, the condition is purely sapraemic, but should any organisms make their way into and multiply in the blood, the condition becomes one of septicaemia. The term pyaemia is

usually associated with the formation of fresh secondary foci of suppuration in distant parts of the body. If the primary abscess occurs in the lungs, the secondary or metastatic abscesses usually occur in the vessels of the general or systemic circulation, and less frequently in other vessels of the lung. When the primary abscess occurs in the systemic area, the secondary abscess occurs first in the lung, and less frequently in the systemic vessels; whilst if the primary abscess be in the portal area (the veins of the digestive tract), the secondary abscesses are usually distributed over the same area, the lungs and systemic vessels being more rarely affected.

Infective Endocarditis. — Acute malignant or ulcerative endo- carditis occurs in certain forms of septicaemia or of pyaemia. It is brought about by the Streptococcus pyogenes (see Plate II. fig. 2), the pneumococcus, or the Staphylococcus pyogenes aureus (see Plate I. fig. 4), or, more rarely, by the gonococcus, the typhoid bacillus or the

tubercle bacillus, as they gain access to acute or chronic valvular lesions of the heart. The aortic and mitral valves are usually affected, the pulmonary and tricuspid valves much more rarely, though Washbourn states that the infective form occurs on the right side more frequently than does simple endocarditis. A rapid necrosis of the surface of the valve is early followed by a deposition of fibrin and leuco- cytes on the necrosed tissue; the bacteria, though not present in the circulating blood during life, are found in these vegeta- tions which break down very rapidly; ulcerative lesions are thus formed, and fragments of the septic clot (i.e. the fibrinous vegetations with their enclosed bacteria) are carried in the circulating blood to different parts of the body, and, becoming impacted in the smaller vessels, give rise to septic infarcts and abscesses. The ulceration of the valves, or in the first part of the aorta, may be so extensive that aneurysm, or even perforation, may ensue.

In certain cases of streptococcic endocarditis the use of anti-streptococcic serum appears to have been attended with good results. Sir A. Wright found that the introduction of vaccines prepared from the pus-producing organisms after first lowering the opsonic index almost invariably, after a very short interval, causes it to rise. He found, too, that the vaccine is specially efficacious when it is prepared from the organisms associated with the special form of suppuration to be treated. Whenever the opsonic index becomes higher under this treatment the suppurative process gradually subsides: boils, acne, pustules, carbuncles all giving way to the vaccine treatment. The immunity so obtained is attributed to the increased activity of the serum as the result of the presence of an increased amount of opsonins. Further, Bier maintains that a passive conges- tion and oedema induced by constriction of a part by means of a ligature or by a modification of the old method of cupping without breaking the skin appears to have a similar effect in modifying localized suppurative processes, that is processes set up by pus-producing bacteria. Wright holds that this treatment is always more effective when the opsonic index is high and that the mere accumulation of oedematous fluid in the part is sufficient to raise the opsonic index of that fluid and therefore to bring about a greater phagocytic activity of the leucocytes that are found in such enormous numbers in the neighbourhood of suppurative organisms and their products.

Erysipelas. — In 1883 Fehleisen demonstrated that in all cases of active erysipelatous inflammation a streptococcus or chain of micrococci (similar to those met with in certain forms of suppuration) may be found in the lymph spaces in the skin. The multiplying streptococci found in the lymph spaces form an active poison, which,

acting on the blood-vessels, causes them to dilate; it also ” attracts ” leucocytes, and usually induces proliferation of the endothelial cells lining the lymphatics. These cells — perhaps by using up all available oxygen — inter- fere with the growth of the streptococcus and act as phagocytes, taking up or devouring the dead or weakened micro-organisms. Both mild and severe phlegmonous cases of erysipelas are the result of the action of this special coccus, alone, or in

combination with other organisms. It has been observed that cancerous and other malignant tumours appear to recede under an attack of erysipelas, and certain cases have been recorded by both Fehleisen and Coley in which complete cessation of growth and degeneration of the tumour have followed such an attack. As the streptococcus of erysipelas can be isolated and grown in pure culture in broth, it was thought by these observers that a subcutaneous injection of such a cultivation might be of value in the treatment of cancerous tumours. No difficulty was experienced in setting up erysipelas by inoculation, but in some cases the process was so acute that the remedy was more fatal than the disease. The virulence of the streptococcus of erysipelas, as pointed out by Fehleisen and Coley, is greatly exalted when the coccus is grown alongside the Bacillus prodigiosus and certain other saprophytic organisms which nourish at the body- temperature. It is an easier matter to control the action of a non-multiplying poison, even though exceedingly active, than of one capable, under favourable conditions, of producing an indefinite amount of even a weaker poison. The erysipelatous virus having been raised to as high a degree of activity as possible by cultivating it along with the Bacillus prodigiosus — the bacillus of ” bleeding ” bread — in broth, is killed by heat, and the resulting fluid, which contains a quantity of the toxic substances that set up the characteristic erysipelatous changes, is utilized for the production of an inflammatory process — which can now be accurately controlled, and which is said to be very beneficial in the treatment of certain malignant tumours. The accurate determination of the aetiology of erysipelas has led to the adoption of a scientific method of treatment of the disease. The Streptococcus erysipelatis is found, not specially in the zone in which inflammation has become evident, but in the tissues outside this zone: in fact, the streptococci appear to be most numerous in the lymphatics of the tissues in which there is little change. Before the appearance of any redness there is a dilata- tion of the lymph spaces with fluid, and the tissues become slightly oedematous. As

soon, however, as the distension of vessels and the emigration of leucocytes, with the accompanying swelling and redness, become marked, the streptococci disappear or are imperfectly stained — they are undergoing degenerative changes — the inflammatory ” reaction ” apparently being suffi- cient to bring about this result.

If it were possible to set up the same reaction outside the advancing streptococci might not a barrier be raised against their advance? This theory was tested on animals, and it was found that the application of iodine, oil of mustard, cantharides and similar rubefacients would prevent the advance of certain micro-organisms. This treatment was applied to erysipelatous patients with the most satisfactory result, the spread of the disease being prevented when- ever the zone of inflammation was extended over a sufficiently wide area. The mere ” ringing ” of the red patch by nitrate of silver or some other similar irritant, as at one time recommended, is not sufficient: it is necessary that the reaction should extend for some little distance beyond the zone to which the streptococci have already advanced.

Gonorrhoea. — A micro-organism, the gonococcus, is the cause of gonorrhoea. It is found in the pus of the urethra and in the conjunctiva lying between the epithelial cells, where it sets up considerable irritation and exudation; it occurs in the fluid of joints of patients affected with gonorrhoeal arthritis; also in the pleuritic effusion and in the vegetations of gonorrhoeal endocarditis. It is a small diplococcus, the elements of which are flattened or slightly concave disks apposed to one another; these, dividing transversely, sometimes form tetrads. They are found in large numbers, usually in the leucocytes, adherent to the epithelial cells or lying free. They stain readily with the basic aniline dyes, but lose this stain when treated by Gram’s method. The gonococcus is best grown on human blood-serum mixed with agar (Wertheim), though it grows on ordinary solidified blood-serum or on blood-agar. Like the pneumo- coccus, it soon dies out, usually before the eighth or ninth day, unless reinoculations are made. It forms a semi-transparent disk-like growth, with somewhat irregular margins, or with small processes running out beyond the main colony. It acts by means of toxins, which have been, found to set up irritative

changes when injected, without the gonococci, into the anterior chamber of the eye of the rabbit.

2. Caused by Specific Bacilli, (a) Acute Infective Fevers. Cholera. — In 1884 Koch, in the report of the German Cholera Commission in Egypt and India, brought forward overwhelming evidence in proof of his

contention that a special bacterium is the causal agent of cholera; subsequent observers in all countries in which cholera has been met with have confirmed Koch's observation. The organism described is the " comma " bacillus or vibrio, one of the spirilla, which usually occurs as a slightly curved rod 1 to 2y. in length and 0-5 to o-6/t in thickness. These comma-shaped rods occur singly or in pairs; they may be joined together to form circles, half-circles, or " S "-shaped curves (see Plate II. fig. 3).

In cultivations in specially prepared media they may be so grouped as to form long wavy or spiral threads, each of which may be made up of ten, twenty, or even thirty, of the short curved vibrios ; in the stools of cholera patients, especially during the earlier stages of the disease, they are found in considerable numbers; they may also be found in the contents of the lower bowel and in the substance of the mucous membrane of the lower part of the small intestine, especially in the crypts and in aid around the epithelium lining the follicles. It is sometimes difficult, in the later stages of the disease, to obtain these organisms in sufficiently large numbers to be able to distinguish them by direct microscopic examination, but by using the Dunbar-Schottelius method they can be detected even when present in small numbers. A quantity of faintly alkaline meat broth, with 2 % of peptone and 1 % common salt, is inoculated j with some of the contents of the intestine, and is placed in an I incubator at a temperature of 35 ° C. for about twelve hours, when, I if any cholera bacilli are present, a delicate pellicle, consisting ! almost entirely of short " comma " bacilli, appears on the surface. If the growth be allowed to continue, the bacilli increase in length, but after a time the pellicle is gradually lost, the cholera organisms being overgrown, as it were, by the other organisms. In order to obtain a pure culture of the cholera bacillus, remove a small frag- ment of the young film, shake it up thoroughly in a little broth, and then make gelatine-plate cultivations, when most characteristic colonies appear as small greyish or white points. Each of these, when examined under a low-power lens, has a yellow tinge; the margins are wavy or crenated; the surface is granular and has a peculiar ground-glass appearance; around the growing colony liquefaction takes place, and the colony gradually sinks to the bottom of the liquefying area, which now appears as a clear ring. The organism grows very luxuriantly in milk, in which, however, it gives rise to no very noticeable alteration ; its presence can only be recognized by a faint aromatic and sweetish smell, which can scarcely be distinguished from the aromatic smell of. the milk itself, except by the most practised nose.

The cholera bacillus may remain alive in water for some time, but it

appears to be less resistant than many of the putre- factive and saprophytic organisms. It grows better in a saline solution (brackish water) than in perfectly fresh water; it flourishes in serum and other albuminous fluids, especially when peptones are present. Its power of forming poisonous substances appears to vary directly with the amount and nature of the albumen present in the nutrient medium; and though it grows most readily in the presence of peptone, it appears to form the most virulent poison when grown in some form or other of crude albumen to which there, is not too free access of oxygen. From the experiments carried out by Koch, Nicati and Rietsch, and Macleod, there appears to be no doubt that the healthy stomach and intestine are not favourable breeding-grounds for the cholera bacillus. In the first place, it requires an alkaline medium for its full and active development, and the acid found in a healthy stomach seems to exert an exceedingly deleterious influence upon it. Secondly, it appears to be incapable of developing except when left at rest, so that the active peristaltic movement of the intestine interferes with its development. Moreover, it forms its poison most easily in the presence of crude albumen. It is interesting to note what an important bearing these facts have on the personal and general spread of cholera. Large quantities of the cholera bacillus may be injected into the stomach of a guinea-pig without any intoxicative or other symptoms of cholera making their appearance. Further, healthy individuals have swallowed, without any ill effect, pills

containing the dejecta from cholera cases, although cases are recorded in which ” artificial ” infection of the human subject has undoubtedly taken place, whilst, as Metchnikoff demonstrated, very young rabbits, deriving milk from mothers whose mammary glands have been smeared with a culture of the cholera vibrio, soon succumbed, suffering from the classical symptoms of this disease.

If, however, previous to the injection of the cholera bacillus the acidity of the stomach be neutralized by an alkaline fluid, especially if at the same time the peristaltic action of the intes- tine be paralysed by an injection of morphia, a characteristic attack of cholera is developed, the animal is poisoned, and in the large intestine a considerable quantity of fluid faeces containing numerous cholera bacilli may be found. There appear to be slight differences in the cholera organisms found in connexion with different outbreaks, but the main character- istics are preserved throughout, and are

sufficiently distinctive to mark out all these organisms as belonging to the cholera group. Amongst the known predisposing causes of cholera are the incautious use of purgative medicines, the use of unripe fruit, insufficient food and intemperance. These may be all looked upon as playing the part of the alkaline solution in altering the composition of the gastric juices, and especially as setting up alkaline fermentation in the stomach and small intestine; beyond this, however, the irritation set up may bring about an accumulation of inflammatory serous fluid, from the albumens of which, as we have seen, the cholera organism has the power of producing very active toxins.

The part played by want of personal cleanliness, overcrowding and unfavourable hygienic conditions may be readily under- stood if it be remembered that the cholera bacillus may grow outside the body. The number of cases in which epidemics of cholera have been traced to the use of drinking-water contami- nated with the discharges from cholera patients is now consider- able. The more organic matter present the greater is the virulence of water so contaminated; and the addition of such water to milk has, in one instance at least, led to an outbreak. If cholera dejecta be sprinkled on moist soil or damp linen, and kept at blood-heat, the bacillus multiplies at an enormous rate in the first twenty-four or thirty-six hours; but, as seen in the Dunbar-Schottelius method, at the end of three or four days it is gradually overcome by the other bacteria present, which, growing strongly and asserting themselves, cause it to die out. The importance of this saprophytic growth in the propagation of the disease can scarcely be over-estimated. Water which con- tains an ordinary amount of organic and inorganic matter in solu- tion does not allow of the multiplication of this organism, which may soon die out; but when organic matter is present in excess, as at the margin of stagnant pools and tanks, development occurs, especially on the floating solid particles. This bacillus grows at a temperature of 30 C. on meat, eggs, vegetables and moistened bread; also on cheese, coffee, chocolate and dilute sugar solutions. In some experiments carried out by Cartwright Wood and the writer in connexion with the passage of the cholera organism through filters it remained alive in the charcoal filtering medium for a period of at least forty-two days, and probably for a couple of months. It must be remembered that cholera bacilli are gradually overcome or overgrown by other organisms, as only on this supposition can the immunity enjoyed by certain regions, even after the water and soil have been contaminated, provided that no fresh supply is brought in " to relight the torch," be explained. In most of the regions in which cholera remains endemic the wells are merely dug-out pits beneath the slightly raised houses, and are open for the reception of sewage

and excreta at all times. These dejecta contain organic material which serves as a nutriment on which infective organisms, derived from the soil and ground-water, may flourish. Not only dejecta, but also the rinsings from soiled linen and utensils used by cholera patients should be removed as soon as possible, “without allowing them to come into contact with the surface of the soil, with wells,” or with vegetables and the like. The discovery of Koch’s comma bacillus, has so

altered our conceptions of the aetiology of this disease that we now study the conditions under which the bacillus can multiply and be disseminated, instead of concerning ourselves with the cholera itself as some definite entity. Telluric agencies become merely secondary factors, the dissemination of the disease by winds from country to country is no longer regarded as being possible, whilst the spread of cholera epidemics along the lines of human intercourse and travel is now recognized. The virulent bacillus requires the human organism to carry it from those localities in which it is endemic to those in which epidemics occur. The epidemiologist has come to look upon the study of the cholera organism and the conditions under which it exists as of more importance than mere local conditions, which are only important in so far as they contribute to the propaga- tion and distribution of the cholera bacillus, and he knows that the only means of preventing its spread is the careful inspection of everything coming from cholera-stricken regions. He also recognizes that the herding together of people of depressed vitality, under unhygienic and often filthy conditions, in quaran- tine stations or ships, is one of the surest means of promoting an epidemic of the disease; that attention should be confined to the careful isolation of all patients, and to the disinfection of articles of clothing, feeding utensils, and the like; that the comma bacillus can only be driven out of rooms by means of light and fresh air; that thorough personal, culinary and house- hold cleanliness is necessary; that all water except that known to be pure should be carefully boiled; and that all excess, both in eating and drinking, should be avoided. The object of the physician in such cases must be first to isolate as completely as possible all his cholera patients, and then to get rid of all predisposing causes in the patients themselves, causes which have already been indicated in connexion with the aetiology of the disease.

Attention has frequently been drawn to the fact that patients who have lived for some time in a cholera region, or who have already suffered from an attack of cholera, appear to enjoy a partial immunity against the disease. Haffkine, working on the assumption that the symptoms of cholera are produced by a toxin formed by the cholera organism, came to the conclusion that, by introducing first a modified

and then a more virulent poison directly into the tissues under the skin, and not into the alimentary canal, it would be possible to obtain a certain insus- ceptibility to the action of this poison. He found that for this purpose the cholera bacillus, as ordinarily obtained in pure culture from the intestinal canal, is too potent for the preliminary inoculation, but is not sufficiently active for the second, if any marked protection is to be obtained. By allowing the organism to grow in a well-aerated culture the virulence is gradually diminished, and this virulence, once abolished, does not return even when numerous successive cultures are made on agar or other nutrient media. On the other hand, by passing the cholera bacillus successively through the peritoneal cavities of a series of about thirty guinea-pigs, he obtains a virus of great activity; this activity is soon lost on agar cultivations, and it is necessary, from time to time, again to pass the bacillus through guinea-pigs, three or four passages now being sufficient to reinforce the activity.

From these two cultures the vaccines are prepared as follows: The surface of a slant agar tube is smeared with the modified cholera organism. After this has been allowed to grow for twenty- four hours, a small quantity of sterile water is poured into the tube, and the surface-growth is carefully scraped off and made into an emulsion in the water; this is then poured off, and the process is repeated until the whole of the growth has been removed. The mixture is made up with water to a bulk of 8 c.c, so that if I c.c. is injected the patient receives i of a surface-growth ; it is found that this quantity, when injected subcutaneously into a guinea-pig, gives a distinct reaction, but does not cause necrosis of the tissues. If the vaccine is to be kept for any length of time, the emulsion is made with 0-5 % carbolic acid solution, prepared with carefully sterilized water, and the mixture is made up to 6 c.c. instead of 8 c.c, since the carbolic acid appears to interfere slightly with the activity of the virus. The stronger virus is prepared in exactly the same way. The preliminary injection, which is made in the left flank, is followed by a rise in temperature and by local reaction.

After three or four hours there is noticeable swelling and some pain ; and after ten hours a rise in temperature, usually not very marked, occurs. These signs soon disappear, and at the end of three or four days the second injection is made, usually on the opposite side. This is also followed by a rise of temperature, by swelling, pain and local

redness: these, however, as before, soon pass off, and leave no ill effects behind. A guinea-pig treated in this fashion is now immune against some eight or ten times the lethal dose of cholera poison, and, from all statistics that can be obtained, a similar protection is conferred upon the human being.

Pfeiffer found that when a small quantity of the cholera vibrio is injected into the peritoneal cavity of a guinea-pig highly immunized against cholera by Haffkine's or a similar method, these vibrios rapidly become motionless and granular, then very much swollen and finally " dissolve." This is known as Pfeiffer's reaction. A similar reaction may be obtained when a quantity of a culture of the cholera vibrio mixed with the serum derived from a guinea-pig immunized against the cholera vibrio, or from a patient convalescent from the disease, is injected into the peritoneal cavity of a guinea-pig not subjected to any preliminary treatment; and, going a step further, it was found that the dissolution of the cholera vibrio is brought about even when the mixture of vibrio and serum is made in a test tube. On this series of experiments as a foundation, the theory of acquired immunity has been reared.

Evidence has been collected that spirilla, almost identical in appearance with the cholera bacillus, may be present in water and in healthy stools, and that it is in many cases almost impos- sible to diagnose between these and the cholera bacillus; but although these spirilla may interfere with the diagnosis, they do not invalidate Koch's main contention, that a special form of the comma bacillus, which gives a complete group of reactions, is the cause of this disease, especially when these reactions are met with in an organism that comes from the human intestine.

Typhoid Fever. — Our information concerning the aetiology of typhoid fever was largely increased during the last twenty years of the 19th century. In 1880 Eberth and Klebs indepen- dently, and in 1882 Coats, described a bacillus which has since been found to be intimately associated with typhoid fever. This organism (Plate II. fig. 4) usually appears in the form of a short bacillus from 2 to zii'itx length and 0-3 to 0-5/* in breadth; it has slightly rounded ends and is stained at the poles; it may also occur as a somewhat longer rod more equally stained through- out. Surrounding the young organism are numerous long and well-formed flagella, which give it a very characteristic appear- ance under the microscope. At present there is no evidence that the typhoid bacillus forms spores. These bacilli are found in the adenoid follicles or lymphatic tissues of the intestine, in the mesenteric glands, in the spleen, liver and kidneys, and may also

be detected even in the small lymphoid masses in the lung and in the post-typhoid abscesses formed in the bones, kidneys, or other parts of the body; indeed, it is probable that they were first seen by von Recklinghausen in 1871 in such abscesses. They undoubtedly occur in the dejecta of patients suffering from typhoid fever, whilst in recent years it has been demon- strated that they may also be found in the urine. It is evident, therefore, that the urine, as well as the faeces, may be the vehicle by means of which the disease has been unwittingly spread in certain otherwise inexplicable outbreaks of typhoid fever, especially as the bacillus may be present in the urine when the acute stage of the disease has gone by, and when it has been assumed that, as the patient is convalescent, he is no longer a focus from which the infection may be spread. Easton and Knox found typhoid bacilli in the urine of 21% of a series of their typhoid patients.

In 1906 Kayser demonstrated what had previously been suspected, that the typhoid bacilli may persist for considerable periods in the bile duct and gall bladder, whence they pass into the intestinal tract and are discharged, with the evacuations. Patients in whom this occurs are spoken of as ” typhoid carriers.” Thev become convalescent and except that now and again they suffer from slight attacks of diarrhoea they appear to be perfectly healthy. It has been observed, however, especially during these attacks of diarrhoea, that typhoid bacilli may be found in the faeces. Curiously enough the bacilli are as virulent as are those isolated when the disease is at its height. Hence these typhoid carriers are exceedingly danger- ous centres of infection, and as women act as ” carriers ” much more frequently than do men, although, as is well known, typhoid fever attacks men much more frequently than women, the facilities

for the distribution of the disease are great, as women so trequentiy act as laundresses, cooks, housemaids, nurses and the like. Frosch states that out of 6708 typhoid patients 310 excreted bacilli for more than 10 weeks after convalescence; 144 of these were no longer infective at the end of three months; 64 had ceased to be infective at the end of a year, and 102 at the end of three and a-half years; further back than this no authentic records could be obtained but from a critical examination of the histories of 25 such carrier cases he was convinced that 14 had been continuously infective for from four to nine years. Dr Donald Greig, in 1908, reported a case in which the patient appears to have been a typhoid carrier for fifty- two years from the time of convalescence. Frosch pointed out. what has now been fully confirmed, that the bacilli in these cases though often present in the faeces in enormous numbers may dis- appear and again reappear from time to time and that a continuous series of

examinations is necessary before a convalescent patient can be acquitted of being a ” typhoid carrier.” In this connexion it is interesting to note that Blumenthal and Kayser have discovered typhoid bacilli in the interior of gall-stones. Drs Alexander and J. C. G. Ledingham, examining the 90 female patients and attendants in a Scottish asylum in which, during some four or five years, 31 cases of typhoid had occurred in small groups in which the source of infection could not be traced to any recognized channel, found amongst them three ” typhoid carriers.” The importance of such a discovery amongst asylum patients may be readily understood when the careless and uncleanly habits of insane patients are borne in mind. As it has been demonstrated that’ the typhoid bacillus is found, not merely in the lymphatic tissue but, in 75 % of the cases, actually circulating in the blood, the appearance of the bacillus in the secretions and excretions may be readily understood.

There can be little doubt that typhoid bacilli are not, as is very frequently assumed, present merely in the lymphatic glands and in the spleen (see Plate II. fig. 5) : they may be found in almost any part of the lymphatic system, in lymph spaces, in the connective tissues, where they appear to give rise to marked proliferation of the endothelial cells, and especially in the various secreting organs. It is probable that the prolifera- tion often noticed in the minute portal spaces in the liver, in cases of typhoid fever, is simply a type of a similar proliferation going on in other parts and tissues of the body. It was for long assumed that the typhoid bacillus could multiply freely in water, but recent experiments appear to indicate that this is not the case, unless a much larger quantity of soluble organic matter is present than is usually met with in water. The fact, however, that the organism may remain alive in water is of great importance; and, as in the case of cholera, it must be recognized that certain of the great epidemics of typhoid or enteric fever have been the result of “water-borne infection.” The bacillus, a facultative parasite, grows outside the body, with somewhat characteristic appearances and reactions: it flourishes specially well on a slightly acid medium: in the presence of putrefactive organisms which develop strongly alkaline products it may gradually die out, but it appears to retain its vitality longer in the presence of acid-forming organisms. It may, however, be stated generally that after a time the typhoid bacillus becomes weakened, and may even die out, in the presence of rapidly growing putrefactive organisms. In distilled water it may remain alive for a con- siderable period — five or six weeks, or even longer. It grows on all the ordinary nutrient media. It does not coagulate milk; hence it may grow luxuriantly in that medium without giving rise to any alteration

in its physical characters; con- taminated milk, therefore, is specially dangerous affording as it does an excellent vehicle for the dissemination of the typhoid bacillus which may also be conveyed by food and even by water. To food the bacillus is readily conveyed by flies, on their limbs or by the proboscis, which become infected by the excrement on which they crawl and feed. The observations of physicians working amongst the British troops in South Africa afford abundant evidence that the typhoid bacillus may also be carried along with dust from excreta to *resh patients, for although these bacilli die very rapidly when they are desiccated, they remain alive sufficiently long to enable them to multiply and flourish when again brought into contact with moist food, milk, &c.

When inoculated on potato, careful examination will reveal the fact that certain almost invisible moist patches are present; these are made up of rapidly multiplying typhoid bacilli. The typhoid bacillus grows in gelatin, especially on the surface,

PARASITIC DISEASES

Plate II.

Fig. 2.

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Fig. 9.

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Fig. 11.

Fig. 12

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Fig. 15. Fig. 16. Fig. 19.

Fig. 2.— Strcpt.ococ.ciispyogencs (rcdbloodcorpusclesandpiiscellsmthepusfromacase of empyacma. (X 1000 diams.) Fig. 3. — Cholera spirillum, from eight days’ agar culture, showing many involution forms. Flagella well stained. (X 1000.) Fig. 4. — Bacillus typhi abdominalis (typhoid bacillus), with well-stained flagella. Young agar cultivation. (X 1000.) Fig. 5. — Group of typhoid bacilli, in a section of spleen. (X 1000.) Fig. 7. — Preparation from young cultivation of Bacillus pestis (plague bacillus). Flagella well stained (X _iooo.) Fig. 9. — Bacillus diphtheriae, from twenty-four hours’ culture. (X 1000.) Fig. 10. — Free edge of false membrane from case of diphtheria containing numerous diphtheria bacilli. (X 1000.) Fig. II. — Bacillus tetani, with well-stained flagella. Twenty-four hours’ culture. (X 1000.) Fig. 12. — Scraping from a wound in a case of tetanus, showing several spore-bearing and a few non- spore-bearing tetanus bacilli. (X 1000.) Fig. 15. — Bacillus tuberculosis. Bacilli in a giant-cell in the human liver m a case of acute tuberculosis. (X 1000.) Fig. 16. — Bacillus leprae. Bacilli in endothelial cells of splenic tissue. (X 1000.) Fig. 19. — Amoebae in wall of dysenteric abscess of liver, from specimen kindly lent by Professor Greenfield. (X 1000.)

PARASITIC DISEASES

somewhat like the bacillus coli communis, but with a less luxuriant growth. This organism, when taken from young broth cultures twelve to twenty-four hours old — during the period at which fiagella are best seen — and examined micro- scopically, exhibits very lively movements. When, as pointed out by Gruber and Durham, blood-serum, in certain dilutions, from a case of typhoid fever is added to such a culture, the broth, at first turbid, owing to the suspended and moving micro- organisms, gradually becomes clear, and a deposit is formed which is found to be made up of masses or clumps of typhoid bacilli which have lost their motility. This reaction is so characteristic and definite, that when the mixture is kept under examination under the microscope, it is quite possible to follow the slowing-down movement and massing together of the organisms. It is found, moreover, that normal diluted blood- serum has no such effect on the bacilli. This property of the blood-serum is acquired at such an early date of the disease- sometimes even at the end of the first week — and occurs with such regularity, that typhoid fever may now actually be diagnosed by the presence or absence of this ” agglutinating ” property in the blood. If serum taken from a patient supposed to be suffering from typhoid fever, and diluted with saline solution to i in 10, to i in 50, or in still greater dilution, causes the bacilli to lose their motility and to become aggregated into clumps within an hour, it may be concluded that the patient is suffering’ from typhoid fever; if this agglutination be not obtained with a dilution of 1 in 10, in from 15 to 30 minutes, experience has shown that the patient is not suffering from this disease. Certain other diseases, such as cholera, give a similar specific serum reaction with their specific organisms. These sera have, in addition, a slight common action — a general agglutinating power — which, however, is not manifested except in concentrated solutions, the higher dilutions failing to give any clumping action at all, except with the specific bacillus associated with the disease from which the patient, from whom the serum is taken, is suffering.

Wright and Semple, working on Haffkine’s lines, introduced a method of vaccination against typhoid, corresponding somewhat to that devised by Haffkine to protect against cholera. They first obtained a typhoid bacillus of fairly constant virulence and of such strength and power of multiplication that an agar culture of 24 hours’ growth when divided into four, and injected hypodermically, will kill four fairly large guinea-pigs, each weighing 350 to 400 grammes. A similar culture emulsified in bouillon or saline solution and killed by heating for five minutes at 6o° C. is a vaccine sufficient for from four to

twenty doses. In place of the agar culture a bouillon culture heated for the same period may be used as the vaccine. In either case the vaccine is injected under the skin of the loin ‘well above the crest of the ileum. This injection is usually followed by local tenderness and swelling within three or four hours, and swelling and tenderness in the position of the nearest lymphatic glands, marked malaise, headache, a general feeling of restlessness and discomfort and a rise of temperature. The blood of a patient so treated early causes agglutination of typhoid bacilli and acts on these bacilli much as does cholera serum in Pfeiffer’s reaction. At the end of ten days a second and stronger dose is given. After each injection there is, according to Wright, a “negative phase” during which the patient is somewhat more susceptible to the attacks of the typhoid bacillus. This negative phase soon passes off and a distinct positive or protected phase appears. The practical outcome of this is that wherever possible a patient who is going into a typhoid infected area should be vaccinated some little time before he sets out. There seems to be no doubt thr.t if this be done a very marked, though not complete, protection is conferred. For a time the agglu- tinative and lytic powers of the serum continue to rise and the patient so vaccinated is far less susceptible to the action of the typhoid bacillus. It is recorded in favour of this method of treatment that of 4502 soldiers of the Indian army inoculated 0-98 % contracted typhoid, while of 25,851 soldiers of the same army who were not inoculated over 2§% (2-54) contracted typhoid. Similarly, at Ladysmith, of the whole of the besieged soldiers only 1705 had been inoculated, but of these only 2 % contracted typhoid, whilst of 10,529 uninoculated men 14% were attacked. Wright, who has been indefatigable in carrying out and watching this method of treatment, has been able to accumulate statistics dealing with 49,600 individuals — of these 8600 were inoculated, and 2\ % contracted typhoid, 12 % of these succumbing to the disease. Of the 41,000 uninoculated men 5 J % contracted the disease, 21 % of those attacked succumbing.

Mediterranean or Malta Fever. — Until comparatively recently, Mediterranean fever was looked upon as a form of typhoid

fever, which in certain respects it resembles; the temperature curve, however, has a more undulatory character, except in the malignant type, where the temperature remains high throughout the course of the attack. According to Hughes, this disease is widely distributed in the countries bordering upon the Mediterranean south of latitude 46°N., and along the Red Sea littoral. Analogous forms of fever giving a ” specific ” serum reaction with the micrococcus of this disease are also met with in parts of India, China, Africa and America.

The Micrococcus melitensis vel Brucei (1887), which is found most abundantly in the enlarged spleen of the patient suffering from Malta fever, is a very minute organism (0-33/* in diameter), ovoid or nearly round, arranged in pairs or in very short chains. If a drop of the blood taken directly from the spleen be smeared over the surface of agar nutrient medium, minute transparent colourless colonies appear; in thirty-six hours these have a slight amber tinge, and in four or five days from their first appearance they become opaque. These colonies, which flourish at the temperature of the human blood, cease to grow at the room-temperature except in summer, and if kept moist, soon die at anything below 6o° F., though when dried they retain their vitality for some time. As the organism grows and multiplies in broth there is opacity of the medium at the end of five or six days, this being followed by precipitation, so that a comparatively clear supernatant fluid remains. It grows best on media slightly less alkaline than human blood; it is very vigorous and may resist desiccation for several weeks.

This organism is distinctly pathogenetic to monkeys, and its virulence may be so increased that other animals may be affected by it. Though unable to live in clean or virgin soil, it may lead a saprophytic existence in soil polluted with faecal matter. Hughes maintains that the ” virus ” leaves the body of goats and of man along with the faeces and urine. The importance of this in ambulatory cases is very evident, especially when it is remembered that goats feeding on grass, &c. which has come in contact with such urine are readily infected. It seldom appears to be carried for any considerable distance. Infection is not conveyed by the sputum, sweat, breath or scraping of the skin of patients, and infected dust does not seem to play a very important part in producing the disease. Hughes divides the fever into three types. In the malignant form the onset is sudden, there are headache, racking pain over the whole body, nausea and sometimes vomiting; the tongue is foul, coated and swollen, and the breath very offensive; the temperature may continue for some time at 103 to 105° F. The stools in the .diarrhoea which is sometimeˆ present may be most offensive. At the end of a few days the lungs become congested and pneu- monic, the pulse weak, hyperpyrexia appears, and death ensues. A second type, by far the most common, is the ” undulatory ” type, in which there is remittent pyrexia, separated by periods in which the patient appears to be improving. These pyrexial curves, from one to seven in number, average about ten days each, the first being the longest, — eighteen to twenty-three days. In an intermittent type, in which the temperature-curve closely resembles the hectic pyrexial curve of phthisis or suppuration, the “undulatory” character is also marked. A considerable number of toxic symptoms make their

appearance — localized neuritis, synovitis, anaemia, emaciation, bronchial catarrh, weak- ness of the heart, neuralgia, profuse night-sweats and similar conditions. Patients otherwise healthy usually recover, even after prolonged attacks of the disease, but the mortality amongst patients suffering from organic mischief of any kind may be comparatively high. The diagnosis from malaria, phthisis, rheumatic affections and pneumonia may, in most cases, be made fairly easily, but the serum agglutinating reaction (first demon- strated by Wright in 1897) with cultures of the Micrococcus melitensis, corresponding to the typhoid reaction with the typhoid bacillus, is sometimes the only trustworthy feature by which a diagnosis may be made between this fever and the above-mentioned diseases. About 50% of the goats in Malta give a positive agglutinative reaction and about 10% excrete milk which contains the micrococcus.

Sir David Bruce, in his investigations on the tsetse fly disease, pointed out that certain wild animals although apparently in good health might serve as reservoirs for, or storehouses of, the N'gana oarasite. He was therefore quite prepared to find

that the Micrococcus melitensis might similarly be " stored " in an animal which might show but slight, if any, manifestations of Malta fever. Ir/fiications as to the direction in which to look were given in the following fashion. There was a strike amongst the dairymen supplying the barracks in Malta and it became necessary to replace the goat's milk in the dietary of the troops by condensed milk. What followed ? In the first half of the year 1906 there had been 144 cases (in 1905 there had been 750 cases), in the second half after the alteration of the milk supply, only 32 cases were recorded and in 1907, 7 cases during the whole year. In the navy during the same period there were, in 1905, 498 cases, in 1906, 248 cases and, from January to September 1907, not a single case.

The most common method of infection is by the ingestion of milk, but the milk when handled may also give rise to infection through finding its .way into cuts, bruises, &c. In the goat the disease is of an extremely mild character, the clinical symptoms, which are present for two or three days only, being easily overlooked. In spite of this the goat is highly susceptible to the infection either by the various methods of inoculation or as the result of feeding with contaminated or infected material. The micrococcus is often found in the circulating

blood from which it may be excreted along with the urine and faeces. In time, however, it disappears, first from the general circulation and most of the viscera, persisting longest in the spleen, kidneys and lymphatic glands. In the later stages of the disease the micrococcus is found in the milk even after it has disappeared from the above glands. It is during this stage that the milk of the goat is so dangerous, as now and again it may contain an enormous number of the specific micrococcus varying ” within wide limits from day to day,” although bearing ” no rela- tionship to the severity of the infection, air temperature, &c. ; the presence of the Micrococcus melitensis in the milk appears to be merely the result of a mechanical flushing of the mammary glands by means of which the cocci multiplying therein are removed.” As pointed out by the Mediterranean Fever Commission the micrococcus of Malta fever from its vantage ground in the milk may make its way to ordinary ice-creams and to native cheeses, in which it appears to retain its full virulence. Monkeys are especially susceptible to this disease, contracting it readily when they are fed with milk from an infected goat. In 1905 an interesting experiment was, unintentionally, carried out. An official of the United States Bureau of Animal Industry visiting Malta in the summer of that year purchased a herd of 61 milch-goats and four billy goats. These were shipped via Antwerp to the United States. On arrival at Antwerp the goats were transferred to a quarantine station, where they remained for five days and were then consigned by steamer to New York. On board the SS. “Joshua Nicholson,” which took the goats from Malta to Antwerp, were twenty-three officers and men ; ten out of the twenty-three were afterwards traced. One was found to have been infected by M. melitensis at an unknown date, and’ eight had subsequently suffered from febrile attacks, five yielding conclusive evidence of infection by M. melitensis. It is interesting to note, however, that two men who boiled the milk before drinking it, and an officer and a cabin-boy who disliked the milk and did not drink it at all, came off scot free.

These cases taken by themselves might leave the question some- what open, as there was a possibility that the men attacked might have been in contact with infected patients in Malta. A far more conclusive case was the following. A woman at the quarantine station at Athenia, N. J., U.S.A., who partook freely of the mixed milk from several goats, over a considerable period, suffered from a typical attack of Mediterranean fever some nine or ten weeks after the goats had been landed in America. In this case " contact " with and other modes of exposure to infection by human patients could all be eliminated.

It may be held then that the M. melitensis leads a more or less passive existence in the body of the Maltese goat, only exercising its full pathogenic action when it gains entrance to the human body. There is some slight evidence that the Micrococcus melitensis may remain alive with its virulence unimpaired even when taken up by the mosquitoes Acartomyia and Stegomyia, and again in the common blood-sucking fly, Stomoxys, for a short period, four or five days. It can be recovered for a longer period and still in a fairly virulent condition from the excreta of these insects. In spite of this, trans- mission of the disease by these insects, though apparently possible, does not appear to be of very frequent occurrence. Inoculation with a vaccine prepared from the Micrococcus melitensis appears to exert a protective influence for a period of about four months, after which time there is a marked diminution in the immunity conferred by this vaccination.

Relapsing Fever. — The specific cause of relapsing fever (famine fever) appears to be the Spirillum Obermeieri, an organism which occurs in the blood (during the febrile stages) of patients suffering from this disease. Between the febrile stages are periods of intermission, during which the spirillum disappears

from the blood and, apparently, retires to the spleen. This disease, in epidemic form, follows in the footsteps of famine and destitution, specially affecting young people between the ages of fifteen and twenty; it seldom attacks children under five years of age, but when it attacks patients over thirty it assumes a very virulent form. In monkeys inoculated with blood containing the Spirillum Obermeieri the first symptoms appear between the second and sixth days. In the human subject this incubation period may last as long as three weeks; then comes an attack of fever, which continues for about a week, and is followed by a similar period of apparent convalescence, on which ensues a pyrexial relapse, continuing about half as long as the first. The spirilla, the cause of this disease, are fine spirals with pointed

ends, three or four times as long as the diameter of a red blood corpuscle. Although it has as yet been found impossible to cultivate these spirilla outside the body, human beings, and monkeys injected with blood containing them, contract the disease; and in monkeys it has been found that during the period before the relapse the spirilla have made their way into the cells of the spleen. As yet little is known as to the mode of development of these organisms, and of the method of their transmission from one patient to another, but it is thought that, as in the case of malaria and the tsetse-fly disease, they may be carried by bloodsucking insects. Relapsing fever is distinguished from typhoid fever by its sudden onset, and by the distinct intermissions; and from influenza by the enlargement of the spleen and liver. The most satisfactory method of diagnosis is the examination of the blood for the presence of the spirillum during the febrile stage. The post-mortem appearances are those of a toxic (bacterial) poisoning. Curious infarction-like masses, in which are numerous spirilla, are found in the spleen; in the liver there is evidence of acute interstitial hepatitis, with cloudy swelling of the liver cells; and similar changes occur in the kidney. Fatty degeneration of the heart and voluntary muscles may also be met with.

Plague. — During recent years opportunities for the study of plague have unfortunately been only too numerous. In patients suffering from this disease, a micro-organism, capable of leading either a saprophytic life or a parasitic existence in the human body, and in some of the lower animals, was described independently by Kitasato and Lowson and by Yersin, 1894, in Hong-Kong. It is a short moderately thick oval bacillus, with rounded ends, which stain deeply, leaving a clear band in the centre (see Plate II., fig. 7). It thus resembles the short diphtheria bacillus and the influenza bacillus. Certain other forms are met with — long rods and ” large oval bacilli, pear- shaped or round, imperfectly stained pale involution forms ” — but the above is the most characteristic. It grows readily on most media at the temperature of the body, but, like the glanders bacillus, soon loses its virulence in cultivations. It may be obtained in pure cultures from the lymph glands, and from the abscesses that are formed in the groin or other positions in which the glands become enlarged and softened. It may also be found in the spleen and in the blood, and, in the case of patients suffering from the pneumonic form of the disease, even in the lungs and in the sputum. It has also been found in the faeces and urine. (It is very important that these excre- tions from plague patients should always be most carefully disinfected.) This organism, when obtained in pure culture and inoculated into rats, mice, guinea-pigs or rabbits, produces exactly the same symptoms as does material taken

fresh from the softened glands. The symptoms are local swelling, enlarge- ment and softening of the lymphatic glands, and high fever.

The difficulty of explaining the spread of plague, at one time apparently almost insuperable, has at last been overcome, as it has been found that although the acute pneumonic plague is undoubtedly highly contagious, the spread of the bubonic and septicaemic forms could not be explained on the same hypothesis. As the pneumonic form is met with in only about 2-5% of the whole of the cases, transmission by direct contagion seems to be an utterly inadequate explanation. In the autumn of 1896, when the plague broke out in India, and those dealing

with the outbreak came to the conclusion that certain houses were centres of infection, it was noticed that these houses were most infective at night, and that they might actually be centres of infection although uninhabited; indeed the infection seemed to spread to houses between which and the infected house there appeared to be no intercommunication of any kind. This seemed to be inexplicable except on the assumption that the infective agent, the Bacillus pestis, was, in some way or other, carried by animals. It had already been noted that rats disappeared from plague-stricken houses, many dying before the appearance of the plague in the human population. Simond, noting these conditions, suggested that the plague bacillus might be transmitted by the flea from rat to rat and from rat to man. Although he was not able to demonstrate this connexion he indicated a line of research to other observers, who, as knowledge accumulated, were able to complete each link in the chain of infection. The plague bacillus having been found in the rat, the next step was to demonstrate its presence in the flea, and living plague germs were found in the stomachs of fleas inhabiting plague-infected houses. Several species seem to be able to transmit this germ, but in none of them does the plague bacillus appear to undergo any special development —alternation of generations or the like — as in the case of the protozoon of malaria in its passage from and to the mosquito and the human subject — it simply passes unchanged through the alimentary canal of the flea, is excreted in the faeces, and is carried into the wound made by the epipharynx-mandibles of the flea.

At least three species of animals, two rats and the human subject, and three species of fleas are involved in this chain. The rat fleas are Pulex

cheopis found in India, and Ceratophyllus fasciatus, the rat flea of northern Europe, and Pulex irritans, the common flea, all of which have the power of transmitting the disease. In India of course the Pulex cheopis, usually solely associated with rats, seems to play the most prominent part. The two rats involved are the Mus decumanus, or brown rat, which is' found in the sewers and develops the plague first, and the Mus rattus, the common black house -rat. From the sewer-rat the house-rat is infected, and from the house-rat man. Under ordinary conditions rat fleas do not attack the human subject, but, as the rats are attacked by plague and die, the infected fleas, starve out as it were, leave them and transfer their attentions to other animals and the human subject, infecting many of those they bite. Colonel Bannerman main- tains that this infection takes place in the majority of cases, by this chain of transmission, and that there is no evidence that the excreta of these rats infect food or contaminate the soil. Colonel Lamb, summarizing the experimental evidence on this question, writes:—

" i. Close contact of plague-infected animals with healthy animals, if fleas are excluded, does not give rise to an epizootic among the latter. As the godowns (experimental huts) were never cleaned out, close contact includes contact with faeces and urine of infected animals, and contact with and eating of food contaminated with faeces and urine of infected animals as well as with pus from open plague ulcers; (2) close contact of young, even when suckled by plague-infected mothers, did not give the disease to the former; (3) if fleas are present, then the epizootic, once started, spreads from animal to animal, the rate of progress being in direct proportion to the number of fleas present; (4) an epizootic of plague may start without direct contact of healthy animal and infected animal ; (5) the rat flea can convey plague from rat to rat ; (6) infection can take place without any contact with contaminated soil; (7) aerial infection is excluded."

The experiments lead to the conclusion that fleas and fleas alone, are the transmitting agents of infection. Bannerman gives in concise form similar evidence in relation to naturally infected native houses. Infection is carried from place to place by fleas, usually on the body or in the clothing of the human being. Such fleas, fed on infected blood, may remain alive for three weeks, and of this period, we are told, may remain infective for fifteen days. At the first opportunity these fleas forsake the human host and return to their natural host the rat. In most of the epidemics there is a definite sequence of events. First the brown rats are attacked, then the black rats,

then the human subject, and Colonel Lamb suggests that after the rat

disappears the flea starves for about three days and then attacks the human subject. Then comes the incubation period of plague, three days. Following this is the period of average duration of the disease, five or six days. This time-table, he says, corresponds to the period — when the epidemics are at their height — that intervenes between the maximum death-rate in rats and the maximum death-rate in man, about ten to fourteen days. This history of the connexion between the flea, the rat, and the human subject reads almost like a fairy tale, but it is now one of the well-authenticated and sober facts of modern medicine.

In India, where the notions of cleanliness are somewhat different from those recognized in Great Britain, most of the conditions favourable to the spread of the plague bacillus are of the most perfect character. This organism may pass into the soil with faeces; it may there remain for some time, and then be taken into the body of one of the lower animals, or of man, and give rise to a fresh outbreak. Kitasato and Yersin were both able to prove that soil and dust from infected houses contain the bacillus, that such bacillus is capable of inducing an attack of plague in the lower animals, and that flies fed on the dejecta or other bacillus-containing material, die, and in turn contain bacilli which are capable of setting up infection. Hankin claims that ants may carry the plague to and from rats, and so to the human being. It has already been mentioned that the organism rapidly loses its virulence when cultivated outside the body; on the other hand, on being passed through a series of animals its virulence gradually increases. Thus may be explained the fact that in most outbreaks of plague there is an early period during which the death-rate is very low; after a time the percentage mortality is enormously increased, the virulence of the disease being very great and its course rapid. There seem to be notable differences in the degree of susceptibility of different races and different individuals, and those who have passed safely through an attack appear to have acquired a marked degree of immunity.

Two methods of treatment, both of which seem to have been attended with a certain degree of success, are now being tried. Haffkine, who was the first to produce a vaccine for the treatment of cholera, prepared a vaccine of a somewhat similar type for the treatment of plague. For this the Bacillus pestis is cultivated in flasks of bouillon; to this small drops or particles of ghee (Indian butter) are added ; these form centres around which the organisms may develop. As the organisms multiply they grow down into the broth, but gradually becoming fewer in number as the floating mass on the surface is left, they fine down to a point and so come to resemble stalactites. These are broken off, from time to time, by shaking, others immediately

beginning to form in their place. This may go on for six weeks. The flask with its contents is then well shaken and heated in a water bath to 70° C. for from one to three hours. On testing by culture the fluid should now be sterile, i.e. no bacilli should remain alive, and the fluid, ready for use, may be injected into the subcutaneous tissues of the arm in a dose of from 3 cc. for a man and 2 to 2$ cc. for a woman, children receiving rela- tively small amounts. A rise of temperature, followed by malaise and headache, which pass off in about 24 hours, is soon noted, and some local swelling and redness appear at the seat of injection. The Indian Plague Commission were satisfied that the use Of this vaccine diminishes the incidence of attacks of plague, and that, although it does not confer a complete immunity against the disease, the case mortality is lowered. They are of opinion also that protec- tion is not conferred at once, but Lieut.-Colonel Bannerman states that the protection is immediate and lasts for six or even twelve months. In the official report (Annual Report of the Sanitary Commissioner with the Government of India) for 1904 occurs the following: ” That its value is great is certain, not only does it largely diminish the danger of plague being contracted, but, if it fails to prevent the attack, the probability of a fatal event is reduced by one-half.”

This method of treatment, however, is of no avail in the case of patients already attacked ; for such cases Yersin’s serum treatment must be called in. Various other vaccines have been described, but all consist of some form of killed or attenuated bacilli, and the results attained do not vary very greatly. Yersin, who first demon- strated the plague bacillus also devised the method of preparing an ” antipest serum.” A horse was inoculated repeatedly, at intervals, and with gradually increasing doses of living plague bacilli. It was afterwards found that cultures sterilized by heat served equally well for this inoculation of the horse and of course were much more

easily worked with. This process of preparation may have to be continued for from six months to a year. The horse is then bled and from the clot the serum is separated, care being taken to determine by injection of the blood into mice that no living bacilli have by accident made their way into, and remained in, the horse’s blood. The serum is not considered to be sufficiently active until a drop and a half will protect the mouse against a dose of living bacilli fatal to a control mouse in from 48 to 60 hours. When this serum is injected in sufficiently large doses subcutaneously in mild cases, and sub-

cutaneously and intravenously (Lancet, 1903, i. 1287) in more severe cases in doses of 150 to 300 cc. the results seem to be excellent, especially when the serum is injected into the tissues around the bubo or swellings formed in this disease. Calmette and Salimbeni used the serum in 142 cases in the Oporto outbreak. Amongst these they had a mortality of under 15%, whilst amongst 72 patients not so treated the death-rate was over 63 %. This serum kills the bacilli and at the same time neutralizes the toxin formed during the course of the disease. The best results are obtained when large doses are given, and when the serum injected subcutaneously is thrown into the area in which the lymph flows towards the bubo. As in the case of the diphtheria antitoxic serum joint pains and rashes may follow its exhibition, but no other ill effects have been noted.

Pneumonia. — The case in favour of acute lobar pneumonia being an infective disease was a very strong one, even before it was possible to show that a special organism bore any aetio- logical relation to it. In 1880, Friedlander claimed that he had isolated such an organism, but the pneumo-bacillus then described appears to be inactive as compared with the pneumo- coccus isolated by Fraenkel and Talamon. This latter organism which is usually found in the sputum, is an encapsuled diplo- coccus. Grown on serum or agar over which sterile blood has been smeared, it occurs as minute, glistening, rather prominent points, almost like a fine spray of water or dew. When the organism is cultivated in broth the capsule disappears, and chains of diplococci are seen. It resembles the influenza bacillus in a most remarkable manner. It may be found, in almost every case of pneumonia, in the ” rusty ” or ” prune-juice ” sputum. Injected into rabbits, it produces death with very great certainty; and by passing the organism through these animals its virulence may be markedly increased. Like the influenza bacillus and even the diphtheria bacillus, this organism may be present in the mouth and lungs of perfectly healthy individuals, and it is only when the vitality of the system is lowered by cold or other depressing influences that pneumonia is induced; two factors, the presence of the bacillus and the, lowered vitality, being both necessary for the production of this disease in the human subject. It is quite possible, however, that, as in the case of cholera, a slight inflammatory exudation may supply a nutrient medium in which the bacillus rapidly acquires greatly increased virulence, and so becomes a much more active agent of infection.

It is claimed by the brothers Klemperer, by Washbourn and by others, that they have been able to produce an anti-pneumococcic serum, by means of which they are able to treat successfully severe cases of pneumonia. The catarrhal pneumonia so frequently met with during

the course of whooping-cough, measles and other specific infective fevers, is also in all probability due to the action of some organism of which the influenza bacillus and the Diplococcus pneumoniae are types.

Infettive meningitis is, in most of the recent works on medicine, divided into four forms: (1) the acute epidemic cerebro-spinal form; (2) a posterior basic form, which, however, is closely allied to the first; (3) suppurative meningitis, usually associated with pneumonia, erysipelas, and pyaemia; and (4) tubercular meningitis, due to the specific tubercle bacillus.

1. The first form, acute infective or epidemic cerebro-spinal meningitis, is usually associated with Weichselbaum's Diplo- coccus intracellularis meningitidis (two closely apposed disks), which is found in the exudate, especially in the leucocytes, of the meninges of the brain and cord. It grows, as transparent colonies, on blood-agar at the temperature of the body, but dies out very rapidly unless reinoculated, and has little patho- genetic effect on any of the lower animals, though under certain conditions it has been found to produce meningitis when injected under the dura mater.

More or less successful attempts have been made to treat acute epidemic cerebro-spinal meningitis by means of antisera obtained

from different sources. Flexner uses the serum of horses that have been highly immunized against numerous strains of the meningo-coccus, the process of immunization extending over four or five months. Meister, Lucius and Briining supply Ruppel's anti- bacterial serum derived from animals immunized against several strains of meningococcus of high pathogenic activity. Both these sera may be looked upon as polyvalent sera. Ivy Mackenzie and Martin, pointing out that the cerebro-spinal fluid, even of patients who have recovered from this form of meningitis, contains no anti- bodies, tried and recommended injections of the patient's own blood serum into the spinal canal. In all cases the action seems to be much the same. These sera contain immune body and complement, and are distinctly bactericidal, acting on the meningococcus and render- ing it much more easily taken up and digested by the white blood corpuscles. It is possible that these sera may also exert some slight antitoxic action. The serum is injected directly into the spinal canal, a corresponding quantity of the cerebro-spinal fluid having first been withdrawn by lumbar puncture. The treatment thus resembles the treatment of lockjaw, where the antitetanus serum is brought as directly as possible into contact with the nerve centres. The dose of these sera ranges from

15 to 40 cc. according to the severity of the disease. Although the general mortality of the disease is from 50 to 80%, it is stated that where Flexner's serum is used the mortality falls to 33%. The result corresponds somewhat closely to those obtained with antidiphtheria serum in diphtheria. In patients injected on the first day of the disease the mortality was only about 15%, on and from the fourth to the seventh day 22%, but after the seventh day 36 %. From this it is evident that although the serum has a distinct effect in bringing about the phagocytosis of the meningococcus and the neutralization of the toxins produced, it cannot make good any damage already done to the tissues. Mackenzie and Martin treated 20 cases with the blood taken from patients suffering, or convalescent, from meningitis. Of 16 acute cases treated 14 received serum from patients who had already recovered from the disease, 8 of the patients recovered, 6 died, and 2 cases which received their own serum both recovered. In the presence of these anti-cerebro-spinal-fever sera the meningeal cocci become diminished in number and do not stain so readily, whilst, simultaneously, the polymorphonuclear leucocytes seem to be diminished in number. The serum should be given until the temperature becomes normal. Mackenzie and Martin assert that even normal human blood contains substances which are bactericidal to the meningeal coccus, but that these substances increase " in amount and activity in the blood serum of patients suffering from an acute or chronic meningococcic infection, and the serum of a patient recently recovered from an infection shows the evidence of the presence of these substances in a still greater degree." They were able to demonstrate, moreover, that the destructive action on the cocci depends on an immune body which requires the presence of a complement to complete the process. The cerebro-spinal fluid differs from the serum in that it does not contain substances which kill this meningeal coccus in vitro, nor are the immune body and complement present in the blood, found in this cerebro-spinal fluid. Hence the efficacy of the blood when it is called upon to replace the fluid in the cerebro-spinal canal.

2. Posterior basic meningitis, according to Dr Still, " is frequently seen during the first six months of life, a period at which tuberculous and epidemic cerebro-spinal meningitis are quite uncommon." The organism found in this disease resembles the diplococcus intracellularis meningitidis very closely, but differs from it in that it remains alive without recultivation for a considerably longer period. It is less pathogenetic than that organism, of which possibly it is simply a more highly sapro- phytic form. This is a somewhat important point, as it would account for the great resemblance that exists between the

sporadic and the epidemic forms of meningitis.

3. In suppurative meningitis these two organisms may still be found in a certain proportion of the cases, but their place may be taken by the pneumococcus or Diplococcus pneumoniae or Fraenkel's pneumococcus — Diplococcus lanceolatus— which appears to grow in two forms. In the first it is an encap- sulated organism, consisting of small oval cocci arranged in pairs or in short chains; the capsule is unstained. When the pneumococcus grows in chains — the second form — as when cultivated outside the body, on blood-serum or on agar over the surface of which a small quantity of sterile blood has been smeared, it produces very minute translucent colonies. Like Weichselbaum's bacillus, it must be recultivated every three or four days, otherwise, it soon dies out. Unlike the other forms previously described, it may, when passed ' through animals, become extremely virulent, very small quantities being sufficient to kill a rabbit. Although the pneumococcus is found in the majority of these cases, especially in children, suppurative

meningitis may also accompany or follow the various diseases that are set up by the Streptococcus pyogenes and Streptococcus erysipelatis; whilst along with it staphylococci and the Bacillus coli communis have sometimes been found. In other cases, again, there is a mixed infection of the pneumococcus and the Streptococcus pyogenes, especially in cases of disease of the middle ear. As might be expected in meningitis occurring in connexion with the specific infective diseases, e.g. influenza and typhoid fever, the presence of the specific bacilli of these diseases may usually be demonstrated in the meningeal pus or fluid.

4. The fourth form, tubercular meningitis (acute hydrocepha- lus), is met with most frequently in young children. It is now generally accepted that this condition is the result of the intro- duction of the tubercle bacillus into the blood-vessels and lymph spaces of the meninges at the base of the brain, and along the fissures of Sylvius.

Influenza. — From 1889 up to the present time, influenza has every year with unfailing regularity broken out in epidemic form in some part of the United Kingdom, and often has swept over the whole country. The fact that the period of incubation is short, and that the infective agent is extremely active at a very early stage of the disease,

renders it one of the most rapidly- spreading maladies with which we have to deal. The infective agent, first observed by Pfeiffer and Canon, is a minute bacillus or ‘diplococcus less that iju in length and o-$ix in thickness; it is found in little groups or in pairs. Each diplococcus is stained at the poles, a clear band remaining in the middle; in this respect it resembles the plague bacillus. It is found in the blood — though here it seems to be comparatively inactive — and in enormous numbers in the bronchial mucus. It is not easily stained in a solution of carbol-fuchsin, but in some cases such numbers are present that a cover-glass preparation may show practically no other organisms. Agar, smeared with blood, and inoculated, gives an almost pure cultivation of very minute transparent colonies, similar to those of the Diplococcus pneu- moniae, but as a rule somewhat smaller. This organism, found only in cases of influenza, appears to have the power of forming toxins which continue to act for some time after recovery seems to have taken place; it appears to exert such a general devitalizing effect on the tissues that micro-organisms which ordinarily are held in check are allowed to run riot, with the result that catarrh, pneumonia and similar conditions are developed, especially when cold and other lowering conditions co-operate with the poison. This toxin produces special results in those organs which, through over-use, impaired nutrition or disease, are already only just able to carry on their work. Hence in cases of influenza the cause of death is usually associated with the failure of some organ that had already been working up to its full capacity, and in which the margin of reserve power had been reduced to a minimum. It is for this reason that rest, nutrition, warmth and tonics are such important and successful factors in the treatment of this condition.

Yellow Fever, endemic in the West Indies and the north- eastern coast of South America, may become epidemic wherever the temperature and humidity are high, especially along the seashore in the tropical Atlantic coast of North America. It appears to be one of the specific infective fevers in which the liver, kidney, and gastro-intestinal systems, and especially their blood-vessels, are affected. In 1897 Sanarelli reported, in the Annates de I’Institut Pasteur, that he had found a bacillus in the blood-vessels of the liver and kidneys, and in the cells of the peritoneal fluid, but never in the alimentary tract, of yellow fever patients. These, he maintained, were perfectly distinct from the putrefactive microbes occurring in the tissues in the later stages, their colonies not growing like those of the bacillus coli communis. They grow readily on all the ordinary artificial nutrient media, as short rods with rounded ends, usually about 2 to 4n in length and about half as broad as they are long. They are stained by

Gram's method and readily by most of the aniline dyes, are ciliated, and do not liquefy gelatine. They flourish specially well alongside moulds, in the dark, in badly-ventilated, warm, moist places, and remain alive for some time in sea- water:

these facts, as Sanarelli points out, may afford an explanation of the special persistence of yellow fever in old, badly-ventilated ships, and in dark, dirty and insanitary sea-coast towns. Once the organism, whatever it may be, finds its way into the system, it soon makes its presence felt, and toxic symptoms are developed. The temperature rises; the pulse, at first rapid, gradually slows down; and after some time persistent vomiting of bile comes, on. At the end of three or four days the temperature and pulse fall, and there is a period during which the patient appears comparatively well; this is followed in a few hours by icterus and scanty secretion of urine. There may be actual anuria, or the small quantity of urine passed may be loaded with casts and albumen; delirium, convulsions and haemorrhages from all the mucous surfaces may now occur, or secondary infections of various kinds, boils, abscesses, suppurations and septicaemia, may result. These often prove fatal when the patient appears to be almost convalescent from the original disease. As regards prognosis, it has been found that the " lower the initial tempera- ture the milder will the case be " (Macpherson). An initial temperature of 106 F. is an exceedingly unfavourable sign. Patients addicted to the use of alcohol are, as a rule, much more severely affected than are others. Treatment is principally directed towards, prevention and towards the alleviation of symptoms, though Sanarelli has hopes that an " anti "-serum may be useful. More recently S. Flexner, working with the. American Commission, isolated another organism, which, he maintains, is the pathogenetic agent in the production of yellow fever; whilst Durham and Myers maintain that a small bacillus previously observed by G. M. Sternberg and others is the true cause of this disease.

Professor Boyce, enumerating the hypotheses as to the cause of yellow fever, points out that as in the case of malaria, suspicion turned to " that form of Miasm which was supposed to arise from the: mixture, in a marsh or on a mud flat, of salt with fresh water." It was early recognized that yellow fever was not carried directly from person to person, but little of definite character was known as to the poison and the method of its dissemination, and Fergusson states that " it is a terrestrial poison which high atmospheric heat generates amongst the newly arrived, and without that heat it cannot exist." The following passage from Beauperthuy (see his collected papers published in 1891) is quoted by Boyce: " But rubbish ! the small amount of sulphuretted hydrogen or marsh gas which might arise from a marsh

could not possibly hurt a fly, much less a man. It is not that, it is a mosquito called in Cumana the ‘ Zancudo bobo,’ the striped or domestic mosquito.” Beauperthuy, recently as he wrote, then stood almost alone in this opinion. Now we know that yellow fever, in common with other specific diseases, is caused by the action of an organized virus. The search for a vegetable parasite, bacillus or micro-coccus, as above indicated, has been very close and strenuous, but it may now be held that up to the present no bacillus or micrococcus, well authenticated as capable of causing yellow fever, has been discovered. Latterly a search has been made for protozoal organisms, organisms similar to those present in the blood of malarious patients and like conditions, or for spiro- chaetes similar to those associated with relapsing fever, and Boyce draws attention to the fact that a spirochaete has recently been identified in the tissues taken from cases of yellow fever. It has however been demonstrated that the virus, whatever it may be, is carried by a species of mosquito ; this seems to favour the protozoan hypothesis, especially as it is found that the Stegomyia fasciata, Fab. (or S. calopus, Meig.), after taking the blood from an infected patient is not infective immediately but only becomes capable of infecting by its bite at the end of twelve days. It would appear therefore that residence in this mosquito is necessary for the material to become fully infective. During this period some special meta- morphosis may occur, and metamorphosis essential to the development of the parasite, or, on the other hand, the time may be required for it to make its way to some position from which it may emerge from the mosquito when that insect

” strikes.” In the interval between the bite of an infected Stegomyia and the appearance of the disease (5 or 6 days) the blood of the patient contains a virus which, when taken into the mosquito, may develop into the infective material; moreover, this virus persists alive and active for three days after the disease is fully developed, but at the end of this time it dis- appears, so far, at any rate, as its infective power is concerned, from the blood, secretions and tissues of the patient. Further, there is no evidence that the infective virus is ever transmitted directly from the patient in secretions or in fact in anything but blood or blood-serum. The infective material, then, is present in the human subject for about eight days, during which the blood and even the blood-serum may serve as a vehicle for the infective agent. If during this period the patient is bitten by the Stegomyia the mosquito cannot distribute the infection for twelve

days, but after this the power of transmitting reinfection persists for weeks and even months during cold weather when the insect is torpid. As soon, however, as the warm weather comes round and the mosquito becomes active and again begins to bite there is evidence that it still maintains its power of transmitting infection; indeed Boyce states that mosquitos infected in one year are capable of transmitting infection and starting a fresh epidemic in the following warm season. When it is remembered that a mosquito by a single bite is capable of setting up an attack of the disease, we see how important is this question.

The Stegomyia, known as the domestic or house mosquito, is spoken of as the " Tiger " mosquito, " Scots' Grey," or " Black and White Mosquito," from the fact that there is " a lyre- shaped pattern in white on the back of the thorax, transverse white bands on the abdomen, and white spots on the sides of the thorax; while the legs have white bands with the last hind tarsal joint also white " (Boyce). It is also spoken of as the " cistern mosquito," as it breeds in the cisterns, barrels, water butts, &c, containing the only water-supply of many houses. It may pass through its various stages of development in any small vessels, but the larvae are not usually found in natural collections of water, such as gutters, pools or wells, if the ovipositing insect can gain access to cleaner and purer water.

The egg of the Stegomyia deposited on the water develops in from 10 to 20 hours into the larval form, the so-called " wiggle- waggle." It remains in this stage for from 1 to 8 days, then becomes a pupa, and within 48 hours becomes a fully developed mosquito. The larvae can only develop if they are left in water, though a very small amount of water will serve to keep them alive. The eggs on the other hand are very resistant, and even when removed from water may continue viable for as long a period as three months. The Stegomyia affects clean water-butts and cisterns by preference. Consequently its presence is not confined to unhygienic districts; they may, however, " seek refuge for breeding purposes in the shallow street drains and wells in the town." The Stegomyia does not announce its advent and attack by a " ping " such as that made by the Anopheles, it works perfectly noiselessly and almost ceaselessly (from 3 p.m. to early morning) so that any human beings in its neighbourhood are not safe from its attacks either afternoon or night.

The most important prophylactic measures against the Stego- myia are ample mosquito nets " with a gauge of eighteen meshes to the inch " (Boyce), so arranged that the person sleeping may not come near the net; these nets should be used not only at night but at the afternoon

siesta. Then the living room should be screened against the entrance of these pests, thorough ventilation should be secured; and all pools and stagnant waters, especially in the neighbourhood of houses, should be drained, water-butts and cisterns should be screened and all stagnant waters oiled with kerosene or petroleum, where drainage is impossible. What has been done through the carrying out of these and similar measures may be gathered from the record of the Panama Canal. In 1884 the French Panama Canal Company, employing from 15,000 to 18,000 men, lost by death

60 per 1000 annually (in 1885 over 70 per 1000). In 1904, when the Americans had taken over the work of construction, Col. W. C. Gorgas undertook to clear the country of the Stegomyia, and within two or three years yellow fever had been eradicated. The death-rate from malaria was also greatly diminished, and by the end of 1907 the death-rate per annum amongst 45,000 workers was only 18 per 1000, a lower death-rate than is met with in many large English towns. Similar examples might be cited from other places, but the above is sufficiently striking to carry conviction that the methods employed in carrying on the warfare against tropical diseases have been attended with unexampled success. These diseases, at one time so greatly feared, are now so much under control that some one has said " ere long we shall be sending our patients to the tropics in search of a health resort."

Weil's disease, a disease which may be considered along with acute yellow atrophy and yellow fever, is one in which there is an acute febrile condition, associated with jaundice, inflammation of the kidney and enlargement of the spleen. It appears to be a toxic condition of a less acute character, however, than the other two, in which the functions and structure of the liver and kidney are specially interfered with. There is a marked affection of the gastro- intestinal system, and the nervous system is also in some cases profoundly involved. Haemorrhage into the mucous and serous membranes is a marked feature. The liver cells and kidney epithe- lium undergo fatty changes, though in the earlier stages there is a cloudy swelling, probably also toxic in origin. Organisms of the Proteus group, which appear to have the power, in certain circum- stances, of forming toxic substances in larger quantities than can be readily destroyed by the liver, and which then make their appear- ance in the kidney and spleen, are supposed to be the cause of this condition.

Diphtheria. — In regard to no disease has medical opinion under- gone greater modification than it has in respect of diphtheria. Accurately applied, bacteriology has here gained one of its greatest

triumphs. Not only have the aetiology and diagnosis of this disease been made clear, but knowledge acquired in connexion with the production of the disease has been applied to a most successful method of treatment. In 1875 Klebs described a small bacillus with rounded ends, and with, here and there, small clear unstained spaces in its substance. He, however, also described streptococci as present in certain cases of diphtheria, and concluded that there must be two kinds of diphtheria, one associated with each of these organisms. In 1883 he again took up the question; and in the following year Loeffler gave a systematic description of what is now known as the Klebs-LoefHer bacillus, which was afterwards proved by Roux and Yersin and many other observers to be the causa causans of diphtheria. This bacillus is a slightly-curved rod with rounded, pointed, or club-shaped end or ends (see Plate II. fig 9). It is usually from 1-2 to 5ˆ1 or more in length and from 0-3 to 0-5ˆ in breadth; rarely it may be considerably larger in both dimensions. It is non-motile, and may exhibit great variety of form, according to the age of the culture and the nature of the medium upon which it is growing. It is stained by Gram's method if the decolorizing process be not too pro- longed, and also by Loeffler's methylene-blue method. Except in the very young forms, it is readily recognizable by a series of transverse alternate stained and unstained bands. The bacillus may be wedge-shaped, spindle-shaped, comma-shaped or ovoid. In the shorter forms the polar staining is usually well marked; in the longer bacilli, the transverse striation. Very- characteristic club-shaped forms or branching filaments are met with in old cultures, or where there is a superabundance of nutri- tive material. In what may be called the handle of the club the banded appearance is specially well marked. These specific bacilli are found in large numbers on the surface of the diphther- itic membrane (Plate II. fig. 10), and may easily be detached for bacteriological examination. In certain cases they may be found by direct microscopic examination, especially when they are stained by Gram's method, but it is far more easy to demon- strate their presence by the culture method. On Loeffler's special medium the bacilli flourish so well at body-temperature— about 37° C. — that, like the cholera bacillus, they outgrow the other organisms present, and may be obtained in comparatively

pure culture. Distinct colonies may often be found as early as the eighth or twelfth hour of incubation; in from eighteen to twenty-four hours they appear as rounded, elevated, moderately translucent,

greyish white colonies, with a yellow tinge, the surface moist and the margins slightly irregular or scalloped. They are thicker and somewhat more opaque in the centre. When the colonies are few and widely separated, each may grow to a considerable size, 4 to 5 mm. ; but when more numerous and closer together, they remain small and almost invariably discrete, with distinct intervals between them. In older growths the central opacity becomes more marked and the crenation more distinct, the moist, shiny appearance being lost. When the surface of the serum is dry, the growth, as a rule, does not attain any very large size.

These ” pure ” colonies, when sown in slightly alkaline broth, grow with great vigour; and if a small amount of such a 48 hours’ culture be injected under the skin of a guinea-pig, the animal succumbs, with a marked local reaction and distinct symp- toms of toxic poisoning very similar to those met with in cases of diphtheria of the human subject. Roux and Yersin demonstrated that the poison was not contained in the bodies of the bacilli, but that it was formed and thrown out by them from and into the nutrient medium. Moreover, they could produce all the toxic symptoms, the local reactions, and even the paralysis which often follows the disease in the human subject, by injecting the culture from which they had previously removed the whole of the diphtheria bacilli by filtration. This cultivation, then, contains a poisonous material, which, incapable of multiplying in the tissues, may be given in carefully graduated doses. If, therefore, there is anything in the theory that tissues may be gradually ” acclimatized ” to the poisons of these toxic substances, they saw that it should be possible to prove it in connexion with this disease. Behring, going still further, found that the tissues so acclimatized have the power of producing a substance capable of neutralizing the toxin, a substance which, at first confined to the cells, when formed in large quantities overflows into the fluids of the blood, with which it is distributed through- out the body. The bulk of this toxin-neutralizing substance remains in the blood-serum after separation of the clot. In proof of this he showed that (1) if this serum be injected into an animal before it is inoculated with even more than a lethal dose of the diphtheria bacillus or its products, the animal remains perfectly well; (2) a certain quantity of this serum, mixed with diphtheria toxin and injected into a guinea-pig, gives rise to no ill effects; and (3) that even when injected some hours after the bacillus or its toxins, the serum is still capable of neutralizing the action of these substances. In these experi- ments we have the germ of the present antitoxic treatment which has so materially diminished the percentage mortality in diphtheria. This serum may also be used as a prophylactic agent.

The antitoxic serum as now used is prepared by injecting into the subcutaneous tissues of a horse the products of the diphtheria bacillus. The bacillus, grown in broth containing peptone and blood-serum or blood-plasma, is filtered and heated to a temperature of 68° or 70° C. for one hour. It then contains only a small amount of active toxin, but injected into the horse it renders that animal highly insusceptible to the action of strong diphtheria toxins, and even induces the production of a considerable amount of antitoxin. This production of antitoxin, however, may be accelerated by sub- sequent repeated injections, with increasing doses of strong diphtheria toxin, which may be so powerful that $ to £ of a drop, or even less, is a fatal dose for a medium-sized guinea-pig. The anti- toxic serum so prepared may contain 200, 400, 600 or even more ” units ” of antitoxin per c.c. — the unit being that quantity of antitoxin that will so far neutralize 100 lethal doses (a lethal dose is the smallest quantity that will kill a 250-gramme guinea-pig on the fifth day) of toxin for a 250-gramme gumea-pig, that the animal continues alive on the fifth day from the injection. This, however, is a purely arbitrary stand ird of neutralizing power, as it is found that, owing to the complicated structure of the toxin, the neutraliz- ing and the lethal powers do net always go hand in hand ; but as the toxin used in testing the antitoxin is always compared with the original standard, accurate results are easily obtained.

Diphtheria, though still prevalent in cities, has now lost many of its terrors. In the large hospitals under the Metropolitan

Asylums Board the death-rate fell from nearly 40% in 1889 to under 10% in 1903; and if antitoxin be given as soon as the disease manifests itself, the mortality is brought down to a very insignificant figure. It has been maintained that as soon as antitoxin came into use the number of cases of paralysis increased rather than diminished. This may be readily understood when it is borne in mind that many patients recover under the use of antitoxin who would undoubtedly have succumbed in the pre-antitoxin days; and it cannot be too strongly insisted that although the antitoxin introduced neutralizes the free toxin and prevents its further action on the tissues, it cannot entirely neutralize that which is already acting on the cells, nor can it make good damage already done before it is injected. Even allowing that antitoxin is not accountable for the whole of the improvement in the percentage mortality statistics since 1896, it has undoubtedly accounted for a very large proportion of recoveries. Antitoxin often cuts short functional albuminuria, but it cannot repair damage already done to the renal epithelium before the antitoxin was given. The clinical evidence of the value of antitoxin in the relief that it affords to

the patient is even more important than that derived from the consideration of statistics.

The diphtheria bacillus or its poison acts locally as a caustic and irritant, and generally or constitutionally as a protoplasmic poison, the most evident lesions produced by it being degeneration of nerves and muscles, and, in acute cases, changes in the walls of the blood- vessels. Other organisms, streptococci or staphylococci, when present, may undoubtedly increase the mortality by producing secondary complications, which end in suppuration. Diphtheria bacilli may also be found in pus, as in the discharges from cases of otorrhoea.

Tetanus (Lockjaw). — Although tetanus was one of the later diseases to which a definite micro-organismal origin could be assigned, it has long been looked upon as a disease typical of the “septic” group. In 1885 Nicolaier described an organism multiplying outside the body and capable of setting up tetanus, but this was only obtained in pure culture by Kitasato, a Japanese, and by the Italians in 1889. It has a very character- istic series of appearances at different stages of its development. First it grows as long, very slender threads, which rapidly break up into shorter sections from 4 to 5 n in length (see Plate II. fig. 11). In these shorter rods spores may appear on the second or up to the seventh day, according to the temperature at which the growth occurs. The rods then assume a very characteristic pin or drumstick form; they are non-motile, are somewhat rounded at the ends, and at one end the spore, which is of greater diameter than the rod, causes a very considerable expansion. Before sporulation the organisms are distinctly motile, occurring in rods of different lengths, in most cases surrounded by bundles of beau- tiful flagella, which at a later stage are thrown off, the presence of flagella corresponding very closely with the ” motile ” period. The bacillus grows best at the temperature of the body; it becomes inactive at 14 C. at the one extreme, and at from 42 to 43 C. at the other; in the latter case involution forms, clubs and branching and degenerated forms, often make their appear- ance. It is killed by exposure for an hour to a temperature of from 6o° to 65 C; the spores however are very resistant to the action of heat, as they withstand the temperature of boiling water for several minutes. The organism has been found in garden earth, in the excrement of animals — horses — and in dust taken from the streets or from living-rooms, especially when it has been allowed to remain at rest for a considerable period. It has also been demonstrated in, and separated from the pus of wounds (see Plate II. fig. 1 2) in patients suffering from lockjaw, though it is then invariably found associated with the micro-organisms that give rise to suppuration.

It is important to remember that this bacillus is a strict anaerobe, and can only grow when free oxygen has been removed from the cultivation medium. It may be cultivated in gelatine to which has been added from 2 to 3 % of grape-sugar, when, along the line of the stab culture, it forms a delicate growth, almost like a fir-tree, the tip of which never comes quite to the surface of the gelatine. The most luxuriant growth — evidenced by the longest branches— occurs in the depth of the gelatine away from free oxygen. After a time the

gelatine becomes sticky, and then undergoes slow liquefaction, the growth sinking and leaving the upper layers comparatively clear. This organism is not an obligate parasite, but a facultative ; it may grow outside the body and remain alive for long periods.

Lockjaw is most common amongst agricultural labourers, gardeners, soldiers on campaign, in those who go about with bare feet, or who, like young children, are liable to get their knees or hands accidentally wounded by rough contact with the ground. Anything which devitalizes the tissues — such as cold, bruising, malnutrition, the action of other organisms and their products — may all be predisposing factors, in so far as they place the tissue at a disadvantage and allow of the multipli- cation and development of the specific bacillus of tetanus. In order to produce the disease, it is not sufficient merely to inocu- late tetanus bacilli, especially where resistant animals are concerned: they must be injected along with some of their toxins or with other organisms, the presence of which seems to increase the power of, or assist, the tetanus organism, by divert- ing the activity of the cells and so allowing the bacillus to develop. The poison formed by this organism resembles the enzymes and diphtheria poison, in that it is destroyed at a temperature of 65 C. in about five minutes, and even at the temperature of the body soon loses its strength, although, when kept on ice and protected from the action of light, it retains its specific properties for months. Though siowly formed, it is tremendously potent, uoJinnj part of a drop (the five-millionth part of a c.c.) of the broth in which an active culture has been allowed to grow for three weeks or a month being sufficient to kill a mouse in twenty-four hours, jfa of a drop killing a rabbit, it a dog, or r\i of a drop a fowl or a pigeon; it is from 100 to 400 times as active as strychnine, and 400 times as poisonous as atropine. It has been observed that, quite apart from size, animals exhibit different degrees of susceptibility. Frogs kept at their ordinary temperature are

exceedingly insusceptible, but when they are kept warm it is possible to tetanize them, though only after a somewhat prolonged incubation period, such as is met with in very chronic cases of tetanus in the human subject. In experimentally-produced tetanus the spasms usually commence and are most pronounced in the muscles near the site of inoculation. It was at one time supposed that this was because the poison acted directly upon the nerve termina- tions, or possibly upon the muscles; but as it is now known that it acts directly on the cells of the central nervous system, it may, as in the case of rabies, find its way along the lymphatic channels of the nerves to those points of the central nervous system with which these nerves are directly connected, spasms occurring in the course of the muscular distribution of the nerves that receive their impulses from the cells of that area. As the amount of toxin introduced may be contained in a very small quantity of fluid and still be very dilute, the local reaction of the connective-tissue cells may be exceedingly slight; consequently a very small wound may allow of the introduction of a strong poisonous dose. Many of the cases of so-called idiopathic tetanus are only idiopathic because the wound is trifling in character, and, unless suppuration has taken place, has healed rapidly after the poison has been introduced. In tetanus, as in diphtheria, the organisms producing the poison, if found in the body at all, are developed only at the seat of inoculation; they do not make their way into the surrounding tissues. In this we have an explanation of the fact that all the earlier experiments with the blood from tetanus patients gave absolutely negative results. It is sometimes stated that the production of tetanus toxin in a wound soon ceases, owing to the arrest of the development of the bacillus, even in cases that ultimately succumb to the disease. Roux and Vaillard, however, maintain that no case of tetanus can be treated with any prospect of success unless the focus into which the bacilli have been introduced is freely removed. The antitetanus serum was the first antitoxic serum produced. It is found, however, that though the anti- tetanic serum is capable of acting as a prophylactic, and of preventing the appearance of tetanic symptoms in animals that are afterwards, or simultaneously, injected with tetanus toxin,

it does not give very satisfactory results when it is injected after tetanic symptoms have made their appearance. It would appear that in such cases the tetanus poison has become too firmly bound up with the protoplasm of the nerve cells, and has already done a considerable amount of damage.

(b) More Chronic Infective Diseases (Tissue Parasites).

Tuberculosis. — In no quarter of the field of preventive medicine have

more important results accrued from the discovery of a specific infective organism than in the case of Koch's demon- stration and separation in pure culture of the tubercle bacillus and the association of this bacillus with the transmission of tuberculosis. In connexion with diagnosis — both directly from observation of the organism in the sputum and urine of tuber- culous patients, and indirectly through the tuberculin test, especially on animals — this discovery has been of very great importance; and through a study of the life-history of the bacillus and its relation to animal tissues much has been learned as to the prevention of tuberculosis, and something even as to methods of treatment. One of the great difficulties met with in the earlier periods of the study- of this organism was its slow, though persistent, growth. At first cultivations in fluid media were not kept sufficiently long under observation to allow of its growth; it was exceedingly difficult to obtain pure cultures, and then to keep them, and in impure cultures the tubercle bacilli were rapidly overgrown. Taken directly from the body, they do not grow on most of the ordinary media, and it was only when Koch used solidified blood-serum that he succeeded in obtaining pure cultures. Though they may now be demonstrated by what appear to be very simple methods, before these methods were devised it was practically impossible to obtain any satis- factory results.

The principle involved in the staining of the tubercle bacillus is that when once it has taken up fuchsin, or gentian violet, it retains the stain much more firmly than do most organisms and tissues, so that if a specimen be thoroughly stained with fuchsin and then decolorized by a mineral acid — 25% of sulphuric acid, say — although the colour is washed out of the tissues and most other organisms, the tubercle bacilli retain it; and even after the section has been stained with methylene-blue, to bring the other tissues and organisms into view, these bacilli still remain bright red, and stand out prominently on a blue background. If a small fragment of tuberculous tissue be pounded in a sterile mortar and smeared over the surface of inspissated blood-serum solidified at a comparatively low temperature, and if evaporation be prevented, dry scaly growths make their appearance at the end of some fourteen days. If these be reinoculated through several generations, they ultimately assume a more saprophytic character, and will grow in broth containing 5 % of glycerin, or on a peptone beef -a gar to which a similar quantity of glycerin has been added. On these media the tubercle bacillus grows more luxuriantly, though after a time its virulence appears to be diminished. On blood-serum its virulence is preserved for long periods if successive cultivations be made. It occurs in the tissues or in cultivations as a

delicate rod or thread 1-5 to y$n in length and about 0-2 to 0-5ˆ in thickness (see Plate II., fig. 15). It is usually slightly curved, and two rods may be arranged end to end at an open angle. There is some doubt as to whether tubercle bacilli contain spores, but little masses of deeply- stained proto- plasm can be seen, alternating with clear spaces within the sheath; these clear spaces have been held to be spores. This organism is found in the lungs and sputum in various forms of consumption; it is met with in tuberculous ulcers of the intestine, in the lymph spaces around the vessels in tuberculous meningitis, in tuberculous nodules in all parts of the body, and in tuberculous disease of the skin — lupus. It is found also in the tuberculous lesions of animals; in the throat-glands, tonsils, spleen and bones of the pig; in the spleen of the horse; and in the lungs and pleura of the cow. Tuberculosis may be produced artificially by inject- ing the tubercle bacillus into animals, some being much more susceptible than others. Milk drawn from an udder in which there are breaking-down tuberculous foci, may contain an enormous

number of active tubercle bacilli; and pigs fed upon this milk develop a typical tuberculosis, commencing in the glands of the throat, which can be traced from point to point, with the utmost precision. It must be assumed that what takes place in the pig may also take place in the human subject; and a sufficient number of cases are now on record to show that the swallowing of tuberculous material is a cause of tuberculosis, especially amongst children and adolescents. Inhaled tubercle bacilli from the recently-dried sputum of phthisical patients, like milk derived from tuberculous udders, may set up tuberculosis of the lungs or of the alimentary tract, especially when the epithe- lial layer is unhealthy or imperfect. The two main causes of the prevalence of tuberculosis in the human subject are: (1) tubercle bacilli may become so modified that they can flourish saprophytically; as yet it has not been possible to trace the exact conditions under which they live, but we are gradually coming to recognize that, although when they come from the body they are almost obligate parasites, they may gradually acquire saprophytic characters. (2) Many of the domestic animals are readily infected with tuberculosis, and in turn may become additional centres from which infection may radiate.

Koch’s tuberculin has been of inestimable value in the early diagnosis of tuberculosis, especially in animals.

Tuberculin, from which the tuberculin test derives its name, consists of the products of the tubercle bacillus when grown for a month or six weeks in peptone meat-broth to which a small propor- tion, say 5 or 6 %, of glycerin has been added. The tubercle bacilli are then killed at boiling- temperature, and are partially removed by sedimentation, and completely by filtration through a Berkfeld or Pasteur- Chamberland filter. If a large dose of this filtered fluid be injected under the skin of a healthy man or brute, it is possible to produce some local swelling and to induce a rise of temperature ; but in a similar patient suffering from tuberculosis a very much smaller dose (one which does not affect the healthy individual in the slightest degree) is sufficient to bring about the characteristic swelling and rise of temperature. To obtain trustworthy results the dosage must always be carefully attended to. The reaction is only obtained under certain well-defined conditions. Driven animals seldom, if ever, react properly. Cattle to be tested should be allowed to remain at rest for some time; they should be well fed, and be carefully protected from cold or draughts. After an injection of tuberculin into the subcutaneous tissues (usually in front of the shoulder or on the chest-wall) they should be kept under the same conditions and should be watched very carefully ; the tem- perature should be taken at the sixth hour, and every three hours afterwards up to the twenty-first or even twenty-fourth hour. If during this time the temperature rises to 104° F., there can be little doubt that the animal is tuberculous; but if it remains under 103°, the animal must be considered free from disease : if the temperature remains between these points the case is a doubtful one, and, accord- ing to Sir John M'Fadyean, should be retested at the end of a month. It is interesting to note that the test is not trustworthy in the case of animals in which tuberculosis is far advanced, especially when the temperature is already high — 103° F. In such cases, however, it is an easy matter to diagnose the disease by the ordinary clinical methods. At first objections were raised to this test on two grounds : (1) that mistakes in diagnosis are sometimes made; (2) that tuber- culin may affect the milk of healthy animals into which it is injected. As the methods of using the tuberculin have been perfected, and as the conditions under which the reaction is obtained have become better known, mistakes have rapidly become fewer; whilst it has been amply proved that tuberculin has not the slightest deteriorating effect on the quality of the milk.

Tuberculin and similar substances are sometimes used as specific reagents in the diagnosis of tuberculosis in the human subject. When small quantities of old tuberculin are injected subcutaneously into a tuberculous patient in whom, however, no tubercle bacilli may be

demonstrable, the temperature begins to rise in six or eight hours and continues to rise for twelve hours or, in rare cases, for an even longer period, a rise of a single degree being considered sufficient to indicate the presenee of the disease. Along with this there is usually some swelling and tenderness, with perhaps redness at the seatof injection, whilst there is also some evidence of a vascular congestion in the neighbourhood of any tuberculous lesion. A second method of applying tuberculin as a diagnostic reagent is that of Pirquet, who, after diluting old tuberculin with two parts of normal saline solution and one part of 5% carbolic glycerin, places a drop of the mixture on the skin and scrapes away the epidermis in lines with ” a small dental burr.” The skin is similarly treated with normal saline some 2 or 3 in. away from that at which the tuberculin is used. In the tuberculin area a little papule develops; this may become a vesicle, surrounded by slight redness and swelling (in the ” saline” area nothing of the kind appears). The swelling begins about six hours after the scarification is made and continues to increase for

24 hours. Reactions, however, are obtained by this test in patients who are not suffering from any active tubercular lesion, whilst on the other hand in certain cases it fails to indicate the presence of tubercle when it is undoubtedly there. Calmette’s or Wolff-Eisner’s ophthalmic reaction test, a third method of using tuberculin, consists in dropping a weak solution of tuberculin into the conjunctival sac of one eye; this is followed by a mild attack of conjunctivitis or inflammation of the eye in the tuberculous patient, whilst in the normal patient no such inflammation should appear. Although this test appears to be of considerable value, it fails to give any information in cases of advanced tuberculosis, of general miliary tuber- culosis and of tuberculous meningitis. It certainly possesses one great advantage over the others — it does not give any reaction in the presence of dormant tubercle in persons clinically sound and healthy. The inflammation of the eye may, however, be so acute, especially where strong solutions of tuberculin are used, that considerable damage may be done, more especially should there be any dormant disease of the eye. It must be remembered that in all these tests the exhibition of tuberculin increases for a time the sensi- tiveness of the patient each time it is administered. It sets up a negative phase, as already described, and renders the patient more susceptible to the action of a fresh dose. It is evident, therefore, that the careful worker wishing to obtain minimal effects will give small doses and gradually repeat these as he may find necessary.

In 1890 Koch, whose brilliant researches on tuberculosis had opened up a new field of investigation and had inspired new hope in the

breasts of patients and physicians alike, followed up his method of diagnosis with a method of vaccination with the products of the tubercle bacillus separated from glycerinated broth culture after the vitality of the bacilli had been destroyed. As is frequently the case with new remedies, this was used so indiscriminately that it soon fell into disrepute. The results in certain cases, however, were so successful that careful investi- gations into the character and action of tuberculin and into the conditions under which it may be used with advantage were undertaken. Tuberculins composed of the triturated bodies of tubercle bacilli, of the external secretions of these bacilli, and of their various constituents in different combinations, were experi- mented with, but at the present time Koch's two tuberculins—especially his new tuberculin — hold the field. The " old tuberculin " consists of the glycerin broth culture of the tubercle bacilli mentioned above. The new tuberculin consists of the centrifugalized deposit from a saline solution of the extract of the triturated dead tubercle bacilli; this is stored in small tubes, each containing two milligrammes of solid substance. This is diluted with distilled water containing 20% of glycerin, great care being taken to maintain the sterility of the solution. The dose is usually from -j-ffVir t0 rˆcnr of a milligramme for an adult, increasing to ^^; according to Sir A. Wright it should not go beyond this.

Perhaps no one has done more to rehabilitate the tuberculin treatment than Sir Almroth Wright, who after a long series of experiments devised what he called the tuberculo-opsonic index, about which a few words may be of interest. It is well-known that certain cells in the human blood have the power of taking bacteria into their substance and there digesting them. This, the so-called " phagocytic power " of Metchnikoff, was found to vary somewhat under different conditions, and Wright set himself to determine, if possible, what were the factors that modified this variability. He found that the white blood corpuscles, the poly- morphonuclear cells, whether from healthy or tuberculous patients, always showed practically the same phagocytic activity when mixed with a fine emulsion of tubercle bacilli and the serum from a healthy patient. If, however, corpuscles from the same individuals, whether healthy or tuberculous, were allowed to act upon the bacilli in the presence of serum drawn from a tuberculous patient, one of three things might happen: (1) the bacilli mightbe taken up in smaller numbers than in the above series of experiments; (2) they might be taken up in larger numbers; or (3) they might be taken up in what might be called normal numbers. In (1) and (2) Wright holds there is evidence of a tuberculous condition, in (3) of course the evidence is negative. He found, however, that when a dose of

tuberculin was injected into a tuberculous patient there was a distinct fall in the number of tubercle bacilli taken up by the leucocytes treated with the serum of the patient. This condition Wright speaks of as the ” negative phase. ‘ Increased phagocytic activity of the cells is associated with what is spoken of as the posi- tive phase. The theory is that the blood serum has the power of preparing bacteria to be eaten by the phagocytes in the same sense that boiling, say, prepares food for ready digestion by the human subject, and Wright applied the term opsonin to the un- known constituent or complex of constituents of the serum that

exerts this action upon the bacteria. The opsonic index is obtained by comparing the average number of bacilli taken up by, say, ioo leucocytes* to which the serum from a tuberculous patient has been added, with the number of bacteria taken up by a’hundred similar corpuscles to which normal serum has been added, the ratio between the two giving the opsonic index. Wright main- tains that after the injection of small doses of tuberculin during a negative phase which first appears, i.e. whilst there is a fall in the number of bacilli taken up by the leucocytes of the blood, the patient is more susceptible than before to the attacks of the tubercle bacillus. Following this, however, there is a gradual rise in the opsonic index until it passes the normal and the patient enters a positive phase, during which the susceptibility to the attacks of the tubercle bacillus is considerably diminished. When the effects of this dose are passing off a fresh injection should be made; this again induces a negative phase, but one that, should not be so marked as in the first instance, whilst the positive phase which succeeds should be still more marked than that first obtained. If this can be repeated systematically and regularly the patient should begin, and continue, to improve. The difficulties involved in the determination of the opsonic index are, however, exceedingly great, and the personal factor enters so largely into the question that some observers are very doubtful as to the practical utility of this method. In Wright’s hands, however, and in the hands of those who work with him, very satisfactory results are obtained. The tuberculin treatment, fortunately, does not stand or fall by the success of the opsonic index determination, especially as most valuable information as to the course of the disease and the effects of the tuberculin may be obtained by a study of the daily tempera- ture chart and of the general condition of the patient.

Tuberculin should not be injected more frequently than about once in 10 or 14 days, and it is well not to increase the dose too rapidly. Wherever the temperature continues high, even a degree beyond normal, and where the pulse is over 100, it is not wise to give tuberculin, nor does it seem to be of any great value where the disease is making rapid headway or has become generalized, especially where there is meningitis or bleeding from the lungs.

It is interesting to note, in connexion with the diagnostic significance of the opsonic index, that in non-tuberculous subjects the administration of a small dose of tuberculin is followed by no negative phase such as is met with in the tuberculous subject. The phagocytic power of the white blood corpuscles is determined by noting the number of organisms taken up by the leucocytes when mixed with equal parts of a standard emulsion of tubercle bacilli and blood serum incubated in fine glass tubes for 15 minutes at a temperature of 37° C. If the period of incubation is much shorter than this the results are irregular, whilst if the _ period is. longer so many organisms are taken up that it becomes impossible to diffe- rentiate two sets of sera.

As an example we might adduce the following. Taking a tubercu- lous patient's serum + leucocytes + tubercle bacilli, let us say we have an average of 1-8 bacilli per leucocyte in 50 or 100 leucocytes counted; with normal serum + corpuscles + tubercle bacilli the average number of bacilli per leucocyte in the same number of cells counted is 3. From these figures the opsonic index obtained is 1-8 ! 3 = o-6 = opsonic index.

Leprosy. — Armauer Hansen in 1871, and Neisser in 1881, described a " leprosy bacillus " corresponding in size and in certain points of staining reaction to the tubercle bacillus, and it is now generally accepted that this bacillus is the direct and specific causal agent of leprosy. The discovery of this organism paved the way for the proof that the tubercular and anaesthetic forms of leprosy are essentially the same disease, or rather are the manifestations of the action of a common organism attacking different series of tissues.

To demonstrate the presence of the leprosy bacillus, tie an indiarubber ring firmly around the base of one of the leprosy tubercles. As soon as the blood is driven out, leaving the nodule pale, make a puncture with the point of a sharp knife. From this puncture a clear fluid exudes; this, dried on a cover- glass, stained with carbol-fuchsin, and rapidly decolorized with a weak mineral acid, shows bacilli stained red and very like tubercle bacilli; they differ from that organism, however, in that they are somewhat shorter, and that if the acid be too strong or

be allowed to act on them for too long a time, the colour is discharged from them much more readily. These organisms, which are from 4 to 6ju in length and 0-3/* in breadth, are as a rule more rigid and more pointed than are the tubercle bacilli (see Plate II., fig. 16). It is doubtful whether they form spores. They are found in large numbers lying embedded in a kind of gelatinous substance in the lymphatics of the skin, in certain cells of which they appear to be taken up.

It is curious that these bacilli affect specially the skin and

nerves, but rarely the lungs and serous membranes, thus being in sharp contrast to the tubercle bacillus, which affects the latter very frequently and the former more rarely. They are seldom found in the blood, though they have been described as occuring there in the later stages of the disease. It is stated that leprosy has been inoculated directly into the human subject, the patient dying some five or six years after inoculation ; but up to the pre- sent no pure culture of the leprosy bacillus has been obtained; it has therefore been impossible to produce the disease by the inoculation of the bacillus only. What evidence we have at our disposal, however, is all in favour of the transmissibility of the disease from patient to patient and through the agency of the leprosy bacillus. None of the numerous non-bacillary theories of leprosy account at all satisfactorily for this transmissibility of the disease, for its progressive nature, and for the peculiar series of histological changes that are met with in various parts and organs of the leprous body. Leprosy occurs in all climates. It is found where no fish diet can be obtained, and where pork and rice are never used, though to these substances has been assigned the power of giving rise to the disease. Locality appears to influence it but little, and with improved sanitation and increased cleanliness it is being gradually eradicated. The only factor that is common in all forms of leprosy, and is met with in every case, is the specific bacillus; and in spite of the fact that it has yet been found impossible to trace tlie method of transmission, we must from what is known of the presence and action of bacilli, in other diseases, especially in tuberculosis, assign to the leprosy bacillus the r51e of leprosy-producer, until much stronger evidence than has yet been obtained can be brought forward in favour of any of the numerous other causes that have been assigned. Two cases are recorded in which people have contracted leprosy from pricking their fingers with needles whilst sewing a leper’s clothes; and a man who had never been out of Dublin is said to have contracted the disease by sleeping with his brother, a soldier who had returned from India suffering from leprosy.

Glanders.— Farcy in the human subject resembles the same disease

experimentally produced in animals with material from a glandered animal, and as there is no pathological distinction between the two, from the aetiological standpoint, they may be considered together. If the pus from a glanders abscess be mixed with a little sterile saline solution and spread over the cut surface of a boiled potato kept at the body-temperature, bright yellow or honey-coloured, thick, moist-looking colonies grow very rapidly and luxuriantly. These colonies gradually become darker in colour, until they assume a cafe-au-lait, or even a chocolate, tint. On examining one of them microscopically, it is found to be made up of bacilli 2 to sn long and £ to ˆ of their own length broad (see Plate I., fig. 2 and fig. 6). The bacillus is usually straight or slightly curved and rounded at one end; it appears to be non-motile. As first pointed out by Loeffler and Schiitz. when a portion of a culture is inoculated subcutaneously, typical farcy, with the acute septicaemia or blood-poisoning so characteristic of certain cases of glanders and farcy, is the result. The human subject is usually inoculated through wounds or scratches, or through the application of the nasal discharge of a glandered animal to the mucous membrane of the nose or mouth. Man is not specially susceptible to the glanders virus, but as he frequently comes into contact with glandered horses a consider- able number of cases of farcy in man are met with, although amongst knackers it is a comparatively rare disease. Cattle never contract it by the ordinary channels, and even when inocu- lated exhibit nothing more than localized ulceration. The goat appears to occupy an intermediate position between cattle and the horse in this respect; in sheep, which are fairly susceptible the disease runs its course slowly, and appears to resemble chronic farcy in man. In rabbits and the dog the disease runs a very slow and modified course. Although field-mice are extra- ordinarily susceptible, white mice and house mice, unless previously fed on sugar or with phloridzin, are unaffected by inoculation of the glanders bacillus. The pigeon is the only bird in which glanders has been produced. Lions and tigers are said to contract the disease, and to take it in a very severe and

rapidly fatal form. The glanders organism soon loses its virulence and even its vitality. Dry, it dies in about ten days; placed in distilled water, in about five days; but kept moist, or on culture media, it retains its vitality for about a month, although its activity soon becomes considerably lessened. These bacilli are readily killed at a temperature of 55 C; they can pass through the kidneys, even when there is no lesion to be made out either with the naked eye or under

the microscope (Sherrington and Bonome).

The glanders bacillus grows best in the presence of oxygen, but it may grow anaerobically; it then appears to have the power of forming toxin, either more in quantity or of greater activity than when it has access to a free supply of oxygen. This poison (mallein) is used for the purpose of diagnosing the presence of glanders. A cultivation is made in peptonized bouillon to which a small portion of glycerin has been added. The bacillus is allowed to grow and multiply at the temperature of the body for a month or six weeks; the organisms are then killed by heat and 0-5% carbolic acid is added. The cultivation is then filtered through a porcelain filter in order to remove the bodies of the bacilli, and the resulting fluid, clear and amber-coloured, should have the power, when injected in quantities of 1 ex., of giving the specific reaction in an animal suffering from glanders; in a healthy animal 6 c.c. will give no reaction. The suspected animal should be kept at rest and in a warm stable for twenty-four to forty-eight hours before the test is applied. The temperature should be normal, as no proper reaction is obtained in an animal in which the temperature is high. This reaction, which is a very definite one, consists in a rise of temperature of from 2° to 4° F., and the appearance of a swelling of from 3 to 4 in. in diameter and from 1 to 15 in. in height, before the sixteenth or eighteenth hour; this swelling should continue to increase for some hours* It has been suggested that the injection of ■£$ to -jˆ c.c. of mallein, at intervals of two or three days, may be used with advantage in the treatment of glanders. Glandered horses seem to improve under this treatment, and then certainly do not react even to much larger doses of mallein. The mallein test has revealed the fact that glanders is a far more common and more widespread disease than was at one time supposed.

II. — To Higher Vegetable Parasites

Actinomycosis. — This disease is very prevalent in certain low-lying districts, especially amongst cattle, giving rise to the condition known as ” sarcoma,” ” wooden tongue,” ” wens,” ” bony growths on the jaw,” &c. It is characterized by the presence of a fungus, which, at first growing in the form of long slender threads that may be broken up into short rods and cocci, ultimately, as the result of a degenerative process, assumes the form of a ” ray-fungus,” in which a series of club-like rays are arranged around a common centre (see Plate I., fig. 8). It is probably a streptothrix — Streptothrix Forskri. Numerous cases have been observed in the human subject. Suppuration and the formation of fistulous openings, surrounded by exuberant granulations, ” proud flesh,” usually supervene where it is growing

and multiplying in the tissues of the human body, and in the pus discharged are yellowish green or reddish brown points, each made up of a central irregular mycelium composed of short rods and spores, along with the clubs already mentioned. The mycelial threads may reach a considerable length (20 to ioojit); some of them become thicker, and are thus differentiated from the rest; the peripheral club is the result of swelling of the sheath; the filaments nearer the centre of the mycelial mass contain spores, which measure from 1 to 2ˆ in diameter. This fungus appears to lead a saprophytic existence, but it has the power of living in the tissues of the animal body, to which it makes its way through or around carious or loose teeth, or through abra- sions of the tongue or tonsils. After the above positions, the abdomen, especially near the vermiform appendix, is a special seat of election, or in some cases the thorax, the lesions being traceable downwards from the neck. Any of the abdominal or thoracic organs may thus be affected. The process spreads somewhat slowly, but once started may extend in any direction,

its track being marked by the formation of a large quantity of fibrous tissue, often around a long fistula. In the more recent growths, and in solid organs, cavities of some size, containing a soft semi-purulent cheesy-looking material, may be found, this mass in some cases being surrounded by dense fibrous tissue. When once a sinus is formed the diagnosis is easy, but before this the disease, where tumours of considerable size are rapidly formed, may readily be mistaken for sarcoma, or when ‘ the lungs are affected, for tuberculosis, especially as bronchitis and pleuritic effusion are frequently associated with both actinomycosis and tuberculosis.

Mycetoma, the Madura foot of India, is a disease very similar to actinomycosis, and, like that disease, is produced by a some- what characteristic streptothrix. It usually attacks the feet and legs, however, and appears to be the result of infection through injured tissues. Under certain conditions and in long-standing cases the fungus appears to become pigmented (black) and degenerated.

Other forms of fungus disease or Mycoses are described. Asper- gillosis, or pigeon-breeders’ disease, is the result of infection with the Aspergillus fumigatus. Certain tumours appear to be the result of the action of a yeast, Blastomycosis or Saccharomycosis. The spores of the Pencillium glaucum, and of some of the Mucors, are also said to have the power of setting up irritation, which may end in the formation of a so-called granuloma or granulation tissue tumour. These, however, are comparatively rare.

Malaria. — Following Laveran's discovery, in 1880, of a parasite in the blood of patients suffering from malaria, our knowledge of this and similar diseases has increased by leaps and bounds, and most important questions concerning tropical diseases have now been cleared up. Numerous observations have been carried out with the object of determining the parasitic forms found in different forms of malaria — the tertian, quartan, and aestivo-autumnal fever — in each of which, in the red blood corpuscles, a series of developmental stages of the parasite from a small pale translucent amoebiform body may be followed. This small body first becomes lobulated, nucleated and pigmented; it then, after assuming a more or less marked rosette- shape .with a deeply pigmented centre, breaks up into a series of small, rounded, hyaline masses of protoplasm, each of which has a central bright point. The number of these, contained in a kind of capsule, varies from 8 to 10 in the quartan, and from 1 2 to 20 in the tertian and aestivo-autumnal forms. There are certain differences in the arrangement of the pigment, which is present in larger quantities and distributed over a wider area in the somewhat larger parasites that are found in the tertian and quartan fevers. In the parasite of the aestivo-autumnal fever the pigment is usually found in minute dots, dividing near the pole at the point of division of the organism, along with it in the earlier stages (see Plate I., fig. 5). Here, too, the rosette form is not so distinct as in the parasite of tertian fever, and in the latter is not so distinct as in the quartan parasites. These dividing forms make their appearance immediately before the onset of a malarial paroxysm, and their presence is diagnostic. The process of division goes on especially in the blood-forming organs, and is therefore met with more frequently in the spleen and in bone-marrow than in any other situation. The parasites, at certain stages of their development, may escape from the red blood corpuscles, in which case (especially when exposed to the air for a few minutes) they send out long processes of proto- plasm and become very active, moving about in the plasma and between the corpuscles, sometimes losing their processes, which, however, continue in active movement. In the aestivo-autumnal fever curious crescent-shaped or ovoid bodies were amongst the first of the parasitic organisms described as occurring in the blood, in the red corpuscles of which they develop. Manson maintains that from these arise the flagellate forms, all of which, he thinks, are developed in order that the life of the malarial parasite may be continued outside the human body. It is probable that most of the pigment found in the organs taken from

malarial patients is derived from red blood corpuscles broken down by the malarial parasites; many of these, in turn, are devoured by leucocytes, which in malarial blood are usually greatly increased in number, and frequently contain much pig- ment, which they have obtained either directly from the fluid plasma or from the pigmented parasitic organism. The work recently carried out by Bruce on the tsetse-fly parasite, by A. J. Smith on Texas fever, and by W. S. Thayer and Hewitson on the blood parasites of birds, has opened up the way for the further study of the malarial parasites outside the human body. There can be no doubt as to the close relation of the multiplication and sporulation of the malarial parasite with the ague paroxysm: the anaemia results from the breaking down of blood corpuscles. Toxic substances are present in the blood during the setting free of the spores; of this we have proof in the increased toxicity of the urine during the paroxysmal stages of the disease; more- over necrotic areas, similar to those found in acute toxic fevers produced by other micro-organisms, are met with. It is well to bear in mind that the accumulation of debris of parasites and corpuscles in the capillaries may be an additional factor in this necrosis, especially when to this is added the impairment of nutrition necessarily involved by the impoverished condition of the malarial blood. It is interesting to note that, although, as pointed out by Nuttall, the Italian and Tirolese peasantry have long been firmly of the opinion that malaria is transmitted through the mosquito, and although the American, Dr Josiah Nott, in 1848 referred to malaria as if the mosquito theory had already been advanced, little attention was given to this question by most observers. Still earlier, Rasori (in 1846) had stated that ” for many years I have held the opinion that inter- mittent fevers are produced by parasites, which renew the paroxysm by the act of their reproduction, which recurs more or less rapidly according to the variety of the species”; and this appears to be the first well-authenticated reference to this subject. Nuttall, who gives an excellent summary of the literature on the mosquito hypothesis of malaria, assigns to King the honour of again drawing attention to this question. Laveran in 1891, Koch in 1892, Manson in 1894, Bignami and Mendini in 1896, and Grassi in 1898, all turned their attention to this hypothesis. Manson, basing his hypothesis upon what he had observed as regards the transmission of Filaria by the mosquito, suggested a series of experiments to Major Ronald Ross. These were carried out in 1895, when it was found that in mosquitoes that had taken up blood containing amoeboid parasites, crescents, which were first described as cells, appeared in the stomach- wall after four or five days; these

contained a number of stationary vacuoles and pigment granules, ten to twenty in number, bunched to- gether or distributed in lines. Grassi, Bignami and Bastianelli confirm and supplement Ross's observations; they find that Anopheles claviger, taking the blood from a patient suffering from malaria, soon develops haemosporidia in the intestine. These parasites are then found between the muscular fibres of the stomach; they increase in size, become pigmented, and more and more vacuolated, until they project into the body-cavity. On the sixth day these large spheres contain an enormous number of minute bodies, refractive droplets like fat, and a diminishing amount of pigment. On the seventh day numerous filaments, arranged in rows around several foci, are seen. They are very delicate, are stained with difficulty, and appear to be perfectly independent of each other, though grouped within a capsule. After the capsule has ruptured, these thread-like " sporozooites," escaping into the body-cavity, gradually make their way to and accumulate in the cells or tubules of the salivary glands, whence their passage through the proboscis into the human blood is easily understood.

Thus two phases or cycles of existence have been demon- strated — one within the human body, the second in the mosquito. Development That within the human body appears to be capable of the of going on almost indefinitely as long as the patient

Malarial lives, but that in the mosquito appears to be an Parasite. offshoot or an intermediate stage. The minute specks of protoplasm, the amoebulae, which have already been

described as occurring in the red blood corpuscles of the higher animals, increase in size, take up blood pigment, probably from the red corpuscles, and then become developed into sporocytes or gametocytes. The sporocyte is the form which, remaining in the body, ultimately breaks up, as already seen, into a series of minute spores or amoebulae, which in turn go through the same cycle again, increasing in size and forming spores, and so on indefinitely. Gametocytes (the true sexual form) are in certain species, to outward appearance, very similar to the sporocyte, but in others they assume the crescentic shape, and can thus be recognized. The male cell resembles the female-cell very closely, except that the protoplasm is hyaline and homogeneous-looking, whilst that of the female cell is granular. It has already been noted that when the blood is withdrawn from the body certain of the malarial parasites become flagellated. These flagella may be looked upon as sperm elements, which, forming in the male gametocyte, are extruded from that cell, and, once set free, seek out the granular female gametocytes. A single flagellum becomes attached

to a small projection that appears on the female cell; it then makes its way into the protoplasm of the female cell, in which rapid streaming movements are then developed. In certain species the female cell is somewhat elongated, and may be peculiarly constricted. It becomes motile, and appears to have the power of piercing the tissues. In this way the first stages of development in the mosquito are passed. The gametocytes, taken along with the blood into the stomach of this insect, pass through the various phases above mentioned, though the zygote form of the human malarial parasite has not yet been traced. In the blood of a patient bitten by an infected mosquito the ordinary malarial parasite may be demonstrated without any difficulty at the end of a week or ten days, and the cycle recommences.

This theory, now no longer a hypothesis, in which the mosquito acts as an intermediary host for one stage of the parasite and transmits the parasite to man, affords an ex- planation of many apparently anomalous conditions associated with the transmission of malaria, whilst it harmonizes with many facts which, though frequently observed, were very difficult of explanation. Malaria was supposed to be associated with watery exhalations and with the fall of dew, but a wall or a row of trees was seemingly quite sufficient to prevent the passage of infection. It was met with on wet soils, on broken ground, in marshes, swamps and jungles; on the other hand, it was supposed to be due to the poisonous exhalations from rocks. All this is now explained by the fact that these are the positions in which mosquitoes occur: wherever there are stagnant pools, even of a temporary nature, mos- quitoes may breed. It has been observed that although the malarial “miasma” never produces any ill effects in patients living at more than a few feet from the surface of the ground, malaria may be found at a height of from 7000 to 9000 ft. above sea-level; and the fact that a belt of trees or a wall will stop the passage of the poison is readily explicable on the mosquito theory. These insects are incapable, owing to their limited power of flight, of rising more than a few feet from the ground, and cannot make their way through a belt of trees of even moderate thickness. Broken ground, such as is found in connexion with railway cuttings and canals, may be a focus from which malaria may spread. In such broken ground pools are of common occurrence, and afford the conditions for the development of the mosquito, and infected tools used in one area may easily convey the ova to another. All these facts afford further support of this theory. The conditions of climate under which malaria is most rife are those which are most suitable for the development of the mosquito. The protection afforded by fires, the recognizee* value of mosquito curtains, the simultaneous disappearance of Anopheles and malaria on

the complete draining of a neigh- bourhood, the coincidence of malaria and mosquitoes, and the protection afforded by large expanses of water near walls and trees are also important in this connexion.

The mosquitoes specially associated with the transmission of malaria in the human subject belong apparently to the genuf

Anopheles. Anopkeles danger (maculipennis) and Anopheles

bifwcatus both are found in Great Britain; Anopheles pictus is

another species found in Europe, but so far not in

Species of Q reaf . Britain. A member of the genus Culex, the

mosquito , ... ,.

Concerned, grey mosquito or Culex JaHgans, is the intermediate host of the proteosoma of birds, on which many of the intermediate phases of the life-history of these parasites have been studied. Ross describes a dappled-wing mosquito as the one with which he performed his experiments on birds in India. Anopheles claviger is interesting in view of the former prevalence of malaria in Great Britain.

The remedy for malaria appears to be the removal or spoiling of the breeding grounds of the mosquito, thorough drainage of pools and puddles, or, where this cannot be easily effected, the throwing of a certain amount ” of kerosene on the surface of these pools” (Nuttall).

Amoebic Dysentery. — In addition to the dysentery set up by bacteria, a form — amoebic dysentery or amoebic enteritis — has been described which is said to be due to an animal parasite, and it has been proposed to separate the various types of dysentery according to their aetiology, in which case the amoebic group is probably more specific than any other. The amoeba {Amoeba dysenteriae, Entamoeba histolytica, of Schaudinn) supposed to give rise to this condition was first described by Losch in 1S75. Since then this amoeba has been described either as a harmless parasite or as a cause of dysentery in Europe, Africa, the United States and in Brazil, and more recently in India. This organism, which is usually placed amongst the rhizopods, consists of a small rounded, ovoid or pear-shaped globule of proto- plasm, varying in size from 6 to 40/4, though, as Lafleur points out,

these limits are seldom reached, the organism being usually from one and a half to three times the diameter of a leucocyte — from 12 to 26/ i (see Plate II., fig. 19). Its margins are well defined, and the body appears to consist of a granular inner portion and a homogeneous outer portion, the latter being somewhat lighter in colour than the inner; in the resting stage this division cannot be made, out. The organism appears to pass through at least two phases, one corresponding to a cystic, the other to an amoeboid, stage. In the latter stage, if the organ- ism be examined on a warm stage, it is seen to send out processes, and, as in other amoebae, vacuoles may be seen as clear spaces lying in the granular and darker-coloured inner protoplasm. In the small vacuoles a deeply stained point may be seen. These vacuoles may be extruded through the ectoplasm. In some cases the vacuoles are so numerous that they occupy the whole of the space usually occupied by the granular protoplasm, and are merely surrounded by a zone of variable thickness, which ” has the appearance of finely granular glass of a distinctly pale green tint” (Lafleur). In the cystic stage a nucleus which appears amongst the vacuoles may be made out, usually towards one side of the amoeba. This nucleus is of considerable size, i.e. nearly as large as a red blood corpuscle, and is readily distinguishable from the surrounding protoplasm. When stained by the Benda method (safranin and light green) a more deeply staining nucle- olus may be seen in the nucleus. The nucleus is perhaps best seen when stained by this method, but it is always difficult to obtain well-stained specimens of this organism. If these amoebae can be kept under observation for some time evidence of amitotic division may sometimes be seen. Red blood corpuscles are often englobed by this amoeba, as are also micrococci and bacilli. The movements of the amoebae are most active at a temperature of about oo° to 98 F. From the fact that pigment is contained in these organisms, it is supposed that they take in the red blood corpuscles as nutritive material, and that other substances may be taken in to serve a similar purpose. Nothing is known of the method of multiplication of the amoeba, but it is supposed that it may be both by fission and by spore formation. These organ- isms are present in the early stage of the acute disease, and dis- appear at the later stages. Perhaps of some importance is the fact that the abscesses found in the liver and lung, which occur so frequently in cases of dysentery, usually contain, especially in the portions immediately adjoining the suppurating mass, a

considerable number of these amoebae. In the very small abscesses the amoebae are numerous and active, and occupy the capillaries in the tissues. It is quite possible that this plugging of the capillaries with

amoebae is the cause both of the haemor- rhages and of the small areas of necrosed tissue, the supply of nutriment being cut off from the liver cells and from the lung tissues, and that suppuration occurs only as a secondary process, though Councilman and Lafleur maintain that the amoeba itself is the primary cause of suppuration. It is possible, of course, that the suppuration is due to the action of pus-forming organisms conveyed along with, or following, the amoeba, as we know that the growth of suppurating organisms can go on in dead tissues when these organisms have no chance of surviving in the healthy tissues and fluids of the body. Lafleur holds that the amoeba forms a toxic substance which exerts a direct devitalizing effect on the liver cells, and that the amoeba itself causes suppuration. The abscesses in the lung, which invariably extend directly from the liver and occur at the base of the right lung, also contain these amoebae. For these reasons this organism is looked upon as the cause of dysentery and of certain forms of dysenteric abscess.

They differ from the Entamoeba coli — often met with in the intestine — which has a more distinct nucleus containing larger chromatin masses and is surrounded by a highly refractile nuclear membrane. Further, in the Entamoeba coli the cyto- plasm is of the same character throughout, there being no differentiation into ectoplasm and endoplasm. The Amoeba histolytica is often met with in a " resting phase," in which the nucleus is less distinctly marked, and may consist of small masses of chromatin distributed throughout the cell or penetrat- ing small buds formed on the surface. Around each of these buds, three, four or more, a highly refractile cyst wall is formed, the cysts becoming separated from the rest of the cell, the remnant of which undergoes disintegration. These cysts are extremely resistant, and probably maintain the continuity of the species outside the body.

In the active phase, the amoeboid form appears able by its tough membranous pseudopodia to push its way into the mucous membrane of the large intestine, especially the rectum, the lower part of the ileum and the flexures. Once it is ensconced in these tissues, small soft oedematous looking swellings soon appear on the mucous surface. Marshall points out that the amoebae probably reach the liver by the portal circulation from the dysen- teric lesions in which the amoebae are found. Other observers maintain that the amoebae may pass through the walls of the intestine, through the peritoneal cavity, and so on to the liver where they give rise to typical abscesses.

Syphilis. — It has long been recognized that syphilis is a specific infective disease, but although characterized by fever, anaemia, and increased growths of tissue followed by rapid degeneration and

ulceration of tissue, it is only within quite recent years that a definite parasitic organism, present in all cases of typical syphilis, has been isolated and studied. Schaudinn and Hoff- mann, followed by Metchnikoff and others, have described as of constant occurrence a spiral or screw-shaped organism in which are seen from half a dozen to a dozen well-defined, short, regular, almost semicircular curves. This organism, when examined fresh, in normal or physiological salt solution, exhibits active screw-like movements as it rotates along its long axis; from time to time it becomes more or less bow- shaped and then straightens out, the while moving about from point to point in the field of the miscroscope. It is not very strongly refractile, and can only be examined properly with the aid of special central illumination and in the presence of minute particles, by the movements of which the organism is more readily traced.

In order to obtain this organism for demonstration it is a good plan to wash the primary or secondary syphilitic sore thoroughly with alcohol; some of the clear fluid is then collected on a cover- glass; or, perhaps better still, the lymphatic gland nearest to one of these sores may be punctured with a hypodermic needle, the fluid being driven out on to a slide on which some normal saline solution has been placed. When the organism has been examined alive the film may be carefully dried and then stained by Giemsa's

modification of the Romanowsky stain (see Plate I., fig. i). This stain, which may be obtained ready prepared from Grubler, of Leipzig, under the name of " Giemsa'sche Losung fiir die Roman- owsky Farbung," is made as follows: Azur Il.-eosin compound, 3 grms. and Azur II. 0-8 grm. are mixed and dried thoroughly in the desiccator over sulphuric acid ; this mixture is then very finely pulverized, passed through a fine-meshed silk sieve and dissolved at 6o° C. in Merck's glycerin, 250 grms., the mixture being well shaken; 250 grms. of methyl-alcohol (Kahlbaum I.), which has been previously heated to 60 C, is then added. The whole, after being well shaken, is allowed to stand for twenty-four hours and filtered. The solution, now ready for use, should be kept in a yellow glass bottle. To 1 c.c. of ammonia-free distilled water add I drop of this stain. Stain for from a quarter to three-quarters of an hour. Wash in running water, blot, dry, and mount in Canada balsam. Longer exposure to the action of a more dilute Giemsa fluid often gives excellent results.

The stained organisms may be seen as delicate, reddish, regular spirals with pointed extremities. They usually measure from 4 to 14ˆ in length, though they may reach 18 or 22/«; the breadth is about 0-25ˆ. In a section of the liver from a case of congenital syphilis an enormous number of these spirochaetes may be found.

Stain by Levaditi's method as follows: Fix fragments of tissue not more than 1 mm. thick in 10% formol solution for twenty- four hours. Rinse in distilled water and harden in 96% alcohol for twenty-four hours. Then wash in distilled water for some minutes, i.e. until the pieces fall to the bottom of the vessel, and transfer to a 1-5—3% solution of nitrate of silver (3% is prefer- able when the tissues have been obtained from the living patient). This impregnation should be carried on at a temperature of 38 C. for from three to five days, according to the nature of the tissue. " Reduce " the silver in the following solution: Pyrogallic acid, 2-4%, Formol, 5 c.c, Aq. dest., 100 c.c. Allow this solution to act on the tissues for from twenty-four to forty-eight hours at room temperature. Again wash in distilled water, dehydrate with alcohol, clear with xylol and cedar-oil, and embed in paraffin. The sections should not be more than 5m thick. In a section so stained the spirochaetes are seen as dark spirals standing out against a pale yellow background. On staining with a weak counterstain many of the spirals may be seen actually within the liver cells.

This organism may be found in the lung, spleen and other visceral organs, and even in the heart of a patient suffering from syphilis. It has also been found in syphilitic lesions produced experimentally in the higher apes, especially the chimpanzee. As a result of these observations it is now generally accepted as being the primary cause of syphilitic lesions in the human subject. It is certainly present in the lesions usuallv met with in cases of primary and secondary syphilis of the human subject, and by its action on the blood and tissues of the body produces an antigen, a specific (?) substance, the presence of which has been utilized by Wassermann in the diagnosis of syphilis. He uses the method of deviation of complement by the antigen substances contained in the syphilitic fluid blood or cerebro spinal fluid — by which the lytic action of a haemolysing fluid is prevented.

Kdla-dzar. — The non-malarial remittent fever, met with in China, known as dum-dum fever in India and as kala-azar in Assam, is associated with peculiar parasitic bodies described by Donovan and Leishman {Herpetomonas Donovani) (? Helcosoma tropicum, Wright). This fever is characterized by its great chronicity, associated with very profound, and ultimately fatal, bloodlessness, in which there is not only a fall in the number of red blood corpuscles, but a marked

diminution in the number of white blood corpuscles. Ulceration of the skin and mucous membrane, especially of the lower parts of the small intestine and of the first part of the colon is often present, this being accompanied by dropsy and by distinct enlargement of the liver and spleen. Leonard Rogers, who has given an excellent account of this condition, points out that there is a marked increase in the number of cells in the bone-marrow.

The Leishman-Donovan bodies have been found in large numbers, especially in the spleen (see Plate I., fig. 7); they may also be found in the ulcerating surfaces and wherever the cellular proliferation is marked. These organisms may be found in sections, or they may be demonstrated in film preparations made from the material scraped from the freshly-cut surface of the spleen.

The films are best stained by Leishman's method: Solution A. — Medicinal methylene-blue (Grubler), 1 part; distilled water, 100 parts; sodium carbonate, 1-5 parts. This mixture is heated to 65 C. tor twelve hours and then allowed to stand at room temperature for ten days. Solution B. — Eosin extra B.A. (Grubler), 1 part; distilled water, 1000 parts. Mix equal parts of solutions A and B in a large open vessel and allow to stand for from six to twelve hours, stirring fr:>m time to time with a glass rod. Filter, and wash

the precipitate which remains on the paper with a large volume of distilled water until the washings are colourless or only tinged a pale blue. Collect the insoluble residue, dry and pulverize.

Make a o- 15 % solution of the powder (which may also be obtained from Grubler & Co., Leipzig) in absolute methyl alcohol (Merck's " for analysis "), and transfer to a clean, dry, well stoppered bottle. Pour three or four drops of this stain on to the prepared film (blood, bone, marrow, &c.) and run from side to side. After about half a minute add six or eight drops of distilled water, and mix thoroughly by moving the slide or cover-glass. Allow the stain to act for five minutes longer or, if the film be thick, for ten. Wash with distilled water, leaving a drop or two on the glass for about a minute. Examine at once or after drying without heat and mounting in xylol balsam

These peculiar parasitic bodies appear as deeply stained points, rounded, oval or cockle-shaped, lying free or grouped in the large endothelial cells of the spleen. Examined under a magnifi- cation of 1000 diameters they are found to measure from 3-5 to 2'«s/*> or even less, in diameter. Their protoplasm is stained, somewhat unequally, light blue; and from this light blue back- ground two very

deeply stained violet corpuscles of unequal size stand out prominently; the smaller of these is more deeply stained than the larger, is thinner, somewhat more elongated or rod-shaped, and parallel or running at right angles to the large corpuscle or obliquely from it. The larger corpuscle is rounded or oval, conical, or sometimes almost dumb-bell shaped. These bodies may appear to touch one another, though usually they are disconnected. Most of these Donovan-Leishman bodies are embedded in the protoplasm of the large endothelial or mono- nuclear splenic cells, of similar cells in the bone marrow, or of certain lymphatic glands. They may also be seen lying in tMfe protoplasm of the endothelial cells lining the capillary vessels and lymphatics. They are considered by Leishman and Leonard Rogers to be organisms in an intermediate stage of development of either a Trypanosome or some form of Herpetomonas. Rogers, who succeeded in cultivating them outside the body, described changes which he considers are associated with this latter germ. Patton goes further than this, and states that the Leishmania donovani Lav. et Mesn. taken up by the bed bug closely resembles in its life cycle that of the Herpetomonas of the common house- fly. It is thought that the Leishman-Donovan bodies are the tissue parasite stage, and that the herpetomonas stage is probably to be sought for in the blood of the patient.

Tsetse-Fly Disease (Trypanosomiasis) .■ — The interesting observations carried out by Sir David Bruce have invested the tsetse- fly with an entirely new significance and importance. In 1895 Bruce first observed that in the tsetse disease— n'gana — there may be found a flagellated haematozoon closely resembling the Trypanosoma Evansii found in Surra. This, like the Surra organism, is very similar in appearance to, but considerably smaller than, the haematozoon often found in the blood of the healthy rat. It has, however, as a rule a single flagellum only. A small quantity of blood, taken from an affected buffalo, wilde- beest, koodoo, bushbuck or hyaena — in all of which animals it was found by Bruce — when inoculated into a horse, mule, donkey, cow, dog, cat, rabbit, guinea-pig, rat or mouse, produces a similar disease, the organisms being found sometimes in enormous numbers in the blood of the inoculated animal, especially in the dog and in the rat. He then found that the tsetse-fly can produce the disease in a healthy animal only when it has first charged itself with blood from a diseased animal, and he produced evidence that Glossina morsitans is not capable of producing the disease except by carrying the parasites from one animal to another in the blood that it takes through its proboscis into its stomach. The parasites taken in along with such blood may remain in the stomach and alive for a

period of 118 hours, but shortly after that the stomach is found to be empty, and the parasites contained in the excrement no longer retain their vitality. The mode of multiplication of these organisms has been studied by Rose-Bradford and Plimmer, who maintain that the multiplication takes place principally in the spleen and lymphatic glands. The tsetse-fly parasite, however, is still imperfectly understood, though much attention is now being paid to its life-history and development.

Sleeping Sickness (Trypanosomiasis). — To the group of diseases caused by Trypanosomes must now be added sleeping sickness. This disease is due to the presence and action in the human body of a form known as T. gambiense (Dutton).

In order to demonstrate the parasite in the blood of a case of sleeping sickness, where they are very scanty and difficult to find, the best method is repeated centrifugalization of the blood (Bruce), ioc.c. being treated at a time; then the sediment in a number of these tubes is collected and again centrifugalized. The living trypanosome may, as a rule, be distinguished in this final sediment, even under a low power of the microscope. The organism may be found in greater numbers in the cerebro-spinal fluid of a case in which the symptoms of sleeping sickness have been developed, though centrifugalization of from ic to 15 c.c. of the cerebro-spinal fluid for half an hour may be necessary before they can be demonstrated. Greig and Gray, at Mott's suggestion, were able to find the organism in the fluid removed by means of a hypodermic syringe from the swollen lymph glands that appear as one of the earliest signs of infection. Examined fresh and in its native fluid or in normal saline solution it is seen as an actively motile, highly refractile, somewhat spindle-shaped organism (see Plate I., fig. 9). The anterior end is prolonged into a pointed flagellum, the posterior end being slightly blunted or rounded. This organism darts about rapidly between the red blood corpuscles or other corpuscles or particles, and shows rapid undulations, the flagellum beating quickly and the body following the flagellum. In this body a couple of very bright points may be seen. On staining by Leishman's stain (see under Kdla-dzar) the general protoplasm of the body is stained blue and is somewhat granular. This trypanosome is from 15 to 25/i in length (without the flagellum, which is from 5 to 6/t) and from 1-5 to 2 -5/1* broad. In the centre of the spindle-shaped mass is a very distinct reddish purple oval corpuscle corresponding to the larger of the two

bright points seen in the unstained specimen; this, the nucleus or macronucleus, is slightly granular. Near the posterior or blunt end of the organism is a second, but much smaller, deeply stained reddish purple point, the second of the bright spots seen in the unstained specimen; this is known as the micro-nucleus or centrosome. Around the micro-nucleus is a kind of court or area of less deeply stained protoplasm, arising from or near which and running along the margin of the body is a narrow band with a very sharply defined wavy free margin. This thin band of protoplasm seems to be continuous with the large spindle-shaped body of the trypanosome, but at the free margin it takes on the red tint of the micro-nucleus instead of the blue tint of the protoplasm. The modulatory membrane, as this band is called, is narrowest at the posterior end, getting broader and broader until the micro-nucleus is reached, beyond which it tapers off irregularly until finally it merges in the flagellum. In sleeping sickness the presence of this organism is usually associated with distinct anaemia, the red cells being diminished in number and the haemoglobin in quantity. Along with this there is an increase in the number of mononuclear leucocytes. *

The trypanosome is carried to the human patient by the Glossina palpalis, in the proboscis of which the organ- isms may be seen for some short time after the insect has sucked blood from an infected patient. These trypano- somes have been found living and active in the stomach of this insect up to 118 hours, but after 140 hours no living parasites can be demonstrated. They undergo no metamor- phoses in this intermediate host and are simply discharged in the intestinal excreta. It may be readily understood that the trypanosome under these conditions soon loses its virulence, and an animal cannot be infected through the bite of the Glossina for more than 48 hours after the infected blood has been ingested by the fly. The organism may remain latent in the human body for a considerable period. It certainly sets up very tardily any changes by which its presence can be detected. The first symptoms of its presence and activity are enlargement of the lymphatic glands, especially those behind the neck, a condition often accompanied by irregular and intermittent fever.

After a time, in from three months to three years, according to Bruce, the organism gains access to the fluid in the cerebro- spinal canal. Accompanying this latter migration are languor, lassitude, a gradually increasing apathy, and finally profound somnolence.

The incubation period, or that between the time of infection and the appearance of the symptoms associated with trypano- somiasis may be

as short as four weeks, or it may extend over several years. The inhabitants of the island of Senegal who have lived in Casamance do not consider themselves safe from the disease until at least seven years after they have left an infected area. At first, amongst negroes, according to Dutton and Todd, there is no external clinical sign of disease except glandular enlargement; in mulattoes and whites an irregular and inter- mittent fever may be the chief sign of infection, ” the tempera- ture being raised for two to four days, then falling to normal or below normal for four or five days.” In other cases the fever is of the septic tyDe, the temperature being normal in the morning but rising in the evening to 101-3° or 102-2° F., rarely to 104° F., the curve differing from that characteristic of malaria in which the rise usually takes place in the morning. Moreover, in sleep- ing sickness there are no rigors before the rise of temperature and but slight sweating, such as there is usually occurring at the end of the rise. Here again we have a distinction between the malarial condition and that of sleeping sickness. The respiration and the pulse rate are increased both during the febrile and the non-febrile attacks; the respiration is from 29 to 30 a minute, and the pulse rises to 90, and even up to 140, a minute, according to the degree of cardiac excitability which appears to be constantly present. The localized swelling and redness are seen as puffiness of the face, oedema of the eyelids and ankles and feet, congested erythematous patches on the face, trunk or limbs. Anaemia, general weakness and wasting, at first very slightly marked, gradually become prominent features, and headache is often present. The enlargement of the spleen appears to go on con- currently with enlargement of the lymphatic glands. Manson points out that trypanosomiasis may terminate fatally without the appearance of any characteristic symptoms of sleeping sickness, but as a rule the ” sleeping ” or second stage supervenes. The temperature now becomes of the hectic type, rising to 102-2° F. in the evening and falling to 98-6° F. in the morning. Here again there are no rigors or sweating. During the last stages of the disease the rectal temperature may fall as low as 95° and for the last day or two to 92° F., the pulse and respiration falling with the temperature. The irritability of the heart is still marked. Headache in the supraorbital region, and pain in the back, and even in the feet, have been described. Activity and intelligence give place to laziness, apathy and dullness; the face loses its brightness, the eyelids approximate, and the muscles around the mouth and nose become flabby and flaccid, the patient becomes drowsy, and when questioned replies only after a marked interval. Fibrillary tremors of the tongue and shaking of the hands and arms, distinct even during rest, become increased when any voluntary movement is attempted. These tremors may extend to the lower limbs

and trunk. Epileptiform convulsions, general weakness and progressive emaciation come on, and shortly before death there is incontinence of urine and faeces. ” The intellec- tual faculties gradually become impaired, the patient has a certain amount of difficulty in understanding what is said to him, and becomes emotional, often crying for no reason whatever; delirium is usually absent, the drowsiness increases and the patient’s attitude becomes characteristic, the head falls forward on the chest and the eyelids are closed. At first the patient is easily aroused from this drowsy condition, but soon he reaches a stage in which he falls sound asleep almost in any attitude and under any conditions, especially after meals. These periods of sleep, which become gradually longer and more profound, lead eventually to a comatose condition from which the patient can be aroused only with the greatest difficulty. It is at this stage that the temperature becomes normal and death occurs.” Nabarro points out, however, that this condition of drowsiness and sleep, leading eventually to coma, is by no means invariably present.

In the early part of the sleeping-sickness stage patients often sleep more than usual, but later do not sleep excessively. They become lethargic and indifferent to their surroundings, however, and often lie with their eyes closed. When spoken to they hear and understand what is said to them and after a longer or shorter interval give a very brief reply.

The leucocytosis that occurs during the course of this form of trypanosomiasis is due, apparently, to secondary or terminal bacterial infections so frequently associated with the disease in its later stages. The first stage of the disease, that of fever, may last for several years; the second or nervous stage with tremors, &c, for from four to eight months. It is quite excep- tional for the disease to be prolonged for more than a year from the time that the nervous symptoms become manifest, though a European who contracted trypanosomiasis in Uganda, having delusions and becoming drowsy within the year, did not die of sleeping sickness until more than eighteen months from the onset of the nervous symptoms.

The Glossina palpalis is not found in swamps. It affects a belt of from ten to thirty yards broad along banks bounding water shaded by scrub and underwood. It may, however, follow or be carried by the animal or human subject it is attack- ing for a distance of, say, three hundred

yards, but unless carried it will not cross an artificial clearing of more than thirty yards made in the natural fly belt. The authorities in the plague- stricken areas recommend, therefore, the clearance of belts thirty yards in width along portions of the lake side, at fords and in such other places as are frequented by natives. No infected person should be allowed to enter a ” fly area,” so that they may not act as centres from which the flies, acting as carriers, may , convey infection. The provision of clothing for natives who are compelled to work in fly areas is an important precautionary measure.

There seems to be some doubt as to whether Trypanosoma gambiense of Dutton is the same organism and produces the same conditions as the Trypanosoma of Bruce and Nabarro from Uganda, but most observers seem to think that the two species are the same and yield the same results when inoculated into animals. It is supposed that this trypanosome may pass through certain stages of metamorphosis in the human or animal body, and different drugs have been recommended as trypanocides during these various stages, an arsenic preparation (atoxyl) first being given, and then, when the organisms have disappeared, injections of bichloride of mercury, this salt appearing to prevent the relapses which occur when atoxyl only is given over a prolonged period. Ehrlich, treating animals suffering from trypanosomiasis with parafuchsin, found that although the parasites disappeared from the blood they soon recurred. On the exhibition of another dose of para- fuchsin they again disappeared. This was repeated for a con- siderable number of times, but after a time the parafuchsin lost its effect, the trypanosome having acquired an immunity against this substance; they had in fact become ” fuchsin-fast.” Such fuchsin-fast organisms injected into animals still retain their im- munity against parafuchsin and may transmit it through more than ioo generations. Nevertheless, they cannot withstand the action of other trypanocidal drugs. The outcome of all this is that large doses of the trypanocidal drug should be given at once, and that the same drug should never be given over too long a period, a fresh drug often being effective even when the first drug has lost action.

II. — To other Animal Parasites

Filariasis. — Since Bancroft and Manson first described Filaria nocturna and its relation to the common form of filariasis, the most important contribution to our knowledge has been made, at the suggestion of the younger Bancroft, by Dr G. C. Low, who has demonstrated that the embryos of the filaria may be found in the proboscis of the mosquito (Culex ciliaris), whence they probably find their way into the circulating blood of the human subject. It appears

that the filaria embryo after being taken, with the blood of the patient, into the stomach of the mosquito, loses its sheath; after which, leaving the stomach, it passes into the thoracic muscles of its intermediate host, and becomes more fully developed, increasing considerably in size and attaining a mouth, an alimentary canal, and the characteristic trilobed caudal appendage. It now leaves the thoracic muscles, and, passing towards the head, makes its way ” into the loose cellular tissue which abounds in the prothorax in the neighbourhood of

the salivary glands.” Most of them then ” pass along the neck, enter the lower part of the head,” whence they may pass into the proboscis. Although it has never been demonstrated that the filaria is directly inoculated into the human subject from the proboscis of the mosquito, it seems impossible to doubt that when the mosquito ” strikes,” the filaria makes its way into the circu- lation directly from the proboscis. It is important to note that the mosquito, when fed on banana pulp, does not eject the filaria from its proboscis. This, however, is not to be wondered at, as the filaria is apparently unable to live on the juices of the banana; moreover, the consistence of the banana is very different from that of the human skin. The importance of this obser- vation, as affording an additional reason for taking measures to get rid* of the mosquito in districts in which filariasis is rife, can scarcely be over-estimated.

C . — Infective Diseases in which an Organism has been found, but has not finally been connected with the Disease.

Hydrophobia is usually contracted by man through inoculation of an abraded surface with the saliva of an animal affected with rabies—through the bite of a dog, the animal in which the so-called rabies of the streets occurs. The puppy is specially dangerous, as, although it may be suffering from rabies when the saliva contains an extremely exalted virus, the animal may exhibit no signs of the disease almost up to the time of its death. The other animals that may be affected ” naturally ” are wolves, cats, foxes, horses, cows and deer; but all warm-blooded animals may be successfully inoculated with the disease. The principal changes met with are found in the nervous system, and include distension of the perivascular lymphatic sheaths, congestion and oedema of the brain and spinal cord and of the meninges. Haemorrhages occur into the cerebral ventricles of the brain, especially in the floor of the fourth, and on the surface and in the substance of the medulla oblongata, and the spinal cord.

In addition to these small haemorrhages, collections of leucocytes are

met with in hyperaemic areas in the medulla oblongata and pons, sometimes in the cortical cerebral tissue and in the spinal cord, in the perivascular lymphatics of the grey matter of the anterior horns and in the white matter of the postero-internal and postero-external columns. Here also the nerve cells are seen to be vacuolated, hyaline and granular, and often pigmented; thrombi may be present in some of the smaller vessels, and the collections of leucocytes may be so prominent, especially in the medulla, that they have been described as miliary abscesses. Haemorrhages are also common in the various mucous and serous membranes; hyaline changes in and around the walls of blood-vessels; proliferation of the endothe- lium; swelling and vacuolation of nerve cells; pericellular infiltration with leucocytes, and infiltration of the salivary glands with leucocytes (Coats). An increased number of leuco- cytes and microcytes in the blood has also been made out. The virus, whatever it may be, has a power of multiplying in the tissues, and of producing a toxic substance which, as in the case of tetanus toxin, appears to act specially on the central nervous system.

In recent years fresh interest has been aroused in the morbid histology of the brain and cord in hydrophobia by the appear ance of Negri's description of " bodies " which he claims are found in the central nervous system only in hydrophobia or rabies (see Plate I., fig. 3). These bodies, which are rounded, oval, triangular, or slightly spindle- or sausage-shaped, when specially stained consist of a red (acidophile) basis in which stand out small blue (basophile) granules, rods and circles, often situated within vacuoles. A small central point which is sur- rounded by no clear space is supposed to correspond to the nucleus of a protozoan. But this can be little more than a sug- gestion. The Negri bodies are certainly present in the central nervous system in cases of hydrophobia, and have not been found in similar positions in any other disease. They are present in large numbers, even at an early stage of the disease, although they are then so small that they may easily escape detection, so small indeed that they may pass through the pores of a Berkefeld

filter, the filtrate in such cases being capable of acting as a rabic virus. In the more chronic cases and in the later stages of the disease the Negri bodies may attain a considerable size and may be easily seen under the microscope. They are from o-sn to 20/4 in diameter — the longer the course of the disease the larger the bodies, these larger forms seldom if ever being met with in specially susceptible animals,

which soon succumb to the disease. The Negri bodies may be constricted in the middle, or; if some- what elongated, there may be two or three constrictions which give it the appearance of a string of sausages. They may be met with in almost all the nerve cells of the central nervous system in well-developed cases of hydrophobia, but they are most numer- ous and are found most readily in the cells of the cornu ammonis, and then in the Purkinje cells of the cerebellum.

Alth6ugh there are several methods of preparing these organisms for microscopical examination, the following is perhaps the simplest. A fragment of the grey substance, say from the cornu ammonis, is taken from a section made at right angles to the surface and placed on a slide about one inch from the end. A coverslip is now " pressed upon it until it is spread out in a moderately thin layer; then the coverslip is moved slowly and evenly over the slide," leaving the first three-quarters of an inch of the slide clear. In making the smear only slight pressure is used, the pressure beginning on the edge of the coverslip away from the end of the slide towards which the coverslip is travelling, thus driving more of the nerve tissues along the smear " and producing more well-spread nerve cells." The smears are then air-dried, placed in methyl-alcohol for one minute, and then in a freshly-prepared mixture of 10 c.c. of distilled water, three drops of a saturated alcoholic solution of rose anilin violet, and six drops of Loeffler's alkaline methylene blue, which is warmed until steam rises; the stain is then poured from the specimen, which after being rinsed in water is allowed to dry and is then mounted in Canada balsam.

The nature of the disease produced by the inoculation of saliva from a rabid animal appears to depend upon (1) the quantity of the rabic virus introduced; (2) the point of its introduction; (3) the activity of the virus. Thus by diluting the poison with distilled water or saline solution and injecting small quantities, the period of incubation may be prolonged. Slight wounds of the skin, of the limbs and of the back are followed by a long incubation period; but when the inoculation takes place in the tips of the fingers or in the skin of the face, where nerves are numerous, and especially where the wound is lacerated or deep, the incubation period is much shorter and the attack usually more severe. This, as in tetanus, is accounted for by the fact that the lymphatics of the nerves are much more directly con- tinuous with the central nervous system than are any other set. of lymphatics. The poison appears to act directly upon the cells of the central nervous system.

Arising out of recent researches on hydrophobia, two methods of treatment — one of which, at any rate, has been attended by

conspicuous success — have been put into practice. The first of these, Pasteur's, is based upon the fact that rabic virus may be intensified or attenuated at will. Pasteur found that although the virus taken from the cerebrospinal fluid of the dog always produces death in the same period when inoculated into the same animal, virus taken from other animals has not the same activity. If passed through a succession of monkeys it may become so attenuated that it is no longer lethal. If either the " monkey virus," which is not fatal to the rabbit, or the " dog virus," which kills in twelve to fourteen days, be passed through a series of rabbits, the virulence may be so exalted that it may kill in about six days: its activity cannot be increased beyond this point by any means at present at our disposal. This intensified virus was therefore named virus fixe by Pasteur, and it forms a standard from which to work. He found, too, that under certain conditions of temperature the virus may be readily attenuated, one hour at 50° or half an hour at 6o° C. completely destroying it. A s % solution of carbolic acid acting for half an hour, or a 1 per 1000 solution of bichloride of mercury or acetic acid or permanganate of potash, brings about the same result, as do also exposure to air and sunlight. The poison contained in the spinal cord of the rabbit exposed to dry air and net allowed to undergo putrefactive changes gradually loses its activity, and at the end of fourteen to fifteen days is incapable of setting up rabic symp-

toms. A series of cords from rabbits inoculated with the virus fixe are cut into short segments, which, held in series by the dura mater, are suspended in sterile glass flasks plugged with cotton- wool and containing a quantity of potassium hydrate — a powerful absorbent of water. At the end of twenty-four hours the activity of the virus is found to have fallen but slightly; at the end of forty-eight hours there is a still further falling off, until on the fourteenth or fifteenth day the virus is no longer lethal. With material so prepared Pasteur treated patients who had been bitten by mad dogs. On the first day of treatment small quantities of an emulsion of the cord exposed for thirteen or fourteen days in saline solution are injected subcutaneously, and the treatment is continued for from fifteen to twenty-one days, according to the severity of the bite, a stronger emulsion — i.e. an emulsion made of a cord that has been desiccated for a shorter period — being used for each succeeding injection, until at last the patient is injected with an emulsion which has been exposed to the air for only three days. In the human subject the period of incu- bation of the disease is comparatively prolonged, owing to the insusceptibility of the tissues to the action of this poison; there is therefore some chance of obtaining a complete protection or

acclimatization of the tissues before the incubation period is completed. The virus introduced at the bite has then no more chance of affecting the nerve centres than has the strong virus injected in the late stages of the protective inoculation: the nerve centres, having become gradually acclimatized to the poisons of the rabic virus, are able to carry on their proper functions in its presence, until in time, as in the case of microbial poisons, the virus is gradually neutralized and eliminated from the body. Various modifications and improvements of this method have from time to time been devised, but all are based on, and are merely extensions of, Pasteur's original work and method. As soon as it was found that antitoxins were formed in the tissues in the case of an attack of tetanus, attention was drawn to the necessity of determining whether something similar might not be done in the production of an antirabic serum for the treat- ment of rabies. Babes and Lepp, and then Tizzoni and his colleagues Schwarz and Centanni, starting from virus fixe, obtained a series of weaker inoculating materials by submitting it for different periods to the action of gastric juice. Beginning with a weak virus so prepared, and from time to time injecting successively stronger emulsions (seventeen injections in twenty days) into a sheep, they succeeded in obtaining a serum of such antirabic power that if injected in the proportion of 1 to 25,000 of body-weight, an animal is protected against a lethal dose of virus fixe. The activity of this serum is still further reinforced if a fresh series of injections is made at intervals varying from two to five months, according to the condition of the animal, each series occupying twelve days. This antirabic substance stored in the blood has not only the power of anticipating (neutralizing?) the action of the poison, but also of acting as a direct curative agent; as a prophylactic agent, readily kept in stock and easily and rapidly exhibited, it possesses very great advantages over the inoculation method. It must be borne in mind that the longer the period after the infection the greater must be the amount of serum used to obtain a successful result.

As regards the necessity for any treatment it may be pointed out that although the saliva of a rabid dog may be infective three days before the manifestation of any symptoms of the disease death takes place almost invariably within six days of the first symptom. If therefore the animal remains alive for ten days after the patient is bitten, there is no necessity for the antirabic treatment to be applied and the patient need fear no evil results from the bite.

There can be little doubt that hydrophobia is a specific disease due to a multiplication of some virus in the nervous system, in the elements of which it is ultimately fixed; that it passes from the wound to the

central nervous system by the lymphatics; and that, as in tetanus, the muscular spasms are the result of the action of some special poison on the central nervous system.

Scarlet Fever. — In scarlet fever recent observations have been comparatively few and unimportant. Craoke, and later Klein,

and others have, however, shown that in the glands and throats of scarlet fever patients a streptococcus, to which is assigned the chief aetiological role in connexion with this disease, is present. On the other hand, it is maintained by many observers that these streptococci are nothing more than the streptococci found in puerperal fever, erysipelas, and similar infective conditions, and certainly the organisms described closely resemble Streptococcus pyogenes. In 1904 Mallory described certain ” bodies ” which he considers may be associated with scarlet fever, and which were sufficiently distinctive to justify him in suggesting that he was dealing with the ” various stages in the developmental cycle of a protozoan.” These bodies, which were demonstrated in four cases of scarlet fever, ” occur in and between the epithelial cells of the epidermis and free in the superficial lymph vessels and spaces of the corium.” They are small, varying from the size of a blood platelet to that of a. red blood corpuscle, and ” stained delicately but sharply with methylene blue.” Well formed rosettes with numerous segments may be seen, forms which Mallory thinks may correspond to the phase of asexual development of the malarial parasite. He also describes ” coarsely reticulated forms which may represent stages in sporogony or be due to degeneration of the other forms.” He gives beautiful illustrations, both drawings and photographs, of these organisms, and without claiming that he has proved any aetiological relation between these bodies and scarlet fever, states that his personal opinion is that such relation exists.

D. — Infective Diseases not yet proved to be due to Micro-organisms.

Small-pox. — There have been few recent additions to our knowledge of the aetiology of small-pox, though Dr Monckton Copeman now holds that the small-pox organism, like that of vaccine, is probably a very minute bacillus, which, from its behaviour in the presence of glycerin, is possessed of the power of forming spores. If vaccine lymph, taken from the calf, be pro- tected from all extraneous sporebearing organisms and treated with 50 % solution of glycerin, it,

in time, becomes absolutely Sterile as regards ordinary non-sporebearing organisms. Even the staphylococci and streptococci, usually found in calf lymph, cannot withstand the prolonged action of this substance, but spore- bearing organisms still remain alive and active. Moreover, the lymph still retains its powerof producing vaccine vesicles,so that the vaccine organism, in its powers of resistance, resembles the spore- bearing, and not the non-sporebearing, organisms with which we are acquainted. This vaccine organism must be very minute; it is stated that it can be cultivated only on special media, though it multiplies freely in the superficial cutaneous tissues of the calf, the monkey and the human subject. Perhaps the most im- portant outcome of Dr Monckton Copeman's work on this subject is that he has obtained a vaccine lymph from which are elimi- nated all streptococci and staphylococci, and, if the lymph be taken with reasonable care, any other organisms which could possibly give rise to untoward results.

Typhus Fever. — Although it is fully recognized that typhus must be one of the specific infective fevers brought about by the action of a special micro-organism, no definite information as to the bacterial aetiology of this condition has been obtained. It is always looked upon as a ” filth ” disease; and from the frequency of minute haemorrhages, and from the resemblance to the haemorrhagic septicaemias in other respects, it appears probable that the bacillus of typhus is the organism described by Mott in 1883 as an actively motile dumb-bell coccus, and ten years later by Dubieff and Bruhl as the Diplococcus typhosus exanthe- malicus; the polar staining and general resemblance to the diplococcus of fowl cholera, the plague bacillus, the diplococcus of ” Wildseuche,” certain forms of swine fever and hog cholera, and others of the haemorrhagic septicaemias, are sufficient to suggest the generic affinity of this organism to this septicaemic group. We have as yet, however (1910), no absolute proof of the aetio- logical relation of the bacillus to this disease.

Measles. — In measles, as in scarlet fever, micrococci have had ascribed to them the power of setting up the specific disease.

Canon and Pielicke have, however, described minute bacilli somewhat resembling those described as occurring in vaccine lymph. These are found in the blood in the early stages of the disease, and also in the profuse catarrhal secretions $0 character- istic of this condition. There are no records of the successful inoculation of this minute bacillus, and until such evidence is forthcoming this organism must be looked upon as being an accessory, possibly, but not the prime cause, of measles.

Mumps. — It is generally accepted that mumps is probably caused by a specific micro-organism, the infective material making its way in the first instance through the ducts to the parotid and other salivary glands. It appears to bring about a peculiar oedematous inflammation of the interstitial tissue of the glands, but slight parenchymatous changes may also be observed. The virus is present in the tissues for some days before there is any manifestation of parotid swelling, but during this period it is extremely active, and the disease may be readily transmitted from patient to patient. The infectivity continues for some time, probably for nearly a week after naked-eye manifestations of the diseased condition have disappeared.

Whooping-Cough. — A diplococcus, a streptococcus, and various higher fungi have in turn been put down as the cause of this disease. It must, from its resemblance to the other specific infective fevers, be

considered as an infective disease of microbic origin, which goes through a regular period of incubation and invasion, and in which true nervous lesions, especially of the pneumogastric and superior laryngeal nerves, are somewhat common.

Affanassieff, and later Koplick, have described a minute bacillus, with rounded ends and bi-polar staining, which occurs in the mucus discharged at the end of a paroxysm of whooping- cough. Koplick examined sixteen cases, and found this organism in thirteen of them. There can be little doubt that the infective material is contained in the expectoration. It may remain active for a considerable period, but is then usually attached to solid particles. It is not readily carried by the breath, and multiplies specially in the mucous membranes, setting up inflammation, probably through its toxic products, which appear to be absorbed, and, as in the case of the tetanus poison, to travel specially along the lymphatics of the local nerves. Affections of the lung — bronchitis and broncho-pneumonia — may be directly associated with the disease, but it is much more likely that these affections are the result of secondary infection of tissues already in a weakened condition.

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(G. S. W.)

PARASITISM, in biology, the condition of an organism which obtains its nourishment wholly or partially from the body of another living organism, and which usually brings about exten- sive modifications in both guest and host, a phenomenon widespread amongst animals and plants. The term has been appropriated by biologists as a metaphor from the Greek (see Parasite). The lives of organisms are so closely intermeshed that if dependence on other organisms for food be the criterion of parasitism it is doubtful if any escape the taint. Green plants, it is true, build up their food from the inorganic elements of the air and the soil, and are farthest removed, from the sus- picion of

dependence; but most, if not all, thrive only by the aid of living microbes either actually attached to their roots or swarming in the nutrient soil. Saprophytes, organisms that live on organic matter, are merely parasites of the dead, whilst all animals derive their nourishment from the bodies of plants, either directly or indirectly through one or more sets of other animals. It is plain, therefore, that if parasitism is to be em- ployed as a scientific term it must connote something more than mere dependence on another living organism for nutrition. The necessary additional conceptions are two: the bodies of

host and parasite must be in temporary or permanent physical contact other than the mere preying of the latter on the former; and the presence of the parasite must not be beneficial, and is usually detrimental to the host.

It is obvious that within the limits of the strictest definition of parasitism that will cover the facts many degrees occur. The terms symbiosis and commensalism have been applied to conditions really outside the definition of parasitism, but closely related and usually described in the same connexion. Both terms cover the physical consorting of organisms in such a fashion that mutual service is rendered.

The name symbiosis was invented by the botanist A. de Bary in 1879, and is applied to such an extraordinary community as the thallus of a lichen, which is composed of a fungus and an alga so intimately associated, physically and physiologically, that it was not until 1868 that the dual nature of the whole was discovered. The presence of chlorophyll, which had always been associated only with vegetable organisms, was detected by Max Schultze in 1851 in the animals Hydra and Vortex, and later on by Ray Lankester in Spongilla and by P. Geddes in some Turbellarian worms. On the theory that the chlorophyll occurs in independent vegetable cells embedded in the animal tissues, such cases form other instances of symbiosis, for the oxygen liberated by the green cells enables their animal hosts to live in fouler water, whilst the hosts provide shelter and possibly nitrogenous food to their guests.

The term commensalism was introduced in 1876 by P. J. Van Beneden to cover a large number of cases in which ” animals have established themselves on each other, and live together on a good understanding

and without injury." The most familiar instance is that of fishes of the genus Fierasfer which live in the digestive tube of sea-cucumbers (Holulhuria; see Echino- derma). A variety of commensalism was termed mutualism by Van Beneden and applied to cases where there appeared to be an exchange of benefits. A well-known instance of mutualism is the relation between sea-anemones and hermit crabs. The hermit crab occupies the discarded shell of a mollusc, and anemones such as Sagartia or Adamsia are attached to the out- side of the shell. The bright colours of the anemone advertise its distasteful capacity for stinging, and secure protection for the crab, whilst the anemone gains by vicarious locomotion and possibly has the benefit of floating fragments from the food of the crab.

It is plain that such terms as symbiosis, commensalism and mutualism cannot be sharply marked off from each other or from true parasitism, and must be taken as descriptive terms rather than as definite categories into which each particular association between organisms can be fitted.

R. Leuckart has made the most useful attempt to classify true parasites. Occasional, or temporary, parasites are to be distinguished from permanent, or stationary, parasites. The former seek their host chiefly to obtain food or shelter and are comparatively little modified by their habits when compared with their nearest unparasitic relatives. They may infest either animals or plants, and as they attack only the superficial surfaces of their hosts, or cavities easy of access from the exterior, they correspond closely with another useful term introduced by Leuckart. They are Epizoa or Ectoparasites, as distinguished from Entozoa or Endoparasites. They include such organisms as plant-lice, and caterpillars which feed on the green parts of plants, and animals such as the flea, the bed-bug and the leech, which usually abandon their hosts when they have obtained their object. Many ectoparasites, however, pass their whole lives attached to their hosts; lice, for instance, lay their eggs on the hairs or feathers or in rugosities of the skin of birds and mammals ; the development of the egg, the larval stages and the adult life are all parasitic. Permanent or stationary parasites are in the most cases endoparasitic, inhabiting the internal organs; bacteria, gregarines, nematodes and tapeworms are familiar instances. But here also there are no sharp lines of demarcation. Leuckart divided endoparasites according to the nature and duration of their strictly parasitic life: (i) Some have free-living

and self-supporting embryos that do not become sexually mature until they have reached their host; (2) others have embryos which are parasitic but migratory, moving either to another part of their host, to

another host, or to a free life before becoming mature; (3) others again are parasitic in every stage of their lives, remaining in the same host, and being without a migratory stage.

Origin of Parasitism. — Now that the theory of spontaneous generation has been disproved, the problem of parasitism is no more than detection of the various causes which may have led ‘organisms to change their environment. Every kind of parasite has relations more or less closely akin which have not acquired the parasitic habit, and every gradation exists between tem- porary and permanent parasites, between creatures that have been only slightly modified and those that have been profoundly modified in relation to this habit. There are many opportunities for an animal or plant in its adult or em- bryonic stage to be swallowed accidentally by an animal, or to gain entrance to the tissues of a plant, whilst in the case of ectoparasites there is no fundamental difference between an organism selecting a dead or a livirig environment for food or shelter. If the living environment in the latter case prove to have special advantages, or if the interior of the body first reached accidentally in the former case prove not too different from the normal environment and provide a better shelter, a more convenient temperature, or an easier food supply, the accident may pass into a habit. From the extent to which parasitism exists amongst animals and plants it is clear that it must have arisen independently in an enormous number of cases, and it may be supposed that there must be many cases in which it has been of recent occurrence; E. Metchnikoff, indeed, has suggested that amongst parasites we are to look for the latest products of evolution. In any case it is impossible to suppose that parasites form a natural group; no doubt in many cases the whole of a group, as for instance the group of tapeworms, is parasitic, but indications point clearly to the tapeworms having had free-living ancestors. Parasitism is in short a physiological habit, which theoretically may be assumed by any organism, and which actually has been assumed by members of nearly every living group.

List of Parasites A. — Animals.

Vertebrata. — These are rarely parasitic, and cases are unknown amongst mammals, birds, reptiles and amphibia. Amongst fish and cyclostomes, Myxine burrows into codfish, Remora attaches itself to the external surface of sharks; Rhodens amarus, the bitterling, a small, carp-like fresh-water fish, injects its eggs into the mantle-cavity of pond-mussels, where the fry develop, whilst the mollusc reciprocates by throwing off its embryos on the parent fish; Stegophilus insidiosus, a small colourless fish from Brazil and the Argentine, lives

parasitically in the gill-cavity of large cat-fishes and sucks the blood in the gills of a large Silurid ; Vandellia cirrhosa, the candiru of Brazil, a minute fish 60 mm. in length, enters and ascends the urethra of people bathing, being attracted by the urine; it cannot be withdrawn, owing to the erectile spines on its gill-covers. The natives in some parts of the Amazon protect themselves whilst in the water by wearing a sheath of minutely perforated coco-nut shell.

Moliusca. — Few if any are true parasites. The Gasteropods, Eulimae, Styliferae and Entoconchae lodge in Echinoderms, the latter at least being truly parasitic.

Protochorda and Hemichorda. — Most of these are sessile and may lodge on other animals, but are not parasitic.

Arachnida. — Mites and Ticks are Arachnids, the vast majority of which are parasitic, and species of which infest almost every vertebrate group, but there are some free-living forms. Pycno- gonids are parasitic in their youthful stages on Hydroids, whilst the Pentastomids have been so much modified by parasitism that they were long regarded as worms; they may occur in most vertebrates.

Crustacea. — These contain an immense number of forms in all stages of parasitism. Some Copepods are amongst the most de- generate parasites known, the so-called fish-lice being for the most part Copepods with piercing mouth-organs, elaborate clinging apparatus, and degenerate organs of locomotion. In Lernea, the female, after becoming attached to its host, undergoes a retro- gressive metamorphosis, losing almost completely the segmentation of the body and discarding the appendages and sense-organs, whilst the male, although not so degenerate in structure, is dwarfed in size and itself becomes a parasite of the female. The Cirripeds

are all sessile in the adult condition. The Lepadidae are the least modified and are rarely parasitic; the Balanidae are more modified and frequently become embedded in the skin of whales. The Abdominalia live as parasites buried in the shells of other Cirripeds and of molluscs. The Apoda live as parasites in the mantle of other Cirripeds, whilst the Rhizocephala live chiefly on the abdomen of Decapod Crustacea, sending burrowing root-like nutritive pro- cesses into their tissues.

Insecta. — A very large number of insects are temporary or permanent parasites of animals or plants, the adult stages being chiefly ectoparasitic, the larval stages endoparasitic. The Hemi- meridae, allies of the earwigs, are ectoparasites on rats. The Mallophaga or bird-lice are degenerate wingless insects spending their whole lives as ectoparasites on birds and mammals. The larvae of Hemerobiinae are parasitic on Aphides. The saw-flies are parasitic on plants. There are over 200,000 species known of the Hymenoptera parasitica or Terebrantia. The adults deposit their eggs in the eggs, caterpillars or adults of other insects, particularly Lepidoptera. The clothes-moth, for instance, is known to be subject to the attack of over sixty species of Hymenoptera. To such an extent has parasitism been developed in this group, that the para- sites themselves are attacked by other parasites, giving rise to the phenomena known as hyperparasitism. The gall-flies (see Galls) are included amongst the Terebrantia, but in their case the early stages are passed in vegetable galls more frequently than in the bodies of other insects. The ruby-flies {Hymenoptera Tubulifera), in the larval condition are parasitic on the larvae of wasps and bees. The Denudatae are bees that in the larval stage are parasitic on other bees, the larvae of the parasites being deposited in the food-cells prepared for their own larvae by other bees. Many of the fossorial Hymenoptera form no special nests for their young, but take advantage of the abodes and food-stores prepared by other insects. The very large number of Hymenopterous insects that collect living larvae to be shut up as provender for their developing young are in a sense parasitic. The complex relations of ants with other insects must be referred to in this connexion. The nests of many species are inhabited by foreign insects of various orders, such insects being termed myrmecophilous or ants'-nest insects. The relations between the ants and their guests are very complex, and the guests migrate with their hosts. Aphidae, Coccidae and other bugs that secrete sugary matter are cherished and tended by ants; so also the caterpillars of some Lycaenid butterflies are kept as a kind of domesticated animal for some useful purpose. There are also many Orthoptera, Hemiptera, and other insects, as well as some acarids and wood-lice found only in ants'-nests as cherished or tolerated guests. The relations between ants and plants is also interesting; the ants live as parasites on the plants or trees, but in return protect them from more harmful intruders. Such phenomena are on the border-line between sym- biosis and true parasitism. Although most beetles live on decaying animal or vegetable matter, a large number are parasitic in the adult or larval condition on animals or plants. The curious beetle known as Platypsyllus castoris is known only as an ectoparasite of the beaver, whilst the Leptinidae are parasites of several species of mammals. The minute beetles of the

families Mordellidae and Rhipiphoridae are endoparasites of wasps and cockroaches, whilst the larvae of many of the Cantharidae are parasites of locusts. The Strepsiptera are endoparasites of Hymenoptera and Hemiptera. The habits of the Diptera easily pass over into parasitism, and a very large number are temporary or permanent parasites in the adult or larval stages. Most of the larvae of the Cecidomyiidae live in plants and form galls or other deformities. The blood- sucking habits of mosquitoes and gnats and sand-flies have not led to any special development in the direction of parasitism. The larvae of Bombyliidae are endoparasites of the larvae of mason- bees, and some of the Cyrtidae similarly infest spiders, whilst the Tachinidae deposit their larvae in other living insects, cater- pillars being especially selected. The larvae of some of the Sarco- phagidae may be deposited in the nostrils of man and other animals, where they may cause death, whilst those of the South American genus Lucilia infest the nasal fossae and frontal sinuses of man, producing great suffering, and the larvae of the numerous kinds of bot-fly attack man and many animals. The very large group of Pupipara live by sucking the blood of mammals and birds, and many of them are reduced to wingless permanent parasites. The single member of the family Braulidae is a parasite of the bee. All the known fleas (Aphaniptera or Siphonaptera) are ectoparasites in the adult condition; the larval stages are usually to be found in organic refuse. The larvae of most Lepidoptera are temporary ectoparasites of plants, but a few attack other insects, such as coccids and aphids. All the Hemiptera (bugs) have sucking-mouth organs and the majority of them are temporary parasites of plants or other animals. Some, such as the bed-bug, have been so modified by parasitism as to be found -only in human dwellings, others, such as the aphids or plant-lice, are permanent parasites of plants, many of them producing galls. The coccids, or scale insects, have been still further modified as plant ectoparasites. The Pediculidae, or lice, are the most completely parasitic of insects, and are de- graded wingless insects found on almost any kind of bird or mammal,

but in most cases so highly modified as to be capable of existence only on the particular species with which they are associated.

Lower Invertebrates. — No true Chaetopods are parasitic, but a few are commensal. The leeches are probably Chaetopods modi- fied by parasitism; and Myzostomes are still more highly modified relatives of the group, very degenerate and parasitic on Crinoids. A few rotifers are ecto- and endo-parasites. No Brachiopods, Polyzoa or Echinoderms are true parasites. The flat-worms and round-worms contain the most characteristic endoparasites, and parasitism is so characteristic a

feature of most of the groups that it is discussed in the separate articles dealing with the various natural assemblages of such worms. All the Cestodes (see Tape- worm), most of the Trematodes (q.v.), and a few of the Planarians (q.v.) are parasites of animals. Most Nemertines are free-living, but Cephalothrix galatheae is endoparasitic in the ovaries of the Crustacean Galathea strigosa, whilst Eunemertes and Tetrastemma occur on Ascidians, and Malacobdella in lamel'ibranch Molluscs. The degraded Mesozoa (q.v.) are endoparasites of Planarians, Nemer- tines and Ophiurids. The Nematoda (q.v.) or typical round- worms, exhibit every degree from absolute free-life to absolute para- sitism in animals and plants. The Echiuroidea (q.v.) are mostly free-living, but the male of Bonellia lives as a very degenerate parasite in the uterus and pharynx of the female. Although Coelentera and Porifera are usually sessile, very few are true parasites; young stages of the Narcomedusae are parasitic in the mouth of adults of different species, whilst Mnestra parasites is a degenerate medusa living on the pelagic mollusc Phyllirhoe. The Protozoa, from their minute size and capacity to live in fluids, naturally include an enormous number of parasitic forms, the importance of which in producing disease in their hosts is so great that a very large special literature on parasitic protozoology is being formed (see Pathology). Of the Sarcodina (q.v.) many forms of Amoeba such as Amoeba coli are associated with dysentery and kindred diseases. A very large number of the Mastigophora (q.v.), including such forms as the trypanosome of sleeping-sickness, are parasitic; in fact, observation by adequate means of the juices of almost any animal reveals the occasional presence of some kind of mobile protozoon, provided with a whip-like process. The enormous group of Sporozoa (q.v.) are entirely parasitic, and have been found in every group of animals except the Protozoa and Coelentera. Infusoria (q.v.) contain a considerable number of parasitic forms, some endoparasitic; others like the Suctoria, ectoparasitic. ˆ

B.— Plants. Bacteria. — Every degree of adaptation to parasitism occurs amongst bacteria, a majority of which pass at least some stage of their lives in a parasitic condition.

Fungi. — As in the case of Bacteria, the absence of chlorophyll from the tissues of fungi makes it necessary that they should take up carbon compounds already assimilated by other organisms, and accordingly they are either saprophytes or parasites. The mycelium is, so to say, the parasitic organ of the fungus, ramifying in the tissues of the host. The plant may obtain access to its host by means of spores which enter usually by wounds in the case of animal and plant hosts, but occasionally by natural apertures such as the stomata of plants. The

fungi that develop in the organs of warm- blooded animals reach the blood-stream through wounds, and thence spread to the tissues where germination takes place. Many fungi, especially those that are epiphytic, reach the tissues of their host by germ-tubes which emerge from the spore and penetrate either by a natural or artificial aperture, whilst in other cases the germ-tubes or hyphae actually penetrate uninjured tissues or membranes.

The fungi parasitic on animals are in most cases little known, and additions to the list, of which the pathological rather than the botanical features have been worked out, are constantly being made. A number of species of Eurotium and Aspergillus, usually saprophytic, may migrate to the bodies of animals, spreading in the tissues and exciting a disease known as mycosis or aspergillosis. They were first discussed in the disease of the human ear known as otomycosis, but they occur also in lungs and air-passages of mammals and birds. Recent pathological investigations conducted at the Prosectorium of the Zoological Society of London, show that mycosis is extremely frequent and fatal in birds and reptiles, and rather less frequent in mammals. Almost any organ of the body is liable to attack. The Laboulbenieae are probably Ascomycetes restricted to parasitism on insects, chiefly beetles and flies, sometimes forming a thick fur on the bodies and spreading by spores. The Ento- mophthoreae, possibly Mucorini, are also restricted to insects, the fungus that kills the common house-fly being the most familiar example. Cordyceps militaris and Botrytis bassii are familiar examples of Ascomycete fungi that attack the caterpillars of insects, the latter producing the fatal disease ” muscardine ” of the silkworm. The group of Saprolegnieae usually vegetate as sapro- phytes but readily settle on aquatic animals such as goldfish, salmon, salamanders and frogs, with fatal results. It is not yet entirely certain if diseases of this kind, of which the salmon disease is the most notorious, are produced on healthy animals, by the

attacks of the fungi, or if some antecedent predisposing condition be necessary. There are a number of well-known fungi that pro- duce diseases of the skin in man and other vertebrates. Achorion Schoenleinii produces favus in man, rabbits, cats, fowls and other birds and .mammals. Trichophyton tonsurans (Malmsten), is the fungus of tinea or ringworm in man, oxen, horses, dogs and rabbits. Saccharomyces albicans (Reess), produces thrush of the mouth in young herbivora and birds. Actinomyces bovis (Harz) is associated

with swellings on the jaw-bone of cattle and kangaroos, but has been found in pigs and human beings.

The fungi parasitic on plants are much better known and are responsible for a large number of diseases. They display every gradation from occasional to complete parasitism. Amongst the Pyrenomycetes, the group Erysipheae contain a large number of common parasites ; the main body of the fungus is usually epiphytic as in various mildews (g.v.). Ergot (q.v.) is the most familiar example of the group. The Discomycetes are chiefly saprophytic, being common on dead fruits, roots and so forth, but many of them kill living plants: Exoascus on plums, peaches and cherries. Scle.rotinia is most common on dead juicy fruits, but will destroy turnips in store, and has been known to attack living Phaseolus and Petunia. The Hymenocyles are naturally saprophytes, but when they gain access through wounds are the most destructive parasites of living timber. The Ustilagineae are endoparasites in Phanerogams, and are especially notorious for their attacks on grain-crops and grasses. The species of Ustilego set up hypertrophy in the tissues of their hosts, and the enlarged spaces thus formed become filled with the spores of the parasite. The Uredineae are also endoparasites of the higher plants and produce the diseases known as rusts .which specially affect cultivated plants. The Peronosporeae are all parasites of plants and are the most destructive enemies of agriculture and horticulture. Phytophthora infestans (de Bary), the potato-disease fungus, is a typical example.

Algae. — The chlorophyll-containing green and yellow cells found in Hydroids and Planarians referred to in connexion with symbiosis and the small green algae that infest the hairs of sloths are on the border-line of parasitism. A species of Nostoc occurs in the intercellular spaces of other plants; Chlorochytrium is found in the tissues of Lemna, and Phyllosiphon arisari (Kiihn) infests the parenchyma of Arum arisarum.

The flowering plants have a considerable number of representa- tives which have become epiphytes and which exhibit various degrees of parasitic degeneration. The Monotropeae allied to the heaths, are degenerate, with no chlorophyll and with scale-like leaves but the evidence as to their parasitism is more than doubtful ; they are possibly only saprophytic. The allied Lennoaceae, a small group also devoid of chlorophyll and with scale-leaves, are true root-parasites. The genus Cuscuta of the Convolvulaceae consists of the true parasites known as dodders. They are destitute of chlorophyll and attach themselves to other plants by twining stems on which occur haustoria

that penetrate the tissues of the host and absorb nutritive material. Cuscuta europaea, the great dodder, is a parasite of nettles and hops; Cuscuta epilinum is the flax dodder; Cuscuta epithymum attacks a number of low-growing plants; and Cuscutum trifolii is very destructive to clover. Several genera of Scrophulariaceae are partially parasitic; they contain chlorophyll but have degenerate roots with haustoria. Euphrasia, the eye- bright, attacks the roots of grasses; Pedicularis, the lousewort, Rhinanthus, the rattle, Melampyrum, the cow-wheat and Bartsia are all partly parasitic on the roots of other plants. The Oroban- chaceae or broomworts, are all destitute of chlorophyll and have scale-leaves; they are parasitic on the roots of other plants, species attacking various Leguminosae, ivy, hemp and hazel. The Cytinaceae are true parasites devoid of chlorophyll and leaves, with deformed bodies and conspicuous flowers or inflorescences. Most of them are tropical, and the group is widely scattered throughout the world. The Santalales are all parasitic; some members like Thesium linophyllum (the bastard toad-flax), a root parasite, and Viscum album (the mistletoe), parasitic on branches, have chlorophyll, but rather degenerate leaves; others like the tropical Balanophora- ceae are devoid of chlorophyll and foliage leaves and have deformed bodies. Of the Lauraceae, a few genera such as Cassytha (the tropical " dodder-laurels,") are true parasites, without chlorophyll and with twining stems.

Effect oj Parasitism on Parasites. — The phenomena of parasi- tism occur so generally in the animal and vegetable kingdoms and are repeated in degrees so varying that no categorical statements can be laid down as to the effects produced on the organisms concerned. All living creatures have a certain degree of correspondence with the conditions of their environment, and parasitism is only a special case of such adaptation. The widest generalization that can be made regarding it is that parasitism tends towards a rigid adaptation to a relatively limited and stable environment, whilst free life tends towards a looser correspondence with a more varying environment. The summum bonum of a parasite is to reach and maintain existence

in the limited conditions afforded by its host; the goal of the free-living organism is a varying or experimental fitness for varying surrounding conditions. And, if the metaphor be continued, the danger of parasitism for the parasite, is that if it become too nicely adjusted to the special conditions of its host, and fail to attain these, it will inevitably perish. The degenera- tion of parasites is merely a more precise adaptation; in the favourable environment the degenerate, or specialized parasite is best equipped for successful existence, but the smallest change of environment is fatal. Such a generalization as has

been formulated covers nearly all the peculiarities of parasitism. Organs of prehension are notably developed; parasitic plants have twining stems, boring roots and special clinging organs; parasitic animals display hooks, suckers and boring apparatus. The normal organs of locomotion tend to disappear, whether these be wings or walking legs. Organs of sense, the chief purpose of which is to make animals react quickly to changes in the environment, become degenerate in proportion as the changes which the parasite may have to encounter are diminished. The changes correlated with nutrition equally conform with the generalization. The chlorophyll of the plant becomes unnecessary and tends to disappear; the stem has no longer to thrust a spreading crown of leaves into the tenuous air or groping rootlets into the soil, but absorbs already prepared nourishment from the tissues of its host through compact conduits. And so the parasitic higher plant tends to lose its division into stem and leaves and roots, and to acquire a compact and amorphous body. The animal has no longer to seek its food, and the lithe segmentation of a body adapted for locomotion becomes replaced by a squat or insinuating form. Jaws give place to sucking and piercing tubes, the alimentary canal becomes simplified, or may disappear altogether, the parasite living in the juices of its host, and absorbing them through the skin. So, also, parasites obtaining protection from the tissues of their host lose their intrinsic protective mechanisms.

The reproduction of parasites offers many peculiarities, all of which are readily correlated with our generalization. A creature rigidly adapted to a special environment fails if it does not reach that environment, and hence species most successful in reproduction are able to afford the largest number of misses to secure a few hits and so to maintain existence. High repro- ductive capacity is still more urgent when the parasites tend to bring to an end their own environment by killing their hosts. Reproduction in parasites, so far from being degenerate, displays an exuberance of activity, and an extraordinary efficiency. In parasitic flowering plants the flowers tend to be highly con- spicuous, the seeds to be numerous, and specially adapted to ready diffusion. Amongst the fungi, the reproductive processes are most prolific, spores are produced by myriads, and very many special adaptations exist for the protection of the latter during their transference from host to host. It is notorious that the spores of bacteria and the higher fungi resist changes of tempera- ture, desiccation, and the action of physical and chemical agents, to an astonishing extent. Vegetative reproduction is extremely active under favourable conditions, and resting reproductive bodies of varying morphological character are produced in great abundance. Amongst

fungi, a phenomenon known as heteroecism is developed as a special adaptation to parasitic conditions, and recalls the similar adaptations in many animal parasites. At one stage of its existence, the fungus is adapted to one host, at another stage to another host. Puccinia graminis, the fungoid rust affecting many grasses, is a typical instance. It inhabits wheat, rye and other grasses, developing a mycelium in the tissues of young plants. During the summer, the myce- lium gives, rise to large numbers of simple processes which break through the tissues of the host and bud off orange-coloured uredogonidia. These small bodies are scattered by the wind, and reach other plants on which- they germinate, enter the new host through the stomata and give rise to new mycelia. Towards autumn, when the tissues of the host are becoming hard and dry, darker-coloured teleutogonidia are produced, and these remain quiescent during the winter. In spring they germinate, produce

small free-living mycelia on which in due course sporidia are formed. When these, scattered by the wind, fall on the leaf of the barberry-plant, they germinate, and entering the leaf- tissue of the new host by the stomata produce a mycelium bearing reproductive organs so different from those of the phase on the grass-plant, that it was described as a distinct fungus (Aecidium berberidis), before its relation with the rust of grasses was known. The spores of the Aecidium when they reach grasses give rise to the Puccinia stage again.

The reproductive processes of animal parasites are equally exuberant. In the first place, hermaphroditism is very common, and the animals in many cases are capable of self-fertilization. Parthenogenetic reproduction and various forms of vegetative budding are found in all stages of the life-history of animal parasites. The prolificness of many parasites is almost incredible. R. Leuckart pointed out that a human tapeworm has an average life of two years, and produces in that time about 1500 proglottides, each containing between fifty and sixty thousand eggs, so that the single tapeworm has over eighty million chances of successfully reproducing its kind. The devices for nourishing and protecting the eggs and embryos are numerous and elaborate, and many complex cases of larval migration ajid complicated cases of heteroecism occur. (See Trematode and Tapeworm.)

The physiological adaptations of parasites are notable, especially in cases where the hosts are warm-blooded. The parasites tend to become so specialized as to be peculiar to particular hosts; ectoparasites frequently differ from species to species of host, and the flea of one mammal, for instance, may rapidly die if it be transferred to another although similar host. The larval and adult stages of endoparasites become similarly specialized, and although there are many cases in which the parasites that excite a disease in one kind of animal are able to infect animals of different species, the general tendency is in the direction of absolute limitation of one parasite, and indeed one stage of one parasite to one kind of host. The series of events seems to be a gradual progression from temporary or occasional parasitism to obligatory parasitism and to a further restriction of the obligatory parasite to a particular kind of host.

Effect of Parasitism on Hosts. — The intensity of the effect of parasitism on the hosts of the parasites ranges from the slightest local injury to complete destruction. Most animals and plants harbour a number of parasites, and seem to be unaffected by them. On the other hand, as special knowledge increases, the range of the direct and indirect effect of parasites is seen to be greater. It is probable that in a majority of cases, the tissues of animals and plants resist the entrance of microbes unless there is some abrasion or wound. In the case of plants the actual local damage caused by animal or vegetable ectoparasites may be insignificant, but the wounds afford a ready entrance to the spores or hyphae of destructive endoparasites. So also in the case of animals, it is probable that few microbes can enter the skin or penetrate the walls of the alimentary canal if these be undamaged. But as knowledge advances the indirect effect of parasites is seen to be of more and more importance. Through the wounds caused by biting-insects the microbes of various skin diseases and inflammations may gain entrance subsequently, or the insects may themselves be the carriers of the dangerous endoparasites, as in the cases of mosquitoes and malaria, fleas and plague, tsetse flies and sleeping sickness. Similarly the wounds caused by small intestinal worms may be in themselves trifling, but afford a means of entrance to microbes. It has been shown, for instance, that there is an association between appendicitis and the presence of small nematodes. The latter wound the coecum and allow the microbes that set up the subsequent inflammation to reach their nidus. It has been suggested that the presence of similar wounding parasites precedes tubercular infection of the gut.

The parasites themselves may cause direct mechanical injury, and such injury is greatly aggravated where active re- production takes

place on or in the host, with larval migrations.

A tangled mass of Ascarid worms may occlude the gut; masses of eggs, larvae or adults may block bloodvessels or cause pressure on important nerves. The irritation caused by the movements or the secretions of the parasites may set up a reaction in the tissues of the host leading to abnormal growths (e.g. galls and pearls) or hypertrophies. Migrations of the parasites or larvae may cause serious or fatal damage. The abstraction of food- substances from the tissues of the host may be insignificant even if the parasites are numerous, but it is notable that in many cases the effect is not merely that of causing an extra drain on the food-supply of the host which might be met by increased appetite. The action is frequently selective; particular sub-‘ stances, such as glycogen, are absorbed in quantities, or particular organs are specially attacked, with a consequent overthrow of the metabolic balance. Serious anaemia out of all proportion to) the mass of parasites present is frequently produced, and the hosts become weak and fail to thrive. A. Giard has worked out the special case which he has designated as ” parasitic castration ” and shown to be frequent amongst animal hosts. Sometimes by direct attacks on the primary sexual organs, and sometimes by secondary disturbance of metabolism, the presence of the parasites retards or inhibits sexual maturity, with the result that the secondary sexual characters fail to appear. The most usual and serious effect on their hosts of parasites is, however, the result of toxins liberated by them. (See Parasitic Diseases.)

Finally, the attacks of parasites have led to the development by the hosts of a great series of protective mechanisms. Such adaptations range from the presence of thickened cuticles, and hairs or spines, the discharge of waxy, sticky or slimy secretions, to the most elaborate reactions of the tissues of the host to the toxins liberated by the parasites.

History and Literature of Parasitism. — The history and literature of parasitism are inextricably involved with the history and litera- ture of zoology, botany, medicine and pathology. Pliny recog- nized the mistletoe as a distinct parasitic plant and gave an account of its reproduction by seed. Until the 18th century little more was done. In 1755 Pfeiffer in his treatise on Fungus melitensis (in Linnaeus’s Amoenitat. acad. Dissert. LXV. vol. iv.) made a group of parasitic flowering plants, but included epiphytes like the ivy. In 1832 A. de Candolle (Physiol, vegetate, vol. iii.) attempted to divide and classify flowering parasites on morphological and physiological grounds, and since then, the study of parasitism has been a part of all botanical

treatises. With regard to Fungi, A. de Bary's treatise on the Comparative Morphology and Biology of the Fungi, Mycetozoa and Bacteria (Eng. ed., 1887) remains the standard work. There is in addition a large special literature on bacteriology. With regard to animal parasites, the first real steps in knowledge were the refutation of spontaneous generation (see Biogenesis). Linnaeus traced the descent of the liver fluke of sheep from a free-living stage, and although his particular observations were erroneous, they laid the foundation on which later observers worked, and pointed the way towards discovery of larval migrations and hete- roecism. O. Fr. Miiller in 1773, and L. H. Bojanus in the beginning of the 19th century reached more nearly to a correct interpretation. J. J. Steenstrup in his famous monograph of which an English edition was published by the Ray Society in 1845 (On the Alternation of Generations, or the Propagation and Development of Animals through Alternate Generations) interpreted many scattered observa- tions by a clear and coherent theory. Thereafter there was a steady and consistent progress, and the literature of animal parasites merges in that of general zoology. The two best-known names are those of T. S. Cobbold (Entozoa: an Introduction to the Study of Helminthology, 1869) and R. Leuckart (The Parasites of Man, Eng. trans., 1886), the former describing a very large number of types, and the latter adding enormously to scientific knowledge of the structure and life-history. Of more modern books, G. Fleming's Eng. ed. of L. G. Neumann's Parasites and Parasitic Diseases of the Domesticated Animals, and the Eng. ed. of Max Braun's Animal Parasites of Man (1906), are the most com- prehensive. (P. C. M.)

PARASNATH, a hill and place of Jain pilgrimage in British India, in Hazaribagh district, Bengal; 4480 ft. above the sea; 18 m. from Giridih station on the East Indian railway. It derives its name from the last of the twenty-four Jain saints, who is believed to have here attained nirvana or beatific annihilation. It is crowded with temples, some of recent date; and the scruples of the Jains have prevented it from being utilized as a sanatorium, for which purpose it is otherwise well adapted.

PARASOL (Fr., from Ital. parasole: parare, to shield, and sole, sun) , a sunshade, a light or small form of umbrella, covered with coloured silk or other material. In Japan and China gaily coloured parasols of paper stretched on bamboo frames are used by all classes. The parasol

of an elaborate and highly ornamented type has been the symbol of high honour and office in the East, being borne over rulers, princes and nobles. The negro chiefs of West Africa reserve to themselves the privilege of bearing parasols of considerable size and substantial construction, the size varying and denoting gradations in rank.

PARAVICINO Y ARTEAGA, HORTENSIO FELIX (1580- 1633), Spanish preacher and poet, was born at Madrid on the 1 2th of October 1580, was educated at the Jesuit college in Ocafia, and on the 18th of April 1600 joined the Trinitarian order. A sermon pronounced before Philip III. at Salamanca in 1605 brought Paravicino into notice; he rose to high posts in his order, was entrusted with important foreign missions, became royal preacher in 1616, and on the death of Philip III. in 1621 delivered a famous funeral oration which was the subject of acute controversy. He died at Madrid on the 12th of December 1633. His Oraciones evangelicas (1638-1641) show that he was not without a vein of genuine eloquence, but he often degenerates into vapid declamation, and indulges in far-fetched tropes and metaphors. His Obras pdsthumas, divinas y humanas (1641) include his devout and secular poems, as well as a play entitled Gridonia; his verse, like his prose, exaggerates the characteristic defects of Gongorism.

PARAY-LE-MONIAL, a town of east-central France in the department of Saone-et-Loire, 58 m. W.N.W. of Macon by the Paris-Lyon railway, on which it is a junction for Moulins, Lozanne, Clermont and Roanne. Pop. (1906), 3382. It lies on the slope of a hill on the right bank of the Bourbince and has a port on the Canal du Centre. The chief building in the town is the priory church of St Pierre. Erected in the 12th century in the Romanesque style of Burgundy, it closely resembles the abbey church of Cluny in the length of the transepts, the height of the vaulting and the general plan. The town is the centre of a district important for its horse-raising; bricks, tiles and mosaics are the chief manufactures of the town. In the 10th century a Benedictine priory was founded at Paray-le-Monial. In the 16th century the town was an industrial centre, but its prosperity was retarded by the wars of religion and still more by the revocation of the edict of Nantes. In 1685 the visions of Marguerite Marie Alacoque, a nun of the convent of the Visitation, who believed herself to possess the Sacred Heart of Jesus, attracted religious gatherings to the town, and yearly pilgrimages to Paray-le-Monial still take place.

PARCEL (Fr. parcelle, Ital. particella, Lat. particula, diminu- tive of pars, part), a small part or division of anything; particu- larly, in the law of real property and conveyancing, a portion of a manor or estate, and so the name of that portion of a legal document, such as a

conveyance or lease relating to lands, which contains a description of the estate dealt with. The word is also used of a package of goods contained in a wrapping or cover for transmission by carriage, &c, or by post; hence the Jerm ” parcel-post ” for the branch of the post-office service which deals with the transmission of such packages. ” Parcel ” was formerly used in an adverbial or quasi-adverbial sense, meaning ” partly,” ” to some extent,” thus ” parcel-Protestant,” ” parcel-lawyer,” &c. This use survives in ” parcel-gilt,” i.e. partly gilt, a term applied to articles made of silver with a gilt lining.

PARCHIM (Parchem), a town of Germany, in the grand duchy of Mecklenburg-Schwerin, on the Elde, which flows through it in two arms, 23 m. S.E. of Schwerin, on the railway from Ludwigslust to Neubrandenburg. Pop. (1905), 10,397. It was the birthplace of Moltke, to whom a monument was erected in 1876. It is an ancient place surrounded with walls, and contains a Gothic town hall and two interesting churches. Founded about 12 10, Parchim was during part of the 14th century the residence of one branch of the family of the dukes of Mecklenburg. It became a prosperous industrial town during

the 16th century, but this prosperity was destroyed by the Thirty Years’ War. A revival, however, set in during the 19th century.

See Hiibbe, 7,ur topographischen Entwichelung der Stadt Parchim (Parchim, 1899); and Weltzien, Zur Geschichte Parckims (Parchim, I903)-

PARCHMENT. Skins of certain animals, prepared after particular methods, have supplied writing material on which has been inscribed the literature of centuries. Such a durable substance, in most cases easily obtainable in fair abundance, would naturally suggest itself for the purpose, and we are therefore prepared for evidence of its use, and also for the survival of actual specimens, from very ancient times. The tradition of the employment of skins as writing material by the ancient Egyptians is to be traced back to the period of the Pharaohs of the I Vth Dynasty, and in the British Museum and elsewhere there exist skin-rolls which date back to some 1500 years B.C. But the country which not only manufactured but also exported in abundance the writing material made from the papyrus plant (see Papyrus) hardly needed to make use of any other material, and the instances of skin-rolls inscribed in Egypt must at all times have been rare. But in western Asia the practice of using skins as writing material, must have been widespread even at a very early period. The Jews made use of them for their sacred books, and it may be presumed for other literature also; and the old tradition has been main- tained by this

conservative race down to our own day, requiring the synagogue rolls to be inscribed on this time-honoured material. No doubt their neighbours the Phoenicians, so ready to adapt the customs of other nations to their own advantage, would also have followed the same practice. The Persians inscribed their annals on skins; and skins were employed by the Ionian Greeks, as proved by the words of Herodotus (v. 58). There is no evidence forthcoming that the same usage was followed by the western Greeks and by the Italic tribes; but it is difficult to suppose that at a remote period, before the importa- tion of papyrus, such an obviously convenient writing material as skin was not used among the early civilized races of Greece and Italy.

The method of preparation of skins for the service of literature in those distant ages is unknown to us; but it may be assumed that it was more or less imperfect, and that the material was rather of the character of tanned leather than of the thinner and better prepared substance which was to follow at a later time. The improvement of the manufacture to which we refer was to be of a nature so thorough as to endow the material with a new name destined to last down to the present day.

The new manufacture was traditionally attributed to Eumenes II. of Pergamum, 197-158 B.C. The common story, as told by Pliny on the authority of Varro, is that Eumenes, when seek- ing to enlarge the library of his capital, was opposed by the jealousy of the Ptolemies, who forbade the export of papyrus from Egypt, thus hoping to check the growth of the rival library; and that the Pergamene king was thus compelled to revert to the old custom of using skins as writing material. It is needless to regard this story as literally true, or as other than a popular explanation of a great development of the manufacture of skin material for books in the reign of Eumenes. In former times the prepared skins had been known by the natural titles Si$0e- pai, (ienfipavai, the Latin membranae, and these were at first also attached to the new manufacture; but the latter soon received a special name after the place of its origin, and became known as irepyaixrivri, charta pergamena, from which descends our English term parchment, through the French parchemin. The title of pergamena actually appears first in the edict De pretiis rerum of Diocletian (a.d. 301), and in a passage in one of St Jerome's Epistles.

The principal improvement in the new manufacture was the dressing of the skins in such a way as to render them capable of receiving writing on both sides, the older methods probably treating only one side for the purpose, a practice which was sufficient in times when the roll was the ordinary form of book

and when it was not customary to write on the back as well as on the face of the material. The invention of parchment with its two surfaces, recto and verso, equally available for the scribe, ensured the development of the codex. (See Manuscript.)

The animals whose skins were found appropriate for the manufacture of the new parchment were chiefly sheep, goats and calves. But in course of time there has arisen a distinction between the coarser and finer qualities of the material; and, while parchment made from ordinary skins of sheep and goats continued to bear the name, the finer kinds of manufacture produced from the more delicate skins of the calf or kid, or of still-born or newly-born, calves or lambs, came to be generally known as vellum (Fr. velin). The skin codices of the early and middle ages being for the most part composed of the finer kinds of material, it has become the custom to describe them as of vellum, although in some instances it would be more correct to call the material parchment.

The ordinary modern process of preparing the skins is by washing, liming, unhairing, scraping, washing a second time, stretching evenly on a frame, scraping a second time and paring down inequalities, dusting with sifted chalk and rubbing with pumice. Somewhat similar methods, no doubt varying in details, must have been employed from the first.

The comparatively large number of ancient and medieval MSS. that have survived enables us to gather some knowledge of the varieties of the material in different periods and in different countries. We know from references in Roman authors that parchment or vellum was entering into competition with papyrus as a writing material at least as early as the 2nd century of our era (see Manuscript), though at that time it was probably not so skilfully prepared as to be a dangerous rival. But the sur- viving examples of the 3rd and 4th centuries show that a rapid improvement must almost at once have been effected, for the vellum of that age is generally of a thin and delicate texture, firm and crisp, with a smooth and glossy surface. Here it should be noticed that there was always, and in some periods and in some countries more than in others, a difference in colour between the surface of the skin from which the hair had been removed and the inner surface next to the flesh of the animal, the latter being whiter than the other. This difference is gene- rally more noticeable in the older examples, those

of a later period having usually been treated more thoroughly with chalk and pumice. To obviate any unsightly contrast, it was customary, when making up the quires for a volume, to lay hair-side next to hair-side and flesh-side to flesh-side, so that, at whatever place the codex was opened, the tint of the open pages should be uniform.

As a rule, the vellum of early MSS., down to and including the 6th century, is of good quality and well prepared. After this, the demand increasing, a greater amount of inferior material came into the market. The manufacture necessarily varied in different countries. In Ireland and England the vellum of the early MSS. is usually of stouter quality than that of foreign examples. In Italy and Greece and in the European countries generally bordering on the Mediterranean, a highly polished surface came into favour in the middle ages, with the ill effect that the hardness of the material resisted absorption, and that there was always a tendency for ink and paint to flake off. On the other hand, in western Europe a soft pliant vellum was in vogue for the better classes of MSS. from the 12th century onwards. In the period of the Italian Renaissance a material of extreme whiteness and purity was affected.

Examples of uterine vellum, prepared from still-born or newly-born young, are met with in choice volumes. A remark- able instance of a codex composed of this delicate substance is the Additional MS. 23935, of the 13th and 14th centuries, in the British Museum, which is made up of as many as 579 leaves, without being a volume of abnormal bulk.

In conclusion, we must briefly notice the employment of vellum of a sumptuous character to add splendour to specially choice codices of the early middle ages. The art of dyeing the material with a rich purple colour was practised both in

Constantinople and in Rome; and, at least as far back as the 3rd century, MSS., generally of the Scriptures, were produced written in silver and gold on the precious stained vellum: a useless luxury, denounced by St Jerome in a well-known passage in his preface to the Book of Job. A certain number of early examples still survive, in a more or less perfect condition: such as the MS. of the Gospels in the Old Latin version at Verona, of the 4th or 5th century; the celebrated codex of Genesis in the Imperial Library at Vienna; the Rossano MS. and the Patmos MS. of the Gospels in Greek; the Gothic Gospels of Ulfilas at Upsala, and others, of the 6th century, besides a few somewhat later specimens. In the revival of learning under Charlemagne a further encouragement was given to the production of

such codices; but soon afterwards the art of purple-staining appears to have been lost or abandoned. A last trace of it is found in a few isolated instances of stained vellum leaves inserted for ornament in MSS. of the period of the Renaissance.

Authorities. — Particulars of the early manufacture and use of parchment and vellum are to be found in most of the handbooks on palaeography and book-development, such as W. Wattenbach, Das Schriftwesen im Mittelalter (3rd ed., 1896) ; G. Birt, Das antike Buchwesen (1882); Sir E. M. Thompson, Handbook of Greek and Latin Palaeography (3rd ed., 1906). See also La Lande. Art de faire le parchemin (1762) ; G. Peignot, Essai sur I'histoire du parchemin et du velin (1812) ; A. Watt, The Art of Leather Manufacture (1885).

(E. M. T.)

PARCLOSE (from the O. Fr. parclore, to close thoroughly; Lat. claudere), an architectural term for a screen or railing used to enclose a chantry, tomb, chapel, &c, in a church, and for the space thus enclosed.

PARDAILLAN, the name of an old French family of Armagnac, of which several members distinguished themselves in the service of the kings of France in the 16th and 17th centuries. Antoine Arnaud de Pardaillan, marechal de camp, served Henry IV. in Franche-Comt6, Picardy and Savoy, and was created marquis de Montespan in 1612 and marquis d'Aritin in 1615 under Louis XIII. His grandson Louis Henri, marquis de Montespan, was the husband of Mme de Montespan, the mistress of Louis XIV. Louis Antoine de Pardaillan de Gondrin (1665- 1736), legitimate son of the famous marquise, became lieutenant- general of the armies of the king in 1702, governor of the Orleanais, director-general of buildings in. 1708, lieutenant- general in Alsace, member of the council of regency, and minister of state. He was created due d'Antin in 1711. The last due d'Antin, Louis, died in 1757.

PARDESSUS, JEAN MARIE (1772-1853), French lawyer, was born at Blois on the nth of August 1772. He was educated by the Oratorians, and then studied law, at first under his father, a lawyer at the Presidial, who was a pupil of Robert J. Pothier. In 1796, after the Terror, he married, but his wife died at the end of three years. He was thus a widower at the age of twenty-seven, but refused to remarry and so give his children a step-mother. He wrote a Traite des servitudes (1806), which went through eight editions, then a Traite du contrat et des leilres de change (1809), which pointed him out as fitted for the

chair of commercial law recently formed at the faculty of law at Paris. The emperor, however, had insisted that the position should be open to competition. Pardessus entered (1810) and was successful ever two other candidates, Andr6 M. J. J. Dupin and Persil, who afterwards became brilliant lawyers. His lectures were published under the title Cours de droit commercial (4 vols., 1813-1817). In 1815 Pardessus was elected deputy for the department of Loir-et-Cher, and from 1820 to 1830 was constantly re-elected; then, however, he refused to take the oath of allegiance to Louis Philippe, and was deprived of his office. After the publication of the first volume of his Collection des lois maritimes anterieures au xviiii* sitcle (1828) he was elected a member of the Academie des Inscriptions et Belles Lettres. He continued his collection of maritime laws (4 vols., 1828-1845), and published Les Us et coutumes de la mer (2 vols., 1847). He also brought out two volumes of Merovingian diplomas (Diplomata, chartae, epistolae, leges, 1843-1849); vols, iv.-vi. of the Table chronologique des diplomes; and

vol. xxi. of Ordonnances des rois de France (1849), preceded by an Essai sur I'ancienne organisation judiciaire, which was reprinted in part in 1851. In 1843 Pardessus published a critical edition of the Loi salique, followed by 14 dissertations, which greatly advanced the knowledge of the subject. He died at Pimpeneau near Blois on the 27th of May 1853.

See notices in Journal general de I'inslruclion publique (July 27, 1853), in the Bibliothique de Vecole des chartes (3rd series, 1854, v. 453), and in the " Histoire de l'academie des inscriptions et belles lettres " (vol. xx. of the Memoires de l'academie, 1861).

PARDO BAZAN, EMILIA (1851-), Spanish author, was born at Corunna, Spain, on the 16th of September 1851. Married in her eighteenth year to Sr D. Jose Quiroga, a Galician country gentleman, she interested herself in politics, and is believed to have taken an active part in the subterranean campaign against Amadeo of Savoy and, later, against the republic. In 1876 she came into notice as the successful com- petitor for a literary prize offered by the municipality of Oviedo, the subject of her essay being the Benedictine monk, Benito Jer6nimo Feij6o. This was followed by a series of articles inserted in La Ciencia cristiana, a magazine of the purest orthodoxy, edited by Juan M. Orti y Lara. Her first novel, Pascual Ldpez (1879), is a simple

exercise in fantasy of no remarkable promise, though it contains good descriptive passages of the romantic type. It was followed by a more striking story, Un Viaje de novios (1881), in which a discreet attempt was made to introduce into Spain the methods of French realism. The book caused a sensation among the literary cliques, and this sensation was increased by the appearance of another naturalistic tale, La Tribuna (1885), wherein the influence of Zola is unmistakable. Meanwhile, the writer's reply to her critics was issued under the title of La Cuestidn palpitante (1883), a clever piece of rhetoric, but of no special value as regards criticism or dialectics. The naturalistic scenes of El Cisne de Vilamorta (1885) are more numerous, more pronounced, than in any of its predecessors, though the authoress shrinks from the logical application of her theories by supplying a romantic and inappropriate ending. Probably the best of Sra Pardo Bazan's work is embodied in Los Pazos de Ulloa (1886), the painfully exact history of a decadent aristocratic family, as notable .for its portraits of types like Nucha and Julian as for its creation of characters like those of the political bravos, Barbacana and Trampeta. Yet perhaps its most abiding merit lies in its pictures of country life, its poetic realiza- tion of Galician scenery set down in an elaborate, highly-coloured style, which, if not always academically correct, is invariably effective. A sequel, with the significant title of La Madre naluraleza (1887), marks a further advance in the path of naturalism, and henceforward Sra Pardo Bazan was uni- versally recognized as one of the chiefs of the new naturalistic movement in Spain. The title was confirmed by the publication of Insolacidn and Morrina, both issued in 1889. In this year her reputation as a novelist reached its highest point. Her later stories, La Cristiana (1890), Cuentos de amor (1894), Arco Iris (1895), Misterio (1903) and La Quimera (1905), though not wanting in charm, awakened less interest. In 1905 she published a play entitled Verdad, remarkable for its boldness rather than for its dramatic qualities. (J. F.-K.)

PARDOE, JULIA (1806—1862), English writer, was born at Beverley, Yorkshire, in 1806. When fourteen years old she published a volume of poems. In 1835 she went to Constanti- nople and her experiences there furnished her with material for vivid pictures of Eastern life in the City of the Sultan (1837), Romance of the Harem (1839) and Beauties of the Bosphorus (1839). Her other works, not always historically accurate, include Louis XIV. and the Court of France in the Seventeenth Century (1847); The Court and Reign of Francis /.(1849); The Life and Memoirs of Marie de Medici (1852); Episodes of French History during the Consulate and the First Empire (1859); and several sprightly and pleasant novels. In i860 she was granted a civil list

pension. She died on the 26th of November

1862.

PARDON (through the Fr. from Late Lat. perdonare, to remit a debt or other obligation on a penalty), the remission, by the power entrusted with the execution of the laws, of the penalty attached to a crime. The right of pardoning is coextensive with the right of punishing. In a perfect legal system, says Beccaria, pardons should be excluded, for the clemency of the prince seems a tacit disapprobation of the laws {Dei Delitti e delle pene, ch. xx.). 1 In practice the prerogative is extremely valuable, when used with discretion, as a means of adjusting the different degrees of moral guilt in crimes or of rectifying a miscarriage of justice. By the law of England pardon is the sole prerogative of the king, and it is declared by 27 Hen. VIII. c. 24 that no other person has power to pardon or remit any treasons or felonies whatsoever. This position follows logically from the theory of English law that all offences are breaches of the king's peace. Indictments still conclude with a statement that the offence was committed " against the peace of our lord king, his crown and dignity." The Crown by pardon only remits the penalty for an attack upon itself. The prerogative is in modern times exercised by delegation, the Crown acting upon the representation of the secretary of state for the home depart- ment in Great Britain, or of the lord lieutenant in Ireland. The prerogative of the Crown is subject to some restrictions : (1) The committing of a subject of the realm to a prison out of the realm is by the Habeas Corpus Act a praemunire, unpardonable even by the king (31 Car. II. c. 2, § 12). (2) The king cannot pardon an offence in a matter of private rather than of public wrong, so as to prejudice the person injured by the offence. Thus a common nuisance cannot be pardoned while it remains unredressed, or so as to prevent an abatement of it. A fine or penalty imposed for the offence may, however, be remitted. By an act of 1859 (22 Vict. c. 32) his majesty is enabled to remit wholly or in part any sum of money imposed upon conviction, and, if the offender has been imprisoned in default of payment, to extend to him the royal mercy. There are other statutes dealing with special offences, e.g. by the Remission of Penalties Act 1875 his majesty may remit any penalty imposed under 21 Geo. III. c. 49 (an act for preventing certain abuses and profanations on the Lord's Day called Sunday). (3) The king's pardon cannot be pleaded in bar of an impeachment. This principle, first asserted by a resolution of the House of Commons in the earl of Danby's case (May 5, 1679), forms one of the provisions of the Act of Settlement, 12 & 13 Will. III. c. 2. It is there enacted " that no pardon under the great seal of England shall be plead- able to an impeachment by the Commons in

parliament," § 3. This provision does not extend to abridging the prerogative after the impeachment has been heard and determined. Thus three of the rebel lords were pardoned after impeachment and attainder in 1715. (4) In the case of treason, murder or rape a pardon is ineffectual unless the offence be particularly specified therein (13 Rich. II. c. 1, § 2). Before the Bill of Rights, 1 Will. & M. c. 2, § 2, this statute seems to have been frequently evaded by a non obstante clause. But, since by the Bill of Rights no dispensation by non obstante is allowed, general words contrary to the statute of Richard II. would seem to be ineffectual.

Pardon may be actual or constructive. Actual pardon is by warrant under the great seal, or under the sign-manual counter- signed by a secretary of state (7 & 8 Geo. IV. c. 28, § 13). Con- structive pardon is obtained by endurance of the punishment. By 9 Geo. IV. c. 32, § 3, the endurance of a punishment on conviction of a felony not capital has the same effect as a pardon under the great seal. This principle is reaffirmed in the Larceny Act 1861, § 109, and in the Malicious Injuries to Property Act 1861, § 67. Further, pardon may be free or conditional. A conditional pardon most commonly occurs where an offender sentenced to death has his sentence commuted to penal servitude or any less punishment. The condition of his pardon is the endurance by him of the substituted punishment. The effect of pardon, whether actual or constructive, is to put the person pardoned in the position of an innocent man, so that he may have

1 See further, on the ethical aspect, Montesquieu, Esprit des lots, bk. vi. ch. 21 ; Bentham, Principles of Penal Law, bk. vi. ch. 4.

an action against any one thenceforth calling him traitor or felon. He cannot refuse to give evidence respecting the offence pardoned on the ground that his answer would tend to criminate him. A pardon may be pleaded on arraignment in bar of an indictment (though not of an impeachment), or after verdict in arrest of judgment. No doubt it would generally be advan- tageous to plead it as early as possible.

It is obvious that, though the Crown is invested with the right to pardon, this does not prevent pardon being granted by the higher authority of an act of parliament. Acts of indemnity have frequently been passed, the effect of which is the same as pardon or remission by the Crown. Examples of acts of indemnity are two private acts passed

in 1880 to relieve Lords Byron and Plunket from the disabilities and penalties to which they were liable for sitting and voting in the House of Peers without taking the oath.

Civil rights are not divested by pardon. The person injured may have a right of action against the offender in spite of the pardon of the latter, if the right of action has once vested, for the Crown cannot affect private rights. In Scotland this civil right is specially preserved by various statutes. Thus 1593, c. 174, provides that, if any respite or remission happen to be granted before the party grieved be first satisfied, the same is to be null and of none avail. The assythment, or indemnification due to the heirs of the person murdered from the murderer, is due if the murderer has received pardon, though not if he has suffered the penalty of the law. The pardon transmitted by the secretary of state is applied by the supreme court, who grant the necessary orders to the magistrates in whose custody the convict is.

In the United States the president is empowered to pardon offences against the United States, except in cases of impeach- ments (U. S. Constitution, art. ii. § 2). The power of pardon is also vested in the executive authority of the different states, with or without the concurrence of the legislative authority, although in some states there are boards of pardon of which the governor is a member ex officio. Thus by the New York Code of Criminal Procedure the governor of the state of New York has power to grant reprieves, commutations and pardons, except in the case of treason, where he can only suspend the execution of the sentence until the case can be reported to the legislature, with whom the power of pardon in this case rests. The usual form of pardon in the United States is by deed under seal of the executive.

PARDUBITZ (Czech, Pardubic), a town of Bohemia, Austria, 65 m. E. of Prague by rail. Pop. (1900), 17,029, mostly Czech. The most interesting buildings are the old fortified chateau of the 16th century, with its Gothic chapel restored in 1880; the church of St Bartholomew, dating in its present form from 1538; the new town hall (1894); the Grimes Tor, also built in 1538; and the handsome new synagogue. Pardubitz has a tolerably active trade in grain and timber, and the horse-fairs attract numerous customers.

PAB.fi, AMBBOISE (1510-1590), French surgeon, was born at Laval, in the province of Maine, and died at Paris in 1590. His professional career and services to his art are described in the article Surgery. A collection of his works was published at Paris in 1575 and they were afterwards frequently reprinted. Several editions have appeared in

German and Dutch, and among the English translations was that of Thomas Johnson

(1665). .

See J. F. Malgaigne, CEuvres completes (Paris, 1840); Le Paulmier, Ambroise Pari d'ap r es de noineaux documents decouverts aux archives nationales et de papier s de famille (Paris, 1885); Stephen Paget, Ambroise Pare and his Times (London, 1897).

PAREJA, JUAN DE (1606-1670), Spanish painter, was born a slave in the West Indies about 1606, and in early life passed into the service of Velazquez, who employed him in colour- grinding and other menial work of the studio. By day he closely watched his master's methods, and by night stealthily practised with his brushes until he had attained considerable manipulative skill. The story goes that, having succeeded in xx. 26

producing a picture satisfactory to himself, he contrived furtively to place it among those on which Velazquez had been working, immediately before an expected visit of King Philip IV. The per- formance was duly discovered and praised, and Pareja forthwith received his freedom, which, however, he continued to devote to his former employer's service. His extant works are not very numerous; the best known, the " Calling of St Matthew," now in the Prado, Madrid, has considerable merit as regards technique, but does not reveal much originality, insight or devotional feeling. He died in 1670.

PARENT, SIMON NAPOLEON (1855-), Canadian politi- cian, son of Simon Polycarpe Parent, merchant, was born in the village of Beauport, in the province of Quebec, on the 12th of September 1855. He was educated at Laval University, where he graduated in 1881. In the same year he was called to the bar of the province of Quebec. He married in 1877 Marie Louise Clara Gendron, of Beauport. In 1890 Parent was elected a member of the municipal council of Quebec, and served as mayor of the city from 1894 to 1906. From the year 1890 to 1905 he represented the county of Saint-Sauveur as a Liberal in the legislative assembly of his native province, and on the formation of the Marchand administration in 1897 he accepted the port- folio of minister of lands, forests and fisheries. After Marchand's death in September 1900 he was called by the lieutenant-governor to form a cabinet, and continued in office as prime minister until his retirement from public life in August 1905. Parent proved a capable administrator of provincial and municipal affairs. Under his administration the finances of the city of Quebec were improved, an

electric car service was provided, public parks were opened, a system of electric light was estab- lished and the streets were well paved. In 1905 he became chairman of the Transcontinental railway of Canada.

PABENTKESIS (from Gr. irapantdkvai., put in alongside), the grammatical term denoting the insertion (and so also the signs for such insertion) of a word, phrase or sentence between other words or in another sentence, without interfering with the construction, and serving a qualifying, explanatory or supple- mentary purpose. In writing or printing such parenthetical words or sentences are marked off by commas, dashes, or, more usually, by square or semi-circular brackets.

PARENZO, a seaport of Austria, in Istria, 95 m. S. by W. of Trieste by rail. Pop. (1900), 9962, mostly Italian. It is situated on the west coast of Istria, and is built on a peninsula nowhere more than 5 ft. above the sea-level; and from the fact that the pavements of the Roman period are 3 ft. below the present surface it is inferred that this part of the coast is slowly subsiding. Parenzo has considerable historic and architectural interest, and its well-preserved cathedral of St Maurus, erected probably between 535 and 543, is one of the most interesting buildings in the whole of Austria. The basilican type is very pure; there are three naves; the apse is hexagonal without and round within. The total length of the church proper is only 120 ft.; but in front of the west entrance is a square atrium with three arches on each side; to the west of the atrium is a now roofless baptistery, and to the west of that rises the campanile; so that the total length from campanile to apse is about 230 ft. Mosaics, now greatly spoiled, form the chief decoration of both outside and inside. The high altar is covered with a noble baldachin, dating from 1277. The basilica is one of those churches in which the priest when celebrating mass stands behind the altar with his face to the west. An older church is referred to in the inscrip- tion of Euphrasius in the mosaic of the apse of the cathedral, and remains of its mosaic pavement and of its apse have been found under the floor of the present church; it belongs perhaps to the 5th century A.D.; while at a still lower level another pavement, perhaps of the 4th century a.d., has been discovered, belonging to the first church, which lay to the north of the present. Several inscriptions mention the name of donors of parts of it. The mosaic pavement of the present church was almost entirely destroyed in 1880, when the floor-level was raised. Small portions of two temples and an inscribed stone are the only [remains of the ancient Roman rity that

readily catch the eye. Parenzo is the seat of the Provincial Diet of Istria, and is also an episcopal see.

Parenzo (Lat. Parentium) , conquered by the Romans in 1 78 B.C. , was made a colony probably by Augustus after the battle of Actium, for its title in inscriptions is Colonia Julia and not, as it has often been given, Colonia Ulpia. It grew to be a place of some note with about 6000 inhabitants within its walls and 10,000 in its suburbs. The bishopric, founded in 524, gradually acquired ecclesiastical authority over a large number of abbeys and other foundations in the surrounding country. The city, which had long been under the influence of Venice, formally recognized Venetian supremacy in 1267, and as a Venetian town it was in 1354 attacked and plundered by Paganino Doria of Genoa. The bishoprics of Pola and Parenzo were united in

1827.

See John Mason Neale, Notes on Dalmatia, Istria, &c. (London, 1861), with ground plan of cathedral; E. A. Freeman, Sketches from the Subject and Neighbour Lands of Venice (London, 1881); and Neumann, Der Dom von Parenzo (Vienna, 1902).

PARGA, a seaport of Albania, European Turkey, in the vilayet of Iannina, and on the Ionian Sea. Pop. (1905), about 5000, of whom the majority are Greeks. Parga has a rock-built citadel and a harbour formed by a mole which the Venetians constructed in 1572. It exports citrons, wool, oak, bark and skins. Originally occupying the site of the ancient Toryne (or Palaeo-Parga) , a short distance to the west, Parga was removed to its present position after the Turkish invasion in the 15th century. Under Venetian protection, freely accepted in 1401, the inhabitants maintained their municipal independence and commercial prosperity down to the destruction of the Venetian republic in 1797, though on two occasions, in 1500 and 1560, their city was burned by the Turks. The attempts of Ali Pasha of Iannina to make himself master of the place were thwarted partly by the presence of a French garrison in the citadel and partly by the heroic attitude of the Pargiotes them- selves, who were anxious to have their city incorporated with the Ionian Republic. To secure their purpose they in 1814 expelled the French garrison and accepted British protection; but the British Government in 1815 determined to go back to the convention of 1800 by which Parga was to be surrendered to Turkey, though nc mosque was to be built or Mussulman to settle within its

territory. Rather than subject themselves to the tyranny of Ali Pasha, the Pargiotes decided to forsake their country; and accordingly in 1819, having previously exhumed and burned the remains of their ancestors, they migrated to the Ionian Islands. The Turkish government was constrained to pay them £142,425 by way of compensation.

PARGETTING (from O. Fr. pargeter or parjeter; par, all over, &nd jeter, to throw, i.e. ” rough cast “; other derivations sugges- ted have been from Lat. spargere, to sprinkle, and from paries, a wall, the last due to writing the par jet in the form pariet), a term applied to the decoration in relief of the plastering between the studwork on the outside of half-timber houses, or sometimes covering the whole wall. The devices were stamped on the wet plaster. This seems generally to have been done by sticking a number of pins in a board in certain lines or curves, and then pressing on the wet plaster in various directions, so as to form geometrical figures. Sometimes these devices are in relief, and in the time of Elizabeth represent figures, birds, foliages, &c; fine examples are to be seen at Ipswich, Maidstone, Newark, &c. (See Plaster-work.) The term is also applied to the lining of the inside of smoke flues to form an even surface for the passage of the smoke.

PARIAH, a name long adopted in European usage for the ” outcastes ” of India. Strictly speaking the Paraiyans are the agricultural labourer caste of the Tamil country in Madras, and are by no means the lowest of the low. The majority are ploughmen, formerly adscripli glebae, but some of them are weavers, and no less than 350 subdivisions have been distin- guished. The name can be traced back to inscriptions of the nth century, and the ” Pariah poet,” Tiruvalluvar, author of the famous Tamil poem, the Kurral, probably lived at about that

time. The accepted derivation of the word is from the Tamil parai, the large drum of which the Paraiyans are the hereditary beaters at festivals, &c. In 1901 the total number of Paraiyans in all India was 21 millions, almost confined to the south of Madras, In the Telugu country their place is taken by the Malas, in the Kanarese country by the Holeyas and in the Deccan by the Mahars. Some of their privileges and duties seem to show that they represent the original owners of the land, subjected by a conquering race. The Pariahs supplied a notable proportion of Clive’s sepoys, and are still enlisted in the Madras sappers and miners. They have always acted as domestic servants to Europeans. That they are not deficient in intelli- gence is proved by the high position which some of them, when converted to Christianity, have occupied in the professions. In modern official usage the ”

outcastes ” generally are termed Panchamas in Madras, and special efforts are made for their education.

See Caldwell, Comparative Grammar of the Dravidian Languages (PP-54 0_ 554)i an d the Madras Census Reports for 1891 and 1901.

PARIAH DOG, a dog of a domesticated breed that has reverted, in a greater or less degree, to a half-wild condition. Troops of such dogs are found in the towns and villages of Eastern Europe, Asia and Africa; and they probably interbreed with wolves, jackals and wild dogs. The Indian breed is near akin to the Australian dingo.

PARIAN CHRONICLE (Chronicon or M armor Parium), a marble tablet found in the island of Paros in 1627, now among the Arundel Marbles at Oxford. It originally embraced an outline of Greek history from the reign cf Cecrops, legendary king of Athens, down to the archonship of Diognetus at Athens (264 B.C.). The Chronicle seems to have been set up by a private person, but, as the opening of the inscription has perished, we do not know the occasion or motives which prompted the step. The author of the Chronicle has given much attention to the festivals, and to poetry and music; thus he has recorded the dates of the establishment of festivals, of the introduction of various kinds of poetry, the births and deaths of the poets, and their victories in contests of poetical skill. On the other hand, important political and military events are often entirely omitted; thus the return of the Heraclidae, Lycurgus, the wars of Messene, Draco, Solon, Cleisthenes, Pericles, the Peloponnesian War and the Thirty Tyrants are not even mentioned. The years are reckoned backwards from the archonship of Diognetus, and the dates are further specified by the kings and archons of Athens. The reckoning by Olympiads is not employed. The Chronicle consists of 93 lines, written chiefly in the Attic dialect.

The Parian Chronicle (first published by Selden in 1628) is printed by A. Bockh in the Corpus inscriptionum graecarum, vol. ii., No. 2374, and by C. W. Miiller in the Fragmenta historicorum graecorum, vol. i. ; there are separate editions by J. Flach (1883) and F. Jacoby (1904). A New fragment was discovered in 1897, bringing the Chronicle down to the year 299 (ed. Crispi and Wilhelm in Mittheilungen des archaeologischen Inslituts, athenische Ablheihmg, vol. xxii., 1897). See also ” Notes on the Text of the Parian Marble ” and review of Jacoby ‘s edition by J. A. R. Munro in Classical Review (March and October 1901 and June 1905).

PARINI, GIUSEPPE (17 29-1 799), Italian poet, was born at Bosio in the Milanese, on the 22nd of May 1729. His parents, who possessed a

small farm on the shore of Lake Pusiano, sent him to Milan, where he studied under the Barnabites in the Academy Arcimboldi, maintaining himself latterly by copying manuscripts. In 1752 he published at Lugano, under the pseudonym of Ripano Eupilino, a small volume of sciolto verse which secured his election to the Accademia dei Trasformati at Milan and to that of the Arcadi at Rome. His poem, II Mattino, which was published in 1763, and which marked a distinct advance in Italian blank verse, consisted of ironical instructions to a young nobleman as to the best method of spending his mornings. It at once established Parini's popularity and influence, and two years later a continuation of the same theme was published under the title of II Mezfogiorno. The Austrian plenipotentiary, Count Firmian, interested himself in procuring the poet's advancement, appointing him- in the

first place, editor of the Milan Gazette, and in 1769, in despite of the Jesuits, to a specially created chair of belles lettres in the Palatine School. On the French occupation of Milan he was appointed magistrate by Napoleon and Saliceti, but almost immediately retired to resume his literary work and to complete // Vespro and La Nolle (published after his death), which with the two other poems already mentioned compose what is collec- tively entitled // Giorno. Among his other poems his rather artificial Odi, composed between 1757 and 1795, have appeared in various editions. He died on the 15th of August 1799.

His works, edited by Reina, were published in 6 vols. 8vo (Milan, 1801-1804) ; and an excellent critical edition by G. Mazzoni appeared at Florence in 1897.

PARIS (also called Alexandros), in Greek legend, the son of Priam, king of Troy and Hecuba. Before he was born his mother dreamed that she was delivered of a firebrand. The dream was interpreted that her child would ruin his country, and when Paris was born he was exposed on Mt Ida. His life was saved by the herdsmen, and he grew up among them, distinguished for beauty and strength, till he was recognized and received by his parents. He was said to have been called Alexandros from his bravery in defending the herds against raids. When the strife arose at the marriage of Peleus and Thetis between Hera, Athena and Aphrodite, each claiming the apple that should belong to the most beautiful, Paris was selected as the judge. The three rivals unveiled their divine charms before a mortal judge on

Mt Ida. Each tried to bribe the judge, Hera by promising power, Athena wisdom, Aphrodite the most beautiful woman in the world. Paris decided in favour of Aphrodite, and thus made Hera and Athena bitter enemies of his country (Homer, Iliad, xxiv. 25; Euripides, Troades, 925; Andromache, 284; Helena, 23). To gain the woman whom Aphrodite had promised, Paris set sail for Lacedaemon, deserting his old love Oenone, daughter of the river-god Cebren, who in vain warned him cf the consequences. He was hospitably received by Menelaus. whose kindness he repaid by persuading his wife Helen to flee with him to Troy {Iliad, vi. 290). The siege of Troy by the united Greeks followed. Paris proved a lazy and backward fighter, though not wanting in actual courage when he could be roused to exert himself. Before the capture of the city he was mortally wounded by Philoctetes with an arrow (Sophocles, Philoctetes, 1426). He then bethought him of the slighted nymph Oenone, who he knew could heal the wound. He was carried into her presence, but she refused to save him. Afterwards, when she found “he was dead, she committed suicide (Apollodorus iii. 12). The judgment of Paris became a favourite subject in Greek art. Paris is represented as a beautiful young man, beardless, wearing the pointed Phrygian cap, and often holding the apple in his hand.

PARIS, ALEXIS PAULIN (1800-1881), French savant, was born at Avenay (Marne) on the 25th of March 1800. He published in 1824 an Apologie pour I’ ecole romantique, and took an active part in Parisian journalism. His appointment, in 1828, to the department of manuscripts in the Bibliotheque royale left him leisure to pursue his studies in medieval French literature. Paulin Paris lived before minute methods of research had been generally applied to modern literature, and his chief merit is that by his numerous editions of early French poems he continued the work begun by Dominique Meon in arousing general interest in the then little-known epics of chivalry. Admitted to the Academie des Inscriptions et Belles Lettres in 1837, he was shortly afterwards appointed on the commission entrusted with the continuation of the Histoire litteraire de la France. In 1853 a chair of medieval literature was founded at the College de France, and Paulin Paris became the first occupant. He retired in 1872 with the title of honorary professor, and was promoted officer of the Legion of Honour in the next year. He died on the 13th of February 1881 in Paris.

His works include : Manuscrits franqais de la bibliotheque du roi (7 vols., 1836-1848); Li Romans di Garin le Loherain, precede d’un examen des romans carlovingiens (1883-1885); Li Romans de Berte iux grans pies (1832); Le Romancero franqais, histoire de quelques

anciens trouveres et choix de leurs chansons (1833); an edition of the Grandes chroniques de France (1836- 1840): La Chanson d'Antioche (1848); Les Aventures de maitre Renart et d'Ysengrin (1861) and Les Romans de la table ronde (1 868-1 877), both put into modern French.

His son Gaston Paris contributed a biographical notice to vol. xxix. of the Histoire litteraire.

PARIS, BRUNO PAULIN GASTON (1839-1903), French scholar, son of Paulin Paris, was born at Avenay (Marne) on the 9th of August 1839. In his childhood Gaston Paris learned to appreciate the Old French romances as poems and stories, and this early impulse to the study of Romance literature was placed on a solid basis by courses of study at Bonn (1856-1857) under Friedrich Diez, at Gottingen (1857-1858) and finally at the Ecole des Chartes (1858-1861). His first important work was an Etude sur le r&le de V accent latin dans la langue franqaise (1862). The subject was developed later in his Lettre d M. Leon Gaulier sur la versification latine rhythmique (1866). Gaston Paris maintained that French versification was a natural development of popular Latin methods which depended on accent rather than quantity, and were as widely different from classical rules as the Low Latin was from the classical idiom.' For his degree as doctor he presented a thesis on the Histoire poStique de Charlemagne (1865). He succeeded his father as professor of medieval French literature at the College de France in 1872; in 1876 he was admitted to the Academy of Inscriptions and in 1896 to the French Academy; and in 1895 he was appointed director of the College de France. Gaston Paris won a European reputation as a Romance scholar. He had learnt German methods of exact research, but besides being an accurate philologist he was a literary critic of great acumen and breadth of view, and brought a singularly clear mind to bear on his favourite study of medieval French literature. His Vie de Saint-Alexis (1872) broke new ground and provided a model for future editors of medieval texts. It included the original text and the variations of it dating from the 12th, 13th and 14th centuries. Gaston Paris contributed largely to the Histoire litteraire de la France, and with Paul Meyer published Romania, a journal devoted to the study of Romance literature. Among his other numerous works may be mentioned Les Plus anciens monuments de la langue franqaise (1875); a Manuel d'ancien Franqais (1888); an edition of the Mysferede la passion d'Arnoul Greban (1878), in collaboration with M. Gaston Raynaud; Deux redactions du roman des sept sages de Rome (1876); a translation of the Grammaire des langues rotnanes (187 4-1878) of Friedrich Diez, in collaboration with MM. Brachet and Morel- Fatio. Among his works cf a more popular nature are La Poesie du moyen age (1885 and 1895); Penseurs

et poetes (1897); Poemes et legendes du moyen age (1900); Franqois Villon (1901), an admirable monograph contributed to the ” Grands Ecrivains P’rancais ” series; Legendes du moyen Age (1903). His excellent summary of medieval French literature forms a volume of the Temple Primers. Gaston Paris endeared himself to a wide circle of scholars outside his own country by his unfailing urbanity and generosity. In France itself he trained at the Ecole des Chartes and the College de France a band of disciples who continued the traditions of exact research that he estab- lished. Among them were: Leopold Pannier; Marius Sepet, the author of Le Drame chritien au moyen age (1878) and of the Origin’es catholiques du theatre modeme (1901); Charles Joret; Alfred Morel-Fatio; Gaston Raynaud, who is responsible for various volumes of the excellent editions published by the Societe des anciens textes franqais; Arsene Darmesteter and others. Gaston Paris died in Paris on the 6th of March 1903.

See ” Hommage a Gaston Paris ” (1903), the opening lecture of his successor, Joseph Bedier, in the chair of medieval literature at the College de France; A. Thomas, Essais de philologie franqaise (1897); W. P. Ker, in the Fortnightly Review (J uly, ‘904); M. Croiset, Notice sur Gaston Paris (1904) ; J. Bedier et M. Roques, Bibliographie des ‘travaux de Gaston Paris (1904).

PARIS, FRANQOIS DE (1690-1727), French theologian, was born in Paris on the 3rd of June 1690. He zealously opposed the bull Unigenitus (1713), which condemned P. Quesnel’s

annotated translation of the Bible. He gave further support to the Jansenists, and when he died (May i, 1727) his grave in the cemetery of St Medard became a place of fanatical pilgrimage and wonder-working. The king ordered the churchyard to be closed in 1732, but earth which had been taken from the grave proved equally efficacious and helped to encourage the disorder which marked the close of the Jansenist struggle (see Jansenism). Lives by B. de la Bruyere and B. Doyen (1731). See also P. F. Matthieu, Histoire des miracles et des convulsionnaires de St Medard; M. Tollemache, French Jansenists (London, 1893).

PARIS, LOUIS PHILIPPE ALBERT D’ORLEANS, Comte de (1838-1894), son of the due d’Orleans, the eldest son of King Louis Philippe, was born on the 24th of August 1838. His mother was the princess Helen

of Mecklenburg-Schwerin, a Protestant. By the death of his father through a carriage accident in 1842, the count, who was then only four years of age, became heir-apparent to the French throne. On the deposition of Louis Philippe in 1848, the duchess of Orleans struggled to secure the succession to her son, and bore him through an excited populace to the chamber of deputies. The chamber itself was soon invaded, however, and the Republic proclaimed. The Orleanists were driven into exile, and the duchess proceeded with her two sons, the comte de Paris and the due de Chartres, first to Eisenach in Saxony, and then to Claremont in Surrey. After his mother's death in 1858 the count made a long foreign tour. In 1861 he and his brother accompanied their uncle, the prince de Joinville, to the United States. The brothers were attached to the staff of General McClellan, commanding the" Army of the Potomac." In April 1862 the count took part in the siege of Yorktown, and was present at the action of Williamsburg on the 5th of May. He was also with McClellan at the battle of Fair Oaks, and was personally engaged in the sanguinary battle at Gaines Mill on the 27th of June. When difficulties arose between France and the United States with regard to the affairs of Mexico, the Orleans princes withdrew from the American army and returned to Europe. During the winter of 1862-1863 the count took a special interest in the organization of the Lancashire Cotton Famine Fund, and contributed an article to the Revue des deux monies entitled " Christmas Week in Lancashire." On the 30th of May 1864 he married his cousin, the princess Marie Isabelle, daughter of the due de Montpensier; and his son and heir, the due d'Orleans, was born at York House, Twickenham, in 1869. The count was refused permission to serve in the Franco-Prussian War, but after the fall of Napoleon III. he returned to France. Abstaining from putting himself forward, he lived quietly on his estates, which had been restored to him by a vote of the Assembly. In August 1873 there was an important political conference at Frohsdorf, the result of which was that a fusion was effected, by which the comte de Paris agreed to waive his claims to the throne in favour of those of the comte de Chambord. By the death of the latter in 1883 the count became undisputed head of the house of Bourbon; but he did not show any disposition to push his claims. The popularity of the Orleans family, however, was shown on the occasion of the marriage of the comte de Paris's eldest daughter with the duke of Braganza, son of the king of Portugal, in May 1886. This so alarmed the French government that it led to a new law of expulsion, by which direct claimants to the French throne and their heirs were banished from France (June n, 1886). The comte de Paris again retired to England, taking up his abode at Sheen House, near Richmond Park. Here he devoted his leisure to his favourite studies. In

addition to his work Les Associations ouvrieres en Angleterre, which was published in 1869 and translated into English, the count edited the letters of his father, and published at intervals in eight volumes his Histoire de la guerre civile en AmSrique. In his later years the count seriously compromised the prospects of the Royalist party by the relations into which he entered with General Boulanger. He died on the 8th of September 1894.

PARIS, the capital of France and the department of Seine, situated on both banks of the Seine, 233 m. from its mouth and 285 m. S.S.E. of London by rail and steamer via Dover and

Calais, in 48 50′ 14″ N., 2 20′ 14″ E. (observatory). It occupies the centre of the so-called Paris basin, which is traversed by the Seine from south-east to north-west, open towards the west, and surrounded by a line of Jurassic heights. The granitic substratum is covered by Jurassic, Cretaceous and Tertiary formations; and at several points building materials — freestone, limestone or gypsum — have been laid bare by erosion. It is partly, indeed, to the existence of such quarries in its neighbour- hood, and to the vicinity of the grain-bearing regions of the Beauce and Brie that the city owes its development. Still more important is its position at the meeting-place of the great natural highways leading from the Mediterranean to the ocean by way of the Rhone valley and from Spain northwards over the lowlands of western France. The altitude of Paris varies between 80 ft. (at the Point du Jour, the exit of the Seine from the fortifications) and 420 ft. at the hill of Montmartre in the north of the city; the other chief eminence is the hill of Ste Genevieve, on the left bank. Since 1840 Paris has been com- pletely surrounded by a wall, which since i860 has served also as the limit for the collection of municipal customs dues (octroi). Proposals are constantly being brought forward to demolish this wall — which, with its talus, is encircled by a broad and deep ditch — either entirely or at least from the Point du Jour, where the Seine intersects the wall below the city, to Pantin, so as to extend the limits of the city as far as the Seine, which runs almost parallel with the wall for that distance. Within the wall the area of the city is 19,279 acres; the river runs through it from east to west in a broad curve for a distance of nearly 8 m. Climate. — Paris has a fairly uniform climate. The mean tempera- ture, calculated from observations extending over fifty years (1841- 1890), is 49°-8 F. The highest reading (observed in July 1874 and again in July l88l)isioi° F., the lowest (in December 1879) is —14°. The monthly means for the fifty years 1 841-1890 were: January 35°-9, February 38°-3, March 42 -3, April 49°-5, May 55°-6, June 6i°-7, July 64-6, August 63°-5, September 58°-2, October 49°-8, November 40-2, December 36°-6. The

Seine freezes when the tem- perature falls below 18 . It was frozen in nearly its whole extent from Bercy to Auteuil in the winters of 1819-1820, 1829-1830, 1879-1880 and 1890-1891. Rain falls, on an average, on about 200 days, the average quantity in a year being between 22 and 23 in. The rainfall from December to April inclusive is less than the average, while the rainfall from May to November exceeds the average for the whole year. The driest month is February, the rainiest June — the rainfall for these months being respectively 1-3 in. and 2-3 in. The prevailing winds are those from the south, south-west and west. The general character of the climate, somewhat continental in winter and oceanic in summer, has been more closely observed since the three observatories at different heights on t,he Eiffel Tower were added in 1889 to the old-established ones of the parks of St Maur and Mont- souris. 1 The observatory at the old church-tower St Jacques (16th century) in the centre of the city, and since 1896 a municipal estab- lishment, is of special interest on account of the study made there of the transparency and purity of the air. There are barely 100 days in the year when the air is very clear. Generally the city is covered by floating mists, possibly 1500 ft. in thickness. During the preva- lence of north-easterly winds the sky is most obscured, since on that side lies the greatest number of factories with, smoking chimneys.

Defences. — Paris, described in a recent German account as the greatest fortress in the world, possesses three perfectly distinct rings of defences. The two inner, the enceinte and the circle of detached forts around it, are of the bastioned type which French engineers of the Noizet school favoured; they were built in the time of Louis Philippe, and with very few additions sustained the siege of 1870-71. The outer works, of more modern type, forming an entrenched camp which in area is rivalled only by the Antwerp system of defences, were built after the Franco-German War.

The enceinte (” the fortifications ” of the guide-books) is of plain bastion trace, without ravelins but with a deep dry ditch (escarp, but not counterscarp revetted). It is nearly 22 m. in perimeter and has 93 bastions, 67 gates and 9 railway passages. The greater part of the enceinte has, however, been given up, and a larger one projected — as at Antwerp — ‘by connecting up the old detached forts.

1 The observatories of the Tour St Jacques and of Montsouris belong to the municipality of Paris; that of St Maur depends on the Central Bureau of Meteorology, a national institution.

These forts, which endured the siege in 1870-71, have a perimeter of about 34 m. Each is designed as a miniature fortress with ample casemates and high cavaliers, the tenailles and ravelins, however, being as a rule omitted. On the north side there are three forts (connected by a plain parapet) around St Denis, one of these being arranged to control an inundation. Next, to the right, or eastward, comes Fort Aubervillers, which commands the approaches north of the wood of Bondy. These four works lie in relatively low ground. The eastern works are situated on higher ground (300-350 ft.); they consist of four forts and various small redoubts, and command the approaches from the great wood of Bondy. In low ground again at the narrowest point of the great loop of the Marne (near St Maur- les-Fosses) there are two redoubts connected by a parapet, and between the Seine and the Marne, in advance of their confluence, Fort Charenton. On the south side of the city, hardly more than a mile from the enceinte, is a row of forts, Ivry, Bicfitre, Montrouge, Vanves and Issy, solidly constructed works in them- selves but, as was shown in 1870, nearly useless for the defences of the city against rifled guns, as (with the exception of BicStre) they are overlooked by the plateau of Chatillon. On the west side of Paris is the famous fortress of Mont Valerien, standing 536 ft. above the sea and about 450 above the river. This completes the catalogue of the inner fort-line. It is strengthened by two groups of works which were erected in ” provisional ” form during the siege, 1 and afterwards reconstructed as perma- nent forts — Hautes Bruyeres on the plateau of Villejuif, 1 m. south of Fort Bicetre, and the Chatillon fort and batteries which now prevent access to the celebrated plateau that overlooks Paris from a height of 600 ft., and of which the rear batteries sweep almost the whole of the ground between Bicetre and Mont Valerien.

The new works are 11 m. from the Louvre and 8 from the enceinte. They form a circle of 75 m. circumference, and an army which attempted to invest Paris to-day would have to be at least 300,000 strong, irrespective of all field and covering forces. The actual defence of the works, apart from troops temporarily collected in the fortified

area, would need some 170,000 men only.

The entrenched camp falls into three sections — the north, the east and the south-west. The forts (of the general 1874-1875 French type, see Fortification and Siegecraft) have from 24 to 60 heavy guns and 600 to 1200 men each, the redoubts, batteries and annexe-batteries generally 200 men and 6 guns. In the northern section a ridge crosses the northern extremities of the St Germain-Argenteuil loop of the Seine after the fashion of the armature of a horse-shoe magnet; on this ridge (about 560 ft.) is a group of works, named after the village of Cormeilles, commanding the lower Seine, the Argenteuil peninsula and the lower ground towards the Oise. At an average distance of 5 m. from St Denis lie the works of the Montlignon-Domont position (about 600-670 ft.), which sweep all ground to the north, cross their fire with the Cormeilles works, and deny the plateau of Montmorency-Mery-sur-Oise to an enemy. At ficouen, on an isolated hill, are a fort and a redoubt, and to the right near these Fort Stains and two batteries on the ceinture railway. The important eastern section consists of the Vaujours position, the salient of the whole fortress, which commands the countryside to the north as far as Dammartin and Claye, crosses its fire with Stains on the one hand and Villiers on the other, and itself lies on a steep hill at the outer edge of the forest of Bondy which allows free and concealed communication between the fort and the inner line of works. The Vaujours works are armoured. Three miles to the right of Vaujours is Fort Chelles, which bars the roads and railways of the Marne valley. On the other side of the Marne, on ground made historic by the events of 1870, are forts Villiers and Champigny, designed as a bridge- head to enable the defenders to assemble in front of the Marne. To the right of these is a fort near Boissy-St-Leger, and on the right of the whole section are the armoured works of the

1 The plateau of Mont Avron on the east side, which was provision-ally fortified in 1870, is not now defended.

Villeneuve-St-Georges position, which command the Seine and Yeres country as far as Brie and Corbeil. The left of the south- western section is formed by the powerful Fort Palaiseau and its annexe-batteries, which command the Yvette valley. Behind Fort Palaiseau, midway between it and Fort Chatillon, is the Verrieres group, overlooking the valley of the Bievre. To the right of Palaiseau on the high ground towards Versailles are other works, and around Versailles itself is a semi-circle of batteries right and left of the armoured Fort St Cyr. In various positions around Marly there are some seven or eight batteries. Topography. — The development of Paris can be traced out-

wards in approximately concentric rings from the Gallo-Roman town on the lie de la Cite to the fortifications which now form its boundary. A line of boulevards known as the Grands Boulevards, 2 coinciding in great part with ramparts of the 14th, 16th and 17th centuries, encloses most of old Paris, a portion of which extends southwards beyond the Boulevard St Germain. Outside the Grands Boulevards lie the faubourgs or old suburbs, round which runs another enceinte of boulevards — boulevards exterieurs — corresponding to ramparts of the 18th century. Beyond them other and more modern suburbs incorporated with the city after i860 stretch to the boulevards which line the present fortifications. On the north, east and south these are commercial or industrial in character, inhabited by the working classes and petite bourgeoisie, while here and there there are still areas devoted to market gardening; those on the west are resi- dential centres for the upper classes (Auteuil and Passy). Of the faubourgs of Paris those to the north and east are mainly commercial (Faubourgs St Denis, St Martin, Poissonniere) or in- dustrial (Faubourgs du Temple and St Antoine) in character, while to the west the Faubourg St Honore, the Champs Elysees and the Faubourg St Germain are occupied by the residences of the upper classes of the population. The chief resorts of business and pleasure are concentrated within the Grands Boulevards, and more especially on the north bank of the Seine. No uni- formity marks the street-plan of this or the other quarters of the city. One broad and almost straight thoroughfare bisects it under various names from Neuilly (W.N.W.) to Vincennes (E.S.E.). Within the limits of the Grands Boulevards it is known as the Rue de Rivoli (over 2 m. in length) and the Rue St Antoine and runs parallel with and close to the Seine from the Place de la Concorde to the Place de la Bastille. From the Eastern station to the observatory Paris is traversed N.N.E. and S.S.W. for 2J m. by another important thoroughfare — the Boulevard de Strasbourg continued as the Boulevard de Sebastopol, as the Boulevard du Palais on the lie de la Cit6. and on the south bank as the Boulevard St Michel. The line of the Grands Boulevards from the Madeleine to the Bastille, by way of the Place de l'Opera, the Porte St Denis and the Porte St Martin (two triumphal arches erected in the latter half of the 17th century in honour of Louis XIV.) and the Place de la Republique stretches for nearly 3 m. It contains most of the large cafes and several of the chief theatres, and though its gaiety and animation are concentrated at the western end — in the Boulevards des Italiens, des Capucines and de la Madeleine — it is as a whole one of the most celebrated avenues in the world. On the right side of the river may also be men- tioned the Rue Royale, from the Madeleine to the Place de la Concorde; the Malesherbes and Haussmann boulevards, the first stretching from the

Place Madeleine north-west to the fortifications, the second from the Grands Boulevards near the Place de l'Opera nearly to the Place de l'Etoile; the Avenue de l'Opera, which unites the Place du Palais Royal, approximately the central point of Paris, with the Place de l'Opera; the Rue de la Paix, connecting the Place Vend6me with the Place de l'Opera, and noted for its fashionable dress-making establishments, and the Rue Auber and Rue du Quatre Septembre, also terminating in the Place de l'Opera, in the vicinity of which are found some

2 The word boulevard means " bulwark " or fortification and thus has direct reference to the old ramparts. But since the middle of the 19th century the title has been applied to new thoroughfares not traced on the site of an old enceinte.

of the finest shops in Paris; the Rue St Honore running parallel with the Rue de Rivoli, from the Rue Royale to the Central Markets; the Rue de Lafayette, one of the longest streets of Paris, traversing the town from the Opera to the Bassin de la Villette; the Boulevard Magenta, from Montmartre to the Place de la Republique; and the Rue de Turbigo, from this place to the Halles Centrales. On the left side of the river the main thoroughfare is the Boulevard St Germain, beginning at the Pont Sully, skirting the Quartier Latin, the educational quarter on the north, and terminating at the Pont de la Concorde after traversing a quarter mainly devoted to ministries, embassies and other official buildings and to the residences of the noblesse.

Squares. — Some of the chief squares have already been mentioned. The finest is the Place de la Concorde, laid out under Louis XV. by J. A. Gabriel and noted as the scene of the execution of Louis XVI., Marie Antoinette and many other victims of the Revolution. The central decoration consists of an obelisk from the great temple at Luxor in Upper Egypt, presented to Louis Philippe in 1 83 1 by Mehemet Ali, and flanked by two monumental fountains. The forma- tion of the Place Vend6me was begun towards the end of the 17th century. In the middle there is a column surmounted by a statue of Napoleon I. and decorated with plates of bronze on which are depicted scenes from the campaign of 1805. The Place de l'Etoile is the centre of twelve avenues radiating from it in all directions. The chief of these is the fashionable Avenue des Champs Elysees which connects it with the Place de la Concorde ; while on the other side the Avenue de la Grande Armee leads to the fortifications, the two forming a section of the main artery of Paris; the well- wooded Avenue du Bois de Boulogne forms the threshold of the celebrated park of that name. In the centre of the Place, the Arc de Triomphe de l'Etoile, the largest triumphal arch in the world (162 ft. high by 147 ft. wide), commemorates the military triumphs of the Revolu- tionary and Napoleonic troops. The finest of the sculptures on its fagades is that representing the departure of the volunteers in 1792 by Francois Rude. The Place de la Republique, in which stands a huge statue of the Republic, did not receive its present form till 1879. The Place de la Bastille stands a little to the east of the site of the famous state prison. It contains the Colonne de Juillet erected in memory of those who fell in the revolution of July 1830. The Place du Carrousel, enclosed within the western wings of the Louvre and so named from a revel given there by Louis XIV., was enlarged about the middle of the 19th century. The triumphal arch on its west side commemorates the victories of 1805 and formed the main entrance to the Tuileries palace (see below). Facing the arch there is a stone pyramid forming the background to a statue of Gambetta. Other squares are the Place des Victoires, dating from 1685, with the equestrian statue of Louis XIV.; the Place des Vosges, formerly Place Royale, formed by Henry IV. on the site of the old Tournelles Palace and containing the equestrian statue of Louis XIII.; the Place de l'H6tel de Ville, once the Place de Greve and the scene of many state executions from the beginning of the 14th century till 1830; the Place du Chatelet, on the site of the prison of the Grand Chatelet, pulled down in 1802, with a fountain and a column com- memorative of victories of Napoleon, and the Place de la Nation decorated with a fountain and a bronze group representing the Triumph of the Republic, and with two columns of

1788 surmounted by statues of St Louis and Philip Augustus, corresponding at the east of the city to the Place de l'Etoile at the west.

South of the Seine are the Place St Michel, adorned with a monumental fountain, and one of the great centres of traffic in Paris; the Carrefour de l'Observatoire, with the monument to Francis Jarnier, the explorer, and the statue of General Ney standing on the spot where he was shot ; the Place du Pantheon ; the Place Denfert Rochereau, adorned with a colossal lion symbolizing the defence of Belfort in 1871; the Place St Sulpice, with a modern fountain embellished with the statues of the preachers Bossuet, Fenelon, Massillon and F16chier; the Place Vauban, behind the Invalides; and the Place du Palais Bourbon, in front of the Chamber of Depu- ties. On the lie de la Cite in front of the cathedral is the Place du Parvis-Notre-Dame, with the equestrian statue of Charlemagne.

Besides those already mentioned, Paris possesses other monumental fountains of artistic value. The Fontaine des Inno- cents in the Square des Innocents belonged to the church of that name demolished in 1786. It is a graceful work of the Renaissance designed by Pierre Lescot and retains sculptures by Jean Goujon. On its reconstruction on the present site other carvings were added by Augustin Paiou. A fountain of the first half of the 1 8th century in the Rue de Crenelle is remarkable for its rich decoration, while another in the Avenue de l'Observatoire is an elaborate modern work, the central group of which by J. B. Carpeaux represents the four quarters of the globe supporting the terrestrial sphere. The Fontaine de Medicis (17th century) in the Luxembourg garden is a work of Salomon Debrosse in the Doric style; the fountain in the Place Louvois (1844) representing the rivers of France is by Louis Visconti. In 1872 Sir Richard Wallace gave the municipality fifty drinking-fountains which are placed in different parts of the city.

The Seine. — The Seine flows for nearly 8 m. through Paris. As it enters and as it leaves the city it is crossed by a viaduct used by the circular railway and for ordinary traffic; that of Point du Jour has two storeys of arches. Three bridges— the Passerelle de l'Estacade, between the lie St Louis and the right bank, the Pont des Arts and the Passerelle Debilly (close to the Trocadero)— are for foot passengers only; all the others are for carriages as well. The most famous, and in its actual state the oldest, is the Pont Neuf, begun in 1578, the two portions of which rest on the extremity of the island called La Cite, the point at which the river is at its widest (863 ft.). On the embankment below the Pont Neuf stands the equestrian statue of Henry IV.

Between La Cite and the left bank the width of the lesser channel is reduced to 95 ft. The river has a width of 540 ft. as it enters Paris and of 446 ft. as it leaves it. After its entrance to the city it passes under the bridges of Tolbiac, Bercy and Austerlitz, that of Sully, those of Marie and Louis Philippe between the lie St Louis and the right bank; that of LaTournelle between the lie St Louis and the left bank; that of St Louis between the lie St Louis and La Cite. The Cite communicates with the right bank by the Pont d'Arcole, the Pont Notre-Dame, built on foundations of the 15th century, and the Pont au Change, owing its name to the shops of the money-changers and goldsmiths which bordered its medieval predecessor; with the left bank by that of the Archeveche, the so-called Pont au Double, the Petit Pont and the Pont St Michel, the original of which was built towards the end of the 14th century. Below the Pont Neuf come the Pont des Arts, Pont du Carrousel, Pont Royal (a fine stone structure leading to the Tuileries), and those of Solferino, La Concorde, Alexandre III. (the finest and most modern bridge in Paris, its foundation-stone having been laid by the czar Nicholas II. in 1896), Invalides, Alma, Iena (opposite the Champ de Mars), Passy, Grenelle and Mirabeau. The Seine has at times caused disastrous floods in the city, as in January 1910. (See Seine.)

The houses of Paris nowhere abut directly on the river banks, which in their whole extent from the bridge of Austerlitz to Passy are protected by broad embankments or " quais." At the foot of these lie several ports for the unloading and loading of goods, &c. — on the right side Bercy for wines, La Rapee for timber, Port Mazas, the Port de 1'Arsenal at the mouth of the St Martin canal, 1 the Port Henry IV., des Celestins, St Paul, des Ormes, de l'H6tel de Ville (the two ktter for fruit) and the Port St Nicolas (foreign vessels) ; on the left bank the Port de la Gare for petroleum, St Bernard for wines and the embarcation of sewage, and the ports of La Tournelle (old iron), Orsay (building material), the Invalides, Gros Caillou, the Cygnes, Grenelle and Javel (refuse). Besides the river ports, the port of Paris also includes the canals of St Martin and the portions of the canals of St Denis and the Ourcq within the walls. All three debouch in the busy and extensive basin of La Villette in the north-east of the city. The traffic of the port is chiefly in coal, building materials and stone, manure and fertilizers, agricultural produce and food-stuffs.

Promenades and Parks. — In the heart of Paris are situated the gardens of the Tuileries 2 (56 acres), designed by Andre Le Notre under Louis XIV. Though added to and altered after- wards they retain the main outlines of the original plan. They are laid out in parterres and bosquets, planted with chestnut trees, lindens and plane trees, and

adorned with playing foun- tains and basins, and numerous statues mostly antique in sub- ject. From the terrace along the river-side a fine view is to be had over the Seine to the park and palace of the Trocadero; and

1 This canal (3 m. long) leaving the Seine below Austerlitz bridge, passes by a tunnel under the Place de la Bastille and Boulevard Richard Lenoir, and rises by sluices to the La Villette basin, from which the St Denis canal (4 m. long) descends to the Seine at St Denis. In this way boats going up or down the river can avoid passing through Paris. The canal de l'Ourcq, which supplies the two canals mentioned, contributes to the water-supply of Paris as well as to its transport facilities.

2 These gardens are the property of the state, the other areas mentioned being the property of the town. ,

from the terraces along the Place de la Concorde the eye takes in the Place and the Avenue of the Champs Elysees. The gardens of the Luxembourg, 1 planned by S. Debrosse (17th century) and situated in front of the palace occupied by the senate, are about the same size as those of the Tuileries; with less regularity of form they present greater variety of appearance. In the line of the main entrance extends the beautiful Observatory Walk, terminating in the monumental fountain mentioned above. Besides these gardens laid out in the French taste, with straight walks and regular beds, there are several in what the French designate the English style. The finest and most extensive of these, the Buttes-Chaumont Gardens, in the north-east of the city, occupy 57 acres of very irregular ground, which up to 1866 was occupied by plaster-quarries, limekilns and brickworks. The " buttes " or knolls are now covered with turf, flowers and shrubbery. Advantage has been taken of the varying relief of the site to form a fine lake and a cascade with picturesque rocks. The Montsouris Park, in the south of the city, 38 acres in extent, also consists of broken ground; in the middle stands the meteorological observatory, built after the model of the Tunisian palace of Bardo, and it also contains a monument in memory of the Flatters expedition to the Sahara in 1881. The small Monceau Park, in the aristocratic quarter to the north of the Boulevard Haussmann, is a portion of the old park belonging to

King Louis Philippe, and contains monuments to Chopin, Gounod, Guy de Maupassant and others.

The Jardin des Plantes 1 (founded in the first half of the 17th century) , about 58 acres in extent, combines both styles. Its museum of natural history (1793), with its zoological gardens, its hothouses and greenhouses, its nursery and naturalization gardens, its museums of zoology, anatomy, anthropology, botany, mineralogy and geology, its laboratories, and its courses of lectures by the most distinguished professors in all branches of natural science, make it an institution of universally acknowledged eminence.

Other open spaces worthy of mention are the Champs Elysees (west of the Place de la Concorde), begun at the end of the 17th century but only established in their present form since 1858; the Trocadero Park, laid out for the exhibition of 1878, with its lakes, cascade and aquarium; the Champ, de Mars (laid out about 1770 as a manoeuvring ground for the Ecole Militaire), containing the Eiffel Tower (q.v.) ; the gardens of the Palais Royal, surrounded by galleries ; and the Ranelagh in Passy.

The Bois de Boulogne and Bois de Vincennes situated outside the fortifications are on a far larger scale than the parks within them. The Bois de Boulogne, commonly cajled the ” Bois,” is reached by the wide avenue of the Champs Elysees as far as the Arc de Triomphe and thence by the avenue of the Bois de Boulogne or that of the Grande Armee. The first of these, with its side walks for foot passengers and equestrians, grass-plots, flower-beds and elegant buildings, affords a wide prospect over the Bois and the hills of St Cloud and Mont Valenen. The Bois de Boulogne covers an area of 2100 acres, is occupied by turf, clumps of trees, sheets of water or running streams. Here are the two race-courses of Longchamp (flat races) and Auteuil (steeplechases), the park of the small chateau of Bagatelle, 1777, the grounds of the Polo Club and the Racing Club and the gardens of the Acclimatization Society, which, with their menageries, conservatories and aquarium, are largely visited by pleasure-seekers. Trees for the public parks and squares are grown in the municipal nurseries situated on the south border of the Bois. On the east it is adjoined by the Park of La Muette, with the old royal chateau. The Bois de Vincennes (see Vincennes) is 2300 acres in area and is similarly adorned with streams, lakes and cascades.

Churches. — The most important church in Paris is the cathedral of Notre-Dame, founded in 1163, completed about 1240. Measuring 130 yds. in length and 52 yds. in breadth, the church consists of a choir

and apse, a short transept, and a nave with double aisles which are continued round the choir and are flanked by square chapels added after the completion of the rest of the church. The central spire, 148 ft. in height, was erected in the course of a restoration carried out between 1846 and 1879 under the direction of Viollet le Due. Two massive square towers crown the principal facade. Its three doors are decorated with fine early Gothic carving and surmounted by a row of figures representing twenty-eight kings of Israel and Judah. Above the central door is a rose window, above which is a third storey consisting of a graceful gallery of pointed arches supported ‘These gardens are the property of the state, the other areas mentioned being the property of the town.

on slender columns. The transept has two facades, also richly decorated with chiselled work and containing rose windows. Of the elaborate decoration of the interior all that is medieval is a part of the screen of the choir (the first half of the 14th century), with sculptures representing scenes from the life of Christ, and the stained glass of the rose windows (13th century). The woodwork in the choir (early 18th century), and a marble group called the “Vow of Louis XIII.” (17th century) by Couston and Coysevox, are other noticeable works of art. The church possesses the Crown of Thorns and a fragment of the Cross, which attract numerous pilgrims.

Paris is poor in Romanesque architecture, which is represented chiefly in the nave and transept of St Germain-des-Pres, the choir of which is Gothic in tendency. The church, which once belonged to the celebrated abbey of St Germain founded in the 6th century, contains fine modern frescoes by Hippolyte Flandrin. The Transi- tion style is also exemplified in St Pierre-de-Montmartre (12th century). Besides the cathearal there are several churches of the Gothic period, the most important being St Julien-le-Pauvre, now serving as a Greek church, which is contemporary with Notre- Dame; St Germain-1 ‘Auxerrois (13th to 1 6th centuries), whose projecting porch is a graceful work of 1435; St Severin (mainly of the 13th and 16th centuries) ; St Gervais, largely in the Flamboyant Gothic style with an interesting facade by S. Debrosse in the classical manner; and St Merry (1520-1612), almost wholly Gothic in archi- tecture. St Gervais, St Merry and St Germain all contain valuable works of art, the stained glass of the two former being especially noteworthy.

St Etienne-du-Mont combines the Gothic and Renaissance styles in its nave and transept, while its choir is of Gothic, its facade of pure Renaissance architecture. In the interior, one of the most beautiful in the city, there is a fine rood-loft (1600-1609) by Pierre Biard and a

splendid collection of stained windows of the 16th and early 17th centuries; a chapel contains part of the sarcophagus of Ste Genevieve, which is the object of a pilgrimage. St Eustache (1532-c. 1650), though its construction displays many Gothic characteristics, belongs wholly, with the exception of a Classical facade of the 18th century, to the Renaissance period, being unique in this respect among the more important of French churches. The church contains the sarcophagus and statue (by A. Coysevox) of Colbert and the tombs of other eminent men.

Of churches in the Classical style the principal are St Sulpice (1655-1777), almost equalling Notre-Dame in dimensions and possessing a facade by J. N. Servandoni ranking among the finest of its period; St Roch (1653-1740), which contains numerous works of art of the 17th and 18th centuries; St Paul-St Louis (1627-1641); and the church (1645-1665) of the former nunnery of Val-de-Grace (now a military hospital and medical school), which has a dome built after the model of St Peter's at Rome. All these churches are in the old city.

Of the churches of the 19th century, the most remarkable is that of the Sacre Coeur, an important resort of pilgrims, begun in 1876 and overlooking Paris from the heights of Montmartre. The Sacre" Coeur is in the Romanesque style, but is surmounted by a Byzantine dome behind which rises a lofty belfry. The bell presented by the dioceses of Savoy and known as "la Savoyarde " weighs between 17 and 18 tons. Of the other modern churches the oldest is the Madeleine, built under Napoleon I. by Pierre Vignon on the founda- tions of a church of the 18th century and finished in 1842. It was intended by the emperor as a " temple of glory " and is built on the lines of a Roman temple with a fine colonnade surrounding it. The interior, consisting of a single nave bordered by chapels and roofed with cupolas, is decorated with sculptures and painting by eminent modern artists. Notre- Dame-de-Lorette (1823-1836) and St Vincent-de-Paul (1824-1844) are in the style of early Christian basilicas. Both contain good frescoes, the frieze of the nave in St Vincent-de-Paul being an elaborate work by Hippolyte Flandrin. Ste Clotilde, the most important representation of modern Gothic in Paris, dates from the middle of the century. St Augustin and La Trinite in the Renaissance style were both built between i860 and 1870. With the exception of Ste Clotilde in the St Germain quarter and the Madeleine, the modern churches above mentioned are all in the northern quarters of Paris.

Civil Buildings. — The most important of the civil buildings of Paris is the palace of the Louvre (Lupara), the south front of which extends along the Seine for about half a mile. It owes its origin to Philip

Augustus, who erected a huge keep defended by a rectangle of fortifications in what is now the south-west corner of the quadrangle, where its plan is traced on the pave- ment. The fortress was demolished by Francis I. and under that monarch and his successors Pierre Lescot built the portions of the wings to the south and west of the courtyard, which rank among the finest examples of Renaissance architecture. The rest

of the buildings surrounding the courtyard date from the reigns of Louis XIII. and XIV., the most noteworthy feature being the colonnade (1666-1670) of the east facade designed by Claude Perrault. The two wings projecting westwards from the corners of the quadrangle, each consisting of two parallel galleries with pavilions at intervals, were built under Napoleon III., with the exception of the Grande Galerie and at right angles to it the Pavilion Henry IV., containing the Apollo gallery, which were erected on the river front by Catherine de Medici and Henry IV. Of these two wings that on the north is occupied by the ministry of finance. The history of the palace of the Tuileries (so called in allusion to the tile kilns which occupied its site) is intimately connected with that of the Louvre, its origin being due to Catherine de Medici and Henry IV. The latter built the wing, rebuilt under Napoleon III., which united it with the Grande Galerie, the corresponding wing on the north side dating from various periods of the 19th century. The palace itself was burnt by the Communists in 1871, with the exception of the terminal pavilion on the south (Pavilion de Flore); only the northern terminal pavilion (Pavilion de Marsan, now occupied by the museum of decorative arts) was rebuilt.

Next in importance to the Louvre is the Palais de Justice (law courts); a huge assemblage of buildings covering the greater part of the lie de la Cite to the west of the Boulevard du Palais. During the Gallo-Roman period the site was occupied by a citadel which became the palace of the Merovingian kings and afterwards of the Capetian kings. In the I2th and 13th centuries it was altered and enlarged by the latter, and during part of that period was also occupied by the parlement of Paris, to which it was entirely made over under Charles V. In 1618, 1737 and 1776 the building was ravaged by fire, and in its present state is in great part the outcome of a systematic reconstruction begun in 1840. In the interior the only medieval remains are the Sainte-

Chapelle, the Conciergerie, an old prison where Marie Antoinette and other illustrious victims of the Revolution were confined, and some halls and kitchens of the 13th century. All these are on the ground floor, a portion of which is assigned to the police. The courts, which include the Cour de Cassation, the supreme tribunal in France, the Court of Appeal and the Court of First Instance, are on the first floor, the chief feature of which is the fine Salle des Pas Perdus, the successor of the Grand' Salle, a hall originally built by Philip the Fair and rebuilt after fires in 1618 and 1871. The Sainte-Chapelle, one of the most perfect specimens of Gothic art, was erected from 1245 to 1248 by St Louis as a shrine for the crown of thorns and other relics now at Notre-Dame, and was restored in the 19th century. It comprises a lower portion for the use of the servants and retainers and the upper portion or royal chapel, the latter richly decorated and lighted by lofty windows set close together and filled with beautiful stained glass. The Palais de Justice presents towards the west a Greek facade by J. L. Due (d. 1879), which is reckoned among the finest achievements of modern art. The facade towards the Seine embodies four towers which date in parts from the reconstruction under the Capetian dynasty. That at the east angle (the Tour de l'Horloge) contains a clock of 1370, said to be the oldest public clock in France. A handsome iron railing of 1787 separates the courtyard on the east side from the Boulevard du Palais.

About a quarter of a mile south of the Palais de Justice adjoining the Jardin de Cluny lies the H8tel de Cluny, acquired in 1833 by the antiquarian A. du Sommerard as a repository for his collections and now belonging to the state. It is a graceful and well-preserved building in late Gothic style distinguished for the beautiful carving of the doors, dormer windows and open-work parapet. The mansion, which contains a rich Gothic chapel, was erected at the end of the 15th century by Jacques d'Amboise, abbot of Cluny. It stands on the site of a Roman palace said to have been built by the emperor Constantius Chlorus (d. 306), and ruins of the baths are still to be seen adjoining it.

The other civil buildings of Paris are inferior in interest and attraction. The H6tel des Invalides on the left bank of the Seine opposite the Champs Elysees dates from the reign of Louis XIV.; by whom it was founded as a retreat for wounded and infirm soldiers, its inmates are few in number, and the building also serves as head- quarters of the military governor of Paris. A garden and a spacious esplanade stretching to the Quai d'Orsay precede the north facade; the entrance to this opens into the Cour d'Honneur, a courtyard enclosed by a moat above which is a battery of cannon used for salutes on important

occasions. On either side of the Cour d'Honneur lie the museums of military history and of artillery (weapons and armour). The parish church of St Louis, decorated with flags captured in the wars of the Second Empire, closes the south side of the Cour d'Honneur, while behind all rises a magnificent gilded dome sheltering another church, the Eglise royale, built by J. H. Mansart from 1693 to 1706. The central crypt of this church contains a fine sarcophagus of red porphyry in which lie

the remains of Napoleon I., brought from St Helena in 1840, while close by are the tombs of his friends Duroc and Bertrand.

The Pantheon, on the left bank near the Luxembourg garden, was built to the plans of J. G. Soufflot in the last half of the 1 8th century under the name of Ste Genevieve, whose previous sanctuary it replaced. In 1791 the Constituent Assembly decreed that it should be no longer a church but a sepulchre for great Frenchmen. Voltaire and Mirabeau were the first to be entombed in the Pantheon as it then came to be called. Reconsecrated and resecularized more than once during the 19th century, the building finally regained its present name in 1885, when Victor Hugo was buried there. The Pantheon is an imposing domed building in the form of a Greek cross. The tympanum above the portico by David d'Angers and, in the interior, paintings of the life of Ste Genevieve by Puvis de Chavannes are features of its artistic decoration.

Various public bodies occupy mansions and palaces built under the ancient regime. The Palais Royal, built by Richelieu about 1630 and afterwards inhabited by Anne of Austria, the regent Philip II. of Orleans and Philippe Egalite, is now occupied by the Council of State and the The&tre Francois. The Palace of the Luxembourg stands on the site of a mansion belonging to Duke Francis of Luxem- bourg, which was rebuilt by Marie de Medici, wife of Henry IV. The architect, Salomon Debrosse, was ordered to take the Pitti Palace at Florence as his model, but notwithstanding the general plan of the building is French. The south facade facing the Luxembourg garden was rebuilt in the original style under Louis Philippe. The residence of various royal personages during the 17th and 18th centuries, the Luxembourg became during the revolutionary period the palace of the Directory and later of the Consulate. In the 19th century it was occupied by the senate of Napoleon I., by the chamber of peers under Louis Philippe, by the senate under Napo- leon III., and since 1879 by the republican senate. The chamber of deputies meets in the Palais Bourbon, built in the 18th century for members of the Bourbon-Conde family. The facade, which faces the Pont de la Concorde, is in the style of an

ancient temple and dates from the early years of the 19th century, when the corps legislatif held their sittings in the building. The Palais de l'Elysee, the residence of the president of the republic, was built in 1718 for Louis d'Auvergne, count of Evreux, and was afterwards acquired by Madame de Pompadour; during the 19th century Napoleon I., Napoleon III., and other illustrious persons resided there. The building has been often altered and enlarged. The h6tel-de-ville (i 8 73 _l8 82), on the right bank of the Seine opposite the lie de la Cite, stands on the site of a town hall built from 1535 to 1628, much enlarged towards 1840, and destroyed by the Communists in 1 87 1. It is an isolated building in the French Renaissance style, the west facade with its statuary, pilasters, high-pitched roofs and dormer windows being specially elaborate. The interior has been decorated by many prominent artists.

Certain of the schools and museums of Paris occupy buildings of architectural interest. The Conservatoire des Arts et Metiers, a technical school and museum of machinery, &c, founded by the engineer Vaucanson in 1775, is established in the old Cluniac priory of St Martin-des-Champs, enlarged in the 19th century. The re- fectory is a fine haii of the 13th century; the church with an interest- ing choir in the Transition style dates from the nth to the 13th centuries. The Musee Carnavalet was built in the 16th century for Frangois de Kernevenoy, whence its present name, and enlarged in 1660; Mme de Sevigne afterwards resided there. The national archives are stored in the H6tel Soubise, a mansion of the early 18th century with 19th-century additions, standing on the site of a house built by Olivier de Clisson in 1370. It was afterwards added to by the family of Guise and rebuilt by Francois de Rohan, duke of Soubise. The palace of Cardinal Mazarin, augmented in modern times, contains the Bibliotheque Nationale. The Palais de l'lnstitut, formerly the College Mazarin, dates from the last half of the 17th century; it is the seat of the academies (except the Academy of Medicine, which occupies a modern building close to the Ecole des Beaux-Arts) and of the Bureau des Longitudes, the great national astronomical council. The Military School overlooking the Champ de Mars is a fine building of the 18th century. The huge Sorbonne buildings date from the latter years of the 19th century with the exception of the church, which belonged to the college as reconstructed by Richelieu. The astronomical observatory, through the centre of which runs the meridian of Paris, is a splendidly equipped building erected under Louis XIV., according to the designs of Claude Perrault. The Ecole des Beaux-Arts (facing the Louvre on the left bank of the Seine), with its interesting collections, partly occupies the site of an Augustine convent and comprises the old H6tel Chimay.

It was erected from 1820 to 1838 and added to later. _ The most striking feature is the facade of the principal building designed by F. L. J. Duban. The courtyard contains part of the fagade of the Norman chateau of Gaillon (16th century), which was destroyed at the Revolution, and the portal of the chateau of Anet (erected by Philibert Delorme in 1548) has been adapted as one of the entrances. The Grand Palais des Beaux-Arts, where horse-shows, &c, as well as annual exhibitions of paintings and sculptures are held, and the Petit Palais des Beaux-Arts, which contains art collections belonging to the city, date from 1897-

1900. Both buildings stand close to the north end of the Pont Alexandre III.

The Bourse, built in imitation of an ancient temple, dates from the first half of the 19th century; the Tribunal of Commerce and the Palais du Trocadero, built for the exhibition of 1878, are both imposing buildings of the latter half of that period, to which also belongs the H6tel des Postes et T&egraphes.

Among the numerous historic mansions of Paris a few demand special mention. The so-called Maison de Frangois I. (on the Cours la Reine overlooking the Seine) is a small but beautifully decorated building erected at Moret in 1527 and re-erected in Paris in 1826. In the St Gervais quarter are the Hotel de Beauvais of the latter half of the 17th century and the H6tel Lamoignon, built after 1580 for Diane de France, duchess of AngoulSme, both of which have handsome courtyards; in the same quarter is the H6tel de Sens, of the 15th century, residence of the archbishops of Sens, whose province then included the diocese of Paris. The H6tel Lambert on the Tie St Louis, built by L. Levau in the 17th century for Nicholas Lambert and afterwards inhabited by Mme du Chitelet and Voltaire and George Sand, has a magnificent staircase and many works of art. The H6tel de Sully, built for the duke of Sully from 1624 to 1630, is in the Rue St Antoine and has an interest- ing courtyard. Of the fine mansion of the dukes of Burgundy the only relic is a tower of the early 15th century built by Jean Sans Peur.

Theatres, &c— Of the theatres of Paris four — the Opera, the OpeVa-

Comique, the Theatre Francais and the Odeon — receive state subventions, amounting in all to £51,000 per annum. The Opera (entitled the National Academy of Music) was originally founded in 1 67 1 by Pierre Perrin, from whom the management was taken over by J. B. Lully. After several changes of locale, it was eventually transferred from the Rue Le Peletier to the present opera- house. The building, which covers 2j acres, is one of the finest theatres in the world. The process of erection, directed by Charles Gamier, lasted from 1861 to 1875 and cost nearly I \ million sterling. The front is decorated on the ground storey with allegorical groups (Music by Guillaume; Lyrical Poetry by Jouffroy; Lyrical Drama by Perraud; and Dancing by Carpeaux) and allegorical statues. Surmounting its angles are huge gilded groups representing music and poetry, and above it appears the dome which covers the auditorium. Behind that rises the vast pediment above the stage decorated at the corners with Pegasi by Lequesne. On the summit of the pediment an Apollo, raising aloft his lyre, is seen against the sky. The interior is decorated throughout with massive gilding, flamboyant scroll-work, statues, paintings, &c. The grand vestibule, with statues of Lully, Rameau, Gluck and Handel, the grand stair- case, the avant-foyer or corridor leading to the foyer, and the foyer or crush-room itself are especially noteworthy. The last is a majestic apartment with a ceiling decorated with fine painting by Paul Baudry. The auditorium is seated for 2156; its ceiling is painted by J. E. Lenepveu. Behind the stage is the foyer de la danse or green-room for the ballet, adorned with large allegorical panels and portraits of the most eminent danseuses.

The Theatre Francais or Comedie Frangaise was formed in 1 68 1 under the latter name by the union of Moliere's company with two other theatrical companies of the time. The name Theatre Frangais dates from 179 1, when part of the company headed by the tragedian Talma migrated to the south-west wing of the Palais Royal, which the company, reunified in 1799, has since occupied. Both the Theatre Francais and the less important Odeon, a building of 1782 twice rebuilt, close to the Luxembourg garden, represent the works of the classical dramatists and modern dramas both tragic and comic. The Opera-Comique, founded in the early 18th cen- tury, occupies a building in the Boulevard des Italiens reconstructed after a fire in 1887. Serious as well as light opera is performed there.

Other theatres well known and long established are the Gymnase (chiefly comedy), the Vaudeville and the Porte St Martin (serious drama and comedy), the Vari6t6s and the Palais Royal (farce and vaudeville) ; and the theatres named after and managed by Sarah Bernhardt and Rejane, the Theatre Antoine, the Gait6 and the Ambigu

may also be mentioned. The finest concerts in Paris are those of the Conservatoire de Musique et de Declamation (Rue du Faubourg Poissonniere), while the Concerts Lamoureux and the Concerts Colonne are also of a high order. Musical and local performances of a more popular kind are given at the music halls, cafes concerts and cabarets artistiques, with which the city abounds.

Paris is the chief centre for sport in France, and the principal societies for the encouragement of sport have their headquarters in the city. Among these may be mentioned the Societe d- encourage- ment pour V amelioration des races de chevaux en France (associated with the Jockey Club), which is the chief authority in the country as regards racing, and the Union des societes francaises de sports athletiques, which comprises committees for the organization of athletics, football, lawn tennis and amateur sport generally. The Racing Club de France, the Stade francais and the Union athletique du premier arrondissement are the chief Parisian athletic clubs. Race meetings are held at Longchamp and Auteuil in the Bois de Boulogne, and at Chantilly, Vincennes, St Cloud, St Ouen, Maisons- Laffitte and other places in the vicinity.

Museums. — Some of the more important museums of Paris require

notice. The richest and most celebrated occupies the Louvre. On the ground floor are museums (i) of ancient sculpture, containing such treasures as the Venus of Milo, the Pallas of Velletri (the most beautiful of all statues of Minerva), the colossal group of the Tiber, discovered at Rome in the 14th century, &c. ; (2) of Medieval and Renaissance sculpture, comprising works of Michelangelo, Jean Goujon, Germain Pilon, &c, and rooms devoted to early Christian antiquities and works by the Delia Robbia and their school ; (3) of modern French sculpture, with works by Puget, the brothers Coustou Coysevox, Chaude, Houdin, Rude, David of Angers, Carpeaux, &c. ; (4) of Egyptian sculpture and inscriptions; (5) of antiquities from Assyria, Palestine, Phoenicia and other parts of Asia; (6) of engravings.

On the first floor are (1) the picture galleries, rich in works of the Italian painters, especially of Leonardo da Vinci (including his Mona Lisa), Raphael, Titian and Paolo Veronese; of the Spanish masters Murillo is best represented ; and there are numerous works by Rubens, Van Dyck and Teniers, and by Rembrandt and Holbein. The examples of French art form about one-third of the collection, and include (1) the collection bequeathed in 1869 by Dr La Caze (chiefly works of the 1 8th century); (2) a collection of ancient bronzes; (3) a collection of furniture of the 17th and 18th centuries; (4) a rich museum of

drawings by great masters; (5) a museum of Medieval, Renaissance and modern art pottery, objects in bronze, glass and ivory, &c. ; (6) the Rothschild collection of objects of art; (7) smaller antiquities from Susiana, Chaldaea and Egypt; (8) a collection of ancient pottery embodying the Campana collection purchased from the Papal government in 1861; (9) the royal jewels and a splendid collection of enamels in the spacious Apollo gallery designed by Charles Lebrun. On the second floor are French pictures of the 19th century, the Thomy-Thiery art-collection bequeathed in 1903, and the marine, ethnographical and Chinese museums. The Pavilion de La Trfimoille contains a continuation of the Egyptian museum and antiquities brought from Susiana by Augustus De Morgan between 1897 and 1905. A museum of decorative art occupies the Pavilion de Marsan.

The museum of the Luxembourg, installed in a building near the palace occupied by the senate, is devoted to works of living painters and sculptors acquired by the state. They remain there for ten years after the death of the artists, that the finest may be selected for the Louvre.

The Cluny museum occupies the old mansion of the abbots of that order (see above). It contains about 11,000 examples of Medieval and Renaissance art-sculptures in marble, wood and stone, ivories, enamels and mosaics, pottery and porcelain, tapestries, bronzes, specimens of goldsmith's work, both religious and civil, including nine gold crowns of the 7th century found near Toledo, Venetian glass, furniture, iron-work, state carriages, ancient boots and shoes and pictures.

The Carnavalet museum comprises a collection illustrating the history of Paris. The Petit Palais des Beaux-Arts contains art- collections belonging to the city (especially the Dutuit collection). The house of Gustave Moreau, Rue Rochefoucauld, is now a museum of his paintings, and that of Victor Hugo, Place des Vosges, contains a collection of objects relating to the poet.

The Trocadero Palace contains a museum of casts illustrating the progress of sculpture, chiefly that of France, from the nth to the 18th century, it also possesses a collection of Khmer antiquities from Cambodia and an ethnographical museum. In the same neighbourhood are the Guimet museum, containing the collections of Oriental pottery, of objects relating to the Oriental religions and of antiquities presented to the state in 1885 by Emile Guimet of Lyons; and the Galliera museum, erected by the duchess of Galliera and containing a collection of tapestries and other works of art belonging to the city.

The Cernuschi Oriental museum, close to the Monceau Park, was bequeathed to the city in 1895 by M. Cernuschi.

The collection of MSS., engravings, medals and antiques in the Bibliothfeque Nationale are important, as also are the industrial and machinery exhibits of the Conservatoire des Arts et Metiers.

For libraries see Libraries.

Population.— Paris is divided into twenty arrondissements. Only the first twelve belonged to it previous to i860; the others correspond to the old suburban communes then annexed. The first four arrondissements occupy the space on the right of the river, extending from the Place de la Concorde to the Bastille, and from the Seine to the line of the Grands Boulevards; the 5th, 6th and 7th arrondissements lie opposite them on the left side; the 8th, 9th, 10th, nth and 12th surround the first four arrondissements on the north; the 13th, 14th and 15th are formed out of the eld suburban communes of the left side; and the 16th, 17th, 18th, 19th and 20th out of the old suburban communes of the right side.

The growth of the population during the 19th century is shown in the following table, which gives the population present on the census day, including the population comptee a part, i.e. troops, inmates of hospitals, prisons, schools, &c.

Years.

Population.

Years.

Population.

1801

547-756

1866

1,825,274

1817

713,966

1872

1,851,792

1831

785,862

1876

1,988,806

1836

899,313

1881

2,239,928

1841

935,261

1886

2,260,945

1846

1,053,897

1891

2,424,705

1851

1,053,262

1896

2,511,629

1856

1,174,346

1901

2,660,559

1861

1.606.14.1

1906

2.722,731

Below is shown the population of the arrondissements separ- ately (in 1906), together with the comparative density of popula- tion therein. The most thickly populated region of Paris comprises a zone stretching northwards frcm the lie de la Cite and the lie St Louis to the fortifications, and including the central quarters of St Gervais with 400 inhabitants to the acre, Ste Avoie with 391 inhabitants to the acre, and Bonne-Nouvelle with 406 inhabitants to the acre. The central arrondissements on the north bank, which (with the exception of I., the Louvre) are among the most densely populated, tended in the latter part of the 19th century to decrease in density, while the outlying arrondissements (XII.-XX.), which with the exception of Batignolles and Montmartre are comparatively thinly populated, increased in density, and this tendency continued in the early years of the 20th century.

Quarters.

Population.

d aj

2. B

3 «

IS

I. Louvre .

St Germain l'Auxerrois, Halles, Palais Royal, Place Vend6rae.

60,906

130

II. Bourse

Gaillon, Vivienne, Mail, Bonne-Nouvelle.

61,116

253

III. Temple .

Arts-et-M6tiers, Enfants- Rouges, Archives, Ste Avoie.

86,152

300

IV. H&tel-de-Ville

St Merri, St Gervais, Arseiial, Notre- Dame.

96,490

249

V. Pantheon

St Victor, Jardin des Plantes, Val de Grace, Sorbonne.

117,666

191

VI. Luxembourg.

Monnaie, Odeon, Notre- Dame des Champs, St Germain des Pres.

97.055

186

VII. Palais Bour-

St Thomas d'Aquin, In-

97,375

98

bon

valides, Ecole-Militaire, Gros-Caillou.

VIII. Elys < 5e . .

Champs Elysees, Fau- bourg-du-Roule, Made- leine, Europe.

99,769

106

IX. OpeYa . .

St Georges, Chaussde d'Antin, Faubourg Mont- martre, Rochechouart.

118,818

226

X. St Laurent .

St Vincent de Paul, Porte St Denis, Porte St Mar- tin, H6pital St Louis.

151,697

215

XI. Popincourt .

Folie-Mericourt, St Am- broise, Roquette, Ste Marguerite.

232,050

260

XII. Reuilly . .

Bel-Air, Picpus, Bercy, Quinze-Vingts.

138,648

99

XIII. Gobelins . .

SalpStriere, Gare, Maison- Blanche, Croulebarbe.

133,133

86

XIV. Observatoire

Montparnasse,Sante,Petit- Montrouge, Plaisance.

150,136

131

XV. Vaugirard

St Lambert, Necker, Grenelle, Javel.

168,190

94

XVI. Passy. . .

Auteuil, Muette, Porte- Dauphine, Chaillot.

130,719

75

XVII. Batignolles-

Ternes, Plaine-Monceau,

207,127

188

Monceau

• Batignolles, Epinette. Grandes-Carrieres, Clig-

XVIII. Montmartre .

258,174

nancourt, Goutte-d'Or,

Chapelle.

XIX. Buttes-Chau-

Villette, Pont-de-Flandre,

148,081

106

mont

Amerique, Combat.

XX. Menilmontant

Belleville, St Fargeau,Pere- Lachaise, Charonne.

169,429

132

The birth-rate, which is low — on an average

diminished steadily in the 19th century, 54,000 births per annum (1901-1905) or

20"2 per 1000 inhabitants as compared with 3i'i in 1851-1855. The death-rate also is low, 48,000 deaths per annum (1901-1905), averaging 17 '9 deaths per 1000 inhabitants. This is accounted for by the fact that Paris is pre-eminently a town of adults, as the following figures, referring to the year 1908, show: —

Inhabitants under 1 year of age 41,107

,, from I to 19 years of age 676,995

„ „ 20 ,,39 „ , 1,108,340

„ 40 „ 59 663,435

„ of 60 years and over 223,836

„ „ unknown age 9,018

In these circumstances there is nothing remarkable in the annual number of marriages in Paris (26,000), a high marriage rate (9-8 per 1000) for the total number of inhabitants, but a low one (28-4 per 1000) compared with the number of marriageable persons.

A large number of the inhabitants (on an average 636 out of every 1000) are not Parisians by birth. The foreign nationalities chiefly represented are Belgians, Germans, Swiss, Italians, Luxembourgers, English, Russians, Americans, Austrians, Dutch, Spaniards. The Belgians, Germans and Italians, mostly artisans, live chiefly in the industrial districts in the north and east of the city. The English and Americans, on the other hand, congregate in the wealthy districts of the Champs Elysees and Passy.

Municipal Administration. — Each arrondissement is divided into four quarters, each of which nominates a member of the municipal council. These 80 councillors, together with 21 additional councillors elected by the cantons of the rest of the department, form the departmental council. The chief function- aries of the arrondissement are a mayor (maire) and three deputies (adjoints) appointed by the president. The mayors act as registrars, draw up electoral and recruiting lists and superintend the poor-relief of their arrondissement. There is a justice of the peace {juge de paix) nominated by the govern- ment in each arrondissement. There is no elective mayor of Paris: the president of the municipal council, who is nominated by his colleagues, merely acts as chairman of their meetings. When occasion requires, the function of mayor of Paris is dis- charged by the prefect of Seine. The municipal council discusses and votes the budget of the city, scrutinizes the administrative measures of the two prefects and deliberates on , municipal affairs in general. The prefect of Seine and the prefect of police (both magistrates named by the government, but each with a quite distinct sphere of action) represent the executive authority as opposed to the municipal council, which latter has no power, by refusing a vote of credit, to stop any public service the maintenance of which legally devolves on the city: in case of such refusal the minister of the interior may officially insert the credit in the budget. In like manner he may appeal to the head of the state to cancel any decision in which the council has exceeded its legal functions.

The prefecture' of Seine comprises the following departments {directions), subdivided into bureaux: —

1. Municipal affairs, including bureaux for the supervision of city property, of provisioning, of cemeteries, of public buildings, &c.

2. Departmental affairs (including the bureau concerned with the care of lunatics and foundlings).

3. Primary education.

4. Streets and public works, including the bureau of water, canals and sewers, and the bureau of public thoroughfares, promenades and lighting.

5. Finance.

The administrative functions of the prefect necessitate a large technical staff of engineers, inspectors, &c, who are divided among the various services attached to the departments. There are also a number of councils and committees on special branches of public work attached to the prefecture {commission des logements insalubres, de statistique municipale, &c). The administration of the three important departments of the octroi, poor-relief {assistance publique) and pawnbroking (the mont-de- piite) is also under the control of the prefect.

The prefecture of police includes the whole department of Seine and the neighbouring communes of the department of Seine-et-Oise — Meudon, St Cloud, Sevres and Enghien. Its sphere embraces the apprehension and punishment of criminals {police judiciaire), general police- work (including political service) and municipal policing. The state, in view of the non-municipal functions of the Paris police, repays a proportion of the annua]

budget which this prefecture receives from the city. The budget of the prefect of police is voted en bloc by the municipal council.

Besides numerous duties consequent on the maintenance of order, the inspection of weights and measures, authority over public spectacles, surveillance of markets and a wide hygienic and sanitary authority belong to the sphere of this prefect. In the last connexion mention may be made of an important body attached to the prefecture of police — the Conseil d'Hygiene Publique et de Salubrite of the department of the Seine, composed of 24 members nominated by the prefect of police and 17 mem- bers called to it in virtue of their office.

To it are referred such questions as the sources from which to obtain drinking-water for the town, the sanitary measures to be taken during important works, the work connected with the main sewers for the cleaning of the Seine and the utilization of the sewage water, the health of workpeople employed in factories, the sanitary condition of the occupants of schools and prisons, questions relating to the disinfection of infected districts, the heating of public vehicles and dwellings, the conveyance of infected persons, night shelters, &c. Board of health (commissions d'hygiene) in each of the twenty arrondissements act in co-operation with this control council. The municipal police, consisting of brigades of gardiens de la paix, are divided among the arrondissements in each of which there is an officier de paix in command. There are besides six brigades in reserve, cne attached to the central markets, another entrusted with the surveillance of cabs, while the others are held in readiness for exceptional duties, e.g. to reinforce the arrondissement brigades at public ceremonies or in times of disorder. In nearly every quarter there is a commissaire de police, whose duties are of a semi-legal nature; the police require his sanction before they can commit an arrested indi- vidual to prison, and he also fulfils magisterial functions in minor disputes, &c.

Finance. — The chief item of ordinary expenditure is the service of the municipal debt, the total of which in 1905 was nearly £125,000,000. Its annual cost rose from £722,000 in i860 to £3,583,000 in 1875 and £4,826,000 in 1905. In the latter year the other chief items of expenditure were : —

Poor relief £1,490,000

Prefecture of police 1,448,000

Primary instruction 1,206,000

Streets and roads 916,000

Water and drainage 579,000

Collection of octroi 471,000

The general total of ordinary expenditure was £14,192,000, and of ordinary and extraordinary expenditure £16,995,000.

The chief of the ordinary sources of revenue are : —

Octroi (municipal customs) £4,35l>ooo

Communal centimes, dog tax and other special taxes . 3,268,000

Revenue from gas company 969,000

Water rate and income from canals 943,000

Public vehicles _ 614,000

State contribution to, and receipts of prefecture of police 514,000

Revenue from public markets 367,000

The total of ordinary revenue was £14,365,000, and of all revenue, ordinary and extraordinary, £25,426,000.

Communications. — Passenger-transport is in the hands of companies. The ordinary omnibuses are the property of the Compagnie Generate des Omnibus, founded in 1855, which has a charter conferring a monopoly until 1910 in return for a payment of £80 per annum for each vehicle. The organization of the omnibus service is under the supervision of the prefect of the Seine. Since 1906 motor-driven omnibuses have been in use. The Compagnie Generate owns a. number of tramways, and there are several other tramway companies. The cab companies, the chief of which are the Com- pagnie G6n6rale des Voitures and the Compagnie Urbaine, have no monopoly. The use of the taximeter is general and motor-cabs are numerous. Cabs pay a license fee and are under the surveillance of the prefect of the Seine as regards tariff and the concession of stands. The steamers {bateaux-omnibus) of the Compagnie Generate des Bateaux Parisiens ply on the Seine between Charenton and Suresnes.

The great railways of France, with the exception of the Midi railway, have terminal stations in Paris. The principal stations of the northern, eastern and western systems (that of the latter known as the Gare St Lazare) lie near the outer boulevards in the north- centre of the city; the terminus of the Paris-Lyon-M6diterranee railway is in the south-east, close to the right bank of the Seine; opposite to it, on the left bank, is the station du Quai d'Austerlitz,

and on the Quai d'Orsay the Gare du Quai d'Orsay, both belonging to the Orleans railway. The Gare Montparnasse, to the south-west of the Luxembourg, is used by the western and the state railways. Other less important stations are the Gare de Vincennes (line of the eastern railway to Vincennes), the Gares du Luxembourg and de Paris-Denfert (line of the Orleans railway to Sceaux and Limours), and the Gare des Invalides (line of western railway to Versailles).

Railway communication round Paris is afforded by the Chemin de Fer de Ceinture, which has some thirty stations along the line of ramparts or near it. The Metropolitain, an electric railway begun in 1898, and running chiefly underground, has a line traversing Paris from east to west (Porte Maillot to the Cours de Vincennes) and a line following the outer boulevards ; within the ring formed by the latter there are transverse lines.

Streets.— The total length of the thoroughfares of Paris exceeds 600 m. For the most part, and especially in the business and in- dustrial quarters where traffic is heavy and incessant, they are paved with stone, Yvette sandstone from the neighbourhood of Paris being the chief material. Wood and macadam come next in impor- tance to stone, and there is a small proportion of asphalte roadway. The upkeep and cleansing is under the supervision of a branch of the department of public works {service technique de la voie publique et de I'eclairage), and for this purpose the city is divided into sections, each comprising two or three arrondissements. All streets having a width of 25 ft. or more are planted with rows of trees, chestnuts and planes being chiefly used for this purpose, and in many of the wide thoroughfares there are planted strips down the middle.

The upkeep (exclusive of cleansing) of the thoroughfares cost about £500,000, towards which the state, as usual, contributed £120,000 and the department £16,000. In. the same year the cleansing cost about £450,000. The original cost of paving a street is borne by the owners of the property bordering it; but in the case of avenues of exceptional width they bear only a proportion of the outlay. Payments are exacted in return for the right to erect newspaper kiosks, &c, to place chairs and tables on the footways and similar concessions.

Water.— The water and sewage system of Paris is supervised by a branch of the public works department {bureau des eaux, canaux et assainissement). The water supply comprises a domestic supply of spring water and a supply for industrial and street cleansing purposes, derived from rivers and artesian wells. The domestic supply, which averaged 55,000,000 gallons daily in 1905, has three sources of origin : —

1. The springs of the Dhuis, to the east of Paris, whence the water is conveyed by an aqueduct 82 m in length to a reservoir in the quarter of Menilmontant.

2. The springs of the Vanne, south-east of Paris, whence the water comes by an aqueduct 108 m. in length to a reservoir near Mont-

souris Park. The springs of the Loing and Lunain, south-east of Paris, also suppl)' the Montsouris reservoir.

3. The springs of the Avre, nea: Verneuil, to the west of the city, the aqueduct from which is 63 m. in length and ends at the St Cloud reservoir.

In addition, filtering installations at the pumping station of Ivry, St Maur and elsewhere make it possible to supplement the domestic supply with river water in hot summers.

Water for public and industrial purposes is obtained (1) from pumping stations at Ivry and other points on the banks of the Seine, and at St Maur on the Marne; (2) from the Ourcq canal, which starts at Mareuil on the Ourcq and ends in the Villette basin; (3) from artesian wells and the aqueduct of Arcueil from Rungis, the latter being of trifling importance. The water is stored in reservoirs in the higher localities of the city, which for the purposes of distribution is divided into zones of altitude; thus the water from the Vanne, stored at the Montsouris reservoir at an altitude of only 260 ft., is supplied to the central and lowest part of the city. The uppei parts of the quarters of Montmartre, Belleville and Montrouge being too high to benefit by the supply from the ordinary reservoirs, are supplied from elevated reservoirs, to which the water is pumped by special works.

The water is distributed throughout the city by two systems: the low or variable pressure, carrying the river water for use in the streets, courts and industrial premises; the high pressure, taking the spring water to the various floors of buildings, and supplying hydraulic lifts, drinking fountains and fire-plugs. The total length of pipes is nearly 1600 m. The water arrives in all cases from two different directions, so that in case of accident the interruptions of the supply may be reduced to a minimum. Consumers are supplied by meter {compteur) at a price of 35 centimes the cubic metre (domestic supply) and at a minimum charge of 16 centimes for river water. In its dealings with individuals the municipality is repre- sented by a company {Compagnie genirale des eaux), which acts as a collecting agent and receives a commission on the takings. Its charter expires at the endˆof 19 10. In 1905, for the first time, the gross takings reached £800,000.

Drainage.— The drainage system of Paris comprises four main collectors, with a length in all of nearly 20 m. ; 27 m. of secondary collectors and several hundred miles of ordinary sewers. Its capacity is such that the Seine (except in certain cases of exceptional pressure, such as sudden and violent storms) is kept free from sewage

water, which is utilized on sewage farms. The larger sewers, which vary between 9 and 20 ft. in width, are bordered by ledges, between which the water runs, and are cleansed by means of slides exactly fitting the channel and mounted on wagons or boats propelled by the force of the stream. Of the main collectors, that serving the north-eastern quarters of the city and debouching in the Seine at St Denis is the longest (7\ m.). The other main sewers converge at Clichy, on the right bank of the Seine, where a powerful elevator forces the sewage partly across the bridge, partly through a tunnel acting as a syphon below the river-level, to the left bank. Thence part of it is distributed over the estate of Gennevilliers, from which it returns purified, after having fertilized the plots, to the Seine. At Colombes a second elevator drives the surplus unused sewage to the hills above Argenteuil (right bank), where begins a conduit extending westwards. This conveys a portion of the sewage to a third elevator at Pierrelaye, whence it is distributed on the hills of Mery and the remainder to the Pare d'Acheres (left bank), the irriga- tion fields of Carrieres-sous-Poissy (right bank), and finally those of Mureaux, opposite Meulan. Certain parts of Paris lie too low for their drains to run into the main sewers, and special elevators are required to raise the sewage of the districts of Bercy, Javel and the Cit6. The sewers are used as conduits for water-pipes, gas-pipes, telegraph and telephone wires and pneumatic tubes.

Lighting. — Gas-lighting in Paris is in the hands of a company whose operations are supervised and directed by municipal engineers. The company pays to the municipality an annual sum of £8000 for the privilege of laying pipes in the streets and 2 centimes for every cubic metre of gas consumed; in addition, the profits of the company, after a fixed dividend has been paid on the stock, are divided with the municipality. The company is bound to supply gas at 30 centimes per cubic metre to private consumers and at half that price for public services. In 1905 the total sum paid by the company amounted to nearly £1,000,000. It was provided that on the expiration of its charter the plant should be made over to the municipality. Electric light is supplied by a number of companies, to each of which in return for certain payments a segment (secteur ilectrique) of the city is assigned, though the con- cession carries with it no monopoly ; the municipality has an electrical station of its own beneath the central

markets.

Law and Justice (see France : Justice, for an account of the judicial system of the country as a whole). — Paris is the seat of four courts having jurisdiction over all France: (1) the Tribunal des Conflits, for settling disputes between the judicial and administrative authorities on questions as to their respective jurisdiction; (2) the Council of State, which includes a section for cases of litigation between private persons and public departments; (3) the Cour des Comptes; and (4) the Cour de Cassation. The first three sit in the Palais Royal, the fourth in the Palais de Justice, which is also the seat of (1) a cour d'appel for seven departments (seven civil chambers, one chamber of appeal for the correctional police, one chamber for preliminary proceedings) ; (2) a cour d'assises ; (3) a tribunal of first instance for the department of Seine, comprising seven chambers for civil affairs, four chambers of correctional police; (4) a police court where each juge de paix presides in his turn assisted by a com- missaire de police. Litigations between the departmental or muni- cipal administrations and private persons are decided by the conseil de prefecture. Besides these courts there are conseils de prud'hommes and a tribunal of commerce. The conseils de prud'hommes settle differences between workmen and workmen, or between workmen and masters; the whole initiative, however, rests with the parties. There are four of these bodies in Paris (for the metal trades, the chemical trades, the textile trades and building industries), composed of an equal number of masters and men. The tribunal of commerce, sitting in a building opposite the Palais de Justice, is composed of business men elected by the " notables " of their order, and deals with cases arising out of commercial transactions; declarations of bankruptcy are made before it; it also acts as registrar of trade- marks and of articles of association of companies; and as court of appeal to the conseils de prud'hommes.

Prisons. — There are three places of detention in Paris — the Depot of the prefecture of police (in the Palais de Justice), where persons arrested and not released by the commissaries of police are tem- porarily confined, the Conciergerie or maisan de justice, for the recep- tion of prisoners accused of crimes, who are there submitted to a preliminary examination before the president of the court of assizes, and the Sante (near the Place Denfert-Rochereau), for prisoners awaiting trial and for remanded prisoners. The old prisons of Mazas, Ste Pelagie and La Grande- Roquette, the demolition of which was ordered in 1894, have been replaced by the prison of Fresnes- les-Rungis for condemned prisoners. The prisoners, kept in solitary confinement, are divided into three groups: those undergoing short sentences, those sentenced to hard labour while awaiting transference

to their final place of detention or to sentences over a year, and sick prisoners occupying the central infirmary of the prison. The Petit Roquette (occupied by children) was replaced by the agricul- tural and horticultural colony of Montesson, inaugurated in 1896.

Education (see also France). — In 1905 there were 170 public icoles maternelles (kindergartens) with 57,000 pupils, and 48 private schools of the kind with 7800 pupils, besides a certain number of icoles enfantines. exclusively managed, as are the icoles maternelles.

by women, and serving as a link between the latter and the icoles primaires, for timid and backward children of from 6 to 8 years of age. There were 374 public primary schools with 173,000 pupils, while over 63,000 children were educated in private primary schools. Subsidiary to the primary schools are the caisses des ecoles (school treasuries), which give clothing, &c, to indigent children and main- tain the cantines scolaires for the provision of hot mid-day meals; the classes de garde and the garderies, which look after children beyond the ordinary school hours ; the classes de vacances, school camps and ■ school colonies for children during the holidays; and the internals primaires, which for a small payment board and lodge children whose parents or guardians are unable to do so satisfactorily.

The higher primary schools (ecoles primaires superieures), which give a course of 3 or 4 years, number 86 for boys (College Chaptal, 1 icoles, J. B. Say, Turgot, Colbert, Lavoisier, Arago) and two for girls (Sophie Germain and Edgar Quinet). Supplementary courses take the place of these schools for children who can afford two years at most for schooling after leaving the primary school. Side by side with the higher primary school, the teaching in which has a com- mercial rather than an industrial bias, are the ecoles professionelles, technical schools for the training of craftsmen. The Ecole Diderot trains pupils in wood- and iron-working; the Ecole Germain Pilon teaches practical drawing, and the Ecole Barnard Palissy teaches applied art; the Ecole Boulle trains cabinet-makers, and the Ecole Estienne teaches all the processes connected with book-production. The school of physics and chemistry imparts both theoretical and practical knowledge of these sciences. The Ecole Dorian is a school of the same type as the Ecole Diderot, but is intended for very poor children, who are received from the age of seven and boarded and lodged. Six ecoles minageres train girls in the duties and employ- ments of their sex. The municipality also provides gratuitous popular courses in scientific and historical subjects at the H&tel de Ville, and there are numerous private associations giving courses of instruction (the Philotechnic Association, the Polytechnic Asso- ciation, the Union francaise de la

jeunesse, &c). Teachers for the elementary primary schools are recruited from two training colleges in the city.

Secondary and Higher Education. — There are 13 lycees for boys and a municipal college— the College Rollin. These give classical and modern courses, and usually have classes preparing pupils for one or more of the government schools. For girls there are five lyc6es.

The five faculties of medicine, lav/, science, literature and Pro- testant theology, and the higher school of pharmacy, form the body of faculties, the association of which is known as the University of Paris. The faculties of science and literature, together with their library, are established at the Sorbonne, which is also the seat ,of the academie, of which Paris is the centre, and of the Ecole des chartes. The faculty of medicine with its laboratories (ecole pratique) occupies separate buildings near the Sorbonne. The law school is also close to the Sorbonne. Of the 12,600 students at the university in 1905- 1906 some 1260 were foreigners, Russians and Rumanians being most numerous among the latter. The faculty of law is the most largely attended, some 6000 students being enrolled therein. The College de France, founded by Francis I. and situated opposite the Sorbonne, gives instruction of a popular kind to adults of the general public ; the various branches of learning are represented by over 40 chairs. The Museum oVhistoire naturelle gives instruction in the natural sciences; the Ecole pratique des hauies itudes, whose students are instructed at the Sorbonne and other scientific estab- lishments in the city, has for its object the encouragement of scientific research. In addition, there are several great national schools attached to various ministries. Dependent on the ministry of education are the ‘Ecole normale superieure, for the training of teachers in lycees ; the Ecole des chartes (palaeography and the use of archives) ; the Ecole speciale des langues orientates, for the training of inter- preters; the Ecole nationale et speciale des beaux-arts (painting, sculpture, architecture, &c), in the various departments of which are conferred the prix de Rome, entitling their winners to a four years’ period of study in Italy; the Conservatoire national de musique et de diclamation (music and acting), which also confers a grand prix and possesses a fine library and collection of musical instruments; the Ecole nationale des arts decoratifs (art applied to the_ artistic industries) ; the Ecole du Louvre, for the instruction of directors of museums. Depending on the ministry of war are the Ecole poly- technique, which trains military, governmental and civil engineers; the Ecole supirieure de guerre (successor of the officers’ training school, founded in 1 751) for advanced military studies. Attached to the ministry of commerce and industry are the Ecole centrale des arts et manufactures for the

training of industrial engineers, works managers, &c. ; the Conservatoire des arts et metiers, which has a rich museum of industrial inventions and provides courses in science as applied to the arts. The Instilut national agrono- mique, a higher school of scientific, agriculture, is dependent on the ministry of agriculture, and the Ecole coloniale for the instruction

1 The Coll6ge Chaptal has a wider scope than the higher primary schools; it has in view general culture rather than commercial apti- tude, and also prepares students for the great scientific schools (ecole des mines, ecole polytechnique, &c).

both of natives of French colonies and of colonial functionaries, on the ministry of the colonies. The Ecole nationale des ponts et chaussees for the training of government engineers, and the Ecole nationale superieure des mines for mining engineers, are under the minister of public works. Of free institutions of higher education the most prominent are the Catholic institute, with faculties of law and theology and schools of advanced literary and scientific studies, the Pasteur institute, founded by Pasteur in 1886 and famous for the treatment of hydrophobia and for its research-laboratories, and the school of political science which prepares candidates for political and governmental careers. The two latter receive state subvention. There are numerous private associations giving courses of instruction, the more important being the Philotechnic Association, the Poly- technic Association and the Union francaise de la jeunesse.

Among the numerous learned societies of Paris the first in import- ance is the Institut de France (see Academies). The French Asso- ciation for the advancement of the sciences, founded in 1872, is based on the model of the older British society, and, like it, meets every year in a different town.

In art Paris has long held a leading place. The Societe des Artistes francais holds an annual salon or exhibition in May and June at the Palais d'Industrie. It is open to artists of all national- ities. Works are selected and awards (including the Prix de Rome) made by a jury of experts selected by the exhibitors. The society was founded in 1872, but the salon takes its name from the academy exhibitions, which,

first held in the Palais Royal in 1667, were trans- ferred to the Salon Carre in the Louvre in 1669. As a result of dissension over the awards of 1889, the society of fine arts (Societe Nationale des Beaux-Arts) established a separate salon, in the Champ de Mars, in May, June and July. There is also a Societe du Salon d'Automne.

Charity. — The administration of public charity is entrusted to a responsible director, under the authority of the Seine prefect, and assisted by a board of supervision, the members of which are nominated by the president. The funds at his disposal are derived (1) from the revenue of certain estates, houses, farms, woods, stocks, shares, (2) from taxes on seats in the theatres (one- tenth of the price), balls, concerts, the mont de piete, and allotments in the cemeteries; (3) from the municipal subsidy; (4) from other sources (including voluntary donations) . The charges on the administration consist of (1) the treatment of the sick in the hospitals; (2) the lodging of old men and of incurables in the hospices; (3) the support of charity children ; (4) the distribution of out-door relief (secours a domicile) by the bureaux de bienfaisance ; (5) the dispensation of medical assistance d domicile.

The doctors, surgeons, chemists, both resident and non-resident, connected with the numerous hospitals, are all admitted by competitive examination. They are assisted by three grades of students, internes (who receive a salary), externes and stagiaires (probationers).

Of the hospices and similar institutions, the following are the chief : BicStre (men), less than a mile south of the fortifications; La Salpetriere (women), Ivry (both sexes); maisons de retraite (for persons not without resources) Issy, La Rochefoucauld, Ste Perine; fondations (privately endowed institutions) — Brezins at Garches (for ironworkers), Devillas, Chardon-Lagache, Lenoir-Jousseran, Galignani (booksellers, printers, &c), Alquier-Debrousse ; and sections for the insane — Bicetre (men), Salpetriere (women), these being distinct from the ordinary departmental asylums controlled by the prefect.

Foundlings and orphans are sent to the Hospice des enfants assistes, which also receives children whose parents are patients in the hospitals or undergoing imprisonment. This institution is not intended as a permanent home. Infants are not kept in the institution, but are boarded out with nurses in the country; the older ones are boarded out with families or placed in technical schools. Up to thirteen years of age the children are kept at the expense of the department of Seine, after which they are apprenticed.

The following establishments in or near Paris belong to the nation and

are dependent on the ministry of the interior: The Quinze- Vingts gives shelter to the 300 blind for whom it was founded by St Louis, and gives outdoor assistance besides. The blind asylum for the young {Institution des jeunes aveugles) has 250 pupils of both sexes. The deaf-mute institution (Institution nationale des sourds-muets) is for boys only, and they are generally paid for by the state, the departments and the communes. The Charenton asylum is for the insane. Those of Vincennes (for male patients) and Le Vesinet (for female patients) take in convalescents from the hospitals. The Vacassy asylum at Charenton is for workmen incapacitated by accident. The Hotel des invalides is for old and infirm soldiers. Private bodies also maintain a great number of institutions.

Religion. — Some 75 % of the population of Paris is Roman Catholic. The department of Seine forms the diocese of the archbishop of Paris, and the city is divided into 70 parishes. It has the important higher ecclesiastical seminary of St Suloice, two lower seminaries and others for training the clergy for missionary and colonial work. Paris is also the seat of the central council of the Reformed Church and of the executive committee of the General Synod of the Lutheran Church, and forms a consistory of both thes*; churches, whose adher- ents together number about 90,000. There are also some 50,000 Jews, Paris being the seat of the Grand Rabbinate of France and of the central consistory.

Industries. — The larger manufacturing establishments of Paris comprise engineering and repairing works connected with the railways, similar private works, foundries and sugar refineries. Government works are the tobacco factories of Gros Caillou and Reuilly, depending on the ministry of finance; the national printing establishment, under the ministry of justice; the mint (with a collec- tion of medals and coins), established in an 18th century building close to the Pont Neuf and under the control of the ministry of finance ; and the famous tapestry factory and dye-works (with a tapestry museum) of the Gobelins, under the minister of education. The list of minor establishments is varied, most of them being devoted to the production of the so-called articles de Paris (feathers, artificial flowers, dolls, toys and fancy goods in general), and carrying the principle of the division of labour to an extreme. The establish- ments which rank next to those above mentioned in the number of workmen are the pharmaceutical factories, the gasworks, the printing-offices, cabinet-makers' workshops, tailoring and dress- making establishments (very numerous) and hat factories.

The textile industries hardly exist in Paris; there are a few tan- neries

on the Bievre, but the leather industry is chiefly represented by the production of morocco leather goods classed as articles de Paris. Mention may be made here of the bureaux de placement gratuit, maintained by the municipality, where those in search of work or workers are put in touch with one another.

Markets. — The slaughter-houses, cattle-yards, and with few exceptions the markets of Paris, belong to the municipality. The chief slaughter-house is the abattoir general of La Villette, covering a space of 47 acres in the extreme north-east of the city on the bank of the Canal de l'Ourcq ; adjoining it, with an area of about 55 acres, on the opposite bank of the canal, are the municipal cattle-yards and markets, which have accommodation for many thousands of animals, and are connected with the Ceinture railway so that the cattle-trucks are brought straight into the market. Cattle-traders and butchers pay dues for the use of these establishments. There are other less extensive slaughter-yards at Vaugirard. Most of the cattle come from Calvados, Maine-et-Loire, Vaucluse, Nievre, Loire-Inferieure and Orne; sheep from Seine-et-Marne, Aveyron, Aisne, Seine-et-Oise, Lot and Cantal; pigs from Loire-Inferieure and other western departments; calves from Loiret, Eure-et-Loir and others of the northern departments. Dead meat, game, poultry, fruit, vegetables, fish and the other food-supplies have their centre of wholesale distribution at the Halles Centrales, close to the Louvre, which comprise besides a large uncovered space a number of pavilions of iron and glass covering some 10 acres. Close to the Halles is the Bourse de Commerce, which is a centre for transactions in alcohol, wheat, rye and oats, flour, oil and sugar; and a market for flour, the trade in which is more important than thit in wheat, is held in the Place St Germain l'Auxerrois, sales being effected chiefly by the medium of samples. Most of the wines and spirits consumed in Paris pass through the entrep&ts of Bercy and the wine-market on the Q ua i St Bernard, the first specially connected with the wine-trade, the second with the brandy-trade. In addition, there are other provision markets in various quarters of the city, owned and supervised by the municipality, as well as numerous flower- markets, bird-markets, a market for horses, carriages, bicycles and dogs, &c. Two fairs are still held in Paris — the foire aux jambons in the Boulevard Richard Lenoir during Holy week, and the foire au pain d'epices in the Place de la Nation and its vicinity at Easter time. Market and market-places are placed under the double supervision of the prefect of Seine and the prefect of police. The former official has to do with the authorization, removal, suppression, and holding of the markets, the fixing and collecting of the dues, the choice of sites, the erection and maintenance of buildings, and the location of vehicles.

The latter maintains order, keeps the roads clear, and watches against fraud. There is a municipal laboratory, where any purchaser can have the provisions he has bought analysed, and can obtain precise information as to their quality. Spoiled provisions are seized by the agents of the prefecture.

The Chamber of Commerce occupies a building close to the Bourse.

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History. — At its first appearance in history there was nothing to foreshow the important part which Paris was to play in Europe and in the world. An island in the Seine, now almost lost in the modern city, and then much smaller than at present, was for centuries the entire site. The sole importance of the town lay in its being the capital of a similarly insignificant Gallic people, which navigated the lower course of the Seine, and doubtless

from time to time visited the coasts of Britain. So few were its inhabitants that they early put themselves under the protec- tion of their powerful neighbours, the Senones, and this vassal- ship was the source of the political dependence of Paris on Sens throughout the Roman period, and of a religious subordination which lasted till the 17th century. The capital did not at once take the name of the Parisii, whose centre it was, but long kept that of Lucetia, Lucotetia or Lutetia, of which Lutece is the generally recognized French form.

During the War of Gallic Independence, after being subjugated by Caesar, who even in 53 B.C. made their territory the meeting- place of

deputies from all Gaul, the Parisii took part in the great rising of the year 52, at the same time separating their cause from that of the Senones, who were held in check by Caesar's lieutenant, Labienus. They joined their forces to the army commanded by an Aulercian, the old Camulogenus, which in turn was to unite with the Bellovaci to crush Labienus advancing from Sens to attack the Parisians. Having marched along the right bank of the river till opposite Lutetia, Labienus learned that the Bellovaci were in arms, and, fearing to find himself between two armies at a distance from his headquarters, he sought to get rid of Camulogenus, who, posted on the left bank, endeavoured to bar his way. The bridges had been cut and the town burned by order of the Gallic chief. By means of a strata- gem Labienus drew his opponent up the river to the district now occupied by the Jardin des Plantes, and quietly by night crossed the Seine lower down in the neighbourhood of Grenelle, near a place which Caesar calls Metiosedum, identified, but not conclusively, with Meudon. The Gauls, retracing their steps a little, met the Romans and allowed themselves to be routed and dispersed; their leader fell in the fore-front of the battle. Still unsubdued, the Parisii were called upon by the general council assembled in Alesia to furnish eight thousand men to help in raising the siege of that city. It is doubtful whether they were able to contribute the whole of this contingent, when their powerful neighbours the Bellovaci managed to send only two thousand of the ten thousand demanded of them. This was their last effort, and after the check at Alesia they took no part in the desperate resistance offered by the Bellovaci.

Lutetia was somewhat neglected under the Roman emperors of the first centuries. Its inhabitants continued quietly carrying on their river traffic, and devoted part of their wealth to the maintenance of a great temple to Jupiter built on the site of the present cathedral of Notre Dame. It is not known at what date Christianity was introduced into the future capital of France; but it is probable, judging by the use of the title " city," that Lutetia was the see of one of the earliest of the bishoprics of Gallia Celtica. The name of the founder of the church is known, but a keen controversy, not yet settled, has recently been raised with regard to the date when the first Roman missionary, St Dionysius or Denis, reached the banks of the Seine, along with his two deacons, Rusticus and Eleutherius. A pious belief, which, in spite of its antiquity, has its origin in nothing better than parochial vanity, identifies the first-named with Dionysius the Areopagite, who was converted by St Paul at Athens, and thus takes us back to the middle of the 1st century of the Christian era. Better founded in the opinion which dates the evangelization of the city two centuries later; the

regular list of bishops, of whom, after Denis, the most famous was St Marcel, begins about 250.

Lutetia was in some sort the cradle of Christian liberty, having been the capital, from 292 to 306, of the mild Constantius Chlorus, who put an end to persecution in Brittany, Gaul and Spain, over which he ruled. This emperor fixed his residence on the banks of the Seine, doubtless for the purpose of watching the Germans without losing sight of Brittany, where the Roman authority was always unstable; perhaps he also felt something of the same fancy for Lutetia which Julian afterwards expressed in his works and his letters. Be that as it may, the fact that these two princes chose to live there naturally drew attention to the city, where several buildings now rose on the left side of the river which could not have been reared within the narrow

boundaries of the island. There was the imperial palace, the remains of which, a magnificent vaulted chamber, beside the Hotel de Cluny, are now known, probably correctly, as Julian's Baths. At some distance up the river, in the quarter of St Victor, excavations in 1870 and in 1883 laid bare the foundations of the amphitheatre, which was capable of holding about 10,000 spectators, and thus suggests the existence of a population of 20,000 to 25,000 souls. Dwelling-houses, villas, and probably also an extensive cemetery, occupied the slope of the hill of St Genevieve.

It was at Lutetia that, in 360, Julian, already Caesar, was in spite of himself proclaimed Augustus by the legions he had more than once led to victory in Germany. The troops invaded his palace, which, to judge by various circumstances of the mutiny, must have been of great extent. As for the city itself, it was as yet but a little town (iroXLxvn) according to the imperial author in his Misopogon. The successive sojourns of Valen- tinian I. and Gratian scarcely increased its importance. The latest emperors preferred Treves, Aries, and Vienne in Gaul, and, besides, allowed Paris, about 410, to be absorbed by the powerful Armcrican league. When the patricians, Aetius, Aegidius and Syagrius, held almost independent sway over the small portion of Gaul which still held together, they dwelt at Soissons, and it was there that Clovis fixed himself during the ten or eleven years between the defeat of Syagrius (486) and the surrender of Paris (497), which opened its gates, at the advice of St Genevieve, only after the conversion of the Frankish king. In 508, at the return of his victorious expedition against the south, Clovis made Paris the official capital of his realm — Cathedram regni constituit, says Gregory of Tours. He chose as his residence the palace of the Thermae, and lost no time in erecting on the summit of the hill, as his future place of interment, the basilica of

St Peter and St Paul, which became not long afterwards the church and abbey of St Genevieve. After the death of Clovis, in spite of the supremacy granted to the kingdom of Austrasia, or Metz, Paris remained the true political centre of the various Frankish states, insomuch that the four sons of Clothaire, fearing the prestige which would attach to whoever of them might possess it, made it a sort of neutral town, though after all it was seized by Sigebert, king of Austrasia, Chilperic, king of Neustria (who managed to keep possession for some time, and repaired the amphitheatre), and Guntram, king of Burgundy. The last sovereign had to defend himself in 585 against the pretender Gondovald, whose ambition aspired to uniting the whole of Gaul under his dominion, and marching on Paris to make it the seat of the half-barbarian half-Roman administration of the kingdom of which he had dreamed.

Numerous calamities befell Paris from 586, when a terrible conflagration took place, to the close of the Merovingian dynasty. During a severe famine Bishop Landry sold the church plate to alleviate the distress of the people, and it was probably he who, in company with St Eloi (Eligius), founded the Hotel Dieu. The kings in the long run almost abandoned the town, especially when the Austrasian influence under the mayors of the palace tended to shift the centre of the Frankish power towards the Rhine.

Though the Merovingian period was for art a time of the deepest decadence, Paris was nevertheless adorned and enriched by pious foundations. Mention has already been made of the abbey of St Peter, which became after the death of Clevis the abbey of St Genevieve. On the same side of the river, but in the valley, Childebert, with the assistance of Bishop St Germain, founded St Vincent, known a little later as St Germain-des-Pres, which was the necropolis of the Frankish kings before St Denis. On the right bank the same king built St Vincent le Rond (afterwards St Germain l'Auxerrois), and in La Cite, beside the cathedral of St Etienne, the basilica of Notre Dame, which excited the admiration of his contemporaries, and in the 12th century obtained the title cf cathedral. Various monasteries were erected on both sides of the river, and served to group in thickly- peopled suburbs the population, which had grown too large for the island.

HISTORY]

The first Carolingian, Pippin the Short, occasionally lived at Paris, sometimes in the palace of Julian, sometimes in the old palace of the Roman governors of the town, at the lower end of the island: the latter ultimately became the usual residence. Under Charlemagne Paris ceased to be capital; and under Charles the Bald it became the seat of mere counts. But the invasions of the Northmen attracted general attention to the town, and showed that its political importance could no longer be neglected. When the suburbs were pillaged and burned by the pirates, and the city regularly besieged in 885, Paris was heroically defended by its " lords," and the emperor Charles the Fat felt bound to hasten from Germany to its relief. The pusillanimity which he showed in purchasing the retreat of the Normans was the main cause of his deposition in 887, while the courage displayed by Count Odo, or Eudes, procured him the crown of France; Robert, Odo's brother, succeeded him; and, although Robert's son, Hugh the Great, was only duke of France and count of Paris, his power counterbalanced that of the last of the Carolingians, shut up in Laon as their capital.

With Hugh Capet in 987 the capital of the duchy of France definitively became the capital of the kingdom, and in spite of the frequent absence of the kings, several of whom preferred to reside at Orleans, the town continued to increase in size and population, and saw the development of those institutions which were destined to secure its greatness. Henry I. founded the abbey of St Martin-des- Champs, Louis VI. that of St Victor, the mother-house of an order, and a nursery of literature and theology. Under Louis VII. the royal domain was the scene of one of the greatest artistic revolutions recorded in history: the Romanesque style of architecture was exchanged for the Pointed or Gothic, of which Suger, in his reconstruction of the basilica of St Denis, exhibited the earliest type. The capital could not remain aloof from this movement; several sumptuous buildings were erected; the Romanesque choir of St Germain- des-Pres was thrown down to give place to another more spacious and elegant; and when, in 1163, Pope Alexander III. had solemnly consecrated it, he was invited by Bishop Maurice de Sully to lay the first stone of Notre Dame de Paris, a cathedral on a grander scale than any previously undertaken. Paris still possesses the Romanesque nave of St Germain-des-Pres, preserved when the building was rebuilt in the 12th century; the Pointed choir, consecrated in 1163; and the entire cathedral of Notre Dame, which, completed sixty years later, underwent various modifica- tions down to the beginning of the 14th century. The sacristy is modern; the site previous to 183 1 was occupied by the episcopal palace, also built by Maurice de Sully, who by a new street had opened up this part of the

island. It was Louis VII. also who granted to the Templars the piece of marshland on the left bank of the Seine on which the Paris Temple, 1 the headquarters of the order in Europe, was built (see Templars).

Philip Augustus may be considered the second founder of Paris. He seldom quitted it save for his military expeditions, and he there built for himself, near St Germain l'Auxerrois, the Louvre, the royal dwelling par excellence, whose keep was the official centre of feudalism. He created or organized a regular system of administration, with its headquarters at Paris; and under his patronage the public lectures delivered at Pre-aux- Clercs were regulated and grouped under the title of a university in 1200.

This university, the most famous and flourishing in Christen- dom, considerably augmented the local population, and formed as it were a new town on the left side of the river, where the great fortified precincts of the Templars, the important abbeys of Ste Genevieve, St Germain-des-Pres and St Victor, and a vast

1 After the suppression of the Templars in 1312 the Temple was assigned to the Knights of St John. It was used as a state prison in the 14th century, and as barracks in the 16th. The church and the greater part of the other buildings survived in the 17th century. At the Revolution the keep (1265 or 1270) alone survived of the Templars' buildings. It was here that Louis XVI. and the royal family were imprisoned. It became a place of pilgrimage for the Royalists, and was, in consequence, pulled down under the Empire , in 181 1. Its site is occupied by the Place du Temole.

Carthusian monastery already stood. Colleges were erected to receive the students of the different countries, and became the great meeting-place of the studious youth of all Europe.

The right side of the river, where commerce and industry had taken up their abode, and where the Louvre, the abbey of St Martin, and a large number of secondary religious establish- ments were already erected, became a centre of activity at least as important as that on the left. The old suburbs, too, were now incorporated with the town and enclosed in the new line of fortifications constructed by Philip Augustus, which, however, did not take in the great abbeys on the left side of the river, and thus obliged them to build defensive works of their own.

Philip Augustus issued from the Louvre a celebrated order, that the streets of the town should be paved. Not far from his palace, on the

site of the present Halles Centrales, he laid out an extensive cemetery and a market-place, which both took their name from the Church of the Innocents, a building of the same reign, destroyed at the Revolution. Fountains were placed in all the quarters. As for the lighting of the town, till the close of the 1 6th century the only lamps were those in front of the madonnas at the street corners. But the first " illumination " of Paris occurred under Philip Augustus: on his return from a victorious expedition to Flanders in 12 14 he was welcomed by the Parisians as a conqueror; and the public rejoicings lasted for seven days, " interrupted by no night," says the chronicler, alluding to the to:ches and lamps with which the citizens lighted up the fronts of their houses. Ferrand, count of Flanders, the traitor vassal, was dragged behind the king to the dungeons of the Louvre.

In 1226 there was held at Paris a council which, by excommunicating Raymond VII., count of Toulouse, helped to prepare the way for the most important treaty which had as yet been signed in the capital. By this treaty (April 12, 1229) the regent, Blanche of Castile, the widow of Louis VIII. , obtained from Raymond VII. a great part of his possessions, while the remainder was secured to the house of Capet through the marriage of Alphonse of Poitiers, brother of St Louis, with Jeanne, the heiress of Languedoc.

In affection for his capital St Louis equalled, or even surpassed, his grandfather Philip, and Paris reciprocated his goodwill. The head of the administration was at that time the provost of Paris, a judiciary magistrate and police functionary whose extensive powers had given rise to the most flagrant abuses. Louis IX. reformed this office and filled it with the judge of greatest integrity to be found in his kingdom. This was the famous Etienne Boileau, who showed such vigilance and upright- ness that the capital was completely purged of evildoers; the sense of security thus produced attracted a certain number of new inhabitants, and, to the advantage of the public revenue, increased the value of the trade. It was Etienne Boileau who, by the king's express command, drew up those statutes of the commercial and industrial gilds of Paris which, modified by the necessities of new times and the caprice of princes, remained in force till the Revolution.

St Louis caused a partial restoration of St Germain l'Auxerrois, his parish church (completed in the 15th century, and deplorably altered under Louis XV.); and besides preferring the palace of La Cite to the Louvre, he entirely rebuilt it, and rendered it one of the most comfortable residences of his time. Of this edifice there still remain, among the buildings of the present Palais de Justice, the great guard-

room, the kitchens with their four enormous chimneys, three round towers on the quay, and { one of the marvels of the middle ages, the Sainte Chapelle, erected in 1248 to receive the crown of thorns sent from Con- stantinople. This church, often imitated during the 13th and 14th centuries, is like an immense shrine in open work; its large windows contain admirable stained glass of its own date, and its paintings and sculptures (restored in the 19th century by Viollet-le-Duc) give a vivid picture of the religious beliefs of the middle ages. It has a lower storey ingeniously arranged, which served as a chapel for the palace servants. The Sainte £hapelle was designed by Pierre de Montereau, one of the most

celebrated architects of his time, to whom is attributed another marvel still extant, the refectory of the abbey of St Martin, now occupied by the library of the Conservatoire des Arts et des Metiers. This incomparable artist was buried in the abbey of St Germain-des-Pres, where, too, he had raised magnificent buildings now no longer existing. Under St Louis, Robert de Sorbon, a common priest, founded in 1253 an unpretending theological college which afterwards became the celebrated faculty of the Sorbonne, whose decisions were wellnigh as authoritative as those of Rome.

The capital of France had but a feeble share in the communal movement which in the north characterizes the nth, 12th and 13th centuries. Placed directly under the central power, it was never strong enough to force concessions; and in truth it did not claim them, satisfied with the advantages of all kinds secured for it by its political position and its university. And, besides, the privileges which it did enjoy, while they could be revoked at the king's pleasure, were of considerable extent. Its inhabit- ants were not subjected to forced labour or arbitrary imposts, and the liberty of the citizens and their commerce and industry were protected by wise regulations. The university and all those closely connected with it possessed the fullest rights and liberties. There was a municipal or bourgeois militia, which rendered the greatest service to Philip Augustus and St Louis, but afterwards became an instrument of revolt. The communal administration devolved on Schevins or juris, who, in conjunction with the notables, chose a nominal mayor called provost of the merchants (prevdt des marchands). The powers of this official had

been grievously curtailed in favour of the provost of Paris and his lieutenants, named by the sovereign. His main duties were to regulate the price of provisions and to control the incidence of taxation on merchandise. He was the chief inspector of bridges and public wells, superintendent of the river police, and commander of the guard of the city walls, which it was also his duty to keep in repair. And, finally, he had jurisdiction in commercial affairs until, the creation of the consular tribunals by the chancellor Michel L'Hopital. The violent attempts made by Etienne Marcel in the 14th century, and those of the communes of 1793 and 187 1, showed what reason royalty had to fear too great an expansion of the municipal power at Paris.

The town council met in the 13th and 14th centuries in an unpretending house on Ste Genevieve, near the city walls on the left side of the river. The municipal assemblies were afterwards held near the Place de Greve, on the right side of the river, in the " Maison aux Piliers," which Francis I. allowed to be replaced by an imposing hotel de ville.

The last of the direct descendants of Capet, and the first two Valois kings did little for their capital. Philip the Fair, however, increased its political importance by making it the seat of the highest court in the kingdom, the parlement, which he organized between 1302 and 1304", and to which he surrendered a part of his cite palace. Under the three sons of Philip the Fair, the Tour de Nesle, which stood opposite, on the site now occupied by the buildings of the Institute, was the scene of frightful orgies, equally celebrated in history and romance. One of the queens, who, if the chronicles are to be trusted, took part in these expiated her crimes in Chateau-Gaillard, where she was strangled in 13 15 by order of her husband, Louis X. During the first part of the War of the Hundred Years, Paris escaped being taken by the English, but felt the effects of the national misfortunes. Whilst destitution excited in the country the revolt of the Jacquerie, in the city the miseries of the time were attributed to the vices of the feudal system, and the citizens seemed ready for insurrection. The provost of the merchants, fitienne Marcel, equally endowed with courage and intellect, sought to turn this double movement to account in the interest of the municipal liberties of Paris and of constitutional guaran- tees. The cause which he supported was lost through the violence of his own acts. Not content with having massacred two ministers under the very eyes of the dauphin Charles, who was regent whilst his father John lay captive in London, he

joined the Jacquerie, and was not afraid to call into Paris the king of Navarre, Charles the Bad, a notorious firebrand, who at that time was

making common cause with the English. Public sentiment, at first favourable to Marcel's schemes, shrank from open treason. A watch was set on him, and, at the moment when, having the keys of the town in his possession in virtue of his office, he was preparing to open one of the gates, he was assassinated by order of Jean Maillard, one of the heads of the milice, on the night of the 31st of July 1358. Marcel had en- larged Philip Augustus's line of fortifications on the right side of the river, and had begun a new one.

When he became king in 1364, Charles V. forgot the outrages he had suffered at the hands of the Parisians during his regency. He robbed the Louvre to some extent of its military equipment, in order to make it a convenient and sumptuous residence; his open-work staircases and his galleries are mentioned in terms of the highest praise by writers of the time. This did not, however, remain always his favourite palace; having built or rebuilt in the St Antoine quarter the mansion of St Paul or St Pol, he was particularly fond of living in it during the latter part of his life, and it was there that he died in 1380. It was Charles V. who, in conjunction with the provost of Paris, Hugues Aubriot, erected the famous Bastille to protect the St Antoine gate as part of an enlarged scheme of fortification. A library which he founded — a rich one for the times — became the nucleus of the national library. With the exception of some of the upper portions of the Sainte Chapelle, which were altered or recon- structed by this prince or his son Charles VI., there are no remains of the buildings of Charles V.

The reign of Charles VI. was as disastrous for the city as that of his father had been prosperous. From the very accession of the new king, the citizens, who had for some time been relieved by a great reduction of the taxes, and had received a promise of further alleviation, found themselves subjected to the most odious fiscal exactions on the part of the king's uncle, who was not satisfied with the well-stored treasury of Charles V., which he had unscrupulously pillaged. In March 1382 occurred what is called the revolt of the " Maillotins " (i.e. men with mallets). Preoccupied with his expedition against the Flemings, Charles VI. delayed putting down the revolt, and for the moment remitted the new taxes. On his victorious return on the 10th of January 1383, the Parisians in alarm drew up their forces in front of the town gates under the pretext of showing their sovereign what aid he might derive from them, but really in order to intimidate him. They were ordered to retire within the walls and to lay down their arms, and they obeyed. The king and his uncles, having destroyed the gates, made their way into Paris as into a besieged city; and with the decapitation of Desmarets, one of the most faithful servants of the Crown, began a series of bloody executions. Ostensibly through the

intercession of the regents an end was put to that species of severities, a heavy fine being substituted, much larger in amount than the annual value of the abolished taxes. The municipal administration was suspended for several years, and its functions bestowed on the provost of Paris, a magistrate nominated by the Crown.

The calamities which followed were due to the weakness and incapacity of the government, given over, because of the madness of Charles VI., to the intrigues of a wicked queen and of princes who brought the most bloodthirsty passions to the service of their boundless ambition. First came the rivalry between the dukes of Orleans and Burgundy, brought to an end in 1407 by assassination of the former. Next followed the relentless struggle for supremacy between two hostile parties: the Armagnacs on one side, commanded by Count Bernard of Armagnac (who for a brief period had the title of constable), and supported by the nobles and burgesses; and on the other side the Burgundians, depending on the common people, and recognizing John the Fearless, duke of Burgundy, as their head. The mob was headed by a skinner at the H6tel Dieu called Simon Caboche, and hence the name Cabochiens was given to the Burgundian party in Paris. They became masters of Paris

in 141 2 and 1413; but so violent were their excesses that the most timid rose in revolt, and the decimated bourgeoisie managed by a bold stroke to recover possession of the town. The Armagnacs again entered Paris, but their intrigues with England and their tyranny rendered them odious in their turn; the Burgundians were recalled in 1418, and returned with Caboche and a formidable band of pillagers and assassins. Perrinet Leclerc, son of a bourgeois guard, secretly opened the gates to them one night in May. The king resided in the H6tel St Paul, an unconscious spectator of those savage scenes which the princes Louis and John, successively dauphins, were helpless to prevent.

The third dauphin, Charles, afterwards Charles VII., managed to put an end to the civil war, but it was by a crime as base as it was impolitic — the assassination of John the Fearless on the bridge of Montereau in 1419. Next year a treaty, from the ignominy of which Paris happily escaped, gave a daughter of Charles VI. to Henry V. of

England, and along with her, in spite of the Salic law, the crown of France. The king of England made his entry into Paris in December 1420, and was there received with a solemnity which ill concealed the misery and real consternation of the poor people crushed by fifteen years of murders, pillage and famine. Charles VI. remained almost abandoned at the Hotel St Paul, where he died in 1422, whilst his son-in-law went to hold a brilliant court at the Louvre and Vincennes. Henry V. of England also died in 1422. His son Henry VI., then one year old, came to Paris nine years later to be crowned at Notre Dame, and the city continued under the government of the duke of Bedford till his death in 1435.

The English rule was a mild one, but it was not signalized by the execution of any of those works of utility or ornament so characteristic of the kings of France. The choir of St Severin, however, shows a style of architecture peculiarly English, and Sauval relates that the duke of Bedford erected in the Louvre a fine gallery decorated with paintings. Without assuming the mission of delivering Paris, Joan of Arc, remaining with Charles VII. after his coronation at Reims, led him towards the capital; but the badly conducted and abortive enterprise almost proved fatal to the Maid of Orleans, who was severely wounded at the assault of the gate of St Honore on the 8th of September 1429. The siege having been raised, Charles awaited the invi- tation of the Parisians themselves upon the defection of the Burgundians and the surrender of St Denis. The St Jacques gate was opened by the citizens of the guard to the constable de Richemont 1 on the 13th of April 1436; but the solemn entry of the king did not take place till November of the following year; subsequently occupied by his various expeditions or attracted by his residences in Berry or Touraine, he spent but little time in Paris, where he retired either to the Hotel St Paul or to a neighbouring palace, Les Tournelles, which had been acquired by his father.

Louis XL made equal use of St Paul and Les Tournelles, but towards the close of his life he immured himself at Plessis-les- Tours. It was in his reign, in 1469, that the first French printing- press was set up in the Sorbonne. Charles VIII. scarcely left Plessis-les-Tours and Amboise except to go to Italy; Louis XII. alternated between the castle at Blois and the palace of Les Tournelles, where he died on the 1st of January 1515.

Francis I. lived at Chambord, at Fontainebleau, at St Germain, and at Villers-Cotterets; but he proposed to form at Paris a residence in keeping with the taste of the Renaissance. Paris had remained for more than thirty years almost a stranger to the artistic movement

begun between 1498 and 1500, after the Italian expedition. Previous to 1533, the date of the com- mencement of the Hotel de Ville and the church of St Eustache, Paris did not possess, apart from the ” Court of Accounts,” any important building in the new style. Between 1527 and 1540 Francis I. demolished the old Louvre, and in 1541 Pierre Lescot began a new palace four times as large, which was

1 Arthur, earl of Richmond, afterwards Arthur III. (q.v.), duke of Brittany.

not finished till the reign of Louis XIV. The buildings were not sufficiently advanced under Henry II. to allow of his leaving Les Tournelles, where in 1559 he died from a wound received at a tournament. His widow, Catherine de’ Medici, immediately caused this palace to be demolished, and sent her three sons — Francis II., Charles IX. and Henry III. — to the unfinished Louvre. Outside the line of the fortifications she laid the foundations of the Chateau des Tuileries as a residence for herself.

Of the three brothers, it was Charles IX. who resided most at the Louvre; it was there that in 1572 he signed the order for the massacre of St Bartholomew. Henry III. remained for the most part at Blois, and hardly came to Paris except to be witness of the power of his enemies, the Guises.

Taking advantage of the absence of the kings, the League had made Paris a centre of opposition. The municipal militia were restored and reorganized; each of the 16 quarters or arron- dissements had to elect a deputy for the central council, which became the council, or rather faction, of The Sixteen, and for four years, from 1587 to 1591, held the city under a yoke of iron. Henry III., having come to the Louvre in 1588, unwillingly received there the duke of Guise, and while endeavouring to take measures for his own protection provoked a riot known as the Day of the Barricades (May 12). It was with difficulty that he escaped from his palace, which at that time had no communication with the country, and which Henry IV. after- wards proposed to unite with the Tuileries in order to provide a sure means of escape in case of need.

When, after the murder of the duke of Guise at Blois at the close of 1588, Henry III. desired to return to Paris, he was not yet master of the city, and was obliged to besiege it in concert with his presumptive heir, the king of Navarre. The operations were suddenly interrupted on the 1st of August 1589, by the assassination of the king, and Henry IV. carried his arms else- where. He returned with his victorious forces

in 1590. This second siege lasted more than four years, and was marked by terrible suffering, produced by famine and the tyranny of The Sixteen, who were supported by the intrigues of the king of Spain and the violent harangues of the preachers. Even the conversion of the king did not allay the spirit of fanaticism, for the king's sincerity was suspected, and the words (which history, however, fails to substantiate), " Paris is surely worth a mass," were attributed to him. But after the coronation of the king at Chartres the commonalty of Paris, weary of intriguing with strangers and Leaguers, gave such decided expression to its feelings that those of its leaders who had kept aloof, or broken off from the faction of The Sixteen attached themselves to the parlement, which had already evaded the ambitious designs of the king of Spain; and after various negotiations the provost of the merchants, L'Huillier, offered the keys of the city to Henry IV. on the 22nd of March 1594. The king met no resist- ance except on the part of a company of German landsknechts, which was cut in pieces, and the students of the university, who, steeped in the doctrines of the League, tried to hold their quarter against the royal troops, but were dispersed. The Spanish soldiers who had remained in the town decamped next day.

Henry IV., who carried on the building of the Louvre, was the last monarch who occupied it as a regular residence. Attempts on his life were made from time to time, and at last, on the 14th of May 1610, he fell under Ravaillac's knife near the market-house in Rue de la Ferronnerie.

Whether royalty gave it the benefit of its presence or not, Paris continued all the same to increase in political importance and in population. Here is the picture of the city presented about 1560 by Michel de Castelnau, one of the most celebrated chroniclers of the 16th century: —

” Paris is the capital of all the kingdom, and one of the most famous in the world, as well for the splendour of its parlement (which is an illustrious company of thirty judges attended by three hundred advocates and more, who have reputation in all Christendom of being the best seen in human laws and acquainted with justice) as for its faculty of theology and for the other tongues and sciences,

which shine more in this town than in any other in the world, besides the mechanic arts and the marvellous traffic which render it very populous, rich and opulent ; in such sort that the other towns of France and all the magistrates and subjects have their eyes directed thither as to the model of their decisions and their political administrations.”

Castelnau spoke rather as a statesman and a magistrate, and did not look close enough to see that the university was beginning to decline. The progress of the sciences somewhat lessened the importance of its classes, too specially devoted to theology and literature; the eyes of men were turned towards Italy, which was then considered the great centre of intellectual advance; the colleges of the Jesuits were formidable rivals; the triumphs of Protestantism deprived it of most of the students, who used to flock to it from England, Germany and Scandi- navia; and finally the unfortunate part it played in political affairs weakened its influence so much that, after the reign of Henry IV. it no longer sent its deputies to the states-general.

If the city on the left side of the river neither extended its circuit nor increased its population, it began in the 16th century to be filled with large mansion?, (hotels), and its communi- cations with the right bank were rendered easier and more direct when Henry IV. constructed across the lower end of the island of La Cite the Pont Neuf, which, though retaining its original name, is now the oldest bridge in Paris. On the right side of the river commerce and the progress of

centralization continued to attract new inhabitants, and old villages become suburbs were enclosed within the line of a bastioned first enceinte, the ramparts of Etienne Marcel being, however, still left untouched. Although Louis XIII., except during his minority, rarely stayed much in Paris, he was seldom long absent from it. His mother, Mary de' Medici, built the palace of the Luxembourg, which, after being extended under Louis Philippe, became the seat of the senate.

Louis XIII. finished, with the exception of the eastern front, the buildings enclosing the square court of the Louvre, and carried on the wing which was to join the palace to the Tuileries. Queen Anne of Austria founded the Val de Grace, the dome of which, afterwards painted on the interior by Mignard, remains one of the finest in Paris. Richelieu built for himself the Palais Royal, since restored, and rebuilt the Sorbonne, where now stands his magnificent tomb by Girardon. The island of St Louis above La Cite, till then occupied by gardens and meadows, became a populous parish, whose streets were laid out in straight lines, and whose finest houses still date from the 17th century. Building also went on in the Quartier du Marais (quarter of the marsh) ; and the whole of the Place Royale (now Place des Vosges), with its curious arcaded galleries, belongs to this period. The church of St Paul and St Louis was built by the Jesuits beside the ruins of the old Hotel St Paul; the church of St Gervais received a facade which has become in our time too famous. St Etienne du Mont and St Eustache were completed (in the latter case with the exception of the front). The beautiful Salle des Pas-Perdus (Hall of Lost Footsteps) was added to the Palais de Justice. Besides these buildings and extensions Paris was indebted to Louis XIII. and his minister Richelieu for three important institutions — the royal printing press in 1620, the Jardin des Plantes in 1626, and the French Academy in 1635. The bishopric of Paris was' separated from that of Sens and erected into an archbishopric in 1623.

As memorials of Mazarin Paris still possesses the College des Quatre-Nations, erected with one of his legacies immediately after his death, and since appropriated to the Institute, and the palace which, enlarged in the 19th century, now accom- modates the national library.

The stormy minority of Louis XIV. was spent at St Germain and Paris, where the court was held at the Palais Royal. The intrigues of the prince of Conde, Cardinal de Retz, and (for a brief space) Turenne resulted in a siege of Paris, during which more epigrams than balls were fired off; but the cannon of the Bastille, discharged by order of Mademoiselle de Montpensier, enabled Conde to enter the city. Bloody riots followed, and came to an end only with the exhaustion of the

populace and

its voluntary submission to the king. Though Louis XIV. ceased to stay in Paris after he grew up, he did not neglect the work of embellishment. On the site of the fortifications of Etienne Marcel, which during the previous hundred years had been gradually disappearing, he laid out the line of boulevards connecting the quarter of the Bastille with that of the Madeleine. Though he no longer inhabited the Louvre (and it never was again the seat of royalty), he caused the great colonnade to be constructed after the plans of Claude Perrault. This immense and imposing facade, 548 ft. long, has the defect of being quite out of harmony with the rest of the building, which it hides instead of introducing. The same desire for effect, altogether irrespective of congruity, appears again in the observatory erected by the same Perrault, without the smallest consideration of the wise suggestions made by Cassini. The Place Vend6me, the Place des Victoires, the triumphal gates of St Denis and St Martin and several fountains, are also productions of the reign of Louis XIV. The hospital of La Salpetriere, with its majestically simple dome, was finished by Liberal Bruant. The Hotel des Invalides, one of the finest institutions of the grand monarque, was also erected, with its chapel, between 167 1 and 1675, by Bruant; but it was reserved for the architect Hardouin Mansart to give to this imposing edifice a complement worthy of itself: it was he who raised the dome, admirable alike for its proportions, for the excellent distribution of its ornaments, and for its gilded lantern, which rises 344 ft. above the ground. ” Private persons,” says Voltaire, ” in imitation of their king, raised a thousand splendid edifices. The number increased so greatly that from the neighbourhood of the Palais Royal and of St Sulpice there were formed in Paris two new towns much finer than the old one.” All the aristocracy had not thought fit to take up their residence at Versailles, and the great geniuses of the century, Corneille, Racine, La Fontaine, Moliere, Madame de Sevigne, had their houses in Paris; there also was the Hotel de Rambouillet, so famous in the literary history of the 17th century.

The halls of the Palais Royal during the minority of Louis XV. were the scene of the excesses of the regency; later on the king from time to time resided at the Tuileries, which henceforward came to. be customarily regarded as the official seat of the monarchy. To the reign of Louis XV. are due the rebuilding of the Palais Royal, the ” Place ” now called De la Concorde, the military school, the greater part of the church of Ste Genevieve, or Pantheon (a masterpiece of the architect Soufflot) , the church of St Roch, the palace of the Elysee (now the residence of the president of the republic), the Palais Bourbon (with

the exception of the facade), now occupied by the chamber of deputies, and the mint, a majestic and scholarly work by the architect Antoine, as well as the rebuilding of the College de France.

Louis XVI. finished or vigorously carried on the works begun by his grandfather. He did not come to live in Paris till com- pelled by the Revolution. That historical movement began indeed at Versailles on the 17th of June 1789, when the states- general were transformed into a constituent assembly; but the first act of violence which proved the starting-point of all its excesses was performed in Paris on the 14th of July 1789 when Paris inaugurated, with the capture of the Bastille, its ” national guard,” organized and then commanded by the celebrated La Fayette. At the same time the assassination of the last provost of the merchants, Jacques de Flesselles, gave the opportunity of establishing, with more extended powers, the mairie (mayoralty) of Paris, which was first occupied by Bailly, and soon became, under the title of commune, a political power capable of effectively counterbalancing the central authority. 1

Paris had at that time once more outgrown its limits. The quarter on the left side of the river had more than doubled its extent by the accession of the great monasteries, the faubourgs of St Germain and St Marceau, the Jardin des Plantes, and

1 Owing to the armed and organized revolutionary elements in the assemblies of the Sections, which enabled the revolutionary commune to direct and control popular emeutes.

the whole of Mont Ste Genevieve. The line of the new enceinte is still marked by a circuit of boulevards passing from the Champs de Mars at Pont d’Austerlitz by Place de l’Enfer and Place dTtalie. Similar enlargements, also marked out by a series of boulevards, incorporated with the town on the right side of the faubourgs of St Antoine and Poissonniere and the quarters of La Chaussee d’Antin and Chaillot. In 1784 was begun, instead of a line of fortifications, a simple customs-wall, with sixty propylaea or pavilions in a heavy but characteristic style, of which the finest are adorned with columns or pilasters like those of Paestum. In front of the Place du Trone (now Place de ia Nation), which formed as it were a facade for Paris on the east side,

there were erected two lofty rostral columns bearing the statues of Philip Augustus and St Louis. Towards the west, the city front was the Place Louis XV. (Place de la Concorde), preceded by the magnificent avenue of the Champs Elysees. Between the barriers of La Villette and Pantin, where the highways for Flanders and Germany terminated, was built a monumental rotunda flanked on the ground floor by four peristyles arranged as a Greek cross, and in the second storey lighted by low arcades supported by columns of the Paestum type. None of these works were completed till the time of the empire. It was also in the latter part of the reign of Louis XIV., and under the first republic, that the quarter of La Chaussee d'Antin was built.

The history of Paris during the Revolutionary period is the history rather of France, and to a certain extent of the whole world (see France: History; French Revolution; and the articles on the Jacobins and other clubs). During the Consulate hardly anything of note took place at Paris except the explosion of the infernal machine directed against Bonaparte on the 24th of December 1800.

The coronation of Napoleon by Pope Pius VII. was celebrated in Notre Dame on the 2nd of December 1804. Eight years later, during the Russian campaign, the conspiracy of General Malet, happily suppressed, was on the point of letting loose on all France a dreadful civil war. The empire, however, was then on the wane, and Paris was witness of its fall when, after a battle on the heights of Montmartre and at the barricre de Clichy, the city was obliged to surrender to the allies on the 30th of March 1814.

For the next two months the city was in the occupation of the allies and witnessed a hitherto unique assembly of sovereigns and statesmen. Their deliberations issued on the 30th of May 1814 in the first treaty of Paris (see Paris, Treaties of, below). So far as the city itself was concerned, the only permanent loss that it suffered through the occupation was that of the art treasures with which Napoleon had enriched it at the expense of other capitals; among these were many paintings and pieces of statuary from the Louvre, and the famous bronze horses from Venice, which were taken down from the triumphal arch of the Carrousel and restored to the facade of St Mark's. The expressed determination of Bliicher and his Prussians to blow up the Pont de Jena, built to commemorate Napoleon's crushing victory of 1806, was frustrated by the vigorous intervention of Wellington and of the emperor Alexander I.

Paris under the Restoration witnessed the revival of religious ceremonials to which it had long been unaccustomed, notably the

great Corpus Christi procession, in which the king himself carried a candle. Then came Napoleon's return from Elba (March 1815) and the interlude of the Hundred Days. After Waterloo, though there was fighting round Paris, there was no effort to defend the city against the allied armies; for the Parisians had grown thoroughly weary of Napoleon, and Louis XVIII. , though he returned " in the baggage train of the enemy," was received by the populace with rapturous acclamation (see Louis XVIII.). The second treaty of Paris was signed on the 20th of November of the same year (see below). It left France in the occupation of 150,000 foreign troops, and the crown and government under the tutelage of a committee of representatives of the foreign great powers in Paris.

Paris now became the centre of the royalist reaction, and of

a political proscription which reflected, though without its popular excesses, the White Terror of the South. The most conspicuous event of this time was the tragedy of the trial and execution of Marshal Ney (q.v.). For the rest, the only event of note that occurred in Paris under Louis XVIII. was the assassination of the duke of Berry by Louvel on the 13th of February 1820. Ten years later the revolution of 1830, 1 splendidly commemorated by the Column of July in Place de la Bastile, put Charles X. to flight and inaugurated the reign of Louis Philippe, a troublous period which was closed by the revolution of 1848 and a new republic. It was this reign; however, that surrounded Paris with bastioned fortifications with ditches and detached forts, the outcome of the warlike fever aroused by the exclusion of France from the treaty of London of 1840 (see Mehemet Ali). The republic of 1848 brought no greater quiet to the city than did the reign of Louis Philippe. The most terrible insurrection was that of the 23rd-26th of June 1848, distinguished by the devotion and heroic death of the Archbishop Afire. It was quelled by General Cavaignac, who then for some months held the executive power. Prince Louis Napoleon next became president of the republic, and after dissolving the chamber of deputies on the 2nd of December 185 1, caused himself to be proclaimed emperor just a year later.

The second empire completed that material transformation of Paris which had already been begun at the fall of the ancient monarchy. First came numerous cases of destruction and demolition caused by the suppression of the old monasteries and of many parish churches. A number of medieval buildings, civil or military, were cleared away for the sake of regularity of plan and improvements in the public streets, or to satisfy the taste of the owners, who thought more of their comfort or profit than of the historic interest of their old mansions or

houses.

It was under the first empire that the new series of improve- ments were inaugurated which have made Paris a modern city. Napoleon began the Rue de Rivoli, built along this street the wing intended to connect the Tuileries with the Louvre, erected in front of the court of the Tuileries the triumphal arch of the Carrousel, in imitation of that of Septimius Severus at Rome: In the middle of the Place Vend6me was reared, on the model of Trajan's column, the column of the Grand Army, surmounted by the statue of the emperor. To immortalize this same Grand Army he ordered from the architect Pierre Vignon a Temple of Victory, which without changing the form of its Corinthian peristyle has become the church of the Madeleine; the entrance to the avenue of the Champs Elysees was spanned by the vast triumphal arch De 1'Etoile (of the star), which owes its celebrity not only to its colossal dimensions and its magnificent situation, but also to one of the four subjects sculptured upon its faces — the Chant du depart or Marseillaise, one of the masterpieces of Rude and of modern sculpture. Another masterpiece was executed by David of Angers— the pediment of the Pantheon, not less famous than Soufflot's dome. The museum of the Louvre, founded by decree of the Convention on the 27th of July 1793, was organized and considerably enlarged; that of the Luxembourg was created in 1805, but was not appropriated exclusively to modern artists till under the Restoration. The Conservatoire des Arts et Metiers, due to the Convention, received also considerable additions in the old priory or abbey of St Martin des Champs, where the council of the.Five Hundred had installed it in 1798.

Under the Restoration and under the government of July many new buildings were erected; but, with the exception of the Bourse, constructed by the architects Brongniart and Labarre, and the colonnade of the Chamber of Deputies, these are of interest not so much for their size as for the new artistic tendencies affected in their architecture. People had grown weary of the eternal Graeco-Roman compilations rendered

1 Notable in the history of the city for the discovery by the populace of the effectiveness of barricades against regular troops. These had been last used in the Fronde.

fashionable by the Renaissance, and reduced under the empire to mere imitations, in producing which all inspiration was repressed. The necessity of being rational in architecture, and of taking full account of practical wants, was recognized; and more suggestive and plastic models were sought in the past. These were to be found, it was believed, in Greece; and in conse- quence the government under Louis Philippe saw itself obliged to found the French school at Athens, in order to allow young artists to study their favourite types on the spot. In the case of churches it was deemed judicious to revive the Christian basilicas of the first centuries, as at Notre Dame de Lorette and St Vincent de Paul; and a little later to bring in again the styles of the middle ages, as in the ogival church of St Clotilde.

Old buildings were also the object of labours more or less important. The Place de la Concorde was altered in various ways, and adorned with eight statues of towns and with two fountains; on the 25th of October 1836 the Egyptian obelisk, brought at great expense from Luxor, was erected in the centre. The general restoration of the cathedral of Notre Dame was voted by the Chamber in 1845, and entrusted to Viollet-le-Duc; and the palace of the Luxembourg and the H6tel de Ville were considerably enlarged at the same time, in the style of the existing edifices.

But the great transformer of Paris in modern times was Napoleon III. To him or to his reign we owe the Grand Op6ra, the masterpiece of the architect Garnier; the new H6tel-Dieu; the finishing of the galleries which complete the Louvre and connect it with the Tuileries; the extension of the Palais de Justice and its new front on the old Place Dauphine; the tribunal of commerce; the central markets; several of the finest railway stations; the viaduct at Auteuil; the churches of La Trinite, St Augustin, St Ambroise, St Francois Xavier, Belleville, M6nilmontant, &c. For the first international Paris exhibition (that of 1855) was constructed the ” palace of industry “; the enlargement of the national library was commenced; the museum of French antiquities was created by the savant Du Sommerard, and installed in the old ” h6tel ” built at the end of the 15th century for the abbots of Cluny.

All this is but the smallest part of the memorials which Napoleon III. left of his presence. Not only was the city traversed in all directions by new thoroughfares, and sumptuous houses raised or restored in every quarter, but the line of the fortifications was made in 1859 the limit of the city. The area was thus doubled, extending to 7450 hectares or

18,410 acres, instead of 3402 hectares or 8407 acres. It was otherwise with the population; to the 1,200,000 inhabitants which Paris possessed in 1858 the incorporation of the suburban zone only added 600,000.

Paris had to pay dear for its growth and prosperity under the second empire. This government, which, by straightening and widening the streets, thought it had effectually guarded against the attempts of its internal enemies, had not sufficiently defended itself from external attack, and at the first reverses of 1870 Paris found itself prepared to overthrow the empire, but by no means able to hold out against the approaching Prussians.

The two sieges of Paris in 1870-71 are among the most dramatic episodes of its history. The first siege began on the 19th of September 1870, with the occupation by the Germans of the heights on the left side of the river and the capture of the unfinished redoubt of Chatillon. Two days later the invest- ment was complete. General Trochu, head of the French Government and governor of the city, had under his command 400,000 men — a force which ought to have been able to hold out against the 240,000 Germans by whom it was besieged, had it not been composed for the most part of hurried levies of raw soldiers with inexperienced officers, and of national guards who, never having been subjected to strict military discipline, were a source of weakness rather than of strength. The guards, it is tiue, displayed a certain warlike spirit, but it was for the sole purpose of exciting disorder. Open revolt broke out on the 31st of October; it was suppressed, but increased the

demoralization of the besieged and the demands of the Prussians. The partial successes which the French obtained in engagements on both sides of the river were rendered useless by the Germans recapturing all the best positions; the severity of winter told heavily on the garrison, and the armies in the provinces which were to have co-operated with it were held in check by the Germans in the west and south. In obedience to public opinion a great sortie was undertaken; this, in fact, was the only alter- native to a surrender; for, the empire having organized every- thing in expectation of victory and not of disaster, Paris, insufficiently provisioned for the increase of population caused by the influx of refugees, was already suffering the horrors of famine. Accidental circumstances combined with the indecision of the leaders to render the enterprise a failure. Despatches sent by balloon to the army of the Loire instructing it to make a diversion reached their destination too late; the bridge of Champigny over the Marne could not be constructed in time; the most advantageous positions

remained in the hands of the Germans; and on the 2nd and 3rd of December the French abandoned the positions they had seized on the 29th and 30th of November. Another sortie made towards the north on the 21st of December was repulsed, and the besieged lost the Avron plateau, the key to the positions which they still held on that side. The bombardment began on the 17th of December, and great damage was done to the forts on the left of the Seine, especially those of Vanves and Issy, directly commanded by the Chatillon battery. A third and last sortie (which proved fatal to Regnault the painter) was attempted in January 1871, but resulted in hopeless retreat. An armistice was signed on the 27th of January, the capitulation on the 28th. The revictualling of the city was not accomplished without much difficulty, in spite of the generous rivalry of foreign nations (London alone sending provisions to the value of £80,000).

On the 1st of March the Germans entered Paris. This event, which marked the close of the siege, was at the same time the first preparation for the ” commune; ” for the national guard, taking advantage of the general confusion and the powerlessness of the regular army, carried a number of cannon to the heights of Montmartre and Belleville under pretext of saving them. President Thiers, appreciating the danger, attempted on the 1 8th of March to remove the ordnance; his action was the signal of an insurrection which, successful from the first, initiated a series of terrible outrages by the murder of the two generals, Lecomte and Thomas. The government, afraid of the defection of the troops, who were demoralized by failure and suffering, had evacuated the forts on the left side of the river and con- centrated the army at Versailles (the forts on the right side were still to be held for some time by the Germans). Mont Val6rien happily remained in the hands of the government and became the pivot of the attack during the second siege. All the sorties made by the insurgents in the direction of Ver- sailles (where the National Assembly was in session from the 20th of March) proved unsuccessful, and cost them two of their improvised leaders — Generals Flourens and Duval. The in- capacity and mutual hatred of their chiefs rendered all organization and durable resistance impossible. On Sunday the 21st of May the government forces, commanded by Marshal MacMahon, having already captured the forts on the right side of the river, made their way within the walls; but they had still to fight hard from barricade to barricade before they were masters of the city; Belleville, the special Red Republican quarter, was not assaulted and taken till Friday. Meanwhile the communists were committing the most horrible excesses: the archbishop of Paris (Georges Darboy, q.v.), President Bonjean, priests,

magistrates, journalists and private individuals, whom they had seized as hostages, were shot in batches in the prisons; and a scheme of destruction was ruthlessly carried into effect by men and women with cases of petroleum (pitroleurs and pUroleuses). The H6tel de Ville, the Palais de Justice, the Tuileries, the Ministry of Finance, the palace of the Legion of Honour, that of the Council of State, part of the Rue de Rivoli, &c, were ravaged by the flames; barrels of gunpowder

were placed in Notre Dame and the Pantheon, ready to blow up the buildings; and the whole city would have been involved in ruin if the national troops had not gained a last and crowning victory in the neighbourhood of La Roquette and Pere-la-Chaise on the 28th of May. Besides the large number of insurgents who, taken in arms, were pitilessly shot, others were afterwards condemned to death, to penal servitude, to transportation; and the survivors only obtained their liberty by the decree of 1870.

From this double trial Paris emerged diminished and almost robbed of its dignity as capital; for the parliamentary assemblies and the government went to sit at Versailles. For a little it was thought that the city would not recover from the blow which had fallen on it. All came back, however — confidence, prosperity, and, along with that, increasing growth of population and the execution of great public works. The H6tel de Ville was rebuilt, the school of medicine adorned with an imposing facade, a vast school of pharmacy established in the old gardens of the Luxembourg, and boulevards completed. The exhibition of 1878 was more marvellous than those of 1855 and 1867, and left a lasting memorial— the palace of the Trocadero. And the chambers in 1879 considered quiet sufficiently restored to take possession of their customary quarters in the Palais Bourbon and the Luxembourg. (A. S.-P. ; W. A. P.)

The Universal Exhibition of 1878, destined to show Europe that France had recovered her material prosperity and moral power, attracted a large concourse. The number of admissions was about 13,000,000. A grand fete, full of gaiety and enthu- siasm, was held on the 30th of June. This was the first public rejoicing since the war. The terrible winter of 1870-1880 was the severest of the century; the Seine, entirely frozen, resembled a sea of ice. The 14th of July, the

anniversary of the taking of the Bastille, was adopted as the French national holiday and celebrated for the first time in 1880. A grand military review was held in the Bois de Boulogne, at which President Grevy distributed flags to all the regiments of the army. On the 17th of March 1881 a national loan of a thousand million francs was issued for the purpose of executing important public works. This loan was covered fifteen times, Paris alone subscribing for ten thousand millions. At the time of the legislative elections, on the 21st of August and the 4th of September 1881, several tumults occurred in the Belleville district, Gambetta, who was a candidate in the two wards of that district vainly tried to address the electors. The great orator died in the following year, on the 31st of December, from the effects of an accident, and his funeral, celebrated in Paris at the expense of the State, was attended by an immense gathering. A slight Legitimist agitation followed Gambetta's death. An unfortunate event occurred on the 29th of September 1883, the day when the king of Spain, Alphonso XII., returned from his visit to Berlin, where he had reviewed the 15th regiment of Prussian Uhlans, of which he was the honorary colonel. The cries of " Down with the Uhlan ! " with which he was greeted by the Paris crowd, gave rise to serious diplomatic incidents. On the 26th of May 1885 the following decree was rendered: " The Pantheon is restored to its primitive and legal destination. The remains of the great men who have merited national recognition will be disposed therein." But it was only on the 4th of August 1899 that the ashes of Lazare Carnot, Hoche, Marceau, Latour d'Auvergne and Baudin were solemnly transported to the Pantheon. Victor Hugo's funeral was celebrated on the 1st of June 1885, and by an urgency vote they were made national obsequies. It was decided that the corpse should be exposed one day and one night under the Arc de Triomphe, veiled with an immense crape. A few days before, upon the occasion of the anniversary of the fall of the Commune, a tumultuous political manifestation had been made in front of the tomb of the Communists buried in Pere Lachaise cemetery.

In 1886 the Monarchists renewed their political demonstra- tions; the most important one was the reception given by the Count of Paris at the Galliera mansion on the occasion of the marriage of his daughter with the King of Portugal. The Count of Paris had invited to this reception all the foreign

ambassadors, and some disturbance having taken place, the Chamber of Deputies, on the nth of June 1886, voted a law interdicting sojourn upon French territory to the Orleanist and Bonapartist pretenders to the throne of France, and also to their direct heirs. At that epoch Paris was in a state of agitation and discontent, and various catastrophes

occurred. First of all came the disastrous bankruptcy of a large financial concern called the Union Generale; then the scandal concerning the traffic in decorations, in which M. Wilson, son-in-law of M. Jules Grevy, was compromised, and which eventually led to the resignation of the President; finally the deplorable Panama affair profoundly enervated the Parisians, and made them feel the necessity of shouting for a military master, some adventurer who would promise them a revenge. All this led to Boulangism. It was by wild acclamations and frantic shouts that General Boulanger was greeted, first at the review of the army on the 14th of July, then two days later at the opening of the Military Club, afterwards at the Winter Circus, where the Patriots' League held a mass meeting under the presidency of Paul Deroulede, and finally, on the 8th of July, at an immense demonstration at the Lyons railway station, when " le brav' General " left Paris to take command of the 13th army corps at Clermont Ferrand. Popular refrains were sung in the streets in the midst of immense excitement on the 27th of January 1889 at the time of the election of General Boulanger as deputy for the Seine department. A majority of 80,000 votes had invested him with an immense moral authority, and he appeared as though elected as the candidate of the entire country; but he lacked the necessary audacity to complete his triumph, and the Government having decided to prosecute him for conspiracy against the security of the state, before the Senate acting as a High Court of Justice, he fled with his accomplices, Rochefort and Dillon. All three were condemned by default, on the 14th of August, to imprisonment in a fortified enclosure.

Other events had also troubled this astonishing interlude of Boulangism. On the 23rd of February 1887 a terrible fire destroyed the Opera Comique during a performance, and a great many of the audience perished in the flames. The first performance of Lohengrin, which took place at the Eden Theatre on the 1st of May 1887, was also the cause of street rioting. In 1 888 there were several strikes. That of the day labourers, which lasted more than a month, occasioned violent scenes, owing to the sudden death of Emile Eudes, a Communist, while he was speaking in favour of the strike at a public meeting. On the 2nd of December there were manifestations in memory of Baudin, a representative of the people, killed upon the barricades in 1851 while fighting in the defence of the Republic. But a calm finally came, and then the Parisians thought only of celebrating the centenary of the Revolution of 1789 by a universal exhibition. This exhibition contained a profusion of marvels such as had never before been seen, and indicated what enormous industrial progress had been accomplished. Sadi Carnot, who had succeeded M. Jules

Grevy as President of the Republic on the 3rd of December 1887, officially opened the exhibition on the 6th of May 1889. Numerous fetes were held in the grounds while the exhibition lasted. The Eiffel Tower and the illuminated fountains enraptured the crowd of visitors, while the Rue du Caire, with its Egyptian donkey-drivers, obtained a prodigious success. Most of the nations were represented at this exhibition. Germany alone confined her co-operation to the display of some paintings. The Shah of Persia, in honour of whom splendid fetes were organized, and the King of Greece, the Prince of Wales, the Lord Mayor of London, several Russian grand dukes, Annamite, Tunisian, Moorish, Egyptian and African princes successively visited the Exhibition. There were 30,000,000 visitors. On the 1 8th of August a banquet was given in the Palais de 1 'Industrie by the Paris Municipal Council to all the mayors in Fiance, and # 15,000 of these officials were present.

In 1890 the duke of Orleans, having attained his majority, came to Paris to draw for military service with the youngest conscripts of his class. He was arrested, and placed, first in

the Cohciergerie, and later in the prison at Clairvaux, but was released after a few months' incarceration. The following years were remarkable for more strikes and several demonstra- tions by the students, which led in 1893 to conflicts with the police, in one of which a student was killed. On the 17th of October an enthusiastic welcome was extended to Admiral Avellan and the Russian sailors upon their arrival in Paris. It was about this time that dynamite began to be used by the Anarchists. After Ravachol, who commenced the sinister exploits of the " propaganda by acts," it was Vaillant who thre-w a bomb into the " Temple of the Laws " on the gth of December 1893, and wounded forty-six deputies. Then there was a succession of these attacks during the two following months, for Ravachol and Vaillant had found emulators. Henry scattered fright and death among the peaceable customers of a brasserie, while bombs were thrown into the doorways and staircases of houses inhabited by wealthy people. Upon the steps of the Madeleine Church, Parvels, who was already the author of two dynamite plots, was struck down by the destruc- tive machine that he' was about to throw into the body of the church. Laurent Tailhade himself, who had celebrated with his pen the beauty

of Vaillant's gesture, was subsequently wounded by dynamite thrown into the Cafe Foy, where he was lunching.

The visit of the emperor and empress of Russia, on the 5th, 6th and 7th of October 1896, was celebrated by incom- parable fetes. The Rue de la Paix was decorated with ropes and sails, stretched across the street like the rigging of a vast vessel, in honour of the Russian sailors. Nothing could be seen anywhere except flags, cockades and badges formed of the colours of the two friendly nations. In the evening there were open-air balls, with farandoles and orchestras at all the street corners. Popular enthusiasm was again manifested on the 31st of August, when President Faure returned from his visit to the Russian court. On the 4th of May 1897 the terrible conflagration at the Charity Bazaar in the Rue Jean Goujon threw into mourning one hundred and forty families of the nobility or the aristocracy of Paris, and spread sorrow among the class always considerate in its benevolence. Then all minds were again troubled and disturbances occurred in the streets for more than two years over the Dreyfus case, dividing the French people into two camps.

President Faure died suddenly on the 18th of February 1899. The very day of his funeral, Paul Deroulede and Marcel Habert tried to make a coup d'etat by urging General Roget tc lead his troops, which had formed part of the guard of honour at the obsequies, against the Elysee. Immediately arrested and put on trial, Deroulede and Habert were acquitted by a timorous jury.

M. fimile Loubet, President of the Senate, was chosen successor to M. Felix Faure. Upon his return to Paris from the Versailles Congress, where he had been elected President of the French Republic, he was greeted by hisses and cries of " Panama! " cries in no wise justifiable. Some time afterwards, Jules Guerin, by a desperate resistance against a summons of the police to give himself up, made the public believe for two months in the existence of an impregnable fortress in the Rue Chabrol, in the very centre of Paris. On the 4th of June there was a great scandal at the Auteuil Races, which President Loubet had been, according to custom, invited to attend. He was insulted and struck by Baron de Christiani, who was encouraged by the young royalists of the " CEillets Blancs " Association. A week later, the extraordinary and excessive police measures taken to prevent a disturbance at the Grand Prix occasioned the downfall of the Dupuy ministry. M. Waldeck-Rousseau then formed a cabinet, himself becoming president of the council. The new premier immediately took energetic measures against the enemies of the Republic. Compromising documents found in various domiciliary searches made among the Monarch- ists and

Nationalists formed the basis of prosecutions before the High Court of Justice. The trial resulted in the condemnation of Jules Guerin to a term of imprisonment, and the banishment

of Paul Deroulede, Marcel Habert, Andre Buffet and the Marquis de Lur Saluces, thereby ridding France of all these promoters of disorder, and opening a new era of peace, which lasted throughout the Universal Exhibition of 1900.

This exhibition covered an enormous space, including the slope of the Trocadero, the Champ de Mars, the Esplanade of the Invalides and both sides of the Seine bordered by the Rue de Paris and the Rue des Nations. Seen from the new Alexandre III. bridge, the spectacle was as fairy-like as a stage setting. Close beside, at the left, were the palaces of the different nations, each one showing its characteristic architecture, and all being of an astonishing diversity. To the right were the pavilion of the city of Paris and the enormous greenhouses, and in the distance Old Paris, so picturesquely constructed by Robida. In short, exotic edifices and scintillating cupolas arose with unparalleled profusion, creating in the heart of Paris a veritable city of dreams and illusion. The most distant countries sent their art treasures or the marvels of their industry. The number of visitors was 51,000,000, and the personages of mark included the Shah of Persia, the King of Sweden, the King of the Belgians and the King of Greece, all of whom were successively the guests of France. On the 22nd of September 22,000 mayors accepted the invitation to the banquet offered in their honour by President Loubet, and thus solemnly affirmed their Republican faith. This admirably organized banquet was spread in the Tuileries Gardens. The exhibition of 1900, a brilliant epilogue of the closing century, was a grand manifestation of universal concord, of the union of peoples by art, science, industry, all branches of human genius. (De B.)

The bibliography of the history of Paris is immense, and it must suffice here, so far as authorities on the medieval period are concerned, to refer to the long list of works, &c, given by Ulysse Chevalier in his Repertoire des sources historiques du moyen dge, topo-biblio- graphi (Montbeliard, 1903), pp. 2267-2290. See also Lacombe, Bibliographic parisienne, tableaux de maurs, 1600-1880 (Paris, ” no ‘\ and Pessard, Nouveau diet. hist, de Paris (1904). Of general

works may be mentioned specially J. C. Dulaure, Hist, physique, civile et morale de Paris (1821 ; new ed. continued by Leynadier and Roquette, 1874; Paul Robiquet, Hist, municipal* de Paris, up to Henry

IV. (1880-1904) ; J. Lebeuf, Hist, de la v4le ei de tout le diocese de Paris (Paris, 1 754-1 758; new ed. revised and enlarged, by H. Cocheris, 1 863-1 867); and the Hist, generate de Paris, pub- lished under the authority of the municipality, of which vol. xxxix. was issued in 1906. Important special works on later periods are W. A. Schmidt, Pariser Zustdnde wdhrend der Revolutionszeit, if 89-1800 (Jena, 1 874-1 876; French trans., Paris pendant la revolu- tion, by P. Viollet, 1 880-1 894), and Tableaux de la revolution francaise (Leipzig, 1 867-1 870); F. Aulard, Collection de documents relatifs a Vhist. de Paris pendant la revolution (1899-1903); Lanzac de Laborie, Paris sous Napoleon (1905); Simond, Paris de 1800 d iqoo (1902); Cilleuls, Hist, de V administration parisienne du xix"" siecle (1900).

PARIS, TREATIES OF (1814-1815). Among the very many treaties and conventions signed at Paris those which bear the title of " treaties of Paris " par excellence are the two sets of treaties, both of the highest importance in the history of the international politics of Europe and the formation of its public law, signed in Paris on the 30th of May 1814 and the 20th of November 1815. The first embodied the abortive attempt made by the Allies and Louis XVIII. of France to re-establish lasting peace in Europe after the first abdication of Napoleon at Fontainebleau on the nth of April 1814. The second contained the penal and cautionary measures which the Allies found it necessary to impose when the practically unopposed return of Napoleon from Elba, and his resumption of power, had proved the weakness of the Bourbon monarchy. (See Europe: History.)

The treaty of the 30th of May 1814 and the secret treaty which accompanied it, were signed by Talleyrand for France; by Lords Castlereagh, Aberdeen and Cathcart for Great Britain; by Counts Rasumovski and Nesselrode for Russia; by Prince Metternich and Count Stadion for Austria; and by Baron Hardenberg and W. von Humboldt for Prussia. Sweden and Portugal adhered later, and Spain adhered on the 20th of July to the public treaty, to which there were in all eight signatories. It is this public treaty which is known as the first treaty of Paris.

It was signed in eight instruments identical in substance. The Allies, who appear as acting in the most friendly co-operation with Louis XVIII., declare that their aim is to establish a lasting peace based on a just distribution of forces among the powers, and that as France has

returned to ” the paternal government of her kings ” they no longer think it necessary to exact those guarantees which they had been regretfully compelled to insist on from her late government. The preamble is more than a nourish of diplomatic humanity; for the treaty is extraordinarily favour- able to France. Putting aside as much of the treaty as is common form, and minute details for which the text must be consulted, it secured her in the possession of all the territory she held in Europe on the 1st of January 1792 (Art. II.); it restored her colonies, except Tobago, Santa Lucia, lie de France (Mauritius), Rodriguez, and the Seychelles, surrendered to Eng- land and the part of San Domingo formerly Spanish, which was to return to Spain (Art. VIII.). Sweden resigned her claim on Guadaloupe (Art. IX.); Portugal resigned French Guiana (Art. X.). The rectifications of the European frontier of France are detailed in the eight subsections of Art. III. They were valuable. France obtained (1) a piece of territory south of Mons; (2 and 3) a larger piece around Philippeville, on the Sambre and Meuse; (4) a rectification including Sarrelouis; (5) a piece of land to connect the formerly isolated fortress of Landau with her own dominions; (6) a better frontier on the east at Doubes; (7) a better frontier as against Geneva; (8) the subprefectures of Annecy and Chambery (Savoy). By the same article she secured all the German enclaves in Alsace, Avignon, the Venaissin and Montbeliard. Art. VI. secured Holland to the house of Nassau, with an addition of territory, not defined in this instrument; asserted the independence, and right to federate of the German states, and the full sovereignty of all the states of Italy outside of the Italian dominions of Austria. Art. VII. gave Malta to Great Britain. By Art. XV. France was to retain two -thirds of all warships and naval stores existing in ports which had belonged to the empire of Napoleon, but were outside the borders of France, with exception of the Dutch ships. Arts. XVIII. to XXXI. dealt with pecuniary claims, return of documents, renunciation of all claims for compensation, &c. By Art. XXXII. the powers bind themselves to meet at Vienna within two months to arrange a final settlement of Europe. Additional articles provided for the settlement of pecuniary claims in the late grand-duchy of Warsaw, for the abrogation of treaties signed with Prussia since the Peace of Basel. By her additional article with Great Britain, France undertook to suppress the slave trade within five years, and to help to bring about its general suppression.

The separate and secret articles of the treaty (or ” Secret Treaty ” as they are commonly called), were meant to bind France to agree in principle to the readjustments and allotments of territory and population to be made at the approaching Congress of Vienna (g.v.).

The treaties of the 20th of November 181 5 and their dependent

instruments, were signed in very different circumstances. The representative of France was the due de Richelieu; Great Britain was represented by Castlereagh and Wellington; Austria by Metternich and Count Wessenberg; Prussia by Hardenberg and W. von Humboldt; Russia by Rasumovski and Capo d'Istria. The preamble stated the altered spirit and purpose of the Allies. It insisted that, as the powers had saved France and Europe from Napoleon's last adventure, they were entitled to compensation and security for the future. They had decided to exact indemnities, partly pecuniary and partly territorial, such as could be exacted without injuring the essential interest of France. The territorial penalty imposed was moderate. France retained the enclaves she had secured by the previous treaty. She had to resign her gains on the north and eastern frontier, to surrender Philippeville, Marienbourg, Bouillon, Sarrelouis and Landau, to cede certain territories to Geneva, and she lost Annecy and Chamb6ry. The standard taken was the frontier of 1790 (Art. I.). By Art. III. she agreed to dismantle the fortress of Huningen near Basel. The most grievous articles

of the treaty are those which imposed the payment of an in- demnity, and the occupation of a part of French territory as security for payment. Art. IV. fixed the indemnity at 700,000,000 frs. Art. V. fixed the strength of the army of occupation at 150,000 under a commander-in-chief to be named by the powers, and specified the fortresses it was to hold in the north and north-east of France. The period of occupation was limited to five years, but might be reduced to three. All pro- visions of the treaty of the 30th of May 1814, and of the Final Act of the Congress of Vienna not expressly revoked were to remain in force. By an additional article the powers agreed to join Great Britain in suppressing the slave trade. Certain complimen- tary instruments were attached to the treaty. (1) A separate article with Russia in regard to pecuniary claims in Poland. (2) A convention as to payment of indemnity under Art. IV. (3) Convention as to the occupation and the rationing of the foreign troops. (4) A convention as to settlement of claims of British bondholders. The retrocession of the colonies was made dependent on the partial settlement of these claims. (5) A convention to arrange for settlement of claims under Art. XIX., &c, of the treaty of the 30th of May 1814.

On the day of the signing of the second treaty of Paris, a treaty of alliance, commonly spoken of as the treaty of the 20th of November 1815, was signed in Paris by Great Britain, Austria, Russia and Prussia. It contained six articles. The first declared the determination of the Allies to enforce the treaty signed with France; the second, third and fourth reaffirmed their determina- tion to exclude the Bonaparte

family from the throne, and specified the measures they were prepared to take to support one another. The fifth declared that the alliafice for the purposes stated would continue when the five years' occupation of France was ended. The sixth article stated that in order to facilitate and assure the execution of the present treaty, the High Contracting Parties had decided to hold periodical meetings of the sovereigns or their ministers, for the examination of such measures as appeared to be salutary for the repose and prosperity of their peoples and the maintenance of the peace of Europe. It was in accordance with this last article that the congresses of Aix-la-Chapelle (1818), Troppau (1820), Laibach (1821), and Verona (1822) were held (see Europe: History).

Bibliography. — See Sir E. Hertslet, The Map of Europe by Treaty, i. (London, 1875), and Martens, Nouveau recueil de traites, &c, ii. (Gottingjen, 1818).

PARIS, a city and the county seat of Edgar county, Illinois, U.S.A., in the E. part of the state, about 19 m. N.W. of Terre Haute, Ind. Pop. (1890), 4996; (1900), 6105, of whom, 179 were foreign-born and 277 negroes; (1910) 7664. Paris is served by the Vandalia, and the Cleveland, Cincinnati, Chicago & St Louis (New York Central system) railways; the main line and the Cairo division of the latter intersect here, and the city is the transfer point for traffic from the E. and W. to the N. and S., and vice versa. It is in a rich farming region, of which Indian corn and oats are important products, and has a large trade. Paris was founded about 1825, was incorporated in 1853, and was re-incorporated in 1873.

PARIS, a city and the county-seat of Lamar county, Texas, U.S.A., about 93 m. N.E. of Dallas. Pop. (1890), 8254; (1900), 9358, of whom 3061 were negroes; (1910 census), 11,269. It is served by the St Louis & San Francisco (of which it is a terminus), the Gulf, Colorado & Santa Fe, the Texas & Pacific, and the Texas Midland railways. The city has cotton gins and a cotton compress, and various manufactures. In 1905 its factory products were valued at $854,930. Paris was settled in 1841, incorporated as a town in 1874, and chartered as a city in 1905.

PARISH (Gr. irapoada, district, neighbourhood; Tra.poi.Kos, one dwelling near or beside, from irapa, 01 /cos, house; Lat. paroecia, Late Lat. parochia; cf. Fr. paroisse), originally an episcopal district or diocese. In the early Christian Church each district was administered by a bishop and his attendant presbyters and deacons, and the word parochia was frequently applied to such a district (Du Cange, sub. tit.). Scattered congregations or

churches within the parochia were served by itinerant presbyters. Towards the close of the 4th century it had become usual for the bishop to appoint resident presbyters to denned districts or territories, to which the term ” parish ” came gradually to be applied (see also Diocese). Parish, in English ecclesiastical law, may be defined as the township or cluster of townships which was assigned to the ministration of a single priest, to whom its tithes and other ecclesiastical dues were paid; but the word has now acquired several distinct meanings.

The Old Ecclesiastical Parish. — In the absence of evidence to the contrary, the ecclesiastical parish is presumed to be com- posed of a single township or vill, and to be conterminous with the manor within the ambit of which it is comprised. Before the process of subinfeudation became prevalent, the most ancient manors were the districts which we call by that name when speaking of the tenants, or ” townships ” when we regard the inhabitants, or ” parishes ” as to matters ecclesiastical. The parish as an institution is in reality later in date than the township. The latter has been in fact the unit of local adminis- tration ever since England was settled in its several states and kingdoms; the beginnings of the parochial system in England are attributed to Theodore of Tarsus, who was archbishop of Canter- bury towards the close of the 7th century. The system was extended in the reign of Edgar, and it appears not to have been complete until the reign of Edward III. It has been considered that the intimate connexion of church and state militates against the view that the parochirl system was founded as a national institution, since any legislation on the subject of the township and parochial systems would probably have resulted in the merging of the one into the other. ” The fact that the two systems, the parish and the township, have existed for more than a thousand years side by side, identical in area and ad- ministered by the same persons, and yet separate in character and machinery, is a sufficient proof that no legislative act could have been needed in the first place; nor was there any lay council of the whole nation which could have sanctioned such a measure ” (Stubbs, Const. Hist. i. 227). The boundaries of the old ecclesiastical parishes are usually identical with those of the township or townships comprised within its precinct; they are determined by usage, in the absence of charters or records, and are evidenced by perambulations, which formerly took place on the ” gang-days ” in Rogation week, but are now, where they still survive, for the most part held triennially, the

Poor-Law Act of 1844 permitting the parish officers to charge the expense on the poor-rate, ” provided the perambulations do not occur more than once in three years.” The expense of preserving the boundary by land-marks or bound-stones is chargeable to the same rate. Many parishes contain more than one township, and this is especially the case in the northern counties, where the separate townships are organized for administrative purposes under an act passed in 1662. In the southern and midland districts the parishes are for the most part subdivided into hamlets or other local divisions known as “tythings,” “boroughs,” and the like; the distinction between a parish and a subordinate district lies chiefly in the fact that the latter will be found to have never had a church or a constable to itself. The select committee of 1873, ap- pointed to inquire into parochial boundaries, reported to the effect that the parish bears no definite relation to any other administrative area, except indeed to the poor-law union. It may be situated in different counties or hundreds, and in many instances it contains, in addition to its principal district, several outlying portions intermixed with the lands in other parishes.

After the abolition of compulsory church rates in 1868 the old ecclesiastical parish ceased to be of importance as an instru- ment of local government. Its officers, however, have still important duties to perform. The rector, vicar or incumbent is a corporation-sole, in whom is vested the freehold of the church and churchyard, subject to the parishioners’ rights of user; their rights of burial have been enlarged by various acts. The churchwardens are the principal lay officers. Their duties consist in keeping the church and churchyard in repair and in raising

a voluntary rate for the purpose tc the best of their power; they have also the duty of keeping order in church during divine service. The other officials are the parish clerk and sexton. They have freeholds in their offices and are paid by customary fees. The office of the clerk is regulated by an act of 1844, enabling a curate to undertake its duties, and providing facilities fcr vacating the office in case of misconduct. The only civil function of the parish clerk remaining in 1894 was the custody of maps and documents, required to be deposited with him under standing orders of parliament before certain public works were begun. By the Local Government Act 1894 they are now deposited with the chairman or clerk of a parish council.

The New Ecclesiastical Parish. — Under the powers given by the Church Building Acts, and acts for making new parishes, many populous parishes have been subdivided into smaller ecclesiastical parishes. This division has not affected the parish in its civil aspect.

The Civil Parish. — For purposes of civil government the term ” parish ” means a district for which a separate poor-rate is or can be made, or for which a separate overseer is or can be appointed; and by the Interpretation Act 1889 this definition is to be used in interpreting all statues subsequent to 1866, except where the context is inconsistent therewith. This district may of itself constitute a poor law union; but in the great majority of cases the unions, or areas under the jurisdiction of boards of guardians according to the Poor-Law Amendment Act of 1834, are made up of aggregated poor-law parishes. Each of these poor-law parishes may represent the extent of an old ecclesiastical parish, or a township separately rated by custom before the practice was stayed in 181 9 or separated from a large parish under the act of 1662, or it may represent a chapelry, tything, borough, ward, quarter or hamlet, or other subdivision of the ancient parish, or, under various acts, an area formed by the’ merger of an extra-parochial place with an adjoining district by the union of detached portions with adjoining parishes, or by the subdivision of a large parish for the better administration of the relief of the poor. The civil importance of the poor-law parishes may be dated from the introduction of the poor law by the statute of 43 Elizabeth, which directed overseers of the poor to be appointed in every parish, and made the churchwardens into ex-qfficio overseers. The statute was preceded by tentative provisions of the same kind enacted in the reigns of Edward VI. and Mary and in the fifth year of Elizabeth, and after several renewals was made perpetual in the reign of Charles I. The chief part of the parochial organization was the vestry-meeting. It derived its name from the old place of assembly, the vestry room attached to the church or chapel. The vestry represented the old assembly of the township, and retained so much of its business as bad not been insensibly transferred to the court-baron and court-leet. The freemen, now appearing as the ratepayers, elected the ” parish officers,” as the churchwardens and way-wardens, the assessors, the overseers, and (if required) paid assistant- overseers, a secretary or vestry-clerk, and a collector of rates if the guardians applied for his appointment. Common vestries were meetings of all the ratepayers assembled on a three days’ notice; select vestries were regulated by local custom, or derived their power from the Vestries Act 1831 (Hobhouse’s Act). The vestries could adopt various acts, and appoint persons to carry those acts into execution. The Local Govern- ment Act 1894 restored the parish to its position as the unit of local government by establishing parish councils. (See England: Local Government.)

The Parish in Scotland. — There can be little doubt that about the beginning of the 13th century the whole, or almost the whole, of the

kingdom of Scotland was parochially divided. It seems pro- bable (though the point is obscure) that i.he bishops presided at the first formation of the parishes — the parish being a subdivision of the diocese — and at any rate down to the date of the Reformation they exercised the power of creating new parishes within their respective dioceses (Duncan, Parochial Law, p. 4). After the Reformation the power of altering parishes was assumed by the legislature. The existing parochial districts being found unsuited to the ecclesiastical requirements of the time, a general

act was passed in 1581, which made provision for the parochial clergy, and, inter alia, directed that ” a sufficient and competent ” district should be appropriated to each church as a parish (1581, • cap. 100). Thereafter, by a series of special acts in the first place, and, subsequent to the year 1617, by the decrees of parliamentary commissions, the creation of suitable parochial districts was pro- ceeded with. In the year 1707 the powers exercised by the com- missioners were permanently transferred to the court of session, whose judges were appointed to act in future as ” commissioners for the Plantation of Kirks and Valuation of Teinds ” (Act, 1707, cap. 9). Under this statute the areas of parishes continued to be altered and defined down to 1844, when the act commonly known as Graham’s Act was passed (7 & 8 Vict. c. 44). This act, which applied to the disjunction and erection of parishes, introduced a simpler form of procedure, and to some extent dispensed with the consent of the heritors, which had been required under the earlier statute. The main division of parishes in Scotland was into civil and ecclesiastical, or, to speak more accurately, into parishes proper (i.e. for all purposes, civil and ecclesiastical) and ecclesiastical parishes. This division is expressed in legal language by the terms, parishes quoad omnia {i.e. quoad civilia et sacra) and parishes quoad sacra — civilia being such matters as church rates, education, poor law and sanitary purposes, and sacra being such as concern the administration of church ordinances, and fall under the cognizance of the church courts. There are other minor divisions which will be noticed below. (1) The Parish Proper. — In a number of instances it is difficult to determine the exact areas of such parishes at the present day. The boundaries of the old ecclesiastical parish were nowhere recorded, and the descriptions in the titles of private properties which appear to lie in the parish have sometimes to be taken as evidence, and sometimes the fact that the inhabitants attended a particular church or made payments in

favour of a par- ticular minister. Where there has been a union or disjunction and erection of parishes the evidence of the boundaries is the relative statute, order in council, or decree of commission or of court of teinds. The parishes proper vary to a great degree both in size and population. For ecclesiastical purposes, the minister and kirk-session constitute the parochial authority. The minister is vested with the manse and glebe, to be held by him for himself and his successors in office, and along with the kirk-session he administers church ordinances and exercises church discipline. The oldest governing authority was the meeting of the heritors or landowners of the parish. Though gradually shorn of much of its old importance, the heritors' meeting retained the power of imposing an assessment for the purpose of providing and maintaining a church and church- yard and a manse and glebe for the minister. It also possessed power to assess under the Parochial Buildings Acts of 1862 and 1866. Kirk-session and heritors were the educational authority until the establishment of school boards in 1872. (2) Quoad Sacra Parishes. — The ecclesiastical or quoad sacra parish is a modern creation. Under Graham's Act, above mentioned, a parish may be disjoined and erected quoad sacra tantum on the application of persons who have built and endowed a church, and who offer securities for its proper maintenance. By the Education Act of 1872 the quoad sacra parish was adopted as a separate school district. (3) Exlra-Burghal Parishes. — For sanitary purposes, highways and some others, certain classes of burghs were made separate areas from the parishes in which they lay. This fact created a set of incomplete parishes, called extra-burghal. (4) Burghal, Landward and Burghal-Land- ward (or Mixed) Parishes. — This division of parishes depends, as the names imply, upon local character and situation of the parochial districts. The importance of the distinction arose in connexion with the rule of assessment adopted for various parochial burdens, and the nature of the rights of the minister and corresponding obligations of the parishioners. (5) Combined Parishes. — Under the Poor-Law, Education and Registration Acts power was given to the central authority to combine parishes for purposes of local administration. The Local Government (Scotland) Act 1894 reformed parish government, although not to the same extent as the corresponding English act. It established a local government board for Scotland, with a parish council in every parish, and abolished all parochial boards. The number of councillors for a parish council was fixed at not less than five nor more than thirty- one, the number being determined, in the case of landward parishes, by the county council; in the case of burghal parishes by the town council and, in the case of mixed parishes, by county and town councils jointly.

The Parish in the United States. — The term ” parish ” is not in use as a territorial designation except in Louisiana, the sixty parishes of which correspond to the counties of the other states of the Union. In the American Episcopal Church the word is frequently used to denote an ecclesiastical district.

Authorities. — The principal records from which information may be gained as to the oldest parochial system in England are the records called Nomina villarum, the Taxatio papae Nicholai made in 1291, the Nonarum inquisitiones relating to assessments made upon the clergy, the Valor ecclesiasticus of Henry VIII. , the lay

subsidies from the reign of Edward III. to that of Charles II., the hearth-tax assessments and the land-tax accounts. On the subject of the parish generally see Stubbs’s Constitutional History; Glen’s Parish Law; Steer’s Parish Law; Toulmin Smith’s work on the Parish ; S. and B. Webb, English Local Government, vol. i. ; Redlich and Hirst, Local Government in England; O. J. Reichel, Rise of the Parochial System in England (1905). For fuller information regard- ing the Scottish parish see Connell on Teinds; Duncan’s Parochial Ecclesiastical Law; the Cobden Club essays on Local Government and Taxation in the United Kingdom (1882); Goudy and Smith’s Local Government in Scotland; Atkinson, Local Government in Scotland.

PARISITE, a rare mineral, consisting of cerium, lanthanum, didymium and calcium fluo-carbonate, (CeF) 2 Ca(COs)3. It is found only as crystals, which belong to the hexagonal system and usually have the form of acute double pyramids terminated by the basal planes; the faces of the hexagonal pyramids are striated horizontally, and parallel to the basal plane there is a perfect cleavage. The crystals are hair-brown in colour and are translucent. The hardness is 4J and the specific gravity 4-36. Light which has traversed a crystal of parisite exhibits a characteristic absorption spectrum. Until recently the only known occurrence of this mineral was in the famous emerald mine at Muzo in Colombia, South America, where it was found by J. J. Paris, who re-discovered and worked the mine in the early part of the 19th century; here it is associated with emerald in a bituminous limestone of Cretaceous age (see Emerald).

Closely allied to parisite, and indeed first described as such, is a mineral from the nepheline-syenite district of Julianebaab in south Greenland. To this the name synchysite (from Gr. airyxvo’is, confounding) has been given. The crystals are rhombohedral (as distinct from hexagonal; they have the composition CeFCa(C0 3)2, and specific gravity 2-90. At the same locality there is also found a

barium-parisite, which differs from the Colombian parisite in containing barium in place of calcium, the formula being (CeF)2Ba(C03)3: this is named cordylite on account of the club-shaped form (/cop6uX»j, a club) of its hexagonal crystals. Bastnasite is a cerium lan- thanum and didymium fluo-carbonate (CeF)C03, from Bastnas, near Riddarhyttan, in Vestmanland, Sweden, and the Pike's Peak region in Colorado, U.S.A. (L. J. S.)

PARK, EDWARDS AMASA (1 808-1 900), American Con- gregational theologian, was born in Providence, Rhode Island, on the 29th of December 1808, the son of Calvin Park (1774-1847), a Congregational minister, professor from 1804 to 1825 at Brown University, and pastor at Stoughton, Massachusetts, in 1826- 1840. The son graduated at Brown University in 1826, was a teacher at Braintree for two years, and in 183 1 graduated from Andover theological seminary. He was co-pastor (with R. S. Storrs) of the orthodox Congregational church of Braintree in 1831-1833; professor of mental and moral philosophy at Amherst in 1835; and Bartlett professor of sacred rhetoric (1836-1847), and Abbot professor of Christian theology (1847-1881) at Andover. He died at Andover on the 4th of June 1900. An ardent admirer of Jonathan Edwards, whose great-grand-daughter he married, Park was one of the most notable American theologians and orators. He was the most prominent leader of the " new school " of " New England Theology." He left his theological impress on the Bibliotheca sacra, which he and Bela B. Edwards took over in 1844 from Edward Robinson, who had founded it in 1843, and of which Park was assistant editor until 1851 and editor-in-chief from 1851 to 1884. As a general statement of the position of orthodox Congregationalism he drew up and annotated the " Associate Creed of Andover Theological Semin- ary " (1883), and the anonymously published " Worcester Creed " of 1884 was his popularized and simplified statement. He edited in i860 The Atonement, a collection of essays by various hands, prefaced by his study of the " Rise of the Edwardean Theory of the Atonement." Dr Park's sermon, " The Theology of the Intellect and that of the Feelings," delivered in 1850 before the convention of the Congregational ministers of Massa- chusetts, and published in the Bibliotheca sacra of July 1850,

was the cause of a long and bitter controversy, metaphysical rather than doctrinal, with Charles Hodge. Some of Park's sermons were published in 1885, under the title Discourses on Some Theological

Doctrines as Related to the Religious Character. With Austin Phelps and Lowell Mason he prepared The Sabbath Hymn Book (1858).

See Professor Park and His Pupils (Boston, 1899), a memorial of his 90th birthday, with articles by R. S. Storrs, G. R. W. Scott, Joseph Cook, G. Frederick Wright and others.

PARK, MUNGO (1771-1806?), Scottish explorer of the Niger, was born in Selkirkshire, Scotland, on the 20th of September 1 77 1, at Foulshiels on the Yarrow — the farm which his father rented from the duke of Buccleuch. He was the seventh in a family of thirteen. Having received a good education, he was apprenticed to a surgeon named Thomas Anderson in Selkirk, and then attended the university of Edinburgh for three sessions (1789-1791), obtaining the surgical diploma. By his brother-in-law, James Dickson, a botanist of repute, he was introduced to Sir Joseph Banks, then president of the Royal Society, and through his good offices obtained the post of assistant-surgeon on board the ” Worcester” East Indiaman. In this capacity he made the voyage in 1792 to Benkulen, in Sumatra, and on his return in 1793 he contributed a description of eight new Sumatran fishes to the Transactions of the Linnean Society.

Park in 1794 offered his services to the African Association, then looking out for a successor to Major Daniel Houghton, who had been sent out in 1790 to discover the course of the Niger and had perished in the Sahara. Supported by the influence of Sir Joseph Banks, Park was successful in his application. On the 21st of June 1795 he reached the Gambia and ascended that river 200 miles to a British trading station named Pisania. On the 2nd of December, accompanied by two negro servants, he started for the unknown interior. He chose the route crossing the upper Senegal basin and through the semi-desert region of Kaarta. The journey was full of difficulties, and at Ludamar he was imprisoned by a Moorish chief for four months. He escaped, alone and with nothing save his horse and a pocket compass, on the 1st of July 1796, and on the 21st of the same month reached the long-sought Niger at Segu, being the first European to gaze on its waters. He followed the river down stream 80 m. to Silla, where he was obliged to turn back, being without means and utterly exhausted. On his return journey, begun on the 30th of July, he took a route more to the south than that originally followed, keeping close to the Niger as far as Bamako, thus tracing the course of that stream in all for some 300 miles. At Kamalia he fell ill, and owed his life to the kindness of a negro in whose house he lived for seven months. Eventually he reached Pisania again on the 10th of June 1797, returning to England by way of America on the 22nd of December. He had been thought to

be dead, and his return home with the news of the discovery of the Niger evoked great public enthusiasm. An account of his journey was at once drawn up for the African Association by Bryan Edwards, and a detailed narrative from his own pen appeared in 1799 (Travels in the Interior of Africa). Abundance of incident and an unaffected style rendered the work extremely popular, and it still holds its place as an acknowledged classic in this department of literature.

Settling at Foulshiels, Park in August 1799 married a daughter of his old master, Thomas Anderson. Two offers made to him to go to New South Wales in some official capacity came to nothing, and in October 1801 Park removed to Peebles, where he practised as a doctor. In the autumn of 1803 he was invited by the government to lead another expedition to the Niger. Park, who chafed at the hardness and monotony of life at Peebles, accepted the offer, but the starting of the expedition was delayed. Part of the waiting time was occupied in the perfecting of his Arabic — his teacher being Sidi Ambak Bubi, a native of Mogador; whose vagaries both amused and alarmed the people of Peebles. In May 1804 Park went back to Foul- shiels, where he made the acquaintance of Sir Walter Scott,

then living near by at Ashesteil, with whom he soon became on terms of warm friendship. In September he was summoned to London to leave on the new expedition; he parted from Sir Walter with the hopeful proverb on his lips, ” Freits (omens) follow those that look to them.” Park had at that time adopted the theory that the Niger and the Congo were one, and in a memorandum drawn up before he left England he wrote: ” My hopes of returning by the Congo are not altogether fanciful.” He sailed from Portsmouth for the Gambia on the 31st of January 1805, having been given a captain’s commission as head of the government expedition. Alexander Anderson, his brother-in-law, was second in command, and on him was .bestowed a lieutenancy. George Scott, a fellow Borderer, was draughtsman, and the party included four or five artificers. At Goree (then in British occupation) Park was joined by Lieutenant Martyn, R.A., thirty-five privates and two seamen. The expedition did not reach the Niger until the middle of August, when only eleven Europeans were left alive; the rest had succumbed to fever or dysentery. From Bamako the journey ˆo Segu was made by canoe. Having received per- mission from the ruler of that town to proceed, at Sansandig, a little below Segu, Park made ready for his journey down the still unknown part of the river. Park, helped by one soldier, the only one left capable of work, converted two canoes into one tolerably good boat, 40 ft. long and 6 ft. broad. This he christened H.M. schooner “Joliba” (the native name for the Niger), and in it, with the surviving members of his party, he

set sail down stream on the 19th of November. At Sansandig r on the 28th of October, Anderson had died, and in him Park lost the only member of the party — -except Scott, already dead— who had been of real use. Those who embarked in the ” Joliba ” were Park, Martyn, three European soldiers (one mad), a guide and three slaves. Before his departure Park gave to Isaaco, a Mandingo guide who had been with him thus far, letters to take back to the Gambia for transmission to England. The spirit with which Park began the final stage of his enterprise is well illustrated by his letter to the head of the Colonial Office:—

” I shall,” he wrote, ” set sail for the east with the fixed resolution to discover the termination of the Niger or perish in the attempt . . . though all the Europeans who are with me should die, and though I were myself half dead, I would stijl persevere, and if I could not succeed in the object of my journey, I would at least die on the Niger.”

To his wife he wrote stating his intention not to stop nor land anywhere fill he reached the coast, where he expected to arrive about the end of January 1806. These were the last communica- tions received from Park, and nothing more was heard of the party until reports of disaster reached the settlements on the Gambia. At length the British government engaged Isaaco to go to the Niger to ascertain the fate of the explorer. At Sansandig Isaaco found the guide who had gone down stream with Park, and the substantial accuracy of the story he told was later confirmed by the investigations of Hugh Clapperton and Richard Lander. This guide (Amadi) stated that Park’s canoe descended the river to Yauri, where he (the guide) landed. In this long journey of about 1000 miles Park, who had plenty of provisions, stuck to his resolution of keeping aloof from the natives. Below Jenn6, came Timbuktu, and at various other places the natives came out in canoes and attacked his boat. These attacks were all repulsed, Park and his party having plenty of firearms and ammunition and the natives having none. The boat also escaped the many perils attendant on the navigation of an unknown stream strewn with many rapids — Park had built the ” Joliba. ” so that it drew only a foot of water. But at the Bussa rapids, not far below Yauri, the boat struck on a rock and remained fast. On the bank were gathered hostile natives, who attacked the party with bow and arrow and throwing spears. Their position being untenable, Park, Martyn, and the two soldiers who still survived, sprang into the river and were drowned. The sole survivor was one of the slaves, from whom was obtained the story of the final scene. Isaaco, and later Lander, obtained some of Park’s effects, but

his journal was never recovered. In 1827 his second son, Thomas, landed on the Guinea coast, intending to make his way to Bussa, where he thought his father might be detained a prisoner, but after penetrating some little distance inland he died of fever. Park's widow died in 1840.

J. Thomson's Mungo Park and the Niger (London, 1890) contains the best critical estimate of the explorer and his work. See also the Life (by Wishaw) prefixed to Journal of a Mission into the Interior of Africa in 1805 (London, 1815); H. B., Life of Mungo Park (Edinburgh, 1835) ; and an interesting passage in Lockhart's Life of Sir Walter Scott, vol. ii.

PARK (Fr. pare; Ital. parco; Sp. parque; O.Eng. pearroc; connected with Ger. pferch, fold, and pfarrei, district, translating med. Lat. parochia, parish), a word ordinarily used in two senses:

(a) an enclosed tract of ground, consisting of grass-land, planted with trees and shrubs, and surrounding a large country house;

(b) a similar space in or near a town, laid out ornamentally, and used by the public as an " open space " for health or recreation.

The term " park " first occurs in English as a term of the forest law of England for a tract of ground enclosed and privileged for beasts of the chase, the distinguishing charac- teristics of which were " vert," i.e. the green leaves of trees, "venison," i.e. deer, and "enclosure." A "park" was a franchise obtained by prescription or by grant from the crown (see Forest Law; also Deer Park).

The word has had a technical military significance since the early part of the 17th century. Originally meaning the space occupied by the artillery, baggage and supply vehicles of an army when at rest, it came to be used of the mass of vehicles itself. From this mass first of all the artillery, becoming more mobile, separated itself; then as the mobility of armies in general became greater they outpaced their heavy vehicles, with the result that faster moving transport units had to be created to keep up communication. A " park " is thus at the present day a large unit consisting of several hundred vehicles carrying stores; it moves several days' marches in rear of the army, and forms a reservoir from " whence the mobile ammunition and supply columns " draw the supplies and stores required for the army's needs. " Parking " vehicles is massing them for a halt. The word " park " is still used to

mean that portion of an artillery or adminstrative troops' camp or bivouac in which the vehicles are placed.

PARKER, SIR GILBERT (1862-), British novelist and politician, was born at Camden East, Addington, Ontario, on the 23rd of November 1862, the son of Captain J. Parker, R.A. He was educated at Ottawa and at Trinity University, Toronto. In 1886 he went to Australia, and became for a while associate- editor of the Sydney Morning Herald. He also travelled exten- sively in the Pacific, and subsequently in northern Canada; and in the early 'nineties he began to make a growing reputation in London as a writer of romantic fiction. The best of his novels are those in which he first took for his subject the history and life of the French Canadians; and his permanent literary reputation rests on the fine quality, descriptive and dramatic, of his Canadian stories. Pierre and his People (1892) was followed by Mrs Falchion (1893), The Trail of the Sword (1894), When Valmond came to Pontiac (1895), An Adventurer of the North (1895), and The Seats of the Mighty (1896, dramatized in 1897). The Lane that had no Turning (1900) contains some of his best work. In The Battle of the Strong (1898) he broke new ground, laying his scene in the Channel Islands. His chief later books were The Right of Way (1901), Donovan Pasha (1902), The Ladder of Swords (1904), The Weavers (1907) and Northern Lights (1909). In 1895 he married Miss Van Tine of New York, a wealthy heiress. His Canadian connexion and his experience in Australia and elsewhere-had made him a strong Imperialist in politics, and from that time he began to devote himself in large measure to a political career. He still kept up his literary work, but some of the books last mentioned cannot compare with those by which he made his name. He was elected to parliament in 1900 (re-elected 1906 and 1 910) as Conservative member for Gravesend and soon made his mark in the House of Commons. He was

knighted in 1902, and in succeeding years continually strengthened his position in the party, particularly by his energetic work on behalf of Tariff Reform and Imperial Preference. If he had given up to public life what at one time seemed to be due to literature, he gave it for enthusiasm in the Imperialist move- ment; and with the progress of that cause he came to rank by 1910 as one of the foremost men in the Unionist party outside those who had held office.

PARKER, SIR HYDE, Bart. (1714-1782), British vice- admiral, was born at Tredington, Worcestershire, on the 25th of February, 1714, his father, a clergyman, being a son of Sir Henry Parker, Bart. His paternal grandfather had married a daughter of Bishop Alexander Hyde, of Salisbury. He began his career at sea in the merchant service.

Entering the royal navy at the age of twenty-four, he was made lieutenant in 1744, and in 1748 he was made post-captain. During the latter part of the Seven Years' War he served in the East Indies, taking part in the capture of Pondicherry (1761) and of Manila (1762). In the latter year Parker with two ships captured one of the valuable Spanish plate ships in her voyage between Acapulco and Manila. In 1778 he became rear-admiral, and went to North American waters as second-in-command. For some time before Rodney's arrival he was in command on the Leeward Islands station, and conducted a skilful campaign against the French at Martinique. In 1781, having returned home and become vice-admiral, he fell in with a Dutch fleet of about his own force, though far better equipped, near the Dogger Bank (Aug. 5). After a fiercely contested battle, in which neither combatant gained any advantage, both sides drew off. Parker considered that he had not been properly equipped for his task, and insisted on resigning his command. In 1782 he accepted the East Indies command, though he had just succeeded to the family baronetcy. On the outward voyage his flagship, the " Cato " (60), was lost with all on board.

His second son, Admiral Sir Hyde Parker (1739-1807), entered the navy at an early age, and became lieutenant in 1758, having passed most of his early service in his father's ships. Five years later he became a post-captain, and from 1766 onwards for many years he served in the West Indies and in North American waters, particularly distinguishing himself in break- ing the defences of the North river (New York) in 1776. His services on this occasion earned him a knighthood in 1779. In 1778 he was engaged in the Savannah expedition, and in the following year his ship was wrecked on the hostile Cuban coast. His men, however, entrenched themselves, and were in the end brought off safely. Parker was with his father at the Dogger Bank, and with Howe in the t ro actions in the Straits of Gibraltar. In 1793, having just become rear-admiral, he served under Lord Hood at Toulon and in Corsica, and two years later, now a vice-admiral, he took part, under Hotham, in the indecisive fleet actions of the 13th of March and the 13th of July 1795. From 1796 to 1800 he was in command at Jamaica and ably conducted the operations in the West Indies. In 1801 he was appointed to command the fleet destined to break up the northern armed neutrality, with Nelson as his second-in-command. Copenhagen, the first objective of the expe- dition, fell on the 2nd of April to the fierce attack of Nelson's squadron, Parker with the heavier ships taking little part. Subsequently Paiker hesitated to advance up the Baltic after his victory, a decision which was severely criticised. Soon after- wards he was recalled and Nelson succeeded him. He died in 1807.

The family name was continued in the navy in his eldest son, who became vice-admiral and was First Sea Lord of the Admiralty in 1853 (dying in 1854); and also in that son's son, who as a captain in the Black Sea was killed in 1854 when storming a Russian fort.

PARKER, JOHN HENRY (1806-1884), English writer on architecture, the son of a London merchant, was born on the 1st of March 1806. He was educated at Manor House School, Chiswick, and in 1821 entered business as a bookseller. Succeed- ing his uncle, Joseph Parker, as a bookseller at Oxford in 1832,

he conducted the business with great success, the most important of the firm's publications being perhaps the series of the " Oxford Pocket Classics." In 1836 he brought out his Glossary of Architecture, which, published in the earlier years of the Gothic revival in England, had considerable influence in extending the movement, and supplied a valuable help to young architects. In 1848 he edited the fifth edition of Rickman's Gothic Architec- ture, and in 1849 he published a handbook based on his earlier volume and entitled Introduction to the Study of Gothic Architec- ture. The completion of Hudson Turner's Domestic Architecture of the Middle Ages next engaged his attention, three volumes being published (1853-1860). In 1858 he published Medieval Architecture of Chester. Parker was one of the chief advocates of the " restoration " of ecclesiastical buildings, and published in 1866 Architectural Antiquities of the City of Wells. Latterly he devoted much attention to explorations of the history of Rome by means of excavations, and succeeded in satisfying himself of the historical truth of much usually regarded as legendary. Two volumes of his Archaeology of Rome were published at Oxford in 1874 and 1876. In recognition of his labours he was decorated by the king of Italy, and received a medal from Pope Pius IX. In 1869 he endowed the keepership of the Ashmolean Museum with a sum yielding £250 a year, and under the new arrangement he was appointed the first keeper. In 187 1 he was nominated C.B. He died at Oxford on the 31st of January 1884. PARKER, JOSEPH (1830-1902), English Nonconformist divine, was born at Hexham-on-Tyne on the 9th of April 1830, his father being a stonemason. He managed to pick up a fair education, which in after-life he constantly supplemented. In the revolutionary years from 1845 to 1850 young Parker as a local preacher and temperance orator gained a reputation for vigorous utterance. He was influenced by Thomas Cooper, the Chartist, and

Edward Miall, the Liberationist, and was much associated with Joseph Cowen, afterwards M. P. for Newcastle. In the spring of 1852 he wrote to Dr John Campbell, minister of Whitefield Tabernacle, Moorfields, London, for advice as to entering the Congregational ministry, and after a short probation he became Campbell's assistant. He also attended lectures in logic and philosophy at University College, London. From 1853 to 1858 he was pastor at Banbury. His next charge was at Cavendish Street, Manchester, where he rapidly made himself felt as a power in English Nonconformity. While here he published a volume of lectures entitled Church Questions, and, anonymously, Ecce Deus (1868), a work provoked by Seeley's Ecce Homo. The university of Chicago conferred on him the degree of D.D. In 1869 he returned to London as minister of the Poultry chur h, founded by Thomas Goodwin. Almost at once he began the scheme which resulted in the erection of the great City Temple in Holborn Viaduct. It cost £70,000, and was opened on the 19th of May 1874. From this centre his influence spread far and wide. His stimulating and original sermons, with their notable leaning towards the use of a racy vernacular, made him one of the best known personalities of his time. Dr Parker was twice chairman of the London Congregational Board and twice of the Congregational Union of England and Wales. The death of his second wife in 1899 was a blow from which he never fully recovered, and he died on the 28th of November 1902.

Parker was pre-eminently a preacher, and his published works are chiefly sermons and expositions, chief among them being City Temple Sermons (1869-1870) and The People's Bible, in 25 vols. (1885-1895). Other volumes include the autobiographical Spring- dale Abbey (1869), The Inner Life of Christ (1881), Apostolic Life (1884), Tyne Chylde: My Life and Teaching (1883; new ed., 1889), A Preacher's Life (1899).

See E. C. Pike, Dr Parker and his Friends (1905) ; Congregational Year- Book (1904).

PARKER, MARTIN (c. 1600-c. 1656), English ballad writer, was probably a London tavern-keeper. About 1625 he seems to have begun publishing ballads, a large number of which bearing his signature or his initials, "M. P.," are preserved in the British Museum. Dryden considered him the best ballad writer of his time. His sympathies were with the Royalist

cause during the Civil War, and it was in support of the declining fortunes of Charles I. that he wrote the best known of his ballads, " When the King enjoys his own again," which he first pub- lished in

1643, and which, after enjoying great popularity at the Restoration, became a favourite Jacobite song in the 18th century. Parker also wrote a nautical ballad, ” Sailors for my Money,” which in a revised version survives as ” When the stormy winds do blow.” It is not known when he died, but the appearance in 1656 of a ” funeral elegy,” in which the ballad writer was satirically celebrated is perhaps a correct indication of the date of his death.

See The Roxburghe Ballads, vol. iii. (Ballad Soc, 9 vols., 1871-1899) ; Joseph Ritson, Bibliographia Poetica (London, 1802); Ancient Songs and Ballads from Henry II. to the Revolution, ed. by W. C. Hazlitt (London, 1877); Sir S. E. Brydges and J. Haslewood, The British Bibliographer, vol. ii. (London, 1810); Thomas Corser, Collectanea Anglo-poetica (London, 1860-1883).

PARKER, MATTHEW (1504-1575), archbishop of Canterbury, was the eldest son of William Parker, a citizen of Norwich, where he was born, in St Saviour’s parish, on the 6th of August 1 504. His mother’s maiden name was Alice Monins, and a John Monins married Cranmer’s sister Jane, but no definite relation- ship between the two archbishops has been traced. William Parker died about 15 16, and his widow married a certain John Baker. Matthew was sent in 1522 to Corpus Christi College, Cambridge, where he is said by most of his biographers, including the latest, to have been contemporary with Cecil; but Cecil was only two years old when Parker went to Cambridge. He graduated B.A. in 1525, was ordained deacon in April and priest in June 1527, and was elected fellow of Corpus in the following September. He commenced M.A. in 1528, and was one of the Cambridge scholars whom Wolsey wished to transplant to his newly founded Cardinal College at Oxford. Parker, like Cranmer, declined the invitation. He had come undo the influence of the Cambridge reformers, and after Anne Boleyn’s recognition as queen he was made her chaplain. Through her he was appointed dean of the college of secular canons at Stoke-by-Clare in 1535. Latimer wrote to him in that year urging him not to fall short of the expectations which had been formed of his ability. In 1537 he was appointed chaplain to Henry VIII., and in 1538 he was threatened with prosecution by the reactionary party. The bishop of Dover, however, reported to Cromwell that Parker “hath ever been of a good judgment and set forth the Word of God after a good manner. For this he suffers some grudge.” He graduated D.D. in that year, and in 1541 he was appointed to the second prebend in the reconstituted cathedral church of Ely. In 1544 on Henry VIII. ‘s recommendation he was elected master of Corpus Christi College, and in 1545 vice-chancellor of the university. He got into some trouble with the chancellor, Gardiner,

over a ribald play, ” Pammachius,” performed by the students, deriding the old ecclesiastical system, though Bonner wrote to Parker of the assured affection he bore him. On the passing of the act of parliament in 1545 enabling the king to dissolve chantries and colleges, Parker was appointed one of the com missioners for Cambridge, and their report saved its college* if there had ever been any intention to destroy them. Stoke, however, was dissolved in the following reign, and Parker received a pension equivalent to £400 a year in modern currency. He took advantage of the new reign to marry in June, 1547, before clerical marriages had been legalized by parliament and convocation, Margaret, daughter of Robert Harlestone, a Norfolk squire. During Rett’s rebellion he was allowed to preach in the rebels’ camp on Mousehold Hill, but without much effect; and later on he encouraged his chaplain, Alexander Neville, to write his history of the rising. His Protestantism advanced with the times, and he received higher promotion under Northumberland than under the moderate Somerset. Bucer was his friend at Cambridge, and he preached Bucer’s funeral sermon in 155 1. In 1552 he was promoted to the rich deanery of Lincoln, and in July 1553 he supped with Northum- berland at Cambridge, when the duke marched north on his hope- less campaign against Mary.

As a supporter of Northumberland and a married man, Parker was naturally deprived of his deanery, his mastership of Corpus, and his other preferments. But he found means to live in England throughout Mary’s reign without further molestation. He was not cast in a heroic mould, and he had no desire to figure at the stake; like Cecil, and Elizabeth herself, he had a great respect for authority, and when his time came he could consistently impose authority on others. He was not eager to assume this task, and he made great efforts to avoid promotion to the archbishopric of Canterbury, which Elizabeth designed for him as soon as she had succeeded to the throne. He was elected on the 1st of August 1559; but it was difficult to find the requisite four bishops willing and qualified to conse- crate him, and not until the 17th of December did Barlow, Scory, Coverdale and Hodgkins perform that ceremony at Lambeth. The legend of an indecent consecration at the Nag’s Head tavern in Fleet Street seems first to have been printed by the Jesuit, Christopher Holywood, in 1604; and it has long been abandoned by reputable controversialists. Parker’s consecration was, however, only made legally valid by the plenti- tude of the royal supremacy; for the Edwardine Ordinal, which

was used, had been repealed by Mary and not re-enacted by the parliament of 1559.

Parker owes his fame to circumstances rather than to personal qualifications. This wise moderation of the Elizabethan settle- ment, which had been effected before his appointment, was obviously not due to him; and Elizabeth could have placed Knox or Bonner in the chair of St Augustine had she been so minded. But she wanted a moderate man, and so she chose Parker. He possessed all the qualifications she expected from an arch- bishop except celibacy. He distrusted popular enthusiasm, and he wrote in horror of the idea that ” the people ” should be the reformers of the Church. He was not inspiring as a leader of religion; and no dogma, no original theory of church government, no prayer-book, not even a tract or a hymn is associated with his name. The 56 volumes published by the Parker Society include only one by its eponymous hero, and that is a volume of correspondence. He was a disciplinarian, a scholar, a modest and moderate man of genuine piety and irreproachable morals. His historical research was exemplified in his De anliquilaie ecclesiae, and his editions of Asser, Matthew Paris, Walsingham, and the compiler known as Matthew of Westminster; his liturgical skill was shown in his version of the psalter and in the occasional prayers and thanksgivings which he was called upon to compose; and he left a priceless collection of manuscripts to his college at Cambridge.

He was happier in these pursuits than in the exercise of his jurisdiction. With secular politics he had little to do, and he was never admitted to Elizabeth’s privy council. But ecclesiastical politics gave him an infinity of trouble. Many of the reformers wanted no bishops at all, while the Catholics wanted those of the old dispensation, and the queen herself grudged episcopal privilege until she discovered in it one of the chief bulwarks of the royal supremacy. Parker was there- fore left to stem the rising tide of Puritan feeling with little support from parliament, convocation or the Crown. The bishops’ Interpretations and Further Considerations, issued in 1 560, tolerated a lower vestiarian standard than was prescribed by the rubric of 1559; the Advertisements, which Parker published in 1566, to check the Puritan descent, had to appear without specific royal sanction; and the Reformatio legum ecclesiasticarum, which Foxe published with Parker’s approval, received neither royal, parliamentary nor synodical authorization. Parliament even contested the claim of the bishops to determine matters of faith. ” Surely,” said Parker to Peter Wentworth, ” you will refer yourselves wholly to us therein. ” ” No, by the faith I bear to God,” retorted Wentworth,” we will pass nothing before we understand what it is; for that were but to make you popes. Make you

popes who list, for we will make you none." Disputes about vestments had expanded into a con- troversy over the whole field of Church government and authority, and Parker died on the 17th of May, 1575, lamenting that Puritan

ideas of " governance " would " in conclusion undo the queen and all others that depended upon her." By his personal conduct he had set an ideal example for Anglican priests, and it was not his fault that national authority failed to crush the individualistic tendencies of the Protestant Reformation.

John Strype's Life of Parker, originally published in 1 71 1, and re-edited for the Clarendon Press in 1821 (3 vols.), is the principal source for Parker's life. A biographical sketch written from a different point of view was published by W. M. Kennedy in 1908. See also J. Bass Mullinger's scholarly life in Diet. Nat. Biog.; W. H. Frere's volume in Stephens and Hunt's Church History; Strype's Works (General Index); Gough's Index to Parker Soc. Publ. Fuller, Burnet, Collier and R. W. Dixon's Histories of the Church; Birt's Elizabethan Settlement; H. Gee's Elizabethan Clergy (1898); Froude's Hist, of England; and vol. vi. in Longman's Political History. (A. F. P.)

PARKER, SAMUEL (1640-1688), English bishop, was born at Northampton, and educated at Wadham College, Oxford. His Presbyterian views caused him to move to Trinity College, where, however, the influence of the senior fellow induced him to join the Church of England, and he was ordained in 1664. In 166.5 ne published an essay entitled Tentamina physico- theologica de Deo, dedicated to Archbishop Sheldon, who in 1667 appointed him one of his chaplains. He became rector of Chartham, Kent, in the same year. In 1670 he became archdeacon of Canterbury, and two years after he was appointed rector of Ickham, Kent. In 1673 he was elected master of Eden- bridge Hospital. His Discourse of Ecclesiastical Politie (London, 1670), advocating state regulation of religious affairs, led him into controversy with Andrew Marvell (1621-1675). James II. appointed him to the bishopric of Oxford in 1686, and he in turn forwarded the king's policy, especially by defending the royal right to appoint Roman Catholics to office. In 1687 the ecclesiastical commission forcibly installed him as president of Magdalen College, Oxford, the fellows having refused to elect any of the king's nominees. He was commonly regarded as a Roman Catholic, but he would appear to have been no more than an extreme exponent of the High Church doctrine of passive obedience. After he became president the action of the king in replacing the expelled fellows with Roman Catholics agitated him to such a degree as to hasten his end; to the

priests sent to persuade him on his death-bed to be received into the Roman Church he declared that he ” never had been and never would be of that religion,” and he died in the communion of the Church of England.

Parker’s second son, Samuel Parker (1681-1730), was the author of Bibliotheca biblica, or Patristic Commentary on the Scriptures (1720-1735), an abridged translation of Eusebius, and other works. He was also responsible during 1708 and 1709 for a monthly periodical entitled Censura temporum, or Good and III Tendencies of Books. He passed most of his life in retire- ment at Oxford. His younger son Richard founded the well- known publishing firm in Oxford.

See Magdalen College and James II. 1686-1688, by the Rev. J. R. Bloxam (Oxford Historical Society, 1886).

PARKER, THEODORE (1810-1860), American preacher and social reformer, was born at Lexington, Massachusetts, on the 24th of August 18 10, the youngest of eleven children. His father, John Parker, a small farmer and skilful mechanic, was a typical New England yeoman. His mother took great pains with the religious education of her children, ” caring, however, but little for doctrines,” and making religion to consist of love and good works. His paternal grand-father, Captain John Parker (1720-1775), was the leader of the Lexington minute-men in the skirmish at Lexington. Theodore obtained the elements of knowledge in the schools of the district, which were open during the winter months only. During the rest of the year he worked on his father’s farm. At the age of seventeen he became himself a winter schoolmaster, and in his twentieth year he entered himself at Harvard, working on the farm as usual (until 1831) while he followed his studies and going over to Cambridge for the examinations only. For the theological course he took up in 1834 his

residence in the college, meeting his expenses by a small sum amassed by school-keeping and by help from a poor students’ fund, and graduating in 1836. At the close of his college career he began his translation (published in 1843) of Wilhelm M. L. De Wette’s Beitrdge zur Einleitung in das Alte Testament. His journal and letters show that he had made acquaintance with a large number of languages, including Hebrew, Chaldee, Syriac, Arabic, Coptic, Ethiopic, as well as the classical and the principal modern European languages. When he

entered the divinity school he was an orthodox Unitarian; when he left it, he entertained strong doubts about the infallibility of the Bible, the possibility of miracles, and the exclusive claims of Christianity and the Church. Emerson's transcendentalism greatly influenced him, and Strauss's Leben Jesu left its mark upon his thought. His first ministerial charge was over a small village parish, West Roxbury, a few'miles from Boston; here he was ordained as a Unitarian clergyman in June 1837 and here he preached until January 1846. His views were slowly assuming the form which sub- sequently found such strong expression in his writing; but the progress was slow, and the cautious reserve of his first rational- istic utterances was in striking contrast with his subsequent rashness. But on the 19th of May 1841 he preached at Boston a sermon on " the transient and permanent in Christianity," which presented in embryo the main principles and ideas of his final theological position, and the preaching of which deter- mined his subsequent relations to the churches with which he was connected and to the whole ecclesiastical world. The Boston Unitarian clergy denounced the preacher, and declared that the " young man must be silenced." No Unitarian publisher could be found for his sermon, and nearly all the pulpits of the city were closed against him. A number of gentlemen in Boston, however, invited him to give a series of lectures there. The result was that he delivered in the Masonic Hall, in the winter of 1841-1842, as lectures, substantially the volume afterwards published as the Discourse of Matters pertain- ing to Religion. The lectures in their published form made his name famous throughout America and Europe, and con- firmed the stricter Unitarians in America in their attitude towards him and his supporters. His friends, however, resolved that he should be heard in Boston, and there, beginning with 1845, he preached regularly for fourteen years. Previous to his removal from West Roxbury to Boston Parker spent a year in Europe, calling in Germany upon Paulus, Gervinus, De Wette and Ewald, and preaching in Liverpool in the pulpits of James Martineau and J. H. Thom. After January 1846 he devoted himself exclusively to his work in Boston. In addition to his Sunday labours he lectured throughout the States, and prosecuted his wide studies, collecting particularly the materials for an opus magnum on the development of religion in mankind. Above all he took up the question of the emancipa- tion of the slaves, and fearlessly advocated in Boston and else- where, from the platform and through the press, the cause of the negroes. He made his influence felt also by correspondence with political leaders and by able political speeches, one of which, delivered in 1858, contained the sentence, " Democracy is direct self-government, over all the people, by all the people, for all the people," which probably suggested Abraham

Lincoln's oft-quoted variant. Parker assisted actively in the escape of fugitive slaves, and for trying to prevent the rendition of perhaps the most famous of them, Anthony Burns, was indicted, but the indictment was quashed. He also gave his aid to John Brown (q.v.). By his voice, his pen, and his utterly fearless action in social and political matters he became a great power in Boston and America generally. But his days were numbered. His mother had suffered from phthisis; and he himself now fell a victim to the same disease. In January 1859 he suffered a violent haemorrhage of the lungs, and sought relief by retreating first to the West Indies and afterwards to Europe. He died at Florence on the 10th of May i860.

The fundamental articles of Parker's religious faith were the three " instinctive intuitions " of God, of a moral law, and

of immortality. His own mind, heart and life were undoubtedly pervaded, sustained and ruled by the feelings, convictions and hopes which he formulated in these three articles; and he rationalized his own religious conceptions in a number of expositions which do credit to his sincerity and courage. But he was a preacher rather than a thinker, a reformer rather than a philosopher.

Parker's principal works are: A Discourse of Matters pertaining to Religion (1842); Ten Sermons of Religion (1853); and Sermons of Theism, Atheism and the Popular Theology (1853). A collected edition of his works was published in England by Frances Power Cobbe (14 vols., 1863-1870), and another — the Centenary edition — in Boston, Mass., by the American Unitarian Association (14 vols., 1907-1911) ; a volume of Theodore Parker's Prayers, edited by Rufus Leighton and Matilda Goddard, was published in America in 1861, and a volume of Parker's West Roxbury Sermons, with a biographical sketch by Frank B. Sanborn, was published in Boston, Mass., in 1892. A German translation of part of his works was made by Ziethen (Leipzig 1854-1857).

The best biographies are John Weiss's Life and Correspondence of Theodore Parker (New York, 1864) ; O. B. Frothingham's Theodore Parker: a Biography (Boston, 1874) ; and John White Chadwick's Theodore Parker, Preacher and Reformer (Boston, 1900), the last containing a good bibliography. Valuable reviews of Parker's theological position and of his character and work have appeared • — by James Martineau, in the National Review (April 1860), and J. H. Thom, in the Theological Review (March 1864).

PARKERSBURG, a city and the county-seat of Wood county, West

Virginia, U.S.A., on the Ohio river, at the mouth of the Little Kanawha, about 95 m. below Wheeling. Pop. (1890), 8408; (1900), 11,703, of whom 515 were foreign-born and 783 were negroes; (1910 census), 17,842. Parkersburg is served by the Baltimore & Ohio, the Baltimore & Ohio South- western, and the Little Kanawha railways, by electric railway to Marietta, Ohio, and by passenger and freight boats to Pitts- burg, Cincinnati, intermediate ports, and ports on the Little Kanawha. Parkersburg is the see of a Protestant Episcopal bishop. Oil, coal, natural gas and fire-clay abound in the neighbouring region, and the city is engaged in the refining of oil and the manufacture of pottery, brick and tile, glass, lumber, furniture, flour, steel, and foundry and machine-shop products. In 1905 the value of the factory products was $3,778,139 (21-9% more than in 1900). Parkersburg was settled in 1789, was incorporated in 1820, and received a new charter in 1903, when its boundaries were enlarged. About 2 m. below the city is the island which was the home of Harman Blenner- hassett (q.v.) and bears his name.

PARKES, SIR HARRY SMITH (1828-1885), English diploma- tist, son of Harry Parkes, founder of the firm of Parkes, Otway & Co., ironmasters, was born at Birchills Hall, near Walsall in Staffordshire, in 1828. When but four years old his mother died and in the following year his father was killed in a carriage accident. Being thus left an orphan, he found a home with his uncle, a retired naval officer, at Birmingham. He re- ceived his education at King Edward's Grammar School. In 1837 his uncle died, and in 1841 he sailed for Macao in China, to take up his residence at the house of his cousin, Mrs Gutzlaff. At this time what was known as the " Opium War " had broken out, and Parkes eagerly prepared himself to take part in the events which were passing around him by diligently applying himself to the study of Chinese. In 1842 he received his first appointment in the consular service. Fortunately for him, he was privileged to accompany Sir Henry Pottinger in his expedition up the Yangtsze- kiang to Nanking, and after having taken part in the capture of Chinkiang and the surrender of Nanking, he witnessed the signing of the treaty on board the " Cornwallis " in August 1842. By this treaty the five ports of Canton, Amoy, Fuchow, Ningpo and Shanghai were opened to trade. After short residences at Canton and the newly opened Amoy, Parkes was appointed to the consulate at Fuchow. Here he served under Mr (afterwards Sir) Rutherford Alcock, who was one of the few Englishmen who knew how to manage the Chinese. In 1849 he returned to England on leave, and after visiting the Continent and doing some hard work for the foreign office he returned to China in 1851. After a short stay

at Amoy as interpreter he was transferred in the same capacity to Canton. In May 1854 he was promoted to be consul at Amoy, and in 1855 was chosen as secretary to the mission to Bangkok, being largely instrumental in negotiating the first European treaty with Siam. In June 1856 he returned to Canton as acting consul, a position which brought him into renewed contact with Commissioner Yeh, whose insolence and obstinacy led to the second China War. Yeh had now met a man of even greater power and determination than himself, and when, in October 1856, as a climax to many outrages, Yeh seized the British lorcha ” Arrow ” and made prisoners of her crew, Parkes at once closed with his enemy. In response to a strongly worded despatch from Parkes, Sir John Bowring, governor of Hong-Kong, placed matters in the hands of Admiral Sir M. ieymour, who took Canton at the close of the same month but had not a sufficient force to hold it. In December 1857 Canton was again bombarded by Admiral Seymour. Parkes, who was attached to the admiral’s staff, was the first man to enter the city, and himself tracked down and arrested Commissioner Yeh. As the city was to be held, an allied commission was appointed to govern it, consisting of two Englishmen, of whom one was Parkes, and a French naval officer. Parkes virtually governed this city of a million inhabitants for three years. Meanwhile the treacherous attack at Taku upon Sir Frederick Bruce led to a renewal of hostilities in the north, and Parkes was ordered up to serve as interpreter and adviser to Lord Elgin (July, i860). In pursuance of these duties he went in advance of the army to the city of Tungchow, near Peking, to arrange a meeting between Lord Elgin and the Chinese commissioners who had been appointed to draw up the preliminaries of peace. While thus engaged he, Mr (afterwards Lord) Loch, Mr de Norman, Lord Elgin’s secretary of legation, Mr Bowlby, the Times correspondent, and others, were treacherously taken prisoners (Sept. 18, i860). Parkes and Loch were carried off to the prison of the board of punishments at Peking, where they were separately herded with the lowest class of criminals. After ten days’ confinement in this den of iniquity they were removed to a temple in the city, where they were comfortably housed and fed, and from which, after a further detention, they were granted their liberty. For this signal instance of treachery Lord Elgin burned down the Summer Palace of the emperor. Towards the end of i860 Parkes returned to his post at Canton. On the restoration (Oct. 1861) of the city to the Chinese he returned to England on leave, when he was made K.C.B. for his services; he had received the companionship of the order in i860. On his return to

China he served for a short time as consul at Shanghai, and was then appointed minister in Japan (1865). For eighteen years he held this post, and throughout that time he strenuously used his influence in support of the Liberal party of Japan. So ‘ earnestly did he throw in his lot with these reformers that he became a marked man, and incurred the bitter hostility of the reactionaries, who on three separate occasions attempted to assassinate him. In 1882 he was trans- ferred to Peking. While in Peking his health failed, and he died of malarial fever on the 21st of March 1885. In 1856 Sir H. (then Mr) Parkes married Miss Fanny Plumer, who died in 1879. The standard Life is by Stanley Lane-Poole (1894). (R. K. D.)

PARKES, SIR HENRY (1815-1896), Australian statesman, was born at Stoneleigh, in Warwickshire, on the 27th of May 1815. The son of parents in very humble circumstances, he received only a rudimentary education, and at an early age was obliged to earn his living as a common labourer. Failing to make his way in England, he emigrated to Australia in 1839, and after a time settled in Sydney as an ivory-turner. Conscious of his great powers, he worked unremittingly to repair the deficiencies of his education, and developed a genuine taste for literature, and a gift for versification which won the approval of so severe a judge as Tennyson. His first volume of poems was published in 1842, under the title of Stolen Moments. He now began to take an active part in politics, and soon showed himself the wielder of an incisive style as a leader-writer, and a popular orator of unrivalled influence. He took a prominent

part in the movement against the transportation of convicts, and in 1849 started the Empire newspaper to inculcate his policy of attacking abuses while remaining loyal to the Crown. The paper at once made its mark, but owing to financial difficulties ceased to appear in 1858. One of the reforms for which Parkes fought most strenuously was the full introduction of responsible government. He was returned to the legislative council under the old constitution as member for Sydney, and on the estab- lishment of a legislative assembly in 1856 was elected for East Sydney. His parliamentary career was twice interrupted by pecuniary embarrassments; indeed, he never acquired the art of making money, and in spite of a public subscription raised in 1887 died in absolute penury. He was elected for East Sydney in 1859 at the first general election under the new electoral act, and sat till 1861, when he was sent to England as a commissioner for promoting emigration. He made a prolonged stay in England, and described his impressions in a series of letters to the Sydney Morning Herald, some of which were reprinted in 1869 under the title of Australian Views of England. He returned to Australia in 1863, and,

re-entering the Assembly, became colonial secretary in the Martin ministry from 1866 to 1868. He succeeded in passing the Public Schools Act of 1866, which for the first time instituted an efficient system of primary education in the colony. His great chance came in 1872, when the Martin ministry resigned on the question of the sum payable by Victoria in lieu of border duties. Parkes had for several years persistently advocated free imports as a remedy for the financial distress of the colony. He now became prime minister and colonial secretary; and rising to the height of his opportunity, he removed the cause of dispute by throwing the colony open to trade. He held office till 1875, and on the fall of the Robertson ministry again became premier and colonial secretary from March till August 1877. At the end of this year he was made K.C.M.G. Finding that the state of parties did not allow of the existence of a stable ministry, he formed a coalition with Sir John Robertson, and became premier and colonial secretary for the third time from December 1878 to January 1883. In 1882 and in 1883-1884 he paid prolonged visits to England. Already distinguished among Australian statesmen for breadth of outlook and passionate devo- tion to the Empire, he returned with those qualities enhanced. For a time he found himself almost in a position of isolation, but in 1887 the policy of protection adopted by his successors brought him again into office. His free trade policy was once more successful. Other important measures of his administra- tion were the reform of the civil service, the prohibition of Chinese immigration, and the railways and public works acts. He fell from office in January 1889, but in the following March became for the fifth time premier and colonial secretary. The remainder of his life was chiefly devoted to the question of Australian federation. The Federal Convention at Melbourne in 1890 was mainly his work; and he presided over the convention at Sydney in 1891, and was chiefly responsible for the draft constitution there carried. Defeated in October 1891 on his refusal to accept an eight hours' day for coal- miners, he remained in opposition for the rest of his career, sacrificing even free trade in the hope of smoothing the path of federation. He died at Sydney on the 27th of April 1896; but though he did not live to see the realization of his efforts, he may justly be called the Father of the Australian Commonwealth.

He published, in addition to the works already named and numerous volumes of verse, a collection of speeches on the Federal Government of Australia (1890), and an autobiography, Fifty Years in the making of Australian History (1892).

PARKIN, GEORGE ROBERT (1846-), British Canadian educationist, was born at Salisbury, New Brunswick, oh the 8th of February 1846.

His father had gone to Canada from Yorkshire. Parkin was the youngest of a family of thirteen, and after attending the local schools he started at an early age as a teacher. Bent on improving his own education, he then entered the university of New Brunswick, where he carried off high honours in 1866-1868. From 1868 to 1872 he was head master

of Bathurst grammar school; but he was not content with the opportunities for study open to him in Canada, and he went to England and entered Oxford. Here the enthusiastic young Canadian was not only profoundly affected himself by entering strenuously into the life of the ancient university (he was secre- tary of the Union when H. H. Asquith was president), but in his turn was instrumental in bringing the possibilities of British Imperialism to the minds of some of the ablest among his con- temporaries — his juniors by six or eight years. It is hardly too much to say that in his intercourse at Oxford in the early 'seven- ties with men of influence who were then undergraduates the imperialist movement in England substantially began. On returning to Canada he became principal of the chief New Bruns- wick school at Fredericton (where in 1878 he married), and for fifteen years he did excellent work in this capacity. But in 1889 he was again drawn more directly into the imperialist cause. The federation movement had gone ahead in the meanwhile, and Parkin had always been associated with it; and now he became a missionary speaker for the Imperial Federation League, travelling for several years about the empire for that purpose. He also became Canadian correspondent of The Times, and in that capacity helped to make Canada better known in the mother country. In 1894 he was given the honorary degree of LL.D. by Oxford. In 1895 he returned to scholastic work as principal of Upper Canada College, Toronto, and retained this post till 1902; but he continued in the mean- while to support the imperialist movement by voice and pen. When in 1902 an organizer was required for the Rhodes Scholar- ship Trust (see Rhodes, Cecil), in order to create the machinery for working it in the countries to which it applied, he accepted the appointment; and his devotion to this task was largely responsible for the success with which Rhodes's idea was carried out at Oxford. His publications include Reorganization of the British Empire (1882), Imperial Federation (1892), Round the Empire (1892), Life of Edward Thring (1897), Life of Sir John Macdonald

(1907).

PARKINSON, JAMES (d. 1824), English palaeontologist, was educated for the medical profession, and practised in Hoxton, from about the year 1785. He was a Fellow of the Royal College of Surgeons, and one of the original members of the Geological Society of London (1807). He was author of numerous chemical and medical books, the most important of which were Organic Remains of a Former World (3 vols., 1804, 1808, 181 1), and Outlines of Or y otology (1822). Parkinson died in London, on the 21st of December 1824.

See Hist, of Collections in Brit. Mus. Nat. Hist. Dep. (1904), PP-315-316.

PARKMAN, FRANCIS (1823-1893), American historian, was born in Boston on the 16th of September 1823. His great- grandfather, Ebenezer Parkman, a graduate of Harvard in 1721, was for nearly sixty years minister of the Congregational Church in Westborough, and was noted for his devotion to the study of history. One of this good clergyman's sons, Samuel Parkman, became an eminent merchant in Boston, and exhibited much skill in horticulture. Samuel's sen, Francis Parkman, a graduate of Harvard in 1807, was one of the most eminent of the Boston clergymen, a pupil and friend of Channing, and noted among Unitarians for a broadly tolerant disposition. This Dr Park- man, a man of rare sagacity and exquisite humour, was the father of Francis Parkman, the historian. His mother was a descendant of the celebrated John Cotton. She was the daughter of Nathaniel Hall of Medford, member of a family which was represented in the convention that framed the constitution of Massachusetts in 1780.

Francis Parkman was the eldest of her six children. As a boy his health was delicate, so that it was thought best for him to spend much of his time at his grandfather Hall's home in Medford rather than in the city. That home was situated on the border of the Middlesex Fells, a rough and rocky woodland, 4000 acres in extent, as wild and savage in many places as the primeval forest. The place is within 8 m. of Boston, and it may be doubted if anywhere else can be found another

such magnificent piece of wilderness so near to a great citj. There young Parkman spent his leisure hours in collecting eggs, insects and reptiles, trapping squirrels and woodchucks, and shooting birds with arrows. This breezy life saved him from the artificial stupidity which-is too often superinduced in boys by their school training. At the age of fourteen Parkman began to show a strong taste for literary

composition. In 1841, while a student at Harvard, he made a rough journey of explora- tion in the woods of northern New Hampshire, where he had a taste of adventure slightly spiced with hardship. About this time he made lip his mind to write a history of the last French war in America, which ended in the conquest of Canada, and some time afterwards he enlarged the plan so as to include the whole course of the American conflict between France and Great Britain; or, to use his own words, ” The history of the American forest; for this was the light in which I regarded it. My theme fascinated me, and I was haunted with wilderness images day and night.” The way in which true genius works could not be more happily described. In the course of 1842 an attack of illness led to his making a journey in Italy, where he spent some time in a monastery belonging to one of the strictest of all the monastic orders, the Passionists, brethren addicted to wearing hair shirts and scourging themselves without mercy. In the young historian’s eyes these good brethren were of much value as living and breathing historic material. In 1844 he graduated at Harvard with high rank.

He now made up his mind to study the real wilderness in its gloom and vastness, and to meet face to face the dusky warriors of the Stone Age. To-day such a thing can hardly be done within the United States, for nowhere does the primitive wilderness exist save here and there in shreds and patches. So recently as the middle of the 19th century, however, it covered the western half of the continent, and could be reached by a journey of 1600 or 1700 miles from Boston to the plains of Nebraska. Parkman had become an adept in woodcraft and a dead shot with the rifle, and could do such things with horses, tame or wild, as civilized people never see done except in a circus. In company with his friend and classmate, Mr Quincy Shaw, he passed several months with the Ogillalah band of Sioux. Knowledge, intrepidity and tact carried Parkman through these experiences unscathed, and good luck kept him clear of encounters with hostile Indians, in which these qualities might not have sufficed to avert destruction. It was a very important experience in relation to his life-work. This outdoor life, however, did not suffice to recruit Parkman’s health, and by 1848, when he began writing The Conspiracy of Pontiac, he had reached a truly pitiable condition. The trouble seems to have been some form of nervous exhaustion, accompanied with such hyper- sensitiveness of the eyes that it was impossible to keep them open except in a dark room. Against these difficulties he struggled with characteristic obstinacy. He invented a machine which so supported his hand that he could write legibly with closed eyes. Books and documents were read aloud to him, while notes were made by him with eyes shut, and were

after- wards deciphered and read aloud to him till he had mastered them. After half an hour his strength would give out, and in these circumstances his rate of composition for a long time averaged scarcely six lines a day. The superb historical mono- graph composed under such difficulties was published in i85r. It had but a small sale, as the American public was then too ignorant to feel much interest in American history.

Undeterred by this inhospitable reception, Parkman took up at the beginning his great work on France and England in the New World, to which the book just mentioned was in reality the sequel. This work obliged him to trace out, collect, arrange, and digest a great mass of incongruous material scattered on both sides of the Atlantic, a large portion of which was in manu- script, and required much tedious exploration and the employ- ment of trained copyists. This work involved several journeys to Europe, and was performed with a thoroughness approaching finality. In 1865 the first volume of the great work appeared, under the title of Pioneers of France in the New World; and then

seven-and-twenty years more elapsed before the final volumes came out in 1892. Nowhere can we find a better illustration of the French critic's definition of a great life — a thought con- ceived in youth, and realized in later years. After the Pioneers the sequence is The Jesuits in North America, La Salle and the Discovery of the Great West, The Old Rigime in Canada, Frontenac and New France and Louis XIV., Montcalm and Wolfe, A Half Century of Conflict. As one obstacle after another was sur- mounted, as one grand division of the work after another became an accomplished fact, the effect upon Parkman's condition seems to have been bracing, and he acquired fresh impetus as he approached the goal. There can be little doubt that his physical condition was much improved by his habit of cultivating plants in garden and conservatory. He was a horticulturist of profound attainments, and himself originated several new varieties of flowers. His work in this department made him an enthusiastic adherent of the views of Darwin. He was professor of horticulture in the agricultural school of Harvard in 1871-1872, and published a few books on the subject of gardening. He died at Jamaica Plain, near Boston, on the 8th of November 1893.

The significance of Parkman's work consists partly in the success with which he has depicted the North-American Indians, those belated children of the Stone Age, who have been so persistently misunderstood alike by romancers, such as Cooper, and by detractors like Dr Palfrey. Parkman was the first great literary author who really understood the Indian's character and motives. Against this savage background of the forest Parkman shows the rise, progress and dramatic termination of the colossal struggle between France and

Great Britain for colonial empire. With true philosophic insight he shows that France failed in the struggle not because of any inferiority in the ability and character of the men to whom the work was entrusted, but chiefly by reason of her despotic and protective regime. There is no more eloquent commentary upon the whole- some results of British self-government than is to be found in Parkman's book. But while the author deals with history philosophically, he does not, like Buckle, hurl at the reader's head huge generalizations, or, like Carlyle, preach him into somnolence. With all its manifold instructiveness, his book is a narrative as entertaining as those of Macaulay or Froude. In judicial impartiality Parkman may be compared with Gardiner, and for accuracy of learning with Stubbs. There is a good Life by G. H. Farnham (Boston, 1900). (J. Fi.) PARLA KIMEDI, a town of British India, in Ganjam dis- trict of Madras. Pop. (1901), 17,336. It is the residence of a raja, who claims descent from the ancient kings of Orissa. His estate covers an area of 614 sq. m., and pays a revenue of £7000 out of an estimated income of £26,000. He maintains a college, and has constructed a light railway (25 m.) to the station of Naupada on the East Coast railway. There is a trade in rice, and mats and other articles are woven of reeds.

PARLEMENT (see Parliament), in O. Fr. the name given to any meeting for discussion or debate (parler, to speak), a sense in which it was still used by Joinville, but from the latter half of the 13th century employed in France in a special sense to designate the sessions of the royal court {curia regis). Finally, when the Parlement of Paris had become a permanent court of justice, having the supreme authority in cases brought before it, and especially in appeals against the sentences of the baillis and seneschals, it retained this name, which was also given to the other supreme courts of the same nature which were created after its model in the provinces.

The early Capetians had a custom, based upon ancient precedents, of summoning periodically to their court their principal vassals and the prelates of their kingdom. These gatherings took place on the occasion of one of the great festivals of the year, in the town in which the king was then in residence. Here they deliberated upon political matters and the vassals and prelates gave the king their advice. But the monarch also gave judgment here in those cases which were brought before him. These were few in number during the early days of the xx. 27

Capetian dynasty; for though the king always maintained the principle that he was judge, and even that his competence in this respect was general and unlimited, this competence was at the same time

undefined and it was not compulsory to submit cases to the king. At this period, too, appeals, strictly so called, did not exist. Nevertheless when a ■ suit was brought before the king he judged it .with the assistance of his prelates and vassals assembled around him, who formed his council. This was the curia regis. But in law the king was sole judge, the vassals and prelates being only advisers. During the 12th and at the beginning of the 13 th centuries the curia regis continued to discharge these functions, except that its importance and actual competence continued to increase, and that we frequently find in it, in addition to the vassals and prelates who formed the council, consiliarii, who are evidently men whom the king had in his entourage; as his ordinary and professional councillors. Under the reign of St Louis (which was also the period at which the name parlement began to be applied to these judicial sessions) the aspect of affairs changed. The judicial competence of the Parlement developed and became more clearly defined; the system of appeals came into existence, and appeals against the judgments of- the baillis and seneschals were brought before it; cases concerning the royal towns, the bonnes miles, were also decided by it. Again, in the old registers of the Parlement at this period, the first Olim books, we see the names of the same councillors recurring from session to session. This suggests that a sufficient number of councillors was assured beforehand, and a list drawn up for each session; the vassals and prelates still figuring as a complementary body at the council.

Next came the series of ordinances regulating the tenure of the Parlement, those of 1278, 1291, 1296 and 1308, and the institution was regularized. Not only were the persons who were to constitute each Parlement named in advance, but those who were not placed on this list, even though vassals or prelates, were excluded from judging cases. The royal baillis had to attend the Parlement, in order to answer for their judgments, and at an early date was fixed the order of the different bailliages, in which the cases coming from them were heard. The baillis, when not interested in the case, formed part of the council, but were afterwards excluded from it. Before the middle of the 14th century the personnel of the Parlement, both presidents and councillors, became fixed de facto if not de jure. Every year a list was drawn up of those who were to hold the session, and although this list was annual, it contains the same names year after year; they are as yet, however, only annual commissaries (commissaires). In 1344 they became officials (officiers) fixed but not yet irremovable. At the same time the Parlement had become permanent; the number of the sessions had diminished, but their length had increased. In the course of the 14th century it became the rule for the Parlement to sit from

Martinmas (Nov. 11) till the end of May; later the session was prolonged till the middle of August, the rest of the year forming the vaca- tion. The Parlement had also become fixed at Paris, and, by a development which goes back to fairly early times, the presidents and councillors, instead of being merely the king's advisers, had acquired certain powers, though these were con- ferred by the monarch; they were, in fact, true magistrates. The king held his court in person less and less often, and it pronounced its decrees in his absence; we even find him pleading his cause before it as plaintiff or defendant. In the 14th century, however, we still find the Parlement referring delicate affairs to the king; but in the 15th century it had acquired a jurisdiction independent in principle. As to its composition, it continued to preserve one notable feature which recalled its origin. It had originally been an assembly of lay vassals and prelates; when its composition became fixed and consisted of councillor- magistrates, a certain number of these offices were necessarily occupied by laymen, and others by ecclesiastics, the conseillers lais and the conseillers clercs.

The Parlement was at the same time the court of peers (cour des pairs). This had as its origin the old principle according

to which every vassal had the right to be tried by his peers, i,e. by the vassals holding fiefs from the same lord, who sat in judgment with that lord as their president. This, it is well known, resulted in the formation of the ancient college of the peers of France, which consisted of six laymen and six ecclesias- tics. But although in strict logic the feudal causes concerning them should have been judged by them alone, they could not maintain this right in the curia regis; the other persons sitting in it could also take part in judging causes which concerned the peers. Finally the peers of France, the number of whom was increased in course of time by fresh royal creations of peerages, became ex officio members of the Parlement; they were the hereditary councillors, taking the oath as official magistrates, and, if they wished, sitting and having a deliberative function in the Parlement. In suits brought against them personally or involving the rights of their peerage they had the right of being judged by the Parlement, the other peers being present, or having been duly summoned.

While maintaining its unity, the Parlement had been sub- divided into several chambres or sections. In the first place there was the Grand

Chambre, which represented the primitive Parlement. To it was reserved the judgment in certain impor- tant cases, and in it a peculiar procedure was followed, known as oral, though it admitted certain written documents. Even after the offices of the Parlement had become legally saleable the councillors could only pass from the other chambers into the Grand Chambre by order of seniority. The Chambres des enquites and des requites originated at the time when it became customary to draw up lists for each session of the Parlement. The enquiteurs or auditeurs of the Parlement had at first been an auxiliary staff of clerks to whom were entrusted the inquests ordered by the Parlement. But later, when the institution of the appeal was fully developed, and the procedure before the various jurisdictions became a highly technical matter, above all when it admitted written evidence, the documents connected with other inquests also came before the Parlement. A new form of appeal grew up side by side with the older form, which had been mainly an oral procedure, namely the appeal by writing (appel par icrit). In order to judge these new appeals the Parlement had above all to study written documents, the inquests which had been made and written down under the jurisdiction of the court of first instance. The duty of the enquiteurs was to make an abstract of the written documents and report on them. Later the reporters {rapporteurs) were admitted to judge these questions together with a certain number of members of the Parlement, and from 13 16 onwards these two kinds of member formed together a chambre des enquites. As yet, no doubt, the rapporteur only gave his opinion on the case which he had prepared, but after 1336 all those who formed part of the chamber were put on the same footing, taking it in turn to report and giving judgment as a whole. For a long time, however, the Grand Chambre received all cases, then sent them to the Chambre des enquites with directions; before it too were argued questions arising out of the inquiry made by the Chambre des enquites, to the decisions of which it gave effect and which it had the power to revise. But one by one it lost all these rights, and in the 16th century they are no longer heard of. Several Chambres des enquites were created after the first one, and it was they who had the greater part of the work.

The Chambre des requites was of an entirely different nature. At the beginning of the 14th century a certain number of t) ose who were to hold the session of the Parlement were set apart to receive and judge the petitions (requites) on judicial questions which had been presented to the king and not yet dealt with. This eventually led to the formation of a chamber, in the strict sense of the word, the Requites du palais. But this became purely a jurisdiction for privileged persons;

before it (or before the Requites de Vhdtel, as the case might be) were brought the civil suits of those who enjoyed the right of Committimus. The Chambre des requites had not supreme jurisdiction, but appeals from its decisions could be made to the Parlement proper.

The Parlement had also a criminal chamber, that of La Tournelle, which was not legally created until the 16th century, but was active long before then. It had no definite member- ship, but the conseillers lais served in it in turn.

Originally there was only one Parlement, that of Paris, as was indeed logical, considering that the Parlement was simply a continuation of the curia regis, which, like the king, could only be one. But the exigencies of the administration of justice led to the successive creation of a certain number of provincial parlements. Their creation, moreover, was generally dictated by political circumstances, after the incorporation of a province in the domain of the Crown. Sometimes it was a question of a province which, before its annexation, possessed a superior and sovereign jurisdiction of its own, and to which it was desired to preserve this advantage. Or else it might be a province forming part of feudal France, which before the annexation had had a superior jurisdiction from which the Crown had endea- voured to institute an appeal to the Parlement of Paris, but for which after the annexation it was no longer necessary to maintain this appeal, so that the province might now be given a supreme court, a parlement. Sometimes an intermediate regime was set up between the annexation of the province and the creation of its provincial parlement, under which delegates from the Parlement of Paris went and held assizes there. Thus were created successively the parlements of Toulouse, Grenoble, Bordeaux, Dijon, Rouen, Aix, Rennes, Pau, Metz, Douai, Besancon and Nancy. From 1762 to 1771 there was even a parlement for the principality of Dombes. The provincial parlements reproduced in a smaller scale the organization of that of Paris; but they did not combine the functions of a court of peers. They each claimed to possess equal powers within their own province. There were also great judicial bodies exercising the same functions as the parlements, though without bearing the name, such as the Conseil souverain of Alsace at Colmar, the Conseil superieur of Roussillon at Perpignan; the provincial council of Artois had not the supreme jurisdiction in all respects.

The parlements, besides their judicial functions, also possessed political lights; they claimed a share in the higher policy of the realm, and the position of guardians of its fundamental laws. In general the laws did not come into effect within their province until they had

been registered by the parlements. This was the method of promulgation admitted by the ancient law of France, but the parlements verified the laws before registering them, i.e. they examined them to see whether they were in conformity with the principles of law and justice) and with the interests of the king and his subjects; if they considered that this was not the case they refused their registration and addressed remon- strances (remontrances) to the king. In acting thus they were merely conforming to the duty of counselling (devoir de conseil) which all the superior authorities had towards the king, and the text of the ordinances (ordonnances) had often invited them to do so. It was natural, however, that in the end the royal will should seek to impose itself. In order to enforce the registra- tion of edicts the king would send lettres de cachet, known as lettres de jussion, which were not, however, always obeyed. Or he could come in person to hold the parlement, and have the law registered in his presence in a lit de justice. This was explained in theory by the principle that if the king himself held his court, it lost, by the fact of his presence, all the authority which he had delegated to it; for the moment the only authority existing in it was that of the king, just as in the ancient curia regis there was the principle that apparente rege cessat magis- trate. But, principally in the 18th century, the parlements maintained that only a voluntary registration, by the consent of the parlement, was valid.

The parlements had also a wide power of administration. They could mak? regulations (pouvoir rfglementaire) having the force of law within their province, upon all points not settled by law, when the matter with which they dealt fell within their judicial competence, and for this it was only neces- sary that their interference in the matter was not forbidden by law. These were what were called arrite de riglement.

By this means the parlements took part in the administration, except in matters the cognisance of which was attributed to another supreme court as that of taxation was to the cours des aides: They could also, within the same limits, address injunctions (injonctions) to officials and individuals.

See La Roche-Flavin, Treize livres des parlements de France (1617); Felix Aubert, Histoire du parlement de Paris, des origines a Francois I. (2 vols., 1894); Ch. V. Langlois, Textes relatifs a Vhistoire du

parlement depuis 1-es origines jusqu'en 1314 (1888) ; Guiihiermoz, EnquUes et prods (1892); Glasson, Le Parlement de Paris, son role politique depuis le regne de Charles VII. jusqu'd la revolution (2 vols., 1901). (J. P. E.)

PARLIAMENT (Anglo-Lat. parliamentum, Fr. parlement, from parler, to speak), the name given to the supreme legislature of the United Kingdom of Great Britain and Ireland. (For the old French parlement, see Parlement; and for analogous foreign assemblies see the articles on their respective countries.) The word is found in English from the 13th century, first for a debate, then for a formal conference, and for the great councils of the Plantagenet kings; and the modern sense has come to be applied retrospectively. William the Conqueror is said in the Chronicle to have had " very deep speech with his Witan "; this " deep speech " (in Latin colloquium, in French parlement) was the distinguishing feature of a meeting between king and people, and thus gave its name to the national assembly itself. The Statute of Westminster (1275) first uses "parlement" of the great council in England.

The British Parliament consists of the King (or Queen regnant), the Lords spiritual and temporal, and the Commons 1 ; and it meets in two houses, the House of Lords (the Upper or Second chamber) and the House of Commons.

The Crown, pre-eminent in rank and dignity, is the legal source of parliamentary authority. The sovereign virtually appoints the lords spiritual, and all the peerages of the lords temporal have been created by the Crown. The king summons parliament to meet, and prescribes the time and place of its meeting, prorogues and dissolves it, and commands the issue of writs for the election of members of the House of Commons. By several statutes, beginning with the 4 Edward III. c. 14, the annual meeting of parliament had been ordained; but these statutes, continually disregarded, were virtually repealed in the reigns of Charles II. and William and Mary (16 Ch. II. 31; 6 & 7 Will. & Mary, 32). The present statute law merely exacts the meeting of parliament once in three years; but the annual voting of supplies has long since superseded obsolete statutes. When parliament is assembled it cannot proceed to business until the king has declared the causes of summons, in person or by com- mission; and though the veto of the Crown on legislation has long been obsolete, bills passed by the two houses only become law on receiving the royal assent.

The House of Lords is distinguished by peculiar dignities, privileges and jurisdictions. Peers individually enjoy the rank and precedence of

their several dignities, and are hereditary councillors of the Crown. Collectively with the lords spiritual they form a permanent council of the Crown; and, when assembled in parliament, they form the highest court of judicature in the realm, and are (in constitutional theory at all events) a co-equal branch of the legislature, without whose consent no iaws can be made (see below, House of Lords Question). Their Judicature is of various kinds, viz. for the trial of peers; for determining claims of peerage and offices of honour, under references from the Crown; for the trial of controverted elections of Scotch and Irish peers; for the final determination of appeals from courts in England, Scotland and Ireland; and lastly, for the trial of impeachments.

The House of Commons also has its own peculiar privileges and jurisdictions. Above all, it has the paramount right of originating the imposition of all taxes, and the granting of supplies for the service of the state. It has also enjoyed, from early times, the right of determining all matters concerning the

1 Or rather, the representatives of the Commons (see Represen- tation) ; but the term has long been used for the deputies them- selves collectively.

election of its own members, and their right to sit and vote in parliament. This right, however, has been greatly abridged, as, in 1868, the trial of controverted elections was transferred to the courts of law; but its jurisdiction in matters of election, not otherwise provided for by statute, is still retained intact. As part of this jurisdiction the house directs the Speaker to issue warrants to the clerk of the Crown to make out new writs for the election of members to fill up such vacancies as occur during the sitting of parliament.

Privileges of Parliament. — Both houses are in the enjoyment of certain privileges, designed to maintain their authority, indepen- dence and dignity. These privileges are founded mainly upon the law and custom of parliament, while some have been confirmed, and others abridged or abrogated by statute. The Lords rely entirely upon their inherent right, as having ” a place and voice in parliament “: but, by a custom dating from the 6th Henry VIII., the Commons lay claim, by humble petition to the Crown at the commencement of every parliament, ” to their ancient and un- doubted rights and privileges.” Each house has its separate rights and jurisdictions; but privileges properly so-called, being founded upon the law and custom of parliament, are common to both houses. Each house adjudges whether any breach of privi- lege has been committed, and punishes offenders

by censure or commitment. This right of commitment is incontestably estab- lished, and it extends to the protection of officers of the house, lawfully and properly executing its orders, who are also empowered to call in the assistance of the civil power. The causes of such commitments cannot be inquired into by courts of law, nor can prisoners be admitted to bail. Breaches of privilege may be summarized as disobedience to any orders or rules of the house, indignities offered to its character or proceedings, assaults, insults, or libels upon members, or interference with officers of the house in discharge of their duty, or tampering with witnesses. Such offences are dealt with as contempts, according to the circum- stances of the respective cases, of which numerous precedents are to be found in the journals of both houses. The Lords may imprison for a fixed period, and impose fines; the Commons can only imprison generally, the commitment being concluded by the prorogation, and have long discontinued the imposition of fines.

Freedom of speech has been one of the most cherished privileges of parliament from early times. Constantly asserted, and often violated, it was finally declared by the Bill of Rights " that the free- dom of speech, and debates and proceedings in parliament, ought not to be impeached or questioned in any court or place out of parliament." Such a privilege is essential to the independence of parliament, and to the protection of members in discharge of their duties. But, while it protects members from molestation else- where, it leaves them open to censure or other punishment by the house itself, whenever they abuse their privilege and transgress the rules of orderly debate.

Freedom from arrest is a privilege of the highest antiquity. It was formerly of extended scope, but has been reduced, by later legislation, within very narrow limits. Formerly not only the persons of members but their goods were protected, and their privilege extended to their servants. At present members are themselves free from arrest, but otherwise they are liable to all the processes of the courts. If arrested, they will be immediately discharged, upon motion in the court whence the process issued. Peers and peeresses are, by the privilege of peerage, free from arrest at all times. Members of the House of Commons are free only for forty days after prorogation and forty days before the next appointed meeting; but prorogations are so arranged as to ensure a con- tinuance of the privilege. Formerly, even suits against members were stayed, but this offensive privilege has been abolished by statute. Exemption from attending as witnesses upon subpoena, once an acknowledged privilege, is no longer insisted upon; but immunity from service upon juries is at once an ancient privilege and a statutory right. The privilege of freedom from arrest is limited

to civil causes, and has not been suffered to exempt members from the operation of the criminal law, nor even from commitments for contempt by other courts. But, whenever the freedom of a member is so interfered with, the courts are required immediately to inform the house of the causes of his commitment. Witnesses, suitors, counsel and agents in attendance upon parliament are protected from arrest and molestation, and from the consequences of statements made by them, or other proceedings in the conduct of their cases.

As both houses, in enforcing their privileges, are obliged to commit offenders or otherwise interfere with the liberty of the subject, the exercise of these privileges has naturally been called in question before the courts. Each house is the sole judge of its own privileges ; but the courts are bound to administer the law, and, where law and privilege have seemed to be at variance, a conflict of juris- diction has arisen between parliament and the courts. Many interesting controversies have arisen upon such occasions; but of lave years privilege has been carefully restrained within the proper limits of the law, and the courts have amply recognized the authority of parliament.

Parliamentary Procedure. — It will be convenient here to sketch the general lines of procedure. On the day appointed by royal proclamation for the meeting of a new parliament both houses assemble in their respective chambers, when the Lords Commissioners for opening the parliament summon the Commons to the bar of the House of Lords, by the mouth of Black Rod, to hear the commission read. The lord chancellor states that, when the members of both houses shall be sworn, the king will declare the causes of his calling this parliament; and, it being necessary that a Speaker of the House of Commons shall be first chosen, the Commons are directed to proceed to the appointment of a Speaker, and to present him, on the following day, for His Majesty's royal approbation. The Commons at once withdraw to their own house and proceed to the election of their Speaker. The next day the Speaker-elect proceeds, with the house, to the House of Lords, and, on receiving the royal approbation, lays claim, in the accustomed form, on behalf of the Commons, " to their ancient and undoubted rights and privileges." The Speaker, now fully confirmed, returns to the House of Commons, and, after repeating his acknowledgments, reminds the house that the first thing to be done is to take and subscribe the oath required by law. Having first taken the

oath himself, he is followed by other members, who come to the table to be sworn. The swearing of members in both houses proceeds from day to day, until the greater number have taken the oath, or affirmation, when the causes of summons are declared by His Majesty in person, or by commission, in ” the King’s speech.” This speech being considered in both houses, an Address (q.v.) in answer is agreed to, which is presented to His Majesty by the whole house, or by ” the lords with white staves ” in one house and privy councillors in the other.

The debate on the Address being over, the real business of the session now commences: the committees of supply and ways and means are set up; bills are introduced; motions are made; committees are appointed; and both houses are, at once, in full activity. The Lord Chancellor presides over the deliberations of the Lords, and the Speaker over those of the Commons. A quorum of the House of Lords, including the chancellor, is three (thirty for divisions) ; that of the House of Commons, including the Speaker, is forty.

Every matter is determined, in both houses, upon questions put from the chair, and resolved in the affirmative or negative, or otherwise disposed of by the withdrawal of the motion, by amendments, by the adjournment of the house, by reading the orders of the day, or by the previous question. Notices are required to be given of original motions; and the different stages of bills, and other matters appointed for consideration by the house, stand as orders of the day. Questions of privilege are allowed precedence of all the business on any day; but this rule, being liable to grave abuses, is guarded by strict limitations. Debates arise when a question has been proposed from the chair; and at the close of the debate (for the ” closure ” in the House of Commons, see below, House of Commons, Internal Reforms) the question is put, with or without amendment, as the case may be, and is determined, when necessary, by a division. No question or bill, substantially the same as one upon which the judgment of the house has already been given, may be again proposed during the same session.

Members claim to be heard in debate by rising in their places. When more than one member rises at the same time, in the Lords the member who is to speak is called by the house, in the Commons by the Speaker. Every member, when called, is bound to speak to the question before the house; and calls to order are very frequent. A member may speak once only to any question, except to explain, or upon a point of order, or to reply when a member has himself submitted a motion to the house, or when an amendment has been

moved which constitutes a new question. He may not refer to past debates, nor to debates in the other house; nor may he refer to any other member by name, or use offensive and disorderly language against the king, either House of Parliament, or other members. Members offending against any of the rules of debate are called to order by

the Speaker, or the attention of the chair is directed to the breach of order by another member. Order is generally enforced by the authority of the chair; but in extreme cases, and especially when obstruction is being practised, the offending member is named by the Speaker, and suspended by an order of the house, or otherwise punished at the discretion of the house.

At the conclusion of a debate, unless the motion be withdrawn, or the question (on being put from the chair) be agreed to or negatived, the house proceeds to a division, which effects the two- fold purpose of ascertaining the numbers supporting and opposing the question, and of recording the names of, members voting on either side. On each side of the house is a division lobby; and in the Lords the ” contents ” and in the Commons the ” ayes ” are directed to go to the right, and the ” not contents ” or ” noes ” to the left. The former pass into the right lobby, at the back of the Speaker’s chair, and return to the house through the bar; the latter pass into the left lobby, at the bar, and return at the back of the chair. The opposing parties are thus kept entirely clear of one another. In each lobby there are two members acting as tellers, who count the members as they pass, and two division clerks who take down their names. After the division the four tellers advance to the table, and the numbers are reported by one of the tellers for the majority. In case of an equality of numbers, in the Lords the question is negatived in virtue of the ancient rule ” semper praesumitur pro negante “; in the Commons the Speaker gives the casting vote.

Committees of the Whole House. — For the sake of convenience in the transaction of business there are several kinds of committees. Of these the most important is a committee of the whole house, which, as it consists of the entire body of members, can scarcely be accounted a committee. It is presided over by a chairman, who sits in the clerk’s chair at the table, the mace, which represents the authority of the house itself, being for the time placed under the table. In this committee are discussed the several provisions of bills, resolutions and other matters requiring the consideration of details. To facilitate discussion, members are allowed to speak any number of times to the same question; otherwise the proceed- ings are similar to those of the

house itself. In the Lords the chair is taken by the chairman of committees; and in the Commons by the chairman of the committee of ways and means, or in his absence by any other member. The quorum of such a committee is the same as that of the house itself. It reports from time to time to the house, but has no power of adjournment. •

Grand and Standing Committees. — In the House of Commons there were formerly four grand committees, viz. for religion, for grievances, for courts of justice, and for trade. They were founded upon the valuable principle of a distribution of labours among several bodies of members ; but, having fallen into disuse, they were discontinued in 1832. The ancient committee of privileges, in which ” all who come are to have voices,” is still appointed at the commencement of every session, but is rarely called into action, as it has been found more convenient to appoint a select committee to inquire into any question of privilege as it arises. In 1882 a partial revival of grand committees was effected by the appointment of two standing committees for the consideration of bills relating to law and courts of justice and to trade; and grand committees have since been considerably extended.

Select Committees. — In select committees both houses find the means cf delegating inquiries, and the consideration of other matters, which could not be undertaken by the whole house. The reports of such committees have formed the groundwork of many important measures ; and bills are often referred to them which receive a fuller examination than could be expected in a committee of the whole house. Power is given to such committees, when required, to send for persons, papers and records. In the Lords the power of examin- ing witnesses upon oath has always been exercised, but it was not until 1871 that the same power was extended to the Commons, by statute.

Communications between the Two Houses. — In the course of the proceedings of parliament, frequent communications between the two houses become necessary. Of these the most usual and con- venient form is that of a message. Formerly the Lords sent a message by two judges or two masters in chancery, and the Commons by a deputation of their own members; but since 1855 messages have been taken from one house to the other by one of the clerks at the table. A more formal communication is effected by a conference, in reference to amendments to bills or other matters; but this proceeding has been in great measure superseded by the more simple form of a message. The two houses are also occasionally brought into communication by means of joint com- mittees and of select committees communicating with each other.

Communications between the Crown and Parliament. — Communications, in various forms, are also conducted between the Crown

and both Houses of Parliament. Of these the most important are those in which the king, in person or by commission, is present in the House of Lords to open or prorogue parliament, or to give the royal assent to bills. His Majesty is then in direct communi- cation with the three estates of the realm, assembled in the same chamber. The king also sends messages to both houses under the royal sign manual, when all the members are uncovered. Verbal messages are also sent, and the king's pleasure, or royal recommenda- tion or consent to bills or other matters, signified through a minister of the Crown or a privy councillor. Messages under the sign manual are acknowledged by addresses, except where grants of money are proposed, in which case no address is presented by the Commons, who acknowledge them by making provision accordingly.

Both houses approach the Crown, sometimes by joint addresses, but usually by separate addresses from each house. Such addresses are presented to His Majesty, either by the whole house, or by the lords with white staves in one house and by privy councillors in the other. His Majesty answers, in person, addresses presented by the whole house; but, when presented otherwise, an answer is brought by one of the lords with white staves, or by one of the privy councillors, by whom the address has been presented. Resolutions of either house are also sometimes directed to be laid before His Majesty; and messages of congratulation or condo- lence are sent to other members of the royal family.

The Passing of Public Bills. — The passing of bills forms the most considerable part of the business of parliament; but a brief notice will suffice to explain the methods of procedure. These are substantially the same in both houses; but the privileges of the Commons, in regard to supply and taxation, require that all bills imposing a charge upon the people should originate in that house. On the other hand, the Lords claim that bills for restoration of honours or in blood, or relating to their own privileges and juris- diction, should commence in their house. An act of grace, or general pardon, originates with the Crown, and is read once only in both houses. Bills are divided into public and private; but here the former only are referred to. In the Lords any peer is entitled to present a bill, but in the Commons a

member is required to obtain the previous leave of the house to bring in the bill; and, in the case of bills relating to religion, trade, grants of public money, or charges upon the subject, a preliminary committee is necessary before such leave will be given. A bill, when presented, is read a first time, and ordered to be printed; and a day is ap- pointed for the second reading. At this latter stage the principle of the bill is discussed ; and, if disapproved of by an adverse vote, the bill is lost and cannot be renewed during the same session. If approved of, it is usually committed to a committee of the whole house, where every provision is open to debate and amend- ment. When the bill has been«fully considered it is reported to the house, with or without amendments, and is ready to pass through its remaining stages. Sometimes, however, the bill is first referred to a select committee; or to a grand committee and not to committee of the whole house.

When a bill has been reported from a committee of the whole house, or from a standing committee, with amendments, the bill, as amended, is ordered to be considered on a future day, when further amendments may be made, or the bill may be recommitted. The next and last stage is the third reading, when the principle of the measure, and its amended provisions, are open to review. Even at this stage the bill may be lost; but if the third reading be agreed to, it is at once passed and sent to the other house. There it is open to the like discussions and amendments, and may be rejected. If returned without amendment, the bill merely awaits the royal assent; but if returned with amendments, such amendments must be agreed to, or otherwise adjusted by the two houses, before it can be submitted for the royal assent. The royal assent consummates the work of legislation, and converts the bill into an act of parliament.

Petitions. — Both houses are approached by the people by means of petitions, of which prodigious numbers are presented to the House of Commons every session. They are referred to the com- mittee on public petitions, under whose directions they are classified, analysed, and the number of signatures counted; and, when necessary, the petitions are printed in extenso.

Parliamentary Papers. — Another source of information is found in parliamentary papers. These are of various kinds. The greater part are obtained either by a direct order of the house itself, or by an address to the Crown for documents relating to matters in which the prerogatives of the Crown are concerned. Other papers, relating to foreign and colonial affairs and other public matters, are pre- sented to both houses by command of His Majesty. Again, many papers are annually presented in pursuance of acts of parliament.

The Granting of Supplies.— The exclusive right of the Commons to grant supplies, and to originate all measures of taxation, imposes a very onerous service upon that house. This is mainly performed by two committees of the whole house — the committee of supply, and the committee of ways and means. The former deals with all the estimates for the public service presented to the house by command of His Majesty; and the latter votes out of the Consoli- dated Fund such sums as are necessary to meet the supplies already

granted, and originates all taxes for the service of the year. It is here that the annual financial statement of the chancellor of the exchequer, commonly known as ” the Budget,” is delivered. The resolutions of these committees are reported to the house, and, when agreed to, form the foundation of bills, to be passed by both houses, and submitted for the royal assent; and towards the close of the session an Appropriation Act is passed, applying all the grants for the service of the year.

Elections. — The extensive jurisdiction of the Commons in matters of election, already referred to, formerly occupied a considerable share of their time, but its exercise has now been contracted within narrow limits. Whenever a vacancy occurs during the continu- ance of a parliament, a warrant for a new writ is issued by the Speaker, by order of the house during the session, and in pursuance of statutes during the recess. The causes of vacancies are the death of a member, his being called to the House of Peers, his acceptance of an office from the Crown, or his bankruptcy. When any doubt arises as to the issue of a writ, it is usual to appoint a committee to inquire into the circumstances of the case; and during the recess the Speaker may reserve doubtful cases for the determina- tion of the house.

Controverted elections had been originally tried by select com- mittees, afterwards by the committee of privileges and elections, and ultimately by the whole house, with scandalous partiality, but under the Grenville Act of 1770, and other later acts, by select committees, so constituted as to form a more judicial tribunal. The influence of party bias, however, too obviously prevailed until 1839, when Sir Robert Peel introduced an improved system of nomination, which distinctly raised the character of election committees; but a tribunal constituted of political partisans, how- ever chosen, was still open to jealousy and suspicion, and at length, in 1868, the trial of election petitions was transferred to judges of the superior courts, to whose determination the house gives effect, by the issue of new writs or otherwise. The house, however, still retains and exercises its jurisdiction in all cases not relegated, by statute, to the judges.

Impeachments and Trial of Peers. — Other forms of parliamentary judicature still remain to be mentioned. Upon impeachments by the Commons, the Lords exercise the highest criminal judicature known to the law ; but the occasions upon which it has been brought into action have been very rare in modern times. Another judica- ture is that of the trial of peers by the House of Lords. And, lastly, by a bill of attainder, the entire parliament may be called to sit in judgment upon offenders.

Private Bill Legislation. — One other important function of parliament remains to be noticed — that of private bill legislation. Here the duties of parliament are partly legislative and partly judicial. Public interests are promoted, and private rights secured. This whole jurisdiction has been regulated by special standing orders, and by elaborate arrangements for the nomination of capable and impartial committees. A prodigious legislative work has been accomplished — but under conditions most costly to the promoters and opponents of private bills, and involving a serious addition to the onerous labours of members of parliament.

History of the British Parliament The Anglo-Saxon Polity. — The origin of parliament is to be traced to Anglo-Saxon times. The Angles, Saxons and other Teutonic races who conquered Britain brought to their new homes their own laws and customs, their settled framework of society, their kinship, their village communities, and a certain rude representation in local affairs. And we find in the Anglo- Saxon polity, as developed during their rule in England, all the constituent parts of parliament. In their own lands they had chiefs and leaders, but no kings. But conquest and territorial settlement were followed by the assumption of royal dignities; and the victoiious chiefs were accepted by their followers as kings. They were quick to assume the traditional attributes of royalty. A direct descent from their god Woden, and heredi- tary right, at once clothed them with a halo of glory and with supreme power; and, when the pagan deity was deposed, the king received consecration from a Christian archbishop, and was invested with sacred attributes as ” the Lord’s anointed.” But the Saxon monarch was a patriarchal king of limited autho- rity, who acted in concert with his people; and, though his succession was hereditary, in his own family, his direct descend- ant was liable to be passed over in favour of a worthier heir. Such a ruler was a fitting precursor of a line of constitutional kings, who in later times were to govern with the advice and consent of a free parliament.

Meanwhile any council approaching the constitution of a House of Lords was of slow growth. Anglo-Saxon scciety, indeed, was not

without an aristocracy. The highest in rank

were aethelings — generally, if not exclusively, sons and brothers of the king. The ealdorman, originally a high officer, having the executive government of a shire, and a seat in the king's witan, became hereditary in certain families, and eventually attained the dignity of an earl. But centuries were to pass before the English nobility was to assume its modern character and denomi- nations. At the head of each village was an eorl, the chief of the freemen, or ceorls — their leader in war and patron in peace. The king's gesiths and thegns formed another privileged class. Admitted to offices in the king's household and councils, and enriched by grants of land, they gradually formed a feudal nobility.

The revival of the Christian Church, under the Anglo-Saxon rule, created another order of rulers and councillors, destined to take a leading part in the government of the state. The archbishops and bishops, having spiritual authority in their own dioceses, and exercising much local influence in temporal affairs, were also members of the national council, or witenage- mot, and by their greater learning and capacity were not long in acquiring a leading part in the councils of the realm. Ecclesi- astical councils were also held, comprising bishops, abbots, and clergy, in which we observe the origin of convocation. The abbots, thus associated with the bishops, also found a place with them in the witenagemot. By these several orders, sum- moned to advise the king in affairs of state, was formed a council of magnates — to be developed, in course of time, into an upper chamber, or House of Lords.

The rise of the Commons (see Representation) as a political power in the national councils, was of yet slower development: but in the Anglo-Saxon moots may be discerned the first germs of popular government in England. In the town-moot the assembled freemen and cultivators of the " folk-lands " regulated the civil affairs of their own township, tithing, village or parish. In the burgh-moot the inhabitants administered their municipal business, under the presidency of a reeve. The hundred-moot assumed a more representative character, comprising the reeve and a selected number of freemen from the several townships and burghs within the hundred. The shire-moot, or shire-gemot, was an assembly yet more important. An ealdorman was its president, and exercised a jurisdiction over a shire, or district

comprising several hundreds. Attended by a reeve and four freemen from every hundred, it assumed a distinctly representa- tive character. Its members, if not elected (in the modern sense) by the popular voice, were, in some fashion, deputed to act on behalf of those whose interests they had come to guard. The shire-moot was also the general folk-moot of the tribe, assembled in arms, to whom their leaders referred the decision of questions of peace and war.

Superior to these local institutions was the witenagemot, or assembly of wise men, with whom the king took counsel in legislation and the government of the state. This national council was the true beginning of the parliament of England. Such a council was originally held in each of the kingdoms commonly known as the Heptarchy; and after their union in a single realm, under King Edgar, the witenagemot became the deliberative and legislative assembly, or parliament, of the extended estate. The witenagemot made laws, imposed taxes, concluded treaties, advised the king as to the disposal of public lands and the appointment and removal of officers of state, and even assumed to elect and depose the king himself. The king had now attained to greater power, and more royal dignities and prerogatives. He was unquestionably the chief power in the witenagem6t; but the laws were already promulgated, as in later times, as having been agreed to with the advice and consent of the witan. The witan also exercised jurisdiction as a supreme court. These ancient customs present further examples of the continuity of English constitutional forms.

The constitution of the witenagemot, however, was necessarily less popular than that of the local moots in the hundred or the shire. The king himself was generally present; and at his summons came prelates, abbots, ealdormen, the king's gesiths and thegns, officers of state and of the royal household, and

leading tenants in chief of lands held from the crown. Crowds sometimes attended the meetings of the witan, and shouted their acclamations of approval or dissent; and, so far, the popular voice was associated with its deliberations; but it was at a distance from all but the inhabitants of the place in which it was assembled, and until a system of representation (q.v.) had slowly grown up there could be no further admission of the people to its deliberations. In the town-moot the whole body of freemen and cultivators of the folk-lands met freely under a spreading oak, or on the village green; in the hundred-moot, or shfre- gemot, deputies from neighbouring communities could readily find a place; but all was changed in the wider council of a king- dom. When there were many kingdoms, distance obstructed any

general gathering of the Commons ; and in the wider area of England such a gathering became impossible. Centuries were yet to pass before this obstacle was to be overcome by representa- tion; but, in the meantime, the local institutions of the Anglo- Saxons were not without their influence upon the central council. The self-government of a free people informed the bishops, ealdormen, ceorls and thegns who dwelt among them of their interests and needs, their sufferings and their wrongs; and, while the popular forces were increasing with an advancing society, they grew more powerful in the councils of their rulers.

Another circumstance must not be overlooked in estimating the political influence of the people in Anglo-Saxon times. For five centuries the country was convulsed with incessant wars — wars with the Britons, whom the invaders were driving from their homes, wars between the several kingdoms, wars with the Welsh, wars with the Picts, wars with the Danes. How could the people continue to assert their civil rights amid the clash of arms and a frequent change of masters? The warrior-kings and their armed followers were rulers in the land which they had conquered. At the same time the unsettled condition of the country repressed the social advancement of its people. Agriculture could not prosper when the farm of the husbandman top often became a battlefield. Trade could not be extended without security to property and industry. Under such con- ditions the great body of the people continued as peasants, handicraftsmen and slaves. The time had not yet come when they could make their voice heard in the councils of the state.

The Norman Conquest. — The Anglo-Saxon polity was suddenly overthrown by the Norman Conquest. A stern foreign king had seized the crown, and was prepared to rule his conquered realm by the sword. He brought with him the absolutist principles of continental rulers, and the advanced feudal system of France and Normandy. Feudalism had been slowly gaining ground under the Saxon kings, and now it was firmly established as a military organization. William the Conqueror at once rewarded his warlike barons and followers with enormous grants of land. The Saxon landowners and peasants were despoiled, and the invaders settled in their homesteads. The king claimed the broad lands of England as his own, by right of conquest; and when he allowed his warriors to share the spoil he attached the strict condition of military service in return for every grant of land. An effective army of occupation of all ranks was thus quartered upon every province throughout the realm. England was held by the sword; a foreign king, foreign nobles, and a foreign soldiery were in possession of the soil, and swore fealty to their master, from whom

they held it. Saxon bishops were deposed, and foreign prelates appointed to rule over the English Church. Instead of calling a national witenagemot, the king took counsel with the officers of his state and household, the bishops, abbots, earls, barons and knights by whom he was phased to surround himself. Some of the forms of a national council were indeed maintained, and its counsel and consent were proclaimed in the making of laws; but, in truth, the king was absolute.

Such a revolution seemed fatal to the liberties and ancient customs of Saxon England. What power could withstand the harsh conqueror? But the indestructible elements of English society prevailed over the sword. The king grasped, in his own hands, the higher administration and judicature of the realm;

but he continued the old local courts of the hundred and the shire, which had been the basis of Saxon freedom. The Norman polity was otherwise destined to favour the liberties of the people, through agencies which had been designed to crush them. The powerful nobles, whom William and his successors exalted, became formidable rivals of the Crown itself; while ambitious barons were in their turn held in check by a jealous and exacting church. The ruling powers, if combined, would have reduced the people to slavery; but their divisions proved a continual source of weakness. In the meantime the strong rule of the Normans, bitter as it was to Englishmen, repressed intestine wars and the disorders of a divided realm. Civil justice was fairly administered. When the spoils of the conquerors had been secured, the rights of property were protected, industry and trade were left free, and the occupation of the soil by foreigners drove numbers of landowners and freemen into the towns, where they prospered as merchants, traders and artificers, and collected thriving populations of townsmen. Meanwhile, foreign rulers having brought England into closer relations with the Continent, its commerce was extended to distant lands, ports and shipping were encouraged, and English traders were at once enriched and enlightened. Hence new classes of society were growing, who were eventually to become the Commons of England.

The Crown, the Barons, the Church and the People. — While these social changes were steadily advancing, the barons were already preparing the way for the assertion of popular rights. Ambitious,

turbulent and grasping, they were constantly at issue with the Crown. Enjoying vast estates and great com- mands, and sharing with the prelates the government of the state, as members of the king's council, they were ever ready to raise the standard of revolt. The king could always count upon barons faithful to his cause, but he also appealed for aid to the Church and the people. The baronage was thus broken by insurrections, and decimated by civil wars, while the value of popular alliances was revealed. The power of the people was ever increasing, while their oppressors were being struck down. The population of the country was still Saxon; they had been subdued, but had not been driven forth from the land, like the Britons in former invasions. The English language was still the common speech of the people; and Norman blood was being mingled with the broader stream of Saxon life. A con- tinuous nationality was thus preserved, and was outgrowing the foreign element.

The Crown was weakened by disputed successions and foreign wars, and the baronage by the blood-stained fields of civil war- fare; while both in turn looked to the people in their troubles. Meanwhile the Church was struggling, alike against the Crown and the barons, in defence of its ecclesiastical privileges and temporal possessions. Its clergy were brought by their spiritual ministrations into close relations with the people, and their culture contributed to the intellectual growth of English society. When William Rufus was threatened by his armed barons he took counsel with Archbishop Lanfranc, and promised good laws and justice to the people. His promises were broken; but, like later charters, as lightly set aside, they were a recognition of the political rights of the people. By the charter of Henry I. restoring to the people the laws of Edward the Confessor, the continuity of English institutions was acknowledged; and this concession was also proclaimed through Archbishop Anselm, the church and the people being again associated with the Crown against the barons. And throughout his reign the clergy and the English people were cordially united in support of the Crown. In the anarchic reign of Stephen — also distinguished by its futile charters — the clergy were driven into opposition to the king, while his oppressions alienated the people. Henry II. commenced his reign with another charter, which may be taken as a profession of good intentions on the part of the new king. So strong-willed a king, who could cripple his too powerful nobles, and forge shackles for the Church, was not predisposed 'to extend the liberties of his people; but they supported him loyally in his critical struggles; and his vigorous reforms in the

administrative, judicial and financial organization of his realm promoted the prosperity and political influence of the Commons. At

the same time the barons created in this and the two previous reigns, being no longer exclusively Norman in blood and connexion, associated themselves more readily with the interests and sympathies of the people. Under Richard I. the principle of representation was somewhat advanced, but it was confined to the assessment and collection of taxes in the different shires.

Magna Carta (q.v.). — It was under King John that the greatest progress was made in national liberties. The loss of Normandy served to draw the baronage closer to the English people; and the king soon united ali the forces of the realm against him. He outraged the Church, the barons and the people. He could no longer play one class against another; and they combined to extort the Great Charter of their liberties at Runnymede (12 15). It was there ordained that no scutage or aid, except the three regular feudal aids, should be imposed, save by the common council of the realm. To this council the archbishops, bishops, abbots, earls and greater barons were to be summoned per- sonally by the king's letters, and tenants in chief by a general writ through the sheriff. The summons was required to appoint a certain place, to give 40 days' notice at least, and to state the cause of meeting. At length we seem to reach some approach to modern usage.

Growth of the Commons. — The improved administration of successive kings had tended to enlarge the powers of the Crown. But one hundred and fifty years had now passed since the Conquest, and great advances had been made in the con- dition of the people, and more particularly in the population, wealth and self-government of towns. Many had obtained royal charters, elected their own magistrates, and enjoyed various commercial privileges. They were already a power in the state, which was soon to be more distinctly recognized.

The charter of King John was again promulgated under Henry III., for the sake of a subsidy: and henceforth the Com- mons learned to insist upon the redress of grievances in return for a grant of money. This reign was memorable in the history of parliament. 1 Again the king was in conflict with his barons, who rebelled against his gross misgovernment of the realm. Simon de Montfort, earl of Leicester, was a patriot in advance of his age and fought for the English people as well as for his own order. The barons, indeed, were doubtful allies of the popular cause, and leaned to the king rather than to Simon. But the towns, the clergy, the universities and large bodies of the commonalty rallied round him, and he overthrew the king and his followers at Lewes. He was now master of the realm, and proclaimed a

new constitution. Kings had made promises, and granted illusory charters; but the rebel ear] called an English parliament (1265) into being. Churchmen were on his side, and a few barons; but his main reliance was upon the Commons. He summoned to a national council, or parliament, bishops, abbots, earls and barons, together with two knights from every shire and two burgesses from every borough. Knights had indeed been summoned to former councils; but never until now had delegates from the towns been invited to sit with bishops, barons and knights of the shire.

In the reign of Edward I. parliament assumed substantially its present form of king, lords and commons. The irregular and unauthorized scheme of Simon de Montfort was fully adopted; and in 1295 the king summoned to a parliament two knights from

1 In 1254 we have a distinct case of two knights summoned from each shire by royal writ. A war was going on in Gascony, and the king wanted money. He called the barons and asked if they would provide the necessary funds. The barons said that un- fortunately the minor gentry v/ere exceedingly unwilling to con- tribute, and the king sent to ask that two knights from each shire might be sent up to consult with him. In the result, the Commons refused to grant a subsidy, and the king had to fall back on the Church ; but though the summoning of the knights of the shire was in form a small change from the previous practice of sending some one down to the counties to put pressure on them, the innovation is important as the first occasion on which their representatives met in a central assembly. — [H. Ch.J

every shire chosen by the freeholders at the shire court, and two burgesses from every city, borough and leading town. 1 The rebel earl had enlarged the basis of the national council; and, to secure popular support, the politic king accepted it as a convenient instrument of taxation. The knights and freeholders had increased in numbers and wealth; and the towns, continually advancing in population, trade and commerce, had become valuable contributors to the revenue of the state. The grant of subsidies to the Crown, by the assembled baronage and representatives of the shires and towns, was a legal and comprehensive impost upon the entire realm.

Secession of the Clergy. — It formed part of Edward's policy to embrace the clergy in his scheme for the representation of all orders

and classes of his subjects. They were summoned to attend the parliament of 1295 and succeeding parliaments of his reign, and their form of summons has been continued until the present time; but the clergy resolutely held aloof from the national council, and insisted upon voting their subsidies in their own convocations of Canterbury and York. The bishops retained their high place among the earls and barons, but the clergy sacrificed to ecclesiastical jealousies the privilege of sharing in the political councils of the state. As yet, indeed, this privilege seemed little more than the voting of subsidies, but it was soon to embrace the redress of grievances and the framing of laws for the general welfare of the realm. This great power they forfeited ; and who shall say how it might have been wielded, in the interests of the Church, and in the legislation of their country? They could not have withstood the Reforma- tion; they would have been forced to yield to the power of the Crown and the heated resolution of the laity; but they might have saved a large share of the endowments of the Church, and perhaps have modified the doctrines and formularies of the reformed establishment.

Reluctance of the Commons to Attend. — Meanwhile the Com- mons, unconscious of their future power, took their humble place in the great council of the realm. The knights of the shire, as lesser barons, or landowners of good social standing, could sit beside the magnates of the land without constraint; but modest traders from the towns were overawed by the power and dignity of their new associates. They knew that they were summoned for no other purpose than the taxing of themselves and their fellow townsmen; their attendance was irksome; it interrupted their own business; and their journeys exposed them to many hardships and dangers. It is not surprising that they should have shrunk from the exercise of so doubtful a privilege. Considerable numbers absented themselves from a thankless service; and their constituents, far from exacting the attendance of their members, as in modern times, begrudged the sorry stipend of 2s. a day, paid to their representatives while on duty, and strove to evade the burden imposed upon them by the Crown. Some even purchased charters, withdrawing franchises which they had not yet learned to value. Nor, in truth, did the representation of towns at this period afford much protection to the rights and interests of the people. Towns were enfran- chised at the will or caprice of the Crown and the sheriffs; they could be excluded at pleasure; and the least show of indepen- dence would be followed by the omission of another writ of

1 It now appears that substantially this was effected as early as 1275. The transition period between Simon de Montfort's parlia- ment of 1265 and the " model parliament " of 1295 was long a puzzle to

historical students, since, except for two provincial councils in 1283, no trace was found in the records, between 1265 and 1295, of the representation — of cities or boroughs, or of repre- sentation of the counties between 1275 and 1290. But in 1910 Mr C. Hilary Jenkinson (see English Historical Review, for April) found in the Record Office some old documents which proved to be fragments of three writs and of returns of members for the Easter parliament of 1275. They make it certain that knights of the shire were then present, and that burgesses and citizens were summoned (not as in 1265 through the mayors, but as since 1295 through the sheriffs). The importance of the 1295 parliament thus appears to be smaller in English constitutional history, the full reforms appearing to have been adopted 20 years earlier. It is noteworthy, however, that in the writs of 1275 the instruction to the sheriff is ” venire facias,” not ” eligi facias.” — [H, Ch.]

summons. But the principle of representation (q.v.), once estab- lished, was to be developed with the expansion of society; and the despised burgesses of Edward I., not having seceded, like the clergy, were destined to become a potential class in the parliaments of England.

Sitting of Parliament at Westminster. — Another constitutional change during this reign was the summoning of parliament to Westminster instead of to various towns in different parts of the country. This custom invested parliament with the char- acter of a settled institution, and constituted it a high court for the hearing of petitions and the redress of grievances. The growth of its judicature, as a court of appeal, was also favoured by the fixity of its place of meeting.

Authority of Parliament recognized by Law. — Great was the power of the Crown, and the king himself was bold and statesman- like; but the union of classes against him proved too strong for prerogative. In 1297, having outraged the Church, the barons, and the Commons, by illegal exactions, he was forced to confirm the Great Charter and the Charter of Forests, with further securities against the taxation of the people without their consent and, in return, obtained timely subsidies from the parliament. Henceforth the financial necessities of a succession of kings ensured the frequent assembling of parliaments. Nor were they long contented with the humble function of voting subsidies, but boldly insisted on the redress of grievances and further securities for national liberties. In 1322 it was declared by statute 15 Edw. II. that “the matters to be established for the estate of the king and of his heirs, and for the estate of the realm and of the people, should be treated, accorded, and established in parliament, by the king, and by the assent of the prelates, earls and barons, and the

commonalty of the realm, according as had been before accustomed." The constitutional powers of parliament as a legislature were here amply recognized — not by royal charter, or by the occasional exercise of preroga- tive, but by an authoritative statute. And these powers were soon to be exercised in a striking form. Already parliament had established the principle that the redress of grievances should have precedence of the grant of subsidies; it had main- tained the right of approving councillors of the Crown, and punishing them for the abuse of their powers; and in 1327 the king himself was finally deposed, and the succession of his son, Edward III., declared by parliament.

Union of Knights of the Shire and Burgesses. — At this period the constitution of parliament was also settling down to its later and permanent shape. Hitherto the different orders or estates had deliberated separately, and agreed upon their several grants to the Crown. The knights of the shire were naturally drawn, by social ties and class interests, into alliance with the barons; but at length they joined the citizens and burgesses, and in the first parliament of Edward III. they are found sitting together as " the Commons."

This may be taken as the turning point in the political history of England. If all the landowners of the country had become united as an order of nobles, they might have proved too strong for the development of national liberties, while the union of the country gentlemen with the burgesses formed an estate of the realm which was destined to prevail over all other powers. The withdrawal of the clergy, who would probably have been led by the bishops to take part with themselves and the barons, further strengthened the united Commons.

Increasing Influence of Parliament. — The reign of Edward III. witnessed further advances in the authority of parliament, and changes in its constitution. The king, being in continual need of subsidies, was forced to summon parliament every year, and in order to encourage its liberality he frequently sought its advice upon the most important issues of peace or war, and readily entertained the petitions of the Commons praying for the redress of grievances. During this reign also, the advice and consent of the Commons, as well as of the Lords spiritual and temporal, was regularly recorded in the enacting part of every • statute.

Separation of the Two Houses. — But a more important event is to be assigned to this reign, — the formal separation of parlia- ment into the two houses of Lords and Commons. There is no evidence — nor is it probable — that the different estates ever voted together as a single assembly. It appears from the rolls of parliament that in the early part of this reign, the causes of summons having been declared to the assembled estates, the three estates deliberated separately, but afterwards delivered a collective answer to the king. While their deliberations were short they could be conducted apart, in the same chamber; but, in course of time, it was found convenient for the Commons to have a chamber of their own, and they adjourned their sittings to the chapter-house of the abbot of Westminster, where they continued to be held after the more formal and permanent separation had taken place. The date of this event is generally assigned to the 17th Edward III.

The Commons as Petitioners. — Parliament had now assumed its present outward form. But it was far from enjoying the authority which it acquired in later times. The Crown was still paramount; the small body of earls and barons — not exceeding 40 — were connected with the royal family, or in the service of the king, or under his influence; the prelates, once distinguished by their independence, were now seekers of royal favour; and the Commons, though often able to extort concessions in return for their contributions to the royal exchequer, as yet held an inferior position among the estates of the realm. Instead of enjoying an equal share in the framing of laws, they appeared before the king in the humble guise of petitioners. Their petitions, together with the king's answers, were recorded in the rolls of parliament; but it was not until the parliament had been discharged from attendance that statutes were framed by the judges and entered on the statute rolls. Under such con- ditions legislation was, in truth, the prerogative of the Crown rather than of parliament. Enactments were often found in the statutes at variance with the petitions and royal answers, and neither prayed for by the Commons nor assented to by the Lords. In vain the Commons protested against so grave an abuse of royal authority; but the same practice was continued during this and succeeding reigns. Henry V., in the second year of his reign, promised " that nothing should be enacted to the petitions of the Commons, contrary to their asking, whereby they should be bound without their assent; " but, so long as the old method of framing laws was adhered to, there could be no security against abuse; and it was not until the reign of Henry VI. that the intro- duction of the more regular system of legislating by bill and statute ensured the thorough agreement of all the estates in the several provisions of every statute.

Increasing Boldness of the Commons. — The Commons, however, notwithstanding these and other discouragements, were con- stantly growing bolder in the assertion of their rights. They now ventured to brave the displeasure of the king, without seeking to shelter themselves behind powerful barons, upon whose forwardness in the national cause they could not reckon. Notably in 1376 their stout Speaker, Peter de la Mare, inveighed, in their name, against the gross mismanagement of the war, impeached ministers of the realm, complained of the heavy burdens under which the people suffered, and even demanded that a true account-should be rendered of the public expenditure. The brave Speaker was cast into prison, and a new parliament was summoned which speedily reversed the resolutions of the last. But the death of the king changed the aspect of affairs. Another parliament was called, when it was found that the spirit of the Commons was not subdued. Peter de la Mare was released from prison, and again elected to the chair. The demands of the former parliament were reiterated with greater boldness and persistence, the evil councillors of the late reign were driven out, and it was conceded that the principal officers of state should be appointed and removed, during the minority of Richard II., upon the advice of the lords. The Commons also insisted upon the annual assembling of parliament under the stringent provisions of a binding law. They claimed the right, not only of voting subsidies, but of appropriating them, and of

examining public accounts. They inquired into public abuses, and impeached ministers of the Crown. Even the king himself was deposed by the parliament. Thus during this reign all the great powers of parliament were asserted and exercised. The foreign wars of Henry IV. and Henry V., by continuing the financial necessities of the Crown, maintained for a while the powers which parliament had acquired by the struggles of centuries.

Relapse of Parliamentary Influence. — But a period of civil wars and disputed successions was now at hand, which checked the further development of parliamentary liberties. The effective power of a political institution is determined, not by assertions of authority, nor even by its legal recognition, but by the external forces by which it is supported, controlled or overborne. With the close of the Wars of the Roses the life of parliament seems to have well-nigh expired.

To this constitutional relapse various causes contributed at the same period. The Crown had recovered its absolute supre- macy. The powerful baronage had been decimated on the battlefield and the scaffold; and vast estates had been confiscated to the Crown. Kings had no longer any dread of their prowess as defenders of their own

order or party, or as leaders of the people. The royal treasury had been enriched by their ruin; while the close of a long succession of wars with France and Scotland relieved it of that continual drain which had reduced the Crown to an unwelcome dependence upon parliament. Not only were the fortunes of the baronage laid low, but feudalism was also dying out in England as on the continent. It was no longer a force which could control the Crown; and it was being further weakened by changes in the art of war. The mailed horseman, the battle-axe and cross-bow of the burgher and yeoman, could not cope with the cannon and arquebus of the royal army.

In earlier times the Church had often stood forth against the domination of kings, but now it was in passive submission to the Throne. The prelates were attracted to the court, and sought the highest offices of state; the inferior clergy had long been losing their influence over the laity by their ignorance and want of moral elevation at a period of increasing enlightenment; while the Church at large was weakened by schisms and a wider freedom of thought. Hence the Church, like the baronage, had ceased to be a check upon the Crown.

Meanwhile what had become of the ever-growing power Qf the Commons? It is true they had lost their stalwart leaders, the armed barons and outspoken prelates, but they had them- selves advanced in numbers, riches and enlightenment; they had overspread the land as knights and freeholders, or dwelt in populous towns enriched by merchandise. Why could they not find leaders of their own? Because they had lost the liberal franchises of an early age. All freeholders, or suitors present at the county court, were formerly entitled to vote for a knight of the shire; but in the eighth year of Henry VI. (1430) an act was passed (c. 37) by which this right was confined to 40s. freeholders, resident in the county. Large numbers of electors were thus disfranchised. In the view of parliament they were ” of no value,” and complaints had been made that they were under the influence of the nobles and greater landowners; but a popular element had been withdrawn from the county repre- sentation, and the restricted franchise cannot have impaired the influence of the nobles.

As for the cities and boroughs, they had virtually renounced their electoral privileges. As we have seen, they had never valued them very highly; and now by royal charters, or by the usurpation of small self-elected bodies of burgesses, the choice of members had fallen into the hands of town councils and neighbouring landowners. The anomalous system of close and nomination boroughs, which had arisen thus early in English history, was suffered to continue without a

check for four centuries, as a notorious blot upon a free constitution.

All these changes exalted the prerogatives of the Crown. Amid the clash of arms and the strife of hostile parties the voice of parliament had been stifled; and, when peace was restored, a

powerful king could dispense with an assembly which might prove troublesome, and from whom he rarely needed help. Hence for a period of two hundred years, from the reign of Henry VI. to that of Elizabeth, the free parliaments of England were in abeyance. The institution retained its form and con- stituent parts; its rights and privileges were theoretically recognized, but its freedom and national character were little more than shadows.

The Three Estates of the Realm. — This check in the fortunes of parliament affords a fitting occasion for examining the composition of each of the three estates of the realm.

Lords Spiritual and Temporal. — The archbishops and bishops had held an eminent position in the councils of Saxon and Norman kings, and many priors and abbots were from time to time asso- ciated with them as lords spiritual, until the suppression of the monasteries by Henry VIII. They generally outnumbered their brethren, the temporal peers, who sat with them in the same assembly.

The lords temporal comprised several dignities. Of these the baron, though now the lowest in rank, was the most ancient. The title was familiar in Saxon times, but it was not until after the Norman Conquest that it was invested with a distinct feudal dignity. Next in antiquity was the earl, whose official title was known to Danes and Saxons, and who after the Conquest obtained a dignity equivalent to that of count in foreign states. The highest dignity, that of duke, was not created until Edward III. conferred it upon his son, Edward the Black Prince. The rank of marquess was first created by Richard II., with precedence after a duke. It was in the reign of Henry VI. that the rank of viscount was created, to be placed between the earl and the baron. Thus the peerage consisted of the five dignities of duke, marquess, earl, viscount and baron. During the 15th century the number of temporal peers summoned to parliament rarely exceeded fifty, and no more than twenty-nine received writs of summons to the first parliament of Henry VII. There were only fifty-nine at the death

of Queen Elizabeth. At the accession of William III. this number had been increased to about one hundred and fifty.

Life Peerages. — The several orders of the peerage are alike distinguished by the hereditary character of their dignities. Some life peerages, indeed, were created between the reigns of Richard II. and Henry VI., and several ladies had received life peerages between the reigns of Charles II. and George II. The highest authorities had also held that the creation of life peerages was within the prerogative of the Crown. But four hundred years had elapsed since the creation of a life peer, entitled to sit in parliament, when Queen Victoria was advised to create Sir James Parke, an eminent judge, a baron for life, under the title of Lord Wensleydale. The object of this deviation from the accustomed practice was to strengthen the judicature of the House of Lords, without unduly enlarging the numbers of the peerage. But the Lords at once took exception to this act of the Crown, and, holding that a prerogative so long disused could not be revived, in derogation of the hereditary character of the peerage, resolved that Lord Wensleydale was not entitled by his letters patent and writ of summons to sit and vote in parliament. His lordship accordingly received a new patent, and took his seat as an hereditary peer. But the necessity of some such expedient for- improving the appellate jurisdiction of the House of Lords could not be contested; and in 1876 three lords of appeal in ordinary were constituted by statute, enjoying the rank of baron for life, and the right of sitting and voting in the House of Lords so long as they continue in office.

The Commons. — The Commons formed a more numerous body. In the reign of Edward I. there were about 275 members, in that of Edward III. 250, and in that of Henry VI. 300. In the reign of Henry VIII. parliament added 27 members for Wales and four for the county and city of Chester, and in the reign of Charles II. 4 for the county and city of Durham. Between the reigns of Henry VIII. and Charles II. 130 members were also added by royal charter.

Parliament under Henry VIII. — To resume the history of parliament at a later period, let us glance at the reign of Henry VIII. Never had the power of the Crown been greater than when this king succeeded to the throne, and never had a. more imperious will been displayed by any king of England. Parliament was at his feet to do his bidding, and the Reforma- tion enormously increased his power. He had become a pope to the bishops; the old nobles who had resisted his will had perished in the field or on the scaffold; the new nobles were his creatures; and he had the vast wealth of the Church in his hands as largesses to his adherents. Such was the dependence of parliament

upon the Crown and its advisers during the Reforma- tion period that in less than thirty years four vital changes were decreed in the national faith. Each of the successive reigns inaugurated a new religion.

Queen Elizabeth and her Parliaments. — With the reign of Elizabeth commenced a new era in the life of parliament. She had received the royal prerogatives unimpaired, and her hand was strong enough to wield them. But in the long interval since Edward IV. the entire framework of English society had been changed; it was a new England that the queen was called upon to govern. The coarse barons of feudal times had been succeeded by English country gentlemen, beyond the influence of the court, and identified with all the interests and sympathies of their country neighbours. From this class were chosen nearlj all the knights of the shire, and a considerable proportion of the members for cities and boroughs. They were generally dis- tinguished by a manly independence, and were prepared to uphold the rights and privileges of parliament and the interests of their constituents. A change no less remarkable had occurred in other classes of society. The country was peopled with yeomen and farmers, far superior to the cultivators of the soil in feudal times; and the towns and seaports had grown into important centres of commerce and manufactures. Advances not less striking had been made in the enlightenment and culture of society. But, above all, recent religious revolutions had awakened a spirit of thought and inquiry by no means confined to questions of faith. The Puritans, hostile to the Church, and jealous of every semblance of Catholic revival, were embittered against the state, which was identified, in their eyes, with many ecclesiastical enormities; and stubborn temper was destined to become a strong motive force in restoring the authority of parliament.

The parliaments of Elizabeth, though rarely summoned, displayed an unaccustomed spirit. They discussed the succession to the Crown, the marriage of the queen, and ecclesiastical abuses; they upheld the privileges of the Commons and their right to advise the Crown upon all matters of state; and they condemned the grant of monopolies. The bold words of the Wentworths and Yelvertons were such as had not been heard before in parliament. The conflicts between Elizabeth and the Commons marked the revival of the independence of parlia- ment, and foreshadowed graver troubles at no distant period.

Conflicts of James I. with the Commons. — James I., with short-sighted pedantry, provoked a succession of conflicts with the Commons, in which abuses of prerogative were stoutly resisted and the rights and privileges of parliament resolutely asserted. The ”

remonstrance ” of 1610 and the ” protestation ” of 1621 would have taught a politic ruler that the Commons could no longer be trifled with; but those lessons were lost upon James and upon his ill-fated son.

Charles I. and the Commonwealth. — The momentous struggles between Charles I. and his parliaments cannot be followed in this place. The earlier parliaments of this reign fairly repre- sented the earnest and temperate judgment of the country. They were determined to obtain the redress of grievances and to restrain undue prerogatives; but there was no taint of dis- loyalty to the Crown; there were no dreams of revolution. But the contest at length became embittered, until there was no issue but the arbitrament of the sword. The period of the Great Rebellion and the Commonwealth proved the supreme power of the Commons, when supported by popular forces. Every- thing gave way before them. They raised victorious armies in the field, they overthrew the Church and the House of Lords, and they brought the king himself to the scaffold. It also displayed the impotence of a parliament which has lost the confidence of the country, or is overborne by mobs, by an army, or by the strong will of a dictator.

Political Agitation of this Period.— -It is to this time of fierce political passions that we trace the origin of political agitation as an organized method of influencing the deliberations of parliament. The whole country was then aroused by passionate exhortations from the pulpit and in the press. No less than thirty thousand political tracts and newspapers during this period have been preserved. Petitions to parliament were multiplied in order to strengthen the hands of the popular leaders. Clamorous meetings were held to stimulate or overawe

parliament. Such methods, restrained after the Restoration, have been revived in later times, and now form part of the acknowledged system of parliamentary government.

Parliament after the Restoration. — On the restoration of Charles II. parliament was at once restored to its old constitu- tion, and its sittings were revived as if they had suffered no interruption. No outward change had been effected by the late revolution; but that a stronger spirit of resistance to abuses of prerogative had been aroused

was soon to be disclosed in the deposition of James II. and ” the glorious revolution ” of 1688. At this time the full rights of parliament were ex- plicitly declared, and securities taken for the maintenance of public liberties. The theory of a constitutional monarchy and a free parliament was established; but after two revolutions it is curious to observe the indirect methods by which the Commons were henceforth kept in subjection to the Crown and the terri- torial aristocracy. The representation had long become an illusion. The knights of the shire were the nominees of nobles and great landowners; the borough members were returned by the Crown, by noble patrons or close corporations; even the representation of cities, with greater pretensions to inde- pendence, was controlled by bribery. Nor were rulers content with their control of the representation, but, after the Restora- tion, the infamous system of bribing the members themselves became a recognized instrument of administration. The country gentlemen were not less attached to the principles of rational liberty than their fathers, and would have resisted further encroachments of prerogatives; but they were satisfied with the Revolution settlement and the remedial laws of William III., and no new issue had yet arisen to awaken opposition. Accord- ingly, they ranged themselves with one or other of the political parties into which parliament was now beginning to be divided, and bore their part in the more measured strifes of the 18th century. From the Revolution till the reign of George III. the effective power of the state was wielded by the Crown, the Church and the territorial aristocracy; but the influence of public opinion since the stirring events of the 17th century had greatly increased. Both parties were constrained to defer to it; and, notwithstanding the flagrant defects in the representation, parliament generally kept itself in accord with the general sentiments of the country.

Union of Scotland. — On the union of Scotland’ in 1707 important changes were made in the constitution of parlia- ment. The House of Lords was reinforced by the addition of sixteen peers, representing the peerage of Scotland, and elected every parliament; and the Scottish peers, as a body, were admitted to all the privileges of peerage, except the right of sitting in parliament or upon the trial of peers. No pre- rogative, however, was given to the Crown to create new peerages after the union; and, while they are distinguished by their antiquity, their number is consequently decreasing. To the House of Commons were assigned forty-five members, representing the shires and burghs of Scotland.

Parliament under George III. — With the reign of George III. there opened a new period in the history of parliament. Agita- tion in its

various forms, an active and aggressive press, public meetings and political associations, the free use of the right of petition, and a turbulent spirit among the people seriously changed the relations of parliament to the country. And the publication of debates, which was fully established in 1771, at once increased the direct responsibility of parliament to the people, and ultimately brought about other results, to which we shall presently advert.

Union of Ireland. — In this reign another important change was effected in the constitution of parliament. Upon the union with Ireland, in 1801, four Irish bishops were added to the lords spiritual, who sat by rotation of sessions, and repre- sented the episcopal body of the Church of Ireland. But those bishops were deprived of their seats in parliament in 1869, on the disestablishment of the Church of Ireland. Twenty-eight representative peers, elected for life by the peerage of Ireland, were admitted to the House of Lords. All the Irish peers were

also entitled to the privilege of peerage. In two particulars the Irish peerage was treated in a different manner from the peerage of Scotland. The Crown was empowered to create a new Irish peerage whenever three Irish peerages in existence at the time of the. Union have become extinct, or when the number of Irish peers, exclusive of those holding peerages of the United Kingdom, has been reduced to one hundred. And, further, Irish peers were permitted to sit in the House of Commons for any place in Great Britain, forfeiting, however, the privilege of peerage while sitting in the lower house.

At the same time one hundred representatives of Ireland were added to the House of Commons. This addition raised the number of members to six hundred and fifty-eight. Parlia- ment now became the parliament of the United Kingdom.

Schemes far Improving the Representation. — By the union of Scotland and Ireland the electoral abuses of those countries were combined with those of England. Notwithstanding a defective representation, however, parliament generally sus- tained its position as fairly embodying the political sentiments of its time. Public opinion had been awakened, and could not safely be ignored by any party in the state. Under a narrow and corrupt electoral system the ablest men in the country found an entrance into the House of Commons; and their rivalry and ambition ensured the acceptance of popular principles and the passing of many remedial measures. As society expanded, and new classes were called into existence, the pressure of public opinion upon the legislature was assuming a more decisive

character. The grave defects of the representa- tion were notorious, and some minor electoral abuses had been from time to time corrected. But the fundamental evils — ■ nomination boroughs, limited rights of election, the sale of seats in parliament, the prevalence of bribery, and the enormous expense of elections — though constantly exposed, long held their ground against all assailants. So far back as 1770 Lord Chatham had denounced these flagrant abuses. ” Before the end of this century,” he said, ” either the parliament will reform itself from within, or be reformed with a vengeance from without.” In 1782, and again in 1783 and 1785, his distinguished son, William Pitt, condemned the abuses of the representation, and proposed schemes of parliamentary reform. In 1793 Mr Grey (afterwards Earl Grey) submitted a motion on the same subject; but the excesses of the French Revolution, political troubles at home, and exhausting wars abroad dis- couraged the supporters of reform for many years. Under more favourable conditions the question assumed greater proportions. Lord John Russell especially distinguished him- self in 1820, and in several succeeding years, by the able exposure of abuses and by temperate schemes of reform. His efforts were assisted by the scandalous disclosures of bribery at Grampound, Penryn and East Retford. All moderate proposals were rejected; but the concurrence of a dissolution, on the death of George IV., with the French Revolution in 1830, and an ill-timed declaration of the duke of Wellington that the representation was perfect and could not be improved, suddenly precipitated the memorable crisis of parliamentary reform. It now fell to the lot of Earl Grey, as premier, to be the leader in a cause which he had espoused in his early youth.

The Reform Acts of 1832. — The result of the memorable struggle which ensued may be briefly told. By the Reform Acts of 1832 the representation of the United Kingdom was reconstructed. In England, fifty-six nomination boroughs returning one hundred and eleven members were disfranchised; thirty boroughs were each deprived of one member, and Wey- mouth and Melcombe Regis, which had returned four members, were now reduced to two. Means were thus found for the enfranchisement of populous places. Twenty-two large towns, including metropolitan districts, became entitled to return two members, and twenty less considerable towns acquired the right of returning one member each. The number of county members was increased from ninety-four to one hundred and fifty-nine, the larger counties being divided for the purposes of representation.

The elective franchise was also placed upon a new basis. In the boroughs a £10 household suffrage was substituted for the narrow and unequal franchises which had sprung up — the rights of freemen, in corporate towns, being alone respected. In the counties, copyholders and leaseholders for terms of years, and tenants at will paving a rent of £50 a year, were added to the 40s. freeholders.

By the Scottish Reform Act the number of members repre- senting Scotland was increased from forty-five, as arranged at the union, to fifty-three, of whom thirty were assigned to counties and twenty-three to cities and burghs. In counties the franchise was conferred upon owners of property of £10 a year, and certain classes of leaseholders; in burghs, upon £10 householders, as in England.

By the Irish Reform Act, no boroughs, however small, were disfranchised; but the franchise was given to £10 householders, and county constituencies were enlarged. These franchises, however, were extended in 1850, when an £8 household suffrage was given to the boroughs, and additions were made to the county franchises. The hundred members assigned to that country at the union were increased to one hundred and five. Notwithstanding these various changes, however, the total number of the House of Commons was still maintained at six hundred and fifty-eight.

The legislature was now brought into closer relations with the people, and became more sensitive to the pressure of popular forces. The immediate effects of this new spirit were per- ceptible in the increased legislative activity of the reformed parliament, its vigorous grappling with old abuses, and its preference of the public welfare to the narrower interests of classes. But, signal as was the regeneration of parliament, several electoral evils still needed correction. Strenuous efforts were made, with indifferent success, to overcome bribery and corruption, and proposals were often ineffectually made to restrain the undue influence of landlords and employers of labour by the ballot; improvements were made in the registra- tion and polling of electors, and the property qualification of members was abolished. Complaints were also urged that the middle classes had been admitted to power, while the work- ing classes were excluded from the late scheme of enfranchise- ment. It was not till 1867 however that any substantial advance was made.

Increased Power of the Commons. — Prior to the reign of Charles I. the condition of society had been such as naturally to subordinate the Commons to the Crown and the Lords. After the Revolution of 1688 society had so far advanced that, under a free representation, the

Commons might have striven with both upon equal terms. But, as by far the greater part of the representation was in the hands of the king and the territorial nobles, the large constitutional powers of the Commons were held safely in check. After 1832, when the representation became a reality, a corresponding authority was asserted by the Commons. For several years, indeed, by reason of the weakness of the Liberal party, the Lords were able successfully to resist the Commons upon many important occasions; but it was soon acknowledged that they must yield whenever a decisive majority of the Commons, supported by public opinion, insisted upon the passing of any measure, however repugnant to the sentiments of the upper house. And it became a political axiom that the Commons alone determined the fate of ministries.

Later Measures of Reform. — In 1852, and again in 1854, Lord John Russell introduced measures of parliamentary reform; but constitutional changes were discouraged by the Crimean War. In 1859 Lord Derby's Conservative government pro- posed another scheme of reform, which was defeated; and in i860 Lord John Russell brought in another bill, which was not proceeded with; and the question of reform continued in abeyance until after the death of Lord Palmerston. Earl Russell, who succeeded him as premier, was prompt to redeem former pledges, and hastened to submit to a new parliament, in 1866, another scheme of reform. This measure, and the

ministry by whom it was promoted, were overthrown by a combination of the Conservative opposition and the memorable " cave " of members of the Liberal party. But the popular sentiment in favour of reform, which had for some years been inert, was suddenly aroused by the defeat of a Liberal ministry and the triumph of the party opposed to reform. Lord Derby and his colleagues were now constrained to undertake the settlement of this embarrassing question; and by a strange concurrence of political events and party tactics a scheme far more democratic than that of the Liberal government was accepted by the same parliament, under the auspices of a Conservative ministry.

The Reform Acts of 1867- 1868. —By the English Reform Act of 1867 four corrupt boroughs were disfranchised, and thirty-eight boroughs returning two members were henceforth to return one only. A third member was given to Manchester, Liverpool, Birmingham and Leeds; a second member to Merthyr Tydfil and Salford; the Tower Hamlets were divided into two boroughs, each returning two members; and ten new boroughs were created, returning one member each, with the exception of Chelsea, to which two were assigned. By these changes

twenty-six seats were taken from boroughs, while a member was given to the university of London. But before this act came into operation seven other English boroughs were disfranchised by the Scottish Reform Act of 1868, these seats being given to Scotland. Thirteen new divisions of counties were erected, to which twenty-five members were assigned. In counties the franchise of copyholders and lease-holders was reduced from £10 to £5, and the occupation franchise from £50 to £12. In boroughs the franchise was extended to all occupiers of dwelling-houses rated to the poor-rates, and to lodgers occupying lodgings of the annual valueof £iounfurnished.

By the Scottish Reform Act of 1868, the number of members representing Scotland was increased from fifty-three to sixty — three new members being given to the shires, two to the univer- sities, and two to cities and burghs. The county franchise was extended to owners of lands and heritages of £5 yearly value, and to occupiers of the rateable value of £14; and the burgh franchise to all occupiers of dwelling-houses paying rates, and to tenants of lodgings of £10 annual value unfurnished.

By the Irish Reform Act of 1868 no change was made in the number of members nor in the distribution of seats; but the boroughs of Sligo and Cashel, already disfranchised, were still left without representation. The county franchise was left unchanged; but the borough franchise was extended to occupiers of houses rated at £4, and of lodgings of the annual value of £10 unfurnished.

That these changes in the representation — especially the household suffrage in boroughs — were a notable advance upon the reforms of 1832, in the direction of democracy, cannot be questioned. The enlarged constituencies speedily overthrew the ministry to whom these measures were due; and the new parliament further extended the recent scheme of reforrr- by granting to electors the protection of the ballot (?.».), for which advanced reformers had contended since 1832. Nor was the existing representation long suffered to continue without question. First, it was proposed, in 1872, to extend the household franchise to counties, and this proposal found favour in the country and in the House of Commons; but, the Conservative party having been restored to power in 1874, no measure of that character could be promoted with any prospect of success. At the dissolution of 1880 a more general revision of the representation was advocated by leading members of the Liberal party, who were soon restored to power.

(T. E.M.;H.Ch.)

Acts of 1884-1885. — The Reform Act of 1884 was ultimately carried with the goodwill of both of the great political parties. The Conservatives resisted Mr Gladstone's attempt to carry a great extension of the franchise before he had disclosed his scheme of redistribution, and the bill was thrown out by the House of Lords in August 1884. But after a conference of Mr Gladstone with Lord Salisbury, to whom the whole scheme

was confided, an agreement was reached, and the bill was passed in the autumn session. In the following session (1885) the Redistribution Act was passed.

A uniform household and lodger franchise was established in counties and boroughs. If a dwelling was held as part payment for service, the occupier was not deprived of his vote because his home was the property of his master. The obliga- tion was thrown on the overseers of ascertaining whether any other man besides the owner was entitled to be registered as an inhabitant occupier, and the owner was bound to supply the overseers with information. The Registration Acts were otherwise widely amended. Polling-places were multiplied, so that little time need be lost in recording a vote. These and other beneficial changes went a long way towards giving a vote to every one who had a decent home. By the Redistribu- tion of Seats Act 1885 all boroughs with less than 15,000 inhabitants ceased to return a member. These small towns were merged into their counties, and the counties were sub- divided into a great number of single-member constituencies, so that the inhabitants of the disfranchised boroughs voted for the member for the division of the county in which they were situated. Boroughs with less than 50,000 inhabitants returning two members were in future to return only one, and towns of over 100,000 were divided into separate constituencies, and received additional members in proportion to their popula- tion. The members for the City of London were reduced to two, but Greater London, including Croydon, returned sixty. Divided Liverpool returned nine, Glasgow seven, Edinburgh, Dublin and Belfast each four, and so on. Six additional seats were given to England and twelve to Scotland, so that, allowing for a diminution by disfranchisement for corruption, the numbers of the House of Commons were raised to 670 members.

Results of Reform since 1833. — From a constitutional stand- point it is important to recognize the results of the successive Reform Acts on

the working of parliament as regards the position of the executive on the one hand and the electorate on the other. Before 1832 the functions of ministers were mainly adminis- trative, and parliament was able to deal much as it pleased with their rare legislative proposals without thereby depriving them of office. Moreover, since before that date ministers were, generally speaking, in fact as well as in theory appointed by the king, while the general confidence of the majority in the House of Commons followed the confidence not so much of the electorate as of the Crown, that house was able on occasions to exercise an effective control over foreign policy. Pitt, after 1784, was defeated several times on foreign and domestic issues, yet his resignation was neither expected nor desired. In 1788, when the regency of the prince of Wales appeared probable, and again in 1812, it was generally assumed that it would be in'his power to dismiss his father's ministers and to maintain the Whigs in office without dissolving parlia- ment. This system, while it gave to ministers security of tenure, left much effective freedom of action to the House of Commons. But the Reform Act of 1832 introduced a new order of things. In 1835 the result of a general election was for the first time the direct cause of a change of ministry, and in 1841 a House of Commons was elected for the express purpose of bringing a particular statesman into power. The electorate voted for Sir Robert Peel, and it would have been as impossible for the house then elected to deny him their support as it would be for the college of electors in the United States to exercise their private judgment in the selection of a president. As time went on, and the party system became more closely organized in the enlarged electorate, the voting power throughout the country came to exercise an increasing influence. The premier was now a party leader who derived his power in reality neither from the Crown nor from parliament, but from the electorate, and to the electorate he could appeal if deserted by his parlia- mentary majority. Unless it was prepared to drive him from the office in which it was elected to support him, that majority would not venture to defeat, or even seriously to modify, his legislative proposals, or to pass any censure on his foreign policy,

for all such action would now be held to be equivalent to a vote of no confidence. From the passing of the Reform Act of 1867 down to 1900 (with a single exception due to the lowering of the franchise and the redistribution of seats) the electorate voted alternately for the rival party leaders, and it was the function of the houses elected for that purpose to pass the measures and to endorse the general policy with which those leaders were respectively identified. The cabinet (g.v.), com- posed of colleagues selected by the prime minister, had

practically, though indirectly, become an executive committee acting on behalf of the electorate, that is to say, the majority which returned their party to office; and the House of Commons practically ceased to exercise control over ministers except in so far as a revolt in the party forming the majority could influence the prime minister, or force him to resign or dissolve. Meanwhile, the virtual identification of the electorate with the nation by the successive extensions of the franchise added immensely to its power, the chief limitation being supplied by the Septennial Act. The House of Lords, whatever its nominal rights, came henceforth in practice to exercise restric- tion rather on the House of Commons than on the will of the electorate, for the acquiescence of the upper house in the decision of the electors, when appealed to on a specific point of issue between the two houses, was gradually accepted by its leaders as a constitutional convention. ■

The history of parliament, as an institution, centres in this later period round two points, (A) the friction between Lords and Commons, resulting in proposals for the remodelling of' the upper house, and (B) the changes in procedure within the House of Commons, necessitated by new conditions of work and the desire to make it a more business-like assembly. These two movements will be discussed separately.

A. House of Lords Question. — In the altered position of the House of Lords, the occasional checks given by it to the House of Commons were bound to cause friction with the representa- tives of the people. In the nature of things this was a matter of importance only when the Liberal party was in power and measures were proposed by the Liberal leaders which involved such extreme changes that the preponderantly Conservative upper house could amend or reject them with some confidence in its action being supported by the electorate. The frequent differences between the two houses during the parliament of 1880-1885, culminating in the postponement by the upper house of the Reform Bill, caused the status of that house to be much discussed during the general election of 1885, and proposals for its ” mending or ending ” to be freely canvassed on Radical platforms. On the 5th of March 1886 Mr Labouchere moved a resolution in the House of Commons condemning the hereditary principle. This was resisted by Mr Gladstone, then prime minister, on the ground that he had never supported an abstract resolution unless he was prepared to follow it up by action, and that the time for this had not arrived. On a division the motion was negatived by 202 votes against 166. The question of the constitution of the House of Lords was much agitated in 1888. The Conservatives were again in power, but many of them thought that it would be prudent to forestall by a moderate reform the more drastic remedies now openly advocated by their opponents. On

the other hand, Radicals were disposed to resist all changes involving the maintenance of the hereditary principle, lest they should thereby strengthen the House of Lords. On the gth of March Mr Labouchere again moved his resolution in the House of Commons. Mr W. H. Smith, the leader of the house, in resisting the motion, admitted that some changes were desirable, and agreed with a previous speaker that it was by the Conservatives that such changes ought to be effected. On the 19th of March in the same year Lord Rosebery, in the House of Lords, moved for a select committee to inquire into the subject. He took the oppor- tunity to explain his own plan of reform. While he did not wish to abolish the hereditary principle, he desired that no peer, outside the Royal family, should be a member of the house by right of birth alone. To the representatives of the peers

he proposed to add other men who had achieved distinction in a public career. He attached a high importance to the existence of a second chamber. His motion was negatived by 97 votes against 50. On the 26th of April Lord Dunraven with- drew a bill for the reform of the House of Lords on the promise of the government to deal with the matter, and on the 18th of June Lord Salisbury fulfilled this pledge. He introduced a bill on that day to provide for the creation of a limited number of life peers and for the exclusion of unworthy members from the house. Under this measure a maximum of five life-peerages in any one year might be created, but the total number was never to exceed fifty. In respect of three out of these five life-peers the choice of the Crown was restricted to judges, generals, admirals, ambassadors, privy councillors and ex- governors of colonies. The two additional life-peers were to be appointed in regard to some special qualification to be stated in the message to the house announcing the intention of the Crown to make the appointment. Power was also to be given to the house to expel members for the period of the current parliament by an address to the Crown praying that their writs of summons might be cancelled. The bill was read a second time on the 10th of July, but it met with a cold reception and was dropped. The only outcome of all that was written and said in this year was that in 1889, after the report of a select committee set up in 1888, the Lords made a few changes in their standing orders, among which the order establishing a quorum of thirty in divisions and those for the constitution of standing committees were the most important.

The parliament which met at Westminster in August 1892 was more

democratic in its tendencies than any of its prede- cessors. At the beginning of the session of 1893, in the course of which the Home Rule Bill was passed by the House of Commons, government bills were introduced for quinquennial parliaments, for the amendment of registration, and for the limitation of each elector to a single vote. The introduction of these bills served merely as a declaration of government policy, and they were not further pressed. On the 24th of March a resolution in favour of payment of members was carried by 276 votes against 229, and again in 1895 by 176 to 158. But the rejection of the Home Rule Bill by the House of Lords, with the apparent acquiescence of the country, combined with the retirement of Mr Gladstone to weaken the influence of this House of Commons, and small importance was attached to its abstract resolutions. In the ensuing session of 1894 an amendment to the Address condemning the hereditary principle was moved by Mr Labouchere, and carried by 147 to 145. The government, however, holding that this was not the way in which a great question should be raised, withdrew the Address, and carried another without the insertion. In his last public utterance Mr Gladstone directed the attention of his party to the reform of the House of Lords, and Lord Rosebery endeavoured to concentrate on such a policy the energies of his supporters at the general election. But the result of the dissolution of 1895, showing, as it did, that on the chief political issue of the day the electorate had agreed with the House of Lords and had disagreed with the House of Commons, greatly strengthened the upper house, and after that date the subject was but little discussed until the Liberal party again came into power ten years later. The House of Lords claimed the right to resist changes made by the House of Commons until the will of the people had been definitely declared, and its defenders contended that its ultimate dependence on the electorate, now generally acknowledged, rendered the freedom from ministerial control secured to it by its constitution a national safeguard.

In 1907, under the Radical government of Sir H. Campbell-Bannerman (q.v.), the conflict between the Commons and the Lords again became more acute. And the prime minister in May obtained a large majority in the lower house for a resolu- tion, on which a bill was to be founded, involving a complicated method of overriding the will of the Lords when the Commons had three times passed a bill. But no further immediate step was taken. In 1908 a strong committee of the House of Lords

with Lord Rosebery as chairman, which had been appointed in consequence of the introduction by Lord Newton of a bill for reforming the constitution of the' upper house, presented an

interesting report in favour of largely restricting the hereditary element and adopting a method of selection.

So the question stood when in 1909 matters came to a head through the introduction of Mr Lloyd George's budget. It had always been accepted as the constitutional right of the House of Lords to reject a financial measure sent up by the Commons but not to amend it, but the rejection of the budget (which was, in point of form, referred to the judgment of the electorate) now precipitated a struggle with the Liberal party, who had persistently denied any right on the part of the upper house to force a dissolution. The Liberal leaders contended that, even if constitutional, the claim of the House of Lords to reject a budget was practically obsolete, and having been revived must now be formally abolished; and they went to the country for a mandate to carry their view into law. The elections of January 1910 gave an unsatisfactory answer, since the two principal parties, the Liberals and the Unionists, returned practically equal; but the Liberal government had also on their side the Irish Nationalist and the Labour parties, which gave them a majority in the House of Commons if they could concentrate the combined forces on the House of Lords question. This Mr Asquith contrived to do; and having introduced and carried through the House of Commons a series of resolutions defining his proposals, he had also tabled a bill which was to be sent up to the House of Lords, when the death of the king suddenly interrupted the course of the consti- tutional conflict, and gave a breathing-space for both sides to consider the possibility of coming to terms. In June Mr Asquith took the initiative in inviting the leaders of the Opposition to a conference with closed doors, and a series of meetings between four representatives of each side were begun. The government were represented by Mr Asquith, Mr Lloyd George, Mr Birrell and Lord Crewe. The Unionists were represented by Mr Balfour, Lord Lansdowne, Mr Austin Chamberlain and Lord Cawdor.

The situation on the Radical side at this juncture may be best understood by setting out the resolutions passed in the House of Commons, and the text ' of the parliament bill of which Mr Asquith had given notice: —

The Resolutions. — " I. That it is expedient that the House of Lords be disabled by law from rejecting or amending a money bill, but that any such limitation by law shall not be taken to diminish or qualify the existing rights and privileges of the House of Commons.

" For the purpose of this resolution, a bill shall be considered a money bill if in the opinion of the Speaker it contains only provisions dealing with all or any of the following subjects — namely, the imposition, repeal, remission, alteration or regulation of taxa- tion; charges on the

Consolidated Fund or the provision of money by parliament; supply; the appropriation, control or regulation of public money ; the raising or guarantee of any loan or the repay- ment thereof; or matters incidental to those subjects or any of them.

” 2. That it is expedient that the powers of the House of Lords, as respects bills other than money bills, be restricted by law, so that any such bill which has passed the House of Commons in three successive sessions and, having been sent up to the House of Lords at least one month before the end of the session, has been rejected by that house in each of those sessions, shall become law without the consent of the House of Lords, on the royal assent being declared : provided that at least two years shall have elapsed between the date of the first introduction of the bill in the House of Commons and the date on which it passes the House of Commons for the third time.

” For the purpose of this resolution a bill shall be treated as rejected by the House of Lords if it has not been passed by the House of Lords either without amendment or with such amend- ments only as may be agreed upon by both houses.

” 3. That it is expedient to limit the duration of parliament to five years.”

The Parliament Bill, iqio. — ” Whereas it is expedient that pro- vision should be made for regulating the relations between the two Houses of Parliament: And whereas it is intended to substitute for the House of Lords as it at present exists a second chamber constituted on a popular instead of hereditary basis, but such substitution cannot be immediately brought into operation: And whereas provision will require hereafter to be made by parlia- ment in a measure effecting such substitution for limiting and denning the powers of the new second-chamber, but it is expedient

to make such provision as in this act appears for restricting the existing powers of the House of Lords: Be it therefore enacted by the king’s most excellent majesty, by and with the advice and consent of the Lords spiritual and temporal, and Commons, in this present parliament assembled, and by the authority of the same, as follows : —

” 1. (1) If a money bill, having been passed by the House of Commons,

and sent up to the House of Lords at least one month before the end of the session, is not passed by the House of Lords without amendment within one month after it is so sent up to that house, the bill shall, unless the House of Commons direct to the contrary, be presented to His Majesty and become an act of parliament on the royal assent being signified, notwithstanding that the House of Lords have not consented to the bill.

” (2) A money bill means a bill which in the opinion of the Speaker of the House of Commons contains only provisions dealing with all or any of the following subjects — namely, the imposition, repeal, remission, alteration or regulation of taxation; charges on the consolidated fund or the provision of money by parliament ; supply ; the appropriation, control or regulation of public money; the raising or guarantee of any loan or the repayment thereof; or matters incidental to those subjects or any of them.

” (3) When a bill to which the House of Lords has not consented is presented to His Majesty for assent as a money bill, the bill shall be accompanied by a certificate of the Speaker of the House of Commons that it is a money bill.

” (4) No amendment shall be allowed to a money bill which, in the opinion of the Speaker of the House of Commons, is such as to prevent the bill retaining the character of a money bill.

” 2. (1) It any bill other than a money bill is passed by the House of Commons in three successive sessions (whether of the same parliament or not), and, having been sent up to the House of Lords at least one month before the end of the session, is rejected by the House of Lords in each of those sessions, that bill shall, on its rejection for the third time by the House of Lords, unless the House of Commons direct to the contrary, be presented to His Majesty and become an act of parliament on the royal assent being signified thereto, notwithstanding that the House of Lords has not consented to the bill: provided that this provision shall not take effect unless two years have elapsed between the date of the first introduction of the bill in the House of Commons and the date on which it passes the House of Commons for the third time.

” (2) A bill shall be deemed to be rejected by the House of Lords if it is not passed by the House of Lords either without amendment or with such amendments only as may be agreed to by both houses.

” (3) A bill shall be deemed to be the same bill as a former bill sent up

to the House of Lords in the preceding session if, when it is sent up to the House of Lords, it is identical with the former bill or contains only such alterations as are certified by the Speaker of the House of Commons to be necessary owing to the time which has elapsed since the date of the former bill, or to represent amend- ments which have been made by the House of Lords in the former bill in the preceding session.

" Provided that the House of Commons may, if they think fit, on the passage of such a bill through the house in the second or third session, suggest any further amendments without insert- ing the amendments in the bill, and any such suggested amend- ments shall be considered by the House of Lords, and if agreed to by that house, shall be treated as amendments made by the House of Lords and agreed to by the House of Commons ; but the exercise of this power by the House of Commons shall not affect the operation of this section in the event of the bill being rejected by the House of Lords.

" 3. Any certificate of the Speaker of the House of Commons given under this act shall be conclusive for all purposes, and shall not be questioned in any court of law.

" 4. Nothing in this act shall diminish or qualify the existing rights and privileges of the House of Commons.

" 5. Five years shall be substituted for seven years as the time fixed for the maximum duration of parliament under the Septennial Act 1715."

Meanwhile, in the House of Lords, Lord Rosebery had carried three resolutions declaring certain principles for the reform of the second chamber, which were assented to by the Unionist leaders; the policy opposed to that of the government thus became that of willingness for reform of the constitution of the Upper Chamber, but not fcr abolition of its powers.

Lord Rosebery's Resolutions. — (1) " That a strong and efficient Second Chamber is not merely an integral part of the British Con- stitution, but is necessary to the well-being of the State and to the balance of Parliament." (2) " Such a Chamber can best be obtained by the reform and reconstitution of the House of Lords." (3) " That a necessary preliminary to such reform and reconstitution is the acceptance of the principle that the possession of a peerage should no longer of itself give the right to sit and vote in the House of Lords."

During the summer and autumn the private meetings between the

eight leaders were continued, until twenty had been held. But on the 10th of November Mr Asquith issued a brief statement that the conference on the constitutional question had come to an end, without arriving at an agree- ment. Within a few days he announced that another appeal would at once be made to the electorate. The Parliament Bill was hurriedly introduced into the House of Lords, with a statement by Lord Crewe that no amendments would be accepted. The dissolution was fixed for the 28th of November. Time was short for any declaration of policy by the Unionist peers, but it was given shape at once, first by the adoption of a further resolution moved by Lord Rosebery for the remodel- ling of the Upper House, and secondly by Lord Lansdowne's shelving the Parliament Bill by coupling the adjournment of the debate on it with the adoption of resolutions providing for the settlement of differences between a reconstituted Upper House and the House of Commons.

Lord Rosebery's additional resolution provided that " in future the House of Lords shall consist of Lords of Parliament: (a) chosen by the whole body of hereditary peers from among themselves and by nomination by the Crown ; (b) sitting by virtue of offices and of qualifications held by them ; (c) chosen from outside." The Lansdowne resolutions provided in effect that, when the House of Lords had been " reconstituted and reduced in numbers " in accor- dance with Lord Rosebery's plan, (i) any differences arising between the two houses with regard to a Bill other than a Money Bill, in two successive sessions, and within an interval of not less than one year, should be settled, if not adjustable otherwise, in a joint sitting composed of members of both houses, except in the case of " a matter which is of great gravity and has not been adequately submitted to the judgment of the people," which should then be " submitted for decision to the electors by Referendum "; (2) and as to Money Bills, the Lords were prepared to forgo their constitu- tional right .of rejection or amendment, if effectual provision were made against " tacking," the decision whether other than financial matters were dealt with in the Bill resting with a joint committee of both Houses, with the Speaker of the House of Commons as chairman, having a casting vote only.

The general election took place in December, and resulted practically in no change from the previous situation. Both sides won and lost seats, and the eventual numbers were: Liberals 272, Labour 42, Irish Nationalists 84 (8 being " inde- pendents" following Mr William O'Brien), Unionists 272. Thus, including the doubtful votes of the 8 Independent Nationalists, Mr Asquith retained an apparent majority of 126 for the ministerial policy, resting as it did on the determination of the Irish Nationalists to pave the way for Home Rule by destroying the

veto of the House of Lords.

B. House of Commons Internal Reforms. — We have already sketched the main lines of English parliamentary procedure. Until the forms of the House of Commons were openly utilized to delay the progress of government business by what became known as ” obstruction ” the changes made in the years following 1832 were comparatively insignificant. They con- sisted in (1) the discontinuance of superfluous forms, questions and amendments; (2) restrictions of debates upon questions of form; (3) improved arrangements for the distribution of busi- ness; (4) the delegation of some of the minor functions of the house to committees and officers of the house; and (5) increased publicity in the proceedings of the house. But with the entry of Mr Parnell and his Irish Nationalist followers into parlia- ment (1875-1880) a new era began in the history of the House of Commons. Their tactics were to oppose all business of whatever kind, and at all hours.

It was not until February 1880 that the house so far overcame its reluctance to restrict liberty of discussion as to pass, in its earliest form, the rule dealing with “order in debate.” It provided that whenever a member was named by the Speaker or chairman as ” disregarding the authority of the chair, or abusing the rules of the house by persistently and wilfully obstructing the rules of the house,” a motion might be made, to be decided without amendment or debate, for his suspension from the service of the house during the remainder of the sitting; and that if the same member should be suspended three times

in one session, his suspension on the third occasion should continue for a week, and until a motion had been made upon which it should be decided, at one sitting, by the house, whether the suspension should then cease or not. The general election, which took place two months later, restored Mr Gladstone to power and to the leadership of the house. Mr Parnell returned to parliament with a more numerous following, and resumed his former tactics. In January 1881 the Protection of Persons and Property (Ireland) Bill was introduced. For twenty-two hours Parnell fought the motion giving precedence to the bill, and for four sittings its introduction. The fourth sitting lasted forty- one hours. Then Mr Speaker Brand intervened, and declined to call on any other member who might rise to address the house,

because repeated dilatory motions had been supported by small minorities in opposition to the general sense of the house. He added: ” A crisis has thus arisen which demands the prompt interposition of the chair and of the house. The usual rules have proved powerless to ensure orderly and effective debate. An important measure, recommended by Her Majesty nearly a month since, and declared to be urgent in the interests of the state by a decisive majority, is being arrested by the action of an inconsiderable minority, the members of which have resorted to those modes of obstruction which have been recognized by the house as a parliamentary offence. The dignity, the credit, and the authority of this house are seriously threat- ened, and it is necessary they should be vindicated. . . . Future measures for ensuring orderly debate I must leave to the judg- ment of the house. But the house must either assume more effectual control over its debates, or entrust greater powers to the chair.” The Speaker then put the question, which was carried by an overwhelming majority. Then followed the decisive struggle. Mr Gladstone gave notice for the next day (Feb. 3) of an urgency rule, which ordered, ” That if the house shall resolve by a majority of three to one that the state of public business is urgent, the whole power of the house to make rules shall be and remain with the Speaker until he shall declare that the state of public business is no longer urgent.” On the next day a scene of great disorder ended in the suspension of the Nationalist members, at first singly, and afterwards in groups. The urgency rule was then passed without further difficulty, and the house proceeded to resolve, ” That the state of public business is urgent.” The Speaker laid upon the table rules of sufficient stringency, and while they remained in force progress in public business was possible. During this session the Speaker had to intervene on points of order 93 s times, and the chairman of committees 939 times; so that, allowing only five minutes on each occasion, the wrangling between the chair and members occupied 150 hours.

The events of the session of 1881 and the direct appeal of the Speaker to the house proved the necessity of changes in the rules The Closure °^ P roce< iure more drastic than had hitherto been ' proposed. Accordingly, in the first week of the session of 1882 Mr Gladstone laid his proposals on the table, and in moving the first resolution on 20th February, he reviewed, in an eloquent speech, the history of the standing orders. It was his opinion, on general grounds, that the house should settle its own procedure, but he showed that the numerous committees which, since 1832, had sat on the subject, had failed for the most part to carry their recommendations into effect from the lack of the requisite " propelling power," and he expressed his regret that

the concentration of this power in the hands of the government had rendered it necessary that they should undertake a task not properly theirs. He noted two main features in the history of the case: (1) the constantly increasing labours of the house, and (2) its constantly decreasing power to despatch its duties; and while he declared that " the fundamental change which has occurred is owing to the passing of the first great Reform Bill," he pointed out that the strain had not become intolerable till the development in recent years of ob- structive tactics. He defined obstruction as " the disposition either of the minority of the house, or of individuals, to resist the prevailing will of the house otherwise than by argument," and

reached the conclusion that the only remedy for a state of things by which the dignity and efficiency of the house were alike compromised, was the adoption in a carefully guarded form of the process known on the Continent as the ” cloture.” He explained that in his early years the house was virtually possessed of a closing power, because it was possessed of a means of sufficiently making known its inclinations; and to those inclinations uniform deference was paid by members, but that since this moral sanction had ceased to be operative, it was necessary to substitute for it a written law. The power to close debate had been of necessity assumed by almost all the European and American assemblies, the conduct of whose members was shaped by no traditional considerations; and the entry into parliament of a body of men to whom the traditions of the house were as nothing made it necessary for the House of Commons to follow this example. He proposed, therefore, that when it appeared to the Speaker, or to the chairman of committees, during any debate to be the evident sense of the house, or of the committee, that the question be now put, he might so inform the house, and that thereupon en a motion being made, ” That the question be now put,” the question under discussion should be forthwith put from the chair, and decided in the affirmative if supported by more than 200 members, or, when less than 40 members had voted against it, by more than 100 members. This resolution was vehemently contested by the opposition, who denounced it as an unprecedented interference with the liberty of debate, but was eventually carried in the autumn session of the same year, after a discussion extending over nineteen sittings.

On the 20th of November the standing order of the 28th of February 1880, providing for the suspension of members who persistently and wilfully obstructed the business of the house or disregarded the authority of the chair, was amended by the in- crease of the penalty to suspension on the first occasion for one week, on the second occasion for a fortnight, and on the third, or any subsequent occasion, for a

month. The other rules, framed with a view to freeing the wheels of the parliamentary machine, and for the most part identical with the regulations adopted by Mr Speaker Brand under the urgency resolution of 1881, were carried in the course of the autumn session, and became standing orders on the 27th of November.

Mr Gladstone's closure rule verified neither the hopes of its supporters nor the fears of its opponents. It was not put into operation until the 20th of February 1885, when the Speaker's declaration of the evident sense of the house was ratified by a majority of 207 — a margin of but seven votes over the necessary quorum. It was clear that no Speaker was likely to run the risk of a rebuff by again assuming the initiative unless in the face of extreme urgency, and, in fact, the rule was enforced twice only during the five years of its existence.

In 1887 the Conservative government, before the introduction of a new Crimes Act for Ireland, gave efficiency to the rule by an important amendment. They proposed that any member during a debate might claim to move, " That the question be now put," and that with the consent of the chair this question should be put forthwith, and decided without amendment or debate. Thus the initiative was transferred from the Speaker to the house. Mr Gladstone objected strongly to this alteration, chiefly on the ground that it would throw an unfair burden of responsibility upon the Speaker, who would now have to decide on a question of opinion, whereas under the old rule he was only called upon to determine a question of evident fact. The alternative most generally advocated by the opposition was the automatic closure by a bare majority at the end of each sitting, an arrangement by which the chair would be relieved from an invidious responsibility; but it was pointed out that under such a system the length of debates would not vary with the importance of the questions debated. After fourteen sittings the closure rule was passed on the 18th of March and made a standing order.

In the next session, on the 28th of February 1888, the rule was yet further strengthened by the reduction of the majority necessary for its enforcement from 200 to 100, the closure rule remaining as follows: —

That, after a question has been proposed, a member rising in his place may claim to move, " That the question be now put," and, unless it

shall appear to the chair that such motion is an abuse of the rules of the house or an infringement of the rights of the minority, the question, ” That the question be now put,” shall be put forthwith, and decided without amendment or debate.

When the motion ” That the question be now put ” has been carried, and the question consequent thereon has been decided, any further motion may be made (the assent of the chair as afore- said not having been withheld), which may be requisite to bring to a decision any question already proposed from the chair; and also if a clause be then under consideration, a motion may be made (the assent of the chair as aforesaid not having been with- held), ” That the question ‘ That certain words of the clause defined in the motion stand part of the clause,’ or ‘ That the clause stand

Cart of, or be added to, the bill,’ be now put.” Such motions shall e put forthwith, and decided without amendment or debate. That questions for the closure of debate shall be decided in the affirmative, if, when a division be taken, it appears by the numbers declared from the chair that not less than one hundred members voted in the majority in support of the motion.

The closure, originally brought into being to defeat the tactics of obstruction in special emergencies, thus became a part of parliamentary routine. And, the principle being Guillotine. once accepted, its operation was soon extended. The practice of retarding the progress of govern- ment measures by amendments moved to every line, adopted by both the great political parties when in opposition, led to the use of what became known as the ” guillotine,” for forcing through parliament important bills, most of the clauses in which were thus undiscussed. The “guillotine,” means that the house decides how much time shall be devoted to certain stages of a measure, definite dates being laid down at which the closure shall be enforced and division taken. On the 17th of June 1887, after prolonged debates on the Crimes Bill in committee, clause 6 only having been reached, the remaining 14 clauses were put without discussion, and the bill was reported in accordance with previous notice. This was the first use of the ” guillotine,” but the precedent was followed by Mr Gladstone in 1893, when many of the clauses of the Home Rule Bill were carried through committee and on report by the same machinery. To the Conservatives must be imputed the in- vention of this method of legislation, to their opponents the use of it for attempting to carry a great constitutional innovation to which the majority of English and Scottish representatives were opposed, and subsequently its extension and development (1906-1909) as a regular

part of the legislative machinery.

The principle of closure has been extended even to the debates on supply. The old rule, that the redress of grievances should precede the granting of money, dating from a time ‘when the minister of the Crown was so far from commanding the confidence of the majority in the House of Commons that he was the chief object of their attacks, neverthe- less continued to govern the proceedings of the house in relation to supply without much resultant inconvenience, until the period when the new methods adopted by the Irish Nationalist party created a new situation. Until 1872 it continued to be possible to discuss any subject by an amendment to the motion for going into supply. In that year a resolution was passed limiting the amendments to matters relevant to the class of estimates about to be considered, and these relevant amendments were further restricted to the first day on which it was proposed to go into committee. This resolution was continued in 1873, but was allowed to drop in 1874. It was revived in a modified form in 1876, but was again allowed to drop in 1877. In 1879, ori the recommendation of the Northcote committee, it was provided in a sessional order that whenever the committees of supply or of ways and means stood as the first order on a Monday, the Speaker should leave the chair without question put, except on first going into committee on the army, navy and civil service estimates respectively. In 1882 Thursday was added to Monday for the purposes of the order, and, some further exceptions having been made to the operation of the rule, it became a standing order. The conditions, however, under which the estimates were voted remained unsatisfactory. The most useful function of the opposition is the exposure of abuses in the

various departments of administration , and this can best be performed upon the estimates. But ministers, occupied with their legislative proposals, were irresistibly tempted to postpone the consideration of the estimates until the last weeks of the session, when they were hurried through thin houses, the members of which were impatient to be gone. To meet this abuse, and to distribute the time with some regard to the comparative importance of the subjects discussed, Mr Balfour in 1 896 proposed and carried a sessional order for the closure of supply, a maxi- mum of twenty-three days being given to its consideration, of which the last three alone might be taken after the 5th of August. On the last but one of the allotted days at 10 o’clock the chairman was to put the outstanding votes, and on the last day the Speaker was to put the remaining questions necessary to complete the reports of supply. In 1901 Mr Balfour so altered the resolution that the question was put, not with respect to each vote,

but to each class of votes in the Civil Service estimates, and to the total amounts of the outstanding votes in the army, navy and revenue estimates.

It is only possible here to refer briefly to some other changes in the procedure of the house which altered in various respects its character as a business-like assembly. The chief other of these is as regards the hours. On Mondays, Changes in Tuesdays, Wednesdays and Thursdays the house Meto ˚d s – meets at 2.45 p.m., ” questions ” beginning at 3 and ending (apart from urgency) at 3.45; and opposed business ends at 11. On Fridays the house meets at 12 noon, and opposed business is suspended at 5 p.m.; this is the only day when government business has not precedence, and private members' bills have the first call, though at 8.15 p.m. on Tuesdays and Wednesdays up to Easter and on Wednesdays up to Whitsuntide the business is interrupted in order that private members' motions may be taken. These arrangements, which only date from 1906, represent a considerable change from the old days before 1879 when the standing order was formed that no opposed business, with certain exceptions, should be taken after 12.30 a.m., or 1888 when the closing hour was fixed at midnight. In fact the hours of the house have become generally earlier. Another important change has been made as regards motions for the adjournment of the house, which used to afford an opportunity to the private members at any time to discuss matters of urgent importance. Since 1902 no motion for the adjournment of the house can be made until all ” questions ” have been disposed of, and then, if forty members support it, the debate takes place at 8.15 p.m. This alteration has much modified the character of the debates on such motions, which used to be taken when feel- ings were hot, whereas now there is time for reflection. In other respects the most noticeable thing in the recent evolution of the House of Commons has been its steady loss of power, as an assembly, in face of the control of the government and party leaders. In former times the private members had far larger opportunities for introducing and carrying bills, which now have no chance, unless the government affords ” facilities “; and the great function of debating ” supply ” has largely been restricted by the closure, under which millions of money are voted without debate. The house is still ruled by technical rules of procedure which are, in the main, dilatory and obstructive, and hamper the expression of views which are distasteful to the Whips or to the government, who can by them arrange the business so as to suit their convenience. It is true indeed that this dilatory character of the proceedings assists to encourage debate, within limits; but with the influx of a new class of representatives, especially the Labour members, there has been in

recent years a rather pronounced feeling that the procedure of the house might well be drastically revised with the object of making it a more business-like assembly. Reform of the House of Commons has been postponed to some extent because reform of the House of Lords has, to professed reformers, been a better ” cry “; but when reform is once ” in the air ” in parliament it is not likely to stop, with so large a field of antiquated procedure before it as is represented by many of the traditional methods of the House of Commons. (H. Ch.)

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PARMA

PARMA, a town and episcopal see of Emilia, Italy, capital of the province of Parma, situated on the Parma, a tributary of the Po, 55 m. N.W. of Bologna by rail. Pop. (1906), 48,523- Parma, one of the finest cities of northern Italy, lies in a fertile tract of the Lombard plain, within view of the Alps and sheltered by the Apennines, 170 ft. above sea-level. From south to north it is traversed by the channel of the Parma, crossed here by three bridges; and from east to west runs the line of the Via Aemilia, by which ancient Parma was connected on the one hand with Ariminum (Rimini), and on the other with Placenlia (Piacenza). The old ramparts and bastions (excluding the circuit of the citadel of 1591, now in great part demolished, in the south-east) make an enceinte of about 4J m., but the enclosed area is not all occupied by streets and houses.

In the centre of the city the Via Aemilia widens out into the Piazza Garibaldi, a large square which contains the Palazzo del Governo and the Palazzo Municipale, both dating from 1627. The cathedral of the Assumption (originally S. Herculanus), erected between 1064 and 1074, and consecrated in 1106 by Pope Paschal II., is a Lombardo-Romanesque building in the form of a Latin cross. The severe west front is relieved by three rows of semicircular arches, and has a central porch (there were at one time three) supported by huge red marble lions, sculptured no doubt with the rest of the facade by Giovanni Bono da Bissone in 1 281. On the south side of the facade is a large brick campa- nile, and the foundations of another may be seen on the north. The walls and ceiling of the fine Romanesque interior are covered with frescoes of 1570, subdued in colour and well suited to the character of the building; those of the octagonal cupola repre- senting the Assumption of the Virgin are by Correggio, but much restored. The crypt contains the shrine of the bishop S. Bernar- dino degli Uberti and the tomb of Bartolommeo Prato — the former by Prospero Clementi of Reggio. In the sacristy are fine intarsias. To the

south-west of the cathedral stands the baptis- tery, designed by Benedetto Antelami; it was begun in 1196 and not completed till 1281. The whole structure is composed of red and grey Verona marble. Externally it is an irregular octagon, each face consisting of a lower storey with a semicircular arch (in three cases occupied by a portal), with sculptures by Antelami, four tiers of small columns supporting as many continuous architraves, and forming open galleries, and above these (an addition of the Gothic period) a row of five engaged columns supporting a series of pointed arches and a cornice. Internally it is a polygon of sixteen unequal sides, and the cupola is supported by sixteen ribs, springing from the same number of columns. The frescoes are interesting works of the early 13th century. In the centre is an octagonal font bearing date 1294. The episcopal palace shows traces of the building of 1232. To the east of the cathedral, and at no great distance, stands the church of S. Giovanni Evangelista, which was founded along with the Benedictine monastery in 981, but as a building dates from 1510, and has a facade erected by Simone Moschino early in the 17th century. The interior is an extremely fine early Renaissance work. The frescoes on the cupola representing the vision of S. John are by Correggio, and the arabesques on the vault of the nave by Anselmi. The Madonna della Steccata (Our Lady of the Palisade), a fine church in the form of a Greek cross, erected between 1521 and 1539 after Zaccagni's designs, contains the tombs and monuments of many of the Bourbon and Farnese dukes of Parma, and preserves its pictures, Parmigiano's " Moses Breaking the Tables of the Law " and Anselmi's " Coro- nation of the Virgin." S. Francesco, probably the earliest Franciscan church in northern Italy (1 230-1 298; now a prison), is a Gothic building in brick with a fine rose-window. The Palazzo della Pilotta is a vast and irregular group of buildings dating mainly from the 16th and 17th centuries; it now com- prises the academy of fine arts (1752) and its valuable picture gallery. Among the most celebrated pictures here are Cor- reggio's " Madonna di San Girolamo " and " Madonna della Scodella." The Teatro Farnese, a remarkable wooden structure erected in 1618-1619 from Aleotti d'Argenta's designs, and capable of containing 4500 persons, is also in this palace. There

are other beautiful ceiling frescoes by Correggio in the former Benedictine nunnery of S. Paolo, executed in 1 518-15 19; in an adjoining chamber are fine arabesques by Araldi (d. 1528); thence come also some fine majolica tiles (1471-1482), now in the museum. The royal university of Parma, founded in 1601 by Ranuccio I., and reconstituted by Philip of Bourbon in 1768, has faculties in law, medicine and natural science, and possesses an observatory, and

natural science collections, among which is the Eritrean Zoological Museum. A very considerable trade is carried on at Parma in grain, cattle and the dairy produce of the district. The grana cheese known as Parmesan is not now so well made at Parma as in some other parts of Italy — Lodi, for example.

From archaeological discoveries it would appear that the ancient town was preceded by a prehistoric settlement of the Bronze Age, the dwellings of which rested upon piles — one, indeed, of the so-called terremare, which are especially frequent in the neighbourhood of Parma. Parma became a Roman colony of 2000 colonists in 183 B.C., four years after the construction of the Via Aemilia, on which it lay. The bridge by which the Via Aemilia crossed the river Parma, from which it probably takes its name, is still preserved, but has been much altered. A bishop of Parma is mentioned in the acts of the council of Rome of a.d. 378. It fell into the power of Alboin in 569 and became the seat of a Lombard duchy; it was still one of the wealthiest cities of Aemilia in the Lombard period. During the nth, 12th and 13th centuries Parma had its full share of the Guelph and Ghibelline struggles, in which it mainly took the part of the former, and also carried on repeated hostilities with Borgo San Donnino and Piacenza. Its bishop Cadalus (1046-107 1) was elected to the papacy by the Lombard and German bishops in 1061, and marched on Rome, but was driven back by the partisans of Alexander III. To him is due the building of the cathedral. As a republic its government was mainly in the hands of the Rossi, Pallavicino, Correggio and Sanvi- tale families. The fruitless siege of Parma in 1248 was the last effort of Frederick II. In the cathedral flags captured in this siege are preserved. In 1307 the city became a lordship for Giberto da Correggio, who laid the basis of its territorial power by conquering Reggio, Brescello and Gaustalla, and was made commander-in-chief of the Guelphs by Robert of Apulia. The Correggio family never managed to keep possession of it for long, and in 1346 they sold it to the Visconti (who constructed a citadel, La Rocchetta, in 1356, of which some remains exist on the east bank of the river, while the later lite du pont may be seen on the west bank), and from them it passed to the Sforza. Becoming subject to Pope Julius II. in 1512, Parma remained (in spite of the French occupation fiom i5i5toi52i)a papal possession till 1545, when Paul III. (Alexander Farnese) invested his son Pierluigi with the duchies of Parma and Piacenza. There were eight dukes of Parma of the Farnese line — Pierluigi (d. 1547), Ottavio (1586), Alessandro (1592), Ranuccio I. (1622), Odoardo (1646), Ranuccio II. (1694), Francesco (1727), Antonio (1731). Antonio and Francesco both having died childless, the duchy passed to Charles of Bourbon (Don Carlos),

infante of Spain, who, becoming king of Naples in 1734, surrendered Parma and Piacenza to Austria, but retained the artistic treasures of the Farnese dynasty which he had removed from Parma to Naples. Spain reconquered the duchies in the war of succession (1745); they were recovered by Austria in 1746; and Maria Theresa again surrendered them to Don Philip, infante of Spain, in 1748. Ferdinand, Philip's son, who succeeded under Dutillot's regency in 1765, saw his states occupied by the revolu- tionary forces of France in 1796, and had to purchase his life- interest with 6,000,000 lire and 25 of the best paintings in Parma. On his death in 1802 the duchies were incorporated with the French republic and his son Louis became " king of Etruria." Parma was thus governed for several years by Moreau de Saint- Mery and by Junot. At the congress of Vienna, Parma, Pia- cenza and Guastalla were assigned to Marie Louise (daughter of Francis I. of Austria and Napoleon's second consort), and on hei death they passed in 1847 to Charles II. (son of Louis of Etruria

and Marie Louise, daughter of Charles IV., king of Spain). The new duke, unwilling to yield to the wishes of his people for greater political liberty, was soon compelled to take flight, and the duchy was for a time ruled by a provisional government and by Charles Albert of Sardinia; but in April 1849 Baron d'Aspre with 15,000 Austrians took possession of Parma, and the ducal government was restored under Austrian protection. Charles II. (who had in 1820 married Theresa, daughter of Victor Emmanuel of Sardinia) abdicated in favour of his son Charles III., on the 14th of March, 1849. On the assassination of Charles III. in 1854, his widow, Marie Louise (daughter of Ferdinand, prince of Artois and duke of Berry), became regent for her son Robert. In i860 his possessions were formally incorporated with the new kingdom of Italy.

The duchy of Parma in 1849 had an area of 2376 sq. m. divided into five provinces — Borgo San Donnino, Valditaro, Parma, Lunigiana Parmense and Piacehza. Its population in 1851 was 497,343- Under Marie Louise (1815-1847) the territory of Guastalla (50 sq. m.) formed part of the duchy, but it was transferred in 1847 to Modena in exchange for the communes of Bagnone, Filattiera, &c, which went to constitute the Lunigiana Parmense.

• See Affo, Storia di Parma (1792-1795); Scarabelli, Storia dei ducati di Parma, Piacenza, e Guastalla (1858); Buttafuoco, Dizion. corogr. dei

ducati, &c. (1853); Mon. hist, ad provincias parmensem et placentinam pertinentia (1855, &c); L. Testi, Parma (Bergamo,

1905)-

PARMENIDES OF ELEA (Velia) in Italy, Greek philosopher. According to Diogenes Laertius he was ” in his prime ” 504-500 B.C., and would thus seem to have been born about 539. Plato indeed (Parmenides, 127 B) makes Socrates see and hear Parmen- ides when the latter was about sixty-five years of age, in which case he cannot have been born before 519; but in the absence of evidence that any such meeting took place this may be regarded as one of Plato’s anachronisms. However this may be, Parmen- ides was a. contemporary, probably a younger contemporary, of Heraclitus, with whom the first succession of physicists ended, while Empedocles and Anaxagoras, with whom the second succession of physicists began, were very much his juniors. Belonging, it is said, to a rich and distinguished family, Parmen- ides attached himself, at any rate for a time, to the aristocratic society or brotherhood which Pythagoras had established at Croton; and accordingly one part of his system, the physical part, is apparently Pythagorean. To Xenophanes, the founder of Eleaticism — whom he must have known, even if he was never in any strict sense of the word his disciple— Parmenides was, perhaps, more deeply indebted, as the theological speculations of that thinker unquestionably suggested to him the theory of Being and Not-Being, of the One and the Many, by which he sought to reconcile Ionian ” monism,” or rather ” henism,” with Italiote dualism. Tradition relates that Parmenides Lamed laws for the Eleates, who each year took an oath to observe them.

Parmenides embodied his tenets in a short poem, called Nature, of which fragments, amounting in all to about 160 lines, have been preserved in the writings of Sextus Empi- ricus, Simplicius and others. It is traditionally divided into three parts — the “Proem,” “Truth” (to. irpds akrfiuav) , and ” Opinion ” (to irpds Sdˆav). In ” Truth,” starting from the formula ” the Ent (or existent) is, the Nonent(or non-existent) is not,” Parmenides attempted to distinguish between the unity or universal element of nature and its variety or particularity, insisting upon the reality of its unity, which is therefore the object of knowledge, and upon the unreality of its variety, which is therefore the object, not of knowledge, but of opinion. In ” Opinion ” he propounded a theory of the world of seeming and its development, pointing out however that, in accord- ance with the principles already laid down, these cosmological speculations do not pretend to anything more than probability. In spite of the contemptuous remarks of Cicero and Plutarch about Parmenides’s versification, Nature is not without

literary merit. The introduction, though rugged, is forcible and picturesque ; and the rest of the poem is written in a simple and effective style suitable to the subject.

Proem.— In the ” Proem ” the poet describes his journey from darkness to light. Borne in a whirling chariot, and attended by the daughters of the sun, he reaches a temple sacred to an unnamed goddess (variously identified by the commentators with Nature, Wisdom or Themis), by whom the rest of the poem is spoken. He must learn all things, she tells him, both truth, which is certain, and human opinions; for, though in human opinions there can be no “true faith,” they must be studied notwithstanding for what they are worth.

Truth. — ” Truth ” begins with the declaration of Parmenides’s principle in opposition to the principles of his predecessors. There are three ways of research, and three ways only. Of these, one asserts the non-existence of the existent and the existence of the non-existent [i.e. Thales, Anaximander and Anaximenes suppose the single element which they respectively postulate to be trans- formed into the various sorts of matter which they discover in the world around them, thus assuming the non-existence of that which is elemental and the existence of that which is non-elemental]; another, pursued by ” restless ” persons, whose ” road returns upon itself,” assumes that a thing “is and is not,” “is the same and not the same ” [an obvious reference, as Bernays points out in the Rhemisclies Museum, vii. 114 seq., to Heraclitus, the philosopher of flux]. These are ways of error, because they confound existence and non-existence. In contrast to them the way of truth starts from the proposition that ” the Ent is, the Nonent is not.”

On the strength of the fundamental distinction between the Ent and the Nonent, the goddess next announces certain characteristics of the former. The Ent is uncreated, for it cannot be derived either from the Ent or from the N°nent; it is imperishable, for it cannot pass into the Nonent; it is whole, indivisible, continuous, for nothing exists to break its continuity in space ; it is unchangeable {for nothing exists to break its continuity in time] ; it is perfect, for there is nothing which it can want; it never was, nor will be, but only is; it is evenly extended in every direction, and therefore a sphere, exactly balanced; it is identical with thought [i.e. it is the object, and the sole object, of thought as opposed to sensation, sensation being concerned with variety and change].

As then the Ent is one, invariable and immutable, all plurality, variety and mutation belong to the Nonent. Whence it follows that all things

to which men attribute reality, generation and destruction, being and not-being, change of place, alteration of colour are no more than empty words.

Opinion. — The investigation of the Ent [i.e. the existent unity, extended throughout space and enduring throughout time, which reason discovers beneath the variety and the mutability of things] being now complete, it remains in ” Opinion ” to describe the plurality of things, not as they are, for they are not, but as they seem to be. In the phenomenal world then, there are, it has been thought [and Parmenides accepts the theory, which appears to be of Pythagorean origin], two primary elements — namely, fire, which is gentle, thin, homogeneous, and night, which is dark, thick, heavy. Of these elements [which, according to Aristotle, were, or rather were analogous to, the Ent and the Nonent respectively] all things consist, and from them they derive their several characteristics. The foundation for a cosmology having thus been laid in dualism, the poem went on to describe the genera tion of ” earth and sun, and moon and air that is common to all, and the milky way, and furthest Olympus, and the glowing stars “; but the scanty fragments which have survived suffice only to show that Parmenides regarded the universe as a series of concentric rings or spheres composed of the two primary elements and of combinations of them, the whole system being directed by an unnamed goddess established at its centre. Next came a theory of animal development. This again was followed by a psychology, which made thought [as well as sensation, which was conceived to differ from thought only in respect of its object] depend upon the excess of the one or the other of the two constituent elements, fire and night. ” Such, opinion tells us, was the generation, such is the present existence, such will be the end, of those things to which men have given distinguishing names.”

In the truism “the Ent is, the Nonent is not,” &v eari, fifi 5v ovk tan, Parmenides breaks with his predecessors, the physicists ot the Ionian succession. Asking themselves— What is the material universe, they had replied respectively — It is water, It is ;uera£6 tl, It is air, It is fire. Thus, while their question meant, or ought to have meant, What is the single element which underlies the apparent plurality of the material world? their answers, Parmenides conceived, by attributing to the selected element various and varying qualities, reintroduced the plurality which the question sought to eliminate. If we would discover that which is common to all things at all times, we must, he submitted, exclude the differences of things, whether simul- taneous or successive. Hence, whereas his predecessors had confounded that which is universally existent with that which is not universally

existent, he proposed to distinguish carefully between that which is universally existent and that which is

not universally existent, between 6v and jui? 6v. The fundamental truism is the epigrammatic assertion of this distinction.

In short, the single corporeal element of the Ionian physicists was, to borrow a phrase from Aristotle, a permanent oiicia having iraBri which change; but they either neglected the ir&0rj or con- founded them with the ovala. Parmenides sought to reduce the variety of nature “to a single material element; but he strictly discriminated the inconstant ird&j from the constant oiffia, and, understanding by ” existence ” universal, invariable, immutable being; refused to attribute to the vadri anything more than the semblance of existence.

Having thus discriminated between the permanent unity of nature and its superficial plurality, Parmenides proceeded to the separate investigation of the Ent and the Nonent. The univer- sality of the Ent, he conceived, necessarily carries with it certain characteristics. It is one; it is eternal; it is whole and continu- ous, both in time and in space; it is immovable and immutable; it is limited, but limited only by itself; it is evenly extended in every direction, and therefore spherical. These propositions having been reached, apart from particular experience, by reflection upon the fundamental principle, we have in them, Parmenides conceived, a body of information resting upon a firm basis and entitled to be called ” truth.” Further, the information thus obtained is the sum total of “truth”; for, as ” existence ” in the strict sense of the word cannot be attributed to anything besides the universal element, so nothing besides the universal element can properly be said to be “known.”

If Parmenides’s poem had had ” Being ” for its subject it would doubtless have ended at this point. Its subject is, however, ” Nature “; and nature, besides its unity, has also the semblance, if no more than the semblance, of plurality. Hence the theory of the unity of nature is necessarily followed by a theory of its seeming plurality, that is to say, of the variety and mutation of things. The theory of plurality cannot indeed pretend to the certainty of the theory of unity, being of necessity untrustworthy, because it is the partial and inconstant represen- tation of that which is partial and inconstant in nature. But, as the material world includes, together with a real unity, the

semblance of plurality, so the theory of the material world includes, together with the certain theory of the former, a probable theory of the latter. ” Opinion ” is then no mere excrescence; it is the necessary sequel to ” Truth.”

Thus, whereas the Ionians, confounding the unity and the plurality of the universe, had neglected plurality, and the Pythagoreans, contenting themselves with the reduction of the variety of nature to a duality or a series of dualities, had neglected unity, Parmenides, taking a hint from Xenophanes, made the antagonistic doctrines supply one another’s deficiencies; for, as Xenophanes in his theological system had recognized at once the unity of God and the plurality of things, so Parmenides in his system of nature recognized at once the rational unity of the Ent and the phenomenal plurality of the Nonent.

The foregoing statement of Parmenides’s position differs from Zeller’s account of it in two important particulars. First, whereas it has been assumed above that Xenophanes was theologian rather than philosopher, whence it would seem to follow that the philosophical doctrine of unity originated, not with him, but with Parmenides, Zeller, supposing Xenophanes to have taught, not merely the unity of God, but also the unity of Being, assigns to Parmenides no more than an exacter con- ception of the doctrine of the unity of Being, the justification of that doctrine, and the denial of the plurality and the mut- ability of things. This view of the relations of Xenophanes and Parmenides is not borne out by their writings; and, though ancient authorities may be quoted in its favour, it would seem that in this case as in others, they have fallen into the easy mistake of confounding successive phases of doctrine, ” constru- ing the utterances of the master in accordance with the principles of his scholar — the vague by the more definite, the simpler by the mere finished and elaborate theory ” (W. H. Thompson). Secondly, whereas it has been argued above that ” Opinion ” is necessarily included in the system, Zeller, supposing Parmenides

to deny the Nonent even as a matter of opinion, regards that part of the poem which has opinion for its subject as no more than a revised and improved statement of the views of opponents, introduced in order that the reader, having before him the false doctrine as well as the true one, may be led the more certainly to embrace the latter. In the judgment of the present writer, Parmenides, while he denied the real existence of plurality, recognized its apparent existence, and consequently, however little value he might attach to opinion, was bound to take account of it : ” pour celui mgme qui nie l’existence

r6elle de la nature," says Renouvier, " il reste encore a. faire une histoire naturelle de l'apparence et de l'illusion."

The teaching of Parmenides variously influenced both his immediate successors and subsequent thinkers. By his recog- nition of an apparent plurality supplementary to the real unity, he effected the transition from the " monism " or " henism " of the first physical succession to the " pluralism " of the second. While Empedocles and Democritus are careful to emphasize their dissent from " Truth," it is obvious that " Opinion " is the basis of their cosmologies. The doctrine of the deceitfulness of " the undiscerning eye and the echoing ear " soon established itself, though the grounds upon which Empedocles, Anaxagoras and Democritus maintained it were not those which were alleged by Parmenides. Indirectly, through the dialectic of his pupil and friend Zeno and otherwise, the doctrine of the inadequacy of sensation led to the humanist movement, which for a time threatened to put an end to philosophical and scientific specula- tion. But the positive influence of Parmenides's teaching was not yet exhausted. To say that the Platonism of Plato's later years, the Platonism of the Parmenides, the Philebus and the Timaeus, is the philosophy of Parmenides enlarged and reconstituted, may perhaps seem paradoxical in the face of the severe criticism to which Eleaticism is subjected, not only in the Parmenides, but also in the Sophist. The criticism was, however, preparatory to a reconstruction. Thus may be explained the selection of an Eleatic stranger to be the chief speaker in the latter, and of Parmenides himself to take the lead in the former. In the Sophist criticism predominates over reconstruction, the Zenonian logic being turned against the Parmenides metaphysic in such a way as to show that both the one and the other need revision: see 241 D, 244 B seq., 257 B seq., 258 D. In particular, Plato taxes Parmenides with his inconsistency in attributing (as he certainly did) to the fundamental unity extension and sphericity, so that " the worshipped ov is after all a pitiful ju?) ov " (W. H. Thompson). In the Parmenides reconstruction pre- dominates over criticism — the letter of Eleaticism being here represented by Zeno, its spirit, as Plato conceived it, by Parmen- ides. Not the least important of the results obtained in this dialogue is the discovery that, whereas the doctrine of the "one" and the "many" is suicidal and barren so long as the "solitary one" and the "indefinitely many" are absolutely separated (137 C seq. and 163 B seq.), it becomes consistent and fruitful as soon as a " definite plurality " is interpolated between them (142 B seq., 157 B seq., 160 B seq.). In short, Parmenides was no idealist, but Plato recognized in him, and rightly, the precursor of idealism.

Bibliography. — The fragments have been skilfully edited by H. Diets,

in Parmenides Lehrgedicht, griechisch u. deutsch (Berlin, 1897), with commentary; in Poetarum phttosophorum fragmenta. with brief Latin notes, critical and interpretative (Berlin, 1901); and in Die Fragmente d. Vorsokratiker (Berlin, 2nd ed., 1906), with German translation); and Diels' text is reproduced with a helpful Latin commentary in Ritter and Preller's Historia philosophiae graecae (8th ed., revised by E. Wellmann, Gotha, 1898). The philosophical system is expounded and discussed by E. Zeller, D. Philosophie d. Griechen (5th ed., Leipzig, 1892; Eng. trans., London, 1881); by T. Gomperz, Griechische Denker (Leipzig, 1896; Eng. trans., London, 1901); and by J. Burnet, Early Greek Philosophy (London, 1908). For the cosmology, see A. B. Krische, D. theologischen Lehren d. griechischen Denker (Gottingen, 1840). On the relations of Eleaticism and Platonism, see W. H. Thompson, "On Plato's Sophist" in the Journal of Philology viii. 303 seq. For other texts, translations, commentaries and monographs see the excellent bibliography contained in the Grundriss d. Geschichte d. Philosophie of Uberweg and Heinzi Cioth ed., Berlin, 1909; Eng. Trans., London, T880). (H. Ja.)

PARMENIO (c. 400-330 B.C.), Macedonian general in the service of Philip II. and Alexander the Great. During the reign of Philip Parmenio obtained a great victory over the Illyrians (356); he was one of the Macedonian delegates appointed to conclude peace with Athens (346), and was sent with an army to uphold Macedonian influence in Euboea (342). In 336 he was sent with Amyntas and Attalus to make preparations for the reduction of Asia. He led the left wing in the battles of the Granicus, Issus and Gaugamela. After the conquest of Dran- giana, Alexander was informed that Philotas, son of Parmenio, was involved in a conspiracy against his life. Philotas was condemned by the army and put to death. Alexander, thinking it dangerous to allow the father to live, sent orders to Media for the assassination of Parmenio. There was no proof that Parmenio was in any way implicated in the conspiracy, but he was not even afforded the opportunity of defending himself.

See Arrian, A nabasis; Plutarch, Alexander; Diod. Sic. xvii.; Curtius vii. 2, n; Justin xii. 5 ; for modern authorities see under Alexander III., the Great.

PARMIGIANO (1504-1540). The name of this celebrated painter of the Lombard, school was, in full, Girolamo Francesco Maria Mazzuoli, or

Mazzola; he dropped the name Girolamo, and was only known as Francesco. He has been more commonly named II Parmigiano (or its diminutive, II Parmigianino), from his native city, Parma. Francesco, born on the nth of January 1504, was the son of a painter. Losing his father in early child- hood, he was brought up by two uncles, also painters, Michele and Pier-Ilario Mazzola. His faculty for the art developed at a very boyish age, and he addicted himself to the style of Correggio, who visited Parma in 15 19. He did not, however, become an imitator of Correggio; his style in its maturity may be regarded as a fusion of Correggio with Raphael and Giulio Romano, and thus fairly original. Even at the age of fourteen (Vasari says sixteen) he had painted a " Baptism of Christ," surprisingly mature. Before the age of nineteen, when he migrated to Rome, he had covered with frescoes seven chapels in the church of S. Giovanni Evangelista, Parma. Prior to starting for the city of the popes in 1523 he deemed it expedient to execute some specimen pictures. One of these was a portrait of himself as seen in a convex mirror, with all the details of divergent perspective, &c, wonderfully exact — a work which both from this curiosity of treatment and from the beauty of the sitter — for Parmigiano was then " more like an angel than a man " — could not fail to attract. Arrived in Rome, he presented his specimen pictures to the pope, Clement VII., who gladly and admiringly accepted them, and assigned to the youthful genius the painting of the Sala de' Pontefici, the ceilings of which had been already decorated by Giovanni da Udine. But while for- tune was winning him with her most insinuating smiles, the utter ruin of the- sack by the Constable de Bourbon and his German and other soldiers overtook both Rome and Parmigiano. At the date of this hideous catastrophe he was engaged in painting that large picture which now figures in the National Gallery, the " Vision of St Jerome " (with the Baptist pointing upward and backward to the Madonna and infant Jesus in the sky). It is said that through all the crash and peril of this barbarian irruption Parmigiano sat quietly before his vast panel, painting as if nothing had happened. A band of German soldiery burst into his apartment, breathing fire and slaughter; but, struck with amazement at the sight, and with some reverence for art and her votary (the other events of the siege forbid us to suppose that reverence for religion had any part in it), they calmed down, and afforded the painter all the protection that he needed at the moment. Their captain, being something of a connoisseur, exacted his tribute, however — a large number of designs. Rome was now no place for Parmigiano. He left with his uncle, intending apparently to return to Parma; but, staying in Bologna he settled down there for a while, and was induced to remain three or four years. Here he painted for the nuns of St Margaret his

most celebrated altarpiece (now in the Academy of Bologna), the "Madonna and Child, with Margaret and other saints."

Spite of the great disaster of Rome, the life of Mazzola; had hitherto been fairly prosperous — the admiration which he excited being proportionate to his charm of person and manner, and to the precocity and brilliancy (rather than depth) of his genius; but from this time forward he became an unfortunate, and it would appear a soured and self-neglected, man. In 1531 he returned to Parma, and was commissioned to execute an exten- sive series of frescoes in the choir of the church of S. Maria della Steccata. These were to be completed in November 1532; and half-payment, 200 golden scudi, was made to him in advance. A ceiling was allotted to him, and an arch in front of the ceiling; on the arch he painted six figures — two of them in full colour, and four in monochrome — Adam, Eve, some Virtues, and the famous figure (monochrome) of Moses about to shatter the tables of the law. But, after five or six years from the date of the contract, Parmigiano had barely made a good beginning with his stipulated work. According to Vasari, he neglected painting in favour of alchemy — he laboured over futile attempts to " congeal mercury," being in a hurry to get rich anyhow. It is rather difficult to believe that the various graphic and caustic phrases which Vasari bestows upon this theory of the facts of Mazzola's life are altogether gratuitous and wide of the mark; nevertheless the painter's principal biographer, the Padre Affo, undertook to refute Vasari's statements, and most subsequent writers have accepted Affo's conclusions. Whatever the cause, Parmigiano failed to fulfil his contract, and was imprisoned in default. Promising to amend, he was released; but instead of redeeming his pledge he decamped to Casal Maggiore, in the territory of Cremona. Here, according even to Vasari, he relinquished alchemy and resumed painting; yet he still hankered (or is said by Vasari to have hankered) after his retorts and furnaces, lost all his brightness, and presented a dim, poverty-stricken, hirsute and uncivilized aspect. He died of a fever on the 24th of August 1540, before he had completed his thirty-seventh year. By his own desire he was buried naked in the church of the Servites called La Fontana, near Casal Maggiore.

Grace has always and rightly been regarded as the chief artistic endowment of Parmigiano — grace which is genuine as an expression of the painter's nature, but partakes partly of the artificial and affected in its developments. " Un po'di grazia del Parmigianino " (a little, or, as we might say, just a spice, of Parmigianino's grace) was among the ingredients which Agostino CaracCi's famed sonnet desiderates for a perfect picture. Mazzola constantly made many studies of the same figure, in order to get the most graceful attainable form, movement

and drapery — the last being a point in which he was ver)' successful. The pro- portions of his figures are over-long for the truth of nature — the stature, fingers and neck; one of his Madonnas, now in the Pitti Gallery, is currently named " La Madonna del collo lungo." Neither expression nor colour is a strong point in his works; the figures in his compositions are generally few — the chief exception being the picture of " Christ Preaching to the Multitude." He etched a few plates, being apparently the earliest Italian painter who was also an etcher; but the statement that he produced several woodcuts is not correct: — he overlooked the production of them by other hands.

The most admired easel-picture of Parmigiano is the " Cupid Making a Bow," with two children at his feet, one crying, and the other laughing. This was painted in 1536 for Francesco Boiardi of Parma, and is now in the gallery of Vienna. There are various replicas of it, and some of these may perhaps be from Mazzola's own hand. Of his portrait-painting, two interesting examples are the likeness of Amerigo Vespucci (after whom America is named) in the Studj Gallery of Naples, and the painter's own portrait in the Uffizi of Florence. One of Parmigiano's principal pupils was his cousin, Girolamo di Michele Mazzola; probably some of the works attributed to Francesco are really by Girolamo.

See B. Bossi, Disegni originali di Francesco Mazzuoli (1789): A. S. Mortara, Delia Vita di Francesco Mazzuoli (1846); Toschi, Affreschi, &c. (1846). (W. M. R.)

PARNAHYBA, or Parnahiba, a port of the state of Piauhy, Brazil, on the right bank of the Parnahyba river, 250 m. below the c pital, Therezina. Pop. of the municipality (1890), 4415. Parnahyba is situated at the point where the most easterly of the delta outlets, or channels, called the Rio Iguarassu, branches off from the main stream. All the outlet channels of the river are obstructed by bars built up by the strong current along the Atlantic coast, and only vessels of light draught can enter. The town has some well-constructed buildings of the old Portuguese type, including two churches and a fine hospital. Parnahyba is the commercial entrepot of the state. It exports hides, goat-skins, cotton and tobacco, chiefly through the small port of Amarracao, at the mouth of the Rio Iguarassu, 11 m. distant.

PARNASSUS (mod. Lidkoura or Likeri), a mountain of Greece, 8070

ft., in the south of Phocis, rising over the town of Delphi. It had several prominent peaks, the chief known as Tithorea and Lycoreia (whence the modern name). Parnassus was one of the most holy mountains in Greece, hallowed by the worship of Apollo, of the Muses, and of the Corycian nymphs, and by the orgies of the Bacchantes. Two projecting cliffs, named the Phaedriadae, frame the gorge in which the Castalian spring flows out, and just to the west of this, on a shelf above the ravine of the Pleistus, is the site of the Pythian shrine of Apollo and the Delphic oracle. The Corycian cave is on the plateau between Delphi and the summit. ;

PARNASSUS PLAYS, a series of three scholastic entertain- ments performed at St John's College, Cambridge, between 1597 and 1603. They are satirical in character and aim at setting forth the wretched state of scholars and the small respect paid to learning by the world at large, as exemplified in the adventures of two university men, Philomusus and Studioso. The first part, The- Pilgrimage to Parnassus, describes allegori- cally their four year's journey to Parnassus, i.e. their progress through the university course of logic, rhetoric, &c, and the temptations set before them by their meeting with Madido, a drunkard, Stupido, a puritan who hates learning, Amoretto, a lover, and Ingenioso, a disappointed student. The play was doubtless originally intended to stand alone, but the favour with which it was received led to the writing of a sequel, The Return from Parnassus, which deals with the adventures of the two students after the completion of their studies at the university, and shows them discovering by bitter experience of how little pecuniary value their learning is. They again meet Ingenioso, who is making a scanty living by the press, but is on the search for a patron, as well as a new character, Luxurioso. All four now leave the university for London, while a draper, a tailor and a tapster lament their unpaid bills. Philomusus and Studioso find work respectively as a sexton and a tutor in a merchant's family, while Luxurioso becomes a writer and singer of ballads. In the meanwhile Ingenioso has met with a patron, a coxcombical fellow named Gullio, for whom he composes amorous verses in the style of Chaucer, Spenser and Shake- speare, the last alone being to the patron's satisfaction. Gullio is indeed a great admirer of Shakespeare, and in his conversations with Ingenioso we have some of the most interesting of the early allusions to him.

A further sequel, The Second Part of the Return from Parnassus, or the Scourge of Simony, is a more ambitious, and from every point of view more interesting, production than the two earlier pieces. In it we again meet with Ingenioso, now become a satirist, who on pretence of discussing a recently-published collection of extracts from

contemporary poetry, John Boden- ham's Belvedere, briefly criticizes, or rather characterizes, a number of writers of the day, among them being Spenser, Constable, Drayton, John Davies, Marston, Marlowe, Jonson, Shakespeare and Nashe — the last of whom is referred to as dead. It is impossible here to detail the plot of the play, and it can only be said that Philomusus and Studioso, having tried all means of earning a living, abandon any further attempt to turn their learning to account and determine to become shepherds. Several

new characters are introduced in this part, real persons such" as Danter, the printer, Richard Burbage and William Kemp, the actors, as well as such abstractions as Furor Poeticus and Phan- tasma. The second title of the piece, "The Scourge of Simony," is justified by a sub-plot dealing with the attempts of one, Academico, to obtain a living from an ignorant country patron, Sir Roderick, who, however, presents it, on the recommendation of his son Amoretto, who has been bribed, to a non-university man Immerito.

The three pieces have but small literary and dramatic value, their importance consisting almost wholly in the allusions to, and criticisms of contemporary literature. Their author is unknown, but it is fairly certain, from the evidence of general style, as well as some peculiarities of language, that they are the work of the same writer. The only name which has been put forward with any reasonable probability is that of John Day, whose claim has been supported with much ingenuity by Professor I. Gollancz (see full discussion in Dr A. W. Ward's Eng. Dram. Lit. ii. 640, note 2), but the question still awaits definitive solution.

As to the date there is more evidence. The three pieces were evidently performed at Christmas of different years, the last being not later than Christmas 1602, as is shown by the refer- ences to Queen Elizabeth, while the Pilgrimage mentions books not printed until 1598, and hence can hardly have been earlier than that year. The prologue of 2 Return states that that play had been written for the preceding year, and also, in a passage of which the reading is somewhat doubtful, implies that the whole series had extended over four years. Thus we arrive at either 1599, 1600 and 1602, or 1598, 1599 and 1601, as, On the whole, the most likely dates of performance. Mr Fleay, on grounds which do not seem conclusive, dates them 1598, 1601 and 1602.

The question of how far the characters are meant to represent actual persons has been much discussed. Mr Fleay maintains that the whole is a personal satire, his identifications of the chief characters in 2 Return being (1) Ingenioso, Thomas Nashe, (2) Furor Poeticus, J.

Marston, (3) Phantasma, Sir John Davies, (4) Philomusus, T. Lodge, (5) Studioso, Drayton. Professor Gollancz identifies Judicio with Henry Chettle {Proc. of Brit. Acad., 1903-1904, p. 202). Dr Ward, while rejecting Mr Fleay's identifications as a whole, considers that by the time the final part was written the author may have more or less identified Ingenioso with Nashe, though the character was not originally conceived with this intention. This is of course possible, and the fact that Ingenioso himself speaks in praise of Nashe, who is regarded as dead, is not an insuperable objection. We must not, however, overlook the fact that the author was evidently very familiar with Nashe's works, and that all three parts, not only in the speeches of Ingenioso, but throughout, are full of reminiscences of his writings.

Bibliography.— The only part of the trilogy which was in print at an early date was 2 Return, called simply The Return from Parnas- sus, or the Scourge of Simony (1606), two editions bearing the same date. This has been several times reprinted, the best separate edition being that of Professor Arber in the " English Scholars' Library " (1879). Manuscript copies of all three plays were found among T. Hearne's papers in the Bodleian by the Rev. W. D. Macray and were printed by him in 1886 (the last from one of the editions of 1606, collated with the MS.). A recent edition in modern spelling by Mr O. Smeaton in the " Temple Dramatists " is of little value. All questions connected with the play have been elaborately discussed by Dr W. Liihr in a dissertation entitled Die drei cambridger Spiele vom Parnass (Kiel, 1900). See also, Dr Ward's English Dramatic Literature, ii. 633-642 ; F. G. Fleay's Biog. Chron. of the Eng. Drama, ii. 347-355. (R. B. McK.)

PARNELL, CHARLES STEWART (1846-1891), Irish Nation- alist leader, was born at Avondale, Co. Wicklow, on the 27th of June 1846. His father was John Henry Parnell, a country gentleman of strong Nationalist and Liberal sympathies, who married in 1834 Delia Tudor, daughter of Commodore Charles Stewart of the United States navy. The Parnell family was of English origin, and more than one of its members attained civic note at Congleton in Cheshire under the Stuarts and during the

Commonwealth. Among them was Thomas Parnell, who migrated to Ireland after the Restoration. He had two sons, Thomas Parnell the poet and John Parnell, who became an Irish judge. From the latter Charles Stewart Parnell was lineally descended in the fifth generation.

Sir John Parnell, chancellor of the exchequer in Grattan's parliament, and one of O'ConnelTs lieutenants in the parliament of the United Kingdom, was the grandson of Parnell the judge. The estate of Avondale was settled on him by a friend and bequeathed by him to his youngest son William (grandfather of Charles Stewart Parnell). His eldest son was imbecile. His second son was Sir Henry Parnell, a noted politician and financier in the early part of the 19th century, who held office under Grey and Melbourne, and * after being raised to the peerage as Baron Congleton, died by his own hand in 1842. William Parnell was a keen student of Irish politics, with a strong leaning towards the popular side, and in 1805 he published a pamphlet entitled " Thoughts on the Causes of Popular Discontents," which was favourably noticed by Sydney Smith in the Edinburgh Review. Thus by birth and ancestry, and especially by the influence of his mother, who inherited a hatred of England from her father,. Charles Stewart Parnell was, as it were, dedicated to the Irish national cause. He was of English extraction, a landowner, and a Protestant. Educated at private schools in England and at Magdalen College, Cambridge, his temperament and demeanour were singularly un-Irish on the surface — reserved, cold, repellent and unemotional. He appears to have been rather turbulent as a school-boy, contentious, insubordinate, and not over-scrupulous. He was fond of cricket and devoted to mathematics, but had little taste for other studies or other games. He was subject to somnambulism, and liable to severe fits of depression — facts which, taken in connexion with the existence of mental affliction among his ancestors, with his love of solitude and mystery, and his invincible superstitions about omens, numbers and the like, may perhaps suggest that his own mental equilibrium was not always stable. He was as little at home in an English school or an English university as he was afterwards in the House of Commons. " These English," he said to his brother at school, " despise us because we are Irish , but we must stand up tc them. That's the way to treat an Englishman — stand up to him."

Parnell was not an active politician in his early years. He found salvation as a Nationalist and even as a potential rebel over the execution of the " Manchester Martyrs " in 1867, but it was not until some years afterwards that he resolved to enter parliament. In the meanwhile he paid a lengthened visit to the United States. At the general election of 1874 he desired to stand for the county of Wicklow, of which he was high sheriff at the time. The lord-lieutenant declined to relieve him of his disqualifying office, and his brother John stood in his place, but was unsuccessful at the poll. Shortly afterwards a bye-election occurred in Dublin, owing to Colonel Taylor

having accepted office in the Disraeli government, and Parnell resolved to oppose him as a supporter of Isaac Butt, but was heavily beaten. He was, however, elected for Meath in the spring of 1875.

Butt had scrupulously respected the dignity of parliament and the traditions and courtesy of debate. He looked very coldly on the method of ” obstruction ” — a method invented by certain members of the Conservative party in opposition to the first Gladstone Administration. Parnell, however, entered parliament as a virtual rebel who knew that physical force was of no avail, but believed that political exasperation might attain the desired results. He resolved to make obstruction in parlia- ment do the work of outrage in the country, to set the church- bell ringing — to borrow Mr Gladstone’s metaphor — and to keep it ringing in season and out of season in the ears of the House of Commons. He did not choose to condemn outrages to gratify the Pharisaism of English members of parliament. He courted the alliance of the physical force party, and he had to pay the price for it. He invented and encouraged ” boycotting,” and did not discourage outrage. When a supporter in America offered him twenty-five dollars, ” five for bread and twenty for lead,” he accepted the gift, and he subsequently told the story

on at least one Irish platform. In the course of the negotiations in 1882, which resulted in what was known as the Kilmainham Treaty, he wrote to Captain O’Shea: ” If the arrears question be settled upon the lines indicated by us, I have every confidence that the exertions we should be able to make strenuously and unremittingly would be effective in stopping outrages and intimidation of all kinds.” This is at least an admission that he had, or could place, his hand on the stop-valve, even if it be not open to the gloss placed on it by Captain O’Shea in a conver- sation repeated in the House of Commons by Mr Forster, ” that the conspiracy which has been used to get up boycotting and outrage will now be used to put them down.”

In 1877 Parnell entered on an organized course of obstruction. He and Mr Joseph Gillis Biggar, one of his henchmen, were gradually joined by a small band of the more advanced Home Rulers, and occasionally assisted up to a certain point by one or two English members. Butt was practically deposed and worried into his grave. William Shaw, a “transient and em- barrassed phantom,” was elected in his place, but Parnell became the real leader of a Nationalist party. The original Home Rule party was split in twain, and after the general election of 1880 the more moderate section of it ceased to exist. Obstruction in Parnell’s hands was no mere weapon of delay and exaspera- tion; it was a calculated policy, the initial stage of a campaign designed to

show the malcontents in Ireland and their kinsmen in other lands that Butt's strictly constitutional methods were quite helpless, but that the parliamentary armoury still contained weapons which he could so handle as to convince the Irish people and even the Fenian and other physical force societies that the way to Irish legislative independence lay through the House of Commons. The Fenians were hard to convince, but in the autumn of 1877 Parnell persuaded the Home Rule Confederation of Great Britain (an association founded by Butt, but largely supported by Fenians) to depose Butt from its presidency and to elect himself in his place. He defined his attitude quite clearly in a speech delivered in New York early in 1880: " A true revolutionary movement in Ireland should, in my opinion, partake both of a constitutional and illegal character. It should be both an open and a secret organization, using the constitution for its own purposes, but also taking advantage of its secret combination." Parnell's opportunity came with the general election of 1880, which displaced the Conservative government of Lord Beaconsfield and restored Mr Gladstone to power with a majority strong enough at the outset to overpower the Opposition, even should the latter be reinforced by the whole of Parnell's contingent. Distress was acute in Ireland, and famine was imminent. Ministers had taken measures to relieve the situation before the dissolution was announced, but Lord Beaconsfield had warned the country that there was a danger ahead in Ireland " in its ultimate results scarcely less disastrous than pestilence and famine. ... A portion of its population is attempt- ing to sever the constitutional tie which unites it to Great Britain in that bond which has favoured the power and prosperity of both. It is to be hoped that all men of light and leading will resist this destructive doctrine." The Liberal party and its leaders retorted that they were as strongly opposed to Home Rule as their opponents, but Lord Beaconsfield's manifesto undoubtedly had the effect of alienating the Irish vote in the English constituencies from the Tory party and throwing it on the side of the Liberal candidates. This was Parnell's deliberate policy. He would have no alliance with either English party. He would support each in turn with a sole regard to the balance of political power in parliament and a fixed determination to hold it in his own hands if he could. From the time that he became its leader the Home Rule party sat together in the House of Commons and always on the Opposition side.

In the government formed by Mr Gladstone in 1880 Lord Cowper became viceroy and Mr W. E. Forster chief secretary for Ireland. The outlook was gloomy enough, but the Gladstone government do not seem to have anticipated, as Peel anticipated in 1 84 1, that Ireland

would be their difficulty. Yet the Land League had been formed by Michael Davitt and others in the

autumn of 1879 for the purpose of agrarian agitation, and Parnell after some hesitation had given it his sanction. He visited the United States at the close of 1879. It was then and there that the ” new departure ” — the alliance of the open and the secret organizations — was confirmed and consolidated. Parnell obtained the countenance and support of the Clan-na- Gael, a revolutionary organization of the American-Irish, and the Land League began to absorb all the more violent spirits in Ireland, though the Fenian brotherhood still held officially aloof from it. As soon as the general election was announced Parnell returned to Ireland in order to direct the campaign in person. Though he had supported the Liberals at the election, he soon found himself in conflict with a government which could neither tolerate disturbance nor countenance a Nationalist agitation, and he entered on the struggle with forces organized, with money in his chest, and with a definite but still undeveloped plan of action. The prevailing distress increased and outrages began to multiply. A fresh Relief Bill was introduced by the govern- ment, and in order to stave off a measure to prevent evictions introduced by the Irish party, Mr Forster consented to add a clause to the Relief Bill for giving compensation in certain circumstances to tenants evicted for non-payment of rent. This clause was afterwards embodied in a separate measure known as the Compensation for Disturbance Bill, which after a stormy career in the House of Commons was summarily rejected by the House of Lords.

The whole Irish question was once more opened up in its more dangerous and more exasperating form. It became clear that the land question — supposed to have been settled by Mr Gladstone’s Act of 1870 — would have to be reconsidered in all its bearings, and a commission was appointed for the purpose. In Ireland things went from bad to worse. Evictions increased and outrages were multiplied. Intimidations and boycotting were rampant. As the winter wore on, Mr Forster persuaded his colleagues that exceptional measures were needed. An abortive prosecution of Parnell and some of his leading colleagues had by this time intensified the situation. Parliament was summoned early, and a Coercion Bill for one year, practically suspending the Habeas Corpus Act and allowing the arrest of suspects at the discretion of the government, was introduced, to be followed shortly by an Arms Bill. Parnell regarded the measure as a declaration

of war, and met it in that spirit. Its discussion was doggedly obstructed at every stage, and on one occasion the debate was only brought to a close, after lasting for forty-one hours, by the Speaker's claiming to interpret the general sense of the house and resolving to put the question without further discussion. The rules of procedure were then amended afresh in a very drastic sense, and as soon as the bill was passed Mr Gladstone introduced a new Land Bill, which occupied the greater part of the session. Parnell accepted it with many reserves. He could not ignore its concessions, and was not disposed to undervalue them, but he had to make it clear to the revolutionary party, whose support was indispensable, that he regarded it only as a payment on account, even from the agrarian point of view, and no payment at all from the national point of view. Accordingly the Land League at his instigation determined to " test " the act by advising tenants in general to refrain from taking their cases into court until certain cases selected by the Land League had been decided. The government treated this policy, which was certainly not designed to make the act work freely and beneficially, as a deliberate attempt to intercept its benefits and to keep the Irish people in subjection to the Land League; and on this and other grounds — notably the attitude of the League and its leaders towards crime and outrage — Parnell was arrested under the Coercion Act and lodged in Kilmainham gaol (October 17, 1881).

Parnell in prison at once became more powerful for evil than he had ever been, either for good or for evil, outside. He may have known that the policy of Mr Forster was little favoured by several of his colleagues, and he probably calculated that the detention of large numbers of suspects without cause assigned and without trial would sooner or later create opposition in

England. Mr Forster had assured his colleagues and the House of Commons that the power of arbitrary arrest would enable the police to lay their hands on the chief agents of disturbance, and it was Parnell's policy to show that so long as the grievances of the Irish tenants remained unredressed no number of arrests could either check the tide of outrage or restore the country to tranquillity. Several of his leading colleagues followed him into captivity at Kilmainham, and the Land League was dissolved, its treasurer, Patrick Egan, escaping to Paris and carrying with him its books and accounts. Before it was formally suppressed the League had issued a manifesto, signed by ParneM and several of his fellow-prisoners, calling upon the tenants to pay no rents until the government had restored the constitutional rights of the people. Discouraged by the priests, the No-Rent manifesto had little effect, but it embittered the struggle and exasperated the

temper of the people on both sides of the Irish Channel.

Lord Cowper and Mr Forster were compelled to ask for a renewal of the Coercion Act with enlarged powers. But there were members of the cabinet who had only accepted it with reluctance, and were now convinced not only that it had failed, but that it could never succeed. A modus vrvendi was desired on both sides. Negotiations were set on foot through the agency of Captain O'Shea — at that time and for long afterwards a firm political and personal friend of Parnell, but ultimately his accuser in the divorce court — and after a somewhat intricate course they resulted in what was known as the Kilmainham Treaty. As a consequence of this informal agreement, Parnell and two of his friends were to be released at once, the understanding being, as Mr Gladstone stated in a letter to Lord Cowper, " that Parnell and his friends are ready to abandon ' No Rent ' formally, and to declare against outrage energetically, intimidation included, if and when the government announce a satisfactory plan for dealing with arrears." Parnell's own version of the under- standing has been quoted above. It also included a hope that the government would allow the Coercion Act to lapse and govern the country by the same laws as in England. Parnell and his friends were released, and Lord Cowper and Mr Forster at once resigned.

The Phoenix Park murders (May 6, 1882) followed (see Ire- land: History). Parnell was prostrated by this catastrophe. In a public manifesto to the Irish people he declared that " no act has ever been perpetrated in our country, during the exciting struggle for social and political rights of the past fifty years, that has so stained the name of hospitable Ireland as this cowardly and unprovoked assassination of a friendly stranger." Privately to his own friends and to Mr Gladstone he expressed his desire to withdraw from public life. There were those who believed .that nevertheless he was privy to the Invincible conspiracy. There is some prima facie foundation for this belief in the indifference he had always displayed towards crime and outrage when crime and outrage could be made to serve his purpose; in his equivocal relation to the more violent and unscrupulous forms of Irish sedition, and in the fact that Byrne, an official of the Land League, was in collusion with the Invincibles, that the knives with which the murder was done had been concealed at the offices of the Land League in London, and had been conveyed to Dublin by Byrne's wife. But the maxim is fecit cui prodest disallows these suspicions. Parnell gained nothing by the murders, and seemed for a time to have lost everything. A new Crimes Bill was introduced and made operative for a period of three years. A regime of renewed coercion was maintained by Lord Spencer and Mr (afterwards Sir George) Trevelyan, who had

succeeded Lord Frederick Cavendish in the office of chief secretary; Ireland was tortured for three years by the necessary severity of its administration, and England was exasperated by a succession of dynamite outrages organized chiefly in America, which Parnell was powerless to prevent. The Phoenix Park murders did more than any other incident of his time and career to frustrate Parnell's policy and render Home Rule impossible.

For more than two years after the Phoenix Park murders Parnell's influence in parliament, and even in Ireland, was only intermittently and not very energetically exerted. His

health was indifferent, his absences from the House of Commons were frequent and mysterious, and he had already formed those relations with Mrs O'Shea which were ultimately to bring him to the divorce court. The Phoenix Park murderers were arrested and brought to justice early in 1883. Mr Forster seized the opportunity to deliver a scathing indictment of Parnell in the House of Commons. In an almost contemptuous reply Parnell repudiated the charges in general terms, disavowed all sympathy with dynamite outrages, their authors and abettors — the only occasion on which he ever did so— declined to plead in detail before an English tribunal, and declared that he sought only the approbation of the Irish people. This last was shortly afterwards manifested in the form of a subscription known as the " Parnell Tribute," which quickly reached the amount of £37,000, and was presented to Parnell, partly for the liquidation of debts he was known to have contracted, but mainly in recog- nition of his public services. The Irish National League, a successor to the suppressed Land League, was founded in the autumn of 1882 at a meeting over which Parnell presided, but he looked on it at first with little favour, and its action was largely paralysed by the operation of the Crimes Act and the vigorous administration of Lord Spencer.

The Crimes Act, passed in 1882, was to expire in 1885, but the government of Mr Gladstone was in no position to renew it as it stood. In May notice was given for its partial renewal, subject to changes more of form than of substance. The second reading was fixed for the 10th of June. On the 8th of June Parnell, with thirty-nine of his followers, voted with the Opposition against the budget, and defeated the government by a majority of 264 votes to 252. Mr Gladstone forthwith resigned. Lord Salisbury undertook to form a government,

and Lord Carnarvon became viceroy. The session was rapidly brought to an end with a view to the dissolution rendered necessary by the Fran- chise Act passed in 1884 — a measure which was certain to increase the number of Parnell's adherents in parliament. It seems probable that Parnell had convinced himself before he resolved to join forces with the Opposition that a Conservative government would not renew the Crimes Act. At any rate, no attempt to renew it was made by the new government. Moreover, Lord Carnarvon, the new viceroy, was known to Parnell and to some others among the Irish leaders to be not unfavourable to some form of Home Rule if due regard were paid to imperial unity and security. He sought and obtained a personal interview with Parnell, explicitly declared that he was speaking for himself alone, heard Parnell's views, expounded his own, and forth- with reported what had taken place to the Prime Minister. In the result the new cabinet refused to move in the direction apparently desired by Lord Carnarvon.

Parnell opened the electoral campaign with a speech in Dublin, in which he pronounced unequivocally in favour of self- government for Ireland, and expressed his confident hope " that it may not be necessary for us in the new parliament to devote our attention to subsidiary measures, and that it may be possible for us to have a programme and a platform with only one plank, and that one plank National Independence." This was startling to English ears. The press denounced Parnell; Lord Harrington (afterwards the duke of Devonshire) protested against so fatal and mischievous a programme; Mr Chamberlain repudiated it with even greater emphasis. Meanwhile Mr Gladstone was slowly convincing himself that the passing of the Franchise Act had made it the duty of English statesmen and English party leaders to give a respectful hearing to the Irish National demand, and to consider how far it could be satisfied subject to the gover- ning principle of " maintaining the supremacy of the crown, the unity of the Empire, and all the authority of parliament necessary for the conservation of the unity." This was the position he took up in the Hawarden manifesto issued in September before the general election of 1885. Speaking later at Newport in October, Lord Salisbury treated the Irish leader with unwonted deference and respect. Parnell, however, took no notice of the Newport speech, and waited for Mr Gladstone to declare himself more fully in Midlothian. But in this he was disappointed.

Mr Gladstone went no farther than he had done at Hawarden, and he implored the electorate to give him a majority indepen- dent of the Irish vote. Subsequently Parnell invited him in a public speech to declare his policy and to sketch the constitution he would give to

Ireland subject to the limitations he had insisted on. To this Mr Gladstone replied, ” through the same confidential channel,” that he could not consider the Irish demand before it had been constitutionally formulated, and that, not being in an official position, he could not usurp the functions of a government. The reply to this was the issue of a manifesto to the Irish electors of Great Britain violently denouncing the Liberal party and directing all Irish Nationalists to give their votes to the Tories. In these circumstances the general election was fought, and resulted in the return of 335 Liberals, four of whom were classed as ” independent,” 249 Conservatives and 86 followers of Parnell.

Mr Gladstone had now ascertained the strength of the Irish demand, but was left absolutely dependent on the votes of those who represented it. Through Mr Arthur Balfour he made infor- mal overtures to Lord Salisbury proffering his own support in case the Prime Minister should be disposed to consider the Irish demand in a ” just and liberal spirit “; but he received no encouragement. Towards the close of the year it became known through various channels that he himself was considering the matter and had advanced as far as accepting the principle of an Irish parliament in Dublin for the transaction of Irish affairs. Before the end of January Lord Salisbury’s government was defeated on the Address, the Opposition including the full strength of the Irish party. Mr Gladstone once more became prime minister, with Mr John Morley (an old Home Ruler) as chief secretary, and Mr Chamberlain provisionally included in the cabinet. Lord Hartington, Mr Bright and some other Liberal chiefs, however, declined to join him.

Mr Gladstone’s return to power at the head of an administra- tion conditionally committed to Home Rule marks the culmina- ting point of Parnell’s influence on English politics and English parties. And after the defeat of the Home Rule ministry in 1886, Parnell was naturally associated closely with the Liberal Opposition. At the same time he withdrew himself largely from active interposition in current parliamentary affairs, and relaxed his control over the action and policy of his followers in Ireland. He entered occasionally into London society — where in certain quarters he was now a welcome guest — but in general he lived apart, often concealing his whereabouts and giving no address but the House of Commons, answering no letters, and seldom fulfilling engagements. He seems to have thought that Home Rule being now in the keeping of an English party, it was time to show that he had in him the qualities of a statesman as well as those of a revolutionary and a rebel. His influence on the remedial legislation proposed by the Unionist government for Ireland was

considerable, and he seldom missed an opportunity of making it felt. It more than once happened to him to find measures, which had been contemptuously rejected when he had proposed them, ultimately adopted by the government; and it may be that the comparative tranquillity which Ireland enjoyed at the close of the 19th century was due quite as much to legislation inspired and recommended by himself as to the -disintegration of his following which ensued upon his appearance in the divorce court and long survived his death. No sooner was Lord Salisbury's new government installed in office in 1886, than Parnell introduced a comprehensive Tenants' Relief Bill. The government would have none of it, though in the following session they adopted and carried many of its leading provisions. Its rejection was followed by renewed agitation in Ireland, in which Parnell took no part. He was ill — " dangerously ill," he said himself at the time — and some of his more hot-headed followers devised the famous " Plan of Campaign," on which he was never consulted and which never had his approval. Ireland was once more thrown into a turmoil of agitation, turbulence and crime, and the Unionist government, which had hoped to be able to govern the country by means of the ordinary law, was compelled to resort to severe repressive

measures and fresh coercive legislation. Mr Balfour became chief secretary, and early in the session of 1887 the new measure was introduced and carried. Parnell took no very prominent part in resisting it. In the course of the spring The Times had begun publishing a series of articles entitled " Parnellism and Crime," on lines following Mr Forster's indictment of Parnell in 1883, though with much greater detail of circumstance and accusation. Some of the charges were undoubtedly well founded, some were exaggerated, some were merely the colourable fictions of political prepossession, pronounced to be not proven by the special commission which ultimately inquired into them. One of the articles, which appeared on the 18th of April, was accom- panied by the facsimile of a letter purporting to be signed but not written by Parnell, in which he apologized for his attitude on the Phoenix Park murders, and specially excused the murder of Mr Burke. On the same evening, in the House of Commons, Parnell declared the letter to be a forgery, and denied that he had ever written any letter to that effect. He was not believed, and the second reading of the Crimes Act followed. Later in the session the attention of the house was again called to the subject, and

it was invited by Sir Charles Lewis, an Ulster member and a bitter antagonist of the Nationalists, to declare the charges of The Times a breach of privilege. The government met this proposal by an offer to pay the expenses of a libel action against The Times to be brought on behalf of the Irish members incrimi- nated. This offer was refused. Mr Gladstone then proposed that a select committee should inquire into the charges, including the letter attributed to Parnell, and to this Parnell assented. But the government rejected the proposal. For the rest, Parnell continued to maintain for the most part an attitude of moderation, reserve and retreat, though he more than once came forward to protest "against the harshness of the Irish administra- tion and to plead for further remedial legislation. In July 1888 he announced that Mr Cecil Rhodes had sent him a sum of £10,000 in support of the Home Rule movement, subject to the condition that the Irish representation should be retained in the House of Commons in any future measure dealing with the question. About the same time the question of " Parnellism and Crime" again became acute. Mr F. H. O'Donnell, an ex-M.P. and former member of the Irish party, brought an action against The Times for libel. His case was a weak one, and a verdict was obtained by the defendants. But in the course of the proceedings the attorney-general, counsel for The Times, affirmed the readiness of his clients to establish all the charges advanced, including the genuineness of the letter which Parnell had declared to be a forgery. Parnell once more invited the House of Commons to refer this particular issue — that of the letter— to a select committee. This was again refused; but after some hesitation the government resolved to appoint by act of parliament a special commission, composed of three judges of the High Court, to inquire into all the charges advanced by The Times. This led to what was in substance, though not perhaps in judicial form, the most remarkable state trial of the 19th century. The commission began to sit in September 1888, and issued its report in February 1890. It heard evidence of immense volume and variety, and the speech of Sir Charles Russell in defence was afterwards published in a bulky volume. Parnell gave evidence at great length, with much composure and some cynicism. On the whole he produced a not unfavour- able impression, though some of his statements might seem to justify Mr Gladstone's opinion that he was not a man of exact veracity. The report of the commission was a very voluminous document, and was very variously interpreted by different parties to the controversy. Their conclusions may be left to speak for themselves: —

" I. We find that the respondent members of parliament collec- tively were not members of a conspiracy having for its object to establish the

absolute independence of Ireland, but we find that some of them, together with Mr Davitt, established and joined in the Land League organization with the intention, by its means, to bring about the absolute independence of Ireland as a separate

nation. ....

” II., We find that the respondents did enter into a conspiracy,

by a system of coercion and intimidation, to promote an agrarian agitation against the payment of agricultural rents, for the purpose of impoverishing and expelling from the country the Irish landlords, who were styled ‘ the English garrison.’

” III. We find that the charge that ‘ when on certain occasions they thought it politic to denounce, and did denounce, certain crimes in public, they afterwards led their supporters to believe such denunciations were not sincere,’ is not established. We entirely acquit Mr Parnell and the other respondents of the charge of insincerity in their denunciation of the Phoenix Park murders, and find that the ‘ facsimile ‘ letter, on which this charge was chiefly based as against Mr Parnell, is a forgery.

” IV. We find that the respondents did disseminate the Irish World and other newspapers tending to incite to sedition and the commission of other crime.

” V. We find that the respondents did not directly incite persons to the commission of crime other than intimidation, but that they did incite to intimidation, and that the consequence of that incite- ment was that crime and outrage were committed by the persons incited. We find that it has not been proved that the respondents made payments for the purpose of inciting persons to commit crime.

” VI. We find, as to the allegation that the respondents did nothing to prevent crime, and expressed no bona fide disapproval, that some of the respondents, and in particular Mr Davitt, did express bona fide disapproval of crime and outrage, but that the respondents did not denounce the system of intimidation that led to crime and outrage, but persisted in it with knowledge of its effect.

“VII. We find that the respondents did defend persons charged with agrarian crime, and supported their families; but that it has not been proved that they subscribed to testimonials for, or were intimately associated with, notorious criminals, or that they made payments to procure the escape of criminals from justice.

” VIII. We find, as to the allegation that the respondents made payments to compensate persons who had been injured in the commission of crime, that they did make such payments.

” IX. As to the allegation that the respondents invited the assistance and co-operation of, and accepted subscriptions of money from, known advocates of crime and the use of dynamite, we find that the respondents did invite the assistance and co-operation of, and accepted subscriptions of money from, Patrick Ford, a known advocate of crime and the use of dynamite; but that it has not been proved that the respondents, or any of them, knew that the Clan-na-Gael controlled the League, or was collecting money for the Parliamentary Fund. It has been proved that the respondents invited and obtained the assistance and co-operation of the Physical Force Party in America, including the Clan-na-Gael, and in order to obtain that assistance abstained from repudiating or condemning the action of that party.”

The specific charges brought against Parnell personally were thus dealt with by the commissioners: —

” (a) That at the time of the Kilmainham negotiations Mr Parnell knew that Sheridan and Boyton had been organizing outrage, and therefore wished to use them to put down outrage. ” We find that this charge has not been proved. ” (b) That Mr Parnell was intimate with the leading Invincibles; that he probably learned from them what they were about when he was released on parole in April 1882; and that he recognized the Phoenix Park murders as their handiwork. ” We find that there is no foundation for this charge. We have already stated that the Invincibles were not a branch of the Land League.

” (c) That Mr Parnell on 23rd January 1883, by an opportune remittance, enabled F. Byrne to escape from justice to France. ” We find that Mr Parnell did not make any remittance to enable F. Byrne to escape from justice.”

The case of the facsimile letter alleged to have been written by Parnell broke down altogether. It was proved to be a forgery. It had been purchased with other documents from one Richard Pigott, a needy and disreputable Irish journalist, who afterwards tried to blackmail Archbishop Walsh by offering, in a letter which was produced in court, to confess its forgery. Mercilessly cross-examined by Sir Charles Russell on this letter to the arch- bishop, Pigott broke down utterly. Before the commission sat again he fled to Madrid, and there blew his brains out. He had confessed the forgery to Mr Labouchere in the

presence of Mr G. A. Sala, but did not stay to be cross-examined on his confession. The attorney-general withdrew the letter on behalf of The Times, and the commission pronounced it to be a forgery. Shortly after the letter had been withdrawn, Parnell filed an action against The Times for libel, claiming damages to the

amount of £100,000. The action was compromised without going into court by a payment of £5000.

Practically, the damaging effect of some of the findings of the commission was neutralized by Parnell's triumphant vindica- tion in the matter of the facsimile letter and of the darker charges levelled at him. Parties remained of the same opinion as before: the Unionists still holding that Parnell was steeped to the lips in treason, if not in crime; while the Home Rulers made abun- dance of capital out of his personal vindication, and sought to excuse the incriminating findings of the commission by the historic antecedents of the Nationalist cause and party. The failure to produce the books and papers of the Land League was overlooked, and little importance was attached by partisans to the fact that in spite of this default (leaving unexplained the manner in which over £100,000 had been expended), the com- missioners " found that the respondents did make payments to compensate persons who had been injured in the commission of crime." Parnell and his colleagues were accepted as allies worthy of the confidence of an English party; they were made much of in Gladstonian Liberal society; and towards the close of 1889, before the commission had reported, but some months after the forged letter had been withdrawn, Parnell visited Hawarden to confer with Mr Gladstone on the measure of Home Rule to be introduced by the latter should he again be restored to power. What occurred at this conference was after- wards disclosed by Parnell, but Mr Gladstone vehemently denied the accuracy of his statements on the subject.

But Parnell's fall was at hand. In December 1889 Captain O'Shea filed a petition for divorce on the ground of his wife's adultery with Parnell. Parnell's intimacy with Mrs O'Shea had begun in 1881, though at what date it became a guilty one is not in evidence. Captain O'Shea had in that year challenged him to a duel, but was pacified by the explanations of Mrs O'Shea. It is known that Captain O'Shea had been Parnell's confidential agent in the negotiation of the Kilmainham Treaty, and in 1885 Parnell had strained his personal authority to the

utmost to secure Captain O'Shea's return for Galway, and had quelled a formidable revolt among some of his most influential followers in doing so. It is not known why Captain O'Shea, who, if not blind to a matter of notoriety, must have been complaisant in 1885, became vindictive in 1889. No defence being offered, a decree of divorce was pronounced, and in June 1891 Parnell and Mrs O'Shea were married.

At first the Irish party determined to stand by Parnell. The decree was pronounced on the 17th of November 1890. On the zoth a great meeting of his political friends and supporters was held in Dublin, and a resolution that in all political matters Parnell possessed the confidence of the Irish nation was carried by acclamation. But the Irish party reckoned without its English allies. The " Nonconformist conscience," which had swallowed the report of the commission, was shocked by the decree of the divorce court. At a meeting of the National Liberal Federation held at Sheffield on the 21st of November, Mr John Morley was privately but firmly given to understand that the Nonconformists would insist on Parnell's resignation. Parliament was to meet on the 25th. Mr Gladstone tried to convey to Parnell privately his conviction that unless Parnell retired the cause of Home Rule was lost. But the message never reached Parnell. Mr Gladstone then requested Mr John Morley to see Parnell; but he could not be found. Finally, on the 24th, Mr Gladstone wrote to Mr Morley the famous and fatal letter, in which he declared his conviction " that, notwithstanding the splendid services rendered by Mr Parnell to his country, his continuance at the present moment in the leadership would be disastrous in the highest degree to the cause of Ireland," and that " the continuance I speak of would not only place many hearty and effective friends of the Irish cause in a position of great embarrassment, but would render my retention of the leadership of the Liberal party, based as it has been mainly upon the presen- tation of the Irish cause, almost a nullity." This letter was not published until after the Irish parliamentary party had met in the House of Commons and re-elected Parnell as its chairman

without a dissentient voice. But its publication was a thunder- clap. A few days later Parnell was requested by a majority of the party to convene a fresh meeting. It took place in Com- mittee Room No. 15, which became historic by the occasion, and after several days of angry recrimination and passionate discussion, during which Parnell, who occupied the chair, scorn- fully refused to put to the vote a resolution for his own deposition, 45 members retired to another room and there declared his leadership at an end. The remainder, 26 in number, stood by him. The party was thus divided into Parnellites and anti-Parnellites, and the schism was not healed until several years after

Parnell's death.

This was practically the end of Parnell's political career in England. The scene of operations was transferred to Ireland, and there Parnell fought incessantly a bitter and a losing fight, which ended only with his death. He declared that Ireland could never achieve her emancipation by force, and that if she was to achieve it by constitutional methods, it could only be through the agency of a united Nationalist party rigidly eschew- ing alliance with any English party. This was the policy he proclaimed in a manifesto issued before the opening of the sittings in Committee Room No. 15, and with this policy, when deserted by the bulk of his former followers, he appealed to the Fenians in Ireland—" the hillside men," as Mr Davitt, who had abandoned him early in the crisis, contemptuously called them. The Fenians rallied to his side, giving him their votes and their support, but they were no match for the Church, which had declared against him. An attempt at reconciliation was made in the spring, at what was known as " the Boulogne negotia- tions," where Mr William O'Brien endeavoured to arrange, an understanding; but it came to nothing in the end. Probably Parnell was never very anxious for its success. He seems to have regarded the situation as fatally compromised by the extent to which his former followers were committed to an English alliance, and he probably saw that the only way to recover his lost position was to build up a new independent party. He knew well enough that this would take time — five years was the shortest period he allowed himself — but before many months were passed he was dead. The life he led, the agonies he endured, the labours he undertook from the beginning of 1891, travelling weekly to Ireland and intoxicating himself with the atmosphere of passionate nationalism in which he moved, would have broken down a much stronger man. He who had been the most impassive of men became restless, nervous, almost distracted at times, unwilling to be alone, strange in his ways and demean- our. He visited Ireland for the last time in September, and the last public meeting he attended was on the 27th of that month. The next day he sent for his friend Dr Kenny, who found him suffering from acute rheumatism and general debility. He left Ireland on the 30th, promising to return on the following Saturday week. He did return on that day, but it was in his coffin. He took to his bed shortly after his return to his home at Brighton, and on the 6th of October he died. His remains were conveyed to Dublin, and on Sunday, the nth of October, they were laid to rest in the presence of a vast assemblage of the Irish people in Glasnevin Cemetery, not far from the grave of O'Connell.

The principal materials for a biography of Parnell and the history of

the Parnellite movement are to be found in Hansard's Parlia- mentary Debates (1875-1891); in the Annual Register for the same period; in the Report of the Special Commission issued in 1890; in The Life of Charles Stewart Parnell, by R. Barry O'Brien; in The' Parnellite Movement, by T. P. O'Connor, M.P. ; and in a copious biography of Parnell contributed by an anonymous but well- informed writer to the Diet, of Nat. Biog., vol. xliii.

(J. R- T.)

PARNELL, THOMAS (1679-1718), English poet, was born in Dublin in 1679. His father, Thomas Parnell, belonged to a family (see above) which had been long settled at Congleton, Cheshire, but being a partisan of the Commonwealth, he removed with his children to Ireland after the Restoration, and purchased an estate in Tipperary which descended to his son. In 1693 the son entered Trinity College, Cambridge,, and in 1700 took his

M.A. degree, being ordained deacon in the same year in spite of his youth. In 1704 he became minor canon of St Patrick's Cathedral and in 1706 archdeacon of Clogher. Shortly after receiving this preferment he married Anne Minchin, to whom he was sincerely attached. Swift says that nearly a year after her death (17 11) he was still ill with grief. His visits to London are said to have begun as early as 1706. He was intimate with Richard Steele and Joseph Addison, and although in 171 1 he abandoned his Whig politics, there was no change in the friend- ship. Parnell was introduced to Lord Bolingbroke in 171 2 by Swift, and subsequently to the earl of Oxford. In 1713 he con- tributed to the Poetical Miscellanies edited for Tonson by Steele, and published his Essay on the Different Styles of Poetry. He was a member of the Scriberlus Club, and Pope says that he had a hand in " An Essay of the learned Martinus Scriblerus con- cerning the Origin of Sciences." He wrote the " Essay on the Life and writings and learning of Homer" 1 prefixed to Pope's translations, and in the autumn of 17 14 both were at Bath together. In 17 16 Parnell was presented to the vicarage of Finglass, when he resigned his archdeaconry. In the same year he published Homer's Battle of the Frogs and Mice. With the remarks of Zoilus. To which is prefixed, the Life of the said Zoilus. Parnell was in London again in 1718, and, on the way back to Ireland, was taken ill and died at Chester, where he was buried on the 24th of October.

Parnell's best known poem is " The Hermit," an admirably executed moral conte written in the heroic couplet. It is based on an old story to be found in the Gesta Romanorum and other sources. He cannot in any sense be said to have been a disciple of Pope, though his verse may owe something to his friend's revision. But this and other of his pieces, " The Hymn to Contentment," " The Night Piece on Death," " The Fairy Tale," were original in treatment, and exercised some influence on the work of Goldsmith, Gray and Collins. Pope's selection of his poems was justified by the publication in 1758 of Posthumous Works of Dr Thomas Parnell, containing Poems Moral and Divine, and on various other subjects, which in no way added to his fame. They were contemptuously dismissed as unauthentic by Thomas Gray and Samuel Johnson, but there seems no reason to doubt the authorship.

In 1770 Poems on Several Occasions was printed with a life of the author by Oliver Goldsmith. His Poetical Works were printed in Anderson's and other collections of the British Poets. See The Poetical Works (1894) edited by George A. Aitken for the Aldine Edition of the British Poets. An edition by the Rev. John Mitford for the same series (1833) was reprinted in 1866. His corre- spondence with Pope is published in Pope's Works (ed. Elwin and Courthorpe, vii. 451-467).

PARNON (mod. Malevo), the mountain ridge on the east of the Laconian plain. Height 6365 ft. It is visible from Athens above the top of the Argive mountains.

PARNY, EVARISTE DESIRE DE FORGES, Vicomte de (1753-1814), was born in the Isle of Bourbon on the 6th of February 1753. He was sent to France at nine years old, was educated at Rennes, and in 1771 entered the army. He was, however, shortly recalled' to the Isle of Bourbon, where he fell in love with a young lady whom he addresses as Eleonore. Her father refused to consent to her marriage with Parny, and she married some one else. Parny returned to France, and published his Poesies trotiques in 1778. He also published about the same time his Voyage de Bourgogne (1777), written in collaboration with his friend Antoine de Bertin (1752-1790); Epitre aux insurgents de Boston (1777), and Opuscules poetiques (1779). In 1796 appeared the Guerre des dieux, a poem in the style of Voltaire's Pucelle, directed against Christianity. Parny devoted himself in his later years almost entirely to the religious and political burlesque. He was elected to the Academy in 1803, and in 1813 received a pension from Napoleon. In 1805 he produced an extraordinary allegoric poem attacking George III.,

1 Pope acknowledged the essay with affectionate praise, but in 1720

he said it was written ” upon such memoirs as I had collected,” and later he complained of its defects, saying it had cost him more pains to revise than it would have done to write it.

his family and his subjects, under the eccentric title of ” Goddam ! Goddam ! par un French-dog.” Parny’s early love poems and elegies, however, show a remarkable grace and ease, a good deal of tenderness, and considerable fancy and wit. One famous piece, the Elegy on a Young Girl, is scarcely to be excelled in its kind. Parny died in 1814.

His (Euvres choisies were published in 1827. There is a sketch of Parny in Sainte-Beuve’s Portraits contemporains.

PARODY (Gr. rapqSia, literally a song sung beside, a comic parallel), an imitation of the form or style of a serious writing in matter of a meaner kind so as to produce a ludicrous effect. Parody is almost as old in European literature as serious writing. The Batrachomyomachia, or ” Battle of the Frogs and Mice,” a travesty of the heroic epos, was ascribed at one time to Homer himself; and it is probably at least as old as the 5th century B.C. The great tragic poetry of Greece very soon provoked the parodist. Aristophanes parodied the style of Euripides in the Acharnians with a comic power that has never been surpassed. The debased grand style of medieval romance was parodied in Don Quixote. Shakespeare parodied the extravagant heroics of an earlier stage, and was himself parodied by Marston, incidentally in his plays and elaborately in a roughly humorous burlesque of Venus and Adonis. The most celebrated parody of the Restoration was Buckingham’s Rehearsal (1672), in which the tragedies of Dryden were inimitably ridiculed. At the beginning of the 18th century The Splendid Shilling of John Philips (1676-1709), which Addison said was ” the finest burlesque poem in the English language,” brilliantly introduced a fashion for using the solemn movement of Milton’s blank verse to celebrate ridiculous incidents. In 1736, Isaac Hawkins Browne (1705- 1760) published a volume, A Pipe of Tobacco, in which the poetical styles of Colley Cibber, Ambrose Philips, James Thom- son, Edward Young and Jonathan Swift were delightfully reproduced. In the following century, Shelley and John Hamilton Reynolds almost simultaneously produced cruel imitations of the naivete and baldness of Wordsworth’s Peter Bell (1819). But in that generation the most celebrated parodists were the brothers Smith, whose Rejected Addresses may be regarded as classic in this kind of artificial production. The Victorian age has produced a plentiful crop of parodists in prose and in verse, in dramatic poetry and in lyric poetry. By common consent, the most subtle and dexterous of these

was C. S. Calverley, who succeeded in reproducing not merely tricks of phrase and metre, but even manneristic turns of thought. In a later day, Mr Owen Seaman has repeated,' and sometimes surpassed, the agile feats of Calverley.

PAROLE (shortened from the Fr. parole d'honneur, word of honour), a military term signifying the engagement given by a prisoner of war that if released he will not again take up arms against his captors during the term of the engagement or the war, unless previously relieved of the obligation by exchange. " Parole " is also used in the same sense as " word " to imply a watchword or password. The French word, formed from the Late Lat. paraula, parabola, Gr. ■KapafioKi], story, parable, was also adopted into English as " parol," i.e. verbal, oral, by word of mouth, now only used in the legal term " parol evidence," i.e. oral as opposed to documentary evidence.

PAROPAMISUS, the name given by the Greeks to the parts of the Hindu Rush bordering Kohistan to the north-west of Kabul. It is now applied in a restricted sense to the water- parting between Herat and the Russian frontier on the Kushk river, which possesses no local name of its own. From Herat city to the crest of the Paropamisus, which is crossed by several easy passes, is a distance of about 36 m., involving a rise of 1000 ft.

PAROS, or Paro, an island in the Aegean Sea, one of the largest of the group of the Cyclades, with a population of 8000. It lies to the west of Naxos, from which it is separated by a channel about 6 m. broad, and with which it is now grouped together, in popular language, under the common name of Paronaxia. It is in 37 N. lat. and 25° 10′ E. long. Its greatest length from N.E. to S.W. is 13 m., and its greatest breadth

10 m. It is formed of a single mountain about 2500 ft. high, sloping evenly down on all sides to a maritime plain, which is broadest on the north-east and south-west sides. The island is composed of marble, though gneiss and mica-schist are to be found in a few places. The capital, Paroekia or Parikia (Italian, Parechia), situated on a bay on the north-west side of the island, occupies the site of the ancient capital Paros. Its harbour admits small vessels; the entrance is dangerous on account of rocks. Houses built in the Italian style with terraced roofs, shadowed by luxuriant vines, and surrounded by gardens of oranges and pomegranates, give to the town a picturesque

and pleasing aspect. Here on a rock beside the sea are the remains of a medieval castle built almost entirely of ancient marble remains. Similar traces of antiquity in the shape of bas-reliefs, inscriptions, columns, &c, are numerous in the town, and on a terrace to the south of it is a precinct of Asclepius. Outside the town is the church of Katapoliani (“H ‘EKarovraTv\i.avri), said to have been founded by the empress Helena; there are two adjoining churches, one of very early form, and also a baptistery with a cruciform font.

On the north side of the island is the bay of Naoussa (Naussa) or Agoussa, forming a safe and roomy harbour. In ancient times it was closed by a chain or boom. Another good harbour is that of Drios on the south-east side, where the Turkish fleet used to anchor on its annual voyage through the Aegean. The three villages of Tragoulas, Marmora and Kepidi (Kr]irL5i, pronounced Tschipidi), situated on an open plain on the eastern side of the island, and rich in remains of antiquity, probably occupy the site of an ancient town. They are known together as the ” villages of Kephalos,” from the steep and lofty headland of Kephalos. On this headland stands an abandoned monastery of St Anthony, amidst the ruins of a medieval castle, which belonged to the Venetian family of the Venieri, and was gallantly though fruitlessly defended against the Turkish general Bar- barossa in 1537.

Parian marble, which is white and semi-transparent, with a coarse grain and a very beautiful texture, was the chief source of wealth to the island. The celebrated marble quarries lie on the northern side of the mountain anciently known as Marpessa (afterwards Capresso), a little below a former convent of St Mina. The marble, which was exported from the 6th century B.C., and used by Praxiteles and other great Greek sculptors, was obtained by means of subterranean quarries driven horizon- tally or at a descending angle into the rock, and the marble thus quarried by lamplight got the name of Lychnites, Lychneus (from lychnos, a lamp), or Lygdos (Piin. H. N. xxxvi. 5, 14; Plato, Eryxias, 400 D; Athen. v. 2050; Diod. Sic. 2, 52). Several of these tunnels are still to be seen. At the entrance to one of them is a bas-relief dedicated to Pan and the Nymphs. Several attempts to work the marble have been made in modern times, but it has not been exported in any great quantities.

History. — The story that Paros was colonized by one Paros of Parrhasia, who brought with him a colony of Arcadians to the island (Heraclides, De rubus publicis, 8: Steph. Byz. s.v. Hapos), is one of those etymologizing fictions in which Greek legend abounds. Ancient names of the island are said to have been Plateia (or Pactia),

Demetrias, Zacynthus, Hyria, Hyleessa, Minoa and Cabarnis (Steph. Byz.). From Athens the island afterwards received a colony of Ionians (Schol. Diunys. Per. 525; cf. Herod, i. 171), under whom it attained a high degree of prosperity. It sent out colonies to Thasos (Thuc. iv. 104; Strabo, 487) and Parium on the Hellespont. In the former colony, which was planted in the 15th or 18th Olympiad, the poet Archilochus, native of Paros, is said to have taken part. As late as 385 B.C. the Parians, in conjunction with Dionysius of Syracuse, founded a colony on the Illyrian island of Pharos (Diod. Sic. xv. 13). So high was the reputation of the Parians that they were chosen by the people of Miletus to arbitrate in a party dispute (Herod, v. 28 seq.). Shortly before the Persian War Paros seems to have been a dependency of Naxos (Herod, v. 31). In the Persian War Paros sided with the Persians and sent a trireme to Marathon to support them.

In retaliation, the capital Paros was besieged by an Athenian fleet under Miltiades, who.demanded a fine of 100 talents. But the town offered a vigorous resistance, and the Athenians were obliged to sail away after a siege of twenty-six days, during which they had laid the island waste. It was at a temple of Demeter Thesmophorus in Paros that Miltiades received the wound of which he afterwards died (Herod., vi. 133-136). By means of an inscription Ross was enabled to identify the site of the temple; it lies, in agreement with the description of Herodotus, on a low hill beyond the boundaries of the town. Paros also sided with Xerxes against Greece, but after the battle of Artemisium the Parian contingent remained in Cythnos watching the progress of events (Herod, viii. 67). For this unpatriotic conduct the islanders were punished by Themistodes, who exacted a heavy fine (Herod, viii. 112). Under the Athen- ian naval confederacy, Paros paid the highest tribute of all the islands subject to Athens — 30 talents annually, according to the assessment of Olymp. 88, 4 (429 B.C.). Little is known of the constitution of Paros, but inscriptions seem to show that it was democratic, with a senate (Boule) at the head of affairs (Corpus inscript. 2376-2383; Ross, Inscr. tried, ii. 147, 148). In 410 B.C. the Athenian general Theramenes found an oligarchy at Paros; he deposed it and restored the democracy (Diod. Sic. xiii. 47). Paros was included in the new Athenian confed- eracy of 378 B.C., but afterwards, along with Chios, it renounced its connexion with Athens, probably about 357 B.C. Thence- forward the island lost its political importance. From the inscription of Adule we learn that the Cyclades, and consequently Paros, were subject to the Ptolemies of Egypt. Afterwards they passed under the rule of Rome. When the Latins made themselves masters of Constantinople, Paros, like the rest, became subject to Venice. In 1537 it was conquered by the Turks. The island

now belongs to the kingdom of Greece.

Among the most interesting discoveries made in the island is the Parian Chronicle (g.v.).

See Tournefort, Voyage du Levant, i. 232 seq. (Lyons, 1717) ; Clarke, Travels, iii. (London, 1814); Leake, Travels in Northern Greece, iii. 84 seq. (London, 1835); Prokesch, Denkwiirdigheiten, ii. 19 seq. (Stuttgart, 1836) ; Ross, Reisen auf den griechischen Inseln, i. 44 seq. (Stuttgart, and Tubingen, 1840) ; Fiedler, Reise durch alle Theile des Konigreich.es Griechenland, ii. 179 seq. (Leipzig, 1 841); Bursian, Geographie von Griechenland, ii. 483 seq. (Leipzig, 1 872). For the Parian Chronicle, Inscriptioms graecae, xii. 100 sqq.

PAROXYSM (Med. Lat. paroxysmus, from the Gr. irapo&veiv, to make sharp, o£us), a violent outbreak or display of emotion or feeling. The term is used of a fit of laughter, pain, anger or fear, and particularly an acute stage in a disease is the earliest sense of the word.

PARQUETRY (Fr. parqueterie, from parquet, flooring, originally a small compartment), a term applied to a kind of mosaic of wood used for ornamental flooring. Materials contrasting in colour and grain, such as oak, walnut, cherry, lime, pine, &c. are employed; and in the more expensive kinds the richly coloured tropical woods are also used. The patterns of parquet flooring are entirely geometrical and angular (squares, triangles, lozenges, &c), curved and irregular forms being avoided on account of the expense and difficulty of fitting. There are two classes of parquetry in use — veneers and solid parquet. The veneers are usually about a quarter of an inch in thickness, and are laid over already existing floors. Solid parquet of an inch or more in thickness consists of single pieces of wood grooved and tongued together, having consequently the pattern alike on both sides.

PARR, CATHERINE (1512-1548), the sixth queen of Henry VIII., was a daughter of Sir Thomas Parr (d. 151 7), of Kendal, an official of the royal household. When only a girl she was married to Edward Borough, and after his death in or before 1529 to John Neville, Lord Latimer, who died in 1542 or 1543. Latimer had only been dead a few months when, on the 12th of July 1543, Catherine was married to Henry VIII. at Hampton Court. The new queen, who was regent of England during the king's absence in r544, acted in a very kindly fashion towards her stepchildren; but her patiencewith the king did not prevent

a charge of heresy from being brought against her. Henry, however, would not permit her arrest, and she became a widow for the third time on his death in January 1547. In the same year she married a former lover, Sir Thomas Seymour, now Lord Seymour of Sudeley. Soon after this event, on the 7th of September 1548, she died at Sudeley castle. Catherine was a pious and charitable woman and a friend of learning; she wrote The Lamentation or Complaint of a Sinner, which was published after her death.

See A. Strickland, Lives of the Queens of England, vol. iii. (1877).

PARR, SAMUEL (1747-18 2 5), English schoolmaster, son of Samuel Parr, surgeon at Harrow-on-the-Hill, was born there on the 26th of January 1747. At Easter 1752 he was sent to Harrow School as a free scholar, and when he left in 1761 he began to help his father in his practice, but the old surgeon realized that his son's talents lay elsewhere, and Samuel was sent (1765) to Emmanuel College, Cambridge. From February 1767 to the close of 1771 he served under Robert Sumner as head assistant at. Harrow, where he had Sheridan among his pupils. When the head master died in September 1771 Parr, after vainly applying for the position, started a school at Stan- more, which he conducted for five years. Then he became head master of Colchester Grammar School (1776-177 8) and subsequently of Norwich School (1778-1786). He had taken priest's orders at Colchester, and in 1780 was presented to the small rectory of Asterby in Lincolnshire, and three years later to the vicarage of Hatton near Warwick. He exchanged this latter benefice for Wadenhoe, Northamptonshire, in 1789, stipulating to be allowed to reside, as assistant curate, in the parsonage of Hatton, where he took a limited number of pupils. Here he spent the rest of his days, enjoying his excellent library, described by H. G. Bohn in Bibliotheca Parriana (1827), and here his friends, Porson and E. H. Barker, passed many months in his company. The degree of LL.D. was conferred on him by the university of Cambridge in 1781. Parr died at Hatton vicarage on the 6th of March 1825.

Dr Parr's writings fill several volumes, but they are all beneath the reputation which he acquired through the variety of his knowledge and dogmatism of his conversation. The chief of them are his Characters of Charles James Fox (1809); and his unjustifiable reprint of the Tracts of Warburton and a Warburtonian, not admitted into their works, a scathing exposure of Warburton and Hurd. Even amid the terrors of the French Revolution he adhered to Whiggism, and his

correspondence included every man of eminence, either literary or political, who adopted the same creed. In private life his model was Johnson. He succeeded in copying his uncouth- ness and pompous manner, but had neither his humour nor his real authority. He was famous as a writer of epitaphs and wrote inscriptions for the tombs of Burke, Charles Burney, Johnson, Fox and Gibbon.

There are two memoirs of his life, one by the Rev. William Field (1828), the other, with his works and his letters, by John Johnstone (1828); and E. H. Barker published in 1828-1829 two volumes of Parriana, a confused mass of information on Parr and his friends. An essay on his life is included in De Quincey's works, vol. v., and a little volume of the Aphorisms, Opinions and Reflections of the late Dr Parr appeared in 1826.

PARR, THOMAS (c. 1483-1635), English centenarian, known as " Old Parr," is reputed to have been born in 1483, at Winning- ton. Shropshire, the son of a farmer. In 1500 he is said to have left his home and entered domestic service, and in 1518 to have returned to Winnington to occupy the small holding he then inherited on the death of his father. In 1563, at the age of eighty, he married his first wife, by whom he had a son and a daughter, bcth of whom died in infancy. At the age of 122, his first wife having died, he married again. His vigour seems to have been unimpaired, and when 130 years old he is said to have threshed corn. In 1635 his fame reached the ears of Thomas Howard, 2nd earl of Arundel, who resolved to exhibit him at court, and had him conveyed to London in a specially constructed litter. Here he was presented to King Charles I.,

but the change of air and diet soon affected him, and the old man died at Lord Arundel's house in London, on the 14th of November 1635. He was buried in the south transept of Westminster Abbey where the inscription over his grave reads: " Tho: Parr of ye county of Salopp Born in Ao 1483. He lived in ye reignes of Ten Princes viz. K. Edw. 4, K. Ed. V. K. Rich. 3. K. Hen. 7. K. Hen. 8. K. Edw. 6. Q. Ma. Q. Eliz. K. Ja. and K. Charles, aged 152 yeares and was buried here Nov. 15. 1635." A post-mortem examination made by the king's orders by Dr William Harvey, revealed the fact that his internal organs were in an unusually perfect state, and his cartilages unossified.

PARR, a name originally applied to the small Salmonoids abundant in British rivers, which were fcr a long time considered to constitute a distinct species of fish (Salmo salmulus). They possess the broad head, short snout and large eye characteristic of young Salmonoids, and are ornamented on the sides of the body and tail with about eleven or

more broad dark cross-bars, the so-called parr-marks. However, John Shaw proved, by experiment, that these fishes represent merely the first stage of growth of the salmon, before it assumes, at an age of one or two years, and when about six inches long, the silvery smolt-dress preparatory to its first migration to the sea. The parr-marks are produced by a deposit of black pigment m the skin, and appear very soon after the exclusion of the fish from the egg; they are still visible for some time below the new coat of scales of the smolt-stage, but have entirely disappeared on the first leturn of the young salmon from the sea. Although the juvenile condition of the parr is now universally admitted, it is a remark- able fact that many male parr, from 7 to 8 inches long, have their sexual organs fully developed, and that their milt has all the fertilizing properties of the seminal fluid of a full-grown and sexually matured salmon. On the other hand, no female pan has ever been obtained with mature ova. Not only the salmon, but also the other species of Salmo, the grayling, and probably also the Coregoni, pass through a parr-stage of growth. The young of all these fishes arc barred, the salmon having generally eleven or more bars, and the parr of the migratory trout from nine to ten, or two or three more than the river-trout. In some of the small races or species of river-trout the parr-marks are retained throughout life, but subject to changes in intensity of colour.

PARRAMATTA, a town of Cumberland county, New South Wales, Australia, 14 m. by rail N.W. of Sydney. Pop. (1901) 12,568. It is situated on the Parramatta River, an arm of Port Jackson, and was one of the earliest inland settlements (1788), the seat of many of the public establishments connected with the working of the convict system. Many of these still remain in another form (the district hospital, the lunatic asylum, the gaol, two asylums for the infirm and destitute, the Protestant and Catholic orphan schools), involving a government expendi- ture which partly sustains the business of the town. Parramatta was one of the earliest seats of the tweed manufacture, but its principal industrial dependence has been on the fruit trade. With the exception of Prospect and Pennant Hills, where there is an outburst of trap rock, the surface soil is the disintegration of the Wainamatta shale, which is well suited for orangeries and orchards. The first grain grown in the colony was harvested at Parramatta, then called Rosehill. The earlier governors had their country residence near the town, but the domain is now a public park in the hands of the municipality. An early observatory, where in 1822 were made the observations for the Parramatta Catalogue, numbering 7385 stars, has long been abandoned. Parramatta was incorporated in i86r. It has one of the finest race-courses in Australia, and in the

King's School, founded in 1832, the oldest grammar school in the colony.

PARRHASIUS, of Ephesus, one of the greatest painters of Greece. He settled in Athens, and may be ranked among the Attic artists. The period of his activity is fixed by the anecdote which Xenophon records of the conversation between him and Socrates on the subject of art; he was therefore distinguished

as a painter before 399 B.C. Seneca relates a tale that Parrhasius bought one of the Olynthians whom Philip sold into slavery, 346 B.C., and tortured him in order to have a model for his picture of Prometheus; but the story, which is similar to one told of Michelangelo, is chronologically impossible. Another tale recorded of him describes his contest with Zeuxis. The latter painted some grapes so perfectly that birds came to peck at them. He then called on Parrhasius to draw aside the curtain and show his picture, but, finding that his rival's picture was the curtain itself, he acknowledged himself to be surpassed, for Zeuxis had deceived birds, but Parrhasius had deceived Zeuxis. He was universally placed in the very first rank among painters. His skilful drawing of outlines is especially praised, and many of his drawings on wood and parchment were preserved and highly valued by later painters for purposes of study. He first attained skill in making his figures appear to stand out from the background. His picture of Theseus adorned the Capitol in Rome. His other works, besides the obscene subjects with which he is said to have amused his leisure, are chiefly mythological groups. A picture of the Demos, the personified People of Athens, is famous; according to the story, which is probably based upon epigrams, the twelve prominent character- istics of 1 he people, though apparently quite inconsistent with each other, were distinctly expressed in this figure.

PARRICIDE (probably for Lat. patricidia, from pater, father, and caedere, to slay), strictly the murder of a parent; the term however has been extended to include the murder of any relative or of an ascendant by a descendant. The first Roman law against parricide was that of the Lex Cornelia de sicariis et veneficis (c. 81 B.C.), which enacted that the murderer of a parent should be sewed up in a sack and thrown into the sea, and provided other punishments for the killing of near relatives. The Lex Pompeia de parricidiis (52 B.C.) re-enacted the principal provisions of the Lex Cornelia and defined

parricide as the deliberate and wrongful slaying of ascendants, husbands, wives, cousins, brothers and sisters, uncles and aunts, stepfathers and mothers, fathers and mothers-in-law, patrons and descendants. For the murder of a father, mother, grandfather or grandmother, the Lex Pompeia ordained that the guilty person should be whipped till he bled, sewn up in a sack with a dog, a cock, a viper and an ape, and thrown into the sea. Failing water, he was either to be torn in pieces by wild beasts or burned.

English law has never made any legal distinction between killing a parent or other relative and simple murder, and the Netherlands and Germany follow in the same direction. French law has been exceptionally severe in its treatment of parricide. Before the Revolution, the parricide if a male, had to make a recantation of his crime, and then suffered the loss of his right hand; his body was afterwards burned and the ashes scattered to the winds. If the parricide was a female she was burned or hanged. After the Revolution the penalty became simply one of death, but the compilers of the penal code adjudged this insufficient and reintroduced some of the previous provisions: the parricide was brought to the place of execution clad in a shirt, bare-footed, and the head enveloped in a black veil. While he was exposed on the scaffold, an officer read aloud the decree of condemnation: the culprit then had his right hand cut off, and was immediately afterwards executed. On the revision of the penal code in 1832 the cutting off of the right hand was omitted, but the other details remained. Other continental European countries, following the example of France, treat the crime of parricide with exceptional severity.

PARROT (according to Skeat, from Fr. Perrot or Pierrot, the diminutive of the proper name Pierre 1), the name given

1 “Parakeet ” (in Shakespeare, 1 Hen. IV. ii. 3, 88, ” Para- quito “) is said by the same authority to be from the Spanish Peri- quito or Perroqueto, a small Parrot, diminutive of Perico, a Parrot, which again may be a diminutive from Pedro, the proper name. Parakeet (spelt in various ways in English) is usually applied to the smaller kinds of Parrots, especially those which have long tails, not as Perroquet in French, which is used as a general term for all Parrots, Perruche, or sometimes Perriche, being the ordinary name for what we call Parakeet. The old English ” Popinjay ” and the old French Papegaut have almost passed out of use, but the German Papagei and

generally to a large and very natural group of birds, which for more than a score of centuries have attracted attention, not only from their

gaudy plumage, but, at first and chiefly, it would seem, from the readiness with which many of them learn to imitate the sounds they hear, repeating the words and even phrases of human speech with a fidelity that is often astonishing. It is said that no representation of any parrct appears in Egyptian art, nor does any reference to a bird of the kind occur in the Bible, whence it has been concluded that neither painters nor writers had any knowledge of it. Aristotle is commonly supposed to be the first author who mentions a parrot; but this is an error, for nearly a century earlier Ctesias in his Indica (cap. 3),* under the name of fiirraicos (Bittacus), so neatly described a bird which could speak an ” Indian ” language — naturally, as he seems to have thought — or Greek — if it had been taught so to do— about as big as a sparrow-hawk (Hierax), with a purple face and a black beard, otherwise blue-green (cyaneus) and vermilion in colour, so that there cannot be much risk in declaring that he must have had before him a male example of what is now commoniy known as the Blossom-headed parakeet, and to ornithologists as Palaeornis cyanocephalus, an inhabitant of many parts of India. After Ctesias comes Aristotle’s ipiTTaici) (Psitlaee), which SundevaU. supposes him to have described only from hearsay. There can be no doubt that the Indian conquests of Alexander were the means of making the parrot better known in Europe, and it is in reference to this fact that another Eastern species of Palaeornis now bears the name of P. alexandri, though from the localities it inhabits it could hardly have had anything to do with the Macedonian hero. That Africa had parrots does not seem to have been discovered by the ancients till long after, as Pliny tells us (vi. 29) that they were first met with beyond the limits of Upper Egypt by explorers employed by Nero. These birds, highly prized from the first, reprobated by the moralist, and celebrated by more than one classical poet, in the course of time were brought in great numbers to Rome, and ministered in various ways to the luxury of the age. Not only were they lodged in cages of tortoise-shell and ivory, with silver wires, but they were professedly esteemed as delicacies for the table, and one emperor is said to have fed his lions upon them! With the decline of the Roman Empire the demand for parrots in Europe lessened, and so the supply dwindled, yet all knowledge of them was not wholly lost, and they are occasionally mentioned by one writer or another until in the 15th century began that career of geographical discovery which has since proceeded uninterruptedly. This immediately brought with it the knowledge of many more forms of these birds than had ever before been seen. Yet so numerous is the group that even now new species of parrots are not uncommonly recognized.

The home of the vast majority of parrot-forms is unquestion- ably

within the tropics, but the popular belief that parrots are tropical birds only is a great mistake. In North America the Carolina parakeet, Conurus carolinensis, at the beginning of the 19th century used to range in summer as high as the shores of lakes Erie and Ontario — a latitude equal to the south of France; and even much later it reached, according to trust- worthy information, the junction of the Ohio and the Mississippi, though now its limits have been so much curtailed that its occurrence in any but the Gulf States is doubtful. In South America, at least four species are found in Chile or the La Plata region, and one, Conurus patagonus, is pretty common on the bleak coast of the Strait of Magellan. In Africa it is true that no species is known to extend to within some ten degrees of the tropic of Cancer; but Pionias robustus inhabits territories

Italian Papagaio still continue in vogue. These names can be traced to the Arabic Babagha; but the source of that word is unknown. The Anglo-Saxon name of the Parret, a river in Somerset, is Pedreda or Pedrida, which at first sight looks as if it had to do with the proper name, Petrus; but Skeat believes there is no connexion between them — the latter portion of the word being ritS, a stream.

2 The passage seems to nave escaped the notice of all naturalist* except W. J. Broderip, who mentioned it in his article ” Psittacidae,” in the Penny Cyclopaedia (xix. 83).

lying quite as far to the southward of the tropic of Capricorn. In India the northern range of the group is only bounded by the slopes of the Himalaya, and farther to the eastward parrots are not only abundant over the whole of the Malay Archipelago, as well as Australia and Tasmania, but two very well-defined families are peculiar to New Zealand and its adjacent islands (see Kakapo and Nestor). No parrot has recently inhabited the Palaearctic Region, 1 and but one (the Conurus carolinensis, just mentioned) probably belongs to the Nearctic; nor are parrots represented by many different forms in either the Ethiopian or the Indian Regions. In continental Asia the distribution of parrots is rather remarkable. None extend farther to the westward than the valley of the Indus, 2 which, considering the nature of the country in Baluchistan and Afghan- istan, is perhaps intelligible enough; but it is not so easy to understand why none are found either in Cochin China or China proper; and they are also wanting in the Philippine Islands, which is the more remarkable and instructive when

we find how abundant they are in the groups a little farther to the southward. Indeed, A. R. Wallace has well remarked that the portion of the earth's surface which contains the largest number of parrots, in proportion to its area, is undoubtedly that covered by the islands extending from Celebes to the Solomon group. " The area of these islands is probably not one-fifteenth of that of the four tropical regions, yet they contain from one-fifth to one- fourth of all the known parrots " (Geogr. Distr. Animals, ii. 330). He goes on to observe also that in this area are found many of the most remarkable forms — all the red Lories, the great cockatoos, the pigmy Nasilernae and other singularities. In South America the species of parrots, though numerically nearly as abundant, are far less diversified in form, and all of them seem capable of being referred to two, or, at most, three sections. The species that has the widest range, and that by far, is the common Ring-necked Parakeet, Palaeornis torquatus, a well-known cage-bird which is found from the mouth of the Gambia across Africa to the coast of the Red Sea, as well as throughout the whole of India, Ceylon and Burmah to Tenas- serim. 3 On the other hand, there are plenty of cases of parrots which are restricted to an extremely small area — often an island of insignificant size, as Conurus xantholaemus, confined to the island of St Thomas in the Antilles, and Palaeornis exsul to that of Rodriguez in the Indian Ocean — to say nothing of the remarkable instance of Nestor productus (see Nestor).

The systematic treatment of this very natural group of birds has long been a subject of much difficulty. A few systematists, among whom C. L. Bonaparte was chief, placed them at the top of the class, conceiving that they were the analogues of the Primates among mammals. T. H. Huxley recognized the Psittacomorphae as forming one of the principal groups of Carinate birds, and they are now generally regarded as forming a suborder Psittaci of the Cuculiform birds (see Bird). Owing to the erroneous number of forms and the close similarities of structure, the subdivision of the group has presented great difficulties. Buffon was unaware of the existence of some of the most remarkable forms of the group, in particular of

1 A few remains of a Parrot have been recognized from the Miocene of the Allier in France, by A. Milne-Edwards (Ois. Foss. France, vol. ii. p. 525, pi. cc), and are said by him to show the greatest resemblance to the common Grey Parrot of Africa, Psittacus eriihacus, through having also some affinity to the Ring-necked Parakeet of the same country, Palaeornis torquatus. He refers them, however, to the same genus as the former, under the name of Psittacus verreauxi.

2 The statements that have been made, and even repeated by writers

of authority, as to the occurrence of ” a green parrot ” in Syria (Chesney, Exped. Survey Euphrates and Tigris, ii. 443, 537) and of a parrot in Turkestan (Jour. As. Soc. Bengal, viii. 1007) originated with gentlemen who had no ornithological knowledge, and are evidently erroneous.

3 It is right to state, however, that the African examples of this bird are said to be distinguishable from the Asiatic by their somewhat shorter wings and weaker bill, and hence they are considered by some authorities to form a distinct species or subspecies, P. docilis; but in thus regarding them the difference of locality seems to have influenced opinion, and without that difference they would scarcely have been separated, for in many other groups of birds distinctions so slight are regarded as barely evidence of local races.

Strigops and Nestor; but he began by making two great divisions of those that he did know, separating the parrots of the Old World from the parrots of the New, and subdividing each of these divisions into various sections somewhat in accordance with the names they had received in popular language — a practice he followed on many other occasions, for it seems to have been with him a belief that there is more truth in the discrimination of the unlearned than the scientific are apt to allow. In 1867- 1868 Dr O. Finsch published at Leiden an elaborate monograph of the parrots, 4 regarding them as a family, in which he admitted 26 genera, forming 5 subfamilies: (1) that composed of Strigops (Kakapo), only; (2) that containing the crested forms or cockatoos; (3) one which he named Sittacinae, comprising all the long-tailed species — a somewhat heterogeneous assemblage, made up of Macaws (q.v.) and what are commonly known as parakeets; (4) the parrots proper with short tails; and (5) the so-called ” brush-tongued ” parrots, consisting of the Lories (q.v.) and Nestors (q.v.). In 1874 A. H. Garrod communicated to the Zoological Society the results of his dissec- tion of examples of 82 species of parrots, which had lived in its gardens, and these results were published in its Proceedings for that year (pp. 586-598, pis. 70, 71). Summarily expressed, Garrod’s scheme was to divide the parrots into two families, Palaeornithidae and Psittacidae, assigning to the former three subfamilies, Palaeornilhinae, Cacatuinae and Stringopinae, and to the latter four, Arinae, Pyrrhurinae, Platycercinae and Chrysotinae. That each of these sections, except the Cacatuinae, is artificial any regard to osteology would show. In the Journal filr Ornithologie for 1881 A. Reichenow published a Conspectus Psittacorum, founded, as several others 5 have been, on external characters only. He makes 9 families of the group, and recog- nizes 45 genera, and 442 species, besides subspecies. His grouping is generally very different from Garrod’s, but

displays as much artificiality: for instance, Nestor is referred to the family which is otherwise 1 composed of the cockatoos.

The system now generally accepted is based on a combination of external and anatomical characters, and is due to Count T. Salvadori (Cat. Birds, Brit. Mus. XX., 1891), and H. F. Gadow (Bronn's Thier-Reich, Aves, 1893). About 80 genera with more than 500 species are recognized, divided into the family Psittacidae with the subfamilies Stringopinae, PsiUacinae and Cacatuinae, and the family Trichoglossidae with the sub- families Cyclopsittacinae, Loriinae and Nestorinae.

The headquarters of parrots are in the Australian Region and the Malay countries; they are abundant in South America; in Africa and India the number of forms is relatively small ; in Europe and North Asia there are none now alive, in North America only one. Parrots are gregarious and usually feed and roost in companies, but are at least temporarily monogamous. Most climb and walk well; the flight is powerful but low and undulating in most. The food is varied but chiefly vegetable, whilst parrots are alone amongst birds in holding the food in the claws. The usual cry is harsh and discordant, but many softer notes are employed. A large number of forms learn in captivity to talk and whistle, the well-known red-tailed grey parrot (Psittacus erithacus) of tropical Africa being pre-eminent. The eggs are laid usually in holes in trees, rocks, or the ground, no lining being formed. The larger species produce one to three, the smaller as many as twelve, the colour being dull white. The young when hatched are naked and helpless. (A. N.)

PARROT-FISHES, more correctly called Parrot-Wrasses, marine fishes of the family Scaridae closely allied to the wrasses or Labridae. The family contains eight genera of which the principal are Scarus, Pseudoscarus, Odan and Sparisama. They are easily recognized by their large scales, of which there are from twenty-one to twenty-five in the lateral line, by having invariably nine spines and ten rays in the dorsal fin and two spines with eight rays in the anal, and especially by their singular

4 Die Papageien, monographisch bearbeitet.

6 Such, for instance, as Kuhl's treatise with the same title, which appeared in 1820, and Wagler's Monographia Psittacorum, published in 1832 — both good of their kind and time.

dentition, of jaws as well as pharynx. The teeth of the jaws are soldered together, and form a sharp-edged beak similar to that of a parrot, but without a middle projecting point, and the upper and lower beak are divided into two lateral halves by a median suture. In a few species the single teeth can be still distinguished, but in the majority (Pseudoscarus) they are united into a homogeneous substance with polished surface. By this sharp and hard beak parrot-fishes are enabled to bite or scrape off those parts of coral-stocks which contain the polypes or to cut off branches of tough fucus, which in some of the species forms the principal portion of their diet. The process of triturating the food is performed by the pharyngeal teeth, which likewise are united, and form plates with broad masticatory surfaces, not unlike the grinding surf ace of the molars of the elephant. Of these plates there is one pair above, opposed to and fitting into the single one which is coalesced to the lower pharyngeal bone. The contents of the alimentary canal, which are always found to be finely divided and reduced to a pulp, prove the efficiency of this triturating apparatus; in fact, ever since the time of Aristotle it has been maintained that the Scarus rumi- nates. Nearly one hundred species of parrot-fishes are known from the tropical and sub-tropical parts of the Indo-Pacific and Atlantic Oceans; like other coral-feeding fishes, they are absent on the Pacific coasts of tropical America and on the coast of tropical West Africa. The most celebrated is the Scarus of the Mediterranean. Beautiful colours prevail in this group of wrasses, but are subject to great changes and variations in the same species; almost all are evanescent and cannot be pre- served after death. The majority of parrot-fishes are eatable, some even esteemed; but they (especially the carnivorous kinds) not unfrequently acquire poisonous properties after they have fed on corals or medusae containing an acrid poison. Many attain to a considerable size, upwards of 3 ft. in length.

PARRY, SIR CHARLES HUBERT HASTINGS, Bart., English musical composer (1848-), second son of Thomas Gambier Parry, of Highnam Court, Gloucester, was born at Bournemouth on the 27th of February 1848. He was educated at Malvern, Twyford, near Winchester, Eton (from 1861), and Exeter College, Oxford. While still at Eton he wrote music, two anthems being published in 1865; a service in D was dedicated to Sir John Stainer. He took the degree of Mus.B. at Oxford at the age of eighteen, and that of B.A. hi 1870; he then left Oxford for London, where in the following year he entered Lloyd's, abandoning business for art soon afterwards. He studied successively with H. H. Pierson (at Stuttgart), Sterndale Bennett and Macfarren; but the most

important .part of his artistic development was due to Edward Dannreuther. Among the larger works of this early period must be mentioned an overture, Guillem de Cabestanh (Crystal Palace, 1879), a pianoforte concerto in F sharp minor, played by Dannreuther at the Crystal Palace and Richter concerts in 1880, and his first choral work, the Scenes from Prometheus Unbound, produced at the Gloucester Festival, 1880. These, like a symphony in G given at the Birmingham Festival of 1882, seemed strange even to educated hearers, who were confused by the intricacy of treatment. It was not until his setting of Shirley's ode, The Glories of our Blood and State, was brought out at Gloucester, 1883, and the Partita for violin and pianoforte was published about the same time, that Parry's importance came to be realized. With his sublime eight-part setting of Milton's Blest Pair of Sirens (Bach Choir, 1887) began a fine series of compositions to sacred or semi-sacred words. In Judith (Birmingham, 1888), the Ode on St Cecilia's Day (Leeds, 1889), L' Allegro ed il penseroso (Norwich, 1890), De Profundis (Hereford, 1891), The Lotus Eaters (Cambridge, 1892), Job (Gloucester, 1892), King Saul (Birmingham, 1894), Invocation to Music (Leeds, 1895), Mag- nificat (Hereford, 1897) , A Song of Darkness and Light (Gloucester, 1898), and Te Deum (Hereford, 1900), are revealed the highest qualities of music. Skill in piling up climax after climax, and command of every choral resource, are the technical qualities most prominent in these works; but in his orchestral composi- tions, such as the three later symphonies, in F, C and E minor,

in two suites, one for strings alone, and above all in his Symphonic Variations (1897), he shows himself a master of the orchestra, and his experiments in modification of the conventional classical forms, such as appear in the work last named, or in the Nineteen Variations for Pianoforte Solo, are always successful. His music to The Birds of Aristophanes (Cambridge, 1883) and The Frogs (Oxford, 1892) are striking examples of humour in music; and that to Agamemnon (Cambridge, 1900) is among the most impressive compositions of the kind. His chamber music, exquisite part-songs and solo songs maintain the high standard of his greater works. At the opening of the Royal College of Music in 1883 he was appointed professor of composition and of musical history, and in 1894, on the retirement of Sir George Grove, Parry succeeded him as principal. He was appointed Choragus of Oxford University in 1883, succeeding Stainer in the professorship of the university in 1900. He received the honorary degree of Mus.D. at Cambridge 1883, Oxford 1884, Dublin 1891; and was knighted in 1898. Outside the domain of creative music, Parry's work for music

was of the greatest importance: as a contributor of many of the most important articles on musical forms, &c, in Grove's dictionary, his literary work first attracted attention; in his Studies of Great Composers musical biography was treated, almost for the first time, in a really enlightened and enlightening way; and his Art of Music is a splendid monument of musical literature, in which the theory of evolution is applied to musical history with wonderful skill and success.

PARRY, SIR WILLIAM EDWARD (1790-1855), English rear-admiral and Arctic explorer, was born in Bath on the 19th of December 1790, the son of a doctor. At the age of thirteen he joined the flag-ship of Admiral Cornwallis in the Channel fleet as a first-class volunteer, in 1806 became a midshipman, and in 1810 was promoted to the rank of lieutenant in the " Alexander " frigate, which was employed for the next three years in the protection of the Spitzbergen whale fishery. He took advantage of this opportunity for the study and practice of astronomical observations in northern latitudes, and after- wards published the results of his studies in a small volume on Nautical Astronomy by Night (1816). From 1813-1817 he served on the North American station. In 18 18 he was given the command of the " Alexander " brig in the Arctic expedition under Captain (afterwards Sir) John Ross. This expedition returned to England without having made any new discoveries but Parry, confident, as he expressed it, "that attempts at Polar discovery had been hitherto relinquished just at a time when there was the greatest chance of succeeding," in the following year obtained the chief command of a new Arctic expedition, consisting of the two ships " Griper " and " Hecla." This expedition returned to England in November 1820 after a voyage of almost unprecedented Arctic success (see Polar Regions), having accomplished more than half the journey from Greenland to Bering Strait, the completion of which solved the ancient problem of a North-west Passage. A narrative of the expedition, entitled Journal of a Voyage to discover a North-west Passage, appeared in 1821. Upon his return Lieutenant Parry was promoted to the rank of commander. In May 182 1 he set sail with the " Fury " and " Hecla " on a second expedition to discover a North-west Passage, but was compelled to return to England in October 1823 without achieving his purpose. During his absence he had in November 182 1 been promoted to post rank, and shortly after his return he was appointed acting hydrographer to the navy. His Journal of a Second Voyage, &c, appeared in 1824. With the same ships he undertook a third expedition on the same quest in 1824, but was again unsuccessful, and the " Fury " being wrecked, he returned home in October 1825 with a

double ship's company. Of this voyage he published an account in 1826. In the following year he obtained the sanction of the Admiralty for an attempt on the North Pole from the northern shores of Spitzbergen, and his extreme point of 82 45′ N. lat. remained for 49 years the highest latitude attained. He published an account of this journey under the title of Narrative of the Attempt to reach the

North Pole, &c. (1827). In April 1829 he was knighted. He was subsequently selected for the post of comptroller of the newly created department of steam machinery of the Navy, and held this office until his retirement from active service in 1846, when he was appointed captain-superintendent of Haslar Hospital. He attained the rank of rear-admiral in 1852, and in the following year became a governor of Greenwich Hospital, and retained this post till his death on the 8th of July 1855. The religious side of Sir Edward Parry's character was strongly marked, and besides the journals of his different voyages he was also the author of a Lecture to Seamen, and Thoughts on the Parental Character of God.

See Memoirs of Rear-Admiral Sir W. E. Parry, by his son, Rev. Edward Parry (3rd ed., 1857).

PARRY (from Fr. parer, to ward off), to turn aside a blow from a weapon. The term is used especially of a defensive movement of the sword or foil in fencing, hence, by transference, to ward off any attack, to turn aside an objectionable question. (See Fencing, &c.)

PARSEES, or Parsis, the followers in India of Zoroaster (Zarathustra), being the descendants of the ancient Persians who emigrated to India on the conquest of their country by the Arabs in the 8th century. They first landed at Sanjan on the coast of Gujarat, where the Hindu rulers received them hospitably. To this day their vernacular language is Gujarati, which they have cultivated in literature and journalism. Their settlement in Bombay dates only from the British occupation of that island. In 1 901 the total number of Parsees in all India was 94,000, of whom all but 7000 were found in the Bombay presidency and the adjoining state of Baroda, the rest being widely scattered as traders in the large towns.

Among Parsees the men are well formed, active, handsome and intelligent. They have light olive complexions, a fine aquiline nose,

bright black eyes, a well-turned chin, heavy arched eyebrows, thick sensual lips, and usually wear a light curling moustache. The women are delicate in frame, with small hands and feet, fair complexions, beautiful black eyes, finely arched eyebrows, and a profusion of long black hair, which they dress to perfection, and ornament with pearls and gems. The Parsees are much more liberal in their treatment of women than any other Asiatic race; they allow them to appear freely in public, and leave them the entire management of household affairs.

The characteristic costume of the Parsees (now frequently abandoned) is loose and flowing, very picturesque in appearance, and admirably adapted to the climate in which he lives. The head is covered with a turban, or a cap of a fashion peculiar to the Parsees; it is made of stiff material, something like the European hat, without any rim, and has an angle from the top of the forehead backwards. It would not be respectful to uncover in presence of an equal, much less of a superior. The colour is chocolate or. maroon, except with the priests, who wear a white turban.

A Parsee must be born upon the ground floor of the house, as the teachings of their religion require life to be commenced in humility, and by ” good thoughts, words and actions ” alone can an elevated position be attained either in this world or the next. The mother is not seen by any member of the family for forty days. Upon the seventh day after the birth an astrologer is invited to cast the nativity of the child. He has first to enumer- ate the names which the child may bear, so that the parents may make choice of one of them. Then he draws on a wooden board a set of hieroglyphs in chalk, and his dexterity in counting or recounting the stars under whose region or influence the child is declared to be born is marvelled at by the superstitious creatures thronging around him. This document is preserved in the family archives as a guidance and encouragement to the child through life. At the age of seven or thereabouts, according to the judgment of the priest, the first religious ceremony is performed upon the young Parsee. He is first subjected to the process of purification, which consists of an ablution with nirang (cow-urine). The ceremony consists in investing him with the kusti, or girdle of his faith. This is a cord,

woven by women of the priestly class, composed of seventy-two threads, representing the seventy-two chapters of the Yasna, a portion of the Zend-Avesta, in the sacredness of which the young neophyte is figuratively bound. The priest ties the cord around the waist as he pronounces the benediction upon the child, throw- ing upon his head at each sentence slices of fruit, seeds, perfumes and spices. He is thus received into the religion of Zoroaster, and is henceforth considered

morally accountable for his acts. If a child die before the performance of this ceremony he is considered to have gone back to Ahura-Mazda, who gave him, as pure as he entered into this world, having not reached the age of accountability.

The marriages of children engage the earliest attention of the parents. The wedding day having been fixed by an astrologer, who consults the stars for a happy season, a Parsee priest goes from house to house with a list of the guests to be invited, and delivers the invitations with much ceremony. The father of the bride waits upon near relatives and distinguished personages, soliciting the honour of their attendance. A little before sunset a procession is formed at the house of the bridegroom, and proceeds with a band of music, amid great pomp and ceremony, to the house of the bride's father. Here a number of relatives and friends are collected at the door to receive the bridegroom with due honour. Presents are sent before, according to the time-honoured custom of the East. Upon the arrival of the procession at the house of the bride the gentlemen gallantly remain outside, leaving room for the ladies to enter the bouse as the escort of the bridegroom. As he passes the threshold his future mother-in-law meets him with a tray filled with fruits and rice, which she strews at his feet. The fathers of the young couple are seated side by side, and between them stands the priest ready to perform the ceremony. The young couple are seated in two chairs opposite each other, their right hands tied together by a silken cord, which is gradually wound around them as the ceremony progresses, the bride in the meantime being concealed with a veil of silk or muslin. The priest lights a lamp of incense, and repeats the nuptial benediction first in Zend and then in Sanskrit. At the conclusion of the ceremony they each throw upon the other some grains of rice, and the most expeditious in performing this feat is considered to have got the start of the other in the future control of the household, and receives the applause of the male or female part of the congregation as the case may be. The priest now throws some grains of rice upon the heads of the married pair in token of wishing them abundance; bouquets of flowers are handed to the assembled guests, and rose- water is showered upon them. The bride and bridegroom now break some sweetmeats, and, after they have served each other, the company are invited to partake of refreshments. At the termination of this feast the procession re-forms, and with lanterns and music escorts the bridegroom back to his own house, where they feast until midnight. As midnight approaches they return to the house of the bride, and escort her, with her dowry, to the house cf the bridegroom, and, having delivered her safely to her future lord and master, disperse to their respective homes. Eight days afterwards

a wedding feast is given by the newly- married couple, to which only near relatives and particular friends are invited. This feast is composed entirely of vegetables, but at each course the wine is served, and toasts are proposed, as ” happiness to the young couple,” &c.

The funeral ceremonies of the Parsees are solemn and imposing. When the medical attendant declares the case hopeless a priest advances to the bed of the dying man, repeats sundry texts of the Zend-Avesta, the substance of which tends to afford him con- solation, and breathes a prayer for the forgiveness of his sins. After life is extinct a funeral sermon is delivered by the priest, in which the deceased is made the subject of an exhortation to his relatives and friends to live pure, holy and righteous lives, so that they may hope to meet again in paradise. The body is then taken to the ground floor where it was born, and, after being washed and perfumed, is dressed in clean white clothes, and laid upon an iron bier. A dog is brought in to take a last look at his inanimate master in order to drive away the evil spirits. This

ceremony is called sagddd. A number of priests attend and repeat prayers for the repose of the soul of the departed. All the male friends of the deceased go to the door, bow down, and raise their two hands from the floor to their heads to indicate their respect for the departed. The body, when put upon the bier, is covered over from head to foot. Two attendants bring it out of the house, holding it low in their hands, and deliver it to four pall-bearers, called nasasaldr, clad in well-washed, white clothes. A procession is formed by the male friends of the deceased, headed by a number of priests in full dress, to follow the body to the dakhma, or “tower of silence.” In Bombay these towers are erected in a beautiful garden on the highest point of Malabar Hill, amid trees swarming with vultures; they are constructed of stone, and rise some 25 ft. high, with a small door at the side for the entrance of the body. Upon arriving at the ” tower of silence ” the bier is laid down, and prayers are said in the sagri, or house of prayer, containing a fire-sanctuary, which is erected near the entrance to the garden. The attendants then raise the body to its final resting-place, lay it upon its stony bed, and retire. A round pit about 6 ft. deep is surrounded by an annular stone pavement about 7 ft. wide, on which the body is exposed to the vultures, where it is soon denuded of flesh, and the bones fall through an iron grating into a pit beneath, from which they are afterwards removed into a subterranean entrance prepared for their reception. On the third day after death an assemblage of the

relatives and friends of the deceased takes place at his late residence, and thence proceed to the Atish-bahrdm, or ” fire- temple.” The priests stand before the urns in which the celestial fire is kept burning, and recite prayers for the soul of the departed. The son or adopted son of the deceased kneels before the high- priest, and promises due performance of all the religious duties and obsequies to the dead. The relatives and friends then hand the priest a list of the contributions and charities which have been subscribed in memory of the deceased, which concludes the cere- mony of ” rising from mourning,” or ” the resurrection of the dead.” On each successive anniversary of the death of a Parsee funeral ceremonies are performed in his memory. An iron frame- work is erected in the house, in which shrubs are planted and flowers cultivated to bloom in memory of the departed. Before the frame, on iron stands, are placed copper or silver vases, filled with water and covered with flowers. Prayers are said before these iron frames two or three times a day. These ceremonies are called muktad, or ” ceremonies of departed souls.”

The Parsees of India are divided into two sects, the Shenshahis and the Kadmis. They do not differ on any point of faith; the dispute is confined to a quarrel as to the correct chronological date for the computation of the era of Yazdegerd, the last king of the Sassanian dynasty, who was dethroned by the caliph Omar about a.d. 640. The difference has been productive of no other inconvenience than arises from the variation of a month in the celebration of the festivals. The Parsees compute time from the fall of Yazdegerd. Their calendar is divided into twelve months of thirty days each; the other five days, being added for holy days, are not counted. Each day is named after some particular angel of bliss, under whose special protection it is passed. On feast days a division of five watches is made under the protection of five different divinities. In midwinter a feast of six days is held in commemoration of the six periods of creation. About the 21st of March, the vernal equinox, a festival is held in honour of agriculture, when planting begins. In the middle of April a feast is held to celebrate the creation of trees, shrubs and flowers. On the fourth day of the sixth month a feast is held in honour of Sahrevar, the deity presiding over mountains and mines. On the sixteenth day of the seventh month a feast is held in honour of Mithra, the deity presiding over and directing the course of the sun, and also a festival to celebrate truth and friend- ship. On the tenth day of the eighth month a festival is held in honour of Farvardin, the deity who presides over the departed souls of men. This day is especially set apart for the perform- ance of ceremonies for the dead. The people attend on the hills where the ” towers of silence ” are situated, and perform in the

sagris prayers for the departed souls. _ The Parsee scriptures

require the last ten days of the year to be spent in doing deeds of charity, and in prayers of thanksgiving to Ahura-Mazda. On the day of Yazdegerd, or New Year's Day, the Parsees emulate the western world in rejoicing and social intercourse. They rise early, and after having performed their prayers and ablutions dress themselves in a new suit of clothes, and sally forth to the " fire-temples," to worship the emblem of their divinity, the sacred fire, which is perpetually burning on the altar. Unless they duly perform this ceremony they believe their souls will not be allowed to pass the bridge " Chinvad," leading to heaven. After they have performed their religious services they visit their relations and friends, when the ceremony of hamijur, or joining hands, is performed. The ceremony is a kind of greeting by which they wish each other " a happy new year." Their relatives and friends are invited to dinner, and they spend the rest of the day in feasting and rejoicing; alms are given to the poor, and new suits of clothes are presented to servants and dependants.

There are only two distinct classes among the Parsees — the priests (dasturs, or high priests; mobeds, or the middle order; and herbads, or the lowest order) and the people (behadin, behdin, or " followers of the best religion "). The priestly office is hereditary, and no one can become a priest who was not born such; but the son of a priest may become a layman.

The secular affairs of the Parsees are managed by an elective committee, or panchayat, composed of six dasturs and twelve mobeds, making a council of eighteen. Its functions resemble the Venetian council of ten, and its objects are to preserve unity, peace and justice amongst the followers of Zoroaster. One law of the panchayat is singular in its difference from the custom of any other native community in Asia; nobody who has a wife living shall marry another, except under peculiar circumstances, such as the barrenness of the living wife, or her immoral conduct. Recently a serious difference arose among the Parsees of Bombay on the question of proselytism. A Parsee had married a French lady, who took the necessary steps to adopt the religion of her husband. But it was decided by the High Court, after prolonged argument, that, though the creed of Zoroaster theoretically admitted proselytes, their admission was not consistent with the practice of the Parsees in India.

Their religion teaches them benevolence as the first principle, and no people practise it with more liberality. A beggar among the Parsees is unknown, and would be a scandal to the society. The sagacity, activity

and commercial enterprise of the Parsees are proverbial in the East, and their credit as merchants is almost unlimited. In this connexion may be mentioned the well-known names of Sir Jamsetjee Jeejeebhoy and Sir Dinshaw Petit, both baronets, and also of J. N. Tata, founder of the Institute of Scientific Research at Bangalore.

The Parsees have shown themselves most desirous of receiving the benefits of an English education; and their eagerness to embrace the science and literature of the West has been con- spicuous in the wide spread of female education, and in the activity shown in studying their sacred writings in critical texts. In recent years many have taken to the professions of law and medicine, and a Parsee barrister was appointed a judge of the High Court at Bombay in 1906. Two Parsees have also been the only natives of India elected to the House of Commons.

See Menant, Les Parsis (Paris, 1898); Dosabhai Framji Karaka, History of the Parsees (London, 1884); Seervai and Patel, Gujarat Parsees from the Earliest Times (Bombay, 1898).

PARSIFAL BELL-INSTRUMENT . (Ger. Parsifal Klavier Instrument), a stringed instrument ingeniously constructed by Schweisgut, of Carlsruhe, from Dr Mottl's design, as a substitute for the church bells in Wagner's Parsifal. This instrument has been constructed somewhat on the principle of the grand piano; the massive frame is shaped like a billiard table. There are five notes, each with six strings, three in unison giving the fundamental note and three an octave higher. The strings are struck by large hammers, covered with cotton-wool, which the performer sets in motion by a strong elastic blow from his fist. The hammers are attached to arms 22 in. long, screwed to a

strong wooden span bridge placed horizontally above the strings at about two-fifths of the length from the front. On the point of the arm is the name of the note, and behind this the felt ledge struck by the fist. Two belly bridges and two wrest-plank bridges, one set for each octave, determine the vibrating length of the strings, and the belly bridge, as in other stringed instru- ments, is the medium through which the vibrations of the strings are communicated to the soundboard. The arrangement of pegs and wrest-pins is much the same as on the piano.

The realism demanded by modern dramatic music taxes the resources of the orchestra to the utmost when the composer aims at reproducing on the stage the effect of church bells, as, for instance, in the Golden Legend, Cavalleria rusticana, Pagliacci, Rienzi and Parsifal. The most serious difficulty of all arose in the last-mentioned drama, where the solemnity of the scene and its deep religious significance demand a corresponding atmo- sphere on the stage. Real church bells for the notes Wagner has scored in the familiar chime would overpower the orchestra. All substitutes for bells were tried in vain; no other instrument, leaving aside the question of pitch, gave a tone in the least similar to that of the bell. Independently of the rich harmonics composing the clang, the bell has two distinct simultaneous notes, first the tap tone, which gives the pitch, and the hum tone or lower accompanying note. On the interval separating the hum from the tap tone depend the dignity and beauty of the bell tone and the emotional atmosphere produced. A stringed instrument, similar to the one here described but with four notes only,. was used at Bayreuth for the first performance of Parsifal, and with it tam-tams or gongs, but after many trials the following combination was adopted as the best makeshift: (i) the stringed instrument with four keys; (2) four tam-tams or gongs tuned to the pitch of the four notes composing the chime; (3) a bass-tuba, which plays the notes staccato in quavers to help make them more distinct; (4) a fifth tam-tam, on which a roll is executed with a drumstick.

The special peal of hemispherical bells constructed for Sir A. Sullivan's Golden Legend is the only other successful substitute known to the writer; the lowest of these bells is a minor tenth higher than the lowest note required for Parsifal, and the aggregate weight of the four bells is 11 cwt. The bells are struck with mallets and have both tap and hum tone. (K. S.)

PARSIMONY, LAW OF (Lat. parsimonia, from parcere, to save), the name given to William of Occam's principle " Entia non sunt multiplicanda praeter necessitatem," i.e. that it is scientifically unsound to set up more than one hypothesis at once to explain a phenomenon. This principle is known as " Occam's razor " (see Occam, William of).

PARSLEY, a hardy biennal herb known botanically as Petroselinum sativum (natural order Umbelliferae), the leaves of which are much used for garnishing and flavouring. It occurs as a garden escape in waste places in Britain and it is doubtful if it is known anywhere as a truly wild plant; A. de Candolle, however (Origin of Cultivated Plants) considers it to be wild in the Mediterranean region. It grows best in a

partially shaded position, in good soil of considerable depth and not too light; a thick dressing of manure should be given before sowing. For a continuous supply three sowings should be made, as early in February as the weather permits, in April or early in May and in July — the last for the winter supply in a sheltered position with southern exposure. Sow thinly in drills from 12 to 15 in. apart and about 1 in. deep; thin out to 3 in. and finally to 6 in. each. In winter the plants should be protected by frames or hand-glasses. The curled and mossy-leaved varieties are preferable. The Hamburg or turnip-rooted variety is grown for the root, which is cut up and used for flavouring.

PARSNIP, botanically known as Pastinaca sativa (or Peuce- danum sativum), a member of the natural order Umbelliferae, found wild in roadsides and waste places in England and through- out Europe and temperate Asia, and as an introduced plant in North America. It has been cultivated since the time of the Romans for the sake of its long fleshy whitish root, which has a peculiar but agreeable flavour. It succeeds best on a free sandy

loam, which should be trenched and manured in the previous autumn, the manure being well buried. The seed should be sown thinly in March, in rows 15 to 18 in. apart, and finally thinned out to 1 ft. apart. The leaves will decay in October or November, when a portion of the roots may be taken up and stored in dryish sand for immediate use, the rest being left in the ground, to be taken up as required, but the whole should be removed by February to a dry cool place, or they will begin to grow. The best sorts are the Hollow-crowned, the Maltese and the Student. Dusting the ground with soot when sowing the seed and again when the leaves appear will keep the plants free from pests.

PARSON, a technical term in English law for the clergyman of the parish. It is a corruption of persona, the parson being, as it were, the persona ecclesiae, or representative of the Church in the parish. Parson imparsonee (persona impersonata) is he that as rector is in possession of a church parochial, and of whom the church is full, whether it be presentative or impropriate (Coke upon Littleton, 300 b). The word parson is properly used only of a rector. A parson must be in holy orders; hence a lay rector could not be called a parson. There are four requisites to the appointment of a parson, viz. holy orders, presentation, institution and induction. The parson is tenant for life of the parsonage house, the glebe, the tithes and other dues, so far as they are not appropriated.

See also Rector ; Vicar ; Benefice ; and Tithes.

PARSONS (or Persons), ROBERT (1546-1610), English Jesuit and political agitator, son of a blacksmith, was born at Nether Stowey, Somerset, on the 24th of June 1546. The vicar of the parish gave him instruction and procured his entrance in 1563 as an exhibitioner to Balliol College, Oxford. He graduated B.A. in 1568, and M.A. in 1572. He was fellow, bursar and dean of his college, but in 1574 he resigned or was dismissed his fellow- ship and offices, for reasons which have been disputed, some alleging improprieties of conduct, and others suspected disloyalty. Soon after his resignation he went to London, and thence in June to Louvain, where he entered the Roman Catholic Church and spent some time in the company of Father William Good, a Jesuit. In July 1575 he entered the Jesuit Society at Rome. In 1580 he was selected, along with Edmund Campion, a former associate at Oxford, and others, to undertake a secret religious and political mission to England. The two emissaries engaged in political intrigue in England and on the Continent. In 1581 Campion was arrested, but Parsons made his escape to Rouen, whence he returned to Rome, where he continued to direct the English mission. In 1588 he went to Spain, where he remained for nine years, founding seminaries for the training of English priests at Valladolid, Lucar, Seville, Lisbon and St Omer. On the death of Cardinal Allen in 1 594 he made strenuous efforts to be appointed his successor. He failed in this, but was made rector of the English college at Rome in 1597, and died there on the 18th of April 1610

Parsons was the author of over 30 polemical writings, mostly tracts. Among the more important are Certayne Reasons why Cutholiques refuse to goe to Church (Douai. 1580), A Christian Direc- torie guiding Men to their Saluation (London, 1583-1591, 2 parts), A Conference about the Next Succession to the Crowne of Ingland (‘594)1 Treatise of the Three Conversions of England (1603-1604, 3 parts), an answer to Foxe’s Acts and Monuments. For portrait, see Gentleman’ s Magazine, lxiv.

PARSONS, THEOPHILUS (1750-1813), American jurist, was born in Byfield, Massachusetts, on the 24th of February 1750, the son of a clergyman. He graduated from Harvard College in 1769, was a schoolmaster at Falmouth (now Portland), Maine, in 1770-1773, studied law, and was admitted to the bar in 1774. In 1800 he removed to Boston. He was chief justice of the supreme court of Massachusetts from 1806 until his death in Boston on the 30th of October 1813. In politics he took an active part as one of the Federalist leaders in the state. He was a member of the Essex County convention of 1778, called to protest against the proposed state constitution, and as a member of the ” Essex Junto ” was probably the author of The Essex

Result, which helped to secure the rejection of the constitution at the polls. He was a member of the state constitutional conven- tion of 1779-1780, and one of the committee of twenty-six which drafted the constitution; he was also a delegate to the state convention of 1788 which ratified the Federal Constitution; and according to tradition was the author of the famous ” Conciliatory Resolutions,” or proposed amendments to the constitution, which did much to win over Samuel Adams and John Hancock to the side of ratification. His Commentaries on the Laws of the United States (1836) contains some of his more important legal opinions.

His son Theophilus Parsons (1797-1882), who was Dane professor of law at Harvard from 1848 to 1870, is remembered chiefly as the author of a series of useful legal treatises, and some books in support of Swedenborgian doctrines; he wrote a life of his father (Boston, 1859).

PARSONS, a city of Labette county, in south-eastern Kansas, U.S.A., situated at the junction of the Big and Little Labette creeks, about 138 m. S. by W. of Kansas City. Pep. (1890), 6736; (1900), 7682, of whom 807 were negroes; (1905), 11,720; (1910), 12,463. It is served by the Kansas City, Fort Scott & Memphis (St Louis & San Francisco system) and the Missouri Kansas & Texas railways. The city has large machine shops of the Missouri Kansas & Texas railway and various manufactures. Natural gas is utilized for light and heat. The first settlement on the site of the city was made in 1869 and was called Mendota (” place of meeting ” — i.e. of the creeks). In 1871 the city was chartered, and in 1910 government by commission went into effect. It was named in honour of Levi Parsons (1822-1887), the first president of the Missouri Kansas and Texas railway.

PARTABGARH, or Pertabgarh, a native state of India, in the Rajputana agency. Area, 886 sq. m.; pop. (1901), 52,025, showing a decrease of 40% in the decade, owing to the effects of famine. The inhabitants are mostly Bhils and other aboriginal tribes. Estimated revenue, £12,000. The town of Partabgarh (pop., 9819) is connected by a metalled road (20 m.) with the station of Mandasor on the Rajputana railway. It has a reputation for a special kind of enamelled jewelry.

PARTABGARH, Pertabgarh, or Pratapgarh, a district of British India in the Fyzabad division of the United Provinces. The administrative

headquarters are at Bela. Area, 1442 sq. m. ; pop. (1901), 912,848. The Ganges forms the south-western boundary line, while the Gumti marks the eastern boundary for a few miles. The only mineral products are salt, saltpetre and kankar or nodular limestone. The principal crops are rice, barley, pulse, millets, sugar-cane and poppy. The district is traversed by the branch of the Oudh & Roliilkhand railway from Rae Bareilly to Benares, opened in 1898. There are manufactures of sugar and a little silk; and grain, opium, oil- seeds, hemp and hides are exported.

See Partabgarh District Gazetteer (Allahabad, 1904).

PARTERRE, a term, taken from the French phrase par terre, i.e. on the surface of the ground, and used of an arrangement in a garden of beds of flowers with gravel or other paths and plots of grass; also of that part of the auditorium of a theatre which is occupied by the orchestra stalls.

PARTHENAY, a town of western France, capital of an arron- dissement in the department of Deux-Sevres, 27 m. N.N.E. of Niort, on the railway between that town and Saumur. Pop. (1906), 5615. The town retains considerable portions of its fine 13th-century ramparts, including the Porte St Jacques, a fortified gateway guarding an old bridge over the Thouet. Amongst ancient buildings of interest are the church of Ste Croix, of the 1 2th century, restored in 1885, with a 15th-century belfry; the church of St Laurent, also restored in modern times, portions of whose walls date from the nth century; the ruined Romanesque portal of Notre-Dame de la Couldre; and 1 m. south-west of the town the ancient church (12th century) of Parthenay-le-Vieux. The manufacture of woollen goods and wool-spinning are the principal local industries.

PARTHENIUS, of Nicaea in Bithynia, Greek grammarian and poet. He was taken prisoner in the Mithradatic War and

carried to Rome (72 B.C.): subsequently he visited Neapolis, where he taught Virgil Greek. Parthenius was a writer of elegies, especially dirges, and of short epic poems. The pseudo-Virgilian Moretum and Ciris were imitated from his Mvttwtos and MeTa//op$

See E. Martini in Mythographi graeci, vol. ii. (1902, in Teubner Series); poetical fragments in A. Meineke, Analecta alexandrina

(1853).

PARTHENON (Hapdevuv), the name generally given, since the 4th

century B.C., to the chief temple of Athena on the Acropolis at Athens (e.g. Demosthenes, c. Androt. 13, 76). The name is applied in the official inventories of the 5th and early 4th centuries to one compartment of the temple, and this was probably its original meaning. It is certainly to be associated with the cult of Athena Parthenos, ” the Virgin,” though it is not clear why the name was given to this particular chamber.

The most convenient position for a temple upon the natural rock - platform of the Acropolis was occupied by the early temple of Athena. When it was decided to supersede this by a larger and more magnificent temple, it was necessary to provide a site for this new temple by means of a great substructure, which is on its south side about 40 ft. high. This substructure was not

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built for the present temple, but for an earlier one, which was longer and narrower in shape; there has been much discussion as to the date of this earlier temple; F. C. Penrose maintained that it was the work of Peisistratus. Some have thought that it dated from the time immediately after the Persian wars; but the fact that portions of its columns and entablature, damaged by fire, were built into the north wall of the Acropolis by Themi- stocles seems to prove that it dates from the 6th century, whether it be the work of the tyrants or of the renewed democracy under Cleisthenes.

The extant temple was the chief among the buildings with which Pericles adorned the Acropolis. The supervision of the whole work was in the hands of Pheidias, and the architects of the temple were Ictinus and Caliicrates. The actual building was not begun until 447 B.C., though the decision to build was made ten years earlier (Keil, Anonynus argentorensis). The temple must have been structurally complete by the year 438 B.C., in which the gold and ivory statue of Athena Parthenos was dedi- cated; but the work of decoration and finish was still going on in 433 B.C. The temple as designed by Ictinus was about 15 ft. shorter and about 6 ft. wider than the building for which the foundations were intended; it thus obtained a proportion of length to breadth of exactly 9:4. It is the most perfect example of the Doric order (see Architecture: Greek). The plan of the temple was peculiar. The cella, which was exactly 100 ft. long, kept the name and traditional measurement of the old Hecatom- pedon. It was surrounded on three sides by a Doric colonnade, and in the middle of it was the great basis on which the statue was erected. This cella was probably lighted only by the great doorway and by the light that

filtered through the marble tiles. The common notion that there was a hypaethral opening is

erroneous. At the back of the cella was a square chamber, not communicating with it, but entered from the west end of the temple; this was the Parthenon in the narrower sense. It seems to have been used only as a store-house, though it may have been originally intended for a more important purpose. The Prodo- mus and the Opisthodomus were enclosed by bronze gratings fixed between the columns, and were thus adapted to contain valuable offerings and other treasures. We have inventories on marble of the contents of these four compartments of the temple. The opisthodomus, in particular, probably served as a treasury for sacred and other money, though it has been disputed whether the opisthodomus mentioned in the inscriptions is part of the Parthenon or another building.

For the sculptures decorating the Parthenon and the statue by Pheidias in the cella, see article Greek Art. The metopes over the outer colonnade were all sculptured, and represented on the east the battle of gods and giants, on the west, probably, the battle of Greeks and Amazons, on the south Greeks and Centaurs; those on the north are almost lost. The east pediment repre- sented the birth of Athena, the west pediment her contest with Poseidon for the land of Attica. The frieze, which was placed above the cella wall at the sides, represented the Panathenaic procession, approaching on three sides the group of gods seated in the middle of the east side. These sculptures are all of them admirably adapted to their position on the building, and are, in themselves, the most perfect works that sculpture has ever produced.

The Parthenon probably remained intact until the 5th century of our era, when the colossal statue was removed, and the temple is said to have been transformed into a church dedicated to St Sophia. In the 6th century it was dedicated to the Virgin Mother of God (©eoroicos) . The adaptation of the building as a church involved the removal of the inner columns and roof, the construction of an apse at the east end, and the opening of a door between the cella and the chamber behind it. These alterations involved some damage to the sculptures. In 1456 Athens was captured by the Turks, and the Parthenon was consequently changed into a mosque, apparently without any serious structural alterations except the addition of a minaret. In this state it was described by Spon and Wheler in 1676 and the sculpture was

drawn by the French artist Carrey in 1674. In 1687 the Turks used the building as a powder magazine during the bombard- ment of the Acropolis by a Venetian army under Morosini, and a shell caused the explosion which blew out the middle of the temple and threw down the columns at the sides. Still further damage to the sculptures was done by Morosini's unsuccessful attempt to lower from the west pediment the chariot of Athena. Later a small mosque was constructed in the midst of the ruins; but nothing except gradual damage is to be recorded during the succeeding century except the visits of various travellers, notably of James Stuart (1 713-1788) and Nicholas Revett (1720-1804), whose splendid drawings are the best record of the sculpture as it existed in Athens. In 1801 Lord Elgin obtained a firman authorizing him to make casts and drawings, and to pull down extant buildings where necessary, and to remove sculpture from them. He caused all the remains of the sculpture to be found on the ground or in Turkish houses, and a certain amount— notably the metopes — that was still on the temple, to be transported to England. Some fault has been found with his methods or those of his workmen; but there is no doubt that the result was the preservation of much that would otherwise have been lost. The Elgin marbles were bought by the British government in 1816, and are now in the British Museum. Certain other sculptures from the Parthenon are in the Louvre, Copenhagen or elsewhere, and much is still in Athens, either still on the temple or in the Acropolis museum.

The most accurate measurements of the temple, showing the exactness of its construction and the subtlety of the curvature of all its lines, was made by F. C. Penrose.

Authorities. — A. Michaelis, dir Parthenon (Leipzig, 1871); T. Stuart and N. Revett, Antiquities of Athens (London, 1762-1815); F- C Penrose, Principles of Athenian Architecture (London, 1 851 and

1888); A. S. Murray, The Sculptures of the Parthenon (London. 1903); British Museum, Catalogue of Sculpture, vol. 1. See also Greek Art. (E. Gr.)

PARTHIA, the mountainous country S.E. of the Caspian Sea, which extends from the Eiburz chain eastwards towards Herat, and is bounded on the N. by the fertile plain of Hyrcania (about Astrabad) at the foot of the mountains in the corner of the Caspian and by the Turanian desert; on the S. by the great salt desert of central Iran. It corresponds to the modern Khorasan. It was inhabited by an Iranian tribe, the Parthava of the inscriptions of Darius; the correct Greek form is Hapdvatoi. Parthia became a province of the Achaemenian

and then of the Macedonian Empire. Seleucus I. and Antiochus I. founded Greek towns: Soteira, Charis, Achaea, Calliope (Appian, Syr. 57; Plin. vi. 15; cf. Strabo xi. 516); the capital of Parthia is known only by its Greek name Hecatompylos (" The Hundred- gated ") from the many roads which met there (Polyb. x. 28), and was, according to Appian, founded by Seleucus I. (cf. Curtius vii. 2). In 208 many Greek inhabitants are found in the towns of Parthia and Hyrcania (Polyb. x. 31, n).

When about 255 B.C. Diodotus had made himself king of Bactria (q.v.). and tried to expand his dominions, the chieftain of a tribe 6f Iranian nomads (Dahan Scyths) east of the Caspian, the Parni or Aparni, who bore the Persian name Arsaces, fled before him into Parthia. 1 Here the satrap Andragoras appears to have shaken off the Seleucid supremacy, as he struck gold and silver coins in his own name, on which he wears the diadem, although not the royal title (Gardner, Numism. Chronicle, 1879- 1881). In Justin xii. 4, 12, Andragoras is wrongly made satrap of Alexander, of Persian origin, and ancestor of Arsaces. He was slain by Arsaces (Justin xli. 4), who occupied Parthia and became the founder of the Parthian kingdom. The date 248 B.C. given by the list of the Olympionicae in Euseb. Chron. i. 207, and in his Canon, ii. 120 (cf. Appian, Syr. 65; Justin, xli. 4, gives wrongly 256 B.C.), is confirmed by numerous Babylonian tablets dated simultaneously from the Seleucid and Arsacid eras (cf. Mahler, in Wiener Zeitschrift fur die Kunde des Morgenlands, iqoi, xv. 57 sqq.; Lehmann Haupt in Beitriige zur alten Geschichte, 1905, v. 128 sqq.). The origin and early history of the Parthian kingdom, of which we possess only very scanty information, is surrounded by fabulous legends, narrated by Arrian in his Parthica (preserved in Photius, cod. 58, and Syn- cellus, p. 539 seq.). Here, Arsaces and his brother Tiridates are derived from the royal house of the Achaemenids, pro- bably from Artaxerxes II.; the young Tiridates is insulted by the prefect Agathocles or Pherecles; in revenge the brothers with five companions (corresponding to the seven Persians of Darius) slay him, and Arsaces becomes king. He is killed after two years and succeeded by his brother Tiridates, who reigns 37 years. There is scarcely anything historical in this account, perhaps not even the name Tiridates, for, according to the older tradition, Arsaces himself ruled for many years. The troubles of the Seleucid empire, and the war of Seleucus II. against Ptolemy III. and his own brother Antio- chus Hierax, enabled him not only to maintain himself in Parthia, but also to conquer Hyrcania; but he was constantly threatened by Diodotus of Bactria (Justin xli. 4). When, about 238 B.C., Seleucus II. was able to march into the east, Arsaces fled to the nomadic tribe of

the Aspasiacae (Strabo xi. 513; cf. Polyb. x. 48). But Seleucus was soon recalled by a rebellion in Syria, and Arsaces returned victorious to Parthia; ” the day of this victory is celebrated by the Parthians as the beginning of their inde- pendence ” (Justin xli. 4). Arsaces was proclaimed king at Asaak in the district of Astauene, now Kuchan in the upper A trek (Attruck) valley (Isidor. Charac), and built his residence Dara on a rock in a fertile valley in Apavarktikene (Justin xli. 5; Plin. vi. 46), now Kelat still farther eastward; the centre of his power evidently lay on the borders of eastern Khorasan and the Turan- ian desert. The principal institutions of the Parthian kingdom

1 Strabo xi. 515; cf. Justin xli. 4; the Parni are said by Strabo [ibid.] to have immigrated from southern Russia, a tradition wrongry transferred to the Parthians themselves by Justin xli. 1, and Arrian ap. Phot. cod. 58.

were created by him (cf. Justin xli. 2). The Scythian nomads became the ruling race; they were invested with large landed property, and formed the council of the king, who appointed the successor. They were archers fighting on horseback, and in their cavalry consisted the strength of the Parthian army; the infantry were mostly slaves, bought and trained for military service, like the janissaries and mamelukes. But these Scythians soon amalgamated with the Parthian peasants. They adopted the Iranian religion of Zoroaster (in the royal town Asaak an eternal fire was maintained), and “their language was a mixture of Scythian and Median ” (i.e., Iranian). Therefore their language and writing are called by the later Persians ” Pehlevi,” i.e. Parthian (Pehlevi is the modern form of Parthawa) and the magnates themselves Pehlevans, i.e. ” Parthians,” a term transferred by Firdousi to the heroes of the old Iranian legend. But the Arsacid kingdom never was a truly national state; with the Scythian and Parthian elements were united some elements of Greek civilization. The successors of Arsaces I. even founded some Greek towns, and when they had conquered Babylonia and Mesopotamia they all adopted the epithet ” Philhellen.”

To Arsaces I. probably belong the earliest Parthian coins; the oldest simply bear the name Arsaces; others, evidently struck after the coronation in Asaak, have the royal title (fiacriKkcas ‘ApaaKov). The reverse shows the seated archer, or occasionally an elephant; the head of the king is beardless and wears a helmet and a diadem; only from

the third or fourth king they begin to wear a beard after the Iranian fashion. In honour of the founder of the dynasty all his successors, when they came to the throne, adopted his name and officially (e.g. on the coins) are almost always called Arsaces, whereas the historians generally use their individual names.

Of the successors of Arsaces I. we know very little. His son, Arsaces II., was attacked by Antiochus III., the Great, in 209, who conquered the Parthian and Hyrcanian towns but at last granted a peace. The next king, whom Justin calls Priapatius, ruled 15 years (about 190-175); his successor, Phraates I., subjected the mountainous tribe of the Mardi (in the Elburz). He died early, and was succeeded not by one of his sons but by his brother, Mithradates I., who became the founder of the Parthian empire. Mithradates I. (c. 170-138) had to fight hard with the Greeks of Bactria, especially with Eucratides (q.v.) ; at last he was able to conquer a great part of eastern Iran. Soon after the death of Antiochus IV. Epiphanes (163) he conquered Media, where he ref ounded the town of Rhagae (Rai near Teheran) under the name of Arsacia; and about 141 he invaded Babylonia. He and his son Phraates II. defeated the attempts of Demetrius II. (139) and Antiochus VII. (1 29) to regain the eastern provinces, and extended the Arsacid dominion to the Euphrates.

For the later history of the Parthian empire reference should be made to Persia: Ancient History, and biographical articles on the kings. The following is a list of the kings, as far as it is possible to establish their succession.

The names of pretenders not generally acknowledged are put in brackets. Arsaces I. 248-e. 211 Vonones 1 8-1 1

(perhaps Tiridates I.) Artabanus II. . . c. 10-40

Arsaces II. . . .c. 211-190 (Tiridates III 36)

Priapatius .c. 190-175 (Cinnamus . . . . . 38)

Phraates I. . . .c. 175-170 (Vardanes 1 40-45)

Mithradates I. . .c. 170-138 Gotarzes 40-51

Phraates II. . . .c. 138-127 Vonones II 51

Artabanus I. . . .c. 127-124 Vologaeses I. ... 51-77 Mithradates II. the (Vardanes II 55)

Great . .. . .c. 124-88 * Vologaeses II. 77-79; m-147

Sanatruces 1 76-70 Pacorus . . . 78-e. 105

Phraates III 70-57 (Artabanus III. . . 80-81)

Orodes 1 57~37 Osroes . . . 106-129

(Mithradates HI. . . 57-54) (Mithradates IV. and his son

Phraates IV 37-2 Sanatruces II., 115; Partha-

(Tiridates II. . 32-31 and 26) maspates, 116-117; and other

Phraates V. (Phraa- pretenders.)

taces) . . .2 b.c-a.d. 5 Mithradates V. . . c. 129-147 Orodes II a.d. 5-7 Vologaeses III. . 147-191

1 The names of the following kings are not known; that one of them was called Artabanus II. is quite conjectural.

Vologaeses IV. . 191-209 Artabanus IV. . . 209-229

(Vologaeses V. . 209-c. 222)

Authorities. — Persian tradition knows very little about the Arsacids, who by it are called Ashkanians (from Ashak, the modern form of Arsaces.) Of modern works on the history of the Parthians (besides the numismatic literature) the most important are: G. Rawlinson, The Sixth Oriental Monarchy (1873), and A. von Gutschmid, Geschichte Irans und seine Nachbarlander von Alexander d. Gr. bis zum Untergang der Arsaciden (1888).

The principal works on the Arsacid coinage are (after the earlier publications of Longperier, Prokesch-Ostan, &c.) : Percy Gardner, The Parthian Coinage (London, 1877), and especially W. Wroth, Catalogue of the Coins of Parthia in the British Museum (London, 1903), who carefully revised the statements of his predecessors. Cf. also Petrowicz, Arsacidenmunzen (Vienna, 1904), and Allotte de la Fuye, ” Classement des monnaies arsacides,” in Revue numismatique, 4 sirie, vol. viii., 1904. (Ed. M.)

PARTICK (formerly Perdyc or Perthick), a municipal and police burgh of the parish of Govan, Lanarkshire, Scotland. Pop. (1891), 36,538; (1901), 54,298. It lies on the north bank of the Clyde, and is continuous with Glasgow, from which it is separated by the Kelvin,

and of which it is a large and wealthy residential suburb. Shipbuilding yards are situated in the burgh, which has also industries of paper-staining, flour-milling, hydraulic- machine making, weighing-machine making, brass-founding and galvanizing. The tradition is that the Hour-mills and granaries — the Bunhouse Mills — as they are called locally, were given by the Regent Moray to the bakers of Glasgow for their public spirit in supplying his army with bread at the battle of Langside in 1568. Victoria Park contains a grove of fossil trees which were discovered in a quarry. The town forms the greater part of the Partick division of Lanarkshire, which returns one member to Parliament. Though it remained a village till the middle of the 19th century, it is an ancient place. Morken, the Pictish king who persecuted St Kentigern, is believed to have dwelt here and, in 1136, David I. gave the lands of Partick to the see of Glasgow. The bishop's palace stood by the side of the Kelvin, and was occupied — or a mansion erected for him on its site — by George Hutcheson (1580-1639), founder of the Hutcheson Hospital in the city.

PARTISAN, or Partizan. (i) A thoroughgoing " party " man or adherent, usually in a depreciatory sense of one who puts his party before principles; (2) an irregular combatant or guerrilla soldier; (3) a weapon with a long shaft and a broad bladed head, of a type intermediate between the spear and the halberd (q.v.). In senses (1) and (2) the word is derived through the Fr. from Ital. partigiano, from parteggiare, to share, take part in, Lat. pars, part. The name for the weapon has also been attributed to the same origin, as being that used by " partisans," but there is no historical evidence for this. The form which the word now takes in French, pertuisane, has given rise to a connexion with pertuis, hole; Lat. pertusus, pertundere, to strike through. But the most probable derivation is from the Teutonic parta, barta, axe, which forms the last part of " halberd."

PARTITION, in law, the division between several persons of land or goods belonging to them as co-proprietors. It was a maxim of Roman law, followed in modern systems, that in communione vel societate nemo potest invitus detineri. Partition was either voluntary or was obtained by the actio communi dividendo. In English law the term partition applies only to the division of lands, tenements and hereditaments, or of chattels real between coparceners, joint tenants or tenants in common. It is to be noticed that not all hereditaments are capable of partition. There can be no partition of homage, fealty, or common of turbary, or of an inheritance of dignity, such as a peerage. Partition is either voluntary or compulsory. Volun- tary partition is effected by mutual conveyances, and can only be made where all parties are sui juris. Since the Real Property Act 1845, § 3, it

must be made by deed, except in the case of copyholds. Compulsory partition is effected by private act of parliament, by judicial process, or through the inclosure com- missioners. At common law none but coparceners were entitled to partition against the will of the rest of the proprietors, but the Acts of 31 Henry VIII. c. 1 and 32 Henry VIII. c. 32 gave a compulsory process to joint tenants and tenants in common of

freeholds, whether in possession or in reversion, by means of the writ of partition. In the reign of Elizabeth the court of chancery- began to assume jurisdiction in partition, and the writ of partition, after gradually becoming obsolete, was finally abolished by the Real Property Limitation Act 1833. The court of chancery could not decree partition of copyholds until the passing of the Copyholds Act 1 84 1 . This act was repealed by the Copyholds Act 1894, which empowers the alienation of ancient tenements with the licence of the lord. By the Judicature Act 1873, § 34, partition is one of the matters specially assigned to the chancery division. An order for partition is a matter of right, subject to the discretion vested in the court by the Partition Act 1868 (amended by the Partition Act 1876). By § 3 of the act of 1868 the court may, on the request of a party interested, direct a sale instead of a partition, if a sale would be more beneficial than a partition. By § 1 2 a county court has jurisdiction in partition where the property does not exceed £500 m value. Under the powers of the Inclosure Act 1845, and the acts amending it, the inclosure commissioners have power of enforcing compulsory partition among the joint owners of any inclosed lands. An order of the inclosure commissioners or a private act vests the legal estate, as did also the old writ of partition. But an order of the chancery division only declares the rights, and requires to be perfected by mutual conveyances so as to pass the legal estate. Where, however, all the parties are not sui juris, the court may make a vesting order under the powers of the Trustee Act 1850,

§3°-

Partition is not a technical term of Scots law. In Scotland division of common property is effected either extra-judicially, or by action of declarator and division or division and sale in the court of session, or (to a limited extent) in the sheriff courts. Rights of common are not divisible in English law without an act of parlia- ment or a decree of

the inclosure commissioners, but in Scotland the act of 1695, c. 38, made all commonties, except those belonging to the king or royal burghs, divisible, on the application of any having interest, by action in the court of session. By the Sheriff Courts (Scotland) Act 1877, § 8, the action for division of common property or commonty is competent in the sheriff court, when the subject in dispute does not exceed in value £50 by the year, or £1000 value. Runng lands, except when belonging to corporations, were made divisible by the act of 1695, c. 23. A decree of division of commonty, common property, or runrig lands has the effect of a conveyance by the joint proprietors to the several participants (Conveyancing [Scotland] Act 1874, § 35).

In the United States, " it is presumed," says Chancellor Kent, (4 Comm., lect. lxiv.), " that the English statutes of 31 & 32 Henry VIII. have been generally re-enacted and adopted, and probably with increased facilities for partition." In a large majority of the states, partition may be made by a summary method of petition to the courts of common law. In the other states the courts of equity have exclusive jurisdiction. As between heirs and devisees the pro- bate courts may in some states award partition. The various state laws with regard to partition v/ill be found in Washburn, Real Property, bk. i. ch. xiii., § 7.

PARTNERSHIP (earlier forms, partener, parcener, from Late Lat. parlionarius for partitionarius, from partitio, sharing, pars, part), in general, the voluntary association of two or more persons for the purpose of gain, or sharing in the work and profits of any enterprise. This general definition, however, requires to be further restricted, in law, according to the account given below.

The partnership of modern legal systems is based upon the societas of Roman law. Societas was either universorum bonorum, a complete communion of property; negotiationis alicujus, for the purpose of a single transaction; vectigalis, for the collection of taxes; or rei unius, joint ownership of a particular thing. The prevailing form was societas universorum quae ex quaestu veniunt, or trade partnership, from which all that did not come under the head of trade profit (quaestus) was excluded. This kind of societas was presumed to be contemplated in the absence of proof that any other kind was intended. Societas was a consensual contract, and rested nominally on the consent of the parties — really, no doubt (though this was not in terms acknowledged by the Roman jurists), on the fact of valuable consideration moving from each partner. No formalities were necessary for the constitution of a societas. Either property or labour must be contributed by the socius; if one

party contributed neither property nor labour, or if one partner was to share in the loss but not in the profit (leonina societas), there was no true societas. Societas was dissolved on grounds substantially the same as those of English law (see below). The only ground peculiar to Roman law was change of status (capitis deminutio). Most of the Roman law on the subject of societas is contained in Dig. xvii. tit. 2, Pro socio.

Though the English law of partnership is based upon Roman law, there are several matters in which the two systems differ.

(1) There was no limit to the number of partners in Roman law.

(2) In societas one partner could generally bind another only by express mandatum; one partner was not regarded as the implied agent of the others. (3) The debts of a societas were apparently joint, and not joint and several. (4) The heres of a deceased partner could not succeed to the rights of the deceased, even by express stipulation. There is no such dis- ability in England. (5) In actions between partners in Roman law, the beneficium compelentiae applied — that is, the privilege of being condemned only in such an amount as the partner could pay without being reduced to destitution. (6) The Roman partner was in some respects more strictly bound by his fiduciary position than is the English partner. For instance, a Roman partner could not retire in order to enjoy alone a gain which he knew was awaiting him. (7) There was no special tribunal to which matters arising out of societas were referred.

Previous to the Partnership Act 1890 the English law of partnership was to be found only in legal decisions and in textbooks. It was mostly the result of judge-made law, and as distinguished from the law of joint stock companies was affected by comparatively few acts of parliament.

In 1890 the Partnership Act of that year was passed to declare and amend the law of partnership; the act came into operation on the 1st of January 1891. With one important exception (§ 23), it applies to the whole United Kingdom. It is not a complete code of partnership law; it contains no provisions regulating the administration of partnership assets in the event of death or bankruptcy, and is silent on the subject of goodwill. The existing rules of equity and common law continue in force, except so far as they are inconsistent with the express provisions of the act. Indeed, the act of 1890 has to be read in the light of the decisions which have built up these rules. On all points specifically dealt with by the act it is now the one binding authority. The act has made no important changes in the law, except in respect of the mode of making a partner's share of the partnership assets available for pay- ment of his separate debts. This change does not affect Scotland. The act is divided into the four main divisions mentioned below.

I. Nature of Partnership. — Partnership is defined to be the " relation which subsists between persons carrying on a business in common with a view of profit." From this definition corporations and companies, such as joint-stock companies and cost-book mining companies, which differ from ordinary partnerships in many important respects, are expressly excluded. The act also contains several subsidiary rules for determining the existence of a partnership. These rules are of a fragmentary nature, and for the most part are expressed in a negative form; they have not introduced any change in the law. Co-ownership of property does not of itself create a partnership, nor does the sharing of gross returns. The sharing of profits, though not of itself sufficient to create a partnership, is prima facie evidence of one. This means that if all that is known is that two persons are sharing profits, the inference is that such persons are partners; but if the participation in profits is only one amongst other circumstances, all the circumstances must be considered, and the participation in profits must not be treated as raising a presumption of partnership, which has to be rebutted. To illustrate the rule that persons may share profits without being partners, the act gives statutory expression to the decision in Cox v. Hickman (i860, 8 H.L.C., 268), viz. that the receipt

by a person of a debt or other fixed sum by instalments, or otherwise, out of the accruing profits of a business does not of itself make him a partner; and it re-enacts with some slight modification the repealed provisions of Bovill's Act (28 & 29 Vict. c. 86), which was passed to remove certain difficulties arising from the decision in Cox v. Hickman. Whenever the question of partnership or no partnership arises, it must not be forgotten (though this is not stated in the act) that partner- ship is a relation arising out of a contract; regard must be paid to the true contract and intention of the parties as appearing from the whole facts of the case. If a partnership be the legal consequence of the true agreement, the parties thereto will be partners, though they may have intended to avoid this consequence (Adam v. Newbigging, 1888, L.R. 13 App. Cas. 315). Partners are called collectively a "firm"; the name under which they carry on business is called the firm name. Under English law the firm is not a corporation, nor is it recognized as distinct from the members composing it; any change amongst them destroys the identity of the firm. In Scotland a firm is a legal person distinct from its members, but each partner can be compelled to pay its debts.

At common law there is no limit to the number of partners, but by the Companies Act 1862 (25 & 26 Vict. c. 89, § 4), not more than ten persons can carry on the business of bankers, and not more than twenty any other business, unless (with some exceptions) they conform to the provisions of the act. (See Company, and also Limited Partnerships below.)

II. Relations of Partners to Persons dealing with them. — Every partner is an agent of the firm and of his co-partners for the purpose of the partnership business; if a partner does an act for carrying on the partnership business in the usual way in which businesses of a like kind are carried on — in other words, if he acts within his apparent authority— he thereby prima facie binds his firm. The partners may by agreement between themselves restrict the power of any of their number to bind the firm. If there be such an agreement, no act done in contravention of it is binding on the firm with respect to persons who have notice of the agreement. Such an agreement does not affect persons who have no notice of it, unless indeed they do not know or believe the person with whom they are dealing to be a partner; in that case he has neither real, nor, so far as they are concerned, apparent authority to bind his firm, and his firm will not be bound. If a partner

does an act, e.g. pledges the credit of the firm, for a purpose apparently not connected with the firm's ordinary course of business, he is not acting in pursuance of his apparent authority, and what- ever liability he may personally incur, his partners will not be bound unless he had in fact authority from them.

Apart from any general rule of law relating to the execution of deeds or negotiable instruments, a firm and all the partners will be bound by any act relating to the business of the firm, and done in the firm name, or in any other manner showing an intention to bind the firm, by any person thereto authorized. An admission or representation by a partner, acting within his apparent authority, is evidence against his firm. Notice to an acting partner of any matter relating to the partnership affairs is, apart from fraud, notice to his firm.

A firm is liable for loss or injury caused to any person not a partner, or for any penalty incurred by any wrongful act or omission of a partner acting in the ordinary course of the partner- ship business, or with the authority of his co-partners; the extent of the firm's liability is the same as that of the individual partner. The firm is also liable to make gocd the loss (a) where one partner, acting within his apparent authority, receives money or property of a third person and misapplies it; and (b) where a firm in the course of its business receives money or property of a third person, and such money or property while in the custody of the firm is misapplied by a partner. It is not sufficient, in order to fix innocent partners With liability for the misapplication of money belonging to a third party, merely to show that such money was employed in the business of the partnership, otherwise all the members

of a firm would in all cases be liable to those beneficially interested therein for trust money improperly employed in this manner by one partner. This is not the case. To fix the other partners with liability, notice of the breach of trust must be brought home to them individually.

The liability of partners for the debts and obligations of their firm arising ex contractu, is joint, and in Scotland several also; the estate of a deceased partner is also severally liable in a due course of administration, but subject, in England or Ireland, to the prior payment of his separate debt. The liability of partners for the obligations of their firm arising ex delicto, is joint and several.

The authority of a partner to bind his co-partners commences with the partnership. A person therefore who enters into a partnership does not

thereby become liable to the creditors of his partners for anything done before he became a partner. But a partner who retires from a firm does not thereby cease to be liable for debts or obligations incurred before his retirement. He may be discharged from existing liabilities by an agreement to that effect between himself and the members of the firm as newly constituted and the creditors. This agreement may be either express or inferred as a fact from the course of dealing between the creditors and the new firm. The other ways in which a partner may be freed from partnership liabilities incurred before his retirement are not peculiar to partnership liabilities, and are not therefore dealt with by the Partnership Act.

A continuing guaranty given to a firm, or in respect of the transactions of a firm, is, in the absence of agreement to the contrary, revoked as to the future by a change in the firm. The reason is that such a change destroys its identity.

Any person, not a partner in the firm, who represents himself (or, as the phrase is, ” holds himself out ‘”’), or knowingly suffers himself to be represented, as a partner, is liable as a partner to any person who has given credit to the firm on the faith of the representation. The representation may be by words spoken or written, or by conduct. The liability will attach, although the person who makes the representation does not know that the person who has acted on it knew of it. The continued use of a deceased partner’s name does not impose liability on his estate.

III. Relations of Partners to one another. — The mutual rights and duties of partners depend upon the agreement between them. Many of these rights and duties are stated in the Part- nership Act; but, whether stated in the act or ascertained by agreement, they may be varied by the consent of all the partners; such consent may be express or inferred from conduct. Subject to any agreement, partners share equally in the capital and profits of their business, and must contribute equally to losses, whether of capital or otherwise; they are entitled to be indemnified by their firm against liabilities incurred in the proper and ordinary conduct of the partnership business, and for anything necessarily done for its preservation; they are entitled to interest at 5 % on their advances to the firm, but not on their capital. Every partner may take part in the manage- ment of the partnership business, but no partner is entitled to remuneration for so doing. The majority can bind the minority in ordinary matters connected with the partnership business, but cannot change its nature nor expel a partner, unless expressly authorized so to do. No partner may be introduced into the firm without the consent of all the partners. The partnership

books must be kept at the principal place of business, and every partner may inspect and copy them. Partners must render to each other true accounts and full information of all things affecting the partnership. A partner may not make use of anything belonging to his firm for his private purposes, nor may he compete with it in business. If he does so he must account to his firm for any profit he may make.

Partners may agree what shall and what shall not be part- nership property, and can by agreement convert partnership property into the separate property of the individual partners, and vice versa. Subject to any such agreement, all property originally brought into the partnership stock, or acquired on

account of the firm or for the purposes and in the course of its business, is declared by the act to be partnership property. Property bought with money of the firm is prima facie bought on account of the firm. Partnership property must be applied exclusively for partnership purposes and in accordance with the partnership agreement. Co-owners of land may be partners in the profits of the land without the land being partnership property; if such co-owners purchase other lands out of the profits, these lands will also belong to them (in the absence of any agreement to the contrary) as co-owners and not as partners. The legal estate in partnership land devolves according to the general law, but in trust for the persons beneficially interested therein. As between partners, and as between the heirs of a deceased partner and his executors or administrators, such land is treated as personal or movable estate, unless a contrary intention appears.

When no fixed term has been agreed upon for the duration of the partnership, it is at will, and may be determined by notice at any time by any partner. If a partnership for a fixed term is continued after the term has expired without any express new agreement, the rights and duties of the partners remain as before, so far as they are consistent with a partnership at will.

A partner may assign his share in the partnership either abso- lutely or by way of mortgage. The assignee does not become a partner; during the continuance of the partnership he has the right to receive the share of profits to which his assignor would have been entitled, but he has no right to interfere in the partnership business, or to require any accounts of the partnership transactions, or to inspect the partnership

books. On a dissolution he is entitled to receive the share of the partnership assets to which his assignor is entitled as between himself and his partners, and for this purpose to an account as from the date of dissolution.

Since the act came into operation no writ of execution may issue in England or Ireland against any partnership property, except on a judgment against the firm. If in either of these countries a judgment creditor of a partner wishes to enforce his judgment against that partner's share in the partnership, he must obtain an order of court charging such share with payment of his debt and interest. The court may appoint a receiver of the partner's share, and may order a sale of such share. If a sale be ordered the other partners may buy the share; they may also at any time redeem the charge. The mode of making a partner's share liable for his separate debts in Scotland has not been altered by the act.

■ IV. Dissolution of Partnership. — A partnership for a fixed term, or for a single adventure, is dissolved by the expiration of the term or the termination of the adventure. A partnership for an undefined time is dissolved by notice of dissolution, which may be given at any time by any partner. The death or bankruptcy of any partner dissolves the partnership as between all its members. If a partner suffers his share in the partner- ship to be charged under the act for his separate debts, his partners may dissolve the partnership. The foregoing rules are subject to any agreement there may be between the partners. A partnership is in every case dissolved by any event which makes the partnership or its business unlawful. The court may order a dissolution in any of the following cases, viz.: When a partner is found lunatic or is of permanently unsound mind, or otherwise permanently incapable of performing his duties as a partner; when a partner has been guilty of conduct calculated to injure the partnership business, or wilfully or persistently breaks the partnership agreement, or so conducts himself in partnership matters that it is not reasonably practi- cable for his partners to carry on business with him; when the partnership can only be carried on at a loss; and lastly, whenever a dissolution appears to the court to be just and equitable. The act is silent as to the effect of the assignment by a partner of his share in the partnership as a cause of dissolution; probably it is now no more than a circumstance enabling the court, if it thinks fit, to grant a dissolution on the ground that it is just

and equitable to do so. A dissolution usually is not complete as against persons who are not partners, until notice of it has been given; until then such persons may treat all apparent partners as still members of

the firm. Consequently, if notice is not given when it is necessary, a partner may be made liable for partnership debts contracted after he ceased to be a partner. Notice is not necessary to protect the estate of a dead or bankrupt partner from partnership debts contracted after his death or bankruptcy: nor is notice necessary when a person not known to be a partner leaves a firm. If a person not generally known to be a partner is known to be so to cer- tain individuals, notice must be given to them. Notice in the Gazette is sufficient as regards all persons who were not previously customers of the firm; notice in fact must be given to old customers. On a dissolution, or the retirement of a partner, any partner may notify the fact and require his co-partners to concur in doing so.

After a dissolution, the authority of each partner (unless he be a bankrupt) to bind the firm, and the other rights and obligations of the partners, continue so far as may be necessary to wind up the partnership affairs and to complete unfinished transactions. The partners are entitled to have the partnership property applied in payment of the debts of the firm, and to have any surplus divided between them. Before a partner can receive any part of the surplus, he must make good whatever may be due from him as a partner to the firm. To enforce these rights, any partner or his representatives may apply to the court to wind up the partnership business. It was well established before the act, and is still law, that in the absence of special agreement the right of each partner is to have the partnership property — including the goodwill of its business, if it be saleable — realized by a sale. The value of the goodwill depends largely on the right of the seller to compete with the purchaser after the sale. The act makes no mention of goodwill, but the rights of a seller in this respect were fully discussed in the House of Lords in Trego v. Hunt (L.R. 1896, App. Cas. 7). In the absence of special agreement, the seller may set up business in competition with, and in the immediate neigh- bourhood of, the purchaser, and advertise his business and deal with his former customers, but may not represent himself as carrying on his former business, nor canvass his former customers. The purchaser may advertise himself as carrying on the former business, canvass its customers, and trade under the old name, unless that name is or contains the name of the vendor, and the purchaser by using it without qualification would expose the vendor to the liability of being sued as a partner in the business. If, on a dissolution or change in the constitution of a firm, the goodwill belongs under the partner- ship agreement exclusively to one or more of the partners, the partner who is entitled to the goodwill has the rights of a seller, and those to whom the goodwill does not belong have the rights of a purchaser.

When a partner has paid a premkim on entering into a partnership for a fixed term, and the partnership is determined before the expiration of the term, the court may, except in certain cases, order a return of the premium or of some part of it. In the absence of fraud or misrepresentation, the court cannot make such an order when the partnership was at will, or, being for a fixed term, has been terminated by death or by reason of the misconduct of the partner who paid the premium; nor can it do so if terms of dissolution have been agreed upon, and the agreement makes no provision for the return of premium.

When a person is induced by the fraud or misrepresentation of others to become a partner with them, the court will rescind the contract at his instance (Adam v. Newbigging, 1888, R. 13 App. Cas. 308). Inasmuch as such a person is under the same liability to third parties for liabilities of the firm incurred before rescission as he would have been under had the contract been valid, he is entitled on the rescission to be indemnified by the person guilty of the fraud or making the representation against these liabilities. He is also entitled, without prejudice

to any other rights, to receive out of the surplus assets of the partnership, after satisfying the partnership liabilities, any money he may have paid as a premium or contributed as capital, and to stand in the place of the creditors of the firm for any payments made by him in respect of the partnership liabilities.

If a partner ceases to be a member of a firm, and his former partners continue to carry on business with the partnership assets without any final settlement of accounts, he, or, if he be dead, his estate, is, in the absence of agreement, entitled to such part of the subsequent profits as can be attributed to the use of his share of the partnership assets, or, if he or his representatives prefer it, to interest at 5% on the amount of his share. If his former partners have by agreement an option to purchase his share, and exercise the option and comply with its terms, he is not entitled to any further or other share in profits than that given him by the agreement. If, however, his former partners, assuming to exercise such an option, do not comply with its terms, they are liable to account for subsequent profits or interest to the extent mentioned above. Subject to any agreement between the partners, the amount due from the surviving or continuing partners to

an outgoing partner, or the representatives of a deceased partner, in respect of his share in the partnership, is a debt accruing at the date of the dissolution or death.

In the absence of any special agreement on a final settlement of accounts between partners, losses (including losses of capital) are paid first out of profits, next out of capital, and lastly by the partners in the proportions in which they share profits. The assets of the firm, including all sums contributed to make up losses of capital, are applied in paying the debts and liabilities of the firm to persons who are not partners; then in paying to each partner rateably what is due from the firm to him, first for advances and next in respect of capital; and the ultimate residue (if any) is divisible among the partners in the proportion in which profits are divisible.

Limited Partnerships. — In the law of partnership as set out above, the Limited Partnership Act 1907 introduced a con- siderable innovation. By that act power was given to form limited partnerships, like the French societe en commandite — that is, a partnership consisting not only of general partners, but of others whose liability is limited to the amount contributed to the concern. Such a limited partnership must not consist, in the case of a partnership carrying on the business of banking, of more than ten persons, and in the case of any other partner- ship of more than twenty persons. There must be one or more persons called general partners who are liable for all the debts and obligations of the firm, and limited partners, who on entering into partnership contribute a certain sum or property valued at a stated amount, beyond which they are not liable. Limited partners cannot withdraw or receive back any of their contributions; any withdrawal brings liability for the debts and obligations of the firm up to the amount withdrawn. A body corporate may be a limited partner. No limited partner can take part in the management of a partnership business; if he does so he becomes liable in the same way as a general partner, but he can at all times inspect the books of the firm and examine into the state and prospects of the business. Every limited partnership must be registered with the registrar of joint stock companies, and the following particulars must be given: (a) the firm name; (b) the general nature of the business; (c) the principal place of business; (d) the full name of each of the partners; (e) the term, if any, for which the part- nership is entered into and the date of its commencement; (f) a statement that the partnership is limited, and the descrip- tion of every limited partner as such; (g) the sum contributed by each limited partner, and whether paid in cash or how otherwise. If any change occurs in these particulars, a statement signed, by the firm and specifying the nature of the change, must be

sent within seven days to the registrar. An advertise- ment* mast also be inserted in the gazette of any arrangement by which a general partner becomes a limited partner or under

which the share of a limited partner is assigned. Any persoi making a false return for the purpose of registration commit; a misdemeanour and is liable to imprisonment with hard laboui for a term not exceeding two years. The law of private part nership applies to limited partners except where it is inconsistent with the express provisions of the Limited Partnership Act.

See Sir Nathaniel [Lord] Lindley, A Treatise on the Law of Partner- ship (7th ed., London, 1905) ; Sir Frederick Pollock, A Digest oj the Law of Partnership, incorporating the Partnership Act 1890 (8th ed., London, 1905) ; also article on ” Partnership ” in the Encyclo- paedia of the Laws of England.

Scots Law. — The law of Scotland as to partnership agrees in the main with the law of England. The principal difference is that Scots law recognizes the firm as an entity distinct from the individuals composing it. The firm of the company is either proper or descriptive. A proper or personal firm is a firm designated by the name of one or more of the partners. 1 A descriptive firm does not introduce the name of any of the partners. The former may sue and be sued under the company name; the latter only with the addition of the names of three at least (if there are so many) of the partners. A consequence of this view of the company as a separate person is that an action cannot be maintained against a partner personally without application to the company in the first instance, the individual partners being in the position of cautioners for the company rather than of principal debtors. The provisions of the Mercantile Law Amendment Act 1856 (19 & 20 Vict. c. 60, § 8), do not affect the case of partners. But, though the company must first be discussed, diligence must necessarily be directed against the individual partners. Heritable property cannot be held in the name of a firm; it can only stand in the name of individual partners. Notice of the retirement of even a dormant partner is necessary. The law of Scotland draws a distinction between joint adventure and partnership. Joint adventure or joint trade is a partnership confined to a particular adventure or speculation, in which the partners, whether latent or unknown, use no firm or social name, and incur no responsibility beyond the limits of the adventure. In the rules applicable to cases of insolvency and bankruptcy of a company and partners, Scots law differs in several respects from English. Thus a company can be made bankrupt without the partners being made so as individuals. And, when both company

and partners are bankrupt, the company creditors are entitled to rank on the separate estates of the partners for the balance of their debts equally with the separate creditors. But in sequestration, by the Bankruptcy Scotland Act 1856, § 66, the creditor of a company, in claiming upon the sequestrated estate of a partner, must deduct from the amount of his claim the value of his right to draw payment from the company's funds, and he is ranked as creditor only for the balance. (See Erskine's Inst. bk. iii. tit. iii.; Bell's Comm. ii. 500-562; Bell's Principles, §§ 350-403.)

United Stales. — In the United States the English common law is the basis of the law. Most states have, however, their own special legislation on the subject. The law in the United States permits the existence of limited partnerships, corresponding to the societes en commandite established in France by the ordinance of 1673, and those legalized in England under the act of 1907 (see above). The State of New York was the first to introduce this kind of partnership by legislative enactment. The provisions of the New York Act have been followed by most of the other states. In many states there can be no limited partnerships in banking and insurance. In this form of partnership one or more persons responsible in solido are associated with one or more dormant partners liable only to the extent of the funds supplied by them. In Louisiana such partnerships are called partnerships in commendam (Civil Code, art. 2810).

1 In France, it is to be noted, the style of a firm must contain no names other than those of actual partners. In Germany it must, upon the first constitution of the firm, contain the name of at least one actual partner, and must not contain the name of any one who is not a partner; when once established the style of the firm may be continued notwithstanding changes.

In New York the responsible partners are called general partners, the others special partners. Such partnerships must, by the law of most states, be registered. In Louisiana universal partnerships (the societates universorum bonorum of Roman law) must be created in writing and registered (Civil Code, art. 2800). In some states the English law as it stood before Cox v. Hickman is followed, and participation in profits is still regarded as the test of partnership, e.g. Leggett v. Hyde (58 New York Rep. 272). In some states nominal partners are not allowed. Thus in New York, where the words " and

Company ” or ” and Co.” are used, they must represent an actual partner or partners. A breach of this rule subjects offenders to penalties. In most states claims against the firm after the death of a partner must, in the first instance, be made to the survivors, The creditors cannot, as in England, proceed directly against the representatives of the deceased. An ordinary partnership between miners for working a mine is not dissolved by the death of one of the partners, nor by the transfer by one of his interest in the concern. Contract is not deemed the basis of the relation between the partners, but rather a common property and co-operation in its exploita- tion (Parsons, Principles of Partnership, § 15). A corporation cannot become a partner in any mercantile adventure, unless specially authorized by charter or general statute. If it could, the management of its affairs would no longer be exclusively in the hands of its directors, to whom the law has entrusted it. Hence, corporations cannot associate for the formation of a ” trust ” to be managed by the associated partners.

See 3 Kent’s Comm., lect. xliii.; Story, On Partnership; Bates, Law of Partnership (1888) ; Burdick, Law of Partnership (1899).

PARTON, JAMES (1822-1891), American biographer, was born in Canterbury, England, on the 9th of February 1822. He was taken to the United States when he was five years old, studied in New York City and White Plains, New York, and was a schoolmaster in Philadelphia and then in New York. He removed (1875) to Newburyport, Massachusetts, where he died on the 17th of October 1891. Parton was the most popular biographer of his day in America. His most important books are Life of Horace Greeley (1855), Life and Times of Aaron Burr (1857), Life of Andrew Jackson (1859-1860), Life and Times of Benjamin Franklin (1864), Life of Thomas Jefferson (1874), and Life of Voltaire (1881). Among his other publications are General Butler in New Orleans (1863), Famous Americans of Recent Times (1867), The People’s Book of Biography (1868); Noted Women of Europe and America (1883), and Captains of Industry (two series, 1884 and 1891), for young people. His first wife, Sara (1811-1872), sister of N. P. Willis, and widow of Charles H. Eldredge (d. 1846), attained considerable popularity as a writer under the pen-name ” Fanny Fern.” (See James Parton’s Fanny Fern : a Memorial Volume, 1873). They were married in 1856. Her works include the novels, Ruth Hall (1854), reminiscent of her own life, and Rose Clark (1857); and several volumes of sketches and stories. In 1876 Parton married Ethel Eldredge, his first wife’s daughter by her first husband.

PARTONOPEUS DE BLOIS, hero of romance. The French romance of

Partonopeus de Blois dates from the 13th century, and has been assigned, on the strength of an ambiguous passage in the prologue to his Vie seint Edmund le rei to Denis Piramus. The tale is, in its essence a variation of the legend of Cupid and Psyche. Partonopeus is represented as having lived in the days of Clovis, king of France. He was seized while hunting in the Ardennes, and carried off to a mysterious castle, the inhabitants of which were invisible. Melior, empress of Con- stantinople, came to him at night, stipulating that he must not attempt to see her for two years and a half. After successful fighting against the ” Saracens,” led by Sornegur, king of Denmark, he returned to the castle, armed with an enchanted lantern which broke the spell. The consequent misfortunes have a happy termination. The tale had a continuation giving the adventures of Fursin or Anselet, the nephew of Sornegur. The name of Partonopeus or Partonopex is generally assumed to be a corruption of Parthenopaeus, one of the seven against

Thebes. It has been suggested that the word might be derived from Partenay, a supposition coloured by the points of similarity between this story and the legend of Melusine (see Jean d’Arras) attached to the house of Lusignan, as the lords of these two places were connected.

Bibliography. — The French romance was edited by G. A. Crape- let, with an introduction by A. C. M. Robert, as, Partonopeus de Blois (2 vols., 1834) ; an English Partonope of Blois, by W. E. Buckley for the Roxburghe Club (London, 1862), and another fragment for the same learned society in 1873; the German Partonopier und Melior of Konrad von Wiirzburg by K. Bartsch (Vienna, 1871); the Icelandic Partalopa saga by O. Klockhoff in Upsala Universitets Arsskrift for 1887. See also H. L. Ward, Catalogue of Romances, (i. 689, &c.) ; E. Kolbing, Die verschiedenen Gestaltungen der Partono- peus-Sage, in German. Stud. (vol. ii., Vienna, 1875), in which the Icelandic version is compared with the Danish poem Persenober and the Spanish prose Historia del conde Partinobles ; E. Pfeiffer, ” Ober die HSS des Part, de Blois ” in Stengel’s Ausg. in Abh. vom phil. (No. 25, Marburg, 1885).

PARTRIDGE, JOHN BERNARD (1861-), British artist, was born in London, son of Professor Richard Partridge, F.R.S., president of the Royal College of Surgeons, and nephew of John Partridge (1790-1872), portrait-painter extraordinary to Queen Victoria. He was educated at Stonyhurst College, and after matriculating at London University entered the office of Dunn & Hansom, architects. He then joined for a couple of years a firm of stained-glass designers (Lavers, Barraud & Westlake), learning drapery and ornament; and then

studied and executed church ornament under Philip Westlake, 1880-1884. He began illustration for the press and practised water-colour painting, but his chief success was derived from book illustration. In 1892 he joined the staff of Punch. He was elected a member of the Royal Institute of Painters in Water-colours and of the Pastel Society. For some years he was well known as an actor under the name of ” Bernard Gould.”

PARTRIDGE, WILLIAM ORDWAY (1861-), American sculptor, was born at Paris, France, on the nth of April 1861. He received his training as a sculptor in Florence (under Galli), in Rome (under Welonski), and in Paris. He became a lecturer and writer, chiefly on art subjects, and from 1894 to 1897 was professor of fine arts in Columbian University (now the George Washington University), Washington, D.C. Among his publications are: Art for America (1894), The Song Life of a Sculptor (1894), The Technique of Sculpture (1895), The Angel of Clay (1900), a novel, and Nathan Hale, the Ideal Patriot (1902). His sculptural works consist largely of portraiture.

PARTRIDGE (Du. Patrijs, Fr. pcrdrix, from Lat. perdix, apparently onomatopoeic from the call of the bird), a game-bird, whose English name properly denotes the only species indigenous to Britain, often nowadays called the grey partridge, the Perdix cinerea of ornithologists. The excellence of its flesh at table has been esteemed from the time of Martial. For the sport of partridge-shooting see Shooting.

The grey partridge has doubtless largely increased in numbers in Great Britain since the beginning of the 19th century, when so much down, heath, and moorland was first brought under the plough, for its partiality to an arable country is very evident. It has been observed that the birds which live on grass lands or heather only are apt to be smaller and darker in colour than the average; but in truth the species when adult is subject to a much greater variation in plumage than is commonly supposed, and the well-known chestnut horso-shoe mark, generally con- sidered distinctive of the cock, is very often absent. In Asia the grey partridge seems to be unknown, but in the temperate parts of Eastern Siberia its place is taken by a very nearly allied form, P. barbata, and in Tibet there is a bird, P. hodgsoniae, which can hardly with justice be generically separated from it.

The common red-legged partridge of Europe, generally called the French partridge, Caccabis rufa, seems to be justifiably considered the type of a separate group. This bird was intro- duced into England in the last quarter of the 18th century, and has established itself in

various parts of the country, notwith- standing a widely-spread, and in some respects unreasonable, prejudice against it. It has certainly the habit of trusting

nearly as much to its legs as to its wings, and thus incurred the obloquy of old-fashioned sportsmen, whose dogs it vexatiously kept at a running point; but, when it was also accused of driving away the grey partridge, the charge only showed the ignorance of those who brought it, for as a matter of fact the French partridge rather prefers ground which the common species avoids — such as the heaviest clay-soils or the most infertile heaths. The French partridge has several congeners, all with red legs and plumage of similar character. In Africa north of the Atlas there is the Barbary partridge, C. petrosa; in southern Europe another, C. saxatilis, which extends eastward till it is replaced by C. chukar, which reaches India, where it is a well-known bird. Two very interesting desert-forms, supposed to be allied to Caccabis, axe the Ammoperdix heyi of North Africa and Palestine and the A. bonhami of Persia; but the absence of the metatarsal knob, or incipient spur, suggests (in our ignorance of their other osteological characters) an alliance rather to the genus Perdix. On the other hand the groups of birds known as Francolins and Snow-Partridges are generally furnished with strong but blunt spurs, and therefore probably belong to the Caccabine group. Of the former, containing many species, there is only room here to mention the francolin, which used to be found in many parts of the south of Europe, Francolinus vulgaris, which also extends to India, where it is known as the black partridge. This seems to have been the Attagas or Attagen of classical authors, 1 a bird so celebrated for its exquisite flavour, the strange disappearance of which from all or nearly all its European haunts still remains inexplicable. It is possible that this bird has been gradually vanishing for several centuries, and if so to this cause may be attributed the great uncertainty attending the determination of the Attagen — it being a common practice among men in all countries to apply the name of a species that is growing rare to some other that is still abundant. Of the snow-partridges, Tetraogallus, it is only to be said here that they are the giants of their kin, and that nearly every considerable range of mountains in Asia seems to possess its specific form.

By English colonists the name Partridge has been very loosely applied, and especially so in North America. Where a qualifying word is

prefixed no confusion is caused, but without it there is sometimes a difficulty at first to know whether the Ruffed Grouse (Bonasa umbellus) or the Virginia Quail (Ortyx virgini- anus) is intended. In South America the name is given to various Tinamous (q.v.). (A.N.)

PARTY WALL, a building term which, in England, apart from special statutory definitions, may be used in four different legal senses (Watson v. Gray, 1880, 14 Ch. D. 192). It may mean (1) a wall of which the adjoining owners are tenants in common; (2) a wall divided longitudinally into two strips, one belonging to each of the neighbouring owners; (3) a wall which belongs entirely to one of the adjoining owners, but is subject to an easement or right in the other to have it maintained as a dividing wall between the two tenements; (4) a wall divided longitudinally into two moieties, each moiety being subject to a cross easement, in favour of the owner of the other moiety. Outside London the rights and liabilities of adjoining owners of party walls are subject to the rules of common law. In London they are governed by the London Building Act 1894. A tenant in common of a party wall is entitled to have a partition vertically and longitudinally, so as to hold separately (Mayfair Property Co. v. Johnston, 1894, 1 Ch. 508); each owner can then use only his own part of the wall. By the London Building Act 1894, § s (16) the expression ” party wall ” means — (a) a wall forming part of a building and used or constructed to be used for separation of adjoining buildings belonging to different owners, or occupied or constructed or adapted to be occupied by different persons; or (b) a wall forming part of a building, and standing to a greater extent than the projection of the foot- ings on lands of different owners. Section 87 regulates the rights

1 Many naturalists have held a different opinion, some making it a woodcock, a godwit, or even the hazel-hen or grouse; see the discussion by Lord Lilford in Ibis (1862), pp. 352-356.

of owners of adjoining lands to erect party walls on the line of junction. Sections 88-90 determine the rights of building owners to deal with party walls by underpinning, repairing or rebuilding. The act also contains provisions for settling disputes (§§ 91-92), and for bearing and recovering expenses (§§ 95-102). Part VI. of the act regulates the structure and thickness, height, &c, of party walls.

See A. R. Rudall, Party Walls (1907).

PARUTA, PAOLO (1 540-1 598), Venetian historian. After studying at Padua he served the Venetian republic in various political capacities,

including that of secretary to one of the Venetian delegates at the Council of Trent. In 1579 he published a work entitled Delia Perfezione della vita politica, and the same year he was appointed official historian to the republic, in succession to Luigi Contarini. He took up the narrative from where Cardinal Bembo had left it, in 15 13, and brought it down to 1551. He was made provveditore to the Chamber of Loans in 1580, savio del gran consiglio in 1590, and governor of Brescia in the following year. In 1596 he was appointed provveditore of St Mark, and in 1597 superintendent of fortifi- cations. He died a year later. His history, which was at first written in Latin and subsequently in Italian, was not published until after his death — in 1 599. Among his other works may be mentioned a history of the War of Cyprus (1570-72), and a number of political orations.

See Apostolo Zeno's edition of Paruta's history (in the series Degli Istorici delle cose veneziane, Venice, 1 718), and C. Monzani's edition of Paruta's political works (Florence, 1852).

PARVIS, Parvise, or Parvyse, an open space surrounded by an enceinte or stone parapet in front of buildings, particularly cathedrals or large churches; probably first used to keep the people from pressing on and confusing the marshalling of processions. The word " parvis " is French and is a corruption of Lat. paradisus, an enclosed garden or paradise (q.v.), which is sometimes also used instead of " parvis." The Lat. paradisus is defined by Du Cange (Glossarium, s.v.) as atrium porticibus circumdatum ante aedes sacras. At St Paul's in London the " parvis " was a place where lawyers met for consultation.

PARYSATIS, daughter of Artaxerxes I., married to her brother Ochus (Ctesias, Pers. 44), who in 424 B.C. became king of Persia under the name of Darius II. (q.v.). She had great influence over her husband, whom she helped by perfidy in the suppression of his brothers Secydianus, who was king before him, and Arsites, who rebelled against him (Ctes. Pers. 48-51). Her favourite son was Cyrus the Younger, whom she assisted as far as possible in his attempt to gain the throne. But when he was slain at Cunaxa (401) she nevertheless gained absolute dominion over the victorious Artaxerxes II. She was the evil genius of his reign. By a series of intrigues she was able to inflict the most atrocious punishment on all those who had taken part in the death of Cyrus. (Ed. M.)

PASADENA, a city in the San Gabriel valley of Los Angeles county, in southern California, U.S.A., about 9 m. N.E. of Los Angeles and about 20 m. from the Pacific Ocean. Pop. (1880) 39r; (1890) 4882; (1900) 9117, of whom 1278 were foreign-born; (rgio census) 30,291. Area

about n sq. m. It is served by the Southern Pacific, the Santa Fe, and the San Pedro, Los Angeles & Salt Lake railway systems, and by inter-urban electric lines. The city lies at an altitude of 750-1000 ft., about 5 m. from the base of the Sierra Madre range. Some half-dozen mountain peaks in the immediate environs rise to heights of 3200 to more than 6000 ft., notably Mt Wilson (6666 ft.), whose base is about 5 m. north-east of Pasadena, Echo mountain (4016 ft.), and Mt Lowe (6100 ft). From Rubio canyon, near Pasadena, to the summit of Echo mountain, runs a steep cable railway, 1000 yds. long. On Echo mountain is the Lowe Observatory (3500 ft.), with a 16-in. equatorial telescope, and on Mt Wilson is the Solar Observatory (5886 ft.) of the Carnegie Institution of Washington, equipped with a 60-in. reflecting telescope and other instruments for stellar photography, a horizontal telescope for solar photography,

a 60-ft. tower telescope (completed in 1907), and a second tower telescope of 150 ft. focal length (under construction in 1010). At this observatory important researches in solar and stellar spectroscopy have been carried on under the direction of George Ellery Hale (b. 1868), the inventor of the spectroheliograph. The physical laboratory, computers' offices and instrument construction shops of the Solar Observatory are in Pasadena. About S m. south-east of Pasadena, in the township of San Gabriel (pop. 2501 in 1900), is the Mission (monastery) de San Gabriel Arcangel, founded in 1771. Pasadena is one of the most beautiful places in southern California. Fruits and flowers and sub-tropical trees and small plants grow and bloom the year round in its gardens. On the first of January of every year a flower carnival, known as the " Tournament of Roses," is held. Among the principal public buildings are a handsome Romanesque public library, which in 1909 contained about 28,500 volumes, an opera house of considerable architectural merit, high school, and several fine churches. The surrounding country was given over to sheep ranges until 1874, when a fruit-growing colony, organized in 1873, was established, from which the city was developed. The sale of town lots began in 1882. Pasadena was first chartered as a city in 1886; by a clause in the present special free-holders' charter, adopted in 1901, saloons are prohibited in the city.

PASARGADAE, a city of ancient Persia, situated in the modern plain of Murghab, some 30 m. N.E. of the later Parse- polis. The name originally belonged to one of the tribes of the Persians, which

included the clan of the Achaemenidae, from which sprang the royal family of Cyrus and Darius (Herod, i. 125; a Pasargadian Badres is mentioned, Herod, iv. 167). According to the account of Ctesias (preserved by Anaximenes of Lampsacus in Steph. Byz. s.v. Haacra.pya.5ai; Strabo xv. 730, cf. 729; Nicol. Damasc. fr. 66, 68 sqq.; Polyaen. vii. 6, 1. 9. 45, 2), the last battle of Cyrus against Astyages, in which the Persians were incited to a desperate struggle by their women, was fought here. After the victory Cyrus built a town, with his palace and tomb, which was named Pasargadae after the tribe (cf. Curt. v. 6, 10; x. 1, 22). Every Persian king was, at his accession, invested here, in the sanctuary of a warlike goddess (Anaitis?), with the garb of Cyrus, and received a meal of figs and terebinths with a cup of sour milk (Plut. Arlax. 3) ; and whenever he entered his native country he gave a gold piece to every woman of Pasargadae in remembrance of the heroic intervention cf their ancestors in the battle (Nic. Damasc. loc. tit.; Plut. Alex. 69). According to a fragment of the same tradition, preserved by Strabo (xv. 729), Pasargadae lay ” in the hollow Persis {Code Persis) on the bank of the river Cyrus, after which the king changed his name, which was formerly Atradates ” (in Nic. Damasc. this is the name of his father). The river Cyrus is the Kur of the Persians, now generally named Bandamir; the historians of Alexander call it Araxes, and give to its tributary, the modern Pulwar, which passes by the ruins of Murghab and Persepolis, the name Medos (Strabo xv. 729; Curt. v. 4, 7). The capital of Cyrus was soon supplanted by Persepolis, founded by Darius; but in Pasargadae remained a great treasury, which was surrendered to Alexander in 336 after his conquest of Persis (Arrian iii. 18, 10; Curt. v. 6, 10). After his return from India he visited Pasargadae on the march from Carmania to Persepolis, found the tomb of Cyrus plundered, punished the malefactors, and ordered Aristobulus to restore it (Arriarf vi. 29; Strabo xv. 730). Aristobulus’ description agrees exactly with the ruins of Murghab on the Bandamir, about 30 m. upwards from Persepolis; and all the other references in the historians of Cyrus and Alexander indicate the same place. Nevertheless, some modern authors 1 have doubted the identity of the ruins of Murghab with Pasargadae, as Ptolemy (vi. 4, 7), places Pasargada or Pasarracha south-eastwards of Persepolis, and mentions a tribe Pasargadae in Carmania on the sea (vi. 8, 12); and Pliny, Nat. hist. vi. 99, names a Persian

1 E.g. Weissbach in Zeitschr. d. d. morgenl. Ges., 48, pp. 653 sqq.; for the identification cf. Stolze, Persepolis, ii. 269 sqq.; Curzon, Persia, ii. 71 sqq.

river Sitioganus ” on which one navigates in seven days to Pasargadae.” 2 But it is evident that these accounts are erroneous. The

conjecture of Oppert, that Pasargadae is identical with Pishiyauvada, where (on a mountain Arakadri) the usurper Gaumata (Smerdis) proclaimed himself king, and where his successor, the second false Smerdis Vahyazdata, gathered an army (inscrip. of Behistun, i. n; iii. 41), is hardly probable.

The principal ruins of the town of Pasargadae at Murghab are a great terrace like that of Persepolis, and the remainders of three buildings, on which the building inscription of Cyrus, ” I Cyrus the king the Achaemenid ” (sc. ” have built this “), occurs five times in Persian, Susian and Babylonian. They were built of bricks, with a foundation ‘ of stones and stone door-cases, like the palaces at Persepolis; and on these fragments of a procession of tribute-bearers and the figure of a winged demon (wrongly considered as a portrait of Cyrus) are preserved. Outside the town are two tombs in the form of towers and the tomb of Cyrus himself, a stone house on a high substruction which rises in seven great steps, surrounded by a court with columns; at its side the remains of a guardhouse, in which the officiating Magians lived, are discernible. The ruins of the tomb absolutely correspond to the description of Aristobulus.

See Sir W. Gore-Ouseley, Travels in Persia (1811); Morier, Ker Porter, Rich and others ; Texier, Description de I’A rmenie et la Perse ; Flandin and Coste, Voyage en Perse, vol. ii. ; Stolze, Persepolis; Dieulafoy, L’Art antique de la Perse; and E. Herzfeld, ” Pasargadae,” in Beitrdge zur alten Geschichte, vol. viii. (1908), who has in many points corrected and enlarged the earlier descriptions and has proved that the buildings as well as the sculptures are earlier than those of Persepolis, and are, therefore, built by Cyrus the Great. New photographs of the monuments are published by Fr. Sarre, Iranische Felsreliefs (unter Mitwirkung von E. Herzfeld, Berlin, 1908).

(Ed. M.)

PASCAL, BLAISE (1623-1662), French religious philosopher and mathematician, was born at Clermont Ferrand on the 19th of June 1623. His father was Etienne Pascal, president of the Court of Aids at Clermont; his mother’s name was Antoinette Begon. The Pascal family were Auvergnats by extraction as well as residence, had for many generations held posts in the civil service, and were ennobled by Louis XI. in 1478, but did not assume the de. The earliest anecdote of Pascal is one of his being bewitched and freed from the spell by the witch with strange ceremonies. His mother died when he was about four years old, and left him with two sisters — Gilberte, who afterwards married M. Perier, and Jacqueline. Both sisters are of importance in

their brother's history, and both are said to have been beautiful and accomplished. When Pascal was about seven years old his father gave up his official post at Clermont, and betook himself to Paris. It does not appear that Blaise, who went to no school, but was taught by his father, was at all forced, but rather the contrary. Neverthe- less he has a distinguished place in the story of precocious children, and in the much more limited chapter of children whose precocity has been followed by great performance at maturity, though he never became what is called a learned man, perhaps did not know Greek, and was pretty certainly indebted for most of his miscellaneous reading to Montaigne.

The Pascal family, some years after settling in Paris, had to go through a period of adversity. Etienne Pascal, who had bought some of the hotel-de-ville rentes, protested against Richelieu's reduction of the interest, and to escape the Bastille had to go into hiding. He was, according to the Jstory (told by Jacqueline herself), restored to favour owing to the good acting and graceful appearance of his daughter Jacqueline in a representation of Scudery's Amour tyrannique before Richelieu. Mme d'Aiguillon's intervention in the matter was perhaps as powerful as Jacqueline's acting, and Richelieu gave fitienne Pascal (in 1641) the important and lucrative

2 In vi. 1 16, he places " the Castle of Frasargida, where is the tomb of Cyrus, and which is occupied by the Magi " — i.e. the guard of Magians mentioned by Aristobulus, which had to protect the tomb- eastwards of Persepolis, and by a curious confusion joins it to Ecbatana.

though somewhat troublesome intendancy of Rouen. The family accordingly removed to the Norman capital, though Gilberte Pascal shortly after, on her marriage, returned to Clermont. At Rouen they became acquainted with Corneille, and Blaise pursued his studies with such vehemence that he already showed signs of an injured constitution. Nothing, however, of importance happened till the year 1646. Then Pascal the elder was confined to the house by the consequences of an accident on the ice, and was visited by certain gentlemen of the neighbourhood who had come under the influence of Saint-Cyran and the Jansenists. It does not appear that up to this time the Pascal family had been contemners of religion, but they now eagerly embraced the creed, or at least the attitude cf Jansenism, and

Pascal himself showed his zeal by informing against the supposed unorthodoxy of a Capuchin, the Pere Saint-Ange.

His bodily health was at this time very far from satisfactory, and he appears to have suffered, not merely from acute dyspepsia, but from a kind of paralysis. He was, however, indefatigable in his mathematical work. In 1647 he published his Nouvelles experiences sur le vide, and in the next year the famous experi- ment with the barometer on the Puy de Dome was carried out for him by his brother-in-law Perier, and repeated on a smaller scale by himself at Paris, to which place by the end of 1647 he and his sister Jacqueline had removed, to be followed shortly by their father. In a letter of Jacqueline's, dated the 27th of September, an account of a visit paid by Descartes to Pascal is given, which, like the other information on the relations of the two, give strong suspicion of mutual jealousy. Descartes, however, gave Pascal the very sensible advice to stay in bed as long as he could (it may be remembered that the philosopher himself never got up till eleven) and to take plenty of beef-tea. As early as May 1648 Jacqueline Pascal was strongly drawn to Port Royal, and her brother frequently accompanied her to its church. She desired indeed to join the convent, but her father, who returned to Paris with the dignity of counsellor of state, disapproved of the plan, and took both brother and sister to Clermont, where Pascal remained for the greater part of two years. E. Flechier, in his account of the Grands Jours at Clermont many years after, speaks of a " belle savante " in whose company Pascal had frequently been — a trivial mention on which, as on many other trivial points of scantily known lives, the most childish structures of comment and conjecture have been based. It is sufficient to say that at this time, despite the Rouen " conversion," there is no evidence to show that Pascal was in any way a recluse, an ascetic, or in short anything but a young man of great intellectual promise and performance, not indifferent to society, but of weak health. He, his sister and their father returned to Paris in the late autumn of 1650, and in September of the next year Etienne Pascal died. Almost immediately afterwards Jacqueline fulfilled her purpose of joining Port Royal — a proceeding which led to some soreness, finally healed, between herself and her brother and sister as to the disposal of her property. It has sometimes been supposed that Pascal, from 165 1 or earlier to the famous accident of 1654, lived a dissipated, extravagant, worldly, luxurious (though admittedly not vicious) life with his friend the due de Roannez and others. His Discours sur les passions de I'amour, a striking and characteristic piece, not very long since discovered and printed, has also been assigned to this period, and has been supposed to indicate a hopeless passion for Charlotte de Roannez, the duke's

sister. But this is sheer romancing. The extant letters of Pascal to the lady show no trace of any affection (stronger than friendship) between them. It is, however, certain that in the autumn of 1654 Pascal's second " conversion " took place, and that it was lasting. He betook himself at first to Port Royal, and began to live a recluse and austere life there. Mme Perier simply says that Jacqueline persuaded him to abandon the world. Jacqueline represents the retirement as the final result of a long course of dissatisfaction with mundane life. But there are certain anecdotic embellishments of the act which are too famous to

be passed over, though they are in part apocryphal. It seems that Pascal in driving to Neuilly was run away with by the horses, and would have been plunged in the river but that the traces fortunately broke. To this, which seems authentic, is usually added the tradition (due to the abbe Boileau) that afterwards he used at times to see an imaginary precipice by his bedside, or at the foot of the chair on which he was sitting. Further, from the 23rd of November 1654 dates the singular document usually known as " Pascal's amulet," a parchment slip which he wore constantly about him, and which bears the date followed by some lines of incoherent and strongly mystical devotion.

It must be noted that, though he lived much at Port Royal, and partly at least observed its rule, he never actually became one of its famous solitaries. But for what it did for him (and for a time his health as well as his peace of mind seems to have been improved) he very soon paid an ample and remarkable return. At the end of 1655 Arnauld, the chief light of Port Royal, was condemned by the Sorbonne for heretical doctrine, and it was thought important by the Jansenist and Port Royal party that steps should be taken to disabuse the popular mind. Arnauld would have undertaken the task himself, but his wiser friends knew that his style was anything but popular, and overruled him. It is said that he personally suggested to Pascal to try his hand, and that the first of the famous Provin- ciates {Provincial Letters, properly Lettres ecrites par Louis de Montalte a un provincial de ses amis) was written in a few days, or, less probably, in a day. It was printed without the real author's name on the 23rd of January 1656, and, being immensely popular, and successful, was followed by others to the number of eighteen.

Shortly after the appearance of the Provinciates, on the 24th of May 1656, occurred the miracle of the Holy Thorn, a fragment of the crown of Christ preserved at Port Royal, which cured the little Marguerite Perier of a fistula lacrymalis. The Jesuits were much

mortified by this Jansenist miracle, which, as it was officially recognized, they could not openly deny. Pascal and his friends rejoiced in proportion. The details of his later years after this incident are somewhat scanty. For years before his death we hear only of acts of charity and of, as it seems to modern ideas, extravagant asceticism. Thus Mme Perier tells us that he disliked to see her caress her children, and would not allow the beauty of any woman to be talked of in his presence. What may be called his last illness began as early as 1.658, and as the disease progressed it was attended with more and more pain, chiefly in the head. In June 1662, having given up his own house to a poor family who were suffering from small-pox, he went to his sister's house to be nursed, and never afterwards left it. His state was, it seems, mistaken by his physicians, so much so that the offices of the Church were long put off. He was able, however, to receive the Eucharist, and soon afterwards died in convulsions on the 19th of August. A post mortem examination was held, which showed not only grave derangement in the stomach and other organs, but a serious lesion of the brain.

Eight years after Pascal's death appeared what purported to be his Pensees, and a preface by his nephew Perier gave the world to understand that these were fragments of a great projected apology for Christianity which the author had, in conversation with his friends, planned out years before. The editing of the book was peculiar. It was submitted to a com- mittee of influential Jansenists, with the due de Roannez at their head, and, in addition, it bore the imprimatur of numerous unofficial approvers who testified to its orthodoxy. It does not appear that there was much suspicion of the garbling which had been practised — garbling not unusual at the time, and excused in this case by the fact of a lull in the troubles of Port Royal and a great desire on the part of its friends to do nothing to disturb that lull. But as a matter of fact no more entirely factitious book ever issued from the press. The fragments which it professed to give were in themselves confused and incoherent enough, nor is it easy to believe that they all formed

part of any such single and coherent design as that referred to above. But the editors omitted, altered, added, separated, combined and so forth entirely at their pleasure, actually making some changes which seem to have been thought improve- ments of style. This rifacimento remained the standard text with a few unimportant additions for

nearly two centuries, except that, by a truly comic revolution of public taste, Condorcet in 1776 published, after study of the original, which remained accessible in manuscript, another garbling, con- ducted this time in the interests of wworthodoxy. It was not till 1842 that Victor Cousin drew attention to the absolutely untrustworthy condition of the text, nor till 1844 that A. P. Faugere edited that text from the MS. in something like a condition of purity, though, as subsequent editions have shown, not with absolute fidelity. But even in its spurious condition the book had been recognized as remarkable and almost unique. Its contents, as was to be expected, are of a very chaotic character — of a character so chaotic indeed that the reader is almost at the mercy of the arrangement, perforce an arbitrary arrangement, of the editors. But the subjects dealt with concern more or less all the great problems of thought on what may be called the theological side of metaphysics — the sufficiency of reason, the trustworthiness of experience, the admissibility of revelation, free will, foreknowledge, and the rest. The peculiarly disjointed and fragmentary condition of the sentiments expressed by Pascal aggravates the appear- ance of universal doubt which is present in the PensSes, just as the completely unfinished condition of the work, from the literary point of view, constantly causes slighter or graver doubts as to the actual meaning which the author wished to express. Accordingly the Pensies have always been a favourite exploring ground, not to say a favourite field of battle, to persons who take an interest in their problems. Speaking generally, their tendency is towards the combating of scepticism by a deeper scepticism, or, as Pascal himself calls it, Pyrrhonism, which occasionally goes the length of denying the possibility of any natural theology. Pascal explains all the contradictions and difficulties of human life and thought by the doctrine of the Fall, and relies on faith and revelation alone to justify each other.

Excluding here his scientific attainments (see below), Pascal presents himself for comment in two different lights, the second of which is, if the expression be permitted, a composite one. The first exhibits him as a man of letters, the second as a philosopher, a theologian, and simply a man, for in no one is the colour of the theology and the philosophy more distinctly personal. Yet his character as a man is not very distinct. The accounts of his sister and niece have the defect of all hagiology; they are obviously written rather with a view to the ideas and the wishes of the writers than with a view to the actual and absolute personality of the subject. Except from these interesting but somewhat tainted sources, we know little or nothing about him. Hence conjecture, or at least inference, must always enter largely into any estimate of Pascal, except a purely literary one.

On that side, fortunately, there is no possibility of doubt or difficulty to any competent inquirer. The Provincial Letters are the first example of French prose which is at once consider- able in bulk, varied and important in matter, perfectly finished in form. They owe not a little to Descartes, for Pascal's indebtedness to his predecessor is unquestionable from the literary side, whatever may be the case with the scientific. But Descartes had had neither the opportunity, nor the desire, nor probably the power, to write anything of the literary im- portance of the Provinciates. The first example of polite controversial irony since Lucian, the Provinciates have continued to be the best example of it during more than two centuries in which the style has been sedulously practised, and in which they have furnished a model to generation after generation. The unfailing freshness and charm of the contrast between the importance, the gravity, in some cases the dry and abstruse nature, of their subjects, and the lightness, sometimes almost

approaching levity in its special sense, of the manner in which these subjects are attacked is a triumph of literary art of which no familiarity dims the splendour, and which no lapse of time can ever impair. Nor perhaps is this literary art really less evident in the PensSes, though it is less clearly displayed, owing to the fragmentary or rather chaotic condition of the work, and partly also to the nature of the subject. The vividness and distinction of Pascal's phrase, his singular faculty of inserting without any loss of dignity in the gravest and most impassioned meditation what may be almost called quips of thought and diction, the intense earnestness of meaning weighting but not confusing the style, all appear here.

No such positive statements as these are, however, possible as to the substance of the PensSes and the attitude of their author. Hitherto the widest differences have been manifested in the estimate of Pascal's opinions on the main questions of philosophy, theology and human conduct. He has been represented as a determined apologist of intellectual orthodoxy animated by an almost fanatical " hatred of reason," and possessed with a purpose to overthrow the appeal to reason; as a sceptic and pessimist of a far deeper dye than Montaigne, anxious chiefly to show how any positive decision on matters beyond the range of experience is impossible; as a nervous believer clinging to conclusions which his clearer and better sense showed to be indefensible; as an almost ferocious ascetic and paradoxer affecting the credo quia impossibile in intellectual matters and the odi quia amabile in matters moral and sensuous; as a wanderer in the regions of doubt and belief, alternately bringing a vast though vague power of thought and an un- equalled power of expression to the expression of

ideas incom- patible and irreconcilable. An unbiased study of the scanty facts of his history, and of the tolerably abundant but scattered and chaotic facts of his literary production, ought to enable any one to steer clear of these exaggerations, while admitting at the same time that it is impossible to give a complete and final account of his attitude towards the riddles of this world and others. He certainly was no mere advocate of ortho- doxy; he as certainly was no mere victim of terror at scepticism; least of all was he a freethinker in disguise. He appears, as far as can be judged from the fragments of his Pensies, to have seized firmly and fully the central idea of the difference between reason and religion. Where the difficulty rises respect- ing him is that most thinkers since his day, who have seen this 'difference with equal clearness, have advanced from it to the negative side, while he advanced to the positive. In other words, most men since his day who have not been contented with a mere concordat, have let religion go and contented themselves with reason. Pascal, equally discontented with the concordat, held fast to religion and continued to fight out the questions of difference with reason. Surveying these positions, we shall not be astonished to find much that is sur- prising and some things that are contradictory in Pascal's utterances on " les grands sujets." The influence exercised on him by Montaigne is the one fact regarding him which has not been and can hardly be exaggerated, and his well-known Entretion with Sacy on the subject (the restoration of which to its proper form is one of the most valuable results of modern criticism) leaves no doubt possible as to the source of his " Pyrrhonian " method. But it is impossible for anyone who takes Pascal's Pensees simply as he finds them in connexion with the facts of Pascal's history to question his theological orthodoxy, understanding by theological orthodoxy the accep- tance of revelation and dogma; it is equally impossible for any one in the same condition to declare him absolutely content with dogma and revelation. It is of the essence of an active mind like Pascal's to explore and state all the arguments which make for or make against the contlusion it is investigating.

To sum up, the PensSes are excursions into the great unknown made with a full acknowledgment of the greatness of that unknown. From the point of view that belief and knowledge, based on experience or reasoning, are separate domains with an unexplored sea between and round them, Pascal is perfectly

comprehensible, and he need not be taken as a deserter from one

region to the other. To those who hold that all intellectual exercise outside the sphere of religion is impious or that all intellectual exercise inside that sphere is futile, he must remain an enigma.

There are few writers who are more in need than Pascal of being fully and competently edited. The chief nominally complete edition at present in existence is that of Bossut (1779, 5 vols., and since reprinted), which not only appeared before any attempt had been made to restore the true text of the Pensees^ but is in other respects quite inadequate. The edition of Lahure, 1858, is not much better, though the Pense.es appear in their more genuine form. An edition promised for the excellent collection of Les Grands ecrivains de la France by A. P. Faugere has been executed as far as the Pensees go by Leon Brunschvig (3 vols., 1904), who has also issued a one- volume edition. The CEuvres completes appeared in three volumes (Paris, 1889). Meanwhile, with the exception of the Provinciates (of which there are numerous editions, no one much to be preferred to any other, for the text is undisputed and the book itself contains almost all the exegesis of its own contents necessary), Pascal can be read only at a disadvantage. There are five chief editions of the true Pensees earlier than Brunschvig's : that of Faugere (1844), the editio princeps ; that of Havet (1852, 1867 and l88i),onthe whole the best ; that of Victor Rochet (1873), good, but arranged and edited with the deliberate intention of making Pascal first of all an orthodox apologist; that of Molinier (1877-1879), a carefully edited and in- teresting text, the important corrections of which have been intro- duced into Havet's last edition and that of G. Michelant (Freiburg, 1896). Unfortunately, none of these can be said to be exclusively satisfactory. The minor works must chiefly be sought in Bossut or reprints of him. Works on Pascal are innumerable: Sainte-Beuve's Port Royal, Cousin's writings on Pascal and his Jacqueline Pascal, and the essays of the editors of the Pensees just mentioned arethe most noteworthy. Principal Tulloch contributed a useful little monograph to the series of Foreign Classics for English Readers (Edinburgh and London, 1878). Recent handlings are, in French, E. Boutroux's Pascal (Paris, 1903) and, in English, an article in the Quarterly Review (No. 407) for April 1906. (G. Sa.)

Pascal as Natural Philosopher and Mathematician. — Great as is Pascal's reputation as a philosopher and man of letters, it may be fairly questioned whether his claim to be remembered by posterity as a mathematician and physicist is not even greater. In his two former capacities all will admire the form of his work, while some will question the value of his results; but in his two latter capacities no one will dispute either. He was a great mathematician in an age which produced Descartes, Fermat, Huygens, Wallis and Roberval. There are

wonderful stories on record of his precocity in mathematical learning, which is sufficiently established by the well-attested fact that he had completed before he was sixteen years of age a .work on the conic sections, in which he had laid down a series of pro- positions, discovered by himself, of such importance that they may be said to form the foundations of the modern treatment of that subject. Owing partly to the youth of the author, partly to the difficulty in publishing scientific works in those days, and partly no doubt to the continual struggle on his part to devote his mind to what appeared to his conscience more important labour, this work (like many others by the same master hand) was never published. We know something of what it contained from a report by Leibnitz, who had seen it in Paris, and from a resumi of its results published in 1640 by Pascal himself, under the title Essai pour les coniques. The method which he followed was that introduced by his contem- porary Girard Desargues, viz. the transformation of geometrical figures by conical or optical projection. In this way he estab- lished the famous theorem that the intersections of the three pairs of opposite §jdes of a hexagon inscribed in a conic are collinear. This proposition, which he called the mystic hexa- gram, he made the keystone of his theory; from it alone he deduced more than 400 corollaries, embracing, according to his own account, the conies of Apollonius, and other results innumerable.

Pascal also distinguished himself by his skill in the infinitesimal cafeilus, then in the embryonic form of Cavalieri's method of indivisibles. The cycloid was a famous curve in those days; it had been discussed by Galileo, Descartes, Fermat, Roberval ancLTorricelli, who had in turn exhausted their skill upon it. Pascal solved the hitherto refractory problem of the general

quadrature of the cycloid, and proposed and solved a variety of others relating to the centre of gravity of the curve and its segments, and to the volume and centre of gravity of solids of revolution generated in various ways by means of it. He published a number of these theorems without demonstration as a challenge to contemporary mathematicians. Solutions were furnished by Wallis, Huygens, Wren and others; and Pascal published his own in the form of letters from Amos Dettonville (his assumed name as challenger) to Pierre de Carcavy. There has been some discussion as to the fairness of the treatment accorded by Pascal to his rivals, but no question of the fact that his initiative led to a great extension of our knowledge of the properties of the cycloid, and indirectly hastened the progress of the differential calculus.

In yet another branch of pure mathematics Pascal ranks as a founder.

The mathematical theory of probability and the allied theory of the combinatorial analysis were in effect created by the correspondence between Pascal and Fermat, concerning certain questions as to the division of stakes in games of chance, which had been propounded to the former by the gaming philosopher De Mer6. A complete account of this interesting correspondence would surpass our present limits; but the reader may be referred to Todhunter's History of the Theory of Probability (Cambridge and London, 1865), pp. 7-21. It appears that Pascal contemplated publishing a treatise De aleae geometria; but all that actually appeared was a fragment on the arithmetical triangle (Traits du triangle arithmetique, " Properties of the Figurate Numbers "), printed in 1654, but not published till 1665, after his death.

Pascal's work as a natural philosopher was not less remarkable than his discoveries in pure mathematics. His experiments and his treatise (written before 1651, published 1663) on the equilibrium of fluids entitle him to rank with Galileo and Stevinus as one of the founders of the science of hydrodynamics. The idea of the pressure of the air and the invention of the instrument for measuring it were both new when he made his famous experiment, showing that the height of the mercury column in a barometer decreases when it is carried upwards through the atmosphere. This experiment was made by himself in a tower at Paris, and was carried out en a grand scale under his instructions by his brother-in-law Florin Perier on the Puy de Dome in Auvergne. Its success greatly helped to break down the old prejudices, and to bring home to the minds of ordinary men the truth of the new ideas propounded by Galileo and Torricelli.

Whether we look at his pure mathematical or at his physical researches we receive the same impression of Pascal; we see the strongest marks of a great original genius creating new ideas, and seizing upon, mastering, and pursuing farther every- thing that was fresh and unfamiliar in his time. We can still point to much in exact science that is absolutely his; and we can indicate infinitely more which is due to his inspiration.

(G. Ch.)

PASCAL, JACQUELINE (1625-1661), sister of Blaise Pascal, was born at Clermont-Ferrand, France, on the 4th of October 1625. She was a genuine infant prodigy, composing verses when only eight years, and a five-act comedy at eleven. In 1646 the influence of her brother converted her to Jansenism. In 1652, she took the veil, despite the strong opposition of her brother, and subsequently was largely instrumental in the latter's own final conversion. She vehemently

opposed the attempt to compel the assent of the nuns to the Papal bulls condemning Jansenism, but was at last compelled to yield her own. This blow, however, hastened her death, which occurred at Paris on the 4th of October i66r.

PASCHAL (Paschalis), the name of two popes, and one anti-pope.

Paschal I., pope from 817 to 824, a native of Rome, was raised to the pontificate by the acclamation of the clergy, shortly after the death of Stephen IV., and before the sanction of the emperor (Louis the Pious) had been obtained — a circum- stance for which it was one of his first cares to apologize. His

relations with the imperial house, however, never became cordial; and he was also unsuccessful in winning the sympathy of the Roman nobles. He died in Rome while the imperial commissioners were investigating the circumstances under which two important Roman personages had been seized at the Lateran, blinded and afterwards beheaded; Paschal had shielded the murderers but denied all personal complicity in their crime. The Roman people refused him the honour of burial within the church of St Peter, but he now holds a place in the Roman calendar (May 16). The church of St Cecilia in Trastevere was restored and St Maria in Dominica rebuilt by him; he also built the church of St Prassede. The successor of Paschal I. was EugeniusII. (L. D.*)

Paschal II. (Ranieri), pope from the 13th of August 1099 to the 21st of January 1118, was a native of Bieda, near Viterbo, and a monk of the Cluniac order. He was created cardinal- priest of S. Clemente by Gregory VII. about 1076, and was consecrated pope in succession to Urban II. on the 14th of August 1099. In the long struggle with the emperors over investiture, he zealously carried on the Hildebrandine policy, but with only partial success. In 1104 Paschal succeeded in instigating the emperor's second son to rebel against his father, but soon found Henry V. even more persistent in maintaining the right of investiture than Henry IV. had been. The imperial Diet at Mainz invited (Jan. 1106) Paschal to visit Germany and settle the trouble, but the pope in the Council of Guastalla (Oct. 1 106) simply renewed the prohibition of investiture. In the same year he brought to an end the investiture struggle in England, in which Anselm, archbishop of Canterbury, had been engaged with King Henry I., by retaining

himself exclusive right to invest with the ring and crozier, but recognizing the royal nomination to vacate benefices and oath of fealty for temporal domains. He went to France at the close of 1106 to seek the mediation of King Philip and Prince Louis in the imperial struggle, but, his negotiations remaining without result, he returned to Italy in September 1107. When Henry V. advanced with an army into Italy in order to be crowned, the pope agreed to a compact (Feb. nil), by the terms of which the Church should surrender all. the possessions and royalties it had rsceived of the empire and kingdom of Italy since the days of Charlemagne, while Henry on his side should renounce lay investiture. Preparations were made for the coronation on the 1 2th of February n n, but the Romans rose in revolt against the compact, and Henry retired taking with him pope and curia. After sixty-one days of harsh imprisonment, Paschal yielded and guaranteed investiture to the emperor. Henry was then crowned in St Peter's on the 13th of April, and after exacting a promise that no revenge would be taken for what had passed withdrew beyond the Alps. The Hildebrandine party was aroused to action, however; a Lateran councilof March n 12 declared null and void the concessions extorted by violence; a council held at Vienna in October actually excom- municated the emperor, and Paschal sanctioned the proceeding. Towards the end of the pontificate trouble began anew in England, Paschal complaining (in 5) that councils were held and bishops translated without his authorization, and threatening Henry I. with excommunication. On the death of the countess Matilda, who had bequeathed all her territories to the Church (n 15), the emperor at once laid claim to them as imperial fiefs and forced the pope to flee from Rome. Paschal returned after the emperor's withdrawal at the beginning of 1118, but died within a few days on the 21st of January 1118. His successor was Gelasius II.

The principal sources for the life of Paschal II. are his Letters in the Monumenta Germaniae historica. Epistolae, vols. 3, 6, 7, 13, 17, 20-23, 25, and the Vita by Petrus Pisanus in the Liber pontificalis, ed. Duchesne (Paris, 1892). Important bulls are in J. A. G. von Pflugk-Harttung, Die Bullen der Papste bis zum Ende des zwolften Jahr-hunderts (Gotha, 1901), and a valuable digest in Jaffe-Wattenbach, Regesta pontif. roman. (1885-1888).

See J. Langen, Geschichte der rbmischen Kirche von Gregor VII. bis Innocenz III. (Bonn, 1893); K. J. von Hefele, Conciliengeschichte, vol. v. (2nd ed., 1873-1890) ; E. Franz, Papst Paschalis II. (Breslau,

1877) ; W. Schum, Die Politik Papst Paschals II. gegen Kaiser Heinrich V. im Jahre 1112 (Erfurt, 1877); I. Roskens, Heinrich V. und Paschalis II. (Essen, 1885); C. Gernandt, Die erste Romfahrt Heinrich V.

(Heidelberg, 1 890) ; G. Peiser, Der deutsche Investitur- streit unter Kaiser Heinrich V. bis zu dem papstlichen Privileg vom 3 April mi (Berlin, 1883); and B. Monod, Essai sur les rapports de Pascal II. avec Philippe I. (Paris, 1907). There is an exhaustive bibliography with an excellent article by Carl Mirbt in Herzog- Hauck, Realencyklopddie (3rd ed., 1904). (C. H. Ha.)

Paschal III., anti-pope from 1164 to 1168, was elected the successor of Victor IV. on the 22nd of April 1164. He was an aged aristocrat, Guido of Crema. Recognized at once by the emperor Frederick I. he soon lost the support of Burgundy, but the emperor crushed opposition in Germany, and gained the co- operation of Henry II. of England. Supported by the victorious imperial army, Paschal was enthroned at St Peter's on the 22nd of July 1167, and Pope Alexander III., became a fugitive. Sudden imperial reverses, however, made Paschal glad in the end to hold so much as the quarter on the right bank of the Tiber, where he died on the 20th of September 1168. He was succeeded by the anti-pope Callixtus III.

See A. Hauck, Kirchengeschichte Deutschlands, Bd. IV. (Leipzig, 1903, 259-276) ; H. Bohmer in Herzog-Hauck, Realencyklopadie, Bd. XIV., 724seq.;and Lobkowtiz, Statistik der Papste (Freiburg, i. B. 1905). (W. W. R.*)

PASCHAL CHRONICLE (Chronicum Paschale, also Chronicum Alexandrinum or Constantinopolitanum, or Fasti Siculi), so called from being based upon the Easter canon, an outline of chronology ' from Adam down to a.d. 629, accompanied by numerous historical and theological notes. The work, which is imperfect at the beginning and end (breaking off in the year 627), is preceded by an introduction on the Christian methods of reckoning time and the Easter cycle. It was written during the reign of Heraclius (610-641), and is generally attributed to an unknown Byzantine cleric and friend of the patriarch Sergius, who is specially alluded to as responsible for the introduction of certain ritual innovations. The so-called Byzantine or Roman era (which continued in use in the Greek Church until its liberation from Turkish rule) was adopted in the Chronicum for the first time as the foundation of chronology, in accordance with which the date of the creation is given as the 21st of March, 5507. The author is merely a compiler from earlier works, except in the history of the last thirty years, which has the value of a contemporary record.

The chief authorities used were: Julius Sextus Africanus (3rd century) ; the consular Fasti ; the Chronicle and Church History of Eusebius; John Malalas; the Acta martyrum; the treatise of Epiphanius, bishop of

Constantia (the old Salamis) in Cyprus (fl. 4th century), on Weights and Measures. Editions: L. Dindorf (1832) in Corpus scriptorum hist, byzantinae, with Du Cange's preface and commentary; J. P. Migne, Patrologia graeca, xcii.; see also C. Wachsmuth, Einleitung in das Studium der alien Geschichte (1895); H. Gelzer, Sextus Julius Africanus und die byzantinische Chronographie, ii. I (1885); J. van der Hagen, Observationes in Heraclii imperatoris methodum paschalem (1736, but still considered indispensable) ; E. Schwarz in Pauly-Wissowa, Realencyclopddie, iii., pt. 2 (1899); C. Krumbacher, Geschichte der byzantinischen Litteratur (1897).

PAS-DE-CALAIS, a maritime department of northern France, formed in 1790 of nearly the whole of Artois and the northern maritime portion of Picardy including Boulonnais, Calaisis, Ardresis, and the districts of Langle and Bredenarde, and bounded N. by the Straits of Dover (" Pas de Calais "), E. by the department of Nord, S. by that of Somme, and W. by the English Channel. Pop. (1906), 1,012,466; Area 2606 sq. m. Except in the neighbourhood of Boulogne-sur-Mer with its cdles de fer or " iron coasts," the seaboard of the department, which measures 65 m., consists of dunes. From the mouth of the Aa (the limit towards Nord) it trends west-south-west to Gris Nez, the point of France nearest to England; in this section lie the port of Calais, Cape Blanc Nez, rising 440 ft. above the sandy shores, and the port of Wissant (Wishant). The seaside resorts include Boulogne, Berck-sur-Mer, Paris-Plage, Wimereux, &c. Beyond Griz Nez the direction is due south; in this section are the small port of Ambleteuse, Boulogne at the mouth of the Liane, and the two bays formed by the

estuaries of the Canche and the Authie (the limit towards Somme). The highest point in the department (700 ft.) is in the west, between Boulogne and St Omer. From the uplands in which it is situated the Lys and Scarpe flow east to the Scheldt, the Aa north to the German Ocean, and the Slack, Wimereux and Liane to the Channel. Farther south are the valleys of the Canche and the Authie, running E.S.E. and W.N.W., and thus parallel with the Somme. Vast plains, open and monotonous, but extremely fertile and well cultivated, occupy most of the department. To the north of the hills running between St Omer and Boulogne, to the south of Gravelines and the south-east of Calais, lies the district of the Wattergands, fens now drained by means of canals and dikes, and turned into highly productive land. The climate is free from extremes of heat and cold, but damp and changeable. At

Arras the mean annual temperature is 47 ; on the coast it is higher. The rainfall varies from 24 to 32 in., though at Cape Gris Nez the latter figure is much exceeded. Cereals are largely grown and give good yields to the acre; the other principal crops are potatoes, sugar-beet, forage, oil-plants and tobacco. Market gardening flourishes in the Wattergands. The rearing of livestock and poultry is actively carried on, and the horses of the Boulonnais are specially esteemed.

The department is the chief in France for the production of coal, its principal coal-basin, which is a continuation of that of Valenciennes, centring round Bethune. The manufacture of beetroot-sugar, oil and alcohol distilling, iron-working, dyeing, brewing, paper-making, and various branches of the textile manufacture, are foremost among the industries of the depart- ment. Boulogne, Calais and Etaples fit out a considerable number of vessels for the cod, herring and mackerel fisheries. Calais and Boulogne are important ports of passenger-transit for England; and Boulogne also carries on a large export trade in the products of the department. The canal system com- prises part of the Aa, the Lys, the Scarpe, the Defile (a tributary of the Lys passing by Lille), the La we (a tributary of the Lys passing by Bethune), and the Sensee (an affluent of the Scheldt), as well as the canals of Aire to Bauvin, Neuffosse, Calais, Calais to Ardres, &c, and in this way a line of communi- cation is formed from the Scheldt to the sea by Bethune, St Omer and Calais, with branches to Gravelines and Dunkirk. The department is served by the Northern railway.

Pas-de-Calais forms the diocese of Arras (archbishopric of Cambrai), belongs to the district of the I. army corps, the educational division (academie) of Lille and the circumscription of the appeal court of Douai. There are six arrondissements (Arras, Bethune, Boulogne, Montreuil-sur-Mer, St Omer and St Pol-sur-Ternoise). The more noteworthy places are Arras, the capital, Boulogne, Calais, St Omer, Bethune, Lens, Mon- treuil-sur-Mer, Bruay, Berck, Etaples and Aire-sur-la-Lys, which are noticed separately. Besides some of the towns mentioned, Lievin (22,070), Henin-Lietard (13,384), in the neigh- bourhood of Lens, are large centres of population. Other places of some importance are:Lillers (pop. 5341), which carries on boot-making and has a fine Romanesque church of the 12th century; Hesdin, which owes its regular plan to Charles V., by whom it was built; and St Pol, which has the remains of medieval fortifications and castles and gave its name to the famous counts of St Pol.

PASDELOUP, JULES ETIENNE (1819-1887), French con- ductor, was born in Paris, and educated in music at the con- servatoire. He founded in 1851 a ” societe des jeunes artistes du conservatoire,” and,

as conductor of its concerts, did much to popularize the best new compositions of the time. His ” popular concerts ” at the Cirque d’hiver, from 1861 till 1884, had also a great effect in promoting French taste in music.

PASEWALK, a town of Germany, in the Prussian province of Pomerania, on the Ucker, 26 m. N.W. from Stettin by the railway to Strassburg. Pop. (1905), 10,519. Pasewalk became a town during the 12th century and was soon a member of the Hanseatic League. In 1359 it passed to the duke of Pomerania. Frequently ravaged during the wars which devastated the

district, it was plundered several times by the imperialists during the Thirty Years’ War; in 1657 it was burnt by the Poles and in 1713 by the Russians. By the peace of Westphalia in 1648 it was given to Sweden, but in 1676 it was conquered by Brandenburg, and in 1720, by the peace of Stockholm, it was definitely assigned to Brandenburg-Prussia.

See Hiickstadt, Geschichte der Stadt Pasewalk (Pasewalk, 1883).

PASHA, also written ” pacha ” and formerly ” pashaw,” &c, a Turkish title, superior to that of bey (q.v.), borne by persons of high rank and placed after the name. It is in the gift, of the sultan of Turkey and, by delegation, tof the khedive of Egypt. The title appears, originally, to have been bestowed exclusively upon military commanders, but it is now given to any high official, and also to unofficial persons whom it is desired to honour. It is conferred indifferently upom Moslems and Chris- tians, and is frequently given to foreigners in the service of the Turks or Egyptians. Pashas are of three grades, formerly distinguished by the number of horse-tails (three, two and one respectively) which they were entitled to display as symbols of authority when on campaign. A pashalik is a province governed by or under the jurisdiction of a pasha.

The word is variously derived from the Persian pddshah, Turkish padishah, equivalent to king or emperor, and from the Turkish bash, in some dialects pash, a head, chief, &c. In old Turkish there was no fixed distinction between b and p. As first used in western Europe the title was written with the initial b. The English forms bashaw, bassaw, bucha, &c, general in the 16th and 17th centuries, were derived through the med. Lat. and Ital. bassa.

PASIG, a town and the capital of the province of Rizal, Luzon, Philippine Islands, about 6 m. E.S.E. of Manila. Pop. (1903), 11,287.

The town, which covers a considerable area, is traversed by the Pasig river and its tributary, the Mariquino river, and for a short distance borders on Laguna de Bay. In the south-western part is Fort McKinley. Although built on low ground, Pasig is fairly healthy. It was formerly an impor- tant commercial centre, the inhabitants being largely engaged in a carrying and forwarding trade between Manila and the lake ports; but this trade was lost after the establishment of direct rail and steamboat service between these ports. The principal industries are rice-farming, the manufacture of a cheap red pottery, and fishing. The language is Tagalog.

PASITELES, the most important member of the Neo-Attic school of sculpture in the time of Julius Caesar. At that period there was at Rome a demand for copies of, or variations on, noted works of Greek sculpture: the demand was met by the workshops of Pasiteles and his pupils Stephanus and Menelaus and others, several of whose statues are extant. In working from early Dorian models they introduced refinements of their own, with the result that they produced beautiful, but some- what vapid and academic types. Pastiteles is said by Pliny (Nat. Hist, xxxvi. 39) to have been a native of Magna Graecia, and to have been granted the Roman citizenship.

PASKEVICH, IVAN FEDOROVICH (1 782-1856), count of Erivan, prince of Warsaw, Russian field marshal, descended from an old and wealthy family, was born at Poltava on the 19th (3th) of May 1782. He was educated at the imperial institution for pages, where his progress was rapid, and in 1800 received his commission in the Guards and was named aide-de-camp to the tsar. His first active service was in 1805, in the auxiliary army sent to the assistance of Austria against France, when he took part in the battle of Austerlitz. From 1807 to 181 2 he was engaged in the campaigns against Turkey, and distinguished himself by many brilliant and daring exploits, being made a general officer in his thirtieth year. During the French War of 181 2-14 he was present, in command of the 26th division of infantry, at all the most important engagements; at the battle of Leipzig he won promotion to the rank of lieutenant- general. On the outbreak of war with Persia in 1826 he was appointed second in command, and, succeeding in the fol- lowing year to the chief command, gained rapid and brilliant successes which compelled the shah to sue for peace in February

1828. In reward of his services he was named by the emperor count of Erivan, and received a million of roubles and a diamond- mounted sword. From Persia he was sent to Turkey in Asia, and, having captured in rapid succession the principal fortresses, he was at the end of the campaign made a field marshal at the age of forty-seven. In 1830 he subdued the mountaineers of Daghestan. In 183 1 he was entrusted with the command of the army sent to suppress the revolt of Poland, and after the fall of Warsaw, which gave the death-blow to Polish indepen- dence, he was raised to the dignity of prince of Warsaw, and created viceroy of the kingdom of Poland. On the outbreak of the insurrection of Hungary in 1848 he was appointed to the command of the Russian troops sent to the aid of Austria, and finally compelled the surrender of the Hungarians at Vilagos. In April 1854 he again took the field in command of the army of the Danube, but on the 9th of June, at Silistria, where he suffered defeat, he received a contusion which compelled him to retire from active service. He died on the 13th (1st) of February 1856 at Warsaw, where in 1869 a memorial was erected to him. He held the rank of field marshal in the Prussian and Austrian armies as well as in his own service.

See Tolstoy, Essai biographique et historique sur le feld-marSchal Prince de Varsovie (Paris, 1835) ; Notice biographique sur le Marechal Paskevitch (Leipzig, 1856); and Prince Stcherbatov's Life (St Petersburg, 1 888-1 894).

PASLEY, SIR CHARLES WILLIAM (1780-1861), British soldier and military engineer, was born at Eskdale Muir, Dum- friesshire, on the 8th of September 1780. In 1796 he entered the Royal Military Academy, Woolwich; a year later he gained his commission in the Royal Artillery, and in 1798 he was transferred to the Royal Engineers. He was present in the defence of Gaeta, the battle of Maida and the siege of Copen- hagen. In 1807, being then a captain, he went to the Peninsula, where his knowledge of Spanish led to his employment on the staff of Sir David Baird and Sir John Moore. He took part in the retreat to Corunna and the Walcheren Expedition, and received a severe wound while gallantly leading a storming party at Flushing. During his tedious recovery he employed himself in learning German. He saw no further active service, the rest of his life being devoted to the foundation of a complete science of military engineering and to the thorough organization and training of the corps of Royal Engineers. He was so success- ful that, though only a captain, he was allowed to act for two years as commanding royal engineer at Plymouth and given a special grant. The events of the Peninsular War having empha- sized the need of a fully trained

engineer corps, Pasley's views were adopted by the war office, and he himself placed at the head of the new school of military engineering at Woolwich. This was in 1812, and Pasley was at the same time gazetted brevet major. He became brevet lieutenant-colonel in 18 13 and substantive lieutenant-colonel in 1814. The first volume of his Military Instruction appeared in 1814, and contained a course of practical geometry which he had framed for his company at Plymouth. Two other volumes completing the work appeared by 181 7, and dealt with the science and practice of fortification, the latter comprising rules for construction. He published a work on Practical Architecture, and prepared an important treatise on The Practical Operations of a Siege (1829-1832), which was translated into French (1847). He became brevet colonel in 1830 and substantive colonel in i83r. From 1831-1834 the subject that engaged his leisure was that of standardization of coins, weights and measures, and he published a book on this in 1834. In 1838 he was presented with the freedom of the city of London for his services in removing sunken vessels from the bed of the Thames near Gravesend; and from 1839 to 1844 he was occupied with clearing away the wrecks of H.M.S. " Royal George " from Spithead and H.M.S." Edgar " from St Helens. All this work was subsidiary to his great work of creating a comprehensive art of military engineering. In 1841 on promo- tion to the rank of major-general he was made inspector-general of railways. In 1846 on vacating this appointment he was made a K.C.B., and thenceforward up to 1855 was chiefly concerned

with the East India Company's military academy at Addis- combe. He was promoted lieutenant-general in 1851, made colonel commandant of the Royal Engineers in 1853, and general in i860. He died in London on the 19th of April 1861. His eldest son, Major-General Charles Pasley (1824-1890), was a distinguished Royal Engineer officer.

Amongst Pasley's works, besides those mentioned, were separate editions of his Practical Geometry Method (1822) and of his Course of Elementary Fortification (1822), both of which formed part of his Military Instruction; Rules for Escalading Fortifications not having Palisaded Covered Ways (1822 ; new eds. 18*15 and 1854) ; descriptions of a semaphore invented by himself in 1804 (1822 and 1823) ; A Simple Practical Treatise on Field Fortification (1823) ; and Exercise of the Newdecked Pontoons invented by Lieutenant- Colonel Pasley (1823).

PASQUIER, ETIENNE (1529-1615), French lawyer and man of letters, was born at Paris, on the 7th of June 1529 by his own account,

according to others a year earlier. He was called to the Paris bar in 1549. In 1558 he became very ill through eating poisonous mushrooms, and did not recover fully for two years. This compelled him to occupy himself by literary work, and in 1 560 he published the first book of his Recherches de la France. In 1565, when he was thirty-seven, his fame was established by a great speech still extant, in which he pleaded the cause of the university of Paris against the Jesuits, and won it. Meanwhile he pursued the Recherches steadily, and published from time to time much miscellaneous work. His literary and his legal occupations coincided in a curious fashion at the Grands Jours of Poitiers in 1579. These Grands Jours (an institution which fell into desuetude at the end of the 17th century, with bad effects on the social and political welfare of the French provinces) were a kind of irregular assize in which a commission of the parlement of Paris, selected and despatched at short notice by the king, had full power to hear and determine all causes, especially those in which seignorial rights had been abused. At the Grands Jours of Poitiers of the date mentioned, and at those of Troyes in 1583, Pasquier officiated; and each occasion has left a curious literary memorial of the jests with which he and his colleagues relieved their graver duties. The Poitiers work was the cele- brated collection of poems on a flea (see Southey's Doctor). In 1585 Pasquier was appointed by Henry III. advocate-general at the Paris cours des comptes, an important body having political as well as financial and legal functions. Here he distinguished himself particularly by opposing, sometimes successfully, the mischievous system of selling hereditary places and offices, which more perhaps than any single thing was the curse of the older French monarchy. The civil wars compelled Pasquier to leave Paris and for some years he lived at Tours, working steadily at his great book, but he returned to Paris in Henry IV.'s train in March 1594. He continued until 1604 at his work in the chambre des comptes; then he retired. He survived this retirement more than ten years, producing much literary work, and died after a few hours' illness on the 1st of September 161 5.

In so long and so laborious a life Pasquier's work was naturally considerable, and it has never been fully collected or indeed printed. The standard edition is that of Amsterdam (2 vols, fol., 1723). But for ordinary readers the selections of Leon Feugere, published at Paris (2 vols. 8vo, 1849), with an elaborate introduction, are most accessible. As a poet Pasquier is chiefly interesting as a minor member of the Pleiade movement. As a prose writer he is of much more account. The three chief divisions of his prose work are his Recherches, his letters and his professional speeches. The letters are of much biographical

interest and historical importance, and the Recherches contain in a somewhat miscellaneous fashion invaluable information on a vast variety of subjects, literary, political, anti- quarian and other.

PASQUIER, ETIENNE DENIS, Duke (1 767-1862), French statesman, was born on the 22nd of April 1767. Descended from a family which had long been distinguished at the bar and in connexion with the parlements of France, he was destined for the legal profession and was educated at the college of Juilly. He then became a counsellor of the parlement of Paris, and witnessed many of the incidents that marked the growing hostility between that body and Louis XVI. in the years preced- ing the outbreak of the French Revolution in 1789. His views

were those of a moderate reformer, who desired to renovate but not to end the institutions of the old monarchy; and his memoirs set forth in a favourable light the actions of that parlement, the existence of which was soon to be terminated amid the political storms of the close of the year 1789. For some time, and especially during the Reign of Terror (1 793-1 794), Pasquier remained in obscurity; but this did not save him from arrest in the year 1794. He was thrown into prison shortly before the coup d'ttat of Thermidor (July 1794) which overthrew Robespierre. In the reaction in favour of ordinary govern- ment which ensued Pasquier regained his liberty and his estates. He did not re-enter the public service until the period of the Empire, when the arch-chancellor Cambac6res used his influence with Napoleon to procure for him the office of " maitre des requetes " to the council of state. In 1809 he became baron of the French Empire, and in February 1810 counsellor of state. Napoleon in 1810 made him prefect of police. The chief event which ruffled the course of his life at that time was the strange conspiracy of the republican general Malet (Oct. 181 2), who, giving out that Napoleon had perished in Russia, managed to surprise and capture some of the ministers and other authorities at Paris, among them Pasquier. The collapse of this bold attempt enabled him, however, speedily to regain his liberty.

When Napoleon abdicated in April 1814 Pasquier continued to exercise his functions for a few days in order to preserve order, and then resigned the prefecture of police, whereupon Louis XVIII. allotted to him the control of roads and bridges. He took no share in the imperial restoration at the time of the Hundred Days (1815), and after the second entry of Louis XVIII. into Paris he became minister of the

interior, but finding it impossible to work with the hot- headed royalists of the Chamber of Deputies {La Chambre introuvable), he resigued office. Under the more moderate ministers of succeeding years he again held various appointments, but refused to join the reactionary cabinets of the close of the reign of Charles X. After the July Revolution (1830) he became president of the Chamber of Peers — a post which he held through the whole of the reign of Louis Philippe (1830-1848). In 1842 he was elected a member of the French Academy, and in the same year was created a duke. After the overthrow of Louis Philippe in February 1848, Pasquier retired from active life and set to work to compile the notes and reminiscences of his long and active career. He died in 1862.

See Memoires du Chancelier Pasquier (6 vols., Paris, 1 893-1 895;

Eartly translated into English, 4 vols., London, 1893-1894). Also 1. de Vieilcastel, Histoire de la Restauration, vols, i.-iv.

(J. Hl. R.)

PASQUINADE, a variety of libel or lampoon, of which it is not easy to give an exact definition, separating it from other kinds. It should, perhaps, more especially deal with public men and public things. The distinction, however, has been rarely observed in practice, and the chief interest in the word is its curious and rather legendary origin. According to the earliest version, given by Mazocchi in 1 509, Pasquino was a schoolmaster (others say a cobbler), who had a biting tongue, and lived in the 15th century at Rome. His name, at the end of that century or the beginning of the next, was transferred to a statue which had been dug up in 1 501 in a mutilated condition (some say near his shop) and was set up at the corner of the Piazza Navona, opposite the palace of Cardinal Caraffa. To this statue it became the custom to affix squibs on the papal government and on prominent persons. At the beginning of the 16th century Pasquin had a partner provided for him in the shape of another statue found in the Campus Martius, said to represent a river god, and dubbed Marforio, a foro Martis. The regulation form of the pasquinade then became one of dialogue, or rather question and answer, in which Marforio usually addressed leading inquiries to his friend. The proceeding soon attained a certain European notoriety, and a printed collection of the squibs due to it (they were long written in Latin verse, with an occasional excursion into Greek) appeared in 1509. In the first book of Pantagruel (1532 or thereabouts) Rabelais introduces books by Pasquillus and Marphurius in the catalogue of the library of St Victor,

and later he quotes some utterances of Pasquin's in his letters to the bishop of Maillezais. These, by the way, show that Pasquin was by no means always satirical, but dealt in grave advice and comment. The original Latin pasquinades were collected in 1544, as Pasquillorum tomi duo, edited by Caelius Secundus Curio. The vogue of these lampoons now became general, and rose to its height during the pontificate of Sixtus V. (1585-1590). These utterances were not only called pasquinades (pasquinate) but simply pasquils (pasquillus, pasquillo, pasquille), and this form was sometimes used for the mythical personage himself. It was used in English for purposes of satire by Sir Thomas Elyot, in his Pasquin the Plain (154c) and by the anonymous author of Pasquin in a Trance (1566); but it was first made popular in England by Thomas Nash, who in 1589 began to sign his violent controversial pamphlets with the pseudonym of Pasquil of England. It continues to occur through the course of the Marprelate controversy as the title of the enemy of the Puritans. These English lampoons were in prose. The French pasquils (examples of which may be found in Fournier's VariitSs histor- iques et litteraires) were more usually in verse. In Italy itself Pasquin is said not to have condescended to the vernacular till the 1 8th century. Contemporary comic periodicals, especially in Italy, still occasionally use the Marforio-Pasquino dialogue form. But this survival is purely artificial and literary, and pasquinade has, as noted above, ceased to have any precise meaning.

PASQUINI, BERNARDO (1637-1710), Italian musical com- poser, was born at Massa in Val di Nievole (Tuscany) on the 8th of December 1637, He was a pupil of Marcantonio Cesti and Loreto Vittori. He came to Rome while still young and entered the service of Prince Borghese; later he became organist of St Maria Maggiore. He enjoyed the protection of Queen Christina of Sweden, in whose honour an opera of his, Dov' e amore e pieta, was produced in 1679. During Alessandro Scarlatti's second sojourn in Rome (1703-1708), Pasquini and Corelli were frequently associated with him in musical perform- ances, especially in connexion with the Arcadian Academy, of which all three were members. Pasquini died at Rome on the 22nd of November 17 10, and was buried in the church of St Lorenzo in Lucina. He deserves remembrance as a vigorous composer for the harpsichord; and an interesting account of his music for this instrument will be found in J. S. Shedlock's The Pianoforte Sonata.

PASSACAGLIA, the name of an old Spanish dance, supposed to be derived from pasar, to walk, and calle, street, the tune being played by wandering musicians in the streets. It was a slow and rather solemn dance of one or two dancers. The dance tune resembled the "

chaconne," and was, like it, constructed on a ground-bass. Brahms's Symphony in E Minor, No. 4, ends with an elaborate passacaglia.

PASSAGLIA, CARLO (1812-18S7), Italian divine, was born at Lucca on the 2nd of May 181 2. Passaglia was soon destined for the priesthood, and was placed under the care of the Jesuits at the age of fifteen. He became successively doctor in mathe- matics, philosophy and theology in the university of Rome. In 1844 he was made professor in the Collegio Romano, the well- known Jesuit college in Rome. In 1845 ne took the vows as a member of the Jesuit order. In 1848, during the expulsion of the Jesuits from Rome which followed on the revolutionary troubles in the Italian peninsula, he paid a brief visit to England. On his return to Italy he founded, with the assistance of Father Curci and Luigi Taparelli d'Azeglio, the celebrated organ of the Jesuit order entitled the Civilld Cattolica. In 1854 came the decision of the Roman Church on the long-debated question of the Immaculate Conception of the Virgin. Into the agitation for the promulgation of this dogma Passaglia threw himself with great eagerness, and by so doing recommended himself strongly to Pope Pius IX. But his favour with the pope was of short duration. In 1859, when the war between Austria and France (the first step towards the unification of Italy) broke out, Passaglia espoused the popular side. He took refuge at Turin, and under the influence of Cavour he wrote an Epistola ad

Episcopos Catholicos pro causa Italica, in which, like Liverani before him, he boldly attacked the temporal power of the pope. For this he was expelled from the order of Jesuits, his book was put on the Index, and his figure struck out, by the pope's order, from a picture painted to commemorate the proclamation of the dogma of the Immaculate Conception. A refuge from the anger of the pope was afforded him in the Casa Cavour at Turin, the house in which Cavour was born. There he laboured for Italian unity with indomitable energy in the north of Italy, in conjunc- tion with Cardinal d'Andrea in the south, and he collected the signatures of 9000 priests to an address to the pope in opposition to the temporal power, and in favour of abandoning all resistance to the union of Italy under a king of the House of Savoy. He and the 9000 priests were excommunicated on the 6th of October 1862. Passagilia disregarded his excommunication, and con- tinued his work as professor of moral philosophy at Turin, to which he had been appointed in 1861, and began a series of Advent addresses in the church of San Carlo at Milan. But on arriving in order to preach his

second sermon he found himself met by an inhibition on the part of Mgr Caccia, the administrator of the archdiocese of Milan. Elected deputy in the Italian parliament, he still advocated strongly the cause of Italian independence, and at a later period wrote a defence of the rights of the episcopate under the title of La Causa di sua eminenza il cardinalt d'Andrea. He also (1864) wrote against Renan's Vie de Jesus. Eight days before his death he endeavoured to be reconciled to the pope, and made a full retractation. He died at Turin on the 12th of March 1887.

PASSAIC, a city of Passaic county, New Jersey, U.S.A., at the head of navigation on the Passaic river, 5 m. S.S.E. of Paterson. (Pop. (1890), 13,028; (1900), 27,777, 0I whom 12,900 were foreign-born; (1910 census), 54,773- Passaic is served by the Erie and the Delaware, Lackawana & Western railways. The east part of the city is a plain occupied chiefly by factories, for which water-power is furnished by the river and a canal; the west part, which is almost wholly residential, extends over hills which command excellent views. Among the principal buildings are the city hall, and the Jane Watson Reid Memorial Library. The city's factory products increased in value from $12,804,805 in 1900 to $22,782,725 in 1905, or 77-9%. About one-half of the value in 1905 was in worsteds, cottons and woollens; other important manufactures are rubber goods and electrical supplies. There are large vineyards near the city. A settlement was established here by the Dutch in 1679, and was called Acquacka- nonk or Paterson Landing until the middle of the 19th century. Passaic was incorporated as a village in 1869, and in 1873 was chartered as a city.

See W. J. Pape and W. W. Scott, The News History of Passaic (Passaic, 1899).

PASSAU, a town and episcopal see of Germany, in the kingdom of Bavaria, picturesquely situated at the confluence of the Danube, the Inn and the Ilz, close to the Austrian frontier, 89 m. N.E. from Munich and 74 S.E. of Regensburg by rail. Pop. (1900), 18,003, nearly all being Roman Catholics. Passau consists of the town proper, lying on the rocky tongue of land between the Danube and the Inn, and of four suburbs, Innstadt on the right bank of the Inn, Ilzstadt on the left bank of the Ilz, Anger in the angle between Ilz and the Danube, and St Nikola. It is one of the most beautiful places on the Danube, a fine effect being produced by the way in which the houses are piled up one above another on the heights rising from the river. The best general view is obtained from the Oberhaus, an old fortress, now used as a prison, which crowns a hill 300 ft. high on the left bank of the Danube. Of the eleven churches, the most inter- esting is the cathedral

of St Stephen, a florid, rococo edifice. It was built after a fire in the 17th century on the site of a church said to have been founded in the 5th century; it has two towers, and contains some valuable relics. Other churches are the Gothic church of the Holy Ghost; the churches of St Severin, of St Paul and of St Gertrude; the double church of St Salvator; the Romanesque church of the Holy Cross; the pilgrimage church of Our Lady of Succour (Mariahilf) ; the church of the hospital

of St John; and the Romanesque Votiv Kirche. The post office occupies the site of a building in which in 1552 the Treaty of Passau was signed between the emperor Charles V. and Maurice, elector of Saxony. The fine Dom Platz contains a statue of the Bavarian king, Maximilian I. The old forts and bastions of the city have been demolished, but the two linked fortresses, the Oberhaus and the Niederhaus, are still extant. The former was built early in the 13th century by the bishop in consequence of a revolt on the part of the citizens; the latter, mentioned as early as 737, is now private property. The chief industries are the manufacture of tobacco, beer, leather, porcelain, machinery and paper. Large quantities of timber are floated down the Ilz. The well-known Passau crucibles are made at the neighbouring village of Obernzell.

Passau is of ancient origin. The first settlement was probably a Celtic one, Boiudurum; this was on the site of the present Innstadt. Afterwards the Romans established a colony of Batavian veterans, the castra batava here. It received civic rights in 1225, and soon became a prosperous place, but much of its history consists of broils between the bishops and the citizens. The strong fortress of the Oberhaus was taken by the Austrians in 1742, and again in 1805. The bishopric of Passau was founded by St Boniface in 738. The diocese was a large one, including until 1468 not only much of Bavaria, but practi- cally the whole of the archduchy of Austria. About 1260 the bishop became a prince of the empire. Amongst the earlier bishops was Pilgrin or Piligrim (d. 991), and among the later ones were the Austrian archdukes, Leopold and Leopold William, the former a brother and the latter a son of the emperor Ferdinand II. In 1803 the bishopric was secularized, and in 1805 its lands came into the possession of Bavaria. The area, which was diminished in the 15th, and again in the 18th century, was then about 350 sq. m., and the population about 50,000. A new bishopric of Passau, with ecclesiastical jurisdiction only, was established in 181 7.

See Erhart, Geschichte der Stadt Passau (Passau, 1862-1864) ; and Morin, Passau (1878). For the history of the bishopric see Scholler, Die Bischofe von Passau (Passau, 1844) ; and Schrodl, Passavia sacra.

Geschichte des Bistums Passau (Passau, 1879).

PASSERAT, JEAN (1534-1602), French poet, was born at Troyes, on the 18th of October 1534. He studied at the uni- versity of Paris, and is said to have had some curious adventures — at one time working in a mine. He was, however, a scholar by natural taste, and became eventually a teacher at the College de Plessis, and on the death of Ramus was made professor of Latin in 1572 in the College de France. In the meanwhile Passerat had studied law, and had composed much agreeable poetry in the Pleiade style, the best pieces being his short ode Du Premier jour de mai, and the charming villanelle, J'ai perdu ma tourlerelle. His exact share in the Satyre minippSe (Tours, 1594), the great manifesto of the politique or Moderate Royalist party when it had declared itself for Henry of Navarre, is differently stated; but it is agreed that he wrote most of the verse, and the harangue of the guerrilla chief Rieux is sometimes attributed to him. The famous lines Sur la journee de Senlis, in which he commends the due d'Aumale's ability in running away, is one of the most celebrated political songs in French. Towards the end of his life he became blind. He died in Paris on the 14th of September 1602.

See a notice by P. Blanchemain prefixed to his edition of Passerat's Poesies frangaises (1880). Among his Latin works should be noticed Kalendae januariae et varia quaedam poemata (2 vols., 1606), ad- dressed chiefly to his friend and patron Henri de Mesmes. For the Satyre menippee see the edition of Charles Read (1876).

PASSION (post-classical Lat. passio, formed from pali, passus, to suffer, endure), a term which is used in two main senses: (1) the suffering of pain, and (2) feeling or emotion. The first is chiefly used of the sufferings of Jesus Christ, extending from the time of the agony in the garden until his death on the cross. In this sense passio was used by the early Christian writers, and the term is also applied to the sufferings and deeds of saints and martyrs, synonymously with acta or gesta, a book containing such being known as a " passional " (liber passionalis) or

'•' passionary " (passionarius) . The order of Passionist Fathers, the full title of which is the " Congregation of the Discalced Clerks of the Most Holy Cross and Passion of cur Lord Jesus Christ," was founded by St Paul of the Cross (Paolo della Croce, 1694- 1775; canonized 1867) in

1720, but full, sanction was not obtained for the order till 1737, when the first monastery was established at Monte Argentario, Orbetello. The secondary sense of ” passion ” is due to the late use of passio to translate the Greek philosophical term iraBos, the classical Latin equivalent being afectus. The modern use generally restricts the term to strong and uncontrolled emotion.

PASSIONFLOWER (Passiflora), the typical genus of the order to which it gives its name. The name passionflower—; fios

Fig. 1.-

-Passiflora Coerulea, showing Leaf with Stipules, Tendril, and detached Flower.

passionis — arose from the supposed resemblance of the corona to the crown of thorns, and of the other parts of the flower to the nails, or wounds, while the five sepals and five petals were taken to symbolize the ten apostles — Peter, who denied, and Judas, who betrayed, being left out of the reckoning. The species are mostly natives of western tropical South America; others are found in various tropical and sub-tropical districts of both hemispheres. The tacsonias, by some considered to form part of this genus, inhabit the Andes at considerable elevations. They are mostly climbing plants (fig. 1) having a woody stock and herbaceous or woody branches, from the sides of which tendrils are produced which enable the branches to support themselves at little expenditure of tissue. Some few form trees of considerable stature destitute of tendrils, and with broad magnolia-like leaves in place of the more or less palmately-lobed leaves which are most generally met with in the order. The leaf is usually provided at the base of the leaf-stalk with stipules, which are inconspicuous, or large and leafy; and the stalk is also furnished with one or more glandular excrescences, as in some cases are the leaf itself and the bracts. The inflorescence is of a cymose character, the terminal branch being represented

by the tendril, the side branches by flower-stalks, or the inflorescence may be reduced to a single stalk. The bracts on the flower-stalk are either small and scattered or large and leafy, and then placed near the flower, forming a sort of outer calyx or epicalyx. The flower itself (seen in section in fig. 2) consists of a receptacle varying in form from that of a shallow saucer to that of a long cylindrical or trumpet-shaped tube, thin or fleshy in consistence, and giving off from its upper border the five sepals, the five petals (rarely these latter are absent), and the threads or membranous processes constituting the ” corona.”

This coronet forms the most conspicuous and beautiful part of the flower of many species, and consists of outgrowths from the tube formed subsequently to the other parts, and having little morphological significance, but being physiologically useful in favouring the cross-fertilization of the flower by means of insects. Other outgrowths of similar character, but less conspicuous, occur lower down the tube, and their variations afford useful means of discriminating between the species. From the base of the inner part of the tube of the flower, but quite free from it, uprises a cylindrical stalk surrounded below by a small cup-like outgrowth, and bearing above the middle a ring of five flat filaments each attached by a thread-like point to an anther. Above the ring of stamens is the ovary itself, upraised on a pro- longation of the same stalk which bears the filaments, or sessile.

Fig. 2. — Flower of Passionflower cut through the centre to show the arrangement of its constituent parts.

The stalk supporting the stamens and ovary is called the ” gyno- phore ” or the ” gynandrophore,” and is a characteristic of the order. The ovary of passionflowers is one-celled with three parietal placentas, and bears at the top three styles, each capped by a large button-like stigma. The ovary ripens into a berry-like, very rarely capsular, fruit with the three groups of) seeds arranged in lines along the walls, but imbedded in a pulpy arillus derived from the stalk of the seed. This succulent berry is in some cases highly perfumed, and affords a delicate fruit for the dessert-table, as in the case of the ” grana- dilla ” (P. quadrangularis) , P. edulis, P. macrocarpa, and various species of Tacsonia known as ” curubas ” in Spanish South America; P. laurifolia is the water-lemon, and P. malijormis the sweet calabash of the West Indies. The fruits do not usually exceed in size the dimensions of a hen’s or of a swan’s egg, but that of P. macrocarpa is a gourd-like oblong fruit attaining a weight of 7 to 8 ft.

The tacsonias, which in cultivation are generally regarded as distinct, differ from Passiflora in having a long cylindrical calyx-tube, bearing two crowns, one at the throat, the other near the base; they are stove or greenhouse plants; T. pinnatistipula, with pale rose-coloured flowers, a native of Chile and Peru, has long been in cultivation; T. Van-Volxemii, with handsome scarlet flowers, is one of the finest species.

PASSION WEEK, the fifth week in Lent, beginning with Passion Sunday (dominica passionis or de passione domini), so called from very early times because with it begins the more special

commemoration of Christ's passion. Passion week is often incorrectly identified with Holy week (q.v.). In the north of England Passion Sunday was formerly known as Carle or Carling Sunday, a name corrupted from " care," in allusion to the sorrowful season which the day heralds. It was the universal custom in medieval England to eat on this Sunday a grey pea steeped and fried in butter, which came to be called from its association " Carling Nut."

PASSOVER

PASSOVER, a Hebrew spring festival, celebrated by the Jews in commemoration of the exodus from Egypt by a family feast in the home on the first evening, and by abstaining from leaven during the seven days of the feast. According to tradition, the first Passover (" The Passover of Egypt"), was preordained by Moses at the command of God. The Israelites were commanded to select on the tenth of Abib (Nisan) a he-lamb of the first year, without blemish, to kill it on the eve of the fourteenth and to sprinkle with its blood the lintel and sidepost of the doors of their dwellings so that the Lord should " pass over " them when he went forth to slay the first-born of the Egyptians. The lamb thus drained of blood was to be roasted and entirely consumed by the Israelites, who should be ready with loins girded, shoes on feet and staff in hand so as to be prepared for the exodus. In memory of this the Israelites were for all time to eat unleavened bread (ma?zoth) for seven days, as well as keep the sacrifice of the Passover on the eve between the fourteenth and the fifteenth of Nisan. This evening meal was not to be attended by any stranger or uncircumcised person. " On the morrow of the Sabbath " a wave offering of a sheaf of barley was to be made. Those who were unable to perform the sacrifice of the Passover owing to impurity at the appointed time, were permitted to do so a month later.

Various theories have been from time to time proposed to account for this complex of enactments. J. Spencer in his De legibus Hebraeorum saw in the Passover a practical protest against the Egyptian worship of Apis. Vatke considered it a celebration of the spring solstice, Baur a means of removing the impurity of the old year. Lengerke recognized a double. motive: the lamb for atonement, the unleavened bread as a trace of the haste of the early harvest. Ewald regarded the Passover as an original pre-Mosaic spring festival made to serve the interest of purity and atonement.

All these views have, however, been cast in the shade by more recent

investigations based on minute literary analysis of the Pentateuch, begun by Graf, continued by Ruenen, and culminat- ing in the work of Wellhausen and Robertson Smith. This view claims to determine the respective ages and relative chrono- logical position of the various passages in which the Passover is referred to in the Pentateuch, and assumes that each successive stratum represents the practice in ancient Israel at the time of composition, laying great stress upon omissions as implying non-existence. The main passages and their contents are arranged chronologically in the following way: —

A. In the Elohist Book of the Covenant (Exod. xxiii.). The feast of unleavened bread to be kept seven days at the time appointed in the month Abib.

B. In the Yahwist Source (Exod. xxxiv. 1 8-2 1, 25). The feast of unleavened bread to be kept seven days, &c. All firstlings to be the Lord's. First-born sons to be redeemed; none to appear before the Lord empty; six days' work, seventh day rest, in the harvest; the sacrifice of the Passover shall not remain until the morning.

C. In the Yahwistic History (Exod. xii. 21-27, 2 9 – 36, 38-39, xiii. 3-16). Moses summons the elders of Israel and orders them to kill the Passover and besprinkle the lintel and sideposts with a bunch of hyssop dipped in blood so that the Lord will pass over the door. In later days when the children shall ask what this means it shall be said that this is the sacrifice of the Lord's Passover. At midnight all the first-born of the Egyptians are slain and Pharaoh sends the Israelites out of Egypt in haste, and the people took the dough before it was leavened upon kneading troughs upon their shoulders.

D. The Deuteronomist (Deut. xvi. 1-8, 16-17). Observe the month of Abib and keep the Passover because in that month God brought out the Israelites from Egypt. The sacrifice of the Passover of the flock and the herd shall be done in the place where God shall cause His name to dwell. No leaven shall be eaten with it for seven days, and bread of affliction shall be eaten because they came forth from Egypt in haste. Flesh shall not remain until the morning; the sacrifice must not be within their gates but in the place where the Lord shall cause His name to dwell. It shall be sodden and eaten, and in the morning they should go to their tents. Six days eat unleavened bread, on the seventh a solemn assembly. Reckon seven weeks from the time of putting the sickle to the standing corn.

E. In the Holiness Code (Lev. xxiii. 4-8, 9-14). The 14th of the first month at even is the Passover of the Lord ; on the 15th of the same

month is the feast of unleavened bread for seven days.

First and seventh days shall be holy assembly, but a re-offering' for seven days. On the morrow after the sabbath a wave offering and also a burnt offering of the he-lamb (with the corresponding meal and drink offering). Neither bread nor parched corn nor fresh ears shall be eaten until the oblation is made.

F. In the Priestly History (Exod. xii. 1-20, 28-31, xiii. 1-2). On the 10th day of the month every household shall take a firstling male without blemish, of sheep or goat, and should kill it on the 14th at even, and sprinkle the two sideposts and lintel with the blood, and eat the roasted flesh, not sodden, including head, legs and inwards; all remaining over until the morning to pe burnt by fire. It should be eaten with loins girded, shoes on feet, and staff in hand because in haste. It is the Lord's Passover; when He sees the blood He will pass over you and there will be no plague upon you. As a memorial of this you shall eat unleavened bread seven days, on the 14th day at eve until the 21st day at eve; when children shall ask what this service means, you shall say that it is the Passover of the Lord.

G. In the Secondary Sources of the Priestly Code (Exod. xii. 40-41, 43~5°> ix. 1-14, xiv. 16-25). No alien, sojourner or hired servant shall eat thereof, but a bought servant, if circumcised. It shall be eaten in haste; none of the flesh shall be carried forth, neither shall a bone be broken. If a sojourner should wish to keep the Passover, all his male shall be circumcised and he will be as one born in the land. The Passover was kept in the first month on the 14th day of the month at even in the wilderness of Sinai; but certain men, unclean by touching a dead body, asked what they should do; they were to keep it on the second month on the 14th day, eating it with unleavened bread and bitter herbs, leaving none of it until the morning, nor breaking a bone. The first month on the 14th day of the month is the Passover; the 15th day of this month shall be a feast; seven days unleavened bread to be eaten; first day a holy assembly with fire offering, two young bullocks and one lamb and seven firstling he-lambs without blemish, with appropriate meal offering and one he-goat for sin-offering; on the seventh day another holy assembly.

Many discrepancies have been observed among critics in the different portions of this series of enactments. Thus in the Elohist and in Deuteronomy the date of the festival is only vaguely stated to be in the month of Abib, while in the Holiness Code and in the Priestly History the exact date is given. In the Yahwist and Deuteronomist a solemn assembly is to be held on the seventh day, but in the Holiness

Code and in the secondary sources of the Priestly Code both the first and the seventh day of the Feast of Unleavened Bread are to be solemn assemblies. In the Deuteronomist the Passover sacrifice can be from either flock or herd, whereas in the Holiness Code only lamb is mentioned, and in the Priestly Code either kid or lamb. In the Deuterono- mist the lamb is to be sodden or boiled, whereas in the Priestly Code this is expressly forbidden. A still more vital contrast occurs concerning the place of sacrificing the Passover; as enjoined in Deuteronomy this is to be by the males of the family at Jerusalem, whereas both in the presumably earlier Yahwist and in the later Priestly Code the whole household joins in the festival which can be celebrated wherever the Israelites are settled. These discrepancies however are chiefly of interest in their bearing upon the problem of the Pentateuch, and really throw little light upon the origin of the two feasts connected together under the name of the Passover, to which the present remarks must be mainly confined. It may be observed however that the absence of a definite date in Deuteronomy must be accidental, since a common pilgrimage feast must be on a fixed day, and the reference to the seven weeks elapsing between Passover and Pentecost also implies the fixing of the date. So too even in the Elohist the time is appointed.

Reverting to the origin and the meaning of the feast, modern criticism draws attention to the different nature of the two observances combined with the name Passover, the pastoral sacrifice of the paschal lamb and the agricultural observance of a seven days' abstention from unleavened bread. It is assumed that the former arose during the pastoral period of Israelite history before or during the stay in Egypt, while the latter was adopted from the Canaanites after the settlement in Palestine. Against this may be urged that, according to the latest inquiries into the pastoral life, there is always connected with it some form of agriculture and a use of cereals, while, historically speaking, the Israelites while in Egypt were dependent on its corn. There is, further, the objection that no distinctive crisis in the agricul- tural era can be associated with the date of the Passover. The

beginning of barley harvest is however generally associated with it, while the wheat harvest is connected with Pentecost. The " sheaf of the first-fruits of your harvest," mentioned in Lev. xxiii. 10, is associated in Jewish tradition with the barley harvest (Mishna, Menachoth x.). This, however, is not immediately connected with the

Passover, and is of more significance as determining the exact date of Pentecost.

Considering however the two sections of the Passover separ- ately, it is remarkable how many of the ceremonies associated either historically or ceremonially with the Passover have connexion with the idea of a covenant. The folk-etymology of the word Passover given in Exod. xii. 23 seems to connect the original of the feast with a threshold covenant (see Trumbull, Threshold Covenant, Philadelphia, 1902) ; the daubing of the side- posts and lintel with blood at the original Passover, which finds its counterpart in Babylonian custom (Zimmern, Beit. z. Bab. Rel. ii. 126-7) an d in Arabic usage (Wakidi, ed. Kremer, p. 28), implies a blood covenant. The communion meal would, according to the views of Robertson Smith, also involve the idea of a covenant; while the fact that no person joining in the meal should be uncircumcised connects the feast with the covenant of Abraham. Finally, the association of the first-born with the festival specially referred to in the texts, and carried out both in Samaritan tradition, which marks the forehead of the first-born with the blood of the lamb, and in Jewish custom, which obliged the first-born to fast on the day preceding Passover, also connects the idea of the feast with the sacro-sanctity of the first-born. The Hebrew tradition further connects the revelation of the sacred name of the God of the Hebrews with this festival, which thus combines, in itself, all the associations connecting the Hebrews with their God. It is not surprising therefore that Hebrew tradition connects it with the Exodus, the beginning of the theocratic life of the nation. It seems easiest to assume that the festival, so far as the Passover itself is concerned, was actually connected historically with the Exodus.

With regard to the abstention from leavened bread, the inquiry is somewhat more complicated. As before remarked, there seems no direct connexion between the paschal sacrifice and what appears to be essentially an agricultural festival; the Hebrew tradition, to some extent, dissociates them by making the sacrifice on the 14th of Nisan and beginning the Feast of Unleavened Bread on the 15th. This seeming casual connexion, to some extent, confirms the historic connexion suggested by the text, that the Jews at the Exodus had to use bread prepared in haste; but not even Hebrew tradition attempts to explain why the abstention should last for seven days. The attempt of modern critics to account for the period as that in which the barley harvest was gathered in, during which the workers in the field could not prepare leavened bread, is not satisfactory. The first-fruits of the barley harvest are to be gathered on the ” morrow of the sabbath” (Lev. xxiii. n). This expression has formed the subject of dispute

between Samaritans and other sectaries and the Jews, the former of whom regard it as referring to the first Sunday during the festival, the latter as a special expression for the second day of the festival itself (see Hoffmann, Lev. ii. 159-215). But whichever interpretation is taken, the connexion of the festival with the harvest is only secondary.

The suggestion has been made by Wellhausen and Robertson Smith that the Passover was, in its original form, connected with the sacrifice of the firstlings, and the latter points to the Arabic annual sacrifices called ‘Atair, which some of the lexico- graphers interpret as firstlings. These were presented in the month Rajab, corresponding to Nisan (Smith, Religion of Semites, p. 210). But the real Arabic sacrifice of firstlings was called Fara’; it might be sacrificed at any time, as was also the case with the Hebrews (Exod. xxii. 30). The paschal lamb was not necessarily a firstling, but only in the first year of its life (Exod. xii. 5). The suggestion of Wellhausen and Robertson Smith confuses the offering of firstlings (Arabic Fara’) and that of the first yeanlings of the year in the spring (Arabic ‘Atair). It is possible that the Passover was originally connected with the latter (cf. Wellhausen, Reste arab. Heidentums, pp. 94 seq.). As regards

the Feast of Unleavened Bread, now indissolubly connected with the paschal sacrifice, no satisfactory explanation has been given either of its original intention or of its connexion with the Passover. It has been suggested that it was originally a hag or pilgrimage feast to Jerusalem, of which there were three in the year connected with the agricultural festivals (Exod, xxxiv. 17, 18). But the real agricultural occasion was not the eating of unleavened bread but the offering of the first sheaf of the barley harvest on the ” morrow of the sabbath” in the Passover week (Lev. xxiii. 10, n), and this occasion determined the second agricultural festival, the Feast of Weeks, fifty days later (Deut. xvi. 9; Lev. xxiii. 16; see Pentecost). The suggestion that the eating of cakes of unleavened bread, similar to the Australian ” damper,” was due to the exigencies of the harvest does not meet the case, since it does not explain the seven days and is incongruous with the fact that the first sheaf of the harvest was put to the sickle not earlier than the third day of the feast. It still remains possible therefore that the seven days’ eating of unleavened bread (and bitter herbs) is an historical reminis- cence of the incidents of the Exodus, where the normal commis- sariat did not begin until a week after the first exit. On the other hand, the absence of leaven may recall primitive practice before its introduction as a domestic luxury; sacral rites generally keep alive primitive custom. There was also associated in the Hebrew mind a connexion of impurity and corruption with the notion of leaven which was tabu in all sacrifice (Exod. xxiii. 18; Lev. ii. n).

According to Robertson Smith, the development of the various institutions connected with the Passover was as follows. In Egypt the Israelites, as a pastoral people, sacrificed the firstlings of their flocks in the spring, and, according to tradition, it was a refusal to permit a general gathering for this purpose that caused the Exodus. When the Israelites settled in Canaan they found there an agricultural festival connected with the begin- nings of the barley harvest, which coincided in point of date with the Passover and was accordingly associated with it. At the time of the reformation under Josiah, represented by Deuteronomy, the attempt was made to turn the family thank-offering of firstlings into a sacrificial rite performed by the priests in the Temple with the aid of the males of each household, who had to come up to Jerusalem but left the next morning to celebrate the Feast of Unleavened Bread in their homes. During the exile this was found impossible, and the old home ceremonial was revived and was kept up even after the return of the exile. This is a highly ingenious hypothesis to explain the discrepancies of the text, but is, after all, nothing but hypothesis.

There appears to have been originally considerable variety in the mode of keeping the Passover, but the earliest mention in the historical narratives (Josh. v. n) connects the paschal sacrifice with the eating of unleavened bread. But it is unsafe to assume, from 2 Kings xxiii. 22, that the festival was not kept in the time of the early kings, since Solomon appears to have kept up the three great pilgrimage festivals, 2 Kings ix. 25, and it is possibly referred to in Isa. i. 9. The complex of observances connected with the Passover and the very want of systemization observed in the literary sources would seem to vindicate the primitive character of the feast, which indeed is recognized by all inquirers.

At any rate the Samaritans have, throughout their history, observed the Passover with all its Pentateuchal ceremonial and still observe it down to the present day. They sacrifice the paschal lamb, which is probably the oldest religious rite that has been continuously kept up. In two important points they differ from later Jewish interpretation. The term ” between the evenings ” (Lev. xxiii. 5) they take as the time between sunset and dark, and the ” morrow of the sabbath” (v. 11) they take literally as the first Sunday in the Passover week; wherein they agree with the Sadducees, Boethusians, Karaites and other Jewish sectaries. This would seem to point to a time when the fixing of the sabbath was determined by the age of the moon, so that the first day of the Passover, which is on the 15th of Nisan, would always occur on a sabbath.

During the existence of the Temple there was a double celebration of the Passover, a series of stipulated sacrifices being offered during the seven days in the Temple, details of which are given in Num. xxviii., but the family ceremonial was still kept up and gradually developed a special ritual, which has been retained among orthodox Jews up to the present day. The paschal lamb is no longer eaten but represented by the shank bone of a lamb roasted in the ashes; unleavened bread and bitter herbs (haroselk) are eaten; four cups of wine are drunk before and after the repast, and a certain number of Psalms are recited. The family service, termed Hagada shel Pesach, includes a description of the Exodus with a running commentary, and is begun by the youngest son of the house asking the father the reason for the difference in Passover customs.

It is stated in the gospels that the Last Supper was the Pass- over meal, though certain discrepancies between the accounts given in the Synoptics and in John render this doubtful. It is, at any rate, certain that Jesus came up to Jerusalem in order to join in the celebration of the Passover. When the Passover fell upon the sabbath, as occurred during his visit, a difficulty arose about the paschal sacrifice, which might involve work on the sabbath. There appears to have been a difference of practice between the Sadduees and the Pharisees on such occasions, the former keeping to the strict rules of the Law and sacrificing on the Friday, whereas the Pharisees did so on the Thursday. It has been suggested that Jesus followed the pharisaic practice, and ate the Passover meal (the Last Supper) on Thursday evening, which would account for the discrepancies in the gospel narratives (see Chwolson, Das letzte Passahmal Jesu, 2nd ed., St Petersburg, 1904). It seems probable in any case that the ritual of the Mass has grown out of that of the Passover service (see Bickell, Messe und Pascha, tr. W. F. Skene, Edinburgh, 1891). Up to the Nicene Council the Church kept Easter (q.v.) coincident with the Jewish Passover, but after that period took elaborate precautions to dissociate the two.

See the commentaries on Exodus and Leviticus; that of Kalisch on the latter book (vol. ii., London, 1871) anticipates much of the critical position. The article in Winer's Bibl. Realworterbuch gives a succinct account of the older views. A not altogether unsuc- cessful attempt to defend the Jewish orthodox position is made by Hoffmann in his Commentary on Leviticus (Berlin, 1906, ii. 116-224). Wellhausen's

views are given in his Prolegomena, ch. iii. A critical yet conservative view of the whole question is given by R. Schaefer, Das Passah-Mazzoth-Fest (Gutersloh, 1900) which has been partly followed above. For the general attitude towards the comparative claims of institutional archaeology and literary criticism adopted above see J.Jacobs, Studies in Biblical Archaeology (London, 1895). (J.]a.)

PASSOW, FRANZ LUDWIG CARL FRIEDRICH (1786-1833), German classical scholar and lexicographer, was born at Lud- wigslust in Mecklenburg-Schwerin on the 20th of September 1786. In 1807 he was appointed to the professorship of Greek literature at the Weimar gymnasium by Goethe, whose acquain- tance he had made during a holiday tour. In 1815 he became professor of ancient literature in the university of Breslau, where he continued to reside until his death on the nth of March 1833. His advocacy of gymnastic exercises, in which he himself took part, met with violent opposition and caused a quarrel known as the ” Breslauer Turnfehde.” Passow’s great work was his Handworterbuch der griechischen Sprache (1819-1824), originally a revision of J. G. Schneider’s lexicon, which appeared in the fourth edition (183 1) as an independent work, without Schneider’s name (new ed. by Crbnert, 1901). It formed the basis of Liddell and Scott’s lexicon. Other works by him are Grundzuge der griech. und rbm. Literatur- und Kunstgeschichte (2nd. ed., 1829) and editions of Persius, Longus, Tacitus Germania, Dionysius Periegetes, and Musaeus. His miscellaneous writings have been collected in his Opuscula academica (1835) and Vermischte Schriften (1843).

See Franz Passow’s Leben und Briefe (1839), by L. and A. Wachler, which contains a full bibliography.

PASSPORT, or safe-conduct in time of war, a document granted by a belligerent power to protect persons and property from the operation of hostilities. In the case of the ship of a

neutral power, the passport is a requisition by the government of the neutral state to suffer the vessel to pass freely with the crew, cargo, passengers, &c, without molestation by the belligerents. The requisition, when issued by the civil authori- ties of the port from which the vessel is fitted out, is called a sea-letter. But the terms passport and sea-letter are often used indiscriminately. A form of sea-letter (literae salvi conductus) is appended to the Treaty of the Pyrenees, 1659. The passport is frequently mentioned in treaties, e.g. the Treaty of Copenhagen, 1670, between Great Britain and Denmark. The violation of a passport, or safe conduct, is a grave breach of international law. The offence in the United States is punishable by

fine and imprisonment where the passport or safe conduct is granted under the authority of the .United States (Act of Congress, April 30, 1790). In its more familiar sense a passport is a document authorizing a person to pass out of or into a country, or a licence or safe-conduct to the person specified therein and authenticating his right to aid and protection. Although most foreign countries may now be entered without passports, the English foreign office recommends travellers to furnish them- selves with them, as affording a ready means of identification in case of need. They are usually granted by the foreign office of a state, or by its diplomatic agents abroad. The English Foreign Office charges two shillings for a passport, whatever number of persons may be named in it. Passports granted in England are subject to a stamp duty of sixpence. They may be granted to naturalized as well as natural-born British subjects.

See ” The Passport System,” by N. W. Sibley, in Jour. Comp. Leg. new series, vol. vii. The regulations respecting passports issued by the English Foreign Office as well as the passport requirements of foreign countries will be found in the annual Foreign Office List.

PASTE (O. Fr. paste, modern pdte, Late Lat. pasta, whence also in Span., Port, and Ital., from Gr. iraarr) or Tacrrd, barley porridge, or salted pottage, ■wao-ceiv, to sprinkle with salt), a mixture or composition of a soft plastic consistency. The term is applied to substances used for various purposes, as e.g. in cookery, a mixture of flour and water with lard, butter or suet, for making pies and pastry, or of flour and water boiled, to which starch or other ingredients to prevent souring are added, forming an adhesive for the affixing of wall-paper, bill-posting and other purposes. In technical language, the term is also applied to the prepared clay which forms the body in the manu- facture of pottery and porcelain (see Ceramics) and to- the specially prepared glass, known also as ” strass,” from which imitation gems are manufactured. This latter must be the purest, most transparent and most highly refractive glass that can be prepared. These qualities are comprised in the highest degree in a flint glass of unusual density from the large percentage of lead it contains. Among various mixtures regarded as suitable for strass the following is an example: powdered quartz 300 parts, red lead 470, potash (purified by alcohol) 163, borax 22, and white arsenic 1 part by weight. Special precau- tions are taken in the melting. The finished colourless glass is used for imitation diamonds; and when employed to imitate coloured precious stones the strass is melted up with various metallic oxides. Imitation gems are easily distinguished from real stones by their inferior hardness and by chemical tests; they may generally be detected by the comparatively warm sensation they communicate to

the tongue.

PASTEL, the name of a particular method of painting with dry pigments, so called from the ” paste ” into which they are first compounded. The invention of pastel, which used to be generally called ” crayon,” has frequently been accredited to Johann Alexander Thiele (1685-1752), landscape-painter and etcher of distinction, as well as to Mme Vernerin and Mile Heid (1688-1753), both of Danzig. But the claim cannot be substantiated, as drawing in coloured chalks had been practised long before, e.g. by Guido Reni (1575-1642), by whom a head and bust in this manner exists in the Dresden Gallery. Thiele was perhaps the first to carry the art to perfection, at least in Germany, where it was extensively exploited in the

17th century; but his contemporary, Rosalba Carriera of Venice (1675-1757), is more completely identified with it, and in her practice of it made a European reputation which to this day is in some measure maintained. The Dresden Museum contains 157 examples of her work in this medium, portraits, subjects and the like. Thiele was followed by Anton Raphael Mengs (1728-1779) and his sister Theresia Mengs (afterwards Maron, 1725-1806), and by Johann Heinrich Schmidt (1749-1829).

When in 1720 Rosalba Carriera accepted an invitation to visit Paris, where she was received with general enthusiasm, she found the art of pastel -pain ting well established; that is to say, it was used to reproduce local colour with truth. She made it fashionable and combined truth with nature. Nearly ahundred years before Claude Lorrain had used coloured chalks as Dutch and Italian painters had used them, often with high finish, employing mainly red, blue and black, for the sake of prettiness of effect and not with the intention of reproducing with accuracy the actual colours of the head, the figure, or the landscape before them. This method of making drawings — rehaussis, as they were called — has remained in common use almost to the present day, especially for studies. It is necessary only to cite among many examples the series of heads by Holbein, the highly esteemed studies by Watteau, Boucher and Greuze, and of John Raphael Smith and Sir Thomas Lawrence, to indicate how general has been the employment of the coloured chalk. In 1747 Nattier (1685-1766) showed a pastel portrait of M. Logerot in the Paris Salon, and his son-in-law, Louis Tocque (1696- 1772), soon followed with

similar work. Hubert Drouais (1699-1 767) had preceded his rival Nattier in the Salon by a single year with five pastel portraits, and Chardin (1699-1779) followed in 1 77 1. This great master set himself to work in emulation of Quentin de la Tour (1 704-1 788), who in spite of the ability of his rivals may be regarded as the most eminent pastellist France has produced. His portraits of Mme Boucher and himself appeared in the Salon in 1737; his full strength as a portrait-pastellist is to be gauged in the collection of eighty-five of his principal works now in the museum of St Quentin. Then followed Simon Mathurin Lantara (1729-1778), who was one of the first to paint pastel-pictures of landscapes, including sunsets and moonlights, as well as marines, into which the figures were drawn by Joseph Vernet, Casanova and others, and Jean Baptiste Perronneau (1731-1796), the best of whose heads have been often attributed to de la Tour and whose ” Jeune fille au chat” in the Louvre, though not the finest, is perhaps the best known of his works, was the last pre-eminent French pastellist of the 18th century. Since then they have been legion; of these it is needful to mention only Girodet and the flower-painters, Jean Saint-Simon and Sprendonck.

Two Swiss painters had considerable influence in spreading the use of pastel — the experimentalist Dietrich Meyer (1572- 1658), one of the first to make designs in coloured chalks (and reputed inventor of soft-ground etching), and Jean Etienne Liotard (1702 or 1704-1788), one of the most brilliant pastellists who ever lived. Two of his works are world-famous, ” La Belle Chocolatiere de Vienne,” executed in 1745, now in the Dresden Museum, and ” La Belle Liseuse” of the following year at the museum at Amsterdam. The latter is a portrait of his niece, Mile Lavergne. In 1753, and again in 1772, Liotard visited England, where his brilliant work, portraits and landscapes, produced a great effect, almost equal to that of de la Tour twenty years before. To the Royal Academy between 1773 and 1775 Liotard contributed the portraits of Dr Thomson, himself, Lord Duncannon and General Cholmondely.

Crayon-painting was practised in England at an early date, and John Riley (1646-1691), many of whose finest works are attributed to Sir Peter Lely, produced ‘numerous portraits in that medium. Francis Knapton (1698-1778), court painter, was a more prolific master, and he, with William Hoare of Bath (? 1 707-1 792) who had studied pastel in Italy and made many classic designs in that medium, exhibiting at the Royal Academy his ” Boy as Cupid,” ” Prudence instructing her Pupil,” ” Diana,” ” A Zingara,” and others, prepared the way for the

triumph of Francis Cotes (? 1725-1770). Then for the first time pastel-painting was fully developed by an English hand. Before he became a painter in oil Cotes had worked under Rosalba Carriera, and, although he was rather cold and chalky in his tones, he produced portraits, such as his ” Mr and Mrs Joah Bates” and ” Lord Hawke,” which testify to his high ability. He was, however, far surpassed by his pupil, John Russell, R.A. (1745-1806), who brought the art to perfection, displaying grace and good expression in all his pastel work, whether portrait, fancy picture, historical subject, group, or ” conversation-piece.” He had brought from Rosalba her four fine pictures representing ” The Seasons,” and in a great measure founded his style on them. He was strong and brilliant in colour, and when he was at his best his high, smooth finish in no way robbed his work of vigour. Romney (1734-1802) in his single pastel portrait, a likeness of William Cowper the poet, showed that he might have excelled in this medium, which, indeed, was par- ticularly suited to his tender manner. Hugh D. Hamilton (c. 1 734-1806) of the Royal Hibernian Academy, produced note- worthy portraits, mainly in grey, red and black, until on the suggestion of Flaxman he abandoned pastel for oil. Ozias Humphry, A.R.A. (1742-1810), painter and miniaturist, is an important figure among the pastellists, commonly believed to be the first in England who made a point of letting his colour strokes be seen (as by Emile Wauters and others in our own day) , contrary to the practice of Russell and his predecessors, whose prime effort was to blend all into imperceptible gradations. Richard Cosway, R.A. (1742-1821) was mainly experimental in his pastels, but his portraits, such as that of George prince of Wales, are forcible and brilliant; those of his wife Maria Cosway (1759- 1838) are more delicate. Daniel Gardner (?i75o-i8o5), whose pictures in oil have often been mitsaken for Reynolds’s and Gainsborough’s, gave rein to his exuberant fancy and his rather exaggerated taste in compositions which, in his arrangement of children, remind us of Sir Thomas Lawrence in his more fantastic mood. Gardner marked the deterioration of the art, which thereafter declined, Henry Bright (1814-1873) being almost the only pastellist of real power who followed him. Bright’s landscapes have, probably in their own line never been surpassed.

Since 1870 there has been a revival of the art of pastel, the result of a better understanding and appreciation on the part of the public. Grimm’s denunciation of it to Diderot — ” every one is agreed that pastel is unworthy the notice of a great painter ” — which for many years had found general acceptance, is now seen to have been based on forgetfulness or ignorance of the virtues inherent in the method. It was thought that ” coloured chalks,” as it used to be called in English-

speaking countries, promised nothing but sketches of an ephemeral kind, so fragile that they were at the mercy of every chance blow or every touch of dampness. The fact is, that with care no greater than is accorded to every work of art, pastel properly used is not more perishable than the oil-painting or the water-colour. Damp will affect it seriously, but so also will it ruin the water- colour; and rough usage is to be feared for the oil-picture not less than for the pastel. Moreover, pastel possesses advantages that can be claimed by neither oil-painting nor water-colour. That is to say, if pictures in these three mediums be hung side by side for a hundred years in a fair light and in a dry place, the oil-painting will have darkened and very probably have cracked; the water-colour will have faded; but the pastel will remain as bright, fresh, and pure as the day it was painted. If Time and Varnish, which Hogarth and Millais both declared the two greatest of the old masters, will do nothing to ” improve ” a pastel, neither will they ruin it — time passes it by and varnish must on no account be allowed to approach it. The pastel- painter, therefore, having no adventitious assistance to hope for, or to fear, must secure at once the utmost of which his method is capable.

The advantages of pastel are threefold: those of working, those of results, and those of permanence. The artist has at his command, without necessity of mixing his colours, every hue to be found in nature, so that freshness and luminosity can

always be secured without fear of that loss of brilliancy commonly attendant on the mixing of colour on the palette. Moreover, the fact of pastel being dry permits the artist to leave his work and take it up again as he may choose; and he is free from many of the technical troubles and anxieties natural to oil and water- colour painting. Applied with knowledge, pastel, which has been likened for delicacy of beauty to ” the coloured dust upon the velvet of butterflies’ wings,” will not fall off. It can, if desired— though this is hardly necessary or desirable — be ” fixed,” most commonly by a. fixatif. If intending so to treat his work, the artist must paint in a somewhat lighter key, as the effect of the fixing medium is slightly to lower the general tone. The fixatif Lacaze is considered the best, but the general consensus of opinion among artists is against the use of any such device. This preparation has the advantage of leaving the colour unchanged, even though it dulls it; shellac fixatif has the effect of darkening the work.

The inherent qualities of pastel are those of charm, of subtlety, softness, exquisite depths of tone, unsurpassable harmonies and unique freshness of colour, sweetness, delicacy, mystery — all the virtues sought for by the artist of daintiness and refine- ment. Pastel-painting is essentially, therefore, the art of the colourist. Now, these very qualities suggest its limitations. Although it is unfair to relegate it — as fashion has foolishly done for so long — to the bunch of pretty triflings which Carlyle called ” Pompadourisms,” we must recognize that a medium which suggests the bloom upon the peach is not proper to be employed for rendering ” grand,” or even genre subjects, or for the covering of large surfaces of canvas. It is inappropriate to the painting of classic compositions, although in point of fact it has been so used, not without success. It is best adapted to the rendering of still life, of landscape and of portraiture. But in these cases it is not advisable to aim at that solidity which is the virtue of oil-painting, if only because oil can bring about a better result. The real reason is that, in securing solidity, pastel tends to forfeit that lightness and grace which constitute its special charm and merit. Strength belongs to oil, tenderness and subtlety to pastel, together with freshness and elegance.

The pre-eminent technical advantage, in addition to those already mentioned, is the permanence of the tones. In water- colours there is an admixture of gum and glycerine which may attract moisture from the air; and, besides, the pigment is used in very thin washes. In oil-painting not only does the oil darken with age but sometimes draws oxygen from a pigment and changes its hue. In pastel the colour is put on without any moist admixture, and can be laid on thick. Moreover, the permanence may arise from the method of manufacture. In a very rare work, The Excellency of the Pen and Pencil (1668), a chapter on ” how to make pastils” [sic] ” of several colours, for drawing figure, landskip, architecture, Src, on blew paper,” describes the manner of grinding up the pigments with grease. This used to be the secret of pastel — that every grain of colour was separately and securely locked up in grease, and so was secured from any chemical change that might have come about through contact of the colours with one another or with the atmosphere. With pastel nothing of the kind could occur; and the works of Rosalba Carriera in Italy, of Quentin Latour, Peronneau, Watteau, St Jean, Paul Hoin and Chardin in France, and of Russell and Cotes in England — to name no others — testify to the permanency of the colours. Some manufac- turers nowadays employ gum as the binding medium; others beeswax (which at one time was more frequently used than it is at present) ; others, again, a very small proportion of tallow, and sometimes a little soap. But this introduction

of binding media is now adopted only in the case of certain colours. Whether the point or edge of the stick be used (as in pastel drawing), or the side of it, helped with the tips of the fingers (as in pastel painting), the result is equally permanent; and if, when the work is done, it be struck two or three times, and then touched up by hand-crayons, no dropping of colour from the paper need ever occur. The drawing is made on a grained

paper that will hold the chalk, or on a specially manufactured toothed cloth. The French paper known as gras gris UeuU is employed by certain of the leading pastellists. The crisp touches of the pastel can be placed side by side, or the ” vibrations ” which the artist seeks may be obtained by glazes and super- posed tones. It should here be mentioned that about the year 1900 M. Jean-Francois Raffaelli produced in Paris sticks of oil colours which he claimed would in a great measure replace painting with the brush. Although the system was widely tried and many good pictures painted in this method, it was found that the colours became dull, and such vogue as these ” solid paints ” enjoyed for a time has to a very great extent disappeared.

The art of pastel, as M. Roger Ballu expressed it, ” was slumbering a little,” until in 1870 the Societe des Pastellistes was founded in France and met with ready appreciation. With many artists it was a matter of ” coloured chalks,” as, for example, with Millet, Lher- mitte and Degas in France, and with Whistler in England. With the majority the full possibilities were seized, and a great number of artists abroad then practised the art for the sake of colour, among whom may be mentioned Adrien Moreau, A. Besnard, Emile Levy, Machard, Pointelin, Georges Picard, de Nittis, Iwill, Rene Billotte, Jozan, Nozel, Raffaelli, Brochard (majnly upon vellum) and LeVy-Dhurmer in France; in Belgium, Emile Wauters (who has produced a great series of life-sized portraits of both men and women of amazing strength, vitality and completeness) and Fernand Khnopff ; in Italy, C. Laurenti.P.Fragiacomo and Giovanni Segantini ; in Holland, Josselin de Jong; in Germany, F. von Lenbach, Max Liebermann and Franz Stuck; and in Norway, Fritz Thaulow.

In England the revival of pastel dates from 1880, when the first exhibition of the Pastel Society was held in the Grosvenor Gallery. The exhibition was a succes d’estime, but after a while the society languished until, in 1899, it was reconstituted, and obtained the adhesion of many of the most distinguished artists practising in the country, as well as of a score of eminent foreign painters. In that year, and since, it has held exhibitions of a high order; and intelligent

public appreciation has been directed to the work of the most noteworthy contributors. Among these are E. A. Abbey, R.A.; M'Lure Hamilton, J. M. Swan, R.A. ; J. Lorimer, R.S.A.; A. Peppercorn, R. Anning Bell, J. J. Shannon, R.A. ; Sir James Guthrie, P.R.S.A.; H. Brabazon, Walter Crane, Melton Fisher, Edward Stott, A.RA. ; S. J. Solomon, R.A. ; and W. Rothenstein.

See Karl Robert [Georges Meusnier], Le Pastel (Laurens, Paris, 1890) ; J. L. Sprinck, A Guide to Pastel Painting (Rowney, London) ; Henry Murray, The Art of Painting and Drawing in Coloured Crayons (Winsor & Newton, London). Among early works are: John Russell, R.A., Elements of Painting with Crayons (1776); M.P.R. de C.C., Traite de la peinture au pastel avec les moyens de prevenir V alteration des couleurs (Paris, 1788); Rosalba Carriera, Diario degli anni 1J20 e 1721 scritlo di propria mano in Parigia, &c. (Giovanni Vianelli, Venice, 1793, 4*0); Girolamo Zanetti, Elogio di Rosalba Carriera, pittrice (Venice, 1818, 8vo). See also Henri Lapauze, Les Pastels de M. Quentin de La Tour a St Quentin, preface by Gustave Larroumet (Paris) ; George C. Williamson, John Russell, R.A. (London, 1894). (M. H. S.)

PASTEUR, LOUIS (1822-1895), French chemist, was born, on the 27th of December 1822, at Dole, Franche-Comte, where his father carried on the business of a tanner. Shortly after- wards the Pasteur family removed to Arbois, where Louis attended the Ecole primaire, and later the college of that place. Here he apparently did not especially distinguish him- self, belonging to the class of bons ordinaires. Fortunately at Arbois he came under the influence of ah excellent teacher in the person of the director of the college, who must have discerned in the quiet boy the germs of greatness, as he con- stantly spoke to him of his future career at the Ecole normale in Paris. In October 1838 Louis was sent with a friend to the metropolis, to a school in the Quartier Latin, preparatory to the Ecole normale. But he did not remain long in Paris, for, being a nervous and excitable boy, his health broke down, and he yearned for his home in Franche-Comte. " If only I could smell the tannery once more," said he to his companion, " I should feel well." So home he went, though not for long, as his ambition was still to become a normalien, and to this end he entered the Royal College of Besancon, " en attendant l'heureux jour ou je serais admis a l'ecole normale." Step by step he attained his end; in 1840 he won his " bachelier es lettres," and shortly afterwards he received an appointment as assistant mathematical master in the college. Two years later he passed the examination for the " baccalaureat es sciences"

enabling him to become candidate for the Ecole normale. But here something (probably the examiner) was at fault, for a note was attached to Pasteur's diploma stating that he was only " mediocre " in chemistry. In those early days and early trials the dominant note of Pasteur's life was sounded. To his sisters he writes: " Ces trois choses, la vol&nte, le travail, le succes, se partagent toute l'existence humaine. La volonte ouvre la porte aux carrieres brillantes et heureuses ; le travail les franchit, et une fois arrive au terme du voyage, le succes vient couronner l'ceuvre." Throughout his life, and to the very end, " work " was his constant inspiration. On his deathbed he turned to the devoted pupils who watched over their master's last hours. "Ou en etes-vous?" he exclaimed. " Que faites- vous?" and ended by repeating his favourite words, " II faut travailler."

The first incentive to his serious ' study of chemistry was given by hearing J. B. A. Dumas lecture at the Sorbonne; and ere long he broke new ground for himself, A. J. Balard having given him an opportunity for chemical work by appoint- ing him to the post of laboratory assistant. A few words of explanation concerning Pasteur's first research are necessary to give the key to all his future work. What was the secret power which enabled him to bring under the domain of scientific laws phenomena of disease which had so far baffled human endeavour? It simply consisted in the application, to the elucidation of these complex problems, of the exact methods of chemical and physical research. Perhaps the most remarkable discovery of modern chemistry is the existence of compounds, which, whilst possessing an identical composition, are absolutely different bodies, judged of by their properties. The first of the numerous cases of isomerism now known was noted, but un- explained, by J. J. Berzelius. It was that of two tartaric acids, deposited from wine-lees. The different behaviour of these two acids to a ray of polarized light was subsequently observed by J. B. Biot. One possessed the power of turning the plane of the polarized ray to the right; the other possessed no rotary power. Still no explanation of this singular fact was forth- coming, and it was reserved for the young chemist from Franche- Comte to solve a problem which had baffled the greatest chemists and physicists of the time. Pasteur proved that the inactivity of the one acid depended upon the fact that it was composed of two isomeric constituents: one the ordinary or dextrorotary acid, and the other a new acid, which possessed an equally powerful left-handed action. The veteran Biot whose acquaint- ance Pasteur had made, was incredulous. He insisted

on the repetition of the experiment in his presence; and when convinced of the truth of the explanation he exclaimed to the discoverer: ” Mon cher enfant, j’ai tant aime les sciences dans ma vie que cela me fait battre le cceur.” Thus at one step Pasteur gained a place of honour among the chemists of the day, and was immediately appointed professor of chemistry at the Faculte of Science at Strasburg, where he soon afterwards married Mile Laurent, who proved herself to be a true and noble helpmeet. Next he sought to prepare the inactive form of the acid by artificial means; and after great and long-continued labour he succeeded, and was led to the commencement of his classical researches on fermentation, by the observation that when the inactive acid was placed in contact with a special form of mould (Penicillium glaucum) the right-handed acid alone was destroyed, the left-handed variety remained unchanged. So well was his position as a leading man of science now established that in 1854 he was appointed professor of chemistry and dean of the Faculte des Sciences at Lille. In his inaugural address he used significant words, the truth of which was soon manifested in his case: ” In the field of observation chance only favours those who are prepared.” The diseases or sicknesses of beer and wine had from time immemorial baffled all attempts at cure. Pasteur one day visited a brewery containing both sound and unsound beer. He examined the yeasts under the microscope, and at once saw that the globules from the sound beer were nearly spherical, whilst those from the sour beer were elongated; and this led him to a dis- covery, the consequences of which have revolutionized chemical

as well as biological science, inasmuch as it was the beginning of that wonderful series of experimental researches in which he proved conclusively that the notion of spontaneous generation is a chimera. Up to this time the phenomenon of fermentation was considered strange and obscure. Explanations had indeed been put forward by men as eminent as Berzelius and Liebig, but they lacked experimental foundation. This was given in the most complete degree by Pasteur. For he proved that the various changes occurring in the several processes of fermentation —as, for example, in the vinous, where alcohol is the chief pro- duct; in the acetous, where vinegar appears; and in the lactic, where milk turns sour — are invariably due to the presence and growth of minute organisms called ferments. Exclude every trace of these organisms, and no change occurs. Brewers’ wort remains unchanged for years, milk keeps permanently sweet, and these and other complex liquids remain unaltered when freely exposed to air from which all these minute organisms are removed. ” The chemical act of fermentation,” writes Pasteur, ” is essentially a

correlative phenomenon of a vital act beginning and ending with it."

But we may ask, as Pasteur did, Why does beer or milk become sour on exposure to ordinary air? Are these invisible germs which cause fermentation always present in the atmosphere? or are they not generated from the organic, but the non-organized constituents of the fermentable liquid? In other words, are these organisms not spontaneously generated? The controversy on this question was waged with spirit on both sides; but in the end Pasteur came off victorious, and in a series of the most delicate and most intricate experimental researches he proved that when the atmospheric germs are absolutely excluded no changes take place. In the interior of the grape, in the healthy blood, no such germs exist; crush the grape, wound the flesh, and expose them to the ordinary air, then changes, either fermentative or putrefactive, run their course. But place the crushed fruit or the wounded animal under conditions which preclude the presence or destroy the life of the germ, and again no change takes place; the grape juice remains sweet and the wound clean. The application of these facts to surgical operations, in the able hands of Lord Lister, was productive of the most beneficent results, and has indeed revolutionized surgical practice.

Pasteur was now the acknowledged head of the greatest chemical movement of the time, the recipient of honours both from his own country and abroad, and installed at the Ecole normale in Paris in a dignified and important post. Not, how- ever, was it without grave opposition from powerful friends in the Academy that Pasteur carried on his work. Biot — who loved and admired him as a son — publicly announced that his enterprise was chimerical and the problem insoluble; Dumas evidently thought so too, for he advised Pasteur not to spend more of his time on such a subject. Yet he persevered: " Travailler, travailler toujours " was his motto, and his patience was rewarded by results which have not merely rendered his name immortal, but have benefited humanity in a way and to a degree for which no one could have ventured to hope. To begin with a comparatively small, though not unimportant, matter, Pasteur's discoveries on fermentation inaugurated a new era in the brewing and wine-making industries. Empiricism, hitherto the only guide, if indeed a guide at all, was replaced by exact scientific knowledge; the connexion of each phenomenon with a controllable cause was established, and rule-of -thumb and quackery banished for ever by the free gift to the world of the results of his researches.

But his powers of patient research and of quick and exact observation were about to be put to a severe test. An epidemic of" a fatal character

had ruined the French silk producers. Dumas, a native of the Alais district, where the disease was rampant, urged Pasteur to undertake its investigation. Up to that time he had never seen a silkworm, and hesitated to attempt so difficult a task; but at the reiterated request of his friend he consented, and in June 1865 went to the south of France for the purpose of studying the disease on the spot. In September of the same year he was able to announce results which pointed to

the means of securing immunity from the dreaded plague. The history of this research, of the gradual elimination of the unim- portant conditions, of the recognition of those which controlled the disease, is one of the most fascinating chapters of scientific discovery. Suffice it here to say that careful experiment and accurate observation succeeded in ascertaining the cause of the disease and in preventing its recurrence, thus bringing back to prosperity the silk trade of France, with all that this entails. ” There is no greater charm,” says Pasteur, ” for the investigator than to make new discoveries; but his pleasure is heightened when he sees that they have a direct application to practical life.” Pasteur had the good fortune, and just reward, of seeing the results of his work applied to the benefit both of the human race and of the animal world. It is to him that the world is indebted for the introduction of methods which have already worked wonders, and bid fair to render possible the preven- tive treatment of all infectious diseases. Just as each kind of fermentation possesses a definite organized ferment, so many diseases are dependent on the presence of a distinct microbe; and just as the gardener can pick out and grow a given plant or vegetable, so the bacteriologist can (in most cases) eliminate the adventitious and grow the special organism — in other words, can obtain a pure cultivation which has the power of bringing about the special disease. But by a process of successive and continued artificial cultures under different conditions, the virus of the organism is found to become attenuated; and when this weakened virus is administered, the animal is rendered immune against further attacks. The first disease investigated by Pasteur was that of chicken cholera, an epidemic which destroyed 10% of the French fowls; after the application of the preventive method the death-rate was reduced to below i%. Next came the successful attempt to deal with the fatal cattle scourge known as anthrax. This is also caused by the presence of a microbe, of which the virus can also be attenuated, and by inoculation of this weakened virus the animal rendered immune. Many- millions of sheep and oxen all over the world have thus been

treated, and the rate of mortality reduced from io to less than i %. As to the money value of these discoveries, T. H. Huxley gave it as his opinion that it was sufficient to cover the whole cost of the war indemnity paid by France to Germany in 1870.

The most interesting of Pasteur's investigations in preventive and curative medicine remains to be told. It is no less than a cure for the dread disease of hydrophobia in man and of rabies in animals; and the interest of the achievement is not only that he successfully combated one of the most mysterious and most fell diseases to which man is subject, but also that this was accomplished in spite of the fact that the special microbe causing the disease had not been isolated. To begin with, Pasteur, in studying the malady in dogs, came to the conclusion that the virus had its seat in the nerve centres, and he proved that the injection of a portion of the matter of the spinal column of a rabid dog into the body of a healthy one produces in the latter with certainty the symptoms of rabies. The next step was to endeavour so to modify and weaken the virus as to enable it to be used as a preventive or as an antitoxin. This, after long and serious labour, he effected; the dog thus inoculated proved to be immune when bitten by a rabid animal. But this was not enough. Would the inoculation of the attenuated virus have a remedial effect on an animal already bitten ? If so, it might be possible to save the lives of persons bitten by mad dogs. Here again experiment was successful. A number of dogs were inoculated, the same number were untreated, and both sets were bitten by rabid animals. All the treated dogs lived; all the untreated died from rabies. It was, however, one thing" to experiment on dogs, and quite another to do so on human beings. Nevertheless Pasteur was bold enough to try. The trial was successful, and by doing so he earned the gratitude of the human race. Then, on the 14th of November 1888, the Institut Pasteur was founded. Thousands of people suffering from bites from rabid animals, from all lands, have been treated in this institute, and the death-rate from this most horrible of all

diseases has been reduced to less than 1 %. Not only in Paris, but in many cities throughout the world, institutes on the model of the original one have been set up and are doing beneficent work, all arising from the genius and labour of one man. At the inauguration of the institute Pasteur closed his oration with the following words: —

" Two opposing laws seem to me now in contest. The one, a law of blood and death, opening out each day new modes of destruction, forces nations to be always ready for the battle. The other, a law of peace, work and health, whose only aim is to deliver man from the

calamities which beset him. The one seeks violent conquests, the other the relief of mankind. The one places a single life above all victories, the other sacrifices hun- dreds of thousands of lives to the ambition of a single individual. The law of which we are the instruments strives even through the carnage to cure the wounds due to the law of war. Treat- ment by our antiseptic methods may preserve the lives of thousands of soldiers. Which of these two laws will prevail, God only knows. But of this we may be sure, that science, in obeying the law of humanity, will always labour to enlarge the frontiers of life.”

Rich in years and in honours, but simple-minded and affec- tionate as a child, this great benefactor to his species passed quietly away near St Cloud on the 28th of September 1895.

Mention need only be made of Pasteur’s chief works, as follows: £tudes sur le vin (1866), £tudes sur le vinaigre (1868), Etudes sur la maladie des vers a sole (1870), Etudes sur la Here (1876). He began the practice of inoculation for hydrophobia in 1885.

See Vie de Pasteur, by Rene Vallerey-Radot (Paris, 1900).

(H. E. R.).

PASTICCIO, an Italian word, now often Englished as ” pas- tiche,” formed from pasta, paste, for a composition in music, painting or other arts, made up of selections from frag- ments or imitations of the work of other artists, a medley or pot-pourri. The term has also been applied to a form of musical composition in which selections from various operas, &c, are pieced together to form a consecutive whole, special librettos being sometimes written for them.

PASTO, a city of Colombia and capital of the department of Narino, about 36 m. from the boundary line with Ecuador, on one of the inland trade routes with that republic, and on a principal line of communication with the great forested regions of the Caqueta, (Japura), Putumayo and Napo. Pop. (1906 estimate), 6000. It stands on an elevated plain, 8347 ft. above the sea, at the eastern foot of the Pasto volcano, which rises above the city to a height of 13,990 ft. Wool is produced to some extent and is woven for the local market in the woollen factories of Pasto.

PASTON LETTERS, an invaluable collection of letters and papers, consisting of the correspondence of members of the Paston family, and others connected with them, between the years 1422 and 1509, and also including some state papers and other important documents. The

bulk of the letters and papers were sold by William Paston, 2nd earl of Yarmouth, the last representative of the family, to the antiquary Peter Le Neve early in the 18th century. On Le Neve's death in 1729 they'came into the possession of Thomas Martin of Palgrave, who married his widow; and upon Martin's death in 1771 they were purchased by John Worth, a chemist at Diss, whose executors sold them three years later to John Fenn of East Dereham. In 1787 Fenn published a selection of the letters in two volumes, and general interest was aroused by this publica- tion. In 1789 Fenn published two other volumes of letters, and when he died in 1794 he had prepared for the press a fifth volume, which was published in 1823 by his nephew, Serjeant Frere. In 1787 Fenn had received a knighthood, and on this occasion, the 23rd of May, he had presented the originals of his first two volumes to King George III. These manuscripts soon disappeared, and the same fate attended the originals of the three other volumes. In these circumstances it is not surprising that some doubt should have been cast upon the

authenticity of the letters. In 1865 their genuineness was impugned by Herman Merivale in the Fortnightly Review, but it was vindicated on grounds of internal evidence by James Gairdner in the same periodical; and within a year Gairdner's contention was established by the discovery of the originals of Fenn's fifth volume, together with other letters and papers, by Serjeant Frere's son, Philip Frere, in his house at Dungate, Cambridgeshire. Ten years later the originals of Fenn's third and fourth volumes, with ninety-five unpublished letters, were found at Roydon Hall, Norfolk, the seat of George Frere, the head of the Frere family; and finally in 1889 the originals of the two remaining volumes were discovered at Orwell Park, Ipswich, the residence of Captain E. G. Pretyman. This latter batch of papers are the letters which were presented to George III., and which possibly reached Orwell through Sir George Pretyman Tomline (1750-1827), the tutor and friend of William Pitt.

The papers which had been in the hands of Sir John Fenn did not, however, comprise the whole of the Paston letters which were extant. When the 2nd earl of Yarmouth died in 1732 other letters and documents relating to the Pastons were found at his seat, Oxnead Hall, and some of these came into the hands of the Rev. Francis Biomefield, who failed to carry out a plan to unite his collection with that of Martin. This section of the letters was scattered in various directions,

part being acquired by the antiquary John Ives. The bulk of the Paston letters and documents are now in the British Museum; but others are at Orwell Park; in the Bodleian Library, Oxford; at Magdalen College, Oxford; and a few at Pembroke College, Cambridge.

Fenn's edition of the Paston Letters held the field until 1872, when James Gairdner published the first volume of a new edition. Taking Fenn's work as a basis, the aim of the new editor was to include all the letters which had come to light since this publication, and in his careful and accurate work in three volumes (London, 1872-1875) he printed over four hundred letters for the first time. Gairdner's edition, with notes and index, also contained a valuable introduction to each volume, including a survey of the reign of Henry VI.; and he was just completing his task when the discovery of 1875 was made at Roydon. An appendix gave particulars of this discovery, and the unpublished letters were printed as a supplement to subsequent editions. In 1904 a new and complete edition of the Paston Letters was edited by Gairdner, and these six volumes, containing 1088 letters and papers, possess a very valuable introduction, which is the chief authority on the subject.

The family of Paston takes its name from a Norfolk village about twenty miles north of Norwich, and the first member of the family about whom anything is known was living in this village early in the 1 5th century. This was one Clement Paston (d. 1419), a peasant, holding and cultivating about one hundred acres of land, who gave an excellent education to his son William, and enabled him to study law. Making good use of his oppor- tunities, William Paston (1378-1444), who is described as " a right cunning man in the law," attained an influential position in his profession, and in 1429 became a justice of the common pleas. He bought a good deal of land in Norfolk, including some in Paston, and improved his position by his marriage with Agnes (d. 1479), daughter and heiress of Sir Edmund Berry of Harlingbury, Hertfordshire. Consequently when he died he left a large and valuable inheritance to John Paston (1421-1466), the eldest of his five sons, who was already married to Margaret (d. 1484), daughter of John Mauteby of Mauteby. At this time England was in a very distracted condition. A weak king surrounded by turbulent nobles was incapable of discharging the duties of government, and only the strong man armed could hope to keep his goods in peace. A lawyer like his father, Paston spent much time in London, leaving his wife to look after his business in Norfolk; and many of the Letters were written by Margaret to her husband, detailing the progress of affairs in the county. It is during the lifetimes of John Paston and his eldest son that the Letters are most numerous and valuable, not only for family

matters, but also for the history of England. In 1448 Faston's manor of Gresham was seized by Robert Hungerford,

Lord Moleyns (1431-1464), and although it was afterwards recovered, the owner could obtain no redress for the loss and injury he had sustained. More serious troubles, however, were at hand. Paston had become very intimate with the wealthy knight, Sir John Fastolf, who was probably related to his wife, and who had employed him on several matters of business. In 1459 Sir John died without children, leaving his affairs in rather a tangled condition. In accordance with the custom of the time, he had conveyed many of his estates in Norfolk and Suffolk to trustees, among whom were John Paston and his brother William, retaining the revenues for himself, and probably intending his trustees after his death to devote the property to the foundation of a college. However, it was found that a few days before his decease Fastolf had executed a fresh will in which he had named ten executors, of whom two only, John Paston and another, were to act; and, moreover, that he had bequeathed all his lands in Norfolk and Suffolk to Paston, subject only to the duty of founding the college at Caister, and paying 4000 marks to the other executors. At once taking possession of the lands, Paston soon found his rights challenged. Various estates were claimed by different noble- men; the excluded executors were angry and aggressive; and Paston soon found himself in a whirlwind of litigation, and exposed also to more violent methods of attack. Something like a regular warfare was waged around Drayton and Hellesdon between John de la Pole, duke of Suffolk, and the Pastons under Margaret and her eldest son, John; Caister Castle was seized by John Mowbray, 3rd duke of Norfolk (d. 1461); and similar occurrences took place elsewhere. Some compensation, doubt- less, was found in the fact that in 1460, and again in 1461, Paston had been returned to parliament as a knight of the shire for Norfolk, and enjoying the favour of Edward IV. had regained his castle at Caister. But the royal favour was only temporary, and, having been imprisoned on three occasions, Paston died in May 1466, leaving the suit concerning Fastolf's will still proceed- ing in the church courts. John Paston left at least five sons, the two eldest of whom were, curiously enough, both named John, and the eldest of whom had been knighted during his father's lifetime. Sir John Paston (1442-1479) was frequently at the court of King Edward IV., but afterwards he favoured the Lancastrian party, and, with his brother John, fought for Henry VI. at the battle of Barnet. Meanwhile the struggle over Fastolf's estates continued, although in 1461 the king and council had decided that Paston's ancestors were not bondmen, and consequently that his title to his father's lands was

good. Caister Castle was taken after a regular siege by John Mowbray, 4th duke of Norfolk (1444-1476), and then recovered by the Pastons, and retaken by the duke. But in 1474 an arrangement was made with William Waynflete, bishop of Winchester, the representative of the excluded executors, by which some of the estates were surrendered to the bishop for charitable purposes, while Paston was secured in the possession of others. Two years later the opportune death of the duke of Norfolk paved the way for the restoration of Caister Castle; but in 1478 a fresh quarrel broke out with the duke of Suffolk. Sir John, who was a cultured man, had shown great anxiety to recover Caister; but in general he had left the conduct of the struggle to his mother and to the younger John. Owing to his carelessness and extravagance the family lands were also diminished by sales; but nevertheless when he died unmarried in November 1479 he left a goodly inheritance to his brother John. About this time the Letters begin to be scanty and less interesting, but the family continued to flourish. The younger John Paston (d. 1503), after quarrelling with his uncle William over the manors of Oxnead and Marlingford, was knighted at the battle of Stoke in 1487. He married Margery, daughter of Sir Thomas Brews, and left a son, William Paston (c. 1479-1554), who was also knighted, and who was a prominent figure at the court of Henry VIII. Sir William's second son, Clement (c. 1515-1597), served his countryˆwith distinction on the sea, and was wounded at the battle of Pinkie. The family was continued by Sir William's eldest son, Erasmus (d. 1540), whose son William succeeded to his grandfather's

estates in 1554, and to those of his uncle Clement in 1597. This William (1528-1610) was knighted in 1578. He was the founder of the Paston grammar-school at North Walsham, and made Oxnead Hall, near Norwich, his principal residence. Christopher Paston was Sir William's son and heir, and Christo- pher's grandson, William (d. 1663), was created a baronet in 1642; being succeeded in the title by his son Robert (1631-1683), who was a member of parliament from 1661 to 1673, and was created earl of Yarmouth in 1679. Robert's son William (1652-1732), who married a natural daughter of Charles II., was the second earl, and, like his father, 'was in high favour with the Stuarts. When he died in 1732 he left no son, and his titles became extinct, his estates being sold to discharge his debts.

The perturbed state of affairs revealed by the Paston Letters reflects the general condition of England during the period. It was a time of

trouble. The weakness of the government had disorganized every branch of the administration; the succession to the crown itself was contested; the great nobles lived in a state of civil war; and the prevailing discontent found expression in the rising of Jack Cade and in the Wars of the Roses. The correspondence reveals the Pastons in a great variety of relations to their neighbours, friendly or hostile; and abounds with illustrations of the course of public events, as well as of the manners and morals of the time. Nothing is more remarkable than the habitual acquaintance of educated persons, both men and women, with the law, which was evidently indispensable to persons of substance.

In addition to the editions of the Paston Letters already mentioned, see F. Blomefield and C. Parkin, History of Norfolk (London, 1805-1810), and the article in Diet. Nat. Biog. (A. W. H.*)

PASTORAL (from Lat. pastor, a shepherd), the name given to a certain class of modern literature in which the ” idyll ” of the Greeks and the ” eclogue ” of the Latins are imitated. It was a growth of humanism at the Renaissance, and its first home was Italy. Virgil had been imitated, even in the middle ages, but it was the example of Theocritus (q.v.) that was originally followed in pastoral. Pastoral, as it appeared in Tuscany in the 1 6th century, was really a developed eclogue, an idyll which had been expanded from a single scene into a drama. The first dramatic pastoral which is known to exist is the Favola di Orfeo of Politian, which was represented at Mantua in 1472. This poem, which has been elegantly translated by J. A. Symonds, was a tragedy, with choral passages, on an idyllic theme, and is perhaps too grave in tone to be considered as a pure piece of pastoral. It led the way more directly to tragedy than to pastoral, and it is the II Sagrifizio of Agostino Beccari, which was played at the court of Ferrara in 1554, that is always quoted as the first complete and actual dramatic pastoral in European literature.

In the west of Europe there were various efforts made in the direction of non-dramatic pastoral, which it is hard to classify. Early in the 16th century Alexander Barclay, in England, trans- lated the Latin eclogues of Mantuanus, a scholastic writer of the preceding age. Barnabe Googe, a generation later, in 1563, published his Eglogs, Epytapkes and Sonnettes, a deliberate but not very successful attempt to introduce pastoral into English literature. In France it is difficult to deny the title of pastoral to various productions of the poets of the Pleiade, but especially to Remy Belleau’s pretty miscellany of prose and verse in praise of a country life, called La Bergerie (1505). But the final impulse was given to non-dramatic pastoral by the publica- tion,

in 1504, of the famous Arcadia of J. Sannazaro, a work which passed through sixty editions before the close of the 16th century, and which was abundantly copied. Torquato Tasso followed Beccari after an interval of twenty years, and by the success of his Antinta, which was performed before the court of Ferrara in 1573, secured the popularity of dramatic pastoral. Most of the existing works in this class may be traced back to the influence either of the Arcadia or of the Aminta. Tasso was immediately succeeded by Alvisio Pasqualigo, who gave a comic turn to pastoral drama, and by Cristoforo Castelletti, in whose hands it grew heroic and romantic, while, finally, Guarini

produced in 1590 his famous Pastor Fido, and Ongaro his fishermen's pastoral of Alceo in 1591. During the last quarter of the 1 6th century pastoral drama was really a power in Italy. Some of the best poetry of the age was written in this form, to be acted privately on the stages of the little court theatres, that were everywhere springing up. In a short time music was introduced, and rapidly predominated, until the little forms of tragedy, and pastoral altogether, were merged. in opera.

With the reign of Elizabeth a certain tendency to pastoral was introduced in England. In Gascoigne and in Whetstone traces have been observed of a tendency towards the form and spirit of eclogue. It has been conjectured that this tendency, combined with the study of the few extant eclogues of Clemont Marot, led Spenser to the composition of what is the finest example of pastoral in the English language, the Shepherd's Calendar, printed in 1579. This famous work is divided into twelve eclogues, and it is remarkable because of the constancy with which Spenser turns in it from the artificial Latin style of pastoral then popular in Italy, and takes his inspiration direct from Theocritus. It is important to note that this is the first effort made in European literature to bring upon a pastoral stage the actual rustics of a modern country, using their own peasant dialect. That Spenser's attempt was very imperfectly carried out does not militate against the genuineness of the effort, which the very adoption of such names as Willie and Cuddie, instead of the customary Damon and Daphnis, is enough to prove. Having led up to this work, the influence of which was to be confined to England, we return to Sannazaro's Arcadia, which left its mark upon every literature in Europe. This remarkable romance, which was the type and the original of so many succeeding pastorals, is written in rich but not laborious periods of musical prose, into which are inserted at frequent intervals passages of verse, contests between shepherds on the " humile fistula di Coridone," or laments for the death of some beautiful virgin. The characters move in a world of supernatural and brilliant beings; they commune without

surprise with ” i gloriosi spiriti degli boschi,” and reflect with singular com- pleteness their author’s longing for an innocent voluptuous existence, with no hell or heaven in the background.

It was in Spain that the influence of the Arcadia made itself most rapidly felt outside Italy. The earliest Spanish eclogues had been tljose of Juan de Encina, acted in 1492. Gil Vicente, who was also a Portuguese writer, had written Spanish religious pastorals early in the 16th century. But Garcilaso de la Vega is the founder of Spanish pastoral. His first eclogue, El Dulce lamentar de los pastores. is considered one of the finest poems of its kind in ancient or in modern literature. He wrote little, and died early, in 1536. Two Portuguese poets followed him, and composed pastorals in Spanish, Francisco de Sa de Miranda, who imitated Theocritus, and the famous Jorge de Montemayor, whose Diana (1524) was founded on Sannazaro’s Arcadia. Gaspar Gil Polo, after the death of Montemayor in 1561, com- pleted his romance, and published in 1564 a Diana enamorada. It will be recollected that both these works are mentioned with respect, in their kind, by Cervantes. The author of Don Quixote himself published an admirable pastoral romance, Galatea, in 1584.

In France there has always been so strong a tendency towards a graceful sort of bucolic literature that it is hard to decide what should and what should not be mentioned here. The charming pastourelles of the 13th century, with their knight on horseback and shepherdess by the roadside, need not detain us further than to hint that when the influence of Italian pastoral began to be felt in France these earlier lyrics gave it a national inclination. We have mentioned the Bergerie of Remy Belleau, in which the art of Sannazaro seems to join hands with the simple sweetness of the medieval pastourelle. But there was nothing in France that cculd compare with the school of Spanish pastoral writers which we have just noticed. Even the typical French pastoral, the Astree of Honore d’Urf6 (1610), has almost more connexion with the knightly romances which Cervantes laughed at than with the pastorals which he praised. The famous AstrSe wss

the result of the study of Tasso’s Aminta on the one hand and Montemayor’s Diana on the other, with a strong flavouring of the romantic spirit of the Amadis. To remedy the pagan ten- dency of the Astree a priest, Camus de Pontcarre, wrote a series of Christian pastorals. Racon produced in 1625 a pastoral drama, Les Bergeries,

founded on the Astree of D'Urfe.

In England the movement in favour of Theocritean simplicity which had been introduced by Spenser in the Shepherd's Calendar, «vas immediately defeated by the success of Sir Philip Sidney's Arcadia, a romance closely modelled on the masterpiece of Sannazaro. So far from attempting to sink to colloquial idiom, and adopt a realism in rustic dialect, the tenor of Sidney's narrative is even more grave and stately than it is conceivable that the conversation of the most serious nobles can have ever been. Henceforward, in England, pastoral took one or other of these forms. It very shortly appeared, however, that the Sannazarian form was more suited to the temper of the age, even in England, than the Theocritean. In 1583 a great impetus was given to the former by Robert Greene, who was composing his Morando, and still more in 1584 by the publication of two pastoral dramas, the Gallathea of Lyly and the Arraignment of Paris of Peele. It is doubtful whether either of these writers knew anything about the Arcadia ot Sidney, which was posthu mously published, but Greene, at all events, became more and more imbued with the Italian spirit of pastoral. His Menaphon and his Never too Late are pure bucolic romances. While in the general form of his stories, however, he follows Sidney, the verse which he introduces is often, especially in the Menaphon, ex- tremely rustic and colloquial. In 1589 Lodge appended some eclogues to his Scilla's Metamorphosis, but in his Rosalynde (1590) he made a much more important contribution to English literature in general, and to Arcadian poetry in particular. This beautiful and fantastic book is modelled more exactly upon the masterpiece of Sannazaro than any other in our language. The Sixe Idittia of 1588, paraphrases of Theocritus, are anony- mous, but conjecture has attributed them to Sir Edward Dyer. In 1598 Bartholomew Young published an English version of the Diana of Montemayor.

In 1585 Watson published his collection of Latin elegiacal eclogues, entitled Amynlas, which was translated into English by Abraham Fraunce in 1587. Watson is also the author of two frigid pastorals, Meliboeus (1590) and Amyntae gaudia (1592). John Dickenson printed at a date unstated, but probably not later than 1592, a "passionate eclogue" called The Shepherd's Complaint, which begins with a harsh burst of hexameters, but which soon settles down into a harmonious prose story, with lyrical interludes. In 1594 the same writer published the romance of Arisbas. Drayton is the next pastoral poet in date of publication. His Idea: Shepherd's Garland bears the date 1593, but was probably written much earlier. In 1595 the same poet produced an Endimion and Phoebe, which was the least happy of his works. He then turned his fluent pen to the other branches of

poetic literature; but after more than thirty years, at the very close of his life, he returned to this early love, and published in 1627 two pastorals, The Quest of Cynthia and The Shepherd's Sirena. The general character of all these pieces is rich, but vague and unimpassioned. The Queen's Arcadia of Daniel must be allowed to lie open to the same charge, and to have been written rather in accordance with a fashion than in following of the author's predominant impulse. The singular eclogue by Barnfield, The Afectionate Shepherd, printed in 1594, is an exercise. on the theme " O crudelis Alexi, nihil mea carmina curas," and, in spite of its juvenility and indiscretion, takes rank as the first really poetical following of Spenser and Virgil, in distinction to Sidney and Sannazaro. Marlowe's pastoral lyric Come live with Me, although not printed until 1599, has beeij attributed to 1589. In 1600 was printed the anonymous pastoral comedy in rhyme, The Maid's Meta-morphosis, long attributed to Lyly.

With the close of the 16th century pastoral literature was not extinguished in England as suddenly or as completely as it was in Italy and Spain. Throughout the romantic Jacobean age xx. 29

the English love of country life asserted itself under the guise of pastoral sentiment, and the influence of Tasso and Guarini was felt in England just when it had ceased to be active in Italy. In England it became the fashion to publish lyrical eclogues, usually in short measure, a class of poetry peculiar to the nation and to that age. The lighter staves of The Shepherd's Calendar were the model after which all these graceful productions were drawn. We must confine ourselves to a brief enumeration of the principal among these Jacobean eclogues. Nicholas Breton came first with his Passionate Shepherd in 1604. Wither followed with The Shepherd's Hunting in 1615, and Braithwaite, an inferior writer, published The Poet's Willow in 1613 and Shepherd's Tales in 162 1. The name of Wither must recall to our minds that of his friend William Browne, who published in 1613-1616 his beautiful collection of Devonshire idylls called Britannia's Pastorals. These were in heroic verse, and less distinctly Spenserian in character than those eclogues recently mentioned. In 1614 Browne, Wither, Christopher Brook and Davies of Hereford united in the composition of a little volume of pastorals entitled The Shepherd's Pipe. Meanwhile the com- position of pastoral dramas was not entirely discontinued. In 1606 Day dramatized part of Sidney's Arcadia in his Isle of Gulls, and about 1625 the Rev. Thomas Goffe composed his Careless Shepherdess, which Ben Jonson deigned to imitate in the opening lines of his Sad Shepherd. In 16 10 Fletcher produced his Faithful Shepherdess in emulation of the Aminta of Tasso. This is the

principal pastoral play in the language, and, in spite of its faults in moral taste, it preserves a fascination which has evaporated from most of its fellows. The Arcades of Milton is scarcely dramatic; but it is a bucolic ode of great stateliness and beauty. In the Sad Shepherd, which was perhaps written about 1635, and in his pastoral masques, we see Ben Jonson not disdaining to follow along the track that Fletcher had pointed out in the Faithful Shepherdess. With the Piscatory Eclogues of Phineas Fletcher, in 1633, we may take leave of the more studied forms of pastoral in England early in the 17th century.

When pastoral had declined in all the other nations of Europe, it enjoyed a curious recrudescence in Holland. More than a century after date, the Arcadia of Sannazaro began to exercise an influence on Dutch literature. Johan van Heemskirk led the way with his popular Batavische Arcadia in 1637. In this curious romance the shepherds and shepherdesses move to and fro between Katwijk and the Hague, in a landscape unaffectedly Dutch. Heemskirk had a troop of imitators. Hendrik Zoete- boom published his Zaanlandsche Arcadia in 1658, and Lambertus Bos his Dordlsche Arcadia in 1662. These local imitations of the suave Italian pastoral were followed by still more crude romances, the Rolterdamsche Arcadia of Willem den Elger, the Watcher sche Arcadia of Gargon, and the Noordwijker Arcadia of Jacobus van der Valk. Germany has nothing to offer us of this class, for the Diana of Werder (1644) and Die adriatische Rosamund of Zesen (1645) are scarcely pastorals even in form.

In England the writing of eclogues of the sub-Spenserian class of Breton and Wither led in another generation to a rich growth of lyrics which may be roughly called pastoral, but are not strictly bucolic. Carew, Lovelace, Suckling, Stanley and Cartwright are lyrists who all contributed to this harvest of country song, but by far the most copious and the most charac- teristic of the pastoral lyrists is Herrick. He has, perhaps, no rival in modern literature in this particular direction. His command of his resources, his deep originality and observation, his power of concentrating his genius on the details of rural beauty, his interest in recording homely facts of country life, combined with his extraordinary gift of song to place him in the 1 very first rank among pastoral writers; and it is noticeable that in Herrick's hands, for the first time, the pastoral became a real and modern, instead of being an ideal and humanistic thing. From him we date the recognition in poetry of the humble beauty that lies about our doors. His genius and influence were almost instantly obscured by the Restoration. During the final decline of the Jacobean drama a certain number of pastorals were still produced. Of these the only ones

which deserve

mention are three dramatic adaptations, Shirley's Arcadia (1640), Fanshawe's Pastor Fido (1646), and Leonard Willan's Astraea (1651). The last pastoral drama in the 17th century was Settle's Pastor Fido (1677). The Restoration was extremely unfavourable to this species of literature. Sir Charles Sedley, Aphra Behn and Congreve published eclogues, and the Pastoral Dialogue between Tkirsis and Strephon of the first-mentioned was much admired. All of these, however, are in the highest degree insipid and unreal, and partook of the extreme artificiality of the age.

Pastoral came into fashion again early in the 18th century. The controversy in the Guardian, the famous critique on Ambrose Philips's Pastorals, the anger and rivalry of Pope, and the doubt which must always exist as to Steele's share in the mystification, give 1708 a considerable importance in the annals of bucolic writing. Pope had written his idylls first, and it was a source of infinite annoyance to him that Philips contrived to precede him in publication. He succeeded in throwing ridicule on Philips, however, and his own pastorals were greatly admired. Yet there was some nature in Philips, and, though Pope is more elegant and faultless, he is not one whit more genuinely bucolic than his rival. A far better writer of pastoral than either is Gay, whose Shepherd's Week was a serious attempt to throw to the winds the ridiculous Arcadian tradition of nymphs and swains, and to copy Theocritus in his simplicity. Gay was far more successful in executing this pleasing and natural cycle of poems than in writing his pastoral tragedy of Dione or his " tragi-comico pastoral farce " of The What d'ye call it? (1715). He deserves a very high place in the history of English pastoral on the score of his Shepherd's Week. Swift proposed to Gay that he should write a Newgate pastoral in which the swains and nymphs should talk and warble in slang. This Gay never did attempt; but a northern admirer of his and Pope's achieved a veritable and lasting success in Lowland Scotch, a dialect then considered no less beneath the dignity of verse. Allan Ramsay's Gentle Shepherd, published in 1725, was the last, and remains the most vertebrate and interesting, bucolic drama pro- duced in Great Britain. It remained a favourite, a hundred and fifty years after, among Lowland reapers and milkmaids.

With the Gentle Shepherd the chronicle of pastoral in England practically closes. This is at least the last performance which can be described as a developed eclogue of the school of Tasso and Guarini. It is in Switzerland that we find the next impor- tant revival .of pastoral properly so-called. The taste of the 1 8th century was very agreeably tickled by the religious idylls of Salomon Gessner, who died in 1787. His Daphnis und Phillis and Der Tod Abels were read and imitated throughout Europe. In German literature they left but little mark, but in France they were cleverly copied by Arnaud Berquin. A much more important pastoral writer is Jean Pierre Clovis de Florian, who began by imitating the Galatea of Cervantes, and continued with an original bucolic romance entitled Estelle. It has always been noticeable that pastoral is a form of literature which disappears before a breath of ridicule. Neither Gessner nor his follower Abbt were able to survive the laughter of Herder. Since Florian and Gessner there has been no reappearance of bucolic literature properly so-called. The whole spirit of romanticism was fatal to pastoral. Voss in his Luise and Goethe in Hermann und Dorothea replaced it by poetic scenes from homely and simple life.

Half a century later something like pastoral reappeared in a totally new form, in the fashion for Dorfgeschichten. About 1830 the Danish poet S. S.. Blicher, whose work connects the grim studies of George Crabbe with the milder modern strain of pastoral, began to publish his studies of out-door romance among the poor in Jutland. Immermann followed in Germany with his novel Der Oberhof in 1839. Auerbach, who has given to the 19th-century idyll its peculiar character, began to publish his Schwarzwdlder Dorfgeschichten in 1843. Meanwhile George Sand was writing Jeanne in 1844, which was followed by La Mare au Diable and Francois le Champi, and in England Clough produced in 1848 his remarkable long-vacation pastoral The

Bothie of Tober-na-Vuolich. It seems almost certain that these writers followed a simultaneous but independent impulse in this curious return to bucolic life, in which, however, in every case, the old tiresome conventionality and affectation of lady-like airs and graces were entirely dropped. This school of writers was presently enriched in Norway by Bjornson, whose Synnove Solbakkenvras the first of an exquisite series of pastoral romances. But perhaps the best of all modern pastoral romances is Fritz Reuter's Ut mine Stromtid, written in the Mecklenburg dialect of German. In England the Dorsetshire poems of William Barnes and the Dorsetshire novels of Thomas Hardy belong to the same class. It will be noticed, of course, that all these recent productions have so much in common with the literature which is produced around them that they almost evade separate

classification. It is conceivable that some poet, in following the antiquarian tendency of the age, may enshrine his fancy once more in the five acts of a pure pastoral drama of the school of Tasso and Fletcher, but any great vitality in pastoral is hardly to be looked for in the future. (E. G.)

PASTORAL EPISTLES, the name given to St Paul's letters to Timothy and Titus. The term seems to have originated with J. A. L. Wegscheider (1 771-1849), professor at Halle. The three epistles mentioned are written to men rather than churches, and to men appointed to certain pastoral work. In this respect they differ from the personal and intimate note which Paul wrote to Philemon. They are closely related in origin, style, diction and thought, and occupy ' so distinct a place in these respects that the Pauline authorship of them has been much questioned. (See Timothy, Epistles to; Titus, Epistle to.)

PASTORAL LETTER, an open letter addressed by a bishop to the clergy or laity of his diocese, or to both, containing either general admonition, instruction or consolation, or directions for behaviour in particular circumstances. In the Catholic Church such letters are also sent out regularly at particular ecclesiastical seasons, particularly at the beginning of fasts. In the non- episcopal Protestant churches the name " pastoral letter " is given to any open letter addressed by a pastor to his congrega- tion, but more especially to that customarily issued at certain seasons, e.g. by the moderator of a Presbyterian assembly or the chairman of a Congregational or Baptist union.

PASTORAL STAFF, in the Christian Church, an ensign of office or dignity. It is some five feet long, ending at the top in a crook {volute) bent inwards, and made of metal, ivory or wood. If of metal, it is hollow; if of wood, it is usually covered with metal. The crook is usually richly ornamented, and is divided from the shaft by a boss; the shaft is commonly separated into sections by rings, so that it can be taken to pieces.

The pastoral staff is the ensign proper of cardinals (except cardinal-deacons) and bishops; but the former are entitled to use it only in the churches from which they derive their titles, the latter only in their dioceses. The pope so early as the time of Innocent III. did not carry the pastoral staff, and it would seem never to have been his custom. The ferula that the Ordo of Cencius Sabellius (ch. 48) speaks of was not a pastoral staff, but the symbol of authority over the papal palace, with which by its transference he was invested. This ferula, mentioned by Luitprand of Cremona in his account of the deposition of Benedict

V., and the baculus aureus of the Historia dedicationis ecclesiae cavensis (Acta Sanctorum, 4 March, i. 354) are sceptres. Abbots carry the pastoral staff only when specially empowered by the pope to do so, and then only in the territory under the jurisdiction of their monastery and in the churches sub- ordinated to it. With certain restrictions the pastoral staff is also sometimes conceded to dignitaries of cathedral and collegiate churches, but never to abbesses (Sacra Congreg. Ril. 29 Jan. 1656).

The pastoral staff, as its name implies, symbolizes the pastoral office and authority, a symbolism already known to Isidore of Seville (De ecclesiast. of. ii. 5). This symbolism is expressed in the words used, at least since the 10th century, by the conse- crate* in delivering the pastoral staff at the consecration of a

bishop and the benediction of an abbot. The pastoral staff is carried in the left hand, in order that the right may remain free to give the blessing. The bishop is directed so to hold it (Cerem. episc. ii. 8, 25) that the crook is turned towards the people. It is used not only at pontifical High Mass but at all solemn pontifical functions, e.g. vespers, consecrations, processions. It is uncertain at what period the use of the pastoral staff was introduced; but the evidence tends to show that it was about the 5th century, in Gaul or Spain. The pastoral staff was certainly in use in Gaul in the 6th century (Vita S. Caesar. Arelat. ii. 18), in Spain at least as early as the 7th, and in Ireland also in the 7th; in Italy, so far as the available evidence shows, its introduction was comparatively late. It had originally nothing of its present liturgical character; this was given to it in the post-Carolingian period.

As regards the development of the form of the pastoral staff, there are four principal types: (1) staves with a simple crook,

the oldest form, which survived in Ireland until the 1 2th century ; (2) staves with a ball or knob at the top, a rare form which did not long survive as a pastoral staff; (3) staves with a horizontal crook, so-called Tau-staves, used especially by abbots and surviving until the 13th century; (4) staves with crook bent inwards. These last already appear

in miniatures of the 9th century; from the nth onwards they predominated; and in the 13th century they ousted all other forms. Originally plain, the crook was from the nth century onwards often made in the form of a snake (5), which in richer staves encircled the Lamb of God or the representation of a figure. Since the 13th century the snake, under Gothic influence, developed into a boldly designed tendril set with leaves, which usually encircled a figure or group of figures, and the knob dividing shaft and crook into an elegant chapel (6 and 7). Finally, at the close of the middle ages, the lower part of the crook was bent outwards so that the actual volute came over the middle of the knob, the type that remained dominant from that time onwards (8) . As a decoration, rather than for practical reasons, a fine folded cloth (pannisellus, sudarium, velum, Eng. veil), was from the 14th century onward often suspended from the knob of the pastoral staff. This was done both in the case of bishops' and of abbots' staves, but is now confined to the latter (Cerem. episc. i. 11, 5; Deer. Alex. VII. 27 Sept. 1659; Sacr. Congr. Rit. 27 Sept. 1847).

From the pastoral staff must be distinguished the staff of the chorepiscopus (director of the choir) and cantors, which is still in use here and there. This, which is also known as bordonus, was developed out of the choir-staves, originally no more than sticks to lean on during the long services.

The Reformation abolished the pastoral staff almost every- where. 1 In the Church of England, however, it was retained among the episcopal ornaments prescribed by the first Prayer- book of Edward VI., and, though omitted in the second Prayer- book, its use seemed once more to be enjoined under the Orna- ments Rubric of Elizabeth's Prayer-book. Whatever the theoretical value of this injunction may have been, however, in practice the use of the pastoral staff was discontinued until its gradual revival in the last decades of the 19th century.

In the Churches of the East, a pastoral staff (Gr. fr&fiSos, Russ. possoch, paterissa, Syr. and Nest, chutra, Arm. gavazan hayrapetatz, Copt. Hot) is borne among the Syrians only by the patriarch, in all the other rites by all bishops, in the Greek

1 Among curious exceptions is the pastoral staff still carried by the Lutheran abbot of Lokkum.

Church also by archimandrites and abbots, and in the Armenian Church also by the varlapeds (teachers). The staff of Armenian bishops is reminiscent of that of the West, from which it is apparently derived;

that of the vartapeds is encircled at the upper end by one or two snakes. The Coptic patriarch uses an iron cross-staff. For the rest, the pastoral staff in the Oriental rites is T-shaped. It is of wood inlaid with ivory and mother-of-pearl. A veil is attached to the staff among the Greeks, Armenians and Copts. The bishops of the Coptic, Syrian and Nestorian Uniate Churches have adopted the Roman pastoral staff.

See Ch. Cahier et A. Martin, Milanges d'archeologie (Paris, 1856), iv. 145 seq. ; Rohault et Fleury, La Messe (Paris, 1889), vii. 75 seq. For the Anglican usage see the Report of the Sub-committee of Convocation on the Ornaments of the Church, &c. (London, 1908). (J. Bra.)

PATAGONIA, the name given to that portion of South America which, to the east of the Andes, lies mainly south of the Rio Negro (41 S.), and, to the west of the Andes, south of the Chilean province of Llanquihue (42 S.). The Chilean portion embraces the two provinces of Chiloe and Magallanes. East of the Andes the Argentine portion of Patagonia is divided into four territories: (1) Neuquen, 42,000 sq. m. approximately, including the triangle between the rivers Limay and Neuquen, and extending south- ward to the northern shore of Lake Nahuel-Huapi (41 S.) and northward to the Rio Colorado; (2) Rio Negro, 76,000 sq. m. approximately, extending from the Atlantic to the Cordillera of the Andes, to the north of 42 S.; (3) Chubut, 95,000 sq. m. approximately, embracing the region between 42° and 46° S.; and (4) that portion of the province of Santa Cruz which stretches from the last-named parallel as far south as the dividing line with Chile, and between Point Dungeness and the watershed of the Cordillera, an area approximately of 106,000 sq. m.

Physiography. — The general character of the Argentine portion of Patagonia is for the most part a region of vast steppe-like plains, rising in a succession of abrupt terraces about 300 ft. at a time, and covered with an enormous bed of shingle almost bare of vegetation. In the hollows of the plains are ponds or lakes of brackish and fresh water. Towards the Andes the shingle gives place to porphyry, granite and basalt lavas, animal life becomes more abundant and vegetation more luxuriant, acquiring the characteristics of the flora of the western coast, and consisting principally of the beech and conifers.

Among the depressions by which the plateau is intersected trans- versely, the principal are the Gualichu, south of the Rio Negro, the Maquinchau and Balcheta (through which previously flowed the waters of lake Nahuel-Huapi, which now feed the river Limay); the Senguerr, the Deseado. Besides these transverse depressions (some of

them marking lines of ancient inter-oceanic communication), there are others which were occupied by more or less extensive lakes, such as the Yagagtoo, Musters and Colhuapi, and others situated to the south of Puerto Deseado, in the centre of the country. In the central region volcanic eruptions, which have taken part in the formation of the plateau from the Tertiary period down to the pre- sent era, cover a large part with basaltic lava-caps ; and in the western third more recent glacial deposits appear above the lava. There, in contact with folded Cretaceous rocks, uplifted by the Tertiary granite, erosion, caused principally by the sudden melting and re- treat of the ice, aided by tectonic changes, has scooped out a deep longitudinal depression, which generally separates the plateau from the first lofty hills, the ridges generally called the pre-Cordillera, while on the west of these there is a similar longitudinal depression all along the foot of the snowy Andean Cordillera. This latter depres- sion contains the richest and most fertile land of Patagonia.

The geological constitution is in accordance with the orographic physiognomy. The Tertiary plateau, flat on the east, gradually rising on the west, shows Upper Cretaceous caps at its base. First come Lower Cretaceous hills, raised by granite and dioritic rocks, undoubtedly of Tertiary origin, as in sortie cases these rocks have broken across the Tertiary beds, so rich in mammal remains; then follow, on the west, metamorphic schists of uncertain age; then quartzites appear, resting directly on the primitive granite and gneiss which form the axis of the Cordillera. Porphyritic rocks occur between the schists and the quartzites. The Tertiary deposits are greatly varied in character, and there is considerable difference of opinion concerning the succession and correlation of the beds. They are divided by Wilckens 2 into the following series (in ascending order) : —

1. Pyrotherium-Notostylops beds. Of terrestrial origin, con- taining remains of mammalia. Eocene and Oligocene.

2 O. Wilckens, ” Die Meeresablagerungen der Kreide- und Ter- tiar-formation in Patagonien,” in Neues Jahrb. f. Min., Beilage- Band XXI. (1906), 98-195.

2. Patagonian Molasse. Partly marine, partly terrestrial. Lower Miocene. Wilckens includes in this series the coal of Punta Arenas, and

the marine beds below it.

3. Santa Cruz series. Containing remains of mammals. Middle and Upper Miocene.

4. Parana series. Sandstones and conglomerates with marine fossils. Pliocene. Confined to the eastern part of the region.

The Upper Cretaceous and Tertiary deposits have revealed a most interesting vertebrate fauna. This, together with the dis- covery of the perfect cranium of a chelonian of the genus Myotonia, which may be said to be almost identical with Myolania oweni of the Pleistocene age in Queensland, forms an evident proof of the con- nexion between the Australian and South American continents. The Patagonian Myolania belongs to the Upper Chalk, having been found associated with remains of Dinosauria. Other specimens of the interesting fauna of Patagonia, belonging to the Middle Tertiary, are the gigantic wingless birds, exceeding in. size any hitherto known, and the singular mammal Pyrolherium, also of very large dimensions. In the Tertiary marine formation a con- siderable number of cetaceans has been discovered. In deposits of much later date, formed when the physiognomy of the country did not differ materially from that of the present time, there have been discovered remains of pampean mammals, such as Clyptodon and Macrauchenia, and in a cave near Last Hope Inlet, a gigantic ground sloth (Grypotherium listai), an animal which lived contem- poraneously with man, and whose skin, well preserved, showed that its extermination was undoubtedly very recent. With the remains of Grypotherium have been found those of the horse (Onoshippidium), which are known only from the lower pampas mud, and of the Arctotherium, which is found, although not in abundance, in even the most modern Pleistocene deposits in the pampas of Buenos Aires. It would not be surprising if this latter animal were still in existence, for footprints, which may be attributed to it, have been observed on the borders of the rivers Tamango and Pista, affluents of the Las Heras, which run through the eastern foot-hills of the Cordillera in 47° S.

Glaciers occupy the valleys of the main chain and some of the lateral ridges of the Cordillera, and descend to lakes San Martin, Viedma, Argentino and others in the same locality, strewing them with icebergs. In Patagonia an immense ice-sheet extended to the east of the present Atlantic coast during the first ice age, at the close of the Tertiary epoch, while, during the second glacial age in modern times, the terminal moraines have generally stopped, 30 miles in the north and 50 miles in the south, east of the summit of the Cordillera. These

ice-sheets, which scooped out the greater part of the longitu- dinal depressions, and appear to have rapidly retreated to the point where the glaciers now exist, did not, however, in their retirement fill up with their detritus the fjords of the Cordillera, for these are now occupied by deep lakes on the east, and on the west by the Pacific channels, some of which are as much as 250 fathoms in depth, and soundings taken in them show that the fjords are as usual deeper in the vicinity of the mountains than to the west of the islands. Several of the high peaks are still active volcanoes.

In so far as its main characteristics are concerned, Patagonia seems to be a portion of the Antarctic continent, the permanence of which dates from very recent times, as is evidenced by the apparent recent emergence of the islets around Chiloe, and by the general character of the pampean formation. Some of the promontories of Chiloe are still called huapi, the Araucanian equivalent for “islands”; and this may perhaps be accepted as perpetuating the recollection of the time when they actually were islands. They are composed of caps of shingle, with great, more or less rounded boulders, sand and volcanic ashes, precisely of the same form as occurs on the Patagonian plateau. From an examination of the pampean formation it is evident that in recent times the land of the province of Buenos Aires extended farther to the east, and that the advance of the sea, and the salt-water deposits left by it when it retired, forming some of the lowlands which occur on the littoral and in the interior of the pampas, are much more recent phenomena; and certain caps of shingle, derived from rocks of a different class from those of the neighbouring hills, which are observed on the Atlantic coasts of the same province, and increase in quantity and size towards the south, seem to indicate that the caps of shingle which now cover such a great part of the Patagonian territory recently extended farther to the east, over land which has now disappeared beneath the sea, while other marine deposits along the same coasts became converted into bays during the subsequent advance of the sea. There are besides, in the neighbourhood of the present coast, deposits of volcanic ashes, and the ocean throws up on its shores blocks of basaltic lava, which in all probability proceed from erup- tions of submerged volcanoes now extinct. One fact, however, which apparently demonstrates with greater certainty the existence in recent times of land that is now lost, is the presence of remains of pampean mammals in Pleistocene deposits in the bay of San Julian and in Santa Cruz. The animals undoubtedly reached these localities from the east ; it is not at all probable that they advanced from the north southwards across the plateau intersected at that cime by great rivers and covered by the ice-sheet. With the exception of the discoveries at the inlet of Ultima Esperanza, which is

in close communication with the Atlantic valley of Gallegos, none of these remains have been discovered in the Andean regions.

On the upper plains of Neuquen territory thousands of cattle; can be fed, and the forests around Lakes Traful and Nahuel-Huapi yield large quantities of valuable timber. The Neuquen river is not navigable, but as its waters are capable of being easily dammed in places, large stretches of land in its valley are utilized; but the lands on each side of

its lower part are of little commercial value. As the Cordillera is approached the soil becomes more fertile, and suitable districts for the rearing of cattle and other agricultural purposes exist between the regions which surround the Tromen volcano and the first ridges of the Andes. Chos Malal, the capital of the territory, is situated in one of these valleys. More to the west is the mining region, in great part unexplored, but containing deposits of gold, silver, copper and lignite. In the centre of the territory, also in the neighbourhood of the mining districts, are the valleys of Norquin and Las Lajas, the general camp of the Argentine army in Patagonia, with excellent timber in the forest on the Andean slope. The wide valleys occur near Rio Malleco, Lake Huechulaf- quen, the river Chimehuin, and Vega de Chapelco, near Lake Lacar, where are situated villages of some importance, such as Junin de los Andes and San Martin de los Andes. Close to these are the famous apple orchards supposed to have been planted by the Jesuits in the 17th and 18th centuries. These regions are drained by the river Collon-Cura, the principal affluent of the river Limay. Lake Lacar is now a contributary of the Pacific, its outlet having been changed to the west, owing to a passage having been opened through the Cordillera.

The Rio Negro runs along a wide transverse depression, the middle part of which is followed by the railway which runs to the settlement of Neuquen at the confluence of the rivers Limay and Neuquen. In this depression are several settlements, among them Viedma, the capital of the Rio Negro territory, Pringles, Conesa, Choele- Choel and Roca. To the south of the Rio Negro the Patagonian plateau is intersected by the depressions of the Gualicho and Maquinchau, which in former times directed the waters of two great rivers (now disappeared) to the gulf of San Matias, the first-named depression draining the network of the Collon-Cura and the second the Nahuel-Huapi lake system. In 42° S. there is a third broad trans- verse depression, apparently the bed of another great river, now perished, which carried to the Atlantic the waters of a portion of the eastern slope of the Andes, between 41 ° and 42 ° 30′ S.

Chubut territory presents the same characteristics as the Rio Negro territory. Rawson, the capital, is situated at the mouth of the river Chubut on the Atlantic (42 30′ S.). The town was founded in 1865 by a group of colonists from Wales, assisted by the Argentine government ; and its prosperity has led to the foundation of other important centres in the valley, such as Treleu and Gaiman, which is connected by railway with Porto Madryn on Bahia Nueva. Here is the seat of the governor of the territory, and by 1895 the inhabitants of this part of the territory, composed principally of Argentines, Welsh and Italians,

numbered 2585. The valley has been irrigated and cultivated, and produces the best wheat of the Argentine Republic. Between the Chubut and the Senguerr there are vast stretches of fertile land, spreading over the Andean region to the foot of the Cordillera and the lateral ridges of the Pre-Cordil- lera, and filling the basins of some desiccated lakes, which have been occupied since 1885, and farms and colonies founded upon them. The chief of these colonies is that of the 16th of October (16 de Octobre), formed in 1886, mainly by the inhabitants of Chubut colony, in the longitudinal valley which extends to the eastern foot of the Cordil- lera. Other rivers in this territory flow into the Pacific through breaches in the Cordillera, e.g. the upper affluents of the Fetaleufu, Palena and Rio Cisnes. The principal affluent of the Palena, the Carrenleufu, carries off the waters of Lake General Paz, situated on the eastern slope of the Cordillera. Rio Pico, an affluent of the same river, receives nearly the whole of the waters of the extensive undu- lating plain which lies between the Rio Teka and the Rio Senguerr to the east of the Cordillera, while the remainder are carried away by the affluents of Rio Jehua, viz., the Cherque, Omkel and Appeleg. This region contains auriferous drifts, but these, like the auriferous deposits, veins of galena and lignite in the mountains farther west which flank the Cordillera, have not been properly investigated. At Lake Fontana there are auriferous drifts and lignite deposits which abound in fossil plants of the Cretaceous age. The streams which form the rivers Mayo and Chalia join the tributaries of the Rio Aisen, which flows into the Pacific, watering in its course exten- sive and valuable districts where colonization has been initiated by Argentine settlers. Colonies have also been formed in the basin of Lakes Musters and Colhuei ; and on the coasts near the Atlantic, along Bahia Camarones and the Gulf of San Jorge, there are exten- sive farms.

The territory of Santa Cruz is arid along the Atlantic coast and in the central portion between 46° and 50 S. With the exception of certain valleys at Puerto Deseado (Port Desire) and in the trans- verse basins which occur as far south as Puerto San Julian, and which contain several cattle farms, few spots are capable of cultivation, the pastures being poor, water insufficient and salt lagunas fairly numerous. Puerto Deseado is the outlet for the produce of the Andean region situated between Lakes Buenos Aires and Pueyrredon.

Into this inlet there flowed at the time of the conquest a voluminous

river, which subsequently disappeared, but returned again to its ancient bed, owing to the river Fenix, one of its affluents, which had deviated to the west, regaining its original direction. Lake Buenos Aires, the largest lake in Patagonia, measuring 75 m. in length, poured its waters into the Atlantic even in post-Glacial times by means of the river Deseado ; and it is so depicted on the maps of the 17th and 18th centuries; and so too did Lake Pueyrredon, which, through the action of erosion, now empties itself westward, through the river Las Heras, into the Calen inlet of the Pacific, in 48° S. San Julian on Puerto San Julian, where Ferdinand Magellan wintered, is the centre of a cattle farming colony, and colonists have pushed into the interior up the valley of a now extinct river which in com- paratively recent times carried down to Puerto San Julian the waters of Lakes Volcan, Belgrano, Azara, Nansen, and some other lakes which now drain into the river Mayer and so into Lake San Martin. The valleys of the Rio Chico throughout their whole extent, as well as those of Lake Shehuen, afford excellent grazing, and around Lakes Belgrano, Burmeister and Rio Mayer and San Martin there are spots suitable for cultivation. In the Cretaceous hills which flank the Cordillera important lignite beds and deposits of mineral oils have been discovered. The Rio Santa Cruz, originally explored by Captain Fitzroy and Charles Darwin, is an important artery of communication between the regions bordering upon the Cordillera and the Atlantic. In Santa Cruz bav an important trade centre has been established. But the present cattle region par excellence of Patagonia is the department of Rio Gallegos, the farms extending from the Atlantic to the Cordillera. Puerto Gallegos itself is an important business centre, which bids fair to rival the Chilean colony of Punta Arenas, on the Straits of Magellan. Owing to the produce of the cattle farms established there, the working of coal in the neighbourhood, and the export of timber from the surrounding forests, the town of Punta Arenas is in a flourishing condition. Its population numbers about 4000. But the colonization of the western (Chilean) coast has generally failed, principally owing to the adverse climatic conditions of the Cordillera in those latitudes.

Climate. — The climate is less severe than was supposed by early travellers. The east slope is warmer than the west, especially in summer, as a branch of the southern equatorial current reaches its shores, whereas the west coast is washed by a cold current. At Puerto Montt, on the inlet behind Chiloe Island, the mean annual temperature is 52° F. and the average extremes 78° and 29-5°, whereas at Bahia Blanca near the Atlantic coast and just outside the northern confines of Patagonia the annual temperature is 59 and the range much greater. At Punta Arenas, in the extreme south, the mean

temperature is 43° and the average extremes 76 and 28°. The prevailing winds are westerly, and the westward slope has a much heavier precipitation than the eastern; thus at Puerto Montt the mean annual precipitation is 97 in., but at Bahia Blanca it is 19 in. At Punta Arenas it is 22 in.

Fauna. — The guanaco, the puma, the zorro or Brazilian fox (Canis azarae), the zorrino or Mephitis patagonica (a kind of skunk), and the tuco-tuco or Clenomys magellanicus (a rodent) are the most characteristic mammals of the Patagonian plains. The guanaco roam in herds over the country and form with the ostrich {Rhea americana, and more rarely Rhea darwinii) the chief means of sub- sistence for the natives, who hunt them on horseback with dogs and bolas. Bird-life is often wonderfully abundant. The carrancha or carrion-hawk (Polyborus tharus) is one of the characteristic objects of a Patagonian landscape ; the presence of long-tailed green parakeets (Conurus cyanolysius) as far south as the shores of the strait attracted the attention of the earlier navigators ; and humming- birds may be seen flyingamidst the fallingsnow. Of the many kinds of water-fowl it is enough to mention the flamingo, the upland goose, and in the strait the remarkable steamer duck.

Population. — The natives of Patagonia are nearly extinct. Here and there one may find a Tehuelchian or Gennaken Encamp- ment, but natives of pure race are now very scarce, and the two races all told probably do not number more than 100 male individuals. The Tehuelches were the dominant race in Pata- gonia. These people, from whom the name of Tierra de Pata- gones was given by Magellan on observing their large footprints, are remarkable for their great stature, having an average height of 6 ft. to 6 ft. 4 in. They are not known to have applied any collective name to their various tribes; Tehuelche is the Arau- canian name for them. They have been described as kindly in disposition, though sometimes quarrelsome; skilled in the chase, addicted to gambling and to drinking, though also capable of long endurance of privation. Their religion recognized a Great Spirit, and designated the new moon as an object of worship. The Gennakens differ in type and language from the Tehuelches. The remaining population is composed of Arau- canians, a mixture of the Tehuelches and Gennaken. But these are not the only type of people who have dwelt in Patagonia. The ancient burial-places have yielded the bones of other races

quite distinct from the present inhabitants, some of them having greatly resembled the primitive types which are met with more to the north, in the Argentine Chaco and in Brazil; while others, again,

strongly resembled certain of the Pacific races, in that they possessed ethnic characteristics which have not been observed elsewhere in South America. Among these remains every type of artificial deformity of the skull hitherto known has been found, while at the present time the natives only practise the occipital deformation which is so common among the western tribes of America.

History. — Patagonia was discovered in 1520 by Ferdinand Magellan, who on his passage along the coast named many of the more striking features — Gulf of San Matias, Cape of 11,000 Virgins (now simply Cape Virgenes), &c. By 16 n the Pata- gonian god Setebos (Settaboth in Pigafetta) was familiar to the hearers of the Tempest. Rodrigo de Isla, despatched inland in 1 535 lrom San Matias by Alcazava Sotomayor (on whom western Patagonia had been conferred by the king of Spain), was the first to traverse the great Patagonian plain, and, but for the mutiny of his men, he would have struck across the Andes to the Chilean side. Pedro de Mendoza, on whom the country was next bestowed, lived to found Buenos Aires, but not to carry his explorations to the south. Alonzo de Camargo (1539), Juan Ladrilleros (1557) and Hurtado de Mendoza (1558) helped to make known the western coasts, and Sir Francis Drake's voyage in 1577 down the eastern coast through the strait and northward by Chile and Peru was memorable for several reasons; but the geography of Patagonia owes more to Pedro Sarmiento de Gamboa (1579-1580), who, devoting himself especially to the south-west region, made careful and accurate surveys. The settlement which he founded at Nombre de Dios and San Felipe were neglected by the Spanish government, and the latter was in such a miserable state when Thomas Cavendish visited it in 1587 that he called it Port Famine. The district in the neigh- bourhood of Puerto Deseado, explored by John Davis about the same period, was taken possession of by Sir John Narborough in the name of King Charles II. in 1669. In the second half of the 18th century knowledge of Patagonia was augmented by Byron (1764-1765), S. Wallis (1766) and L. A. de Bougainville (1766); Thomas Falkner, a Jesuit who " resided near forty years in those parts," published his Description of Patagonia (Hereford, 1774); Francesco Viedma founded El Carmen, and Antonio advanced inland to the Andes (1782); and Basilio Villarino ascended the Rio Negro (1782). The "Adventure" and " Beagle " expeditions under Philip King (1826-1830) and Robert Fitzroy (1832-1836) were of first-rate importance, the latter especially from the participation of Charles Darwin; but of the interior of the country nothing was observed except 200 miles of the course of the Santa Cruz. Captain G. C. Musters in 1869 wandered in company with a band of Tehuelches through the whole length of the country from

the strait to the Manzaneros in the north-west, and collected a great deal of information about the people and their mode of life. Since that date ex- plorations have been carried on by F. P. Moreno, Ramon Lista, Carlos M. Moyano, A. Bertrand, H. Steffen, P. Krtiger, R. Hauthal, C. Burckhardt, O. Nordenskiold, J. B. Hatcher, .the surveyors of the Argentine and Chilean Boundary Commissions and others.

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PATAN (= " city "), the name of two historic cities in India. One of these, known as Anhilwada Patan, was the capital of the last Hindu

dynasty of Gujarat, sacked by Mahmud of Ghazni and finally destroyed by the Mahommedans in 1298. Near its ruins, which are not considerable, has sprung up a modern town, in the state of Baroda (pop. 31,402), which contains many Jain temples (with palm-leaf MSS.) and has manufactures of fine cotton and silk textiles. The other Patan, known as Lalita Patan, was the capital of one of the three Newar kingdoms in the valley of Nepal, conquered by the Gurkhas at the end of the 18th century. It is situated close to Katmandu, on the opposite bank of the river Baghmati. The population is estimated at about 30,000, mostly Newars, who are Buddhists; and the build- ings consist mainly of old Buddhist shrines and monasteries.

PATARA, an ancient town of Asia Minor, on the Lycian coast, 3 m. E. of the mouth of the Xanthus river (mod. Eshen Chai). It was noted from early times for its temple and oracle of Apollo, and, as the port of Xanthus and other towns of the same valley, had a large trade, and was regarded as the metropolis of Lycia. Enlarged by Ptolemy Philadelphus I. and renamed for a time Arsinoe, it was adorned by Vespasian with baths. St Paul changed there into a ” ship of Phoenicia ” on his way to Jerusalem in a.d. 60. Patara was the reputed birth-place of St Nicholas. The principal extant monuments are a triple triumphal arch, with inscription, through which ran the road to Xanthus, and the walls, discernible on either hand of it; the theatre, 265 ft. in diameter, built in a.d. 145 (as attested by an inscription) and wonderfully well preserved, though largely filled with drift sand; and the thermae built by. Vespasian north of the harbour.

PATARENES, or Patarelli, a name apparently first used in Milan about 1058 to denote the extreme opponents of clerical marriages. The party was so called because, under the leader- ship of Arialdus, a deacon of Milan, its members used to assemble in the Pataria or ragmen’s quarter of that city {pates being a provincial word for a rag). In the 13th century the name was appropriated by the Cathari, who said it came from pati (to suffer), because they endured hardship for their faith. See Bogomils.

PATAS MONKEY, a West African species of the guenon monkeys (see Guenon), characterized by its- large size, the foxy-red colour of the upper parts, blue face and white belly. Scientifically it is known as Cercopilhecus (Erythrocebus) patas, and typifies a section of its genus of which the other represent- ative is the East African nisnas (C. [E.] pyrrhonotus) . See Privates.

PATAVIUM (mod. Padova, Eng. Padua, q.v.), an ancient city of Venetia, Italy, 55 m. E. of Verona by road. Its central position gave it

great importance. One road led from it south- west to Ateste, Hostilia (where the Po was crossed) and Bononia; another east-north-east to Altinum and Concordia. It was accessible by canals from the sea, a distance of about 30 m. The old town (40 ft. above sea-level) lay and lies on a peninsula surrounded by the Bacchiglione except on the south, where it was protected by a canal. Of the bridges which cross the canals by which Padua is now intersected, four go back to Roman times. Remains of a public building, possibly belonging to the forum, were found in the centre of the modern city in making the foundations of the Caffe Pedrocchi at the south-west angle of Piazza Cavour — possibly a colonnade of fine Corinthian architecture (see P. Selvatico, Relazione dello Scavo . . . su la Piazzetia Pedrocchi. A large mosaic with geometric designs was also

recently discovered in the centre of the city. In imperial times the town spread even farther, as is shown by the position outside the town of the amphitheatre, built of blocks of local stone with brick courses, which was excavated in 1881 (G. Ghirardini in Notizie degli Scavi, 1881, 225). It measures 325 by 205 ft., and is the only Roman building of which visible remains exist. A so- called ” paletta ” (a bronze plate with a handle — possibly a bell or a votive axe or a simple pendant) with a figure of a horse on one side and a votive inscription on the other, belonging to the 5th or 4th century B.C., was found in 1899 at a great depth close to the church of S. Antonio (G. Ghirardini in Notizie degli Scavi, 1901, 314). The name of the town is probably connected with Padus (Po). According to the legend it was founded by the Trojan Antenor. The memory of the defeat of the Spartan king Cleonymus by the fleet of Patavium in 302 B.C. was perpetuated by Spartan spoils in the temple of Juno and a yearly sea-fight which took place on the river. On land Patavium was equally powerful (it had been able, we are told, to put 120,000 men into the field), and perpetually made war against its Celtic neighbours. Patavium acquired Roman citizenship with the rest of Gallia Transpadana in 49 B.C. Under Augustus, Strabo tells us, Patavium surpassed all the cities of the north in wealth, and in the number of Roman knights among its citizens in the census of Augustus was only equalled by Gades, which had also 500.

Its commercial importance was also great, being especially due to its trade in wool. The numerous inscriptions, however, as Th. Mommsen remarks {Corp. inscr. latin, v. 268), show remarkable dignity and simplicity and avoidance of pomposity; to this Pliny the younger and Martial testify. The importance of Patavium as a literary centre was also considerable. Livy, Q. Asconius Pedianus and Thrasea Paetus were natives of the town; and Quintilian speaks of the directness and

simplicity of their diction as Patavinitas, comparing it with the artificial obscurity of the writers of Rome itself.

After the 2nd century a.d. it is hardly mentioned, and seems to have been outstripped by other cities, such as Milan and Aquileia. It was destroyed by the Lombards with fire and sword, and it was then that it lost practically all its monuments of the Roman period. (T. As.)

PATEL, FRAMJEE NASARWANJEE (1804-1894), Parsee merchant and philanthropist, was born in 1804, and had a sound vernacular education, with a smattering of English received in Bombay. At the age of fifteen he entered upon a business career, and its pursuit proved so congenial that by 1827 he had worked his way to a partnership in the firm of Frith, Bomanjee & Co. Banking facilities being then exceedingly scanty, such Parsees as had any capital at command acted as bankers and brokers to the rising English firms. Patel's experience enabled him in a few years to raise the status of his compatriots to the higher level of independent merchants, and he founded in 1844 a business house under the name of Wallace & Co., in which he was himself a partner with the English members of the firm. When he retired in 1858 he had amassed a large competence, and in the following year he established a firm on the same lines under the style of Framjee, Sands & Co., of which the members were some of his sons, together with English partners. It was, however, not so much for his success as a merchant, as for his spirit and liberality as an educationist, reformer and philanthropist, that his name is notable in the annals of western India. He entered on his civic labours in 1837, and in all public movements figured prominently Ss an accredited representative of his community. As a pioneer of education, both for boys and girls, his example inspired the younger men of his time, like Dadabhai Naoroji, at one time M.P. for East Finsbury, and Naoroji Fardoonjee and Sorabjee Shapurjee Bengallee. When Mountstuart Elphinstone, during his governorship, conceived the idea of concentrating the literary and educational activity which had arisen from isolated efforts on the part of men who had themselves been brought into contact with Western culture, among his chief collaborators were Framjee Cowasjee Banajee and Framjee Patel. To their initiative was due the establishment of the Elphinstone Institution, which comprised a high 3chool and, after some years,

a college, which continue to hold foremost rank among the similar

academies since established in western India. But Mr Patel's most remarkable public service was performed in connexion with the Parsee Law Association, of which he was president. Since their exodus from Persia the domestic affairs of the Parsees had been in a very unsettled state. Matrimonial obligations and the rights of succession in cases of intestacy had fallen into hopeless confusion, and the adjudication of disputes in relation thereto was effected by certain elders of the community, who had neither the knowledge and help of fixed principles to guide their judgments, nor any authority to enforce their decisions. The case of Ardesir Curseljee v. Peeroxebai, which came up on appeal before the privy council in England, brought to light the strange fact that even the supreme court of Bombay had no jurisdiction over matrimonial and ecclesiastical disputes among Parsees. This state of lawlessness was recognized by that community as intolerable, and the agitation which ensued thereupon led to the appointment of a commission, of which the distinguished jurist, Sir Joseph Arnould, was the president and Framjee Patel the chief Parsee member. The Parsee Law Association, under the guidance of Patel and Sorabjee Bengallee, rendered invaluable help to the commission, and their joint efforts resulted in the passing by the government of India of the Parsee Marriage and Divorce Act and the Parsee Intestate Succession Act (15 and 21 of 1 86 5) . These acts form the charter of matrimonial and ecclesi- astical status for the Parsees. At the time of his death in 1894, at the ripe age of nearly ninety years, Framjee Patel was the most revered and best beloved of the distinguished natives of India, having during an eventful public life extending over sixty years worked in co-operation with three generations of the most prominent of his compatriots to better the condition of their country. His family surname refers to the title of patel, that is, " mayor," of Bombay, conferred on its founder for services rendered to the English in 1692. (M. M. Bh.)

PATEN (through the Fr. from Lat. patina or patena, Gr. ■KO.7b.1n), a flat dish), the name of the shallow plate or dish used in the celebration of the Eucharist for the consecrated bread or wafer. The paten has from the first been almost always of a circular shape. There is a rare example of a rectangular one, dating from the 7th century, in the Cabinet des Medailles in Paris. The central portion of the paten is sometimes decorated with the engraved head of the Saviour, or commonly with a group of lobes.

PATENdTRE DES NOYERS, JULES (1845-), French diplomatist, was born at Baye (Marne) on the 20th of April 1845. Educated at the Ecole Normale Superieure, he taught for some years in the lycee at Algiers before he joined the diplo- matic service in 1871. His most important

mission was in 1884, when he was sent as French minister to China to regularize the French dominion in Annam. After arranging at Hue with the king of Annam the condition of the French protectorate, he proceeded to Shanghai to settle with China the difficulties which had arisen over the evacuation of Tongking by the Chinese troops. The negotiation failed, and the French admiral resumed hostilities against China in August. Next year Patenotre signed with Li Hung Chang a treaty of peace at Tien-tsin, by which the French protectorate in Annam and Tongking was recognized, and both parties agreed to remain within their own borders in the future. After serving as minister plenipotentiary in Morocco (1888-1891), M. Paten6tre was sent to Washington, where he was raised to the rank of ambassador in 1893. He was ambassador at Madrid from 1897 to 1902.

Pierre Loti in Au Maroc has described his diplomacy in Morocco. M. Paten6tre himself published some reminiscences in the Revue des deux mondes.

PATENTS, properly documents conferring some privilege, right, &c, short for ” letters patent ” (q.v.). Patents for inventions, instruments which formerly bore the great seal of the United Kingdom, are now issued at the Patent Office in London under the seal of that office. By their means inventors obtain a monopoly in their inventions for fourteen years, a term which, if insufficient to remunerate the inventor, can be extended.

This monopoly is founded on exactly the same principle as the copyright enjoyed by authors and artists. There are persons who argue that no such privilege should be permitted; there are others who think that the most trifling exertions of the inventive faculties should be protected. The right course clearly lies between these extremes. To grant a very long term of exclusive possession might be detrimental to the public, since it would tend to stop the progress of improvement. A limited property must therefore be allowed — large enough to give the inventor an opportunity of reaping a fair reward, but not barring the way for an unreasonable period. And, when this compromise has been decided on, it will be seen how difficult it may be to determine beforehand what is the real merit of an invention, and apportion the time to that merit. Hence it has been found necessary to allot one fixed period for all kinds of inventions falling within the purview of the patent laws.

United Kingdom. — Formerly the reigning prince considered himself entitled, as part of his prerogative, to grant privileges of the nature of monopolies to any one who had gained his favour. These grants

became so numerous that they were oppressive and unjust to various classes of the commonwealth; and hence, in the reign of James I., a statute was wrung from that king which declared all monopolies that were grievous and inconvenient to the subjects of the realm to be void. (See Letters Patent; Monopoly.) There was, however, a special exception from this enactment of all letters patent and grants of privilege of the " sole working or making of any manner of new manufacture within the realm to the true and first inventor of such manufacture, which others at the time of making such letters patent and grants should not use, so they be not contrary to law, nor mischievous to the state by raising of the prices of commodities at home or hurt of trade or generally inconvenient." Upon these words hangs the whole law of letters patent for inventions. Many statutes were afterwards passed, but these were all repealed by the Patent Act of 1883 (46 & 47 Vict. c. 57), which, besides introducing a new procedure, modified the law in several par- ticulars. Subsequently acts amending the law were passed in 1885, 1886, 1888, 1901, 1902 and 1907. These acts, with the exception of certain sections of the act of 1883, were repealed by a consolidating act, the Patents and Designs Act 1907, which also introduced new provisions into English patent law. Where the law is not expressly laid down by act of parliament, it has to be gathered from the numerous decisions of the courts, for patent law is to no inconsiderable extent " judge-made law."

The inventions for which patents are obtained are chiefly either vendible articles formed by chemical or mechanical operations, such as cloth, alloys, vulcanized india-rubber, &c, or machinery and apparatus, or processes. It may be remarked here that a scientific principle cannot form the subject of a valid patent unless its application to a practical and useful end and object is shown. An abstract notion, a philosophical idea, may be extremely valuable in the realm of science, but before it is allowed to form a sound basis for a patent the world must be shown how to apply it so as to gain therefrom some immediate material advantage. With regard to processes, the language of the statute of James has been strained to bring them within the words " any manner of new manufacture," and judges on the bench have admitted that the exposition of the act has gone much beyond the letter. However, it is undoubted law that a process is patentable; and patents are accordingly obtained for processes every day.

The principal classes of patentable inventions seem to be these: (1) new contrivances applied to new ends, (2) new con- trivances applied to old ends, (3) new combinations of old parts, whether relating to material objects or processes, (4) new methods of applying a well-

known object.

With regard to a patent for the new application of a well- known object it may be remarked that there must be some display of ingenuity, some amount of invention, in making the appli- cation, otherwise the patent will be invalid on the ground that the subject-matter is destitute of novelty. For example, a fishplate, used before the introduction of railways to connect

wooden beams could not be patented to connect the rails of a railway (Harwood v. Great Northern Railway Co., 1860-1865, 11 H. L. C. 654) ; nor can a spring long used in the rear of a carriage be patented for use in the front (Morgan v. Windover, 1890, 7 R. P. C. 131). But a small amount of invention will suffice, so long as the improvement is manifest, either as saving time or labour (Rickmann v. Thierry, 1896, 14 R.P, C. 105: Patent Exploitation, Ltd. v. Siemensˆ Co., 1904, 21 R.P.C. 549).

Whatever be the nature of the invention, it must possess the incidents of utility and novelty, else any patent obtained in respect of it will be invalid. The degree of utility need not, however, be great. As to novelty, this is the rock upon which most patents split; for, if it can be shown that other persons have used or published the invention before the date of the patent, it will fall to the ground, although the patentee was an independent inventor deriving his ideas from no one else. The difficulty of steering clear of this rock will be apparent at once. Suppose A in London patents an invention the result of his own ingenuity and patient study, and it afterwards appears that B, in some distant part of the kingdom, had been previously openly using the same thing in his workshop, A's patent is good for nothing. Thus, where the patent sued on was a lock, it was proved that a similar lock had been in use on a gate adjoining a public road for sixteen years prior to the patent, which was accordingly invali- dated (Carpenter v. Smith, 1842, 1 Web. P.C. 540) . It is therefore a very frequent subject of inquiry, whether an invention has been previously used to such an extent as to have been publicly used in the sense attached by the courts to this phrase. But whereas " user " in public is sufficient prior publication to invalidate a subsequent patent for the invention so used, publication in books, &c, will not be a bar to novelty unless its effect is to make the invention actually a part of public knowledge; and in dealing with alleged anticipations by patents that have never

come into general use the courts will not invalidate a subsequent patent unless a person of ordinary knowledge of the subject, on having the alleged anticipation brought under his notice, would at once perceive, understand, and be able practically to apply the in- vention without making experiments or seeking for further information. The inventor himself is not allowed to use his invention, either in public or secretly, with a view to profit, before the date of the patent. Thus, if he manufactures an article by some new process, keeping the process an entire secret, but selling the produce, he cannot afterwards obtain a patent in respect of it. If he were allowed to do this he might in many cases easily obtain a monopoly in his invention for a much longer period than that allowed by law (Morgan v. Seaward, 1837, 1 Web. P.C. 192). The rule that an inventor's use of the invention invalidates a subsequent patent does not, however, apply to cases where the use was only by way of experiment with a view to improve or test the invention (Elias v. Grovesend Tinplate Co., 1890, 7 P.O.R. 466). And it has been repeatedly decided that the previous experiments of other persons, if in- complete or abandoned before the realization of the discovery, will not have the effect of vitiating a patent. Even the prior discovery of an invention will not prevent another independent discoverer from obtaining a valid patent if the earlier inventor kept the secret to himself, the law holding that he is the " true and first inventor " who first obtains a patent.

The Patents Act 1883 provided that the exhibition of an in- vention at an industrial or international exhibition certified as such by the Board of Trade, or the publication of any description of the invention during the period of the holding of the exhibition, or its use for the purpose of the exhibition in the place where it is held, or during the period of the exhibition by any person else- where, without the privity or consent of the inventor, should not prejudice the right of the inventor or of his legal personal representative to apply for and obtain a patent, or the validity of any patent granted on the application, provided that two conditions are complied with, viz. (a) the exhibitor must, before exhibiting the invention, give the Comptroller-General a pre- scribed notice of his intention to do so; and (b) the application for the patent must be made before or within six months from the

date of the opening of the exhibition. The Patents Act 1886, enabled the Sovereign, by order in council, to extend the pro- vision above mentioned to industrial and international exhibi- tions held out of the United Kingdom. The act of 1907 re-enacted these provisions (§§ 45, 59). When an invention is the joint production of more persons than one, they must all apply for and obtain a joint patent, for a patent is rendered invalid on showing that a material part of the invention was

due to some one not named therein. The mere suggestion of a workman employed by an inventor to carry out his ideas will not, however, require that he should be joined, provided that the former adds nothing substantial to the invention, but merely works out in detail the principle discovered by his employer.

Procedure. — The attributes of novelty and utility being possessed in due degree by an invention, it remains to put in motion the machinery for its protection. The Patents Act 1907, re-enacting former provisions, requires an application to be made in a prescribed form (the forms and stamps are on sale at all postal money order offices in the United Kingdom), and left at or sent by post to the patent office in the prescribed manner. The application must contain a declaration that the applicant is the true and first in- ventor, and it must be accompanied by either a provisional or complete specification. A provisional specification describes the nature of an invention, and a complete specification particularly describes and ascertains the nature of the invention and the manner in which it is to be performed. Since the introduction of the patent specification, it has been necessary that an invention pro- tected by patent should be accurately described by the inventor. Formerly, when the condition on which letters patent issued was that the patentee should file a specification completely describing the nature of his invention- within a certain time after the grant, the function of giving the necessary preliminary information on the subject was to some extent discharged by the title; at any rate, the validity of the grant was liable to be objected to on the ground of the title being too general. Under the present law the task of preliminary disclosure falls to the provisional specification, intro- duced by the Patent Law Amendment Act 1852, and continued by the Patents Acts of 1883 and 1907, although a patentee may, under the latter statutes, dispense with a provisional specification if he thinks proper to file a complete one in the first instance. Where however, these two specifications are filed, it becomes of vital moment to an invehtor that the true relation between them should be maintained as defined above. The object of the provisional specification is to secure immediate protection, and to enable a

Eatentee to work at and improve his invention without the risk of is patent being invalidated by premature publication. He is therefore entitled to embody in his complete specification any im- proved method of working his invention which he may discover in the interval; and he is indeed bound to do so, since, as we have said, the price that a man who desires a patent has to pay to the public for the privilege is that he should make a full disclosure of his invention in his complete specification. But there is a limit to what the patentee

may do in this respect. He must not describe in his complete specification an invention different from that declared in the provisional. If he falls into this error there is said to be a ” variance ” or ” disconformity ” between the two specifica- tions. The Patents Act 1883, § 9, made it the duty of the ex- aminers of the Patent Office to consider the question of discon- formity between specifications on applications for patents, but the only power the comptroller had, on discovery of disconformity, was to refuse to accept the specification until the disconforming parts had been eliminated. By the act of 1907, § 6, he may now refuse to accept the complete specification until it has been amended to his satisfaction, or (with the consent of the applicant) cancel the provisional specification and treat the application as having been made on the date at which the complete specification was left. Moreover, if the complete specification includes an invention not included in the provisional specification, the application may proceed as a whole, or may be divided, and the claim for the ad- ditional invention included in the complete specification be re- garded as an application for that invention made on the date at which the complete specification was left. An act of 1902 (which, with the exception of a portion dealing with compulsory licences, came into operation on the 1st of January 1905) provided for an examination or search as to novelty, such investigation dealing with British complete specifications published and dated within fifty years prior to the date of the application. This search was re-enacted by the act of 1907 (§ 7) and power given to the comp- troller to refuse the grant of a patent in cases in which the invention had been wholly and specifically claimed in specifications to which his search had extended.

The term for which a patent is originally granted is fourteen years, but a patentee may, after advertisement according to the rules of the Supreme Court, petition for a further term. The court, in considering its decision, takes regard of the nature and merit of the invention in relation to the public, of the profits made by

the patentee as such, and of all the circumstances of the case. If it appears to the court that the patentee has been inadequately remunerated by his patent, it may extend the term of the patent to a further term not exceeding seven or, in exceptional cases, fourteen years, or may order the grant of a new patent for a certain term, with any restrictions or provisions it may think fit (Act of 1907, § 18).

Patent privileges, like most other rights, can be made the subject of sale. Partial interests can also be carved out of them by means of licences, instruments which empower other persons to exercise the invention, either universally and for the full time of the patent (when they are tantamount to an assignment of the patentee's entire rights), or for a limited time, or within a limited district. By an exclusive licence is meant one that restrains the patentee from granting other licences to any one else. By means of a licence a patentee may derive benefit from his patent without entering into trade and without running the risks of a partnership.

One of the regulations of the act of 1883 was that a patentee could be compelled by the Board of Trade to grant licences to persons who were able to show that the patent was not being worked in the United Kingdom, or that the reasonable requirements of the public with respect to the invention could not be supplied, or that any person was prevented from working or using to the best ad- vantage an invention of which he was possessed. This regulation, however, remained practically a dead letter, for only three applica- tions were made between the years 1883 and 1897, and these never proceeded to a hearing. After 1897 a few petitions were heard, but even so late as in 1908 there was only one petition and that was withdrawn by agreement between the parties. By § 3 of the act of 1902, the hearing of petitions for a grant of compulsory licences was transferred to the judicial committee of the privy council, but the act of 1907 substituted the High Court as the tribunal in the place of the judicial committee. It also laid down that the reasonable requirements of the public should not be deemed to be satisfied: (a) if by reason of the default of the patentee to manufacture to an adequate extent and supply on reasonable terms, the patented article or any parts thereof necessary for its efficient working or to carry on the patented process to an ade- quate extent or to grant licences on reasonable terms, any existing trade or industry or the establishment of any new trade or in- dustry in the United Kingdom is unfairly prejudiced, or the demand for the patented article is not reasonably met; or (b) if any trade or industry in the United Kingdom is unfairly prejudiced by the conditions attached by the patentee before or after the passing of the act to the purchase, hire or use of the patented article or to the using or working of the patented process. Clause b is an en- deavour to remedy an abuse by which patentees bound down pur- chasers and licences by all kinds of conditions. Section 38 of the act of 1907 contains also a further remedy, making it unlawful in any contract in relation to the sale or lease of, or licence to use or work, any patented article or process to insert conditions prohibiting or restricting the use of the

patent or process from using articles supplied by a third person or requiring him to use other articles not protected by the patent. Such conditions are declared ” null and void as being in restraint of trade and contrary to public policy.”

Another new and very important provision of the act of 1907 is that dealing with the revocation of patents worked outside the United Kingdom. It may be stated here that in the year 1908 out of a total number of 16,284 patentees, 2819 were resident in the United States, 2516 in Germany, 822 in France, 334 in Austria- Hungary, 200 in Switzerland, 166 in the Australian Commonwealth, 159 in Belgium, 155 in Canada, 139 in Sweden and 134 in Italy. It had been a common practice to take out licences in the United Kingdom (especially in the dyeing industry) in order to close the British market to all except the patentees and their licensees, the patented articles or processes being worked entirely abroad. Section 27 of the act of 1907 enacted that at any time not less than four years after the date of a patent and not less than one year after the passing of the act, any person might apply to the comptroller for the revocation of a patent on the ground that the patented article or process is manufactured or carried on exclusively or mainly outside the United Kingdom. The comp- troller is given power to make an order revoking the patent forth- with or after a reasonable interval, unless the patentee can show satisfactory reasons. The insertion of this provision resulted in the establishment of many factories in the United Kingdom.

Legal Remedies. — A patentee’s remedy for an infringement of his rights is by civil suit, there being no criminal proceedings in such a case. In prosecuting such suit he subjects those rights to a searching examination, for the alleged infringer is at liberty to show that the invention is not new, that the patentee is not the true and first inventor, &c, as well as to prove that the alleged infringement is not really an infringement. But it may here be remarked that a patentee is not bound down (unless he chooses so to be) to the precise mode of carrying the invention into effect described in the specification. If the principle is new, it is not to be expected that he can describe every mode of working it; he will sufficiently secure the principle by giving some illustrations of it ; and no person will be permitted to adopt some mode of carrying

the same principle into effect on the ground that such mode has not been described by the patentee. On the other hand, when the principle is not new, a patentee can only secure the particular method which he has invented, and other persons may safely use other methods of effecting the same object. Instances of this occur every day; and it is

well known that scores of patents have been taken out for screw-propellers, steam-hammers, water-meters, &c, each of which is limited to the particular construction described, and cannot be extended further. Again, where the invention patented consists of a combination of parts, some old and some new, the whole constituting a new machine or a new process, it is not open to the world to copy the new part and reject the rest. A man is not permitted to allege that the patent is for a combination, and that, the identical combination not having been used, there has been no infringement. If he has borrowed the substance of the invention, it will be held that he has infringed the patent. At common law a person who, alleging that he has a patent, threatens his rivals in trade, is liable to an action for damages, but the plaintiff cannot succeed without showing that the threats were made maliciously. The Patents Act 1883 provided another remedy — what is known as " the threats action." This has been incorporated in the act of 1907, § 36. The statute makes the good faith of the

Eatentee threatening legal proceedings no answer to an action rought against him by any person aggrieved by his threats if the acts complained of are not in fact an infringement of the patent, and if the patentee fails with due diligence to commence and prosecute an action for infringement.

Extent and Construction. — The patent when sealed is to have effect in the United Kingdom and the Isle of Man. The act of 1907, unlike the Patent Law Amendment Act of 1852, does not extend the monopoly to the Channel Islands.

The patent business of the United Kingdom is transacted at the Patent Office in London under the superintendence of the comp- troller, an officer appointed by the Board of Trade, under whose direction he performs his duties. At this office is kept a register of all patents issued, of assignments of patents, licences granted under them, &c. An illustrated journal of patent inventions is published at the same office, where printed copies of all specifica- tions can also be obtained. The fees payable to government on patents were considerably reduced by an order of the Board of Trade which came into operation on the 1st of October 1892, and may now be paid by convenient annual instalments. The follow- ing are the present fees : before the expiration of the 4th year from the date of the patent, £5 instead of £10; of the 5th year, £6 instead of £10; of the 6th year, £7 instead of £10; of the 7th year, £8 instead of £10; of the 8th year, £9 instead of £15; of the 10th year, £11 instead of £20; of the nth year, £12 instead of £20; of the 12th year, £13 instead of £20; and of the 13th year, £14 instead of £20. The preliminary fees amounting to £4 were left

untouched by the order but under the Patent Rates of 1905 an additional fee of £1 is payable on the sealing of the patent. The entire cost of a patent is now reduced from £154 to £100.

A new Patent Office was constructed on the site of the old buildings, the frontage extending from Southampton Buildings into Staple Inn. The number of applications for patents, which sprang from 5993 in 1883 to 17,110 in 1884, culminated in a total of 30,952 for the year 1892, since which date a steady decline set in down to 1900, when the number was 23,924. But the numbers went up again, reaching 30,030 in 1906, but only 28,598 in 1908. The number of patents sealed on application for a given year shows less variation, the minimum being 8775 for 1885 against 16,060 in 1907. The proportion of seals to applications varies from about 46 to 50%. The receipts from patent fees in 1908 were £262,890, against a total expenditure of £179,531.

The official publications of the Patent Office deserve some notice, as, in the absence of official investigation into novelty, the onus of search rests with the applicant or his agent. The procedure has been greatly simplified by the publication, on a uniform system and at a low rate (is. per volume), of illustrated abridgments of specifications. From 1877 practically to date the searcher obtains a chronological digest of all specifications falling within a given class. To these classes there is a reference index, known as the " abridgment class and index key," which at once directs the searcher to his proper class and index heading.

Patent Agents. — Patents are frequently obtained through the intervention of persons termed patent agents, who devote them- selves to this branch of business. Their position is now regulated by statute. By the Patents Act 1888, it was provided that no person should, after July I, 1889, be entitled to describe himself (and whoever does so knowingly incurs liability to a maximum penalty of £20) as a patent agent whether by advertisement, de- scription of his place of business or otherwise, without being registered as such in pursuance of the act. But the act preserves the right to registration of every person who, to the satisfaction of the Board of Trade, shows that he had been bona fide practising as a patent agent before it passed. The Board of Trade is em- powered by this statute to make from time to time general rules for the purpose of carrying out its provisions, and by rules issued in 1889, and reissued in 1891, the Board of Trade delegated to the Institute of Patent Agents (which obtained a royal charter in

1891) the care of the register of patent agents and the duty of holding the necessary examinations for entrance into the profession.

British Dominions. — The following notes on colonial law give the salient facts. Prior to 1852 British letters patent extended to all the colonies, but the act of 1852 restricted the rights granted to the United Kingdom, Channel Islands and Isle of Man.

Australia. — The Commonwealth Acts are No. 21 of 1903, and No. 19 of 1906. They are founded on the English act of 1883 and amending acts. They provide for a department of patents con- trolled by a commissioner "under the minister" (§ 10 of 1903). Any person, whether a British subject or not, may apply for a patent (§ 32 of 1903). The term of a patent is 14 years (§64 of 1903). The Commonwealth or a state may acquire patents compulsorily (§§ 93, 94 of 1903). The act creates a new class of " patent attorneys " (§ 101, 1903). There is an examination as to novelty (§ 41 of 1903). The renewal fees amount to a sum of £5 before the end of the 4th year, and £5 before the end of the 7th year from the date of the patent.

Bahama Islands. — The law is regulated by the following acts of the colony: 52 Vict. c. 23; 53 Vict. c. 2; 54 Vict. c. 12; and 63 Vict. c. 3. Duration of patent 7 years, with power in governor to renew for another 7 years, and thereafter for a third period of 7 years. The fees are £10 on filing specification, £10 for second renewal and £20 for third. Apparently there is no preliminary examination as to novelty.

Barbadoes. — Acts of 1903 (No. 31) and of 1908 (No. 10). Duration of patent 14 years. The governor in council has power to grant compulsory licences. Fees are £2, 10s. on filing specification, £50 before the end of the 4th year and £100 before the end of the 7th year. No preliminary examination as to novelty.

Bermuda. — Act of 1902 (No. 51), on the lines of that of Trinidad.

British Guiana. — The law is regulated by ordinance No. 31 of 1902 and is practically the same as the English act of 1883. The fees are $15 on filing specification and $100 before the end of 7 years.

British Honduras. — The law of the 10th of September 1862 has been re-enacted with slight modifications (see supplement to Patent Laws of the World, No. 4, 1900). There is no examination as to novelty.

British India. — The law is now governed by Act 5 of 1888, which

applies to the whole of British India. Duration of patent is 14 years. A preliminary examination into novelty might apparently be ordered. The following taxes are payable: annual sums of Rs. 50 from the 4th to the 8th year, and of Rs. 100 from the 8th to the 13th year of the term.

British New Guinea. — The Queensland Patents Acts, No 13 of 1884 and No. 5 of 1886, have been adopted. See British New Guinea ordinance No. 6 of 1889, schedule A.

British North Borneo. — Straits Settlements law (No. 12 of 1871), adopted by Patents Proclamation 1887 (No. I of 1887).

Canada. — Patent legislation belongs exclusively to the Dominion Parliament [B.N.A. Act 1867, § 91 (22)]. The existing acts are c. 61 of 1886; 55 & 56 Vict. c. 24; 56 Vict. c. 34; and act of 1903. The duration of the patent is 18 years. At the time of application the applicant may pay the full fee required for that term (viz. $60) or the partial fee required for the term of 6 years ($20) or for the term of 12 years ($40). If a partial fee only is paid, the amount is stated in the patent, and the patent ceases at the end of the term covered by such partial payment, unless before the expiration of such term the patentee pays the fee required for the further term of 6 or 12 years, viz. $20 in the former case and $40 in the latter. There is a preliminary examina- tion into novelty by examiners, with an appeal from the decision of the commissioner of patents to the governor in council. The patent is void unless it is worked in Canada within 2 years, or if after the expiration of 12 months, or any authorized extension of either of these periods, the patentee imports the invention into Canada, but conditions may be substituted for condition as to manufacture in Canada, as, for example, a licence to another to manufacture, &c.

Cape of Good Hope. — The law is regulated by act No. 17 of i860, No. 24 of 1902 and No. 28 of 1904. There is no preliminary ex- amination into novelty, and the act contains no provisions for compulsory working, or as to the importation of patented articles from abroad.

Ceylon. — The law is now regulated by act 15 of 1906. The duration of the patent is 14 years, with power vested in the governor in council to grant extensions of 7 and 14 years. There is a pre- liminary examination as to novelty, but there are no provisions as to compulsory working or the importation of patented articles from abroad. The renewal fees are Rs. 50 annually from before the expiration of the 4th to before the expiration of the 8th year from the

filing of the specification, Rs. 100 after the expiration of the 8th and before the expiration of the 9th year, Rs. 1 50 after the expiration of the 9th and before the expiration of the 10th year, and Rs. 200 annually after the expiration of the 10th year to before the expiration of the 13th year.

Cliannel Islands. — These are not now included in grant of letters patent. See form of grant, schedule I., form D., Patents Act 1883.
Falkland Islands. — By ordinance No. 2 of 1903 letters patent for any invention may be granted to any person holding in the United Kingdom a valid patent for any invention or to any person to whom all interest in the patent has been assigned. The fee on application is £5.

Fiji Islands.— The law depends on ordinances No. 3 of 1879 and 7 of 1882, and order of December 29, 1890. The duration of the patent is 14 years. There is no preliminary examination, and there are no provisions as to compulsory working or importation from abroad. The patent is not subject to any payment after issue. A fee of 5 guineas is payable on deposit of petition and specification. The fee for provisional protection is 5 guineas; on obtaining letters patent the applicant pays 10 guineas.

Gambia. — An ordinance (No. 5 of 1900) is practically identical with the English act of 1883. No. 5 of 1904 made international arrangements for protection of patents.

Gibraltar. — There is no patent law in Gibraltar, but special ordinances are sometimes passed extending the privileges of British patentees to the dependency for the unexpired residues of the original terms. See as examples No. 5 of 1890, No. I of 1896, and No. 1 of 1898.

Gold Coast. — The law is now regulated by the Patents Ordinances 1900 to 1906, which closely resemble the Imperial Act.

Hong-Kong.— The law is regulated by ordinance No. 2 of 1892. The inventor or assignee of any invention patented in England may obtain protection in the colony for the unexpired residue of the original term. If the English patent is extended by the advice of the Judicial Committee, an extension of the colonial patent may be obtained, or a new patent granted for the extended period. A fee of $25 is payable on grant of patent, and another fee of the same amount on grant of extension or original letters in lieu of extension. There is no preliminary examination, and there are no provisions as to

compulsory working or importation from abroad.

Jamaica. — The law is still in substance governed by c. 30 of 1857. But under ordinance No. 15 of 1891 the stamp duty on letters patent is now £2 instead of £6, 10s., and there is no longer any fee payable on the reference to the attorney general. There is no _ preliminary examination as to novelty, and there are no provisions as to importation from abroad.

Lagos.— Ordinances of 1900 (No. 17) and 1902 (No. 2) introduce substantially the English law.

Leeward Islands. — Act No. 3 of 1906 has adopted the English act of 1883. The fees are on filing specification £2, 10s. ; at end of 4th year £20; at end of 7th year £40.

Malta. — The law is governed by ordinance No. 11 of 1899 and No. 7. of 1907, the duration of the patent is 14 years. There is no express provision for a preliminary examination into novelty. Provision is made for compulsory assignation or licence, where the invention has not been put into use within 3 years subsequent to the grant or its working has been suspended for 3 years con- tinuously. The annual fees are £5 before the expiration of the 4th year from the date of the patent; £6 before the expiration of the 5th; £7 and £8 respectively before the expiration of the 6th and 7th years; £9 and £10 before the expiration of the 8th and 9th; and from £11 to £14 before the expiration of the 10th, nth, I2th and 13th years.

Mauritius. — The law is still regulated by ordinance No. 16 of 1875. There is no preliminary examination as to novelty, and there are no provisions for compulsory working or importation from abroad.

Natal. — The law is still regulated by No. 4 of 1870. But certain details of practice are amended by No. 2 of 1895. There is no preliminary examination as to novelty, and there are no provisions as to compulsory working or importation from abroad.

Newfoundland. — The law is contained in the Consolidated Statutes, t. xii. c. 109. There is no preliminary examination into novelty. In addition to the office fees, the patentee is required to deposit with the colonial secretary the sum of $25, to be paid by him to the receiver-general for the use of the colony.

New Zealand. — The law now depends on No. 12 of 1889, amended in details by No. 8 of 1897. The duration of a patent is 14 years. There is no preliminary examination as to novelty, and there are no

provisions as to compulsory working or importation from abroad. The following fees are payable: £2 on obtaining letters patent, £5 before the expiration of the 4th year and £10 before the expiration of the 7th.

Nigeria, Northern. — No. 12 of 1902 introduces practically the English law of 1883.

Orange River Colony. — Up to the outbreak of war in 1899 the law was regulated by ordinance No. 10 of 1888 and no change has yet been made. The term of a patent was 14 years. No prelimi- naiy examination as to novelty. Compulsory licences might be obtained. No prohibition of the importation of patented articles. The fee for signing and sealing the patent was not less than £10 nor more than £50. Taxes of £5 and £10 were payable before or at the expiration of the 3rd and 7th years of the term respectively. Rhodesia, Southern. — Ordinance No. 7 of 1904 adopts practically the English law.

St Helena. — The law is regulated by ordinance No. 3 of 1872. The grantee of an English patent, or his representatives, can have the grant extended to the colony. All cases of doubt and difficulty not provided for by the laws of the colony are governed by the law in force in England. A fee of one guinea is payable on filing copy of letters patent and specification with the registrar of the Supreme Court.

Sierra Leone. — No special regulations exist, but an ordinance practically identical with that of the Gold Coast is being adopted.

Straits Settlements. — The law is prescribed by ordinance No. 12 of 1871. The duration of a patent is 14 years. There is no pre- liminary examination as to novelty, and there are no provisions as to compulsory working or importation from abroad. There is a stamp duty of $50 on the petition. No renewal fees are payable.

Transvaal Colony. — Proclamations Nos. 22 and 29 of 1902 intro- duce substantially the English law.

Trinidad and Tobago. — The law is regulated by ordinance No. 10 of 1900 and No. 13 of 1905. The duration of the patent is 14 years. There is no preliminary examination into novelty, and there are no provisions as to compulsory working or importation from abroad. A fee of £10 is payable on application for a patent.

Turks and Caicos Islands. — The law of Jamaica has been ex- tended to these islands by No. 7 of 1 897. See supplement to Patent Laws of the World, No. 3 of 1900.

Windward Islands. — In the Windward Islands other than Barbadoes, viz. Grenada, St Lucia and St Vincent, patents for invention were granted until recently only by special ordinances. See, e.g. St Lucia, ordinance No. 41 of 1875 (Tooth's patent). A stamp duty of £10 was payable in this island on letters patent for inventions (No. 6 of 1881, schedule). But ordinances basedon the Imperial Act have now been passed, St Vincent (No. 5 of 1898). Grenada (No. 4 of 1898) and St Lucia (No. 14 of 1899).

Foreign Patent Laws. — For the text of these see Patent Laws of the World, ed. 1899 and supplemental volumes. But the following are the essential facts.

Algeria. — French law applied by decree of June 5, 1850.

Argentine Republic. — The law of October 11, 1864, is still in force. There is no provision as to importation from abroad.

Austria.— A law of January 11, 1897, came into force on January I, 1899. The principal changes introduced by this measure were these. A strict preliminary examination was made into novelty. The term of the patent was fixed at 15 years, and besides an application fee of 10 florins, annual'fees were imposed rising from 20 florins for the 1st year to 340 florins for the 15th. The period for compulsory working was raised from 1 year to 3 years from the date of the publication of the grant of the patent in the patent journal. Provision was made for the conversion of patents under the old law of August 15, 1852 (extended to Hungary by law of June 27, 1878, and to Bosnia and Herzegovina by law of December 20, 1879) into patents under the present law.

Belgium. — The law is still governed by the law of May 24, 1854. Patents are granted, as in France, without guarantee of novelty.

Bolivia.— The patent law depends on a law of May 8, 1858. The duration of the grant is in the case of a patent of invention not less than 10 nor more than 15 years; in the case of an im- ported invention, 3 years if its establishment requires an outlay of $25,000, if it reaches $50,000, 6 years, and if $100,000 or more, 10 years. The novelty neither of patents for invention nor of patents for imported inventions is guaranteed. The patent lapses unless the invention is put

into complete practice within a year and a day from the date of the privilege, unless the omission is excused by Justifiable causes according to law.

Brazil. — Patents are granted under the law of October 14, 1882. The patent lapses unless the invention is brought into effective use within 3 years from the date of the grant, or if such use is suspended for more than a year, except by reason of force majeure admitted by government to be a sufficient excuse. Besides expenses and fees, patents of invention are subject to an annual and progressive tax, commencing at $20 and increasing at the rate of $10 a year. The patents issued are without guarantee of novelty or utility.

Chile. — The law is regulatedby the law of September 9, 1840, decree of August 1, 1851, and laws of July 25, 1872, January 20, 1883, and January 20, 1888. There is a preliminary examination as to novelty and utility. Though the duration of a patent does not ordinarily exceed 10 years, the term may be extended to 20 years by the president of the republic, if the report of the experts on the nature and importance of the invention seem to justify it. There are no provisions as to importation from abroad.

Colombia. — Patents are granted under law No. 35 of 1869 and decree No. 218 of 1900. The term varies from 5 to 20 years at the option of the applicant. There is no preliminary examination as to novelty, and there is no provision as to importation from abroad. A patent for a new industry is void when such industry is idle for a whole year, unless inevitable circumstances have intervened. An applicant pays a sum of 20 pesos, which is forfeited if the patent is refused, and taken in part payment of the patent fee if it is granted. The patent tax is from 5 to 20 pesos a year for every year of the privilege.

Congo. — Patents are issued under a law of October 29, 1886, and a decree of October 30, 1886. They are of three kinds, patents of invention, of importation and of improvement. There is no preliminary examination as to novelty, and the patent ex pressly mentions that the grant is made without guarantee. The term of a patent of invention is 20 years. A patent of importation or of improvement expires in the former case with the foreign, in the latter with the principal patent. Patents of improvement are not liable to any tax; on other patents a payment of 100 francs is required. There are no provisions as to compulsory working or prohibiting the importation of patented articles.

Costa Rica. — Prior to June 26, 1896, applications for patents had to be made to the Constitutional Congress. The matter is now dealt with by a law of the above-mentioned date. The dura- tion of the term is 20 years. There is apparently no preliminary examination into novelty. The period for compulsory working is 2 years, and a patent which ceases to be worked during any 3 consecutive years becomes public property.

Denmark. — Patents are now granted under a law of March 28, 1894. The duration of the patent is 15 years, and no extension can be granted. There is a preliminary examination into novelty. The patent may, on terms, be appropriated by the state if the public interest demands it. The period for compulsory working is 3 years, and the patent will also lapse if the exercise of the in- vention is discontinued for more than a year. The patent com- mission may release the patentee from the obligation of manu- facturing the patented article in Denmark, if satisfied that the cost of such manufacture would be unreasonable, on condition that the patented article is always kept on sale in Denmark. The tax is an annual fee of 25 kroner for the first 3 years, 50 kroner for the next 3, 100 for the following 3; then for 3 years 200 kroner yearly, and for the last 3, 300 kroner yearly.

Ecuador. — Patents are granted under a law of October 18, 1880. The provisions are identical with those given for Bolivia.

Finland. — The law is regulated by ordinances of January 21, 1898. The term of the patent is 15 years. There is a preliminary examination into novelty. The period for compulsory working is 3 years, the penalty for non-compliance being an obligation on the part of the patentee to grant compulsory licences. The tax consists of annual fees, commencing with the second year of the patent, and of the following amounts : 20 marks yearly for the 2nd and 3rd years; 40 marks from the 4th to and including the 6th year ; 50 marks from the 7th to and including the 9th ; 60 marks from the 10th to and including the 12th year; and 70 marks from the 13th to and including the 15th.

France. — The law is still regulated by the law of July 5, 1844. The following additional points should be noted: The term of a patent of invention is 5, or 10, or 15 years, at the option of the patentee. Every such patent is subject to the following taxes, payable by annual instalments of 100 francs: 500 francs for a patent of 5 years, 1000 francs for a patent of 10 years, and 1500 francs for a patent of 15 years. A tax of 20 francs is payable on application for a patent of addition. Patents of addition are not subject to annual taxes. There is no preliminary examination as to novelty. A patentee is not obliged to

mark patented articles as such, but, if he does, the words Sans Garantie duGouvernement, or the initial letters of these words — S. G. D. G. — must be added, under liability to a penalty for omission of from 50 francs to 1000 francs. The provisions as to compulsory working {exploitation) are in the main so interpreted as to strike only at voluntary and calculated inactivity. The law of July 5, 1844 is applied to the French colonies by a decree of October 21, 1848, to Madagascar by decree of 1902, and as to French Indo-China, see decree of June 24, 1893.

Germany. — Patents (the law as to" which is not affected by the civil code of 1900) are granted under a law of April 7, 1891. The duration of the patent is 15 years. There is a strict preliminary examination into novelty. The period for compulsory working is 3 years, but it is sufficient if the patentee has done everything that is necessary to ensure the carrying out of the invention. A tax of 30 marks has to be paid before the grant. In addition to this there has to be paid at the commencement of the second and every following year of the term a tax amounting to 50 marks for the first year and increasing by 50 marks every subsequent year. An act of 1900 regulates the profession of patent agents.

Greece. — No special patent law apparently exists. A private act is required, which can be introduced by a deputy and is treated like any other bill.

Guatemala. — Patents are granted under the law of May 21, 1886 and a decree of December 17, 1897. The term of the patent ranges from 5 to 15 years. An annual tax of 30 pesos is payable. The period of compulsory working is I year, and abandonment of working for a year forfeits the patent. There is apparently a preliminary examination as to novelty (see Art. 16 of the decree of Dec. 17, 1897), but there is no prohibition of the importation of patented articles.

Hawaiian Islands. — Patents were issued till 1900 under the civil code (§§ 255, 256) and a law of August 29, 1884, which were not at first affected by the annexation of the islands by the United States. There was a preliminary examination as to novelty.

The maximum duration of the patent was 10 years. On application a fee of $5 was payable, the commissioner of patents received $20 for

his examination, and a fee of $5 was payable when the patent was issued. No further payments. Now the United States law applies. Honduras. — No. 177 of March 10, 1898. Term not to exceed 20 years. Annual tax 5 to 10 silver pesos; in the case of foreigners 10 to 50 gold pesos.

Hungary.— The law in force is that of July 7, 1895. The duration of the patent is 15 years. The period for compulsory working is ordinarily 3 years. The annual taxes range from 40 kroner for the 1st year to 500 for the 15th.

Italy. — The law is still governed by that of lanuary 31, 1864, extending the Sardinian law of October 30, 1859 to the whole kingdom. There is no preliminary examination into novelty, and there is no provision prohibiting the importation of patented articles. Patents are subject (i.) to a proportional tax of as many times 10 lire as the years for which the patent is applied for, and (ii.) to an annual tax of 4o4ire for the first 3 years; 65 lire for the following 3; 90 lire for the 7th, 8th and 9th; 115 lire for the 10th and nth; and 140 lire for the remaining 3 years.

Japan. — Patents are issued under an act which came into opera- tion on July 16, 1899. The law as to subject matter resembles that of England and the United States. The term of a patent is 15 years from the date of registration. The patent may be annulled if the patentee has not worked his invention within 3 years from the date of the certificate of grant, or if, having discontinued such use for 3 years, he has refused" a reasonable request by a third party for an assignment or a licence. An applicant not domiciled in the empire must appoint within 6 months a duly qualified agent by power of attorney. There is apparently a preliminary examination into novelty. The patent owner must affix his mark to the patent. The fees are calculated on a gradually ascending scale.

Liberia. — Patents are issued under a law of December 23, 1864. The maximum term is 20 years. There is a preliminary examina- tion as to novelty. A sum of $25 or $50 is payable on appli- cation, according as the applicant is a citizen or an alien. An invention patented by an alien must be put in practical operation within 3 years. There is no prohibition of the importation of patented articles.

Luxemburg (law of June 30, 1880). — The term of the patent is 15 years. There is no preliminary examination as to novelty, and the importation of patented articles is not prohibited. An annual and progressive tax, commencing at 10 francs and increasing by 10 francs

annually, is payable in advance. The period for compulsory working is 3 years, and after the expiration of that period compulsory licences may be ordered.

Mexico (law of Oct. 1, 1903). — The duration of a patent is 20 years, with possible extension for another 5 years. The act defines what is patentable and what is not patentable. There is on request of the interested party, an examination without guarantee as to novelty. There are no provisions as to compulsory working (but compulsory licences may be ordered) or prohibiting the im- portation of patented articles. The tax ranges from $50 to $150. The patentee must also at the end of each 5 years of the grant, in order to keep the patent in force for another 5 years, pay 50 pesos at the end of the first 5 years, 75 pesos at the end of 10 years, and at the end of 15 years, 100 pesos. The Patent Office publishes a special gazette — La Gaceta Oficial de Patentes y Marcas. Nicaragua.— Patents were, as a general rule, until 1899, granted only by special Act of Congress. But see now supplement 720, No. 15, Patent Laws of the World.

Norway (law of June 10, 1885).— The term of the patent is 15 years. There is a preliminary examination into novelty. The invention must be worked within 3 years, and the working must not be discontinued for a year on pain of forfeiture. For each patent an annual tax is payable amounting to 10 crowns for the 2nd year and increasing by 5 crowns each year.

Panama. — Law 88 of 1904 adopts the rules prescribed by the laws of Colombia. The fee is an annual one of $20.

Peru (law of Jan. 28, 1869 and law of Jan. 3, 1896).— The maximum term of the patent is 10 years, and the tax is an annual sum of 100 dollars. There is no preliminary examination into novelty. The period for compulsory working is 2 years, and the importation of patented articles from abroad (except models of machinery whose introduction is authorized by the government) is prohibited.

Portugal (law of Dec. 15, 1894).— The maximum term is 15 years. The patent tax is 3000 reis, payable in advance, for each year of the term for which the privilege is granted or renewed. There is no preliminary examination into novelty. The period for compulsory working is 2 years, and discontinuance of working for any 2 years at a stretch forfeits the patent unless the inaction can be justified. The importation of patented articles from abroad is not prohibited.

Russia (law of May 20, 1896).— The maximum term is 15 years; the

tax ranges from 15 roubles for the first year to 400 roubles for the fifteenth. There is apparently (see Arts. 3 and 13) a preliminary examination into novelty, but none into utility. The period for compulsory working is 5 years. There is no prohibition of importation of patented articles.

Spain. — Patents are issued under the law of June 7, 1902. There is no preliminary examination as to novelty, and the importa- tion of patented articles is not prohibited. The duration of a patent is 20 years, and it is subject to an annual and progressive tax, as follows: 10 pesetas for the 1st year, 20 for the 2nd, 30 for the 3rd, and so on successively to the 5th or 20th year, for which the tax is respectively 50 and 200 pesetas.

Sweden (law of May 16, 1884).— The term is 15 years. The annual tax is 25 crowns for the 2nd, 3rd, 4th and 5th years; 50 crowns for each of the following 5 years; and 75 crowns for each of the remaining 5 years. There is a preliminary examination as to novelty, the period for compulsory working is 3 years, and dis- continuance during any entire year entails forfeiture. There is no prohibition of the importation of patented articles.

Switzerland. — Federal law of June 21, 1907. The term of the patent is 15 years. There is an annual and progressive tax, rising from 20 francs for the 1st year by an annual increase of 10 francs up to 160 francs for the 15th. There is no preliminary examination as to novelty. The patent is forfeited if the invention has not been carried into practice by the end of the 3rd year, or if patented articles are imported from abroad, while at the same time the proprietor has refused applications on equitable terms for Swiss licences.

Tunis (law of 22nd Rabia-et-Tani, 1306; Dec. 26, 1888).— The term is either 5 years (fee 500 piastres) or 10 years (fee 1000 piastres) or 15 years (fee 1500 piastres). There is no preliminary examination as to novelty. The period for compulsory working is 2 years, and two consecutive years' discontinuance of such working, unless justified, forfeits the patent. So also does the importation of patented articles, but the introduction may be authorized (i.) of models of machines, and (ii.) of articles, made abroad, intended for public exhibitions or for trials.

Turkey. — Patents are still granted under the law of the 2nd of March 1880. There is no preliminary examination as to novelty, and a patentee who mentions his title as such without adding the words " without guarantee of government," is liable to a maximum penalty of

45 Turkish pounds.

United States. — The American law may be considered at greater length. The Federal Constitution empowered Congress ” to pro- mote the progress of science and useful arts by securing for limited times to . . . inventors the exclusive right to their … dis- coveries.” The existing American patent law is based on a series of Acts of Congress passed in virtue of this provision in the con- stitution, and on the judicial interpretation of these statutes. Between American and English patent law there is, as will appear j? the course of this sketch, a considerable degree of similarity. The fact is not surprising when it is remembered that the Statute of Monopolies (21 Jac. I. c. 3) was, except in limiting the maximum duration of letters patent for inventions at fourteen years, only declaratory of the common law; and therefore formed part of the original common law of America. The English and American patent systems further agree in this, that they contain no provision as to compulsory working, and no prohibition of the importation of patented articles. But there are important differences between the two systems, not merely in points of detail, but in matters affecting the theory and practical working of the law. In England the consideration for the grant of a patent has all along been mainly the benefit which the public derives from the introduction of a new manufacture. In America greater emphasis is placed on the right of an inventor to have his merits rewarded. Again, under the Statute of Monopolies an inventor’s exclusive privilege arises only in regard to inventions not known or used at the date of the grant, although it should be observed that under the modern Patents Acts the date of a patent, once granted, relates back to the date of the application. In the United States, on the other hand, the right is conferred on inventors to an exclusive privilege in such inventions as were not known or used before their dis- covery by the patentees. The oractical bearing of this difference is explained in an admirable note on ” The Statute of Monopolies ” in Ruling Cases, sub tit.” Patent ” (xx. 5) : ” It shifts the point of view in the important question of novelty. Many good American inventions have been given away in England by the premature publication in America of the inventor’s proceedings. He is interviewed, and an article in the New York Sun, or some other paper, in due time finds its way to England. This does no harm in America ; on the contrary, it is good evidence of the date of the actual invention. But it is fatal to a subsequent application in England.”

The definition of patentability in American law is contained in sect. 4886 of the Revised Statutes of the United States as amended by an act of the 3rd of March 1897. In the following passage the amendments are indicated by italics: —

” Any person who has invented or discovered any new and useful art, machine, manufacture or composition of matter, or any new and useful improvement thereof, not known or used by others in this country before his invention or discovery thereof, and not patented or described in any printed publication in this or any foreign country before his invention or discovery thereof or more than two years prior to his application, and not in public use or on

sale for more than two years prior to his application, unless the same is proved to have been abandoned, may, upon payment of the fees required by law and other due proceedings had, obtain a patent therefor.”

The effect of the two amendments made by the act of 1897 should first be noted: (i.) The old law failed to state at what time the invention should be known or used by others in America so as to bar a patent; whether before the application or before the invention. This ambiguity is removed by the use of the words ” before his invention or discovery thereof.” (ii.) Under the old law a foreign patentee could take out a patent in America for the same invention at any time during the life of the foreign patent, provided it had not been in use in America more than two years prior to his application, unless anticipated by a prior invention or publication. The words ” or more than two years prior to his application,” merely give the same force to a foreign patent or publication that had previously been given to prior use. An invention to be patentable roust, according to American law, be both novel and useful. Utility may be evidence of novelty and vice versa, and commercial success is relevant evidence of utility. As in England, a bare principle is not patentable. A “process” is included under the words ” useful art ” in the above definition of patentability, and is good subject matter for a patent when the term is used to represent a practical method of producing a beneficial result or effect. The word ” machine ” in the definition includes every mechanical device or combination of devices for producing certain results. Such a device or combination is patentable when it possesses utility and novelty, and produces either a new result or an old result in a better form.

Under the law of 1790, which was exclusively American in spirit, the duty of granting letters patent for inventions was discharged by the secretary of state, the secretary of war and the attorney- general, or

any two of them. The law from 1793 to 1836 was exclusively English in spirit, and during that period the duty fell to the secretary of state, subject to the attorney-general's approval. It was in 1837 that the marked divergence between the English and American patent system began. In that year the patent business of the United States had attained to such dimensions that the powers and duties of the secretary of state in regard to patents were transferred to a sub-department of the state department known as the Patent Office. The American Patent Office consists of a commissioner of patents, one assistant commissioner, and three examiners-in-chief, who are appointed by the President of the United States with the advice and consent of the Senate; and also of other examiners, and a staff of officers, clerks and employes, appointed by the secretary of the interior on the nomination of the commissioner of patents. The commissioner of patents, under the direction of the secretary of the interior, is charged with the superintendence or performance of all duties respecting the grant and issue of patents, and has the control and custody of all books, records, papers, &c, belonging to the Patent Office. He is author- ized to make, from time to time, regulations not inconsistent with law, for the conduct of proceedings in the Patent Office, and pre- pares an annual report which is laid before Congress, and which is framed on the same lines as that of the comptroller-general in England. " He is the final judge, so far as the Patent Office is concerned, of all controverted questions arising in the office, and in granting or withholding patents he is not bound by the decisions of his inferiors " (Robinson on Patents, i. 84). The examiners- in-chief are required to be persons of competent legal knowledge and ability. Their duties are : On the written petition of inventors to revise and determine upon the validity of the adverse decisions of subordinate examiners, upon applications for patents, and for reissues of patents, and in interference cases, and when required by the commissioner of patents to hear and report upon claims for extension, and to do such other similar work as he may assign to them. The Patent Office publishes an Official Gazette corre- sponding to the English Patent Office Illustrated Journal, and discharges similar functions to those of the English Patent Office in regard to the public dissemination of information as to patented inventions. The number of original applications for patents in the period covered by the report of the commissioner of patents for 1906-1907 was 58,762; the number of patents granted was 36,620; the receipts amounted to $1,910,618, the expenditure to$i,63i,458, leaving a surplus of $279,160.

The first step in the procedure to obtain a patent is the lodging by the inventor at the Patent Office of a written application, to- gether with a

specification of particular written description of his invention, and a claim distinctly pointing out and claiming what he alleges to be his invention or discovery. The specification and claim are signed by the inventor and attested by two witnesses. Drawings, specimens of ingredients, and models may be required to be furnished. On the filing of each original application for a patent, a fee of $15 is payable. The applicant is required to verify his claim to the invention on oath, taken, if he resides within the United States, before any person authorized by American law to administer oaths; if he resides in a foreign country, before any diplomatic or commercial agent of the United States, or any notary public of the foreign country in which the applicant may

be. The commissioner of patents then causes an examination to be made into the novelty of the invention, and if the result is satisfactory the patent issues. On the issuing of each original patent, a fee of $20 is payable. A patent is issued in the name of the United States of America and under the seal of the Patent Office. It consists of a short title or description of the in- vention or discovery, correctly indicating its nature and design, and a grant to the patentee, his heirs and assigns. Patents, it may be observed in passing, may be granted and issued or re- issued to the assignee of the inventor or discoverer, and every patent or any interest in it is assignable, the assignment being recorded in the Patent Office, for the term of seventeen years, of the exclusive right to make use of and vend the invention or discovery throughout the United States and the territories thereof. The rights of property in patents granted in Cuba, Porto Rico, the Philippines and other ceded territory under Spanish law are to be respected in those territories as if that law were still in force there. A patent is dated as of a day not later than three months from the time at which it was passed, and if the fee is not paid within six months the patent is withheld. In case, however, the issue of a patent has been prevented by a failure to pay the fee within the prescribed period, the application may be renewed within 2 years after the allowance of the original application. But the applicant has no right to damages for any use of the invention in the interval, and on the hearing of the renewed application abandonment may be considered as a question of fact. So far we have followed the procedure to obtain a patent where its course is uninterrupted. A double form of interruption is, however, possible. A claim for a patent may be rejected on the ground of want of novelty in the alleged invention. In this case, the fact of the rejection, together with the reasons for it, is com- municated to the applicant by the commissioner; and if he persists in his claim a re-examination is ordered. Or, again, an application may appear to the

commissioner to interfere with a pending ap- plication, 1 or with any expired patent. In these circumstances, he gives notice to the applicant, and directs the primary examiner to proceed to determine the question of priority of invention. This interruption of the course of the proceedings to obtain a patent is called an ” interference.” In either of the cases above mentioned an appeal lies, on payment of a fee of $10, from the primary examiner to the board of examiners-in-chief, and, on payment of a fee of $20, from the examiners-in-chief to the commissioner in person. An applicant for a patent, but not a party to an inter- ference, may appeal from the decision of the commissioner to the supreme court of the District of Columbia sitting in banc. In interference cases the appeal lies to the District of Columbia court of appeals. There is an ultimate right of appeal, in cases involving the validity of a patent, to the Supreme Court of the United States. Patents are obtainable by bill in equity, although the commissioner of patents (or, on appeal, the supreme court of the District of Columbia) may have refused them. The circuit courts of the United States have original jurisdiction in all patent suits. Appellate jurisdiction is vested in the circuit court of appeals; and on the certificate of that court, or by certiorari, an appeal may be brought to the Supreme Court of the United States.

Section 4887 of the revised statutes provides that: —

” No person otherwise entitled thereto shall be debarred from receiving a patent for his invention or discovery, nor shall any patent be declared invalid by reason of its having been first patented or caused to be patented by the inventor or his legal representatives or assigns in a foreign country, unless the application for the said foreign patent was filed more than seven months prior to the filing of the applica- tion in this country, in which case no patent shall be granted tn this country.”

The words italicized in the above section were added by an Amend- ing Act of the 3rd of March 1897. In its original form the section provided that no person should be debarred from receiving a patent because the invention was first patented in a foreign country, whether he was otherwise entitled to the patent or not. The words ” other-, wise entitled to ” merely postulate that no other bar to the issue of the patent shall exist. The words ” by the inventor or his legal representatives or assigns ” safeguard the inventor to some extent against fraud by third parties; while the provision requiring the application in the United States to be filed within seven months of the filing of the foreign patent is intended to carry out the pro- visions of the International Convention. It should be noted that the duration of

an American patent for an invention already patented abroad is no longer limited by that of the prior foreign patent, but is granted for 17 years from the date of issue.

Patented articles are required to be marked as such, either by the word ” patented,” together with the day and the year the patent was granted, being affixed to them, or, when from the charac- ter of the article this cannot be done, by fixing to it, on the package containing one or more of such articles, a label containing the like

1 A citizen of the United States, or an alien who has within the preceding twelve months given notice of his intention to become one, may, by filing in the Patent Office a ” caveat,” the fee for which is $10, secure for himself notice of possibly conflicting applications.

notice; and in any suit for infringement by a party failing so to mark, no damages shall be recovered by the plaintiff, except on proof that the defendant was duly notified of the infringement, and continued after such notice to make, use or vend the article so patented. A penalty of not less than ioo dollars is attached to falsely marking or labelling articles as patented.

When through inadvertence, accident or mistake, and without fraudulent or deceptive intention, a patentee has claimed more than he is entitled to, his patent is valid for all that part which is truly and justly his own; provided this is a material or substantial part of the thing patented and the patentee, or his heirs or assigns, on payment of the prescribed fee ($10) disclaim the surplusage. The disclaimer must be in writing, and attested by one or more witnesses; it is recorded in the Patent Office, and is thereafter con- sidered a part of the original specification. But no disclaimer affects any action pending at the time of its being filed, except so far as may relate td the question of unreasonable neglect or delay in filing it.

In the same circumstance, or where a patent is inoperative or invalid by reason of a defective or insufficient specification, the patentee may surrender his patent, and the commissioner of’ patents may, on the application of the patentee and on payment of a fee of $30, issue a new patent in accordance with the amended specification.

Uruguay (law of 12th November 1885). — The term is 3, 6 or 9 years, at the option of the applicant. There is an annual tax of $25 for every

year of the privilege. The invention must be worked within a time fixed by the executive, and the working must not be discontinued for a year, on pain of forfeiture. There is no preliminary examination as to novelty.

Venezuela. — A new law was promulgated by a decree of the 19th of March 1900, but revoked in January 1901 and the old law of 1882 substituted. The term is 5, 10 or 15 years. The tax is 80 francs (bolivars) a year if the patent is for an invention or discovery, and 60 francs (bolivars) a year if it relates to an improved process. There is no preliminary examination as to novelty, nor is there any compulsory working.

International Patents. — The International Convention for the protection of industrial property was signed at Paris on the 20th of March 1883; the necessary ratifications were exchanged on the 6th of June 1884, and the Convention came into force a month later. Provision was made by sections 103 and 104 of the Patents Act 1883 for carrying out the Convention in Great Britain by orders in council, applying it from time to time to (a) British possessions whose legislatures had made satisfactory arrangements for the protection of inventions patented in Great Britain; (b) foreign states with which the sovereign had made arrangements for the mutual protection of inventions. The following governments have signed the international convention: Australia, Austria-Hungary, Belgium, Brazil, Ceylon, Cuba, Denmark. France, Germany, Italy, Japan, Mexico, Netherlands, New Zealand, Norway, Portugal, San Domingo, Servia, Spain, Sweden, Switzerland, Trinidad and Tobago, Tunis and the United States. Under the powers of the Foreign Jurisdiction Act 1890 penalties have been imposed on British subjects committing offences against the Patents, &c, Acts 1883-1888, and the orders in council issued thereunder, in Africa, East Africa, Morocco, Persia, Persian coast and Zanzibar.

An international bureau in connexion with the Convention has been established at Bern, where an official monthly periodical, La Propri4t6 industrielle, is published. Conferences were held under the Convention at Rome in April and May 1886, and at Madrid in April 1890. At the latter conference an important article was adopted, under which it is left to each country to define and apply ” compulsory working ” (exploitation) for the purposes of the convention in the sense that it chooses.

Authorities. — In addition to the works noted incidentally above, see Edmunds, Patents (London) ; Wallace and Williamson, Patents (London) ; Frost, Patent Law and Practice (London, 1898) ; Terrell,

Letters Patent (London) ; Cunynghame, Patents (London) ; Lawson, The Patents, &c, Acts (London). For the old law, Webster, Patent Cases (London, 1844); Hindmarsh, Patents (London, 1846); and the very valuable Parliamentary Reports of 1829, 1 85 1, 1865, 1872. Gordon, Monopolies by Patents (London, 1897) ; Gould and Tucker, Notes on Rev Stat, of the U.S., vol. ii. (1887-1897) ; Robinson, Patents (3 vols., Boston, 1890); Whitman, Patent Laws (Washing- ton, 1871); Law, Copyright and Patent Laws of the United Slates, 17QO-1866 (New York, 1866); Curtis, Law of Patents (4th ed., Boston and London, 1873); Campbell, U. S. Patent System: a History (Washington, 1891). (A. W. R.; T. A. I.)

PATENTS OF PRECEDENCE. A patent of precedence is a grant to an individual by letters patent (q v.) of a higher social

or professional position than the precedence to which his ordinary rank entitles him. The principal instance in modern times of patents of grants of this description has been the grant of pre- cedence to members of the English bar. In the days when acceptance of the rank of king's counsel not only precluded a barrister from appearing against the Crown, but, if he was a member of parliament, vacated his seat, a patent of precedence was resorted to as a means of conferring similar marks of honour on distinguished counsel without any such disability attached to it. The patents obtained by Mansfield, Erskine, Scott and Brougham were granted on this ground. After the order of the coif lost its exclusive right of audience in the court of common pleas, it became customary to grant patents of precedence to a number of the serjeants-at-law, giving them rank immediately after counsel of the Crown already created and before those of subsequent creation. Mr Justice Phillimore was, on his appoint- ment as a judge of the queen's bench division (in 1897) the only holder of a patent of precedence at the bar, except Serjeant Simon, who died in that year, and who was the last of the Serjeants who held such a patent. See also Precedence.

In Canada patents of precedence are granted both by the governor-general and by the lieutenant-governor of the provinces under provincial legislation which has been declared intra vires. (Alt. Gen. for Canada v. Alt. Gen. for Ontario, 1898, A.C. p. 247; Todd, Parliamentary Govt, in Canada, 2nd ed. p. 333).

See Pulling's Order of the Coif.

PATER, WALTER HORATIO (1830-1894), English man of letters, was born at Shadwell on the 4th of August 1839. He was the second son of Richard Glode Pater, a medical man, of Dutch extraction, born in New

York. Jean-Baptiste Pater, the painter, was probably of the same family. Richard Pater moved from Olney to Shadwell early in the century, and continued to practise there among the poorer classes. He died while his son Walter was yet an infant, and the family then moved to Enfield, where the children were brought up. In 1853 Walter Pater was sent to King's School, Canterbury, where he was early impressed by the aesthetic beauties of the cathedral. These associations remained with him through life. As a schoolboy he read Modern Painters, and was attracted to the study of art, but he did not make any conspicuous mark in school studies, and showed no signs of the literary taste which he was afterwards to develop. His progress was always gradual. He gained a school exhibition, however, with which he proceeded in 1858 to Queen's College, Oxford. His undergraduate life was unusually uneventful; he was a shy, " reading man," making few friends. Jowett, however, was struck by his promise, and volunteered to give him private tuition. But Pater's class was a disappointment, and he only took a second in literae humaniores in 1862. After taking his degree he settled in Oxford and read with private pupils. As a boy he had cherished the idea of entering the Anglican Church, but, under the influence of his Oxford reading, his faith in Christi- anity became shaken, and by the time he took his degree he had thoughts of graduating as a Unitarian minister. This project, too, he resigned; and when, in 1864, he was elected to a fellowship at Brasenose, he had settled down easily into a university career. But it was no part of his ambition to sink into academic torpor. With the assumption of his duties as fellow the sphere of his interests widened rapidly; he became acutely interested in litera- ture, and even began to write articles and criticisms himself. The first of these to be printed was a brief essay upon Coleridge, which he contributed in 1866 to the Westminster Review. A few months later (January, 1867) appeared in the same review his now well-known essay on Winckelrnann, the first expression of his idealism. In the following year his study of " Aesthetic Poetry " appeared in the Fortnightly Review, to be succeeded by essays on Leonardo da Vinci, Sandro Botticelli, Pico della Mirandola and Michelangelo. These, with ether studies of the same kind, were in 1878 collected in his Studies in the History of the Renaissance. Pater was now the centre of a small but very interesting circle in Oxford. Such men as cherished aesthetic tastes were naturally drawn to him; and, though always retiring and, in a sense, remote in manner, he was continually spreading his influence, not only

in the university, but among men of letters in London and elsewhere. The little body of Pre-Raphaelites were among his friends, and by the time that Marius the Epicurean appeared he had quite a following of disciples to hail it as a gospel. This fine and polished work, the chief of all his contributions to litera- ture, was published early in 1885. In it Pater displays, with perfected fullness and loving elaboration, his ideal of the aesthetic life, his cult of beauty as opposed to bare asceticism, and his theory of the stimulating effect of the pursuit of beauty as an ideal of its own. In 1887 he published Imaginary Portraits, a series of essays in philosophic fiction; in 1889, Appreciations, with an Essay on Style; in 1803, Plato and Platonism; and in 1894, The Child in the House. His Greek Studies and his Miscellaneous Studies were collected posthumously in 1895; his posthumous romance of Gaston de Latour in 1896; and his Essays from the ” Guardian ” were privately printed in 1897. A collected edition of Pater’s works was issued in 1901. Pater changed his residence from time to time, living sometimes at Kensington and in different parts of Oxford; but the centre of his work and influence was always his rooms at Brasenose. Here he laboured, with a wonderful particularity of care and choice, upon perfecting the expression of his theory of life and art. He wrote with difficulty, correcting and recorrecting with imperturbable assiduity. His mind, moreover, returned to the religious fervour of his youth, and those who knew him best believed that had he lived longer he would have resumed his boyish intention of taking holy orders. He was cut off, however, in the prime of his powers. Seized with rheumatic fever, he rallied, and sank again, dying on the staircase of his house, in his sister’s arms, on the morning of Monday the 30th of July 1894. Pater’s nature was so contemplative, and in a way so centred upon reflection, that he never perhaps gave full utterance to his individuality. His peculiar literary style, too, burnished like the surface of hard metal, was too austerely magnificent to be always persuasive. At the time of his death Pater exercised a remarkable and a growing influence among that necessarily restricted class of persons who have themselves something of his own love for beauty and the beautiful phrase. But the cumulative rich- ness and sonorous depth of his language harmonized intimately with his deep and earnest philosophy of life; and those who can sympathize with a nervous idealism will always find inspiration in his sincere and sustained desire to ” burn with a hard, gem-like flame,” and to live in harmony with the highest. (A. Wa).

Mr Ferris Greenslet’s Walter Pater (in the ” Contemporary Men of Letters ” series, 1904) is an interesting piece of criticism. Mr Arthur Benson’s study in the ” English Men of Letters ” series is admir- able.

See too a sketch in Edmund Gosse's Critical Kit-Kats; and an estimate from a Roman Catholic standpoint in Dr William Barry's Heralds of Revolt, where Pater is compared with J. Addington Symonds. T. Wright's Life of Walter Pater (1907) is an elaborate but unsatisfactory piece of work.

PATERA, the Latin name for a shallow circular vessel used for drinking or for pouring libations. The Greek name for such a vessel was ia\i]. It has no foot or stem underneath, but occasionally a boss rising in the centre inside. The term is sometimes given incorrectly in architecture to a circular disk carved with a conventional rose, which is found in many early styles, the proper term being rosette.

PATERNd, a town of Sicily, in the province of Catania, n m. W.N.W. of Catania by rail, at the southern foot of Mt Etna. Pop. (1881), 15,230; (1901), 20,098 (town), 22,857 (commune). The castle, originally erected in 1073, u P on tne acropolis of the ancien f Hybla Minor or Galeatis, has a square tower and a chapel with frescoes belonging to the 14th century. Some mosaic pavements still exist under the houses in the Strada dell' Ospedale, and remains of baths and of an ancient bridge over the Simeto on the road to Centuripa are to be seen in the neighbourhood. The place was unsuccessfully besieged by the Athenian forces in the summer of 415 B.C.

PATERSON, ROBERT (1715-1801), Scottish stone-mason, who suggested to Sir Walter Scott the character of " Old Mortality," was born near Hawick in 1715. Through the patronage of Sir Thomas Kirkpatrick, whose cook he had married, he

obtained the lease of a quarry at Gatelawbrig, but in 1745 his house was plundered by the retreating Jacobites, and Paterson himself, a pronounced Cameronian, was carried off a prisoner. He subsequently devoted his life to cutting and erecting stones for the graves of the Covenanters, for 40 years wandering from place to place in the lowlands. He died in poverty in 1801, and a stone to his memory was erected by Scott's publishers in 1869 in Caerlaverock churchyard.

PATERSON, WILLIAM (1658-1719), British writer on finance, founder of the Bank of England and projector of the Darien scheme, was born in April 1658 at the farmhouse of Skipmyre, parish of Tinwald, Dumfriesshire. His parents occupied the farm there, and with them he resided till he was about seventeen. A desire to escape the religious persecution then raging in Scot- land, and the immemorial ambition of his race, led him south- ward. He went through England with a pedlar's pack (" whereof the print may be seen, if he be alive," says a

pamphleteer in 1700), settled for some time in Bristol, and then proceeded to America. There he lived chiefly in the Bahamas, and is said by some to have been a predicant or preacher, and by others a buccaneer. In truth his intellectual and moral superiority to his fellow-settlers caused his selection as their spiritual guide, whilst his thirst for knowledge led to intercourse with the buccaneers. It was here he formed that vast design which is known in history as the Darien scheme. On his return to England he was unable to induce the government of James II. to engage in his plan. He went to the continent and pressed it to no purpose in Hamburg, Amsterdam and Berlin, and on his return to London he engaged in trade and rapidly amassed a considerable fortune. About 1690 he was occupied in the formation in the Hampstead Water Company, and in 1694 he founded the Bank of England. The government required money, and the country, rapidly increasing in wealth, required a bank. The subscribers lent their money to the nation, and this debt became the bank stock. The credit of having formulated the scheme and persuaded its adoption is due to Paterson. He was one of the original directors, but in less than a year he fell out with his colleagues, and withdrew from the management. He had already propounded a new plan for an orphan bank (so called because the debt due to the city orphans by the corporation of London was to form the stock). They feared a dangerous rival to their own undertaking, and they felt some distrust for this eager Scotsman whose brain teemed with new plans in endless succession.

At that time the people of the northern kingdom were con- sidering how best to share in that trade which was so rapidly enriching their southern neighbours. Paterson saw his oppor- tunity. He removed to Edinburgh, unfolded his Darien (q.v.) scheme, and soon had the whole nation with him. He is the supposed author of the act of 1695 which formed the ” Company of Scotland trading to Africa and the Indies.” This company, he arranged, should establish a settlement on the Isthmus of Darien, and ” thus hold the key of the commerce of the world.” There was to be free trade, the ships of all nations were to find shelter in this harbour not yet erected, differences of race or religion were neglected; but a small tribute was to be paid to the company, and this and other advantages would so act that, at one supreme stroke, Scotland was to be changed from the poorest to the richest of nations.

On the 26th of July 1698 the first ships of the expedition set sail ” amidst the tears and prayers and praises of relatives and friends and countrymen.” Some financial transactions in which Paterson was concerned, and in which, though he had acted with perfect honesty,

the company had lost, prevented his nomina- tion to a post of importance. He accompanied the expedition as a private individual, and was obliged to look idly on whilst what his enemies called his ” golden dream ” faded away indeed like the ” baseless fabric of a vision ” before his eyes. His wife and child died, and he was seized with a dangerous illness, ” of which, as I afterwards found,” he says, ” trouble of mind was not the least cause.” It was noted that ” he hath been so mightily concerned in this sad disaster, so that he looks how more

like a skeleton than a man.” Still weak and helpless, and yet protesting to the last against the abandonment of Darien, he was carried on board ship, and, after a stormy and terrible voyage, he and the remnant of the ill-fated band reached home in December 1699.

In his native air Paterson soon recovered his strength, and immediately his fertile and eager mind was at work on new schemes. He prepared an elaborate plan for developing Scottish resources by means of a council of trade, and then tried to induce King William, with whom he had frequent interviews, to enter on a new Darien expedition. In 1701 he removed to London, and here by conferences with statesmen, by writing, and by personal persuasion helped on the union. He was much employed in settling the financial relations of the two countries. One of the last acts of the Scots parliament was to recommend him to the consideration of Queen Anne for all he had done and suffered. The United Parliament, to which he was returned as a member for the Dumfries burghs, though he never took his seat, decided that his claim should be settled, but it was not till 1715 that an indemnity of £18,241 wasordered to be paid him. Even then he found considerable difficulty in obtaining his due. His last years were spent in Queen Square, Westminster, but he removed from there shortly before his death on the 22nd of January

1719.

As many as twenty-two works, all of them anonymous, are attributed to Paterson. These are classified by Bannister under six heads, as dealing with (1) finance, (2) legislative union, (3) colonial enterprise, (4) trade, (5) administration, (6) various social and political questions. Of these the following deserve special notice: (1) Proposals and Reasons for constituting a Council of Trade (Edinburgh, 1701). 1 This

was a plan to develop the resources of his country. A council, consisting of a president and twelve members, was to be appointed. It was to have a revenue collected from a duty on sales, lawsuits, successions, &c. With these funds the council was to revive the Darien scheme, to build workhouses, to employ, relieve and maintain the poor, and to encourage manufactures and fisheries. It was to give loans without interest to companies and shippers, to remove monopolies, to construct all sorts of vast public works. Encouragement was to be given to foreign Protestants and Jews to settle in the kingdom, gold and silver were to be coined free of charge, and money kept up to its nominal standard. All export duties were to be abolished and import regulated on a new plan. Paterson believed that thus the late disasters would be more than retrieved. (2) A Proposal to plant a Colony in Darien to protect the Indians against Spain, and to open the Trade of South A merica to all Nations (1701). This was the Darien scheme on a new and broader basis. It points out in detail the advantages to be gained: free trade would be advanced over all the world, and Great Britain would largely profit. (3) Wednesday Club Dialogues upon the Union (London, 1706). These were imaginary conversations in a club in the city of London about the union with Scotland. Paterson's real opinions were put into the mouth of a speaker called May. Till the Darien business all Scots were for the union, and they were so still if reasonable terms were offered. Such terms ought to include an incorporating union with equal taxes, freedom of trade, and a proportionate representation in parliament. A union with Ireland, " as likewise with other dominions the queen either hath or shall have," is proposed. (4) Along with this another discussion of the same imaginary body, An Inquiry into the State of the Union of Great Britain and the Trade thereof (17 17), may be taken. This was a consideration of the union, which, now " that its honeymoon was past," was not giving satisfaction in some quaiters, and also a discussion as to the best means of paying off the national debt — a subject which occupied a great deal of Paterson's attention during the later years of his life.

Paterson's plans were vast and magnificent, but he was no

1 This work was attributed to John Law, who borrowed some of his ideas from it. To Law's, " system " Paterson was strongly opposed, and it was chiefly due to his influence that it made no way in Scotland.

mere dreamer. Each design was worked out in minute detail, 2 each was possible and practical. The Bank of England was a stupendous success. The Darien expedition failed from hostile attacks and bad arrangements. But the original design was that the English and Dutch

should be partakers in it, and, if this had occurred, and the arrangements, against many of which Paterson in letter after letter in vain protested, had been different, Darien might have been to Britain another India. Paterson was a zealous almost a fanatic free-trader long before Adam Smith, and his remarks on finance and his argument against an inconvertible paper-currency, though then novel, now hold a place of economic orthodoxy. Paterson's works are excellent in form and matter; they are quite impersonal, for few men who have written so much have said so little about them- selves. There is no reference to the scurrilous attacks made on him. They are the true products of a noble and disinterested as well as vigorous mind. There is singular fitness in the motto " Sic vos non vobis " inscribed under the only portrait of him we possess.

See Life of W. Paterson, by S. Bannister (Edinburgh, 1858); Paterson's Works, by S. Bannister (3 vols., London, 1859); The Birthplace and Parentage of W. Paterson, by W. Pagan (Edinburgh, 1865); Eng. Hist. Review, xi. 260. The brilliant account of the Darien scheme in the fifth volume of Macaulay's History is incorrect and misleading; that in Burton's Hist, of Scotland (vol. viii. ch. 84) is much truer. Consult also the memoir in Paul Coq, La Monnaie de banque (Paris, 1863), and J. S. Barbour, A History of William Paterson and the Darien Company (1907). For a li§t of fugitive writings on Paterson see Poole's Index of Periodicals. (F. Wa.)

PATERSON, a city and the county-seat of Passaic county, New Jersey, U.S.A., in the north-eastern part of the state, on the west bank of the Passaic, river, andi6m. N.W. of New York city. Pop. (1880), 51,031; (1890), 78,347; (1900), 103,171; (1906. estimate), 112,801; (1910), 125,600. Of the total in 1900, 38,791 were foreign-born. Paterson is served by the main lines of the Delaware, Lackawanna & Western, the Erie, and the New York, Susquehanna & Western railways, and by a number of inter- urban electric lines. The Morris Canal was formerly important for shipping freight between Paterson and Jersey City, but has fallen into disuse. The city lies along a bend of the Passaic river, the southern portion being in a plain and the extreme northern part lying among the hills that rise from the stream near the Great Falls. The river has a descent here of about 70 ft. (of which 50 ft. are in a perpendicular fall), and furnishes water- power for manufactories. The principal public buildings are the city-hall, the post office, the county court-house and the Danforth Memorial (public library) building. Paterson is pre- eminently a manufacturing centre. There were, in 1905, 513 factories employing a capital of $53,595,585, and furnishing work for 28,509 employes; and the total factory product was valued at $54,673,083. The city is the centre of silk

manufacturing in the United States. In 1905 it contained 190 silk-mills, and the products were valued at $25,433,245. There were also, in 1905, 27 dyeing and finishing establishments, with products valued at $5,699,295; 39 foundries and machine shops, with products valued at $2,317,185; 3 wholesale slaughtering and packing houses, with products valued at $2,206,698; and 3 jute and jute-goods factories, with an output valued at $929,319. Among the machine works are two locomotive shops, with an average capacity of three locomotives per day, and a large steel mill.

Paterson had its origin in an act of the legislature of New Jersey on the 22nd of November 1701, incorporating the Society for Establishing Useful Manufactures, the plan for this society being drawn up by Alexander Hamilton. As the most suitable location for its enterprise the society in the following year selected the Great Falls of the Passaic river, and named the place Paterson, in honour of William Paterson (1745-1806), a member of the state Constitutional Convention in 1776, attorney-general of New Jersey in 1776-1783, a delegate to the Continental Congress in 1780-1781, and to the Constitutional Convention of

2 The books of the Darien Company were kept after a new and very much improved plan, believed to be an invention of Paterson's (Burton's Hist. Scot. viii. 36, note).

1787 (where he proposed the famous " New Jersey Plan "), a United States Senator in 1789-1790, governor of the state in 1790-1793, and an associate justice of the United States Supreme Court from 1793 until his death. Paterson was incorporated as a township in 1831, chartered as a city in 1851 and rechartered in 1 86 1. Three great industries — the manufacture of cotton, machinery and silk — were established in Paterson almost con- temporaneously with their introduction into the United States. In 1793 the first cotton yarn was spun at Paterson in a mill run by ox-power, and in the next year, when the dams and reservoir were completed, Paterson's first cotton factory began its opera- tions. After 1840 the manufacture of machinery and of silk gradually supplanted that of cotton goods. Although an attempt was made to manufacture machinery in Paterson as early as 1800, there was little progress until after 1825. The building of the " Sandusky," Paterson's first locomotive, in 1837, marked the beginning of a new industry, and before i860 the city was

supplying locomotives to all parts of the United States and to Mexico and South America. By 1840 the silk industry had obtained a footing, and after this date there was a steady advance in the quantity and quality of the product. From 1872 to 1 88 1 inclusive Paterson consumed two-thirds of the raw silk imported into the country.

See L. R. Trumbull, History of Industrial Paterson (Paterson,

1882).

PATEY, JANET MONACH (1842-1894), English vocalist, was born in London on the 1st of May 1842, her maiden name being Whytock. She had a fine alto voice, which developed into a contralto, and she studied singing under J. Wass, Pinsuti and Mrs Sims Reeves. Miss Whytock's first appearance, as a child, was made at Birmingham, and her first regular engagement was in 1865, in the provinces. From 1866, in which year she sang at the Worcester festival, and married John Patey, a bass singer, she was recognized as one of the leading contraltos; and on the retirement of Mme Sainton-Dolby in 1870 Mme Patey was without a rival whether in oratorio or in ballad music. She toured in America in 1871, sang in Paris in 1875, and in Australia in 1890. She died at Sheffield on the 28th of February 1894.

PATHAN, the name applied throughout India to the Afghans, especially to those permanently settled in the country and to those dwelling on the borderland. It is apparently derived from the Afghan name for their own language, Pushtu or Pukhtu, and may be traced back to the Paktues of Herodotus. In 1901 the total number of Pathans in all India was nearly 3ˆ- millions, but the speakers of Pushtu numbered less than ij millions. The name is frequently, but incorrectly, applied to the Mahommedan dynasties that preceded the Moguls at Delhi, and also to the style of architecture employed by them; but of these dynasties only the Lodis were Afghans.

The Pathans of the Indian borderland inhabit the mountainous country on the Punjab frontier, stretching northwards from a line drawn roughly across the southern border of the Dera Ismail Khan district. South of this line are the Baluchis. The Pathans include all the strongest and most warlike tribes of the North- West frontier of India, such as the Afridis, Orakzais, Waziris, Mohmands, Swatis and many other clans. Those in the settled districts of the North- West Frontier Province (in 1901) numbered 883,779, or more than two-fifths of the population. Each of the principal divisions is dealt with separately in this work under its tribal name. The Pathans are split up into different tribes, each tribe into clans, and each clan into sections, so that the

nomen- clature is often very puzzling. The tribe, clan and section are alike distinguished by patronymics formed from the name of the common ancestor by the addition of the word zai or khel; zai being a corruption of the Pushtu word zoe, meaning son, while khel is an Arabic word meaning an association or company. Both terms are used indifferently for both the larger and smaller divisions. Pathans enlist largely in the native army of India; and since the frontier risings of 1897 they have been formed with increasing frequency into class-regiments and regiments of native militia. They make excellent soldiers. The greater part

of the Pathan country was placed under British political control by the Durand agreement made with the Amir of Afghanistan in

1893.

PATHOLOGY (from Gr. irdflos, suffering), the science dealing with the theory or causation of disease. The term by itself is usually applied to animal or human pathology, rather than to vegetable pathology or Phytopathology (see Plants: Pathology).

The outstanding feature in the history of pathology during the 19th century, and more particularly of the latter half of it, was the completion of its rescue from the thraldom of abstract philosophy, and its elevation to the dignity of one of the natural sciences. Our forefathers, if one may venture to criticize them, were too impatient. Influenced by the prevailing philosophy of the day, they interpreted the phenomena of disease through its lights, and endeavoured from time to time to reduce the study of pathology to philosophical order when the very elements of philosophical order were wanting. The pathology of the present day is more modest; it is content to labour and to wait. Whatever its faults may be — and it is for our successors to judge of these — there is this to be said in its favour: that it is in nowise dogmatic. The eloquence of facts appeals to the scientific mind nowadays much more than the assertion of crude and unproven principles. The complexity and mystery of action inherent in living matter have probably been accountable for much of the vague philosophy of disease in the past, and have furnished one reason at least why pathology has been so long in asserting its independence as a science. This, indeed, holds good of the study of biology in general. There are other factors, however, which have kept pathology in the background. Its existence as a science could never have been recognized so long as the subjects of physics, chemistry and biology, in the widest accepta- tion of the term, remained unevolved. Pathology, in fact, is the child of this ancestry; it begins where they

end.

Progress in the study of pathology has been greatly facilitated by the introduction of improved methods of technique. The certainty with which tissues can now be fixed in the state they were in when living, and the delicacy ˆ eceat with which they can be stained differentially, have r ° gress ‘ been the means of opening up a new world of exploration. Experimental pathology has benefited by the use of antiseptic surgery in operations upon animals, and by the adoption of exact methods of recording; while the employment of solid culture media in bacteriology — the product of Koch’s fertile genius — is responsible for a great part of the extraordinary development which has taken place in this department of patho- logical research. The discoveries made in pathological bacteri- ology, indeed, must be held to be among the most brilliant of the age. Inaugurated by Pasteur’s early work, progress in this subject was first marked by the discovery of the parasite of anthrax and of those organisms productive of fowl-cholera and septic disease. Then followed Koch’s great revelation in 1882 of the bacillus of tubercle (fig. 22, PI. II.), succeeded by the isolation of the organisms of typhoid, cholera, diphtheria, actinomycosis, tetanus, &c. The knowledge we now possess of the causes of immunity from contagious disease has resulted from this study of pathological bacteriology: momentous practical issues have also followed upon this study. Amongst these may be mentioned the neutralizing of the toxins in cases of diphtheria, tetanus and poisonous snake-bite; ” serum therapeutics “; and treatment by ” vaccines.” By means of ” vaccination ” we are enabled to induce an active immunity against infection by certain patho- genic bacteria. The value of such protective inoculations is demonstrated in the treatment against small-pox (Jenner), cholera, plague (Haffkine) and typhoid (Wright and Semple). Pasteur’s inoculation against hydrophobia is on the same principle. ” Vaccines ” are also used as a method of treatment during the progress of the disease. Sir A. Wright and others, in recent work on opsonins, have shown that, by injecting dead cultures of the causal agent into subjects infected with the organism, there is produced in the body fluids a substance (opsonin) which apparently in favourable conditions unites with the living causal bacteria and so sensitizes them that they are

readily taken up and destroyed by the phagocytic cells of tissues. Before the discovery of the bacillus of tubercle, scrofula and tuber-

culosis were regarded as two distinct diseases, and it was supposed that the scrofulous constitution could be distinguished from the tubercular. It was always felt, however, that there was a close bond of relationship between them. The fact that the tubercle bacillus is to be found in the lesions of both has set at rest any misgiving on the subject, and put beyond dispute the fact that so-called scrofulous affections are simply local manifestations of tuberculosis. A knowledge of the bacteriology of scrofulous affections of bone and joints, such as caries and gelatinous degeneration, has shown that they also are tubercular diseases — that is to say, diseases due to the presence locally of the tubercle bacillus. At a very early period it was held by Virchow that the large cheesy masses found in tuberculosis of the lung are to be regarded as pneumonic infiltrations of the air-vesicles. Their pneumonic nature has been amply substantiated in later times; they are now regarded simply as evidence of pneumonic reaction to the stimulus of the tubercle bacillus. The caseous necrosis of the implicated mass of lung tissue, and indeed of tubercles generally, is held to be, in great measure, the result of the necrotic influence of the secretions from the bacillus. Tubercular pneumonia may thus be looked upon as comparable to pneumonia excited by any other specific agent.

In the ” seventies ” of the 19th century feeling ran somewhat high over the rival doctrines concerning the origin of pus- corpuscles, Cohnheim and his school maintaining that they were derived exclusively from the blood, that they were leucocytes which had emigrated through the walls of the vessels and escaped into the surrounding tissue-spaces, while Strieker and his followers, although not denying their origin in part from the blood, traced them, in considerable proportion, to the fixed elements, such as fibrous tissues and endothelia. Our present-day knowledge prompts the adoption of a middle course between the two theories. The cells found in an inflamed part are undoubtedly drawn from both sources, but while the blood leucocytes have a great tendency to become fatty and to die, those cells derived from the fixed tissues incline more to organization; the latter are, in fact, the source of the cicatrix which follows upon the cessation of suppuration (fig. 23, PI. II. and figs. 31 and 32, PI. III.). Organ- ization and healing have been keenly inquired into, with results which seem to point the lesson that all methods of healing are to be regarded as extensions of the natural phenomena of growth. Normal cytology, of late, has become a science of itself, and has had a direct bearing upon that which is pathological.

At no time has so much been done to advance our knowledge of diseases of the nervous system as during the last thirty years of the

19th century. The localization of function in the cerebral and in the cerebellar cortex has doubtless been the main cause of this progress, and has proceeded pari passu with an extended insight into the structure and connexions of the parts concerned. The pathology of aphasia, as worked out by a combination of the experimental, the pathological and the anatomical lines of inquiry is a favourable example of what has been accomplished. The origin, nature, and propagation of neoplasms of all kinds, especially of those which are malignant, are engaging much attention. Much light has been thrown upon the functions and diseases of the blood-forming tissues. The origin of the corpus- cles, previously a matter of so much difference of opinion, is now pretty fairly set at rest, and has proved the key to the interpre- tation of the pathology of many diseases of the blood, such as the different forms of anaemia, of leucocythaemia, &c.

It is largely to researches on the bone marrow that we owe our present knowledge of the origin and the classification of the different cellular elements of the blood, both erythrocytes or red corpuscles, and the series of granular leucocytes or white corpuscles. Whatever be the ancestral cell from which these cells spring, it is in the bone marrow that we find a differentiation into the various marrow cells from which are developed the mature corpuscles that pass from the marrow into the blood circulation. The healthy bone marrow reacts with remarkable rapidity to the demand for more blood cells which may be required by the organism; its reactions and variations in disease are very striking. If the demand be for the red cells owing to loss from haemorrhage or any of the anaemias,

the fatty marrow is rapidly replaced by cellular elements; this is mainly an active proliferation of the nucleated red cells, and gives rise to the erythroblastic type of marrow. If the white cells be required, as in local suppurating abscess, general septicaemia, acute pneumonia, &c, there is an active proliferation of the myelocytes to form the polymorpho-nuclear leucocytes, so that we have in this condition a leucoblastic transformation of the fatty marrow.

The cytology of bone marrow, with the technique of blood examination, is of great assistance in the diagnosis of different pathological conditions. The deleterious influence of high blood-pressure has engaged the attention of physicians and pathologists in later years, and the conclusion arrived at is, that although it may arise from accidental causes, such as malcomposition of the blood, yet that in many instances it is a hereditary or family defect, and is bound up with the tendency to gout and cirrhotic degeneration of the kidney. The pathology of intra-cardiac and vascular murmurs has also been

inquired into experimentally, the general impression being that these abnormal sounds result, in most cases at least, from the production of a sonorous liquid vein. Pneumonia of the croupous type has been proved to be, as a rule, a germ disease, the nature of the germ varying according to circumstances. The structural changes occurring in the bronchi in catarrhal bronchitis have also been ascertained, and, as in the case of pneumonia, have been shown to be frequently excited by the presence of a microphyte. The vexed question of the diagnosis of diphtheria is now a thing of the past. Quite irrespective of the nature of the anatomical lesion, the finding of the diphtheria bacillus on the part affected and the inoculability of this upon a suitable fresh soil are the sole means by which the diagnosis can be made certain.

The part played by the thyroid body in the internal economy of the organism has also received much attention. The gland evidently excretes, or at any rate gets rid of, a certain waste product of a proteid nature, which otherwise tends to accumulate in the tissues and to excite certain nervous and tissue phenomena. It wastes in the disease known as ” myxoedema,” and the above product gathers in the tissues, in that disease, to such an extent as to give rise to what has been termed a ” solid oedema.” It is questionable if the substance in question is mucoid. The pituitary body probably subserves a like purpose. When the pancreas is excised in an animal, or when it is destroyed in man by disease, grape-sugar appears in the urine. The gland is supposed to secrete a ferment, which, being absorbed into the portal circulation, breaks up a certain portion at least of the grape-sugar contained in the portal blood, and so prevents this overflowing into the circulation in general. The transplantation of a piece of living pancreas into the tissues of an animal, thus rendered artificially diabetic, is said to restore it to health.

Pathological chemistry has been remarkable chiefly for the knowledge we have obtained of the nature of bacterial poisons. Certain of these are alkaloids, others appear to be albumoses. The publication of Ehrlich’s chemical, or rather physical, theory of immunity has thrown much light upon this very intricate and obscure subject.

Pathology is the science of disease in all its manifestations, whether structural or functional, progressive or regressive. In times past it has been the habit to look upon its sphere Connexion as lying really within that of practical medicine, and with human medicine more particularly; as something B ‘o’

kingdoms. So it is with the diseased conditions to which it is a prey: there is a wonderful community of design, if the term may be used in such a sense, between the diseases of animals and plants, which becomes singularly striking and instructive the more they are inquired into. Utilitarian, or perhaps rather practical, considerations have very little to do with the subject from a scientific point of view — no more so than the science of chemistry has to do with the art of the manufacturing chemist. The practical bearings of a science, it will be granted, are simply, as it were, the summation of its facts, with the legitimate con- clusions from them, the natural application of the data ascer- tained, and have not necessarily any direct relationship to its pursuit. It is when studied on these lines that pathology finds its proper place as a department of biology. Disease as an entity — as something to which all living matter is subject — is what the pathologist has to recognize and to investigate, and the practical application of the knowledge thus acquired follows as a natural consequence.

Since pathology is the science of disease, we are met at the very threshold by the question: What is disease? This may Health best be answered by defining what we understand by and health. What do we mean when we talk of a healthy

Disease, organism? Our ideas upon the subject are purely arbitrary, and depend upon our everyday experience. Health is simply that condition of structure and function which, on examina- tion of a sufficient number of examples, we find to be commonest. The term, in fact, has the same significance as ” the normal.” Disease we may define, accordingly, as any departure from the normal standard of structure or function of a tissue or organ. If, for instance, we find that instead of the natural number of Mal- pighian bodies in the kidney there are only half that number, then we are entitled to say that this defect represents disease of structure; and if we find that the organ is excreting a new substance, such as albumen, we can affirm logically that its function is abnormal. Once grant the above definition of disease, and even the most trivial aberrations from the normal must be regarded as diseased conditions, quite irrespective of whether, when structural, they interfere with the function of the part or not. Thus an abortive supernumerary finger may not cause much, if any, inconvenience to the possessor, but neverthe- less it must be regarded as a type of disease, which, trivial as it may appear, has a profound meaning in phylogeny and ontogeny.

Classification. — From the foregoing it will be gathered that the problems in pathology are many-sided and require to be attacked from all points of vantage; and the subject falls naturally into certain great divisions, the chief of which are the following: —

I. Morbid anatomy.

(a) Naked-eye or macroscopic.

(b) Morbid histology or microscopic.

II. Pathological physiology.

III. Pathogenesis.

IV. Aetiology.

V. Pathological chemistry.

The term ” pathogenesis ” has reference to the generation and development of disease, and that of ” aetiology,” in its present bearing, has to do with its causes. The use of the term ” patho- logical physiology ” may at first appear strange, for if we define physiology as the sum of the normal functions of the body or organism, it may be hard to see how there can be a physiology which is pathological. The difficulty, however, is more apparent than real, and in this sense, that if we start with a diseased organ as our subject of inquiry, we can quite properly, and without committing a solecism, treat of the functions of that organ in terms of its diseased state.

Influences Working for Evil upon the Organism (i) Malnutrition. — When the blood supply is entirely cut off from a tissue the tissue dies, and in the act of dying, or after- wards, it suffers certain alterations dependent upon its sur- roundings. Thus, when the circulation to an external part is obstructed completely, as in the case of a limb where the main artery has been occluded and where the anastomatic communi-

cations have not sufficed to continue the supply of blood, the part becomes gangrenous (fig. 24, PI. II.) ; that is to say, it dies and falls a prey to the organisms which excite putrefaction, just as would happen to any other dead animal tissue were it unconnected with the body. Fermentative changes are set up in it, character- ized by the evolution of gas and the formation of products of suboxidation, some of which, being volatile, account for the characteristic odour. In the formation of these the tissues break down, and in course of time lose their

characteristic histological features. The blood suffers first; its pigment is dissolved out and soaks into the surroundings, imparting to them the pink hue so diagnostic of commencing gangrene. Muscle and white fibrous tissue follow next in order, while elastic tissue and bone are the last to show signs of dis- integration. The oil separates from the fat-cells and is found lying free, while the sulphuretted hydrogen evolved as one of the products of putrefaction reacts upon the iron of the blood and throws down a precipitate of sulphide of iron, which in course of time imparts to the limb a range of colour commencing in green and terminating in black.

The temperature at which the limb is kept, no doubt, favours and hastens the natural process of destruction, so that putre- faction shows itself sooner than would be the case with a dead tissue removed from the body and kept at a lower temperature. Nevertheless, gangrene is nothing more or less than the putre- factive fermentation of an animal tissue still attached to the body. If the amount of liquid contained in the tissue be small in quantity the part mummifies, giving rise to what is known as ” dry gangrene.” If the dead part be protected from the ingress of putrefactive organisms, however, it separates from that which is living without the ordinary evidences of gangrene, and is then known as an ” aseptic slough.” Should the portion of tissue deprived of its circulation be contained in an internal organ, as is so often the case where the obstruction in the artery is due to embolism, it becomes converted into what is known as an ” infarction.” These infarcts are most common in organs provided with a terminal circulation, such as prevails in the kidney and spleen. The terminal branches of the arteries supplying these organs are usually described as not anastomosing but many, if not all, of Cohnheim’s end-arteries have minute collateral channels; which, however, are usually insufficient to completely compensate for the blocking that may occur in these arteries, therefore, when one of them is obstructed, the area irrigated by it dies from malnutrition. Being protected from the ravages of the organisms which induce putrefaction, however, it does not become gangrenous; it is only where the obstructing agent contains these organisms that a gangrenous slough follows, or, in the case of the contaminating organisms being of a suppur- ative variety, ends in the formation of a so-called ” pyaemic abscess,” followed by rapid dissolution of the dead tissue (fig. 24, PL II.). In ordinary circumstances, where the artery is ob- structed by an agent free from such organismal contamination, the part becomes first red. This is due to intense engorgement of the vessels brought about through these minute existing collateral channels and results in a peripheral congested zone round the infarct. There may be haemorrhage from

these vessels into the tissues. This collateral supply not being sufficient to keep up the proper flow of blood through the part the veins tend to become thrombosed, thus increasing the engorge- ment. The central part of the obstructed area very soon under- goes degenerative changes, and rapidly becomes decolourized. This necrosed area forms the pale infarct. ‘ Absorption of this infarcted zone is carried on by means of leucocytes and other phagocytic cells, and by new blood-vessels. If absorption be not complete the mass undergoes caseation and becomes surrounded by a capsule of fibrous tissue — being sharply cut off from the healthy tissue.

Where the malnutrition is the effect of poorness in the quality of the blood, the results are of course more widespread. The muscles suffer at an early period: they fall off in bulk, and later suffer from fatty degeneration, the heart being probably the first muscle to give way. Indeed, all tissues when under-nourished,

either locally as the result of an ischaemia, or generally as from some impairment of the blood, such as that prevailing in perni- cious anaemia, tend to suffer from fatty degeneration; and at first sight it seems somewhat remarkable that under-nourished tissues should develop fat in their substance (figs. 26 and 27, PL II.). The fatty matter, however, it must be borne in mind, is the expression of dissimilation of the actual substance of the proteids of the tissues, not of the splitting up of proteids or other carbona- ceous nourishment supplied to them.

A part deprived of its natural nerve-supply sooner or later suffers from the effects of malnutrition. When the trigeminus nerve is divided (Majendie), or when its root is compressed injuri- ously, say by a tubercular tumour, the cornea begins to show points of ulceration, which, increasing in area, may bring about total disintegration of the eyeball. The earliest interpretation put upon this experiment was that the trophic influence of the nerve having been withdrawn, the tissue failed to nourish itself, and that degeneration ensued as a consequence. The subsequent experiments of Snellen, Senftleben, and, more lately, of Turner, seem to show that if the eyeball be protected from the impingement of foreign particles, an accident to which it is liable owing to its state of anaesthesia, the ulceration may be warded off indefinitely. If the eyeball be kept perfectly clean and no organism be admitted from the outside then ulceration will not follow. If, on the

other hand, any pathogenic organisms be present the results are disastrous because the tissue, deprived of its nervous trophic supply, has greatly lessened resistance. The bed-sores which follow paralysis of the limbs are often quoted as proof of the direct trophic action of the nerve-supply upon the tissues, yet even here the evidence is somewhat contradictory. Still, there are facts which, for want of a better explanation, we are almost bound to conclude are to be accounted for on the direct nerve-control theory. The common variety of bed-sore is the result of continuous pressure on and irritation of the skin, the vitality and resisting power of which are lowered by a lesion of the cord cutting off the trophic supply to the skin affected. The acute bed-sore is, in some cases, a true trophic lesion occurring, as it may, on parts not subjected to con- tinuous pressure or irritation. Trophic disturbance in the nutrition of the skin may be so great that a slight degree of external pressure or irritation is sufficient to excite even a gangrenous inflammation. Again, a fractured bone in a paralysed limb often fails to unite, while another in the opposite sound limb unites readily, and an ulcerated surface on a paralysed limb shows little healing reaction. A salivary gland degenerates when its nerve-supply is cut off; and the nerves leading up to the symmetrical sloughs in Raynaud's disease have been found in an advanced state of degeneration (Affleck and Wiglesworth). It is just a question, however, whether, even in instances such as these, the nutritional failure may not be explained upon the assumption of withdrawal of the local vasomotor control. There seems to be little doubt, notwithstanding, that one of the chief functions of the nerve cell is that of the propagation of a trophic influence along its axon. When a nerve-trunk is separated from its central connexion, the distal portion falls into a state of fatty degeneration (Wallerian or secondary degeneration). That special trophic nerves, however, exist throughout the body, seems to be a myth. It is much more likely, as Verworn alleges, that the nerves which influence the characteristic function of any tissue regulate thereby the metabolism of the cells in question — in other words, that every nerve serves as a trophic nerve for the tissues it supplies. It is a significant fact that neoplasms contain very few nerve-fibres, even although growing luxuriantly, and there is a doubt whether the few twigs contained in them may not merely have been dragged into their midst as the tumour mass expanded (Young).

Overwork. — The effect of overwork upon an organ or tissue varies in accordance with (a) the particular organ or tissue concerned, (b) the amount of nourishment conveyed to it, and (c) the power of assimilation possessed by its cells. In the case of muscle, if the available nourishment be sufficient, and if the power of assimilation of

the muscle cells remain unimpaired, its bulk increases, that is to say, it becomes hypertrophied.

It may be advisable to define exactly what is meant by " hypertrophy," as the term is often used in a loose and insignifi- cant sense. Mere enlargement of an organ does not imply that it is in a state of hypertrophy, for some of the largest organs met with in morbid anatomy are in a condition of extreme atrophy. Some organs are subject to enlargement from deposition within them of a foreign substance (amyloid, fat, &c). This, it need hardly be said, has nothing to do with hypertrophy. The term hypertrophy is used when the individual tissue elements become bigger to meet the demands of greater functional activity; hyper- plasia, if there is an increase in the number of these elements;

and pseudo-hypertrophy, when the specific tissue element is largely replaced by another tissue.

There are conditions in which we have an abnormal increase in the tissue elements but which strictly should not be defined as hypertrophies, such as new-growths, abnormal enlargements of bones and organs due to syphilis, tuberculosis, osteitis deformans, acromegaly, myxoedema, &c. The enormously long teeth sometimes found in rodents also are not due to hypertrophy, as they are normally endowed with rapid growth to compensate for the constant and rapid attrition which takes place from the opposed teeth. Should one of these teeth be destroyed the opposed one loses its natural means of attrition and becomes a remarkable, curved tusk-like elongation. The nails of the fingers, or the hair of the scalp may grow to an enormous length if not trimmed.

True hypertrophy is commonly found in the hollow muscular organs such as the heart, bladder and alimentary canal. As any obstruction to the outflow of the contents throws an increased amount of work on the walls, in order to overcome the resistance, the intermittent strain, acting on the muscle cells, stimulates them to enlarge and proliferate, fig. 28, PI. II., and gives rise to adaptive hypertrophy. Should there be much loss of tissue of an organ, the cells of the remaining part will enlarge and undergo an active proliferation (hyperplasia) so that it may be made up to the original amount. Or again, in the case of paired organs, if one be removed by operation, or destroyed by disease, the other at once undertakes to carry on the functions of both. To do so a general enlargement takes place until it may reach the size and weight equal to the original pair. This is known as compensatory hypertrophy.

Examples of physiological hypertrophy are found in the ovaries, uterus and mammary glands, where there is an increased functional activity required at the period of gestation. Local hypertrophy may also be due to stimulation resulting from friction or intermittent

Cressure, as one may see in the thickenings on the skin of the artisan's ands. The extreme development of the muscles in the weight- lifting athlete and in the arm of the blacksmith is the result of increased functional activity with a corresponding increase in the vascular supply; this exercise may produce an over-development so excessive as to be classed as abnormal.

In atrophy we have a series of retrograde processes in organs and tissues, which are usually characterized by a progressive diminution in size which may even end in their complete dis- appearance (fig. 29, PI. II.). This wasting may be general or local — continuously from the embryonic period there is this natural process of displacement and decay of tissues going on in the growing organism. The functions of the thymus gland begin to cease after the second year from birth. The gland then slowly shrinks and undergoes absorption. From atrophy of their roots, caused by the pressure of the growing permanent teeth, the " milk teeth " in children become loose and are cast off. The ovaries show atrophic changes after the menopause. In old age there is a natural wearing out of the elements of the various tissues. Their physiological activities gradually fail owing to the constructive processes having become so exhausted from long use that the destructive ones are able to overtake them. As the cell fails and shrinks, so does it become more and more unable to make good the waste due to metabolism. This physiological wasting is termed senile atrophy.

General atrophy or emaciation is brought about by the tissues being entirely or partially deprived of nutriment, as in starvation, or in malignant, tubercular, and other diseases of the alimentary system which interfere with the proper ingestion, digestion or absorption of food material. The toxic actions produced in continued fevers, in certain chronic diseases, and by intestinal parasites largely aid in producing degeneration, emaciation and atrophy.

Atrophy may follow primary arrest of function — disuse atrophy. The loss of an eye will be followed by atrophy of the optic nerve; the tissues in a stump of an amputated limb show atrophic changes; a paralysed limb from long disuse shows much wasting; and one finds at great depths of the sea fishes and marine animals, which have almost completely lost the organs

of sight, having been cut off for long ages from the stimuli (light) essential for these organs, and so brought into an atrophic condition from disuse.

Atrophy may also follow from overwork. Increased work thrown on to a tissue may produce hypertrophy, but, if this excessive function be kept up, atrophy will follow; even the blacksmith's arm breaks down owing to the hypertrophic muscle fibres becoming markedly atrophied.

From these causes a certain shrinkage is liable to occur, more evident in some parts of the body than in others. Thus the brain falls off in bulk, and the muscles become attenuated, and in no muscle is this more notable than in the case of the heart. A tendency to pigmentation also develops in certain tissues of the body, such as the nerve and muscle cells. As a result of these various degenerations the functions of the body deteriorate, the faculties become blunted, and the muscular energy of the body is below what it was in earlier life, while the secreting glands in certain instances become functionally obsolescent.

Continuous Over-pressure. — The tissues of an animal or plant are all under a certain pressure, caused, in the one case, by the expulsive action of the heart and the restraint of the skin and other elastic tissues, and, in the other case, by the force of the rising sap and the restraint of the periderm or bark. Under this normal amount of pressure they can live and grow. But when- ever, from any cause, the degree of pressure which they are naturally intended to withstand is surpassed, they fail to nourish themselves, become granular, die, and, falling to pieces, are absorbed.

Deleterious Surroundings. — There can be little doubt that all unnatural and artificial modes of life tend to deterioration of the powers of resistance of the organism to disease. We see it exemplified in plant life in circumstances which are unnatural to the life of the plant, and the prevalence of certain constitu- tional tendencies among the inhabitants of crowded cities bears evidence to the same law.

Man, like other animals, was naturally intended to lead an out- door life. He was originally a hunter and a tiller of the ground, breathing a pure atmosphere, living on a frugal diet, and exer- cising his muscles.

Whenever these conditions are infringed his powers of resistance to disease are lessened, and certain tendencies begin to show themselves, which are generally termed constitutional. Thus the liability to tubercular infection is far commoner in the midst of a depraved population than in one fulfilling the primary laws of nature; rickets is a disease of great cities rather than of rural districts; and syphilis is more disastrous and protracted in its course in the depraved in health than in the robust. Cattle kept within-doors are in a large proportion of cases tubercular, while those leading an outdoor life are much less liable to infection. The improvement which has taken place in the general health of the inhabitants of cities during recent years, concurrent with hygienic legislation, is ample proof of the above assertions. The diminution in the number of deaths from tuberculosis during the last forty to fifty years of the 19th century of itself points in this direction. Every living organism, animal and vegetable, tends to maintain a normal state of health; it is when the natural laws of health are violated that the liability to disease begins to assert itself. If, in these circumstances, the food supply be also insuffi- cient, the combination of influences is sure, in course of time, to bring about a physical deterioration of the race. Certain avocations have a direct and immediate influence in causing diseased states of body. Thus workers in lead suffer from the effects of this sub- stance as a poison, those who work in phosphorus are liable to necrosis of bone and fatty degeneration of the blood vessels and organs, and the many occupations in which dust is inhaled (coal- mining, stone-dressing, steel-polishing, &c. ; fig. 30, PI. III.) are fraught with the greatest danger, owing to the destructive influence exerted upon the lungs by the inhaled particles. Among the most dangerous of the last class (the pneumokonioses) is perhaps that in which the dust particles take the form of finely divided freestone, as in stone-dressing and the dry-polishing on the grindstone of steel. The particles in this case set up a form of fibrosis of the lung, which, either of itself or by rendering the organ liable to tubercular infection, is extremely fatal. The abuse of alcohol may also be mentioned here as a factor in the poduction of disease.

Parasitism. — Of all external agents acting for evil, however, probably vegetable and animal micro-organisms with a patho- genic bent are most to be feared. When we consider that tuberculosis, diphtheria, cholera, tetanus, typhoid fever, anthrax, malaria and a host of other contagious diseases have each been proved to be of parasitical origin, an idea may be conveyed of the

range of the subject. The living organism may be regarded as constantly engaged in a warfare with these silent and apparently

insignificant messengers of destruction and death, with the result that too often the battle ends in favour of the attacking enemy.

Heredity. — The tendencies to disease are in great part heredi- tary. They probably express a variation which may have occurred in a far-back ancestor, or in one more recent, and render the individual vulnerable to the attacks of parasitic fungi, or, it may be, become manifest as errors of metabolism. The psychopathic, the tubercular, the rickety, and the gouty consti- tution may all be transmitted through a line of ascendants, and only require the necessary exciting agents to render them apparent. A distinction must be drawn between the above and diseases, like syphilis and small-pox, in which the contagion of, not the tendency to, the disease is transmitted directly to the foetus in utero. (See Heredity.)

The Cellular Doctrine in Pathology

The cellular pathology is the pathology of to-day; indeed, protoplasm — its vital characteristics under abnormal influences and its decay — will be regarded most likely as the basis of patho- logy in all time. According to our present knowledge of physio- logical and pathological processes, we must regard the cell as the ultimate biological unit — a unit of structure and a unit of function; this was first put forward by Schleidenin 1838, and by Schwann in 1839, but we owe to Virchow the full recognition of the fundamental importance of the living cell in all the processes of life, whether in health or disease. When Virchow wrote, in 1850, ” every animal presents itself as a sum of vital unities, every one of which manifests all the characteristics of life,” he expressed a doctrine whose sway since then has prac- tically been uninterrupted. The somatic cells represent com- munities or republics, as it were, which we name organs and tissues, but each cell possesses a certain autonomy and inde- pendence of action, and exhibits phenomena which are indicative of vitality.

Still, it must be borne in mind that this alleged autonomy of action is said to be founded upon an erroneous supposition, on the supposition that each cell is structurally, and it may be said functionally, separated from those in its neighbourhood. It is well known that in the vegetable kingdom the protoplasm of one cell frequently overflows into that of cells adjacent — that there is, as it were, a continuous network of protoplasm (idio- plasm of Nageli) prevailing throughout vegetable tissues, rather than an aggregation of isolated units. The same inter-communi- cation prevails between adjacent cells in some animal tissues, and more particularly in those which are pathological, as in the case of the epithelial cells of cancer. Assuming, with

Sedgwick and others, this amassed and bound condition of the tissues to be true, it would be necessary to reject the cell-doctrine in pathology altogether, and to regard the living basis of the organism as a continuous substance whose parts are incapable of living independently of the whole. Until, however, further evidence is forthcoming in support of this syncytial theory of structure, it would be unwise to regard it as established sufficiently to consti- tute a serviceable working hypothesis; hence, for the time being, we must accept the assertion that the cell represents the ultimate tissue-unit. Our present day definition of a cell is a minute portion of living organized substance or protoplasm.

The cells met with in morbid parts which are in a state of active vitality are built up of the same components as those found in normal tissues (PI. I.). 1 Thus they are pro- „ ™ , , , vided with a nucleus which is the centre of cell activity; wtooiogicai both of the reproductive and chemical (metabolic) pro- c ^" s – cesses which occur in the cell protoplasm. The executive centre

iTJESCRIPTION OF PLATeI. Series of Figures illustrative of Irregula rDivision of Cells.

Figs. 1 to 6 are from the epithelial cells of a cancer of the mamma, {After Galeotti.) „ 7 to 21 are from a sarcoma. {After Trambusti.) Fig. i. — Resting epithelial cell.

varies in shape, but is usually round or oval, and is sharply defined by a nuclear membrane from the cytoplasm in which it lies. The nucleus in it's vegetative stage shows a fine network throughout containing in the meshes the so-called nuclear-sap; attached to the network are the chromosomes, in the form of small irregular masses, which have a strong affinity for the " basic dyes." Embedded in the nucleus are one or more nucleoli (plasmosomes) having an affinity for the " acid dyes." The nucleolus shows an unstainable point at the centre known as the endonucleolus or nucleoluolus (Auerbach).

The cell body, or cytoplasm, is apparently composed of a fine reticulum or network, containing within the meshes a soft viscid, transparent substance, the cell-sap, or hyaloplasm, which is probably a nutrient material to the living cell. Within the cytoplasm are found manifestations of functional activity, in the form of diges- tive

vacuoles, granules, fat, glycogen, pigment, and foreign bodies. Usually the cytoplasm shows a marked affinity for the acid stains, but the different bodies found in the cell may show great variation in their staining reactions.

The centrosomes which play so important a part in cell division may be found either lying within or at one side of the nucleus in the vegetative condition of the cell. Centrosomes may be single, but usually two are lying close together in the attraction-sphere. When mitosis is about to take place, they separate from one another and pass to the poles of the nucleus, forming the achromatic spindle. After the division and cleavage of the chromosomes of the original nucleus have taken place they pass from the equator to the poles of the spindle, rearranging themselves close to the separated centro- somes to form daughter nuclei.

The cytoplasm of the cell now undergoes division in a line between the two daughter nuclei. When complete separation has taken place, we have two daughter cells formed from the original, each being a perfect cell-unit. Some pathological cells, such as the giant-cells of tumours, of bone, and those of tubercle, are polynucleated; in some instances they may contain as many as thirty or more nuclei. The only evidence we have in pathology of living structures in which apparently a differentiation into cell-body and nucleus does not exist, is in the case of bacteria, but then there comes the question whether they may not possess chromatin distributed through their substance, in the form of metachromatic points, as is the case in some infusoria (Trachelocerca, Gruber).

Although the methods of cell-division prevailing in normal structures are maintained generally in those which are pathological, yet certain modifications of these methods are more noticeable in the latter than in the former. Thus in the neoplasmata direct cell-division is more the rule than in healthy parts. In actively growing neoplasmata, certainly, the indirect method prevails largely, but seems to go on side by side with the direct.

A curious and interesting modification of the indirect method, known as ” asymmetrical division,” occurs frequently in epithelio- mata, sarcomata, &c. (Hansemann). It consists in an unequal number of chromosomes passing over to each of the daughter nuclei, so that one may become hypochromatic, the other hyperchromatic. When this happens the resulting cleavage of the cytoplasm and nucleus is also unequal. Several explanations have been given of

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-Asymmetrical diaster.

-Tripolar division in which the splitting of the loops has

commenced. -Tetrapolar karyokinesis. -Another form of tetrapolar division. -Cell in a state of degeneration and chromatolysis; the large

rounded body in the cell is a cancer parasite. -Polynucleated cell with nuclei of normal size arising from

multiple karyokinetic division. -Pigmented cell with resting nucleus. The attraction-sphere

and centrosome lie in the cytoplasma in the neighbour- hood of the nucleus. -Hypertrophic nucleolus. -Large cell with a single nucleus; nucleoli in a state of

degeneration. -Multinucleated giant-cell, the nuclei small and produced

amitotically. -Karyokinetic figure, the one centrosome much larger than

the other. -Cell in process of karyokinetic division with retention of the

nucleolus during the division. -Division of the nucleolus and formation of nuclear plate.

The nucleolus is elongated, and its longest measurement

lies in the direction of the equatorial plane of the nucleus. -Division of the nucleolus by elongation, construction, and

equilateral division of the nucleus. -Division of the nucleolus without any evidence of division of

the nucleus. -Nucleus with many nucleoli. -Direct division of nucleus. -Multiple direct division of the nucleus. -Nail-like nucleolus. -Fragmentation of the nucleus.

the meaning of these irregularly chromatic cells, but that which most lends itself to the facts of the case seems to be that they represent a* condition of abnormal karyorhexis.

In many pathological cells undergoing indirect segmentation, centrosomes appear to be absent, or at any rate do not manifest themselves at the poles of the achromatic spindle. When they are present, that at one end of the spindle may be unusually large, the other of natural size, and they may vary in shape. In pathological cell-division it happens occasionally that the segmentation of the cytoplasm is delayed beyond that of the mitotic network. The daughter nuclei may have arrived at the anaphase stage, and have even gone the length of forming a nuclear membrane, without an. equatorial depression having shown itself in the cell-body. Sometimes the equatorial depression fails entirely, and the separation, as in some vegetable cells, takes place through the construction of a cell-plate. Intranuclear plexuses are not usually found in giant- cells, but have been described in the giant-cells of sarcomata by Klebs and Hansemann, and in those of tubercle by Baumgarten. Some of the nuclei within multinucleated cells may occasionally be engaged in mitotic division, the others being in the resting state.

In the earlier accepted notion of direct segmentation, usually known as the schema of Remak, division was described as com- mencing in the nucleolus, as thereafter spreading to the nucleus, and as ultimately implicating the cell-substance. Trambusti, curiously, finds confirmatory evidence of this in the division of cells in sarcoma. Contrary, however, to the experience of others, he has never found that the attraction-spheres play an important part in direct cell-division, or, indeed, that they exert any influence whatever upon the mechanism of the process. Where pigment was present within the cells (sarcoma), the attraction-spheres were represented by quite clear unpigmented areas, sometimes with a centrosome in their midst.

Repair of Injuries

In the process of inflammation we have a series of reactions on the part of the tissues, and fluids of the body, to counteract the ill effects

of irritation or injury, to get rid of the cause, and to repair its results. Injury and loss of tissue are usually followed by repair, and both the destructive and reparative changes are, as a rule, classified under the term inflammation. The irritants may be bacteria and their toxins, or they may be mechanical, chemical or thermic.

We do not now concur with the old view that inflammation was essentially an injurious process; rather do we look upon it as beneficial to the organism. In the various reactions of the tissues against the exciting cause of the injury we see a striking example of a beautifully organized plan of attack and defence on the part of the organism.

In some of the infective conditions the conflict fortifies the organism against future attacks of the same nature, as for example in the immunity following many of the acute infective diseases. This acquired immunity is brought about by the development of a protective body as a result of the struggle of the cells and fluids of the body with the invading bacteria and their toxins. This resistance may be more or less permanent. If the inva- sion is due to a pus-producing micro-organism which settles in some local part of the body, the result is an abscess (fig. 25, PL II.).

Abscesses. — One can easily demonstrate all the actions and reactions which take place in this form of acute inflammation. In such a conflict one can see the presence of these minute but dangerous foes in the tissues. At once they proceed to make good their hold on the position they have secured by secreting and throwing out toxins which cause more or less injury to the tissues in their immediate neighbourhood. These micro-organisms having found in the tissues everything favourable for their needs, rapidly multiply and very soon produce serious results. At this point one's attention is focused on the wonderful reactions possessed by the healthy tissues t<" "ombat these evil influences.

In a very short period — within three or four hours after infection — ■ there appears to have been a message conveyed to the defenders of the body both as to the point of attack and the nature of the invasion. There is thus brought into play a series of processes on the part of the tissues— the vascular inflammatory changes — -which is really the first move to neutralize the malign effects. We find at this early stage oedema of the part. This is an increased exudation of fluid from the engorged blood vessels which not only dilutes the toxins, but is supposed to contain substances which in some way act on these living micro-organisms and render them a more easy prey to the polymorpho-nuclear leucocytes (fig. 23, PI. II.) — cells that are motile and extremely phagocytic to these bacteria. At this stage the

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rapidity of the blood circulation has become greatly diminished. The polymorpho-nuclear leucocytes are seen in great numbers in the blood vessels.

In health these cells, belonging to our first army of defenders, are found continually circulating in the blood stream in fairly large numbers ; they are ever ready to rush to the point of attack, where they at once leave the blood stream by passing through the vessel walls — emigration — into the tissues of the danger zone. There they show marked phagocytosis, attacking and taking up into their interior and destroying the micro-organisms in large numbers. At the same time large numbers of these cells perish in the struggle, but even the death of these cells is of value to the body, as in the process of breaking down there are set free ferments which not only act detrimentally to the bacteria, but also may stimulate the bringing forward of another form of cell defenders — the mononuclear leucocyte.

To replace this cellular destruction there has been a demand for reinforcements on the home centres of the polymorpho-nuclear leucocytes— the bone marrow. This call is immediately answered by an active proliferation and steady maturing of the myelocytes in the marrow to form the polymorpho-nuclear leucocytes. These then pass into the blood stream in very large numbers, and appear to be specially attracted to the point of injury by a positive chemiotactic action. This phenomenon, called chemiotaxis, has been studied by several investigators. Leber experimented with several chemical compounds to find what reaction they had on these cells; by using fine glass tubes sealed at the outer end and containing a chemical substance, and by introducing the open end into the blood vessels he

found that the leucocytes were attracted — positive chemiotaxis — by the various compounds of mercury, copper, turpentin, and other substances. That quinine, chloroform, glycerin, alcohol, with others, had no attractive influence on them — negative chemiotaxis. It was also found that a weak solution may have a marked positive attraction whilst a strong solution of the same substance will have the opposite effect. It has been proved that the pyo-genic bacterial toxins, if not too concentrated, will attract the polymorpho-nuclear leucocytes, but if concentrated, may have a repelling influence.

Then we have the property of adaptation, in which the negative reaction may be changed into a positive ; a given toxin may at first repel the cell, but by a gradual process the cell becomes accustomed to such a toxin and will move towards it.

On reaching the vicinity they leave the blood stream and join in the warfare — many performing their function of phagocytosis (q.v.), others falling victims to the toxins. The tissues of the part become disorganized or destroyed, and their place is taken by the mass of warring cellular elements now recognized as pus.

As soon as the fluids and the polymorpho-nuclear leucocytes have succeeded in diminishing the virulence of the micro-organism, the second line of defenders — the large mononuclear leucocytes (fig. 23, PI. II.) make their appearance at the field of battle in ever increasing numbers. These are amoeboid cells and are extremely phagocytic, their power of digestion being greatly developed. Their principal function is to bring about the removal of foreign, dead or degener-ating material. This they take up into their protoplasm, where it is rapidly digested by being acted on by some intracellular digestive ferment (fig. 31, PI. III.). Where the material is too large to be taken up by an individual cell, the dissolution is brought about by the cells surrounding the material, to which they closely apply them- selves, and by the secreting of the ferment, a gradual process of erosion is brought about with ultimate absorption.

If the abscess be deeply situated in some tissue and not able to open on to a free surface so allowing the contents to be drained off, the phagocytic cells play a very prominent part in the resolution of the abscess. They are seen pushing their way right into the field of conflict and greedily ingesting both friends and foes. The first defenders, the polymorpho-nuclear leucocytes, having performed their functions, are of no more use to the organism and are therefore removed by the mono-nuclear phagocytes as useless material (fig. 31,

The tissues having now mobilized an army that completely surrounds the fighting zone, there is a gradual and general advance made from all sides. The vanguard of this advancing army is composed of a more or less compact layer of the mono-nuclear phagocytes (polyblasts) accompanied by numerous new vessels. These phagocytic cells carry out the complete removal of all the injured warring elements and the damaged tissues of the part. The vessels are only temporary channels by which is brought forward the food supply that is needed by the advancing army if it is suc- cessfully to carry on its function; they probably also drain off the deleterious fluid substances formed by the cellular disintegration that has taken place in the part. Closely on the advance of this army of phagocytes or scavenger cells follows the third line of defenders, the connective tissue cells or fibroblasts.

All these cells are probably of local origin and are now stimulated to make good the damage. The connective tissue cells or fibroblasts (hg. 32, PI. III.) are seen in active proliferation around the phagocytic Z °” e ji [rst they are round or ova l in shape; later they become spindle shaped, arranging themselves in layers. Then they develop definite fibrils which differentiate into fibrous laminae forming a

zone which shuts off the abscess from the healthy tissue and so prevents the further invasion and injurious effects of the micro-organism Bv the aid of the new fibroblasts this fibrous tissue zone gradually encroaches on the pus area and replaces the phagocytic layer of cells as they proceed with the absorption of the pus mass (fig. 33, PI. III.). When complete removal of the pus mass has been accomplished by the process of absorption, the damaged area is replaced by the new fibrous tissue, which later becomes condensed and forms the cicatricial or scar tissue (fig. «, PI. III.)— a healed abscess. s “”’

Wounds.— The healing of wounds is brought about by similar processes to that seen in the evolution of an abscess.

If the injury be a small incised wound through the skin and sub-cutaneous tissues without any septic contamination, there usually follows a minimum of reaction on the part of the tissues. As the edges of the wound are brought into accurate apposition there is little or no blood lodged between them, so that an extremely narrow strip of fibrin glues the cut edges together. This strip is rapidly replaced, mainly by the connective tissue cells of the adjoining tissue growing across the temporary filled breach and firmly uniting the two cut

surfaces. The vascular changes are practically absent in healing by first intention.

Healing by second intention, or granulation, is usually seen where there has been loss of tissue, or extensive damage. The reactions of the tissues vary in degrees according to the nature and severity of the injury. In resenting such insults, a remarkable uniformity and regularity in the processes is brought about by the different cells and fluids of the healthy tissues of the body. Although we have not reached a stage of certainty regarding their origin, 1 unction and destiny, recent investigations have brought forward evidence to elucidate the importance of the part played by the different cells in the various types of the inflammatory process.

It there be a loss of tissue brought about by severe injury to the skin and the deeper tissues, there is usually an extravasation of blood from the severed vessels. Along with the exuded serum this nils up the breach in the tissues and the whole is rapidly formed into a fibrinous mass due to the disintegration of the polymorpho- nuclear leucocytes setting free their ferment. The ferment thus set free brings about the coagulation of the serum, which acts as a protective and temporary scaffolding to the injured tissues. Lying between the fibrin mass and the healthy tissues is a zone ot injured and degenerated tissue elements, the result of the trauma.

As early as six hours after the injury the polymorpho-nuclear leucocytes are seen passing in large numbers from the dilated and congested blood vessels of the tissues at the margin of the wound into the injured zone, where they carry on an active phagocytosis. It is believed also that they secrete bactericidal substances and ferments which bring about the liquefaction of the fibrin and the damaged tissues— histolysis— and thus assist the process of absorption, lney appear to prepare the injured zone for the coming of the next series of cells. Their function being at an end they give way to these cells which carry on the process of absorption.

In a period varying from twenty-four to thirty hours there is marked evidence of the removal of the degenerated cellular elements in the damaged zone by the mono-nuclear phagocytes. Numerous fibroblasts, together with polyblasts, are visible in the hbnn mass, and the vessels at the periphery of the damaged zone are now seen to be sending out offshoots which assist in the process ot absorption. These vascular buds grow out in various directions as little solid projections of cells; they then become channelled and torm the new but temporary meshwork.

After two to four days these processes are more clearly emphasized. By these processes we reach the stage where the fibrin mass and damaged tissues have been completely removed, and replaced by a temporary vascular and cellular tissue, known as granulation tissue (fig. 34, PL III.), which in turn has to give way to the more nrm , * nd differentiated fibrous tissue. By this time the skin epithelium may have grown over the wound.

After five to seven days we find the connective tissue cells taking the principal part in the building up of the new permanent tissue, lor at this stage there is an active proliferation of the fibroblasts. 1 hese cells of various shapes are seen in large numbers, mainly lying in a direction parallel to the new vessels and capillaries, which all run at right angles to, the wound surface. The branching pro- cesses of these cells apparently anastomose with one another and torm a delicate supporting network. It is from these cells that the fine fibrillar substance is formed, and from this stage onwards— eight to fifteen days— there is a steady increase in the new fibrils, giving more density to the new tissue. At the same time there is u u £u ?r° ut an alteration in the arrangement of the position of the fibroblasts. These become spindle shaped with their long axis more and more assuming a position at right angles to the vessels (tig. 34, PL III.) ; the two edges of the wound are thus more firmly bound _ together. As their fibrils become more developed they grad- ually form fibrous laminae which are laid down first in the deeper part of the wound. When this process has reached a certain stage and all the absorption necessary has occurred the new blood vessels, Irom the increasing pressure of the successive fibrous layers, gradually dwindle and become obliterated, i.e. at a period corresponding to

the condensation of the fibrous laminae and the disappearance of the cellular character of the granulation tissue. Thus is formed in the damaged area a permanent tissue known as scar tissue (fig. 35, PL III.). .

Fibrosis. — wnere a chronic inflammatory process has taken possession of an organ, or, let us say, has been located in periosteum or other fibrous part, there is a great tendency to the production of cicatricial fibrous tissue in mass. Thus it is laid down in large quantity in cirrhosis of the liver, kidney or lung, and reacts upon these organs by contracting and inducing atrophy. The term ” cirrhosis ” or ”

fibrosis ” is usually applied to such a condition of organs (figs. 36 and 37, PI. IV.), that of ” sclerosis ” is used when such a deposition of fibrous tissue occurs within the central nervous system. Gull and Sutton asserted that in particular states of body, and more especially i’n the condition associated with cirrhotic kidney, such a fibrosis becomes general, running, as they alleged it does, along the adventitia of arteries and spreading to their capillaries. They supposed that it was accompanied by a peculiar hyaline thickening of the arterial wall, usually of the tunica intima, and hence they termed the supposed diseased state ” arterio-capillary fibrosis,” and gave the fibrous substance the name ” hyaline-fibroid.” They held that the cirrhotic kidney is simply a local manifestation of a general fibrous disease. Their theory, however, has fallen into disfavour of late years.

Tumours or New Growths

The various definitions of the term ” new growth ” leave us with a definite conception of it as a new formation of tissue which appears to originate and to grow independently. We have already compared the body to a social community, each constituent element of which — the cell — lives its own life but subordinates its individuality to the good of the whole organism. The essential characteristic of a new growth is that this sub- ordination is lost and the tissue elements, freed from the normal mutual restraint of their interdependence, give way to an abnormal growth. All the hypotheses about the causation of new growths seek to explain the secret of this individuality or ” autonomy,” as they recognize that the mystery of the origin of the great majority of tumours would be solved if we could trace how or why the tissue elements in which they develop first took on this abnormal growth.

Tumours are divided into two main groups — innocent and malignant. These differ only in degree and there is no hard and fast line between them. Innocent tumours are usually sharply defined from the surrounding tissues, and show no tendency to spread into them or to pass by means of lymphatics and blood- vessels to neighbouring parts (fig. 38, PI. IV.). Malignant tumours, on the other hand, invade the adjacent tissues and pass by lymphatics and blood vessels to distant parts, where they set up secondary growths (fig. 39, PI. IV.).

Tumours appear to arise spontaneously, i.e. without evident cause; they may develop in association with prolonged irritation or injury (later referred to in more detail). To heredity, as an indirect or predisposing cause, has probably been assigned too great importance, and the many facts brought forward of the relative frequency of

cancer in members of one family only justify the conclusion that the tissue-resistance of certain families is lowered.

At the present time we have still before us the question, what is the essential cause of tumours (g.».) ? This, one of the most difficult problems of pathology, is being attacked by many able workers, who are all striving from different standpoints to elucidate the nature of these new formations, which spring from the normal tissues in which they develop and which they destroy. In spite of all the valuable research work that has been done within the last few years, the essential cause of new growths still remains unknown.

To the work carried on by the Imperial Cancer Research Fund in England, and to investigators in other countries, are due the present day scientific efforts made to systematize investigation and clear away many of the hypothetical speculations that have gathered round this most difficult subject. Their investigations on cancers found in the lower animals, and the successful transplantation of such growths into a new host of the same species (mice and rats), have greatly advanced our knowledge of the etiology of this disease.

Many of the hypotheses of the past put forward to explain cancer must be discarded, in view of tne facts brought to light by the comparative and experimental research of recent times. According to the hypothesis of Waldeyer and Thiersch there is perfect equi- librium between the normal epithelium and its supporting structure, the connective tissue, but with advancing age this balance is upset

owing to the connective tissue gradually losing its restraining power. The epithelial cells are then able to pass from their normal position, in consequence of which they proliferate and at the same time revert to a more primitive type of cell. In this way they give rise to a malignant new growth.

Cohnheim's hypothesis of " embryonic residues " provides that early in the development of the embryo some of the cells, or groups of cells, are separated from their organic continuity during the various foldings that take place in the actively growing embryo. The separated cells become intermingled with other tissue elements amongst which they lie dormant with their inherent power of proliferation in abeyance. At a later date in the life of the individual, by some unknown stimuli, they resume their active power of proliferation and so give rise to new growths.

The " tissue- tension " hypothesis of Ribbert is a combination of the

two foregoing. He holds that new growths arise, both before birth or at any subsequent period of life, by the separation of cells or clumps of cells from their normal position, and that in health there is a balance between the various tissues and tissue elements regulated by what he calls the ” tissue-tension ” of the part, i.e. that cells or groups of cells have a restraining power on one another which prevents any physiological over-activity.

From whatever cause the resisting power of the tissue elements is thus weakened, the invasion of other tissue elements is then allowed to take place. These being freed from the normal inhibiting power of the neighbouring elements, multiply and go on to the formation of a new growth. According to Ribbert it is the isolation, together with the latent capacity of isolated cells for unlimited pol iteration, that gives rise to new growths.

Hansemann’s ” anaplasia ” hypothesis seeks to find an explana- tion of the formation of new growths in the absence of the histo- logical differentiation of the cell associated with a corresponding increase in its proliferative power and a suspension, or loss, of its functional activity.

The greater the degree of anaplasia the more the tumour cells con- form in character and appearance to the embryonic type of cell and the more malignant is the new growth. A simple fibroma is a growth composed of fully formed fibrous tissue (fig. 40, PL IV.). The small round celled sarcoma is a malignant growth, and is composed of the primitive type of cell that goes to form fibrous tissue (fig. 41,

Them we have Beard’s ” germ-cell ” hypothesis, in which he holds that many of the germ-cells in the growing embryo fail to reach their proper position — the generative areas — and settle down and become quiescent in some somatic tissue of the embryo. They may at some later date become active in some way, and so give rise to a cellular proliferation that may imitate the structure in which they grow, so giving rise to new growths.

Some workers regard certain appearances in dividing cells found in cancer as evidence of a reversion of the somatic cell to the germ- cell type (heterotypical), otherwise found only in the process which results in the formation of an embryo. These appearances are probably due to a pathological mitosis, commonly found in cancer, in which there is an irregular diminution in the number of chromo- somes ; some are cast out and become degenerated or some pass over to one of the daughter cells, leaving a reduced number in the other, and thus give

rise to asymmetrical mitosis.

From the histological examination of tumour cells there is no evidence to show that they resemble the protozoal unicellular organisms in occasionally passing through a sexual process of re- production, i.e. that nuclear conjugation between cells ever takes place.

In recent years the successful experimental transplantation of new growths, occurring sporadically in white mice and rats, into animals of the same species, has thrown a fresh light on all the features of malignant growths. From these experiments it is shown that cells taken from these growths and introduced into animals of the same species give rise to a cancerous growth, whose cells have acquired unlimited powers of proliferation. They are direct lineal descendants of the cells introduced, and are in no way formed from the tissue cells of the host in which they are placed and grow.

Not only is this true of epithelial cells, but the connective tissue- cells of the supporting structure of cancerous growth, after repeated transplantation, may become so altered that a gradual evolution of apparently normal connective tissue into sarcomatous elements takes place, these giving rise to ” mixed tumours.” The sarcomatous development may even completely outgrow the epithelial elements and so form and continue to grow as a pure sarcoma.

The fact that it is possible to propagate these cells of one animal for years in other animals of the same species, without any loss of their vegetative vitality, suggests that this continued growth is kept up by a growth-stimulating substance present in the proper species of animal; this substance, however, has not the power of transforming the normal tissue into a cancerous one.

Henser, Bencke, Adami, Marchand and others have also put forward hypotheses to account for the origin of new growths. These observers maintain that the cells from some cause lose, or may never have had developed, their functional activity, and thus

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Fig. 30.— Anthracosis — coal-miner’s lung — showing excessive accumulation of carbon pigment in the lymphatic spaces around the vessels of the lung. (X 50 diam.)

Fig. 36.— Polylobular cirrhosis, or ” Gin-drinker’s Liver,” show- ing

well-formed fibrous overgrowth which has divided up the liver tissue into irregular masses and caused atrophic and degenerative changes in the liver cells. (X 24 diam.)

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Fig. 32. -Fibroblasts in young temporary granulation tissue. These are spindle shaped and have long processes. It is from these cells the permanent fibrous tissue is formed. (X 400 diam.)

Fig. 31.— Cells from inflammatory exudateshow- ing active phagocytosis. The mono-nuclear cells are ingesting and digesting many of the polymorphonuclear leucocytes. Note that these phagocytic cells are pushing out pro- toplasmic processes (pseudopodia) by which they grasp their victims. (X 1000 diam.)

Fig. 35. — Scar tissue m a healed wound. Note the disappearance of blood- vessels and that the cellular char- acter has diminished — the fibroblasts having now developed into well- formed fibrous tissue. (X 200 diam.)

Fig. 33. — Healing ab

young cellular and vascular granulation tissue, which separates the pus area (top of Fig.) from the muscle fibres seen at lower part of Fig. (X 60 diam.)

wall being separated and’ becoming atrophied by a slow fibrous overgrowth of the connective tissue. (X 300 diam.)

elements to the new blood-vessels in the young temporary tissue. (X 200 diam.)

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Fig. 22.— Tubercle bacilli in tissues from human lung in a case of acute phthisis. The bacilli are seen lying as short rods, singly and in clumps, in the caseous and degenerated tissues of the lung, (x iooo diam.)

Fig. 25. — Acute abscess in the kidney. A small cellular area formed by emigrated polymorpho- nuclear leucocytes surrounding a central mass of bacteria, (x 75 diam.)

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Fig. 23.— Inflammatory cells from acute exudate. Numerous polymorpho- nuclear leucocytes and a few mono- nuclear cells, one of which has taken up a leucocyte into its interior (phagocytosis). (x 600 diam.)

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Fig. 28. — Muscle fibre greatly increased in size, from hypertrophied heart. (x 400 diam.)

Fig. 24. — Symmetrical gangrene of toes (3 months' dura- tion), showing the sharp " line -of demarcation " between the mummified toes and the more healthy

Fig. 29. — Muscle fibres from atro- phied heart. (Contrast Fig. 28.) (x 400 diam.)

Fig. 26.— Fatty degeneration of heart from case of perni- cious anaemia. Many of the muscle fibres show numerous droplets of oil seen as dark round granules. (x 200 diam.)

Fig. 27. — Fatty degeneration of kidney from case of starvation. Black droplets of oil are seen in the epithelial cells lining the secreting tubules. (x 250 diam.)

acquire the activity of growth. The descendants of such cells will become more and more undifferentiated, thereby developing an increased vegetative activity.

Oertel finds an explanation of this want of complete cell-differentiation, loss of function, and acquired vegetative activity in the non-homogeneous character of the nuclear chromatin elements of the cell, and maintains that the different properties of the cell are carried and handed down by the different orders of chromatin loops. We have analogies to this in the two nuclei of some of the protozoa, the one being solely for the purpose of propagation, the other being associated with the functional activities of the cell. Oertel thinks that in man we have these two different functions carried on by the one nucleus containing both chromatin orders. If, from whatever cause, any of the chromatin loops belonging to the functional order be lost the descendants of such a cell, being unable to restore these loops, will be minus the functional attributes associated with the lost elements. These, having the full equip- ment of the vegetative order, will now develop the inherent power of proliferation to a greater or lesser extent.

The foregoing hypotheses have all sought the origin of new growths in some intrinsic cause which has altered the characters of the cell or cells which gave rise to them, but none of them explain the direct exciting cause. The parasitic hypothesis postulates the invasion of a parasite from without, thus making a new growth an infective process. Many cancer-parasites have been described in cancerous growths, including bacteria, yeasts and protozoa, but the innumerable attempts made to demonstrate the causal infective organism have all completely failed.

It is well known that cancer may develop in places where there has been chronic irritation ; an example may be found in cancer of the tongue following on prolonged irritation from a jagged tooth. Clay-pipes may also give rise to cancer of lips in males in England, while cancer of the mouth of both sexes is common in India where chewing a mixture of betel leaves, areca-nut, tobacco and slaked lime is the usual practice. In the case of the squamous epithelial cancer of the anterior abdominal wall found so frequently in the natives of Kashmir, the position of the cancer is peculiar to this people, and is due to the chronic irritation following on repeated burns from using the ” kangri ” — a small earthenware vessel containing a charcoal fire enclosed in basket-work, and suspended round the waist, to assist in maintaining warmth in the extreme cold of the hills of Kashmir.

The irritant may be chemical, as is seen in the skin cancers that develop in workers in paraffin, petroleum, arsenic and aniline. However close the relationship is between chronic irritation and the starting of cancer, we are not in a position to say that irritation,

physical or chemical, by itself can give rise to new growths. It may merely act locally in some way, and so render that part susceptible to unknown tissue stimuli which impart to the cells that extraordinary power of proliferation characteristic of new growth.

At the present time we are quite uncertain what is the ultimate cause of new growths; in all probability there may be one or more aetiological factors at play disturbing that perfect condition of equilibrium of normal tissues. A defect in co-ordination allows the stimulated active vegetative cellular elements, or the more fully differentiated tissue, to over-develop and so form tumours, simple or malignant.

Other Tissue Products

Mucoid. — In many pathological conditions we have degenera- tive products of various kinds formed in the tissues. These substances may be formed in the cells and given out as a secre- tion, or they may be formed by an intercellular transformation. In the mucinoid conditions, usually termed ” mucoid ” and ” colloid ” degenerations, we have closely allied substances which, like the normal mucins of the body, belong to the gluco- proteids, and have in common similar physical characters. There is neither any absolute difference nor a constancy in their chemical reactions, and there can be brought about a transition of the ” colloid ” material into the ” mucoid,” or conversely. By mucoid is understood a soft gelatinous substance containing mucin, or pseudomucin, which is normally secreted by the epi- thelial cells of both the mucous membranes and glands. In certain pathological conditions an excessive formation and discharge of such material is usually associated with catarrhal changes in the epithelium. The desquamated cells containing this jelly-like substance become disorganized and blend with the secretion. Should this take place into a closed gland space it will give rise to cysts, which may attain a great size, as is seen in the ovarian adenomata. In some of the adenoid cancers of the alimentary tract this mucoid material is formed by the epithelial cells from which it flows out and infiltrates the

surrounding tissues; both the cells and tissues appear to be transformed into this gelatinous substance, forming the so-called “colloid cancer” (fig. 42, PL IV.).

The connective tissue is supplied normally with a certain amount 1 of these mucinoid substances, no doubt acting as a lubricant. In many pathological conditions this tissue is commonly found to undergo mucoid or myxomatous degeneration, which is regarded as a reversion

to a closely similar type — that of foetal connective tissue (fig. 43, PL IV). These changes are found in senile wasting, in metaplasia of cartilage, in many tumours, especially mixed growths of the parotid gland and testicle, and in various infiam-. matory granulation ulcers. In the wasting of the thyroid gland in myxoedema, or when the gland is completely removed by opera- tion, myxomatous areas are found in the subcutaneous tissue of the skin, nerve-sheaths, &c.

Colloid. — This term is usually applied to a semi-solid substance of homogeneous and gelatinous consistence, which results partly from excretion and partly from degeneration of cellular struc- tures, more particularly of the epithelial type. These cells become swollen by this translucent substance and are thrown off into the space where they become fused together, forming colloid masses. This substance differs from the mucins by being precipitated by tannic acid but not by acetic acid, and being endowed with a higher proportion of sulphur.

In the normal thyroid there is formed and stored up in the spaces this colloid material. The enlarged cystic goitres show, in the distended vesicles, an abnormal formation and retention of this substance (fig. 44, PL V.). Its character is readily changed by the abnormal activities which take place in these glands during some of the acute fevers; the semi-solid consistence may become mucoid or even fluid.

Serous degeneration is met with in epithelial cells in inflammatory conditions and following on burns. The vitality of these cells being altered there is imbibition and accumulation of watery fluid in their cytoplasm, causing swelling and vacuolation of the cells. The bursting of several of these altered cells is the method by which the skin vesicles are formed in certain conditions.

Glycogen is formed by the action of a ferment on the carbo- hydrates — the starches being converted into sugars. The sugars are taken up from the circulation and stored in a less soluble form — known as ” animal starch ” — in the liver and muscle cells; they play an important part in the normal meta- bolism of the body. The significance of glycogen in large amounts, or of its absence from the tissues in pathological con- ditions, is not clearly understood. It is said to be increased in saccharine diabetes and to be greatly diminished in starvation and wasting diseases.

Fat. — Fatty accumulations in the tissues of the body are found in health and in pathological conditions; these are usually recognized and described as fatty infiltrations and fatty degenera- tions, but there are intermediate conditions which make it difficult to separate sharply

these processes.

The fatty accumulations known as infiltrations (figs. 45 and 46, PL V.) are undoubtedly the result of excessive ingestion of food material containing more neutral fats than the normal tissues can oxidize, or these, as a result of defective removal owing to enfeebled oxidative capacities on the part of the tissues, become stored up in the tissues.

In acute and chronic alcoholism, in phthisis, and in other diseases this fatty condition may be very extreme, and is com- monly found in association with other tissue changes, so that probably we should look on these changes as a degeneration.

Adiposity or obesity occurs when we have an excessive amount of fat stored in the normal connective-tissue areas of adipose tissue. It may be caused by various conditions, e.g. over- nutrition with lack of muscular energy, beer-drinking, castration, lactation, disturbed metabolism, some forms of insanity, and may follow on some fevers.

Fatty degeneration is a retrogressive change associated with the deposit of fatty granules or globules in the cytoplasm, and is caused by disorganized cellular activity (figs. 26 and 27, PL II.). It is frequently found associated with, or as a sequel to, cloudy swelling in intense or prolonged toxic conditions. Over and above the bacterial intoxications we have a very extreme degree of fatty degeneration, widely distributed throughout the tissues,

which is produced by certain organic and inorganic poisons; it is seen especially in phosphorus and chloroform poisoning. The changes are also common in pernicious anaemia, advanced chlorosis, cachexias, and in the later stages of starvation. In diabetes mellitus, in which there is marked derangement in metabolism, extreme fatty changes are occasionally found in the organs, and the blood may be loaded with fat globules. This lipoemic condition may cause embolism, the plugging especially occurring in the lung capillaries.

Fatty degeneration is common to all dead or decaying tissues in the body, and may be followed by calcification.

Autolysis is a disintegration of dead tissues brought about by the action of their own ferments, while degeneration takes place in the still living cell. The study of autolytic phenomena which closely

simulates the changes seen in the degenerating cell has thrown much light on these degenerative processes.

These conditions may be purely physiological, e.g. in the mammary gland during lactation or in sebaceous glands, caused by increased functional activity. It may follow a diminished functional activity, as in the atrophying thymus gland and in the muscle cells of the uterus after parturition'.

Any of the abnormal conditions that bring about general or local defective nutrition is an important factor in producing fatty degeneration.

The part played by fats and closely allied compounds in normal and abnormal metabolism need not here be discussed, as the subject k too complex and the views on it are conflicting. It will be sufficient to state briefly what appears to be the result of recent investigation.

The neutral fats are composed of fatty acids and glycerin. In the physiological process of intestinal digestion, the precursors of such fats are split up into these two radicles. The free fatty acid radicle then unites with an alkali, and becomes transformed into a soluble soap which is then readily absorbed in this fluid condition by the epithelial cells of the mucous membrane. There it is acted on by ferments (Upases) and converted into neutral fat, which may remain in the cell as such. By the reverse action on the part of the same ferments in the cell, these neutral fats may be redissolved and pass into the lacteals. _

Many cells throughout the body contain this ferment. _ The soluble soaps which are probably conveyed by the blood will be quickly taken up by such cells, synthetized into neutral fats, and stored in a non-diffusible form till required. The fat in this con- dition is readily recognized by the usual microchemical and stain- ing reactions. As fat is a food element essential to the carrying out of the vital energies of the cell, a certain amount of fatty matter must be present, in a form, however, unrecognizable by our present microchemical and staining methods.

Some investigators hold that the soaps may become combined with albumin, and that on becoming incorporated with the cyto- plasm they can no longer be distinguished as fat. If from some cause the cell be damaged in such a way as to produce disintegra- tion of the cytoplasm, there will be a breaking down of that com- bination, so that the fat will be set free from the complex protein molecule in which it was combined as a soap-albumin, and will become

demonstrable by the usual methods as small droplets of oil. This splitting up of the fats previously combined with albumin in the cell by the action of natural ferments — lipases — and the setting free of the fats under the influence of toxins represent the normal and the pathological process in the production of so-called fatty degeneration.

Calcification. — Calcification and calcareous deposits are extremely common in many pathological conditions.

There are few of the connective tissues of the body which may not become affected with deposits of calcareous salts (fig. 47, PI. V.). This condition is not so frequently seen in the more highly differentiated cells, but may follow necrosis of secreting cells, as is found in the kidney, in corrosive sublimate poisoning and in chronic nephritis. These conditions are quite distinct from the normal process of ossification as is seen in bone.

Many theories have been advanced to explain these processes, and recently the subject has received considerable attention. The old idea of the circulating blood being supersaturated with lime salts which in some way had first become liberated from atrophying bones, and then deposited, to form calcified areas in different tissues will have to be given up, as there is no evidence that this ” metastatic ” calcification ever takes place. In all probability no excess of soluble lime salts in the blood or lymph can ever be deposited in healthy living tissues

At the present day both experimental and histological investi- gations seem to indicate that in the process of calcification there is a combination of the organic substances present in degenerated tissues, or in tissues of low vitality, with the lime salts of the body. From whatever cause the tissues become disorganized and undergo fatty degeneration, the fatty acids may become liberated and com- bine with the alkalies to form potash and soda soaps.

The potash and soda is then gradually replaced by calcium to form an insoluble calcium soap. The interaction between the soaps, the phosphates and the carbonates which are brought by the blood and lymph to the part results in the weaker fatty acids being re- placed by phosphoric and carbonic acid, and thus in the formation of highly insoluble calcium phosphate and carbonate deposits in the disorganized tissues.

Pathological Pigmentations. — These pigmentary changes found in abnormal conditions are usually classified under (i) Albumi- noid, (2) Haematogenous, (3) Extraneous.

1. The normal animal pigments and closely allied pigments are usually found in the skin, hair, eye, supra-renal glands, and in certain nerve cells. These represent the albuminoid series, and are probably elaborated by the cells from albuminous substances through the influence of specific ferments, This pigment is usually intracellular, but may be found lying free in the intercellular substance, and is generally in the form of fine granules of a yellowish-brown or brown-black colour. In the condition known as albinism there is a congenital deficiency or entire absence of pigment. Trophic and nervous conditions sometimes cause localized deficiency of pigment which produces white areas in the skin.

Excessive pigmentation of tissue cells (fig. 48, PI. V.) is seen in old age, and usually in an accompaniment of certain atrophic processes and functional disorders. Certain degenerative changes in the supra-renal glands may lead to Addison's disease, which is characterized by an excessive pigmentary condition of the skin and mucous membranes. This melanin pigment is found in certain tumour growths, pigmented moles of the skin, and espe- cially in melanatic sarcomata (fig. 49, PL V.) and cancer. The action of the sun's rays stimulates the cells of theskin to increase the pigment as a protection to the underlying tissues, e.g. summer bronzing, " freckles," and the skin of the negro.

The coloured fats, or lipochromes, are found normally in some of the cells of the internal organs, and under certain pathological conditions. This pigment is of a light yellow colour, and contains a fatty substance that reacts to the fat-staining reagents. Little is known regarding this class of pigment.

2. Haematogenous pigments are derived from the haemo- globin of the red blood corpuscles. These corpuscles may break down in the blood vessels, and their colouring material (haemo- globin) is set free in the serum. But their disintegration is more commonly brought about by " phagocytosis " on the part of the phagocytic cells in the different organs concerned with the function of haemolysis, i.e. the liver, spleen, haemolymph glands and other tissues.

The ˆhaemoglobin may be transformed into haematoidin, a pigment that does not contain iron, or into a pigment which does contain iron, haemosiderin.

The haematoidin pigment may vary in colour from yellowish or orange-red to a ruby-red, and forms granular masses, rhombic prisms or acicular crystals. It can be formed independently of cell activity,

nor does it require oxygen. These crystals are extremely resistant to absorption, are found in old blood clots, and have been known to persist in old cerebral haemorrhages after many years. Haematoidin in normal metabolism is largely excreted by the liver in the form of bilirubin.

Haemosiderin, an iron-containing pigment (probably an hydrated ferrous oxide), is found in more or less loose combination with protein substances in an amorphous form as brownish or black granules. Cellular activity and oxygen appear to be essential for its development; it is found usually in the cells of certain organs, or it may be deposited in the intercellular tissues. _ Haemosiderin in the normal process of haemolysis is stored up in the cells of certain organs until required by the organism for the formation of fresh haemoglobin. In diseases where haemolysis is extreme, particularly in pernicious anaemia, there are relatively large quanta ties occasionally as much as ten times the normal amount of haemosiderin deposited in the liver.

In hepatogenous pigmentation (icterus or jaundice) we_ have the iron-free pigment modified and transformed by the action of the liver cells into bile pigment (bilirubin). If the discharge of this

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Fig. 38.— Myoma uteri. A simple fibro-myomatous tumour growing in the wall of the uterus. Note the sharp line of demarcation between the growth and the tissue in which it is growing. (x 24 diam.)

Fig. 40.— Fibroma. A simple tumour composed of well -differentia ted fibrous tissue. The fibres are arranged in irregular bundles forming a dense firm tissue, (x 100 diam.)

Fig. 39. — Secondary cancerous growth in heart wall. Note that the malignant cells are invading and destroying the muscle fibres of the heart. (X 75 diam.)

Fig. 41. — Small round-celled sarcoma. _ A malignant tumour composed of undifferentiated masses of cells. These cells are readily carried to distant parts and give rise to secondary growths, (x 100 diam.)

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Fig. 42. — ” Colloid cancer of stomach “showing the cancer cells in the spaces being transformed into the “colloid material.” (x 75 diam.)

Fig. 43.— Myxoma showing the stellate and branch- ing cells with their processes interlacing and forming a network. The mucinpid substance is contained in the fine meshes, (x 100 diam.)

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Fig. 44. — Thyroid gland — cystic goitre. The gland spaces vary in size and many may show marked cystic formation. These vesicles are filled with the colloid material. (x 90 diam.)

Fig. 45.— Liver. Fatty Infiltration. Tl

are seen to contain a large globule of fat which pushes the cell nucleus to one side— giving the signet-ring appearance. (x 250 diam.)

Fig. 50. — Phagocytic cells fin sputum) Fig. which have taken into their proto- ;

plasm particles of carbon pigment, { x 5 00 diam.)

47-— Pudic artery showing calcified areas Fig. 46.— Heart. Fatty Infiltration. The fat f W ?T C 1 lilar f COat °i tjf ˆ , These cells are increased and infiltrate the con-

degenerated parts are darkly stained owing – . .

to the calcareous particles having a strong affinity for the haemotoxylin stain. (x 35 diam.)

nectjve tissue between the bundles of muscle fibres. These are pressed upon and become atrophied, and may ultimately be replaced by adipose tissue. (x 40 diam.)

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Fig. 49. — Melanotic sarcoma. Many of these malignant ceils develop

and accumulate in their protoplasm granules of melanin pigment. (x 300 diam.)

Fig. 48. — Brown atrophy of heart. The muscle fibres show the pigment granules, which are of a light yellow colour, situated specially at the poles of the fibre nucleus and extending short distance.

(x 400 diam.)

Fig. 51. Liver, waxy. The swollen waxy capillaries are pressing on the columns of liver cellsand are causing marked atrophy, (x 75 diam.)

pigment from the liver by the normal channels be prevented, as by obstruction of the main bile ducts, the bile will accumulate until it regurgitates or is absorbed into the lymph and blood vessels, and is carried in a soluble state throughout the tissues, thus producing a general staining — an essential characteristic of jaundice.

3. In extraneous pigmentation we have coloured substances either in a solid or fluid state, gaining entrance into the organism and accumulating in certain tissues. The channels of entrance are usually by the respiratory or the alimentary tract, also by the skin. Pneumonokoniosis is due to the inhalation of minute particles of various substances — such as coal, stone, iron, steel, &c. These foreign particles settle on the lining membranes, and, by the activity of certain cells (fig. 50, PL V. and fig. 30, PL III.), are carried into the tissues, where they set up chronic irritation of a more or less serious nature according to the nature of the inhaled particles.

Certain metallic poisons give rise to pigmentation of the tissues, e.g. in the blue line on the gums around the roots of the teeth due to the formation of lead sulphide, or in chronic lead poisoning, where absorption may have taken place through the digestive tract, or, in the case of workers in lead and lead paints, through the skin. Prolonged ingestion of arsenic may cause pigmentary changes in the skin. If silver nitrate salts be administered for a long period as a medication, the skin that is exposed to light becomes of a bluish-grey colour, which is extremely persistent. These soluble salts combine with the albumins in the body, and are deposited as minute granules of silver albuminate in the connective tissue of the skin papillae, serous membranes, the intima of arteries and the kidney. This condition is

known as argyria.

Various coloured pigments may be deposited in the tissues through damaged skin surface — note, for example, the well-known practice of ” tattooing.” Many workers following certain occu- pations show pigmented scars due to the penetration of carbon and other pigments from superficial wounds caused by gunpowder, explosions, &c.

Hyaline. — This term has been applied to several of the trans- parent homogeneous appearances found in pathological condi- tions. It is now commonly used to indicate the transparent homogeneous structureless swellings which are found affecting the smaller arteries and the capillaries. The delicate connective- tissue fibrillae of the inner coat of the arterioles are usually first and most affected. The fibrils of the outer coat also show the change to a less extent, while the degeneration very rarely spreads to the middle coat. This swelling of the walls may partly or completely occlude the lumen of the vessels.

_ Hyaline degeneration is found in certain acute infective condi- tions ; the toxins specially act on these connective-tissue cell elements. It also seems to be brought about by chronic toxaemias, e.g. in subacute and chronic Bright’s disease, lead poisoning and other obscure conditions. The hyaline material, unlike the amyloid, does net give the metachromatic staining reactions with methylene- violet or iodine. The chemical constitution is not certain. The substance is very resistant to the action of chemical reagents, to digestion, and possibly belongs to the glyco-proteids.

Amyloid. — The wax-like or amyloid substance has a certain resemblance to the colloid, mucoid and hyaline. It has a firm gelatinous consistence and wax-like lustre, and, microscopically, is found to be homogeneous and structureless, with a trans- lucency like that of ground-glass. Watery solution of iodine imparts to it a deep mahogany-brown colour; iodine and sulphuric acid occasionally, but not always, an azure-blue, methyl- violet, a brilliant rose-pink and methyl-green gives a reaction very much like that of methyl-violet, but not so vivid. The reaction with iodine is seen best by direct light; the reactions with the other substances are visible only by transmitted light. The name ” amyloid ” was applied to it by Virchow on account of the blue reaction which it gives occasionally with iodine and sulphuric acid, resembling that given with vegetable cellulose. It is now known to have nothing in common with vegetable cellulose, but is regarded as one of the many albuminoid substances existing in the body under pathological conditions. Virchow’s conjecture as to the

starchy nature of the substance was disproved by Friedrich and Kekule, who cpnfirmed Professor Miller's previous finding as to its albuminous or protein nature. Oddi in 1894 isolated from the amyloid liver a substance

which Schmiedeberg had previously obtained from cartilage and named " chondroitinic-sulphuric acid " (Chondrottinschwefel- saure). It also occurs in bones and elastic tissue, but is not present in the normal human liver. Oddi does not regard it as the essential constituent of amyloid, chiefly because the colour reactions are forthcoming in the residuum after the substance has been removed, while the substance itself does not give these reactions. Quite likely the amyloid may be a combination of the substance with a proteid. The soda combination of the acid as obtained from the nasal cartilage of pigs had the composition C 18 H25Na 2 NSOi7.

Krawkow in 1897 clearly demonstrated it to be a proteid in firm combination with chrondroitin-sulphuric acid. As probably the protein constituent varies in the different organs, one infers that this will account for the varying results got from the analysis of the substance obtained from different organs in such cases.

This amyloid substance is slowly and imperfectly digested by pepsin — digestion being more complete with trypsin and by autolytic enzymes.

There is no evidence that this material is brought by the circulating blood and infiltrates the tissues. It is believed rather that the condition is due to deleterious toxic substances which act for prolonged periods on the tissue elements and so alter their histon proteins that they combine in situ with other protein substances which are brought by the blood or lymph.

Amyloid develops in various organs and tissues and is commonly associated with chronic phthisis, tubercular disease of bone and joints, and syphilis (congenital and acquired). It is known to occur in rheumatism, and has been described in connexion with a few other diseases. A number of interesting experiments, designed to test the relationship between the condition of suppuration and the production of amyloid, have been made of late years. The animal most suitable for experimenting upon is the fowl, but other animals have been found to react. Thus Krawkow and Nowak, employing the frequent subcutaneous injection of the usual organ- isms of suppuration, have induced in the fowl the deposition within the tissues of a homogeneous substance giving the colour reactions of true amyloid.

When hardened in spirit, however, the greater part of this experimental amyloid in the fowl vanishes, and the reactions are not forthcoming. They were unable to verify any direct connexion between its production and the organism of tubercle. These observations have been verified in the rabbit, mouse, fowl, guinea-pig and cat by Davidsohn, occasionally in the dog by Lubarsch; and confirmatory observations have also been made by Czerny and Maximoff. Lubarsch succeeded in inducing it merely by the subcutaneous injection of turpentine, which produces its result, it is said, by exciting an abscess. Nowak, however, found later that he could generate it where the turpentine failed to induce suppuration; he believes that it may arise quite apart from the influence of the organisms of suppuration, that it is not a biological product of the micro-organisms of disease, and also that it has nothing to do with emaciation. It is a retrogressive process producing characteristic changes in the fine connective- tissue fibrils. The change appears to begin in the fibrils which lie between the circular muscle fibres of the middle coat of the smaller arterioles and extends both backwards and forwards along the vessels. It spreads forwards, affecting the supporting fibres out- side the epithelium of the capillaries, and then passes to the connective-tissue fibrils of the veins. The secreting cells never show this change, although they may become atrophied or destroyed by the pressure and the disturbance of nutrition brought about by the swollen condition of the capillary walls. The circulation is little interfered with, although the walls of the vessels are much thickened by the amyloid material (fig. 51, PI. V.).

Amyloid Bodies. — These are peculiar bodies which are found in the prostate, in the central nervous system, in the lung, and in other localities, and which get their name from being very like starch-corpuscles, and from giving certain colour reactions closely resembling those of vegetable cellulose or even starch itself. They are minute structures having a round or oval shape, concentrically striated, and frequently showing a small nucleus-like body or cavity in their centre. Iodine gives usually a dark brown reaction, some- times a deep blue; iodine and sulphuric acid almost always call forth an intense deep blue reaction; and methyl- violet usually a brilliant pink, quite resembling that of true amyloid. They are probably a degeneration-product of cells.

Spurious Amyloid. — If a healthy spinal cord be hung up in spirit for a matter of six months or more, a glassy substance develops within it quite like true amyloid. It further resembles true amyloid

in giving all its colour reactions. The reaction with methyl- violet, however, differs from that with true amyloid in being evanescent.

Response of Tissues to Stimulation

A stimulus may be defined as every change of the external agencies acting upon an organism; and if a stimulus come in contact with a body possessing the property of irritability, i.e. the capability of reacting to stimuli, the result is stimulation (Verworn). Stimuli comprise chemical, mechanical, thermal, photic and electrical changes in the environment of the organism. A stimulus may act on all sides and induce a general effect with- out direction of movement, but in the production of movement in a definite direction the stimulus must be applied unilaterally. Stimuli applied generally, not unilaterally, in most cases induce increased divisibility of the cells of the part.

Thus the poison of various insects induces in plants the cellular new formation known as a gall-nut; a foreign body implanted in a limb may become encysted in a capsule of fibrous tissue; septic matter introduced into the abdomen will cause proliferation of the lining endo(epi)thelium; and placing an animal (salamander, Galeotti) in an ambient medium at a higher temperature than that to which it is accustomed naturally, increases the rapidity of cell- division of its epithelium with augmentation of the number of karyokinetic figures. Hair and some other like structures grow luxuriantly on a part to which there is an excessive flux of blood. Bone (e.g. drill-bones) may develop in a soft tissue with no natural bone-forming tendencies, as a result of interrupted pressure, or a fatty tumour may arise in the midst of the natural subcutaneous fat in the same circumstances.

Among stimuli acting unilaterally, perhaps none has proved more interesting, in late times, than what is known as Chetnio- taxis. By it is meant the property an organism endowed with the power of movement has to move towards or away from a chemical stimulus applied unilaterally, or, at any rate, where it is applied in a more concentrated state on the one side than on the others, and more particularly where the concentration increases gradually in one direction away from the living organism acted upon. Observed originally by Engelmann in bacteria, by Stahl in myxomycetes, and by Pfeffer in ferns, mosses, &c, it has now become recognized as a widespread phenomenon. The influence of the chemical substance is either that of attraction or repulsion, the one being knowD as ,posit>«?. the other as negative chemiotaxis.

The female organs of certain cryptogams, for instance, exert a positive chemiotactic action upon the spermatozoids, and probably, as Pfeffer suggests, the chemical agent which exerts the influence is malic acid. No other substance, at least, with which he experi- mented had a like effect, and it is possible that in the archegonium which contains the ovum malic acid is present. Massart and Bordet, Leber, Metchnikoff and others have studied the pheno- menon in leucocytes, with the result that while there is evidence of their being positively chemiotactic to the toxins of many pathogenic microbes, it is also apparent that they are negatively influenced by such substances as lactic acid.

From a pathological point of view the subject of chemiotaxis must be considered along with that of phagocytosis. Certain free mobile cells within the body, such as blood-leucocytes, as well as others which are fixed, as for instance the endothelium of the hepatic capillaries, have the property of seizing upon some kinds of particulate matter brought within their reach. Within a quarter of an hour after a quantity of cinnabar has been injected into the blood of the frog nearly every particle will be found engulfed by the protoplasm of the leucocytes of the circulating blood. Some bacteria, such as those of anthrax, are seized upon in the same manner, indeed; very much as small algae and other particles are incorporated and devoured by amoeba. Melanine particles formed in the spleen in malaria, which pass along with the blood through the liver, are appropriated by the endothelial cells of the hepatic capillaries, and are found embedded within their substance. If the particle enveloped by the protoplasm be of an organic nature, such as a bacterium, it undergoes digestion, and ultimately becomes destroyed, and accordingly the term ” phagocyte ” is now in common use to indicate cells having the above properties. This phagocytal action of certain cells of the body is held by Metchnikoff and his followers to

have an important bearing on the pathology of immunity. Phagocytes act as scavengers in ridding the body of noxious particles, and more especially of harmful bacteria.

A further application of the facts of chemiotaxis and phago- cytosis has been made by Metchnikoff to the case of Inflammation. It is well known that many attempts to define the process of inflammation have been made from time to time, all of them more or less unsatisfactory. Among the latest is that of Metchnikoff: ” Inflammation generally,” he says, ” must be regarded as a phagocytic reaction on the part of the organism against irritants. This reaction is carried out by the mobile phagocytes sometimes alone, sometimes with the aid of the vascular

phagocytes, or of the nervous system." Given a noxious agent in a tissue, such, let us say, as a localized deposit of certain bacteria, the phago- cytes swarm towards the locality where the bacteria have taken up their residence. They surround individual bacteria, absorb them into their substance, and ultimately destroy them by diges- tion. The phagocytes are attracted from the blood vessels and elsewhere towards the noxious focus by the chemiotaxis exerted upon them by the toxins secreted by the bacteria contained within it. The chemiotaxis in this instance is positive, but the toxins from certain other bacteria may act negatively; and such bacteria are fraught with particular danger from the fact that they can spread through the body unopposed by the phagocytes, which may be looked upon as their natural enemies.

Natural Protection against Parasitism

The living organism is a rich storehouse of the very materials from which parasites, both animal and vegetable, can best derive their nourishment. Some means is necessary, therefore, to protect the one from the encroachments of the other. A plant or animal in perfect health is more resistant to parasitical invasion than one which is ill-nourished and weakly. Of a number of plants growing side by side, those which become infected with moulds are the most weakly, and an animal in low health is more subject to contagious disease than one which is robust. Each organism possesses within itself the means of protection against its parasitical enemies, and these properties are more in evidence when the organism is in perfect health than when it is debilitated.

One chief means employed by nature in accomplishing this object is the investment of those parts of the organism liable to be attacked with an armour-like covering of epidermis, periderm, bark, &c. The grape is proof against the inroads of the yeast- plant so long as the husk is intact, but on the husk being injured the yeast-plant finds its way into the interior and sets up vinous fermentation of its sugar. The root of the French vine is attacked by the Phylloxera, but that of the American vine, whose epidermis is thicker, is protected from it. The larch remains free from parasitism so long as its covering is intact, but as soon as this is punctured by insects, or its continuity interfered with by cracks or fissures, the Peziza penetrates, and before long brings about the destruction of the branch. So long as the epidermis of animals remains sound, disease germs may come in contact with it almost with impunity, but immediately on its being fissured, or a larger wound made through it, the underlying parts, the blood and soft tissues, are attacked by them. A very remarkable instance of an

acquired means of protecting a wound against parasitical invasion is to be found in granulations. Should these remain unbroken they constitute a natural barrier to the penetration of most patho- genic and other forms of germ-life into the parts beneath. Bacteria of various kinds which alight upon their surfaces begin to fructify in abundance, but are rapidly destroyed as they burrow deeply. This is accomplished by a twofold agency, for while numbers of them are seized upon by the granulation phagocytes, others are broken up and dissolved by the liquid filling the granulation inter- spaces (Afanassieff). This latter, or histolytic, property is not con- fined to the liquid of granulations ; normal blood-serum possesses it to a certain extent, and under bacterial influence it may become very much exalted. Jurgeliinas makes out that when an animal is rendered immune to a particular micro-organism this histolytic property becomes exalted.

Dropsy

During conditions of health a certain quantity of lymphy liquid is constantly being effused into the tissues and serous cavitier of the body, but in the case of the tissues it never accumulates to excess, and in that of the serous cavities it is never more than

sufficient to keep them moist. When any excessive accumula- tion takes place the condition is known as ” hydrops ” or ” dropsy.” A ” transudate ” is a” liquid having a composition resembling that of blood-serum, while the term ” exudate ” is applied to an effused liquid whose composition approaches that of the blood-plasma in the relationship of its solid and liquid parts, besides in most cases containing numbers of colourless blood-corpuscles. Exudates are poured out under inflammatory conditions, while none of the truly dropsical effusions are of inflammatory origin; and hence the class of exudates, as above denned, may be rejected from the category of liquids we are at present considering. Where the dropsical condition is more or less general the term ” anasarca ” is applied to it; if the tissues are infiltrated locally the term ” oedema ” is employed; and various names are applied, with a local significance, to dropsies of individual parts or cavities, such as ” hydro thorax,” ” hydro- peritoneum ” or ” ascites,” ” hydrocephalus,” and so on. In ” anasarca ” the tissues which suffer most are those which are peculiarly lax, such as the lower eyelids, the scrotum, and the backs of the hands and feet. It is

invariably the result of some cause acting generally, such as renal disease, valvular defect of the heart, or an impoverished state of the blood; while a mere oedema is usually dependent upon some local obstruction to the return of blood or lymph, or of both, the presence of parasites within the tissue, such as the filaria sanguinis hominis or trichina spiralis, or the poisonous bites of insects. Dropsy of the serous cavities is very commonly merely part of a general anasarca, although occasionally it may be, as in the case of ascites, the sequel to an obstruction in the venous return. Dropsical liquids are usually pale yellow or greenish, limpid, with a saltish taste and alkaline reaction, and a specific gravity ranging from 1005 to 1024. They all contain albumen and throw down a precipitate with heat and nitric acid. None of them, in man, coagulates spontaneously, although they contain fibrinogen. The addition of some of the liquid squeezed out from a blood-clot, of the squeezed blood-clot itself, or of a little blood-serum, is sufficient to throw down a fibrinous coagulum (Buchanan), evidently by these substances supplying the fibrin-ferment. The proteid constituents are very much like those of blood-serum, although they never come up to them in amount (Runeberg). The quantity of proteid matter in a purely dropsical effusion never amounts to that of an inflammatory exudation (Lassar). Certain peculiar substances, probably degenerative products, some of them reducing copper, are occasionally met with. The liquid of ascites sometimes contains chyle in abundance (hydrops lacteus), the escape having taken place from a ruptured receptaculum

chyli.

In a given case of anasarca due to a cause acting generally, it will be found that the liquid of the pleural cavity always contains the highest percentage of proteid, that of the peritoneal cavity comes next, that of the cerebral ventricles follows this, and the liquid of the subcutaneous areolar tissue contains the lowest. The reason of this is apparently that the negative pressure of the pleural, and partly of the peritoneal, cavity tends to aspirate a liquid relatively thicker, so to speak, than that effused where no such extraneous mechanism is at work (James).

The subject of the conditions under which dropsical liquids are poured out opens up a very wide question, and one about which there is the greatest diversity of opinion. It turns in part, but in part only, upon the laws regulating the effusion of lymph, and physiologists are by no means at one in their conclusions on this subject. Thus Ludvvig was of opinion that the lymph-flow is dependent upon two factors, first, difference in pressure of the blood in the capillaries and the liquid in the plasma spaces outside ; and, secondly, chemical interchanges

setting up osmotic currents through the vessel-walls. His results, so far, have been confirmed by Starling, who finds that the amount of lymph-flow from the thoracic duct is dependent upon difference in pressure. It varies with the increase of the intracapillary or decrease of the extra- capillary pressure, and is also in part regulated by the greater or lesser permeability of the vessel walls. Heidenhain, on the other hand, rejected entirely the filtration view of lymph-formation, believing that the passage of lymph across the capillary wall is a true secretion brought about by the secretory function of the endothelial plates. Starling does not accept this view, and cannot regard as an article of faith Heidenhain's dictum that normally filtration plays no part in the formation of lymph. Lazarus- Barlow, again, looks upon the pouring out of lymph as evidence of

the demands of the tissue-elements for nutrition. An impulse is communicated to the blood vessels in accordance with this demand, and a greater or smaller outflow is the result. He traces various local dropsies to the starvation from which the tissues are suffering, the liquid accumulating in excess in accordance with the demand for more nourishment. It may be asked, however, whether a dropsical tissue is being held in a high state of nutrition, and whether, on the contrary, the presence of lymph in excess in its interstices does not tend to impair its vitality rather than to lend it support. According to Rogowicz and Heidenhain, certain substances in- crease the quantity of lymph given off from a part by acting upon the cells of the capillary wall; they hold, in fact, that these sub- stances are true lymphagogues. Heidenhain recognizes two classes, first, such substances as peptone, leech extract and cray- fish extract; and, secondly, crystalloids such as sugar, salt, &c. Starling sees no reason to believe that members of either class act otherwise than by increasing the pressure in the capillaries or by injuring the endothelial wall. The members of the first class influence the endothelial plates of the capillaries injuriously, in- ducing thereby increased permeability; those of the second class (sugar, &c), on injection into the biood, attract water from the tissues and cause a condition of hydraemic plethora with increased capillary pressure. The increased flow of lymph is due to the increased pressure in the abdominal capillaries.

It is now coming to be recognized that increase of blood pressure alone is not sufficient to account for all dropsical effusions. Much more important is the effect of the alteration in the amount of crystal- loids in the tissues and blood and therefore of the alteration in the osmotic pressure between these. Loeb found experimentally that increase of metabolic products in muscle greatly raised its osmotic pressure, and so it would absorb water from a relatively concentrated

sodium chloride solution. Welch produced oedema of the lungs experimentally by increasing the pressure in the pulmonary vessels by ligature of the aorta and its branches, but this raised the blood pressure only about one-tenth of an atmosphere, while in some of Loeb's experiments the osmotic pressure, due to retained metabolic products, was equal to over thirty atmospheres. Thus differences in osmotic pressure may be much more powerful in producing oedema than mere differences in blood pressure.

Now differences in the amount of crystalloids cause alteration in osmotic pressure while the proteid content affects it but little; and of the crystalloids the chlorides appear to be those most liable to variation.

Widal, Lemierre and other French observers have noted a diminution in the excretion of chlorides in nephritis associated with oedema; Widal and Javal found that a chloride- free diet caused diminution in the oedema and a chloride containing diet an increase of oedema. Oliver and Audibert published some cases of cirrhosis of the liver with ascites in which they got results com- parable to those of Widal. Some other observers, however, have not got such good results with a chloride-free diet, and Marishler, Scheel, Limbecx, Dreser and others, dispute Widal's hypothesis of a retention of chlorides as being the cause of oedema, in the case of renal dropsy at all events; they assert that the chlorides are held back in order to keep the osmotic pressure of the fluid, which they assume to have been effused, equal to that of the blood and tissues. Certainly not all cases of renal dropsy show diminution in the excretion of chlorides. Bainbridge suggests that a retention of metabolic products may cause the oedema in renal disease, Bradford having previously shown that loss of a certain amount of renal tissue caused retention of metabolic products in the tissues. As sodium chloride is one of the most permeable of crystalloids it seems strange that damage to the renal tissue should impede its excretion. Cushny has shown experimentally that slowing of the blood-flow through renal tissue causes less sodium chloride to appear in the urine while the excretion of urea and sulphates remains unaffected; apparently the chloride, being more per- meable, is reabsorbed and so only appears to be excreted in less quantity.

In the dropsy of cardiac disease, owing to the deficient oxidation from stagnation of blood, metabolic products must accumulate in the tissues; also lymph return must be impeded by the increased pressure in the veins and so dropsy results (Wells).

The local oedema seen in some nervous affections might be ex-

plained on the hypothesis of increased metabolic activity in these areas due to some local nervous stimulation.

Thus, while increased pressure in the blood or lymph vessels may be one factor, and increased permeability of the capillary endothelium another, increased osmotic pressure in the tissues and lymph is probably the most important in the production of dropsy. This increased osmotic pressure is again due to accumula- tion of crystalloids in the tissues, either products of metabolism due to deficient oxidation from alteration in the blood or other cause, or, it may be, as in some cases of nephritis, owing to a retention or reabsorption of chlorides in the tissues.

Practical Applications Medicine and surgery have never been slow to appropriate and apply the biological facts of pathology, and at no period have

they followed more closely in its wake than during the last quarter of the 19th century. When, for instance, the cause of septic infection had been revealed, the prophylaxis of the disease became a possibility. Seldom has it happened, since the discovery of the law of gravity, that so profound an impression has been made upon the scientific world at large as by the revelation of the part played by germ-life in nature; seldom has any discovery been fraught with such momentous issues in so many spheres of science and industry.

The names of Pasteur and Lister will descend to posterity as those of two of the greatest figures in the annals of medical science, and indeed of science in general, during the 19th century. The whole system of treatment of tubercular disease has been altered by the discovery of the tubercle microphyte. Previously consumptive individuals were carefully excluded from contact with fresh air, and were advised to live in rooms almost her- metically sealed and kept at a high temperature. The treatment of the disease has now gone off in the opposite direction. Sana- toria have started up all over Europe and elsewhere for its treat- ment on the open-air principle. Individuals suffering from pulmonary phthisis are encouraged to live night and day in the open, and with the best results. The rapid diagnosis of diph- theria, by recognizing its bacillus, has enabled the practitioner of medicine to commence the treatment early, and it has also enabled the medical officer of health to step in and insist on the isolation of

affected persons before the disease has had time to spread. The discovery of the parasite of malaria by Laveran, and of the method by which it gains entrance to the human body, through the bite of a particular variety of mosquito, by Manson and Ross, promises much in the way of eradication of the disease in the future. One of the most remarkable practical out- comes of germ-pathology, however, has been the production of the immunized sera now employed so extensively in the treatment of diphtheria and other contagious diseases. By the continuous injections under the skin, in increasing doses, of the toxins of certain pathogenic micro-organisms, such as that of diphtheria, an animal — usually the horse — may be rendered completely refractory to the disease. Its serum in course of time is found to contain something (antitoxin) which has the power of neutra- lizing the toxin secreted by the organism when parasitical upon the body. This immunity can be transferred to a fresh host (e.g. man) by injecting such serum subcutaneously. The modern system of hygiene is in great part founded upon recent pathology. The recognition of the dangers accompanying the drinking of polluted water or milk, or of those attached to the breathing of a germ-polluted atmosphere, has been the natural sequence of an improved knowledge of pathology in its bacteriological relation- ships. Skin-grafting and regeneration of bone are among not the least remarkable applications of pathological principles to the combat with disease in recent times; and in this connexion may also be mentioned the daring acts of surgery for the relief of tumours of the brain, rendered practicable by improved methods of localization, as well as operations upon the serous cavities for diseased conditions within them or in their vicinity.

For the special pathological details of various diseases, see the separate articles on Parasitic Diseases; Neuro-Pathology ; Digestive Organs; Respiratory System; Blood: Circulation; Metabolic Diseases; Fever; Bladder; Kidneys; Skin Dis- eases; Eye Diseases; Heart Disease; Ear, &c. ; and the articles on different diseases and ailments under the headings of their common names.

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(London, 1896); Ziegler, ” Entziindung,” in Eulenburg’s Real Encyclopddie, also Text-Book of Special Pathological Anatomy (Eng. trans., New York, 1897). (D. J. H. ; R. Mr.*)

PATIALA, or Puttiala, a native state of India, within the Punjab. It is the premier state of the Punjab, and chief of the three Sikh Phulkian states — Patiala, Natha and Jind. It consists of three detached blocks of territory, mostly in the plains, though one portion extends into the hills near Simla. Area 5412 sq. m.; pop. (1901), 1,596,692; estimated revenue, £440,000; military force (including Imperial Service troops) ,3429 men. The state was founded by a Sikh chieftain about 1763, and came under British protection, with the other cis-Sutlej states, in 1809. Patiala remained conspicuously loyal to the British during the Mutiny of 1857, Narindar Singh, its ruler, setting an example to the other Sikh states which was of the utmost value. The maharaja, Rajendra Singh, who died in 1900, was devoted to riding and sport. He took part personally in the Tirah campaign of 1897- 98, with a battalion of his own Imperial Service infantry and a field troop of Imperial Service lancers. In recognition of his services on this occasion he received the G.C.S.I. He was succeeded by his son, Bhupindar Singh, who was born in 189 1. The town of Patiala has a station on the branch of the North- Western railway from Rajpura to Bhatinda. Pop. (1901), 53,545. It contains several fine modern buildings, including palaces, hospitals and schools.

See Phulkian States Gazetteer (Lahore, 1909).

PATIENCE, the name given to certain card-games played by a single person. Although known for centuries, they have seldom been mentioned by writers on playing-cards, and the rules have for the most part been handed down orally. There are two main varieties; in one luck alone prevails, since the player has no choice of play but must follow strict rules; in the other an opportunity is given for the display of skill and judgment, as the player has the choice of several plays at different stages of the game. The usual object is to bring the cards into regular ascending or descending sequences. The starting card is called the ” foundation,” and the ” family ” (sequence) is ” built ” upon it. In other varieties of Patience the object is to make pairs, which are then discarded, the game being brought to a successful conclusion when all the cards have been paired; or to pair cards which will together make certain numbers, and then .discard as

before. There are hundreds of Patience games, ranging from the simplest to the most complicated.

See Jarbart's Games of Patience in De la"Rue's series of handbooks (1905); Patience Games, by "Cavendish" (London, 1890); Cyclopaedia of Card and Table Games, by Professor Hoffmann (London, 1891); Patience Games, by Professor Hoffmann (London, 1892); Games of Patience, by A. Howard Cady (Spalding's Home Library, New York, 1896); Dick's Games of Patience, edited by W. B. and H. B. Dick (New York, 1898) ; Games of Patience (4 series), by Mary E. W. Jones (London, 1898) ; Le Livre illusive des patiences, by " Comtesse de Blanccoeur " (Paris, 1898).

PATINA (probably from the Latin word for a flat dish, from patere, to lie open; cf. "paten "), a thin coating or incrustation which forms on the surface of bronze after exposure to the air or burial in the ground. It is looked on as a great addition to the beauty of the bronze, especially when it is of the green colour found on antique bronzes (see Bronze). By extension, the word is applied to the discoloured or incrusted surface of marble, flint, &c, acquired after long burial in the ground or exposure to the air, and also to the special colour given to wood surfaces by time.

PATINO, JOS£ or Josep (1666-1736), Spanish statesman, was born at Milan, on the nth of April 1666. His father, Don Lucas Patifio de Ibarra, Senor de Castelar, who was by origin a Galician, was a member of the privy council and inspector of the troops in the duchy of Milan for the king of Spain, to whom it then, belonged. His mother's maiden name was Beatrice de Rosales y Facini. The Patifio family were strong supporters of the Bourbon dynasty in the War of the Spanish Succession. The elder brother Baltasar, afterwards marquis of Castelar, had a distinguished career as a diplomatist, and his son Lucas was a general of some note. Jose Patifio, who had been intended for the priesthood but adopted a secular career, was granted the reversion of a seat in the senate of Milan on the acces- sion of Phillip V. in 1700, but on the loss of the duchy he was

transferred to Spain, and put on the governing body of the mili- tary orders in 1707. During the War of Succession he served as intendent of Estremadura, and then of Catalonia from 1711 to 1 7 18. In 1 71 7 he was named intendent of the navy, which had just been reorganized on the French model. His capacity and his faculty for hard work secured him the approval of Alberoni, with whom, however, he was never on very friendly terms in private life. Patino's Italian education, which affected his Spanish style, and caused him to fall into

Italianisms all through his life, may have served to recommend him still further. Patifio profoundly distrusted the reckless foreign policy under- taken by Alberoni under the instigation of the king and his obstinate queen, Elizabeth Farnese. He foretold that it would lead to disaster, but as a public servant 'he could only obey orders, and he had the chief merit of organizing the various expeditions sent out to Sardinia, Sicily and Ceuta between 1718 and 1720. He became known to the king and queen in the latter year, while he was acting as a species of commissary-general during the disastrous operations against the French troops on the frontier of Navarre. It was not, however, until 1726 that he was fully trusted by the king. He and his brother, the marquis of Castelar, were the chief opponents 6f the adventurer Ripperda, who captivated the king and queen for a time. On the fall of this remarkable person, Patifio was named secretary for the navy, the Indies — that is to say the colonies — and for foreign affairs. The war office was added to the other departments at a later date. From the 13th of May 1726 until his death on the 3rd of November 1736 Patifio was in fact prime minister. During the later part of his administration he was much engaged in the laborious negotiations with England in relation to the disputes between the two countries over their commercial and colonial rivalries in America, which after his death led to the outbreak of war in 1739.

In his Patino y Campillo (Madrid, 1882), Don Antonio Rodriquez Villa has collected the dates of the statesman's life,- and has pub- lished some valuable papers. But the best account of Patino's administration is to be found in Coxe's Memoirs of the Kings of Spain of the House of Bourbon (London, 1815), which is founded on the correspondence of the English ministers at Madrid.

PATIO, the Spanish name for an inner court or enclosed space in a house, which is open to the sky. The " patio " is a common feature in houses in Spain and Spanish America. The word is generally referred to the Lat. patere, to lie open; cf. " patent," or to spatium, space.

PATKUL, JOHANN REINHOLD (1660-1707), Livonian politician and agitator, was born in prison at Stockholm, where his father lay under suspicion of treason. He entered the Swedish army at an early age and was already a captain when, in 1689, at the head of a deputation of Livonian gentry, he went to Stockholm to protest against the rigour with which the land-recovery project of Charles XL was being carried out in his native province. His eloquence favourably impressed Charles XL, but his representations were disregarded, and the offensive language with which, in another petition addressed to the king three years later, he renewed his complaints, involved him in a

government prosecution. To save himself from the penalties of high treason, Patkul fled from Stockholm to Switzer- land, and was condemned in contumaciam to lose his right hand and his head. His estates were at the same time confiscated. For the next four years he led a vagabond life, but in 1698, after vainly petitioning the new king, Charles XII., for pardon, he entered the service of Augustus the Strong of Saxony and Poland, with the deliberate intention of wresting from Sweden Livonia, to which he had now no hope of returning so long as that province belonged to the Swedish Crown. The aristocratic republic of Poland was obviously the most convenient suzerain for a Livonian nobleman; so, in 1698, Patkul proceeded to the court of the king-elector at Dresden and bombarded Augustus with proposals for the partition of Sweden. His first plan was a combination against her of Saxony, Denmark and Branden- burg; but, Brandenburg failing him, he was obliged very un- willingly to admit Russia into the partnership. The tsar was to be content with Ingria and Esthonia, while Augustus was

to take Livonia, nominally as a fief of Poland, but really as an hereditary possession of the Saxon house. Military operations against Sweden's Baltic provinces were to be begun simultane- ously by the Saxons and Russians. After thus forging the first link of the partition treaty, Patkul proceeded to Moscow, and, at a secret conference held at Preobrazhenskoye, easily persuaded Peter the Great to accede to the nefarious league (Nov. n, 1699). Thoughout the earlier, unluckier days of the Great Northern War, Patkul was the mainstay of the confederates. At Vienna, in 1702, he picked up the Scottish general George Benedict Ogilvie, and enlisted him in Peter's service. The same year, recognizing the unprofitableness of serving such a master as Augustus, he exchanged the Saxon for the Russian service. Peter was glad enough to get a man so famous for his talents and energy, but Patkul speedily belied his reputation. His knowledge was too local and limited. On the 19th of August 1704 he succeeded, at last, in bringing about a treaty of alliance between Russia and the Polish republic to strengthen the hands of Augustus, but he failed to bring Prussia also into the anti- Swedish league because of Frederick I.'s fear of Charles and jealousy of Peter. From Berlin Patkul went on to Dresden to conclude an agreement -with the imperial commissioners for the transfer of the Russian contingent from the Saxon to the Austrian service. The Saxon ministers, after protesting against the new arrangement, arrested Patkul and shut him up in the fortress of

Sonnenstein (Dec. 19, 1705), altogether disregarding the remonstrances of Peter against such a gross violation of international law. After the peace of Altranstadt (Sept. 24, 1 707) he was delivered up to Charles, and at Kazimierz in Poland (Oct. 10, 1707) was broken alive on the wheel, Charles rejecting an appeal for mercy from his sister, the princess Ulrica, on the ground that Patkul, as a traitor, could not be pardoned for example's sake.

See O. Sjogren, Johan Reinhold Patkul (Swed.) (Stockholm, 1882) ; Anton Buchholtz, Beitrdge zur Lebensgeschichte J. R. Patkuls (Leipzig, 1893). (R. N. B.)

PATMORE, COVENTRY KERSEY DIGHTON (1823-1896), English poet and critic, the eldest son of Peter George Patmore, himself an author, was born at Woodford in Essex, on the 23rd of July 1823. He was privately educated, being his father's intimate and constant companion, and derived from him his early literary enthusiasm. It was his first ambition to become an artist, and he showed much promise, being awarded the silver palette of the Society of Arts in 1838. In the following year he was sent to school in France, where he studied for six months, and began to write poetry. On his return his father contemplated the publication of some of these youthful poems; but in. the meanwhile Coventry had evinced a passion for science and the poetry was set aside. He soon, however, returned to literary interests, moved towards them by the sudden success of Tennyson; and in 1844 he published a small volume of Poems, which was not without individuality, but marred by inequalities of workmanship. It was widely criticized, both in praise and blame; and Patmore, distressed at its reception, bought up the remainder of the edition and caused it to be destroyed What chiefly wounded him was a cruel review in Blackwood, written in the worst style of unreasoning abuse; but the enthusiasm of private friends, together with their wiser criticism, did much to help him and to foster his talent. Indeed, the publication of this little volume bore immediate fruit in introducing its author to various men of letters, among whom was Dante Gabriel Rossetti, through whose offices Patmore became known to Holman Hunt, and was thus drawn into the eddies of the pre-Raphaelite movement, contributing his poem " The Seasons " to the Germ. At this time Patmore's father became involved in financial embarrassments ; and in 1 846 Monckton Milnes secured for the son an assistant-librarianship in the British Museum, a post which he occupied industriously for nineteen years, devoting his spare time to poetry. In 1847 he married Emily, daughter of Dr Andrews of Camberwell. At the Museum he was austere and remote among his companions, but was nevertheless instrumental in 1852 in starting the Volunteer movement. He

wrote an important letter to The Times upon the subject, and stirred up much martial enthusiasm among his colleagues. In the next year he republished, in Tamerton Church Tower, the more successful pieces from the Poems of 1844, adding several new poems which showed distinct advance, both in conception and treatment; and in the following year (1854) appeared the first part of his best known poem, “The Angel in the House,” which was continued in ” The Espousals ” (1856), ” Faithful for Ever ” (i860), and ” The Victories of Love ” (1862). In 1862 he lost his wife, after a long and lingering illness, and shortly afterwards joined the Roman Catholic Church. In 1865 he married again, his second wife being Miss Marianne Byles, second daughter of James Byles of Bowden Hall, Gloucester; and a year later purchased an estate in East Grinstead, the history of which may be read in How I managed my Estate, published in 1886. In 1877 appeared The Unknown Eros, which unquestion- ably contains his finest work in poetry, and in the following year Amelia, his own favourite among his poems, together with an interesting, though by no means undisputable, essay on English Metrical Law. This departure into criticism he continued further in 1879 with a volume of papers, entitled Principle in Art, and again in 1893 with Religio poetae. Meanwhile his second wife died in 1880, and in the next year he married Miss Harriet Robson. In later years he lived at Lymington, where he died on the 26th of November 1896.

A collected edition of his poems appeared in two volumes in 1886, with a characteristic preface which might serve as the author’s epitaph. ” I have written little,” it runs; ” but it is all my best; I have never spoken when I had nothing to say, nor spared time or labour to make my words true. I have respected posterity; and should there be a posterity which cares for letters, I dare to hope that it will respect me.” The obvious sincerity which underlies this statement, combined with a certain lack of humour which peers through its naivete, points to two of the principal characteristics of Patmore’s earlier poetry; characteristics which came to be almost unconsciously merged and harmonized as his style and his intention drew together into unity. In the higher flights, to which he arose as his practice in the art grew perfected, he is always noble, and often sublime. His best work is found in the volume of odes called The Unknown Eros, which is full not only of passages but of entire poems in which exalted thought is expressed in poetry of the richest and most dignified melody. The animating spirit of love, moreover, has here deepened and intensified into a crystalline harmony of earthly passion with the love that is divine and transcending; the outward manifestation is regarded as a symbol of a sentiment at once eternal and quint- essential. Spirituality

informs his inspiration; the poetry is of the finest elements, glowing and alive. The magnificent piece in praise of winter, the solemn and beautiful cadences of ” De- parture,” and the homely but elevated pathos of ” The Toys,” are in their various manners unsurpassed in English poetry for sublimity of thought and perfection of expression. Pat- more is one of the few Victorian poets of whom it may confidently be predicted that the memory of his greater achievements will outlive all consideration of occasional lapses from taste and dignity. He wrote, at his best, in the grand manner, melody and thought according with perfection of expression, and his finest poems have that indefinable air of the inevitable which is after all the touchstone of the poetic quality. His son, Hemy John Patmore (1860-1883), left a number of poems posthumously printed at Mr Daniell’s Oxford Press, which show an unmistakable lyrical quality. (A. Wa.)

The standard life of Patmore is the Memoirs and Correspond- ence (1901), edited by Basil Champneys. See also E. W. Gosse, Coventry Patmore (1905, “Literary Lives” series), and an essay by Mrs Meynell prefixed to the selection (1905) in the ” Muses’ Library.”

PATMOS, an island in the east of the Aegean Sea, one of the group of the Sporades, about 28 m. S.S.W. of Samos, in 37 20′ N. lat. and 26 35′ E. long. Its greatest length from N. to S. is about 10 m., its greatest breadth 6 m., its circumference, owing to the winding nature of the coast, about 37 m. The island,

which is volcanic, is bare and rocky throughout; the hills, of which the highest rises to about 800 ft., command magnificent views of the neighbouring sea and islands. The skill of the natives as seamen is proverbial in the archipelago. The deeply indented coast, here falling in huge cliffs sheer into the sea, there retiring to form a beach and a harbour, is favourable to commerce, as in former times it was to piracy. Of the numerous bays and harbours the chief is that of Scala, which, running far into the land on the eastern side, divides the island into two nearly equal portions — a northern and a southern. A narrow isthmus separates Scala from the bay of Merika on the west coast. On the belt of land between the two bays, at the junction between the northern and southern half of the island, stood the ancient town. On the hill above are still to be seen the massive remains of the citadel, built partly in poly- gonal style. The modern town stands oh a hill top

in the southern half of the island. A steep paved road leads to it in about twenty minutes from the port of Scala. The town clusters at the foot of the monastery of St John, which, crowning the hill with its towers and battlements, resembles a fortress rather than a monastery. Of the fioo MSS. once possessed by the library of the monastery only 240 are left. The houses of the town are better built than those of the neighbouring islands, but the streets are narrow and winding. The population is about 4000. The port of Scala contains about 140 houses, besides some old well-built magazines and some potteries. Scattered over the island are about 300 chapels.

Patmos is mentioned first by Thucydides (iii. 33) and after- wards by Strabo and Pliny. From an inscription it has been inferred that the name was originally Patnos. Another ancient inscription seems to show that the Ionians settled there at an early date. The chief, indeed the only, title of the island to fame is that it was the place of banishment of St John the Evangelist, who according to Jerome (De scr. HI. c. 9) and others, was exiled thither under Domitian in a.d. 95, and released about eighteen months afterwards under Nerva. Here he is said to have written the Apocalypse; to the left of the road from Scala to the town, about half-way up the hill, a grotto is still shown (TdffirfiXaiovTrjs'AiroKdSvipeus) in which the apostle is said to have received the heavenly vision. It is reached through a small chapel dedicated to St Anne. The Acts of St John, attributed to Prochorus, narrates the miracles wrought by the apostle during his stay on the island, but, strangely enough, while describing how the Gospel was revealed to him in Patmos, it does not so much as mention the Apocalypse. During the dark ages Patmos seems to have been entirely deserted, probably on account of the pirates. In 1088 the emperor Alexis Com- nenus, by a golden bull, which is still preserved, granted the island to St Christodulus for the purpose of founding a monastery. This was the origin of the monastery of St John, which now owns the greater part of the southern half of Patmos, as well as farms in Crete, Samos and other neighbouring islands. The embalmed body of the saintly founder is to be seen to this day in a side chapel of the church. The number of the monks, which amounted to over a hundred at the beginning of the 1 8th century, is now much reduced. The abbot {nyovnevos) has the rank of a bishop, and is subject only to the patriarch of Constantinople. There is a school in connexion with the monastery which formerly enjoyed a high reputation in the Levant. The modern town was recruited by refugees from Constantinople in 1453, and from Crete in 1669, when these places fell into the hands of the Turks. The island is subject to Turkey; the governor is the pasha of Rhodes. The popula- tion is Greek. The women are chiefly engaged in

knitting cotton stockings, which, along with some pottery, form the chief exports of the island.

See Tournefort, Relation d'un voyage du Levant (Lyons, 1717); Walpole, Memoirs (relating to Turkey) (London, 1820); Ross, Reisen aaf den griechischen Inseln (Stuttgart and Halle, 1840-1852); Guerin, Description de Vile de Patmos (Paris, 1856) ; H. F. Tozer, Islands of the Aegean, pp. 178-195.

PATNA, a city, district, and division of British India, in the Behar province of Bengal. The city, which is the most xx. 30

important commercial centre in Bengal after Calcutta, lies on the right bank of the Ganges, a little distance below the confluence of the Sone and the Gogra, and opposite the confluence of the Gandak, with a station on the East Indian railway 332 m. N.W. of Calcutta. Municipal area, 6184 acres. Pop. (1901), 134,785. Including the civil station of Bankipur to the west, the city stretches along the river bank for nearly 9 miles. Still farther west is the military cantonment of Dinapur. A government college was founded in 1862. Other educational institutions include the Behar school of engineering organized in 1897.

Patna city has been identified with Pataliputra (the Palibothra of Megasthenes, who came as ambassador from Seleucus Nicator to Chandragupta about 300 B.C.). Megasthenes describes Palibothra as being the capital of India. He adds that its length was 80 stadia, and breadth 15; that it was surrounded by a ditch 30 cubits deep, and that the walls were adorned with 570 towers and 64 gates. According to this account the cir- cumference of the city would be 190 stadia or 25! miles. Asoka built an outer masonry wall and beautified the city with innumer- able stone buildings. Tne greater part of the ancient city still lies buried in the silt of the rivers under Patna and Bankipur at a depth of from 10 to 20 ft. The two events in the modern history of the district are the massacre of Patna (1763) and the Sepoy Mutiny in 1857. The former occurrence, which may be said to have settled the fate of Mahommedan rule in Bengal, was the result of a quarrel between the nawab, Mir Kasim, and the English authorities regarding transit duties, which ultimately led to open hostilities. The company's sepoys, who had occupied Patna city by the orders of the company's factor, were driven out by the nawab's troops and nearly all killed. The remainder afterwards surrendered, and were put into confinement, together with the European officers and the entire staff of the Cossimbazar factory, who had also been arrested on the first outbreak of hostilities. Mir Kasim was defeated in two pitched battles

at Gheria and Udhanala (Oodeynullah) in August and September 1763, and in revenge ordered the massacre of all his prisoners, which was carried out with the help of a renegade in his employ- ment named Walter Reinhardt, (afterwards the husband of the famous Begum Samru). About sixty Englishmen were murdered on this occasion, the bodies being thrown into a well belonging to the house in which they were confined. At the outbreak of the mutiny in May 1857 the three sepoy regiments stationed at Dinapur (the military cantonment of Patna, adjoining the city) were allowed to retain their arms till July, when, on an attempt being made to disarm them, they broke into open revolt. Although many who attempted to cross the Ganges in boats were fired into and run down by a pursuing steamer, the majority crossed by the Sone river into Shahabad, where they joined the rebels under Kuar Singh who were then besieging a small European community at Arrah.

The District or Patna has an area of 2075 sq. m.; pop. (1901), 1,624,985. Throughout the greater part of its extent the district is a level plain; but towards the south the ground rises into hills. The soil is for the most part allu- vial, and the country along the bank of the Ganges is peculiarly fertile. The general line of drainage is from west to east; and high ground along the south of the Ganges forces back the rivers flowing from Gaya district. The result is that during the rains nearly the whole interior of the district south of a line drawn parallel to the Ganges, and 4 or 5 m. from its bank, is flooded. In the south-east are the Rajgir Hills, consisting of two parallel ridges running south- west, with a narrow valley between, intersected by ravines and passes. These hills, which seldom exceed 1000 ft. in height, are rocky and clothed with thick low jungle, and contain some of the earliest memorials of Indian Buddhism. The chief rivers are the Ganges and the Sone. The only other river of any consequence is the Punpun, which is chiefly remarkable for the number of petty irrigation canals which it supplies. So much of the river is thus diverted that only a small portion of its water ever reaches the Ganges at Fatwa. The chief crops are rice, wheat, barley, maize and pulse; poppy and potatoes

are also of importance. Apart from the Sone canal, irrigation is largely practised from private channels and also from wells. The district is traversed by the main line of the East Indian railway, with two

branches south to Gaya and Bihar.

The Division of Patna extended across both sides of the Ganges. It comprised the seven districts of Patna, Gaya, Shahabad, Saran, Champaran, Muzaffarpur and Darbhanga. Total area, 23,748 sq. m.; pop. (1901), 15,514,987. In 1908 the four last districts north of the Ganges were formed into the new division of Tirhut; and the name of Patna division was confined to the three first districts south of the Ganges.

See L. A. Waddell, Discovery of the Exact Site of Asoka's Classic Capital of Pataliputra (1892); Vincent Smith, Asoka (" Rulers of India " series, 1901) ; Patna District Gazetteer (Calcutta, 1907).

PATNA, one of the Orissa tributary states in Bengal, with an area of 2399 sq. m. It lies in the basin of the Mahanadi river, and is divided by a forest-clad hilly tract into a northern and a southern portion, both of which are undulating and well cultivated. Pop. (1901), 277,748, showing a decrease of 16% in the decade, mainly due to the effects of famine in 1900. Nearly the whole population consists of Oriyas. The capital is Bolangir: pop. (1901), 3706. The principal crop is rice. The maharajas of Patna were formerly heads of a group of states known as the athara garhjat or " eighteen forts." They are Chauhban Rajputs, and claim to have been established in Patna for six centuries. Patna was the scene of a rebellion of the Khonds, followed by atrocities on the part of their rulers, in 1869, and, in consequence, came under British management in 1871. The maharaja Ramchandra Singh, installed in 1894, was insane and put an end to his own life in the following year, whereupon his uncle, Lai Dalganjan Singh, became chief, undertaking to administer with the assistance of a diwan or minister appointed by the British government. The powers of this official were extended in 1900 after a serious outbreak of dacoity. Till 1905 the state was included in the Central Provinces.

PATOIS, a French term strictly confined to the dialect of a district or locality in a country which has a common literary language, often used of the form of a common language as spoken by illiterate or uneducated persons, marked by vulgar- isms in pronunciation, grammar, &c. The origin of the word is not certain. It has been taken to be a corruption of patrois, from Low Lat. partriensis, of or belonging to one's patria, or native country, fatherland.

PATON, JOHN BROWN (1830-), British Nonconformist divine, was born on the 17th of December 1830. He was educated at London, Poole and Spring Hill College, Birming- ham; he graduated B.A. at

London University in 1849, an d was Hebrew and New Testament prizeman in 1850 and gold medallist in philosophy in 1854. He received the honorary degree of doctor of divinity from Glasgow University in 1881. When the Nottingham Congregational Institute was founded in 1863 he became the first principal, a post which he held till 1898, when he was succeeded by James Alexander Mitchell (1849-1905), who from 1903 till his death was general secretary of the Congregational Union. Paton became vice-president of the British and Foreign Bible Society in 1907. He took an active part in the foundation and direction of a number of societies for religious and social work, notably the National Home Reading Union Society and English Land Colonization Society, and was a constant contributor to literary reviews. His publications include The Two-fold Alternative (3rd ed., 1900), The Inner Mission of the Church (new ed., 1900), and two volumes of collected essays. His son, John Lewis Paton (b. 1863), who headed the Cambridge classical tripos in 1886, became head master of Manchester grammar school in 1903.

PATON, SIR JOSEPH NOEL (1821-1901), British painter, was born, on the 13th of December 1821, in Woolers Alley, Dunfermline, where his father, a fellow of the Scottish Society of Antiquaries, carried on the trade of a damask manufacturer. He showed strong artistic inclinations in early childhood, but had no regular art training, except a brief period of

study in the Royal Academy School in 1843. He gained a prize of £200 in the first Westminster Hall competition, in 1845, for his cartoon ” The Spirit of Religion,” and in the following year he exhibited at the Royal Scottish Academy his ” Quarrel of Oberon and Titania.” A companion fairy picture, ” The Reconciliation of Oberon and Titania ” went to Westminster Hall in 1847, and for it and his picture of ” Christ bearing the Cross ” he was awarded a prize of £300 by the Fine Arts Commissioners. The two Oberon pictures are in the National Gallery of Scotland, where they have long been a centre of attraction. His first exhibited picture, ” Ruth Gleaning,” appeared at the Royal Scottish Academy in 1844. He began to contribute to the Royal Academy of London in 1856. Throughout his career his preference was for allegorical, fairy and religious subjects. Among his most famous pictures are ” The Pursuit of Pleasure ” (1855), ” Mors Janua Vitae ” (1866), ” Oskold and the Elle-maids ” (1874), and ” In Die Malo ” (1882). Sir Noel Paton also produced a certain amount of sculpture, more notable for design than for searching execution. He was elected an associate of the Royal Scottish Academy in 1847, and a full member in 1850; he was appointed Queen’s Limner for Scotland in 1866, and received knighthood in 1867. In 1878 the University of

Edin- burgh conferred upon him the degree of LL.D. He was a poet of distinct merit, as his. Poems by a Painter (1861) and Spindrift (1867) pleasantly exemplified. He was also well known as an antiquary, his hobby, indeed, being the collection of arms and armour. Sir Noel died in Edinburgh on the 26th of Decem- ber 1901. His eldest son, Diarmid Noel Paton (b. 1859), became regius professor of physiology in Glasgow in 1906; and another son, Frederick Noel Paton (b. 1861), became in 1905 director of commercial intelligence to the government of India.

PATRAS (Gr. Patrai), the chief fortified seaport town on the west coast of Greece, and chief town of the province of Achaea and Elis, on a gulf of the same name, 70 m. W.N.W. of Corinth. There are two railway stations, one in the north-east on the line to Athens (via Corinth), the ether on the line to Pyrgos. Pop. (1889), 33,529; (1907), 37,401. It has been rebuilt since 1821 (the War of Independence), and is the seat of a Greek arch- bishop and an appeal court. It is the chief port of Greece, from which the great bulk of its currants are despatched. The port, formed by a mole and a breakwater, begun in 1880, offers a fair harbour for vessels drawing up to 22 ft. The exports consist of currants, sultanas, valonea, tobacco, olive oil, olives in brine, figs, citrons, wine, brandy, cocoons, and lamb, goat, and kid skins. The imports consist chiefly of colonial produce, manufactured goods and sulphate of copper. The two most interesting buildings are the castle, a medieval structure on the site of the ancient acropolis, and the cathedral of St Andrew, which is highly popular as the reputed burial-place of the saint.

The foundation of Patras goes back to prehistoric times, the legendary account being that Eumelus, having been taught by Triptolemus how to grow grain in the rich soil of the Glaucus valley, established three townships, Aroe (i.e. ploughland), Antheia (the flowery), and Mesatis (the middle settlement), which were united by the common worship of Artemis Triclaria at her shrine on the river Meilichus. The Achaeans having strengthened and enlarged Aroe, called it Patrae, as the exclusive, residence of the ruling families, and it was recognized as one of the twelve Achaean cities. In 419 B.C. the town was, by the advice of Alcibiades, connected with its harbour by long walls in imitation of those at Athens. The whole armed force was destroyed by Metellus after the defeat of the Achaeans at Scarpheia, and many of the remaining inhabitants forsook the city; but after the battle of Actium Augustus restored the ancient name Aroe, introduced a military colony of veterans from the 10th and 12 th legions (not, as is usually said, the 22 nd), and bestowed the rights of coloni on the inhabitants of Rhypae and Dyme, and all the Locri Ozolae except

those of Amphissa. Colonia Augusta Aroe Patrensis became one of the most populous of all the towns of Greece; its colonial coinage extends

from Augustus to Gordian III. That the town was the scene of the martyrdom of St Andrew is purely apocryphal, but, like Corinth, it was an early and effective centre of Christianity; its archbishop is mentioned in the lists of the Council of Sardica in 347. In 551 it was laid in ruins by an earthquake. In 807 it was able without external assistance to defeat the Slavonians (Avars), though most of the credit of the victory was assigned to St Andrew, whose church was enriched by the imperial share of the spoils, and whose archbishop was made superior of the bishops of Methone, Lacedaemon and Corone. Captured in 1205 by William of Champlitte and Villehardouin, the city became the capital and its archbishop the primate of the principality of Achaea. In 1387 De Heredia, grand master of the order of the Hospital at Rhodes, endeavoured to make himself master of Achaea and took Patras by storm. At the close of the 15th century the city was governed by the archbishop in the name of the pope; but in 1428 Constantine, son of John VI., managed to get possession of it for a time. Patras was at length, in 1687, surrendered by the Turks to the Venetians, who made it the seat of one of the seven fiscal boards into which they divided the Morea. In 17 14 it again fell, with the rest of the Morea, into Turkish hands. It was at Patras that the Greek revolution began in 1821; but the Turks, confined to the citadel, held out till 1828.

PATRIARCH (M.E. and O. Fr. patriarche, Lat. patriarcha, Gr. ira.Tpiapxi7S, from irarptd, clan, and apxh, rule), originally the father or chief of a tribe, in this sense now used more especially of the ” patriarchs ” of the Old Testament, i.e. Abraham, Isaac and Jacob, with their forefathers, and the twelve sons of Jacob. In late Jewish history the title ” patriarch ” (Heb. nasi, prince, chief) was given to the head of the sanhedrim in Palestine, and is sometimes, though wrongly, applied to the ” exilarch,” a head of the Jewish college at Babylon.

In the early centuries of the Christian Church the designation ” patriarch ” was applied, like ” archbishop,” to bishops of the more important sees as a merely honorary style. It developed into a title implying jurisdiction over metropolitans, partly as a result of the organization of the empire into ” dioceses,” partly owing to the ambition of the greater metro- politan bishops, which had early led

them to claim and exercise authority in neighbouring metropolitanates. At the Council of Chalcedon (451) the patriarchs still bore the title of ” exarch ” ; it was not till the 7th century that that of ” patriarch ” was fixed as proper to the bishops of Constantinople, Alexandria, Antioch and Jerusalem, ” exarch ” being reserved for those of Ephesus and Caesarea, who had fallen to a lower rank. In the West the only patriarch in the fully developed sense of the Eastern Church has been the bishop of Rome, who is patriarch as well as pope.

PATRICIANS (Lat. patricius, an adjectival form from pater, father; not, as some say, from pater and ciere, to call), a term originally applied to the members of the old citizen families of ancient Rome (see I. below). Under the later Roman Empire the name was revived by the Byzantine emperors as the title of a new order of nobility. Subsequently it was used as a personal title of honour for distinguished servants of Constantine I. and his successors, and was conferred on barbarian chiefs (II. below).. It was afterwards conferred by the popes on the Frankish kings. In the medieval Italian republics, e.g. Genoa and Venice, the term was applied to the hereditary aristocracy (patrizio), and in the free cities of the German Empire it was borne by distinguished citizens (patrizier). In Italy it is still used for the hereditary nobility. From these specific uses the word has come into general use as a synonym of ” aristocrat ” or ” noble,” and implies the possession of such qualities as are generally associated with long descent, hereditary good breeding and the like. In Church history a sect founded by Patricius (c. 387), teacher of Symmachus the Marcionite, are known as the Patricians; they believed that all flesh was made by the devil. The name is also, though rarely, applied to the Roman Catholic body in Ireland regarded as the followers of St Patrick.

I. From the earliest period known to us the free population

of Rome contains two elements, patricians and plebeians, the former class enjoying all political privileges, the latter un- privileged. The derivation and significance of the two names have been established with certainty. The patricians (patricii) are those who can point to fathers, i.e. those who are members of the clans (gentes) whose members originally comprised the whole citizen body. The plebeians (plebs, plebes) are the com- plement (from root pleo, fill, see Plebs) of the noble families possessing a genealogy, and include all the free population other than the patricians. It has been held by T. Mommsen that the plebeian order had its sole origin in the clients who attached themselves in a position of semi-freedom to the heads of patrician

houses, and gradually evolved a freedom and citizenship of their own (see Patron and Client). The logical consequence of this view is that the plebs as an order in the state is of considerably later growth than the beginning of the city, the patricians being originally the only freemen and the only citizens. But this view is untenable on two grounds. First, in the struggle between the two orders for political privilege we find the clients struggling on the side of the patricians against the main body of the plebeians (Livy ii. 56). Again, a method of taking up Roman citizenship which is well attested for a very early period reveals the possibility of a plebeian who does not stand in any relation to a patron. When an immigrant moved to Rome from one of the cities of the Latin league, or any city which enjoyed the jus commercii with Rome, and by the exercise of the right of voluntary exile from his own state (jus exulandi), claimed Roman citizenship, it is impossible to suppose that it was necessary for him to make application to a Roman patron to represent him in his legal transactions; for the jus commercii gave its holder the right of suing and being sued in his own person before Roman courts. Such an immigrant, therefore, must have become at once a free plebeian citizen of Rome. It may therefore be assumed that long before the clients obtained the right to hold land in their own names and appear in the courts in their own persons there was a free plebs existing alongside of the patricians enjoying limited rights of citizenship. But it is equally certain that before the time of Servius Tullius the rights and duties of citizenship were practically exercised only by the members of the patrician clans. This is perhaps the explanation of the strange fact that the clients, who through their patrons were attached to these clans, obtained political recognition as early as the plebeians who had no such semi- servile taint. At the time of the Servian reforms both branches of the plebs had a plausible claim to recognition as members of the state, the clients as already partial members of the curia and the gens, the unattached plebeians as equally free with the patricians and possessing clans of their own as solid and united as the recognized gentes.

But not only can it be shown that patricians and plebeians coexisted as distinct orders in the Roman state at an earlier date than the evolution of citizenship by the clients. It has further been established on strong archaeological and linguistic evidence that the long struggle between patricians and plebeians in early Rome was the result of a racial difference between them. There is reason to believe that the patricians were a Sabine race which conquered a Ligurian people of whom the plebeians were the survivors (see Rome: History). Apart from the definite evidence, the theory of a racial distinction gains probability

from the fact that it explains the survival of the distinction between the patricii, men with a family and genealogy, and the rest of the citizens, for some time after the latter had acquired the legal status of patres and were organized in gentes of their own; for on this theory privilege would belong not to all who could trace free descent but only to those who could trace descent to an ancestor of the conquering race. The family organization of the conquering race was probably higher than that of the conquered, and was only gradually attained by the latter. Thus descent from a father would be distinctive enough of the dominant race to form the title of that race (patricii), and when that term had been definitely adopted as the title of a class its persistence in the same sense after the organization

of the family and the clan by the unprivileged class would be perfectly natural.

The absurdity of excluding the plebeians from all but a merely theoretical citizenship, based on the negative fact of freedom, seems to have become apparent before the close of the monarchical period. The aim of the reforms associated with the name of Servius Tullius appears to have been the imposition of the duties of citizenship upon the plebeians. Incidentally this involved an extension of plebeian privilege in two directions. First, it was necessary to unify the plebeian order by putting the legal status of the clients on a level with that of the un- attached plebeians; and again enrolment in the army involved registration in the tribes and centuries; and as the army soon developed into a legislative assembly meeting in centuries (comitia centuriata), the whole citizen body, including plebeians, now acquired a share of political power, which had hitherto belonged solely to the patricians. At the close of the monarchy, the plebeian possessed the private rights of citizenship in entirety, except for his inability to contract a legal marriage with a patrician, and one of the public rights, that of giving his vote in the assembly. 1 But in the matter of liability to the duties of citizenship, military service and taxation, he was entirely on a level with the patrician. This position was probably tolerable during the monarchy, when the king served to hold the power of the patrician families in check. But when these families had expelled the Tarquins, and formed themselves into an exclusive aristocracy of privilege, the inconsistency between partial privilege and full burdens came to be strongly felt by the plebeians.

The result was the long struggle for entire political equality of the two orders which occupies the first few centuries of the republic (see Rome: History, § II. ” The Republic “)• The struggle was inaugurated by the plebeians, who in 494 B.C. formed themselves into an exclusive order with annually elected officers (tribuni plebis) and an assembly of their own, and by means of this machinery forced themselves by degrees into all the magistracies, and obtained the coveted right of intermarriage with the patricians. Admission to the higher magistracies carried with it admission to the senate, and by the close of the struggle (about 300 B.C.) the political privilege of the two orders was equalized, with the exception of certain disabilities which, originally devised to break the political monopoly of the order, continued to be attached to the patricians after the victory of the plebs. They were excluded from the tribunate and the council of the plebs, which had become important instruments of government, and were only eligible for one place in the consulship and censorship, while both were open to plebeians. It is possible, though far from certain (see Senate), that the powers of the interregnum and the senatorial confirmation {patrum auctoritas) necessary to give validity to decisions of the people, remained the exclusive privileges of the patrician members of the senate. But while the patrician disabilities were of a kind that had gained in importance with the lapse of centuries, these privileges, even if still retained, had become merely formal in the second half of the republican period. Since the plebeian element in the state had an immense numerical preponderance over the patrician these disabilities were not widely spread, and seem generally to have been cheerfully borne as the price of belonging to the families still recognized as the oldest and noblest in Rome. But the adoption of P. Clodius Pulcher into a plebeian family in 59 B.C. with a view to election to the tribunate shows that a rejection of patrician rights (transitio ad plebem) was not difficult to effect by any patrician who preferred actual power to the dignity of ancient descent. It was not so easy to recruit the ranks of the patricians. The traditions of early Rome indeed represent the patricians as receiving the Claudii by a collective act into their body; but the first authenticated instance of the admission of new members to the patriciate is that of the lex Cassia, which authorized Caesar as dictator to create fresh patricians. The same procedure

1 Cf. the privileges of the Athenians under the Solonian system eee Solon; Ecclesia; Archon).

was followed by Augustus. Later on, the right of creating patricians came to be regarded as inherent in the principate, and was exercised by Claudius and Vespasian without any legal enactment, apparently in

their capacity as censor (Tac. Ann. xi. 25; Vita M. Antonini, i.). Patrician rank seems to have been regarded as a necessary attribute of the princeps; and in two cases we are told that it was conferred upon a plebeian princeps by the senate (Vita Juliani, 3 ; Macrini, 7) . A comparison of this procedure with the original conception of the patriciate as revealed by the derivation of the word, is significant of the history of the conception of nobility at Rome, and illustra- tive of the tenacity with which the Romans clung to the name and form of an institution which had long lost its significance. After the political equalization of the two orders, noble birth was no longer recognized as constituting a claim to political privilege. Instead of the old hereditary nobility, consisting of the members of the patrician clans, there arose a nobility of office, consisting of all those families, whether patrician or plebeian, which had held curule office. It was now the tenure of office that conferred distinction. In the early days of Rome, office was only open to the member of a patrician gens. In the principate, patrician rank, a sort of abstract conception based upon the earlier state of affairs, was held to be a dignity suitable to be conferred on an individual holder of office. But the confer- ment of the rank upon an individual as distinct from a whole family (gens) is enough to show how widely the modern con- ception of patrician rank differed from the ancient. The explanation of this is that the plebeians had long been or- ganized, like the patricians, in gentes, and nothing remained distinctive of the old nobility except a vague sense of dignity and worth. (A.M.Cl.)

‘ II. Under Constantine an entirely new meaning was given to the word Patrician. It was used as a personal title of honour conferred for distinguished services. It was a title merely of rank, not of office ; its holder ranked next after the emperor and the consul. It naturally happened, however, that the title was generally bestowed upon officials, especially on the chief provincial governors, and even among barbarian chieftains whose friendship was valuable enough to call forth the imperial benediction. Among the former it appears to have become a sort of ex officio title of the Byzantine vicegerents of Italy, the exarchs of Ravenna; among the barbarian chiefs who were thus dignified were Odoacer, Theodoric, Sigismund of Burgundy, Clovis, and even in later days princes of Bulgaria, the Sara- cens, and the West Saxons. The word thus acquired an official connotation. The dignity was not hereditary and belonged only to individuals; thus a patrician family was merely one whose head enjoyed the rank of patricius. Gradually the root sense of ” father ” came to the front again, and the patricius was regarded as the ” father of the emperor ” (Ammian Marc, xxix. 2). With the word were associated such further

titles as eminenlia, magnitude, magnificentia. Those patricians who were purely honorary were called honor arii or codicillarii; those who were still in harness were praesentales. They were all distin- guished by a special dress or uniform and in public always drove in a carriage. The emperor Zeno enacted that no one could become patricius who had not been praejectus mililum, consul or magister militum, but less careful emperors gave the title to their favourites, however young and undistinguished. The writ in which the title was conferred was called a diploma.

A further change in the meaning of the name is marked by its conferment on Pippin the Frank 2 by Pope Stephen. The idea of this extension originated no doubt in the fact that the Italian patricius of the 6th and 7th centuries had come to be regarded as the defensor, protector , patronus of the Church. At all events, the conferring of the title by a pope was entirely unprecedented'; previously its validity had depended on the emperor solely. As a matter of fact it is clear that the patriciate of Pippin was a new office, especially as the title is henceforward generally patricius Romanorum, not patricius alone. It was

2 The name is used of Charles Martel, but it was not apparently formally conferred upon him.

subsequently conferred on Charlemagne at his coronation, and borne, as we gather from medieval documents, indiscriminately, not only by subsequent emperors, but also by a long line of Burgundian rulers and minor princes of the middle ages generally. 1 On the fall of the Carolingian house the title passed to Alberic II. Subsequently it was held by John Crescentius, and many leading men who received it from Otto III. {e.g. Boleslaw Chabri of Poland). In 1046 it returned to the German Henry III. The emperor Frederick Barbarossa was the last to wear the insignia (in 1167).

Bibliography. — (1) The Ancient Patricians: Th. Mommsen, Staatsrecht III. passim (3rd ed., Leipzig, 1887); Romische Forsch- ungen I. (Berlin, 1864); P. Willems, Le Droit public romain, pt. i (Louvain, 1888). (2) The Medieval Patricians: J. B. Bury's Later Roman Empire (1889); Bryce, Holy Roman Empire (1904), pp. 40 seq. ; Du Cange, Glossarium med. et inHrn. latinitatis, s.v. " Patricius" ; and histories of Charlemagne (q.v.) and his successors. For the Ger-

man Patriziertum see Roth von Schreckenstein, Das Patriziat in den deutschen Stadten, besonders Reiclistadten (2nd ed. Freiburg, 1886) ; Foltz, Beitrdge zur Gesch. des Palrizials in den deutschen Stadten (Marburg, 1899). Q. M. M.)

PATRICK, ST, the patron saint of Ireland, 2 was probably bom about the year 389. He was the son of a deacon, Calpurnius, and the grandson of a presbyter named Potitus. His father was a middle-class landed proprietor and a decurion, who is represented as living at a place called Bannauenta. The only place of this name we know is Daventry, but it seems more probable that Patrick's home is to be sought near the Severn, and Rhys con- jectures that one of the three places called Ban wen in Glamorgan- shire may be intended. The British name of the future apostle was Sucat, to which Mod. Welsh hygad, " warlike," corresponds. His Roman name has also survived in a hibernicized form, Cothrige, with the common substitution of Irish c for Brythonic p (cf. Irish case, Lat. pascha). Patrick was doubtless educated as a Christian and was imbued with reverence for the Roman Empire. When about sixteen years of age he was carried off by a band of Irish marauders. The latter were possibly taking part in the raid of the Irish king Niali Noigiallach, who met with his end in Britain in 405. Irish tradition represents the future apostle as tending the herds of a chieftain of the name of Miliucc (Milchu), near the mountain called Slemish in county Antrim, but Bury tries to show that the scene of his captivity was Connaught, perhaps in the neighbourhood of Croagh Patrick. His bondage lasted for six years. During this time he became subject to religious emotion and beheld visions which encouraged him to effect his escape. He fled, in all probability to the coast of Wicklow, and encountered a vessel which was engaged in the export of Irish wolf-dogs. After three days at sea the traders landed, possibly on the west coast of Gaul, and journeyed for twenty-eight days through a desert. At the end of two months Patrick parted from his companions and betook himself to the monastery of Lerins, where he probably spent a few years. On leaving the Mediterranean he seems to have returned home. It was doubtless during this stay in Britain that the idea of mission- ary enterprise in Ireland came to him. In a dream he saw a man named Victorious bearing innumerable epistles, one of which he received and read; the beginning of it contained the words " The Voice of the Irish "; whilst repeating these words he says, " I imagined that I heard in my mind the voice of those who were near the wood of Foclut (Fochlad), which is near the western sea, and thus they cried: ' We pray thee, holy youth, to come and walk again amongst us as before.' " The forest of Fochlad was in the neighbourhood of Killala Bay, but it is possible that it extended

considerably to the south. Despite

1 We even find a feminine form, palricissa, for the wife of a patricius. The golden circlet worn on the head by the patricius as a symbol of his dignity was called a patricialis circulus.

2 His career is involved in considerable obscurity. Widely varying views have been held by modern scholars with regard to his activity, some going so far as to treat all the accounts of his labours as the fictitious creation of a later age. In the present article Bury's reconstruction of the saint's life has been chiefly followed. Apart from its importance in other respects, Bury's treatment of the sub- ject has at any rate the merit of defending the traditional view of St Patrick's career.

his natural diffidence, and opposition on the part of his relatives, Patrick resolved to return to Gaul in order to prepare himself for his mission. He proceeded to Auxerre — a place which seems to have had a close connexion with Britain and Ireland — and was ordained deacon by Bishop Amator, along with two others who were afterwards associated with him in spreading the faith in Ireland. The one was an Irishman called Fith, better known as Iserninus, the other Auxilius. Patrick must have spent at least fourteen years at Auxerre.

It seems not unlikely that Pelagianism had taken root among the Christian communities of Ireland, and it was found necessary to send a bishop to combat the heresy. Pope Celestine's choice fell on the deacon Palladius, who had taken a prominent part in stamping out the doctrine in Britain. The mission of Palladius (431-432), whom Zimmer has endeavoured to identify with Patrick, is obscure. Tradition associates his name with the mountains of Wicklow, and we are told that he retired to the j land of the Picts in North Britain, where he died. Patrick probably felt great disappointment when Palladius was sent as the chosen envoy of Rome, but now Germanus seems to have decided that Patrick was the man for the task, and he was consecrated in 432. For the peculiar social conditions with which the Christian missionary would be confronted in Ireland see Brehon Laws and Ireland: Early History. Suffice it to say here that the land belonged to the tribes, and that the success of Patrick's undertaking depended entirely on his ability to gain the goodwill of the tribal kings and chiefs of clans. We are totally ignorant as to the extent and number of the pre-Patrician Christian communities in Ireland. It seems probable that they were, largely, if not wholly confined to the south-east of the island. Patrick landed at Inverdea, the mouth of the river Vartry in Wicklow, but we are not informed as to any of his doings in Leinster

at this period. According to the story, he immediately proceeded northward to the kingdom of TJlidia (east Ulster), though a certain tradition represents him as going to Meath. Landing on the shores of Strangford Lough, he commenced his labours in the plain on the south-west side of that inlet. A convert chief named Dichu granted him a site for an establish- ment, and a wooden barn is stated to have been utilized for the purpose of worship, whence the modern Saul (Ir. saball. " barn "). Patrick's activity was bound to bring him sooner or later into conflict with the High-king Loigaire (reigned 428-467), son of Niali Noigiallach. Fedilmid, a brother of the monarch, is represented as having made over his estate at Trim to the saint to found a church, and thus the faith was established within Loigaire's territory. The story in picturesque fashion makes Patrick challenge the royal authority by lighting the Paschal fire on the hill of Slane on the night of Easter Eve. It chanced to be the occasion of a pagan festival at Tara, during which no fire might be kindled until the royal fire had been lit. A number of trials of skill between the Christian missionary and Loigaire's Druids ensue, and the final result seems to have been that the monarch, though unwilling to embrace the foreign creed, under- took to protect the Christian bishop. At a later date the saint was probably invited by Loigaire to take part in the codification of the Senchus Mor in order to represent the interests of the Christian communities. On another occasion Patrick is reported to have overthrown a famous idol known as Cenn Cruaich or Cromm Cruaich in the plain of Mag Slecht (county Cavan). Several churches seem to have been founded in the kingdom of Meath by the saint, but they cannot now be identified. Patrick is stated to 'have visited Connaught on three different occasions and to have founded churches, one of the most impor- tant being that at Elphin. As regards Ulster our information is very scanty, though we find him establishing churches in the three kingdoms of the province (Ailech, Oriel and Ulidia). Patrick's work is more closely identified with the north of Ireland than with the south. Traces of his mission, however, are to be found in Ossory and Muskerry. But his task in the south was doubtless rather that of an organizer, and a kind of circular letter has come down to us which was addressed by Patrick, Auxilius and Iserninus, to all the clergy of the island. There is some

evidence that he made a journey to Rome (441-443) and brought back with him valuable relics. On his return he founded the church and monastery of Armagh, the site of which was granted him by Daire,

king of Oriel, and it is probable that the see was intended by him to be specially connected with the supreme ecclesiastical authority. Some years before his death, which took place in 461, Patrick resigned his position as bishop of Armagh to his disciple Benignus, and possibly retired to Saul in Dalaradia, where he spent the remainder of his life. The place of his burial was a matter of dispute in early Ireland, but it seems most likely that he was interred at Saul.

Two highly important documents purporting to have been written by Patrick have come down to us. Although the genuineness of these writings has been impugned on various occasions by different scholars, there seems to be no reason for assuming that they did not emanate from the saint's pen. The one is the Confession, which is contained in an imperfect state in the Book of Armagh (c. 807), but complete copies are found in later MSS. The Confession, written towards the end of his life, gives a general account of his career. Various charges had been brought against him by his enemies, among them that of illiter- acy, the truth of which is borne out by the crudeness of his style, and is fully admitted by the writer himself. Before being admitted to deacon's orders he had communicated to a friend some fault which he had committed when about fifteen years of age. This friend had not considered it an obstacle to ordina- tion. Later the secret was betrayed and came to the ears of persons who, as he says, " urged my sins against my laborious episcopate." It is impossible to ascertain who these detractors were — possibly British fellow-workers in Ireland. The other document is the so-called Letter to Coroticus. The soldiers of Coroticus (Ceretic), a British king of Strathclyde, had in the course of a raid in Ireland killed a number of Christian neophytes on the very day of their baptism while still clad in white garments. Others had been carried off into slavery, and a deputation of clergy which Patrick had sent to ask for their release had been subjected to ridicule. In his Letter the saint in very strong language urges the Christian subjects of the British king not to have any dealings with their ruler and his bloodthirsty followers until full satisfaction should have been made. The text of this letter occurs in a number of MSS. but is not contained in the Book of Armagh. It is however certain that it was known in the 7th century. A strange barbaric chant commonly known as the Lorica or Hymn of St Patrick is preserved in the Liber hymnorum. This piece, called in Irish the Faed Fiada or " Cry of the Deer," contains a number of remarkable grammatical forms, and the latest editors are of opinion that it may very well be genuine. From such slender material it is not easy to form a clear conception of the saint's personality. His was evidently an intensely spiritual nature, and in addition to the qualities which go to

form a strong man of action he must have possessed an enthusiasm which enabled him to surmount all difficulties. His importance in the history of Ireland and the Irish Church consists in the fact that he brought Ireland into touch with western Europe and more particularly with Rome, and that he introduced Latin into Ireland as the language of the Church. His work consisted largely in organizing the Christian societies which he found in existence on his arrival, and in planting the faith in regions such as the extreme west of Connaught which had not yet come under the sway of the gospel.

Authorities. — Apart from the Letter and Epistle mentioned above our chief sources of information with regard to the life of St Patrick are contained in the Book of Armagh. The one is the memoir by Tirechan, a bishop who had been the disciple of Bishop Ultan of Ardbraccan in Meath (d. 657). The first part of this memoir, which was probably compiled about 670, deals with the saint's work in Meath, the second with his activity in Connaught. Various additions are appended to this compilation, and there are still further additional notes. The other biography was written towards the end of the 7th century by Muirchu Maccu Machtheni, who dedicated his work to Bishop Aed of Slebte (d. 700). The first portion deals with Patrick's career down to his arrival in Ireland and contains an unvarnished statement of fact. But when the story passes to Ireland Muirchu's narrative becomes full of the mythical

element. The influence of Muirchu's work can be traced in all later biographies. Bury has shown that both Tirechan and Muirchu drew from written material which existed in part at any rate in Irish. Among later lives we may mention the hymn Genair Patraicc, commonly attributed to Fiacc, which is considered by the latest editors to have been originally composed about 800. Three anonymous Latin lives were published by Colgan in his Trias Thaumaturga (Louvain, 1645), and there exists an nth-century Irish life in three parts published by Whitley Stokes for the Rolls series (1887). A Latin translation of a different copy of this work, now lost, was pub- lished by Colgan. Lastly a life by an otherwise unknown Irish writer named Probus occurs in the Basel edition of Bede"s works (1563) and was reprinted by Colgan.

See J. B. Bury, The Life of St Patrick and his Place in History (London, 1905) ; J. H. Todd, St Patrick the Apostle of Ireland (Dublin, 1861); H. Zimmer, article " Keltische Kirche " in Realencyklopddie fur protestantische Theologie und Kirche (1901 ; trans, by Miss Meyer, "The Celtic Church in Britain and Ireland," London, 1902); J. Gwynn, Liber Ardmachanus ; Whitley Stokes, The Tripartite Life of St Patrick

(London, 1887) ;N. J. D. White, ” The Writings of St Patrick ” (critical edition) in Proceedings of the Royal Irish Academy (1904). (E. C. Q.)

PATRICK, SIMON (1626-1707), English divine, was born at Gainsborough, Lincolnshire, on the 8th of September 1626. He entered Queen’s College, Cambridge, in 1644, and after taking orders in 1651 became successively chaplain to Sir Walter St John and vicar of Battersea, Surrey. He was afterwards (1662) preferred to the rectory of St Paul’s, Covent Garden, London, where he continued to labour during the plague. He was appointed dean of Peterborough in 1679, and bishop of Chichester in 1689, in which year he was employed, along with others of the new bishops, to settle the affairs of the Church in Ireland. In 1691 he was translated to the see of Ely, which he held until his death on the 31st of May 1707. His sermons and devotional writings, which are very numerous, were long held in high estimation, and his Commentary on the Historical and Poetical Books of the Old Testament, in 10 vols., brought down as far as the Song of Solomon, was reprinted as recently as 1853. His Friendly Debate between a Conformist and a Nonconformist was a controversial tract which excited considerable feeling at the time of its publication in 1668, but he lived long enough to soothe by his moderation and candour the exasperation it had caused. He also contributed to a volume of Poems upon Divine and Moral Subjects (17 19).

The first collected edition of his works appeared at Oxford in 1859 (9 vols., 8vo) ; a small Autobiography was published also at Oxford in 1839.

PATRIZZI, FRANCESCO (Francisctjs Patritius) (1529- 1597), Italian philosopher and scientist, was born at Clissa, in Dalmatia, and died in Rome. He gained the patronage of the bishop of Cyprus, who brought him to Venice, where his abilities were immediately recognized by his appointment to the chair of philosophy at Ferrara. He was subsequently invited to Rome by Clement VIII. In spite of his almost incessant contro- versies with the Aristotelians, he found time to make a com- prehensive study of contemporary science. He published in 15 books a treatise on the New Geometry (1587), and works on history, rhetoric and the art of war. He studied ancient theories of music, and is said to have invented the thirteen-syllable verse known subsequently as versi martelliani. In his philosophy he was mainly concerned to defend Plato against the followers of Aristotle.

His two great works, Discussionum peripateticorum libri XV. (Basel, 1571), and Nova de universis philosophia (Basel, 1591), developed the view that, whereas Aristotle’s teaching was in direct opposition to

Christianity, Plato, on the contrary, foreshadowed the Christian revelation and prepared the way for its acceptance. In the earlier treatise he attacks the life and character of Aristotle, impugns the authenticity of almost all his works, and attempts to refute his doctrines from a theological standpoint. In the second and greater work he goes back to the theories and methods of the Ionians and the pre-Socratics generally. His theory of the universe is that, from God there emanated Light which extends throughout space and is the explanation of all development. This Light is not cor- poreal and yet is the fundamental reality of things. From Light came Heat and Fluidity ; these three* together with Space make up the elements out of which all things are constructed. This cosmic theory is a curious combination of materialistic and abstract ideas; the influence of his master Telesio (q.v.), generally predominant,

is not strong enough to overcome his inherent disbelief in the adequacy of purely scientific explanation.

PATROCLES (c. 312-261 B.C.), a Macedonian general and writer on geographical subjects, who lived during the reigns of Seleucus I. and Antiochus I. When in command of the fleet of Seleucus (285) he undertook a voyage of exploration on the Caspian Sea to discover possible trade routes, especially for communication with the peoples of northern India. He came to the conclusion that the Caspian was a gulf or inlet, and that it was possible to enter it by sea from the Indian Ocean. The only information as to his work (even the title is unknown) is derived from Strabo. After the death of Seleucus, Patrocles was sent by his successor Antiochus to put down a revolt in Asia Minor, and lost his life in an engagement with the Bithynians.

See Strabo ii. 68, 74, xi. 508, xv. 689 ; Diod. Sic. xix. 100 ; Plutarch, Demetrius, 47; Pliny, Nat. Hist. vi. 21 ; Photius, cod. 224 (on Mem-non) ; C. W. Miiller, Fragmenta historicorum graecorum, ii. 442 ; E. H. Bunbury, Hist, of Ancient Geography, vol. i. (1879) ; W. W. Tarn, ” Patroeles and the Oxo-Caspian Trade Route ” in Journal of Hellenic Studies, vol. xxi. (1901).

PATROL (Fr. patrouiller, connected with patte, foot), a verb meaning to move up and down or traverse a specified ” round ” or ” beat ” in a district in a town, camp or other place, or on a stretch of water on a river or sea, for the purpose of watching and protecting the same, or for reconnoitring the numbers or positions of an enemy. As a substantive the term is used of the detachment of troops or police employed.

PATRON, a word of which the various meanings in European languages are derived and transferred from that of the Lat. palronus, whose position in Roman law and antiquities is treated below (Patron and Client). The most general application of the word in these transferred senses is that of an influential supporter or protector. The earliest use of the word in English appears to have been in the special ecclesiastical sense of the holder of an advowson, the right of presentation to a benefice. From this meaning is deduced that of the person in whom lies the right of presenting to public offices, privileges, &c, still surviving in the title of the Patronage Secretary of the Treasury in Great Britain. From the earliest Christian times the saints took the place of the pagan tutelary deities (Di tutelares) and were in this capacity called tutelares or patroni, patron-saints. To them churches and other sacred buildings are dedicated, and they are

regarded as the protectors and guardians of countries, towns, professions, trades and the like. Further, a person may have a patron-saint, usually the one on or near whose festival he has been born, or whose name has been taken in baptism.

A full list of saints, with the objects of the peculiar patronage of each, is given in M. E. C. Walcott's Sacred Archaeology (1868).

PATRON AND CLIENT (Lat. palronus, from pater, father; clientes or cluentes, from cluere, to obey), in Roman law. Clien- tage appears to have been an institution of most of the Graeco- Italian peoples in early stages of their history; but it is in Rome that we can most easily trace its origin, progress and decay. Until the reforms of Servius Tullius, the only citizens proper were the members of the patrician and gentile houses; they alone could participate in the solemnities of the national religion, take part in the government and defence of the state, contract quiritarian marriage, hold property, and enjoy the protection of the laws. But alongside of them was a gradually increasing non-citizen population composed partly of slaves, partly of free- men, who were nevertheless not admitted to burgess rights. To the latter class belonged the clients, individuals who had attached themselves in a position of dependence to the heads of patrician houses as their patrons, in order thereby to secure attachment to a gens, which would involve a de facto freedom. Mommsen held that the plebs consisted originally of clients only; but the earliest records of Rome reveal the possibility of a man becoming a plebeian member of the Roman state without assuming the dependent position of clientship (see Patricians); and long before the time of Servius Tullius the clients must be regarded as a section only of the plebeian order, which also contained members unattached to any palronus. The relation- ship of patron and client was ordinarily created by what, from the

client's point of view, was called adplicalio ad patronum, from that of the patron, susceptio clientis — the client being either a person who had come to Rome as an exile, who had passed through the asylum, or who had belonged to a state which Rome had overthrown. According to Dionysius and Plutarch, it was one of the early cares of Romulus to regulate the relationship, which, by their account of it, was esteemed a very intimate one, imposing upon the patron duties only less sacred than those he owed to his children and his ward, more urgent than any he could be called upon to perform towards his kinsmen, and whose neglect entailed the penalty of death (Tellumoni sacer esto). He was bound to provide his client with the necessaries of life; and it was a common practice to make him a grant during pleasure of a small plot of land to cultivate on his own account. Further, he had to advise

him in all his affairs; to represent him in any transactions with third parties in which, as a non-citizen, he could not act with effect; and, above all things, to stand by him, or rather be his substitute, in any litigation in which he might become involved. The client in return had not only generally to render his patron the respect and obedience due by a dependant, but, when he was in a position to do so and the circumstances of the patron required it, to render him pecuniary assistance. As time advanced and clients amassed wealth, we find this duty insisted upon in a great variety of forms, as in contributions towards the dowries of a patron's daughters, towards the ransom of a patron or any of his family who had been taken captive, towards the payment of penalties or fines imposed upon a patron, even towards his maintenance when he had become reduced to poverty. Neither might give evidence against the other — a rule we find still in observance well on in the 1st century B.C., when C. Herennius declined to be a witness against C. Marius on the ground that the family of the latter had for generations been clients of the Herennii (Plut. Mar. 5). The client was regarded as a minor member (gentilicius) of his patron's gens; he was entitled to assist in its religious services, and bound to contribute to the cost of them; he had to follow his patron to battle on the order of the gens; he was subject to its jurisdiction and discipline, and was entitled to burial in its common sepulchre. And this was the condition, not only of the client who personally had attached himself to a patron, but that also of his descen- dants; the patronage and the clientage were alike hereditary. The same relationship was held to exist between a freedman and his former owner; for originally a slave did not on enfranchise- ment, become a citizen; it was a de facto freedom merely that he enjoyed; his old owner was always called his patron, while he and his descendants were substantially in the position of clients, and often so designated.

In the two hundred years that elapsed before the Servian constitutional reforms, the numerical strength of the clients, whether in that condition by adplicatio, enfranchisement or descent, must have become considerable; and it was from time to time augmented \>y the retainers of distinguished immigrants admitted into the ranks of the patriciate. There seems also to have been during this period a gradual growth of virtual indepen- dence on the part of the clients, and it is probable that their precarious tenure of the soil had in many cases come to be practically regarded as ownership, when a patron had not asserted his right for generations. The exact nature of the privi- leges conferred on the clients by Servius Tullius is not known. Probably this king guaranteed to the whole plebeian order, including the clients, the legal right of private ownership of Roman land. At the

same time he imposed upon the whole order the duty of serving in the army, which was now organized on a basis of wealth. The client had previously been liable to military service at the command of the gens. Now he was called upon to take his part in it as a member of the state. As a natural corollary to this, all the plebeians seem to have been enrolled in the tribes, and after the institution of the plebeian assembly {concilium plebis) the clients, who formed a large part of the order, secured a political influence which steadily increased. It is not certain how soon they acquired the right to litigate in person on their own behalf, but their possession of this right

seems to be implied in the XII. Tables, and may have been granted them at an earlier date. At any rate after 449 B.C. there were no disabilities in private law involved in their status. The relation of patron and client, it is true, still remained; the patron could still exact from his client respect, obedience and service, and he and his gens had still an eventual right of succes- sion to a deceased client's estate. But the fiduciary duties of the patron were greatly relaxed, and practically little more was expected of him than that he should continue to give his client his advice, and prevent him falling into a condition of indi- gence; sacer esto ceased to be the penalty of protection denied or withheld, its application being limited to fraus facta, which in the language of the Tables meant positive injury inflicted or damage done.

So matters remained during the 4th, 3rd and 2nd centuries. In the 2nd and 1st a variety of events contributed still further to modify the relationship. The rapacity of patrons was checked by the lex Cincia (passed by M. Cincius Alimentus, tribune in 204 B.C.), which prohibited their taking gifts of money from their clients; marriages between patron and client gradually ceased to be regarded as unlawful, or as ineffectual to secure to the issue the status of the patron father. At the same time the remaining political disabilities of the clients were removed by their enrolment in all the tribes instead of only the four city tribes, and their admission to the magistracy and the senate. Hereditary clientage ceased when a client attained to a curule dignity; and in the case of the descendants of freedmen enfran- chised in solemn forms it came to be limited to the first genera- tion. Gradually but steadily one feature after another of the old institution disappeared, till by the end of the 1st century it had resolved itself into the limited relationship between patron and freedman on the one

hand, and the unlimited honorary relationship between the patron who gave gratuitous advice on questions of law and those who came to consult him on the other. To have a large following of clients of this class was a matter of ambition to every man of mark in the end of the republic ; it increased his importance, and ensured him a band of zealous agents in his political schemes. But amid the rivalries of parties and with the venality of the lower orders, baser methods had to be resorted to in order to maintain a patron's influence; the favour and support of his clients had to be purchased with some- thing more substantial than mere advice. And so arose that wretched and degrading clientage of the early empire, of which Martial, who was not ashamed to confess himself a first-rate specimen of the breed, has given us such graphic descriptions; gatherings of idlers, sycophants and spendthrifts, at the levees and public appearances of those whom, in their fawning servility, they addressed as lords and masters, but whom they abused behind their backs as close-fisted upstarts — and all for the sake of the sportida, the daily dole of a dinner, or of a few pence wherewith to procure one. With the middle empire this disap- peared; and when a reference to patron and client occurs in later times it is in the sense of counsel and client, the words patron and advocate being used almost synonymously. It was not so in the days of the great forensic orators. The word advocate, it is said, occurs only once in the singular in the pages of Cicero. But at a later period, when the bar had become a profession, and the qualifications, admission, numbers and fees of counsel had become a matter of state regulation, advocali was the word usually employed to designate the pleaders as a class of professional men, each individual advocate, however, being still spoken of as patron in reference to the litigant with whose interest he was entrusted. It is in this limited connexion that patron and client come under our notice in the latest monuments of Roman law.

Literature. — On the clientage of early Rome see T. Mommsen, " Die romische Clientel," Rom. Forschungen, i. 355 (Berlin, 1864) ; M. Voigt, " Ueber die Clientel und Libertinitat," in Ber. d. phil. histor. Classe d. konigl. sacks. Gesellsch. d. Wissenschaften (1878, pp. 147-219); J. Marquardt, Privatleben d. Romer, pn. 196-200 (Leipzig, 1879); M. Voigt, Die XII. Tafeln., ii. 667-679 (Leipzig, 1883). Earlier literature is noted in P. Willems, Le Droit public ! >»»4ra, 4th ed., p. 26 (Louvain, 1880). On the clientage of the early

empire see W. A. Becker, Gattus, vol. ii., Excursus 4 (London, 1849); L. Friedlander, Sitlengeschichte Roms, i. 200-212 (Leipzig, 1901); Marquardt, op. cit. pp. 200-208. On the latest clientage, see T. Grellet-Dumazeau, Le Barreau romain (Paris, 1858).

(J.M.*;A.M.Cl.)

PATTEN (adapted from Fr. patin, in modern usage meaning a ” skate “; Med. Lat. patinus, Ital. patlino, of unknown origin; cf. patte, paw), a kind of shoe which, varying in form at different times and places, raised the wearer from the ground in order to keep the feet out of mud or wet. Pattens were necessaries to women of all classes in the uncleaned and unpaved streets of the 16th, 17th and 18th centuries. They may still be found in use in rural parts of England. A wooden shoe or clog, a light strapped shoe with a very thick sole of wood or cork, and, more particularly, an iron ring supporting at a little distance from the ground a wooden sole with a strap through which the foot slips, have all been types which the patten has taken. An extraor- dinary kind of ” patten ” was fashionable in Italy and Spain in the 1 6th or 17th centuries. This was the chopine, 1 a loose slipper resting on a very thick sole of cork or wood. During the 17th century at Venice ladies wore ” chopines ” of exaggerated size. Coryat, in his Crudities, 161 1 (vol. i. p. 400, ed. 1905), gives a description of these Venetian ” chapineys.” They were of wood covered with red, white and yellow leather, some gilt or painted, and reached a height sometimes of half a yard. Ladies wearing these exaggerated chopines had to be accompanied by attendants to prevent them falling. There is a 16th century Venetian ” chopine ” in the British Museum. The ” Patten- makers ” Company is one of the minor Livery companies of London. The patten-makers were originally joined with the ” Pouch and Galoche Makers,” and are mentioned as early as 1400. They became a separate fraternity in 1469, but did not obtain a charter till 1670.

PATTER, properly a slang word for the secret or ” cant ” language used by beggars, thieves, gipsies, &c, hence the fluent plausible talk that a cheap-jack employs to pass off his goods, or a conjuror to cover up his tricks. It is thus used of any rapid manner of talking, and of a ” patter-song,” in which a very large number of words have to be sung at high speed to fit them to the music. The word, though in some of its senses affected by ” patter,” to make a series of rapid strokes or pats, as of rain- drops, is derived from the quick, mechanical repetition of the Paternoster, or Lord’s Prayer.

PATTERN, a model, that which serves as an original from which similar objects may be made, or as an example or specimen; in particular an artistic design serving as a sample or model, hence the arrangement or grouping of lines, figures, &c, which make up such a design. The word was taken from Fr. patron, Lat. patronus, a defender or protector. In medieval Latin patronus had the specific meaning of

example, and in modern French both meanings of patron and pattern attach to patron. ” Patron ” in the sense of copy, example, began to be pro- nounced and spelled in England as ” pattern ” in the 16th century.

PATTESON, JOHN COLERIDGE (1827-1871), English mis- sionary, bishop of Melanesia, was born in London on the 1st of April 1827, the eldest son of Sir John Patteson, justice of the King’s Bench, and Frances Duke Coleridge, a near relative of Samuel Taylor Coleridge. He was educated at Ottery St Mary and at Eton, where he distinguished himself on the cricket-field. He entered Balliol College, Oxford, in 1845, graduated B.A. in 1848, and in 1852 became a fellow of Merton College. In 1853 he became curate of Alfington, Devon, and in the following year he was ordained priest. He then joined George Augustus Selwyn, bishop of New Zealand, in a mission to the Melanesian islands. There he laboured with great success, visiting the different islands of the group in the mission ship the ” Southern Cross,” and by his good sense and devotion winning the esteem and affection of the natives. His linguistic powers were

1 The word is taken from an obsolete French chapine or Spanish chapin, and is of doubtful origin. The Spanish chapa, flat plate, has been suggested. The word does not occur in Italian, though it is often Italianized in English in such forms as cioppino.

exceptional, and he spoke 23 languages with ease. In 1861 he was consecrated bishop of Melanesia, and fixed his headquarters at Mota. He was killed by natives at Nukapu, in the Santa Cruz group, on the 20th of September 1871, the victim of a tragic error. The traders engaged in the nefarious traffic in Kanaka labour for Fiji and Queensland had taken to personating missionaries in order to facilitate their kidnapping; Patteson was mistaken for one of these and killed. His murderers evidently found out their mistake and repented of it, for the bishop’s body was found at sea floating in a canoe, covered with a palm fibre matting, and a palm-branch in his hand. He is thus represented in the bas-relief erected in Merton College to his memory.

See Life by Charlotte M. Yonge (1873).

PATTI, ADELINA JUANA MARIA [Baroness Cederstrom] (1843-), the

famous vocalist, daughter of an Italian singer, Salvatore Patti, was born at Madrid on the 19th of February 1843. Her mother, also a singer, was Spanish, being known before her marriage as Signora Barili. Both the parents of Adelina went to America, where their daughter was taught singing by Maurice Strakosch, who married Amelia Patti, an elder sister. Gifted with a brilliant soprano voice, Adelina Patti began her public career at the age of seven in the concert halls of New York, where in 1859 she also made her first appear- ance as Lucia in Donizetti's opera, Lucia di Lammermoor. On the 14th of May 1861 she sang as Amina in Bellini's opera La Sonnambula at Covent Garden, and from this time she became the leading operatic prima donna, her appearances in London, Paris and the other principal musical centres being a long succession of triumphs, and her roles covering all the great parts in Italian opera. In 1868 she married Henri, marquis de Caux, a member of Napoleon III.'s household, from whom she was divorced in 1885; she then married Nicolini, the tenor, who died in 1898; and in 1899 she became the wife of Baron Cederstrom, a Swede, who was naturalized as an Englishman. Madame Patti ceased to appear on the operatic stage in public after the 'eighties, but at Craig-y-Nos, her castle in Wales, she built a private theatre, and her occasional appearances at concerts at the Albert Hall continued to attract enthusiastic audiences, her singing of "Home, Sweet Home" becoming peculiarly associated with those events. Partly owing to her fine original training, partly to her splendid method and partly to her avoidance of Wagnerian roles, Madame Patti wonderfully preserved the freshness of her voice, and she will be remembered as, after Jenny Lind, the greatest soprano of the 19th century.

PATTI, a town and episcopal see of Sicily, in the province of Messina, 42 m. W. by S. of Messina by rail. Pop. (1901), 5473 (town), 10,995 (commune). The cathedral, founded about 1300, has been modernized; it contains the tomb (restored in the 17th century) of Adelasia, widow of Count Roger of Sicily. The abandoned church of San Marco is built into the remains of a Greek temple.

PATTISON, MARK (1813-1884), English author and rector of Lincoln College, Oxford, was born on the 10th of October 1813. He was the son of the rector of Hauxwell, Yorkshire, and was privately educated by his father. In 1832 he matriculated at Oriel College, where he took his B.A. degree in 1836 with second- class honours. After other attempts to obtain a fellowship, he was elected in 1839 to a Yorkshire fellowship at Lincoln, an anti-Puseyite College. Pattison was at this time a Puseyite, and greatly under the influence of J. H. Newman, for whom he worked, helping in the translation of Thomas Aquinas's

Catena Aurea, and writing in the British Critic and Christian Remembrancer. He was ordained priest in 1843, and in the same year became tutor of Lincoln College, where he rapidly made a reputa- tion as a clear and stimulating teacher and as a sympathetic friend of youth. The management of the college was practically in his hands, and his reputation as a scholar became high in the university. In 1851 the rectorship of Lincoln became vacant, and it seemed certain that Pattison would be elected, but he lost it by a disagreeable intrigue. The disappointment was acute and his health suffered. In 1855 he resigned the tutorship,

travelled iri Germany to investigate Continental systems of education, and began his researches into the lives of Casaubon and Scaliger, which occupied the remainder of his life. In 1861 he was elected rector of Lincoln, marrying in the same year Emilia Francis Strong (afterwards Lady Dilke). The rector contributed largely to various reviews on literary subjects, and took a considerable interest in social science, even presiding over a section at a congress in 1876. The routine of university business he avoided with contempt, and refused the vice-chan- cellorship. But while living the life of a student, he was fond of society, and especially of the society of women. He died at Harrogate on the 30th of July 1884. His biography of Isaac Casaubon appeared in 1875; Milton, in Macmillan's English Men of Letters series in 1879. The 18th century, alike in its literature and its theology, was a favourite study, as is illustrated by his contribution (Tendencies of Religious Thought in England, 1 688-1750) to the once famous Essays and Reviews (i860), and by his edition of Pope's Essay on Man (1869). &c. His Sermons and Collected Essays, edited by Henry Nettleship, were published posthumously (1889), as well as the Memoirs (1885), an auto- biography deeply tinged with melancholy and bitterness. His projected Life of Scaliger was never finished. Mark Pattison possessed an extraordinary distinction of mind. He was a true scholar, who lived entirely in the things of the intellect. He writes of himself, excusing the composition of his memoirs, that he has known little or nothing of contemporary celebrities, and that his memory is inaccurate: " All my energy was directed upon one end — to improve myself, to form my own mind, to sound things thoroughly, to free myself from the bondage of unreason. . . If there is anything of interest in my story, it is as a story of mental development " (Memoirs, pp. 1, 2). The Memoirs is a rather morbid book, and Mark Pattison is merciless to himself throughout. It is evident that he carried rationalism in religion to an extent that seems hardly consistent with his position as a priest of the English Church.

Mark Pattison's tenth and youngest sister was Dorothy Wyndlow

Pattison (1832-1878), better known as Sister Dora, the name she took in 1864 on becoming a member of the Anglican sisterhood of the Good Samaritan at Coatham, Yorkshire. In 1865 she was sent as nurse to their cottage hospital in Walsall, and from 1867 to 1877 she was in charge of a new hospital there. She left the sisterhood in 1874, and their hospital in 1877, to take charge of the municipal epidemic hospital, where the cases were largely small-pox. She had meanwhile qualified herself thoroughly as a nurse and had acquired no mean skill as a sur- geon. Her efforts greatly endeared her to those among whom she worked, and after her death a memorial window was erected in the parish church, and a marble portrait statue by F. J. Williamson in the principal square of Walsall.

See Margaret Lonsdale's Sister Dora (1887 ed.).

PATTON, FRANCIS LANDEY (1843-), American educa- tionalist and theologian, was born in Warwick parish, Bermuda, on the 22nd of January 1843. He studied at Knox College and at the university of Toronto; graduated at Princeton Theological Seminary in 1865; was ordained to the Presbyterian ministry in June 1865; was pastor of the 84th Street Presby- terian Church, New York City, in 1865-1867, of the Presby- terian Church of Nyack, New York, in 1867-1870, of the South Church, Brooklyn, in 1871, and of the Jefferson Park Presbyterian Church, Chicago, in 1874-1881; and in 1872-1881 was professor in McCormick Seminary, Chicago. He was moderator of the General Assembly of the Presbyterian Church in 1878. In 1881- 1888 he was Stuart professor " of the relation of philosophy and science to the Christian religion " (a chair founded for him) in Princeton Theological Seminary; in 1888-1902 he was president of the College of New Jersey, which in 1896 became Princeton University; in 1902 he became president of Princeton Theological Seminary. He brought charges of heresy in 1874 against David Swing, and was prosecuting attorney at Swing's trial. In 1891 and 1892 he was one of the opponents of Dr Charles A. Briggs at the time of the Briggs heresy case. Dr Patton was an opponent of the revision of the Confession

of Faith. He was editor, with Dr Briggs, of the Presbyterian Review, in 1880-1888. He wrote The Inspiration of the Scrip- tures (1869), and Summary of Christian Doctrine (1874).

PAU, a city of south-western France, chief town of the department of

Basses-Pyrenees, 66 m. E.S.E. of Bayonne on the southern railway to Toulouse. Pop. (1906), 30,315. It is situated on the border of a plateau 130 ft. above the right bank of the Gave de Pau (a left-hand affluent of the Ad'our), at a height of about 620 ft. above the sea. A small stream, the Hedas, flowing in a deep ravine and crossed by several bridges, divides the city into two parts. The modern importance of Pau is due to its climate, which makes it a great winter health-resort. The most striking characteristic is the stillness of the air, resulting from the peculiarly sheltered situation. The average rainfall is about 33 in., and the mean winter temperature is 43°, the mean for the year being 56°.

The town is built on a sandy soil, with the streets running east and west. The Place Royale (in the centre of which stands Nicolas Bernard Raggi's statue of Henry IV., with bas-reliefs by Antoine Etex) is admired for the view over the valley of the Gave and the Pyrenees; it is connected by the magnificent Boulevard des Pyrenees with the castle gardens. Beyond the castle a park of thirty acres planted with beech trees stretches along the high bank of the Gave. Access to the castle is obtained by a stone bridge built under Louis XV. ; this leads to the entrance, which gives into a courtyard. On the left of the entrance is the donjon or tour de Gaston Phcebus. On the right are the lour neuve, a modern erection, and the Tour de Montauzet (Monte-Oiseau) , the higher storeys of which were reached by ladders; the Tour de Bilheres faces north-west, the Tours de Mazeres south-west. Another tower between the castle and the Gave, the Tour de la Monnaie, is in ruins.

In the gardens to the west of the castle stand a statue of Gaston Phcebus, count of Foix, and two porphyry vases presented by Bernadotte king of Sweden, who was born at Pau. On the ground-floor is the old hall of the estates of Beam, 85 ft. long and 36 ft. wide, adorned with a white marble statue of Henry IV. » and magnificent Flemish tapestries ordered by Francis I. Several of the upper chambers are adorned with Flemish, Brussels or Gobelins tapestry, but the most interesting room is that in which Henry IV. is said to have been born, containing his cradle made of a tortoise-shell, and a magnificent carved bed of the time of Louis XII. The churches of St Jacques and St Martin in the Gothic style are both modern. The lycee occupies a portion of the buildings of a Jesuit college founded in 1622. The prefecture, the law-court and the hotel de ville present no remarkable features. Pau is the seat of a court of appeal and a court of assizes and has a tribunal of first instance, a tribunal of commerce and a chamber of arts and manufactures. There are training colleges for both sexes, a library, an art museum and several learned societies. Pau owes most of its prosperity to its visitors. The golf club, established 1856, has a

course of 18 holes, on the Plaine de Billere, about a mile from the town. Among the industrial establishments are flour-mills, cloth factories and tanneries, and there is trade in wine, hams, horses and cloth.

Pau derives its name from the word pal, in allusion to the stakes which were set up on the site chosen for the town. It was founded probably at the beginning of the nth century by the viscounts of Beam. By the erection of the present castle in the latter half of the 14th century, Gaston Phcebus made the town a place of importance and after his death the viscounts of Beam visited it frequently. Gaston IV. granted a charter to the town in 1464. Francois Phoebus, grandson and successor of Gaston, became king of Navarre in 1479, and it was not until 1512 that the loss of Spanish Navarre caused the rulers of Beam to transfer their residence from Pampeluna to Pau, which till 1589 was their seat of government. Margaret of Valois, who married Henri d'Albret, made her court one of the most brilliant of the time. In 1553 her daughter Jeanne d'Albret gave birth to Henry IV. at Pau. It was the residence of Catherine, sister of Henry IV., who governed Beam in the name of her brother. In 1620

when French Navarre and Beam were reduced to the rank of province, the intendants took up their quarters there. In the 19th century Abd-el-Kader, during part of his captivity, resided in the castle.

PAUL, " the Apostle of the Gentiles," the first great Christian missionary and theologian. He holds a place in the history of Christianity second only to that of the Founder himself. It was no accident that one who has been styled " the second founder of Christianity " was born and bred a Pharisee.- Rather it was through personal proof of the limitations of legal Judaism that he came to distinguish so clearly between it and the Gospel of Christ, and thereby to present Christianity as the universal religion for man as man, not merely a sect of Judaism with proselytes of its own. For this, and nothing less, was the issue involved in the problem of the relation of Christianity to the Jewish Law; and it was Paul who settled it once and for all.

A modern Jew has said, " Jesus seems to expand and spiritu- alize Judaism; Paul in some senses turns it upside down." The reason of this contrast is their respective attitudes to the Law as the heart of Judaism. Jesus seems never to have breathed the atmosphere of Rabbinic religion. 1 Hence his was a purely positive reinterpretation of the spirit of Old Testament religion as a whole. His attitude to the Law was one of habitual dutifulness to its ordinances, combined with

sovereign freedom towards it's letter when the interests of its spirit so required (cf. F. J. A. Hort, Judaistic Christianity, chap. ii.). To this the primitive apostles and their converts in the main adhered, without seeing far into their Master's principle in the matter; nor did they feel any great straitening of the spirit by the letter of the Mosaic, rather than the Rabbinic Law. But with Paul it was otherwise. As Saul the Pharisee he had taken the Mosaic Thorah as divine Law in the strictest sense, demanding perfect inner and outer obedience; and he had relied on it utterly for the righteousness it was held able to confer. Hence when it gave way beneath him as means of salvation — nay, plunged him ever more deeply into the Slough of Despond by bringing home his inability to be righteous by doing righteousness — he was driven to a revolutionary attitude to the Law as method of justification. " Through (the) Law " he " died unto (the) Law," that he " might live unto God " (Gal. ii. 19). By this experience not only Pharisaic Judaism, but the legal principle in religion alto- gether, was turned " upside down " within his own soul; and of this fact his teaching and. career as an apostle were the outcome.

But Paul had in him other elements besides the Jewish, though these lay latent till after his conversion. As a native and citizen of Tarsus, he had points of contact with Greek culture and senti- ment which help to explain the sympathy and tact with which he adapted his message to the Greek. As a Roman citizen likewise, conscious of membership in a world-wide system of law and order which overrode local and racial differences, he could realize the idea of a universal religious franchise, with a law and order of its own. Both these factors in his training contributed to the moulding of Paul the missionary statesman. In his mind the conception of the Church as something catholic as the Roman Empire first took shape; and through his wonderful labours the foundations of its actual realization were firmly laid. In giving some account of this man and of his teaching, we shall expound the latter mainly as it emerges in the course of his personal career.

Method. — Paul's own letters are our, critical basis, as F. C. Baur and the Tubingen school made clear once for all. The book of Acts and other sources of information are to be used only so far as they

1 This, since the full success of the Maccabaean reaction more than a century before, was determined by the Pharisaic notion of the Law, as a rigorous and technical method of attaining " righteousness " before God by correctness of religious conduct. But this ideal represented only one stream of the religion of the original Chasidim, or " pious ones " of the Psalms (see Assideans). The simpler form in which their piety lived on in less official circles, was that amidst which John the

Baptist and Jesus himself were reared. It breathes in the more popular literature of edification represented by the Testaments of the Twelve Patriarchs, as well as in Luke i. , ii.

are compatible with the letters, 1 as our only strictly contemporary documents. If our results to-day are far more positive than those of the Tubingen critics, this is due partly to the larger number of letters now generally acknowledged as Paul's (some eight or ten), and partly to a fuller knowledge both of Judaism and the Graeco- Roman world. These are seen to have embraced more varieties of religious thought and feeling than used to be assumed. The " particularist " tendency in Judaism was more limited than Baur supposed; while there was even a pre-Christian gnosticism, both Jewish and non-Jewish. Albrecht Ritschl in his Altkath. Kirche (2nd ed., 1857) did much to break through the hard-and-fast cate- gories of the school in which he was trained, and in particular showed that Gentile Christians generally were far from Pauline in their modes of conceiving either Law or Gospel.

Chronology. — This has been discussed by Sir W. M. Ramsay in Pauline and Other Studies (1907), and by C. H. Turner in Hastings's Diet, of the Bible (article " Chronology of New Test."). Their results agree in the main for the period when precision first becomes possible, viz. between Paul's first missionary journey and his arrival in Rome. Here Turner antedates Ramsay by a year throughout. C. Clemen, in his Paulus i. 349-410, reaches rather different results. The piVot of the whole is Festus's succession to Felix as procurator, which Turner places in 58 and Ramsay in 59, while they agree in excluding 56 (Blass and Harnack), 57 (Bacon), 60 (Lightfoot, Zahn), as well as yet earlier and later extremes (Clemen argues for 61). On the chronology from Paul's conversion down to the Relief visit (Acts xi. 30), c. 45-47, hardly two scholars agree; but on the whole the tendency is to put his conversion rather earlier than was formerly usual.

I. Paul's Life. — "Saul, who is also Paul," was "a Hebrew, of Hebrews " born, i.e. of strict Jewish origin, and of the tribe of Benjamin (Phil. iii. 5; cf. 2 Cor. xi. 22). Yet, as his double name suggests, he was not reared on Jewish soil but amid the Dispersion, at Tarsus in Cilicia, the son of a Roman citizen (Acts xxii. 28; cf. xvi. 37, xxiii. 27). " Saul," his Jewish name, was a natural one for a Benjamite to bear, in memory of

Israel's first king. " Paul " was his name for the non- Jewish world, according to a usage seen also in John Mark, Simeon Niger, &c. Paulus was not an uncommon name in Syria and eastern Asia Minor (see the Index nominum in Boeckh's Corp. inscr. graec), and was a natural one for the son of a Roman citizen. Ramsey develops this point suggestively {Pauline and Other Studies, p. 65). "It is as certain that he had a Roman name and spoke the Latin language as it is that he was a Roman citizen. If, for example's sake, we could think of him some- times as Gaius Julius Paulus — to give him a possible and even not improbable name — how completely would our view of him be transformed. Much of what has been written about him [as a narrow, one-sided Jew] would never have been written in Tarsus. ˆ Luke had mentioned his full name." Nor would much of the same sort have been written, if the influences due to his Tarsian citizenship 2 (xxi. 39), viewed in the light of the habits of Jewish life in Asian cities, had been kept in mind. Tarsus, it seems, was peculiarly successful " in producing an amalgamated society in which the Oriental and Occidental spirit in unison attained in some degree to a higher plane of thought and action" (id., The Cities of St. Paul, 89). Accordingly it is natural that Paul's letters should bear traces of Hellenic culture up to the level of a man of liberal education. Whether he went beyond this to a first-hand study of philosophy, particularly of the Stoic type for which Tarsus as a university was famous, is open to question. 3 In any case Paul had learnt, when he wrote his epistles, to value Greek " wisdom " at its true worth — the suggestiveness and sanity of its best thoughts,

1 The method which reverses this relation, using the " we " passages of Acts to discredit the epistles of Paul (as well as the rest of Acts), is a mere tour de force, which has received artificial vogue by incorporation in the Encyclopaedia Biblica, and to a less degree in the external and partial article " Saul of Tarsus " in the Jewish Encyclopaedia. The essential harmony of the epistles and Acts has been shown afresh by A. Harnack, Die Apostelgeschickte (1908).

a Probably as member of the Jewish " tribe " dating from the Seleucid colony planted there in 171 B.C. (Ramsay).

3 The main difficulty in deciding on this, as on other points of contact between Paul and Hellenism, is the fact that he certainly got many of his Greek ideas through the medium of Judaeo-Greek or Hellenistic literature, like the Wisdom of Solomon (cf. Romans i. 18-ii. fin.). It is clear from the way in which he uses the Greek Bible, even where it diverges wrongly from the original, that he was reared on it rather than on the Hebrew text

but at the same time its inadequacy to meet the deeper longings of the human spirit. Above all he felt the mental and moral shallowness of the verbal ” show of wisdom ” which marked current philosophical rhetoric.

Thanks to his letters, we can form some idea of the character and strength of the element in Paul’s early life due to Judaism. Looking back, he says (Phil. iii. 4-7), ” If any other man thinketh to have confidence in the flesh, I yet

Jewish Training.

more. Circumcised the eighth day, ... a Hebrew of Hebrews; as touching the Law, a Pharisee; as touching the righteousness which is in the Law, found blameless. Howbeit what things were gain to me, these have I counted loss for Christ.” He came indeed to regard such inherited advantages as in themselves things of ” the flesh,” natural rather than spiritual (w. 4, 9). Yet as advantages, tending to awaken the spirit’s thirst for God, he did esteem them, seeing in them part of the preparation vouchsafed by divine providence to himself (Gal. 1. 15). Upon the ” advantage of the Jew,” as ” entrusted with the oracles of God ” (Rom. iii. 1 seq.), he dwells in Rom.ii.17 in a way suggestive of his own youthful attitude to ” the name of a Jew.” Thus we may imagine the eager boy in Tarsus, as developing, under the instructions of a father strictly loyal to the Law, and under the teaching of the synagogue, a typical Jewish consciousness of the more serious and sensitive order.

A good deal depends on the age at which the young Saul passed from Tarsus to Jerusalem and the school of Gamaliel. If he felt his vocation as teacher of the Law at the earliest possible age, this great change may have J emaa f em , come soon after his fifteenth year, when Rabbinic studies might begin. This would well accord with the likelihood that he never married. But in any case we must not exaggerate the contrast involved, since he came from a Pharisaic home and passed to sit at the feet of the leader of the more liberal Palestinian Rabbinism. The transition would simply accentuate the legal element in his religious life and outlook. Nor was it mere personal acceptance with God that floated before his soul as the prize of such earnestness. The end of ends was a righteous nation, worthy the fulfilment of the divine promises. But this too could come only by obedience to the Law. Thus all that the young Pharisee cared for most hung upon the Law of his fathers.

Outwardly he obtained the goal of legal blamelessness as few attained

it; and for a time he may have felt a measure of self-satisfaction. But if so, a day came when the inner meaning of the Law, as extending to the sphere of desire and motive, came home to him in stern power, and his peace fled (Rom. vii. 9). For sin in his inner, real life was unsubdued; nay, it seemed to grow ever stronger, standing out more clearly and defiantly as insight into the moral life grew by means of the Law. To the Law he had been taught to look for righteous- ness. In his experience it proved but the means to " knowledge of sin," without a corresponding impulse towards obedience. Not only did it make him realize the latent possibilities of evil desire (" the evil heart," Yetzer hard), it also made him aware of a subtler evil, the reaction of self-will against the demands of the Law. While one element was in abiding harmony with the will of God, the other was in equal sympathy with " the law of sin." Could the Law achieve the separation, making the moral person " die " to " the flesh " and so escape its sway ? No, answered Saul's experience: the Law rather adds power to sin as self-will (1 Cor. xv. 56; Rom. vii. 11, 13). Whence then is deliverance to come? It can only come with the Messianic age and through Messiah. The Law would reign inwardly as outwardly, being "written on the heart" as promised in prophecy.

So may we conceive the position reached by Saul, though not with full consciousness, before he came into contact with Christianity. But as yet he did not realize that "through the Law he had died to the Law" (Gal. ˆJ"* sas ii. 19), much less the logical bearing of this fact upon 'tojeun!** the nature and function of the Law. How then would the message, " Jesus is the Messiah," strike such 3

man? It would seem a blasphemous caricature of things most sacred. It is doubtful whether he had heard Jesus Him- self (2 Cor. v. 16 has perhaps another meaning). He may even have been absent from Jerusalem in the first days of apostolic preaching, possibly as a rabbi in Tarsus. But if so, his ardent nature soon brought him on the scene, in time at least to hear Stephen and take part against him (Acts vii. 58, 60). If the simple message of the first witnesses, that one whose life and preaching were largely out of harmony with the Law as Saul understood it, had in fact been raised from the dead by Israel's God and so vindicated — to the condemnation of that generation of God's people — if this seemed to Saul mere madness, what was he to say to Stephen's views as to the Law and the people of the Law, both past and present? (see Stephen) . Stephen could not be right in the views

which still divided them. Perish the thought! Perish too all those who upheld the crucified Nazarene, the accursed of the Law ! For His death could mean but one of two things. Either He was accursed of God also, or — awful alternative, yet inevitable to Saul's logical mind— the Law relative to which He was accursed was itself set aside. Saul turned from the suggestion as too shocking to his pride alike in his people and in its divine Law, for him seriously to consider its alleged credentials — the Resur- rection, and the supernatural power and goodness of Him whose claims it was held to confirm. Why stay to weigh the evidence of Galilean common folk (Am-ha-aretz), themselves lax in their observance of Thorah, when over against it stood the whole weight of immemorial prescription, and the deliberate judgment of the custodians of the Law as to this man as " a deceiver "? No doubt they were self -deceived fanatics. But the logic of the movement had at length declared itself through the mouth of Stephen, and weak toleration must be abandoned.

So Saul was driven to persecute, driven by his acute sense of the radical issue involved, and perhaps hoping to find relief from his own bitter experience in such zeal for the Persecutor Law. Yet the goading of unsatisfied intuitions ' did not cease. We may even suspect that Stephen's philosophy of Israel's history had made an impression on him, and was undermining his confidence in the infallibility of his nation's religious authorities. If mistaken before, why not again ? This granted possible, all turned on the evidence as to the Resurrection of the crucified Prophet of Nazareth. Yet though the joyous mien of His followers, even when confronted with death, seemed to betoken a good conscience before God which could hardly fail to impress him, Saul felt the status of the Law to be too grave an issue to depend on the probabilitic 3 of human testimony. So he plunged on, in devotion to what still seemed the cause of God against impugners of His Thorah, but not without his own doubts. He was, in fact, finding it " hard to kick against the goad " (Acts xxvi. 14) plied in his deeper consciousness, as he followed his inherited and less personal beliefs. He was, in language which he later applied to his compatriots, loth to " submit himself to the righteousness of God " (Rom. x. 3), when it came in a manner humbling to his feelings. Still he was in the main honest (1 Tim. i. 13), and the hindrances to his belief were exceptional. Direct personal experience on the point on which all hinged, the alleged divine vindication of Jesus as Messiah following on the legal condemnation by the national authorities, was needful to open up a clear exit from his religious impasse.

It was at this critical point in his inner history that, as he neared Damascus on a mission of persecution, there was granted The vision

him — as he believed ever after in the face of all atDamas- challenge — a vision of Jesus, in risen and glorified cus * humanity, as objective as those to the original

witnesses with which in 1 Cor. xv. he classes it.

As to the sense in which this vision, so momentous in its issues, may be regarded as ” objective,” the following; points deserve notice. On the one hand it is generally agreed (1) that Paul dis- tinguished this appearance of the risen Jesus from his other ” visions and revelations of the Lord,” such as he refers to in 2 Cor. xii. 1 sqq., and classed it with those to the Twelve and others which first created the belief that Jesus had been ” raised from the dead “; (2) that

this belief included for Paul a transformed or spiritualized body (cf. the note of time, ” on the third day,” and the argument in 1 Cor. xv. 12 sqq., 35 sqq.), his own vision of which seems to colour his con- ception of the Resurrection body generally (Phil. iii. 21, though he had certain traditional notions on the subject to start with; cf. 2 Cor. v. I sqq. with Apoc. Baruch, xlix.-li., representing Jewish belief about A.D. 70-100, and see Dr R. H. Charles’s ed.). On the other hand, analogies furnished by religious psychology, including a sudden vision amid light and the hearing of a voice as accompaniments of religious crisis in certain cases, affect our ability to take Saul’s consciousness in the matter as a simple transcript of objective facts. There is indeed reason to believe that the dazzling light was such a fact, if it blinded Saul temporarily (Acts ix. 8-19) and affected his companions (xxii. 9, xxvi. 14). But beyond this physical prelude to his vision we cannot go critically. Thus the nature of the connexion between the light as an objective antecedent, and the vision subjective to Saul himself, remains doubtful on the plane of history. It is possible to penetrate further only by the aid of faith, with or without speculations based on certain psychical facts more and more establishing themselves to scientific minds. Religious faith, dwelling on the unique issues of the vision in the history of Christianity and arguing from effects to a cause as real as themselves, tends to postulate the objectivity which Saul himself asserts. Some do so in an absolute sense, in spite of the differences between Saul’s experience and that of his companions (Acts ix. 7, xxii. 9). Others confine the objectivity to a divine act, producing by special action on Saul’s brain a vision not due simply to the antecedents in himself. Thus it was not merely subjective, a mere vision in the sense of hallucination, but an objective vision or genuine revelation of the real, as Paul claimed. Such an objective-subjective revelation, being in this but a special form of what is involved in any real divine revelation, accords in general with modern research as to

telepathy and phantasms of distant or deceased persons. But, after all, the main point for Paul's religious history — as well as the basis of all theories of the vision — is the question as to the degree of discontinuity between his thought before and after the event. On this Paul is clear and emphatic ; nor can we here go behind the evidence of one whose writings prove him a master in introspective reflection. " There was no possibility that he should by any process of mere thinking come to realize the truth " as to Jesus, so rooted were the prejudices touching things divine which barred the way (see Ramsay, Pauline and Other Studies, p. 18).

Important as is the question as to the nature of the vision which changed Saul's career, it is its spiritual content which bears most upon the story of his life. Jesus was,! in spite of all, God's Messiah, His Righteous '^feat."* 1 One, His Son, the type and ideal of righteousness in man, through spiritual union with whom like righteous- ness was to be attained, if at all. In a flash Saul's personal problem as to acceptance with God and victory over sin was changed. It became simply a question how spiritual union with the Messiah was to come about. He had vanquished and " condemned sin in the flesh " by His perfect obedience (Rom. viii. 3, v. 19), of which the Cross was now seen to be the crowning act. As for the Law as means of justification, it was superseded by the very fact that Messiah had realized His righteousness on another principle altogether than that of "works of the Law," and had in consequence been crucified by its action, as one already dead to it as a dispensational principle. This meant that those united to Him by faith were themselves sharers in His death to the Law as dispensational 1 laster and judge, and so were quit of its claims in that new moral world into which they were raised as sharers also in His Resurrection (Rom. vi. i-vii. 6). Henceforth they " lived unto God " in and through Messiah, by the self-same Spirit by which He had lived the sinless life (viii. 9).

Here we have at once Paul's mysticism and his distinc- tive gospel in germ, though the full working out in various directions came only gradually under the stimulus „...-... of circumstances. But already the old regime New „ ags had dissolved. His first act was to make explicit, through confession and baptism, his submission and adhesion to Jesus as Messiah implicit in his cry from the ground, " What shall I do, Lord ? " Thereby he formally " washed away his sins" (Acts xxii. 16; cf. Rom. x. 9). Then with new-born enthusiasm he began boldly to proclaim in the synagogues of Damascus that Jesus, whose followers he had come to root out, was verily the Messianic Son of God (ix. 2o;cf. Matt.xvi. 16). Yet ere long he himself felt the need for quiet in which to think

out the theory of his new position. He withdrew to some secluded spot in the region south of Damascus, then vaguely called Arabia (Gal. i. 17). Chief among the problems pressing

for reinterpretation in the light of his recent experi- Z% eNe Z f ence was the place of the Law in God's counsels. tbe°Law. While the Law could condemn, warn and in some

degrees restrain the sinner from overt sins, it could not redeem or save him from the love of sin. In a word, it could not " give life " (Gal. iii. 21). Hence its direct remedial action was quite secondary. Its primary effect, and therefore divine purpose, was to drive men humbly to seek God's grace. It " shut up all unto (realized) disobedience, that God might have mercy upon all" (Rom. xi. 32; Gal. iii. 22). Thus the place of the Law in God's counsels was episodic. The radical egoism of the natural man could be transcended, and self- glorying excluded, not by the law, with its " law (principle) of works," but by the "law of faith " (Rom. iii. 27). In fine, the function of the Law was secondary, preparatory, temporary. The reign of the Law closed when its work in shutting up men to faith in Christ— the perfect form of faith, that of conscious sonship — was accomplished. It had a high place of honour as a dispensation for a limited end and time; but its day was over when Jesus accepted crucifixion at its hands, and so passed on as the inaugurator of a new dispensation marked by a final relation between man and God, the filial, the Spirit of which was already in the hearts of all Christian believers (Gal. iii. 23-iv. 7). Thus the Cross of Jesus was the satisfaction of the claims of Law as a dispensation or divinely sanctioned method, which had to be honoured even in the act of being transcended, " that God might be just (i.e. dispensationally consistent), while justifying the believer in Jesus " on a fresh basis (Rom. iii. 26). Such a view did but "establish the Law" (v. 31) within its own proper sphere, while pointing beyond it to one in which its final aim found fulfilment.

Here lay the revolutionary element in Paul's thought in relation to Judaism, turning the latter " upside down " and marking his gospel off from the form in which Judaeo- versai'valae. Christians had hitherto apprehended the salvation in Jesus the Christ. It was the result of profound insight, and, historically, it saved Christianity from being a

mere Jewish sect. But as it was conditioned by recoil from an overdriven use of the Law in the circles in which Saul was trained, so there was something one-sided in its emphasis on the pathological workings of the Law upon human nature in virtue of sinful egoism. Saul was the pioneer who secured mankind for ever against bondage to religious legalism. He it was who first detected that specific virus generated by Law in the " natural man," and also discovered the sovereign antidote provided in Christ. Nor is it as though Paul, even in those apologetic writings which present his antitheses to Law in the sharpest form, had the Jewish Thorah exclusively in view. He deals with it rather as the classic .type of law in religion: it is really law qua law, even the unwritten law in conscience, as determining man's relations to God, that he has in mind in his psychological criticism of its tendencies in the human soul (see Sanday and Headlam, on Rom. ii. 12 seq.): " Nitimur in vetitum cupimusque negata." This is too often overlooked by his Jewish critics. Paul felt nothing but reverence for the Thorah in what he took to be its proper place, as secondary to faith and subordinate to Christ. In short, Paul first per- ceived and set forth the principle of inspiration to God-likeness by a personal ideal in place of obedience to an impersonal Law, as condition of salvation. The former includes the latter, while safeguarding the filial quality of religious obedience.

The above seems to meet part of the criticism directed by modern Jews a-gainst Paul's theory of the Law. Other criticisms (cf. C. G. Montefiore, Jewish Quarterly Review, vi. 428-474, xiii. 161-217) may just be noted. If Paul supports his theory by bad Scripture exegesis, that is a common Rabbinic failing. If it be said that it is mon- strous to hold that God gave the Law mainly for another end than the ostensible one, viz. to lead to life by obedience, this holds so far; but one cannot exclude from the divine purpose the negative effect, viz. promotion of self-knowledge in sinful man and the breaking

down of his self-confidence, conditions essential to a mature filial relation between man and God. Nor did Paul deny the positive or directly beneficent, though limited, function of the Law, so far as it was viewed in the light of the grace of God, as by prophets, psalmists, and others who " walked humbly with God," not as meriting His approval as of right by " works of law." But, objects the modern Jew, the notion of Rabbinic Judaism as generally tainted by " legalism " in any such sense, is a mere figment of Paul's. Nevertheless it is unproven and improbable that Paul unfairly represents the prevailing tendency in the Pharisaic Judaism of his own day as " legalistic " in the bad sense. He is really the one extant witness upon the point, as just defined, if we except certain apoca- lyptic writings (whose

evidence modern Tews are anxious to discount), like the Apocalypse of Baruch and 4 Ezra, the latter of which suggests that already the humbling effect of the capture of Jerusalem was being felt. Finally the same liberal Jew who com- plains that Paul turns Judaism ” upside down ” by his doctrine of the Law, cites with approval his words, ” There is no distinction between Jew and Greek,” and adds, ” Not till St Paul had written did the prophetic universalism attain its goal.” Surely there is a vital connexion between these uvo things. ” Universalism ” was the true issue of the higher tendency in Hebraism, as seen in certain of Israel’s prophets. But it was attained only through Jesus Of Nazareth; and historically the main link between His supra-legal universalism and its actual outcome in the Christian Church was the ex-Pharisee Saul, with his anti-legal gospel.

Saul’s conversion left Jesus the Christ as central to his new world as the Law had been to his old. All; was summed up in Christ, and Him crucified. This was to him the essence of Christianity as distinct from Judaism. /p au /. * As, to the Jew, life was lived under the Law or in it as native element, so the Christian life was ” in Christ ” as element and law of being. Christ simply replaced the Law as form and medium of relations between God and man. In this Paul went far beyond the older apostles, whose simpler attitude to the Law had never suggested the problem of its dispensational relation to Messiah, though in fact they relied on Messiah alone for justification before God. The logic of this, as Paul later urged it on Peter of Antioch (Gal. ii. 15 sqq.), they did not yet perceive. To him it was clear from the first. But the contrast goes farther. The very form in which Jesus was known to Saul by direct experience, namely, as a spiritual being, in a body already glorified in virtue of a regnant “spirit of’ holiness ” — revealed by the Resurrection as the essence of His personality (Rom. i. 4) — determined all his thought about Him. To this even Jesus’ earthly life, real as it was, was subordinate. Paul was not indifferent to Jesus’ words and deeds, as helping to bring home in detail the spirit of Him who by resurrection was revealed as the Son of God; but apart from insight into His redemptive work, knowledge of these things was of little religious moment. The extent of Paul’s knowledge of the historical Jesus has been much debated. Few think that |he had seen Jesus in the flesh; some even deny that he knew or cared for more than the bare facts to which he alludes in his epistles — the Davidic birth, the institution of the Supper, the Death and Resurrection. But beyond his express appeals to precepts of ” the Lord ” in 1 Cor. vii. 10, ix. 14 (cf. Rom. xii. 14), he ” shows a marked insight into the character of Jesus as it is described in the Gospels ” (see 2 Cor. x. 1; cf. Phil. ii. 5-8). The sources of such knowledge were no doubt oral,

e.g: Peter (Gal. i. 18), Barnabas, Mark, as well as collections of Jesus' words, along with connected incidents in His life, used in catechesis. Thus Saul's attitude to Jesus was fixed by his own experience. The varied theoretic expressions found in his writings as to Christ's relations to God, to mankind, and „ J ogy even to the universe, were to him but corollaries xpe rtence. of this. The most persistent element in his concep- tion of Christ's person, viz. as a heavenly being, who, though God's Son, voluntarily humbled Himself and suffered in fulfil- ment of God's will, and had in consequence been exalted to fresh glory, took its start from his own personal experience, although it included the speculative postulate of pre-existence in terms of some current Messianic form of thought. Paul's theory expressed the deeper sense of the all-inclusive significance of Christ, in keeping with his own experience. Hence, too, all his distinctive thoughts on religion, sometimes called

" Paulinism " (see below), were both experimental in origin and capable of statement in terms of his Christ. To him the Death and Resurrection of Christ were not isolated facts, nor yet abstractions. To this man of faith the crucial fact of Christ's Resurrection, in full spiritual humanity, had been brought within his own experience; so that here, and not in any second-hand facts touching Christ's earthly career, lay the real and verified basis of the whole Christian life. This makes his gospel so individual, and at the same time so universal — for those at least who at all share his religious experience.

It is unlikely that Saul began straightway to preach all his ideas or even those most prominent in his epistles, which belong only to some ten years at the end of a ministry Apo»totato. of some thirty. In particular his special mission to the Gentiles dawned on him only gradually. No doubt as he looked back in writing Gal. i. 15 seq., he felt that the final purpose of God in " revealing His Son in him " had been that he " might preach Him among the Gentiles." But this does not prove that he saw it all at once as involved in " the heavenly vision." For one thing the contracted horizon afforded by the hope of a speedy second Advent (Parousia) would limit his outlook materially. Then too he was intensely Jewish in feeling; and the probability is that he would begin to declare salvation through Christ alone, apart from "works of the Law," to his compatriots. Only bitter experience convinced him (Rom. ix. 1 sqq., x. 1 sqq.) that the Jews as a people did not share his experience as to the Law, and spurned their proffered

birthright in Messiah.

Saul began his preaching in the synagogues of Damascus, and made a deep impression, especially, we may suppose, after his return from Arabia (Acts ix. 22; Gal. i. 17). But finally his Jewish opponents planned to do away with him, by the connivance of the ethnarch of King Aretas (cf. 2 Cor. xi. 32 seq.). Then came his first visit to Jerusalem since his conversion, in the third year from that event, for the purpose of making the personal acquaintance of Peter (Gal. i. 18), presumably to hear first-hand about Jesus' earthly ministry and teaching, as well as to make the leading apostle directly acquainted with his own remarkable conversion and mission. 1 It was natural that Barnabas should help to break through the suspicion with which the arch-persecutor was at first regarded; also that such preaching as Saul did in Jerusalem should be directed to the Hellenists, e.g. his Ciiician compatriots (ix. 29; cf. vi. 9). This led to his having to leave suddenly, apparently after a vision in the Temple which brought him fresh light as to the scope of his future ministry. During the ten or eleven years at least " in the regions of Syria and Cilicia " which ensued, it was still primarily to the Jews that he preached; for the news of him which reached " the churches of Judaea " from time to time {aicobovTts rjaav) was such that they " kept glorifying God " in him (Gal. i. 21-23), as they certainly would not have done had he all along addressed himself largely to Gentiles. His preach- ing, that is, was for the most part confined to the synagogue and its adherents of non-Jewish origin, whether circumcised or not. Of Saul's actual history, however, during these obscure years we gain only rare glimpses, 2 the first and most important being in connexion with the foundation at Antioch of a mixed Church of Jews and Gentiles. Whatever may have been the first beginnings of this new departure (a question which depends on the alternative readings 3 "Hellenists " and " Greeks " in

1 Here Galatians (i. 18 sqq.) emphasizes its own special points of interest, in that Saul stayed only a fortnight and saw of the apostolic leaders none save Peter and James the Lord's brother; whereas Acts, in its popular account of the more public side of his visit, conveys a rather different effect, yet one not incompatible with what he himself relates.

2 It is likely that some at least of the five scourgings in synagogues referred to in 2 Cor. xi.24, befell him during this period. Many Jews would resent not only the preaching of a crucified Messiah, but also the filching from them of their proselytes.

3 The present writer now believes that " Hellenists," the better

supported reading (see Acts), is yet secondary, being due to assimilation to preceding usage in vi. 1, ix. 29, and possibly also to misinterpretation of the turning to the Gentiles in xiii. 46.

Acts xi. 20), a situation soon arose which Barnabas, who had been sent from Jerusalem to supervise the work begun by certain Hellenist preachers, felt to call for Saul's co-operation. He sought him out in Tarsus; and " for a whole year " the two enjoyed the hospitality of the Antiochene Church and instructed numerous converts — including not a few uncircumcised Gentiles. It is not clear how far Saul continued to reside in Antioch after his first " whole year " of continuous work as colleague of Barnabas. It no doubt remained his headquarters. But we may imagine him evangelizing also in the

His Aposlolale

region between Antioch and Tarsus (Gal. i. 21; cf. Expands. Acts xv. 23, 41). Whilst so engaged, whether at Antioch or elsewhere, he seems to have attained quite a fresh sense of the degree to which Gentiles were destined to form an integral part of that " Israel of God " which was being gathered through faith in Jesus as the Christ (cf. the name " Christians," Acts xi. 26). Writing about summer a.d. 56, he speaks of having had an overpowering revelation some thirteen years previously (2 Cor. xii. 2-4), that is, about 42-43, the very period now in question. He says nothing, it is true, as to its theme; but it can hardly have been unconnected with his central preoccupation, the scope of the Church, as set forth later in Eph. ii. 11, iii. 13.

Saul's relations with the Jerusalem community between his coming to Antioch and his final relinquishing of it as his headquarters about a.d. 50 (a period of some ten years), form a crucial point in his missionary life. The extreme Tubingen theory that Saul was now, and even later, in sharp conflict with the leaders in Judaea, is a thing of the past. But many problems remain, and what follows is offered only on its own merits, as seeming best to unify the relevant data in the light of all we know of Paul as a man and a missionary. Points of divergence from current views will be indicated as far as possible.

Such a new revelation would naturally lead to more definite efforts to win Gentiles as such, and this again to his second visit to Jerusalem, some eleven years after his former visit (or rather more than thirteen, if the yˆ"ˆ interval in Gal. ii. 1 be reckoned from that visit Jerusalem. and not from his conversion). He would come to feel the need of a clear understanding with Jerusalem touching his gospel, " lest perchance he should run in vain or have already so run " (ii. 2). Saul

was not the man to wait for a foreseen evil to develop. ” In accordance with a revelation ” he induced Barnabas to accompany him to a private conference with the leaders in Jerusalem, to lay before them his gospel (ii. 2). The date of this was c. 43-45. His aim was to confer solely with leaders (contrast Acts xv. 4, 12) like James and Cephas and John, the ” pillars ” of the Jerusalem community. But certain persons who showed such a spirit as to make him describe them as ” pseudo-brethren,” managed to be present and demanded the circumcision of Titus, a Greek whom Saul had taken with him. In this demand he saw a blow at the heart of his gospel for Gentiles, and would not give way. The ” pillars ” themselves, too, felt that his distinctive mission was bound up with Gentile freedom from obligation to the Mosaic Law as such. They recognized Saul and Barnabas as entrusted with a specific Gentile mission, parallel with their own to Jews. Only, as pledge that the two should not diverge but remain sister branches of Messiah’s Ecclesia, until He should return and remove all anomalies, they asked that the Gentile mission should prove the genuineness * of its piety by making it a habit to ” remember the poor.” Here was a proviso which Saul was as eager as they could be to get carried out; and this he was able to prove ere long in the special form of

4 How essential a mark of true piety such conduct was in the eyes of Jews at this time is well known. A synonym for almsgiving was ” righteousness ” (cf. Matt. vi. 1 seq.); it is specially praised, in the Pirke Aboth, along with Thorah and divine worship, as the ” three things on which the world rests “; while in Baba Bathra 10 b. we read, ” As sin-offering makes atonement for Israel, so alms for the Gentiles.” In the light of this, confirmed by Acts x. 2, 4, in the case of Cornelius, it seems that the reference in Gal. ii. 10 is to deeds of charity generally, as a token of genuine piety in Messianic .proselytes, just as in ordinary Jewish ones; for the primitive Judaeo-Christian community was most earnest on the point: cf. Acts ii. 44 seq., iv. 32-37.

relief to the poor in Judaea, which he and Barnabas fitly administered in person (Acts xi. 30, xii. 25). This relief visit took place about 45-46. 1 Having now reached an understanding with the leaders in Jerusalem as to his mission to the Gentiles Saul felt

anxious to break fresh ground, and probably broached Broadens. *-he subject to the local leaders. As they waited on

God for guidance, the Spirit through one of the ” prophets ” directed

that Barnabas and Saul be set apart for such an enterprise; and this was done in solemn form (xiii. 1-3). Naturally Barnabas thought of his native Cyprus; and thither they sailed, about spring A.D. 47, with Mark (q.v.) as their assistant. That they had at least one other companion is probable not only from the phrase ” Paul and his company ” (xiii. 13), but also from the traces of eyewitness in the narrative of Acts (see Luke). Their work lay at first in synagogues. But at Paphos an unparalleled event occurred, to which due prominence is given. The Roman proconsul, Sergius Paulus, a man whose wide religious interest showed itself in having about his person a Jewish ” prophet ” with magical pretensions, sent for the new preachers. Barjesus, the magus or wizard (as his surname, Elymas, probably denotes), opposed the rivals to his patron’s attention; and this brought Saul decisively to the front. His fitness for his part, as no nfere Jew but in a sense Roman facing Roman, is indicated by the pointed descrip- tion, ” Saul, who is also Paulus.” His intervention procured the confusion of the magus and the conversion of the proconsul. This incident — so significant of the future in many ways — marked the beginning of a new prominence of Paul in the conduct of the mission (cf. ” Paul and his company “). Further, on leaving Cyprus the mission entered the region where Paul, not Barnabas, was most at home. At Perga in Pamphylia a fresh decision was reached as to the route now to be taken, and this led to Mark’s withdrawing altogether (see Mark).

It does not seem that the personal factor weighed most with Mark; rather it was the nature of ” the work ” itself (xv. 38). Perhaps it had been tacitly assumed that the mission would not cross the Taurus range to the different world beyond, but keep to the coast-lands south of that great natural barrier, which were in close relation with Antioch and Syria generally. Accordingly, when Paul at last outlined the larger scheme, which had perhaps lain in principle in his own mind all along, Mark recoiled from its boldness. The natural thing indeed was to evangelize in Pam- phylia, a country in close relations with Cilicia and Syria. Why then did Paul insist on pushing inland straight for the Taurus range and the high table-land some 3600 ft. above sea-level ? Not to evangelize Pisidian Antioch, and the other cities in the south of Roman Galatia lying to the east of it ; for Paul himself says that his preaching there was due to sickness (Gal. iv. 13), seemingly when on his way to other fields. These would be in the first instance certain cities in the south-east of the Roman province of ” Asia,” where Jews abounded and had a large Gentile following. Had the great cities of western Asia, and particularly Ephesus (cf. xvi. 6), been his primary aim, he would have taken the easier and more direct route running west- north-west through Laodicea. Sir W. M. Ramsay thinks that Paul

sought the Galatian highlands on purpose to get rid of malarial fever, contracted in the lowlands of Pamphylia. But Mark would hardly have left under these conditions. It seems better to suppose that it was only on the arduous journey to Antioch, amid ” perils of rivers, perils of robbers,” or even after his arrival there, that the malaria (if such it was) so developed as to reduce Paul to the pitiable state, as of one smitten by the wrath of some deity, in which he preached to the Galatians in the first instance (Gal. iv. 13 seq.).

It was in the late summer or autumn of a.d. 46 or 47 that Paul arrived in the Pisidian Antioch, a considerable Roman

colony. Its population was typical of the Graeco- Qaiatia. Oriental part of the empire. It included the native

Anatolian, the Greek, and the Jewish elements, 2 so frequently found together in Asia Minor since the days of the Seleucid kings of the Hellenistic period, who used Jews as colonists attached to their cause. The Anatolian ground-stock had marked affinity with the Semitic peoples, though it was

1 Sir W. M. Ramsay would identify the visit of Gal. ii. 1-10 with the relief visit itself (a view differing but little in effect from that given above) ; but most scholars identify it with Acts xv., in spite of Gal. i. 22 seq. compared with Acts xi. 30, xii. 25.

2 For these, their history and significance in connexion with each of the cities studied, see Sir W. M. Ramsay, The Cities of St Paul

(1907).

Hellenized in speech and education. It is in this light that we must view the enthusiasm with which Paul’s gospel was received (xiii. 44 sqq.; Gal. iv. 14 seq.), and which marked an epoch in his ministry to the Gentiles. It was here and now that he uttered the memorable exclamation: ” It was necessary that the word of God should first be spoken to you: seeing ye thrust it from you, and judge yourselves unworthy of eternal life, lo, we turn to the Gentiles ” (xiii. 46). Yet even so he did not here and now give up all hope that the Jews of the Dispersion with their more liberal conception of Judaism, might be won over to a spiritual rather than a national fulfilment of ” the promise made to the fathers ” by ” the voices of the prophets ” (xiii. 26-28, 32 seq., 38 seq.). Primarily this ” turning to the Gentiles ” had for Paul only a local meaning, as he continued to begin in each city

with the synagogue. 3 But the emphasis laid on the incident in Acts shows that to one looking back it had a more far-reaching meaning, since henceforth Paul's work was in fact to lie mainly among Gentiles.

Paul's experiences were much the same at Iconium, whither he and Barnabas betook themselves when expelled from Antiochene territory (probably after being scourged by the 'lictors, 2 Cor. xi. 25). There, too, Jews were at the bottom of the tumult raised against the missionaries (" apostles," xiv. 4, 14), which forced them to flee into the Lycaonian regio of the province. In this district, marked by the native pre-Greek village system, they made Lystra and Derbe successively their headquarters. In the former occurred the healing of the lame man at the word of Paul (cf. Rom. xv. 9; 2 Cor. xii. 12; Gal. iii. 5), with its sequel in the naive worship offered to the strangers as gods manifest in human form. The story, told in a few graphic touches, sets before us Paul as the tactful missionary, meeting the needs of the simple Lycaonians with an elementary, natural theology. Again his work was disturbed by Jews, this time his old foes from Antioch and Iconium, and he barely escaped death — one of those " deaths oft " to which he refers in 2 Cor. xi. 23, a passage which shows how far Acts is from exhausting the tale of Paul's hardships and dangers, either in Galatia or elsewhere (with xiv. 1 cf. 2 Tim. iii. 11). At Derbe, the frontier city of Galatia to the south-east, Paul was within easy reach of Tarsus, his old home. But the needs of his young converts drew him back to face fresh dangers in Lystra, Iconium and Antioch (where, however, new magistrates were now in office), in order to encourage " the disciples." To give them the support of responsible oversight, the apostles procured the election of " elders " in each church, probably on the model of the synagogue: for Paul had a due sense of the corporate life of each local brotherhood (Rom. xii. 4 seq.), and of the value of recognized leaders and pastors (1 Thess. v. 12 seq.; 1 Cor. xvi. 15 seq.; cf. Acts xx. 17, 28). Then, passing through Pamphylia they returned to Antioch, and reported to a church meeting " all that God had done with them, and how he had opened a door of faith unto the Gentiles."

So ended Paul's first missionary journey known to us in detail, the very first wherein his vocation as apostle of the Gentiles took marked effect. So far Gentile believers The New had been a mere minority, not essentially affecting /**ue the Jewish character and atmosphere of the Messianic Ral *e

3 Naturally Paul would have a regular address which he used with minor variations in beginning his mission in any local synagogue; and this Luke has in substance preserved for us here. For its authenticity,

see Sir W. M. Ramsay, op. cit. 303 sqq. ; compare A. Sabatier, L'Apdtre Paul (3rd ed., 1896), p. 89, for disproof of dependence on Stephen's speech.

in toto, it could not but appear to many Jewish Christians time to reconsider the situation, and boldly deny the reality of any Gentile's portion in Messianic salvation apart from circumcision (as binding to observance of the Law). .So argued the stricter section, those with Pharisaic antecedents, who boldly invaded the headquarters of the liberal mission at Antioch, and began to teach the Gentile converts that circumcision and the Law were matters of life and death to them. Paul and Barnabas took up the gage; and as the judaizers no doubt claimed that they had the Judaean Church at their back, the local church felt that the issue would have to be decided in Jerusalem itself. So they sent up Paul and Barnabas " and certain others of their number " (Acts xv. 2; contrast Gal. ii. 1 seq.) to confer with " the apostles and elders " there. The fact that Paul consented to go at all, to the seeming prejudice of his direct divine commission, is best explained by his prior understanding with " the Pillars " of the Judaean Church itself (Gal. ii. 1-10). His object was twofold: to' secure in the centre of Judaeo-Christianity that public vindication of Gentile freedom from " the yoke of the Law " on which he felt he could count, and at the same time to save the Church of Christ from outward schism.

On the main issue there could be no compromise. It was conceded, largely through the influence of Peter and James, that the good pleasure of the Holy Spirit (xv. 28"), in possessing Gentile hearts, settled the question. But as to the need of considering age-long Jewish sentiment on points where divergent practice would tend to prevent Jewish Christians from recog- nizing Gentile believers as brethren, as well as place a needless stumbling-block between Jews and a Messianic society in which unlimited " uncleanness " was tolerated — on this compromise was possible. The compromise was proposed by James (xv. 20 seq.) and accepted by Paul. Indeed he had less to sacrifice than the other side in the concordat. For his Gentile converts had only to limit their freedom a little, in the cause of considerate love; but their Jewish brethren had to surrender a long-standing superiority conferred by divinely instituted national law. For while the law of Moses was still observed by Jewish Christians, in the case of Gentile proselytes to Messianic Judaism it was to be waived, and a

minimum of proselyte rules, indispensable (xv. 28) to a type of piety 1 essentially common to all “in Christ,” taken as sufficient. Of the “abstinences” in question only that touching blood (in its two forms) was really a ritual matter, and it was one on which there was a good deal of scruple outside Judaism. The other two were obvious deductions from funda- mental Christian ideas, as well as elements of proselyte piety. On the other hand, security against Gentile liberty undermining Jewish-Christian observance of the Law was felt to exist in the firmly rooted tradition of the synagogues of the Diaspora (xv. 21).

The above is only one reading of the case, though the simplest. Not a few scholars dispute that Paul could have been a party to such a concordat at all, and suppose that the letter embodying it is a fiction, probably composed by the author of Acts. Others hold that, if any such letter were ever sent, it was by James and the Jerusalem Church at a later date, without consulting Paul. In fact it was their solution of the deadlock to which interference with Peter’s table-fellowship with Gentiles led in Antioch after the Jerusa- lem conference ; but the author of Acts unhistorically fused it with the decision of that conference. Finally Harnack {Die Apostel- geschichle, 1908, pp. 188 sqq.) maintains that the reference to ” things strangled ” is an interpolation, not shared by early Western authori- ties for the text, and that ” blood ” meant originally homicide. Hence the rules had no reference to food apart from constructive idolatry. This theory — which does not remove the contradiction with Gal. ii. io, on the assumption that Acts. xv. = Gal. ii. 1-10 — – seems at once textually improbable (feeling in the East being too anti-Jewish in the sub-apostolic age to allow of such an interpolation) and historically needless.

At no point in his career does Paul’s greatness appear more strikingly than now in his relations with Judaeo-Christianity. Equally above the doctrinaire temper which cannot see its

1 For this as the spirit of these rules, whatever their exact origin, see Hort, Judaistic Christianity, pp. 68 sqq. They thus correspond to the ” remembrance of the poor ” in the earlier agreement between ” the Pillars ” and Paul in Gal. ii. 10.

favourite principle practically limited by others, and a mere opportunism which snatches at any compromise as the line of least resistance, he acted as a true missionary states- p au i > s c n- man, with his eye both on the larger future and dilatory on the limiting present. As he himself obeyed the s ”” W- principle of loving concern

for others' good by conforming to certain Jewish forms of piety (1 Cor. ix. 19 seq., 22), as being a Jew by training; so he was ready to enjoin on Gentiles, short of the point of compulsion, abstinence from blood simply as a thing abhorrent to Jewish sentiment. His was the spirit of a strong man, who can afford and loves to be generous for the greater good of all. This is the key to his conduct all along, leading him to interrupt his work on two later occasions simply to keep in touch with Jerusalem by conciliatory visits, as prejudice against him recurred owing to rumours of his free conduct on his Gentile missions.

On the other hand, it was the opposite side of his character, viz. inflexible courage in defence of vital principle, that was called into action soon after, owing to Peter's visit Peter's to Antioch (the abrupt reference to which in Gal. visit to ii. 11 probably means that the judaizers were Antioch. making capital of it in Galatia). There for a time Peter fell in readily with the focal custom whereby Jewish and Gentile Christians ate together. But this was more than was understood even by James to be involved in alliance of the two missions. It was one thing not to force Judaism on Gentile Christians; it was another to sanction table-fellowship between Gentile and Jewish Christians, in consideration for the former as brethren. Let Peter, said James through his friends, remember Judaean feelings as well. Such a step was in advance of their convictions; and in any case it seemed wrong to break with the sentiment of the Mother Church in Judaea for the comfort of Gentile brethren on the spot, whom they had but recently regarded as by nature " unclean."

One man, however, saw further into both the logic and the expediency of the case. Paul saw that by their very reliance on Christ rather than the Law for justification, Jewish Christians had in principle set aside the Law potest, as the divinely appointed means of righteousness: that thereby they had virtually come down from their preroga- tive standing on the Law and classed themselves with " sinners of the Gentiles "; and finally that they had been led into this by Jesus the Messiah Himself. If that attitude were sinful " then was Christ the minister of sin." If righteousness depend after all on the Law, then why did Christ die? This penetrating analysis (Gal. ii. 14-21) of the implications of Christian faith was unanswerable as regards any legal observance as condition of justification. But was it not possible that the degree of sanctifkation to be hoped for depended, for Jews at least, upon adhering as closely as possible to the old law of holiness? This was probably the position of Peter and Barnabas and the rest, as it was certainly the theory with which the judaizers " be- witched " the Galatian converts for whose benefit Paul recounts the story (iii. 1-3). But for it too he had an answer, in his doctrine of an evangelical

sanctifkation, homogeneous in nature and motives with the justification out of which it grows, as fruit from root (iii. 5, v. 16-26). But at Antioch he confined his protest to the vital matter of principle, the true relation of Christ and the Law, and the deadly danger of confusing their vajues and functions if both were to be treated as essential to Christian faith. Thus a higher expediency, for Jews in particu- lar, told against the expediency alleged on the other side ; while as for expediency in relation to the Gentiles, it was a matter not only of Antioch and the Jews and Gentiles there involved, but also of the Roman world and the relative numbers of potential converts from either class in it. This point is not made explicit in Gal. ii. 14 sqq. ; but it was probably present to Paul's mind and added to the intensity of his feeling touching the gravity of the issue.

The standpoint of the Epistle to the Galatians is of great moment in judging of its historical retrospect. What Paul had to establish in the first instance was his independence up to the date of his

evangelization of the Galatians, which God had obviously blessed (iii. 2, 5). It is therefore natural to regard all related in chapters i.-ii., including his rebuke of Peter, as prior to that cardinal fact. Next the logic of the case, as well as his explicit words in i. 22 sqq., rules out any visit to Jerusalem, including the relief visit to Judaea of Acts xi. 30, xii. 25, between his first visit and that of Gal. ii. I sqq. (this tells against the common view that Gal. ii. I sqq. = Acts xv.). Finally the reason why no explicit reference is made to the visit of Acts xv. is that it was already familiar to his readers from his own account of it on his second and recent visit to them (Acts xvi. 4-6), and was in fact the starting-point of the judaizers' case. As regards the " Galatians " addressed in this epistle, we assume with the majority of scholars, since Sir W. M. Ramsay's writings on the subject, that they were those evangelized in Acts xiii., xiv., not in xvi. 6. According to the above reading of this epistle it was written in the winter of Paul's first journey to Europe, c. 51-52, say in Corinth (so Rendall, Zahn, Bacon), which would explain not only the " so quickly ■' of i. 6., but also his inability to hasten to their side (iv. 20). This last condition seems to exclude as place of writing both Antioch on the eve of the second (McGiffert) or third (Ramsay) missionary journey, and Ephesus during Paul's long sojourn there. The one seeming alternative, viz. Antioch on the eve of the conference in Acts xv. (so V. Weber), is preferable only on the assumption that the epistle excludes all knowledge of this event

(as the present writer formerly held).

Not long after this episode Paul proposed to Barnabas a visitation of the churches they had jointly founded. But Paul's Barnabas, perhaps feeling more than before the Second difference in their attitudes to the Law, made the Great Mis- reinstatement of John Mark as their helper a son our. con(jj t j on f co-operation. To this Paul demurred on the ground that he could not be relied upon in all emer- gencies; and the feeling caused by this difference as to Mark's fitness was sufficient to cause Paul and Barnabas to take separate lines. Each went to his own sphere of work, Barnabas to Cyprus and Paul towards Asia Minor, and we never again read of them as together, though Paul continued to refer to his old colleague in kindly terms (1 Cor. ix. 6 and Col. iv. 10). Paul found a colleague in Silas (Silvanus), a " leading " man in the Jerusalem church and a " prophet," but like himself a Roman citizen (Acts xvi. 37, 39); and started, with the goodwill of the Antiochene Church, probably in summer a.d. 50. His way lay through churches of his own foundation, in one of which he found a helper to replace Mark, Timothy of Lystra, who was to be as a son to him up to the very end. Confident in the concilia- tory spirit of both sides in the Concordat, and anxious to show how ready he was to consider Jewish feeling where Gentile freedom was not involved, he circumcised this young semi- Jew before taking him as his associate into regions where work would still lie largely among Jews. In a similar spirit he also com- mended " the resolutions " of the Concordat to the observance of his churches in Galatia, though the circular letter of the conference did not make it apply to more than those of the Syro-Cilician region.

But while the immediate result of this visit was good, the secondary issues were among the bitterest in Paul's life, Judaizers owing to the unscrupulous action of judaizers in South who, taking advantage of his absence, soon began Qalatia. a vigorous, but subtle, propaganda amongst his converts in this region. They represented Paul as having changed his policy in deference to the Jerusalem authorities, to the extent of allowing that the Law had some claim upon Gentile believers in the Jewish Messiah. Otherwise why were the " abstinences " enjoined? Nay, more: these had been put forward as a bare minimum cf what was expedient, to judge from the practice of those same Judaean authori- ties. But if so, surely it must at least be necessary to full Christian piety (Gal. iii. 3; cf. Peter's conduct at Antioch), though not perhaps to a bare place in the coming kingdom. Had not Paul himself confessed the value of circumcision (v. n) in the case of Timothy, the son of a Gentile father? As for his earlier policy, it must have been due simply to a wish to humour his converts' prejudices (i. 10), to begin with. At any rate the gospel they now brought was the

authentic Apostolic Gospel, and if Paul's did differ from it, so much the worse for his gospel, since it could in no case claim to be other than derived from theirs (i. 1-9, 11 seq.). How plausible

must such a plea have seemed to inexperienced Gentile converts, " bewitching " their minds away from the central facts, Christ crucified and the free gift of the spirit through faith in Him. But how disingenuous as regards Paul's real position! Can we wonder at his indignation as he wrote in reply, and that he was goaded on to pass, in his final peroration, a counter-judgment upon their motives too sweepingly severe (vi. 12 seq.)? In any case the gross abuse by the judaizers of Paul's promulgation of the " abstinences " in Galatia fully explains his contrary practice elsewhere.

Paul left his Galatian converts about autumn a.d. 50, bound for the adjacent Asia. But not even yet was he to preach there, being diverted by something in which he saw the divine hand. Such as when, on his way north- Europe. "" wards through the Phrygian region of Galatia, 1 he tried to enter Bithynia (where also were cities with a large Jewish element), he was again turned aside by " the Spirit of Jesus " (? a vision in the form of Jesus, xvi. 7, cf. xviii. 9, xxii. 17). Thus his course seemed open only westwards through Mysia (northern " Asia ") to the coast, which was reached at Troas, the chief port in the north-west Aegean for intercourse between Asia and Macedonia. These were but sister provinces, united by the easy pathway of the sea. Yet in sentiment and in conditions of work it was a new departure to which Paul found himself summoned, when in a night-vision " a certain Macedo- nian " stood as if entreating him: " Come over into Macedonia and help us." Here was the positive guidance to which two negative divine interventions had been leading up. Paul hesitated not a moment, though the idea was bolder than that of his own frustrated plan. " Straightway," in the words of Luke, " we sought to go forth into Macedonia, concluding that God had called us for to preach the Gospel unto them " (xvi. 10). So, at this crucial point in Paul's mission to the Gentiles, Luke seems to preserve the thrill of emotion which passed from the leader to his companions, by breaking out into the first person plural (see Acts, for the psychological rather than literary reason of this " we," here and later).

The new mission began at Philippi, a Roman colonic,. Here the Jewish settlement, in which as usual Paul sought first to gain a footing, was a small one, consisting in the main of women — who enjoyed much freedom in pp '

Macedonian society. But the normal extension of his work was cut

short by an incident characteristic both of the age and of the way in which the fortunes of the Gospel were affected by the vested interests around it. The story of Paul's imprison- ment, with the light it casts on his quiet mastery of any situation, is familiar in its vivid detail.

After being thus " shamefully treated " in Philippi (1 Thess. ii. 2), Paul passed on rapidly to Thessalonica, the real capital of the province and an admirable centre of influence (cf. 1 Thess. i. 8). In this great seaport there was tonka?' at least one synagogue; and for three weeks he there discussed from the scriptures the cardinal points in his message (cf. 1 Cor. xv. 3 seq.), " that it behoved the Christ to suffer and to rise again from the dead," and that accordingly " this Jesus … is the Christ " (xvii. 2 seq.). Some Jews believed, " and of the Godfearing Greeks " (semi-proselytes) a large number, including not a few of the leading women. There was also successful work among those who turned directly " from idols, to serve a God living and real " (1 Thess. i. 9). This must have occupied several weeks beyond those specified above (cf. 1 Thess. i.-ii.; and the material help received more than once from Philippi, Phil. iv. 16).

But Jewish jealousy was aroused particularly by the loss of their converts; and at length in alliance with the rabble of the market place, it was able once more to cut short the preachers' work among the Gentiles. The charge made against them had a serious ring, since it involved not only danger to public order

1 The region to which some think the Epistle to the Galatians (see s.v.) was addressed — so modifying the older " North Galatian " theory of Bishop Lightfoot and others.

Athens.

but treason against the emperor (laesa majestas). Thus at Thessalonica Paul had experience of the imperial system as Confronting rival to his gospel of the sovereignty of God and of the imperial His Christ, the true king of humanity. Yet it is c "* > doubtful if he was thinking of this l when he wrote

to his converts touching " the mystery of lawlessness," working towards its final conflict with the divine principle also at work in the world. He seems in the whole passage (2 Thess. ii. 3-12) to view the empire in its positive aspect as a system of law and order rather than

in its idolatry of its official head, the incarnation of worldly success and power; and he alludes to both emperor and empire (6 seq.) as the force at present restraining ” the mystery of lawlessness ” {avofiia). This phrase itself suggests something more abnormal than the world-principle latent in paganism, such as ” the apostasy ” of God’s own people, the Jewish nation, as once before under Antiochus Epiphanes the prototype of ” the man of lawlessness ” seated in ” the temple of God ” (v. 4), of whom the late emperor Caligula might well seem a forerunner. Even so monstrous an issue of Jewish refusal of God’s truth, in His Messiah, would be but the climax of so unhallowed an alliance as that which existed at Thessalonica between Jewish unbelief and paganism, seeing that the former was using the very Messianic idea itself to stir up the latter against the followers of Jesus (Acts xvii. 7; cf. 1 Thess. ii. 15 seq.). Paul and Silas withdrew by night, and began work in Beroea, a small city of Thessaly, in the hope of returning when excitement had subsided. But Jewish intriguers from Thessalonica stirred up the populace with the old charges, and Paul, as the prime actor, was forced to retire, first to the coast (whence he may have thought of a secret visit to Thessalonica, 1 Thess. ii. 18; cf. iii. 5), and then by sea to Athens.

At Athens he was consumed with anxiety, and sent word to Silas and Timothy to join him with fresh news about his ” orphans ” in the faith. While waiting, however, he felt compelled by the signs of idolatry on every hand to preach his gospel. He began discussing in the synagogue with the Jews and their circle, and also in the Agora, after the manner of the place, in informal debate with casual listeners. The scope of his doctrine, the secret of right living, was such as to attract the notice of the Epicureans and Stoics. But its actual contents seemed to them a strange farrago of familiar Greek phrases and outlandish talk about a certain “Jesus” and some power associated with him styled ” the Resurrection.” To clear up this, the latest intellectual novelty of the Athenian quidnuncs, they carry him off to ” the Areopagus,” probably the council, 2 so called after its original place of meeting on Mars’ Hill. This body seems still to have had in some sense charge of religion and morals in Athens; and before it this itinerant ” sophist ” seemed most likely to make his exact position plain. A mark of authenticity is the very fruitlessness of his attempt to adapt the gospel of Jesus to Greek ” wisdom.” One only of his audience, a member of the Areopagus, seems to have been seriously impressed. The real effect of the episode was upon Paul himself and his future ministry among typical Greeks.

Before Timothy’s return Paul had moved on to Corinth, where he was to win success and to find material for such experi- ences, both when

present and absent, as developed the whole range of his powers of heart and mind, (see Corinthians, Epistles to the). Corinth was more typical of the Graeco-Roman world than any other city, certainly of those visited by Paul. In addition to its large Jewish colony, it had Oriental elements of other kinds, especially mystic and ecstatic cults; and its worship of Venus under semi-oriental attributes added to the general sensuality of the moral atmo- sphere. Over all was a veneer of Greek intellect and polish;

1 As Sir W. M. Ramsay argues in his Cities of St Paul, pp. 425-

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2 This is the view favoured by archaeologists like Ernst Curtius (Expositor, vii. 4. 436 sqq.) and Sir W. M. Ramsay. On the whole it suits the narrative better than the view which regards the Hill of Ares simply as a good spot for one of those rhetorical ” displays ” in which Athenians delighted.

for in its way Corinth prided itself on its culture no less than did Athens. No wonder that Paul’s first feeling in this microcosm was one of utter impotence. It was ” in weakness, and in fear, and in much trembling,” though in dauntless faith, that he began a most fruitful ministry of a year and a half. His guiding principle was to trust solely to the moral majesty of the gospel of the Cross, declared in all simplicity as to its form (1 Cor. ii. 1 sqq.), not heeding its first impression upon the Jew of intolerable humiliation, and on the Greek of utter folly (i. 18 sqq.). Most gladly then would he preach in such a way that ” faith should not stand in the wisdom of men, but in the power of God” (ii. 5); ” that no flesh should glory before God ” (i. 29). How central this was to his gospel, especially as it defined itself over against Greek self-sufficiency of intellect, may be seen from his whole conception of the ” spiritual ” man in his letters to Corinth (esp. 1 Cor. ii. i-iv. 7). Before his great work there began, Paul gained two fresh fellow-workers, whose share in parts at least of his later ministry was very great, Aquila, a Jew of Pontus, and his talented wife Priscilla. Probably they were already Christians, and as they too were tent-makers Paul shared their home and their work. That he was often in straitened circumstances is proved by his having to accept aid from Macedonia (2 Cor. xi. 9; cf. Phil. iv. 15). On the arrival of Silas and Timothy from that quarter, he began to preach with yet more intensity, especially to the Jews (xviii. 5). A breach with the synagogue soon followed. The definite turning to the Gentiles met

with much success, and Paul was encouraged by a night vision to continue in Corinth for more than a year longer. An attempt of the Jews (cf. 1 Thess. ii. 15 seq; 2 Thess. iii. 1 seq.) to use Gallio, the new proconsul of Achaia, as a tool against him, not only failed but recoiled upon themselves.

It was during his first winter at Corinth, a.d. 51-52, 3 that he wrote his earliest extant missionary letters (see above for Gala- tians). Paul wrote not as a theologian but as the Plrst prince of missionaries. His gospel was always in Missionary essence the same; but the form and perspective Letters. of its presentation varied with the training, mental and moral, of his hearers or converts. It was no abstract, rigid system, presented uniformly to all. This warns us against hasty inferences from silence, in judging of Paul's own thought at the time represented by any epistle, and so limits our attempt to trace progress in his theology. But it bears also on our estimate of him as a man and an apostle, full of sympathy for Others and asking from them only such faith as could be real to them at the time.

His Thessalonian converts had met with much social persecu- tion. The bulk belonged to the working class (iv. n, 2 Thess. iii. 10-12); and Paul must have endeared himself to them by sharing their lot and plying his own manual industry (Acts xviii. 3). However hard his double toil of teacher and tent- maker might be, no sordid suspicions, such as his Jewish foes were ready to suggest (1 Thess. ii. 9; 2 Thess. iii. 8), should gain any colour from his conduct. He would be to his converts as a father, and an embodiment of the new Christian ethics which he pressed upon his spiritual children as the essential " fruit of the Spirit," and also as a demonstration of the Gospel to " them that were without " (i. 7-12; cf. i. 6, iv. 1 seq.).

The special perspective of his first two epistles is affected by the brevity of his stay at Thessalonica and the severity of persecution there. Owing to the latter fact the Parousia, as a vindication of their cause, so near as reasonably to influence conduct (v. n), had naturally been prominent in his teaching among them. So in these epistles he deals with it more fully than elsewhere (iv. 13 sqq.); and the moral fruits of the new life in the Spirit are here enjoined in a very direct manner (iv. 1-8).

We need not suppose that Paul himself or his assistants used a set of rules as elaborate as the " Two Ways " (of Life and Death)

3 This date (and so Ramsay's chronology from this point) is con- firmed by a fresh inscription showing that Gallio was proconsul from

5 2 -53 (spring), rather than 51-52; see Expositor for May 1909, pp. 467-469-

embodied, e.g. in the Teaching of the Apostles. 1 But to judge from these epistles (i Thess. iv. I seq., 6; 2Thess. ii. I5;iii. 6), and his reference to the ” type of teaching ” (bearing on ” sin, unto death,” and ” obedience, unto righteousness “) unto which the Roman Christians had been ” committed ” (Rom. vi. 16 seq.), Paul gave to his converts a fairly full outline of moral instruction, similar at least to that of Judaeo-Christian missionaries (note too the rather uniform lists of vices in Rom. i. 24 seq. ; 1 Cor. v. 10 seq. ; Gal. v. 19 ; Col. iii. 5 ; cf. E. von Dobschutz, Christian Life in the Primitive Church, app. 6).

What was distinctive of Paul’s ethical teaching was not any lack of positive precepts, but the intimate way in which he, Paulas like his Master, infused them with the spirit in Ethical which and by which they were to be realized, as Teacher. aS p e cts of the ideal of Jove to God and man. He was supremely concerned with the dynamic of conduct, as to which his own experience made him the most inspiring of teachers and the greatest interpreter of the mind of Christ. The master motive on which he relied for all, was the imitation of Christ in a peculiarly inward sense. To the believer Christ was no mere external example, but was already within him as the principle of his own new moral being, in virtue of the Holy Spirit indwelling as the Spirit of Christ. Here lay the secret of the new ” power ” so characteristic of the Gospel (Rom. i. 16), a power adequate to realize even the enhanced moral ideal revealed in Christ. The wonder of it was that this power annulled the moral past, giving the once vicious an equal freedom with the ” virtuous.” To this sovereign, emancipating influence of God’s Holy Spirit, antagonizing ” the flesh ” and all its works, Paul confidently entrusted his converts for ” sanctification ” or progressive transformation (Gal. iii. 3, v. 16 sqq.) into ” the image of Christ,” the full actuality of the type already latent in Christian faith. Such teaching is implicit in the Thessalonian letters; but it is explicit in the Epistle to the Galatians. Here he announces in the clearest accents the secret of Christian conduct. ” Walk by (the) Spirit, and desire of the flesh ye shall not fulfil.” ” If we live by the Spirit, by the Spirit let us also walk.” ” On the basis of freedom (from law as external to the conscience) were ye called; only turn not freedom into an opportunity for the flesh, but through love serve one another. Pauliae For the whole Law stands fulfilled in this, Thou Aatl- shalt love thy neighbour as thyself” (v. 13 sqq., 25).

nomlanlsm. These are the watchwords of Paul's antinomianism, which had grown out of the soil of his own strict moral discipline, where the ethical ideal had become an instinct and a passion. But how would they be taken by raw Gentiles, say in Corinth, untutored to self-denial whether in the things of sense or spirit? That their egoism often perverted Paul's libertarianism into an apology for libertinism, in keeping with current habits, as well as for selfish individualism in the use of intellect or even " gifts of the Spirit," may be gathered from his letters to Corinth (see Corinthians, Epistles to the). What here concerns us, however, is the splendidly positive way in which Paul met such abuses, not by falling back upon legalism as a " safeguard " against licence, but by reapplying the laws of spirituality, both in relation to God as source of spiritual gifts, and to God's people as the appointed sphere of their exercise. He does not recede from his way of teaching; he insists that they shall understand it and abide by its real obliga- tions. But while thinking of Paul's work in Corinth, we must note certain special religious conditions affecting both the reception of his gospel and the way in which it was afterwards conceived. Side by side with the religion of the city and of the family, both of them polytheistic and utilitarian in the main, stood the " mysteries " or esoteric cults, which were sought out and participated in by the individual for the satisfaction of essentially personal religious needs. Clearly those trained by such Mysteries would be more drawn than ordinary polytheists to his gospel, with its doctrine of mystical yet real union with the divine in Christ, and would less than others find the Cross, with its message of life through death, to be folly. This being

1 Yet compare " the Way " (Acts xix. 9, 23), or " the Way of the Lord " (xviii. 25) as a name for Christianity on its practical side. So Sergius Paulus was " astonished at the Teaching (didache) of the Lord," xiii. 12; cf. Tit. i. 8 seq.

so, we shall not be surprised to find, especially at Corinth, traces of the reaction of conceptions proper to the Mysteries upon the ideas and practices of Paul's converts (cf. 1 Cor. xv. 29), and even upon the language in which he set forth his meaning to them (see ii. 6 sqq.). Whether Paul himself was influenced by such ideas, e.g. in relation to the Sacraments, is a further question as to which opinions are divided. 2

After some eighteen months in Corinth, Paul felt the time had come to break fresh ground now at last perhaps at Ephesus, the key to the province of Asia. With this in view

Visit to Jerusalem.

Ephesus.

he took with him his fellow-workers Priscilla and Aquila, and left them at Ephesus while he himself visited Syria for ends of his own. That these ends were of high import we may be sure, else he would not have spent on them a period of months when the door seemed already opening in Asia (Acts xviii. 19-21). Acts gives no hint as to their nature, save the statement that ” he went up ” from Caesarea to Jeru- salem, ” and saluted the church,” before he ” went down to Antioch.” But Paul’s letters enable us to infer that he relied largely on this visit for counteracting rumours which represented him as an apostate from Judaism. 3 After some stay in Antioch Paul started before autumn a.d. 53 for his third great campaign, the centre of which he had already chosen in Ephesus, where Priscilla and Aquila were helping to prepare the ground. Passing through south Galatia, where he further fortified his con- verts (xviii. 23), he would reach Ephesus before winter closed in. Already his circle of helpers had gained a fresh member of great gifts, the Alexandrine Jew Apollos (q.v.), who had been brought into fuller sympathy with the Pauline gospel by Priscilla and Aquila, and who, learning from them the situation in Corinth, volunteered to try to overcome the prejudices of the Jews there (xviii. 24-28). At first Paul taught in the synagogue, until growing hostility drove him to ” separate the disciples ” and transfer his headquarters to ” the school of Tyrannus.” This was a lecture-room such as ” so- phists ” or rhetors were wont to hire for their ” displays.” The change was not only one of place, but also of style of discourse, his appeal now being directly to the Gentiles, who would at first regard Paul as a new lecturer on morals and religion. The influence which went forth from this centre radiated throughout the whole province of Asia, partly through visitors to Ephesus on business or for worship at its great temple, and partly through Paul’s lieutenants, such as Timothy and Epaphras (Col. i. 7; iv. 13). Witness to this extensive influence is afforded both by the friendly conduct of certain ” Asiarchs ” at the time of the riot (xix. 31), and by the fact that Paul later wrote a circular letter to this region, the so-called Epistle to the Ephesians. This result was due not only to Paul’s persuasive speech but also to deeds of power, 4 connected with the superhuman gifts with which he felt himself to be endowed by the Spirit of God (Acts xix. 11; cf. Rom. xv. 18 seq.; 2 Cor. xii. 12). Nor can we feel Paul’s full greatness unless we remember that he was tried by the searching test of supernormal psychical and physical powers operating through him, and that he came through all with an enhanced sense of the superiority of rational and moral gifts, and of

love as the crown and touchstone of all, as well as with a deepened humility. : That he suffered much before the final tumult, due to his success affecting wˆJfae”ˆ trades dependent on the cult of the Ephesian Artemis is implied in his own words, ” humanly speaking, I,

2 The affirmative is maintained by the so-called Religions-geschichtliche Schule in particular. The more general verdict is ” not proven.”

3 In this light his polling of his head before embarking at Cenchreae in token of a vow of special self-consecration (to be redeemed at the end of a month in Jerusalem itself; cf. Josephus, Jewish War, II. xv. 1), is significant of his feelings as to the critical nature of the visit, including danger from Jewish fanaticism during a voyage probably on the eve of a feast (say Pentecost), for which he went up on his later visit (Acts. xx. 16).

4 We may doubt whether Paul himself countenanced the practices by which some believed that they drew magical virtue from his person (xviii. 12). But he did perform what he, in common with his age, believed to be the exorcism of evil spirits, as the story of Sceva’s sons itself implies (xix. 13 sqq.).

fought the beasts at Ephesus ” (i Cor. xv. 32), which may mean that he was almost torn in pieces by mob fury. It was perhaps on this occasion that Aquila and his wife risked their lives for him (Rom. xvi. 3 seq.). Indeed he lived much of his time in Ephesus as one under daily sentence of death, so constant was his danger (1 Cor. xv. 30 seq.; cf. iv. 9; 2 Cor. i. 9; iv. 9-11). But this almost unbearable strain on his human frailty simply deepened his sense of dependent union with Jesus, both in His death and victorious life, and softened his strong nature into a wonderful gentleness and sympathy with suffering in others (2 Cor. i. 4 sqq.). It is no accident that it was from the midst of his Ephesian experi- ences that his Hymn of Love (1 Cor. xiii. esp. 6-Sa, 13) sounded forth. His own spiritual life seems to have grown in Ephesus more than at any other period since the era of his conversion.

This brings us to the most tragic episode in Paul’s career, judged by his own feelings, a psychological crucifixion of which The we have the vivid record in his correspondence

Corinthian with the Corinthian church. Reduced to its simplest

Troubles. t ernls the situation was as follows. The Corinthian church was suffering from the fermentation of ideas and ideals too heterogeneous for their powers of Christian assimi- lation. Paul had laid the foundation, and others had built on it with materials of varied kind and value (see Corinthians). Specially dangerous was the intellectual and moral reaction of the typically Greek mind, starting from a deep-seated dualism between mind and matter, upon the facts and doc- trines of the Gospel. Its issue was an exaggeration of Paul's own religious antithesis between "the flesh" and "the mind " into a metaphysical dualism, so that the conduct of the body, crudely identified with " the flesh," became a thing indifferent for the inner and higher life of the spirit illumined by the Spirit of God. There was not only divergent practice in morals and in religious usage; there was also a spirit of faction threatening to destroy the unity of church life, to which Paul attached the greatest importance. To lead them to realize their unity in Christ and in His spirit of love was the central aim of Paul's first extant letter to this church. He rises sheer above every mani- festation of the sectional element in man — whether Jewish, Greek, intellectual, ritual, or ascetic — into the sphere of pure religion, the devotion of the whole personality to God and His ends, as realized once for all in Christ, the second Adam, the archetype of divine sonship. It is his enforcement of this idea, along with firm yet flexible application to the various disorders and errors at Corinth of certain other of his fundamental prin- ciples, such as the indwelling of the Holy Spirit in the individual and the community, that makes this epistle so significant for Paul's biography. Thus, while it gives a more complete picture of a Pauline church than all other sources of knowledge put together, it at the same time illustrates the rare balance of Paul's mind. But neither this letter nor the influence of Timothy (iv. 17), already on his way to Corinth with Erastus via Macedonia, on collection business (Acts xix. 22; 1 Cor. xvi. 1 seq., 10 seq.)— nor even, as some think, of Paul himself in person (2 Cor. ii. 1; xii. 14, 21; xiii. 1 seq.) — brought about an under- standing on certain points involving Paul's authority. In this connexion the presence of interloping Jewish " apostles " with their claims for themselves and their insinuations as to Paul's motives (2 Cor. xii. 14-16), greatly complicated and embittered the situation on both sides.

When next the curtain rises, we gather that Paul had been forced to write a letter of protest in a tone of severity fitted Paul leaves to arouse his converts' better selves. It was in for Mace- fact an ultimatum 1 that Titus carried to Corinth donia. before Paul left Ephesus, his departure hastened by the great tumult. On leaving for Macedonia he " exhorted " the assembled disciples, and perhaps left

Timothy to check the tendencies to error which he perceived at work (xx. 1, 1 Tim. i. 3). Then starting from Miletus, the chief port in the vicinity (cf. xx. 15), — where he had to leave Trophimus

1 On the question whether this letter has been lost (as here assumed), or on the other hand has been partially preserved in 2 Cor. x.-xiii , see Corinthians.

owing to sickness (2 Tim. iv. 20, probably a fragment from a brief note to Timothy written soon after) — he reached Troas. Here he intended to evangelize pending the return of Titus (1 Cor. ii. 12 seq.). But though ” a door ” of opportunity at once opened to him, growing anxiety as to the reception of his severe letter drove him forward to meet Titus half-way in Mace- donia. There ” fightings without ” were added to ” fears within ” (vii. 5), until at last his meeting with Titus brought unspeakable relief. The bulk of the Corinthian church, in deep remorse for the way in which they had wounded him who after all was their ” father ” in Christ (1 Cor. iv. 15), had come out clearly as loyal to him, not only in word but also in discipline on the arch offender, whose contumacious conduct (now repu- diated by the church) had so grieved him, but for whom Paul is now the first to bespeak loving treatment, ” lest haply he be swallowed up of excessive grief ” (ii. 5 sqq.; vii. 12). Accord- ingly in his next letter his heart overflows with gladness and affection, yet not so as to blind his clear eye to the roots of danger still remaining in the situation.

The interloping judaizing missionaries (xi. 4, seq., 13, 22; cf. x. 7) are still on the spot, glorifying themselves and glorying in their welcome on the field prepared by another’s toils (x. 12-18); while in the church itself there are moral abuses yet unredressed, even unacknowledged (xii. 20 seq.), on which Paul felt bound still to press for confession and penitence (xiii. I sqq.), in spite of what some might brazenly insinuate, in reliance on his not having acted summarily on his former visit, when the church as a whole was not heartily with him. Hence Paul felt himself bound to act boldly (x. 1-6), if and when on his arrival he found the obedience of the majority full and complete (xii. 6). It is to prepare the way for this (xiii. 10) that Paul, while recognizing in the main the church’s loyal affection, writes the second part of his letter (x.-xiii. 10) in so different a key, striving to complete the reaction against his foes, with their taunt as to his not daring openly to take an apostle’s support from his converts at Corinth (xi. 12 sqq., xii. 11-18).

The Second Epistle to the Corinthians was written from Phi- lippi or Thessalonica (ix. 2); and Timothy joins in its opening salutation. He had, it seems, been summoned to Paul’s side from Ephesus by a

hurried note, written after Titus's return from Corinth, in which he is informed that Erastus had remained in Corinth (? as now city-treasurer, Rom. xvi. 13), while Paul had been deprived also of the help of Trophimus, so that Timothy was unexpectedly needed at his side (this is embedded in an alien context in 2 Tim. iv. 20, 2i a , see below). One reason at least for Paul's need of Timothy is suggested by the reference to Erastus (cf. Acts xix. 22), viz. the business of the great collection from his churches in Galatia, Asia, Macedonia and Achaia. This had been some time in progress and was to be carried by delegates to Jerusalem on Paul's approaching visit, from which much was hoped in connexion with the unity of Jewish and Gentile Christianity. Another may have been the labour of inspecting the churches in those parts, which now reached at least as far as, if not into, Illyricum (Rom. xv. 19). In any case it was midwinter (56) before Paul became the guest of the hospitable Gaius in Corinth (Rom. xvi. 23).

Touching the resettlement of local church affairs during Paul's three months in Corinth, we know nothing. For us the great event of this visit is the writing of that epistle The Epistle which shows that his mind was now bent on the to the extension of his mission westwards to the metropolis # OB,ans – of the empire itself. To Rome his thoughts had been turned for many a year, but he had time and again checked the impulse to visit it (Rom. xv. 22 seq.). For the city had long been occupied by the Gospel in one form or another ; and it was a point of honour with him to preach " where Christ was not named," not to build on others' foundations (xv. 20). But his eye was now fixed on Spain, if not also on south Gaul. It was, then, largely as basis for his mission to the western Mediterranean that Paul viewed Rome. Yet after all Rome was not like other places: it was the focus of the world. Hence Paul could not simply pass by it (i. n seq.). Very tactfully does he now offer his preliminary contributions to them — " by way of reminder," at least — emboldened thereto by the consciousness of a divine commission to the Gentiles, proved by what he had been enabled already to accomplish (xv. 15 sqq.).

But how could Paul write at length to a community he had never visited? Not to dwell on what he might have gathered from " Prisca and Aquila," the wonderful list of salutations by- name, often with brief characterizations, proves how constant was the flow of Christian life between the capital and provincial centres like Ephesus and

Corinth. But, beyond all this, there is the nature of the epistle itself as a great ” tract for the times,” applicable to the general situation at Rome, but typical also of the hour as reflected in Paul’s consciousness. It has therefore a profound biographical significance for Paul himself, summing up all his thought so far, on the basis of his conversion as un- folded by his experiences as an apostle. It is his philosophy of religion and of history, the first worthy of the name, because the first deep-based upon the conception of the unity of humanity, as related to God, its source and the determining factor in its destiny. As such it also includes in broadest outline (viii. 18 sqq.) a philosophy of nature, as related to humanity, its crown and key. Thus it is in effect a universal philosophy in terms of the moral order, which Paul, like every Hebrew, regarded as the most real and significant element in the universe. At the centre of this grand survey stands the Jewish race, the chosen vessel for bearing God’s treasure for mankind during the pro- visional period of human history; and at its spiritual heart, in turn, Jesus, Messiah of Israel, Saviour of mankind, in whom the distinction between the special and general spheres of revelation is transcended, while the law, ” the middle wall of partition ” between them, is broken down by the Cross.

Into the sweep of this high argument, as it is unfolded step by step, with an organic completeness or exposition peculiar to Romans among his writings (cf. Ephesians), there is wrought not only the problem of the Jew and Gentile (still the burning question of the time), but also the stubborn paradox of the actual rejection of Israel’s Messiah by the nation as a whole. This forms a great appendix (ix.xi.) to the more theoretic part of the epistle, and lays bare Paul’s inmost heart, showing how truly a Jewish patriot he was. Even the categories in which he grapples, without formal success, with the problem of divine election and human responsibility, betray the Jew, to whom the final axioms are God’s sovereignty and God’s righteous ness. Further into the contents of this most characteristic writing it is not ours to go (see Romans). Suffice it to say, he who apprehends it, as the issue of a real religious experience, already knows Paul as he knew himself and cared to be known. He who masters its thought knows the Pauline theology. Some indeed assume that Paul ceased really to progress beyond the point represented by Romans, and that certain of his later writings, if they be his at all, show a certain enfeeblement of grasp upon principle. But that is to confuse once more Paul’s personal theology with the forms of instruction which experience showed him were expedient for the strengthening and develop- ment of feeble or undeveloped moral types.

Yet while the horizon of the Roman epistle was so universal in one

sense, it was restricted in another. Owing to the fore- shortening influence of the parcusia hope, even Paul's programme of a world-mission meant simply seizing certain centres of influence, to serve as earnest of Messiah's possession of all man- kind on His return to take His great power and reign. Evangel- ization on the farther side of the parousia was the greater part of the whole. So we gather from this very epistle, as well as from i Cor. xv. 23-25 (and yet more clearly from Col. i. 23). In other ways, too, the Christianity of Paul and his age was re- lative to the parousia, both in theory and in practice (e.g. in its " ascetic " or " other worldly " attitude to life). This dif- ference of perspective, and the ancient view of the world of spirits operating upon human life, are the chief things to be allowed for in reading his epistles.

Thus viewing things, how eagerly Paul must have looked westwards at this time. Yet his heart turned also to Judaea, „ . „ where he felt his line of march still threatened by for Unity. tne danger of disunion in the very Body of Christ. At all cost this must be averted. The best hope lay in a practical exhibition of Gentile sympathy with the Mother

Church in Jerusalem, such as would be to it a token of the Holy Spirit as indwelling Paul's churches. The means for such a thankoffering for benefits received ultimately from Jerusalem (Rom. xv. 27) had been collected with much patient labour, .and the delegates to accompany Paul with it had already assembled at Corinth (xx. 4). Paul had intended to cross the Aegean from Corinth with his party, by the direct route to Syria. But a Jewish plot, probably to take effect on the voyage, caused him to start earlier by the ^^alem! longer land-route, as far as Philippi, whence, after waiting to observe the Days of the Unleavened Bread, 1 he sailed to join his fellow-almoners at Troas. There is no need to follow all the stages of what follows (see Ramsay, St Paul the Traveller). But every personal touch is meant to tell, even Paul's walk from Troas to Assos, perhaps for solitary meditation, away from the crowded ship; and all serves to heighten the feeling that it was the path to death that Paul was already treading (xx. 23). This lies too at the heart of his impressive farewell to the Ephesian elders, a discourse which gives a vivid picture of his past ministry in Ephesus. Its burden, as Luke is at pains to emphasize by his comment upon the actual parting, is that " they should behold his face no more." The scene was repeated at Tyre; while at Caesarea, the last stage of all, the climax was reached, in Agabus's prophetic action and the ensuing dissuasion of all those about him. But Paul, though moved in his feelings, was not to be moved from his purpose. The party went forward, taking the precaution to secure Paul a trusty host on the road to Jerusalem in the person of Mnason, a Hellenist of Cyprus. He

entered the holy city in good time to show his loyalty to the Jewish Feast of Pentecost. He was well received by James and the elders of the church. So far scholars are agreed, since the ” we ” form of narrative which began again at Philippi (xx. 5), reaches to Jerasakm , this point. But as to the historical value of what follows, before ” we ” reappears with the start for Rome from Caesarea there is large diversity of opinion. The present writer, holding that ” we ” is no exclusive mark of the eye- witness, sees no reason to doubt the substantial accuracy of the narrative in Acts xxi. 19-xxvi. 2 touching the Jewish outbreak against Paul and its sequel. Its significance for Paul’s life is fairly clear, though we are not told what acceptance the Gentile offering of loyal love met with in the Jerusalem church as a whole. But that its general effect upon the comity of the two branches of the Messianic Ecclesia was good seems implied by the serene tone of Paul’s later references to the unity of the Body (Eph. ii. 19-22; iii. 5 seq.). What does stand out clearly in Acts is all that bears on Paul’s position as between the Jewish and the Roman authorities. Here we observe a gradual shifting of the charge against him, corresponding in part to the changes of venue. The more local elements recede, and those of interest to a Roman court emerge.

To the Jewish mob he is ” the man that teacheth all men every- where against the People, and the Law, and this place; and moreover he brought Greeks also into the Temple ” (xxi. 28). Before Felix, Tertullus describes him as “a pestilent fellow, and a mover of tumults among all the Jews throughout the world, and a ringleader of the sect of the Nazarenes, who also tried to profane the Temple” (xxiv. 5 seq.). Similarly among ” the many and grievous ” offences alleged before Festus (xxv. 7 seq.) we gather that one or more were

1 This is a valuable datum not only for Paul’s own loyalty to the usages of Jewish piety, but also for the chronology of his life, as show- ing in the light of what follows the day of the week on which Passover fell that year, and so tending to fix the year as 56 or 57 (see above, Chronology).

2 These chapters contain passages as vivid and circumstantial as any in the ” we ” sections. As to the speeches, their fidelity naturally varies with the circumstances of delivery ; but in all there is that which could not be Luke’s free composition. The verisimili- tude of the demonstration of Paul’s personal loyalty to forms of Jewish piety in connexion with the four men under vows (xxi. 23-27) is complete, especially in view of Paul’s own vow at Cenchreae and his regard for Jewish feasts; and even Paul’s non-recognition of the high priest in what was not a regular session of the Sanhedrin (xxiii. 2-5), is quite

probable. Other points hardly merit notice here; see Knowling's Testimony of St Paul, lect. xx.

Rome.

■" against Caesar," i.e. treason of one sort or another. Though the others weighed with a procurator like Felix (anxious to humour the Jews cheaply) sufficiently to keep Paul (in the absence of bribes) in prison for two years, it was the last class of charge that was most dangerous, especially when once the case was transferred from the provincial court to the appeal court at Rome. The last words of Agrippa, " This man could have been set at liberty had he not appealed to Caesar," are probably recorded with a touch of tragic irony.

But what of Paul himself during the two years at Caesarea ? Though he must have been in correspondence with his churches, at least through messengers, nothing from his pen Caesarea. ˆ as reacne(l us – We can only infer from epistles written later how much this period contributed to his reflective life. The outlook was indeed stimulating to thought. Near at hand Judaea was sliding rapidly down the incline of lawlessness and fanatical resentment of Roman rule, towards a catastrophe which to Paul's eye, trained by Jewish Apocalyptic to regard certain things as signs of the days of Antichrist, would seem to betoken the prelude of the Parousia itself. Then, farther afield, the growing confederacy of Messiah's churches was stepping into the place vacated by " Israel after the flesh," as the people ready for God's Messiah.

The journey to Rome calls for no detailed notice (see Ramsay, St Paul the Traveller) . Its main interest for us is the impression of nobility, courage and power Which Paul conveyed to the centurion Julius and his fellow-passengers generally; while the enthusiasm of the eyewitness 1 himself visibly reaches its climax as dangers thicken and Paul rises above them all. At last Italy is reached, and Paul is met by detachments of " brethren " from Rome, who came as far as thirty and forty miles to welcome him; " whom when Paul saw, he thanked God and took courage." From Paul's letters, however, we gather that if he looked for sympathy from the Roman Christians, he looked largely in vain. Whilst some welcomed and most regarded him as indeed a champion of the Gospel whose fearless testimony even in bonds

emboldened many, including the judaizing section who wished him no good, to preach Jesus more openly than before; few, if any, really showed him brotherly love or cared for the interests of Christ outside Rome that were still on his heart (Phil. i. 12-17, h. 21). Such absorption in their own local affairs struck Paul as strangely un-Christian in spirit, and added disappointment to his irksome confinement, chained as he was by one wrist to a praetorian soldier night and day. Yet he rose above it all. Only let ” Christ be magnified ” in his body, whether by life or death. Then should he not be ashamed, come what might.

The letter which makes us aware how things lay is Philippians, the most devotional of all his writings and the most Christlike. The Epistle It is the perfect expression of personal ” Paulinism ” te Philip- in his maturer and more positive manner. It flows plans. from his heart as joyful thanks for tokens of continued mindfulness of him recently received from his old Philippian friends through Epaphroditus, one of their number. Touched and filled with spiritual joy the more that, save for his own personal circle, love, was so scant around him, he turns to comfort his friends in their sorrow for him, out of the stores of Divine consolation received through his own fresh sense of need (cf. 2 Cor. i. 3 sqq.). ” Rejoice in the Lord ” is its recurring note. Here we get the word of the hour, both for Paul and for his converts. The date of Philippians is an open question, English scholars tending to place it early, while most foreign scholars put it late in the ” two years ” of Acts. The present writer would place it last of those written during the first year, i.e. last of all save 2 Timothy.

Of the remaining imprisonment epistles, the beautiful little note to Philemon touching his slave Onesimus casts fresh light on Paul ” the Christian gentleman,” by its humour and perfect 1 That he regarded Paul as endowed with superhuman powers, both of premonition and of healing (as in Malta), is evident, even if in his mind, like that of most ancients, ” the line between the miraculous and the providential quite vanishes away ” — as B. W. Bacon says (Story of St Paul, p. 214) relative to xxviii. 3-5, comparing also the case of Eutychus’ ” insensibility.” But if so, why not apply this to the earthquake at Philippi also?

considerateness of tone. The two larger ones do not seem at first sight to reflect his personality so much as his Letters to life as the father of churches, and the way in Asian which he extended the lines of his gospel so as to Churcl > e s- ,bear on problems raised by ever fresh reactions upon it of the old traditions amid which his Asian converts still lived. Both aspects really blend; for the epistles are addressed to

churches which were feeling certain effects of the seeming calamity that had overtaken him whom they in some sense regarded as their founder, and aim at raising them to the writer's own higher standpoint (Eph. iii. 13, vi. 19-22; Cok ii. 1 seq.,iv. 8 seq.). It was just here that many of his Asian converts hesitated. They did not realize the all-sufficiency of Christ in the moral sphere; and they viewed their relations with the invisible world of ultimate or heavenly realities in keeping with this fact. They traced the hand of beings belonging to the supernal spheres in their earthly experiences of weal and woe. Hence they dreamed of supplementing what they derived from Christ by help from other spiritual beings. To judge from Colossians (see s.v.) it was largely along the lines of Jewish thought (cf. the Testaments of the Twelve Patriarchs), modified by Greek and other Pagan ideas, that this tendency operated. For at Colossae at least it issued in observance of ritual rules connected with the protection of good angels against evil ones, as taught by a sort of theosophy, probably basing itself on a legendary handling of pre-Mosaic Bible history in particular (cf. the Pastorals). Paul does not discuss how far " guardian angels " have any function left them in view of the all-sufficiency of Christ and His Spirit for believers. He obviously (Eph. vi. n sqq.) believed in the reality of angelic foes, because this hypothesis explained for him certain moral phenomena; but he had really stripped angelic helpers of all functions necessary to the Christian. Perhaps he was not sufficiently interested in the matter to think it out fully.

How does Paul deal with this situation of depressed faith and hope as to the power of Christ to confer all needful to the perfect- ing of the Christian's life on earth, in spite of the hostile forces, visible and invisible? All they need, he says, is to hold fast the Gospel which has already done so much for them — annulling the special privileges of the Jew, and quickening them as Gentiles '"dead in sins " and under the full sway of the powers of ill, into a life of filial access to God as Father. Of Christ's ability to achieve God's purpose in all things, the wonderful progress of His Church " in all the world " is already witness (Col. i. 8, 23). Looking then to these things, visible to Christian gnosis based on spiritual experience, there is no cause for depression at the sufferings endured for Christ's sake by Christians, and least of all at his own. Both in Colossians and " Ephesians " (really a circular epistle to churches in Asia, including those of the Lycus valley and perhaps most of the Seven Churches of the Apocalypse (see Ephesians), he lays stress on " love, which is the bond of perfectness," and on " unity of the Spirit," as the atmosphere of life worthy the vocation he describes in inspiring terms.

In this respect, as in nearly every other, these epistles exhibit marked

affinity with the next group claiming to come from Paul's pen, the so-called Pastoral Epistles, the The ethical supposed " moralism " of which is often urged Emphasis in against their authenticity. In both cases the Paul's later development is quite natural in Paul the missionary, B P lst,es ' as it answers to growing defects among his churches in the sphere of conduct. Such errors, while twofold in effect, alike sprang from a defective sense for ethics as the essential form of piety (1 Tim. vi. 3-1 1; 2 Tim. iii. 5; cf. Jas. i. 27) flowing from Christian faith. A merely intellectual faith, instead of the genuinely Pauline type, involving enthusiastic moral devotion to Christ, tended in practice either to a negative and ritual piety, as at Colossae, or to moral laxity. The latter was sometimes defended on a dualistic theory of " flesh " and " spirit," as two realms radically opposed and morally independent. 2

2 Of this we have a hint in the " empty words " alluded to in Eph. v. 6 (perhaps also iv. 14), probably of the same sort as in

Paul meets both errors by his doctrine of the " new man," the new moral personality, God's workmanship, " created in Christ Jesus for good works " (Eph. ii. 10), whose nature it is to be fruitful unto holiness and love (cf. Gal. v. 6, vi. 15).

In the so-called Pastoral Epistles the same subject is handled similarly, yet more summarily, as befits one writing instruc- tions to friends familiar with the spirit behind the Epistles! ™' Concrete precepts. Allowing for this, and for the special circumstances presupposed, there is no more " moralism " about the " wholesome instruction " in the Christian walk given in these epistles (1 Tim. i. 10; cf. vi. 3; 2 Tim. iv. 3) than in the other group. " Moralism " is ethical precept divorced from the Christian motive of grateful love, or connected with the notion of salvation as " of works " rather than prevenient grace. But of this there is no real trace in the Pastorals, which are a type of letter by themselves, as regards their recipients and certain of the aspects of church life with which they deal. As dealing with methods of instruction and organization, which must have occupied increasingly the atten- tion of those responsible for the daily course of church life, they contain nothing inappropriate to the last two years of Paul's life, when he was considering how his churches might best be safeguarded from errors in thought and practice in his absence or after his decease.

The main difficulties as to their substance have been imported by anachronistic reading of them, and are falling to the ground with the progress of exegesis and knowledge of the conditions of early church life. Our real difficulties in conceiving the Pastorals as what they purport to be, relate to their form, and ” lie in the field of language and of ideas as embodied in language ” (Hort, Jud. Christ, p. 131). But these, even as regards style and syntax, are reduced to narrow limits, when once due weight is given to the fresh analogies furnished by the now admitted Imprisonment Epistles (see also Ramsay, Expositor, 1909). This is specially the case with the use of new words of religious import, like ” Saviour ” or ” Deliverer ” {Soter, of God and Christ: see Eph. v. 23; Phil. iii. 20) — the idea of which springs naturally from Paul’s own outward state, as well as from the trials of his readers; the ” washing ” or ” laver ” of baptism (Eph. v. 26; Tit. iii. 5); the Gospel as a revealed ” mystery ” (Eph. passim, esp. ” the mystery ” as ” great,” Eph. v. 32; 1 Tim. iii. 16); and the future ” appearing ” of Christ (so already in 2 Thess. ii. 8; cf. Col. iii. 4). As to the use of the last term for the incarnation in 2 Tim. I. 10, it has a parallel in the ” was manifested ” of I Tim. iii. 16, itself a fragment of a Christian hymn of praise to Christ, such as is implied in Eph. v. 19, and especially Col. iii. 16. Not only is the fragment in question one in type with that in Eph. v. 14, but may even be part of the same hymn. Nothing could be more natural than for Paul to weave into his epistle to Timothy the religious phraseology actu- ally current among Pauline Christians in Asia, as we see him doing in his repeated citations of the hortatory parts of their hymnology, with the formula ” Faithful is the (familiar) saying” (i. 15, iii. I, 16, iv. 10; cf. 2 Tim. ii. n seq.). All this borrowed language, and much more that is virtually the parlance of the Asian churches, helps to explain a comparative lack of the distinctively Pauline element even in letters which contain highly characteristic passages. Hence there seem no insuperable difficulties to the authenticity of all three epistles — which most scholars recognize as at least partly from Paul’s pen, though they disagree as to the exact limits of the genuine fragments — if only a natural historic setting can be found for them in Paul’s life. But there is a general assumption that this cannot be found within the limits allowed by Acts. Accordingly some reject the situations implied in them as on the whole un-historical, while others postulate a period in Paul’s life of which Acts gives no hint, if it does not exclude it. This theory of a release after the ” two whole years ” with which Acts closes, and of a second imprisonment before the end really came, bases itself partly on the personal notices in the Pastorals themselves (for a suggested itinerary see e.g. Lightfoot, Biblical Essays), often full of verisimilitude, and partly on tradition. As regards the latter, the only evidence of real

weight is the reference in a highly rhetorical passage of the Epistle of Clement (c. A.D. 96) to Paul as having come in his universal ministry, in East and West alike, ” to the bound of the West.” But, granting that Spain be meant, there is no sign that Clement thought of this visit as following on an imprisonment 1 in Rome,

1 Cor. vi. 12-14, J ust as the denial by Hymenaeus and Philetus in

2 Tim. ii. 17 seq. of any resurrection, save that of the spirit in conversion (cf . Eph. v. 14), finds its earlier parallel in I Cor. xv. 12, 32-34.

1 Add the fact that Clement (ch. vi.) conceives Paul as being joined in the place of reward by’ the Neronian martyrs, and therefore as martyred not later than summer 64. No theory of the Pastorals, therefore, based on Clement’s witness, can place Paul’s death after this date.

rather than as falling somewhere in his career, simply on the warrant of Rom. xv. 28: while nowhere do the Pastorals themselves point to any journey west of Rome. Further no early tradition is clear enough to override the almost certain implication of Acts (xx. 25 and 38, read in the light of the closing chapters, and especially of xxvi. 32, which suggests that the appeal to Caesar was a fatal step) that Paul never visited Asia after his farewell at Miletus. Accordingly room for the epistles must be found, if at all, before the spring of 62 in keeping with Acts. 2 The following is an attempt to show how this may be done.

The pastoral epistles reveal certain special aspects of Paul’s life and work in Rome during the ” two years ” of Acts xxviii. fin. Addressed to intimate associates, they show him in the act of caring for his churches by deputy. In Titus* the case of Titus, indeed, the churches in question were apparently not of Paul’s own foundation, but those in whose welfare he had become interested while sheltering on his voyage to Rome at Fair Havens in Crete (Acts xxvii. 8 seq.). This spot was nigh to a city named Lasea; and as they were detained ” a considerable time,” for men eager to be gone, we may well imagine Paul coming into touch with the local Chris- tians and leaving Titus (whose presence is never alluded to in Acts, even when proved by Paul’s letters) to set in order the defective conditions prevailing among them (Tit. i. 5). Now, about early summer 60, we seem to see him writing further instructions, on the basis of reports received from Titus. There is no talk of a journey to Spain, and to judge from Paul’s plan to winter at Nicopolis (iii. 12) he expects his case to come on too late in autumn to admit of the visit to Asia which he had in mind only

shortly before, as it seems, when referring more indefinitely to his hopes in 1 Tim. iii. 14, iv. 13. Possibly his further reference in iii. 13 to Apollos and Zenas “the lawyer” (bearers of the letter), as on a journey of urgency, may mean that a date for his trial was fixed in the interval, and that he was sending to the East to collect counter-evidence to that of the Jews of Asia (Acts xxi. 27; cf. the later plaint in 2 Tim. i. 15, that ” all in Asia ” had ” turned their backs on him “).

Paul’s appeal case was not a safe topic for correspondence (cf. Col. iv. 7 seq.), and we gather little directly on the point from his epistles. The long delay in its hearing would be due in part to the accusers’ desire to collect evidence sufficient to ensure success even before a tribunal thought to be less amenable to Jewish influence than a procurator’s; and, once the first summer was past, the wintry sea {mare clausum) would postpone things for another six months. The delay seems to have been unexpected by Paul, and to have led him to mistaken forecasts during his first half year in Rome, in 1 Tim., Titus and Philemon. Somewhat later he expressed himself more guardedly (Phil, ii. 23 seq.; cf. i. 25). As to the charges on which all came to turn, we are left to intrinsic probabilities. They were no doubt those serious from the Roman rather than Jewish standpoint, viz. endangering public law and order by exciting the Jews throughout the world on religious matters, and fostering treason against the imperial cult generally (cf. the charge at Thessa- lonica). In defence Paul would urge the privileged position of a Jewish monotheist, and the Jews would be at pains to differentiate Christianity from Judaism, and so deprive it of the status of a legally recognized religion {religio licita). If they succeeded here, Paul’s condemnation was only a matter of time. This is the most probable issue of the case {pace Sir W. M. Ramsay and others), both a priori and in the light of later phenomena, e.g. 1 Pet. (which in 62-63 seems to imply a recent impulse to persecution for the Name).

The rather earlier but vaguer situation implied in 1 Tim. is as follows. At the moment of Paul’s appeal from Caesarea to Rome Timothy was perhaps on duty in Ephesus. t ximothr. There he would receive a message from Paul, possibly through Aristarchus (Acts xxvii. 2, 5 seq.), in terms of good hope as to his appeal. Timothy would in turn send word as to the situation in Ephesus, and at the same time express his desire to hasten to Paul’s side. This would lead Paul, in

2 Also with 1 Pet., if Dr H. B. Swete {Comm. on St Mark, 1898, p. xvii.) is right in saying that it implies Paul’s death; for 1 Pet. probably dates from 62-63 (see Dr Hort’s Comm.).

sending him a letter of encouragement and specific instructions, to open with a sentence (characteristically wanting a gram- matical conclusion) in which he recalls a parallel case, where he had exhorted Timothy to ” stay on ” in Ephesus 1 (i.e. in a.d. 56). Nor was the need less urgent now, owing to Judaic ” fables ” touching the primitive period of biblical history (” genealogies “), meant to bear on certain parts of the Law (i. 4-7) as of universal religious validity. At Ephesus (as also in Crete) much the same type of Judaism as was re-emerging at Colossae was reacting on local Christianity; while here and there were traces of dualistic antinomian theory (see i. 19 seq.; cf. 2 Tim. ii. 17 seq.). The general need of the hour was whole- some Christian ethics applied all round, supported by firmer organization in church life, especially with a view to check irresponsible teaching (1 Tim. v. 17, vi. 3; Tit. i. 9-1 1; 2 Tim. ii. 2, iv. 3). To the special local problems Paul addresses himself in this letter, but above all to the bracing of Timothy’s somewhat sensitive nature to face the opposition which he must encounter as a Christian leader at such a time (note the similes of the soldier and athlete, both of whom face hardship readily, as part of their profession, i. 18, v. 8 sqq., vi. 12 seq., 20; 2 Tim. ii. 3 sqq., iv. 5). In this connexion occur also certain autobiographic passages, as well as solemn affirmations of his own divine commission (e.g. i. 1, n sqq., ii. 7), the aim of which is to reassure his disciple that his gospel will bear all the strain that is being put upon it, or can be in the future (cf. Eph. vi. 19 seq. for all this). Here Paul is answering challenges which he knows are being made in Timothy’s hearing on every side, especially now that the apostle seemed less likely to return to Asia. He himself does not flinch, because he knows he had not run save ” at the command of God ” (i. 1), after being wondrously changed from his former self (i. 12 sqq.). Thus as to the authority of the Gospel ” committed to his charge,” however much it may be called in question (i. 10 seq., ii. 7), he has no shadow of doubt.

When the curtain rises for the last time, it is on the morrow of the long-expected hearing of Paul’s appeal. The case stands 2 Timothy adjourned, but he is no . longer under any illusion as to its final issue. His one comfort is that by the Lord’s support he had been delivered from the greatest danger, ” the mouth of the lion ” ready to ” swallow up ” (cf. 1 Pet. v. 8) his soul through craven fear, as he stood solitary before Caesar. From that the Lord had rescued him, and would yet rescue him from every ” work of ill ” (2 Tim. iv. 16-18). Yet his earthly work is done (iv. 6 seq.). So he writes to Timothy, his ”

beloved child," whom now he longs to see once more. But lest this should not be granted him, he prefixes to the summons a last will and testament, which may help Timothy to rise above the dismay which his death at the hands of Roman law is bound to cause. Let Timothy take up the Gospel torch as it falls from his own dying hand, and " do the work of an Evangelist," heeding not the hardship. Then after providing for the Gospel, he turns to more personal interests. " Hasten to me with all 'speed," he says in effect, " for I am all alone, save for Luke. My other trusty friends are away on various missions, and Demas has deserted the sinking ship. Tychicus I had already sent to Ephesus; he will replace you. Pick up Mark and bring him with you—he is so helpful. Bring my cloak, papers and books [copies of the Scriptures], lying in Carpus's hands at Troas " 2 — perhaps since Acts xx. 6 sqq. " Alexander the bronze-worker [an old Jewish foe at Ephesus, Acts xix. 33] did me many a bad turn in my case (his case is in the Lord's hands) ; be on thy guard against him." Then follow allusions to Paul's " first defence," unsupported by such as might

1 It is quite likely that Timothy left Ephesus for Rome before receiving 1 Tim., since he was with Paul when Colossians and Philippians were written, the former at least in the summer of 60 (see Philem. 22).

2 It seems best to take iv. 13-15 as all part of this letter, rather than as part of the note from which iv. 20, 21″ probably comes (see above). The homely details follow naturally enough oi» the reference to Mark; while the reference to Alexander is so far borne out by Heb. xiii. 23, which suggests that Timothy was accused on his arrival in Rome.

have appeared on his behalf (especially from Asia; cf. i. 15); and next salutations to Prisca and Aquila, and to the house of Onesiphorus — an Ephesian who had sought Paul out in Rome (i. 16-18).

So the curtain falls for the last time. But Paul's fate is hardly obscure. He himself saw that the charge against him, unrebutted by independent evidence, must bring him to the executioner's sword, the last penalty for a Roman citizen. With this late 2nd-century tradition agrees (Tertullian, De praescr. haer. 36), naming the very spot on the Ostian Way, marked by a martyr-memorial (tropaion, Caius ap. Euseb. ii. 25), probably at the modern Tre Fontane, some three miles from Rome. But the traditional date (June 29) reaches us only on far later authority. Acts simply suggests the first half of a.d. 62; and we may imagine Timothy reaching Rome in time to share Paul's last days (cf. Heb. xiii. 23).

Early Tradition has little to say about Paul. Possibly the earliest

reference outside the New Testament is a Christian addition to the Testament of Benjamin, xi., which describes a Benjamite as ” enlightening with new knowledge the Gentiles.” The notice in Clement’s epistle (ch. v.) to Paul’s having borne bonds ” seven times ” may be mere rhetoric (perhaps based on 2 Cor. xi. 23). Ignatius refers with reference (cf. Rom. iv. 3) to Paul as his example in martyrdom (Ad Eph. xii. 2) ; similarly Polycarp (Ad Phil. iii. 2) deprecates the notion that he, or any other like him, could rival ” the wisdom of the blessed and glorious Paul,” and refers to his letter(s) to the Philippians. The Acts of Paul, composed not long after a.d. 150 by an Asian presbyter, in order to glorify Paul by supplementing Luke’s story, is striking evidence of the regard felt for him in certain circles; but it contains (so far as extant in the Coptic, which also enables us to identify other documents as once parts of these Acts) no fresh data, unless the episode dealing with Paul and Thekla echoes an original tradition belonging to Iconium and Pisidian Antioch. Its description of Paul as ” a man small in size, bald, bow-legged, sturdy, with eyebrows meeting and a slightly prominent nose, full of grace ” in expression, may or may not be based on local memories (see 2 Cor. x. 10; cf. Diet. Christ. Antiq. ii., 1 62 1, for early representations of him). The hostile conception of him lying behind the Simon of our Clementine literature (q.v.) has no historic value; and the same may be said Of all traditions not to be traced earlier than the 3rd century (cf. R. A. Lipsius, Die apokr. Apostelgesch. u.s.w., and C. Clemen, Paulus, i. 331 sqq.).

Paul’s personality is one of the most striking in history. No character of the distant past is known to us more fully, both from within and from without, thanks largely to the self-revealing quality of his letters. His was a deep, complex, many-sided nature, varying widely in mood, yet all so concentrated by moral unity of purpose that the variety of gift and sensibility is apt to escape notice. During his career every faculty comes into play, and we realize how largely human he was. ” Even though Paul was an apostle,” says Chrysostom, ” still he was a man.” A true picture of him must preserve the vital unity in which these two aspects appear in our sources. To judge him save through that vocation which he himself felt to determine all his being, is to fall into unreality. To view him as a mere individual is vain. He cannot be judged entirely by com- mon standards, whether religious or ethical ; for owing to his vocation his personality had an universal import which must needs put him out of ordinary human perspective at certain points. Further, we must allow for his limited temporal horizon, shut in for practical purposes by a near Parousia, conceived as bringing ordinary history to an abrupt close, and the hope of which foreshortened all issues. Bearing this in mind, we shall wonder, not so

much at any other- worldly spirit or peremptoriness of tone, which were positive duties under such conditions, but rather at the sanity of temper and moral judgment which mark the apostle amid his consuming zeal ” by all means to save some ” from ” the wrath ” soon to be revealed against sin and unrighteousness (i* Thess. i. 10; Rom. i. 18). We must remember too that he lived in an atmosphere of intense ” en- thusiasm,” in the most literal sense, among those who felt that ” the powers of the coming age ” (Heb. vi. 4 seq.) were already at work in ” the saints,” men possessed by the divine afflatus and made as it were but organs of the Spirit of God. Viewed in such an environ- ment, Paul is seen to have been a great steadying influence, insisting on character as the normal fruit of the Spirit and the real ground of human worth (1 Cor. xiii. 1-3) ; insisting also that possession by the Spirit did not supersede responsibility for self-control (xiv. 32 seq.), and that the element of conscious reason was superior to blind ecstasy (xiv. 1 sqq.). He spoke from full personal experience ; for he exercised every gift on the list in I Cor. xii. 8. Yet with clear and ever-growing emphasis he defined spirituality in moral terms, those of the will informed by love like that of Christ. How great this service was, none can say. It was his balanced attitude to the operations of the Spirit — outwardly the most distinctive thing in Christianity, as compared with Judaism — an attitude at once reverent and reason- able, that savedl the Church from fanaticism on the one hand or

moralism on the other. It was his own experience as a passionate seeker after righteousness which gave him the key to that reinter- pretation of Jesus the Christ as at once moral ideal, master motive and immanent principle of life at work in the soul by the Spirit which was peculiarly his own and may be styled his ethical mysti- cism. This was his main contribution to Christianity ; and as depend- ing on his personal experience, it was bound up closely with his personality — a fact which makes his direct influence, while intense, yet rather limited in its area of appeal.

At the root of Paul’s nature lay the Hebrew capacity for personal devotion to the Divine as moral perfection, to an unbounded degree. It found its object in a concrete form, stirring both imagination and affections, in Jesus the Christ, ” the image of the invisible God ” whose spiritual glory man was created to reflect. This instinct for ideal

devotion seems never to have been diverted, even for a season, into a single human channel, in the love of woman. From his early youth his soul was preoccupied by a passion for God and His will in His people. This he came to regard as a special divine gift or voca- tion (l Cor. vii. 7), imposing on its possessor, in the face of the world's needs (cf. 29-31), a higher duty than could be fulfilled within the conditions of the closest of human relations (32-35). But the tender- ness and chivalrous self-sacrifice which found no vent in the ordinary channel came to pour itself forth in an absorbing love for his churches, which were to him as his own spouse, though his aim was rather to " present them as a pure virgin to Christ " (2 Cor. xi. 2). This educated his human affections, and softened the outlines of a nature inflexibly loyal to principle and absorbed with the divine aspect of life. Thus it was through " the love of Christ " constraining him to look at all, as it were, through Christ's eyes, that Paul came to love men even to the point of a self-forgetfulness that seemed to some hardly sane (2 Cor. v. 13-16"; cf. Mark Hi. 21, " He is beside him- self "). So too his proud, strong-willed spirit gradually put on " the meekness and conciliatoriness of Christ " to such a degree that during the Corinthian troubles his critics contrasted the vigour of his letters with the seeming feebleness of his outward bearing (2 Cor. x. I, 10). .

There is no good evidence that his presence was physically weak or unimpressive, even if his stature was small, as tradition has it (see above; cf. Acts xiv. 12). Nor is there any sign that he bore habitual traces of those periodic attacks of some nervous affection — allied to epilepsy, 1 but apparently not involving loss of consciousness — to which, as dating from a certain overpowering trance about 42-43, he refers in 2 Cor. xii. 7 sqq. These were most humiliating while they lasted (cf . Gal. iv. 14). But they seem not to have drained his vigour even for great and constant labours of body and mind. His energy indeed was portentous, as he himself felt, when he traced it to the divine power " energizing mightily " in him (1 Cor. xv. 10 Col. i. 29), and that most effectively when he felt weakest in himself (2 Cor. xii. 9 seq.). . .

Not only had Paul a supernormal spiritual force, marked by a rare combination of religious inspiration and reasoning power, which made him impressive both as speaker and writer, he had also a genius for adaptation to varied mental conditions, due partly to his Hellenistic training, but also to the fact that his message was one not of the letter but of spirit and power (cf. 2 Cor. iii. 4 sqq.). This showed itself as tact in relation to individuals and special audiences, and as statesmanlike breadth of view in handling large problems of principle, such as were constantly emerging in relation to the Jewish and Gentile

types of Christianity, and again as to the Christian attitude to the pagan state (Rom. xiii. 1 sqq.). He combined grasp with vital flexibility in a degree which made him the prince of missionaries. He was the prophet in the originality of his message ; he was the theologian in the reflective interpretation which he gave to it, in terms derived mainly from a profound knowledge of Jewish thought, liberalized by contact with another world, the Graeco- Roman ; but above all he was the missionary in the attitude in which he stood to his gospel and to men as its subjects. There was in him nothing doctrinaire: to that, along with the legal attitude, he had been crucified with Christ, for both belonged to ” the rudiments of the world ” of sense (1 Cor. xiii. 8 sqq. ; 2 Cor. x. 4 seq.; Col. li. 20 seq. ; Phil. iv. 7). Accordingly he was great as an organizer of a new order among his Gentile churches, where much was left to local instinct informed by the one Spirit, while yet he jealously cared for such unity in usages as seemed needful to the embodiment of the one life of the Spirit in all, Jew and Gentile alike (1 Cor. iv. 17, xv. 33, 36). In particular he showed his Christian largeness in his exertionsto keep in communion the two sections of Christ’s people, to the point of risking his life for this end.

In his more personal relations he had the power of feeling and inspiring friendship of the noblest order, a comradeship ” in Christ which fills his letters with delightful touches of loyal affection and trust, even of playfulness on occasion (Philem.). He was a man of heart, with rapid alternations of mood, with nothing of the Stoic

1 See Lightfoot, Galatians, pp. 183 sqq., who cites King Alfred as a parallel; and Hastings’s Diet. Bible, iii. 7°i- Sir W- M. Ramsay, St Paul the Traveller, pp. 94 sqq., prefers “a species of chronic malarial fever,” connecting it specially with the attack mentioned in Gal. iv. 13 sqq.

in his self-mastery, which was an acquired grace, rooted in the ” peace of God ” (Phil. iv. 7, 10-13). Indeed it was in his impetuous, choleric temperament that there lurked ” the last infirmity ” of his soul, which at times betrayed him into vehemence of expression (Acts xxii. 4 seq.) and a sweeping harshness of judgment (cf . 2 Cor. vii. 8 seq.), especially where he had detected disingenuous conduct in those who were interfering with his work for Christ or imputing base motives to himself, like the judaizers in Galatia and Corinth (cf. Phil. iii. 2). As to the charge of egoism, based on the emphasis he lays on his own person as medium of Christ’s mind and will, it can hold only so far as Paul can be shown to do this gratuitously, and not really in the interests of his vocation. By this latter standard alone can an apostle be judged. Paul is careful, moreover, to dis- tinguish his ordinary and

his vocational self (2 Cor. xii. 5), as well as what he says as quoting Christ, as speaking qua apostle (1 Cor. vii. 10, 12), and again as simply one found ” faithful ” (ib. 25). Such is not the way of egoists or fanatics.

In his Epistles Paul found a fitting vehicle for his personality, whereby to speak not only to his own age but also to kindred souls all down the ages, so coming to spiritual life again and again, when buried under convention and tradition. For the letter is the most spontaneous form of writing, nearest in nature to conversation, and leaving personality most free. No doubt Paul’s letters followed current forms (cf. G. A. Deissmann, Bible Studies, 1901, ch. i.). But he transfigured what he used by the new fullness of meaning infused into address, salutation, final messages and benediction. His letters are indeed ” the life-blood of a noble spirit,” poured forth to nourish its spiritual offspring (cf. I Thess. ii. 7 seq.)._ They are data for his Life and form incidentally an. immovable critical basis for historical Christianity, on which the hypercriticism of Van Manen and others (see Ency. biblica, s.v. ” Paul “) can make no real im- pression. On the other hand, as the sources of our knowledge of ” Paulinism,” they impose by their very form certain limits to our effort to reduce his thought to system. Canon R. J. Knowling’s Witness of the Epistles (1892) and The Testimony of St Paul to Christ (1905) contain full summaries of all bearing on Paul’s epistles. The history of the collection of Paul’s letters into a corpus styled ” The Apostle,” for reading in Christian worship, is very significant, so far as we can trace it. The reference in 2 Pet. iii. 15 seq. would be of high value, were the date of 2 Pet. itself not so doubtful. The first definite notice we possess of a canon of Pauline epistles is that of the ultra-Pauline Marcion, who used ten Pauline epistles (c. i4o)._ Cer- tain apocryphal Pauline epistles appeared in early times, beginning with one To the Alexandrines, forged in the interests of Marcionism (Canon Murat), and an exchange of letters between the Corinthians and Paul, originally part of the Acta Pauli (ed. C. Schmidt, pp. 145- 160). For the forged correspondence between Paul and Seneca, see Lightfoot, Philippians, pp. 329-333.

II. Paulinism. — Of recent years the ambiguity lurking in this term, as used to describe Paul’s teaching as a whole, has been fully realized, and efforts have been made to distinguish what is distinctive and essential from what is traditional in form and relative in importance. For Paul, if ” the first Christian theologian,” was no systematic theologian. His mind was fundamentally Semitic. It seized on one truth at a time, penetrating to the underlying principle with extraordinary- power and viewing it successively from various sides. But, unlike a Greek thinker, he did not labour to reduce the sum of his

principles to formal harmony in a system. In the absence of such critical testing of his thought by Paul himself, we must observe his relative emphasis and the varying causes of this, whether personal conviction or external occasion. Even when this is done it still remains to ask how much represents direct spiritual vision, due to " revelation," and how much traditional forms of thought or imagination, adopted by him as the most natural vehicle of expression occurring to his mind in a given mental environment. That Paul himself was conscious of the limitations here implied, is clear from what he says in 1 Cor. xiii. 9 sqq. as to the transience of the conceptions used by himself and others to body forth divine ideas and relations. After all, his was the theology of a prophet rather than a philosopher. Hence we have to distinguish what may be styled " personal Paulinism," the generalization of his own religious experience, from his apologetic exposition of it over against current Pharisaic Judaism if largely in its terms and also from the speculative setting which it took on in his mind, as his experience enlarged and the thoughts of his converts suggested fresh points of view.

It is mainly in this last sphere that development is traceable in Paulinism. Some idea of its nature and extent has already been given in connexion with Paul's life. If one must attempt

to reproduce the Pauline " system " as a whole, it is best to take the form in which it appears in the Epistle to the Romans, and then supplement it with the fresh elements in the later epistles (so far as these seem really to be in terms of the writer's thought, rather than his readers'), instead of constructing an amalgam from the whole range of his epistles taken pro- miscuously. Paulinism, in the widest sense, 1 includes much that is not distinctively his at all; what can here be given is confined to Paul's specific contribution to Christianity.

i. Paulinism proper springs from an absorbing passion for a righteousness real from the heart outwards, real before God. This could not be satisfied by " works of the Law," i.e. deeds prompted by the categorical imperative of Law, itself viewed as the will of God and supported by sanctions of reward and penalty. Two things hindered; "the flesh," the sensuous element in human nature, positively prone to sin since the first man's trespass introduced an actual bias to evil (Rom. v. 12, 14, 19) ; and (the) Law itself, a form of divine claim which acted on man's sinful nature as a challenge and irritant, to his egoism, so breeding either positive rebellion or self- confident pride, but in neither case real righteousness before God. Thus the main effect

of Law was negative ; it brought to light the sin latent in ” the flesh,” i.e. the personality as conditioned by the post-Adamic flesh. From this deliverance could come only by divine interposition or redemption, achieving at once reconciliation and regeneration by the removal of guilt and the creation of a new moral dynamic. Justification, then, or the placing of man in a state in which God could reckon him radically righteous, must be due to ” grace ” apart altogether from ” works of law ” and their desert. The medium of such grace was the Christ, in whom the claims of the dispensation of Law, in its typical form as the Jewish Thorah, were satisfied by death, while the Resurrection set the seal of God’s ap- proval upon Christ’s fulfilment of righteousness (Rom. v. 17-19; 1 Cor. xv. 17) on the new and higher plane of filial obedience by love to God as Father.

Thus what the Law could not do, in its weakness in relation to the flesh, had been divinely achieved by God’s Son, the Messiah, in virtue of ” the Spirit of life ” in Him, which annulled ” sin and death ” in human nature (Rom. viii. 2-4), first in the flesh of Christ Himself as second Adam, and then in the humanity which should be united to Him as spiritual Head (1 Cor. xv. 45). This union was affected by faith, a profound receptivity whereby the personality of the Saviour became as it were the germ of the new moral personality of the believer. He was ” in Christ ” and Christ ” in him ” by a mutual spiritual interpenetration, begun on Christ’s side by vica- rious self-sacrificing love, and consummated on the believer’s side by self-surrendering trust under the influence of the Spirit of God and Christ (Gal. ii. 20; Rom. viii. 9, 15 seq.).

Such mystic union by faith (cf. Eph. iii. 16-19) is the very nerve of Paulinism, having two main aspects. In its initial aspect, itisthe real basis of justification (as radical sanctification) and regeneration; in its abiding aspect, it is the secret of progressive sanctification or assimilation to the image of Christ, Himself ” the image of God.” To the one aspect corresponds the initial rite of baptism ; to the other the recurring rite of communion in the Lord’s Supper. These have both an essentially corporate significance. It is as members of the mystical Body of Christ — or rather of the mystic Christ, consisting of Christ the Head and of His Body the Church — that believers, already united to the Head by faith, partake in these sacraments (1 Cor. xii. 12 seq., x. 16 seq.)-

The keystone of all this is the Christ of God, the glorified Christ who appeared to Paul at his conversion, and in the rays of whose heavenly glory the earthly life of Jesus of Nazareth was ever seen. Here, as elsewhere, the mode of Paul’s conversion determined his whole

perspective. It differentiated his emphasis from that of the older Judaeo-Christianity, which always started from the earthly manifestation, while it looked fixedly forward to the future manifestation in glory (of which the Resurrection appearances were the fore-gleams). To Paul the glorified Jesus or spirit-Christ (1 Cor. xv. 45; 2 Cor. iii. 18) of his vision became the Christ mystical of permanent, present Christian faith and experience. In union with Him the believer was already essentially ” saved,” because possessed of Christ’s spirit of Sonship (Rom. viii. 9, 14-17, 30), although his redemption was not complete until the body was in- cluded, like the soul, in the penetrating ” life ” of the Spirk (viii. 2 3 _2 5> IO seq.). Accordingly he shifted the centre of gravity in Christian faith decisively from the future aspect of the Kingdom, to the present life of righteousness enjoyed by believers through ” the first-fruits of the Spirit ” in them. Here lay his great advance on Judaeo-Christianity, with its preponderant eschatological em- phasis, along with a more external conception of Jesus, as Jewish Messiah, and of relation to Him. To this mode of thought Christ was not the very principle of the new filial righteousness. In a word, while Judaeo-Christianity only implicitly or unconsciously tran- scended legalism, Paulinism did so explicitly and consciously, thus

1 One of the best critical summaries of ” Pauline Theology ” is that by E. Hatch in the Ency. Brit. 9th ed,

safeguarding the future. For Paul’s religion was Christocentric in a sense unknown before. Compared with this, his distinctive attitude of soul to Christ, the exact metaphysical conception he formed of Christ’s pre-existence was secondary and conditioned by inherited modes of thought. His own specific contribution was his consciousness of Christ’s complete religious efficacy, which marked Him as essentially Divine, the Son of God in the highest sense conceivable under human conditions.

ii. Jesus and Paul. — In calling Paulinism ” Christocentric,” one raises the question as to its relation to the Gospel proclaimed by Jesus. That Paul conceived himself as utterly dependent for his gospel upon Jesus the Christ, is not in doubt, but only how far he unconsciously modified the Gospel by making Christ its subject matter rather than its revealer. In one aspect this is but the question as to Paul’s attitude to the historic Jesus over again: yet it is more. Granting that Paul felt his gospel to be in essential agreement with the words and deeds of Jesus of Nazareth, as known to him, it remains to ask whether he did not

put all into so fresh a perspective as to change the relative emphasis on points central to the teaching of Jesus, and so alter its spirit. A school of writers, by no means unappreciative of Paul as they understand him, of whom W. Wrede may be taken as example, answer that Paul so changed Christianity as to become its ” second founder ” — the real founder of ecclesiastical Christianity as distinct from the Christianity of Jesus. They say, ” either Jesus or Paul: it cannot be both at once.” They urge not only that Paulinism is involved in certain ” mythological ” conceptions, by its view of sin, of redemption and of the pre-existent celestial person of the Redeemer; but also that, apart from the Rabbinic and anti-Rabbinic element in Paul, his whole mystical attitude towards Christ as the medium of redemption (an idea borrowed, they say, not from Jesus Himself but from the religion of the Mysteries) is alien to the sunny and sane teaching of Jesus as to God and man, and their true relations.

The essential issue here is this. Could Jesus the Messiah set forth the Gospel in the same perspective as a devoted disciple of His? Must not the personal embodiment of the life of the Messianic king- dom by Jesus Himself, and so His personality, become the prime medium through which this life in its essential features, and especially in its spirit of devoted love, attains and maintains its hold upon the souls of men ? Surely the new life must appear most fully and movingly sub specie Christi; and the imitatio Christi, in an inner sense which finds in Him the very principle of the new Christian consciousness as to God and man, must be the most direct and morally potent means to the realization of the Christ- type. Thus to say that Paulinism is practically and proximately ” Christocentric,” is not to deny that it is ultimately and theoretically ” Theocentric,” if only Christ be regarded as the revealer of God the Father, and that in virtue of a special community of nature with Him as Son. It may be questioned whether Paul attained, or indeed had within his reach in that age, the best intellectual equiva- lent of his religious intuition of Christ as ” mediator between God and man.” But it is another matter to question whether his intui- tion that the personality of the Christ Himself was the secret of the spiritual power latent in His Gospel, be a true interpretation’ of the Gospel as it appears even in the Synoptics. 2 Thus the truth seems to lie rather with those who see in Paul ” Jesus’s most genuine disciple ” (H. Weinel), the one who best understood and reproduced His thought. True, Jesus’s Gospel is one seen through the sinless con- sciousness of the Saviour, while Paul’s is one seen through the eyes of a conscious sinner. But that is the perspective in which mankind generally has to view the Gospel ; and apart from the special intensity of Paul’s personal experience of sin, the Gospel as it ” found

” him may surely be in principle the needful experimental complement to the Gospel as set forth in more ideal form by Tesus Himself. By restoring Jesus’s own stress upon ” eternal life as present rather than future, and that on lines other than those of obedience to a divine law, Paul saved Christianity from a judaizing of the universal and spiritual religion with which Jesus had in fact inspired His personal disciples, but which they had not been able to grasp.

No doubt there is another side to all this, the side of Paul’s idio- syncrasy, both religiously and as a thinker. The peculiar depth and form of Paul’s religious experience, especially as regards sin, have proved a limitation to his direct and full influence. While ” numberless men have discovered themselves in reading Paul,” more have not been ” found ” by him; and of those who have felt the religious appeal of his writings, not a few have gravely misunder- stood the theoretic setting of his message. Indeed misunderstanding, one way or another, was Paul’s usual lot in the ancient Church, 3 as regards his most distinctive ideas, due partly to the difficult form in which some of those ideas were couched. But to say this is little more than saying that Paulinism is a less universal form of the Gospel than that given it by his Master Jesus Christ. To do full justice

2 The whole history of Christianity is proof that the personality of Jesus has counted for_ more in producing Christians than his teaching per se, that is, his Gospel in the narrower sense. And it was Paul, not the older apostles, who first concentrated attention on that personality as the type and pledge of man’s potential son- ship to God.

3 See S. Means, Saint Paul and the ante-Nicene Church (1903).

to Paulinism in this respect, we must compare it with other interpretations of Jesus and His Gospel in the age immediately ensuing. At the one extreme stands Judaeo-Christianity (so far as uninfluenced by Paul), with its ultra-conservatism and un- developed spirituality; at the other Gnosticism, with its ultra- spiritualism, born of a rigid dualism and defective sense for historical continuity in revelation. Between these stands Paul, blending the positive ideas of both in a religious unity of immense ethi- cal power and initiative; while the other and intermediate types represented in the New Testament— by I Peter, Hebrews and the Johannine writings— all testify to his pervasive influence.

Literature. — For this in anything like its immense range, refer- ence may be made to the articles ” Paul ” in Hastings’s Diet. Bible, the Ency. Bib., A. Hauck’s Realencyklopddie (Zahn) ; to R. J. Know- ling’s Witness of the Epistles (1892) and The Testimony of St Paul to Christ (1905), and C. Clemen, Paulus (1904), the footnotes’ of which are a mine of information on this subject. Besides these, the leading works on New Tool iment introduction or theology and on the apostolic age deal largely with Paul, and often contain biblio- graphies. The following works may be taken as fairly typical : —

1. For Paul’s Life: A. Neander, Gesch. der Pflanzung . . . der chrisll. Kirche, vol. i. (4th ed., 1847; Eng. trans, in Bohn’s Library), and Lives by F. C. Baur (1845, 1866) ; G. V. Lechler, Das apost. . . . Zeitalter (1851; 3rd ed., 1885; Eng. trans. 1886); E. Renan (1869); T. Lewin (1851, 1874, rich in archaeology); Conybeare and Howson (1852 and later) ; H. Ewald, History of Israel (vol. vi., 3rd ed., 1868) ; M. Krenkel (1869); A. Hausrath (2nd ed., 1872); F. W. Farrar (1879); A. Sabatier (2nd ed., 1881); K. Schmidt, Die Apostelgesch. (vol. i., 1882); C. Weizsacker, Das apost. Zeitalter (1886; Eng. trans., 1894) ; W. M. Ramsay, St Paul the Traveller and Roman Citizen (1896); A. C. McGiffert, The Apostolic Age (1897); O. Cone (1898); C. Clemen (1904) ; B. W. Bacon (1905). Some of these deal largely with Paul’s teaching.

2. For Paul’s Teaching: L. Usteri, Die Entwichelung des pauli- nischen Lehrbegriffs (1824; 6th ed. 1851) ; Baur’s Paulus (1845, 1866) ; A. Ritschl, Die. Entsteh. d. altkath. Kirche (2nd ed., 1857); E. Reuss, Hist, de la thiol, chret. au siecle apostolique, tome ii. (3rd ed., 1864; Eng. trans., 1872); B. Jowett, essays in his Epistles of St Paul to the Thess., &c. (2nd ed., 1859) ; C. Holsten, Zum Evang. d. Paulus u. Petrus (1868), &c. ; J. B. Lightfoot, dissertations in his Commentaries ; Matthew Arnold, St Paul and Protestantism (1870); O. Pfleiderer, Der Paulinismus (1873; Eng. trans. 1877), also Hibbert Lecture (1885) and Das Urchristentum, vol. i. (2nd ed., 1902; Eng. trans., 1907) ; A. Sabatier, L’Apotre Paul (1881) ; E. Menˆgoz, Le PecM et la redemption d’apres S. Paul (1882); J. F. Clarke, The Ideas of the Apostle Paul (1884); G. B. Stevens, The Pauline Theology (1892); A. B. Bruce, St Paul’ s Conception of Christianity 1(1894) ;C. C. Everett, The Gospel of Paul; G. Matheson, The Spiritual Development of St Paul; P. Feine, Das gesetzfreie Evang. des Paulus (1899); brief sketches by W. Bousset, H. Weinel, W. Wrede, P. Wernle (also his Anfange unserer Religion, 1901 ; Eng. trans., 1904), and A. Julicher (in Die Kultur der Gegenwart, 1905, I. iv. i, 69-97) ! but especially W. Sanday, article ” Paul ” in Diet, of Christ and the Gospels (1908), where the literature bearing on ” Jesus and Paul ” will be found. For commentaries, see

under the several epistles. (J. V. B.)

PAUL (Paulus), the name of five popes.

Paul I., pope from 757 to 767, succeeded his brother Stephen III. on the 29th of May 757. His pontificate was chiefly remarkable for his close alliance with Pippin, king of the Franks, to whom he made a present of books highly significant of the intellectual poverty of the times; and for his unsuccessful endeavours to effect a reconciliation with the iconoclastic emperor of the East, Constantine Copronymus. He died on the 28th of June 767. His successor was Stephen IV.

Paul II. (Pietro Barbo), pope from the 30th of August 1464 to the 26th of July 1471, was born at Venice in 1417. Intended for a business career, he took orders during the pon- tificate of his uncle, Eugenius IV., and was appointed suc- cessively archdeacon of Bologna, bishop of Cervia, bishop of Piacenza, protonotary of the Roman Church, and in 1440 cardinal-deacon of Sta Maria Nuova. He was made cardinal-priest of Sta Cecilia, then of St Marco by Nicholas V., was a favourite of Calixtus III. and was unanimously and unexpectedly elected the successor of Pius II. He immediately declared that election " capitulations," which cardinals had long been in the habit of affirming as rules of conduct for future popes, could affect a new pope only as counsels, not as binding obliga- tions. He opposed with some success the domineering policy of the Venetian government in Italian affairs. His repeated condemnations of the Pragmatic Sanction of Bourges resulted in strained relations with Louis XI. of France. He pronounced excommunication and deposition against King George Podiebrad

on the 23rd of December 1466 for refusal to enforce the Basel agreement against the Utraquists, and prevailed on Matthias Corvinus, king of Hungary, to declare war against him on the 31st of March 1468. Matthias was not particularly successful, but George Podiebrad died on the 22nd of March 1471. The pope carried on fruitless negotiations (1469) with the emperor Frederick III. for a crusade against the Turks. Paul endea- voured to make drastic reforms in the curia, and abolished the college of abbreviators (1466), but this called forth violent protests from the historian Platina, one of their number and subsequently librarian under Sixtus IV., who is responsible for the fiction that Paul was an illiterate persecutor of learning. It is true that the pope suppressed the Roman academy, but on religious grounds. On the other hand he was friendly to Christian scholars; he restored many ancient monuments; made a magnificent collection of antiquities and works of art; built the Palazzo di St Marco, now the Palazzo di Venezia; and probably first introduced printing into Rome.

Paul embellished the costume of the cardinals, collected jewels for his own adorn- ment, provided games and food for the Roman people and practically instituted the carnival. He began in 1469 a revision of the Roman statutes of 1363 — a work which was not completed until 1490. Paul established the special tax called the quiri- dennium in 1470, and by bull of the same year (April 19) announced the jubilee for every twenty-five years. He began negotiations with Ivan III. for the union of the Russian Church with the Roman see. Paul was undoubtedly not a man of quick parts or unusual views, but he was handsome, attractive, strong-willed, and has never been accused of promoting nephews or favourites. He died very suddenly, probably of apoplexy, on the 26th of July, 1471, and was succeeded by Sixtus IV.

The principal contemporary lives of Paul II., including that by Platina, are in L. Muratori, Rerum ital. scriptores, iii. pt. 2, and in Raynaldus, Annates ecclesiastici (1464-1471). The inventory of his personal effects, published by E. Mtintz (Les Arts, ii., 1875), is a valuable document for the history of art. See also L. Pastor, History of the Popes, vol. iv. ; trans, by F. I. Antrobus (London, 1898) ; M. Creighton, History of the Papacy, vol. iv. (London, 1901) ; F. Gregorovius, Rome in the Middle Ages_, vol. vii. (trans, by Mrs G. W. Hamilton, London, 1900-1902); H. L'Epinois, Paul II.; F. Palacky, Geschichte von Bbhmen, Bd. IV .-V. (Prague, 1860-1865); A us den Annalen-Registern der Pdpste Eugen IV., Pius II., Paul II., u. Sixtus IV., ed. by K. Hayn (Cologne, 1896). There is an excel- lent article by C. Benrath in Hauck's, Realencyklopddie (3rd ed.), vol. xv. (C. H. Ha.)

Paul III. (Alessandro Farnese), pope from 1534 to 1549, was born on the 28th of February 1468, of an old and distinguished family. As a pupil of the famous Pomponius Laetus, and, subsequently, as a member of the circle of Cosmo de' Medic he received a finished education. From Florence he passed to Rome, and became the father of at least two children, later legitimized. Upon entering the service of the Church, however, he lived more circumspectly. His advancement was rapid. To the liaison between his sister Giulia Farnese Orsini and Alexander VI. he owed his cardinal's hat; but the steady favour which he enjoyed under successive popes was due to his own cleverness and capacity for affairs. His election to the papacy, on the 13th of October 1534, to succeed Clement VII., was virtually without opposition.

The pontificate of Paul III. forms a turning-point in the history of the papacy. The situation at his accession was grave and complex: the steady growth of Protestantism, the preponderant power of the emperor and his prolonged wars with France, the advances of the Turks, the uncertain mind of the Church itself — all conspired to

produce a problem involved and delicate. Paul was shrewd, calculating, tenacious; but on the other hand over-cautious, and inclined rather to temporize than to strike at the critical moment. His instincts and ambitions were those of a secular prince of the Renaissance; but circumstances forced him to become the patron of reform. By the promotion to the cardinalate of such men as Contarini, Caraffa, Pole and Morone, and the appointment of a commission to report upon existing evils and their remedy, the way was opened for reform; while by the introduction of the Inquisition

into Italy (1542), the establishment of the censorship and the Index (1543), and the approval of the Society of Jesus (1540), most efficient agencies were set on foot for combating heresy.

But in the matter of a general council, so urgently desired by the emperor, Paul showed himself irresolute and procras- tinating. Finally on the 13th of December 1545 the Council assembled in Trent; but when the victories of Charles V. seemed to threaten its independence it was transferred to Bologna (March 1547) and not long afterwards suspended (Sept. 1549). He concluded the truce of Nice (1538) between Charles and Francis, and contracted an alliance with each. But the peace of Crespy and the emperor's negotiations with the Protestants (1544) turned him against Charles, and he was suspected of desiring his defeat in the Schmalkaldic War. The most de- plorable weakness of Paul was his nepotism. Parma and Piacenza, states of the Church, he bestowed upon his natural son Pier Luigi (1545)- But in 1549 Pier Luigi was assassinated by his outraged subjects, and the emperor thereupon claimed the two duchies for his son-in-law Ottavio Farnese, Paul's grandson. This led to a family quarrel which greatly embittered the last days of the pope and hastened his death (Nov. 10, 1549). Parma and Piacenza continued to be a bone of contention for two hundred and fifty years.

Paul w.ts gifted and cultured, a lover and patron of art. He began the famdus Farnese Palace; constructed the Sala Regia in the Vatican; commissioned Michelangelo to paint the " Last Judgment," and to resume work upon St Peter's; and other- wise adorned the city. Easy-going, luxurious, worldly-minded, Paul was not in full sympathy with the prevailing influences about him.

See Panvinio, continuator of Platina, De vitis pontiff, rom.; Ciaconius,

Vitae et res gestae summorum pontiff, rom. (Rome, 1601-1602, both contemporaries of Paul III.) ; # Quirini, Imago optimi . . . pontif. expressa in gestis Pauli III.' (Brixen, 1745) ; Ranke, Popes (Eng. trans., Austin), i. 243 seq. ; v. Reumont, Gesch. der Stadt Rom., iii. 2, 471 seq., 716 seq.; Brosch, Gesch. des Kirchen- staates (1880), i. 163 seq.; Ehses, " Kirchliche Reformarbeiten unter Paul III. vor dem Trienter Konzil," Rom. Quartalschrift (1901), xv. 153 seq. ; Capasso, La Politico di papa Paolo III. el' Italia (Camerino, 1901); and also the extensive bibliography in Herzog-Hauck, Realencyklopadie, s.v. " Paul III."

Paul IV. (Giovanni Pietro Caraffa), pope from 1555 to 1559, was born on the 28th of June 1476, of a noble Neapolitan family. His ecclesiastical preferment he owed to the influence of an uncle, Cardinal Oliviero Caraffa. Having filled the post of nuncio in England and Spain, he served successive popes as adviser in matters pertaining to heresy and reform. But he resigned his benefices, and, in conjunction with Cajetan, founded the order of the Theatines (1524) with the object of promoting personal piety and of combating heresy by preaching. In 1536 Paul III. made him cardinal-archbishop of Naples and a member of the reform commission. After the failure of Contarini's attempt at reconciliation with the Protestants (1541) the papacy committed itself to the reaction advocated by Caraffa; the Inquisition and censorship were set up (1542, 1543), and the extermination of heresy in Italy undertaken with vigour. Elected pope, on the 23rd of May 1555, in the face of the veto of the emperor, Paul regarded his elevation as the work of God. With his defects of temper, his violent antipathies, his extravagant notion of papal prerogative, his pontificate was filled with strife. Blinded by ungovernable hatred he joined with France (1555) in order to drive the " accursed Spaniards " from Italy. But the victory of Philip II. at St Quentin (1557) and the threatening advance of Alva upon Rome forced him to come to terms and to abandon his French alliance. He denounced the peace of Augsburg as a pact with heresy; nor would he recognize the abdication of Charles V. and the election of Ferdinand. By insisting upon the restitution of the confiscated church-lands, assuming to regard England as a papal fief, requiring Elizabeth, whose legitimacy he aspersed, to submit her claims to him, he raised insuperable obstacles to the return of England to the Church of Rome.

Paul's attitude towards nepotism was at variance with bis character as a reformer. An unworthy nephew, Carlo Caraffa,

was made cardinal, and other relatives were invested with the duchies of Paliano and Montebello. It was Paul's hope in this way to acquire a

support in his war with the Spaniards. But the defeat of his plans disillusioned him, and he turned to reform. A stricter life was introduced into the papal court; the regular observance of the services of the Church was enjoined; many of the grosser abuses were prohibited. These measures only increased Paul's unpopularity, so that when he died, on the 1 8th of August 1559, the Romans vented their hatred by demolishing his statue, liberating the prisoners of the Inquisition, and scattering its papers. Paul's want of political wisdom, and his ignorance of human nature aroused antagonisms fatal to the success of his cause.

See Panvinio, continuator of Platina, De vitis pontiff, rom. ; Ciaconius, Vitae et res gestae summorum pontiff, rom. (Rome, 1601-1602, both contemporaries of Paul IV.); Caraccioli, De vita Pauli IV. P.M. (Cologne, 1612; for criticism see Hist. Zeitschr., xliv. 460 seq.), whose rich collection of materials was used by Bromata, Vita di Paolo IV. (Ravenna, 1748), and Samm, Une Question ital. au seizieme si'ecle (Paris, 186 1). See also Castaldo, Vita del pontifice Paolo Quarto (Modena, 1618) ; Ranke, Popes (Eng. trans, by Austin), i. 286 seq. (an excellent sketch); v. Reumont, Gesch. der Stadt Rom., iii. 2, 513 seq. and Benrath, " G. P. Caraffa u. d. reformatorische Bewegung seiner Zeit.," in Jahrb. fur prot. Theol. (1878), vol. i. ; Ancel, Disgrace et proces des Caraffa (1909); Riess, Politik Pauls IV. (1909).

P'UL V. (Camillo Borghese), successor of Leo XL, was born in Rome on the 17th of September 1552, of a noble family. He studied in Perugia and Padua, became a canon lawyer, and was vice-legate in Bologna. As a reward of a successful mission to Spain Clement VIII. made him cardinal (1596) and later vicar in Rome and inquisitor. Elevated to the papacy, on the 16th of May 1605, his extreme conception of papal prerogative, his arrogance and obstinacy, his perverse insistence upon the theoretical and disregard of the actual, made strife inevitable. He provoked disputes with the Italian states over ecclesiastical rights. Savoy, Genoa, Tuscany and Naples, wishing to avoid a rupture, yielded; but Venice resisted. The republic stood upon her right to judge all her subjects, and by her demands touching benefices, tithes and papal bulls showed her deter- mination to be supreme in her own territory. Excommunication and interdict (April 17, 1606) were met with defiance. The cause of the republic was brilliantly advocated by Fra Paolo Sarpi, counsellor of state; the defenders of the papal theory were Cardinals Baronius and Bellarmine. The pope talked of coercion by arms; but Spain, to whom he looked for support, refused to be drawn into war, and the quarrel was finally settled by the mediation of France (March 22, 1607). Not- withstanding certain concessions, the victory remained with the republic (see Sarpi).

Paul became involved in a quarrel with England also. After the Gunpowder Plot parliament required a new oath of alle- giance to the king and a denial of the right of- the pope to depose him or release his subjects from their obedience. Paul forbade Roman Catholics to take the oath; but to no purpose, beyond stirring up a literary controversy. By his condemnation of Gallicanism (1613) Paul angered France, and provoked the defiant declaration of the states general of 16 14 that the king held his crown from God alone.

Paul encouraged missions, confirmed many new congregations and brotherhoods, authorized a new version of the Ritual, and canonized Carlo Borromeo. His devotion to the interests of his family exceeded all bounds, and they became enormously wealthy. Paul began the famous Villa Borghese; enlarged the Quirinal and Vatican; completed the nave, facade and portico of St Peter's; erected the Borghese Chapel in Sta Maria Maggiore; and restored the aqueduct of Augustus and Trajan (" Acqua Paolina "). He also added to the Vatican library, and began a collection of antiquities. Paul died on the 28th of January 162 1, and was succeeded by Gregory XV.

See Bzovius (Bzowski), De vita Pauli V. (Rome, 1625; contained in Platina, De vitis pontiff, rom., ed. 1626), who depicts Paul as a paragon of all public and private virtues; Vitorelli, continuator of Ciaconius, Vitae et res gestae summorum pontiff, rom. (a con- temporary of the pope); Goujet, Hist, du pontifical de Paul V.,

(T 765) ; Ranke, Popes (Eng. trans, by Austin), ii. 330 seq., iii. 72 seq. ; v. Reumont, Gesch. der Stadt Rom, iii. 2, 605 seq.; Brosch, Gesch. des Kirchenstaates (1880), i. 351 seq. The Venetian version of the quarrel with the pope was written by Sarpi (subsequently translated into English, London, 1626) ; see also Cornet, Paolo V. et la repub. veneta (Vienna, 1859); and Trollope, Paul the Pope and Paul the Friar (London, i860). An extensive biography will be found in Herzog-Hauck, Realencylkopadie, s.v. " Paul V.' (T. F. C.)

PAUL I. (1754-1801), emperor of Russia, was born in the Summer Palace in St Petersburg on the 1st of October (n.s.) — the 20th of September by the Russian calendar — 1754. He was the son of the grand duchess, afterwards empress, Catherine. According to a scandalous report his father was not her husband the grand duke Peter, afterwards emperor, but one Colonel Soltykov. There is

probably no foundation for this story except gossip, and the cynical malice of Catherine. During his infancy he was taken from the care of his mother by the empress Elizabeth, whose ill-judged fondness is believed to have injured his health. As a boy he was reported to be intelligent and good-looking. His extreme ugliness in later life is attributed to an attack of typhus, from which he suffered in 1 771. It has been asserted that his mother hated him, and was only restrained from putting him to death while he was still a boy by the fear of what the consequences of another palace crime might be to herself. Lord Buckinghamshire, the English ambassador at her court, expressed this opinion as early as 1764. In fact, however, the evidence goes to show that the empress, who was at all times very fond of children, treated Paul with kindness. He was put in charge of a trust- worthy governor, Nikita Panin, and of competent tutors. Her dissolute court was a bad home for a boy who was to be the sovereign, but Catherine took great trouble to arrange his first marriage with Wilhelmina of Darmstadt, who was renamed in Russia Nathalie Alexeevna, in 1773. She allowed him to attend the council in order that he might be trained for his work as emperor. His tutor Poroshin complained of him that he was ” always in a hurry,” acting and speaking without thinking. After his first marriage he began to engage in intrigues. He suspected his mother of intending to kill him, and once openly accused her of causing broken glass to be mingled with his food. Yet, though his mother removed him from the council and began to keep him at a distance, her actions were not unkind. The use made of his name by the rebel Pugachev in 1775 tended no doubt to render his position more difficult. When his wife died in childbirth in that year his mother arranged another marriage with the beautiful Sophia Dorothea of Wiirttemberg, renamed in Russia Maria Feodorovna. On the birth of his first child in 1777 she gave him an estate, Pavlovsk. Paul and his wife were allowed to travel through western Europe in 1781-1782. In 1783 the empress gave him another estate at Gatchina, where he was allowed to maintain a brigade of soldiers whom he drilled on the Prussian model. As Paul grew his character became steadily degraded. He was not incapable of affection nor without generous impulses, but he was flighty, passionate in a childish way, and when angry capable of cruelty. The affection he had for his wife turned to suspicion. He fell under the influence of two of his wife’s maids of honour in succession, Nelidov and Lapuknin, and of his barber, a Turkish slave named Koroiissov. For some years before Catherine died it was obvious that he was hovering on the border of insanity. Catherine contemplated setting him aside in favour of his son Alexander, to whom she was attached. Paul was aware of his mother’s. half-intention — for it does not appear to have been more — and became

increas- ingly suspicious of his wife and children, whom he rendered perfectly miserable. No definite step was taken to set him aside, probably because nothing would be effective short of putting him to death, and Catherine shrank from the extreme course. When she was seized with apoplexy he was free to destroy the will by which she left the crown to Alexander, if any such will was ever made. The four and a half years of Paul's rule in Russia were unquestionably the reign of a madman. The excitement of the change from his retired life in Gatchina

to omnipotence drove him below the line of insanity. His conduct of the foreign affairs of Russia plunged the country first into the second coalition against France in 1778, and then into the armed neutrality against Great Britain in 1801. In both cases he acted on personal pique, quarrelling with France because he took a sentimental interest in the Order of Malta, and then with England because he was flattered by Napoleon. But his political follies might have been condoned. What was unpardonable was that he treated the people about him like a shah, or one of the craziest of the Roman emperors. He began by repealing Catherine's law which exempted the free classes of the population of Russia from corporal punishment and mutilation. Nobody could feel himself safe from exile or brutal ill-treatment at any moment. If Russia had possessed any political institution except the tsardom he would have been put under restraint. But the country was not sufficiently civilized to deal with Paul as the Portuguese had dealt with Alphonso VI., a very similar person, in 1667. In Russia as in medieval Europe there was no safe prison for a deposed ruler. A conspiracy was organized, some months before it was executed, by Counts Pahlen and Panin, and a half-Spanish, half- Neapolitan adventurer, Admiral Ribas. The death of Ribas delayed the execution. On the night of the nth of March 1 801 Paul was murdered in his bedroom in the St Michael Palace by a band of dismissed officers headed by General Bennigsen, a Hanoverian in the Russian service..' They burst into his bedroom after supping together and when flushed with drink. The conspirators forced him to the table, and tried to compel him to sign his abdication. Paul offered some resistance, and one of the assassins struck him with a sword, and he was then strangled and trampled to death. He was succeeded by his son, the emperor Alexander I., who was actually in the palace, and to whom Nicholas Zubov, One of the assassins, announced his accession.

See, for Paul's early life, K. Waliszewski, Autour d'un trdne (Paris, 1894), or the English translation, The Story of a Throne (London, 1895), and P. Morane, Paul I. de Russie avant I'avenement (Paris, 1907). For his reign, T. Schiemann, Geschichte Russlands unter

Nikolaus I. (Berlin, 1904), vol. i. and Die Ermordung Pauls, by the same author (Berlin, 1902).

PAUL OF SAMOSATA, patriarch of Antioch (260-272), was, if we may credit the encyclical letter of his ecclesiastical opponents preserved in Eusebius's History, bk. vii. ch. 30, of humble origin. He was certainly born farther east at Samosata, and may have owed his promotion in the Church to Zenobia, queen of Palmyra. The letter just mentioned is the only indisputably contemporary document concerning him and was addressed to Dionysius and Maximus, respectively bishops of Rome and Alexandria, by seventy bishops, priests and deacons, who attended a synod at Antioch in 269 and deposed Paul. Their sentence, however, did not take effect until late in 272, when the emperor Aurelian, having defeated Zenobia and anxious to impose upon Syria the dogmatic system fashionable in Rome, deposed Paul and allowed the rival candidate Domnus to take his place and emoluments. Thus it was a pagan emperor who in this momentous dispute ultimately determined what was orthodox and what was not; and the advanced Christology to which he gave his preference has ever since been upheld as the official orthodoxy of the Church. Aurelian's policy moreover was in effect a recognition of the Roman bishop's pretension to be arbiter for the whole Church in matters of faith and dogma.

Scholars will pay little heed to the charges of rapacity, extortion, pomp and luxury made against Paul by the authors of this letter. It also accuses him not only of consorting himself with two " sisters " of ripe age and fair to look upon; but of allowing his presbyters and deacons also to contract platonic unions with Christian ladies. No actual lapses how- ever from chastity are alleged, and it is only complained that suspicions were aroused, apparently among the pagans.

The real gravamen against Paul seems to have been that he clung to a Christology which was become archaic and had in Rome and Alexandria already fallen into the background.

Paul's heresy lay principally in his insistence on the genuine humanity of Jesus of Nazareth, in contrast with the rising orthodoxy which merged his human consciousness in the divine Logos. It is best to give Paul's beliefs in his own words; and the following sentences are translated from Paul's Dis- courses to Sabinus, of which fragments are

preserved in a work against heresies ascribed to Anastasius, and printed by Angelo Mai: —

I. ” Having been anointed by the Holy Spirit he received the title of the anointed {i.e. Christos), suffering in accordance with his nature, working wonders in accordance with grace. For in fixity and resoluteness of character he likened himself to God; and having kept himself free from sin was united with God, and was empowered to grasp as it were the power and authority of wonders. By these he was shown to possess over and above the will, one and the same activity (with God), and won the title of Redeemer and Saviour of our race.”

II. ” The Saviour became holy and just; and by struggle and hard work overcame the sins of our forefather. By these means he succeeded in perfecting himself, and was through his moral excellence united with God ; having attained to unity and sameness of will and energy {i.e. activity) with Him through his advances in the path of good deeds. This will be preserved inseparable (from the Divine), and so inherited the name which is above all names, the prize of love and affection vouchsafed in grace to him.”

III. ” The different natures and the different persons admit of union in one way alone, namely in the way of a complete agreement in respect of will; and thereby is revealed the One {or Monad) in activity in the case of those (wills) which have coalesced ,in the manner described.”

IV. ” We do not award praise to beings which submit merely in virtue of their nature; but we do award high praise to beings which submit because their attitude is one of love; and so sub- mitting because their inspiring motive is one and the same, they are confirmed and strengthened by one and the same indwelling power, of which the force ever grows, so that it never ceases to stir. It was in virtue of this love that the Saviour coalesced with God, so as to admit of no divorce from Him, but for all ages to retain one and the same will and activity with Him, an activity perpetually at work in the manifestation of good.”

V. ” Wonder not that the Saviour had one will with God. For as nature manifests the substance of the many tc subsist as one and the same, so the attitude of love produces in the many an unity and sameness of will which is manifested by unity and same- ness of approval and well-pleasingness.”

From other fairly attested sources we infer that Paul regarded the baptism as a landmark indicative of a great stage in the moral advance

of Jesus. But it was a man and not the divine Logos which was born of Mary. Jesus was a man who came to be God, rather than God become man. Paul's Christology therefore was of the Adoptionist type, which we find among the primitive Ebionite Christians of Judaea, in Hermas, Theo- dotus and Artemon of Rome, and in Archelaus the opponent of Mani, and in the other great doctors of the Syrian Church of the 4th and 5th centuries. Lucian the great exegete of Antioch and his school derived their inspiration from Paul, and he was through Lucian a forefather of Arianism. Probably the Paulicians of Armenia continued his tradition, and hence their name (see Paulicians).

Paul of Samosata represented the high-water mark of Christian speculation; and it is deplorable that the fanaticism of his own and of succeeding generations has left us nothing but a few scattered fragments of his writings. Already at the Council of Nicaea in 325 the Pauliani were put outside the Church and condemned to be rebaptized. It is interesting to note that at the synod of Antioch the use of the word consubstantial to denote the relation of God the Father to the divine Son or Logos was condemned, although it afterwards became at the Council of Nicaea the watchword of the orthodox faction.

Literature. — Adolph Harnack, History of Dogma, vol. lii.; Gieseler's Compendium of Ecclesiastical History (Edinburgh, 1854), vol. i. ; Routh, Reliquiae sacrae, vol. iii.; F. C. Conybeare, Key of Truth (Oxford) ; Hefele, History of the Christian Councils (Edinburgh, 1872), vol. i. ; Ch. Bigg, The Origins of Christianity (Oxford, 1909), ch. xxxv. (F. C. C.)

PAULDING, JAMES KIRKE (1778-1860), American writer and politician, was born in Dutchess county, New York, on the 22nd of August 1778. After a brief course at a village school, he removed in 1800 to New York City, where in connexion

with his brother-in-law, William Irving, and Washington Irving, he began in January 1807 a series of short lightly humorous articles, under the title of The Salmagundi Papers. In 18 14 he published a political pamphlet, "The United States and England," which attracted the notice of President Madison, who in 181 5 appointed him secretary to the board of navy commissioners, which position he held until November 1823, Subsequently Paulding was navy agent in New York City from 1825 to 1837, and from 1837 to 1841 was secretary of the navy in the cabinet of President Van Buren. From 1841 until his death on the 6th of April i860 he lived near Hyde Park, in Dutchess county, New York. Although much of his literary work consisted of

political journalism, he yet found time to write a large number of essays, poems and tales. From his father, an active revolutionary patriot, Paulding inherited strong anti-British sentiments. He was among the first dis- tinctively American writers, and protested vigorously against intellectual thraldom to the mother-country. As a prose writer he is chaste and elegant, generally just, and realistically descriptive. As a poet he is gracefully commonplace, and the only lines by Paulding which survive in popular memory are the familiar —

” Peter Piper picked a peck of pickled peppers: Where is the peck of pickled peppers Peter Piper picked ?”

which may be found in Koningsmarke.

The following is a partial list of his writings : The Diverting History of John Bull and Brother Jonathan (18 1 2); The Lay of the Scottish Fiddle (1813), a good-natured parody on The Lay of the Last Minstrel; Letters from the South (1817); The Backwoodsman: a Poem (1818); Salmagundi (2nd series, 1819-1820); A Sketch of Old England, by a New England Man (1822) ; Koningsmarke, the Long Finne (1823), a quiz on the romantic school of Walter Scott; John Bull in America; or the New Munchausen (1824), a broad caricature of the early type of British traveller in America; The Merry Tales of the Three Wise Men of Gotham (1826); Chronicles of the City of Gotham, from the Papers of a Retired Common Councilman (1830); The Dutchman’s Fireside (1831) ; Westward Ho! (1832) ; A Life of Washington (1835), ably and gracefully written; Slavery in the United States (1836), in which he defends slavery as an institution; The Book of Saint Nicholas (1837), a series of stories of the old Dutch settlers; A merican Comedies (1847), the joint production of himself and his son William J. Paulding; and The Puritan and his Daughter (1849). The same son also published an edition of Paulding’s Select Works (4 vols., 1 867 -1 868), and a biography called Literary Life of James K. Paulding (New York, 1867).

PAULET, Poulett or Powlett, an English family of an ancient Somersetshire stock, taking a surname from the parish of Pawlett near Bridgwater. They advanced themselves by a series of marriages with heirs, acquiring manors and lands in Somersetshire, Wiltshire, Devonshire and Hampshire. A match with a Denebaud early in the 15th century brought the manor of Hinton St George, still the seat of the elder line, the earls Poulett. An ancestor of this branch, Sir Amias Poulett or Paulet (d. 1537), knighted in 1487 after the battle of Stoke, was treasurer of the Middle Temple in 1521, when Wolsey, in revenge for an indignity suffered at the knight’s hands when the future chancellor was a young parson at Limington, forbade his leaving

London without leave. To propitiate the cardinal, Sir Amias, rebuilding the Middle Temple gate, decorated it with the cardinal's arms and badge. Sir Htgh Poulett, his eldest son, a soldier who had distinguished himself in 1544 at Boulogne in the king's presence, had, in 1551, a patent of the captaincy of Jersey with the governance of Montorgueil Castle. His wisdom and experience in the wars made Queen Elizabeth employ him at Havre in 1562 as adviser to the earl of Warwick. He died in 1572, having married, as his second wife, the wealthy widow of Sir Thomas Pope, founder of Trinity College, Oxford. Sir Amias Poulett (1536-1588), Sir Hugh's son and heir by a first marriage, is famous as the puritan knight into whose charge at Tutbury and Chartley was given the queen of Scots. After his prisoner's sentence at Fotheringhay, he beset Elizabeth's ministers with messages advising her execution, but he firmly withstood " with great grief and bitterness," the sug- gestion that she should be put to death secretly, saying that God and the law forbade. Sir Anthony Poulett (1562-1600),

his eldest surviving son, succeeded him as governor of Jersey and was father of John Poulett (i 586-1649) to whom Charles I. in 1627 gave a patent of peerage as Lord Poulett of Hinton St George. In spite of the puritan opinions of his family he declared for the king, raising for the royal army a brigade which he led in Dorsetshire and Devonshire. He was taken prisoner for the second time at the fall of Exeter in 1646 and suffered a heavy fine. His eldest son John, the second Lord Poulett (1615-1665) was taken with his father at Exeter. John, the fourth Lord Poulett (1663-1743), having been a commissioner for the union, was created in 1706 Viscount Hinton of Hinton St George and Earl Poulett. In 1710-1711 he was first lord of the treasury and nominal head of an adminis- tration controlled by Harley. A garter was given him in 1712. A moderate Tory, his places were taken from him at the accession of the house of Brunswick. The fifth earl (d. 1864) re-settled the family estates in 1853 in order to bar the inheritance of one William Tumour Thomas Poulett who, although born in wedlock of the wife of the earl's cousin William Henry Poulett, was repudiated by her husband, afterwards the sixth earl. In 1903 the sixth earl's son by a third marriage established his claim to the peerage, and in 1909 judgment was given against the claim of William Tumour Thomas Poulett, then styling himself Earl Poulett.

A younger line of the Paulets, sprung from William Paulet of

Melcombe, serjeant-at-law (d. 1435), reached higner honours than an earldom. William Paulet, by his marriage with Eleanor Delamare (d. 1413), daughter of Philip Delamare and heir of her brother, acquired for his descendants Fisherton Delamare in Wiltshire and Nunney Castle in Somerset. Their son Sir John Paulet married Constance, daughter and coheir of Hugh Poynings, son and heir of Sir Thomas Poynings, Lord St John of Basing. Through this marriage came the lordship and manor of Basing, and the manor of Amport or Ham Port which is still with the descendants of Hugh de Port, its Norman lord at the time of the Domesday Survey. Sir John Paulet of Basing, by his cousin Alice Paulet of the Hinton line (his wife in or before 1467), was father of Sir William Paulet, who, during a very long and supple career as a statesman in four reigns — " I am sprung," he said, " from the willow and not from the oak " — raised his house to a marquessate. Henry VIII. rewarded his diplomatic and judicial services and his campaign against the Pilgrims of Grace with the site and lands of Netley Abbey, the revival of the St John barony, a garter and many high offices. The king's death found him lord president of the council and one of the executors of the famous will of the sovereign. The fall of the protector Somerset gave him the lord treasurership and a patent of the earldom of Wiltshire. He shared the advancement of Northumberland and was created in 1 55 1 marquess of Winchester, but, although he delivered the crown jewels to the Lady Jane in 1553, he was with the lords at Baynard Castle who proclaimed Queen Mary. In spite of his great age he was in the saddle at the proclamation of Mary's successor and .was speaker in two Elizabethan parliaments. Only his death in 1572 drove from office this tenacious treasurer, whose age may have been nigh upon a hundred years.

His princely house at Basing was held for King Charles by John, the fifth marquess, whose diamond had scratched " Aimez Loyaute " upon every pane of its windows. Looking on a main road, Basing, with its little garrison of desperate cavaliers, held out for two years against siege and assault, and its shattered walls were in flames about its gallant master when Cromwell himself stormed an entry. The old cavalier marquess died in 1675, his great losses unrecompensed, and his son Charles, a morose extravagant, had the dukedom of Bolton in 1689 for his desertion of the Stuart cause. This new title was taken from the Bolton estates of the Scropes, Lord Winchester having married a natural daughter of Emmanuel, earl of Sunderland, the last Lord Scrope of Bolton. Charles, second duke of Bolton (1661-1722), was made lord-lieutenant of Ireland in 1717. A third Charles, the 3rd duke, is remembered as an opponent of Sir Robert Walpole and as the husband of Lavinia

Fenton, the Polly Peachum of Gay's opera. The sixth and last duke of Bolton, an admiral of undistinguished services, died in 1794 without legitimate issue. His dukedom became extinct, and Bolton Castle again passed by bequest to an illegitimate daughter of the fifth duke, upon whom it had been entailed with the greater part of the ducal estates. (O. Ba.)

PAULI, REINHOLD (1823-1882), German historian, was born in Berlin on the 25th of May 1823. He was educated at the universities of Bonn and Berlin, went to England in 1847, and became private secretary to Baron von Bunsen, the Prussian ambassador in London. Returning to Germany in 1855 he was professor of history successively at the universities of Rostock, Tubingen (which he left in 1866 because of his political views), Marburg and Gottingen. He retained his chair at Gottingen until his death at Bremen on the 3rd of June 1882. He was a careful and industrious student of the English records, and his writings are almost wholly devoted to English history.

His first work, Kbnig Aelfred und seine Stellung in der Geschichte Englands (Berlin, 1851), was followed by monographs on Bischof Grosseteste und Adam von Marsh (Tubingen, 1864), and on Simon von Montfort (Tubingen, 1867). He continued J. M. Lappenberg's Geschichte von England from 1154 to 1509 (Gotha, 1853-1858), and himself wrote a Geschichte Englands (Leipzig, 1 864-1 875), dealing with the period between 1814 and 1852. Two volumes of historical essays, Bilder aus Alt-England (Gotha, i860 and 1876), and Aufsatze zur englischen Geschichte (Leipzig, 1869 and 1883), and numerous historical articles in German periodicals came from his pen; and he edited several of the English chroniclers for the Monumenta Germaniae historica.

See R. Pauli, Lebenserinnerungen, edited by E. Pauli (Halle, 1895) ; and the sketch of his life prefixed to O. Hartwig's edition of his Aufsatze (Leipzig, 1883).

PAULICIANS, an evangelical Christian Church spread over Asia Minor and Armenia from the 5th century onwards. The first Armenian writer who notices them is the patriarch Nerses II. in an encyclical of 553, 1 where he condemns those " who share with Nestorians in belief and prayer, and take their bread- offerings to their shrines and receive communion from them, as if from the ministers of the oblations of the Paulicians." The patriarch John IV. (c. 728) 2 states that Nerses, his prede- cessor, had chastised the sect, but ineffectually; and that after his death (c. 554) they had continued to lurk in Armenia, where, reinforced by Iconoclasts driven out of Albania of the Caucasus, they

had settled in the region of Djirka, probably near Lake Van. In his 31st canon John identifies them with the Mes- salians, as does the Armenian Gregory of Narek (c. 950). In Albania they were always numerous. We come now to Greek sources. An anonymous account was written perhaps as early as 840 and incorporated in the Chronicon of Georgius Monachus. This (known as Esc.) was edited by J. Friedrich in the Munich Academy Sitzungsberichte (1896),' from a 10th- century Escorial codex (Plut. 1, No. 1). It was also used by Photius (c. 867), bk. i., chs. 1-10 of his Historia Manicheorum, who, having held an inquisition of Paulicians in Constantinople was able to supplement Esc. with a few additional details; and by Petrus Siculus (c. 868). The latter visited the Paulician fortress Tephrike to treat for the release of Byzantine prisoners. His History of the Manicheans is dedicated to the archbishop of Bulgaria, whither the Paulicians were sending missionaries. Zigabenus (c. 1100), in his Panoplia, uses beside Esc. an independent source.

The Paulicians were, according to Esc, Manicheans, so called after Paul of Samosata (

1 In the Armenian Letterbook of the Patriarchs (Tiflis, 1901), p. 73.

2 Opera (Venetiae, 1834), p. 89.

name. His successors were Simeon, called Titus; Gegnesius, an Armenian, called Timotheus; Joseph, called Epaphroditus; Zachariah, rejected by some; Baanes, accused of immoral teaching; lastly Sergius, called Tychicus. As Cibossa, so their other congregations were renamed, Mananali as Achaea, Argaeum and Cynoschora as Colossae, Mopsuestia as Ephesus, and so on.

Photius and Petrus Siculus supply a few dates and events. Constantine was martyred 684 by Simeon whom Constantine Pogonatus had sent to repress the movement. His victim's death so impressed him that he was converted, became head of the sect, and was martyred in 690 by Justinian II. About 702 Paul the Armenian, who had fled to Episparis, became head of the church. His son Gegnesius in 722 was taken to Constantinople, where he won over to his opinions the iconoclast emperor, Leo the Isaurian. He died in 745, and was succeeded by Joseph, who evangelized Phrygia and died near Antioch of Pisidia in 775. In 752 Constantine V. transplanted many Paulicians from

Germanicia, Doliche, Melitene, and Theodosiu- polis (Erzerum), to Thrace, to defend the empire from Bulgarians and Sclavonians. Early in the 9th century Sergius, greatest of the leaders, profiting by the tolerance of the emperor Nice- phorus, began that ministry which, in one of the epistles canonized by the sect, but lost, he describes thus: “I have run from east to west, and from north to south, till my knees were weary, preaching the gospel of Christ.” The iconoclast emperor Leo V., an Armenian, persecuted the sect afresh, and provoked a rising at Cynoschora, whence many fled into Saracen territory to Argaeum near Melitene. For the next 50 years they continued to raid the Byzantine empire, although Sergius condemned retaliation. The empress Theodora (842-857) hung, crucified, beheaded or drowned some 100,000 of them, and drove yet more over the frontier, where from Argaeum, Amara, Tephrike and other strongholds their generals Karbeas and Chrysocheir harried the empire, until 873, when the emperor Basil slew Chrysocheir and took Tephrike.

Their sect however continued to spread in Bulgaria, where in 969 John Zimiskes settled a new colony of them at Philippo- polis. Here Frederick Barbarossa found them in strength in 1 1 89. In Armenia they reformed their ranks about 821 at Thonrak (Tendarek) near Diadin, and were numerous all along the eastern Euphrates and in Albania. In this region Smbat, of the great Bagraduni clan, reorganized their Church, and was succeeded during a space of 170 or 200 years by seven leaders, enumerated by the Armenian Grigor Magistros, who as duke of Mesopotamia under Constantine Monomachos harried them about 1 140. Fifty years later they were numerous in Syria and . Cilicia, according to the Armenian bishops Nerses the Graceful and Nerses of Lambron. In the 10th century Gregory of Narek wrote against them in Armenian, and in the nth Aristaces of Lastivert and Paul of Taron in the same tongue. During these later centuries their propaganda embraced all Armenia. The crusaders found them everywhere in Syria and Palestine, and corrupted their name to Publicani, under which name, often absurdly conjoined with Sadducaei, we find them during the ages following the crusades scattered all over Europe. After 1200 we can find no notice of them in Armenian writers until the 18th century, when they reappear in their old haunts. In 1828 a colony of them settled in Russian Armenia, bringing with them a book called the Key of Truth, which contains their rites of name-giving, baptism and election, compiled from old MSS., 1 we know not when.

1 That this is so, is proved by the presence of a doublet in the text of the rite of baptism, the words ” But the penitent ” on p. 96, as far as ” over the person baptized ” on p. 97, repeating in substance the words

” Next the elect one ” on p. 97 to ” am well- pleased ” on p. 98. This rite therefore was compiled from at least two earlier MSS. In the colophon also the compiler (as he calls himself) excuses the errors of orthography and grammar on the ground that they are not due to himself but to earlier and ig- norant copyists. The division (often inept) of the text into chapters, the references to chapter and verse of a printed N.T., and sundry pious stanzas which interrupt the context, are due to a later editor, perhaps to the copyist of the existing text of 1782. The controversial introduction is later than the Crusades; but the rituals, as far as

Regarding Paulician beliefs we have little except hostile evidence, which needs sifting. Esc. gives these particulars: —

1. They anathematized Mani, yet were dualists and affirmed two principles — one the heavenly Father, who rules not this world but the world to come; the other an evil demiurge, lord and god of this world, who made all flesh. The good god created angels only. The Romans {i.e. the Byzantines) erred in confusing these two first principles. Similarly the Armenian writer Gregory Magistros (c. 1040) accuses the Thonraki of teaching that ” Moses saw not God, but the devil,” and infers thence that they held Satan to be creator of heaven and earth, as well as of mankind. The Key of Truth teaches that after the fall Adam and Eve and their children were slaves of Satan until the advent of the newly created Adam, Jesus Christ. Except Gregory Magistros none of the Armenian sources lays stress on the dualism of the Paulicians. John IV. does not hint at it.

2. They blasphemed the Virgin, allegorizing her as the upper Jerusalem in which the Lord came in and went out, and denying that he was really made flesh of her. John IV. records that in the orthodox Armenian Church of the 7th century many held Christ to have been made flesh in, but not of, the Virgin; and Armenian hymns call the Virgin mother church at once Theotokos and heavenly Jerusalem. It is practically certain that Paulicians held this view.

3. They allegorized the Eucharist and explained away the bread and wine of which Jesus said to His apostles, ” Take, eat and drink,” as mere words of Christ, and denied that we ought to offer bread and wine as a sacrifice.

Such allegorization meets us already in Origen, Eusebius and other early fathers, and is quite compatible with that use of a material Eucharist which Nerses II. attests among the Paulicians of the early 6th century, and for which the Key of Truth provides a form. The

Thonraki, according to Gregory Magistros, held that ” Jesus in the evening meal, spoke not of an offering of the mass, but of every table.” We infer that the Paulicians merely rejected the Eucharistic rites and doctrine of the Greeks. According to Gregory Magistros the Thonraki would say: ” We are no worshippers of matter, but of God; we reckon the cross and the church and the priestly robes and the sacrifice of mass all for nothing, and only lay stress on the inner sense.”

4. They assailed the cross, saying that Christ is cross, and that we ought not to worship the tree, because it is a cursed instrument. John IV. and other Armenian writers report the same of the Armenian Paulicians or Thonraki, and add that they smashed up crosses when they could.

S- They repudiated Peter, calling him a denier of Christ, and would not accept his repentance and tears. 2 So Gregory

the language is concerned, may belong to the remote age which alone suits the adoptionist Christology of the prayers.

2 In a fragmentary Syriac homily by Mar Jochanis, found in a Sinai MS. written not later than the 10th century and edited by J. F. Stenning and F. C. Burkitt, Anecdota oxon. (Clarendon Press, 1896), the same hostility to Peter is expressed. Compare the following passages: “O Petros, thou wast Convicted of fault by Paulos thy colleague. How do men say that upon Petros I have built the church? . . .

” The Lord said not to him, upon thee I build the church, but he said, upon this rock (the which is the body wherewith the Lord was clothed) I build my church. . . . Behold, I have made thee know from the N.T. that that rock was the Messiah. . . .

” O Petros, after that thou didst receive the keys of heaven, and the Lord was seen by thee after he rose from the dead, thou didst let go of the keys, and thy wage is agreed with thy master when thou saidst to him, Behold we have let go of everything and have come after thee. What then shall be to us? And the Lord said to him, Ye shall be sitting on twelve thrones and judging the tribes of Israel. And after all these signs, O Petros, thou wentest away again to the former catching of fish. Wast thou ashamed of me, O Petros? ”

Yet the same homilist” concerning the one who is made a priest,” writes thus: ” Lo, thou seest the priest of the people, with what care the Lord instructed Peter! He said not to him once and stopped, but three times, Feed my sheep.” The Syriac text is rendered from a Greek original of unknown age, which from its complete correspondence with the Key of Truth may be judged to have been a Paulician writing.

Magistros reports the Thonraki as saying, ” We love Paul and excrecrate Peter.” But in the Key of Truth there is little trace of extreme hostility to Peter. It merely warns us that all the apostles constitute the Church universal and not Peter alone; and in the rite of election, i.e. of laying on of hands and reception of the Spirit, the reader who is being elected assumes the ritual name of Peter. An identical rite existed among the 1 2th century Cathars (q.v.), and in the Celtic church of Gildas every presbyter was a Peter.

6. The monkish garb was revealed by Satan to Peter at the baptism, when it was the devil, the ruler of this world, who, so costumed, leaned forward and said, This is my beloved son. The same hatred of

monkery characterized the Thonraki and inspires the Key of Truth. The other statements are nowhere echoed.

7. They called their meetings the Catholic Church, and the places they met in places of prayer, irpocrevxai- The Thonraki equally denied the name of church to buildings of wood or stone, and called themselves the Catholic Church.

8. They explained away baptisms as ” words of the Holy Gospel,” citing the text ” I am the living water.” So the Thonraki taught that the baptismal water of the Church was ” mere bath-water,” i.e. they denied it the character of a reserved sacrament. But there is no evidence that they eschewed water- baptism. The modern Thonraki baptise in rivers, and in the nth century when Gregory asked them why they did not allow themselves to be baptized, they answered: ” Ye do not under- stand the mystery of baptism ; we are in no hurry to be baptized, for baptism is death.” They no doubt deferred the baptism which is death to sin, perhaps because, like the Cathars, they held post-baptismal sin to be unforgivable.

o. They permitted external conformity with the dominant Church, and held that Christ would forgive it. The same trait is reported of the Thonraki and of the real Manicheans.

10. They rejected the orders of the Church, and had only two grades of clergy, namely, associate itinerants (crvvkKdrifioc, Acts xix. 20) and copyists {vorhpwi). A class of Astati (aoraroi) is also mentioned by Photius, i. 24, whom Neander regards as elect disciples of Sergius. They called their four original founders apostles and prophets — titles given also in the Key of Truth to the elect one. The Synecdemi and Notarii dressed like other people; the Thonraki also scorned priestly vestments.

11. Their canon included only the ” Gospel and Apostle,” of which they respected the text, but distorted the meaning. Gregory Magistros, as we have seen, attests their predilection for the apostle Paul, and speaks of their perpetually ” quoting the Gospel and the Apostolon.” These statements do not warrant us in supposing that they rejected 1 and 2 Peter, though other Greek sources allege it. The ” Gospel and Apostle ” «?as a comprehensive term for the whole of the New Testament (except perhaps Revelation), as read in church.

13. Their Christology was as follows: God out of love for mankind called up an angel and communicated to him his desire and counsel; then he bade him go down to earth and be born of woman. . . . And he

bestowed on the angel so commissioned the title of Son, and foretold for him insults, blasphemies, sufferings and crucifixion. Then the angel undertook to do what was enjoined, but God added to the sufferings also death. However, the angel, on hearing of the resurrection, cast away fear and accepted death as well; and came down and was born of Mary, and named himself son of God according to the grace given him from God; and he fulfilled all the command, and was crucified and buried, rose again and was taken up into heaven. Christ was only a creature (/cricyua), ?,nd obtained the title of Christ the Son of God in the reign of Octavius Caesar by way of grace and remuneration for fulfilment of the command.

The scheme of salvation here set forth recurs among the Latin Cathars. It resembles that of the Key of Truth, in so far as Jesus is Christ and Son of God by way of grace and reward for faithful fulfilment of God's command. But the Key lays more stress on the baptism. " Then, it says, he became Saviour of us sinners, then he was filled with the Godhead; then he was XX. 31

sealed, then anointed; then was he called by the voice, then he became the loved one." In this scheme therefore the Baptism occupies the same place which the Birth does in the other, but both are adoptionist.

The main difference then between the Greek and Armenian accounts of the Paulicians is that the former make more of their dualism. Yet this did not probably go beyond the dualism of the New Testament .itself. They made the most of Paul's antithesis between law and grace, bondage to Satan and freedom of the Spirit. Jesus was a new Adam and a fresh beginning, in so far as he was made flesh in and not of his mother, to whom, as both Esc. and the Key insist, Jesus particularly denied blessedness and honour (Mark iii. 31-35), limiting true kinship with himself to those who shall do the will of God. The account of Christ's flesh is torn out of the Key, but it is affirmed that it was at the baptism that " he put on that primal raiment of light which Adam lost in the garden." And this view we also meet with in Armenian fathers accounted orthodox.

The Armenian fathers held that Jesus, unlike other men, possessed incorruptible flesh, made of ethereal fire, and so far they shared the main heresy of the Paulicians. In many of their homilies Christ's baptism is also regarded as his regeneration by water and spirit, and this view almost transcends the modest adoptionism of the Thonraki as revealed in the Key of Truth.

What was the origin of the name Paulician ? The word is of Armenian formation and signifies a son of Paulik or of little Paul; the termination ik must here have originally expressed scorn and contempt. Who then was this Paul ? ” Paulicians from a certain Paul of Samosata,” says Esc. ” Here then you see the Paulicians, who got their poison from Paul of Samosata,” says Gregory Magistros. They were thus identified with the old party of the Pauliani, condemned at the first council of Nice in 325, and diffused in Syria a century later. They called themselves the Apostolic Catholic Church, but hearing themselves nicknamed Paulicians by their enemies, probably interpreted the name in the sense of ” followers of St Paul.” Certain features of Paulicianism noted by Photius and Petrus Siculus are omitted in Esc. One of these is the Christhood of the fully initiated, who as such ceased to be mere : ‘ hearers ” (audientes) and themselves became vehicles of the Holy Spirit. As Jesus anointed by the Spirit became the Christ, so they became christs. So Gregory of Narck upbraids the Thonraki for their ” anthropolatrous apostasy, their self conferred contemptible priesthood which is a likening of themselves to Satan” (= Christ in Thonraki parlance). And he repeats the taunt which the Arab Emir addressed to Smbat their leader, as he led him to execution: ” If Christ rose on the third day, then since you call yourself Christ, I will slay you and bury you; and if you shall come to life again after thirty days, then I will know you are Christ, even though you take so many days over your resurrection.” Similarly (in a 10th-century form of renunciation of Bogomil error preserved in a Vienna codex 1) we hear of Peter ” the founder of the heresy of the Messalians or Lycopetrians or Fundaitae and Bogomils who called himself Christ and promised to rise again after death.” Of this Peter, Tychichus (? Sergius) is reported in the same document to have been fellow initiate and disciple.

Because they regarded their Perfect or Elect ones as Christs and anointed with the Spirit, the medieval Cathars regularly adored them. So it was with Celtic saints, and Adamnan, in his life of St Columba, i. 37, tells how the brethren after listening to St Baithene, ” still kneeling, with joy unspeakable, and with hands spread out to heaven, venerated Christ in the holy and blessed man.” So in ch. 44 of the same book we read how a humble stranger ” worshipped Christ in the holy man ” (i.e. St Columba) ; but such veneration was due to every presbyter. In 1837 we read of how an elect one of the Thonraki sect in Russian Armenia addressed his followers thus: ” Lo, I am the cross: on my two hands light tapers, and give me adoration. For I am able to give you salvation, as much as the

‘Cod. theol. gr. 306, fol. 32, edited by Thall6czy, in Wissensch.

Mittheil. aus Bosnien (Vienna, 1895).

11

cross and the saints” ; and by the light of this we ought perhaps to interpret section ix. of Esc. ” They blaspheme the precious cross, saying that the Christ is a cross.” The Christ is an elect one, who, as the Cathars (g.v.) put it, having been consoled or become a Paraclete in the flesh, stands in prayer with his hands outspread in the form of a cross, while the congregation of hearers or audienles adore the Christ in him. The same idea that the perfect ones are christs as. having received the Paraclete is met with in early Christian documents, and still survives among the Syriac-speaking shepherds on the hills north of Mardin. These have their christs, and Dr E. A. Wallis Budge, to whom the present writer owes his information, was shown the stream in which their last christ had been baptized. In modern Russia also survives a sect of Bogomils called Christowschtschina, 1 because one member of it is adored by the rest as Christ. It was because they believed themselves to have living christs among them that the Paulicians rejected the fetish worship of a material cross, in which orthodox Armenian priests imagined they had by prayers and anointings confined the Spirit of Christ. It is also likely enough that they did not consider sensible matter to be a vehicle worthy to contain divine effluence and holy virtues, and knew that such rites were alien to early Christianity. The former scruple, however, was not confined to Paulicians, for it inspires the answer made by Eusebius, bishop of Thessalonica, to the emperor Maurice, when the latter asked to have relics sent to him of Demetrius the patron saint of that city. It runs thus: ” While informing your Reverence of the faith of the Thessalonicans and of the miracles wrought among them, I must yet, in respect of this request of yours, remark that the faith of the city is not of such a kind as that the people desire to worship God and to honour his saints by means of anything sensible. For they have received the faith from the Lord’s holy testimonies, to the effect that God is a spirit, and that those who worship him must worship him in spirit and in truth.” 2 Manicheans, Bogomils, Cathars and Paulicians for like reasons denied the name of church to material constructions of wood and stone. Among the later Cathars of Europe we find the repudiation of marriage defended on the ground, that the only true marriage is of Christ with his bride the Virgin church, and perhaps this is why Paulicians and Thonraki would not make of marriage a

religious rite or sacrament.

Did the Paulicians, like the later Cathars (who in so much resembled them), reject water baptism? And must we so interpret clause ix. of Esc? Perhaps they merely rejected the idea that the numen or divine grace can be confined by priestly consecration in water and by mere washing be imparted to persons baptized. The Key of Truth regards the water as a washing of the body, and sees in the rite no opus operatum, but an essentially spiritual rite in which ” the king releases certain rulers 3 from the prison of sin, the Son calls them to himself and comforts them with great words, and the Holy Spirit of the king forthwith comes and crowns them, and dwells in them for ever.” For this reason the Thonraki adhere to adult baptism, which in ancient wise they confer at thirty years of age or later, and have retained in its primitive significance the rite of giving a Christian name to a child on the eighth day from birth. It is hardly likely that the Thonraki of the 10th century would have rejected water-baptism and yet have retained unction with holy oil; this Gregory Magistros attests they did, but he is an unreliable witness.

1 ” dass einer der Sektierer von den andern als Christus verehrt werde,” K. K. Grass, Die russischen Sekten (Leipzig, 1906), Bd. 1, Lief. 3.

2 From Monuments of Early Christianity, by F. C. Conybeare (London, 1894), p. 349. .

3 The term ” rulers appears to be derived from Mamchean speculation, or from the same cycle of myth which is reflected in I Cor. ii. 6, 8. The title ” elect one,” used by the Armenian Paulicians also has a Manichean ring. It may be that under stress of common persecution there was a certain fusion in Armenia of Pauliani and Manicheans. The writings and tenets of Mani were widely diffused there. Such a fusion is probably reflected in the Key of Truth.

It is then on the whole probable that the Paulicians who appear in Armenian records as early as 550, and were afterwards called Thonraki, by the Greeks by the Armenian name Pauli- kiani, were the remains of a primitive adoptionist Christianity, widely dispersed in the east and already condemned under the name of Pauliani by the council of Nice in 325. A renegade Armenian Catholicos of the 7th century named Isaac has pre- served to us a document which sums up their tenets. 4 He adduces it as a sort of reduetio ad absurdum of Christians who would model life and cult on Christ and his apostles, unencumbered by later church traditions. It runs thus: (1) Christ was

thirty years old when he was baptized. Therefore they baptize no one until he is thirty years of age. (2) Christ, after baptism, was not anointed with myrrh nor with holy oil, therefore let them not be anointed with myrrh or holy oil. (3) Christ was not baptized in a font, but in a river. Therefore, let them not be baptized in a font. (4) Christ, when he was about to be baptized, did not recite the creed of the 318 fathers of Nice, therefore shall they not make profession of it. (5) Christ when about to be baptized, was not first made to turn to the west and- renounce the devil and blow upon him, nor again to turn to the east and make a compact with God. For he was himself true God. So let them not impose these things on those to be baptized. (6) Christ, after he had been baptized, did not partake of his own body. Nor let them so partake of it. (7) Christ, after he was baptized, fasted 40 days and only that; and for 120 years such was the tradition which prevailed in the Church. We, however, fast 50 days before Pascha. (8) Christ did not hand down to us the teaching to celebrate the mystery of the offering of bread in church, but in an ordinary house and sitting at a common table. So then let them not offer the sacrifice of bread in churches. (9) It was after supper, when his disciples were sated, that Christ gave them to eat of his own body. Therefore let them first eat meats and be sated, and then let them partake of the mysteries. (10) Christ, although he was crucified for us, yet did not command us to adore the cross, as the Gospel testifies. Let them therefore not adore the cross, (n) The cross was of wood. Let them therefore not adore a cross of gold or silver or bronze or stone. (12) Christ wore neither humeral nor amice nor maniple nor stole nor chasuble. Therefore let them not wear these garments. (13) Christ did not institute the prayers of the liturgy or the Holy Epiphanies, and all the other prayers for every action and every hour. Let them therefore not repeat them, nor be hallowed by such prayers. (14) Christ did not lay hands on patriarchs and metropolitans and bishops and presbyters and deacons and monks, nor ordain their several prayers. Let them therefore not be ordained nor blessed with these prayers. (15) Christ did not enjoin the building of churches and the furnishing of holy tables, and their anointing with myrrh and hallowing with a myriad of prayers. Let them not do it either. (16) Christ did not fast on the fourth day of the week and on the Paraskevi. Let them not fast either. (17) Christ did not bid us pray towards the east. Neither shall they pray towards the east.

Literature. — Beside the works mentioned in the text see J. C. L. Gieseler, Ecclesiastical History, ii. 208 (Edinburgh, 1848) and ” Untersuchungen iiber die Geschicnte der Paulicianer ” in Theol. Studien u. Kritiken, Heft I. s. 79 (Jahrg., 1829) ; Neander, Ecclesi-

astical History, vols. v. and vi. ; Mosheim's Ecclesiastical History, Century IX. ii. 5; G. Finlay, History of Greece, vols. ii. and iii. ; Gibbon, History of the Decline and Fall of the Roman Empire, ch. liv. ; Ign. von Dollinger, Sektengeschichte des Mittelalters, chs. i.-iii. ; Karapet Ter-Mkhrttschian, Die Paulikianer (Leipzig, 1893) ; Arsak Ter Mikelian, Die armenische Kirche (Leipzig, 1892); Basil Sarkisean, A Study of the Manicheo-Paulician Heresy of the Thonraki (Venice, San Lazaro, 1893, in Armenian); F. C. Conybeare, The Key of Truth (Oxford, 1898). (F. C. C.)

PAULINUS, SAINT, of Nola (353-431). Pontius Meropius Anicius Paulinus, who was successively a consul, a monk and a

4 See Fr. Combefis, Historia heretiae monothelitarum col. 317 (Paris, 1648), col. 317. In the printed text this document, entitled An Invective Against the Armenians, is dated 800 years after Constantine, but the author Isaac Catholicos almost certainly belonged to the earlier time.

bishop, was born at Bordeaux in a.d. 353. His father, praefectus praetorio in Gaul, was a man of great wealth, who entrusted his son's education, with the best of results, to Ausonius. In 378 Paulinus was raised to the rank of consul suffectus, and in the following year he appears to have been sent as consularis into Campania. It was at this period, while present at a festival of St Felix of Nola, that he entered upon his lifelong devotion to the cult of that saint. He had married a wealthy Spanish lady named Therasia; this happy union was clouded by the death in infancy of their only child — a bereavement which, combined with the many disasters by which the empire was being visited, did much to foster in them that world-weariness to which they afterwards gave such emphatic expression. From Campania Paulinus returned to his native place and came into correspon- dence or personal intimacy with men like Martin of Tours and Ambrose of Milan, and ultimately (about 389) he was formally received into the church by bishop Delphinus of Bordeaux, whence shortly afterwards he withdrew with his wife beyond the Pyrenees. The asceticism of Paulinus and his liberality towards the poor soon brought him into great repute; and while he was spending Christmas at Barcelona the people insisted on his being forthwith ordained to the priesthood. The irregularity of this step, however, was resented by many of the clergy, and the occurrence is still passed lightly over by his Roman Catholic

panegyrists. In the following year he went into Italy, and after visiting Ambrose at Milan and Siricius at Rome — the latter of whom received him somewhat coldly — he proceeded into Campania, where, in the neighbourhood of Nola, he settled among the rude structures which he had caused to be built around the tomb and relics of his patron saint. With Therasia (now a sister, not a wife), while leading a life of rigid asceticism, he devoted the whole of his vast wealth to the entertainment of needy pilgrims, to payment of the debts of the insolvent, and to public works of utility or ornament; besides building basilicas at Fondi and Nola, he provided the latter place with a much-needed aqueduct. At the next vacancy, not later than 409, he succeeded to the bishopric of Nola, and this office he held with ever-increasing honour until his death, which occurred shortly after that of Augustine, whose friend he was, in 43 r. He is commemorated by the Church of Rome on the 22nd of June.

The extant writings of Paulinus consist of some fifty Epistolae, addressed to Sulpicius Severus, Delphinus, Augustine, Jerome and others; thirty-two Carmina in a great variety of metre, including a series of hexameter ” natales,” begun about 393 and continued annually in honour of the festival of St Felix, metrical epistles to Ausonius and Gestidius, and paraphrases of three psalms; and a Passio S. Genesii. They reveal to us a kindly and cheerful soul, well versed in the literary accomplishments of the period, but without any strength of intellectual grasp and peculiarly prone to superstition.

His works were edited by Rosweyde and Fronton le Due in 1622 (Antwerp, 8vo), and their text was reprinted in the Bibl. max. pair. (1677). The next editor was Le Brun des Marettes (2 vols. 4to, Paris, 1685), whose text was reproduced in substance by Mura- tori (Verona, 1736), and reprinted by Migne. The poems and letters are edited in the Vienna Corpus script, eccl. lat. vol. xxviii. See also P. Reinelt, Studien iiber die Briefe d. h. Paulin von Nola Breslau, 1904) and other literature cited in Herzog-Hauck, Real- encyk. fur prot. Theol. vol. xv.

PAULINUS (d. 644), first bishop of the Northumbrians and archbishop of York, was sent to England by Pope Gregory I. in 6or to assist Augustine in his mission. He was consecrated by Justus of Canterbury in 625 and escorted jEthelberg, daughter of /Ethelberht, to the Northumbrian king Edwin (q.v.). In. 627 Edwin was baptized and assigned York to Paulinus as his see. It was at Lincoln that he consecrated Honorius as archbishop of Canterbury. In 633 Edwin was slain at Hatfield Chase and Paulinus retired to Kent, where he became bishop of Rochester. The pallium was not sent him until 634, when he had withdrawn from his province. He died in 644.

See Bede, Historia ecclesiastica (ed. C. Plummer, Oxford, 1896). xx. 31 a

PAULINUS, GAIUS SUETONIUS (1st century a.d.), Roman general. In 42, during the reign of Claudius, he put down a revolt in Mauretania, and was the first of the Romans to cross the Atlas range. He subsequently wrote an account of his experiences. From 59-62 he commanded in Britain, and, after a severe defeat, finally crushed the Iceni under Boadicea (Boudicca). A complaint having been made to the emperor that he was needlessly protracting hostilities, he was recalled, but he was consul (for the second time) in 66. During the civil war he fought on the side of Otho against Vitellius, and obtained a considerable success against Aulus Caecina Alienus (one of the Vitellian generals) near Cremona, but did not follow it up. When Caecina had been joined by Fabius Valens, Paulinus advised his colleagues not to risk a decisive battle, but his advice was disregarded, and Otho {q.v.) was utterly defeated at Bedria- cum. After Vitellius had been proclaimed emperor, Paulinus asserted that it was in consequence of his own treachery that Otho's army had been defeated. Vitellius pretended to believe this, and eventually pardoned Paulinus, after which nothing further is heard of him.

See Dio Cassius lxii. 7-12; Tacitus, Annals, xiv. 30-39, Histories, i. 87, 90, ii. 23-41, 44, 60; Pliny, Nat. Hist. v. 1; Plutarch, Otho.

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PAULSEN, FRIEDRICH (1846-1908), German philosopher and educationalist, was born at Langenhorn (Schleswig) and educated at Erlangen, Bonn and Berlin, where he became extraordinary professor of philosophy and pedagogy in r878. In 1896 he succeeded Eduard Zeller as professor of moral philosophy at Berlin. He died on the 14th of August 1908. He was the greatest of the pupils of G. T. Fechner, to whose doctrine of panpsychism he gave great prominence by his Einleilung in die Philosophic (1892; 7th ed., 1900; Eng. trans., 1895). He went, however, considerably beyond Fechner in attempting to give an epistemological account of cur knowledge of the psycho- physical. Admitting Kant's hypothesis that by inner sense we are conscious of mental states only, he holds that this consciousness constitutes a knowledge of the " thing-in-itself " — which Kant denies. Soul is, therefore, a practical reality which Paulsen, with Schopenhauer, regards as known by the act of "will." But this "will" is neither rational desire, unconscious irrational will, nor conscious intelligent will, but an instinct, a " will to live" (Zielstrebigkeit) , often subconscious, pursuing ends, indeed, but without reasoning as to

means. This conception of will, though consistent and convenient to the main thesis, must be rigidly distinguished from the ordinary significance of will, i.e. rational desire. Paulsen is almost better known for his educational writings than as a pure philosopher. His German Education, Past and Present (Eng. trans., by I. Lorenz, 1907) is a work of great value.

Among his other works are : Versuch einer Entwickelunggeschichte d. Kantischen Erhenntnistheorie (Leipzig, 1875) ; Im. Kant (1898, 1899); ” Griindung Organization und Lebensordnungen cjer deutschen Universitaten im Mittelalter ” (in Sybel’s Histor. Zeitschr. vol. xlv. 1881); Gesch. d. gelehrten Unterrichts auf d. deutschen Schulen und Universitaten (1885, 1896); System der Ethih (1889, 1899; Eng. trans, [partial] 1899); Das Realgymnasium u. d. humanist. Bildung (1889); Kant d. Philos. d. Protestantismus (1899) ; Schopenhauer, Hamlet u. Mephistopheles (1900) ; Philosophiamilitans (1900,1901) ; Parteipolitik u. Moral (1900).

PAULUS, HEINRICH EBERHARD GOTTLOB (1761-1851), German rationalistic theologian, was born at Leonberg, near Stuttgart, on the 1st of September 1761. His father, a Lutheran clergyman at Leonberg, dabbled in spiritualism, and was deprived of his living in 1771. Paulus was educated in the seminary at Tubingen, was three years master in a German school, and then spent two years in travelling through England, Germany, Holland and France. In 1789 he was chosen professor ordinarius of Oriental languages at Jena. Here he lived in close intercourse with Schiller, Goethe, Herder and the most distinguished literary men of the time. In 1793 he succeeded Johann Christoph Doderlein (1 745-1 792) as professor of exe- getical theology. His special work was the exposition of the Old and New Testaments in the light of his great Oriental learning

and according to his characteristic principle of ” natural explanation.” In his explanation of the Gospel narratives Paulus sought to remove what other interpreters regarded as miracles from the Bible by distinguishing between the fact related and the author’s opinion of it, by seeking a naturalistic exegesis of a narrative, e.g. that «ri rrjs daXacrcris (Matt. xiv. 25) means by the shore and not on the sea, by supplying circumstances omitted by the author, by remembering that the author produces as miracles occurrences which can now be explained otherwise, e.g. exorcisms. His Life of Jesus (1828) is a

synoptical trans- lation of the Gospels, prefaced by an account of the preparation for the Christ and a brief summary of His history, and accom- panied by very short explanations interwoven in the translation. The form of the work was fatal to its success, and the subsequent Exegetisches Handbuch rendered it quite superfluous. In this Handbuch Paulus really contributed much to a true interpreta- tion of the Gospel narratives. In 1803 he became professor of theology and Consistorialrat at Wurzburg. After this he filled various posts in south Germany — school director at Bamberg (1807), Nuremberg (1808), Ansbach (1810) — until he became professor of exegesis and church history at Heidelberg (181 1- 1844). He died on the 10th of August 1851.

His chief exegetical works are his Philologisch-kritischer und historischer Kommentar iiber. das Neue Testament (4 vols., 1800-1804); Philologischer Clavis iiber die Psalmen (1791); and Philo- logischer Clavis iiber Jesaias (1793) ; and particularly his Exegetisches Handbuch iiber die drei ersten Evangelien (3 vols., 1830-1833; 2nd ed., 1841-1842). He also edited a collected small edition of Baruch Spinoza's works (1802-1803), a collection of the most noted Eastern travels (1792-1803), F. W. J. Schelling's Vorlesungen iiber die Offenbaruug (1843), and published Skizzen aus meiner Bildungs- und Lebensgeschichte (1839). See Karl Reichlin-Meldegg, H. E. G. Paulus und seine Zeit (1853), and article in Herzog-Hauck, Real-encyklopadie; cf. F. Lichtenberger, History of German Theology in the Nineteenth Century, pp. 21-24.

PAULUS (older form Pauixus), LUCIUS AEMILIUS, sur- named Macedonicus (c. 229-160 B.C.), Roman general, a member of a patrician family of the Aemilian gens, son of the consul of the same name who fell at Cannae. As consul for the second time (168) he was entrusted with the command in the Macedonian War, which the incapacity of previous generals had allowed to drag on for three years. He brought the war to a speedy termination by the battle of Pydna, fought on the 22nd of June (Julian calendar) 1 68. Macedonia was henceforward a Roman province, and Paulus, having made a tour through Greece, with the assistance of ten Roman commissioners arranged the affairs of the country. He enjoyed a magnificent triumph, which lasted three days and was graced by the presence of the captive king Perseus and his three children. He lost his two sons by his second wife, and was thus left without a son to bear his name, his two sons by his first wife having been adopted into the Fabian and Cornelian gentes. Paulus was censor in 164, and died in 160 after a long illness. At the funeral games exhibited in his honour the Hecyra of Terence was acted for the second and the Adelphi for the first time. An

aristocrat to the back- bone, he was yet beloved by the people. Of the vast sums brought by him into the Roman treasury from Spain and Mace- donia he kept nothing to himself, and at his death his property scarcely sufficed to pay his wife's dowry. As a general he was a strict disciplinarian; as an augur he discharged his duties with care and exactness. He was greatly in sympathy with Greek learning and art, and was a friend of the historian Polybius.

See Plutarch, Aemilius Paulus; Livy xliv. 17-xlvi. 41; Polybius xxix.-xxxii.

PAULUS, surnamed Silentiaritjs (" the silentiary," one of the ushers appointed to maintain silence within the imperial palace), Greek poet, contemporary and friend of Agathias, during the reign of Justinian. In addition to some 80 epigrams, chiefly erotic and panegyric in character, preserved in the Greek Anthology, there is extant by him a description (tKcbpacns) of the church of St Sophia, and of its pulpit (anfiuv), in all some 1300 hexameters after the style of Nonnus, with short iambic dedications to Justinian. The poem was recited at the second dedication of the church (a.d. 562), in the episcopal hall of the

patriarchate. The poems are of importance for the history of Byzantine art in the 6th century. Another poem (also preserved in the Anthology) on the warm baths of Pythia in Bithynia, written in the Anacreontic rhythm, has sometimes been attributed to him.

Bibliography.— Ed. of the poems on St Sophia, by I. Bekker in the Bonn Corpus scriptorum hist. byz. (1837), including the descriptions of the church by Du Cange and Banduri, and in J. P. Migne, Patrologia graeca, lxxxvi. ; metrical translations, with commentary, by C. W. Korttim (1854), and J. J. Kreutzer (1875); poem on the Baths in G. E. Lessing, Zur Geschichte und Literatur, i. 5 (1773); see also Merian-Genast, De Paulo Silentiario (Leipzig, 1889).

PAULUS DIACONUS, or Warnefridi, or Casinensis (c. 720-c. 800), the historian of the Lombards, belonged to a noble Lombard family and'flourished in the 8th century. An ancestor named Leupichis entered Italy in the train of Alboin and received lands at or near Forum Julii (Friuli). During an invasion the Avars swept off the five sons of this warrior into Illyria, but one, his namesake, returned to Italy and restored the ruined fortunes of his house. The grandson of the younger Leupichis was Warnefrid, who by his wife Theodelinda became the father of Paulus. Born between 720 and 725 Paulus received an excep- tionally good education, probably at the court of the Lombard king Ratchis in Pavia, learning from a teacher named

Flavian the rudiments of Greek. It is probable that he was secretary to the Lombard king Desiderius, the successor of Ratchis; it is certain that this king's daughter Adelperga was his pupil. After Adelperga had married Arichis, duke of Benevento, Paulus at her request wrote his continuation of Eutropius. It is possible that he took refuge at Benevento when Pavia was taken by Charlemagne in 774, but it is much more likely that his residence there was anterior to this event by several years. Soon he entered a monastery on the lake of Como, and before 782 he had become an inmate of the great Benedictine house of Monte Cassino, where he made the acquaintance of Charlemagne. About 776 his brother Arichis had been carried as a prisoner to France, and when five years later the Frankish king visited Rome, Paulus successfully wrote to him on behalf of the captive. His literary attainments attracted the notice of Charlemagne, and Paulus became a potent factor in the Carolingian renaissance. In 787 he returned to Italy and to Monte Cassino, where he died on the 13th of April in one of the years between 794 and 800. His surname Diaconus, or Levita, shows that he took orders as a deacon; and some think he was a monk before the fall of the Lombard kingdom.

The chief work of Paulus is his Historia gentis Langobardorum. This incomplete history in six books was written after 787 and deals with the story of the Lombards from 568 to the death of King Liutprand in 747. The story is told from the point of view of a Lombard patriot and is especially valuable for the relations between the Franks and the Lombards. Paulus used the document called the Origo gentis Langobardorum, the Liber ponticfialis, the lost history of Secundus of Trent, and the lost annals of Benevento; he made a free use of Bede, Gregory of Tours and Isidore of Seville. In some respects he suggests a comparison with Jordanes, but in learning and literary' honesty is greatly the superior of the Goth. Of the Historia there are about a hundred manuscripts extant. It was largely used by subsequent writers, was often continued, and was first printed in Paris in 15 14. It has been translated into English, German, French and Italian, the English translation being by W. D. Foulke (Philadelphia, 1807), and the German by O. Abel and R. Jacobi (Leipzig, 1878). Among the editions of the Latin the best is that edited by L. Bethmann and G. Waitz, in the Monumenta Germaniae historica. Scriptores rerum langobardicarum (Hanover, 187S).

Cognate with this work is Paulus's Historia romana, a continua- tion of the Breviarium of Eutropius. This was compiled between 766 and 771, at Benevento. The story runs that Paulus advised Adelperga to read Eutropius. She did so, but complained that this heathen writer said nothing about ecclesiastical affairs and stopped with the

accession of the emperor Valens in 364; con- sequently Paulus interwove extracts from the Scriptures, from the ecclesiastical historians and from other sources with Eutropius, and added six bookr, thus bringing the history down to 553. This work has little value, although it was very popular during the middle ages. It has been edited by H. Droysen and published in the Monumenta Germaniae historica. Auctores anliquissimi, Bd. ii

(1879).

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Paulus wrote at the request of Angilratn, bishop of Metz (d. 791), a history of the bishops of Metz to 766, the first work of its kind north of the Alps. This Gesta episcoporum mettensium is pub- lished in Bd. ii. of the Monumenta Germaniae historica Scrip- tores, and has been translated into German (Leipzig, 1880). He also wrote many letters, verses and epitaphs, including those of Duke Arichis and of many members of the Carolingian family. Some of the letters are published with the Historia Langobardorum in the Monumenta ; the poems and epitaphs edited by E. Dummler will be found in the Poetae latini aevi carolini, Bd. i. (Berlin, 1881). Fresh material having come to light, a new edition of the poems (Die Gedichte des Paulus Diaconus) has been edited by Karl Neff (Munich, 1908). While in France ‘Paulus was requested by Charlemagne to compile a collection of homilies. He executed this after his return to Monte Cassino, and it was largely used in the Frankish churches. A life of Pope Gregory the Great has also been attributed to him.

See C. Cipolla, Note bibliografiche circa Vodierna condizione degli studi critici sul testo delle opere di Paolo Diacono (Venice, 1901); the A tti e memorie del congresso storico tenuto in Cividale (Udine, 1900); F. Dahn, Langobardische Studien, Bd. i. (Leipzig, 1876); W. Wattenbach, Deutschlands Geschichtsquellen, Bd. i. (Berlin, 1904); A. Hauck, Kirchengeschichte Deutschlands, Bd. ii. (Leipzig, 1898); P. del Giudice, Studi di storia e diritto (Milan, 1889); and U. Balzani, Le Cronache italiane nel medio evo (Milan, 1884).

PAUL VERONESE (1528-1588), the name ordinarily given to Paolo Caliari, or Cagliari, the latest of the great cycle of painters of the Venetian school, who was born in Verona in 1528 according to Zanetti and others, or in 1532 according to Ridolfi. His father, Gabriele Caliari, a sculptor, began to train Paolo to his own profession. The

boy, however, showed more propensity to painting, and was therefore transferred to his uncle, the painter Antonio Badile, whose daughter he eventually married. According to Vasari, he was the pupil of Giovanni Carotto, a painter proficient in architecture and perspective; this statement remains unconfirmed. Paolo, in his early years, applied himself to copying from the engravings of Albert Diirer and the drawings of Parmigiano. He did some work in Verona, but found there little outlet for his abilities, the field being pretty well occupied by Ligozzi, Battista dal Moro, Paolo Farinato, Domenico Riccio, Brusasorci and other artists. Cardinal Ercole Gonzaga took him, when barely twenty years of age, to Mantua, along with the three last-named painters, to execute in the cathedral a picture of the ” Temptation of St Anthony “; here Caliari was considered to excel his competitors. Returning to Verona, he found himself exposed to some envy and ill-will. Hence he formed an artistic partnership with Battista Zelotti, and they painted together in the territories of Vicenza and Treviso. Finally Paolo went on to Venice. In this city his first pictures were executed, in 1555, in the sacristy and church of S. Sebastiano, an uncle of his being prior of the monastery. The subjects on the vaulting are taken from the history of Esther; and these excited so much admiration that henceforward Caliari, aged about twenty-eight, ranked almost on a par with Tintoretto, aged about forty-five, or with Titian, who was in his eightieth year. Besides the Esther subjects, these buildings contain his pictures of the ” Baptism of Christ,” the ” Martyrdom of St Marcus and St Marcellinus,” the ” Martyrdom of St Sebas- tian,” &c. As regards this last-named work, dating towards 1563, there is a vague tradition that Caliari painted it when he had taken refuge in the monastery. He entered into a competi- tion for painting the ceiling of the library of St Mark, and not only obtained the commission but executed it with so much power that his very rivals voted him the golden chain which had beefn tendered as an honorary distinction. At one time he returned to Verona, and painted the ” Banquet in the House of Simon the Pharisee, with Jesus and Mary Magdalene ” — a picture now in Turin. In 1560, however, he was in Venice again, working partly in the S. Sebastiano buildings and partly in the ducal palace. He visited Rome in 1563, in the suite of Girolamo Grimani, the Venetian ambassador, and studied the works of Raphael and Michelangelo, and especially the antique. Returning to Venice, he was overwhelmed with commissions. He was compelled to decline an invitation from Philip II. to go to Spain and assist in decorating the Escorial. One of his pictures of this period is the famous ” Venice, Queen of the Sea,” in the ducal palace. He died in Venice on the 20th (or

perhaps 19th) of April 1588, and was buried in the church of S. Sebastiano, a monument being set up to him there by his two sons, Gabriele and Carlo, and bis brother, Benedetto, all of them painters.

Beyond his magnificent performances as a painter, the known incidents in the life of Paul Veronese are very few. He was honoured and loved, being kind, amiable, generous and an excellent father. His person is well known from the portraits left by himself and others: he was a dark man, rather good- looking than otherwise, somewhat bald in early middle age, and with nothing to mark an exceptional energy or turn of character In his works the first quality which strikes one is their palatial splendour. The pictorial inspiration is entirely that of the piercing and comprehens : ve eye and the magical hand — not of the mind. The human form and face are given with decorous comeliness, often with beauty; but of individual apposite expression there is next to none. In fact, Paolo Veronese is pre-eminently a painter working pictorially, and in no wise amenable to a literary or rationalizing standard. He enjoys a sight much as Ariosto enjoys a story, and displays it in form and colour with a zest like that of Ariosto for language and verse. He was supreme in representing, without huddling or confusion, numerous figures in a luminous and diffused atmo- sphere, while in richness of draperies and transparency of shadows he surpassed all the other Venetians or Italians. In gifts of this kind Rubens alone could be pitted against him. In the modera- tion of art combined with its profusion he far excelled Rubens; for, dazzling as is the first impression of a great work by Veronese, there is in it, in reality, as much of soberness and serenity as of exuberance. By variety and apposition he produces a most brilliant effect of colour; and yet his hues are seldom bright. He hoards his primary tints and his high lights. He very rarely produced small pictures: the spacious was his element.

Of all Veronese's paintings the one which has obtained the greatest world-wide celebrity is the vast " Marriage at Cana," now in the Louvre. It contains about a hundred and twenty figures or heads — those in the foreground being larger than life. Several of them are portraits. Among the personages specified (some of them probably without sufficient reason) are the Mar- quis del Vasto, Queen Eleanor of France, Francis I., Queen Mary of England, Sultan Soleyman I., Vittoria Colonna, Charles V., Tintoretto, Titian, the elder Bassano, Benedetto Caliari and Paolo Veronese himself (the figure playing the viol). It is impossible to look at this picture without astonishment. The only point of view from which it fails is that of the New Testa- ment narrative; for there is no relation between the Galilean wedding and Veronese's court-banquet. This stupendous per- formance was

executed for the refectory of the monastery of S. Giorgio Maggiore in Venice, the contract for it being signed in June 1562 and the picture completed in September 1563. Its price was 324 silver ducats (= £160), along with the artist's living expenses and a tun of wine. There are five other great banquet-pictures by Caliari, only inferior in scale and excellence to this of Cana. One of them is also in the L ->uvre, a " Feast in the House of Simon the Pharisee," painted towards 1570-1575 for the refectory of the Servites 1 Venice. A different version of the same theme is in the Brera Gailery of Milan. " The Feast of Simon the Leper" (1570) was done for the refectory of the monks of St Sebastian, and the " Feast of Levi " (St Matthew) (J 573)1 now in the Venetian academy, for the refectory of the monks of St John and St Paul. In each instance the price barely exceeded the cost of the materials. The Louvre contains ten other specimens of Veronese, notably the " Susanna and the Elders" and the " Supper at Emmaus." In the National Gallery, London, are ten examples. The most beautiful is " St Helena's Vision of the Cross," founded upon an engraving by Marcantonio after a drawing supposed to be the work of Raphael. Far more famous than this is the " Family of Darius at the Feet of Alexander the Great after the Battle of Issus" — the captives having mistaken Hephaestion for Alexander. It was bought for £13,560, and has even been termed (very un- reasonably) the most celebrated of all Veronese's works. The

principal figures are portraits of the Pisani family. It is said that Caliari was accidentally detained at the Pisani villa at Este, and there painted this work, and, on quitting, told the family that he had left behind him an equivalent for his courteous entertainment. Another picture in the National Gallery, " Europa and the Bull," is a study for the large painting in the imperial gallery of Vienna, and resembles one in the ducal palace of Venice. The Venetian academy contains fourteen works by Veronese. One of the finest is a comparatively small picture of the Battle of Lepanto, with Christ in heaven pouring light upon the Christian fleet and darkness on the Turkish. In the UfSzi Gallery of Florence are two specimens of exceptional beauty — the " Annunciation " and " Esther Presenting herself to Ahasuerus" ; for delicacy and charm this latter work yields to nothing that the master produced. In Verona " St George and St Julian," in Brescia the " Martyrdom of St Afra," and in Padua the " Martyrdom of St Justina" are works of leading renown. Celebrated frescoes by Caliari are in four villas near Venice, more especially the Villa Masiera. His drawings are

very fine, and he took pleasure at times in engraving on copper.

The brother and sons of Paolo already mentioned, and Battista Zelotti, were his principal assistants and followers. Benedetto Caliari, the brother, who was about ten years younger than Paolo, is reputed to have had a very large share in the architec- tural backgrounds which form so conspicuous a feature in Paolo's compositions. If this is not overstated, it must be allowed that a substantial share in Paolo's fame accrues to Benedetto; for not only are the backgrounds admirably schemed and limned, but they govern to a large extent the invention and distribution of the groups. Of the two sons Carlo (or Carletto), the younger, is the better known. He was born in 1570, and was sent to study under Bassano. He produced various noticeable works, and died young in 1596. Gabriele, born in 1568, attended, after Carlo's death, almost entirely to commercial affairs; his works in painting are rare. All three were occupied after the death of Paolo in finishing his pictures left uncompleted.

See Ridolfi, Le Meraviglie dell' ■arte, &c. ; Dal Pozzo, Vite de' pittori veronesi, &c. ; Zanetti, Delia Pittura veneziana, &c. ; and Lanzi; also, among recent works, the biographies by C. Yriarte (1888) ; F. H. Meisner (1897) ; and Mrs Arthur Bell (1904).

(W. M. R.)

PAUMOTU, Tuamotu, or Low Archipelago, a broad belt of 78 atolls in the Pacific Ocean, belonging to France, between 14° and 24° S., and 131 and 149 W. They trend in irregular lines in a north-west and south-west direction, the major axis of the group extending over 1300 m. The largest atoll, Rangiroa, with a lagoon 45 m. long by 15 wide, is made up of twenty islets. Fakarava, the next in size, consists of fifteen islets, and its oblong lagoon affords the best anchorage in the group. Hau has fifty islets, and its lagoon is dangerously studded with coral.. The symmetrically placed eleven islets of Anaa suggested to Captain Cook the name of Chain Island. Heavy storms sometimes greatly alter the form of the atolls. The first discovery of part of the archipelago was made by the Spaniard Pedro Fernandez Quiros in 1606. Many navigators subsequently discovered or rediscovered various parts of the group—among them may be mentioned Jacob Lemaire anc' Willem Schouten (1616), John Byron (1765), Philip Carteret (.1767), Louis Antoine de Bougain- ville (1768), Captain James Cook (1769), Lieutenant Bligh (1792), Captain Wilson of the " Duff " (1797), Otto von Kotzebue (1815 S,nd 1824), Fabian Gottlieb von Bellingshausen (1819-1820) and Charles Wilkes (1839) who made a detailed survey of the islands. As a result almost all the islands bear alternative

names. The dates given are those of first discovery. In the north-west part of the chain are Rangiroa (Vliegen, Deans or Nairsa, this part of the group bearing the name of the Palliser Islands); Fakarava (Witgenstein, 1819), the seat of the French- resident ; Anaa (Chain, 1769), Makemo (Makima, Phillips, Kutusov, 1803), Hau (Hao, Harp, Bow, 1768). North and east of these are Manihi (Oahe, Waterlandt, 1616), Tikei (Romanzov, 1815), the Disappointment group (1765) of which Napuka is the chief island, Pukapuka (Henuake, Honden, Dog, 1616), Raroia I

(Barclay de Tolly, 1820), Angatau (Ahangatu, Arakchev, 1820), Akahaina (Fakaina, Predpriatie, 1824), Tatakoto (Narcissus, Egmont, Clerke, 1774), Pukaruha (Serle, 1797). In the southern part of the archipelago are Hereheretui (Bligh, Santablo, 1606), the Duke of Gloucester group (1767), Tematangi (Bligh Lagoon, 1792), Maruroa (Braburgh, Matilda, 1767), the Actaeon or Amphitrite group (discovered by the Tahitian trading vessel “Amphitrite” in 1833), Marutea (Lord Hood, 1791), and the Gambier or Mangareva group (1797), of which Mangareva (Gambier, Peard) is the chief member. To the south again are: Pitcairn (q.v.), Ducie, and a few other islets, which are British and do not properly belong to the Paumotu Archipelago. The Gambier Islands are a cluster of four larger and many smaller volcanic islets, enclosed in one wide reef. The wooded crags of Mangareva, the largest islet, 5 m. in length, rise to a height of 13 1 5 ft. and are covered with a rich vegetation, quite Tahitian in character; but, as in the other Paumotus, there is a dearth of animal life.

The climate of the islands is healthy, and they have a lower mean temperature than Tahiti. The easterly trade winds prevail. Rain and fogs occur even during the dry season. The stormy season lasts from November to March, when devastating hurricanes are not uncommon and a south-westerly swell renders the western shores dangerous. Plants and animals are scantily represented. Coco-nut palms and the pandanus thrive on many of the islets, and the bread-fruit, banana, pine-apple, water-melon and yam have been introduced from Tahiti into the western islands. Mammals are represented by a few rats; among land-birds parakeets, thrushes and doves are noticeable; and of reptiles there are only lizards. Insects are scarce. But the sea and lagoons teem with turtle, fish, molluscs, crustaceans and zoophytes. Coral is luxuriant everywhere. From the abundance of pearl oysters the archipelago gets its traders’ name of Pearl Islands.

The Paumotus are sparsely inhabited by a fine strong race of Polynesians, more muscular and mostly darker-skinned than that

inhabiting Tahiti. In the west considerable intermixture with other races has taken place. In physique, language, religion and customs the Gambier Islanders closely resemble the Raro- tongans. The pearl fisheries in the rocky and surf waters are a source of revenue, the pearls being sold in Tahiti. The best harbour of the group is that of Fakarava, which, together with Mangareva, is open to trade.

The land area of the entire group is about 330 sq. m., and the population is about 6000. The group passed under the protection of France in 1844, and was annexed in 1881, forming part of the dependency of Tahiti.

PAUNCEFOTE, JULIAN PAUNCEFOTE, ist Baron (1828- 1902), English diplomatist, third son of Robert Pauncefote of Preston Court, Gloucestershire, was born on the 13th of Septem- ber 1828. He was educated at Marlborough, Paris and Geneva, and called to the bar at the Inner Temple in 1852. He was for a short time secretary to Sir William Molesworth, secretary for the colonies, and in 1862 went out to Hong-Kong, where he was made attorney-general (1865) and then chief justice of the supreme court. He was appointed chief justice of the Leeward Islands in 1873, and, returning to England in the next year, became one of the legal advisers to the colonial office. Two years later he received a similar appointment in the foreign office, and in 1882 was made permanent under-secretary of state for foreign affairs. In 1885 he was one of the delegates to the Suez Canal international commission, and received the G.C.M.G. and the K.C.B, Lord Salisbury departed from precedent in choosing him to succeed Sir Lionel Sackville-West as British minister at Washington in 1889, but the event showed that his knowledge of international law made up for any lack of the ordinary diplomatic training. He did much during his term of office to maintain friendly relations between the two countries, especially during the Venezuelan crisis. The Bering Sea fishery dispute (1890-1892) was successfully negotiated by him; he arranged a draft treaty for Anglo-American arbitration, which was, however, quashed by the Senate; and carried through

the revision of the Clayton-Bulwer Treaty on the subject of the Panama Canal. In 1893 the British minister at Washington was raised to the rank of ambassador, and Sir Julian Pauncefote became the doyen of the diplomatic corps. He died on the 26th of May 1902 at Washington. He had been made Baron Pauncefote of Preston in 1899

in recognition of his services at the Peace Conference at the Hague, and he was a member of the Court of Arbitration which resulted from the conference.

PAUPERISM (Lat. pauper, poor), a term meaning generally the state of being poor, poverty; but in English usage particu- larly the condition of being a " pauper," i.e. in receipt of relief administered under the poor law. In this sense the word is to be distinguished from " poverty." A person to be relieved under the poor law must be a destitute person, and the moment he has been relieved he becomes a pauper, and as such incurs certain civil disabilities. Statistics dealing with the state of pauperism in this sense convey not the amount of destitution actually prevalent, but the particulars of people in receipt of poor law relief.

PAUSANIAS . (5th century B.C.), Spartan regent and com- mander, of the Agiad family, son of Cleombrotus and nephew of Leonidas, the hero of Thermopylae. Upon the death of the latter in 480 B.C. his son Pleistarchus became king, but as he was still a minor the regency devolved first on Leonidas's brother Cleombrotus, and after his death in 479 on Pausanias. He first distinguished himself as commander of the combined Greek forces in the victory of Plataea. In 478 he was appointed admiral of the Greek fleet, and succeeded in reducing the greater part of Cyprus, the strategic key of the Levant, and in capturing Byzantium from the Persians, thus securing the command of the Bosporus, and of the route by which Darius had invaded Europe. But he entered into treacherous negotiations with the Persian king, and his adoption of Oriental dress and customs, and his haughty behaviour to the Greeks under his command, roused their resentment and suspicion (see Deiian League). Pausanias was recalled by the ephors and, though acquitted on the main charge of Medism, was not again sent out in any official position. He returned to Byzantium, nevertheless, in a ship of Hermione and seized that town and, apparently, Sestos also. He was dislodged from both by the Athenians," to whom the allies had transferred from Sparta the naval hegemony. For some time he lived at Cleonae in the Troad, carrying on negotiations with Xerxes, but was again recalled to Sparta, where he incited the helots to revolt. When his schemes were almost matured, the evidence of a confidential slave led to the discovery of his plot by the ephors. He fled to the sanctuary of Athena Chalcioecus on the Spartan Acropolis: there he was immured, and when starvation and exposure had all but done their work he was dragged out to die. This crime against religion the state subsequently expiated by the burial of his body at the spot where he died and the dedication of two bronze statues. To commemorate Leonidas and Pausanias a yearly

festival was held, at which speeches were made extolling their victories; this was still celebrated when the geographer Pausanias visited Sparta more than six centuries later (Paus. iii. 14). The date of the regent's death probably falls in 471 or 470, though some assign it to a later date on a very doubtful statement of Justin (ix. 1) that Pausanias held Byzantium for seven years.

See Herodotus v. 32, ix. 10-88; Thucydides i. 94-96, 128-134, ii. 71, 72, iii. 58; Diodorus Siculus xi. 30-47, 54; Cornelius Nepos, Pausanias; Justin ii. ig, ix. I, 3; Pausanias iii. 4, 14, 17; Polyaenus viii. 51; Aristodemus ii., iv., vi.-viii. ; Athenaeus xii. 535E, 536A; Plutarch, Cimond, Themistocles 23, Aristides 1 1-20, 23; N. Hanske, Ueber den Kbnigsregenten Pausanias (Leipzig, 1873). (M. N. T.)

PAUSANIAS, Greek traveller and geographer of the 2nd century a.d., lived in the times of Hadrian, Antoninus Pius and Marcus Aurelius. He was probably a native of Lydia, and was possibly born at Magnesia ad Sipylum; he was'certainly inter- ested in Pergamum and familiar with the western coast of Asia Minor; but his travels extended far beyond the limits of Ionia. Before visiting Greece he had been to Antioch, Joppa and

Jerusalem, 1 and to the banks of the river Jordan. In Egypt he had seen the pyramids and had heard the music of the vocal Memnon, while at the temple of Ammon he had been shown the hymn once sent to that shrine by Pindar. He had taken note of the fortifications of Rhodes and Byzantium, had visited Thessaly, and had gazed on the rivulet of " blue water " beside the pass of Thermopylae. In Macedonia he had almost certainly viewed the traditional tomb of Orpheus, while in Epirus he was familiar with the oracular oak of Dodona, and with the streams of Acheron and Cocytus. Crossing over to Italy, he had seen something of the cities of Campania, and of the wonders of Rome.

His Description of Greece' (iKpirryriois rfjs 'EXKaSos) takes the form of a tour in the Peloponnesus and in part of northern Greece. It is divided into ten books: (i.) Attica and Megara; (ii.) Argolis, including Mycenae, Tiryns and Epidaurus; (iii.) Laconia; (iv.) Messenia; (v.) and (vi.) Elis, including Olympia; (vii.) Achaea; (viii.) Arcadia; (ix.) Boeotia, and (x.) Phocis, including Delphi.

Book i. was written after Herodes Atticus had built the Athenian Stadium (a.d. c. 143), but before he had built the Odeum (c. 1 60-1 61). There is reason to believe that this book was published some years before the rest. The statement in book v. (1,2), that 217 years

had elapsed since the restoration of Corinth (44 B.C.), shows that Pausanias was engaged on his account of Elis in the year a.d. 174, during the reign of Marcus Aurelius. He repeatedly refers to buildings erected by Hadrian, who died in a.d. 138. He had lived in that emperor's time, but had not actually seen that emperor's favourite, Antinoiis, who died about 130. He mentions the wars of Antoninus Pius against the Moors, and of Marcus Aurelius (in and after a.d. 166) against the Germans (viii. 43). The latest event which he records is the incursion of the robber-horde of the Costobocs (a.d. c. 176; x. 34, 5). Book i. having been published before 160, and books vi.-x. after 174, the composition of the whole must have extended over more than fourteen years.

The work has no formal preface or conclusion. It suddenly begins with the promontory of Sunium, the first point in Attica that would be seen by the voyager from the shores of Asia Minor, and it ends abruptly with an anecdote of a blind man of Naupactus. The author's general aim may be inferred from his saying at the close of his account of Athens and Attica: " Such (in my opinion) are the most famous of the Athenian traditions and sights; from the mass of materials I have aimed from the outset at selecting the really notable " (i. 39, 3). It is possibly in the hope of giving variety and interest to the topo- graphical details of Athens that the author intersperses them with lengthy historical disquisitions; but the result is that the modern reader is tempted to omit the " history " and to hasten on to the " topography," on which the author is now a primary authority. In the subsequent books he introduces two improve- ments. His account of each important city begins with a sketch of its history; and, in his subsequent descriptions, he adopts a strictly topographical order. He takes the nearest road from the frontier to the capital; he there makes for the central point, e.g. the market-place, and describes in succession the several streets radiating from that centre. Similarly, in the surrounding district, he follows the principal roads in succession, returning to the capital in each case, until, at the end of the last road, he crosses the frontier for the next district. In the later books he supplies us with a few glimpses into the daily life of the inhabi- tants. He is constantly describing ceremonial rites or super- stitious customs. He frequently introduces narratives from the domain of history and of legend and folk-lore; and it is only

'The tomb of Helena at Jerusalem, which Pausanias viii. 16, 4-5, compares with the Mausoleum, is mentioned by Toseˆhus, Ant. xx. 4> 3; Bell. jud. v. 2, 2; 3, 3; 4, 2; fand Eusebius, H.E. ii. 12, 3. Helen, the daughter of Izates, king of Adiabene, sent large shiploads of provisions to Rome during the great famine in the time of Claudius (a.d. 44-48).

Her tomb is identified by universal consent with the so-called ” Tombs of the Kings,” half a mile north of the Damascus gate. Cf. Schurer, Geschichte des judischen Volkes, 3rd ed., iii. 120-122; view of tomb in Picturesque Palestine, i. 103.

rarely that he allows us to see something of the scenery. But, happily, he notices the pine-trees on the sandy coast of Elis, the deer and the wild boars in the oak-woods of Phelloe, and the crows amid the giant oak-trees of Alalcomenae. lie tells us that ” there is no fairer river than the Ladon,” ” no reeds grow so tall as those in the Boeotian Asopus,” and the rain that deluges the fallow plain of Mantinea vanishes into a chasm to rise again elsewhere. It is mainly in the last three books that he touches on the products of nature, the wild strawberries of Helicon, the date-palms of Aulis, and the olive-oil of Tithorea, as well as the bustards of Phocis, the tortoises of Arcadia and the ” white blackbirds ” of Cyllene. He is rather reticent as to the character of the roads, but he records, with the gratitude of a traveller, the fact that the narrow and perilous cornice of the Scironian way along the coast of Megara had been made wider and safer by Hadrian. He is inspired by a patriotic interest in the ancient glories of Greece, recognizing in Athens all that was best in the old Greek life, and lamenting the ruin that had befallen the land on the fatal field of Chaeronea. He is most at home in describing the religious art and architecture of Olympia and of Delphi; but, even in the most secluded regions of Greece, he is fascinated by all kinds of quaint and primitive images of the gods, by holy relics and many other sacred and mysterious things. He is interested in visiting the battlefields of Marathon and Plataea, and in viewing the Athenian trophy on the island of Salamis, the grave of Demosthenes at Calauria, of Leonidas at Sparta, of Epaminondas at Mantinea, and the colossal lion guarding the tomb of the Thebans on the Boeotian plain. At Thebes itself he views the shields of those who died at Leuctra, and the ruins of the house of Pindar; the statues of Hesiod and Arion, of Thamyris and Orpheus, in the grove of the Muses on Helicon; the portrait of Corinna at Tanagra, and of Polybius in the cities of Arcadia. At Olympia he takes note of the ancient quoit of Iphitus inscribed with the terms of the Olympic truce, the tablets recording treaties between Athens and other Grecian states, the memorials of the victories of the Greeks at Plataea, of the Spartans at Tanagra. of the Messenians at Naupactus, and even those of Philip at Chaeronea and of Mummius at Corinth. At Delphi, as he climbs the sacred way to the shrine of Apollo, he marks the trophies of the

victories of the Athenians at Marathon and on the Eurymedon, of the united Greeks at Artemisium, Salamis and Plataea, of the Spartans at Aegos potami, of the Thebans at Leuctra, and the shields dedicated in memory of the repulse and defeat of the Gauls at Delphi itself. At Athens, he sees pictures of historic battles, portraits of famous poets, orators, statesmen and philosophers, and inscriptions recording the laws of Solon; on the Acropolis, the trophy of the Persian wars, the great bronze statue of Athena; at the entrance to the harbour of the Peiraeus, the grave of Themistocles; and, outside the city, the monuments of Harmodius and Aristogeiton, of Cleisthenes and Pericles, of Conon and Timotheus, and of all the Athenians who fell in battle, except the heroes of Marathon, ” for these, as a meed of valour, were buried on the field.”

In the topographical part of his work, he is fond of digressions on the wonders of nature, the signs that herald the approach of an earthquake, the phenomena of the tides, the ice-bound seas of the north, and the noonday sun which at the summer solstice casts no shadow at Syene. While he never doubts the existence of the gods and heroes, he sometimes criticizes the myths and legends relating to them. His main interest is in the monuments of ancient art, and he prefers the works of the 5th and 4th centuries B.C. to those of later times. At Delphi he admires the pictures of Polygnotus, closing the seven chapters cf his minute description with the appreciative phrase: ” so varied and beautiful is the painting of the Thasian artist ” (x. 31, 2). In sculpture his taste is no less severe. Even in the ” uncouth ” work of Daedalus, he recognizes ” a touch of the divine ” (ii. 4, 5). In architecture, he admires the prehistoric walls of Tiryns, and the ” Treasury of Minyas,” the Athenian Propylaea, the theatre of Epidaurus, the temples of Bassae and Tegea, the walls of Messene, the Odeum at Patrae, as well as the building

of the same name lately built at Athens by Herodes Atticus (vii. 20, 6), and finally the Stadium which that munificent Athenian had faced with white marble from the quarries of Pentelicus. His descriptions of the monuments of art are plain and unadorned; they bear the impress of reality, and their accuracy is confirmed by the extant remains. He is perfectly frank in his confessions of ignorance. When he quotes a book at second hand he takes pains to say so.

He has been well described by J. G. Frazer as ” a man made of common stuff and cast in a common mould; his intelligence and abilities seem to have been little above the average, his opinions not very different from those of his contemporaries.” His literary style is ” plain and unadorned yet heavy and laboured”; it is not careless or

slovenly; the author tried to write well, but his ” sentences are devoid of rhythm and harmony ” (Introduction, pp. xlix., lxix.).

In considering his use of previous writers, we must draw a distinction between the historical and the descriptive parts of his work. In the former it was necessary for him to depend on written or oral testimony; in the latter it was not. In the historical passages, his principal poetic authority is Homer; he frequently quotes the Theogony of Hesiod, and he often refers to Pindar and Aeschylus. His writings are full of echoes of Herodotus, and his debt to Thucydides and Xenophon extends beyond the isolated mention of their names (i. 3, 4; vi. 19, 5). He has carefully studied the Elean register of the Olympic victors; he makes large use of inscriptions, and has generally examined them with care and copied them with accuracy. In the descriptive portion the question arises whether he derived his knowledge from personal observation, or from books, or from both. He does not profess to have seen everything, but he does not acknowledge that he has borrowed any of his descriptions from previous writers. He ” cannot commend the men who took the measurements ” of the Zeus at Olympia (v. 11, 9). “A certain writer,” who states that a particular spring is the source of an Arcadian river, ” cannot have seen the spring himself, or spoken with any one who had; I have done both ” (viii. 41, 10). There are fifty passages in which he either directly states or implies that he had seen the things that he describes. All of these have been carefully collected and examined by R. Heberdey (1894), who, by using a distinctive type in marking on a map the places ” seen ” by Pausanias, and by joining those places by lines representing the routes described by him, has shown the large extent of the author’s travels in Greece. The complicated coast of Hermionis has, however, been incorrectly described (ii. 34, 8 seq.), and there is some confusion in the account of the three roads leading to the north from Lepreiis, in the extreme south of Elis (v. 5, 3).

A greater difficulty has long been felt in connexion with the ” Enneacrunus episode ” in the description of Athens (i. 8, 6, and 14, 1-6). In the midst of the account of the market-place, north- west of the Acropolis, the reader is transported to the fountain of Enneacrunus and to some buildings in its neighbourhood, and is suddenly brought back to the market-place. It has been naturally assumed that the Enneacrunus can only be the fountain of that name in the bed of the Ilissus. If so, the description of the fountain is out of place, and its insertion at this point has been ascribed either to some confusion in the author’s notes or to a dislocation in the text. On the other hand, it has been suggested that the description may really refer to some other fountain near the market-place, which was shown to Pausanias as the

Enneacrunus. Thus it has been held by Dr Dorpfeld that the name Enneacrunus was originally applied to a spring west of the Acropolis, that the old name of this spring, Callirrhoe, had been abandoned from the time when Peisistratus converted it into a ” fountain with nine jets,” and that the names Callirrhoe and Enneacrunus were afterwards transferred to another fountain in the bed of the Ilissus. The evidence of his own excavations has led him to place the original Enneacrunus near the eastern foot of the hill of the Pnyx, and to identify certain adjacent remains with the buildings mentioned by Pausanias. If this opinion is correct, the account of the Ennea- crunus, and the neighbouring buildings, in Pausanias, ceases to be an ” episode,’* and falls into the natural sequence of the narrative. (The ” episode ” has been fully discussed by the expounders and translators of Pausanias, and by the writers on the topography of Athens. Dr Ddrpfeld’s views are clearly set forth in Miss J. E. Harrison’s Primitive Athens (1906). A. Malinin’s paper (Vienna,

1906), which assumes a dislocation of the text, has been answered by Dorpfeld {Wochenschrift fur kl. Philologie (1907), p. 940 seq.).

The account of the law courts of Athens and of the altars at Olympia may have been derived from monographs on those subjects. In both cases the author departs from his usual method of following the order of place, and deals with a group of monuments belonging to the same class. But in the extant literature of antiquity (as J. G. Frazer has shown) no passage has been found agreeing in form or substance so closely with the description in Pausanias as to make it probable that he copied it. The theory that Pausanias borrowed largely from Polemon of Ilium, who flourished about 200-177 B.C., and wrote on the Acropolis and the eponymous heroes of Athens, on the treasuries of Delphi, and on other antiquarian topics, was incidentally suggested by Preller in his edition of the fragments (1838), and was revived by Professor von Wilamowitz-Moellendorff in 1877 {Hermes, xii. 346). It was subsequently maintained by A. Kalkmann (1886) that Pausanias slavishly copied from Polemon the best part of his descriptions of Athens, Delphi and Olympia, and described those places, not as they were in his own age, but as they had been in that of Polemon, some 300 years before. It is alleged that, in the notices of the monuments on the Acropolis of Athens, and of the sculptors and the athlete-statues of Olympia, the lower limit of Pausanias is practically 150 B.C.; it is inferred that the authority followed by him ended with this date, and

it is more than suggested that his sole authority was Polemon. But the comparative neglect of works later than 150 B.C. might also be explained by the fact that the indepen- dence of Greece came to an end in 146. And, further, it so happens that Pausanias refers to very few sculptors for the 140 years (296-156 B.C.) before the age of his supposed authority, while some of the sculptors represented at Olympia have since been placed after that date, and not a few of the Athenian monuments described by Pausanias belong to the period between that date and the accession of Hadrian, or, approximately, the period between about 166 B.C. and a.d. 117 (Gurlitt, Uber Pausanias, pp. 117 seq., 194 seq., 257-267). More than one hundred extracts from, or reference to, the works of Polemon have come down to us, and it has been shown by Mr Frazer that " the existing fragments hardly justify us in supposing that Pausanias was acquainted with the writings of his learned predecessor; certainly they lend no countenance to the view that he borrowed descriptions of places and monuments from them." Again, it has been urged that his brief description of the Peiraeus is not true of his own time, as it had been burnt by Sulla (86 B.C.), and was still lying desolate in the age of Augustus, but his account of the buildings and monuments has been confirmed by an inscription conjecturally ascribed to the time of Pausanias (Frazer ii. 14 seq.). It has also been stated that the description of Arcadia must have been borrowed from far earlier writers, because Strabo (p. 388) says that most of the famous cities of that land had either ceased to exist or had left hardly a trace behind them; but the evidence of coins has proved that at least seven of the eleven cities described by Pausanias were still in existence long after the death of Strabo. It has further been assumed that his account of the temple of Apollo at Delphi is " irreconcilable with the remains of the building " and with the inscriptions recently discovered by the French archaeologists. We are told that Pausanias describes the temple of the 6th century B.C. as if it still existed in his own time. On the contrary, he states that the first sculptures for the gables were executed by a pupil of Calamis, the pupil of a sculptor still at work in 427 B.C., and the shields that he saw suspended on the architrave were captured from the Gauls in 279. Again, his description of New Corinth, built in 44 B.C., more than a century after the time of Polemon, is most minute and systematic, and it is confirmed by coins of the imperial age. In at least one important point Pausanias compares favourably with Strabo. While Strabo erroneously declares that not a vestige of Mycenae remains, Pausanias gives a brief but accurate description of the Lion-gate and the existing circuit-wall of the Acropolis, with a notice of the tombs " within the wall " (ii. 16,

5-7), a notice which led to their discovery by Schliemann. In all parts of Greece the accuracy of his descriptions has been proved by the remains of the buildings which he describes; and a few unim- portant mistakes (in v. 10, 6 and 9; viii. 37, 3, and 45, 5), and some slight carelessness in copying inscriptions, do not lend any colour to an imputation of bad faith. It has been stated with perfect justice by Frazer (p. xcv. seq.) that " without him the ruins of Greece would for the most part be a labyrinth without a clue, a riddle without an answer." " His book furnishes the clue to the labyrinth, the answer to many riddles. It will be studied so long as ancient Greece shall continue to engage the attention and awaken the interest of mankind."

Editions. — Siebelis (Leipzig, 1822); Schubart and Walz (1838); Teubner texts, Schubart (1862), and Spiro (1903). Text, Latin translation and index, L. Dindorf (Didot, Pans, 1845); text and German commentary, Hitzig and Bliimner, books i.-ix., already published in five parts (Leipzig, 1896-1907). Special edition of Descriplio arcis Athenarum, Otto Jahn (Bonn, i860), 3rd ed., with maps and plans, &c, A. Michaelis (1901). F. Imhoof-Blumer and Percy Gardner, " Numismatic Commentary on Pausanias," first pub- lished in Journal of Hellenic Studies, vi.-viii. (1885-1887); J. G. Frazer, Pausanias 1 $ Description of Greece, in six vols., introduction and translation (vol. i.), commentary (vols, ii.-v.), maps and index (vol. vi.) (Macmillan, London, 1898); introduction reprinted in Frazer's Pausanias and other Creek Sketches (1900).

Special Literature. — Wernicke, De Pausaniae studiis hero- doteis (Berlin, 1884); Wilamowitz, " Thukydideslegende," in Hermes (1877), xii. 346; P. Hirt, De fontibus Pausaniae in Eliacis (Greifswald, 1878); A. Flasch, in Baumeister's Denkmaler, s.v. "Olympia," 90 pp. (1887); A. Kalkmann, Pausanias der Perieget (Berlin, 1886), and in Archaologischer Anzeiger (1895), p. 12 ; opposed by W. Gurlitt, Uber Pausanias (Graz, 1890), 494 pp.; Bencker, Anteil der Periegese an der Kunstschriftstellerei (1890), and R. Heberdey, Die Reisen des Pausanias in Griechenland, with two maps (Vienna, 1894).

The present writer is much indebted to Gurlitt's comprehen- sive monograph, and to the admirable Introduction prefixed to J. G. Frazer's excellent Translation and Commentary. See also C. Robert, Pausanias als Schriftsteller (Berlin, 1909). (J. E. S.*)

PAUSIAS, a Greek painter of the 4th century, of the school of Sicyon. He introduced the custom of painting ceilings of houses. His great merit appears to have lain in the better rendering of foreshortening. The words in which Pliny (xxxv. 127) describes a bull painted by him

should be quoted: ” Wishing to display the length of the bull’s body, he painted it from the front, not in profile, and yet fully indicated its measure. Again, while others fill in with white the high lights, and paint in black what is less salient, he painted the whole bull of dark colour, and gave substance to the shadow out of the shadow itself, with great skill making his figures stand out from a flat background, and indicating their shape when foreshortened.” This passage well marks the state of painting at the time.

PA VANE, Pavan or Pavin, the name of a slow stately dance of the 16th and 17th centuries. The word has been variously derived: (1) from Lat. pavo, peacock; the dancers, as they wheel and turn, spread out their long cloaks, which they retained in this dance, like the tail of the bird; (2) from Padovana, i.e. of Padua, in Italy; the dance, however, is usually taken to have come from Spain. As an instrumental composition, common in the 16th and 17th centuries, the ” pavane ” was usually followed by the quick and lively ” galliard,” as the ” gigue ” followed the ” saraband ” in the later suite (see Dance).

PAVEMENT (Lat. pavimentu’M, a floor beaten or rammed hard, from pavire, to beat), a term originally applied to the covering of a road or pathway with some durable material, and so used of the paved footway at the side of a street — the “side- walk ” as opposed to the roadway proper. The term is also extended to the interior floor of churches and public buildings. It is probable that the earliest pavements consisted only of rammed clay, as in the ” beehive ” tombs of Mycenae, or of cement or stucco decorated with lines in coloured marbles, such as those mentioned in the Book of Esther (vi. 1) in the palace at Susa. W. M. Flinders Petrie discovered at Tell el’ Amarna in the palace of Akhenaton the remains of a stucco pavement, decorated with foliage, flowers, birds, &c, and a complete naturalistic treatment. The threshold of the doors of the Assyrian palaces were of stone carved with patterns in imitation of those in a

carpet. The pavements of Greek temples were either in stone or marble, and at Olympia the pronaos of the temple of Zeus was laid in mosaic representing tritons, and the floor of the naos was in coloured marbles. The Roman pavements were invariably in mosaic, sometimes of a very elaborate nature, as in the House of the Faun at Pompeii, where the mosaic represented the battle of Issus between Alexander

the Great and Darius III., a repro- duction probably of some Greek painting of the period. In Rome the palaces on the Palatine Hill and the thermae were all paved with mosaic, and numerous pavements have been found in Carthage, many of which are in the British Museum, as are also examples from the Roman villas in England. Perhaps the richest Roman pavements outside Italy are those at Treves in Germany. The Roman tradition was continued by the Byzan- tine architects, who, throughout the East, paved their churches with mosaics, frequently of the same design and execution as those of the Romans, but with Christian symbols. The churches of the Romanesque, Gothic and Renaissance periods were all paved in marble, but of a different character from those of the earlier period (see Mosaic).

PAVIA (anc. Ticinum, q.v.), a town of Lombardy, Italy, capital of the province of Pavia, situated on the Ticino about 2 m. above its junction with the Po, 225 m. S. of Milan by rail, 253 ft. above sea-level. Pop. (1906), 28,706 (town), 36,424 (commune). On the right bank of the river lies the small suburb of Borgo Ticino, connected with the town by a remark- able covered bridge dating from 1351-1354. In 1872 the city ceased to be a fortress, and the bastions have been transformed into boulevards and public gardens. The church of San Michele Maggiore is one of the finest specimens of the Lombard style in existence, and as it was within its walls that the crown was placed on the head of those ” kings of Italy ” from whom the house of Savoy claims descent it was by royal decree of 1863 given the title of Basilica Reale. S. Michele (for plan see Architecture: § Romanesque and Gothic in Italy) was originally constructed under the Lombard kings, but was burnt in 1004, and the present building dates from the latter part of the nth (crypt, choir and transepts) and the first half of the 1 2th centuries (facade and nave with two aisles), and was completed in 1 1 55- The lower part of the facade is adorned with three fine portals and with reliefs of a fantastic kind in sandstone, arranged in horizontal bands, and has arcading under the gable. The dome is octagonal. The interior is vaulted and has eight pillars, supporting double round arches. The interior has a mosaic pavement of the I2th-i3th centuries. The cathedral church of San Martino is a Renaissance building begun in 1488 by Cristoforo Rocchi; it is a vast ” central ” structure, finely designed, with four arms, which remained for centuries unfinished until the dome (only surpassed by those of St Peter at Rome and the cathedral at Florence) and facade were completed in 1898 according to Rocchi’s still extant model; adjoining the church is the massive Torre Maggiore, 258 ft. high, which is mentioned as early as 1330. The upper part is due to Pellegrino

Tibaldi (1583). The cathedral contains the tomb of S. Syrus, first bishop of Pavia (2nd century); an altar-piece (1521), the best work of Giampietino (Rizzi), a pupil of Leonardo da Vinci; and another, the masterpiece of Bernardino Gatti of Parma (1531). The church of S. Pietro in Ciel d'Oro, the origin of which dates from the beginning of the 6th (?) century, but which as it stands was consecrated in 1132, is very similar to S. Michele in respect of its facade (though it has not the elaborate sculptures) , dome and mosaic pavements. The use of disks of majolica may be noted in the decoration of the exterior. It has been carefully restored. It served as the burial place of the Lombard king Liutprand (711-744), whose bones were found there in 1896 (R. Majocchi in Nuovo bidletino d'archeologia cristiana, 1896, p. 139). The Area diS. Agostino (after 1362) is a sumptuous tomb containing the relics of S. Augustine of Hippo brought hither by Liutprand from Sardinia. It was only restored to this, its original position, from the cathedral when the church itself was restored.

The church of S. Maria del Carmine is externally one of the

most beautiful of the brick Gothic churches in northern Italy and dates from 1273 (or 1323?). S. Francesco has also a good facade after that of Chiaravalle near Milan. The church of S. Maria di Canepanova with its small dome was designed by Bramante. Near it are three tall, slender brick towers of the Gothic period. S. Teodoro with a 12th-century exterior has frescoes by Bar- tolommeo Suardi (Bramantino) after 1507. Outside the town on the west lie the churches of S. Salvatore (founded in the 7th century but rebuilt in the 15th and 16th), and of S. Lanfranc (or the Holy Sepulchre, 12th century) with the fine tomb of Bishop Lanfranco Beccari (d. 1 189) by Giovanni Antonio Amedeo (1498), one of the best Lombard sculptors and architects of this period (1447-1522) and a native of Pavia, which has a few other works by him. He was for eighteen years in charge of the work at the Certosa. Interesting medieval views of Pavia exist in the churches of S. Teodoro and S. Salvatore; the former dating from 1522 has been published by P. Moiraghi in Bullettino storico pavese (1893), i. 41 sqq. (See Magenta, / Visconti e gli Sjorza nel castello di Pavia (Milan, 1884), for other medieval plans.)

Of the secular buildings the most noteworthy is the university founded by Galeazzo II. in 1361 on the site of a law school probably founded by Lanfranc (d. 1089), though we find Pavia a centre of study as early as a.d. 825. The present imposing building was begun by Lodovico il Moro in 1490; in the library are preserved some of the ashes of Columbus, who was a student here. Volta made here his first electrical experiments. For the maintenance of a number of poor students there

are two subsidiary colleges, the Borromeo and the Ghislieri founded by S. Carlo Borromeo (1563) and Pope Pius V. (1569); of the latter a colossal bronze statue has been erected in the piazza before his college. The university of Pavia has long been famous as a medical school, and has the oldest anatomical cabinet in Italy; in addition it has a natural history museum founded under Spallan- zini in 1772, a botanical garden, begun in 1774, and excellent geological, palaeontological and mineralogical collections. The old castle of the Visconti built in 1360 for Galeazzo II. is used as barracks. The Museo Civico is housed in the Palazzo Malaspina and contains many interesting national relics and a small picture gallery, with a large collection of offprints on paper from niello plates, including a very fine " Fountain of Love " by Antonio Pollainolo; another fine old palace, the Palazzo Mezzabarba, is now used as the Municipio.

Pavia has a number of iron-foundries, military engineering and electrical production works, and other factories, as well as a large covered market, built in 1882. Pavia lies on the main line from Milan to Genoa (which crosses the Ticino by a bridge half a mile long, and shortly afterwards the Po), with several branch lines. Barges from Pavia can pass down the Po to the Adriatic or to Milan by canal. Five miles north of Pavia is the Carthusian monastery of Certosa di Pavia, one of the most magnificent in the world. Its founder Gian Galeazzo Visconti (also the founder of Milan Cathedral) laid the first stone in August 1396, and the nave was then begun in the Gothic style, but was hot completed until 1465. However the influence of the Early Renaissance had meanwhile become supreme throughout Italy, and the rest of the church with its external arcaded galleries and lofty pinnacles (including the fine dome) and the cloisters were executed in the new style under Guiniforte Solari (1453-1481) with details in terra-cotta of great beauty and richness. Giovanni Antonio Amedeo was chief architect in 1481-1499, and the lower part of the facade was finished in 1507. It is perhaps the finest piece of elaborate and richly adorned Renaissance architecture in existence, and is the work of a number of different artists. In the south transept of the church is the tomb of the founder; the figure of Galeazzo guarded by angels lies under a marble canopy, with the Madonna in a niche above. It was begun in 1494-1497 by Giovanni Cristoforo Romano and Benedetto Briosco, but was not finished until 1 562. In the north transept is the tomb of Lodovico Sforza, il Moro, and his wife, the figures on which were brought from S, Marja della Grazie in 1 564 when the monument of the prince in

that church was broken up and sold; these statues are considered to be one of the chief works of Cristoforo Solari. The church contains numerous other works of art. An elegant portal leads from the church into the small cloister, which has a pretty garden in the centre; the terra-cotta ornaments surmounting the slender marble pillars are the work of Rinaldo de Stauris (1463-1478), who executed similar decorations in the great cloister. This cloister is 412 ft. long by 334 ft. wide and contains 24 cells of the monks, pleasant little three-roomed houses each with its own garden. Within the confines of the monastery is the Palazzo Ducale which since 1901 has been occupied by the Certosa museum. The Carthusian monks, to whom the monastery was entrusted by the founder, were bound to employ a certain proportion of their annual revenue in prosecuting the work till its completion, and even after 1542 the monks continued voluntarily to expend large sums on further decoration. The Certosa di Pavia is thus a practical textbook of Italian art for wellnigh three centuries. The Carthusians were expelled in 1782 by the emperor Joseph II., and after being held by the Cistercians in 1784 and the Carmelites in 1789 the monastery was closed in 1810. In 1843 the Certosa was restored to the Carthusians and was exempted from confiscation in 1866, but it has since been declared a national monument.

History. — For earlier period see Ticinum. Under the name Papia (Pavia) the city became, as the capital of the Lombard kingdom, one of the leading cities of Italy. By the conquest of Pavia and the capture of Desiderius in 774 Charlemagne completely destroyed the Lombard supremacy; but the city continued to be the centre of the Carolingian power in Italy, and a royal residence was built in the neighbourhood (Cor- teolona on the Olona). It was in San Michele Maggiore in Pavia that Berengar of Friuli, and his quasi-regal successors down to Berengar II. and Adalbert II., were crowned ” kings of Italy.” Under the reign of the first the city was sacked and burned by the Hungarians, and the bishop was among those who perished. At Pavia was celebrated in 951 the marriage of Otto I. and Adelheid (Adelaide), which exercised so important an influence on the relations of the empire and Italy; but, when the succession to the crown of Italy came to be disputed betwden the emperor Henry II. and Arduin of Ivrea, the city sided strongly with the latter. Laid in ruins by Henry, who was attacked by the citizens on the night after his coronation in 1004, it was none the less ready to close its gates on Conrad the Salic in 1026. In the nth and 12th centuries we find Pavia called the ” Second Rome.” The jealousy between Pavia and Milan having in 1056 broken out into open war, Pavia had recourse to the hated emperors, though

she seems to have taken no part in the battle of Legnano; and for the most part she remained attached to the Ghibelline party till the latter part of the 14th century. From 1360, when Galeazzo was appointed imperial vicar by Charles IV., Pavia became practically a possession of the Visconti family and in due course formed part of the duchy of Milan. For its insurrection against the French garrison in 1499 it paid a terrible penalty in 1500, and in 1512, after the victory of Ravenna, Pavia presented to Louis XII., as a sign of fidelity, a magnificent standard: this however fell into the hands of Swiss mercenaries and was sent to Fribourg as a trophy of war (it no longer exists). Having been strongly fortified by Charles V., the city was in 1525 able to bid defiance to Francis I., who was so disastrously beaten in the vicinity, but two years later the French under Lautrec subjected it to a sack of seven days. In 1655 Prince Thomas of Savoy invested Pavia with an army of 20,000 Frenchmen, but had to withdraw after 52 days' siege. The Austrians under Prince Eugene occupied it in 1706, the French in 1733 and the French and Spaniards in 1743; and the Austrians were again in possession from 1746 till 1796. In May of that year it was seized by Napofeon, who, to punish it for an insurrection, condemned it to three days' pillage. In 1814 it became Austrian once more. The revolutionary movement of February 1848 was crushed by the Austrians and the university was closed; and, though the. Sardinian forces obtained possession in March, the Austrians soon recovered

their ground. It was not till 1859 that Pavia passed with the rest of Lombardy to the Sardinian crown.

At several periods Pavia has been the centre of great intel- lectual activity. It was according to tradition in a tower which, previous to 1584, stood near the church of the Annunziata that Boethius wrote his De consolatione philosophiae; the legal school of Pavia was rendered celebrated in the nth century by Lanfranc (afterwards archbishop of Canterbury); Petrarch was frequently here as the guest of Galeazzo II., and his grandson died and was buried here. Columbus studied at the university, about 1465; and printing was introduced in 1471. Two of the bishops of Pavia were raised to the papal throne as John XIV. and Julius III. Lanfranc, Pope John XIV., Porta the anatomist and Cremona the mathematician were bo-rn in the city.

See C. Dell' Acqua, Guida illustrata di Pavia (Pavia, 1900), and refs. there given; L. Beltrami, La Chartreuse de Pavie (Milan, 1899) ; Storia documentata della Certosa di Pavia (Milan, 1896). (T. As.)

PAVIA Y ALBUQUERQUE, MANUEL (1828-1895), Spanish general, was born at Cadiz on the 2nd of August 1828. He was the son of

Admiral Pavia, a naval officer of some note in the early part of the 19th century. He entered the Royal Artillery College at Segovia in 1841 ; became a lieutenant in 1846, a captain in 1855 and major in 1862. Three years later he joined the staff of Marshal Prim, and took part in the two unsuccessful revolutionary movements concerted by Prim in 1866, and, after two years of exile, in the successful revolution of 1868. Pavia showed much vigour against the republican risings in the southern provinces; the governments of King Amadeus of Savoy, from 1871 to 1873, also showed him much favour. After the abdication of that prince, General Pavia put down the Carlists and the cantonal insurrections of the chief towns of the south. On three occasions during the eventful year 1873, as captain-general of Madrid, he offered his services to put an end to the anarchy that was raging in the provinces and to the disorganization prevalent in the Cortes. To all he used the same arguments, namely, that they had to choose between an Alphonsist restoration or a dictatorial, military and political republic, which would rally round its standard all the most conservative groups that had made the revolution of 1868. This he hoped to realize with Castelar, but the plan was interrupted by the military pronunciamiento for the purpose of dissolving the Cortes of 1873. As soon as the federal Cortes had defeated Castelar, Pavia made his coup d'Uat of the 3rd of January 1874, and after the pronunciamiento was absolute master of the situation, but having no personal ambition, he sent for Marshal Serrano to form a government with Sagasta, Martos, Ulloa and other Conservatives and Radicals of the revolution. Pavia sat in the Cortes of the Restoration several times, and once defended himself skilfully against Emilio Castelar, who upbraided him for the part he had played on the 3rd of January 1874. He died suddenly on the 4th of January 1895.

PAVILION, properly a tent, a late use of Lat. papilio, butterfly, from which the word is derived through the French. The term is chiefly used of a tent with a high pitched roof, a small detached building used as a summer-house, &c, and particularly for a building attached to a recreation ground for the use of players and members. In architecture the term pavilion is specifically applied to a portion of a building which pro- jects from the sides or central part. It is a characteristic of French renaissance architecture. Where the buildings of a large institution are broken up into detached portions, as in St Thomas's Hospital, London, the term is generally applied to such detached buildings.

For the musical instrument known as the Chinese pavilion or Jingling Johnny, see Chinese Pavilion.

PA VIS, or Pa vise, a large convex shield, some 4 to 5 ft. high and sufficiently broad to cover the entire body, used in medieval warfare, as a protection against arrows and other missiles. The word appears in innumerable forms in Old French, Italian and Medieval Latin, and is probably to be referred to Pavia, in Italy, where such shields were made. The term ” pavisade ” or ” pavesade ” was used of a portable screen of

hurdles behind which archers might find protection, or of a similar defensive screen formed by linking together ” pavises,” especially on board a ship of war extending along the bulwarks, and hence in later times of a canvas screen similarly placed to conceal the rowers in a galley or the sailors on other types of ships.

PAVLOVO, a town of Russia, in the government of Nizhniy- Novgorod, 42 m. S.W. of the town of Nizhniy-Novgorod, on the Oka river. Pop. (1897), 12,200. It is the centre of a con- siderable cutlery, hardware and locksmith trade, which, carried on since the 17 th century in cottages and small workshops, engages, besides Pavlovo itself, no less than 120 villages. There are also steel works and cotton, silk, soap and match factories. Pavlovo has a museum of cutlery models and a library.

PAVLOVO POSAD, or Vokhna, a town of Russia, in the government of Moscow, 41 m. by rail E. of the city of Moscow, on the Klyazma river. Pop. (1897), 10,020. It is the centre of a manufacturing district, with silk, cotton and woollen mills, and dyeing and printing works.

PAVLOVSK, a town of Russia, in the government of St Petersburg 17 rri. by rail S. of the city of St Petersburg. Pop. (1897), 4949. It has an imperial castle (1782-1803) standing in a beautiful park and containing a small fine art museum and gallery. In the vicinity are smaller imperial palaces and summer residences of St Petersburg families.

PAWN. (1) A pledge, an object left in the charge of another, as security for the repayment of money lent, for a debt or for the performance of some obligation (see Pawnbroking). The word is an adaptation of O. Fr. pan, pledge, plunder, spoil. This has usually been identified with pan, from Lat. pannus, piece of cloth. The Teutonic words for pledge — such as Du. pand, Ger. Pfand have been also

traced to the same source; on the other hand these Teutonic forms have been connected with the word which appears in O. Eng. as pending, a penny, Ger. Pfennig, but this too has been referred to pannus. (2) The smallest piece on the chessboard. This, in its early forms, poun, pown, &c, is taken from Fr. poon or paon, variants of peon, Med. Lat. pedo, pedonis, a foot soldier, from pes, foot.

PAWNBROKING (O. Fr. pan, pledge, piece, from Lat. pannus; for " broking " see Broker), the business of lending money on the security of goods taken in pledge. If we desire to trace with minuteness the history of pawnbroking, we must go back to the earliest ages of the world, since the business of lending money on portable security (see Money-lending, and Usury) is one of the most ancient of human occupations. The Mosaic Law struck at the root of pawnbroking as a profitable business, since it forbade the taking of interest from a poor borrower, while no Jew was to pay another for timely accommodation. And it is curious to reflect that, although the Jew was the almost universal usurer and money-lender upon security of the middle ages, it is now very rare in Great Britain to find a Hebrew pawnbroker.

In China the pawnshop was probably as familiar two or three thousand years ago as it is to-day, and its conduct is still regulated quite as strictly as in England. The Chinese conditions, too, are decidedly favourable to the borrower. He may, as a rule, take three years to redeem his property, and he cannot be charged a higher rate than 3 % per annum — a regulation which would close every pawnshop in England in a month. Both Rome and Greece were as familiar with the operation of pawning as the modern poor all the world over; indeed, from the Roman jurisprudence most of the contemporary law on the subject is derived. The chief difference between Roman and English law is that under the former certain things, such as wearing apparel, furniture, and instruments of tillage, could not be pledged, whereas there is no such restriction in English legisla- tion. The emperor Augustus converted the surplus arising to the state from the confiscated property of criminals into a fund from which sums of money were lent, without System.ˆ interest, to those who could pledge valuables equal to double the amount borrowed. It was, indeed, in Italy, and in more modern times, that the pledge system which

is now almost universal on the continent of Europe arose. In its origin that system was purely benevolent, the early monts de piete established by the authority of the popes lending money to the poor only, without interest, on the sole condition of the advances being

covered by the value of the pledges. This was virtually the Augustan system, but it is obvious that an institution which costs money to manage and derives no income from its operations must either limit its usefulness to the extent of the voluntary support it can command, or must come to a speedy end. Thus as early as 1198 something of the kind was started at Freising in Bavaria; while in 1350 a similar endeavour was made at Salins in Franche Comte, where interest at the rate of 75% was charged. Nor was England backward, for in 1361 Michael Northbury, or de Northborough, bishop of London, bequeathed 1000 silver marks for the establishment of a free pawnshop. These primitive efforts, like the later Italian ones, all failed. The Vatican was therefore constrained to allow the Sacri monti di pieta — no satisfactory derivation of the phrase has yet been suggested — to charge sufficient interest to their customers to enable them to defray expenses. Thereupon a learned and tedious controversy arose upon the lawfulness of charging interest, which was only finally set at rest by Pope Leo X., who, in the tenth sitting of the Council of the Lateran, declared that the pawnshop was a lawful and valuable institution, and threatened with excommunication those who should presume to express doubts on the subject. The Council of Trent inferentially confirmed this decision, and at a somewhat later date we find St Charles Borromeo counselling the establishment of state or municipal pawnshops.

Long before this, however, monti di pieta charging interest for their loans had become common in Italy. The date o f their establishment was not later than 1464, when the earliest of which there appears to be any record in ˆ/p/ e ˆ # that country — it was at Orvieto — was confirmed by Pius II. Three years later another was opened at Perugia by the efforts of two Franciscans, Barnabus Interamnensis and Fortunatus de Copolis. They collected the necessary capital by preaching, and the Perugian pawnshop was opened with such success that there was a substantial balance of profit at the end of the first year. The Dominicans endeavoured to preach down the ” lending-house,” but without avail. Viterbo obtained one of 1469, and Sixtus IV. confirmed another to his native town in Savona in 1479. After the death of Brother Barnabus in 1474, a strong impulse was given to the creation of these establishments by the preaching of another Franciscan, Father Bernandino di Feltre, who was in due course canonized. By his efforts monti di pieta were opened at Assisi, Mantua, Parma, Lucca, Piacenza, Padua, Vicenza, Pavia and a number of places of less importance. At Florence the veiled opposition of the municipality and the open hostility of the Jews prevailed against him, and it was reserved to Savonarola, who was a Dominican, to create

the first Florentine pawnshop, after the local theologians had declared that there was “no sin, even venial,” in charging interest. The readiness of the popes to give permission for pawnshops all over Italy, makes it the more remarkable that the papal capital possessed nothing of the kind until 1539, and even then owed the convenience to a Franciscan. From Italy the pawnshop spread gradually all over Europe. Augsburg adopted the system in 1591, Nuremberg copied the Augsburg regulations in 1618, and by 1622 it was established at Amsterdam, Brussels, Antwerp and Ghent. Madrid followed suit in 1705, when a priest opened a charitable pawnshop with a capital of fivepence taken from an alms-box.

The institution was, however, very slow in obtaining a footing in France. It was adopted at Avignon in 1577, and at Arras in 1624. The doctors of the once powerful Sorbonne could not reconcile themselves to the lawfulness i a France. of interest, and when a pawnshop was opened in Paris in 1626, it had to be closed within a year. Then it was that Jean Boucher published his Defense des monts de piete. Marseilles obtained one in 1695; but it was not until 1777 that the first mont de piet6 was founded in Paris by

royal patent. The statistics which have been preserved rela- tive to the business done in the first few years of its existence show that in the twelve years between 1777 and the Revolution, the average value of the pledges was 42 francs 50 centimes, which is double the present average. The interest charged was 10% per annum, and large profits were made upon the sixteen million livres that were lent every year. The National Assembly, in an evil moment, destroyed the monopoly of the mont de piete, but it struggled on until 1795, when the competi- tion of the money-lenders compelled it to close its doors. So great, however, were the extortions of the usurers that the people began to clamour for its reopening, and in July 1797 it recom- menced business with a fund of £20,000 found by five private capitalists. At first it charged interest at the rate of 36 % per annum, which was gradually reduced, the gradations being 30, 24, 18, 15, and finally 12% in 1804. In 1806 it fell to 9%, and in 1887 to 7 %. In 1806 Napoleon I. re- established its monopoly, while Napoleon III., as prince-president, regulated it by new laws that are still in force. In Paris the pledge- shop is, in effect, a department of the administration; in the French

provinces it is a municipal monopoly; and this remark holds good, with modifications, for most parts of the continent of Europe.

In England the pawnbroker, like so many other distinguished personages, ” came in with the Conqueror.” From that time, indeed, to the famous legislation of Edward I., the Jew money-lender was the only pawnbroker. Yet, despite the valuable services which the class rendered, not infrequently to the Crown itself, the usurer was treated with studied cruelty — Sir Walter Scott’s Isaac of York was no mere creation of fiction. These barbarities, by diminishing the number of Jews in the country, had, long before Edward’s decree of banishment, begun to make it worth the while of the Lombard merchants to settle in England. It is now as well established as anything of the kind can be that the three golden balls, which have for so long been the trade sign of the pawn- broker, were the symbol which these Lombard merchants hung up in front of their houses, and not, as has often been suggested, the arms of the Medici family. It has, indeed, been conjectured that the golden balls were originally three flat yellow effigies of byzants, or gold coins, laid heraldically upon a sable field, but that they were presently converted into balls the better to attract attention. In 1338 Edward III. pawned his jewels to the Lombards to raise money for his war with France. An equally great king — Henry V. — did much the same in 1415.

The Lombards were not a popular class, and Henry VII. harried them a good deal. In the very first year of James I. ” An Act against Brokers ” was passed and remained on the statute-book until Queen Victoria had been thirty-five years on the throne. It was aimed at ” counterfeit brokers,” of whom there were then many in London. This type of broker was evidently regarded as a mere receiver of stolen goods, for the act provided that ” no sale or pawn of any stolen jewels, plate or other goods to any pawnbroker in London, Westminster or Southwark shall alter the property therein,” and that ” pawnbrokers refusing to produce goods to their owner from whom stolen shall forfeit double the value.”

In the time of Charles I. there was another act which made it quite clear that the pawnbroker was not deemed to be a very respectable or trustworthy person. Nevertheless a plan was mooted for setting that king up in the business. The Civil War was approaching and supplies were badly needed, when a too ingenious Royalist proposed the establishment of a state ” pawn- house.” The preamble of the scheme recited how ” the intoler- able injuries done to the poore subjects by brokers and usurers that take 30, 40, 50, 60, and more in the hundredth, may be remedied and redressed, the poor thereby greatly

relieved and eased, and His Majestie much benefited.” That the king would have been ” much benefited ” is obvious, since he was to enjoy two-thirds of the profits, while the working capital of £100,000 was to be found by the city of London. The reform of what Shakespeare calls ” broking pawn ” was in the air at that time,

although nothing ever came of it, and in the early days of the commonwealth it was proposed to establish a kind of mont de piete. The idea was emphasized in a pamphlet of 165 1 entitled Observations manifesting the Conveniency and Commodity of Mount Pieteyes, or Public Bancks for Relief of the Poor or Others in Distress, upon Pawns. No doubt many a ruined cavalier would have been glad enough of some such means of raising money, but this radical change in the principles of English pawnbroking was never brought about. It is said that the Bank of England, under its charter, has power to establish pawnshops; and we learn from A Short History of the Bank of England, published in its very early days, that it was the intention of the directors, ” for the ease of the poor,” to institute ” a Lombard ” ” for small pawns at a penny a pound interest per month.”

Throughout both the 17th and 18th centuries the general suspicion of the pawnbroker appears to have been only too well founded. It would appear from the references Fielding makes to the subject in Amelia, which, was written when George II. was on the throne, that, taken in the mass, he was not a very scrupulous tradesman. Down to about that time it had been customary for publicans to lend money on pledges that their customers might have the means of drinking, but the practice was at last stopped by act of parliament. Nor was respect for the honesty of the business increased by the attempt of ” The Charitable Corporation ” to conduct pawnbroking on a large scale. Established by charter in 1707, ” this nefarious corporation,” as Smollett called it, was a swindle on a large scale. The directors gambled wildly with the shareholders’ money, and in the end the common council of the city of London petitioned parliament for the dissolution of this dishonest concern, on the ground that’ ” the corporation, by affording an easy method’ of raising money upon valuables, furnishes the thief and pickpocket with a better opportunity of selling their stolen goods, and enables an intending bankrupt to dispose of the goods he buys on credit for ready money, to the defraud- ing of his creditors.” When the concern collapsed in 1731 its cashier was Mr George Robinson, M.P. for Marlow. In company with another principal official he disappeared, less than £30,000 being left of a capital which had once been twenty times as much.

The pawnbroker’s licence dates from 1785, the duty being fixed at

£10 in London and £5 in the country; and at the same time the interest chargeable was settled at |% per modern month, the duration of loans being confined to one Regulations year. Five years later the interest on advances ln En s Ian < 1 – over £2 and under £10 was raised to 15%. The modern history of legislation affecting pawnbroking begins, however, in 1800, when the act of 39 & 40 Geo. III. c. 99 (1800) was passed, in great measure by the influence of Lord Eldon, who never made any secret of the fact that, when he was a young barrister without briefs, he had often been indebted to the timely aid of the pawnshop. The pawnbrokers were grateful, and for many years after Lord Eldon's death they continued to drink his health at their trade dinners. The measure increased the rate of interest to a halfpenny per half-crown per month, or fourpence in the pound per mensem — that is to say, 20% per annum. Loans were to be granted for a year, although pledges might be redeemed up to fifteen months, and the first week of the second month was not to count for interest. The act worked well, on the whole, for three-quarters of a century, but it was thrice found necessary to amend it. Thus in 181 5 the licence duties were raised to £15 and £7, 10s. for London and the country respectively; another act of 1840 abolished the reward to the " common informer " for reporting illegal rates of interest; while in i860′ the pawnbroker was empowered to charge a halfpenny for the pawn-ticket when the loan was under five shillings. As time went on, however, the main provisions of the act of 1800 were found to be very irksome, and the Pawnbrokers' National Association and the Pawn-brokers' Defence Association worked hard to obtain a liberal revision of the law. It was argued that the usury laws had been abolished for the whole of the community with the

single exception of the pawnbroker who advanced less than £10. The limitations of the act of 1800 interfered so considerably with the pawnbrokers' profits that, it was argued, they could not afford to lend money on bulky articles requiring extensive storage room. In 1870 the House of Commons appointed a Select Committee on Pawnbrokers, and it was stated in evidence before that body that in the previous year 207,780,000 pledges were lodged, of which between thirty and forty millions were lodged in London. The average value of pledges appeared to be about 4s., and the proportion of articles pawned dishonestly was found to be only 1 in 14,000. Later official statistics show that of the forfeited pledges sold in London less than 2c per million are claimed by the police.

The result of the Select Committee was the Pawnbrokers Act of 1872, which repealed, altered and consolidated all previous legislation on the subject, and is still the measure which regulates the relations between the public and the ” brokers of pawn.” Based mainly upon the Irish law passed by the Union Parliament it put an end to the old irritating restrictions, and reduced the annual tax in London from £15 to the £7, 10s. paid in the provinces. By the provisions of the act (which does not affect loans above £10), a pledge is redeemable within one year, and seven days of grace added to the year. Pledges pawned for 10s. or under and not redeemed in time become the property of the pawnbroker, but pledges above 10s. are redeemable until sale, which must be by public auction. In addition to one halfpenny for the pawn-ticket — which is sometimes not charged for very small pawns — the pawnbroker is entitled to charge as interest one halfpenny per month on every 2s. or part of 2s. lent where the loan is under 40s., and on every 2s. 6d. where the loan is above 40s. <: Special contracts " may be made where the loan is above 40s. at a rate of interest agreed upon between lender and borrower. Unlawful pawning of goods not the property of the pawner, and taking in pawn any article from a person under the age of twelve, or intoxicated, or any linen, or apparel or unfinished goods or materials entrusted to wash, make up, &c, are, inter alia, made offences punishable by summary conviction. A new pawnbroker must produce a magistrate's certificate before he can receive a licence; but the permit cannot be refused if the applicant gives sufficient evidence that he is a person of good character. The word " pawnbroker " must always be inscribed in large letters over the door of the shop. Elaborate provisions are made to safeguard the interests of borrowers whose unredeemed pledges are sold under the act. Thus the sales by auction may take place only on the first Monday of January, April, July and October, and on the follow- ing days should one not be sufficient. This legislation was, no doubt, favourable to the pawnbroker rather than to the borrower. The annual interest on loans of 2s. had been increased by successive acts of parliament from the 6 % at which it stood in 1784 to 25% in 1800, and to 27 in i860 — a rate which was continued by the measure of 1872. The annual interest upon a loan of half-a-crown is now 260%, as compared with 173 in i860 and 86 in 1784; while the extreme point is reached in the case of a loan of is. for three days, in which case the interest is at the rate of 1014% per annum. An English mont de piete was once projected by the Salvation Army, and in 1894 the London County Council considered the practicability of municipal effort on similar lines; but in neither case was anything done.

The growth of pawnbroking in Scotland, where the law as to pledge

agrees generally with that of England, is remarkable.

Early in the 19th century there was only one pawn- aˆndlrelaad. broker in that country, and in 1833 the number

reached only 52. Even in 1865 there were no more than 312. It is probable that at the present moment Glasgow and Edinburgh together contain nearly as many as that total. In Ireland the rates for loans are practically identical with those charged in England, but a penny instead of a halfpenny is paid for the ticket. Articles pledged for less than £1 must be redeemed within six months, but nine months are allowed when the amount is between 30s. and £2. For sums over £2 the period is a year, as in England. In Ireland, too,

a fraction of a month is calculated as a full month for purposes of interest, whereas in England, after the first month, fortnights are recognized. In 1838 there was an endeavour to establish monts de piete in Ireland, but the scheme was so unsuccessful that in 1841 the eight charitable pawnshops that had been opened had a total adverse balance of £5340. But 1847 or dy three were left, and eventually they collapsed likewise.

The pawnbroker in the United States is, generally speaking, subject to considerable legal restriction, but violations of the laws and ordinances are frequent. Each state has its own regulations, but those of New York and Mas- states. sachusetts may be taken as fairly representative. ” Brokers of pawn ” are usually licensed by the mayors, or by the mayors and aldermen, but in Boston the police commissioners are the licensing authority. In the state of New York permits are renewable annually on payment of $500, and the pawnbroker must file a bond with the mayor, executed by himself and two responsible sureties, in the sum of $10,000. The business is conducted on much the same lines as in England, and the rate of interest is 3% per month for the first six months, and 2% monthly afterwards. Where, however, the loan exceeds $100 the rates are 2 and 1 % respectively. To exact higher rates is a misdemeanour. Unredeemed pledges may be sold at the end of a year. Pawnbrokers are not allowed to engage in any kind of second-hand business. New York contains one pawn- shop to every 12,000 inhabitants, and most of the pawnbrokers are Jews. In the state of Massachusetts unredeemed pledges may be sold four months after the date of deposit. The licensing authority may fix the rate of interest, which may vary for different amounts, and in Boston every pawnbroker is bound to furnish to the police daily a list of the pledges taken in during the preceding twenty-four hours, specifying the hour of each

transaction and the amount lent.

The fact that on the continent of Europe monts de piete are almost invariably either a state or a municipal monopoly necessarily places thein upon an entirely different footing from the British pawnshop, but, compared pawnshops. with the English system, the foreign is very elabor- ate and rather cumbersome. Moreover, in addition to being slow in its operation, it is, generally speaking, based upon the supposition that the borrower carries in his pockets ” papers ” testifying to his identity. On the other hand, it is argued that the English borrower of more than £2 is at the mercy of the pawn- broker in the matter of interest, that sum being the highest for which a legal limit of interest is fixed. The rate of interest upon a ” special contract ” may be, and often is, high. For the matter of that, indeed, this system of obtaining loans is always expensive, either in actual interest or in collateral disadvantages, whether the lender be a pawnbroker intent upon profit, or the official of a mont de piete. In Paris the rate charged is 7 , and even then the business is conducted at a loss except in regard to long and valuable pledges. Some of the French provincial rates are as high as 12, but in almost every case they are less than they were prior to the legislation of 1851 and 1852. The French establishments can only be created by decree of the president of the Republic, with the consent of the local conseil communal. In Paris the prefect of the Seine presides over the business; in the provinces the mayor is the president. The administrative council is drawn one-third each from the conseil communal, the governors of charitable societies, and the townspeople. A large proportion of the capital required for conducting the. institutions has to be raised by lean, while some part of the property they possess is the product of gifts and legacies. The profits of the Paris mont de piete are paid over to the ” Assistance Publique,” the comprehensive term used by France to indicate the body of charitable foundations. Originally this was the rule throughout France, but now many of them are entirely independent of the charitable institutions. Counting the head office, the branches and the auxiliary shops, the Paris establish- ment has its doors open in some fifty or sixty districts; but the volume of its annual business is infinitely smaller than that transacted by the London pawnbrokers. The amount to be

advanced by a municipal pawnshop is fixed by an official called the commissoire-priseur, who is compelled to load the scales against the

borrower, since, should the pledge remain unredeemed and be sold for less than was lent upon it, he has to make good the difference. This official is paid at the rate of \ % upon loans and renewals, and 3% on the amount obtained by the sales of forfeited pledges. This is obviously the weakest part of the French system. The Paris mont de piete undertakes to lend four-fifths of the intrinsic value of articles made from the precious metals, and two-thirds of that of other articles. The maximum and minimum that may be advanced are also fixed. The latter varies in different parts of the country from one to three francs, and the former from a very small sum to the 10,000 francs which is the rule in Paris. Loans are granted for twelve months with right of renewal, and unredeemed pledges may then be sold by auction, but the proceeds may be claimed by the borrower at any time within three years. Pledges may be redeemed by instalments.

Somewhere between forty and fifty French towns possess muni- cipal pawnshops, a few of which, like those of Grenoble and Mont- pellier, having been endowed, charge no interest. Elsewhere the rate varies from nil in some towns, for very small pledges, to 10 %. The constant tendency throughout France has been to reduce the rate. The great establishment in Paris obtains part of its working capital — reserves and surplus forming the balance — by borrowing money at a rate varying from 2 to 3 % according to the length of time for which the loan is made. Under a law passed in 1891 the Paris mont de pieˆte' makes advances upon securities at 6%, plus a duty of 5 centimes upon every hundred francs. The maximum that can be lent in this way is £20. Up to 80% is lent on the face value of government stock and on its own bonds, and 75 % upon other securities; but 60% only may be advanced on railway shares. These advances are made for six months. Persons wishing to borrow a larger sum than sixteen francs from the Paris mont de pi6te have to produce their papers of identity. In every case a numbered metal check is given to the customer, and a duplicate is attached to the article itself. The appraising clerks decide upon the sum that can be lent, and the amount is called Out with the number. If the borrower is dissatisfied he can take away his property, but if he accepts the offer he has to give full particulars of his name, address and occupation. The experts calculate that every transaction involving less than twenty-two francs results in a loss to the Paris mont de piete, while it is only those exceeding eighty-five francs which can be counted upon to be invariably profitable. The average loan is under thirty francs.

The borrowing of money on the security of goods deposited has been the subject of minute regulations in the Low Countries from an early date. So far back as the year 1600 the " archdukes " Albert and

Isabella, governors of the Spanish Netherlands under Philip III., reduced the lawful rate of interest from 325 to 2if%; but since extortion continued they introduced the mont de piete in 1618, and, as we have already seen, in the course of a dozen years the institution was established in all the populous Belgian towns, with one or two exceptions. The interest chargeable to borrowers was fixed originally at 15%, but was shortly afterwards reduced, to be again increased to nearly the old level. Meanwhile various towns possessed charitable funds for gratuitous loans, apart from the official institutions. Shortly after the mont de piete was introduced in the Spanish provinces, the prince-bishop of Liege (Ferdinand of Bavaria) followed the example set by the archdukes. He ordained that the net profits were to accumulate, and the interest upon the fund to be used in reduction of the charges. The original rate was 15%, when the Lombard money-lenders had been charging 43; but the prince-bishop's monts de piete were so successful that for many years their rate of interest did not exceed 5% — it was, indeed, not until 1788 that it was increased by one-half. These flourishing institutions, along with those in Belgium proper, were ruined by the French Revolution. They were, however, re-established under French dominion, and for many years the laws governing them were constantly altered by the French, Dutch and Belgian governments in turn. The whole subject is now regulated by a law of 1848, supplemented by a new constitution for the Brussels mont de piete dating from 1891.

The working capital of these official pawnshops is furnished by charitable institutions or the municipalities, but the Brussels one

possesses a certain capital of its own in addition. The rate of interest charged in various parts of the country varies from 4 to 16%, but in Brussels it is usually less than half the maximum. The management is very .similar to that of the French monts de pi6t6, but the arrangements are much more favourable to the borrower. The ordinary limit of loans is £120. In Antwerp there is an " anonymous " pawnshop, where the customer need not give his name or any other particulars. In Holland private pawn- brokers flourish side by side with the municipal " Banken van Leening," nor are there any limitations upon the interest that may be charged. The rules of the official institutions are very similar to those of the monts de piete in the Latin countries, and unredeemed pledges are sold publicly fifteen months after being pawned. A large proportion of the advances are made upon gold and diamonds; workmen's tools are not taken in pledge, and the amount lent varies from 8d. upwards. On condition of

finding such sum of money as may be required for working capital over and above loans from public institutions, and the ” caution money ” deposited by the city officials, the municipality receives the profits.

Pawnbroking in Germany is conducted at once by the state, by the municipalities, and by private enterprise; but of all these institutions the state loan office in Berlin is the most interesting. It dates from 1834, and the working a ™*° a- capital was found, and still continues to be in part provided, by the Prussian State Bank. The profits are invested, and the interest devoted to charitable purposes. The maximum and minimum rates of interest are fixed, but the rate varies, and often stands at about 12%. Two-thirds of the estimated value is the usual extent of a loan; four-fifths is advanced on silver, and five-sixths on fine gold. State and municipal bonds may be pledged up to a maximum of £150, the advance being 80 % of the value, and a fixed interest of 6% is charged upon these securities. The values are fixed by professional valuers, who are liable to make good any loss that may result from over-estimation. The bulk of the loans are under £5, and the state office is used less by the poor than by the middle classes. Loans run for six months, but a further six months' grace is allowed for redemption before the article pledged can be sold by auction. The net annual profit usually amounts to little more than 1 % upon the capital employed. The pawn- broking laws of Austria-Hungary are very similar to those which prevail in England. Free trade exists, and the private trader, who does most of the business, has to obtain a government concession and deposit caution-money varying in amount from £80 to £800, according to the size of the town. He has, however, to compete with the monts de piete or Versatzaemter, which are sometimes municipal and sometimes state institutions. The chief of these is the imperial pawn office of Vienna, which was founded with charitable objects by the emperor Joseph I. in 1707, and one-half of the annual surplus has still to be paid over to the Vienna poor fund. Here, as in Berlin, the profits are relatively small. Interest is charged at the uniform rate of 10%, which is calculated in fortnightly periods, however speedily redemption may follow upon pawning. For small loans varying from two to three kronen, 5% only is charged. The Hungarian state and municipal institutions appear, on the whole, to compete somewhat more successfully with the private firms than is the case in Vienna.

In Italy, the ” country of origin ” of the mont de piete, the institution still flourishes. It is, as a rule, managed by a com- mittee or commission, and the regulations follow pretty closely the lines of the one in Rome, which never lends less than iod. or more than £40. Four-

fifths of the value is lent upon gold, silver and jewels, and two-thirds upon other articles. The interest, which is reckoned monthly, varies with the amount of the loan from 5 to 7 %, but no interest is chargeable upon loans up to 5 lire. A loan runs for six months, and may be renewed for similar periods up to a maximum of five years. If the renewal does not take place within a fortnight of the expiration of the ticket, the pledge is sold, any surplus there may be being paid to the pawner. When more than 10 lire is lent there is a charge of 1 % for the ticket. Agencies of the mont de piete are scattered about Rome, and carry on their business under the same rules as the central office, with the disadvantage to the borrower that he has to pay an ” agent’s

Italy,

fee ” of 2 %, which is deducted from the loan. Private pawn- shops also exist in Italy, under police authority; but they charge very high interest.

The monts de piete in Spain have for a generation past been inseparably connected with the savings banks. We have already

seen that the institution owes its origin in that country Portugal t0 *- he c h ar i ta ble exertions of a priest who charged

no interest, and the system grew until in 1840, a century after his death, the mont de piete began to receive the sums deposited in the savings bank, which had just been estab- lished, for which it paid 5% interest. In 1869 the two institu- tions were united. This official pawnshop charges 6% upon advances which run for periods varying from four to twelve months, according to the nature of the article pledged, and a further month’s grace is allowed before the pledges are sold by auction. Private pawnbrokers are also very numerous, espe- cially in Madrid; but their usual charges amount to about 60% per annum. They appear, however, to derive advantage from making larger advances than their official rivals, and from doing business during more convenient hours. In Portugal the monte pio is an amalgamation of bank, benefit society and pawnshop. Its business consists chiefly in lending money upon marketable securities, but it also makes advances upon plate, jewelry and precious stones, and it employs officially licensed valuers. The rate of interest varies with the bank rate, which it slightly exceeds, and the amount advanced upon

each article is about three-fourths of its certified value. There is in Portugal a second class of loan establishment answering exactly to the English pawnshop. The pawnbroker is compelled to deposit a sum, in acceptable securities, equal to the capital he proposes to embark, and the register of his transactions must be sub- mitted quarterly to the chief of the police for examination. As regards small transactions, there appears to be no legal limit to the rate of interest. The sale of unredeemed pledges is governed by the law affecting the ” monte pio geral.”

In Russia the state maintains two pawnbroking establish- ments, one at St Petersburg and the other at Moscow, but

only articles of gold and silver, precious stones

and ingots of the precious metals are accepted by them. Advances are made upon such securities at 6% per annum, and the amounts of the loans are officially limited. Loans run for twelve months, with a month’s grace before unredeemed pledges are put up to auction. The bulk of this class of business in Russia is, however, conducted by private companies, which advance money upon all descriptions of movable property except stocks and shares. The interest charged is not allowed to exceed 1% per month, but there is an additional charge of \ % per month for ” insurance and safe keeping.” The loan runs for a year, with two months’ grace for redemption before sale. There are also a certain number of pawnshops conducted by individuals, who find it very difficult to compete with the companies. These shops can only be opened by a police permit, which runs for five years, and security, varying from £100 to £700, has to be deposited; 2% per month is the limit of interest fixed, and two months’ grace is allowed for redemption after the period for which an article is pledged.

Pawnbroking in Denmark dates from 1753, when the Royal Naval Hospital was granted the monopoly of advancing

money on pledges and of charging higher interest and Norway. tnan tri e law permitted. The duration of a loan

is three months, renewals being allowed. The old law was extended in 1867, and now all pawnbrokers have to be licensed by the municipalities and to pay a small annual licence fee. The rate of interest varies from 6 to 12% according to the amount of the loan, which must not be less than 7d., and unredeemed pledges must be sold by auction. In Sweden there are no special statutes affecting pawnbroking, with the exception of a proclamation by the governor of

Stockholm pro- hibiting the lending of money upon articles w.hich may be sus- pected of having been stolen. Individuals still carry on the business on a small scale, but the bulk of it is now conducted by

Russia,

companies, which give general satisfaction. For many years there was in Stockholm a municipal establishment charging 10% for loans paid out of the city funds. The cost of adminis- tration was, however, so great that there was an annual loss upon its working, and the opportunity was taken to abolish it when, in 1880, a private company was formed called the “Pant Aktie Bank,” to lend money on furniture and wearing apparel at the rate of 3 ore per krone a month, and 2 ore per krone a month on gold, silver and other valuables: a krone, which equals is. i|d., contains 100 ore. Some years later an opposition was started which charged only half these rates, with the result that the original enterprise reduced its interest to the same level, charging, however, 2 ore per krone per mensem for bulky articles — a figure which is now usual for pledges of that description. The money is lent for three months, and at the end of five months the pledge, if unredeemed, is sold by auction under very carefully prescribed conditions. In Norway a police licence is required for lending money on pawn where the amount advanced does not exceed £4, 10s. Beyond that sum no licence is necessary, but the interest charged must not exceed such a rate as the king may decide.

The fate of pawnbroking in Switzerland appears to be not very dissimilar from that of the Jew who is fabled to have once started in business at Aberdeen. Nevertheless „ „ . . the cantons of Bern and Zurich have elaborate laws for the regulation of the business. In Zurich the broker must be licensed by the cantonal government, and the permit can be refused only when the applicant is ” known to be a person undeserving of confidence.” Regular books have to be kept, which must be at all times open to the inspection of the police, and not more than 1% interest per month must be charged. A loan runs for six months, and unredeemed pledges may be sold by auction a month after the expiration of the fixed period, and then the sale must take place in the parish in which the article was pledged. No more than two persons at a time have ever been licensed under this law, the business being unprofitable owing to the low rate of interest. In the canton of Bern there were once two pawnbrokers. One died and the other put up his shutters. The Zurich cantonal bank, however, conducts a pawnbroking department, which lends nothing under 4s. or over £40 without the special sanction of the bank commission. Loans must not exceed two-thirds of the trade value of the pledge, but

80% may be lent upon the intrinsic value of gold and silver articles. The establishment makes practically no profit. The Swiss disinclination to go to the pawnshop is, perhaps, accounted for in some measure by the growing number of dealers in second-hand articles, to whom persons in want of ready money sell outright such things as are usually pledged, in the hope of subsequently buying them back. Since, however, the dealer is at liberty to ask his own price for repurchase, the expectation is often illusory, and can usually be fulfilled only upon ruinous terms. (J. P.-B.)

PAWNEE (perhaps from the native word for ” horn,” in allusion to their scalping lock, which was ” dressed ” so as to stand straight up), a tribe of North- American Indians of Caddoan stock. They formerly lived on the Platte river in Nebraska. They call, themselves Skihiksihiks (” men of men “). They were a brave, war-loving tribe, whose history was one of continual strife with their neighbours. In 1823 their village was burned by the Delawares, and in 1838 the tribe suffered severely from small-pox, the death-roll being, it is said, 2000. By treaty in 1833 they had ceded their territory south of the Platte, and in 1858 they surrendered all their remaining land except a strip on the Loup River. Here they lived till 1874, when they moved to a reservation in Indian Territory (now Oklahoma), where they now are.

PAWTUCKET, a city of Providence county, Rhode Island, U.S.A., on the Blackstone river (known below the Pawtucket Falls here as the Pawtucket or Seekonk river), 4 m. N. of Providence, and near the city of Central Falls. Pop. (1905, state census), 43,381, of whom 14,369 were foreign-born, includ- ing 4273 English, 3484 Irish, 2706 French Canadians, and 1198

Scotch; (1910), 51,622. Pawtucket is served by the New York, New Haven & Hartford railroad; and the river is navigable below tbe falls. The city lies on both sides of the river and its land area in 1906 was nearly 8-6 m. The east bank of the river rises quite abruptly 15-30 ft., but back of this the surface is level or only slightly undulating. On the west side the surface is more diversified. The Blackstone River here makes a picturesque plunge of nearly 50 ft. (Pawtucket Falls) over an irregular mass of rocks, providing a good water-power. The most attractive public building is the Sayles Memorial library, erected (1899-1902) by Frederick Clark Sayles (1835-1902) in memory of his wife. The city has a park of 181 acres in the east end, a park of 55

acres on the west side, three small parks near the business centre, a soldiers' monument, a home for the aged, an emergency hospital, and a state armoury. Manu- facturing is the principal industry, and the value of the factory products increased from $19,271,582 in 1900 to $25,846,899 in 1905, or 34-1%. More than one-half the value for 1905 was represented by textiles. Other important manufactures in 1905 were foundry and machine-shop products, packed meats, and electrical machinery, apparatus and supplies. The commerce of tbe city has been much increased by the deepening and widening of the channel of the Pawtucket river by the United States government. In 1867 the river could not be navigated at low water by boats drawing more than 5 ft. of water, but by March 1905 the government had constructed a channel ico ft. wide and 12 ft. deep at low water, and Congress had passed an act for increasing the depth to 16 ft.; in 1907 the Federal Congress and the general assembly of the state made appropriations to complete the work.

That portion of Pawtucket which lies east of the river was originally a part of the township of Rehoboth, Massachusetts, but in 181 2 the township of Seekonk was set apart from Rehoboth, in 1828 the township of Pawtucket was set apart from Seekonk, and in 1 86 2 almost all of the Massachusetts township of Pa wtucket was transferred to Rhode Island. The portion west of the river was taken from the township of North Providence and annexed to the township of Pawtucket in 1874, and in 1885 Pawtucket was chartered as a city. The first settlement within the present city limits was made about 1670 on the west side by Joseph Jenks (c. 1632-1717), a manufacturer of domestic iron implements. His manufactory was destroyed during King Philip's War, but he rebuilt it, and until a century later the industries on the west side were managed largely by his family. In 1790 Samuel Slater reproduced here the Arkwright machinery for the manufacture of cotton goods; this was the first manufactory of the kind that had any considerable success in the United States, and his old mill is still standing in Mill Street.

See R. Grieve, An Illustrated History of Pawtucket, Central Falls, and Vicinity (Pawtucket, 1897).

PAX (Lat. for " peace "), the name given in ecclesiastical usage to a small panel or tablet decorated usually with a representa- tion of the Crucifixion, which in the Roman ritual was kissed at the eucharistic service by the celebrating priest, then by the other priests and deacons, and then by the congregation. The " Pax " is also known by the names osculatorium, tabula pads and pax-bred {i.e. " pax-board "). The use of the " pax " dates from the 13th century, and it is said to

have been first introduced in England in 1250 by Archbishop Walter of York. It took the place of the actual ” kiss of peace ” (csculum sanctum, or osculum pads) which was in the Roman Mass given by the bishop to the priests, and took place after the consecration and before communion. In the Greek Church the kiss {dpr)vq, d

are in the British Museum. Though the Crucifixion is most usually represented, other religious subjects, such as the Virgin and Child, the Annunciation, the figures of patron saints and the like, are found. In the ” Inventarie of the Plate, Jewells . . . and other Ornaments appertayning to the Cathedrall Churche of Sayncte Paule in London,” 1552, we find two paxes mentioned; one “with the ymage of the Crucifix and of Marie and John all gylte with the Sonn alsoe and the Moone, the backsyde whereof is crymosin velvett,” and another ” with the ymage of our Ladie sett aboughte with x greate stones the backsyde whereof is grene velvett ” (Hierurgia anglicana, pt. i.,

1902).

PAXO [Paxos], one of the Ionian Islands (q.v.), about 8 m. S. of the southern extremity of Corfu, is a hilly mass of limestone 5 m. long by 2 broad, and not more than 600 ft. high. Pop. about 5000. Though it has only a single stream and a few springs, and the inhabitants were often obliged, before the Russians and English provided them with cisterns, to bring water from the mainland, Paxo is well clothed with olives, which produce oil of the very highest quality. Gaion (or, less correctly, Gaia), the principal village, lies on the east coast, and has a small harbour. Towards the centre, on an eminence, stands Papandi, the residence of the bishop of Paxo, and throughout the island are scattered a large number of churches, whose belfries add greatly to the picturesqueness of the views. On the west and south-west coasts are some remarkable caverns, of which an account will be found in Davy’s Ionian Islands, i. 66-71. Ancient writers — Polybius, Pliny, &c. — do not mention Paxos by itself, but apply the plural form Paxi (Ilafot) to Paxos and the smaller island which is now known as Antipaxo (the Propaxosof the Antonine Itinerary). Paxos is the scene of the curious legend, recorded in Plutarch’s De defectu oraculorum, of the cry ” Pan is dead ” (see Pan).

PAXTON, SIR JOSEPH (1801-1865), English architect and ornamental gardener, was born of humble parents at Milton Bryant, near Woburn, Bedfordshire, on the 3rd of August 1801, and was educated at the grammar school of that town. Having served his apprenticeship as gardener from the age of fifteen, and himself constructed a large lake when gardener to Battlesden in 1821, he was in 1823 employed in the

arboretum at Chiswick, the seat of the duke of Devonshire, and eventually became superintendent of the duke's gardens and grounds at Chatsworth, and manager of his Derbyshire estates. In 1836 he began to erect a grand conservatory 300 ft. in length, which was finished in 1840, and formed the model for the Great Exhibition building of 1851. In this year Faxton received the honour of knighthood. Perhaps his most interesting design was that for the mansion of Baron James de Rothschild at Ferrieres in France, but he designed many other important buildings. His versatility was shown in his organization of the Army Works Corps which served in the Crimea, his excellent capacity as a man of business in railway management, and his enterprising experi- ments in floriculture. In 1854 he was chosen M.P. for Coventry, which he continued to represent in the Liberal interest till his death at Sydenham on the 8th of June 1865. Paxton was elected in 1826 a fellow of the Horticultural Society. In the following year he married Sarah Bown. In 1833 he became a fellow of the Linnean Society, and in 1844 he was made a knight of the order of St Vladimir by the emperor of Russia.

He was the author of several contributions to the literature of horticulture, including a Practical Treatise on the Culture of the Dahlia (1838), and a Pocket Botanical Dictionary (1st ed., 1840). He also edited the Cottage Calendar, the Horticultural Register and the Botanical Magazine.

PAYMASTER-GENERAL, in England, a public officer and a member of the ministry for the time being. The office was, by statutes passed in 1835 and 1848, consolidated with other offices through which moneys voted by parliament were pre- viously paid. The paymaster-general is appointed by sign manual warrant, he is unpaid, and does not require to offer himself for re-election on acceptance of office. The money appropriated by parliament for the various services of the country is placed

by order of the Treasury to the account of the paymaster- general, and a communication to that effect made to the comptroller and auditor-general. The paymaster-general then makes all payments required by the various departments in accordance with the parliamentary vote. The duties of the office are carried out by a permanent staff, headed - by an assistant paymaster-general, acting on powers granted by the paymaster-general.

PAYMENT (Fr. paiement, from payer, to pay; Lat. pacare, to appease, pax, peace), the performance of an obligation, the discharge of a sum due in money or the equivalent of money. In law, in order that payment may extinguish the obligation it is necessary that it should be made at a proper time and place, in a proper manner, and by and to a proper person. If the sum due be not paid at the appointed time, the creditor is entitled to sue the debtor at once, in spite of the readiness of the latter to pay at a later date, subject, in the case of bills and notes, to the allowance of days of grace. In the common case of sale of goods for ready money, a right to the goods vests at once upon sale in the purchaser, a right to the price in the seller; but the seller need not part with the goods till payment of the price.

Payment may be made at any time of the day upon which it falls due, except in the case of mercantile contracts, where the creditor is not bound to wait for payment beyond the usual hours of mercantile business. If no place be fixed for payment, the debtor is bound to find, or to use reasonable means to find, the creditor, unless the latter be abroad. Payment must be made in money which is a legal tender (see below), unless the creditor waive his right to payment in money by accepting some other mode of payment, as a negotiable instrument or a transfer of credit. If the payment be by negotiable instrument, the instrument may operate either as an absolute or as a conditional discharge. In the ordinary case of payment by cheque the creditor accepts the cheque conditionally upon its being honoured; if it be dishonoured, he is remitted to his original rights. If payment be made through the post, in a letter properly directed, and it be lost, the debt is discharged if there was a direction so to transmit the money. The creditor has a right to payment in full, and is not bound to accept part payment unless by special agreement. Part payment is sufficient to take the debt out of the Statute of Limitation. It is a technical rule of English law that payment of a smaller sum, even though accepted by the creditor in full satisfaction, is no defence to a subsequent action for the debt. The reason of this rule seems to be that there is no consideration for the creditor foregoing his right to full payment. In order that payment of a smaller sum may satisfy the debt, it must be made by a person other than the person originally liable, or at an earlier date, or at another place, or in another manner than the date, place, or manner contracted for. Thus a bill or note may be satisfied by money to a less amount, or a money debt by a bill or note to a less amount; a debt of £100 cannot be discharged by pay- ment of £90 (unless the creditor execute a release under seal), though it may be discharged by payment of £10 before the day appointed, or by a bill for £10. Payment must in general be made by the debtor or 1 is agent,

or by a stranger to the contract with the assent of the debtor. If payment be made by a stranger without the assent of the debtor, it seems uncertain how far English law regards such payment as a satisfaction of the debt. If the debtor ratify the payment, it then undoubtedly becomes a satisfaction. Payment must be made to the creditor or his agent. A bona fide payment to an apparent agent may be good, though he has in fact no authority to receive it. Such payment will usually be good where the authority of the agent has been countermanded without notice to the debtor. The fact of payment may be presumed, as from lapse of time. Thus payment of a testator's debts is generally presumed after twenty years. A written receipt is only presumptive and not conclusive evidence of payment. By the Stamp Act 1891 a duty of one penny is imposed upon a receipt for or upon the payment of money amounting to £2 or upwards, and also a fine of £10 upon any person who, in any case where a receipt would be

liable to duty, refuses to give a receipt duly stamped. If pay- ment be made under a mistake of fact, it may be recovered, but it is otherwise if it be made under a mistake of law, for it is a maxim of law that ignorantia legis neminem excusat. Money paid under compulsion of law, even though not due, cannot generally be recovered where there has been no fraud or extor- tion. For appropriation of payments see Appropriation.

Payment Into and Out of Court. — Money is generally paid into court to abide the result of pending litigation, as where litigation has already begun, as security for costs or as a defence or partial defence to a claim. Payment into court does not necessarily (except in actions for libel and slander) operate as an admission of liability. Payment into court is regulated by the Rules of the Supreme Court, O. xxii. The fact that money has been paid into court may not be mentioned to a jury. Money may sometimes be paid into court where no litigation is pending, as in the case of trustees. Payment of money out of court is obtained by the order of the court upon petition or summons or otherwise, or simply on the request or the written authority of the person entitled to it.

Payment of Wages. — The payment of wages to labourers and workmen otherwise than in coin is prohibited. See Labour Legislation: Truck. Domestic or agricultural servants are ex- cepted. Payment of wages in public-houses (except in the case of domestic servants) is illegal.

Tender. — This is payment duly proffered to a creditor, but ren- dered

abortive by the act of the creditor. In order that a tender may be good in law it must as a rule be made under circumstances which would make it a good payment if accepted. The money tendered must be a legal tender, unless the creditor waive his right to a legal tender, as where he objects to the amount and not the mode of tender. Bank of England notes are legal tender for any sum above £5, except by the bank itself. Gold is legal tender to any amount, silver up to 40s., bronze up to is. (Coinage Act 1870). Any gold coinage, whether British, colonial or foreign, may be made legal tender by proclamation. The effect of tender is not to discharge the debt, but to enable the debtor, when sued for the debt, to pay the money into court and to get judgment for the costs of his defence.

Scotland. — The law of Scotland as to payment agrees in “most points with that of England. Where a debt is constituted by writ payment cannot be proved by witnesses; where it is not consti- tuted by writ, payment to the amount of £100 Scots may be proved by witnesses; beyond that amount it can only be proved by writ or oath of party. The term tender seems to be strictly applied only to a judicial offer of a sum for damages and expenses made by the defender during litigation, not to an offer made by the debtor before litigation. Bank of England notes are not a legal tender in Scotland or in Ireland.

United States. — In the United States the law as a rule does not materially differ from English law. In some states, however, money may be recovered, even when it has been paid under a mis- take of law. The question of legal tender has been an important one. In 1862 and 1863 Congress passed acts making treasury notes legal tender (see Greenbacks). After much litigation, the Supreme Court of the United States decided in 1871 {Knox v. Lee) in favour of the constitutionality of these acts, both as to contracts made before and after they were passed. These notes are legal tender for all purposes except duties on imports and interest on the public debt. All gold coins and standard silver dollars are legal tender to any amount. Silver coins below the denomination of a dollar are legal tender up to $10, and cent and 5-cent pieces legal tender to an amount not exceeding 25 cents. It falls exclusively within the jurisdiction of Congress to declare paper or copper money a legal tender. By the constitution of the United States, ” no state shall . . . make anything but gold and silver coin a tender in payment of debts ” (art. i. § 10). (T. A. I.)

PAYMENT OF MEMBERS. From time to time proposals have been made to reintroduce in the English parliamentary system a practice which is almost universally adopted in other countries, that of paying a state salary to members of the legislative body. In the earlier history

of the English parlia- ment the payment of commoners or representatives of the people was for long the practice. They had first been summoned to the great council of the realm in 1265 in the reign of Henry III. The shires and boroughs they representecLpaid them for their services, and reimbursed the expenses they were put to in journeying to and from the place of meeting. In 1322, by a statute of Edward II., the salary of a knight was fixed at 4s. a day, and that of a citizen or burgher at 2s. a day. These payments could be enforced by writs issued after the dissolution of each parliament, and there are many instances of the issue of such writs down to the reign of Henry VIII.; while the last known instance is that of one Thomas King, who in 168 1 obtained

a writ for his salary against the corporation of Harwich. The practice of the payment of members of parliament gradually fell into desuetude, and in the second parliament of Charles II. strong disapproval was expressed of the practice. Its gradual abandonment was due first to the difficulty of securing repre- sentatives in the early parliaments. Men of business were unwilling to detach themselves from their affairs, as travel was slow and dangerous; in addition to the perils of the journey there was the almost certain knowledge that a safe return from parliament would be followed by the ill will of the member's neighbours, for every meeting of parliament was but a device on the part of the sovereign for inflicting some new form of taxation, and a refusal to vote such taxation was but to incur the royal displeasure. The towns themselves were equally disinclined to bear the burden of their member's maintenance, and some even went so far as to obtain their disfranchisement. In the second place, the growing influence of parliament in the 1 6th century brought about a revulsion of feeling as to parliamentary services, and the increase in the number of candidates led first to bargaining on their part in the shape of undertaking to accept reduced wages and expenses, and, finally, to forego all. A step further was reached when the constituency bargained as to what it should receive from its representative, resulting in wholesale bribery, which required legislation to end it (see Corrupt Practices).

In England, the House of Commons has on various occa- sions carried resolutions in favour of the principle, more especially on the 24th of March 1893 (by 276 votes to 220), and on the 22nd of March 1895 (by 176 to 158). On these occasions the resolutions simply specified

an “adequate allowance”; but on the 7th of March 1906 a resolution was carried (by 348 votes tD no) in favour of an allowance ” at the rate of £300 per annum.”

Appended are the salaries paid to legislators in various countries in 1 910.

British Colonies

South Africa. — Before the South Africa Act 1909, which brought about the union of Cape Colony, Natal, Orange River Colony and the Transvaal, each colony had its own legislature. For purposes of comparison, the salaries which were paid to the members of these state legislatures are given below. The act of 1909 reduced the colonies to the position of dependent provinces, entrusted only with local administration by means of provincial councils. The act of 1909 (§ 76) enacts that the members of provincial councils shall receive such allowances as shall be determined by the governor-general in council. Mem- bers of the new South African legislature receive £400 a year, subject to a deduction of £3 a day for each day’s non-attendance.

Cape Colony. — Members of either house were paid 21s. a day, and those residing more than 15 m. from Cape Town an additional 15s. a day, for a period not exceeding 90 days.

Natal. — Members of the legislature were not paid, but those residing more than 2 m. from the seat of government received a travelling allowance of £1 a day during the session.

Orange River Colony. — At the end of the session each member received £150, and an additional £2 for each day of actual attendance, but not more than £300 in all.

Transvaal Colony. — As in the Orange River Colony.

Canada. — Federal government. Members of both houses are paid $2500 per session, but subject to a deduction of $15 a day lor each day of non-attendance.

Ontario. — Members of the Legislative Assembly are paid mileage and an allowance of $6 a day for 30 days, with a maximum of $1000.

Quebec’ — Members of the Legislative Assembly are paid $6 a day during the session.

Nova Scotia. — Members are paid an indemnity of $500 for the session.

New Brunswick. — Members of the Legislative Assembly receive $500 per session and travelling expenses.

Manitoba. — Members of the Legislat ive Assembly receive $1000 per session and travelling expenses.

British Columbia. — Members of the Legislative Assembly receive $1200 per session and travelling expenses.

Prince Edward Island. — Members of the Legislative Assembly

1 Quebec and Nova Scotia have each two chambers. The other Canadian provinces have only one chamber.

receive $160 per annum and travelling expenses, with an additional $12 for postage.

Australian Commonwealth. — Members of parliament receive £600 per annum.

New South Wales. — Members of the Legislative Assembly receive £300 per annum, and free travel over all government railways and tramways. They are also given official stamped envelopes for their postage purposes.

Victoria. — Members of the Legislative Assembly receive £300 per annum and free passes over all railways.

Queensland. — Members of the Legislative Assembly receive £300 per annum, with travelling expenses.

South Australia. — Members both of the Legislative Council and of the House of Assembly receive £200 per annum and free passes over all government railways.

Western Australia. — Members of the Legislative Council receive £200 a year and free travel on all government railways.

Tasmania. — Members of both houses receive £100 a year and free railway passes.

New Zealand. — Members of the Legislative Council are paid £200 per annum. Members of the House of Representatives are paid £25 a month.

United States

Federal Government. — Senators, representatives or delegates receive $7500 a year, and travelling expenses.

Alabama. — There is a session once in four years, such session being limited to 50 days, during which senators and representatives receive $4 a day and mileage.

Arizona Territory. — A biennial session of 60 days' duration, during which members of the council and representatives receive $4 a 'day and mileage.

Arkansas has a biennial session of 60 days' duration, for which senators and representatives receive $6 a day and mileage.

California's legislature meets biennially, but there is no fixed length for the session. Senators and members of the Assembly receive $1000 and mileage for the term.

Colorado's session is biennial and limited to 90 days. Senators and representatives receive $7 a day and mileage during session.

Connecticut gives senators and representatives $300 and mileage for their term of two years.

Delaware has biennial sessions of 60 days, and may have extra sessions limited to 30 days. Senators and representatives receive $5 a day during sessions.

Florida has biennial sessions of 60 days. Senators and repre- sentatives receive $6 a day during the session and mileage.

Georgia has annual sessions limited to 50 days. Senators and representatives receive $4 a day and mileage.

Idaho's senators and representatives receive mileage and $5 a day during the session, which is biennial.

Illinois has a biennial session, for which senators and repre- sentatives receive $1000 a year and mileage. For extraordinary sessions they receive $5 a day.

Indiana has biennial sessions limited to 60 days. Senators and representatives receive $6 a day and mileage.

Iowa has biennial sessions of unlimited length. Senators and

representatives receive $550 for the session, with mileage.

Kansas has biennial sessions limited to 50 days. Senators and representatives receive $3 a day during the session, with mileage.

Kentucky has biennial sessions limited to 60 days. Senators and representatives receive $5 a day and mileage.

Louisiana has biennial sessions limited to 60 days. Senators and representatives receive $5 a day during the session with mileage.

Maine's senators and representatives receive $300 a year and mileage. Sessions are biennial and of no fixed length.

Maryland has biennial sessions limited to 90 days. Senators and delegates receive $5 a day during the session and mileage.

Massachusetts has an annual session, for which senators and representatives receive each a lump sum of $750 and mileage.

Michigan has biennial sessions not of fixed length, and senators and representatives are paid $ 800 a year and mileage.

Minnesota has biennial sessions limited to 90 days. Senators and representatives receive $1000 a year besides limited travelling expenses.

Mississippi has a session every four years, unlimited in length. Special sessions, also, limited to 30 days, are held in alternate years. Senators and representatives receive a sum of $400 for each session.

Missouri has biennial sessions of no fixed length. Senators and representatives receive $5 a day for the first 70 days of each session, and $1 a day for each succeeding day.

Montana has biennial sessions limited to 60 days. Senators and representatives receive $12 a day during session.

Nebraska has biennial sessions unlimited in length. Senators and representatives are paid $5 a day and mileage (10 cents a mile) for not more than 60 days of any one session. If extra- ordinary sessions are held the total days paid for must not exceed 100 during the two years for which they sit.

Nevada has biennial sessions limited to 60 days, but special sessions limited to 20 days may be held. Senators and repre- sentatives receive $10 a day and mileage during sessions.

New Hampshire has biennial sessions, which last until prorogued by the governor. The duration is usually about three months. Senators and representatives receive $200 for the session and mileage.

New Jersey has an annual session, unlimited in length. Senators and members of the General Assembly receive $500 a year.

New Mexico has biennial sessions of 60 days. Members of the Council and representatives receive $4 a day.

New York has an annual session. Members of the Senate and of the Assembly receive $1500 a year.

North Carolina has biennial sessions limited to 60 days. Senators and representatives receive $4 a day during the session, and mileage.

North Dakota has biennial sessions limited to 60 days. Senators and representatives receive $5 a day during the session and mileage.

Ohio has biennial sessions not limited in length. Senators and representatives receive $1000 a year.

Oklahoma has biennial sessions. Senators and representatives receive $6 a day for the first 60 days — thereafter $2 a day — and mileage (10 cents a mile).

Oregon has biennial sessions limited to 240 days. Senators and representatives receive $3 a day during the session and mileage.

Pennsylvania has biennial sessions. Senators and representatives receive J1500 for the session with mileage, with an extra allowance of $150 for stationery and postage.

Rhode Island has an annual session unlimited in length. Senators and representatives receive $5 a day during the session.

South Carolina has an annual session unlimited in length. Senators and representatives receive $4 a day for the first 40 days.

South Dakota has biennial sessions of 60 days. Senators and representatives receive $5 for each day’s attendance, and travelling expenses.

Tennessee has biennial sessions. Senators and representatives receive $4 a day for not more than 75 days a session and mileage (16 cents a mile). If absent they do not receive pay, unless they are physically unable to be present.

Texas has biennial sessions, unlimited in length. Senators and representatives receive mileage and $5 a day for the first 60 days of the session ; for succeeding days $2 a day.

Utah has biennial sessions limited to 60 days. Senators and representatives receive $4 a day during the session, and mileage.

Vermont has biennial sessions unlimited in length. Senators and representatives receive $4 a day during the session and mileage.

Virginia has biennial sessions limited to 60 days. Senators and delegates receive $500 for the session and mileage.

Washington has biennial sessions limited to 60 days. Senators and representatives receive $5 a day for each day s attendance and travelling expenses.

West Virginia has biennial sessions limited to 45 days, which can be added to by a two-thirds majority. Senators and delegates receive $4 a day during the session and mileage.

Wisconsin has biennial sessions. Senators and members of the Assembly receive $500 for the session, and travelling expenses at the rate of 10 cents a mile.

Wyoming has biennial sessions limited to 40 days. Senators and representatives receive $8 a day during the session and mileage.

Foreign Countries

Argentina. — Both senators (30) and members of the House of Deputies (120) receive £1060 a year.

Austria. — Members of the Lower House (516) receive 16s. 8d. for each day's attendance, with travelling expenses.

Belgium. — Members of the Chamber of Representatives (166) receive £160 a year and a free pass over railways.

Bolivia. — Senators (16) and deputies (69) receive £40 a month during sessions, which last from 60 to 90 days.

Bulgaria. — Members of the Legislature receive 16s. a day during the session, which nominally lasts from the 15th of October to the 15th of December.

Denmark. — Members both of the Landsthing (66) and of the Folkething (114) receive us. id. a day for the first six months of the session, and 6s. 8d. for each additional day of the session. They receive also second-class free passes on all railways.

France. — Members of both the Senate (300) and of the Chamber of Deputies (584) receive £600 a year.

German Empire. — Members both of the Bundesrat (58) and of the Reichstag (397) receive £150 for the session, but have

deducted £1 for each day's absence. They receive also free passes over the German railways during the session.

Baden pays members of its Second Chamber and such members of the Upper Chamber as have not got hereditary seats 1 2s. a day and travelling expenses, but to those members who reside in the capital 9s. a day only.

Bavaria pays members of the Lower House (163) £180 for a regular session. They are also allowed free travel over the government railways.

Hesse.— Members of the Second Chamber (50) and non- hereditary members' of the Upper Chamber who reside more than 1 1 m. from the place of meeting receive 9s. a day and 3s. for each night, besides a refund of their travelling expenses.

Prussia. — Members of the Lower Chamber (433) receive travelling expenses and diet money (according to a fixed scale) of 15s. a day.

Saxe-Coburg. — Members of the Second Chamber residing in Coburg or Gotha receive 6s. a day; other members receive 10s. a day and travelling expenses.

Saxony.- — Members of the Second Chamber (82) and non- hereditary members of the Upper Chamber receive 12s. a day (6s. a day if they live in the place of meeting) and an allowance for travelling.

Wiirttemberg. — Members of both chambers receive 15s. a day for actual attendance; also free passes over the railways.

Greece. — The members (235) receive £72 for the session, also free passes on railway and steamship lines.

Hungary. — Members of the House of Representatives (453) receive £200 a year, with allowance of £66 13s. for house rent.

Italy. — Members of the Legislature receive no payment, although attempts have been made from 1862 onwards to intro- duce payment of members. It was last brought forward in 1908, the amount suggested being 24s. for every sitting attended.

Japan. — Members of the House of Representatives (379) and non-hereditary members of the House of Peers receive £210 a year, besides travelling expenses.

Mexico. — Both senators (56) and representatives (340) receive $3000 a year.

Netherlands. — Members of the First Chamber (50) not residing in the Hague receive 16s. 8d. a day during the session; members of the Second Chamber (100) receive £166 a year, besides travel- ling expenses.

Norway. — Members of the Storting (123) receive 13s. 4d. a day during the session, besides travelling expenses.

Paraguay. — Both senators and deputies receive £200 a year.

Portugal. — Deputies have been unpaid since 1892, but deputies for the colonies, whose homes are in the colonies, receive £20 a month or 13s. 4d. a day during sittings of the Chamber, and £10 a month when the Chamber is not sitting.

Rumania. — Both senators (120) and deputies (183) receive 1 6s. 8d. for each day of attendance, besides free railway passes.

Russia. — Members of the Duma receive 21s. a day during the session, and travelling expenses.

Servia. — Deputies (120) receive 12s. a day and travelling expenses.

Spain. — Members of the Legislature receive no salary, but deputies on their election receive a railway ticket for 2480 m. travel.

Sweden. — Members of both the First Chamber (150) and the Second Chamber (230) receive £66 for each session of 4 months, besides

travelling expenses.

Switzerland. — Members of the State Council are paid by the canton they represent, and their salary varies according to the wealth or liberality of the canton. The salary ranges thus from 12s. 6d. to 25s. a day, the average of the whole being 16s. a day. Members of the National Council (167) jre paid from Federal funds. They receive 16s. 8d. a day for each day they are present, with travelling expenses. (T. A. I.)

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Pharyngitis;

Phlebitis.

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Israel Abrahams, M.A. [

Reader in Talmudic and Rabbinic Literature in the University of Cambridge. J PerleS JOSeph. Formerly President, Jewish Historical Society of England. Author of A Short | History of Jewish Literature; Jewish Life in the Middle Ages; Judaism; &c. L

Israel Gollancz, M.A., Litt.D. f

Professor of English Language and Literature, King's College, London, and Dean J p„_i rm,., of the Faculty of Arts, University of London. Fellow and Secretary of the British 1 rear, » ln8. Academy. Editor of The Pearl; The " Temple " Shakespeare; &c. I

John Allan Howe, B.Sc. f Permian;

Curator and Librarian of the Museum of Practical Geology, London. Author of \ Pleistocene; The Geology of Building Stones. ' Pliocene.

Polar Regions.

Periodicals.

Platypus (in part).

Phonetics.

Pistol.

Plate (in part).

Peter des Roches.

John Addington Symonds, LL.D., D.C.L." See the biographical article: Symonds, J. A.

James Bartlett.

Lecturer on Construction, Architecture, Sanitation, Quantities, &c, at King's College, London. Member of Society of Architects. Member of Institute of Junior " Engineers. Author of Quantities. |_

James David Bourchier, M.A., F.R.G.S. r

King's College, Cambridge. Correspondent of The Times in South-Eastern Europe. J Philjnni Commander of the Orders of Prince Danilo of Montenegro and of the Saviour of 1 Greece, and Officer of the Order of St Alexander of Bulgaria. [

[Petrarch; Poggio; 1 Politian.

Plaster-work.

John Edwin Sandys, M.A., Litt.D., LL.D.

Public Orator in the University of Cambridge, and Fellow of St John's College. Fellow of the British Academy. Author of History of Classical Scholarship ; &c.

James Fitzmaurice-Kelly, Litt.D., F.R.Hist.S.

Gilmour Professor of Spanish Language and Literature, Liverpool University. Norman McCoIl Lecturer, Cambridge University. Fellow of the British Academy. ■ Member of the Royal Spanish Academy. Knight Commander of the Order of Alphonso XII. Author of A History of Spanish Literature ; &c.

Joseph Frank Payne, M.D., F.R.C.P. (1840-1910).

Formerly Harveian Librarian, Royal College of Physicians. Hon. Fellow of. Magdalen College, Oxford. Fellow of University of London. Author of Lectures' on A nglo-Saxon Medicine ; &c.

James Gairdner, C.B., LL.D.

See the biographical article: Gairdner, James.

John George Clark Anderson, M.A. f p. gsi – nng

Student, Censor and Tutor of Christ Church, Oxford. Formerly Fellow of Lincoln -I resslnu5. College. Craven Fellow (Oxford), 1896. Conington Prizeman, 1893. [

Pliny the Elder; Pliny the Younger.

Pereda, Jos6 Maria de; Perez Galdos, Benito; Picaresque Novel, The.

Plague (in part).

Percy: family (in part).

X

J. G. Ft.

J. H. A. H. J. H. M.

J. H. R. J. H. V. C.

J. L. M.

J. L. W.

J. Mt.

J. M. M. 3. P. P.

J. R. C. J. R. Gr.

J. S. P.

J. T. Be. J. T. C.

J.W. J. Wa.

J. Wal.* J. W. D.

INITIALS AND HEADINGS OF ARTICLES

James George Feazer, M.A., D.C.L., LL.D., Litt.D.

Professor ot Social Anthropology, Liverpool University, and Fellow of Trinity – College, Cambridge. Fellow of the British Academy. Author of The Golden Bough; &c.

John Henry Arthur Hart, M.A.

Fellow, Theological Lecturer and Librarian, St John's College, Cambridge.

John Henry Middleton, M.A., Litt.D., F.S.A., D.C.L. (1846-1806).

Slade Professor of Fine Art in the University of Cambridge, 1 886-1 895. Director of the Fitzwilliam Museum, Cambridge, 1889-1892. Art Director of the South "1 p – t ■ h – Kensington Museum, 1892-1896. Author of The Engraved Gems of Classical ' rintuncemo. Times ; Illuminated Manuscripts in Classical and Mediaeval Times.

Penates (in part).

Pharisees.

Phigalia (in part);

John Horace Round, M.A., LL.D.

Balliol College, Oxford. Author of Feudal England ; Studies in Peerage and Family • History; Peerage and Pedigree.

Percy: family (in part); Plantagenet.

John Henry Verrinder Crowe. f

Lieut. -Colonel, Royal Artillery. Commandant of the Royal Military College of Canada. Formerly Chief Instructor in Military Topography and Military History^ Plevna, and Tactics at the Royal Military Academy, Woolwich. Author of Epitome of the Russo-Turkish War, 1877-1878; &c. L

John Linton Myres, M.A., F.S.A., F.R.G.S.

Wykeham Professor of Ancient History in the University of Oxford, and Fellow of Magdalen College. Formerly Gladstone Professor of Greek and Lecturer in Ancient Geography, University of Liverpool. Lecturer in Classical Archaeology in University of Oxford, and Student and Tutor of Christ Church. Author of A History of Rome ; &c. t

Jessie Laidlay Weston.

Author of Arthurian Romances unrepresented in Malory.

{

Pelasgians.

Perceval.

James Moffatt, M.A., D.D.

Minister of the United Free Church of Scotland. tnent ; &c.

Author of Historical New Testa-

John Malcolm Mitchell.

Sometime Scholar of Queen's College, Oxford. Lecturer in Classics, East London College (University of London). Joint-editor of Grote's History of Greece.

J Philemon;

[Philippians, Epistle to the.

Peisistratus;

Peloponnesian War;

Persia: History (Transition

Period) ; Plutarch (in part).

John Percival Postgate, M.A., Litt.D. r

Professor of Latin in the University of Liverpool. Fellow of Trinity College,) p . , Cambridge. Fellow of the British Academy. Editor of the Classical Quarterly. ~| “naeflrus. Editor-in-chief of the Corpus Poetarum Latinorum ; &c. [_

Joseph Rogerson Cotter, M.A. r

Assistant to the Professor of Natural and Experimental Philosophy, Trinity College, 4 Phosphorescence. Dublin. Editor of 2nd edition of Preston’s Theory of Heat. _

Joseph Reynolds Green, M.A., D.Sc, F.L.S., F.R.S.

Fellow, Lecturer and Librarian of Downing College, Cambridge

Lecturer on Plant Physiology, University of Liverpool. Author of History

Botany ; &c.

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n

John Smith Flett, D.Sc, F.G.S.

f Pegmatite; Peridotite; Perlite; Petrology; Phonolite;

Petrographer to the Geological Survey of the United Kingdom. Formerly Lecturer J Phosphates: Mineral Phos-

on Petrology in Edinburgh University. Neill Medallist of the Royal Society of Edinburgh. Bigsby Medallist of the Geological Society of London.

phates (in part); Pbyllite; Picrite; Pitchstone; Pneumatolysis.

John Thomas Bealby. r Perm (in part);

Joint-author of Stanford's Europe. Formerly Editor of the Scottish Geographical i Podolla (in pari) ; Magazine. Translator of Sven Hedin's Through Asia, Central Asia and Tibet; &c [Poland Russian (in part).

Joseph Thomas Cunningham, M.A. , F.Z.S. r

Lecturer on Zoology at the South-Western Polytechnic, London. Formerly Fellow J P ear 'j of University College, Oxford. Assistant Professor of Natural History in the 1 Pilchard. University of Edinburgh. Naturalist to the Marine Biological Association. I

James Williams, M.A., D.C.L. , LL.D.

All Souls' Reader in Roman Law in the University of Oxford, and Fellow of Lincoln College. Barrister of Lincoln's Inn. Author of Wills and Succession ; &c.

James Waterhouse.

Major-General, Indian Army (retired). Assistant Surveyor-General of India in charge of Photographic and Lithographic Branch, Calcutta, 1866-1897. President of the Royal Photographic Society, 1905-1906. Author of The Preparation of Drawings for Photographic Purposes ; &c. L

James Walker, M.A. [

Christ Church, Oxford. Demonstrator in the Clarendon Laboratory. Formerly J Polarization of Light. Vice-President of the Physical Society. Author of The Analytical Theory of Light;) &c. I

Personal Property.

Photography: Apparatus.

Whitly Dixon. Captain, R.N, Nautical Assessor to the Court of Appeal.

J Pilot (in part).

INITIALS AND HEADINGS OF ARTICLES

XI

K.G. K.L.

K.S.

Karl Friedrich Geldner, Ph.D.

Professor of Sanskrit and Comparative Philology in the University of Marburg. Author of Vedische Studien ; &c.

Persia: Language.

L.C.

L. F. V.-H.

L. J. S.

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H. W. T.

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P. A. K.

Rev. Kirsopp Lake, M.A. F

Lincoln College, Oxford. Professor of Early Christian Literature and New Testa- J Peter, Saint; ment Exegesis in the University of Leiden. Author of The Text of the New Testa- Peter, Epistles of, ment; The Historical Evidence for the Resurrection of Jesus Christ; &c. *-

Pedal Clarinet;

Kathleen Schlesinger.

Editor of the Portfolio of Musical Archaeology. Author of The Instruments of the – Orchestra.

Philomel; Physharmonica; Pianoforte {in part); Piccolo; Pipe and Tabor; Platerspiel.

Count Lutzow, Litt.D., Ph.D., F.R.G.S.

Chamberlain of H.M. the Emperor of Austria, King of Bohemia. Hon. Member of the Royal Society of Literature. Member of the Bohemian Academy, &c. Author “j of Bohemia, a Historical Sketch; The Historians of Bohemia (Ilchester Lecture, ‘ Oxford, 1904) ; The Life and Times of John Hus; &c.

Rev. Lewis Campbell, D.C.L., LL.D.

See the biographical article: Campbell, Lewis.

Leveson Francis Vernon-Harcourt, M.A., M.Inst. CE. (1839-1907).

Professor of Civil Engineering at University College, London, 1882-1905. Author J pj er

of Rivers and Canals ; Harbours and Docks : Civil Engineering as applied in Con- | struction; &c. I

Podebrad, George of.

J Plato.

Leonard James Spencer, M.A.

Assistant in Department of Mineralogy, British Museum. Sidney Sussex College, Cambridge, and Harkness Scholar. alogical Magazine.

Formerly Scholar of Editor of the Miner-

Lord Macaulay.

See the biographical article: Macaulay, Thomas Babington Macaulay, Baron.

Malcolm Bell.

Author of Pewter Plate ; &c.

C Perovskite; Petalite;

Pharmacosiderite ; \ Phenacite; Phillipsite; ! Phlogopite; Phosgenite; I Fitchblende; Plagioclase.

Pitt.

Rev. Marcus Dods, D.D.

See the biographical article: Dods, Marcus.

Marcus Niebuhr Tod, M.A.

Fellow and Tutor of Oriel College, Oxford. University Lecturer in Epigraphy. Joint-author of Catalogue of the Sparta Museum.

I Pewter. -j Pelagius.

P.H.„,

Maximilian Otto Bismarck Caspari, M.A.

Reader in Ancient History at London University. Lecturer in Greek at Birmingham University, 1905-1908.

Max Verworn, D.Sc, M.D., Ph.D. r

Professor of Physiology and Director of the Physiological Institute in the University -j Physiology, of Bonn. Author of Allgemeine Physiologic, &c. t

Pelopidas; Periander; Pericles; Phocion; Phocis; Plataea.

Newton Dennison Mereness, A.M., Ph.D. Author of Maryland as a Proprietary Province.

Norman McLean, M.A.

Lecturer in Aramaic, Cambridge University. Fellow and Hebrew Lecturer, Christ's < College, Cambridge. Joint-editor of the larger Cambridge Septuagint.

Joseph Marie Noel Valois.

Member of Academie des Inscriptions et Belles-Lettres, Paris. Honorary Archivist at the Archives Nationales. , Formerly President of the Societe de l'Histoire de . France and the Societe de l'Ecole des Chartes. Author of La France et le grand schisme d' Occident; &c.

Northcote Whitridge Thomas, M.A.

Government Anthropologist to Southern Nigeria. Corresponding Member of the Societe d'Anthropologie of Paris. Author of Thought Transference ; Kinship and – Carriage in A uslralia ; &c.

Osmund Airy, M.A., LL.D.

H.M. Inspector of Schools and Inspector of Training Colleges, Board of Education, London. Author of Louis XIV. and the English Restoration; Charles' II. ; &c. Editor of the Lauderdale Papers ; &c.

Oswald Barron, F.S.A.

Editor of The Ancestor, 1902-1905. Hon. Genealogist to Standing Council of the – Honourable Society of the Baronetage.

Rev. Owen Charles Whitehouse, M.A., D.D.

Senior Theological Tutor and Lecturer in Hebrew, Cheshunt College, Cambridge. – Principal of the Countess of Huntingdon's College, Cheshunt, 1895-1905.

Olaus Magnus Friedrich Henrici, Ph.D., LL.D., F.R.S.

Professor of Mechanics and Mathematics in the Central Technical College of the City and Guilds of London Institute. Author of Vectors and Rotors; Congruent Figures ; &c.

Prince Peter Alexeivitch Kropotkin.

See the biographical article: Kropotkin, Prince P. A.

(Philippine Islands:

\ Geography and Statistics

\ Philoxenus.

Pisa, Council of.

Physical Phenomena.

Penn, William. Pole {family). Pentecost.

Perm {in part); Podolia {in part); .Poland, Russian (in part).

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P. A. T. P. C. M.

P. G. P. GL

P. La.

P. Sm. P.V. R. C. J. R. G. R. I. P. R. K. D.

R.L.*

R. N. B.

R. Po. R. e. S.

R.S.* R. S. C.

R.W.

S.A.C.

S.P.H.

INITIALS AND HEADINGS OF ARTICLES

A. TlELE. f

Formerly Librarian, Utrecht University. Author of Biographical and Historical H Plantin. Memoir on the Voyages of the Dutch Navigators ; &c. L

Phosphorescence: in Zoology.

Pheidias.

Peter Chalmers Mitchell, M.A., F.R.S., F.Z.S., D.Sc., LL.D.

Secretary of the Zoological Society of London. University Demonstrator in . Comparative Anatomy and Assistant to Linacre Professor at Oxford, 1888-1891. Author of Outlines of Biology; &c.

Percy Gardner, LL.D., F.S.A., D.Litt.

See the biographical article : Gardner, Percy. I

Peter Giles, M.A., LL.D., Litt.D. f

Fellow and Classical Lecturer of Emmanuel College, Cambridge, and University J Philology (in part). Reader in Comparative Philology. Formerly Secretary of the Cambridge Philological 1 Society. I

Philip Lake, M.A., F.G.S. f

Lecturer on Physical and Regional Geography in Cambridge University. Formerly J p ers j a: Geoloey.

of the Geological Survey of India. Author of Monograph of British Cambrian | ‘

Trilobites. Translator and Editor of Keyser’s Comparative Geology. I

Preserved Smith, Ph.D.

Rufus B. Kellogg University Fellow, Amherst College, U.S.A.

Pasqtjale Villari.

See the biographical article: Villari, Pasquale.

Sir Richard Claverhodse Jebb, LL.D., D.C.L.

See the biographical article: Jebb, Sir Richard ClaverhousE.

Richard Garnett, LL.D.

See the biographical article: Garnett, Richard.

Reginald Innes Pocock, F.Z.S.

Superintendent of the Zoological Gardens, London.

J Pius

1. and II.

J Pisa.

■I Pindar {in part).

{

Peacock, Thomas Love.

J Pedipalpi; Pentastomida.

Sir Robert Kennaway Douglas. <-

Formerly Professor of Chinese, King's College, London. Keeper of Oriental Printed .

Books and MSS. at British Museum, 1892-1907. Member of the Chinese Consular -i Peking. Service, 1 858-1 865. Author of The Language and Literature of China; China; Europe and the Far East; &c. I

Peccary; Pecora;

Richard Lydekker, F.R.S., F.Z.S., F.G.S.

Member of the Staff of the Geological Survey of India, 1874-1882. Author of Catalogues of Fossil Mammals, Reptiles and Birds in the British Museum ; The Deer of all Lands ; &c.

Robert Nisbet Bain (d. 1900).

Assistant Librarian, British Museum, 1883-1909. Author of Scandinavia; the Political History of Denmark, Norway and Sweden, 15 13-1900; The First Romanovs, 1613-1725 ; Slavonic Europe : The

Political History of Poland and Russia from 1460 to 1706 ; &c.

Rene Poupardin, D. is L.

Secretary of the Ecole des Chartes. Honorary Librarian at the Bibliotheque Nationale, Paris. Author of Le Royaume de Provence sous les Carolingiens; Recueil des chartes de Saint-Germain; &c.

R. Phene Spiers, F.S.A., F.R.I.B.A.

Formerly Master of the Architectural School, Royal Academy, London. Past President of Architectural Association. Associate and Fellow of King's College, London. Corresponding Member of the Institute of France. Editor of Fergusson's History of Architecture. Author of Architecture: East and West; &c.

Ralph Stockman, M.D., F.R.S.(Edin.), F.R.C.P.(Edin.).

Professor of Materia Medica and Therapeutics in the University of Glasgow.

Robert Seymour Conway, M.A., D.Litt.

Pere David's Deer; Perissodactyla; Phalanger; Phenacodus; Pica; Polecat. Pazmany; Pechlin; Peter I. and III. of Russia; Petofi, Alexander; Philaret; Piper, Carl; L Poland: History {in pari).

Philip the Bold; Philip the Good.

Pier {in architecture).

Pharmacology.

Professor of Latin and Indo-European Philology injihe University of Manchester. J pjcenum (in Part). ~ – - – - – ■■ "iff, and Fellow of Gonville")

Formerly Professor of Latin in University College, Cardiff,

and Caius College, Cambridge. Author of The Italic Dialects. (_

Robert Wallace, F.R.S.(Edin.), F.L.S.

Professor of Agriculture and Rural Economy at Edinburgh University, and Garton Lecturer on Colonial and Indian Agriculture. Professor of Agriculture, R.A.C., Cirencester, 1882-1885. Author of Farm Live Stock of Great Britain; The Agri- culture and Rural Economy of

Australia and New Zealand; Farming Industries of Cape Colony; &c.

Stanley Arthur Cook, M.A.

Lecturer in Hebrew and Syriac, and formerly Fellow, Gonville and Caius College, Cambridge. Editor for the Palestine Exploration Fund. Examiner in Hebrew and Aramaic, London University, 1904-1908. Author of Glossary of Aramaic In-‘ scriptions; The Law of Moses and the Code of Hammurabi; Critical Notes on Old Testament History; Religion of Ancient Palestine; &c.

Sidney Frederic Harmer, M.A., D.Sc, F.R.S., F.Z.S.

Keeper of Zoology, Natural History Department, British Museum. Fellow, formerly Tutor and Lecturer, King’s College, Cambridge. Joint-editor of The Cambridge Natural History.

Pig (in partV

Philistines.

Phoronidea.

INITIALS AND HEADINGS OF ARTICLES

XUi

S. H. V.*

S.N. T. As.

T. Ba.

T. F. C. T. G. Br.

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W. C. Su.

W. D. C.

W. D. W. W. de W. A.

W. E. G. F. W. Ft.

W. F. C.

W. Ga.

W. HI. W. H.F.

Sydney Howard Vines, M.A., D.Sc, F.R.S.

Sherardian Professor of Botany, University of Oxford and Fellow of Magdalen College. Fellow of the University of London. President of the Linnean Society, 1900-1904. Formerly Reader in Botany in the University of Cambridge and Fellow and Lecturer of Christ's College. Author of A Student's Textbook of Botany; &c.

Simon Newcomb, D.Sc-, LL.D.

See the biographical article : Newcomb, Simon.

Thomas Ashby, M.A., D.Litt.

Director of British School of Archaeology at Rome. Formerly Scholar of Christ Church, Oxford. Craven Fellow, 1897. Conington Prizeman, 1906. Member of the Imperial German Archaeological Institute. Author of The Classical Topo- graphy of the Roman Campagna.

Plants: Morphology.

Sir Thomas Barclay.

Member of the Institute of International Law. Author of Problems of International Practice Blackburn, 1910.

Theodore Freylinghuysen Collier, Ph.D.

Assistant Professor of History, Williams College, Williamstown, Mass

Officer of the Legion of Honour. . and Diplomacy; &c. M.P. for

U.S.A.

f Planet;

I Planets, Minor.

Perugia;

Picenum (in part);

Piperno.

Peace;

Peace Conferences;

Pirate and Piracy: Law.

Pius III., IV. and V.

Phagocytosis.

4 Persepolis (in part).

Lecturer on Chemistry -{ PoiSOu.

Thomas Gregor Brodie, M.D., F.R.S.

Professor Superintendent, Brown Animal Sanatory Institution, University of London. Professor of Physiology, Royal Veterinary College, London. Lecturer on Physiology, London School of Medicine for Women. Fellow of King's College, London. Author of Essentials of Experimental Physiology.

Rev. Thomas Martin Lindsay, LL.D., D.D. f

Principal of the United Free Church College, Glasgow. Formerly

Assistant to the J Plymouth Brethren (in part) rrotessor 01 Logic and Metaphysics in the University 01 Edinburgh. Author oi r

History of the Reformation; Life of Luther; &c. I

Theodor Noldeke, Ph.D.

See the biographical article: Noldeke, Theodor.

Sir Thomas Stevenson, M.D., F.R.C.P. (1838-1908). Formerly Senior Scientific Analyst to the Home Office, and Forensic Medicine at Guy's Hospital, London.

Walter Theodore Watts-Dunton.

See the biographical article: Watts-Dunton, Walter Theodore.

Thomas Wentworth Higginson, A.M., LL.D.

Author of Atlantic Essays; Cheerful Yesterdays; History of the United States; &c.

Thomas William Rhys Davids, LL.D., Ph.D.

Professor of Comparative Religion, Manchester University. President of the Pali Text Society. Fellow of the British Academy. Secretary and Librarian of Royal Asiatic Society, 1 885-1902. Author of Buddhism; Sacred Books of the Buddhists ; Early Buddhism ; Buddhist India ; Dialogues of the Buddha ; &c.

. Walter Coventry Summers, M.A.

Professor of Latin in the University of Sheffield. Formerly Fellow of St John's ,

College, Cambridge. Craven Scholar, 1890. Chancellor's Medallist, 1892. Author] Petronius (in part).

of A Study of Valerius Flaccus ; &c. [

William Douglas Caroe, M.A., F.S.A., F.R.I.B.A.

Trinity College, Cambridge. Architect to the Ecclesiastical Commission and the – Charity Commission, London

-j Poetry.

{ Phillips, Wendell.

Piprawa.

Persius;

Pearson, John Loughborough

Philology (in part).

William Dwight Whitney.

See the biographical article: Whitney, William Dwight.

Sir William de Wiveleslie Abney, K.C.B., D.C.L., D.Sc, F.R.S. r

Adviser in Science to the Board of Education for England. Member of the Advisory Council for Education to the War Office. Formerly President of Royal -j Photography. Astronomical Society, Physical Society and Royal Photographic Society. Author of Instruction in Photography; Colour Vision; &c. I

William Edward Garrett Fisher, M.A. J

Author of The Transvaal and the Boers. 1 Pnylloxera.

University of Edinburgh, and A Pig (in pari),

William Fream, LL.D. (d. 1906).

Formerly Lecturer on Agricultural Entomology, , ■ „ .

Agricultural Correspondent of The Times. [

William Feilden Craies, M.A. f

Barrister-at-Law, Inner Temple and Lecturer on Criminal Law, King's College, -j Pleading. London. Editor of Archbold's Criminal Pleading (23rd edition). I

Walter Garstang, M.A., D.Sc.

Professor of Zoology in the University of Leeds. Formerly Fellow of Lincoln

College, Oxford. Scientific Adviser to H.M. Delegates on the International Council -j Pisciculture.

for the Exploration of the Sea, 1901-1907. Author of The Impoverishment of the

Sea; &c.

Wheelton Hind, M.D., F.R.C.S., F.G.S.

Surgeon, North Staffs Infirmary. Lyell Medallist, Geological Society, 1902. of British Carboniferous Lambellibranchiata ; &c.

Author i Pendleside Series.

Sir William Henry Flower, F.R.S.

See the biographical article: Flower, Sir W. H.

Platypus (in part).

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INITIALS AND HEADINGS OF ARTICLES

W. W. R.* W. Y. S.

William Michael Rossetti.

See the biographical article : Rossetti, Dante G.

Sir William Mitchell Ramsay, LL.D., D.C.L., D.Litt. See the biographical article : Ramsay, Sir W. M.

William Prideaux Courtney.

See the article: Courtney, Baron.

William Richard Morfill, M.A. (d. ioio). f

Formerly Professor of Russian and the other Slavonic Languages in the University J Poland* of Oxford. Curator of the Taylorian Institution, Oxford. Author of Russia; 1 Slavonic Literature ; &c. I

f Perino del Vaga; I Perugino, Pietro.

-j Phrygia; Pisidia.

/Peterborough and Monmouth, I Earl of.

Literature.

-j Phylactery {in part).

William Robertson Smith, LL.D.

See the biographical article: Smith, William Robertson.

William Roy Smith, M.A., Ph.D.

Associate Professor of History, Bryn Mawr College, Pennsylvania.

Author of -\ Polk, James Knox.

Sectionalism in Pennsylvania during the Revolution ; &c.

William Smyth Rockstro. [

Author of A Great History of Music from the Infancy of the Greek Drama to the \ Plain Song. Present Period ; and other works on the history of music. I

Sir William Turner Thiselton-Dyer, F.R.S., K.C.M.G., CLE., D.Sc, LL.D., Ph.D., F.L.S. Hon. Student of Christ Church, Oxford. Director, Royal Botanic Gardens, Kew, – 1885-1905. Botanical Adviser to Secretary of State for Colonies, 1902-1906. Joint-author of Flora of Middlesex.

William Walker Rockwell, Lic.Theol.

Assistant Professor of Church History, Union Theological Seminary, New York.

William Young Sellar, LL.D. f p e tronius {in part).

See the biographical article: Sellar, W. Y. L

Plants: Distribution.

Pius VI., VII., and VIII.

PRINCIPAL UNSIGNED ARTICLES,

Pea.

Peach.

Pear.

Peat.

Peeblesshire.

Pembroke, Earls of.

Pembroke.

Pembrokeshire.

Pen.

Pencil.

Penitential.

Pennine Chain.

Pennsylvania.

Pennsylvania, University of.

Pensacola.

Pension.

Penzance.

Peoria.

Pepper.

Peppermint.

Perfumery.

Perier.

Perigueux.

Peripatetics.

Perjury.

Pernambuco.

Perrault.

Perrot.

Personality.

Perth (N.B.).

Perthshire.

Pessimism.

Peterborough.

Petition.

Philadelphia.

Philately.

Philostratus.

Phonograph.

Phormium.

Phosphorus.

Photius.

Photochemistry.

Physiocratic School.

Physiologus.

Piacenza.

Picardy.

Piccolomini.

Pichegru.

Pietism.

Pigeon-flying.

Pilgrim.

Pin.

Pink.

Pipe.

I Piquet Pistoia.

Pitcher Plants. Pittsburg. Plantation. Platinum. Pleurisy.

Pleuro-Pneumonia. Plock.

Plough and Ploughing. Plum.

Plymouth (U.S.A.). Pneumatic Gun. Pneumonia. Pnom-Penh. Poitiers. Poker. Pola.

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PAYN, JAMES (1830-1898), English novelist, was born at Cheltenham, on the 28th of February 1830, his father being clerk to the Thames Commissioners and treasurer to the county of Berkshire. He was educated at Eton, and afterwards entered the Military Academy at Woolwich; but his health was not equal to the demands of a military career, and he proceeded in 1847 to Trinity College, Cambridge. He was among the most popular men of his time, and served as president of the Union. Before going to Cambridge he had published some verses in Leigh Hunt's Journal, and while still an undergraduate put forth a volume of Stories from Boccaccio in 1852, and in 1853 a volume of Poems. In the same year he left Cambridge, and shortly afterwards married Miss Louisa Adelaide Edlin, sister of Sir Peter Edlin. He then settled down in the Lake district to a literary career and contributed regularly to Household Words and Chambers's Journal. In 1858 he removed to Edin- burgh to act as joint-editor of the latter periodical. He became sole editor in 1850, and conducted the magazine with much success for fifteen years. He removed to London in 1861. In the pages of the Journal he published in 1864 his most popular story, Lost Sir Massingberd. From this time he was always engaged in novel-writing, among the most popular of his productions being Married Beneath Him (1865), Carlyon's Year (1868), By Proxy (1878), and The Talk of the Town (1885). In 1883 he succeeded Leslie Stephen as editor of the Cornhill Magazine and continued in the post until the breakdown of his health in 1896. He was also literary adviser to Messrs Smith, Elder & Company. His publications included a Handbook to the English Lakes (1859), and various volumes of occasional essays, Maxims by a Man of the World (1869), Some Private Views (1881), Some Literary Recollections (1884). A posthumous work, The Backwater of Life (1899), revealed much of his own personality in a mood of kindly, sensible reflection upon familiar topics. He died in London, on the 25th of March 1898.

A biographical introduction to The Backwater of Life was furnished by Sir Leslie Stephen.

PAYNE, PETER (c. 1380-1455), English Lollard and Taborite, the son of a Frenchman by an English wife, was born at Hough- on the-Hill near Grantham, about 1380. He was educated at Oxford, where he adopted Lollard opinions, and had graduated as a master of arts before the 6th of October 1406, when he was concerned in the irregular proceedings through which a letter declaring the sympathy of the university was addressed to the Bohemian reformers. From 1410 to 1414 Payne was principal of St Edmund Hall, and during these years was engaged in controversy with Thomas Netter of Walden, the Carmelite defender of Catholic doctrine. In 1414 he was compelled to leave Oxford and taught for a time in London. Ultimately

he had to flee from England, and took refuge in Bohemia, where he was received by the university of Prague on the 13th of February 141 7, and soon became a leader of the reformers. He joined the sect of the ” Orphans,” and had a prominent part in the discussions and conferences of the ten years from 1420 to 1430. When the Bohemians agreed to send representatives to the Council of Basel, Payne was naturally chosen to be one of their delegates. He arrived at Basel, on the 4th of January 1433, and his unyielding temper and bitter words probably did much to prevent a settlement. The Bohemians left Basel in April. The party of the nobles, who had been ready to make terms, were attacked in the Diet at Prague, by the Orphans and Taborites. Next year the dispute led to open war. The nobles were victorious at Lipau on the 29th of May 1434, and it was reported in England that Payne was killed. When soon afterwards the majority of the Orphans joined the moderate party, Payne allied himself with the more extreme Taborites. Nevertheless his reputation was so great that he was accepted as an arbitrator in doctrinal disputes amongst the reformers. In February 1437 the pope desired the emperor Sigismund to send Payne to be tried for heresy at Basel. Payne had to leave his pastorate at Saas, and took refuge with Peter Chelcicky, the Bohemian author. Two years later he was captured and imprisoned at Gutenstein, but was ransomed by his Taborite friends. Payne took part in the conferences of the Bohemian parties in 1443-1444, and again in 1452. He died at Prague in 1455. He was a learned and eloquent controversialist, and a faithful adherent to Wycliffe’s doctrine. Payne was also known as Clerk at Oxford, as Peter English in Bohemia, and as Freyng, after his French father, and Hough from his birth place.

Bibliography. — The chief facts of Payne’s English career are given in the Loci e libro veritatum of T. Gascoigne (ed. Thorold Rogers, Oxford, 1881). For his later life the principal sources are contained in the Monumenta conciliorum generalium saeculi v., Saeculi xv., or saeculi quinlodecimi, vols, i.-iii. (Vienna, 1857-1894). For modern

authorities consult Palacky, Ceschichte von Bohtnen, vii.-ix., and Creighton's History of the Papacy. The biography by James Baker, A Forgotten Great Englishman (London, 1894) is too partial. (C. L. K.)

PAYNTER (or Painter), WILLIAM (c. 1 540-1 594), English author, was a native of Kent. He matriculated at St John's College, Cambridge, in 1554. In 1561 he became clerk of the ordnance in the Tower of London, a position in which he appears to have amassed a fortune out of the public funds. In 1586 he confessed that he owed the government a thousand pounds, and in the next year further charges of peculation were brought against him. In 1591 his son Anthony owned that he and his father had abused their trust, but Paynter retained his office until his death. This event probably followed

immediately upon his will, which was nuncupative and was dated the 14th of February 1594. The first volume of his Palace of Pleasure appeared in 1566, and was dedicated to the earl of Warwick. It included sixty tales, and was followed in the next year by a second volume containing thirty-four new ones. A second improved edition in 1575 contained seven new stories. Paynter borrows from Herodotus, Plutarch, Aulus Gellius, Aelian, Livy, Tacitus, Quintus Curtius; from Giraldi Cinthio, Matteo Bandello, Ser Giovanni Fiorentino, Straparola, Queen Margaret of Navarre and others. To the vogue of this and similar collections we owe the Italian setting of so large a pro- portion of the Elizabethan drama. The early tragedies of Appius and Virginia, and Tancred and Gismund were taken from The Palace of Pleasure; and among better-known plays derived from the book are the Shakespearian Titnon of Athens, All's Well that Ends Well (from Giletta of Narbonne), Beaumont and Fletcher's Triumph of Death and Shirley's Love's Cruelty.

The Palace of Pleasure was edited by Joseph Haslewood in 1813. This edition was collated (1890) with the British Museum copy of '575 by Mr Joseph Jacobs, who added further prefatory matter, including an introduction dealing with the importance of Italian novelle in Elizabethan drama.

PAYSANDtJ, or Paisandu, a town and river port of Uruguay and capital of a department of the same name, on the left bank of the Uruguay River about 214 m. N.W. of Montevideo, with which it is connected by rail. Pop. (1908 estimate), 15,000. It has railway connexion with Rio Negro and Montevideo to the south-east, and with Salto and Santa Rosa, on the Brazilian frontier, on the north; it is at

the head of low water navigation on the Uruguay River, and is in regular steamer communication with Montevideo and Buenos Aires.

There are some good public buildings, including two churches, a hospital, a theatre and the government offices. Paysandu exports cattle and sheep and salted meats, hides, ox tongues, wool and other animal products. There is a meat- curing establishment (saladero) at Guaviyu, in the vicinity. The town was named in honour of Pay, or Pai (Father) Sandu, a priest who settled there in 1772. It has suffered severely from revolutionary outbreaks, was bombarded by Rivera in 1846, and was partly destroyed in 1865 by a Brazilian bombardment, after which its gallant defenders, Leandro Gomez and his companions, were butchered in cold blood.

The department of Paysandu — area 5117 sq. m.; pop. (1907, estimate), 34,097 — is one of the richest stock-raising regions of the republic.

PAYSON, EDWARD (1 783-1827), American Congregational preacher, was born on the 25th of July 1783 at Rindge, New Hampshire, where his father, Seth Payson (1758-1820), was pastor of the Congregational Church. His uncle, Phillips Payson (1736-1801), pastor of a church in Chelsea, Massachusetts, was a physicist and astronomer. Edward Payson graduated at Harvard in 1803, was then principal of a school at Portland, Maine, and in 1807 became junior pastor of the Congregational Church at Portland, where he remained, after 181 1, as senior pastor, until his death on the 22nd of October 1827.

The most complete collection of his sermons, with a memoir by Asa Cummings originally published in 1828, is the Memoir, Select Thoughts and Sermons of the late Rev. Edward Payson (3 vols., Portland, 1846; Philadelphia, 1859). Based on this is the volume, Mementos of Edward Payson (New York, 1873), by the Rev. E. L. Janes of the Methodist Episcopal Church.

PAZMANY, PfiTER (1570-1637), Hungarian cardinal and statesman, was born at Nagyvarad on the 4th of October 1570, and educated at Nagyvarad and Kolozsvar, at which latter place he quitted the Calvinist confession for the Roman com- munion (1583). In 1587 he entered the Jesuit order. Pazmany went through his probation at Cracow, took his degree at Vienna, and studied theology at Rome, and finally completed his academic course at the Jesuit college at Graz. In 1601 he was sent to the order's establishment at Sellye, where his eloquence and dialectic won back hundreds to Rome, including many of the noblest families. Prince Nicholas Esterhazy and Paul Rakoczy

were among his converts. In 1607 he was attached

to the archbishop of Esztergom, and in the following year attracted attention by his denunciation, in the Diet, of the 8th point of the peace of Vienna, which prohibited the Jesuits from acquiring landed property in Hungary. At about the same time the pope, on the petition of the emperor Matthias II., released Pazmany from his monkish vows. On the 25th of April 1616 he was made dean of Turocz, and on the 28th of September became primate of Hungary. He received the red hat from Urban VIII. in 1629. Pazmany was the soul of the Roman Catholic reaction in Hungary. Particularly remarkable is his Igazsdgra vezeto Kalauz {Guide to Truth), which appeared in 1613. This manual united all the advantages of scientific depth, methodical arrangement and popular style. As the chief pastor of the Hungarian church Pazmany used every means in his power, short of absolute contravention of the laws, to obstruct and weaken Protestantism, which had risen during the 16th century. In 1619 he founded a seminary for theological candidates at Nagyszombat, and in 1623 laid the foundations of a similar institution at Vienna, the still famous Pazmanaeum, at a cost of 200,000 florins. In 1635 he contributed 100,000 florins towards the foundation of a Hungarian university. He also built Jesuit colleges and schools at Pressturg, and Franciscan monasteries at Ersekujvar and Kormoczbanya. In politics he played a considerable part. It was chiefly due to him that the diet of 161 8 elected the archduke Ferdinand to succeed the childless Matthias II. He also repeatedly thwarted the martial ambitions of Gabriel Bethlen, and prevented George Rakoczy I., over whom he had a great influence, from combining with the Turks and the Protestants. But Pazmany's most unforgetable service to his country was his creation of the Hungarian literary language. As an orator he well deserved the epithet of " the Hungarian purple Cicero." Of his numerous works the chief are: The Four Books of Thomas d Kempis on the imitation of Christ (Hung., 1603), of which there are many editions; Diatribe theologica de visibili Chrisli in terris ecclesia (Graz, 1615); Vindiciae ecclesiasticae (Vienna, 1620); Sermons for every Sunday in the Year (Hung., Pressburg, 1636); The Triumph of Truth (Hung., Pressburg, 1614).

See Vi'.mos Fraknoi, Peter Pazmany and his Times (Hung. Pest, 1 868-1 872) ; Correspondence of Pazmany (Hung, and Latin), published by the Hungarian Academy (Pest, 1873). (R. N. B.)

PAZ SOLDAN, MARIANO FELIPE (1821-1886), Peruvian historian and geographer, was born at Arequipa, on the 22nd of August 1821. He studied law, and after holding some minor judicial offices, was

minister to New Granada in 1853.- After his return he occupied himself with plans for the establishment of a model penitentiary at Lima, which he was enabled to accomplish through the support of General Castilla. In i860 Castilla made him director of public works, in which capacity he superintended the erection of the Lima statue of Bolivar. He was also concerned in the reform of the currency by the withdrawal of the debased Bolivian coins. In 1861 he published his great atlas of the republic of Peru, and in 1868 the first volume of his history of Peru after the acquisition of her inde- pendence. A second volume followed, and a third, bringing the history down to 1839, was published after his death by his son. In 1870 he was minister of justice and worship under President Balta, but shortly afterwards retired from public life to devote himself to his great geographical dictionary of Peru, which was published in 1877. During the disastrous war with Chile he sought refuge at Buenos Aires, where he was made professor in the National College, and where he wrote and published a history of the war (1884). He died on the 31st of December 1886.

PEA (Pisum), a genus of the order Leguminosae, consisting of herbs with compound pinnate leaves ending in tendrils, by means of which the weak stems are enabled to support themselves, and with large leafy stipules at the base. The flowers (fig. 1) are typically ” papilionaceous,” with a ” standard ” or large petal above, two side petals or wings, and two front petals below forming the keel. The stamens are ten — nine united, the tenth usually free or only slightly joined to the others.

PEABODY, A. P.

Fig. i. — Flower of Pea. c, Calyx. st, Standard. a, Alae, or wings. car, Carina, or Keel.

This separation allows approach to the honey which is secreted at the base of the staminal tube. The ovary is prolonged into a long, thick, bent style, com- pressed from side to side at the tip and fringed with hairs. The fruit is a characteristic ” legume ” or pod (fig. 2), bursting when ripe into halves, which bear the large globular seeds (peas) on their edges. These seeds are on short stalks, the upper ex- tremity of which is dilated into a shallow cup {aril) ; the two seed-leaves {cotyledons) are thick and fleshy, with a radicle bent along their edges on one side. The genus is exceedingly close to Lathyrus, being only distinguished technically by the style, which in the latter genus is compressed from above downwards and not thick. It is not surprising, therefore, that under the general name ” pea ” species both of Pisum and of Lathyrus are included. The common field pea with tan-coloured

or compressed mottled seeds and two to four leaflets is Pisum arvense, which is culti- vated in all temperate parts of the globe, but which, according to the Italian botanists, is truly a native of central and southern Italy: it has purple flowers. The garden pea, P. sativum, which has white flowers, is more tender than the preceding, and its origin is not known. It has not been found in a wild state anywhere, and it is considered that it may be a form of P. arvense, having, however, from four to six leaflets to each leaf and globular seeds of uniform

Text-book of Botany, by colour.

permission of Swan, Son-

nenschein & Co. P. sativum was known to Theophrastus;

Pig_ 2. The Pod an d De Candolle {Origin of Cultivated Plants,

(legume) of the Pea. P- 3.29) points out that the word “pison”

From Vine’s Students’

r, The dorsal suture.

b, The ventral.

c, Calyx. s, Seeds.

or its equivalent occurs in the Albanian tongue as well as in Latin, whence he con- cludes that the pea was known to the Aryans, and was perhaps brought by them into Greece and Italy. Peas have been found in the Swiss lake-dwellings of the bronze period. The garden peas differ considerably in size, shape of pod, degree of productive- ness, form and colour of seed, &c. The sugar peas are those in which the inner lining of the pod is very thin instead of being somewhat horny, so that the whole pod can be eaten. Unlike most papilion- aceous plants, peaflowers are perfectly fertile without the aid of insects, and thus do not intercross so freely as most similar plants do. On the other hand, a case is known wherein the pollen from a purple- podded pea applied to the stigma of one of the green-podded sugar peas produced a purple pod, showing that not only the ovule but even the ovary was affected by the cross. The numerous varieties of peas in cultivation have been obtained by cross-fertilization, but chiefly by selection. Peas constitute a highly nutritious article of diet from the large quantity of nitrogenous materials they contain in addition to starchy and saccharine matters.

The sweet pea, cultivated for the beauty and fragrance of its flowers, is a species of the allied genus Lathyrus {L. odoratus), a native of southern Europe. The chick pea {q.v.) {Cicer arieti- num), not cultivated in England, is still farther removed from the true peas. The everlasting pea of gardens is a species of Lathyrus {L. latifolius) with very deep fleshy roots, bold foliage, and beautiful but scentless flowers; the field pea (Pisum arvense) is better adapted than the bean to light soils, and is best culti- vated in rows of such a width as to admit of horse-hoeing. The early stage at which the plants fall over, and forbid further culture, renders it even more needful than in the case of beans to sow them only on land already clean. If annual weeds can be kept in check until the peas once get a close cover, they then occupy the ground so completely that nothing else can live under them; and the ground, after their removal, is found in the choicest condition. A thin crop of peas should never be allowed to stand, as the land is sure to get perfectly wild. The

difficulty of getting this crop well harvested renders it peculiarly advisable to sow only the early varieties.

The pea prefers a friable calcareous loam, deeply worked, and well enriched with good hotbed or farm-yard manure. The early crops require a warm sheltered_ situation, but the later are better grown 6 or 8 ft. apart, or more, in the open quarters, dwarf crops being in- troduced between the rows. The dwarf or early sorts may be sown 3 or 4 ft. apart. The deep working of the soil is of importance, lest the plants should suffer in hot dry weather from mildew or arrest of growth. The first sowing may be made about the beginning or middle of November, in front of a south wall, the plants being defended by spruce fir branches or other spray throughout the winter. In February sowings are sometimes made in private gardens, in flower- pots or boxes, and the young plants afterwards planted out. The main crop should be sown towards the end of February, and moder- ate sowings should be made twice a month afterwards, up to the beginning of July for the north, and about the third week in July for warmer districts. During dry hot weather late peas derive great benefit from mulching and watering. The latest sowings, at the middle or end of August, should consist of the best early sorts, as they are not so long in producing pods as the larger and finer sorts, and by this means the supply may be prolonged till October or November. As they grow the earth is drawn up to the stems, which are also supported by stakes, a practice which in a well-kept garden is always advisable, although it is said that the early varieties arrive sooner at maturity when recumbent.

Peas grown late in autumn are subject to mildew, to obviate which it has been proposed to dig over the ground in the usual way, and to soak the spaces to be occupied by the rows of peas thoroughly with water — the earth on each side to be then collected so as to form ridges 7 or 8 in. high, these ridges being well watered, and the seed sown on them in single rows. If dry weather at any time set in, water should be supplied profusely once a week.

To produce very early crops the French market-gardeners used to sow early in November, in frames, on a border having a good aspect, the seeds being covered very slightly. The young plants are trans- planted into other frames in December, the ground inside being dug out so as to be 18 or 20 in. below the sashes, and the earth thus removed placed against the outside of the frames. The young plants, when 3 or 4 in. high, are planted in patches of three or four, 8 in. asunder, in four longitudinal rows. The sashes are covered at night with straw mats, and opened whenever the weather is sufficiently mild. When 8 or 10 in. high the stems are inclined towards the back of the frame, a little earth being drawn to their base, and when the plants come into blossom the tops are pinched out above the third or fourth flower to force them into bearing. As soon as they begin to pod, the soil may have a gentle watering, whenever sufficiently warmed by the sun, but a too vigorous growth at an earlier period would be detrimental. Thus treated the plants bear pods fit for gathering in the first fortnight in April.

A very convenient means of obtaining an early crop is to sow in 5-in. pots, a few seeds in each, the plants to be ultimately planted out on a warm border. Peas may also be obtained early if gently forced in frames, in the same way as kidney beans, the dwarfest varieties being preferable.

For the very early peas the rows should range east and west, but for the main crops north and south. The average depth of the drills should be about 2 in. for small sorts, and a trifle more for the larger kinds. The drills should be made wide and flat at bottom so that the seeds may be better separated in sowing. The large sorts are the better for being sown 3 in. apart, Chopped furze may be advantageously scattered in the drill before covering in, to check the depredations of mice, and before levelling the surface the soil should be gently trodden down over the seeds.”

A good selection of sorts may be made from the following: —

Early. — William Hurst; Chelsea Gem; Sutton’s Bountiful and

Excelsior; Gradus.

Second Early. — Stratagem; Telephone; Telegraph; Carter's Daisy; Duke of York; Veitch's Autocrat.

Late.— Veitch's Perfection; Ne Plus Ultra, the finest of all late peas, but a little delicate in cold wet soils and seasons ; British Queen ; Champion of England ; Duke of Albany.

PEABODY, ANDREW PRESTON (1811-1893), American clergyman and author, was born in Beverly, Massachusetts, on the 19th of March 181 1, and was descended from Lieut. Francis Peabody of St Albans, who emigrated to Massachusetts in 1635. He learned to read before he was three years old, entered Harvard College at the age of twelve, and graduated in 1826, with the single exception of Paul Dudley (class of 1690) the youngest graduate of Harvard. In 1833 he became assistant pastor of the South Parish (Unitarian) of Portsmouth, New Hampshire; the senior pastor died before Peabody had been preaching a month, and he succeeded to the charge of the church, which he held until i860. In 1852-1860 he was proprietor and editor of the North American Review. He was preacher to

Harvard University and Plummer professor of Christian morals from i860 to 1 88 1, and was professor emeritus from 1881 until his death in Boston, Massachusetts, on the 10th of March 1893. On the walls of Appleton Chapel, Cambridge, U.S.A., is a bronze tablet to his memory.

Besides many brief memoirs and articles, he wrote: Christianity the Religion of Nature (2 id ed., 1864), Lowell Institute Lectures; Reminiscences of European Travel (1868); A Manual of Moral Philosophy (1873); Christian Belief and Life (1875), and Harvard Reminiscences (1888). See the Memoir (Cambridge, 1896) by Edward J. Young.

PEABODY, ELIZABETH PALMEB (1804-1894), American educationist, was born at Billerica, Massachusetts, on the 16th of May 1804. Early in life she was assistant in A. Bronson Alcott's school in Boston, Mass., the best account of which is probably her Record of Mr Alcott's School (1835). She had been instructed in Greek by Emerson at Concord when she was eighteen years old. She became interested in the educational methods of Froebel, and in i860 opened in Boston a small school resembling a kindergarten. In 1867 she visited Germany for the purpose of studying Froebel's methods. It was largely through her

efforts that the first public kindergarten in the United States was established in Boston in 1870. She died at Jamaica Plain, Boston, on the 3rd of January 1894. She was the sister-in-law of Nathaniel Hawthorne and of Horace Mann.

Among her publications are: Kindergarten in Italy (1872); Reminiscences of William Ellery Channing (1880); Lectures in the Training Schools for Kinder gartners (1888); and Last Evening with Allston, and other Papers (1886).

PEABODY, GEORGE (1 795-1869), American philanthropist, was descended from an old yeoman family of Hertfordshire, England, named Pabody or Pebody. He was born in the part of Danvers which is now Peabody, Mass., on the 18th of February 1795. When eleven years old he became apprentice at a grocery store. At the end of four years he became assistant to his brother, and a year afterwards to his uncle, who had a business in Georgetown, District of Columbia. After serving as a volunteer at Fort Warburton, Maryland, in the War of 181 2, he became partner with Elisha Riggs in a dry goods store at George-town, Riggs furnishing the capital, while Peabody was manager. Through his energy and skill the business increased with astound- ing rapidity, and on the retirement of Riggs about 1830 Peabody found himself at the head of one of the largest mercantile con- cerns in the world. About 1837 he established himself in London as merchant and money-broker at Wanford Court, in the city, and in 1843 he withdrew from the American business. The number of his benefactions to public objects was very large. He gave £50,000 for educational purposes at Danvers; £200,000 to found and endow a scientific Institute in Baltimore; various sums to Harvard University; £700,000 to the trustees of the Peabody Educational Fund to promote education in the southern states; and £500,000 for the erection of dwelling-houses for the working-classes in London. He received from Queen Victoria the offer of a baronetcy, but declined it. In 1867 the United States Congress awarded him a special vote of thanks. He died in London on the 4th of November 1869; his body was carried to America in a British warship, and was buried in his native town.

See the Life (Boston, 1870) by Phebe A. Hanaford. PEABODY, a township of Essex county, Massachusetts, U.S.A., in the eastern part of the state, 2 m. N.W. of Salem. Pop. (1905) 13,098; (1910) 15,721. It is served by the Boston & Maine railroad. The township covers an area of 17 sq. m. Its principal village is also known as Peabody. It contains the Peabody institute (1852), a gift of George Peabody ; in 1909 the institute had a library of 43,200 vols., and in connexion with it is the Eb'en Dale Sutton reference library, containing 4100 vols, in 1909. In

the institute is the portrait of Queen Victoria given by her to Mr Peabody. Among the places of interest in the township are the birthplace of George Peabody, the home of Rufus Choate (who lived here from 1823 to 1828), and the old burying-ground, where many soldiers of the War of Indepen- dence are buried; and the town has a Lexington monument,

dedicated in 1835, and a soldiers' monument, dedicated in 1881. Manufacturing is the principal industry, and leather is the principal product; among other manufactures are shoes, gloves, glue and carriages. The value of the factory products in 1905 was $10,236,669, an increase of 47-4% over that for 1900, and of the total the leather product represented 77-3%.

Peabody was originally a part of the township of Salem. In 1752 the district of Danvers was created, and in 1757 this district was made a separate township. In 1855 the township was divided into Danvers and South Danvers, and in 1868 the name of South Danvers was changed to Peabody, in honour of George Peabody.

See Old Naumkeag (Salem, 1877), by C. H. Webber and W. H. Nevins.

PEACE, a river of western Canada. It rises in the Rocky Mountains near 55 N., and breaking through the mountains, flows N.E. into Slave River, near lake Athabasca. The district between 56° 40′ and 6o° N., and between 112° W. and the Rocky Mountains is usually known as the Peace River district.

PEACE (Lat. pax; Fr. paix; Ger. Friede), the contrary of war, conflict or turmoil, and the condition which follows their cessation. Its sense in international law is the condition of not being at war. The word is also used as an abridgment for a treaty of peace, in such cases as the Peace of Utrecht (17 13) and the Peace of Amiens (1802).

Introduction. — Peace until quite recently was merely the political condition which prevailed in the intervals between wars. It was a purely negative condition. Even Grotius, who reduced the tendencies existing in his time to a sort of orderly expression, addressed himself to the law of war as the positive part of international jurisprudence and dealt only with peace as its negative alternative. The very name of his historic treatise, De jure belli ac pacts (1625), shows the subordination of peace to the main subject of war. In our own time peace has attained a higher status. It is now customary among writers on international law to give peace at any rate a volume to itself. Peace in fact has become a separate branch of the subject. The rise of

arbitration as a method of settling international difficulties has carried it a step further, and now the Hague Peace Con- ventions have given pacific methods a standing apart from war, and the preservation of peace has become an object of direct political effort. The methods for ensuring such preservation are now almost as precise as the methods of war. However reluctant some states may be to bind themselves to any rules excluding recourse to brute force when diplomatic negotiations have failed, they have nevertheless unanimously at the Hague Conference of 1907 declared their ” firm determination to co-operate in the maintenance of general peace ” (la ferme volonli de concourir au mainlien de la paix generate) 1 , and their resolution ” to favour with all their efforts the amicable settlement of international conflicts ” (preamble to Peace Convention). The offer of mediation by independent powers is provided for (Peace Convention: art. 3), and it is specifically agreed that in matters of a ” legal character ” such as ” questions of interpretation and application ” of international conventions, arbitration is the ” most efficacious and at the same time most equitable method ” of settling differences which have not been solved by diplomacy (Peace Convention: art. 38). In the final act, the conference went farther in agreeing to the ” principle of compulsory arbi- tration,” declaring that ” certain disputes, in particular those relating to the interpretation and application of the provisions of international agreements, are suitable (susceptible) to be submitted to compulsory arbitration without any restriction.” These declarations were obviously a concession to the wide- spread feeling, among civilized nations, that peace is an object in itself, an international political condition requiring its code of methods and laws just as much as the domestic political conditions of nations require their codes of methods and laws. In other words peace among nations has now become, or is fast becoming, a positive subject of international regulation, while war is

1 This has been incorrectly rendered in the English official trans- lation as ” the sincere desire to work for the maintenance of general peace.”

coming, among progressive peoples, to be regarded merely as an accidental disturbance of that harmony . and concord among mankind which nations require for the fostering of their domestic welfare.

Though the idea of preserving peace by general international regulation has had several exponents in the course of ages, no deliberate plan has ever yet been carried into effect. Indirectly,

however, there have been ‘many agencies which have operated towards this end. The earliest, known to history, is the Amphi- ctyonic Council (q.v.) which grew out of the common worship of the Hellenes. It was not so much a political as a religious body. ” If it had any claim,” says Freeman, 1 ” to the title of a general council of Greece, it was wholly in the sense in which we speak of general councils in modern Europe. The Amphictyonic Council represented Greece as an ecclesiastical synod repre- sented western Christendom. Its primary business was to regulate the concerns of the temple of Apollo at Delphi. The Amphictyonic Council which met at Delphi was only the most famous of several bodies of the same kind.” ” It is easy, however,” adds Freeman, ” to understand how the religious functions of such a body might assume a political character. Thus the old Amphictyonic oath forbade certain extreme measures of hostility against any city sharing in the common Amphictyonic worship, and it was forbidden to raze any Amphi- ctyonic city or to cut off its water. As the only deliberative body in which most Greek communities were represented, its decisions were those of the bulk of the Hellenic people. It sank eventually into a mere political tool in the hands first of Thebes, and then under Philip of Macedonia.”

The so-called pax romana was merely peace within an empire governed from a central authority, the constituent parts of which were held together by a network of centralized authority.

The feudal system again was a system of offence and defence, and its object was efficiency for war, not the organized regulation of peace. Yet-it had elements of federation within the bonds of its hierarchy.

The spiritual influence of the Church again was exerted to preserve relative peace among feudal princes. The ” Truce of God ” was established by the clergy (originally in Guyenne in 1031) to take advantage of holy days and festivals for the purpose of restricting the time available for bloodshed.

The ” grand design ” of Henry IV. (France), which some historians regard merely as the fantastic idea of a visionary, was probably a scheme of his great minister Sully to avert by a federation the conflict which he probably foresaw would break out sooner or later between Catholic and Protestant Europe, and which, in fact, broke out some fifteen years later in the Thirty Years’ War.

The Holy Roman Empire itself was in some respects an agent for the preservation of peace among its constituent states. In the same way the federation of Swiss cantons, of the states of the North American

Union and of the present German Empire have served as means of reducing the number of possible parties to war, and consequently that of its possible occasions.

Not only the number of possible war-making states but also the territorial area over which war can be made has been reduced in recent times by the creation of neutralized states such as Switzerland, Belgium, Luxemburg and Norway, and areas such as the Congo basin, the American lakes and the Suez Canal. The ” balance of power,” which has played in the history of modern Europe such an important part, is inherent in the notion of the independence and stability of states. Just as in Italy the common weal of the different republics which were crowded within the limited area of the peninsula required that no one of them should become so powerful as to threaten the independence of the others, so western Europe had a similar danger to counteract. France, Spain and the Empire were competing with each other in power to the detriment of smaller states. Great Britain and the Netherlands, Prussia and Russia,

1 History of Federal Government in Greece and Italy (2nd ed., London, 1893), p. 97.

had interests in the preservation of the status quo, and wars were waged and treaties concluded to adjust the strength of states in the common interest of preventing any one of them from obtain- ing undue predominance. Then came the break up of what remained of feudal Europe and a readjustment under Napoleon, which left the western world with five fairly balanced homo- geneous nations. These now took the place of the old hetero- geneous areas, governed by their respective sovereigns without reference to any idea of nationality or of national representation. The leading nations assumed the hegemony of the west, and in more recent times this combination has become known as the ” concert of Europe.” This concert of the great powers, as its name implies, in contradistinction to the ” balance of power,” was essentially a factor for the preservation of peace. For a century back it has played the part of an upper council in the management of Europe. In all matters affecting the Near East, it considers itself supreme. In matters of general interest it has frequently called conferences to which the minor states have been invited, such as the West African Conference in Berlin in 1885, and the Anti-Slavery Conference at Brussels in 1889- 1890, and the Conference of Algeciras in 1906. Meanwhile the concert has admitted among its members first in 1856 Turkey, later in 1878 at the Congress of Berlin the United States, and now undoubtedly Japan will expect to be included as a great power in this controlling body. The essential feature of the

concert has been recognition of the advantage to all the great powers of common action in reference to territorial changes in the Near East, of meeting together as a council, in preference to unconcerted negotiation by the powers acting severally.

A departure of more recent origin has been the calling together of the smaller powers for the settlement of matters of general administrative interest, conferences such as those which led to the conclusion of the conventions creating the Postal Union, the Copyright and Industrial Property Unions, &c.

These conferences of all the powers serve in practice as a sort of common council in the community of states, just as the concert of the great powers acts as a kind of senate. We have thus the nucleus of that international parliament which idealist peacemakers have dreamt of since the time of Henry IV.'s " grand design."

This brings us down to the greatest deliberate effort ever made to secure the peace of the world by a- general convention. It was due to the initiative of the young tsar Nicolas II., who, in his famous rescript of the 24th of August 1898, stated that he thought that the then moment was " very favourable for seeking, by means of international discussion, the most effectual means of assuring to all peoples the benefits of a real and durable peace." " In the course of the last twenty years," added the rescript, " the preservation of peace had become an object of international policy." Economic crises, due in great part to the existing system of excessive armaments, were transforming armed peace into a crushing burden, which peoples had more and more difficulty in bearing. He therefore proposed that there should be an international conference for the purpose of focusing the efforts of all states which were " sincerely seeking to make the great idea of universal peace triumph over the elements of trouble and discord." The first conference was held in 1899, and another followed it in 1907: at the earlier one twenty-six powers were represented; at that of 1907 there were forty-four, this time practically the whole world. The conventions drawn up at the second conference were a deliberate codification of many branches of international law. By them a written law has been substituted for that unwritten law which nations had been wont to construe with a latitude more or less corre- sponding to their power. At the conference of 1899, moreover, a court of arbitration was instituted for the purpose of dealing judicially with such matters in dispute as the powers agreed to submit to it.

In the interval between the two Hague Conferences, Great Britain and France concluded the first treaty applicable to future difficulties, as

distinguished from the treaties which had preceded it, treaties which related in all cases to difficulties already

existing and confined to them. This treaty made arbitration applicable to all matters not affecting ” national honour or vital interests.” Since then a network of similar treaties, adopted by different nations with each other and based on the Anglo- French model, has made reference to the Hague Court of Arbitra- tion practically compulsory for all matters which can be settled by an award of damages or do not affect any vital national interest. The third Hague Conference is timed to be held in 191 7. Meanwhile a conference of the maritime powers was held in London in 1908-1909 for the elaboration of a code of international maritime law in time of war, to be applied in the international Court of Prize, which had been proposed in a convention signed ad referendum at the Hague Conference of 1907.

A further development in the common efforts which have been made by different powers to assure the reign of justice and judicial methods among the states of the world was the pro- posal of Secretary Knox of the United States to insert in the instrument of ratification of the International Prize Court Convention (adopted at the Hague in 1897) a clause stating that the International Prize Court shall be invested with the duties and functions of a court of arbitral justice, such as recommended by the first Voeu of the Final Act of the con- ference. The object of this proposal was to give effect to the idea that the existing ” permanent ” court lacked the essential characteristics of national courts of justice in not being ready at all times to hear cases, and in needing to be specially con- stituted for every case submitted to it. The new court would be permanently in session at the Hague, the full panel of judges to assemble in ordinary or extraordinary session once a year.

Thus, while armaments are increasing, and wars are being fought out in the press and in public discussion, the great powers are steadily working out a system of written law and establishing a judiciary to adjust their differences in accordance with it. 1

The Current Grouping of Mankind and Nation-making. — In the consolidation of peace one of the most important factors is unquestionably the grouping of mankind in accordance with the final territorial and racial limitations of their apparent destiny. Language has played a vital part in the formation of Germany and Italy. The language question still disturbs the tranquillity of. the Near East. The

Hungarian government is regarded by the Slav, Ruman and German inhabitants of the monarchy as an oppressor for endeavouring to force every- body within the realm to learn the Magyar language. The " Young Turkish " government has problems to face which will be equally difficult, if it insists on endeavouring to institute centralized government in Turkey on the French model.

Whereas during the 19th century states were being cut out to suit the existing distribution of language, in the 20th the tendency seems to be to avoid further rearrangement of boun- daries, and to complete the homogeneity, thus far attained, by the artificial method of forcing reluctant populations to adopt the language of the predominant or governing race. In the United States this artificial method has become a necessity, to prevent the upgrowth of alien communities, which might at some later date cause domestic trouble of a perilous character. For example, when a community of French Canadians, discontented with British rule, many years ago migrated and settled in Massachusetts, they found none of the tolerance they had been enjoying in Canada for their French schools and the French language they wished to preserve. In Alsace-Lorraine German-speaking immigrants are gradually displacing, under

1 Schemes of thinkers, like William Penn's European Parliament (1693); the Abbe St Pierre's elaboration (c. 1700) of Henry IV.'s " grand design " (see supra) ; Jeremy Bentham's International Tribunal (1 786-1 789); Kant's Permanent Congress of Nations and Perpetual Peace (1796); John Stuart Mill's Federal Supreme Court; Seetey's, Bluntschli's, David Dudley Field's, Professor Leone Levi's, Sir Edmund Hornby's co-operative schemes for promoting law and order among nations, have all contributed to popularizing in different countries the idea of a federation of mankind for the preservation of peace.

government encouragement, the French-speaking population. Poland is another case of the difficulty of managing a population which speaks a language not that of the governing majority, and Russia, in trying to solve one problem by absorbing Finland into the national system, is burdening herself with another which may work out in centuries of unrest, if not in domestic violence. Not very long ago Pan-Germans were paying much attention to the German settlers in 'the Brazilian province of Rio Grande do Sul, where large villages spoke nothing but German, and German, as the only language known on the spot, had become the tongue in which municipal business was transacted. The Brazilian government, in view of the danger to which such a state of things might give rise, followed the example of the United States in dealing with the language question.

Thus while in the one case homogeneity of language within state boundaries seems to be one of the conditions making for peace, the avoidance of interference with a well-marked homo- geneous area like Finland would seem to contribute equally to the same end.

Meanwhile the difficulties in the way of contemporary nation- making are fostered by many extraneous influences, as well as by dogged resistance of the races in question. Not the least important of these influences is the sentimental sympathy felt for those who are supposed to be deprived of the use of their mother-tongue, and who are subjected to the hardship of learning an alien one. The hardship inflicted on those who have to learn a second language is very easily exaggerated, though it is to be regretted that in the case of Hungary the second language is not one more useful for international purposes.

Contemporary Statecraft.— Nation-making has hitherto been more or less unconscious — the outcome of necessity, a natural growth due to the play of circumstance and events. But in our own age conscious statecraft is also at work, as in Canada, where the genius of statesmen is gradually endowing that dominion with all the attributes of independence and power. Australia has not learnt the lesson of Canada in vain. Whatever value may attach to the consolidation of the' British Empire itself as a factor in spreading the peace which reigns within it, it is also a great contribution to the peace of the world that the British race should have founded practically independent states like the Dominion of Canada, the Commonwealth of Australia, the South African Union and the Dominion of New Zealand. These self-governing colonies with their spheres of influence, with vast areas still unpeopled, have a future before them which is dissociated from the methods of an over-peopled Europe, and among them the preservation of peace is the direct object and condition of their progressive develop- ment. Like the United States, they have or will have their Monroe doctrine. Colonized by the steady industrial peoples of northern Europe, there is no danger of the turbulence of the industrially indolent but more passionate peoples of Central and South America. As in Europe, these northern peoples will hold the power which intelligent democracies are consciously absorbing, and the British faculty for statecraft is gradually welding new nations on the British model, without the obsolete traditions and without that human sediment which too frequently chokes the currents of national vitality in the older communities of Europe.

Militarism. — It is often stated, as if it were incontrovertible, that conscription and large standing armies are a menace to peace, and yet, although throughout the civilized world, except in the British

Empire and the United States, conscription is the system employed for the recruiting of the national forces of both defence and offence, few of these countries show any particular disposition to make war. The exceptional position of the United States, with a population about equal to that of the rest of the American continent, and of Great Britain, an island state but little exposed to military invasion, places both beyond absolute need of large standing armies, and renders an enlisting system feasible which would be quite inadequate for the recruitment of armies on the French or German scale. Demo- cratic progress on the Continent has, however, absorbed

conscription as a feature in the equalization of the citizen's rights and liabilities. Just as in Anglo-Saxon lands a national ideal is gradually materializing in the principle of the equalization of chances for all citizens,- so in continental Europe, along with this equalization of chances, has still more rapidly developed the ideal of an equalization of obligations, which in turn leads to the claim for an enlargement of political rights co-extensive with the obligations. Thus universal conscription and universal suffrage tend to become in continental political development complementary conditions of the citizen's political being. In Germany, moreover, the military service is designed not only to make the recruit a good soldier, but also to give him a healthy physical, moral and mental training. German statesmen, under the powerful stimulus of the emperor William II., have, in the eyes of some critics, carried this secondary object of conscript training to such excess as to be detrimental to military efficiency. To put it shortly, the Germans have taught their soldiers to think, and not merely to obey. The French, who naturally looked to German methods for inspiration, have come to apply them more particularly in the development of their cavalry and artillery, especially in that of the former, which has taken in the French army an ever higher place as its observing and thinking organ.

Militarism on the Continent has thus become allied with the very factors which made for the reign of reason. No agitation for the development of national defences, no beating of drums to awaken the military spirit, no anti-foreign clamour or invasion panic, no parading of uniforms and futile clash of arms, are necessary to entice the groundling and the bumpkin into the service. In Germany patriotic waving of the flag, as a political method, is directed more especially to the strengthen- ing of imperial, as distinguished from local, patriotism. Where conscription has existed for any appreciable time it has sunk into the national economy, and men do their military service with as

little concern as if it were a civil apprenticeship.

As implied above, military training under conscription does not by any means necessarily tend to the promotion of the military spirit. In France, so far from taking this direction, it has resulted, under democratic government and universal suffrage, in a widespread abhorrence of war, and, in fact, has converted the French people from being the most militant into being the most pacific nation in Europe. The fact that every family throughout the land is a contributory to the military forces of the country has made peace a family, and hence a national, ideal. Paradoxical as it may seem, it is the logical conclusion of such comparisons that militarism only exists in countries where there are no citizen armies, and that, where there are citizen armies, they are one of the elements which make for permanent peace.

Normal Nature of Peace. — America has been the pioneer of the view that peace is the normal condition of mankind, and that, when the causes of war arc eliminated, war ceases to have a raison d'etre. The objects and causes of war are of many kinds. War for fighting's sake, although in the popular mind there may be, during most wars, only the excitement and the emotion of a great gamble, has no conscious place among the motives of those who determine the destinies of peoples. Apart, however, from self-defence, the main causes of war are four: (i) The desire for territorial expansion, due to the overgrowth of population, and insufficiency of the available food-supply; if the necessary territory cannot be obtained by negotiation, conquest becomes the only alternative to emigration to foreign lands. (2) The prompting of national ambition or a desire to wipe out the record of a humiliating defeat. (3) Ambitious potentates again may seek to deflect popular tendencies into channels more satisfactory for their dynasty. (4) Nations, on the other hand, may grow jealous of each other's commercial success or material power. In many cases the apparent cause may be of a nobler character, but historians have seldom been content to accept the allegations of those who have claimed to carry on war from disinterested motives.

On the American continent South and Central American

states have had many wars, and the disastrous effects of them not only in retarding their own development, but in impair- ing their national credit, have led to earnest endeavours on the part of their leading statesmen to arrive at such an under- standing as will banish from their international polity all excuses for resorting to armed conflicts. In 1881 Mr Blaine, then U.S. secretary of state, addressed an instruction to the ministers of the United States of America accredited

to the various Central and South American nations, directing them to invite the governments of these countries to par- ticipate in a congress, to be held at Washington in 1882, ” for the purpose of considering and discussing the methods of preventing war between the nations of America.” Owing to different circumstances the conference was delayed till the autumn of 1889. At this conference a plan of arbitration was drawn up, under which arbitration was made obligatory in all controversies whatever their origin, with the single exception that it should not apply where, in the judgment of any one of the nations involved in the controversy, its national independence was imperilled, and even in this case arbitration, though optional for the nation so judging, was to be obligatory for the adversary power. At the second International Confer- ence of American States, which sat in the city of Mexico from the 22nd of October 1901 to the 31st of January 1902, the same subject was again discussed, and a scheme was finally adopted as a compromise which conferred authority on the government of Mexico to ascertain the views of the different governments represented in the conference, regarding the most advanced form in which a general arbitration convention could be drawn up that would meet with the approval and secure ratification by all the countries represented, and afterwards to prepare a plan for such a general treaty. The third Pan-American Conference was held in the months of July and August 1906, and was attended by the United States, Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, the Dominican Republic, Ecuador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Salvador and Uruguay. Only Haiti and Venezuela were absent. The conference, being held only a year before the time fixed for the second Hague Conference, applied itself mainly to the question of the extent to which force might be used for the collection of pecuniary claims against defaulting governments, and the forwarding of the principle of arbitration under the Hague Conventions. The possible causes of war on the American continent had meanwhile been considerably reduced. Different states had adjusted their frontiers, Great Britain in British Guiana had settled an out- standing question with Venezuela, France in French Guiana another with Brazil, Great Britain in Newfoundland had re- moved time-honoured grievances with France, Great Britain in Canada others with the United States of America, and now the most difficult kind of international questions which can arise, so far as the American continent is concerned, have been removed from among existing dangers to peace. Among the Southern Republics Argentina and Chile concluded in 1902 a treaty of arbitration, for the settlement of all difficulties without dis- tinction, combined with a disarmament agreement of the same date, to which more ample reference will be

made hereafter. Thus in America progress is being rapidly made towards the realization of the idea that war can be super- annuated by elimination of its causes and the development of positive methods for the preservation of peace (see Pan- American Conferences).

With the American precedent to inspire him, the emperor Nicolas II. of Russia in 1898 issued his invitation to the powers to hold a similar conference of European states, with a more or less similar object. In 1899 twenty-six states met at the Hague and began the work, which was continued at the second con- ference in 1907, and furthered by the Maritime Conference of London of 1908-1909. The creation of the Hague Court and of a code of law to be applied by it have further eliminated causes of difference.

These efforts in the two hemispheres are based on the idea

that international differences can be adjusted without war, where the parties are honestly aggrieved. With this adjust- ment of existing cases the number of possible pretexts for the employment of force is being rapidly diminished.

Peace Procedure under the Hague Conventions. — The Hague Peace Convention of 1907, which re-enacts the essential parts of the earlier one of 1899, sets out five ways of adjusting inter- national conflicts without recourse to war. Firstly, the signatory powers have undertaken to use their best efforts to ensure the pacific settlement of international difficulties. This is a general declaration of intention to lend themselves to the peaceable adjustment of difficulties and employ their diplomacy to this end. Secondly, in case of serious disagreement, diplomacy having failed, they agree to have recourse, as far as circumstances allow, to the good offices or mediation of one or more friendly powers. Thirdly, the signatory powers agree that it shall not be regarded as an unfriendly act if one or more powers, strangers to the dispute, on their own initiative offer their good offices or mediation to the states in disagreement, or even during hostili- ties, if war has already broken out. Fourthly, the convention recommends that in disputes of an international nature, involving neither national honour nor vital interests, and arising from a difference of opinion on points of fact, the parties who have not been able to come to an agreement by means of diplomacy should institute an international commission of inquiry to facilitate a solution of these disputes by an

investigation of the facts. Lastly, the high contracting parties have agreed that in questions of a legal nature, and especially in interpretation or application of international conventions, arbitration is recog- nized as the most effective, and at the same time the most equitable, means of settling disputes which diplomacy has failed to adjust. *

Down to 1910 no suggestion of mediation had actually been carried out, but a number of cases of arbitration had been tried by the Hague Court, created by the Hague Peace Convention (see Arbitration, International), and one case, viz. that of the Dogger Bank incident, was submitted to a commission of inquiry, which sat in January 190s. 1

If Secretary Knox's proposal (see supra) to convert the International Prize Court into a permanently sitting court of arbitration is adopted, a detailed procedure and jurisprudence will no doubt grow out of a continuity which is lacking in the present system, under which the court is recruited from a large panel for each special case. Secretary Knox's idea, as expressed in the identical circular note addressed by him on the 18th of October 1909 to the powers, was to invest the International Prize Court, proposed to be established by the convention of the 18th of October 1907, with the functions of a " court of arbitral justice." The court contemplated by the convention was a court of appeal for reviewing prize decisions of national courts both as to facts and as to the law applied, and, in the exercise of its judicial discretion, not only to confirm in whole or in part the national decision or the contrary, but also to certify its judgment to the national court for enforcement thereof. The adoption of this jurisdiction would have involved a revision of the judicial systems of probably every country accepting it. The United States government therefore proposed that the signatories should insert in the act of ratification a reservation to the effect that resort to the International Prize Court, in respect of decisions of their national tribunals, should take the form of a direct claim for compensation. This in any case would remove the United States' constitutional objection to the establishment of the proposed court. In connexion with this enabling clause Mr

1 The procedure adopted by the commission was afterwards incorporated in the convention of 1907. Under the rules adopted, the examination of witnesses is conducted by the president in accordance with the system prevailing in most continental countries; members of the commission may only put questions to witnesses for the eliciting of further information; and they may not interrupt the witness when

he is in course of making his statement, but they may ask the president to put any additional questions. This seems likely to become the procedure also in cases before the Hague Court, where witnesses are examined.

Secretary Knox also proposed that a further enabling clause be inserted providing that the International Court of Prize be competent to accept jurisdiction in all matters, arising between signatories, submitted to it, the Court to sit at fixed periods every year and to be composed according to the panel which was drawn up at the Hague. This court, which the American government proposed to call a ” Court of Arbitral Justice,” would take the place of that which it was proposed to institute under Vceu No. 1 of the Final Act of the conference of 1907. The intention of the Hague draft annexed to the Vceu was to create a permanent court as distinguished from that established in 1899, which, though called permanent, was not so, having to be put together ad hoc as the occasion arose. The new court, if adopted, would hold regular and continuous sessions, consist of the same judges, and pay due heed to the precedents created by its prior decisions. The two courts would have separate spheres of activity, and litigants would practically have the option of submitting their differences to a judicial court which would regard itself as being bound by the letter of the law and by judicial methods or to a special court created ad hoc with a purely arbitrative character.

The Place of Diplomacy. — The utility of the diplomatic service has been considerably diminished through the increasing efficiency of the public press as a medium of information. It is not too much to say that at the present day an experienced journalist, in a place like Vienna or Berlin, can give more information to an ambassador than the ambassador can give to him. It is even true to say that an ambassador is practically debarred from coming into actual touch with currents of public feeling and the passing influences which, in this age of democracy, determine the course of events in the political life of peoples. The diplomatist has therefore lost one of his chief functions as an informant of the accrediting government. The other chief function of diplomacy is to be the courteous medium of conveying messages from one government to another. Even this function is losing its significance. The ciphered telegram leaves little discretion to the envoy, and written notes are exchanged which are practically a mere transcription of the deciphered telegram or draft prepared at the instructing foreign office. Neverthe- less, the personality of an ambassador can play a great part, if he possesses charm, breadth of understanding and interest in the social, intellectual and industrial life of the country to which he is accredited. There are several instances of

such men in Europe and America, but they are so rare that some reformers consider them as hardly justifying the large expenditure necessary to maintain the existing system. On the other hand, the utility of the consular service has concurrently increased. Administrative indifference to the eminently useful officials forming the service has led, in many cases, to diminishing instead of increas- ing their number and their salaries, but it is obvious that the extension of their duties and a corresponding raising of their status would be much more in accordance with the national interest. The French, with that practical sense which distin- guishes so much of their recent administrative work, have connected the two services. A consul-general can be promoted to a diplomatic post, and take with him to his higher office the practical experience a consul gains of the material interests of the country to which he belongs.

There is thus still good work for diplomacy to do, and if, in the selection of diplomatic representatives, states followed on the one hand the above-mentioned French example, and on the other hand the American example of selecting for the heads of diplomatic missions men who are not necessarily de la carriere, diplomacy might obtain a new lease of activity, and become once more an extremely useful part of the administrative machinery by which states maintain good business relations as well as friendly political intercourse with one another.

International Regulation by Treaty. — It seems a truism to say that among the agencies which most effectively tend to the preservation of peace are treaties which regulate the relations of states in their intercourse with other states. Such treaties, however, are of quite recent origin. The first of a comprehensive

character was the general act adopted at the South African Conference at Berlin in 1885, which laid down the principle, which has since become of still wider application, that ” any Power which henceforth takes possession of a tract of land on the coast of the African continent outside of its present pos- sessions or which, being hitherto without such possessions, shall acquire them . . . shall accompany the act relating to it with a notification thereof, addressed to the other Signatory Powers of the present act, in order to enable them, if need be, to make good any claims of their own,” and, furthermore, that ” the Signatory Powers of the present act recognize the obligation to ensure the establishment of authority in the regions occupied by them on the coasts of the African continent sufficient to protect existing

rights, and, as the case may be, freedom of trade and transit under the conditions agreed upon." Under these articles occupation of unoccupied territory to be legal had to be effective. This led to the creation and determination of spheres of influence. By fixing the areas of these spheres of influence rival states in western and central Africa avoided conflicts and preserved their rights until they were able to take a more effective part in their development. The idea of " spheres of influence " has in turn been applied even to more settled and civilized countries, such as China and Persia.

Other cases of regulation by treaty are certain contractual engagements which have been entered into by states for the preservation of the status quo of other states and territories.

The Anglo- Japanese Treaty of the 12th of August 1905 sets oat its objects as follows: —

a. " The consolidation and maintenance of the general peace in the regions of Eastern Asia and India;

b. " The preservation of the common interests of the Powers in China, of insuring the independence and the integrity of the Chinese empire, and the principle of equal opportunities for the commerce and industry of all nations in China ;

c. " The maintenance of the territorial rights of the high con- tracting parties in the regions of Eastern Asia and of India, and the defence of their special interests in such regions."

It is a treaty for the maintenance of the status quo in certain parts of Asia in which the parties to it have dominant interests. The same principle underlies different other self-denying arrange- ments and declarations made by the powers with reference to Chinese integrity.

The Treaty of Algeciras is essentially a generalization of the Franco-German agreement of the 28th of September 1905. By it all the powers represented agree to respect the territorial integrity of Morocco, subject to a possible intervention limited to the purpose of preserving order within it.

Differing from these general acts in not being contractual is the Monroe doctrine, which is a policy of ensuring the mainte- nance of the territorial status quo as regards non-American powers throughout the American continent. If necessary, the leading republics of South and Central America would no doubt, however, further ensure respect for it by treaty.

With these precedents and current instances of tendency to place the territorial relations of the powers on a permanent footing of respect for the existing status quo, it seems possible to go beyond the mere enunciation of principles, and to take a step towards their practical realization, by agreeing to respect the territorial status quo throughout still larger tracts of the world, neutralize them, and thus place them outside the area of possible wars.

A third contractual method of avoiding conflicts of interest has been the signing of agreements for the maintenance of the ” open-door.” The discussion on the question of the ” open- door ” in connexion with the Morocco difficulty was useful in calling general public attention once more to the undesir- ability of allowing any single power to exclude other nations from trading on territory over which it may be called to exercise a protectorate, especially if equality of treatment of foreign trade had been practised by the authority ruling over the territory in question before its practical annexation under the name of protectorate. The habitable parts of the world are a limited area, exclusion from any of which is a diminution of

the available markets of the nations excluded. Every power, is, therefore, rightfully interested in the prevention of such exclusion.

The United States government in 1899 called attention to the subject as regards China, without, however, going into any question of principle. It thought that danger of international irritation might be removed by each power making a declaration respecting the ” sphere of interest ” in China to which it laid claim. Lord Salisbury informed Mr Choate that H.M. govern- ment were prepared to make a declaration in the sense desired. All the powers concerned eventually subscribed to the declara- tion proposed by the United States government.

The principle of the ” open-door ” in fact has already been consistently applied in connexion with certain non-European areas. As these areas are practically the only areas which of late years have come within the scope of European regulation, the time seems to be approaching when the principle may be declared to be of general application. From the point of view of diminishing the possible causes of conflict among nations, the adoption of this principle as one of international contractual obligation would be of great utility. While putting an end to the injustice of exclusion, it would obviously reduce the danger of nations seeking colonial aggrandizement with a view to im- posing exclusion, and thus one of the chief temptations to colonial adventure would be eliminated.

In the fourth place, there is the self-denying ordinance against employment of arms for-the enforcement of contractual obliga- tions adopted at the Hague Conference of 1907. Under it the high contracting powers have agreed not to have recourse to armed force for the recovery of contractual debts claimed from the government of one country by the government of another country as due to its subjects. The only qualification admitted under the new convention is that it shall not apply when the debtor-state refuses or leaves unanswered an offer of arbitration, or in case of acceptance renders the settlement of the terms of arbitration impossible, or, after arbitration, fails to comply with the award. The theory on which this convention is based is' known as the Drago theory, having taken a practical form during the administration of Dr L. M. Drago, when he filled the post of Argentine minister of foreign affairs. The doctrine, however, is not new, having already been enunciated a century before by Alexander Hamilton and reiterated since then by several American statesmen, such as Albert Gallatin, William L. Marcy and F. T. Frelinghuysen, as the view prevailing at Washington during their respective periods of office.

Limitations of Disarmament. — Disarmament, or to speak more correctly, the contractual limitation of armaments, has become, of late years, as much an economic as a humanitarian peace-securing object.

" The maintenance of universal peace and a possible reduction of the excessive armaments which weigh upon all nations, represent, in the present condition of affairs all over the world, the ideal towards which the efforts of all governments should be directed," were the opening words of the Note which the Russian Minister of Foreign Affairs, Count Mouraviev, handed to the diplomatic representatives of the different powers suggesting the first Hague Conference.

" The ever-increasing financial burdens," the Note went on, " strike at the root of public prosperity. The physical and intellectual forces of the people, labour and capital, are diverted for the greater part from their natural application and wasted unproductively. Hundreds of millions are spent in acquiring terrible engines of destruction, which are regarded to-day as the latest inventions of science, but are destined to-morrow to be rendered obsolete by some new discovery. National culture, economic progress and the production of wealth are either paralysed or developed in a wrong direction. Therefore the more the armaments of each power increase the less they answer to the objects aimed at by the governments. Economic dis- turbances are caused in great measure by this system of excessive armaments; and the constant danger involved in this accumula- tion of war material

renders the armed peace of to-day a crushing

burden more and more difficult for nations to bear. It conse- quently seems evident that if this situation be prolonged it will inevitably result in the very disaster it is sought to avoid, and the thought of the horrors of which makes every humane mind shudder. It is the supreme duty, therefore, of all states to place some limit on these increasing armaments, and find some means of averting the calamities which threaten the whole world.”

A further Note submitting the programme proposed gave more precision to this item, which thereupon took the following form: ” An understanding not to increase for a fixed period the present effectives of the armed military and naval forces, and at the same time not to increase the budgets pertaining thereto; and a preliminary examination of the means by which even a reduction might be effected in future in the forces and budgets above mentioned.”

When the subject came on for discussion at the conference the German military delegate stated his view that the question of effectives could not be discussed by itself, as there were many others to which it was in some measure subordinated, such, for instance, as the length of service, the number of cadres whether existing in peace or made ready for war, the amount of training received by reserves, the situation of the country itself, its railway system, and the number and position of its fortresses. In a modern army all these questions went together, and national defence included them all. In Germany, moreover, the military system ” did not provide for fixed numbers annually, but increased the numbers each year.”

After many expressions of regret at finding no method of giving effect to the proposal, the commission confined itself to recording its opinion that ” a further examination of the question by the Powers would prove a great benefit to humanity.”

The Conference, however, were unanimous in the adoption of the following resolution: —

” The Conference is of opinion that the restriction of military budgets, which are at present a heavy burden on the world, is extremely desirable for the increase of the material and moral welfare of mankind;”

and it passed also the following vosu : —

” That governments, taking into account the proposals made at the Conference, should examine the possibility of an understanding concerning the limitation of military and naval armaments, and of war budgets.”

The general public, more particularly in Great Britain and France, shows an ever-increasing distrust of the rapid growth of armaments as a possible cause of grave economic troubles. A high state of military preparedness of any one state obliges all the others to endeavour to be prepared on the same level. This process of emulation, very appropriately called by the late Sir H. Campbell-Bannerman ” a policy of huge armaments,” unfortunately is a policy from which it is impossible for any country to extricate itself without the co-operation, direct or indirect, of other nations.

The, subject was brought forward in view of the second Hague Conference in both the French and Italian parliaments.

The declaration of the French government stated that: —

” France hoped that other nations would grow, as she had done, more and more attached to solutions of international difficulties based upon the respect of justice, and she trusted that the progress of universal opinion in this direction would enable nations to regard the lessening of the present military budgets, declared by the states represented at the Hague to be greatly desirable for the benefit of the material and moral state of humanity, as a practical possibility.” (Chamber of Deputies, June 12, 1906.)

In the Italian Chamber of Deputies, an interpellation was addressed to the minister of foreign affairs about the same time asking ” whether the Government had knowledge of the motion approved by the British House of Commons, and of the under- taking of the British government that, in the programme of the coming Hague Conference, the question of the reduction of armaments should be inserted, and in what spirit the Italian government had taken or proposed to take the propositions of the British government, and what instructions it would give to the Italian representatives at the conference.”

The minister of foreign affairs, M Tittoni, in reply expressed the adhesion of the Italian government to the humanitarian ideas which had met with such enthusiasm in the historic House of Parliament at Westminster. ” I have always believed,” he said, ” that, as far as we

are concerned, it would be a national crime to weaken our own armaments while we are surrounded by strongly armed European nations who look upon the improve- ment of armaments as a guarantee of peace. Nevertheless, I should consider it a crime against humanity not to sincerely co-operate in an initiative having for object a simultaneous reduction of armaments of the great powers. Italian practice has always aimed at the maintenance of peace; therefore, I am happy to be able to ‘ say that our delegates at the coming Hague Conference will be instructed to further the English initiative.”

The only existing case of contractual reduction of armaments is that of the Disarmament Agreement of the 28th of May 1902 between the Chilian and Argentine republics, adopted ” owing to the initiative and good offices of His Britannic Majesty,” which is as follows: —

Art. I. — In order to remove all cause of fear and distrust between the two countries, the governments of Chile and of the Argentine Republic agree not to take possession of the warships which they are having built, or for the present to make any other acquisitions. The two governments furthermore agree to reduce their respective fleets, according to an arrangement establishing a reasonable proportion between the two fleets. This reduction to be made within one year from the date at which the present agreement shall be ratified.

Art. II. — The two governments respectively promise not to increase their maritime armaments during five years, unless the one who shall wish to increase them shall give the other eighteen months’ notice in advance. This agreement does not include any armaments for the purpose of protecting the shore and ports, and each party will be at liberty to acquire any vessels (maquina flotante) intended for the protection thereof, such as submarines, &c.

Art. III. — The reductions (i.e. ships disposed of) resulting from this agreement will not be parted with to countries having any dispute with either of the two contracting parties.

Art. IV. — In order to facilitate the transfer of the pending orders the two governments agree to increase by two months the time stipulated for the beginning of the construction of the respective ships. They will give instructions accordingly.

An agreement of this kind is obviously more feasible as among states whose navies are small and of comparatively recent origin than among states whose navies are composed of vessels of many and widely different ages. It may be difficult to agree in the latter case on a

principle for assessment of the proportionate fighting value of the respective fleets. The break-up or sale of obsolete warships is a diminution of the paper effective of a navy, and their purchase by another state a paper increase of theirs. Even comparatively slight differences in the ages of ships may make great differences in their fighting value. It would be a hard, though probably not insurmountable, task to establish ” a reasonable proportion,” such as provided for in Art. II. of the Chile-Argentina Agreement, as between large and old-standing navies like those of Europe.

On the other hand, as regards military power, it seems some- times forgotten in the discussion of the question of armaments, that the conditions of the present age differ entirely from those of the time of the Napoleonic wars. With conscription a national army corresponds more or less numerically to the proportion of males in the national population. Great Britain, without con- scription, has no means of raising troops in any such proportion. Thus, so long as she refrains from adopting conscription, she can only carry on defensive warfare. The object of her navy is therefore necessarily defensive, unless it act in co-operation with a foreign conscript army. As there are practically only three great armies available for the purpose of a war of aggression, the negotiation of contingent arrangements does not seem too remote for achievement by skilful and really well-meaning negotiation. The Hague Conference of 1907, owing to difficulties which occurred in the course of the preliminary negotiations for the conference, did not deal with the subject.

Principle and Capabilities of Neutralization. — Among the different methods which have grown up practically in our own

time for the exclusion of war is neutralization. We have been dealing hitherto with the elimination of the causes of war; neutralization is a curtailment of the areas of war and of the factors in warfare, of territory on the one hand and states on the other. The neutralization of territory belonging to states which are not otherwise neutralized includes the neutralization of waterways such as the Suez and Panama canals.

Under the General Act of Berlin of the 26th of February 1885, ” in case a power exercising rights of sovereignty or protec- torate ” in any of the regions forming the basin of the Congo and its affluents,

including Lake Tanganyika, and extending away to the Indian Ocean, should be involved in a war, the parties to the General Act bound themselves to lend their good offices in order that the territories belonging to this power be placed during the war ” under the rule of neutrality and considered as belonging to a neutral state, the belligerents thenceforth abstaining from extending hostilities to the territories thus neutralized, and from using them as a basis for warlike operations ” (art. 2).

Neutralization is not necessarily of general application. Thus two states can agree to neutralize specific territory as between them. For example between Costa Rica and Nicaragua by a treaty of the 15th of April 1858 the parties agreed that ” on no account whatever, not even in case of war,” should ” any act of hostility be allowed between them in the port of San Juan del Norte nor on the river of that name nor on Lake Nicaragua” (art. 2). 1

Again, the Straits of Magellan are neutralized as between Argentina and Chile under a treaty of the 23rd of July 1881. Article 5 provides that they are ” neutralized for ever and their free navigation is guaranteed to the flags of all nations. To ensure this neutrality and freedom it is agreed that no fortifica- tions or military defences which might interfere therewith shall be erected.”

Luxemburg was declared by the Treaty of London of the nth of May 1867 (art. 1) to be a perpetually neutral state under the guarantee of Great Britain, Austria, Prussia and Russia. Swit- zerland, by a declaration confirmed by the Treaty of Vienna, of 1 81 5 (art. 84), likewise enjoys perpetual neutrality. And now Norway has placed herself under a neutral regime of a similar character.

A neutralized state does not mean a state which is forbidden to have fortifications or an army; in this it differs from neu- tralized territory of a state not otherwise neutralized. Thus Belgium, which is a neutralized state, not only has an army but has fortifications, although by the treaties of 1831 and 1839 she was recognized as a ” perpetually neutral state, bound to observe the same neutrality with reference to other states.”

Of waterways, international rivers have been the chief subject of neutralization. It has long been an established principle in the intercourse of nations, that where the navigable parts of a river pass through different countries their navigation is free to all. The rivers Scheldt and Meuse were opened up in this way to riparian states by a decree of the French Convention of the 1 6th of November 1792. By

the treaty of Vienna of the 9th of June 1815, the powers whose territories were separated or traversed by the same navigable river, undertook to regulate by common consent all that regarded its navigation, and for this purpose to name commissioners who should adopt as the bases of their proceedings the principle that the navigation of such rivers along their whole course ” from the point where each of them becomes navigable to its mouth, shall be entirely free, and shall not in respect of commerce be prohibited to anyone.” The only case in Europe in which this internationalization of rivers has been maintained is that of the Danube. On the other hand neutralization has made progress in respect of waterways,

1 Under the treaty of the 29th of March 1864, the courts of Great Britain, France and Russia in their character of guaranteeing powers of Greece declared with the assent of the courts of Austria and Prussia that the islands of Corfu and Paxo as well as their dependencies should, after their union to the Hellenic kingdom, enjoy the advantages of perpetual neutrality, and the king of the Hellenes undertook on his part to maintain such neutrality. (Art. 2).

natural as well as artificial. Thus the Bosporus and Dardanelles under the Treaty of Paris of 1856 and by the Treaty of London 1871 were and remain closed to the passage of foreign armed vessels in time of war, though the Porte may permit their passage in time of peace in certain cases. The Suez and the Panama canals have been permanently neutralized, the former by a convention among the great powers, and the latter by a treaty between Great Britain and the United States.

Alongside this neutralization has grown up a collateral institution, the purpose of which is in some respects similar. We refer to “buffer” zones. “Buffer” zones are of quite recent origin as a political creation, 2 i.e. where their object is to establish upon the territory of two contiguous states a strip or zone on either side of the frontier which the respective states agree to regard as neutral, on which the parties undertake to erect no fortifications, and maintain no armed forces but those necessary to enforce the ordinary respect of government. The word ” neutral ” does not correctly describe the character of the zone. It is. not neutral in the sense of being recognized as such by any third state, and it necessarily ceases to be neutral in case of war between the states concerned. The word ” buffer ” comes nearest to the object, but even this term implies more than is meant. Between Spain and Morocco a treaty of the 5th of March 1894 established between the Camp of Melilla and Moroccan territory a zone within which no new roads were to be made, no herds to be allowed to graze, no land to be cultivated, no troops of either party, or even private persons carrying

arms, to set foot, no inhabitants to dwell, and all habitations to be razed. The zone between Burma and Siam, established by an agreement between Great Britain and France dated the 15th of January 1896, declared ” the portion of Siam which is comprised within the drainage basin of the Menam, and of the coast streams of a corresponding longitude,” neutral as between them. Within this area the two powers undertook not to ” operate by their military or naval forces, except in so far as they might do so in concert for any purpose requisite for maintaining the indepen- dence of Siam.” They also undertook not to acquire within that area any privileges or commercial facilities not extended to both of them.

” Buffer ” zones might fulfil a useful purpose even in Europe. They would obviously react against the feeling known as ” esprit de frontiere,” and diminish the danger of incidents arising out of this feeling, and might attenuate the rivalry of neighbouring counter-armaments.

These considerations no doubt led the Swedish and Norwegian governments, in their settlement of September 1905, to establish a ” buffer ” zone of 15 kilometres on either side of the frontier between the two states in question. Within these 30 kilometres all existing fortresses are dismantled, 3 no new ones are to be erected, and no armed troops to be maintained; any question between the two states relative to the provisions respecting the ” buffer ” zone to be decided by arbitration.

A rather special case of neutralization of a territorial area

‘ The institution of ” buffer ” zones in a more strictly correct sense of the term is of very ancient origin. One is mentioned in the annals of China two centuries before our era, between the terri- tories of the Huns in the west and those of the Tunguses in the east — a vast area of some 300 to 400 m. p on the opposite margin of which the two peoples kept watch. In Europe, bands of territory from time to time have been made desert to better establish sepa- ration. The Romans and Germans protected themselves in this way. In the middle ages the Teutonic Order established a frontier belt on the side of Lithuania. Later, Austria dealt in the same way in her policy in regard to Turkey in the organization of a ” military frontier.” See Nys, Droit International (Brussels, 1904), i. 418.

3 It was stipulated that the dismantling should be controlled by a technical commission of three officers of foreign nationality, to be chosen, one by each of the contracting powers and the third by the

two officers thus appointed, or, in default of an agreement on their part, by the president of the Swiss Confederation. The dismantling of the forts in question has now been carried out. The Commission was composed on the part of Sweden of an engineer on the staff of the Austrian army, and on the part of Norway of a colonel in the German army, and, by agreement of these, of a colonel in the Dutch army.

is that of the practical neutralization of the Great Lakes in America. In 1817, at the instance of John Quincy Adams, the United States and Great Britain entered into a compact whereby the Great Lakes, and the waterways from them to the ocean by the St Lawrence river, which divide the United States from the Dominion of Canada, were practically excluded from any possible hostilities. Through a simple agreement, ” conditions which make for peace and prosperity, and the absence of those which so often lead to disastrous war, have for nearly a century reigned over these great inland waters, whose commerce, con- ducted for the benefit of the states and nations of Europe and America, rivals that which passes through the Suez Canal or over the Mediterranean Sea, and with a result foreshadowed in these words of President Monroe in his communication to the Senate commending the proposed agreement : ‘ In order to avoid collision and save expense.’ Forts which had been erected at salient points on either side of the lakes and rivers dividing the United States from Canada, which but for this agreement would, in the natural course of events, have been enlarged, increasingly garrisoned, and provided with modern implements of destruction, at large expense, have remained substantially as when the agreement was made, or now constitute but inter- esting or picturesque ruins; and the great cost of constructing and maintaining, through a long series of years, naval armaments of ever-increasing power has been avoided.” 1

As we have already said, the Monroe doctrine is a means of excluding European warfare from the American continent and therefore is in the nature of a form of neutralization. A sort of Monroe doctrine is growing into popular favour also throughout the Australian Commonwealth, where it is felt that a continent so far removed from European rivalries ought not to be exposed to complications on account of them.

From time to time questions of adding to existing neutralized areas are raised. When it was announced in 1905 that a British fleet was about

to manoeuvre in the Baltic Sea, several German newspapers suggested that Germany should combine with other Baltic powers to assure its neutralization. 2 No official observa- tion on the subject, however, was made on the part of any Baltic power. The Baltic is still an open sea for the whole world, without restriction of any kind; and even hostilities between any two non-Baltic powers could be carried on in the Baltic, as elsewhere on the high sea, under the existing practice.

When the Dogger Bank incident occurred, the possibility of operations of war being carried on within a few miles of British home ports, and amid the busy traffic of the North Sea, was brought vividly home to British minds.

A movement set on foot at the instance of Edward Atkinson, the well-known Boston economist, and warmly supported by the Massachusetts State Board of Trade, seeks to establish by treaty neutral zones from the ports of North America to the ports of Great Britain and Ireland and the continent of Europe, within which zones steamship and sailing vessels in the conduct of lawful commerce should be free to pass without seizure or interruption in time of war. There is however no precedent of neutralization of any such area of the high sea, and international rivers, ocean canals and neutralized states are obviously no criterion in discussing a proposal to neutralize a strip of the ocean, which may be denned accurately enough on the map and which skilful navigators could approximately determine, but which might be violated without any practical means of detection by a belligerent commander whenever he misread, or it suited him to misread, his bearings.

Connected with the principle of neutralization is that of guaranteeing the integrity of states. Several such guarantees have been given in quite recent times. In November 1907 a treaty was concluded between France, Germany, Great Britain and Russia on the one part and Norway on the other, for the maintenance of the integrity of Norway. This treaty differed

1 Memoir of Massachusetts State Board of Trade (Feb. 13, 1905).

2 This was merely reviving an idea which had come and gone many times before. See Barclay, Problems of International Practice and Diplomacy (1907).

from the older one of 1855 in which France and Great Britain guaranteed the integrity of Norway and Sweden, in the fact that whereas the older treaty was for the protection of these two states

against Russia, the new treaty is intended, if it is to serve at all as a protection against invasion, to protect Norway against Sweden.

Another such guarantee of a vaguer character is that which the North Sea powers recently entered into for the maintenance of the status quo of their respective North Sea territories; and the similar one entered into by the Mediterranean powers for the same objects in the Mediterranean. Lastly in the same order of ideas Austria-Hungary and Russia are said to have concluded an arrangement between them for the maintenance of the status quo in the Balkans.

The future has no doubt still other extensions of the principle of neutralization in store for us. Not the least interesting of existing possibilities is the limitation of the area of visit and search in time of war itself, as a restriction of belligerent right. It seems contrary to common sense that neutral ships should be exposed to being detained, taken out of their course, and overhauled on mere suspicion of carrying contraband, when they are so far from the seat of war that there can be no presumption as to their destination. Neutrals have a right to carry on their ordinary business unmolested in so far as they do nothing to assist either belligerent. When they are beyond a certain distance from the seat of war it seems reasonable that the presumption that they are merely carrying on their legitimate business should be considered absolute. Such a limitation of the area of hostilities is not only feasible, but it was actually put in practice by the British government during the Boer War. 3

In the course of the Russo-Japanese War the question came up again, being raised this time by Great Britain. Lord Lans- downe called the attention of the Russian foreign office to the extreme inconvenience to neutral commerce of the Russian search for contraband not only in the proximity of the scene of war, but over all the world, and especially at places at which neutral . commerce could be most effectually intercepted. H.M. Govern- ment had become aware that a large addition was likely to be made to the number of Russian cruisers employed in this manner, and they had, therefore, to contemplate the possibility that such vessels would shortly be found patrolling the narrow seas which lie on the route from Great Britain to Japan in such a manner as to render it virtually impossible for any neutral vessel to escape their attention. The effect of such interference with neutral trade, he said, would be disastrous to legitimate commerce passing from a British port in the United Kingdom to a British port in the Far East. The British government had no desire to place obstacles in the way of a belligerent desiring to take reasonable precautions in order to prevent the enemy from receiving supplies, but they insisted that

the right of taking such precautions did not imply a ” consequential right to intercept at any distance from the scene of operations and without proof that the supplies in question were really destined for use of the enemy’s forces, any articles which that belligerent might determine to regard as contraband of war.”

3 In January 1900 it was reported that the British government had issued instructions to British naval commanders not to stop or search German merchant vessels at any places not in the vicinity of the seat of war. There is no proper statement of the British position on this subject, the only official information having been given by the German chancellor in a speech to the Reichstag. According to this information, the area was ultimately limited as north of Aden, and afterwards it was agreed that the immunity from search should be extended to all places beyond a distance from the seat of war equal to the distance from it of Aden. This was substantially correct, though the telegrams sent by the Admiralty can hardly be said to have fixed any precise area. As a fact, the commanders-in-chief on the East Indies and Cape of Good Hope stations were instructed that in consequence of the great practical difficulty of proving — at ports so remote from the scene of war operations as Aden and Perim — the real destination of contraband of war carried by vessels visiting those parts, directions were to be given to the officers concerned to cease to search such vessels, and to merely report to the commander-in-chief at the Cape the names of ships suspected of carrying contraband, and the date of clearance.

The position thus assumed is not clear. On the one hand the British claim did not, it is seen, go the length of the restriction Great Britain consented to place on her own right of search during the Boer War, seeming to apply only to the case of ships carrying conditional contraband. On the other, the complaint is based on the ” interference ” with neutral trade, which means the stoppage and search of vessels to ascertain whether they have contraband of any kind on board or not.

It must not be forgotten in this connexion that restriction of the rights of the belligerent necessarily entails extension of the duties of the neutral. The belligerent has an unquestioned right to ” interfere ” with all neutral vessels navigating in the direction of the seat of war, for the purpose of ascertaining whether they are carrying any kind of

contraband or not. Under the Declaration of London of the 26th of February 1909 it is provided under arts. 32 and 35 that a ship's papers are conclusive proof as to the voyage on which she is engaged unless she is clearly out of the course indicated by her papers and is unable to give adequate reasons to justify her deviation. Thus the interference, if the declaration is ratified, will be confined to an examination of the ship's papers where the ship is not bound for a belligerent port (cf. art. 30 of the same convention).

Standing Peace Agreements. — Foremost among standing peace agreements are, of course, the International Hague Conventions relating directly to peace, agreements which have not only created a special peace jurisdiction for the settlement of international difficulties by judicial methods but also a written law to apply within the scope of this jurisdiction.

Alongside the Hague Peace Conventions and more or less connected with them are standing treaties of arbitration which have been entered into by different nations for terms of years separately. The first of what may be called a new series was that between Great Britain and France. It has now been followed by over a hundred others forming a network of international relationships which shows that, at any rate, the wish for peace is universal among mankind. 1

1 The following list of standing arbitration treaties concluded after the signing of the Anglo-French treaty of October 14th 1903 is as complete as possible down to June 1910: —

Argentina-Brazil, September 7, 1905.

,, Portugal, August 27, 1909. Austria-Hungary-Switzerland, December 3, 1904. Belgium-Denmark, April 26, 1905.

,, Greece, May 2, 1905.

,, Norway and Sweden, November 30, 1904.

,, Rumania, May 27, 1905. Russia, October 30, 1904.

,, Spain, January 23, 1905.

,, Switzerland, November 15, 1904. Brazil-Portugal, March 25, 1909.

,, Spain, April 8, 1909.

,, Mexico, April 11, 1909.

,, Honduras, April 26, 1909.

,, Venezuela, April 30, 1909.

„ Panama, May I, 1909.

,, Ecuador, May 13, 1909.

,, Costa Rica, May 18, 1909.

,, Cuba, June 19, 1909.

,, Bolivia, June 25, 1909.

„ Nicaragua, June 28, 1909.

„ Norway, July 13, 1909.

,, China, August 3, 1909.

,, Salvador, September 3, 1909.

,, Peru, December 7, 1909.

,, Sweden, December 14, 1909. Colombia- Peru, September 12, 1905.

,, France, December 16, 1908.

Denmark-France, September 15, 1905.

„ Italy, December 16, 1905.

„ Netherlands, February 12, 1904.

„ Russia, March 1, 1905.

,, Spain, December 1, 1905.

,, Norway, October 8, 1908.

France-Italy, December 26, 1903.

,, Netherlands, April 6, 1904.

,, Norway and Sweden, July 9, 1 904.

,, Spain, February 26, 1904.

There are, however, a large number of conventions which, although not concluded with the direct object of assuring peace where difficulties have arisen, tend in a very practical manner to contract the area of possible difficulties. These are conventions for the regulation of intercourse between the subjects and citizens of different states. Such conventions obviously remove occasions for friction and are therefore among the most effective agencies contributing to the preservation of peace among civilized peoples. In most cases such conventions have created inter- national unions of states for all matters which lend themselves to international co-operation. The first in order of date was the postal union. The system it inaugurated has now extended its scope to telegraphs, copyright, industrial property, railway traffic, the publication of customs tariffs, metric measures, monetary systems and agriculture. Berne, being the capital of the most central of the neutral European states, is the adminis- trative centre of most of these unions. Customs tariffs and the monetary unions, however, are centralized at Brussels,

France—Sweden and Norway, July 9, 1904. ,, Switzerland, December 14, 1904. ,, Brazil, April 7, 1909. Great Britain-France, October 14, 1903. Germany, July 12, 1904. Italy, February 1, 1907. Austria-Hungary, January II, 1905. Netherlands, February 15, 1905. Colombia, December 30, 1908. Sweden and Norway, August 11, 1904. Denmark, October 25, 1904. Portugal, November 16, 1904. Spain, February 27, 1904. Switzerland, November 16, 1904. United States, April 4, 1908. Brazil, June 18, 1909. Honduras-Spain, May 13, 1905. Italy-Argentine, September 18, 1907. ,, Mexico, October 1, 1907. „ Peru, April 18, 1907. ,, Portugal, May 11, 1905. „ Switzerland, November 23, 1904. „ Netherlands, November 21, 1909. Netherlands-Portugal, October 26, 1905. Norway-Sweden, October 26, 1905. Norway and Sweden-Russia, December 9, 1904. ,, ,, Spain, January 23, 1905.

,, ,, Switzerland, December 17, 1904.

PortugaU-Spain, May 31, 1904.

,, Austria-Hungary, February 13, 1906.

Denmark, March 20, 1907. ,, France, June 29, 1906.

Italy, May 11, 1905. ,, Netherlands, October I, 1904.

,, Norway and Sweden, May 6, 1905. (Suspended for

,, Norway by a new one dated December 8, 1908.)

,, Spain, May 31, 1904.

,, Switzerland, August 18, 1905.

,, Nicaragua, July 17, 1909.

Russia-Norway and Sweden, November 26, 1904. Spain-Greece, December 3-16, 1909.

Switzerland, May 14, 1907. United States-Spain, April 20, 1908.

Denmark, May 18, 1908. Italy, March 28, 1908. Japan, May 5, 1908. Netherlands, May 2, 1908. Portugal, April 6, 1908. Sweden, May 2, 1908. Switzerland, February 29, 1908. Argentina, December 23, 1908. Peru, December 3, 1908. Salvador, December 21, 190? Norway, April 4, 1908. Mexico, March 24, 1908. France, February 2, 1908. Ecuador, January 7, 1909. Bolivia, January 7, 1909. Haiti, January 7, 1909. Uruguay, January 9, 1909. Chile, January 13, 1909. Costa Rica, January 13, 1909. Austria-Hungary, January 15, 1309 Brazil, January 23, 1909. Paraguay, March 13, 1909. China, October 8, 1908.

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the weights and measures union in Paris and the agricultural institute at Rome.

The general postal union was treated by a convention signed at Berne in 1874. A convention for a similar union for telegraphs was signed in Paris in 1875 (revised at St Petersburg and replaced by another the same year). Both unions issue monthly bulletins and other publications giving useful information about these two services. 1

The international bureau of weights and measures at Paris was created by a convention signed there in 1875, for the purpose of comparing and verifying weights and measures on the metric system, and preserving their identity for the contracting states. The double-standard Latin union monetary system was founded by a convention of 1865, between Belgium, France, Italy and Switzerland. In 1868 it was joined by Greece. A single standard union exists between Sweden, Norway and Denmark under a convention of 1873.

The copyright union was created by an international con- vention signed in 1874. The official bureau of the union is at Berne. It issues a periodical publication called Le Droit d’auteur giving information

respecting the laws of different states relating to published matter of all kinds.

The term ” industrial property ” covers patents, trade marks, merchandise marks, trade names, designs and models. The convention dealing with them signed in 1883 created a union with its central office at Berne. It, too, issues a bulletin and other publications which help to prevent misunderstandings.

The railway traffic union was formed by a convention of 1890. The central bureau at Berne issues a monthly bulletin. A subsequent convention was signed at Berne in 1886 relating to matters of technical unification.

1 A subsidiary convention not quite falling within the scope of the above convention is the submarine telegraphs convention, which was signed in 1884. It applies outside territorial waters to all legally established submarine cables landed on the territories, colonies or possessions of one or more of the high contracting parties. Under its provisions it is a punishable offence ” to break or injure a submarine cable wilfully or by culpable negligence in such manner as might interrupt or obstruct telegraphic communi- cation either wholly or partially, such punishment being without prejudice to any civil action for damages. It also provides that: — ” Vessels engaged in laying or repairing submarine cables shall conform to the regulations as to signals which have been, or may be, adopted by mutual agreement among the high contracting parties with the view of preventing collisions at sea. When a ship engaged in repairing a cable exhibits the said signals, other vessels which see them or are able to see them shall withdraw to or keep beyond a distance of one nautical mile at least from the ship in question so as not to interfere with her operations ” (art. 5). ” Owners of ships or vessels who can prove that they have sacrificed an anchor, a net or other fishing-gear in order to avoid injuring a submarine cable shall receive compensation from the owner of the cable,” and “in order to establish a claim to such compensation a statement supported by the evidence of the crew should whenever possible be drawn up immediately after the occurrence and the master must within twenty-four hours after his return to or next putting into port make a declaration to the proper authorities ” (art. 7). ” The tribunals competent to take cognizance of infractions of the present convention are those of the country to which the vessel on board of which the offence was committed belongs ” (art. 8). By art. 15 it is provided that the stipulations of the con- vention do not in any way restrict the action of belligerents. It may be remarked that the British representative at the time of signing the convention declared that his government understood that in the time of war a belligerent would be free to act in regard to submarine cables as though the convention did

not exist. The act to carry into effect the above convention is the Submarine Telegraph Act 1885 (48 & 49 Vict. c. 49) which was slightly modified by 50 Vict. c. 3. Section 3 of the earlier act provides that a person who injures the cable either wilfully or by culpable negli- gence is ” guilty of a misdemeanour and on conviction: (a) if he acted wilfully, shall be liable to penal servitude for a term not exceeding five years, or to imprisonment with or without hard labour for a term not exceeding two years, and to a fine either in lieu of or in addition to such penal servitude or imprisonment; and (b) if he acted by culpable negligence shall be liable to im- prisonment for a term not exceeding three months without hard labour, and to a fine not exceeding £100 either in lieu of or in addition to such imprisonment.”

See Board of Trade Correspondence on Protection of Submarine Cables, printed on the 24th of July 1 882; and Parliamentary Paper C. 5910: 1890.

Under the convention creating the customs tariffs union, signed in 1890, thirty states, including Great Britain and most British colonies, are associated for the purpose of prompt publication of custom tariffs and their modifications.

The agricultural institute, created by a convention of 1905 with its seat at Rome, as the latest in date is perhaps the most interesting of the series. It shows how deep and widespread the sense of the utility of international state co-operation has become. The convention sets out the scope and objects of the institute, which a recent British official publication states has been joined by 38 states, including Great Britain and all other great powers, as follows :-

Whilst limiting its action to international questions, it shall be the duty of the institute: (a) To collect, elaborate and publish, with as little delay as possible, statistical, technical, or economic information regarding the cultivation of the soil, its productions, whether animal or vegetable, the trade in agricu’tural products, and the prices obtained on the various markets, (b) To communi- cate to interested parties, also without delay, full information of the nature above mentioned, (c) To indicate the wages of rural labour, (d) To notify all new diseases of plants which may appear in any part of the world, indicating the districts affected, the spread of the disease, and, if possible, the efficacious means of resistance. (e) To consider questions relating to agricultural co-operation, insurance and credit, in all their forms, collecting and publishing information which may be useful in the various countries for the organization of undertakings relating to agricultural co-operation, insurance and credit. (/) To present, if

expedient, to the govern- ments, for their approval, measures for the protection of the common interests of agriculturists and for the improvement of their con- dition, after having previously taken every means of obtaining the necessary information, e.g. resolutions passed by international congresses or other congresses relating to agriculture or to sciences applied to agriculture, agricultural societies, academies, learned societies, &c.

All questions relating to the economic interests, the legislation and administration of any particular state, must be excluded from the sphere of the institute. (Art. 9).

Lastly, there is a class of difficulties which might arise from preferential treatment of trade from different countries. To obviate them statesmen have been led to adopt the principle of the ” most - favoured-nation-clause ” — that is to say, a clause providing that if any reductions of tariff or other advantages are granted by either contracting state to any third state, the others shall have the benefit of it. In Europe this clause has been uniformly treated as applying to all reductions of tariff without distinction. The United States interpretation, on the other hand, distinguishes between reductions of a general character and reductions made specifically in return for reductions by some other state. The latter do not come within the operation of the clause, and a co-contracting state is only entitled to obtain extension of them to itself on granting similar concessions. In other words, concessions to any co-contracting state are only allowed gratuitously to a third co-contracting state when nothing has been given for them, the clause not covering advan- tages granted in return for advantages. It is to be hoped that this special view of the meaning of the clause will be met in the future, as in some recent treaties, by specifically dealing with the exceptions. 2

The Utility of Popular Effort. — Until quite recently it had been a distinctive mark of practical wisdom to treat private efforts for the improvement of international relations for the preservation of peace, with the patronizing tolerance courteous people of the world extend to half-crazy idealists. Since the opening of the century, an immense change has taken place in the attitude of the leaders of popular opinion towards the advocacy of peace. This new attitude has been contemporary with the greater interest displayed by the mercantile classes of England and the United States in the improvement of their political relations with their neighbours. It may be said to have begun with the visit of the Association of British Chambers of Commerce to Paris in 1900, at a time when France was still smarting from the humiliation of the Fashoda affair, and the Boer War was exciting

hostile demonstrations against Great Britain throughout the continent of Europe. That some four hundred British manufacturers

2 See Barclay, Problems of International Practice and Diplomacy (1907), p. 137 seq.

and merchants, representing about eighty chambers of commerce of the United Kingdom, should have swept aside all political objections and have boldly trusted to the efficacy of friendly advances as between man and man, appealed to the French people. It seems to have been the first great popular effort ever made deliberately by a representative body of the middle class of a nation for the promotion of international friendship without the aid of diplomacy and without official assistance or even countenance of any kind.

Otherwise, private agencies of a standing character which contribute towards the promotion of peace may be divided into four classes, viz. (1) those which, without having peace for their direct object, promote friendship among men of different races and nationalities; (2) those which directly address themselves to the promoting of friendship and goodwill among peoples; (3) those which regarding peace as the immediate object of their efforts, endeavour to educate democracy in this sense; (4) those which endeavour to remove the causes of international friction by the codification of international law and the promotion of the international regulation of common interests. Lastly, there are two agencies which cannot be classed among the foregoing; one is the International Parliamentary Union and the other the Nobel Prize Committee.

1. Agencies which are indirectly making for peace are of many kinds. Science and medicine now bring men of all nations together in periodical congresses. Technology, electricity, mining, railways, navigation and many other subjects are now dealt with in international congresses. International exhibitions are always used as an occasion for holding many such meetings.

2. One of the most notable efforts directed to the deliberate cementing of friendship has been the interchange of official visits by municipal bodies. In the course of the Anglo-French agitation which culminated in March 1903 with the visit of King Edward to Paris, the French municipal councils passed many resolutions in favour of the entente.

After the conclusion of the Anglo-French standing treaty of arbitration (Oct. 14, 1903) and the arrangements for the general settlement of outstanding difficulties with France (April 8, 1904), the municipal bodies in France were prepared to go a step farther, and in 1906 the Muni- cipal Council of Paris was invited by the London County Council to pay an official visit to England. This visit was followed by a return visit to Paris and a similar exchange of visits between the London City Corporation and the Paris Municipal Council, exchange visits of the city corporations of Manchester, Glasgow and Edinbuigh and Lyons, and a visit of the Manchester Corpora- tion to Dusseldorf, Barmen and Cologne. A society, numbering many thousands of working men among its members, which has set itself the more special task of promoting the interchange of visits between working men of different nations, is called the " International Brotherhood Alliance," or, after the initials of its motto, Fraternitas inter gentcs, the F.I.G. Another agency, called the " American Association for International Concili- ation," seeks by the publication of essays on the different aspects of international friendship to promote the same cause.

3. The " peace societies," which are scattered over the whole world, number several hundreds. 1 Their first International Congress was held in London at the suggestion of Joseph Sturge in 1843. In 1848 a second congress was held at Brussels. The third in 1849 took place in Paris, and was presided over by Victor Hugo. Other congresses were held at Frankfurt, again in London, and in 1853 at Manchester, where Richard Cobden and John Bright took part in the discussions. Then followed an interval of wars during which the- Pacifists were unable to raise their voices. At length in 1878 a congress was held at the Paris International Exhibition of that year, but it was not till the next Paris International Exhibition of 1889 that these international peace congresses became periodical. Since then numerous con- gresses have been held, the seventeenth having sat in London in 1908, and the eighteenth at Stockholm in igio. These congresses have been supplemented by national congresses in

1 See Annuaire du mouvement pacifiste pour I'annee iqio, published by the Bureau International de la Paix, at Bern.

both Great Britain and France. Such congresses are doing admirable work in the popularizing of thought upon the numerous questions which are discussed at the meetings, such as compulsory arbitration, the restriction of armaments, private property at sea in time of war, the position of subject races, airships in war, &c. 2

4. First among the bodies which try to remove the causes of

international friction is the Institute of International Law. This is a body of international lawyers, consisting of sixty mem- bers and sixty associates recruited by election — the members from those who " have rendered services to international law in the domain of theory or practice," and associates from those " whose knowledge may be useful to the Institute." It was formed in 1873, chiefly through the efforts of M. Rolin-Jaequemyns. The official language of the Institute is French, and its annual meetings are held wherever the members at the previous meeting decide to assemble. Its mode of operation is to work out tht matters it deals with during the intervals between the sessions, in permanent commissions, among which the whole domain of international law is divided up. The commissions, under the direction of their rapporteurs or conveners, prepare reports and proposals, which are printed and distributed among the members some time before the plenary sittings at which they are to be discussed. If the members are not agreed, the subject is adjourned to another session, and still another, until they do agree. Thus the resolutions of the Institute have the authority attaching to a mature expression of the views of the leading international jurists of Europe. Another body having a more or less similar purpose is the International Law Association, which was founded in 1873 as the " Association for the Reform and Codification of the Law of Nations," with practically the same objects as those which led to the constitution of the Institute of International Law. It also meets in different countries, but it differs from the Institute in the number of its members being unlimited and in all respectable persons being eligible for mem* berchip. A report is published after each meeting. There are now numerous volumes of such reports, many of them containing most valuable materials for international jurists. In 1895 the name was changed to International Law Association.

A new society was recently (1906) formed in America called the American Society of International Law, " to foster the study of international law and piomote the establishment of international relations on the basis of law and justice." " Membership in the society is not restricted to lawyers, and any man of good moral character interested in the objects of the society may be admitted to membership." The publications of this society have already taken an important place among the literature of international law.

Still more recently yet another society came into being in Switzerland with objects which seem to be similar to those of the Institute of International Law.

The Incer-Parliamentary Union, which dates back to 1887, owes its

origin to the initiative of the late Sir W. R. Cremer. It is composed of groups of the different parliaments of the world, who meet periodically to ” bring about the acceptance in their respective countries, by votes in parliament and by means of arbitration treaties, of the principle that differences between nations should be submitted to arbitration and to consider other questions of international importance.” 3 The sixteenth conference was held at Brussels in August-September, 1910.

2 At the third congress of the new series, held at Rome in 1891, was created the Bureau International de la Paix. This most useful institution, which has its office at Bern, serves as a means of bringing and keeping together all the known peace societies. Its Correspondance bimensuelle and Annuaire du mouvement pacifiste are well known, and its obliging hon. secretary, Dr A. Gobat, is always ready to sunply information from the now considerable archives of the Bureau. In this connexion we may mention that the secretary of the London Peace Society, Dr Evans Darby, has edited an exhaustive collection of materials called International Tribunals. His statements every two years on the progress of arbitration at the International Law Association meetings also form an excellent source of materials for reference.

3 Art. 1 of Statutes revised Sept. 1908.

The Nobel Committee owes its existence to the will of the late Alfred B. Nobel (1833-1896), the inventor of dynamite, who left a considerable fortune for the encouragement of men who work for the benefit of humanity. The interest of this money was to be divided into five equal parts, to be distributed every year as rewards to the persons who had deserved best of mankind in five departments of human activity. The clauses of the will governing the distribution of these prizes are as follows: —

” The entire sum shall be divided into five equal parts, one to go to the man who shall have made the most important discovery or invention in the domain of physical science ; another to the man who shall have made the most important discovery or introduced the greatest improvement in chemistry; the third to the author of the most important discovery in the domain of physiology or medicine; the fourth to the man who shall have produced the most remarkable work of an idealistic nature; and, finally, the fifth to the man who shall have done the most or best work for the fraternity of nations, the

suppression or reduction of standing armies, and the formation and propagation of peace congresses. The prizes shall be awarded as follows: For physical science and chemistry, by the Swedish Academy of Sciences; for physiological or medical work, by the Caroline Institution at Stockholm ; for litera- ture, by the Stockholm Academy, and for peace work, by a com- mittee of five members elected by the Norwegian Storthing. It is my express desire that, in awarding the prizes, no account shall be taken of nationality, in order that the prize may fall to the lot of the most deserving, whether he be Scandinavian or not."

Peace v. War. — Peace is the ultimate object of all statecraft — peace in the development of the domestic activities of the nation administered, and peace in the relations of states with one another. For the purpose of ensuring peace an expensive diplomacy is maintained by all states, and to perpetuate it treaties are entered into by states with one another. Even war has no other avowed purpose than that of placing specific international relations on a definite footing. Ultimate peace is uniformly proclaimed by every dictator at home, by every conqueror abroad, as the goal to which he is directing his efforts. And yet dissentient voices are sometimes heard defending war as if it were an end in itself. Without going back to the well-known reply of Count Moltke to Professor Bluntschli respecting the Manual of the Laws of War drawn up by the Institute of International Law in 1880, 1 we need only quote that highly up-to-date philosopher, Nietzsche: " It is mere illusion and pretty sentiment," he observes, " to expect much (even anything at all) from mankind if it forgets how to make war. As yet no means are known which call so much into action as a great war, that rough energy born of the camp, that deep impersonality born of hatred, that conscience born of murder and cold-blooded- ness, that fervour born of effort in the annihilation of the enemy, that proud indifference to loss, to one's own existence, to that of one's fellows, to that earthquake-like soul-shaking which a people needs when it is losing its vitality." s

It is pleasant to contrast this neurotic joy of one onlooker with the matter-of-fact reflexions of another, the late W. E. H. Lecky. " War " he says " is not, and never can be a mere passionless discharge of a painful duty. It is in its essence, and it is a main condition of its success, to kindle into fierce exercise among great masses of men the destructive and com- bative passions — passions as fierce and as malevolent as that with which the hound hunts the fox to its death or the tiger springs upon its prey. Destruction is one of its chief ends. Deception is one of its chief means, and one of the great arts of skilful generalship is to deceive in order to destroy. Whatever other elements

may mingle with and dignify war, this at least is never absent; and however reluctantly men may enter into war, however conscientiously they may endeavour to avoid it, they must know that when the scene of carnage has once opened, these things must be not only accepted and condoned, but stimulated, encouraged and applauded. It would be difficult to conceive a disposition more remote from the morals of ordinary life, not to speak of Christian ideals, than that with

1 ” Perpetual peace,” he said, ” is a dream, and it is not even A beautiful dream. War is an element in the order of the world ordained by God . . . Without war the world would stagnate and lose itself in materialism.”

2 Menschliches, Allzumenschliches, No. 477.

which the soldiers most animated with the fire and passion that lead to victory rush forward to bayonet the foe. ... It is allow- able to deceive an enemy by fabricated despatches purporting to come from his own side; by tampering with telegraph mes- sages; by spreading false intelligence in newspapers; by sending pretended spies and deserters to give him untrue reports of the numbers or movements of the troops; by employing false signals to lure him into an ambuscade. On the use of the flag and uniform of an enemy for purposes of deception there has been some controversy, but it is supported by high military authority. . . . Hardly any one will be so confident of the virtue of his rulers as to believe that every war which his country wages in every part of its dominions with uncivilized as well as civilized populations, is just and necessary, and it is certainly prima facie not in accordance with an ideal morality that men should bind themselves absolutely for life or for a term of years to kill without question, at the command of their superiors, those who have personally done them no wrong.” 3

Surely with all the existing activity in the removal of causes of war, in the reduction to precise expression of the rules of law governing the relations of states with one another, in the creation of international judicatures for the application of these rules, in the concluding of treaties specifically framed to facilitate the pacific settlement of difficulties diplomacy may have failed to adjust, in the promotion of democratic civilian armies with everything to lose by war, and all the other agencies which have been described above, the hope seems warranted that, in no distant future, life among nations will become still more closely assimilated to life among citizens of the same nation, with legislation, administration, reform all tending to the one great object of law, order and peace among men. (T. Ba.)

PEACE, BREACH OF THE. Theoretically all criminal offences cognizable by English law involve a breach of the king's peace, and all indictments whether for offences against the common law or by statute conclude " against the peace of our lord the king, his crown and dignity." Historically this phrase, now legally superfluous, represents the last trace of the process by which the royal courts assume jurisdiction over all offences, and gradually extruded the jurisdiction of the sheriff and of lords of manors and franchises, making crime a matter of national concern as distinguished from civil wrongs or infractions of the rights of local magnates, or of the rights of the tribal chiefs of the Teutonic conquerors of Britain. The peace of the king was sworn on his accession or full recognition, and the jurisdiction of his courts to punish all violations of that peace was gradually asserted. The completion of this process is marked by the institution of the office of justice of the peace.

In modern times the expression " breach of the peace " is usually limited to offences involving actual tumult, disturbances or dis- order. As regards such offences, although they do not fall into the class of grave crimes described as felonies, officers of police and even private persons have larger powers and duties, as to immediate arrest without waiting for judicial warrant, than they possess as to other minor offences (see Arrest). Justices of the peace have under early statutes and the commission of the peace power to take sureties of the peace from persons who are threatening to commit a breach of the peace, and it is within the power of any court on conviction of any misdemeanour and of many felonies to require the offender to enter into a recognizance (q.v.) to keep the peace.

PEACE CONFERENCES, the official title of the two inter- national conferences held at the Hague in 1899 and 1907. Both were organized at the instance of the emperor Nicholas II. of Russia. The chief object of the first conference, as set out in the note of Count Mouraviev, the Russian minister of foreign affairs (Jan. 11, 1899), was to arrive at an "understanding not to increase for a fixed period the present effectives of the armed military and naval forces, and at the same time not to increase the budgets pertaining thereto; and a preliminary examination of the means by which even a reduction might be effected in future in the forces and budgets above 8 The Map of Life, 1902, pp. 92-97.

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mentioned." 1 The conference, which was attended by repre- sentatives of 26 states, sat from the 18th of May to the 29th of July

1899.

When the subject of excessive armaments came up for dis- cussion, the objections of the German military delegate led to its abandonment. Other very important matters, however, were dealt with, and three momentous conventions were adopted, viz. —

I. A convention for the pacific settlement of international disputes.

II. A convention relating to the laws and customs of war by land.

III. A convention for the adaptation to maritime warfare of the principles of the Geneva Convention of the 22nd of August 1864.

Three declarations on the following matters were also adopted : —

a. Prohibition of the launching of projectiles and explosives from

balloons or by other similar new methods. 2

b. Prohibition of the use of projectiles the only object of which

is the diffusion of asphyxiating or deleterious gases.

c. Prohibition of the use of bullets which expand or flatten easily

in the human body, such as bullets with a hard envelope, of which the envelope does not entirely cover the core, or is pierced with incisions.

The conference furthermore passed the following resolutions:—

" The Conference is of opinion that the restriction of military budgets, which are at present a heavy burden on the world, is extremely desirable for the increase of the material and moral welfare of mankind."

" The Conference, taking into consideration the preliminary steps taken by the Swiss Federal Government for the revision of the Geneva Convention, expresses the wish that steps may be shortly taken for the assembling of a special Conference, having for its object the revision of that Convention."

The following vceux were adopted, but not unanimously: —

" I. The Conference expresses the wish that the question of the rights and duties of neutrals may be inserted in the programme of a conference in the near future.

” 2. The Conference expresses the wish that the questions with regard to rifles and naval guns, as considered by it, may be studied by the Governments with the object of coming to an agreement respecting the employment of new types and calibres.

” 3- The Conference expresses the wish that the Governments, taking into consideration the proposals made at the Conference, may examine the possibility of an agreement as to the limitation of armed forces by land and sea, and of war budgets.

” 4. The Conference expresses the wish that the proposals which contemplate the declaration of the inviolability of private property in naval warfare may be referred to a subsequent conference for consideration.

” 5. The Conference expresses the wish that the proposal to settle the question of the bombardment of ports, towns and villages by naval forces may be referred to a subsequent conference for consideration.”

Great Britain signed and became a party to the three Conventions, but not to all the declarations, &c.

The Conference of 1907, which was attended by representatives of forty-four states, sat from the 15th of June to the 18th of October. Again, in spite of the resolution and vceu on arma- ments handed down from the Conference of 1899 this subject was waived, but still more important conventions than in 1899 were adopted on other matters. These were as follows: —

I. Convention for the pacific settlement of international disputes. 3

II. Convention respecting the limitation of the employment of Sorce for the recovery of contract debts.

III. Convention relative to the commencement of hostilities.

IV. Conventions concerning the laws and customs of war on land. 3

V. Convention respecting the rights and duties of neutral powers and persons in war on land.

VI. Convention relative to the status of enemy merchant-ships at the outbreak of hostilities.

1 At the Conference the Russian government, further developing the proposal, submitted the following details: —

I. Establishment of an international understanding for a term of five years, stipulating non-increase of the present figures of the peace effective of the troops kept up for home use. *

“2. Fixation, in case of this understanding being arrived at, and, if possible, of the figures of the peace effective of all the powers excepting colonial troops.

” 3. Maintenance for a like term of five years of the amount of the military budgets at present in force.”

2 This Conference was held at Geneva in June-July 1906. The revised Convention, composed of 33 articles, is dated July 6, 1906.

‘ This is an amended edition of that of 1899.

VII. Convention relative to the conversion of merchant-ships into war-ships.

VIII. Convention relative to the laying of automatic submarine contact mines.

IX. Convention respecting bombardment by naval forces in time of war.

X. Conventions for the adaptation of the principles of the Geneva Convention to maritime war. 4

XI. Convention relative to certain restrictions on the exercise of the right of capture in maritime war. 4

XII. Convention relative to the establishment of an international prize court.

XIII. Convention respecting the rights and duties of neutral powers in maritime war.

XIV. Declaration prohibiting discharge of projectiles, &c, from balloons. 6

A draft Convention relative to the creation of a judicial arbitration court was also drawn up in connexion with the first of the four following vceux: —

1. The Conference calls the attention of the signatory powers to the

advisability of adopting the annexed draft convention for the creation of a judicial arbitration court, and of bringing it into force as soon as an agreement has been reached respecting the selec- tion of the judges and the constitution of the court.

2. The Conference expresses the opinion that, in case of war, the responsible authorities, civil as well as military, should make it their special duty to ensure and safeguard the maintenance of pacific relations, more especially of the commercial and industrial relations between the inhabitants of the belligerent states and neutral countries.

3. The Conference expresses the opinion that the powers should regulate, by special treaties, the position, as regards military charges, of foreigners residing within their territories.

4. The Conference expresses the opinion that the preparation of regulations relative to the laws and customs of naval war should figure in the programme of the next conference, 6 and that in any case the powers may apply, as far as possible, to war by sea the principles of the Convention relative to the laws and customs of war on land.

Finally, the Conference recommended to the powers the assembly of a Third Peace Conference, and it called their atten- tion to the necessity of preparing the programme of this Third Conference a sufficient time in advance to ensure its deliberations being conducted with the necessary authority and expedition.

In order to attain this object the Conference considered that it ” would be very desirable that, some two years before the probable date of the meeting, a preparatory committee should be charged by the governments with the task of collecting the various proposals to be submitted to the Conference, of ascertaining what subjects are ripe for embodiment in an international regulation, and of preparing a programme which the governments should decide upon in sufficient time to enable it to be carefully examined by the countries interested,” and that this committee should further be entrusted with the task of proposing a system of organization and procedure for the Conference itself. (T. Ba.)

PEACH, CHARLES WILLIAM (1800-1886), British naturalist and geologist, was born on the 30th of September 1800 at Wans- ford in Northamptonshire; his father at the time was a saddler and harness-maker, and afterwards became an innkeeper farming about 80 acres of land. He received an elementary education at Wansford and at Folkingham in Lincolnshire; and assisted for several years in the inn

and farm. In 1824 he was appointed riding officer in the Revenue Coast-guard at Weybourn in Norfolk. Sea-weeds and other marine organisms now attracted his attention, and these he zealously collected. His duties during the next few years led him to remove successively to Sheringham, Hasboro (Happisburgh), Cromer and Cley, all in Norfolk. In the course of his rambles he met the Rev. James Layton, curate at Catfield, who lent him books and assisted in laying the foundations of accurate knowledge About the year 1830 he was transferred to Charmouth in Dorset, thence to Beer, and Paignton in Devon, and to Gorran Haven near Mevagissey in Cornwall. Here he continued to pursue his zoological studies

4 This is an amended edition of that of 1899.

5 This was practically a re-enactment of that of 1899.

6 This has since been done to a large extent by the Conference of London (1908-1909). See Blockade, Contraband, International Law Peace.

and supplied many specimens to G. Johnston, who was then preparing his History of the British Zoophytes (1838). It was here too that he first found fossils in some of the older rocks previously regarded as unfossiliferous — the discovery of which proved the presence of Bala Beds (Ordovician or Lower Silurian) in the neighbourhood of Gorran Haven. In 1841 he read a paper before the British Association at Plymouth ” On the Fossil Organic Remains found on the south-east coast of Cornwall,” and in 1843 he brought before the Royal Geological Society of Cornwall an account of his discovery of fish remains in the Devo- nian slates near Polperro. Peach was transferred for a time to Fowey; and in 1840 to Scotland, first to Peterhead and then to Wick (1853), where he made acquaintance with Robert Dick of Thurso. He collected the old red Sandstone fishes; and during a sojourn at Durness he first found fossils in the Cambrian limestone (1854). Peach retired from the government service in 1 86 1, and died at Edinburgh on the 28th of February 1886.

Biographical notice, with portrait, in S. Smiles’s Robert Dick, Baker, of Thurso, Geologist and Botanist (1878).

PEACH, the name of a fruit tree which is included by Bentham and Hooker (Genera plantarum, i. 610) under the genus Prunus (Prunus

persica); its resemblance to the plum is indeed obvious. Others have classed it with the almond as a distinct genus, Amygdaius; while others again have considered it sufficiently distinct to constitute a separate genus, Persica.

In general terms the peach may be said to be a medium-sized tree, with lanceolate, stipulate leaves, borne on long, slender, relatively unbranched shoots, and with the flowers arranged singly, or in groups of two or more, at intervals along the shoots of the previous year's growth. The flowers have a hollow tube at the base bearing at its free edge five sepals, an equal number of petals, usually con- cave or spoon-shaped, pink or white, and a great number of stamens. The pistil consists of a single carpel with its ovary, style, stigma and solitary ovule or twin ovules. The fruit is a drupe (fig. 1) having a thin outer skin (epi- carp) enclosing the flesh of the peach (mesocarp), the inner layers of the carpel becoming woody to form the stone, while the ovule ripens into the kernel or seed. This is exactly the structure of the plum or apricot, and differs from that of the almond, which is identical in the first instance, only in the circumstance that the fleshy part of the latter eventually becomes dry and leathery and cracks open along a line called the suture.

The nectarine is a variation from the peach, mainly charac- terized by the circumstance that, while the skin of the ripe fruit is downy in the peach, it is shining and destitute of hairs in the nectarine. That there is no essential difference between the two is, however, shown by the facts that the seeds of the peach will produce nectarines, and vice versa, and that it is not very uncommon, though still exceptional, to see peaches and nectarines on the same branch, and fruits which combine in them- selves the characteristics of both nectarines and peaches. The blossoms of the peach are formed the autumn previous to their expansion, and this fact, together with the peculiarities of their form and position, requires to be borne in mind by the gardener in his pruning and training operations. The only point of practical interest requiring mention here is the very singular fact attested by all peach-growers, that, while certain peaches are liable to the attacks of mildew, others are not. In the case of the peach this peculiarity is in some way connected with the presence of small glandular outgrowths on the stalk, or at the base of the leaf. Some peaches have globular, others reniform glands, others none at all, and these latter trees are much more subject to mildew than are those provided with glands.

The history of the peach, almond and nectarine is interesting and important as regards the question of the origin of species and

Fig. 1. — Fruit (drupe) of Peach cut lengthwise. e, Skin or epicarp. m, Flesh or mesocarp. s, Stone or endocarp,

within which is the

seed or kernel.

the production and perpetuation of varieties. As to the origin of the peach two views are held, that of Alphonse de Candolle, who attributes all cultivated varieties to a distinct species, probably of Chinese origin, and that adopted by many naturalists, but more especially by Darwin, who looks upon the peach as a modification of the almond.

In the first place, the peach as we now know it has been nowhere recognized in the wild state. In the few instances where it is said to have been found wild the probabilities are that the tree was an escape from cultivation. Aitchison, however, gathered in the Hazardarakht ravine in Afghanistan a form with different-shaped fruit from that of the almond, being larger and flatter. ” The surface of the fruit,” he observes, ” resembles that of the peach in texture and colour; and the nut is quite distinct from that of the wild almond. The whole shrub resembles more what one might consider a wild form of the peach than that of the almond.” It is admitted, however, by all competent botanists that the almond is wild in the hotter and drier parts of the Mediterranean and Levan- tine regions. Aitchison also mentions the almond as wild in some parts of Afghanistan, where it is known to the natives as ” bedam,” the same word that they apply to the cultivated almond. The branches of the tree are carried by the priests in religious ceremonies. It is not known as a wild plant in China or Japan. As to the necta- rine, of its origin as a variation from the peach there is abundant evidence, as has already been mentioned ; it is only requisite to add the very important fact that the seeds of the nectarine, even when that nectarine has been produced by bud-variation from a peach, will generally produce nectarines, or, as gardeners say, ” come true.” Darwin brings together the records of several cases, not only of gradations between peaches and nectarines, but also of inter- mediate forms between the peach and the almond. So far as we know, however, no case has yet been recorded of a peach or a necta- rine producing an almond, or vice versa, although if all have had a common origin such an event might be expected. Thus the botanical evidence seems to indicate that the wild almond is the source of cultivated almonds, peaches and nectarines, and consequently that the peach was introduced from Asia Minor or Persia, whence the name Persica given to the peach; and Aitchison’s discovery in Afghanistan of

a form which reminded him of a wild peach lends additional force to this view.

On the other hand, Alphonse de Candolle, from philological and other considerations, considers the peach to be of Chinese origin. The peach has not, it is true, been found wild in China, but it has been cultivated there from time immemorial ; it has entered into the literature and folk-lore of the people; and it is designated by a distinct name, ” to ” or ” tao,” a word found in the writings of Confucius five centuries before Christ, and even in other writings dating from the 10th century before the Christian era. Though now cultivated in India, and almost wild in some parts of the north- west, and, as we have seen, probably also in Afghanistan, it has no Sanskrit name; it is not mentioned in the Hebrew text of the Scriptures, nor in the earliest Greek times. Xenophon makes no mention of the peach, though the Ten Thousand must have traversed the country where, according to some, the peach is native; but Theophrastus, a hundred years later, does speak of it as a Persian fruit, and De Candolle suggests that it might have been introduced into Greece by Alexander. According to his view, the seeds of the peach, cultivated for ages in China, might have been carried by the Chinese into Kashmir, Bokhara, and Persia between the period of the Sanskrit emigration and the Graeco-Persian period. Once established, its cultivation would readily extend westward, or, on the other hand, by Cabul to north-western India, where its cultiva- tion is not ancient. While the peach has been cultivated in China for thousands of years, the almond does not grow wild in that country and its introduction is supposed not to go back farther than the Christian era.

On the whole, greater weight is due to the evidence from botanical sources than to that derived from philology, particularly since the discovery both of the wild almond and of a form like a wild peach in Afghanistan. It may, however, well be that both peach and almond are derived from some pre-existing and now extinct form whose descendants have spread over the whole geographic area mentioned ; but this is a mere speculation, though indirect evidence in its support might be obtained from the nectarine, of which no mention is made in ancient literature, and which, as we have seen, originates from the peach and reproduces itself by seed, thus offering the characteristics of a species in the act of developing itself.

The treatment in horticulture of the peach and nectarine is the same in every respect. To perpetuate and multiply the choicer varieties, peaches and nectarines are budded upon plum or almond stocks. For dry situations almond stocks are preferable, but they are not long-

lived, while for damp or clayey loams it is better to use certain kinds of plums. Double-working is some- times beneficial ; thus an almond budded on a plum stock may be rebudded with a tender peach, greatly to the advantage of the latter. The peach border should be composed of turfy mellow

loam, such as is suitable for the vine and the fig; this should be used in as rough a state as possible, or not broken small and fine. The bottom should slope towards the outer edge, where a drain should be cut, with an outlet, and on this sloping bottom should be laid a thickness of from g in. to 12 in. of rough materials, such as broken bricks or mortar rubbish, over which should be placed a layer of rough turf with the grassy side downwards, and then the good loamy soil to form the border, which should have a depth of about 2 ft. 6 in. The peach-tree is most productive when the roots aˆe kept near the surface, and the borders, which should be from 8 ft. to 1 2 ft. wide, should not be cropped heavily with culinary vegetables, as deep trenching is very injurious. Sickly and unfruitful trees may often be revived by bringing up their roots within 5 or 6 in. of the surface. It is questionable whether it is not better, in cold soils and bleak situations, to abandon outdoor peach culture, and to cover the walls with a casing of glass, so that the trees may be under shelter during the uncongenial spring weather.

The fruit of the peach is produced on the ripened shoots of the

Jjreceding year. If these be too luxuriant, they yield nothing but eaves; and if too weak, they are incapable of developing flower buds. To furnish young shoots in sufficient abundance, and of requisite strength, is the great object of peach training and pruning. Trees of slender-growing, twiggy habit naturally fall most readily into the fan form of training, and accordingly this has generally been

adopted in the culture of peaches and nectarines (fig. 2). The young tree is, in many cases, procured when it has been trained for two or three years in the nursery ; but it is gener- ally better to begin with a maiden plant — that is, a plant of the first year after it has been budded. It is

Fig. 2.-Montreuil Fan Training. ˆ CI \ » n ° rdinar y practice

° headed down to five or six buds, and in the following summer from

two to four shoots, according to the vigour of the plant, are trained in, the laterals from which, if any, are thinned out and nailed to the wall. If there are four branches, the two central ones are shortened back at the subsequent winter pruning so as to produce others, the two lower ones being laid in nearly at full length. In the following season additional shoots are sent forth; and the process is repeated till eight or ten principal limbs or mother branches are obtained, forming, as it were, the frame-work of the future tree. The branches may be depressed or elevated, so as to check or encourage them, as occasion may arise; and it is highly advantageous to keep them thin, without their becoming in any part deficient of young shoots. Sometimes a more rapid mode of formation is now adopted, the main shoots being from the first laid in nearly at full length, instead of being shortened. The pruning for fruit consists in shortening back the laterals which had been nailed in at the disbudding, or summer pruning, their length depending on their individual vigour and the luxuriance of the tree. In well-developed shoots the buds are generally double, or rather triple, a wood bud growing between two fruit buds; the shoot must be cut back to one of these, or else to a wood bud alone, so that a young shoot may be produced to draw up the sap beyond the fruit, this being generally desirable to secure its proper swelling. The point of this leading shoot is subsequently pinched off, that it may not draw away too much of the sap. If the fruit sets too abundantly, it must be thinned, first when as large as peas, reducing the clusters, and then when as large as nuts to distribute the crop equally; the ex- tent of the thinning must depend on the vigour of the tree, but one or two fruits ultimately left to each square foot of wall is a full average crop. The final thinning should take place after stoning.

The best-placed healthy young shoot produced from the wood buds at the base of the bearing branch is to be carefully preserved and in due time nailed to the wall. In the following winter this will take the place of the branch which has just borne, and which is to be cut out. If there be no young shoot below, and the bearing branch is short, the shoot at the point of the latter may sometimes be preserved as a fruit bearer, though if the bearing branch be long it is better to cut it back for young wood. It is the neglect of this which constitutes the principal fault in carrying out the English fan system, as it is usually practised. Several times during summer the trees ought to be regularly examined, and the young shoots respectively topped or thinned out; those that remain are to be nailed to the wall, or braced in with pieces of slender twigs, and the trees ought occasionally to be washed with the garden engine or thoroughly syringed, especially during very hot summers. After gathering the fruit all the wood not needed for

extending the tree

or for fruit bearing next season should be cut out so as to give the shoots left full exposure to air and light.

The Montreuil form of training is represented by fig. 2. The principal feature is the suppression of the direct channel of the sap, and the substitution of four, or more commonly two, mother branches, so laid to the wall thac the central angle contains about 90 . The other branches are all treated as subordinate members. This form is open to the objection that, if the under branch should die, the upper one cannot be brought down into its place.

The form a la Dumoutier (fig. 3), so called from its inventor, is merely a refinement on the Montreuil method. The formation

b

Fig. 3. — Dumoutier's Fan Training.

of the tree begins with the inferior limbs and proceeds towards the centre, the branches being lowered from time to time as the tree acquires strength. What is most worthy of notice in this method is the management of the subordinates in the pruning for fruit. When a shoot promises blossom, it is generally at some distance from the point of insertion into the old wood, and the inter- mediate space is covered with wood buds. All the latter, therefore, which are between the old wood a and the blossoms c in fig. 4, except the lowest b, are carefully removed by rubbing them off with the finger. This never fails to produce a shoot d, the growth of which is favoured by destroying the useless spray e above the blossoms, and pinching off the points of those which are necessary to perfect the fruit. A replacing shoot is thus obtained, to which the whole is invariably shortened at the end of the year.

Seymour's form (fig. 5) approaches more nearly to the French method than any other practised in England ; but the direct channel

Fig. 4. — Pruning a la Dumoutier.

Fig. 5. — Seymour's Fan Training.

of the sap is not suppressed, and this results in the production of branches of unequal vigour, which is very undesirable.

For cold and late situations, Thomas Andrew Knight recommended the

encouragement of spurs on the young wood, as such spurs, when close to the wall, generate the best organized and most vigorous blossoms, and generally ensure a crop of fruit. They may be pro- duced, by taking care, during the summer pruning or disbudding, to preserve a number of the little shoots emitted by the yearly wood, only pinching off the minute succulent points. On the spurs thus formed blossom buds will be developed early in the following season. This practice is well adapted to cold situations. Peach- trees require protection, especially at the period of blossoming;, particularly in the north of England and in Scotland. Canvas or bunting screens are most effectual. By applying these early in the season, great benefit may be derived from retarding the blossom till the frosty nights of spring have passed. Wooden and glass copings are also very useful in warding off frosts. Care must be taken that the roots always have a sufficient supply of moisture and that the soil is moist wherever the roots run.

Forcing. — The pruning and training of the trees in the peach house do not differ materially from the methods practised out of doors. It may also be stated here that when occasion arises peach- trees well furnished with buds may be transplanted and forced immediately without risking the crop of fruit, a matter of some importance when, as sometimes happens, a tree may accidentally fail. In the forcing of peaches fire heat is commonly applied about December or January ; but it may, where there is a demand, begin a month sooner. The trees must be got to start growth very

r,

gradually, and at first the house should be merely kept closed at a temperature of about 45 , but the heat should gradually increase to jo' at night by the time the trees are in flower, and to 60° when the ruit is set, after which the house should be kept moist by sprinkling the walls and paths, or by placing water troughs on the return pipes, and the temperature should range from 65 ° by day to 70° or more with sun heat. After the fruit has set, the foliage should be refreshed and cleansed by the daily use of the syringe or garden engine. When the fruit has stoned — that is, as soon as the kernels have been formed — the temperature should be raised to about 65° as a minimum, and to 70 , with 75° by sun heat, as a maximum. Water must now be copiously supplied to the border, and air admitted in abundance, but cold draughts which favour the attack of mildew must be avoided.

After the end of April little fire heat is required. When the fruit begins to ripen, syringing must be discontinued till the crop is gathered, after which the syringe must be again occasionally used. If the leaves should happen to shade the fruit, not only during the ripening process but at any time after the stoning period, they should be gently turned aside, for, in order that the fruit may acquire good colour and flavour, it should be freely exposed to light and air when ripening ; it will bear the direct rays of the sun, even if they should rise to 100°, but nectarines are much more liable to damage than peaches. The trees often suffer from mildew, which is best prevented by keeping the borders of the peach house clear and sufficiently moist and the house well ventilated, and if it should appear the trees should be sprayed with 1 oz. potas- sium sulphide dissolved in 3 gallons of water. Care must be taken in using this fungicide not to wet the painted wood, as it is sure to become discoloured.

Peaches and nectarines are frequently cultivated in well-drained pots, and are then usually trained as pyramids, and in some cases as half-standards. The potting must be done very firmly, using turfy loam with which a little mortar rubble has been mixed. The trees are to be top-dressed from time to time with well-decayed manure and turfy loam, and considerable space must be left in the pots for this and the watering.

The following are some of the best peaches and nectarines, arranged in the order of the times of their ripening : —

Early Beatrice . Early Louise Hales's Early Rivers's Early York A'bec …. Crimson Galande .

Crawford's Early . j Grosse Mignonne Noblesse

m.

e.

b.

b.m

m.

e.

e.

b.

e.

b.

e.

b.

Peaches. July

July

Aug.

Aug.

Aug.

Aug.

Aug.

Sept.

Aug.

Sept.

Aug.

Sept.

Nectarines.

Royal George . j

Bellegarde Belle Bauce Dymond. Late Admirable Sea Eagie

WalburtonAdmirable j

Salwey …. Princess of Wales

Cardinal (under glass) e. July

Lord Napier Darwin Early Rivers

Balgowan Elruge

b. Aug.

m. Aug.

m. Aug.

1 e. Aug.

J b. Sept.

1 e. Aug.

I b. Sept.

Pitmaston Orange . j

Violette Hative . . \

Victoria (under glass) Pineapple Stanwick Elruge Humbolt

e.

Aug.

b.

Sept.

b.n

l.Sept.

m.

Sept.

m.

Sept.

m.e

. Sept.

e.

Sept.

e.

Sept.

b.

Oct.

e.

Oct.

b.

Nov.

e.

Oct.

e.

Aug.

b.

Sept.

e.

Aug.

b.

Sept

Sept

b.

Sept

b.

Sept

m.

Sept

Stanwick (under glass) m.e. Sept.

PEACHAM, HENRY (c. 1576-c. 1643), English writer, was the son of Henry Peacham, curate of North Mimms, Hertford- shire, and author of a book on rhetoric called the Garden of Rhetoric (1577). The elder Peacham became in 1597 rector of Leverton, Lincolnshire. The son was educated at Trinity College, Cambridge, where he graduated B.A. in 1594-1595 and M. A. in 1 598. He was for some time a schoolmaster at Wymond- ham, Norfolk, but settled in London in 161 2, earning his living as tutor to young men preparing for the universities. His first book was Graphice (1606), a treatise on pen and water-colour drawing, which, as The Gentleman's Exercise, passed through three editions. The years 1613-1614 he spent abroad, part of the time as tutor to the three young sons of Thomas Howard (1585-1646), earl of Arundel, and partly on his own account. He travelled in Italy, France, Westphalia and the Netherlands. The table of Sir John Ogle, English governor of Utrecht, was, he says, a " little academy," where he met soldiers and scholars of all nationalities. When he returned to London he was accused of libel on the king. Incriminating papers had been discovered in the house of Edmond Peacham, rector of Hinton Saint George, who, on being charged with an attack on the king denied the

authorship, stating that they were written by a namesake, " a divine, a scholar and a traveller." The change was, however, easily rebutted. Peacham had many friends in London, among them Thomas Dowland the musician, Inigo Jones, and Edward Wright the mathematician. In 1622 appeared Peacham's magnum opus, the Compleat Gentleman. Enlarged editions appeared in 1626 and 1627. The 1627 edition was reprinted in 1634, and a third, with additional notes on blazonry by Thomas Blount (1617-1679), appeared in 1661. The book is a text-book of manners and polite learning; it includes chapters on cosmo- graphy, geometry, poetry, music, antiquities, painting, the lives of the painters, the " art of limming " (Peacham himself was a proficient engraver), and the military art, including the order of " a maine battaile or pitched field in eight several! wayes." The book differs from the Courtier of Castiglione, which had been the guide of an earlier generation. Peacham was a Cavalier, even an ardent polemist in the royal cause, but the central point of his book is a more or less Puritan sentiment of duty. In his later years Peacham was reduced to extreme poverty, and is said to have written children's books at a

penny each. His last book was published in 1642, and it may be concluded that he died soon afterwards.

His other works include: Minerva Britanna (1612), dedicated to Henry, prince of Wales; The Period of Mourning (1613), in honour of the same prince; Thalia's Banquet (1620), a book of epigrams; The Art of Living in London (1642), and The Worth of a Peny (1641), &c. There is a nearly complete collection of Peacham's works in the Bodleian, Oxford. Harleian MS. 6855 contains a translation by Peacham of James I.'s Basilicon doron into Latin verse, written in his own hand and ornamented with pen and ink drawings. His Compleat Gentleman was edited by G. S. Gordon in 1906 for the Clarendon Press; the Art of Living is reprinted in the Harleian Misc. ix. ; The Worth of a Peny in E. Arber's English Garner (vol. vi. 1883).

PEACOCK, SIR BARNES (1810-1890), English judge, was born in 1810, the son of Lewis Peacock, a solicitor. After practising as a special pleader, he was called to the bar in 1836, and in 1844 obtained great reputation by pointing out the flaw which invalidated the conviction of Daniel O'Connell and his fellow defendants. In 1852 he went to India as legal member of the governor-general's council. He here displayed great activity as a law reformer, but sometimes manifested too little consideration for native susceptibilities. The legislative council was established soon after his arrival, and although no orator, he was so frequent a speaker that legislation enjoining councillors to deliver their speeches sitting was said to have been devised with the sole object of restraining him. As a member of Lord Dalhousie's council he supported the annexation of Oudh, and he stood by Lord Canning all through the Mutiny. In 1859 he became chief justice of the Supreme Court. He returned to England in 1870, and in 1872 was placed upon the judicial committee of the privy council, where his Indian experience rendered him invaluable. He died on the 3rd of December 1890.

PEACOCK, GEORGE (1791-1858), English mathematician, was born at Thornton Hall, Denton, near Darlington, on the 9th of April 1 791. He was educated at Richmond, Yorkshire, and entered Trinity College, Cambridge, in 1809. He was second wrangler in 181 2 (Sir J. F. W. Herschel being senior), was elected fellow of his college in 1814, became assistant tutor in 1815 and full tutor in 1823. While still an undergraduate he formed a league with John Herschel and Charles Babbage, to conduct the famous struggle of " d-ism versus dot-age," which ended in the introduction into Cambridge of the continental notation in the infinitesimal calculus to the exclusion of the fluxional notation of Sir Isaac Newton. This was an important reform, not so

much on account of the mere change of notation (for mathe- maticians follow J. L. Lagrange in using both these notations), but because it signified the opening to the mathematicians of Cambridge of the vast storehouse of continental discoveries. The analytical society thus formed in 1813 published various memoirs, and translated S. F. Lacroix's Differential Calculus in 1816. Peacock powerfully aided the movement by publishing in 1820 A Collection of Examples of the Application of the Differential and Integral Calculus. In 1841 he published a pamphlet on the

university statutes, in which he indicated the necessity for reform; and in i8soahd 1855 he was a member of the commission of inquiry relative to the university of Cambridge. In 1837 he was appointed Lowndean professor of astronomy. In 1839 he took the degree of D.D., and the same year was appointed by Lord Melbourne to the deanery of Ely. Peacock threw himself with characteristic ardour into the duties of this new position. He improved the sanitation of Ely, published in 1840 Observations on Plans for Cathedral Reform, and carried out extensive works of restoration in his own cathedral. He was twice prolocutor of the lower house of convocation for the province of Canterbury. He was also a prime mover in the establishment of the Cambridge Astronomical Observatory, and in the founding of the Cambridge Philosophical Society. He was a fellow of the Royal, Royal Astronomical, Geological and other scientific societies. In 1838, and again in 1843, he was one of the commissioners for standards of weights and measures; and he also furnished valuable infor- mation to the commissioners on decimal coinage. He died on the 8th of November 1858.

Peacock's original contributions to mathematical science were concerned chiefly with the philosophy of its first principles. He did good service in systematizing the operational laws of algebra, and in throwing light upon the nature and use of imaginaries. He published, first in 1830, and then in an enlarged form in 1842, a Treatise on Algebra, in which he applied his philosophical ideas concerning algebraical analysis to the eluci- dation of its elements. A second great service was the publica- tion in the British Association Reports for 1833 of his " Report on the Recent Progress and Present State of certain branches of Analysis." Modern mathematicians may find on reading this brilliant summary a good many dicta which they will call in question, but, whatever its defects may be, Peacock's report

remains a work of permanent value. In 1855 he published a memoir of Thomas Young, and about the same time there appeared Young's collected works in three volumes, for the first two of which Peacock was responsible.

PEACOCK, THOMAS LOVE (1785-1866), English novelist and poet, was born at Weymouth on the 18th of October 1785. He was the only son of a London glass merchant, who died soon after the child's birth. Young Peacock was educated at a private school at Englefield Green, and after a brief experience of business determined to devote himself to literature, while living with his mother (daughter of Thomas Love, a naval man) on their private means. His first books were poetical, The Monks of Si Mark (1804), Palmyra (1806), The Genius of the Thames (1810), The Philosophy of Melancholy (1812) — works of no great merit. He also made several dramatic attempts, which were never acted. He served for a short time as secretary to Sir Home Popham at Flushing, and paid several visits to Wales. In 181 2 he became acquainted with Shelley. In 181 5 he evinced his peculiar power by writing his novel Headlong Hall. It was published in 1816, and Melincourt followed in the ensuing year. During 1817 he lived at Great Marlow, enjoying the almost daily society of Shelley, and writing Nightmare Abbey and Rhododaphne, by far the best of his long poems. In 1819 he was appointed assistant examiner at the India House. Peacock's nomination appears to have been due to the influence of his old schoolfellow Peter Auber, secretary to the East India Company, and the papers he prepared as tests of his ability were returned with the comment, " Nothing superfluous and nothing wanting." This was char- acteristic of the whole of his intellectual work; and equally characteristic of the man was his marriage about this time to Jane Griffith, to whom he proposed by letter, not having seen her for eight years. They had four children, only one of whom, a son, survived his father; one daughter was the first wife of George Meredith. His novel Maid Marian appeared in 1822, The Misfortunes of Elphin in 1829, and Crotchet Castle in 1831; and he would probably have written more but for the death in 1833 of his mother. He also contributed to the Westminster Review and the Examiner. His services to the East India Com- pany, outside the usual official routine, were considerable. He defended it successfully against the attacks of James Silk

Buckingham and the Liverpool salt interest, and made the subject of steam navigation to India peculiarly his own. He represented the company before the various parliamentary committees on this question; and in 1839 and 1840 superintended the con- struction of iron steamers, which not only made the voyage round the Cape

successfully, but proved very useful in the Chinese War. He also drew up the instructions for the Euphrates expedition of 1835, subsequently pronounced by its commander, General F. R. Chesney, to be models of sagacity. In 1836 he succeeded James Mill as chief examiner, and in 1856 he retired upon a pension. During his later years he contributed several papers to Fraser's Magazine, including reminiscences of Shelley, whose executor he was. He also wrote in the same magazine his last novel, Gryll Grange (i860), inferior to his earlier writings in humour and vigour, but still a surprising effort for a man of his age. He died on the 23rd of January 1866 at Lower Halliford, near Chertsey, where, so far as his London occupations would allow him, he had resided for more than forty years.

Peacock's position in English literature is unique. There was nothing like hJs type of novel before his time; though there might have been if it had occurred to Swift to invent a story as a vehicle for the dialogue of his Polite Conversation. Peacock speaks as well in his own person as through his puppets; and his pithy wit and sense, combined with remarkable grace and accuracy of natural description, atone for the primitive simplicity of plot and character. Of his seven fictions, Nightmare Abbey and Crotchet Castle are perhaps on the whole the best, the former displaying the most vis comica of situation, the latter the fullest maturity of intellectual power and the most skilful grouping of the motley crowd of " perfectibilians, deteriorationists, statu- quo-ites, phrenologists, transcendentalists, political economists, theorists in all sciences, projectors in all arts, morbid visionaries, romantic enthusiasts, lovers of music, lovers of the picturesque and lovers of good dinners," who constitute the dramatis personae of the Peacockian novel. Maid Marian and The Misfortunes of Elphin are hardly less entertaining. Both contain descriptive passages of extraordinary beauty. Melincourt is a comparative failure, the excellent idea of an orang-outang mimicking humanity being insufficient as the sole groundwork of a novel. Headlong Hall, though more than foreshadowing the author's subsequent excellence, is marred by a certain bookish awkwardness char- acteristic of the recluse student, which reappears in Gryll Grange as the pedantry of an old-fashioned scholar, whose likes and dislikes have become inveterate and whose sceptical liberalism, always rather inspired by hatred of cant than enthusiasm for progress, has petrified into only toe earnest conservatism. The book's quaint resolute paganism, however, is very refreshing in an age eaten up with introspection; it is the kindliest of Peacock's writings, and contains the most beautiful of his poems, " Years Ago," the reminiscence of an early attachment. In general the ballads and songs interspersed through his tales are

models of exact and melodious diction, and instinct with true feeling. His more ambitious poems are worth little, except Rhododaphne, attractive as a story and perfect as a composition, but destitute of genuine poetical inspiration. His critical and miscellaneous writings are always interesting, especially the restorations of lost classical plays in the Horae dramaticae, but the only one of great mark is the witty and crushing exposure in the Westminster Review of Thomas Moore's ignorance of the manners and belief he has ventured to portray in his Epicurean. Peacock resented the misrepresentation of his favourite sect, the good and ill of whose tenets were fairly represented in his own person. Some- what sluggish and self-indulgent, incapable of enthusiasm or self- sacrifice, he yet possessed a deep undemonstrative kindliness of nature; he could not bear to see anyone near him unhappy or uncomfortable; and his sympathy, no less than his genial humour, gained him the attachment of children, dependants, and friends. In official life he was upright and conscientious; his judgment was shrewd and robust. What Shelley justly termed " the lightness, strength and chastity " of his diction secures him an honourable rank among those English writers whose claims to remembrance depend not only upon matter but upon style.

Peacock's works were collected, though not completely, and published in three volumes in 1875, at the expense of his friend and former prctegd, Sir Henry Cole, with an excellent memoir by his granddaughter Mrs Clarke, and a critical essay by Lord Houghton. His prose works were collected by Richard Garnett in ten volumes (1891). Separate novels are included in " Macmillan's Illustrated Standard Novels," with introductions by Mr Saintsbury. For an interesting personal notice, see A Poet's Sketch Book, by R. W. Buchanan (1884). (R. G.)

PEACOCK (Lat. Pavo, 0. Eng. Pawe, Du. pauuw, Ger. Pfau, Fr. Paon), the bird so well known from the splendid plumage of the male, and as the proverbial personification of pride. It is a native of the Indian peninsula and Ceylon, in some parts of which it is very abundant. Setting aside its importation to Palestine by Solomon (1 Kings x. 22; 2 Chron. ix. 21), its assignment in classical mythology as the favourite bird of Hera testifies to the early acquaintance the Greeks must have had with it; but, though it is mentioned by Aristophanes and other older writers, their knowledge of it was probably very slight until after the conquests of Alexander. Throughout all succeeding time, however,

it has never very freely rendered itself tp domestication, and, though in earlier days highly esteemed for the table, 1 it is no longer considered the delicacy it was once thought; the young of the wild birds are, however, still esteemed in the East.

Japan or ” black-shouldered ” Peafowls.

As in most cases of domestic animals, pied or white varieties of the ordinary peacock, Pavo crislalus, are not infrequently to be seen, and they are valued as curiosities. Greater interest, however, attends what is known as the Japanese or Japan peacock, a form which has received the name of P. nigripennis, as though it were a distinct species. In this form the cock, besides other less conspicuous differences, has all the upper wing-coverts of a deep lustrous blue instead of being mottled with brown and white, while the hen is of a more or less grizzled- white. It ” breeds true “; but occasionally a presumably pure stock of birds of the usual coloration throws out one or more having the Japan plumage. It is to be observed that the male has in the coloration of the parts mentioned no little resemblance to that of the second indubitably good species, the P. muticus (or P. spicifer of some writers) of Burma and Java, though the character of the latter’s crest — the feathers of which are barbed along their whole length instead of at the tip only — and its

1 Classical authors contain many allusions to its high appreciation at the most sumptuous banquets; and medieval bills of fare on state occasions nearly always include it. In the days of chivalry one of the most solemn oaths was taken “on the peacock,” which seems to have been served up garnished with ks gaudy plumage.

golden-green neck and breast furnish a ready means of distinction. Sir R. Heron was confident that the. Japan breed had arisen in England within his memory, 2 and C. Darwin (Animals and Plants under Domestication, i. 290-292) was inclined to believe it only a variety; but its abrupt appearance, which rests on indis- putable evidence, is most suggestive in the light that it may one day throw on the question of evolution as exhibited in the origin of ” species.” It should be stated that the Japan bird is not known to exist anywhere as a wild race, though apparently kept in Japan. The accompanying illustration is copied from a plate drawn by J. Wolf, given in D. G. Elliot’s Monograph of the Phasianidae.

The peafowls belong to the group Gallinae, from the normal mem- bers of which they do not materially differ in structure; and, though by some systematists they are raised to the rank of a family,

Pavonidae, most are content to regard them as a sub-family of Phasianidae (Pheasant, q.v.). Akin to the genus Pavo is Poly- plectrum, of which the males are armed with two or more spurs on each leg, and near them is generally placed the genus Argusianus, containing the argus-pheasants, remarkable for their wonderfully ocellated plumage, and the extraordinary length of the secondary quills of their wings, as well as of the tail-feathers. It must always be remembered that the so-called ” tail ” of the peacock is formed not by the rectrices or true tail-feathers, but by the singular develop- ment of the tail-coverts. (A. N.)

‘PEAK, THE, a high table-land in the north of Derbyshire, England, included in the Pennine range of hills. The name, however, is extended, without definite limits, to cover the whole of the hilly district north of Buxton. The table-land reaches an elevation of 2088 ft. in Kinder Scout. The geological formation is millstone-grit, and the underlying beds are not domed, but cup-shaped, dipping inward from the flanks of the mass. The summit is a peaty moorland, through which masses of rock project at intervals. The name of this high plateau has from the 17th century been identified with ” peak,” the pointed or conical top of a mountain, but the very early references to the district and certain places in it show clearly, as the New English Dictionary points out, that this connexion is unwarranted. The name appears in the Old English Chronicle (924) as Peaclond, of the district governed from the castle of Peveril of the Peak (see Derbyshire), and also in the name of the cavern under the hill at Castleton, Peac’s Arse. Peac, it has been suggested, is the name of a local deity or demon, and possibly may be indentified with Puck. For the etymology of ” peak,” point, &c, and its variants or related words, ” pick ” and ” pike,” see Pike.

PEALE, CHARLES WILLSON (1741-1826), American portrait painter, celebrated especially for his portraits of Washington, was born in Queen Anne county, Maryland, on the 16th of April 1 74 1. During his infancy the family removed to Chestertown, Kent county, Maryland, and after the death of his father (a country schoolmaster) in 1750 they removed to Annapolis. Here, at the age of 13, he was apprenticed to a saddler. About 1764 he began seriously to study art. He got some assistance from Gustavus Hesselius, a Swedish portrait painter then living near Annapolis, and from John Singleton Copley in Boston; and in 1 767-1 770 he studied under Benjamin West in London. In 1770 he opened a studio in Philadelphia, and met with immediate success. In 1772, at Mount Vernon, Peale painted a three-quarters-length study of Washington (the earliest known portrait of him), in the uniform of a colonel of Virginia militia. This canvas is now in the Lee Memorial Chapel of Washington and Lee University. He painted various other

portraits of Washington; probably the best known in a full-length, which was made in 1778, and of which Peale made many copies. This portrait had been ordered by the Continental Congress, which, however, made no appropriation for it, and eventually it was bought for a private collection in Philadelphia. Peale painted two miniatures of Mrs Washington (1772 and 1777), and portraits of many of the famous men of the time, a number of which are in Independence Hall, Philadelphia. His portraits of Washington do not appeal so strongly to Americans as do those of Gilbert Stuart, but his admitted skill as a draughtsman gives to all of his work considerable historical value. Peale removed to 5 A. Newton himself regarded this as probably incorrect.

Philadelphia in 1777, and served as a member of the committee of public safety; he aided in raising a militia company, became a lieutenant and afterwards a captain, and took part in the battles of Trenton, Princeton and Germantown. In i77Q-i78ohe was a member of the Pennsylvania assembly, where he voted for the abolition of slavery — he freed his own slaves whom he had brought from Maryland. In 1801 he undertook, largely at his own expense, the excavation of the skeletons of two mastodons in Ulster and Orange counties, New York, and in 1802 he estab- lished at Philadelphia Peale's Museum. He was one of the founders, in 1805, of the Pennsylvania Academy of the Fine Arts at Philadelphia. At the age of eighty-one Peale painted a large canvas, " Christ Healing the Sick at Bethesda," and at eighty- three a full-length portrait of himself, now in the Academy of the Fine Arts. He died at his country home, near Germantown, Pennsylvania, on the 22nd of February 1826.

His brother, James Peale (1749-1831), also an artist, painted two portraits of Washington (one now the property of the New York Historical Society, and the other in Independence Hall, Philadelphia), besides landscapes and historical compositions.

PEALE, REMBRANDT (1778-1860), American artist, was born in Bucks county, Pennsylvania, on the 22nd of February 1778, the son of Charles Willson Peale (q.v.). He studied under his father, under Benjamin West in London (1802-1803), and in Paris in 1807 and 1809. As early as 1795 he had begun from life a portrait of Washington. Of this he made many replicas, the latest in 1823, purchased by the United States government in 1832, and now in the

Capitol of Washington. Peale was one of the first of American lithographers. He was an excellent draughtsman, but in colour his work cannot rank with his father's. In 1843 he devised for the Philadelphia public schools a system of teaching drawing and penmanship. His portraits include those of President Jefferson, Mrs Madison, Commodores Perry, Decatur, and Bainbridge, Houdon, the sculptor, General Arm- strong, and an equestrian portrait of General Washington, now in Independence Hall, Philadelphia. His " Court of Death " (1820) is in the Detroit Art Gallery. In 1825 Peale succeeded John Trumbull as president of the American Academy of Fine Arts (founded in 1802 as the New York Academy of Fine Arts), and he was one of the original members of the National Academy of Design. He wrote several books, among them Notes on Italy (1831), Reminiscences of Art and Artists (1845). He died in Philadelphia on the 3rd of October i860.

A brother, Raphaelle Peale (1774-1825), was one of the earliest of American still-life painters; and another brother, Titian Ramsey Peale (1800-1885), made numerous drawings, some of them in water-colour, in illustration of animal life.

See " Rembrandt Peale," partly autobiographical, in C. E. Lester's The Artists of America (New York, 1846).

PEAR (Pyrus communis), a member of the natural order Rosaceae, belonging to the same genus as the apple (P.malus), which it resembles in floral structure. In both cases the so- called fruit is composed of the receptacle or upper end of the flower-stalk (the so-called calyx tube) greatly dilated, and en- closing within its cellular flesh the five cartilaginous carpels which constitute the " core " and are really the true fruit. From the upper rim of the receptacle are given off the five sepals, the five petals, and the very numerous stamens. The form of the pear and of the apple respectively, although usually characteristic enough, is not by itself sufficient to distinguish them, for there are pears which cannot by form alone be distinguished from apples, and apples which cannot by superficial appearance be recognized from pears. The main distinction is the occurrence in the tissue of the fruit, or beneath the rind, of clusters of cells filled with hard woody deposit in the case of the pear, constituting the " grit," while in the apple no such formation of woody cells takes place. The appearance of the tree — the bark, the foliage, the flowers — is, however, usually quite characteristic in the two species. Cultivated pears, whose number is enormous, are without doubt derived from one or two wild species widely distributed throughout Europe and western Asia, and sometimes forming part of the natural vegetation of

the forests. In England,

where the pear is sometimes considered wild, there is always the doubt that it may not really be so, but the produce of some seed of a cultivated tree deposited by birds or otherwise, which has degenerated into the wild spine-bearing tree known as Pyrus communis.

The cultivation of the pear extends to the remotest antiquity. Traces of it have been found in the Swiss lake-dwellings; it is mentioned in the oldest Greek writings, and was cultivated by the Romans. The word ” pear ” or its equivalent occurs in all the Celtic languages, while in Slavonic and other dialects different appellations, but still referring to the same thing, are found — a diversity and multiplicity of nomenclature which led Alphonse de Candolle to infer a very ancient cultivation of the tree from the shores of the Caspian to those of the Atlantic. A certain race of pears, with white down on the under surface of their leaves, is supposed to have originated from P. nivalis, and their fruit is chiefly used in France in the manufacture of Perry (see Cider). Other small-fruited pears, distinguished by their precocity and apple-like fruit, may be referred to P. cordata, a species found wild in western France, and in Devonshire and Cornwall.

Karl Koch considered that cultivated pears were the descendants of three species — P. persica (from which the bergamots have descended), P. elaeagrifolia and P. sinensis. J. Decaisne, who made the subject one of critical study for a number of years, and not only investigated the wild forms, but carefully studied the peculiarities of the numerous varieties cultivated in the Jardin des Plantes at Paris, refers all cultivated pears to one species, the individuals of which have in course of time diverged in various directions, so as to form now six races: (1) the Celtic, including P. cordata; (2) the Germanic, including P. communis, P. achras, and P. piraster; (3) the Hellenic, including P. parviflora, P. sinaica and others; (4) the Pontic, including P. elaeagrifolia; (5) the Indian, comprising P. Paschae; and (6) the Mongolic, represented by P. sinensis. With reference to the Celtic race, P. cordata, it is interesting to note its connexion with Arthurian legend and the Isle of Avalon or Isle of Apples. An island in Loch Awe has a Celtic legend containing the principal features of Arthurian story; but in this case the word is ” berries ” instead of ” apples.” Dr Phene visited Armorica (Brittany) with a view of investigating these matters, and brought thence fruits of a small berry-like pear, which were identified with the Pyrus cordata of western France.

Cultivation. — The pear may be readily raised by sowing the pips of ordinary cultivated or of wilding kinds, these forming what are known

as free or pear stocks, on which the choicer varieties are grafted for increase. For new varieties the flowers should be fertilized with a view to combine, in the seedlings which result from the union, the desirable qualities of the parents. The dwarf and pyramid trees, more usually planted in gardens, are obtained by grafting on the quince stock, the Portugal quince being the best; but this stock, from its surface-rooting habit, is most suitable for soils of a cold damp nature. The pear-stock, having an inclination to send its roots down deeper intc the soil, is the best for light dry soils, as the plants are not then so likely to suffer in dry seasons. Some of the finer pears do not unite readily with the quince, and in this case double working is resorted to; that is to say, a vigorous-growing pear is first grafted on the quince, and then the choicer pear is grafted on the pear introduced as its foster parent.

In selecting young pear trees for walls or espaliers, some persons prefer plants one year old from the graft, but trees two or three years trained are equally good. The trees should be planted immediately before or after the fall of the leaf. The wall trees require to be planted from 25 to 30 ft. apart when on free stocks, and from 15 to 20 ft. when dwarfed. Where the trees are trained as pyramids or columns they may stand 8 or 10 ft. apart, but standards in orchards should be allowed at least 30 ft., and dwarf bush trees half that distance.

In the formation of the trees the same plan may be adopted as in the case of the apple. For the pear orchard a warm situation is very desirable, with a soil deep, substantial, and thoroughly drained. Any good free loam is suitable, but a calcareous loam is the best. Pear trees worked on the quince should have the stock covered up to its junction with the graft. This is effected by raising up a small mound of rich compost around it, a contriv- ance which induces the graft to emit roots into the surface soil.

and also keeps the stock from becoming hard or bark-bound. The fruit of the pear is produced on spurs, which appear on shoots more than one year old. The mode most commonly adopted of training wall pear-trees is the horizontal. For the slender twiggy sorts the fan form is to be preferred, while for strong growers the half-fan or the horizontal is more suitable. In the latter form old trees, the summer pruning of which has been neglected, are apt to acquire an undue projection from the wall and become scraggy, to avoid which a portion of the old spurs should be cut out annually.

The summer pruning of established wall or espalier-rail trees consists chiefly in the timely displacing, shortening back, or rubbing off of the superfluous shoots, so that the winter pruning, in horizontal training, is little more than adjusting the leading shoots and thinning out the spurs, which should be kept close to the wall and allowed to retain but two or at most three buds. In fan-training the subordinate branches must be regulated, the spurs thinned out, and the young laterals finally established in their places. When horizontal trees have fallen into disorder, the branches may be cut back to within o in. of the vertical stem and branch, and trained in afresh, or they may be grafted with other sorts, if a variety of kinds is wanted.

Summer and autumn pears should be gathered before they are fully ripe, otherwise they will not in general keep more than a few days. The Jargonelle should be allowed to remain on the tree and be pulled daily as wanted, the fruit from standard trees thus succeeding the produce of the wall trees. In the case of the Crassane the crop should be gathered at three different times, the first a fortnight or more before it is ripe, the second a week or ten days after that, and the third when fully ripe. The first gathering will come into eating latest, and thus the season of the fruit may be considerably prolonged. It is evident that the same method may be followed with other sorts which continue only a short time in a mature state.

Diseases. — The pear is subject to several diseases caused by fungi. Gymnosporangium sabinae, one of the rusts (Uredineae) passes one stage of its life-history on living pear leaves, forming large raised spots or patches which are at first yellow but soon become red and are visible on both faces; on the lower face of each patch is a group of cluster-cups or aecidia containing spores which escape when ripe. This stage in the life-history was formerly regarded as a distinct fungus with the name Roeslelia cancellata ; it is now known, however, that the spores germinate on young juniper leaves, in which they give rise to this other stage in the plant's history known as Gymnosporangium. The gelatinous, generally reddish-brown masses of spores— the teleutospores — formed on the juniper in the spring germinate and form minute spores — sporidia — which give rise to the aecidium stage on the pear. Diseased pear leaves should be picked off and destroyed before the spores are scattered and the various species of juniper on which the alternate stage is developed should not be allowed near the pear trees.

Pear scab is caused by a parasitic fungus, Fusicladium pyrinum, very closely allied and perhaps merely a form of the apple scab

fungus, F. dendriticum. As in e the case of the apple disease it forms large irregular blackish blotches on the fruit and leaves, the injury being often very severe especially in a cool, damp season. The fungus mycelium grows between the cuticle and the epidermis, the former being ultimately ruptured by numerous short branches bearing spores (con- idia) by means of which the disease is spread. As a pre- ventive repeated spraying with dilute Bordeaux mixture is recommended, during the flowering season and early development of the fruit. Similar spraying is recom- (Fiom a specimen in the British Museum.) mended for pear-leaf blister Pear Scab (Fusicladium pyrinum). cˆ. 5 ˆ by Taphrina bullata, , t , . j- . which forms swollen areas on

1, Leaf showing diseased areas. the leaves. Pear trees may

2. Section of leaf surface showing the algo be attacked by a gre / t spores or comdta, c, borne on long vaf ; et o{ insec(. ‘ ts Thug stalks (conidiophores). the younger branches are often

injured by the pearl oyster scale (Aspidiotus ostreaeformis), which

may be removed by washing in winter with soft soap and hot water. A number of larvae of Lepidoptera feed on the leaves — ■ the remedy is to capture the mature insects when possible. The winter moth (Cheimatobia brumata) must be kept in check by putting greasy bands round the trunks from October till December or January, to catch the wingless females that crawl up and deposit their eggs in the cracks and crevices in the bark. The caterpillars of the leopard moth (Zeuzera pyrina) and of the goat moth (Cossus ligniperda) sometimes bore their way into the trunks and destroy the sap channels. If badly bored, the trees are useless; but in

Pear-leaf Cluster-cups (Gymnosporangium sabinae). I. Leaf showing groups of cups or aecidia. 2, Early stage of disease. 3, Cups, the early stages if the entrance of the caterpillars has been detected, a wire should be pushed into the hole. One of the worst pests of pear trees is the pear midge, known as Diplosis pyrivora or Cecidomyia nigra, the females of which lay their eggs in the flower- buds before they open. The yellow maggots devour the seeds and thus ruin the crop. When deformed fruits are noticed they should be picked off and burned immediately. Species of aphides may be removed by tobacco infusion, soapsuds or other solutions. A gall mite (Phytoplus pyri) sometimes severely injures the leaves, on which it forms blisters — the best remedy is to cut off and burn the diseased leaves.

The Alligator or Avocado Pear is Persea gratissima, a member of the

natural order Lauraceae, and a native of the West Indies and other parts of tropical America. It is a tree of 25 to 30 ft. high and bears large pear-shaped fruits, green or deep purple in colour, with a firm yellowish-green marrow-like pulp surrounding a large seed. The pulp is much esteemed in the West Indies and is eaten as a salad, usually with the addition of pepper, salt and vinegar. The pulp contains much oil, which is used for lighting and soap-making, and the seeds yield a deep indelible black stain which is used for marking linen.

Prickly pear is the popular name for species of Opuntia (see Cactus).

The name wooden pear is applied to the fruits of Xylomelum (nat. ord. Proteaceae), an Australian genus of trees with very thick, woody, inversely pear-shaped fruits which split into two parts when ripe.

PEARCE, CHARLES SPRAGUE (1851-), American artist, was born at Boston, Massachusetts, on the 13th of October 1851. In 1873 he became a pupil of Leon Bonnat in Paris, and after 1885 he lived in Paris and at Auvers-sur-Oise. He painted Egyptian and Algerian scenes, French peasants, and portraits, and also decorative work, notably for the Congressional Library at Washington. He received medals at the Paris Salon and elsewhere, and was decorated with the Legion of Honour, the order of Leopold, Belgium, the order of the Red Eagle, Prussia, and the order of Dannebrog, Denmark. Among his best known paintings are ” The Decapitation of St John the Baptist ” (i88i),in the Art Institute of Chicago; ” Prayer ” (1884), owned by the Massachusetts Charitable Mechanic Association; ” The Return of the Flock,” in the Bohemian Club, San Francisco; and ” Meditation,” in the New York Metropolitan Museum.

PEARL. Pearls are calcareous concretions of peculiar lustre, produced by certain molluscs, and valued as objects of personal ornament. The experience of pearl-fishers shows that those shells which are irregular in shape and stunted in growth, or

which bear excrescences, or are honeycombed by boring parasites, are those most likely to yield pearls.

The substance of a pearl is essentially the same as that which lines the interior of many shells and is known as ” mother-of- pearl.” Sir D. Brewster first showed that the iridescence of this substance was an optical phenomenon due to the interference of rays- of light reflected

from microscopic corrugations of the surface — an effect which may be imitated by artificial striations on a suit- able medium. When the inner laminated portion of a nacreous shell is digested in acid the calcareous layers are dissolved away, leaving a very delicate membranous pellicle, which, as shown by Dr Carpenter, may retain the iridescence as long as it is undisturbed, but which loses it when pressed or stretched.

It is obvious that if a pearl presents a perfectly spherical form it must have remained loose in the substance of the muscles or other soft tissues of the mollusc. Frequently, however, the pearl becomes cemented to the interior of the shell, the point of attach- ment thus interfering with its symmetry. In this position it may receive successive nacreous deposits, which ultimately form a pearl of hemispherical shape, so that when cut from the shell it may be flat on one side and convex on the other, forming what jewelers know as a ” perle bouton.” In the course of growth the pearl may become involved in the general deposit of mother- of-pearl, and be ultimately buried in the substance of the shell. It has thus happened that fine pearls have occasionally been unexpectedly brought to light in cutting up mother-of-pearl in the workshop.

When a pearl oyster is attacked by a boring parasite the mollusc protects itself by depositing nacreous matter at the point of invasion, thus forming a hollow body of irregular shape known as a ” blister pearl.” Hollow warty pearl is sometimes termed in trade ” coq de perle.” Solid pearls of irregular form are often produced by deposition on rough objects, such as small fragments of wood, and these, and in fact all irregular-shaped pearls, are termed ” perles baroques,” or ” barrok pearls.” It appears that the Romans in the period of the Decline restricted the name unio to the globular pearl, and termed the baroque margaritum. It was fashionable in the 16th and 17th centuries to mount curiously shaped baroques in gold and enamel so as to form ornamental objects of grotesque character. A valuable collection of such mounted pearls by Dinglinger is preserved in the Green vaults at Dresden.

A pearl of the first water should possess, in jewelers’ language, a perfect ” skin ” and a fine ” orient “; that is to say, it must be of delicate texture, free from speck or flaw, and of clear almost translucent white colour, with a subdued iridescent sheen. It should also be perfectly spherical, or, if not, of a symmetrical pear-shape. On removing the outer layer of a pearl the sub- jacent surface is generally dull, like a dead fish-eye, but it occasionally happens that a poorpearl encloses a “lively kernel,” and may therefore be improved by careful

peeling. The most perfect pearl in existence is said to be one, known as ” La Pelle- grina,” in the museum of Zosima in Moscow; it is a perfectly globular Indian pearl of singular beauty, weighing 28 carats. The largest known pearl is one of irregular shape in the Beresford Hope collection at the Victoria and Albert Museum. This magnificent pearl weighs 3 oz., has a circumference of 4ˆ in., and is surmounted by an enamelled and jewelled gold crown, forming a pendant of great value.

Pearl Fisheries. — The ancients obtained their pearls chiefly from India and the Persian Gulf, but at the present time they are also procured from the Sulu seas, the coast of Australia, the shores of Central America and some of the South Pacific Islands. The ancient fisheries of Ceylon (Taprobane) are situated in the Gulf of Manaar, the fishing-banks lying from 6 to 8 m. off the western shore, a little to the south of the isle of Manaar. The Tinnevelly fishery is on the Madras side of the strait, near Tuticorin. These Indian fishing-grounds are under the control of government inspectors, who regulate the fisheries. The oysters yield the best pearls at about four years of age. Fishing generally com- mences in the second week in March, and lasts for from four to six weeks, according to the season. The boats are grouped in fleets

of from sixty to seventy, and start usually at midnight so as to reach the oyster-banks at sunrise. Each boat generally carries ten divers. On reaching the bank a signal-gun is fired, and diving commences. A stone weighing about 40 lb is attached to the cord by which the diver is let down. The divers work in pairs, one man diving while the other watches the signal-cord, drawing up the sink-stone first, then hauling up the baskets of oysters, and finally raising the diver himself. On an average the divers remain under water from fifty to eighty seconds, though exceptional instances are cited of men remaining below for as long as six minutes. After resting for a minute or two at the surface, the diver descends again; and so on, until exhausted, when he comes on board and watches the rope, while his comrade relieves him as diver. The native descends naked, carrying only a girdle for the support of the basket in which he places the pearl oysters. In his submarine work the diver makes skilful use of his toes. To arm himself against the attacks of the sharks and other fishes which infest the Indian waters he carries spikes of iron- wood; and the genuine Indian diver never descends without the incantations of shark-charmers, one of whom accompanies the boat while others remain on shore. As a rule the diver is a short- lived man.

The diving continues from sunrise to about noon, when a gun is fired.

On the arrival of the fleet at shore the divers carry their oysters to a shed, where they are made up into four heaps, one of which is taken by the diver. The oysters are then sold by auction in lots of 1000 each. The pearls, after removal from the dead oysters, are ” classed ” by passing through a number of small brass colanders, known as ” baskets,” the holes in the successive vessels being smaller and smaller. Having been sized in this way, they are sorted as to colour, weighed and valued.

Since the days of the Macedonians pearl-fishing has been carried on in the Persian Gulf. It is said that the oyster-beds extend along the entire Arabian coast of the gulf, but the most important are on sandbanks off the islands of Bahrein. The chief centre of the trade is the port of Lingah. Most of the products of this fishery are known as ” Bombay pearls,” from the fact that many of the best are sold there. The shells usually present a dark colour about the edges, like that of ” smoked pearl.” The yellow-tinted pearls are sent chiefly to Bombay, while the whitest go to Bagdad. Very small pearls, much below a pea in size, are generally known as ” seed-pearls,” and these are valued in India and China as constituents of certain electuaries, while occasionally they are calcined for chunam, or lime, used with betel as a masticatory. There is a small pearl-fishery near Karachi on the coast of Bombay.

From the time of the Ptolemies pearl-fishing has been prosecuted along the coast of the Red Sea, especially in the neighbourhood of Jiddah and Koseir. This fishery is now insignificant, but the Arabs still obtain from this district a quantity of mother-of-pearl shells, which are shipped from Alexandria, and come into the market as ” Egyptians.”

Very fine pearls are obtained from the Sulu Archipelago, on the north-east of Borneo. The mother-of-pearl shells from the Sulu seas are characterized by a yellow colour on the border and back, which unfits them for many ornamental purposes. Pearl oysters are also abundant in the seas around the Aru Islands to the south-west of New Guinea. From Labuan a good many pearl-shells are occasionally sent to Singapore. They are also obtained from the neighbourhood of Timor, and from New Caledonia. The pearl oyster occurs throughout the Pacific, mostly in the clear water of the lagoons within the atolls, though fine shells are also found in deep water outside the coral reefs. The Polynesian divers do not employ sink-stones, and the women are said to be more skilful than the men. They anoint their bodies with oil before diving. Fine pearl-shells are obtained from Navigators’ Islands, the Society Islands, the Low Archi- pelago or Paumota Isles and the Gambier Islands. Many of the Gambier pearls present a bronzy tint.

Pearl-fishing is actively prosecuted along the western coast of Central America, especially in the Gulf of California, and to a less extent around the Pearl Islands in the Bay of Panama. The

fishing-grounds are in water about 40 ft. deep, and the season lasts for four months. An ordinary fishing-party expects to obtain about three tons of shells per day, and it is estimated that one shell in a thousand contains a pearl. The pearls are shipped in barrels from San Francisco and Panama. Some pearls of rare beauty have been obtained from the Bay of Mulege, near Los Coyetes, in the gulf of California; and in 1882 a pearl of 75 carats, the largest on record from this district, was found near La Paz in California. The coast of Guayaquil also yields pearls. Columbus found that pearl-fishing was carried on in his time in the Gulf of Mexico, and pearls are still obtained from the Carib- bean Sea. In the West Indies the best pearls are obtained from St Thomas and from the island of Margarita, off the coast of Venezuela. From Margarita Philip II. of Spain is said to have obtained in 1579 a famous pearl of 250 carats.

Of late years good pearls have been found in Shark's Bay, on the coast of West Australia, especially in an inlet termed Useless Harbour. Mother-of-pearl shells are also fished at many other points along the western coast, between the 15th and 25th parallels of south latitude. An important pearl-fishery is also established in Torres Strait and on the coast of Queensland. The shells occur in water from four to six fathoms deep, and the divers are generally Malays and Papuans, though sometimes native Australians. On the western coast of Australia the pearl-shells are obtained by dredging rather than by diving. Pearl-shells have also been found at Port Darwin and in Oakley Creek, New Zealand.

River pearls are produced by the species of Unio and Anoionta, especially by Unio margariliferus. These species belong to the family Unionidae, order Eulamellebranchia. They inhabit the mountain-streams of temperate climates in the northern hemisphere — especially in Scotland, Wales, Ireland, Saxony, Bohemia, Bavaria, Lapland and Canada. The pearls of Britain are mentioned by Tacitus and by Pliny ; and a breastplate studded with British pearls was dedicated by Julius Caesar to Venus Genetrix. As early as 1355 Scotch pearls are referred to in a statute of the goldsmiths of Paris; and in the reign of Charles II. the Scotch pearl trade was sufficiently important to

attract the attention of parliament. The Scotch pearl-fishery, after having declined for years, was revived in i860 by a German named Moritz Unger, who visited Scotland and bought up all the pearls he could find in the hands of the peasan- try, thus leading to an eager search for more pearls the following season. It is estimated that in 1865 the produce of the season's fishing in the Scotch rivers was worth at least £12,000. This yield, however, was not maintained, and at the present time only a few pearls are obtained at irregular intervals by an occasional fisherman.

The principal rivers in Scotland which have yielded pearls are the Spey, the Tay and the South Esk; and to a less extent the Doon, the Dee, the Don, the Ythan, the Teith, the Forth and many other streams. In North Wales the Conway was at one time celebrated for its pearls; and it is related that Sir Richard Wynn, chamberlain to the queen of Charles II., presented her with a Conway pearl which is believed to occupy a place in the British crown. In Ireland the rivers of Donegal, Tyrone and Wexford have yielded pearls. It is said that Sir John Hawkins the circumnavigator had a patent for pearl-fishing in the Irt in Cumberland. Although the pearl- fisheries of Britain are now neglected, it is otherwise with those of Germany. The most important of these arc in the forest-streams of Bavaria, between Ratisbon and Passau. The Saxon fisheries are chiefly confined to the basin of the White Elster, and those of Bohemia to the Horazdiowitz district of Wotawa. For more than two centuries the Saxon fisheries have been carefully regulated by inspectors, who examine the streams every spring, and determine where fishing is to be permitted. After a tract has been fished over, it is left to rest for ten or fifteen years. The fisher-folk open the valves of the mussels with an iron instrument, and if they find no pearl restore the mussel to the water.

River pearls are found in many parts of the United States, and have been systematically worked in the Little Miami river, Warren county, Ohio, and also on the Mississippi, especially about Musca- tine, Iowa. The season extends from June to October. Japan produces fresh-water pearls, found especially in the Anoionta japonica. But it is in China that the culture of the pearl-mussel is carried to the greatest perfection. The Chinese also obtain marine pearls, and use a large quantity of mother-of-pearl for decorative purposes. More than twenty-two centuries before our era pearls are enumerated as a tribute or tax in China; and they are mentioned as products of the western part of the empire in the Rh'ya, a dictionary compiled earlier than 1000 B.C. A process for promoting the artificial formation of pearls in the Chinese river-mussels was discovered by Ye-jin-yang, a native of Hoochow, in the 13th century ; and this process is still extensively

carried on near the city

of Teh-tsing, where it forms the staple industry of several villages, and is said to give employment to about 5000 people. Large num- bers of the mussels are collected in May and June, and the valves of each are gently opened with a spatula to allow of the introduction of various foreign bodies, which are inserted by means of a forked bamboo stick. These ” matrices ” are generally pellets of prepared mud, but may be small bosses of bone, brass or wood. After a num- ber of these objects have been placed in convenient positions on one valve, the unfortunate mollusc is turned over and the operation is repeated on the other valve. The mussels are then placed in shallow ponds connected with the canals, and are nourished by tubs of night- soil being thrown in from time to time. After several months, in some cases two or three years, the mussels are removed, and the pearls which have formed over the matrices are cut from the shells, while the molluscs themselves serve as food. The matrix is generally extracted from the pearl and the cavity filled with white wax, the aperture being neatly sealed up so as to render the appearance of the pearl as perfect as possible. Millions of such pearls are annually sold at Soo-chow. The most curious of these Chinese pearls are those which present the form of small seated images of Buddha. The figures are cast in very thin lead, or stamped in tin, and are inserted as previously described. Specimens of these Buddha pearls in the British Museum are referred to the species Dipsas plicata. It should be mentioned that Linnaeus, probably ignorant of what had long been practised in China, demonstrated the possibility of producing artificial pearls in the fresh-water mussels of Sweden.

Pink pearls are occasionally found in the great conch or fountain shell of the West Indies, Strombus gigas, L. ; but these, though much prized, are not nacreous, and their tint is apt to fade. They are also produced by the chank shell, Turbinella scolymns, L. 1 Yellowish- brown pearls, of little or no value, are yielded by the Pinna squamosa, and bad-coloured concretions are formed by the Placuna placenta. 11 Black pearls, which are very highly valued, are obtained chiefly from the pearl oyster of the Gulf of Mexico. The common marine mussel Mytilus edulis also produces pearls, which are, however, of little value.

According to the latest researches the cause of pearl-formation is in most cases, perhaps in all, the dead body of a minute parasite within the tissues of a mollusc, around which nacreous deposit is secreted. The parasite is a stage in the life history of a Trema- tode in some cases, in others of a Cestode; that is to say of a form resembling the

common liver-fluke of the sheep, or of a tape- worm. As long ago as 1852 Filippi of Turin showed that the species of Trematode Distomum duplicatum was the cause of a pearl formation in the fresh-water mussel Anodonta. Kuchen- meister subsequently investigated the question at Elster in Saxony and came to a different conclusion, namely that the central body of the pearl was a small specimen of a species of water mite which is a very common parasite of A nodonta. Filippi however states that the mite is only rarely found within a pearl, the Trematode occurring in the great majority of cases. R. Dubois and Dr H. Lyster Jameson have made special investi- gations of the process in the common mussel Mytilus edulis. The latter states that the pearl is produced in a sac which is situated beneath the epidermis of the mantle and is lined by an epithelium. This epithelium is not derived from the cells of the epidermis but from the internal connective-tissue cells. This statement, if correct, is contrary to what would be expected, for calcareous matter is usually secreted by the external epidermis only. The sac or cyst is formed by the larva of a species of Trematode belonging to the genus Leucithodendrium, a species closely resembling and probably identical with L. somateriae, which lives in the adult state in the eider duck. At Billiers, Morbihan, in France, the host of the adult Trematode is another species of duck, namely the common Scoter, Oedemia nigra, which is notorious in the locality for its avidity for mussels. Trema- todes of the family Distomidae, to which the parasite under consideration belongs, usually have three hosts in each of which they pass different stages of the life history. In this case the first host at Billiers is a species of bivalve called Tapes decussatus, but at Piel in Lancashire there are no Tapes and the first stages of the parasite are found in the common cockle. The Trematode enters the first host as a minute newly hatched embryo and

1 Strombus gigas, L., is a Gastropod belonging to the family Strombidae, of the order Pectinibranchia. Turbinella scolymus, Lam., is a Gastropod of the same order.

2 Placuna placenta, L., belongs to the family Anomiidae; it is found on the shores of North Australia. Pinna squamosa, Gmelin, belongs to the Ostreacea; it occurs in the Mediterranean. Both are Lamellibranchs.

leaves it in the form called Cercaria, which is- really an immature condition of the adult. The Cercaria makes its way into the tissues of a mussel and there becomes enclosed in the cyst previously described. If the mussel is then swallowed by the duck the Cercariae develop into

adult Trematodes or flukes in the liver or intestines of the bird. In the mussels which escape being devoured the parasites cannot develop further, and they die and become embedded in the nacreous deposit which forms a pearl. Dr Jameson points out that, as in other cases, pearls in Mytilus are common in certain special localities and rare elsewhere, and that the said localities are those where the parasite and its hosts are plentiful.

The first suggestion that the most valuable pearls obtained from pearl oysters in tropical oceans might be due to parasites was made by Kelaart in reports to the government of Ceylon in 1857-1859. Recently a special investigation of the Ceylon pearl fishery has been organized by Professor Herdman. Herdman and Hornell find that in the pearl oyster of Ceylon Margaritifera vulgaris, Schum, the nucleus of the pearl is, in all specimens examined, the larva of a Cestode or tapeworm. This larva is of globular form and is of the type known as a cysticercus. As in the case of the mussel the larva dies in its cyst and its remains are enshrined in nacreous deposit, so that, as a French writer has said, the ornament associated in all ages with beauty and riches is nothing but the brilliant sarcophagus of a worm.

The cysticercus described by Herdman and Hornell has on the surface a muscular zone within which is a depression containing a papilla which can be protruded. It was at first identified as the larva of a tapeworm called Tetrarhynchus, and Professor Herdman concluded that the life-history of the pearl parasite consisted of four stages, the first being exhibited by free larvae which were taken at the surface of the sea, the second that in the pearl oyster, the third a form found in the bodies of file-fishes which feed on the oysters, and the fourth or adult stage living in some species of large ray. It has not however been proved that the pearl parasite is a Tetrarhynchus, nor that it is connected with the free larva or the form found in the file-fish, Balistes; nor has the adult form been identified. All that is certain is that the pearls are due to the presence of a parasite which is the larva of a Cestode; all the rest is probability or possibility. A French naturalist, M. Seurat, studying the pearl oyster of the Gambier Archipelago in the Pacific, found that pearl formation was due to a parasite quite similar to that described by Herdman and Hornell. This parasite was described by Professor Giard as characterized by a rostrum arm'ed with a single terminal sucker and he did not identify it with Tetrarhynchus.

Genuine precious pearls and the most valuable mother-of-pearl are produced by various species and varieties of the genus Meleagrina of Lamarck, for which Dr Jameson in his recent revision of the species

prefers the name Margaritifera. The genus is represented in tropical regions in all parts of the world. It belongs to the family Aviculidae, which is allied to the Pectens or scallop shells. In this family the hinge border is straight and prolonged into two auriculae; the foot has a very stout byssus. Meleagrina is distinguished by the small size or complete absence of the posterior auricula. The species are as follows. The type species is Meleagrina margaritifera, which has no teeth on the hinge. Geographical races are distinguished by different names in the trade. Specimens from the Malay Archipelago have a dark band along the margin of the nacre and are known as black-edged Banda shell; those from Australia and New Guinea and the neighbouring islands of the western Pacific are called Australian and New Guinea black-lip. Another variety occurs in Tahiti, Gambier Islands and Eastern Polynesia generally, yielding both pearls and shell. It occurs also in China, Ceylon, the Andaman Islands and the Maldives. Another form is taken at Zanzibar, Mada- gascar, and the neighbouring islands, and is called Zanzibar and Madagascar shell. Bombay shell is another local form fished in the Persian Gulf and shipped via Bombay. The Red Sea variety is known as Egyptian shell. Another variety occurs along the west coast of America and from Panama to Vancouver, and supplies Panama shell and some pearls. A larger form, attaining a foot in diameter and a weight of 10 lb per pair of shells, is considered as a distinct species by Dr Jameson and named Margaritifera maxima. It is found along the north coast of Australia and New Guinea and the Malay Archipelago. The nacreous surface of this shell is white, without the black or dark margin of the common species; it is known in the trade as the silver-lip, gold-lip and by other names. It is the most valuable species of mother-of-pearl oyster.

Dr Jameson distinguishes in addition to the above thirty-two species of Margaritifera or Meleagrina; all these have rudimentary teeth on the hinge. The most important species is Meleagrina vulgaris, to which belong the pearl oyster of Ceylon and southern India, the lingah shell of the Persian Gulf and the pearl oyster of the Red Sea. Since the opening of the Suez Canal the latter form has invaded the Mediterranean, specimens having been taken at Alexandria and at Malta, and attempts have been made to cultivate it on the French coast. The species occurs also on the coasts of the Malay Peninsula, Australia and New Guinea, where it is fished both for its shells (Australian lingah) and for pearls. Two species occur on the coasts of South Africa but have no market value. Melea- grina carchariarum is the Shark's Bay shell of the London market. It is_ taken in large quantities at Shark's Bay, Western Australia, and is of rather small

value; it also yields pearls of inferior quality. The pearl oyster of Japan, known as Japan lingah, is probably a variety of Meleagrina vulgaris. Meleagrina radiata is the West Indian pearl oyster.

The largest and steadiest consumption of mother-of-pearl is in the button trade, and much is also consumed by cutlers for handles of fruit and dessert knives and forks, pocket-knives, &c. It is also used in the inlaying of Japanese and Chinese lacquers, European lacquered papier-mache work, trays, &c, and as an ornamental inlay generally. The carving of pilgrim shells and the elaboration of crucifixes and ornamental work in mother-of-pearl is a distinctive industry of the monks and other inhabitants of Bethlehem. Among the South Sea Islands the shell is largely fashioned into fishing-hooks. Among shells other than those of Meleagrina margaritifera used as mother-of-pearl may be mentioned the Green Ear or Ormer shell (Haliotis tuberculata) and several other species of Haliotis, besides various species of Turbo.

Artificial pearls were first made in western Europe in 1680 by Jacquin, a rosary-maker in Paris, and the trade is now largely carried on in France, Germany and Italy. Spheres of thin glass are filled with a preparation known as ” essence d’orient,” made from the silvery scales of the bleak or ” ablette,” which is caused to adhere to the inner wall of the globe, and the cavity is then filled with white wax. Many imitation pearls are now formed of an opaline glass of nacreous lustre, and the soft appearance of the pearl obtained by the judicious use of hydrofluoric acid. An excellent substitute for black pearl is found in the so-called ” ironstone jewelry,” and consists of close-grained haematite, not roo highly polished ; but the great density of the haematite immediately destroys the illusion. Pink pearls are imitated by turning small spheres out of the rosy part of the conch shell, or even out of pink coral.

See Clements R. Markham, ” The Tinnevelly Pearl Fishery,” in Journ. Soc. Arts (1867), xv., 256; D. T. Macgowan, ” Pearls and Pearl-making in China,” ibid. (1854), ii. 72; F. Hague, “On the Natural and Artificial Production of Pearls in China,” in Journ. Roy. Asiatic Soc. (1856), vol. xvi. ; H. J. Le Beck, ” Pearl Fishery in the Gulf of Manar,” in Asiatic Researches (1798), v. 393; K. Mobius, Die echten Perlen (Hamburg, 1857) ; H. Lyster Jameson, ” Formation of Pearls,” Proc. Zool. Soc. (1902), pi. 1 ; idem, ” On the Identity and Distribution of Mother-of-Pearl Oysters,” Proc. Zool. Soc. (1901), pi. I, pp. 372-394; Herdman and Hornell, Rep-Ceylon Pearl Fisheries (London, Royal Soc, 1903) ; and Kunz and Stevenson, Book of the Pearl (New York, 1908), with bibliography. (J. T. C.)

PEARL, THE. The Middle-English poem known as Pearl, or The Pearl, is preserved in the unique manuscript Cotton Nero Ax at the British Museum; in this volume are contained also the poems Cleanness, Patience, and Sir Gawayne and the Green Knight. All the pieces are in the same handwriting, and from internal evidences of dialect, style and parallel references, it is now generally accepted that the poems are all by the same author. The MS., which is quaintly illustrated, belongs to the end of the 14th or the beginning of the 15th century, and appears to be but little later than the date of composition; no line of Pearl or of the other poems is elsewhere to be found.

Pearl is a poet's lament for the loss of a girl-child, " who lived not upon earth two years " — the poet is evidently the child's father. In grief he visits the little grave, and there in a vision beholds his Pearl, now transfigured as a queen of heaven — he sees her beneath " a crystal rock," beyond a stream; the dreamer would fain cross over, but cannot. From the opposite bank Pearl, grown in wisdom as in stature, instructs him in lessons of faith and resignation, expounds to him the mystery of her transfiguration, and leads him to a glimpse of the New Jerusalem. Suddenly the city is filled with glorious maidens, who in long procession glide towards the throne, all of them clad in white, pearl-bedecked robes as Pearl herself. And there he sees, too, "his little queen." A great love- longing possesses him to be by her. He must needs plunge

into the stream that keeps him from her. In the very effort the dreamer awakes, to find himself resting upon the little mound where his Pearl had " strayed below ": —

" I roused me, and fell in great dismay, And, sighing, to myself I said :

Now all be to that Prince's pleasure."

The poem consists of one hundred and one stanzas, each of twelve lines, with four accents, rhymed ab, ab, ab, ab, be, be; the versification combines rhyme with alliteration; trisyllabic effects add to the easy movement and lyrical charm of the lines. Five stanzas (in one case six), with the same refrain, constitute a section, of which accordingly there are twenty in all, the whole sequence being linked together by the device of making the first line of each stanza catch up the refrain of the previous verse, the last line of the poem re-echoing

the first line. The author was not the creator of this form, nor was he the last to use it. The extant pieces in the metre are short religious poems, some of the later (e.g. God's Complaint, falsely attributed to Scottish authorship) revealing the influence of Pearl.

The dialect is West Midland, or rather North- West Midland, and the vocabulary is remarkable for the blending of native speech with Scandinavian and Romance elements, the latter partly Anglo-French, and partly learned French, due to the author's knowledge of French literature.

" While the main part of the poem," according to Gollancz, " is a paraphrase of the closing chapters of the Apocalypse and the parable of the Vineyard, the poet's debt to the Romaunt of the Rose is noteworthy, more particularly in the description of the wonderful land through which the dreamer wanders; and it can be traced throughout the poem, in the personification of Pearl as Reason, in the form of the colloquy, in the details of dress and ornament, in many a characteristic word, phrase and reference. ' The river from the throne,' in the Apocalypse, here meets ' the waters of the wells ' devised by Sir Mirth for the Garden of the Rose. From these two sources, the Book of Revelation, with its almost Celtic glamour, and The Romaunt of the Rose, with its almost Oriental allegory, are derived much of the wealth and brilliancy of the poem. The poet's fancy revels in the richness of the heavenly and the earthly paradise, but his fancy is subordinated to his earnestness and intensity."

The leading motifs of Pearl are to be found in the Gospel — in the allegory of the merchant who sold his all to purchase one pearl of great price, and in the words, so fraught with solace for the child-bereft; " for of such is the Kingdom of Heaven." Naturally arising from the theme, and from these motifs, some theological problems of the time are touched upon, or treated somewhat too elaborately perhaps, and an attempt has been made to demonstrate that Pearl is merely allegorical and theological, and not really a lament. Those who hold this view surely ignore or fail to recognize the subtle personal touches whereby the poem transcends all its theological interests, and makes its simple and direct appeal to the human heart. Herein, too, lies its abiding charm, over and above the poetical talent, the love of nature, colour and the picturesque, the technical skill, and the descriptive power, which in a high degree belonged to the unknown poet.

Various theories have been advanced as to the authorship of Pearl and the other poems in the manuscript. The claims of Huchown " of the Awle Ryale " have been vigorously (but unsuccessfully) advocated; the

case in favour of Ralph Strode (Chaucer's " philosophical Strode ") — the most attractive of all the theories — is still, unfortunately, " not proven." By piecing together the personal indications to be found in the poems an imaginary biography of the poet may be constructed. It may safely be inferred that he was born about 1330, somewhere in Lancashire, or a little to the north; that he delighted in open- air life, in woodcraft and sport; that his early life was passed amid the gay scenes that brightened existence in medieval hall and bower; that he availed himself of opportunities of study, theology and romance alike claiming him; that he wedded, and had a child named Margery or Marguerite — the Daisy, or the

Pearl — at whose death his happiness drooped and life's joy ended.

The four poems are closely linked and belong to one period of the poet's career. In Gawayne, probably the first of the four, the poet is still the minstrel rejoicing in the glamour of the Arthurian tale, but using it, in almost Spenserian spirit, to point a moral. In Pearl the minstrel has become the elegiac poet, harmonizing the old Teutonic form with the newer Romance rhyme. In Cleanness he has discarded all attractions of form, and writes, in direct alliterative metre, a stern homily on chastity. In Patience — a homiletic paraphrase of Jonah — he appears to be autobiographical, reminding himself, while teaching others, that " Poverty and Patience are needs playfellows." He had evidently fallen on evil days.

It is noteworthy that soon after 1358 Boccaccio wrote his Latin eclogue Olympia in memory of his young daughter Violante. A comparative study of the two poems is full of interest; the direct influence of the Latin on the English poem is not so clear as has been maintained. Pearl cannot be placed earlier than 1360; it is most probably later than Olympia.

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PEARSALL, ROBERT LUCAS DE (1795-1856), English composer, was born on the 14th of March 1795, at Clifton. Educated for the bar, he practised till 1825, when he left England for Germany and studied composition under Panny of Mainz; with the exception of three comparatively short visits to England, during one of which he made the acquaintance of the English school of madrigals, he lived abroad, selling his family property of Willsbridge and settling in the castle of Wartensee, 011 the lake of Constance. He produced many works of lasting beauty, nearly all of them for voices- in combination : from his part songs, such as ” Oh, who will o’er the downs ? ” to his elaborate and scholarly madrigals, such as the admirable eight-part compositions, ” Great God of Love ” and ” Lay a Garland,” or the beautiful ” Light of my Soul.” His reception into the Roman Church in his later years may have suggested the composition of some beautiful sacred music, among other things a fine ” Salve Regina.” He wrote many valuable treatises on music, and edited a Roman Catholic hymn-book. He died on the 5th of August 1856.

PEARSON, CHARLES HENRY (1830-1894), British historian and colonial statesman, was born in London on the 7th of September 1830. After receiving his early education at Rugby and King's College, London, he went up to Oxford, where he

was generally regarded as the most brilliant of an exceptionally able set, and in 1854 obtained a fellowship at Oriel College. His constitutional weakness and bad eyesight forced him to abandon medicine, which he had adopted as a career, and in 1855 he returned to King's College as lecturer in English language and literature, a post which he almost immediately quitted for the professorship of modern history. He made numerous journeys abroad, the most important being his visit to Russia in 1858, his account of which was published anonymously in 1859 under the title of Russia, by a Recent Traveller; an adven- turous journey through Poland during the insurrection of 1863, of which he gave a sympathetic and much praised account in die Spectator; and a visit to the United States in 1868, where he gathered materials for his subsequent discussion of the negro problem in his National Life and Character. In the meantime, besides contributing regularly, first to the Saturday Review and then to the Spectator, and editing the National Review, he wrote the first volume of The Early and Middle Ages of England (1861). The work was bitterly attacked by Freeman, whose " extrava- gant Saxonism " Pearson had been unable to adopt. It appeared in 1868 in a revised form with the title of History of England during the Early and Middle Ages, accompanied by a second volume which met with general recognition. Still better was the reception of his admirable Maps of England in the First Thirteen Centuries (1870). But as the result of these labours he was threatened with total blindness; and, disappointed of receiving a professorship at Oxford, in 187 1 he emigrated to Australia. Here he married and settled down to the life of a sheep-farmer; but finding his health and eyesight greatly improved, he came to Melbourne as lecturer on history at the university. Soon afterwards he became head master of the Presbyterian Ladies' College, and in this position practically organized the whole system of higher education for women in Victoria. On his election in 1878 to the Legislative Assembly he definitely adopted politics as his career. His views on the land question and secular education aroused the bitter hostility of the rich squatters and the clergy; but his singular nobility of character, no less than his powers of mind, made him one of the most influential men in the Assembly. He was minister without

portfolio in the Berry cabinet (1880-1881), and as minister of education in the coalition government of 1886 to 1890 he was able to pass into law many of the recommendations of his report. His reforms entirely remodelled state education in Victoria. In 1892 a fresh attack of illness decided him to return to England. Here he published in 1893 the best known of his works, National Life and Character. It is an attempt to show that the white man can flourish only in the temperate zones, that the yellow and black races must increase out of all proportion to the white, and must in time crush out his civilization. He died in London on the 29th of May 1894.

A volume of his Reviews and Critical Essays was published in 1896, and was followed in 1900 by his autobiography, a work of great interest.

PEARSON, JOHN (161 2-1 686), English divine and scholar, was born at Great Snoring, Norfolk, on the 28th of February 161 2. From Eton he passed to Queen's College, Cambridge, and was elected a scholar of King's in April 1632, and a fellow in 1634. On taking orders in 1639 he was collated to the Salisbury prebend of Nether-Avon. In 1640 he was appointed chaplain to the lord-keeper Finch, by whom he was presented to the living of Thorington in Suffolk. In the Civil War he acted as chaplain to George Goring's forces in the west. In 1654 he was made weekly preacher at St Clement's, Eastcheap, in London. With Peter Gunning he disputed against two Roman Catholics on the subject of schism, a one-sided account of which was printed in Paris by one of the Roman Catholic disputants, under the title Scisme Unmask't C1658). Pearson also argued against the Puritan party, and was much interested in Brian Walton's polyglot Bible. In 1659 he published in London his celebrated Exposition of the Creed, dedicated to his parishioners of St Clement's, Eastcheap, to whom the substance of the work had been preached several years before. In the same year he

published the Golden Remains of the ever-memorable Mr John Hales of Eton, with an interesting memoir. Soon after the Restoration he was presented by Juxon, bishop of London, to the rectory of St Christopher-le-Stocks; and in 1660 he was created doctor of divinity at Cambridge, appointed a royal chaplain, prebendary of Ely, archdeacon of Surrey, and master of Jesus College, Cambridge. In 1661 he was appointed Lady Margaret professor of divinity; and on the first day of the ensuing year he was nominated one of the commissioners for the review of the liturgy in the conference held at the Savoy. There he won the esteem of his opponents and high praise from Richard Baxter. On the 14th of April 1662 he was made master of Trinity College,

Cambridge. In 1667 he was admitted a fellow of the Royal Society. In 1672 he published at Cambridge Vindiciae epistolarum S. Ignatii, in 4to, in answer to Jean Daille. His defence of the authenticity of the letters of Ignatius has been confirmed by J. B. Lightfoot and other recent scholars. Upon the death of John Wilkins in 1672, Pearson was appointed to the bishopric of Chester. In 1682 his Annates cyprianici were published at Oxford, with John Fell's edition of that father's works. He died at Chester on the 16th of July 1686. His last work, the Two Dissertations on the Succession and Times of the First Bishops of Rome, formed with the Annates Paulini the principal part of his Opera posthuma, edited by Henry Dodwell in 1688.

See the memoir in Biographia Britannica, and another by Edward Churton, prefixed to the edition of Pearson's Minor Theological Works (2 vols., Oxford, 1844). Churton also edited almost the whole of the theological writings.

PEARSON, JOHN LOUGHBOROUGH (1817-1897), English architect, son of William Pearson, etcher, of Durham, was born in Brussels on the 5th of July 1817. He was articled at the age of fourteen to Ignatius Bonomi, architect, of Durham, but soon removed to London, and worked under the elder Hardwicke. He revived and practised largely the art of vaulting, and acquired in it a proficiency unrivalled in his generation. He was, however, by no means a Gothic purist, and was also fond of Renaissance and thoroughly grounded in classical architecture. From the erection of his first church of Ellerker, in Yorkshire, in 1843, to that of St Peter's, Vauxhall, in 1864, his buildings are Geometrical in manner and exhibit a close adherence to pre- cedent, but elegance of proportion and refinement of detail lift them out of the commonplace of mere imitation. Holy Trinity, Westminster (1848), and St Mary's, Dalton Holme (1858), are notable examples of this phase. St Peter's, Vauxhall (1864), his first groined church, was also the first of a series of buildings which brought Pearson to the forefront among his contempor- aries. In these he applied the Early English style to modern needs and modern economy with unrivalled success. St Augus- tine's, Kilburn (1871), St John's, Red Lion Square, London (1874), St Alban's, Birmingham (1880), St Michael's, Croydon (1880), St John's, Norwood (1881), St Stephen's, Bournemouth (1889), and All Saints', Hove (1889), are characteristic examples of his matured work. He is best known by Truro Cathedral (1880), which has a special interest in its apt incorporation of the south aisle of the ancient church. Pearson's conservative spirit fitted him for the reparation of ancient edifices, and among cathedrals and other historical buildings placed under his care were Lincoln, Chichester, Peterborough, Bristol and Exeter Cathedrals, St George's

Chapel, Windsor, Westminster Hall and Westminster Abbey, in the surveyorship of which last he succeeded Sir G. G. Scott. Except as to the porches, the work of Scott, he re-faced the north transept of Westminster Abbey, and also designed the vigorous organ cases. In his hand- ling of ancient buildings he was repeatedly opposed by the ultra anti-restorers (as in the case of the west front of Peterborough Cathedral in 1896), but he, generally proved the soundness of his judgment by his executed work. Pearson's practice was not confined to church building. Treberfydd House (1850), Quar Wood (1858), Lechlade Manor, an Elizabethan house (1873), Westwood House, Sydenham, in the French Renaissance style (1880), the Astor estate offices (1892) upon the Victoria

Embankment, London, the remodelling of the interiors of Clieveden House (1893) and No. 18 Carlton House Terrace (1894), with many parsonages, show his aptitude for domestic architec- ture. In general design he first aimed at form, embracing both proportion and contour; and his work may be recognized by accurate scholarship coupled with harmonious detail. Its key- notes are cautiousness and refinement rather than boldness. He died on the nth of December 1897, and was buried in the nave of Westminster Abbey, where his grave is marked by the appropriate motto Sustinuit et abstinuit. He was elected A.R.A. in 1874, R.A. in 1880, was a fellow of the Society of Antiquaries, and a fellow and member of the Council of the Royal Institute of British Architects.

The following are some of Pearson's more important works, not already named: Ferriby church (1846); Stow, Lincolnshire (restoration, 1850) ; Weybridge, St James's (1853) ; Freeland church, parsonage and schools (1866); Kilburn, St Peter's Home (1868); Wentworth church (1872); Horsforth church (1874); Cullercoats, St George's (1882) ; Chiswick, St Michael's (restoration, 1882) ; Great Yarmouth church (restoration, 1883); Liverpool, St Agnes' (1883); Woking Convalescent Home (1884); Headingley church (1884); Torquay, All Saints (1884); Maidstone, All Saints (restoration, 1885); Shrewsbury Abbey (1886); Ayr, Holy Trinity (1886); Hythe church (restoration, 1887); Oxford, New College, reredos (com- pletion, 1889); Cambridge University Library (additions, 1889); Friern Barnet, St John's (1890); Cambridge, Sidney Sussex College (additions, 1890); Middlesex Hospital chapel (1890); Bishopsgate, St Helen's (restoration, 1891) ; Maida Hill (Irvingite) church (1891) ; Barking,

AH Hallows (restoration, 1893); Cambridge, Emmanuel College (additions, 1893); Ledbury, St Michael's (restoration, 1894); Malta, Memorial church (1894); Port Talbot church (1895).

(W. D. C.)

PEARY, ROBERT EDWIN (1856-), American Arctic explorer, was born at Cresson, Pennsylvania, on the 6th of May 1856. He graduated at Bowdoin College in 1877, and in 1881 became a civil engineer in the U.S. navy with the rank of lieuten- ant. In 1884 he was appointed assistant-engineer in connexion with the surveys for the Nicaragua Ship Canal, and in 1887-1888 he was in charge of these surveys. In 1886 he obtained leave of absence for a summer excursion to Disco Bay on the west coast of Greenland. From this point he made a journey of nearly a hundred miles into the interior, and the experience impressed him with the practicability of using this so-called inland ice-cap as a highway for exploration. In 1891 he organized an expedi- tion under the auspices of the Academy of Natural Sciences of Philadelphia. The party of seven included Lieut. Peary's wife, the first white woman to accompany an Arctic ex- pedition. After wintering in Inglefield Gulf on the north- west coast of Greenland, in the following spring Lieut. Peary, with a young Norwegian, Eivind Astrup, crossed the inland ice-cap along its northern limit to the north-east of Greenland and back. The practical geographical result of this journey was to establish the insularity of Greenland. Valuable work was also performed by the expedition in the close study which was made of the isolated tribe of the Cape York or Smith Sound Eskimos, the most northerly people in the world. 1 Lieut. Peary was able to fit out another Arctic expedition in 1893, and was again accompanied by Mrs Peary, who gave birth to a daughter at the winter quarters in Inglefield Gulf. The expedition returned in the season of 1894, leaving Peary with his coloured servant Henson and Mr Hugh G. Lee to renew the attempt to cross the inland ice in the next year. This they succeeded in doing, but without being able to carry the work of exploration any farther on the opposite side of Greenland. During a summer excursion to MeJville Bay in 1894, Peary discovered three large meteorites, which supplied the Eskimos with the material for their iron implements, as reported by Sir John Ross in 18 18, and on his return in 1895 he brought the two smaller ones with him. The remaining meteorite was brought to New York in 1897. In 1898 Lieut. Peary published Northward over the Great Ice, a record of all his expeditions up to that time, and in the same year he started

1 A narrative of the expedition written by Mrs Peary, and con- taining an account of the " Great White Journey across Greenland," by her

husband, was published under the title of My Arctic Journal.

on another expedition to the Arctic regions. In this and sub- sequent expeditions he received financial aid from Mr Morris Jesup and the Peary Arctic Club. The greatest forethought was bestowed upon the organization of the expedition, a four- years' programme being laid down at the outset and a system of relief expeditions provided for. A distinctive feature was the utilization of a company of Eskimos. Although unsuccessful as regards the North Pole, the expedition achieved the accurate survey (1900) of the northern limit of the Greenland continent and the demonstration that beyond it lay a Polar ocean. In 1902 Peary with Henson and an Eskimo advanced as far north as lat. 84° 17′ 27", the highest point then reached in the western hemisphere. Lieut. Peary had now been promoted to the rank of Commander, and on his return he was elected president of the American Geographical Society. In November 1903 he went to England on a naval commission to inquire into the system of naval barracks in Great Britain, and was presented with the Livingstone Gold Medal of the Royal Scottish Geographical Society. Commander Peary then began preparations for another expedition by the con- struction of a special ship, named the " Roosevelt," the first ever built in the United States for the purpose of Arctic exploration. He sailed from New York on the 16th of July 1905, having two years' supplies on board. The " Roosevelt " wintered on the north coast of Grant Land, and on the 21st of February a start was made with sledges. The party experienced serious delay owing to open water between 84 and 85°, and farther north the ice was opened up during a six days' gale, which cut off communications and destroyed the dep6ts which had been established. A steady easterly drift was experienced. But on the 21st of April, 1906, 87°6′ was reached — the"farthest north " attained by man — by which time Peary and his com- panions were suffering severe privations, and had to make the return journey in the face of great difficulties. They reached the north coast of Greenland and subsequently rejoined the ship, from which, after a week's rest, Peary made a sledge journey along the north coast of Grant Land. Returning home, the expedition reached Hebron, Labrador, on the 13th of October, the " Roosevelt " having been nearly wrecked en route. In 1907 the narrative of this journey, Nearest the Pole, was published. In 1908 Peary started in the " Roosevelt " on the journey which was to bring him his final success. He left Etah on the 1 8th of August, wintered in Grant Land, and set forward over the ice from Cape Columbia on the 1st of March 1909. A party of six started with him, and moved in sections, one in front of another. They were gradually sent back as supplies diminished. At the end of the month Captain

Bartlett was the only white man left with Peary, and he turned back in 87° 48′ N., the highest latitude then ever reached. Peary, with his negro servant and four Eskimos, pushed on, and on the 6th of April 1909 reached the North Pole. They remained some thirty hours, took obser- vations, and on sounding, a few miles from the pole, found no bottom at 1500 fathoms. The party, with the exception of one drowned, returned safely to the ” Roosevelt,” which left her winter quarters on the 18th of July and reached Indian Harbour on the 5th of September. Peary’s The North Pole: Its Discovery in igog was published in 19 10.

Just before the news came of Peary’s success another American explorer, Dr F. A. Cook (b. 1865), returning from Greenland to Europe on a Danish ship, claimed that he had reached the North Pole on the 21st of April 1908. He had accompanied an expedition northward in 1907, prepared to attempt to reach the Pole if opportunity offered, and according to his own story had done so, leaving his party and taking only some Eskimos, early in 1908. Nothing had been heard of him since March of that year, and it was supposed that he had perished. Cook’s claim to have forestalled Peary was at first credited in various circles, and he was given a rapturous reception at Copenhagen; but scientific opinion in England and America was more reserved, and eventually, after a prolonged dispute, a special committee of the university of Copenhagen, to whom his documents were submitted, declared that they

contained no proof that he had reached the Pole. By that time most other people had come to an adverse conclusion and the sensation was over.

PEASANT (O. Fr. paysant, Mod. paysan; Lat. pagensis, belonging to the pagus or country; cf. ” pagan “), a countryman or rustic, either working for others, or, more specifically, owning or renting and working by his own labour a small plot of ground. Though a word of not very strict application, it is now frequently used of the rural population of such countries as France, where the land is chiefly held by small holders, ” peasant proprietors.” (See Allotments and Metayage).

PEASE, EDWARD (1767-1858), the founder of a famous industrial Quaker family in the north of England, was born at Darlington on the

31st of May 1767, his father, Joseph Pease (1737-1808), being a woollen manufacturer in that town. Having retired from this business Edward Pease made the acquaintance of George Stephenson, and with him took a prominent part in constructing the railway between Stockton and Darlington. He died at Darlington on the 31st of July 1858. His second son, Joseph Pease (1799-1872), who assisted his father in his railway enterprises, was M.P. for South Durham from 1832 to 1841, being the first Quaker to sit in parliament. He was interested in collieries, quarries and ironstone mines in Durham and North Yorkshire, as well as in cotton and woollen manu- factures; and he was active in educational and philanthropic work. Another son, Henry Pease (1807-1881), was M.P. for South Durham from 1857 to 1865. Like all the members of his family he was a supporter of the Peace Society, and in its interests he visited the emperor Nicholas of Russia just before the outbreak of the Crimean War, and later the emperor of the French, Napoleon III.

Joseph Pease's eldest son, Sir Joseph Whitwell Pease (1828- 1903), was made a baronet in 1882. He was M.P. for South Durham from 1865 to 1885 and for the Barnard Castle division of Durham from 1885 to 1903. His elder son, Sir Alfred Edward Pease (b. 1857), who succeeded to the baronetcy, became famous as a hunter of big game, and was M.P. for York from 1885 to 1892 and for the Cleveland division of Yorkshire from 1897 to 1902. A younger son, Joseph Albert Pease (b. i860), entered parliament in 1892, and in 1908 became chief Liberal whip, being advanced to the cabinet as chancellor of the duchy of Lancaster in 1910.

Another son of Joseph Pease was Arthur Pease (1837-1898), member of parliament from 1880 to 1885 and again from 1895 to 1898. His son, Herbert Pike Pease (b. 1867), M.P. for Darlington 1898-1910, was one of the Unionist Whips.

The Diaries of Edward Pease were edited by Sir Alfred Pease in

1907.

PEAT (possibly connected with Med. Lat. petia, pecia, piece, ultimately of Celtic origin; cf. O. Celt, pet, O. Ir. pit, Welsh pelh, portion), a product of decayed vegetation found in the form of bogs in many parts of the world. The continent of Europe is estimated to contain 212,700 sq. m. of bog; Ireland has 2,858,150 acres, Canada 30,000,000 acres, and the United States 20,000,000 acres. The plants which give origin to these deposits are mainly aquatic, including reeds, rushes, sedges and mosses. Sphagnum is present in most peats,

but in Irish peat Thacomitrum lanugino- sum predominates. It seems that the disintegration of the vegetable tissues is effected partly by moist atmospheric oxida- tion and partly by anaerobic bacteria, yeasts, moulds and fungi, in depressions containing fairly still but not stagnant water, which is retained by an impervious bed or underlying strata. As decomposition proceeds the products become waterlogged and sink to the bottom of the pool; in the course of time the deposits attain a considerable thickness, and the lower layers, under the superincumbent pressure of the water and later deposits, are gradually compressed and carbonized. The most favourable conditions appear to be a moist atmosphere, and a mean annual temperature of about 45° F.; no bogs are found between latitudes 45 N. and 45 S.

Peat varies from a pale yellow or brown fibrous substance, resembling turf or compressed hay, containing conspicuous plant

remains, to a compact dark brown material, resembling black clay when wet, and some varieties of lignite when dry. Two typical forms may be noticed: ” Hill peat ” (the mountain or brown bogs of Ireland), found in mountainous districts, and consisting mainly of Sphagnum and Andromeda; and ” Bottom peat ” (the lowland or red bogs of Ireland), found in lakes, rivers, and brooks, and containing Hypnum. It always contains much water, up to 90%, which it is necessary to remove before the product can be efficiently employed as a fuel, and for most other purposes. A specimen dried at ioo° C. had the composi- tion: carbon = 60-48%, hydrogen = 6- 10%, oxygen = 32-55%, nitrogen = o-88%, ash = 3 -30%; the ash is very variable — from 1 to 65% — and consists principally of clay and sand, with lesser amounts of ferric oxide, lime, magnesia, &c. The specific gravity has been variously given, owing to the variable water content and air spaces; when dried and compressed, however, it is denser than water.

Peat-winning presents certain special features. The general practice is to cut a trench about a foot deep with a peculiarly shaped spade, termed in Ireland a ” slane,” and remove sods from 3 to 4 ft. long. When one layer has been removed, the next is attacked, and so on. If the deposit be more solid step- working may be adopted, and should water be reached recourse may be had to long-handled slanes. The sods are allowed to drain, and then stacked for drying in the air, being occasionally turned so as to dry equally; this process may require about six weeks. The dried sods are known as ” dug peat.” Excavators and dredges are now extehsively used, and the drying is effected in heated chambers, both fixed and revolving.

The low value of ordinary dug peat as a fuel has led to processes for

obtaining a more useful product. In M. Ekenberg's process the wet peat is pulped and milled so as to make it of uniform composition, and the pulp passed into an oven maintained at i8o°-20o° F., where it is carbonized by superheated water. The pressed product, which resembles lignite, still contains 8 to 14% of water; this is driven off by heat, and the residue briquetted. The final product is nearly equal to coal in calorific value, and has the additional advantage of a lower sulphur content — 0-2 to 0-4 % against about 2 % in ordinary coal. M. Zeigler's method leads to the production of a useful coke. Both these processes permit the recovery of valuable by-products, especially ammonium sulphate. Experiments for obtaining a gas suitable for consumption in gas- engines have been followed by commercial processes devised by the Mond Gas Corporation, London, and Crossley Bros, of Manchester, and by Caro and Frank in Germany. The processes essentially consist in destructively distilling peat in special retorts and under specified conditions, and, in addition to the gas, there is recovered a useful coke and also the nitrogen as ammonium sulphate.

The conversion of the nitrogen into ammonia has been the subject of much work, and is commercially pursued at a works at Carn- lough, Co. Antrim, under patents held by H. C. Woltereck. The peat is treated with a mixture of air and water vapour in special furnaces, and the gaseous products, including paraffin tar, acetic acid and ammonia, are led through a special scrubber to remove the tar, then through a tower containing milk of lime to absorb the acid (the calcium acetate formed being employed for the manu- facture of acetone, &c), and finally through a sulphuric acid tower, where the ammonia is converted into ammonium sulphate which is recovered by crystallization.

Peat has also been exploited as a source of commercial alcohol, to be employed in motors. In the process founded on the experi- ments of R. W. Wallace and Sir W. Ramsay, which gives 25 to 26 gallons of spirit from a ton of peat, the peat is boiled with water containing a little sulphuric acid, the product neutralized with lime and then distilled; the ammonia is also recovered. In another process a yield of 40 gallons of spirit and 66 lb of ammonium sulphate per ton of peat is claimed.

Of other applications we may notice C. E. Nelson's process for making a paper, said to be better than ordinary wrapping; the first factory to exploit this idea was opened at Capac, Michigan, in 1906. Peat has been employed as a manure for many years, and recently attempts have been made to convert artificially its nitrogen into assimilable nitrates; such a process was patented by A. Muntz and A. G. Girard of

Paris, in 1907.

See P. R. Bjorling and F. T. Gissing, Peat and its Manufacture (1907) ; F. T. Gissing, Commercial Peat (1909) ; E. Nystrom, Peat and Lignite (1908), published by Department of Mines of Canada.

PfiCAUT, FELIX (1828-1898), French educationalist, a member of an old Huguenot family, was born at Salies de Beam, in 1828. He was for some months evangelical pastor at Salies, but he had no pretence of sympathy with ecclesiastical authority

He was consequently compelled to resign his pastorate, and for some years occupied himself by urging the claims of a liberal Christianity. In 1879 he conducted a general inspection of primary education for the French government, and several similar missions followed. His fame chiefly rests in his successful organization of the training school for women teachers at Fontenoy-aux-Roses, to which he devoted fifteen years of ceaseless toil. He died on the 31st of July 1898.

A summary of his educational views is given in his Public Educa- tion and National Life (1897).

PECCARY, the name of the New World representatives of the swine (Suidae) of the E. hemisphere, of which they constitute the sub-family Dicotylinae (or Tagassuinae). (See Artiodactyla and Swine.)

The teeth of the peccaries differ from those of the typical Old World pigs (Sus) , numerically, in wanting the upper outer incisor and the anterior premolar on each side of each jaw, the dental formula being: i. f , c. \, p. f , m. f , total 38. From those of all Old World swine or Suinae, the upper canines, or tusks, differ in having their points directed downwards, not outwards or

The Collared Peccary (Dicotyles tajacu).

upwards; these being very sharp, with cutting hinder edges, and completely covered with enamel until worn. The lower canines are large and directed upwards and outwards, and slightly curved backwards. The cheek-teeth form a continuous series, gradually increasing in size from the first to the last : the molars having square four-cusped crowns. The stomach is much more complex than in the true pigs, almost approaching that of a ruminant. In the feet the two middle (third and fourth) metacarpal and metatarsal bones, which are completely separate in the pigs, are united at their upper ends. On the fore-foot the two (second and fifth) outer toes are equally developed as in pigs, but on the hind-foot, although the inner (or second) is present, the outer or fifth toe is entirely wanting. As in all Suidae the snout is truncated, and the nostrils are situated in its flat, expanded, disk-like termination. The ears are rather small, ovate and erect; and there is no external appearance of a tail.

Peccaries, which range f romNewMexico andTexas to Patagonia, are represented by two main types, of which the first is the collared peccary, Dicotyles (or Tagassu) tajacu, which has an extensive range in South America. Generally it is found singly or in pairs, or at most in small herds of from eight to ten, and is not inclined to attack other animals or human beings. Its colour is dark grey, with a white or whitish band passing across the chest from shoulder to shoulder. The length of the head and body is about 36 in. The second form is typified by the white-lipped peccary or warri, D. (or T.) labiatus, or pecari, representing the sub-genus Olidosus. Typically it is rather larger than the collared species, being about 40 in. in length, of a blackish colour, with the lips and lower jaw white. It is

not found farther north than Guatemala, or south of Paraguay. Generally met with in large droves of from fifty to a hundred, it is of a more pugnacious disposition than the former species, and a hunter who encounters a herd in a forest has often to climb a tree as his only chance of safety. Peccaries are omnivorous, living on roots, fallen fruits, worms and carrion, and often inflict great devastation upon crops. Both types are so nearly allied that they will breed together freely in captivity. Unlike pigs, they never appear to produce more than two young ones at a birth.

Remains of extinct peccaries referable to the modern genus occur in the caverns and superficial deposits of South America, but not in the earlier formations. This, coupled with the occurrence of earlier types in North America, indicates that the group is a northern one. Of the extinct North American peccaries, the typical Dicotyles occur in the

Pliocene while the Miocene Bothriolabis, which has tusks of the peccary type, approximates in the structure of its cheek-teeth to the European Miocene genus among the Suinae. From this it may be inferred that the ancestral peccaries entered America in the Upper Oligoeene. Platygonus is an aberrant type which died out in the Pleistocene. (R. L .*.)

PECHLIN, KARL FREDRIK (1720-1796), Swedish politician and demagogue, son of the Holstein minister at Stockholm, was educated in Sweden, and entered the Swedish army. He rose to the rank of major-general, but became famous by being the type par excellence of the corrupt and egoistic Swedish parlia- mentarian of the final period of the Frihetstiden (see Sweden. History); he received for many years the sobriquet of ” General of the Riksdag.” Pechlin first appears prominently in Swedish politics in 1760, when by suddenly changing sides he contrived to save the ” Hats ” from impeachment. Enraged at being thus excluded from power by their former friend, the ” Caps ” procured Pechlin’s expulsion from the two following Riksdags. In 1769 Pechlin sold the ” Hats ” as he had formerly sold the ” Caps, ” and was largely instrumental in preventing the pro- jected indispensable reform of the Swedish constitution. During the revolution of 1772 he escaped from Stockholm and kept quietly in the background. In 1786, when the opposition against Gustavus III. was gathering strength, Pechlin reappeared in the Riksdag as one of the leaders of the malcontents, and is said to have been at the same time in the pay of the Russian court. In 1789 he was one of the deputies whom Gustavus III. kept under lock and key till he had changed the government into a semi-absolute monarchy. It is fairly certain that Pechlin was at the bottom of the plot for murdering Gustavus in 1792. On the eve of the assassination (March 16) the principal conspirators met at his house to make their final preparations and discuss the form of government which should be adopted after the king’s death. Pechlin undertook to crowd the fatal masquerade with accomplices, but took care not to be there personally. He was arrested on the 17th of March, but nothing definite could ever be proved against him. Nevertheless he was condemned to imprisonment in the fortress of Varberg, where he died four years later.

See R. N. Bain, Gustavus III. and his Contemporaries (London, 1905). (R. N. B.)

PECHORA, a river of N. Russia, rising in the Urals, almost on 62 N., in the government of Perm. It flows W. for a short distance, then turns N. and maintains that, direction up to about 66° 20′ N. It then describes a double loop, to N. and to S., and after that resumes its N. course,

finally emptying into the Gulf of Pechora, situated between the White Sea and the Kara Sea. Its total length is 970 m. At its mouth it forms an elongated delta. Although frozen in its upper reaches for 190 days in the year and for 138 days in its lower reaches, it is navigable throughout the greater part of its course. Its drainage basin covers an area of 127,200 sq. m. The principal tributaries are, on the right, the Ilych and the Usa, and on the left the Izhma, the Tsylma and the Sula.

PECK, a dry measure of capacity, especially used for grain. It contains 8 quarts or 2 gallons, and is J of a bushel. The

imperial peck contains 554-348 cub. in., in the United States of America 537-6 cub. in. The word is in M.E. pek, and is found latinized as peccum or pekka. In Med. Lat. are found picotinus, ” mensura frumentaria,” and picotus, ” mensura liquidorum ” (Du Cange, Gloss, s.vv.) These words seem to be connected with the Fr. picotcr, to peck, of a bird, and this would identify the word with ” peck,” a variant of ” pick,” a tap or stroke of the beak, especially used of the action of a bird in picking up grain or other food. The sense-development in this case is very obscure, and the name of the measure is found much earlier than ” peck ” as a variant form of ” pick.”

PECKHAM, JOHN (d. 1292), archbishop of Canterbury, was probably a native of Sussex, and received his early education from the Cluniac monks of Lewes. About 1250 he joined the Franciscan order and studied in their Oxford convent. Shortly afterwards he proceeded to the university of Paris, where he took his degree under St Bonaventure and became regent in theology. For many years Peckham taught at Paris, coming into contact with the greatest scholars of the day, among others St Thomas Aquinas. About 1270 he returned to Oxford and taught there, being elected in 1275 provincial minister of the Franciscans in England, but he was soon afterwards called to Rome as lector sacri palatii, or theological lecturer in the schools of the papal palace. In 1279 he returned to England as archbishop of Canterbury, being appointed by the pope on the rejection of Robert Burnell, Edward I.‘s candidate. Peckham was always a strenuous advocate of the papal power, especially as shown in the council of Lyons in 1274. His enthronement in October 1279 marks the beginning of an important epoch in the history of the English primacy. Its characteristic note was an insistence on discipline which offended contemporaries. Peckham’s zeal was not tempered by discernment,

and he had little gift of sympathy or imagination. His first act on arrival in England was to call a council at Reading, which met in July 1 279. Its main object was ecclesiastical reform, but the pro- vision that a copy of Magna Carta should be hung in all cathedral and collegiate churches seemed to the king a political action, and parliament declared void any action of this council touching on the royal power. Nevertheless Peckham's relations with the king were often cordial, and Edward called on him for help in bringing order into conquered Wales. The chief note of his activity was, however, certainly ecclesiastical. The crime of " plurality," the holding by one cleric of two or more benefices, was especially attacked, as also clerical absenteeism and ignorance, and laxity in the monastic life. Peckham's main instrument was a minute system of " visitation," which he used with a frequency hitherto unknown. Disputes resulted, and on some points Peckham gave way, but his powers as papal legate complicated matters, and he did much to strengthen the court of Canterbury at the expense of the lower courts. The famous quarrel with St Thomas of Cantilupe, bishop of Hereford, arose out of similar causes. A more attractive side of Peckham's career is his activity as a writer. The numerous manuscripts of his works to be found in the libraries of Italy, England and France, testify to his industry as a philosopher and commentator. In philosophy he represents the Franciscan school which attacked the teaching. of St Thomas Aquinas on the " Unity of Form." He wrote in a quaint and elaborate style on scientific, scriptural and moral subjects and engaged in much controversy in defence of the Franciscan rule and practice. He was " an excellent maker of songs," and his hymns are characterized by a lyrical tenderness which seems typically Franciscan. Printed examples of his work as com- mentator and hymn writer respectively may be found in the Fir amentum trium ordinum (Paris, 151 2), and his office for Trinity Sunday in the " unreformed " breviary.

The chief authority on Peckham as archbishop of Canterbury, is the Registrum fratris Johannis Peckham, edited by C. Trice Martin for the Rolls Series (London, 1882-1885). A sympathetic account of his life as a Franciscan is to be found in L. Wadding, Annates minorum (Lyons, 1625, 1654). See also the article by C. L. Kingsford in Diet. Nat. Biog., and Wilkin's Concilia magnae Britanniae (London, 1737). (E. O'N.)

XXI. 2

PECOCK (or Peacock), REGINALD (c. 1395-c. 1460), English prelate and writer, was probably born in Wales, and was edu- cated at Oriel College, Oxford. Having been ordained priest in 142 1, he secured a mastership in London in 143 1, and soon became prominent by his

attacks upon the religious position of the Lollards. In 1444 he became bishop of St Asaph, and six years later bishop of Chichester. He was an adherent of the house of Lancaster and in 1454 became a member of the privy council. In attacking the Lollards Pecock put forward religious views far in advance of his age. He asserted that the Scriptures were not the only standard of right and wrong; he questioned some of the articles of the creed and the infallibility of the Church; he wished ” bi cleer witte drawe men into consente of trewe feith otherwise than bi fire and swerd or hangement ” and in general he exalted the authority of reason. Owing to these views the archbishop of Canterbury,Thomas Bourchier, ordered his writings to be examined. This was done and he was found guilty of heresy. He was removed from the privy council and he only saved himself from a painful death by privately, and then publicly (at St Paul’s Cross, Dec. 4, 1457), renounc- ing his opinions. Pecock, who has been called ” the only great English theologian of the 15th century,” was then forced to resign his bishopric, and was removed to Thorney Abbey in Cambridgeshire, where he doubtless remained until his death. The bishop’s chief work is the famous Repressor of over-much weeting [blaming] of the Clergie, which was issued about 1455. I Q addition to its great importance in the history of the Lollard movement the Repressor has an exceptional interest as a model of the English of the time, Pecock being one of the first writers to use the vernacular. In thought and style alike it is the work of a man of learning and ability.

A biography of the author is added to the edition of the Repressor published by C. Babington for the Rolls Series in i860. Pecock’s other writings include the Book or Rule of Christian Religion; the Donet, ” an introduction to the chief truths of the Christian faith in the form of a dialogue between father and son ” ; and the Folewer to the Donet. The two last works are extant in manuscript. His Book of Faith has been edited from the manuscript in the library of Trinity College, Cambridge, by J. L. Morison (Glasgow, 1909). See also John Lewis, Life of Pecock (1744; new ed., 1820).

PECORA (plural of Lat. pecus, cattle), a term employed — in a more restricted sense — in place of the older title Ruminantia, to designate the group of ruminating artiodactyle ungulates represented by oxen, sheep, goats, antelopes, deer, giraffes, &c.

The leading characteristics of the Pecora are given in some detail in the article Artiodactyla (q.v.) ; but it is necessary to allude to a few of these here. Pecora, or true ruminants as they may be conveniently called, have complex stomachs and chew the cud; they have no upper incisor teeth; and the lower canines are approximated to the outer

incisors in such a manner that the three incisors and the one canine of the two sides collectively form a continuous semicircle of four pairs of nearly similar teeth. In the cheek-teeth the component columns are crescent-shaped, constituting the selenodont type. In the fore- limbs the bones corresponding to the third and fourth metacar- pals of the pig's foot are fused into a cannon-bone; and a similai condition obtains in the case of the corresponding metatarsals in the hind-limbs. There is generally no sagittal crest to the skull; and the condyle of the lower jaw is transversely elongated. Another general, although not universal, characteristic of the Pecora is the presence of simple or complex appendages on the forehead commonly known as horns. In a few existing species, such as the musk-deer and the water-deer, these appendages are absent, and they are likewise lacking in a large number of extinct members of the group, in fact in all the earlier ones. They are, therefore, a specialized feature, which has only recently attained its full development.

These horns present several distinct structural types, which may be classified as follows : — –

I. The simplest type is that of the giraffe, in which three bony prominences — a single one in front and a pair behind — quite separate from the underlying bones and covered during life with skin, occupy the front surface of the skull. The summits of the hind pair are surmounted by bristly hairs. In the extinct

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Sivatherium there are two pairs of such appendages, of which the hinder are large and were probably covered during life either with skin or thin horn. In the giraffes the separation of the horns from the skull may be a degenerate character.

II. In the Asiatic muntjac deer we find a pair of skin-covered horns, or " pedicles, ' corresponding to the paired horns of the giraffe, although welded to the skull. From the summits of these

Fig. i. — Head of Siamese Deer {Cervus schomburgkii), showing antlers.

pedicles arise secondary outgrowths, at first covered with skin, which (owing to the growth of a ring of bone at the base arresting the flow

of blood) eventually dries up and leaves bare bone incapable of further growth. In the muntjac the bare bony part, or ” antler,” is small in proportion to the skin-covered pedicle, and simple in structure; but in the majority of deer the antler increases in size at the expense of the pedicle — which dwindles — and in some species, like the Siamese deer (fig. i), the sambar and the red deer, becomes very large and more or less branched. Owing to liability to necrosis, the permanent retention of such a mass of dead bone would be dangerous; and the antlers are consequently shed annually (or every few years), to be renewed the following year, when, till the animal becomes past its prime, they are larger than their predeces- sors. The periodical shedding is also necessary in order to allow of this increase in size. With the exception of the reindeer, antlers are confined to the males.

III. The third type of horn is presented by the American prongbuck, or pronghorn, in which bony processes, or ” cores,” corre- sponding to the horns of the giraffe, have acquired a horny sheath, in place of skin ; the sheath being in this instance forked, and annually shed and renewed, although the core is simple. The sheaths are akin to hair in structure, thus suggesting affinity with the hairs surmounting the giraffe’s horns. Female prongbuck may or may not have horns.

IV. In the great majority of ” Hollow-horned Ruminants,” such as oxen, sheep, goats and antelopes (fig. 2), the horny sheath (or true ” horn “) forms a simple unbranched cone, which may be compressed, spirally twisted, or curved in one or more directions, but is permanently retained and continues to grow throughout life from the base, while it becomes worn away at the tip. Rarely, as in the four-horned antelope, there are two pairs of horns. In many cases these horns are present in both sexes.

Dr H. Gadow is of opinion that the antlers of the deer, the horn- like protuberances on the skull of the giraffe, and the true horns of the prongbuck and other hollow-horned ruminants (Bovidae) are all different stages of evolution from a single common type: the antlers of the deer being the most primitive, and the horns of the Bovidae the most specialized. From the fact that the bony horn-core of the hollow-horned ruminants first develops as a separate ossification, as do the horns of the giraffe, while the pedicle of the antlers of the deer grow direct from the frontal bone, it has been proposed to place the hollow-horned ruminants (inclusive of the prongbuck) and the giraffes in one group and the deer in another. This arrangement has the disadvantage of separating the deer from

the giraffes, to which they are evidently nearly related; but Dr

Gadow's work brings them more into line. Whether he is right in regarding the hollow- horned ruminants as derived from the primitive deer may, however, be a matter of opinion. One very important fact recorded by Dr Gadow is that calves and lamb's shed their horns at an early age. The Bovidae are thus brought into nearer relationship with the American prongbuck (the only living ruminant which sheds its horn-cover in the adult condition) than has generally been supposed.

The above-mentioned four types of skull appendages are gener- ally regarded as severally characteristic of as many family groups, namely the Giraffidae, Cervidae, Antilocapridae and Bovidae. The two last are, however, much more closely connected than are either of the others, and should perhaps be united.

Giraffidae. — In the Giraffidae, which include not only giraffes (Giraffa) but also the okapi (Ocapia) and a number of extinct species from the Lower Pliocene Tertiary deposits of southern Europe, Asia and North Africa, the appendages on the skull are of type No. I., and may well be designated " antler-horns." Another important feature is that the lower canine has a cleft or two-lobed crown, so that it is unlike the incisors to which it is approximated. There are no upper canines; and the cheek-teeth are short -crowned (brachyodont) with a peculiar grained enamel, resembling the skin of a slug in character. The feet have only two hoofs, all traces of the small lateral pair found in many other ruminants having disappeared.

The giraffes (Giraffa) are now an exclusively African genus, and have long legs and neck, and three horns — a single one in front and a pair behind — supplemented in some instances with a rudi- mentary pair on the occiput.

The okapi (Ocapia), which is also African but restricted to the tropical forest-region, in place of being an inhabitant of more or less open country, represents a second genus, characterized by the shorter neck and Hmbs, the totally different type of colouring, and the restriction of the horns to the male sex, in which they form a pair on the forehead; these horns being more compressed than

Fig. 2. — Head of Grant's Gazelle (Gazella granti), showing horns.

the paired horns of the giraffe, and penetrating the skin at theit summits (see Giraffe and Okapi). Remains of extinct speciei of giraffe occur in the Lower Pliocene formations of Greece, Hungary, Persia, Northern India and China. From deposits of the same age in Greece, Samos and elsewhere have been obtained skulls and other remains of

Palaeotragus or Samoiherium, a ruminant closely allied to Ocapia, the males of which were armed with a very similar pair of dagger -shaped horns. Helladotherium was a much larger animal, known by a single hornless skull from the Pliocene of Greece, which may be that of a female. In the equally large

Bramaiherium and Hydaspitherium of India the horns of the males were complex, those of the former including an occipital pair, while those of the latter arise from a common base. In both genera, as in the okapi, there is a vacuity in front of the orbit. Largest of all is Sivatherium, typically from the Lower Pliocene of Northern India, but also recorded from Adrianople, in which the skull of the male is short and wide, with a pair of simple conical horns above the eye, and a huge branching pair at the vertex. Libytherium is an allied form from North Africa. Whether the Giraffidae were originally an African or a Euro-Asiatic group there is not yet sufficient evidence to decide. The family is unrepre- sented in the western hemisphere.

Cervidae. — In the deer-tribe, or Cervidae, the lower canine, as in the two following families, is simple and similar to the incisors. The frontal appendages, when present, are confined (except in the case of the reindeer) to the males, and take the form of antlers, that is to say of type No. II. in the foregoing description. As a general rule, the molars, and more especially the first, are partially brachy- odont (short-crowned) ; although they are taller in the chital (Cervus axis). In the skull there are two orifices to the lachrymal duct, situated on or inside the rim of the orbit. A preorbital vacuity of such dimensions as to exclude the lachrymal bone from articulation with the nasal. Upper canines usually present in both sexes, and sometimes attaining a very great size in the male (see fig. 3).

Fig. 3. — Skull of Chinese Water-Deer, Hydrelaphus inermis (adult male), a Deer without Antlers, but with largely developed upper canine teeth.

Lateral digits of both fore and hind feet almost always present, and frequently the lower ends of the metacarpals and the meta- tarsals as well. Placenta with few cotyledons. Gall-bladder absent (except in the musk-deer, Moschus). This family contains numerous species, having a wide geographical distribution, ranging in the New World from the Arctic circle as far south as Patagonia, and in the Old World

throughout the whole of Europe and Asia, but absent in Africa south of the Sahara, and, of course, Australasia. Evidently the family originated in the northern continent of the Old World, from which an entrance was effected by way of Bering Strait into America. Some of the more northern American deer, such as the %vapiti, reindeer and elk (moose), are closely allied to Old World species; but there is also a group of exclusively American deer (Mazama) — the only one found in Central and South America — the members of which are unlike any living Old World deer; and these must be regarded as having reached the western hemi- sphere at an earlier date than the wapiti, reindeer and elk (see Deer, Elk, Fallow-Deer, Muntjac, Musk-Deer, Pere David's Deer, Reindeer, Roebuck, Water-Deer, &c).

Remains of deer more or less nearly allied to species inhabiting the same districts are found over the greater part of the present habitat of the family. It is noteworthy, however, that certain Pliocene European deer (Anoglochis) appear to be closely allied to the modern American deer (Mazama). As we descend in the geo- logical series the deer have simpler antlers, as in the European Miocene Dkrocerus ; while in the Oligocene Amphitragulus , Dremo- therium and Palaeomeryx, constituting the family Palaeomerycidae, antlers were absent, and the crowns of the molars so low that the whole depth of the hollows between the crescentic columns is com- pletely visible. Most of these animals were of small size, and many had long upper canines, like those of the existing Hydrelaphus; while in all there was no depression for a gland in front of the eye.

From North America have been obtained remains of certain ruminants which seem in some degree intermediate between deer and the prongbuck. Of one of these a complete skeleton was obtained in 1901 from the Middle Miocene deposits of north-eastern Colorado, and as mounted stands 19 in. in height at the withers. With the exception that the right antler is malformed and partially aborted, and that the bones of the lateral toes have been lost, the skeleton is practically complete. The one complete antler has a well-marked burr and a long undivided beam, which eventually forks. After this there is a bifurcation of the hinder branch, thus producing three tines. From the presence of these well-marked antlers the skeleton would at first sight be set down as that of a small and primitive deer, conforming in regard to the structure of these appendages to the American type of the group. Mr W. D.

Matthew shows, however, that the skeleton of Merycodus, as the extinct ruminant is called, differs markedly from that of all deer. The most noteworthy point of distinction is in the skull, in which the facial

portion is sharply bent down on the posterior basal axis in the fashion characteristic of the hollow-horned ruminants (oxen, antelopes, &c), and the American prongbuck, instead of running more or less nearly parallel to the same, as in deer. Again, the cheek-teeth have the tall crowns characteristic of a large number of representatives of the first group and of the prongbuck, thereby showing that Merycodus can scarcely be regarded as a primitive type. As regards the general structure of the rest of the skeleton, it must suffice to say that this agrees closely with that of the ante- lopes and the prongbuck, and differs markedly from the cervine type. In the absence of any trace of the lower extremities of the metacarpal and metatarsal bones of the lateral toes the skeleton differs from the American deer, and resembles those hollow-horned ruminants in which these toes persist.

As a whole Merycodus presents a curious mixture of cervine and antilopine character. To explain these, two alternatives are offered by the describer. Either we must regard Merycodus as a deer which parallels the antelopes and the prongbuck in every detail of skeletal structure, or else, like the prongbuck, an antelope separated from the main stock at a date sufficiently early to have permitted the development of a distinct type of cranial appendages, namely, antlers in place of true horns. The former alternative, it is urged, involves a parallelism too close and too uniform between unrelated types to have been probable. On the latter view Mery- codus, the prongbuck (Antilocapra) and the antelopes must be regarded as representing three branches from an original common stock, divergent as regards the structure of their cranial appendages, but parallel in other respects. If, therefore, Antilocapra deserves to be separated as a family from the Bovidae, the same can scarcely be refused for Merycodus. But American extinct types appear to indicate signs of intimate relationship between antelopes, prong- buck and deer, and it may be necessary eventually to amend the current classification. As a temporary measure it seems prefer- able to regard Merycodus either as representing a distinct sub- family of Antilocapridae or a family by itself, the latter course being adopted by Mr Matthew.

Whatever be the ultimate verdict, the association of antlers — and these, be it noticed, conforming almost exactly with the forked type characteristic of American deer — with an antilopine type of skull, skeleton and teeth in Merycodus is a most interesting and unexpected feature. Merycodus was named many years ago by Professor J. Leidy on the evidence of imperfect materials, and other remains now known to belong to the same type were subsequently described as Cosoryx, to which Blastomeryx seems to be allied. Not till the discovery of the skeleton of the species described by Mr Matthew was it possible to

arrive at an adequate conception of the affinities of this remarkable ruminant.

Antilocapridae. — By many modern writers the American prong-buck, pronghorn or " antelope," alone forming the genus Antilo-capra, is regarded as representing merely a sub-family of the Bovidae, to which latter group the animal is structurally akin. In view of what has been stated in the preceding paragraph with regard to the extinct American genus Merycodus, it seems, however, at least provisionally advisable to allow the prongbuck to remain as the type of a family — Antilocapridae. The characteristic of this family — as represented by the prongbuck— is that the sheath of the horns is forked, and shed annually, or every few years. The cheek- teeth are tall-crowned (hypsodont), and lateral hoofs are wanting (see Prongbuck).

Bovidae. — Lastly, we have the great family of hollow-horned ruminants or Bovidae, in which the horns (present in the males at least of all the existing species) take the form of simple non-deciduous hollow sheaths growing upon bony cores. As a rule the molars are tall-crowned (hypsodont). Usually only one orifice to the lachrymal canal, situated inside the rim of the orbit. Lachrymal bone almost always articulating with the nasal. Canines absent in both sexes. The lateral toes may be completely absent, but more often are represented by the hoofs alone, supported sometiires by a very rudimentary skeleton, consisting of mere irregular nodules of bone. Lower ends of the lateral metacarpals and metatarsals never present. Gall-bladder almost always present. Placenta with many cotyledons.

The Bovidae form a most extensive family, with members widely distributed throughout the Old World, with the exception of the Australian region; but in America they are less numerous, and confined to the Arctic and northern temperate regions, no species being indigenous either to South or Central America. The home of the family was evidently the Old World, whence a small number of forms made their way into North America by way of what is now Bering Strait. It has already been pointed out that the Cervidae originated in the northern continent of the Old World; and it has been suggested that the Bovidae were developed in Africa. Unfortunately, we know at present practically nothing as to the past history of the group, all the fossil species at present discovered approximating more or less closely to existing types. While admitting, therefore, that there are several facts in favour of the theory of an African origin of the Bovidae, final judgment

must for the present be suspended. For the various generic types see Bovidae, and the special articles referred to under that heading. (R. L.*)

PECS (Ger. Funjkirchen) , a town of Hungary, capital of the country of Baranya, 160 m. S.S.W. of Budapest by rail. Pop. (1900), 42, 252. It lies on the outskirts of the Mecsek Hills, and is composed of the inner old town, which is laid out in an almost regular square, and four suburbs. Pecs is the see of a Roman Catholic bishop, and its cathedral, reputed one of the oldest churches in Hungary, is also one of the finest medieval buildings in the country. It was built in the nth century in the Romanesque style with four towers, and completely restored in 1881-1891. In the Cathedral Square is situated the Sacellum, a subterranean brick structure, probably a burial-chapel, dating from the end of the 4th or the beginning of the 5th century. Other noteworthy buildings are the parish church, formerly a mosque of the Turkish period; the hospital church, also a former mosque, with a minaret 88 ft. high, and another mosque, the bishop's palace, and the town and county hall. Pecs has manufactories of woollens, porcelain, leather and paper, and carries on a considerable trade in tobacco, gall-nuts and wine. The hills around the town are covered with vineyards, which produce one of the best wines in Hungary. In the vicinity are valuable coal-mines, which since 1858 are worked by the Danube Steamship Company.

According to tradition Pecs existed in the time of the Romans under the name of Sompiana, and several remains of the Roman and early Christian period have been found here. In the Frankish-German period it was known under the name of Quinque ecclesiae; its bishopric was founded in 1009. King Ludwig I. founded here in 1367 a university, which existed until the battle of Mohacs. In 1 543 it was taken by the Turks, who retained possession of it till 1686.

PECTORAL, a word applied to various objects worn on the breast (Lat. pectus); thus it is the name of the ornamental plate of metal or embroidery formerly worn by bishops of the Roman Church during the celebration of mass, the breastplate of the Jewish high priest, and the metal plate placed on the breast of the embalmed dead in Egyptian tombs. The " pectoral cross," a small cross of precious metal, is worn by bishops and abbots of the Roman, and by bishops of the Anglican, communion. The term has also been used for the more general " poitrel " or " peitrel " (the French and Norman French forms respectively), the piece of armour which protected the breast of the

war-horse of the middle ages.

PECULIAR, a word now generally used in the sense of that which solely or exclusively belongs to,or is particularly character- istic of, an individual; hence strange, odd, queer. The Lat. peculiaris meant primarily ” belonging to private property,” and is formed from peculium, private property, particularly the property given by a paterfamilias to his children, or by a master to his slave, to enjoy as their own. As a term of ecclesias- tical law ” peculiar ” is applied to those ecclesiastical districts, parishes, chapels or churches, once numerous in England, which were outside the jurisdiction of the bishop of the diocese in which they were situated, and were subject to a jurisdiction ” peculiar ” to themselves. They were introduced originally, in many cases by papal authority, in order to limit the powers of the bishop in his diocese. There were royal peculiars, eg. the Chapel Royal St James’s, or St George’s Windsor, peculiars of the archbishop, over certain of which the Court of Peculiars exercised jurisdiction (see Arches, Court of), and peculiars of bishops and deans (see Dean). The jurisdiction and privi- leges of the ” peculiars ” were abolished by statutory powers given to the Ecclesiastical Commissioners, by the Ecclesiastical Commissioners Acts 1836 and 1850, by the Pluralities Act 1838, the Ecclesiastical Jurisdiction Act 1847, and other statutes.

PECULIAR PEOPLE, a small sect of Christian faith-healers founded in London in 1838 by John Banyard. They consider themselves bound by the literal interpretation of James v. 14, and in cases of sickness seek no medical aid but rely on oil, prayer and nursing. The community is in the main composed

of simple working people, who, apart from their peculiarity, have a good reputation; but their avoidance of professional medical attendance has led to severe criticism at inquests on children who have died for want of it.

PEDAGOGUE, a teacher or schoolmaster, a term usually now applied with a certain amount of contempt, implying pedantry, dogmatism or narrow-mindedness. The Gr. Trcudayioyos (irats, boy, d7«7os, leader, ayeiv, to lead), from which the English word is derived, was not strictly an instructor. He was a slave in an Athenian household who looked after the personal safety of the sons of the master of the house, kept them from bad company, and took them to and from school and the gymnasium. He probably sat with his charges in school. The boys were put in his charge at the age of six. The ircudaycxyyos, being a slave, was necessarily a foreigner, usually a Thracian or Asiatic. The

Romans adopted the paedagogus or pedagogus towards the end of the republic. He probably took some part in the instruction of the boys (see Schools) . Under the empire, the pedagogus was specifically the instructor of the boy slaves, who were being trained and educated in the household of the emperor and of the rich nobles and other persons; these boys lived together in a paedagogium, and were known as pueri paedagogiani, a name which has possibly developed into ” page ” (q.v.).

PEDAL CLARINET, a contrabass instrument invented in 1891 by M. F. Besson to complete the quartet of clarinets, as the contrafagotto or double bassoon completes that of the oboe family ; it is constructed on practically the same principles as the clarinet, and consists of a tube 10 ft. long, in which cylin- drical and conical bores are so ingeniously combined that the acoustic principles remain unchanged. The tube is doubled up twice upon itself; at the upper end the beak mouthpiece stands out like the head of a viper, while at the lower a metal tube, in the shape of a U with a wide gloxinea-shaped bell, is joined to the wooden tube. The beak mouthpiece is exactly like that of the other clarinets but of larger size, and it is furnished with a single or beating reed. There are 13 keys and 2 rings on the tube, and the fingering is the same as for the B flat clarinet except for the eight highest semitones. The compass of the pedal clarinet is as follows: —

Notation

Real Sounds —

from

from

8va bassa

The instrument is in B flat two octaves below the B flat clarinet, and, like it, it is a transposing instrument, the music being written in a key a tone higher than that of the composition, and in order to avoid ledger lines a whole octave higher besides. The tone is rich and full except for the lowest notes, which are unavoidably a little rough in quality, but much more sonorous than the corresponding notes on the double bassoon. The upper register resembles the chalumeau register of the B flat clarinet, being reedy and sweet. The instrument is used as a fundamental bass for the wood wind at Kneller Hall, and it has also been used at Covent Garden to accompany the music of Fafner and Hunding in the Nibelungen Ring.

Many attempts have been made since the beginning of the 19th century to construct contra clarinets, but all possessed inherent faults and have been discarded (see Batyphone). A contrabass clarinet in F, an octave below the basset horn, constructed by Albert of Brussels in 1890, was, we believe, considered successful, but it differed in design from the pedal clarinet. (K. S.)

PEDANT, one who exaggerates the value of detailed erudition for its own sake; also a person who delights in a display of the exact niceties of learning, in an excessive obedience to theory without regard to practical uses. The word came into English in the latter part of the 16th century in the sense of schoolmaster, the original meaning of Ital. pedante, from which it is derived. The word is usually taken to be an adaptation of Gr. iraiSebew,

to teach. Others connect with an 0. Ital. pedare, to tramp about (Lat. pes, foot), of an usher tramping about with his pupils.

PEDEN, ALEXANDER (c. 1626-1686), Scottish divine, one of the leading forces in the Covenant movement, was born at Auchincloich, Ayrshire, about 1626, and was educated at Glasgow University. He was ordained minister of New Luce in Galloway in 1660, but had to leave his parish under Middleton's Ejectment Act in 1663. For 23 years he wandered far and wide, bringing comfort and succour to his co-religionists, and often very narrowly escaping capture. He was indeed taken in June 1673 while holding a conventicle at Knockdow, and condemned by the privy council to 4 years and 3 months' imprisonment on the Bass Rock and a further 15 months in the Tolbooth at Edinburgh. In December 1678 he was, with sixty others, sentenced to banishment to the American plantations, but the party was liberated in London, and Peden made his way north again to divide the remaining years of his life between his own country and the north of Ireland. His last days were spent in a cave in the parish of Sorn, near his birthplace, and there he died in 1686, worn out by hardship and privation.

See A. Smelhe, Men of the Covenant, ch. xxxiv.

PEDERSEN, CHRISTIERN (c. 1480-1554), Danish writer, known as the " father of Danish literature, " was a canon of the cathedral of Lund, and in 1510 went to Paris, where he took his master's degree in 1 515.

In Paris he edited the proverbs of Peder Laale and (15 14) the Historia danica of Saxo Grammaticus. He showed signs of the spirit of reform, asserting that the gospels should be translated into the vernacular so that the common people might understand. He worked at a continuation of the history of Saxo Grammaticus, and became secretary to Christian II., whom he followed into exile in 1525. In Holland he translated the New Testament (1529) and the Psalms (1531) from the Vulgate, and, becoming a convert to the reformed opinion, he issued several Lutheran tracts. After his return to Denmark in 1532 he set up a printing press at Malmo. He published a Danish version (Kronike om Holger Danske) of the French romance of Ogier the Dane, and another of the Charlemagne legends, which is probably derived immediately from the Norwegian Karlamagnus saga. His greatest work, the Danish version of the Holy Scriptures, which is known generally as " Christian III.'s Bible, " is an important landmark in Danish literature. It was founded on Luther's version, and was edited by Peder Palladius, bishop of Zealand, and others.

See C. Petersen's Danske Skrifter, edited by C. J. Brandt and B. T. Fenger (5 vols., Copenhagen, 1850-1856).

PEDESTAL (Fr. piedeslal, Ital. piedestallo, foot of a stall), a term generally applied to a support, square, octagonal or circular on plan, provided to carry a statue or a vase. Although in Syria, Asia Minor and Tunisia the Romans occasionally raised the columns of their temples or propylaea on square pedestals, in Rome itself they were employed only to give greater importance to isolated columns, such as those of Trajan and Antoninus, or as a podium to the columns employed decoratively in the Roman triumphal arches. The architects of the Italian revival, however, conceived the idea that no order was complete without a pedestal, and as the orders were by them employed to divide up and decorate a building in several storeys, the cornice of the pedestal was carried through and formed the sills of their windows, or, in open arcades, round a court, the balustrade of the arcade. They also would seem to have considered that the height of the pedestal should correspond in its proportion with that of the column of pilaster it supported; thus in the church of St John Lateran, where the applied order is of considerable dimensions, the pedestal is 13 ft. high instead of the ordinary height of 3 to 5 ft.

PEDICULOSIS, or Phthiriasis, the medical term for the pathological symptoms in man due to the presence of lice (pcdiculi), either on the head {pediculus capitis), body (pediculus corporis, or vestimentorum) , or pubes {pediculus pubis).

PEDIGREE, a genealogical tree, a tabular statement of descent (see Genealogy). The word first appears at the beginning of the 15th century and takes an extraordinary variety of forms,

e.g. pedicree, pe de gre, petiegrew, petygru, &c. It is generally accepted that these point to a corruption of Fr. pied de grue, foot of a crane, and that the probable reference is to the marks resembling the claw of a bird found in old genealogies showing the lines of descent. Such etymologies as Minshea's par degrts, by degrees, or pere degres, descent by the father, are mere guesses.

PEDIMENT (equivalents, Gr. aeros, Lat. fastigium, Fr. ponton), in classic architecture the triangular-shaped portion of the wali above the cornice which formed the termination of the roof behind it. The projecting mouldings of the cornice which surround it enclose the tympanum, which is sometimes decorated with sculpture. The pediment in classic architecture corre- sponds to the gable in Gothic architecture, where the roof is of loftier pitch. It was employed by the Greeks only as the front of the roof which covered the main building; the Romans, how- ever, adopted it as a decorative termination to a doorway, niche or window, and occasionally, in a row of windows or niches, alternated the triangular with a segmental pediment. It was reserved for the Italian architects of the decadence to break the pediment in the centre, thus destroying its original purpose. The earliest English form of the word is periment or peremint, probably a workman's corruption of " pyramid. "

PEDIPALPI, Arachnida (q.v) related to the spiders, and serving in a measure to bridge over the structural interval between the latter and the scorpions. The appendages of the second pair are large and prehensile, as in scorpions, but are armed with spines, to impale and hold prey. The appendages of the third pair, representing the first pair'of walking legs in spiders and scorpions, are, on the contrary, long, attenuated and many- jointed at the end. Like the antennae of insects, they act as feelers. It is from this structural feature that the term " pedi- palpi " has been derived. In the tailless division of the Pedipalpi,

JXmHb

Mexican tailed Pedipalp (Mastigoproetus giganteus).

namely the Amblypygi of which Phrynus is a commonly cited type, these tactile appendages are exceedingly long and lash- like, whereas in the tailed division, the Uropygi, of which Thely- phonus is best

known, the limb is much shorter andless modified. Thelyphonus and its allies, however, have a long tactile caudal flagellum, the homologue of the scorpion's sting; but its exact use is unknown. A third division, the Tartarides, a subordinate group of the Uropygi, contains minute Arachnida differing principally from the typical Uropygi in having the caudal process unjoiated and short. Apart from the Tartarides, the Pedipalpi

are large or medium-sized Arachnida, nocturnal in habits and spending the day under stones, logs of wood or loosened bark. Some species of the Uropygi (Thelyphonidae) dig burrows; and in the east there is a family of Amblypygi, the Charontidae, of which many of the species live in the recesses of deep caves. Specimens of another species have been found under stones between tide marks in the Andaman Islands. The Pedipalpi feed upon insects, and like spiders, are oviparous. The eggs after being laid are carried about by the mother, adhering in a glutinous mass to the underside of the abdomen.

Pedipalpi date back to the Carboniferous Period, occurring in deposits of that age both in Europe and North America. More- over, the two main divisions of the order, which were as sharply differentiated then as they are now, have existed practically unchanged from that remote epoch.

In spite of the untold ages they have been in existence, the Pedipalpi are more restricted in range than the scorpions. The Uropygi are found only in Central and South America and in south and eastern Asia, from India and south China to the Solo- mon Islands. The absence of the entire order from Africa is an interesting fact. The distribution of the Amblypygi practically covers that of the Uropygi, but in addition they extend from India through Arabia into tropical and southein Africa. Both groups are unknown in Madagascar, in Australia, with the exception possibly of the extreme north, and in New Zealand. Very little can be said with certainty about the distribution of the Tartar- ides. They have been recorded from the Indian Region, West Africa and sub-tropical America. (R. I. P.)

PEDOMETER (Lat. pes, foot, and Gr. fikrpov, measure), an apparatus in the form of a watch, which, carried on the person of a walker, counts the number of paces he makes, and thus indicates approximately the distance travelled. The ordinary form has a dial-

plate marked for yards and miles. The regis- tration is effected by the fall of a heavy pendulum, caused by the percussion of each step. The pendulum is forced back to a horizontal position by a delicate spring, and with each stroke a fine-toothed ratchet-wheel connected with it is moved round a certain length. The ratchet communicates with a train of wheels which work the dial-hands. In using the apparatus a measured mile or other known distance is walked and the indication thereby made on the dial-plate observed. According as it is too great or too small, the stroke of the pendulum is shortened or lengthened by a screw. Obviously the pedometer is little better than an ingenious toy, depending even for rough measurements on the uniformity of pace maintained throughout the journey measured.

PEDRO II. (1825-1891), emperor of Brazil, came to the throne in childhood, having been born on the 2nd of December 1825, and proclaimed emperor in April 1831, upon the abdication of his father. He was declared of full age in 1840. For a long period few thrones appeared more secure, and his prosperous and beneficent rule might have endured throughout his life but for his want of energy and inattention tc the signs of the times. The rising generation had become honeycombed with republicanism, the prospects of the imperial succession were justly regarded as unsatisfactory, the higher classes had been estranged by the emancipation of the slaves, and all these causes of discontent found expression in a military revolt, which in November 1889 overthrew the seemingly solid edifice of the Brazilian Empire in a few hours. Dom Pedro retired to Europe, and died in Paris on the 5th of December 1891. The chief events of his reign had been the emancipation of the slaves, and the war with Paraguay in 1864-70. Dom Pedro was a model constitutional sovereign, and a munificent patron of science and letters. He travelled in the United States (1876), and thrice visited Europe (1871-1872, 1876-1877, 1886-1889).

PEEBLES, a royal and police burgh and county town of Peeblesshire, Scotland, situated at the junction of Eddleston Water with the Tweed. Pop. (1901), 5266. It is 27 m. south of Edinburgh by the North British Railway (22 m. by road), and is also the terminus of a branch line of the Caledonian system from Carstairs in Lanarkshire. The burgh consists of the new

town, the principal quarter, on the south of the Eddleston, and the old on the north; the Tweed is crossed by a handsome five- arched bridge. Peebles is a noted haunt of anglers, and the Royal Company of Archers shoot here periodically for the silver arrow given by the burgh. The chief public buildings are the town and county halls, the corn

exchange, the hospital and Chambers Institution. The last was once the town house of the earls of March, but was presented to Peebles by William Chambers, the publisher, in 1859. The site of the castle, which stood till the beginning of the 18th century, is now occupied by the parish church, built in 1887. Of St Andrew's Church, founded in 1195, nothing remains but the tower, restored by William Chambers, who was buried beside it in 1883. The church of the Holy Rood was erected by Alexander III. in 1261, to contain a supposed remnant of the true cross discovered here. The building remained till 1784, when it was nearly demolished to provide stones for a new parish church. Portions of the town walls still exist, and there are also vaulted cellars constructed in the 16th and 17th centuries as hiding-places against Border freebooters. The old cross, which had stood for several years in the quadrangle of Chambers Institution, was restored and erected in High Street in 1895. The industries consist of the manufactures of woollens and tweeds, and of meal and flour mills. The town is also an important agricultural centre.

The name of Peebles is said to be derived from the pebylls, or tents, which the Gadeni pitched here in the days of the Romans. The place was early a favourite residence of the Scots kings when they came to hunt in Ettrick forest. It probably received its charter from Alexander III., was created a royal burgh in 1367 and was the scene of the poem of Peblis to the Play, ascribed to James I. In 1544 the town sustained heavy damage in the expedition led by the 1st earl of Hertford, afterwards the protector Somerset, and in 1604 a large portion of it was destroyed by fire. Though James VI. extended its charter, Peebles lost its importance after the union of the Crowns.

On the north bank of the Tweed, one mile west of Peebles, stands Neidpath Castle. The ancient peel tower dates probably from the 13th century. Its first owners were Tweeddale Frasers or Frisels, from whom it passed, by marriage, to the Hays of Yester in Had- dingtonshire, earls of Tweeddale. It was besieged and taken by Cromwell in 1650. The third earl of Tweeddale (1645-1713) sold it to the duke of Queensberry in 1686. The earl of Wemvss suc- ceeded to the Neidpath property in 1810.

PEEBLESSHIRE, or Tweeddale, a southern inland county of Scotland, bounded N. and N.E. by Edinburghshire, E. and S.E. by Selkirkshire, S. by Dumfriesshire, and W. by Lanarkshire. Its area is 222,599 acres or 547-8 sq. m. The surface consists of a succession of hills, which are highest in the south, broken by the vale of the Tweed and the glens formed by its numerous tributaries. South of the Tweed the highest points are Broad Law and Cramalt Craig on the confines of

Selkirkshire (each 2723 ft.), while north of the river are, in the west centre, Brough- ton Heights (1872), Trahenna Hill (1792), Penvalla (1764) and Ladyurd Hill (1724), and in the north-west the Pentland emin- ences of Mount Maw (1753), Byrehope Mount (1752) and King Seat (1521). The lowest point above sea-level is on the banks of the Tweed, where it passes into Selkirkshire (about 450 ft.). The principal river is the Tweed, and from the fact that for the first 36 m. of its course of 97 m. it flows through the south of the shire, the county derives its alternative name of Tweeddale. Its affluents on the right are the Stanhope, Drummelzier, Manor and Quair; on the left, the Biggar,Lyne, Eddlestone and Leithen. The North Esk, rising in Cairnmuir, forms the boundary line between Midlothian and Peeblesshire for about four miles, during which it presents some very charming pictures, especially at Habbie's Howe, where Allan Ramsay laid the scene of the Gentle Shepherd. For 4 m. of its course the South Medwin divides the south-western part of the parish of Linton from Lanarkshire. Portmore Loch, a small sheet of water 2 m. north- east of Eddlestone church, lies at a height of rooo ft. above the sea, and is the only lake in the county. The shire is in favour with anglers, its streams being well stocked and unpolluted, and few restrictions being placed on the fishing.

Geology. — The southern elevated portion of the county is occupied by Silurian rocks, mainly by shales and grits or greywackes of Llandovery age. Owing to the repeated folding and crumpling of the rocks in this region there are numerous elliptical exposures of Ordovician strata within the Silurian tract; but the principal area of Ordovician rocks lies north of a line running south-west from the Moorfoot Hills through Lyne and Stobo. Here these rocks form a belt some four to five miles in breadth; they are com- posed of radiolarian cherts and mudstones with associated con- temporaneous volcanic rocks of Arenig age, and of shales, grits and limestones of Llandeilo and Caradoc age. The general direction of strike of all these formations is south-west-north-east, but the dips are sometimes misleading through occasional inversion of the strata. Patches of higher Silurian, with Wenlock and Ludlow fossils, are found in the north of the country in the Pentland Hills, and resting conformably upon the Silurian in the same district is the Lower Old Red Sandstone. The Old Red Sandstone here consists of a lower division, red and chocolate marls and sandstones ; a middle division, volcanic rocks, porphyrites, tuffs, &c, which are unconformable on the lower marls in

this area; and an upper division, sandstones and conglomerates. The south-west extremity of the Edinburgh coalfield just enters this county over the north- west border where a slice of Carboniferous strata is found let down between Silurian and Old Red rocks by two important faults. Both Calciferous sandstone and Carboniferous limestone occur, with useful beds of coal, limestone, ironstone, fireclay and alum shale. An outlier of Carboniferous limestone, surrounded by Lower Old Red Sandstone, lies south of Linton. Much glacial boulder clay with gravel and sand rests upon the higher ground, while morainic deposits are found in the valleys.

Climate and Industries. — The annual rainfall averages from 33 to 41 in.; the mean temperature for the year is 47-5° F., for January 38° F., and for July 59° F. The character of the soil varies considerably, peat, gravel and clay being all repre- sented. The low-lying lands consist generally of rich loam, composed of sand and clay. The farming is pastoral rather than arable. The average holding is about 200 acres of arable land, with pasturage for from 600 to 800 sheep. Roughly speaking, one-fifth of the total area is under cultivation. Oats are the chief grain and turnips the chief root crop. The hill pastures are better suited to sheep than to cattle, but both flocks and herds are comparatively large. Cheviots and half-breds are preferred for the grass lands, the heathery ranges being stocked with black- faced sheep. Crosses of Cheviots, black-faced and half-bred ewes with Leicestershire rams are common. The favourite breed of cattle is a cross between Ayrshires and shorthorns, the cows being Ayrshire. Many of the horses are Clydesdales bred in the county. Pig-keeping is on the decline. A few acres have been laid down as nurseries and market gardens, and about 10,000 acres are under wood, especially at Dalwick, where larch and horse-chestnut were first grown in Scotland. Apart from agriculture, the only industries are the woollen factories and flour mills at Peebles and Innerleithen.

The North British railway crosses the county in the north from Leadburn to Dolphinton, and runs down the Eddlestone valley from Leadburn to Peebles and Thornielee, while in the south the Caledonian railway connects the county town with Biggar in Lanarkshire.

Population and Administration. — In 1901 the population numbered 1 5,066 or 43 persons to the sq. m. In 1901 one person spoke Gaelic only, 72 Gaelic and English. The chief towns are Peebles (pop. 5266) and Innerleithen (2181). West Linton, on Lyne Water, is a holiday resort. The shire combines with Selkirkshire to return one member to parliament, the electors of Peebles town voting with the county.

Peeblesshire forms a sheriffdom with the Lothians and a sheriff-substitute sits in the county town. There is a high school in Peebles, and one or more schools in the county usually earn grants for secondary education.

History. — The country was originally occupied by the Gadeni, a British tribe, of whom there are many remains in the shape of camps and sepulchral mounds (in which stone coffins, axes and hammers have been found), while several place-names (such as Peebles, Dalwick and Stobo) also attest their presence. The standing stones near the confluence of the Lyne and Tweed are supposed to commemorate a Cymric chief. The natives were reduced by the Romans, who have left traces of their military rule in the fine camp at Lyne, locally known as Randal's Walls.

The hill-side terraces at Romanno are conjectured, somewhat fancifully, to be remains of a Roman method of cultivation . On the retreat of the Romans the Gadeni came into their own again, and although they are said to have been defeated by King Arthur at Cademuir in 530, they held the district until the consolidation of the kingdom after Malcolm II. 's victory at Carham in 1018, before which the land, constantly harried by Danes, was nomi- nally included in the territory of Northumbria. This tract of Scotland is closely associated with the legend of Merlin. David I. made the district a deanery in the archdeaconry of Peebles, and it afterwards formed part of the diocese of Glasgow. Towards the middle of the 12 th century it was placed under the jurisdiction of two sheriffs, one of whom was settled at Traquair and the other at Peebles. At Happrew, in the valley of the Lyne, the English defeated Wallace in 1304. The Scottish sovereigns had a lodge at Polmood, and often hunted in the uplands and the adjoining forests. English armies occasionally invaded the county, but more frequently the people were harried by Border raiders. Many castles and peels were erected in the valley of the Tweed from the Bield to Berwick. Several were • renowned in their day, among them Oliver Castle (built by Sir Oliver Fraser in the reign of David I.), Drumelzier, Tinnis or Thane's Castle, and Neidpath. Three miles south of Romanno stand the ruins of Drochil Castle, designed for the Regent Morton, who was beheaded at Edinburgh in 1581, and the building was never completed. Memories of the Covenanters cluster around Tweedhopefoot, Tweedshaws, Corehead, Tweeds- muir, Talla Linns and other spots. In the churchyard of Tweedsmuir is the tombstone of John Hunter, the martyr, which was relettered by " Old Mortality." The " men of the moss hags " did little fighting in Peeblesshire, but Montrose first drew rein at Traquair House after he was defeated at Philip- haugh on the Yarrow in 1645. The plain of Sheriffmuir near

Lyne is the place where the Tweeddale wapinschaws used to be held in the 17th century. The Jacobite risings left the county untouched, and since the beginning of the 19th century the shire has been more conspicuous in literature than in politics.

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PEEKSKILL, a village of Westchester county, New York, U.S.A., on the E. bank of the Hudson river, about 41 m. N. of New York City. Pop. (1910, census), 15,245. It is served by the New York Central & Hudson River railway, and by passenger and freight steamboat lines on the Hudson river. The village is the home of many New York business men. At Peekskill are the Peekskill military academy (1833, non- sectarian); St Mary's school, Mount St Gabriel (Protestant Episcopal), a school for girls established by the sisterhood of St Mary; the Field memorial library; St Joseph's home (Roman Catholic) ; the Peekskill hospital, and several sanatoria. Near the village is the state military camp, where the national guard of the state meets in annual encampment. Peekskill has many manufactures, and the factory products were valued in 1905 at $7,251,897, an increase of 306-7% since 1900. The site was settled early in the 18th century, but the village itself dates from about 1760, when it took its present name from the adjacent creek or " kill," on which a Dutch trader, Jans Peek, of New York City, had established a trading post. During the latter part of the War of Independence Peekskill was an important outpost of the Continental Army, and in the neighbourhood several small engagements were fought between American and British scouting parties. The village was incorporated in 1816. Peekskill was the country home of Henry Ward Beecher.

PEEL, ARTHUR WELLESLEY PEEL, ist Viscount (1829-), English statesman, youngest son of the great Sir Robert Peel, was born on the 3rd of August 1829, and was educated at Eton and Balliol College, Oxford. He unsuccessfully

contested Coventry in 1863; in 1865 he was elected in the liberal interest for Warwick, for which he sat until his elevation to the peerage. In December 1868 he was appointed parliamentary- secretary to the poor law board. This office he filled until 187 1, when he became secretary to the board of trade, an appointment which he held for two years. In 1873-1874 he was patronage secretary to the treasury, and in 1880 he became under- secretary for the home department. On the retirement of Mr Brand (afterwards Viscount Hampden) in 1884, Peel was elected Speaker. He was thrice re-elected to the post, twice in 1886, and again in 1892. Throughout his career as Speaker he exhibited conspicuous impartiality, combined with a perfect knowledge of the traditions, usages and forms of the house, soundness of judg- ment, and readiness of decision upon all occasions; and he will always rank as one of the greatest holders of this important office. On the 8th of April 1895 he announced that for reasons of health he was compelled to retire. The farewell ceremony was of a most impressive character, and warm tributes were paid from all parts of the house. He was created a viscount and granted a pension of £4000 for life. He was presented with the freedom of the City of London in July 1895. The public interest in the ex-Speaker's later life centred entirely in his some- what controversial connexion with the drink traffic. A royal commission was appointed in April 1896 to inquire into the operation and administration of the licensing laws, and Viscount Peel was appointed chairman. In July 1898 Lord Peel drew up a draft report for discussion, in five parts. Some differences of opinion arose in connexion with the report, and at a meeting of the commissioners on the 12th of April 1899, when part 5 of the draft report was to be considered, a proposal was made to substitute an alternative draft for Lord Peel's, and also a series of alternative drafts for the four sections already discussed. Lord Peel declined to put these proposals, and left the room. Sir Algernon West was elected to the chair, and ultimately two main reports were presented, one section agreeing with Lord Peel, and the other — including the majority of the commis- sioners — presenting a report which differed from his in several important respects. The Peel report recommended that a large reduction in the number of licensed houses should be immediately effected, and that no compensation should be paid from the public rates or taxes, the money for this purpose being raised by an annual licence-rental levied on the rateable value of the licensed premises; it at once became a valuable weapon in the hands of advanced reformers.

Lord Peel married in 1862, and had four sons and two daughters (married to Mr J. Rochfort Maguire and to Mr C. S. Goldman). His

eldest son, William Robert Wellesley Peel (b. 1866), married the daughter of Lord Ashton; he was Unionist M.P. for South Manchester from 1900 to 1905, and later for Taunton, and also acted as Municipal Reform leader on the London County Council.

PEEL, SIR ROBERT, Bart. (1788-1850), English statesman, was born on the 5th of February 1788 at Chamber Hall, in the neighbourhood of Bury, Lancashire, or, less probably, at a cottage near the Hall. He was a scion of that new aristocracy of wealth which sprang from the rapid progress of mechanical discovery and manufactures in the latter part of the 18th century. His ancestors were Yorkshire yeomen in the district of Craven, whence they migrated to Blackburn in Lancashire. His grandfather, Robert Peel, first of Peeltcld, and afterwards of Brookside, near Blackburn, was a calico-printer, who, appre- ciating the discovery of his townsman Hargreaves, took to cotton-spinning with the spinning- jenny and grew a wealthy man. His father, Robert Peel (1750-1830), third son of the last-named, carried on the same business at Bury with still greater success, in partnership with his uncle, Mr Haworth, and Mr Yates, whose daughter, Ellen, he married. He made a princely fortune, became the owner of Drayton Manor and member of parlia- ment for the neighbouring borough of Tamworth, was a trusted and honoured, as well as ardent, supporter of Pitt, contributed munificently towards the support of that leader's war policy, and was rewarded with a baronetcy (1 800) .

At Harrow, according to the accounts of his contemporaries, Peel was a steady industrious boy, the best scholar in the school, fonder of country walks with a friend than of school games, but reputed one of the best football players. At Christ Church, where he entered as a gentleman commoner, he was the first who, under the new examination statutes, took a first class both in classics and in mathematics. His examination for his B.A. degree in 1808 was an academical ovation in presence of a numerous audience, who came to hear the first man of the day. From his classical studies Robert Peel derived not only the classical, though somewhat pompous, character of his speeches and the Latin quotations with which they were often happily interspersed but something of his lofty ideal of political ambition. To his mathematical training, which was then not common among public men, he no doubt owed in part his method, his clearness, his great power of grasping steadily and working out difficult and complicated questions. His speeches show that, in addition to his academical knowledge, he was well versed in English literature, in history, and in the principles of law, in order to study which he entered at Lincoln's Inn. But while reading hard he did not neglect to develop his tall and vigorous frame, and, though he lost his

life partly through his bad riding, he was always a good shot and an untiring walker after game. His Oxford education confirmed his atachment to the Church of England. His practical mind remained satisfied with the doctrines of his youth, and he never showed that he had studied the great religious controversies of his day.

In 1809, being then in his twenty-second year, he was brought into parliament for the close borough of Cashel, which he after- wards exchanged for Chippenham, and commenced his parlia- mentary career under the eye of his father, then member for Tamworth, who fondly saw in him the future leader of the Tory party. In that House of Commons sat Wilberforce, Windham, Tierney, Grattan, Perceval, Castlereagh, Plunkett, Romilly, Mackintosh, Burdett, Whitbread, Horner, Brougham, Parnell, Huskisson, and, above all, George Canning. Lord Palmerston entered the house two years earlier, and Lord John Russell three years later. Among these men young Peel had to rise. And he rose, not by splendid eloquence, by profound political philosophy or by great originality of thought, but by the closest attention to all his parliamentary duties, by a study of all the business of parliament, and by a style of speaking which owed its force not to high flights of oratory, but to knowledge of the subject in hand, clearness of exposition, close reasoning, and tact in dealing with a parliamentary audience. With the close of the struggle against revolutionary France, political progress in England was soon to resume the march which that struggle had arrested. Young Peel's lot, however, was cast, through his father, with the Tory party. In his maiden speech in 18 10, seconding the address, he defended the Walcheren expedition, which he again vindicated soon afterwards against the report of Lord Porchester's committee. It is said that even then his father had discerned in him a tendency to think for himself, and told Lord Liverpool that to make sure of his support it would be well to place him early in harness. At all events he began official life in 1810 as Lord Liverpool's under-secretary for war and the colonies under the administration of Perceval. In 181 2 he was transferred by Lord Liverpool to the more important but unhappy post of secretary for Ireland. There he was engaged till 18 18 in maintaining English ascendancy over a country heaving with discontent, teeming with conspiracy, and ever ready to burst into rebellion. A middle course between Irish parties was impossible, and Peel plied the established engines of coercion and patronage with a vigorous hand. At the same time, it was his frequent duty to combat Grattan, Plunkett, Canning and the other movers and advocates of Roman Catholic emancipation in the House of Commons. He, however, always spoke on this question with a command of temper wonderful in hot youth, with the utmost

courtesy towards his opponents, and with warm expressions of sympathy and even of admiration for the Irish people. He also, thus early, did his best to advocate and promote joint education in Ireland as a means of reconciling

sects and raising the character of the people. But his greatest service to Ireland as secretary was the institution of the regular Irish constabulary, nicknamed after him ” Peelers,” for the protection of life and property in a country where both were insecure. His moderation of tone did not save him from the violent abuse of O’Conneli, whom he was ill advised enough to challenge — an affair which covered them both with ridicule. In 181 7 he obtained the highest parliamentary distinction of the Tory party by being elected member for the university of Oxford — an honour for which he was chosen in preference to Canning on account of his hostility to Roman Catholic emancipation, Lord Eldon lending him his best support. In the following year he resigned the Irish secretaryship, of which he had long been very weary, and remained out of office till 1821. But he still supported the ministers, though in the affair of Queen Caroline he stood aloof, disapproving some steps taken by the government, and sensitive to popular opinion; and when Canning retired on account of this affair Peel declined Lord Liverpool’s invitation to take the vacant place in the cabinet. During this break in his tenure of office he had some time for reflection, which there was enough in the aspect of the political world to move. But early office had done its work. It had given him excellent habits of business, great knowledge and a high position; but it had left him somewhat stiff and punctilious, too cold and reserved and over anxious for formal justifications when he might well have left his conduct to the judgment of men of honour and the heart of the people. At the same time he was no pedant in business; in corresponding on political subjects he loved to throw off official forms and com- municate his views with the freedom of private correspondence; and where his confidence was given, it was given without reserve.

At this period he was made chairman of the bullion committee on the death of Horner. He was chosen for this important office by Huskisson, Ricardo and their fellow-economists, who saw in him a mind open to conviction, though he owed hereditary allegiance to Pitt’s financial policy, and had actually voted with his Pittite father for a resolution of Lord Liverpool’s government asserting that Bank of

England notes were equivalent to legal coin. The choice proved judicious. Peel was converted to the currency doctrines of the economists, and proclaimed his con- version in a great speech on the 24th of May 1819, in which he moved and carried four resolutions embodying the recommen- dations of the bullion committee in favour of a return to cash payments. This laid the foundation of his financial reputation, and his co-operation with the economists tended to give a liberal turn to his commercial principles. In the course he took he somewhat diverged from his party, and particularly from his father, who remained faithful to Pitt's depreciated paper, and between whom and his schismatic son a solemn and touching passage occurred in the debate. The author of the Cash Pay- ments Act had often to defend his policy, and he did so with vigour. The act is sometimes said to have been hard on debtors, including the nation as debtor, because it required debts to be paid in cash which had been contracted in depreciated paper; and Peel, as heir to a great fundholder, was even charged with being biased by his personal interests. But it is answered that the Bank Restriction Acts, under which the depreciated paper had circulated, themselves contained a provision for a return to cash payments six months after peace.

In 1820 Peel married Julia, daughter of General Sir John Floyd, who bore him five sons and two daughters. The writers who have most severely censured Sir Robert Peel as a public man have dwelt on the virtues and happiness of his private and domestic life. He was not only a most loving husband and father but a true and warm-hearted friend. In Whitehall Gardens or at Drayton Manor he gathered some of the most distinguished intellects of the day. He indulged in free and cheerful talk, and sought the conversation of men of science; he took delight in art, and was a great collector of pictures; he was fond of farming and agricultural improvements; he actively promoted useful works and the advancement of knowledge; he

loved making his friends, dependants, tenants and neighbours happy. And, cold as he was in public, few men could be more bright and genial in private than Sir Robert Peel.

In 1 82 1 Peel consented to strengthen the enfeebled ministry of Lord Liverpool by becoming home secretary; and in that capacity he had again to undertake the office of coercing the growing discontent in Ireland, of which he remained the real administrator, and had again to lead in the House of Commons the opposition to the rising cause of Roman Catholic emancipa- tion. In 1825, being defeated on the Roman Catholic question in the House of Commons, he wished to resign office, but Lord Liverpool pleaded that his resignation would

break up the government. He found a congenial task in reforming and humanizing the criminal law, especially those parts of it which related to offences against property and offences punishable by death. The five acts in which Peel accomplished this great work, as well as the great speech of the 9th of March 1826, in which he opened the subject to the house, will form one of the most solid and enduring monuments of his fame. Criminal law reform was the reform of Romilly and Mackintosh, from the hands of the latter of whom Peel received it. But the masterly bills in which it was embodied were the bills of Peel — not himself a creative genius, but, like the founder of his house, a profound appreciator of other men's creations, and unrivalled in the power of giving them practical and complete effect.

In 1827 the Liverpool ministry was broken up by the fatal illness of its chief, and under the new premier, George Canning, Peel, like the duke of Wellington and other high Tory members of Lord Liverpool's cabinet, refused to serve. Canning and Peel were rivals; but we need not interpret as mere personal rivalry that which was certainly, in part at least, a real difference of connexion and opinion. Canning took a Liberal line, and was supported by many of the Whigs; the seceders were Tories, and it is difficult to see how their position in Canning's cabinet could have been otherwise than a false one. Separation led to public coolness and occasional approaches to bitterness on both sides in debate. But there seems no ground for exaggerated complaints against Peel's conduct. Canning himself said to a friend that " Peel was the only man who had behaved decently towards him." Their private intercourse remained uninterrupted to the end; and Canning's son afterwards entered public life under the auspices of Peel. The charge of having urged Roman Catholic emancipation on Lord Liverpool in 1825, and opposed Canning for being a friend to it in 1827, made against Sir Robert Peel in the fierce corn-law debates of 1846, has been withdrawn by those who made it.

In January 1828, after Canning's death, the duke of Welling- ton formed a Tory government, in which Peel was home secretary and leader of the House of Commons. This cabinet, Tory as it was, did not include the impracticable Lord Eldon, and did include Huskisson and three more friends of Canning. Its policy was to endeavour to stave off the growing demand for organic change by administrative reform, and by lightening the burdens of the people. The civil list was retrenched with an unsparing hand, the public expenditure was reduced lower than it had been since the Revolutionary war, and the import of corn was permitted under a sliding scale of duties. Peel also intro- duced into London the improved system of police which he had previously established with so much success in Ireland. But the tide ran too

strong to be thus headed. First the government were compelled, after a defeat in the House of Commons, to acquiesce in the repeal of the Test and Corporation Acts, Peel bringing over their High Church supporters, as far as he could. Immediately afterwards the question of Roman Catholic emanci- pation was brought to a crisis by the election of O'Conneli for the county of Clare. In August Peel expressed to the duke of Wellington his conviction that the question must be settled. He wrote that out of office he would co-operate in the settlement but in his judgment it should be committed to other hands than his. To this the duke assented, but in January 1829, owing to the declared opinions of the king, of the House of Lords, and of the Church against a change of policy, Wellington came to the

conclusion that without Peel's aid in office there was no prospect of success. Under that pressure Peel consented to remain, and all the cabinet approved. The consent of the king, which could scarcely have been obtained except by the duke and Peel, was extorted, withdrawn (the ministers being out for a few hours), and again extorted; and on the 5th of March 1829 Peel proposed Roman Catholic emancipation in a speech of more than four hours. The apostate was overwhelmed with obloquy. Having been elected for the university of Oxford as a leading opponent of the Roman Catholics, he had thought it right to resign his seat on being converted to emancipation. His friends put him again in nomination, but he was defeated by Sir R. H. Inglis. He took refuge in the close borough of Westbury, whence he afterwards removed to Tamworth, for which he sat till his death. Catholic emancipation was forced on Peel by circumstances; but it was mainly owing to him that the measure was complete, and based upon equality of civil rights. This great concession, however, did not save the Tory government. The French Revolution of July 1830 gave fresh strength to the movement against them, though, schooled by the past, they promptly recognized King Louis Philippe. The parliamentary reform movement was joined by some of their offended Protestant supporters. The duke of Wellington committed them fatally against all reform, and the elections went against them on the demise of the Crown; they were beaten on Sir H. ParnelFs motion for a committee on the civil list, and Wellington took the opportunity to resign rather than deal with reform.

While in office, Peel succeeded to the baronetcy, Drayton Manor and a great estate by the death of his father (May 3, 1830). The old man had

lived to see his fondest hopes fulfilled in the greatness of his son; but he had also lived to see that a father must not expect to fix his son's opinions — above all, the opinions of such a son as Sir Robert Peel, and in such an age as that which followed the French Revolution.

Sir Robert Peel's resistance to the Reform Bill won back for him the allegiance of his party. His opposition was resolute but it was temperate, and once only he betrayed the suppressed fire of his temper, in the historical debate of the 22nd of April 1831, when his speech was broken off by the arrival of the king to dissolve the parliament which had thrown out reform. He refused to join the duke of Wellington in the desperate enterprise of forming a Tory government at the height of the storm, when the Grey ministry had gone out on the refusal of the king to promise them an unlimited creation of peers. By this conduct he secured for his party the full benefit of the reaction which he no doubt knew was sure to ensue. The general election of 1832, after the passing of the Reform Bill, left him with barely 150 followers in the House of Commons; but this handful rapidly swelled under his management into the great Conservative party. He frankly accepted the Reform Act as irrevocable, taught his party to register instead of despairing, appealed to the intelligence of the middle classes, whose new-born power he appreciated, steadily supported the Whig ministers against the Radicals and O'Connell, and gained every moral advantage which the most dignified and constitutional tactics could afford. To this policy, and to the great parliamentary powers of its author, it was mainly due that, in the course of a few years, the Conservatives were as strong in the reformed parliament as the Tories had been in the unre- formed. It is vain to deny the praise of genius to such a leader, though the skill of a pilot who steered for many years over such waters may sometimes have resembled craft. But the duke of Wellington's emphatic eulogy on him was, " Of all the men I ever knew, he had the greatest regard for truth." The duke might have added that his own question, "How is the king's government to be carried on in a reformed parliament?" was mainly solved by the temperate and constitutional policy of Sir Robert Peel, and by his personal influence on the debates and proceedings of the House of Commons during the years which followed the Reform Act.

In 1834, on the dismissal of the Melbourne ministry, power came to Sir Robert Peel before he expected or desired it. He hurried from Rome at the call of the duke of Wellington, whose

sagacious modesty yielded him the first place, and became prime minister, holding the two offices of first lord of the treasury and

chancellor of the exchequer. He vainly sought to include in his cabinet two recent seceders from the Whigs, Lord Stanley and Sir James Graham. A dissolution gave him a great increase of strength in the house, but not enough. He was outvoted on the election of the speaker at the opening of the session of 1835, and, after struggling on for six weeks longer, resigned on the question of appropriating part of the revenues of the Church in Ireland to national education. His time had not yet come; but the capacity, energy and resource he displayed in this short tenure of office raised him immensely in the estimation of the house, his party and the country. Of the great budget of practical reforms which he brought forward, the plan for the commutation of tithes, the ecclesiastical commission, and the plan for settling the question of dissenters' marriages bore fruit.

From 1835′ to 1840 he pursued the same course of patient and far-sighted opposition. In 1837 the Conservative members of the House of Commons gave their leader a grand banquet at Merchant Taylors' Hall, where he proclaimed in a great speech the creed and objects of his party. In 1839, the Whigs having resigned on the Jamaica Bill, he was called on to form a govern- ment, and submitted names for a cabinet, but resigned the commission owing to the young queen's persistent refusal to part with any Whig ladies of her bedchamber (see Victoria, Queen). In 1840 he was hurried into a premature motion of want of con- fidence. But in the following year a similar motion was carried by a majority of one, and the Whigs ventured to appeal to the country. The result was a majority of ninety-one against them on a motion of want of confidence in the autumn of 1841, upon which they resigned, and Sir Robert Peel became first lord of the treasury, with a commanding majority in both Houses of Parliament.

The crisis called for a master-hand. The finances were in disorder. For some years there had been a growing deficit, estimated for 1842 at more than two millions, and attempts to supply this by additions to assessed taxes and customs duties had failed. The great financier took till the spring of 1842 to mature his plans. He then boldly supplied the deficit by im- posing an income-tax on all incomes above £150 a year. He accompanied this tax with a reform of the tariff, by which pro-hibitory duties were removed and other duties abated on a vast number of articles of import, especially the raw materials of manu-factures and prime articles of food. The increased consumption, as the reformer expected, countervailed the reduction of duty. The income-tax was renewed and the reform of the tariff carried still farther on the same principle in 1845. The result was, in place of a deficit of upwards of two millions, a surplus of five millions in C845, an d the removal of seven millions and a half of taxes up to 1847, not only

without loss, but with gain to the ordinary revenue of the country. The prosperous state of the finances and of public affairs also permitted a reduction of the interest on a portion of the national debt, giving a yearly saving at once of £625,000, and ultimately of a million and a quarter to the public. In 1844 another great financial measure, the Bank Charter Act, was passed and, though severely controverted and thrice suspended at a desperate crisis, has ever since regulated the currency of the country. In Ireland O'ConnelPs agitation for the repeal of the Union had now assumed threatening pro- portions, and verged upon rebellion. The great agitator was prosecuted, with his chief adherents, for conspiracy and sedition; and, though the conviction was quashed for informality, repeal was quelled in its chief. At the same time a healing hand was extended to Ireland. The Charitable Bequests Act gave Roman Catholics a share in the administration of charities and legal power to endow their own religion. The allowance to Maynooth was largely increased, notwithstanding violent Protestant opposition. Three queen's colleges, for the higher education of all the youth of Ireland, without distinction of religion, were founded, notwithstanding violent opposition, both Protestant and Roman Catholic. The principle of toleration once accepted, was thoroughly carried out. The last remnants of the penal laws

were swept from the statute-book, and justice was extended to the Roman Catholic Church in Canada and Malta. In the same spirit acts were passed for clearing from doubt Irish Presbyterian marriages, for settling the titles of a large number of dissenters' chapels in England, and removing the municipal disabilities of the Jews. The grant for national education was trebled, and an attempt was made, though in vain, to introduce effective education clauses into the factory bills. To the, alienation of any part of the revenues of the Established Church Sir Robert Peel never would consent; but he had issued the ecclesiastical com- mission, and he now made better provision for a number of populous parishes by a redistribution of part of the revenues of the Church. The weakest part of the conduct of this great government, perhaps, was its failure to control the railway mania by promptly laying down the lines on a government plan. It passed an act in 1844 which gave the government a right of purchase, and it had prepared a palliative measure in 1846, but was compelled to sacrifice this, like all other secondary measures, to the repeal of the corn laws. It failed also, though not without an effort, to avert the great schism in the Church of Scotland. Abroad it was as prosperous as at home. It

had found disaster and disgrace in Afghanistan. It speedily ended the war there, and in India the invading Sikhs were destroyed upon the Sutlej. The sore and dangerous questions with France, touching the right of search, the war in Morocco, and the Tahiti affair, and with the United States touching the Maine boundary and the Oregon territory, were settled by negotiation.

Yet there were malcontents in Sir Robert Peel's party. The Young Englanders disliked him because he had hoisted the flag of Conservatism instead of Toryism on the morrow of the Reform Bill. The strong philanthropists and Tory Chartists disliked him because he was a strict economist and an upholder of the new poor law. But the fatal question was protection. That question was being fast brought to a crisis by public opinion and the Anti-Corn-Law League. Sir Robert Peel had been recognized in 1841 by Cobden as a Free Trader, and after experience in office he had become in principle more and more so. Since his accession to power he had lowered the duties of the sliding scale, and thereby caused the secession from the cabinet of the duke of Buckingham. He had alarmed the farmers by admitting foreign cattle and meat under his new tariff, and by admitting Canadian corn. He had done his best in his speeches to put the mainte- nance of the corn laws on low ground, and to wean the landed interest from their reliance on protection. The approach of the Irish famine in 1845 turned decisively the wavering balance. When at first Sir Robert proposed to his cabinet the revision of the corn laws, Lord Stanley and the duke of Buccleuch dis- sented, and Sir Robert resigned. But Lord John Russell failed to form a new government. Sir Robert again came into office; and now, with the consent of all the cabinet but Lord Stanley, who retired, he, in a great speech on the 27th of January 1846, brought the repeal of the corn laws before the House of Commons. In the long and fierce debate that ensued he was assailed, both by political and personal enemies, with the most virulent invective, which he bore with his wonted calmness, and to which he made no retorts. His measure was carried; but immediately afterwards the offended protectionists, led by Lord George Bentinck and Benjamin Disraeli, coalesced with the Whigs, and threw him out on the Irish Coercion Bill. He went home from his defeat, escorted by a great crowd, who uncovered as he passed, and he immediately resigned. So fell a Conservative government which would otherwise have probably ended only with the life of its chief.

Though out of office he was not out of power. He had " lost a party, but won a nation." The Whig ministry which succeeded him leant much on his support, with which he never taxed them. He joined them in carrying forward free-trade principles by the repeal of the

navigation laws. He helped them to promote the principle of religious liberty by the bill for the emancipation of the Jews. One important measure was his own. While in office he had probed, by the Devon commission of inquiry, the sores of Ireland connected with the ownership and occupation of

land. In 1849, in a speech on the Irish Poor Laws, he first suggested, and in the next year he aided in establishing, a com- mission to facilitate the sale of estates in a hopeless state of encumbrance. The Encumbered Estates Act made no attempt, like later legislation, to secure by law the uncertain customary rights of Irish tenants, but it transferred the land from ruined landlords to solvent owners capable of performing the duties of property towards the people. On the 28th of June 1850 Sir Robert Peel made a great speech on the Greek question against Lord Palmerston's foreign policy of interference. This speech was thought to show that if necessary he would return to office. It was his last. On the following day he was thrown from his horse on Constitution Hill, and mortally injured by the fall. Three days he lingered and on the fourth (July 2, 1850) he died. All the tributes which respect and gratitude could pay were paid to him by the sovereign, by parliament, by public men of all parties, by the country, by the press, and, above all, by the great towns and the masses of the people to whom he had given " bread unleavened with injustice." He would have been buried among the great men of England in Westminster Abbey, but his will desired that he might be laid in Drayton church. It also renounced a peerage for his family, as he had before declined the garter for himself when it was offered him by the queen through Lord Aberdeen.

Those who judge Sir Robert Peel will remember that he was bred a Tory in days when party was a religion; that he entered parliament a youth, was in office at twenty-four and secretary for Ireland at twenty-five; that his public life extended over a long period rife with change; and that his own changes were all forward and with the advancing intellect of the time. They will enumerate the great practical improvements and the great acts of legislative justice of those days, and note how large a share Sir Robert Peel had, if not in originating, in giving thorough practical effect to all. They will reflect that as a parliamentary statesman he could not govern without a party, and that it is difficult to govern at once for a party and for the whole people. They will think of his ardent love of his country, of his abstinence from intrigue, violence and faction, of his boundless labour through a long life devoted to the public service. Whether he was a model of statesmanship may be doubted. Models of statesmanship are rare, if by a model of statesmanship is meant a great administrator

and party leader, a great political philo- sopher and a great independent orator, all in one. But if the question is whether he was a ruler loved and trusted by the English people there is no arguing against the tears of a nation.

Those who wish to know more of him will consult his own post- humous Memoirs (1856), edited by his literary executors Earl Stanhope and Viscount Cardwell; his private correspondence, edited by C. S. Parker (1 891-1899) ; the four volumes of his speeches; a sketch of his life and character by Sir Lawrence Peel (i860); an historical sketch by Lord Dalling (1874); Guizot's Sir Robert Peel (1857) ; Kiinzel's Leben und Reden Sir Robert Peel's (1851) ; Disraeli's Life of Lord George Bentinck (1858); Morley's Life of Cobden; mono- graphs by F. C. Montague (1888), J. R. Thursfeld (1891), and the earl of Rosebery (1899); Peel and O'Connell, by Lord Eversley; the Life of Sir J. Graham (1907), by C. S. Parker; Lord Stanmore's Life of Lord Aberdeen (1893); and the general histories of the time. (C. S. P.)

Four of Sir Robert's five sons attained distinction. The eldest, Sir Robert Peel (1822-1895), who became the 3rd baronet on his father's death, was educated at Harrow and at Christ Church, Oxford. He was in the diplomatic service from 1844 to 1850, when he succeeded his father as member of parlia- ment for Tamworth, and he was chief secretary to the lord- lieutenant of Ireland from 1861 to 1865. He represented Tam- worth until the general election of 1880; in 1884 he became member for Huntingdon and in 1885 for Blackburn, but after 1886 he ceased to sit in the House of Commons. Sir Robert described himself as a Liberal-Conservative, but in his later years he opposed the policy of Gladstone, although after 1886 he championed the cause of home rule for Ireland. In 1871 he sold his father's collection of pictures to the National Gallery for £75,000, and in his later life he was troubled by financial difficul- ties. Sir Robert was interested in racing, and was known on the

turf as Mr F. Robinson. He died in London on the 9th of May 1895, and was succeeded as 4th baronet by his son, Sir Robert Peel (b. 1867).

Sir Frederick Peel (1823-1906), the prime minister's second son, was educated at Harrow and at Trinity College, Cambridge, becoming a barrister in 1849. He ˆntered parliament in that year, and with the

exception of the period between 1857 and 1859 he remained in the House of Commons until 1865. In 1851-1852 and again in 1853-1855 he was under-secretary for the colonies; from 1855 to 1857 he was under-secretary for war; and from 1859 to 1865 he was secretary to the treasury. He became a privy councillor in 1857 and was knighted in 1869. Sir Frederick Peel's chief service to the state was in connexion with the railway and canal commission. He was appoirted a com- missioner on the inception of this body in 1873, and was its president until its reconstruction in 1888, remaining a member of the commission until his death on the 6th of June 1906.

The third son was Sir William Peel (1824-1858), and the youngest Viscount Peel (q.v.). Sir William was a sailor, who distinguished himself in the Crimea, where he gained the Victoria Cross, and also during the Indian Mutiny, being wounded at the relief of Lucknow. He died on the 27th of April 1858. Sir William wrote A Ride through the Nubian Desert (1852), giving an account of his travels in 185 1.

Two of Sir Robert Peel's brothers were also politicians of note. William Yates Peel (1789-1858), educated at Harrow and at St John's College, Cambridge, was a member of parliament ftom 1817 to 1837, and again from 1847 to 1852; he was under- secretary for home affairs in 1828, and was a lord of the treasury in 1830 and again in 1834-1835. Jonathan Peel (1799-1879) was first a soldier and then a member of parliament during the long period between 1826 and 1868, first representing Norwich and then Huntingdon. From 1 841 to 1846 he was surveyor-general of the ordnance, and in 1858-1859 and again in 1866-1867 he was a very competent and successful secretary of state for war. General Peel was also an owner of racehorses, and in 1844 his horse Orlando won the Derby, after another horse, Running Rein, had been disqualified.

For the history of the Peel family see Jane Haworth, A Memoir of the Family of Peel from the year 1600 (1836).

PEEL, a seaport and watering-place of the Isle of Man, on the W. coast, 11ˆ m. W.N.W. of Douglas by the Isle of Man railway. Pop. (1901), 3304. It lies on Peel Bay, at the mouth of the small river Neb, which forms the harbour. The old town consists of narrow streets and lanes, but a modern resi- dential quarter has grown up to the east. On the west side of the river-mouth St Patrick's Isle is connected with the mainland by a causeway. It is occupied almost wholly by the ruins of Peel castle. St Patrick is said to have founded here the first church in Man, and a small chapel, dedicated to him, appears to date from the 8th or 10th century. There is a round tower, also of very early date,

resembling in certain particulars the round towers of Ireland. The ruined cathedral of St German has a transitional Norman choir, with a very early crypt beneath, a nave with an early English triplet at the west end, transepts, and a low and massive central tower still standing. There are remains of the bishops' palace, of the so-called Fenella's tower, famous through Scott's Peveril of the Peak, of the palace of the Lords of Man, of the keep and guardroom above the entrance to the castle, and of the Moare or great tower, while the whole is surrounded by battlements. There are also a large artificial mound supposed to be a defensive earthwork of higher antiquity than the castle, and another mound known as the Giant's Grave. The guardroom is associated with the ghostly apparition of the Moddey Dhoo (black dog), to which reference is made in Peveril of the Peak. In 1397 Richard II. condemned the earl of Warwick to imprisonment in Peel Castle for con- spiracy, and in 1444 Eleanor, duchess of Gloucester, received a like sentence on the ground of having compassed the death of Henry VI. by magic. Peel has a long-established fishing industry, which, however, has declined in modern times. In the town the most notable building is the church of St German, with a fine tower and spire. Peel was called by the Northmen Holen (island, i.e. St Patrick's Isle) ; the existing name is Celtic,

meaning " fort " (cf. the peel towers of the borderland of England and Scotland).

PEEL. (1) The skin or rind of a fruit; thus " to peel " ia to remove the outer covering of anything. The etymology of the word is closely connected with that of " pill," to plunder, surviving in "pillage." Both words are to be referred to French and thence to Latin. In French peler and piller, though now distinguished in meaning (the first used of stripping bark or rind,ˆ the second meaning to rob), were somewhat confused in application, and a similar confusion occurs in English till comparatively late. The Latin words from which they are derived are pellis, skin, and pilar e, to strip of hair (pilus). (2) The name of a class of small fortified dwelling-houses built during the 16th century on the borders between Scotland and England. They are also known as " bastel-houses," i.e. "bastille-houses," and consist ?i a square massive tower with high pitched roof, the lower part being vaulted, the upper part containing a few living rooms. The entrance is on the upper floor, access being gained by a movable ladder. The vaulted ground-floor chamber served for the cattle when there was danger of attack. The word appears in various forms, e.g. pele, peil, and Latinized as pelum, &c; " pile " is also found used synonymously, but the New English Dictionary (s.v. pile) considers the two words distinct. It seems more probable that the word is to be identified with " pale," a stake (Lat.

palus). The earlier meaning of ” peel ” is a palisaded enclosure used as an additional defence for a fortified post or as an independent stronghold.

PEELE, GEORGE (1558-c. 1598), English dramatist, was born in London in 1558. His father, who appears to have belonged to a Devonshire family, was clerk of Christ’s Hospital, and wrote two treatises on book-keeping. George Peele was educated at Christ’s Hospital, and entered Broadgates Hall (Pembroke College), Oxford, in 1571. In 1574 he removed to Christ Church, taking his B.A. degree in 1577, and proceeding M.A. in 1579. In 1579 the governors of Christ’s Hospital requested their clerk to ” discharge his house of his son, George Peele.” It is not necessary to read into this anything more than that the governors insisted on his beginning to earn a livelihood. He went up to London about 1580, but in 1583 when Albertus Alasco (Albert Laski), a Polish nobleman, was entertained at Christ Church, Oxford, Peele was entrusted with the arrangement of two Latin plays by William Gager (fl. 1580-1619) presented on the occasion. He was also compli- mented by Dr Gager for an English verse translation of one of the Iphigenias of Euripides. In 1585 he was employed to write the Device of the Pageant borne before Woolston Dixie, and in 1591 he devised the pageant in honour of another lord mayor, Sir William Webbe. This was the Descensus Astraeae (printed in the Harleian Miscellany, 1808), in which Queen Elizabeth is honoured as Astraea. Peele had married as early as 1583 a lady who brought him some property, which he speedily dissipated. Robert Greene, at the end of his Groats- worth of Wit, exhorts Peele to repentance, saying that he has, like himself, ” been driven to extreme shifts for a living.” The sorry traditions of his reckless life were emphasized by the use of his name in connexion with the apocryphal Merrie conceited Jests of George Peele (printed in 1607). Many of the stories had done service before, but there are personal touches that may be biographical. He died before 1598, for Francis Meres, writing in that year, speaks of his death in his Palladis Tamia.

His pastoral, comedy of The Araygnement of Paris, presented by the Children of the Chapel Royal before Queen Elizabeth perhaps as early as 1581, was printed anonymously in 1584. Charles Lamb, sending to Vincent Novello a song from this piece of Peele’s, said that if it had been less uneven in execution Fletcher’s Faithful Shepherdess ” had been but a second name in this sort of writing.” Peele shows considerable art in his flattery. Paris is arraigned before Jupiter for having assigned the apple to Venus. Diana, with whom the final decision rests, gives the apple to none of the competitors but to a nymph called Eliza, whose identity is confirmed by the further

explanation, ” whom some Zabeta call.” The Famous Chronicle of King Edward the first, sirnamed Edward Longshankes, with his relume from the holy land. Also the life of Lleuellen, rebell in Wales. Lastly, the sinking of Queen Elinor, who suncke at Charingcrosse, and rose again at Potlers-hith, now named Queenehith (printed 1593). This ” chronicle history,” formless enough, as the rambling title shows, is nevertheless an advance on the old chronicle plays, and marks a step towards the Shake- spearian historical drama. The Battell of Alcazar — with the death of Captaine Slukeley (acted 1588-1589, printed 1594), published anonymously, is attributed with much probability to Peele. The Old Wives Tale, registered in Stationers’ Hall, perhaps more correctly, as ” The Owlde wifes tale ” (printed 159s). was followed by The Love of King David and fair Bethsabe (written c. 1588, printed 1599), which is notable as an example of Elizabethan drama drawn entirely from scriptural sources. Mr Fleay sees in it a political satire, and identifies Elizabeth and Leicester as David and Bathsheba, Mary Queen of Scots as Absalom. Sir Clyomon and Sir Clamydes (printed 1599) has been attributed to Peele, but on insufficient grounds. Among his occasional poems are ” The Honour of the Garter,” which has a prologue containing Peek’s judgments on his contemporaries, and ” Polyhymnia ” (1590), a blank-verse description of the ceremonies attending the retirement of the queen’s champion, Sir Henry Lee. This is concluded by the ” Sonnet,” ” His golden locks time hath to silver turn’d,” quoted by Thackeray in the 76th chapter of The Newcomes. To the Phoenix Nest in 1593 he contributed “The Praise of Chastity.” Mr F. G. Fleay (Biog. Chron. of the Drama) credits Peele with The Wisdom of Doctor Doddipoll (printed 1600), Wily Beguiled (printed 1606), The Life and Death of Jack Straw, a notable rebel (1587?), a share in the First and Second Parts of Henry VI., and on the authority of Wood and Winstanley, Alphonsus, Emperor of Germany.

Peele belonged to the group of university scholars who, in Greene’s phrase, ” spent their wits in making playes.” Greene went on to say that he was ” in some things rarer, in nothing inferior,” to Marlowe. Nashe in his preface to Greene’s Mena- phon called him ” the chief supporter of pleasance now living, the Atlas of Poetrie and primus verborum artifex, whose first encrease, the Arraignement of Paris, might plead to your opinions his pregnant dexteritie of wit and manifold varietie of invention, wherein (me judice) hee goeth a step beyond all that write.” This praise was not unfounded. The credit given to Greene and Marlowe for the increased dignity of English

dramatic diction, and for the new smoothness infused into blank verse, must certainly be shared by Peele. Professor F. B. Gummere, in a critical essay prefixed to his edition of The Old Wives Tale, puts in another claim for Peele. In the contrast between the romantic story and the realistic dialogue he sees the first instance of humour quite foreign to the comic ” business ” of earlier comedy. The Old Wives Tale is a play within a play, slight enough to be perhaps better described as an interlude. Its background of rustic folk-lore gives it additional interest, and there is much fun poked at Gabriel Harvey and Stanyhurst. Perhaps Huanebango, 1 who parodies Harvey’s hexameters, and actually quotes him on one occasion, may be regarded as representing that arch-enemy of Greene and his friends.

Peele’s Works were edited by Alexander Dyce (1828, 1829-1839 and 1861); by A. H. Bullen (2 vols., 1888). An examination of the metrical peculiarities of his work is to be found in F. A. R. Lammerhirt’s Georg Peele, Untersuchungen iiber sein Leben und seine Werke (Rostock, 1882). See also Professor F. B. Gummere, in Representative English Comedies (1903) ; and an edition of The Battell of Alcazar, printed for the Malone Society in 1907.

PEEP-OF-DAY BOYS, an Irish Protestant secret society, formed about 1785. Its object was to protect the Protestant peasantry, and avenge their wrongs on the Roman Catholics. The ” Boys ” gained their name from the hour of dawn which

1 Mr Fleay goes so far as to see in the preposterous names of Huanebango’s kith and kin puns on Harvey’s father’s trade. ” Polymacnaeroplacidus ” he interprets as ” Polly-make-a-rope- lass ”

they chose for their raids on the Roman Catholic villages. The Roman Catholics in return formed the society of ” The Defenders.”

PEEPUL, or Piptjl (Ficus religiosa), the ” sacred fig ” tree of India, also called the Bo tree. It is not unlike the banyan, and is venerated both by the Buddhists of Ceylon and the Vaishnavite Hindus, who say that Vishnu was born beneath its shade. It is planted near temples and houses; its sap abounds in caoutchouc, and a good deal of lac is obtained from insects who feed upon the branches. The fruit is about the size of a walnut and is not much eaten.

PEERAGE (Fr. pairage, med. Lat. paragium; M.E. pere, O. Fr. per, peer, later pair; Lat. paris, ” equal “). Although in England the terms ” peerage,” ” nobility,” ” House of Lords ” are in common parlance frequently regarded as synonymous, in reality each expresses a

different meaning. A man may be a peer and yet not a member of the House of Lords, a member of the House of Lords and yet not strictly a peer; though all peers (as the term is now understood) are members of the House of Lords either in esse or in posse. In the United Kingdom the rights, duties and privileges of peerage are centred in an individual; to the monarchial nations of the Continent nobility conveys the idea of family, as opposed to personal, privilege.

Etymologically ” peers ” are ” equals ” (pares), and in Anglo- Norman days the word was invariably so understood. The feudal tenants-in-chief of the Crown were all the peers of each other, whether lords of one manor or peerage of a hundred; so too a bishop had his ecclesiastical peer in a brother bishop, and the tenants of a manor their peers in their fellow-tenants. That even so late as the reign of John the word was still used in this general sense is clear from Magna Carta, for the term ” judicium parium ” therein must be understood to mean that every man had a right to be tried by his equals. This very right was asserted by the barons as a body in 1233 on behalf of Richard, earl marshal, who had been declared a traitor by the king’s command, and whose lands were forfeited without proper trial. In 1233 the French bishop Peter des Roches, Henry III.‘s minister, denied the barons’ right to the claim set up on the ground that the king might judge all his subjects alike, there being, he said, no peers in England (Math. Paris. 389). The English barons undoubtedly were using the word in the sense it held in Magna Carta, while the bishop probably had in his mind the French peers (pairs de France), a small and select body of feudatories possessed of exceptional privileges. In England the term was general, in France technical. The change in England was gradual, and probably gathered force as the gulf between the greater barons and the lesser widened, until in course of time, for judicial purposes, there came to be only two classes, the greater barons and the rest of the people. The barons remained triable by their own order (i.e. by their peers), whilst the rest of the people rapidly became subject to the general practice and procedure of the king’s justices. The first use of the word ” peers ” as denoting those members of the baronage who were accustomed to receive regularly a writ of summons to parliament is found in the record of the proceedings against the Despensers in 13 21 (Stubbs, Const. Hist. ii. 347), and from that time this restricted use of the word has remained its ordinary sense.

Properly to understand the growth and constitution of the peerage it is necessary to trace the changes which occurred in the position of the Anglo-Norman baronage, first Anglo- through the gradual strengthening of royal supre- Norman macy with the consequent

decay of baronial power Baronage. locally, and subsequently by the consolidation of parliamentary institutions during the reigns of the first three Edwards.

Before the conquest the national assembly of England (see Parliament) was the Witan, a gathering of notables owing their presence only to personal influence and standing. The Saxon The imposition of a modified feudal system resulted Witena- in a radical alteration. Membership of the Great * em0 Councils of the Norman kings was primarily an incident of

tenure, one of the obligations the tenants-in-chief were bound I consequently throughout the early years of William's reign to perform, although this membership gradually became restricted | some of the English bishops and abbots attended his courts

by the operation of the Royal prerogative to a small section of the Baronial class and eventually hereditary by custom. The Norman Councils may have arisen from the ashes of a Saxon Witenagemot, but there is little evidence of any historical continuity between the two. The Church in England, as in Christendom generally, occupied a position of paramount importance and far-reaching influence; its leaders, not alone from their special sanctity as ecclesiastics, but as practically the only educated men of the period, of necessity were among the chief advisers of every ruler in Western Europe. In England churchmen formed a large proportion of the Witan, the more influential of the great landowners making up the rest of its membership.

In place of the scattered individual and absolute ownership of Saxon days the Conqueror became practically the sole Norman owner of the soil. The change, though not imme- Feudal diately complete, followed rapidly as the country Tenure. se ttled down and the power of the Crown extended to its outlying frontiers. As Saxon land gradually passed into Norman hands the new owners became direct tenants of the king. Provided their loyal and military obligations were duly performed they had fixity of tenure for themselves and their heirs. In addition fixed money payments were exacted on the succession of the heir, when the king's eldest son was knighted, his eldest daughter married, or his person ransomed from captivity. In like manner and under similar conditions the king's tenants, or as they were termed

tenants-in-chief, sub-granted the greater portion of their holdings to their own immediate followers. Under Norman methods the manor was the unit of local government and jurisdiction, and when land was given away by the king the gift invariably took the form of a grant of one or more manors.

When he brought England into subjection the Conqueror's main idea was to exalt the central power of the Crown at the expense of its feudatories, and the first two centuries following the conquest tell one long tale of Opposition by the great tenants- in-chief to a steadily growing and unifying royal pressure. With this idea of royal supremacy firmly fixed in his mind, William's grants, excepting outlying territory such as the marches of Wales or the debateable ground of the Scottish border, which needed special consideration, were seldom in bulk, but took the form of manors scattered over many counties. Under such conditions it was practically impossible for a great tenant to set up a powerful imperium in imperio (such as the fiefs of Normandy, Brittany and Burgundy), as his forces were distributed over the country, and could be reached by the long arm of royal power, acting through the sheriff of every county, long before they could effectively come together for fighting purposes. The tenants-in-chief were termed generally barons (see Baron) and may be regarded historically as the parents of the peers of later days. The pages of Domesday (1086), the early Norman fiscal record of England, show how unevenly the land was distributed; of the fifteen hundred odd tenants mentioned the majority held but two or three manors, while a favoured few possessed more than a hundred each. Land was then the only source of wealth, and the number of a baron's manors might well be regarded as a correct index of his importance.

The king's tenants owed yet another duty, the service of attending the King's Court {curia regis), and out of this custom grew the parliaments of later days. In theory all Court tne king's tenants-in-chief, great and small, had a right to be present as incident to their tenure. It has therefore been argued by some authorities that as the Conqueror's system of tenure constituted him the sole owner of the land, attendance at his courts was solely an incident of tenure, the Church having been compelled to accept the same conditions as those imposed on laymen. But, as already pointed out, the change in tenure had not been immediate, and there had been no general forfeiture suffered by ecclesiastical bodies;

as much by virtue of their personal and ecclesiastical importance as by right of tenure. The King's Court was held regularly at the three great festivals of the Church and at such other times as were deemed

advisable. The assembly for several generations neither possessed nor pretended to any legislative powers. Legislative power was a product of later years, and grew out of the custom of the Estates granting supplies only on condition that their grievances were first redressed. The great bulk of the tenants were present for the purpose of assenting to special taxation above and beyond their ordinary feudal dues. When necessary a general summons to attend was sent through the sheriff of every county, who controlled a system of local government which enabled him to reach every tenant. In course of time to a certain number of barons and high ecclesiastics, either from the great extent of their possessions, their official duties about the king or their personal importance, it became customary to issue a personal writ of summons, thus distinguishing them from the general mass summoned through the sheriff. That this custom was in being within a century of the Conquest is clear from an incident in the bitter fight for supremacy between Archbishop Becket and Henry II. in n 64 (Stubbs, Const. Hist. i. 504), it being recorded that the king withheld the Archbishop's personal summons to parliament, and put upon him the indignity of a summons through the sheriff. During the succeeding fifty years the line becomes even more definite, though it is evident that the Crown sometimes dis- regarded the custom, as the barons are found complaining that many of their number deemed entitled to a personal summons had frequently been overlooked.

The sequel to these complaints is found in Magna Carta, wherein it is provided that the archbishops, bishops, abbots, earls and greater barons are to be called up to the Magna Caria council by writ directed to each severally; and all end Personal who hold of the king in chief, below the rank of Summons greater barons, are to be summoned by a general ˆ, aJo e res writ addressed to the sheriff of their shire. 1 Magna Barones. Carta thus indicates the existence of two definite sections of the king's tenants, a division which had evidently persisted for some time. The " greater barons " are the immediate parents of the peerages of later days, every member of which for more than four centuries had a seat in the House of Lords. As for the rest of the tenants-in-chief, poorer in estate and therefore of less consequence, it is sufficient here to note that they fell back into the general mass of country families, and that their representatives, the knights of the shire, after some hesitation, at length joined forces with the city and burgher representatives to form the House of Commons.

In 1254, instead of the general summons through the sheriff to all the lesser tenants-in-chief, the king requires them to elect

two knights for each shire to attend the council as

the accredited representative of their fellows. In of j2S4. the closing days of 1264 Simon de Montfort sum- moned to meet him early in 1265 the first parliament worthy of the name, a council in which prelates, earls and greater barons, knights of the shire, citizens and burghers were present, thus constituting a representation of all classes of people. It has been argued that this assembly cannot be regarded as a full parlia- ment, inasmuch as Simon de Montfort summoned personally only such members of the baronage as were favourable to his cause, and issued writs generally only to those counties and cities upon which he could rely to return representatives in support of his policy. Stubbs holds the view that the first assembly we ought to regard as a full parliament was the Model Parliament which met at Westminster in 1295. This Model parliament, unlike Simon's partisan assembly of Parliament 1265, was free and representative. To every spiritual otl29s –

1 Et ab habendum commune consilium regni . . . summoneri faciemus archiepiscopos, episcopos, abbates, comites et majores barones sigillatim per litteras nostras et praeterea faciemus summoneri in generali per vicecomes et ballivos nostras omnes illos qui de nobis tenent in capite (cited in Stubbs, Const. Hist. i. 547 n.).

and temporal baron accustomed to receive an individual writ, one was issued. Every county elected its knights and every city or borough of any importance was instructed by the sheriff to elect and to return its allotted number of representatives. Stubbs's view (Const. Hist. ii. 223) may prob- ably be regarded as authoritative, inasmuch as it was adopted by Lord Ashbourne in the Norfolk peerage case of 1906 (Law Reports [1907], A.C. at p. 15). Edward I. held frequent parlia- ments throughout his reign, and although many must be regarded as merely baronial councils, nevertheless year after year, on all important occasions, the knights of the shire and the citizens appear in their places. The parliament of Shrews- bury in 1283, for instance, has been claimed as a full parliament in several peerage cases, but no clear decision on the point has ever been given by the Committee for Privileges. It may be taken for granted, however, that any assembly held since 1295, which did not conform substantially to the model of that year, cannot be regarded constitutionally as a full parliament. The point is even of modern importance, as in order to establish the

existence of a barony by writ it must be proved that the claimant's ancestor was summoned by individual writ to a full parliament, and that either he himself or one of his direct descendants was present in parliament. It is now convenient to consider the various grades into which the members of the peerage are grouped, and their relative positions. An examination of the early writs Peerage, issued to individuals shows that the baronage con- sisted of archbishops, bishops, abbots, priors, earls and barons. In course of time every member of these classes came to hold his land by feudal tenure from the Crown, and eventually in every instance the writs issued as an incident of tenure. It is therefore necessary to discover, if possible, what combination of attributes clothed the greater baron with a right to receive the king's personal writ of summons. While the archbishops and bishops received their writs with regularity, the summonses to heads of ecclesiastical houses and greater barons were intermittent. The prelate held an office which lived on regardless of the fate of its temporary holder, and if by reason of death, absence or translation the office became vacant, a writ still issued to the " Guardian of the Spiritualities." The abbot, on the other hand, often outside the jurisdiction of the English Church, and owing allegiance to a foreign order, was but the personal representative of a land-holding community. It has already been pointed out that the amount of land held direct from the king by individuals varied greatly, and that the extent of his holding must have had something to do with a man's importance. A landless noble in those days was inconceivable. The conclusion, then, may be drawn that in theory the issue of a writ was at the pleasure of the Crown, and that in practice the moving factor in the case of the prelates was office and personal importance, and in the case of abbots and barons probably, in the main, extent of* possession. There is nothing however to show that in the early years of the custom any person had a right to claim a writ if it were the king's pleasure or caprice to withhold it and to treat everyone not summoned individually as being duly summoned under the general writs issued to the sheriff of the county.

The next point for consideration is when did the peerage, as the baronage subsequently came to be called, develop into a body definitely hereditary ? Here again growth Principle?' was gradual and somewhat obscure. Throughout the reigns of the Edwards summonses were not always issued to the same individual for successive parliaments; and it is quite certain that the king never considered the issue of one writ to an individual bound the Crown to its repetition for the rest of his life, much less to his heirs in perpetuity. Again we must look to tenure for an explanation. The custom of primogeniture tended

to secure estates in strict family succession, and if extent of possession had originally extracted the acknowledgment of a personal summons from the Crown it is more than probable that as successive heirs came into their inheritance they too would similarly be acknowledged. In

early days the summons was a burden to be suffered of necessity, an unpleasant incident of tenure, in itself undesirable, and probably so regarded by the majority of recipients during at least the two centuries following the Conquest. The age of the Edwards was in the main a rule of settled law, of increase in population generally, of growing power in the large landowners and of opportunities for those about the person of the king. The times were changing, and in place of the idea of the writ being a burden, its receipt gradually came to be looked upon as a mark of royal favour, a recognition of position and an opportunity leading on to fortune. Once such a view was established it is easy to understand how desirous any individual would be to preserve so valuable a privilege for his posterity; and primogeniture with its strict settlement of estates pointed out an easy way. The Crown was itself an hereditary dignity; and what more natural than that it should be surrounded by an hereditary peerage ? Thus the free and indiscriminate choice of the Crown became fettered by the custom that once a summons had been issued to an individual to sit in parliament and he had obeyed that summons he thereby acquired a right of summons for the rest of his lifetime; and in later years when the doctrine of nobility of blood became established his descendants were held to have acquired the same privilege by hereditary right.

The earl's position in the baronage needs some explanation. Various suggestions have been made as to Saxon or Norman origin of a high official nature, but historical opinion ˆ ar u oms- seems generally to incline towards the theory that the term was a name of dignity conferred by royal prerogative on a person already classed among the greater barons. At first the dignity was official and certainly not hereditary, and the name of a county of which he is said to have been an officer in the king's name was not essential to his dignity as an earl. There were also men who, though Scottish and Norman earls, and commonly so addressed and summoned to parliament, were rated in England as barons (Lords Reports, ii. 116, 120; Earldom of Norfolk Peerage Case, Law Reports [1907], A.C. p. 18). Earls received individual summonses to parliament by the name of Earl (q.v.) ; but there is reason to believe, as already mentioned, that in early days at any rate they sat not in right of their earldoms but by tenure as members of the baronage.

If we review the political situation at the beginning of the T4th century a great change is evident. The line between those members of the baronage in parliament and yyrtt the rest of the people is firmly and clearly drawn. Supersedes Tenure as the sole qualification for presence in the Tenure. national assembly has disappeared, and in its place there appears for the baronage a system of royal selection and for the rest of the people one of representation. The rules and customs of law relating to the baronage slowly crystallized so as to provide the House of Lords, the history of which for generations is the history of the peerage of England, whilst the representative part of parliament, after shedding the lower clergy, ultimately became the House of Commons.

Until the reign of Richard II. there is no trace of any use of the term baron (q.v.) as importing a personal dignity existing apart from the tenure of land, barons owing their seats in parlia- ment to tenure and writ combined. This is borne out by the fact that a husband was often summoned to parliament in his wife's right and name, and while she lived fulfilled those feudal, military and parliamentary obligations attached to her lands which the physical disabilities of sex prevented her from carrying out in her own person (Pike, House of Lards, p. 103).

Primogeniture, a custom somewhat uncertain in early Anglo- Norman days, had rapidly developed into a definite rule of law. As feudal dignities were in their origin inseparable pgergrg from the tenure of land it is not surprising that they becomes a too followed a similar course of descent, although Personal as the idea of a dignity being exclusively personal D fr D “J” gradually emerged, some necessary deviations from the rules of law relating to the descent of land inevitably resulted. In the eleventh year of his reign Richard II. created by letters patent

John Beauchamp ” Lord de Beauchamp and baron of Kydder- mynster, to hold to him and the heirs of his body.” These letters patent were not founded on any right by tenure of land possessed by Beauchamp, for the king makes him ” for his good services and in respect of the place which he had holden at the coronation (i.e. steward of the household) and might in future hold in the king’s councils and parliaments, and for his noble descent, and his abilities and discretion, one of the peers and barons of the king- dom of England; willing that the said John and the heirs-male of his body issuing, should have the state of baron and should be called by the name of Lord de Beauchamp and Baron of Kyddermynster.” The grant rested wholly on the grace and favour of the Crown and was a personal reward for services rendered. Here then is a barony entirely a personal dignity and quite unconnected with land. From Richard’s reign to the present day baronies (and indeed all other peerage honours) have continued to be conferred by patent. The custom of summons by writ was not in any way interfered with, the patent operating merely to declare the dignity and to define its devolu- tion. Summons alone still continued side by side for many generations with summons founded on patent; but after the reign of Henry VIII. the former method fell into disuse, and during the last two hundred and fifty years there have been no new creations by writ of summons alone. 1 So from the reign of Richard II. barons were of two classes, the older, and more ancient in lineage summoned by writ alone, the honours descending to heirs-general, and the newer created by letters patent, the terms of which governed the issue of the summons and prescribed the devolution of the peerage in the line almost invariably of the direct male descendants of the person first ennobled. The principle of hereditary succession so clearly recognized in the Beauchamp creation is good evidence to show that a prescriptive right of hereditary summons

probably existed in those families whose members had long been accustomed to receive individual writs. By the time the House of Lancaster was firmly seated on the throne it may be taken that the peerage had become a body of men possessing well-defined personal privileges and holding personal dignities capable of descending to their heirs.

The early origin of peerages was so closely connected with the tenure of land that the idea long prevailed that there were originally peerages by tenure only, i.e. dignities Teeure? * or titles annexed to the possession (and so following it on alienation) of certain lands held in chief of the king. The older writers, Glanville (bk. ix. cc. 4, 6) and Bracton (bk. ii. c. 16), lend some colour to the view. They are followed, but not very definitely, by Coke, Selden and Madox. Black- stone, who discusses the question in his Commentaries (bk. i. c. xii.), seems to believe that such dignities existed in pre- parliamentary days hut says further: ” When alienations grew to be frequent, the dignity of peerage was confined to the lineage of the party ennobled, and instead of territorial became per- sonal.” The Earldom of Arundel case, in 1433, at first sight seems to confirm the theory, but it may be noted that when in later years this descent came to be discussed the high authority of an act of parliament was found necessary to confirm the succes- sion to the dignity. The case is discussed at some length in the Lords Reports (ii. 115), the committee regarding it as an anomaly from which no useful precedent can be drawn. Other cases discussed in the same Report are those of De Lisle, Abergavenny, Fitzwalter and Berkeley. The Berkeley case of 1858-1861 (better reported 8 H.L.C. 21) is essential for the student who wishes to examine the question carefully; and may be regarded as finally putting an end to any idea of bare tenure as an existing means of establishing a peerage right (see also Cruise on Dignities, 2nd ed. pp. 60 et seq.). The main attribute of a peerage is that hereditary and inalien- 1 Not intentional at any rate. In some cases where it was in- tended to call a son up ir his father’s barony, a mistake in the name has been made with the result that a new peerage by writ of sum- mons has been created. The barony of Buller, of Moore Park (cr. 1663), now in abeyance, is said to be an instance of such a mistake.

able quality which ennobles the blood of the holder and his heirs, or, as a great judge put it in 1625 in the Earldom of Oxford case, “he cannot alien or give away this in- heritance because it is a personal dignity annexed /nˆjeˆi/e. to the posterity and fixed in the blood ” (Dodridge, J., at p. 123, Sir W. Jones’s Reports). Were the theory of barony by tenure accepted it would be possible for the temporary holder of such a barony to sell it or even to will it away to a stranger

possessing none of the holder's blood, with the effect that, in the words of Lord Chancellor Campbell (Berkeley case, 8 H.L.C. 77), " there might be various individuals and various lines of peers successively ennobled and created peers of parlia- ment by a subject," an impossible condition of affairs in a country where the sovereign has always been the: fountain of honour. Moreover, while no peerage honour can be extinguished or surrendered, the owner of lands can freely dispose of such rights as he possesses by sale or transfer. Finally we may accept the verdict in the Fitzwalter case of 1669 (Cruise, ibid. p. 66), which was adopted by the House of Lords in the Berkeley case: " and the nature of a barony by tenure being discussed, it was found to have been discontinued for many ages, and not in being, and so not fit to be revived or to admit any pretence or right of succession thereupon."

Until the reign of Edward III. the peerage consisted only of high ecclesiastics, earls and barons. The earls were barons with their special name of dignity added, and their Dukes names always appear on the rolls before those of the barons. In 1337 King Edward created his son, the Black Prince, duke of Cornwall, giving him precedence over the rest of the peerage. The letters patent (under which the present heir to the throne now holds the dukedom) limited the dignity in perpetuity to the first-born son of the king of England. 2 Subsequently several members of the royal family were created dukes, but no subject received such an honour until fifty years later, when Richard II. created his favourite Robert de Vere, earl of Oxford, duke of Ireland (for life) . The original intention may have been to confine the dignity to the blood royal, as with the exception of de Vere it was some years before a dukedom was again conferred on a subject.

In 1385 Richard II. had created Robert de Vere marquess of Dublin, thus importing an entirely new and unknown title into the peerage. The grant was, however, only for life, Marquesses and was in fact resumed by the Crown in 1387, when its recipient was created duke of Ireland. It was not until 1397 that another creation was made, this time in favour of one of the blood royal, John de Beaufort, eldest legitimated son of John of Gaunt, who became marquess of Dorset. His title was shortly afterwards taken away by Henry IV 's first parliament. Subsequently creations were made only at long intervals, that of Winchester (1551) being the only one (of old date) under which an English marquess at present sits in the House of Lords (see Marquess). •

Under the name of viscount (q.v.) Henry VI. added yet another order, and the last in point of time, to the peerage, creating in 1440, John,

Baron Beaumont, Viscount Beaumont viscounts. and giving him precedence next above the barons. The name of this dignity was also borrowed from the Continent, having been in use for some time as a title of honour in the king's French possessions. None of the new titles above mentioned ever carried with them any official position; they were conferred originally as additional honours on men who were already members of the peerage.

The application of the hereditary principle to temporal peerages early differentiated their holders from the spiritual peers. Both spiritual and temporal peers were equally lords of parliament, but hereditary preten- /£ ers "&c sions on the one side and ecclesiastical exclusiveness on the other soon drew a sharp line of division between the two orders. Gradually the temporal peers, strong in their doctrine of " ennobled " blood, came to consider that theirs was an order

2 . . . . principi et ipsius et haeredum suorum Regum Angliae filiis primogenitis (The Prince's Case, 8 Co. Reg. 27a; 77 E.R. 513).

above and beyond all other lords of parliament, and before long, arrogated to themselves the exclusive right to be called peers, and as such the only persons entitled to the privileges of peerage. In early parliamentary days it had been the custom to summon regularly to attend the Lords for deliberative purposes another body of men — the judges. Less important than the prelates, they also owed their summons to official position, and like them were eventually overshadowed by the hereditary principle. The force of hereditary right gave to ennobled blood a position never possessed by either judge or prelate. It is true the prelate, in point of antiquity, was senior to both earl and baron, and in many cases superior in extent of possessions; but these attributes belonged to his office, the resignation or deprivation of which would at any time have caused him to lose his writ of summons. The writ issued really to the office. The judge's position was even worse. His judicial office evoked the writ, but at any moment he might be deprived of that office at the arbitrary pleasure of the Crown. It is doubtful whether the judges ever had voice and vote in the same sense as the other lords of parliament, and even if they had they soon came to be regarded merely as counsellors and assessors.

The pretensions of the lay peers were not admitted without a struggle

on the part of the prelates, who made the mistake of aiming at the establishment of a privileged position for their own order while endeavouring to retain every right possessed by their lay brethren. They fell between two stools, lost their position as peers, and were beaten back in their fight for eccle- siastical privilege. In the reign of Richard II. the prelates are found clearly defining their position. Neville, archbishop of York, de Vere, duke of Ireland and others, were ” appealed ” for treason, and the archbishop of Canterbury took the oppor- tunity in parliament of making clear the rights of his order. He said ” of right and by the custom of the realm of England it belongeth to the Archbishop of Canterbury for the time being as well as others his suffragans, brethren and fellow bishops, abbots and priors and other prelates whatsoever, holding of our lord the king by barony, to be present in person in all the king’s parliaments whatsoever as Peers of the Realm aforesaid, and there with the other Peers of the Realm, and with other persons having the right to be there present, to advise, treat, ordain, establish and determine as to the affairs of the realm and other matters there wont to be treated and to do all else which there presses to be done.” After this he went on to say that as to the particular matters in question they intended to be present and to take their part in all matters brought before parliament ” save our estate and order and that of each of the prelates in all things. But because in the present parliament there is question of certain matters, in which it is not lawful for us or anyone of the prelates according to the institute of the Holy Canons in any manner, to take part personally ” we intend to retire ” saving always the rights of our peerage ” {Rot. Pari. ii Rich. II. No. 6 — printed iii. 236-237). At the desire of the prelates this statement of their rights was duly enrolled in parlia- ment, but their claim to be peers was neither denied nor admitted, and the proceedings went on without them. For themselves Churchmen never claimed the privilege of trial by peers. Whenever they were arraigned they claimed to be altogether outside secular jurisdiction, and it was therefore a matter of small concern to them whether they were in the hands of peers or peasants. Such was the attitude of Becket towards Henry II. (Stubbs, Const. Hist. i. 504), of Archbishop Stratford towards Edward III. (Pike, pp. 188 seq.), and it was probably with the history of these two cases in his mind that the archbishop of Richard II. ‘s reign speaks of the saving rights of his order. These rights were never willingly admitted in England, and as the pope’s power for interference waned so the prelates were forced under the ordinary law of the land. Henry VIII. cer- tainly never regarded ecclesiastics as peers, as may be gathered from a grant early in his reign to the then abbot of Tavistock for himself and each succeeding abbot the right to be ” one of the spiritual and religious lords of parliament.” As to

abbots, the subsequent dissolution of the monasteries put an end to the

discussion. In this reign also Cranmer and Fisher, though the former was archbishop of Canterbury, were tried by a common jury, and they certainly claimed no privilege of peerage. The Standing Orders of the House of Lords for 1625 contain the statement that ” Bishops are only Lords of Parliament and not Peers ” {Lords Journals, iii. 349). In 1640 the ” Lords Spiritual ” were altogether excluded from the House of Lords by act of parliament, and were not brought back until the second year of the Restoration. From that period there has been no ques- tion as to their position. Peers and holders by barony when parliaments first met, by the end of the 1 5th century thev had put themselves outside the pale of the peerage. To-day their ancient lands are vested in trustees (Ecclesiastical Commissioners), and office alone constitutes a bishop’s qualification, and that only if he occupies one of the five gieat sees of Canterbury, York, London, Durham and Winchester, or is of sufficient seniority in appointment to fill one of the remaining twenty-one places on the bench of bishops in the house — for there are now only twenty-six seats for thirty-six prelates.

The reign of Henry VIII. brought about far-reaching changes in the position of the peerage. When that king ascended the throne the hereditary element was in a decided Henry vm. minority, but the balance was gradually redressed and the until at length a bare hereditary majority was Peerage. secured and the dissolution of the monasteries made possible. The peers, many now grown fat on abbey lands, at once began to consolidate their position; precedents were eagerly sought for, and the doctrine of ennobled blood began to find definite and vigorous expression. So long, the peers declared, as there is any ennobled blood, a peerage must exist; and it can be extinguished only by act Bl”od ‘ of parliament, failure of heirs, or upon corruption of blood by attainder. Stubbs writes with some contempt of the doctrine {Const. Hist. iii. 458 n.), apparently on the ground that it is absurd to speak of ennobled blood so long as the children of a peer still remain commoners. The doctrine is neither unreasonable nor illogical. By it is meant blood in which there always exists a capacity to inherit a particular peerage, and every person in whose veins the ennobled blood runs is competent to occupy the peerage if the chances of nature should remove those who are senior to him in the line of descent. A good illustration is the popular use of the term ” blood royal,” which of course does not mean that an individual of the blood royal necessarily occupies a throne but that he or she is in the line of succession to it. Similarly, persons of ” ennobled blood ” are not necessarily peers but in the line of descent to peerages,

to which they may or may not succeed. (See Nobility.)

The English peer is not like the continental noble the member of a caste, but the holder for life of an office clothed with high and exceptional legislative and judicial attributes entirely dependent on his office and exercisable only in conjunction with his fellow peers in parliament assembled. Such privileges as he possesses are due primarily to his office rather than to his blood. His children are commoners, who though accorded courtesy titles by the usage of society have no legal privileges not shared with the humblest of British subjects. It is this peculiar official quality of an English peerage which saved England from the curse of a privileged noble caste such as that which so long barred all progress in France and Germany. As a result there are hundreds of families in the United Kingdom who, commoners there, would yet, from their purity of blood, position and influence, be accounted noble in any continental country.

From the doctrine of nobility of blood is derived the rule of law that no peerage (a Scots peerage is under Scots Law) can be surrendered, extinguished, or in any way got rid of unless the blood be corrupted. The rule is “pˆ.™ St well illustrated by the earldom of Norfolk case {Law Reports [1907], A. C. 10) in which its development w r as traced, and the principle authoritatively confirmed. In 1302 the hereditary earldom of Norfolk (created in 1135) was in the possession of Hugh Bygod, one of the most powerful nobles of

Plantagenet days. The earl got into difficulties, and as some say, for a consideration, and others, to spite his brother and debtor, surrendered his earldom and all the lands thereto belonging, to King Edward I. from whom he subsequently received it back with an altered limitation to himself and the heirs of his body. As he was a childless old man this was practi- cally a short life interest to the exclusion of all his relatives, the nearest of whom but for the surrender would have succeeded. Soon after Bygod died, and the earldom fell into the hands of Edward II. who granted it to his brother Thomas of Brotherton in 13 1 2. Lord Mowbray, the lineal descendant of this Thomas, recently came forward and claimed the earldom, but in 1906 the House of Lords decided against his claim on the ground that in law Bygod’s surrender was invalid, and that therefore Edward II. had no valid power to grant this particular earldom to Thomas of Brotherton. Historically there is little to support such a decision, and indeed this

rigid application of the law is of comparatively recent date. Without doubt king, nobles and lawyers alike were all agreed, right down to Tudor days, that such surrenders were entirely valid. Many certainly were made, but, according to the decision of 1906, any living heirs of line of those nobles who thus got rid of their peerage honours can, if their pedigrees be provable, come to the House of Lords with a fair chance of reviving the ancient honours. Even as late as 1663 we find the Crown, naturally with the concurrence of its legal advisers, stating in the barony of Lucas patent (1663) that, on the appearance of co-heirs to a barony, the honour may be suspended or extinguished at the royal pleasure. The royal view of the law (at any rate as to extinction) was strongly objected to by the Lords, who guarded their privileges in Stuart days even more strictly than did the Commons. As early as 1626, in the celebrated dispute over the earldom of Oxford, the lord great chamberlainship and the baronies of Bolebec, Badlesmere and Sandford, Mr Justice Dodridge, who had been called in by the Lords to advise them, said that an earl could not give away or alien his inheritance, because it was ” a personal dignity annexed to the posterity and fixed in the blood.” Fourteen years later, in the Grey de Ruthyn case, the Lords solemnly resolved, ” That no peer of the realm can drown or extinguish his honour (but that it descends unto his descendants), neither by surrender, grant, fine nor any other conveyance to the king.” In 1678 the Lords became, if possible, even more definite, in view probably of the fact that the Crown had disregarded the Grey de Ruthyn resolution, having in 1660 taken into its hands, by surrender of Robert Villiers, 2nd viscount, the viscounty of Purbeck. In 1676 the son of the second viscount applied for his writ of summons, and on the advice of Sir William Jones, the attorney-general, who reported that ” this (surrender) was a considerable question, never before resolved that he knew of,” the king referred the whole matter to the Lords. The Lords were very explicit, being ” unanimously of the opinion, and do resolve that no fine now levied, or at any time hereafter to be levied by the king, can bar such title of honour (i:e. of a peer of the realm), or the right of any person claiming under him that levied, or shall levy such fine.” On these resolutions passed in the seventeenth century, the Lords of 1906 find illegal a surrender of 1302. The result seems strange, but it is, at any rate, logical from the legal point of view. It was urged that in 1302 no real parliament, in the sense applied to those of later years, was in existence; and consequently, a resolution founded on parliamentary principles should not apply. To this answer was made: Although it may be true that the law and practice of parliament had not then crystallized into the definite shape of even a hundred years later, the ” Model Parliament ” was summoned seven years before Bygod’s

surrender, and it is neces- sary to have some definite occurrence from which to date a legal beginning — a point of law with which an historian can have little sympathy.

Briefly, perhaps, from the teaching of the case it may be permissible to state the rule as follows: In early days the Norman and Plantagenet kings took upon themselves to deal with the barons in a manner which, though illegal, was suffered

because no one dared oppose them; but as time went on, becom- ing stronger and more determined to enforce their privileges and exalt their order the peers were able to compel recognition of their rights, and their resolutions in Stuart days were only declaratory of law which had always existed, but had been systematically disregarded by the Crown. This being so, resolutions of the peers deliberately and expressly laid down must, when in point, always be followed.

The application of the doctrine of corruption of blood to peerages arises out of their close connexion with the tenure of land, peerage dignities never having been regarded Attainder as personal until well on into the 14th century, gad Cor- Conviction for any kind of felony — and treason ruptioa of originally was a form of felony — was always followed Blood – by attainder. This resulted in the immediate corruption of the blood of the offender, and its capacity for inheritance was lost for ever. Such corruption with all its consequences could be set aside only by act of parliament. This stringent rule of forfeiture was to some extent mitigated by the passing in 1285 of the statute De Donis Conditionalibus (Blackstone's Commen- taries, ii. 116) which made possible the creation of estates tail, and when a tenant-in-tail was attainted forfeiture extended only to his life interest. The statute De Donis was soon applied by the judges to such dignities as were entailed (e.g. dignities conferred by patent with limitations in tail) , but it never affected baronies by writ, which were not estates in 'tail but in the nature of estates in fee simple descendible to heirs general. In the feign of Henry VIII. an act was passed (1534) which brought estates tail within the law of forfeiture, but for high treason only. The position then became that peerages of any kind were for- feitable by attainder following on high treason, while baronies by writ remained as before forfeitable for attainder following on felony. In 1708, just after the Union with Scotland, an act was passed by which on the death of the Pretender and three years after Queen Anne's death the effects of corruption of blood consequent on attainder for high treason were to be abolished, and the actual offender only to be punished (stat. 7 Anne, c. 21, § 10). Owing to the 1745 rising, the operation of this act was postponed until the decease

of the Pretender and all his sons (stat. 17 Geo. II. c. 39, § 3). In 1814 forfeiture for every crime other than high and petty treason and murder was re- stricted to the lifetime of the person attainted (stat. 54 Geo. III. c. 145). Finally in 1870 forfeiture, except upon outlawry, was altogether abolished and it was provided that ” no judgment of or for any treason or felony should cause any attainder or corruption of blood, or any forfeiture or escheat.” The necessity for ascertaining the exact condition of the law with regard to attainder throughout the whole period of English parliamentary history will be realized when it is remembered that there still exist dormant and abeyant peerages dating from 1295 onwards which may at any time be the subject of claim before the House of Lords, and if any attainders exist in the history of such peerages the law governing their consequences is not the law as it exists to-day but as it existed when the attainder occurred. The dukedom of Atholl case of 1764 is interesting as showing the effect of attainder on a peerage where the person attainted does not actually succeed. John first duke of Atholl died in 1725 leaving two sons James and George, George the younger was attainted of treason in 1745 and died in 1760, leaving a son John. James, the second son of the first duke, who had succeeded his father in 1725 died in 1764 without issue. John his nephew then claimed the dukedom, and was allowed it on the ground that his father never having been in the possession of the dukedom his attainder could not bar his son, who succeeds by reason of his heirship to his uncle. It would have been otherwise had the younger son outlived his brother, for he would then have succeeded to the dukedom and so destroyed it by his attainder. In many cases there have been passed special parliamentary acts of attainder and forfeiture, and these, of course, operate apart from the general law. In any event, attainder and forfeiture of a dignity, whether resulting from the rules of the I common law or from special or general acts of parliament can

only be reversed by act of parliament. The procedure in reversing an attainder and recovering a dignity is as follows. The Crown signifies its pleasure that a bill of restoration shall be prepared and signs it. The bill is then brought in to the House of Lords, passed there, and sent to the Commons for assent. The last bills of the kind became law in 1876, when Earl Cowper procured the removal of the attainder on one of his Ormond ancestors and so by purging the blood of corruption became entitled to, and was allowed, the barony of Butler of Moore Park (created in 1663). There should also be noted the Earldom of

Mar Restitution Act 1885, which, while mainly con- firmatory of a disputed succession, at the same time reversed any attainders that existed.

The House of Lords grew steadily throughout the Tudor period, and during the reign of the first two Stuarts underwent a still greater increase. In the Great Rebellion the majority of the peers were the king's stoutest supporters and thus inevitably involved themselves in the ruin of the royal cause. Immediately after the execution of Charles I. the Republicans proceeded Common- to sweep away everything which savoured of mon- weatth archy and aristocracy. The House of Commons Abolition of voted the Lords " useless and dangerous," got rid of ' them as a part of parliament by the simple expedient of a resolution (Comms. Journs. 1648-1649, vi. 111) and placed the sole executive power in Cromwell's hands, but there was no direct abolition of the peerage as such. Evidently it took Cromwell but little time to realize the fallacy, in practice, of Cmm weirs single-chamber government, as he is found ten House of years after the " useless and dangerous " resolu- Lords. t j Qn bygy establishing a second chamber. 1 What to call it aroused much discussion, and eventually the unruly Commons consented to speak of and deal with " the other house." It is very difficult to realize what was the constitution of this body, so short was its life and so contemptuous its treat- ment by the Commons. The members of " the other house " were summoned by writs under the Great Seal, similar in form to those used to summon peers of past days. Some sixty writs were issued, and presumably their recipients were entitled thereby to sit for the duration of the parliament to which they were summoned; but it may be considered as certain that Cromwell's lords were never regarded as hereditary peers. They were entitled to the courtesy appellation " Lord " and appear to have been in the main substantial men — existing peers, judges, distinguished lawyers and members of well-known county families. Judging from Cromwell's speech at the opening of parliament, and subsequent entries in Whitelock's diaries, the new house appears to have had revising functions both of a legislative and judicial nature and also the duty of taking cognizance of foreign affairs. Cromwell certainly issued two patents of hereditary peerage — the barony of Burnell and the barony of Gilsland (with which went the viscounty of Howard of Morpeth), but neither title was recognized on the Restoration, and it does not appear that the possession of these titles ever conferred on their holders any hereditary right to a writ of summons to sit in " the other house." Whitelock himself was promised a viscounty by Cromwell, but no patent ever appears to have passed the Great Seal. Eventually business between the two houses grew

impossible, and Cromwell was compelled to dissolve parliament. Richard's first parliament also contained Lords as well as Commons, the latter considerately voting " to transact business with the persons sitting in the other house as an House of Parliament, saving the right of the peers who had been faithful to the parliament," the saving clause evidently a loophole for the future. The dissolution of this parliament and the retirement of the protector Richard into private life preceded by only a few months the restoration to the throne of Charles II. With the king the peers returned to their ancient places.

From the reign of William of Orange the peerage has been freshened by a steady stream of men who as a rule have served

1 Whitelock's Memorials of English Affairs (in the reign of Charles I. and up to the Restoration) (1853 ed. iv. 313).

their country as statesmen, lawyers and soldiers. Little of note occurred in the history of the peerage until the reign of Anne. By the Act of Union with Scotland (1707) Scottish the Scottish parliament was abolished; but the Represents- Scottish peerage were given the privilege of ™ vePeers – electing, for each parliament of Great Britain, sixteen of their number to represent them in the House of Lords. Further creations in the Scottish peerage were no longer to be made. The effect of this act was to leave the great majority of the Scottish peers outside the House of Lords, as only sixteen of their number were to become lords of parliament. Close upon a hundred years later Ireland was united with Great Britain, the Irish parliament being merged in the Irish Repre- parliament of the United Kingdom of Great Britain sentative and Ireland. Twenty-eight Irish peers were to be Peers# elected for life by their order to represent it in the House of Lords. One archbishop and three bishops were also chosen in turn to represent the Irish Church in the House of Lords, but when that Church was disestablished in 1867 the spiritual lords lost their seats. The merger of the three kingdoms had an important effect on their peerages. Every peer in his own country had been a lord of parliament by hereditary right. The English peer (and, as the Acts of Union were passed, the peer of Great Britain and the peer of the United Kingdom) continued by hereditary right a lord of parliament. The Scottish and Irish peers lost this right though by the two Acts of Union they retained every other privilege of peerage. Hence- forth they were lords of parliament only as and when their fellow peers elected them. Thus though not all were lords of parliament in esse, every one was always so in posse, and in any case it was the hereditary quality of the peerage which either actually seated its holder in the House of Lords or made it possible for him to get there by the votes of his fellows.

It now becomes possible to arrive at the modern meaning of the term ” a peerage,” and we may define it as a dignity of England, Scotland or Ireland, which, by its heredi- Modern tary quality, confers on its holder for the time Meaning of being the right to be or not to be elected a lord of ” Peera £ e – parliament. The term ” peerage ” is also used in a collective sense.

The reign of Anne is remarkable for an attempt made by the House of Lords to limit its numbers by law. The queen, in order to secure a majority for the court party, Queen Anne had created a batch of twelve peers at one time, a andPeerage considerable number in relation to existing peerages; Limitation. and it was feared this expedient might be used as ‘ a precedent. A peerage limitation bill was introduced into the House of Lords in 17 19. Six new creations were to be allowed, but after these the Crown, except in the case of royal princes, was to create a new peerage only when an old one became extinct. Twenty-five hereditary peerages in Scotland were to take the place of the sixteen representative peers for all time. The bill passed the Lords, but was eventually thrown out in the House of Commons, though not by an overwhelming majority. In 1856 it was desired to strengthen the judicial element in the House of Lords, and the Crown issued letters patent creating Sir James Parke, one of the barons of the M/ .

exchequer, Baron Wensleydale and a peer ” for Case- and during the term of his natural life.” The burden of an hereditary peerage is heavy, and many men thoroughly well qualified in legal attainments have been known to refuse it on the ground of expense alone. This life-peerage was thought to be a way out of the difficulty, and it was on Lord Chancellor Cranworth’s advice that the Crown issued the Wensleydale patent. The House of Lords at once realized that the creation of life-peers, at the will of the ministry of the day, might put the hereditary section into an absolute minority, and possibly in time, by form of law, get rid of it altogether. Eventually it was decided by the house that ” neither the said letters patent nor the said letters patent with the usual writ of summons enable the grantee to sit and vote in parliament,” a formal resolution which closed the door in the face of every

Judicial Peers.

person whom the Crown might endeavour to make a life-peer. The government of the day accepted the situation, and soon afterwards a new patent was made out which followed the usual limitation to heirs-male. The precedents in favour of the Crown's action were not strong. The essential and outstanding attribvte of the house was its hereditary character. The whole balance of the constitution worked on the pivot of the indepen- dence of the pesrs. They existed as a moderating force in the counsels of parliament, and the alteration of the hereditary character of the House of Lords might easily have rendered it amenable to whatever pressure the government of the day might see fit to exercise. In such circumstances its position as arbiter betveen people and government would tend to dis- appear. A change fraught with so many serious possibilities ought not, it was said, to be made by the simple prerogative of the Crown. If so far-reaching an alteration in the law were justifiable it was for parliament to make it. Further, it was pointed out, there had been no life-creations for centuries, and those that are recorded to have been conferred since the crys- tallization of our parliamentary system were of such a nature that the grantees never sat in the house by virtue of their life-honours, inasmuch as they were existing peers or women. Soon after the Wensleydale debates the government introduced a bill into the House of Lords to authorize the creation of two life-peers, who were to be persons of at least five years' standing as judges. They were to sit as lords of appeal but to be peers for life. Eventually the bill, disappeared in the House of Commons. In 1869 Earl Russell introduced another life-peerage bill of far wider scope. Twenty- eight life-peerages might be in existence at any one time, but not more than four were to be created in any one year. The life peers would be lords of parliament for life. They were to be selected by the Crown from the peerages of Scotland and Ireland, persons who had sat for ten years in the Commons, distinguished soldiers, sailors, civil servants and judges or persons distinguished in science, literature or art. The bill received a rough handling in committee of the Lords, and the time was evidently not ripe for change, as the bill failed to pass its third reading.

In 1S70 attempts were made in the House of Lords to alter the position of the Scottish and Irish representative peers. In Suggested 1876 the need of further judicial strength in the Reforms and Lords was tardily admitted, and an act was passed Alterations, authorizing the creation of two lords of appeal in ordinary, and power was reserved to appoint two more as certain judicial vacancies occurred. They were to be entitled to the rank of baron during their lives but were to sit and vote in parliament only so long as they held their

judicial office. Their dignities lasted for life only. Eleven years later another act enabled all retired lords of appeal to sit and vote as members of the House of Lords for life. To those interested in House of Lords reform the pages of Hansard's Parliamen- tary Debates are the best authority. In 1888 reform bills were introduced by Lords Dunraven and Salisbury, and in 1907 by Lord Newton. In December 1908 the publication of a long report with sweeping recommendations for reform ended the labours of a House of Lords committee which had been appointed to consider the question in detail. In the session of 1910, following the general election, long discussions took place in both houses of parliament. Opinion generally was freely expressed that the time had arrived for diminishing the number of lords of parliament and for putting into practice the principle that hereditary right alone should no longer confer lordship of parliament. (See Parliament.)

The Scottish peerage, like that of England, owes its origin to feudalism. In Anglo-Norman days Scotland was a small country, and for some generations after England Peerage. was set; tled the Scottish king's writ ran little beyond the foot of the Highlands, and even the Lord of the Isles reckoned himself an independent sovereign until the beginning of the 1 5th century. The weak and usually ineffective control of the Crown resulted in opportunities for acquiring personal power which the nobles were not slow to take advantage

of. Seldom accustomed to act in concert, they soon developed particularist tendencies which steadily increased the strength of their territorial position. These conditions of existence were entirely unfavourable to the establishment of any system of parliamentary government such as centralization had made possible in England, therefore it is not surprising to find that the lesser barons were not relieved of their attendance at the national assemblies until well on in the 15th century (Burton's Scotland, iii. 111). Again, when the Scottish earls and barons came to parliament, they did not withdraw themselves from the rest of the people, it being the custom for the estates of Scotland to deliberate together, and this custom persisted until the abolition of their parliament by the Act of Union in 1707. The territorial spirit of the nobles inevitably led them to regard the honour as belonging to, and inseparable from, their land, and until comparatively late in Scottish history there is nowhere any record of the conferment of a personal dignity unattached to land such as that conferred in England on Beauchamp by Richard II. This explains the frequent surrenders and altered grants which are so common in Scottish peerage history, and which, in sharp distinction to the English rule of law, are there regarded as perfectly legal. To-day there exists

no Scottish dukedom (except the royal dukedom of Rothesay), marquessate or viscount)' created before the reign of James VI. of Scotland (and I. of England). Of the existing Scottish peerages sixty-three were created in the period between James's accession to the English throne and the Act of Union. There are now only eighty-seven in all. Unlike one of the English peerages owing its origin exclusively to a writ of summons, ancient Scottish peerages do not fall into abeyance, and when there are only heirs-general, the eldest heir of line succeeds.

Whenever a new parliament is summoned, proclamation is made in Scotland summoning the peers to meet at Holyrood to elect sixteen of their number to represent them in such parliament. The Scottish peerages are recorded on a roll, and this is called over by the lord clerk register before the assembled peers seated at a long table. Each peer answers to the name of the peerage (it may be one or more) he possesses. The roll is then read again and each peer in turn (but only once) rises and reads out the list of those sixteen peers for whom he votes. Proxies are allowed for absent peers and are handed in after the second roll-call. The votes are counted and the lord clerk register reads out the names of those elected, makes a return, and signs and seals it in the presence of the peers assembled. The return eventually finds its way to the House of Lords. The Scottish representative peer so elected receives no writ of summons to parliament, but attends the House of Lords to take the oath, his right to sit being evidenced by the return made. It might be thought that the rules of election in so important a matter would be more stringent, but the fact remains that it is quite possible for an entirely unqualified person to attend and vote at Holyrood. No evidence of identity or of a man's right to be present is required and the lord clerk register is compelled to receive any vote tendered except in respect of peerages for which no vote has been given since 1800, these being struck off the roll (10 & n Vict. c. 52). Any person claiming to represent such a peerage must prove his right before the House of Lords, as was done in the case of the barony of Fairfax in 1908. It is true that by the act last cited any two peers may protest against a vote at Holyrood, and the lord clerk register thereupon reports the proceedings to the House of Lords, who will consider the question if application be made for an inquiry, but nothing is done unless an application is made. The right to vote certainly needs better proof than that now accepted. For many years the House of Lords main- tained that the Crown could not confer a new peerage of Great Britain on a Scottish peer, the ground being that the Scottish peerage was only entitled to the sixteen representative peers given it by the Act of Union, but eventually in 1782 in the case

of the duke of Hamilton this contention was given up.

The Anglo-Norman conquerors of Ireland carried with them the laws and the system of tenure to which they were accustomed

Irish Peerage.

in England, and consequently the growth of the baronage and the establishment of parliamentary government in Ireland proceeded on parallel lines with the changes which occurred in England. Until the reign of Henry VIII. the Irish were without representation in parliament, but gradually the Irish were admitted, and by the creation of new parliamentary counties and boroughs were enabled to elect representatives. In 1613 the whole country shared in representation (Ball's Legislative Systems of Ireland). Just as James I. had added many members to the Scottish peerage, so he increased the number of Irish peers.

In 1800 the Union of Great Britain and Ireland abolished the parliament of Ireland. By the Act of Union the Irish peers became entitled to elect twenty-eight of their number to repre- sent them in the House of Lords. The election is for life, and only those peers are entitled to vote at elections of representative peers who have proved their right of succession to the satisfaction of the lord chancellor, who issues his notice to that effect after each individual proof. The names of such peers are added to the voting-roll of the peerage, and when voting papers are distributed — the Irish peers do not meet for election purposes as do those of Scotland — they are sent only to those peers who have proved their right to vote. If any ciaim to the right to vote is rejected by the lord chancellor the claimant must prove his case before the Committee for Privileges (barony of Graves, J907). When an Irish peer has been elected a representative peer he receives, as a matter of course, a writ of summons at the beginning of each parliament. The great bulk of the Irish peerage ewes its existence to creations during the last two centuries, only seven of the existing peerages dating back beyond the 17th century; of the rest twenty-two were created during the year of Union, and thirty-three have been added since that date. Some hundred or more years ago ministers found the Irish peerage a useful means of political reward, in that it was possible to bestow a title of honour, with all its social prestige, and yet not to increase the numbers of the House of Lords.

On the death of a representative peer of Scotland or Ireland a vacancy occurs and a new election takes place, but in accor- dance with modern practice promotion to a United Kingdom peerage does not vacate the holder's representative position (May's Parliamentary Practice, p. n n.). Scottish and Irish peers, if representative, possess all the privileges of peerage and parliament enjoyed by peers of the United Kingdom; if non-representative all privileges of peerage, except the right to a writ of summons to attend parliament and to be present at and vote in the trial of peers. A Scottish peer, if non-representa- tive, is in the anomalous position of being disabled from serving his country in either house of parliament, but an Irish peer may sit for any House of Commons constituency out of Ireland, though while a member of the Commons his peerage privileges abate.

Though many peers possess more than one peerage, and frequently of more than one country, only that title is publicly used which is first in point of precedence. It was once argued that whenever a barony by writ came into the possession of a person already a peer of higher rank, the higher peerage " at- tracted" or overshadowed the lower, which thenceforth followed the course of descent of the dignity which had attracted it. This doctrine is now exploded and cannot be regarded as apply- ing to any case except that of the Crown (Baronies of Fitzwalter, 1660, and De Ros, 1666; Collins's Claims, 168, 261). Every peerage descends according to the limitations prescribed in its patent of creation or its charter, and where these are non- existent (as in the case of baronies by writ) to heirs-general. (See Abeyance.)

In dealing with English dignities it is essential to realize the difference between a mere title of honour and a peerage. The Crown as the fountain of honour is capable of conferring upon a subject not only any existing title of honour, but may even invent one for the purpose. So James I. instituted an order of hereditary knights which he termed baronets,

and Edward VII. created the duchess of Fife " Princess Royal "• — a life dignity. The dignities of prince of Wales, earl marshal and lord great chamberlain have been creations for centuries hereditary, and though of high court and must be social precedence, of themselves confer no right to according a seat in the House of Lords — they are not peerages. ° aw ' The grant of a peerage is a very different matter; its holder becomes thereby a member of the Upper House of Parlia- ment, and therefore the prerogative of the Crown in creat- ing such an office of honour must be exercised strictly in accordance with the law of the land. The Crown's prerogative is limited in several directions. The course of descent must be known to the law; and so, in the first

place, it follows that a peer cannot be created for life with a denial of succession to his descendants (unless it be as one of the lords of appeal in ordinary under the acts of 1876 and 1887). The courses of descent of modern patents are invariably so marked out as ultimately to fix the peerage in some male line according to the custom of primogeniture, though the immediate successor of the first holder may be a woman or even a stranger in blood. The following instances may be cited; Amabell, Baroness Lucas, was in 1816 created Countess de Grey with a limitation to the heirs-male of her sister; a nephew afterwards succeeded her and the earldom is now held by the marquess of Ripon. Other courses of descent known to the law are as follows: Fee simple, which probably operates as if to heirs-general, earldoms of Oxford (1155) and Norfolk (1135), both probably now in abeyance; and Bedford (1367), extinct; to a second son, the eldest being alive, dukedom of Dover (1708), extinct, and earldom of Cromartie (1861) called out of abeyance in 1895; a son-in-law and his heirs-male by the daughter of the first grantee, earldom of Northumberland (1747) ; to an elder daughter and her heirs-male, earldom of Roberts (1901); to an elder or younger brother and his heirs-male, viscounty of Kitchener (1902) and barony of Grimthorpe (1886). It is, however, not lawful for the Crown to make what is called a shifting limitation to a peerage, i.e. one which might vest a peerage in an individual, and then on a certain event happening (e.g. his succession to a peerage of higher rank) shift it from him to the representative of some other line. Such a limitation was held illegal in the Buckhurst case (1864). A peerage may not be limited to the grantee and ” his heirs-male for’ ever.” Such a grant was that of the earldom of Wiltes in 1398. The original grantee died without issue, but left a male heir-at-law, whose descendants in 1869 claimed the earldom, but the original limitation was held invalid.

There is no limitation on the power of the Crown as to the number of United Kingdom peerages which may be created. As to Scotland, the Act of Union with that country operates to prevent any increase in the number of Scottish peerages, and consequently there have been no creations since 1707, with the result that the Scottish peerage, as a separate order, is gradually approaching extinction. The Irish peerage is supposed always to consist of one hundred exclusively Irish peers, and the Crown has power to grant Irish peerages up to the limit. When the limit is reached no more peerages may be granted until existing ones become extinct or their holders succeed to United Kingdom peerages. Only four lords of appeal in ordinary may hold office at any one time. The number of archbishops and bishops capable of sitting in the House of Lords is fixed by various statutes at twenty-six, but, as

pointed out previously, the spiritual lords are not now regarded as peers.

Since party government became the rule, the new peerages have usually been created on the recommendation of the prime minister of the day, though the Crown, especially in considering the claims of royal blood, is believed N um t, e rs. in some instances to take its own course; and constitutionally such action is entirely legal. By far the greater number of peerage honours granted during the last two centuries have been rewards for political services. Usually these services are well known, but there exists several instances in which_ the reasons for conferring the honour have not been quite clear. Until the reign of George III. the peerage was

comparatively small, but that monarch issued no fewer than 388 patents of peerage. Many of these have become extinct or obscured by higher titles, but the general tendency is in the direction of a steady increase, and where the peers of Tudor times might be counted by tens their successors of 1910 were numbered in hundreds. The full body would be 546 English peers. There are also 12 ladies holding English peerages. The Irish peerage has 175 members, but 82 of these are also peers of the United Kingdom, leaving 28 representative and 65 without seats in the House of Lords. Of 87 Scottish peers 51 hold United Kingdom peerages, the remainder consisting of 16 representative and 20 without seats.

As centuries have gone by and customs changed, many privileges once keenly asserted have either dropped out of

use or been forgotten. The most important now ofPeerate. * n being are a seat in the House of Lords and the

right to trial by peers. The right to a seat in parliament is one sanctioned by centuries of constitutional usage. The right of a peer in England to a seat in parliament was not, as pointed out in the early part of this article, entirely admitted by the Crown until late in the Plantagenet period, the king's pleasure as to whom he should summon always having been a very material factor in the question. Charles I. made a deliberate attempt to recover the ancient discretion of the Crown in the issue of writs of summons. The earl of Bristol was the subject of certain treasonable charges, and though he was never put

on his trial the king directed that his writ of summons should not issue. The excluded peer petitioned the Lords, as for a breach of privilege, and a com- mittee to whom the matter was referred reported that there was no instance on record in which a peer capable of sitting in parliament had been refused his writ. There was a little delay, but the king eventually gave in, and the earl had his writ (Lords Journals, iii. 544).

At the beginning of a new parliament every peer entitled receives a writ of summons issued under the authority of the Great Seal; he presents his writ at the table of the House of Lords on his first attendance, and before taking the oath. If the peer be newly created he presents his letters-patent creating the peerage to the lord chancellor on the woolsack, together with the writ of summons which the patent has evoked. A peer on succession presents his writ in the ordinary way, the Journals recording, e.g. that Thomas Walter, Viscount Hampden, sat first in Parliament after the death of his father (Lords Journals, cxxxix. 4). The form of writ now issued (at the beginning of a parliament: for the variation when parliament is sitting see Lords Journals, cxxxix. 185) corresponds closely to that in use so long ago as the 14th century. It runs as follows: —

George the Fifth by the Grace of God of the United Kingdom of Great Britain and Ireland and of the British Dominions beyond the seas King Defender of the Faith to our right trusty and well- beloved Greeting Whereas by the advice and consent of our Council for certain arduous and urgent affairs concerning us the state and the defence of our said United Kingdom and the Church we have ordered a certain Parliament to be holden at our City of Westminster on the . . . day of . . . next ensuing and there to treat and have conference with the prelates great men and peers of our realm We strictly enjoining command you upon the faith and allegiance by which you are bound to us that the weightiness of the said affairs and imminent perils considered (waiving all excuses) you be at the said day and place personally present with us and with the said prelates great men and peers to treat and give your counsel upon the affairs aforesaid. And this as you regard us and our honour and the safety and defence of the said United Kingdom and Church and despatch of the said affairs in no wise do you omit.

Formerly all peers were required to attend parliament, and there are numerous recorded instances of special grants of leave of absence, but nowadays there is no compulsion.

After the right to a summons the principal privilege possessed

Pe rsTri d ˆ a P eer i s hi s right to be tried by his peers on a

bv Peers. charge of treason or felony. Whatever the origin

of this right, and some writers date it back to

Saxon times (Trial of Lord Morley, 1678, State Trials vii.

145), Magna Carta has always been regarded as its con- firmatory authority. The important words are: —

” nullus liber homo capiatur imprisonetur aut disseisiatur de libero tenemento suo vel libertatibus seu liberis consuetudinibus suis, aut utlagetur aut exuletur nee aliquo modo distruatur nee dominus rex super ipsum ibit nee super eum mittet nisi per legale judicium parium suorum vel per legem terrae.”

The peers have always strongly insisted on this privilege of trial by their own order, and several times the heirs of those wrongly condemned recovered their rights and heritage on the ground that there had been no proper trial by peers (R.D.P., v. 24). In 1442 the privilege received parliamentary con- firmation (stat. 20 Henry VI. c. 9). If parliament is sitting the trial takes place before the House of Lords in full session, i.e. the court of our lord the king in parliament, if not then before the court of the lord high steward. The office of lord high steward was formerly hereditary, but has not been so for centuries and is now only granted pro hoc vice. When necessity arises the Crown issues a special commission naming some peer (usually the lord chancellor) lord high steward pro hac vice (Blackstone’s Comm. iv. 258). When a trial takes place in full parliament a lord high steward is also appointed, but his powers there are confined to the presidency of the court, all the peers sitting as judges of law as well as of fact. Should the lord high steward be sitting as a court out of parliament he summons a number of peers to attend as a jury, but rules alone on all points of law and practice, the peers present being judges of fact only. Whichever kind of trial is in progress it is the invariable practice to summon all the judges to attend and advise on points of law. The distinction between the two tribunals was fully discussed and recognized in 1760 (Trial of Earl Ferrers, Foster’s Criminal Cases, 139). The most recent trial was that of Earl Russell for bigamy (reported 1901, A.C. 446). Among others are the Kilmarnock, Cromarty and Balmerino treason trials in parliament in 1746 (State Trials xviii. 441), and in the court of the lord high steward, Lord Morley (treason, 1666, State Trials vi. 777), Lord Cornwallis (murder, 1678 State Trials vii. 145), Lord Delamere (1686, treason, State Trials

xi. 510). Recently some doubt has been expressed as to the origin of the court of the lord high steward. It is said that the historical document upon which the practice is founded is a forgery. The conflicting views are set forth in Vernon Harcourt's His Grace the Steward and Trial of Peers, p. 429, and in Pike's Constitutional History of the House of Lords, p. 213. In any case, whatever its historical origin, the court for centuries as a matter of fact has received full legal recognition as part of the constitution. The right to trial by peers extends only to cases of treason and felony, and not to those of misdemeanour; nor can it be waived by any peer (Co. 3 Inst. 29; Kelyng's Rep. 56). In the case of R. v. Lord Graves (1887), discussed in Hansard's Parliamentary Debates, 3rd series, vol. cccx. p. 246, Lord Halsbury points out that the question of trial by peers is one of jurisdiction established by law rather than a claim of privilege in the discretion of the accused. Scottish and Irish peers, whether possessing seats in the House of Lords or not, are entitled to trial by peers, the same procedure being followed as in the case of members of the House of Lords. Peers with a seat in the House of Lords possess practically the same parliamentary privileges as do members of the House of Commons. Among other privileges peculiar to themselves they have the right of personal access to the sovereign (Anson's Law of the Constitution, i. 227). In the House of Lords, when a resolution is passed contrary to his sentiments, any peer, by leave of the house, may " protest," that is, enter his dissent on the journals of the house (Blackstone, Comm. i. 162). Formerly a peer might vote by proxy (Blackstone, ibid.), but since 1868 there has been a standing order discontinuing this right. In accordance with resolutions passed by the two houses, neither house has power by any vote or declaration to clothe itself with new privileges unknown to the law and customs of parliament (Commons Journal, xiv. 555). Peeresses and non-representative peers of Ireland and Scotland have,

with the exception of the right to sit in the House of Lords and its attendant parliamentary privileges, every peerage privilege: a widowed peeress retains her privilege of peerage while un- married, but loses it if she marries a commoner (Co. Litt. 166; Cowley v. Cowley [iqoi] A.C. 450). Dissolution of marriage probably deprives a peeress of all peerage privileges which she acquired by marriage.

The children of peers are commoners. The eldest son of a peer of the rank of earl (and above) is usually known socially by the Position of

name of his father's next peerage, but the courtesy Families of na ture of such title is clearly indicated in every public Peers. or legal document, the phraseology employed being

" John Smith, Esq., commonly known as Viscount Blackacre." Several cases are on record in which peers' eldest sons have actually borne courtesy titles not possessed as peerage honours by their fathers, but inasmuch as such are only accorded by courtesy, no question of peerage privilege arises. The younger sons of dukes and marquesses are entitled to the prefix " Lord " before their Christian names, and all the daughters of earls as well as of dukes and marquesses are entitled similarly to style them- selves " Lady," on the principle that all the daughters are equal in rank and precedence. The younger sons of earls and all the younger children of viscounts and barons are entitled to the prefix Honourable." Usually when the direct heir of a peer dies his children are given, by the Crown, on the death of the peer, the courtesy titles and precedence they would have enjoyed had their father actually succeeded to the peerage.

An alien may be created a peer, but while remaining an alien .cannot sit in the House of Lords, nor, if a Scottish or Irish peer, can he vote at elections for representative peers. Peer- ~™ ages may be created (1) by writ of summons, (2) by

Peerages. p a t e nt. The writ of summons method is not now used except in the case of calling up an eldest son in the barony of his father. This does not create a new peerage but only accelerates the heir's appearance in the House of Lords. On the father's death the peerage remains vested in the son. Should the son die without heir the peerage revests in the father. The invariable method of creation in all ordinary cases is by patent. The letters patent describe the name of the dignity, the person upon whom it is conferred, and specify its course of descent.

Claims to peerages are of two kinds: (1) of right, (2) of grace. In theory the Crown, as the fountain of honour, might settle any claim without reference to the House of Lords and Culms to j ssue a writ f summons to its petitioner. This would Peerages. not; ; n an y wa y p reven t tfje House of Lords from examining the patent and writ of summons when the favoured petitioner or any heir claiming through him came to take his seat. If of opinion that the patent was illegal the house might refuse admittance, as it did in the Wensleydale case. In the case of a petitioner who has persuaded the Crown to terminate in his favour as a co-heir the abeyance of an ancient barony and who has received his writ of summons, the-' matter is more difficult. The house

cannot refuse to admit any person properly summoned by the Crown, as the prerogative is unlimited in point of numbers; but it can take into account the precedence of the newcomer. If he has an old barony he naturally expects its proper place on the bench of barons; but if the house thought fit they might compel him to prove his pedigree before according any precedence. If he refused to do this they would still be bound to admit him, but it would be as the junior baron of the house.with a peerage dating, for parliamentary purposes, from the day of his summons. The general result is that the Crown, unless there can be no question as to pedigree, seldom terminates an abeyance without referring the matter to the House of Lords, and invariably so refers all claims which are disputed or which involve any question of law. 1 The procedure is as follows: The claimant petitions the Crown through the home secretary, setting forth his pedigree and stating the nature of his claim. The Crown then refers the petition to its legal adviser, the attorney-general. The petitioner then in course of time appears before the attorney-general with his proofs. Finally the attorney-general reports that a prima facie case is, or is not, made out. If a case be made out, the Crown, if it does not take immediate action, refers the whole matter to the House of Lords, who pass it on to their Committee for Privileges for examination and report.

The Committee for Privileges, which for peerage claims is usually constituted of the law lords and one or two other lords interested Committee in peerage history, sits as an ordinary court of justice for Privl- an d follows all the rules of law and evidence. The leges. attorney-general attends as adviser to the committee

and to watch the interests of the Crown. According to the nature of the case the Committee reports to the house, and the house to the Crown, that the petitioner (if successful) (1) has made out his claim and is entitled to a writ of summons, or (2)

1 This was not done in the case of the earldom of Cromartie called out of abeyance in 1895. The holder of the title being a lady the house has had, as yet, no opportunity of considering the validity of the Crown's action.

has proved his co-heirship to an existing peerage, and has also proved the descent of all existing co-heirs. In the first case the writ of summons is issued forthwith, but the second, being one of abeyance, is a matter for the pleasure of the Crown, which need not be exercised at all, but, if exercised, may terminate the abeyance in favour of any one of the co-heirs. The seniority of a co-heir (though this alone is of little moment), his power to support the dignity, and the number of

existing co-heirs, are all factors which count in the chances of success.

Reference has already been made in the earlier part of this article, to the reply of Bishop Peter de Roches to the English barons who claimed trial by their peers, and, as was suggested Peers of the bishop probably had in his mind the peers of France. Prance. Possibly the word pares, as eventually used in England, was borrowed from this source, but this is uncertain. The great men known originally as the twelve pairs de France, were the feudal holders of large territories under the nominal sway of the king of France. They were the (archbishop) duke of Rheims, the (bishop) dukes of Langres and Laon, the (bishop) counts of Beauvais, Noyon and Chalons, the dukes of Burgundy, Normandy and Aquitaine, and the counts of Flanders, Toulouse and Champagne. These magnates, nominally feudatories, were practically independent rulers, and their position can in no way be compared to that of the English baronage. It is said that this body of peers was in- stituted in the reign of Philip Augustus, though some writers even ascribe its origin to Charlemagne. Some of the peers were present at Philip's coronation in 1 179, and later again at the alleged trial of John of England when his fief of Normandy,, was adjudged forfeit to the French Crown.

As the central power of the French kings grew, the various fiefs lost their independence and became united to the Crown, with the exception of Flanders which passed into the hands of the emperor Charles V. In the 14th century the custom arose for the sovereign to honour his more important nobles by granting them the title of Peer of France. At first the grant was confined to the royal dukes, but later it was conferred on others, amongst whom late in the 17th century appears the archbishop of Paris. To several counties and baronies the honour of a peerage was added, but most of these eventually became reunited with the Crown. As a legislative body a chamber of peers in France was first founded by Louis XVIII. in 1814; it was hereditary and modelled on the English House of Lords. The revolution of 1830 reduced its hereditary quality to life tenure, and in the troubles of 1848 the chamber itself finally disappeared.

Austria, Hungary and Portugal are other countries possessing peerages which to some extent follow the English model . In Austria there is a large hereditary nobility and those other members of it in whose families the legislative dignity peerages. is hereditary by nomination of the emperor sit in the Herrenhaus or Austrian Upper Chamber, together with certain pre- lates and a large number of nominated life-members. In Hungary all those nobles who possess the right of hereditary peerage (as admitted by the act of 1885 and subsequent

acts) and who pay a land tax of cen iin value, are members of the House of Magnates, of which they for 1 a large majority, the remainder of the mem- bers being Romai Catholic prelates, representatives of Protestant churches and life eers. In Portugal until recent years the House of Peers was an hereditary body, but it is now practically a chamber of life-peers. (G. E.*)

PEERLKAMP, PETRUS HOFMAN (1786-1865), Dutch classical scholar and critic, descended from a family of French refugees named Perlechamp, was born at Groningen on the 2nd of February 1786. He was professor of ancient literature and universal history at Leiden from 1822 to 1849, when he resigned his post and retired to Hilversum near Utrecht, where he died on the 27th of March 1865. He was the founder of the subjective method of textual criticism, which consisted in rejecting in a classical author whatever failed to come up to the standard of what that author, in the critic's opinion, ought to have written. His ingenuity in this direction, in which be went much farther than Bentley, was chiefly exercised oh the Odes of Horace (the greater part of which he declared spurious), and the Aencid of Virgil.- He also edited the Ars poetica and Satires of Horace, the Agricola of Tacitus, the romance of Xenophon of Ephesus, and was the author of a history of the Latin poets of the Netherlands {De vita, doclrina, et facilitate Nederlandorum qui carmina latino composuerunt, 1838).

See L. M tiller, Gesch. der Massischen Philologie in den Niederlanden (1869), and J. E. Sandys, Hist, of Class. Schol. (1908), iii. 276.

PEESEMSKY, ALEXEY FEOFILACTOVICH (1820-1881), Russian novelist, was born on his father's estate, in the province of Kostroma, on the ioth/22nd of March 1820. In his auto- biography he describes his family as belonging to the ancient

Russian nobility, but his more immediate progenitors were all very poor, and unable to read or write. His grandfather ploughed the fields as a simple peasant, and his father, as Peesemsky himself said, was washed and clothed by a rich relative, and placed as a soldier in the army, from which he retired as a major after thirty years' service. During childhood Peesemsky read eagerly the translated works of Walter Scott and Victor Hugo, and later those of Shakespeare, Schiller, Goethe, Rousseau, Voltaire and George Sand. From the gymnasium of Kostroma he passed through Moscow University, and in 1884 entered

the government service as a clerk in the office of the Crown domains in his native province. Between 1854 and 1872, when he finally quitted the civil service, he occupied similar posts in St Petersburg and Moscow. His early works exhibit a profound disbelief in the higher qualities of humanity, and a disdain for the other sex, although he appears to have been attached to a particularly devoted and sensible wife. His first novel, Boyarstchina, was forbidden for its unflattering description of the Russian nobility. His principal novels are Tufak ("A Muff"), 1850; Teesicha doush ("A Thousand Souls "), 1862, which is considered his best work of the kind; and Vzbalomoucheneoe more ("A Troubled Sea"), giving a picture of the excited state of Russian society about the year 1862. He also produced a comedy, Gorkaya scudbina ("A Bitter Fate"), depicting the dark sides of the Russian peasantry, which obtained for him the Ouvaroff prize of the Russian Academy. In 1856 he was sent, together with other literary men, to report on the ethnographical and commercial condition of the Russian interior, his particular field of inquiry having been Astrakhan and the region of the Caspian Sea. His scepticism in regard to the liberal reforms of the 'sixties made him very unpopular among the more progressive writers of that time. He died at Moscow on the 2nd of February 1881 (Jan. 21, Russian style).

PEGASUS (from Gr. 7177765, compact, strong), the famous winged horse of Greek fable, said to have sprung from the trunk of the Gorgon Medusa when her head was cut off by Perseus. 3ellerophon caught him as he drank of the spring Peirene on the Acrocorinthus at Corinth, or received him tamed and bridled at the hands of Athena (Pindar, 01. xiii. 63; Pausanias ii. 4). Mounted on Pegasus, Bellerophon slew the Chimaera and overcame the Solymi and the Amazons, but when he tried to fly to heaven on the horse's back he threw him and continued his heavenward course (Apollodorus ii. 3). Arrived in heaven, Pegasus served Zeus, fetching for him his thunder and lightning (Hesiod, Theog. 281). Hence some have thought that Pegasus is a symbol of the thundercloud. According to O. Gruppe (Griechischc Mythologie, i. 75, 123) Pegasus, like Arion the fabled offspring of Demeter and Poseidon, was a curse-horse, symbolical of the rapidity with which curses were fulfilled. In later legend he is the horse of Eos, the morning. The erroneous derivation from irrjyrj, " a spring of water," may have given birth to the legends which connect Pegasus with water; e.g. that his father was Poseidon, that he was born at the springs of Ocean, and that he had the power of making springs rise from the ground by a blow of his hoof. When Mt Helicon, enchanted by the song of the Muses, began to rise to heaven, Pegasus stopped its ascent by stamping on the ground (Antoninus Liberalis 9), and where

he struck the earth Hippocrene (horse- spring), the fountain of the Muses, gushed forth (Pausanias ii. 31, ix. 31). But there are facts that speak for an independent mythological connexion between horses and water, e.g. the sacredness of the horse to Poseidon, the epithets Hippios and Equester applied to Poseidon and Neptune, the Greek fable of the origin of the first horse (produced by Poseidon striking the ground with his trident), and the custom in Argolis of sacrificing horses to Poseidon by drowning them in a well. From his connexion with Hippocrene Pegasus has come to be regarded as the horse of the Muses and hence as a symbol of poetry. But this is a modern attribute of Pegasus, not known to the ancients, and dating only from the Orlando innamorato of Boiardo.

See monograph by F. Hannig, Breslauer philologische Abhani- lungen (1902), vol. viii., pt. 4.

PEGAU, a town of Germany, in the kingdom of Saxony, situated in a fertile country, on the Elster, 18 m. S.W. from Leipzig by the railway to Zeitz. Pop. (1905), 5656. It has two Evangelical churches, that of St Lawrence being a fine Gothic structure, a 16th-century town-hall; a very old hospital and an agricultural school. Its industries embrace the manu- facture of felt, boots and metal wares.

Pegau grew up round a monastery founded in 1096, but does not appear as a town before the close of the 12th century. Markets were held here and its prosperity was further enhanced by its position on a main road running east and west. In the monastery, which was dissolved in 1539, a valuable chronicle was compiled, the Annates pegavienses, covering the period from 1039 to 1227.

See Fiissel, Anfang und Ende des Klosters St Jacob zu Pegau (Leipzig, 1857) ; and Dillner, Grossel and Gtinther, Altes und neues aus Pegau (Leipzig, 1905). The Annates pegavienses are published in Bd. XVI. of the Monumenta Germaniae historica. Scriptores.

PEGMATITE (from Gr. itriyˆa, a bond), the name given by Haiiy to those masses of graphic granite which frequently occur in veins. They consist of quartz and alkali feldspars in crystalline intergrowth (see Petrology, Plate II. fig. 6). The term was subsequently used by Naumann to signify also the coarsely crystalline veins rich in quartz, feldspar and muscovite, which often in great numbers ramify through outcrops of granite and the surrounding rocks. This application of the name has now obtained general acceptance, and has been extended by many authors to include vein-rocks of similar structure and geological relationships, which occur with syenites, diorites and gabbros. Only a

few of these pegmatites have graphic structure or mutual intergrowth of their constituents. Many of them are exceedingly coarse-grained; in granite-pegmatites the feldspars may be several feet or even yards in diameter, and other minerals such as apatite and tourmaline often occur in gigantic crystals. Peg- matites consist of minerals which are found also in the rocks from which they are derived, e.g. granite-pegmatites contain principally quartz and feldspar while gabbro-pegmatites consist of diallage and plagioclase. Rare minerals, however, often occur in . these veins in exceptional amount and as very perfect crystals. The minerals of the pegmatites are always those which were last to separate out from the parent rock. As the basic minerals are the first formed the pegmatites contain a larger proportion of the acid or more siliceous components which were of later origin. In granite-pegmatites there is little hornblende, biotite or sphene, but white mica, feldspar and quartz make up the greater part of the veins. In gabbro-pegmatites olivine seldom occurs, but diallage and plagioclase occur in abundance. In this respect the pegmatites and aplites agree; both are of more acid types than the average rock from which they came, but the pegmatites are coarsely crystalline while the aplites are fine-grained. Segregations of the early minerals of a rock are frequent as nodules, lumps and streaks scattered through its mass, and often dikes of basic character (lampro- phyres, &c.) are injected into the surrounding country. These have been grouped together as intrusions of melanocrale facies (yueXas, black, tcparos, strength, predominance) because in them the dark basic minerals preponderate. The aplites and pegmatites, on the other hand, are leucocrate (hevKos, white), since they are of acid character and contain relatively large amounts of the white minerals quartz and feldspar.

Pegmatites are associated with plutonic or intrusive rocks and were evidently formed by slow crystallization at considerable depths below the surface: nothing similar to them is known in lavas. They are very characteristic of granites, especially those which contain muscovite and much alkali feldspar; in gabbros, diorites and syenites piegmatite dikes are comparatively rare. The coarsely crystalline structure may be ascribed to

slow crystallization; and is partly the result of the rocks, in

which the veins lie, having been at a high temperature when the

minerals of the pegmatites separated out. In accordance I with this we find that pegmatite veins are nearly always restricted

to the area occupied by the parent rock (e.g. the granite), or to its immediate vicinity, and within the zone which has been greatly heated by the plutonic intrusion, viz. the contact aureole. Another very important factor in producing the coarse crystal- lization of the pegmatite veins is the presence of abundant water vapour and other gases which served as mineralizing agents and facilitated the building together of the rock molecules in large crystalline individuals.

Proof that these vapours were important agents in the forma- tion of pegmatites is afforded by many of the minerals con- tained in the veins. Boron, fluorine, hydrogen, chlorine and other volatile substances are essential components of some of these minerals. Thus tourmaline, which contains boron and fluorine, may be common in the pegmatites but rare in the granite itself. Fluorine or chlorine are present in apatite, another frequent ingredient of granite pegmatites. Muscovite and gilbertite both contain hydrogen and fluorine; topaz is rich in fluorine also and all of these are abundant in some pegmatites. The stimulating effect which volatile substances exert on crystallizing molten masses is well known to experi- mental geologists who, by mixing tungstates and fluorides with fused powders, have been able to produce artificial minerals which they could not otherwise obtain. Most pegmatites are truly igneous rocks so far as their composition goes, but in their structure they show relations to the aqueous mineral veins. Many of them for example have a comby structure, that is to say, their minerals are columnar and stand perpendicular to the walls of the fissure occupied by the vein. Sometimes they have a banding owing to successive deposits having been laid down of different character; mica may be external, then feldspar, and in the centre a leader or string of pure quartz. In pegmatite veins also there are very frequently cavities or vugs, which are lined by crystals with very perfect faces. These bear much resemblance to the miarolitic or drusy cavities common in granite, and like them were probably filled with the residual liquid which was left over after the mineral substances were deposited in crystals.

Pegmatites are very irregular not only in distribution, width and persistence, but also in composition. The relative abun- dance of the constituent minerals may differ rapidly and much from point to point. Sometimes they are rich in mica, in enormous crystals for which the rock is mined or quarried (India). Other pegmatites are nearly pure feldspar, while others are locally (especially near their terminations) very full of quartz. They may in fact pass into quartz veins (alaskites) some of which are auriferous (N. America). Quartz veins of another

type are very largely developed, especially in regions of slate and phyllite; they are produced by segregation of dissolved silica from the country rock and its concentration into cracks produced by stretching of the rock masses during folding. In these segregation veins, especially when the beds are of feldspathic nature, crystals of albite and orthoclase may appear, in large or small quantity. In this v/ay a second type of pegmatite (segregation pegmatite) is formed which is very difficult to distinguish from true igneous veins. These two have, however, much in common as regards the conditions under which they were formed. Great pressures, presence of water, and a high though not necessarily very high temperature were the principal agencies at work.

Granite pegmatites are laid down after their parent mass had solidified and while it was cooling down : sometimes they contain such minerals as garnet, not found in the main mass, and showing that the temperature of crystallization was comparatively low. Another special feature of these veins is the presence of minerals containing precious metals or rare earths. Gold occurs in not a few cases; tin in others, while sulphides such as copper pyrites are found also. Beryl is the commonest of the minerals of the second group: spodumene is another example, and there is much reason to hold that diamond is a native of some of the pegmatites of Brazil and India, though this is not yet incontestably proved. The syenite- pegmatites of south Norway are remarkable both for their coarse crystallization and for the great number of rare minerals they have yielded. Among these may be mentioned laavenite, rinkite, rcsen- buschite, mosandrite, pyrochlore, perofskite and lamprophyllite.

(J. S. F.)

PEGNITZ, a river of Germany. It rises near Lindenhard in Upper Franconia (Bavaria) from two sources. At first it is called the Fichtenohe, but at Buchau it takes the name of the Pegnitz, and flowing in a south-westerly direction disappears below the small town of Pegnitz in a mountain cavern. It emerges through three orifices, enters Middle Franconia, and after flowing through the heart of the city of Nuremberg falls into the Regnitz at Ftirth.

See Specht, Das Pegnitzgebiet in Bezug auf seinen Wasserhaushalt (Munich, 1905).

The Pegnitz Order (Order of the society of Pegnitz shepherds), also known as ” the crowned flower order on the Pegnitz,” was one of the societies founded in Germany in the course of the 17th century for the

purification and improvement of the German language, especially in the domain of poetry. Georg Philipp Harsdbrffer and Johann Klaj instituted the order in Nuremberg in 1644, and named it after the river. Its emblem was the passion flower with Pan's pipes, and the motto Mil Nutzen erfreulich, or Alle zu einem Ton einslimmig. The members set themselves the task of counteracting the pedantry of another school of poetry by imagination and gaiety, but lacking imagination and broad views they took refuge in allegorical subjects and puerile trifling. The result was to debase rather than to raise the standard of poetic art in Germany. At first the meetings of the order were held in private grounds, but in 1681 they were transferred to a forest near Kraftshof or Naunhof. In 1794 the order was reorganized, and it now exists merely as a literary society.

See Tittman, Die nurnberger Dichterschule (Gottingen, 1847) ; and the Festschrift zur 250-jahrigen Jubetfeier des pegnesischen Blumenordens (Nuremberg, 1894).

PEGOLOTTI, FRANCESCO BALDUCCI (ft. 1315-1340), Florentine merchant and writer, was a factor in the service of the mercantile house of the Bardi, and in this capacity we find him at Antwerp from 1315 (or earlier) to 1317; in London in 13 1 7 and apparently for some time after; in Cyprus from 1324 to 1327, and again (or perhaps in unbroken continuation of his former residence) in 1335. In this last year he obtained from the king of Little Armenia (i.e. medieval Cilicia, &c.) a grant of privileges for Florentine trade. Between 1335 and 1343, probably in 1339-1340, he compiled his Libro di divisamenti di paesi e di misuri di mercatanzie e d'altre cose bisognevoli di sapere a' mercatanti, commonly known as the Pratica delta mercatura (the name given it by Pagnini). Beginning with a sort of glossary of foreign terms then in use for all kinds of taxes or payments on merchandise as well as for " every kind of place where goods might be bought or sold in cities," the Pratica next describes some of the chief trade routes of the 14th century, and many of the principal markets then known to Italian merchants; the imports and exports of various important commercial regions; the business customs prevalent in each of those regions; and the comparative value of the leading moneys, weights and measures. The most distant and extensive trade routes described by Pegolotti are: (1) that from Tana or Azov to Peking via Astrakhan, Khiva, Otrar, Kulja and Kanchow (Gittarchan, Organci, Ottrarre, Armalecco and Camexu in the Pratica) ; (2) that from Lajazzo on the Cilician coast to Tabriz in north Persia via Sivas, Erzingan and Erzerum (Salvastro, Arzinga and Arzerone); (3) that from Trebizond to Tabriz. Among the markets enumerated are: Tana, Constantinople, Alexandria, Damietta, and the ports of Cyprus and the Crimea.

Pegolotti's notices of ports on the north of the Black Sea are very valuable; his works show us that Florentine exports had now gained a high reputation in the Levant. In other chapters an account is given of 14th-century methods of packing goods (ch. 29); of assaying gold and silver (ch. 35); of shipment; of "London in England in itself" (ch. 62); of monasteries in Scotland and England (" Scotland of England," Scozia di Inghilterra) that were rich in wool (ch. 63). Among the latter are Newbattle, Balmerino, Gupar, Dunfermline, Dundrennan, Glenluce, Coldingham, Kelso, Newminster near Morpeth, Furness, Fountains, Kirkstall, Kirstead, Swineshead, Sawley

and Calder. Pegolotti's interest in England and Scotland is chiefly connected with the wool trade.

There is only one MS. of the Pratica, viz. No. 2441 in the Riccar- dian Library at Florence (241 fols., occupying the whole volume), written in 1471 ; and one edition of the text, in vol. iii. of Gian Francesco Pagnini's Delia Decima e delle altre gravezze imposte dal commune di Firenze (Lisbon and Lucca — really Florence — 1766) ; Sir Henry Yule, Cathay, ii. 279-308, translated into English the most interesting sections of Pegolotti, with valuable commentary (London, Hakluyt Society, 1866). See also W. Heyd, Commerce du Levant, ii., 12, 50, 58, 78-79, 85-86, 112-119 (Leipzig, 1886); H. Kiepert, in Sitzungsberichte der philos.-hist. CI. der berliner Akad., p. 901, &c. (Berlin, 1 881); C. R. Beazley, Dawn of Modem Geography, iii. 324-332, 550, 555 (Oxford, 1906).

PEGU, a town and former capital of Lower Burma, giving its name to a district and a division. The town is situated on a river of the same name, 47 m. N.E. of Rangoon by rail; pop. (1901), 14,132. It is still surrounded by the old walls, about 40 ft. wide, on which have been built the residences of the British officials. The most conspicuous object is the Shwe- maw-daw pagoda, 324 ft. high, considerably larger and even more holy than the Shwe-dagon pagoda at Rangoon. Pegu is said to have been founded in 573, as the first capital of- the Talaings; but it was as the capital of the Toungoo dynasty that it became known to Europeans in the 16th century. About the middle of the 18th century it was destroyed by Alompra; but it rose again, and was important enough to be the scene of fighting in both the first and second Burmese Wars. It gave its name to the province (including Rangoon) which was annexed by the British in 1852.

The district, which was formed in 1883, consists of an alluvial tract between the Pegu Yoma range and the Sittang river: area, 4276 sq. m.; pop. (1901), 339,572, showing an increase of 43% in the decade. Christians numbered nearly 9000, mostly Karens. Almost the only crop grown is rice, which is exported in large quantities to Rangoon. The district is traversed by the railway, and also crossed by the Pegu-Sittang canal, navi- gable for 85 m., with locks.

The division of Pegu comprises the five districts of Rangoon city, Hanthawaddy, Tharrawaddy, Pegu and Prome, lying east of the Irrawaddy: area 13,084 sq. m.; pop. (1901), 1,820,638.

Pegu has also given its name to the Pegu Yoma, a range of hills running north and south for about 200 m., between the Irrawaddy and Sittang rivers. The height nowhere exceeds 2000 ft. but the slopes are steep and rugged. The forests yield teak and other valuable timber. The Pegu river, which rises in this range, falls into the Rangoon river just below Rangoon city, after a course of about 180 m.

PEILE, JOHN (1838-1910), English philologist, was born at Whitehaven on the 24th of April 1838. He was educated at Repton and Christ's College, Cambridge. After a distinguished career (Craven scholar, senior classic and chancellor's medallist), he became fellow and tutor of his college, reader of comparative philology in the university (1884-1891), and in 1887 was elected master of Christ's. He took a great interest in the higher education of women and became president of Newnham College. He was the first to introduce the great philological works of George Curtius and Wilhelm Corssen to the English student in his Introduction to Greek and Latin Etymology (1869). He died at Cambridge on the 9th of October 1910, leaving practically completed his exhaustive history of Christ's College.

PEINE, a town of Germany, in the Prussian province of Hanover, 16 m. by rail N.W. of Brunswick, on the railway to Hanover and Hamburg. Pop. (1905), 15,421. The town has a Roman Catholic and a Protestant church and several schools. Its industries include iron and steel works, breweries, distilleries and brickyards, and the manufacture of starch, sugar, malt, machinery and artificial manure. There are also large horse and cattle markets held here. Peine was at one time a strongly fortified place, and until 1803 belonged to the bishopric of Hildesheim.

PEINE FORTE ET DURE (French for "hard and severe punishment "), the term for a barbarous torture inflicted on those who, arraigned of felony, refused to plead and stood silent, or

challenged more than twenty jurors, which was deemed a con- tumacy equivalent to a refusal to plead. By early English law a prisoner, before he could be tried, must plead ” guilty ” or ” not guilty.” Before the 13th century it was usual to imprison and starve till submission, but in Henry IV. ‘s reign the peine was employed. The prisoner was stretched on his back, and stone or iron weights were placed on him till he either submitted or was pressed to death. Pressing to death was abolished in 1772; ” standing mute ” on an arraignment of felony being then made equivalent to conviction. By an act of 1828 a plea of ” not guilty ” was to be entered against any prisoner refusing to plead, and that is the rule to-day. An alternative to the peine was the tying of the thumbs tightly together with whip- cord until pain forced the prisoner to speak. This was said to be a common practice at the Old Bailey up to the 19th century.

Among recorded instances of the infliction of the peine are: Juliana Quick (1442) for high treason in speaking derisively of Henry VI.; Margaret Clitherow, “the martyr of York” (1586); Walter Calverly, of Calverly, Yorks, for the murder of his children (1605) ; and Major Strangways at Newgate, charged with murder of his brother-in-law (1657). In this last case it is said that upon the weights being placed in position several cavalier friends of Strang- ways sprang on his body and put him out of his pain. In 172 1 one Nathaniel Hawes lay under a weight of 250 lb for seven minutes, finally submitting. The peine was last employed in 1 741 at Cambridge assizes, when a prisoner was so put to death ; the penalty of thumb-tying having first been tried. In 1692 at Salem, Massa- chusetts, Giles Corey, accused of witchcraft, refusing to plead, was pressed to death. This is believed to be the only instance of the infliction of the penalty in America.

PEIPUS, or Chudskoye Ozero, a lake of north-west Russia, between the governments of St Petersburg, Pskov, Livonia and Esthonia. Including its southern extension, sometimes known as Lake Pskov, it has an area of 1356 sq. m. Its shores are flat and sandy, and in part wooded; its waters deep, and they afford valuable fishing. The lake is fed by the Velikaya, which enters it at its southern extremity, and by the Embach, which flows in half way up its western shore; it drains into the Gulf of Finland by the Narova, which issues at its north-east corner.

PEIRAEUS, or Piraeus (Gr. Yleipaitbs), the port town of Athens, with which its history is inseparably connected. Pop. (1907), 67,982. It consists of a rocky promontory, contain- ing three natural harbours, a large one on the north-west which is still one of the chief commercial harbours of the Levant, and two smaller ones on the east, which were

used chiefly for naval purposes. Themistocles was the first to urge the Athenians to take advantage of these harbours, instead of using the sandy bay of Phaleron; and the fortification of the Peiraeus was begun in 493 B.C. Later on it was connected with Athens by the Long Walls in 460 B.C. The town of Peiraeus was laid out by the architect Hippodamus of Miletus, probably in the time of Pericles. The promontory itself consisted of two parts — the hill of Munychia, and the projection of Acte; on the opposite side of the great harbour was the outwork of Eetioneia. The most stirring episode in the history of the Peiraeus is the seizure of Munychia by Thrasybulus and the exiles from Phyle, and the consequent destruction of the ” 30 tyrants ” in 404 B.C. The three chief arsenals of the Peiraeus were named Munychia, Zea and Cantharus, and they contained galley slips for 82, 196 and 94 ships respectively in the 4th century B.C.

See under Athens. Also Angelopoulos, Htpi n«pv airov (Athens, 1898).

PEIRCE, BENJAMIN (1809-1880), American mathematician and astronomer, was born at Salem, Massachusetts, on the 4th of April 1809. Graduating at Harvard College in 1829, he became mathematical tutor there in 1831 and professor in 1833. He had already assisted Nathaniel Bowditch in his translation of the Mecanique celeste, and now produced a series of mathematical textbooks characterized by the brevity and terseness which made his teaching unattractive to inapt pupils. Young men of talent, on the contrary, found his instruction most stimulating, and after Bowditch’s death in 1838 Peirce stood first among American mathematicians. His researches into the perturbations of Uranus and Neptune (Proc. Amer.

Acad., 1848) gave him a wider fame; he became in 1849 con- sulting astronomer to the American Nautical Almanac, and for this work prepared new tables of the moon (1852). A discussion of the equilibrium of Saturn’s rings led him to conclude in 1855 that they must be of a fluid nature. From 1867 to 1874 he was superintendent of the Coast Survey. In 1857 he published his best known work, the System of Analytical Mechanics, which was, however, surpassed in brilliant originality by his Linear Associative Algebra (lithographed privately in a few copies, 1870; reprinted in the Amer. Joum. Math., 1882). He died at Cambridge, Mass., on the 6th of October 1880.

See New Amer. Cyclopaedia (Ripley and Dana), vol. xiii. (1861); T. J.

J. See, Popular Astronomy, iii. 49; Nature, xxii. 607; R. Grant, Hist, of Phys. Astronomy, pp. 205, 292; J. C. Poggendorff, Biog. lit. Handworterbuch; Month. Notices Roy. Astr. Society, xli. 191.

PEISANDER, of Camirus in Rhodes, Greek epic poet, sup- posed to have flourished about 640 B.C. He was the author of a Heracleia, in which he introduced a new conception of the hero, the lion's skin and club taking the place of the older Homeric equipment. He is also said to have fixed the number of the " labours of Hercules " at twelve. The work, which accord- ing to Clement of Alexandria (Stromata, vt. ch. 2) was simply a plagiarism from an unknown Pisinus of Lindus, enjoyed so high a reputation that the Alexandrian critics admitted the author to the epic canon. From an epigram (20) of Theocritus we learn that a statue was erected in honour of Peisander by his countrymen. He is to be distinguished from Peisander of Laranda in Lycia, who lived during the reign of Alexander Severus (a.d. 222-235), and wrote a poem on the mixed marriages of gods and mortals, after the manner of the Eoiai of Hesiod.

See fragments in G. Kinkel, Epicorum graecorum fragmenta (1878) ; also F. G. Welcker, Kleine Schriften, vol. i. (1844), on the twelve labours of Hercules in Peisander.

PEISISTRATUS, (6os?S27 B.C.), Athenian statesman, was the son of Hippocrates. He was named after Peisistratus, the youngest son of Nestor, the alleged ancestor of his family; he was second cousin on his mother's side to Solon, and numbered among his ancestors Codrus the last great king of Athens. Thus among those who became " tyrants " in the Greek world he gained his position as one of the old nobility, like Phalaris of Agrigentum, and Lygdamis of Naxos; but unlike Orthagoras of Sicyon, who had previously been a cook. Peisistratus, though Solon's junior by thirty years, was his lifelong friend (though this is denied), nor did their friendship suffer owing to their political antagonism. From this widely accepted belief arose the almost certainly false statement that Peisistratus took part in Solon's successful war against Megara, which necessarily took place before Solon's archonship (probably in 600 B.C.). Aristotle's Constitution of Athens (ch. 17) carefully distinguishes Solon's Megarian War from a second in which Peisistratus was no doubt in command, undertaken between 570 and 565 to recapture Nisaea (the port of Megara) which had apparently been recovered by the Megarians since Solon's victory (see Sandys on The Constitution of Athens, ch. 14, 1, note, and E. Abbott, History of Greece, vol. i. app. p. 544). Whatever be the true explanation of this problem, it is certain (1) that Peisistratus was regarded as a leading soldier, and (2) that his position was

strengthened by the prestige of his family. Furthermore (3) he was a man of great ambition, persuasive eloquence and wide generosity; qualities which especially appealed at that time to the classes from whom he was to draw his support — hence the warning of Solon (Frag. II. B): “Fools, you are treading in the footsteps of the fox; can you not read the hidden meaning of these charm ing words >” Lastly, (4) and most important, the times were ripe for revolution. In the article on Solon {ad fin.) it is shown that the Solonian reforms, though they made a great advance in some directions, failed on the whole. They were too moderate to please the people, too democratic for the nobles. It was found that the government by Boule and Ecclesia did not mean popular control in the full sense; it meant government by the leisured classes, inasmuch as the industrious farmer or herdsman could not leave his work to give his vote at the Ecclesia, or do his duty as a councillor. Partly owing to this, and partly to

ancient feuds whose origin we cannot trace, the Athenian people was split up into three great factions known as the Plain (Pedieis) led by Lycurgus and Miltiades, both of noble families; the Shore (Parali) led by the Alcmaeonidae, represented at this time by Megacles, who was strong in his wealth and by his recent marriage with Agariste, daughter of Cleisthenes of Sicyon; the Hill or Upland (Diacreis, Diacrii) led by Peisistratus, who no doubt owed his influence among these hillmen partly to the possession of large estates at Marathon. In the two former divisions the influence of wealth and birth predominated; the hillmen were poorly housed, poorly clad and unable to make use of the privileges which Solon had given them. 1 Hence their attachment to Peisistratus, the ” man of the people,” who called upon them to sweep away the last barriers which separated rich and poor, nobles and commoners, city and countryside. Lastly, there was a class of men who were discontented with the Solonian constitution: some had lost by his Seisachtheia, others had vainly hoped for a general redistribution. These men saw their only hope in a revolution. Such were the factors which enabled him to found his tyranny.

To enter here into an exhaustive account of the various theories which even before, though especially after, the appearance of the Constitution of Athens have been propounded as to the chronology of the Peisistratean tyranny, is impossible. For a summary of these hypotheses see J. E. Sandys’s edition of the Constitution of Athens (p. 56, c. 14 note). The following is in brief the sequence of events: In 560 B.C. Peisistratus drove into the market-place, showed to an indignant assembly marks of violence on himself and his mules, and claimed to be the victim of assault at the hands of political enemies. The people

unhesitatingly awarded their ” champion ” a bodyguard of fifty men (afterwards four hundred) armed with clubs. With this force he proceeded to make himself master of the Acropolis and tyrant of Athens. The Alcraaeonids fled and Peisistratus remained in power for about five years, during which Solon’s death occurred. In 555 or 554 B.C. a coalition of the Plain and the Coast succeeded in expelling him. His property was confiscated and sold by auction, but in his absence the strife between the Plain and the Coast was renewed, and Megacles, unable to hold his own, invited him to return. The condition was that their families should be allied by the marriage of Peisistratus to Megacles’ daughter Coesyra. A second coup d’ttat was then effected. A beautiful wotaan, it is said, by name Phya, was disguised as Athena and drove into the Agora with Peisistratus at her side, while proclamations were made that the goddess herself was restoring Peisistratus to Athens. The ruse was successful, but Peisistratus soon quarrelled with Megacles over Coesyra. By a former marriage he already had two sons, Hippias and Hipparchus, now growing up, and in his first tyranny or his first exile he married an Argive, Timonassa, by whom he had two other sons Iophon and Hegesistratus, the latter of whom is said to be identical with Thessalus (Atk. Pol. c. 17), though from Thucydides and Herodotus we gather that they were distinct — e.g. Herodotus describes Hegesistratus as a bastard, and Thucydides says that Thessalus was legitimate. Further it is suggested that Peisistratus was unwilling to have children by one on whom lay the curse of the Cylonian outrage. The result was that in the seventh year (or month, see Ath. Pol. c. 15. 1, Sandys’s note) Megacles accused him of neglecting his daughter, combined once more with the third faction, and drove the tyrant into an exile lasting apparently for ten or eleven years. During this period he lived first at Rhaecelus and later near Mt Pangaeus and on the StrymOn collecting resources of men and money. He came finally to Eretria, and, with the help of the Thebans and Lygdamis of Naxos, whom he afterwards made ruler of that island, he passed over to Attica and defeated the Athenian forces at the battle of Pallenis or Pellene. From this time till his death he remained undisputed master of Athens. The Alcmaeonids were compelled to leave Athens, and from

1 It is suggested with probability that the Diacrii were rather the miners of the Laurium district (P. M. Ure, J own. Hell. Stud., 1906, pp. 131-142).

the other noble families which remained he exacted 400 hostages whom he put in the care of hL= ally Lygdamis.

In the heyday of the Athenian democracy, citizens both conservative and progressive, politicians, philosophers and historians were unanimous in their denunciation of ” tyranny.” Yet there is no doubt that the rule of Peisistratus was most beneficial to Athens both in her foreign and in her internal relations. (1) During his enforced absence from Athens he had evidently acquired a far more extended idea of the future of Athens than had hitherto dawned on the somewhat parochial minds of her leaders. He was friendly with Thebes and Argos; his son Hegesistratus he set in power at Sigeum (see E. Abbott, Hist, of Gr. vol. i. xv. 9) and his friend Lygdamis at Naxos. From the mines of Thrace, and perhaps from the harbour dues and from the mines of Laurium, he derived a large revenue; under his encouragement, Miltiades had planted an Athenian colony on the shores of the Thracian Chersonese; he had even made friends with Thessaly and Macedonia, as is evidenced by the hospitality extended by them to Hippias on his final ex- pulsion. Finally, he did not allow his friendliness with Argos to involve him in war with Sparta, towards whom he pursued a policy of moderation. (2) At home it is admitted by all authori- ties that his rule was moderate and beneficent, and that he was careful to preserve at least the form of the established constitution. It is even said that, being accused of murder, he was ready to be tried by the Areopagus. Everything which he did during his third period of rule was in the interests of discipline and order. Thus he hired a mercenary bodyguard, and utilized for his own purposes the public revenues; he kept the chief magistracies (through which he ruled) in the hands of his family; he imposed a general tax 1 of 10% (perhaps reduced by Hippias to 5%) on the produce of the land, and thus obtained control over the fleet and spread the burden of it over all the citizens (see the spurious letter of Peisistratus to Solon, Diog. Laert. i. 53 ; Thuc. vi. 54 and Arnold’s note ad loc; Boeckh iii. 6; Thirlwall c. xi., pp. 72-74; and Grote). But the great wisdom of Peisistratus is shown most clearly in the skill with which he blinded the people to his absolutism. Pretending to maintain the Solonian constitution (as he could well afford), he realized that people would never recognize the deception if a sufficient degree of prosperity were ensured. Secondly, he knew that the greater the propor- tion of the Athenians who were prosperously at work in the country and therefore did “not trouble to interfere in the work of government the less would be the danger of sedition, whose seeds are in a crowded city. Hence he appears to have encouraged agriculture by abating the tax on small farms, and even by assisting them with money and stock.

Secondly, he established deme law-courts to prevent people from having recourse to the city tribunals; it is said that he himself occasionally ” went on circuit,” and on one of these occasions was so struck by the plaints of an old farmer on Hymettus, that he remitted all taxation on his land. Thus Athens enjoyed immunity from war and internecine struggle, and for the first time for years was in enjoyment of settled financial prosperity (see Constitution of Athens, c. 16. 7 6 iici Kpovov j3tos).

The money which he accumulated he put to good use in the construction of roads and public buildings. Like Cleisthenes of Sicyon and Periander of Corinth, he realized that one great source of strength to the nobles had been their presidency over the local cults. This he diminished by increasing the splendour of the Panathenaic festival every fourth year and the Dionysiac 2 rites, and so created a national rather than a local religion. With the same idea he built the temple of the Pythian Apollo and began, though he did not finish, the temple of Zeus (the magni- ficent columns now standing belong to the age of Hadrian).

1 It should be noted as against this, the general account, that Thucydides, speaking apparently with accuracy, describes the tax as ei«wri7 (5%); the Constitution of Athens speaks of (the familiar)

S«OT*(lO%).

2 Dionysus, as the god of the rustics, was especially worshipped at Icaria, near Marathon, and so was the god of the Diacrii. It seems likely that Peisistratus, to please his supporters, originated the City-Dionysia.

To him are ascribed also the original Parthenon on the Acropolis, afterwards burned by the Persians, and replaced by the Parthenon of Pericles. It is said that he gave a great impetus to the dramatic representations which belonged to the Dionysiac cult, and that it was under his encouragement that Thespis of Icaria, by impersonating character, laid the foundation of the great Greek drama of the 5th and 4th centuries. Lastly, Peisistratus carried out the , purification of Delos, the sacred island of Apollo of the Ionians; all the tombs were removed from the neighbourhood of the shrine, the abode of the god of light and joy.

We have spoken of his services to- the state, to the poor, to religion. It remains to mention his alleged services to literature. All we can reasonably believe is that he gave encouragement to poetry as he had

done to architecture and the drama; Onoma- critus, the chief of the Orphic succession, and collector of the oracles of Musaeus, was a member of his household. Honestly, or to impress the people, Peisistratus made considerable use of oracles (e.g. at the battle of Pellene), and his descendants, by the oracles of Onomacritus, persuaded Darius to undertake their restoration. As to the library of Peisistratus, we have no good evidence; it may perhaps be a fiction of an Alexandrian writer. There is strong reason for believing the story that he first collected the Homeric poems and that his was the text which ultimately prevailed (see Homer).

It appears that Peisistratus was benevolent to the last, and, like Julius Caesar, showed no resentment against enemies and calumniators. What Solon said of him in his youth was true throughout, ” there is no better-disposed man in Athens, save for his ambition.” He was succeeded by his sons Hippias and Hipparchus, by whom the tyranny was in various ways brought into disrepute.

It should be observed that the tyranny of Peisistratus is one of the many epochs of Greek history on which opinion has almost entirely changed since the age of Grote. Shortly, his services to Greece and to the world may be summed up under three heads: In foreign policy, he sketched out the plan on which Athens was to act in her external relations. He advocated (a) alliances with Argos, Thessaly and Macedon, (b) ascendancy in the Aegean (Naxos and Delos), (c) control of the Hellespontine route (Sigeum and the Chersonese), (d) control of the Strymon valley (Mt Pangaeus and the Strymon). Further, his rule exemplifies what is characteristic of all the Greek tyrannies — the advantage which the ancient monarchy had over the republican form of government. By means of his sons and his deputies (or viceroys) and by his system of matrimonial alliances he gave Athens a widespread influence in the centres of commerce, and brought her into connexion with the growing sources of trade and production in the eastern parts of the Greek world. (2) His importance in the sphere of domestic policy has been frequently underrated. It may fairly be held that the reforms of Solon would have been futile had they not been fulfilled and amplified by the genius of Peisistratus. (3) It was under his auspices that Athens began to take the lead in literature. From this period we must date the beginning of Athenian literary ascendancy. But see Athens.

Authorities.— Ancient: Herod, i. 59; Plut. Solon 30; Arist. Politics, v. 12, 5-1315 b.; Constitution of Athens {Ath. Pol.) cc. 14-19. On the chronological problems see also P. Meyer, Arist. Pol. and the Ath. Pol. pp. 48-9; Gomperz, Die Schrift v. Staatswesen, &c. (1891); Bauer, Lit.

und hist. Forsch. z. Arist. Ath. Pol. (50 sqq.). On the characteristics of the Peisistratid tyranny see Greenidge, Handbook of Greek Constitutional History , pp. 26 sqq. ; and the histories of Greece. On the question of the family of Peisistratus see Wilamo- witz-Moellendorff, Aristoteles und Athen (Berlin, 1893) and a criticism by E. M. Walker in the Classical Review, vol. viii. p. 206, col. 2.

(J. M. M.) PEKIN, a city and the county-seat of Tazewell county, Illinois, U.S.A., on the Illinois river, in the central part of the state, about 11 m. S. of Peoria, and about 56 m. N. of Springfield. Pop. (1910), 9897. It is served by the Atchison, Topeka & Santa Fe, the Chicago & Alton, the Chicago, Peoria & St Louis, the Illinois Central, the Cleveland, Cincinnati, Chicago & St Louis, the Peoria Railway Terminal Company, the Peoria

& Pekin Union and (for freight between Peoria and Pekin) the Illinois Valley Belt railways. Situated in a rich agricultural region and in the Illinois coalfields, Pekin is a shipping point and grain market of considerable importance, and has various manufactures. The value of the factory products in 1905 was $1,121,130. Pekin was first settled about 1830, was incorpor- ated in 1839, and re-incorporated in 1874.

PEKING, or Pekin, the capital of the Chinese Empire, situated in 39° 57′ N. and n6 c 29′ E., on the northern extremity of the great alluvial delta which extends southward from its walls for 700 m. For nine centuries Peking, under various names and under the dominion of successive dynasties, has, with some short intervals, remained an imperial city. Its situation near the northern frontier recommended it to the Tatar invaders as a convenient centre for their power, and its peculiarly fortunate position as regards the supernatural terrestrial influences per- taining to it has inclined succeeding Chinese monarchs to accept it as the seat of their courts. In 986 it was taken by an invading force of Khitan Tatars, who adopted it as their headquarters and named it Nanking, or the ” southern capital.” During the early part of the 12 th century the Chinese recaptured it and re- duced it from the rank of a metropolis to that of a provincial city of the first grade, and called it Yen-shan Fu. In 1151 it fell into the hands of the Kin Tatars, who made it a royal residence under the name of Chung-tu, or ” central capital.” Less than a century later it became the prize of Jenghiz Khan, who, having his main interests centred on the Mongolian steppes, declined to move his court southwards. His great

successor, Kublai Khan (1280-1294), rebuilt the town, which he called Ytnking, and which became known in Chinese as Ta-tu, or ” great court,” and in Mongolian as Khanbalik (Cambaluc), or ” city of the khan.” During the reign of the first emperor of the dynasty (1368-1399) which, succeeded that founded by Jenghiz Khan the court resided at the modern Nanking, but the succeeding sovereign Yung-lo (1403-1425) transferred his court to Pe-king (i.e. ” north-court “), which has ever since been the seat of government. For further history see Cambaluc.

During the periods above mentioned the extent and boundaries of the city varied considerably. Under the Kin dynasty the walls extended to the south-west of the Tatar portion of the present city, and the foundations of the northern ramparts of the Khan-balik of Kublai Khan are still to be traced at a distance of about 2 m. north beyond the existing walls. The modern city consists of the net cli hig,ox inner city, commonly known to foreigners as the “Tatar city,” and the wai ch’eng, or outer city, known in the same way as the ” Chinese city.” These names are somewhat misleading, as the inner city is not enclosed within the outer city, but adjoins its northern wall, which, being longer than the nei ch’eng is wide, outflanks it considerably at both ends. The outer walls of the double city contain an area of about 25 sq. m., and measure 30 m. in circumference. Unlike the walls of most Chinese cities, those of Peking are kept in perfect order. Those of the Tatar portion, which is the oldest part of the city, are 50 ft. high, with a width of 60 ft. at the base and 40 ft. at the top, while those of the Chinese city, which were built by the emperor Kia-tsing in 154.3, measure 30 ft. in height, and have a width of 25 ft. at the base and 15 ft. at the top. The terre-plein is well and smoothly paved, and is defended by a crenellated parapet. The outer faces of the walls are strength- ened by square buttresses built out at intervals of 60 yds., and on the summits of these stand the guard-houses for the troops on duty. Each of the sixteen gates of the city is protected by a semi-circular enceinte, and is surmounted by a high tower built in galleries and provided with countless loopholes.

Peking suffered severely during the Boxer movement and the siege of the legations in the summer of 1900. Not only were most of the foreign buildings destroyed, but also a large number of important Chinese buildings in the vicinity of the foreign quarter, including the ancient Hanlin Yuen, the boards of war, riles, &c. Almost the whole of the business quarter, the wealthiest part of the Chinese city, was laid in ashes (see China: History).

The population of Peking is reckoned to be about 1,000,000, a number

which is out of all proportion to the immense area enclosed within its walls. This disparity is partly accounted for by the facts that large spaces, notably in the Chinese city, are not built over, and that the grounds surrounding the imperial palace, private residences and temples are very extensive. One of such enclosures constitutes the British legation, and most of the other foreign legations are similarly, though not so sumptuously, lodged. Viewed from the walls Peking looks like a city of gardens. Few crowded neighbourhoods are visible, and the characteristic features of the scene which meets the eye are the upturned roofs of temples, palaces, and mansions, gay with blue, green and yellow glazed tiles, glittering among the groves of trees with which the city abounds. It is fortunate that the city is not close-built or crowded, for since the first advent of foreigners in Peking in i860 nothing whatever had been done until 1900 to improve the streets or the drainage. The streets as originally laid out were wide and spacious, but being unpaved and undrained they were no better than mud tracks diversified by piles of garbage and foul-smelling stagnant pools. Such drainage as had at one time existed was allowed to get choked up, giving rise to typhoid fever of a virulent type. Some attempt has been made to improve matters by macadamizing one of the principal thoroughfares, but it will be the labour of a Hercules to cleanse this vast city from the accumulated filth of ages of neglect.

Enclosed within the Tatar city is the Hwang ch'tng, or " Imperial city," which in its turn encloses the Tsze-kin ch'tng, or " Forbidden city," in which stands the emperor's palace. On the north of the Tsze-kin ch'eng, and separated from it by a moat, is an artificial mound known as the Kingshan, or " Pros- pect Hill." This mound, which forms a prominent object in the view over the city, is about 150 ft. high, and is topped with five summits, on each of which stands a temple. It is encircled by a wail measuring upwards of a mile in circumference, and is prettily planted with trees, on one of which the last emperor of the Ming dynasty (1644), finding escape from the Manchu invaders impossible, hanged himself. On the west of Prospect Hill is the Si yuan, or ' Western Park," which forms part of the palace grounds. This park is tastefully laid out, and is traversed by a lake, which is mainly noticeable from the remark- ably handsome marble bridge which crosses it from east to west. Directly northwards from Prospect Hill stands the residence of the T'itu, or " governor of the city," and the Bell and the Drum Towers, both of which have attained celebrity from the nature of their contents — the first from the huge bell which hangs in it, and the second from the appliances it contains for marking the time. The bell is one of five which the emperor Yung-lo ordered to be cast. In common with the others, it weighs 120,000 lb, is 14 ft.

high, 34 ft. in circumference at the rim, and 9 in. thick. It is struck by a, wooden beam swung on the outside, and only at the changes of the night-watches, when its deep tone may be heard in all parts of the city. In the Drum Tower incense-sticks, specially prepared by the astronomical board, are kept burning to mark the passage of time, in which important duty their accuracy is checked by a clepsydra. ‘ Another of Yung-lo’s bells is hung in a Buddhist temple outside the north-west angle of the city wall, and is covered both on the inside and outside with the Chinese texts of the Lankavatara Sutra, and the Sad- dharma pundarika Sutra.

Turning southwards we come again to the Forbidden City, the central portion of which forms the imperial palace, where, in halls which for the magnificence of their proportions and barbaric splendour are probably not to be surpassed anywhere, the Son of Heaven holds his court. In the eastern and western portions of this city are situated the residences of the highest dignitaries of the empire; while beyond its confines on the south stanc? the offices of the six official boards which direct the affairs of the eighteen provinces. It was in the ” yamen ” of one of these boards — the Li Pu or board of rites — that Lord Elgin signed the treaty at the conclusion of the war in i860 — an event whicK I derives especial interest from the fact of its having been the firsj

occasion on which a European plenipotentiary ever entered Peking accompanied by all the pomp and circumstance of his rank.

Outside the Forbidden City the most noteworthy building is the Temple of Heaven, which stands in the outer or Chinese city. Here at early morning on the 21st of December the emperor offers sacrifice on an open altar to Shang-ti, and at periods of drought or famine presents prayers for relief to the same supreme deity. The altar at which these solemn rites are performed consists of a triple circular marble terrace, 210 ft. wide at the base, 150 in the middle and 90 at the top. The uppermost surface is paved with blocks of the same material forming nine concentric circles, the innermost consisting of nine blocks, and that on the outside of eighty-one blocks. On the central stone, which is a perfect circle, the emperor kneels. In the same temple stands the altar of prayer for good harvests, which is surmounted by a triple-roofed circular structure 99 ft. in height. The tiles of these roofs are glazed porcelain of the most exquisite deep-blue colour, and add a

conspicuous element of splendour to the shrine.

The other powers of nature have shrines dedicated to them in the altar: to the Earth on the north of the city, the altars to the Sun and Moon outside the north-eastern and north-western angles respectively of the Chinese city, and the altar of agricul- ture inside the south gate of the Chinese city. Next to these in religious importance comes the Confucian temple, known as the Kwo-tsze-kien. Here there is no splendour; everything is quite plain; and one hall contains all that is sacred in the building. There the tablets of ” the soul of the most holy ancestral teacher, Confucius,” and of his ten principal disciples stand as objects of worship for their countless followers. In one courtyard of this temple are deposited the celebrated ten stone drums which bear poetical inscriptions commemorative of the hunting expeditions of King Suan (827-781 B.C.), in whose reign they are believed, though erroneously, to have been cut; and in another stands a series of stone tablets on which are inscribed the names of all those who have obtained the highest literary degree of Tsin-shi for the last five centuries.

In the south-eastern portion of the Tatar city used to stand the observatory, which was built by order of Kublai Khan in 1296. During the period of the Jesuit ascendancy in the reign of K’ang-hi (1661-1721), the superintendence of this institution was confided to Roman Catholic missionaries, under whose guidance the bronze instruments formerly existing were con- structed. The inhabitants of Peking being consumers only, and in no way producers, the trade of the city is very small, though the city is open to foreign commerce. In 1897 a railway was opened between Tientsin and Peking. This was only effected after great opposition from the ultra-Conservatives, but once accomplished the facilities were gladly accepted by all classes, and the traffic both in goods and passengers is already enormous. Out of deference to the scruples of the ultra-Conser- vatives, the terminus was fixed at a place called Lu-Kou-ch’iao, some 4 m. outside the walls, but this distance has since been covered by an electric tramway. The trunk line constructed by the Franco-Belgian syndicate connects Lu-Kou-ch’iao, the original terminus, with Hankow — hence the name Lu-Han by which this trunk line is generally spoken of, Lu being short for Lu-Kou-ch’iao and Han for Hankow.

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artists) ; N. Oliphant, A Diary of the Siege of the Legations in Peking during the Summer of igoo (London, 1901); A. H. Smith, China in Convulsion (2 vols., Edinburgh, 1902). (R. K. D.)

PELAGIA, ST. An Antiochene saint of this name, a virgin of fifteen years, who chose death by a leap from the housetop rather than dishonour, is mentioned by Ambrose (De virg. iii. 7, 33; Ep. xxxvii. ad Simplic.), and is the subject of two sermons by Chrysostom. Her festival was celebrated on the 8th of October (Wright's Syriac Martyrology). In the Greek synaxaria

the same day is assigned to two other saints of the name of Pelagia — one, also of Antioch, and sometimes called Margarito and also " the sinner "; the other, known as Pelagia of Tarsus, in Cilicia. The legend of the former of these two is famous. She was a celebrated dancer and courtesan, who, in the full flower of her beauty and guilty sovereignty over the youth of Antioch, was suddenly converted by the influence of the holy bishop Nonnus, whom she had heard preaching in front of a church which she was passing with her gay train of attendants and admirers. Seeking out Nonnus, she overcame his canonical scruples by her tears of genuine penitence, was baptized, and, disguising herself in the garb of a male penitent, retired to a grotto on the Mount of Olives, where she died after three years of strict penance. This story seems to combine with the name of the older Pelagia some traits from an actual history referred to by Chrysostom (Horn, in Matth. lxvii. 3). In associating St Pelagia with St Marina, St Margaret (q.v.), and others, of whom either the name or the legend recalls Pelagia, Hermann Usener has endeavoured to show by a series of subtle deductions that this saint is only a Christian travesty of Aphrodite. But there is no doubt of the existence of the first Pelagia of Antioch, the Pelagia of Ambrose and Chrysostom. The legends which have subsequently become connected with her name are the result of a very common development in literary history.

See Acta sanctorum, October, iv. 248 seq.; H. Usener. Legenden der heiligen Pelagia (Bonn, 1879); H. Delehaye, The Legends of the Saints (London, 1907), pp. 197-205. (H. De.) ,

PELAGIUS, the name of two popes.

Pelagius I., pope from 555 to 561, was a Roman by birth, and first appears in history at Constantinople in the rank *of deacon, and as apocrisiarius of Pope Silverius, whose over- throw in favour of Vigilius his intrigues promoted. Vigilius continued him in his diplomatic appointment, and he was sent by the emperor Justinian in 542 to

Antioch on eccle- siastical business; he afterwards took part in the synod at Gaza which deposed Paul of Alexandria. He had amassed some wealth, which on his return to Rome he so employed among the poor as to secure for himself great popularity; and, when Vigilius was summoned to Byzantium in 544, Pelagius, now archdeacon, was left behind as his vicar, and by his tact in dealing with Totila, the Gothic invader, saved the citizens from murder and outrage. He appears to have followed his master to Constantinople, and to have taken part, in the Three Chapters controversy; in 553, at all events, he signed the " constitutum " of Vigilius in favour of these, and for refusing, with him, to accept the decrees of the fifth general council (the 2nd of Constantinople, 553) shared his exile. Even after Vigilius had approved the comdemnation of the Three Chapters, Pelagius defended them, and even pub- lished a book on the subject. But when Vigilius died (June 7, 555), he accepted the council, and allowed himself to be desig- nated by Justinian to succeed the late pope. It was in these circumstances that he returned to Rome; but most of the clergy, suspecting his orthodoxy, and believing him to have had some share in the removal of his predecessor, shunned his fellowship. He enjoyed, however, the support of Narses, and, after he had publicly purged himself of complicity in Vigilius's death in the church of St Peter, he met with toleration in his own immediate diocese. The rest of the western bishops, however, still held aloof, and the episcopate of Tuscany caused his name to be removed from the diptychs. This elicited from him a circular, in which he asserted his loyalty to the four general councils, and declared that the hostile bishops had been guilty of schism. The bishops of Liguria and Aemilia, headed by the archbishop of Milan, and those of Istria and Venice, headed by Paulinus of Aquileia, also withheld their fellowship; but Narses resisted the appeals of Pelagius, who would have invoked the secular arm. Childebert, king of the Franks, also refused to interfere. Pelagius died on the 4th of March 561, and was succeeded by John III.

Pelagius II., a native of Rome, but of Gothic descent, was pope from 579 to 590, having been consecrated successor of Benedict I., without the sanction of the emperor, on tie 26th oi

November. To make his apologies for this irregularity he sent Deacon Gregory, who afterwards became Pope Gregory the Great, as his apocrisiarius to Constantinople. In 585 he sought to heal the schism which had subsisted since the time of Pelagius I. in connexion with

the Three Chapters, but his efforts were without success. In 588 John, patriarch of Constantinople, by reviving the old and disputed claim to the title of oecumenic patriarch, elicited a vigorous protest from Pelagius; but the decretal which professes to convey the exact words of the document is now known to be false. He died in January 590, and was succeeded by Gregory I.

PELAGIUS (c. 360- c. 420), early British theologian. Of the origin of Pelagius almost nothing is known. The name is supposed to be a graecized form of the Cymric Morgan (sea- begotten). His contemporaries understood that he was of British (probably of Irish) birth, and gave him the appellation Brito. He was a large ponderous person, heavy both in body and mind (Jerome, ” stolidissimus et Scotorum pultibus prae- gravatus “). He was influenced by the monastic enthusiasm which had been kindled in Gaul by Athanasius (336), and which, through the energy of Martin of Tours (361), rapidly communi- cated itself to the Britons and Scots. For, though Pelagius remained a layman throughout his life, and though he never appears in any strict connexion with a coenobite fraternity, he yet adhered to monastic discipline (“veluti monachus “), and distinguished himself by his purity of life and exceptional sanctity (” egregie Christianus “)• He seems to have been one of the earliest, if not the very earliest, of that remarkable series of men who issued from the monasteries of Scotland and Ireland, and carried back to the Continent in a purified form the religion they had received from it. Coming to Rome in the beginning of the 5th century (his earliest known writing is of date 405), he found a scandalously low tone of morality prevalent. But his remonstrances were met by the plea of human weakness. To remove this plea by exhibiting the actual powers of human nature became his first object. It seemed to him that the Augustinian doctrine of total depravity and of the consequent bondage of the will both cut the sinew of all human effort and threw upon God the blame which really belonged to man. His favourite maxim was, ” If I ought, I can.”

The views of Pelagius did not originate in a conscious reaction against the influence of the Augustinian theology, although each of these systems was developed into its ultimate form by the opposition of the other. Neither must too much weight be allowed to the circumstance that Pelagius was a monk, for he was unquestionably alive to the delusive character of much that passed for monkish sanctity. Yet possibly his monastic training may have led him to look more at conduct than at character, and to believe that holiness could be arrived at by rigour of discipline. This view of things suited his matter-of-fact temperament. Judging from the general style of his

writings, his religious development had been equable and peaceful, not marked by the prolonged mental conflict, or the abrupt transitions, which characterized the experience of his great opponent. With no great penetration he saw very clearly the thing before him, and many of his practical counsels are marked by sagacity, and are expressed with the succinctness of a proverb (" corpus non frangendum, sed regendum est "). His interests were primarily ethical; hence his insistence on the freedom of the will and his limitation of the action of divine grace.

The peculiar tenets of Pelagius, though indicated in the commentaries which he published at Rome previous to 409, might not so speedily have attracted attention had they not been adopted by Coelestius, a much younger and bolder man than his teacher. Coelestius, probably an Italian, had been trained as a lawyer, but abandoned his profession for an ascetic life. When Rome was sacked by the Goths (410) the two friends crossed to Africa. There Pelagius once or twice met with Augustine, but very shortly sailed for Palestine, where he justly expected that his opinions would be more cordially received. Coelestius remained in Carthage with the view of receiving ordination. But Aurelius, bishop of Carthage, being warned

against him, summoned a synod, at which Paulinus, a deacon of Milan, charged Coelestius with holding the following six errors: (1) that Adam would have died even if he had not sinned; (2) that the sin of Adam injured himself alone, not the human race; (3) that new-born children are in the same condition in which Adam was before the fall; (4) that the whole human race does not die because of Adam's death or sin, nor will the race rise again because of the resurrection of Christ; (5) that the law gives entrance to heaven as well as the gospel; (6) that even before the coming of Christ there were men who were entirely without sin. To these propositions a seventh is sometimes added, " that infants, though unbaptized, have eternal life," a corollary from the third. Coelestius did not deny that he held these opinions, but he maintained that they were open questions, on which the Church had never pronounced. The synod, notwithstanding, condemned and excommunicated him. Coelestius, after a futile appeal to Rome, went to Ephesus, and there received ordination. In Palestine Pelagius lived unmolested and revered, until in 415 Orosius, a Spanish priest, came from Augustine, who in the meantime had written his De peccatorum meritis, to warn Jerome against him. The result was that in June of that year Pelagius was cited by Jerome before John, bishop of Jerusalem, and charged with holding that man may be without sin, if only he desires it. This prosecution broke down, and in December of the same year Pelagius was summoned before a synod of fourteen

bishops at Diospolis (Lydda). The prosecutors on this occasion were two deposed Gallican bishops, Heros of Aries and Lazarus of Aix, but on account of the illness of one of them neither could appear. The proceedings, being conducted in various languages and by means of interpreters, lacked certainty, and justified Jerome's application to the synod of the epithet " miserable." But there is no doubt that Pelagius repudiated the assertion of Coelestius, that " the divine grace and help is not granted to individual acts, but consists in free will, and in the giving of the law and instruction." At the same time he affirmed that a man is able, if he likes, to live without sin and keep the commandments of God, inasmuch as God gives him this ability. The synod was satisfied with these statements, and pronounced Pelagius to be in agreement with Catholic teaching. Pelagius naturally plumed himself on his acquittal, and provoked Augus- tine to give a detailed account of the synod, in which he shows that the language used by Pelagius was ambiguous, but that, being interpreted by his previous written statements, it involved a denial of what the Church understood by grace and by man's dependence on it. The North African Church as a whole resented the decisions of Diospolis, and in 416 sent up from their synods of Carthage and Mileve (in Numidia) an appeal to Innocent, bishop of Rome, who, flattered by the tribute thus paid to the see of Rome, decided the question in favour of the African synods. And, though his successor Zosimus wavered for some time, he at length fell in with what he saw to be the general mind of both the ecclesiastical and the civil powers. For, simultaneously with the largely attended African synod which finally condemned Pelagianism in the West, an imperial edict was issued at Ravenna by Honorius on the 30th of April 418, peremptorily determining the theological question and enacting that not only Pelagius and Coelestius but all who accepted their opinions should suffer confiscation of goods and irrevocable banishment. Thus prompted, Zosimus drew up a circular inviting all the bishops of Christendom to subscribe a condemnation of Pelagian opinions. Nineteen Italian bishops refused, among them Julian of Eclanum in Apulia, a man of good birth, approved sanctity and great capacity, who now became the recognized leader of the movement. But not even his acuteness and zeal could redeem a cause which was rendered hopeless when the Eastern Church (Ephesus, 431) confirmed the decision of the West. Pelagius himself disappears after 420; Coelestius was at Constantinople seeking the aid of Nestorius in 428.

Pelagianism. — The system of Pelagius is a consistent whole, each part involving the existence of every other. Starting from the idea that " ability limits obligation," and resolved that men

should feel their responsibility, he insisted that man is able to do all that God commands, and that there is, and can be, no sin where the will is not absolutely free — able to choose good or evil. The favourite Pelagian formula, ” Si necessitatis est, peccatum non est; si voluntatis, vitati potest,” had an appearance of finality which imposed on superficial minds. The theory of the will involved in this fundamental axiom of Pelagianism is that which is commonly known as the ” liberty of indifference,” or ” power of contrary choice ” — a theory which affirms the freedom of the will, not in the sense that the individual is self-determined, but in the sense that in each volition and at each moment of life, no matter what the previous career of the individual has been, the will is in equipoise, able to choose good or evil. We are born characterless (non pleni), and with no bias towards good or evil (ut sine virtute, ita et sine vitio). It follows that we are uninjured by the sin of Adam, save in so far as the evil example of our predecessors misleads and influences us (non propagine sed exemplo). There is, in fact, no such thing as original sin, sin being a thing of will and not of nature ; for if it could be of nature our sin would be chargeable on God the creator. This will, capable of good as of evil, being the natural endowment of man, is found in the heathen as well as in the Christian, and the heathen may therefore perfectly keep such law as they know. But, if all men have this natural ability to do and to be all that is required for perfect righteousness, what becomes of grace, of the aid of the Holy Spirit, and, in a word, of Christianity ? Pelagius vacillates considerably in his use of the word ” grace.” Sometimes he makes it equivalent to natural endowment. Indeed one of his most careful statements is to this effect: ” We distinguish three things — the ability, the will, the act (posse, velle, esse). The ability is in nature, and must be referred to God, who has bestowed this on His creature; the other two, the will and the act, must be referred to man, because they flow from the fountain of free will ” (Aug., De gr. Christi, ch. 4). But at other times he admits a much wider range to grace, so as to make Augustine doubt whether his meaning is not, after all, orthodox. But, when he speaks of grace ” sanctifying,” ” assisting,” and so forth, it is only that man may ” more easily ” accomplish what he could with more difficulty accomplish without grace. A decisive passage occurs in the letter he sent to the see of Rome along with his Confessio fidei: ” We maintain that free will exists generally in all mankind, in Christians, Jews and Gentiles; they have all equally received it by nature, but in Christians only is it assisted by grace. In others this good of their original creation is naked and unarmed. They

shall be judged and condemned because, though possessed of free will, by which they might come to the faith and merit the grace of God, they make an ill use of their freedom; while Christians shall be rewarded because, by using their free will aright, they merit the grace of the Lord and keep His commandments ” (ibid. chs. 33, 34). Pelagius allowed to grace everything but the initial determining movement towards salvation. He ascribed to the unassisted human will power to accept and use the proffered salvation of Christ. It was at this point his departure from the Catholic creed could be made apparent: Pelagius maintains, expressly and by implication, that it is the human will which takes the initiative, and is the determining factor in the salvation of the individual; while the Church maintains that it is the divine will that takes the initiative by renewing and enabling the human will to accept and use the aid or grace offered.

Semipelagianism. — It was easy for Augustine to show that this was an ” impia opinio ” ; it was easy for him to expose the defective character of a theory of the will which implied that God was not holy because He is necessarily holy ; it was easy for him to show that the positions of Pelagius were anti-Scriptural (see Augustine) ; but, though his arguments prevailed, they did not wholly convince, and the rise of Semipelagianism — an attempt to hold a middle course between the harshness of Augustinianism and the obvious errors of Pelagianism — is full of significance. This earnest and conciliatory movement discovered itself simultaneously in North Africa and in southern Gaul. In the former Church, which naturally desired to adhere to the views of its own great theologian, the monks of Adrum- etum found themselves either sunk to the verge of despair or pro- voked to licentiousness by his predestinarian teaching. When this was reported to Augustine he wrote two elaborate treatises to show that when God ordains the end He also ordains the means, and if any man is ordained to life eternal he is thereby ordained to holiness and zealous effort. But meanwhile some of the monks themselves had struck out a via media which ascribed to God sovereign grace and yet left intact man’s responsibility. A similar scheme was adopted by Cassian of Marseilles (hence Semipelagians are often spoken of as Massilians), and was afterwards ably advocated by Vincent of Lerins and Faustus of Rhegium. These writers, in opposition to Pelagius, maintained that man was damaged by the fall, and seemed indeed disposed to purchase a certificate of orthodoxy by the abusive epithets they heaped upon Pelagians (ranae, muscae moriturae, &c). The differentia of Semipelagianism is the tenet that in regeneration, and all that results from it, the divine and the human will are co-operating (synergistic) coefficient factors. After finding considerable acceptance, this theory was ultimately condemned, because it retained the root-principle of Pelagianism — that man has some ability to will good and that the beginning of salvation may be with man. The Councils of Orange and Valence

(529), however, which condemned Semipelagianism, did so with the significant restriction that predestination to evil was not to be taught — a restriction so agreeable to the general feeling of the Church that, three centuries after, Gottschalk was sentenced to be degraded from the priesthood, scourged and imprisoned for teaching reprobation. The questions raised by Pelagius continually recur, but, without tracing the strife as sustained by Thomists and Jansen- ists on the one side and the Jesuits and Arminians on the other, this article can only indicate the general bearing of the controversy on society and the Church.

The anthropology of Pelagius was essentially naturalistic. It threatened to supersede grace by nature, to deny all immediate divine influence, and so to make Christianity practically useless. Pelagius himself did not carry his rationalism through to its issues; but the logical consequence of his system was, as Augustine per- ceived, the denial of the atonement and other central truths of revealed religion. And, while the Pelagians never existed as a sect separate from the Church Catholic, yet wherever rationalism has infected any part of the Church there Pelagianism has sooner or later appeared; and the term " Pelagian " has been continued to denote views which minimize the effects of the fall and unduly magnify man's natural ability. These views and tendencies have appeared in theologies which are not in other respects rationalistic, as, e.g. in Arminianism; and their presence in such theologies is explained by the desire to remove everything which might seem to discourage human effort.

It is not easy to determine how far the vices which ate so deeply into the life of the Church of the middle ages were due to the sharp- ness with which some of the severer features of the Augustinian theology were defined during the Pelagian controversy. The pernicious belief in the magical efficacy of the sacraments and the consequent defective ethical power of religion, the superstitious eagerness to accept the Church's creed without examining or really believing it, the falsity and cruelty engendered and propagated by the idea that in the Church's cause all weapons were justifiable, these vices were undoubtedly due to the belief that the visible church was the sole divinely-appointed repository of grace. And the sharply accentuated tone in which Augustinianism affirmed man's inability quickened the craving for that grace or direct agency of God upon the soul which the Church declared to be needful and administered through her divinely appointed persons and sacra- ments, and thus brought a decided impulse to the development of the sacerdotal system.

Again, although it may fairly be doubted whether, as Baur supposes, Augustine was permanently tainted with the Manichaean notion of the inherent evil of matter, it can scarcely be questioned that his views on marriage as elicited by the Pelagian controversy gave a considerable impulse to the already prevalent idea of the superiority of virginity. When the Pelagians declared that Augus- tine's theory of original sin discredited marriage by the implication that even the children of the regenerate were born in sin, he could only reply {De nuptiis et concupiscentia) that marriage now cannot partake of the spotless purity of the marriage of unfallen man, and that, though what is evil in concupiscence is made a good use of in marriage, it is still a thing to be ashamed of — not only with the shame of natural modesty

(which he does not take into account) but with the shame of guilt. So that, even although he is careful to point out the advantages of marriage, an indelible stigma is still left even on the lawful procreation of children.

" The Pelagians deserve respect," says Harnack, " for their purity of motive, their horror of the Manichaean leaven and the opus operatum, their insistence on clearness, and their intention to defend the Deity. But we cannot but decide that their doctrine fails to recognize the misery of sin and evil, that in its deepest roots it is godless, that it knows, and seeks to know, nothing of redemption and that it is dominated by an empty formalism (a notional mytho- logy), which does justice at no single point to actual quantities, and on a closer examination consists of sheer contradictions. In the form in which this doctrine was expressed by Pelagius — and in fact also by Julian — i.e. with all the accommodations to which he condescended, it was not a novelty. But in its fundamental thought it was; or rather, it was an innovation because it abandoned in spite of all accommodations in expression, the pole of the mystical doctrine of redemption, which the Church had steadfastly maintained side by side with the doctrine of freedom."

In the Pelagian controversy some of the fundamental differences between the Eastern and Western theologies appear. The former laid stress on " the supernatural character of Christianity as a fact in the objective world " and developed the doctrines of the Trinity and the Incarnation; the Western emphasized " the supernatural charac- ter of Christianity as an agency in the subjective world " and developed the doctrines of sin and grace. All the Greek fathers from Origen to Chrysostum had been jealous for human freedom and loath to make sin a natural power, though of course admitting a general state of sinfulness. The early British monasteries had been connected with the Orient. Pelagius was familiar with the Greek language and theology, and when he came to Rome he was much in the company of Rufinus and his circle who were endeavouring to propagate Greek theology in the Latin Church.

Literature. — Pelagius's Commentarii in epistolas Pauli, Libellus

fidei ad Innocentium and Epistola ad Demelriadem are preserved in Jerome's works (vol. v. of Martiani's ed., vol. xi. of Vallarsi's). The

last-named was also published separately by Semler (Halle, 1775)- There are of course many citations in the Anti-Pelagian Treatises of Augustine. On the Commentaries see Journal of Theol. Studies, vii. 568, viii. 526; an edition is being prepared for the Cambridge Texts and Studies by A. Souter.

See also F. Wiggers, Darstellung des Augustinismus und Pelagianismus (2 vols., Berlin, 1831-1832 ; Eng. trans, of vol. i., by R. Emerson, Andover, 1840); J. L. Jacobi, Die Lehre d. Pelagius (Leipzig, 1842); F. Klasen, Die innere Entwickelung des Pelagianismus (Freiburg, 1882) ; B. B. Warfield, Two Studies in the History of Doctrine (New York, 1893) ; A. Harnack, History of Dogma, Eng. trans., v. 168-202; F. Loofs, Dogmengeschischte and art. in Hauck-Herzog's Real- encyklo. fiir prot. Theologie u. Kirche (end of vol. xv.), where a full bibliography is given. (M. D.)

PELASGIANS, a name applied by Greek writers to a pre- historic people whose traces were believed to exist in Greek lands. If the statements of ancient authorities are marshalled in order of their date it will be seen that certain beliefs cannot be traced back beyond the age of this or that author. Though this does not prove that the beliefs themselves were not held earlier, it suggests caution in assuming that they were. In the Homeric poems there are Pelasgians among the allies of Troy: in the catalogue, Iliad, ii. 840-843, which is otherwise in strict geogra- phical order, they stand between the Hellespontine towns and the Thracians of south-east Europe, i.e. on the Hellespontine border of Thrace. Their town or district is called Larissa and is fertile, and they are celebrated for their spearmanship. Their chiefs are Hippothous and Pylaeus, sons of Lethus son of Teutamus. Iliad, x. 428-429, describes their camping ground between the town of Troy and the sea; but this obviously proves nothing about their habitat in time of peace. Odyssey, xvii. 175-177, notes Pelasgians in Crete, together with two appa- rently indigenous and two immigrant peoples (Achaeans and Dorians), but gives no indication to which class the Pelasgians belong. In Lemnos (Iliad, vii. 467; xiv. 230) there are no Pelasgians, but a Minyan dynasty. Two other passages (Iliad, ii. 681-684; xvi. 233-235) apply the epithet " Pelasgic " to a district called Argos about Alt Othrys in south Thessaly, and to Zeus of Dodona. But in neither case are actual Pelasgians mentioned; the Thessalian Argos is the specific home of Hellenes and Achaeans, and Dodona is inhabited by Perrhaebians and Aenianes (Iliad, ii. 750) who are nowhere described as Pelasgian. It looks therefore as if " Pelasgian " were here used connota- tively, to mean either " formerly occupied by Pelasgian " or simply " of immemorial age."

Hesiod expands the Homeric phrase and calls Dodona ” seat of Pelasgians ” (fr. 225); he speaks also of a personal Pelasgus as father of Lycaon, the culture-hero of Arcadia; and a later epic poet, Asius, describes Pelasgus as the first man, whom the earth threw up that there might be a race of men. Hecataeus makes Pelasgus king of Thessaly (expounding Iliad, ii. 681-684) ; Acusilaus applies this Homeric passage to the Peloponnesian Argos, and engrafts the Hesiodic Pelasgus, father of Lycaon, into a Peloponnesian genealogy. Hellanicus a generation later repeats this blunder, and identifies this Argive and Arcadian Pelasgus with the Thessalian Pelasgus of Hecataeus. For Aeschylus (Supplices 1, sqq.) Pelasgus is earthborn, as in Asius, and rules a kingdom stretching from Argos to Dodona and the Strymon; but in Prometheus 879, the ” Pelasgian ” land simply means Argos. Sophocles takes the same view (Inachus, fr. 256) and for the first time introduces the word ” Tyrrhenian ” into the story, apparently as synonymous with Pelasgian.

Herodotus, like Homer, has a denotative as well as a conno- tative use. He describes actual Pelasgians surviving and mutually intelligible (a) at Placie and Scylace on the Asiatic shore of the Hellespont, and (b) near Creston on the Strymon; in the latter area they have ” Tyrrhenian ” neighbours. He alludes to other districts where Pelasgian peoples lived on under changed names; Samothrace and Antandrus in Troas are probably instances of this. In Lemnos and Imbros he describes a Pelasgian population who were only conquered by Athens shortly before 500 B.C., and in this connexion he tells a story of earlier raids of these Pelasgians on Attica, and of a temporary XXI. i

settlement there of Hellespontine Pelasgians, all dating from a time ” when the Athenians were first beginning to count as Greeks.” Elsewhere ” Pelasgian ” in Herodotus connotes anything typical of, or surviving from, the state of things in Greece before the coming of the Hellenes. In this sense all Greece was once ” Pelasgic “; the clearest instances of Pelasgian survival in ritual and customs and antiquities are in Arcadia, the ” Ionian ” districts of north-west Peloponnese, and Attica, which have suffered least from hellenization. In Athens itself the prehistoric wall of the citadel and a plot of ground close below it were venerated in the 5th century as ” Pelasgian “; so too Thucydides (ii. 17). We may note that all Herodotean examples of actual Pelasgi he round, or near, the actual Pelasgi of Homeric Thrace; that the most distant of these is confirmed by the testimony of Thucydides (iv. 106) as to the Pelasgian and Tyrrhenian population of the adjacent seaboard: also that Thucydides adopts the same general Pelasgian theory of early Greece, with the refinement that he regards the Pelasgian name as originally specific, and as having come gradually

into this generic use.

Ephorus, relying on Hesiodic tradition of an aboriginal Pelas- gian type in Arcadia, elaborated a theory of the Pelasgians as a warrior-people spreading (like ” Aryans “) from a ” Pelasgian home,” and annexing and colonizing all the parts of Greece where earlier writers had found allusions to them, from Dodona to Crete and the Troad, and even as far as Italy, where again their settlements had been recognized as early as the time of Hellanicus, in close connexion once more with ” Tyrrhenians.”

The copious additional information given by later writers is all by way either of interpretation of local legends in the light of Ephorus’s theory, or of explanation of the name” Pelasgoi “; as when Philochorus expands a popular etymology ” stork-folk ” (■n-tXao-yoL — TreKapyoL) into a theory of their seasonal migrations; or Apollodorus says that Homer calls Zeus Pelasgian ” because he is not far from every one of us,” 8ri -rijs yrjs xeXas horiv. The connexion with Tyrrhenians which began with Hellanicus, Herodotus and Sophocles becomes confusion with them in the 3rd century, when the Lemnian pirates and their Attic kinsmen are plainly styled Tyrrhenians, and early fortress-walls in Italy (like those on the Palatine in Rome) are quoted as ” Arcadian ” colonies.

Modern writers have either been content to restate or amplify the view, ascribed above to Ephorus, that ” Pelasgian ” simply means ” prehistoric Greek,” or have used the name Pelasgian at their pleasure to denote some one element in the mixed population of the Aegean — Thracian, Illyrian (Albanian) or Semitic. G. Sergi (Origine e dijfusione delta stirpe mcdiler- ranea, Rome, 1895; Eng. trans. The Mediterranean Race, London, 1901), followed by many anthropologists, describes as ” Pelasgian ” one branch of the Mediterranean or Eur-African race of mankind, and one group of types of skull within that race. The character of the ancient citadel wall at Athens, already mentioned, has given the name ” Pelasgic masonry ” to all constructions of large unhewn blocks fitted roughly together without mortar, from Asia Minor to Spain.

For another view than that here taken see Achaeans; also Greece: Ancient History, § 3, ” Homeric Age.”

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PELEUS, in Greek legend, king of the Myrmidones of Phthia in Thessaly, son of Aeacus, king of Aegina, and brother (or

intimate friend) of Telamon. The two brothers, jealous of the athletic prowess of their step-brother Phocus, slew him; but the crime was discovered, and Peleus and Telamon were banished. Peleus took refuge in Phthia with his uncle Eurytion, who purified him from the guilt of murder, and gave him his daughter Antigone to wife, and a third of the kingdom as her dowry. Having accidentally killed his father-in-law at the Calydonian boar-hunt, Peleus was again obliged to flee, this time to Iolcus, where he was purified by Acastus. The most famous event in the life of Peleus was his marriage with the sea-goddess Thetis, by whom he became the father of Achilles. The story ran that both Zeus and Poseidon had sought her hand, but, Themis (or Prometheus or Proteus) having warned the former that a son of Thetis by Zeus would prove mightier than his father, the gods decided to marry her to Peleus. Thetis, to escape a distasteful union, changed herself into various forms, but at last Peleus, by the instructions of Chiron, seized and held her fast till she resumed her original shape, and was unable to offer further resistance. The wedding (described in the fine Epithalamium of Catullus) took place in Chiron’s cave on Mt Pelion. Peleus survived both his son Achilles and his grandson Neoptolemus, and was carried away by Thetis to dwell for ever among the Nereids.

See Apollodorus Hi. 12, 13; Ovid, Metam. xi; Pindar, ‘Isthmia, viii. 70, Nemea, iv. 101 ; Catullus, lxiv. ; schol. Apoll. Rhod. iv. 816; Euripides, Andromache, 1242-1260.

PELEW ISLANDS (Ger. Palauinseln, also Palao), a group of twenty-six islands in the western Pacific Ocean, between 2° 35′ and 9° N., and 130° 4′ and 134 40′ E., belonging to Germany. They lie within a coral barrier reef, and in the south the islands are of coral, but in the north of volcanic rocks. They are well wooded, the climate is healthy, and the water-supply good. A few rats and bats represent the indigenous mammals, but the sea is rich in fish and molluscs; and Dr Otto Finsch (Journ. des Museum Godeffroy, 1875) enumerated 56 species of birds, of which 12 are peculiar to the group. The total area is 175 sq. m., the largest islands being Babeltop (Babelthuap, Baobeltaob and other variants), Uruktapi (Urukthopel), Korror, Nyaur, Peleliu and Eilmalk (Irakong). The population is about 3100. The natives are Micronesians, and are darker and shorter than their kinsmen, the Caroline Islanders. They usually have the frizzly hair of the Melanesians, and paint their bodies in brilliant colours, especially yellow. The men vary in height from 5 ft. to 5 ft. 5 in., the women from 4 ft. 9 to. 5 ft. 2 in. The skull shows a strong tendency to brachycephalism. Two curious customs may be noted — the institution of an honourable order bestowed by the king, called klilt; and a species of mutual aid society, sometimes confined to women, and possessing considerable political influ- ence. There are five kinds of currency in the islands, consisting of beads of glass and enamel, to which a supernatural origin is ascribed.

The islands were sighted in 1343 by Ruy Lopez de Villalobos, who named them the Arrecifos. The origin of the name Islas Palaos is doubtful. The islands were bought by Germany from Spain in 1899, and are administered together with the western Carolines, Yap being the administrative centre.

See K. Semper, Die Palau-Inseln (Leipzig, 1873); J- S. Kubary, Die sozialen Einrichtungen der Palauer (Berlin, 1 885) ; A. A. Marche, Lucon el Palouan (Paris, 1887).

PELF, a term now chiefly used of money and always in a derogatory sense. The word originally meant plunder, pillage (O. Fr. pelf re, probably from Lat. pilare, to deprive of hair, pilus), and this significance is still kept in the related word ” pilfer,” to make petty thefts.

PELHAM, the name of an English family, derived from Pelham in Hertfordshire, which was owned by a certain Walter de Pelham under Edward I., and is alleged to have been in the possession of the same family before the Norman conquest. The family dignities included the barony of Pelham of Laughton (1706-1768), the earldom of Clare

(1714-1768), the dukedom of Newcastle (1715-1768), the barony of Pelham of Stanmer from

1762, the earldom of Chichester from 1801 and the earldom of Yarborough from 1837.

John de Pelham, who was one of the captors of John II. of France at Poitiers, acquired land at Winchelsea by his marriage with Joan Herbert, or Finch. His son, John de Pelham (d. 1429), was attached to the party of John of Gaunt and his son Henry IV. In 1393 he received a life appointment as constable of Pevensey Castle, an honour subsequently extended to his heirs male, and he joined Henry on his invasion in 1399, if he did not actually land with him at Ravenspur. He was knighted at Henry's coronation, and represented Sussex in parliament repeatedly during the reign of Henry IV., and again in 1422 and 1427. As constable of Pevensey he had at different times the charge of Edward, duke of York, in 1405; Edmund, earl of March, with his brother Roger Mortimer in 1406; James I. of Scotland in 1414; Sir John Mortimer in 1422, and the queen dowager, Joan of Navarre, from 1418 to 1422. He was con- stantly employed in the defence of the southern ports against French invasion, and his powers were increased in 1407 by his appointment as chief butler of Chichester and of the Sussex ports, and in 141 2 by the grant of the rape of Hastings. He was treasurer of England in 1412-1413, and although he was superseded on the accession of Henry V. he was sent in the next year to negotiate with the French court. He was included among the executors of the wills of Henry IV., of Thomas, duke of Clarence, and of Henry V. He died on the 12th of February 1429, and was succeeded by his son John, who took part in Henry V.'s expedition to Normandy in 141 7.

In the reign of Queen Elizabeth Sir William Pelham (c. 1530- 1587), third son of Sir William Pelham (d. 1538) of Laughton, Sussex, became lord justice of Ireland. He was captain of pioneers at the siege of Leith in 1560, and served at the siege of Havre in 1562, and with Coligny at Caen in 1563. He then returned to Havre, at that time occupied by English troops, and was one of the hostages for the fulfilment of its surrender to Charles IX. in 1 564. After his return to England he fortified Berwick among other places, and was appointed lieutenant- general of ordnance. He was sent to Ireland in 1579, when he was knighted by Sir William Drury, the lord justice. Drury died in October, and Pelham was provisionally made his successor, an appointment subsequently confirmed by Elizabeth. Alarmed by the proceedings of Gerald Fitzgerald, 15th earl of Desmond, and his brother John Desmond, he proclaimed the earl a traitor. Elizabeth

protested strongly against Pelham's action, which was justified by the sack of Youghal by Desmond. Thomas Butler, 10th earl of Ormonde, was entrusted with the campaign in Munster, but Pelham joined him in February 1 580, when it was believed that a Spanish descent was about to be made in the south-west. The English generals laid waste northern Kerry, and proceeded to besiege Carrigafoyle Castle, which they stormed, giving no quarter to man, woman or child. Other strongholds submitted on learning the fate of Carrigafoyle, and were garrisoned by Pelham, who hoped with the concourse of Admiral Winter's fleet to limit the struggle to Kerry. He vainly sought help from the gentry of the county, who sym- pathized with Desmond, and were only brought to submission by a series of " drives." After the arrival of the new deputy, Lord Grey of Wilton, Pelham returned to England on the ground of health. He had retained his office as lieutenant-general of ordnance, and was now made responsible for debts incurred during his absence. Leicester desired his services in the Nether- lands, but it was only after much persuasion that Elizabeth set him free to join the army by accepting a mortgage on his estates as security for his liabilities. The favour shown by Leicester to Pelham caused serious jealousies among the English officers, and occasioned a camp brawl in which Sir Edward Norris was injured. Pelham was wounded at Doesburg in 1586, and accompanied Leicester to England in 1587. Returning to the Netherlands in the same year he died at Flushing on the 24th of November 1587. His half-brother, Sir Edmund Pelham (d. 1606), chief baron of the exchequer in Ireland, was the first English judge to go on circuit in Ulster.

Sir William married Eleanor, daughter of Henry Neville, earl of Westmorland, and was the ancestor of the Pelhams of Brocklesby, Lincolnshire. In the fourth generation Charles Pelham died in 1763 without heirs, leaving his estates to his great-nephew Charles Anderson (1749-1823), who thereupon assumed the additional name of Pelham, and was created Baron Yarborough in 1794. His son Charles (1781-1846), who was for many years commodore of the Royal Yacht Squadron, was created earl of Yarborough and Baron Worsley in 1837. Charles Alfred Worsley, the 4th earl (b. 1859), exchanged the name of Anderson-Pelham for that of Pelham in 1905. He married in 1886 Marcia Lane-Fox, eldest daughter of the 12th Baron Conyers, who became in 1892 Baroness Conyers in her own right.

Sir Nicholas Pelham (1517-1560), an elder half-brother of Sir William Pelham, defended Seaford against the French in 1545, and sat for Arundel and for Sussex in parliament. He was the ancestor of the earls of Chichester. His second son, Sir Thomas Pelham (d. 1624), was created a baronet in 1611. His descendant, Sir Thomas Pelham, 4th baronet (c. 1650-1712), represented successively East Grinstead, Lewes and Sussex in parliament, and was raised to the House of Lords as Baron Pelham of Laughton in 1706. By his second marriage with Grace (d. 1700), daughter of Gilbert Holies, 3rd earl of Clare, and sister of John Holies, duke of Newcastle, he had five daugh- ters, and two sons — Thomas Pelham, earl of Clare, duke of Newcastle-on-Tyne and 1st duke of Newcastle-under-Lyme (see Newcastle, Dukes of), and Henry Pelham (g.v.). The duke of Newcastle died without heirs, and the dukedom of Newcastle- under-Lyme descended to his nephew, Henry Fiennes Clinton, afterwards known as Pelham-Clinton, and his heirs, but the barony of Pelham of Laughton became extinct. In 1762 Newcastle had been created Baron Pelham of Stanmer, with reversion to his cousin and heir-male, Thomas Pelham (1728- 1805), who became commissioner of trade (1754), lord of the admiralty (1761-1764), comptroller of the household (1765- 1774), privy councillor (1765), surveyor-general of the customs of London (1773-1805), chief justice in eyre (1774-1775) and keeper of the wardrobe (1775-1782), and was created earl of Chichester in 1801. His third son, George (1766-1827), was successively bishop of Bristol, Exeter and Lincoln. Thomas Pelham, 2nd earl of Chichester (1756-1826), son of the 1st earl, was surveyor-general of ordnance in Lord Rockingham's ministry (1782), and chief secretary for Ireland in the coalition ministry of 1783. In 1795 he became Irish chief secretary under Pitt's government, retiring in 1798; he was home secre- tary from July 1801 to August 1803 under Addington, who made him chancellor of the duchy of Lancaster in 1803. Pelham went out of office in 1804, and in the next year succeeded to the earldom. He was joint postmaster-general from 1807 to 1823, and for the remaining three years of his life postmaster-general. His son and heir, Henry Thomas Pelham (1804-1886), 3rd earl, was an ecclesiastical commissioner from 1850 until his death, and was greatly interested in various religious, philanthropic and educational movements; and two other sons were well-known men — Frederick Thomas Pelham (1808-1861), who became a rear-admiral in 1858, and subse- quently lord-commissioner of the admiralty, and John Thomas Pelham (1811-1894), who was bishop of Norwich from 1857 to 1893. The third earl's son, Walter John Pelham (1838-1892), succeeded his father in 1886, and his nephew Jocelyn Brudenell Pelham (b. 1871) became 6th earl of Chichester in 1905.

PELHAM, HENRY (1696-1754), prime minister of England, younger brother of Thomas Holies Pelham, duke of Newcastle, was born in 1696. He was a younger son of Thomas, 1st Baron Pelham of Laughton (1650-17×2; cr. 1706) and of Lady Grace Holies, daughter of the 3rd earl of Clare (see above). He was educated by a private tutor and at Christ Church, Oxford, which he entered in July 17 10. As a volunteer he served in Dormer's regiment at the battle of Preston in 171 5, spent some time on the Continent, and in 171 7 entered parliament for Seaford, Sussex. Through strong family influence and the

recommendation of Walpole he was chosen in 1721 a lord of the Treasury. The following year he was returned for Sussex county. In 1724 he entered the ministry as secretary of war, but this office he exchanged in 1730 for the more lucrative one of paymaster of the forces. He made himself conspicuous by his support of Walpole on the question of the excise, and in 1 743 a union of parties resulted in the formation of an adminis- tration in which Pelham was prime minister, with the office of chancellor of the exchequer; but rank and influence made his brother, the duke of Newcastle, very powerful in the cabinet, and, in spite of a genuine attachment, there were occasional disputes between them, which led to difficulties. Being strongly in favour of peace, Pelham carried on the war with languor and indifferent success, but the country, wearied of the interminable struggle, was disposed to acquiesce in his foreign policy almost without a murmur. The king, thwarted in his favourite schemes, made overtures in 1746 to Lord Bath, but his purpose was upset by the resignation of the two Pelhams (Henry and Newcastle), who, however, at the king's request, resumed office. Pelham remained prime minister till his death on the 6th of March 1754, when his brother succeeded him. His very defects were among the chief elements of Pelham's success, for one with a strong personality, moderate self-respect, or high conceptions of statesmanship could not have restrained the discordant elements of the cabinet for any length of time. Moreover, he possessed tact and a thorough acquaintance with the forms of the house. Whatever quarrels or insubordination might exist within the cabinet, they never broke out into open revolt. Nor can a high degree of praise be denied to his financial policy, especially his plans for the reduction of the national debt and the simplification and consolidation of its different branches. He had married in 1726 Lady Catherine Manners, daughter of the 2nd duke of Rutland; and one of his daughters married Henry Fiennes Clinton, 2nd duke of Newcastle.

See W. Coxe, Memoirs of the Pelham Administration. (2 vols., 1829). For the family history see Lower, Pelham Family (1873); also the

Pelham and Newcastle MSS. in the British Museum.

PELHAM, HENRY FRANCIS (1846-1907), English scholar and historian, was born at Berg Apton, Norfolk, on the 19th of September 1846, son of the Hon. John Thomas Pelham (1811-1894), bishop of Norwich, third son of the 2nd earl oi Chichester. He was educated at Harrow and at Trinity College, Oxford, where he took a first class in literae humaniores in 1869. He was a tutor of Exeter College from 1869 to 1890. In 1887 he became university reader in ancient history, and two years later was elected to the Camden professorship. He became curator of the Bodleian library in 1892, and in 1897 president of Trinity College. He was also a fellow of Brasenose College, honorary fellow of Exeter, a fellow of the British Academy and of other learned societies, and a governor of Harrow School. His chief contribution to ancient history was his article on Roman history in the 9th edition of the Encyclo- paedia Britannica (1886), which was republished with additions as the Outlines of Roman History (1890). His university lectures, though perhaps lacking in inspiration, were full of original research and learning. His death on the 13th of February 1907 not only prevented the publication in systematic form of his own important researches, but also delayed the appearance of much that had been left in MS. by H. Furneaux and A. H. J. Greenidge, and was at the time under his charge. Apart from the Outlines he published only The Imperial Domains and the Colonate (1890), The Roman Frontier System (1895), and articles in periodicals of which the most important was an article in the Quarterly Review on the early Caesars (April, 1905). He did much for the study of archaeology at Oxford, materially assisted the Hellenic Society and the British School at Athens, and was one of the founders of the British School at Rome. He married in 1873 Laura Priscilla, daughter of Sir Edward North Buxton.

PELIAS, in Greek legend, son of Poseidon and Tyro, daughter of Salmoneus. Because Tyro afterwards married her father's brother Cretheus, king of Iolcus in Thessaly, to whom she bore Aeson, Pheres and Amythaon, Pelias was by some thought to be

the son of Cretheus. He and his twin-brother Neleus were exposed by their mother, but were nurtured by a herdsman. When grown to manhood they were acknowledged by their mother. After the death of Cretheus, Pelias made himself master of the kingdom of Iolous, having

previously quarrelled with Neleus, who removed to Messenia, where he founded Pylos. In order to rid himself of Jason, Pelias sent him to Colchis in quest of the golden fleece, and took advantage of his absence to put to death his father, Aeson, his mother and brother. When Jason returned he sought to avenge the death of his parents, and Medea persuaded the daughters of Pelias to cut in pieces and boil their father, assuring them that he would thus be restored to youth. Acastus, son of Pelias, drove out Jason and Medea and celebrated funeral games in honour of his father, which were celebrated by the poet Stesichorus and represented on the chest of Cypselus. The death of Pelias was the subject of Sophocles' Rhizotomoi (Root-cutters), and in the Tyro he treated another portion of the legend. Peliades (the daughters of Pelias) was the name of Euripides' first play.

PELICAN (Fr. Pelican; Lat. Pelecanus or Pelicanus), a large fish-eating water-fowl, remarkable for the enormous pouch formed by the extensible skin between the lower jaws of its long, and apparently formidable but in reality very weak, bill. The ordinary pelican, the Onocrolalus of the ancients, to whom it was well known, and the Pelecanus onocrolalus of ornithologists, is a very abundant bird in some districts of south-eastern Europe, south-western Asia and north-eastern Africa, occasionally straying, it is believed, into the northern parts of Germany and France; but the possibility of such wanderers having escaped from confinement is always to be regarded, 1 since few zoological gardens are without examples. Its usual haunts are the shallow margins of the larger lakes and rivers, where fishes are plentiful, since it requires for its sustenance a vast supply of them. The nest is formed among reeds, placed on the ground and lined with grass. Therein two eggs, with white, chalky shells, are com- monly laid. The young during the first twelvemonth are of a greyish-brown, but when mature almost the whole plumage, except the black primaries, is white, deeply suffused by a rich blush of rose or salmon-colour, passing into yellow on the crest and lower part of the neck in front. A second and somewhat larger species, Pelecanus crispus, also inhabits Europe, but has a more eastern distribution. This, when adult, is readily dis- tinguishable from the ordinary bird by the absence of the blush from its plumage, and by the curled feathers that project from and overhang each side of the head, which with some difference of coloration of the bill, pouch, bare skin round the eyes and irides give it a wholly distinct expression. Two specimens of the "kumerus have been found in the English fens (Ibis, 1868, p. 363; Proc. Zool. Society, 1871, p. 702), thus proving the existence of the bird in England at no very distant period, and one of th'em being that of a young example points to its having been bred in this country. It is

possible from their large size that they belonged to P. crispus. Ornithologists have been much divided in opinion as to the number of living species of the genus Pele- canus (cf. op. cit., 1868, p. 264; 1869, p. 571; 1871, p. 631) — the estimate varying from six to ten or eleven; but the former is the number recognized by M. Dubois {Bull. Mus. de Belgique, 1883). North America has one, P. erythrorhynchus, very similar to P. onocrolalus both in appearance and habits, but remarkable for a triangular, horny excrescence developed on the ridge of the male's bill in the breeding season, which falls off without leaving trace of its existence when that is over. Australia has P. conspicillatus, easily distinguished by its black tail and wing- coverts. Of more marine habit are P. philippensis and P. fuscus, the former having a wide range in Southern Asia, and, it is said, reaching Madagascar, and the latter common on the coasts of the warmer parts of both North and South America.

The genus Pelecanus as instituted by Linnaeus included the 1 This caution was not neglected by the prudent, even so long ago as Sir Thomas Browne's days; for he, recording the occurrence of a pelican in Norfolk, was careful to notice that about the same time one of the pelicans kept by the king (Charles II.) in St James's Park, had beep lost.

cormorant (q.v.) and gannet (q.v.)~a.s well as the true pelicans, and for a long while these and some other distinct groups, as the snake-birds (q.v.), frigate-birds (q.v.) and tropic-birds (q.v.), which have all the four toes of the foot connected by a web, were regarded as forming a single family, Pelecanidae; but this name has now been restricted to the pelicans only, though all are still usually associated in the suborder Steganopodes of Ciconii- form birds. It may be necessary to state that there is no founda- tion for the venerable legend of the pelican feeding her young with blood from her own breast, which has given it an important place in ecclesiastical heraldry, except that, as A. D. Bartlett suggested (Proc. Zool. Society, 1869, p. 146), the curious bloody secretion ejected from the mouth of the flamingo may have given rise to the belief, through that bird having been mistaken for the "Pelican of the wilderness." 2 (A. N.)

PELION, a wooded mountain in Thessaly in the district of Magnesia, between Volo and the east coast. Its highest point (mod. Plessidi) is 5340 ft. It is famous in Greek mythology; the giants are said to have piled it on Ossa in order to scale Olympus, the abode of the gods; it was the home of the centaurs, especially of Chiron, who had a cave near its summit, and educated many youthful heroes; the ship " Argo " was built from its pine-woods. On its summit was an altar of Zeus

Actaeus, in whose honour an annual festival was held in the dog-days, and worshippers clad themselves in skins.

PELISSE (through the Fr. from Lat. pellicia: sc. vestis, a garment made of fur, pellis, skin), properly a name of a cloak made of or lined with fur, hence particularly used of the fur- trimmed ” dolman ” worn slung from the shoulders by hussar regiments. The word is now chiefly employed as the name of a long-sleeved cloak of anv material worn by women and children. PEUSSIER, AIMABLE JEAN JACQUES (1794-1864), duke of Malakoff, marshal of France, was born on the 6th of November 1794 at Maromme (Seine Inferieure), of a family of prosperous artisans or yeoman, his father being employed in a powder- magazine. After attending the military college of La Fleche and the special school of St Cyr, he in 1815 entered the army as sub-lieutenant in an artillery regiment. A brilliant examination in 1 81 9 secured his appointment to the staff. He served as aide-de-camp in the Spanish campaign of 1823, and in the expedition to the Morea in 1828-29. In 1830 he took part in the expedition to Algeria, and on his return was promoted to the rank of chef d’escadron. After some years’ staff service in Paris he was again sent to Algeria as chief of staff of the province of Oran with the rank of lieutenant-colonel, and remained there till the Crimean War, taking a prominent part in many important operations. The severity of his conduct in suffocating a whole Arab tribe in the Dahra or Dahna caves, near Mustaganem, where they had taken refuge (June 18, 1845), awakened such indignation in Europe that Marshal Soult, the minister of war, publicly expressed his regret; but Marshal Bugeaud, the governor-general of Algeria, not only gave it his approval, but secured for Pelissier the rank of general of brigade, which he held till 1850, when he was promoted general of division. After the battles of October and November 1854 before Sevastopol, Pelissier was sent to the Crimea, where on the 16th of May 1855 he succeeded Marshal Canrobert as commander-in-chief of the French forces before Sevastopol (see Crimean War). His command was marked by relentless pressure of the enemy and unalterable determination to conduct the campaign without interference from Paris. His perseverance was crowned with

2 The legend was commonly believed in the middle ages. Epiphanius, bishop of Constantia, in his Physiologus (1588), writes that the female bird, in cherishing her young, wounds them with loving, and pierces their sides, and they die. After three days the male pelican comes and finds them dead, and his heart is pained. He smites his own side, and as he stands over the wounds of the dead young ones the blood trickles down, and thus are they made alive again. The pelican ” in his piety ” — i.e. in this pious act of reviving his offspring — was a

common subject for 15th-century emblem books; it became a symbol of self-sacrifice, a type of Christian redemption and of the Eucharistic doctrine. The device was adopted by Bishop Fox in 1516 for his new college of Corpus Christi, Oxford.— [H. Ch.1

success in the storming of the Malakoff on the 8th of September. On the 1 2th he was promoted to be marshal. On his return to Paris he was named senator, created duke of Malakoff (July 22, 1856), and rewarded with a grant of 100,000 francs per annum. From March 1858 to May 1859 he was French ambassador in London, whence, he was recalled to take command of the army of observation on the Rhine. In the same year he became grand chancellor of the Legion of Honour. In i860 he was appointed governor-general of Algeria, and he died there on the 22 nd of May 1864.

See Marbaud, Le Marechal Pclissier (1863); Castille, Portraits historiques, 2nd series (1859).

PELL, JOHN (1610-1685), English mathematician, was born on the 1st of March 1610 at Southwick in Sussex, where his father was minister. He was educated at Steyning, and entered Trinity College, Cambridge, at the age of thirteen. During his university career he became an accomplished linguist, and even before he took his M.A. degree (in 1630) corresponded with Henry Briggs and other mathematicians. His great reputation and the influence of Sir William Boswell, the English resident, with the states-general procured his election in 1643 to the chair of mathematics in Amsterdam, whence he removed in 1646, on the invitation of the prince of Orange, to Breda, where he remained till 1652.

Fmm 16 $4 to 1658 Pell acted as Cromwell's political agent to the Protestant cantons of Switzerland. On his return to England he took orders and was appointed by Charles II. to the rectory of Fobbing in Essex, and in 1673 he was presented by Bishop Sheldon to the rectory of Laindon in the same county. His devotion to mathematical science seems to baye interfered alike with his advancement in the Church and with the proper management of his private affairs. For a time he was confined as a debtor in the king's bench prison. He lived, on the invitation of Dr Whistler, for a short time in 1682 at the College of Physicians, but died on the 12th of December 1685 at the house of Mr Cothorne, reader of the church of St Giles-in-the Fields. Many of Pell's manuscripts fell into the hands of Dr Busby, master of Westminster School, and afterwards came into the possession of the Royal Society;

they are still preserved in something like forty folio volumes, which contain, not only Pell's own memoirs, but much of his correspondence with the mathematicians of his time.

The Diophantine analysis was a favourite subject with Pell; he lectured on it at Amsterdam; and he is now best remembered for the indeterminate equation $ax^2 + i = y^2$, which is known by his name. This problem was proposed by Pierre de Fermat first to Berahard Frenicle de Bessy, and in 1657 to all mathematicians. Pell's connexion with the problem simply consists of the publication of the solutions of John YVallis and Lord Brounker in his edition of Branker's Translation of Rhonius's Algebra (1668). His chief works are: Astronomical History of Observations of Heavenly Motions and Appearances (1634); Ecliptica prognoslica (1634); Controversy with Longomonianns concerning the Quadrature of the Circle (1646?) ; An Idea of the Mathematics, i2mo (1650); A Table of Ten Thousand Square Numbers (fob; 1672).

PELLA, the capital of ancient Macedonia under Philip II. (who transferred the seat of government hither from Edessa) and Alexander the Great, who was Lorn here. It seems to have retained some importance up to the time of Hadrian. Scanty remains exist and some springs in the neighbourhood are still known as the baths of Pel. The site (identified by Leake) is occupied by the village of Neochori (Turk. Yeni-Keui) about 32 m. north-west of Salonika.

PELLAGRA (Ital. pclle agra, smarting skin), the name given, from one of its early symptoms, to a peculiar disease, of com- paratively modern origin. For some time it was supposed to be practically confined to the peasantry in parts of Italy (particu- larly Lombardy) and France, and in the Asturias {mal de la rosa), Rumania and Corfu. But it has recently been identified in various outlying parts of the British Empire (Barbadoes, India) and in both Lower and Upper Egypt; also among the Zulus and Basutos. In the United States sporadic cases had been observed up to 1906, but since then numerous cases have been reported. It is in Italy, however, that it has been most

prevalent. The malady is essentially chronic in character. The indications usually begin in the spring of the year, declining towards autumn, and recurring with increasing intensity and permanence in the spring seasons following. A peasant who is acquiring the malady feels unfit for work, suffers from head- aches, giddiness, singing in the ears, a burning of the skin, especially in the hands and feet, and diarrhoea. At the same time a red rash appears on the skin, of the nature of erysipelas, the red or livid spots being tense and painful,

especially where they are directly exposed to the sun. About July or August of the first season these symptoms disappear, the spots on the skin remaining rough and dry. The spring attack of the year following will probably be more severe and more likely to leave traces behind it; with each successive year the patient becomes more like a mummy, his skin shrivelled and sallow, or even black at certain spots, as in Addison's disease, his angles pro- truding, his muscles wasted, his movements slow and languid, and his sensibility diminished. Meanwhile there are more special symptoms relating to the nervous system, including drooping of the eyelid, dilatation of the pupil, and other disorders of vision, together with symptoms relating to the digestive system, such as a red and dry tongue, a burning feeling in the mouth, pain on swallowing, and diarrhoea. After a certain stage the disease passes into a profound disorganization of the nervous system; there is a tendency to melancholy, imbecility, and a curious mummified condition of body. After death a general tissue degeneration is observed.

The causation of this obscure disease has recently come up for new investigation in connexion with the new work done in relation to sleeping-sickness and other tropical diseases. So long as it was supposed to be peculiar to the Italian peasantry, it was associated simply with their staple diet, and was regarded as due to the eating of mouldy maize. It was by his views in this regard that Lombroso (q.v.) first made his scientific reputa- tion. But the area of maize consumption is now known to be wider than that of pellagra, and pellagra is found where maize is at least not an ordinary diet. In 1905 Dr L. W. Sambon, -"■*. the meeting of the British Medical Association, suggested that pellagra was probably protozoal in origin, and subsequently he announced his belief that the protozoon was communicated by sand-flies, just as sleeping-sickness by the tsetse fly; and this opinion was supported by the favourable action of arsenic in the treatment of the disease. His hypothesis was endorsed by Sir Patrick Manson, and in January 1910 an influential committee was formed, to enable Dr Sambon to pursue his investigations in a pellagrous area.

PELLETAN, CHARLES CAMILLE (1846-), French politician and journalist, was born in Paris on the 28th of June 1846, the son of Eugene Pelletan (1813-1884), a writer of Rome distinction and a noted opponent of the Second Empire. Camille Pelletan was educated in Paris, passed as licentiate in laws, and was qualified as an " archiviste paleograpbe." At the age of twenty he became an active contributor to the press, and a bitter critic of the Imperial Government. After the war of 1870-71 he took a leading place among

the most radical section of French politicians, as an opponent of the " opportunists " who continued the policy of Gambetta. In 1880 he became editor of Justice, and worked with success to bring about a revision of the sentences passed on the Communards. In 1881 he was chosen member for the tenth arrondissement of Paris, and in 1885 for the Bouches du Rhone, being re-elected in 1889, 1893 and 1898; and he was repeatedly chosen as " reporter " to the various bureaus. During the Nationalist and Dreyfus agitations he fought vigorously on behalf of the Republican government and when the coalition known as the "Bloc" was formed he took his place as a Radical leader. He was made minister of marine in the cabinet of M. Combes, June 1902 to January 1905, but his administration was severely criticized, notably by M. de Lanessan and other naval experts. During the great sailors' strike at Marseilles in 1904 he showed pronounced sympathy with the socialistic aims and methods of the strikers, and a strong feeling was aroused that

his Radical sympathies tended to a serious weakening of the navy and to destruction of discipline. A somewhat violent controversy resulted, in the course of which M. Pelletan's indiscreet speeches did him no good; and he became a common subject for ill-natured caricatures. On the fall of the Combes ministry he became less prominent in French politics.

PELLICANUS, CONRAD (1478-1556), German theologian, was born at Ruffach in Alsace, on the 8th of January 1478. His German name, Kiirsner, was changed to Pellicanus by his mother's brother Jodocus Gallus, an ecclesiastic connected with the university of Heidelberg, who supported his nephew for sixteen months at the university in 1491-1492. On returning to Ruffach, he taught gratis in the Minorite convent school that he might borrow books from the library, and in his sixteenth year resolved to become a friar. This step helped his studies, for he was sent to Tubingen in 1496 and became a favourite pupil of the guardian of the Minorite convent there, Paulus Scriptoris, a man of considerable general learning. There seems to have been at that time in south-west Germany a considerable amount of sturdy independent thought among the Franciscans; Pellicanus himself became a Protestant very gradually, and without any such revulsion of feeling as marked Luther's conversion. At Tubingen the future " apostate in three languages " was able to begin the study of Hebrew. He had no teacher and no grammar; but Paulus Scriptoris carried him

a huge codex of the prophets on his own shoulders all the way from Mainz. He learned the letters from the transcription of a few verses in the Star of the Messiah of Petrus Niger, and, with a subsequent hint or two from Reuchlin, who also lent him the grammar of Moses ICimhi, made his way through the Bible for himself with the help of Jerome's Latin. He got on so well that he was not only a useful helper to Reuchlin but anticipated the manuals of the great Hebraist by composing in 1501 the first Hebrew grammar in the European tongue. It was printed in 1503, and afterwards included in Reysch's Margarita philosophica. Hebrew remained a favourite study to the last. Pellican's autobiography de- scribes the gradual multiplication of accessible books on the subjects, and he not only studied but translated a vast mass of rabbinical and Talmudic texts, his interest in Jewish literature being mainly philological. The chief fruit of these studies is the vast commentary on the Bible (Zurich, 7 vols., 1 532-1539), which shows a remarkably sound judgment on questions of the text, and a sense for historical as opposed to typological exegesis. Pellicanus became priest in 1501 and continued to serve his order at Ruffach, Pforzheim, and Basel till 1526. At Basel he did much laborious work for Froben's editions, and came to the conclusion that the Church taught many doctrines of which the early doctors of Christendom knew nothing. He spoke his views frankly, but he disliked polemic; he found also more toleration than might have been expected, even after he became active in circulating Luther's books. Thus, supported by the civic authorities, he remained guardian of the convent of his order at Basel from 1519 till 1524, and even when he had to give up his post, remained in the monastery for two years, professing theology in the university. At length, when the position was becoming quite untenable, he received through Zwingli a call to Zurich as professor of Greek and Hebrew, and formally throwing off his monk's habit, entered on a new life. Here he remained till his death on the 6th of April 1556.

Pellicanus's scholarship, though not brilliant, was really extensive; his sound sense, and his singularly pure and devoted character gave him a great influence. He was remarkably free from the pedantry of the time, as is shown by his views about the use of the German vernacular as a vehicle of culture (Chron. T 3S) 36). As a theologian his natural affinities were with Zwingli, with whom he shared the advantage of having grown up to the views of the Reformation, by the natural progress of his studies and religious life. Thus he never lost his sympathy with humanism and with its great German representative, Erasmus.

Pellicanus's Latin autobiography {Chronicon C.P.R.) is one of the most interesting documents of the period. It was first published

by Riggenbach in 1877, and in this volume the other sources for his life are registered. See also Emil Silberstein, Conrad Pellicanus; ein Beitrag zur Geschichte des Studiums der hebr. Sprache (Berlin,

1900).

PELLICIER, GUILLAUME (c. 1490-1568), French prelate and diplomatist, was educated by his uncle, the bishop of Maguelonne, whom he succeeded in 1529. In 1536 he had the seat of his bishopric transferred to Montpellier. Appointed ambassador at Venice in 1539, he fulfilled his mission to the entire satisfaction of Francis I., but on the discovery of the system of espionage he had employed the king had to recall him in 1542. Returning to his diocese, he was imprisoned in the chateau of Beaucaire for his tolerance of the Reformers, so he replaced his former indulgence by severity, and the end of his episcopate was disturbed by religious struggles. He was a man of wide learning, a humanist and a friend of humanists, and took a keen interest in the natural sciences.

See J. Zeller, La Diplomatie francaise . . . d' apres le correspondance de G. Pellicier (Paris, 1881) ; and A. Tausserat-Radel, Correspondance politique de Guillaume Pellicier (Paris, 1899).

PELLICO, SILVIO (1788-1854), Italian dramatist, was born at Saluzzo in Piedmont on the 24th of June 1788, the earlier portion of his life being passed at Pinerolo and Turin under the tuition of a priest named Manavella. At the age of ten he composed a tragedy under the inspiration of Caesarotti's translation of the Ossianic poems. On the marriage of his twin sister Rosina with a maternal cousin at Lyons he went to reside in that city, devoting himself during four years to the study of French literature. He returned in 1810 to Milan, where he became professor of French in the Collegio degli Orfani Militari. His tragedy Francesca da Rimini, was brought out with success by Carlotta Marchionni at Milan in 1818. Its publication was followed by that of the tradegy Eujemio da Messina, but the representation of the latter was forbidden. Pellico had in the meantime continued his work as tutor, first to the unfortunate son of Count Briche, and then to the two sons of Count Porro Lambertenghi. He threw himself heartily into an attempt to weaken the hold of the Austrian despotism by indirect educa- tional means. Of the powerful literary executive which gathered about Counts Porro and Confalonieri, Pellico was the able secretary — the management of the Conciliatore, which appeared in 1818 as the organ of the association, resting largely upon him. But the paper, under the censorship of the Austrian officials, ran for a year only, and the society itself was broken up by the government. In

October 1820 Pellico was arrested on the charge of carbonarism and conveyed to the Santa Margherita prison. After his removal to the Piombi at Venice in February 1821, he composed several Cantiche and the tragedies Ester d'En- gaddi and Iginia d'Asti. The sentence of death pronounced on him in February 1822 was finally commuted to fifteen years carcere duro, and in the following April he was placed in the Spielberg at Briinn. His chief work during this part of his imprisonment was the tragedy Leoniero da Dertona, for the preservation of which he was compelled to rely on his memory. After his release in 1830 he commenced the publication of his prison compositions, of which the Ester was played at Turin in 1 83 1, but immediately suppressed. In 1832 appeared his Gismonda da Mendrizio, Erodiade and the Leoniero, under the title of Tre nuovi tragedie, and in the same year the work which gave him his European fame, Le Mie prigioni, an account of his sufferings in prison. The last gained him the friendship of the Marchesa di Barolo, the reformer of the Turin prisons, and in 1834 he accepted from her a yearly pension of 1200 francs. His tragedy Tommaso Moro had been published in 1833, his most important subsequent publication being the Opere inedite in 1837. On the decease of his parents in 1838 he was received into the Casa Barolo, where he remained till his death, assisting the marchesa in her charities, and writing chiefly upon religious themes. Of these works the best known is the Dei Doveri degli uomini, a series of trite maxims which do honour to his piety rather than to his critical judgment. A fragmentary biography of the marchesa by Pellico was published in Italian and English after her death. He died on the 31st of January 1854, and was

buried in the Campo Santo at Turin. His writings are defective in virility and breadth of thought, and his tragedies display neither the insight into character nor the constructive power oi a great dramatist. It is in the simple narrative and naive egotism of Le Mie prigioni that he has established his strongest claim to remembrance, winning fame by his misfortunes rather than by his genius.

See Piero Maroncelli, Addizioni alle mie prigioni (Paris, 1834) ; the biographies by Latour; Gabriele Rosselli; Didier, Revue des deux mondes (September 1842) ; De Lomenie, Galerie des contemp. illustr. iv. (1842); Chiala (Turin, 1852); Nollet-Fabert (1854); Giorgio Briano (1854); Bourdon (1868); Rivieri (1899-1901).

PELLISSON, PAUL (1624-1693), French author, was born at Beziers on the 30th of October 1624, of a distinguished Calvinist family. He studied law at Toulouse, and practised at the bar of Castres. Going to Paris with letters of introduction to Valentin Conrart, who was a co-religionist, he became through him acquainted with the members of the academy. Pellisson undertook to be their historian, and in 1653 published a Relation contenant I'histoire de I'academie francaise. This panegyric was rewarded by a promise of the next vacant place and by permission to be present at their meetings. In 1657 Pellisson became secretary to the minister of finance, Nicolas Fouquet, and when in 1661 the minister was arrested, his secretary was imprisoned in the Bastille. Pellisson had the courage to stand by his fallen patron, in whose defence he issued his celebrated Memoire in 1661, with the title Discours au roi, par un de ses fideles sujets sur le proces de M. de Fouquet, in which the facts in favour of Fouquet are marshalled with great skill. Another pamphlet, Seconde defense de M. Fouquet, followed. Pellisson was released in 1666, and from this date sought the royal favour. He became historiographer to the king, and in that capacity wrote a fragmentary Histoire de Louis XIV., covering the years 1660 to 1670. In 1670 he was converted to Catholicism and obtained rich ecclesiastical preferment. He died on the 7th of February 1693. He was very intimate with Mile de Scudery, in whose novels he figures as Herminius and Acante. His sterling worth of character made him many friends and justified Bussy-Rabutin's description of him as " encore plus honnete homme que bel esprit."

See Sainte-Beuve, Causeries du lundi, vol. xiv. ; and F. L. Marcon, Etude sur la vie et les osuvres de Pellisson (1859).

PELLITORY, in botany, the common name for a small hairy perennial herb which grows on old walls, hedgebanks and similar localities, and is known botanically as Parietaria offici- nalis (Lat. paries, a wall). It has a short woody rootstock from which spring erect or spreading stems 1 to 2 ft. long, bearing slender leafy branches, and axillary clusters of small green flowers. It belongs to the nettle order (Urticaceae) , and is nearly allied to the nettle, Urtica, but its hairs are not stinging.

PELLOUX, LUIGI (1839-), Italian general and politician, was born on the 1st of March 1839, at La Roche, in Savoy, of parents who retained their Italian nationality when Savoy was annexed to France. Entering the army as lieutenant of artillery in 1857, he gained the medal for military valour at the battle of Custozza in 1866, and in 1870 commanded the brigade of artillery which battered the breach in the wall of Rome at Porta Pia. He was elected to the Chamber in 1881 as

deputy for Leghorn, which he represented until 1895, and joined the party of the Left. He had entered the war office in 1870, and in 1880 became general secretary, in which capacity he introduced many useful reforms in the army. After a succession of high military commands he received the appointment of chief of the general staff in 1896. He was minister of war in the Rudini and Giolitti cabinets of 1 891-1893. In July 1896 he resumed the portfolio of war in the Rudini cabinet, and was appointed senator. In May 1897 he secured the adoption of the Army Reform Bill, fixing Italian military expenditure at a maximum of £9,560,000 a year, but in December of that year he was defeated in the Chamber on the question of the promotion of officers. Resigning office, he was in May 1898 sent as royal commissioner to Bari, where, without recourse to martial law, he succeeded in restoring

public order. Upon the fall of Rudini' in June 1898, General Pelloux was entrusted by King Humbert with the formation of a cabinet, and took for himself the post of minister of the interior. He resigned office in May 1899, but was again en- trusted with the formation of the ministry. He took stern measures against the revolutionary elements in southern Italy, and his new cabinet, was essentially military and conservative. The Public Safety Bill for the reform of the police laws, taken over by him from the Rudini cabinet, and eventually promul- gated by royal decree, was fiercely obstructed by the Socialist party, which, with the Left and Extreme Left, succeeded in forcing General Pelloux to dissolve the Chamber in May 1900, and to resign office after the general election in June. In the autumn of 1901 he was appointed to the command of the Turin army corps.

PELOMYXA, so named by R. Greeff, a genus of Lobose Rhizopoda (q.v.), naked, multinucleate, with very blunt rounded pseudopodia, formed by eruption (see Amoeba), often containing peculiar vesicles (glycogen?), and full of a symbiotic bacterium. It inhabits the ooze of decomposing organic matter at the bottom of ponds and lakes.

PELOPIDAS (d. 364 B.C.), Theban statesman and general. He was a member of a distinguished family, and possessed great wealth which he expended on his friends, while content to lead the life of an athlete. In 385 B.C. he served in a Theban contingent sent to the support of the Spartans at Mantineia, where he was saved, when dangerously wounded, by Epami- nondas (q.v.). Upon the seizure of the Theban citadel by the Spartans (383 or 382) he fled to Athens, and took the lead in a conspiracy to liberate Thebes. In 379 his party surprised and killed their chief political opponents, and roused the people against the Spartan garrison, which surrendered to an army gathered by

Pelopidas. In this and subsequent years he was elected boeotarch, and about 375 he routed a much larger Spartan force at Tegyra (near Orchomenus). This victory he owed mainly to the valour of the Sacred Band, a picked body of 300 infantry. At the battle of Leuctra (371) he contributed greatly to the success of Epaminondas's new tactics by the rapidity with which he made the Sacred Band close with the Spartans. In 370 he accompanied his friend Epaminondas as boeotarch into Peloponnesus. On their return both generals were unsuc- cessfully accused of having retained their command beyond the legal term. In 369, in response to a petition of the Thessa- lians, Pelopidas was sent with an army against Alexander, tyrant of Pherae. After driving Alexander out, he passed into Macedonia and arbitrated between two claimants to the throne. In order to secure the influence of Thebes, he brought home hostages, including the king's brother, afterwards Philip II., the conqueror of Greece. Next year Pelopidas was again called upon to interfere in Macedonia, but, being deserted by his mercenaries, was compelled to make an agreement with Ptolemaeus of Alorus. On his return through Thessaly he was seized by Alexander of Pherae, and two expeditions from Thebes were needed to secure his release. In 367 Pelopidas went on an embassy to the Persian king and induced him to prescribe a settlement of Greece according to the wishes of the Thebans. In 364 he received another appeal from the Thessalian towns against Alexander of Pherae. Though an eclipse of the sun prevented his bringing with him more than a handful of troops, he overthrew the tyrant's far superior force on the ridge of Cynoscephalae; but wishing to slay Alexander with his own hand, he rushed forward too eagerly and was cut down by the tyrant's guards.

Plutarch and Nepos, Pelopidas; Diodorus xv. 62-81; Xenophon, Hellenica, vii. 1. See also Thebes. (M. O. B. C.)

PELOPONNESIAN WAR, in Greek history, the name given specially to the struggle between Athens at the head of the Delian League and the confederacy of which Sparta was the leading power. 1 According to Thucydides the war, which was

1 Some historians prefer to call it the Second Peloponnesian War, the first being that of 457, which ended with the Thirty Years' Peace.

in his view the greatest that had ever occurred in Greece, lasted from 431 to the downfall of Athens in 404. The genius of Thucydides has

given to the struggle the importance of an epoch in world history, but his view is open to two main criti- cisms — (1) that the war was in its ultimate bearings little more than a local disturbance, viewed from the standpoint of universal history; (2) that it cannot be called a war in the strict sense. The former of these criticisms is justified in the article on Greece: History (q.v.). Unless we are to believe that the Macedonian supremacy is directly traceable to the mutual weakening of the Greek cities in 431-403, it is difficult to see what lasting importance attaches to the war. As regards the second, a few chief difficulties may be indicated. The very narrative even of Thucydides himself shows that the ” war ” was not a connected whole. It may be divided into three main periods — (1) from 431 to 421 (Lysias calls it the ” Archidamian ” War) , when the Peace of Nicias, not merely formally, but actually produced a cessation of hostilities; (2) from 421 till the inter- vention of Sparta in the Sicilian War; during these years there was no ” Peloponnesian War,” and there were several years in which there was in reality no fighting at all: the Sicilian expedi- tion was in fact a side issue; (3) from 413 to 404, when fighting was carried on mainly in the Aegean Sea (Isocrates calls this the ” Decelean ” War). The disjointed character of the struggle is so obvious from Thucydides himself that historians have come to the conclusion that the idea of treating the whole struggle as a single unit was ex post facto (see Greece: History, § A, ” Ancient ” ad fin.).

The book itself affords evidence which goes far to justify this view. A very important problem is presented by bk. v., which is obviously put in as a connecting link to prove a theory. Thucy- dides expressly warns us not to regard the period of this book as one of peace, and yet the very contents of the book refute his argument. In 419 and 417 there is practically no fighting: the Mantinean War of 418 is a disconnected episode which did not lead to a resumption of hostilities: in 420 there are only obscure battles in Thrace: in 416 there is only the expedition to Melos; and finally from 421 to 413 there is official peace. Other details may be cited in corroboration. Book v. (ch. 26) contains a second introduction to the subject; 85e 6 iroXefios in i. 23 and iv. 48 is the Archidamian or Ten Years’ War; in v. 26 we read of a TpHros irokenos, a varepos iroKe/xos and an avaKwxV- Some critics think on these and other grounds that Thucydides wrote and published bks. i.v. 25 by itself, then bks. vi. and vii. (Sicilian expedition), and finally revising his view joined them into one whole by the somewhat unsatisfactory bk. v. 26 and following chapters, and began to round off the story with the incomplete bk. viii. (on this see Greece: History, as above). It is perhaps most probable that he retained notes made con temporarily and worked them up some time

after 404, in a few passages failing to correct inconsistencies and dying before bk. viii. was completed. The general introduction in bk. i. was unquestionably written shortly after 404.

The causes of the war thus understood are complex. The view taken by Thucydides that Sparta was the real foe of Athens has been much modified by modern writers. The key to the situation is in fact the commercial rivalry of the Corin- thians, whose trade (mainly in the West) had been seriously limited by the naval expansion of the Delian League. This rivalry was roused to fever heat by the Athenian intervention in 434-33 on behalf of Corcyra, Corinth's rebellious colony (see Corfu) and from that time the Corinthians felt that the Thirty Years' Truce was at an end. An opportunity soon offered for making a counter attack. Potidaea, a Dorian town on the western promontory of Chalcidice in Thrace, a tributary ally of Athens — to which however Corinth as metropolis still sent annual magistrates — was induced to revolt, 1 with the support of the Macedonian king Perdiccas, formerly an Athenian ally. The Athenian Phormio succeeded in blockading the city so that

1 The importance of this revolt lay in the fact that it immediately involved danger to Athens throughout the Chalcidic promontories, and her north-east possessions generally.

its capture was merely a question of time, and this provided the Corinthians with an urgent reason for declaring war.

Prior to these episodes Athens had not been in hostile contact with any of the Peloponnesian confederate states for more than ten years, and Pericles had abandoned a great part of his imperial policy. He now laid an embargo upon Megara by which the Megarians were forbidden on pain of death to pursue trading operations with any part of the Athenian Empire. The circum- stances of this decree (or decrees) are not material to the present argument (see Grote, History of Greece, ed. 1907, p. 370 note) except that it turned special attention to the commercial supremacy which Athens claimed to enjoy. In 432 a conference of Peloponnesian allies was summoned and the Corinthian envoys urged the Spartans to declare war on the ground that the power of Athens was becoming so great as to constitute a danger to the other states. This might have been urged with justice before the Thirty Years' Truce (447); but by that truce Athens gave up all her conquests in Greece proper except Naupactus and Plataea, while her solitary gains in Amphipolis and Thurii were compensated by other losses. The fact that the Corinthian argument failed to impress Sparta and many of the delegates is shown by the

course of the debate. What finally impelled the Spartans to agree to the war was the veiled threat by the Corinthians that they would be driven into another alliance (i.e. Argos, i. 71). We can hardly regard Sparta as the deter- mined enemy of Athens at this time. Only twice since 461 had she been at war with Athens — in 457 (Tanagra) and 447, when she deliberately abstained from pushing the advantage which the revolt in Euboea provided; she had refused to help the oligarchs of Samos in 440. Corinth however had not only strong, but also immediate and urgent reasons (Potidaea and Corcyra) for desiring war. It has been argued that the war was ulti- mately a struggle between the principles of oligarchy and democracy. This view, however, cannot be taken of the early stages of the war when there was democracy and oligarchy on both sides (see ad fin.) ; it is only in the later stages that the political difference is prominent.

The Opposing Forces. — The permanent strength of the Peloponnesian confederacy lay in the Peloponnesian states, all of which except Argos and Achaea were united under Sparta's leadership. But it included also extra-Peloponnesian states — viz. Megara, Phocis, Boeotia and Locris (which had formed part of the Athenian land empire), and the maritime colonies round the Ambracian Gulf. The organization was not elaborate. The federal assembly with few exceptions met only in time of war, and then only when Sparta agreed to summon it. It met in Sparta and the delegates, having stated their views before the Spartan Apella, withdrew till the Apella had come to a decision. The delegates were then invited to return and to confirm that decision. It is clear that the link was purely one of common interest, and that Sparta had little or no control over, e.g. so powerful a confederate as Corinth. Sparta was the chief member of the confederacy (hegemon), but the states were autonomous. In time of war each had to provide two-thirds of its forces, and that state in whose territory the war was to take place had to equip its whole force.

The Athenian Empire is described elsewhere (Delian League, Athens). Here it must suffice to point out that there was among the real and technical allies no true bond of interest, and that many of the states were in fact bound by close ties to members of the Peloponnesian confederacy (e.g. Potidaea to Corinth) . Sparta could not only rely on voluntary co-operation but could undermine Athenian influence by posing as the champion of autonomy. Further, Thucydides is wrong on his own showing in saying that Sparta refused to tolerate democratic government in confederate cities: it was not till after 418 that this policy was adopted. Athens, on the other hand, had un- doubtedly interfered in the interest of democracy in various allied states (see Delian League).

No detailed examination of the comparative military and naval resources of the combatants can here be attempted. On land the Peloponnesians were superior: they had at least 30,000

hoplites not including 10,000 from Central Greece and Boeotia: these soldiers were highly trained. The Athenian army was undoubtedly smaller. There has been considerable discussion as to the exact figures, the evidence in Thucydides being highly confusing, but it is most probable that the available fighting force was not more than half that of the Peloponnesian confed- eracy. Even of these we learn (Thuc. iii. 87) that 4400 died in the great plague. The only light-armed force was that of Boeotia at Delium (10,000 with 500 peltasts). Of cavalry Athens had 1000, Boeotia a similar number. The only other cavalry force was that of Thessaly, which, had it been loyal to Athens, would have meant a distinct superiority. In naval power the Athenians undoubtedly had an overwhelming advantage at the beginning, both in numbers and in training.

Financially Athens had an enormous apparent advantage. She began with a revenue of 1000 talents (including 600 from obfifiaxoi.) , and had also, in spite of the heavy expense which the building schemes of Pericles had involved, a reserve of 6000 talents. The Peloponnesians had no reserve and no fixed revenue assessment. On the other hand the Peloponnesian armies were unpaid, while Athens had to spend considerable sums on the payment of crews and mercenaries. In the last stages of the war the issue was determined by the poverty of Athens and Persian gold.

The events of the struggle from 431 to 404 may be summarized in the three periods distinguished above.

1. The Ten Years' or Archidamian War. — The Spartans sent to Athens no formal declaration of war but rather sought first to create some specious casus belli by sending requisitions to Athens. The first, intended to inflame the existing hostilities against Pericles (q.v.) in Athens, was that he should be expelled the city as being an Alcmaeonid (grand-nephew of Cleisthenes) and so implicated in the curse pronounced on the murderers of Cylon nearly 200 years before. This outrageous demand was followed by three others — that the Athenians should (1) withdraw from Potidaea, (2) restore autonomy to Aegina, and (3) withdraw the embargo on Megarian commerce.

Upon the refusal of all these demands Sparta finally made the maintenance of peace contingent upon the restoration by Athens of autonomy to all her allies. Under the guidance of Pericles Athens replied that she would do nothing on compulsion, but was prepared to submit difficulties to amicable arbitration on the basis of mutual concessions. Before anything could come of this proposal, matters were precipitated (end of March 431) by the attack of Thebes upon Plataea (q.v.), which immediately sought and obtained the aid of Athens. War was begun. The Spartan king Archidamus assembled his army, sent a herald to announce his approach, marched into Attica and besieged Oenoc.

Meanwhile Pericles had decided to act on the defensive, i.e. to abandon Attica, collect all its residents in Athens and treat Athens as an island, retaining meanwhile command of the sea and making descents on Peloponnesian shores. , The policy, which Thucydides and Grote commend, had grave defects — though it is by no means easy to suggest a better; e.g. it meant the ruin of the landed class, it tended to spoil the moral of those who from the walls of Athens annually watched the wasting of their homesteads, and it involved the many perils of an over- crow led city — a peril increased by, if not also the cause of, the plague. Moreover sea power was not everything, and delay exhausted the financial reserves of the state, while financial considerations, as we have seen, were comparatively unimportant to the Peloponnesians. The descents on the Peloponnese were futile in the extreme.

Archidamus, having wasted much territory, including Achar- nae, retired at the end of July. The Athenians retaliated by attacking Methone (which was secured by Brasidas),by successes in the West, by expelling all Aeginetans from Aegina (which was made a cleruchy), and by wasting the Megarid.

In 430 Archidamus again invaded Attica, systematically wasting the country. Shortly after he entered Attica plague broke out in Athens, borne thither by traders from Carthage or Egypt (Holm, Greek History, ii. 346 note}. The effect upon

the overcrowded population of the city was terrible. Of the 1200 cavalry (including mounted archers) 300 died, together with 4400 hoplites: altogether the estimate of Diodorus (xii. 58) that more than 10,000 citizens and slaves succumbed is by no means excessive. None the less Pericles sailed with 100 triremes, and ravaged the territory near Epidaurus. Subsequently he re- turned and the expedition proceeded to Potidaea. But the plague went with them and no results

were achieved. The enemies of Pericles, who even with the aid of Spartan intrigue had hitherto failed to harm his prestige, now succeeded in inducing the desperate citizens to fine him for alleged malversation. The verdict, however, shocked public feeling and Pericles was reinstated in popular favour as strategus (c. Aug. 430). About a year later he died. In the autumn of 430 a Spartan attack on Zacynthus failed and the Ambraciots were repulsed from Amphilochian Argos. In reply Athens sent Phormio to Nau- pactus to watch her interests in that quarter. In the winter Potidaea capitulated, receiving extremely favourable terms.

In 429 the Peloponnesians were deterred by the plague from invading Attica and laid siege to Plataea in the interests of Thebes. The Athenians failed in an expedition to Chalcidice under Xenophon, while the Spartan Cnemus with Chaonian and Epirot allies was repulsed from Stratus, capital cf Acarnania, and Phormio with only 20 ships defeated the Corinthian fleet of 47 sail in the Gulf of Corinth. Orders were at once sent from Sparta to repair this disaster and 77 ships were equipped. Help sent from Athens was diverted to Crete, and after much manoeuvring Phormio was compelled to fight off Naupactus. Nine of his ships were drivon ashore, but with the other n he subsequently defeated the enemy and recovered the lost nine. With the reinforcement which arrived afterwards he established complete control of the western seas. A scheme for operating with Sitalces against the Chalcidians of Thrace fell through, and Sitalces joined Perdiccas.

The year 428 was marked by a third invasion of Attica and by the revolt of Lesbos from Athens. After delay in fruitless negotiations the Athenian Cleippides, and afterwards Paches, besieged Mytilene, which appealed to Sparta. The Pelopon- nesian confederacy resolved to aid the rebels both directly and by a counter demonstration against Athens. The Athenians, though their reserve of 6000 talents was by now almost exhausted (except for 1000 talents in a special reserve), made a tremendous effort (raising 200 talents by a special property tax), and not only prevented an invasion by a demonstration of 100 triremes at the Isthmus, but sent Asopius, son of Phormio, to take his place in the western seas. In spring 427 the Spartans again invaded Attica without result. The winter of 428-427 was marked by the daring escape of half the Plataean garrison under cover of a stormy night, and by the capitulation of Mytilene, which was forced upon the oligarchic rulers by the democracy. The Spartan fleet arrived too late and departed without attempting to recover the town. Paches cleared the Asiatic seas of the enemy, reduced the other towns of Mytilene and returned to Athens with upwards of 1000 prisoners. An assembly

was held and under the invective of Cleon (q.v.) it was decided to kill all male Mytileneans of military age and to sell the women and children as slaves. This decree, though in accordance with the rigorous customs of ancient warfare as exemplified by the treat- ment which Sparta shortly afterwards meted out to the Plataeans, shocked the feelings of Athens, and on the next day it was (illegally) rescinded just in time to prevent Paches carrying it out. The thousand 1 oligarchic prisoners were however executed, and Lesbos was made a cleruchy.

Meanwhile there occurred civil war in Corcyra, in which ultimately, with the aid of the Athenian admiral Eurymedon, the democracy triumphed amid scenes of the wildest savagery. In the autumn of the year Nicias fortified Minoa at the mouth of the harbour of Megara. Shortly afterwards the Spartans

1 So Thuc. iii. 50. It is suggested that this number is an error for 30 or 50 (i.e., A or N for A). It seems incredible that 1000 could be described as ” ringleaders ” out of a population of perhaps

5000.

planted an unsuccessful colony at Heraclea in the Trachinian territory north-west of Thermopylae.

In the summer of 426 Nicias led a predatory expedition along the north-west coast without achieving any positive victory. More important, though equally ineffective, was the scheme of Demosthenes to march from Naupactus through Aetolia, sub- duing the wild hill tribes, to Cytinium in Doris (in the upper valleys of the Cephissus) and thence into Boeotia, which was to be attacked simultaneously from Attica. The scheme was crushed by the courage and skill of the Aetolians, who thereupon summoned Spartan and Corinthian aid for a counter attack on Naupactus. Demosthenes averted this, and immediately after- wards by superior tactics inflicted a complete defeat at Olpae in Acarnania on Eurylochus at the head of a Spartan and Ambracian force. An Ambracian reinforcement was annihilated at one of the peaks called Idornene, and a disgraceful truce was accepted by the surviving Spartan leader Menedaeus. This was not only the worst disaster which befell any powerful state up to the peace of Nicias (as Thucydides says), but was a serious blow to Corinth, whose

trade on the West was, as we have seen, one of the chief causes of the war.

The year 425 is remarkable for the Spartan disaster of Pylos (q.v.). The Athenians had despatched 40 triremes under Eurymedon and Procles to Sicily with orders to call first at Corcyra to prevent an expected Spartan attack. Meantime Demosthenes had formed the plan of planting the Messenians of Naupactus in Messenia — now Spartan territory — and obtained permission to accompany the expedition. The fleet was, as it chanced, delayed by a storm in the Bay of Navarino, and rough fortifications were put up by the sailors on the promontory of Pylos. Demosthenes was left behind in this fort, and the Spartans promptly withdrew from their annual raid upon Attica and their projected attack on Corcyra to dislodge him. After a naval engagement (see Pylos) a body of Spartan hoplites were cut off on Sphacteria. So acutely did Sparta feel their position that an offer of peace was made on condition that the hoplites should go free. The eloquence of Cleon frustrated the peace party's desire to accept these terms, and ultimately to the astonishment of the Greek world the Spartan hoplites to the number of 292 surrendered unconditionally (see Cleon).

Thus in 424 the Athenians had seriously damaged the prestige of Sparta, and broken Corinthian supremacy in the north-west, and the Peloponnesians had no fleet. This was the zenith of their success, and it was unfortunate for them that they declined the various offers of peace which Sparta made. The next two years changed the whole position. The doubling of the tribute in 425 pressed hardly on the allies (see Delian League): Nicias failed in a plot with the democratic party in Megara to seize that town; and the brilliant campaigns of Brasidas (q.v.) in the north-east, culminating in the capture of Amphipolis (422), finally destroyed the Athenian hopes of recovering their land empire, and entirely restored the balance of success and Spartan prestige. Moreover, the admirably conceived scheme for a simultaneous triple attack upon Boeotia at Chaeronea in the north, Delium in the south-east, and Siphae in the south-west had fallen through owing to the inefficiency of the generals. The scheme, which probably originated with the atticizing party in Thebes, resulted in the severe defeat of Hippocrates at Delium by the Boeotians under Pagondas, and was a final blow to the policy of an Athenian land empire.

These disasters at Megara, Amphipolis and Delium left Athens with only one trump card — the possession of the Spartan hoplites captured in Sphacteria. This solitary success had already in the spring

of 423 induced Sparta jn spite of the successes which Brasidas was achieving in Thrace to accept the ” truce of Laches ” — which, however, was rendered abortive by the refusal of Brasidas to surrender Scione. The final success of Brasidas at Amphipolis, where both he and Cleon were killed, paved the way for a more permanent agreement, the peace parties at Athens and Sparta being in the ascendant.

2. From 421 to 413. — Peace was signed in March 421 on the basis of each side’s surrendering what had been acquired by

the war, not including those cities which had been acquired by capitulation. It was to last for fifty yeais. Its weak points, however, were numerous. Whereas Sparta had been least of all the allies interested in the war, and apart from the campaigns of Brasidas had on the whole taken little part in it, her allies benefited least by the terms of the Peace. Corinth did not regain Sollium and Anactorium, while Megara and Thebes respectively were indignant that Athens should retain Nisaea and receive Panactum. These and other reasons rapidly led to the isolation of Sparta, and there was a general refusal to carry out the terms of agreement. The history of the next three years is therefore one of complex inter-state intrigues combined with internal political convulsions. In 421 Sparta and Athens concluded a defensive alliance; the Sphacterian captives were released and Athens promised to abandon Pylos. Such a peace, giving Sparta everything and Athens nothing but Sparta’s bare alliance, was due to the fact that Nicias and Alcibiades were both seeking Sparta’s friendship. At this time the Fifty Years’ Truce between Sparta and Argos was expiring. The Peloponnesian malcontents turned to Argos as a new leader, and an alliance was formed between Argos, Corinth, Elis, Mantinea and the Thraceward towns (420). This coalition between two different elements — an anti-oligarchic party and a war party — had no chance of permanent existence. The war party in Sparta regained its strength under new ephors and negotiations began for an alliance between Sparta, Argos and Boeotia. The details cannot here be discussed. The result was a re-shuffling of the cards. The democratic states of the Peloponnese were driven, partly by the intrigues of Alcibiades, now anti-Laconian, into alliance with Athens, with the object of establishing a democratic Peloponnese under the leadership of Argos. These unstable combinations were soon after upset by Alcibiades himself, who, having succeeded in displacing Nicias as strategus in 419, allowed Athenian troops to help in attacking Epidaurus. For a cause not easy to determine Alcibiades was defeated by Nicias in the election to the post of strategus in the next year, and the suspicions of the Pelopon- nesian coalition were roused by the inadequate

assistance sent by Athens, which arrived too late to assist Argos when the Spartan king Agis marched against it. Ultimately the Spartans were successful over the coalition at Mantinea, and soon afterwards an oligarchic revolution at Argos led to an alliance between that city and Sparta (c. Feb. 417). This oligarchy was overthrown again in June, and the new democracy having vainly sought an agreement with Sparta rejoined Athens. It was thus left to Athens to expend men and money on protecting a democracy by the aid of which she had hoped practically to control the Peloponnesus. All this time, however, the alliance between her and Sparta was not officially broken.

The unsatisfactory character of the Athenian Peloponnesian coalition was one of the negative causes which led up to the Sicilian Expedition of 415. Another negative cause may be found in the failure of an attempt or attempts to subdue the Thraceward towns. By combining the evidence of Plutarch (in his comparison of Nicias and Crassus), Thuc. v. 83, and the in- scription which gives the treasury payments for 418-415 (Hicks and Hill, Gr. Hist. Inscr. 70), we can scarcely doubt that there were expeditions in 418 (Euthydemus) and the summer of 417 (Nicias), and that in the winter of 417 a blockading squadron under Chaeremon was despatched. This policy — which was presumably that of Nicias in opposition to Alcibiades — having failed, the way was cleared for a reassertion of that policy of western conquest which had always had advocates from Themistocles onward in Athens, 1 and was part of the democratic programme.

The tragic fiasco of the Sicilian expedition, involving the death

1 In 454 Athens made a treaty with Segesta (inscr. Hicks and Hill, Greek Hist. Inscr. 34) : in 433 with Rhegium and Leontini (Hicks and Hill, 51 and 52; cf. Thuc. iii. 86, iraXaid vv/iftaxla witb Chalcidic towns in Sicily) : in 444 the colony of Thurii was founded: in 427 (see above) 60 ships were sent to Sicily; and if we may believe Aristophanes (Eq. 1302) Hyperbolus asked for 100 triremes for Carthage.

of Nicias and the loss of thousands of men and hundreds of ships, was a blow from which Athens never recovered (see under Syracuse and Sicily). Even before the final catastrophe the Spartans had reopened hostilities. On the advice of Alcibiades (g.v.), exiled from Athens in 415, they had fortified Decelea in Attica within fifteen miles of

Athens. This place not only served as a permanent headquarters for predatory expeditions, but cut off the revenue from the Laurium mines, furnished a ready asylum for runaway slaves, and rendered the transference of supplies from Euboea considerably more difficult (i.e. by the sea round Cape Sunium). Athens thus entered upon the third stage of the conflict with exceedingly poor prospects.

3. The Ionian or Decelean War. — From the Athenian stand- point this war may be broken up into three periods: (1) period of revolt of allies (413-41 1), (2) the rally (410-408), (3) the relapse (407-404). As contrasted with the Archidamian War, this war was fought almost exclusively in the Aegean Sea, the enemy was primarily Sparta, and the deciding factor was Persian gold. Furthermore, apart from the gradual disintegration of the empire, Athens was disturbed by political strife.

In 412 many Ionian towns revolted, and appealed either to Agis at Decelea or to Sparta direct. Euboea, Lesbos, Chios, Erythrae led the way in negotiation and revolt, and simul- taneously the court of Susa instructed the satraps Pharnabazus and Tissaphernes to renew the collection of tribute from the Greek cities of Asia Minor. The satraps likewise made over- tures to Sparta. The revolt of the Ionian allies was due in part to Alcibiades also, whose prompt action in co-operation with his friend the ephor Endius finally confirmed the Chian oligarchs in their purpose. In 411 a treaty was signed by Sparta and Tissaphernes against Athens: the treaty formally surrendered to the Fersian king all territory which he or his predecessors had held. It was subsequently renewed in a form somewhat less disgraceful to Greek patriotism by the Spartans Astyochus and Theramenes. On the other hand, a democratic rising in Samos prevented the rebellion of that island, which for the remainder of the war was invaluable to Athens as a stronghold lying between the two great centres of the struggle.

After the news of the Sicilian disaster Athens was compelled at last to draw on the reserve of 1000 talents which had lain untouched in the treasury. 1 The revolt of the Ionian allies, and (in 411) the loss of the Hellespontine, Thracian and Island tributes (see Delian League), very seriously crippled her finances. On the other hand, Tissaphernes undertook to pay the Peloponnesian sailors a daily wage of one Attic drachma (afterwards reduced to § drachma). In Attica itself Athens lost Oenoe and Oropus, and by the end of 411 only one quarter of the empire remained. In the meanwhile Tissaphernes began to play a double game with the object of wasting the strength of the combatants. Moreover Alcibiades lost the confidence of the Spartans and passed over to Tissaphernes, at whose disposal he placed his great

powers of diplomacy, at the same time scheming for his restoration to Athens. He opened negotiations with the Athenian leaders in Samos and urged them to upset the democracy and establish a philo-Persian oligarchy. After elaborate intrigues, in the course of which Alcibiades played false to the conspirators by forcing them to abandon the idea of friendship with Tissaphernes owing to the exorbitant terms proposed, the new government by the Four Hundred was set up in Athens (see Theramenes). This government (which received no support from the armament in Samos) had a brief life, and on the final revolt of Euboea was replaced by the old democratic system. Alcibiades (q.v.) was soon afterwards invited to return to Athens.

The war, which, probably because of financial trouble, the Spartans had neglected to pursue when Athens was thus in the throes of political convulsion, was now resumed. After much manoeuvring and intrigues a naval battle was fought at Cynos-

1 She had already abolished the system of tribute in favour of a 5 % ad valorem tax on all imports and exports carried by sea between her ports and those of the allies.

sema in the Hellespont in which victory on the whole rested with the Athenians (Aug. 411), though the net result was inconsiderable. About this time the duplicity of Tissaphernes — who having again and again promised a Phoenician fleet and having actually brought it to the Aegean finally dismissed it on the excuse of trouble in the Levant — and the vigorous honesty of Pharnabazus definitely transferred the Peloponnesian forces to the north-west coast of Asia Minor and the Hellespont. There they were regularly financed by Pharnabazus, while the Athenians were compelled to rely on forced levies. In spite of this handicap Alcibiades, who had been seized and imprisoned by Tissaphernes at Sardis but effected his escape, achieved a remark- able victory over the Spartan Mindarus at Cyzicus (about April 410). So complete was the destruction of the Peloponnesian fleet that, according to Diodorus, peace was offered by Sparta (see ad fin.)&nd would have been accepted but for the warlike speeches of the ” demagogue ” Cleophon representing the extreme democrats. 2 Another result was the return to allegiance (409) of a number of the north-east cities of the empire. Great attempts were made by the Athenians to hold the Hellespont and then to protect the corn-supply from the Black Sea. In Greece these gains were compensated by the loss of Pylos and Nisaea. –

In 408 Alcibiades effectively invested Chalcedon, which surrendered by agreement with Pharnabazus, and subsequently Byzantium also fell

into his hands with the aid of some of its inhabitants.

Pharnabazus, weary of bearing the whole cost of the war for the Peloponnesians, agreed to a period of truce so that envoys might visit Susa, but at this stage the whole position was changed by the appointment of Cyrus the Younger as satrap of Lydia, Greater Phrygia and Cappadocia. His arrival coincided with the appointment of Lysander (c. Dec. 408) as Spartan admiral — the third of the three great commanders (Brasidas and Gylippus being the others) whom Sparta produced during the war. Cyrus promptly agreed on the special request of Lysander (q.v.) to pay slightly increased wages to the sailors, while Lysander established a system of anti-Athenian clubs and oligarchic governments in various cities. Meanwhile Alcibiades (May 407), having exacted levies in Caria, returned at length to Athens and was elected strategus with full powers (see Strategus). He raised a large force of men and ships and endeavoured to draw Lysander (then at Ephesus) into an engagement. But Cyrus and Lysander were resolved not to fight till they had a clear advantage, and Alcibiades took a small squadron to Phocaea. In spite of his express orders his captain Antiochus in his absence provoked a battle and was defeated and killed at Notium. This failure and the refusal of Lysander to fight again destroyed the confidence which Alcibiades had so recently regained. Ten strategi were appointed to supersede him and he retired to fortified ports in the Chersonese which he had prepared for such an emergency (c. Jan. 406). At the same time Lysander's year of office expired and he was superseded by Callicratidas, to the disgust of all those whom he had so carefully organized in his service. Callicratidas, an honourable man of pan-Hellenic patriotism, was heavily handicapped in the fact that Cyrus declined to afford him the help which had made Lysander powerful, and had recourse to the Milesians and Chians, with whose aid he fitted out a fleet of 140 triremes (only 10 Spartan). With these he pursued Conon (chief of the ten new Athenian strategi), captured 30 of his 70 ships and besieged him in Mytilene. Faced with inevitable destruction, Conon succeeded in sending the news to Athens, where by extraordinary efforts a fleet of no ships was at once equipped. Callicratidas, hearing of this fleet's approach, with- drew from Mytilene, leaving Eteonicus in charge of the blockade. Forty more ships were collected by the Athenians, who met and defeated Callicratidas at Arginusae with a loss of more than half his fleet. The immediate result was that Eteonicus left Mytilene and Conon found himself free. Unfortunately the victorious generals at Arginusae, through negligence or owing

2 Xenophon, Hell, does not mention it : Thucydides's history had by

this time come to an end.

to a storm, failed to recover the bodies of those of their crews who were drowned or killed in the action. They were therefore recalled, tried and condemned to death, except two who had disobeyed the order to return to Athens.

At this point Lysander was again sent out, nominally as secretary to the official admiral Aracus. Cyrus, recalled to Susa by the illness of Darius, left him in entire control of his satrapy. Thus strengthened he sailed to Lampsacus on the Hellespont and laid siege to it. Conon, now in charge of the Athenian fleet, sailed against him, but the fleet was entirely destroyed while at anchor at Aegospotami (Sept. 405), Conon escaping with only 12 out of 180 sail to Cyprus. In April 404 Lysander sailed into the Peiraeus, took possession of Athens, and destroyed the Long Walls and the fortifications of Peiraeus. An oligarchical government was set up (see Critias), and Lysander having compelled the capitulation of Samos, the last Athenian stronghold, sailed in triumph to Sparta.

Two questions of considerable importance for the full understand- ing of the Peloponnesian War may be selected for special notice : (1) how far was it a war between two antagonistic theories of govern- ment, oligarchic and democratic ? and (2) how far was Athenian statesmanship at fault in declining the offers of peace which Sparta made?

1. A common theory is that Sparta fought throughout the war as an advocate of oligarchy, while Athens did not seek to interfere with the constitutional preferences of her allies. The view is based partly on Thuc. i. 19, according to which the Spartans took care that their allies should adhere to a policy convenient to themselves. This idea is disproved by Thucydides' own narrative, which shows that down to 418 (the battle of Mantinea) Sparta tolerated democratic governments in Peloponnesus itself — e.g. Elis, Mantinea, Sicyon, Achaea. It was only after that date that democracy was suppressed in the Peloponnesian League, and even then Mantinea remained democratic. In point of fact, it was only when Lysander became the representative of Spartan foreign policy — i.e. in the last years of the war — that Sparta was identified with the oligarchic policy.

On the other hand, there is strong evidence that the Athenian Empire at a much earlier date was based upon a uniform democratic type of government (cf. Thuc. i. 19, viii. 64; Xen. Pol. i. 14, Hell. iii. 47; Arist. Pol. viii. 69). It is true that we find oligarchic govern- ment in Chios and Lesbos (up to 428) and in Samos (up to 440), but this is discounted by the fact that all three were ” autonomous ” allies. Moreover, in the case of Samos there was a democracy in 439, though in 412 the government was again oligarchic. The case of Selymbria (see Hicks and Hill, op. oil. 77) is of little account, because at that time (409) the Empire was in extremis. In general we find that Athenian orators take special credit on the ground that the Athenian had given to her allies the constitutional advantages which they themselves enjoyed.

2. In view of the disastrous issue of the war, it is important to notice that on three occasions — (a) after Pylos, (b) after Cyzicus, (c) after Arginusae — Athens refused formal peace proposals from Sparta, (a) Though Cleon was probably wise in opposing peace negotiations before the capture of the Spartans in Sphacteria, it seems in the light of subsequent events that he was wrong to refuse the terms which were offered after the hoplites had been captured. No doubt, however, the temper in Athens was at that time pre- dominantly warlike, and the surrender of the hoplites was a unique triumph. Possibly, too, Cleon foresaw that peace would have meant a triumph for the philo-Laconian party. (6) The peace proposals of 410 are given by Diodorus, who says that the ephor Endius proposed that a peace should be made on the basis of uti possidetis, except that Athens should evacuate Pylos and Cythera, and Sparta, Decelea. Cleophon, however, perhaps doubting whether the offer was sincere (cf. Philochorus in Schol. ap. Eurip. Orest. 371; Fragm. ed. Didot, 117, 118), demanded the status quo ante (413 or 431). (c) The proposals of 406, mentioned by Ath. Pol. 34, were on the same lines, except that Athens no longer had Pylos and Cythera, and had lost practically half her empire. At this time peace must therefore have been advantageous to Athens as showing the world that in spite of her losses she was still one of the great powers of Greece. Moreover, an alliance with Sparta would have meant a check to Persian interference. It is probable, again, that party interest was a leading motive in Cleophon’s mind, since a peace would have meant the return of the oligarchic exiles and the establishment of a moderate oligarchy.

Authorities. — G. Busolt, Griech. Gesch., Bd. iii., Teil ii. (1904), ” Der Peloponnesische Krieg ” is essential. All histories of Greece may be consulted (see Greece: History, Ancient, section ” Authorities “). (J. M. M.)

PELOPONNESUS (” Island of Pelops “), the ancient and modern Greek official name for the part of Greece south of the Isthmus of Corinth. In medieval times it was called the Morea,

from its resemblance to a mulberry-leaf in shape, and this name is still current in popular speech.

PELOPS, in Greek legend, the grandson of Zeus, son of Tantalus and Dione, and brother of Niobe. His father’s home was on Mt Sipylus in Asia Minor, whence Pelops is spoken of as a Lydian or a Phrygian. Tantalus one day served up to the gods his own son Pelops, boiled and cut in pieces. The gods detected the crime, and none of them would touch the food except Demeter (according to others, Thetis), who, distracted by the loss of her daughter Persephone, ate of the shoulder. The gods restored Pelops to life, and the shoulder consumed by Demeter was replaced by one of ivory. Wherefore the descen- dants of Pelops had a white mark on their shoulder ever after (Ovid, Metam. vi. 404; Virgil, Georgics, iii. 7). This tale is perhaps reminiscent of human sacrifice amongst the Greeks. Poseidon carried Pelops off to Olympus, where he dwelt with the gods, till, for his father’s sins, he was cast out from heaven. Then, taking much wealth with him, he crossed over from Asia to Greece. He went to Pisa in Elis as suitor of Hippodameia, daughter of king Oenomaus, who had already vanquished in the chariot-race and slain many suitors for his daughter’s hand. But by the help of Poseidon, who lent him winged steeds, or of Oenomaus’s charioteer Myrtilus, whom he or Hippodameia bribed, Pelops was victorious in the race, wedded Hippodameia, and became king of Pisa (Hyginus, Fab. 84). The race of Pelops for his wife may be a reminiscence of the early practice of marriage by capture. When Myrtilus claimed his promised reward, Pelops flung him into the sea near Geraestus in Euboea, and from his dying curse sprang those crimes and sorrows of the house of Pelops which supplied the Greek tragedians with such fruitful themes (Sophocles, Eleclra, 505, with Jebb’s note) I Among the sons of Pelops by Hippodameia were Atreus, Thyestes and Chrysippus. From Pisa Pelops extended his sway over the neighbouring Olympia, where he celebrated the Olympian games with a splendour unknown before. His power and fame were so great that henceforward the whole peninsula was known to the ancients as Peloponnesus, ” island of Pelops ” (vfjaos, island). In after times Pelops was honoured at Olympia above all other heroes; a temple was built for him by Heracles, his descendant in the fourth generation, in which the annual magistrates sacri- ficed to him a black ram.

From the reference to Asia in the tales of Tantalus, Niobe and Pelops it

has been conjectured that Asia was the original seat of these legends, and that it was only after emigration to Greece that the people localized a part of the tale of Pelops in their new home. In the time of Pausanias the throne of Pelops was still shown on the top of Mt Sipylus. The story of Pelops is told in the first Olympian ode of Pindar and in prose by Nicolaus Damascenus.

PELOTA (Sp. ” little ball,” from Lat. pila), a ball game which, originating centuries ago in the Basque provinces, has developed into several forms of the sport. Epigrams of Martial show that there were at least three kinds of pelota played in his time. Blaid, practically hand fives against the back wall of a court, is still played on both sides of the Pyrenees. It is so popular that the authorities had to forbid its being played against the walls of the cathedral at Barcelona. In uncovered courts of large size there are two varieties of pelota. One, the favourite pastime of the Basque, is played against a front wall (fronton), either bare- handed, with a leather or wooden long glove-like protector (cesta), or with a chistera strapped to the wrist, a sickle-shaped wicker-work implement three feet long, much like a hansom-wheel basket mud-guard, in the narrow groove of which the ball is caught and from which, thanks to the leverage afforded, it can be hurled with tremendous force. There are several players to a side, frequently an uneven number to allow a handicap. The score is announced by a cantara, whose melodious vocal efforts make him not the least appreciated participant in the game. In the other form of the game, played nearly exclusively by profes- sionals (pelolaris) , there are usually three players on each side, two forwards and a back, distinguished by a coloured sash or cap. The server (butteur) slips off his chistera to- serve, bouncing the ball on the but, a kind of stool, about 30 ft. from the wall, and

striking it low against the wall. The side that wins the toss has the first service. The ball must be replayed by the opposing side at the wall, which it must hit over a line 3 ft. from the base of the wall and under the net fixed at the top of the wall. The game is counted 15, 30, 40, game, reckoned by the number of faults made by the opposing side. A fault is scored (a) when after the service the ball is not caught on the volley or first bounce, (t>) when it does not on the return strike the wall within the prescribed limits, (c) when it goes out of the prescribed limits of the court, (d) when it strikes the net fixed at the top of the court. The side making the fault loses the service. A game like this has been played in England by Spanish professionals on a court 250 ft. long, against a wall 30 ft. high and 55 ft. wide. The ball

used, a trifle smaller than a base-ball, is hard rubber wound with yarn and leather-covered, weighing 5 ounces. The server bounces the ball on the concrete floor quite near the fronton, and hits it with his chistera against the wall with a force to' make it rebound beyond a line 80 ft. back. It usually goes treble that distance.

PELOTAS, a city of the state of Rio Grande do Sul, Brazil, on the left bank of the Sao Gonpalo river near its entrance into tne Lagoa dos Patos, about 30 m. N.W. of the city of Rio Grande. Pop. (1900), city, about 24.000; municipio (commune, 1037 sq. m.), 43,091. The Rio Grande Bage railway communi- cates with the city of Rio Grande, and with the railways extend- ing to Bage, Cacequy, Santa Maria, Passo Fundo and Porto Alegre. The Sao Goncalo river is the outlet of Lag6a Mirim, and Pelotas is therefore connected with the inland water routes. The city is built on an open grassy plain (campo) little above the level of the lake (28 ft. above sea-level). The public buildings include the church of Sao Francisco, dating from the early part of the 19th century, the municipal hall, a fine theatre, the Misericordia hospital, a public library containing about 25,000 volumes and a great central market. Pelotas is the centre of the xarque or came secca (jerked beef) industry of Rio Grande do Sul. In its outskirts and the surrounding country are an immense number of xarqueadas (slaughter-houses), with large open yards where the dressed beef, lightly salted, is exposed to the sun and air. There are many factories or packing houses where the by- products are prepared for market. Pelotas was only a small settlement at the beginning of the 19th century and had no parochial organization until 1812. It became a villa in 1830 and a city in 1835.

PELOUZE, THEOPHILE JULES (1807-1867), French chemist, was born at Valognes, in Normandy, on the 26th (or 13th) of February 1807. His father, Edmond Pelouze (d. 1847), was an industrial chemist and the author of several technical handbooks. The son, after spending some time in a pharmacy at La Fere, acted as laboratory assistant to Gay-Lussac and J. L. Lassaigne (1800-1859) at Paris from 1827 to 1829. In 1830 he was ap- pointed associate professor of chemistry at Lille, but returning to Paris next year became repetiteur, and subsequently professor, at the Erole Polytechnique. He also held the chair of chemistry at the College de France, and in 1833 became assayer to the mint and in 1848 president of the Commission des Monnaies. After the coup d'itat in 185 1 he resigned his appointments, but con- tinued to conduct a laboratory-school he had started in 1846. He died in Paris on the 1st of June 1867. Though Pelouze made no discovery of outstanding importance, he was a busy investi- gator, his work including researches on salicin, on beetroot sugar, on various

organic acids — gallic, malic, tartaric, butyric, lactic, &c. — on oenanthic ether (with Liebig), on the nitrosulphates, on gun-cotton, and on the composition and manufacture of glass. He also carried out determinations of the atomic weights of several elements, and with E. Fremy, published Traite de chimie generate (1847-1850); Abrege de chimie (1848); and Notions generates de chimie (1853).

PELTIER, JEAN CHARLES ATHANASE (1785-1845), French physicist, was born at Ham (Somme) on the 22nd of February 1785. He was originally a watchmaker, but retired from business about the age of thirty and devoted himself to experi- mental and observational science. His papers, which are

numerous, are devoted in great part to atmospheric electricity, waterspouts, cyanometry and polarization of skylight, the temperature of water in the spheroidal state, and the boiling- point at great elevations. There are also a few devoted to curious points of natural historjr. But his name will always be associ- ated with the thermal effects at junctions in a voltaic circuit. His great experimental discovery, known as the ” Peltier effect,” was that if a current pass from an external source through a circuit of two metals it cools the junction through which it passes in the same direction as the thermo-electric current which would be caused by directly heating that junction, while it heats the other junction (see Thermoelectricity). Peltier died in Paris on the 27th of October 1845.

PELTUINUM [mod. Civita Ansidonia], a town of the Vestini, on the Via Claudia Nova, 12 m. E.S.E. of Aquila. It was apparently the chief town of that portion of the Vestini who dwelt west of the main Apennine chain. Remains of the town walis, of an amphitheatre, and of other buildings still exist.

PELUSIUM, an ancient city and port of Egypt, now repre- sented by two large mounds close to the coast and the edge of the desert, 20 m. E. of Port Said. It lay in the marshes at the mouth of the most easterly (Pelusiac) branch of the Nile, which has long since been silted up, and was the key of the land towards Syria and a strong fortress, which, from the Persian invasion at least, played a great part in all wars between Egypt and the East. Its name has not been found on Egyptian monuments, but it may be the Sin of the Bible and of Assur-bani-pal’s inscription. Pelusium (” the muddy “) is the Farama of the Arabs, Pere- moun in Coptic; the name Tina which clings to the locality seems etymologically connected with the Arabic word for clay or mud. The site, crowned with extensive ruins of burnt brick of the Byzantine cr Arab period, has not yielded any important remains. (F. Ll. G.)

PELVIS (Lat. for ” basin,” cf. Gr. ireXXts), in anatomy, the bony cavity at the lower part of the abdomen in which much of the genito-urinary apparatus and the lower part of the bowels are contained (see Skeleton, § Appendicular).

PEMBA, an island in the Indian Ocean off the east coast of Africa, forming part of the sultanate of Zanzibar. Pemba lies 30 m. N.N.E. of Zanzibar island between 4 80′ and 5 30′ S., and 39 35′ and 39 50′ E. It is some 40 m. long and 10 across at its broadest part, and has an area of 380 sq. m. It is of coral- line formation. On the side facing the mainland the coast is much indented. From its luxuriant vegetation it gets its’ Arabic name of Al-huthera — ” The Green.” The interior is diversified by hills, some of which exceed 600 ft. The land is chiefly owned by great Arab proprietors, who work their plantations with Swahili labour, and with negroes from the mainland. Prior to 1897 the labourers were all slaves. Their gradual manumission was accomplished without injury to the prosperity of the island. The population is estimated at between 50,000 and 60,000, of whom 2000 to 3000 are Arabs. Most of the inhabitants are of Bantu stock, and are known as Wapemba. In the ports there are many Hindu traders and a few Europeans. The plantations • are nearly all devoted to cloves (the annual average output being 10,000,000 lb) and coco-nut palms (for the preparation of copra). The number of coco-nut plantations is very small compared with those devoted to cloves. Yet cloves need much care and attention and yield small profit, while the coco-nut palm yields a fairly uniform crop of nuts and will grow almost anywhere. The preponderance of clove plantations dates from a cyclone which in 1872 destroyed nearly all the clove-trees in the island of Zanzibar. Thereupon, to benefit from the great rise in the price of cloves, the Pemba planters cut down their palms and planted cloves. The value of the cloves exported in 1907 was £339,000, or 92 % of the total exports. India, Germany and Great Britain are, in the order named, the chief purchasers. Other exports include fire-wood, skins and hides, mother-of-pearl, wax and small quantities of rubber, cowries, tortoiseshell and so-called tortoise-nail. The ” tortoise-nail ” is the valve with which a shell-fish closes its shell. The Llandolphia rubber-vine is indigenous, and since 1006 Ceara rubber-trees have been

extensively planted. Rice, the chief of Pemba’s imports, could easily be grown on the island. Cotton cloths (Kangas) form the next most considerable item in the imports.

Pemba has three ports, all on the west side of the island. Shaki-Shaki, the capital and the centre of trade, is centrally situated at the head of a shallow tidal creek partly blocked by dense growths of mangroves. Mkoani is on the south-west coast, Kishi-Kashi on the north-west coast; at the last-named port there is a deep and well-sheltered harbour, approached however by a narrow and dangerous channel.

Pemba is administered as an integral part of the Zanzibar dominions, and yields a considerable surplus to the exchequer, mainly from a 2 5 % duty imposed on cloves exported. There is a weekly steamship service to Zanzibar, and in 1907 the two islands were connected by wireless telegraphy (see Zanzibar).

PEMBROKE, EARLS OF. The title of earl of Pembroke has been held successively by several English families, the jurisdiction and dignity of a palatine earldom being originally attached to it. The first creation dates from 1138, when the earldom of Pembroke was conferred by King Stephen on Gilbert de Clare (d. 1148), son of Gilbert Fitz-Richard, who possessed the lordship of Strigul (Estrighoiel, in Domesday Book), the modern Chepstow. After the battle of Lincoln (1141), in which he took part, the earl joined the party of the empress Matilda, and he married Henry I.'s mistress, Isabel, daughter of Robert de Beaumont, earl of Leicester.

Richard de Clare, 2nd earl of Pembroke (d. 11 76), commonly known as " Strongbow," son of the first earl, succeeded to his father's estates in 1148, but had forfeited or lost them by 11 68. In that year Dermot, king of Leinster, driven out of his kingdom by Roderick, king of Connaught, came to solicit help from Henry II. He secured the services of Earl Richard, promising him the hand of his daughter Eva and the succession to Leinster. The earl crossed over in person (11 70), took both Waterford and Dublin, and was married to Eva. But Henry II., jealous of this success, ordered all the troops to return by Easter 1171. In May Dermot died; this was the signal of a general rising, and Richard barely managed to keep Roderick of Connaught out of Dublin. Immediately afterwards he hurried to England to solicit help from Henry II., and surrendered to him all his lands and castles. Henry crossed over in October 1172; he stayed in Ireland six months, and put his own men into nearly all the important places, Richard keeping only Kildare. In 1173 he went in person to France to help Henry II., and was present at Verneuil, being reinstated in Leinster as a reward. In n 74 he advanced into Connaught and was severely defeated, but for- tunately Raymond le Gros re-established his supremacy in Leinster. Early in 1176 Richard died, just as Raymond had taken Limerick for him. Strongbow was the statesman, as the Fitzgeralds

were the soldiers, of the conquest. He is vi\idly described by Giraldus Cambrensis as a tall and fair man, of pleasing appearance, modest in his bearing, delicate in features, of a low voice, but sage in council and the idol of his soldiers. He was buried in the cathedral church of Dublin, where his effigy and that of his wife are still preserved.

See Giraldus Cambrensis, Expugnatio hibernica; and the Song of Dermot, edited by G. H. Orpen (1892).

Strongbow having died without male issue, his daughter Isabel became countess of Pembroke in her own right, and the title was borne by her husband, Sir William Marshal, or Le Marechal, second son of John le Marechal, by Sibylle, the sister of Patrick, earl of Salisbury. John le Marechal was a partisan of the empress Matilda, and died about 1164.

The date of Sir William Marshal's birth is uncertain, but his parents were married not earlier than 1141, and he was a mere child in 1152, when he attracted the notice of King Stephen. In 1 1 70 he was selected for a position in the household of Prince Henry, the heir-apparent, and remained there until the death of his young patron (1183). He undertook a pilgrimage to the Holy Land, where he served as a crusader with distinction for two years. Although he had abetted the prince in rebellion he was pardoned by Henry H. and admitted to the royal service

about 1 188. In 1189 he covered the flight of Henry II. from Le Mans to Chinon, and, in a skirmish, unhorsed the undutiful Richard Coeur de Lion. None the less Richard, on his accession, promoted Marshal and confirmed the old king's licence for his marriage with the heiress of Strigul and Pembroke. This match gave Marshal the rank of an earl, with great estates in Wales and Ireland, and he was included in the council of regency which the king appointed on his departure for the third crusade (1190). He took the side of Prince John when the latter expelled the justiciar, William Longchamp, from the kingdom, but he soon discovered that the interests of John were different from those of Richard. Hence in 1193 he joined with the loyalists in making war upon the prince. Richard forgave Marshal his first error of judgment, allowed him to succeed his brother, John Marshal, in the hereditary marshalship, and on his death-bed designated him as custodian of Rouen and of the royal treasure during the interregnum. Though he quarrelled more than once with John, Marshal was one of the few English laymen who clung to the royal side through the Barons' War. He was one of John's executors, and was subsequently elected regent of the king and kingdom by the royalist barons in 1216. In spite of his

advanced age he prosecuted the war against Prince Louis and the rebels with remarkable energy. In the battle of Lincoln (May 1217) he charged and fought at the head of the young king's army, and he was preparing to besiege Louis in London when the war was terminated by the naval victory of Hubert de Burgh in the straits of Dover. He was criticized for the generosity of the terms he accorded to Louis and the rebels (September 1217); but his desire for an expeditious settlement was dictated by sound statesmanship. Self-restraint and compromise were the key-notes of Marshal's policy. Both before and after the peace of 1 217 he reissued Magna Carta. He fell ill early in the year 1219, and died on the 14th of May at his manor of Caversham near Reading. He was succeeded in the regency by Hubert de Burgh, in his earldom by his five sons in succession. 1

See the metrical French life, Histoire de Guillaume le Marechal (ed. P. Meyer, 3 vols., Paris, 1891-1901) ; the Minority of Henry III., by G. J. Turner (Trans. Royal Hist. Soc, new series, vol. xviii. pp. 245-295) ; and W. Stubbs, Constitutional History, chs. xii. and xiv. (Oxford, 1896-1897).

Marshal's eldest son, William Marshal (d. 1231), 2nd earl of Pembroke of this line, passed some years in warfare in Wales and in Ireland, where he was justiciar from 1224 to 1226; he also served Henry III. in France. His second wife was the king's sister, Eleanor, afterwards the wife of Simon de Montfort, but he left no children. His brother Richard Marshal (d. 1234), 3rd earl, came to the front as the leader of the baronial party, and the chief antagonist of the foreign friends of Henry III. Fearing treachery he refused to visit the king at Gloucester in August 1233, and Henry declared him a traitor. He crossed to Ireland, where Peter des Roches had instigated his enemies to attack him, and in April 1 234 he was overpowered and wounded, and died a prisoner. His brother Gilbert (d. 1241), who became the 4th earl, was a friend and ally of Richard, earl of Cornwall. When another brother, Anselm, the 6th earl, died in December 1245, the male descendants of the great earl marshal became extinct. The extensive family possessions were now divided among Anselm's five sisters and their descendants, the earldom of Pembroke reverting to the Crown.

The next holder of the lands of the earldom of Pembroke was William de Valence (d. 1296), a younger son of Hugh de Lusignan, count of La Marche, by his marriage with Isabella of Angouleme (d. 1246), widow of the English king John, and was born at Valence, near Lusignan. In 1247 William and his brothers, Guy and Aymer, crossed over to England at the invitation of their half-brother, Henry III. In 1250 Aymer (d. 1260) was elected bishop of Winchester, and in 1247 Henry

arranged a marriage between William and Joan de Munchensi (d. 1307) a grand- daughter of William Marshal, 1st earl of Pembroke. The custody of Joan's property, which included the castle and lordship of Pembroke, was entrusted to her husband, who in 1295 was summoned to parliament as earl of Pembroke. In South Wales

Valence tried to regain the palatine rights which had been attached to the earldom of Pembroke. But his energies were not confined to South Wales. Henry III. heaped lands and honours upon him, and he was soon thoroughly hated as one of the most prominent of the rapacious foreigners. Moreover, some trouble in Wales led to a quarrel between him and Simon de Montfort, and this soon grew more violent. He would not comply with the provisions of Oxford, and took refuge in Wolvesey Castle at Winchester, where he was besieged and compelled to surrender and leave the country. In 1259 he and Earl Simon were formally reconciled in Paris, and in 1261 he was again in England and once more enjoying the royal favour. He fought for Henry at the battle of Lewes, and then, after a stay in France, he landed in Pembrokeshire, and took part in 1265 in the siege of Gloucester and the battle of Evesham. After the royalist victory he was restored to his estates and accompanied Prince Edward, afterwards Edward I., to Palestine. He went several times to France on public business; he assisted in the conquest of North Wales; and he was one of Edward's representatives in the famous suit over the succession to the crown of Scotland in 1201 and 1292. He died at Bayonne on the 13th of June 1296, his body being buried in Westminster Abbey. His eldest surviving son, Aymer (c. 1265-1324), succeeded to his father's estates, but was not formally recognized as earl of Pembroke until after the death of his mother Joan about 1307. He was appointed guardian of Scotland in 1306, but with the accession of Edward II. to the throne and the consequent rise of Piers Gaveston to power, his influence sensibly declined; he became prominent among the discontented nobles and was one of those who were appointed to select the lord ordainers in 131 1. In 131 2 he captured Gaveston at Scarborough, giving the favourite a promise that his life should be spared. Ignoring this under- taking, however, Guy Beauchamp, earl of Warwick, put Gaveston to death, and consequently Pembroke left the allied lords and attached himself to Edward II. Valence was present at Bannock-burn; in 1317, when returning to England from Rome, he was taken prisoner and was kept in Germany until a large ransom was paid. In 1318 he again took a conspicuous part in making peace between

Edward and his nobles, and in 1322 assisted at the formal condemnation of Earl Thomas of Lancaster, and received some of his lands. His wife, Mary de Chatillon, a descendant of King Henry III., was the founder of Pembroke College, Cambridge.

In 1339 Laurence, Lord Hastings (d. 1348), a great-grand- son of William de Valence, having inherited through the female line a portion of the estates of the Valence earls of Pembroke was created, or recognized as, earl of Pembroke. His son John (d. 1376) married Margaret Plantagenet, daughter of King Edward III., and on the death without issue of his grandson in 1389 the earldom of Pembroke reverted again to the Crown, while the barony of Hastings became dormant and so remained till 1840.

In 1414 Humphrey Plantagenet, fourth son of King Henry IV., was created duke of Gloucester and earl of Pembroke for life, these titles being subsequently made hereditary, with a reversion as regards the earldom of Pembroke, in default of heirs to Humphrey, to William de la Pole, earl of Suffolk. Accordingly, on the death of Humphrey, without issue, in 1447 this nobleman became earl of Pembroke. He was beheaded in 1450 and his titles were forfeited. In 1453 the title was given to Sir Jasper Tudor, half-brother of King Henry VI. Sir Jasper being a Lancastrian, his title was forfeited during the pre-dominance of the house of York, but was restored on the accession of Henry VII. On his death without heirs in 1495, his title became extinct.

During his attainder Sir Jasper was taken prisoner by Sir William Herbert (d. 1469), a zealous Yorkist, who had been raised to the peerage as Baron Herbert by Edward IV., and for this service Lord Herbert was created earl of Pembroke in 1468. His son William (d. 1491) received the earldom of Huntingdon in lieu of that of Pembroke, which he surrendered to Edward IV., who thereupon conferred it (1479) on his son Edward, prince

of Wales; and when this prince succeeded to the throne as Edward V., the earldom of Pembroke merged in the crown. Anne Boleyn, a few months previous to her marriage with Henry VIII., was created marchioness of Pembroke in 1532. It is doubted by authorities on peerage law whether the title merged in the royal dignity on the marriage of the marchioness to the king, or became extinct on her death in 1536.

The title of earl of Pembroke was next revived in favour of Sir William Herbert (c. 1501-1570), whose father, Richard, was an illegitimate son

of the 1st earl of Pembroke of the house of Herbert. He had married Anne Parr, sister of Henry VIII. ‘s sixth wife, and was created earl in 15s 1. The title has since been held by his descendants.

An executor of Henry VIII. ‘s will and the recipient of valuable grants of land, Herbert was a prominent and powerful personage during the reign of Edward VI., both the protector Somerset and his rival, John Dudley, afterwards duke of Northumberland, angling for his support. He threw in his lot with Dudley, and after Somerset’s fall obtained some of his lands in Wiltshire and a peerage. It has been asserted that he devised the scheme for settling the English crown on Lady Jane Grey; at all events he was one of her advisers during her short reign, but he declared for Mary when he saw that Lady Jane’s cause was lost. By Mary and her friends Pembroke’s loyalty was at times suspected, but he was employed as governor of Calais, as president of Wales and in other ways. He was also to some extent in the confidence of Philip II. of Spain. The earl retained his place at court under Elizabeth until 1569, when he was suspected of favouring the projected marriage between Mary, queen of Scots, and the duke of Norfolk. Among the monastic lands granted to Herbert was the estate of Wilton, near Salisbury, still the residence of the earls of Pembroke.

His elder son Henry (c. 1534-1601), who succeeded as 2nd earl, was president of Wales from 1586 until his death. He married in 1577 Mary Sidney, the famous countess of Pembroke (c. 1561- 1621), third daughter of Sir Henry Sidney and his wife Mary Dudley. Sir Philip Sidney to whom she was deeply attached through life, was her eldest brother. Sir Philip Sidney spent the summer of 1580 with her at Wilton, or at Ivychurch, a favourite retreat of hers in the neighbourhood. Here at her request he began the Countess of Pembroke’s Arcadia, which was intended for her pleasure alone, not for publication. The two also worked at a metrical edition of the Psalms. When the great sorrow of her brother’s death came upon her she made herself his literary executor, correcting the unauthorized editions of the Arcadia and of his poems, which appeared in 1590 and 1591. She also took under her patronage the poets who had looked to her brother for protection. Spenser dedicated his Ruines of Time to her, and refers to her as Urania in Colin Clout’s come home againe ; in Spenser’s Astrophel she is ” Clorinda.” In 1599 Queen Elizabeth was her guest at Wilton, and the countess composed for the occasion a pastoral dialogue in praise of Astraea. After her husband’s death she lived chiefly in London at Crosby Hall, where she died.

The Countess’s other works include: A Discourse of Life and Death, translated from the French of Plessis du Mornay (1593), and Antoine

(1592), a version of a tragedy of Robert Gamier.

William Herbert, 3rd earl of Pembroke (1580-1630), son of the 2nd earl and his famous countess, was a conspicuous figure in the society of his time and at the court of James I. Several times he found himself opposed to the schemes of the duke of Buckingham, and he was keenly interested in the colonization of America. He was lord chamberlain of the royal household from 1615 to 1625 and lord steward from 1626 to 1630. He was chancellor of the university of Oxford in 1624 when Thomas Tesdale and Richard Wightwick refounded Broadgates Hall and named it Pembroke College in his honour. By some Shake- spearian commentators Pembroke has been identified with the ” Mr W. H. ” referred to as ” the onlie begetter “of Shakespeare’s sonnets in the dedication by Thomas Thorpe, the owner of the published manuscript, while his mistress, Mary Fitton (?.».), has been identified with the ” dark lady ” of the sonnets. In both

cases the identification rests on very questionable evidence (see Shakespeare, William). He and his brother Philip are the ” incomparable pair of brethren ” to whom the first folio of Shakespeare is inscribed. The earl left no sons when he died in London on the 10th of April 1630. Clarendon gives a very eulogistic account of Pembroke, who appears, however, to have been a man of weak character and dissolute life. Gardiner describes him as the Hamlet of the English court. He had literary’ tastes and wrote poems; one of his closest friends was the poet Donne, and he was generous to Ben Jonson, Massinger and others.

His brother, Philip Herbert, the 4th earl (1584-1650), was for some years the chief favourite of James I., owing this position to his comely person and his passion for hunting and for field sports generally. In 1 605 the king created him earl of Montgomery and Baron Herbert of Shurland, and since 1630, when he succeeded to the earldom of Pembroke, the head of the Herbert family has carried the double title of earl of Pembroke and Montgomery. Although Philip’s quarrelsome disposition often led him into trouble he did not forfeit the esteem of James I., who heaped lands and offices upon him, and he was also trusted by Charles I., who made him lord chamberlain in 1626 and frequently visited him at Wilton. He worked to bring about peace between the king and the Scots in 1639 and 1640, but when in the latter year the quarrel between Charles and the English parliament was renewed, he deserted the king who soon deprived him of his office of chamberlain. Trusted by the popular party, Pembroke was made governor of the Isle of Wight, and he was one of the representatives of the parliament on several occasions, notably during the negotiations at Uxbridge in 1645 and at Newport in 1648, and when the Scots surrendered Charles in 1647. From 1641 to 1643, and again from 1647 to 1650, he was chancellor of the university of Oxford; in 1648 he removed some of the heads of houses from their positions because they would not take the solemn league and covenant, and his foul language led to the remark that he was more fitted ” by his eloquence in swearing to preside over Bedlam than a learned academy.” In 1649, although a peer, he was elected and took his seat in the House of Commons as member for Berkshire, this ” ascent downwards ” calling forth many satirical writings from the royalist wits. The earl was a great collector of pictures and had some taste for architecture. His eldest surviving son, Philip (1621-1669), became 5th earl of Pembroke, and 2nd earl of Montgomery; he was twice married, and was succeeded in turn by three of his sons, of whom Thomas, the

8th earl (c. 1656-1733), was a person of note during the reigns of William III. and Anne. From 1690 to 1692 he was first lord of the admiralty; then he served as lord privy seal until 1699, being in 1697 the first plenipotentiary of Great Britain at the congress of Ryswick. On two occasions he was lord high admiral for a short period; he was also lord president of the council and lord-lieutenant of Ireland, while he acted as one of the lords justices seven times; and he was president of the Royal Society in 1689-1690. His son Henry, the 9th earl (c. 1689-1750), was a soldier, but was better known as the " architect earl." He was largely responsible for the erection of Westminster Bridge. The title descended directly to Henry, 10th earl (1734-1794), a soldier, who wrote the Method of Breaking Horses (1762); George Augustus, nth earl (1759-1827), an ambassador extraordinary to Vienna in 1807; and Robert Henry, 12th earl (1791-1862), who died without issue. George Robert Charles, the 13th earl (1850-1895), was a grandson of the nth earl and a son of Baron Herbert of Lea (q.v.), whose second son Sidney (b. 1853) inherited all the family titles at his brother's death.

See G. T. Clark, The Earls, Earldom and Castle of Pembroke (Tenby, 1880); J. R. Planche, "The Earls of Strigul" in vol. x. of the Proceedings of the British Archaeological Association (1855); an d G. E. C(okayne), Complete Peerage, vol. vi. (London, 1895).

PEMBROKE, a town of Ontario, Canada, capital of Renfrew county, 74 m. W.N.W., of Ottawa by rail on the south shore of Allumette Lake, an expansion of the Ottawa river, and on the Canadian Pacific and Canada Atlantic railways. Pop. (1901), 5156. It is the seat of a Roman Catholic bishopric, an

important centre in the lumber trade, and contains saw, grist and woollen mills, axe. factory, &c. The Muskrat river affords excellent water-power.

PEMBROKE {Penfro), an ancient municipal borough, a contributory parliamentary borough and county-town of Pem- brokeshire, Wales, situated on a narrow peninsula at the head of the Pennar tidal inlet or " pill " of Miiford Haven. Pop. (1901), 4487; together with Pembroke Dock 15,853. Pembroke is a station on the South Wales system of the Great Western railway. The old-fashioned town, consisting chiefly of one long broad street, retains portions of its ancient walls. A large mill-dam is a conspicuous feature on the north of the town. St Mary's church in the centre of the town possesses a massive tower of the 12 th century. Near the ruined West Gate is the entrance to Pembroke Castle, a splendid specimen of medieval fortified architecture. The

circular vaulted keep erected by Earl William Marshal (c. 1200), remains almost intact. Close to the keep stands the ruined chamber wherein, according to local tradition, Henry VII. was born in 1457. Beneath the fine banqueting hall, a flight of steps descends into ” the Wogan,” a vast subterranean chamber giving access to the harbour. Facing the castle, on the western side of the pill, stand the considerable remains of Monkton Priory, a Benediction house founded by Earl William Marshal as a cell to the abbey of Seez or Sayes in Normandy, but under Henry VI. transferred to the abbey of St Albans. The priory church, now the parish church of the suburb of Monkton, contains monuments of the families of Meyrick of Bush and Owen of Orielton. St Daniel’s chapel forms a prominent landmark on the ridge south of the town.

Pembroke Dock (formerly known as Pater, or Paterchurch), a naval dockyard and garrison town, is situated close to Hobb’s Point, at the eastern extremity of Miiford Haven. It forms the Pater Ward of Pembroke, from which it is distant 2 m. to the north-west. The place owes its origin to the decision of the government in 1814 to form a naval depot on Miiford Haven. The dockyard, enclosed by high walls and covering 80 acres,. is protected by a powerful fort — the construction and repairing of ironclads are extensively carried on here. There is a submarine depot at Pennar Gut, and also accommodation for artillery and infantry. Ferry boats ply frequently between Pembroke Dock and Neyland on the opposite shore of the Haven.

Pembroke is probably an Anglo-Norman form of the Cymric Penfro, the territory lying between Miiford Haven and the Bristol Channel, now known as the Hundred of Castlemartin. During the invasion of South Wales under William Rufus, Arnulf de Montgomeri, fifth son of Roger earl of Shrewsbury, seems to have erected a fortress of stone (c. 1090) on the site of the castle. The first castellan of this new stronghold was Giraldus de Windsor, husband of the Princess Nest of South Wales and grandfather of Giraldus Cambrensis. Throughout the 1 2th and 13th centuries the castle was strengthened and enlarged under successive earls palatine of Pembroke, who made this fortress their chief seat. As the capital of the palatinate and as the nearest port for Ireland, Pembroke was in Plantagenet times one of the most important fortified cities in the kingdom. The town, which had grown up under the shadow of the almost impregnable castle, was first incorporated by Henry I. in 1109 and again by Earl Richard de Clare in n 54 (who also encircled the town with walls), and these privileges were confirmed and extended under succeeding earls palatine and kings of England. In 1835 the corporation was remodelled under the

Municipal Corporations Act. Henry II. occasionally visited Pembroke, notably in 117 2, and until the close of the Wars of the Roses, both town and castle played a prominent part in the history of Britain. With the passing of the Act of Union of Wales and England in 1536 however, the jura regalia of the county palatine of Pembroke were abolished, and the prosperity of the town began to decline. Although acknowledged as the county town of Pembrokeshire, Pembroke was superseded by Haverfordwest as the judicial and administrative centre of the shire on account of the more convenient position of the latter place. By the act 1 of 1536 Pembroke was declared the leading borough in the

Pembroke parliamentary district, yet the town continued to dwindle until the settlement of the government dockyard and works on Milford Haven. At the outbreak of the Civil Wars the town and castle were garrisoned for parliament by the mayor, John Poyer, a leading Presbyterian, who was later appointed governor, with Rowland Laugharne of St Brides for his lieu- tenant. But at the time of the Presbyterian defection in 1647, Poyer and his lieutenant-governors, Laugharne and Powell, declared for Charles and held the castle in the king's name. In June 1648 Cromwell himself proceeded to invest Pembroke Castle, which resisted with great obstinacy. But after the water-supply of the garrison had been cut off, the besieged were forced to capitulate, on the nth of July 1648, on the condition of surrendering up the three chief defenders of the castle. Poyer, Laugharne and Powell were accordingly brought to London, but finally only Poyer was executed. The magnificent ruin of Pembroke Castle is the nominal property of the Crown, but has been held on lease since the reign of James II. by the family of Pryse of Gogerddan in Cardiganshire.

PEMBROKESHIRE (Sir Benjro, Dyfed), the most westerly county of South Wales, bounded N.E. by Cardigan, E. by Carmar- then, S. by the Bristol Channel and W. and N.W. by St Bride's Bay and Cardigan Bay of St George's Channel. Area 615 sq. m. The whole coast is extremely indented, extending over 140 m. in length. The principal inlets are Milford Haven, St Bride's Bay, Freshwater Bay, Fishguard Bay and Newport Bay. The chief promontories are Cemmaes, Dinas, Scrumble, St David's, St Ann's and St Gowan's Heads. Five islands of moderate size lie off the coast, viz. Ramsey, Grassholm, Skomer and Skokholm in St Bride's Bay, and Caldy Island (Ynys Pyr) opposite Tenby; the last

named having a population of about 70 persons. Rare birds, such as peregrine falcons, ravens and choughs are not uncommon, while guillemots, puffins and other sea-fowl breed in immense numbers on the Stack Rocks, on Ramsey Island and at various points of the coast. Seals are plentiful in the caves of St Bride's Bay and Cardigan Bay. The county is undulating, and large tracts are bare, but the valleys of the Cleddau, the Nevcrn, the Teifi and the Gwaun are well-wooded. The Preselley Mountains stretch from Fishguard to the border of Carmarthen, the principal heights being Preselley Top (1760 ft.) and Cam Englyn (1022 ft.). Treffgarn Rock in the Plumstone Mountains is popularly supposed to mark the northern limit of the ancient settlement of the Flemings. The principal rivers are the Teifi, forming the northern boundary of the county from Abercych to Cardigan Bay; the Nevern and the Gwaun, both falling into Cardigan Bay; and the Eastern and Western Cleddau, forming the Daugleddau after their junction below Haverford- west. All these streams contain trout and salmon. There are no lakes, but the broad tidal estuaries of the Daugleddau and other rivers, which fall into Milford Haven and are locally called " pills," constitute a peculiar feature of south Pembrokeshire scenery.

Geology. — Pembrokeshire is divisible into a northern portion occupied mainly by Ordovician and Silurian strata, which have been subjected to pressures from the north, the strike of the beds being south-west-north-east ; and a southern portion, the westerly continuation of the South Wales coalfield, with associated Lower Carboniferous, Old Red Sandstone and narrow belts cf Silurian rocks, the whole having been considerably folded and faulted by pressure from the south, which has produced a general north-west- south-east strike. In the neighbourhood of St Davids are the Pre- Cambrian granitic rocks (Dimetian) and volcanic rocks (Pebedian). These are surrounded by belts of unconformable Cambrian strata (Lingula Flags, Tremadoc beds), followed by Ordovician (Arenig, Llandeilo and Bala beds) with associated igneous rocks. These comprise gabbros and diabases of Strumble Head, Fishguard, Llanwnda, Prescelly; diorites north-west of St Davids, bostonites and porphvrites about Abercastle and the basaltic laccolite of Pen Caer, besides various contemporaneous acid lavas and tuffs. The Ordovician and Silurian rocks extend southward to the neighbour- hood of Xarberth and Haverfordwest, where Arenig, Llandeilo and Bala beds (Slade and Red Hill beds; Sholeshook and Robeston Walthen Limestone) and Llandovery beds are recorded. The Coal Measures, highly inclined and anthracitic, stretch across from Carmarthen Bay to the shore of St Bride's Bay; they are bordered on the north and south-east by the

Millstone Grits, Carboniferous Limestone series and Old Red Sandstone. On account of the folding

the limestone appears again farther south at Pembroke, Caldy Island and St Gowan's Head; most of the remaining ground about Milford Haven being occupied by Old Red Sandstone with infolded strips of Silurian. A fairly large tract of blown-sand occurs in Freshwater Bay south of Milford Haven. Silver-bearing lead has been mined at Llanfyrnach.

Climate and Industries. — The climate is everywhere mild, and in the sheltered valleys near the coast sub-tropical vegetation flourishes in the open air. In the south the rainfall is small, and the districts round Pembroke suffer from occasional droughts. The chief industry is agriculture, wherein stock-raising is preferred to the growing of cereals. Of cattle the long-horned, jet-black Castlemartin breed is everywhere conspicuous. South Pembroke has long been celebrated for its horses, which are bred in great numbers by the farmers. The deep-sea fisheries of Tenby and Milford are valuable; and fresh fish of good quality is exported by rail to the large towns. Oysters are found at Langwm and near Tenby; lobsters and crabs abound on the western coast. The South Wales coalfield extends into south Pembroke, and coal is worked at Saundersfoot, Begelly, Temple- ton, Kilgetty and other places. There are slate quarries at Glogue, Cilgerran and elsewhere; copper has been worked near St Davids, and lead at Llanfyrnach.

Communications. — The South Wales branch of the Great Western railway enters Pembrokeshire from the east near Clynderwen Junction, whence the main line leads to Fishguard Harbour with its important Irish traffic. Other lines proceed to Neyland and Milford Haven by way of Haverfordwest, and a branch line from Clynderwen to Goodwick joins the main- line at Letterston. The Whitland-Cardigan branch traverses the north-east by way of Crymmych and Cilgerran. Another line running south-west from Whitland proceeds by way of Narberth and Tenby to Pembroke Dock.

Population and Administration. — The area of Pembrokeshire is 395,151 acres with a population in 1891 of 89,138 and 1901 of 88,732, showing a slight decrease. The municipal boroughs are Pembroke (pop. 15,853); Haverfordwest (6007); and Tenby (4400). The hamlet of Bridgend and a part of St DogmeO's parish are included within the municipal limits of Cardigan. Newport (Trefdraeth) (1222), the chief town of the barony of Kemes, or Cemmaes, still possesses a mayor and corporation under a charter granted in 1215 by Sir

Nicholas Marteine, lord of Kemes, whose hereditary representative still nominates the mayor and aldermen, but its surviving municipal privileges are practically honorary. Milford Haven (5102), Narberth (1070) and Fishguard (2002) are urban districts. Other towns are St Davids (17 10), St Dogmells (Llandudoch) (1286); and Cilgerran (1038). Pembrokeshire lies in the South Wales circuit, and assizes are held at Haverfordwest. Two members are returned to parliament; one for the county, and one for the united boroughs of Pembroke, Haverfordwest, Tenby, Fishguard, Narberth, Neyland, Milford and Wiston (Castell Gwys). Ecclesiastically, the county contains 153 parishes and lies wholly in the diocese of St Davids.

History. — Pembrokeshire, anciently known to the Welsh as Dyfed, was originally comprised in the territory of the Dimetae, conquered by the Romans. During the 6th century St David, or Dewi Sant, moved the chief seat of South Welsh monastic and ecclesiastical life from Caerleon-on-Usk to his native place Menevia, which, known in consequence as Tyddewi, or St Davids, continued a centre of religious and educational activity until the Reformation, a period of 1000 years. On the death of Rhodri Mawr in 877, Dyfed fell nominally under the sway of the princes of Deheubarth, or South Wales; but their hold was never very secure, nor were they able to protect the coast towns from the Scandinavian pirates. In 1081 William the Conqueror penetrated west as far as St Davids, where he is said to have visited St David's shrine as a devout pilgrim. In 1092 Arnulf de Montgomeri, son of Roger, earl of Shrewsbury, did homage to the king for the Welsh lands of Dyfed. With the building of Pembroke Castle, of which Gerald de Windsor was appointed castellan, the Normans began to spread over southern Dyfed; whilst Martin de Tours, landing in Fishguard

Bay and building the castle of Newport at TrSfdraeth, won for himself the extensive lordship of Kernes (Cemmaes) between the river Teifi and the Preselley Mountains. The systematic planting of Flemish settlers in the hundred of Rhos, or Roose, in or about the years 1106, 1108 and nil with the approval of Henry I., and again in 1156 under Henry II., marks an all-important episode in the history of Pembrokeshire. The castles of Haverfordwest and Tenby were now erected to protect these aliens, and despite the fierce attacks of the Welsh princes their domain grew to be known as " Little England beyond Wales," a district whereof the language, customs and people still remain characteristic. In 1138 Gilbert de Clare, having previously

obtained Henry I.‘s permission to enjoy all lands he might win for himself in Wales, was created earl of Pembroke in Stephen’s reign with the full powers of an earl palatine in Dyfed. The devolution of this earldom is dealt with in a separate article.

In 1536, by the Act of Union (27 Henry VIII.), the king abolished all special jurisdiction in Pembrokeshire, which he placed on an equal footing with the remaining shires of Wales, while its borders were enlarged by the addition of Kernes, Dewisland and other outlying lordships. By the act of 1536 the county returned to parliament one knight for the shire and two burgesses; one for the Pembroke boroughs and one for the town and county of Haverfordwest, both of which since 1885 have been merged in theˆ Pembroke-and-Haverfordwest parliamentary division. The Reformation deprived the county of the presence of the bishops of St Davids, who on the partial dismantling of the old episcopal palace at St Davids removed their chief seat of residence to Abergwiliy, near Carmarthen. Meanwhile the manor of Lamphey was granted to the family of Devereux, earls of Essex, and other episcopal estates were alienated to court favourites, notably to Sir John Perrot of Haroldstone (1517-1592), afterwards lord-deputy of Ireland. During the Civil Wars the forces of the parliament, commanded by Colonel Laugharne and Captain Swanley, reduced the royal forts at Tenby, Milford and Haverfordwest. In February 1797 some French frigates appeared off Fishguard Bay and landed about 1400 Frenchmen at Llanwnda. The invaders soon capitulated to the local militia, practically without striking a blow. The 19th century saw the establishment of the naval dockyard at Paterchurch and the building of docks and quays at Neyland and Milford. In 1906 extensive works for cross- traffic with Ireland were opened at Fishguard Harbour.

Many of the old Pembrokeshire families, whose names appear prominent in the county annals, are extinct in the county itself. Amongst these may be mentioned Perrot of Haroldstone, Devereux of Lamphey, Barlow of Slebech, Barrett of Gilliswick, Wogan of Wiston, Elliot of Amroth and Owen of Henllys. Amongst ancient families still existing are Philipps of Lydstep and Amroth (descendants of the old Welsh lords of Cilsant); Philipps of Picton Castle (a branch of the same house in the female line) ; Lort of Stackpole Court, now represented by Earl Cawdor; Scourfield of Moate; Bowen of Llwyngwair; Edwardes, Lords Kensington, of St Brides; Meyrickof Bush; Lort-Philipps of Lawrenny; Colby of Ffynone; Stokes of Cuff em; Lloyd of Newport Castle (in which family is vested the hereditary lord- ship of the barony of Kernes); Saunders-Davies of Pentre; and Go wer of Castle Malgwyn. ■> . V _. ‘

Antiquities. — There are few remaining traces in the county of the Roman occupation of Dimetia, but in British encamp- ments, tumuli, cromlechs and monumental stones Pembrokeshire is singularly rich. Of the cromlechs the best preserved are those at Longhouse, near Mathry; at Pentre Evan in the Nevern Valley; and at Llech-y-dribedd, near Moylgrove; whilst of the many stone circles and alignments, that known as Pare-y-Marw, or " The Field of the Dead," near Fishguard, is the least injured. Stones inscribed in Ogam characters are not uncommon, and good examples exist at Caldy Island, Bridell, St Dogmells and Cilgerran. There are good specimens of Celtic floriated churchyard crosses at Carew, Penally and Nevern. Interesting examples of medieval domestic architecture are the ruins

of the former episcopal mansions at Llawhaden, St Davids and Lamphey, the two latter of which were erected by Bishop Gower between the years 1328-1347. With the exception of the cathedral at St Davids and the principal churches of Haver- fordwest and Tenby, the parish churches of Pembrokeshire are for the most part small, but many are ancient and possess fine monuments or other objects of interest, especially in " Little England beyond Wales." Amongst the more note- worthy are the churches at Stackpole Elidur, Carew, Burton, Gumfreston, Nevern, St Petrox and Rudbaxton, the last-named containing a fine Jacobean monument of the Hayward family. Pembrokeshire has long been famous for its castles, of which the finest examples are to be observed at Pembroke; Manorbier, built in the 12th century and interesting as the birthplace and home of Giraldus Cambrensis; Carew, exhibiting many interest- ing features both of Norman and Tudor architecture; and Picton, owned and inhabited by a branch of the Philipps family. Other castles are the keep of Haverfordwest and the ruined for- tresses at Narberth, Tenby, Newport, Wiston, Benton, Upton and Cilgerran. There are some remains of monastic houses at Tenby and Pembroke, but the most important religious communities were the priory of the Augustinian friars at Haverfordwest and the abbey of the Benedictines at St Dogmells. Of this latter house, which was founded by Martin de Tours, first lord of Kemes, at the close of the nth century, and who owned the priories of Pill and Caldy, considerable ruins exist near the left bank of the Teifi about 1 m. below Cardigan. Of the ancient preceptory of the Knights of St John at Slebech scarcely a trace remains, but of the college of St Mary at St Davids founded by Bishop Houghton in 1377, the shell of the chapel survives in fair preservation. Pembrokeshire contains an unusually large number of county seats, particularly in the south, which includes Stackpole Court, the residence of Earl Cawdor, a fine mansion erected in the 18th century; Picton Castle; Slebech, once

the seat of the Barlows; Orielton, formerly belonging to the Owens; and Ffynone, the residence of the Colby family.

Customs, &* <;. — The division of Pembrokeshire ever since the 1 2th century into well-defined Englishry and Welshry has produced two distinct sets of languages and customs within the county. Roughly speaking, the English division, the Anglia Transwattiana of Camden, occupies the south-eastern half and comprises the hundreds of Roose, Castlemartin, Narberth and Dungleddy. In the Welshry, which includes the hundreds of Dewisland and Cilgerran together with the old barony of Kemes, the language, customs, manners and folk-lore of the inhabitants are almost identical with those of Cardigan and Carmarthen. The old Celtic game of Knappan, a pastime partaking of the nature both of football and hockey, in which whole parishes and even hundreds were wont to take an active part, was pre- valent in the barony of Kemes so late as the 16th century, as George Owen of Henllys, the historian and antiquary, records; and the playing of knappan lingered on after Owen's day. Amongst the settlers of the Englishry, who are of mingled Anglo- Saxon, Flemish, Welsh and perhaps Scandinavian descent, many interesting superstitions and customs survive. The English spoken by these dwellers in " Little England beyond Wales " contains many curious idioms and words and the pronun- ciation of some of the vowels is peculiar. Certain picturesque customs, many of them dating from pre-Reformation times, are still observed, notably in the neighbourhood of Tenby. Such are the sprinkling of persons with dewy evergreens on New Year's morning; the procession of the Cutty Wren on St Stephen's day, and the constructing of little huts at Lammastide by the farm boys and girls. As early as the opening years of the 19th century, cripples and ophthalmic patients were in the habit of visiting the ancient hermitage at St Gowan's Head to bathe in its sacred well; and Richard Fenton, the county historian alludes (c. 1808) to the many crutches left at St Gowan's chapel by grateful devotees. Belief in ghosts, fairies, witches, &c, is still prevalent in the more remote places, and the dress of the fishwives of Langwm near Haverfordwest is highly picturesque with its short skirt, scarlet shawl and buckled shoes.

Authorities. — Richard Fenton, A Historical Tour through Pembrokeshire (London, 1810) ; Edward Laws, History of Little Eng- land beyond Wales (London, 1888); Basil Jones and £. A. Freeman, History and Antiquities of St David’s (London, 1856), &c.

PEMMICAN, a North American Indian (Cree) word for a meat prepared in such a way as to contain the greatest amount of nourishment in the most compact form. As made by the Indians it was composed of the lean parts of the meat, dried in the sun-, and pounded or shredded and mixed into a paste with melted fat. It is flavoured with acid berries. If kept dry it will keep for an indefinite time, and is thus particularly service- able in arctic or other explorations. fc* <

PEMPHIGUS (Gr. 7r£ju<ˆi£, a bubble), a skin disease, in which large blebs appear, on a red base, containing a clear or yellowish fluid; the blebs occasion much irritation, and when they burst leave raw ulcerated surfaces. The disease is principally known in unhealthy or neglected children. A variety of the malady, pemphigus foliaceous, affects the whole body, and gradually proves fatal. Pemphigus of an acute septicaemic type occurs in butchers or those who handle hides, and a diplococcus has been isolated by William Bullock. The treatment is mainly constitutional, by means of good nourishment, warm baths, local sedatives and tonics. In chronic pemphigus, streptococci have been found in the blebs, and the opsonic index was low to streptococci. Improvement has been known to take place on the injection of a vaccine of streptococci.

PEN (Lat. penna, a feather, pen), an instrument for writing or for forming lines with an ink or other coloured fluid. The English word, as well as its equivalents in French (plume) and in German (Feder), originally means a wing-feather, but in ancient times the implements used for producing written characters were not quills. The earliest writing implement was probably the stilus (Gr. ypais), a pointed bodkin of metal, bone or ivory, used for producing incised or engraved letters on boxwood tablets covered with wax. The calamus (Gr. KoWafios) or arundo, the hollow tubular stalk of grasses growing in marshy lands, was the true ancient representative of the modern pen; hollow joints of bamboo were similarly employed.

An early specific allusion to the quill pen occurs in the writings of St Isidore of Seville (early part of the 7th century), 1 but there is no reason to assume that it was not in use at a still more remote date. The quills still largely employed among Western communities as writing instruments are obtained principally from the wings of the goose (see Feather). In 1809 Joseph Bramah devised and patented a machine for cutting up the quill into separate nibs by dividing the barrel into three or even four parts, and cutting these transversely into ” two, three, four and some into five lengths.” Bramah’s invention first familiarized the public with the appearance and use of the nib slipped

into a holder. In 181 8 Charles Watt obtained a patent for gilding and preparing quills and pens, which may be regarded as the precursor of the gold pen. But a more distinct advance was effected in 1822, when J. I. Hawkins and S. Mordan patented the application of horn and tortoise-shell to the formation of pen-nibs, the points of which were rendered durable by small pieces of diamond, ruby or other very hard substance, or by lapping a small piece of thin sheet gold over the end of the tortoise-shell.

Metallic pens, though not unknown in classical times — a bronze pen found at Pompeii is in the Naples Museum — were little used until the 19th century and did not become common till near the middle of that cen- tury. It is recorded that a Birmingham split-ring manufacturer, Samuel Harrison, made a steel pen for Dr Joseph Priestley in 1780. Steel pens made and sold in London by a certain Wise in 1803 were in the form of a tube or barrel, the edges of which met to form the slit, while the sides were cut away as in the case of an ordinary quill. Their price was about five shillings each, and as they were hard, stiff and unsatisfactory instruments they were not in great demand. A metallic pen patented by

1 ” Instrumenta scribae calamus et penna; ex his enim verba paginis infiguntur; sed calamus arboris est, penna avis, cujus acumen dividitur in duo.”

Bryan Donkin in 1808 was made of two separate parts, flat or nearly so, with the flat sides placed opposite each other to form the slit, or alternatively of one piece, flat and not cylindrical as in the usual form, bent to the proper angle for insertion in the tube which constituted the holder. To John Mitchell prob- ably belongs the credit of introducing machine-made pens, about 1822, and James Perry is believed to have been the first maker of steel slip pens. In 1828 Josiah Mason, who had been associated with Samuel Harrison, in the manufacture of split rings, saw Perry’s pens on sale in Birmingham, and after examin- ing them saw his way both to improve and to cheapen the process of making them. He therefore put himself in communication with Perry, and the result was that he began to make barrel pens for him in 1828 and slip pens in 1829. Perry, who did much to popularize the steel pen and bring it into general use, in his patent of 1830 sought to obtain greater flexibility by forming a central hole between the points and the shoulders and by cutting one or more lateral slits on each side of the central slit; and Joseph Gillot, in 1831 described an improvement which consisted in forming elongated

points on the nibs of the pens.

The metal used consists of rolled sheets of cast steel of the finest quality made from Swedish charcoal iron. These sheets, after being cut into strips of suitable width, annealed in a muffle- furnace and pickled in a bath of dilute sulphuric acid to free the surface from oxidized scale, are rolled between steel rollers till they are reduced to ribbons of an even thickness, about xhs i n – From these ribbons the pen blanks are next punched out, and then, after being embossed with the name of the maker or other marks, are pierced with the central perforation and the side or shoulder slits by which flexibility is obtained. After another annealing, the blanks, which up to this point are flat, are “raised” or rounded between dies into the familiar semi-cylindrical shape. The next process is to harden and temper them by heating them in iron boxes in a muffle-furnace, plunging them in oil, and then heating them over a fire in a rotating cylindrical vessel till their surfaces attain the dull blue tint characteristic of spring-steel elasticity. Subsequently they are ” scoured ” in a bath of dilute acid, and polished in a revolving cylinder. The grinding of the points with emery follows, and then the central slit is cut by the aid of two very fine-edged cutters. Finally the pens are again polished, are coloured by being heated over a fire in a revolving cylinder, and in some cases are coated with a varnish of shellac dissolved in alcohol. Birmingham was the first home of the steel-pen industry, and continues its principal centre. The manufacture on a large scale was begun in the United States about i860 at Camden, N. J., where the Esterbrook Steel Pen Manufacturing Company was incorporated in 1866.

Metals other than steel have frequently been suggested by inventors, those most commonly proposed being gold, silver, zinc, German silver, aluminium and aluminium bronze. Dr W. H. Wollaston, it is recorded, had a gold pen composed of two thin strips of gold tipped with rhodium, apparently made on the principle patented by Donkin in 1808, and Lord Byron used one in 1810. Gold being extremely resistant to corrosion, pens made of it are very durable, but the metal is too soft for the points, which wear quickly unless protected by some harder material. For this purpose iridium is widely employed, by fusing the gold round it with a blowpipe.

Various devices have been adopted in order to increase the time for which a pen can be used without a fresh supply of ink. These fall into two main classes. In one, the form _ of the nib itself is modified, or some attachment p ens . is added, to enlarge the ink capacity; in the other, which is by far the more important, the holder of the pen is utilized as a cistern or reservoir from which ink is supplied to the nib.

Pens of the second class, which have the further advantage of being portable, are heard of under the name of ” fountain inkhorns ” or ” fountain pens ” so far back as the beginning of the 18th century, but it was not till a hundred

years later that inventors applied themselves seriously to their construction. Joseph Bramah patented several plans; one was to employ a tube of silver or other metal so thin that it could be readily squeezed out of shape, the ink within it being thus forced out to the nib, and another was to fit the tube with a piston that could slide down the interior and thus eject ink. In modern fountain pens a feed bar conveys, by capillary action, a fresh supply of ink to replace that which has been left on the paper in the act of writing, means being also provided by which air can pass into the reservoir and fill the space left empty by the outflowing ink. In another form of reservoir pen, which is usually distinguished by the name stylograph, there is no nib, but the ink flows out through a minute hole at the end of the holder, which terminates in a conical point. An iridium needle, held in place by a fine spring, projects slightly through the hole and normally keeps the aperture closed; but when the pen is pressed on the paper, the needle is pushed back and allows a thin stream of ink to flow out.

See J. P. Maginnis, ” Reservoir, Stylographic and Fountain Pens,” Cantor Lectures, Society of Arts (1905).

PENALTY (Lat. poena, punishment), in its original meaning, a punishment inflicted for some violation of the law or rule of conduct. Although still freely used in its original sense in such phrases, for example, as ” the death penalty,” ” the penalty of rashness,” &c., the more usual meaning attached to the word is that of a pecuniary mulct. Penalty is used specifically for a sum of money recovered by virtue of a penal statute, or re- coverable in a court of summary jurisdiction for infringement of a statute. A sum of money agreed upon to be paid in case of non-performance of a condition in a bond or in breach of a contract or any stipulation of it is also termed a penalty (see Damages).

PENANCE (Old Fr. penance, fr. Lat. poenitentia, penitence), strictly, repentance of sins. Thus in the Douai version of the New Testament the Greek word fieravoLa is rendered ” penance,” where the Authorized Version has ” repentance.” The two words, similar in their

derivation and original sense, have however come to be symbolical of conflicting views of the essence of repentance, arising out of the controversy as to the respective merits of ” faith ” and ” good works.” The Reformers, uphold- ing the doctrine of justification by faith, held that repentance consisted in a change of the whole moral attitude of the mind and soul (eirLOTpkfco-dai, Matt. xiii. 15; Luke xxii. 32), and that the Divine forgiveness followed true repentance and confession to God without any reparation of ” works.” This is the view generally held by Protestants. In the Roman Catholic Church the sacrament of penance consists of three parts: contritio, confessio, satisfactio. Contritio is in fact repentance as Protestant theologians understand it, i.e. sorrow for sin arising from love of God, and long before the Reformation the schoolmen debated the question whether complete “contrition” was or was not in itself sufficient to obtain the Divine pardon. The Council of Trent, however, decided that “reconciliation” could not follow such contrition without the other parts of the sacrament, which form part of it (sine sacramenti volo, quod in ilia includatur). Contrition is also distinguished from ” attrition ” (atlritio), i.e. repentance due to fear of punishment. It was questioned whether a state of mind thus produced would suffice for obtaining the benefits of the sacrament; this point was also set at rest by the Council of Trent, which decided that attrition, though not in itself capable of obtaining the justification of the sinner, is also inspired by God and thus disposes the soul to benefit by the grace of the sacrament.

The word ” penance,” applied to the whole sacrament, is also used of the works of satisfaction imposed by the priest on the penitent, i.e. the temporal punishment (poena). This varies with the character and hcinousness of the offences com- mitted. In the middle ages ” doing penance ” was often a process as terrible and humiliating to the penitent as it was possibly edifying to the Church. Public penances have, how- ever, long been abolished in all branches of the Christian Church. (See Confession.)

PENANG (Pulau Pinang, i.e. Areca-nut Island), Jhe town and island which, after Singapore, form the most important portion of the crown colony of the Straits Settlements. The island is situated in 5° 24′ N. and 100° 21′ E., and distant about 2 1 m. from the west coast of the Malay Peninsula. The island is about 1 5J m. long by iof m. wide at its broadest point. Its area is something over 107 sq. m. The town, which is built on a pro- montory at a point nearest to the mainland, is largely occupied by Chinese and Tamils, though the Malays are also well represented; Behind the town, Penang Hill rises to a height of some 2700 ft., and upon it are built several government and private bungalows. The town possesses a fine European club, a racecourse,

and good golf links. Coco-nuts are grown in considerable quantities along the seashore, and rice is cultivated at Balek Pulau and in the interior, but the jungle still spreads over wide areas. Penang has an excellent harbour, but has suffered from its proximity to Singapore. There are a Church of England and a Roman Catholic church in the town, and a training college under the Roman Catholic missionaries of the Societe des Missions Etrangeres at Pulau Tikus, a few miles outside the town.

Administration. — Since 1867 Penang has been under the administrative control of a resident councillor who is responsible to the governor of the Straits. He is aided in his duties by officers of the Straits Civil Service. Two unofficial members of the legislative council of the colony, which holds its sittings in Singapore, are nominated by the governor, with the sanction of the secretary of state for the colonies, to represent Penang. Their term of office is for five years. The official name of the island is Prince of Wales Island and that of the town is George- town; neither of these names, however, is in general use. Among the Malays Penang is usually spoken of as Tanjong or " The Cape," on account of the promontory upon which the town is situated. The town is administered by a municipal council composed of ex officio, nominated, and elected members.

Population. — The population of Penang at the time of the census of 1901 was 128,830, of whom 85,070 were males (69,210 over and 15,860 under 15 years of age), and 43,760 were females (28,725 over and 15,035 under 15 years of age). The population was composed of 71,462 Chinese, 34,286 Malays, 18,740 Tamils and other natives of India, 1649 Eurasians, 993 Europeans and Americans, and 1699 persons of other nationalities. As in other parts of the Straits Settlements the men are far more numerous than the women. The total population of the settlement of Penang, which includes not only the island but Province Wellesley and the Dindings, was 248,207 in 1901.

Shipping. — The number of ships which entered and left the port of Penang during 1906 was 2324 with an aggregate tonnage of 2,868,459. Of these 1802 were British with an aggregate tonnage of 1,966,286. These figures reveal a considerable falling-off during the past decade, the number of vessels entering and leaving the port in 1898 being 5114 with an aggregate tonnage of 3,761,094. This is mainly due to the construction of the railway which runs from a point on the mainland opposite to Penang, through the Federated Malay States of Perak, Selangor and the Negri Sembllan to Malacca, and has diverted to other ports and eventually to Singapore much of the

coastal traffic which formerly visited Penang.

Finance and Trade. — The revenue of Penang, that is to say, not only of the island but of the entire settlement, amounted in 1906 to $6,031,917, of which $2,014,033 was derived from the revenue farms for the collection of import duties on opium, wine and spirits; $160,047 from postal revenue; $119,585 from land revenue; $129,151 from stamps. The expenditure for 1906 amounted to $5,072,406, of which $836,097 was spent on administrative establishments, $301,252 on the upkeep of existing public works; $415,175 on the construction of works and buildings, and of new roads, streets, bridges, &c. The imports in 1906 were valued at $94,546,112; the exports at $90,709,225. Of the imports $57,880,889 worth came from the United Kingdom or from British possessions or protectorates; $23,937,737 worth came from foreign countries; and $3,906,241 from the Dindings, Malacca and Singapore. Of the exports, $23,122,947 went to the United Kingdom, or to British possessions or protectorates; $37,671,033 went to foreign countries; and $2,754,238 went to the Dindings, Malacca or Singapore.

History— Penang was founded on the 17th of July 1786, having been ceded to the East India Company by the Sultan of Kedah in 1785 by an agreement with Captain Light, for an annuity of $10,000 for eight years. In 1791 the subsidy was

changed to $6ooc, in perpetuity; for some years later this was raised to $10,000, and is still annually paid. This final addition was made when Province Wellesley was purchased by the East India Company for $2000 in 1798. At the time of the cession Penang was almost uninhabited. In 1796 it was made a penal settlement, and 700 convicts were transferred thither from the Andaman Islands. In 1805 Penang was made a separate presidency, ranking with Bombay and Madras; and when in 1826 Singapore and Malacca were incorporated with it, Penang continued to be the seat of government. In 1829 Penang was reduced from the rank of a presidency, and eight years later the town of Singapore was made the capital of the Settlements. In 1867 the Straits Settlements were created a Crown colony, in which Penang was included.

See Straits Settlements Blue Book igo6 (Singapore, 1907); The Straits Directory (Singapore, 1907); Sir Frank Swettenham, British Malaya

(London, 1906). (H. Cl.)

PENARTH, an urban district and seaport in the southern parliamentary division of Glamorganshire, Wales, 166 m. by rail from London, picturesquely situated on rising ground on the south side of the mouth of the Ely opposite Cardiff, from which it is 4 m. distant by rail and 2 m. by steamer. Pop. (1901), 14,228. The place derives its name from two Welsh words, ” pen,” a head, and ” garth,” an enclosure. Penarth was a small and unimpor- tant village until a tidal harbour at the mouth of the Ely was opened in 1859, and a railway, 6 m. long, was made about the same time, connecting the harbour with the Taff Vale railway at Radyr. A dock, authorized in 1857, was opened in 1865, when all three undertakings, which had cost £775,000, were leased in perpetuity to the Taff Vale Railway Company. The monopoly which the Bute Docks at Cardiff had previously enjoyed in shipping coal from the valleys of the Taff and Rhondda was thus terminated. The town is frequented in summer as a bathing-place, and the Rhaetic beds at the head are of special interest to geologists. On this head there stood an old church, probably Norman, which served as a landmark for sailors. The remains of an old chantry have been converted into a barn. Besides two Established and one Roman Catholic church, the principal buildings of Penarth are its various Nonconformist chapels, intermediate and technical school (1894), custom house, dock offices, and Turner House with a private art gallery which is thrown open on certain days to the public. Three miles to the west is Dinas Powis Castle. In 1880-1883 gardens were laid out along the cliff, in 1894 a promenade and landing-pier with a length of 630 ft. were constructed, and in 1900 a marine subway open at all times for foot passengers was made under the river Ely. The dock, as first constructed, comprised 17! acres, was extended in 1884 at a cost of £250,000, and now covers 23 acres with a basin of 3 acres. It is 2900 ft. in length, has a minimum depth of 26 ft., and is furnished with every modern appliance for the export of coal, of which from 20,000 to 30,000 tons can be stored in the sidings near by. The Penarth-Ely tidal harbour has a water area of 55 acres with a minimum depth of 20 ft., and a considerable import trade is carried on here mainly by coasting vessels; but as only one of its sides has wharves (about 3000 ft. along) scarcely more than 5% of the total shipping of the port is done here. It has commo- dious warehouses, also tanks to hold about 6000 tons of oil.

PENATES (from Lat. pemis, eatables, food), Roman gods of the store-room and kitchen. The store-room over which they presided was, in old times, beside the atrium, the room which served as kitchen, parlour, and bedroom in one; but in later times the store-room, was in

the back part of the house. It was sanctified by the presence of the Penates, and none but pure and chaste persons might enter it, just as with the Hindus the kitchen is sacred and inviolable. They had no individual names, but were always known under the general designation, Penates. Closely associated with the Penates were the Lares (q.v.) another species of domestic deity, who seem to have been the deified spirits of deceased ancestors. But while each family had two Penates it had but one Lar. In the household shrine the image of the Lar (dressed in a toga) was placed

between the two images of the Penates, which were represented as dancing and elevating a drinking-horn in token of joy and plenty. The three images together were sometimes called Penates, sometimes Lares, and either name was used metaphori- cally for" home." The shrine stood originally in the atrium, but when the hearth and the kitchen were separated from the atrium and removed to the back of the house, and meals were taken in an upper storey, the position of the shrine was also shifted. In the houses at Pompeii it is sometimes in the kitchen, sometimes in the rooms. In the later empire it was placed behind the house-door, and a taper or lamp was kept burning before it. But the worship in the interior of the house was also kept up even into Christian times; it was forbidden by an ordinance of Theodosius (a.d. 392). The old Roman used, in company with his children and slaves, to offer a morning sacrifice and prayer to his household gods. Before meals the blessing of the gods was asked, and after the meal, but before dessert, there was a short silence, and a portion of food was placed on the hearth and burned. If the hearth and the images were not in the eating-room, either the images were brought and put on the table, or before the shrine was placed a table on which were set a salt-cellar, food and a burning lamp. Three days in the month, viz. the Calends, Nones and Ides (i.e. the first, the fifth or seventh, and the thirteenth or fifteenth), were set apart for special family worship, as were also the Caristia (Feb. 22) and the Saturnalia in December. On these days as well as on such occasions as birthdays, marriages, and safe returns from journeys, the images were crowned and offerings made to them of cakes, honey, wine, incense, and sometimes a pig. As each family had its own Penates, so the state, as a collection of families, had its public Penates. Intermediate between the worship of the public and private Penates were probably the rites (sacra) observed by each clan (gens) or collec- tion of families supposed to be descended from a common ancestor. The other towns of Latium had their public Penates as well as Rome. The sanctuary of the whole Latin league was at Lavinium. To these Penates at Lavinium the Roman priests brought yearly offerings, and the Roman consuls, praetors and

dictators sacrificed both when they entered on and when they laid down their office. To them, too, the generals sacrificed before departing for their province. Alba Longa, the real mother-city of Latium, had also its ancient Penates, and the Romans maintained the worship on the Alban mount long after the destruction of Alba Longa. The Penates had a temple of their own at Rome. It was on the Velia near the Forum, and has by some been identified with the round vestibule of the church of SS. Cosma e Damiano. In this and many other temples the Penates were represented by two images of youths seated holding spears. The Penates were also worshipped in the neighbouring temple at Vesta. To distinguish the two worships it has been supposed that the Penates in the former temple were those of Latium, while those in the temple of Vesta were the Penates proper of Rome. Certainly the worship of the Penates, whose altar was the hearth and to whom the kitchen was sacred, was closely connected with that of Vesta, goddess of the domestic hearth.

The origin and nature of the Penates was a subject of much discussion to the Romans themselves. They were traced to the mysterious worship of Samothrace; Dardanus, it was said, took the Penates from Samothrace to Troy, and after the destruction of Troy, Aeneas brought them to Italy and established them at Lavinium. From Lavinium Ascanius carried the worship to Alba Longa, and from Alba Longa it was brought to Rome. Equally unsatisfactory with this attempt to connect Roman religion with Greek legend are the vague and mystic speculations in which the later Romans indulged respecting the. nature of the Penates. Some said they were the great gods to whom we owe breath, body and reason, viz. Jupiter representing the middle ether, Juno the lowest air and the earth, and Minerva the highest ether, to whom some added Mercury as the god of speech (Servius, on Aen. ii. 296; Macrobius, Sat. iii. 4, 8; Arnobius, Adv. Nat. iii. 40). Others identified them with Apollo

and Neptune (Macrob. iii. 4, 6; Arnob. loc. cit.; Servius, on Aen. iii. 1 19). The Etruscans held the Penates to be Ceres, Pales and Fortuna, to whom others added Genius Jovialis (Servius on Aen. ii. 325; Arnob. loc. cit.). The late writer Martianus Capella records the view that heaven was divided into sixteen regions, in the first of which were placed the Penates, along with Jupiter, the Lares, &c. More fruitful than these misty speculations is the suggestion, made by the ancients themselves, that the worship of these family gods sprang from the

ancient Roman custom (common to many savage tribes) of burying the dead in the house. But this would account for the worship of the Lares rather than of the Penates. A comparison with other primitive religious beliefs suggests the conjecture that the Penates may be a remnant of fetishism or animism. The Roman genii seem certainly to have been fetishes and the Penates were perhaps originally a species of genii. Thus the Penates, as simple gods of food, are probably much more ancient than deities like Jupiter, Neptune, Apollo and Minerva.

With the Penates we may compare the kindly household gods of old Germany; they too had their home on the kitchen hearth and received offerings of food and clothing. In the castle of Hudemiihlen (Hanover) there was a kobold for whom a cover was always set on the table. In Lapland each house had one or more spirits. The souls of the dead are regarded as house- spirits by the Russians; they are represented as dwarfs, and are served with food and drink. Each house in Servia has its patron-saint. In the mountains of Mysore every house has its bhuta or guardian deity, to whom prayer and sacrifices are offered. The Chinese god of the kitchen presents some curious analogies to the Penates: incense and candles are burnt before him on the first and fifteenth of the month; some families burn incense and candles before him daily; and on great festivals, one of which is at the winter solstice (nearly corresponding to the Saturnalia), he is served with cakes, pork, wine, incense, &c, which are placed on a table before him.

See Roman Religion. (J. G. Fx. ; X.)

PENCIL (Lat. penicillus, brush, literally little tail), a name originally applied to a small fine-pointed brush used in painting, and still employed to denote the finer camel's-hair and sable brushes used by artists, but now commonly signifying solid cones or rods of various materials used for writing and drawing. It has been asserted that a manuscript of Theophilus, attributed to the 13th century, shows signs of having been ruled with a black-lead pencil; but the first distinct allusion occurs in the treatise on fossils by Conrad Gesner of Zurich (1565), who describes an article for writing formed of wood and a piece of lead, or, as he believed, an artificial composition called by some stimmi anglicanum (English antimony). The famous Borrowdale mine in Cumberland having been discovered about that time, it is probable that we have here the first allusion to that great find of graphite. While the supply of the Cumberland mine lasted, the material for English pencils consisted simply of the native graphite as taken from the mine. The pieces were sawn into thin sheets, which again were cut into the slender square rods forming the " lead " of the pencil.

Strenuous efforts were made on the continent of Europe and in England to enable manufacturers to become independent of the product of the Cumberland mine. In Nuremberg, where the great pencil factory of the Faber family (q.v.) was established in 1760, pencils were made from pulverized graphite cemented into solid blocks by means of gums, resins, glue, sulphur and other such substances, but none of these preparations yielded useful pencils. In the year 1795 N. J. Conte (q.v.), of Paris, devised the process by which now all black-lead pencils, and indeed pencils of all sorts, are manufactured. In 1843 William Brockedon patented a process for compressing pure black-lead powder into solid compact blocks by which he was enabled to use the dust, fragments, and cuttings of fine Cumberland lead. Brockedon's process would have proved successful but the exhaustion of the Borrowdale supplies and the excellence of Conte's process rendered it more of scientific interest than of commercial value.

The pencil leads prepared by the Conte process consist of a mixture of graphite and clay. The graphite, having been pulver- ized and subjected to any necessary purifying processes, is " floated " through a series of settling tanks, in each of which the comparatively heavy particles sink, and only the still finer particles are carried over. That which sinks in the last of the series is in a condition of extremely fine division, and is used for pencils of the highest quality. The clay, which must be free from sand and iron, is treated in the same manner. Clay and graphite so prepared are mixed together in varying propor- tions with water to a paste, passed repeatedly through a grinding mill, then placed in bags and squeezed in a hydraulic press till they have the consistency of stiff dough, in which condition they are ready for forming pencil rods. For this purpose the plastic mass is placed in a strong upright cylinder, from which a plunger or piston, moved by a screw, forces it out through a perforated base-plate in a continuous thread. This thread is finally divided into suitable lengths, which are heated in a closed crucible for some hours. The two factors which determine the comparative hardness and blackness of pencils are the proportions of graphite and clay in the leads and the heat to which they are raised in the crucible. According as the proportion of graphite is greater and the heat lower the pencil is softer and of deeper black streak.

The wood in which the leads are cased is pencil cedar from Juniperus virginiana for the best qualities, and pine for the cheaper ones. A board of the selected wood, having a thickness about equal to half the diameter of the finished pencil and as wide as four or six pencils, is passed through a machine which smooths the surface and cuts round

or square grooves to receive the leads. The leads being placed in the grooves the board is covered with another similarly grooved board, and the two are fastened together with glue. When dry they are taken to rapidly revolving cutters which remove the wood between the leads. The individual pencils thus formed only need to be finished by being dyed and varnished and stamped with name, grade, &c. Instead of wood, paper has been tried for the casings, rolled on in narrow strips which are torn off to expose fresh lead as the point becomes worn down by use.

Black pencils of an inferior quality are made from the dust of graphite melted up with sulphur and run into moulds. Such, with a little tallow added to give them softness, are the pencils commonly used by carpenters. Coloured pencils consist of a mixture of clay, with appropriate mineral colouring matter, wax, and tallow, treated by the Conte method, as in making lead pencils. In indelible and copying pencils the colouring matter is an aniline preparation mixed with clay and gum. The mixture not only makes a streak which adheres to the paper, but, when the writing is moistened with water, it dissolves and assumes the appearance and properties of an ink.

PENDA, king of Mercia (d. 654 or 655), son of Pybba, probably came to the throne in 626, but it is doubtful whether he actually became king of Mercia until 633, the year of the defeat and death of Edwin of Northumbria. According to the Anglo-Saxon Chronicle he was eighty years old at his death, but the energy of his administration and the evidence with regard to the ages of his children and relatives render it almost impossible. In 628 the Chronicle records a battle between him and the West Saxons at Cirencester in that year. In 633 Penda and Ceadwalla ovei threw Edwin at Hatfield Chase; but after the defeat of the Welsh king at Oswald at ” Hefenfelth ” in 634, Mercia seems to have been for a time subject to Northumbria. In 642 Penda slew Oswald at a place called Maerfeld. He was continually raiding Northumbria and once almost succeeded in reducing Bamborough. He drove Cenwalh of Wessex, who had divorced his sister, from his throne. In 654 he attacked the East Angles, and slew their king Anna (see East Anglia). In 654 or 655 he invaded Northumbria in spite of the attempts of Oswio to buy him off, and was defeated and slain on the banks of the ” Winwaed.” In the reign of Penda the districts corresponding to Cheshire, Shropshire and Herefordshire were probably acquired, and he established his son Peada as a dependent prince in Middle Anglia. Although a pagan, he allowed his daughter Cyneburg to marry Alchfrith, the son of

Oswio, and it was in his reign that Christianity was introduced into Middle Anglia by his son Peada.

See Bede, Hist. Eccl. (ed. C. Plummer, Oxford, 1896) ; Anglo-Saxon Chronicle (ed. Earle and Plummer, Oxford, 1899).

PENDANT (through Fr. from Lat. pendere, to hang), any hang- ing object, such as a jewel or other ornament hanging from a brooch, bracelet, &c, or the loose end of a knight's belt left hanging after passing through the buckle, and terminating in an ornamental end. In architecture the word is applied to an elongated boss, either moulded or foliated, such as hangs down from the intersection of ribs, especially in fan tracery, or at the end of hammer beams. Sometimes long corbels, under the wall pieces, have been so called. The name has also been given to the large masses depending from enriched ceilings, in the later works of the Pointed style. " Pendants " or " Pendent posts " are those timbers which are carried down the side of the wall from the plate, and receive the hammer braces.

PENDENTIVE, the term given in architecture to the bridging across the angles of a square hall, so as to obtain a circular base for a dome or drain. This may be done by corbelling out in the angles, in which case the pendentive may be a portion of a hemisphere of which the half diagonal of the square hall is the radius; or by throwing a series of arches across the angle, each ring as it rises advancing in front of the one below and being carried by it during its construction; in this case the base obtained is octagonal, so that corbels or small pendentives are required for each angle of the octagon, unless as in the church of SS. Sergius and Bacchus at Constantinople a portion of the dome is set back; or again, by a third method, by sinking a semicircular niche in the angle. The first system was that employed in St Sophia at Constantinople, and in Byzantine churches generally, also in the domed churches of Perigord and Aquitaine. The second is found in the Sassanian palaces of Serbistan and Firuzabad, and in medieval architecture in England, France and Germany, where the arches are termed " squinches." The third system is found in the mosque at Damascus, and was often adopted in the churches in Asia Minor. There is still another method in which the pendentive and cupola are part of the same hemispherical dome, and in this case the ring courses lie in vertical instead of horizontal planes, examples of which may be found in the vault of Magnesia on Maeander in Asia Minor, and in the tomb at Valence known as le pendent if de Valence. The problem is one which has taxed the ingenuity of many builders in ancient times;

the bas-reliefs found at Nimrud show that in the 9th century B.C. domes were evidently built over square halls, and must have been carried on pendentives of some kind.

PENDER, SIR JOHN (1816-1S96), British cable pioneer, was born in the Yale of Leven, Scotland, on the 10th of September 18:6, and after attending school in Glasgow became a successful merchant in textile fabrics in that city and in Manchester. His name is chiefly known in connexion with submarine cables, of which on the commercial side he was an important promoter. He was one of the 345 contributors who each risked a thousand pounds in the Transatlantic Cable in 1857, and when the Atlantic Telegraph Company was ruined by the loss of the 1865 cable he formed the Anglo-American Telegraph Company to continue the work, but it was not till he had given his personal guarantee for a quarter of a mil 1 ion pounds that the makers would under- take the manufacture of a new cable. But in the end he was justified, and telegraphic communication with America became a commercial success. Subsequently he fostered cable enter- prise in all parts of the world, and at the time of his death, which occurred at Footscray Place, Kent, on the 7th of July 1896, he controlled companies having a capital of 15 millions sterling and owning 73,640 nautical miles of cables. He repre- sented Wick Burghs in parliament from 1872 to 1885 and from 1892 to 1896. He was made a K.C.M.G. in 1888 and was pro- moted in 1892 to be G.C.M.G. His eldest son James (b. 1841), who was M.P. for Mid Northamptonshire in 1895-1900, was created a baronet in 1897; and his third son, John Denison (b. 1855), was created a K.C.M.G. in 1901.

PENDLESIDE SERIES, in geology, a series of shales between the upper division of the Carboniferous Limestone and the Millstone Grits occurring in the Midlands between Stoke-on- Trent and Settle. It consists of black limestones at the base, followed by black shales with calcareous nodules, which pass into sandy shales with ganister-like sandstones. In places the series attains a thickness of 1500-1000 ft., and where it is thickest the Millstone Grits also attain their maximum thickness. The peculiarities of the series, which is characterized by a rich fauna with Produclus giganteus, P. striatus, Dibunophyllum, Cyathaxonia cornu and Lonsdaleia floriformis, can be best studied on the western slope of Pendle Hill, Lancashire, in the valley of the Hodder, dividing the counties of Lancashire and Yorkshire, at Mam Tor and the Edale valley in Derbyshire, and Morredge, the Dane valley in north Staffordshire, Bagillt and Teilia in North Wales, and Scarlett and Poolvash, Isle of Man. The limestones at the base are hard, compact and fissile, often cherty, and vary much in the amount of calcium carbonate which they contain, at times passing into

calcareous shales.

These limestones and shales contain a distinct fauna which appears for the first time in the Midlands, characterized by Pterinopecten papyraceus, Posidoniella laevis, Posidonomya Becheri, Posidonomya membranacea, Nomismoceras rotiforme and Glyphioceras striatus. Immediately below beds with this fauna are thin limestones with Prolecanites compressus, Strobo- ceras bisulcatus, many trilobites, and corals referable to the genera Cyathaxonia, Zaphrentis and Amplexizaphrentis. The fauna characteristic of the Carboniferous Limestone becomes largely extinct and is replaced by a shale fauna, but the oncoming of the age of Goniatites is shown by the presence in the upper part of the Carboniferous Limestone of numerous species and genera of this group, Glyphioceras crenestria being the most common and having the wider horizontal range. The whole Pendleside series can be divided into zones by the different species of Goniatites. At the base Prolecanites com- pressus characterizes the passage beds between the Carboniferous Limestone and the Pendlesides; Nomismoceras rotiforme and Glyphioceras striatus are found in a narrow zone immediately above. Then Glyphioceras reticulatum appears and reaches its maximum, and is succeeded by Glyphioceras diadema and Glyphioceras spirale, while immediately below the Millstone Grits Glyphioceras bilingue appears and passes up in that series. The Millstone Grits are characterized by the presence of Gaslrioceras Listeri. The Pendleside series is therefore characterized by an Upper Carboniferous fauna, Pterinopecten papyraceus, Posidoniella laevis and some other species which pass up right through the Coal Measures appearing for the first time, and the base of the series marks the division between Upper and Lower Carboniferous times.

The series passes eastward into Belgium and thence into Germany, when the same fossil zones are found in the basin of Namur and the valley of the Dill. Traced westward the series is well developed in Co. Dublin and on the west coast of Cos. Clare and Limerick. There can be no doubt that the Pendleside series of the Midlands represents the Lower Culm of Codden Hill, north Devon, and the Lower Culm of the continent of Europe. The faunas in these localities have the same biological succession as in the midlands.

See Wheelton Hind and J. Allen Howe, Quart. Journ. Geog. Soc. vol. lvii. (1901), and numerous other papers by the first-named author. . (W. Hi.)

PENDLETON, EDMUND (1721-1803), American lawyer and statesman, was born, of English Royalist descent, in Caroline county,

Virginia, on the 9th of September 1721. He was self-educated, but after reading law and being admitted to the bar (1744) his success was immediate. He served in the Virginia House of Burgesses from 1752 until the organization of the state government in 1776, was the recognized leader of the conservative Whigs, and took a leading part in opposing the British government. He was a member of the Virginia committee of correspondence in 1773, in 1774 was president of the Virginia provincial convention, and a member of the first

Continental Congress. In 1776, as president of the provincial convention, which adopted a state constitution for Virginia, he drew up the instructions to the Virginia members of Congress directing them to advocate the independence of the American colonies. In the same year he became president of the Virginia committee of safety, and in October was chosen the first speaker of the House of Delegates. With Jefferson and Chan- cellor George Wythe he drew up a new law code for Virginia. He was president of the court of chancery in 1777-1788, and from 1779 until his death was president of the Virginia court of appeals. He was an enthusiastic advocate of the Federal consti- tution, and in 1788 exerted strong influence to secure its ratifi- cation by his native state. He was a leader of the Federalist party in Virginia until his death at Richmond, Va., on the 23rd of October 1803.

PENDLETON, GEORGE HUNT (1825-1889), American lawyer and legislator, was born in Cincinnati, Ohio, on the 25th of July 1825. He was educated at the university of Heidelberg, studied law, was admitted to the bar, and began to practise at Cincinnati. He was a member of the Ohio Senate in 1854 and 1855, and from 1857 to 1865 was a Democratic member of the national House of Representatives, in which he opposed the war policy of Lincoln. In 1864 he was the Democratic candidate for vice-president. After leaving Congress he became one of the earliest champions of the ” Ohio idea ” (which he is said to have originated), demanding that the government should pay the principal of its 5-20-year 6% bonds in the ” greenback ” currency instead of in coin. The agricultural classes of the West regarded this as a means of relief, and Pendleton became their recognized leader and a candidate for the Democratic nomination to the presidency in 1868, but he failed to receive the requisite two-thirds majority. In 1869 he was the Democratic candidate for governor of Ohio, but was defeated by Rutherford B. Hayes. For the next ten years he devoted himself to

the practice of law and to the supervision of the Kentucky Railroad Company, of which he had become president in 1869. From 1879 to 1885 he was a Democratic member of the United States Senate, and introduced the so-called Pendleton Act of 1883 for reforming the civil service, hostility to which lost him his seat in 1885. He was minister to Germany from 1885 to the summer of 1889, and died at Brussels on the 24th of November 1889.

PENELOPE, in Greek legend, wife of Odysseus, daughter of Icarius and the nymph Periboea. During the long absence of her husband after the fall of Troy many chieftains of Ithaca and the islands round about became her suitors; and, to rid herself of the importunities of the wooers, she bade them wait till she had woven a winding-sheet for old Laertes, the father of Odysseus. But every night she undid the piece which she had woven by day. This she did for three years, till her maids revealed the secret. She was relieved by the arrival of Odysseus, who returned after an absence of twenty years, and slew the wooers. The character of Penelope is less favourable in late writers than in the Homeric story. During her husband's absence she is said to have become the mother of Pan by Hermes, and Odysseus, on his return, repudiated her as unfaithful (Herodotus ii. 145 and schol.). She thereupon withdrew to Sparta and thence to Mantineia, where she died and where her tomb was shown. According to another account she married Telegonus the son of Odysseus and Circe, after he had killed his father, and dwelt with him in the island of Aeala or in the Islands of the Blest (Hyginus, Feb. 127).

PENGELLY, WILLIAM (1812-1894), English geologist and anthropologist, was born at East Looe in Cornwall on the 12th of January 181 2, the son of the captain of a small coasting vessel. He began life as a sailor, after an elementary education in his native village, but in 1828 he abandoned a seafaring life. He had developed a passion for learning, and about 1836 he removed to Torquay and started a school; in 1846 he became a private tutor in mathematics and natural science. Geology had in early years attracted his attention, but it was not until he was about 30 years of age that he began seriously to cultivate

the study. In 1837 he was instrumental in the reorganization of the Torquay Mechanics' Institute, in 1844 mainly owing to his energy the Torquay Natural History Society was founded, and in 1862 he assisted in founding the Devonshire Association for the Advancement of Literature, Science and Art. Meanwhile he had been occupied in collecting fossils from many parts of Devon and Cornwall, and in i860 the Baroness Burdett- Coutts acquired and presented them to the

Oxford Museum, where they form " The Pengelly Collection." Through the generosity of the same lady he was called upon to examine the lignites and clays of Bovey Tracey, in conjunction with Dr Oswald Heer, who undertook the determination of the plant-remains. Their report was published by the Royal Society (1862), and Pengelly was elected F.R.S. in 1863. He aided in the investigations of the Brixham bone-cavern from the date of its discovery in 1858, the full report being issued in 1873; and he was the main explorer of Kent's Hole, Torquay, and from 1864 for more than fifteen years he laboured with unflagging energy in examining and recording the exact position of the numerous organic remains that were disinterred during a systematic investigation of this cave, carried on with the aid of grants from, the British Association. He first attended the British Association at the Cheltenham meeting in 1856, and was present at subsequent meetings (except that at Montreal in 1884) until 1889. His observations assisted in establishing the important fact of the contemporaneity of Palaeolithic man with various Pleistocene mammalia, such as the mammoth, cave-bear, cave-lion, &c. He was awarded the Lyell medal by the Geological Society of London in 1886. He died at Torquay on the 16th of March 1894.

See Memoir of William Pengelly, edited by his daughter Hester Pengelly, with a summary of his scientific work by the Rev. Pro- fessor T. G. Bonney (1897).

PENGUIN, the name of a flightless sea-bird, 1 but, so far as is known, first given to one inhabiting the seas of Newfound- land as in Hore's "Voyage to Cape Breton," 1536 (Hakluyt, Researches, in. 168-170), which subsequently became known as the great auk or garefowl (q.v.) ; though the French equiva- lent Pingouin 2 preserves its old application, the word penguin is by English ornithologists always used for certain birds inhabiting the Southern Ocean, called by the French Manchots, the Spheiiiscidae of ornithologists. For a long while their position was very much misunderstood, some systematists having placed them with the Alcidae or Auks, to which they bear only a relationship of analogy, as indeed had been perceived by a few ornithologists, who recognized in the penguins a very distinct order, Impcnnes. L. Stejneger {Standard Nat. Hist. vol. iv., Boston, 1885) gave the Impennes independent rank equivalent to the rest of Carinate birds; M. A. Menzbier {Vergl. Osteol. d. Penguine, Moscow, 1887) took a similar view; M. Fiirbringer was first to show their relation to Procellariformes, and this view is now generally accepted.

1 Of the three derivations assigned to this name, the first is by Drayton in 1613 {Polyolbion, Song 9), where it is said to be the Welsh

pen gwyn, or “white head”; the second, which seems to meet with Littre’s approval, deduces it from the Latin pinguis (fat), which idea has given origin to the German name, Fettgdnse, for these birds; the third supposes it to be a corruption of ” pin-wing ” {Ann. Nat. History, 4th series, vol. iv. p. 133), meaning a bird that has under- gone the operation of pinioning or, as in one part at least of England it is commonly called, ” pin-winging.” The first hypothesis has been supported on the ground that Breton sailors speaking a language closely allied to Welsh were acquainted with the great auk, and that the conspicuous white patches on the head of that bird justified the name ” white head.” To the second hypothesis Skeat {Dictionary, p. 433) objects that it ” will not account for the suffix -in, and is therefore wrong; besides which the ‘ Dutchmen ‘ [who were asserted to be the authors of the name] turn out to be Sir Francis Drake ” and his men. In support of the third hypothesis Mr Reeks wrote {Zoologist, 2nd series, p. 1854) that the people in Newfoundland who used to meet with this bird always pronounced its name ” pin wing.” Skeat’s inquiry {loc. cit.), whether the name may not after all be South American, is to be answered in the negative, since, so far as evidence goes, it was given to the North-American bird before the South-American was known in Europe.

2 Gorfou has also been used by some French writers, being a corruption of Geirfugl or Garefowl.

There is a total want of quills in their wings, which are incapable of flexure, though they move freely at the shoulder-joint, and some at least of the species occasionally make use of them for progressing on land. In the water they are most efficient paddles. The plumage, which clothes the whole body, generally consists of small scale-like feathers, many of them consisting only of a simple shaft without the development of barbs; but several of the species have the head decorated with long cirrhous tufts, and in some the tail-quills, which are very numerous, are also long. J In standing these birds preserve an upright position, sometimes resting on the ” tarsus ” 2 alone, but in walking or running this is kept nearly vertical, and their weight is supported by the toes alone.

The most northerly limit of the penguins’ range in the Atlantic is Tristan d’Acunha, and in the Indian Ocean Amsterdam Island, but they also occur off the Cape of Good Hope and along the coast of Australia,

as well as on the south and east of New Zealand, while in the Pacific one species at least extends along the west coast of South America and to the Galapagos; but north of the equator none are found. In the breeding season they resort to the most desolate lands in higher southern latitudes, and indeed have been met with as far to the southward as navigators have penetrated. Possibly the Falkland Islands are richest in species, though, as individuals, they

King- Penguin {Aptenodytes pennanti).

are not nearly so numerous there as in many other places. The food of penguins consists of crustaceans, cephalopods and other molluscs, varied by fish and vegetable matter. The birds form immense breeding colonies, known as ” rookeries.” The nest of grass, leaves, or where vegetation is scanty of stones or rubbish, is placed on the ground or in holes. Two chalky white or greenish eggs are laid. The young penguins, clad in thick down, are born blind and are fed by the parents for an unusually long time before taking to the water. Penguins bite savagely when molested, but are easily trained and display considerable intelligence.

The S pheniscidae have been divided into at least eight genera, but three, or at most four, seem to be all that are needed, and

1 The pterylographical characters of the penguins are well described by A. Hyatt (Proc. Boston Soc. Nat. History, 1871). A. D. Bartlett has observed (Proc. Zool. Soc, 1879, pp. 6-9) that, instead of moulting in the way that birds ordinarily do, penguins, it least in passing from the immature to the adult dress, cast off the short scale-like feathers from their wings in a manner that he compares to ” the shedding of the skin in a serpent.”

2 The three metatarsals in the penguins are not, as in other birds, united for the whole of their length, but only at the extremities, thus preserving a portion of their originally distinct existence, a fact probably attributable to arrest of development, since the researches of C. Gegenbaur show that the embryos of all birds, so far as is known, possess these bones in an independent condition.

three can be well distinguished, as pointed out by E. Coues in Proc. Acad, of Nat. Sci. of Philadelphia, 1872 (pp. 170-212), by anatomical as well as by external characters. They are: (1) Aptenodyles, easily recognized by its long and thin bill, slightly decurved, from which Pygoscelis, as M. Watson has shown, is hardly distinguishable; (2) Eudyptes, in which the bill is much shorter and rather broad; and (3)

Spheniscus, in which the shortish bill is compressed and the maxilla ends in a conspi- cuous hook. Aplenodytes contains the largest species, among them those known as the ” Emperor ” and ” King ” penguins A. patagonica and A. longirostris. Three others belong also to this genus, if Pygoscelis be not recognized, but they seem not to require any particular remark. Eudyptes, containing the crested penguins, known to sailors as ” Rock-hoppers ” or” Macaronis,” would appear to have five species, and Sphenis- cus four, among which S. mendiculus, which occurs in the Galapagos, and therefore has the most northerly range of the whole group, alone needs notice here. (A. N.)

The generic and specific distribution of the penguins is the subject of an excellent essay by Alphonse Milne-Edwards in the Annates des sciences naturelles for 1880 (vol. ix. art. 9, pp. 23-81); see also the Records of the Antarctic Expedition, 1901-1904.

PENHALLOW, SAMUEL (1665-1726), American colonist and historian, was born at St Mabon, Corn, ‘11, England, on the 2nd of July 1665. From 1683 to 1686 he attended a school at Newington Green (near London) conducted by the Rev. Charles Morton (1627-1698), a dissenting clergyman, with whom he emigrated to Massachusetts in 1686. He was commissioned by the Society for the Propagation of the Gospel in New England to study the Indian languages and to preach to the Indians; but he was soon diverted from this work. Removing to Portsmouth, New Hampshire, he there married a daughter of John Cutt (1625-1681), president of the province of New Hampshire in 1679-1680, a successful merchant and mill-owner, and thus came into possession of considerable property (including much of the present site of Portsmouth). In 1 70c he was speaker of the Assembly and in 1702 became a member of the Provincial Council, but was suspended by Lieut. -Governor George Vaughan (1676-17 24). Penhallow, however, was sustained by Governor Samuel Shute (1662-1742), and Vaughan was removed from office in 1716. In 1714 Penhallow was appointed a justice of the superior court of judicature, and from 171 7 until his death was chief justice of that court; and he also served as treasurer of the province in 1699- 1726, and as secretary of the province in 1714-1726. He died at Portsmouth on the 2nd of December 1726. He wrote a valuable History of the War of New England with the Eastern Indians, or a Narrative of their Continued Perfidy and Cruelty (1726; reprinted in the Collections of the New Hampshire Historical Society, vol. i., 1824, and again at Cincinnati in 1859), which covers the period from 1703 to 1726, and is a standard contem- porary authority.

PENINGTON, SIR ISAAC (c. 1587-1661), lord mayor of London, eldest

son of Robert Penington, a London fishmonger, was born probably in 1587. His father besides his London business had landed estates in Norfolk and Suffolk, which Isaac inherited in addition to a property in Buckinghamshire which he himself purchased. In 1638 Isaac became an alderman and high sheriff of London. In 1640 he was elected to the House of Commons as member for the city of London, and immediately took a prominent place among the Puritan party. In 1642 he was elected lord mayor of London, but retained his seat in parliament by special leave of the Commons; and he was elected lord mayor for a second term in the following year, continuing while in office to raise large sums of money for the opposition to the Court party. From 1642 to 1645 he was lieutenant of the Tower, in which capacity he was present at the execution of Laud; but, though one of the commissioners for the trial of Charles I., he did not sign the death warrant. After the king's death Penington served on Cromwell's council of state, and on several committees of government. His services were rewarded by considerable grants of land, and a

knighthood conferred in 1649. He was tried and convicted of treason at the Restoration, and died while a prisoner in the Tower on the 17th of December 1661. He was twice married, and had six children by his first wife, several of whom became Quakers.

Isaac Penington (1616-1679), Sir Isaac's eldest son, was one of the most notable of the 17th-century Quakers. He was early troubled by religious perplexities, which found expres- sion in many voluminous writings. No less than eleven religious works, besides a political treatise in defence of democratic principles, were published by him in eight years. He belonged for a time to the sect of the Independents; but about 1657, influenced probably by the preaching of George Fox, whom he heard in Bedfordshire, Penington and his wife joined the Society of Friends. His wife was daughter and heiress of Sir John Proude, and widow of Sir William Springett, so that the worldly position of the couple made them a valuable acquisition to the Quakers. Isaac Penington was himself a man of very consider- able gifts and sweetness of character. In 1661 he was imprisoned for refusing to take the oath of allegiance, and on several subse- quent occasions he passed long periods in Reading and Aylesbury gaols. He died on the 8th of October 1679; his wife, who wrote an account of his imprisonments, survived till 1682. In 1681 Penington's writings were published in a collected edition, and several later editions were

issued before the end of the 18th century. His son John Penington (1655-17 10) defended his father's memory against attack, and published some con- troversial tracts against George Keith. Edward Penington (1667-1711), another of Isaac Penington's sons, emigrated to Pennsylvania, where he founded a family. Isaac Penington's stepdaughter, Gulielma Springett, married William Penn.

See Maria Webb, The Penns and Peningtons of the 17th Century (London, 1867); Lord Clarendon, History of the Rebellion and Civil Wars in England (7 vols., Oxford, 1839); Bulstrode Whitelocke, Memorials of English Affairs: Charles I. to the Restoration (London, 1732); J. Gurney Bevan, Life of Isaac Penington (London, 1784); Thomas Ellwood, History of the Life of Ellwood by his own hand (London, 1765); Willem Sewel, History of the Quakers (6th ed., 2 vols., London, 1834).

PENINSULA (Lat. paeninsula, from paene, almost, and insula, an island), in physical geography, a piece of land nearly sur- rounded by water. In its original sense it connotes attachment to a larger land-mass by a neck of land (isthmus) narrower than the peninsula itself, but it is often extended to apply to any long promontory, the coast-line of which is markedly longer than the landward boundary.

PENINSULAR WAR (1808-14). This important war, the conduct and result of which greatly enhanced the prestige of British arms, had for its main object the freedom of the Peninsula of Spain and Portugal from the domination of Napoleon; and hence it derives its name, though it terminated upon the soil of France.

Nelson having destroyed the French fleet at Trafalgar, Napoleon feared the possibility of a British army being landed on the Peninsular coasts, whence in conjunction with Portuguese and Spanish forces it might attack France from the south. He therefore called upon Portugal, in August 1807, to comply with his Berlin decree of the 21st of November 1806, under which continental nations were to close their ports to British subjects, and have no communication with Great Britain. At the same time he persuaded the weak king of Spain (Charles IV.) and his corrupt minister Godoy to permit a French army to pass through Spain towards Portugal; while under a secret treaty signed at Fontainebleau on the 27th of October 1807 Spanish troops were to support the French. Portugal was to be sub- sequently divided between Spain and France, and a new princi- pality of the Algarve was to be carved out for Godoy. Portugal remonstrated against Napoleon's demands, and a French corps (30,000) under General Junot was instantly despatched to Lisbon. Upon its approach the prince regent

fled, and the country was occupied by Junot, most of the Portuguese troops being disbanded or sent abroad. Napoleon induced the king of Spain to allow French troops to occupy the country and to

send the flower of the Spanish forces (15,000) under the marquis of Romana 1 to assist the French on the Baltic. Then Dupont de l'Etang (25,000) was ordered to cross the Bidassoa on the 22nd of November 1807; and by the 8th of January 1808 he had reached Burgos and Valladolid. Marshal Moncey with a corps occupied Biscay and Navarre; Duhesme with a division entered Catalonia; and a little later Bessieres with another corps had been brought up. There were now about 100,000 French soldiers in Spain, and Murat, grand duke of Berg, as " lieutenant for the emperor," entered Madrid. During February and March 1808 the frontier fortresses of Pampeluna, St Sebastian, Barcelona and Figueras were treacherously occupied and Spain lay at the feet of Napoleon. The Spanish people, in an outburst of fury against the king and Godoy, forced the former to abdicate in favour of his son Ferdinand; but the inhabitants of Madrid having (May 2, 1808) risen against the French, Napoleon refused to recognize Ferdinand; both he and the king were compelled to renounce their rights to the throne, and a mercenary council of regency having been induced to desire the French emperor to make his brother, Joseph Bonaparte, king, he acceded to their request. 2

The mask was now completely thrown off, and Spain and Portugal rose against the French. Provincial " juntas " (com- mittees of government) were organized; appeals for assistance made to the British government, which granted arms, money and supplies, and it was resolved to despatch a British force to the Peninsula. Before it landed, the French under Dupont, Moncey and Marshal Bessieres (75,000) had occupied parts of Biscay, Navarre, Aragon and the Castiles, holding Madrid and Toledo, while General Duhesme (14,000) was in Catalonia. Moncey (7000) had marched towards the city of Valencia, but been repulsed in attempting to storm it (June 28); Bessieres had defeated the Spanish general Joachim Blake at Medina de Rio Seco (June 14, 1808) and Dupont (13,000) had been detached (May 24) from Madrid to reduce Seville and Cadiz in Andalusia. Spanish levies, numbering nearly 100,000 regulars and militia, brave and enthusiastic, but without organization, sufficient training, or a commander-in-chief, had collected together; 30,000 being in Andalusia, a similar number in Galicia, and others in Valencia and Estremadura. but few in the central portion of Spain.

At this juncture Dupont, moving upon Cadiz, met with a reverse which greatly influenced the course of the Peninsular War. On the 7th

of June 1808 he had sacked Cordova; but while he was laden with its spoils the Spanish general Castanos with the army of Andalusia (30,000), and also a large body of armed peasantry, approached. Falling back to Andujar, where he was reinforced to 22,000 strong, Dupont detached a force to hold the mountain passes in his rear, whereupon the Spaniards interposed between the detachment and the main body and seized Baylen. Failing to dislodge them, and surrounded by hostile troops and an infuriated peasantry, Dupont capitulated with over Battle of 20,000 men. This victory, together with the in- Baylen, July trepid defence of Saragossa by the Spanish general ‘ Jose Palafox (June 15 to August 13, 1808) temporarily paralysed the French and created unbounded enthusiasm in Spain. Duhesme, having failed to take Gerona, was blockaded in Barcelona, Joseph fled from Madrid (Aug. 1, 1808), and the French forces closed to their rear to defend their communications with France. The British troops were directed towards Lisbon and Cadiz, in order to secure these harbours, to prevent the subjugation of Andalusia, and to operate up the basins of the Guadiana, Tagus and Douro into Spain. The British force consisted of 9000 men from Cork, under Sir Arthur Wellesley — at first in chief command; 5000 from Gibraltar, under General (Sir Brent) Spencer; and 10,000 under Sir John Moore coming from Sweden; Wellesley and Moore being directed towards Portugal, and Spencer to Cadiz. On the 1st of August 1808

1 They subsequently escaped from Jutland, on British vessels, and reached Santander in October 1808.

2 The king, the queen and Godoy were eventually removed to Rome, and Ferdinand to Valencay in France.

Wellesley began to land his troops, unopposed, near Figueira da Foz at the mouth of the Mondego; and the Spanish victory of Baylen having relieved Cadiz from danger, Spencer now joined him, and, without waiting for Moore the army, under 15,000 in all (which included some Portuguese) 1 with 18 guns, advanced towards Lisbon.

Campaign in Portugal, 1808. — The first skirmish took place at Obidos on the 15th of August 1808, against Delaborde’s division (5000 men with 5 guns), which fell back to Roleia (Rorica or Rolica). A battle took place here (Aug. 17) in which Sir Arthur Wellesley attacked and drove him from two successive positions. The allied loss

was about 500: the French 600 and three guns. 1 On the 20th of August the Allies, strengthened by the arrival of two more brigades (4000 men), occupied some heights north of Vimiera (Vimeira or Vimeiro) where the roads branch off to Torres Vedras and Mafra. Wellesley meant to turn the defile of Torres Vedras by Mafra at once if possible; but on this night Sir Harry Burrard, his senior, arrived off Vimiera, and though he did not land, gave instructions to wait for Sir John Moore. On the 21st of August the Allies were attacked by Junot at Vimiera, who, leaving a force at Lisbon, had come up to reinforce Delaborde. In this battle the Allies Battle of numbered about 18,000 with 18 guns, French nearly Vimiera, 14,000, with 20 guns. Junot, believing the allied August 21, j e f t t0 kg W eakly held, attacked it without recon- m8 ‘ noitring, but Wellesley’s regiments, marched thither

behind the heights, sprang up in line; and under their volleys and bayonet charge, supported by artillery fire, Junot’s deep columns were driven off the direct road to Lisbon. The losses were: Allies about 800, French 2000 and 13 guns. It was now again Wellesley’s wish to advance and seize Torres Vedras; but Sir Hew Dalrymple, having at this moment assumed command, decided otherwise. On the 2nd of August Junot, knowing of the approach of Moore with reinforcements, and afraid of a revolt in Lisbon, opened negotiations, which resulted in the Convention of Cintra 2 (Aug. 30, 1808), under which the French evacuated Portugal, on condition that they were sent with their artillery and arms to France. Thus this campaign had been rapidly brought to a satisfactory conclusion; and Sir Arthur Wellesley had already given proof of his exceptional gifts as a leader. In England however a cry was raised that Junot should have been forced to an absolutely unconditional surrender; and Sir Arthur Wellesley, Sir Hew Dalrymple and Sir Harry Burrard 3 were brought before a court of inquiry in London. This acquitted them of blame, and Sir John Moore in the mean- time after the departure of Dalrymple (Oct. 6, 1808) had assumed command of the allied army in Portugal, now about 32,000 strong.

Moore’s Campaign in Spain, 1808-9— The British govern- ment notified to Sir John Moore that some 10,000 men were to be sent to Corunna under Sir David Baird; that he, with 20,000, was to join him, and then both act in concert with the Spanish armies. As the conduct of this campaign was largely influenced by the operations of the Spanish forces, it is necessary to mention their positions, and also the fact that greater reliance had been placed, both in England and Spain, upon them than future events justified. On the 26th of October 1808, when Moore’s troops had left Lisbon to join Baird, the French still held

a defensive position behind the Ebro; Bessieres being in the basin of Vitoria, Marshal Key north-west of Logrono, and Moncey covering Pampeluna, and near Sanguessa. With the garrisons of Biscay, Navarre, and a reserve at Bayonne, their strength was about 75,000 men. Palafox (20,000) was near Saragossa and observing Sanguessa; Castafios with the victors of Baylen

1 In this account of the war the losses and numbers engaged in different battles are given approximately only; and the former include killed, wounded and missing. Historians differ much on these matters.

‘■ It was not, however, signed at Cintra, but at Lisbon, and was mainly negotiated near Torres Vedras.

3 The two latter were recalled from the Peninsula ; Sir Arthur Wellesley had proceeded to London upon leave, and had only signed the armistice with Junot, not the convention itself.

(34,000) west and south of Tudela and near Logrono; Blake (32,000) east of Reynosa, having captured Bilbao; Count de Belvedere (11,000) near Burgos; reserves (57,000) were assem- bling about Segovia, Talavera and Cordova; Catalonia was held by 23,000, and Madrid had been reoccupied.

Moore had to decide whether to join Baird by sea or land. To do so by sea at this season was to risk delay, while in moving by land he would have the Spanish armies between him and the French. For these reasons he marched by land; and as the roads north of the Tagus were deemed impassable for guns, while transport and supplies for a large force were also difficult to procure, he sent Sir John Hope, with the artillery, cavalry and reserve ammunition column, south of the river, through Badajoz to Almaraz, to move thence through Talavera, Madrid and the Escurial Pass, involving a considerable detour; while he himself with the infantry, marching by successive divisions, took the shorter roads north of the Tagus through Coimbra and Almeida, and also by Alcantara and Coria to Ciudad Rodrigo and Sala- manca. Baird was to move south through Galicia to meet him, and the army was to concentrate at Valladolid, Burgos, or whatever point might seem later on to be best. But as Moore was moving forward, the whole situation in Spain changed. Napoleon’s forces, now increased to some 200,000 men present and more following, were assuming the offensive, and he himself on the 30th of October — had left Paris to place himself at their head. Before them the Spaniards were routed in every direction: Castafios was defeated near Logrono (Oct. 27); Castafios and Palafox at Tudela (Nov. 23); Blake at Zornoza (Oct.’ 29),

Espinosa (Nov. n) and Reynosa (Nov. 13); and Belvedere at Gamonal, near Burgos (Nov. 10). Thus when Moore reached Salamanca (Nov. 28) Baird was at Astorga; Hope at the Escurial Pass; Napoleon himself at Aranda; and French troops at Valladolid, Arevalo and Segovia; so that the French were nearer than either Baird or Hope to Moore at Salamanca. Moore was ignorant of their exact position and strength, but he knew that Valladolid had been occupied, and so his first orders were that Baird should fall back to Galicia and Hope to Portugal. But these were soon changed, and he now took the important resolution of striking a blow for Spain, and for the defenders of Madrid, by attacking Napoleon's communications with France. Hope having joined him through Avila, and magazines having been formed at Benavente, Astorga and Lugo, in case of retreat in that direction, he moved forward, and on the 13th of December approached the Douro, at and near Rueda east of Toro. Here he learnt that Madrid had fallen to Napoleon (Dec. 3) after he had by a brilliant charge of the Polish lancers and chasseurs of the Guard forced the Somosierra Pass (Nov. 30) and in another action stormed the Retiro commanding Madrid itself (Dec. 3) ; that the French were pressing on towards Lisbon and Andalusia; that Napoleon was unaware of his vicinity, and that Soult's corps, isolated on the Carrion River, had been ordered towards Benavente. He then finally decided to attack Soult (intending subsequently to fall back through Galicia) and ordered up transports from Lisbon to Corunna and Vigo; thus changing his base from Portugal to the north-west of Spain; Blake's Spanish army, now rallying under the marquis de la Romana near Leon, was to co-operate, but was able to give little effective aid.

On the 20th of December Baird joined Moore near Mayorga, and a brilliant cavalry combat now took place at Sahagun, in which the British hussar brigade distinguished itself. But on the 23rd of December, when Moore was at Sahagun and about to attack Soult, he learnt that overwhelming French forces were hastening towards him, so withdrew across the Esla, near Benevente (Dec. 28), destroying the bridge there. Napoleon, directly he realized Moore's proximity, had ordered Soult to Astorga to cut him off from Galicia; recalled his other troops from their march towards Lisbon and Andalusia, and, with 50,000 men and 150 guns, had left Madrid himself (Dec. 22). He traversed over 100 m. in less than five days across the snow- covered Escurial Pass, reaching Tordesillas on the Douro on the 26th of December. Hence he wrote to Soult, " If the English

pass to-day in their position (which he believed to be Sahagun) they are lost." But Moore had passed Astorga by the 31st of December, where Napoleon arrived on the 1st of January 1809. Thence he turned back, with a large portion of his army towards France, leaving Soult with over 40,000 men to follow Moore.

On the " Retreat to Corunna " fatigue, wet and bitter cold, combined with the sense of an enforced retreat, shook the discipline of Moore's army; but he reached Corunna on the nth of January 1809, where he took up a position across the road from Lugo, with his left on the river Mero. On the 14th of January the transports arrived; and on the 16th Soult attacked.

Battle of Ii this battle the French numbered about 20,000 with Contnaa, 40 guns; the British 15,000 with 9 very light guns.

January 16, Soult failed to dislodge the British, and Moore was

1809

about to deliver a counter-attack when he himself

fell mortally wounded. Baird was also wounded, and as night was approaching, Hope suspended the advance, and subse- quently embarked the army, with scarcely any further loss. The British casualties were about 1000, the French 2000. When the troops landed in England, half clothed and half shod, their leader's conduct of the campaign was at first blamed, but his reputation as a general rests solidly upon these facts, that when Napoleon in person, having nearly 300,000 men in Spain, had stretched forth his hand to seize Portugal and Andalusia, Moore with 30,000, forced him to withdraw it, and follow him to Corunna, escaping at the same time from his grasp. Certainly a notable achievement.

Campaign in Portugal and Spain, i8og. — On the 22iidof April 1809 Sir Arthur Wellesley reached Lisbon. By this time, French armies, to a great extent controlled by Napoleon from a distance, had advanced —

Soult from Galicia to capture Oporto and Lisbon (with General Lapisse from Salamanca moving on his left towards Abrantes) and Marshal Victor, still farther to the left, with a siege train to take Badajoz, Merida and subse- quently Cadiz. Soult (over 20,000), leaving Ney in Galicia, had taken and sacked Oporto (March 29, 1809); but the Portuguese having closed upon his rear and occupied Vigo, he halted, detaching a force to Amarante to keep open the road to Braganza and asked for reinforcements. Victor had crossed the Tagus, and defeated Cuesta at Medellin (March 28, 1809); but, surrounded by insurgents, he also had halted; Lapisse had joined him, and together they were near Merida, 30,000 strong. On the allied side the British (25,000), including some German auxiliaries, were about Leiria: the Portuguese regular troops (16,000) near Thomar; and some thousands of Portuguese militia were observ- ing Soult in the north of Portugal, a body under Silveira being at Amarante, which Soult was now approaching. Much progress had been made in the organization and training of the Portuguese levies; Major-General William Carr Beresford, with the rank of marshal, was placed at their head. Of the Spaniards, Palafox, after his defeat at Tudela had roost gallantly defended Saragossa a second time (Dec. 20, 1808- Feb. 20, 1809); the Catalonians, after reverses at Molins de Rey (Dec. 21, 1808) and at Vails (Feb. 25, 1800) had taken refuge in Tarragona; and Rosas had fallen (Dec. 5, 1808) to the French general Gouvion St Cyr who, having relieved Barcelona, was besieging Gcrona. Romana's force was now near Orense in Galicia. A supreme junta had been formed which could nominally assemble about 100,000 men, but jealousy among its members was rife, and they still declined to appoint any commander-in-chief.

On the 5th of May 1809, Wellesley moved towards the river Douro, having detached Beresford to seize Amarante, from which the French had now driven Silveira. Soult Passage of expected the passage of the Douro to be attempted the Douro, near its mouth, with fishing craft; but Wellesley, by May 12,1809. a c i ar ; n g surprise, crossed (May 12) close above Oporto, and also by a ford higher up. After some fighting Oporto was taken, and Soult driven back. The Portuguese being in his rear, and Wellesley closing with him, the only good road of retreat available lay through Amarante, but he now learned that Beresford had taken this important point from Silveira; so he was then compelled, abandoning his guns and

much baggage, to escape, with a loss of some 5000 men, over the mountains of the Sierra Cataiina to Salamonde, and thence to Orense.

During the above operations, Victor, with Lapisse, had forced the

passage of the Tagus at Alcantara but, on Wellesley return- ing to Abrantes, he retired. News having been received that Napoleon had suffered a serious check at the battle of Aspern, near Vienna (May 22, 1809), Wellesley next determined — leaving Beresford (20,000) near Ciudad Rodrigo — to move with 22,000 men, in conjunction with Cuesta's Spanish army (40,000) towards Madrid against Victor, who, with 25,000 supported by King Joseph (50,000) covering the capital, was near Talavera. Sir Robert Wilson with 4000 Portuguese from Salamanca, and a Spanish force under Venegas (25,000) from Carolina, were to co-operate and occupy Joseph, by closing upon Madrid. Cuesta, during the advance up the valley of the Tagus, was to occupy the pass of Bafios on the left flank; the Spanish authorities were to supply provisions, and Venegas was to be at Arganda, near Madrid, by the 22nd or 23rd of July; but none of these arrange- ments were duly carried out, and it was on this that the remain- der of the campaign turned. Writing to Soult from Austria, Napoleon had placed the corps of Ney and Mortier under his orders, and said: " Wellesley will most likely advance by the Tagus against Madrid; in that case, pass the mountains, fall on his flank and rear, and crush him."

By the 20th of July Cuesta had joined Wellesley at Oropesa; and both then moved forward to Talavera, Victor falling back before them: but Cuesta, irritable and jealous, would not work cordially with Wellesley; Venegas — Talavera, counter-ordered it is said by the Spanish junta — did July 27, 28, not go to Arganda, and Wilson, though he advanced ' close to Madrid, was forced to retire, so that Joseph joined Victor, and the united force attacked the Allies at Talavera de la Reina on the Tagus. The battle lasted for two days, and ended in the defeat of the French, who fell back towards Madrid. 1 Owing to want of supplies, the British had fought in a half-starved condition; and Wellesley now learnt to his sur- prise that Soult had passed the mountains and was in his rear. Having turned about, he was on the march to attack him, when he heard (Aug. 23) that not Soult's corps alone, but three French corps, had come through the pass of Bafios without opposition; that Soult himself was at Naval Moral, between him and the bridge of Almaraz on the Tagus, and that Cuesta was retreating from Talavera. Wellesley's force was now in a dangerous position: but by withdrawing at once across the Tagus at Arzobispo, he reached Jaraicejo and Almaraz (by the south bank) blowing up the bridge at Almaraz, and thence moved, through Merida, northwards to the banks of the Agueda, commencing to fortify the country around Lisbon.

Elsewhere in the Peninsula during this year, Blake, now in Catalonia, after routing Suchet at Alcaniz (May 23, 1809), was defeated by him at Maria (June 15) and at Belchite (June 18); Venegas, by King Joseph

and Sebastiani, at Almonacid on the nth of August; Del Parque (20,000), after a previous victory near Salamanca (Oct. 18), was overthrown at Alba de Tormes by General Marchand (Nov. 28) ; the old forces of Venegas and Cuesta (50,000), now united under Areizaga, were decisively routed by King Joseph at OcafLa (Nov. 19); and Gerona after a gallant defence, had surrendered to Augereau (Dec. 10).

Sir Arthur Wellesley was for this campaign created Baron Douro and Viscount Wellington. He was made captain-general by Spain, and marshal-general by Portugal. But his experience after Talavera had been akin to that of Moore; his expectations from the Spaniards had not been realized; he had been almost intercepted by the French, and he had narrowly escaped from a critical position. Henceforth he resisted all proposals for joint operations, on any large scale, with Spanish armies not under his own direct command.

1 After the battle the Light Division, under Robert Craufurd, joined Wellesley. In the endeavour to reach the field in time it had covered, in heavy marching order, over 50 m. in 25 hours, in hot July weather.

Campaign in Portugal, 18io. — Napoleon, having avenged Aspern by the victory of Wagram (July 6, 1809), despatched to Spain large reinforcements destined to increase his army there to about 370,000 men. Marshal Massena with 120,000, including the corps of Ney, Junot, Reynier and some of the Imperial Guard, was to operate from Salamanca against Portugal; but first Soult, appointed major-general of the army in Spain (equivalent to chief of the staff), was, with the corps of Victor, Mortier and Sebastiani (70,000), to reduce Andalusia. Soult (Jan. 31, 1810) occupied Seville and escaping thence to Cadiz, the Supreme Junta resigned its powers to a regency of five members (Feb. 2, 18 10). Cadiz was invested by Victor's corps (Feb. 4), and then Soult halted, waiting for Massena, who arrived at Valladolid on the 15th of May.

In England a party in parliament were urging the withdrawal of the British troops, and any reverse to the allied arms would have strengthened its hands. Wellington's policy was thus cautious and defensive, and he had already commenced the since famous lines of Torres Vedras round Lisbon. In June 1810 his headquarters were at Celorico. With about 35,000 British, 30,000 Portuguese regular troops

and 30,000 Portuguese militia, he watched the roads leading into Portugal past Ciudad Rodrigo to the north, and Badajoz to the south of the Tagus, as also the line of the Douro and the country between the Elga and the Ponsul.

Soult having been instructed to co-operate by taking Badajoz and Elvas, Massena, early in June 18 10, moved forward, and Ciudad Rodrigo surrendered to him (June 10). Next pushing back a British force under Craufurd, he invested Almeida, taking it on the 27th of August. Then calling up Reynier, who during this had moved on his left towards Alcantara, he marched down the right bank of the Mondego, and entered Viseu (Sept. 21). Wellington fell back before him down the left bank, ordering up Rowland Hill's force from the Badajoz road, the peasantry having been previously called upon to destroy their crops and retire within the lines of Torres Vedras. A little north of Coimbra, the road which Massena followed crossed the Sierra de Bussaco (Busaco), a very strong position where Wellington resolved to offer him battle. Massena, superior in numbers and over-confident, made a direct attack upon the heights on the 27th of September 1810: his Battle of strength being about 60,000, while that of the Allies Busaco, was about 50,000, of whom nearly half were Portu- September g Uese . After a stern conflict the French were

' ' repulsed, the loss being five generals and nearly 5000 men, while the Allies lost about 1300. The next day Massena turned the Sierra by the Boyalva Pass and Sardao, which latter place, owing to an error, had not been occupied by the Portu- guese, and Wellington then retreated by Coimbra and Leiria to the lines, which he entered on the nth of October, having within them fully 100,000 able-bodied men.

The celebrated " Lines of Torres Vedras " were defensive works designed to resist any army which Napoleon could send Lines of a g amst them. They consisted of three great lines, Torres strengthened by about 150 redoubts, and earthworks Vedras, of various descriptions, mounting some 600 cannon; ISJO-II. tne outer jj nej nearly 30 m. long, stretching over heights north of Lisbon, from the Tagus to the sea. As Massena advanced, the Portuguese closing upon his rear retook Coimbra (Oct. 7) , and when he neared the lines, astounded at their strength, he sent General Foy to the emperor to ask for reinforcements. After an effort, defeated by Hill, to cross the Tagus, he withdrew (Nov. 15) to Santarem. This practically closed Wellington's operations for the year 1810, his policy now being not to lose men in battle, but to reduce Massena by hunger and distress.

In other parts of Spain, Augereau had taken Hostalrich (May 10); captured Lerida (May 14); Mequinenza (June 8); and invested Tortosa (Dec. 15). The Spanish levies had been unable to contribute much aid to the Allies; the French having subdued almost all Spain, and being now in possession of Ciudad Rodrigo and Almeida. On the other hand Wellington still held Lisbon with parts of Portugal, Elvas and Badajoz, for Soult had not felt disposed to attempt the capture of the last two fortresses.

Campaign of 1811.— Napoleon, whose attention was now directed towards Russia, refused to reinforce Massena, but enjoined Soult to aid him by moving against Badajoz. Soult, therefore, leaving Victor before Cadiz, invested Badajoz (Jan. 26, 1811) and took it from the Spaniards (March 10). With the hope of raising the blockade of Cadiz, a force under Sir Thomas Graham (afterwards Lord Lynedoch [q.v.]) left that harbour by sea, and joining with Spanish troops near Tarifa, advanced by land against Victor's blockading force, a Spanish general, La Pena, being in chief command. As they neared Barrosa, Victor attacked them, the Allies numbering in the battle about 13,000 with 24 guns, 4000 being British; the French 9000, actually engaged, with 14 guns; but with 5000 more a few miles off and others in the French lines. Hard fighting, chiefly B ut . between the French and British, now ensued, and Barrosa, at one time the Barrosa ridge, the key of the position MarchS, left by La Pefia's orders, practically undefended, ,8,t ' fell into the French hands: but Graham by a resolute counter-attack regained it, and Victor was in the end driven back. La Pena, who had in the battle itself failed to give proper support to Graham, would not pursue, and Graham declining to carry on further operations with him, re-entered Cadiz. The French afterwards resumed the blockade, so that although Barrosa was an allied victory, its object was not attained. The British loss was about 1200; the French 2000, 6 guns and an eagle.

On the day of the above battle Massena, having destroyed what guns he could not horse, and skilfully gained time by a feint against Abrantes, began his retreat from before the lines, through Coimbra and Espinhal. His

MassSaa's Retreat,

army was in serious distress; he was in want of food and supplies; most of his horses were dead, and his men were deserting. Wellington followed, directing the Portuguese to remove all boats from the Mondego and Douro, and to break up roads north of the former river. Beresford was detached to succour Badajoz, but was soon recalled, as

it had fallen to Soult. Ney, commanding Massena's rearguard, conducted the retreat with great ability. In the pursuit, Wellington adhered to his policy of husbanding his troops for future offensive operations, and let sickness and hunger do the work of the sword. This they effectually did. Nothing could well exceed the horrors of Massena's retreat. Rearguard actions were fought at Pombal (March 10) , Redinha (March 1 2) and Condeixa (March 13) . Here Ney was directed to make a firm stand; but, ascertaining that the Portuguese were at Coimbra and the bridge there broken, and fearing to be cut off also from Murcella, he burnt Condeixa, and marched to Cazal Nova. An action took place here (March 14) and at Foz d'Arouce (March 15). Wellington now sent off Beresford with a force to retake Badajoz; and Massena, sacri- ficing much of his baggage and ammunition, reached Celorico and Guarda (March 21). Here he was attacked by Wellington (March 29) and, after a further engagement at Sabugal (April 3, 181 1), he fell back through Ciudad to Salamanca, having lost in Portugal n%arly 30,000 men, chiefly from want and disease, and 6000 in the retreat alone.

The key to the remaining operations of 181 1 lies in the impor- tance attached by both Allies and French to the possession of the fortresses which guarded the two great roads from Portugal into Spain — Almeida and Ciudad Rodrigo on the northern, and Badajoz and Elvas on the southern road; all these except Elvas were in French hands. Wellington, on the 9th of April 181 1, directed General Spencer to invest Almeida; he then set off himself to join Beresford before Badajoz, but after reconnoitring the fortress with his lieutenant he had at once to return north on the news that Massena was moving to relieve Almeida. On the 3rd of May Loison attacked him at Fuentes d'Onor near Almeida, and Massena coming up himself made a more serious attack on the 5th of May. The Allies numbered Batt j e ot about 33,000, with 42 guns; the French 45,000 with Fuentes 30 guns. The battle is chiefly notable for the steadi- d'Onor, ness with which the allied right, covered by the Light Ma ? s – '*"• Division in squares, changed position in presence of the French

cavalry; and for the extraordinary feat of arms of Captain Norman Ramsay, R.H.A., in charging through the French cavalry with his guns. Massena failed to dislodge the Allies, and on the 8th of May withdrew to Salamanca, Almeida falling to Wellington on the nth of May 1811. The allied loss in the fighting on both days at Fuentes d'Onor was

about 1500: the French 3000.

In the meantime Soult (with 23,000 men and 50 guns), ad- vancing to relieve Badajoz, compelled Beresford to suspend Battle of *-he s i e § e > an ˆ to ta ˆ e U P a Position with about 30,000 Albuera, men (of whom 7000 were British) and 38 guns May 16, behind the river Albuhera (or Albuera). Here Soult attacked him on the 16th of May. An unusu- ally bloody battle ensued, in which the French efforts were chiefly directed against the allied right, held by the Spaniards. At one time the right appeared to be broken, and 6 guns were lost, when a gallant advance of Sir Lowry Cole's division restored the day, Soult then falling back towards Seville. The allied loss was about 7000 (including about half the British force) ; the French about 8000.

After this Wellington from Almeida rejoined Beresford and the siege of Badajoz was continued: but now Marshal Marmont, having succeeded Massena, was marching southwards to join Soult, and, two allied assaults of Badajoz having failed, Welling- ton withdrew. Subsequently, leaving Hill in the Alemtejo, he returned towards Almeida, and with 40,000 men commenced a blockade of Ciudad Rodrigo, his headquarters being at Fuente Guinaldo. Soult and Marmont now fell back, the former to Seville, the latter to the valley of the Tagus, south of the pass of Bafios.

In September, Marmont joined with the army of the north under General Dorsenne, coming from Salamanca — their total force being 60,000, with 100 guns — and succeeded (Sept. 25) in introducing a convoy of provisions into Ciudad Rodrigo. Before so superior a force, Wellington had not attempted to maintain the blockade; but on Marmont afterwards advancing towards him, he fought a rearguard action with him at El Bodon (Sept. 25), notable, as was Fuentes d'Onor, for the coolness with which the allied squares retired amidst the enemy's horsemen; and again at Fuente Guinaldo (Sept. 25 and 26) he maintained for 30 hours, with 15,000 men, a bold front against Marmont's army of 60,000, in order to save the Light Division from being cut off. At Aldea de Ponte there was a further sharp engage- ment (Sept. 27)., but Wellington taking up a strong position near Sabugal, Marmont and Dorsenne withdrew once more to the valley of the Tagus and Salamanca respectively, and Wellington again blockaded Ciudad Rodrigo.

Thus terminated the main operations of this year. On the 28th of October 1811, Hill, by a very skilful surprise, captured Arroyo de los Molinos (between Badajoz and Trujillo), almost annihilating a French corps under Gerard; and in December 181 1 the French were repulsed

in their efforts to capture Tarifa near Cadiz. In the east of Spain Suchet took Tortosa (Jan. 1, 1811); Tarragona (June 28) ; and Murviedro (Oct. 26), defeating Blake's relieving force, which then took refuge in Valencia. Macdonald also retook Figueras which the Spaniards had taken on the 9th of April 1811 (Aug. 19). Portugal had now been freed from the French, but they still held Ciudad Rodrigo and Badajoz, the two main gates into Spain.

Campaign in Spain, 1812. — The campaign of 181 2 marks an important stage in the war. Napoleon, with the Russian War in prospect, had early in the year withdrawn 30,000 men from Spain; and Wellington had begun to carry on what he termed a war of " magazines." Based on rivers (the navigation of which greatly improved) and the sea, he formed depots or magazines of provisions at many points, which enabled him always to take and keep the field. The French, on the other hand, had great difficulty in establishing any such reserves of food, owing to their practice of depending for sustenance entirely upon the country in which they were quartered. Wellington assumed the offensive, and by various movements and feints, aided the guerrilla bands by forcing the French corps to assemble in their

districts, which not only greatly harassed them but also materi- ally hindered the combination of their corps for concerted action. Having secretly got a battering train into Almeida and directed Hill, as a blind, to engage Soult by threatening Badajoz, he suddenly (Jan. 8, 181 2) besieged Ciudad Rodrigo.

The French, still numbering nearly 200,000, now held the following positions: the Army of the North — Dorsenne (48,000) — was about the Pisuerga, in the Asturias, and along the northern .coast; the Army of Portugal — Marmont' (50,000) — mainly in the valley of the Tagus, but ordered to Salamanca; the Army of the South — Soult (55,000) — in Andalusia; the Army of the Centre — Joseph (19,000) — about Madrid.

The siege of Ciudad Rodrigo was calculated in the ordinary course to require twenty-four days: but on it becoming known that Marmont was moving northward, the assault was 5/ e ~ / delivered after twelve days only (Jan. 19). The ciudad gallantry of the troops made it successful, though with Rodrigo, the loss of Generals Craufurd and McKinnon,and 1300 "fif"}^ *" men, and Marmont's battering train of 1 50 .guns here fell into the allied hands. Then, after a feint of passing on into Spain, Wellington rapidly marched south and, with 22,000 men, laid siege to Badajoz (March 17, 1812), Hill with 30,000

covering the siege near Merida. Wellington was hampered by want of time, and had to assault prematurely. Soult and Marmont having begun to move to relieve the garrison, the assault was delivered on the night of the 7th of April, and siege of though the assailants failed at the breaches, the Badajoz, carnage at which was terrible, a very daring escalade March it to of one of the bastions and of the castle succeeded, p ‘ and Badajoz fell, Soult’s pontoon train being taken in it. After the assault, some deplorable excesses were committed by the victorious troops. The allied loss was 3600 in the assault alone and 5000 in the entire siege.

The Allies had how got possession of the two great gates into Spain: and Hill, by an enterprise most skilfully carried out, destroyed (May 19) the Tagus bridge at Almaraz, by which Soult to the south of the river chiefly communicated with Mar- mont to the north. Wellington then, ostentatiously making preparations to enter Spain by the Badajoz line, once more turned northward, crossed the Tormes (June 17, 1812), and advanced to the Douro, behind which the French were drawn up. Marmont had erected at Salamanca some strong forts, the reduction of which occupied Wellington ten days, and cost him 600 men. The Allies and French now faced each other along the Douro to the Pisuerga. The river was high, and Wellington hoped that want of supplies would compel Marmont to retire, but in this he was disappointed.

On the 15th of July 181 2, Marmont, after a feint against Wellington’s left, suddenly, by a forced march, turned his right, and made rapidly towards the fords of Huerta and Alba on the Tormes. Some interesting manoeuvres now took place, Wellington moving parallel and close to Marmont, but more to the north, making for the fords of Aldea Lengua and Santa Marta on the Tormes nearer to Salamanca, and being under the belief that the Spaniards held the castle and ford at Alba on that river. But Marmont’s manoeuvring and marching power had been underestimated, and on the 21st of July while Wellington’s position covered Salamanca, and but indirectly his line of communications through Ciudad Rodrigo, Marmont had reached a point from which he hoped to interpose between Wellington and Portugal, on the Ciudad Rodrigo road. This he endeavoured to do on the 22nd of July 1812, which’ brought on the important battle of Salamanca (q.v.) in which g a m e „f Wellington gained a decisive victory, the French Salamanca, falling back to Valladolid and thence to Burgos. J ”’ 3 l 22, Wellington entered Valladolid (July 30), and thence marched against Joseph, who (July 21) had reached Blasco Sancho with reinforcements for Marmont. Joseph retired before him, and Wellington entered Madrid (Aug. 12, 1812), where, in the Retiro, 1700 men, 180 cannon, two

eagles, and a quantity of stores were captured. Soult now raised the siege of Cadiz (Aug. 26), and evacuating Andalusia joined Suchet

with some 55,000 men. Wellington then brought up Hill to Madrid.

On the 1 st of September 181 2, the French armies having begun once more to collect together, Wellington marched against the Stem of the ˆ TTR y °ˆ l ˆ e North, now under General Clause], and Castle of laid siege to the castle of Burgos (Sept. 19) to secure Burgos, the road towards Santander on the coast. But the nrt”””?/’ t0 strength of the castle had been underrated ; Wellington had insufficient siege equipment and transport for heavy guns; five assaults failed, and Soult (having left Suchet in Valencia) and also the Army of Portugal were both approaching, so Wellington withdrew on the night of the Retreat 21st of October, and, directing the evacuation of from Madrid, commenced the ” Retreat from Burgos.”

Burgos. j n this retreat, although military operations were skilfully conducted, the Allies lost 7000 men, and discipline, as in that to Corunna, became much relaxed.

By November 181 2, Hill having joined him at Salamanca, Wellington once more had gone into cantonments near Ciudad Rodrigo, and the French armies had again scattered for con- venience of supply. In spite of the failure before Burgos, the successes of the campaign had been brilliant. In addition to the decisive victory of Salamanca, Madrid had been occupied, the siege of Cadiz raised, Andalusia freed, and Ciudad Rodrigo and Badajoz stormed. Early in January also the French had abandoned the siege of Tarifa, though Valencia had surrendered to them (Jan. 9). One important result of the campaign was that the Spanish Cortes nominated Wellington (Sept. 22, 1812) to the unfettered command of the Spanish armies. For the operations of this campaign Wellington was created earl, and subsequently marquess of Wellington; duke of Ciudad Rodrigo by Spain, and marquis of Torres Vedras by Portugal.

Campaign in Spain and the South of France, 1813. — At the opening of 1813, Suchet, with 63,000 men, had been left to hold Valencia, Aragon and Catalonia; and the remainder of the French (about 137,000) occupied Leon, the central provinces and Biscay, guarding also the communications with France. Of these about 60,000 under Joseph were more immediately opposed to Wellington, and posted, in scattered detachments, from Toledo and Madrid behind the Tormes to the Douro, and along that river to the Esla. Wellington had further organized the Spanish forces — Castanos (40,000), with the guerrilla

bands of Mina, Longa and others, was in Galicia, the Asturias and northern Spain; Copons (10,000) in Catalonia; Elio (20,000) in Murcia; Del Parque (12,000) in the Sierra Morena, and O'Donell (15,000) in Andalusia. More Portuguese troops had been raised, and reinforcements received from England, so that the Allies, without the Spaniards above alluded to, now numbered some 75,000 men, and from near the Coa watched the Douro and Tormes, their line stretching from their left near Lamego to the pass of Bafios, Hill being on the right. The district of the Tras- os-Montes, north of the Douro, about the Tamega, Tua and Sabor, was so rugged that Wellington was convinced that Joseph would expect him to advance by the south of the river. He therefore, moving by the south bank himself with Hill, to confirm Joseph in this expectation, crossed the Tormes near and above Salamanca, having previously — which was to be the decisive movement — detached Graham, with 40,000 men, to make his way, through the difficult district above mentioned, towards Braganza, and then, joining with the Spaniards, to turn Joseph's right. Graham, crossing the Douro near Lamego, carried out his laborious march with great energy, and Joseph retired precipitately from the Douro, behind the Pisuerga. The allied army, raised by the junction of the Spanish troops in Galicia to 90,000, now concentrated near Toro, and moved to- wards the Pisuerga, when Joseph, blowing up the castle of Burgos, fell back behind the Ebro. Once more Wellington turned his right, by a sweeping movement through Rocamunde and Puente Arenas near the source of the Ebro, when he retreated behind the Zadorra near the town of Vitoria.

Santander was now evacuated by the French, and the allied line of communications was changed to that port. On the 20th

of June Wellington encamped along the river Bayas, and the next day attacked Joseph. For a description of the decisive battle of Vitoria (June 21, 1813), see Vitoria. In it Battle of King Joseph met with a crushing defeat, and, after vitoria, it, the wreck of his army, cut off from the Vitoria- June 21, Bayonne road, escaped towards Pampeluna. Within I813 – a few days Madrid was evacuated, and all the French forces, with the exception of the garrisons of San Sebastian (3000), Pampeluna (3000), Santona (1500), and the troops under Suchet holding posts in Catalonia and Valencia, had retired across the Pyrenees into France. The Spanish peninsula was, to all intents and purposes, free from foreign domination, although the war was yet far from concluded. The French struggled gallantly to the close: but now a long succession of their leaders — Junot, Soult, Victor, Massena, Marmont, Joseph — had been in turn forced to recoil before Wellington; and while their troops fought henceforward under the

depressing memory of many defeats, the Allies did so under the inspiriting influence of great successes, and with that absolute confidence in their chief which doubled their fighting power.

For this decisive campaign, Wellington was made a field marshal in the British army, and created duke of Victory 1 by the Portuguese government in Brazil. He now, with about 80,000 men, took up a position with his left (the Spaniards) on the Bidassoa near San Sebastian. Thence his line stretched along the Pyrenees by the passes of Vera, Echallar, Maya and Roncesvalles, to Altobiscar; his immediate object now being to reduce the fortresses of San Sebastian and Pampeluna. Not having sufficient matSriel for two sieges, he laid siege to San Sebastian only, and blockaded Pampeluna. Sir Thomas Graham commenced the active siege of San Sebastian on the 10th of July 1 8 13, but as Soult was approaching to its relief, the assault was ordered for daylight on the 24th. Unfortunately siege of San a conflagration breaking out near the breaches Sebastian, caused it to be postponed until nightfall, when, the Ju, y 10-24, breaches in the interval having been strengthened, it was delivered unsuccessfully and with heavy loss. Wellington then suspended the siege in order to meet Soult, who endeavoured (July 25) to turn the allied right, and reach Pampeluna. Attacking the passes of Maya and Roncesvalles, he obliged their defenders to retire, after sharp fighting, to a position g ati i es f close to Sorauren, which, with 25,000 men, he thePyre- attempted to carry (July 28). By this time Welling- nees,Jufy2S ton had reached it from the allied left ; reinforcements t° August 2, were pressing up on both sides, and about 1 2,000 allied troops faced the French. A struggle, described by Wellington as ” bludgeon work,” now ensued, but all efforts to dislodge the Allies having failed, Soult, withdrawing, manoeuvred to his right towards San Sebastian. Wellington now assumed the offensive, and, in a series of engagements, drove the French back (Aug. 2) beyond the Pyrenees. These included Roncesvalles and Maya (July 25); Sorauren (July 28 and 30); Yanzi (Aug. 1); and Echallar and Ivantelly (Aug. 2), the total losses in them being about — Allies under 7000, French 10,000. After this, Wellington renewing the siege of San Sebastian carried the place, excepting the castle, after a heavy expenditure of life (Aug. 31). Upon the day of its fall Soult attempted to relieve it, but storm of San in the combats of Vera and St Marcial was repulsed. Sebastian, The castle surrendered on the 9th of September, August 31, the losses in the entire siege having been about — Allies 4000, French 2000. Wellington next determined to throw his left across the river Bidassoa to strengthen his own position, and secure the port of Fuenterrabia.

Now commenced a series of celebrated river passages, which had to be

effected prior to the further invasion of France. At daylight on the 7th of October 1813 he crossed the Bidassoa in seven columns, and attacked the entire French position, which stretched in two heavily entrenched lines from north

1 Duque da Victoria, often incorrectly duke of Vitoria. The coincidence of the title with the place-name of the battle which had not yet been fought when the title was conferred, is curious, but accidental.

of the Irun-Bayonne road, along mountain spurs to the Great Rhune, 2800 ft. high. The decisive movement was a passage in Passage strength near Fuenterrabia, to the astonishment of of the the enemy, who in view of the width of the river Bidassoa, and the shifting sands, had thought the crossing October 7, impossible at that point. The French right was ,813 ‘ then rolled back, and Soult was unable to reinforce his

right in time to retrieve the day. His works fell in succession after hard fighting, and he withdrew towards the river Nivelle. The loss was about — Allies, 1600; French, 1400. The passage of the Bidassoa ” was a general’s not a soldiers’ battle ” (Napier).

On the 31st of October Pampeluna surrendered, and Welling- ton was now anxious to drive Suchet from Catalonia before further invading France. The British government, however, in the interests of the continental powers, urged an immediate advance, so on the night of the 9th of November 1813 he brought up his right from the Pyrenean passes to the northward of Maya and towards the Nivelle. Soult’s army (about 79,000), in three entrenched lines, stretched from the sea in front of St Jean de Luz along commanding ground to Amotz and thence, behind the river, to Mont Mondarin near the Nive. Each army had with it about 100 guns; and, during a heavy cannonade, Wellington on the 10th of November 1813 attacked this extended Passage of position of 16 m. in five columns, these being so the Nivelle, directed that after carrying Soult’s advanced works Nov. 10, a mass of about 50,000 m en converged towards the 1813. French centre near Amotz, where, after hard fighting,

it swept away the 18,000 of the second line there opposed to it, cutting Soult’s army in two. The French right then fell back to St Jean

de Luz, the left towards points on the Nive. It was now late and the Allies, after moving a few miles down both banks of the Nivelle, bivouacked, while Soult, taking advantage of the respite, withdrew in the night to Bayonne. The allied loss was about 2700; that of the French 4000, 51 guns, and all their magazines. The next day Wellington closed in upon Bayonne from the sea to the left bank of the Nive.

After this there was a period of comparative inaction, though during it the French were driven from the bridges at Urdains and Cambo. The weather had become bad, and the Nive unfordable; but there were additional and serious causes of delay. The Portuguese and Spanish authorities were neglecting the payment and supply of their troops. Wellington had also difficulties of a similar kind with his own government, and also the Spanish soldiers, in revenge for many French outrages, had become guilty of grave excesses in France, so that Wellington took the extreme step of sending 25,000 of them back to Spain and resigning the command of their army, though his resignation was subsequently withdrawn. So great was the tension at this crisis that a rupture with Spain seemed possible. These matters, however, having been at length adjusted, Wellington, who in his cramped position between the sea and the Nive could not use his cavalry or artillery effectively, or interfere with the French supplies coming through St Jean Pied de Port, deter- mined to occupy the right aswell as the left bank of the Nive. He could not pass to that bank with his whole force while Soult held Bayonne, without exposing his own communications through Irun. Therefore, on the 9th of December 1813, after making a demonstration elsewhere, he effected the passage with Passage of a portion of his force only under Hill and Beresford, the Nive, near Ustaritz and Cambo, his loss being slight, and Dec. 9, thence pushed down the river towards Villefranque, 1813. where Soult barred his way across the road to

Bayonne. The allied army was now divided into two portions by the Nive; and Soult from Bayonne at once took advantage of his central position to attack it with all his available force, first on the left bank and then on the right. On the morning of the 10th of December he fell, with 60,000 men and 40 guns, upon Hope, who with 30,000 men and 24 guns held a position from the sea. 3 m. south of Biarritz on a ridge behind two lakes (or tanks) through Arcangues towards the Nive. Desperate fighting now ensued, but fortunately, owing to the intersected

ground, Soult was compelled to advance slowly, and in the end,

Wellington coming up with Beresford from the right bank, the

French retired baffled. On the nth and 12th of Battles

December there were engagements of a less severe ˆ/cre

character, and finally on the 13th of December Soult ˆ ay °, ane ‘ (” . , 11 , Battles of

with 35,000 men made a vehement attack up the the Nive,

right bank of the Nive against Hill, who with about Dec 10 -13, 14,000 men occupied some heights from Villefranque ist3. past St Pierre (Lostenia) to Vieux Moguerre. The conflict about St Pierre (Lostenia) was one of the most bloody of the war; but for hours Hill maintained his ground, and finally repulsed the French before Wellington, delayed by his pontoon bridge over the Nive having been swept away, arrived to his aid. The losses in the four days’ fighting in the battles before Bayonne (or battles of the Nive) were — Allies about 5000, French about 7000. Both the British and Portuguese artillery, as well as infantry, greatly distinguished themselves in these battles.

In eastern Spain Suchet (April n, 1813) had defeated Elio’s Murcians at Yecla and Villena, but was subsequently routed by Sir John Murray 1 near Castalla (April 13), who then besieged Tarragona. The siege was abandoned after a time, but was later on renewed by Lord W. Bentinck. Suchet, after the battle of Vitoria, evacuated Tarragona (Aug. 17) but defeated Bentinck in the combat of Ordal (Sept. 13).

Campaign in the South of France, 1814. — When operations re-commenced in February 1814 the French line extended from Bayonne up the north bank of the Adour to the Pau, thence bending south along the Bidouze to St Palais, with advanced posts on the Joyeuse and at St Jean Pied de Port. Wellington’s left, under Hope, watched Bayonne, while Beresford, with Hill, observed the Adour and the Joyeuse, the right trending back till it reached Urcuray on the St Jean Pied de Port road. Exclu- sive of the garrison of Bayonne and other places, the available field force of Soult numbered about 41,000, while that of the Allies, deducting Hope’s force observing Bayonne, was of much the same strength. It had now become Wellington’s object to draw Soult away from Bayonne, in order that the allied army might, with less loss, cross the Adour and lay siege to the place on both banks of the river.

At its mouth the Adour was about 500 yds. wide, and its entrance

from the sea by small vessels, except in the finest weather, was a perilous undertaking, owing to the shifting sands and a dangerous bar. On the other hand, the deep sandy soil near its banks made the transport of bridging materiel by land laborious, and almost certain of discovery. Wellington, con- vinced that no effort to bridge below Bayonne would be expected, decided to attempt it there, and collected at St Jean Pied de Port and Passages a large number of country vessels (termed chasse-maries) . Then, leaving Hope with 30,000 men co watch Bayonne, he began an enveloping movement round Soult's left. Hill on the 14th and 15th of February, after a combat at Garris, drove the French posts beyond the Joyeuse; and Wellington then pressed these troops back over the Bidouze and Gave 2 de Mauleon to the Gave d'Oleron. Wellington's object in this was at once attained, for Soult, leaving only 10,000 men in Bayonne, came out and concentrated at Orthes on the Pau. Then Wellington (Feb. 19) proceeded to St Jean de Luz to superintend the despatch of boats to the Adour. Unfavour- able weather, however, compelled him to leave this to Sir John Hope and Admiral Penrose, so returning to the Gave d'Oleron he crossed it, and faced Soult on the Pau (Feb. 25). Hope in the meantime, after feints higher up the Adour, suc- ceeded (Feb. 22 and 23) in passing 600 men across Passage of the river in boats. The nature of the ground, the Adour, and there being no suspicion of an attempt at this Feb- 22 to point, led to the French coming out very tardily to 26 > ls,4 ~ oppose them; and when they did, some Congreve rockets (then a novelty) threw them into confusion, so that the right bank was held until, on the morning of the 24th, the flotilla of

1 Commander of a British expedition from the Mediterranean islands.

2 "Gave" in the Pyrenees means a mountain stream or torrent.

chasse-marees appeared from St Jean de Luz, preceded by men- of-war boats. Several men and vessels were lost in crossing the bar; but by noon on the 26th of February the bridge of 26 vessels had been thrown and secured; batteries and a boom placed to protect it, 8000 troops passed over, and the enemy's gunboats driven up the river. Bayonne was then invested on both banks as a preliminary to the siege.

On the 27 th of February Wellington, having with little loss effected

the passage of the Pau below Orthes, attacked Soult. In this battle the Allies and French were of about equal strength (37,000): the former having 48 guns, the latter 40. Soult held Battle of a strong position behind Orthes on heights command- Orthes, ing the roads to Dax and St Sever. Beresford was Feb. 27, directed to turn his right, if possible cutting him off ,814 ‘ from Dax, and Hill his left towards the St Sever road.

Beresford’s attack, after hard fighting over difficult ground, was repulsed, when Wellington, perceiving that the pursuing French had left a central part of the heights unoccupied, thrust up the Light Division into it, between Soult’s right and centre. At the same time Hill, having found a ford above Orthes, was turning the French left, when Soult retreated just in time to save being cut off, withdrawing towards St Sever, which he reached on the 28th of February. The allied loss was about 2000; the French 4000 and 6 guns.

From St Sever Soult turned eastwards to Aire, where he covered the roads to Bordeaux and Toulouse. Beresford, with 1 2,000 men, was now sent to Bordeaux, which opened its gates as promised to the Allies. Driven by Hill from Aire on the 2nd of March 1814, Soult retired by Vic Bigorre, where there was a combat (March 19), and Tarbes, where there was a severe action (March 20), to Toulouse behind the Garonne. He endeavoured also to rouse the French peasantry against the Allies, but in vain, for Wellington’s justice and moderation afforded them no grievances. Wellington wished to pass the Garonne above Toulouse in order to attack the city from the south — its weakest side — and interpose between Soult and Suchet. But finding it impracticable to operate in that direction, he left Hill on the west side and crossed at Grenade below Toulouse (April 3). When Beresford, who had now rejoined Wellington, had passed over, the bridge was swept away, which left him isolated on the right bank. But Soult did not attack; the bridge (April 8) was restored; Wellington crossed the Garonne and the Ers, and attacked Soult on the 10th of April. In the battle of Toulouse the French numbered about 40,000 (exclusive of the local National Guards) with 80 guns; the Allies under 52,000 with 64 Battle of guns. Soult’s position to the north and east of the Toulouse, city was exceedingly strong, consisting of the canal of Languedoc, some fortified suburbs, and (to the extreme east) the commanding ridge of Mont Rave, crowned with redoubts and earthworks. Wellington’s columns, under Beresford, were now called upon to make a flank march of some two miles, under artillery, and occasionally musketry, fire, being threatened also by cavalry, and then, while the Spanish troops assaulted the north of the ridge, to wheel up, mount the eastern slope, and carry the works. The

Spaniards were repulsed, but Beresford gallantly took Mont Rave and Soult fell back behind the canal. On the 12th of April Welling- ton advanced to invest Toulouse from the south, but Soult on the night of the nth had retreated towards Villefranque, and Wellington then entered the city. The allied loss was about 5000; the French 3000. Thus, in the last great battle of the war, the courage and resolution of the soldiers of the Peninsular army were conspicuously illustrated.

On the 13th of April 1814 officers arrived with the announce- ment to both armies of the capture of Paris, the abdication of Xapoleon, and the practical conclusion of peace; and on the 18th a convention, which included Suchet's force, was entered into between Wellington and Soult. Unfortunately, after Toulouse had fallen, the Allies and French, in a sortie from Bayonne on the 14th of April, each lost about 1000 men: so that some 10,000 men fell after peace had virtually been made. In the east, during this year (1814), Sir W. Clinton had, on xxi. 4

April 10,

1814.

the 1 6th of January, attacked Suchet at Molins de Rey and blockaded Barcelona (Feb. 7); the French posts of Lerida, Mequinenza and Monzon had also been yielded up, and Suchet, on the 2nd of March, had crossed the Pyrenees into France. Figueras surrendered to Cuesta before the end of May; and peace was formally signed at Paris on the 30th of May.

Thus terminated the long and sanguinary struggle of the Peninsular War. The British troops were partly sent to England, and partly embarked at Bordeaux for America, with which country war had broken out (see American War of 181 2-1 5): the Portuguese and Spanish recrossed the Pyrenees: the French army was dispersed throughout France: Louis XVIII. was restored to the French throne: and Napoleon was permitted to reside in the island of Elba, the sovereignty of which had been conceded to him by the allied powers. For the operations of this campaign Wellington was created marquess of Douro and duke of Wellington, and peerages were conferred upon Beresford, Graham and Hill.

The events of the Peninsular War, especially as narrated in the Wellington Despatches, are replete with instruction not only for the soldier, but also for the civil administrator. Even in a brief summary of the war one salient fact is noticeable, that all Wellington's reverses

were in connexion with his sieges, for which his means were never adequate. In his many battles he was always victorious, his strategy eminently successful, his organizing and administrative power exceptionally great, his practical resource unlimited, his soldiers most courageous; but he never had an army fully complete in its departments and warlike equipment. He had no adequate corps of sappers and miners, or transport train. In 181 2 tools and material of war for his sieges were often insufficient. In 1813, when he was before San Sebastian, the ammunition ran short ; a battering train, long demanded, reached him not only some time after it was needed, but even then with only one day's provision of shot and shell. For the siege of Burgos heavy guns were avail- able in store on the coast; but he neither had, nor could procure, the transport to bring them up. By resource and dogged determination Wellington rose superior to almost every diffi- culty, but he could not overcome all; and the main teaching of the Peninsular War turns upon the value of an army that is completely organized in its various branches before hostilities break out. (C. W. R.)

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PEfilSCOLA, a town of eastern Spain, in the province of Cas- tellon de la Plana, and on the Mediterranean Sea, 5 m. by road S. of Benicarlo. Pop. (1900), 3142. Peniscola, often called the Gibraltar of Valencia, is a fortified seaport, with a lighthouse, built on a rocky headland about 220 ft. high, and only joined to the mainland by a narrow strip of sand. Originally a Moorish stronghold, it was captured in 1233 by James I. of Aragon, who entrusted it to the Knights Templar. In the 14th century it was garrisoned by the knights of Montesa, and in 1420 it reverted to the Crown. From 141 5 it was the home of the schismatic pope Benedict XIII. (Pedro de Luna), whose name is commemorated in the Bufador de Papa Luna, a curious cavern with a landward entrance through which the sea-water escapes in clouds of spray.

PENITENTIAL (Lat. poenitentiale, libellus poenitenlialis, &c), a manual used by priests of the Catholic Church for guidance in assigning the penance due to sins. Such manuals played a large role in the early middle ages, particularly in Ireland, England and Frankland, and their influence in the moral education of the barbarian races has not received sufficient attention from historians. They were mainly com- posed of canons drawn from various councils and of dicta from

writings of some of the fathers. Disciplinary regulations in Christian communities are referred to from the very borders of the apostolic age, and a system of careful oversight of those admitted to the mysteries developed steadily as the membership grew and dangers of contamination with the outside world increased. These were the elaborate precautions of the catechumenate, a,nd — as a bulwark against the persecutions — the rigid system known as the Discipline of the Secret (disciplina arcani). The treat- ment of the lapsed, which produced the Novatian heresy, was also responsible for what has frequently been referred to as the first penitential. This is the libellus in which, according to Cyprian (Ep. 51), the decrees of the African synods of 251 and 255 were embodied for the guidance of the clergy in dealing with their repentant and returning flocks. This manual, which has been lost, was evidently not like the code-like compilations of the 8th century, and it is somewhat misleading to speak of it as a penitential. Jurisdiction in penance was still too closely limited to the upper ranks of the clergy to call forth such literature. Besides the bishop an official well versed in the penitential regulations of the Church, called the poeni- tentiarius, assigned due penalties for sins. For their guidance there was considerable conciliar legislation (e.g. Ancyra, Nicaea, Neocaesarea, &c), and certain patristic letters which had acquired almost the force of decretals. Of the latter the most important were the three letters of St Basil of Caesarea (d. 379) to Bishop Amphilochus of Iconium containing over eighty headings.

Three things tended to develop these rules into something like a system of penitential law. These were the development of auricular confession and private penance; the extension of the penitential jurisdiction among the clergy owing to the growth of a parochial priesthood; and the necessity of adapting the penance to the primitive ideas of law prevailing among the newly converted barbarians, especially the idea of compensation by the wergild. In Ireland in the middle of the 5th century appeared the ” canons of St Patrick.” In the first half of the next century these were followed by others, notably those of St Finian (d. 552). At the same time the Celtic British Church produced the penitentials of St David of Menevia (d. 544) and of Gildas (d. 583) in addition to synodal legislation. These furnished the material to Columban (d. 615) for his Liber de poenitentia and his monastic rule, which had a great influence upon the continent of Europe. The Anglo-Saxon Church was later than the Irish, but under Theodore of Tarsus (d.690), archbishop of Canterbury, the practice then in force was made

the basis of the most important of all penitentials. The Poenitentiale Theodori became the authority in the Church’s treatment of sinners

for the next four centuries, both in England and elsewhere in Europe. The original text, as prepared by a disciple of Theodore, and embodying his decisions, is given in Haddan and Stubbs's Councils and Ecclesiastical Documents relating to Great Britain and Ireland (iii. 173 seq.). A. Penitentiale Commeani (St Cumian), dating apparently from the early 8th century, was the third main source of Frankish penitentials. The extent and variety of this literature led the Gallican Church to exercise a sort of censorship in order to secure uniformity. After numerous synods, Bishop Haltigar of Cambrai was commissioned by Ebo of Reims in 829 to prepare a definitive edition. Haltigar used, among his other materials, a so-called poenitentiale romanum, which was really of Frankish origin. The canons printed by David Wilkins in his Concilia (1737) as being by Ecgbert of York (d. 767) are largely a transla- tion into Anglo-Saxon of three books of Haltigar's penitentials. In 841 Hrabanus Maurus undertook a new Liber poenitentium and wrote a long letter on the subject to Heribald of Auxerre about 853. Then followed the treatise of Reginon of Prum in 906, and finally the collection made by Burchard, bishop of Worms, between 1012 and 1023. The codification of the canon law by Gratian and the change in the sacramental position of penance in the 12 th century closed the history of penitentials.

Much controversy has arisen over the question whether there was an official papal penitential. It is claimed that (quite apart from Haltigar's poenitentiale romanum) such a set of canons existed early in Rome, and the attempt has been made by H. J. Schmitz in his learned treatise on penitentials (Buszbucher und das kanonische Buszverfahren, 1883 and 1898) to establish their pontifical character. The matter is still in dispute, Schmitz's thesis not having met with universal acceptance.

In addition to the works mentioned above the one important work on the penitentials was L. W. H. Wasserschleben's epoch-making study and collection of texts, Die Buszordnungen der abendldndischen Kirche nebst einer rechtsgeschichtlichen Einleitung (Halle, 1851). See articles in Wetzer and Welte's Kirchenlexikon, Hauck's Real-encyklopddie, and Haddan and Stubbs's Councils. See also Seebasz in Zeitschrift filr Kirchengeschichte , xviii. 58. On the canons of St Patrick see the Life of St Patrick by J. B. Bury (pp. 233-275).

PENITENTIARY (med. Lat. poenitentiarius, from poenitentia, penance, poena, punishment, a term used both as adjective and substantive, referring either to the means of repentance or that of punishment. In its ecclesiastical use the word is used as the equivalent both of the Latin poenitentiarius, " penitentiary priest," and poenitentiaria, the dignity or office of a poenitenti- arius. By an extension of the latter

sense the name is applied to the department of the Roman Curia known as the apostolic penitentiary (sacra poenitentiaria apostolica), presided over by the cardinal grand penitentiary (major poenitentiarius, Ital. penitenziere maggiore) and having jurisdiction more particu- larly in all questions in foro interno reserved for the Holy See (see Curia Romana). In general, the poenitentiarius, or peni- tentiary priest, is in each diocese what the grand penitentiary is at Rome, i.e. he is appointed to deal with all cases of conscience reserved for the bishop. In the Eastern Church there are very early notices of such appointments; so far as the West is con- cerned, Hinschius (Kirchenrecht, i. 428, note 2) quotes from the chronicle of Bernold, the monk of St Blase (c. 1054-1100), as the earliest record of such appointment, that made by the papal legate Odo of Ostia in 1054. In 1215 the fourth Lateran Council, by its 10th canon, ordered suitable men to be ordained in all cathedral and conventual churches, to act as coadjutors and assistants to the bishops in hearing confessions and imposing penances. The rule was not immediately nor universally obeyed, the bishops being slow to delegate their special powers. Finally, however, the council of Trent (Sess. xxiv. cap. viii. de reform.) ordered that, ” wherever it could conveniently be done,” the bishop should appoint in his cathedral a poenitentiarius, who should be a doctor or licentiate in theology or canon law and at least forty years of age.

See P. Hinschius, Kirchenrecht, i. 427, &c. (Berlin, 1869); Du Cange, Glossarium s.v. ” Poenitentiarius ” ; Herzog-Hauck, Real- encyklopddie (ed. 1904), s.v. ” Ponitentiarius.”

PENKRIDGE, a town in the western parliamentary division of Staffordshire, England; 134 m. N.W. from London by the London & North-Western railway, on the small river Penk. Pop. (1901), 2347. Trade is chiefly agricultural and there are stone-quarries in the vicinity. The church of St Michael and All Angels, formerly collegiate and dedicated to St Mary, is a fine building principally Perpendicular, but with earlier portions. The Roman Watling Street passes from east to west 3 m. south of Penkridge. In the neighbourhood is Pillaton Hall, retaining a picturesque chapel of the 15th century.

PENLEY, WILLIAM SYDNEY (1852-), English actor,

was born at Broadstairs, and educated in London, where his father had

a school. He first made his mark as a comedian by his exceedingly amusing performance as the curate in The Private Secretary, a part in which he succeeded Beerbohm Tree; but he is even more associated with the title role in Brandon Thomas's Charley's Aunt (1892), a farce which had an unprecedentedly long run and was acted all over the world.

PENMARC'H, a village of western France in the department of Finistere, 18 m. S.W. of Quimper by road. Pop. (1906), of the village, 387; of the commune, 5702. On the extremity of the peninsula on which it is situated are fortified remains of a town which was of considerable importance from the 14th to the 16th centuries and included, besides Penmarc 'h, St Guenole and Kerity. It owed its prosperity to its cod-banks, the dis- appearance of which together with the discovery of the New- foundland cod-banks and the pillage of the place by the bandit La Fontenelle in 1595 contributed to its decadence. The church of St Nouna, a Gothic building of the early 16th century at Penmarc 'h, and the church of St Guenole, an unfinished tower of the 15th century and the church of Kerity (15th century) are of interest. The coast is very dangerous. On the Point de Penmarc 'h stands the Phare d'Eckmuhl, with a light visible for 60 miles. There are numerous megalithic monuments in the vicinity.

PENN, WILLIAM (1621-1670), British admiral, was the son of Giles Penn, merchant and seaman of Bristol. He served his apprenticeship at sea with his father. In the first Civil War he fought on the side of the parliament, and was in com- mand of a ship in the squadron maintained against the king in the Irish seas. The service was arduous and called for both energy and good seamanship. In 1648 he was arrested and sent to London, but was soon released, and sent back as rear admiral in the " Assurance " (32). The exact cause of the arrest is unknown, but it may be presumed to have been that he was suspected of being in correspondence with the king's supporters. It is highly probable that he was, for until the Restoration he was regularly in communication with the Royal- ists, while serving the parliament, or Cromwell, so long as their service was profitable, and making no scruple of applying for grants of the confiscated lands of the king's Irish friends. The character of " mean fellow " given him by Pepys is borne out by much that is otherwise known of him. But it is no less certain that he was an excellent seaman and a good fighter. After 1650 he was employed in the Ocean, and in the Mediter- ranean in pursuit of the Royalists under Prince Rupert. He was so active on this service that when he returned home on the 18th of March 1651 he could boast that he had not put foot on shore for more than a year. When the first Dutch War broke out Penn was appointed vice-admiral

to Blake, and was present at the battle of the 28th of September off the Kentish Knock. In the three days' battle off Portland, February 1653, he commanded the Blue squadron, and he also served with distinction in the final battles of the war in June and July. In December he was included in the commission of admirals and generals at sea, who exercised the military command of the fleet, as well as " one of the commissioners for ordering and managing the affairs of the admiralty and navy." In 1654 he offered to carry the fleet over to the king, but in October of

the same year he had no scruple in accepting the naval command in the expedition to the West Indies sent out by Cromwell, which conquered Jamaica. He was not responsible for the shameful repulse at San Domingo, which was due to a panic among the troops. On their return he and his military colleague Vena.bles were sent to the Tower. He made humble submission, and when released retired to the estate he had received from confiscated land in Ireland. He continued in communication with the Royalists, and in 1660 had a rather obscure share in the Restoration. He was reappointed commissioner of the navy by the king, and in the second Dutch War served as " great captain commander" or captain of the fleet, with the duke of York (afterwards King James II.) at the battle of Lowestoft (June 3, 1665). When the duke withdrew from, the command, Penn's active service ceased. He continued however to be a commissioner of the navy. His death occurred on the 16th of September 1670, and he was buried in the church of St Mary Redcliffe, Bristol. His portrait by Lely is in the Painted Hall at Greenwich. By his wife Margaret Jasper, he was the father of William Penn, the founder of Pennsylvania. Though Sir William Penn was not a high-minded man, he is a figure of considerable importance in British naval history. As admiral and general for the parliament he helped in 1653 to draw up the first code of tactics provided for the navy. It was the base of the " Duke of York's Sailing and Fighting Instructions," which continued for long to supply the orthodox tactical creed of the navy.

See the Memorials of the Professional Life and Times of SirWilliam Penn, by Granville Penn. (D. H.)

PENN, WILLIAM (1644-1718), English Quaker and founder of Pennsylvania, son of Admiral Sir William Penn (1621-1670) and Margaret Jasper, a Dutch lady, was born at Tower Hill, London, on the 14th of October 1644. During his father's absence at sea he lived at Wanstead in Essex, and went to school at Chigwell close by, in which places he was brought under strong Puritan influences. Like many children of sensitive temperament, he had times of spiritual

excitement; when about twelve he was ” suddenly surprised with an inward comfort, and, as he thought, an external glory in the room, which gave rise to religious emotions, during which he had the strongest conviction of the being of a God, and that the soul of man was capable of enjoying communication with Him.” Upon the death of Cromwell, Penn’s father, who had served the Protector because there was no other career open, remained with his family on the Irish estates which Cromwell had given him, of the value of £300 a year. On the resignation of Richard Cromwell he at once declared for the king and went to the court in Holland, where he was received into favour and knighted; and at the elections for the convention parliament he was returned for Weymouth. Meanwhile young Penn studied under a private tutor on Tower Hill until, in October 1660, he was entered as a gentleman commoner at Christ Church. He appears in the same year to have contributed to the Threnodia, a collection of elegies on the death of the young duke of Gloucester.

The rigour with which the Anglican statutes were revived, and the Puritan heads of colleges supplanted, roused the spirit of resistance at Oxford to the uttermost. With this spirit Penn, who was on familiar terms with John Owen (1616-1683), and who had already fallen under the influence of Thomas Loe the Quaker, then at Oxford, actively sympathized. He and others refused to attend chapel and church service, and were fined in consequence. How far his leaving the university resulted from this cannot be clearly ascertained. Anthony Wood has nothing regarding the cause of his leaving, but says that he stayed at Oxford for two years, and that he was noted for proficiency in manly sports. There is no doubt that in January 1662 his father was anxious to remove him to Cambridge, and consulted Pepys on the subject ; and in later years he speaks of being ” banished ” the college, and of being whipped, beaten and turned out of doors on his return to his father, in the anger of the latter at his avowed Quakerism. A reconciliation, however, was effected ; and Penn was sent to France to forget this

folly. The plan was for a time successful. Perm appears to have entered more or less into the gaieties of the court of Louis XIV., and while there to have become acquainted with Robert Spencer, afterwards earl of Sunderland, and with Dorothy, sister to Algernon Sidney. What, however, is more certain is that he somewhat later placed himself under the tuition of Moses Amyraut, the celebrated

president of the Protestant college of Saumur, and at that time the exponent of liberal Calvinism, from whom he gained the patristic knowledge which is so prominent in his controversial writings. He afterwards travelled in Italy, returning to England in August 1664, with ” a great deal, if not too much, of the vanity of the French garb and affected manner of speech and gait.” 1

Until the outbreak of the plague Penn was a student of Lincoln’s Inn. For a few days also he served on the staff of his father — now great captain commander — and was by him sent back in April 1665 to Charles with despatches. Returning after the naval victory off Lowestoft in June, Admiral Penn. found that his son had again become settled in seriousness and Quakerism. To bring him once more to views of life not incon- sistent with court preferment, the admiral sent him in February 1666 with introductions to Ormonde’s pure but brilliant court in Ireland, and to manage his estate in Cork round Shannan- garry Castle, his title to which was disputed. Penn appears also later in the year to have been ” clerk of the cheque ” at Kinsale, of the castle and fort of which his father had the command. When the mutiny broke out in Carrickfergus Penn volunteered for service, and acted under Arran so as to gain considerable reputation. The result was that in May 1666 Ormonde offered him his father’s company of foot, but, for some unexplained reason, the admiral demurred to this arrange- ment. It was at this time that the well-known portrait was painted of the great Quaker in a suit of armour; and it was at this time, too, that the conversion, begun when he was a boy by Thomas Loe in Ireland, was completed at the same place oy the same agency. 2

On the 3rd of September 1667 Penn attended a meeting of Quakers in Cork, at which he assisted to expel a soldier who had disturbed the meeting. He was in consequence, with others present, sent to prison by the magistrates. From prison he wrote to Lord Orrery, the president of Munster, a letter, in which he first publicly makes a claim for perfect freedom of conscience. He was immediately released, and at once returned to his father in London, with the distinctive marks of Quakerism strong upon him. Penn now became a minister of the denomi- nation, and at once entere.d upon controversy and authorship. His first book, Truth Exalted, was violent and aggressive in the extreme. The same offensive personality is shown in The Guide Mistaken, a tract written in answer to John Clapham’s Guide to the True Religion. It was at this time, too, that he appealed, not unsuccessfully, to Buckingham, who on Clarendon’s fall was posing as the protector of the Dissenters, to use his efforts to procure parliamentary toleration.

Penn's first public discussion was with Thomas Vincent, a London Presbyterian minister, who had reflected on the " damnable " doctrines of the Quakers. The discussion, which had turned chiefly upon the doctrine of the Trinity, ended uselessly, and Penn at once published The Sandy Foundation Shaken, a tract of ability sufficient to excite Pepys's astonish- ment, in which orthodox views were so offensively attacked that Penn was placed in the Tower, where he remained for nearly nine months. The imputations upon his opinions and good citizenship, made as well by Dissenters as by the Church, he repelled in Innocency with her Open Face, in which he asserts his full belief in the divinity of Christ, the atonement, and justification through faith, though insisting on the necessity of good works. It was now, too, that he published the most important of his books, No Cross, No Crown, which contained an able defence of the Quaker doctrines and practices, and a scathing attack on the loose and unchristian lives of the clergy.

1 Pepys, August 30. 1664.

2 Webb, The Penns and Penningtons (1867), p. 174.

While completely refusing to recant Penn addressed a letter to Arlington in July 1669, in which, on grounds of religious freedom, he asked him to interfere. It is noteworthy, as showing the views then predominant, that he was almost at once set at liberty.

An informal reconciliation now took place with his father, who had been impeached through the jealousy of Rupert and Monk (in April 1668), and whose conduct in the operations of 1665 he had publicly vindicated; and Penn was again sent on family business to Ireland. At the desire of his father, whose health was fast failing, Penn returned to London in 1670. Having found the usual place of meeting in Gracechurch Street closed by soldiers. Penn, as a protest, preached to the people in the open street. With William Mead he was at once arrested and indicted at the Old Bailey on the 1st of September for preaching to an unlawful, seditious and riotous assembly, which had met together with force and arms. The Conventicle Act not touching their case, the trial which followed, and which may be read at length in Penn's People's Ancient and Just Liberties Asserted, was a notable one in the history of trial by jury. With extreme courage and skill Penn exposed the illegality of the prosecution, while the jury, for the first time, asserted the right of juries to decide in opposition to the ruling of the court. They brought in a verdict declaring Penn and Mead " guilty of speaking in Gracechurch Street," but refused to add " to an unlawful assembly "; then, as the pressure upon them increased,

they first acquitted Mead, while returning their original verdict upon Penn, and then, when that verdict was not admitted, returned their final answer ” not guilty ” for both. The court fined the jurymen 40 marks each for their contumacy, and, in default of payment, imprisoned them, whereupon they vindicated and established for ever the right they had claimed in an action (known as Bushell’s case from the name of one of the jurymen) before the court of common pleas, when all twelve judges unanimously declared their imprisonment illegal.

Penn himself had been fined for not removing his hat in court, had been imprisoned on his refusal to pay, and had earnestly requested his family not to pay for him. The fine, however, was settled anonymously, and he was released in time to be present at his father’s death on the 16th of September 1670, at the early age of forty-nine. Penn now found himself in possession of a fortune of £1500 a year, and a claim on the Crown for £16,000, lent to Charles II. by his father. Upon his release Penn at once plunged into controversy, ‘challenging a Baptist minister named Jeremiah Ives, at High Wycombe, to a public dispute and, according to the Quaker account, easily defeating him. No account is forthcoming from the other side. Hearing at Oxford that students who attended Friends’ meeting were rigorously used, he wrote a vehement and abusive remonstrance to the vice-chancellor in defence of religious freedom. This found still more remarkable expression in the Seasonable Caveat against Popery (Jan. 1671).

In the beginning of 1671 Penn was again arrested for preaching in Wheeler Street meeting-house by Sir J. Robinson, the lieutenant of the Tower, formerly lord mayor, and known as a brutal and bigoted churchman. Legal proof being wanting of any breach of the Conventicle Act, and the Oxford or Five Mile Act also proving inapplicable, Robinson, who had some special cause of enmity against Penn, urged upon him the oath of allegiance. This, of course, the Quaker would not take, and consequently was imprisoned for six months. During this imprisonment Penn wrote several works, the most important being The Great Case of Liberty of Conscience (Feb. 1671), a noble defence of complete toleration. Upon his release he started upon a missionary journey through Holland and Germany; at Emden he founded a Quaker society, and established an intimate friendship with the princess palatine Elizabeth.

Upon his return home in the spring of 1672 Penn married Gulielma Springett, daughter of Mary Pennington by her first husband, Sir William Springett; she appears to have been

equally remarkable for beauty, devotion to her husband, and firmness to the religious principles which she had adopted when little more than a child. 1 He now settled at Rickmansworth in Hertfordshire, and gave himself up to controversial writing. To this year, 1672, belong the Treatise on Oaths and England's Present Interest Considered. In the year 1673 Penn was still more active. He secured the release of George Fox, addressed the Quakers in Holland and Germany, carried on public controversies with Thomas Hicks, a Baptist, and John Faldo, an Independent, and published his treatise on the Christian Quaker and his Divine Testimony Vindicated, the Discourse of the General Rule of Faith and Practice, 2 Reasons against Railing (in answer to Hicks), Counterfeit Christianity Detected, and a Just Rebuke to One-and-twenly Learned Divines (an answer to Faldo and to Quakerism no Christianity). His last public controversy was in 1675 with Richard Baxter, in which, of course, each party claimed the victory.

At this point Penn's connexion with America begins. The province of New Jersey, comprising the country between the Hudson and Delaware rivers on the east and west, had been granted in March 1663-1664 by Charles II. to his brother; James in turn had in June of the same year leased it to Lord Berkeley and Sir G. Carteret in equal shares. By a deed, dated 18th of March 1673-1674, John Fenwick, a Quaker, bought one of the shares, that of Lord Berkeley (Stoughton erroneously says Carteret's) in trust for Edward Byllinge, also a Friend, for £1000. This sale was confirmed by James, after the second Dutch War, on the 6th of August 1680. Disputes having arisen between Fenwick and Byllinge, Penn acted as arbitrator; and then, Byllinge being in money difficulties, and being compelled to sell his interest in order to satisfy his creditors, Penn was added, at their request, to two of themselves, as trustee. The disputes were settled by Fenwick receiving ten out of the hundred parts into which the province was divided, 3 with a considerable sum of money, the remaining ninety parts being afterwards put up for sale. Fenwick sold his ten parts to two other Friends, Eldridge and Warner, who thus, with Penn and the other two, became masters of West Jersey, West New Jersey, or New West Jersey, as it was indifferently called. 4 The five proprietors appointed three commissioners, with instructions dated from London the 6th of August 1676, to settle disputes with Fenwick (who had bought fresh land from the Indians, upon which Salem was built, Penn being himself one of the settlers there) and to purchase new territories, and to build a town — New Beverley, or Burlington, being

the result. For the new colony Penn drew up a constitution, under the title of ” Concessions.” The greatest care is taken to make this constitution ” as near as may be conveniently to the primitive, ancient and fundamental laws of the nation of England.” But a democratic element is introduced, and the new principle of perfect religious freedom stands in the first place (ch. xvi.). With regard to the liberty of the subject, no one might be condemned in life, liberty or estate, except by a jury of twelve, and the right of challenging was granted to the uttermost (ch. xvii.). Imprisonment for debt was not abolished (as Dixon states), but was reduced to a minimum (ch. xviii.), while theft was punished by twofold restitution either in value or in labour to that amount (ch. xxviii.). The provisions of ch. xix. deserve special notice. All causes were to go before three justices, with a jury. ” They, the said justices, shall pronounce such judgment as they shall receive from, and be directed by the said twelve men, in whom only the judgment resides, and not otherwise. And in case of their neglect and refusal, that then one of the twelve, by consent of the rest, pronounce their own judgment as the justices should have done.” The justices and constables, moreover, were

1 For a very charming account of her, and the whole Pennington connexion, see Maria Webb’s The Penns and Penningtons.

2 See on this Stoughton’s Penn, p. 113.

3 The deed by which Fenwick and Byllinge conveyed West New Jersey to Penn, Lawry and Nicholas Lucas is dated the loth of February 1674-1675.

4 The line of partition was ” from the east side of Little Egg Harbour, straight north, through the country, to the utmost branch of Delaware River.”

elected by the people, the former for two years only (ch. xli.). Suitors might plead in person, and the courts were public (ch. xxii.). Questions between Indians and settlers were to be arranged by a mixed jury (ch. xxv.). An assembly was to meet yearly, consisting of a hundred persons, chosen by the inhabitants, freeholders and proprietors, one for each division of the province. The election was to be by ballot, and each member was to receive a shilling a day from his division, ” that thereby he may be known to be the servant of the people.” The executive power was to be in the hands of ten commissioners 5 chosen by the assembly. Such a constitution soon attracted large numbers of Quakers to West Jersey.

It was shortly before these occurrences that Penn inherited through his wife the estate of Worminghurst in Sussex, whither he removed from Rickmansworth. He now (July 25, 1677) undertook a second missionary journey to the continent along with George Fox, Robert Barclay and George Keith. He visited particularly Rotterdam and all the Holland towns, renewed his intimacy with the princess Elizabeth at Herwerden, and, under considerable privations, travelled through Hanover, Germany, the lower Rhine and the electorate of Brandenburg, returning by Bremen and the Hague. It is worthy of recollec- tion that the Germantown (Philadelphia) settlers from Kirch-heim, one of the places which responded in an especial degree to Penn's teaching, are noted as the first who declared it wrong for Christians to hold slaves. Penn reached England again on the 24th of October. He tried to gain the insertion in the bill for the relief of Protestant Dissenters of a clause enabling Friends to affirm instead of taking the oath, and twice addressed the House of Commons' committee with considerable eloquence and effect. The bill, however, fell to the ground at the sudden prorogation.

In 1678 the popish terror came to a head, and to calm and guide Friends in the prevailing excitement Penn wrote his Epistle to the Children of Light in this Generation. A far more important publication was An Address to Protestants of all Persuasions, by William Penn, Protestant, in 1679; a powerful exposition of the doctrine of pure tolerance and a protest against the enforcement of opinions as articles of faith. This was succeeded, at the general election which followed the dissolution of the pensionary parliament, by an important political manifesto, England's Great Interest in the Choice of this New Parliament, in which he insisted on the following points: the discovery and punishment of the plot, the impeachment of corrupt ministers and councillors, the punishment of " pensioners," the enactment of frequent parliaments, security from popery and slavery, and ease for Protestant Dissenters. Next came One Project for the Good of England, perhaps the most pungent of all his political writings. But he was not merely active with his pen. He was at this time in close intimacy with Algernon Sidney, who stood successively for Guildford and Bramber. In each case, owing in a great degree to Penn's eager advocacy, Sidney was elected, only to have his elections annulled by court influence. Toleration for Dissenters seemed as far off as ever. Encouraged by his suc- cess in the West Jersey province, Penn again turned his thoughts to America. In repayment of the debt mentioned above he now asked from the Crown, at a council held on the 24th of June 1680, for " a tract of land in America north of Maryland, bounded on the east by the Delaware, on the west limited as Maryland [i.e. by New Jersey],

northward as far as plantable"; this latter limit Penn explained to be " three degrees northwards." This formed a tract of 300 m. by r6o, of extreme fertility, mineral wealth and richness of all kinds. Disputes with James, duke of York, and with Lord Baltimore, who had rights over Maryland, delayed the matter until the 14th of March 1681, when the grant received the royal signature, and Penn was made master of the province of Pennsylvania. His own account of the name is that he suggested " Sylvania," that the king added the " Penn " in honour of his father, and that, although he

5 Penn's letter of the 26th of August 1676 says twelve, and Clark- son has followed this ; but the Concessions, which were not assented to by the inhabitants until the 3rd of March 1676-1677, say ten.

strenuously objected and even tried to bribe the secretaries, he could not get the name altered. It should be added that early in 1682 Carteret, grandson of the original proprietor, transferred his rights in East Jersey to Penn and eleven associates, who soon afterwards conveyed one-half of their interest to the earl of Perth and eleven others. It is uncertain to what extent Penn retained his interest in West and East Jersey, and when it ceased. The two provinces were united under one governor in 1699, and Penn was a proprietor in 1700. In 1702 the government of New Jersey was surrendered to the Crown.

By the charter for Pennsylvania Penn was made proprietary of the province. He was supreme governor; he had the power of making laws with the advice, assent and approbation of the freemen, of appointing officers, and of granting pardons. The laws were to contain nothing contrary to English law, with a saving to the Crown and the privy council in the case of appeals. Parliament was to be supreme in all questions of trade and commerce; the right to levy taxes and customs was reserved to England; an agent to represent Penn was to reside in London; neglect on the part of Penn was to lead to the passing of the government to the Crown (which event actually took place in 1692); no correspondence might be carried on with countries at war with Great Britain. The importunity of the bishop of London extorted the right to appoint Anglican ministers, should twenty members of the colony desire it, thus securing the very thing which Penn was anxious to avoid — the recognition of the principle of an establishment.

Having appointed Colonel (Sir William) Markham, his cousin, as

deputy, and having in October sent out three commissioners to manage his affairs until his arrival, Penn proceeded to draw up proposals to adventurers, with an account of the resources of the colony. He negotiated, too, with James and Lord Balti- more with the view, ultimately successful, of freeing the mouth of the Delaware, wrote to the Indians in conciliatory terms, and encouraged the formation of companies to work the infant colony both in England and Germany, especially the ” Free Society of Traders in Pennsylvania,” to whom he sold 20,000 acres, absolutely refusing, however, to grant any monopolies. In July he drew up a body of ” conditions and concessions.” This constitution, savouring strongly of Harrington’s Oceana, was framed, it is said, in consultation with Sidney, but the statement is doubtful. Until the council of seventy-two (chosen by universal suffrage every three years, twenty-four retiring each year) , and the assembly (chosen annually) were duly elected, a body of provisional laws was added. ■ ■, ■■■■..’.■ ˆ \j-

It was in the midst of this extreme activity that Penn was made a Fellow of the Royal Society. Leaving his family behind him, Penn sailed with a hundred comrades from Deal in the ” Welcome ” on the 1st of September 1682. His Last Farewell to England and his letter to his wife and children contain a beautiful expression of his pious and manly nature. He landed at New Castle on the Delaware on the 27th of October, his company having lost one-third of their number by small-pox during the voyage. After receiving formal possession, and having visited New York, Penn ascended the Delaware to the Swedish settlement of Upland, to which he gave the name of Chester. The assembly at once met, and on the 7th of December passed the ” Great Law of Pennsylvania.” The idea which informs this law is that Pennsylvania was to be a Christian state on a Quaker model. Philadelphia was now founded, and within two years contained 300 houses and a population of 2500. At the same time an act was passed, uniting under the same govern- ment the territories which had been granted by feoffment by James in 1682. Realistic and entirely imaginative accounts (cf. Dixon, p. 270), inspired chiefly by Benjamin West’s picture, have been given of the treaty which there seems no doubt Penn actually made in November 1683 with the Indians. His con- nexion with them was one of the most successful parts of his management, and he gained at once and retained through life their intense affection.

Penn now wrote an account of Pennsylvania from his own observation for the ” Free Society of Traders,” in which he

shows considerable power of artistic description. Tales of violent

persecution of the Quakers, and the necessity of settling disputes, which had arisen with Lord Baltimore, his neighbour in Maryland, brought Penn back to England (Oct. 2, 1684) after an absence of two years. In the spring of 1683 he had modified the original charter at the desire of the assembly, but without at all altering its democratic character. 1 He was, in reference to this alteration, charged with selfish and deceitful dealing by the assembly. Within five months after his arrival in England Charles II. died, and Penn found himself at once in a position of great influence. Penn now took up his abode at Kensington in Holland House, so as to be near the court. His influence there was great enough to secure the pardon of John Locke, who had been dismissed from Oxford by Charles, and of 1200 Quakers who were in prison. At this time, too, he was busy with his pen once more, writing a further account of Pennsylvania, a pamphlet in defence of Buckingham's essay in favour of toleration, in which he is supposed to have had some share, and his Persuasive to Moderation to Dissenting Christians, very similar in tone to the One Project for the Good of England. When Monmouth's rebellion was suppressed he appears to have done his best to mitigate the horrors of the western commission, opposing Jeffreys to the uttermost. 2 Macaulay has accused Penn of being concerned in some of the worst actions of the court at this time. His complete refutation by Forster, Paget, Dixon and others renders it unnecessary to do more than allude to the cases of the Maids of Taunton, Alderman Kiffin, and Magdalen College (Oxford).

In 1686, when making a third missionary journey to Holland and Germany, Penn was charged by James with an informal mission to the prince of Orange to endeavour to gain his assent to the removal of religious tests. Here he met Burnet, from whom, as from the prince, he gained no satisfaction, and who greatly disliked him. On his return he went on a preaching mission through England. His position with James was undoubtedly a compromising one, and it is not strange that, wishing to tolerate Papists, he should, in the prevailing temper of England, be once more accused of being a Jesuit, while he was in constant antagonism to their body. Even Tillotson took up this view strongly, though he at once accepted Penn's vehement disavowal. In 1687 James published the Declaration of indul- gence, and Penn probably drew up the address of thanks on the part of the Quakers. It fully reflects his views, which are further ably put in the pamphlet Good Advice to the Church of England, Roman Catholics, and Protestant Dissenters, in which he showed the wisdom and duty of repealing the Test Acts and Penal Laws. At the Revolution he behaved with courage. He was one of the few friends of the king who remained in London, and, when twice summoned before the council, spoke

boldly in his behalf. He admitted that James had asked him to come to him in France; but at the same time he asserted his perfect loyalty. During the absence of William in 1690 he was proclaimed by Mary as a dangerous person, but no evidence of treason was forthcoming. It was now that he lost by death two of his dearest friends, Robert Barclay and George Fox. It was at the funeral of the latter that, upon the information of the notorious informer William Fuller] (1670-1717?), an attempt was made to arrest him,but[he had just left the ground; the fact that no further steps were then taken shows how little the government believed in his guilt. He now lived in retirement in London, though his address was perfectly well known to his friends in the council. In 1691, again on Fuller's evidence, a proclamation was issued for the arrest of Penn and two others as being concerned in Preston's plot. In 1692 he began to write again, both on questions of Quaker discipline and in defence of the sect. Just Measures in an Epistle of Peace and Love, The New Athenians (in reply to the attacks of the Athenian Mercury), and A Key opening the Way to every Capacity are the principal publications of this year.

Meantime matters had been going badly in Pennsylvania

1 Dixon, p. 276.

s Burnet, iii. 66; Dalrymple, i. 282.

Penn had, in 1686, been obliged to make changes in the com- position of the executive body, though in 1689 it reverted to the original constitution; the legislative bodies had quarrelled; and Penn could not gain his rents. The chief difficulty in Pennsylvania was the dispute between the province — i.e. the country given to Penn by the charter — and the " territories," or the lands granted to him by the duke of York by feoffment in August 1682, which were under the same government but had differing interests. The difficulties which Quaker principles placed in the way of arming the colony — a matter of grave importance in the existing European complications — fought most hardly against Penn's power. On the 21st of October 1692 an order of council was issued depriving Penn of the governorship of Pennsylvania and giving it to Colonel Benjamin Fletcher, the governor of New York. To this blow were added the illness of his wife and a fresh accusation of treasonable correspondence with James. In his enforced retirement he wrote the most devotional and most charming

of his works — the collection of maxims of conduct and religion entitled The Fruits of Solitude. In December, thanks to the efforts of his friends at court, among whom were Buckingham, Somers, Rochester, and Henry Sidney, he received an intimation that no further steps would be taken against him. The accusation, however, had been public, and he insisted on the withdrawal being equally public. He was therefore heard in full council before the king, and honourably acquitted of all charges of trea- son. It was now that he wrote an Essay towards the Present and Future Peace of Europe, in which he puts forth the idea of a great court of arbitration, a principle which he had already carried out in Pennsylvania.

f. In 1694 (Feb. 23) his wife Gulielma died, leaving two sons, Springett and William, and a daughter Letitia, afterwards married to William Aubrey. Two other daughters, Mary and Hannah, died in infancy. He consoled himself by writing his Account of the Rise and Progress of the People called Quakers. The coldness and suspicion with which he had been regarded by his own denomination had now ceased, and he was once more regarded by the Quaker body as their leader. About the same time (Aug. 20) he was restored to the governorship of Pennsylvania; and he promised to supply money and men for the defence of the frontiers. In 1695 he went on another preaching mission in the west, and in March 1696 he formed a second marriage, with Hannah Callowhill, his son Springett dying five weeks later. In this year he wrote his work On Primi- tive Christianity, in which he argues that the faith and practice of the Friends were those of the early Church. In 1697 Penn removed to Bristol, and during the greater part of 1698 was preaching with great success against oppression in Ireland, whither he had gone to look after the property at Shannangarry.

In 1699 he was back in Pennsylvania, landing near Chester on the 30th of November, where the success of Colonel Robert Quary, judge of the admiralty in Pennsylvania — who was in the interests of those who wished to make the province an imperial colony — and the high-handed action of the deputy Markham in opposition to the Crown, were causing great difficulties. Penn carried with him particular instructions to put down piracy, which the objections of the Quakers to the use of force had rendered audacious and concerning which Quary had made strong representations to the home government, while Markham and the inhabitants apparently encouraged it. Penn and Quary, howevei came at once to a satisfactory understanding on this matter, and the illegal traffic was vigorously and success- fully attacked. In 1696 the Philadelphian Yearly Meeting had passed a resolution declaring slavery contrary to the first principles of the

gospel. Penn, however, did not venture upon emancipation; but he insisted on the instruction of negroes, permission for them to marry, repression of polygamy and adultery, and proposed regulations for their trial and punishment. The assembly, however, a very mixed body of all nations, now refused to accept any of these proposals except the last-named. His great success was with the Indians; by their treaty with him in 1700 they promised not to help any enemy of England,

to traffic only with those approved by the governor, and to sell furs or skins to none but inhabitants of the province. At the same time he showed his capacity for legislation by the share he took with Lord Bellomont at New York in the consolidation of the laws in use in the various parts of America.

Affairs now again demanded his presence in England. The king had in 1701 written to urge upon the Pennsylvania government a union with other private colonies f< r defence, and had asked for money for fortifications. The difl culty felt by the Crown in this matter was a natural one. A bill was brought into the lords to convert private into Crown colonies. Penn's son appeared before the committee of the house and managed to delay the matter until his father's return. On the 15th of September Penn called the assembly together, in which the differences between the province and the territories again broke out. He succeeded, however, in calming them, appointed a council of ten to manage the province in his absence, and gave a borough charter to Philadelphia. In May 1700, experience having shown that alterations in the charter were advisable, the assembly had, almost unanimously, requested Penn to revise it. On the 28th of October 1701 he handed it back to them in the form in which it afterwards remained. An assembly was to be chosen yearly, of four persons from each county, with all the self-governing privileges of the English House of Commons. Two-thirds were to form a quorum. The nomination of sheriffs, coroners, and magistrates for each county was given to the governor, who was to select from names handed in by the free men. Moreover, the council was no longer elected by the people, but nominated by the governor, who was thus practically left single in the executive. The assembly, however, who, by the first charter, had not the right to propound laws, but might only amend or reject them, now acquired that privilege. In other respects the original charter remained, and the inviol- ability of conscience was again emphatically asserted. Penn reached England in December 1701. He once more assumed the position of leader of the Dissenters and himself read the address of thanks for the promise from the Throne to maintain the Act of Toleration. He now took up his abode again at Kensington, and published while here his More Fruits of Solitude.

In 1703 he went to Knightsbridge, where he remained until 1706, when he removed to Brentford, his final residence being taken up in 1710 at Field Ruscombe, near Twyford. In 1704 he wrote his Life of Bulstrode Whitelocke. He had now much trouble from America. The territorialists were openly rejecting his authority, and doing their best to obstruct all business in the assembly; and matters were further embarrassed by the inju- dicious conduct of Governor John Evans in 1706. Moreover, pecuniary troubles came heavily upon him, while the conduct of his son William, who became the ringleader of all the dissolute characters in Philadelphia, was another and still more severe trial. This son was married, and had a son and daughter, but appears to have been left entirely out of account in the settle- ment of Penn's proprietary rights on his death.

Whatever were Penn's great qualities, he was deficient in judgment of character. This was especially shown in the choice of his steward Ford, from whom he had borrowed money, and who, by dexterous swindling, had managed, at the time of his death, to establish, and hand down to his widow and son, a claim for £14,000 against Penn. Penn, however, refused to pay, and spent nine months in the Fleet rather than give way. He was released at length by his friends, who paid £7500 in composi- tion of all claims. Difficulties with his government of Penn- sylvania continued to harass him. Fresh disputes took place with Lord Baltimore, the owner of Maryland, and Penn also felt deeply what seemed to him the ungraceful treatment which he met with at the hands of the asser bly. He therefore in 1 7 10 wrote, in earnest and affectionat' language, an address to his " old friends," setting forth his wrongs. So great was the effect which this produced that the assembly which met in October of that year was entirely in his interests; revenues were properly paid; the disaffected were silenced and complaints

were hushed; while an advance in moral sense was shown by the fact that a bill was passed prohibiting the importation of negroes. This, however, when submitted to the British parlia- ment, was cancelled. Penn now, in February 171 2, being in failing health, proposed to surrender his powers to the Crown. The commission of plantations recommended that Penn should receive £12,000 in four years from the time of surrender, Penn stipulating only that the queen should take the Quakers under her protection; and £1000 was given him in part payment. Before, however, the matter could go further he was

seized with apoplectic fits, which shattered his understanding and memory. A second attack occurred in 17 13. He died on the 30th of May 1 7 18, leaving three sons by his second wife, John, Thomas and Richard, and was buried along with his first and second wives at Jourdans meeting-house, near Chalfont St Giles in Buckingham- shire. In 1790 the proprietary rights of Penn's descendants were bought up for a pension of £4000 a year to the eldest male descendant by his second wife, and this pension was commuted in 1884 for the sum of £67,000.

Penn's Life was written by Joseph Besse, and prefixed to the collected edition of Penn's Works (1726); see also the bibliographical note to the article in Diet. Nat. Biog. W. Hepworth Dixon's bio- graphy, refuting Macaulay's charges, appeared in 1851. In 1907 Mrs Colquhoun Grant, one of Penn's descendants, brought out a book, Quaker arid Courtier: the Life and Work of William Penn.

(O. A.)

PENNANT, THOMAS (1726-1798), British naturalist and antiquary, was descended from an old Welsh family, for many generations resident at Downing, Flintshire, where he was born on the 14th of June 1726. He received his early education at Wrexham, and afterwards entered Queen's College, Oxford, but did not take a degree. At twelve years of age he was inspired with a passion for natural history through being presented with Francis Willughby's Ornithology; and a tour in Cornwall in 1 746-1 747 awakened his strong interest in minerals and fossils. In 1750 his account of an earthquake at Downing was inserted in the Philosophical Transactions, where there also appeared in 1756 a paper on several coralloid bodies he had collected at Coalbrookdale, Shropshire. In the following year, at the instance of Linnaeus, he was elected a member of the Royal Society of Upsala. In 1766 he published the first part of his British Zoology, a work meritorious rather as a laborious compilation than as an original contribution to science. During its progress he visited the continent of Europe and made the acquaintance of Buffon, Voltaire, Haller and Pallas. In 1767 he was elected F.R.S. In 1771 was published his Synopsis of Quadrupeds, afterwards extended into a History of Quadrupeds. At the end of the same year he published A Tour in Scotland in 17 6q, which proving remarkably popular was followed in 1774 by an account of another journey in Scotland, in two volumes. These works have proved invaluable as preserving the record of important antiquarian relics which have now perished. In 1778 he brought out a similar Tour in Wales, which was followed by a Journey to Snowdon (pt. i. 1781; pt. ii. 1783), afterwards forming the second

volume of the Tour. In 1782 he published a Journey from Chester to London. He brought out Arctic Zoology in 1785-1787. In 1790 appeared his Account of London, which went through a large number of editions, and three years later he published the Literary Life of the late T. Pennant, written by himself. In his later years he was engaged on a work entitled Outlines of the Globe, vols. i. and ii. of which appeared in 1798, and vols. iii. and iv., edited by his son David Pennant, in 1800. He was also the author of a number of minor works, some of which were published posthumously. He died at Downing on the 16th of December 1798.

PENNAR, or Penner, two rivers of southern India, distin- guished as North an South. The native name is Pinakini. Both rise near the hil. of Nandidrug in Mysore state, and flow eastward into the Baj of Bengal. The northern is the more important and has a total length of 355 m., that of the southern being 245 m. This latter bears the alternative name of the Ponniar. The Pennar (northern) river canal system comprises more than 30 m. of canals, irrigating 155,500 acres.

PENNE, a town and episcopal see of Italy, in the province of Teramo, 26 m. S.E. of Teramo, and 16 m. inland from the Adriatic, 1437 ft. above sea-level. Pop. (1901), 10,394. The cathedral has been much altered; in its treasury is some fine 13th (?) century silversmiths' work; the church of S. Giovanni has a fine cross by Nicola di Guardiagrele, and that of S. Maria in Colleromano, outside the town, a Romanesque portal. Many of the houses have fine terra-cotta friezes. It occupies the site of the ancient Pinna, the chief city of the Vestini, who entered into alliance with Rome in 301 B.C. and remained faithful to her through the Hannibalic wars and even during the revolt of the Italian allies in 90 B.C. No remains of the Roman period exist, even the city walls being entirely medieval.

See G. Colasanti, Pinna (Rome, 1907) ; V. B'indi, Monumenti degli Abruzzi (Naples, 1889, pp. 565 sqq.).

PENNELL, JOSEPH (i860-), American artist and author, was born in Philadelphia on the 4th of July i860, and first studied there, but like his compatriot and friend, J. M. Whistler, he afterwards went to Europe and made his home in London. He produced numerous books (many of them in collaboration with his wife, Elizabeth Robins Pennell) , but his chief distinction is as an original etcher and lithographer, and notably as an illustrator. Their close acquaintance with Whistler led to Mr and Mrs Pennell undertaking a biography of that artist in 1906, and, after some litigation with his executrix on the right to use his letters, the book was published in 1908.

PENNI, GIANFRANCESCO (1488-1528), Italian painter, surnamed ” II Fattore,” from the relation in which he stood to Raphael, whose favourite disciple he was after Giulio Romano, was a native of Florence, but spent the latter years of his life in Naples. He painted in oil as well as in fresco, but is chiefly known for his work in the Loggie of the Vatican.

PENNINE CHAIN, an extensive system of hills in the north of England. The name is probably derived from the Celtic pen, high, appearing in the Apennines of Italy and the Pennine Alps. The English system is comprised within the following physical boundaries. On the N. a well-marked depression, falling below 500 ft. in height, between the upper valleys of the Irthing and the south Tyne, from which it is known as the Tyne Gap, separates the Pennines from the system of the Cheviots. On the N.E., in Northumberland, the foothills extend to the North Sea. On the N.W. the Eden valley forms part of the boundary between the Pennines and the hills of the Lake District, and the division is continued by the upper valley of the Lune. For the rest the physical boundaries consist of extensive lowlands — on the E. the vale of York, on the W. the coastal belt of Lan- cashire and the plain of Cheshire, and on the S. and S.E. the valley of the river Trent. The Pennines thus cover parts of Cumberland, Westmorland and Northumberland, Lancashire and Yorkshire, Cheshire and Derbyshire, while the southern foothills extend into Staffordshire and Nottinghamshire.

The Pennine system is hardly a range, but the hills are in effect broken up into numerous short ranges by valleys cut back into them in every direction, for the Pennines form a north and south watershed which determines the course of all the larger rivers in the north of England. The chain is divided into two sections by a gap formed by the river Aire flowing east, a member of the Humber basin, and the Ribble flowing west and entering the Irish Sea through a wide estuary south of Morecambe Bay.

The northern section of the Pennine system is broader and generally higher than the southern. Its western slope is generally short and steep, the eastern long and gradual ; this distinction apply- ing to the system at large. In the north-west a sharp escarpment overlooks the Eden valley. This is the nearest approach to a true mountain range in the Pennine system and indeed in England. It is known as the Cross Fell Edge from its highest point, Cross Fell (2930 ft.), to the south-east of which a height of 2780 ft. is reached in Milburn Forest, and of 2591 ft. in Mickle Fell. This range is marked off eastward by the upper valleys of the south Tyne and the Tees, and, from the divide between these two, branch ranges spring eastward, separated by the valley of

the Wear, at the head of which are Burnhope Seat (2452 ft.) and Dead Stones (2326 ft.). In the northern range the highest point is Middlehope Moor (2206 ft.), and in the southern. Chapel Fell Top (2294 ft.). It is thus seen that the

higher elevations, like the steeper slopes, lie towards the west. Cross Fell Edge terminates southward at a high pass (about 1400 ft.) between the head of the Belah, a tributary of the Eden, and the Greta, a tributary of the Tees. This pass is followed by the Tebay and Barnard Castle line of the North Eastern railway. The hills between the Lune valley on the west and the headstream of the Eden and the Ribble on the east are broken into masses by the dales of tributaries to the first-named river — here the chief elevations are Wild Boar Fell (2323 ft.), Whernside (2414 ft.), and Ingleborough (2373 ft.). The Ribble and Eden valleys afford a route for the main line of the Midland railway. Well-marked eastward ranges occur here between Swaledale and the river Ure, which traverses the celebrated Wensleydale (?.».), and between the Ure and Wharfe. In the first the highest points are High Seat (2328 ft.) and Great Shunner Fell (2340 ft.) ; and in the second Buckden Pike (2302 ft.) and Great Whernside (2310 ft.). There is then a general southerly slope to the Aire gap.

The southern section of the system calls for less detailed notice. Heights exceeding 2000 ft. are rare. The centre of the section is the well-known Peak (q.v.) of Derbyshire. Both here and through- out the system the summits of the hills are high uplands, rounded or nearly flat, consisting of heathery, peaty moorland or hill pasture. The profile of the Pennines is thus not striking as a rule, but much fine scenery is found in the narrow dales throughout; Wensleydale, Wharfedale and other Yorkshire dales being no less famous than the dales of Derbyshire. In the parts about Settle below Ingle- borough, in Derbyshire, and elsewhere, remarkable caverns and subterranean watercourses in the limestone have been explored to great depths. In Ingleborough itself are the Ingleborough cave, near Clapham; the chasm of Gaping Ghyll, over 350 ft. deep; Helln or Hellan Pot, a vast swallow-hole 359 ft. deep, only exceeded by Row-, ten Pot (365 ft.) near Whernside; and many others. Malham Tarn, near the head of the Aire, is drained by a stream which quickly disappears below ground, and the Aire itself is fed by a brook gushing forth in full stream at the foot of the cliffs of Malham Cove. A notable example in Derbyshire is the disappearance of the Wye into Plunge Hole, after which it

traverses Poole's Cave, close to Buxton. There may also be noted the remarkable series of caverns near Castleton (q-v.). Lakes are few and small in the Pennine district, but in some of the upland valleys, such as those of the Nidd and the Etherow, reservoirs have been formed for the supply of the populous manufacturing districts of Lancashire and the West Riding of York- shire, which lie on either flank of the system between the Aire gap and the Peak. (For geology see England and articles on the several counties.)

PENNSYLVANIA, a North Atlantic state of the United States of America and one of the original thirteen, lying for the most part between latitudes 39° 43′ 26-3″ and 42° N. and between longitudes 74° 40′ and 8o° 31′ 36″ W. The state is in the form of a rectangle, except in the north-west where a triangular projection, extending to 42 15′ N.lat., gives it a shore- line of almost 40 m. on Lake Erie, on the east where the Dela- ware river with two large bends separates it from New York and New Jersey, and in the south-east where the arc of a circle which was described with a 12-m. radius from New Castle, Delaware, forms the boundary between it and Delaware. The forty-second parallel of N. latitude forms the boundary between it and New York on the N. ; Mason and Dixon's line is the border between it and Maryland and West Virginia on the south and a north and south line marks the boundary between it and West Virginia and Ohio on the west. The total area is 45,126 sq. m. and of this 294 sq. m. are water surface.

Physical Features. — Pennsylvania skirts the coastal plain in the south-east below Philadelphia, is traversed from north-east to south-west by the three divisions of the Appalachian province — Piedmont or older Appalachian belt, younger Appalachian ridges and valleys and Alleghany plateau — and in the north-west corner is a small part of the Erie plain. The entire surface has a mean elevation of about 1 100 ft. above the sea. It rises from 20 ft. or less on the bank of the Delaware between Philadelphia and Chester to 2000-3000 ft. on the higher ridges in the middle section (3136 ft. on Blue Knob in Bedford county), and falls again to 900-1000 ft. on the Ohio border and to 750 ft. or less on the Erie plain; in the south-east is an area of about 6100 sq. m. that is less than 500 ft. above the sea, while on the ridges in the middle of the state is an aggregate area of about 2000 sq. m. that everywhere exceeds 2000 ft. in elevation. The area below 500 ft. is mostly in the Triassic lowland of the Piedmont region, or, as the Pennsylvania portion of it is called, the south-east province. This is an un- dulating plain which has been produced by the wearing away of weak sandstones, &c. On the north and west borders of this plain are two parts of a chain of semi-detached and usually rounded hills,

known as the South Mountains. The north-east part is a south-westward arm of the New England uplands, is known as the Reading Prong, and extends from New Jersey through Easton to

Reading. The south-west part is a north-eastern prolongation of the Virginia Piedmont, is known as the Cumberland Prong, and extends N.N.E. through the south part of Cumberland county. In the Reading Prong most of the hills rise 900-1000 ft. above the sea and about one-half that height above the surrounding country; in the Cumberland Prong their height increases to the southward until, on the Maryland border, they rise 2100 ft. above the sea and 1400 ft. above the adjoining plain. Another range of hills, known as the Trenton Prong, extends from the northern suburbs of Philadelphia both westward and southward through Chester, Delaware, Lancaster and York counties, but these rise only 400-600 ft. above the sea and have few steep slopes. Both of these ranges of hills are composed of hard crystalline rocks, and between them lies the lowland eroded on the weaker sandstones and sediments. In Bucks and Montgomery counties is a large sandstone area; traversing Chester county is the narrow Chester Valley with a limestone bottom, and in Lancaster county is the most extensive limestone plain. The Pennsylvania portion of the younger Ap- palachian ridges and valleys, known as the central province of the state, embraces the region between the South Mountains, on the south-east, and the crest of the Alleghany plateau or Alleghany Front, on the north-west. It extends from south-west to north- east about 230 m. and has a nearly uniform width of 50 m. except that it narrows rapidly as it approaches the north-east corner of the state. The ridges and intervening valleys, long parts of which have an approximately parallel trend from south-west to north-east, were formed by the erosion of folded sediments of varying hardness, the weak belts of rock being etched out to form valleys and the hard belts remaining as mountain ridges. After the folding the whole region was worn down nearly to sea-level, forming a low plain which bevelled across the geological structure of the entire ‘ state, including the Piedmont area to the south-east and the plateau area to the north-west. Then came a broad uplift followed by the erosion which carved out the valleys, leaving hard rocks as mountain ridges which rise about to the level of the old erosion plain. In Bedford county and elsewhere the ridges rise to 2400 ft. or more above the sea, but their more usual height is 1400 to 2000 ft. above the sea and 500 to 1000 ft. above the intervening valleys. Their crest lines are often of nearly uniform height for miles and generally are little broken except by an occasional V-shaped wind gap, a narrow water gap or a rounded knob. The valleys rarely exceed more than a few miles in width, are usually steep-sided, and fre-

quently are traversed by longitudinal ranges of hills and cross ridges ; but the Pennsylvania portion of the Appalachian or Great Valley, which forms a distinct division of the central province and lies between the South Mountains and the long rampart of Blue Mountain, is about 10 m. in width on the Maryland border and to the north-east its width increases to 20 m. The north-west part of it is a slate belt that has been much dissected by eroding streams, but the south-east part is a gently rolling belt of limestone to which occasionally a steep hill descends from the slate belt. The Pocono plateau, into which the central province merges at its north-east extremity, is a continuation of the Catskill plateau southward from New York and covers Wayne, Pike and Monroe counties and the east portion of Carbon county. Its surface is underlaid by a hard sandstone and conglomerate which erode slowly, and the general upland level, which is 1400-1800 ft. above the sea, is little broken except by shallow valleys and occasional knobs. The Alleghany plateau, which extends from the crest of the Alleghany Front to and beyond the west and north borders of Pennsylvania and covers more than one-half of the state, is much more dissected. In Tioga and Potter counties on the north middle border, it rises 2400-2500 ft. above the sea, but from this height the general upland level falls gradually to 1200-1300 ft. in the south-west and 900- 1000 ft. along the Ohio border, and in Erie county there is a sudden fall of about 200 ft. to the Erie plain. In the northern, middle and south-west portions of this plateau province the upland is cut by an intricate network of narrow valleys and ravines that are commonly 300-600 ft. deep and occasionally 800-1000 ft. deep, but west of the Allegheny river, where harder rocks have resisted such deep dissection and glacial drift has filled depressions or smoothed rough surfaces, the uplands are broader and the valleys wider and shallower. Most of the Pennsylvania shore of Lake Erie is lined with a wall of sand and clay 50-100 ft. in height and along the foot of this is only a narrow beach, but in front of the city of Erie the shore currents have formed a spit, known as Presque Isle, which affords a good harbour.

The Pocono plateau, nearly all of the central and south-east provinces and the north-east portion of the Alleghany plateau are drained by the Susquehanna and Delaware river-systems into the Chesapeake and Delaware Bays; the greater part of the Alleghany plateau is drained by the Allegheny and Monongahela rivers into the Ohio river; the extreme southern portion of the central province and the extreme western portion of the south-east province are drained by tributaries of the Potomac ; the Erie plain is drained by short streams into Lake Erie; and a very small section of the Alleghany plateau, in the northern part of Potter county, is drained by the Genesee river into

Lake Ontario. The Susquehanna drains about 21 ,000 sq. m. of the state ; the Ohio, Allegheny and Monongahela

14,747 sq. m. ; and the Delaware 6443 sq. m. The Susquehanna is a wide and shallow stream with a zigzag course and numerous islands, but both the Susquehanna and the Delaware, together with their principal tributaries, flow for the most part transverse to the geological structure, and in the gorges and water-gaps through which they pass ridges in the mountain region, is some of the most picturesque scenery in the state; a number of these gorges, too, have been of great economic importance as passages for railways. The lower portion of the Delaware river has been entered by the sea as the result of the depression of the land, giving a harbour, at the head of which developed the city of Philadelphia. The present course of the Upper Allegheny river is the result of the glacier which blocked the northward drainage of the region through which it flows and turned it southward. The Monongahela is an older stream, but like the Allegheny, it meanders much, and both rivers flow in deeply intrenched valleys. The few small lakes of the state are mostly on the Pocono plateau, where they were formed by glaciation; here, too, are some streams with picturesque cascades.

Fauna. — Under the protection of a game commission which was created in 1895, of some game preserves which have been established by this commission, and of various laws affecting wild animals and birds, the numbers of Virginia deer, black bear, rabbits, ruffed grouse, quail and wild turkeys have increased until in some of the wilder sections they are quite plentiful, while the numbers of weasels, minks, lynx and foxes have been diminished. Squirrels, racoons, woodchucks and skunks are common, and musk-rats, porcupines and opossums are found in some sections. Two species of venomous snakes — the rattlesnake and the copper-head — occur in the sparsely settled regions. The avifauna include — among the birds of prey — the red-shouldered hawk, red-tailed hawk, marsh hawk, Cooper's hawk, sharp-shinned hawk and sparrow hawk ; the great horned owl, the barn owl and the screech owl ; and bald eagles are not uncommon in the mountainous regions along the larger rivers. The " turkey-buzzard " — turkey-vulture — (very valuable as a scavenger) is seen occasionally, especially in the south and south-west. The game birds include the ruffed grouse, quail and English pheasant (which have increased rapidly under protection), besides woodcock, snipe, many

species of ducks and a few Canada geese. The song and insectivorous birds — thrushes, flycatchers, vireos and woodpeckers — of this latitude, are well represented, and the high plateaus (particu- larly the Pocono plateau) have especial ornithological interest as the tarrying-places, during the migratory seasons, of many species of birds whose natural breeding ground is much farther north. Perch, sunfish, trout, bass, pike and pickerel abound in many of the streams. Yellow perch are especially plentiful in the lakes on the Pocono plateau. Pike-perch and a few blue pike are taken in the Susque- hanna, where shad are no longer plentiful since work was begun on McCall's Ferry dam, and in 1908 the entire catch for the river was valued at about $20,000, but in the Delaware there are valuable shad?and herring fisheries. The blue pike, whitefish and herring, obtained on Lake Erie are of. considerable commercial importance. In 1908 the total catch on Lake Erie was valued at $200,860, the principal items being herring ($90,108), blue pike ($13,657) and whitefish ($31,580). The catch of herring was twice as much in 1908 as in 1907 and that of whitefish nearly four times as much in 1908 as in 1907; this increase was attributed to the work of the state hatcheries. There were eight hatcheries in 1910 and the number of fish distributed from these during 1908 was about 662,000,000; they consisted chiefly of pickerel, yellow perch, wall- eyed pike, white fish, herring, blue pike, trout and shad.

Flora. — Except on some portions of the Pocono plateau, Penn- sylvania was originally well forested, and, although most of the merchantable timber has been cut, about one-half of the state is still woodland. On the higher elevations the trees are mostly white pine, yellow pine and hemlock, but in the valleys and lower levels are oaks, hickories, maples, elms, birches, locusts, willows, spruces, gums, buckeyes, the chestnut, black walnut, butternut, cedar, ash, linden, poplar, buttonwood, hornbeam, holly, catalpa, magnolia, tulip-tree, Kentucky coffee-tree, sassafras, wild cherry, pawpaw, crab-apple and other species. The flora is most varied in the Susquehanna Valley below Harrisburg, and on Presque Isle are some plants peculiar to the Lake region. The state has forest reserves (918,000 acres in 1910) in 26 counties, the largest areas being in Potter, Clinton, Center, Cameron, Lycoming, Hunting- don, Union and Mifflin counties; and there is an efficient department of forestry under a state commissioner of forestry. A state forest academy (the only one in the United States) is at Mont Alto, where there is one of the three state nurseries; its first class gradu- ated in 1906. In 1909 the state legislature passed an act authorizing any city, borough or township of the first class to acquire, subject to the approval of the commissioner of forestry, a municipal

forest; and it authorized the distribution of seedling forest trees, at cost, to those who would plant and protect them, for growing private forests.

Climate. — The temperature is quite mild and equable in the south-east province where the ocean influences it and where the mountains bounding it on the north and north-west are some protection from the colder winds. The crests of the higher ridges in the central province are delightfully cool in summer, but the

adjacent valleys are subject to excessive heat in summer and severe cold in winter. The mean annual temperature decreases to the north-westward on the Alleghany plateau, but on the Erie plain, in the extreme north-west, Lake Erie exerts its moderating influence, the mean temperature rises, and extremes shorten. The mean annual temperature in the south-east province is about 52 ° F. ; it decreases to 50 ° in the central province and to 47 ° or less in some of the north-west counties of the Alleghany plateau, but rises to 49° on the shore of Lake Erie. At Philadelphia the mean tempera- ture in winter (December, January and February) is 34°, the mean temperature in summer (June, July and August) is 74 °, and the range of extremes here for a long period of years ending with 1907 was within 103 ° and 6°. At Huntingdon, Huntingdon county, in the Juniata Valley, the winter mean is 30°, the summer mean 71 °, and within the period from 1888 to 1907 extremes ranged from 104 to 23 . The summer maxima on the mountains are usually 8° to io° less than in the valleys directly below them; Saegerstown, Crawford county, is nearly 30 m. south of Erie, on Lake Erie, and yet the winter mean is 28 ° at Erie and only 25 ° at Saegerstown, and the lowest temperature on record for Erie is -16° while for Saegerstown it is -27°. During the period from 1875 to 1905 inclusive, extremes within the state ranged from 107° at York, York county, in July 1901, to -42 ° at Smithport, McKean county, in January 1904. July is the warmest month in all parts of the state. January is the coldest in some and February in others. The average annual rainfall is 44 in. It is 50 in. or more in some regions along the south-east border of the mountain district or farther south-east where the rains are occasionally heavy, and it is less than 40 in. in some of the north-east and south-west counties. The amount of rainfall during the summer is about 3 in. more than that during either autumn or winter and 2 in. more than that during spring. In the mountain region and in the vicinity of Lake Erie there is often a fall of several inches of snow during the winter months and the rapid melting of this produces floods on the Dela- ware, Susquehanna and Ohio rivers and some of their tributaries. The prevailing winds are westerly, but they are frequently interrupted by warm breezes from

the south, or moisture-bearing currents from the east. -1

Soils. — The most productive soil is that in the south-east section of the Great Valley and in Chester Valley where it is derived largely from limestone. There is some of the same formation as well as that derived from red shales on the sandstone hills in the south-east province and in many of the middle and western valleys, but often a belt of inferior slate soil adjoins a limestone belt, and many of the ridges are covered with a still more sterile soil derived from white and grey sandstones. The north-west and north-east sections contain some glacial drift but the soil in these parts is not suitable for cultivation except in the larger valleys in the north-west where it is drained by glacial gravel or there is some sandy loam mixed with clay.

Agriculture. — Pennsylvania is noted for its mineral wealth and manufactures rather than for its agricultural resources, but in 1900 about two-thirds of its land was included in farms, a little more than two-thirds of its farm-land was improved, and in several crops the state has long ranked high. The number of farms in- creased from 127,577 in 1850 to 224,248 in 1900, the increase resulting in part from a reduction of their size but more largely from the appropriation of new lands for farming purposes. The average size in 1900 was 86-4 acres. Nearly 60% of them con- tained less than 100 acres and only about 2-7% contained 260 acres or more. More than seven-tenths (160,105) were worked by owners or part owners, and only 34,529 by share tenants, and 2 3.737 by cash tenants. Hay, Indian corn, wheat, oats, potatoes, fruits, vegetables and tobacco are the principal crops. Of the total crop acreage in 1899 nearly two-fifths was devoted to hay and forage, and the value of the hay crop in 1909 ‘ (when the crop was 3,742,000 tons, valued at $54,633,000) was greater than that of any other state in the Union except New York. Hay is grown in largest quantities in the north, and in the section south-east of Blue Mountain. More than one-half of the crop acreage in 1899 was devoted to cereals, and of the total cereal acreage 32 % was of wheat, 31-2% was of Indian corn, 24-8% was of oats, 6-5% was of rye, and 5-3 % was of buckwheat. The product of Indian corn was 48,800,000 bushels in 1909; of wheat 26,265,000 bushels; of oats 25,948,000 bushels; of barley 196,000 bushels; of rye 5,508,000 bushels; and of buckwheat 5,665,000 bushels.

Indian corn, wheat and rye, are cultivated most extensively in the south-east counties. Some of the larger oat-producing counties also are in the south-east, but most of the buckwheat, barley and oats are grown in the north and west counties. The dairy business, for which much of the hay crop is needed, has grown with the growth of the

urban population as is shown in part by a steady increase in the number of dairy cows from 530,224_ in 1850 to 1,140,000 in 1910; the value of the dairy products in 1899 ($35,860,110) was exceeded only in New York. The number of other cattle has fluctuated somewhat, but there were 917,000 in 1910 as against 623,722 in 1850. Horses increased in number

1 Statistics for 1909 and 19 10 are from the Year Book of the United States Department of Agriculture.

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from 350,398 in 1850 to 619,000 in 1910. The number of mules increased steadily from 2259 in 1850 to 43,000 in 1910. The raising of sheep and swine was of considerably less relative impor- tance in 1910 than in 1850, there being 1,882,357 sheep and 1,040,366 swine in 1850 and 1,112,000 sheep and 931,000 swine in 1910. The dairy business is largest in the regions around Philadelphia and Pittsburg, and in Erie and Bradford counties. Cattle other than dairy cows as well as horses and sheep are most numerous in the western counties, in Bradford county on the north border, and in some of the counties of the south-east. Swine are mort numerous in the south-east and south-west counties. The state ranks high in the production of potatoes, cabbages, lettuce and turnips, and it produces large crops of sweet Indian corn, tomatoes, cucumbers, musk-melons, asparagus and celery. The total value of all vegetables produced in 1899 was $15,832,904, an amount exceeding that of any other state except New York. A large portion of the vegetables are grown in the vicinity of Philadelphia or in the vicinity of Pitts- burg. The culture of tobacco, which was introduced as early as 1689, was a small industry until the middle of the 19th century, but it then developed rapidly except during a brief interruption caused by the Mexican War. In 1909 the crop was 30,732,000 lb. More than two-thirds of the state's crop of 1899 was produced in Lancaster county, which is one of the largest tobacco-producing counties in the United States, and most of the other third was produced in York, Tioga, Bradford and Clinton counties. Apples, cherries and pears are the principal orchard fruits. Grapes,

peaches, plums and prunes, apricots, strawberries, raspberries and logan- berries, blackberries and dewberries, currants and gooseberries are also grown. Orchard fruits are most abundant south-east of Blue Mountain, and small fruits near the larger cities, but about two-thirds of the grapes are grown in Erie county. Flori- culture is an important industry in Philadelphia and its vicinity. The sale of nursery products, more than one-half of which were grown in Chester and Montgomery counties, amounted in 1899 to $541,032, and although this was less than one-third that of New York it was exceeded in only three other states.

Minerals. — Pennsylvania is by far the most important coal-producing state in the Union, and as much of the iron ore of the Lake Superior region is brought to its great bituminous coal-field for rendering into pig-iron, the value of the state's mineral products constitutes a large fraction of the total value for the entire country; in 1907, when the value of the mineral products of the state was $657,783,345, or nearly one-third that of all the United States, and in 1908 when the total for the state was $473,083,212, or more than one-fourth that of the whole United States, more than four- fifths of it was represented by coal and pig-iron. With the ex- ception of two small areas in Colorado and New Mexico, Penn- sylvania contains the only anthracite-coal region in the country. This is in the east of the state, and although it has a total area of about 3300 sq. m., its workable measures are mostly in Lacka- wanna, Luzerne, Carbon, Schuylkill and Northumberland counties in an area of less than 500 sq. m. This coal was discovered as early as 1762 near the site of the present city of Wilkes- Barre and during the War of Independence it was used at Carlisle in the manu- facture of war materials, but it was of little commercial importance until early in the next century. In 18 15 the output was reported as only 50 tons, but it steadily rose to 74,347,102 tons (valued at $158,178,849) in 1908. Besides having practically all the anthracite, Pennsylvania has the thickest bituminous coal-measures, and most of the coal obtained from these is of the best quality. They form the northern extremity of the great Appalachian coal-field and under- lie an area of 15,000 sq. m. or more in the west of the state. The Pittsburg district, comprising the counties of Allegheny, Washing- ton, Fayette and Westmoreland, is exceptionally productive, and the coal in Allegheny and Washington counties is noted for its gas-producing qualities, while in Fayette and Westmoreland counties is obtained the famous Connellsville coking coal. The bituminous coal was first used at nearly the same time as the anthracite and it was first shipped from Pittsburg in 1803. In 1840 the state's output was 464,826 tons. It increased to 1,000,000 tons in 1

850, to 1 1,760,000 tons in 1875, to 79,842,326 tons in 1900, to 150,143,177 tons in 1907; and was 117,179,527 tons in 1908, when it was 35-2 % of that of the entire country and was valued at $118,816,303. In 1880 the output of coal (anthracite and bituminous) in Penn- sylvania was_ 66% of that of the entire country; in 1908 it was 48-2%; but in the latter year the Pennsylvania mines produced more coal thtn the combined production of all the countries of the world excepting Great Britain, Germany and Austria-Hungary, and it was nearly four times as much as the total mined in Austria, nearly five times as much as that mined in France, and seven times as much as the output of Russia in that year. Extending from the south-west corner of the state through Greene, Washington, Alle- gheny, Beaver, Butler, Venango, Clarion, Forest, Elk, Warren, McKean and Tioga counties is the Pennsylvania section of the Appalachian oil-field which, with the small section in New York, furnished nearly all of the country's supply of petroleum for some years following the discovery of its value for illuminating purposes. The mineral was made known to white men by the Indians, who sold it, under the name of Seneca oil, as a cure for various ills, and burned it at some of their ceremonies. The early settlers in

west Pennsylvania also found that some unknown people had dug pits several feet in depth around the oil springs apparently for the purpose of collecting the oil. But it was not until the middle of the 19th century that its value as an illuminating oil became known and not until 1859 was the first petroleum well drilled. Thd was the Drake well, on the flats of Oil Creek at Titusville; it was about 70 ft. in depth, and when 25 barrels were pumped from it in a day its production was considered enormous. By the close of 1 861 wells had been drilled from which 2000 to 3000 barrels flowed in a day without pumping, and the state's yearly output continued to increase until 1891, when it amounted to 31,424,206 barrels. Since then, however, wells have been going dry, and when, in 1895, the output fell to 19,144,390 barrels it was exceeded by that of Ohio. It went down quite steadily to 9,424,325 in 1908, and in that year Pennsylvania was out-ranked as an oil-producing state by Oklahoma, California, Illinois, Texas and Ohio. In drilling for some of the first oil wells gas escaped, and in a few instances this was used as a fuel for generating steam in the boilers of the drilling-engines. In some instances, too, wells which were drilled for oil produced only gas. A little later, about 1868, successful experiments were made with gas as a manufacturing fuel, and in 1872 the gas industry was fairly well established near Titusville by drilling a well and piping the gas for consumption both as fuel and light. The value of the state's output increased from approxi- mately

$75,000 in 1882 to approximately $19,282,000 in 1888, and the total value of its output during these and the intervening years was more than 80% that of all the United States. The industry then became of greater importance in several other states and declined in Pennsylvania until in 1896 the value of Penn- sylvania's product amounted to only $5,528,610, or 42-5% of that of the United States. This temporary decline was, however, followed by a rather steady rise and in 1908 the output was valued at $19,104,944, which was still far in excess of that of any other state and nearly 35% of that of the entire country. The gas region has an area of about 15,000 sq. m. and embraces about all of the Pennsylvania section of the Alleghany plateau except a narrow belt along its east and south-east border. There are de- posits of various kinds of iron ore in the eastern, south-eastern, . middle and some of the western counties, and from the middle of the 18th century until near the close of the 19th Pennsylvania ranked high among the iron-ore-producing states. As late as 1880 it ranked first, with a product amounting to 1,951,496 long tons. But the state's iron foundries moved rapidly westward after the first successful, experiments in making pig-iron with bituminous coal, in 1845, and the discovery, a few years later, that rich ore could be obtained there at less cost from the Lake Superior region resulted in a decline of iron-mining within the state until, in 1902, the product amounted to only 822,932 long tons, 72-2 % of which was magnetite ore from the Cornwall mines in Lebanon county which have been among the largest producers of this kind of ore since the erection of the Cornwall furnace in 1742. In 1908 the entire iron-ore product of the state, amounting to 443,161 long tons, was not I -3 % of that of the United States, but the production of the magnetite-ore alone (343,998 long tons) was more than one- fifth that of all the United States. In the manufacture of pig-iron Pennsylvania is easily first among the states, with a product value in 1908 of $111,385,000, nearly 43-8% of that of the entire country. Pennsylvania has extensive areas of limestone rock suitable for making cement, and in Northampton and Lehigh counties enormous quantities of it are used in this industry. Natural-rock cement was first made in the state soon after the discovery, in 1 83 1, of deposits of cement rock near Williamsport, Lycoming county, and the in- dustry was greatly promoted in 1850 when the vast deposits in the lower Lehigh Valley were discovered and large quantities of cement were required in the rebuilding of the Lehigh Canal. Com- petition produced in Lehigh county the first successful Portland cement plant in the United States in 1870. The output of the natural-rock cement continued greater than that of the Portland until 1896, but for the succeeding ten years the enormous development of the cement industry was almost entirely in

the Portland branch, its production in the state increasing from 825,054 barrels in 1896 to 8,770,454 barrels in 1902, and to 18,254,806 barrels (valued at $13,899,807) in 1908, when it was more than 30% of that of the United States. The production of natural-rock cement was 608,000 barrels in 1896 and only 252,479 barrels (valued at $87,192) in 1908. Limestones and dolomites suitable for building purposes are obtained chiefly in Montgomery, Chester and Lancaster counties, and even these are generally rejected for ornamental work on account of their colour, which is usually bluish, grey or mottled. However until increased facilities of transport brought more desirable stones into competition they were used extensively in Philadelphia and with them the main building of Girard College and the United States Naval Asylum were erected and the long rows of red-brick residences were trimmed. There are limestone quarries in nearly two-thirds of the counties and great quantities of the stone are used for flux in the iron furnaces, for making quicklime, for railway ballast and for road making. The total value of the limestone output in 1908 amounted to $4,057,471, and the total value of all stone quarried was $6,371,152. In Dauphin county is a quarry of bluish-brown Triassic sandstone that has been used extensively

especially in Philadelphia, for the erection of the so-called brown stone fronts. On the Pocono plateau is a large deposit of a fine-grained dark-blue stone of the Devonian formation which is known as the Wyoming Valley stone, and, like the New York ” bluestone,” which it closely resembles, is much used for window and door trimmings, steps and nagging. Several of the western counties contain Carboniferous or sub-Carboniferous sandstones that are used locally for building and for various other purposes. In 1908 the value of Pennsylvania sandstone and bluestone was $1,368,784. Northampton, Lehigh and York counties contain the most productive slate quarries in the country, and in 1908 the value of their output was $3,902,958; the Northampton and Lehigh slate is the only kind in the United States used for school blackboards. There is an extensive area in the south-east part of the state containing shale clay of a superior quality for making common brick. Kaolin abounds in Chester and Delaware counties, and fire-clay in several of the western counties. In 1908 the state ranked first in the value of its output of brick and tile ($18,981,743), which was 14-74 % of the entire product of the United States, and was second only to Ohio in the total value of its clay products ($14,842,982), which was 11-14% ˚f that for the entire

country. Glass sand abounds both in the eastern and in the western sections and for many years Pennsylvania has used this more extensively in the manufacture of glass than any other state. Deposits of crystalline graphite are found in Chester and Berks counties. In Chester county, also, is one of the most productive deposits of feldspar, second in impor- tance only to those of Maine. Soapstone is quarried in Montgomery and Northampton counties, phosphate rock, in Juniata county; rocks from which mineral paints are made, in several counties, and there is some garnet in Delaware county.

Manufactures. — The state ranks second to New York in the value of its manufactures, which increased from $155,044,910 in 1850 to $1,955,551,332 (factory products alone) in 1905, a growth which has been promoted by an abundance of fuel, by a good port on the Atlantic seaboard, by a network of canals which in the early years was of much importance in connecting the port with the Mississippi river system, by its frontage on Lake Erie which makes the ores of the Lake Superior region easily accessible, and by a great railway system which has been built to meet the demands arising from the natural resources. By far the most important industry is the production of iron and steel. The manufacture of iron was es- tablished on a commercial basis in 1716-1718, when a furnace was built on Manatawney Creek above Pottstown, and before the close of the colonial era Pennsylvania had risen to first rank among the iron-producing colonies, a position which it has always held among the states of the Union. So long as charcoal only was used in the furnaces (until about 1840) and during the brief period in which this was replaced largely by anthracite, the industry was of chief importance in the eastern section, but with the gradual increase in the use of bituminous coal, or of coke made from it, the industry moved westward, where, especially in the Pittsburg district, it received a new impetus by the introduction of iron ore from the Lake Superior region. The value of the output of iron and steel increased from $264,571,624 in 1890 to $471,228,844 in 1905, and the state furnished 46-5 % of the pig-iron and 54 % of the steel and malleable iron produced in the entire country. The manu- facture of great quantities of coke has resulted from the demand for this product in the iron and steel industry and from the abun- dance of coking coal ; the manufacture of glass has been promoted by the supply of glass sand and natural gas in the west of the state ; the manufacture of leather by the abundance of hemlock bark; the manufacture of pottery, terra-cotta and fire-clay products by the abundance of raw material; the manufacture of silk and silk goods by the large number of women and girls who came into the state in families of which the men and boys were employed in mining and picking anthracite coal;

and in each of these industries as well as in a few others the state has for many years produced a large portion of the country's product.

In 1905 the twelve leading manufactures, with the value of each, were: steel and malleable iron, $363,773,577; foundry and machine-shop products, consisting most largely of steam locomotives, metal-working machinery and pumping machinery, $119,650,913; pig- iron, $107,455,267; leather, $69,427,852; railway cars and repairs by steam railway companies, $61,021,374; refined petroleum, $47,459,502; silk and silk goods, $39,333,520; tobacco, cigars and cigarettes, $39,079,122; flour and grist-mill products, $38,518,702; refined sugar and molasses, $37,182,504; worsted goods, $35,683,015; and malt liquors, $34,863,823. The most marked advances from 1900 to 1905 were in worsted goods (61-4 %) structural iron-work (60 0/ o), and tin and terne-plate (54-4 %). Philadelphia is the great manufacturing centre. Within its limits, in 1905, all the sugar and molasses were manufactured and much of the petroleum was refined, nearly all of the iron and steel ships and steam loco- motives were built, and 93 % of the carpets and rugs were made, and the total value of the manufactures of this city in that year was nearly one-third of that for the entire state. Nearly 20 % of the iron and steel was produced by Pittsburg together with Alle- gheny ,with which it has since been consolidated, and the production of these is the leading industry of New Castle, Johnstown, Duquesne, McKeesport, Sharon, Braddock and Dubois, also in the west part of

the state and of Reading, Harrisburg, Steelton, South Bethlehem, Pottstown, Lebanon, Phoenixville and Danville in the east part. The silk and cement industries are confined largely to the eastern cities and boroughs; the coke, tin and terne-plate, and pickling industries to the western; and the construction and repair of rail- way cars to Altoona, Meadville, Dunmore, and repair of railway cars to Altoona, Meadville, Dunmore, Chambersburg, Butler and Philadelphia.

Transport and Commerce. — The new road cut through the Juniata region in the march of the army of Brigadier-General John Forbes, against Fort Duquesne in 1758, was a result of the influence of Pennsylvania, for it was considered even then a matter of great importance to the future prosperity of the province that its seaport, Philadelphia, be connected with navigation on the Ohio by the easiest line of communication that could be had wholly within its limits. As early as 1762 David Rittenhouse and others made a survey for a canal to connect the Schuylkill and the Susquehanna rivers, and in 1791 a committee of the state legislature reported in favour of a project for establishing communication by canals and river improvement from

Philadelphia to Lake Erie by way of the Susquehanna river. Before anything was done, the need of improved means of transportation between Philadelphia and the anthracite coal-fields became. the more pressing. The Schuylkill Canal Company, chartered in 1815, began the construction of a canal along the Schuylkill river from Philadelphia to Mount Carbon, Schuylkill county, in 1816, and completed it in 1826. In 1818 the Lehigh Navigation Company was formed to improve the naviga- tion of the Lehigh river from its confluence with the Delaware to Coalport, and two years later coal was successfully carried down the Lehigh and Delaware rivers to Philadelphia in ” arks ” or rectangular boxes, two or more of which were joined together and steered by a long oar. So prosperous was the business that in 1827-1829 the company built a number of locks which made the Lehigh navigable in either direction, and in 1827-1832 the state did the same for the Delaware between the mouth of the Lehigh and Bristol. , The Union Canal Company, incorporated in 181 1, completed a canal from Middletown on the Susquehanna to Reading on the Schuylkill in 1827. In 1824 the state legislature authorized the appointment of a commission to explore routes from the Schuyl- kill to Pittsburg, and from the West Branch of the Susquehanna to the Allegheny, and in the three or four succeeding yerrs the state committed itself to a very extensive system of internal improvements. Work was begun on the system in 1826 and was continued without interruption until 1840, when the completed or nearly completed portions embraced a railway from Philadelphia to Columbia on the Susquehanna, a canal up the Susquehanna and the Juniata from Columbia to Hollidaysburg, a portage railway from Hollidaysburg through Blair’s Gap in the Alleghany Front to Johnstown on the Conemaugh river, a canal down the Conemaugh, Kiskiminetas, and Allegheny rivers to Pittsburg, a canal up the Susquehanna and its west branch from the mouth of the Juniata to Farrandsville, in Clinton county, a canal up the Susquehanna and its north branch from Northumberland nearly to the New York border, and a canal up the Delaware river from Bristol to the mouth of the Lehigh ; considerable work had also been done on two canals to connect the Ohio river with Lake Erie. Work was stopped, in 1840, before the system was completed because of the intense popular discontent arising from the burden of debt which had been assumed and because the success of competing railways was then fully assured. In 1845 the state began to sell its canals and railways to private corporations and the sale was completed in 1859. The western division of the system was abandoned by the new owners in 1865 and the worked portion of the east division gradually decreased until it, too, was wholly abandoned in 1904, with the exception of the Delaware Division Canal, which since

1866 has been worked by the Lehigh Coal & Navigation Company in connexion with the Lehigh Canal. In its natural condition there were bars in the Delaware river below Philadelphia which obstructed the navigation of vessels drawing more than 17-20 ft. of water, but in 1899 the Federal government adopted a project for obtaining a channel having a minimum depth of 30 ft. The Federal govern- ment has much improved the navigation of the Monongahela and Allegheny rivers and is committed to a project for slack-water navigation on the Ohio which is expected to give Pittsburg com- munication with the sea by vessels drawing 9 ft. of water.

The first railway in the state was that built in 1827 by the Lehigh Coal & Navigation Company from Mauch Chunk to its mines, 9 m. distant; but this was only a gravity road down which cars loaded with coal descended by their own gravity and up which the empty cars were drawn by mules. In 1823 a company was incor- porated to build a railway from Philadelphia to Columbia, but nothing further was done until 1828, when the state canal com- missioners were directed to build this road and the Allegheny Portage railway from Hollidaysburg to Johnstown. The latter was built with ten inclined planes, five on each side of the summit at Blair's Gap and cars were drawn up these by stationary engines. Both the Philadelphia & Columbia and the Allegheny Portage railways were completed in 1834. From these and other begin- nings the state's railway mileage gradually increased to 1240 m. in 1850. to 4656 m. in 1870, to 8639 m. in 1890 and to 11,373 m. at

the end of 1908, when it was exceeded by only two states in the Union, Texas and Illinois. The principal railways are the lines operated by the Pennsylvania Railroad Company from New York to Washington through Philadelphia; from Philadelphia to Cincin- nati, Cleveland, Chicago and St Louis through Harrisburg and Pittsburg; from Baltimore, Maryland, to Sodus Point on Lake Ontario (Northern Central) through Harrisburg and Williamsport ; from Williamsport to Buffalo and to Erie, and from Pittsburg to Buffalo; the Philadelphia & Reading; the Lehigh Valley; the Erie; the Delaware, Lackawanna & Western; the Baltimore & Ohio; and the Buffalo, Pvochester & Pittsburg.

The state has one port of entry along the Atlantic coast, one on the Ohio river, and one on the Great Lakes. Philadelphia, the Atlantic

port, exports chiefly petroleum, coal, grain and flour, and imports chiefly iron ore, sugar, drugs and chemicals, manufactured iron, hemp, jute and flax. In 1909 the value of its exports, $80,650,274, was greater than that of any other Atlantic port except New York, and the value of its imports, $78,003,464, was greater than that of any except New York and Boston. Pittsburg ranks high among the interior ports of the country in foreign commerce and first among the cities of the United States in the tonnage of its domestic commerce. Erie is quite unimportant among the lake ports in foreign commerce, but has a large domestic trade in iron ore, copper, wheat and flour.

Population. — The population of Pennsylvania was 434,373 in 1790; 602,365 in 1800; 810,091 in 1810; 1,049,458 in 1820; 1,348,233 in l8 3°; i,7 2 4,o33 in 1840; 2,311,786 in 1850; 2,906,215 in i860; 3,521,951 in 1870; 4,282,891 in 1880; 5,258,014 in 1890; 6,302,115 in 1900; 7,665,111 in 1910. Of the total in 1900, 985,250, or 15-6%, were foreign-born, 156,845 were negroes, 1639 were Indians, 1927 were Chinese and 40 were Japanese. Nearly 95% of the foreign-born was composed of natives of Germany (212,453), Ireland (205,909), Great Britain (180,670), Poland (76,358), Austria (67,492), Italy (66,655), Russia (5°>959)> Hungary (47,393) and Sweden (24,130). Of the native popula- tion (5,316,865) 90-7% were born within the state and a little more than two-fifths of the remainder were natives of New York, Maryland, Ohio, New Jersey, Virginia, New England, Delaware and West Virginia. Almost two-thirds of the Indians were in Cumberland county where, at Carlisle, is a United States Indian Industrial School. In 1906 the total number of communicants of different religious denominations in the state was 2,977,022, of whom 1,717,037 were Protestants and 1,214,734 ‘ were Roman Catholics. There is a large number of the smaller religious sects in the state; the principal denominations, with the number of communicants of each in 1906, are: Metho- dist (363,443), Lutheran (33 5,643) ,_ Presbyterian (322,542), Reformed Church (177,270), Baptist (141,694), Protestant Episcopalian (99,021), United Brethren (55,574), United Evan- gelical Church (45,480), Disciples of Christ (26,458), German Baptist Brethren (23,176), Eastern Orthodox Churches (22,123), Mennonites (16,527), Congregational (14,811), Evangelical Asso- ciation (13,294), Friends (12,457), Church of God or ” Winne- brennerians ” (11,157), and Moravian (5322).

Of the total population in 1900, 3,223,337, or 51- 1 , were urban (i.e. in places having a population of 4000 or more), 762,846, or 12-15, were semi-urban (i.e. in incorporated places having a population less than 4000) and 2,315,932, or 36-75%, were rural (i.e. outside of the incorporated places). From 1890 to 1900 the urban population

increased 854,730, or 36%, and the semi-urban 134,077, or 18-4%, but the rural increased only 55,195, or 2-4%. The populations of the principal cities in 1900 were as follows: Philadelphia, 1,293,697; Pittsburg, 321,616; Allegheny, 129,896 (subsequently annexed to Pittsburg); Scranton, 102,026; Reading, 78,961; Erie, 52,733; Wilkes-B a rre, 51,721; Harrisburg, 50,167; Lancaster, 41,459; Altoona, 38,973 ; Johnstown, 35,936; Allentown, 35,416; McKeesport, 34,227; Chester, 33,988; York, 33,708; Williamsport, 28,757; New Castle, 28,339; Easton, 25,238; Norristown, 22,265; Shenandoah, 20,321 ; Shamokin (borough), 18,202; Lebanon, 17,628.

Administration. — Pennsylvania has been governed' under constitutions of 1776, 1790 and 1838 ; the present government is under the constitution of the 16th of December 1873 with amendments adopted on the 5th of November 1901. An amendment to the constitution to be adopted must be approved by a majority of the members elected to each house of the general assembly in two successive legislatures and then, at least three months after the second approval of the general assembly, by a majority of the popular vote cast on the adoption of the amendment. All male citizens over 21 years of age,

who have been citizens of the United States for one month, residents of the state for one year and of the election district for two months immediately preceding the election, have the right of suffrage, provided they have paid within two years a state or county tax, which shall have been assessed at least two months and paid at least one month before the election. The Australian or " Massachusetts " ballot, adopted in 1891 under a law which fails to require personal registration, by a provision like that in Nebraska makes it easy to vote a straight ticket; party names are arranged on the ballot according to the number of votes secured by each party at the last preceding election.

Executive. — The office of governor, superseded in 1776 by a president and council of twelve, was restored in 1790. Under the present constitution the governor serves for four years and is ineligible for the next succeeding term. The governor and lieutenant-governor must be at least 30 years old, citizens of the United States, and inhabitants of the state for seven years last preceding election; no member of Congress or person holding any office under the United States or Pennsylvania may be governor or lieutenant- governor. The governor controls a large amount of patronage, appointing, subject to the advice and consent of two-thirds of the senate, a secretary of the commonwealth and an attorney-general during pleasure, and a

superintendent of public instruction for four years, and may fill vacancies in various offices which occur during the recess of the senate. He has a right of veto, extending to items in appropriation bills, which may be overridden by a two-thirds vote in each house. His power of pardon is limited, being subject to the recommendation of three members of a board which consists of the lieutenant-governor, secretary of the commonwealth, attorney- general and secretary of internal affairs. The other executive officials are the lieutenant-governor and the secretary of internal affairs, elected for four years, the auditor-general, elected for three years, the treasurer, elected for two years, and (all appointed by the governor) the secretary of the commonwealth, the attorney-general and a superintendent of public instruction. All those chosen by election are ineligible for a second consecutive term except the secretary of internal affairs. The department of internal affairs consists of six bureaus: the land office, vital statistics, weather service, assessments, industrial statistics, and railroads, canals, telegraphs and telephones. There are also many statutory admini- strative officials and boards, such as the adjutant-general, insurance commissioner, board of health, board of agriculture, board of public grounds and buildings, commissioners of fisheries, and factory and mining inspectors.

Legislature. — During the colonial period and the early years of statehood the legislature was composed of one house, but the bicameral system was adopted in the constitution of 1790. There are fifty senators, elected for four years, and approximately two hundred representatives, elected for two years. Senators must be at least 25 years old, citizens and inhabitants of the state for four years next before election and inhabitants of the senatorial districts from which each is elected for one year next before election; representatives must be at least 21 years old and must have lived in the state three years and in the district from which, elected one year next before election. To avoid the possibility of metropolitan domination provision is made that no city or county shall be entitled to more than one-sixth of the total number of senators. Sessions are biennial. The powers of the two houses are the same except that the senate exercises the usual right of confirming appointments and of sitting as a court of impeachment, while the House of Repre- sentatives initiates money bills and impeachment cases. • Judiciary. — The supreme court consists of seven judges elected by the voters of the state at large. Minority representation is. secured by the provision that each elector shall vote for one less than the number of judges to be chosen at each election. The state is divided into three supreme judicial districts, the eastern, the middle and the western. This court was formerly very much

overworked, but it was relieved by an act of the 24th of June 1895 establishing a superior court (now of seven judges) with appellate jurisdiction. There were in 1910 fifty-six district courts of common pleas, one for each county of forty thousand inhabitants and not more than four counties in a district. The judges of the common pleas are also judges of the courts of oyer and terminer, quarter sessions of the peace and general gaol delivery, and the orphans' courts, although there are separate orphans' courts in the counties (ten in 1909) having a population of more than one hundred and fifty thousand. Justices of the peace are elected in wards, districts, boroughs and townships. In the colonial period all judges were appointed by the governor during good behaviour. The constitution of 1776 provided for terms of seven years, that of 1790 restored the life term, and that of 1838 fixed the terms for judges of the common pleas at ten years and judges of the supreme court at fifteen. A constitutional amend- ment of 1850 provided that all judges should be elected by the people. 1

1 The constitution of 1873 made provision for minority represen- 1 tation as follows: " Whenever two judges of the supreme court are

At present supreme court judges serve for twenty-one years and are ineligible for re-election. Superior court and common pleas judges serve for ten years, and justices of the peace for five. Judges may be impeached for misdemeanour in office or they may be removed by the governor, with the consent of two-thirds of each house of the general assembly, for any reasonable cause which shall not be sufficient ground for impeachment.

Local Government. — The local government is a combination of the county system of the South and the township system of New England. The county officers are sheriffs, coroners, prothonotaries, registers of wills, recorders of deeds, commissioners, treasurers, surveyors, auditors or comptrollers, clerks of the courts, and district attorneys, elected for three years. The three commissioners and the three auditors in each county are chosen by the same limited vote process as the supreme-court judges, thus allowing a representation to the minority party. Pennsylvania has suffered more perhaps than any other state in the Union from legislative interference in local affairs. Under an act of the general assembly passed in 1870 the people of Philadelphia were forced to contribute more than $20,000,000 for the construction of a city-hall. To guard against such encroachments in

the future the constitution of 1873 imposed the most detailed limitations upon special legislation. The object of the provision, however, has been in a large measure nullified by the system of city classification, under which Philadelphia is the only city of the first class. The passage of the " Ripper Bill " of 1901 shows that the cities of the second class are by no means secure. The apparent object of the measure was to deprive the people of Pittsburg temporarily of the privileges of self-government by empowering the governor to appoint a recorder (in 1903 the title of mayor was again assumed) to exercise (until 1903, when the muni- cipal executive should be again chosen by the people) the functions of the mayor, thus removed by the governor under this statute; and this act applied to the other cities of the second class, Allegheny and Scranton, although they had not offended the party managers.

Miscellaneous Laws. — A woman's right to hold, manage and acquire property in her own right is not affected by marriage, but for a married woman to mortgage or convey her real estate the joint action of herself and her husband is necessary. _ The rights of dower and courtesy both obtain. When a husband dies intestate leaving a widow and issue, the widow has the use of one-third of his real estate for life and one-third of his personal estate abso- lutely ; if he leaves no issue but there be collateral heirs or other kindred, the widow has the real or personal estate or both to the value of $5000, the use of one-half the remaining real estate for life, and one-half the remaining personal estate absolutely; if the husband leaves a will the widow has the choice between her dower right and the terms of the will. When a wife dies intestate leaving a husband and issue the husband has the use of all her real estate for life, and the personal estate is divided among the husband and children share and share alike; if there be no issue the husband has the use of all her real estate for life and all her personal estate absolutely; if the wife leaves a will the husband has the choice between its terms and his right by courtesy. Whenever there is neither issue nor kindred the surviving husband or wife has all the estate. The principal grounds for an absolute divorce are impo- tency, adultery, wilful or malicious desertion, cruel and barbarous treatment, personal abuse and conviction of any such crime as arson, burglary, embezzlement, forgery, kidnapping, larceny, murder, perjury or assault with intent to kill. Before filing a petition for a divorce the plaintiff must have resided within the state at least one year. A suit for a divorce on the ground of deser- tion may be commenced when the defendant has been absent six months, but the divorce may not be granted until the desertion has continued two years. The party convicted of adultery is forbidden to marry the co-respondent during

the lifetime of the other party. A marriage of first cousins or a bigamous marriage may be declared void. Pennsylvania has no homestead law, but the property of a debtor amounting to $300 in value, exclusive of the wearing apparel of himself and family and of all Bibles and school-books in use, is exempt from levy and sale on execution or by distress for rent ; and the exemption extends to the widow and children unless there is a lien on the property for purchase money. The child-labour law of 1909 forbids the employment of children under eighteen years of age in blast furnaces, tanneries, quarries, in managing elevator lifts or hoisting machines, in oiling dangerous machinery while in motion, at switch tending, as brakesmen, firemen, engineers, motormen and in other positions of similar character. The same law prescribes conditions under which children between fourteen and eighteen years of age may be employed in the manufacture of white-lead, red-lead, paints, phosphorus, poisonous acids, tobacco or cigars, in mercantile establishments, stores, hotels, offices or in other places requiring protection to their health or safety; and it forbids the employment of boys under sixteen years of age or of girls under eighteen years of age in such factories or establishments more than ten hours a day (unless it be to prepare for a short day) or for more than fifty-eight hours

to be chosen for the same term of service each voter shall vote for one only, and when three are to be chosen he shall vote for no more than two; candidates highest in vote shall be declared elected.”

a week, or their employment there between nine o’clock in the evening and six o’clock in the morning, except that in the factories requiring continuous night and day employment boys not under fourteen years of age may be employed partly by day and partly by night not exceeding nine hours in any twenty-four. The em- ployment of children under fourteen years of age in coal-mines is forbidden, as is also the employment of children under fourteen years of age in any cotton, woollen, silk, paper, bagging or flax factory, or in any laundry, or the employment of children under twelve years of age in any mill or factory whatever within the commonwealth.

Prisons and Charities. — Penal and charitable institutions are under the supervision of a board of public charities of ten members, established in 1869, and a committee in lunacy, composed of five members of this board, appointed under an act of 1883. An agita- tion begun by the Philadelphia society for assisting distressed prisoners in 1776, checked for a time by the War of Independence, led ultimately to the passage of a statute in 181 8 for the establish- ment of the Western Penitentiary at Allegheny (opened 1826) and another of 1821

for the establishment of the Eastern Penitentiary in Philadelphia (opened 1829). In the former penitentiary prisoners are congregated ; in the latter they are kept in solitary confinement. An act of 1878 provided for a third penitentiary in the middle district, but through the efforts of Governor Henry M. Hoyt the plans were changed and instead the Industrial Reformatory was established at Huntingdon (opened 1889). The House of Refuge of western Pennsylvania, located in Allegheny in 1854 (act of 1850), became the Pennsylvania Reform School in 1872, and was removed to Morganza, Washington county, in 1876. Few states have done so much as Pennsylvania for the humane and scientific treatment of its dependent and defective classes. Largely as a result of the efforts of Dorothea Lynde Dix (q.v.), a hospital for the insane was established at Harrisburg in 1851 (act of 1845). A second hospital was opened at Pittsburg in 1853 (act of 1848), but the location was ruined by Pennsylvania railway improvements, and in 1862 it was removed to a new site about 7 m. from the city, which was called Dixmont in honour of Miss Dix; the hospital is not a state institution, but the state provides for the maintenance there of patients committed by the courts or the poor authorities in the thirteen counties forming the western district. For three other districts three state institutions have been established — at Danville, 1872 (act of 1868), Warren, 1880 (act of 1873), and Norris- town, 1880 (act of 1876). An act of 1901 established a homoeopathic hospital for the insane at Allentown. A distinction is made between hospitals and asylums. The asylum for the chronic insane is at South Mountain, 1894 (act of 1891). A state institution for feeble- minded of western Pennsylvania at Polk, Venango county, was opened in 1897 (act of 1893), and the eastern Pennsylvania state institution for feeble-minded and epileptic at Spring City, Chester county, was opened in 1908 (act of 1903). There are institutes for the blind at Overbrook and Pittsburg, and for the deaf and dumb at Philadelphia and Edgewood Park, an oral school for the deaf at Scranton, a home for the training of deaf children at Philadelphia, a soldiers' and sailors' home at Erie (1886), a soldiers' orphans' industrial school (1895) at Scotland, Franklin county, the Thaddeus Stevens industrial school (1905) at Lancaster, hospitals for the treatment of persons injured in the mines, at Ashland (1879), Hazleton (1887) and Shamokin (1907), and cottage hospitals at Blossburg, Connellsville, Mercer and Philipsburg (all 1887). In addition to the institutions under state control a large number of local charities receive aid from the public treasury. In 1907- 1908, $14,222,440 was appropriated for institutions: $7,479,732 for state institutions, $1,240,108 for semi-state institutions, $4,757,100 for general hospitals, $149,500 for hospitals for con- sumptives, and $745,900 for homes, asylums, &c. The system

of juvenile courts, created under a statute of 1901, has done much to ameliorate the condition of dependent and delinquent children.

Education. — During the colonial period there were many sectarian and neighbourhood subscription schools in which the poor could receive a free education, but public schools in the modern American sense were unknown. The famous Friends' public school, founded in Philadelphia in 1689 and chartered in 1697, still exists as the William Penn charter school. An agitation begun soon after the War of Independence resulted in the creation of a school fund in 1 83 1 and the final establishment of the present system of public schools in 1834. The attempt to repeal the law in 1835 was defeated largely through the efforts of Thaddeus Stevens, who was then a member of the state house of representatives. During the years 1 852-1 857 the educational department became a separate branch of the state government, the office of county school superintendent was created, the state teachers' association (known since 1900 as the Pennsylvania educational association) was organized, and a law was enacted for the establishment of normal schools. Since 1893 the state has furnished textbooks and other necessary supplies free of charge, and since 1895 education has been compulsory for all children between the ages of eight and thirteen. Schools must be kept open not less than seven and not more than ten months in the year. Out of a total expenditure of $30,021,774 for the fiscal year 1909, $7,875,083 was for educational purposes, of which $6,810,906 was for common schools, being appropriations to the

in

counties, There is a biennial school appropriation of $15,000,000. In addition the district directors levy local rates which must not be greater than the state and county taxes combined. The Pennsylvania state college at State College, Center county, was established in 1855 as the farmers' high school of Pennsylvania, in 1862 became the Agricultural College of Pennsylvania, and received its present name in 1874 after the income from the national land grant had been appropriated to the use of the institutions; in 1909-1910 it had 147 instructors, 1400 students and a library of 37,000 volumes. Other institutions for higher education are the University of Pennsylvania, at Philadelphia (1749), an endowed institution which receives very little support from the state; the University of Pittsburgh (1819), at Pittsburg {q.v.) ; Dickinson College (Methodist Episcopal, 1783), at Carlisle; Haverlord College (Society of Friends, 1833), at Haverford;

Franklin and Marshall (German Reformed, 1853), at Lancaster; Washington and Jefferson (Presbyterian, 1802), at Washington ; Lafayette (Presbyterian, 1832), at Easton; Bucknell University (Baptist, 1846), at Lewisburg; Waynesburg (Cumberland Presbyterian, 1851), at Waynesburg; Ursinus (German Reformed, 1870), at Collegeville ; Allegheny College (Methodist Episcopal, 18 15), at Meadville; Swarthmore (Society of Friends (Hicksites), 1866), at Swarthmore; Muhlenberg (Lutheran, 1867), at Allentown; Lehigh University (non-sectarian, 1867), at Bethlehem; and for women Bryn Mawr College (Society ' of Friends, 1885), at Bryn Mawr; the Allentown College (German Reformed, 1867), at Allentown; Wilson College (Presbyterian, 1870), and the Pennsylvania College for women (1869), at Pittsburg. There are theological seminaries at Pittsburg, the Allegheny Semin- ary (United Presbyterian, 1825), Reformed Presbyterian (1856), and Western Theological Seminary (Presbyterian, 1827); at Lan- caster (German Reformed, 1827); at Meadville (Unitarian, 1844); at Bethlehem (Moravian, 1807); at Chester, the Crozer Theological Seminary (Baptist, 1868); at Gettysburg (Lutheran, 1826); and in Philadelphia several schools, notably the Protestant Episcopal Church divinity school (1862) and a Lutheran seminary (1864), at Mount Airy. There are many technical and special schools, such as Girard College, Drexel institute and Franklin institute at Phila-delphia, the Carnegie institute at Pittsburg and the United States Indian school at Carlisle (1891).

Finance. — The revenues of the state are derived primarily from corporation taxes, business licences, and a 5 % rate on collateral inheritance. Taxes on real estate have been abolished and those on personal property are being reduced, although the heavy expenditures on the new capitol at Harrisburg checked the movement temporarily. The total receipts for the year ending on the 30th of November 1909 were $28,945,210, and the expenditure was $30,021,774. During the provincial period Pennsylvania, in common with the other colonies, was affected with the paper money craze. From 1723 to 1775 it issued £1,094,650 and from 1775 to 1785 £1,172,000 plus $1,550,000. Acts were passed in 1781, 1792, 1793 and 1794 to facilitate redemption at depreciated rates, and the last bills were called in on the 1st of January 1806. The state was also carried along by the movement which began about 1825 for the expenditure of public funds on internal improvements. On turnpikes, bridges, canals and railways $53,352,649 was spent between 1826 and 1843, the public debt in the latter year reaching the high-water mark of $42,188,434. An agitation was then begun for retrenchment, the public works were put up for sale, and were finally disposed of in 1858 (when the debt was

$39,488,244) to the Pennsylvania Railroad Company for $7,500,000. Under authority of a constitutional amendment of 1857 a sinking fund commission was established in 1858. Aside from a temporary increase during the Civil War (1861-65) the debt has been rapidly reduced. The constitution of 1873 and subsequent legislation have continued the commission, but the sources of revenue have been very much curtailed, being restricted to the interest on the deposits of the fund and interest on certain Allegheny Railroad bonds. The total debt on the 30th of November 1909 was $2,643,917, of which the greater part were 3 J and 4% bonds, maturing on the 1st of February 1912. The sinking fund at the samedate amounted to $2,652,035, leaving a net surplus in the sinking fund of $8118. The sinking fund was formerly divided among certain favoured banks in such manner as would best advance the political interests of the organi- zation which controlled the state; but just after the reform victory in the election of 1905 the sinking fund commission instituted the policy of buying bonds at the market price, and the debt is now being reduced by that method. The financial institutions of Penn- sylvania other than national banks are created by state charters limited to twenty years and are subject to the supervision of a commissioner of banking.

History. — The chief features of Pennsylvania history in colonial days were the predominance of Quaker influence, the heterogeneous character of the population, liberality in matters of religion, and the fact that it was the largest and the most successful of proprietary provinces. The earliest European settlements within the present limits of the state were some small trading posts established by the Swedes and the Dutch in the

lower valley of the Delaware River in 1623-1681. Between 1650 and 1660 George Fox and a few other prominent members of the Society of Friends had begun to urge the establishment of a colony in America to serve as a refuge for Quakers who were suffering persecution under the ” Clarendon Code.” William Penn (g.v.) became interested in the plan at least as early as 1666. For his charters of 1680-1682 and the growth of the colony under him see Penn, William.

During Penn’s life the colony was involved in serious boundary disputes with Maryland, Virginia and New York. A decree of Lord Chancellor Hardwicke, in 1750, settled the Maryland- Delaware dispute and led to the survey in 1763-1767 of the boundary between Pennsylvania and Maryland (lat. 39 43′ 26-3″ N.), called the Mason and Dixon line in honour of the surveyors; it acquired considerable importance later as separat- ing the free and the slave states. In 1784 Virginia agreed to the extension of the line and to the establishment of

the western limit (the present boundary between Pennsylvania and Ohio) as the meridian from a point on the Mason and Dixon line five degrees of longitude west of the Delaware river. The 42nd parallel was finally selected as the northern boundary in 1780, in 1792 the Federal government sold to Pennsylvania the small triangular strip' of territory north of it on Lake Erie. A territorial dispute with Connecticut over the Wyoming Valley was settled in favour of Pennsylvania in 1782 by a court of arbitration appointed by the Continental Congress.

Upon William Penn's death, his widow became proprietary. Sir William Keith, her deputy, was hostile to the council, which he practically abolished, and was popular with the assembly, which he assiduously courted, but was discharged by Mrs Penn after he had quarrelled with James Logan, secretary of the province. His successors, Patrick Gordon and George Thomas, under the proprietorship of John, Thomas and Richard Penn, continued Keith's popular policy of issuing a plentiful paper currency ; but with Thomas the assembly renewed its old struggle, refusing to grant him a salary or supplies because of bis efforts to force the colony into supporting the Spanish War. Again, during the Seven Years' War the assembly withstood the gov- ernor, Robert Hunter Morris, in the matter of grants for military expenses. But the assembly did its part in assisting General Braddock to outfit; and after Braddock's defeat all western Pennsylvania suffered terribly from Indian attacks. After the proprietors subscribed £5000 for the protection of the colony the assembly momentarily gave up its contest for a tax on the proprietary estates and consented to pass a money bill, without this provision, for the expenses of the war. But in 1760 the assembly, with the help of Benjamin Franklin as agent in England, won the great victory of forcing the proprietors to pay a tax (£566) to the colony; and thereafter the assembly had little to contest for, and the degree of civil liberty attained in the province was very high. But the growing power of the Scotch-Irish, the resentment of the Quakers against the pro- prietors for having gone back to the Church of England and many other circumstances strengthened the anti-proprietary power, and the assembly strove to abolish the proprietorship and establish a royal province; John Dickinson was the able leader of the party which defended the proprietors; and Joseph Galloway and Benjamin Franklin were the leaders of the anti-proprietary party, which was greatly weakened at home by the absence after December 1764 of Franklin in England as its agent. The question lost importance as independence became the issue.

In 1755 a volunteer militia had been created and was led with great success by Benjamin Franklin; and in 1756 a line of forts was begun to

hold the Indians in check. In the same year a force of pioneers under John Armstrong of Carlisle surprised and destroyed the Indian village of Kittanning (or Atique) on the Allegheny river. But the frontier was disturbed by Indian attacks until the suppression of Pontiac's conspiracy. In December 1763 six Christian Indians, Conestogas, were massacred by the " Paxton boys " from Paxton near the present Harrisburg; the Indians who had escaped were taken

to Lancaster for safe keeping but were seized and killed by the " Paxton boys," who with other backwoodsmen marched upon Philadelphia early in 1764, but Quakers and Germans gathered quickly to protect it and civil war was averted, largely by the diplomacy of Franklin. The Paxton massacre marked the close of Quaker supremacy and the beginning of the predominance of the Scotch-Irish pioneers.

Owing to its central position, its liberal government, and its policy of religious toleration, Pennsylvania had become during the 1 8th century a refuge for European immigrants, especially persecuted sectaries. In no other colony were so many different races and religions represented. There were Dutch, Swedes, English, Germans, Welsh, Irish and Scotch-Irish; Quakers, Presbyterians, Episcopalians, Catholics, Lutherans (Reformed), Mennonites, Dunkers, Schwenkfelders, and Moravians. Most of these elements have now become merged in the general type, but there are still many communities in which the popular language is a corrupt German dialect, largely Rheno-Franconian in its origin, known as " Pennsylvania Dutch." Before the Seven Years' War the Quakers dominated the government, but from that time until the failure of the Whisky Insurrection (1704) the more belligerent Scotch-Irish (mostly Presbyterians) were usually in the ascendancy, the reasons being the growing numerical strength of the Scotch-Irish and the increasing dissatisfaction with Quaker neglect of means of defending the province.

As the central colony, Pennsylvania's attitude in the struggle with the mother country was of vast importance. The British party was strong because of the loyalty of the large Church of England element, the neutrality of many Quakers, Dunkers, and Mennonites, and a general satisfaction with the liberal and free government of the province, which had been won gradually and had not suffered such catastrophic

reverses as had em- bittered the people of Massachusetts, for instance. But the Whig party under the lead of John Dickinson, Thomas Mifflin and Joseph Reed was successful in the state, and Pennsylvania contributed greatly to the success of the War of Independence, by the important services rendered by her statesmen, by providing troops and by the financial aid given by Robert Morris (q.v.). The two Continental Congresses (1774, and 1775-1781) met in Philadelphia, except for the months when Philadelphia was occupied by the British army and Congress met in Lancaster and York, Pennsylvania, and then in Prince- ton, New Jersey. In Philadelphia the second Congress adopted the Declaration of Independence, which the Pennsylvania delegation, excepting Franklin, thought premature at the time, but which was well supported by Pennsylvania afterwards. During the War of Independence battles were fought at Brandy- wine (1777), Paoli (1777), Fort Mifflin (1777) and Germantown (1777), and Washington's army spent the winter of 1777-1778 at Valley Forge; and Philadelphia was occupied by the British from the 26th of September 1777 to the 18th of June 1778. The Penns lost their governmental rights in 1776, and three years later their territorial interests were vested in the common- wealth in return for a grant of £120,000 and the guarantee of titles to private estates held in severalty. They still own con- siderable property in and around Wilkes-Barre, in Luzerne county, and in Philadelphia. The first state constitution of September 1776 was the work of the Radical party. It deprived the Quakers of their part in the control of the government and forced many Conservatives into the Loyalist party. This first state constitution was never submitted to popular vote. It continued the unicameral legislative system, abolished the office of governor, and provided for an executive council of twelve members. It also created a curious body, known as the council of censors, whose duty it was to assemble once in seven years to decide whether there had been any infringements of the fundamental law. The party which had carried this con- stitution through attacked its opponents by withdrawing the charter of the college of Philadelphia (now the university of Pennsylvania) because its trustees were anti-Constitutionalists and creating in its place a university of the state of Pennsyl-

vania. The Constitutional party in 1785 secured the annulment by the state assembly of the charter of the Bank of North America, which still retained a congressional charter; and the cause of this action also seems to have been party feeling against the anti-Constitutionalists, among whom Robert Morris of the bank was a leader, and who, especially Morris, had opposed the paper money policy of the Constitutionalists. These actions of the state assembly against the

college and the bank probably were immediate causes for the insertion in the Federal Constitu- tion (adopted by the convention in Philadelphia in 1787) of the clause (proposed by James Wilson of Pennsylvania, a friend of the college and of the bank) forbidding any state to pass a law impairing the obligation of contracts. The state ratified the Federal Constitution, in spite of a powerful opposition — largely the old (state) Constitutional party — on the 22nd of December 1787, and three years later revised its own constitution to make it conform to that document. Under the constitution of 1790 the office of governor was, restored, the executive council and the council of censors were abolished, and the bicameral legis- lative system was adopted. Philadelphia was the seat of the Federal government, except for a brief period in 1 789-1 790, until the removal to Washington in 1800. The state capital was removed from Philadelphia to Lancaster in 1799 and from Lancaster to Harrisburg in 181 2.

The state was the scene of the Scotch-Irish revolt of 1794 against the Federal excise tax, known as the Whisky Insurrection {q.v.) and of the German protest (1799) against the house tax, known as the Fries Rebellion from its leader John Fries (q.v.). In 1838 as the result of a disputed election to the state house of representatives two houses were organized, one Whig and the other Democratic, and there was open violence in Harrisburg. The conflict has been called the " Buckshot War." The Whig House of Representatives gradually broke up, many members going over to the Democratic house, which had possession of the records and the chamber and was recognized by the state Senate. Pennsylvania was usually Democratic before the Civil War owing to the democratic character cf its country population and to the close commercial relations between Philadelphia and the South. The growth of the protectionist movement and the development of anti-slavery sentiment, however, drew it in the opposite direction, and it voted the Whig national ticket in 1840 and in 1848, and the Republican ticket for Lincoln in i860. A split among the Democrats in 1835, due to the opposition of the Germans to internal improve- ments and to the establishment of a public school system, resulted in the election as governor of Joseph Ritner, the anti- Masonic candidate. The anti-Masonic excitement subsided as quickly as it had risen, and under the leadership of Thaddeus Stevens the party soon became merged with the Whigs. During the Civil War (1861-65) the state gave to the Union 336,000 soldiers; and Generals McClellan, Hancock, Meade and Reynolds and Admirals Porter and Dahlgren were natives of the state. Its nearness to the field of war made its position dangerous. Chambersburg was burned in 1862; and the battle of Gettys- burg (July 1863), a defeat of Lee's attempt to invade the North

in force was a turning point in the war.

The development of the material resources of the state since 1865 has been accompanied by several serious industrial dis- turbances. The railway riots of 1877, which centred at Pittsburg and Reading, resulted in the destruction of about two thousand freight cars and a considerable amount of other property. An organized association, known as the Molly Maguires (q.v.), terrorized the mining regions for ‘many years, but was finally suppressed through the courageous efforts of President Franklin Benjamin Gowen (1863-1889) of the Philadelphia & Reading rail- road with the assistance of Allan Pinkerton and his detectives. There have been mining strikes at Scranton (1871), in the Lehigh and Schuylkill regions (1875), at Hazleton (1897), and one in the anthracite fields (1902) which was settled by a board of arbitra- tors appointed by President Roosevelt; and there were street railway strikes at Chester in 1908 and in Philadelphia in 1910. The calling in of Pinkerton detectives from Chicago and New

York to settle a strike in the Carnegie steel works at Homestead in 1892 precipitated a serious riot, in which about twenty persons were killed. It was necessary to call out two brigades of the state militia before the disorder was finally suppressed. The labour unions took advantage of this trouble to force Pennsylvania, Indiana, Illinois, Minnesota, Colorado and several other states to pass anti-Pinkerton statutes making it illegal to import irresponsible armed men from a distance to quell local disturbances. On the political side the chief features in the history of the state since 1865 have been the adoption of the constitution of 1873, the growth of the Cameron-Quay-Penrose political machine, and the attempts of the reformers to over- throw its domination. The constitution of 1838, which super- seded that of 1700, extended the functions of the legislature, limited the governor’s power of appointment, and deprived negroes of the right of suffrage. The provision last mentioned was nullified by the fourteenth and fifteenth amendments to the constitution of the United States. The chief object of the present state constitution (1873) was to prohibit local and special legislation. It increased the number of senators and represen- tatives, created the office of lieutenant-governor, substituted biennial for annual sessions of the legislature, introduced minority representation in the choice of the higher judiciary and of the county commissioners and auditors and provided (as had an amendment

adopted in 1850) for the election of all judges by popular vote. The political organization founded by Simon Cameron (q.v.) and strengthened by his son, James Donald Cameron, Matthew Stanley Quay and Boies Penrose (b. i860), is based upon the control of patronage, the distribution of state funds among favoured banks, the support of the Pennsylvania railway and other great corporations, and upon the ability of the leaders to persuade the electors that it is necessary to vote the straight Republican, ticket to save the protective system. Robert E. Pattison (1850-1904), a Democrat, was elected governor in 1883 and again in 1891, but he was handicapped by Republican legislatures. In 1905 a Democratic state treasurer was elected.

Pennsylvania Governors. Under Dutch Rule (1624-1664). 1

Cornelis Jacobsen Mey Director . . 1624-1625

William van Hulst ,, . . 1625-1626

Peter Minuit Governor . . 1626-1632

David Pieterzen de Vries .... ,, . . 1632-1633

Wouter van Twiller ,, . . 1633-1638

William Kieft ,, . . 1638-1647

Peter Stuyvesant ,, . . 1 647-1 664

Under Swedish Rule (1638-1655). 2

Peter Minuit 1638-1641

Peter Hollender 1641-1642

John Printz 1642-1653

John Pappegoya 1653-1654

John Claude Rysingh 1654-1655

Under the Duke of York (1664-1673).

Richard Nicolls 1664-1667

Robert Carr Deputy . . 1664-1667

Robert Needham . . Commander on the Delaware 1664-1668

Francis Lovelace 1667-1673

John Carr …. Commander on the Delaware 1668-1673 Under Dutch Rule (1673-1674).

Anthony Colve 1673-1674

Peter Alrichs Deputy on the Delaware 1673-1674

Under the Duke of York (1674-1681).

Sir Edmund Andros 1674-1681

Under the Proprietors (1681-1693). William Markham …. Deputy-Governor . 1681-1682

William Penn 1682-1684

Thomas Lloyd President of the Council 1684-1686

Thomas Lloyd

Robert Turner |

Arthur Cook I Executive Commissioners 1686-1688

John Simcock

John Eckley ■ >

John Blackwell Deputy-Governor . 1688-1690

1 Governors of New Netherland and of the Dutch settlements on the Delaware.

- The Swedish colonies on the Delaware conquered by the Dutch in 1655.

Thomas Lloyd President of the Council 1690-1691

Thomas Lloyd Deputy-Governor . 1691-1693

William Markham 3 ,, . 1691-1693

Under the Crown (1693-1695). Benjamin Fletcher 1693-1695

William Markham …. Deputy-Governor .

Under the Proprietors (1695-1776).

William Markham William Penn Andrew Hamilton Edward Shippen John Evans Charles Gookin . Sir William Keith Patrick Gordon James Logan George Thomas Anthony Palmer James Hamilton Robert H. Morris William Denny . James Hamilton John Penn James Hamilton Richard Penh John Penn

Period

Benjamin Franklin, Chairman of the Committee of Safety 1776-1777

Deputy-Governor .

1693-1695

1695-1699

1699-1701

. Deputy-Governor . 1 701-1703

President of the Council 1 703-1 704

Lieutenant-Governor 1 704-1 709

1 709-1 717

11 1717-1726

• . „ 1726-1736

President of the Council 1736-1738

Deputy-Governor 1 738-1 747

President of the Council 1 747-1 748

Lieutenant-Governor Deputy-Governor

President of the Council Lieutenant-Governor

of Statehood (1776-

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1 748-1 754 1 754-1 756 1 756-1 759 1 759-1 763 1 763-1 77 1 1771 1771-1773 1773-1776

President of the Council 1777-1778 Acting President of the Council 1777

President of the Council 1778-1781

1781-1782

Thomas Wharton, Jr. George Bryan 4 . Joseph Reed William Moore . John Dickinson . Benjamin Franklin Thomas Mifflin . Thomas Mifflin . Thomas McKean Simon Snyder William Finley . Joseph Heister . John A. Shulze . George Wolf Joseph Ritner D. R. Porter F. R. Shunk W. F. Johnston 5 William Bigler . James Pollock W. F. Packer . A. G. Curtin John W. Geary . John F. Hartranft Henry M. Hoyt Robert E. Pattison James A. Beaver Robert E. Pattison Daniel H. Hastings William A. Stone Samuel W. Pennypacker Edwin S. Stuart John K. Tener

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For the administration of the state see: The Constitution of the Commonwealth of Pennsylvania, adopted December 16, 1873, amended November 5, 1901 (Harrisburg, 1902); S. George et al. (editors), Laws, of Pennsylvania, 1682-1700, preceded by the Duke of York's Laws, 1676-1682 (Harrisburg, 1879); A. J. Dallas (editor), Laws of Pennsylvania, 1700-1801 (Philadelphia and Lancaster, 1 797-1 801); Laws of the General Assembly of Pennsylvania

3 Lloyd was deputy-governor of the province, the present state of Pennsylvania ; Markham of the lower counties, the present state of Delaware.

4 The state was governed by a supreme executive council in

1777-1790.

5 Governor Shunk resigned in July 1848 and was succeeded by W. F. Johnston, president of the state senate.

II

1782-1785

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1785-1788

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1788-1790

Federalist .

1 790-1 799

ocratic-Republican

1 799-1 808

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1808-1817

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1817-1820

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1820-1823

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1823-1829

Democrat .

1 829-1 835

Anti-Masonic

1835-1839

Democrat .

1 839-1 845

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1 845- 1 848

Whig . .

1 848-1 852

Democrat .

1852-1855

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1855-1858

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1858-1861

Republican .

1861-1867

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1 867-1 873

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1873-1879

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1879-1883

Democrat .

1883-1887

Republican . .

1887-1891

Democrat .

1891-1895

Republican .

1 895-1 899

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1 899-1903

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1903-1907

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1907-1911

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1911-

PENNSYLVANIA, UNIVERSITY OF

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(Philadelphia, 1801 sqq. and Harrisburg, 1802 sqq.); and The Statutes at Large of Pennsylvania (Philadelphia, 1896 sqq.), published under an act of 1887. Some valuable information is to be found in B. A. and M. L. Hinsdale, History and Civil Government of Penn- sylvania . . . (Chicago, 1899) ; and in the various editions of Smull's Legislative Handbook and Manual. For the history of penal and charitable institutions, see the Annual Reports of the Board of Commissioners of Public Charities (Harrisburg, 1871 sqq.) ; the Annual Reports of the Committee on Lunacy (Harrisburg, 1883 sqq.); and Amos H. Mylin, Penal and Charitable Institutions of Pennsylvania (2 vols., Harrisburg, 1897), an official publication, well written and handsomely illustrated. For educational history, see N. C. Schaeffer, The Common School Laws of Pennsylvania (Harrisburg, 1904); B. A. Hinsdale, Documents Illustrative of American Educational History (Washington, 1895); and J. P. Wickersham, History of Education in Pennsylvania (Lancaster, 1886), one of the best state histories of education. For finance and banking, see the annual reports of the state treasurer, auditor- general, sinking fund commissioners, and the commissioner of banking, all published at Harrisburg; An Historical Sketch of the

Paper Money of Pennsylvania, by a member of the Numismatic Society of Philadelphia (Philadelphia, 1862); and B. M. Mead, A Brief Review of the Financial History of Pennsylvania . . . to the Present Time (1682-1881) (Harrisburg, 1881).

The only complete history of the entire period is Howard M. Jenkins, et al., Pennsylvania, Colonial and Federal (3 yols.,_ Phila- delphia, 1903). This is especially valuable for the detailed histories of gubernatorial administrations from 1790 to 1 903. The .third volume contains useful chapters on education, the judiciary, the medical profession, journalism, military affairs, internal improve- ments, &c. S. G. Fisher, Pennsylvania, Colony and Commonwealth (Philadelphia, 1S97) contains the best short account of the colonial and revolutionary history, but it gives only a very brief summary of the period since 1783. W. R. Shepherd, History of Proprietary Government in Pennsylvania (New York, 1896), a detailed study of the proprietary from the political, governmental and territorial points of view, is scholarly, and gives a good account of the boundary disputes with Maryland, Virginia, New York and Connecticut. Among the older standard works are Samual Hazard, Annals _ j > f Pennsylvania from the Discovery of the Delaware, 1600-1682 (Phila- delphia, 1850), an elaborate account of the early Dutch and Swedish, settlements on the Delaware river and bay; and Robert Proud, History of the Pennsylvania from 1681 until after the year 1742 (2 vols., Philadelphia, 1797-1798), written from the Quaker standpoint. For early literary history, see M. K. Jackson, Outline of the Literary History of Colonial Pennsylvania (New York, 1908). W. H. Egle, Illustrated. History of the Commonwealth of Pennsylvania (Harris- burg, 1877), contains trustworthy histories of individual counties by various writers. J. B. McMaster and F. D. Stone, Pennsylvania and the Federal Constitution, 1787-1788 (Philadelphia, 1888), is a useful work. For the anti-Masonic movement, see Charles McCarthy, The Anti-Masonic Party (Washington, 1903). S. G. Fisher, The Making of Pennsylvania (Philadelphia, 1896), intro- ductory to the same author's Colony and Commonwealth, is an interesting study of the various nationalities and religions repre- sented among the settlers of the state. For the period of Quaker predominance (1681-1756), see Isaac Sharpless, History of Quaker Government in Pennsylvania (2 vols., Philadelphia, 1898-1899). See also J. Taylor Hamilton's " History of the Moravian Church " (Nazareth, Pa., 1900), vol. vi. of the Transactions of the Moravian Historical Society; Proceedings and Addresses of the Pennsylvania German Society, vols. vii. and viii. (Reading, 1897-1898) ; J. F. Sachse, German Pietists of Provincial Pennsylvania, 1694-1708 (Phila- delphia, 1895), and German

Sectarians of Pennsylvania, 1708-1800 (2 vols., Philadelphia, 1899-1901). The chief sources are the Pennsylvania Archives (first series, 12 vols., Philadelphia, 1852- 1856; second series, 19 vols., Harrisburg, 1 874-1 893; and third series, 4 vols., Harrisburg, 1 894-1 895); Colonial Records, 1683- 1700 (16 vols., Philadelphia, 1852); and Samuel Hazard, Register of Pennsylvania (16 vols., Philadelphia, 1828-1836). The Penn- sylvania Historical Society, organized in Philadelphia in 1825, has published 14 vols, of Memoirs (1 826-1 895), a Bulletin of 13 numbers (1845-1847), one volume of Collections (1853), and the Pennsylvania Magazine of History and Biography, a Quarterly (1877 sqq.). There is a good account of the public archives, both printed and manuscript, in the first report of the Public Archives Commission of the American Historical Association, published in vol. ii. of the annual report of the association for the year 1900 (Washington, 1901).

PENNSYLVANIA, UNIVERSITY OF, an American institution of higher learning, in Philadelphia, occupying about 60 acres, near the west bank of the Schuylkill river, north-east of the Philadelphia Hospital, east of 39th Street, south-east of Woodland Avenue, and south of Chestnut Street. In this irregular area are all the buildings except the Flower Astronomical Observatory (1896), which is 2 m. beyond the city limits on the West Chester Pike. The northernmost

of these buildings is the law school, between Chestnut and Sansom Streets, on 34th Street. In a great triangular block bounded by Woodland Avenue, Spruce Street, and 34th Street are: the university library, which had in 1909 about 275,000 bound volumes and 50,000 pamphlets, including the Biddle Memorial law library (1886) of 40,000 volumes, the Colwell and Henry C. Carey collections in finance and economics, the Francis C. Macauley library of Italian, Spanish and Portu- guese authors, with an excellent Dante collection, the classical library of Ernst von Leutsch of Gottingen, the philological library of F. A. Pott of Halle, the Germanic library of R. Bech- stein of Rostock, the Semitic library of C. P. Caspari of Copen- hagen, the (Hebrew and Rabbinical) Marcus Jastrow Memorial library, the ethnological library of D. G. Brinton, and several special medical collections; College Hall, with the university offices; Howard Houston Hall (1896) the students' club; Logan Hall; the Robert Hare chemical laboratory; and (across 36th Street) the Wistar institute of anatomy and biology. Imme- diately east of this triangular block are: Bennett House; the Randal Morgan laboratory of physics; the engineering building (1906); the laboratory of hygiene (1892); dental hall; and the John Harrison laboratory of chemistry. Farther east are the gymnasium, training quarters and Franklin (athletic) field, with brick grand-stands. South

of Spruce Street are: the free museum of science and art (1899), the north-western part of a projected group, with particularly valuable American, Egyp- tian, Semitic and Cretan collections, the last two being the results in part of university excavations at Nippur (1888-1902) and at Gournia (1901-1904); between 34th and 36th Streets the large and well-equipped university hospital (1874) ; large dormitories, consisting in 1909, of 29 distinct but connected houses; medical laboratories; a biological hall and vivarium; and across Woodland Avenue, a veterinary hall and hospital. The university contains various departments, including the college (giving degrees in arts, science, biology, music, architec- ture, &c), the graduate school (1882), a department of law (founded in 1790 and re-established in 1850) and a department of medicine (first professor, 1756; first degrees granted, 1768), the oldest and probably the most famous medical school in America. Graduation from the school of arts in the college is dependent on the successful completion of 60 units of work (the unit is one hour's work a week for a year in lectures or recita- tions or two hours' work a week for a year in laboratory courses) ; this may be done in three, four or five years; of the 60 counts: 22 must be required in studies (chemistry, 2 units; English, 6; foreign languages, 6; history, logic and ethics, mathematics, and physics, 2 each); 18 must be equally distributed in two or three " groups " — the 19 groups include astronomy, botany, chemistry, economics, English, fine arts, French, geology, German, Greek, history, Latin, mathematics, philosophy, physics, political science, psychology, sociology and zoology; and in the remaining 20 units the student's election is practically free. Special work in the senior year of the college counts 8 units for the first year's work in the department of medicine. College scholar- ships are largely local, two being in the gift of the governor of the state, fifty being for graduates of the public schools of the city of Philadelphia, and five being for graduates of Pennsyl- vania public schools outside Philadelphia; in 1909 there were twenty-eight scholarships in the college not local. In the graduate school there are five fellowships for research, each with an annual stipend of $800, twenty-one fellowships valued at $500 each, for men only, and five fellowships for women, besides special fellowships and 39 scholarships.

The corporation of the university is composed of a board of twenty-four trustees, of which the governor of Pennsylvania is ex-officio president. The directing head of the university, and the head of the university faculty and of the faculty of each department is the provost — a title rarely used in American universities; the provost is president pro tempore of the board of trustees.

In 1908-1909 the university had 454 officers of instruction, of whom 220 were in the college and 157 in the department

of medicine, and an enrolment of 4570 students, of whom 2989 were in the college (412 in the school of arts; 987 in the Towne scientific school; 472 in the Wharton school, and 253 in the evening school of accounts and finance; 384 in courses for teachers; and 481 in the summer school), 353 in the graduate school, 327 in the department of law, 559 in the department of medicine, 385 in the department of dentistry, and 150 in the department of veterinary medicine.

In August 1907 the excess of the university's assets over its liabilities was 813,239,408 and the donations for the year were $305,814 A very large proportion of the university's investments is in real estate, especially in Philadelphia. In 1907 the total value of real estate (including the university buildings) was $6,829,154; and libraries, museums, apparatus and furniture were valued at $2,025,357. Students' tuition fees vary from $150 to S200 a year in the college; and are $160 in the department of law, S200 in the department of medicine, $150 in the depart- ment of dentistry and $100 in the department of veterinary science. The income from tuition fees in 1906-1907 was $458,396; the payments for "educational salaries" amounted to $433,311, and for " administration salaries " to $135,314.

The university publishes the following series: Astronomical Series (1899 sqq.); Contributions from the Botanical Laboratory (1892 sqq.) ; Contributions from the Laboratory of Hygiene (1898 sqq.) ; Contributions from the Zoological Laboratory (1893 sqq.); Series in History (1901 sqq.); Series in Mathematics (1897 sqq.); Series in Philology and Literature (1891 sqq.); Series in Romanic Languages and Literatures (1907 sqq.); Series in Philosophy (1890 sqq.); Series in Political Economy and Public Law (1 885 sqq .) ; The A merican Law Register (1852 sqq.); The University of Pennsylvania Medical Bulletin (1888 sqq.); Transactions of the Department of Archaeology (1904 sqq.) ; the Journal of Morphology (i887,sqq.) ; and Transactions and Proceedings of the Botanical Society of Pennsylvania (1897 sqq.). There are also occasional publications by institutes and depart- ments connected with the university. Student publications include: a daily, The Pennsylvanian (1885); the weekly, Old Penn (1902); a comic monthly, The Punch Bowl; a literary monthly, The Red and Blue; a quarterly of the department of dentistry, The Penn Dental Journal; an annual, The Record; and The Alumni Register (1896), a monthly.

Benjamin Franklin in 1749 published a pamphlet, entitled Proposals Relating to the Education of Youth in Pensilvania, which led to the formation of a board of twenty-four trustees, nineteen of whom, on the 13th of November 1749, met for organization and to promote ” the Publick Academy in the City of Philadelphia,” and elected Benjamin Franklin president of the board, an office which he held until 1756. So closely was Franklin identified with the plan that Matthew Arnold called the institution ” the University of Franklin.” On the 1 st of February 1750 there was conveyed to this board of trustees the ” New Building ” on Fourth Street, near Arch, which had been erected in 1740 for a charity school— a use to which it had not been put— and as a ” house of Publick Worship,” in which George Whitefield had preached in November 1740; the original trustees (including Franklin) of the ” New Building ”' and of its projected charity school date from 1740, and therefore the university attaches to its seal the words ” founded 1740.” In the ” New Building ” the academy was opened on the 7th of January 1751, the city having voted £200 in the preceding August for the completion of the building. On the 16th of September 1751 a charitable school ” for the instruction of poor Children gratis in Reading, Writing, and Arithmetic!} ” was opened in the ” New Building.” The proprietaries, Thomas and Richard Penn, incorporated ” The Trustees of the Academy and Charitable School in the Province of Pennsylvania ” in 1753; and in 1755 issued a confirmatory charter, changing the corporate name to ” The Trustees of the College, Academy and Charitable School,” &c, whereupon William Smith (1727-1803) of the university of Aberdeen, who had become rector of the academy in 1752 and had taken orders in the Church of England in 1753, became provost of the college. In 1756 Dr Smith established a complete and liberal curriculum which was adopted by Bishop James Madison in 1777 when he became president of the College of William and Mary. In 1757 the first college class graduated. Under Smith’s control the Latin school grew in importance at the expense of the English school, to the great annoyance of Franklin. In 1 762-1 764 Dr Smith collected for

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the college in England about £6900; and in 1764 his influence had become so strong that it was feared that the college would become sectarian. The Penns and others deprecated this and the trustees bound themselves (1764) to ” use their utmost endeavours that . . . (the original plan) be not narrowed, nor the members of the Church of England, nor those dissenting from them … be put on any worse footing in this seminary than they were at the time of receiving the

royal brief." From September 1777 to June 1778 college exercises were not held because Philadelphia was occupied by British troops. In 1779 the state legislature, on the ground that the trustees' declaration in 1764 was a " narrowing of the foundation," 1 confiscated the rights and property of the college and chartered a new corporation " the Trustees of the University of the State of Pennsylvania"; in 1789 the college was restored to its rights and property and Smith again became its provost; in 1791 the college and the university of the State of Pennsylvania were united under the title, "the University of Pennsylvania," whose trustees were elected from their own members by the board of trustees of the college and that of the university. In 1802 the university purchased new grounds on Ninth Street, between Market and Chestnut, where the post office building now is; there until 1829 the university occupied the building erected for the administrative mansion of the president of the United States; there new buildings were erected after 1829; and from these the university removed to its present site in

1872.

The provosts have been: in 1755-1779 and in 1789-1803, William Smith; in 1779-1791, of the university of the state of Pennsylvania, John Ewing (1732-1802); in 1807-1810, John McDowell (1750-1820) ; in i8io-i8i3,John Andrews (1746-1813); in 1813-1828, Frederick Beasley (1777-1845); in 1828-1833, William Heathcote De Lancey (1797-1865); in 1834-1853, John Ludlow (1793-1857); in 1854-1859, Henry Vethake (i792-i866);in 1860-1868, Daniel Raynes Goodwin (1811-1890); in 1868-1880, Charles Janeway Stille (1819-1899); in 1881-1894, William Pepper (1843-1898); in 1894-1910, Charles Custis Har- rison (b. 1844), and in 1911 sqq. Edgar Fahs Smith (b. 1856).

See T. H. Montgomery, A History of the University of Pennsylvania from its Foundation to A.D. 1770 (Philadelphia, 1900); George B Wood, Early History of the University of Pennsylvania (3rd ed ' ibid., 1896); J. B. McMaster, The University of Pennsylvania (ibid. 1897); G. E. Nitzsche, Official Guide to the University of Penn- sylvania (ibid., 1906); and Edward P. Cheyney, "University of Pennsylvania," in vol. i. of Universities and their Sons (Boston

1901).

PENNY (Mid. Eng. peni or peny, from O. Eng. form penig, earlier penning and pending; the word appears in Ger. Pfennig and Du. penning; it has been connected with Du. pand, Ger. Pfand, and Eng. "

pawn," the word meaning a little pledge or token, or with Ger. Pfanne, a pan), an English coin, equal in value to the one-twelfth of a shilling. It is one of the oldest of English coins, superseding the sceatta or sceat (see Numismatics; and Britain: Anglo Saxon, § " Coins "). It was introduced into England by Offa. king of Mercia, who took as a model a coin _ first struck by Pippin, father of Charlemagne, about 735, which was known in Europe as novus denarius. Offa's penny was made of silver and weighed 22ˆ grains, 240 pennies weighing one Saxon pound (or Tower pound, as it was afterwards called), hence the term pennyweight (dwt.). In 1527 the Tower pound of 5400 grains was abolished, and the pound of 5760 grains adopted instead. The penny remained, with some few exceptions, the only coin issued in England until the introduction of the gold florin by Edward III. in 1343. It was not until the reign of Edward I. that halfpence and farthings became a regular part of the coinage, it having been usual to subdivide the penny for trade purposes by cutting it into halves and quarters, a practice said to have originated in the reign of jEthelred II. In 1257, in the reign of Henry III., a gold penny,

1 Probably the actual reason was that the assembly, dominated by the advocates of the radical constitution of 1776, was attempting to punish the trustees of the college, who were almost all " anti-constitutionalists. ' '

of the value of twenty silver pence, was struck. The weight and value of the silver penny steadily declined from 1300 onwards, as will be seen from the following table: —

Value in silver

Reign.

Weight.

925 fine, at 5s. 6d. per oz.

Grains.

Penny.

William I., 1066 ....

22j

3-°9

Edward I., 1300 ….

22

3-02

III., 1344 • • •

20|

2-78

HI., I34 6 . . .

20

2-75

III., 1351 • • •

18

2-47

Henry IV., 1412 ….

15

2-06

Edward IV., 1464

12

1-65

Henry VIII., 1527 . .

IO§

1-44

„ VIII., 1543 • ■ •

10

1-37

Edward VI., 1552

8

I-IO

Elizabeth, 1601 ….

71

14,

i-o6

The last coinage of silver pence for general circulation was in the reign of Charles II. (1661-1662), since which time they have only been coined for issue as royal alms on Maundy Thurs- days, Copper halfpence were first issued in Charles II. ‘s reign, 1 but it was not until 1797, in the reign of George III., that copper pence were struck. This copper penny weighed 1 oz. avoir- dupois. In the same year copper twopences were issued weighing 2 oz., but they were found too cumbersome and were discon- tinued. In i860 bronze was substituted for the copper coinage, the alloy containing 95 parts of copper, 4 of tin, and 1 of zinc. The weight was also reduced, 1 lb of bronze being coined into 48 pennies, as against 24 pennies into which 1 lb of copper was coined.

PENN YAN, a village and the county-seat of Yates county, New York,

U.S.A., situated N. of Keuka Lake, on the outlet extending to Lake Seneca, about 170 m. W. of Albany, and about 95 m. E. by S. of Buffalo. Pop. (1905), 4504; (1910) 4597. It is served by the New York Central & Hudson River and the Northern Central railways and by electric railway to Branchport, and has steamboat connexions with Hammonds- port at the head of Keuka Lake. The lake, one of the most beautiful of the so-called ” finger lakes ” of central New York, abounds in lake and rainbow trout, black bass, pickerel and pike, and there are many summer cottages along its shores. At Keuka Park, on the west shore of the lake, is Keuka College (1890), and at Eggleston’s Point is held a summer “natural science camp ” for boys. The village is the seat of the Penn Yan Academy (1859). The lake furnishes water-power, and among the manufactures are paper, lumber, carriages, shoes, &c. Much ice is shipped from the village. Penn Yan is an important shipping point in the apple and grape-growing region of central New York, and winemaking is an important industry. The first frame dwelling at Penn Yan was built in 1799; the village became the county-seat in 1823, when Yates county was created, and was incorporated in 1833. The first settlers were chiefly followers of Jemima Wilkinson (1753-1819), a religious enthusiast, born in Cumberland township, Providence county, Rhode Island, who asserted that she had received a divine commission. She preached in Rhode Island, Connec- ticut, Massachusetts and Pennsylvania. Obtaining a large tract (which was called Jerusalem in 1789) in the present Yates county, she founded in 1788 the village of Hopeton on the outlet of Keuka Lake about a mile from Seneca Lake. Many followers settled there, and she herself lived there after 1790. Some of her followers left her before 1800, and then the community gradually broke up. The name of the village is said to have been derived from the first syllables of ” Pennsylvania ” and ” Yankee,” as most of the early settlers were Pennsylvanians and New Englanders.

1 The figure of Britannia first appeared on this issue of copper coins. The original of Britannia is said to have been Frances Stewart, afterwards duchess of Richmond (Pepys, Diary, Feb. 25, 1667). It was in Charles II.‘s reign, too, that the practice was established of placing the sovereign’s bust in a direction contrary to that of his predecessor.

See Lewis C. Aldrich, History of Yates County, New York (Syracuse,

1892).

PENNYROYAL, in botany, a herb formerly much used in medicine, the name being a corruption of the old herbalist’s name ” Pulioll-royall,” Pulegium regium. It is a member of the mint genus, and has been

known to botanists since the time of Linnaeus as Mentha pulegium. It is a perennial herb with a slender branched stem, square in section, up to a foot in length and rooting at the lower nodes, small opposite stalked oval leaves about half-inch long, and dense clusters of small reddish-purple flowers in the leaf axils, forming almost globular whorls. It grows in damp gravelly places, especially near pools, on heaths and commons. It has a strong smell somewhat like that of spearmint, due to a volatile oil which is readily obtained by distillation with water, and is known in pharmacy as Oleum pulegii. The specific name recalls its supposed property of driving away fleas (pulices). Like the other mints it has carminative and stimulant properties.

PENOBSCOT, a tribe of North American Indians of Algonquian stock. Their old range was the country around the river Penobscot in Maine. They sided with the French in the colonial wars, but made a treaty of peace with the English in 1749. They fought against the English in the War of Independence, and were subsequently settled on an island in the Penobscot river, near Oldtown.

PENOLOGY (Lat. poena, punishment), the modern name given to penitentiary science, that concerned with the processes devised and adopted for the repression and prevention of crime. (See Crime; Criminology; Prison; Juvenile Offenders; Recidivism, &c.)

PENRHYN, GEORGE SHOLTO GORDON DOUGLAS-PEN- NANT, 2nd Baron (1836-1907), was the son of Colonel Edward Gordon Douglas (1800-1886), brother of the 19th earl of Morton, who, through his wife, Juliana, elder daughter and coheir of George Hay Dawkins-Pennant, of Penrhyn Castle, Carnarvon, had large estates in Wales and elsewhere, and was created Baron Penrhyn in 1866. Dawkins had inherited the estates from Richard Penryn, who was created Baron Penryn in 1763, the title becoming extinct on his death in 1808.

George Douglas-Pennant was conservative M.P. for Car- narvonshire in 1866-1868 and 1874-1880, and succeeded his father in the title in 1886. A keen sportsman, a benevolent landlord, a kind and considerate employer, Lord Penrhyn came of a proud race, and was himself of an imperious disposition. He came prominently before the public in 1897 and subsequent years in connexion with the famous strike at his Welsh slate- quarries. During his father's lifetime the management of the Penrhyn quarry had been left practically to an elective com- mittee of the operatives, and it was on the verge of bankruptcy when in 1885 he took matters in hand; he abolished the com- mittee, and with the help of Mr E. A. Young, whom he brought

in from London as manager, he so reorganized the business that this slate-quarry yielded a profit of something like £150,000 a year. The new men and new methods were, however, not to the taste of the trade unionist leaders of the quarrymen, and in 1897, when the ” new unionism ” was rampant in labour questions throughout England, a strike was deliberately fomented. Lord Penrhyn refused to recognize the union or its officials, though he was willing to consider any grievances from individual quarrymen, and a protracted struggle ensued, in which his determination was invincible. He became the object of the bitterest political hostility, and trade unionism exerted itself to the utmost, but vainly, to bring about some form of government intervention. Penrhyn strikers perambulated the country, singing and collecting contributions to their funds. But in spite of every pressure Lord Penrhyn insisted on being master of his own property, and by degrees the agitation col- lapsed. His death on the 10th of March 1907 evoked general and genuine regret. Lord Penrhyn was twice married, and had fifteen surviving children. He was succeeded in the title by his eldest son, Edward Sholto (b. 1864), who was Unionist M.P. for South Northamptonshire from 1895 to 1900.

PENRITH, a municipality of Cumberland county, New South Wales, Australia, on the Nepean River, 34 m. by rail W. by N. of Sydney. Penrith and the adjoining township of St Mary’s are chiefly remarkable for their connexion with the railway. The iron tubular bridge which carries the line over the Nepean is the best of its kind in the colony, while the viaduct over Knapsack Gulley is the most remarkable erection of its kind in Australia. There are large engineering works and railway fitting shops at Penrith, which is also the junction for all the western goods traffic. The inhabitants of both towns are mainly railway employes. Pop. (1901), of Penrith 3539, of St Mary’s

1840.

PENRITH, a market town in the Penrith parliamentary division of Cumberland, England, in a valley near the river Eamont, on the Cockermouth, Keswick & Penrith, London & North Western and North Eastern railways. Pop. of urban district (1901), 9182. It contains some interesting brasses. A 14th-century grammar school was refounded by Queen Elizabeth; and there are two mansions dating from the same reign, which have been converted into inns. Though there are

breweries, tanneries and saw-mills, the town depends mainly on agriculture. There are some ruins of a castle erected as a protection against the Scots. Near Penrith on the south, above the precipitous bank of the Eamont, stands a small but beau- tiful old castellated house, Yanwath Hall. To the north-east of the town is Eden Hall, rebuilt in 1824. Among many fine paintings, it contains portraits by Hoppner, Kneller, Lely, Opie and Reynolds. The " Luck of Eden Hall," which has been celebrated in a ballad by the duke of Wharton, and in a second ballad written by Uhland, the German poet, and translated by Longfellow, is an enamelled goblet, kept in a leathern case dating from the times of Henry IV. or Henry V. It was long supposed to be Venetian, but has been identified as of rare Oriental workmanship. The legend tells how a seneschal of Eden Hall one day came upon a company of fairies dancing at St Cuthbert's Well in the park. These flew away, leaving their cup at the water's edge, and singing " If that glass either break or fall, Farewell to the luck of Eden Hall." Its true history is unknown.

Penrith, otherwise Penreth, Perith, Perath, was founded by the Cambro-Celts, but on a site farther north than the present town. In 1222 Henry III. granted a yearly fair extending from the eve of Whitsun to the Monday after Trinity and a weekly market on Wednesday, but some time before 1787 the market day was changed to Tuesday. The manor in 1242 was handed over to the Scottish king who held it till 1295, when Edward I. seized it. In 1397 Richard II. granted it to Ralph Neville, first earl of Westmorland; it then passed to Warwick the king- maker and on his death to the crown. In 1694 William III. granted the honour of Penrith to the earl of Portland, by whose descendant it was sold in 1787 to the duke of Devonshire. A court leet and view of frankpledge have been held here from time immemorial. In the 18th and early part of the 19th century Penrith manufactured checks, linen cloth and ginghams, but the introduction of machinery put an end to this industry, only the making of rag carpets surviving. Clock and watch-making seems to have been an important trade here in the 18th century. The town suffered much from the incursions of the Scots, and Ralph, earl of Westmorland, who died 1426, built the castle, but a tower called the Bishop's Tower had been previously erected on the same site. In 1597-1598 a terrible visitation of plague attacked the town, in which, according to an old inscrip- tion on the church, 2260 persons perished in Penrith, by which perhaps is meant the rural deanery. During the Civil War the castle was dismantled by the Royalist commandant. In 1745 Prince Charles Edward twice marched through Penrith, and a skirmish took place at Clifton. The church of St Andrew is of unknown foundation,

but the list of vicars is complete from 1223.

PENRY, JOHN (1559-1593), Welsh Puritan, was born in Brecknockshire in 1559; tradition points to Cefn Brith, a farm near Llangammarch, as his birthplace. He matriculated at

Peterhouse, Cambridge, in December 1580, being then almost certainly a Roman Catholic; but soon became a convinced Protestant, with strong Puritan leanings. Having graduated B.A., he migrated to St Alban's Hall, Oxford, and proceeded M.A. in July 1586. He did not seek episcopal ordination, but was licensed as University Preacher. The tradition of his preaching tours in Wales is slenderly supported; they could only have been made during a few months of 1 586 or the autumn of 1587. At this time ignorance and immorality abounded in Wales. In 1562 an act of parliament had made provision for translating the Bible into Welsh, and the New Testament was issued in 1567; but the number printed would barely supply a copy for each parish church. Indignant at this negligence, Penry published, early in 1587, The ˆEquity of an Humble Supplication — in the behalf of the country of Wales, that some order may be taken for the preaching of the Gospel among those people. Archbishop Whitgift, angry at the implied rebuke, caused him to be brought before the High Commission and imprisoned for about a month. On his release Penry married a lady of Northampton, which town was his home for some years. With the assistance of Sir Richard Knightley and others, he set up a printing press, which for nearly a year from Michaelmas 1 588 was in active operation. It was successively located at East Moulsey (Surrey), Fawsley (Northampton), Coventry and other places in Warwickshire, and finally at Manchester, where it was seized in August 1589. On it were printed Penry's Exhortation to the governours and people of Wales, and View of . . . such publike wants and disorders as are in the service of God . . . in Wales; as well as the celebrated Martin Mar prelate tracts. In January 1 590 his house at Northampton was searched and his papers seized, but he succeeded in escaping to Scotland. There he published several tracts, as well as a translation of a learned theological work known as Theses Genevenses. Returning to England in September 1592, he joined the Separatist Church in London, in which he declined to take office, though after the arrest of the ministers, Francis Johnson and John Greenwood, he seems to have been the regular preacher. He was arrested in March 1593, and efforts were made to find some pretext for a capital charge. Failing this a charge of sedition was based on the rough draft of a petition to the queen that had been found among his private papers; the language of which was indeed harsh and offensive, but had been neither presented nor published. He was convicted by

the Queen's Bench on the 21st of May 1593, and hanged on the 29th at the unusual hour of 4 p.m., the signature of his old enemy Whitgift being the first of those affixed to the warrant.

See the Life, by John Waddington (1854).

PENRYN, a market town and port, and municipal and contributary parliamentary borough of Cornwall, England, 2 m. N.W. of Falmouth, on a branch of the Great Western railway. Pop. (1901), 3190. It lies at the head of the estuary of the Penryn River, which opens from the main estuary of the Fal at Falmouth. Granite, which is extensively quarried in the neighbourhood, is dressed and polished at Penryn, and there are also chemical and bone manure works, engineering, iron and gunpowder works, timber-yards, brewing, tanning and paper-making. The harbour dries at low tide, but at high tide has from 9 to i2j ft. of water. Area, 291 acres.

Penryn owed its development to the fostering care of the bishops of Exeter within whose demesne lands it stood. These lands appear in Domesday Book under the name of Trelivel. In 1230 Bishop Briwere granted to his burgesses of Penryn that they should hold their burgages freely at a yearly rent of 1 2d. by the acre for all service. Bishop Walter de Stapeldon secured a market on Thursdays and a fair at the Feast of St Thomas. The return to the bishop in 1307 was £7, 13s. 2ˆd. from the borough and £26, 7s. 5d. from the forum. In 13 1 1 Bishop Stapeldon procured a three days' fair at the Feast of St Vitalis. Philip and Mary gave the parliamentary franchise to the burgesses in 1553. James I. granted and renewed the charter of incorporation, providing a mayor, eleven

aldermen and twelve councillors, markets on Wednesdays and Saturdays, and fairs on the ist of May, the 7th of July and the 21st of December. The charter having been surrendered, James II. by a new charter inter alia confined the parliamentary franchise to members of the corporation. This proviso however was soon disregarded, the franchise being freely exercised by all the inhabitants paying scot and lot. An attempt to deprive the borough of its members, owing to corrupt practices, was defeated by the House of Lords in 1827. The act of 1832 extended the franchise to Falmouth in spite of the rivalry existing between the two boroughs, which one of the sitting members asserted was so great that no Penryn man was ever known to marry a

Falmouth woman. In 1885 the united borough was deprived of one of its members. The corporation of Penryn was remodelled in 1835, the aldermen being reduced to four. Its foreign trade, which dates from the 14th century, is considerable. The extra-parochial collegiate church of Glasney, founded by Bishop Bronescombe in 1265, had a revenue at the time of its suppression under the act of 1545 of £221, 18s. 4d. See Victoria County History, Cornwall; T. C. Peter, Glasney Collegiate Church.

PENSACOLA, a city, port of entry, and the county-seat of Escambia county, Florida, U.S.A., in the N.W. part of the state, on Pensacola Bay, about 6 m. (11 m. by channel) N. of the Gulf of Mexico. Pop. (1900) 17,747; Oe-to) 22,982. It ranks second in size among the cities of Florida. The city is served by the Louisville & Nashville and the Pensacola, Alabama & Tennessee railways, and by steamers to West Indian, European and United States ports. The harbour 1 is the most important deep-water harbour south of Hampton Roads. The narrow entrance is easily navigable and is defended by Fort Pickens on the west end of Santa Rosa Island, with a great sea-wall on the Gulf side (completed in 1909), Fort McRee on a small peninsula directly opposite, and Fort Barrancas on the mainland imme- diately north-east of Fort McRee. On the mainland 1 m. east of Fort Barrancas are a United States Naval Station, consisting of a yard (84 acres enclosed) with shops, a steel floating dry dock and marine barracks; and a reservation (1800 acres) on which are a naval hospital, a naval magazine, two timber ponds, a national cemetery, and the two villages of Warrington andWoolsey, with a population of about 1500, mostly employes of the yard. The city's principal public buildings are the state armoury, the Federal building, and the city hall. The mean annual temperature is about 72 F., and breezes from the Gulf temper the heat. Pensacola is a shipping point for lumber, naval stores, tobacco, phosphate rock, fish, cotton and cotton-seed oil, meal and cake, and is one of the principal markets in the United States for naval stores. In 1895 the foreign exports were valued at $3,196,609, in 1897 at $8,436,679, and in 1909 at $20,971,670; the imports in 1909 were valued at $1,479,017. The important factor in this vast development has been the Louisville & Nashville railway, which after 1895 built exten'ive warehouses and docks at Pensacola. There are excellent coaling docks — good coal is brought hither from Alabama — and a grain elevator. Among the manufactures are sashes, doors and blinds, whiting, fertilizers, rosin and turpentine, and drugs.

Pensacola Bay may have been visited by Ponce de Leon in 1513 and by Panfilo de Narvaez in 1528. In 1540 Maldonado, the commander of the fleet that brought De Soto to the Florida coast, entered the

harbour, which he named Puerta d'Auchusi, and on his recommendation De Soto designated it as a basis of supplies for his expedition into the interior. In 15 59 a perma- nent settlement was attempted by Tristan de Lu:ia, who renamed the harbour Santa Maria, but two years later this settlement was abandoned. In 1696 another settlement was made by Don Andres d'Arriola, who built Fort San Carlos near the site of the present Fort Barrancas, and seems to have named the place Pensacola. In 17 19, Spain and France, being at war, Pensacola was captured by Sieur de Bienville, the French

1 In 1881 the United States government began to improve the harbour by dredging, and in June 1909 the depth of the channel, for a minimum width of about 300 ft., was 30 ft. at mean low water.

governor of Louisiana. Later in the same year it was succes- sively re-taken by a Spanish force from Havana and recaptured by Bienville, who burned the town and destroyed the fort. In 1723, three years after the close of hostilities, Bienville relinquished possession. The Spanish then transferred their settlement to the west end of Santa Rosa Island, but after a destructive hurricane in 1754 they returned to the mainland. In 1763, when the Floridas were ceded to Great Britain, Pensa- cola became the seat of administration for West Florida and most of the Spanish inhabitants removed to Mexico and Cuba. During the War of American Independence the town was a place of refuge for many Loyalists from the northern colonies. On the 9th of May 1781 it was captured by Don Bernardo de Galvez, the Spanish governor at New Orleans. Most of the English inhabitants left, but trade remained in the hands of English merchants. During the War of 181 2 the British made Pensacola the centre of expeditions against the Americans, and in 1814 a British fleet entered the harbour to take formal posses- sion. In retaliation General Andrew Jackson attacked the town, driving back the British. In 1818, on the ground that the Spanish encouraged the Seminole Indians in their attacks upon the American settlements in the vicinity, Jackson again captured Pensacola, and in 1821 Florida was finally transferred to the United States. On the 12th of January 1861 the Navy Yard was seized by order of the state government, but Fort Pickens, defended first by an insignificant force under Lieut. Adam J. Slemmer (1828-68) and afterwards by a larger force under Lieut. -Colonel Harvey Brown (1796-1874), remained in the hands of the Union forces, and on the 8th of May 1862 the Confederates abandoned Pensacola. Pensacola was chartered as a city in 1895.

PENSHURST, a village in the south-western parliamentary division of Kent, England, at the confluence of the Eden and Medway, 4ˆ m. S. W. of Tonbridge. Pop. (1901), 1678. Thevillage is remarkable for some

old houses, including a timbered house of the 15th century, and for a noted factory of cricket implements. The church, chiefly late Perpendicular, contains a large number of monuments of the Sidney family and an effigy of Sir Stephen de Penchester, Warden of the Cinque Ports in the time of Edward I. Penshurst Place is celebrated as the home of the Sidney family. Anciently the residence of Sir Stephen de Pen- chester, Penshurst was granted to Henry. VIII. ‘s chamberlain, Sir William Sidney, whose grandson, Sir Philip Sidney, was born here in 1554. It passed to Sir Philip’s younger brother Robert, who in 1 6 1 8 was created earl of Leicester. On the death of the seventh earl in 1743 the estates devolved upon his niece Elizabeth, whose only child married Sir Bysshe Shelley of Castle Goring. Their son was created a baronet in 181 8 as Sir John Shelley-Sidney, and his son was created Baron de L’Isle and Dudley in 1835. The mansion is quadrangular, and has a fine court, chapel and hall (c. 1341) with open timber roof and a minstrels’ gallery. The various rooms contain an interesting collection of portraits, armour and other family relics. The praises of the park and the house have been sung in Sir Philip Sidney’s Arcadia, and by Ben Jonson, Edmund Waller and Robert Southey.

PENSION (Lat. pensio, a payment, from pendere, to weigh, to pay), a regular or periodical payment made by private employers, corporations or governments, in consideration either of past services or of the abolition of a post or office. Such a pension takes effect on retirement or when the period of service is over. The word is also used in the sense of the payment by members of a society in respect of dues.

United Kingdom.

In the United Kingdom the majority of persons in the employ of the government are entitled to pensions on reaching a certain age and after having served the state for a certain minimum number of years. That such is the case, and moreover that it is usual to define such pensions as being given in consideration of past services, has led to the putting forward very generally the argument that pensions, whether given by a government or

by private employers, are in the nature of deferred pay, and that holders of posts which carry pensions must therefore be rewarded by a remuneration less than the full market rate, by the difference of the

value of the pension. This view is hardly correct, for the object of attaching a pension to a post is not merely to reward past services, but to attract continuity of service by the holder as well as to enable the employer to dispense with the services of the employe without hardship to him should age or infirmity render him less efficient. Dissatisfaction had been expressed from time to time by members of the English civil service with the system in force, viz. that the benefit of long service was confined only to survivors, and that no advantage accrued to the representatives of those who died in service. This was altered by an act of 1909. See Royal Commission on Superannuation in the Civil Service: Report and Evidence (1903). For the gefieral pensions given by the state to the aged poor see Old Age Pensions.

Civil Service. — In the English civil service the grant of pensions on superannuation is regulated by statute, the four principal acts being the Superannuation Acts of 1834, I 859, 1887 and 1909. To qualify for a pension it is necessary (1) that a civil servant should have been admitted to the service with a certificate from the civil service commissioners, or hold an office specially exempted from this requirement; (2) that he should give his whole time to the public service; (3) that he should draw the emoluments of his office from public funds exclusively; (4) that he should have served for not less than ten years; (5) that if under the age of 60 years he should be certified to be permanently incapable, from infirmity of body or mind, of discharging his official duties, or have been removed from his office on the ground of his inability to discharge his duties efficiently. On retirement on these conditions a civil servant is qualified for a pension calculated at one-eightieth of his retiring salary (or, in certain cases, of his average salary for the last three years) for each complete year of service, subject to a maximum of forty-eightieths. Civil servants retiring on the ground of ill health after less than ten years' service qualify for a gratuity of one month's pay for each year of service. Previous to the Superannuation Act of 1909 the pension was calculated at the rate of one-sixtieth of the retiring salary for each completed year of service, subject to a maximum of forty-sixtieths. This is still the rate for those who entered the service previous to the pass- ing of the act (September 20, 1909) unless they availed themselves of the permission in the act to take advantage of its provisions, which were more than a compensation for the lowering of the rate. The act gave power to the treasury to grant by way of additional allowance to a civil servant who retired after not less than two years' service, in addition to his superannuation, a lump sum equal to one-thirtieth of his annual salary and emoluments multiplied by the number of completed years he has served, so however, that

such lump sum does not exceed one and a half times his salary, while if he retires after attaining the age of sixty-five years, there must be deducted from that lump sum one-twentieth for every completed year that he has served after attaining that age. In the case of those who entered the service before the passing of the act, and take advantage of the act, this additional allowance is increased by one-half per cent, for each completed year served at the passing of the act. The act also provided that where a civil servant died after serving five years or upwards, a gratuity equal to his annual salary and emoluments might be granted to his legal personal repre- sentatives. Where the civil servant attains the age of sixty-five this gratuity is reduced by one-twentieth for each completed year beyond that age. On the other hand, where the civil servant has retired from the service and all the sums received by him at his death on account of superannuation are less than his annual salary his representatives may receive the difference as a gratuity. Provision was also made in the act for granting compensation on abolition of office, provided that such compensation does not exceed what the recipient might be granted or bˆ entitled to if he retired on the ground of ill health. Pensions are also sometimes awarded in excess of the scale as a reward for special services, as compensation for injury in certain cases, or to holders of pro- fessional office?, appointed at an age exceeding that at which public service ordinarily begins. In the estimates for civil services for the year 1909-1910, there was provided for non-effective and charitable services (as pensions and gratuities in lieu of pensions are known as) the sum of £9,625,920; this, however, included an item of £8,750,000 for old-age pensions, leaving a sum of £875,920. There was charged on the Consolidated Fund, on account of pensions and compensation allowance for civil, judicial and other services, a sum of £142,767, while the following sums for civil pensions were provided in the estimates of the several departments: War Office, £158,000; Admiralty, £369,800; Customs and Excise, £412,358; Inland Revenue, £116,096; Post Office, £649,000; Royal Irish Constabulary, £416,500; Dublin Metropolitan Police, £33,646, making a total of £2,298,167, or a gross total for civil pensions of

£3,174,087. A return is published annually containing a complete list of the various pensions.

Perpetual or Hereditary Pensions. — Perpetual pensions were freely granted either to favourites or as a reward for political services from the time of Charles II. onwards. Such pensions were very frequently attached as ” salaries ” to places which were sinecures, or, just as often, posts which were really necessary were grossly overpaid, while the duties were discharged by a deputy at a small salary. Prior to the

reign of Queen Anne such pensions and annuities were charged on the hereditary revenues of the sovereign and were held to be binding on the sovereign's successors (The Bankers' Case, 1691 ; State Trials, xiv. 3-43). By I Anne c. 7 it was provided that no portion of the hereditary revenues could be charged with pensions beyond the life of the reigning sovereign. This act did not affect the hereditary revenues of Ireland and Scotland, and many persons were quartered, as they had been before the act, on the Irish and Scottish revenues who could not be provided for in England — for example, the duke of St Albans, illegitimate son of Charles II., had an Irish pension of £800 a year; Catherine Sedley, mistress of James II., had an Irish pension of £5000 a year; the duchess of Kendall and the countess of Darlington, mistresses of George I., had pensions of the united annual value of £5000, while Madame de Walmoden, a mistress of George II., had a pension of £3000 (Lecky, History of Ireland in the Eighteenth Century). These pensions had been granted in every conceivable form — during the pleasure of the Crown, for the life of the sovereign, for terms of years, for the life of the grantee, and for several lives in being or in reversion (Erskine May, Constitutional History of England). On the accession of George III. and his surrender of the hereditary revenues in return for a fixed civil list, this civil list became the source from which the pensions were paid. The subsequent history of the civil list will be found under that heading (Civil List), but it may be here mentioned that the three pension lists of England, Scotland and Ireland' were con- solidated in- 1830, and the civil pension list reduced to £75,000, the remainder of the pensions being charged on the Consolidated Fund.

In 1887, Charles Bradlaugh, M.P., protested strongly against the payment of perpetual pensions, and as a result a Committee of the House of Commons inquired into the subject (Report of Select Committee on Perpetual Pensions, 248, 1887). An appendix to the Report contains a detailed list of all hereditary pensions, pay- ments and allowances in existence in 1881, with an explanation of the origin in each case and the ground of the original grant; there are also shown the pensions, &c, redeemed from time to time, and the terms upon which the redemption took place. The nature of some of these pensions may be gathered from the follow- ing examples: To the duke of Marlborough and his heirs in per- 1 petuity, £4000 per annum; this annuity was redeemed in August I 1884 for a sum of £107,780, by the creation of a ten years' annuity of £12,796, 17s. pet annum. By an act of 1806 an annuity of £5000 per annum was conferred on Lord Nelson and his heirs in perpetuity. In 1793 an annuity of £2000 was conferred on Lord Rodney and his heirs. All these pensions were for

services rendered, and although justifiable from that point of view, a preferable policy is pursued in the 20th century, by parliament voting a lump sum, as in the cases of Lord Kitchener in 1902 (£50,000) and Lord Cromer in 1907 £50,000). Charles II. granted the office of receiver-general and controller of the seals of the court of king's bench and common pleas to the duke of Grafton. This was purchased in 1825 from the duke for an annuity of £843, which in turn was commuted in 1883 for a sum of £22,714, 12s. 8d. To the same duke was given the office of the pipe or remembrancer of first-fruits and tenths of the clergy. This office was sold by the duke in 1765, and after passing through various hands was purchased by one R. Harrison in 1798. In 1835 on the loss of certain fees the holder was com- pensated by a perpetual pension of £62, 9s. 8d. The duke of Grafton also possessed an annuity of £6870 in respect of the commutation of the dues of butlerage and prisage. To the duke of St Albans was granted in 1684 the office of master of the hawks. The sums granted by the original patent were: master of hawks, salary, £391, is. 5d.; four falconers at £50 per annum each, £200; provision of hawks, £600; provision of pigeons, hens and other meats, £182, ios.; total, £1373, us. 5d. This amount was reduced by office fees

to be abolished; that all existing perpetual pensions and payments and all hereditary offices should be abolished : that where no service or merely nominal service is rendered by the holder of an hereditary office or the original grantee of a pension, the pension or payment should in no case continue beyond the life of the present holder and that in all cases the method of commutation ought to ensure a real and substantial saving to the nation (the existing rate, about 27 years' purchase, being considered by the committee to be too high). These recommendations of the committee were adopted by the government and outstanding hereditary pensions were gradually commuted, the only ones left outstanding being those to Lord Rodney (£2000) and to Earl Nelson (£5000), both chargeable on the consolidated fund.

Political Pensions. — By the Political Offices Pension Act 1869, pensions were instituted for those who had held political office. For the purposes of the act political offices were divided into three classes'. (1) those with a yearly salary of not less than £5000;

(2) those with a salary of less than £5000 and not less than £2000;

(3) those with a salary of less than £2000 and more than £1000. For service in these offices there may be awarded pensions for life in the following scale: (1) a first class pension not exceeding £2000 a year, in respect of not less than four years' service or its equivalent, in an office of the first class; (2) a second class pension not exceeding £1200, in respect of service of not less than six years or its equivalent, in an office of the second class; (3) a third class pension not exceeding £800 a year, in respect of service of not less than ten years in an office of the third class. The service need not be continuous, and the act makes provision for counting service in lower classes as a qualification for pension in a higher class. These pensions are limited in number to twelve, but a holder must not receive any other pension out of the public revenue, if so, he must inform the treasury and surrender it if it exceeds his political pension, or if under he must deduct the amount. He may, however, hold office while a pensioner, but the pension is not payable during the time he holds office. To obtain a political pension, the applicant must file a declaration stating the grounds upon which he claims it and that his income from other sources is not sufficient to maintain his station in life.

Civil List Pensions. — These are pensions granted by the sovereign from the civil list upon the recommendation of the first lord of the treasury. By I & 2 Vict. c. 2 they are to be granted to " such persons only as have just claims on the royal beneficence or who by their personal services to the Crown, or by the perform- ance of duties to the public, or by their useful discoveries in science and attainments in literature and the arts, have merited the gracious consideration of their sovereign and the gratitude of their country." A sum of £1200 is allotted each year from the civil list, in addition to the pensions already in .force. From a Return issued in 1908 the total of civil list pensions payable in that year amounted to £24,665.

Judicial, Municipal, &c. — There are certain offices of the exe- cutive whose pensions are regulated by particular acts of parliament. Judges of the Supreme Court, on completing fifteen years' service or becoming permanently incapacitated for duty, whatever their length of service, may be granted a' pension equal to two-thirds of their salary (Judicature Act 1873). The lord chancellor of England however short a time he may have held office, receives a pension of £5000, but he usually continues to sit as a law lord in the House of Lords — so also does the lord chancellor of Ireland, who receives a pension of £3,692 6s. id. A considerable number of local author- ities have obtained special parliamentary powers for the pur- pose of superannuating their officials and workmen who have reached the age of 60-65. Poor law officers receive superannua- tion allowances under

the Poor Law Officers Superannuation Acts

1864-1897.

Ecclesiastical Pensions. — Bishops, deans, canons or incumbents who are incapacitated by age or infirmity from the discharge of their ecclesiastical duties may receive pensions which are a charge upon the revenues of the see or cure vacated.

Navy pensions were first instituted by William III. in 1693 and regularly established by an order in council of Queen Anne in 1700. Since then the rate of pensions has undergone various modifications and alterations; the full regulations concerning pensions to all ranks will be found in the quarterly Navy List, published by the authority of the Admiralty. In addition to the ordinary pensions there are also good-service pensions, Greenwich Hospital pension and pensions for wounds. An officer is entitled to a pension when he is retired at the age of 45, or if he retires between the ages of 40 and 45 at his own request, otherwise he receives only half pay. The amount of his pension depends upon his rank, length of service and age. The maximum retired pay of an admiral is £830 per annum, for which 30 years' service or its equivalent in half-pay time is necessary; he may, in addition, hold a good service pension of £300 per annum. The maximum retired pay of a vice-admiral, with 29 years' service is £725 ; of rear-admirals with 27 years' service £600 per annum. Pensions of captains who retire at the age of 55, commanders, who retire at 50, and lieutenants who retire at 45, range from £200 per annum for 17 years' service to £525 for 24 years' service. The pensions of other officers are calculated in the same way. according to age and length of service. The

good-service pensions consist of ten pensions of £300 per annum for flag-officers, two of which may be held by vice-admirals and two by rear-admirals; twelve of £150 for captains; two of £200 a year and two of £150 a year for engineer officers; three of £100 a year for medical officers of the navy; six of £200 a year for general officers of the Royal Marines and two of £150 a year for colonels and lieut.-colonels of the same. Greenwich Hospital pensions range from £150 a year for flag officers to £25 a year for warrant officers. All seamen and marines who have completed twenty-two years' service are entitled to pensions ranging from iod. a day to a maximum of is. 2d. a day, according to the number of good-conduct badges, together with the good-conduct medal, possessed. Petty officers, in addition to the rates of pension allowed them as seamen, are allowed for each year's service in the capacity of superior petty officer, 15s. 2d. a year, and in

the capacity of inferior petty officer 7s. 7d. a year. Men who are discharged the service on account of injuries and wounds or disability attributable to the service are pensioned with sums varying from 6d. a day to 2s. a day. Pensions are also given to the widows of officers in certain circumstances and compassionate allowances made to the children of officers. In the Navy estimates for 1908-1909 the amount required for half- pay and retired-pay was £868,800, and for pensions, gratuities and compassionate allowances £1,334,600, a total of £2,203,400.

Army. — The system of pensions in the British Army is somewhat intricate, provision being made for dealing with almost every case separately. As a general rule officers can retire after eight years' service on a pension of £100 per annum for ten years, provided that they take commissions in either the Imperial Yeomanry or Special Reserve and attend the annual trainings during that period. The other pensions are as follows: 2nd lieutenants, lieutenants, captains and majors after 15 years' service (or 12 years in the West India regiment), £120, if 45 years of age £200 ; majors, after 25 years'service, £200. Royal artillery or royal engineers if commissioned, after 21 years of age, £300, if 48 years of age, £300; lieutenant colonels, after 3 years as such, with 15 years' service, £250, with 27 years' service, £300, with 30 years' service, £365, after term of employment as lieu tenant-colonel commanding a unit, or staff appointment as lieutenant-colonel, or after 5 years as lieutenant-colonel cavalry and infantry, £420. Royal artillery, royal engineers and army service corps, £450; Colonels, after 5 years as colonel, cavalry and infantry, £420. Royal artillery, royal engineers and army service corps, £450, after completing the term of command of a regimental district or a regiment of foot-guards, or employed in any other capacity for three years, £45o-£soo according to age; Brevet-colonels, with the substantive rank of lieutenant-colonel, receive, cavalry or infantry, £420; royal artillery, royal engineers and army service corps, £450. Major-generals retire at the age of 62 with a pension of £700; lieutenant-generals at 67 with £850; generals at 67 with £1000.

Officers whose first permanent commission bears date prior to

the 1st of January, 1887, retire with a gratuity in lieu of pension.

Officers of the departmental corps retire either with pensions

ranging from £1125 yearly to 10s. daily, or with gratuities ranging

from £2500 to £1000.

Warrant officers with 5 years' service as such, and 20 years' total service, receive 3s. 6d. per diem if discharged from the service on account of disability, reduction of establishment or age. On dis- charge for any reasons (except misconduct or inefficiency) they receive from 3s. 6d. to 5s. per diem, according to length of service and corps. If they have less than 5 years' service as warrant officers, but not less than 21 years' total service, they receive at least 3s. per diemj and if discharged at their own request after 18 years' total service, 2s. 7§d.

Additional pensions are given at the rate of 6d. per diem for gallant conduct, and i|d. to is. per diem for re-employed pensioners on completing their second term of employment, with 3d. per diem extra if promoted while so serving. Special pensions are also granted in exceptional cases.

For the purposes of pensions, non-commissioned officers are divided into four classes, corresponding roughly to quartermaster- sergeants, colour-sergeants, sergeants and corporals.

With not more than 21 years' total service, and with the following continuous service in one of the above classes, the rates of pensions (per diem) are : —

Class.

12 years' Service.

9 years' Service.

6 years' Service.

3 years' Service.

s. d.

s. d.

s. d.

s. d.

I.

2 9

2 6

2 3

2

II.

2 6

2 3

2

1 9

III.

2 3

2

1 9

I 6

IV.

1 8

1 6

I 4

I

Privates (Class V.) receive the following pensions :-

21 years' Service.

20 years' Service.

19 years' Service.

18 years' Service.

14 to 18 years' Service.

is. id.

is. od.

nd.

iod.

8d. to iod.

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For service in excess of 21 years, the following amounts are added to the pensions enumerated above : —

Classes I. to III. Classes IV. and V.

For each complete year in excess of 21 years.

id. per diem to oxi. per diem, id. per diem to 5d. per diem.

A man promoted to higher rank within one year of his comˆ pleting 21 years' service, receives, on his discharge in the higher rank, an extra 3d. per diem, provided that he has completed 25 years' service in all. An additional pension of 6d. per diem is awarded for gallant conduct, as in the case of warrant officers.

N.C.O.'s and men disabled through military service are granted the following pensions: —

If partially capable of earning a livelihood

Per diem.

Class I. to III

„ IV

V

is. to 3s. 9d. to 2s. 6d. to is. 6d.

If totally incapable of earning a livelihood

Per diem.

Class I. to III

„ IV

„ V

2s. 6d. to 3s. 6d. 2s. od. to 3s. od. is. 6d. to 2s. 6d.

Pensions may also be granted to N.C.O.‘sand men who are disabled by causes other than military service, according to circumstances.

United States. In the ordinary sense of the word, pensions in the United States are confined to federal judges and officers of the army and navy, but the United States ” Pension Fund ” is so singular a feature of the national budget, that it is desirable to give an account of the different classes of allowances which are granted. In the United States allowances for services in wars prior to the 4th of March 1861 are called ” old war ” pensions, and may be divided into three classes, viz.,(i) invalid pensions, based upon wounds or injuries received, or disease contracted in the course of duty, (2) ” service ” pensions, and (3) land bounties, both granted for service irrespective of injuries.

The first provision made by Congress for pensions was a resolution passed on the 26th of August 1776, promising invalid pensions to officers and men of the army or navy who lost a limb or were otherwise disabled in the War of Independence, at a rate equal to half of their monthly pay as officers or soldiers during life or continuance of the disability, those not totally disabled to receive an adequate monthly pension not to exceed half of their pay. Then followed various Acts of Congress enlarging the provisions for invalid pensions and extending them to those who had been in the war of 1812, and to the widows and children of those who died in the war or from wounds received in the war. The act of the 3rd of May 1846, provided for the prosecution of the war with Mexico and for pension- ing those volunteers wounded or otherwise disabled in service. Other acts were subsequently passed making further provision for pension on account of service in the Mexican war. The first general law granting ” service ” pensions was not passed until the 18th of March 1818, thirty-five years after the termination of the War of Independence. Its beneficiaries were required to be in indigent circumstances and in need of assistance from their country. Two years later Congress became alarmed by reason of the large number of claims filed (about 8000), and enacted what was known as the ” Alarm Act,” requiring each applicant for pension and each pensioner on the rolls to furnish a schedule of his whole estate and income, clothing and bedding excepted. Many pensioners were dropped who were possessed of as much as $150 worth of property. Numerous acts were, however,

passed from time to time liberaliz- ing the law or dealing more generously with the survivors of the Revolution. Service pensions were not granted to widows of the soldiers of this war until 1836, and then only for a period of five years and on condition that the marriage of the soldier was prior to his last service, and that the soldier's service was not less than six months. In 1853, seventy years after the close of the war, the limi- tation as to the time of marriage was removed. The rolls in 1901 contained nine and in 1908 two pensions based upon service in the War of Independence. The last survivor was Daniel F. Bakeman, who died on the 5th of April 1869, aged 109 years and 6 months.

The first law granting service pensions on account of the war of 1812 was passed in 1871, fifty-six years after the close of the war. This act required sixty days' service. Widows were not pension- able unless the marriage to the soldier had taken place prior to the treaty of peace of 15th February 1815. On 9th March 1878, sixty-three years after the war, an act was passed reducing the requisite period of service to fourteen days and removing the limitations as to date of marriage. In 1908 the pension rolls

contained the names of 471 widows of this war, the last male survivor having died in 1905, at the age of 105 years. Service pensions were provided for those who served in the Black Hawk war, Creek war, Cherokee disturbances and the Seminole war (1832 to 1842), on the 27th of July 1892, fifty years after the period embraced in the act ; they were granted to those who had served for thirty days and were honourably discharged, and to their widows. In 1908 there were 1820 survivors and 3018 widows, pensioners of the Indian wars. Service pensions were granted to the survivors of the war with Mexico by an act passed on the 29th of January 1887, thirty-nine years after the Guadeloupe-Hildalgo treaty. The pensions were granted to those who were honourably discharged and to the widows, for service of sixty days, if sixty-two years of age, or disabled or dependent. This law was liberalized by the acts of the 5th of January 1893, 23rd of April 1900, 6th of February 1907, and 19th of April 1908, increasing the pension to $15 for those who have reached the age of seventy years, and to $20 for those seventy-five years and over. In 1908 the pension rolls contained the names of 2932 survivors and 6914 widows on account of service in the Mexican war. To give title to bounty land, service must have been for at least fourteen days or in a battle prior to 3rd March 1855; and if in the navy or regular army, must have been in some war in which the United States was engaged. Bounty land warrants are issued for 160 acres, and over 70,000,000 acres have been granted under the different Bounty Land Acts.

For services rendered in the Civil War (1861-65) in the army or navy of the United States, or in their various branches, the law provided two distinct systems of pensioning — (1) the general laws, granting pensions for wounds or injuries received, or disease con- tracted in service in the line of duty, the pensions ranging from $6 to $100 per month; and (2) the so-called Dependent Pension Act and amending acts, granting pensions for permanent disabilities regardless of the time and manner of their origin, provided thay were not the result of vicious habits, the pensions ranging from $6 to $12 per month. What is known as the general law for dis- abilities incurred in service and in the course of duty was constituted in the act of the 14th of July 1862, as amended by the act of the 3rd of March 1873. Under its provisions the following classes of persons are entitled to benefit, viz. any officer of the army, navy or marine corps, or any enlisted man in the military or naval service of the United States, whether regularly mustered or not ; any master or any pilot, engineer, sailor or other person not regularly mustered, serving upon any gunboat or war-vessel of the United States; any acting assistant or contract surgeon; any provost-marshal, deputy provost-marshal or enrolling officer; subject to the several con- ditions in each particular case prescribed in the law. This law also embraces in its provisions the following classes, each class being subject to certain specified conditions, viz. widows, children under sixteen years of age, dependent parents, and brothers and sisters. This act has been the subject of numerous amendments along more liberal lines. As an illustration a case may be cited where a soldier lost both hands in the service in the course of duty, and was discharged in 1862. He is entitled to a pension of $8 per month from the date of his discharge. Under subsequent acts he is entitled to $25 per month from 4th July 1864; $31-25 from 4th June 1872; $50 from 4th June 1874; $72 from 17th June 1878, and $100 from 12th February 1889.

Under the general law a widow or dependent relative could not be pensioned unless the cause of the soldier's death originated in service in the line of duty; if it were so shown, a widow might be pensioned whether she were rich or poor. Upon the death or remarriage of the widow the minor children of the soldier under the age of sixteen years become entitled to pension. If the soldier died of causes due to his service, and left no widow or minor children, his other relatives become entitled, if dependent, in the following order, viz; first, the mother; secondly, the father; thirdly, orphan sisters and brothers under sixteen years of age, who shall be pen- sioned jointly. In 1908 the number of invalids pensioned under the general law was 142,044, and the number of widows and depen- dent relatives was 81,168.

The so-called Dependent Pension Act was based upon an Act of Congress approved 27th June 1890, which was amended on 9th May 1900. Properly speaking, it might be called ” dependent ” only as regards widows and parents. The main conditions as to the soldier or sailor were, ninety days’ service, an honourable discharge, and a permanent disability from disease or otherwise, not the result of his own vicious habits, to such an extent as to render him unable to maintain himself by manual labour. The rates of pension under this act were $6, $8, $10 and $ 12 per month. Widows became entitled under this law if they married the soldier or sailor prior to 27th June 1890, provided they were without means of support other than their daily labour, and an actual net income not exceeding $250 per year, and had not remarried. Claims of children under sixteen years of age were governed by the same conditions as applied to claims of widows, except that their dependence was presumed, and need not be shown by evidence. If a minor child was insane, idiotic or otherwise physically or ment- ally helpless, the pension continued during the life of said child or during the period of disability. Further acts made more liberal provisions. That of the 6th of February 1907, granted pensions

to persons who had served ninety days or more in the military or naval service in the civil war, or sixty days in the Mexican war, and were honourably discharged, no other conditions being attached. The rate of pension was fixed at $12 per month when sixty-two years of age, $15 per month when seventy years of age and $20 per month when seventy-five years of age. The act of April 1908, fixed the rate of pension for widows, minor children under the age of sixteen and helpless minors on the roll or afterwards to be placed on it at 812 per month, and granted pensions at the same rate to the widows of persons who served ninety days or more during the civil war, without regard to their pecuniary condition. In 1908 there were 140,600 invalids on the roll, and 4294 minor and helpless children. In the same year under the act of 1907 there were 338,341 dependants, while under the act of 1908ˆ 188,445 widows were put on the roll. All women employed by competent authority as nurses during the Civil War for six months or more, who are unable to earn a support, are granted a pension of $12 per month by an act of the 5th of August 1892. In 1908 the pension rolls contained the names of 31 10 pensioners under this act.

There were on the roll in 1908 on account of the Spanish war, 11,786

invalids and 3722 dependants. The total amount paid in pensions in 1908 on account of that war and the insurrection in the Philippine Islands was $3,654,122. The grand total of pen- sioners on the roll for all wars was, in 1908, 951,687.

In addition to pensions, the United States government grants the following gratuities: First: If a soldier lost a limb in the service, or as a result of his service in line of duty, he is furnished with an artificial limb free of cost every three years, or commuta- tion therefor, and transportation to and from a place where he shall select the artificial limb. Second: An honourably discharged soldier or sailor is given preference for appointment to places of trust and profit, and preference for retention in all civil service positions. Third: There are ten National Soldiers' Homes situ- ated at convenient and healthy points in different parts of the country, where comfortable quarters, clothing, medical attendance, library and amusements of different kinds are provided free of all expense; government providing the soldiers free transportation to the home, continuing payments of pension while they are members of the home, and increasing the same as disabilities increase. Fourth: There are thirty homes maintained by the different states, which are similar in their purpose to the National Homes, the sum of $100 per year being paid by the general government for each inmate. Many of these state homes also provide for the wives and children of the inmates, so that they need not be separated while they are members of such home. Fifth: Schools are estab- lished by the different states for the maintenance and education of soldiers' orphans until they attain the age of sixteen years.

From the close of the Civil War in 1865 to 1908, the government of the United States paid to its pensioners for that war the sum of *3>533.593>° 2 5- The payments on account of all wars for the fiscal year ended on the 30th of June 1908 were $153,093,086. Over $17,000,000 has been paid to surgeons for making medical examinations of pensioners and applicants for pensions. The total disbursement for pensions from 1790 to 1908 amounted to $3.75'. 108,809. No other nation or government in all time has dealt so liberally with its defenders.

The money appropriated by Congress for the payment of pensions is disbursed by eighteen pension agents established in different parts of the country. Pensions are paid quarterly, and the agencies are divided into three classes, one of which pays on the 4th of every month.

PENSIONARY, a name given to the leading functionary and legal adviser of the principal town corporations of Holland, because they

received a salary, or pension. At first this official was known by the name of ” clerk ” or ” advocate.” The office originated in Flanders. The earliest ” pensionaries ” in Holland were those of Dort (1468) and of Haarlem (1478). The pensionary conducted the legal business of the town, and was the secretary of the town council and its representative and spokesman at the meetings of the Provincial States. The post of pensionary was permanent and his influence was great.

In the States of the province of Holland pensionary of the order of nobles {Ridderschap) was the foremost official of that assembly and he was na med — until the death of Oldenbarneveldt in 1619 — the land’s advocate, or more shortly, the advocate. The importance of the advocate was much increased after the outbreak of the revolt in 1572, and still more so during the long period 1586-1619 when John van Oldenbarneveldt held the office. The advocate drew up and introduced all resolutions, concluded debates and counted the votes in the Provincial Assembly. When it was not in session he was a permanent member of the college of deputed councillors who carried on the administration. He was minister of justice and of finance.

All correspondence passed through his hands, and he was the head and the spokesman of the deputation, who represented the province in the States General. The conduct of foreign affairs in particular was entrusted almost entirely to him.

After the downfall of Oldenbarneveldt the office of lands’- advocate was abolished, and a new post, tenable for five year? only, was erected in its place with the title of Raad-Pensionaris. or Pensionary of the Council, usually called by English writers Grand Pensionary. The first holder of this office was Anthony Duyck. Jacob Cats and Adrian Pauw, in the days of tht stadtholders Frederick Henry and William of Orange II. had to be content with lessened powers, but in the stadtholderless regime 1650-1672 the grand pensionary became even more influential than Oldenbarneveldt himself, since there was no prince of Orange filling the offices of stadtholder, and of admiral and captain-general of the Union. From 1653-1672 John de Witt, re-elected twice, made the name of grand pensionary of Holland for ever famous during the time of the wars with England. The best known of his successors was Anthony Heinsius, who held the office from 1688 to his death in 1720. He was the intimate friend of William III., and after the decease of the king continued to carry out his policy during the stadtholderless period that followed. The office was abolished after the conquest of Holland by the French in 1795.

See Robert Fruin,. Geschiedenis der Staats-Instellingen in Neder- land,

The Hague, 1901 ; G. W. Vreede, Inleiding tot eene Gesch. der Nederlandsche Diplomatic (Utrecht, 1858). (G. E.)

PENTAMETER, the name given to the second and shorter line of the classical elegaic verse. It is composed of five (ireire) feet or measures (juerpa), and is divided into two equal parts of two and a half feet each: the second of these parts must be dactylic, and the first may be either dactylic or spondaic. The first part must never overlap into the second, but there must be a break between them. Thus:

- u u I — I

In the best Latin poets, the first foot of each part of the penta- meter is a dactyl. The pentameter scarcely exists except in conjunction with the hexameter, to which it always succeeds in elegaic verse. The invention of the rigidly dactylic form was attributed by the Greeks to Archilochus. Schiller described the sound and method of the elegaic couplet in two very skilful verses, which have been copied in many languages:

Im Hexameter steigt des Springquells fliissige Saule, Im Pentameter drauf fallt sie melodisch herab.

The pentameter was always considered to add a melancholy air to verse, and it was especially beloved by the Greeks in those recitations (/5a<ˆco5eiT

PENTASTOMIDA, or Linguattjuna, vermiform entoparasitic animals, of which the exact zoological position is unknown, although they are usually regarded as highly modified degenerate Arachnida of the order Acari.

The body is sub-cylindrical or somewhat convex above, flatter below, broad and oval in front and narrowed and elongate behind. Its integument is marked by a large number of transverse grooves simulating the segmentation of Annelids, and near the anterior extremity close to the mouth are two pairs of recurved chitinous hooks. The alimentary canal is a simple tube traversing the body from end to end, the anus opening at the extremity of its narrowed tail-like termination. The nervous system is represented by ah oesophageal collar and a suboesophageal ganglion, whence paired nerves pass outwards to innervate the anterior extremity and backwards towards its posterior end. No respiratory or circulatory organs are known. The sexes are distinct but dissimilar in size, the female being usually much larger than the male. The generative organs occupy a large part of the

body cavity. In the female the ovary is a large unpaired organ from the anterior end of. which arise two oviducts, and connected with the latter are a pair of large so-called copulatory pouches, which perhaps act as receptacula seminis. These and the oviducts lie on the anterior half of the body; but the oviducts themselves soon unite to form a single tube of great length, which runs backwards to its posterior extremity, terminating in the genital orifice close to the anus.

PEMl«3Ui»§©4ˆTlGPST

In the male, on the contrary, this orifice is situated in the anterior half of the body, not far behind the mouth. The orifice leads into a large pouch lodging a pair of very long penes, which are coiled up when not in use. The two testicles, which extend far back into the posterior part of the body, are long and tubular. Anteriorly their vasa deferentia soon unite into a common duct, which opens into the pouch containing the penes. Also com- municating with this pouch is a pair of long slender flagelliform tubes, of which the function is unknown.

The structure of the adult Linguatula or Pentastomum, above described, does not supply convincing evidence of relationship with the Acari. At the same time some Acari, like Eriophyes (Phytoptus) and Demodex, have the body elongated and annulated, but in these groups the elongation of the body is caudal or post-anal, as is attested by the position of the anus far forwards on its ventral surface. Again, the adult Pentastomum shows no trace of appen- dages, unless the two pairs of chitinous hooks are to be regarded as the vestiges of jaws or ambulatory limbs. In the embryo, however, what have been regarded as remnants of limbs may be seen.

In the mature stage Pentastomida live in the respiratory- passages of mammalia, principally in the nasal cavities. The remarkable life-history of one species, Linguatula taenioides, has been worked out in detail and presents a close analogy to that of some Cestodes. The adults live in the nose of dogs, where they have been known to survive over fifteen months. Each female lays a vast number of eggs, about 500,000 being the estimated amount. These are expelled along with mucus by the sneezing of the host. If they fall on pasture land or fodder of any kind and are eaten by any herbivorous animal, such as a hare, rabbit, horse, sheep or ox, the active embryos or larvae are set free in the alimentary canal of the new host.

Fig. 1 . — Linguatula taenioides, Rud. adult.

Fig. 2. — The same, in the first larval stage ; under side. a … a, Leg-

like processes.

These larvae are minute oval creatures with a comparatively short apically fringed caudal prolongation and furnished with two pairs of short two-clawed processes, which may represent the limbs of anthropods and possibly the two pairs of legs found in Acari of the family Eriophyidae. The larva is also armed anteriorly with a median piercing probe and a pair of sharp hooks by means of which it perforates the walls of the alimentary tract and makes its way into the body cavity, lungs or liver. Here it becomes encysted, and losing its boring apparatus and claw-bearing processes remains for a time quiescent. After a series of moults it passes into the second larval stage, somewhat like the parent but differing in having each integumental ring armed with a fringe cf backwardly directed short bristles. This sexually immature stage, regarded at one time as representing a distinct species and named Linguatula denticulata, is reached in about six or seven months and measures from 6 to 8 mm. in length. In the event of the host escaping being killed and eaten it is believed that some of these larvae wander about or ultimately make their way to the exterior, possibly through the bronchi ; nevertheless it seems to be certain that they can only reach sexual maturity in the nasal passages of some carnivorous animal, and the chance of attaining this environment is afforded when the viscera of the host are devoured by some flesh-eating mammal.

The adult female of L. taenioides measures about 4 in. long and the male barely one-fourth of that. The adult and immature stages are, however, by no means confined respectively to car- nivorous and herbivorous species of mammals. The adult stage, for example, has been found in the nasal passages of sheep, goata,

horses and even of man, and the larval stage in the pleura) and peritoneal cavities of dogs and cats. (R. I. P.)

PENTATEUCH, the name found as early as in Tertullian and Origen corresponding to the Jewish trnnd wain nam (the five-fifths of the Torah, or Law), and applied to the first five books of the Old Testament (Genesis, Exodus, Leviticus, Num- bers, Deuteronomy). The several books were named by the Jews from their initial words, though at least Leviticus, Numbers, and Deuteronomy had also titles resembling those we use, viz. n'na mm, o<-npsn ren (Anixeaˆ eKwdetn, Origen, in Eus., H. E. vi. 25), and rnw mro. The Pentateuch, together with Joshua, Judges and Ruth, with which it is usually united in Greek MSS., makes up the Octateuch; the Pentateuch and Joshua together have recently been named the Hexateuch. On the

critical questions arising from the Pentateuch or Hexa- teuch, see Bible and the articles on the several books.

PENTECOST, a feast of the Jews, in its original meaning a ” harvest feast, ” as consisting of the first-fruits of human toil (Exod. xxiii. 16), extending over the seven weeks which fairly correspond with the duration of the Canaanite harvest. Hence it was the closing feast of the harvest gladness.

The agricultural character of this feast clearly reveals its Canaanite origin (see Hebrew Religion). It does not, however, rank equal in importance with the other two agricultural festivals of pre-exilian Israel, viz. the Massoth or feast of unleavened cakes (which marked the beginning of the corn-harvest), and the Aslph (” ingathering,” later called succoth, ” booths “) which marked the close of all the year’s ingathering of vegetable products. This is clear in the ideal scheme of Ezekiel (xlv. 21 seq.) in which according to the original text, Pentecost is omitted (see Cornill’s revised text and his note ad loc). It is a later hand that has inscribed a reference to the ” feast of weeks ” which is found in our Massoretic Hebrew text. Nevertheless occasional allusions to this feast, though secondary, are to be found in Hebrew literature, e.g. Isa. ix. 3 (2 Heb.) and Ps . iv. 7 (8 Heb.).

In both the early codes, viz. in Exod. xxiii. 16 (E) and in Exod. xxxiv 22 (J, in which the harvest festival is called ” feast of weeks “) we have only a bare statement that the harvest festival took place some weeks after the opening spring festival called Massoth. It is in Deut. xvi. 9 that we find it explicitly stated that seven weeks elapsed between the beginning of the corn-harvest (” when thou puttest the sickle to the corn “) and the celebration of the harvest festival {%.asir). We also note the same generous inclusion of the household slaves and of the resident alien as well as the fatherless and widow that charac- terizes the autumnal festival of ” Booths.”

But when we pass to the post-exilian legislation (Lev. xxiii. 10-21; cf. Num. xxviii. 26 seq.) we enter upon a far more detailed and specific series of ritual instructions. (1) A special ceremonial is described as taking place on ” the morrow after the Sabbath,” i.e. in the week of unleavened cakes. The first-fruits of the harvest here take the form of a sheaf which is waved by the priest before Yahweh. (2) There is the offering of a male lamb of the first year without blemish and also a meal offering of fine flour and oil mixed in defined proportions as well as a drink-offering of wine of a certain measure. After this ” morrow after the Sabbath ” seven weeks are to be reckoned, and when we reach the morrow after the seventh Sabbath fifty days have been

enumerated. Here we must bear in mind that Hebrew numeration always includes the day which is the terminus a quo as well as that which is term, ad quern. On this fiftieth day two wave-loaves made from the produce of the fields occupied by the worshipper (" your habitations ") are offered together with seven unblemished lambs of the first year as well as one young bullock and two rams as a burnt offering; We have further precise details respecting the sin-offering and the peace- offerings which were also presented. 1 This elaborate ceremonial connected with the wave-offering (developed in the post-exile period) took place on the morrow of the seventh Sabbath called

1 On the critical questions involved in these ritual details of Lev. xxiii. 18 as compared with Num. xxviii. 27-30 cf. Driver and White in 5. B. O. T., note on Lev. xxiii. 18.

a " day of holy convocation " on which no servile work was to be done. It was called a " fiftieth-day feast." Pentecost or " Fiftieth " day is only a Greek equivalent of the last name (irevrriKOCTTr)) in the Apocrypha and New Testament. The orthodox later Jews reckoned the fifty days from the 16th of Nisan, but on this there has been considerable controversy among Jews themselves. The orthodox later Jews assumed that the Sabbath in Lev. xxiii. n, 15 is the 15th Nisan, or the first day of the feast of Massoth. Hitzig maintained that in the Hebrew calendar 14th and 21st Nisan were always Sabbaths, and that 1st Nisan was always a Sunday, which was the opening day of the year. " The morrow after the Sabbath " means, according to Hitzig, the day after the weekly Sabbath, viz. 22nd Nisan. Knobel (Comment, on Leviticus) and Kurtz agree with Hitzig's premises but differ from his identification of the Sabbath. They identify it with the 14th Nisan. Accordingly the " day after " falls on the 15th. (See Purves's article, " Pente- cost," in Hastings's Diet, of the Bible, and also Ginsburg's article in Kitto's Cyclopaedia). Like the other great feasts, it came to be celebrated by fixed special sacrifices. The amount of these is differently expressed in the earlier and later priestly law (Lev. xxiii. 18 seq.; Num. xxviii. 26 seq.); the discrepancy was met by adding the two lists. The later Jews also extended the one day of the feast to two. Further, in accordance with the tendency to substitute historical for economic explanations of the great feasts, Pentecost came to be regarded as the feast commemorative of the Sinaitic legislation.

To the Christian Church Pentecost acquired a new significance

through the outpouring of the Spirit (Acts ii.). (See Whit- sunday.)

It is not easy to find definite parallels to this festival in other ancient religious cults. The Akitu festival to Marduk was a spring festival at the beginning of the Babylonian year (Nisan). It therefore comes near in time to the feast of unleavened cakes rather than to the later harvest festival in the month Sivan called ” feast of weeks.” Zimmern indeed connects the Akitu festival with that of Purim on the 15th Adar (March); see K.A.T? p. 514 seq. Also the Roman Cerealia of April 12th-19th rather correspond to Massoth than to Kasir. (O. C. W.)

PENTELICUS (BP1X770-0-65, or UevreKiKov opos from the deme TlevTekr); mod. Mendeli), a mountain to the N.E. of the Athenian plain, height 3640 ft. Its quarries of white marble were not regularly worked until after the Persian wars; of this material all the chief buildings of Athens were constructed, as well as the sculpture with which they were ornamented. The ancient quarries are mostly on the south side of the mountain. The best modern quarries are on the north side. The top of Pentelicus commands a view over the plain of Marathon, and from it the Athenian traitors gave the signal to the Persians by a flashing shield on the day of the battle. There was a statue of Athena on the mountain.

PENTHEUS, in Greek legend, successor of Cadmus as king of Thebes. When Dionysus, with his band of frenzied women (Maenads) arrived at Thebes (his native place and the first city visited by him in Greece), Pentheus denied his divinity and violently opposed the introduction of his rites. His mother Agave having joined the revellers on Mount Cithaeron, Pentheus followed and climbed a lofty pine to watch the proceedings. Being discovered he was torn to pieces by Agave and others, who mistook him for some wild beast. His head was carried back to Thebes in triumph by his mother. Labdacus and Lycurgus, who offered a similar resistance, met with a like fearful end. Some identify Pentheus with Dionysus himself in his character as the god of the vine, torn to pieces by the violence of winter. The fate of Pentheus was the subject of lost tragedies by Thespis and Pacuvius.

See Euripides, Bacckae, passim; Ovid, Melam. iii. 511 ; Theocritus xxvi; Apollodorus iii. 5, 2; Nonnus, Dionysiaca, xliv-xlvi; on representations in art see O. Jahn, Pentheus und die Mainaden (1841).

PENTHIEVRE, COUNTS OF. In the nth and 12th centuries the countship of Penthievre in Brittany (dep. of C6tes-du-Nord)

belonged to a branch of the sovereign house of Brittany. Henry

d'Avaugour, heir of this dynasty, was dispossessed of the count- ship in 1235 by the duke of Brittany, Pierre Mauclerc, who gave it as dowry to his daughter, Yolande, on her marriage in 1238 to Hugh of Lusignan, count of La Marche. Duke John I. of Brittany, Yolande's brother, seized the countship on her death in 1272. In 1337 Joan of Brittany brought Penthievre to her husband, Charles de Chatillon-Blois. In 1437 Nicole de Blois, a descendant of this family, married Jean de Brosse, and was deprived of Penthievre by the duke of Brittany, Francis II., in 1465. The countship, which was restored to Sebastian of Luxemburg, heir of the Brasses through his mother, was erected for him into a duchy in the peerage of France (duche-pairie) in 1569, and was afterwards held by the duchess of Mercceur, daughter of the first duke of Penthievre, and then by her daughter, the duchess of Vend6me. The duchess of Vendome's grandson, Louis Joseph, inherited Penthievre in 1669, but it was taken from him by decree in 1687 and adjudged to Anne Marie de Bourbon, princess of Conti. In 1696 it was sold to the count of Toulouse, whose son bore the title of duke of Penthievre. This title passed by inheritance to the house of Orleans.

PENTHOUSE, a sloping roof attached to a building either to serve as a porch or a covering for an arcade, or, if supported by walls, as a shed, a " lean-to." In the history of siegecraft, the word is particularly applied to the fixed or movable construc- tions used to protect the besiegers when mining, working batter- ing-rams, catapults, &c, and is thus used to translate Lat. vinea and pluteus, and also testudo, the shelter of locked shields of the Romans. The Mid. Eng. form of the word is pentis, an adaptation of O. Fr. apentis, Med. Lat. appendilium or appen- dicium, a small structure attached to, or dependent on, another building, from appendere, to hang on to. The form " pent-house " is due to a supposed connexion with " house " and Fr. pente, sloping roof. The more correct form " pentice " is now frequently used.

PENTSTEMON, in botany, a genus of plants (nat. order Scrophulariaceae), chiefly natives of North America, with showy open-tubular flowers. The pentstemon of the florist has, however, sprung from P. Hartwegii and P. Cobaea, and possibly some others. The plants endure English winters unharmed in favoured situations. They are freely multiplied by cuttings, selected from the young side shoots, planted early in September, and kept in a close cold frame till rooted. They winter safely in cold frames, protected by mats or litter during frost. They produce seed freely, new kinds being obtained by that means. When special varieties are not required true from cuttings, the simplest way to raise pentstemons is to sow seed in heat (65° F.) early

in February, afterwards pricking the seedlings out and hardening them off, so as to be ready for the open air by the end of May. Plants formerly known under the name of Chelone (e.g. C. barbata, C. campanulata) are now classed with the pentstemons.

PENUMBRA (Lat. paene, almost, umbra, a shadow), in astro- nomy, the partial shadow of a heavenly body as cast by the sun. It is defined by the region in which the light of the sun is partially but not wholly cut off through the interception of a dark body. (See Eclipse.)

PENZA, a government of eastern Russia, bounded N. by the government of Nizhniy-Novgorod, E. by Simbirsk, and S. and W. by Saratov and Tambov; area 14,992 sq. m.; pop. (est. 1906) 1,699,000. The surface is undulating, with deep valleys and ravines, but does not exceed 900 ft. above sea-level. It is principally made up of Cretaceous sandstones, sands, marls and chalk, covered in the east by Eocene deposits. Chalk, potter's clay, peat and iron are the chief mineral products in the north. The soil is a black earth, more or less mixed with clay and sand; marshes occur in the Krasnoslobodsk district; and expanses of sand in the river valleys. There are extensive forests in the north, but the south exhibits the characteristic features of a steppeland. The government is drained by the j Moksha, the Sura (both navigable), and the Khoper, belonging I to the Oka, Volga and Don systems. Timber is floated down

several smaller streams, while the Moksha and Sura are important means of conveyance. The climate is harsh, the average tem- perature at the city of Penza being only 38 . The popula- tion consists principally of Russians, together with Mordvinians, Meshcheryaks and Tatars. The Russians profess the Ortho- dox Greek faith, and very many, especially in the north, are Raskolniks or Nonconformists, The chief occupation is agri- culture. The principal crops are rye, oats, buckwheat, hemp, potatoes and beetroot. Grain and flour are considerable exports. The local authorities have established depots for the sale of modern agricultural machinery. There are several agricultural and horticultural schools, and two model dairy- farms. Cattle breeding and especially horse-breeding are comparatively flourishing. Market-gardening is successfully carried on, and improved varieties of fruit-trees have been introduced through the imperial botanical garden at Penza and a private school of gardening in the Gorodishche district. Sheep-breeding is especially developed in

Chembar and Insar. The Mordvinians devote much attention to bee-keeping. The forests (22 % of the total area) are a considerable source of wealth, especially in Krasnoslobodsk and Gorodishche. The manufac- tures are few. .Distilleries come first, followed by beet sugar and oil mills, with woollen cloth and paper mills, tanneries, soap, glass, machinery and iron-works. Trade is limited to the export of corn, spirits, timber, hempseed-oil, tallow, hides, honey, wax, woollen cloth, potash and cattle, the chief centres for trade being Penza, Nizhni-Lomov, Mokshany, Saransk and Krasnoslobodsk.

The government is divided into ten districts, the chief towns of which are Penza, Gorodishche, Insar, Kerensk, Krasnoslobodsk, Mokshany, Narovchat, Nizhni-Lomov, Saransk and Chembar. The present government of Penza was formerly inhabited by Mordvinians, who had the Mescheryaks on the W. and the Bulgars on the N. In the 13th century these populations fell under the dominion of the Tatars, with whom they fought against Moscow. The Russians founded the town of Mokshany in 1535. Penza was founded in the beginning of the 17th century, the permanent Russian settlement dating as far back as 1666. In 1776 it was taken by the rebel Pugashev. The town was almost totally destroyed by conflagrations in 1836, 1839 and 1858. PENZA, a town of Russia, capital of the government of the same name, 492 m. by rail S.E. from Moscow. It stands on a plateau 567 ft. above the sea, at the confluence of the Penza with the navigable Sura. Pop. (1897), 61,851. The older parts of the town are constructed of wood, but the newer parts are well built. The cathedral was erected in 1820-1821. Penza has technical schools, public libraries, a museum of antiquities, and a theatre which has played some part in the history of the Russian stage. The bulk of the inhabitants support themselves by agriculture or fishing in the Sura. An imperial botanical garden is situated within two miles of the town. Apart from paper-mills and steam Hour-mills, the manufacturing establish- ments are small. There is a trade in corn, oil, tallow, timber and spirits, and two fairs where cattle and horses are sold.

PENZANCE, a municipal borough, market town and seaport in the St Ives parliamentary division of Cornwall, England, the terminus of the Great Western railway, 3255 m. W.S.W. of London. Pop. (1901), 13,136. It is finely situated on the western shore of Mount’s Bay, opposite St Michael’s Mount, being the westernmost port in England. The site of the old town slopes sharply upward from the harbour, to the west of which there extends an esplanade and modern residential quarter; for Penzance, with its mild climate, is in considerable favour as a health resort. The town has no buildings of great antiquity, but the public buildings (1867), in Italian style, are handsome. By the

market house is a statue of Sir Humphry Davy, who was born here in 1778. Among institutions there are a specially fine public library, museums of geology and natural history and antiquities, mining and science schools, the West Cornwall Infirmary and a meteorological station. The harbour, enclosed within a breakwater, has an area of 24 acres, with 1 2 to 16 ft. depth of water, and floating and graving docks. There is a

large export trade in fish, including that of pilchards to Italy. Other exports are tin and copper, granite, serpentine, vegetables and china clay. Imports are principally coal, iron and timber. Great quantities of early potatoes and vegetables, together with flowers and fish, are sent to London and elsewhere. The borough is under a mayor, 6 aldermen and 18 councillors. Area, 35s acres.

Nearly two miles inland to the north-west is Madron (an urban district with a population of 3486). The church of St Maddern is principally Perpendicular, with earlier portions and a Norman front. Near the village a ” wishing well ” of ancient fame is seen, and close to it the ruins of a baptistery of extreme antiquity. Monoliths and cromlechs are not uncommon in the neighbourhood. Three miles north-east is the urban district of Ludgvan .(pop. 2274), and to the south is Paul (6332), which includes the village of Newlyn (q.v.).

Penzance. (Pensans) was not recognized as a port until the days of the Tudors, but its importance as a fishing village dates from the 14th century. In 1327 thirty burgesses in Penzance and thirteen boats paying 13s. yearly are found among the pos- sessions of the lords of Alverton, of which manor it formed a portion of the demesne lands. The year 151 2 marks the begin- ning of a new era.. Until then St Michael’s Mount had been regarded as the port of Mounts Bay; but in that year Henry VIII. granted the tenants of Penzance whatever profits might accrue from the ” ankerage, kylage and busselage ” of ships resorting thither, so long as they should repair and maintain the quay and bulwarks for the safeguard of the ships and town. Nevertheless thirty years later it is described by Leland as the westernmost market town in Cornwall ” with no socur for Botes or shippes but a forsed Pere or Key.” During the war with Spain the town was devastated in 1595. The charter of incor- poration granted in 16 14 states that by the invasion of the Spaniards it had been treacherously spoiled and burnt but that its strength, prosperity and usefulness for navigation, and the acceptable and laudable services of the inhabitants in rebuilding and fortifying it, and their enterprise in erecting a pier, have moved the king to grant the petition for its incorporation. This charter provides for a mayor, eight aldermen and twelve assist- ants to

constitute the common council, the mayor to be chosen by the council from the aldermen, the aldermen to be chosen from the assistants, and the assistants from the most sufficient and discreet of the inhabitants. It also ratified Henry's grant of anchorage, keelage and busselage. In 1663 Penzance was constituted a coinage town for tin. It has never enjoyed independent parliamentary representation. In 1332 a market on Wednesdays and a fair at the Feast of St Peter ad Vincula were granted to Alice de Lisle and in 1405 this market was ratified and three additional fairs added, viz. at the feasts of St Peter in Cathedra and the Conception and Nativity of the Blessed Virgin. The charter of 1614 substicuted markets on Tuesdays and Thursdays for the Wednesday market and added two fairs one at Corpus Christi and the other on the Thursday before St Andrew. Of the fairs only Corpus Christi remains; markets are now held on Tuesday, Thursday and Saturday. Apart from fishing and shipping, Penzance has never been an industrial centre.

PEONAGE (Span, peon; M. Lat. pedo (pes), primarily a foot- soldier, then a day-labourer), a system of agricultural servitude common in Spanish America, particularly in Mexico. In the early days the Spanish government, with the idea of protecting the Indians, exempted them from compulsory military service, the payment cf tithes and other taxes, and regulated the system of labour; but left them practically at the mercy of the Spanish governors. The peons, as the Indian labourers were called, were of two kinds: (1) the agricultural workman who was free to contract himself, and (2) the criminal labourers who, often for slight offences, or more usually for debt, were condemned to practical slavery. Though legally peonage is abolished, the unfortunate peon is often lured into debt by his employer and then kept a slave, the law permitting his forcible detention till he has paid his debt to his master.

PEOPLE, a collective term for persons in general, especially as forming the body of persons in a community or nation, the " folk " (the O.E. and Teut. word, cf. Ger. Volk). The earlier forms of the word were peple, poeple, puple, &c. ; the present form is found as early as the 1 5th century, but was not established till the beginning of the 16th. Old French, from which it was adapted, had many of these forms as well as the mod. Fr. peuple. The Lat. populus is generally taken to be a reduplication from the root pie, — fill, seen in plenus, full; plebs, the commons; Gr. 7rX?)0os, multitude.

PEORIA, a city, port of entry, and the county-seat of Peoria county, Illinois, U.S.A., in the north central part of the state, on the lower end of Lake Peoria, an expansion of the Illinois river, and about 150 m. S.W. of Chicago. Pop. (1900) 56,100; (1910) 66,950. It is served by 13 railways, of which the most important are the Chicago, Burlington & Quincy, the Chicago, Rock Island & Pacific, the Chicago & Alton, the Illinois Central, the Cleveland, Cincinnati, Chicago & St Louis, and the Chicago & North-Western. The Illinois river is navigable to its mouth, and at La Salle, above Peoria, connects with the Illinois & Michigan Canal extending to Chicago. The river is spanned at Peoria by two railway bridges and a wagon bridge. The residential portion of the city is situated on bluffs overlooking Lake Peoria, and the business streets lie on the plain between these elevations and the water front. The park system includes more than 400 acres; Bradley Park (140 acres), the largest, was given to the city by Mrs Lydia Moss Bradley (1816-1908) and was named in her honour. On a bluff north-east of the city is Glen Oak Park (103 acres), modelled after ForestPark, St Louis, Missouri; in the south-western part of the city is Madison Park (88 acres); and in the lo%ver part of the city is South Park (10 acres). In the Court House Square there are two monuments in honour of the Federal soldiers and sailors of Peoria county who perished in the Civil War; in Springdale Cemetery there are two similar memorials, one of which (a large granite boulder) is in memory of the unknown dead; and in the same cemetery there is a monument erected by the state (1906) to mark the grave of Thomas Foid (d. 1851), governor of Illinois in 1842-1846. Among the principal public buildings and institutions are the Peoria Public Library founded in 1855, the City Hall, the Court House, the Federal building, St Mary's Cathedral, the Bradley Polytechnic Institute (affiliated with the university of Chicago), founded in 1896 by Mrs Lydia Moss Bradley, who gave it an endowment of $2,000,000; Spalding Institute, founded through the efforts of John L. Spalding (b. 1840), who was Bishop of the Roman Catholic diocese of Peoria in 187 7-1 908; an Evangelical Lutheran Orphans' Home (1902), an Industrial School for girls (1892), Cottage Hospital (1876), St Francis Hospital (1875), a Florence Crittenton Home (1902), a Home for the Friendless (1876), and a House of the Good Shepherd (1891), and the Guyer Memorial (1889), St Joseph's (1892), and John C. Proctor homes for the aged and infirm (1907). At Bartonville, a suburb, there is a state hospital for the incurable insane.

In 1900 and in 1905 Peoria ranked second among the cities of Illinois in the value of its manufactures. The invested capital amounted in 1905 to $22,243,821, and the factory products were valued at $60,920,411. The principal industry is the manufac- ture of distilled

liquors, which were valued in 1905 at $42,170,815. Other important manufactures are agricultural implements ($2,309,962), slaughter-house and meat-packing products ($1,480,398), glucose, cooperage ($1,287,742), malt liquors ($887,570), foundry and machine-shop products, strawboard, automobiles, brick and stone, and flour and grist mill products. Peoria is also an important shipping point for grain and coal.

Peoria was named from one of the five tribes of the Illinois Indians. In 1680 La Salle, the explorer, built Fort Crevecceur, on the lake shore bluffs, opposite the present city; this fort, however, was destroyed and deserted in the same year by La Salle's followers after he had set out to return to Fort Frontenac. There is evidence that a French mission was established on or near the site of Peoria as early as 1711; and certainly by 1725 a settlement, known as Peoria, and composed of French and

" breed " traders, trappers and farmers, had been established about i| m. above the foot of the lake, on its west shore. This village was practically deserted during the later years (1781- 1783) of the War of Independence, and when its inhabitants returned after the peace they settled in a village which had been established about 1778, on the present site of Peoria, by Jean Baptiste Maillet (d. 1801), and was at first called La Ville de Maillet. It is probable that Jean Baptiste Point de Saible, believed to have been a Santo Domingan negro, and jocularly spoken of "as the first white seUler in Chicago," lived in the " old village " of Peoria as early as 1773 — or six years before he settled on the present site of Chicago — and again about 1783. In November 181 2 about half of the town was burned by a company of Illinois militia who had been sent thither to build a fort, and whose captain asserted that his boats had been fired upon at night by the villagers. In the following year a fort, named Fort Clark in honour of George Rogers Clark, was erected on the site of the old village; it was evacuated in 18 18, and soon afterwards was burned by the Indians. After the town was burned there was no serious attempt to rebuild until 1819. Peoria was incorporated as a town in 1835 and was chartered as a city in 1845. In 1900 North Peoria was annexed.

See David McCulloch, Early Days of Peoria and Chicago, an address read before the Chicago Historical Society in 1904, and published by that society, (n.d.j, and " Old Peoria," by the same author, in publication No. 6 of the Illinois State Historical Society Trans- actions (Springfield, 111. 1901); also Historical Encyclopaedia of Illinois (Chicago, 1900), ed. by Newton Bateman and Paul Selby; History of Peoria County,.. III. (Chicago, 1880) ; and C. Ballance, History of

Peoria (Peoria, 1870).

PEPE, 6UGLIELM0 (1 783-1855), Neapolitan general, was born at Squillace in Calabria. He entered the army at an early age, but in 1799 he took part in the republican movement at Naples inspired by the French Revolution; he fought against the Bourbon troops under Cardinal Ruffo, was captured and exiled to France. He entered Napoleon's army and served with distinction in several campaigns, including those in the Nea- politan kingdom, first under Joseph Bonaparte and later under Joachim Murat. After commanding a Neapolitan brigade in the Peninsular campaign, Pepe returned to Italy in 18 13, with the rank of general, to help to reorganize the Neapolitan army. When the news of the fall of Napoleon (1814) reached Italy Pepe and several other generals tried without success to force Miirat to grant a constitution as the only means of saving the kingdom from foreign invasion and the return of the Bourbons. On Napoleon's escape from Elba (1815) Murat, after some hesitation, placed himself on the emperor's side and waged war against the Austrians, with Pepe on his staff. After several engagements the Neapolitans were forced to retire, and eventually agreed to the treaty of Casalanza by which Murat was to abandon the kingdom; but the Neapolitan officers retained their rank under Ferdinand IV. who now regained the throne of Naples. While engaged in suppressing brigandage in the Capitanata, Pepe organized the carbonari (q.v.) into a national militia, and was preparing to use them for political purposes. He had hoped that the king would end by granting a constitution, but when that hope failed he meditated seizing Ferdinand, the emperor of Austria, and Metternich, who were expected at Avellino, and thus compelling them to liberate Italy (1819). The scheme broke down through an accident, but in the following year a military rising broke out, the mutineers cheering for the king and the constitution. Pepe himself was sent against them, but while he was hesitating as to what course he should follow Ferdinand promised a constitution (July 1820). A revolt in Sicily having been repressed, Pepe was appointed inspector-general of the army. In the meanwhile the king, who had no intention of respecting the constitution, went to Laibach to confer with the sovereigns of the holy alliance assembled there, leaving his son as regent. He obtained the loan of an Austrian army with which to restore absolute power, while the regent dallied with the Liberals. Pepe, who in parliament had declared in favour of deposing the king, now took command of the army and marched against the Austrians. He attacked them at Rieti (March 2,

1821), but his raw levies were repulsed. The army was gradually disbanded, and Pepe spent several years in England, France and other countries, publishing a number of books and pamphlets of a political character and keeping up his connexion with the Carbonari. When in 1848 revolution and war broke out all over Italy, Pepe returned to Naples, where a constitution had again been proclaimed. He was given command of the Nea- politan army which was to co-operate with Piedmont against the Austrians, but when he reached Bologna the king, who had already changed his mind, recalled him and his troops. Pepe, after hesitating between his desire to fight for Italy, and his oath to the king, resigned his commission in the Neapolitan service and crossed the Po with 2000 Volunteers to take part in the campaign. After a good deal of fighting in Venetia, he joined Manin in Venice and took command of the defending army. When the city was forced by hunger to surrender to the Austrians, Pepe and Manin were among those excluded from the amnesty; he again went into exile and died in Turin in 1855.

The story of Pepe's life down to 1846 is told in his own interesting Memorie (Lugano, 1847), and his Narrative of the Events. . . at Naples in 1820 and 1821 (London, 1821); for the later period of his life see the general histories of the Risorgimento, and the bio- graphical sketch in vol. ii. of L. Carpi's Risorgimento (Milan, 1886).

PEPERINO, an Italian name applied to a brown or grey volcanic tuff, containing fragments of basalt and limestone, with disseminated crystals of augite, mica, magnetite, leucite, &c. The typical peperino occurs in the Alban Hills, near Rome, and was used by the ancients, under the name of lapis albanus, as a building stone and for the basins of fountains. Other tuffs and conglomerates in Auvergne and elsewhere are also called peperino. The name originally referred to the dark coloured inclusions, suggestive of pepper-corns. In English the word has sometimes been written peperine.

PEPPER, WILLIAM (1843-1808), American physician, was born in Philadelphia, on the 21st of August 1843. He was educated at the university of Pennsylvania, graduating from the academic department in 1862 and from the medical depart- ment in 1864. In 1868 he became lecturer on morbid anatomy in the same institution, and in 1870 lecturer on clinical medicine. From 1876 to 1887 he was professor of clinical medicine, and in 1887 succeeded Dr Alfred Stille as professor of theory and practice of medicine. He was elected provost of the university in 1881, resigning that position in 1894. For

his services as medical director of the Centennial Exhibition in 1876 he was made knight commander of St Olaf by the king of Sweden. He founded the Philadelphia Medical Times, and was editor of that journal" in 1870-1871. He was known particularly for his contributions on the subject of the theory and practice of medicine, and the System of Medicine which he edited in 1885-1886 became one of the standard textbooks in America. Among his contribu- tions to the medical and scientific journals of the day, were " Trephining in Cerebral Disease " (1871); " Local Treatment in Pulmonary Cavities" (1874); "Catarrhal Irrigation" (1881); "Epilepsy " (1883); and " Higher Medical Education: the True Interest of the Public and the Profession. " He died on the 28th of July 1808 at Pleasanton, California.

PEPPER, a name applied to several pungent spices known respectively as black, white, long, red, or cayenne, Ashanti, Jamaica, and melegueta pepper, but derived from at least three different natural orders of plants.

Black pepper is the dried fruit of piper nigrum, a perennial climbing shrub indigenous to the forests of Travancore and Malabar, from whence it has been introduced into Java, Sumatra, Borneo, the Malay Peninsula, Siam, the Philippines, and the West Indies. It climbs on tree-trunks by roots in the same way as ivy, and from its climbing habit is known as the pepper vine. It is one of the earliest spices known to mankind, and for many ages formed a staple article of commerce between India and Europe. Tribute has been levied in pepper; one of the articles demanded in 408 by Alaric as part of the ransom of Rome was 3000 lb of pepper. Its exorbitant price during the middle ages was one of the inducements which led the Portuguese to seek a

sea-route to India. The discovery or! the passage round the Cape of Good Hope led (1498) to a considerable fall in the price, and about the same time the cultivation of the plant was ex- tended to the western islands of the Malay Archipelago. Pepper, however, remained a monopoly of the Portuguese crown as late as the 18th century. In Great Britain it was formerly taxed very heavily, the impost in 1623 amounting to 5s., and as late as 1823 to 2s. 6d. lb.

The largest quantities of pepper are produced in Penang, the island of Riouw, and Johore near Singapore — Penang affording on an average about half of the entire crop. Singapore is the great emporium for this spice in the East, the largest proportion being shipped thence to Great Britain. The varieties of black pepper met with in commerce are

known as Malabar, Aleppy or Tellicherry, Cochin, Penang, Singapore and Siam.

longitudinal section 01

Piper nigrum, a. Twig with fruit (about J nat. size) ; b, flower much enlarged ; c, section of fruit.

It owes its pungency to a resin, and its flavour to a volatile oil, of which it yields from 1-6 to 2-2%. The oil agrees with oil of turpentine in composition as well as in specific gravity and boiling point. In polarized light it deviates the ray, in a column 50 mm. long, 1-2° to 3-4° to the left. Pepper also contains a yellow crystal- line alkaloid, called piperine, to the extent of 2 to 8 %. This substance has the same empirical formula as morphine, C17 H19 NO3, but differs in constitution and properties. It is insoluble in water when pure, is devoid of colour, flavour and odour, and may be resolved into piperic acid, G2H10O4, and piperidine, C 6 HnN. The latter is a liquid colourless alkaloid, boiling at 106° C, has an odour of pepper and ammonia, and yields crystallizable salts. A fatty oil is found in the pericarp of pepper, and the berries yield on incineration from 4-1 to 5-7 of ash. The only use of black pepper is as a condiment, but it may be given therapeutically in doses of 5 to 20 grains. It has the pharmacological actions of a volatile oil.

In the south-west of India, where the pepper-plant grows wild, it is found in rich, moist, leafy soil, in narrow valleys, propagating itself by running along the ground and giving off roots into the soil. The only method of cultivation adopted by the natives is to tie up the end of the vines to the neighbouring trees at distances of at least 6 ft., especially to those having a rough bark, in order that the roots may easily attach themselves to the surface. The underwood is then cleared away, leaving only sufficient trees to provide shade and permit free ventilation. The roots are manured with a heap of leaves, and the shoots are trained twice a year. In localities where the pepper does not grow wild, ground is selected which permits of free drainage, but which is not too dry nor liable to inundation, and cuttings are planted at about a foot from the trees either in the rainy season in June or in the dry season in February. Sometimes several cuttings about 18 in. long are placed in a basket and buried at the root of the tree, the cuttings being made to slope towards the trunk. In October or November the young plants are manured with a mixture of leaves and cow- dung. On dry soils the young plants require watering every other day during the dry season for the first three years. The plants bear in the fourth or fifth year, and if raised from cuttings are

fruitful for seven years, ifvfrom seed for fourteen years. The pepper from plants raised from cuttings is said to be superior in quantity and quality, and this method is in consequence most frequently adopted. Where there are no trees the ground is made into terraces and enclosed by a mud wall, and branches of Erythrina indica are put into the ground in the rainy season and in the course of a year are capable of supporting the young pepper plants. In the meantime mango trees are planted, these being preferred as supports, since their fruit is not injured by the pepper plant, while the Erythrina is killed by it in fourteen or fifteen years.

In Sumatra the ground is cleared, ploughed, and sown with rice, and cuttings of the vine are planted in September, 5 ft. apart each way, together with a sapling of quick growth and rough bark. The plants are now left for twelve or eighteen months and then entirely buried, except a small piece of bent stem, whence new shoots arise, three or four of which are allowed to climb the tree near which they are planted. These shoots generally yield flowers and fruits the next year. Two crops are collected every year, the principal one being in December and January and the other in July and August, the latter yielding pepper of inferior quality and in less quantity.

Two or three varieties are met with in cultivation; that yielding the best kinds has broadly ovate .leaves, five to seven in number, nerved and stalked. The flower-spikes are opposite the leaves, stalked and from 3 to 6 in. long; the fruits are sessile and fleshy. A single stem will bear from twenty to thirty of these spikes. The harvest begins as soon as one or two berries at the base of the spikes begin to turn red, and before the fruit is mature, but when full- grown and still hard; if allowed to ripen, the berries lose pungency, and ultimately fall off and are lost. The spikes are collected in bags or baskets and dried in the sun. When dry the pepper is put into bags containing from 64 to 128 lb. In Sumatra the yield is estimated at about 15 ft) per plant per annum. In Malabar each vine gives 2 lb a year up to the fifteenth or twentieth year, or about 24 lb from each tree, a single tree sometimes supporting eight or twelve vines; an acre is calculated to bear 2500 plants, to cost about £4. in outlay to bring it into bearing, and to yield a produce of £80 when in its best condition.

White pepper differs only in being prepared from the ripe fruits. These, after collection, are kept in the house three days and then

bruised and washed in a basket with the hand until the stalks and pulpy matter are removed, after which the seeds are dried. It is, however, sometimes prepared from the dried black pepper by removing the dark outer layer. It is less pungent than the black but possesses a finer flavour. It is chiefly prepared at the island of Riouw, but the finest comes from Tellicherry.

White pepper affords on an average not more than 1-9% of essential oil ; but, according to Cazeneuve, as much as 9 % of piperine, and of ash not more than 1 • 1 %.

Long pepper is the fruit-spike of Piper officinarum a-nd P. longum, gathered shortly before it reaches maturity and dried. The former is a native of the Indian Archipelago, and has oblong- ovate, acuminate leaves, which are pinnately veined. The latter is indigenous in the hotter provinces of India, Ceylon, Malacca and the Malay Islands; it is distinguished from P. officinarum by the leaves being cordate at the base and five-veined.

Long pepper appears to have been known to the ancient Greeks and Romans under the name of irkvtpi fianpov; and in the 10th century mention is made of long pepper, or macropiper, in conjunc- tion with black and white peppers. The spice consists of a dense spike of minute baccate fruits closely packed around the central axis, the spike being about l| in. long and i in. thick; as met with in commerce they have the appearance of having been limed. In Bengal the plants are cultivated by suckers, which are planted about 5 ft. apart on dry rich soil on high ground. An English acre will yield about 3 maunds (80 lb) the first year, 12 the second, and 18 the third year; after this time the yield decreases, and the roots are therefore grubbed up and sold as pipli mul, under which name they are much used as a medicine in India. After the fruit is collected, which is usually in January, the stem and leaves die down to the ground. Long pepper contains piperine, resin and volatile oil and yields about 8 % of ash. Penang and Singapore are the principal centres in the East for its sale.

Ashanti or West African pepper is the dried fruit of Piper Clusii, a plant widely distributed in tropical Africa, occurring most abundantly in the country of the Niam-niam. It differs from black pepper in being rather smaller, less wrinkled, and in being attenuated into a stalk, like cubebs (the dried unripe fruits of P. Cubeba), to which it bears considerable resemblance externally. The taste, however, is pungent, exactly like that of pepper, and the fruit contains piperine. It was imported from the Grain Coast by the merchants of Rouen and Dieppe as early

as 1364 and was exported from Benin by the Portuguese in 1485; but, according to Clusius, its importation was forbidden by the king of Portugal for fear it should depreciate the value of the pepper from India. In tropical Africa it is extensively used as a condiment, and it could easily be collected in large quantities if a demand for it should arise.

Jamaica pepper is the fruit of Pimenta officinalis, an evergreen tree of the Myrtle family. It is more correctly termed ” pimento” or ” allspice,” as it is not a true pepper.

Melegueta pepper, known also as ” Guinea grains,” ” grains of paradise” (q.v.) or ” alligator pepper,” is the seed of Amomum Melegueta, a plant of the ginger family; the seeds are exceedingly pungent, and are used as a spice throughout central and northern Africa.

For Cayenne pepper, see that article.

PEPPER-CORN, the fruit or seed of the pepper plant ; hence anything very small or insignificant. Pepper-corn rent is a merely nominal rent, reserved for the purpose of having the tenancy acknowledged by the tenant. Building leases fre- quently reserve a pepper-corn as rent for the first few years. See Rent.

PEPPERMINT, an indigenous perennial herb of the natural order Labiatae, and genus Mentha (see Mint), the specific name being Mentha piperita, is distinguished from other species of the genus by its stalked leaves and oblong-obtuse spike-like heads of flowers. It is met with, near streams and in wet places, in several parts of England and on the European continent, and is also extensively cultivated for the sake of its essential oil in England, 1 in several parts of continental Europe, and in the

Fig. 1. — Mentha piperita.

a, Flowering branch (about 5 nat. size) ; b, flower showing form of

calyx teeth (enlarged).

United States. Yet it was only recognized as a distinct species late in the 17th century, when Dr Eales discovered it in Hertford- shire and pointed it out to Ray, who published it in the second edition of his Synopsis stirpium britannicarum (1696). The medicinal properties of the plant were speedily recognized and it was admitted into the London Pharmacopoeia in 1721, undei the name of Mentha piperitis

sapore.

Two varieties are recognized by growers, the white and the black mint. The former has purplish and the latter green stemsj the leaves are more coarsely serrated in the white. The black is more generally cultivated, probably because it is found to yield more oil, but that of the white variety is considered to have a more delicate odour, and obtains a higher price. The white is the kind chiefly dried for herbalists. The flavour varies to a slight extent even with particular plots of land, badly drained ground being known to give unfavourable results both as to the quantity and quality of the oil. That of the Japanese

1 Near Mitcham in Surrey, Wisbech in Cambridgeshire, Market Deeping in Lincolnshire and Hitchin in Hertfordshire.

and Chinese oil also differs slightly from the English, and is thus distinguishable by experts. In America the oil is liable to be injured in flavour by aromatic weeds which grow freely among the crop, the most troublesome of these being Erigeron canadense, and Erechlhites hieracifolia. When pure the oil is nearly colour- less and has an agreeable odour and powerful aromatic taste, followed by a sensation of cold when air is drawn into the mouth. It has a specific gravity of 0-84 to 0-92, and boils at 365 F. Mitcham oil, when examined by polarized light in a column 50 mm. long, deviates from 14-2° to 10-7° to the left, the American 4-3°. When oil of peppermint is cooled to 4 C. it sometimes deposits colourless hexagonal prisms of menthol, C10H20O, which are soluble in alcohol and ether, almost insoluble in water, and fusible at 02° F. The oil consists chiefly of menthol and a terpene called menthene, Ci Hi 8 . Oil of peppermint is often adulter- ated with a third part of rectified spirit, which may be detected by the milkiness produced when the oil is agitated with water. Oil of rosemary and rectified oil of turpentine are sometimes used for the same purpose. If the oil contains turpentine it will explode with iodine. If quite pure it dissolves in its own weight

of rectified spirits of wine. Pep- permint oil is largely distilled at Canton, a considerable quantity being sent to Bombay, also a large quantity of menthol. The species cultivated in the neigh- bourhood of Canton, is Mentha arvensis, var. glabraia. Pepper- mint is chiefly cultivated in the province of Kiang-si; and accord- ing to native

statements as much as 40 piculs of oil of peppermint are sent annually to ports on the coast. In Japan also the distillation of oil of peppermint forms a considerable industry, the plant cultivated being M. arvensis, var. piperascens. The oil, under the name of hakka no abura, is exported from Hiogo and Ozaka, but is said to be frequently adulterated. The menthol is obtained by subjecting the oil to a low temperature, when it crystallizes out and is separated. The two varieties of M. arvensis just named yield much more menthol than M. piperita. It is remarkable, however, that the M. arvensis, var. javanica, growing in Ceylon, has not the flavour of peppermint but that of garden mint, while typical form of M. arvensis grown in Great Britain has an odour so different from peppermint that it has to be carefully removed from the field lest it should spoil the flavour of the peppermint oil when the herb is distilled. M. incana, cultivated near Bombay as a herb, also possesses the flavour of peppermint. In the form in which menthol is imported it bears some resemblance to Epsom salts, with which it is sometimes adulterated.

The volatile oil of Mentha piperita is a valuable and widely used drug. Its chief constituents are menthol and menthene, which is a liquid terpene. The British pharmacopoeia contains two pre- parations of this oil, the Aqua menthae piperilae and the Spiritus menthae piperitae. The oil has the characters of its class, with certain special features. Its local anaesthetic action is exceptionally strong. It is also powerfully antiseptic. These two properties make it valuable in the relief of toothache and in the treatment of carious cavities in the teeth. They also render the drug valuable in certain forms of dyspepsia and in colic generally, ” soda-mint lozenges ” being a familiar form. The characteristic anti-spasmodic action of the volatile oils is perhaps more marked in this than in any other oil, and greatly adds to its power of relieving pains arising in the alimentary canal. The volatile oil of spearmint is also official in Great Britain and the United States, being given in the same doses and for the same purposes as oil of peppermint. It is of less value medicinally, not containing any appreciable quantity of menthol, the place of which is taken in the oleum menthae viridis —

xxi. 5

Fig. 2. — Mentha -arvensis, var. piperascens.

a, Flowering branch re- duced) ; b, calyx showing form of teeth (enlarged).

the pharmacopoeial name — by carvone, CioHuO, found in caraway

oil, and isomeric with thymol.

The following mode of cultivation of peppermint is adopted at Market Deeping. A rich friable soil, retentive of moisture, is selected, and the ground is well tilled 8 to 10 in. deep. The plants are propagated in the spring, usually in April and May. When the young shoots from the crop of the previous year have attained a height of about 4 in. they are pulled up and trans- planted into new soil. They grow vigorously the first year, and throw out numerous stolons on the surface of the ground. After the crop has been removed these are allowed to harden or become woody, and then farm-yard manure is scattered over the field and ploughed in. In this way the stolons are divided into numerous pieces, and covered with soil before the frost sets in. If the autumn is wet they are liable to become sodden, and rot, and the next crop fails. In the spring the fields are dressed with Peruvian guano. In new ground the peppermint requires hand- weeding two or three times, as the hoe cannot be used without injury to the plants. Moist heavy weather in August is apt to cause the foliage to drop off and leave the stems almost bare. In these circumstances rust (Puccinia menthae) also is liable to attack the plants. This is. prevented to a certain extent by a rope being drawn across the plants, by two men walking in the furrows, so as to remove excessive moisture. The average yield of peppermint is about 165 cwt. per acre. The first year's crop is always cut with the sickle to prevent injury to the stolons. The herb of the second and third year is cut with scythes, and then raked by women into loose heaps ready for carting. The field is then gleaned by boys, who add what they collect to the heaps. The plants rarely yield a fourth crop on the same land. The harvest usually commences in the beginning or middle of August, or as soon as the plants begin to flower, and lasts for six week?, the stills being kept going night and day. The herb is carted direct from the field to the stills, which are made of copper, and contain about 5 cwt. of the herb. Before putting the peppermint into the still water is poured in to a depth of about 2 ft., at which height a false bottom is placed, and on this the herb is thrown and trodden down by men. The lid, which fits into a water-joint, is then let down by pulleys and fastened by two bars, any excess of. pressure or temperature being indicated by the water that is ejected at the joint. The distillation is conducted by the application of direct heat at the lowest pos- sible temperature, and is continued for about four and a half hours. When this operation is completed, the lid is removed and a rope is attached to a hook on the false bottom, which, as well as the herb resting on it, is raised bodily by a windlass and the peppermint carried away in the empty carts on their return journey to the fields, where it is placed in heaps and

allowed to rot, being subsequently mixed with the manure applied in the autumn as above stated. The usual yield of oil, if the season be warm and dry, is said to be I oz. from 5 lb of the fresh flowering herb, but, if wet and unfavour- able, the product is barely half that quantity. The yield of a charge of the still is estimated at from I lb 12 oz. to 5 R>. The oil improves in mellowness even if kept as long as ten or fourteen years. The green colour sometimes present in the oil is stated to be due to a quantity of water larger than necessary having been used in the distillation ; on the other hand, if the herb be left in the still from Saturday to Monday, the oil assumes a brown tint.

In France peppermint is cultivated on damp rich ground at Sens, in the department of the Yonne. In Germany it is grown in the neighbourhood of Leipzig, where the little town of Colleda produces annually as much as 40,000 cwt. of the herb. In the United States peppermint is cultivated on a most extensive scale, chiefly in south-west Michigan, the west districts of New York state, and Ohio. The yield averages from 10 to 30 lb per acre. In Michigan the plant was introduced in 1855.

PEPPERRELL, SIR WILLIAM (1696-1759), American soldier, was born in Kittery, Maine, then a part of Massachusetts, on the 27th of June 1696. He studied surveying and navigation, and joined his father in his ship-building, fishing and general trading business, quickly becoming one of the wealthiest and most influential men in the province. He was commissioned captain (17 17), major, lieutenant-colonel, and in 1726 colonel of militia. Pepperrell served in the Massachusetts general court (1726-1727), and in the governor's council (1727-1759), of which for eighteen years he was president. Although not a trained lawyer, he was chief justice of the court of common pleas from 1730 until his death. In 1745 he was commander-in-chief of the New England force of about 4000, which, with the assist- ance of a British squadron under Commodore Peter Warren, besieged and captured the French fortress of Louisburg, the garrison surrendering on the 16th of June and Pepperrell and Warren taking possession on the following day. For his services Pepperrell, in November 1746, was created a baronet — the oniv New Englander so honoured. He was active in raising troops

during the " French and Indian War," and received the rank of lieutenant-general in February 1 7 59. He died in Kittery, Maine, on

the 6th of July in the same year.

See Usher Parsons, Life of Sir William Pepperrell, Bart. (Cam- bridge, Mass., 1855), based on the family papers.

PEPPER TREE, a tree which has no proper connexion with the true pepper {Piper), and is really a member of the natural order Anacardiaceae, being known botanically as Schinus Molle, from the Peruvian name Mvlli. It is a native of tropical South America and is grown in the open air in the south of Europe. It is a small tree with unequally pinnate leaves, the segments linear, entire or finely saw-toothed, the terminal one longer than the rest, and all filled with volatile oil stored in large cells or cysts, which are visible to the naked eye and appear like holes when the leaf is held up to the light. When the leaves are thrown upon the surface of water the resinous or oily fluid escapes with such force as violently to agitate them. The flowers are small, whitish, arranged in terminal clusters and polygamous or uni- sexual, with five sepals, as many petals, ten stamens (as large as the petals in the case of the male flower, very small in the female flower, but in both springing from a cushion-like disk surrounding the base of the three-celled ovary). The style is simple or three- cleft, and the fruit a small, globose, pea-like drupe with a bony kernel enclosing a single seed. The fleshy portion of the fruit has a hot aromatic flavour from the abundance of the resin it contains. The resin is used for medicinal purposes by the Peruvians, and has similar properties to mastic. The Japan pepper tree is Xanthoxylum piperitum the fruits of which have also a hot taste. Along the Riviera the tree known as Melia Azedarach, or the ” Pride of India,” is also incorrectly called the pepper tree by visitors.

PEPSIN, an enzyme or ferment obtained by drying the mucous lining of the fresh and healthy stomach of a pig, sheep or calf. As used in medicine it consists of a light yellow-brown or white powder or of pale yellow translucent grains or scales. It is only slightly soluble in water and alcohol. Pepsin is used to help gastric digestion in old people and in those in whom there is a deficient secretion of the gastric juice. It is useful in chronic catarrhal conditions of the stomach, the dyspepsia of alcoholism, and in gastric ulcer and cancer of the stomach.

Pepsin digests the albumens but is useless in the digestion of fats or carbohydrates. It may also be used to predigest albuminous foods. The following is a method of peptonizing beef. Take \ lb of minced raw lean beef, J pint of water containing 0-2 % of hydrochloric acid, place in a jar with 30 grs. of pepsin, set in a warm place at 1 io° F. for 3

hours, stirring occasionally. Then quickly boil it. It is usually unnecessary to strain it, as the meat is reduced to a fine almost impalpable powder which is readily assimilated. Many varieties of proprietary peptonizing tablets are on the market and are convenient for the preparation of peptonized milk. The following is a method of preparing it. Take a clean glass quart bottle, pour in a pint of perfectly fresh cold milk, then add a teacup- ful of cold water in which a peptonizing tablet has been dissolved. Submerge the bottle in a can of water at loo° F. for from 5 to 10 minutes, take out the bottle and place on ice to prevent the further action of the pepsin. If no ice is convenient bring the milk to a boil for the same purpose. If the action of the pepsin be continued for a much longer period the milk becomes bitter to the taste from the development of excess of peptones. Predigested foods should not be used over a long period or the digestive functions of the stomach may atrophy from disuse.

Pancreatic solution, derived from the pancreas of a pig digested in alcohol, has the power of converting starch into sugar, and albumen and fibrin into peptones. It only acts in an alkaline medium and at a temperature under 140 F. If used to peptonize milk sodium bicarbonate should be added. Many commercial preparations are on the market. Trypsin, the principal ferment of the pancreas, also changes proteids into peptones.

PEPUSCH, JOHN CHRISTOPHER (1667-1752), English musician, of German parentage, was born in Berlin. He began his study of music at an early age, and about 1700 left Berlin and went to England, where he had various engagements, and where he went on with his researches into ancient music. He composed a number of church services and instrumental pieces, besides music for masques and plays, but he is best known in connexion with the founding in 17 10 of the Academy of Ancient Music. In 1713 he was made a Mus.D. of Oxford, and in 1746

F.R.S. In 1718 he married Margarita de 1'Epine (d. 1746), who, as the first Italian to sing in England, was described in 1692 in the London Gazette simply as " the Italian woman." Pepusch died in London on the 20th of July 1752. His Treatise on Harmony (anonymous 1st ed. 1730) is believed to have been an embodiment of his rules drafted by his pupil Viscount Paisley, afterwards earl of Abercorn.

PEPYS, SAMUEL (1633-1703), English diarist, was born on the 23rd of February 1633. The place of his birth is not known. The name was pronounced in the 17th century, and has always been pronounced by the family, " Peeps." The family can be traced in Cambridgeshire as

far back as the reign of Edward I. They rose by slow degrees from the class of small copyholders and yeoman farmers to the position of gentry. In 1563 they had a recognized right to use a coat of arms. John Pepys, Samuel's father, was a younger son, who, like other gentlemen in his position in that age, went into trade. He was for a time estab- lished as a tailor in London, but in 1661 he inherited a small estate at Brampton near Huntingdon, where he lived during the last years of his life.

Samuel was fifth child and second son of a large family, all of whom he survived. His first school was in Huntingdon, but he was afterwards sent to St Paul's in London, where he remained till 1650. While at St Paul's he was an eye-witness of the execu- tion of King Charles I. On the 21st of June in that year his name was entered as a sizar on the books of Trinity Hall, Cambridge, but it was transferred to Magdalene on the 1st of October. On the 5th of March he entered into residence, and he remained there till 1654 or 1655. He obtained a Spendluffe scholarship a month after entering, and one on Dr John Smith's foundation on the 14th of October 1653. Nothing is known of his university career except that on the 21st of October 1653 he was publicly admonished with another undergraduate for having been " scandalously overserved with drink." At Cambridge he wrote a romance, Love is a Cheat, which he afterwards destroyed. On the 1st of December 1655 he was married at St Margaret's church, Westminster, to Elizabeth, daughter of Alexander Marchant, Sieur de St Michel, a French Huguenot exile from Anjou who had married an English lady named Kingsmill. Pepys had at this time no independent means, and probably relied on his cousins, the Montagues, to provide for him. On the 26th of March 1658 he was cut for the stone, an event which he always kept in memory by a solemn anniversary. In 1659 he went as secretary with his cousin, Edward Montagu, after- wards earl of Sandwich, on a voyage to the Sound. On his return he was engaged as a clerk under Mr (afterwards Sir) Edward Downing, one of the four tellers of the exchequer. In 1660 he accompanied his cousin, who commanded the fleet which brought King Charles II. back from exile. In that year, by the interest of his cousin, he was named " clerk of the acts " in the navy office, but. was compelled to buy off a competitor, one Barlow, by an annuity of £100.

Pepys was now fairly established in the official career which led him to honour. On the 1st of January 1660 he had begun his second and hidden life as a diarist. It is in that capacity that he is of such unique interest. But if his diary had never been written, or had been lost, he would still be a notable man, as an able official, the author of valuable Memoirs of the Navy (1690), an amateur musician and protector of

musicians, a gentleman who took an enlightened interest in science, and was elected president of the Royal Society. To his contemporary diarist, John Evelyn, he appeared as ” a worthy, industrious and curious person.” It is true that Andrew Marvel accused him of having accumulated a fortune of £40,000 by ” illegal wages.” But this charge, made in a pamphlet called A List of the principal Labourers in the great design of Popery and Arbitrary Power, was attributed to political animosity. To the world he appeared as an honourable and religious man, and so he would seem to have been to us if he had not recorded in his diary all those weaknesses of character and sins of the flesh which other men are most careful to conceal.

His place of clerk to the Navy Board was equivalent to the

post of permanent under secretary in modern times. It made him chief of the secretariat and a member of the administrating body of the navy. Though he was so ignorant of business that he did not even know the multiplication table when he first took office, he soon mastered the needful mechanical details by work- ing early and late. He had other posts and honours, which came to him either as consequential on his clerkship or because he was a useful official. On the 23rd of July 1660 he was ap- pointed one of the clerks of the privy seal, an office which returned him £3 a day in fees. He was made a justice of the peace. In 1662 he was appointed a younger brother of the Trinity House, and was named a commissioner for managing the affairs of Tangier, then occupied by an English garrison. In 1664 he became a member of the corporation of the Royal Fishery, to which body he was named treasurer when another official had brought the accounts into confusion. In that year he also joined the Royal Society. During the naval war with Holland (1664-67) he proved himself an indefatigable worker. As sur- veyor of the victualling, the whole burden of a most important department was thrown on him in addition to his regular duties. He in fact organized the department. While the plague was raging in London in 1666 he remained at his post when many of his colleagues ran away, and he manfully avowed his readiness to take the risk of disease, as others of the king’s servants faced the dangers of war. He had now gained the full confidence of the lord high admiral, the duke of York, afterwards King James II. When, on the termination of the war, the navy office was violently attacked in parliament, he was entrusted with its defence. The speech which he delivered at the bar of the House of Commons on the 5th of

March 1668 passed for a complete vindication. In sober fact the charges of mismanagement were well founded, but the fault was not in the officials of the navy office only, and Pepys, . who was master of the details, had no difficulty in throwing dust in the eyes of the House of Commons, which was ignorant. Nobody indeed was better acquainted with the defects of the office, for in 1668 he drew up for the duke of York two papers of inquiry and rebuke, ” The Duke’s Reflections on the severall Members of the Navy Board’s Duty ” and ” The Duke’s answer to their severall excuses ” (Harleian MS. 6003). In 1669 he travelled abroad. His success in addressing parliament gave him the ambition to become a member of the House of Commons. He stood for Aldborough, but the death of his wife, on the 10th of November 1669, prevented him from conducting his canvass in person, and he was not elected. In 1673 he was returned for Castle Rising. The validity of his election was questioned by his opponent, Mr Offley, and the committee of privilege decided against him, but the prorogation of the house prevented further action. The no-popery agitation was now growing in strength. The duke of York was driven from office by the Test Act, and Pepys was accused of ” popery,” partly on the ground that he was said to keep a crucifix and altar in his house, partly because he was accused of having converted his wife to Roman Catholi- cism. The crucifix story broke down on examination, but there is some reason to believe that Mrs Pepys did become a Roman Catholic. Pepys was transferred by the king from the navy office to the secretaryship of the admiralty in 1673. In 1679 he was member for Harwich, and in the height of the popish plot mania he was accused, manifestly because he was a trusted servant of the duke of York, of betraying naval secrets to the French, but the charges were finally dropped. Pepys was released on bail on the 12th of February 1680. In that year he accom- panied the king to Newmarket, and took down the narrative of his escape after the battle of Worcester. A proposal to make him head of King’s College, Cambridge, in 1681, came to nothing. In 1682 he accompanied the duke of York to Scotland, where the uncleanly habits of the people caused him great offence. In 1683-1684 he was engaged in arranging for the evacuation of Tangier. He visited the place and kept a diary of his voyage. In 1684 he was elected president of the Royal Society. On the accession of King James II. in 1685 he retained his place as secretary to the admiralty, to which he had been appointed by patent when James resumed the lord high admiralship (June 10,

1684), and Pepys was in effect minister for the navy. The revolution of 1688 ended his official career. He was dismissed on the 9th of March 1689, and spent the rest of his life in retire- ment, and, except for a

brief imprisonment on the charge of Jacobite intrigue in 1690, in peace. He died at his house in Clapham on the 25th of May 1703. His last years were passed in correspondence with his friends, who included Evelyn and Dryden, or in arranging his valuable library. It was left on his death to his nephew, John Jackson, son of his sister Pauline, and in 1 7 24, by the terms of his will, was transferred to Magdalene College, Cambridge, where it is still preserved.

Such was the outward and visible life of Samuel Pepys, the public servant whose diligence was rewarded by success. The other Pepys, whom Sir Walter Scott called ” that curious fellow,” was revealed in 1825, when his secret diary was partly published. The first entry was made on the 1st of January 1660, the last on the 31st of May 1669, when the increasing weakness of his eyes, which had given him trouble since 1664, compelled him to cease writing in the conditions he imposed upon himself. If there is in all the literature of the world a book which can be called ” unique ” with strict propriety it is this. Confessions, diaries, journals, autobiographies abound, but such a revelation of a man’s self has not yet been discovered. The diary is a thing apart by virtue of three qualities which are rarely found in perfection when separate and nowhere else in combination. It was secret; it was full; and it was honest. That Pepys meant it for his own eye alone is clear. He wrote it in Shelton’s system of tachygraphy published in 1641, which he complicated by using foreign languages or by varieties of his own invention whenever he had to record the passages least fit to be seen by his servants or by ” all the world.” Relying on his cypher he put down what- ever he saw, heard, felt or imagined, every motion of his mind, every action of his body. And he noted all this, not as he desired it to appear to others, but as it was to his seeing. The result is ” a human document ” of amazing vitality. The man who displays himself to himself in the diary is often odious, greedy, cowardly, casuistical, brutal. He tells how he kicked his cook, and blacked his wife’s eye, and was annoyed when others saw what he had done. He notes how he compelled the wives of unfortunate men who came to draw their husband’s pay at the navy office to prostitute themselves; how he took ” compliments,” that is to say gifts, from all who had business to do with the navy office; how he got tipsy and suffered from sick headache; how he repented, made vows of sobriety, and found casuistical excuses for breaking them. The style is as peculiar as the matter — colloquial, garrulous, racy from simplicity of language, and full of the unconscious humour which is never absent from a truthful account of the workings of nature in the average sensual man. His position enabled him to see much. His complete harmony with the animalism and vulgarity of the Restoration makes

him a valuable witness for his time. To his credit must be put the facts that he knew the animalism and vulgarity to be what they were; that he had a real love of music and gave help to musicians, Cesare Morelli for instance; that though he made money out of his places he never allowed bad work to be done for the navy if he could help it; that he was a hard worker; and that he had a capacity for such acts of kindness and generosity as are com- patible with a gross temperament and a pedestrian ambition.

The diary, written in a very small hand in six volumes, was included among his books at Magdalene. On the publication of Evelyn's diary in 1818, the then head of Magdalene, the Hon. and Rev. George Neville, decided to publish Pepys's. Part of the MS. was deciphered by his cousin Lord Grenville. The library contained both the short and the long-hand copies of Pepys's account of King Charles's adventures, but its books were so little known by the curators that this key was overlooked. The MS. was deciphered by John Smith, afterwards rector of Baldock in Hertfordshire, between 1819 and 1822. The first and partial edition, edited by Richard Neville Griffin, 3rd Lord Braybrooke, appeared in 1825 in two volumes quarto (London). It attracted great attention and was reviewed by Sir Walter Scott in the Quarterly for January 1826. A second edition in two octavo

volumes followed in 1828 (London). A third and enlarged edition in five volumes octavo appeared in 1848-1840, and a fourth in four in 1854 (London) . In 1875-1870 Dr Minors Bright published a still fuller edition in six volumes octavo (London). Many portraits of Pepys are known to have been taken and several can be traced. One was taken by Savill (1661), another by John Hales (1666), now in the National Portrait Gallery. A portrait by Sir Peter Lely is in the Pepysian library, Magdalene College, Cambridge. Three portraits were taken by Sir Godfrey Kneller, of which one belongs to the Royal Society, and another is in the Hall of Magdalene. Pepys's only known publication in his life was the Memoirs of the Navy, but other writings have been attributed to him.

Authorities. — The standard edition of Pepys's Diary is that by H. B. Wheatley, in nine volumes octavo, with a supplementary volume of Pepysiana (London, 1893-1899). See also Wheatley's Samuel Pepys, and the world he lived in (London, 1880) ; The Life, Journals and Correspondence of Pepys, by J. Smith (London, 1841); E. H.

Moorhouse, Samuel Pepys, Administrator, Observer, Gossip (1909) ; and P. Lubbock, Samuel Pepys (1909). (D. H.)

PEQUOT, an Algonquian tribe of North-American Indians, a branch of the Mohicans. They occupied the coast of Connecticut from Niantic river to the Rhode Island boundary. Together with their kinsmen, the Mohegans, they formed a powerful and warlike people, bitterly hostile to the early settlers. In 1637 the Pequots were surprised by the whites at their fort on the Mystic river, and suffered so completely a defeat that the tribe was broken up, and its remnants took refuge with neighbouring tribes. The Pequot country passed under the control of the Mohegans. At the height of their power the Pequots numbered, it is estimated, some 3000.

PERCEPTION (from Lat. percipere, to perceive), in psychology, the term specially applied to the mental process by which the mind becomes conscious of an external object; it is the mental completion of a sensation, which would otherwise have nothing but a momentary existence coextensive with the duration of the stimulus, and is intermediate between sensation and the ” ideal revival,” which can reinstate a perceptual consciousness when the object is no longer present. This narrow and precise usage of the term ” perception ” is due to Thomas Reid, whose view has been generally adopted in principle by modern psychologists. On the other hand some psychologists decline to accept the view that the three processes are delimited by sharp lines of cleavage. It is held on the one hand that sensation is in fact impossible as a purely subjective state without cognition; on the other that sensation and perception differ only in degree, perception being the more complex. The former view admits, which the latter practically denies, the distinction in principle. Among those who adopt the second view are E. B. Titchener and William James. James {Principles of Psychology, ii. 76) compares sensation and perception as ” the barer and the richer conscious- ness,” and says that ” beyond the first crude sensation all our consciousness is a matter of suggestion, and the various sugges- tions shade gradually into each other, being one and all products of the same psychological machinery of association.” Similarly Wundt and Titchener incline to obliterate the distinction between perception and ideal revival. Prior to Reid, the word perception had a long history in the wider sense of cognition in general. Locke and Hume both use it in this sense, and regard thinking as that special kind of perception which implies deliberate attention. (See Psychology.)

PERCEVAL, or Percyvelle (Ger. Parzival, Fr. Perlesvaus, Welsh, Peredur), the hero of a comparatively small, but highly important,

group of romances, forming part of the Arthurian cycle. Originally, the story of Perceval was of the character of a folk-tale, and that one of remarkable importance and world-wide diffusion. He is represented as the son of a widow, ” la dame veuve,” his father having been slain in tourney, battle or by treachery, either immediately before, or shortly after his birth. The mother, fearful lest her son should share his father’s fate, flies to the woods, either alone with one attendant, or with a small body of faithful retainers, and there brings up her son in ignorance of his name, his parentage and all knightly accomplishments.

The youth grows up strong, swift-footed and of great personal beauty, but, naturally enough, of very limited intelligence. This last is one of the most characteristic traits of the Perceval story, connecting it alike with the Irish Lay of the Great Fool, and the Teutonic Dummling tales. He spends his days chasing the beasts of the forest, running them down by sheer speed, or killing them with darts (javelots) or bow and arrows, the only weapons he knows.

One day, however, he meets a party of knights in armour; he first adores the leader as God, and then takes them to be some new and wondrous kind of animal, asking the most naive questions as to their armour and equipment. Being told that they are knights he determines that he too will be one, and returns to his mother announcing his intention of at once setting forth into the world to seek for knighthood. Dressed as a peasant (or a fool), he departs (his mother, in some versions, dying of grief), and comes to the king’s court. Of course in the romance it is the court of Arthur; probably in the original tale it was simply ” the king.” Here his uncouth behaviour and great personal beauty attract general attention, and he is alike mocked by Kay, and his future distinction mysteriously foretold. He slays a foe of Arthur’s, the Red Knight, who has insulted the king, and challenged the knights of the court, who, for some mysterious reason, are unable to respond to the challenge. Dressing himself in the armour of the slain knight, which he has great difficulty in handling and eventually puts on over his peasant’s garb, he sets out on a series of adventures which differ greatly in the various versions, but the outcome of which is that he becomes a skilful and valiant knight and regains the heritage of his father.

This, the Perceval story proper, has been recognized by scholars as a variant of a widespread folk-tale theme, designated by J. C. von Hahn as the Aryan Expulsion and Return formula, which counts among its representatives such heroes as Perseus, Cyrus, Romulus and Remus, Siegfried, and, as Alfred Nutt has pointed out, Arthur himself. This

particular variant appears to be of British-Celtic origin, and the most faithful representative of the original tale is now very generally held to be the English Syr Percyvelle of Galles, a poem preserved in the Thornton manuscript. Here the hero is nephew to Arthur on the mother's side, and his father, of the same name as himself, is a valiant knight of the court. A noticeable feature of the story is the uncertainty as to the hero's parentage; the mother is always a lady of rank, a queen in her own right, or sister of kings (as a rule of the Grail kings) ; but the father's rank varies, he is never a king, more often merely a valiant knight, and in no instance does he appear to be of equal rank with his wife. This distinguishes the story from that of Lancelot, with which some modern scholars have been inclined to identify it; for Lancelot's parentage is never in doubt, he is fis du roi.

The connexion of the story with Arthur and his court brought about a speedy and more important development, the precise steps of which are not yet clear: Perceval became the hero of the Grail quest, in this ousting Gawain, to whom the adventure originally belonged, and the Perceval became merged iri the Grail tradition. Of the Perceval-Grail romances the oldest from the point of view of manuscript preservation is the Perceval or Conte del Graal of Chretien de Troyes. Two manuscripts, indeed, the British Museum and Mons texts, preserve a fragment relating the birth and infancy of the hero, which appears to represent the source at the root alike of Chretien and of the German Parzival, but it is only a fragment, and so far no more of the poem has been discovered. Chretien left his poem unfinished, and we do not know how he intended to complete the adventures of his hero; but those writers who undertook the task, Wauchier de Denain, Gerbert de Montreuil and Manessier, carried it out with such variety of detail, and such a bewildering indifference to Chretien's version, that it seems practically certain that there must have been, previous to Chretien's work, more than one poem dealing with the same theme. The German poet, Wolfram von Eschenbach, whose Parzival in parts closely agrees with the Perceval and who was long held to be a mere translator of Chretien,

differs widely in the setting of his story. He gives an introduction, in which the adventures of the father, here a prince of Anjou, are related; a conclusion, in which the Swan-Knight, Lohengrin, is made Parzival's son; he represents the inhabitants of the Grail castle as Templars (Templeisen) ; and makes the Grail itself a stone. Finally, he

reproaches Chretien with having told the story amiss, whereas Kiot, the Provencal, whose version Wolfram was following, had told it aright from beginning to end. It is certain that Gerbert knew, and used, a Perceval which, if not Kiot's poem, must have been closely akin to it; as he too makes the Swan-Knight a descendant of the Grail hero. The probability seems to be that the earliest Perceval- Grail romance was com- posed at Fescamp, and was coincident with the transformation, under the influence of the Saint-Sang legend, of the originally Pagan talisman known as the Grail into a Christian relic, and that this romance was more or less at the root of all subsequent versions.

Besides the poems, we have also two prose Perceval romances, the relative position of which has not yet been satisfactorily deter- mined. The first is found in two manuscripts only, the so-called " Didot " (from its original possessor M. Firmin-Didot) ,"now in the Bibliotheque Nationale, Paris; the other, and much superior text, in the Biblioteca Estense, Modena. In both cases the romance follows the prose rendering of Borron's Joseph of Arimathea and Merlin, and precedes a Mort Artus, thus forming part of a complete cycle. The text shows a curious mingling of sources; the real primitive Perceval story, the Enfances, is omitted; he grows up in his father's house and goes to court at his wish. Later, however, stories which certainly derive from an early non-Grail tradition are introduced, and there are references which imply a knowledge of the prose Lancelot and of Chretien's poem. The romance is probably a somewhat late, and not very skilful, compilation. The other prose romance, the Perlesvaus, is decidedly superior in literary form, but here too we have a mingling of old and new elements. The Enfances story is omitted, and there are parallels with the German Parzival, with Wauchier de Denain and with Gerbert, while much is peculiar to the Perlesvaus itself. It is not improbable that it represents a free and individual working over of the original Fescamp version, and that in its later shape it was intended to form, and did at one time form, the Quest section of the cyclic redaction of the Arthurian prose romances, being dislodged from this position by the Galahad Quite. It is a curious fact that the printed editions always give it in conjunc- tion with this latter and that the two have also been preserved together in a Welsh manuscript translation. We also possess in one of the so-called Mabinogi a Welsh version of the tale, Pcredur, son of Evrawc. This appears to be a free rendering of the adventures found in Chretien combined with incidents drawn from Welsh tradition. This was at one time claimed as the original source of all the Perceval romances, but this theory cannot be maintained in face of the fact that the writer gives in one place what is practically a literal

translation of Chretien's text in a passage which there is strong reason to believe was borrowed by Chretien from an earlier poem. In order of time the Peredur probably ranks latest in the series of Perceval romances, which, however, does not detract from its interest as a possible representative of genuine Welsh traditions, unknown to other writers.

The value and interest of the Perceval romances stand very high, not alone for their intrinsic merit, though that is con- siderable — Chretien's Perceval, though not his best poem, is a favourable specimen of his work, and von Eschenbach's Parzival, though less elegant in style, is by far the most humanly interest- ing, and at the same time, most deeply spiritual, of the Grail romances— but also for the interest of the subject matter. The Perceval story is an admirable folk-tale, the Grail problem is the most fascinating problem of medieval literature; the two combined form a romance of quite unique charm and interest. This has been practically proved by the extraordinary success which has attended Richard Wagner's dramatic re-telling of the legend in his Parsifal. The immediate source of this

version is the poem of Wolfram von Eschenbach, though the Grail, of course, is represented in the form of the Christian relic, not as the jewel talisman of the Parzival; but the psycho- logical reading of the hero's character, the distinctive note of von Eschenbach's version, has been adapted by Wagner with marvellous skill, and his picture of the hero's mental and spiritual development, from extreme simplicity to the wisdom born of perfect charity, is most striking and impressive.

Bibliography. — There are early printed editions of the Perceval (1530) and of the Perlesvaus (1516 and 1523). The Perceval was edited from the Mons text by Potvin (6 vols., 1866-1871); Syr Percyvelle of Galles, in The Thornton Romances, by Halliwell (1844) for the Camden Society. Parzival exists in numerous editions; critical texts have been edited by Lachmann (1891), Martin (1903) and Leitzmann (1902-1903). For the general reader the most useful text is that of Bartsch in Deutsche Classiker des Mittelalters, as it includes notes and a glossary. Modern German versions are by Simrock (very close to the original) and Hertz (freer, but with excellent notes and appendices); Eng. trans, by J. L. Weston (1894). The " Didot " Perceval was published by Hucherin vol. i. of Le Saint Graal (1875-1878); an edition of the Modena text has also been prepared. Perlesvaus was published by Potvin in vol. i. of his edition of Chretien's poem. The Welsh text, with translation, has been edited by Canon Williams. A fine translation by Dr Sebastian Evans is published in " The Temple Classics," under the title of The High History of the

Holy Grail. Peredur will be found in Alfred Nutt's edition of the Mabinogion (1902). For the critical treatment of the subject see The Legend of Sir Perceval (Grimm Library, vol. xvii.) ; Perlesvaus by Nitze (1902) ; Legends of the Wagner Drama by J. L. Weston. (J. L. W.)

PERCEVAL, SPENCER (1762-1812), prime minister of Eng- land from 1809 to 181 2, second son of John, 2nd earl of Egmont, was born in Audley Square, London, on the 1st of November 1762. He was educated at Harrow and at Trinity College, Cambridge, and was called to the bar at Lincoln's Inn in 1786. A very able speech in connexion with a famous forgery case having drawn attention to his talents, his success was from that time rapid, he was soon regarded as the leading counsel on the Midland circuit, and in 1796 became a K.C. Entering parlia- ment for Northampton in April of that year, he distinguished himself by his speeches in support of the administration of Pitt. In 1 801, on the formation of the Addington administration, he was appointed solicitor-general, and in 1802 he became attorney- general. An ardent opponent of Catholic Emancipation, he delivered in 1807 a speech on the subject which helped to give the deathblow to the Grenville administration, upon which he became chancellor of the exchequer under the duke of Portland, whom in 1809 he succeeded in the premiership. Notwithstand- ing that he had the assistance in the cabinet of no statesman of the first rank, he succeeded in retaining office till he was shot by a man named Bellingham, a bankrupt with a grievance, who had vainly applied to him for redress, in the lobby of the House of Commons on the nth of May 1812. Bellingham was cercainly insane, but the plea was set aside and he was hanged. Perceval was a vigorous debater, specially excelling in replies, in which his thorough mastery of all the details of his subject gave him a great advantage. He married in 1790 and had six sons and six daughters; one of the latter married Spencer Horatio Walpole (d. 1898), home secretary, and their son Sir Spencer Walpole, the well-known historian, published an excellent biography of Perceval in 1874.

See also P. Treherne, Spencer Perceval (1909).

PERCH (through Fr. from Lat. perca, Gr. irepKij; the last word is connected with mpuvos, dark-coloured, spotted), a fresh-water fish {Perca fluviatilis) , generally distributed over Europe, northern Asia and North America, and so well known as to have been selected for the type of an entire family of spiny- rayed fishes, the Percidae, which is represented in European fresh-waters by several other fishes such as the pope (Acerina cernua) and the pike-perch (Lucioperca). It inhabits

rivers as well as lakes, but thrives best in waters with a depth of not less than 3 ft.; in large deep lakes it frequently descends to depths of 50 fathoms and more. It occurs in Scandinavia as far north as the 69th parallel, but does not extend to Iceland or any of the islands north of Europe. In the Alps it ascends to an altitude of 4000 ft.

The shape of its body is well proportioned, but many varia- tions occur, some specimens being singularly high-backed, others low and long-bodied; sometimes such variations are local, and Agassiz and other naturalists at one time thought it possible to distinguish two species of the common perch of Europe; there are not even sufficient grounds, however, for separating specifi- cally the North-American form, which in the majority of ichthyo- logical works is described as Perca flavescens. The brilliant and striking colours of the perch render it easily recognizable even at a distance. A rich greenish-brown with golden reflections covers the back and sides, which are ornamented with five or seven dark cross-bands. A large black spot occupies the

The Perch, Perca fluviatilis. membrane between the last spines of the dorsal fin; and the ventral, anal and lower part of the caudal are bright ver- milion. In the large peaty lakes of north Germany a beautiful variety is not uncommon, in which the golden tinge prevails, as in a goldfish.

The perch is strictly carnivorous and most voracious; it wanders about in small shoals within a certain district, playing sad havoc among small fishes, and is therefore not to be toler- ated in waters where valuable fry is cultivated. Perch of three pounds in weight are not infrequently caught in suitable local- ities; one of five would now be regarded as an extraordinarily large specimen, although in older works we read of individuals exceeding even that weight.

Perch are good, wholesome food, and highly esteemed in inland countries where marine fish can be obtained only with difficulty. The nearly allied pike-perch is one of the best European food- fishes. The perch is exceedingly prolific; it begins to spawn when three years old, in April or in the first half of May, deposit- ing the ova, which are united by a viscid matter in lengthened or net-shaped bands, on water plants.

PERCH (through Fr. perche from Lat. pcrtica, a pole or rod used for

measurement), a bar or rod used for various purposes, as e.g. for a navigation mark in shallow waters, for a support on which a bird may rest, or for a pole which joins the back with the fore part of a wagon or other four-wheeled vehicle. As a term of linear measurement, ” perch,” also ” rod ” or ” pole,” = i6j ft., si yds.; of superficial area, = 30ˆ sq. yds.; 160 perches = 1 acre. As a stonemason’s measure, a ” perch ” = i linear perch in length by 1ˆ ft. in breadth and 1 ft. in thickness.

PERCHE, a region of northern France extending over the departments of Orne, Eure, Eure-et-Loir and Sarthe. Its boundaries are Normandy on the N. and W., Maine on the S.W., Vendomois and Dunois on the S., Beauce on the E. and Thime- rais on the N.E. The greater part of the district is occupied by a semicircle of heights (from 650 to 1000 ft. in height) stretch- ing from Moulins-la-Marche on the north-west to Montmirail on the south ; within the basin formed thereby the shape of which is defined by the Huisne, an affluent of the Sarthe, lie the chief towns — Mortagne, Nogent-le-Rotrou and Belleme. Stock-raising and dairy-farming are flourishing in the Perche, which is famous for the production of a breed of large and powerful horses. Cider-apples and pears are grown throughout the district. In the middle ages the Perche constituted a countship of which Corbon, Mortagne and Nogent-le-Rotrou were successively the capitals. Under the ancien rigime it formed, together with Maine, a gouvernement of which Mortagne was the capital.

PERCIVAL, JAMES GATES (1795-1856), American poet, philologist and geologist, was born in Kensington parish, Berlin, Connecticut, on the 15th of September 1795. He graduated

at Yale in 1815, and in 1820 took the degree of M.D., and started practice in Berlin. He contributed verse to the Microscope, a semi-weekly paper, founded at New Haven in 1820. In this first appeared his best-known poem,” ” The Suicide,” which reflects his chronic melancholy, due doubtless to ill-health; it was begun in 1816 and finished in 1820, after he had actually made two attempts on his own life. In 1823 Percival became an editor of the Connecticut Herald at New Haven; and in 1824 he was in turn an assistant-surgeon and lecturer on chemistry at West Point, and an inspector of recruits at the Charlestown (Mass.) Navy Yard. He prepared (1826-1831) an English edition of Malte-Brun’s Geography (published 1834); and in 1827-1829 read the manuscripts and proof-sheets of Webster’s Dictionary, giving special attention to scientific words. In 1835- 1840, with Professor Charles U. Shepard (1804- 1886), he made a geological survey of Connecticut; his Report (1842) showed great learning and

much patient research. In 1854 he became state geologist of Wisconsin, and in 1855 published one volume of his Report; the second he had nearly completed at the time of his death, on the 22nd of May 1856, at Hazel Green, Wisconsin. See his Poetical Works (2 vols., Boston, 1859), w ‘th a biographical sketch by L. W. Fitch; and Julius H. Ward, Life and Letters of James Gates Percival (Boston, 1866).

PERCY (Family). This family, whose deeds are so prominent in English history, was founded by William de Perci (c. 1030- 1096), a follower of the Conqueror, who bestowed on him a great fief in Yorkshire and Lincolnshire. The register of Whitby Abbey, which he founded anew, and in later days the heralds, were responsible for the fabulous origin and pedigree of the family which are still current. By Emma, daughter of Hugh de Port, a great Hampshire baron, William was father of several sons, of whom Alan the eldest succeeded him. His grandson William was the last of the house in the direct line, and left two sisters and coheiresses, Maud countess of Warwick, who died childless, and Agnes. Agnes de Perci had married Josceline, styled ” brother of the queen ” {i.e. Adeliza of Louvaih, second wife of Henry I.), whose legitimacy has been questioned, and from this marriage descended the second house of Percy (which name it assumed), till its own extinction in the male line five centuries later (1670). By it was brought into the family the great Petworth estate in Sussex, which Josceline had obtained from his sister, who was holding Arundel and its fief. His son Richard (c. 1170-1244) and Richard’s nephew William (c. 1183- 1245) were among the barons who rose in arms against John, but the latter made his peace with Henry III., and had his lands restored to him. Richard de Percy was one of the twenty- five barons appointed to enforce the observance of Magna Carta.

The next important member of the family is William’s grandson Henry de Percy (c. 1272-1315), whom Edward I., after the deposi- tion of John Baliol, appointed governor of Galloway, and who was one of his most active agents in the subjugation of Scotland till the success of Robert Bruce drove him out of Turnberry Castle, and made him withdraw into England. He was rewarded by Edward II. with the barren title of earl of Carrick, declared to be forfeited by the Scottish hero; and the same king appointed him governor of the castles of Bamburgh and Scarborough. But in 1309 he himself made his position strong in the north of England by purchasing lands from Anthony Bek, bishop of Durham, among which was the honour of Alnwick, the principal seat of the family ever since. The Percies had chiefly resided till then at Spofforth in Yorkshire, and their connexion with Northumberland dates from this acquisition. Henry’s son, another

Henry (c. 1299-1352), took part in the league against Edward II. ‘s favourites the Despensers, was in favour with Edward III., and obtained from Edward Baliol as king of Scotland grants of Lochmaben, Annandale and Moffatdale, which he surrendered to the English king for the castle and constableship of Jedburgh, or Jedworth, with the forest of Jed- worth and some neighbouring towns. A few years later, in fuller recompense of the unprofitable gift of Baliol, a grant of 500 marks a year was made to him out of the old customs at Berwick;

and in 1346 he did splendid service to his sovereign by defeating and taking prisoner David II., king of Scotland, at the battle of Neville’s Cross.

To him succeeded another Henry Percy (1322-1368), a feudal baron like his predecessors, who fought at Crecy during his father’s lifetime and whose brother Thomas Percy (1333-1369) was bishop of Norwich from 1356-1369. The next head of the Percys was Henry’s son, another Henry, who was made earl of Northumberland at the coronation of Richard II., and whose younger brother Thomas (d. 1403) was created earl of Worcester in 1397. The 1st earl of Northumberland, father of the famous Hotspur, Sir Henry Percy (g.v.), was killed at Bramham Moor in 1408, while in arms against the king, and his title and estates were forfeited. But, by an act no less gracious than politic, Henry V. restored them in 1414 to this earl’s grandson, Henry (1394-1455), then a prisoner with the Scots, whose liberation he had no difficulty in procuring from the duke of Albany during the time of James I.‘s captivity. From that day the loyalty of the family to the house of Lancaster was steadfast and undeviating. The 2nd earl died fighting for Henry VI. at the first battle of St Albans in 1455; the 3rd, Henry (1421- 1461), was slain on the bloody field of Towton; the 4th, Henry (1446-1489), was killed in quelling an insurrection in the time of Henry VII. So strong was the Lancastrian feeling of the family that even Sir Ralph Percy (1425-1464), a brother of the earl who fell at Towton, though he had actually submitted once to Edward IV., turned again, and when he fell at Hedgley Moor in April 1464 consoled himself with the thought that he had, as he phrased it, ” saved the bird in his bosom.”

No wonder, then, that in Edward IV. ‘s days the title and estates of the family were for a time taken away and given to John Neville Lord Montagu, brother of Warwick the king-maker. But the north of

England was so accustomed to the rule of the Percys that in a few years Edward saw the necessity of restoring them, and did so even at the cost of alienating still further the powerful family of the Nevilles, who were then already on the point of rebellion.

A crisis occurred in the fortunes of the family in the reign of Henry VIII. on the death of Henry, the 6th earl (c. 1502- IS37). whose brothers Sir Thomas and Sir Ingelram Percy, much against his will, had taken part in the great insurrection called the Pilgrimage of Grace. A thriftless man, of whom it is recorded that in his youth he was smitten with the charms of Anne Boleyn, but was forced to give her up and marry a woman he did not love, he died childless, after selling many of the family estates and granting the others to the king. The title was forfeited on his death, and was granted by Edward VI. to the ambitious John Dudley, earl of Warwick, who was attainted in the succeeding reign. It was restored in the days of Queen Mary to Thomas Percy (1 528-1 572), a nephew of the 6th earl, who, being a stanch Roman Catholic, was one of the three earls who took the lead in the celebrated rising of 1572, and was beheaded at York. His brother Henry (c. 1532-1585), who succeeded him, was no less unhappy. Involved in Throg- morton's conspiracy, he was committed to the Tower of London, and was supposed to have shot himself in bed with a pistol found beside him; but there were grave suspicions that it had been discharged by another hand. His son, Henry (1567-1632), the next earl, suffered like his two predecessors for his attachment to the religion of his forefathers. The Crown lawyers sought in vain to implicate him in the Gunpowder Plot, but he was imprisoned for fifteen years in the Tower and compelled to pay a fine of £30,000. Algernon (1602-1668), the son who next succeeded, was a parliamentary general in the Civil War. At length, in 1670, the male line of this illustrious family became extinct, at least in the direct line, about five hundred years after the marriage of Agnes de Perci with Josceline of Louvain.

The representation of the earlier Percys had passed away through the daughters of Earl Thomas, beheaded in 1572, but his earldom of Northumberland (created anew for him in 1557) had passed to his brother Henry, under a special remainder, and appears to have become extinct in 1670, though persistently

claimed by James Percy, " the trunk-maker. " The last earl's daughter Elizabeth, a great heiress, was mother by Charles Seymour, 6th duke of Somerset, of Algernon, 7th duke, who was summoned (in error) as Lord Percy in 1722 and created earl of Northumberland in 1749. On the duke's death in 1750 his earldom of Northumberland passed under

a special remainder, with the main inheritance of the Percys, to Sir Hugh Smithson, bart. (1715-1786), who had married his daughter and eventual heiress in 1740, and was created duke of Northumberland and Earl Percy in 1766. From this marriage descends the present ducal house, which bears the name of Percy in lieu of Smithson, and owns vast estates in Northumberland.

Alnwick Castle, their chief seat, where much state is still kept up, has been described by Mr Clark as ” probably the finest extant example of a Norman castle of this type, having an open keep and a complete enceinte.” It had been hardly occupied and in decay for some two centuries when the present family succeeded to it, but was restored by them to its former splendour between 1750 and 1786. “Princely Petworth,” however, the seat of the later Percys, with their ancient Sussex estates and those in Yorkshire (Leconfield) and Cumberland (Cockermouth), all passed away in 1750 with the earldom of Egremont and barony of Cockermouth to Charles Wyndham, nephew of the 7th duke of Somerset, and these estates are now held by Lord Leconfield. The actual representation in blood of the later Percys (i.e. from 1572) passed in 1865, on the death of the 4th duke, to the dukes of Atholl, who in virtue of it are Lords Percy, under the writ of 1722, the oldest of the family titles now remaining. The ancient London residence of the Percys, Northumberland Plouse, Charing Cross, was removed to make way for Northumberland Avenue. Above it stood the Percy crest, a (blue) lion with stiffly extended tail; but the famous badge of the house was the white crescent or half moon — ” the Half-Moone shining all soe faire ” of ” the Northern Rising ” ballad — with a pair of manacles. Their coat of arms was a blue lion rampart on a yellow ground — ” Jaune o un bleu lyon rampart ” of the Carlaverock roll, stated, but wrongly, to have been derived from the dukes of Louvain and Brabant. With it they, quartered the ” Luces ” coat of the Lucys of Cockermouth after succeeding to their estates, whence the lines in The Battle of Otlerbourne:—

” The Lucetts and the Cressaunts both, The Skotts fought them agayne.” See E. B. De Fonblanque, Annals of the House of Percy (1887), and G. Brenan, History of the House of Percy (edited by W. A. Lindsay, 1902), both somewhat adulatory and needing critical revision; Tate, History of Alnwick (1866); Hartshorne’s paper on the Percys and their Castles in the Newcastle volume of the Archaeo-logical Institute (1852) ; E. A. Freeman, ” The Percy Castles ” (1875) in English Towns and Districts; G. T. Clark, Medieval Military Architecture (1884) ;G. E.C(okayne), Complete Peerageˆ 1895), vol. vi. ; Bishop Percy, Northumberland Household Booh. See also the article Northumberland, Earls and Dukes of. (J. Ga. ; J. H. R.)

PERCY, SIR HENRY, called Hotspur (1364-1403), eldest son of Henry, 1st earl of Northumberland, was born on the 20th of March 1364. He saw active service when he was fourteen at the siege of Berwick. Six years later he was associated with his father in the wardenship of the eastern march of Scotland, and his zeal in border warfare won the name of Hotspur for him from his opponents. In 1386 he was sent to Calais, and raided French territory, but was shortly afterwards recalled to defend England against a naval attack by France. In popular story and ballad he is known as one of the heroes of Otterburn or Chevy Chase, which is the subject of one of the most stirring recitals of Froissart. In the summer of 1388 the Scots invaded England by way of Carlisle, sending a small body under the earls of Douglas, Mar and Moray to invade Northum- berland. The earl of Northumberland remained at Alnwick, but sent his sons Sir Henry and Sir Ralph against the enemy. In hand-to-hand fighting before the walls of Newcastle, Douglas is said to have won Sir Henry's pennon, which he swore to fix upon the walls of Dalkeith. The Scots then retreated to Otter- burn, where Percy, who was bent on recovering his pennon, attacked them on a fine August evening in 1388. Douglas was

slain in the battle, though not, as is stated by Walsingham, by Percy's hand: Henry Percy was captured by Sir John Mont- gomery, and his brother Ralph by Sir John Maxwell. Hotspur was released on the payment of a heavy ransom, to which Richard II. contributed £3000, and in the autumn his term as warden of Carlisle and the West March was extended to five years. In 1399 together with his father he joined Henry of Lancaster. Henry IV. gave the charge of the West March to Northumberland, while Henry Percy received the castles of Bamburgh, Roxburgh and Berwick, and the wardenship of the East March, with a salary of £3000 in peace time and £12,000 in war. During the first year of Henry's reign Hotspur further was appointed justiciar of North Wales and constable of the castles of Chester, Flint, Conway, Denbigh and Carnarvon. Henry also gave him a grant of the island of Anglesey, with the castle of Beaumaris. William and Rees ap Tudor captured Conway Castle on the 1st of April 1401, and Percy in company with the prince of Wales set out to recover the place, Percy providing the funds. In May he reported to the king the pacification of Merioneth and Carnarvon, and before the end of the month Conway was surrendered to him. Meanwhile he wrote demanding arrears of pay, with the threat of resignation if the money were not forthcoming, but the king intimated that the loss of Conway had been due to his

negligence, and only sent part of the money. He had the same difficulty in obtaining money for his northern charge that he had experienced in Wales. 1 Anglesey was taken from him, and he was deprived of Roxburgh Castle in favour of his rival, the earl of Westmorland. The Scots again invaded England in the autumn of 1402, headed by the earl of Douglas and Murdoch Stewart, son of the duke of Albany. Northumberland and Hotspur barred their way at Millfield, near Wooler, and the Scots were compelled to fight at Humbledon, or Homildon Hill, on the 14th of September. The English archers were provided with a good target in the masses of the Scottish spearmen, and Hotspur was restrained from charging by his ally, George Dunbar, earl of March. The Scottish army was almost destroyed, while the English loss is said to have been five men. Disputes with the king arose over the disposal of the Scottish prisoners, Percy insisting on his right to hold Douglas as his personal prisoner, and he was summoned to court to explain. It is related that when he arrived Henry asked for Douglas, and Hotspur demanded in return that his brother-in-law, Edmund Mortimer, should be allowed to ransom himself from Owen Glendower, with whom he was a prisoner. High words followed, in the course of which Henry called Percy a traitor, struck him on the face, and drew his sword on him Percy is said to have answered this defiance with the words, ” Not here, but on the field.” This was late in 1402, and in 1403 Hotspur issued a proclamation in Cheshire stating that Richard II. was alive, and summoning the inhabi- tants to his standard. He made common cause with his prisoner Douglas, and marched south to join forces with Glendower, who was now reconciled with Mortimer. He was reinforced by his uncle Thomas, earl of Worcester, who, although steward to the household of the prince of Wales, joined his family in rebellion. The mythical Richard II. was heard of no more, and Percy made himself the champion of the young earl of March. When he arrived at the Castle Foregate, Shrewsbury, early on the 21st of July, and demanded provisions, he found the king’s forces had arrived before him. He retired in the direction of Whitchurch, and awaited the enemy about 3! m. from Shrewsbury. After a long parley, in which a truce of two days was even said to have been agreed on, the Scottish earl of March, fighting on the royal side, forced on the battle in the afternoon, the royal right being commanded by the prince of 1 The dissatisfaction of the Percys seems to have been chiefly due to the money question. Sir J. H. Ramsay (Lancaster and York) estimates that in the four years from 1399 to 1403 they had received from the king the sum of £41,750, which represented a very large capital in the 14th century, and they had also received considerable grants of land. King Henry IV. was about to march north himself to look into the real

relations between the Percys and the Scots, when on the 6th of July 1403 Henry Percy was in open rebellion.

Wales. Hotspur was killed, the earls of Douglas and Worcester, Sir Richard Venables of Kinderton, and Sir Richard Vernon were captured, and the rebel army dispersed. Worcester, Venables and Vernon were executed the next day. Percy's body was buried at Whitchurch, but was disinterred two days later to be exhibited in Shrewsbury. The head was cut off, and fixed on one of the gates of York.

See Northumberland, Earls and Dukes of; and Percy: (Family). Also Chronique de la traison et mort de Richard II., ed. B. Williams (Eng. Hist. Soc, 1846); J. Creton, Histoire du roy Richard II., ed. John Webb, in Archaeologia (xx., 1824); and Adam of Usk's Chronicon, 1377-1404, ed. E. M. Thompson (1876); the authorities are cited in detail in J. H. Wylie's England under Henry IV. (1884-1898), and Sir J. H. Ramsay's Lancaster and York (Oxford, 1892). Holinshed's Chronicle was the chief source of Shakespeare's account of Hotspur in Henry IV.

PERCY, THOMAS (c. 1 560-1605), one of the Gunpowder Plot conspirators, was a son of Edward Percy of Beverley, who was grandson of Henry Percy, 4th earl of Northumberland. Though brought up a Protestant, he early became well-affected to the Roman Catholics and finally an adherent. He entered the service of his cousin, Henry Percy, 9th earl of Northumber- land, and was appointed by him constable of Alnwick Castle and agent for his northern estates, in which capacity he showed himself tyrannical and extortionate. In 1602 he was sent by Northumberland to James in Scotland to secure toleration for the Roman Catholics and returned announcing favourable promises from the king, the extent of which he probably greatly exaggerated; and when James, after his succession to the English throne, did not immediately abrogate the penal laws, Percy, although he had accepted the court appointment of gentleman pensioner, professed himself highly indignant and indulged himself in thoughts of revenge. Some time in May 1603 Percy angrily declared his intention to Catesby of killing the king, and in April 1604 he met Catesby with John Wright, Thomas Winter and Guy Fawkes, and was then initiated into Catesby's gunpowder plot, which met with his zealous approval and support. To Percy was allotted the special duty after the explosion of seizing the infant prince Charles and riding off with him on his saddle to Warwickshire. All the preparations being complete, Percy went to Alnwick in October and collected £3000 of the earl of Northumberland's rents which he intended using in

furtherance of the plot, returning to London on the 1st of November. Meanwhile the plot had been revealed through the letter to Lord Monteagle on the 26th of October, and it was Percy's insistence at the last meeting of the conspirators on the 3rd that decided them not to fly but to hazard the attempt. On the news of Guy Fawkes's arrest, Percy with the rest of the conspira- tors, except Tresham, fled on horseback, taking refuge ulti- mately at Holbeche, near Stourbridge, in Staffordshire, where on the 8th of November, during the attack of the sheriff's men upon the house, he was struck down by a bullet, fighting back to back with Catesby, and died two days later. Percy married a sister of the conspirator John Wright and left a son Robert and two daughters, one of whom is said to have married Robert, the son of Catesby.

PERCY, THOMAS (1729-1811), bishop of Dromore, editor of the Percy Reliques, was born at Bridgnorth on the 13th of April 1729. His father, Arthur Lowe Percy, a grocer, was of sufficient means to send his son to Christ Church, Oxford, in 1746. He graduated in 1750 and proceeded M.A. in 1753. In the latter year he was appointed to the vicarage of Easton Maudit, Northamptonshire, and three years later was instituted to the rectory of Wilby in the same county, benefices which he retained until 1782. In 1759 he married Anne, daughter of Barton Gutter- ridge. At Easton Maudit most of the literary work for which he is now remembered — including the Reliques — was completed- When his name became famous he was made domestic chaplain to the duke and duchess of Northumberland, and was tempted into the belief that he belonged to the illustrious house of Percy. Through his patron's influence he became dean of Carlisle in 1778 and bishop of Dromore in Ireland in 1782. His wife died before him in 1806; the good bishon. blind but otherwise in

sound health, lived until the 30th of September 1811. Both were buried in the transept which Percy added to Dromore Cathedral.

Dr Percy's first work was a translation from a Portuguese manuscript of a Chinese story, published in 1761. Two years later he published Five Pieces of Runic Poetry, translated from the Islandic. In 1763 he edited the earl of Surrey's poems with an essay on early blank verse, translated the Song of Solomon, and published a key to the New Testament. His Northern Antiquities (1770) is a translation from the French of Paul Henri Mallet. His reprint of The Household Book of the

Earl of Northum- berland in ijia is of the greatest value for the illustrations of domestic life in England at that period. But these works are of little estimation when compared with the Reliques of Ancient English Poetry (1765). This was based on an old manuscript collection of poetry, rescued by Percy in Humphrey Pitt's house at Shifnal, Shropshire, from the hands of the housemaid who was about to light the fire with it. The manuscript was edited in its complete form by J. W. Hales and F. J. Furnivall in 1867-1868.

See A. C. C. Gaussen, Percy: Prelate and Poet (1908). The Reliques has been edited by various hands, notably by H. B. Wheat- ley (1876). The fourth edition was by Percy's nephew, Thomas Percy (1768-1808), himself a writer of verse.

PERDICCAS, the name of three kings of Macedonia, who reigned respectively c. 700 B.C., c. 454-413 B.C., and 364-359 B.C., and of one of Alexander the Great's generals, son of Orontes, a descendant of the independent princes of the province of Orestis. The last named distinguished himself at the conquest of Thebes (335 B.C.), and held an important command in the Indian campaigns of Alexander. In the settlement made after Alexander's death (323) it was finally agreed that Philip Arrhi- daeus, an insane son of the great Philip, and Roxana's unborn child (if a son) should be recognized as joint kings, Perdiccas being appointed, according to one account, guardian and regent, according to another, chiliarch under Craterus. He soon showed himself intolerant of any rivals, and acting in the name of the two kings (for Roxana gave birth to a son, Alexander IV.) sought to hold the empire together under his own hand. His most loyal supporter was Eumenes, governor of Cappadocia and Paphlagonia. These provinces had not yet been conquered by the Macedonians, and Antigonus (governor of Phrygia, Lycia and Pamphylia) refused to undertake the task at the command of Perdiccas. Having been summoned to the royal presence to stand his trial for disobedience, Antigonus fled to Europe and entered into alliance with Antipater, Craterus and Ptolemy, the son of Lagus. Perdiccas, leaving the war in Asia Minor to Eumenes, marched to attack Ptolemy in Egypt. He reached Pelusium, but failed to cross the Nile. A mutiny broke out amongst the troops, disheartened by failure and exasperated by his severity, and Perdiccas was assassinated by some of his officers (321). (E. R. B.)

See Macedonian Empire.

PEREDA, JOSE MARiA DE (1833-1906), one of the most distinguished of modern Spanish novelists, was born at Polanco near Santander on

the 6th of February 1833. He was educated at the Instituto Cantabro of Santander, whence he went in 1852 to Madrid, where he studied with the vague purpose of entering the artillery corps. Abandoning this design after three years' trial, he returned home and began his literary career by contributing articles to a local journal, La Abeja montanesa in 1858. He also wrote much in a weekly paper, El Tio Cayetdn, and in 1864 he collected his powerful realistic sketches of local life and manners under the title of Escenas montanesas. Pereda fought against the revolution of 1868 in El Tio Cayetdn, writing the newspaper almost single-handed. In 1871 he was elected as the Carlist deputy for Cabuerniga. In this same year he pub- lished a second series of Escenas montanesas under the title of Tipos y paisajes; and in 1876 appeared Bocetos al temple, three tales, in one of which the author describes his disenchanting political experiences. The Tipos trashumantes belongs to the year 1877, as does El Buey suelto, which was intended as a reply

to the thesis of Balzac's work, Les P elites miseres de la vie con- jugate. More and more pessimistic as to the political future of his country, Pereda took occasion in Don Gonzalo Gonzdlez de la Gonzalera (1879) to ridicule the Revolution as he had seen it at work, and to pour scorn upon the nouveaux riches who exploited Liberalism for their personal ends. Two novels by his friend Perez Galdos, Dona Perfecta and Gloria, drew from Pereda a reply, De Tal polo tal astilla (1880), in which he endea- vours to show that tolerance in religious matters is disastrous alike to nations and to individuals. The Esbozos y rasguiios (1881) is of lighter material, and is less attractive than El Sabor de la Tierruca (1882), a striking piece of landscape which won immediate appreciation.. New ground was broken in Pedro Sdnchez (1883), where Pereda leaves his native province to portray the disillusion of a sincere enthusiast who has plunged into the political life of the capital. Pereda's masterpiece is Sotileza (1884), a vigorous rendering of marine life by an artist who perceives and admires the daily heroisms of his fisher-folk. It has often been alleged against the author that he confines himself to provincial life, to lowly personages and to unrefined subjects, and no doubt an anxiety to clear himself from this absurd reproach led him to attempt a description of society at the capital in La Montdlvez (1888), which is certainly the least interesting of his performances. In La Puchera (1889) he returned to the marine subjects which he knew and loved best. Again, in Penas arriba (1895), the love of country life is mani- fested in the masterly contrast between the healthy, moral labour of the fields and the corrupt, squalid life of cities. Pereda's fame was now established; the statutes of the Spanish Academy, which require members to reside at

Madrid, were suspended in his favour (1896). But his literary career was over. The tragic death of his eldest son, the disastrous cam- paign in Cuba and the Philippines, darkened his closing years, and his health failed long before his death at Polanco on the 1st of March 1906.

Pereda belongs to the native realistic school of Spain, which, founded by the unknown author of Lazarillo de Tormes, was continued by Meteo Aleman, Cervantes, Quevedo, Castillo Solorzano and many others. With the single exception of Cervantes, however, the picaresque writers are almost entirely wanting in the spirit of generous sympathy and tenderness which constitutes a great part of Pereda's charm. His realism is purely Spanish, as remote from Zola's moroseness as from the graceful sentimentality of Pierre Loti. Few 19th-century writers possessed the virile temperament of Pereda, and, with the single exception of Tolstoy, none kept a moral end more steadily in view. This didactic tendency unquestionably injures his effects. Moreover, his grim satire occasionally degenerates into somewhat truculent caricature, and the exces- sive use of dialect and technical terms (which caused him to supply Sotileza with a brief vocabulary) is a grave artistic blemish. But he saw, knew, understood character; he created not only types, but living personages, such as Andres, Cleto and Muergo in Sotileza, Pedro Juan and Pilara in La Puchera; and he personified the tumult and calm of the sea with more power than Victor Hugo displayed in Les Travailleurs de la mer. His descriptive powers were of the highest order, and his style, pure of all affectations and embellishments, is of singular force and suppleness. With all his limitations, he was as original a genius as Spain produced during the 19th century.

(J. F.-K.) PERE DAVID'S DEER, the mi-lou of the Chinese, an aberrant and strangely mule-like deer (q.v.), the first evidence of whose existence was made known in Europe by the Abbe (then Pere) David, who in 1865 obtained the skin of a specimen from the herd kept at that time in the imperial park at Pekin. This skin, with the skull and antlers, was sent to Paris, where it was described in 1866 by Professor Milne-Edwards. In lacking a brow- tine, and dividing in a regular fork-like manner some distance above the burr, the large and cylindrical antlers of this species conform to the general structural type characteristic of the American deer. The front prong of the main fork, however,

curves somewhat torward and again divides at least once; while the hind prong is of great length undivided, and directed back- wards in a manner found in no other deer. As regards general form, the most distinctive feature is the great relative length of the tail, which reaches the hocks, and is donkey-like rather than deer-like in form. The head is long and narrow, with a prominent ridge for the support of the antlers, moderate-sized ears, and a narrow and pointed muzzle. A gland and tuft are present on the skin of the outer side of the upper part of the hind cannon-bone; but, unlike American deer, there is no gland on the inner side of the hock. Another feature by which this species differs from the American deer is the conformation of the bones of the lower part of the fore-leg, which have the same structure as in the red deer group. The coat is of moderate length, but the hair on the neck and throat of the old stags is elongated to form a mane and fringe. Although new-born fawns are spotted, the adults are in the main uniformly coloured; the general tint of the coat at all seasons being reddish tawny with a more or less marked tendency to grey: It has been noticed at Woburn Abbey that the antlers are shed and replaced twice a year.

The true home of this cteer has never been ascertained, and probably never will be; all the few known specimens now living being kept in confinement — the great majority in the duke of Bedford's park at Woburn, Bedfordshire. (R. L.*)

PEREGRINUS PROTEUS (2nd cent, a.d.), Cynic philosopher, of Parium in Mysia. At an early age he was suspected of parricide, and was obliged to leave his native place. During his wanderings he reached Palestine, where he ingratiated him- self with the Christian community, and became its virtual head. His fanatical zeal and craving for notoriety led to his imprison- ment, but the governor of Syria let him go free, to prevent his posing as a martyr. He then returned to Parium to claim his paternal inheritance, but finding that the circumstances of his father's death were not yet forgotten, he publicly surrendered all claims to the property in favour of the municipality. He resumed his wandering life, at first assisted by the Christians, but having been detected profaning the rites of the Church, he was excommunicated. During a visit to Egypt he made the acquaintance of the famous Cynic Agathobulus and joined the sect. Meeting with little encouragement, he made his way to Rome, whence he was expelled for insulting the emperor Anto- ninus Pius. Crossing to Greece, he finally took up his abode at Athens. Here he devoted himself to the study and teaching of philosophy, and obtained a considerable number of pupils, amongst them Aulus Gellius, who speaks of him in very favour- able terms. But, having given offence by

his attacks on Herodes Atticus and finding his popularity diminishing, he determined to create a sensation. He announced his intention of immolating himself on a funeral pyre at the celebration of the Olympian games in 165, and actually carried it out. Lucian, who was present, has given a full description of the event.

C. M. Wieland's Geheime Geschichte des Philosophen Peregrinus Proteus (Eng. trans., 1796) is an attempt to rehabilitate his character. See also Lucian, De morte Peregrini; Aulus Gellius xii. 11; Ammianus Marcellinus xxix. ; Philostratus, Vit. Soph. ii. I, 33; J. Bemays, Lucian und die Kyniker (1875); E. Zeller, " Alexander und Peregrinus," in his Vortrdge und Abhandlungen, ii. (1877).

PEREIRE [Pereira], GIACOBBO RODRIGUEZ (1715- 1780), one of the inventors of deaf-mute language, a member of a Spanish-Jewish family, was born at Estremadura, Spain, on the nth of April 1715- At the age of eighteen he entered a business at Bordeaux. Here he fell in love with a young girl who had been dumb from birth, and henceforth devoted himself to discover a method of imparting speech to deaf-mutes. His first subject was Aaron Baumann, a co-religionist, whom he taught to enunciate the letters of the alphabet, and to articulate certain ordinary phrases. He next devised a sign alphabet for the use of one hand only, and in 1 749 he brought his second pupil before the Paris Academy of Sciences, the members of which were astonished at the results he had accomplished. In 1759 Pereire was made .a member of the Royal Society of London. He died at Paris on the 15th of September 1780.

PEREKOP, a town of Russia, in the government of Taurida, 60 m. S.E. of Kherson, on the isthmus which connects the Crimea with the Continent, and commanding the once defensive ditch and dike which cross from the Black Sea to the Sivash (putrid) lagoon. Pop. about 5000. It was formerly an important place, with a great transit trade in salt, obtained from salt lakes in the immediate neighbourhood. Since the opening of the railway route from Kharkov to Simferopol in the Crimea Perekop has greatly declined. In ancient times the isthmus was crossed (about 17 m. south of the present town) by a ditch which gave the name of Taphros to a Greek settlement. This line of defence having fallen into decay, a fort was erected and a new ditch and dike constructed in the 15th century by the Tatar khan of the Crimea, Mengli Ghirai, and by his son and successor Sahib Ghirai. The fort, known as Kapu or Or-Kapu, became the nucleus of the town. In the middle ages Perekop was known as Tuzla. In 1736 it was captured by the Russians under Munnich, and again in 1738 under Lascy (Lacy), who blew up the fort and destroyed a great part of the dike. In 1754

the fort was rebuilt by Krim Ghirei; but the Greek and Armenian inhabitants of Perekop formed a new settlement at Armyanskiy Bazar (Armenian Market), 3 m. farther south. Captured by the Russians in 1771, the town passed into Russian possession with the rest of the Crimea in 1783.

PEREMPTORY, an adjective adapted from the Roman law term peremptorium edictum, peremptoria exceptio, a decree or plea which put an end to or quashed (Lat. perimere, to destroy) an action, hence decisive, final. A similar use is found in English law in ” peremptory challenge,” a challenge to a jury allowed to a prisoner without cause shown, or ” peremptory mandamus,” an absolute command. The natural repugnance to a final order has given this word in its ordinary usage a sense of objec- tionable and intolerant emphasis.

PEREYASLAVL, a town of Russia, in the government of Poltava, 26 m. S.E. of the city of Kiev, at the confluence of the Trubezh and the Alta, which reach the Dnieper 5 m. lower down at the town’s port, the village of Andrushi. Pop. 14,609. Besides the town proper there are three considerable suburbs. Though founded in 993 by Vladimir the Great of Moscow in memory of his signal success over the Turkish Pechenegs, Pereyaslavl has now few remains of antiquity. The town has a trade in grain, salt, cattle and horses, and some manufactures — tallow, wax, tobacco, candles and shoes.

From 1054 Pereyaslavl was the chief town of a separate principality. As a southern outpost it often figures in the nth, 1 2th and 13th centuries, and was plundered by the Mongols in 1 239. In later times it was one of the centres of the Cossack movement; and in 1628 the neighbourhood of the town was the scene of the extermination of the Polish forces known as ” Tara’s Night.” It was by the Treaty of Pereyaslavl that in 1654 the Cossack chieftain Bogdan Chmielnicki acknowledged the supremacy of Tsar Alexis of Russia.

PEREYASLAVL (called Zalyeskiy, or ” Beyond the Forest,” to distinguish it from the older town in Poltava after which it was named), one of the oldest and most interesting cities in middle Russia, situated in the government of Vladimir, 45 m. N.E. of Moscow on the road to Yaroslavl, and on both banks of the Trubezh near its entrance into Lake Pleshcheevo. Pop. 8662. Pereyaslavl was formerly remarkable for the number and importance of its ecclesiastical foundations. Among those still standing are the 12th-century cathedral, with ancient wall-paintings and the graves of Demetrius, son of Alexander Nevsky, and other princes, and a church founded by Eudoxia (Euphrosyne), wife of Demetrius Donskoi, in the close of the

14th century. It is by its extensive cotton manufactures that Pereyaslavl is now best known. The fisheries in the lake (20 m. sq. in extent and 175 ft. deep) have long been of great value.

Founded in n 52 by Yuryi Dolgoruki, prince of Suzdal, Pereyaslavl soon began to play a considerable part in the history of the country. From 1195 till 1302 it had princes of its own; and the princes of Moscow, to whom it was at the latter date

bequeathed, kept it (apart from some temporary alienations in the 14th century) as part of their patrimony throughout the 15th and 16th centuries. Lake Pleshcheevo was the scene of Peter the Great's first attempts (1691) at creating a fleet.

PEREZ, ANTONIO (c. 1 540-161 1), for some years the favourite minister of Philip II. of Spain and afterwards for many more the object of his unrelenting hostility, was by birth an Aragonese. His reputed father, Gonzalo Perez, an ecclesiastic, has some place in history as having been secretary both to Charles V. and to Philip II., and in literature as author of a Spanish translation of the Odyssey (La Ulyxea de Homero, Antwerp, 1556). Antonio Perez, who was legitimated by an imperial diploma issued at Valladolid in 1542, was, however, believed by many to be in reality the son of Philip's minister, Ruy Gomez de Silva, prince of Eboli, to whom, on the completion of a liberal education at home and abroad, he appears at least to have owed his first introduction to a diplomatic career. 1 In 1567 he became one of the secretaries of state, receiving also about the same time the lucrative appointment of protonotary of Sicily, and in 1573 the death of Ruy Gomez himself made room for Perez's promotion to be head of the " despacho universal," or private bureau, from which Philip attempted to govern by assiduous correspondence the affairs of his vast dominions. Another of the king's secretaries at this time, though in a less confidential relation, was a friend and contemporary of Perez, named Juan de Escovedo, who, however, after the fall of Tunis in 1574, was sent off to supersede Juan de Soto as secretary and adviser of Don John of Austria, thus leaving Perez without a rival. Some time after Don John's appointment to the governorship of the Netherlands Perez accidentally became cognisant of his inconveniently ambitious " empresa de Inglaterra," in which he was to rescue Mary Queen of Scots, marry her, and so ascend the throne of England. The next step might even be against Spain itself. This secret

scheme the faithful secretary at once carried to Philip, who characteristically resolved to meet it by quietly removing his brother's aider and abettor. With the king's full cognisance, accordingly, Perez, after several unsuccessful attempts to poison Escovedo, succeeded in procuring his assas- sination in a street of Madrid on the 31st of March 1578. The immediate effect was to raise Perez higher than ever in the royal confidence and favour, but, wary though the secretary had been, he had not succeeded in obliterating all trace of his connexion with the crime, and very soon a prosecution was set on foot by the representatives of the murdered man. For a time Philip was both willing and able to protect his accomplice, but ulti- mately he appears to have listened to those who, whether truly or falsely, were continually suggesting that Perez had had motives of his own, arising out of his relations with the princess , of Eboli, for compassing the assassination of Don John's secre- tary; be this as it may, from trying to screen Perez the king came to be the secret instigator of those who sought his ruin. The process, as such matters often have been in Spain, was a slow one, and it was not until 1589 that Perez, after more than one arrest and imprisonment on a variety of charges, seemed on the eve of being convicted and condemned as the murderer of Escovedo. At this juncture he succeeded in making his escape from prison in Castile into Aragon, where, under the ancient " fueros " of the kingdom he could claim a public trial in open court, and so bring into requisition the documentary evidence he possessed of the king's complicity in the deed. This did not suit Philip, who, although he instituted a process in the supreme tribunal of Aragon, speedily abandoned it and caused Perez to be attacked from another side, the charge of heresy being now preferred, arising out of certain reckless and even blasphe- 1 On the other hand it is suggested that this story of his being the son of Gomez was only circulated by Ruy Gomez's wife, Ana de Mendoza, as a refutation of the possibility of a supposed amour between her and Perez. It is contended by Mignet that this intrigue between her and Perez was known to Escovedo, and that this accounts for the part played by Perez in Escovedo's murder, because Ana had also been Philip's mistress, and Escovedo might have made mischief between Philip and Perez. Major Hume appears to combine the latter theory with Philip's political objection to Escovedo.

mous expressions Perez had used in connexion with his troubles in Castile. But all attempts to remove the accused from the civil prison in Saragossa to that of the Inquisition raised popular tumults, which in the end led to Perez's escape across the Pyrenees, but unfortunately also furnished Philip with a pretext for sending an army into Aragon and suppressing the ancient "fueros" altogether (1591). From the

court of Catherine de Bourbon, at Pau, where he was well received, Perez passed to that of Henry IV. of France, and both there and in England his talents and diplomatic experience, as well as his well-grounded enmity to Philip, secured him much popularity. While in England he became the ” intimate coach-companion and bed-companion ” of Francis Bacon, and was also much in the society of the earl of Essex. The peace of Vervins in 1598 greatly reduced his apparent importance abroad, and Perez now tried to obtain the pardon of Philip III., that he might return to his native country. His efforts, however, proved vain, and he died in comparative obscurity in Paris on the 3rd of November

1611.

Perez’s earliest publication was a small quarto, dedicated to the earl of Essex, written and apparently printed in England about 1594, entitled Pedazos de historia, and professedly published &’- Leon. A Dutch translation appeared in 1594, and in 1598 he pub- lished his Relaciones, including the Memorial del kecho de su causa, drawn up in 1590, and many of his letters. Much has been done, by Mignet {Antonio Perez et Philippe II , 1845; 4th ed., 1874) and by Froude (” An Unsolved Historical Riddle,” Nineteenth Cent., 1883) among others, towards the elucidation of various difficult points in Perez’s somewhat perplexing story. For the murder of Escovedo, see Andrew Lang’s discussion of it in his Historical Mysteries (1904); and the Espanoles e ingleses (1903) of Major Martin Hume, who had access to various newly discovered MSS.

PEREZ GALDdS, BENITO (1845-), was born at Las Palmas, in the Canary Islands, on the 10th of May 1845. In 1863 he was sent to Madrid to study law, drifted into literature, and was speedily recognized as one of the most promising recruits on the Liberal side. Shortly after the Revolution of 1868 he abandoned journalism, and employed fiction as the vehicle for propagating advanced opinions His first novel, La Fontana de oro, was printed in 1871, and later in the same year appeared El Audaz. The reception given to these early essays encouraged the writer to adopt novel-writing as a profession. He had al- ready determined upon the scheme of his Episodios nacionales, a series which might compare with the Comedie humairie. Old charters, old letters, old newspapers were collected by- him with the minuteness of a German archivist; no novelist was ever more thoroughly equipped as regards the details of his period. Tra- falgar, the first volume of the Episodios nacionales, appeared in 1879; the remaining books of this first series are entitled La Cort de Carlos IV., El ig de mdrzo y el 2 de mayo, Bailen, Napoledn en Chamarlin,

Zaragoza, Gerona, Cadiz, Juan Martin el Empecinado and La Batalla de Ar piles. As the titles suffice to show, the author's aim was to write the national epic of the 19th century in prose; and he so completely succeeded that, long before the first series ended in 1881, he took rank among the foremost novelists of his time. A second series of Episodios nacionales, beginning with El Equipaje del rey Jose and ending with a tenth volume, Un Faccioso mas y algunas frailes menos, was brought to a close in 1883, and was, like its predecessor, a monument of industry and exact knowledge, of realism and romantic conception; and he carried on the Episodios nacionales into a fourth series, raising the total of volumes to forty. In fecundity and in the power of creating characters, Perez Galdos vies with Balzac. Parallel with his immense achievement in historical fiction, Perez Galdos published a collection of romances dealing with contemporary life, its social problems and religious difficulties. Of these the best known, and perhaps the best, are Dona Perfecla (1876); Gloria (1877) ! La Familia de Le6n Rock (1878) ; Marianela (1878) ; Fortunata y Jacinta (1887); and Angel Guerra (1891). Nor does this exhaust his prodigious activity. Besides adapting several of his novels for stage purposes, he wrote original dramas such as La Loca de la casa (1893), San Quintin (1894), Elecira (1900) and Mariucha (1904); but his diffuse, exuberant genius

•was scarcely accommodated to the convention of theatrical form. Perez Galdos became a member of the Spanish Academy, and was also elected to the Cortes; but it is solely as a ro- mancer that his name is familiar wherever Spanish is spoken, as a national novelist of fertile talent, and a most happy humorist who in his eccentrics and oddities is hardly inferior to Dickens. (J. F.-K.)

PERFUMERY (Lat. per, through, and fumare, to smoke), the preparation of perfumes, or substances which are pleasing to the sense of smell. Perfumes may be divided into two classes, the first of which includes all primitive or simple odoriferous bodies derived from the animal or vegetable kingdom, as well as the definite chemical compounds specially manufactured, while the second comprises the various " bouquets " or " melanges " made by blending two or more of the foregoing in varying proportions — toilet powders, dentifrices, sachets, &c. To the former class belong (1) the animal products, ambergris, castor, civet, musk; (2) the essential oils (also called attars), mostly procured by the distillation of the stems, leaves,

flowers and other parts of plants; (3) the philicome butters or oils, which are either solid or liquid fats charged with odours by the processes of inflowering or maceration; (4) the odoriferous gum-resins or balsams which exude naturally or from wounds in the trunks of various trees and shrubs, such as benzoin, opoponax, Peru, Tolu, storax, myrrh; (5) the large number of synthetic perfumes which simulate the odour of the natural scents. The second class contains the endless combination of tinctures sold under fancy names which may or may not afford a clue to their compo- sition, such as ” comedie francaise,” “eau de senteur,” ” eau de Cologne,” ” lavendre ambree,” ” blumengeist.” In general, they are mixtures of a number of perfumes dissolved in alcohol. Strictly speaking, most of the perfumes on the market belong to the second class, since, in most cases, they are prepared by blending various natural or artificial odorous principles.

Natural Perfumes. — The animal perfumes are extremely limited in number. Ambergris (q. v.), one of the most important, is secreted by the sperm whale; musk (q.v.), the best known scent of this class, is secreted by the male musk-deer and other animals — musk-ox, musk-rat, &c; civet (q.v.) is a musky scent named from the animal which secretes it; and castor or castoreum is a somewhat similar secretion of the beaver (q.v.). More important are the scents yielded by flowering plants. As a general rule fragrant flowers flourish in hot climates, but the more delicate perfumes are yielded by plants having a colder habitat; it must be remembered, however, that some costly perfumes are obtained from the plants of Ceylon, the East Indies, Mexico and Peru. In Europe, Grasse, Cannes and Nice are the centres of the natural perfume industry. Cannes is famous for its rose, acacia, jasmine and neroli oil; Nimes for its thyme, rosemary and lavender; and Nice for its violets. Citron and orange oil come from Sicily; iris and bergamot from Italy; and roses are extensively cultivated in Bulgaria, and in European Turkey. England is unsurpassed for its lavender and peppermint, which flourish at Mitcham and Hitchin.

The natural sources of the attars or essential oils are the different parts of the plants which yield them — the wood (lign, aloe, santal, cedar), the bark (cinnamon, cascarilla), the leaves (patchouli, bay, thyme), the flowers (rose, lavender, orange- blossom), the fruit (nutmeg, citron), or the seeds (caraway, almond). Some plants yield more than one, such as lemon and bergamot. They are mostly obtained by distilling that part of the plant in which they are contained with water, or with high- pressure or superheated steam; but some few, as those from the rind of bergamot (from Citrus bergamia), lemon (citron zeste, from C. Limonum), lime (C. Limetta), by “expression.” The outer layer of the cortex is rasped off from the unripe fruits, the raspings

placed in a canvas bag, and squeezed in a screw or hydraulic press. The attars so obtained are separated from the admixed water by a tap-funnel, and are then filtered. Certain flowers, such as jasmine, tuberose, violet, cassia, either do not yield their attars by distillation at all, or do it so sparingly as not to admit of its collection for commercial purposes; and

sometimes the attar, as in the case of orange (neroli), has an odour quite different from that of the fresh blossoms. In these cases the odours are secured by the processes of inflowering (enfleurage) or by maceration. Both depend upon the remark- able property which fats and oils possess of absorbing odours. Enfleurage consists in laying the leaves or flowers on plates covered with a layer of fat. The flowers are renewed every morning, and when the fat has sufficient odour it is scraped off, melted and strained. Maceration consists in soaking the flowers in heated fat; in due time they are strained off and replaced by fresh ones, as in the enfleurage process. The whole of the necessary meltings and heatings of the perfumed greases are effected by means of water-baths, whereby the temperature is kept from rising too high. For the manufacture of perfumes for the handkerchief the greases now known as pomades, butters or philocomes are treated with rectified spirit of wine 60° over- proof, i.e. containing as much as 95% °f absolute alcohol by volume, which practically completely abstracts the odour.

The gum-resins and resins have been employed as perfumes from the earliest times. The more important are incense, frankincense and myrrh (q.v.). They are largely used in the manufacture of perfumes, both for burning as pastilles, ribbon of Bruges, incenses, &c, and in tinctures, to which they impart their characteristic odours, affording, at the same time, a certain fixity to other perfumes of a more fleeting nature when mixed with them.

Synthetic Perfumes. — Under this heading are included all perfumes in which artificial substances are odorous ingredients. Although the earliest perfumes of this class were introduced in about the middle of the 19th century, the important industry which now prevails is to be regarded as dating from the ‘seventies and ‘eighties. Three main lines of development may be dis- tinguished: (1) the chance discovery of substances which have odours similar to natural perfumes; (2) the elucidation of the composition of the natural scents, and the chemical constitution of their ingredients, followed by the synthetic preparation of the substances so determined; and (3), which may be regarded as connected with (2), the extraction and separation of the essential oils yielded by less valuable plants, and their reblending to form

marketable perfumes.

The first synthetic perfume was the ” essence of Mirbane ” introduced by Collas in about 1850; this substance was the nitro-benzene discovered by E. Mitscherlich in 1834. Soon after- wards many esters of the fatty acids simulating the odours of fruits were introduced; and in 1888 Baur discovered the ” arti- ficial musks,” which are derivatives of s-trinitrobenzene. The above are instances of the first line of progress. The second line has for early examples the cases of artificial oil of wintergreen, which followed Cahour’s discovery that the natural oil owed its . odour, in the main, to methyl salicylate, and of artificial oil of bitter almonds which followed the preparation of benzaldehyde from benzal chloride in 1868. The synthesis of coumarin, the odorous principle of hay and woodruff, by Sir W. H. Perkin in 1868; of vanillin, the odorous principle of vanilla, by F. Tiemann and W. Haarmann in 1875; and of ionone, almost identical with the natural irone, the odorous principle of violets, by Tiemann and P. Kriiger in 1898, are to be regarded as of the highest importance. Equally important are the immense strides made in the elucidation of the constitution and syntheses of the terpenes (q.v.), a group of compounds which are exception- ally abundant as odorous principles in the essential oils.

The present state of our knowledge does not permit a strict correlation of odour and chemical constitution. One theory regards odour as due to ” osmophores,” or odour-producing groups, in much the same way as colour is associated with chromophores. Such osmophores are hydroxyl (OH), aldehyde (CHO), ketone (CO), ether (0), nitrile (CN), nitro (N0 2), &c; we may also notice the isonitrile group (-NG) associated with an unpleasant odour, and the iso-thiocyanate group (-NCS) to which the mustard oils owe their characteristic smell. The same group, however, is not invariably associated with the same odour, or even any odour at all, as, for instance, in such closely related

compounds as the members of a homologous series. For example, the lower fatty aldehydes have unpleasant odours, those with ten carbon atoms (and also double linkages, which in itself may affect odour) form some of the most delicate scents, while the higher members are odourless. The absence of odour in the higher members may be possibly associated with the low volatility exhibited by compounds of

high molecular weight. Certain osmophores have practically equal effects; for example, benzaldehyde, nitrobenzene, benzonitrile, and phenyl azoimide have practically identical odours, and among the ” artificial musks,” a nitro group may be replaced by the azoimido group without the odour being modified. As a general rule, homologues have similar odours, but many exceptions are known. For example the methyl and ethyl ethers of /3-naphthol have the odour of neroii; on the other hand, of the esters of anthranilic acid, the methyl has the odour of orange blossoms, the ethyl has a slight odour, and the isobutyl is odourless. The introduc- tion of a methyl group into the benzene ring generally involves little or no change in odour; but when it (and more especially higher alkyl radicals) is introduced into side chains the odour may be entirely changed. For example, benzene and its homologues have similar odours; phthalide is odourless, but the isopropyl and butyl phthalides, in which substitution occurs in the side chain, smell of celery. Especially characteristic are the derivatives of phenylacetylene. This hydrocarbon is distinctly unpleasant; on the other hand, para-ethyl and para- methyl phenylacetylene smell of anise. While the triply-linked carbon system is generally associated with strong and unpleasant odours, the doubly linked system gives pleasant ones. Thus the unpleasant phenylacetylene, CeHs-CiCH, is contrasted with styrolene, C6H 5 ‘CH:CH 2 , which occurs in storax, and phenyl- propiolic aldehyde with cinnamic aldehyde, C 6 H 5 - CH:CH-CHO, which occurs in cassia and cinnamon. The reduction of a double to a single linkage may not destroy odour. Thus hydrocinnamic aldehyde, the reduction product of cinnamic aldehyde, smells of jasmine and lilac, and melilotin, which occurs in yellow melilot (Melilotus officinalis), has the same odour (woodruff) as its oxidation product coumarin. The orientation of the substituent groups in the benzene nucleus also affects odour. In general, the meta compounds are odourless, while the ortho and para may have odour. Thus ˆ- methoxyaceto- phenone has a pleasant odour, the meta compound is odourless,

The concentration and even the solvent has considerable effect on the odour of a substance. Many of the artificial principles — vanillin, heliotropine, ionone, &c. — have very different odours in strong and in dilute solution; phenyl acetic acid and /3-naphthylamine are odourless when solid, but have disagreeable odours when dissolved. Traces of impurities often have the effect of making odourless or pleasant- smelling compounds quite intolerable. Acetylene as generated from calcium carbide, and carbon disulphide prepared from its elements are quite intolerable, though when pure they are, at least, not unpleasant; artificial benzaldehyde must be very care- fully

purified before it can be used in the preparation of the more delicate scents. In all cases the natural scents are complex mixtures of many ingredients, and a variation in the amount of any one may completely alter the scent. Such mixtures would be difficult to reproduce economically; the perfumer is content with a product having practically an identical odour, with or without the natural substance which it is designed to compete with.

We now give an account of the artificial scents, principally arranged according to their chemical relations. The fatty esters are interesting as providing many of the fruit essences; in fact, by appropriate blending, any fruit odour can be reproduced. Their use, however, is inhibited by the fact that they irritate the re- spiratory organs, producing coughing and headaches. Isobutyl carbinol acetic ester (amyl acetate),

CHCH 2 -CH 2 -OGCH3, forms when in dilute alcoholic solution the artificial pear oil; a similar odour is possessed by isoamyl-M-butyrate, CsHt-CCVCbHu.

»-Octyl acetate, CgHn-OjC-CHs, has the odour of oranges. Isoamyl propionate, C 5 Hir0 2 C-C 2 H 5 , and ethyl-ra-butyrate, C3H 7 -0 2 C-C 2 H 5 , have the odour of pineapple, the latter constituting the artificial pineapple oil of commerce. Isoamyl isovalerate, C 6 Hir0 2 C-C4H 9 , is the artificial apple oil. Of the fatty ketones, methyl nonyl ketone, CHs-CO-C 9 Hi9, which is the scent of oil of rue, and methyl-ethyl acetone, CHs-CO-CHtCHs) (C 2 H 5), which has the odour of peppermint, receive commercial application. Of exceptional importance in the chemistry of perfumes are the unsaturated open chain compounds containing at least eight carbon atoms. These are chemically considered, along with the related cyclic compounds, in the article Terpenes ; here we notice their odours and occurrence in perfumes. Of the alcohols, /-linalol occurs in oil of lavender, bergamot, limet and origanum; d-linalol in coriander; citronellol and geraniol in rose, geranium and pelargonium oils. Of the aldehydes, citral or geranial has the odour of lemons; citronellal is the chief constituent of citronella oil. By condensing citral with acetone and treating the product with dilute sulphuric acid, the valuable violet substitute ionone results. This substance is a hydroaromatic ketone, and closely resembles the natural principle irone. By successive treatment with acetic anhydride (to form isopulegol), oxidation to isopulegone, and treatment with baryta citronellal yields the cyclic compound pulegone, the chief constituent of oil of pennyroyal. The olefinic terpenes are generally convertible into methyl heptenone, (CH 3) 2 C :CH(CH 2) 2 -CO-CH3, which has been synthesized from sodium acetonylacetone and amylene dibromide; this ketone occurs in several essential oils, and has the odour of rue. For the occurrence of cyclic terpenes in the essential oils reference should be made to the table below, which contains the names, sources and chief ingredients of the more important essential oils. 1 The terpenes are printed in italics, the aliphatic and benzenoid compounds in ordinary type.

Name of Oil.

Source.

Anise

Bay . . .

Bergamot .

Cajaput . Cassia .

Caraway Camphor

Chamomile .

Cinnamon .

Clove Coriander Cumin . Eucalyptus

Fennel . Geranium

Jasmine .

Lavender Lemon .

Lemon-grass Neroii .

Orange . Peppermint .

Pine-needle . Rose . Rose .

Geranium . Rosemary .

Sage . Sassafras Spearmint . Star anise . Tansy . Thyme . Wormwood . Ylang-ylang

Constituents.

Pimpinella anisum Pimenta acris

Citrus bergamia

Melaleuca, sp. Cinnamonum cassia

Carum carvi Cinnamonum camphor

Anthemis nobilis

Cinnamonum Zeylani

cum Eugenia caryophyllata Coriandum sativum Cuminum cymium Eucalyptus globulus

Foeniculum vulgare Andropogon schoen-

anthus Jasminum grandi-

florum

Lavendula vera Citrus limonum

Andropogon citratus Citrus bigardia

Citrus aurantium Mentha piperita

Pinus sylvestris Rosa damascena Pelargonium odoratis

semum Rosamarinus officina- lis Salvia officinalis Sassafras officinalis Mentha viridis Illicium anisatum Tanacetum vulgare Thymus vulgaris Artemisia absinthum Cananga odorata

Anethole, estragole. Eugenol, methyl eugenol,

chavicol, estragole,myrcene,

phellandrene. Linalol, linalyl acetate, d-

limonene, bergaptene. Cineol. Cinnamic aldehyde, cinnamyl

acetate. Carvone, d-limonene. d-Pinene, phellandrene, terpi-

neol, eugenol, safrole. Isobutyl and isoamyl esters

of angelic and tiglic acids. Cinnamic aldehyde.

Eugenol.

Linalol.

Cumic aldehyde, cymene.

Cineol, d-pinene, and fatty

aldehydes. Anethole, fenchone, d-pinene. Geraniol, citronellol.

Methyl anthranilate, indol, benzyl alcohol, benzyl ace- tate, linalol, linalyl acetate.

Linalol, l-linalyl acetate.

Limonene, phellandrene, citral, citronellal, geranyl acetate, linalol.

Citral.

l-Linalol, geraniol, limonene, methyl anthranilate.

d-Limonene.

Menthol, menthyl acetate and valerate.

d-Pinene, d-sylvestrene.

Geraniol, -citronellol.

Geraniol, citronellol.

Pinene, camphene, camphor,

cineol, borneol. Pinene, cineol,thujone,borneol. Safrole.

-Linalol, l-carvone. Anethole. Thujone. Thymol.

Thujone and thujyl esters. -Linalol, geraniol.

1 See J. B. Cohen, Organic Chemistry, p. 532 ; or J. Parry, Chemistry of Perfumes (1908).

The chief benzenoid compounds used as perfumes are aldehydes, oxyaldehydes, phenols and phenol ethers. Benzaldehyde has the odour of almonds, cinnamic aldehyde of cinnamon, and cumin aldehyde gives the odour to cumin oil. Of oxyaldehydes salicyl- aldehyde gives the odour to spiraea oil, and vanillin is the active ingredient of vanilla (q.v.). Anisaldehyde smells like hawthorn, and is extensively used under the name aubepine for scenting soaps and extracts. Carvacrol and thymol are isomeric methyl propyl phenols; both have the odour of thyme. Of phenol ethers eugenol (allyl guaiacol) has the odour of cloves, and anethole (allyl phenyl methyl ether) is the chief constituent of anise oil, being chiefly used in the manufacture of liqueurs. Several piperonyl compounds are of commercial importance. Thealdehyde, CH2o 2 :C6H3-CHO, piperonal, has the odour of heliotrope; an allyl derivative, safrole CH 2 [0]2:C 6 H3-C3H6, occurs in sassafras, while apiole or dimethoxy safrole has the odour of parsley oil. Of other syn- thetic perfumes amyl salicylate is used under the names of orchidee or trefol as the basis of many perfumes, in particular of clover scents; methyl anthranilate occurs in the natural neroli and other oils, and has come into considerable use in the

preparation of arti- ficial bergamot, neroli, jasmine and other perfumes (the Trolene, Marceol and Amanthol of the Actien Gesellschaft fur Anilin Fabrika- tion have this substance as a base); the “artificial musks” are derivatives of i-trinitrobenzene ; coumarin is the principle of wood- ruff; and /S-naphthol methyl ether is used for the preparation of artificial neroli.

The Odophone. — The most important element in the perfumer’s art is the blending of the odorous principles to form a mixture which gratifies the sense of smell. Experience is the only guide. It is impossible to foretell the odour of a mixture from the odours of its components. Septimus Piesse endeavoured to show that a certain scale or gamut existed amongst odours as amongst sounds, taking the sharp smells to correspond with high notes and the heavy smells with low. He illustrated the idea by classifying some fifty odours in this manner, making each to correspond with a certain note, one-half in each clef, and extending above and below the lines. For example, treble clef note E (4th space) corresponds with Portugal (orange), note D (1st space below clef) with violet, note F (4th space above clef) with ambergris. It is readily noticed in practice that ambergris is much sharper in smell (higher) than violet, while Portugal is intermediate. He asserted that properly to constitute a bouquet the odours to be taken should correspond in the gamut like the notes of a musical chord — one false note among the odours as among the music destroying the harmony. Thus on his odophone, santal, geranium, acacia, orange-flower, camphor, corresponding with C (bass 2nd line below), C (bass 2nd space), E (treble 1st line), G (treble 2nd line), C (treble 3rd space), constitute the bouquet of chord C.

Other Branches of Perfumery. — As a natural outcome of the development of the perfume industry, scented articles for toilet and other uses are now manufactured in large quantities. Soaps, toilet powders, tooth powders, hair-washes, cosmetics generally, and note-paper have provided material on which the perfumer works. For the preparation of scented soaps two methods are in use ; both start with a basis either of fine yellow soap (which owes its odour and colour to the presence of resin), or of curd soap (which is hard, white and odourless, and is prepared without resin). In one process the soap is melted by superheated steam, and while still hot and semi-fluid mixed by means of a stirrer of wood with iron cross-bar, technically called a ” crutch,” with the attars and colouring matter. It is then removed from the melting pan to a rectangular iron mould or box, the sides of which can be removed by unscrewing the tie-rods which hold them in position; when cold the mass is cut into slabs and bars with a thin brass wire. In the other or cold process the soap is first cut into chips

or shavings by a plane or ” chipping machine,” then the colouring matters are added and thoroughly incorporated by passing the soap between rollers; the tinted soap emerges in a continuous sheet but little thicker than paper. The perfumes are then added, and after standing for about twelve hours the soap is again sent through the rolling machine. It is next transferred to a bar-forming machine, from which it emerges as a continuous bar almost as hard as wood. Soap thus worked contains less than 10% of water; that prepared by melting contains 20 and even 30%. The amount of perfume added depends upon its nature, and amounts usually to about 7 or 8 %. The] finest soaps are always manufactured by the cold process.

Toilet Powders are of various sorts. They consist of rice-starch or wheat-starch, with powdered orris-root in varying proportions, and with or without the addition of zinc oxide, bismuth oxide or French chalk. The constituent powders, after the addition of the perfume, are thoroughly incorporated and mixed by sifting through a fine sieve. Violet powder for the nursery should consist entirely of powdered violet root (Iris florentina) , from the odour of which the powder is named. It is of a yellowish tint, soft and pleasant to the touch. The white common so-called ” violet powders ” consist of starch scented with bergamot, and are in every sense inferior.

Tooth Powders consist for the most part of mixtures of powdered orris-root with precipitated chalk, and some other constituent destined to particularize it as to properties or flavour, such as

charcoal, finely pulverized pumice, quassia, sugar, camphor, &c. The perfume of the contained orris-root is modified, if required, by the addition of a little of some perfume. Tooth Pastes are formed of the same constituents as the powders, and are worked into a paste by the addition of a little honey or glucose syrup, which sub- stances are usually believed ultimately to have an injurious effect on the teeth.

Perfume Sachets consist either of a powder composed of a mixture of vanilla, musk, Tonqua beans, &c, one or other predominating as required, contained m an ornamental silk sac; or of some of the foregoing substances spread upon card or chamois leather or flannel after being made into a paste with mucilage and a little glycerin. When dry the card so prepared is daintily covered with various parti-coloured silks for sale. Where the ingredients employed in their manufacture are of good quality these cards, known as ” peau d’Espagne ” sachets, retain their odour unimpaired for years.

Adulterations. — There is, as might be expected, considerable scope

for the adulteration of the ” matieres premieres ” employed in perfumery. Thus, in the case of musk, the ” pods ” are fre- quently found to be partially emptied of the grain, which has been replaced by hide or skin, while the weight has been increased by the introduction of lead, &c. In other instances the fraud consists in the admixture of refuse grain, from which the odour has been ex- hausted with spirit, with dried blood, and similar substances, whilst pungency is secured by the addition of ammonium carbonate. Attar of rose is diluted with attar of Palma rosa, a variety of geranium of only a quarter or a fifth of the value. The main adulterant of all the natural essential oils, however, is castor oil. This is a bland neutral body, practically odourless, and completely soluble in alcohol; it therefore presents all the requisites for the purpose.

Bibliography. — See generally, J. C. Sawyer, Odorographia, vol. i. (1892), vol. ii. (1894) ; G. W. Askinson, Perfumes (Eng. trans, by Isidor Fiirst, 1892); S. Piesse, Art of Perfumery (1891); Paul Hubert, Plantes i parfumes (1909); M. Otto, V Industrie des parfums (1909). Synthetic perfumes are treated in detail in C. Deite, Manual of Toilet Soap-making (Eng. trans, by S. I. King, 1905), and in E. J. Parry, Chemistry of the Essential Oils and Artificial Parfumes (2nd ed., 1908). Reference may also be made to T. Roller, Cosmetics (1902). The standard works on the essential oils are given in the article Oils. G. Cohn, Die Riechstoffe (1904), treats the chemistry, and Zwaardemaker, Physiologic des Geruchs (1895), the physiology of perfumes. See also the reports and bulletins of Schimmel & Co. and Rouse Bertrand et Fils.

PERGA (mod. Murtana), an ancient city of Pamphylia, situated about 8 m. inland, at the junction of a small stream (Sari Su) with the Cestrus. It was a centre of native influences as contrasted with the Greek, which were predominant in Attalia, and it was a great seat of the worship of ” Queen ” Artemis, here represented as a human-headed cone and a purely Anatolian nature goddess. There Paul and Barnabas began their first mission in Asia Minor (Acts ix. 13). A much frequented route into Phrygia and the Maeander valley began at Perga, and Alexander made it the starting-point of his invasion of inner Asia Minor. Long the metropolis of Pamphylia Secunda, it was superseded in Byzantine times by its port, Attalia, which became a metropolis in 1084. The extensive ruins all lie in the plain south of the Acropolis. The walls are well preserved, but of late Roman or Byzantine reconstruction. The lines of intersecting streets can be easily made out, and there are ruins of two sets of baths, two basilicas and a forum. But the most notable monument is the theatre, which lies outside the walls on the south-west, near the stadium. This is as

perfect as those of Myra and Patara, but larger than either, and yields the palm only to those of Aspendus and Side. Modern Murtana is a large village, long under the dominion of the Dere Beys of the Tekke Oglu family.

See C. Lanckoronski, Villes de la Pamphylie et de la Pisidie, vol. i. (1890) ; Sir W. M. Ramsay, Church in the Roman Empire (1893). (D. G. H.)

PERGAMENEOUS (Lat. pergamena, parchment), a technical term used of anything of the texture of parchment, as in zoology of the wing-covers of insects.

PERGAMUM, or Pergamus (mod. Bergama), an ancient city of Teuthrania, a district in Mysia. It is usually named Hepyanov by Greek writers, but Ptolemy has the form Hepyanos. The name, which is related to the German burg, is appropriate to the situation on a lofty isolated hill in a broad fertile valley, less than 15 m. from the mouth of the Cai'cus. According to the belief of its inhabitants, the town was founded by Arcadian colonists, led by Telephus, son of Heracles. Auge, mother of

PERGAMUM

Plate I.

["HE NORTH WING, WEST AND SOUTH SIDES.

THE SOUTH WING, WEST AND SOUTH SIDES.

THE GREAT ALTAR OF ZEUS, FROM THE NORTH-WEST, AS SET UP IN THE KAISER FRIEDRICH MUSEUM, BERLIN,

XXI. 14a. From photographs by W. Tileenthalcr, Berlin.

Plate II.

PERGAMUM

NORTH, SOUTH, EAST, AND WEST SIDES OF THE GREAT ALTAR OF ZEUS.

From photographs by W. Titzenthaler, Berlin.

Telephus, was priestess of Athena Alea at Tegea, and daughter I of Aleus; fleeing from Tegea, she became the wife of Teuthras, the eponymous king of Teuthrania, and her son Telephus succeeded him. Athena Polias was the patron-goddess of Pergamum, and the legend combines the ethnological record of the connexion claimed between Arcadia and Pergamum with the usual belief that the hero of the city was son of its guardian deity, or at least of her priestess. Nothing more is recorded of the city till the time of Xenophon, when it was a small fortified town on the summit of the hill; but it had been striking coins since 420 B.C. at latest. Its importance began under Lysimachus, who deposited his treasures, 9000 talents, in this strong fortress under the charge of a eunuch, Philetaerus of Tium. In 283 B.C. Philetaerus rebelled, Lysimachus died without being able to put down the revolt, and Pergamum became the capital of a little principality. Partly by clever diplomacy, partly through the troubles caused by the Gaulish invasion and by the dissen- sions among the rival kings, Philetaerus contrived to keep on good terms with his neighbours on all sides (283-263 B.C.). His nephew Eumenes (263-241) succeeded him, increased his power, and even defeated Antiochus II. of Syria in a pitched battle near Sardis. His successor Attalus I. (241-197) won a great battle over the Gauls, and assumed the title of king. The other Greek kings who aimed at power in Asia Minor were his natural enemies, and about 222 reduced Pergamenian power to a very low ebb. On the other hand, the influence of the Romans was beginning to make itself felt in the East. Attalus prudently connected himself with them and shared in their continuous success. Pergamum thus became the capital of a considerable territory and a centre of art and regal magnificence. The wealth of the state and the king's desire to celebrate his victories by monuments of art led to the rise of the " Pergamenian school " in sculpture. The splendour of Pergamum was at its height under Eumenes II. (197-159). He continued true to the Romans during their wars with Antiochus and Perseus, and his kingdom spread over the greater part of western Asia Minor, including Mysia, Lydia, great part of Phrygia, Ionia and Caria. To celebrate the great achievement of his feign, the defeat of the barbarian Gauls, he built in the agora a vast altar to Zeus Soter (see below). He left an infant son, Attalus (III.), and a brother, Attalus II. (Philadelphus), who ruled 159-138, and was succeeded by his nephew, Attalus III. (Philometor). The latter died in 133, and bequeathed his kingdom to the Romans, who erected part of it (excluding Great Phrygia, which they gave to Mithradates of Pontus) into a province under the name of Asia. Pergamum continued to rank for two centuries as the capital,

and subsequently, with Ephesus and Smyrna, as one of the three great cities of the province; and the devotion of its former kings to the Roman cause was continued by its citizens, who erected on the Acropolis a magnificent temple to Augustus. It was the seat of a conventus, including the cities of the Caicus valley and some of those in the northern part of the Hermus valley. Under the Roman Empire Pergamum was one of the chief seats of the worship of Asclepius ” the Saviour “; invalids came from distant parts of the country to ask advice from the god and his priests. The temple and the curative establishment of the god were situated outside the city. Pergamum was the chief centre of the imperial cult under the early empire, and, in W. M. Ramsay’s opinion, was for that reason referred to in Rev. ii. 13 as the place of ” Satan’s throne.” It was also an early seat of Christianity, and one of the Seven Churches. The place, re-fortified by the Byzantines, and still retaining its name as Bergama, passed into Moslem hands early in the 14th century. The lower town was rebuilt, and in the 17th and 18th centuries became a chief seat of the great Dere Bey family of Kara Osman Oglu (see Manisa), which did not resign it to direct Ottoman control until about 1825. It is still an administrative and commercial centre of importance, having some 20,000 inhabitants.

Excavations.— The site of the ancient city has been the scene of extensive excavations promoted by the Berlin museum since 1878, and directed first by K. Humann and A. Conze, and

afterwards by W. Dorpfeld. The first impulse to them was given in 1873 by the reception in Berlin of certain reliefs, extracted by Humann from the walls of Bergama. These were recognized as probably parts of the Great Altar of Zeus erected by Eumenes II. in 180 B.C. and decorated with a combat of gods and giants, symbolic of the struggle between the Pergamene Greeks and the Gaulish barbarians. Excavation at the south end of the Acro- polis led to the discovery of the Altar itself and the rest of its surviving reliefs, which, now restored and mounted in Berlin, form one of the glories of that city. In very high relief and representing furious action, these sculptures are the finest which survive from the Pergamene school, which replaced the repose and breadth of earlier schools by excess of emphasis and detail. The summit of the Acropolis is crowded with public buildings, between the market place, which lies at the southern point, and the Royal Gardens on the north. In the interval are the Zeus altar; the great hexastyle Doric temple of Athena flanked by the palace on the east, by the theatre and its long terrace on the west, and by a library on the north; and a large Corinthian temple of Trajan. The residential part of the Greek, and practically all the Roman city lay

below the Acropolis on ground now mostly occupied by modern Bergama; but west of the river Selinus, oh rising ground facing the Acropolis, are to be seen notable remains of a Roman theatre, an amphitheatre and a circus.

See, beside general authorities for Asia Minor, J. Dallaway, Constantinople, &c. (1797); W. M. Ramsay, Letters to the Seven Churches (1904) ; and especially the publication by the Royal Museum of Berlin, Alterthumer von Pergamon (1885 sqq.); “Operations at Pergamon 1906-1907,” in Athenische Mitteil. (1908), xxxiii. 4; G. Leroux, “La Pretendue basilique de Pergame” in Bull. Corr. Hell. (1909), pp. 238 sqq. (D. G. H.) ,

PERGOLA (Lat. pergula, a projecting roof, shed, from pergety, to reach forward, project), a term adopted from the Italian for an arbour of trellis- work over which are trained creeping plants, vines, &c, and especially for a trellis- work covering a path, walk or balcony in a garden.

PERGOLESI (or Pergolese), GIOVANNI BATTISTA (1710- 1736), Italian musical composer, was born at Jesi near Ancona on the 3rd of January 17 10, and after studying music undei “local masters until he was sixteen was sent by a noble patron to complete his education at Naples, where he became a pupil of Greco, Durante and Feo for composition and of Domenico de Matteis for the violin. His earliest known composition was a sacred drama, La Conversione di S. Guglielmo d’ Aquitania, between the acts of which was given the comic intermezzo II Maestro di tnusica. These works were performed in 1731, probably by fellow pupils, at the monastery of St Agnello Maggiore. Through the influence of the prince of Stigliano and other patrons, including the duke of Maddaloni, Pergolesi was commissioned to write an opera for the court theatre, and in the winter of 1731 successfully produced La Sallustia, followed in 1732 by Ricimero, which was a failure. Both operas had comic intermezzi, but in neither case were they successful. After this disappointment he abandoned the theatre for a time and wrote thirty sonatas for two violins and bass for the prince of Stigliano. He was also invited to compose a mass on the occasion of the earthquake of 1731, and a second mass, also for two choirs and orchestra, is said to have been praised by Leo. In September

1732 he returned to the stage with a comic opera in Neapolitan dialect, Lo Frate inammorato, which was well received; and in

1733 he produced a serious opera, II Prigionier, to which the

celebrated Serva padrona furnished the intermezzi. There seems, however, no ground for supposing that this work made any noticeable difference to the composer's already established reputation as a writer of comic opera. About this time (1733- 1734) Pergolesi entered the service of the duke of Maddaloni, and accompanied him to Rome, where he conducted a mass for five voices and orchestra in the church of St Lorenzo in Lucina (May 1734). There is no foundation for the statement that he was appointed maestro di cappella at the Holy House of Loreto; he was, in fact, organist of the royal chapel at Naples in 1735.

1 The complete failure of L'Olimpiade at Rome in January 1735

is said to have broken his health, and determined him to abandon the theatre for the Church; this statement is, however, incom- patible with the fact that his comic opera // Flaminio was produced in Naples in September of the same year with un- doubted success. His ill health was more probably due to his notorious profligacy. In 1736 he was sent by the duke of Maddaloni to the Capuchin monastery at Pozzuoli, the air of the place being considered beneficial to cases of consumption. Here he is commonly supposed to have written the celebrated Stabat Mater; Paisiello, however, stated that this work was written soon after he left the Conservatorio dei poveri di Gesu Crista in 1729. We may at any rate safely attribute to this period the Scherzo jatto ai Cappuccini di Pozzuoli, a musical jest of a somewhat indecent nature. He died on the 17th of March 1736, and was buried in the cathedral of Pozzuoli.

Pergolesi's posthumous reputation has been exaggerated beyond all reason. This was due partly to his early death, and largely to the success of La Serva padrona when performed by the Bouffons Italiens at Paris in 1752. Charming as this little piece undoubtedly is, it is inferior both for music and for humour to Pergolesi's three-act comic operas in dialect, which are remem- bered now only by the air " Ogni pena piu spietata " from Lo Frate inammorato. As a composer of sacred music Pergolesi is effective, but essentially commonplace and superficial, and the frivolous style of the Stabat Mater was rightly censured by Paisiello and Padre Martini. His best quality is a certain senti- mental charm, which is very conspicuous in the cantata L'Orfeo and in the genuinely beautiful duets " Se cerca, se dice " and " Ne' giorni tuoi felici " of the serious opera L'Olimpiade; the latter number

was transferred unaltered from his early sacred drama S. Guglielmo, and we can thus see that his natural talent underwent hardly any development during the five years of his musical activity. On the whole, however, Pergolesi is in no way superior to his contemporaries of the same school, and it is purely accidental that a later age should have regarded him as its greatest representative.

Bibliography. — The most complete life of Pergolesi is that by E. Faustini Fasini (Gazzetta musicale di Milano, 31st of August 1899, &c, published by Ricordi in book form, 1900); G. Annibaldi's II Pergolesi in Pozzuoli, vita inlima (Jesi, 1890) gives some interest- ing additional details derived from documents at Jesi, but is cast in the form of a romantic novel. H. M. Schletterer's lecture in the Sammlung musikalischer Vortrage, edited by Count P. von Walder- see, is generally inaccurate and uncritical, but gives a good account of later performances of Pergolesi's works in Italy and elsewhere. Various portraits are reproduced in the Gazz. mus. di Milano for the 14th of December 1899, and in Musica e musicisti, December 1905. Complete lists of his compositions are given in Eitner's Quellen-Lexicon and in Grove's Dictionary (new ed.). (E. J. D.)

PERGOLESI, MICHAEL ANGELO, an 18th-century Italian decorative artist, who worked chiefly in England. Biographical details are almost entirely lacking, but like Cipriani he was brought, or attracted, to England by Robert Adam after his famous continental tour. He worked so extensively for the Adams, and his designs are so closely typical of much upon which their reputation rests, that it is impossible to doubt his influence upon their style. His range, like theirs, was catholic. He designed furniture, mantelpieces, ceilings, chandeliers, doors and mural ornament with equal felicity, and as an artist in plaster work in low relief he was unapproached in his day. He delighted in urns and sphinxes and interlaced gryphons, in amorini with bows and torches, in trophies of musical instruments and martial weapons, and in flowering arabesques which were always graceful if sometimes rather thin. The centre panels of his walls and ceilings were often occupied by classical and pastoral subjects painted by Cipriani, Angelica Kauffmann, Antonio Zucchi, her husband, and sometimes by himself. These nymphs and amorini, with their disengaged and riant air and classic grace, were not infrequently used as copies for painting upon that satinwood furniture of the last quarter of the 18th century which has never been surpassed for dainty elegance, and for the popularity of which Pergolesi was in large measure responsible; they were even reproduced in marquetry. Some of this painted work was, apparently, executed by his own hand; most of the

pieces attributed to him are remarkable examples of artistic taste and technical skill. His satin-wood table-tops, china cabinets and side-tables are the last word in a daintiness which here and there perhaps is mere prettiness. Pergolesi likewise designed silver plate, and many of his patterns are almost instinctively attributed to the brothers Adam by the makers and purchasers of modern reproductions. There is, moreover, reason to believe that he aided the Adam firm in purely archi- tectural work. In later life Pergolesi appears, like Angelica Kauffmann, to have returned to Italy.

Our chief source of information upon his works is his own publi- cation, Designs for Various Ornaments on Seventy Plates, a series of folio sheets, without text, published between 1777 and 1801.

PERI, JACOPO (1561-16 ?), Italian musical composer, was born at Florence on the 20th of August 1561, of a noble family. After studying under Cristoforo Malvezzi of Lucca, he became maestro di cappella, first to Ferdinand, duke of Tuscany, and later to Cosmo II. He was an important member of the literary and artistic circle which frequented the house of Giovanni Bar,di, conte de Vernio, where the revival of Greek tragedy with its appropriate musical declamation was a favourite subject of discussion. With this end in view the poet Ottavio Rinuccini supplied a drama with the title of Dafne, to which Peri composed music, and this first attempt at opera was per- formed privately in 1597 in the Palazzo Corsi at Florence. This work was so much admired that in 1600 Rinuccini and Peri were commissioned to produce an opera on the occasion of the marriage of Henry IV. of France with Maria di' Medici. This work {V Euridice) attracted a great deal of attention, and the type once publicly established, the musical drama was set on the road to success by the efforts of other composers and the patronage of other courts. Peri himself seems never to have followed up his success with other operas; he became maestro di cappella to the duke of Ferrara in 1601, but after the publica- tion of his Varie musiche a una, due e tre voci at Florence in 1609, nothing more is known of him.

Peri's Dafne (which has entirely disappeared) and Euridice (printed at Florence 1600; reprinted Venice 1608 and Florence 1863) are of the greatest importance not only as being the earliest attempts at opera, but as representing the new monodic and declamatory style which is the basis of modern music as opposed to the contrapuntal methods of Palestrina and his contemporaries. Peri's work is of course primitive in the extreme, but it is by no means without beauty, and there are many scenes in Euridice which show a considerable dramatic power.

PERIANDER (Gr. UepiavSpos) , the second tyrant of Corinth (625-585 B.C.). In contrast with his father Cypselus, the founder of the dynasty, he is generally represented as a cruel despot, or at any rate as having used all possible devices for keeping his city in subjection. Among numerous anecdotes the following is characteristic. Periander, on being consulted by the tyrant Thrasybulus of Miletus as to the best device for maintaining himself in power, by way of reply led the messenger through a cornfield, and as he walked struck off the tallest and best-grown ears (a legend applied to Roman circumstances in Livy i. 54). It seems, however, that the prevalent Greek tradition concerning him was derived from the versions of the Corinthian aristocracy, who had good reasons for giving a prejudiced account, and the conflicting character of the various legends further shows that their historical value is slight. A careful sifting of the available evidence would rather tend to represent Periander as a ruler of unusual probity and insight, and the exceptional firmness and activity of his government is beyond dispute. His home admin- istration was so successful that he was able to dispense with direct taxation. He fostered wealth by the steady encourage- ment of industry and by drastic legislation against idleness, luxury and vice; and the highest prosperity of the Corinthian handicrafts may be assigned to the period of his rule (see Corinth). At the same time he sought to check excessive accumulation of wealth in individual hands and restricted the influx of population into the town. Employment was found

for the proletariat in the erection of temples and of public works. Periander further appears as a patron of literature, for it was by his invitation that the poet Arion came to Corinth to organize the dithyramb. He devoted no less attention to the increase of Corinthian commerce, which in his days plied busily on both eastern and western seas. With this end in view he established colonies at Potidaea and Apollonia in Macedonia, at Anactorium and Leucas in north-western Greece, and he is said to have projected a canal through the Isthmus, In Greece proper he conquered Epidaurus, and with the help of his fleet of triremes brought the important trading centre of Corcyra under his control, while his interest in the Olympian festival is perhaps attested by a dedication which may be ascribed to him — the famous ” chest of Cypselus.” He cultivated friendly relations with the tyrants of Miletus and Mytilene, and maintained a connexion with the kings of Lydia, of Egypt and, possibly, of Phrygia. In spite of these varied achievements Periander never entirely conciliated his subjects,

for he could not trust himself without a bodyguard. Moreover his family life, accord- ing to all accounts, was unfortunate. His sons all died or were estranged from him, and the murder of his last remaining child Lycophron, the governor of Corcyra, is said to have broken his spirit and hastened on his death.

Periander was reckoned one of the seven sages of Greece, and was the reputed author of a collection of maxims (‘TirodrjKai) in 2000 verses. The letters ascribed to him by Diogenes Laertius are undoubtedly spurious.

Herodotus iii. 48-53, v. 92; Aristotle, Politics, v. 6, 10-12; Heracleides Ponticus in C. Miiller’s Frag. hist, grate, ii. 212; Nicolaus Damascenus, ibid., iii. 393; Diogenes Laertius, De vitis darorum philosophorum, i. ch. 7. (M. O. B. C.)

PERICLES (490-429 B.C.), Athenian statesman, was born about 490 B.C., the son of Xanthippus and Agariste. His father 1 took a prominent part in Athenian politics, and in 479 held high command in the Greek squadron which annihilated the remnants of Xerxes’ fleet at Mycale; through his mother, the niece of Cleisthenes, he was connected with the former tyrants of Sicyon and the family of the Alcmaeonidae. His early training was committed to the ablest and most advanced teachers of the day: Damon instructed him in music, Zeno the Eleatic revealed to him the powers of dialectic; the philosopher Anaxagoras, who lived in close friendship with Pericles, had great influence on his cast of thought and was commonly held responsible for that calm and undaunted attitude of mind which he preserved in the midst of the severest trials.

The first important recorded act of Pericles falls in 463, when he helped to prosecute Cimon on a charge of bribery, after the latter’s Thasian campaign; but as the accusation could hardly have been meant seriously Pericles was perhaps put forward only as a lay-figure. Undue prominence has commonly been assigned to him in the attack upon th2 Areopagus in 462 or 461 (see Areopagus, Cimon). The Aristotelian Constitution of Athens shows conclusively that Pericles was not the leader of this cam- paign, for it expressly attributes the bulk of the reforms to Ephialtes (ch. 25), and mentions Ephialtes and Archestratus as the authors of the laws which the reactionaries of 404 sought to repeal (ch. 35): moreover, it was Ephialtes, 2 not Pericles, on whom the Conservatives took revenge as the author of their discomfiture. To Ephialtes likewise we must ascribe the renunciation of the Spartan alliance and the new league with Argos and Thessaly (461).

Not long after, however, when Ephialtes fell by the dagger, Pericles undoubtedly assumed the leading position in the state.

1 He must have been born before 485-484, in which years his father was ostracized. On the other hand, Plutarch describes him as vios S>v, i.e. not yet 30, in 463.

2 The later eminence of Pericles has probably misled historians into exaggerating his influence at this time. Even the Const. Ath. (ch. 27) says that Pericles took ” some ” prerogatives from the Areopagus; this looks like a conjecture based on Arist. Pol: ii. 9 (12), 1273; T-qv iv ‘Apeiai f&7(j) /SouXiji’ ‘Eta\Trjs e«SXoutr€ ko.1 HepiKXijs, a passage which realiy proves nothing. Plutarch, who is clearly blinded by Pericles’ subsequent brilliance, makes him suddenly biirst into prominence and hold the highest place for 40 years (i.e. from 469) ; he degrades Ephialtes into a tool of Pericles.

The beginning of his ascendancy is marked by an unprecedented outward expansion of Athenian power. In continuance of Cimon’s policy, 200 ships were sent to support the Egyptian insurgents against Persia (459) , 3 while detachments operated against Cyprus and Phoenicia. At the same time Athens embarked on several wars in Greece Proper. An alliance with the Megarians, who were being hard pressed by their neighbours of Corinth, led to enmity with this latter power, and before long Epidaurus and Aegina were drawn into the struggle. On sea the Athenians, after two minor engagements, gained a decisive victory which enabled them to blockade Aegina. On land their general Myronides beat off two Corinthian attacks on Megara, which had been further secured by long walls drawn between the capital and its port Nisaea, nearly a mile distant. In 4S7 the Athenians and their allies ventured to intercept a Spartan force which was returning home from central Greece. At Tanagra in Boeotia a pitched battle was fought, in which both Pericles and the partisans of Cimon distinguished them- selves. The Spartans were successful but did not pursue their advantage, and soon afterwards the Athenians, seizing their opportunity, sallied forth again, and, after a victory under Myronides at Oenophyta, obtained the submission of all Boeotia, save Thebes, and of Phocis and Locris. In 455 Tolmides ravaged Laconia and secured Naupactus on the Corinthian gulf; in 454 4 Pericles himself defeated the Sicyonians, and made a descent upon Oeniadae at the mouth of the gulf, and in 453 conducted a cleruchy to the Thracian Chersonese. These years mark the zenith of Athenian greatness. Yet the drain on the country’s strength was severe, and when news arrived in 453 that the whole of the Egyptian armament, together with a reserve fleet, had been destroyed by the Persians, a

reaction set in, and Cimon, who was recalled on Pericles' motion (but see Cimon), was empowered to make peace with Sparta on the basis of the status quo. For a while the old anti-Persian policy again found favour in Athens, and Cimon led a great expedition against Cyprus; but on Cimon's death hostilities were suspended, and a lasting arrangement with Persia was brought about. 5 It was probably in order to mark the definite conclusion of the Persian War and to obtain recognition for Athens' work in punishi;; s the Mede that Pericles now 6 proposed a pan-Hellenic congress at Athens to consult about the rebuilding of the ruined temples and the policing of the seas; but owing to the refusal of Sparta the project fell through.

Pericles may now have hoped to resume his aggressive policy in Greece Proper, but the events of the following years completely disillusioned him. In 447 an Athenian army, which had marched into Boeotia to quell an insurrection, had to surrender in a body at Coronea, and the price of their ransom was the evacuation of Boeotia. Upon news of this disaster Phocis, Locris and Euboea revolted, and the Megarians massacred their Athenian garrison, while a Spartan army penetrated into Attica as far as Eleusis. In this crisis Pericles induced the Spartan leaders to retreat, apparently by means of a bribe, and hastened to re- conquer Euboea; but the other land possessions could not be recovered, and in a thirty years' truce which was arranged in 445 Athens definitely renounced her predominance in Greece Proper. Pericles' foreign policy henceforward underwent a profound change — to consolidate the naval supremacy, or to extend it by a cautious advance, remained his only ambition.

3 The chronology of these years down to 449 is not quite certain.

4 An abortive expedition to reinstate a Thessalian prince probably also belongs to this year; there is also evidence that Athens inter- fered in a war between Selinus and Segesta in Sicily about this time.

6 The " peace of Callias " is perhaps a fiction of the 4th century orators. All the earlier evidence goes to show that only an informal understanding was arrived at, based on the de facto inability of either power to cripple the other (see Cimon).

6 448 seems the most likely date. Before 460 Pericles' influence was as yet too small; 460-451 were years of war. After 445 Athens was hardly in a position to summon such a congress, and would not have sent 10 envoys out of 20 to northern and central Greece, where she had just lost all her influence; nor is it likely that the building of the Parthenon (begun not later than 447) was entered on before the congress.

While scouting the projects of the extreme Radicals for interfering in distant countries, he occasionally made a display of Athens' power abroad, as in his expedition to the Black Sea, 1 and in the colonization of Thurii, 2 which marks the resumption of a Western policy.

The peaceful development of Athenian power was interrupted by the revolt of Samos in 440. Pericles himself led out a fleet against the seceders and, after winning a first engagement, unwisely divided his armament and allowed one squadron to be routed. In a subsequent battle he retrieved this disaster, and after a long blockade reduced the town itself. A demand for help which the Samians sent to Sparta was rejected at the instance of the Corinthians.

Turning to Pericles' policy towards the members of the Delian League, we find that he frankly endeavoured to turn the allies into subjects (see Delian League). A special feature of his rule was the sending out of numerous cleruchies(g.i).), which served the double purpose of securing strategic points to Athens and converting the needy proletariate of the capital into owners of real property. The land was acquired either by confiscation from disaffected states or in exchange for a lowering of tribute. The chief cleruchies of Pericles are: Thracian Chersonese (453-452), Lemnos and Imbros, Andros, Naxos and Eretria (before 447) ; 5 Brea in Thrace (446) ; Oreus (445) ; Amisus and Astacus in the Black Sea (after 440); Aegina (431).

In his home policy Pericles carried out more fully Ephialtes' project of making the Athenian people truly self-governing. His chief innovation was the introduction of payment from the public treasury for state service. Chief of all, he provided a remuneration of 1 to 2 obols a day for the jurymen, probably in 451. 4 Similarly he created a"theoricon" fund which enabled poor citizens to attend the dramatic representations of the Dionysia. To him we may also attribute the 3 obols pay which the soldiers received during the Peloponnesian War in addition to the old-established provision-money. The archons and members of the boule, who certainly received remuneration in 411, and also some minor magistrates, were perhaps paid for the first time by Pericles. In connexion with this system of salaries should be mentioned a somewhat reactionary law carried by Pericles in 451, by which an Athenian parentage on both sides was made an express condition of retaining the franchise and with it the right of sitting on paid juries. The measure by which the archonship was opened to the

third and (practically) to the fourth class of citizens (the Zeugitae and Thetes) may also be due to Pericles; the date is now known to be 457 (Const. Ath. 26; and see Archon).

The last years of his life were troubled by a new period of storm and stress which called for his highest powers of calculation and self-control. A conflict between Corcyra and Corinth, the second and third naval powers of Greece, led to the simultaneous appearance in Athens of an embassy from either combatant (433). Pericles had, as it seems, resumed of late a plan of Western expansion by forming alliances with Rhegium and Leontini, and the favourable position of Corcyra on the trade- route to Sicily and Italy, as well as its powerful fleet, no doubt helped to induce him to secure an alliance with that island, and so to commit an unfriendly act towards a leading repre- sentative of the Peloponnesian League. Pericles now seemed to have made up his mind that war with Sparta, the head of that

1 The date can hardly be fixed ; probably it was after 440.

1 It has been doubted whether Pericles favoured this enterprise, but among its chief promoters were two of his friends, Lampon the soothsayer and Hippodamus the architect. The oligarch Cratinus (in a frag, of the “t>v7<ˆ«) violently attacks the whole project.

s These dates are suggested by the decrease of tribute which the inscriptions prove for this year.

- This is the date given by the Const. Ath., which also mentions a Sia\l’T)[<.o pis tS>i> &iko.v] (Blass’ restoration) in frag. c. 18. The confused story of Philochorus and Plutarch, by which 4760 citizens were disfranchised or even sold into slavery in 445, when an Egyptian prince sent a largess of corn, may refer to a subsequent application of Pericles’ law, though probably on a much milder scale than is here represented.

League, had become inevitable. In the following spring he fastened a quarrel upon Potidaea, a town in Chalcidice, which was attached by ancient bonds to Corinth, and in the campaign which followed Athenian and Corinthian troops came to blows. A further casus belli was provided by a decree forbidding the importation of Megarian goods into the Athenian Empire, 5 pre- sumably in order to punish Megara for her alliance with Corinth (spring 432). The combined complaints of the injured parties led Sparta to summon a Peloponnesian congress which decided on war against Athens, failing a concession to Megara and Corinth (autumn 432). In this crisis

Pericles peisuaded the wavering assembly that compromise was useless, because Sparta was resolved to precipitate a war in any case. A further embassy calling upon the Athenians to expel the accursed family of the Alcmaeonidae, clearly aimed at Pericles himself as its chief representative, was left unheeded, and early in 431 hostilities began between Athens and Sparta and their respective allies (see Peloponnesian War).

At the same time, Pericles was being sorely hampered by his adversaries at home. The orthodox Conservatives and some democrats who were jealous of his influence, while afraid to beard the great statesman himself, combined to assail his nearest friends. The sculptor Pheidias (q.v.) was prosecuted on two vexatious charges (probably in 433), and before he could disprove the second he died under arrest. Anaxagoras was threatened with a law against atheists, and felt compelled to leave Athens. A scandalous charge against his mistress Aspasia, which he defeated by his personal intercession before the court, was taken very much to heart by Pericles. His position at home scarcely improved during the war. His policy of aban- doning the land defence was unpopular with the land-owning section of the people, who from the walls of Athens could see their own property destroyed by the invaders. At the end of the first year of war (early in 430) Pericles made a great appeal to the pride of his countrymen in his well-known funeral speech. But in the ensuing summer, after a terrible outbreak of plague had ravaged the crowded city, the people became thoroughly demoralized. Pericles led a large squadron to harry the coasts of the Peloponnese, but met with little success. On his return the Athenians sued for peace, though without success, and a speech by Pericles had little effect on their spirits. Late in 430 they deposed him from his magistracy. In addition to this they prosecuted him on a charge of embezzlement, and imposed a fine of 50 talents. A revulsion of feeling soon led to his rein- statement, apparently with extraordinary powers. But the plague, which had carried off two of his sons and a sister, had left its mark also on Pericles himself. In the autumn of 429 he died 6 and was buried near the Acadetnia, where Pausanias (150 a.d.) saw his tomb. A slightly idealized portrait of Pericles as strategus is preserved to us in the British Museum bust, No. 549, which is a good copy of the well-known bronze original by Cresilas.

If we now endeavour to give a general estimate of Pericles' character and achievements, it will be well to consider the many departments of his activity one by one. In his foreign policy Pericles differs from those statesmen of previous generations who sought above all the welfare of Greece as a whole. His standpoint was at all times purely Athenian.

Nor did he com- bine great statesmanlike qualities with exceptional ability in the field. We may clearly distinguish two periods in his adminis- tration of foreign affairs. At first, joining to Cimon's anti-Persian ambitions and Themistocles' schemes of Western expan- sion a new policy of aggression on the mainland, he endeavoured to push forward Athenian power in every direction, and engaged himself alike in Greece Proper, in the Levant and in Sicily. After Cimon's death he renounced the war against Persia, and the collapse of 447-445 had the effect of completing his change

6 The general impression in Greece was that this decree was the proximate cause of the war. Tne scurrilous motives which Aristo- phanes suggests for this measure can be entirely disregarded.

6 His dying boast, that " no Athenian had put on mourning through his doing," perhaps refers to his forbearance towards his political rivals, whom he refused to ruin by prosecution.

of attitude. Henceforward he repressed all projects of reckless enterprise, and confined himself to the gradual expansion and consolidation of the empire. It is not quite easy to see why he abandoned this successful policy in order to hasten on a war with Sparta, and neither the Corcyrean alliance nor the Megarian decree seems justified by the facts as known to us, though com- mercial motives may have played a part which we cannot now gauge. In his adoption of a purely defensive policy at the beginning of the Peloponnesian War, he miscalculated the temper of the Athenians, whose morale would have been better sustained by a greater show of activity. But in the main his policy in 431-429 was sound, and the disasters of the war cannot fairly be laid to his charge. The foundation of cleruchies was an admirable device, which in many ways anticipated the colonial system of the Romans.

In his attitude towards the members of the Delian League Pericles likewise maintained a purely Athenian point of view. But he could hardly be said seriously to have oppressed the subject cities, and technically all the League money was spent on League business, for Athena, to whom the chief monuments in Athens were reared, was the patron goddess of the League. Under Pericles Athens also attained her greatest measure of commercial prosperity, and the activity of her traders all over the Levant, the Black Sea and the West, is attested not

only by literary authority, but also by numerous Attic coins, vases, &c.

Pericles' home policy has been much debated since ancient times. His chief enactments relate to the payment of citizens for State service. These measures have been interpreted as an appeal to the baser instincts of the mob, but this assumption is entirely out of keeping with all we know of Pericles' general attitude towards the people, over whom Thucydides says he practically ruled as a king. We must, then, admit that Pericles sincerely contemplated the good of his fellow-countrymen, and we may believe that he endeavoured to realize that ideal Athens which Thucydides sketches in the Funeral Speech — an Athens where free and intelligent obedience is rendered to an equitable code of laws, where merit finds its way to the front, where military efficiency is found along with a free development in other directions and strangles neither commerce nor art. In accordance with this scheme Pericles sought to educate the whole community to political wisdom by giving to all an active share in the government, and to train their aesthetic tastes by making accessible the best drama and music. It was most unfortunate that the Peloponnesian War ruined this great project by diverting the large supplies of money which were essential to it, and confronting the remodelled Athenian democracy, before it could dispense with his tutelage, with a series of intricate questions of foreign policy which, in view of its in- experience, it could hardly have been expected to grapple with successfully.

Pericles also incurred unpopularity because of his rationalism in religious matters; yet Athens in his time was becoming ripe for the new culture, and would have done better to receive it from men of his circle — Anaxagoras, Zeno, Protagoras and Meton — than from the more irresponsible sophists. The influence of Aspasia on Athenian thought, though denounced unsparingly by most critics, may indeed have been beneficial, inasmuch as it tended towards the emancipation of the Attic woman from the over-strict tutelage in which she was kept. As a patron of art Pericles was a still greater force. His policy in encouraging the drama has already been mentioned: among his friends he could count three of the greatest Greek writers — the poet Sophocles and the historians Herodotus and Thucydides. Pericles likewise is responsible for the epoch-making splendour of Attic art in his time, for had he not so- fully appreciated and given such free scope to the genius of Pheidias, Athens would hardly have witnessed the raising of the Parthenon and other glorious structures, and Attic art could not have boasted a legion of first-rate sculptors of whom Alcamenes, Agoracritus and Paeonius are only the chief names. (See also Greek Art.)

Of Pericles' personal characteristics we have a peculiarly full

and interesting record. He was commonly compared to Olympian Zeus, partly because of his serene and dignified bearing, partly by reason of the majestic roll of the thundering eloquence, with its bold poetical imagery, with which he held friend and foe spellbound. The same dignity appeared in the grave beauty of his features, though the abnormal height of his cranium afforded an opportunity for ridicule of which the comedians made full use. In spite of an unusually large crop of scandals about him we cannot but believe that he bore an honourable character, and his integrity is vouched for by Thucydides in such strong terms as to exclude all further doubt on the question.

Ancient Authorities. — Our chief source must always remain Thucydides (i. and ii. 1-65), whose insight into the character and ideals of Pericles places him far above all other authorities. The speeches which he puts into his mouth are of special value in disclosing to us Pericles' inmost thoughts and aspirations (i. 140-144; ii-35 – 46; ii. 60-64). Thucydides alone shows sympathy with Pericles, though, as J. B. Bury points out (Ancient Greek Historians, 1909, pp. 133 seq.), he was by no means a blind admirer. Of other 5th-century sources, Aristophanes is obviously a caricaturist, pseudo-Xenophon (de republica Atheniensium) a mere party pam- phleteer. Plato, while admiring Pericles' intellect, accuses him of pandering to the mob; Aristotle in his Politics and especially in the Constitution of Athens, which is valuable in that it gives the dates of Pericles' enactments as derived from an official document, accepts the same view. Plutarch (Pericles) gives many interesting details as to Pericles' personal bearing, home life, and patronage of art, literature and philosophy, derived in part from the old comic poets, Aristophanes, Cratinus, Eupolis, Hermippus, Plato and Teleclides; in part from the contemporary memoirs of Stesim- brotus and Ion of Chios. At the same time he reproduces their scandalous anecdotes in a quite uncritical spirit, and accepts un- questioningly the 4th-century tradition. He quotes Aristotle, Heraclides Ponticus, Aeschines Socraticus, Idomeneus of Lampsacus and Duris of Samos, and is also indebted through some Alexandrine intermediary to Ephorus and Theopompus. Diodorus (xi. and xii.), who copied Ephorus, contains nothing of value.

Modern Works. — Historians are agreed that Pericles was one of the most powerful personalities of ancient times, and generally allow him to have been a man of probity. J. Beloch, Griech. Gesch. vols. i. and ii. (Strassburg and Bonn, 1893-1896), and Die attische Politik seit Perikles (Leipzig, 1884) takes the most disparaging view ; E. Abbott,

GreekHist., vol. ii. (London, 1892), and M. Duncker, Gese/t. d. Altertums, vols, viii., ix. (Leipzig, 1884-1886), are on the whole unfavourable; Adolf Schmidt, Das Perikleische Zeitalter (Jena, 1877), V. Duruy, History of Greece (Eng. trans., London, 1892), G. Busolt, Griech. Gesch., vol. iii. (Gotha, 1897, 1904), and E. Meyer, Gesch. d. Altertums, vols. iii. and iv. (Stuttgart, l<)Oi),Forschungen,vo\.n. (Halle, 1899; London, 1902), apportion praise and blame more equally; J. B. Bury and E. Curtius, Hist, of Greece (Eng. trans., vols. ii. and iii., London, 1869, 1870), A. Holm, Hist, of Greece (Eng. trans., vol. ii., London, 1895), W. Lloyd, The Age of Pericles (London, 1875), and especially G. Grote, Hist, of Greece, vols. iv. and v. (see also additional notes in the edition by J. M. Mitchell and M. Caspari, 1907) take a favourable view. For Pericles' buildings, see C. Wachsmuth, Gesch. d. Stadt Athen, i. 516-560 (Leipzig, 1874); E. A. Gardner, Ancient Athens (London, 1902), for his strategy, H. Delbriick, Die Strateg. d. Perikles (Berlin, 1890). See Athens: History; Greece: Ancient History; and Greek Art. (M. O. B. C.)

PERIDOT, sometimes written peridote, a name applied by jewelers to ” noble olivine,” or that kind of olivine which can be used as a gem-stone (see Olivine). The word peridot is an old trade-term, of unknown origin, used by French jewelers and introduced into science by J. R. Hauy. Peridot is practi- cally the same stone as chrysolite (q.v.), though it is convenient to restrict that term to transparent olivine of pale yellowish green colour, and to apply the term peridot to those kinds which are darker and decidedly green: the colour, which is due to the presence of ferrous iron, is never vivid, like that of emerald, but is usually some shade of olive-, pistachio- or leek-green. Although the stone is sometimes cut en cabochon, and in rose- form, the cutting best adapted to display the colour is that of a table or a step-cut stone. Unfortunately the hardness of peri- dot is only about 6-5, or but little above that of glass, so that the polished stone readily suffers abrasion by wear. In polishing peridot the final touch is given on a copper wheel moistened with sulphuric acid.

Although olivine has a fairly wide distribution in nature, the varieties used as gem-stones are of very limited occurrence. Much myitery for a long time surrounded the locality which

yields most of the peridot of commerce but it is now identified with the island of St John, or Isle Zeboiget, in the Red Sea, where it occurs,

as shown by M. J. Couyat, in an altered dunite, or olivine rock {Bull soc. JranQ. min., 1908). This is probably the Topaz Isle, roTrdfios vrjcos, of the ancients. It is generally held that the mineral now called topaz was unknown to ancient and mediaeval writers, and that their Towaˆtov was our peridot. Such was probably the Hebrew pitdah, translated" topaz in the Old Testament. Dr G. F. Kunz has suggested that the peridots of modern trade are largely derived from old jewelry. The famous shrine of the Three Kings in Cologne Cathedral contains a large peridot, which has commonly been regarded as an emerald. It is notable that pebbles of transparent olivine, fit for cutting, are found in the United States in Montana, Arizona and New Mexico; in consequence of their shape and curiously pitted surface they are known as " Job's tears." (F. W. R.*)

PERIDOTITE, a plutonic holo-crystalline rock composed in large part of olivine, and almost or entirely free from feldspar. The rocks are the most basic, or least siliceous plutonic rocks, and contain much iron oxide and magnesia. Hence they have dark colours and a high specific gravity (3-0 and over). They weather readily and are changed to serpentine, in which process water is absorbed and enters into chemical combination with the silicates of magnesia and iron. In some peridotites, such as the dunites, olivine greatly preponderates over all other minerals. It is always in small, rather rounded crystals without good crystalline form, and pale green in colour. Most of the rocks of this group, however, contain other silicates such as augite, hornblende, biotite or rhombic pyroxene, and often two or three of these are present. By the various mineral combinations different species are produced, e.g. mica-peridotjte, hornblende-peridotite, enstatite-peridotite. Of the accessory minerals the commonest are iron oxides and chromite or picotite. In some peridotites these form segregations or irregular masses which are of importance as sources of the ores of chromium. Corundum occurs in small crystals in many North American peridotites and platinum and the nickel-iron compound awaruite are found in rocks of this class in New Zealand. Red garnet (pyrope) characterizes the peridotites of Bohemia. The diamond mines of South Africa are situated in pipes or volcanic necks occupied by a peridotite breccia which has been called kimber- lite. In this rock in addition to diamond the following minerals are found, hypersthene, garnet, biotite, pyroxene (chrome- diopside), ilmenite, zircon, &c.

Some peridotites have a granular structure, e.g. the dunites, all the crystal grains being of rounded shape and nearly equal size; a few are porphyritic with large individuals of diallage, augite or hypersthene. Some are banded with parallel bands of dissimilar composition, the

result probably of fluxion in a magma which was not quite homogeneous. The great majority of the rocks of this group are poikilitic, that is to say, they contain olivine in small rounded crystals embedded in large irregular masses of pyroxene or hornblende. The structure is not unlike that known as ophitic in the dolerites, and arises from the olivine having first separated out of the liquid magma while the pyroxene or amphibole succeeded it and caught up its crystals. In hand specimens of the rocks the smooth and shining cleavage surfaces of hornblende and augite are dotted over with dull blackish green spots of olivine; to this appearance the name ” lustre-mottling ” has been given.

Mica-peridotites are not of frequent occurrence. A well-known rock from Kaltes Thai, Harzburg, contains much biotite, deep brown in thin section. Other examples are found in India and in Arkansas. Poikilitic structure is rarely well developed in this group. The ” blue-ground ” of Kimberley which contains the diamonds is a brecciform biotite-hypersthene-peridotite with augite. In the north of Scotland, in several places in Sutherland and Ross, there are peridotites with silvery yellow green biotite and large plates of pale green hornblende: these have been called scyelites. In the hornblende-peridotites lustre-mottling is often very striking. The amphibole may be colourless tremolite in small prisms, as in some varieties of serpentine from the Lizard (Cornwall) ; or pale green hornblende as in scyelite. In both these cases there is some

actinolite are very frequent. Other rocks contain dark brown hornblende, with much olivine; there may also be augite which is often intergrown perthitically with the hornblende. Examples of this type occur in North Wales, Anglesey, Cornwall, Cortland, New York, and many other localities. A well-known peridotite from SchriesheimerTal in the Odenwald has pale brownish green amphibole in large crystals filled with small grains of olivine which are mostly serpentinized. Very often primary brown hornblende in rocks of this type is surrounded by fringes and outgrowths of colourless tremolite which has formed as a secondary mineral after olivine. Complete pseudomorphs after olivine composed of a matrix of scaly talc and chlorite crossed by a network of tremolite needles, are also very common in some peridotites, especially those which have undergone pressure or shearing: these aggregates are known as pilite.

The peridotites which contain monoclinic pyroxene may be divided into two classes, those rich in diallage and those in which there is much augite. The diallage-peridotites have been called wehrlites; often they show excellent lustre-mottling. Brown or green hornblende

may surround the diallage, and hypersthene may occur also in lamellar intergrowth with it. Some of these rocks contain biotite, while a little feldspar (often saussuritic) may often be seen in the sections. Rocks of this kind are known in Hungary, in the Odenwald and in Silesia. In Skye the pyroxene- bearing peridotites usually contain green chrome-diopside (a variety of augite distinguished by its pale colour and the presence of a small amount of chromium). The augite-peridotites are grouped by German petrographers under the picrites, but this term has a slightly different signification in the English nomenclature (see Picrite).

The enstatite-peridotites are an important group represented in many parts of the world. Their rhombic pyroxene is often very pale coloured but may then be filled with platy enclosures which give it a metallic or bronzy lustre. These rocks have been called saxonites or harzburgites. When weathered the enstatite passes into platy masses of bastite. Picotite and chromite are common accessory minerals and diallage or hornblende may also be present. Many of the serpentine rocks of the Lizard (Cornwall) Ayrshire and north-western Scotland are of this type. Examples are known also from Baste near Harzburg, New York and Maryland, Norway, Finland, New Zealand, &c. Often the enstatite crystals are of large size and are very conspicuous in the hand specimens. They may be porphyritic, or may form a coarsely crystalline matrix enclosing innumerable olivine grains, and then lustre-mottling is as a rule very well shown.

The lherzolites are rocks, first described from Lherz in the Pyrenees, consisting of olivine, chrome-diopside and enstatite, and accessory picotite or chromite. They are fine-grained, bright green in colour, often very fresh, and may be somewhat granulitic. The dunites are peridotites, similar to the rock of Dun Mountain, New Zealand, composed essentially of olivine in a finely granular condition. Many examples of this type are known in different parts of the world, usually as local facies of other kinds of peridotite. In olivine-basalts of Tertiary age in the Rhine district small nodules of green olivine occur frequently. They are of rounded shapes and may be a foot in diameter. The structure is granular and in addition to olivine they may contain chromite, spinel and magnetite, enstatite and chrome-diopside. Some geologists believe these to be fragments of dunite detached from masses of that rock not exposed at the surface; others consider that they are aggre- gations of the early minerals of the basalt magma, which were already crystallized before the liquid rock was emitted.

The great majority of stony or lithoidal meteorites (aerolites) are rich in olivine and present many analogies to the terrestrial peridotites.

Among their minerals are hypersthene (enstatite) augite and chrome-diopside, chromite, pyrite and troilite, nickeliferous iron and basic plagioclase feldspar. The structure of these meteor- ites is described as ” chondritic ” ; their minerals often occur as small rounded grains arranged in radiate clusters; this has very rarely been observed in ordinary peridotites.

Although many peridotites are known in which the constituent minerals are excellently preserved, the majority show more or less advanced decomposition. The olivine is especially unstable and is altered to serpentine, while augite, hornblende and biotite are in large measure fresh. In other cases the whole rock is changed to an aggregate of secondary products. Most serpentines (q.v.) arise in this way. (J- S. K)

PERIER, CASIMIR PIERRE (1777-1832), French statesman, was born at Grenoble on the nth of October 1777, the fourth son of a rich banker and manufacturer, Claude Perier (1742- 1801), in whose house the estates of Dauphiny met in 1788. Claude Perier was one of the first directors of the Bank of France; of his eight sons, Augustin (1773-1833), Antoine Scipion (1776- 1821), Casimir Pierre and Camille (1781-1844ˆ, all distinguished themselves in industry and in politics. The family removed to Paris after the revolution of Thermidor, and Casimir joined

froˆSne’or ˆˆ t ?TlLˆ1SKˆ P SS5«S. 1, SS ‘ the army of Italy in i 79 8. On his father’s death he left the

arm} and with his brother ‘Scipion founded a bank in Paris, the speculations of which he directed while Scipion occupied himself with its administration. He opposed the ruinous methods by which the due de Richelieu sought to raise the war indemnity demanded by the Allies, in a pamphlet Reflexions sur le projet d’emprunt (1817), followed in the same year by Dernieres reflexions … in answer to an inspired article in the Moniteur. In the same year he entered the chamber of deputies for Paris, taking his seat in the Left Centre with the moderate opposition, and making his first speech in defence of the freedom of the press. Re-elected for Paris in 1822 and 1824, and in 1827 for Paris and for Troyes, he elected to represent Troyes, and sat for that constituency until his death. Perier’s violence in debate was not associated with any disloyalty to the monarchy, and he held

resolutely aloof from the republican conspiracies and intrigues which prepared the way for the revolution of 1830. Under the Martignac ministry there was some prospect of a reconciliation with the court, and in January 1829 he was nominated a candidate for the presidency of the chamber; but in August with the elevation to power of Polignac the truce ceased, and on the 15th of March 1830 he was one of the 221 deputies who repudiated the pretensions put forward by Charles X. Averse by instinct and by interest to popular revolu- tion he nevertheless sat on the provisory commission of five at the hotel-de-ville during the days of July, but he refused to sign the declaration of Charles X.‘s dethronement. Perier reluctantly recognized in the government of Louis Philippe the only alterna- tive to the continuance of the Revolution ; but he was no favourite with the new king, whom he scorned for his truckling to the mob. He became president of the chamber of deputies, and sat for a few months in the cabinet, though without a portfolio. On the fall of the weak and discredited ministry of Lafntte, Casimir Perier, who had drifted more and more to the Right, was summoned to power (March 13, 1831), and in the short space of a year he restored civic order in France and re-established her credit in Europe. Paris was in a constant state of disturb- ance from March to September, and was only held in check by the premier’s determination; the workmen’s revolt at Lyons was suppressed after hard fighting; and at Grenoble, in face of the quarrels between the military and the inhabitants, Perier declined to make any concession to the townsfolk. The minister refused to be dragged into armed intervention in favour of the revolutionary government of Warsaw, but his policy of peace did not exclude energetic demonstrations in support of French interests. He constituted France the protector of Belgium by the prompt expedition of the army of the north against the Dutch in August 183 1; French influence in Italy was asserted by the audacious occupation of Ancona (Feb. 23, 1832); and the refusal of compensation for injuries to French residents by the Portuguese government was followed by a naval demonstra- tion at Lisbon. Perier had undertaken the premiership with many forebodings, and overwork and anxiety prepared the way for disease. In the spring of 1832 during the cholera outbreak in Paris, he visited the hospitals in company with the duke of Orleans. He fell ill the next day of a violent fever, and died six weeks later, on the 16th of May 1832.

His Opinions el discours were edited by A. Lesieur (2 vols., 1838); C. Nicoullaud published in 1894 the first part {Casimir -Perier, depute de V opposition, 1817-1830) of a study of his life and policy; and his ministry is exhaustively treated by Thureau-Dangin in vols. i. and ii. (1884) of his Histoire de la monarchie dejuillet.

His elder son, Auguste Victor Laurent Casimir Perier (1811-1876), the father of President Casimir-Perier (see Casimir- Perier), entered the diplomatic service, being attached suc- cessively to the London, Brussels and St Petersburg embassies, and in 1843 became minister plenipotentiary at Hanover In 1846 he resigned fiom the service to enter the legislature as deputy for the department of Seine, a constituency which he exchanged for Aube after the Revolution of 1848. On the establishment of the Second Empire he retired temporarily from public life, and devoted himself to economic questions on which he published a series of works, notably Les Finances e! la

politique (1863), dealing with the interaction of political in- stitutions and finance. He contested Grenoble unsuccessfully in 1863 against the imperial candidate, Casimir Royer; and failed again for Aube in 1869. In 1871 he was returned by three departments to the National Assembly, and elected to sit for Aube. He was minister of the interior for a few months in 1871-1872, and his retirement deprived Thiers of one of the strongest elements in his cabinet. He also joined the short-lived ministry of May 1873. He consistently opposed all efforts in the direction of a monarchical restoration, but on the definite constitution of the republic became a life senator, declining MacMahon's invitation to form the first cabinet under the new constitution. He died in Paris on the 6th of June 1876.

For the family in general see E. Choulet, La Famille Casimir- Perier (Grenoble, 1894).

PERIGEE (Gr. irepi, near, 717, the earth), in astronomy that point of the moon's orbit or of the sun's apparent orbit at which the moon or sun approach nearest to the earth. The sun's perigee and the earth's perihelion are so related that they differ 180° in longitude, the first being on the line from the earth toward the sun, and the second from the sun toward the earth. The longitude of the solar perigee is now 101 , that of the earth's perihelion 281°.

PERIGORD, one of the old provinces of France, formed part of the military government of Guienne and Gascony, and was bounded on the N. by Angoumois, on the E. by Limousin and Quercy, on the S. by Agenais and Bazadais, and on the W. by Bordelais and Saintonge. It is now represented by the departments of Dordogne and part of Lot-et-Garonne. Perigord was in two divisions: Perigord blanc (cap. Perigueux) and Perigord noir (cap. Sarlat). In the time of Caesar it formed the civitas Petrocoriorum, with Vesunna (Perigueux) as its capital. It became later part of Aquitania secunda and formed the

pagus petragoricus, afterwards the diocese of Perigueux. Since the 8th century it had its own counts (see the Histoire genealogique of P. Anselme, tome iii.), who were feudatories of the dukes of Aquitaine and in the 13th century were the vassals of the king of England. In the 15th century the county passed into the hands of the dukes of Orleans, and in the 16th came to the family of d'Albret, becoming Crown land again on the accession of Henry IV.

See Dessalles, Histoire du Perigord (1888), the Bulletin of the Societe historique et archeologique du Perigord (1874 seq.), I ' Inventaire sommaire de la" Collection de Perigord " in the Bibliotheque nationale (1874); the Dictionnaire topographique du departement de la Dordogne by the Vicomte de Gourgues (1873).

PERIGUEUX, a town of south-western France, formerly capital of the old province of Perigord, now chief town of the department of Dordogne, 79 m. E.N.E. of Bordeaux, on the railway between that city and Limoges. Pop. (1906), 28,199. The town, situated on an eminence on the right bank of the Isle, is divided into three parts. On the slope of the hill is the medieval town, bordered south-east by the river and on the other three sides by esplanades and promenades; to the west is the modern town, which stretches to the station; to the south of the modern town is the old Roman town or cite, now traversed by the railway.

Three bridges connect Perigueux with the left bank of the Isle, where stood Vesunna, the capital of the Petrocorii. Hardly a trace of this old Gallic town remains, but not far off, on the Plateau de la Boissiere, the rampart of the old Roman camp can still be traced. On the right bank of the Isle, in the Roman city, there have been discovered some baths of the 1st or 2nd century, supplied by an aqueduct four miles long, which spanned the Isle. A circular building, called the " Tower of Vesunna," 68 ft. in diameter and 89 ft. in height, stands at what was formerly the centre of the city, where all the chief streets met It is believed to have been originally the cella or main part oi a temple, probably dedicated to the tutelary deities of Vesunna. Of the amphitheatre there still remain huge fragments of wall and vaulting. The building had a diameter of 131 2 ft., that of the arena being 870 ft.; and, judging from its construction,

must be as old as the 3rd or even the 2nd century. The counts of

Perigueux used it for their chateau, and lived in it from the 1 2th to the end of the 14th century. In 1644 it was given over by the town to the Order of the Visitation, and the sisters took from it the stones required for the construction of their nunnery. The most remarkable, however, of the ruins of the citi is the Chateau Barriere, an example of the fortified houses formerly common there. Two of its towers date from the 3rd or 4th century, and formed part of the fortified enceinte; the highest tower is of the 10th century; and the part now inhabited is of the nth or 12th century, and was formerly used as a burial chapel. The bulk of the chateau is of the 12th, and some of the windows of the 16th century.

The chief medieval building in the citi is the church of St Etienne, once the cathedral. It dates from the nth and 12th centuries, but suffered much injury at the hands of the Pro- testants in the religious wars when the tower and two of the three cupolas were destroyed. The choir and its cupola were skilfully restored in the 17th century. A fine carved wooden reredos of the 1 7th century and a tomb of a bishop of the 1 2th century are to be seen in the interior. In the medieval town, known as Le Puy-St-Front, the most remarkable building is the cathedral of St Front, which, till its restoration, or rather rebuilding, in the latter half of the 19th century when the old features were to a great extent lost, was of unique architectural value. It bears a striking resemblance to the Byzantine churches and to St Mark's at Venice, and according to one theory was built from 984 to 1047, contemporaneously with the latter (977-1085). It consists of five great cupolas, arranged in the form of a Greek cross, and conspicuous from the outside. The arms of the cross are 69 ft. in width, and the whole is 184 ft. long. These cupolas, 89 ft. high from the keystone to the ground, are supported on a vaulted roof with pointed arches after the manner characteristic of Byzantine architecture. The pointed arches imitated from it prepared the way for the introduction of the Gothic style. Adjoining St Front on the west are the remains of an old basilica of the 6th century, above which rises the belfry, the only one in the Byzantine style now extant. It dates from the nth century, and is composed of two massive cubes, placed the one above the other in retreat, with a circular colonnade surmounted by a dome. To the south-west of St Front, the buildings of an old abbey (nth to 16th century) surround a cloister dating chiefly from the 13th century. Of the fortifications of Puy St Front, the chief relic is the Tour Mataguerre (14th century).

Perigueux is seat of a bishop, prefect and court of assizes, and has tribunals of first instance and of commerce, a chamber of commerce and a branch of the Bank of France. Its educational establishments

include a lycee for boys, training colleges for both sexes and a school of drawing. The trade of the town is in pigs, truffles, flour, brandy, poultry and pies known as pates de Perigord.

Vesunna was the capital of the Petrocorii, allies of Vercinge- torix when Caesar invaded Gaul. The country was afterwards occupied by the Romans, who built a second city of Vesunna on the right bank of the Isle opposite the site of the Gallic town. The barbarian invasion brought this prosperity to a close. St Front preached Christianity here in the 4th century and over his tomb there was raised a monastery, which became the centre of the new town called Le Puy St Front. The cite was pillaged by the Saracens about 731, and in 844 the Normans devastated both quarters. The new town soon began to rival the old city in importance, and it was not until 1240 that the attempts of the counts of Perigord and the bishops to infringe on their municipal privileges brought about a treaty of union. During the Hundred Years' War, Perigueux was twice attacked by the English, who took the cilS in 1356; and the whole town was ceded to them by the Treaty of Bretigny, but returned to the French Crown in the reign of Charles V. The county passed by marriage into the hands of Anthony of Bourbon, father of Henry IV., and was converted by the latter into royal domain. During the Huguenot wars Perigueux was frequently

a stronghold of the Calvinists, ' who in 1575 did great destruction there, and it also suffered during the troubles of the Fronde.

PERIHELION (Gr. Tte.pl, near, ijXios, sun), in astronomy, the point of nearest approach of a body to the sun. (See Orbit.)

PERIM, a British island in the strait of Bab-el-Mandeb, at the entrance to the Red Sea, and 96 m. W. by S. of Aden. Perim is 2 m. from the Arabian shore, is about 3! m. long with an average breadth of over a mile and covers some 7 sq. m. There is a good harbour with easy entrance on the south side with a depth of water from 25 to 30 ft. It is largely used by mercantile vessels as a coaling-station and for taking in stores, including fresh water and ice. Perim, the Diodoros island of the Periplus, was, in consequence of the French occupation of Egypt, garrisoned from 1799 to 1801 by a British force. In view of the construction of the Suez Canal and the increasing importance of the Red Sea route to India the island was annexed to Great Britain in 1857, fortified and placed under the charge of the Aden residency. In 1861 a lighthouse was built at its eastern end. Submarine cables connect the island with Aden, Egypt and Zanzibar. Population, including a garrison of 50 sepoys, about 200. • "

PERINO DEL VAGA (1500-1547), a painter of the Roman school, whose true name was Perino (or Piero) Buonaccorsi. He was born near Florence on the 28th of June 1500. His father ruined himself by gambling, and became a soldier in the invading army of Charles VIII. His mother dying when he was but two months old, he was suckled by a she-goat; but shortly afterwards he was taken up by his father's second wife. Perino was first apprenticed to a druggist, but soon passed into the hands of a mediocre painter, Andrea da Ceri, and, when eleven years of age, of Ridolfo Ghirlandajo. Perino rapidly surpassed his fellow-pupils, applying himself especially to the study of Michelangelo's great cartoon. Another mediocre painter, Vaga from Toscanella, undertook to settle the boy in Rome, but first set him to work in Toscanella. Perino, when he at last reached Rome, was utterly poor, and with no clear prospect beyond journey-work for trading decorators. He, however, studied with great severity and spirit from Michelangelo and the antique, and was eventually entrusted with some of the subordinate work undertaken by Raphael in the Vatican. He assisted Giovanni da Udine in the stucco and arabesque decorations of the loggie of the Vatican, and executed some of those small but finely composed scriptural subjects which go by the name of " Raphael's Bible " — Raphael himself furnishing the designs. Perino's examples are: " Abraham about to sacrifice Isaac," " Jacob wrestling with the Angel," " Joseph and his Brethren," the " Hebrews crossing the Jordan," the " Fall and Capture of Jericho," " Joshua commanding the Sun to stand still," the " Birth of Christ," " His Baptism " and the " Last Supper." Some of these are in bronze-tint, while others are in full colour. He also painted, after Raphael's drawings, the figures of the planets in the great hall of the Appartamenti Borgia. Perino exhibited very uncommon faculty in these works and was soon regarded as second only to Giulio Romano among the great painter's assistants. To Raphael himself he was always exceedingly respectful and attentive, and the master loved him almost as a son. He executed many other works about Rome, always displaying a certain mixture of the Florentine with the Roman style.

After Raphael's death in 1520 a troublous period ensued for Perino, with a plague which ravaged Rome in 1523, and again with the sack of that city in 1527. Then he accepted an invita- tion to Genoa, where he was employed in decorating the Doria Palace, and rapidly founded a quasi-Roman school of art in the Ligurian city. He ornamented the palace in a style similar to that of Giulio Romano in the Mantuan Palazzo del Te, and frescoed historical and mythological subjects in the apartments, fanciful and graceful arabesque work, sculptural and architec- tural details — in short, whatever came to hand. Among the

principal works are: the ” War between the Gods and Giants,” ” Horatius Codes defending the Bridge,” and the ” Fortitude

of Mutius Scaevola.” The most important work of all, the ” Shipwreck of Aeneas,” is no longer extant. From Genoa Perino twice visited Pisa, and began some painting in the cathedral. Finally he returned to Rome, where Paul III. allowed him a regular salary till the painter’s death. He retouched many of the works of Raphael, and laboured hard on his own account, undertaking all sorts of jobs, important or trivial. Working for any price, he made large gains, but fell into mechanical negligence. Perino was engaged in the general decoration of the Sala Reale, begun by Paul III., when his health, undermined by constant work and as constant irregularities, gave way, and he fell down dead on the 19th of October 1547. He is buried in the Pantheon.

Perino produced some excellent portraits, and his smaller oil pictures combine with the manner of Raphael something of that of Adrea del Sarto. Many of his works were engraved, even in his own lifetime. Daniele Ricciarelli, Girolamo Siciolante da Ser- moneta, Luzio Romano and Marcello Venusti (Mantovano) were among his principal assistants. (W. M. R.)

PERINTHUS (Turk. Eski Eregli, old Heraclea), an ancient town of Thrace, on thePropontis, 22 m. W. of Selymbria, strongly situated on a small peninsula on the bay of that name. It is said to have been a Samian colony, founded about 599 B.C. According to Tzetzes, its original name was Mygdonia; later it was called Heraclea (Heraclea Thraciae, Heraclea Perinthus). It is famous chiefly for its stubborn and successful resistance to Philip II. of Macedon in 340; at that time it seems to have been more important than Byzantium itself.

PERIOD (Gr. Teplodos, a going or way round, circuit, irepi, round, and 656s, way, road), a circuit or course of time, a cycle; particularly the duration of time in which a planet revolves round its sun, or a satellite round its primary, a definite or indefinite recurring interval of time marked by some special or peculiar character, e.g. in history, literature, art, &c; it is so used of a division of geological time. Particular uses of the word are for the various phases through which a disease passes, the termination or conclusion of any course of events, the pause at the end of a completed sentence, and the mark (.) used to signify the same (see Punctuation) .

PERIODICALS, a general term for literary publications which appear in numbers, or parts at regular intervals of time — as a rule, weekly, monthly or quarterly. The term strictly includes “newspapers” (q.v.), but in the narrower sense usually intended it is distinguished as a convenient expression for periodical publications which differ from newspapers in not being primarily for the circulation of news or information of ephemeral interest, and in being issued at longer intervals. In modern times the weekly journal has become so much of the nature of a newspaper that it seldom can be called a periodical in this sense. The present article chiefly deals with publications devoted to general literature, literary and critical reviews and magazines for the supply of miscellaneous reading. In the article Societies (q.v.) an account is separately given of the transactions and proceedings of learned and scientific bodies. Year-books, almanacs, directories and other annuals belong to a distinct type of publication, and are not referred to here.

British

The first literary periodical in English was the Mercurius librarius, or a Faithful Account of all Books and Pamphlets (1680), a mere catalogue, published weekly or fortnightly in London, followed by Weekly Memorials for the Ingenious (Jan. 16, 1681-1682 to Jan. 15, 1683), which was more of the type of the Journal des Savants (see under France below), whence it borrowed many contributions. Of the History of Learning (1691) — another with the same title came out in 1694 — only a few numbers appeared, as the conductor, De la Crose, started the monthly Works of the Learned (Aug. 1691 to April 1692), devoted principally to continental scholarship. The monthly Compleat Library (1692 to 1694) was a venture of John Dunton; the monthly Memoirs for the Ingenious (1693), edited by J. de la Crose, ran for 12 months, and another with the same title appeared in the following year, only to enjoy a briefer career. The first periodical of merit and influence was the History of the Works of the Learned (1699-1712), largely consisting of descriptions of foreign books. The Memoirs of Literature, the first English review consisting entirely of original matter, published in London from 1710 to 1714, had for editor Michel de la Roche, a French Protestant

refugee, who also edited at Amsterdam the Bibliotheque angloise (1717-1719), and subsequently Memoires litleraires de la Grande Bretagne (1720-1724). Returning to England in 1725, he recommenced his New Memoirs of Literature (1725-1728), a monthly, and in 1730 a Literary Journal. Dr Samuel Jebb started Bibliotheca literaria (1722-1724), to appear every two months, which dealt with

medals and antiquities as well as with literature, but only ten numbers appeared. The Present State of the Republick of Letters was commenced by Andrew Reid in January 1728, and completed in December 1736. It contained not only excellent reviews of English books but papers from the works of foreigners. Two volumes came out each year. It was successful, as also was the Historia literaria (1730-1734) of Archibald Bower. 1 The Bee, or Universal Weekly Pamphlet (1733-1735) of the unfortunate Eustace Budgell, and the Literary Magazine (1735-1736), with which Ephraim Chambers had much to do, were short-lived. The last named was continued in 1737 as the History of the Works of the Learned, and was carried on without intermission until 1743, when its place was taken by A Literary Journal (Dublin, 1 744-1 749), the first review published in Ireland. The Museum (1746) of R. Dodsley united the character of a review of books with that of a literary magazine. It came out fortnightly to the 12th of September 1747. Although England can show nothing like the Journal des savants, which has flourished almost without a break for two and a half centuries, a nearly complete series of reviews of English literature may be made up from 1 681 to the present day.

After the close of the first quarter of the 1 8th century the literary periodical began to assume more of the style of the modern review, and in 1749 the title and the chief features were united in the Monthly Review, established by Ralph Griffiths, 2 who conducted it until 1803, whence it was edited by his son down to 1825. It came to an end in 1845. From its commencement the Review dealt with science and literature, as well as with literary criticism. It was Whig in politics and Nonconformist in theology. The first series ran from 1749 to December 1789, 81 vols.; the second from 1790 to 1 81 5, 108 vols. ; the third or new series from 1826 to 1830, 15 vols. ; and the fourth from 1831 to 1845, 45 vols., when the magazine stopped. There is a general index (1749-1789) 3 vols., and another (1790-1816), 2 vols.

The Tory party and the established church were defended in the Critical Review (1756-1817), founded by Archibald Hamilton and supported by Smollett, Dr Johnson and Robertson. Johnson contributed to fifteen numbers of the Literary Magazine (1756-1758). The reviews rapidly increased in number towards the end of the century. Among the principal were the London Review (1775-1780), A New Review (1 782-1 786), the English Review (1 783-1 796), incorpor- ated in 1797 with the Analytical Review (1788-1799), the Anti- Jacobin Review and Magazine (1798-1821), and the British Critic (l793-!843)> the organ of the High Church party, and first edited by Archdeacon Nares and Beloe.

These periodicals had now become extremely numerous, and many of the leading London publishers found it convenient to maintain their own particular organs. It is not a matter of surprise, therefore, that the authority of Q uarter ‘ , ‘ s – the reviews should have fallen somewhat in public estimation. The time was ripe for one which should be quite independent of the booksellers, and which should also aim at a higher standard of excellence. As far back as 1755 Adam Smith, Blair and others had produced an Edinburgh Review which only ran to two numbers, and in 1773 Gilbert Stuart and William Smellie issued during three years an Edinburgh Magazine and Review. To Edinburgh is also due the first high-class critical journal, the Edinburgh Review, established in October 1802 by Jeffrey, Scott, Horner, Brougham and Sydney Smith. It created a new era in periodical criticism, and assumed from the commencement a wider range and more elevated tone than any of its predecessors. The first editor was Sydney Smith, then Jeffrey for many years, and later editors were Macvey Napier, William Empson, Sir G. C. Lewis, Henry Reeve and the Hon. Arthur Elliot. Its buff and blue coyer was adopted from the colours of the Whig party whose political principles it advocated. Among its more famous contributors were Lord Brougham, Sir Walter Scott, Carlyle, Hazlitt and Macaulay. Scott, being dissatisfied with the new review, persuaded John Murray, his London publisher, to start its brilliant Tory competitor, the Quarterly Review (Feb. 1809), first edited by William Gifford, then by Sir J. T. Coleridge, and subsequently by J. G. Lockhart, Rev. Whitwell Elwin, W. M. Macpherson, Sir Wm. Smith, Rowland Prothero and G. W. Prothero. Among the contributors in successive years were Canning, Scott (who reviewed himself), Robert Southey,

1 Archibald Bower (1686-1766) was educated at Douai, and became a Jesuit. He subsequently professed himself a convert to the Anglican Church, and published a number of works, but was more esteemed for his ability than for his moral character.

2 The biographers of Goldsmith have made us familiar with the name of Griffiths (1720-1803), the prosperous publisher, with his diploma of LL.D. granted by an American university, and with the quarrels between him and the poet.

Sir John Barrow, J. Wilson Croker, Isaac Disraeli, A. W. Kinglake, Lord Salisbury and W. E. Gladstone. 1 The Westminster Review (1824),

established by the followers of Jeremy Bentham, advocated radical reforms in church, state and legislation. In 1836 it was joined to the London Review (1829), founded by Sir William Moles- worth, and then bore the name of the London and Westminster Review till 1 85 1, when it returned to the original title. Other quarterly reviews worth mentioning are the Eclectic Review (1805- 1868), edited down to 1834 by Josiah Conder (1 789-1 855) and supported by the Dissenters; the British Review (1811-1825; the Christian Remembrancer (1819-1868); the Retrospective Review (1820-1826, 1828, 1 853-1 854), for old books; the Foreign Quarterly Review (1827-1846), afterwards incorporated with the Westminster; the Foreign Review (1828-1829) ; the Dublin Review (1836), a Roman Catholic organ; the Foreign and Colonial Quarterly Review (1843- 1847) ; the Prospective Review (1845-1855), given up to theology and literature, previously the Christian Teacher (1835-1844); the North British Review (1844-1871); the British Quarterly Review (1845), successor to the British and Foreign Review (1835-1844); the New Quarterly Review (1852-1861), the Scottish Review (1853-1862), published at Glasgow; the Wesleyan London Quarterly • Review (i 8 53-); the National Review (1855-1864); the Diplomatic Review (1855-1881); the Irish Quarterly Review (1851-1859), brought out in Dublin; the Home and Foreign Review (1 862-1 864); the Fine Arts Quarterly Review (1863-1865); the New Quarterly Magazine (1873-1880); the Catholic Union Review (1863-1874) ; the Anglican Church Quarterly Review (1875); Mind (1876), dealing with mental philosophy; the Modern Review (1880-1884); the Scottish Review (1882) ; the Asiatic Quarterly Review (1886; since 1891 the Imperial and Asiatic Quarterly Review) ; and the Jewish Quarterly Review.

The monthly reviews include the Christian Observer (1802-1857), conducted by members of the established church upon evangelical principles, with Zachary Macaulay as the first editor; Monthlies. and the Monthly Repository (1800-1837), originally purely theological, but after coming into the hands of the Rev. W. J. Fox made entirely literary and political. The Fortnightly Review (1865), edited successively by G. H. Lewes, John Morley, T. H. S. Escott, Frank Harris, Oswald Crawfurd and W. L. Courtney, was intended as a kind of English Revue des deux mondes. Since 1866 it has appeared monthly. The Contemporary Review (1866), long edited by Sir Percy Bunting, and the Nineteenth Century (1877), founded and edited by Sir James Knowles (q.v.), and renamed Nineteenth Century and After in 1900, are similar in character, consisting of signed articles by men of mark of all opinions upon questions of the day. The National Review (1883), edited succes- sively by Alfred Austin, W. Earl

Hodgson, and L. J. Maxse, is alone in taking editorially a pronounced party line in politics as a Conser- vative organ. Modern Thought (1879-1884), for the free discussion of political, religious and social subjects, and the Modern Review (1 892-1894) may also be mentioned. Other monthlies are the Indian Magazine (1871); the Irish Monthly (Dublin, 1873); the Gaelic Journal (Dublin, 1882); the African Review (1892) and the Empire Review (1900). The Monthly Review (1900-1908), edited till 1904 by Henry Newbolt, was for some years a notable addition to the high class literary monthlies.

The weekly reviews dealing generally with literature, science and art are the Literary Gazette (1817-1862), first edited by William Jerdan; the Athenaeum (1828), founded by James Silk Weeklies. Buckingham, but successfully established by C. W. Dilke, and long edited in later years by Norman MacColl (1843-1904), and afterwards by Mr Vernon Rendall; and the Academy (1869). Among those which also include political and social topics, and are more particularly dealt with under Newspapers, may be mentioned, the Examiner (1808-1881), the Spectator (1828), the Saturday Review (1855), the Scots or National Observer (1888-1897), Outlook (1898), Pilot (1900-1903), and Speaker (1890), which became the Nation.

Soon after the introduction of the literary journal in England, one of a more familiar tone was started by the eccentric John Dunton in the Athenian Gazette, or Casuistical Mercury, resolving all the most Nice and Curious Questions (1689-1690 to 1695-1696), afterwards called The Athenian Mercury, a kind of forerunner of Notes and Queries, being a penny weekly sheet, with a quarterly critical supplement. In the last part the publisher announces that it will be continued ” as soon as ever the glut of news is a little over.” Dunton was assisted by Richard Sault and Samuel Wesley. Defoe’s Review (1704-1713) dealt chiefly with politics and commerce, but the introduction in it of what its editor fittingly termed the “scandalous club ” was another step nearer the papers of Steele and the periodical essayists, the first attempts to create an organized popular opinion in matters of taste and manners. These little papers, rapidly thrown off for a temporary purpose, were destined to form a very important

1 The centenary of the Edinburgh Review was celebrated in an article in October 1902, and that of the Quarterly Review in two articles April and July 1909. See also On the Authorship of the First Hundred Numbers of the Edinburgh Review (1895), by W. A. Copinger, and The First Edinburgh Reviewers in Literary Studies (1879), vol. i., by W. Bagehot.

part of the literature of the 18th century, and in some respects its most marked feature. Although the frequenters of the clubs and coffee-houses were the persons for whom the essay-papers were mainly written, a proof of the increasing refinement of the age is to be found in the fact that now for the first time were women specially addressed as part of the reading public. The Tatter. was commenced by Richard Steele in 1709, and Tatter, &c. issued thrice a week until 171 1. The idea was at once extremely popular, and a dozen similar papers were started within the year, at least one half bearing colourable imitations of the title. Addison contributed to the Tatter, and together with Steele estab- lished and carried on the Spectator (1710-1714), and subsequently the Guardian (1713). The newspaper tax enforced in 1712 dealt a hard blow at these. Before this time the daily issue of the Spectator had reached 3000 copies; it then fell to 1600; the price was raised from a penny to twopence, but the paper came to an end in 1714. Dr Drake (Essays illustr. of the Rambler, &c, ii. 490) drew up an imperfect list of the essayists, and reckoned that from the Tatler to Johnson's Rambler, during a period of forty-one years, 106 papers of this description were published. Dr Drake continued the list down to 1809, and described altogether 221 which had appeared within a hundred years. The following is a list of the most consider- able, with their dates, founders and chief contributors: —

Tatler (April 12, 1709 to Jan. 2, 1710-1711), Steele, Addison, Swift, Hughes, &c. ; Spectator (March I, 1710-1711 to Dec. 20, 1714), Addison, Steele, Budgell, Hughes, Grove, Pope, Parnell, Swift, &c. ; Guardian (March 12, 1713 to Oct. I, 1713), Steele, Addison, Berkeley, Pope, Tickell, Budgell, &c. ; Rambler (March 20, 1750 to March 14, ! 75 2)> Johnson; Adventurer (Nov. 7, 1752 to March 9, 1754), Hawkes- worth, Johnson, Bathurst, Warton, Chapone; World (Jan. 4, 1753 to Dec. 30, 1756), E. Moore, earl of Chesterfield, R. O. Cambridge, earl of Orford, Soame Jenyns, &c. ; Connoisseur (Jan. 31, 1754 to Sept. 30, 1756), Colman, Thornton, Warton, earl of Cork, &c. ; Idler (April 15, 1758 to April 5, 1760), Johnson, Sir J. Reynolds and Bennet Langton; Bee (Oct. 6, 1759 to Nov. 24, 1759), O. Goldsmith; Mirror (Jan. 23, 1779 to May 27, 1780), Mackenzie, Craig, Abercromby, Home, Bannatyne, &c. ; Lounger (Feb. 5, 1785 to Jan. 6, 1787), Mackenzie, Craig, Abercromby, Tytler; Observer (1785 to 1790), Cumberland ; Looker-on (March 10, 1792 to Feb. I, 1794), W. Roberts, Beresford, Chalmers.

As from the " pamphlet of news " arose the weekly paper wholly devoted to the circulation of news, so from the general newspaper was specialized the weekly or monthly review of litera- ture, antiquities and science, which, when it included * ™ essay-papers, made up the

magazine or miscellaneous agaz s * repository of matter for information and amusement. Several monthly publications had come into existence since 1681, but perhaps the first germ of the magazine is to be found in the Gentleman's Journal (1691-1694) of Peter Motteux, which, besides the news of the month, contained miscellaneous prose and poetry. Dr Samuel Jebb included antiquarian notices as well as literary reviews in his Bibliotheca literaria (1722-1724), previously mentioned, but the Gentleman's Magazine, founded in 1731, fully established, through the tact and energy of the publisher Edward Cave (q.v.), the type of the magazine, from that time so marked a feature of English periodical literature. The first idea is due to Motteux, from whom the title, motto and general plan were borrowed. The chief feature in the new venture at first consisted of the analysis of the journals, which Cave undertook personally. Prizes were offered for poetry. In April 1732 the leading metropolitan publishers, jealous of the interloper Cave, started the London Magazine, or Gentleman's Monthly Intelligencer (1 732-1 784), which had a long and prosperous career. The new magazine closely copied Cave's title, plan and aspect, and bitter war was long waged between the two. The rivalry was not without benefit to the literary public, as the conductors of each used every effort to improve their own review. Cave intro- duced the practice of giving engravings, maps and portraits, but his greatest success was the addition of Samuel Johnson . (q.v.) to the regular staff. This took place in 1738, when the latter wrote the preface to the volume for that year, observing that the magazine had " given rise to almost twenty imitations of it, which are either all dead or very little regarded. ' The plan was also imitated in Denmark, Sweden and Germany. The Gentleman's Magazine was continued by Cave's brother-in-law, David Henry, afterwards by John Nichols and his son. 2 Cave appears to have been the first

2 The first series of the Gentleman's Magazine or Trader's Monthly Intelligencer, extended from January 1731 to December 1735, 5 vols.; the Gentleman's Magazine and Historical Chronicle from January 1736 to December 1807, vols. 6-77; new series, January 1808 to December 1833, vols. 78-103; new series, 1834-1856, 45 vols.; new (third) series, 1856-1865, 19 vols.; new (fourth) series, 1866- 1868, 5 vols. A general index to the first twenty vols, appeared in 1753- S. Ayscough brought out an index to the first fifty-six vols., 1731-1786 (1789), 2 vols., and one by J. Nichols, 1787-1818 (1821), 2 vols. A complete list of the plates and woodcuts (1731-1813) was published in 1814, and another list (1731-1818), in 1821. The Gentleman' s Magazine Library, being a classified collection of the chief contents of the Gentleman's Magazine, from 173 1′ to 1868, is now being edited

by Mr G. L. Gomme (1883, &c, vols. 1-17).

to use the word magazine in the sense of a periodical of miscellaneous literature. The specially antiquarian, biographical and historical features, which make this magazine so valuable a store-house for information for the period it covers, were dropped in 1868, when an ” entirely new series,” a miscellany of light literature was succes- sively edited by Gowing, Joseph Hatton and Joseph Knight.

Many other magazines-were produced in consequence of the success of these two. It will be sufficient to mention the following: The Scots Afagazine (1739-1817) was the first published in Scotland; from 1817 to 1826 it was styled the Edinburgh Magazine. The Universal Magazine (1747) had a short, if brilliant, career; but the European Magazine, founded by James Perry in 1782, lasted down to 1826. Of more importance than these, or than the Royal Magazine (1759-1771) was the Monthly Magazine (1796-1843), with which Priestley and Godwin were originally connected. During thirty years the Monthly was conducted by Sir Richard Phillips, under whom it became more statistical and- scientific than literary. Class magazines were represented by the Edinburgh Farmer’s Magazine (1800-1825) and the Philosophical Magazine (1798), established in London by Alexander Tilloch ; the latter at first consisted chiefly of translations of scientific articles from the French. The following periodicals, all of which date from the 18th century, are still published: the Gospel Magazine (1 766, with which is incorporated the British Protestant), the Wesleyan Methodist Magazine (1778), Curtis’s Botanical Magazine (1786), Evangelical Magazine (1793; since 1905 ‘the Evangelical British Missionary), the Philosophical Magazine (1798), now known as the London, Edinburgh and Dublin Philosophical Magazine.

The increased influence of this class of periodical upon public opinion was first apparent in Blackwood’s Edinburgh Magazine, founded in 1817 by the publisher of that name, and carried to a high degree of excellence by the contributions of Scott, Lockhart, Hogg, Maginn, Syme and John Wilson (” Christopher North “), John Gait and Samuel Warren. It has always remained Liberal in literature and Conservative in politics. The New Monthly Magazine is somewhat earlier in date. It was founded in 1814 by the London publisher, Colburn, and was edited in turn by Campbell, Theodore Hook, Bulwer-Lytton and Ainsworth. Many of Carlyle’s and Thackeray’s pieces first appeared in

Fraser's Magazine (1830), long famous for its personalities and its gallery of literary portraits. The Metropolitan Magazine was started in opposition to Fraser, and was first edited by Campbell, who had left its rival. It subsequently came into the hands of Captain Marryatt, who printed in it many of his sea-tales. The British Magazine (1832- 1849) included religious and ecclesiastical information. From Ireland came the Dublin University Magazine (1833). The regular price of these magazines was half a crown; the first of the cheaper ones was Tait's Edinburgh Magazine (1832-1861) at a shilling. It was Radical in politics, and had Roebuck as one of its founders. Bentley's Miscellany (1837-1868) was exclusively devoted to novels, light literature and travels. Several of Ainsworth's romances, illustrated by Cruikshank, first saw the light in Bentley. The Nautical Magazine (1832) was addressed specially to sailors, and Colburn's United Service Journal (1829) to both services. The Asiatic Journal (18 16) dealt with Oriental subjects.

From 1 815 to 1820 a number of low-priced and unwholesome periodicals flourished. The Mirror (1823-1849), a two-penny Ch Pi h ''' ustra ted magazine, begun by John Limbird,* and ''''the Mechanics Magazine (1823) were steps in a better Hcatlons. direction, -pˆe political agitation of 1 83 1 led to a further popular demand, and a supply of cheap and healthy serials for the reading multitude commenced with Chambers' s Journal (1832), the Penny Magazine (1832-1845) of Charles Knight, and the Saturday Magazine (1 832-1 844), begun by the Society for Promoting Christian Knowledge. The first was published at 1 Jd. and the last two at id. Knight secured the best authors and artists of the day to write for and illustrate his magazine, which, though at first a commercial success, may have had the reason of its subsequent discontinuance in its literary excellence. At the end of 1832 it had reached a sale of 200,000 in weekly numbers and monthly parts. It came to an end in 1845 and was succeeded by Knight's Penny Magazine (1845), which was stopped after six monthly parts. These periodicals were followed by a number of penny weeklies of a lower tone, such as the Family Herald (1843), the London Journal (1845) and Lloyd's Miscellany. In 1850 the sale of the first of them was placed at 175,000 copies, the second at 170,000, and Lloyd's at 95,000. In 1846 fourteen penny and three half-penny magazines, twelve social journals, and thirty-seven book-serials were produced every week in London. A further and permanent improvement in cheap weeklies for home reading may be traced from the foundation of Howitt's Journal (1 847-1 849), and more especially Household Words (1850), conducted by Charles Dickens, All the Year Round (1859), by the same editor, and afterwards by his son, Once A

Week (1859), and the Leisure Hour (1852). The plan of Notes and Queries (1849), for the purpose of inter-communication among those interested in special points of literary and antiquarian character, has led to the

1 John Limbird, to whom even before Chambers or Knight is due the carrying out the idea of a cheap and good periodical for the people, died on the 31st of October 1883, without having achieved the worldly prosperity of his two followers.

adoption of similar departments in a great number of newspapers and periodicals, and, besides several imitators in England, there are no* parallel journals in Holland, France, and Italy.

Shilling monthlies began with Macmillan (1859), the Cornhill (i860), first edited by Thackeray, and Temple Bar (i860). St James's Magazine (1861), Belgravia (1866), St Paul's (1867-1874), London Society (1862), and Tinsley's (1867) were devoted chiefly to novels and light reading. Sixpenny illustrated magazines com- menced with Good Words (i860) and the Quiver (1861), both religious in tendency. In 1882 Fraser changed its name to Longman's Magazine, and was popularized and reduced to sixpence. The Cornhill followed the same example in 1883, reducing its price to sixpence and devoting its pages to light reading. The English Illustrated Magazine (1883) was brought out in competition with the American Harper's and Century. The Pall Mall Magazine followed in 1893. Of the artistic periodicals we may signalize the Art Journal (1849), Portfolio (1870), Magazine of Art (1878-1904), Studio (1893), Connoisseur (1901), and Burlington (1903). The Bookman (1886), for a combination of popular and literary qualities, and the Badminton (1895), for sport, also deserve mention. One of the most characteristic developments of later journalism was the establishment in 1890 of the Review of Reviews by W. T. Stead. Meanwhile the number of cheap periodicals increased enormously, such as the weekly Tit-bits (1881), and Answers (1888), and profusely illustrated magazines appeared, like the Strand (1891), Pearson's (1896), or Windsor (1895). Professions and trades now have not only their general class-periodicals, but a special review or magazine for every section. In 1910 the magazines and reviews published in the United Kingdom numbered 2795. Religious periodicals were 668; 338 were devoted to trade; 361 to sport; 691 represented the professional classes; 51 agriculture; and 218 were juvenile periodicals. The London monthlies were 797 and the quarterlies 155.

Indexes to English Periodicals. — A large number of periodicals do not

preserve literary matter of permanent value, but the high- class reviews and the archaeological, artistic and scientific magazines contain a great mass of valuable facts, so that general and special indexes have become necessary to all literary workers. Lists of the separate indexes to particular series are given in H. B. Wheatley's What is an Index? (1879), W. P. Courtney's Register of National Bibliography (1905, 2 vols.), and the List of Books forming the Reference Library in the reading room of the British Museum (4th ed. 1910, 2 vols).

Authorities. — " Periodicals," in the British Museum catalogue; Lowndes, Bibliographer's Manual, by Hy. G. Bohn, (1864); Cat. of Periodicals in the Bodl. Lib., pt. i., " English Periodicals " (1878); Cat. of the Hope Collection of Early Newspapers and Essayists in the Bodl. Lib. (1865); Scudder, Cat. of Scientific Serials (1879); Andrews, Hist, of Brit. Journalism (1859) ; Cucheval Clarigny, Hist, de la Presse en Angleterre et aux Etats Unis (1857) I Madden, Hist, of Irish Period. Lit. (1867); J. Grant, The Great Metropolis, ii. 229-327; " Periodical Essays of the Age of Anne," in N. American Rev. vol. xlvi. ; Drake, Essays on the " Spectator," " Taller," &c. (1810-1814); Courthope, Addison ("Engl. Men of Letters," 1884); "Forgotten Periodical Publications," in Notes and Queries, 3rd series, vol. ix. p. 53; " Account of Periodical Literary Journals from 1681 to 1749," by S. Parkes, in Quart. Journ. of Sc, Lit., &c, xiii. 36, 289; see also Notes and Queries, 1st series, vol. vi. pp. 327, 435; "Last Century Magazines," in Fraser's Mag. Sept. (1876), p. 325; " Periodicals during 1712-1732," in Notes and Queries, 3rd series, vol. ix. p. 72, &c, x. 134; " Catholic Period. Lit.," ib., 5th series, vol. xi. 427. 494; " Early Roman Catholic Magazines," ib., 6th series, vol. iii. p. 43, &c, iv. 211; Timperley, Ency. of Lit. Anec. (1842); C. Knight, The Old Printer and the Modern Press (1854), and Passages of a Working Life (1 864-1 865); Memoir of Robert Chambers (1872); the London Cat. of Periodicals, Newspapers, &c. (1844-1910); The Bookseller (February 1867, June and July 1868, August 1874, July 1879); "On the Unstamped Press," Notes and Queries, 4th series, vol. x. and xi. (1872-1873), and English Hist. Review (1897), xii. 711-726; " Contributions Towards an Index of Serial Stories," by W. L. Fletcher, Library Journal (1881), vi. 42, 166; " Byways of Periodical Literature," Walford's Antiq. Mag. (1887), xi. 177-186, xii. 65-74; Catalogue of Magazines &c, reed, at the Melbourne Pub. Lib. (1891); "English Periodical Literature," by W. Robertson Nicoil, Bookman (1895), vol. i. ; " The Periodical Press, 1&55-1895," by T. H. S. Escott, Blackwood (1894), pp. 156, 532; " Bibliography of Periodical Literature," by F. Campbell, The Library d898), viii. 49; " Bibliography

of the British Periodical Press," by I). Williams in Mitchell's Newspaper Directory (1902), pp. 12-13; " English Reviews," by A. Waugh, Critic, vol. 40; " Excursus on Periodical Criticism," Saintsbury, History of Criticism (1904), iii. 408-428. As regards the treatment of periodicals in libraries see " Helps for Cataloguers of Serials," by H. C. Bolton in Boston Bull, of Biblio- graphy (1897); " Co-operative lists of periodicals," Library Journal, (1899), xxiv. 29-32, " Union List of Periodicals in Chicago Libraries," Public Libraries, Chicago (1900), v. 60; " Care of Periodicals in a Library," by F. R. Jackson, Public Libraries, Chicago (1906) , vol. xi. Complete lists of current British periodicals are included in Mitchell's Newspaper Press Directory, Street's Newspaper Directory, and Willing's Press Guide, and a select list and other information ' are given in the Literary Year Book.

United States The two earliest American miscellanies were produced almost simultaneously. Spurred by the success of the Gentleman's Magazine in England Benjamin Franklin founded the General Magazine (1741) at Philadelphia, but it expired after six monthly numbers had appeared. Franklin's rival, Andrew Bradford, forestalled him by three days with the American Magazine (1741) edited by John Webbe, which ran only to two numbers. Further attempts at Philadelphia in 1757 and 1769 to revive periodicals with the same name were both fruitless. The other pre-revolutionary magazines were the Boston American Magazine (1743-1747), in imitation of the London Magazine; the Boston Weekly Magazine (1743); the Christian History (1743-1744); the New York Independent Reflector (1752-1754); the Boston New England Magazine (1758-1760), a collection of fugitive pieces; the Boston Royal American Magazine (1774-1775); and the Pennsylvania Magazine (1775-1776), founded by Robert Aitken, with the help of Thomas Paine. The Columbian Magazine (1786-1790) was continued as the Universal Asylum (1790-1792). Matthew Carey brought out the American Museum in 1787, and it lasted until 1792. Among the other magazines which ran out a brief existence before the end of the century was the Philadelphia Political Censor or Monthly Review (1796-1797) edited by William Cobbett. One of the most successful was the Farmer's Weekly Museum (1790-1799), supported by perhaps the most brilliant staff of writers American periodical literature had yet been able to show, and edited by Joseph Dennie, who in 1801 began the publication of the Portfolio, carried on to 1827 at Philadelphia. For five years it was a weekly miscellany in quarto, and afterwards an

octavo monthly; it was the first American serial which could boast of so long an existence. Charles Brockden Brown established the New York Monthly Magazine (1799), which, changing its title to The American Review, was continued to 1802. Brown founded at Philadelphia the Literary Magazine (1803-1808); he and Dennie may be considered as having been the first American professional men of letters. The Anthology Club was established at Boston in 1803 by Phineas Adams for the cultivation of literature and the discussion of philosophy. Ticknor, Everett and Bigelow were among the members, and were contributors to the organ of the club, the monthly Anthology and Boston Review (1803-180), the fore- runner of the North American Review. In the year 1810 Thomas (Printing in America, ii. 292) informs us that 27 periodicals were issued in the United States. The first serious rival of the Portfolio was the Analectic Magazine (1813-1820), founded at Philadelphia by Moses Thomas, with the literary assistance of W. Irving (for some time the editor). Paulding, and the ornithologist Wilson. In spite of a large subscription list it came to an end on account of the costly style of its production. The first southern serial was the Monthly Register (1805) of Charleston. New York possessed no periodical worthy of the city until 1824, when the Atlantic Magazine appeared, which changed its name shortly afterwards. to the New York Monthly Review, and was supported by R. C. Sands and W. C. Bryant. N. P. Willis was one of the editors of the New York Mirror (1823-1842). Between 1840 and l8ˆoGraham's Magazine was the leading popular miscellany in the country, reaching at one time a circulation of about 35,000 copies. The first western periodical was the Illinois Monthly Magazine (1830-1832), published, owned, edited and almost entirely written by James Hall, who followed with his Western Monthly Magazine (1833-1836), produced in a similar manner. In 1833 the novelist C. F. Hoffman founded at New York the Knickerbocker (1833-1860), which soon passed under the control of Timothy Flint and became extremely successful, most of the leading native writers of the next twenty years having been contributors. Equally popular was Putnam's Monthly Magazine (1853-1857,1867-1869). It wasrevivedin 1906-1910. The Dial{ 1840-1844), Boston, the organ of the transcendentalists, was first edited by Margaret Fuller, and subsequently by R. W. Emerson and G. Ripley. Other magazines were the American Monthly Magazine (1833-1838), the Southern Literary Messenger (1834), Richmond, the Gentleman's Magazine (1837-1840), and the International Magazine (1850-1852), edited by R. W. Griswold. The Yale Literary Magazine dated from 1836. The Merchants' Magazine was united in 1871 with the Commercial and Financial Chronicle. First in order of date among the current monthly magazines comes the New York Harper's New

Monthly Magazine (1 850) , the earliest existing illustrated American serial, then the Boston Atlantic Monthly (1857), with which was incorporated the Galaxy (1866) in 1878, famous for its editors Lowell, Howells and T. B. Aldrich, and its contributors O. W. Holmes, Longfellow, Whittier and others. Next came Lippincott's Magazine (1868) frcm Philadelphia, and the Cosmopolitan (1886) and Scribner's Monthly (1870, known as the Century Illustrated Magazine since 1 881) from New York. These were followed by Scribner's Magazine (1887), the New England Magazine (1889), the Illustrated Review of Reviews (1890), McClure's Magazine (1893), the Bookman (1895), the World's Work (1902), the American Magazine (1906) succeeding Frank Leslie's Popular Monthly, and Munsey's Magazine (1889). All are illustrated, and three in particular, the Century, Scribner's and Harper's, carried the art of wood-engraving to a high standard of excellence.

The first attempt to carry on an American review was made by Robert Walsh in 181 1 at Philadelphia with the quarterly American

Review of History and Politics, which lasted only a couple of years. Still more brief was the existence of the General Repository and Review (1812), brought out at Cambridge by Andrews Norton with the help of the professors of the university, but of which only four numbers appeared. Niles's Weekly Register (1811-1848) was political, historical and literary. The North American Review, the oldest and most famous of all the American reviews, dates from 1815, and was founded by William Tudor, a member of the previously mentioned Anthology Club. After two years' control Tudor handed over the review to the club, then styled the North American Club, whose most active members were E. T. Channing, R. H. Dana and Jared Sparks. In 1819 E. Everett became the editor; his brother Alexander acquired the property in 1829. The roll of contributors numbers almost every American writer of note. Since 1879 it has been published monthly (except in Sept. 1906-Sept. 1907, whenitap- peared semi-monthly). The American Quarterly Review (1827-1837), established at Philadelphia by Robert Walsh, came to an end on his departure for Europe. The Southern Quarterlyˆ Review (1828- 1832), conducted by H. Legare, S. Elliot and G. W. Simms in defence of the politics and finance of the South, enjoyed a shorter career. It was resuscitated in 1 842, and lived another thirteen years. These two were followed by the Democratic Review (1 838-1 852) , the American Review (1845-1849), afterwards the American Whig Review (1850- 1852), the Massachusetts Quarterly Review (i847-i8so),and a few more. The New Englander (1 843-1 892), the Biblical Repertory and Princeton Review (1825), the National Quarterly Review (i860) and the New York

International Review (1874-1883), may also be mentioned. The critical weeklies of the past include the .New York Literary Gazette (1834-1835, 1839), De Bow's Review (1846), the Literary World (1847-1853), the Criterion (1855-1856), the Round Table (1863-1864), the Citizen (1864-1873), and Appleton's Journal (1869). The leading current monthlies include the New York Forum (1886), Arena (1890), Current Literature (1888), and Bookman, the Chicago Dial (1880), and the Greenwich, Connecticut, Literary Collector. Foremost among the weeklies comes the New York Nation (1865). ,* Religious periodicals have been extremely numerous in the United States. The earliest was the Theological Magazine (1796-1798). The Christian Examiner dates from 1824 and lasted down to 1870. The Panoplist (1805) changed its name to the Missionary Herald, representing the American Board of Missions. The Methodist Magazine dates from 1818 and the Christian Disciple from 1813. The American Biblical Respository (1 831-1850), a quarterly, was united with the Andover Bibliotheca Sacra (1843) and with the Theological Eclectic (1865). Brownson's Quarterly Review began as the Boston Quarterly Review in 1838, and did much to introduce to American readers the works of the modern French philosophical school. Other serials of this class are the Protestant Episcopal Quarterly Review (1854), the Presbyterian Magazine (1851-1860), the Catholic World (1865), the Southern Review (1867), the New Jerusalem Magazine (1827), American Baptist M agazine (18 17), the Church Review (1848), the Christian Review (1836), the Universalist Quarterly (1844). Current religious quarterlies are the Chicago American Journal of Theology and the Oberlin Bibliotheca Sacra. The Chicago Biblical World is published monthly.

Among historical periodicals may be numbered the American Register (1806-1811), Stryker's American Register (1848-1851), Edwards's American Quarterly Register (1829-1843), the New England Historical and Genealogical Register (1847), Folsom's Historical Magazine (1857), the New York Genealogical Record (1869), and the Magazine of American History (1877). There is also the Lancaster, Pennsylvania, American Historical Review, issued quarterly.

Many serial publications have been almost entirely made up of extracts from English sources. Perhaps the earliest example is to be found in Select Views of Literature (1811-1812). The Eclectic Magazine (1844) and Littell's Living Age (1844) may be mentioned. In 1817 America possessed only one scientific periodical, the Journal of Mineralogy. Professor Silliman established the journal known by his name in 1818. Since that time the American Journal of Science has enjoyed unceasing favour. The special periodicals of the day are very

numerous. Among the most representative are: the Popular Science Monthly, New York; the monthly Boston Journal of Education; the quarterly American Journal of Mathe- matics, Baltimore ; the monthly Cassier's Magazine (1 89 1) , New York ; the monthly American Engineer (1893), New York; the monthly House and Garden, Philadelphia; the monthly Astrophysical Journal, commenced as Sidereal Messenger (1882), Chicago; the monthly American Chemical Journal, Baltimore; the monthly American Naturalist, Boston; the monthly American Journal of the Medical Sciences, Philadelphia; the monthly Outing, New York; the weekly American Agriculturist, New York; the quarterly Metaphysical Magazine (1895) New York; the bi-monthly American Journal of Sociology, Chicago; the bi-monthly American Law Review, St Louis; the monthly Banker's Magazine, New York; the quarterly American Journal of Philology (1880), Baltimore; the monthly Library Journal (1876), New York; the monthly Public Libraries, Chicago; the weekly Scientific American, New York; the quarterly American Journal of Archaeology (1885), New York.

The number of periodicals devoted to light literature and to female readers has been, and still remains, extremely large. The earliest

in the latter class was the Lady's Magazine (1792) of Philadelphia. The Lowell Offering (1841) was written by factory girls of Lowell {q.v.), Mass. Godey's Lady's Book was long popular, and the Ladies Home Journal (1883) and the Woman's Home Companion (1893) ar e now current. Children's magazines originated with the Young Misses' Magazine (1806) of Brooklyn; the New York St Nicholas (monthly) and the Boston Youth's Companion (weekly) are promi- nent juveniles.

The total of American periodicals mentioned in the Guide by H. 0. Severance and C. H. Walsh (1909, Ann Arbor), is 5136 for the year 1908.

Authorities. — The eighth volume of the Tenth Report of the United States Census (1884) contains a statistical report on the newspaper and periodical press of America by S. N. D. North. See also Cucheval Clarigny, Ilistoire de la presse en Angleterre et aux Etats Unis (1857); H. Stevens, Catalogue of American Books in the Library of the British Museum (1866), and American Books with Tails to 'em (1873); I. Thomas, History of Printing in America (Albany, 1874) ; J. Nichol,

American Literature (1882) ; ” Check List of American Magazines,” in Library Journ., xiv. 373; G. P. Rowell & Co.‘s American Newspaper Directory (New York) ; A. R. Spofford, Book for all Readers (1900); F. W. Faxon’s Check list of American and English Periodicals (Boston, 1908). Many American libraries co-operate in issuing joint or union lists of periodicals. See list of these as well as lists of special indexes in A. B. Kroeger’s Guide to Reference Books (2nd ed., Boston, 1908).

Indexes to Periodicals. — The contents of English and American periodicals of the last 100 years are indexed in the following publications: W. F. Poole’s Index to Periodical Literature (1802-1881, revised ed., Boston, 1891); 1st supplement, 1882-1887, by W. F. Poole and W. I. Fletcher, 1888; 2nd supplement, 1887-1892, by W. I. Fletcher, 1893; 3rd supplement, 1892-1896, by W. I. Fletcher and F. O. Poole, 1898; 4th supplement, 1897-1902, 1902; 5th supple- ment, 1902-1907, 1908; Poole’s Index, abridged edition, by W. I. Fletcher and M. Poole (Boston, 1901); 1st supplement, 1900-1904 (Boston, 1905) ; The Co-operative Index to Periodicals (1885-1894, ed. W. I. Fletcher, 1 886-1 894); The Annual Literary Index, including Periodicals, ed. by W. I. Fletcher and R. R. Bowker (New York, 10 vols., 1892-1907) ; “Index of Periodicals. for 1890,” &c. (Review of Reviews), by Miss Hetherington (13 vols., 1 891-1902) ; Q. P. Indexes; Cotgreave’s Contents Subject Index to General and Periodical Literature (1900) ; Cumulative Index to a Selected list of Periodicals, begun in the Cleveland Public Library in 1896 and 1897 by W. H. Brett, merged in 1903 with the Reader’s Guide to Periodical Literature (8 vols., 1 901-1908, ed. by A. L. Guthrie, Minneapolis, U.S.) ; Magazine Subject Index, by F. W. Faxon (Boston, 1908), continued quarterly in Bulletin of Bibliography, which in 1907 began a magazine subject index; Eclectic Library Catalogue (Minneapolis, 1908), issued quarterly.

Canada Canadian periodicals have reached a higher standard than in any other British self-governing colony. Like that of South Africa, the press is bi-lingual. The first Canadian review, the Quebec Magazine (1791-1793), was published quarterly in French and English. It was followed by the British American Register (Quebec, 1803), L’Abeille canadienne (Montreal, 1818), edited by H. Mezigre, the Canadian Magazine (Montreal, 1823-1825), the Canadian Review (Montreal, 1824-1826), La Bibliothique canadienne (Montreal, 1825-1830), continued as L’ Observateur (1830-1831), and the Magasin du Bas-Canada (Montreal, 1832). The three latter’ were edited by Michel Bibaud. The Literary Garland (Montreal, 1838-1850), edited by John Gibson, was for some time the only English magazine published in Canada. Later magazines were L’Echo du cabinet du lecture paroissial (Montreal, 1859), 15 vols.; Le Foyer canadien (Quebec, 1863-1866),

one of the most interesting French-Canadian reviews; La Revue canadienne, which was started at Montreal in 1864, and contained the best writings of contemporary French-Canadian litterateurs ; La Revue de Montreal (1877-1881), edited by the abbe T. A. Chandonnet; the Canadian Journal (Toronto), commenced in 1852 under Henry Youle Hind and continued by Daniel Wilson; L'Abeille (Quebec, 1848-1881), and the Canadian Monthly (Toronto, 1872-1882). The Bystander (Toronto, 1 880-1 883), was edited by Galdwin Smith. Le Canada francais (Quebec, 1888-1891), edited by the staff of the Laval University, and Canadiana (1889-1890), were important historical and literary reviews. Contemporary magazines are the Canadian Magazine (1893), the Westminster, both produced at Toronto, La Nouvelle-France (Quebec), the Canada Monthly (London, Ontario), and the University Magazine, edited by Professor Macphail, of the McGill University.

See H. J. Morgan, Bibliotheca canadensis (1867), " Canadian Magazines, ' by G. Stewart, Canadian Monthly, vol. xvii.; " Periodi- cal Literature in Canada," ty J. M. Oxley, North Am. Rev. (1888); P. Gagnon, Essai de bibliographie canadienne (1895), and S. E. Dawson, Prose Writers of Canada (1901). South Africa The earliest magazine was the South African Journal, issued by the poet Pringle and John Fairbairn in 1824. It was followed by the South African Quarterly Journal (1829-1834), the Cape of Good Hope Literary Gazette (1830-1833), edited by A. J. Jardine, the Cape

of Good Hope Literary Magazine (1847-1848), edited b>' J. L. Fitz-patrick, and the Eastern Province Monthly Magazine, published at Grahamstown in 1857-1858. A Dutch periodical called Elpis, alge-meen tijdschrift voorZuid Afrika (1857-1861) appealed to the farming community. The Eastern Province Magazine was issued at Port Elizabeth in 1861-1862, and the South African Magazine appeared in 1 867-1 868. The Orange Free Stale Magazine, the only English magazine published at Bloemfontein, was issue'd in 1877-1878; and the E. P. Magazine was published at Grahamstown in 1892- 1897. The Cape Monthly Magazine, the most important of the periodicals, was issued from 1857 to 1862, and was again continued under the editorship of Professor Noble from 1870 to 1881. The Cape Illustrated Magazine (1 890-1 899) was edited by Professor J. Gill. In Durban the Present Century was started in 1903, and the Natal Magazine was issued at Pietermaritzburg in 1877. The weekly New Era (1904-1905) was succeeded by the South African Magazine (1906-1907) ; both were edited by C. H. Crane. The African Monthly (Grahamstown, 1907) and the State of South Africa (Cape Town, 1909) are monthly reviews, while the South African Railway Magazine (1907) is of wider

interest than its name denotes. See S. Mendelssohn, South African Bibliography (2 vols., 1910); and P. E. Lewin, Catalogue of the Port Elizabeth Library (2 vols.,

1906).

Australia and New Zealand New South Wales. — The Australian Magazine was published monthly at Sydney in 1821-1822. This was followed by the South Asian Register (1827), the Australian Quarterly Journal (1828), edited by the Rev. P. N. Wilton, the New South Wales Magazine (1833), the New South Wales Literary, Political and Commercial Advertiser (1835), edited by the eccentric Dr Lhotsky, Tegg's Monthly Magazine (1836), the Australian Magazine (1838), the New South Wales Magazine (1843), the Australian Penny Journal (1848) and many others. The Sydney University Magazine (1855), again published in 1 878-1 879, and continued as the Sydney University Review, is the first magazine of a high literary standard. The Sydney Magazine of Science and Art (1857) and the Month (1857) were short-lived. Of later magazines the Australian (1878- 1881), Aurora australis (1868), and the Sydney Magazine (1878), were the most noteworthy. Of contemporary magazines Dalgety's Review is mainly agricultural, the Australian Magazine (1909) and the Lone Hand (1907) are popular, and the Science of Man is an anthropological review.

See Australasian Bibliography (Sydney, 1893) ; G. B. Barton, Literature of N. S. W. (1866); E. A. Petherick, Catalogue of Books Relating to Australasia (1899).

Victoria. — The Port Phillip Magazine (1843) must be regarded as the first literary venture in Victoria. This was followed by the Australia Felix Magazine (1849), and the Australasian Quarterly Reprint (1850-1851) both published at Geelong, the Illustrated Australian Magazine (1 850-1 852), the Australian Gold-Digger's Monthly Magazine (1852-1853), edited by James Bonwick, and the Melbourne Monthly Magazine (1855-1856). The Journal of Austral- asia (1856-1858), the Australian Monthly Magazine (1865-1867), which contained contributions from Marcus Clarke and was con- tinued as the Colonial Monthly (1867-1869), the Melbourne Review (1876-1885) and the Victorian Review (1879-1886) may also be mentioned. The Imperial Review, apparently the work of one pen, has been published since 1879; the Pastoralists' Review appeals more especially to the agricultural community. A Library Record of Australasia was published in 1901-1902. An Australian edition of the Review of Reviews is published at Melbourne.

See " Some Magazines of Early Victoria," in the Library Record of Australasia, Nos. 2-4 (1901).

South Australia.— The South Australian Magazine was issued monthly in 1841-1843, the Adelaide Magazine (1845), the Adelaide Miscellany (1848-1849), and the Wanderer in 1853. The South Australian Twopenny Magazine was published at Plymouth, England, in 1839, and the South Australian Miscellany and New Zealand Review at London in the same year.

See T. Gill, Bibliography of South Australia (1886). Tasmania. — The first magazine was Murray's Austral-Asiatic Review, published at Hobart in 1828. The Hobart Town Magazine appeared in 1 833-1 834, and the Van Diemen's Land Monthly Magazine in 1835.

New Zealand. — The New Zealand Magazine, a quarterly, was published at Wellington in 1850. In 1857 appeared the New Zealand Quarterly Review, of little local interest, followed by Chap- man's New Zealand Monthly Magazine (1862), the Southern Monthly Magazine (1863), the Delphic Oracle (1866-1870), the Stoic (1871), the Dunedin Review (1885), the Literary Magazine (1885), the four latter being written by J. G. S. Grant, an eccentric genius, the Monthly Review (1888-1890), the New Zealand Illustrated Magazine

(1899-1905), chiefly devoted to the light literature of New Zealand subjects, the Maori Record (1905-1907), and the Red Funnel, published since 1905.

See T. M. Hocken, Bibliography of New Zealand (1909).

West Indies and British Crown Colonies In Jamaica the Columbian Magazine was founded at Kingston in 1796 and ceased publication in 1800. Two volumes were

published of a New Jamaica Magazine which was started about 1798. The Jamaica Magazine (1812-1813), the Jamaica Monthly Magazine (1844-1848), and the Victoria Quarterly (1889-1892), which contained many valuable articles on the West Indies, were other magazines. The West Indian Quarterly was published at George- town, British Guiana, from 1885 to 1888. At Georgetown was also published the well-known Timehri (1882-1898) which contained many important historical articles. In Trinidad the Trinidad Monthly Magazine was started in 1 87 1, and the Union Magazine in 1892'.

Malta had a Malta Penny Magazine in 1839-1841, and the Revue historique et litteraire was founded in Mauritius in 1887. Many magazines dealing with the colonies have been published in England, such as the Colonial Magazine (1840-1843).

See F. Cundall, Bibliographia Jamaicensis (1902-1908).

India and Ceylon

Calcutta. — The first Indian periodical was the Asialick Mis- cellany (Calcutta, 1 785-1 789), probably edited by F. Gladwin. The Calcutta Monthly Register was published in 1790, and the Cal- cutta Monthly Journal from 1798 to 1841. Among other early Calcutta magazines were the Asiatic Observer (1823-1824), the Quarterly Oriental Magazine (1824-1827), and the Royal Sporting Magazine (1833-1838). The Calcutta Literary Gazette was published in 1 830-1 834, and the Calcutta Review, still the most important serial of the Indian Empire, first appeared in 1846 under the editor- ship of Sir J. W. Kaye.

Bombay. — The Bombay Magazine was started in 181 1 and lasted but a short time. The Bombay Quarterly Magazine (1851-1853) gave place

to the Bombay Quarterly Review, issued in 1855.

Madras. — Madras had a Journal of Literature and Science and the Oriental Magazine and Indian Hurkuru (1819). The Indian Antiquary was started at Bombay in 1872 and still continues. Of other contemporary magazines the Hindustan Review (Allahabad), the Modern Review (Calcutta), the Indian Review (Madras), the Madras Review, a quarterly first published in 1895, and the Calcutta University Magazine (1894), are important.

Ceylon. — In Ceylon the Religious and Theological Magazine was started at Colombo in 1833, the Colombo Magazine in 1839, the Ceylon Magazine in 1840, and the Investigator at Kandy in 1841. Of contemporary magazines the Tropical Agriculturist was started in 1881, the Ceylon Literary Register (1886-1896), afterwards the Monthly Literary Register and the Ceylon National Review in 1893. In Burma the quarterly Buddhism appeared in 1904. Singapore had a Journal of the Indian Archipelago from 1847 to 1859, and the Chinese Repository (1832-1851) was edited at Carton by Morrison.

See ” Periodical Literature in India,” in Dark Blue (1872-1873).

France

We owe the literary journal to France, where it soon attained to a degree of importance unapproached in any other country. The first idea may be traced in the Bureau d’adresse (1633-1642) of Theophraste Renaudot, giving the proceedings of his conferences upon literary and scientific matters. About the year 1663 Mezeray obtained a privilege for a regular literary periodical, which came to nothing, and it was left to Denis de Sallo. counsellor of the parliament of Paris and a man of rare merit and learning, to actually carry the project into effect. The first number of the Journal des savants appeared on the 5th of January 1665, under the assumed name of the sieur d’Hedouville. The prospectus promised to give an account of the chief books published throughout Europe, obituary notices, a review of the progress of science, besides legal and ecclesiastical information and other matters of interest to cultivated persons. The criticisms, however, wounded alike authors and the clergy, and the journal was suppressed after a career of three months. Colbert, seeing the public utility of such a periodical, ordered the abbe Gallois, a contributor of De Sallo’s, to re-establish it, an event which took place on the 4th of January 1666. It lingered nine years under the new editor, who was re- placed in 1675 by the abbe de la Roque, and the latter in his turn by the president Cousin, in 1686. From 1 701 commenced a new era

for the Journal, which was then acquired by the chancellor de Pontchartrain for the state and placed under the direction of a commission of learned men. Just before the Revolution it de- veloped fresh activity, but the troubles of 1792 caused it to be discontinued until 1796, when it again failed to appear after twelve numbers had been issued. In 1816 it was definitely re-established and replaced under government patronage, remaining subject to the chancellor or garde-des-sceaux until 1857, when it was trans- ferred to the control of the minister of public instruction. Since 1903 the organization of the publication has changed. The state subsidy having been withdrawn, the Institute voted a yearly subscription of 10,000 francs and nominated a commission of five members, one for each section, who managed the Journal. Since 1909, however, the various sections have left to the Academie des Inscriptions et Belles Lettres the entire direction of the Journal, while still paying the annual subsidy. It now restricts itself to publishing contributions relating to antiquities and the middle ages and Oriental studies.

Louis Augiiste de Bourbon, sovereign prince of Dombes, having transferred his parliament to Trevoux, set up a printing press, and was persuaded by two Jesuits, Michel le Tellier and Philippe Lalle- man, to establish the Memoires pour servir a I'histoire des sciences et des arts (1701-1767), more familiarly known as the Journal des Trevoux, long the best -informed and best-written journal in France. One feature of its career was its constant appeal for the literary assistance of outsiders. It was continued in a more popular style as Journal des sciences et des beaux-arts (1768-1775) by the abbe Aubert and by the brothers Castilhon (i776-i778),and as Journal de litterature, des sciences, et des arts (1779-1782) by the abbe Grosier.

The first legal periodical was the Journal du palais (1672) of Claude Blondeau and Gabriel Gueret, and the first devoted to medicine the Nouvelles decouvertes dans toutes les parties de la medecine (1679) of Nicolas de Blegny, frequently spokenˆ of as a charlatan, a term which sometimes means simply a man of many ideas. Religious periodicals date from 1680, and the Journal ecclisiastique of the abbe de la Roque, to whom is also due the first medical journal (1683). The prototype of the historico-literary periodical may be discovered in La Clef du cabinet des princes de V Europe { 1704- 1706), familiarly known as Journal de Verdun, and carried on under various titles down to 1794.

Literary criticism was no more free than political discussion, and no person was allowed to trespass either upon the domain of the Journal des savants or that of the Mercure de France (see News- papers)

without the payment of heavy subsidies. This was the origin of the clandestine press of Holland, and it was that country which for the next hundred years supplied the ablest periodical criticism from the pens of French Protestant refugees. During that period thirty-one journals of the first class proceeded from these sources. From its commencement the Journal des savants was pirated in Holland, and for ten years a kind of joint issue made up with the Journal des Trevoux appeared at Amsterdam. From 1764 to 1775 miscellaneous articles from different French and English reviews were added to this reprint. Bayle, a born journalist and the most able critic of the day, conceived the plan of the Nouvelles de la republique des lettres (1684-1718), which at once became entirely successful and obtained for him during the three years of his control the dictatorship of the world of letters. He was succeeded as editor by La Roque, Barrin, Bernard and Leclerc. Bayle's method was followed in an equally meritorious periodical, the Histoire des ouvrages des Savants (1687-1704) of H. Basnage de Beauval. Another continuator of Bayle was Jean Leclerc, one of the most learned and acute critics of the 1 8th century, who carried on three reviews — the Bibliotheque universelle et historique (1686- ID 93). the Biblioiheque choisie (1703-1713), and the Bibliotheque ancienne et moderne (1714-1727). They form one series, and, besides valuable estimates of new books, include original disserta- tions, articles and biographies like our modern learned magazines. The Journal litteraire (1713-1722, 1 729-1 736) was founded by a society of young men, who made it a rule to discuss their con- tributions in common. Specially devoted to English literature were the Bibliotheque anglaise (1716-1728), the Memoires litteraires de la Grande Bretagne (1720-1724), the Bibliotheque britannique (I 733 _I 734). and the Journal britannique (1750-1757) of Maty, 1 who took for his principle, " pour penser avec liberte il faut penser seul." One of these Dutch-printed reviews was L'Europe savante (1718-1720), founded chiefly by Themiseul de Saint-Hyacinthe, with the intention of placing each separate department under the care of a specialist. The Bibliotheque germanique (1720-1740) was established by Jacques Lenfant to do for northern Europe what the Bibliotheque britannique did for England. It was followed by the Nouvelle bibliotheque germanique (1746-1759). The Biblio- theque raisonnee des ouvrages des savants (1728-1758) was supple- mentary to Leclerc, and was succeeded by the Bibliotheque des sciences et des beaux-arts (1754-1780). Nearly all of the preceding were produced either at Amsterdam or Rotterdam, and, although out of place in a precise geographical arrangement, really belong to France by the close ties of language and of blood.

Taking up the exact chronological order again, we find the success of the English essay-papers led to their prompt introduction to the Continent. An incomplete translation of the Spectator was published at Amsterdam in 1714, and many volumes of extracts from the Tatler, Spectator and Guardian were issued in France early in the 1 8th century. Marivaux brought out a Spectateur Francais (1722), which was coldly received; it was followed by fourteen or fifteen others, under the titles of La Spectatrice (1728- 1730), Le Radoteur (1775), Le Babillard (1778-1779), &c. Of a similar character was Le Pour et le contre (1723-1740) of the abb£ Prevost, which contained anecdotes and criticism, with special reference to Great Britain. Throughout the 18th century, in France as in England, a favourite literary method was to write of social subjects under the assumed character of a foreigner, generally an

1 Matthew Maty, M.D., born in Holland, 1718, died principal librarian of the British Museum, 1776. He settled in England in 1740, published several books, and wrote the preface to Gibbon'' first work, Etude de la litterature.

Oriental, with the title of Turkish Spy, Lettres chinoises, &c. These productions were usually issued in periodical form, and, besides an immense amount of worthless tittle-tattle, contain some valuable matter.

During the first half of the century France has little of impor- tance to show in periodical literature. The Nouvelles ecclesiastiques (1 728-1803) were first printed and circulated secretly by the Jansen- ists in opposition to the Constitution unigenitus. The Jesuits retaliated with the Supplement des nouvelles ecclesiastiques (1734- 1748). The promising title may have had something to do with the temporary success of the Memoires secrets de la republique des lettres (1744-1748) of the marquis d'Argens. In the Observations sur Jes ecrits modernes (1 735-1 743) Desfontaines held the gates of Philistia for eight years against the Encyclopaedists, and even the redoubtable Voltaire himself. It was continued by the Jugements sur quelques outrages nouveaux (1744-1745). The name of Freron, perhaps the most vigorous enemy Voltaire ever encountered, was long connected with Lettres sur quelques ecrits de ce temps (1749- 1754), followed by L'Annee litteraire (1754-1790). Among the contributors of Freron was another manufacturer of criticism, the abbe de la Porte, who, having

quarrelled with his confrere, founded Observations sur la litterature moderne (1749-1752) and L ‘Observateur litteraire (1758-1761).

A number of special organs came into existence about this period. The first, treating of agriculture and domestic economy, was the Journal economique (1751-1772); a Journal de commerce was founded in 1759; periodical biography may be first seen in the Necrologe des hommes celebres de France (1764-1782); the political economists established the Ephemcrides du ciloyen in 1765; the first Journal a” education was founded in 1768, and the Courrier de la mode in the same year ; the theatre had its first organ in the Journal des theatres (1770); in the same year were produced a Journal de musique and the Encyclopedic militaire; the sister service was supplied with a Journal de marine in 1778. We have already noticed several journals specially devoted to one or other foreign literature. It was left to Freron, Grimm, Prevost and others in 1754 to extend the idea to all foreign productions, and the Journal etranger (1754-1762) was founded for this purpose. The Gazette litteraire (1764-1766), which had Voltaire, Diderot and Saint- Lambert among its editors, was intended to swamp the small fry by criticism; the Journal des dames (1759-1778) was of a light magazine class; and the Journal de monsieur (1776-1783) had three phases of existence, and died after extending to thirty volumes. The Memoires secrets pour servir a I’histoire de la republique des lettres (1762-1787), better known as Memoires de Bachaumont, from the name of their founder, furnish a minute account of the social and literary history for a period of twenty-six years. Of a similar character was the Correspondance litteraire secrete (1774-1793), to which Metra was the chief contributor. L’ Esprit des Journaux (1772-18 1 8) forms an important literary and historical collection, which is rarely to be found complete.

The movement of ideas at the close of the century may best be traced in the Annates politiques, civiles, et litteraires (1777-1792) of Linguet. The Decade philosophique (year V., or 1796/1797), founded by Ginguene, is the first periodical of the magazine class which appeared after the storms of the Revolution. It was a kind of resurrection of good taste; under the empire it formed the sole refuge of the opposition. By a decree of the 17th of January 1800 the consulate reduced the number of Parisian journals to thirteen, of which the Decade was one; all the others, with the exception of those dealing solely with science, art, commerce and advertise- ments, were suppressed. A report addressed to Bonaparte by Fievee 1 in the year XI. (1802/1803) furnishes a list of fifty-one of these periodicals. In the year XIII. (1804/1805) only seven non- political serials were permitted to appear.

Between 1815 and 1819 there was a constant struggle between freedom of thought on the one hand and the censure, the police and the law officers on the other. This oppression led to the device of " semi-periodical " publications, of which La Minerve francaise (1818-1820) is an instance. It was the Satire Menippee of the Restoration, and was brought out four times a year at irregular intervals. Of the same class was the Bihliotheque historique (1818-1820), another anti-royalist organ. The censure was re-established in 1820 and abolished in 1828 with the monopoly. It has always seemed impossible to carry on successfully in France a review upon the lines of those which have become so numerous and important in England. The Revue britannique (1825-1901) had, however, a long career. The short-lived Revue francaise (1828-1830), founded by Guizot, Rcmusat, De Broglie, and the doctrinaires, was an attempt in this direction. The well-known Revue des deux mondes was estab- lished in 1829 by Segur-Dupeyron and Mauroy, but it ceased to appear at the end of the year, and its actual existence dates from its acquisition in 1 83 1 by Francois Buloz, 2 a masterful editor,

1 The novelist and publicist Joseph FieVce (1767-1839), known for his relations with Napoleon I., has been made the subject for a study by Sainte-Beuve (Causeries, v. 172).

2 This remarkable man (1804-1877) beean life as a shepherd. Educated through the charity of M. Naville, he came to Paris as

under whose energetic management it soon achieved a world-wide reputation. The most distinguished names in French literature have been among its contributors, for whom it has been styled the " vestibule of the Academy." It was preceded by a few months by the Revue de Paris (1829-1845), founded by Veron, who intro- duced the novel to periodical literature. In 1834 this was pur- chased by Buloz, and brought out concurrently with his other Revue. While the former was exclusively literary and artistic, the latter dealt more with philosophy. The Revue independanle (1841- 1848) was founded by Pierre Leroux, George Sand and Viardot for the democracy. The times of the consulate and the empire were the subjects dealt with by the Revue de Vempire (1842-1848). In Le Correspondant (1843), established by Montalembert and De Falloux, the Catholics and Legitimists had a valuable supporter. The Revue contemporaine (1852), founded by the comte de Belval as a royalist organ, had joined to it in 1856 the Athenaeum francais. The Revue_ germanique (1858) exchanged' its exclusive name and character in 1865 to the Revue moderne. The Revue europeenne (1859) was at first subventioned . like the Revue contemporaine, from which it soon withdrew

government favour. The Revue nationale (i860) appeared quarterly, and succeeded to the Magazin de librairie (1858).

The number of French periodicals, reviews and magazines has enormously increased, not only in Paris but in the provinces. In Paris the number of periodicals published in 1883 was 1379; at the end of 1908 there were more than 3500 of all kinds. The chief current periodicals may be mentioned in the following order. The list includes a few no longer published.

Archaeology. — Revue archeologique (i860), bi-monthly; Ami des monuments (1887); Bulletin de numismatique (1891); Revue biblique (1892) ;_ L'Annee ipigraphique (1880) — a sort of supplement to the Corpus inscriptionum latinarum; Celtica (1903) — common to France and England; Gazette numismatique francaise (1897); Revue semitique d'epigraphie et d'histoire ancienne (1893); Bulletin monumental, bi-monthly ; V Intermediate, weekly, the French " Notes and Queries," devoted to literary and antiquarian questions.

Astronomy. — Annuaire astronomique et meteor ologique (1901); Bulletin astronomique (1884), formerly published under the title Bulletin des sciences mathematiques et astronomiques.

Bibliography. — Annates de bibliographie theologique (1888); Le bibliographe moderne (1897); Bibliographie anatomique (1893); Bibliographie scientifique francaise (1902) ; Bulletin des bibliotheques et des archives (1884) ; Bulletin des livres relatifs a V Amerique (1899) ; Courrier des bibliotheques (1910); Repertoire methodique de I'histoire moderne et contemporaine de la France (1898); Repertoire methodique du moyen Age francais (1894); Revue bibliographique et critique des langues et litteratures romanes (1889); Revue des bibliotheques (1891); Polybiblion : revue bibliographique universelle, monthly ; Revue generate de bibliographie francaise, bi-monthly.

Children's Magazines. — L 'Ami de la jeunesse; Le Jeudi de la jeunesse, weekly.

Fashions. — La Mode illustree ; Les Modes, monthly.

Fine Arts. — Les Arts (1902); Gazette des beaux-arts (1859), monthly, with Chronique des arts; Revue de I' art ancien et moderne (1897) monthly; L 'Art decoratif, monthly, Art et decoration, monthly; L'Art pour tous, monthly; La Decoration, monthly; L 'Architecture — journal of the Soc. centrale des Architectes francais, weekly; L'Art (1875) is no longer published.

Geography and Colonies. — Bulletin de gtographie historique; Annates de geographie (1891), with useful quarterly bibliography; Nouvelles geographiques—supp\ement to the Tour du monde 1,1891); La Vie coloniale (1902); La Geographie, monthly, published by the Soc. de Geographie (1900); Revue de geographie, monthly; Revue gkographique Internationale, monthly.

History. — For long the chief organs for history and archaeology were the Bibliotheque de I'ecole des chartes (1835), appearing every two months and dealing with the middle ages, and the Cabinet historique (1855), a monthly devoted to MSS. and unprinted docu- ments. The Revue historique (1876) appears bi-monthly; there is also the Revue d'histoire moderne et contemporaine.

Law and Jurisprudence. — Annates de droit commercial (1877) ; Revue algerienne et tunisienne de legislation et de jurisprudence (1885); Revue du droit public et de la science politique (1894); Revue generate du droit international public (1894).

Literary Reviews. — The Revue des deux mondes and the Corre- spondant have already been mentioned. One of the first of European weekly reviews is the Revue critique (1866). The Revue politique et litteraire, successor to the Revue des cours litte'raires (1863) and known as the Revue bleue, also appears weekly. Others of interest are: AnUe, revue mensuelle de litterature (1904) ; L'Art et la vie (1892) ; Cosmopolis (1896); L'Ermitage (1890); Le Mercure de France, serie moderne (1890), a magazine greatly valued in literary circles; La Revue de Paris, fortnightly (1894), and the Nouvelle Revue (1879) —

a compositor, and by translating from the English earned sufficient to purchase the moribund Revue des deux mondes, which acquired its subsequent position in spite of the tyrannical editorial behaviour of the proprietor. Buloz is said to have eventually enjoyed an income of 365,000 francs from the Revue.

both serious rivals of the Revue des deux mondes; Revue francaise d'Edimbourg (1897); Revue germanique (1905); Le Livre (1880), dealing with bibliography and literary history, and La Revue latine (1902), no longer published; La Revue, monthly.

Mathematics. — Intermediate des malhematiciens (1894); Bulletin des sciences mathematiques (1896); Revue de mathematiques speciales

(1890) ; Journal de mathematiques pures el appliquees, quarterly.

Medicine. — Revue de medecine (1881); Annates de I'Acole de plein exercise de medicine et de pharmacie de Marseille (1891); La Chronique medecale (1893); Revue de gynecologie, bi-monthly; La Semaine medicate, weekly ; Journal d'hygiene, monthly.

Military. — Revue des troupes coloniales, monthly; La Revue d'infantrie, monthly.

Music. — Musica (1902); Revue d'histoire et de critique musicale (1901) ; Annates de la musique; Le Menestral, weekly.

Philology. — L'Annee linguistique (1901-1902) ; Bulletin de la societe des parlers de France (1893); Bulletin des humanites francais (1894); Bulletin hispanique (1899); Bulletin italien (1901); Lou-Gai-Sabi-Antoulongio prouvencalo (1905); Le Maitre phonetique (1886); Le Moyen Age (1888) ; Revue de la renaissance (1901) ; Revue de metrique et de versification (1894-1895) ; Revue des etudes grecques (1888) ; Revue des etudes rabelaisiennes (1903); Revue des parlets populaires (1902); Revue des patois (1887); Revue hispanique (1894); Revue celtique, quarterly; Revue de philologie frangaise et de litterature.

Philosophy and Psychology. — Revue philosophique (1876), monthly; Annates des sciences psychiques (1891); L'Annee philo- sophique (1890), critical and analytical review of all philosophical works appearing during the year; L'Annee psychologique (1894); Journal de psychologie normale et pathologie (1904) ; Bulletin de I'institut general de psychologie (1903); Revue de I'hypnotisme et de la psychologie physiologique (1900); Revue de mStaphysique et de morale (1893); Revue de philosophie (1900); Revue de psychiatrie (i897)-.

Physics and Chemistry. — Bulletin des sciences physiques (1888); V Eclair age electrique (1894); Le Radium (1904); Revue generate des sciences pures et appliquees (1890); Revue pratique de I'electricite

(1892).

Popular and Family Reviews. — A trovers le monde (1898); Femina (1901); Je sais tout (1905); La Lecture moderne (1901); La Revue hebdomadaire (1892); Les Lectures pour tous (1898); Mon bonheur (1902); La Vie heureuse (1902).

Science (General). — La Nature, weekly; Revue scientifique (1863),

weekly; La Science frangaise, monthly. — Science (Applied): Les inventions illustrees, weekly; Revue industrielle, weekly. — Science (Natural) : Archives de biologie; Journal de botanique (1887) ; L'Annee biologique (1895); Revue des sciences nalurelles de Vouest (1891); Revue generale de botanique (1889) ; La Pisciculture pratique (1895). — Science (Political, Sociological and Statistical): Annates economiques (founded as La France commerciale in 1885); L'Annee sociologique (1896-1897); Bulletin de I 'office du travail (1894); Bulletin de V office international du travail (1902) ; Le Mouvement socialiste— international bi-monthly (1899); Notices et comptes rendus de V office du travail (1892); L'Orient et I'abeille du Bosphore (1889); Revue politique et parlementaire (1894); Revue international de sociologie, monthly.

Sports. — L'Aerophile (1893) ; L'Aeronautique (1902) ; V Aerostation (1904) ; La Vie au grand air (1898) ; La Vie automobile (1901) ; Revue de V aeronautique (1888).

Authorities.— The subject of French periodicals has been exhaustively treated in the valuable works of Eugene Hatin — Histoire de la presse en France (8 vols., 1859-1861), Les Gazettes de Hollande et la presse clandestine aux 17′ et 18′ slides (1865), and Bibliographie de la presse periodique francaise (1866). Sete also Catalogue de I'histoire de France (11 vols., 1855-1879), V. Gebe, Catalogue des journaux, &c, publies a Paris (1879); Brunet, Manuel du libraire, avec supplement 48 vols., 1860-1880); F. Mege, Les Journaux et ecrits periodiques de la Basse Auvergne (1869); Bulletin des sommaires des journaux (1888); D. Jordell, Repertoire biblio- graphique des principals revues francaises (3 vols., 1897-1899, 1898-1900), indexes about 350 periodicals; Annuaire de la presse francaise et du monde politique (1909-1910); Le Soudier, Annuaire des journaux, revues et publications periodiques parus d. Paris jusqu' en IQOQ (1910). For lists of general indexes consult Stein, Manuel de bibliographie generale (1897), pp. 637-710.

Germany

The earliest trace of the literary journal in Germany is to be tound in the Erbauhche Monatsunlerredungen (1663) of the poet Johann Rist and in the Miscellanea curiosa medico-physica (1670- 1704) of the Academia naturae curiosorum Leopoldina-Carolina, the first scientific annual, uniting the features of the Journal des savants and of the Philosophical Transactions. D. G. Morhof, the author of the well-known Polyhistor, conceived the idea of a monthly serial to be devoted to the history of modern books and learning, which came to

nothing. While professor of morals at Leipzig, Otto Mencke planned the Acta eruditorum, with a view to make known, by means of analyses, extracts and reviews, the new works produced throughout Europe. In 1680 he travelled in England and Holland in order to obtain literary assistance, and

the first number appeared in 1682, under the title of Acta eruditorum lipsiensium, and, like its successors, was written in Latin. Among the contributors to subsequent numbers were Leibnitz, Seckendorf and Cellarius. A volume came out each year, with supplements. After editing about thirty volumes Mencke died, leaving the publication to his son, and thereto remained in the possession of the family down to 1745, when they extended to 117 volumes, which form an extremely valuab'e history of the learning of the period. A selection of the dissertations and articles was pub- lished at Venice in 7 vols. 4to (1740). The Acta soon had imitators. The Ephemerides litterariae (1686) came out at Hamburg in Latin and French. The Nova litteraria maris Balthici et Septentrionis (1698- 1 708) was more especially devoted to north Germany and the universities of Kiel, Rostock and Dorpat. Supplementary to the preceding was the Nova litteraria Germaniae collecta Hamburgi (1 703-1 709), which from 1707 widened its field of view to the whole of Europe. At Leipzig was produced the Teutsche acta eruditorum (1712), an excellent periodical, edited by J. G. Rabener and C. G. Jocher, and continued from 1740 to 1758 as Zuverldssige Nachrichten. It included portraits.

The brilliant and enterprising Christian Thdmasius brought out periodically, in dialogue form, his Monatsgesprdche (1688-1690), written by himself in the vernacular, to defend his novel theories against the alarmed pedantry of Germany, and, together with Strahl, Buddeus and others, Observationes selectae ad rem litterariam spectantes (1700), written in Latin. W. E. Tenzel also published Monalliche Unterredungen (1689-1698), continued from 1704 as Curieuse Bibliothek, and treating various subjects in dialogue form. After the death of Tenzel the Bibliothek was carried on under differ- ent titles by C. Woltereck, J. G. Krause and others, down to 1721. Of much greater importance than these was the Monatlicher Auszue (1701), supported by J. G. Eccard and Leibnitz. Another periodical on Thomasius's plan was Neue Unterredungen (1702), edited by N. H. Gundling. The Gundlingiana of the latter person, published at Halle {1715-171,2), and written partly in Latin and partly in German by the editor, contained a miscellaneous collection of juridical, historical and theological observations and dissertations.

Nearly all departments of learning possessed their several special

periodical organs about the close of the 17th or the beginning of the 1 8th century. The Anni franciscanorum (1680) was edited by the Jesuit Stiller; and J. S. Adami published, between 1690 and 1713, certain theological repertories under the name of Deliciae. Historical journalism was first represented by Electa juris publici (T 7°9) > philology by Neue acerra philologica (1715-1723), philosophy by the Acta philosophorum (1715-1727), medicine by Der patriotische Medikus (1725), music by Der musikalische Patriot (1725), and education by Die Matrone (1728). Reference has already been made to the Miscellanea curiosa medico-physica (1670-1704); the Monalliche Erzdhlungen (1689) was also devoted to natural science.

Down to the early part of the 1 8th century Halle and Leipzig were the headquarters of literary journalism in Germany. Other centres began to feel the need of similar organs of opinion. Hamburg had its Niedersdchsische neue Zeitungen, styled from 1731 Nieder- sachsische Nachrichten, which came to an end in 1736, and Mecklen- burg owned in 1 7 10 its Neuer Vorrath, besides others brought out at Rostock. Prussia owes the foundation of its literary periodicals to G. P. Schulze and M. Lilienthal, the former of whom began with Gelehrtes Preussen (1722), continued under different titles down to 1729; the latter helped with the Erldutertes Preussen (1724), and was the sole editor of the Acta borussica (1730-1732). Pomerania and Silesia also had their special periodicals in the first quarter of the 18th century. Franconia commenced with Nova litteraria, and Hesse with the Kurze Historie, both in 1725. In south Germany appeared the Wurttembergische Nebenstunden (1718), and the Par- nassus boicus, first published at Munich in 1722. The Frankfurter gelehrte Zeitungen was founded in 1736 by S. T. Hocker, and existed down to 1790. Austria owned Das merkwiirdige Wien.

In 1715 the Neue Zeitungen von gelehrten Sachen was founded by J. G. Krause at Leipzig and carried on by various editors down to I797 : It was the first attempt to apply the form of the weekly political journal to learned subjects, and was imitated in the Ver- mischte Bibliothek (1718-1720) and the Bibliotheca novissima (1718- 1721), both founded by J. G. Francke in Halle. Shortly after the foundation of the university of Gottingen appeared Zeitungen von gelehrten Sachsen (1739), still famous as the Gbttingische gelehrte Anzeigen, which during its long and influential career has been conducted by professors of that university, and among others by Halier, Heyne and Eichhorn.

Influenced by a close study of English writers, the two Swiss, Bodmer and Breitinger, established Die Discurse der Maler (1721), and by paying more attention to the matter of works reviewed than to their

manner, commenced a critical method new to Germany. The system was attacked by Gottsched, who, educated in the French school, erred in the opposite direction. The struggle between the two parties gave fresh life to the literature of the country but German criticism of the higher sort can only be said really to begin with Lessing. The Berlin publisher Nicolai founded the Bibliothek der schonen Wissenschaften, and afterwards handed it oyer to C. F. Weisse in order to give his whole energy to the Briefe, die neueste Literatur betreffend (1759-1765), carried on by the help

of Lessing Mendelssohn and Abbt. To Nicolai Ls also due the Allgemeine deutsche Bibliothek (1 765-1 806), which embraced a much wider field and soon became extremely influential. Herder founded the Kritische Walder in 1766. Der deutsche Merkur (1771-1780 revived 1790-1810) of Wieland was the solitary representative of the trench school of criticism. A new era in German periodical literature began when Bertuch brought out at Jena in 1785 the AUgemeine Literaturzeitung, to which the leading writers of the country were contributors. On being transferred to Halle in 1804 it was replaced by the Jenaische allgemeine Literaturzeitung, founded by bichstadt. Both reviews enjoyed a prosperous career down to the year 1848.

At the beginning of the 19th century we find the Erlanger Literatur-zeitung (1799-1810), which had replaced a Gelehrte Zeitung (1746) • 1 -i. » h ei f Zlg 7 literaturzeitung (1800-1834); the Heidelbergische Jahrbucher der Liter atur (1 808-1 872); and the Wiener Literatur-zeitung (1813-1816), followed by the Wiener Jahrbucher der Literatur U8I8-1848), both of which received government support and resembled the English Quarterly Review in their conservative politics and high literary tone. Hermes, founded at Leipzig in 1819 by W. T. Krug, was distinguished for its erudition, and came out down to 1 83 1 One of the most remarkable periodicals of this class was the Jahrbucher fur wissenschaftiiche Kritik (1827-1846) first published by Cotta. The Hallische Jahrbucher (1 838-1 842) was lounded by Ruge and Echtermeyer, and supported by the government. The Repertorium der gesammten deutschen Literatur established by Gersdorf in 1834, and known after 1843 as the Leipziger Repertorium der deutschen und ausldndischen Literatur existed to i860. Buchner founded the Literarische Zeitung at Berlin in 1834. It was continued by Brandes down to 1849. The political troubles of 1848 and 1849 were most disastrous to the welfare of the literary and miscellaneous periodicals. Gersdorf's Repertorium the Gelehrte Anzeigen of Gottingen and of

Munich, and the Heidel bergische Jahrbucher were the sole survivors. The Allgemeine Monatschrift fur Literatur (1850), conducted after 1851 by Droysen Nitzfch and others, continued only down to 1854; the Literarisches Centralblatl (1850) is still published. The Blatter filr literarische Unternaltung sprang out of the Literarisches Wochenblatt (1818) founded by Kotzebue; after 1865 it was edited by R. Gottschall with considerable success. Many of the literary journals did not disdain to occupy themselves with the fashions, but the first periodical of any merit specially devoted to the subject was the Dazar (1855). The first to popularize science was Natur (1852). I he Hausblatter (1855), a bi-monthly magazine, was extremely successful. The Salon (1868) f ollowed more closely the type of the knghsh magazine. About this period arose a great number of weekly serials for popular reading, known as ” Sonntagsblatter ” of which the Gartenlaube (1858) and Daheim (1864) are surviving examples. ”

In course of time a large number of similar publications were issued, some illustrated, for instance: Illustrierte Zeitung (Leipzig 1843), Berliner Illustrierte Zeitung (1892), Die Woche (1899) the last the most widely circulated of the kind, 500,000 beinsr printed. s

At a somewhat earlier date commenced a long series of weekly and monthly periodicals of a more solid character, of which the following list indicates the more important in chronological order: Die Lrrenzbolen (1862), weekly; the Deutsches Museum (1851-1857) of

»J UtZ , W? To en if 1; Ber H ner R ™™ (1855-1873); Westerma’nns Monatshefte (1856), monthly; Unsere Zeit (1857-1891), beginning as a kind of supplement to Brockhaus’s Conversationslexikon ; Preussische Jahrbucher (1858), monthly; Deutsches Magazin (1861-1863); Die Gegenwart (1873), weekly; Konservative Monatsschrift r ! 7 A P£ ece ded by the Volksblatt fiir Stadt und Land (1843); Deutsche Rundschau (1874), fortnightly, conducted upon the method oi the Revue des deux mondes; Deutsche Revue (1876), monthly Nord und Sud (1877), monthly; Das Echo (1882), weekly; Die Zukunft (1882) weekly; Die neue Zeit (1883), weekly; Reclams Unwersum (1884), weekly; Velhagen und Klasings Monatshefte V,,, 9 ‘,’ . m ? nthl y; D ie deutsche Rundschau (1890), monthly; Die Wahrheit (1893-1897); Kritik (1894-1902); Die Umschau (1897), weekly; Das literarische Echo (1898), fortnightly; Kynast (1898- 1899), known later as Deutsche Zeitschrift (1899-1903) and Iduna (1903-1906) ; Der Turmer (1898), monthly; Die Warte (1900), weekly Deutschland (1902-1907); Deutsche Monatsschrift (1902-1907)-‘ Hochland (1903), monthly; Charon (1904), monthly; Suddeutsche Monatshefte (1904) ; Der Deutsche (1905-1908); Deutsche Kultur y9°5~i9o8); Arena (1906),

monthly; Das Blaubuch (1906), weekly; Eckart (1006), monthly; Die Standarte (1906), weekly; Mdrz (1907) fortnightly; Morgen (1907), weekly; Neue Revue (1907), weekly Internationale Wochenschrift fur Wissenschaft, Kunst, und Technik U907), weekly supplement to the Miinchener allgemeine Zeitung- Wissen (1907). weekly; Unsere Zeit (1907), monthly; Hyperion (190b), bi-monthly; Xenien (1908), monthly; Das neue Jahrhundert (1909), rnonthly; Die Tat (1909), monthly.

Fenodicals have been specialized in Germany to an extent perhaps unequalled in any other country. No subject of human interest is now without one or indeed several organs. Full details oi these serials are supplied by a special class of periodical with which every department of science, art and literature in German-

speaking countries is equipped, the Jahresberichte and Bibliographien which give each year a full account of the literature of the subject with which they are concerned. The chief of these are :— „ Bibliography and Librarianship : Bibliographic des Buch- und Biblwthekswesens (1905); Chemistry: Jahresbericht uber die Fortschritte der Chemie (1847); Classical Archaeology and Philology Jahresbericht uber die Fortschritte der klassischen Altertumswissenschaft (1873); Education: Jahrbuch der padagogischen Literatur (1901); Geography: Geographisches Jahrbuch (1874); Bibliotheca geographica (1891); History: Jahresberichte der Geschichtswissenschaft (1878); Fine Arts: Internationale Bibliographic der Kunslwissenschaft (1902); Law and Political Economy: Uebersicht der gesamten staats- und rechtswissenschafllichen Literatur (1868) ■ Junsprudentia Germaniae (1905); Bibliographic des burgerlichen Rechts (1888); Bibhographie der Sozialwissenschaften (1905); Bibliographic fur Sozial- und Wirtschaftsgeschichte (1903); Bibliographie fur Volkswirtschaftslehre und Rechtswissenschaft (1906); Literature and Languages: Bibliographie der vergleichenden Liter atur geschichte (1903); Jahresberichte fiir neuere deutsche Literaturgeschichte (1890)- Jahresbericht uber die Erscheinungen auf dem Gebiete der germanischen Philologie (1879); Uebersicht uber die auf dem Gebiete der englischen Philologie erschienenen Bilcher, Schnften, und Aufsdtze (1878) • Krihscher Jahresbericht uber die Fortschritte der romanischen Philo- logie (1875); Bibliographie fiir romanische Philologie— Supl. zur toiosJ' l oman – Philologie (1875); Orientalische Bibliographie (1888); Mathematics: Jahrbuch uber die Fortschritte der Mathematik (1869) ; Medicine and Surgery: Jahresbericht uber die Leistungen und Fortschritte der gesamten

Medizin (1866); Jahresbericht uber die Leistungen auf dem Gebiete der Veterindrmedizin ‘ (1881); Military Jahresbericht uber Verdnderungen und Fortschritte im Militarwesen (1874); Jahresbericht uber die Leistungen und Fortschritte auf dem Gebiete des Mihtdrsanitatswesens (1873); Natural Science: Naturae noyitates (1879), fortnightly; Bibliographie der deutschen natur-wissenschafthchen Literatur (1901); Bibliographia zoologica (1896) • Zoologischer Jahresbericht (1879); Justs botanischer Jahresbericht (1873) ;Dte Fortschritte der Physik (1847) ; Technicology : Repertorium der technischen Journalliteratur (1874); Theology: Theologischer Jahresbericht (1881) ; Bibliographie der Kirchengeschichtlichen Literatur (l8 77)-

Austria , The most notable periodicals of a general character have been the Wiener Jahrbucher der Literatur (1818-1848) and the Oester-reichische Revue (1863-1867). Among current examples the follow-ing may be mentioned : Heimgarten (1877), monthly; Oesterreichisch-Ungarische Revue (1886), monthly; Allgemeines Literaturblatt (1892) fortnightly; Die Kultur (1899), quarterly; Deutsche Arbeit (1900)’ monthly; Oesterreichische Rundschau (1904), fortnightly Die Karpathen (1907) ; fortnightly. ‘

There were in Austria 22 literary and 41 special periodicals in 1848, and no literary and 413 special periodicals in 1873 (see the statistical inquiry of Dr Johann Winckler, D-‘e period. Presse Oester- reichs, 1875). In 1905 the total number had increased to 806, of which 564 were published in Vienna.

According to the Deutscher Zeitschriften-Katalog (1874), 2219 periodicals were published in Austria, Germany and Switzerland in 1874 in the German language. In 1905 the number of periodicals in German-speaking countries was 5066, of which 4019 appeared in Germany (in Berlin alone 1107) 806 in Austria and 218 in Switzer-land (Bbrsenblattfur den deutschen Buchhandel, 1909, No. 124).

Authorities.— C. Juncker, Schediasma de ephemeridibus ‘ eruditorum (Leipzig 1692) ; H. Kurz, Geschichte der deutschen Literatur (Leipzig, 1852); R. Prutz, Geschichte des deutschen Journalismus (1845) vol. 1., — unfortunately it does not go beyond 1713) ; H. Wuttke Die deutschen Zeitschriften (1875); P. E. Richter, Verzeichnis der Periodica im Besitze der k. off. Bibl. zu Dresden (1880) ; Generalkatalog der laufenden periodischen Druckschriften an den oesterr. Univer- sitdts- und Studienbibliotheken hrsg. von F. Grassauer (Vienna 1898) ; Konigliche Bibliothek zu Berlin, Alphabetisches Verzeichnis der laufenden Zeitschriften (1908); Systematisches

Verzeichnis der laufen- den Zeitschriften (1908); Alphabetisches Verzeichnis der laufenden Zeitschriften, welche von der K. Hof- und Staatsbibliothek Miinchen und einer Anzahl anderer Bibliotheken Bay em gehalten werden (Munchen, 1909); Kurschner, Jahrbuch der Presse (1902); Sperlings Zeitschriften Adressbuch (Stuttgart, 1910) ; Bibliographisches Reper- torium, Berlin: Walzel-Houben, Zeitschriften der Romantik (1904)- Houben, Zeitschriften des jungen Deutschlands (1906) ; Luck Die deutsche Fachpresse (Tubingen, 1908). The Bibliographie der deutschen Zeitschriftenliteratur, edited by F. Dieterich, which has appeared annually since 1896, describes about 1300 periodicals (mostly scientific) by subjects and titles; from 1900 it has been supplemented by Bibliographie der deutschen Recensionen, which indexes notices and reviews in over 1000 serials each year, chiefly scientific and technical.

Switzerland The NovaJitteraria helvetica (1703-1715) of Zurich is the earliest literary periodical which Switzerland can show. From 1728 to 1/^4 a Bibliotheque italique, and towards the end of the century the Bibhotheque britannique (1796-1815), dealing with agriculture, literature, and science, in three separate series, were published at Geneva. The latter was followed by the leading periodical

of French-speaking Switzerland, the Bibliotheque universelle (1816), which has also had a scientific and a literary series. The Revue Suisse (1838) was produced at Neuchatel. These two have been amalgamated and appear as the Bibliotheque universelle et revue Suisse. La Suisse romande (1885) only lasted twelve months. Theologie et philosophie (1868-1872), an account of foreign literature on those subjects, was continued as Revue de theologie et de philoso- phie (1873) at Lausanne. Among current serials may be mentioned Archives de psychologie de la Suisse romande (1901) edited by Flournoy and Claparede; Jahresverzeichnis der schweizerischen Universitats-schriften (1897-1898); Untersuchungen zur neueren Sprach- und Literaturgeschichte (1903); Zwingliana: Mitteilungen zur Geschichte Zwingli und der Reformation (1897).

Italy

Prompted by M. A. Ricci, Francesco Nazzari, the future cardinal, established in 1668 the Giornale de' letter ali upon the plan of the French Journal des savants. His collaborateurs each agreed to

undertake the criticism of a separate literature while Nazzari retained the general editorship and the analysis of the French books. The journal was continued to 1675, and another series was carried on to 1769. Bacchini brought out at Parma (1688-1690) and at Modena (1692-1697) a periodical with a similar title. A much better known Giornale was that of Apostolo Zeno, founded with the help of Maffei and Muratori (1710), continued after 1718 by Pietro Zeno, and after 1728 by Mastraca and Paitoni. Another Giornale, to which Fabroni contributed, was published at Pisa from 1771 onwards. The Galleria di Minerva was first published at Venice in 1696. One of the many merits of the antiquary Lami was his connexion with the Novelle letterarie (1740-1770), founded by him, and after the first two years almost entirely written by him. Its learning and impartiality gave it much authority. The Frusta letter aria (1763- !765) was brought out at Venice by Giuseppe Baretti under the pseudonym of Aristarco Scannabue. The next that deserve mention are the Giornale enciclopedico (1806) of Naples, followed by the Progresso delle scienze (1833-1848) and the Museo di scienze e letteratura of the same city, and the Giornale arcadico (18 19) of Rome. Among the contributors to the Poligrafo (181 1) of Milan were Monti, Perticari, and some of the first names in Italian litera- ture. The Biblioleca italiana (1816-1840) was founded at Milan by the favour of the Austrian government, and the editorship was offered to and declined by Ugo Foscolo. It rendered service to Italian literature by its opposition to the Della-Cruscan tyranny. Another Milanese serial was the Conciliatore (1818-1820), which although it only lived two years, will be remembered for the en- deavours made by Silvio Pellico, Camillo Ugoni and its other con- tributors to introduce a more dignified and courageous method of criticism. After its suppression and the falling off in interest of the Biblioteca italiana the next of any merit to appear was the Antologia, a monthly periodical brought out at Florence in 1820 by Gino Capponi and Giampetro Vieusseux, but suppressed in 1833 on account of an epigram of Tommaseo, a principal writer. Some striking papers were contributed by Giuseppe Mazzini. Naples had in 1832 II Progresso of Carlo Troya, helped by Tommaseo and Centofanti, and Palermo owned the Giornale di statistica (1834), suppressed eight years later. The Archivio storico, consisting of reprints of documents with historical dissertations, dates from 1842, and was founded by Vieusseux and Gino Capponi. The Civilta cattolica (1850), fortnightly, is still the organ of the Jesuits. The Rivista contemporanea (1852) was founded at Turin in emulation of the French Revue des deux mondes, which has been the type followed by so many continental periodicals. The Politecnico (1839) of Milan was suppressed in 1844 and revived in 1859. The Nuova

antologia (1866) soon acquired a well-deserved reputation as a high-class review and magazine; its rival, the Rivista europea, being the special organ of the Florentine men of letters. The Rassegna settimanale was a weekly political and literary review, which after eight years of existence gave place to a daily newspaper, the Rassegna. The Archivio trentino (1882) was the organ of " Italia Irredenta." The Rassegna nazionale, conducted by the marchese Manfredo di Passano, a chief of the moderate clerical party, the Nuova rivista of Turin, the Fanfulla della Domenica, and the Gazzetta letteraria may also be mentioned.

Some of the following are still published: Annali di matematica (1867); Annuario di giurisprudenza (1883); Archivio di statistica (1876); Archivio storico lombardo (1874); Archivio veneto (187.1); Archivio per lo studio delle tradizioni popolari; Archivio per la zoologia; II Bibliofilo; II Filangieri (1876); La Natura (1884); Nuovo giornale botanico (1869) ; Giornale degli eruditi (1883) ; Giornale di filologia romanza; Nuova rivista Internazionale (1879) ; La Rassegna italiana (1881); Revue internationale (1883). In more recent years a great expansion has been witnessed. Local reviews have largely increased, as well as those devoted to history, science and university undertakings. Among representative serials are the following — Archaeology: Museo italiano di antichita classica (1885) with atlas in folio; Oriens christianus (1901); Nuovo bollettino di archeologia cristiana, quarterly at Rome (1895). Bibliography: Rivista delle biblioteche e degli archivi (1888), published monthly at Rome and Florence, the official organ of librarians and archivists; Giornale

della libreria della tipografia (1888), supplement to the Bibliografia italiana ; Bollettino di bibliografia e storia delle scienze matematiche (1898); La Bibliofilia (1899), Florence, monthly; Raccolta Vinciana (1904). Philology: Bollettino di filologia classica (1894); Giornale italiano di filologia e linguistica classica (1886); Studi di filologia romanza (1885) ; Studi italiani di fdologia classica (1893) ; Bessarione, bi-monthly. No class has developed more usefully than the his- torical, among them being: Bollettino dell' instituto storico italiano (1886) ; Nuovo archivio veneto (1890) ; Rivista di storia antica e scienze affini (1895); Rivista storica italiana (1884). New literary and scientific reviews are: L'Alighieri, rivista di cose dantesche (1889); Giornale dantesco (1894); Giornale storico della letteratura italiana (1883); Studi di letteratura italiana (1899); Studi medievali (1904); V Arcadia, periodico mensile di scienze, lettere, ed arti (1889); Periodica di matematica per I ' insegnamento secondario (1885); Rivista di matematica (1891); Rivista philosofica (1899); Rivista d' Italia, monthly at Rome. Fine Arts: L'Arte, monthly; Arte

italiana, monthly; Rassegna d' arte, monthly.

Authorities. — See G. Ottino, La Stampa periodica in Italia (Milan, 1875); Raccolta dei periodica presentata all' esposizione in Milano (1881); A. Roux, La Litter ature contemporaine en Italic (1871-1883), Paris, 1883.

Belgium The Journal encyclopedique (1 756-1 793) founded by P. Rousseau, made Liege a propagandist centre for the philosophical party. In the same city was also first established L'Esprit des journaux (1772-18 1 8), styled by Sainte-Beuve " cette considerable et excellente collection," but " journal voleur et compilateur." The Journal hislorique el litteraire (1788-1790) was founded at Luxem- burg by the Jesuit De Feller; having been suppressed there, it was transferred to Liege, and subsequently to Maestricht. It is one of the most curious of the Belgian periodicals of the 18th century, and contains most precious materials for the national history. A complete set is very rare and much sought after. The Revue beige (: 835-1 843) , in spite of the support of the best writers of the kingdom, as well as its successor the Revue de Liege (1844-1847), the Tresor national (1842-1843), published at Brussels, and the Revue de Belgique (1846-1851) were all short-lived. The Revue de Bruxelles (1837-1848), supported by the nobility and the clergy, had a longer career. The Revue nationale was the champion of Liberalism, and came to an end in 1847. The Messager des sciences historiques (1833), at Ghent, was in repute on account of its historical and antiquarian character. The Revue catholique, the organ of the professors of the university of Louvain, began in 1846 a controversy with the Journal historique et litteraire of Kersten (1834) upon the origin of human knowledge, which lasted for many years and excited great attention. The Annates des \travaux publics (1843), the Bulletin de I'industrie (1842), the Journal des beaux-arts (1858), and the Catholic Precis historiques (1852), the Protestant Chretien beige (1850), are other examples. The Revue trimestrielle was founded at Brussels by Van Bemmel in 1854. The Athenaeum beige (1868) did not last long.

Among current periodicals in French are the following — Bibliography: Bulletin bibliographique et pedagogique du musee beige (1897); La Revue des bibliotheques et archives de Belgique (1903); Le Glaneur litteraire, musical et bibliographie (1901); Archives des arts et de la bibliographie de Belgique (Tables 1833-1853 and 1875- 1894). Philosophy and ecclesiastical history: Revue neo-schola- stique publiee par la societe philosophique de Louvain (1894); Revue d'histoire ecclesiastique (1900), the organ of the Catholic university of Louvain; Revue benidicline (1884); Analectes pour servir ct I'histoire

ecclesiastique de la Belgique, 2 e serie (1881-1904) and 3 e serie l 90$); with an Annexe for Cartularies. Science: Archives internationales de physiologie (1902), published by Leon Fredericq; La Cellule, recueil de cytologic et d' histologic generate (1884); Le Museon (1882); Le Mouvement geographique (1884); Le Musee beige (1897); Revue chirurgicale beige et du nord de la France (1901). Annates des mines belgiques appears quarterly, and L 'Art moderne weekly at Brussels.

Among Flemish serials may be mentioned the Nederduitsche Letteroefeningen (1834) I the Belgisch Museum (1836-1846), edited by Willems; the Broederhand, which did not appear after 1846; the Taalverbund of Antwerp; the Kunst- en Letterblad (1840-1843); and the Vlaemsche Rederyker (1844). Current Flemish periodicals include: Onze kunst ge'illustreed maandschrift voor beeldenie kunst (1900); Averbode's weekblad Godsdienst huisgezin moedertaal (1907); De Raadselbode talk van den vlamschen raadselliefhebber (1901); Rechtskundig tijdschrift voor vlamsch Belgie (1901).

It has been calculated that in i860 there were 51 periodicals published in Belgium. In 1884 the number had increased to 412, and in 1908 to 1701.

See U. Capitaine, Recherches sur les journaux et les ecrits periodiques liegeois (1850); Releve de tous les ecrits periodiques qui se publient dans le royaume de Belgique (1875); Catalogue des journaux, revues, et publications periodiques de la Belgique (19 10); Revue bibliographique beige.

Holland The first serial written in Dutch was the Boekzaal van Europa (1692-1708, and 1715-1748), which had several changes of name

during its long life. The next of any note was the Republijk der Geleerden (1710-1748). The English Spectator was imitated by J. van Effen in his Misanthrope (1711-1712), written in French, and in the Hollandsche Spectator (1731-1735), in Dutch. An im- portant serial was the long-lived Vaderlandsche Letter oefeningen (1761). The Algemeene Kunst en Letterbode (1788) was long the leading review of Holland; in i860 it was joined to the Nederlandsch Spectator (1855). Of those founded in the 19th century may be mentioned the Rccensent (1803), and Nieuwe Recensent; the Neder- landsch Museum (1835);

the Tijdstroom (1857); the Tijdspiegel, a literary journal of Protestant tendency ; the Theologisch Tijdschrift (1867), the organ of the Leiden school of theology; and the Dietsche Warande, a Roman Catholic review devoted to the national anti- quities. Colonial interests have been cared for by the Tijdschrift voor nederlandsch Indie (1848). Current periodicals are Hollandsche revue, monthly; De Gids (1837), monthly; De nieuvie Gids (1886), monthly; De Architect, bi-monthly; Caecilia (for music); Tijdschrift voor Strafrecht; Museum, for philology (1893), monthly; Tijdschrift voor nederlandsche taal en letterkunde ; Nederlandsch Archievenblad; De Paleograaf; Elsevier s geillustreerd Maandschrift, monthly; Groot Nederland, monthly.

Denmark

Early in the 18th century Denmark had the Nye Tidender (1720), continued down to 1836 under the name of Danskliteraturtidende. The Minerva (1785) of Rahbek was carried on to 1819, and the Skandinavisk Museum (1798-1803) was revived by the Liiteratur-Selskabs Skrifter (1805). These were followed by the Laerde Efter-rctninger (1799-1810), afterwards styled Litter -atur-Tidende (181 1-1836), the Athene (1813-1817), and Historisk Tidsskrift (1840). In more modern times appeared Tidsskrift for Lilteratur og Krilik (1832-1842, 1843); Maanedsskrift for Lilteratur (1829-1838); Nord og Syd (1 848-1 849) of Goldschmidt, succeeded by Ude og Hjemme, and the Dansk Maanedsskrift (1858) of Steenstrup, with signed historical and literary articles. One of the most noteworthy Scandinavian periodicals has been the Nordisk Vniversitets Tids- skrift (1 854-1 864), a bond of union between the universities of Christiania, Upsala, Lund and Copenhagen. Current periodicals are: Studier fra Sprog- og Oldtidsforskning (1891), quarterly; Danske Magazin, yearly; Nyt Tidsskrift for Mathematih, monthly; Theologisk Tidsskrift, monthly; Nationalokonomisk Tidsskrift, bi-monthly; Dansk bogforlegnelse, bi-monthly for bibliography; Athenaeum finsk; Tilskueren, monthly; Aarboger for Nordisk Oldhyndighed (archae- ology) quarterly.

Iceland has had the Islenzk Sagnablod (1817-1826), Ny Fjelagsril (1841-1873), and Gefn (1870-1873). Skirnir (1831), which absorbed in 1905 Timarit hins islenska Bokmentafelags (1880-1904), is still published.

Norway

The first trace of the serial form of publication to be found in Norway is in the Ugentlige korte Afhandlinger (1760-1761), ” Weekly Short Treatises,” of Bishop Fr. Nannestad, consisting of moral and

theological essays. The Maanedlige Afhandlinger (1762), ” Monthly Treatises,” was supported by several writers and devoted chiefly to rural economy. These two were followed by Politik og Historie (1807-1810); Saga (1816-1820), a quarterly review edited by J. S. Munch; Den norske Tilskuer (1817-1821), a miscellany brought out at Bergen; Hermoder (1 82 1-1 827), a weekly aesthetic journal; Iduna, (1822-1823), of the same kind but of less value; Vidar (1832-1834), a weekly scientific and literary review; Nor (1840-1846), of the same type; Norsk Tidsskrift for Videnskab og Lilteratur (1 847-1 855); lllustreret Nyhedsblad (1851-1866). “Illustrated News”; Norsk Maanedsskrift (1 856-1 860), ” Monthly Review for Norway,” devoted to history and philology; and Norden (1866), a literary and scientific review. Popular serials date from the Skilling Magazin (1835), which first introduced wood-engraving. Representative current periodicals are; Samtidcn, monthly; Elektroteknisk tidsskrift; nordisk musik-revue, fortnightly; Naluren; Norsk havetidende, monthly; Urd; Noroegia.

Sweden

The Swenska Argus (1 733—1 734) of Olof Dalin is the first contribution of Sweden to periodical literature. The next were the Tidningar om den Ldrdas Arbeten (1742) and the Ldrda Tidningar. The patriotic journalist C. C. Gjorwell established about twenty literary periodicals of which the most important was the Swenska Mercurius (1755—1789). Atterbom and some fellow-students founded about 1810 a society for the deliverance of the country from French pedantry, which with this end carried on a periodical entitled Phosphoro: (1810-1813), to propagate the opinions of Schlegel and Schelling. The Svensk Liter atur-Tidning (1813-1825) of Palmblad and the Polyfem (1810-1812) had the same objects. Among later periodicals we. may mention Skandia (1 833-1 837) ; Liter aiurbladet (1838-1840); Stallningar och Forhallanden (1838) of Crusenstolpe, a monthly review of Scandinavian history; Tidskrift for Lilteratur (1850) ; Norsk Tidsskrift (1852), weekly, Fbrr och Nu; and the Revue suedoise (1858) of Kramer, written in French. Among the monthlies which now appear are the following: Social Tidskrift, Nordisk Tidskrijt and Ord och Bild

xxi. 6

Spain Spain owes her intellectual emancipation to the monk Benito Feyjoo, who in 1726 produced a volume of dissertations somewhat after the fashion of the Spectator, but on graver subjects, entitled Teatro critico, which was continued down to 1739. His Cartas eruditas (1742-1760) were also issued periodically. The earliest critical serial,

the Diario de los literatos (1737-1742), kept up at the expense of Philip V., did not long survive court favour. Other periodicals which appeared in the 18th century were Mafier's Mercurio (1738); the Diario noticioso (1758-1781); El Pensador (1762-1767) of Joseph Clavijo y Fajardo; El Belianis literario (1765), satirical in character; the Semanario erudito (1778-1791), a clumsy collection of documents; El Correo literario de la Europa (1781-1782); El Censor (1781); the valuable Memorial literario (1784-1808); El Correo literario (1786-1791), devoted to literature and science; and the special organs El Correo mercantil (1 792-1 798) and El Semanario de agricultura (1797-1805). In the 19th century were Variedades de ciencias, literatura, y artes (1803-1805), among whose contributors have been the distinguished names of Quintana, Moratin and Antillon; Misceldnea de comercio (1819); and Diario general de las ciencias medicas. The Spanish refugees in London published Ocios de espanoles refugiados (1 823-1 826) and Misceldnea hispano-americana (1 824-1 828), and at Paris Misceldnea escojida americana (1826). The Cronica cientifica y literaria (1817-1820) was afterwards transformed into a daily newspaper. Subsequently to the extinc- tion of El Censor (1820-1823) there was nothing of any value until the Cartas espanolas (1832), since known as the Revista espanola (1832-1836) and as the Revista de Madrid (1838). Upon the death of Ferdinand VII. periodicals had a new opening; in 1836 there were published sixteen journals devoted to science and art. The fashion of illustrated serials was introduced in the Semanario pintoresco espanol (1836-1857), noticeable for its biographies and descriptions of Spanish monuments. El Panorama (1839-1841) was another literary periodical with engravings. Of later date have been the Revista iberica (1861-1863), conducted by Sanz del Rio; La America (1857-1870), specially devoted to American subjects and edited by the brothers Asquerino; Revista de Cataluna, published at Barcelona; Revista de Espana; Revista contempordnea; Espana moderna (1889), and Revista critica (1895). Current special perio- dicals are: Euskal-erria, revista bascongada (1880, San Sebastian); Monumenla historica societatis Jesu (1 894) ; El Progreso matematico, afterwards Revista de matematicas puras y aplicadas (1891); Revista de bibliografia Catalano (Catalunya, Baleares, Rosselo, Valencia, 1901); La Naturaleza, fortnightly; La Energia electrica, fortnightly; Revista minera, weekly; Revista de medicina, weekly; Bibliografia espanola, fortnightly; La Lectura; Espana y America, monthly.

See E. Hartzenbusch, Periodicos de Madrid (1876); Lapeyre, Catalogo-tarifa de los periodicos, revistas, y ilustraciones en Espana (1882) ; Georges le Gentil, Les Revues litteraires de I'Espagne pendant la

premiere moitie du XIX' siecle (Paris, 1909).

Portugal

Portugal could long boast of only one review, the Jornal enci- clopedico (1779-1806), which had many interruptions; then came the Jornal de Coimbra (1812-1820); the Panorama (1836-1857), founded by Herculano; the Revista universal lisbonense (1841-1853), established by Castilho; the Instituto (1853) of Coimbra; the Archivo pittoresco (1857) of Lisbon; and the Jornal do sociedade dos amigos das letter as. In 1868 a review called Vox femenina, and con- ducted by women, was established at Lisbon. Current periodicals include: Archeologo portugues (1895); Jornal de sciencias mathe- maticas et astronomicas (1877); Revista lusitana, Archivo de estudos philologicos e ethnologicos relatives a Portugal (1887); Ta-ssi-Yang- Kuo, Archivos e annaes de extremo oriente portuguez (1899); Portugal artistico, fortnightly; Revista militar; Arte musical, fortnightly; Boletim do agricultor, monthly; Archivo historico portuguez, monthly.

Greece

The periodical literature of modern Greece commences with 'O Aoyios 'Epixijs, brought out at Vienna in 18 11 by Anthimos Gazi and continued to 1821. In Aegina the Aiyivaia. appeared in 1831, edited by Mustoxidis; and at Corfu, in Greek, Italian and English, the 'Aj- SoXoYta (1834). After the return of King Otho in 1833 a literary review called T Ipu was commenced. Le Spectateur de I'Orient, in French, pleaded the national cause before Europe for three years from 1853. A military journal was published at Athens in 1855, and two years later the archaeological periodical con- ducted by Pittakis and Rangabes. For many years Havddipa (1850-1872), edited by Rangabes and Paparrigopoulos, was the leading serial. £ >

See A. R. Rangabe, Hist, litteraire de la Grece moderne (Paris, 1879) ; R. Nicolai, Geschichte der neugriechischen Literalur (1876).

Russia

The historian Gerhard Friedrich Miiller made the first attempt to establish periodical literature in Russia in his Yejem' yes vatchniya

Sotchineniya (1755-1764), or " Monthly Works." In 1759 Sumara- kov

founded the Trudolyubivaya Ptcheld, or ” Industrious Bee,” giving translations from the Spectator, and, for the first time, critical essays. Karamsin brought out in 1802 the V’yestnik Evropi, an important review with Liberal tendencies. The Conservative Russkoi V’yestnik (1808) was revived at Moscow in 1856 by Kattkov. The two last named are still published each month. The romantic school was supported by Sin Otetcheslva (1812), ” Son of the Father- land,” united in 1825 to the Severnoi Arkhiv (1822), which dwindled and came to an end soon after 1839. One of the most successful Russian reviews has been the Biblioteka dl’ya Tchtenia (1834) or ” Library of Reading.” The Russkaya Missl, ” Russian Thought,” published in Moscow, represented the Slavophil party. The following are some representative periodicals of the day: Zurnal ministersva narodnago prosvescenija, monthly ; Baltische Monatsschrift (i860), monthly; V’yestnik vospitania (for education) ; Mir iskusstra (for fine art) ; Russkoie bogatstvo (for literature) ; Russki arkhiv (archives) ; Mir Boji, monthly ; Istorichesky v’yestnik (history) ; Russkaia starina (archaeology). In Finland Suomi (1841), written in Swedish, is still published.

Other Countries Bohemia has the Casopis musea krdlovstvi leskiho (1827), quarterly, founded by Palacky; Nase doba, monthly; Cechische Revue (1907) quarterly. Hungary can show the Ungarisches Magazin (1781-1787, I79 1). published at Pressburg, and the Magyar Muzeum (1788). The Tudomdnyos gyujetemeny (1817-1841). and the Figyelmezb (‘837-1843) deserve mention. Uj Magyar Muzeum was a scientific magazine, and the Budapesti Szemle (1857) °f a more general character. Among current Hungarian periodicals are: Magyar Kbnyvszemle (1876), and Magyar Nyomddszat. Before the revolution of 1830 Poland had the Pamietnik Warszawski of Lach Szyrma. Among other Polish reviews may be mentioned the Dziennik Literacki of Lemberg; the Biblioteka Warszawska (1841), monthly; Przeglad Polski (1866), monthly; Przewodnik naukowy i literacki (1873), monthly; Przewodnik bibliograficzny (1878), monthly; Przeglad powzechny (1884), monthly. Rumania commenced with the Magasinal istorica pentru Dacia (1845), containing valuable historical documents; and Moldavia with Dacia Literaria (1840) and Archiva Romanesca (1841). Rumania now has the Convorbiri literare (1868), monthly, and Romanul, revistd literara illustrata sepiemdnala. The best literary review Servia has had was the WUa, edited by Novakovic.

Japan now possesses native periodicals of the European type, of which the following are representative examples: Fudzoku-Gaho (native customs) ; The Kokka (art) ; Toyo-Gakugei-Zasshi (science) ; Jogaku-Zasshi (domestic economy) ; Tetsugaku-Zasshi (philosophy) ; Keizai-

Zasshi (political economy); Taiyo (literature).

General Indexes to Periodicals. — The most complete collec- tion of periodicals in all languages ever brought together is that preserved in the British Museum, and the excerpt from the printed catalogue of the library, entitled Periodical Publications (London, 1 899-1900, 2nd ed. 6 parts folio, with index), includes journals, reviews, magazines and other works issued periodically, with the exception of transactions and proceedings of learned societies and of British and Colonial newspapers later than 1700. The titles of these periodicals, which number about 23,000, are arranged under the town or place of their publication.

The Edinburgh and Quarterly Reviews, the Revue des deux mondes, the Revue historique, Deutsche Rundschau and others issue from time to time general indexes of their contents, while the periodical literature of special departments of study and research are noted in the various Jahresberichte published in Germany, and indexed monthly in such English and American magazines as the Engineering Magazine, the Geographical Journal, English Historical Review, A merican Historical Review, Economic Journal (for political economy) , Library Journal and Library Association Record (for bibliography) and the Educational Review. The Cat. of Scientific Papers (1800- 1900) of the Royal Society (1867-1908), and the Repertorium der techn. Journ. Literatur (1879-1899) of the German Patent Office, are specimens of indexes of special periodicals. There are also annual indexes such as those in the Zoological Record and Annates de giographie. Complete lists are given by A. B. Kroeger {Guide to Reference Books, 1908) and Stein (Manuel de bibliographie generale, 1897). See also Bibliography of Books reviewed in American Periodicals, by G. F. Danforth (1902-1903); Book Review Digest (1906), &c; H. C. Bolton's Cat. of Scientific and Technical Periodi- cals 1665-1895, Smithsonian Inst. (2nd ed., 1897); Harrison's Int. Cat. of Scientific Lit. (1903-1904) ; -S. H. Scudder's Cat. of Scientific Serials, 1633-1876 (Camb. [Harvard Univ.] 1876) ; Cat. of Periodicals (English and Foreign) in Bod. Lib., 1878-1880; Bibliotheque Na- tionalˆ, Liste des piriodiques Strangers (1896). A useful select list, including all languages, is J. D. Brown's Classified List of Current Periodicals (1904). (H. R. T.)

PERIOECI (xepiouftx, those who dwell around, in the neigh- bourhood), in ancient Laconia the class intermediate between the Spartan citizens and the serfs or helots (q.v.). Ephorus says (Strabo viii. 364 seq.) that they were the original Achaean inhabitants of the country, that for the first generation after

the Dorian invasion they shared in the franchise of the hv vaders, but that this was afterwards taken from them and they were reduced to a subject condition and forced to pay tribute. The term, however, came to denote not a nationality but a political status, and though the main body of the perioeci may have been Achaean in origin, yet they afterwards included Arcadians on the northern frontier of Laconia, Dorians, especially in Cythera and in Messenia, and Ionians in Cynuria. They inhabited a large number of settlements, varying in size from important towns like Gythium to insignificant hamlets (Isocrates xii. 179); the names of these, so far as they are known, have been collected by Clinton (Fasti hellenici, 2nd ed. i. 401 sqq.). They possessed personal freedom and some measure of communal independence, but were apparently under the immediate super- vision of Spartan harmosts (governors) and subject to the general control of the ephors, though Isocrates is probably going too far in saying (xii. 181) that the ephors might put to death without trial as many of the perioeci as they pleased. Certain it is that they were excluded not merely from all Spartan offices of state, but even from the assembly, that they were absolutely subject to Spartan orders, and that, owing to the absence of any legal right of marriage (enryajuia.) the gulf between the two classes was impassable. They were also obliged to pay the "royal tribute," perhaps a rent for domain-land which they occupied, and to render military service. This last burden grew heavier as time went on; 5000 Spartiates and 5000 perioec hoplites fought at Plataea in 479 B.C., but the steady decrease in the number of the Spartiates necessitated the increasing employment of the perioeci. Perioeci might serve as petty officers or even rise to divisional commands, especially in the fleet, but seemingly they were never set over Spartiates. Yet except at the beginning of the 4th century the perioeci were, so far as we can judge, fairly contented, and only two of their cities joined the insurgent helots in 464 B.C. (Thuc. i. 101). The reason of this was that, though the land which they cultivated was very unproductive, yet the prohibition which shut out every Spartiate from manufacture and commerce left the industry and trade of Laconia entirely in the hands of the perioeci. Unlike the Spartiates they might, and did, possess gold and silver and the iron and steel wares from the mines on Mt Taygetus, the shoes and woollen stuffs of Amyclae, and the import and export trade of Laconia and Messenia probably enabled some at least of them to live in an ease and comfort unknown to their Spartan lords.

See G. Grote, History of Greece, pt. ii., ch. 6 ; C. O. Miiller, Dorians (Eng. trans.), bk. iii., ch. 2 ; A. H. J. Greenidge, Greek Constitutional History, p. 78 sqq. ; G. Gilbert, Greek Constitutional Antiquities (Eng.

trans.) p. 35 sqq. ; G. F. Schomann, Antiquities of Greece (Eng. trans.) p. 201 sqq.; G. Busolt, Die griech. Staats- und Rechtsaltertilmer , § 84; Griech. Geschichte, i. 528 seq. (2nd ed.) ; V. Thumser, Lehrbuch der griech. Staatsaltertiimer (6th ed.), § 19; B. Niese, Nachrichten von der wissenschaftlichen Gesellschaft zu Gottingen, Phil. -Hist. Klasse (1906), 101 sqq. (M. N. T.)

PERIPATETICS (from Gr. TrepnrareLV, to walk about), the name given in antiquity to the followers of Aristotle (5.11.), either from his habit of walking up and down as he lectured to his pupils, or from the irepiiraTos (covered walk) of the Lyceum.

Aristotle's immediate successors, 1 Theophrastus and Eudemus of Rhodes, were diligent scholars rather than original thinkers. They made no innovations upon the main doctrines of their master, and their industry is chiefly directed to supplementing his works in minor particulars. Thus they amplified Theo- the Aristotelian logic by the theory of the hypo- pbrastas. thetical and disjunctive syllogism, and added to the first figure of the categorical syllogism the five moods out of which the fourth figure was afterwards constructed. The impulse towards natural science and the systematizing of empirical details which distinguished Aristotle from Plato was shared by ˆTheophrastus (q.v.). The same turn for detail is observable In his ethics, where, to judge from the imperfect evidence of the Characters, he elaborated still farther Aristotle's portraiture of the virtues

1 See Gellius, Noct. Att. xiii. 5, for the story of how Aristotle chose Theophrastus as his surcˆssor.

and their relative vices. In his doctrine of virtue the distinctive Peripatetic position regarding the importance of external goods was defended by him with emphasis against the assaults of the Stoics. He appears to have laid even more stress on this point than Aristotle himself, being doubtless led to do so, partly by the heat of controversy and partly by the importance which leisure and freedom from harassing cares naturally assumed to a man of his studious temperament. The meta- physical airoplaL of Theophrastus which have come down to us show that he was fully alive to the difficulties that beset many of the Aristotelian definitions. But we are ignorant how he proposed to meet his own criticisms; and they do not appear to have suggested to him an actual departure from his master's

doctrine, much less any radical transformation of it. In the difficulties which he raises we may perhaps detect a leaning towards a naturalistic interpretation. The tendency of Eudemus, on the other hand, is more towards the theological of Rhodes. or Platonic side of Aristotle's philosophy. The Eudemian Ethics (which, with the possible exception of the three books common to this treatise and the Nicomachean Ethics, there need be no hesitation in ascribing to Eudemus) expressly identify Aristotle's ultimate ethical ideal of Becapla with the knowledge and contemplation of God. And this supplies Eudemus with a standard for the determination of the mean by reason, which Aristotle demanded, but himself left vague. Whatever furthers us in our progress towards a knowledge of God is good; every hindrance is evil. The same spirit may be traced in the author of the chapters which appear as an appendix to book i. of Aristotle's Metaphysics. They have been attributed to Pasicles, the nephew of Eudemus. For the rest, Eudemus shows even less philosophical indepen- dence than Theophrastus. Among the Peripatetics of the first generation who had been personal disciples of Aristotle, the other chief names are those of Aristoxenus (q.v.) of Tarentum and Dicaearchus (q.v.) of Messene. Aristoxenus, who had formerly belonged to the Pythagorean school, maintained the position, already combated by Plato in the Phaedo, that the soul is to be regarded as nothing more than the harmony of the body. Dicaearchus agreed with his friend in this naturalistic rendering of the Aristotelian entelechy, and is recorded to have argued formally against the immortality of the soul.

The naturalistic tendency of the school reached its full expression in Strato of Lampsacus, the most independent, and probably the ablest, of the earlier Peripatetics. His Lampsaais. system is based upon the formal denial of a trans- cendent deity. Cicero attributes to him the saying that he did not require the aid of the gods in the construction of the universe; in other words, he reduced the formation of the world to the operation of natural forces. We have evidence that he did not substitute an immanent world-soul for Aristotle's extra-mundane deity; he recognized nothing beyond natural necessity. He was at issue, however, with the atomistic materialism of Democritus in regard to its twin assumptions of absolute atoms and infinite space. His own speculations led him rather to lay stress on the qualitative aspect of the world. The true explanation of things was to be found, according to Strato, in the forces which produced their attributes, and he followed Aristotle in deducing all phenomena from the funda- mental attributes or elements of heat and cold. His psycho- logical doctrine explained all the functions of the soul as modes of motion,

and denied any separation of the reason from the faculties of sense-perception. He appealed in this connexion to the statement of Aristotle that we are unable to think without a sense-image.

The successors of Strato in the headship of the Lyceum were Lyco, Aristo of Ceos, Critolaus (q.v.), Diodorus of Tyre, and Erymneus, who brings the philosophic succession down to about 100 B.C. Other Peripatetics belonging to this period are Hiero- nymus of Rhodes, Prytanis and Phormio of Ephesus, the delirus senex who attempted to instruct Hannibal in the art of war (Cic. De orat. ii. 18). Sotion, Hermippus and Satyrus were historians rather than philosophers. Heraclides Lembus.

Agatharchides and Antisthenes of Rhodes are names to us and nothing more. The fact is that, after Strato, the Peripatetic school has no thinker of any note for about 200 years.

Early in the 1st century B.C. all the philosophic schools began to be invaded by a spirit of eclecticism. This was partly due to the influence of the practical Roman spirit. This in- fluence is illustrated by the proconsul Lucius Gellius Publicola (about 70 B.C.), who proposed to the representatives of the schools in Athens that he should help them to settle their differences (Cic. De leg. 1. 20). This atmosphere of indifference imper- ceptibly influenced the attitude of the contending schools to one another, and we find various movements towards unity in the views of Boethus the Stoic, Panaetius and Antiochus of Ascalon, founder of the so-called ” Fifth Academy.” Meanwhile the Peripatetic school may be said to have taken a new departure and a new lease of life. The impulse was due to Andronicus of Rhodes. His critical edition of Aristotle indicated to the later Peripatetics the direction in which they could Aal{roll i cas profitably work, and the school devoted itself hence- forth almost exclusively to the writing of commentaries on Aristotle, e.g. those of Boethus of Sidon, Aristo of Alexandria, Staseas, Cratippus, and Nicolaus of Damascus. The most interesting Peripatetic work of the period is the treatise De mundo, which is a good example within the Peripatetic school of the eclectic tendency which was then in the air. The admixture of Stoic elements is so great that some critics have attributed the work to a. Stoic author; but the writer’s Peripateticism seems to be the more fundamental constituent of his doctrine.

Our knowledge of the Peripatetic school during the first two centuries of the Christian era is very fragmentary; but those of its representatives of whom anything is known con- fined themselves entirely to commenting upon the different treatises of Aristotle. Thus

Alexander of Aegae, the teacher of Nero, commented on the Categories and the De caelo. In the 2nd century Aspasius (q.v.) and Adrastus of Aphro- disias wrote numerous commentaries. The latter also treated of the order of the Aristotelian writings in a separate work. Somewhat later, Herminus, Achaicus and Sosigenes commented on the logical treatises. Aristocles of Messene, the teacher of Alexander of Aphrodisias, was the author of a complete critical history of Greek philosophy. This second phase of the activity of the school closes with the comprehensive labours of Alexander of Aphrodisias (Scholarch, c. 200), the exegete par excellence, called sometimes the second Aristotle. Alexander's interpretation proceeds throughout upon the natur- alistic lines which have already become familiar to us. Aristotle had maintained that the individual Aphrodisias. alone is real, and had nevertheless asserted that the universal is the proper object of knowledge. Alexander seeks consistency by holding to the first position alone. The individual is prior to the universal, he says, not only " for us," but also in itself, and universals are abstractions which have merely a subjective existence in the intelligence which abstracts them. Even the deity must be brought under the conception of individual substance. Such an interpretation enables us to understand how it was possible, at a later date, for Aristotle to be regarded as the father of Nominalism. Form, Alexander proceeds, is everywhere indivisible from matter. Hence the soul is inseparable from the body whose soul or form it is. Reason or intellect is bound up with the other faculties. Alexander's commentaries formed the foundation of the Arabian and Scholastic study of Aristotle. Soon after Alexander's death the Peripatetic school was merged, like all others, in Neo- platonism (q.v.).

PERIPATUS, a genus of animals belonging to the air-breathing division of the phylum Arthropoda. It differs, however, from all other Arthropoda in such important respects that a special class, equivalent in rank to the old-established Arthropod classes, had been created for its sole occupancy. This class has been named the Prototracheata or Onychophora (see Arthropoda), and may be most appropriately placed in the system in the

neighbourhood of the Myriapoda, though it must not be forgotten that it differs from the Myriapoda more than the Myriapoda differ from other Arthropoda, and that in some respects it presents features which recall the segmented worms (Annelida). The genus has a wide

distribution (see below) , but it has not been found in Europe or in North America. There is but little variety of structure in the genus, and the species are limited in number. They live beneath the bark of trees, in the crevices of rock and of rotten stumps of trees, and beneath stones. They require a moist atmosphere, and are exceedingly susceptible to drought. They avoid light, and are therefore rarely seen. They move slowly, picking their course by means of their antennae. When irritated they eject with considerable force the contents of their slime reservoirs by means of the sudden contraction of the muscular body-wall. The slime, which appears to be harm- less, is extremely sticky, but it easily comes away from the skin of the animal itself. Locomotion is effected by means of the legs, with the body fully extended. Hutton describes his specimens as sucking the juices of flies, which they had stuck down with their slime, and they have been observed in captivity to devour the entrails which have been removed from their fellows, and to eat raw sheep's liver. They move their mouths in a suctorial manner, tearing the food with their jaws. They have the power of extruding their jaws from the mouth, and of working them alternately backwards and forwards. They are viviparous; the young are fully formed at birth, and differ from the adult only in size and colour. The mothar does not appear to pay any special attention to her offspring, which wander away and get their own living. It has lately been stated that some of the Australian species are normally oviparous, but this has not been fully proved. Sexual differences are not strongly marked, and are sometimes absent. There does not appear to be any true copulation. In some species the male deposits small oval spermatophores indiscriminately on any part of the body of the female. It seems probable that in such cases the spermatozoa make their way from the adherent spermatophore through the body-wall into the body, and so by traversing the tissues reach the ovary. In other species which possess reccptacula seminis it is probable that fertilization is effected once only in early life before any ova pass into the uterus.

External Features. — The anterior part of the body may be called the head, though it is not sharply marked off from the rest of the body (fig. 1). The head carries three pairs of appendages, a pair of simple eyes, and a ventrally placed mouth. The body is elon- gated and vermiform; it bears a number of paired appendages, each terminating in a pair of claws, and all very much alike. The number varies in the different species. The anus is always at the

called the buccal cavity, and is surrounded by an annular tumid lip, raised into papilliform ridges and bearing a few spines (fig. 2). Within the buccal cavity are the two jaws. They are short, stump- like,

muscular structures, armed at their free extremities by a pair of cutting blades or claws, and are placed one on each side of the mouth. In the median line of the buccal cavity in front is placed a thick muscular protuberance, which may be called the tongue, though attached to the dorsal instead of to the ventral wall of the mouth (fig. 2). The tongue bears a row of small, chiti- nous teeth. The jaw-claws (figs. 3 and 4) , which resemble in all essential points the claws borne by the feet, and, like these, are thickenings of the cuticle, are sickle-shaped. They have their convex edge directed forwards, and their concave, or cutting edge, turned backwards. The inner cutting plate (fig. 3) usually bears a number of cutting teeth. The oral papillae are placed at the sides of the head (fig. 2). The ducts of the slime-glands open at their free end. They possess two main rings of projecting tissue, and their extremities bear papillae irregularly arranged. The ambulatory appendages vary in number. There are seventeen pairs in P. capensis and eighteen in P. balfouri, while in P. jamai- censis the number varies from twenty-nine to forty-three. They consist of two main divisions, which we may call the leg and the foot (fig. 5). The leg (/) has the form of a truncated cone, the broad end of which is attached to

(After Sedgwick.)

Fig. 2. — Ventral view of the head of

P. capensis. ant, Antennae; or.p, Oral papillae; F.i, First leg; T, Tongue.

(After Sedgwick.) Fig. 1

-Peripatus capensis, drawn from life. Life size.

posterior end of the body, and the generative opening is on the ventral surface, just in front of the anus; it may be between the legs of the penultimate pair, or between the legs of the” last pair, or it may be subterminal. The colour varies considerably in the different species, and even in different individuals of the same species. The skin has a velvety appearance, and is thrown into a number of transverse ridges, along which wart-like papillae are placed. These papillae, which arc found everywhere, are the primary papillae; they are covered with small, scale-like projections called secondary papillae, and are specially developed on the dorsal surface, less so on the ventral. Each papilla carries at its extremity a well-marked spine. Among the primary papillae smaller accessory papillae are sometimes present.

The appendages of the head are the antennae, the jaws and the oral

papillae. The mouth is at the hinder end of a depression

(After Balfour.) (After Balfour.)

Fig. 3. — Inner jaw-claw of Fig. 4. — Outer jaw-claw of

P. capensis. * P. capensis.

the ventro-lateral wall of the body, of which it is a prolongation. It is marked by a number of rings of papillae placed transversely to its long axis, the dorsal of which are pigmented like thfe dorsal surface of the body, and the ventral like the ventral surface. At the narrow distal end of the leg there are on the ventral surface three or

four (rarely five) spiniferous

pads, each of which is con- tinued dorsally into a row of

papillae. The foot is attached

to the distal end of the leg.

It is slightly narrower at its

attached extremity than at

its free end. It bears two

sickle-shaped claws, and at

its distal end three (rarely

four) papillae. The part of

the foot which carries the

claws is especially retractile,

and is generally found more

or less telescoped into the

proximal part. The legs of the fourth and fifth pairs differ from the others in the fact that the third pad (counting from the distal end of the leg) carries the ,,, _ , . , , opening of the enlarged nephridia (A£ter Sed S™ k > of these segments. In some species Fig. 5. — Ventral view of last certain of the legs bear on their leg of a male P. capensis.

ventral sides furrows with tumid lips f < Foot; /, leg; p, spinifer and lined by smooth non-tuberculate us' pads. ' The white papilla epithelium; they are called coxal { the proximal part of this organs, and it appears that they can l eg is characteristic of the be everted. The males are generally ma l e of this species, rather smaller and less numerous

than the females. In those species in which the number of legs varies the male has a smaller number of legs than the female.

Breeding. — As already stated, Peripatus is viviparous. The Australasian species come nearest to laying eggs, inasmuch as the eggs are large, full of yolk, and enclosed in a shell; but development normally takes place in the uterus, though abnormally, incompletely developed eggs are extruded. The uterus always contains several young, which are usually at different stages of development and are born^at different times of the year. In most of the African species, however, the embryos of the uterus are almost of the same age and are born at a definite season. The young of P. capensis are born in April and May. They are almost colourless at birth, excepting the antennae, which are green, and their length is 10 to 15 mm. A large female will produce thirty to forty young in one year. The period of gestation is thirteen months, that is to say, the ova pass into the oviducts about one month before the young of the preceding year are born.

Anatomy. — The alimentary canal (fig. 6). The buccal cavity, as explained above, is a secondary formation around the true

mouth, which is at its dorsal posterior end. It contains the tongue and the jaws, which have already been described, and into the hind end 01 it there open ventrally by a median opening the salivary glands. The mouth leads into a muscular pharynx, which is connected by a short oesophagus with the stomach The stomach forms by far the largest part of the alimentary canal. It is a dilated soft-walled tube, and leads behind into the short narrow rectum, which opens at the anus. There are no glands opening into the alimentary canal. The central nervous system, the anterior part of which is shown in fig. 7, is of the " rope-ladder " type, and the ven- tral cords meet over the rectum. The cuticle is a thin layer, of which the spines, jaws and claws are special developments. Its surface is not, however, smooth, but is everywhere,

with the ex- ception of the perioral region, raised into minute secondary

L-aln

(After Balfour.)

Fig. 6. — Peripatus capensis dis- sected so as to show the ali- mentary canal, slime glands and salivary glands. The dissection is viewed from the ventral side, and the lips (L) have been cut through in the middle line behind and pulled outwards so as to expose the jaws (7), which have been turned outwards, and the tongue {T) bearing a median row of chitinous teeth, which branches behind into two. The muscular pharynx, extending back into the space between the first and second pairs of legs, is followed by a short tubular oeso- phagus. The latter opens into the large stomach with plicated walls, extending almost to the hind end of the animal. The stomach at its point of junction with the rectum presents an S-shaped ven- tro-dorsal curve.

A, Anus; at, antenna; F.i, F.2, first and second feet; j, jaws; L, lips; oe, oesophagus; or.p, oral papilla; ph, pharynx; R, rectum; s.d, salivary duct; s.g, salivary gland; sl.d, slime reservoir; sl.g, portion of tub- ules of slime gland ; st, stomach ; T, tongue in roof of mouth.

papillae, which in most instances bear at their free extremity a somewhat prominent spine. The epidermis, placed immediately within the cuticle, is composed of a single row of cells. The pigment which gives the characteristic colour to the skin is deposited in the protoplasm of the outer ends of the cells in the form of small granules. Beneath the epidermis is a thin cutis, which is followed by the muscular layers (external circular and internal longitudinal). The muscular fibres of the jaws are transversely striated, the other muscles are unstriated.

The apertures of the tracheal system are placed in the depressions between the papillae or ridges of the skin. Each of them leads into a tube, which may be called the tracheal pit (fig. 8) ; the walls

-tr.o.

(After Balfour.)

FlG. 8. — Section through a tracheal pit and diverging bundles

of tracheal tubes taken transversely to the long axis of the body.

tr. Tracheae, showing rudimentary spiral fibre ; tr.c, Cells resembling those lining the tracheal pits, which occur at intervals along the course of the tracheae; tr.o, Tracheal stigma; tr.p, Tracheal pit.

of this are formed of epithelial cells, bounded towards the lumen of the pit by a very delicate cuticular membrane continuous with the cuticle covering the surface of the body. Internally it expands in the transverse plane, and from the expanded portion the tracheal tubes arise in diverging bundles. The tracheae are minute tubes exhibiting a faint transverse striation which is probably the indication of a spiral fibre. They appear to branch, but only exceptionally. The tracheal apertures are diffused over the surface of the body, but are especially developed in certain regions.

The vascular system consists of a dorsal tubular heart with paired ostia leading into it from the pericardium, of the peri- cardium, and the various other divisions of the perivisceral cavity (fig. 12, D). As in all Arthropoda, the perivisceral ‘ cavity is a haemocoele, i.e. contains blood, and forms part of the vascular system. It is divided by septa into chambers (fig. 12, D), of which the most important are the central chamber containing the ali- mentary canal and the dorsal chamber or pericardium. Nephridia are present in all the legs. In all of them (except the first three) the following parts may be recognized (fig. 9) : (1) a vesicular portion

CO

(After Balfour.)

Fig. 7. — Brain and anterior part of the ventral nerve-cords of Peripatus capensis enlarged and viewed from the ventral surface.

atn, Antennary nerves; co, commissures between ventral cords; d, ventral appendages of brain; E, eye; en, nerves passing outwards from ventral cord; F.g.i, ganglionic en- largements from which nerves to feet pass off; jn, nerves to jaws; org, ganglionic enlarge- ment from which nerves to oral papillae pass off; orn, nerves to oral papillae; pc,

posterior lobe of brain; pn, nerves to feet; sy, sym- pathetic nerves.

Fig. 9. — Nephridium from the ninth pair of legs of P. capensis.

o.s. External opening of segmen- tal organ.

p.f, Internal opening of nephrid- ium into the body cavity (lateral compartment).

s, Vesicle of segmental organ.

s.c.i, s.c.2, s.c.3, s.c.4, Successive regions of coiled portion of nephridium.

s.o.t, Third portion of nephridium broken off at p.f from the in- ternal vesicle, which is not shown.

(s) opening to the exterior on the ventral surface of the legs by a narrow passage (s.d) ; (2) a coiled portion, which is again subdivided into several sections (s.c) ; (3) a section with closely-packed nuclei ending by a somewhat enlarged opening (p.f) ; (4) the terminal portion, which consists of a thin-walled vesicle. The nephridia of the first three pairs of legs are smaller than the rest, consisting only of a vesicle and 4, uct – The fourth and fifth pairs are larger than those behind, and are in other respects peculiar; for instance, they open on the third pad (counting from the distal end of the

leg) , and the external vesicular portion is not dilated. The external opening of the other nephridia is placed at the outer end of a trans- verse groove at the base of the legs. The salivary glands are the modified nephridia of the segment of the oral papillae.

The male generative organs (fig. 10) consist of a pair of testes (te), a pair of seminal vesicles (v), vasa deferentia (v.d.), and acces- sory glandular tubules (/). All the above parts lie in the central

(After Balfour.) FlG. io. — Male Generative Organs of Peripatus capensis. Dorsal view.

p, Common duct into which vasa

a.g, Enlarged crural glands of last

pair of legs. F. 16, 17, Last pair of legs. /, Small accessory glandular

tubes.

deferentia open. te, Testes, v, Seminal vesicles. v.c, Nerve-cord. v.d, Vas deferens.

compartment of the body cavity. The ovaries consist of a pair of tubes closely applied together, and continued posteriorly into the oviducts. Each oviduct, after a short course, becomes dilated into the uterus. The two uteri join behind and open to the exterior by a median opening. The ovaries always contain spermatozoa, some of which project through the ovarian wall into the body cavity. Spermatozoa are not found in the uterus and ovi- ducts, and it appears probable, as we have said, that they reach the ovary directly by boring through the skin and traversing the body cavity. In all the species except the African species there is a globular receptaculum seminis opening by two short ducts close together into the oviduct, and in the neotropical species there is in addition a small receptaculum ovorum, with extremely thin walls, opening into the oviduct by a short duct just in front of the recep- taculum seminis. The epithelium of the latter structure is clothed with actively moving cilia. There appear to be present in most, if not all, of the legs some accessory glandular structures opening just externally to the nephridia. They are called the crural glands.

The development has been worked out in P. capensis, to which species the following description refers. The segmentation is peculiar, and leads to the formation of a solid gastrula, consisting of a cortex of ectoderm nuclei surrounding a central endodermal mass, which is exposed at one point — the blastopore. The enteron arises as a space in the endoderm, and an opacity — the primitive streak — appears at the hind end of the blastopore (fig. II, B). The elongation of the embryo is accompanied by an elongation of the blastopore, which soon becomes dumb-bell shaped (fig. 11, C). At the same time the mesoblastic somites (embryonic segments of mesoderm) make their appearance in pairs at the hind end, and gradually travel forwards on each side of the blastopore to the front end, where the somites of the anterior pair soon meet in front of the blastopore (fig. 11, D). Meanwhile the narrow middle part of the blastopore has closed by a fusion of its lips, so that the blastopore is represented by two openings, the future mouth and anus. A primitive groove makes its appearance behind the blasto- pore (fig. II, D). At this stage the hind end of the body becomes curved ventrally into a spiral (fig. 11, E), and at the same time the appendages appear as hollow processes of

the body-wall, a mesoblastic somite being prolonged into each of them. The first to appear are the antennae, into whieh the praeoral somites are prolonged. The remainder appear from before backwards in regular order, viz. jaw, oral papillae, legs 1-17. The full number of somites and their appendages is not, however, completed until a later stage. The nervous system is formed as an annular thickening of ectoderm passing in front of the mouth and behind the anus, and lying on each side of the blastopore along the lines of the somites. The praeoral part of this thickening, which gives rise to the cerebral ganglia, becomes pitted inwards on each side (fig. 11, F, e.g.). These pits are eventually closed, and form the hollow ventral appendages of the suprapharyngeal ganglia of the adult (fig. 7, d). The lips are formed as folds of the side wall of the body, extending from the praeoral lobes to just behind the jaw (fig. II, F, L). They enclose the jaws (j), mouth (M), and opening of the salivary glands (o.s), and so give rise to the buccal cavity. The embryo has now lost its spiral curvature, and becomes completely doubled upon itself, the hind end being in contact with the mouth (fig. 11, G). It remains in this position until birth. The just-born young are from 10 to 15 mm. in length, and have green antennae, but the rest of the body is either quite white or of a reddish colour. This red colour differs from the colour of the adult in being soluble in spirit. The mesoblastic somites are paired sacs formed from the anterior lateral portions of the primitive streak (fig. 11, C). As they are formed they become placed in pairs on each side of the

orj)

D

Development. — Peripatus is found in Africa, in Austral- asia, in South America and the West Indies, in New Britain, and in the Malay Peninsula and Sumatra. The species found in these various localities are closely similar in their anatomical characters, the principal differences relating to the structure of the female generative organs and to the number of the legs. They, however, differ in the most striking manner in the structure of the ovum and the early development. In all the Australasian species the egg is large and heavily charged with food- yolk, and is surrounded by a tough membrane. In the Cape species the eggs are smaller, though still of con- siderable size; the yolk is much less developed, and the egg membrane is thinner though dense. In the New Britain species the egg is still smaller (i mm), and there is a large trophic vesicle. In the neotropical species the egg is minute, and almost entirely devoid of yolk. The unsegmented uterine ovum of P. novae zealandiae measures

1-5 mm. in length by -8 mm. in breadth; that of P. capensis is -56 mm. in length: and that of P. trinidadensis 04 mm. in diameter. In corre spondence with these differences in the ovum there are differences in the early development, though the later stages are closely isimilar.

(After Sedgwick.)

Fig. 11. — A Series of Embryos of P. capensis. The hind end of embryos B, C, D is uppermost in the figures, the primitive streak is the white patch behind the blastopore.

A, Gastrula stage, ventral view, showing blastopore.

B, Older gastrula stage, ventral view, showing elongated blasto- pore and primitive streak.

C, Ventral view of embryo with three pairs of mesoblastic somites, dumb-bell shaped blas- topore and primitive streak.

Ventral view of embryo, in which the blastopore has com- pletely closed in its middle portion. The anterior pair

of somites have moved to the front end of the body.

E, side view of later embryo.

At, Antenna; d, dorsal pro- jection; p.s., praeoral somite.

F, Ventral view of head of embryo,

intermediate between E and G. At, Antennae; eg, cerebral groove; j, jaws; j.s. swelling at base of jaws; L, lips; M, mouth; or.p, oral papillae ; o.s, opening of salivary gland.

G, side view of older embryo.

blastopore, position

The somites of entirely in front

the first pair eventually obtain of the blastopore (Fig. II, D). They form the somites of the praeoral lobes. The full comple- ment of somites is acquired at about the stage of fig. II, E. The relations of the mesoblastic somites are shown in fig. 12, A, which represents a transverse section taken between the mouth and anus of an embryo of the stage of fig. 11, D. The his- tory of these somites is an exceedingly interesting one, and may be described shortly as follows: They divide

into two parts — a ventral part which extends into the appendage, and a dorsal part (fig. 12, B). Each of the ventral parts acquires an opening to the exterior, just outside the nerve-cord,

and becomes entirely transformed into a nephridium (fig. 12, D, 2'). The dorsal part shifts dorsalwards and diminishes rela- tively in size (fig. 12, C). Its fate differs in the different parts of the body. In the anterior somites it dwindles and disappears, but in the posterior part it unites with the dorsal divisions of con- tiguous somites of the same side, and forms a tube — the generative tube (fig. 12, D, 2). The last section of this tube retains its con- nexion with the ventral portion of the somite, and so acquires an external opening, which is at first lateral, but soon shifts to the middle line, and fuses with its fellow, to form the single generative opening. The praeoral somite develops the rudiment of a nephri- dium, but eventually entirely disappears. The jaw somite also disappears; the oral papilla somite forms ventrally the salivary glands, which are thus serially homologous with nephridia. The various divisions of the perivisceral cavity develop as a series of

though not characteristic of all the classes of the Arthropoda, are found nowhere outside that group, and constitute a very important additional reason for uniting Peripatus with it. Peri- patus, though indubitably an Arthropod, differs in such impor- tant respects from all the old-established Arthropod classes, that a special class, equivalent in rank to the others, and called Prototracheata or Onychophora, has had, as we have seen, to be created for its sole occupancy. This unlikeness to other Arthropoda is mainly due to the Annelidan affinities which it presents, but in part to the presence of the following peculiar features: (1) the number and diffusion of the tracheal apertures; (2) the restriction of the jaws to a single pair; (3) the dis- position of the generative organs; (4) the texture of the skin; and (5) the simplicity and similarity of all the segments of the body behind the head. The Annelidan affinities are superficially indicated in so marked a manner by the thinness of the cuticle, the dermo- muscular body-wall, the hollow appendages, that, as already stated, many of the earlier zoologists who examined Peripatus placed it among the segmented worms; and the discovery that there is some solid morphological basis for this determination constitutes one of the most interesting points of the recent work on the genus. The Annelidan features are: (1) the paired nephridia in every segment of the body behind the first two (Saenger, Balfour); (2) the presence of cilia in the

generative tracts (Gaffron). It is true that neither of these features is absolutely distinctive of the Annelida, but when taken in conjunction with the Annelidan disposition of the chief systems of organs, viz. the central nervous system, and the main vascular trunk or heart, they may be considered as indicating affinities in that direction.

(After Sedgwick.) ssm^^sa^^ ~***£i&gg2&t

Fig. 12. — A series of diagrams of transverse sections through Peripatus embryos Synopsis of Species.

to show the relations of the coelom at successive stages. Peripatus (Guildmg).— Soft-bodied vermiform animals,

A, Early stage; no trace of the vascular space; endoderm and ectoderm in ™\? “PJS” ° f •TJ nged a ” tennae – ? ne P air ° f jaws, one contact P papillae, and a varying number of claw-

B, Endoderm has separated from the dorsal and ventral ectoderm. The ¥%?„ ˆlˆthfn dorsal surface arched and more somite is represented as having divided on the left side into a dorsal and SlT?ˆJ J u + u ventral v f r fac ?” . f Skln ventral portion transversely ridged and beset by wart-like spiniferous

CThe haemocoele (3) has become divided up into a number of spaces, the P-?” 1 ˆ- ˆouth anterior ventral; anus posterior, terminal, arrangement of which is unimportant. The dorsal part of the somite has n”™W n (P? \ S S1 ” g ‘ n ˆ“l’ ventral and posterior. travelled dorsalwards, and now constitutes a small space (triangular in ° n ,f P alr o of sl , mP Y ♦ i™ lar g e ‘. , w ! th ˆ° Y entral section) just dorsal to the gut. The ventral portion (2) has assumed a ˆ!° w t a RP*. ndag es = ventral cords widely divancated, tubular character, and has acquired an external opening. The internal without distinct ganglia. Alimentary canal simple, un- vesicle is alreadv indicated, and is shown in the diagram by the thinner ?? 1 ‘ ed – Segmentally arranged paired nephridia are present black line: I, gut; 2, somite; 2’, nephridial part of coelom; 3, haemocoele; ? odv cavltv ls continuous with the vascular system and 3’, part of haemocoele which will form the heart-the part of th e does not communicate with the paired nephridia. Heart haemocoele on each side of this will form the pericardium; 4, nerve-cord ; ™ ar ‘ wl ˆ. P aired ostia v Respiration by means of 4 slime glands tracheae. Dioecious; males smaller and generally less

D represents the conditions at the time of birth. The coelom is represented n. uraerous than females . Generative glands tubular, con- surrounded by a thick black line, except in the part which forms the lˆLT n- ? tˆ Yj v ? pa ?r- UB – ˆ? U ” § nwV” 1 ˆ :ernal vesicle of the nenhridmm. * developed. Distnbution :Afnca (Cape Colony, Natal, and

the Gaboon), New Zealand, Australia and Tasmania, New

internal vesicle of the nephridium.

spaces between the ectoderm and endoderm, and later in the meso- derm. The mesoderm seems to be formed entirely from the proliferation of the cells of the mesoblastic somites. It thus appears

that in Peripatus the coelom does not develop a perivisceral portion, but gives rise only to the renal and reproductive organs.

The genus Peripatus was established in 1826 by L. Guilding, who first obtained specimens of it from St Vincent in the Antilles. He regarded it as a mollusc, being no doubt deceived by the slug-like appearance given by the antennae. Specimens were subsequently obtained from other parts of the neotropical region, and from South Africa and Australia, and the animal was variously assigned by the zoologists of the day to the Anne- lida and Myriapoda. Its true place in the system, as a primitive member of the group Arthropoda, was first established in 1874 by H. N. Moseley, who discovered the tracheae. Peripatus is an Arthropod, as shown by (1) the presence of appendages modified as jaws; (2) the presence of paired lateral ostia per- forating the wall of heart and putting its cavity in communication with the pericardium; (3) the presence of a vascular body cavity and pericardium (haemocoelic body cavity); (4) absence of a perivisceral section of the coelom. Finally, the tracheae,

Britain, South and Central America and the West Indies, the Malay Peninsula [and in Sumatra ?].

The genus Peripatus, so far as adult conformation is concerned, is a very homogeneous one. It is true, as was pointed out by Sedgwick, that the species from the same part of the world re- semble one another more closely than they do species from other regions, but recent researches have shown that the line between them cannot be so sharply drawn as was at first supposed, and it is certainly not desirable in the present state of our knowledge to divide them into generic or subgeneric groups, as has been done by some zoologists. (The following genera have been pro- posed: Peripatus for the neotropical species, Peripatoides for the Australasian, Peripatopsis and Opisthopatus for the African, Paraperipatus for the New Britain, Eoperipatus for the Malayan species, _ and Ooperipatus for the supposed oviparous species of Australia and New Zealand.) The colour is highly variable in species from all regions; it is perhaps more constant in the species from the neotropical region than in those from elsewhere. The number of legs tends to be variable whenever it exceeds 19 praegenital pairs: when the number is less than that it is usually, though not always, constant. More constant points of difference are the form of the jaws, the position of the generative orifice, the presence of a receptaculum seminis and a receptaculum ovorum, the arrangement of the primary papillae on the distal end of the feet, and above all the early development.

South African Species. — With three spinous pads on the legs,

and feet with two primary papillae on the anterior side and one on the posterior side; outer jaw with one minor tooth at the base of the main tooth, inner jaw with no interval between the large tooth and the series of small ones; last fully developed leg of the male with enlarged crural gland opening on a large papilla placed on its ventral surface; coxal organs absent; the nephridial open- ings of the 4th and 5th pairs of legs are placed in the proximal spinous pad. Genital opening subterminal, behind the last pair of fully developed legs; oviduct without receptacula seminis or receptacula ovorum ; the terminal unpaired portion of vas deferens short. Ova of considerable size, but with only a small quantity of yolk. The embryos in the uterus are all nearly of the same age, except for a month or two before birth, when two broods overlap.

The following species are aberrant in respect of these characters : Peripatus {Opisthopatus) cinctipes, Purcell (Cape Colony and Natal), presents a few Australasian features ; there is a small receptaculum seminis on each oviduct, some of the legs are provided with well-developed coxal organs, the feet have one anterior, one posterior and one dorsal papilla, and the successive difference in the ages of the embryos in the uterus, though nothing like that found in the neotropical species, is slightly greater than that found in othe investigated African species. Several pairs of legs in the middle region of the body are provided with enlarged crural glands which open on a large papilla. Male with four accessory glands, opening on each side of and behind the genital aperture. P. tholloni, Bouvier, (Equatorial West Africa [Gaboon]), shows some neotropical features; there are 24 to 25 pairs of legs, the genital opening is between the penultimate legs, and though there are only three spinous pads the nephridial openings of the 4th and 5th legs are proximal to the 3rd pad, coxal organs are present, and the jaws are of the neo- tropical type ; the oviducts have receptacula seminis. The following South African species may be mentioned: P. capensis (Grube), with 17 (rarely 18) pairs of claw-bearing legs; P. balfouri (Sedgw.) with 18 (rarely 19) pairs; P. moseleyi (Wood-M.), with 20 to 24 pairs.

Australasian Species. — With 14, 15 or 16 pairs of claw-bearing ambulatory legs, with three spinous pads on the legs, and nephridial opening of the 4th and 5th legs on the proximal pad ; feet with one

anterior, one posterior and one dorsal primary papilla; inner jaw without diastema, outer with or without a minor tooth. Last leg of the male with or without a large white papilla on its ventral surface for the opening of a gland, and marked papillae for the crural glands are sometimes present on other legs of the male; well-developed coxal glands absent. Genital opening between the legs of the last pair; oviducts with receptacula seminis, without receptacula ovorum; the terminal portion of the vas deferens long and complicated ; the accessory male glands open between the genital aperture and the anus, near the latter. Ova large and heavily charged with yolk, and provided with a stoutish shell. The uterus appears to contain embryos of different ages. Specimens are recorded from West Australia, Queensland, New South Wales, Victoria and New Zealand. The Australasian species are in some confusion. The number of claw-bearing legs varies from 14 to 16 pairs, but the number most often found is 15. Whether the number varies in the same species is not clear. There appears to be evidence that some species are occasionally or normally oviparous, and in the supposed oviparous species the oviduct opens at the end of a papilla called from its supposed function an ovipositor, but the oviparity has not yet been certainly proved as a normal occur- rence. Among the species described may be mentioned P. leuckarti (Saenger), P. insignis (Dendy), P. oviparus (Dendy), P. viridimacu- lalus (Dendy), P. novae zealandiae (Hutton), but it is by no means certain that future research will maintain these. Mr J. J.Fletcher, indeed, is of opinion that the Australian forms are all varieties of one species, P. leuckarti.

Neotropical Species. — With three to five spinous pads on the legs, nephridial opening of the 4th and 5th legs usually proximal to the 3rd pad, and feet either with two primary papillae on the anterior side and one on the posterior, or with two on the anterior and two on the posterior; outer jaw with small minor tooth or teeth at the base of the main tooth, inner jaw with diastema. A variable number of posterior legs of the males anterior to the genital opening with one or two large papillae carrying the open- ings of the crural glands; well-developed coxal organs present on most of the legs. The primary papillae usually divided into two portions. Genital opening between the legs of the penultimate pair; oviduct provided with receptacula seminis and ovorum; unpaired part of vas deferens long and complicated ; accessory organs of male opening at the sides of the anus. Ova minute, with little food-yolk; embryos in the uterus at very different stages of development. The number of legs usually if not always variable in the same species; the usual number is 28 to 32 pairs, but in some species 40 to 43 pairs are found. The neotropical species appear to fall into

two groups: (1) the so-called Andean species, viz. those which inhabit the high plateaus or Pacific slope of the Andes; in these there are 4 (sometimes 5) pedal papillae, and the nephridial openings of the 4th and 5th legs are on the third pad; and (2) the Caribbean species, viz. the remaining neotropical species, in which there are 3 papillae on the foot and the nephridial openings of the

4th and 5th legs are between the 3rd and 4th pads. The Andean species are P. eisenii (Wh.), P. tuberculatus (Bouv.), P. lankesteri (Bouv.), P. quitensis (Schm.), P. corradi (Cam.), P. cameranoi (Bouv.) and P. balzani (Cam.). Of the remaining species, which are the majority, may be mentioned P. edwardsii (Blanch), P. jamaicensis (Gr. and Cock.), P. Irinidadensis (Sedgw.), P. torquatus (Ken.), P. im thurmi (Scl.).

New Britain Peripatus. — With 22 to 24 pairs of claw-bearing legs, with three spinous pads on the legs, and nephridial openings of legs 4 and 5 (sometimes of 6 also) on the proximal pad; feet with one primary papilla on the anterior, one on the posterior side, and one on the dorsal side (median or submedian) ; outer jaw with a minor tooth, inner jaw without diastema; crural glands absent; well-developed coxal organs absent. Genital opening subterminal behind the last pair of legs; oviduct with receptaculum seminis, without receptaculum ovorum; unpaired part of vas deferens very short ; accessory glands two, opening medianly and dorsally. Ova small, I mm. in diameter, with little yolk, and the embryos pro vided with large trophic vesicles (Willey). Embryos in the uterus of very different ages, and probably born all the year round. One species only known, P. novae britanniae (Willey).

Sumatran Peripatus.— Peripatus with 24 pairs of ambulatory legs, and four spinous pads on the legs. The primary papillae of the neotropical character with conical bases. Generative opening between the legs of the penultimate pair. Feet with only two papillae. Single species. P. sumatranus (Sedgw.). The existence of this species is doubtful.

Peripatus from the Malay Peninsula. — With 23 to 25 pairs of claw-bearing legs, four spinous pads on the legs, and nephridial open- ings of legs 4 and 5 in the middle of the proximal pad or on its proximal side; feet with two primary papillae, one anterior and one posterior; outer jaw with two, inner jaw with two or three minor teeth at the base of the main tooth, separated by a diastema from the row of small teeth ; crural glands present in the male only, in the two pairs of legs preceding the generative opening; coxal glands present. Genital opening between the penultimate legs; oviduct with receptacula

seminis and ovorum ; unpaired part of vas deferens long; male accessory glands two, opening medianly between the legs of the last pair. Ova large, with much yolk and thick mem- brane, like those of Australasian species ; embryos with slit-like blastopore and of very different ages in the same uterus, probably born all the year round. The species are P. weldoni (Evans), P. horsti (Evans) and P. butleri (Evans). It will thus be seen that the Malay species, while resembling the neotropical species in the generative organs, differ from these in many features of the legs and feet, in the important characters furnished by the size and structure of the ovum, and by their early development.

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PERIPTERAL (Gr. 7repi, round, and Trep6v, a wing), in architecture, the term applied to a temple or other structure where the columns of the front portico are returned along its sides as wings at the distance of one or two intercolumniations from the walls of the naos or cella. Almost all the Greek temples were peripteral, whether Doric, Ionic, or Corinthian (see Temple).

PERISSODACTYLA (i.e. odd-toed), the name proposed by Sir R. Owen for that division of ungulate mammals in which the toe corresponding to the middle (third) digit of the human hand and foot is symmetrical in itself, and larger than those on either side (when such are present). The Perissodactyla have been brigaded with the Artiodactyla (q.v.) to form the typical group of the ungulates, under the name of Diplarthra, or Ungulata Vera, and the features distinguishing the combined group from the less specialized members of the order Ungulata will be found under the heading of that order.

The following are the leading characteristics by means of which the sub-order Perissodactyla is distinguished from the \rtiodactyla. The cheek-teeth (premolars and molars) form a

Fig. 1. — Bones of Right Fore-Foot of existing Perissodactyla.

A, Tapir (Tapir us indicus).

B, Rhinoceros (Rhinoceros sumatrensis) .

C, Horse (Equus caballus).

U, ulrta; R, radius; c, cuneiform; /.lunar; s, scaphoid; u, unciform; m, magnum; Id, trapezoid; tm, trapezium.

continuous series, with massive, quadrate, transversely ridged or complex crowns — the posterior premolars usually resembling the molars in structure. Crown of the last lower molar commonly bilobed. Dorso-lumbar vertebrae never fewer than twenty- two, usually twenty-three in the existing species. Nasal bones expanded posteriorly. An alisphenoid canal. Femur with a third trochanter. The middle or third digit on both fore and hind feet larger than any of the others, and symmetrical in itself, the free border of the terminal phalanx being evenly rounded (see fig. 1). This may be the only functional toe, or the second and fourth may be subequally developed on each side. In the tapirs and many extinct forms the fifth toe also remains on the fore-limb, but its presence does not interfere with the symmetrical arrangement of the remainder of the foot on each side of the median line of the third or middle digit. The astraga- lus has a pulley-like surface above for articulation into the tibia, but its lower surface is flattened and unites to a much greater extent with the navicular than with the cuboid, which bone is of comparatively less importance than in the Artiodactyles. In existing forms the calcaneum does not articulate with the lower end of the fibula. The stomach is simple, the caecum large and capacious, the placenta diffused, and the teats inguinal. The Perissodactyla may be divided into the four following sections, namely the extinct Titanotheroidea, the Hippoidea, represented by the horse tribe and their ancestors, the Tapiroidea,

typified by the tapirs, and the Rhinocerotoidea, which includes the modern rhinoceroses and their forerunners.

1. Titanotheres. — In the Titanotheroidea the dentition may be expressed by the formula i-frfS, c i > Pz-s > m l- There is usually a short gap between the canine and first premolar; the upper molars are short-crowned and transitional between the bunodont (tubercular) and selenodont (crescentic) types, with two outer concave tubercles and two inner conical ones; while the lower molars are crescentic, with three lobes in the last of the series. The skull is elongated, with the orbit not separated from the tem- poral fossa and the nasals, which may or may not carry horns, reaching at least as far forwards as the union of the premaxillae. The post-glenoid, post-tympanic and paroccipital processes of the skull are large, and there is an alisphenoid canal. There are four functional toes in front and three behind; while the calcaneum, unlike that of the other three groups, articulates with the fibula. The group is represented by the families Palaeosyopidae and Titano- theriidae in the Tertiary deposits of North America. Both families are described under the heading TitanothERHBAE.

2. Horse Group. — In the Hippoidea there is generally the full series of 44 teeth, but the first premolar, which is always small, is often deciduous or even absent in the lower or in both jaws. The incisors are chisel-shaped, and the canines tend to become isolated, so as in the more specialized forms to occupy a more or less midway position in a longer or shorter gap between the incisors and premolars. In the upper molars the two outer columns or tubercles of the primitive tubercular molar coalesce to form an outer wall, from which proceed two crescentic transverse crests, the connexion between the crests and the wall being slight or im- perfect, and the crests themselves sometimes tubercular. Each of the lower molars carries two crescentic ridges. In the earlier forms the cheek-teeth are low-crowned, but in the higher types they become high-crowned. The number of front toes range? from four to one, and of hind ones from three to one. The post-glenoid, post-tympanic and paroccipital processes of the skull are large; the second of these being always distinct. Nasals long, normally without traces of horns.

The section is divisible into the families Equidae and Palaeo-theriidae, of which the latter is extinct.

In the Equidae the premolars are generally j or jj. In the earlier short-crowned forms these teeth are unlike the molars, and the first of the series is separated by a gap from the second. In the high-crowned types, as well as in some of the intermediate ones, they become molar-like, and roots are not developed in the whole cheek-series till late. Orbit in higher forms closed by bone; and ridges of lower cheek-teeth terminating in large loops. Front toes 4, 3 or 1, hind; 3 or 1. (See Equidae and Horse.)

In the Palaeolheriidae the premolars may be | or |, and are generally molar-like, while the first (when present) is always close to the second; all the cheek-teeth short-crowned and rooted, with or without cement. Outer walls of upper cheek-teeth W-shaped, and transverse crests oblique. Orbit open behind ; and ridges of lower cheek-teeth generally terminating in small loops. Feet always 3-toed. (See Pai.aeotherium.)

3. Tapir Group. — In the Tapiroidea the dentition may be either the full 44, or lack the first premolar in the lower or in both jaws. The incisors are chisel-shaped ; and (unlike the early Hippoidea) there is no gap between the first premolar, when present, and the second. The upper cheek-teeth are short-crowned and without cement, and show distinct traces of the primitive tubercles; the two outer columns form a more or less complete external wall, connected with the inner ones by

a pair of nearly straight transverse crests; and the premolars are originally simpler than the molars. Lower cheek-teeth with two straight transverse ridges. Nasals long in early, but shorter in later forms, hornless; orbit open behind. Front toes, 4; hind toes, 3.

This group is also divided into two families, the Tapiridae and Lophiodontidae , the latter extinct.

In the Tapiridae the dentition may be reduced below the typical 44 by the loss of the first lower premolar. Hinder premolars either simple or molar-like. Outer columns of upper molars similar, the hinder ones not flattened ; ridges of lower molars oblique or directly transverse, a third ridge to the last molar in the earlier forms. The Lophiodontidae, which date from the Eocene, come very close to Hyracotherium in the horse-line; and it is solely on the authority of American palaeontologists that the division of these early forms into equoids and tapiroids is attempted. In North America the earliest representative of the group- is Systemodon of the Lower Eocene, in which all the upper premolars are quite simple ; while the molars are of a type which would readily develop into that of the modern tapirs, both outer columns being conical and of equal size. The absence of a gap between the lower canine and first premolar and between the latter and the following tooth is regarded as an essentially tapir-like feature. Lophiodochoerus apparently represents this stage in the European Lower Eocene; 1 ‘ sectolophus , of the American Middle Eocene, represents a distinct advance, the last upper premolar becoming molar-like, while a second species from the Upper Eocene is still more advanced; the third lobe is, however, retained in the last lower molar. In the

Oligocene of both hemispheres appears Protapirus, which ranges well into the Miocene, and is essentially a tapir, having lost the third lobe of the last lower molar, and being in process of acquiring molar-like upper premolars, although none of these teeth have two complete inner columns. Finally, Tapirus itself, in which the last three upper premolars, makes its appearance in the Upper Miocene, and continues till the present day. The characters of the genus may be expressed as follows in a more detailed manner.

The dentition is i f , c \, pi,m\, total 42. Of the upper incisors the first and second are nearly equal, with short, broad crowns, the third is

large and conical, considerably larger than the canine, which is separated from it by an interval. Lower incisors diminish- ing in size from the first to the third; the canine, which is in contact with the third incisor, large and conical, working against (and behind) the canine-like thira upper incisor. In both jaws there is a long space between the canines and the commencement of the teeth of the cheek-series, which are all in contact. First upper premolar with a triangular crown narrow in front owing to the absence of the anterior inner column. The other upper premolars and molars all forrped on the same plan and of nearly the same size, with four roots and quadrate crowns, rather wider transversely than from before backwards, each having four columns, connected by a pair of transverse ridges, anterior, and posterior. The first lower premolar compressed in front ; the others composed of a single pair of transverse crests, with a small anterior and posterior basal ridge. Skull elevated and compressed ; with the orbit and temporal fossa widely continuous, there being no true post-orbital process from the frontal bone. Nasal apertures very large, and extending high on the face between the orbits; nasal bones short, elevated, triangular and pointed in front. Vertebrae: cervical, 7; dorsal, 18; lumbar, 5; sacral, 6; caudal about 12. Limbs short and stout. Fore-feet with four toes, having distinct hoofs: the first toe being absent, the third the longest, the second and fourth nearly equal, and the fifth the shortest and scarcely reaching the ground in the ordinary standing position. Hind-feet with the typical perisso- dactyle arrangement of three toes — the middle one being the largest, the two others nearly equal. Nose and upper lip elongated into a flexible, mobile snout or short proboscis, near the end of which the nostrils are situated. Eyes rather small. Ears of moderate size, ovate, erect. Tail very short. Skin thick and but scantily covered with hair. Tapirs are common to the Malay countries and tropical America; two species from the latter area differ from the rest in having a vertical bony partition to the nasal septum, and are hence subgenerically or

fenerically separated as Tapirella (Elasmognathus) (see Tapir). learly related is the extinct family Lophiodontidae (inclusive of the American Helaletidae) , in which both the upper and lower first premolar may be absent, while the upper molars present a more rhinoceros-like form, owing to the lateral compression and consequent lengthening of the outer columns, of which the hinder is bent somewhat inwards and is more or less concave externally, thus forming a more complete outer wall. In America the family is represented by Heptodon, of the Middle Eocene, which differs from the early members of the tapir-stock in having a long gap between the lower canine and first premolar; the dentition is com- plete, and the upper premolars are

simple. The next stage is Helaletes, also of Middle Eocene age, in which the first lower pre- molar has disappeared, and the last two upper premolars have become molar-like. Finally, in the Oligocene Colodon the last three upper premolars are like the molars, and the first pair of lower incisors is lost. In Europe the group is represented by the long-known and typical genus Lophiodon with three premolars in each jaw, of which the upper are simpler than the molars. The genus is especially characteristic of the Middle and Upper Eocene, and some of the species attained the size of a rhinoceros.

4. Rhinoceros Group. — The last section of the Perissodactyla is that of the Rhinocerotoidea, represented by the modern rhinoce- roses and their extinct allies. In this group the incisors and canines are very variable in number and form; the lower canine being separated by only a short gap from the outer incisor (when present), but by a long one from the first premolar, which is in contact with the second. The second and third premolars, which are always present, are large and molar-like; the whole of these teeth being essentially of the lophodont type of Lophiodon, but the last upper molars assume a more or less triangular form, with an oblique outer wall, and there are certain complications in the structure of all these teeth in the more specialized types (fig. 2). The lower cheek- teeth have, unlike those of the Tapiroidea, crescentic ridges, which have not the loops at their extremities characteristic of the advanced Hippoidea; the last lower molar has no third lobe. The facial portion of the skull is generally shorter than the cranial ; the orbit is freely open behind; and the premaxillae tend to be reduced and fused with the nasals. Front toes, 3 or 4; hind toes, 3.

The most primitive group is that of the American Hyracodontidae, represented in the Oligocene by Hyrachyus, Hyracodon and Triplo- pus. With the exception of the first lower premolar, the dentition is complete; the incisors being normal, but the canine rudimen- tary, and the last upper molar distinctly triangular. The upper molars have a crista and a crochet (fig. 2). The skull is high, with the facial and cranial portions approximately equal. There

are only three front toes, and the limbs are long and adapted for running.

In the Amynodontidae, represented by the North American Middle Eocene Amynodon and Metamynodon, the premolars may be either f or f , making the total number of teeth either 44 or 40. The incisors tend to become latera 1 , the canines are enlarged, and the last upper molar is sub-quadrangular. The upper molars have a crista but no

crochet (fig. 2). As in the last family, the post-glenoid process of the skull is broad; the whole skull being depressed with a shortened facial portion. The fore-foot is five- toed and spreading; indicating that the members of the family were swamp-dwelling animals.

Finally, we have the family Rhinocerotidae, which includes the existing representatives of the group. In this family the dentition has undergone considerable reduction, and may be represented inclusive of all the variations, by the formula i f-ˆj c Jfjf£ p 4 ° r r 2 m |. The first upper incisor, when present, has an antero-posteriorly elongated crown, but the second is small; when fully developed, the lower canine is a large forwardly directed tusk-like tooth with sharp cutting-edges, and biting against the first upper incisor. The third upper molar is triangular, and most of the teeth of the upper cheek-series may have both crochet and crista (fig. 2). The post-glenoid process is small, and the facial and cranial portions of the skull are approximately of equal length. Usually there are three, but occasionally four front toes; and the limb-bones are short.

A large number of representatives of the group are known from both the Old and the New World; specialization displaying itself in the later ones in the development of dermal horns over the nasal bones, either in laterally placed pairs as in some of the early forms, or in the median line, either single or double. In North America rhinoceroses became extinct before the close of the Pliocene period; but in the Old World, although their geographical distri- bution has become greatly restricted, at least five well-marked species survive. The group is unknown in South America.

As regards the dentition of the existing species, the cheek-series consists of the four premolars and three molars above and below, all in contact and closely resembling each other, except the first, which is much smaller than the rest and often deciduous; the

a B

2 e 2

Fig. 2. — Grinding Surface of moderately worn Right Upper Second Molars of Rhinoceros.

A, Rhinoceros unicornis.

1 , Anterior surface.

2, Posterior surface.

3, Internal surface.

4, External surface (wall or

dorsum).

5, Antero-internal pillar or

column.

B, Rhinoceros sondaicus.

6, Postero-internal pillar

column.

7, Anterior valley.

8, Median valley.

9, Posterior valley.

10, Accessory valley.

11, Crista.

12, Crochet.

others gradually increasing in size up to the penultimate. The upper molars present a characteristic pattern of crown, having a much-developed flat or more or less sinuous outer wall, and two transverse ridges running obliquely inwards and backwards from it, terminating internally in conical eminences or columns, and enclosing a deep valley between. The posterior valley is formed behind the posterior transverse ridge, and is bounded externally by a backward continuation of the outer wall and behind by the cingulum. The anterior valley is formed in the same manner, but is much smaller. The middle valley is often intersected by vertical ” crista ” and ” crochet ” plates projecting into it from the anterior surface of the posterior transverse ridge or from the wall, the development of which is a useful guide in discriminating species, especially those known only by teeth and bones. The depressions between the ridges are not filled up with cement. As stated above, the lower molars have the crown formed by a pair of crescents; the last having no third lobe.

The head is large, and the skull elongated, and elevated posteriorly into a transverse occipital crest. No post-orbital processes or any

separation between orbits and temporal fossae. Nasal bones large and stout, co-ossified, and standing out freely above the premaxillae, from which they are separated by a deep and wide fissure; the latter small, generally not meeting in the middle line in front, often rudimentary. Tympanies small, not forming a bulla. Brain-cavity small for the size of the skull. Vertebrae: cervical, 7; dorsal 19-20; lumbar, 3; sacral, 4; caudal, about 22.

Limbs stout, and of moderate length. Three completely developed toes, with distinct broad rounded hoofs on each foot. Teats two, inguinal. Eyes small. Ears of moderate size, oval, erect, promi- nent, placed near the occiput. Skin very thick, in many species thrown into massive folds. Hairy covering scanty. One or two median horns on the face. When one is present it is situated over the conjoined nasal bones; when two, the hinder one is over the frontals. These horns, which are of a more or less conical form and usually recurved, and often grow to a great length (three or even four feet), are composed of a solid mass of hardened epidermic cells growing from a cluster of long dermal papillae. The cells formed on each papilla constitute a distinct horny fibre, like a thick hair, and the whole is cemented together by an inter- mediate mass of cells which grow up from the interspaces between the papillae. It results from this that the horn has the appearance of a mass of agglutinated hairs, which, in the newly growing part at the base, readily fray out on destruction of the softer intermediate substance ; but the fibres differ from true hairs in growing from a free papilla of the derm, and not within a follicular involution of the same. Considerable difference of opinion exists with regard to the best classification of the family, some authorities including most of the species in the typical genus Rhinoceros, while others recognize quite a number of sub-families and still more genera. Here the family is divided into two groups Rhinocerotinae and Elasmotheriinae, the latter including only Elasmotherium, and the former all the rest. In the Lower Oligocene of Europe we have Ronzolherium and in that of America Leptaceratherium (Trigonias), which were primitive species with persistent upper canines and three-toed fore-feet. Possibly they belonged to the Amynodontidae, but they may have been related to the Upper Oligocene Dicera- therium, in which the nasal bones formed a transverse pair; this genus being common to Europe and North America. Caenopus is an allied American type. Hornless rhinoceroses, with five front- toes, ranging from the Oligocene to the Lower Pliocene in Europe, represent the

genus Aceratherium, which may also occur in America, as it certainly does in India. With the short-skulled, short-footed, three-toed and generally horned rhinoceroses ranging in Europe and America from the Lower Miocene to the Lower Pliocene, typified by the European R. goldfursi and if. brachypus, we may consider the genus Rhinoceros to commence; these species constituting the subgenus Teleoceras. The living R. (Dicerorhinus) sumatrensis of south-eastern Asia indicates another subgenus, represented in the European Miocene by R. sansaniensis and in the Indian Pliocene by R. platyrhinus, in which two horns are combined with the presence of upper incisors and lower canines. Next we have the living African species, representing the subgenus Diceros, in which there are two horns but no front teeth. Tc this group belongs the extinct European and Asiatic woolly rhinoceros, Rhinoceros {Dicero's) antiquilatis, of Pleistocene age, of which the frozen bodies are sometimes found in Siberia, and R. (D.) pachygnathus of the Lower Pliocene of Greece. Finally the Great Indian rhinoceros R. unicornis, the Javan R. sondaicus, and the Lower Pliocene Indian R. sivalensis and R. palaeindicus, represent Rhinoceros proper, in which front teeth are present, but there is only one horn. (See Rhinoceros.)

The subfamily Elasmotheriinae is represented only by the huge E. sibircum of the Siberian Pleistocene, in which the premolars were reduced to j while front-teeth were probably wanting, and the cheek teeth developed tall crowns, without roots, but with cement in the valleys, and the enamel of the central parts curiously crimped. A hump on the forehead probably indicates the existence of a large frontal horn.

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PERISTYLE (Gr. irepi, round, and otv\os, column), in archi- tecture, a range of columns (whether rectangular or circular on plan) in one or two rows, enclosing the sanctuary of a temple; the term is also applied to the same feature when built round the court in which the temple is situated and in Roman houses to the court in the rear, round which the private rooms of the family were arranged, which were entered from the covered colonnade round the court.

PERITONITIS, inflammation of the peritoneum — the serous membrane which lines the abdominal and pelvic cavities and gives a covering to their viscera. It may exist in an acute or a chronic form, and may be either localized or diffused.

Acute peritonitis may be brought on, like other inflammations, by exposure to wet or cold, or in connexion with injury to, or disease of, some abdominal organ, or with general feebleness of health. It is an occasional result of hernia and of obstruction

of the bowels, of wounds penetrating the abdomen, of the perforation of viscera, as in ulcer of the stomach, and of the intestine in typhoid fever, of the bursting of abscesses or cysts into the abdominal cavity, and also of the extensions of inflammatory action from some abdominal or pelvic organ, such as the appendix, the uterus, or bladder. At first localized, it may afterwards become general. The changes effected in the peritoneum are similar to those undergone by other serous membranes when inflamed. Thus, there are congestion; exudation of lymph in greater or less abundance, at first greyish and soft, thereafter yellow, becoming tough and causing the folds of the intestine to adhere together; effusion of fluid, either clear, turbid, bloody or purulent. The tough, plastic lymph connecting adjacent folds of intestine is sometimes drawn out like spun-glass by the movements of the intestines, forming bands and loops through or beneath which a piece of bowel may become fatally snared.

The symptoms of acute peritonitis usually begin by a shivering fit or rigor, together with vomiting, and with pain in the abdomen of a peculiarly severe and sickening character, accom- panied with extreme tenderness, so that pressure, even of the bed-clothes, causes aggravation of suffering. The patient lies on the back with the knees drawn up so as to relax the abdominal muscles; the breathing becomes rapid and shallow, and is performed by movements of the chest only, the abdominal muscles remaining quiescent — unlike what takes place in healthy respiration. The abdomen becomes swollen by flatulent distension of the intestines, which increases the distress. There is usually constipation. The skin is hot, although there may be perspiration; the pulse is small, hard and wiry; the urine is scanty and high coloured, and is passed with pain. The face is pinched and anxious. These symptoms may pass off in a day or two; if they do not the case is apt to go on to a fatal termina- tion. In such event the abdomen becomes more distended; hiccough, and the vomiting of brown or blood-coloured matter occur; the temperature falls, the face becomes cold and clammy; the pulse is exceedingly rapid and feeble, and death takes place from collapse, the mental faculties remaining

clear till the close. When the peritonitis is due to perforation — as may happen in the case of gastric ulcer or of ulcers of typhoid fever, or in the giving way of a loop of strangulated bowel — the above-mentioned symptoms and the fatal collapse may all take place in from twelve to twenty-four hours. The puerperal form of this disease, which comes on within a day or two after childbirth, is often rapidly fatal. The actual cause of death is the absorption of the poisonous inflammatory products which have been poured out into the peritoneal cavity, as well as of the toxic fluids which have remained stagnant in the paralysed bowel.

Perhaps the commonest cause of septic peritonitis is the escape of . micro-organisms (bacillus coli) from the ulcerated, mortified or inflamed appendix (see Appendicitis). A genera- tion or so ago deaths from this cause were generally placed under the single heading of ” peritonitis,” but at the present time the primary disease is shown upon the certificate which too often runs thus: appendicitis five days, acute peritonitis two daysˆ Chronic peritonitis may occur as a result of the acute attack, or as a tuberculous disease. In the former case, the gravest symptoms having subsided, some abdominal pain continues, and there is considerable swelling of the abdomen, corresponding to a thickening of the peritoneum, and to the presence of fluid in the peritoneal cavity. This kind of peritonitis may also develop slowly without there having been any preceding acute attack. There is a gradual loss of strength and flesh. The disease is essentially a chronic one; it is not usually fatal.

Tuberculous peritonitis occurs either alone or in association with tuberculous disease of a joint or of the lungs. The chief symptoms are abdominal discomfort, or pain, and distension of the bowels. The patient may suffer from either constipation or diarrhoea, or each alternately. Along with these local mani- festations there may exist the usual phenomena of tuberculous disease, viz. high fever, with rapid emaciation and loss of strength. But some cases of tuberculous peritonitis present symptoms which are not only obscure, but actually misleading.

There may be no abdominal distension, and no pain or tender- ness. The patient may lie quietly in bed, flat on his back, with the legs down straight, and he may have no marked elevation of temperature. There may be no vomiting and no constipation or diarrhoea. In some

cases, the neighbouring coils of intestine having been glued together, a collection of serous fluid takes its place in the midst of the mass, and, being walled in by the adhesions, forms a rounded tumour, dull on percussion, but not tender or painful. Such cases, especially when occurring in women, are apt to be mistaken for cystic disease of the ovary.

As regards the treatment of acute peritonitis, the first thing that the surgeon has to do is to assure himself that the disease is not due to some cause which itself should be dealt with, to a septic disease of appendix or Fallopian tube, for instance, or to a toxic condition of the uterus, the result, perhaps, of a criminal or innocent abortion, or to a perforated ulcer of stomach or intestine. In many obscure cases the safest treatment is likely to be afforded by an exploratory abdominal section. If the medical attendant has made up his mind that the question of exploration is not to be entertained — a decision which should be arrived at only after most deliberate consultation — the best thing will be to apply fomenta- tions to the abdomen, and to administer small and repeated doses of morphia by the skin — | or j grain — repeated every hour or so until the physiological effect is produced. As regards other drugs, it may be a question as to whether calomel or Epsom salts should be given. As regards food, the only thing that can be safely recommended is a little hot water taken in sips. A bed- cradle should be placed over the patient in order to keep the weight of the bed-clothes from the abdomen. (E. O.*)

PERIZONIUS (or Accinctus), the name of Jakob Voorbroek (1651-1715), Dutch classical scholar, who was born at Appin- gedam in Groningen on the 26th of October 1651. He was the son of Anton Perizonius (1626-1672),' the author of a once well- known treatise, De ratione studii theologici. Having studied at the university of Utrecht, he was appointed in 1682 to the chair of eloquence and history at Franeker through the influence of J. G. Graevius and Nicolas Heinsius. In 1693 he was pro- moted to the corresponding chair at Leiden, where he died on the 6th of April 17 15. The numerous works of Perizonius entitle him to a very high place among the scholars of his age. Special interest attaches to his edition of the Minerva of Francisco Sanchez or Sanctiusof Salamanca (1st ed., 1587; ed. C. L. Bauer, 1703-1801), one of the last developments of the study of Latin grammar in its pre-scientific stage, when the phenomena of language were still regarded as for the most part disconnected, conventional or fortuitous. Mention should also be made of his Animadversiones historicae (r685), which may be said to have laid the foundations of historical criticism, and of his treatises on the Roman republic, alluded to by Niebuhr as marking the beginning of that new era of historical

study with which his own name is so closely associated.

The article on Perizonius in Van der Aa's Biographisch Woorden- boek der Nederlanden contains full biographical and bibliographical particulars; see also F. A. Eckstein in Ersch and Gruber's Allge- meine Encyklopddie.

PERJURY (through the Anglo-Fr. perjurie, modern parjure, Lat. perjurium, a false oath, perjurare, to swear falsely), an assertion upon an oath duly administered in a judicial pro- ceeding before a competent court of the truth of some matter of fact, material to the question depending in that proceeding, which assertion the assertor does not believe to be true when he makes it, or on which he knows himself to be ignorant (Stephen, Digest of the Criminal Law, art. 135). In the early stages of legal history perjury seems to have been regarded rather as a sin than as a crime, and so subject only to supernatural penalties. The injury caused by a false oath was supposed to be done not so much to society as to the Divine Being in whose name the oath was taken (see Oath). In Roman law, even in the time of the empire, the perjurer fell simply under divine reprobation, and was not dealt with as a criminal, except where he had been bribed to withhold true or give false evidence, or where the oath was by the genius of the emperor. In the latter case punishment was no doubt inflicted more for the insult to the emperor than for the perjury. False testimony leading to the conviction of a

person for a crime punishable with death constituted the offence of homicide rather than of perjury. In England, perjury, as being a sin, was originally a matter of ecclesiastical cognisance. At a later period, when it had become a crime, the jurisdiction of the spiritual courts became gradually confined to such perjury as was committed in ecclesiastical proceedings, and did not extend to perjury committed in a temporal court. The only perjury which was for a long time noticed at common law was the perjury of jurors. Attaint of jurors (see Attaint, Writ of) who were originally rather in the position of witnesses than of judges of fact, incidentally subjected them to punishment for perjury. Criminal jurisdiction over perjury by persons other than jurors seems to have been first assumed by the Star Chamber, acting under the powers supposed to have been conferred by an act of Henry VII. (1487). After the abolition of the Star Chamber by the Long Parliament in 1641 and the gradual diminution of the authority of the spiritual courts, perjury (whether in the strict sense of the word or the taking of a false oath in non-judicial proceedings) practically fell entirely within the jurisdiction of the ordinary criminal tribunals. At common law only a false oath in judicial proceedings is

perjury. But by statute the penalties of perjury have been extended to extra-judicial matters e.g. false declarations made for the purpose of procuring marriage (The Marriage and Registration Act 1856), and false affidavits under the Bills of Sale Act 1878. False affirmation by a person permitted by law to affirm is perjury (The Evidence Further Amendment Act 1869; The Evidence Amendment Act 1870).

In order to support an indictment for perjury the prosecution must prove the authority to administer the oath, the occasion of administering it, the taking of the oath, the substance of the oath, the materiality of the matter sworn, the falsity of the matter sworn, and the corrupt intention of the defendant. The indictment must allege that the perjury was wilful and corrupt, and must set out the false statement or statements on which perjury is assigned, subject to the provisions of the Prosecutions for Perjury Act 1749 (which also applies to subor- nation of perjury). By that act it is sufficient to set out the substance of the offence, without setting forth the bill, answer, &c, or any part of the record and without setting forth the commission or authority of the court before whom the perjury was committed. The matter sworn to must be one of fact and not of mere belief or opinion. It is not homicide, as in Roman law, to procure the death of another by false evidence, but the Criminal Code, ss. 118, 164, proposed to make such an offence a substantive crime of greater gravity than ordinary perjury, and punishable by penal servitude for life. It is a rule of evi- dence, founded upon obvious reasons, that the testimony of a single witness is insufficient to convict on a charge of perjury. There must be corroboration of his evidence in some material particular. Perjury is a common law misdemeanour, not triable at quarter-sessions. Most persons in a judicial position have the right of directing the prosecution of any witness, if it appears to them that he has been guilty of perjury (The Criminal Pro- cedure Act 1 851). The provisions of the Vexatious Indictments Act 1859 extend to perjury and subornation of perjury. By that Act no indictment for either of such offences can be preferred unless the prosecutor or accused is bound by recognisance, or the accused is in custody, or the consent of a judge is obtained, or (in the case of perjury) a prosecution is directed under the act of 1851.

Subornation of perjury is procuring a person to commit a per- jury which he actually commits in consequence of such procure- ment. If the person attempted to be suborned do not take the oath, the person inciting him, though not guilty of subornation, is liable to fine and corporal punishment. Perjury and suborna- tion of perjury are punishable at common law with fine and imprisonment. By the combined operation of the Perjury Act 1728 and later statutes, the

punishment at present appears to be penal servitude for any term, or imprisonment with or without hard labour for a term not exceeding seven years (see Stephen, Digest, art. 148). The punishment at common law was whipping, imprisonment, fine and pillory.

Perjury or prevarication committed before a committee of either House of Parliament may be dealt with as a contempt or breach of privilege as well as by prosecution. As to false oaths not perjury, it is a misdemeanor at common law, punishable by fine and imprisonment, to swear falsely before any person authorized to administer an oath upon a matter of common concern, under such circumstances that the false swearing, if committed in judicial proceedings, would have amounted to perjury. There are some cases of making false declarations which are punishable on summary conviction, e.g. certain declarations under the Registration of Births and Deaths Act 1874, and the Customs Consolidation Act 1876.

In Scotland the law, as a general rule, agrees with that of England. Perjury may be committed by a party on reference to oath as well as by a witness. A witness making a false affirmation is guilty of perjury (The Affirmation [Scotland] Act, 1865). The a/:ts of 1851 and 1859 do not extend to Scotland. The trial, though usually by the court of justiciary, may be by the court of session if the perjury is committed in the course of an action before that court. The punishment is penal servitude or imprisonment at the discretion of the court. Formerly a person convicted of perjury was disabled from giving evidence in future; this disability was abolished by the Evidence (Scotland) Act 1852.

In the United States the common law has been extended by most states to embrace false affirmations and false evidence in proceedings not judicial. Perjury in a United States court is dealt with by an act of Congress of the 3rd of March 1825, by which the maximum punishment for perjury or subornation of perjury is a fine of_ $2000 or imprisonment for not more than five years. Jurisdiction to punish perjury committed in the state courts belongs to the states, as the Federal Constitution did not give it to the Federal gov- ernment. Statutory provisions founded upon the English act of 1749, have been adopted in some states. In the states which have not adopted such provisions, the indictment must set out the offence with the particularity necessary at common law.

On the continent of Europe perjury is also regarded as an offence of gravity punishable by imprisonment for varying periods. In Germany, as in England, it was at one time a matter for the spiritual courts. In Austria it is treated as a form of fraud, and the punish- ment is proportioned to the estimated amount of damage done to the party aggrieved. In France the term perjury (parjure) is specifically applied only to the making of false oaths by parties in a civil suit.

PERKIN, SIR WILLIAM HENRY (1838-1907), English chemist, was born in London on the 12th of March 1838. From an early age he determined to adopt chemistry as his profession, although his father, who was a builder, would have preferred him to be an architect. Attending the City of London School he devoted all his spare time to chemistry, and on leaving, in 1853, entered the Royal College of Chemistry, then under the direction of A. W. Hofmann, in whose own research laboratory he was in the course of a year or two promoted to be an assistant. Devoting his evenings to private investigations in a rough laboratory fitted up at his home, Perkin was fired by some remarks of Hofmann's to undertake the artificial production of quinine. In this attempt he was unsuccessful, but the observations he made in the course of his experiments induced him, early in 1856, to try the effect of treating aniline sulphate with bichro- mate of potash. The result was a precipitate, aniline black, from which he obtained the colouring matter subsequently known as aniline blue or mauve. He lost no time in bringing this substance before the managers of Pullar's dye-works, Perth, and they expressed a favourable opinion of it, if only it should not prove too expensive in use. Thus encouraged, he took out a patent for his process, and leaving the College of Chemistry, a boy of eighteen, he proceeded, with the aid of his father and brother, to erect works at Greenford Green, near Harrow, for the manufacture of the newly discovered colouring matter, and by the end of 1857 the works were in operation. That date may therefore be reckoned as that of the foundation of the coal- tar colour industry, which has since attained such important dimensions — in Germany, however, rather than in England, the country where it originated. Perkin also had a large share in the introduction of artificial alizarin (q.u.), the red dye of the madder root. C. Graebe and C. T. Liebermann in 1868 pre- pared that substance synthetically from anthracene, but their process was not practicable on a large scale, and it was left to him to patent a method that was commercially valuable. This

he did in 1869, thus securing for the Greenford Green works a monopoly of alizarin manufacture for several years. About the same time he also carried out a series of investigations into kindred substances, such as anthrapurpurin. About 1874 he abandoned the

manufacture of coal-tar colours and devoted himself exclusively to research in pure chemistry, and among the discoveries he made in this field was that of the reaction known-by his name, depending on the condensation of aldehydes with fatty acids (see Cinnamic Acid). Later still he engaged in the study of the relations between chemical constitution and rotation of the plane of polarization in a magnetic field, and enunciated a law expressing the variation of such rotation in bodies belonging to homologous series. For this work he was in 1889 awarded a Davy medal by the Royal Society, which ten years previously had bestowed upon him a Royal medal in recognition of his investigations in the coal-tar colours. The Chemical Society, of which he became secretary in 1869 and president in 1883, presented him with its Longstaff medal in 1889, and in 1890 he received the Albert medal of the Society of Arts. In 1906 an international celebration of the fiftieth anniversary of his invention of mauve was held in London, and in the same year he was made a knight. He died near Harrow on the 14th of July 1907.

His eldest son, William Henry Perkin, who was born at Sudbury, near Harrow, on the 17th of June i860, and was educated at the City of London School, the Royal College of Science, and ..the universities of Wiirzburg and Munich, became professor of chemistry at the Heriot-Watt College, Edinburgh, in 1887, and professor of organic chemistry at Owens College, Manchester, in 1892. His chief researches deal with the poly- methylene compounds, the alkaloids, in particular hydrastine and berberine, and the camphors and terpenes (q.v.). He received the Davy medal from the Royal Society in 1904.

PERKINS, CHARLES CALLAHAN (1823-1886), American artist and author, was born in Boston and educated at Harvard, subsequently studying art in Rome and Paris. Returning to Boston, he helped to found the Museum of Fine Arts, of which he was honorary director, and for many years he played a leading part in artistic circles as a cultured critic and writer. His chief publications were Tuscan Sculptors (1864) and Italian Sculptors (1868) — replaced in 1883 by The Historical Handbook of Italian Sculptors — Art in Education (1870), and Sepulchral Monuments in Italy (1885).

PERKINS, JACOB (1766-1849), American inventor and physicist, was born at Newburyport, Massachusetts, in 1766, and was apprenticed to a goldsmith. He soon made himself known by a variety of useful mechanical inventions, and in 1818 came over to England with a plan for engraving bank-notes on steel, which ultimately proved a signal success, and was carried out by Perkins in partnership with the English engraver Heath. His chief contribution to physics lay in the

experiments by which he proved the compressibility of water and measured it by a piezometer of his own invention (see Phil. Trans., 1820, 1826). He retired in 1834, and died in London on the 30th of July 1849.

His second sen, Angler March Perkins (i799?i88i), also born at Newburyport, went to England in 1827, and was the author of a system of warming buildings by means of high pressure steam. His grandson, Loftus Perkins (1834-1891), most of whose life was spent in England, experimented with the application to steam engines of steam at very high pressures, constructing in 1880 a yacht, the ” Anthracite,” whose engines worked with a pressure of 500 lb to the sq. in.

PERLEBERG, a town of Germany, in the Prussian province of Brandenburg, on the Stepenitz, 6 m. N.E. from Wittenberge by the railway to Neustrelitz. Pop. (1905), 9502. It contains a fine Gothic Evangelical church, a Roman Catholic church, a synagogue and several schools, and has a town-hall, dating from the 15th century, and a Roland column. Its chief manu- factures are machinery, soap, blacking and clogs.

See Hopfner, Perleberger Reimchronik. Perleberg von 1200 bii 1700 (Perleberg, 1876).

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PERLES— PERM

PERI.ES, JOSEPH (1835-1894), Jewish rabbi, was born in Hungary in 1835, and died at Munich in 1894. He was one of the first rabbis trained at the new type of seminary (Breslau). Perles’ most important essays were on folk-lore and custom. There is much that is striking and original in his history of marriage (Die jiidische Hochzeit in nachbiblischer Zeit, i860), and of mourning customs (Die Leichenfeierlichkeiten im nachbiblischen Judenthum, 1861), his contributions to the sources of the Arabian Nights (Zur rabbinischen Sprach-und Sagenkunde, 1873), and his notes on rabbinic antiquities (Beitrage zur rabbinischen Sprach- und Altertumskundc, 1893). Perles’ essays are rich in suggestive- ness, and have been the starting-point of much fruitful research. He also wrote an essay on Nachmanides, and a biography and critical appreciation of Rashba (1863). (I. A.)

PERLITE, or Pearlstone, a glassy volcanic rock which, when struck with a hammer, breaks up into small rounded masses that often have a pearly lustre. The reason for this peculiarity is obvious in microscopic

sections of the rock, for many small cracks may be seen traversing the glassy substance. These mostly take a circular course, and often occur in groups, one within another. The circular cracks bound the little spheres into which the rock fa'ls when it is struck, and the concentric fissures, are the cause of the pearly lustre, by the reflection of light from enclosed films of air. Longer straight cracks run across the sections separating areas in which the circular fissures preponderate. By decomposition the fissures may be occupied by deposits of limonite, which make them more obvious, or by other secondary minerals. The glass itself often undergoes change along the cracks by becoming finely crystalline or devitrified, dull in appearance and slightly opaque in section. In polarized light the perlitic glass is usually quite isotropic, but sometimes the internal part of some of the spheres has a slight double refraction which is apparently due to strain. The glass found on the waste-heaps of glass-furnaces is sometimes " very coarsely perlitic.

Perlitic structure is not confined to glass, but may be seen also in that variety of opal which is called hyalite. This forms small transparent rounded masses like drops of gum, and in microscopic section exhibits concentric systems of cracks. Hyalite, like perlitic obsidian, is amorphous or non-crystalline. It is easy to imitate perlitic structure by taking a little Canada balsam and heating it on a slip of glass till most of the volatile matters are driven out; then drop it in a basin of cold water and typical perlitic structure will be produced. The reason is apparently the sudden contraction when the mass is chilled. In the glaze on tiles and china rounded or polygonal systems of cracks may often be seen which somewhat resemble perlitic structure but are less perfect and regular. Many rocks which are cryptocrystalline or felsitic, and not glassy, have perfect perlitic structure, and it seems probable that these were originally vitreous obsidians or pitchstones and have in process of time been changed to a finely crystalline state by devitrification. Occasionally in olivine and quartz rounded cracks not unlike perlitic structure may be observed.

Many perlitic rocks contain well-developed crystals of quartz, feldspar, augite or magnetite, &c, usually more or less corroded or rounded, and in the fine glassy base minute crystallites often abound. Some of the rocks have the resinous lustre and the high percentages of combined water which distinguish the pitchstones; others are bright and fresh obsidians, and nearly all the older examples are dull, cryptocrystalline felsites. According to their chemical compositions they range from very acid rhyolites to trachytes and andesites, and the dark basaltic glasses or tachylytes are sometimes highly perlitic. It is prob- able that most perlites are of intrusive origin, and the general

absence of steam cavities in these rocks would support this conclusion, but some perlitic Hungarian rhyolites are believed to be lavas.

Very well known rocks of this kind are found in Meissen, Saxony,

as dikes of greenish and brownish pitchstone. Other examples

are furnished by the Tertiary igneous rocks of Hungary (Tokai, &c),

the Euganean Hills (Italy) and Ponza Island (in the Mediterranean).

In mineralogical collections rounded nodules of brown glass

varying from the size of a pea to that of an orange may often be seen labelled Marekanite. They have long been known to geologists and are found at Ockotsk, Siberia, in association with a large mass of perlitic obsidian. These globular bodies are, in fact, the more coherent portions of a perlite; the rest of the rock falls down in a fine powder, setting free the glassy spheres. They are subject to considerable internal strain, as is shown by the fact that when struck with a hammer or sliced with a lapidary's saw they often burst into fragments. Their behaviour in this respect closely resembles the balls of rapidly cooled, unannealed glass which are called Prince Rupert's drops. In their natural condition the marekanite spheres are doubly refracting, but when they have been heated and very slowly cooled they lose this property and no longer exhibit any tendency to sudden disintegration.

In Great Britain Tertiary vitreous rocks are not common, but the pitchstone which forms the Scuir of Eigg is a dark andesitic porphyry with perlitic structure in its glassy matrix. A better example, however, is provided by a perlitic dacitic pitchstone porphyry that occurs near the Tay Bridge in Fifeshire. The tachylytic basalt dikes of Mull are occasionally highly perlitic. At Sandy Braes in Antrim a perlitic obsidian has been found, and the Lea Rock, near Wellington in Shropshire, is a devitrified obsidian which shows perlitic cracks and the remains of spherulites. (J. S. F.)

PERM, a government of east Russia, bounded S. by the governments of Orenburg and Ufa, W. by Vyatka, N.W. by Vologda, and E. by Tobolsk (Siberia). It has an area of 128,173 sq. m. Though administratively it belongs entirely to Russia in Europe, its eastern part (about 57,000 sq. m.) is situated in Siberia, in the basin of the Ob. The government is traversed from north to south by the Ural Mountains, 30 to 45 m. in width, thickly clothed with forests, and deeply excavated by rivers. The highest summits do not rise above 3600 ft. in the northern section

of the range (the Vogulian Ural); in the central portion, between 59° and 6o° 30′ N., they once or twice exceed 5000 ft. (Denezhkin, 5360 ft.) ; but the chain soon sinks towards the south, where it barely attains an elevation of 3000 ft. Where the great Siberian road crosses it the highest point is 1400 ft.

The government is very well drained by rivers belonging to the Pechora, Tobol (affluent of the Ob) and Kama systems. The Pechora itself rises in the northern corner of the government, and its tributary the Volosnitsa is separated by a distance of less than 3 m. from the navigable Vogulka, a tributary of the Kama, a circumstance of some commercial importance. The chief river of Perm, is however, the Kama, whose navigable tributaries the Chusovaya, Sylva and Kolva are important channels for the export of heavy iron goods to Russia. The government is dotted with a great number of lakes of comparatively trifling size, their total area being 730 sq. m., and with marshes, which are extensive in the hilly tracts of the north. Granites, diorites, porphyries, serpentines and Laurentian gneisses and limestones, containing iron, copper and zinc ores, constitute the main axis of the Ural chain; their western slope is covered by a narrow strip of Huronian crystalline slates, which disappear in the east under the Post-Tertiary deposits of the Siberian lowlands, while on the west narrow strips of Silurian limestones, quartzites and slates, and separate islands of Devonian deposits, appear on the surface. These in their turn are overlain with Carboniferous clays and sandstones, containing Coal Measures in several isolated basins. The Permian deposits extend as a regular strip, parallel to the main ridge, over these last, and are covered with the so-called ” variegated marls,” which are considered as Triassic, and appear only in the western corner of the territory.

Perm is the chief mining region of Russia, owing to its wealth in iron, silver, platinum, copper, nickel, lead, chrome ore, manganese and auriferous alluvial deposits. Many rare metals, such as iridium, osmium, rhodium and ruthenium, are found along with the above, as also a great variety of precious stones, such as diamonds, sapphires, jaspers, tourmalines, beryls, phenacites, chrysoberyls, emeralds, aquamarines, topazes, amethysts, jades, malachite. Salt-springs occur in the west; and the mineral waters, though still little known, are worthy of mention. No less than 70 % of the total area is occupied with forest; but the forests are distributed very unequally, covering 05% of the area in the north and only 25% in the south-east. Firs, the pine, cedar, larch, birch, alder and lime are the most. common; the oak appears only in the south-west. The flora of

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Perm presents a mixture of Siberian and Russian species, several of which have their north-eastern or south-western limits within the government. The climate is severe, the average temperature at different places being as follows: —

Lat. N.

Altitude.

Yearly Average.

January Average.

July Average.

Bogoslovsk Usolye (Kama) Nizhniy-Tagilsk Ekaterinburg .

59° 45′ 59° 25′ 57° 55′

56 48′

Ft.

630 300

59°

890

F. 29-3° 34-o 33-i°

32-9

F.

3-°:

4-5 o

2-0°

2-5°

F. 62-6° 63-8° 64-9° 63-5°

The estimated population in 1906 was 3,487,100, and consists chiefly of Great Russians, besides Bashkirs (including Meshcher- yaks and Teptyars), Permyaks or Permians, Tatars, Cheremisses, Syryenians, Votyaks and Voguls. Agriculture is the general occu- pation; rye, oats, barley and hemp are raised in all parts, and wheat, millet, buckwheat, potatoes and flax in the south. Cattle- breeding is specially developed in the south-east among the Bashkirs, who have large numbers of horses. Mining is develop- ing steadily though slowly. The ironworks employ nearly 200,000 hands (12,000 being in the Imperial ironworks), and their aggregate output reaches an estimated value of £6,000,000 annually. The annual production of gold is valued at nearly half a million sterling, and of platinum at approximately a quarter of a million, the output of platinum being equal to 95% of the world's total output. Coal and coke to the extent of 300,000 to 500,000 tons, salt to 300,000 tons, asbestos and other minerals are also obtained. The first place among the manufacturing industries is taken by flour-mills. The cutting of precious stones is extensively carried on throughout the villages on the eastern slope of the Ural Mountains, the chief market for them being at Ekaterinburg. An active trade, greatly favoured by the easy communication of the chief centres of the mining industry with the market of Nizhniy Novgorod on the one side and with the network of Siberian rivers on the other, is carried on in metals and metal wares, minerals, timber and wooden wares, tallow, skins, cattle, furs, corn and linseed. Large caravans descend the affluents of the Kama every spring, and reach the fairs of Laishev and Nizhniy Novgorod, or descend the Volga to Samara and Astrakhan; while Ekaterinburg is an important centre for the trade with Siberia. The fairs at Irbit, second in importance only to that of Nizhniy Novgorod, and Ivanov (in the district of Shadrinsk) are centres for supplying Siberia with groceries and manufactured wares, as also for the purchase of tea, of furs for Russia, and of corn and cattle for the mining districts. The chief commercial centres are Ekaterinburg, Irbit, Perm, Kamyshlov, Shadrinsk and Cherdyn.

Perm is more largely provided with educational institutions and primary schools than most of the governments of central Russia. Besides the ecclesiastical seminary at Perm there is a mining school at Ekaterinburg. The Perm zemstvo or provincial council is one of the most active in Russia in promoting the spread of education and agricultural knowledge among the peasants.

The government is intersected by a railway from Perm east- wards across the Urals, and thence southwards along their eastern slope to Ekaterinburg, Chelyabinsk (main Siberian trunk line) and Tyumen; also by a railway from Perm to Kotlas, at the head of the Northern

Dvina.

History. — Remains of palaeolithic man, everywhere very scarce in Russia, have not yet been discovered in the upper basins of the Kama and Ob, with the exception, perhaps, of a single human skull found in a cavern on the Chanva (basin of Kama), together with a skull of Ursus spelaeus. Neolithic remains are met with in immense quantities on both Ural slopes. Still larger quantities of implements belonging to an early Finnish, or rather Ugrian, civilization are found everywhere in the basin of the Kama. Herodotus speaks of the richness of this country inhabited by the Ugrians, who kept up a brisk traffic with the Greek colony of Olbia near the mouth of the Dnieper, and with the Bosporus by way of the Sea of Azov and the Volga. The precise period at which the Ugrians left the district for the southern steppes

of Russia (the Lebedia of Constantine Porphyrogenitus) is not known. In the 9th century, if not earlier, the Norsemen were acquainted with the country as Bjarmeland, and Byzantine annalists knew it as Permia. Nestor describes it as a territory of the Perm or Permians, a Finnish people.

The Russians penetrated into this region at an early date. In the nth century Novgorod levied tribute from the Finnish inhabitants, and undertook the colonization of the country, which in the treaties of the 13th century is dealt with as a separate territory of Novgorod. In 147 1 the Novgorod colonies in Perm were annexed to Moscow, which in the following year erected a fort to protect the Russian settlers and tradesmen against the Voguls, Ostiaks and Samoyedes. The mineral wealth of the country attracted the attention of the Moscow princes, and in the end of the 15th century Ivan III. sent two Germans to search for ores; these they succeeded in finding south of the upper Pechora. The Stroganovs in the 16th century founded the first salt- and ironworks, built forts, and colonized the Ural region. The rapidly-growing trade with Siberia gave a new impulse to the development of the country. This trade had its centres at Perm and Solikamsk, and later at Irbit.

(P. A. K.; J.T. Be.)

PERM, a town of Russia, capital of the government of the same name, stands on the left bank of the Kama, on the great highway to Siberia, 1130 m. by rail and river N.E. from Moscow. Pop. (1879), 32,350; (1897), 45,403. During summer it has regular steam communication with Kazan, 605 m. distant, and it is connected by rail (311 m.) with Ekaterinburg on the east side of the Urals. The town is mostly built of

wood, with broad streets and wide squares, and has a somewhat poor aspect, especially when compared with Ekaterinburg. It is the seat of a' bishop of the Orthodox Greek Church, and has an ecclesiastical seminary and a military school, besides several scientific institutions (the Ural society of natural sciences, archives committee, technical society), and a scientific museum. Its industries develop but slowly, the chief works being ship-building yards, tanneries, chemical works, saw-mills, brickfields, copper foundries, machinery works, soap and candle factories and rope- works. The government has a manufactory of steel guns and munitions of war in the immediate neighbourhood of the town.

The present site of Perm was occupied, as early as 1568, by a settlement named Brukhanovo, founded by one of the Stroganovs; this settlement seems to have received the name of Perm in the 17th century. A copperworks was founded in the immediate neighbourhood in 1723, and in 1781 it received officially the name of Perm, and became an administrative centre both for the country and for the mining region.

PERMEABILITY, MAGNETIC, the ratio of the magnetic induction or flux-density in any medium to the inducing magnetic force. In the C.G.S. electromagnetic system of units the permeability is regarded as a pure number, and its value in empty space is taken as unity. The permeability of a metal belonging to the ferromagnetic class — iron, nickel, cobalt and some of their alloys — is a function of the magnetic force, and also depends upon the previous magnetic history of the specimen. As the force increases from zero the permeability of a given specimen rises to a maximum, which may amount to several thousands, and then gradually falls off, tending to become unity when the force is increased without limit. Every other sub- stance has a constant permeability, which differs from unity only by a very small fraction; if the substance is paramagnetic, its permeability is a little greater than 1 ; if diamagnetic, a little less. The conception of permeability (Lat. per, through, and meare, to wander), is due to Faraday, who spoke of it as " conducting power for magnetism " (Experimental Researches, xxvi.), and the term now in use was introduced by W. Thomson (Lord Kelvin), in 1872, having been suggested by a hydrokinetic analogy (Reprint of Papers on Electrostatics and Magnetism, xxxi., xlii.). It is generally of importance that the iron employed in the construction of electrical machinery should possess high permeability under the magnetic force to which it is to be subjected. (See Electromagnetism and Magnetism.)

PERMEAMETER, an instrument for rapidly measuring the permeability of a sample of iron or steel with sufficient accuracy for many commercial purposes. The name was first applied by S. P. Thompson to an apparatus devised by himself in 1890, which indicates the mechanical force required to detach one end of the sample, arranged as the core of a straight electromagnet, from an iron yoke of special form; when this force is known, the permeability can be easily calculated. (See Magnetism.)

PERMIAN, in geology, the youngest and uppermost system of strata of the Palaeozoic series, situated above the Carboniferous and below the Trias. The term ” Permian ” (derived from the

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Russian province of Perm, where the rocks are extensively developed) was introduced in 1841 by Sir R. I. Murchison. In England the series of red sandstones, conglomerates, breccias and marls which overlie the Coal Measures were at one time grouped together in one great formation as the ” New Red Sandstone,” in contradistinction to the Old Red Sandstone below the Carboniferous: they were likewise known as the Poikilitic series (from Gr. koikiKos, mottled) from their mottled or variegated colour. They are now divided into two systems or groups of formations; the lower portion being included in the Palaeozoic series under the name Permian, the upper portion being relegated to the Mesozoic series and termed Trias. In Germany the name Dyas was proposed by J. Marcou for the rocks of this age on account of the twofold nature of the series in Thuringia, Saxony, &c. The intimate stratigraphical relation ship that exists in many quarters between the Permian rocks and the Carboniferous beds, and the practical difficulties in the way of drawing a satisfactory base-line to the system, have led to the adoption of the term Permo-carboniferous in South Africa, southern Asia, America, Australia and Russia, for strata upon this horizon: C. W. von Gumbel used ” Post-carbon ” in this sense. In a similar manner Permo-triassic has been employed in cases where a stratigraphical passage from rocks with Permian fossils to others bearing a Triassic fauna is apparent.

The Permian system in England consists of the following sub- divisions : —

W. of England. E. of England. Red sandstones, clays, and gypsum

Upper … j

600 ft. 50-100 ft.

600

100-250

2. Middle .. 5 Magnesian limestone . .)

1 Marl slate) ™~3V

Red and variegated sandstone ” Reddish-brown and purple I. Lower … ˆ sandstones and marls, with ,

calcareous conglomerates 1 J and breccias of volcanic rocks

From the thicknesses here given it is evident that the Permian rocks have a very different development on the two sides of England. On the east side, from the coast of Northumberland southwards to the plains of the Trent, they consist chiefly of a great central mass of limestone. But on the west side of the Pennine Chain, and extending southwards into the central counties, the calcareous

zone disappears, and we have a great accumulation of red, arenaceous and gravelly rocks.

The lower subdivision attains its greatest development in the vale of the Eden, where it consists of brick-red sandstones, the Penrith sandstone series, with some beds of calcareous conglomerate or breccia, locally known as ” brockram,” derived from the waste of the Carboniferous Limestone. These red rocks extend across the Solway into the valleys of the Nith and Annan, in the south of Scotland, where they lie unconformably on the Lower Silurian rocks. Their breccias consist of fragments of the adjacent Silurian greywackes and shales, but near Dumfries some calcareous breccias or ” brockrams ” occur. These breccia ted masses have evidently accumulated in small lakes or narrow fiords. Much farther south, in Staffordshire, and in the districts of the Clent and Abberley Hills, the brecciated conglomerates in the Permian series attain a thickness of 400 ft. They have been shown by Sir A. C. Ramsay to consist in large measure of volcanic rocks, grits, slates and lime- stones, which can be identified with rocks on the borders of Wales. Some of the stones are 3 ft. in diameter and show distinct striation. The same writer pointed out that these Permian drift-beds cannot be distinguished by any essential character from modern glacial drifts; on the other hand, W. W. King and others have

opposed this view. The middle subdivision is the chief repository of fossils in the Permian system. Its strata are not red, but consist of a lower zone of hard brown shale with occasional thin limestone bands (Marl Slate) and an upper thick mass of dolomite (Magnesian Limestone). The latter is the chief feature in the Permian development of the east of England. It corresponds with the Zechstein of Germany, as the Marl Slate does with the Kupfer-schiefer. It is a very variable rock in its lithological characters, being sometimes dull, earthy, fine-grained and fossiliferous, in other places quite crystalline, and composed of globular, reniform, botryoidal, or other irregular concretions of crystalline and frequently internally radiated dolomite. Though the Magnesian Limestone runs as a thick persistent zone down the east of England, it is represented on the Lancashire and Cheshire side by bright red and variegated sandstone covered by a thin group of red marls, with numerous thin courses of limestone, containing Schizodus, Bakevellia and other characteristic fossils of the Magnesian Limestone.

Concerning the rocks classed as Permian in the central counties of England there exists some doubt, for recent work tends to show that the lower parts are clearly related to the Carboniferous rocks by their fossils ; while there is little evidence to warrant the exclusion of the higher beds from the Trias. Similarly in south Devon, where red sandstones and coarse breccias are well exposed, it has been found difficult to say whether the series should be regarded as Triassic or Permian, though the prevailing tendency is to retain them in the latter system.

The ” Dyas ” type of the system is found in enormous masses of strata flanking the Harz Mountains, and also in the Rhine provinces, Saxony, Thuringia, Bavaria and Bohemia. In general terms it may be said that in this region there is a lower sandy and conglomeratic subdivision with an upper one more calcareous; the former is known as the Rothliegende, the latter as the Zechstein group. On the south side of the Harz Mountains the following subdivisions are recognized : —

Anhydrite, gypsum, rock-salt, dolomite, marl, fetid shale and limestone. The amorphous gypsum is the chief member of this group; the limestone is some- times full of bitumen.

Dolomite (Haupt-dolomit) , crystalline granular (Rauchwacke) , and fine powdery (Asche) with gypsum at bottom.

Zechstein-limcstone, an argillaceous, thin-bedded compact limestone 15 to 90 ft. thick.

Kupfer-schiefer, a black bituminous copper-bearing shale, not more than 2 ft. thick, often much less, but very constant.

Zechstein-conglomerate and calcareous sandstone. I” Red sandstones (Kreuznach beds), red shales J (Monsig beds) with sheets of melaphyre tuff, and I quartz-porphyry-conglomerate (Wadern, Oberhof, I Sbtern and Tambach beds).

Sandstones and glomerates (Tholayer beds) on black shales with poor coal seams and clay iron- stones (Lebach and Goldlauter beds).

Sandstones and shales with seams of coal on red and grey sandstones and shales with impure limestones (Cusel beds, including Manebach beds, upper, and Gehren beds, lower). The name Rothliegende or Rothtodtliegende (red-dead-layer) was given by the miners because their ores disappeared in the red rocks below the copper-bearing Kupfer-schiefer. The Kupfer- schiefer, although so thin, has been worked in the Mansfeld district for a long period ; it contains abundant rsmains of fish (Palaeoniscus, Platysomus) and plants (Ullmannia) . The beds of rock-salt in the German Zechstein are of the greatest importance; at Sperenberg near Berlin it has been penetrated to a depth of 4000 ft. Associated with the salt, gypsum and anhydrite are numerous

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potassium and magnesium salts, including carnallite, kieserite and polyhalite, which ate exploited at Stassfurt and are the only important potassium deposits known. Permian rocks of the Rothliegende type are scattered over a wide area in France, where the lower beds are usually conformable with the Coal Measures. In the upper beds occur the bituminous or ” Boghead ” shale of Autun. In Russia strata of this age cover an enormous area, in the Ural region, in the governments of Perm, Kasan, Kostroma, and in Armenia. The Russian Permian shows no sharp division into two series; the two types of deposit tend to be more mixed and include in addition some deposits of the more open sea. The general sequence begins with the Artinsk beds, sandy and marly or conglomeratic beds in close connexion with the Carboniferous, overlain by the Kungur limestones and dolomites ; these are followed by red fresh-water sandstones, over which comes an important series of copper-bearing sandstones and conglomerates. Above this, in Kostroma, Vyatka and Kasan there is a calcareous and dolomitic series, the so-called ” Russian Zechstein ” with marine fossils; the uppermost beds are red marls, with few fresh-water fossils, the Tartarian beds.

The character of the fossils in the Permian of the Mediterranean and south-east Europe — well exemplified in the deposits of Sicily — together with their more generally calcareous nature, indicate a more open sea and more stable marine conditions than obtained farther north. This sea is traceable across south-east Russia into the middle of Asia, through Turkestan and Persia, into the Salt Range of India, where the Productus limestone may be taken as representative of the normal marine plan of Permian times. Southwards, however, of the Nerbudda River another and quite distinct continental assemblage of deposits holds the ground, viz. the lower portion of the great fresh-water Gondwana system. The coarse Talchir conglomerates at the base are succeeded by the sandstones and shales of the Karharbari group,

with numerous coal seams, and these in turn are followed by the Damuda series (upwards of 10,000 ft.) of similar rocks, with ironstones and very valuable coal seams. All these strata are characterized by the presence of the Glossopteris flora. A similar succession of beds has been recorded in north-west Afghanistan. In close relationship with the lower members of the Indian Gondwana series, both as regards fossil contents and lithological characters, are the lower Karoo beds of South Africa (Dwyka conglomerate, Ecca shales and mudstones, Beaufort beds and Kimberley shales), also the coal- bearing beds of the Transvaal; the Permo-carboniferous rocks of Australia (including the rich coal measures of Newcastle, the Greta coal measures and marine beds, upper and lower, of New South Wales; those of Tasmania, the Bowen River beds of Queensland, and the Bacchus Marsh glacial beds of Victoria), and similar rocks in New Zealand (Maitai formation, south island ; Dun Mountain lime- stone and Rimutaka beds of the north island) and South America. In North America Permian rocks occur in the east in Pennsylvania, West Virginia, Maryland and Ohio (" Upper Barren Measures "), and in Prince Edward Island, New Brunswick, where they succeed the Carboniferous rocks very regularly. West of the Mississippi, in Texas (7000 ft., including the Wichita beds, Clear Fork and Double Mountain beds), Kansas and Nebraska, the Permian is more extensive and on the whole is more readily separable from the Carboniferous. Here the lower beds are marine and contain many limestones and dolomites; the higher beds are mainly red sand-

stones and marls with gypsum; in Texas it is of interest to note the occurrence of copper-stained strata. These upper " Red Beds " are" often not clearly distinguishable from the Trias.

Life of the Permian Period. — The records of the plants and animals of this period are comparatively meagre. The plants show that a gradual change from the Carboniferous types was in progress. Two floral regions are clearly indicated, a northern and a southern. In the latter, which may be regarded as conterminous with the continent of Gondwana, the Lepidodendrons, Sigillarias, Calamites, &c, of the Coal Measures gave place to a distinct flora, named from the prevalence of Glossopteris, the Glossopteris (tongue-fern) flora. Traces of this southern flora have been found in northern Russia. Gangamopteris, Callipteris, Taeniopteris, Schizopteris, Walchia, Voltzia, Ullmannia, Saportea, Baiera are characteristic Permian genera. Among the larger animals amphibians occupied a promi- nent position, their footprints being very common in the sandstones ; they include numerous Labyrinthodonts, Archegosaurus, Stereo- rachis, Branchiosaurus. At this time the true reptiles began to leave their remains in the rocks;

many highly interesting forms are known — Palaeohatteria, Proterosaurus, Stereosternum ; others having certain mammalian characteristics include Pareiosaurus, Cynognathus, Dicynodon. Among the fishes may be mentioned Platysomus, Palaeoniscus, Amblypterus, Pleuracanthus. Turning to the inverte- brates, undoubtedly the most interesting feature is gradual intro- duction into the Cephalopoda of the ammonite-like forms such as Medlicottia, Waagenoceras, Popanoceras, in place of the more simple lobed goniatites of the Carboniferous. Brachiopods (Productus horridus, Bakevellia tumida), Bryozoa and corals were by no means scarce in the more open Permian seas. Schizodus Schlotheimii, Strophalosia Goldfussi, Myophoria, Leimyalind, Bellero- phon are characteristic Permian molluscs. The last of the trilobites appears in the Permian of North America.

The evidence so far obtained indicates that in Permian times much of the land in the northern hemisphere was near the general sea-level, and that conditions of considerable aridity prevailed which involved the repeated isolation and evaporation of marine lagoons and land-locked seas. South of this region in Europe and Asia there extended an open ” Mediterranean ” sea, the ” Tethys ” of E. Suess; while over an enormous area in the southern hemisphere a great’ land area was spread, ” Gondwana land,” the land of the Glossopteris flora. At many points in this vast tract, as we have seen, coarse conglomeratic, deposits, Talchir, Dwyka, Bacchus Marsh, &c, indicate profound glacial conditions, which some have thought were present also in Britain, Germany and elsewhere in the north. Moderate earth movements were taking place in North America, where the Appalachian and Ouachita mountains were in course of elevation, and in Europe this was a time of great volcanic activity. In the Saal region volcanic rocks in the lower Rothliegende have been penetrated for 1100 ft. without reaching the bottom, and elsewhere in central Europe great sheets of con- temporaneous quartz porphyry, granite porphyry, melaphyre and porphyrite are abundant with their corresponding tuffs. Melaphyres and tuffs appear in the Vosges, which in the south of France are enormous masses of melaphyre and quartz porphyry. Basic lavas and tuffs — diabase, pierite, olivine basalt and andesite tuffs — were erupted from many small vents in Ayrshire and the Nith basin, and basic lavas occur also in Devonshire. Volcanic rocks occur also in New Zealand, Sumatra and the Transvaal.

Table of Permian Strata, showing approximate correlations.

Stages.

Britain.

Saxony, Thuringia, Bohemia.

Basin of the Saar.

Alps.

Russia.

India.

North America.

Thuringian

Marls and gypsum.

Magnesian limestone.

Marl slate.

Salt beds of Stassfurt. Zechstein lime- stones. Kupfer-schiefer.

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Upper red

sandstones,

breccias and

conglomerates.

Bellerophon limestone. Dolomites and shales

of Neumarkt. Sandstones of Groden.

Tartarian

Marls. Cephalopod beds of Armenia. Copper- bearing sandstones in Ural region. Limestones and dolo- mites of Kostroma (Russian

Zechstein). Kungur and

Artinsk

sandstones.

Beds of

Novaya

Zemblya and

Spitzbergen.

Talchir beds. Kaharbari group. Damuda group. (?) Pancjiet group. Productus limestones. Dan- dote group of Salt Range. Productus limestones. Limestone of Chitichan.

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Punjabian

or Saxonian

Red sandstones, conglomerates, breccias and marls doubtfully assigned to this period.

Volcanic rocks in Scotland and Devonshire.

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Weissliegendes.

Tambach beds.

Oberhof beds

Goldlauter

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Red sandstones with eruptive

rocks.

The beds of

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Wadern,

Sotern,

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Artinskian (marine)

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(continental)

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Manebach

beds.

Brandschiefer

beds of Wessig.

Gehren beds.

Braunau beds

of Bohemia.

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Lebach beds. Cusel beds.

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very many others have made important contributions to the subject. Numerous references will be found in Sir A. Geikie, Textbook of Geology, 4th ed., and in the annual Geological Literature of the Geological Society of London. See also an interesting summary by C. Schuchert, ” The Russian Carboniferous and Permian compared with those of India and America,” Amer. Journ. Set. (1906), 4th series, vol. xxii. pp. 29 seq. and a general account of the system in Lethaea geognoshca, Th. I. Bd. II., F. Freeh and others (Stuttgart 1897-1902). H, Everding, ” Zur GeologiederdeutschenZechsteinsalze,” .Kg/, geolog. Landesanst. (Berlin, 1907) gives a full account of the salt and potassium-bearing beds. (J. A. H.)

PERNAMBUCO, a north-eastern state of Brazil, bounded N. by Ceara and Parahyba, E. by the Atlantic, S. by Alagoas and Bahia, and W. by Piauhy. Area, 49,573 sq. m.; pop. (1900), 1,178,150. It comprises a comparatively narrow coastal zone, a high inland plateau, and an intermediate zone formed by the terraces and slopes between the two. Its surface is much broken by the remains of the ancient plateau which has been worn down by erosion, leaving escarpments and ranges of flat-topped mountains, called chapadas, capped in places by horizontal layers of sandstone. Ranges of these chapadas form the boundary lines with three states — the Serras dos Irmaos and Vermelha with Piauhy, the Serra do Araripe with Ceara, and the Serra dos Cariris Velhos with Parahyba. The coastal zone is low, well-wooded and fertile. It has a hot, humid climate, relieved to some extent by the south-east trade winds. This region is locally known as the mattas (forests). The middle zone, called the caatinga or agreste region, has a drier climate and lighter vegetation. The inland region, called the sertao, is high, stony, and dry, and frequently devastated by prolonged droughts (se’ecas). The climate is characterized by hot days and cool nights, and is considered healthy, though the daily change tends to provoke bronchial, catarrhal and inflammatory diseases. There are two clearly defined seasons, a rainy season from March to June, and a dry season for the remaining months. The rivers of the state include a number of small plateau streams flowing southward to the Sao Francisco River, and several large streams in the eastern part flowing eastward to the Atlantic. The former are the Moxoto, Ema, Pajehu, Terra Nova, Brigida, B6a Vista and Pontal, and are dry channels the greater part of the year. The largest of the coastal rivers are the Goyanna, which is formed by the confluence of the Tracunhaem and Capibaribe-mirim, and drains a rich agricultural region in the north-east part of the state; the Capibaribe, which has its source in the Serra de Jacarara and flows eastward to the Atlantic at Recife with a course of nearly 300 m. ; the Ipojuca, which rises in the

Serra de Aldeia Velha and reaches the coast south of Recife; theSerinhaen and the Una. A large tributary of the last — the Rio Jacuhipe, forms part of the boundary line with Alagoas.

Pernambuco is chiefly agricultural, the lowlands being devoted to sugar and fruit, with coffee in some of the more elevated localities, the agreste region to cotton, tobacco, Indian corn, beans and stock, and the sertao to grazing and in some localities to cotton. Sugar, molasses, rum (aguardente or cachaca), tobacco and fruit are largely exported. Coco-nuts, cacao, bananas, mangoes and other tropical fruits are produced in profusion, but the production of foodstuffs (beans, Indian corn, mandioca, &c.) is not sufficient for local consumption. Manga-beira rubber is collected to a limited extent, and piassava fibre is an article of export. Orchids are also collected for export in the districts of Garanhuns and Timbauba. Cotton-weaving and cigar-making are the principal manufacturing industries, after the large engenhos devoted to the manufacture of sugar and rum. The railways of the state are the Recife and Sao Francisco (77 m.), Central de Pernambuco (132 m.) andSulde Pernambuco (120 m.) — all government properties leased to the Great Western of Brazil Railway Co., Ltd., since 1901. Besides these there are the line from Recife to Limoeiro and Timbauba (112 m.), with an

extension from Timbauba to Pilar (24 m.).« All these lines concentrate at the port of Recife. The capital of the state is Recife, commonly known among foreigners as Pernambuco. There are a number of large towns in the state, but the census returns include their populations in those of the municipios (communes) to which they belong. The most important are: Bezerros (17,484), Bom Jardim (40,160), Brejo da Madre de Deus (13,655), atown of thehigher agreste region, Cabo (13,337), Caruaru (17,844), Escada (9331), Garanhuns (32,788, covering six towns and villages), Gloria de Goyta, (24,554), Goyanna, Limoeiro (21,576), Olinda (8080), the old colonial capital and episcopal see, Rio Formosa (6080), Timbauba (9514) and Victoria (32,422).

Pernambuco was first settled in 1526 by Christovao Jacques who founded a settlement on the Rio Iguarassu that was after- wards abandoned. The first permanent settlement was made by Duarte Coelho Pereira at Olinda in 1530, and four years later he was granted a capitania of 50 leagues extending from the mouth of the Sao Francisco northward to that of the Iguarassu. Adjacent to this grant on the north was the capitania of Itamaraca, granted to Pero Lopes de Souza, which covered the remainder of the present state. The capitania of Pernambuco was ably governed and took an active part in

the expulsion of the French from the trading posts established along the coast northward to Maranhao, and in establishing Portuguese colonies in their places. In 1630 Pernambuco was occupied by the Dutch and continued under their rule until 1654. Although an active guerrilla warfare was waged against the Dutch during a large part of that period, they did much to promote the agricultural and commercial interests of the colony, especially under the wise administration of Maurice of Nassau. In 1817 Pernambuco was the scene of a revolutionary outbreak, which resulted in the separation of the present states of Alagoas and Rio Grande do Norte, Ceara and Parahyba having been detached in 1799. There'was another insurrection in 1822 when the Portuguese captain-general, Luiz de Rego, and his garrison was expelled, and in 1824 dissatisfaction with the arbitrary proceedings of Dom Pedro I. at Rio de Janeiro led to a separatist revolution for the formation of a new state, to be called the Federacao do Equador. There was another outbreak in 183 1 and frequent disorders down to 1848, when they culminated in another unsuccessful revolution. The population of the Pernambuco sertao has always been noted for its turbulent, lawless character, due partly to distance from the coast where the bulk of the population is concentrated, partly to difficult means of communication, and partly to the fact that this remote region has long been the refuge of criminals from the coast towns.

PERNAU (in Russ. Pernov and in Esthonian Pernolin), a seaport and watering-place of western Russia, in the government of Livonia, 155 m. N. of Riga, on the left bank of the Pernau or Pernova, which about half a mile farther down enters the Bay of Pernau, the northern arm of the Gulf of Riga. Pop., 12,856. The harbour is usually free from ice from the end of April to the middle of December.

Founded on the right side of the river in 1255 by one of the bishops of Oesel, Pernau soon became a flourishing place. In the 1 6th century it was occupied in succession by the Swedes, the Poles and the Teutonic Knights. After 1599 the Poles transferred the town to the left side of the river; and in 1642 the Swedes, who had been in possession since 161 7, strengthened it with regular fortifications. In 1710 it was taken by the Russians, and the fortress is now demolished.

PERNE, ANPREW (c. 1519-1589), vice-chancellor of Cam- bridge University and dean of Ely, born about 1591, was son of John Perne of East Bilney, Norfolk. He was educated at St John's college, Cambridge, graduating B.A. in 1539, B.D. in 1,547 and D.D. in 1552. He was elected fellow of Queens' in 1540, and vice-president in 1551, and was five times vice- chancellor; but he owes his notoriety to his

remarkable versatility, and, like the vicar of Bray, he was always faithful to the national religion, whatever it might be. In April 1547 he advocated Catholic doctrines, but recanted two months later, and his

Protestant faith was strengthened during Edward VI. ‘s reign; he was appointed a royal chaplain and canon of Windsor. Soon after Mary’s accession, however, he perceived the error of his ways and was made master of Peterhouse in 1554 and dean of Ely in 1557. He preached the sermon in 1556 when the bodies of Bucer and Fagius were disinterred and burnt for heresy, and also in 1 560 when these proceedings were reversed and the dead heretics were rehabilitated. In Elizabeth’s reign he subscribed the Thirty-nine Articles, denounced the pope and tried to convert Abbot Feckenham to Protestantism; and in 1584 Whitgift in vain recommended him for a bishopric. He died on the 26th of April 1589. He was selected as the type of Anglican prelate by the authors of the Martin Mar-prelate tracts and other Puritans, who nicknamed him ” Old Andrew Turncoat,” ” Andrew Ambo,” ” Old Father Palinode.” Cam- bridge wits, it was said, translated ” perno ” by ” I turn, I rat, I change often “; and a coat that had often been turned was said to have been ” perned.” (A. F. P.)

PERONNE, a town of northern France, capital of an arron- dissement of the department of Somme, on the right bank of the Somme at its confluence with the Cologne, 35 m. E. by N. of Amiens by rail. Pop. (1906), 3698. The church of St Jean (1509-1525) was greatly damaged during the bombardment of 1870-71, but has since been restored. The castle of Peronne still retains four large conical-roofed towers dating from the middle ages, one of which is said to have been the prison of Louis XL in 1468, when he was forced to agree to the ” Treaty of Peronne.” Peronne has a sub-prefecture, a tribunal of first instance and a communal college. Its trade and industry are of little importance.

The Frankish kings had a villa at Peronne, which Clovis II. gave to Erchinoaldus, mayor of the palace. The latter founded a monastery here, and raised in honour of St Fursy a collegiate church, which was a wealthy establishment until the Revolution; it is the burial-place of Charles the Simple, who died of starvation in a dungeon in Peronne, into which he had been thrown by the count of Vermandois (929). After the death of Philip of Alsace, Peronne, which he had inherited

through his wife, escheated to the French Crown in the reign of Philip Augustus, from whom in 1209 it received a charter. By the treaty of Arras (1435) it was given to the Burgundians; bought back by Louis XL, it passed again into the hands of Charles the Bold in 1465. On the death of Charles, however, in 1477, Louis XL resumed possession. In 1536 the emperor Charles V. besieged Peronne, but without success; in its defence a woman called Marie Foure greatly distinguished herself. A statue of her stands in the town; and the anniversary of the raising of the siege is still celebrated annually. It was the first town after Paris at which the League was proclaimed in 1577. Peronne's greatest misfortunes occurred during the Franco-German War. It was invested on the 27th of December 1870, and bombarded from the 28th to the 9th of the following January, upon which date, on account of the sufferings of the civil population, among whom small-pox had broken out, it was compelled to capitulate.

PEROVSKITE, or Perofskite, a mineral consisting of calcium titanate, $CaTi0_3$, usually with a small proportion of the calcium replaced by iron. The crystals found in schistose rocks have the form of cubes, which are sometimes modified on the edges and corners by numerous small planes; on the other hand, the crystals occurring as an accessory constituent of eruptive rocks are octahedral in form and microscopic in size. Although geometrically cubic, the crystals 'are always doubly refracting, and they sometimes show evidence of complex mimetic twinning; their structure as shown in polarized light is very similar to that of the mineral boracite, and they are therefore described as pseudo-cubic. There are distinct cleavages parallel to the faces of the cube. The colour varies from pale yellow to blackish- brown and the lustre is adamantine to metallic; the crystals are transparent to opaque. The index of refraction is high, the hardness 55 an d the specific gravity 4-0. The mineral was discovered at Achmatovsk near Zlatonst in the Urals by G. Rose in 1839, and named in honour of Count L. A. Perovsky;

at this locality large cubes occur with calcite and magnetite in a chlorite-schist. Similar crystals are also found in talc-schist at Zermatt in Switzerland. The microscopic octahedral crystals are characteristic of melilite basalt and nepheline basalt; they have also been found in peridotite and serpen- tine. (L. J. S.)

PEROWNE, JOHN JAMES STEWART (1823-1904), English bishop, was born, of Huguenot ancestry, at Burdwan, Bengal, on the 13th of March 1823. He was educated at Norwich and at Corpus Christi College, Cambridge, bcoming a fellow in 1849. After holding a chair in King's College, London, he was appointed vice-principal at St

David's College, Lampeter (1862-1872). In 1868 he was Hulsean lecturer, taking as his subject Immor- tality. He was elected canon of Llandaff in 1869, dean of Peter- borough r878, and in 1891 succeeded Henry Philpott as bishop of Worcester. Perowne was a good Hebrew scholar of the old type and sat on the Old Testament Revision Committee. He is best remembered as the general editor of the Cambridge Bible for Schools and Colleges. His chief works were a Com- mentary on the Book of Psalms (2 vols., 1864-1868) and a life of Bishop Thirlwall (1877-1878). He resigned his see in 1901, and died on the 6th of November 1904.

PEROZ (Peirozes, Priscus, fr. 33; Perozes, Procop. Pers. i. 3 and Agath. iv. 27; the modern form of the name is Feroz, Firuz, cf. Fieuzabad), Sassanid king of Persia, a.d. 457-484, son of Yazdegerd II. He rebelled against his brother Homizd III., and in 459 defeated and killed him with the help of the Ephtha- lites, or White Huns, who had invaded Bactria. He also killed most of his other relatives, and persecuted the Christians. But he favoured the introduction of Nestorianism, in opposition to the orthodox creed of Byzantium. With the Romans he main- tained peace, but he tried to keep down the Ephthalites, who began to conquer eastern Iran. The Romans supported him with subsidies; but all his wars were disastrous. Once he was himself taken prisoner and had to give his son Kavadh as hostage till after two years he was able to pay a heavy ransom. Then he broke the treaty again and advanced with a large army. But he lost his way in the eastern desert and perished with his whole army (484). The Ephthalites invaded and plun- dered Persia for two years, till at last a noble Persian from the old family of Karen, Zarmihr (or Sokhra), restored some degree of order. He raised Balash, a brother of Peroz, to the throne. (Ed. M.)

PERPENDICULAR PERIOD, the term given by Thomas Rickman to the third period of Gothic architecture in England, in consequence of the great predominance of perpendicular lines. In the later examples of the Decorated period the omission of the circles in the tracery had led to the employment of curves of double curvature which developed into flamboyant tracery, and the introduction of the perpendicular lines was a reaction in the contrary direction. The mullions of the windows (which are sometimes of immense size, so as to give greater space for the stained glass) are carried up into the arch mould of the windows, and the upper portion is subdivided by additional mullions. The buttresses and wall surface are likewise divided up into vertical panels. The doorways are frequently enclosed within a square head over the arch mouldings, the spandrils being fitted with quatrefoils or tracery. Inside the church the triforium disappears, or its place is filled

with panelling, and greater importance is given to the clerestory windows which constitute the finest features in the churches of this period. The mouldings are flatter and less effective than those of the earlier periods, and one of the chief characteristics is the introduction of large elliptical hollows. The finest features of this period are the magnificent timber roofs, such as those of Westminster Hall (1395), Christ Church Hall, Oxford, and Crosby Hall.

The earliest examples of the Perpendicular period, dating from 1360, are found at Gloucester, where the masons of the cathedral would seem to have been far in advance of those in other towns. Among other buildings of note are the choir and tower of York Cathedral (T389-1407); the nave and western transepts of Canterbury Cathedral (1378-1411), and the tower

(towards the end of the 15th century); New College, Oxford (1380-1386); the Beauchamp Chapel, Warwick (1381-1391); the nave and aisles of Winchester Cathedral (1399-1419); the transept and tower of Merton College, Oxford (1424-1450); Manchester Cathedral (1422); the central tower of Gloucester Cathedral (1454-1457), and that of Magdalen College, Oxford (1475-1480). To those examples should be added the towers at Wrexham, Coventry, Evesham, and St Mary's at Taunton, the first being of exceptional magnificence.

PERPENT, or Parpent Stones, in architecture, bond or " through stones," the Sloltovoi. of the Greeks and Romans, long stones going right through walls, and tying them together from face to face. The O. Fr. parpain, modern parpaing, from which this word is derived, is obscure in origin. It may be from a supposed Lat. perpago, perpaginis, formed like compago, a joint, from the root of pangere, to fasten, and meaning " some- thing fastened together," or from some popular corruption of Lat. perpendiculum, plummet or plumb-line (pir or pendere, to hang), referring to the smooth perpendicular faces of the stone.

PERPETUAL MOTION, or Perpetuum Mobile, in its usual significance, not simply a machine which will go on moving for ever, but a machine which, once set in motion, will go on doing useful work without drawing on any external source of energy, or a machine which in every complete cycle of its operation will give forth more energy than it has absorbed. Briefly, a perpetual motion usually means

a machine which will create energy.

The earlier seekers after the ” perpetuum mobile ” did not always appreciate the exact nature of their quest; for we find among their ideals a clock that would periodically rewind itself, and thus go without human interference as long as its machinery would last. The energy created by such a machine would simply be the work done in overcoming the friction of its parts, so that its projectors might be held merely to have been ignorant of the laws of friction and of the dynamic theory of heat. Most of the perpetual motionists, however, had more practical views, and explicitly declared the object of their inventions to be the doing of useful work, such as raising water, grinding corn, and so on. Like the exact quadrature of the circle, the transmuta- tion of metals and other famous problems of antiquity, the perpetual motion has now become a venerable paradox. Still, like these others, it retains a great historical interest. Just as some of the most interesting branches of modern pure mathe- matics sprang from the problem of squaring the circle, as the researches of the alchemists developed into the science of modern chemistry, so, as the result of the vain search after the perpetual motion, there grew up the greatest of all the general- izations of physical science, the principle of the conservation of energy.

There was a time when the problem of the perpetual motion was one worthy of the attention of a philosopher. Before that analysis of the action of ordinary machines which led to the laws of dynamics, and the discussion of the dynamical interdependence of natural phenomena which accompanied the establishment of the dynamical theory of heat, there was nothing plainly unreason- able in the idea that work might be done by the mere concatena- tion of machinery. It had not then been proved that energy is uncreatable and indestructible in the ordinary course of nature; even now that proof has only been given by induction from long observation of facts. There was a time when wise men believed that a spirit, whose maintenance would cost nothing, could by magic art be summoned from the deep to do his master’s work; and it was just as reasonable to suppose that a structure of wood, brass and iron could be found to work under like conditions. The disproof is in both cases alike. No such spirit has ever existed, save in the imagination of his describer, and no such machine has ever been known to act, save in the fancy of its inventor.

The principle of the conservation of energy, which in one sense is simply denial ot the possibility of a perpetual motion, rests on facts drawn from every branch of physical science; and, although its full establishment only dates from the middle of the

19th century, yet so numerous are the cases in which it has been tested, so various the deductions from it that have been proved to accord with experience, that it is now regarded as one of the best-established laws of nature. Consequently, on any one who calls it in question is thrown the burden of proving his case. If any machine were produced whose source of energy could not at once be traced, a man of science (complete freedom of investi- gation being supposed) would in the first place try to trace its power to some hidden source of a kind already known ; or in the last resort he would seek for a source of energy of a new kind and give it a new name. Any assertion of creation of energy by means of a mere machine would have to be authenticated in many instances, and established by long investigation, before it could be received in modern science. The case is precisely as with the law of gravitation; if any apparent exception to this were observed in the case of some heavenly body, astronomers, instead of denying the law, would immediately seek to explain the occurrence by a wider application of it, say by including in their calculations the effect of some disturbing body hitherto neglected. If a man likes to indulge the notion that, after all, an exception to the law of the conservation of energy may be found, and, provided he submits his idea to the test of experiment at his own charges without annoying his neighbours, ail that can be said is that he is engaged in an unpromising enterprise. The case is otherwise with the projector who comes forward with some machine which claims by the mere ingenuity of its contri- vance to multiply the energy supplied to it from some of the ordinary sources of nature and sets to work to pester scientific men to examine his supposed discovery, or attempts therewith to induce the credulous to waste their money. This is by far the largest class of perpetual-motion-mongers nowadays. The interest of such cases is that attaching to the morbid anatomy of the human mind. Perhaps the most striking feature about them is the woful sameness of the symptoms of their madness. As a body perpetual-motion seekers are ambitious, lovers of the short path to wealth and fame, but wholly superficial. Their inventions are very rarely characterized even by mechanical ingenuity. Sometimes indeed the inventor has simply bewildered himself by the complexity of his device; but in most cases the machines of the perpetual motionist are of child-like simplicity, remarkable only for the extraordinary assertions of the inventor concerning them. Wealth of ideas there is none; simply asser- tions that such and such a machine solves the problem, although an identical contrivance has been shown to do no such thing by the brutal test of standing still in the hands of many previous inventors. Hosts of the seekers for the perpetual motion have attacked their insoluble problem with less than a schoolboy’s share of

the requisite knowledge; and their confidence as a rule is in proportion to their ignorance. Very often they get no further than a mere prospectus, on the strength of which they claim some imaginary reward, or offer their precious discovery for sale; sometimes they get the length of a model which wants only the last perfection (already in the inventor's brain) to solve the great problem; sometimes fraud is made to supply the motive power which their real or pretended efforts have failed to discover.

It was no doubt the barefaced fallacy of most of the plans for perpetual motion that led the majority of scientific men to conclude at a very early date that the " perpetuum mobile " was an impossibility. We find the Paris Academy of Sciences refusing, as early as 1775, to receive schemes for the perpetual motion, which they class with solutions of the duplication of the cube, the trisection of an angle and the quadrature of the circle. Stevinus and Leibnitz seem to have regarded its impossibility as axiomatic; and Newton at the beginning of his Principia states, so far as ordinary mechanics are concerned, a principle which virtually amounts to the same thing.

The famous proof of P. De la Hire simply refers to some of the more common gravitational perpetual motions. The truth is, as we have said already, that, if proof is to be given, or considered necessary, it must proceed by induction from all physical phenomena.

Fig. t.

It would serve no useful purpose here to give an exhaustive historical account 1 of the vagaries of mankind in pursuit of the " perpetuum mobile." The reader may refer to Henry Dircks's Perpeluum Mobile (2 vols., 1861 and 1870), from which, for the most Dart, we select the following facts.

By far the most numerous class of perpetual motions is that which seeks to utilize the action of gravity upon rigid solids. We have not read of any actual proposal of the kind, but the most obvious thing to imagine in this way would be to procure some substance which intercepts gravitational attraction. If this could be had, then, by introducing a plate of it underneath a body while it was raised, we could elevate the body without doing work; then, removing the plate, we could allow the body to fall and do work; eccentrics or other

imposing device being added to move the gravitation intercepter, behold a perpetual motion complete ! The great difficulty is that no one has found the proper material for an intercepter.

Fig. 1 represents one of the most ancient and oftenest-repeated of gravitational perpetual motions. The idea is that the balls

rolling in the compartments between the felloe and the rim of the wheel will, on the whole, so comport themselves that the moment about the centre of those on the descending side exceeds the moment of those on the ascending side. Endless devices, such as curved spokes, levers with elbow-joints, eccen- trics, &c, have been proposed for effecting this impossibility. The student of dynamics at once convinces himself that no machinery can effect any such result; because if we give the wheel a complete turn, so that each ball returns to its original position, the whole work done by the ball will, at the most, equal that done on it. We know that if the laws of motion be true, in each step the kinetic energy given to the whole system of wheel and balls is equal to that taken from the potential energy of the balls less what is dissipated in the form of heat by frictional forces, or vice versa, if the wheel and balls be losing kinetic energy — save that the friction in both cases leads to dissipation. So that, whatever the system may lose, it can, after it is left to itself, never gain energy during its motion.

The two most famous perpetual motions of history, viz. the wheels of the marquis of Worcester (d. 1667) and of Councillor Orffyraeus, were probably of this type. The marquis of Worcester gives the following account of his machine in his Century of Inventions (art. 56) :— _

” To provide and make that all the Weights of the descending side of a Wheel shall be perpetually further from the Centre than those of the mounting side, and yet equal in number and heft to one side as the other. A most incredible thing, if not seen but tried before the late king (of blessed memory) in the Tower, by my directions, two Extraordinary Embassadors accompanying His Majesty, and the Duke of Richmond, and Duke Hamilton, with most of the Court, attending him. The Wheel was 14. Foot over, and 40. Weights of 50. pounds apiece. Sir William Balfore, then Lieutenant of the Tower, can justify it, with several others. They all saw that no sooner these great Weights passed the Diameter-line of the lower side, but they hung a foot further from the Centre, nor no sooner passed the Diameter-line of the upper side but they hung a foot nearer. Be pleased to judge the consequence.”

1 We may here notice, so far as more recent times are concerned, the

claim of an American enthusiast, who, having worked a Hampson plant for liquefying air, stated that 3 lb of liquid air sufficed to liquefy ten, and of these ten seven could be employed as a source of motive power, whilst the remaining three could be utilized in the production of another 10 lb of the liquid gas. There was thus available an inexhaustible supply of energy ! The absurdity of the proposition is obvious to any one acquainted with the laws of thermodynamics. Of more interest is the radium clock devised by the Hon. R. J. Strutt. This consists of a vacuum vessel from the top of which depends a short tube containing a fragment of a radioactive substance. At the lower end of this tube there are two gold leaves as in an electroscope. Fused into the sides of the vacuum vessel at points where the extended gold leaves touch the glass are two platinum wires, the outer ends of which are earthed. The ” clock ” acts as follows. The radio-active substance emits a preponderating number of positively electrified particles, so that the leaves become charged and hence extended. On contact with the wires fused into the vessel, this charge is conducted away and the leaves fall together. The process is then repeated, and will continue until all the energy of the radium has been dissipated. This period is extremely long, for 1000 years must elapse before ?ven half the radium has disappeared. — [Ed.]

Orffyraeus (whose real name was Johann Ernst Elias Bessler) (1680-1745) also obtained distinguished patronage for his invention. His last wheel, for he appears to have constructed more than one, was 12 ft. in diameter and 1 ft. 2 in. broad; it consisted of a light framework of wood, covered in with oilcloth so that the interior was concealed, and was mounted on an axle which had no visible connexion with any external mover. It was examined and approved of by the landgrave of Hesse-Cassel, in whose castle at Weissenstein it is said to have gone for eight weeks in a sealed room. The most remarkable thing about this machine is that it evidently imposed upon the mathematician W. J. ‘sGravesande, who wrote a letter to Newton giving an account of his examination of Orffyraeus’s wheel undertaken at the request of the landgrave, wherein he professes himself dissatisfied with the proofs theretofore given of vhe impossibility of perpetual motion, and indicates his opinion that the invention of Orffyraeus is worthy of investigation. He himself, however, was not allowed to examine the interior of the wheel. The inventor seems to have destroyed it himself. One story is that he did so on account of difficulties with the landgrave’s government as to a licence for it; another that he was annoyed at the examination by ‘sGravesande, and wrote on the wall of the room containing the fragments of his model that he had destroyed it because of the impertinent curiosity of

‘sGravesande.

The overbalancing wheel perpetual motion seems to be as old as the 13th century. Dircks quotes an account of an invention by Wilars de Honecort, an architect whose sketchbook is still preserved in the Ecoles des Chartes at Paris. De Honecort says, ” Many a time have skilful workmen tried to contrive a wheel that shall turn of itself; here is a way to do it by means of an uneven number of mallets, or by quicksilver.” He thereupon gives a rude sketch of a wheel with mallets jointed to its circumference. It would appear from some of the manuscripts of Leonardo da Vinci that he had worked with similar notions.

Another scheme of the perpetual motionist is a water-wheel which shall feed its own mill-stream. This notion is probably as old as the first miller who experienced the difficulty of a dry season. One form is figured in the Mathematical Magic (1648) of Bishop Wilkins (1614-1672); the essential part of it is the water- screw of Archimedes, which appears in many of the earlier machines of this class. Some of the later ones dispense with even the subtlety of the water-screw, and boldly represent a water-wheel pumping the water upon its own buckets.

Perpetual motions founded on the hydrostatical paradox are not uncommon; Denis Papin exposes one of these in the Philosophical Transactions for 1685. The most naive of these devices is that illustrated in fig. 2, the idea of which is that the larger quantity of water in the wider part of the vessel weighing more will overbalance the smaller quantity in the narrower part, so that the water will run over at C, and so on continually.

Capillary attraction has also been a favourite field for the vain quest; for, if by capillary action fluids can be made to disobey the law of never rising above their own level, what so easy as thus to produce a continual ascent and overflow, and thus perpetual motion? Various schemes of this kind, in- volying an endless band which should raise more water by its capillary action on one side than on the other, have been proposed. The most celebrated is that of Sir William Congreve (1772-1828). EFG (fig. 3) is an inclined plane over pulleys ; at the top and bottom travels an endless band of sponge, abed, and over this again an endless band of heavy weights jointed together. The whole stands over the surface of still water. The capillary action raises the water in ab, whereas the same thing cannot hap- pen in the part ad, since the weights squeeze the water out. Hence, inch for inch, ab is heavier than ad; but we know that if ab were only just as heavy inch

for inch , as ad there would be equilibrium, if the heavy chain be also uniform; therefore the extra weight of ab will cause the chain to move round in the direction of the arrow, and this will go on continually.

The more recondite vehicles of energy, such as electricity and magnetism, are more seldom drawn upon by perpetual-motion inventors than might perhaps be expected. William Gilbert, in his treatise De Magnete, alludes to some of them, and Bishop Wilkins mentions among others a machine ” wherein a loadstone is so disposed

Fig. 2.

Fig. 4.

that it shall draw unto it~on a reclined plane a bullet of steel, which, still, as it ascends near to the loadstone, may be contrived to fall through some hole in the plane and so to return unto the place whence at first it began to move, and being there, the loadstone will again attract it upwards, till, coming to this hole, it will fall down again, and so the motion shall be perpetual.” The fact that screens do exist whereby electrical and magnetic action can be cut off would seem to open a door for the perpetual- motion seeker. Unfortunately the bringing up and removing of these screens involves in all cases just that gain or loss of work which is demanded by the law of the conservation of energy. A shoemaker of Linlithgow called Spence pretended that he had found a black substance which intercepted magnetic attraction and repulsion, and he produced two machines which were moved, as he asserted, by the agency of permanent magnets, thanks to the black substance. The fraud was speedily exposed, but it is worthy of remark that Sir David Brewster thought the things worth mentioning in a letter to the Annates de chimie (1818), wherein he states ” that Mr Playfair and Captain Kater have inspected both of these machines and are satisfied that they resolve the problem of perpetual motion.”

The present writer once was sent an elaborate drawing of a locomotive engine which was to be worked by the agency of permanent magnets. He forgets the details, but it was not so simple as the plan represented in fig. 4, where M and N are permanent magnets, whose attraction is ” screened ” by the wooden blocks A and B from

the upper left and lower right quadrants of the soft iron wheel W, which consequently is attracted round in the same direction by both M and N, and thus goes on for ever.

One more page from this chapter of the book of human folly, the author is the famous Jean Bernoulli the elder. We N translate his Latin, as far as possible, into modern phraseology. In the first place we must premise the following (see fig. 5). (1) If there be two fluids of different densities whose densities are in the ratio of G to L, the height of equiponderating cylinders on equal bases will be in the inverse ratio of L to G. (2) Accordingly, if the height AC of one fluid, contained in the vase AD, be in this ratio to the height EF of the other liquid, which is in a tube open at both ends, the liquids so placed will remain at rest. (3) Wherefore, if AC be to EF in a greater ratio than L to G, the liquid in the tube will ascend; or if the tube be not sufficiently long the liquid will overflow at the orifice E (this follows from hydrostatic principles). (4) It is possible to have two liquids of different density that will mix. (5) It is possible to have a filter, colander, or other separator, by means of which the lighter liquid mixed with the heavier may be separated again therefrom.

Construction. — These things being presupposed (says Bernoulli), I thus construct a perpetual motion. Let there be taken in any (if you please, in equal) quantities two liquids of different densities mixed together (which may be had by hyp. 4), and let the ratio of their densities be first determined, and be the heavier to the lighter as G to L, then with the mixture let the vase AD be filled up to A. This done let the tube EF, open at both ends, be taken of such a length that AC: EF > 2L:G + L; let the lower orifice F of this tube be stopped, or rather covered with the filter or other material separating the lighter liquid from the heavier (which may also be had by hyp. 5) ; now let the tube thus prepared be immersed to the bottom of the vessel CD ; I say that the liquid will continually ascend through the orifice F of the tube and overflow by the ■■ orifice E upon the liquid below.

Demonstration. — Because the orifice F of the tube is covered by the filter (by constr.) which separates the lighter liquid from the heavier, it follows that, if the tube be immersed to the bottom of the vessel, the lighter liquid alone which is mixed with the heavier ought to rise through the filter into the tube, and that, too, higher than the surface of the surrounding liquid (by hyp. 2), so that AC:EF = 2L:G + L; but since by constr. AC:EF > 2L:G + L it necessarily follows (by hyp. 3) that the lighter liquid will flow over by the orifice E into the vessel below, and there will meet the heavier and be again mixed with it; and it will then penetrate the filter, again ascend the tube, and be a second time

driven through the upper orifice. Thus, therefore, will the flow be continued for ever. — Q.E D.

Bernoulli then proceeds to apply this theory to explain the per- petual rise of water to the mountains, and its flow in rivers to the

eR

Fig. 5.

sea, which others had falsely attributed to capillary action — his idea being that it was an effect of the different densities of salt and fresh water.

One really is at a loss with Bernoulli's wonderful theory, whether to admire most the conscientious statement of the hypothesis, the prim logic of the demonstration, so carefully cut according to the pattern of the ancients, or the weighty superstructure built on so frail a foundation. Most of our perpetual motions were clearly the result of too little learning; surely this one was the product of too much. (G. Ch.)

PERPETUITY (Lat. perpetuus, continuous), the state of being perpetual or continuing for an indefinite time; in law the tying-up of an estate for a lengthened period, for the purpose of preventing or restricting alienation. As being opposed to the interest of the state and individual effort, the creation of perpetuities has been considerably curtailed, and the rule against perpetuities in the United Kingdom now forbids the making of an executory interest unless beginning within the period of any fixed number of existing lives and an additional period of twenty-one years (with a few months added, if necessary, for the period of gestation). The rule applies to dispositions of personal property (see Accumulation) as well as of real property. There are certain exceptions to the rule, as in the case of limitations in mortmain and to charitable uses, and also in the case of a perpetuity created by act of parliament (e.g. the estate of Blenheim, settled on the duke of Marlborough, and Strathfieldsaye on the duke of Wellington). In the United States the English common-law rule against perpetuities obtains in many of the states; in others it has been replaced or reinforced by statutory rules (see Gray on Alienation, § 42). Charities may be established in perpetuity, and provision may be made for an accumulation of the funds for a reasonable time, e.g. for 100 years (Woodruff v. Marsh, 63 Conn. Rep. 125; 38 Amer. St. Rep. 346). The general tendency of American legislation is to favour tying up estates to a greater extent than was formerly approved.

PERPIGNAN, a town of south-western France, capital of the department of Pyrenees-Orientales, on the right bank of the Tet, 7 m. from the Mediterranean and 42 m. S. by W. of Narbonne by rail. Pop. (1906), town, 32,683; commune, 38,898. The north-west quarter of the town is traversed by the Basse, a tributary of the Tet, while to the south it is overlooked by a citadel enclosing a castle (13th century) of the kings of Majorca. The chapel is remarkable as being a mixture of the Romanesque, Pointed and Moorish styles. The ramparts surrounding the citadel are the work of Louis XL, Charles V. and Vauban. The sculptures and caryatides still to be seen on the gateway of the citadel were placed there by the duke of Alva. The cathedral of St Jean was begun in 1324 and finished in 1509. The most noteworthy feature in the building is an immense reredos of white marble (early r.7th century) by Bartholomew Soler of Barcelona,

In the north of the town commanding the gateway of Notre- Dame (1481) there stands a curious machicolated stronghold known as the Castillet (14th and 15th centuries), now used as a prison. The buildings of the old university (1 8th century) contain the library and the museum, the latter possessing the first photographic proofs executed by Daguerre and a collection of sculptures and paintings. Statues of Francois Arago, the astronomer, and Hyacinthe Rigoud, the painter, stand in the squares named after them.

Perpignan is a fortified place of the first class, and seat of a prefect, a bishop and a court of assizes, and has tribunals of first instance and of commerce, a chamber of commerce, a branch of the Bank of France, a communal college for boys, a school of music and training colleges for both sexes. The higher tribunal of Andovic sits at Perpignan. Trade is in wine, iron, wool, oil, corks and leather.

Perpignan dates at least from the 10th century. In the nth and 1 2th centuries it was a capital of the counts of Roussillon. from whom it passed in 1172 to the kings of Aragoii. Philip the Bold, king of France, died there in 1285, as he was returning from an unsuccessful expedition into Aragon. At that time it belonged to the kingdom of Majorca, and its sovereigns resided there until, in 1344, that small state reverted to the possession of the

kings of Aragon, who in 1349 founded a university at Perpignan. When Louis XI. occupied Roussillon as security for money advanced

by him to the king of Aragon, Perpignan resisted the French arms for a considerable time, and only yielded through stress of famine (March 15, 1475). Roussillon was restored to Aragon by Charles VIII. and Perpignan was again besieged in 1542 under Francis I., but without success. Later on, however, the inhabitants, angered by the tyranny and cruelty of the Spanish governor, surrendered the town to Louis XIII. The citadel held out until the 9th of September 1642, and the place has ever since belonged to France, to which it was formally ceded by the treaty of the Pyrenees (1659). In 1602 the bishopric of Elne was transferred to Perpignan.

See P. Vibal, Perpignan depuis les origines jusqu' & nos jours (Paris, 1898).

PERQUISITE (Lat. perquisitum, that which has been acquired by careful search ; perquirere, to search diligently) , a term properly used of the profits which accrue to the holder of an office over and above the regular emoluments; also, in law, the casual profits, such as accrue by heriots, fines, reliefs, &c, to a lord of a manor above the yearly revenue from the copyholds. The word is used generally of the casual profits allowed by custom to servants or other employes from superfluous articles which the employer has enjoyed the use of or which are supposed not to be needed.

PERRAULT, CHARLES (1628-1703), French author, was born in Paris on the 12th of January 1628. His father, Pierre Perrault, was a barrister, all of whose four sons were men of some distinction: Claude (1613-1688), the second, was by profession a physician, but became the architect of the Louvre, and trans- lated Vitruvius (1673). Charles was brought up at the College de Beauvais, until he chose to quarrel with his masters, after which he was allowed to follow his own bent in the way of study. He took his degree of licencii en droit at Orleans in 1651, and was almost immediately called to the Paris bar, where, however, he practised for a very short time. In 1654 his brother became receiver-general of Paris, and made Charles his clerk. After nearly ten years of this employment he was, in 1663, chosen by Colbert as his secretary to assist and advise him in matters relating to the arts and sciences, not forgetting literature. He was controller-general of the department of public works, member of the commission that afterwards developed into the Academie des inscriptions, and in 167 1 he was admitted to the Academie frangaise. Perrault justified his election in several ways. One was the orderly arrangement of the business affairs of the Academy, another was the suggestion of the custom of holding public seances for the reception of candidates. Colbert's death in 1683 put an end to Perrault's official career, and he

then gave himself up to literature, beginning with Saint Paulin eveque de Nole, avec une epltre chritienne sur la penitence, et une ode aux nouveaux convertis. The famous dispute of the ancients and moderns arose from a poem on the Steele de Louis le Grand (1687), read before the Academy by Perrault, on which Boileau com- mented in violent terms. Perrault had ideas and a will of his own, and he published (4 vols., 1688- 1696) his Par allele des anciens et des modernes. The controversy that followed in its train raged hotly in France, passed thence to England, and in the days of Antoine Houdart de la Motte and Fenelon broke out again in the country of its origin. As far as Perrault is concerned he was inferior to his adversaries in learning, but decidedly superior to them in wit and politeness.

It is not known what drew Perrault to the composition of the only works of his which are still read, but the taste for fairy stories and Oriental tales at court is noticed by Mme de Sevigne in 1676, and at the end of the 17th century gave rise to the fairy stories of Mile L'Heritier de Villaudon, whose Bigarrures ingeni- euses appeared in 1696, of Mme d'Aulnoy and others, while Antoine Galland's translation of the Thousand-and-One Nights belongs to the early years of the 18th century. The first of Perrault's contes, Grise'lidis, which is in verse, appeared in 1691, and was reprinted with Peau d'dne and Les Souhails ridicules, also in verse, in a Recueil de pieces curieuses — published at the

Hague in 1694. But Perrault was no poet, and the merit of these pieces is entirely obscured by that of the prose tales, La Belle au bois dormant, Petit chaperon rouge, La Barbe bleue, Le Chat botte, Les Fies, Cendrillon, Riquet a la houppe and Le Petit poucet, which appeared in a volume with 1697 on the title-page, and with the general title of Histoires ou contes du temps passi avec des moralitts. The frontispiece contained a placard with the inscription, Contes de ma mire I'oie. In 1876 Paul Lacroix attributed the stories to the authorship of Perrault's son, P. Darmancour, who signed the dedication, and was then, according to Lacroix, nineteen years old. Andrew Lang has suggested that the son was a child, not a young man of nineteen, that he really wrote down the stories as he heard them, and that they were then edited by his father. This supposition would explain the mixture of naivete and satire in the text. Perrault's other works include his MSmoires (in which he was assisted by his brother Claude), giving much valuable information on Colbert's ministry; an Eneide travestie written in collaboration with his two brothers, and Les Hommes illustres qui ont paru en France pendant ce siecle (2 vols., 1696-1700). He died on the 16th of May 1703, in Paris. His son, Perrault d'Arma-Court, was the author of a well-known book, Contes

des fees, containing the story of Cinderella, &c.

Except the tales, Perrault's works have not recently been re- printed. Of these there are many modern editions, e.g. by Paul Lacroix (1876), and by A. Lefebvre (" Nouvelle collection Jannet," J 875); also Perrault's Popular Tales (Oxford, 1888), which contains the French text edited by Andrew Lang, with an introduction, and an examination of the sources of each story. , See also Hippolyte Rigault, Hist, de la querelle des anciens et des modernes

(1856).

PERRERS (or De Windsor), ALICE (d. 1400), mistress of the English king Edward III., belonged probably to the Hert- fordshire family of Perrers, although it is also stated that she was of more humble birth. Before 1366 she had entered the service of Edward's queen, Philippa, and she appears later as the wife of Sir William de Windsor, deputy of Ireland (d. 1384). Her intimacy with the king began about 1366, and during the next few years she received from him several grants of land and gifts of jewels. Not content with the great influence which she obtained over Edward, Alice interfered in the proceedings of the courts of law to secure sentences in favour of her friends, or of those who had purchased her favour; actions which induced the parliament of 1376 to forbid all women from practising in the law courts. Alice was banished, but John of Gaunt, duke of Lancaster, allowed her to return to court after the death of Edward the Black Prince in June 1376, and the parliament of 1377 reversed the sentence against her. Again attempting to pervert the course of justice, she was tried by the peers and banished after the death of Edward III. in June 1377; but this sentence was annulled two years later, and Alice regained some influence at court. Her time, however, was mainly spent in lawsuits, one being with William of Wykeham, bishop of Winchester, and another with her dead husband's nephew and heir, John de Windsor.

PERRON, PIERRE CUILLIER (1755-1834), French military adventurer in India, whose name was originally Pierre Cuillier, was born in 1755 at Chateau du Loire in France, the son of a cloth merchant. In 1780 he went out to India as a sailor on a French frigate, deserted on the Malabar coast, and made his way to upper India, where he enlisted in the rana of Gohad's corps under a Scotsman named Sangster. In 1790 he took' service under De Boigne, and was appointed to the command of his second brigade. In 1795 he assisted to win the battle of Kardla against the nizam of Hyderabad, and on De Boigne's retirement became commander-in-chief of Sindhia's army. At the battle of Malpura (1800) he defeated the Rajput forces. After the defeat of

Ujjain (1801) he refused to send his troops to the aid of Sindhia. His treachery on this occasion shook his position, and on the outbreak of war between Sindhia and the British in 1803 Perron was superseded and fled to the British camp. In the battles of Delhi, Laswari and Assaye, Perron's battalions were completely destroyed by Lord Lake and

Sir Arthur Wellesley. He returned to France with a large I fortune, and died in 1834.

See H. Compton, European Military Adventurers of Hindustan

(1892).

PERRON (a French word meaning properly a " large stone," Ttal. petrone, from Lat. petra, Fr. pierre, stone), in architecture,

I term applied to a raised platform reached by steps in front of the entrance to a building. The grand flight of external steps entering the mansions of the medieval nobility or high officials was considered in itself a mark of jurisdiction, as it is said that sentence was there pronounced against criminals, who were afterwards executed at the foot of the steps— as at the Giant's Stairs of the Doge's palace at Venice.

PERRONE, GIOVANNI (1794-1876), Italian theologian, was born at Chieri (Piedmont) in 1794. He studied theology at Turin, and in his twenty-first year went to Rome, where he joined the Society of Jesus. In 1816 he was sent as professor of theology to Orvieto, and in 1823 was appointed to a similar post in the Collegium Romanum. From Ferrara, where he was rector of the Jesuit College after 1830, he returned to his teaching work in Rome, being made head of his old college in 1850. He took a leading part in the discussions which led up to the promul- gation of the dogma of the Immaculate Conception (1854), and 'n 1869 was prominent on the Ultramontane side in the Vatican Council. His numerous dogmatic works are characteristic of orthodox modern Roman theology. They include Praelec- liones theologicae (9 vols., Rome, 1835 sqq.), Praelectiones theologicae in compendium redactae (4 vols., Rome, 1845),

II Hermesianismo (Rome, 1838), // Proteslantismo e la regola di fede (3 vols., 1853), De divinitate D. N. Jesu Christi (3 vols., Turin, 1870).

He died on the 26th of August 1876.:

PERROT, SIR JOHN (c. 1527-1592), lord deputy of Ireland, was the son of Mary Berkley, who afterwards married Thomas Perrot, a Pembrokeshire gentleman. He was generally reputed to be a son of Henry VIII., and was attached to the household of William Paulet, 1st marquess of Winchester. He was in this way brought to the notice of Henry VIII., who died, however, before fulfilling his promises of advancement, but Perrot was knighted at the coronation of Edward VI. During Mary's reign he suffered a short imprisonment on the charge of harbour- ing his uncle, Robert Perrot, and other heretics. In spite of his Protestantism he received the castle and lordship of Carew in Pembrokeshire, and at the beginning of Elizabeth's reign he was entrusted with the naval defence of South Wales. In 1570 Perrot reluctantly accepted the newly created post of lord president of Munster. He landed at Waterford in February of the next year, and energetically set about the reduction of the province. In the course of two years he hunted down James Fitzmaurice Fitzgerald, whose submission he received in 1572. Perrot resented the reinstatement of Gerald Fitzgerald, 15th earl of Desmond, and after vainly seeking his own recall left Ireland without leave in July 1573, and presenting himself at court was allowed to resign his office, in which he was succeeded by Sir William Drury. He returned to his Welsh home, where he was fully occupied with his duties as vice-admiral of the Welsh seas and a member of the council of the marches. Al- though in 1578 he was accused by the deputy-admiral, Richard Vaughan, of tyranny, subversion of justice and of dealings with the pirates, he evidently retained the royal confidence, for he was made commissioner for piracy in Pembrokeshire in 1578, and in the next year was put in command of a squadron charged to intercept Spanish ships on the Irish coast.

The recall of Arthur Grey, Lord Grey de Wilton, in 1582, left vacant the office of lord deputy of Ireland, and Perrot was appointed to it early in 1584. Sir John Norris became lord president of Munster and Sir Richard Bingham went to Con- naught. Perrot's chief instructions concerned the plantation of Munster, where the confiscated estates, some 600,000 acres in extent, of the earl of Desmond were to be given to English landlords at a nominal rent, provided that they brought with them English farmers and labourers. Before he had had time to embark on this enterprise he heard that the Highland clans

of Maclean and MacDonnell were raiding Ulster at the invitation of Sorley Boy MacDonnell, the Scoto-Irish constable of Dunluce Castle. He marched into Ulster, but Sorley Boy escaped him, and crossed to

Scotland, only to return later with reinforcements. The lord deputy was roundly abused by Elizabeth for under- taking ” a rash, unadvised journey,” but Sorley Boy was reduced to submission in 1586. In 1585 Perrot succeeded in completing the ” composition of Connaught,” a scheme for a contract between Elizabeth and the landholders of the province by which the queen should receive a small quitrent. During his career as lord deputy he had established peace, and had deserved well of Elizabeth. But a rash and violent temper, coupled with unsparing criticism, not to say abuse, of his associates, had made him numerous enemies. A hastily con- ceived plan for the conversion of the revenues of St Patrick’s Cathedral, Dublin, to provide funds for the erection of two colleges, led to a violent quarrel with Adam Loftus, archbishop of Armagh. Perrot had interfered in Bingham’s government of Connaught, and in May 1587 he actually struck Sir Nicholas Bagenal, the knight marshal, in the council chamber. Elizabeth decided to supersede him in January 1588, but it was only six months later that his successor, Sir William Fitzwilliam, arrived in Dublin. After his return to England his enemies continued to work for his ruin, and a forged letter purporting to be from him to Philip II. of Spain gave colour to an accusation of treasonable correspondence with the queen’s enemies, but when he was tried before a special commission in 1592 the charge of high treason was chiefly based on his alleged contemptuous remarks about Elizabeth. He was found guilty, but died in the Tower in September 1592. Elizabeth was said to have intended his pardon.

A life of Sir John Perrot from a MS. dating from the end of Elizabeth’s reign was printed in 1728. Sir James Perrot (1571- 1637), writer and politician, was his illegitimate son.

PERRY, MATTHEW CALBRAITH (1794-1858), American naval officer, was born in South Kingston, Rhode Island, on the 10th of April 1794. He became a midshipman in 1809, and served successively in the schooner ” Revenge ” (then com- manded by his brother, Oliver H. Perry) and the frigate ” President.” In 1813 he became a lieutenant, and during the War of 18 1 2 served in the frigate ” United States ” (which, when abandoned by Perry, was blockaded in the harbour of New London, Connecticut), the ” President ” and the ” Chippewa.” Soon after the war Perry was assigned to the Brooklyn (New York) navy yard, where he served till 18 19. He became a commander in 1826, and during 1826-1830 was in the recruiting service at Boston, where he took a leading part in organizing the first naval apprentice system of the United States navy. He was promoted in 1837 to the rank of captain (then the highest actual rank in the United States navy), and in 1838-1840 commanded the ” Fulton II.,” the first

American steam war vessel. He also planned the ” Missouri ” and the ” Mississippi,” the first steam frigates of the United States navy, and was in command of the Brooklyn navy yard from June 1841 until March 1843, when he assumed command of a squadron sent to the African coast by the United States, under the Webster-Ashburton treaty, to aid in suppressing the slave trade. This command of a squadron entitled him to the honorary rank of commodore. On the 23rd of October 1846, during the Mexican War, Perry, in command of the steam vessels ” Vixen ” and ” McLane,” and four schooners, attacked and captured Frontera, at the mouth of the Tobasco river, then pushed on up the river and (on the 24th) captured the town of Tobasco, thereby cutting off Mexico from Yucatan. He relieved Commodore David Conner at Vera Cruz on the 21st of March 1847, and after a two days’ bombardment by a battery landed from the ships the city wall was breached sufficiently to admit the entrance of troops.

Commodore Perry’s distinctive achievement, however, was his negotiation in 1854 of the treaty between the United States and Japan, which opened Japan to the influences of western civilization. Perry sailed from Norfolk, Virginia, on the 24th of November 1852, in the “Mississippi.” He reached Hong-Kong

on the 7th of April and on the 8th of July dropped anchor off the city of Uraga, on the western shore of the Bay of Yedo with the ” Susquehanna,” his flagship, the ” Mississippi,” and the sloops-of-war ” Saratoga ” and ” Plymouth.” On the 14th of July, accompanied by his officers and escorted by a body of armed marines and sailors (in all about 300 men), he went ashore and presented to commissioners especially appointed by the shogun to receive them, President Fillmore’s letters to the em- peror, and his own credentials. A few days later the American fleet sailed for Hong-Kong with the understanding that Perry would return in the following spring to receive the emperor’s reply. On the nth of February, accordingly, he reappeared in the Bay of Yedo with his fleet — this time composed of the ” Susquehanna,” ” Powhatan ” and ” Mississippi,” and the sailing vessels ” Vandalia,”” Lexington “and “Southampton,” and despite the protests of the Japanese selected an anchorage about 1 2 m. farther up the bay, nearly opposite the present site of Yokohama, and within about 10 m. of Yedo (Tokyo). Here, on the 31st of March 1854, was concluded the first treaty (ratified at Simoda, on the 21st of February 1855, and proclaimed on the 22nd of June following) between the

United States and Japan. The more important articles of this treaty provided that the port of Simoda, in the principality of Idzu, and the port of Hakodate, in the principality of Matsmai, were constituted as ports for the reception of American ships, where they could buy such supplies as they needed; that Japanese vessels should assist American vessels driven ashore on the coasts of Japan, and that the crews of such vessels should be properly cared for at one of the two treaty ports; that shipwrecked and other American citizens in Japan should be as free as in other countries, within certain prescribed limits; that ships of the United States should be permitted to trade at the two treaty ports under temporary regulations prescribed by the Japanese, that American ships should use only the ports named, except under stress of weather, and that privileges granted to other nations thereafter must also be extended to the United States. Commodore Perry died in New York City on the 4th of March 1858.

A complete and readable account of this expedition, and its results, scientific as well as political, compiled from the journals and reports of Commodore Perry and his officers, was published by the United States government under the title, Narrative of the Expedition of an American Squadron to the China Seas and Japan (3 vols., Washington, 1856). The first volume of this work, con- taining Commodore Perry's narrative, was also published separately. A brief biography of Perry is included in Charles Morris's Heroes of the Navy in America (Philadelphia and London, 1907). See also William E. Griffis's Matthew Calbraith Perry, a Typical American Naval Officer (Boston, 1887).

PERRY, OLIVER HAZARD (1785-1819), American naval officer, was born at South Kingston, Rhode Island, on the 23rd of August 1785. He entered the navy as midshipman (1 799) with his father, Christopher Raymond Perry (1761-1818), a captain in the navy, and saw service against the Barbary pirates. At the beginning of the War of 181 2 he was in command of a flotilla at Newport, but was transferred (Feb. 1813) to the Lakes. He served with Commodore Chauncey, and then was sent from Lake Ontario to Lake Erie, where he took up the chief command at the end of March 1813. With the help of a strong detachment of officers and men from the Atlantic coast he equipped a squadron consisting of one brig, six fine schooners and one sloop. Other vessels were laid down at Presque Isle (now Erie), where he concentrated the Lake Erie fleet in July. When Captain Perry appeared off Amherst- burg, where Captain Robert Heriot Barclay (d. 1837), the British commander, was lying with his squadron, he had a very marked superiority. Captain Barclay, after a hot en- gagement — the Battle of Lake Erie — in which Captain Perry's flagship the "

Lawrence," a brig, was so severely shattered that he had to leave her, was completely defeated. Perry com- manded the " Java " in the Mediterranean expedition of 1815- 1816, and he died at Port of Spain in Trinidad on the 23rd of August 1819, of yellow fever contracted on the coast of Brazil.

See O. H. Lyman, Commodore 0. H. Perry and the War on the Lakes (New York, 1905).

PERRY, a city and the county-seat of Noble county, Okla- homa, U.S.A., 30 m. N. by E. of Guthrie. Pop. (1900), 335r (399 negroes); (1910) 3133. Perry is served by the Atchison, Topeka & Santa Fe railway and by the St Louis & San Francisco system. It is the commercial centre of a large agricultural and stock-raising region, which produces cotton and grain. Perry was settled in 1889.

PERRY (from Fr. poire", from poire, a pear), an alcoholic beverage, obtained by the fermentation of the juice of pears. The manufacture is in all essentials identical with that of Cider (q.v.).

PERRYVILLE, a town of Boyle county, Kentucky, U.S.A., about 10 m. W. of Danville. Pop. (1910), 407. Here on the 8th of October 1863 General Braxton Bragg, in command of the Confederate army of the Mississippi of about 16,000 men, with which he had invaded Kentucky, faced about in his slow retreat across the state and gave battle to the Union army of the Ohio of about 40,000 (of whom only about 22,000 were actually engaged) commanded by Major-General Don Carlos Buell. Bragg's order to attack was disregarded by Major-General Leonidas Polk, who preferred adopting the ' ' defensive-offensive ' ' rather than engage all of Buell's force. Bragg himself came on the field about 10 a.m. and repeated his orders for an attack, but it was 2 p.m. before there was an actual engagement. Then after much delay on Polk's part the Confederate army joined battle with McCook's corps. The Confederate lines were broken and driven back through Perryville, where caissons, ammunition wagons and 140 officers and men were captured. Darkness had now come on, and in the night Bragg withdrew. His losses were reported as 510 killed, 2635 wounded and 251 missing. The Union loss was 845 killed, 2851 wounded and 515 captured or missing. The battle was drawn tactically, but strategically it was a Union victory and it virtually closed Bragg's unsuc- cessful Kentucky campaign, which is sometimes called the Perryville campaign.

PERSEPOLIS, an ancient city oi Persia, situated some 40 m. N.E. of Shiraz, not far from where the small river Pulwar flows into the Kur

(Kyrus). The site is marked by a large terrace with its east side leaning on Kuhi Rahmet (" the Mount of Grace "). The other three sides are formed by a retaining wall, varying in height with the slope of the ground from 14 to 41 ft' on the west side a magnificent double stair, of very easy steps, leads to the top. On this terrace are the ruins of a number of colossal buildings, all constructed of dark-grey marble from the adjacent mountain. The stones were laid without mortar, and many of them are still in situ. Especially striking are the huge pillars, of which a number still stand erect. Several of the buildings were never finished. F. Stolze has shown that in some cases even the mason's rubbish has not been removed. 1 These ruins, for which the name Kizil minare or Chihil menare (" the forty columns or minarets "), can be traced back to the 13th century, are now known as Takhti Jamshid (" the throne of Jamshid "). That they represent the Persepolis captured and partly destroyed by Alexander the Great has been beyond dispute at least since the time of Pietro della Valle. 2

Behind Takhti Jamshid are three sepulchres hewn out of the rock in the hillside, the fac. ades, one of which is incomplete, being richly ornamented with reliefs. About 8 m. N.N.E., on the opposite side of the Pulwar, rises a perpendicular wall of rock, in which four similar tombs are cut, at a considerable height from the bottom of the valley. The modern Persians call this place Nakshi Rustam (" the picture of Rustam ") from the Sassanian reliefs beneath the opening, which they take to be a representation of the mythical hero Rustam. That the

1 Cf. J. Chardin, E. Kaempfer, C. Niebuhr and W. Ouseley. Niebuhr's drawings, though good, are, for the purposes of the archi- tectural student, inferior to the great work of C. Texier, and still more to that of E. Flandin and P. Coste. Good sketches, chiefly after Flandin, are given by C. Kossowicz, Inscriptiones palaeo- persicae (St Petersburg, 1872). In addition to these we have the photographic plates in F. Stolze's Persepolis (2 vols., Berlin,

1882).

2 Letter a XV. (ed. Brighton, 1843), ii. 246 seq.

occupants of these seven tombs were kings might be inferred from the sculptures, and one of those at Nakshi Rustam is expressly declared in its inscription to be the tomb of Darius Hystaspis, concerning whom

Ctesias relates that his grave was in the face of a rock, and could only be reached by means of an apparatus of ropes. Ctesias mentions further, with regard to a number of Persians kings, either that their remains were brought ” to the Persians,” or that they died there. 1 Now we know that Cyrus was buried at Pasargadae (q.v.) and if there is any truth in the statement that the body of Cambyses was brought home ” to the Persians ” his burying-place must be sought somewhere beside that of his father. In order to identify the graves of Persepolis we must bear in mind that Ctesias assumes that it was the custom for a king to prepare his own tomb during his lifetime. Hence the kings buried at Nakshi Rustam are probably, besides Darius, Xerxes I., Artaxerxes I. and Darius II. Xerxes II., who reigned for a very short time, could scarcely have obtained so splendid a monument, and still less could the usurper Sogdianus (Secy- dianus). The two completed graves behind Takhti Jamshid would then belong to Artaxerxes II. and Artaxerxes III. The unfinished one is perhaps that of Arses, who reigned at the longest two years, or, if not his, then that of Darius III. (Codomannus), who is one of those whose bodies are said to have been brought ” to the Persians ” 2 (see Architecture, fig. 12). Another small group of ruins in the same style is found at the village of Hajjlabad, on the Pulwar, a good hour’s walk above Takhti Jamshid. These formed a single building, which was still intact 900 years ago, and was used as the mosque of the then existing city of Istakhr.

Since Cyrus was buried in Pasargadae, which moreover is mentioned in Ctesias as his own city, 3 and since, to judge from the inscriptions, the buildings of Persepolis commenced with Darius I., it was probably under this king, with whom the sceptre passed to a new branch of the royal house, that Persepolis became the capital 4 (see Persia: Ancient History, V. 2) of Persia proper. As a residence, however, for the rulers of the empire, a remote place in a difficult alpine region was far from con- venient, and the real capitals were Susa, Babylon and Ecbatana. This accounts for the fact that the Greeks were not acquainted with the city until it was taken and plundered by Alexander the Great. Ctesias must certainly have known of it, and it is possible that he may have named it simply Ilepcrai, after the people, as is undoubtedly done by certain writers of a somewhat later date. 5 But whether the city really bore the name of the people and the country is another question. And it is extremely hazardous to assume, with Sir H. Rawlinson and J. Oppert, that the words ana Pdrsd, ” in this Persia,” which occur in an inscrip- tion on the gateway built by Xerxes (D. 1. 14), signify ” in this city of Parsa,” and consequently prove that the name of the city is identical with the name of the country. The form Persepolis (with a play on irepcris, destruction) appears first in

Cleitarchus, one of the earliest, but unfortunately one of the most imaginative annalists of the exploits of Alexander.

It has been universally admitted that ” the palaces ” or “the palace ” (to. (3acrtXeia) burned down by Alexander are those now in ruins at Takhti Jamshid. From Stolze’s investigations it appears that at least one of these, the castle built by Xerxes, bears evident traces of having been destroyed by fire. The locality described by Diodorus after Cleitarchus corresponds in important particulars with Takhti Jamshid, for example, in being supported by the

1 This statement is not made in Ctesias (or rather in the extracts of Photius) about Darius II., which is probably accidental; in the case of Sogdianus, who as a usurper was not deemed worthy of honourable burial, there is a good reason for the omission.

2 Arrian, iii. 22, 1.

- Cf. also in particular Plutarch, Artax. iii., where Pasargadae is distinctly looked on as the sacred cradle of the dynasty.

4 The story of Aelian (H. A. i. 59), who makes Cyrus build his royal palace in Persepolis, deserves no attention.

‘So Arrian (iii. 18, 1, 10), or rather his best authority, King Ptolemy. So, again, the Babylonian Berossus, shortly after Alexander. See Clemens Alex., Admon. ad gentfs, c. 5, where, with Georg Hoffmann (Pers. Martyrer, 137), nal is to be inserted before LUpcraxs, and this to be understood 3-s the name of the metropolis.

mountain on the east. 6 There is, however, one formidable difficulty. Diodorus says that the rock at the back of the palace containing the royal sepulchres is so steep that the bodies could be raised to their last resting-place only by mechanical appliances. This is not true of the graves’ behind Takhti Jamshid, to which, as F. Stolze expressly observes, one can easily ride up; on the other hand, it is strictly true of the graves at Nakshi Rustam. Stolze accordingly started the theory that the royal castle of Persepolis stood close by Nakshi Rustam, and has sunk in course of time to shapeless heaps of earth, under which the remains may be concealed. The vast ruins, however, of Takhti Jamshid, and the terrace constructed with so much labour, can hardly be anything else than the ruins of palaces; as for temples, the Persians had no such thing, at least in the time of Darius and Xerxes. Moreover, Persian tradition at a very remote period knew of only three architectural wonders in that region, which it attributed to the

fabulous queen Humai (Khumai) — the grave of Cyrus at Murgab, the building at Hajjlabad, and those on the great terrace. 7 It is safest therefore to identify these last with the royal palaces destroyed by Alexander. Cleitarchus, who can scarcely have visited the place himself, with his usual recklessness of statement, confounded the tombs behind the palaces with those of Nakshi Rustam; indeed he appears to imagine that all the royal sepulchres were at the same place. In 316 B.C. Persepolis was still the capital of Persis as a province of the great Macedonian Empire (see Diod. xix, 21 seq., 46 ; probably after Hieronymus of Cardia, who was living about 316). The city must have gradually declined in the course of time; but the ruins of the Achaemenidae remained as a witness to its ancient glory. It is probable that the principal town of the country, or at least of the district, was always in this neighbour- hood. About a.d. 200 we find there the city Istakhr (properly Stakhr) as the seat of the local governors. There the foundations of the second great Persian Empire were laid, and Istakhr acquired special importance as the centre of priestly wisdom and orthodoxy. The Sassanian kings have covered the face of the rocks in this neighbourhood, and in part even the Achaemenian ruins, with their sculptures and inscriptions, and must themselves have built largely here, although never on the same scale of magnificence as their ancient predecessors. The Romans knew as little about Istakhr as the Greeks had done about Persepolis — and this in spite of the fact that for four hundred years the Sassanians maintained relations, friendly or hostile, with the empire.

At the time of the Arabian conquest Istakhr offered a desperate resistance, but the city was still a place of considerable impor- tance in the 1st century of Islam (see Caliphate), although its greatness was speedily eclipsed by the new metropolis Shiraz. In the 10th century Istakhr had become an utterly insignificant place, as may be seen from the descriptions of Istakhr, a native (c. 950), and of Mukaddasi (c. 985). During the following cen- turies Istakhr gradually declines, until, as a city, it ceased to exist. This fruitful region, however, was covered with villages till the frightful devastations of the 18th century; and even now it is, comparatively speaking, well cultivated. The ” castle of Istakhr ” played a conspicuous part several times during the Mahommedan period as a strong fortress. It was the middle- most and the highest of the three steep crags which rise from the valley of the Kur, at some distance to the west or north-west of Nakshi Rustam. We learn from Oriental writers that one of the Buyid (Buwaihid) sultans in the 10th century of the Flight constructed the great cisterns, which may yet be seen, and have been visited, amongst others, by James Morier and E. Flandin. W. Ouseley points out that this castle was still

used in the 16th century, at least as a state prison. But when Pietro della Valle was there in 162 1 it was already in ruins.

3 The name of this mountain too, jScunXt/cA* opoj, is identical with Shdhkuh, which is at least tolerably well established by W. Ouseley (ii. 417) as a synonym of Kuhi rahmet.

7 See especially Hamza Isp., 38 ;Tabari, i. 690, 816 (cf. T. Noldeke, Geschichte der Perser . . . aus . . . Tabari, p. 8). The ruins at Takhti Jamshid are alluded to as the work of Humai, in connexion with an event which occurred shortly after A.D. 200.

Bibliography. — E. Flandin and P. Coste, Voyage en Perse (1843-1847); F. Stolze, Die Achaemenidischen und Sassanidischen Denkmalcr und Inschriften von Persepolis, &c. (1882); G. Perrot and C. Chipiez, Histoire de I'art dans l'antiquite,v. (1890). See also Darius; Persia: Ancient History; and Caliphate.

(Th. N.;A. H.S.)

PERSEUS, in Greek legend, son of Danae and Zeus. When Perseus was grown to manhood Polydectes, king of Seriphus, cast his eye on Danae; and, in order to rid himself of the son, exacted of him a promise that he would bring him the head of the Gorgon Medusa. The Gorgons dwelt with their sisters the Graeae (the grey women) by the great ocean, far away in the west. Guided by Hermes and Athena, Perseus came to the Graeae. They were three hags, with but one eye and one tooth between them. Perseus stole the eye and the tooth, and would not restore them till the Graeae had guided him to the Nymphs, from whom he received the winged sandals, a wallet (/ci(3i

The legend of Perseus was localized in various places. Italy claimed that the chest containing Danae and Perseus drifted ashore on the Italian coast (Virgil, Aen. vii. 372, 410). The Persian kings were said to have been descended from Perses a son of Perseus, and, according to Pausanias of Damascus, 1 he taught the Persians to worship fire, and founded the Magian priesthood. His cult was transferred to the kings of Pontus, for on coins of Amisus he is represented with the features of Mithradates Eupator. Like Andromeda, Hesione, the daughter of Laomedon, king of Troy, was rescued by Heracles from a sea- monster, and both stories have been interpreted of the sun slaying the darkness, Andromeda and Hesione being the moon, which the darkness is about to devour. In one version of the story of Hesione, Heracles is said to have spent three days, like Jonah, in the belly of

the beast, and it is noteworthy that the Greek representations of Andromeda's monster were the models for Jonah's fish in early Christian art. Its bones and Andro- meda's chains were shown on a rock at Joppa. Perseus appears on coins of Pontus and Cappadocia, and of Tarsus in Cilicia, which he was said to have founded. The legend of St George was influenced by the traditions current regarding Perseus in Syria and Asia Minor.

For the slaying of the Medusa, see F. H. Knatz, Quomodo Persei fabulam artifices graeci et romani tractaverint (1893) ; and, on the whole story, E. S. Hartland, The Legend of Perseus (1894-1896).

PERSEUS, in astronomy, a constellation of the northern hemisphere, called after the Greek legendary hero, it is mentioned by Eudoxus (4th century B.C.) and Aratus (3rd century B.C.);

1 Author of a history of Antioch ; he is quoted by John Malalas, Chronographia, pp. 37-38, ed. Bonn (1831). Nothing further is known of him (see C. W. Miiller, Fragmenta historicorum graecorum, W. 467).

Ptolemy and Tycho Brahe catalogued 29 stars, Hevelius 46. The most important member of this constellation is /3 Persei or Algol {q.v.), a famous variable star. 6 Persei is a triple star, composed of one 4th magnitude star and two of the 10th magni- tude; p Persei is an irregular variable, with a range in magnitude of 3-4 to 4-1. Nova Persei is a " new " star discovered in 1887 and subsequently recognized on Harvard plates by Mrs Fleming in 1895; another new star was discovered by Anderson on the 21st of February 1901, which, after increasing in magnitude, gradually became fainter and ultimately disappeared. There is a nebula surrounding Nova Persei (1901) which was photo- graphed at Yerkes observatory in September 1901; a pair of star clusters, appearing as a bright patch in the Milky Way; and the meteoric swarm named the Perseids, which appear in August and have their radiant in Perseus. (See Meteor.)

PERSEUS OF MACEDONIA (b. c. 212 B.C.), the last king of Macedonia, eldest son of Philip V. He had his brother Demetrius killed, and thus cleared his way to the throne in 179. War broke out with Rome in 171 B.C. when P. Licinius Crassus was sent to attack him. Perseus defeated Crassus at Callinicus in Thessaly, but in 168 he was annihilated at Pydna by L. Aemilius Paulus. He was led in triumph through Rome, and died in captivity at Alba Fucens. (See Macedonia,)

PERSHORE, a market town in the Evesham parliamentary division of Worcestershire, England, 113 m. W.N.W.of London and 7 S.E. of Worcester by the Great Western railway. Pop. (1901), 3348. The station is i\ m. from the town. Market gardening and fruit-growing (especially plums) are carried on and agricultural implements are manufactured. The churches of the two parishes of Holy Cross and St Andrew face one another across a road. Holy Cross is a remnant of a mitred abbey of Benedictines, said to have been founded about 970 by King Edgar, on the site of a Mercian religious settlement. There remain only the fine Early English choir, with Decorated addi- tions, the Norman south transept and the majestic Decorated, tower; while slight fragments of a Norman nave are seen.

PERSIA, a kingdom of western Asia, bounded on the N. by the Caspian Sea and the Russian Transcaucasian and Trans- caspian territories, on the E. by Afghanistan and Baluchistan, on the S. by the Arabian Sea and the Persian Gulf, and on the W. by Turkish territory. Long before the Christian era the satrapies of Darius comprehended roughly an immense range of territory, from the Mediterranean to the Indus and from the Caucasian chain and Jaxartes to the Persian Gulf and Arabian Ocean. In the 17th and 18th centuries a.d. the conquests of ‘Abbas and Nadir kept up these boundaries more or less on the east, but failed to secure them on the west, and were limited to the Caucasus and Oxus on the north. Persia of the present day is not only, in the matter of geographical definition, far from the vast empire of Sacred Writ and remote history, but it is not even the less extensive dominion of the Safawi kings and Nadir Shah. It may be said, however, to comprise now quite as much settled and consolidated territory as at any period of its political existence of which we can speak with authority.

Boundaries. — The region of Ararat presents a good starting point for the definition of the western and northern frontiers of Persia. A line 20 m. in length from a point on the river Aras, in 39 45′ N. and 44 40′ E. to Frontier. Mt Ararat, in the south-westerly direction, divides Persia from Russia. Southwards from Mt Ararat the Perso- Turkish frontier extends about 700 m. to the mouth of the Shatt el Arab in the Persian Gulf in 30° N. and 48 40′ E., but is undefined with the exception of the western boundary of the little district of Kotur. A mixed commission was appointed in 1843 for the settlement of the Perso-Turkish frontier. The labours of this commission resulted in the Erzerum treaty of 1847, by which both powers abandoned some lands and agreed to appoint commissioners to define the frontier. The com- missioners met in 1849, 1850 and 1851 at Bagdad and Muhamrah without arriving at any result. In 1851 Lord Palmerston proposed that the general line of frontier should be traced by the agents of Turkey

and Persia at Constantinople, assisted by the

commissioners, in conformity with the treaty of Erzerum, leaving doubtful localities to be settled in future. The Russian government agreed to this proposal, and the work of surveying the country from Mt Ararat to the Persian Gulf was then undertaken. When this was done the preparation of a map, embracing territory 700 m. in length by 20 to 40 m. broad, was

unsettled, and disputes have frequently arisen between the Turkish and Persian governments with regard to their respective claims to land (Hertslet, Persian Treaties). In the autumn of 1907 Turkish troops occupied not only “doubtful localities” but also adjoining lands which were indisputably Persian territory. The want of a determined line of demarcation

put in hand, and this work lasted from November 1857 till March 1865, when the Porte was informed in May of that year that ” in the opinion of the mediating Powers, the future line of boundary between the respective dominions of the sultan and the shah was to be found within the limits traced on the map; that the two Mahommedan governments should themselves mark out the line; and that in the event of any differences arising between them in regard to any particular locality, the points in dispute should be referred to the decision of the govern- ments of England and Russia.” This boundary has remained

between the two countries may have political advantages, but is inconvenient to the geographer and most unfavourable to the cause of order and good government.

From the point on the Aras River 20 m. north-east of Mt Ararat, the river forms the northern boundary down to 48° E. The frontier line then runs about 35 m. in a south- easterly direction through the Moghan steppe to plogtier. Pilsowar on the Bulgharu River and then south with a bend to the west to the Astara River and the port of Astara in 38° 27′ N. and 48° 53′ E. From Astara eastwards the boundary

is formed by the shore of the Caspian until it touches the Bay of Hassan Kul north of As arabad. East of the Caspian Sea and beginning at Has an Kuli Bay the river Atrek serves as the frontier as far as Chat. It then extends east and south-east to Serrakhs on the Tejen River in 36 40′ N. and 6i° 20′ E. The distance from Mt Ararat to Serrakhs in a straight line is about 930 m. The frontier from Mt Ararat to Astara was defined by the treaty of Turkmanchai (Feb. 22, 1828), and a convention of the 8th of July 1893. The frontier east of the Caspian was defined by the Akhal-Khorasan Boundary Conven- tion of the 21st of December 1881 and the frontier convention of the 8th of July 1893.

The eastern frontier extends from Serrakhs to near Gwetter on the Arabian Sea in 25 N. and 6i° 30′ E., a distance of about

800 m. From Serrakhs to near Kuhsan the boundary Frontier. ‘ s formed by the Tejen River (called Hari Rud, or

river of Herat, in its upper course); it then runs almost due south to the border of Seistan in 31 N., and then through Seistan follows the line fixed by Sir Frederick Gold- smid’s and Sir Henry McMahon’s commissions in 1872 and 1903-1905 to Kuh i Malik Siah. From this point to the sea the frontier separates Persian territory from British Baluchistan and runs south-east to Kuhak and then south-west to Gwetter. This last section was determined by Sir Frederick Goldsmid’s commission in 187 1.

The southern boundary is the coast line of the Arabian Sea and the Persian Gulf from Gwetter to the mouth of the Shatt

el Arab, a distance of about 870 m., comprised Frontier, between 48° 40′ E. and 6i° 30′ E. The islands situated

close to the northern shore of the Persian Gulf are Persian territory; they are, from east to west, Hormuz (Ormus), Larak, Kishm, Hengam, Furur, Kish (Kais), Hindarabi, Shaikh-Shu’aib, Jebrin, Kharak, Kharaku (Khorgu).

Physical Geography. — Modern Persia occupies the western and larger half of the great Iranian plateau which, rising to a height of from 4000 to 8000 ft. between the valleys of the Indus and Tigris, covers more than a million square miles. Taking the Kuren Dagh or Kopet Dagh to form the northern scarp of this plateau east of the Caspian, we find a

prolongation of it in the highlands north of the political frontier on the Aras, and even in the Caucasus itself. On the north-west Persia is united by the highlands of Armenia to the mountains of Asia Minor; on the north-west the Paropamisus and Hindu Kush connect it with the Himalayas. The lines of boundary on the western and eastern faces are to be traced amid high ranges of mountains broken here and there by deserts and valleys. These ranges lie for the most part north-east and south- east, as do those in the interior, with a marked exception between Teheran and Bujnurd, and in Baluchistan, where they lie rather north-east and south-west, or, in the latter case, sometimes east and west. The real lowlands are the tracts near the sea-coast belonging to the forest-clad provinces of the Caspian in the north and the shores of the Persian Gulf below Basra and elsewhere. The Persians have no special names for the great ranges. Mountains and valleys are known only by local names which frequently cover but a few miles. Even the name Elburz, which European geo- graphers apply to the chains and ranges that extend for a length of over 500 m. from Azerbaijan in the west to Khorasan in the east, stands with the Persians only for the 60 or 70 m. of mountains north and north-east of Teheran, including the cone of Demavend. The great central range, which extends, almost unbroken, for nearly 800 m. from Azerbaijan in the north-west to Baluchistan in the south-east, may aptly be called the Central Range. It has many peaks 9000 to 10,000 ft. in height, and some of its summits rise to an elevation of 11,000 ft. and near Kerman of nearly 13,000 ft. (Kuh-i-Jupar). The valleys and plains west of the Central Range, as for instance those of Mahallat, Joshekan, Isfahan, Sirjan, have an elevation of 5000 to 6500 ft.; those within the range, as Jasp, Ardahal, So, Pariz, are about 1000 ft. higher; arid those east of it slope from an elevation of 5000 to 6000 ft. down to the depressions of the central plateau which, east of Kum, are not more than 2600 ft. and east of Kerman 1500 to 1700 ft. above the sea-level. Some of the ranges west of the Central Range, which form the highlands of Kurdistan, Luristan, Bakhtiari and Fars, and are parallel to it, end near the Persian Gulf ; others follow the Central Range, and take a direction to the east at some point between Kerman and the sea on the western frontier of Baluchistan. Some of these western ranges rise to considerable elevations; those forming the Turko- Persian frontier west of the lake of Urmia have peaks 11,000 ft. in height, while the Sahand, east of the lake and south of Tabriz, has an elevation of 12,000 ft. Farther south, the Takht-i-Bilkis, in the Afshar district, rises to 11,200 ft., the Elvend (ancient

Orontes), near Hamadan, to 11,600. The Shuturun Kuh, south of Burujird, is over 11,000 ft. in height, the Shahan Kuh, Kuh-i- Gerra,

Zardeh Kuh and Kuh-i-Karan (by some writers called Kuh-i-Rang), all in the Bakhtiari country west of Isfahan, are 12,800 to 13,000 ft. in height; and the Kuh-i-Dina (by some writers wrongly called Kuh-i-Dinar) has an elevation of over 14,000 ft. Still farther south, towards Kerman, there are several peaks (Bid- Khan, Lalehzar, Shah-Kuh, Jamal Bariz, &c.) which rise to an eleva- tion of 13,000 ft. or more, and the Kuh-i-Hazar, south of Kerman, is 14,700 ft. in height. Beginning near Ardebil in Azerbaijan, where the cone of Savelan rises to an elevation of 15,792 ft. (Russian trigonometrical survey), and ending in Khorasan, the great Elburz range presents on its southern, or inward, face a more or less abrupt scarp rising above immense gravel slopes, and reaches in some of its summits a height of nearly 13,000 ft. ; and the peak of Demavend, north-west of Teheran, has a height of at least 18,000 ft. There are several important ranges in Khorasan, and one of them, the Binalud, west of Meshed and north of Nishapur, has several peaks of 11,000 to 12,000 ft. in height. In south-eastern Persia the Kuh- i-Basman, a dormant volcano, 11,000 to 12,000 ft. in height, in the Basman district, and the Kuh-i-Taftan, i.e. the hot or burning mountain (also called Kuh-i-Nushadar from the ” sal ammoniac,” nushadar, found on its slopes), an active triple-peaked volcano in the Sarhad district and 12,681 ft. in height (Captain Jennings), are notable features.

Taking the area of Persia at 628,000 sq. m. the drainage may thus be distributed: (1) into the Arabian Sea and Persian Gulf, 135,000 sq. m.; (2) into the Caspian, 100,000; (3) into _. the Seistan depression, 43,000; (4) into the Urmia vera *

Lake, 20,000; (5) into the interior of Persia, 330,000. The first district comprises most of the south-western provinces and the whole of the coast region as far east as Gwetter; the second relates to the tracts west, south and east of the southern part of the Caspian Sea. The tracts south of the Caspian are not more than 20 to 50 m. wide; those on the west widen out to a depth of 250 m., meeting the watershed of the Tigris on the one side and that of the Euphrates and Lake Van on the other, and embracing between the two the basin of Lake Urmia. On the east the watershed of the Caspian gradually increases in breadth, the foot of the scarp extending considerably to the north of the south-eastern angle of that sea, three degrees east of which it turns to the south-east, parallel to the axis of the Kopet Dagh. The third drainage area comprises Persian Seistan with part of the Helmund (Hilmend) basin and a considerable tract adjoining it on the west. The fourth is a com- paratively small area on the western frontier containing the basin of Lake Urmia, shut off from the rest of the inland drainage, and the fifth area takes in a part of Baluchistan, most

of Kerman, a part of Fars, all Yezd, Isfahan, Kashan, Kum, Irak, Khamseh, Kazvin, Teheran, Samnan, Damghan, Shahrud, Khorasan and the central desert regions.

Four rivers belonging essentially to Persia, in reference to the Caspian watershed, are the Seafid Rud or Kizil Uzain on the south- west, the Herhaz on the south and the Gurgan and Atrek at the south-eastern corner of that inland sea. The Seafid Rud rises in Persian Kurdistan in about 35° 50′ N. and 46° 45′ E., a few miles from Senendij. It has a very tortuous course of nearly 500 m., for the distance from its source to the Caspian, 57 m. east of Resht, is only 210 m. in a straight line. The Kizil Uzain takes up some important affluents and is called Seafid Rud from the point where it breaks through the Elburz to the sea, a distance of 70 m. It drains 25,000 to 30,000 sq. m. of the country. The Herhaz, though not important in length of course or drainage, also, like the Seafid Rud, breaks through the Elburz range from the inner southern scarp to the north. It rises on the slopes of the Kasil Kuh, a peak 12,000 ft. in height within the Elburz, and about 25 m. north of Teheran, flows easterly through the Lar plateau, where it is known as the Lar River, and takes up several affluents; turns to the north- east at the foot of Demavend, leaving that mountain to the left, and flows due north past Amol to the Caspian. Its length is about 120 m. The Gurgan rises on the Armutlu plateau in Khorasan east of Astarabad, and enters the Caspian in 37 4′ N., north- west of Astarabad, after a course of about 200 m. The Atrek rises a few miles from Kuchan and enters the Caspian at the Bay of Hassan Kuli in 37 ° 21′ N., after a course of about 300 m. From the sea to the Russian frontier post of Chat the river forms the frontier between Persia and the Russian Transcaspian region.

The drainage of the rivers which have no outlet to the sea and form inland lakes and swamps (kavir) may be estimated at 350,000 sq. m., including the drainage of Lake Urmia; which is about 20,000 sq. m. Fourteen rivers flow into the lake: the Aji Chai, Safi Chai, Murdi Chai and Jaghatu from the east, the Tatau (Tatava) from the south, and nine smaller rivers from the west. During heavy rains and when the snows on the hills melt, thousands of streams flow from all directions into the innumerable depressions of inner Persia, or help to swell the perennial rivers which have no outlet to the sea. These latter are few in number, and some of them barely suffice for purposes of agricultural irrigation, and in summer dwindle down to small rills. The perennial streams which help to form the kavirs (salt swamps) east of Kum and Kashan are the Hableh-rud, rising east of Demavend, the Jajrud,

rising north of Teheran, the Kend and Kerej rivers, rising north- west of Teheran, the Shureh-rud (also called Abhar-rud), rising near Sultanieh on the road between Kazvin and Tabriz, and the Kara-su, which rises near Hamadan and is joined by the Zarin- rud (also known as Do-ab), the Reza Chai (also called Mazdakan- rud), the Jehrud River and the Kum-rud. The river of Isfahan, Zendeh-rud, i.e. ” the great river ” (from Persian zendeh [Pehlevi, zendek], great), but now generally known as Zayendeh-rud, i.e. ” the life-giving river,” flows into the Gavkhani or Gavkhaneh swamp, east of Isfahan. In Fars the Kur with its affluents forms the lake of Bakhtegan (also known as Lake of Niriz), and in its lower course, is generally called Bandamir (made famous by Thomas Moore) from the band (dam) constructed by the Amir (prince) Asad-ed-dowleh in the loth century. (” Note on the Kur River in Fars,” Proc. Royal Geog. Soc, London, 1891.) The rivers flowing into the Persian Gulf and Arabian Sea diminish in importance from west to east. There are first the Diyala and Kerkheh flowing into the Tigris from the hills of Kurdistan ; the Ab i Diz and Karun which unite below Shushter, and reach the Shatt el Arab at Muhamrah; and the Jarahi and Tab, which with the Karun form ” the delta of Persian Arabistan, the most extensive and fertile plain in Persia.” There are many streams which though fordable at most seasons (some of them are often quite dry) are unfordable during the rains. Two of these may be mentioned here, viz. the Mand and the Minab, which St John Qoc. cit. p. 9) considered as being ” of far more importance than the maps would lead the observer to suppose.” The former, after a run of over 300 m. from its sources in the hills west of Shiraz, debouches at Khor-i-Ziaret about 60 m. south of Bushire. It is mentioned by the old Arab and Persian geographers as the Sitakan (in some MSS. misspelt Sakkan), and is the Sitakos of Atrian and the Sitioganus of Pliny. In its upper course it is now known as the Kara-aghach (Wych-elm) River (cf. ” Notes on the River Mand in Southern Persia,” Royal Geog. Soc, London, December 1883). The Minab has two outlets into the Persian Gulf, one the Khor-i-Minab, a salt-water creek into which the river overflows during the rains, about 30 m. east of Bander Abbasi, the other the true Minab, at Khagun, some miles south of the creek. It rises in the hills about 100 m. north of Bander Abbasi, and has a considerable drainage. Its bed near the town of Minab (15 m. from the coast) is nearly a mile in width, and during the rains the water covers the whole bed, rendering it quite unfordable. During ordinary

weather, in March 1884, the water flowing past the town was 100 yds. in width and 2 ft. deep (Preece, Proc. Royal Geog. Soc, January 1885). In ordinary seasons very little water of the river runs into its original bed, being diverted into canals, &c. The creek, the Anamis of Nearchus, is navigable nearly all through the year as far as Shahbander, the custom-house, about 7 m. inland, for vessels of 20 tons burden.

" The great desert region of Persia," writes Le Strange {Lands of the Eastern Caliphate, 1905), " stretches right across the high _ . plateau of Irftn going from north-west to south-east,

5e " and dividing the fertile provinces of the land into two groups; for the desert is continuous from the southern base of the Elburz mountains, that to the north overlook the Caspian, to the arid ranges of Makran, which border the Persian Gulf. Thus it measures nearly 800 m. in length, but the breadth varies consider- ably; for in shape this immense area of drought is somewhat that of an hour-glass with a narrow neck, measuring only some IOO m. across, dividing Kerm&n from Seistan, while both north and south of this the breadth expands and in places reaches to over 200 m. At the present day the desert, as a whole, is known as the Lflt or Dasht-i-Lfit ; the saline swamps and the dry salt area being more particularly known as the Dasht-i-Kavir, the term Kavir being also occasionally applied to the desert as a whole."

A three-wire telegraph line on .iron posts, completed in March 1907, passes through this region, and it is the unenviable lot of some Englishmen stationed at Bam and Nusretabad Ispi (Isbidh of medieval Arab geographers) on the confines of the desert regu- larly to inspect and test it. Of the northerly Great Kavir Dr Tietze thought that it was composed of a complex of isolated salt swamps separated by sand-dunes, low ridges of limestone and gypsum, perhaps also by volcanic rocks (Jahrbuch k. k. geolog. Keichsanstalt, Vienna, 1877). Dr Sven Hedin explored the northern part of the Great Desert in 1906. t (A. H.-S.)

Geology. — Persia consists of a central region covered by Quaternary deposits and bordered on the north, west and south by a raised rim composed of older rocks. These older rocks also form the isolated ranges which rise through the Quaternary deposits of the central area.

In northern Persia the rocks of the elevated rim are thrown into folds which form a curve round the southern shore of the Caspian. The mountain ranges of Khorasan show the western portion of a second

curve of folding which is probably continued into the Hindu Kush. In the western rim of Persia the folds run from north-west to south-east, and in the south these foids appear to curve gradually eastward, following the trend of the coast. The folds in the central Persian chains run from north-west to south-east, parallel to those of the western border. It is seldom that the old crystalline rocks, which form the floor upon which the sedimentary strata were

deposited, are exposed to view. Gneiss, granite and crystalline schist, however, are found in the Elburz and in some of the central ranges; and similar rocks form a large part of the Zagros. Some of these rocks are probably Archean, but some appear to be meta- morphosed sedimentary deposits of later date. The oldest beds in which fossils have yet been found belong to the Upper Devonian. They are well developed in the Elburz range, where they attain a thickness of some 9000 to 10,000 ft., and they have been found also in some 01 the central ranges and in the Bakhtiari Mountains. In the Elburz range the Devonian is succeeded by a series of lime- stones with Productus. The greater part of the series belongs to the Carboniferous, but the upper beds are probably of Permian age. The limestones are followed by sandstones and shales with occasional seams of coal. The plants which have been found in these beds indicate a Rhaetic or Liassic age. The Middle and Upper Jurassic form a considerable portion of the Elburz and have yielded marine fossils belonging to several different horizons. The Cretaceous system is very widely spread in Persia. It is one of the most conspicuous formations in the Zagros and in the central ranges, and probably forms a large part of the plateau, beneath the Quaternary deposits. The most prominent member of the series is a massive limestone containing Hippurites and belonging to the upper division of the system. The Tertiary deposits include nummulitic limestone (Eocene) ; a series of limestones, sandstones and conglomerates, with marine Miocene fossils; and red marls, clays and sandstones with rock-salt and gypsum, believed to belong to the Upper Miocene. In the Elburz there is a considerable deposit of palagonite tuff which appears to be of Oligocene age. The nummulitic limestone takes part in the formation of the mountain chains. The Miocene deposits generally lie at the foot of the chains, or in the valleys; but occasionally they are found at higher levels. Pliocene deposits cover a considerable area near the coast. Both in the Elburz range and near the Baluchistan frontier there are numerous recent volcanoes. Some of these seem to be extinct, but several continue to emit vapours and gases. Demavend in the Elburz and Kuh-i-Taftan on the Balu- chistan frontier are among the best-known. (P. La.)

See W. K. Loftus, ” On the Geology of Portions of the Turko- Persian

Frontier, and of the Districts adjoining," Quart. Journ. Geol. Soc. vol. xi. pp. 247-344, pi. ix. (London, 1855) ; W. T. Blanford, Eastern Persia, vol. ii. (Zoology and Geology) (London, 1876) ; C. L. Griesbach, Field-notes: No. 5, to accompany a Geological Sketch Map of Afghanistan and North-Eastern Khorasan, Rec. Geol. Surv. India, xx. 93-103 (1887), with map; A. F. Stahl, " Zur Geologie von Persien," Peterm. Mitt., Erganzungsheft 122 (1897); J. de Morgan, Mission scientifique en Perse, vol. iii. (completed I905, Paris). A summary by H. Douville of the principal geological results of de Morgan's expedition will be found in Butt. soc. geol. France, 4th series, vol. iv. pp. 539"553-

Climate. — For the rainfall on the watershed of the Persian Gulf there are two places of observation, Bushire and Jask; at the first it is a little in excess of that of inner Persia, while at the second it is very much less. The rainfall on the Caspian watershed greatly exceeds that of inner Persia ; at Astarabad and Ashurada, in the south-eastern corner of the Caspian, it is about 50 % more ; and at Resht and Lenkoran, in the south-western corner, it is four and five times that of the adjoining districts across the ridges to the south. With the exception of the Caspian watershed and that of the Urmia basin, the country has probably in no part a yearly rainfall exceeding 13 or 14 in., and throughout the greater part of central and south-eastern Persia the yearly rainfall probably does not exceed 6 in. The following mean values of the rainfall at Teheran have been derived from observations taken by the writer during 1892-1907:—

Mean . –

Jan.

Feb.

Mar.

•April.

May.

-

June.

Total for Year.

9-86 in.

in.

1-76

in.

1-17

in. I-8 7

in.

1-41

in. •5°

in. •06

July.

Aug.

Sept.

Oct.

Nov.

Dec.

in. •05

in. •05

in. •06

in. •32

in. i-35

in.”

1-26

Good harvests depend on the rainfall from October to April, and on an amount of snow sufficient to cover the crops during frosts. During normal winters in Teheran and surrounding dis- tricts the rainfall amounts to 9 or 10 in., with 3 to 4 of snow, but in the winter

1898-1899 it was only 5§ in., with only 1 in. of snow; and in 1899-1900 the harvests were in consequence exceptionally bad, and large quantities of wheat and flour had to be brought from the provinces and even from Russia at high freights, causing the price of bread at Teheran to rise 200 %. The first table on p. 191 shows the mean annual rainfall in inches at fifteen stations in and near Persia.

The prevailing winds throughout Persia and the Persian Gulf are the north-west and south-east owing partly to the position of the Black Sea and Mediterranean and of the Arabian Sea, and partly

to the bearing of the axes of the great mountain chains. A dry and warm wind comes down from the snowy Elburz to Gilan in December and January, and much resembles the fohn of the Alps (Dr Tholozan, ” Sur les vents du Nord de la Perse et sur le foehn du Guilan,” Comptes renins, Acad. d. Sciences, March 1882).

of ions.

Station.

Lat. N.

Long. E.

Alti- tude.

11

Year.

Authority.

Feet.

Years.

Lenkoran

38° 46′

48° 5i’

5 -60

28J

46-82

Supan. 1

Resht . .

37° 17′

49° 35′

-50

2

56-45

British Consul. 2

Ashurada

36° 54′

53° 55′

-80

19

17-17

Supan. 1

Astarabad

36° 51′

54° 25′

-40

7

16-28

Symons. 3

Meshed .

36° 17′

59° 36′

3180

9

9-33

British Consul. 4

Quetta .

30° 11′

67° 3′

5500

19

10-09

Supan. 1

Kalat . . .

28° 53′

66° 28′

6500

•15

8-98

Maskat .

23° 29′

58° 33′

—

3

6-13

IT

Jask .

25° 39′

57° 46′

—

10

3-24

English Telegraph. 6

Bushire .

28 59′

5o° 49′

—

19

I3-36

Supan. 1

Isfahan .

32 37′

51° 40′

5370

7

5-44

English Telegraph. 6

Teheran

35° 4i’

51° 25′

45° 8ˆ

3810

15

9-86

The writer.

Urmia (Sair).

37° 28′

6225

1

21-51

Symons. 3

Bagdad .

33° 19′

44 26′

— ■

7

io-59

Supan. 1

Merv

37° 35′

6i°5o’

700

1

6-36

Symons. 3

Observations for temperature have been taken for many years at the stations of the Indo-European Telegraph and for a few years at the British consulate in Meshed, and the monthly and annual means shown in the following table have been derived from the indications of maximum and minimum thermometers in degrees Fahrenheit.

Frequently when the temperature in the shade at Bushire is not more than 85 or 90 , and the great humidity of the air causes much bodily discomfort, life is almost pleasant 12 or 20 m. inland with a temperature of over ioo°.

Fauna. — Mr W. T. Blanford has described with great care and minuteness the zoology of Persia. In company with Major St John, R.E., he made a large collection of the vertebrate fauna in a journey from Gwetter to Teheran in 1872. Having added to this a previous collection made by the same officer with the assist- ance of a native from Calcutta, he had before him the principal materials for his work. Before com- mencing his analysis he adverted to his prede- cessors in the same field, i.e. Gmelin (whose travels were published in 1774-1784), Olivier (1807), Pallas (1811), Menetries (1832), Belanger (1834), Eichwald (i834-i84i),AucherEloy (1851), Loftus, Count Key- serling, Kokschy, Chesney, the Hon. C. Murray, De Filippi (1865), Hume (1873), and Professor Strauch of St Petersburg. All of these had, more or less, contributed something to the knowledge of the subject, whether as writers or as collectors, or in both capacities, and to all the due meed of credit was assigned. Blanford divided Persia into five zoological provinces: (1) the Persian plateau, or from the Kopet Dagh southwards to nearly 28° N. lat., including all Khorasan to the Perso-Afghan border, its western limit being indicated by a long line to the north- west from near Shiraz, taking in the whole upper country to the Russian frontier and the Elburz ; (2) the provinces south and south-west of the Caspian; a narrow strip of wooded country south-west of the Zagros range, from the Diyala River in Turkey in Asia to Shiraz; (4) the Persian side of the Shatt-el-Arab, and Aralictan, east of the

Tigris; and (5) the shores of the Persian Gulf and Baluchistan. The fauna of the Persian plateau he described as ” Palaearctic, with a great prevalence of desert forms ; or, perhaps more correctly,

(3)

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Station.

Jan.

Feb.

Mar.

April.

May.

June.

July-

Aug.

Sept.

Oct.

Nov.

Dec.

Year.

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Meshed

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56-3

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Teheran

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38

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81

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81

73

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60-4

in

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Tabriz 6

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25

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54

6.3

74

79

81

73

62

48

34

54-1

99

-18

117

I Kasha n 7

35

36

43

60

74

83

90

«5

77

68

53

42

62-2

113

9

104

Isfahan

58-o

106

- 3

109

Abadeh 8

41

41

47

56

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75

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46

59-5

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Dehbid »

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Shiraz u

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Kazerun u

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73-2

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Borazjuan u

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Bushire

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75-4

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Very few hygrometrical observations have been taken, and only those of the British residency at Bushire are more or less trustworthy, and have been regularly registered for a number of years. In inner Persia the air is exceptionally dry, and in many districts polished steel may be exposed in the open during a great part of the year without becoming tarnished. Along the shores of the Caspian, particularly in Gilan and Mazandaran, and of the Persian Gulf from the mouth of the Shatt el Arab down to Bander Abbasi, the air during a great part of the year contains much moisture — dry- and wet-bulb thermometers at times indicating the same temperature — and at nights there are heavy falls of dew. In Gilan and Mazandaran the air contains much moisture up to con- siderable elevations and as far as 30 to 40 m. away from the sea; but along the Persian Gulf, where vegetation is very scanty, stations only a few miles away from the coast and not more than 20 or 30 ft. above the sea-level have a comparatively dry climate.

1 Dr A. Supan, ” Die Vertheilung des Niederschlag’s auf der festen Erdoberflache,” Pet. Mitt., Suppl. 124 (1898).

2 Consular report (Gilan, 1897).

3 Symons’s Monthly Meteorological Mag. (Dec. 1893).

- 1 899-1907.

6 Observations taken at the telegraph stations, and kindly communicated by Mr R. C. Barker, C.I.E., director of the Indo-European Telegraph Department in Persia. Those for Isfahan are during the years 1900-1907.

6 38° 5′ N. ; 46 18′ E. ; altitude 4423 ft.

‘34″ ., ;5i°2 7 ‘„ ;

3190

8 31 18′ „ 152° 38’,, ;

6200

9 30° 37′ .. ; 53° 10′ „ ;

, 8000

10 29° 37′ .. ; 52° 32′ „ ;

5000

11 29° 37′ .. .51° 43’.. ;

, 2800

“29″ 15′ „ -,5i° 3 ‘„ ;

, 100

as being of the desert type with Palaearctic species in the more fertile regions.” In the Caspian provinces he found the fauna, on the whole, Palaearctic also, ” most of the animals being identical with those of south-eastern Europe.” But some were essentially indigenous, and he observed ” a singular character given to the fauna by the presence of certain Eastern forms, unknown in other parts of Persia, such as the tiger, a remarkable deer of the Indo- Malayan group, allied to Cervus axis, and a pit viper (Halys).” Including the oak-forests of Shiraz with the wooded slopes of the Zagros, he found in his third division that, however little known was the tract, it appeared to contain, like the second, ” a Palaearctic fauna with a few peculiar species.” As to Persian Mesopotamia, he considered its fauna to belong to the same Palaearctic region as Syria, but could scarcely speak with confidence on its character- istic forms. The fifth and last division, Baluchistan and the shores of the Persian Gulf, presented, however, in the animals common to the Persian highland ” for the most part desert types,

whilst the characteristic Palaearctic species almost entirely disappear, their place being taken by Indian or Indo-African forms." The Persian Gulf Arab, though not equal to the pure Arabian, is a very service- able animal, and has always a value in the Indian market. Among others the wandering Turkish tribes in Fars have the credit of possessing good steeds. The Turkoman horse of Khorasan and the Atak is a large, bony and clumsy-looking quadruped, with marvel- lous power and endurance. Colonel C. E. Stewart stated that the Khorasan camel is celebrated for its size and strength, that it has very long hair, and bears cold and exposure far better than the ordinary Arabian or Persian camel, and that, while the ordinary Persian camel only carries a load of some 320 lb and an Indian camel one of some 400 lb, the Khorasan camel will carry from 600 to 700 lb. The best animals, he notes, are a cross between the Bactrian or two-humped and the Arabian or one-humped camel. Sheep, goats, dogs and cats are good of their kind; but not all the last are the beautiful creatures which, bearing the name of the

country, have arrived at such distinction in Europe. _ Nor are these to be obtained, as supposed, at Angora in Asia Minor. Van or Isfahan is a more likely habitat. The cat at the first place, called by the Turks " Van kedisi," has a certain local reputation. Among the wild animals are the lion, tiger, leopard, lynx, brown bear, hyena, hog, badger, porcupine, pole-cat, weasel, marten, wolf, jackal, fox, hare, wild ass, wild sheep, wild cat, mountain- goat, gazelle and deer. The tiger is peculiar to the Caspian pro- vinces. Lovett says they are plentiful in Astrabad; he measured two specimens, one 10 ft. 8 in., the other 8 ft. 10 in. from the tip of the nose to the end of the tail. Lynxes and bears were to be found in the same vicinity, and the wild pig was both numerous and destructive.

According to Blanford there are about four hundred known species of birds in Persia. The game birds have admirable repre- sentatives in the pheasant, " karkavul " (Phasianus colchicus, L.) ; snowcock or royal partridge, " kebk-i-dari " [Tetraogallus Caspius, Gmel.); black partridge, " durraj " (Francolinus vulgaris, Steph.); red-legged partridge, " kebk " (Caccabis chukar, Gray) ; sand- partridge or seesee, " tihu " (Ammoperdix bonhami, Gray) ; Indian grey partridge, " jirufti " {Ortygornis ponticerianus , Gmel.); quail, belderjin " (Coturnix

communis, Bonn.); sandgrouse, ” siyah- sineh ” (Pterocles arenarius, Pall.); bustard, ” hubareh ” {Otis tetrax, L. and O. McQueenii, Gray); woodcock, snipe, pigeon, many kinds of goose, duck, &c. The flamingo comes up from the south as far north as the neighbourhood of Teheran ; the stork abounds. Poultry is good and plentiful. A large kind of fowl known as ” Lari ” (from the province Lar, in southern Persia) is said to be a descendant of fowls brought to Persia by the Portu- guese in the 16th century.

The fish principally caught along the southern shore of the Caspian are the sturgeon, ” sagmahi,” dogfish (Acipenser ruthenus and A. huso); sheat-fish or silure, ” simm,” ” summ ” (Silurus glanis); salmon, ” azad mahi ” (Salmo salar); trout, ” maseh ” (Salmo trutla); carp, ” kupur ” (Cyprinus ballerus and C. carpio); Dream,” subulu ” (Abramis brama) ; pike-perch, ” mahi safid” (Perca lucioperca or Lucioperca sandra). There is also a herring which frequents only the southern half of the Caspian, not passing over the shallow part of the sea which extends from Baku eastwards. As it was first observed near the mouth of the river Kur it has been named Clupea Kurensis. Fish are scarce in inner Persia; salmon trout and mud-trout are plentiful in some of the mountain streams. Many underground canals are frequented by carp and roach. The silure has also been observed in some streams which flow into the Urmia lake, and in Kurdistan.

Flora. — In the provinces of Gilan, Mazandaran and Astarabad on the Caspian, from the shore to an altitude of about 3000 ft. on the northern slopes of the great mountain range which separates those provinces from the highlands of Persia, the flora is similar to that of Grisebach’s ” mediterranean region.” At higher altitudes many forms of a more northern flora appear. As we approach inner Persia the flora rapidly makes place to ” steppe vegetation ” in the plains, while the mediterranean flora predominates in the hills. The steppe vegetation extends in the south to the outer range of the hills which separate inner- Persia from the Persian Gulf and the Indian Ocean. Beyond this outer range and along the shore of the sea the flora is that of the ” Sahara region,” which extends eastwards to Sind.

Generally speaking, everywhere, excepting in the northern lowlands and in a few favoured spots in the hilly districts, the vege- tation is scanty. In inner Persia the hills and plains are bare of trees, and steppe and desert predominate. The date-palm thrives well as far north as Tabbas in latitude 33° 36′ and at an altitude of 2000 ft. and in the south extensive date-groves, producing ex- cellent fruit, exist at altitudes of 2000 to 5000 ft. The olive is cultivated at Rudbar south of Resht in Gilan, and a few isolated olive-trees have been observed in

central and southern Persia.

Of fruits the variety is great, and nearly all the fruits of Europe are well represented. The common, yet excellent melons, water- melons, grapes, apricots, cherries, plums, apples, are within the reach of the poorest. Less common and picked fruits are expensive, particularly so when cost of transport has to be considered; for instance, a good orange costs 2d. or 3d. in Teheran, while in Mazan- daran (only 100 m. distant), whence the oranges are brought, it costs Jd. Some fruits are famous and vie in excellence with any that European orchards produce; such are the peaches of Tabriz and Meshed, the sugar melons of Kashan and Isfahan, the apples of Demavend, pears of Natanz, figs of Kermanshah, &c. The strawberry was brought to Persia about 1859, and is much culti- vated in the gardens of Teheran and neighbourhood ; the raspberry was introduced at about the same time, but is not much appreci- ated. Currants and gooseberries are now also grown. The common vegetables also are plentiful and cheap, but only a few, such as the broad-bean, egg-plant (Solatium melongena), onion, carrot, beetroot, black turnip, are appreciated by the natives, who gener- ally do not take kindly to newly-introduced varieties. The potato, although successfully cultivated in Persia since about 1780, has not yet found favour, and the same may be said of the tomato, asparagus, celery arid others. Flowers are abundant, but it is only since the beginning of Nasr ed din Shah's reign (1848), when European

gardeners were employed in Persia, that they were rationally cultivated. Nearly all the European garden flowers, even the rarer ones, can now be seen not only in the parks and gardens of the rich and well-to-do but in many unpretentious courtyards with only a few square yards of surface.

Population. — In 1881 the present writer estimated the popula- tion of Persia at 7,653,600; 1,963,800 urban, 3,780,000 rural and 1,909,800 wandering (" Bevolkerung der Erde," p. 28; Ency. Brit. 9th ed. p. 628) ; and, allowing for an increase of about 1 % per annum the population for 1910 may be estimated at 10 millions. No statistics whatever being kept, nothing precise is known of the movement of the population. During the ninth decade of the 19th century many Persian subjects emigrated, and many Persian villages were deserted and fell to ruins ; since then a small immigration has set in and new villages have been founded. Persians say that the females exceed the males by 10 to 20%, but wherever the present writer has been able to obtain trustworthy information he found the excess to be less than 2%. Of 'the deaths in any place the only check obtainable is from the public

body-washers, but many corpses are buried without the aid of the public body- washers ; and the population of the place not being accurately known, the number of deaths, however correct, is useless for statistical purposes. Medical men have stated that the number of deaths, in times when there are no epidemics, amounts to 19 or 20 per thousand, and the number of births to 25 to 40 per thousand.

The prices of the staple articles of food and all necessaries of life have risen considerably since 1880, and, particularly in the large cities, are now very high. As salaries and wages have not increased at the same rate, many of the upper classes and officials are not so well off as formerly. By dismissing their servants in order to reduce expenditure, they have thrown great numbers of men out of employment, while many labourers and workmen are living very poorly and often suffer want. Tradesmen are less affected, because they can sell the articles which they manufacture at values which are more in proportion with the increased prices of food. In 1880 a labourer earning 25 krans, or £l sterling a month, could afford to keep a family; by 1908, in krans, he earned double what he did in 1880, but his wage, expressed in sterling, was the same, and wherever the prices of food have risen more than his wages he could not afford to keep a family. In many districts and cities the number of births is therefore reduced, while at the same time the mortality, in consequence of bad and often insufficient food, is considerably increased.

The description of the Persian character by C. J. Wills, in his In the Land of the Lion and Sun (1883), is still worth quoting: —

” The character of the Persian is that of an easy-going man with a wish to make things pleasant generally. He is hospitable, obliging, and specially well disposed to the foreigner. His home virtues are many: he is very kind and indulgent to his children and, as a son, his respect for both parents is excessive, developed in a greater degree to his father, in whose presence he will rarely sit, and whom he is in the habit of addressing and speaking of as ‘ master.’ The full stream of his love and reverence is reserved for his mother; he never leaves her to starve, and her wishes are laws to. him. The mother is always the most important member of the household, and the grandmother is treated with veneration. The

fjresence of the mother-in-law is coveted by their sons-in-law, who 00k on them as the guardians of the virtue of their wives. The paternal uncle is a much nearer tie than with us; while men look on their first cousins on the father’s side as their most natural wives.

” Black slaves and men-nurses or ‘ lallahs ‘ are much respected; the ‘ dayah ‘ or wet nurse is looked on as a second mother and usually provided for for life. Persians are very kind to their servants; a master will often be addressed by his servant as his father, and the servant will protect his master’s property as he would his own. A servant is invariably spoken to as ‘ bacha ‘ (child). The servants expect that their master will never allow them to be wronged. The slaves in Persia have a good time ; well fed, well clothed, treated as spoiled children, given the lightest work, and often given in marriage to a favourite son or taken as ‘ segah ‘ or concubine by the master himself, slaves have the cer- tainty of a well-cared-for old age. They are looked on as con- fidential servants, are entrusted with large sums of money, and the conduct of the most important affairs; and seldom abuse their trust. The greatest punishment to an untrustworthy slave is to give him his liberty and let him earn his living. They vary in colour and value : the ‘ Habashi ‘ or Abyssinian is the most valued ; the Suhali or Somali, next in blackness, is next in price; the Bom- bassi, or coal-black negro of the interior, being of much less price, and usually only used as a cook. The prices of slaves in Shiraz are, a good Habashi girl of twelve to fourteen £40, a good Somali

same age, half as much ; while a Bombassi is to be got for £14, being chosen merely for physical strength. They are never sold, save on importation, though at times they are given away. ... I have never seen a Persian unkind to his own horse or his slave, and when overtaken by poverty he will first sell his shirt, then his slave.

” In commercial morality, a Persian merchant will compare not unfavourably with the European generally. ... To the poor, Persians are unostentatiously generous; most of the rich have regular pensioners, old servants, or poor relations who live on their bounty ; and though there are no workhouses, there are in ordinary times no deaths from starvation; and charity, though not organized, is general. . . . Procrastination is the attribute of all Persians, ‘ to-morrow ‘ being ever the answer to any proposition, and the ‘ to-morrow ‘ means indefinite delay. A great dislike is shown generally to a written contract binding the parties to a fixed date; and, as a rule, on breaking it the Persian always appeals for and expects delay and indefinite days of grace. . . .

” Persians are clean in their persons, washing themselves and their garments frequently. The Persian always makes the best of his appearance; he is very neat in his dress, and is particular as to the sit of his hat and the cut of his coat. All Persians are fond of animals, and do not treat them badly when their own property. ” Cruelty is not a Persian vice; torture and punishments of an unusual and painful nature being part of their judicial system. There are no vindictive punishments, such as a solitary confinement, penal servitude for long terms of years, &c. Seldom, indeed, is a man imprisoned more than twelve months, the rule being that there is a general jail delivery at the New Year. Royal clemency is frequently shown, often, perhaps, with want of judgment.”

Costume. — The costume of the Persians may be shortly described as fitted to their active habits. The men invariably, wear an un- starched shirt of cotton, sewn with white silk, ofteni particularly in the south of Persia, elaborately embroidered about the neck. It fastens in front by a flap, having two small buttons or knots at the left shoulder, and seldom comes below the hips. It has no collar, and the sleeves are loose. The lower orders often have it dyed blue ; but the servant and upper classes always prefer a white shirt. Silk shirts are now seldom seen on men. Among the very religious during the mourning month (” Muharram “) the shirt is at times dyed black. The ” zir-jamah,” or trousers, 1 are of cloth among the higher classes, particularly those of the military order, who affect a garment of a tightness approaching that worn by Europeans. The ordinary ” zir-jamah ” are of white, blue or red cotton, very loose, and are exactly similar to the pyjamas worn by Europeans in India. They are held up by a thin cord of red or green silk or cotton round the waist, and the labouring classes, when engaged in heavy or dirty work, or when running, generally tuck the end of these garments under the cord, which leaves their legs bare and free to the middle of the thigh. The amplitude of this part of his attire enables the Persian to sit without discomfort on his heels; chairs are only used by the rich, great or Europeanized. Over the shirt and ” zir-jamah ” comes the ” arkhalik,” generally of quilted chintz or print, a closely-fitting garment, collarless, with tight sleeves to the elbow, whence, to the wrist, are a number of little metal buttons, fastened in winter, but not in summer. Above this is the ” kamarchin,” a tunic of coloured calico, cloth, Kashmir or Kerman shawl, silk, satin or velvet (gold embroidered, or otherwise), according to the time of the year and the purse and position of the wearer. This, like the ” arkhalik,” is open in front, and shows the shirt. It sometimes has a small standing collar, and is double-breasted. It has a pocket-hole on either side, giving access to the pockets, which are always in the ” arkhalik,”

where also is the breast-pocket in which watch, money, jewels, and seals are kept. The length of the ” kamarchin ” denotes the class of the wearer. The military and official classes and the various servants wear it short, to the knee, while fops and sharpers wear it even shorter. Priests, merchants, villagers, especially about Shiraz, townsmen, shopkeepers, doctors and lawyers wear it very long, often nearly to the heels. Over the ” kamarchin ” is worn the ” kulijah,” or coat. This is, as a rule, cast off in summer, save on formal occasions, and is often borne by a servant, or carried over the shoulder by the owner. It is of cloth, shawl or camel-hair cloth, and is lined with silk or cloth, flannel or fur. It has, like the Turkish frockcoat, a very loose sleeve, with many plaits behind. It has lapels, as with us, and is trimmed with gold lace, shawl or fur, or is worn quite plain. It has a roll collar and false pockets.

Besides these garments there are others: the long ” jubba,” or cloth cloak, worn by ” mirzas ” (secretaries), government employes of high rank, as ministers, farmers of taxes, courtiers, physicians, priests; the “abba,” or camel-hair cloak of the Arab, worn by travellers, priests and horsemen; the ” pustin,” or Afghan skin- cloak, used by travellers and the sick or aged; the ” nimtan,” or common sheepskin jacket, with short sleeves, used by shopkeepers and the lower class of servants, grooms, &c, in winter; the ” ya- panjah,” or woollen Kurdish cloak, a kind of felt, having a shaggy side, of immense thickness, worn generally by shepherds, who use it as greatcoat, bed and bedding. There is also the felt coat of the

1 Zir jamah are loose trousers and also drawers worn under the shaivar, or tight trousers.

villager, very warm and inexpensive, the cost being from 5 to 15 krans (a kran = iod.). The ” kamarband,” or girdle, is also charac- teristic of class. It is made of muslin, shawl or cotton cloth among the priests, merchants, bazaar people, the secretary class and the more aged government employes. In it are carried, by literati and merchants, the pen-case and a roll of paper; its voluminous folds are used as pockets; by the bazaar people and villagers, porters and merchants’ servants, a small sheath knife is struck in it ; while by ” farrashes,” the carpet-spreader class, a large ” khanjar,” or curved dagger, with a heavy ivory handle, is carried. The headgear is very distinctive. The turban worn by priests is generally white, consisting of many yards of muslin. When the wearers are ” saiyid ” of the Prophet, a green 2 turban is worn, also a ” kamarband ” of green muslin, or shawl or cotton cloth.

Merchants generally wear a turban of muslin embroidered in colours, or of a yellow pattern on straw-coloured muslin, or of calico, or shawl. The distinctive mark of the courtier, military, and upper servant class is the belt, generally of black varnished leather with a brass clasp; princes and courtiers often replace this clasp by a huge round ornament of cut stones. The ” kulah,” or hat, is of cloth or sheepskin on a frame of pasteboard. The fashions in hats change yearly. The Isfahan merchant and the Armenian at times wear the hat very tall. (The waist of the Persian is generally small, and he is very proud of his fine figure and broad shoulders.)

The hair is generally shaved at the crown, or the entire head is shaved, a ” kakul,” or long thin lock, being sometimes left, often 2 ft. long, from the middle of the crown. This is to enable the prophet Mahomet to draw up the believer into paradise. The lower orders generally, have the hair over the temporal bone long, and brought in two long locks turning backwards behind the ear, termed “zulf”; the beaux and youths are constantly twisting and combing these. The rest of the head is shaven. Long hair, however, is going out of fashion in Persia, and the more civilized affect the cropped hair worn by Europeans, and even have a parting in it. The chin is never shaved, save by ” beauty men,” or ” kashangs,” though often clipped, while the moustache is usually left long. At forty a man generally lets his beard grow its full length, and cherishes it much ; part of a Persian’s religious exercises is the combing of his beard. Socks, knitted principally at Isfahan, are worn; they are only about 2 in. long in the leg. The rich, however, wear them longer. They are of white cotton in summer and coloured worsted in winter. Villagers only wear socks on state occasions. Shoes are of many patterns. The ” urussi,” or Russian shoe is the most common; next, the ” kafsh ” or slipper of various kinds. The heel is folded down and remains so. The priests wear a peculiar heavy shoe, with an ivory or wooden lining at the heel. Green shoes of shagreen are common at Isfahan. Blacking is un- known to Persians generally. Boots are only used by horsemen, and are then worn much too large for ease. Those worn by couriers often come up the thigh. With boots are worn ” shalwars,” or baggy riding breeches, very loose, and tied by a string at the ankle ; a sort of kilt is worn by couriers. Pocket-handkerchiefs are seldom used, save by the rich or the Teheranis. Most Persians wear a ” shab kulah,” or night hat, a loose baggy cap of shawl or quilted material, often embroidered by the ladies.

Arms are usually carried only by tribesmen. The natives of the south of Persia and servants carry a ” kammah,” or dirk. The soldiery, on or off duty, always carry one of these or their side- arms, sometimes

both. They hack but never thrust with them. On the road the carrying of weapons is necessary.

The costume of the women has undergone considerable change in the last century. It is now, when carried to the extreme of fashion, highly indecent and must be very uncomfortable. The garment doing duty as a chemise is called a ” pirahan “; it is, with the lower orders, of white or blue calico, and comes down to the middle of the thigh, leaving the leg nude. Among the upper classes it is frequently of silk. At Shiraz it is often of fine cotton, and elaborately ornamented with black embroidery. With the rich it is often of gauze, and much embroidered with gold thread,. pearls, &c. The head is usually covered with a ” char-kadd,” or large square of embroidered silk or cotton, folded so as to display the corners, and fastened under the chin by a brooch. It is often of consider- able value, being of Kashmir shawl, embroidered gauze, &c. A ” jika,” a jewelled feather-like ornament, is often worn at the side of the head, while the front hair, cut to a level with the mouth, is brought up in love-locks on either cheek. Beneath the . ” char- kadd ” is generally a small kerchief of dark material, only the edge of which is visible. The ends of the ” char-kadd ” cover the shoulders, but the gauze ” pirahan ” is quite transparent. A pro- fusion of jewellery is worn of the most solid description, none hollow ; silver is worn only by the very poor, coral only by negresses. Neck- laces and bracelets are much affected, and chains with scent -caskets attached, while the arms are covered with clanking glass bangles called ” alangu,” some twenty even of these being on one arm. Jewelled ” bazubands,” containing talismans, are often worn on the upper arm, while among the lower orders and south Persian or Arab women nose-rings are not uncommon, and bangles or anklets of beads.

1 Green turbans are now rarely seen; the colour is generally dark blue, or black.

The face on important occasions is usually much painted, save by young ladies in the heyday of beauty. The colour is very freely applied, the cheeks being as much raddled as a clown’s, and the neck smeared with white, while the eyelashes are marked round with ” kuhl.” This is supposed to be beneficial to the eyes, and almost every

woman uses it. The eyebrows are widened and painted till they appear to meet, while sham moles or stars are painted on the chin and cheek ; even spangles are stuck at times on the chin and forehead. Tattooing is common among the poor and in villages, and is seen among the upper classes. The hair, though generally hidden by the ” char-kadd,” is at times exposed and plaited into innumerable little tails of great length, while a coquettish little skull-cap of embroidery, or shawl, or coloured silk is worn. False hair is common. The Persian ladies’ hair is very luxuriant and never cut ; it is nearly always dyed red with henna, or with indigo to a blue-black tinge; it is naturally a glossy black. Fair hair is not esteemed. Blue eyes are not uncommon, but brown ones are the rule. A full-moon face is much admired, and a dark complexion termed ” namak ” (salt) is the highest native idea of beauty. Most Persian women are small, with tiny feet and hands. The figure is always lost after maternity, and no support of any kind is worn.

A very short jacket, of gay colour, quite open in front, having tight sleeves with many metal buttons, is usually worn in summer, and a lined outer coat in cold weather. In winter a pair of very short white cotton socks are used, and tiny slippers with a high heel ; in summer in the house ladies go often barefoot. The rest of the costume is composed of the ” tumbun ” or ” shalvar,” short skirts of great width, held by a running string — the outer one being usually of silk, velvet, or Kashmir shawl, often trimmed with gold lace, or, among the poor, of loud-patterned chintz or print. Beneath are innumerable other garments of the same shape, varying in texture from silk and satin to print. The whole is very short, among the women of fashion extending only to the thigh. In winter an over-mantle like the ” kulijah,” or coat of the man, with short sleeves, lined and trimmed with furs, is worn. Leg-coverings are now being introduced. In ancient days the Persian ladies always wore them, as may be seen by the pictures in the South Kensington Museum. Then the two embroidered legs, now so fashionable as Persian embroideries (” naksh “), occupied a girl from childhood to marriage in making; they are all sewing in elaborate patterns of great beauty, worked on muslin in silk. The outdoor costume of the Persian women is quite another thing. Enveloped in a huge blue sheet, with a yard of linen as a veil per- forated for two inches square with minute holes, the feet thrust into two huge bags of coloured stuff, a wife is perfectly unrecogniz- able, even by her husband, when out of doors. The dress of all is the same ; and, save in quality or costliness, the effect is similar.

As for the children, they are always when infants swaddled; when they can walk they are dressed as little men and women, and with the

dress they generally ape the manners. It is a strange custom with the Persian ladies to dress little girls as boys, and little boys as girls, till they reach the age of seven or eight years; this is often done for fun, or on account of some vow — oftener to avert the evil eye.

Towns. — The principal cities of Persia with their populations as estimated in 1908 are: Teheran (280,000); Tabriz (200,000); Isfahan (100,000); Meshed (80,000); Kerman, Resht, Shiraz (60,000); Barfurush, Kazvin, Yezd (50,000); Hamadan, Ker- manshah (40,000); Kashan, Khoi, Urmia (35,000); Birjend, Burujird, Bushire, Dizful, Kum, Senendij (Sinna), Zenjan (25,000 to 30,000); Amol, Ardebil, Ardistan, Astarabad, Abekuh, Bam, Bander, Abbasi, Bander Lingah, Damghan, Dilman, Istahbanat, Jahrum, Khunsar, Kumishah, Kuchan, Marand, Maragha, Nishapur, Sari, Sabzevar, Samnan, Shahrud, Shushter (10,000 to 20,000).

Political' and Administrative Divisions. — The empire of Persia, officially known as Mamalik i Mahruseh i Iran, " the protected kingdoms of Persia," is divided into a number of provinces, which, when large, and containing important sub-provinces and districts, are called mamlikat, " kingdom," when smaller, vilayat and ayalat, and are ruled by governors-general and governors appointed by and directly responsible to the Crown. These provinces are further divided into sub-provinces, vilayats, districts, sub-districts and parishes, buluk, nahiyeh, mdhal, and towns, cities, parishes and villages, shehr, kassabeh, mahalleh, dih, which are ruled by lieutenant-governors and other function- aries appointed by and responsible to the governors. All governors are called hakim, or hukmran, but those of large provinces generally have the title of vali, and sometimes firman-firma. A governor of a small district is a zabit; a deputy- governor is called naib el hukumeh, or naib el ayaleh ; an adminis- trative division is a kalamro, or hukumat. Until recently the

principal governorships were conferred upon the shah's sons, brothers, uncles and other near relatives, but now many of them are held by men who have little if any connexion with the royal family. Also, the governors are now, as a rule, resident in their provinces instead of being absentees at the capital. There are also some small districts or dependencies generally held in fief, turyul, by princes or high functionaries who take the revenues in lieu of salaries, pensions, allowances, &c, and either them- selves govern or appoint others to do so.

Every town has a mayor, or chief magistrate, called beglerbegi, " lord of lords," kalantar, " the greater," and sometimes darogha, "

overseer," or chief of police; every ward or parish, mahalleh, of a town and every village has a head-man called ked khoda, " house-lord." These officers are responsible to the governor for the collection of the taxes and the orderly state of their towns, parishes and villages. In the important provinces and sub- provinces the governors are assisted by a man of experience, to whom the accounts and details of the government are entrusted. This person, called viziar, or paishhar, is often nominated by the shah, and his functions in the provincial government are similar to those of the grand vizir in the central government, and com- prise very extended administrative powers, including at times the command of the military forces in his province. Among the nomads a different system of titles prevails, the chiefs who are responsible for the taxes and the orderly conduct of their tribes and clans being known as ilkhani, ilbegi (both meaning " tribe-lord," but the latter being considered an inferior title to the former), khan,rais, amir, mir, shaikh, tushmal, &c.

The governors and chiefs, excepting those possessing heredi- tary rights, are frequently changed; appointments are for one year only and are sometimes renewed, but it does not often occur that an official holds the same government for longer than that period, while it happens rarely that a province is governed by the same person for two or three years. This was not so formerly, when not infrequently an official, generally a near relation of the shah, held the same governorship for five, ten or even more years. The governorship of the province of Azerbaijan was an exception until the end of 1906, being always held by the Valiahd, " heir apparent," or crown prince.

The political divisions cf Persia, provinces, sub-provinces, dis- tricts, &c, ruled by hakims number over 200 (cf. the statement in Noldeke's Geschichte des Artachsir Pdpakdn, "after Alexander's death there were in Iran 240 local governors "), but the adminis- trative divisions, hukumat, or kalamro, with governors appointed by the Crown and responsible to it for the revenues, have been under fifty for sixty-five years or more. In 1840 there were twenty- nine administrative divisions, in 1868 twenty-two, in 1875 twenty- nine, in 1884 nineteen, in 1890 forty-six, and in 1908 thirty-five, as follows : —

(a) Provinces: —

1. Arabistan and Bakhtiari. 14. Kamseh.

2. Astarabad and Gurgan. 15. Khar.

3. Azerbaijan. 16. Khorasan.

4. Fars. 17. Kum.

5. Gerrus. 18. Kurdistan.

6. Gilan and Talish. 19. Luristan and Burujird.

7. Hamadan. 20. Mazandaran.

8. Irak, Gulpaigan, Khunsar, 21. Nehavend, Malayir and

Kamereh, Kezzaz, Fera- Tusirkhan.

kan. ■ 22. Savah.

9. Isfahan. 23. Samnan and Damghan. 10ˆ Kashan. 24. Shahrud and Bostam.

11. Kazvin. 25. Teheran.

12. Kerman and Baluchistan. 26. Zerend and Bagdadi

13. Kermanshah. Shahsevens. (b) Dependencies, or Fiefs: —

1. Asadabad. 6. Natanz.

2. Demavend. 7. Talikan.

3. Firuzkuh. 8. Tarom Ulia.

4. Josehekan. 9. Kharakan.

5. Kangaver.

Roads. — With the exception of five short roads, having an aggre- gate length of less than 900 m., all the roads of the country are mere mule tracks, carriageable in the plains and during the dry season, but totally unfit for continuous wheeled traffic during all seasons, and in the hilly districts often so difficult as to cause much damage to goods and the animals carrying them. There are a few miles of roads in the immediate neighbourhood of Teheran leading from the city to royal palaces, but not of any commercial

importance. The five exceptions are- (1) Resht-Kazvin-Teheran, 227 m.; (2) Julfa-Tabriz, 80 m.; (3) Teheran-Kum-Sultanabad, 160 m.; (4) Meshed-Kuchan-Askabad, 150 m.; 30 of which are on Russian territory; (5) Isfahan-Ahvaz, 280 m; The first of these roads consists of two sections: Resht-Kazvin, 135 m., and Kazvin- Teheran, 92 m. The first section was constructed in 1897-1899 by a Russian company, in virtue of a concession which the Persian government granted in 1893; and the second section was con- structed in 1 878-1 879 by the Persian government at a cost of about £20,000, ceded to the concessionnaire of the first section in 1896, and repaired and partly reconstructed by the Russian company in 1 898- 1 899. Both sections were officially opened to traffic in August 1899. The capital of the company is 3,200,000 roubles (j£34 I .33°), of which 1,700,000 is in shares taken by the public, and 1,500,000 in debentures taken by the Russian government, which also guarantees 5 % on the shares. About two-thirds of the capital has been expended on construction. The company's income is derived from tolls levied on vehicles and animals using the road. These tolls were at first very high but were reduced by 15% in 1904, and by another 10% in 19O9. If all the trade between Russia and Teheran were to pass over this road, the tolls would no doubt pay a fair dividend on the capital, but much of it goes by way of the Teheran-Meshed-i-Sar route, which is much shorter and has no tolls. The second road, Julfa-Tabriz, 80 m., was constructed by the same Russian company in 1903. The third road, Teheran-Kum-Sultanabad, 160 m., also consists of two sections: the first, Teheran-Kum, 92 m., the other, Kum-Sultanabad, 68 m. The first section was constructed by the Persian government in 1883 at a cost of about £12,000, purchased by the Imperial Bank of Persia in 1890 for £10,000, and reconstructed at a cost of about £45,000. The second section formed part of the " Ahvaz road concession " which was obtained by the Imperial Bank of Persia in 1890 with the object of connecting Teheran with Ahvaz on the Karun by a direct cart road via Sultanabad, Burujird, Khorremabad (Luristan), Dizful and Shushter. The concession was ceded to Messrs Lynch, of London, " The Persian Road and Transport Company," in 1903. The fourth cart-road, Meshed-Askabad, 120 m. to the Persian frontier, was constructed by the Persian government in 1889-1892 in accordance with art. v. of the Khorasan Boundary Convention between Russia and Persia of December 1 881. The Persian section cost £13,000. The fifth road, Isfahan-Ahvaz, 280 m., is the old mule track provided with some bridges, and improved by freeing it of boulders and stones, &c, at a totai cost of £5500. The con- cession for this road was obtained in 1897 by the Bakhtiari chiefs and ceded to Messrs Lynch, of London, who advanced the necessary capital at 6% interest and later formed

the Persian Road and Transport Company. The road was opened for traffic in the autumn of 1900. The revenue is derived from tolls levied on animals passing with loads. The tolls collected in 1907 amounted to £3100. Railways. — Persia possesses only 8 m. of railway and 6| m. of tramway, both worked by a Belgian company. The railway consists of a single line, one-metre gauge, from Teheran to Shah-abdul-Azim, south of Teheran, and of two branch lines which connect the main line with some limestone quarries in the hills south-east of the city. The tramway also is a single line of one-metre gauge, and runs through some of the principal streets of Teheran. The length of the main railway line is 5§ m., that of the branches 2?. The main line was opened in 1888, the branches were constructed in 1893, and the tramway started in 1889. The capital now invested in this enterprise, and largely subscribed for by Russian capitalists, amounts to £320,000. There are also ordinary shares to the amount of £200,000 put down in the company's annual balance-sheets as of no value. The general opinion is that if Russian capitalists had not been interested in the enterprise the company would have liquidated long ago. (On railways in Persia, the many concessions granted by the Persian government, and only one having a result, ch. xviii. of Lord Curzon's Persia [i. 613-639], and on the Belgian enterprise, Lorini's La Persia economica [pp. 157-158] may be consulted.)

Posts. — Down to 1874 the postal system was in the hands of an official called chaparchi bashi, who was the head farmer of the post, or chapars, and letters and small parcels were conveyed by him and his agents at high and arbitrary rates and without any responsibility. The establishment of a regular post was one of the results of the shah Nasr-ed-din's first visit to Europe (1873). Two officials of the Austrian postal department having been engaged in 1874, an experiment of a post office upon European lines was made in the following year with a postal delivery in the capital and some of the neighbouring villages where the European legations have their summer quarters. In the beginning of 1876 a regular weekly post was established between Teheran, Tabriz and Julfa (Russo-Persian frontier) and Resht. Other lines, connecting all the principal cities with the capital, were opened shortly afterwards, and on the 1st of September 1877 Persia joined the international postal union with the rates of 2|d. per § oz. for letters, id. for post -cards, id. per 2 oz. for newspapers, &c, between Persia and any union country. The inland rates were a little less. There are now between Persia and foreign countries a bi-weekly service via Russia (Resht-Baku, Tabriz-Tiflis) and a weekly service via India (Bushire-Bombay). On the inland lines, with the exception of that between Teheran

and Tabriz, the service is weekly. There are reported to be 140 post offices. Statistics as to the number of letters, post-cards, newspapers, &c, conveyed are kept but not published; and since 1885, when a liberal-minded director communicated those for the year 1884-1885 to the present writer, no others, although many times promised, have been obtained. In the year 1884-1885 there were conveyed 1,368,835 letters, 2050 post-cards, 7455 samples, and 173,995 parcels, having a value of £304,720; and the receipts exceeded the expenditure by £466. Since then the traffic has much increased, and the excess of receipts over expenditure in the year 1898-1899 was reported to have been £10,000, but was probably more than that, for the minister of posts farmed the department for £12,000 per annum. The farm system was abolished in 1901 and in the following year the post office was joined to the customs department worked by Belgian officials. Under the most favourable conditions letters from London via Russia are delivered at Tabriz in 9 days, at Teheran in 10, at Isfahan in 14, and at Shiraz in 18 days; and via India, at Bushire in 26 days, at Shiraz in 31, at Isfahan in 36, and at Teheran in 40 days; but during the winter letters between London and Teheran sometimes take a month. In the interior the mails are conveyed on horseback, and, being packed in badly- made soft leather bags, are frequently damaged through careless packing and wet. The first Persian postage stamps were issued in 1875 and roughly printed in Persia. Since then there have been numerous issues, many practically bogus ones for collectors. Authentic specimens of the early ones are much valued by stamp collectors. (For information on the postal system of Persia, see G. Riederer, Aus Persien, Vienna, 1882; Fr. Schueller, Die persische Post und die Postwerthzeichen von Persien, Vienna, 1893.)

Telegraphs. — The first line of telegraphs — from Teheran to Sultanieh, about 160 m. on the road to Tabriz — was constructed in 1859. In the following year it was continued to Tabriz, and in 1863 to Julfa on the Russian frontier. With the object of establish- ing a direct telegraphic communication between England and India, by connecting the European and Indian systems by a land line through Persia from Bagdad — then the most easterly Turkish telegraphic station — to Bushire and by a cable from Bushire east- wards, a telegraphic convention was concluded in the same year between the British and Persian governments, and a one-wire line on wooden posts from the Turkish frontier, near Bagdad, to Bushire via Kermanshah, Hamadan, Teheran, Isfahan and Shiraz, was constructed at the cost and under the supervision of the British government. In 1865 a new convention, providing for a second wire, was concluded, and for some years messages between Europe and India were transmitted either via

Constanti- nople, Bagdad, Teheran, Bushire, or via Russia, Tifiis, Tabriz, Teheran, Bushire. An alternative line between Bagdad and India was created by the construction of a land line to Fao, at the head of the Persian Gulf, and the laying of a cable thence to Bushire. The service was very inefficient, and messages between England and India took several days and sometimes weeks to reach their desti- nation. In 1869 Messrs Siemens of Berlin, in virtue of concessions obtained in the year before and later disposed of to the I ndo-European Telegraph Company, Ltd. — who also took over Reuter's cable from Lowestoft to Emden (274 knots) — constructed a two-wire line on iron posts through Germany and Russia, and in Persia from Julfa to Teheran. This line was opened on the 31st of January 1870. The British government then handed the Bagdad-Teheran section, which had become unnecessary for international through traffic between Europe and India, over to the Persian government, and changed its Teheran-Bushire line into one of two wires on iron posts. In 1873, according to a convention signed December 1872, a third wire was added to the line, and there was then a three-wire line on iron posts (439 m. Indo-European Telegraph Company, 675 m. Indian government) from Julfa to Bushire. In August 1901 a convention was concluded between the British and Persian governments for a three-wire line on iron posts from Kashan (a station on the Teheran-Bushire line) to Baluchistan via Yezd, Kerman and Bam (805 m.). The construction of this "Central Persia line," as it is known officially, was begun in December 1902 and completed in March 1907. The section Kashan-Isfahan of the old Teheran-Bushire was then taken up and Isafahan was connected with the Central Persia line by a two-wire line from Ardistan, 71 m. south-east from Kashan. One of the three wires between Isfahan and Bushire was also taken up, and there are now a five-wire line from Teheran to Ardistan (224ˆ m.), a three-wire line from Ardistan to the Baluchistan frontier (734 m.) and a two- wire line from Ardistan to Bushire (497 m.). These lines, as well as that of the Indo-European Telegraph Company from Julfa to Teheran, are worked throughout by an English staff and may be classed among the finest and most efficient in the world. The central line is continued through Baluchistan to Karachi, and from Bushire messages go by cable (laid in 1864) to Jask, and thence either by cable or by land to Karachi, Bombay, &c. The telegraphic convention between the British and Persian governments has again been renewed, and is in force until 1925 ; and the concessions to the company were prolonged to the same year by the Russian government in March 1900. In addition to these lines, Persia possesses 4191 m. of single- wire lines on wooden poles belonging to the Persian government and worked by a Persian staff; the

Teheran-Meshed line (555 m.), however, is looked after by an English inspector and two English clerks at Meshed, and since 1885 the Indian government has allowed a sum not exceeding 20,000 rupees per annum for its maintenance; and the Meshed- Seistan line, 523 m., is looked after by twelve Russian inspectors and clerks. The Persian lines are farmed out for 1,800,000 krans (about £36,000) per annum and no statistics are published. There are in all 131 stations. Statistics of the traffic on the Indo-European line are given in the administration reports of the Indo-European telegraph department, published by government, and from them the figures in the following table have been obtained : —

Year.

Traffic over Lines

between London

and Karachi.

Earnings in

thousands of

Pounds.

Net Profits of the Government Dept.

Number of

Messages

transmitted.

it

O u

0«

2S.U

48

Total amount. Rupees.

if

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t’S.

0,U

I887-1888 I 892-I 893 I897-I898 I 902- I 903 I 905- I 906

1 906- 1 907

83.031 117,500 146,988 178,250 211,003 259,355

74

84

106

in

113 108

100 116

H5

155 157 149

198,381

437,668 758,172 589.571 774.368 458.559

1-75

3-8o

6-57

4-5°

Manufactures, &c. — The handbook on Persian art published by Colonel Murdoch Smith, R.E., in 1876, with reference to the collection purchased and sent home by him for the Victoria and Albert Museum, has an instructive account of the more common manufactures of the country. They are classified under the respective heads of ” porcelain and earthenware,” “tiles,” “arms and armour,” ” textile fabrics,” ” needlework and embroidery,” ” metal-work,” ” wood carving and mosaic-painting,” ” manuscripts,” ” enamel,” ” jewelry ” and ” musical instruments.” Specimens of the greater number are not only to be procured in England, but are almost familiar to the ordinary Londoner. It need scarcely be said that tiles have rather increased in value than deteriorated in the eyes of the connoisseur, that the ornamentation of metal-work, wood carving and inlaying, gem and seal engraving, are exquisite of their kind, and that the carpets manufactured by skilled workmen, when left to themselves and their native patterns, are to a great extent unrivalled. Of the above-mentioned articles, carpets, shawls, woollen and cotton fabrics and silk stuffs are the more important. Carpets may be divided into three categories: (1) Kali, with a pile, and cut like plush; (2) gilim, smooth; (3) nimads, felts. Only the two first are exported. The Kali and its smaller sizes, called Kalicheh (in Europe, rugs), are chiefly made in Ferahan, Sultanabad (Irak), Khorasan, Kurdistan, Karadagh, Yezd, Kerman, and among the nomad tribes of southern Persia. From the two first-mentioned localities, where a British firm has been established for many years, great quantities, valued in some years at £100,000, find their way to European and American markets, while rugs to the value of £30,000 per annum are exported from the Persian Gulf ports. Of the second kind, gilim (used in Europe for curtains, hangings, and chair-covers), considerable quantities are exported from Shushter and Kurdistan. The value of the carpets exported during the year 1906-1907 was close upon £900,000, Turkey taking £613,300, Russia £196,700, United States £40,600, Great Britain £20,700, Egypt £18,500 and India £5400. Shawls are manufactured in Kerman and Meshed, and form an article of export, principally to Turkey. Woollen fabrics are manufactured in many districts, but are not exported in any great quantity. Coarse cotton stuffs, chiefly of the kind called Kerbaz, used in their natural colour, or dyed blue with indigo, are manufactured in all districts but not exported; cottons, called Kalamkar, which are made in Manchester and block-printed in colours at Isfahan and Kumishah, find their way to foreign markets, principally Russian. Of silk fabrics manufactured in Persia, principally in Khorasan, Kashan and Yezd, about £100,000 worth per annum is

exported to Turkey, Russia and India. In the environs of Kashan and in Fars, chiefly at Maimand, much rose-water is made, and a considerable quantity of it is exported by way of Bushire to India and Java. Many attempts have been made to start manufactures, supported by foreign capital and conducted by foreigners, but nearly all have resulted in loss. In 1879 the Persian government was induced to spend £30,000 on the erection of a gas factory in Teheran, but work was soon stopped for want of good coal. A few years later a Persian bought the factory and plant for £10,000, and made them over in 1891 to the Compagnie generale pour l'eclairage et le hauffage en Perse, which after bringing out much additional plant, and wasting much capital in trying for some years in vain to make

food and cheap gas out of bad and dear coal, closed the factory, n 189 1 another Belgian company, Societe anonyme des verreries nationales de Perse, opened a glass factory in Teheran, but the difficulty of obtaining the raw material cheaply and in large quanti- ties was too great to make it a paying concern, and the factory

had to be closed. A third Belgian company, Societe anonyme pour la fabrication du sucre en Perse, with a large capital, then came to Persia, and began making beetroot sugar in the winter of 1895. But, like the gas and glass companies, it found the cost of the raw material and the incidental expenses too great, and ceased its operations in 1899. In 1890 a Russian company started a match factory near Teheran with an initial outlay, it is said, of about £20,000, but could not successfully compete with Austrian and Swedish matches and ceased operations very soon. A Persian gentleman erected a cotton-spinning factory at Teheran in 1894 with expensive machinery; it turned out some excellent yarn but could not compete in price with imported yarns.

Agricultural Products. — Wheat, barley and rice are grown in all districts, the two former up to considerable altitudes (8000 ft.), the last wherever the water supply is abundant, and in inner Persia generally along rivers; and all three are largely exported. The most important rice-growing districts which produce more than they require for local consumption and supply other districts, or export great quantities, are Astarabad, Mazandaran, Gilan, Veramin, (near Teheran). Lenjan (near Isfahan), and some localities in Fars and Azerbaijan. Peas, beans, lentils, gram, maize, millet, are also universally cultivated, and exported from the Persian Gulf ports to India and the Arabian coast. The export of rice amounted to 52,200 tons in 1906-1907, and was valued at £472,550. The Persian fruit is excellent and abundant, and large quantities, princi- pally dried and

called khushkbar (dry fruit), as quinces, peaches, apricots, plums (of several kinds), raisins, figs, almonds, pistachios, walnuts and dates (the last only from the south), as well as oranges (only from the Caspian provinces), are exported. The fruit exported during 1906-1907 had a value of £1,019,000. Nothing is being done to improve the vine, and the Persian wines, until recently of world-wide reputation, are yearly getting thinner and poorer. The phylloxera has done much damage. The naturalist S. G. Gmelin, who explored the southern shores of the Caspian in 1 77 1, observed that the wines of Gilan were made from the wild grape. Cotton is largely grown, principally in the central districts and Khorasan, and some qualities are excellent and command high prices in the European markets; 18,400 tons of raw cotton, valued a t £ 838,787, were exported to Russia in 1906-1907. Good hemp grows wild in Mazandaran. Tobacco of two kinds, one the tumbaku (Nicotiana persica, Lindl.), for water pipes, the other the tutun (Nicotiana rustica, L.), for ordinary pipes and cigarettes, is much cultivated. The tumbaku for export is chiefly produced in the central districts round about Isfahan and near Kashan, while the tumbaku of Shiraz, Fessa, and Darab in Fars, considered the best in Persia, is not much appreciated abroad. Tutun is cultivated in Azerbaijan, near Urmia and other places near the Turkish frontier, in Kurdistan, and, since 1875, in the district of Resht.in Gilan. About 1885 the quantity of tobacco exported amounted to between 4000 and 5000 tons. In 1906-1907 only 1820 tons, valued at £42,000, were exported. The cultivation of poppy for opium greatly increased after 1880, and it was estimated in 1900 that the annual produce of opium amounted to over 1000 tons, of which about two-fifths was consumed and smoked in the country. The principal opium-producing districts are those of Shiraz, Isfahan, Yezd, Kerman, Khorasan, Burujird and Kermanshah. While the quantity consumed in the country is now probably the same, the quantity exported is much less: 239 tons, valued at £237,270 in 1906-1907. The value of the silk produced in Persia in the ‘sixties was £1,000,000 per annum, and decreased in consequence of silk- worm disease to £30,000, in 1890. The quantity produced has since then steadily increased and its yearly value is estimated at half a million. Cocoons and raw silk valued at £316,140 were exported in 1906-1907. Of oil-yielding plants the castor-oil plant, sesame, linseed and olive are cultivated, the last only in a small district south of and near Resht. Very little oil is exported. The potato, not yet a staple article of food, tomatoes, celery, cauliflower, arti-chokes and other vegetables are now much more grown than formerly, chiefly in consequence of the great influx of Europeans, who are the principal consumers.

Among the valuable vegetable products forming articles of export are various gums and dyes, the most important being gum tragacanth, which exudes from the astragalus plant in the hilly region from Kurdistan in the north-west to Kerman in the south-east. Other gums are gum-ammoniac, asafetida, galbanum, sagapanum, sarcocolla and opoponax. In 1906-1907, 3310 tons of various gums of a value of £300,000 were exported. Of dye-stuffs there are produced henna (Lawsonia inermis) principally grown at Khabis near Kerman, woad and madder; a small quantity of indigo is grown near Dizful and Shushter. The export of dyes in I 906-1907 was 985 tons, valued at £32,326.

Horses, mules and donkeys, formerly exported in great numbers, are at present not very abundant, and their prices have risen much since 1880. Some nomad tribes who owned many brood mares, and yearly sold hundreds of horses, now hardly possess suffi- cient animals for their own requirements. The scarcity of animals, as well as the dearness of fodder, is one of the causes of the dearness of transport, and freights have risen on the most frequented roads from 3d. per ton-mile in 1880 to iod., and even 13d., per ton-mile. The prices of staple articles of food rose steadily from 1880 and

reached a maximum in 1900 and 1901, as will be seen from the following table : —

Average

Price,

April

Price

June

Price

, 1880.

1900.

1908.

s.

d.

i.

d.

s.

d.

Wheat, per kharvar. .

22

6

102

32

(649 lb)

Rice

56

3

64

64

Bread, ordinary, per

mann (6J lb) .

360

9-60

3-84

Meat,mutton(per mann)

1

2-40

2

9-60

1

5-28

Cheese „

1

6

2

4-80

1

Clarified butter ,,

2

3

4

9-60

5

4- 80

Milk

4-5°

9-60

7-68

Eggs, per 100. .

1

6

3

7-20

3

2-40

Forests and Timber.— Timber from the forests of Mazandaran and Gilan has been a valuable article of export for many years, and since about 1870 large quantities of boxwood have also been exported thence; in some years the value of the timber and box- wood exported has exceeded £50,000. This value represented about 200,000 box trees and quite as many others. Much timber is also used for charcoal-burning, and occasionally large parts of forest are burned by the people in order to obtain clearings for the cultivation of rice. The destruction of the forests by timber- cutters and charcoal-burners has been allowed to go on unchecked, no plantations have been laid out, and nothing has been done for forest conservation. Indiscriminate cutting has occasionally been confined within certain bounds, but such restrictions were generally either of short duration or made for the convenience and profit of local governors. The oak forests of Kurdistan, Luristan and the Bakhtiari district are also being rapidly thinned. A small step in the right direction was made in 1900 by engaging the services of an official of the Prussian forest department, but unfortunately, beyond sending him to inspect the Mazandaran forests belonging to the Crown, and employing him to lay out a small plantation in the Jajrud valley, east of Teheran, nothing was done. The monopoly for cutting and exporting the timber of the Mazandaran forests is leased to European firms, principally for box and oak. Boxwood has become scarce. There are many kinds of good timber-yielding trees, the best known being alder (Alnus glutinosa, Wild., A. barbata, A. cordifolia, Ten.), ash {Fraxinus excelsior, L.), beech (Fagus sylvatica), elm {Ulmus campestris, U. effusa, U. pedunculata) , wych-elm (Ulmus montana), hornbeam (Carpinus betulus, L.), juniper (Juniperus excelsa, J. communis, J. sabina), maple {Acer insigne, Boiss., A. campestre, A. pseudo-platanus , L.), oak (Quercus ballota, Q. castaneaefolia, Q. sessiliflora, Q. pedunculata), walnut, nettle tree {Celtis australis, L.), Siberian elm (Zelkova crenata, Spach.), and various kinds of poplar. Pipe-sticks, from the wild cherry tree, are exported to Turkey.

Fisheries. — Fish is a staple food along the shores of the Persian Gulf, but the Crown derives no revenue from fisheries there. The fisheries of the Caspian littoral are leased to a Russian firm (since 1868), and most of the fish goes to Russia (31,120 tons, value £556,125, in 1906-1907). The fish principally caught are sturgeon, giving caviare, sheat fish or silure, salmon, carp, bream and perch. Minerals and Mining. — Persia possesses considerable mineral riches, but the absence of cheap and easy means of transport, and the scarcity of fuel and water which prevails almost everywhere, make any exploitation on a remunerative scale impossible, and the attempts which have been made to work mines with European capital and under European superintendence have been financially unsuccessful. Deposits of rich ores of copper, lead, iron, manganese, zinc, nickel, cobalt, &c, abound. A few mines are worked by natives in a primitive, systemless manner, and without any great outlay of capital. There are turquoise mines near Nishapur (for description of mines, manner of working, &c, see A. Houtum- Schindler, Report on the Turquoise Mines in Khorasan, F. 0. Reports, 1884, and " Die Gegend zwischen Sabzwar und Meschhed," Jahrbuch k. k. geol. R. A . Wien, vol. xxxvi. ; also E. Tielze, Verhandl. k. k. geol. R. A., 1884, p. 93); several copper mines in Khorasan, Samnan, Azerbaijan and Kerman; some of lead, two cpnsiderably argentiferous, in Khorasan, Tudarvar (near Samnan), Anguran, Afshar (both west of Zenjan), and Kerman; two of iron at Mesula in Gilan and Nur in Mazandaran; two of orpiment in Afshar and near Urmia ; one of cobalt at Kamsar (near Kashan) ; one of alum in Tarom (near Kazvin) ; and a number of coal in the Lar district, north-east of Teheran, and at Hiv and Abyek, north-west of Teheran. There are also many quarries of rock-salt, gypsum, lime and some of marble, alabaster, soapstone, &c. The annual revenue of the government from the leases, rents and royalties of mines does not amount to more than £15,000, and about £6000 of this amount is derived from the turquoise mines near Nishapur. As the rents and royalties, excepting those on the turquoise mines, amount to about one-fifth of the net proceeds, it may be estimated that the value of the annual output does not exceed £50,000, while the intrinsic value of the ores, particularly those of lead, iron, cobalt and nickel, which have not yet been touched can be estimated at

millions. There are also some very rich coal seams in eastern Persia, far away on the fringe of the desert, and under existing conditions quite valueless. The richest deposits of nickel, cobalt and antimony ores are also situated in localities where there is little water and the nearest useful fuel some hundred miles away. Auriferous alluvial strata have been discovered in various localities, but everywhere the

scarcity of water has been a bar to their being exploited with profit. A rich naphtha-bearing zone stretches from the Luristan hills near Kermanshah down to the Persian Gulf. Competent engineers and specialists have declared that borings in the Bakhtiari hills, west of Shushter, would give excellent results, but the difficult hilly country and the total absence of roads, as well as the antipathy of the inhabitants of the district, would make the transport and establishment of the necessary plant a most difficult matter. A British syndicate has been boring at several places in the zone since 1903.

Commerce. — The principal centres of commerce are Tabriz, Teheran, Resht, Meshed and Yezd; the principal, ports Bander Abbasi, Lingah, Bushire and Muhamrah on the Persian Gulf, and Astara, Enzeli, Meshed i Sar and Bander i Gez on the Caspian.

Until 1899 all the customs were farmed out (1898-1899 for £300,000), but in March of that year the farm system was abolished in the two provinces of Azerbaijan and Kermanshah, and, the experiment there proving successful, in all other provinces in the following year. At the same time a uniform duty of 5 % ad valorem was established. In October 1901 a treaty fixing a tariff and re- serving ” the most favoured nation ” treatment for the countries already enjoying it was concluded between Persia and Russia. It was ratified in December 1902 and came into force on the 14th of February 1903. The commercial treaty with Great Britain, concluded in 1857, provided for the ” most favoured nation ” treatment, but nevertheless a new treaty under which the duties levied on British imports would be the same as on Russian imports was made with Great Britain a few days before the new tariff came into force and was ratified in May.

For the value of imports and exports previous to 1901 the only statistics available were the figures given in consular reports, which were not always correct. In 1897 it was estimated that the value of the imports from and exports to Great Britain, including India, amounted to £3,250,000. About a quarter of this trade passed over the western frontier of Persia, while three-quarters passed through the Persian Gulf ports. The value of the trade between Russia and Persia was then about £3,500,000. Since 1901 detailed statistics have been published by the customs department, and according to them the values of the imports and exports in thousands of pounds sterling for the six years 1901-1907 were as follows: —

Imports.

Exports.

Total.

1901-1902

5429

2738

8,167

1902-1903

4970

3388

8,358

1903-1904

7000

4632

11,632

1904-1905

5832

4132

9.964

I 905- I 906

6441

4886

“,327

1906-1907

7982

6544

14.526

The imports and exports during the year 1 906-1 907 (total value

£14,526,234) were distributed as

sterling) : —

Russia 8292

Great Britain . . . 3128

Turkey 1335

France 700

Austria 277

Afghanistan . . . 203 Germany … .182 China 142

follows (values in thousands

U.S. America Italy …. Egypt . . . Netherlands Belgium Switzerland Sweden . Other countries .

69 65 41 37 24 22 8

I

14.526

While the value of the trade between Great Britain and Persia in 1906-1907 was almost the same as in 1897, that of the trade with Russia had increased from 3J millions to 8| or 137 %. The average yearly value of the trade between Great Britain and Persia during the six years was £2,952,185 (imports £2,435,016, exports £517,169); between Russia and Persia £6,475,866 (imports £3,350,072, exports £3,125,794). The average values of the trade with other coun- tries were: France £666,000, Austria £246,000, Germany £124,000, Italy £79,ooo,United States of America £52,000, Netherlands £39,000.

The principal imports into Persia in approximate order of value are cottons, sugar, tea, woollens, cotton yarn, petroleum, stuffs of wool and cotton mixed, wool, hardware, ironmongery, matches, iron and steel, dyes, rice, spices and glassware. The principal exports are fruits (dried and fresh), carpets, cotton, fish, rice, gums, wool, opium, silk cocoons, skins, live animals, silks, cottons, wheat, barley, drugs and

tobacco.

Shipping and Navigation.— Shipping under the Persian flag is restricted to vessels belonging to the Persian Gulf ports. Some of the larger craft, which are called baglah, and vary from 50 to 300 tons, carry merchandise to and from Bombay, the Malabar

coast, Zanzibar, &c. ; while the smaller vessels, called bagarah, and mostly under 20 tons, are employed in the coasting trade and the pearl-fisheries on the Arabian coast. It is estimated that the four principal ports and the many smaller ones (as Mashur, Hindian, Zaidin, Bander, Dilam, Rig, Kongan, Taheri, Kishm, Hormuz, &c.) possess at least 100 baglahs and several hundred bagarahs, besides a large number of small boats. The following figures from the commercial statistics published by the Persian Customs Department show the total shipping at the four principal Persian Gulf ports, Bushire, Bander Lingah, Bander Abbasi and Muhamrah during the years 1904-1907.

	1904-1905.	1905-1906.	1906-1907.
	Tons.	Tons.	Tons.
British . . .	671,386	827,539	826,594
Persian .			

36,797

25,069

6,425

Russian

24,121

29,182

40,616

Arabian .

22,487

16,749

7-932

Turkish

3.176

3,877

5,005

French

2,901

57o

—

German .

Total . .

—

52,935

760,868

902,986

939,507

The British shipping amounted to 89-2 % of the total shipping at the four ports during the years 1904-1907. There was no German shipping in the gulf before 1906, but in the first year of its appearance (1906-1907), its tonnage at the gulf ports was almost as much as that of all other nations with the exception of Great Britain.

The shipping of 1906-1907 was distributed among the four ports as follows : —

Bushire . . . 354,798 tons. Bander Lingah 155,720 „

Bander Abbasi Muhamrah

245,746 tons.

183,243 ,-

Bander Lingah being the port where most of the pearls obtained on the Arabian coast of the gulf are brought to and exported from, has more native shipping (all sailing vessels) than the other ports.

All the shipping on the Caspian is under the Russian flag 1 and no returns of the arrivals and departures of vessels at the Persian ports were published before 1906. According to the statistics of the customs department the shipping of the Persian ports amounted in 1906-1907 to 650,727 tons. The shipping at the principal Persian ports on the Caspian in the year 1 906-1907 was: Astara 137,935 tons; Enzeli 292,132 tons; Meshed i Sar 90,799 tons; Bander-i-Gez 56,135 tons. Two or three flat-bottomed sailing vessels navigate the lake of Urmia in north-western Persia, carrying merchandise, principally agricultural produce, from the western and south-western shores to the eastern for the supply of Tabriz. The navigation is a state monopoly, leased out for £250 per annum.

Coinage, Weights and Measures. — The monetary unit is the kran, a silver coin, formerly weighing 28 nakhods (88 grains), then reduced to 26 nakhods (77 grains), and now weighing only 24 nakhods (71 grains) or somewhat less. Before the new coinage came into use (1877) the proportion of pure silver was from 92 to 95%; subsequently the proportion was for some time 90%; now it is about 89! %. In consequence of this depreciation of the coin- age and the fall in the price of silver, partly also in consequence of exchange

transactions by banks, the value of the kran has since 1895 rarely been more than 4-8od., or half what it was in 1874, and fell to less than 4d. in 1905. In 1874 the kran was worth a franc; in June 1908 the exchange for a £1 bill on London was 50 krans which gives the value of I kran as 4|d. Taking this value of the kran, the values of the various nickel and silver coins in circulation work out as:—

Nickel Coins. Shahi = 2 pul . . o-24d. Two shahis = 4 pul . o-48d.

Silver Coins. Five shahis = { kran . I -20d. Ten shahis = J kran . 2-4od. One kran =20 shahis =

40 pul …. 4-8od. Two krans …. 9-6od.

In 1899 from 80 to 83 copper shahis (weighing about f lb) were being given for one silver kran. This was owing to the depreciation of the copper coinage from 1896 onwards, consequent upon there being an excess of coinage due to the excessive quantities formerly put in circulation from the mint. Accordingly the government in 1900 replaced the copper by a nickel coinage (face value of nickel coin in circulation end of 1907, 4,000,000 krans). Accounts are

1 By article v. of the Treaty of Gulistan of 1813, confirmed by article viii. of the Treaty of Turkmanchai of 1828, it was declared that Russia alone should have the right of maintaining vessels of war on the Caspian, and that no other Power should fly the military flag on that sea; and by a decision of the council of the Russian Empire, published on the 24th of November 1869, the establishment of companies for the navigation of the Caspian, except by Russian subjects, and the purchase of shares of such companies by foreigners were prohibited. (State Papers, vol. lxiii. 925.)

640 misl

cals = 6-49 lb

720

= 7-30 „

1000 ,,

= 10-14 „

1280

= 12-98 „

2560

= 25-96 „

840 „

= 8-52 „

720 ,,

= 116-80 „

kept in dinars, formerly a gold piece, now an imaginary coin yjˆj of a kran. Ten thousand dinars are equal to one toman (a word meaning ten thousand), or 10 krans silver, and 50 dinars are one shahi.

Gold coins are: J, J, 1, 2, 5, and 10 toman pieces, but they are not in circulation as current money because of their ever-varying value in silver krans, which depends upon the exchange on London. The unit of weight is the miskal (71 grains), subdivided into 24 nakhods (2-96 grains), a nakhod being further subdivided into 4 gandum (-74 grains). Larger weights, again, are the sir (16 miskals) and the abbasi, wakkeh, or kervankeh (5 sir). Most articles are bought and sold by a weight called batman, or man, of which there are several kinds, the principal being : —

Man-i-Tabriz = 8 abbasis

Man-i-Noh abbasi =9 abbasis

Man-i-Kohneh (the old man)

Man-i-Shah = 2 Tabriz mans

Man-i-Rey = 4 ,, ,,

Man-i-Bander abbasi

Man-i-Hashemi = 16 mans of Corn, straw, coal, &c, are sold by kharvar = ioo Tabriz mans = 649 lb.

The unit of measure is the zar or gez, of which, as in the case of the man, there are several variants. 40-95 in. is the most common length for the zar, but in Azerbaijan the length is 44-09 in. Long distances are calculated in farsakhs, a farsakh being equal to 6000 zar. Probably the

zar in this measure = 40-95 in., which makes the farsakh 3-87 m., but the other length of the zar is sometimes used, when the farsakh becomes 4-17 m. Areas are measured in jeribs of from 1000 to 1066 square zar of 40-95 in., the surface unit thus being from 1294 to 1379 sq. yds.

Constitution and Government. — Up to the year 1906 the government of Persia was an absolute monarchy, and resembled in its principal features that of the Ottoman Empire, with the excep- tion, however, that the monarch was not the religious head of the community. The powers of the Shah (Shahanshah, 2 or ” king of kings “) over his subjects and their property were absolute, but only in so far as they were not opposed to the shar’, or ” divine law,” which consists of the doctrines of the Mahom- medan religion, as laid down in the Koran, the oral commentaries and sayings of the Prophet, and the interpretations by his successors and the high priesthood. In 1905, however, the people began to demand judicial reforms, and in 1906 cried out for representative institutions and a constitution. By a rescript dated the 5th of August Muzaffar-ud-Dln Shah gave his assent to the formation of a national council {Majlis i shora i milli), to be composed of the representatives of the various classes: princes, clergy, members of the Kajar family and tribe — chiefs and nobles, landowners, agriculturists, merchants and trades- men. By an ordinance of the 10th of September the number of members was fixed at 162 (60 for Teheran, 102 for the provinces) to be raised to 200 if necessary, and elections were held soon after. Electors must be males and Persian subjects of not less than 25 years of age and of good repute. Landowners must possess land of at least 1000 tomans (£200) in value, merchants and tradesmen must have a fixed and well-known place of business or shop with an annual value of not less than the average values in the localities where they are established. Soldiers and persons convicted of any criminal offence are not entitled to vote. The qualifications for membership are know- ledge of the Persian language and ability to read and write it and good repute in the constituency. No person can be elected who is an alien, is under the age of 30 years or over the age of 70 years, is in the employ of the government, is in the active service of the army or navy, has been convicted of any criminal offence, or is a bankrupt.

On the 7 th of October the national council, or as many mem- bers of it as could be got together, was welcomed by the shah and elected a president. This was considered as the inaugura- tion and formal opening of parliament. An ordinance signed

2 We see this title in its old Persian form, Khshayathiya Khshaya- thiy,

in the cuneiform inscriptions; as BacnX«os BacriXewv on the coins of the Arsacides, and as the Pahlavi Malkan Malka on the coins and in the inscriptions of the Sassanians. With the Mahom- medan conquest of Persia and the fall of the Sassanians the title was abolished ; it was in use for a short time during the 10th century, having been granted to Shah Ismail Samani by the Caliph Motadid A.D. 900; it appeared again on coins of Nadir Shah, 1736-1747, and was assumed by the present dynasty, the Kajars, in 1799.

RELIGION]

by Muzaffar-ud-Din Shah, Mahommed Ali Mirza (his successor) and the grand vizir, on the 30th of December 1906, deals with the rescript of the 5th of August, states the powers and duties of the national council and makes provision for the regulation of its general procedure by the council itself. The members have immunity from prosecution except with the knowledge of the national council. The publicity of their proceedings except under conditions accepted by the council is secured. Ministers, or their delegates may appear and speak in the national council and are responsible to that body, which also has special control of financial affairs and internal administration. Its sanction is required for all territorial changes, for the alienation of state property, for the granting of concessions, for the contracting of loans, for the construction of roads and railways, for the ratification of treaties, &c. There was to be a senate of 60 members of whom 30 were to be appointed to represent the shah and 30 to be elected on behalf of the national council, 15 of each class being from Teheran and 15 from the provinces (the senate, however, was not immediately formed).

By a rescript dated February 2, 1907, Mahommed Ali Shah confirmed the ordinance of the 30th of December, and on the 8th of October 1907 he signed the final revised constitution, and took the oath which it prescribes on the 12th of November in the presence of the national council.

In accordance with the constitution the shah must belong to the Shlah faith, and his successor must be his eldest son, or next male in succession, whose mother was a Kajar princess. The shah's civil list amounts to 500,000 tomans (£100,000).

The executive government is carried on under a cabinet composed of seven or eight vizirs (ministers), of whom one, besides holding a portfolio, is vizir azam, prime minister. The vizirs are the ministers of the interior, foreign affairs, war, justice, finance, commerce, education, public works.

Until 1906 the shah was assisted in the task of government by the sadr azam (grand vizir), a number of vizirs, ministers or heads of departments somewhat on European lines, and a ” grand council of state,” composed of some ministers and other members nomin- ated by the shah himself as occasion required. Many of the ” ministers ” would have been considered in Europe merely as chiefs of departments of a ministry, as, for instance, the minister for Crown buildings, that for Crown domains, the minister of cere- monies, those for arsenals, army accounts, &c. ; also an accumulation of several offices without any connexion between their functions, in the hands of a single person, was frequently a characteristic departure from the European model. The ministers were not responsible to the Crown in a way that ministers of a European government are; they rarely took any initiative, and generally referred their affairs to the grand vizir or to the shah for final decision.

There were twenty-seven vizirs (ministers), but only some of them were consulted on affairs of state. The departments that had a vizir at their head were the following: court, ceremonies, shah’s secretarial department, interior, correspondence between court and governors, revenue accounts and budget, finance, treasury, outstanding accounts, foreign affairs, war, army accounts, military stores, arsenals, justice, commerce, mines and industries, agri- culture and Crown domains, Crown buildings, public works, public instruction, telegraphs, posts, mint, religious endowments and pensions, customs, press. In addition to these twenty-seven vizirs with portfolios, there were some titulary vizirs at court, like Vizir i Huzur i Humayun (minister of the imperial presence), Vizir i makhsus (extraordinary minister), &c, and a number in the provinces assisting the governors in the same way as the grand vizir assists the shah. Most of these ministers were abolished tinder the new constitution, and the heads of subsidiary depart- ments are entitled tnudir or rais, and are placed under the responsible ministers.

Religion. — About 9,000,000 of the population are Mahom- medans of the Shiah faith, and 800,000 or 900,000, principally Kurds in north-western Persia, are said to belong to the other great branch of Islam, the Sunni, which differs from the former in religious doctrine and historical belief, and is the state religion of the Turkish Empire and other Mahommedan countries. Other religions are represented in

Persia by about 80,000 to 90,000 Christians (Armenians, Nestorians, Greek Orthodox and Roman Catholics, Protestants), 36,000 Jews, and 9000 Zoroastrians.

Society in Persia, being based almost exclusively on religious law, is much as it was in Biblical times among the Jews, with this

difference, however, that there exists no sacerdotal caste. In Persia any person capable of reading the Koran and interpreting its laws may act as a priest {mullah), and as soon as such a priest becomes known for his just interpretation of the shar' and his superior knowledge of the traditions and articles of faith, he becomes a mujtahid, literally meaning " one who strives " (to acquire knowledge), and is a chief priest. The mullahs are referred to in questions concerning religious law, hold religious assemblies, preach in mosques, teach in colleges, and are appointed by the government as judges, head-preachers, &c. Thus the dignitaries, whose character seems to us specially a religious one, are in reality doctors, or expounders and interpreters of the law, and officiating ministers charged with the ordinary accomplish- ment of certain ceremonies, which every other Mussulman, " true believer," has an equal right to fulfil. Formerly there were only four or five mujtahids in Persia, now there are many, sometimes several in one city — Teheran, for instance, has ten; but there are only a few whose decisions are accepted as final and without appeal. The highest authority of all is vested in the mujtahid who resides at Kerbela, or Nejef, near Bagdad, and is considered by many Shi'ites as the vicegerent of the Prophet and representative of the imam. The shah and the government have no voice whatever in the matter of appointing mullahs or mujtahids, but frequently appoint sheikhs-ul-islam and cadis, and occasionally chief priests of mosques that receive important subsidies out of government funds. The chief priest of the principal mosque of a city, the masjid i jami ', is called imam juma', and he, or a representative appointed by him, reads the khutba, " Friday oration," and also preaches. The reader of the khutba is also called khatib. The leader of the prayers in a mosque is the pishnamaz, and the crier to prayers is the mu'azzin. Many priests are appointed guardians of shrines and tombs of members of the Prophet's family (imams and imamzadehs) and are responsible for the proper administration of the property and funds with which the establishments are endowed. The guardian of a shrine -is called mutavali, or, if the shrine is an important one with much property and many attendants, mutavali-bashi, and is not necessarily an ecclesiastic, for instance, the guardianship of the great shrine of Imam Reza in Meshed is generally given to a high court functionary or minister as a reward for long services to the state. In the precincts of a

great shrine a malefactor finds a safe refuge from his pursuers and is lodged and fed, and from the security of his retreat he can arrange the ransom which is to purchase his immunity when he comes out.

Formerly all cases, civil and criminal, were referred to the clergy, and until the 17th century the clergy were subordinate to a kind of chief pontiff, named sadr-us-sodur, who possessed a very extended jurisdiction, nominated the judges, and managed all the religious endowments of the mosques, colleges, shrines, &c. Shah Safi (1 629-1 642), in order to diminish the influence of the clergy, appointed two such pontiffs, one for the court and nobility the other for the people. Nadir Shah (1 736-1 747) abolished these offices altogether, and seized most of the endowments of the ecclesiastical establishments in order to pay his troops, and, the lands appropriated by him not having been restored, the clergy have never regained the power they once possessed. Many members of the clergy, particularly those of the higher ranks, have very liberal ideas and are in favour of progress and reforms so long as they are not against the shar', or divine law; but, unfortunately, they form the minority.

The Armenians of Persia, in so far as regards their ecclesiastical state, are divided into the two dioceses of Azerbaijan and Isfahan, and, since the late troubles in Turkey, which caused many to take refuge in Persia, are said to number over 50,000. About three-fifths of this number belong to the diocese of Azerbaijan, with a bishop at Tabriz, and reside in the cities of Tabriz, Kho'i, Selmas, Urmia and Maragha, and in about thirty villages close to the north-western frontier; the other two-fifths, under the diocese of Isfahan, with a bishop in Julfa, reside .in Teheran, Hamadan, Julfa, Shiraz, Bushire, Resht, Enzeli and other towns, and in some villages in the districts of Chahar Mahal, Feridan, Barbarud, Kamareh, Kazaz, Kharakan, &c. Many Persian Armenians are engaged in trade and commerce, and some of

their merchants dispose of much capital, but the bulk live on the proceeds of agriculture and are poor.

The Nestorians in Persia, all living in cities and villages close to the Turkish frontier, numbered about 25,000 to 30,000 but many of them, some say half, together with two or three bishops, recently went over

to the Greek Orthodox (Russian) Church, in consequence of the unsatisfactory protection afforded them by their patriarch, who resides in Mosul. These latter are now cared for by an archi- mandrite of Russian nationality and some Russian priests.

The Greek Orthodox Catholics are represented by Russians, who reside in northern Persia; they have a church at the Russian legation in Teheran, and another at the Russian consulate in Tabriz.

The Roman Catholics in Persia, Europeans and natives (mostly Armenians), number about three or four thousand, and have churches in Teheran, Julfa and Azerbaijan, served by members of the French Lazarist Mission. They also have some orphanages, schools and medical dispensaries, under the care of sisters of charity of St Vincent de Paul.

The Protestants, Europeans and natives (converted Armenians and Nestorians), number about 6500. The religious missions ministering to their spiritual welfare are: (1) The board of foreign missions of the Presbyterian Church in the United States of America, which has six establishments in Persia: Urmia since 1835, Teheran since 1872, Tabriz since 1873, Hamadan since 1880, Resht since 1902 and Kazvin since 1903. The establishments of Tabriz and Urmia form the Western Persia Mission, those of Teheran, Hamadan, Resht and Kazvin the Eastern Persia Mission. The former mission has 24 churches, 118 schools, 2 hospitals and 4 dispensaries ; the latter has 4 churches, 11 schools, 2 hospitals and 4 dispensaries. (2) The Church Missionary Society, established in Persia since 1869. In June 1908 it had 4 places of worship (Julfa, Yezd, Kerman, Shiraz), 5 schools (Julfa, Isfahan, Yezd, Kerman and Shiraz). There are also hospitals and dispensaries for men and women at Julfa, Isfahan, Yezd and Kerman. The hospitals at Julfa and Isfahan have ac- commodation for 100 patients each, and are sometimes full to overflowing; the dispensaries are generally overcrowded. The establishment of the Church Missionary Society is under the care of a bishop, who resides at Julfa and is under the bishop of London. (3) The Anglican mission, which was established by Dr Benson, archbishop of Canterbury, and has its work among the Nestorians in Azerbaijan. (4) The London Society for promoting Christianity among the Jews, which was established at Teheran in 1876, and at Isfahan and Hamadan in 1889. It has in Teheran a church and a school, at Isfahan a school and at Hamadan a small school. (5) The British and Foreign Bible Society has been represented at Isfahan since 1879.

The Jews in Persia number about 36,000, and are found in nearly all

cities of the country, but communities with synagogues and

§riests exist only in the larger cities like Teheran, Isfahan, Yezd, hiraz, Hamadan, &c.

The Zoroastrians, commonly called ” gabrs,” numbering about 9000, reside principally in the cities and villages of Yezd and Ker- man, and only three or four hundred live in Teheran, Kashan, Isfahan and Shiraz, some engaged in trade and commerce, but most of them employed in agricultural work and gardening. Their interests are attended to by a delegate who is appointed by the Bombay Parsis and resides at Teheran.

The non-Mussulman Persian subjects, particularly those in the provinces, were formerly much persecuted, but since 1873, when Nasru ‘d-DIn Shah returned to Persia from his first journey to Europe they have been treated more liberally. In cities where many non-Mussulman subjects reside a special official is appointed to protect them; and the ministry of justice has a special section to look after them and see that they are protected against fanaticism and injustice.

Instruction. — Primary schools, maktab (where Persian and a little Arabic, sufficient for reading the Koran, and sometimes also a little arithmetic, are taught to boys between the ages of seven and twelve), are very numerous. These schools are private establishments, and are under no supervision whatever. The payment for tuition varies from fourpence or fivepence to tenpence a month for each child. Colleges, madrasah (where young men are instructed, fed, and frequently also lodged gratuitously), exist in nearly every town. Most of them are attached to mosques, and the teachers are members of the clergy, and receive fixed salaries out of the college funds. The students are instructed in Arabic and Persian literature, religion, inter- pretation of the Koran, Mussulman law, logic, rhetoric, philo- sophy and other subjects necessary for admittance to the clergy, for doctors of law, &c, while modern sciences are neglected. Families who have means and do not desire their children to become members of the clergy, employ private tutors, and several have latterly obtained the services of English and French professors to educate their children, while others send their boys to school in England, France, Germany and Russia. At

the beginning of Nasru’d-Din Shah’s reign, a public school on the lines of a French lycee was opened in Teheran, principally with the object of educating officers for the army, but also of introducing a knowledge of Western science and languages, and a ministry of public instruction was created at the same time. Military and civilian teachers were

obtained from Europe, and the state granted a large sum of money for the support of the establishment. The tuition is gratuitous, and the pupils are clothed and partly fed at government expense. Some years later a similar school, but on a much smaller scale, was opened in Tabriz. After a time the annual grant for the support of these two schools was reduced, and during the years 1890-1908 amounted to only £5000. The average number of pupils was about 250, and until the beginning of 1899 these two schools were the only establishments under the supervision of the minister of public instruction. Soon after his accession in 1896 Muzaffar-ud-Din Shah expressed a desire that something more should be done for public instruction, and in the following year a number of Persian notables formed a committee and opened some schools in Teheran and other places in the beginning of 1898. A year later the new schools, until then private estab- lishments, were placed under the minister of public instruction. The new schools at Teheran have from 1000 to 1400 pupils.

A German school with an annual grant of £2400 from Persia and of £1000 from Germany was opened at Teheran in 1907. There is also established a French school under the auspices of the Alliance Francaise. Much has been and is being done for education by the Armenians and the Protestant and Roman Catholic missions in Persia, and a large percentage of the pupils is composed of Mussul- mans. The Alliance Israelite has opened a school in Teheran. In 1907 the American Protestant mission had 129 schools with 3423 pupils, the English Protestant missions had 5 schools with 425 pupils, the Roman Catholic mission (Lazaristes) had 3 schools with 400 pupils, and the Armenians had 4 schools and 646 pupils. All these schools are supported by voluntary subscriptions and donations, and instruct both boys and girls.

Army. — Persia had no regular army until 1807, when some regiments of regular infantry (sarbaz) were embodied and drilled by the first French military mission to Persia under General Gardane. Since then seven other military missions (two British, two French, two Austrian, and one Russian) have come to Persia at the request of the Persian government, and many officers and non-commissioned officers, and even civilians, of various nationalities, have been engaged as army instructors. The last serious attempt to reorganize the Persian army was made in 1879, when the second Austrian mission formed the ” Austrian corps ” of seven new battalions of 800 men each. These new battalions were disbanded in 1882. The Russian mission of 1879 has been the most successful, and the so-called ” Cossack brigade” which it formed has always been commanded by Russian officers. The brigade has a strength of about 1800 men and

costs £50,000 per annum. The total annual expenditure for the army amounts to about a third of the total revenues of the government.

According to statistics published for 1905 the Persian army has an effective force of about 91,000 men, but the number of men actually serving with the colours does not exceed 35,000: —

Artillery 5309

Irregular cavalry H.957

Infantry, 79 battalions of 400-1000 men each . . 63,865

Cossack brigade, artillery, horse and foot . . . 1800

Road and frontier guards, horse and foot . . . 5493

Total 91,334 Navy. — The Persian government possesses nine steamers. One is the “Nasru ‘d-Dln,” an old yacht of about 120 tons, presented in the ‘seventies by the emperor of Russia, and stationed at Enzeli, the port of Resht. The others, all employed in the customs service in the Persian Gulf, are the following: The ” Persepolis,” built 1884, 600 tons, 450 h.p., with three 7J cm. and one 85 cm. Krupp. The ” Susa,” built 1884, 36 tons, with one Krupp. An old Belgian yacht ” Sehka,” purchased 1903 and renamed ” Muzafferi,” with two Hotchkiss guns. Five launches built in the Royal Indian Marine Docks, Bombay, in 1905, at a cost of 60,000 rupees each, of about 80 tons.

JUSTICE: FINANCE]

PERSIA

20I

Justice. — By the theory of a Mahommedan state there should be no other courts of justice except those established for the ad- ministration of the shar’, the ” divine or written law,” but in Persia there is another judicature, which is called ‘urf and repre- sents the ” customary ” or ” known and unwritten law.” Justice) therefore, is administered by the shah and his representatives according to one law and by the clergy according to another, but the decisions of the former must not be opposed to the fundamental doctrines of Islam. The shah’s representatives for the adminis- tration of justice are the governors and other officers already mentioned. The officials charged with the administration of justice according to the shar’ are judges, called sheikh-ul-islam and kazi (kadhi, kadt or cadi of Arabs and Turks),

members of the clergy appointed by the government and receiving a fixed salary, but some cities are without regular appointed judges and the title of cadi is almost obsolete; decisions according to the shar' axe given by all members of the clergy, ranging from ignorant mullahs of little villages and cantons to learned mujtahids of the great cities. If the parties to the suit are dissatisfied with the judgment, they may appeal to a priest who stands higher in public estimation, or one of the parties may induce a higher authority by bribery to quash the judgment of the first. Unfortunately, many members of the clergy are corrupt, but the mujtahids, as a rule are honest and entirely trustworthy. The functions of the representatives of the shar' are now limited to civil cases, while all criminal cases are referred to the 'urf, which, however, also takes cognizance of civil disputes, should the parties desire it.

In criminal cases the dispensation of justice is always summary, and, when the offence is small, the whole procedure, including the examination of witnesses and criminal, as well as the decision and the punishment, a bastinado, is a matter of some minutes. For commercial cases, not paying a bill in time, bankruptcies, &c, a kind of jurisdiction is exercised by the minister of commerce, or a board of merchants, but the decisions of the minister, or those of the board, are rarely final. In Teheran the board of merchants is presided over by the malik ut tujjar, " King of Merchants," in the provincial cities by a person called malik amin, and muin of merchants.

After his second journey to Europe in 1878 Nasru'd-Din Shah desired to organize a police for the whole of Persia on the European system, but only a small body of police, in the capital and its immediate neighbourhood, was created in 1879. Its strength is 60 mounted policemen and 190 foot, with II superior and 40 subaltern officers.

There is also a " Tribunal of the Ministry for Foreign Affairs," presided over at Teheran by an official of the foreign office, and in the provincial cities by the harguzars, " agents," of that depart- ment. The functions of this tribunal are to inquire into and judge differences and suits between Persian subjects and foreigners, and it is stipulated in the treaty of Turkmanchai, which is the basis of all existing treaties between Persia and other countries, that " such differences and suits shall only be examined and judgment given in the presence of the dragoman of the mission or consulate (of the foreign subject), and that, once judicially concluded, such suits shall not give cause to a second inquiry. If, however, cir- cumstances should be of a nature to require a second inquiry, it shall not take place without previous notice given to the minister, or the charge d'affaires, or the consul,

and in this case the business shall only be proceeded with at the supreme chancery of the shah at Tabriz or Teheran, likewise in the presence of a dragoman of the mission, or of the consulate." (Article vii.)

A foreign subject implicated in a criminal suit cannot be pursued or molested in any way unless there exist full proofs of his having taken part in the crime imputed to him, and should he be duly convicted of the crime, he is handed over to his legation, which either sends him back to his own country to undergo the punish- ment established by law, or, according to more recent usage, punishes him in Persia by fine, imprisonment, &c. In this respect the powers of the foreign representatives in Persia, now numbering ten (Great Britain, Russia, France, Turkey, Austria-Hungary, Germany, United States of America, Italy, Belgium and the Netherlands) vary considerably, some having the power of con- demning a criminal to death, while others cannot do more than fine and imprison for short periods. Suits, civil and criminal, between foreign subjects are altogether out of Persian jurisdiction, and are judged by the representatives of the foreign powers accredited to Persia.

In 1889, after Nasru 'd-Din Shah's return from his third visit to Europe, the council of state was instructed to compile a code of law for the regulation of justice. A beginning was made by order- ing the translation of the Code Napoleon, the Indian Mahommedan code, and the Code Napoleon as modified for Algeria; but nothing further was done.

Finance. — The fixed revenues of Persia are derived from (1) regular taxation (maliat) composed of taxes on lands, flocks, herds, shopkeepers, artisans and trade; (2) revenues from Crown lands; (3) customs ; (4) rents and leases of state monopolies. There is also a kind of irregular revenue derived from public requisitions, presents, fines, confiscations, &c, nowadays not producing much. The land tax, which varies according to localities, is paid in money

and kind, and should amount on an average to about 25% of the yield of the soil. The taxation on flocks and herds exists either as a supplementary method of land taxation, or as a contribution of a certain sum per animal, and the tax on shopkeepers, artisans and trades sometimes takes the form of a poll-tax, sometimes that of an impost on the profits of the trades. The revenue from Crown lands consists of a certain proportion of the produce, and also varies much according to localities. Until March 1899 all the customs were farmed out, but since then they have been organized on European principles,

with the help of Belgian officials. By treaties with Russia and Great Britain, concluded in 1901 and 1903 respectively, the 5% duty fixed by the Turkmanchai treaty was abolished, and an equitable tariff was established. The revenues from rents and leases of state monopolies are derived from posts, telegraphs, mines, mint, forests, banks, fisheries, factories, &c, and amount to about £110,000 per annum.

The total revenue of Persia, from all sources, amounted in 1876 to 58,700,000 krans, in 1884 to 50,800,000, in-i890 to 60,000,000; and in 1907-1908 to about 80,000,000 krans. This would seem to show a steady increase, but when we consider that the value of the kran in 1876 was nearly 8ˆ d., and has fallen in consequence of the great depreciation of silver to only 4! d., the total revenue really decreased from £1,950,000 in 1876 to £1,600,000 in 1907- 1908. Out of the actual total revenue £500,000 is represented by customs and £110,000 by rents and leases of state monopolies, leaving £990,000 for maliat and revenues of Crown lands. In 1876 the two latter items amounted to about £1,600,000, while the two former were only £350,000 instead of £610,000 in 1907- 1908. While the prices in krans of agricultural produce, and hence the profits of the landowners and the wages and profits of artisans and tradesmen, were in 1907-1908 more than double what they were in 1876, the maliat, the backbone of the revenue, has hardly increased at all, being 50,000,000 krans (£1,000,000) against 43,200,000 krans (£1,600,000) in 1876, and showing a decrease of over 37% in sterling money. A new assessment of the maliat, based upon the present value of the produce of lands and actual profits of artisans and tradesmen, has frequently been spoken of, and government, aided by a strong minister of the interior and an able minister of finance, ought to have no difficulty in raising the maliat to its proper level and the total revenues of the country to about two millions sterling.

Until 1888 the yearly expenditure was less than the yearly income, but subsequently the revenues were not sufficient to cover the expenditure, and many payments fell in arrear in spite of empty- ing the treasury of its reserve and contracting numerous loans.

In May 1892 the Persian government concluded a contract with the Imperial Bank of Persia, established by British royal charter in 1889, for a loan of £500,000 at 6%, repayable in the course of forty years, and guaranteed by the customs of Fars and the Persian Gulf ports. The produce of this loan served for the payment of an indemnity to the Imperial Tobacco Corporation, which began in 1890 and had to cease its operations in January 1892. In January 1900 the Persian government, in order to pay the arrears and start afresh with a clear

balance-sheet, contracted a loan through the Banque des PrSts de Perse, a Russian institution connected with the Russian state bank, and established in 1890. This loan was for 22 j million roubles (£2,400,000) at 5% interest, guaranteed by all the Persian customs with the exception of those of Fars and the Persian Gulf ports, and repayable in the course of seventy-five years. In the contract, which was signed at St Petersburg at the end of January 1900, the Persian government "undertook to redeem all its former foreign obligations (the 1892 loan) out of the proceeds of the new loan, and not to contract any other foreign loan before the redemption of the new loan without the consent of the Russian bank. The loan was at 86|, less if for commission and charges, the Persian government thus receiving 85% of the nominal capital, or £2,040,000. The bonds enjoy the full guarantee of the Russian government. The yearly charge for interest and amortization, about £124,000, is to be paid in two half-yearly instalments, and in the event of default the Russian bank will have the right to exercise effective control of the customs with a maximum number of twenty-five European employes. When the contract for the new loan was concluded, the liabilities of the Persian government for the balance of the 1892 loan (about £435,000), temporary loans from various banks, arrears of pays and salaries, and other debts, amounted to over £1,500,000, so that not much margin was left. The shah's visit to Europe in the same year cost the exchequer about £180,000. In March 1902 the Russian bank agreed to grant a further loan of 10 million roubles on the same conditions as those of the first loan, and the whole amount was paid by the end of the year, but another visit of the shah to Europe and reckless expenditure at home made the position worse than before. After November 1903 the expenditure was reduced, and the new customs tariff which came into force on the 14th of February 1903 increased the revenue by nearly £200,000 per annum; it was thought that the expenditure would not exceed the receipts, even if the shah undertook a third voyage in Europe (which he did in 1905). However, in November 1907, when the national assembly or council demanded a budget and made inquiries as to the financial position, it was found that the expenditure for

some years past had been half a million sterling per annum in excess of the receipts and that considerable sums were owing to banks and commercial firms who had lent money. Most of the money borrowed

is at 12 to 15% interest.

Banking. — It was only in 1888 that a European bank (the New Oriental Bank Corporation, Limited) established itself in Persia and modern ideas of banking were introduced into the country. Until then the banking was done by the native money-changers (sarrafs) and some merchants — foreign and native — who occasion- ally undertook special outside transactions. In 1889 the shah granted a concession to Baron Julius de Reuter for the formation of a state bank with the exclusive right of issuing bank-notes — not exceeding £800,000 without special assent of the Persian government — on the basis of the local currency, the silver kran. With the title of ” The Imperial Bank of Persia ” the bank was formed in the autumn of the same year, and incorporated by royal charter granted by Queen Victoria and dated the 2nd of September 1889. The authorized capital was four millions sterling, but the bank started with a capital of one million, and began its business in Persia in October 1889. In April 1890 it took over the’Persian business of the New Oriental Bank Corporation, soon afterwards opened branches and agencies at the principal towns, and issued notes in the same year. During the first two years the bank re- mitted the greater part of its capital to Persia at the then prevailing exchange, and received for every pound sterling 32 to 34 krans; but in consequence of the great fall in silver in 1893 and 1894, the exchange rose to 50 krans per pound sterling and more, and the bank’s capital employed in Persia being reduced in value by more than one-third — 100 krans, which at the beginning represented £3, then being worth only £2 or less — the original capital of one million sterling was reduced to £650,000 in December 1894. The bank has made steady progress in spite of innumerable difficulties, and paid a fair dividend to its shareholders. In his paper on ” Banking in Persia ” {Journal of the Institute of Bankers, 1891), Mr Joseph Rabino pointed out the great difficulties which make the easy distribution of funds— that is, the providing them when and where required — -a matter of impossibility in Persia, and gives this fact as the reason why the Imperial Bank of Persia has local issues of notes, payable at the issuing branches only, ” for, in a country like Persia, where movements of specie are so costly, slow and difficult as to become impracticable except on a small scale, the danger of issuing notes payable at more than one place is obvious.” On the 20th of September 1907 the value of the notes in circulation was £395,000, and the bank held £550,000 deposits in Persia.

In 1889 the shah also granted a concession to Jaques de Poliakov of St Petersburg for the establishment of a ” loan bank,” or, as the original concession said, ” mont-de-piete,” with exclusive rights of holding

public auctions. A company was formed in the same year and started business at Teheran in 1890 as the ” Banque des Prets de Perse.” After confining its operations for some years to ordinary pawnbroking, without profits, it obtained the aid of the Russian State Bank, acquired large premises in Teheran,; made advances to the Persian government (since 1898), and in January 1900 and March 1902 financed the loans of £2,400,000 and £1 ,000,000 to Persia. It has branches at Tabriz, Resht, Mesheol and other places.

Various Armenian firms, one with branches at many places in Persia and Russia, also do banking business, while various European firms at Tabriz, Teheran, Isfahan, Shiraz and Bushire, facilitate remittances between Europe and Persia.

The chief business of the native sarrafs (money-changers, bankers; &c.) is to discount bills at high rates, hardly ever less than 12%, and remit money from place to place in Persia for a commission amounting to from 1 to 5, or even 6% on each transaction; and in spite of the European banks giving lower rates of discount and remitting money at par, the majority of the people and mercantile classes still deal with the natives. For advances with good security a native sarraf charges at least 12% interest per annum; as the security diminishes in value the rate of interest increases, and transactions at 10% a month, or more than 120% per annum, are not infrequent. A Persian who obtains an advance of money at less than 12 % considers that he gets money ” for nothing.”

(A. H.-S.)

History

A. — Ancient, to the Fall of the Sassanid Dynasty.

I. The Name. — “Persia,” in the strict significance of the word, denotes the country inhabited by the people designated as Persians, i.e. the district known in antiquity as Persis (q.v.), the modern Fars. Custom, however, has extended the name to the whole Iranian plateau; and it is in this sense that the term Persia is here employed.

II. Ancient Ethnography. — In historical times we find the major portion of Iran occupied by peoples of Indo-European origin, terming themselves Aryans (Arya; Zend, Airya) and their language Aryan — so in the inscriptions of Darius — the

same name, which is used by the consanguineous tribes of India who were their nearest relations. The whole country is designated Ariana

(Zend, Airyana) — ” the land Descent of the Aryans ” — the original of the Middle-Persian of the Eran and the modern Iran; the Greek geo-Iranians. graphers Eratosthenes and Strabo were in error when they limited the name to the eastern districts of Iran. Thus the name of Iranians is understood to comprehend all these people of Aryan nationality.

Besides the Iranians, numerous tribes of alien origin were found in Iran. In Baluchistan, even yet, we find side by side with the eponymous Iranian inhabitants, who only penetrated thither a few centuries ago, theˆfj r ˆ rifies ethnologically and philologically distinct race of the Brahui, who are probably connected with the Dravidians of India. In them we may trace the original population of these districts; and to the same original population may be assigned the tribes here settled in antiquity: the Paricanii and Gedrosii (Gadrosii), and the Myci (Herod, iii. 93, vii. 68; the Maka of Darius, the modern Mekran), to whom the name ” Aethiopians ” is also occasionally applied (Herod, iii. 94, vii. 70). In Media the Greek geographers mention a people of Anariacae (Strabo xi. 508, 514; Pliny, Nat. Hist. vi. 48; Ptolem. vi. 25; in Polyb. v. 44. 9, Aviapanai.) , i.e. ” Non-Aryans.” To these the Tapuri, Amardi, Caspii, and especially the Cadusii or Gelae — situated in Ghilan on the Caspian — probably belonged. Presumably they were also related to the tribes of Armenia and the Caucasus. In the chains of Zagros we find, in Babylonian and Assyrian times, no trace of Iranians; but partly Semitic peoples — the Gutaeans, Lulubaeans, &c. — partly tribes that we can refer to no known ethnological group, e.g. the Cossaei (see below), and in Elymais or Susiana the Elymaeans (Elamites).

That the Iranians must have come from the East to their later home, is sufficiently proved by their close relationship to the Indians, in conjunction with whom they pre- Iranians viously formed a single people, bearing the name and Aryan Arya. Their residence must have lain chiefly in /mHaDS – the great steppe which stretches north of the Black Sea and the Caspian, through South Russia, to Turan (Turkestan) and the Oxus and Jaxartes. For here we continually discover traces of Iranian nationality. The names and words of the Scythians (Scoloti) in South Russia, which Herodotus has preserved, are for the most part perfectly transparent Iranian formations, identified by Zeuss and Mullenhoff ; among them are many proper names in Aria-(kpio-) and aspa (-horse-a ottos; Zend, aspa). The predatory tribes of Turan (e.g. the Massa- getae) seem to have belonged to the same stock. These tribes are distinguished by the Iranian peasants as Daha (Gr. AAcu), “enemies,” “robbers”; by the Persians as Sacae; and by the Greeks generally as Scythians.

From the region of the steppes the Aryans must have pene- trated into the cultivable land of Eastern Iran: thence one part spread over the district of the Indus, then on again to the Ganges; another moved westward to Zagros and the borders of the Semitic world.

The date of this migration cannot yet be determined with certainty. We know only that the Aryans of India* already occupied the Punjab in the Vedic era, c. 1600 B.C. i* er i $ On the other hand, about the same period a number of the of names, undoubtedly Iranian, made their appear- Iranian ance in Western Asia, (cf. Edward Meyer, ” Zur / M * rawarzana, &c; while the kings of Mitanni on the Euphrates are Artatama, Shutarna, Arta shumara, and Dushratta — names too numerous and too genuinely Iranian to allow of the hypothesis of coincidence. Later still, in the Assyrian inscriptions we occasionally meet with Iranian names borne by North-Syrian princes — e.g. Kundaspi and

Kustaspi (= Hystaspis). Their subjects, on the contrary, speak absolutely different tongues: for the attempts to explain the languages of the Cossaeans, Mitannians, and Arzapians as Indo-European (Iranian) have ended in failure (cf. Blomfield in the American Journal of Philology, xxv. p. i sqq.).

It appears, then, that towards the middle of the second millennium before Christ, the Iranians made a great forward movement to the West, and that certain of their princes — at first, probably in the role of mercenary leaders — reached Mesopotamia and Syria and there founded principalities of their own, much as did the Germans under the Roman Empire, the Normans, Turks, &c. With this we may probably connect the well-known fact that it was about this very period (1700 B.C. approximately) that the horse made its appearance in Babylonia, Egypt and Greece, where for centuries subsequently its use was confined to war and the war-chariot. Before this it was as foreign to the Babylonians, even in the time of Khammurabi, as to the Egyp- tians under the Xllth Dynasty. On the other hand, it had been familiar to the Aryans from time immemorial: indeed they have always been peculiarly a people of riders. Thus it is quite conceivable that they brought it with them into Western Asia: and the quarter from which it came is sufficiently indicated by the fact that the

Babylonians write the word ” horse ” with a group of signs denoting “ass of the East.”

Of the Assyrian kings, Shalmaneser (Salmanassar) II. was the first to take the field against the Medes in 836 B.C., and from that period onwards they are frequently mentioned in the Assyrian annals. Sargon penetrated farthest, receiving in 715 B.C. the tribute of numerous Median town-princes. He gives a list of their names, twenty-three of which are preserved either tvholly or in part, and almost all are unmistakably Iranian; as is also the case with those preserved by Esar-haddon (Assarhaddon) and elsewhere.

The Medes, then, were an Iranian nation, already occupying in the 9th century B.C. their later home in the centre of the Median highland. On the other hand, among their neighbours in Zagros and the north — corresponding to the Anariacae (Non-Aryans) of the Greeks — Iranian names are at best isolated phenomena. With other Iranian tribes the Assyrians never came in contact: for the oft-repeated assertion, that the Parsua, so prominent in their annals, were the Persians or the Parthians, is quite untenable. The Parsua of the Assyrians are located south of Lake Urmia, and can hardly have been Iranians.

None the less, the Assyrian statements with regard to the Medes demonstrate that the Iranians must have reached the west of Iran before 900 B.C. It is probable that at this period the Persians also were domiciled in their later home, even though we have no direct evidence to adduce. If this reasoning is correct, the Iranian immigration must be assigned to the first half of the second pre-Christian millennium.

The Aryans of Iran are divided into numerous tribes; these, again, being subdivided into minor tribes and clans. The Tribes principal, according to the inscriptions of Darius of the — which closely agree with Herodotus — are the Iranians, following, several of them being also enumerated in the Avesta: —

1. The Medes (Mada) in the north-west (see Media).

2. The Persians (Parsa) in the south (see Persis). To these belong the Carmanians and the Utians (Yutiya), who are mentioned expressly by Darius as inhabiting a district in Persis (Beh. III. 40).

3. The Hyrcanians (Varkdna in Darius, Zend Vehrkana) on the eastern corner of the Caspian, in the fertile district of Astarabad.

4. The Parthians (Parthyaei; Pers. Parthava) in Khorasan (see Parthia).

5. The Arians {‘Apeioi, Pers. Haraiva), in the vicinity of the river Arius {Heri-rud), which derived its name from them. This name, which survives in the modern Herat, has of course no connexion with that of the Aryans.

6. The Drangians (Zaranka in Darius, Sarangians in Herod, iii. 93, 117, vii. 67), situated south of the Arians, in the north-west of Afghanistan (Arachosia) by the western affluents of Lake Hamun, and extending to the present Seistan.

7. Arachotians (Pers. Harauvati), in the district of the Helmand and its tributaries, round Kandahar. They are mentioned in the lists of Darius, also by the Greeks after Alexander. In Herodotus their place is taken by the Pactyans, whose name survives to the

present day in the word Pushtu, with which the Afghans denote their language (Herod, iii. 102, iv. 44, vii. 67, 85). Probably it was the old tribal name; Arachosia being the local designation. The Thamanaeans, who appear in Herodotus (iii. 93, 117), must be classed with them.

8. The Bactrians (Pers. Bakhtri), on the northern declivity of the Hindu Kush, as far as the Oxus. Their capital was Bactra, the modern Balkh (see Bactria).

9. The Sogdians (Pers. Sugudu), in the mountainous district between the Oxus and Jaxartes.

10. The Chorasmians (Khwarizmians, Pers. Uvarazmiya), in the great oasis of Khiva, which still bears the name Khwarizm. They stretched far into the midst of the nomadic tribes.

11. The Margians (Pers. Margu), on the river Margus (Murghab); chiefly inhabiting the oasis of Merv, which has preserved their name. Darius mentions the district of Margu but, like Herodotus, omits them from his list of peoples; so that ethnographically they are perhaps to be assigned to the Arians.

12. The Sagartians (Pers. A sagarta) ; according to Herodotus (vii. 85), a nomadic tribe of horsemen; speaking, as he expressly declares, the Persian language. Hence he describes them (i. 125) as a subordinate nomad clan of the Persians. They, with the Drangians, Utians and Myci, formed a single satrapy (Herod, iii. 93). Ptolemy (vi. 2, 6) speaks of Sagartians in the Eastern Zagros in Media.

13. We have already touched on the nomadic peoples (Dala, Dahans) of Iranian nationality, who occupied the steppes of Turkestan as far as

the Sarmatians and Scythians of South Russia. That these were conscious of their Aryan origin is proved by the names Ariantas and Ariapeithes borne by Scythian (Scolot) kings (Herod, iv. 76, 87). Still they were never counted as a portion of Iran or the Iranians. To the settled peasantry, these nomads of the steppe were always ” the enemy ” {dana, daha, AAai, Dahae). Side by side with this name we find ” Turan ” and ” Turanian “; a designation applied both by the later Persians and by modern writers to this region. The origin of the word is obscure, derived perhaps from an obsolete tribal name. It has no connexion what- ever with the much later ” Turks,” who penetrated thither in the 6th century after Christ. Though found neither in the inscriptions of Darius nor in the Greek authors, the name Turan must never- theless be of great antiquity; for not merely is it repeatedly found in the Avesta, under the form Tura, but it occurs already in a hymn, which, without doubt, originates from Zoroaster himself, and in which ” the Turanian Fryana ” and his descendants are commemorated as faithful adherents of the prophet {Yasna, 46, 62).

The dividing line between Iranian and Indian is drawn by the Hindu Kush and the Soliman mountains of the Indus district. The valley of the Kabul (Cophen) is already occupied by Indian tribes, especially the Gandarians; and the Satagydae (Pers. Thatagu) there resident were presumably also of Indian stock. The non-Aryan population of Iran itself has been discussed above. Of its other neighbours, we must here mention the Sacae, a warlike equestrian people in the mountains of the pamir plateau and northward; who are probably of Mongol origin. Herodotus relates that the Persians distinguished ” all the Scythians ” — i.e. all the northern nomads — as Sacae; and this statement is confirmed by the inscriptions of Darius. The Babylonians employ the name Gimiri {i.e. Cimmerians) in the same sense.

III. Civilization and Religion of the Iranians. — In the period when the ancestors of Indian and Iranian alike still formed a single nation — that of the Aryans— they developed a very marked character, which can still be distinctly Rˆifgioa, traced, not only in their language, but also in their religion and in many views common to both peoples. A great number of gods — Asura, Mithras, the Dragon-slayer Vereth-raghna (the Indra of the Indians), the Water-shoot Apam napat (the lightning), &c. — date from this era. So, too, fire-worship, especially of the sacrificial flame; the preparation of the intoxicat- ing soma, which fills man with divine strength and uplifts him to the gods; the injunction to ” good thoughts and good works,” imposed on the pious by Veda and Avesta alike: the belief in an unwavering order (rta) — a lav/ controlling gods and men and dominating them all; yet with this, a belief in the power of magical formulae {mantra), exclamations and

prayers, to whose compulsion not merely demons (the evil spirits of deception — druh) but even the gods {daeva) must submit; and, lastly, the institution of a priesthood of fire-kindlers {athravan), who are' at once the repositories of all sacral traditions and the mediators in all intercourse between earth and heaven. The transition, moreover, to settled life and agriculture belongs to the Aryan

period; and to it may be traced the peculiar sancitity of the cow in India and Persia. For the cow is the animal which voluntarily yields nourishment to man and aids him in his daily labours, and on it depends the industry of the peasant as contrasted with the wild desert brigand to whom the cow is unknown.

Very numerous are the legends common to both nations. These, in part, are rooted in the primeval Indo-European days, though their ultimate form dates only from the Aryan epoch. Foremost among them is the myth relating the battle of a sun- god (Ind. Trita, generally replaced by Indra, Iran. Thraetona) against a fearful serpent (Ind. Ahi, Iran. Azhi; known moreover as Vrtra) : also, the legend of Yama, the first man, son of Vivas- vant, who, after a long and blessed life in the happy years of the beginning, was seized by death and now rules in the kingdom of the departed. Then come a host of other tales of old-world heroes; as the " Glorious One " (Ind. Sushrava, Pers. Husrava, Chosrau or Chosroes), or the Son who goes on a journey to seek his father, and, unknown, meets his end at his hands.

These legends have lived and flourished in Iran at every period of itshistory; and neither the religion of Zoroaster, nor yet Islam, has availed to suppress them. Zoroastrianism — at least in that form in which it became the dominant

creed of the Iranians — legitimized not only the old gods, but the old heroes also; and transformed them into pious helpers and servants of Ahuramazda; while the creator of the great national epic of Persia, Firdousi (a.d. 935-1020), displayed astonishing skill in combining the ancient tradition with Islam. Through his poem, this tradition is perfectly familiar to every Persian at the present day; and the primitive features of tales, whose origin must be dated 4000 years

ago, are still preserved with fidelity. This tenacity of the Saga stands in the sharpest contrast with the fact that the historical memory of the Persian is extremely defective. Even the glories of the Achaemenid Empire faded rapidly, and all but completely, from recollection ; so also the conquest of Alexander, and the Hellenistic and Parthian eras. In Firdousi, the legendary princes are followed, almost without a break, by Ardashir, the founder of the Sassanid dynasty: the intervening episode of Darius and Alexander is not drawn from native tradition, but borrowed from Greek literature (the Alexander-romance of the Pseudo-Callisthenes) in precisely the same way as among the nations of the Christian East in the middle ages. 1

Needless to say, however, this long period saw the Saga much recast and expanded. Many new characters — Siyawush, Rus- tam, &c. — have swelled the original list: among them is King Gushtasp (Vishtaspa), the patron of Zoroaster, who was known from the poems of the prophet and is placed at the close of the legendary age. The old gods and mythical figures reappear as heroes and kings, and their battles are fought no longer in heaven but upon earth, where they are localized for the most part in the east of Iran. In other words, the war of the gods has degenerated to the war between Iranian civilization and the Turanians. Only the evil serpent Azhi Dahaka (Azhdahak) is domiciled by the Avesta in Babylon (Bawri) and depicted on the model of Babylonian gods and demons: he is a king in human form with a serpent growing from either shoulder and feeding on the brains of men. In these traits are engrained the general conditions of history and culture, under which the Iranians lived: on the one hand, the contrast between Iranian and Turanian; on the other, the dominating position of Babylon, which influenced most strongly the civilization and religion of Iran. It is idle, however, to read definite historical events into such traits, or to attempt, with some scholars, to convert them into history itself. We cannot deduce from them a conquest of Iran from Babylon: for the Babylonians never set foot in Iran, and even the Assyrians merely conquered the western portion of Media. Nor yet can we make the favourite assumption of a great empire in Bactria. On the contrary, it is historically

1 The fundamental work on the history of the Iranian Saga is Noldeke., Das iranische Nationalepos 1896 (reprinted from the Grundriss der iran. Philologie, ii.).

evident that before the Achaemenids there were in Bactria

only small local principalities of which Vishtaspa’s was one:

and it is possible that the primeval empire of the Saga is only a

reflection of the Achaemenid and Sassanid empires of reality,

whose existence legend dates back to the beginning of the world,

simply because legend is pervaded by the assumption that the

conditions obtaining in the present are the natural conditions,

and, as such, valid for all time.

Closely connected as are the Mythology and Religion of

Indian and Iranian, no less clearly marked is the fundamental

difference of intellectual and moral standpoint, „„„

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which has led the two nations into opposite paths between the

of history and culture. The tendency to religious Iranianand thought and to a speculative philosophy, compre- (I”? a , a hending the world as a whole, is shared by both and is doubtless an inheritance from the Aryan period. But with the Indians this speculation leads to the complete abolition of all barriers between God and man, to a mystic pantheism, and to absorption in the universal Ego, in contrast with which the world becomes an unsubstantial phantasm and sinks into nothingness. For the Iranian, on the contrary, practical life, the real world, and with them the moral commandment, fill the foreground. The new gods created by Iran are ethical powers; those of India, abstractions of worship (brahman) or of philosophy {atman). These fundamental features of Iranian sentiment encounter us not only in the doctrine of Zoroaster and the confessions of Darius, but also in that magnificent product of the Persia of Islam — the Sufi mysticism. This is pantheistic, like the Brahman philosophy. But the pantheism of the Persian is always positive, —affirming the world and life, taking joy in them, and seeking its ideal in union with a creative god: the pantheism of the Indian is negative — denying world and life, and descrying its ideal in the cessation of existence.

This contrast in intellectual and religious life must have developed very early. Probably, in the remote past violent religious disputes and feuds broke out : for otherwise it is almost inexplicable that the old Indo-European word, which in India, also, denotes the gods — deva—

should be applied by the Iranians to the malignant demons or devils (daeva; mod. div); while they denote the gods by the name bhaga. Conversely the Asuras, whose name in Iran is the title of the supreme god (ahura, aura), have in India degenerated to evil spirits. It is of great importance that among the Slavonic peoples the same word bogu distinguishes the deity; since this points to ancient cultural influences on which we have yet no more precise informa- tion. Otherwise, the name is only found among the Phrygians, who, according to Hesychius, called the Heaven-god (Zeus) Bagaeus; there, however, it may have been borrowed from the Persians. We possess no other evidence for these events; the only document we possess for the history of Iranian religion is the sacred writing, containing the doctrines of the prophet who gave that religion a new form. This is the Avesta, the Bible of the modern Parsee, which comprises the revelation of Zoroaster. As to the home and time of Zoroaster, the Parsee tradition yields us no sort of information which could possibly be of his- torical service. Its contents, even if they go back _ to lost parts of the Avesta, are merely a late patch- work, based on the legendary tradition and devoid of historical foundation. The attempts of West (Pahlavi Texts Translated, vol. v.) to turn to historical account the statements of the Bundahish and other Parsee books, which date Zoroaster at 258 years before Alexander, are, in the present writer's opinion, a complete failure. Jackson {Zoroaster, the Prophet of Ancient Iran, 1001) sides with West. The Greek theory, which rele- gates Zoroaster to the mists of antiquity, or even to the period of the fabulous Ninus and Semiramis, is equally valueless. Even the statement that he came from the north-west of Media (the later Atropatene), and his mother from Rai (Rhagae) in eastern Media, must be considered as problematic in the extreme. Our only trustworthy information is to be gleaned from his own testimony and from the history of his religion. And here we may take it as certain that the scene of his activity was laid in

the east of Iran, in Bactria and its neighbouring regions. The contrast there existing between peasant and nomad is of vital consequence for the whole position of his creed. Among the adherents whom he gained was numbered, as already mentioned, a Turanian, one Fryana and his household. The west of Iran is scarcely ever regarded in the Avesta, while the districts and rivers of the east are often named. The

language, even, is markedly different from the Persian; and the fire-priests are not styled Magians as in Persia— the word indeed never occurs in the Avesta, except in a single late passage — but athravan, identical with the atharvan of India (irvpcuSoi., ” fire-kindlers,” in Strabo xv. 733). Thus it cannot be doubted that the king Vishtaspa, who received Zoroaster’s doctrine and protected him, must have ruled in eastern Iran: though strangely enough scholars can still be found to identify him with the homonymous Persian Hystaspes, the father of Darius. The possibility that Zoroaster himself was not a native of East Iran, but had immi- grated thither (from Rhagae?), is of course always to be con- sidered; and this theory has been used to explain the phenomenon that the Gathas, of his own composition, are written in a different dialect from the rest of the Avesta. On this hypothesis, the former would be his mother-tongue: the latter the speech of eastern Iran.

This district is again indicated as the starting-point of Zoroastrianism, by the fact that dead bodies are not embalmed and then interred, as was usual, for instance, in Persia, but cast out to the dogs and birds (cf. Herod, i. 140), a practice, as is well known, strictly enjoined in the Avesta, ruthlessly executed under the Sassanids, and followed to the present day by the Parsees. The motive of this, indeed, is to be found in the sanctity of Earth, which must not be polluted by a corpse; but its origin is evidently to be traced in a barbaric custom of nomadic or semi-nomadic tribes who leave the dead to lie on the steppe; and we know from Greek sources that this custom was widely diffused among the tribes of eastern Iran.

The next clue towards determining the period of Zoroaster is, that Darius I. and all his successors, as proved by their inscriptions and by Greek testimony, were zealous adherents of the pure word of Zoroastrianism; which consequently must already have been accepted in the west of Iran. That Cyrus too owned allegiance to the creed, cannot be doubted by an unprejudiced mind, although in the dearth of contemporary monuments we possess no proof at first hand. The Assyrian inscriptions demonstrate, however, that Zoroaster’s teaching was dominant in Media two centuries before Cyrus. For in the list of Median princes, to which we have already referred, are two bearing the name of Mazdaka — evidently after the god Mazda. Now this name was the invention of Zoroaster himself; and he who names himself after Mazda thereby makes a con- fession of faith in the religion of Zoroaster whose followers, as we know, termed themselves Mazdayasna, ” worshippers of Mazda.”

Thus, if the doctrine of Zoroaster predominated in Media in 714 B.C.,

obviously his appearance in the r&le of prophet must have been much earlier. A more definite date cannot be deduced from the evidence at our disposal, but his era may safely be placed as far back as 1000 B.C.

The religion which Zoroaster preached was the creation of- a single man, who, having pondered long and deeply the problems of existence and the world, propounded the solution he found as a divine revelation. Naturally he starts from the old views, and is indebted to them for many of his tenets and ideas; but out of this material he builds a uniform system which bears throughout the impress of his own intellect. In this world, two groups of powers confront each other in a truceless war, the powers of Good, of Light, of creative Strength, of Life and of Truth, and the powers of Evil, of Darkness, Destruction, Death and Deceit. In the van of the first stands the Holy Spirit (spenta mainyu) or the ” Great Wisdom ” Mazdao. His helpers and vassals are the six powers of Good Thought (vohu mano, ‘Sluavis), of Right Order (asha, Ind. rto, Pers. aria, ” lawfulness “), of the Excellent Kingdom (khshathra vaifya), of Holy Character (spenta armaiti), of Health (haurvatat) , and of Immortality (ameretat). These are comprised under the general title of “undying holy ones ” (amesha spenta, amshaspand) ; and a host of subordinate angels (yazata) are ranked with them.

The powers of evil are in all points the opposite of the good ; at their head being the Evil Spirit (angra mainyu, Ahriman). These evil demons are identical with the old gods of the popular faith— the devas (div) — while Mazdao bears the name Ahura, above discussed; whence Ahuramazda (Ormuzd).

From this it will be manifest that the figures of Zoroaster’s religion are purely abstractions; the concrete gods of vulgar belief being set aside. All those who do not belong to the devils (devas), might be recognized as inferior servants of Ahuramazda: chief among them being the Sun-god Mithras (see Mithras) ; the goddess of vegetation and fertility, especially of the Oxus-stream, Anahita Ardvisura (Anaitis) ; and the Dragon-slayer Verethraghna (Gr. Artagnes), with the god of the intoxicating Haoma (the Indian Soma). In the religion of the people, these divinities always survived ; and the popularity of Mithras is evinced by the numerous Aryan proper names thence derived (Mithradates, &c). The educated community who had embraced the pure doctrine in its completeness scarcely recognized them, and the inscriptions of Darius ignore them. Only once he speaks of ” the gods of the clans,” and once of ” the other gods which there are.” Not till the time of Artaxerxes II. were Mithra and Anaitis received into the official religion of the Persian kings. But they always played a leading

part in the propaganda of the Persian cults in the West.

Only one element in the old Aryan belief was preserved by Zoro- aster in all its sanctity: that of Fire — the purest manifestation of Ahuramazda and the powers of Good. Thus fire-altars were every- where erected; and, to the prophet also, the Fire-kindlers (athravan) were the ministers and priests of the true religion and the inter- mediaries between God and man; at last in the popular mind, Zoroastrianism was identified with Fire-worship pure and simple, — inadequate though the term in reality is, as a description of its essentials.

Midway in this opposition of the powers of Good and Evil, man is placed. He has to choose on which side he will stand : he is called to serve the powers of Good: his duty lies in speaking the truth and combating the lie. And this is fulfilled when he obeys the com- mands of law and the true order; when he tends his cattle and fields, in contrast with the lawless and predatory nomad (Dahae) ; when he wars on all harmful and evil creatures, and on the devil- worshippers; when he keeps free from pollution the pure creations of Ahuramazda — fire foremost, but also earth and water; and, above all, when he practises the Good and True in thought, word and work. And as his deeds are, so shall be his fate and his future lot on the Day of Judgment ; when he must cross the Bridge Cinvat, which, according to his works, will either guide him to the Paradise of Ahuramazda or precipitate him to the Hell of Ahriman. Obvi- ously, it was through this preaching of a judgment to come and a direct moral responsibility of the individual man, that, like Mahomet among the Arabs, Zoroaster and his disciples gained their adherents and exercised their greatest influence.

In this creed of Zoroastrianism three important points are especially to be emphasized : for on them depend its peculiar charac- teristics and historical significance : —

1. The abstractions which it preaches are not products of meta- physical speculation, as in India, but rather the ethical forces which dominate human life. They impose a duty upon man, and enjoin on him a positive line of action — a definite activity in the world. And this world he is not to eschew, like the Brahman and the Buddhist, but to work in it, enjoying existence and life to the full. Thus a man's birthday is counted the highest festival (Herod, i. 133) ; and thus the joie de vivre, rich banquets and carousals are not rejected by the Persian as godless and worldly, but are even prescribed by his religion. To create offspring and people the world with servants of

Ahuramazda is the duty of every true believer. 1

2. This religion grew up in the midst of a settled peasant popu- lation, whose mode of life and views it regards as the natural disposition of things. Consequently, it is at once a product of, and a main factor in civilization; and is thereby sharply differ- entiated from the Israelite religion, with whose moral precepts it otherwise coincides so frequently.

3. The preaching of Zoroaster is directed to each individual man, and requires of him that he shall choose his position with regard to the fundamental problems of life and religion. Thus, even though it arose from national views, in its essence it is not national (as, for instance, the Israelite creed), but individualistic, and at the same time universal. From the first, it aims at propa- ganda ; and the nationality of the convert is a matter of indifference. So Zoroaster himself converted the Turanian Fryana with his kindred (see above) ; and the same tendency to proselytize alien peoples sur- vived in his religion. Zoroastrianism, in fact, is the first creed to work by missions or to lay claim to universality of acceptance. It was, however, only natural that its adherents should be won, first and chiefly, among the countrymen of the prophet, and its further success in gaining over all the Iranian tribes gave it a national stamp. So t he Susan translation of Darius' Behistun inscription

1 These ideas are strongly exposed in a polemic against the Christians contained in an official edict of the Persian creed to the Armenians by Mihr Narseh, the vizier of Yazdegerd II- (about A.D. 450), preserved by the Armenian historian, Eliane.

terms Ahuramazda " the god of the Aryans." Thus the creed became a powerful factor in the development of an united Iranian nationality.

That a religion, which lays its chief stress upon moral precepts, may readily develop into casuistry and external formalism, with an infinity of minute prescriptions, injunctions on purity and the like, is well known. In the Avesta all these recur ad nauseam, so much so that the primitive spirit of the religion is stifled beneath them, as the doctrine of the ancient prophets was stifled in Judaism and the Talmud. The Sassanid Empire, indeed, is completely dominated by this formalism

and ritualism; but the earlier testimony of Darius in his inscriptions and the statements in Herodotus enable us still to recognize the original healthy life of a religion capable of awaken- ing the enthusiastic devotion of the inner man. Its formal character naturally germinated in the priesthood (Herod, i. 140; cf. Strabo xv – 733 > &c). The priests diligently practise all the precepts of their ritual — e.g. the extermination of noxious animals, and the exposure of corpses to the dogs and birds, that earth may not be polluted by their presence. They have advice for every contingency in life, and can say with precision when a man has been defiled, and how he may be cleansed again; they possess an endless stock of formulae for prayer, and of sentences which serve for protection against evil spirits and may be turned to purposes of magic.

How the doctrine overspread the whole of Iran, we do not know. In the West, among the Medes a.nd Persians, the guardianship ... and ministry of Zoroastrianism is vested in an exclusive

m ri n priesthood — the Magians. Whence this name — unknown agia s. ag a i rea(jy mentioned, to the Avesta — took its rise, we have no knowledge. Herodotus (i. 101) includes the Magians in his list of Median tribes; and it is probable that they and their teaching reached the Persians from Media. At all events, they play here not merely the r61e of the ” Fire-kindlers ” (fithravan) in the Avesta, but are become an hereditary sacerdotal caste, acting an important part in the state — advisers and spiritual guides to the king, and so forth. With them the ritualism and magical character, above mentioned, are fully developed. In the narrations of Herodotus, they interpret dreams and predict the future; and in Greece, from the time of Herodotus and Sophocles (Oed. Tyr. 387) onward, the word Magian connotes a magician-priest.

See further, Zoroaster and works there quoted.

IV. Beginnings of History. — A connected chain of historical evidence begins with the time when under Shalmaneser (Sal- Assyrian manassar II.), the Assyrians in 836 B.C. began for Conquest the first time to penetrate farther into the moun- ot Media. t ams f the east; and there, in addition to several non-Iranian peoples, subdued a few Median tribes. These ‘ wars were continued under successive kings, till the Assyrian power in these regions attained its zenith under Sargon (q.v.), who (715 B.C.) led into exile the Median chief Dayuku (see Deioces), a vassal of the Minni (Mannaeans), with all his family, and subjected the princes of Media as far as the mountain of Bikni (Elburz) and the border of the great desert. At that time twenty-eight Median

“town-lords” paid tribute to Nineveh; two years later, (713 B.C.) no fewer than forty-six. Sargon’s successors, down to Assur-bani-pal (668-626 B.C.), maintained and even augmented their suzerainty over Media, in spite of repeated attempts to throw off the yoke in conjunction with the Mannaeans, the Saparda, the Cimmerians — who had penetrated into the Armenian mountains — and others. Not till the last years of Assur-bani-pal, on which the extant Assyrian annals are silent, can an independent Median Empire have arisen.

As to the history of this empire, we have an ancient account in Herodotus, which, with a large admixture of the legendary, The still contains numerous historical elements, and a

Median completely fanciful account from Ctesias, preserved Empire. j n Diodorus (ii. 32 sqq.) and much used by later writers. In the latter Nineveh is destroyed by the Mede Arbaces and the Babylonian Belesys about 880 B.C., a period when the Assyrians were just beginning to lay the foundations of their power. Arbaces is then followed by a long list of Median kings, all of them fabulous. On the other hand, according to Herodotus the Medes revolt from Assyria about 710 B.C., that is to say, at the exact time when they were subdued by Sargon. Deioces founds the monarchy; his son Phraortes begins the work of conquest; and his son Cyaxares is first overwhelmed by the Scythians, then captures Nineveh, and raises Media ‘to a great power. A little supplementary information may be gleaned from the inscriptions of King Nabonidus of Babylon (555-539)

and from a few allusions in the Old Testament. Of the Median Empire itself we do not possess a single monument. Consequently its history still lies in complete obscurity (cf. Media; Deioces; Phraortes; Cyaxares).

The beginnings of the Median monarchy can scarcely go farther back than 640 B.C. To all appearance, the insurrection against Assyria must have proceeded from the desert tribe of the Manda, mentioned by Sargon: for Nabonidus invariably de- scribes the Median kings as ” kings of the Manda.” According to the account of Herodotus, the dynasty was derived from Deioces, the captive of Sargon, whose descendants may have found refuge in the desert. The first historical king would seem to have been Phraortes, who probably succeeded in subduing the small local princes of Media and in rendering himself independent of Assyria. Further development was arrested by the Scythian invasion described by Herodotus. We know from Zephaniah and Jeremiah that these northern barbarians, in 626 B.C., overran and harried Syria and Palestine (cf. Cyaxares; Jews). With these inroads of

the Cimmerians and Scythians (see Scythia), we must doubtless connect the great ethnographical revolution in the north of anterior Asia; the Indo-European Armenians (Haik), displacing the old Alarodians (Urartu, Ararat), in the country which has since borne their name; and the entry of the Cappadocians — first mentioned in the Persian period — into the east of Asia Minor. The Scythian invasion evidently contributed largely to the enfeeblement of the Assyrian Empire: for in the same year the Chaldaean Nabo- polassar founded the New-Babylonian empire; and in 606 B.C. Cyaxares captured and destroyed Nineveh and the other Assyrian cities. Syria and the south he abandoned to Nabo- polassar and his son Nebuchadrezzar; while, on the other hand, Assyria proper, east of the Tigris, the north of Mesopotamia with the town of Harran (Carrhae) and the mountains of Armenia were annexed by the Medes. Cappadocia also fell before Cyaxares; in a war with the Lydian Empire the decisive battle was broken off by the celebrated eclipse of the sun on the 28th of May 585 B.C., foretold by Thales (Herod, i. 74). After this a peace was arranged by Nebuchadrezzar of Babylon and Syen- nesis of Cilicia, recognizing the Halys as the borderline. To the east, the Median Empire extended far over Iran, even the Persians owning its sway. Ecbatana (q.v.) became the capital. Of the states which arose out of the shattered Assyrian Empire (Media, Babylon, Egypt, Cilicia and Lydia), Media was by far the strongest. In Babylon the kings feared, and the exiled Jews hoped, an attack from the Medes (cf. Isa. xiii., xiv., xxi.; Jer. 1., Ii.); and Nebuchadrezzar sought by every means — great fortifications, canals and so forth — to secure his empire against the menace from the north. He succeeded in maintain- ing the status quo practically unimpaired, additional security being found in intermarriage between the two dynasties. In this state of equilibrium the great powers of Anterior Asia remained during the first half of the 6th century.

V. The Persian Empire of the Achaemenids. — The balance, however, was disturbed in 553 B.C., when the Persian Cyrus, king of Anshan in Elam (Susiana), revolted against conquests his suzerain Astyages, the son of Cyaxares, and of Cynis three years later defeated him at Pasargadae (q.v.). 1 and

Shortly afterwards Astyages was taken prisoner,

Cambyses.

Ecbatana reduced, and the Median Empire replaced by the Persian. The Persian tribes were welded by Cyrus into a single nation, and now became the foremost people in the world (see Persis and Cyrus). At

first Nabonidus of Babylon hailed the fall of the Medes with delight and utilized the opportunity by occupying Harran (Carrhae). But before long he recognized the danger threatened from that quarter. Cyrus and his Persians paid little heed to the treaties which the Median king had concluded with the other powers; and the result was a great coalition against him, embracing Nabonidus of Babylon, Amasis of Egypt, Croesus of Lydia, and the Spartans, whose highly efficient army seemed to the Oriental states of great value. In the spiing of 546 B.C., Croesus opened the attack. Cyrus 1 See further, Babylonia and Assyria: § v. History.

flung himself upon him, beat him at Pteria in Cappadocia and pursued him to Lydia. A second victory followed on the banks of the Pactolus; by the autumn of 546 Sardis had already fallen and the Persian power advanced at a bound to the Medi- terranean. In the course of the next few years the Greek littoral towns were reduced, as also the Carians and Lycians. The king of Cilicia (Syennesis) voluntarily acknowledged the Persian suzerainty. In 539 Nabonidus was defeated and Baby- lon occupied, while, with the Chaldean Empire, Syria and Pales- tine also became Persian (see Jews). The east of Iran was further subdued, and, after Cyrus met his end (528 B.C.) in a war against the eastern Nomads (Dahae, Massagetae), his son Cambyses conquered Egypt (525 B.C.). Cyprus and the Greek islands on the coast of Asia Minor also submitted, Samos being taken by Darius. On the other hand, an expedition by Cam- byses against the Ethiopian kingdom of Napata and Meroe came to grief in Nubia. The usurpation of Smerdis (522-521 B.C.) and his death at the hands of Darius was the signal for numerous insurrections in Babylon, Susiana, Persis, Media, Armenia and many of the Eastern provinces. But, within two years (521-519), they were all crushed by Darius and his generals.

The causes of this astonishing success, which, in the brief space of a single generation, raised a previously obscure and secluded tribe to the mastery of the whole Orient, can only be Arms ana p ar tially discerned from the evidence at our disposal. Armour. tj.ˆ e decisive factor was of course their military superi- ority. The chief weapon of the Persians, as of all Iranians, was the bow, which accordingly the king himself holds in his portraits, e.g. on the Behistun rock and the coins (darics). In addition to the bow, the Persians carried short lances

and short daggers. But it was not by these weapons, nor by hand to hand fighting, that the Persian victories were won. They overwhelmed their enemy under a hail of arrows, and never allowed him to come to close quarters. While the infantry kneeled to shoot, the cavalry swarmed round the hostile squadrons, threw their lines into confusion, and completed their discomfiture by a vigorous pursuit. In a charge the infantry also might employ lance and dagger; but the essential point was that the archers should be mobile and their use of the bow unhampered.

Consequently, only a few distinguished warriors wore shirts of mail. For purposes of defence the rank and file merely carried a light hide-covered shield ; which the infantry, in shooting, planted before them as a sort of barrier against the enemy's missiles. Thus the Persian army was lost, if heavy-armed hoplites succeeded in gaining their lines. In spite of all their bravery, they succumbed to the Greek phalanx, when once the generalship of a Miltiades or a Pausanias had brought matters to a hand to hand conflict ; and it was with justice that the Greeks— Aeschylus, for instance — viewed their battles against the Persian as a contest between spear and bow. None the less, till Marathon the Persians were successful in discomfiting every enemy before he could close, whether that enemy consisted of similarly accoutred bowmen (as the Medes), of cavalry armed with the lance (as the Lydians), or of heavily armoured warriors (as the Babylonians, Egyptians and Greeks).

To all this should be added the superiority of their leaders; Cyrus especially must have been an exceedingly able general. Obviously, also, he must have understood the art of organizing his people and arousing the feeling of nationality and the courage of self-sacrifice. In his time the Persians were a strong manly peasantry, domiciled in a healthy climate and habituated to all hardships — a point repeatedly emphasized, in the tales preserved by Herodotus, as the cause of their successes (e.g. Herod, ix. 122). Herodotus, however, also records (i. 135) that the Persians were " of all mankind the readiest to adopt foreign customs, good or bad," a sentence which is equally applicable to the Romans, and which in the case of both nations goes far to explain, not merely their successes, but also the character of their empires.

The fundamental features of the imperial organization must have been due to Cyrus himself. Darius followed in his steps Orgaaiza- and completed the vast structure. His role, indeed, tloa at was peculiarly that of supplementing and perfecting Darius – the work of his great predecessor. The organization of the empire is planned throughout on

broad, free lines; there is nothing mean and timorous in it. The great god Ahuramazda, whom king and people alike acknowledge, has given them domi- nion “over this earth afar, over many peoples and tongues;” and the consciousness is strong in them that they are masters of the world. Thus their sovereign styles himself ” the king of kings ” and ” the king of the lands ” — that is to say, of the

whole civilized world. For the provinces remaining unsubdued on the extreme frontiers to the west, the north and the east are in their view almost negligible quantities. And far removed as the Persians are from disavowing their proud sense of nation- ality (” a Persian, the son of a Persian, an Aryan of Aryan stock ” says Darius of himself in the inscription on his tomb) — yet equally vivid is the feeling that they rule the whole civilized world, that their task is to reduce it to unity, and that by the will of Ahuramazda they are pledged to govern it aright.

This is most clearly seen in the treatment of the subject races. In contrast with the Assyrians and the Romans the Persians invariably conducted their wars with great humanity. The vanquished kings were honourably Nations. dealt with, the enemy’s towns were spared, except when grave offences and insurrections, as at Miletus and Athens, rendered punishment imperative; and their inhabitants were treated with mildness. Like Cyrus, all his successors welcomed members of the conquered nationalities to their service, employed them as administrators or generals and made them grants of land: and this not only in the case of Medes, but also of Armenians, Lydians, Jews and Greeks. The whole population of the empire was alike bound to military service. The subject-contingents stood side by side with the native Persian troops; and the garrisons— in Egypt, for instance — were composed of the most varied nationalities.

Among the subject races the Medes particularly stood high in favour. Darius in his inscriptions always names them imme- diately after the Persians. They were the predecessors of the Persians in the empire and the more civilized people. Their institutions, court ceremonial and dress were all adopted by the Achaemenids. Thus the tribal distinctions began to recede, and the ground was prepared for that amalgamation of the Iranians into a single, uniform nation, which under the Sassanids was completely perfected — at least for west of Iran.

The lion’s share, indeed, falls to the dominant race itself. The inhabitants of Persis proper — from which the eastern tribes of Carmanians, Utians, &c, were excluded and formed into a separate

satrapy — -pay no taxes. Persians. Instead, they bring the best of their possessions (e.g. a particularly fine fruit) as a gift to their king on festival days; peasants meeting him on his excursions do the same (Plut. Artax. 4. 5; Dinon ap. Aelian. var. hist. i. 31; Xen. Cyr. viii. 5, 21. 7, 1). In recompense for this, he distributes on his return rich presents to every Persian man and woman — the women of Pasargadae, who are members of Cyrus's tribe, each receiving a piece of gold (Nic. Dam. fr. 66. Plut. Alex. 69). In relation to his Persians, he is always the people's king. At his accession he is consecrated in the temple of a warrior-goddess (Anaitis ?) at Pasargadae, and partakes of the simple meal of the old peasant days — a mess of figs, tere- binths and sour milk (Plut. Artax. 3). The Persians swear allegiance to him and pray to Ahuramazda for his life and the welfare of the people, while he vows to protect them against every attack, and to judge and govern them as did his fathers before him (Herod, i. 132; Xen. Cyr. xviii. 5, 25, 27). For helpers he has at his side the " law-bearers " (databara Dan. iii. 2, and in Babyl. documents; cf. Herod, iii. 31, v. 25, vii. 194; Esther i. 13, &c). These — the Persian judges — are nominated by the king for life, and generally bequeath their office to their sons. The royal decision is based on consultation with the great ones of his people: and such is the case with his officials and governors everywhere (cf. the Book of Ezra).

Every Persian able to bear arms is bound to serve the king — the great landowners on horseback, the commonalty on foot. The noble and well-to-do, who need not till their fields in person, are pledged to appear at court as frequently as possible. Their children are brought up in company with the princes " at the gates of the king," instructed in the handling of arms, in riding and hunting, and introduced to the service of the state and the knowledge of the law, as well as the commandments of religion. Then such as prove their worth are called to high office and rewarded, generally with grants of land.

The highest rank was held by the descendants of the six great families, whose heads stood by Darius at the killing of the Magian. The Greeks class them and the king together, under the name of " the seven Persians." These enjoyed the right of entering the presence unannounced, and possessed princely estates in the provinces. Besides these, however, numbers of other Persians were despatched to the

provinces, settled there, and endowed with lands. There existed, in fact, under the Achaemenids a strong colonizing movement, diffused through the whole empire; traces of this policy occur more especially in Armenia, Cappadocia and Lycia, but also in the rest of Asia Minor, and not rarely in Syria and Egypt. These colonists formed the nucleus of the provincial military levy, and were a tower of strength to the Persian dominion. They composed, moreover, the Persian council, and vice-regal household of the Satraps, exactly as the Persians of the home-country composed *hat of the king.

Though the world-empire of Persia was thus deeply impressed by a national character, care was nevertheless exercised that the general duties and interests of the subject races should receive due consideration. We find their representatives, side by side with the Persians, occupying every sort of position in the regal and vice-regal courts. They take their part in the councils of the satraps, precisely as they do in military service (cf. the evidence of Ezra); and they, too, are rewarded by bounties and estates. To wield a peaceful authority over all the subjects of the empire, to reward merit, and to punish transgression — such is the highest task of king and officials.

On his native soil Gyrus built himself a town, with a palace and a tomb, in the district of Pasargadae (now the ruins of Murghab). This Darius replaced by a new capital, r° Wences deeper in the centre of the country, which bore the name ” Persian ” (Pdrsa), the Persepolis (q.v.) of the later Greeks. But the district of Persis was too remote to be the administrative centre of a world-empire. The natural centre lay, rather, in the ancient fertile tract on the lower Tigris and Euphrates. The actual capital of the empire was therefore Susa, where Darius I. and Artaxerxes II. erected their magnifi- cent palaces. The winter months the kings chiefly spent in Babylon: the hot summer, in the cooler situation of Ecbatana, where Darius and Xerxes built a residence on Mt Elvend, south of the city. From a palace of Artaxerxes II. in Ecbatana itself, the fragments of a few inscribed columns (now in the possession of Mr Lindo Myers and published by Evetts in the Zeitschr. f. Assyr. V.) have been preserved. To Persis and Persepolis the kings paid only occasional visits especially at their coronations. Within the empire, the two great civilized states incorporated by Cyrus and Cambyses, Babylon and Egypt, occupied a position of their own. After his defeat of Nabonidus, Cyrus *^’ t proclaimed himself ” King of Babel “; and the same title was born by Cambyses, Smerdis and Darius. So, in Egypt, Cambyses adopted in full the titles of the Pharaohs. In this we may trace a desire to conciliate the native population, with the object of maintaining the fiction that the old state still continued. Darius went still farther. He encouraged the

efforts of the Egyptian priesthood in every way, built temples, and enacted new laws in continuance of the old order. In Babylon his procedure was presumably similar, though here we possess no local evidence. But he lived to see that his policy had missed its goal. In 486 B.C. Egypt revolted and was only reduced by Xerxes in 484. It was this, probably, that induced him in 484 to renounce his title of ” king of Babel,” and to remove from its temple the golden statue of Bel-Marduk (Mero- dach), whose hands the king was bound to clasp on the first day of each year. This proceeding led to two insurrections in Babylon (probably in 484 and 479 B.C.), which were speedily repressed. After that the ” kingship of Babel ” was definitely abolished. In Egypt the Persian kings still retained the style of the Pharaohs; but we hear no more of concessions to the priesthood or to the old institutions, and, apart from the great o»&is of el-Kharga, no more temples were erected (see Egypt: History).

At the head of the court and the imperial administration stands the commandant of the body-guard — the ten thousand ” Immortals,” often depicted in the sculptures of The vizier Persepolis with lances surmounted by golden apples, and other This grandee, whom the Greeks termed ” Chiliarch,” Oftkl&is. corresponds to the modern vizier. In addition to him, we find seven councillors (Ezra vii. 14; cf. Esther i. 14). Among the other officials, the ” Eye of the King ” is frequently mentioned. To him was entrusted the control of the whole empire and the superintendence of all officials.

The orders of the court were issued in a very simple form of the cuneiform script, probably invented by the Medes. This comprised 36 signs, almost all of which denote single sounds. In nff ., the royal inscriptions, a translation into Susan (Elam- Ottkia! itic) and Babylonian was always appended to the l ‘ an S > ’ a K es ‘ Persian text. In Egypt one in hieroglyphics was added, as in the inscriptions of the Suez canal; in the Grecian provinces, another in Greek (e.g. the inscription of Darius on the Bos- porus, Herod, iv. 37, cf. iv. 91). The cuneiform script could only be written on stone or clay. Thus there has been discovered in Babylon a copy of the Behistun (q.v.) inscription preserved on a block of dolerite (Weissbach, Babylonische Miscellen. p. 24). For administrative purposes, however, it would seem that this inconvenient material was not employed; its place being taken by skins (5u£0ep(u, parchment), the use of which was adopted from the western peoples of the empire. On these were further written the journals and records kept at the court (cf. Diod. ii. 22, 32; Ezra iv. 15, v. 17, vi. 2; Esther vi. 1, ii. 23). _ With such materials the cuneiform script could not be used; instead, the Persian language was written in Aramaic characters, a method which later led

to the so-called Pahlavi, i.e. Parthian script. This mode of writing was obviously alone employed in the state-services since Darius I.; and so may be explained the fact that, under the Achaemenids, the Persian language rapidly declined, and, in the inscriptions of Artaxerxes III., only appears in an extremely neglected guise (see Cuneiform Inscriptions, Alphabet).

Side by side with the Persian, the Aramaic, which had long been widely diffused as tˆs «r>eech of commerce, enjoyed currency in all the western halt of the empire as a second dominant language. Thus all deeds, enactments and records designed for these provinces were furnished with an official Aramaic version (Ezra iv. 7). Numer- ous documents in this tongue, dating from the Persian period, have been discovered in Egypt (cf. Sayce and Cowley, Arama-L Papyri discovered at Assuan 1906), and the coins minted by the satraps and generals usually bear an Aramaic inscription. (So, also, a lion-weight from Abydos, in the British Museum.) The Demotic in Egypt was employed in private documents alone. Only in the Hellenic provinces of the empire Greek replaced Aramaic (cf. the letter to Pausanias in Thuc. i. 129; an edict to Gadatas in Magnesia, Cousin et Deschamps, Bulletin de corresp. hellenique xii. 530, Dittenberger, Sylloge 2; so, also, on coins) — a clear proof that the Persians had already begun to recognize the independent and important position of Greek civilization. 1

Darius I. divided the Persian Empire into twenty great pro- vinces, satrapies, with a ” guardian of the country ” (khshalhra- pavan; see Satrap) at the head of each. A list is preserved in Herodotus (iii. 89 sqq.); but the boun- satrapies. daries were frequently changed. Each satrapy was again subdivided into several minor governorships. The satrap is the head of the whole administration of his province. He levies the taxes, controls the legal procedure, is responsible for the security of roads and property, and superintends the subor- dinate districts. The heads of the great military centres of the empire and the commandants of the royal fortresses are outside his jurisdiction: yet the satraps are entitled to a body of troops of their own, a privilege which they used to the full, especially in later periods. The satrap is held in his position as a subject by the controlling machinery of the empire, especially the ” Eye of the King “; by the council of Persians in his province with

1 For the editions of the Persian inscriptions see Behistun. For the Persian documents, Ed. Meyer Entstehung des Judentums, p. 19 sqq. The hieroglyphic inscriptions of the Suez Canal are pub- lished in the Recueil de trav. d’egyptol. et d’assyriol. vols. vii. ix. xi. xiii; the private

documents from Babylonia and Nippur, by Strassmaier, Babyl. Urkunden, and Hilprecht and Clay, Babyl. Exped. of Univ. of Pennsylvania, vols. ix. x. Numerous Jewish docu- ments in Aramaic have been found at Elephantine (Sayce and Cowley, Aramaic Papyri discovered at Assuan, 1906), among them an official complaint of the Jewish colony settled at Elephantine, addressed to the Persian satrap of Judaea, in 408 B.C., which throws a new light on many passages in Ezra and Nehemiah, published by Sachan in Abhandlungen der berl. Akademie, 1907.

whom he is bound to debate all matters of importance; and by the army: while in the hands of the messengers (Pers. &crri.v8ai. or byyapoi — a Babylonian word: see Angaria) the government despatches travel ” swifter than the crane ” along the great imperial highways, which are all provided with regular postal stations (cf. the description of the route from Susa to Sardis in Herod, v. 52).

Within the satrapies the subject races and communities occupied a tolerably independent position; for instance, the Subject Jews, under their elders and priests, who were even Com muni- able to convene a popular assembly in Jerusalem ties. (c f the Books of Ezra and Nehemiah). Obviously

also, they enjoyed, as a rule, the privilege of deciding law-suits among themselves; their general situation being similar to that of the Christian nationalities under the Ottomans, or to that of many tribes in the Russian Empire at the present day. The pressure of despotism was manifest, not so much in that the king and his officials consistently interfered in individual cases, but that they did so on isolated and arbitrary occasions, and then swept aside the privileges of the subject, who was impotent to resist.

For the rest, the subject population falls into a number of distinct groups. In the desert (as among the Arabian and Turanian nomads), in wild and sequestered mountains (as in Zagros in north Media, and Mysia, Pisidia, Paphlagonia and Bithynia in Asia Minor), and also in many Iranian tribes, the old tribal constitution, with the chieftain as its head, was left intact even under the imperial suzerainty. The great majority of the civilized provinces were subdivided into local

administra- tive districts governed by officials of the king and his satraps. These the Greeks named Wvt), ” peoples.” Within these, again, there might lie large town settlements whose internal affairs were controlled by the elders or the officials of the com- munity: as, for instance, Babylon, Jerusalem, the Egyptian cities, Tarsus, Sardis and others. On the same footing were the spiritual principalities, with their great temple-property; as Bambyce in Syria, the two Comanas in Cappadocia, and so forth. Besides these, however, vast districts were either con- verted into royal domains (irapaSeicrot,) with great’ parks and hunting grounds under royal supervision, or else bestowed by the king on Persians or deserving members of the subject-races (the ” benefactors”) as their personal property. Many of these estates formed respectable principalities: e.g. those of the house of Otanes in Cappadocia, of Hydarnes in Armenia, Pharnabazus in Phrygia, Demaratus in Teuthrania, Themis- tocles in Magnesia and Lampsacus. They were absolute private property, handed down from father to son for centuries, and in the Hellenistic period not rarely became independent king- doms. These potentates were styled by the Greeks dw6.

The last class, quite distinct from all these organizations, was formed by the city-states (iroXeis) with an independent constitution — whether a monarchy (as in Phoenicia), States!* an aristocracy (as inLycia),or a repubtic with council and popular assembly (as in the Greek towns). The essential point was that they enjoyed a separate legalized organization (autonomy). This was only to be seen in the extreme western provinces of the empire among the Phoeni- cians, Greeks and Lycians, whose cities were essentially distinct from those of the east; which, indeed, to Greek eyes, were only great villages (/«wr6Xeis). It is readily intelligible that their character should have proved practically incomprehensible to the Persians, with whom they came into perpetual collision. These sought, as a rule, to cope with the difficulty by transferring the government to individual persons who enjoyed their confi- dence: the ” tyrants ” of the Greek towns. Mardonius, alone, after his suppression of the Ionic revolt — which had originated with these very tyrants — made an attempt to govern them by the assistance of the democracy (492 B.C.).

The provinces of the Persian Empire differed as materially in economy as in organization. In the extreme west, a money currency in its most highly developed form — that of coinage minted by

the state, or an autonomous community — had developed since the 7th century among the Lydians and Greeks. In the co mmerce main portion, however, of the Oriental world — Egypt, an< / Finaace.

Svria, Phoenicia and Babylonia — the old mode of commerce was still in vogue, conducted by means of gold and silver bars, weighed at each transaction. Indeed, a money currency only began to make headway in these districts in the 4th century B.C. In the eastern provinces, on the other hand, the primitive method of exchange by barter still held the field. Only in the auriferous and civilized frontier districts of India (the Punjab) did a system of coinage find early acceptance. There Persian and Attic money was widely distributed, and imitations of it struck, in the fifth and fourth pre-Christian centuries.

Thus the empire was compelled to grapple with all these varied conditions and to reconcile them as best it might. At the court, ” natural economy ” was still the rule. The officials and Oriental troops received payment in kind. They were fed ” by the table of the king,” from which 15,000 men daily drew their sustenance (cf. Heraclides of Cyme in Athen.iv. 145 B, &c.)and were rewarded by gifts and assignments of land. The Greek mercenaries, on the contrary, had to be paid in currency; nor could the satraps of the west dispense with hard cash. The king, again, needed the precious metals, not merely for bounties and rewards, but for important enterprises in which money payment was imperative. Conse- quently, the royal revenues and taxes were paid partly in the precious metals, partly in natural produce — horses and cattle, grain, clothing and its materials, furniture and all articles of industry (cf. Theopomp. fr. 124, 125, &c). The satraps, also, in addition to nioney payments, levied contributions ” for their tabie,” at which the officials ate (Nehem. v. 14).

The precious metals brought in by the tribute were collected in the great, treasure-houses at Susa, Persepolis, Pasargadae and Ecbatana, where gigantic masses of silver and, more Money and especially, ‘ of gold, were stored in bullion or partially coinage. wrought into vessels (Herod, iii. 96; Strabo xv. 731, 735; Arrian iii. 16, &c.) ; exactly as is the case to-day in the shah’s treasure-chamber (Curzon, Persia, ii. 484). It is also observable that the conjunction of payments in kind and money taxes still exists. The province of Khorasan, for instance, with some half million inhabitants, paid in 1885 £154,000 in gold, and in addition natural produce to the value of £43,000 (Curzon, op. cit. i. 181, ii. 380). When the king required money he minted as much as was necessary. A reform in the coinage was effected by Darius, who struck the Daric (Pers. Zariq, i.e. “piece of gold “; the word has nothing to do with the name of Darius), a gold piece of 130 grains (value about 23s.) ; this being equivalent to 20 silver pieces (” Median shekels,” criyXoi) of 86-5 grains (value according to the then rate of silver — 13$ silver to I gold— about is. 2d.). The coining of gold was the exclusive prerogative of the king; silver could be coined by the

satraps, generals, independent communities and dynasts.

The extent of the Persian Empire was, in essentials, defined by the great conquests of Cyrus and Cambyses. Darius was no more a conquistador than Augustus. Rather, the task he set himself was to round off the empire p£/w. and secure its borders: and for this purpose in Asia Minor and Armenia he subdued the mountain-tribes and advanced the frontier as far as the Caucasus; Colchis alone remaining an independent kingdom under the imperial suzerainty. So, too, he annexed the Indus valley and the auriferous hill-country of Kafiristan and Cashmir (Ka

Side by side, however, with these wars, we can read, even in the scanty tradition at our disposal, a consistent effort to further the great civilizing mission imposed on the empire. In the district of Herat, Darius established a great water-basin, designed to facilitate the cultivation of the steppe (Herod, iii. 117). He had the course of the Indus explored by the Carfan captain Scylax (q.v.) of Caryanda, who then navigated the Indian Ocean back to Suez (Herod, iv. 44) and wrote an account of his voyage in Greek. The desire to create a direct communication between I the seclusion of Persis and the commerce of the world is evident

in his foundation of several harbours, described by Nearchus, on the Persian coast. But this design is Still more patent in his completion of a great canal, already begun by Necho, from the Nile to Suez, along which several monuments of Darius have been preserved. Thus it was possible, as says the remnant of an hieroglyphic inscription there discovered, ” for ships to sail direct from the Nile to Persia, over Saba.” In the time of Hero- dotus the canal was in constant use (ii. 158, iv. 39): afterwards, when Egypt regained her independence, it decayed, till restored by the second Ptolemy. Even the circumnavigation of Africa was attempted under Xerxes (Herod, iv. 43).

It has already been mentioned, that, in his efforts to conciliate the Egyptians, Darius placed his chief reliance on the priest- hood: and the same tendency runs throughout the imperial policy toward the conquered races. Thus Cyrus himself gave the exiled Jews in Babylon

permission to return and rebuild Jeru- salem. Darius allowed the restoration of the Temple; and Artaxerxes I., by the protection accorded to Ezra and Nehemiah, made the foundation of Judaism possible (see Jews: §§ 19 sqq.). Analogously in an edict, of which a later copy is preserved in an inscription (see above), Darius commands Gadatas, the governor of a domain (■Kapa.deiooi) in Magnesia on the Maeander, to observe scrupulously the privileges of the Apollo-sanctuary. With all the Greek oracles — even those in the mother-country — the Persians were on the best of terms. And since these might reasonably expect an enormous extension of their influence from the establishment of a Persian dominion, we find them all zealously medizing during the expedition of Xerxes.

For the development of the Asiatic religions, the Persian Empire was of prime importance. The definite erection of a single, vast, „ fj-i oa world-empire cost them their original connexion with e ˆ ‘ the state, and compelled them in future to address themselves, not to the community at large, but to individuals, to promise, not political success nor the independence of the people, but the welfare of the man. Thus they became at once universal and capable of extension by propaganda; and, with this, of entering into keen competition one with the other. These traits are most clearly marked in Judaism; but, after the Achaemenid period, they are common to all Oriental creeds, though our information as to most is scanty in the extreme.

In this competition of religions that of Iran played a most spirited part. The Persian kings — none more so than Darius, whose religious convictions are enshrined in his inscriptions— and, with the kings, their people, were ardent professors of the pure doctrine of Zoroaster ; and the Persians settled in the provinces diffused his creed throughout the whole empire. Thus a strong Persian propagandism arose especially in Armenia and Cappadocia, where the religion took deep root among the people, but also in Lydia and Lycia. In the process, however, important modifications were introduced. In contrast with Judaism, Zoroastrianism did not enter the lists against all gods save its own, but found no difficulty in recognizing them as subordinate powers — helpers and servants of Ahuramazda. Consequently, the foreign creeds often reacted upon the Persian. In Cappadocia, Aramaic inscriptions have been discovered (1900), in which the indigenous god, there termed Bel the king, recognizes the ” Mazdayasnian Religion ” (Din Mazdayasnish) — i.e. the religion of Ahuramazda personified as a woman — as his sister and wife (Lidzbarski, Ephem. j. semit. Epigr. i. 59 sqq.).

The gorgeous cult of the gods of civilization (especially of Baby- lon),

with their host of temples, images and festivals, exercised a corresponding influence on the mother-country. Moreover, the unadulterated doctrine of Zoroaster could no more become a permanent popular religion than can Christianity. For the masses can make little of abstractions and an omnipotent, omnipresent deity; they need concrete divine powers, standing nearer to them- selves and their lot. Thus the old figures of the Aryan folk-religion return to the foreground, there to be amalgamated with the Baby- lonian divinities. The goddess of springs and streams (of the Oxus in particular) and of all fertility — Ardvisura Anahita, Anaitis — is endowed with the form of the Babylonian Ishtar and Belit. She is now depicted as a beautiful and strong woman, with prominent breasts, a golden crown of stars and golden raiment. She is wor- shipped as the goddess of generation and all sexual life (cf. Herod, i. 131, where the names of Mithras and Anaitis are interchanged); and religious prostitution is transferred to her service (Strabo xi. 532, xii. 559). At her side stands the sun-god Mithras, who is re- presented as a young* and victorious hero. Both deities occupy the very first rank in the popular creed; while to the theologian they are the most potent of the good powers — Mithras being the herald and propagator of the service of Light and the mediator betwixt man and Ahuramazda, who now fades more into the background. Thus, in the subsequent period, the Persian religion

appears purely as the religion of Mithras. The festival of Mithras is the chief festival of the empire, at which the king drinks and is drunken, and dances the national dance (Ctes. jr. 55 ; Duris jr. 13). This development culminated under Artaxerxes II., who, according to Berossus (jr. 16 ap. Clem. Alex. prot. i. 5, 65), first erected statues to Anaitis in Persepolis, Ecbatana, Bactria, Susa, Babylon, Damascus and Sardis. The truth of this account is proved by the fact that Artaxerxes II. and Artaxerxes III. are the only Achaemenids who, in' their inscriptions, invoke Anaitis and Mithra side by side with Ahuramazda. Other gods, who come into prominence, are the dragon-slayer Verethraghna (Artagnes) and the Good Thought (Vohumano, Omanos) ; and even the Sacaean festival is adopted from Babylon (Berossus jr. 3; Ctes.,/r. 16; Strabo xi. 512, &c). The chief centres of the Persian cults in the west were the district of Acilisene in Armenia (Strabo xi. 532, &c), the town of Zela in Cappadocia (Strabo xii. 559), and several cities in Lydia.

The position of the Persian monarchy as a world-empire is characteristically emphasized in the buildings of Darius and Xerxes in Persepolis and Susa. The peculiarly national basis, .ˆ

still recognizable in Cyrus's architecture at Pasargadae, recedes into

insignificance. The royal edifices and sculptures are dependent, mainly, on Babylonian models, but, at the same time, we can trace in them the influence of Greece, Egypt and Asia Minor; the last in the rock-sepulchres. All these elements are combined into an organic unity, which achieved the greatest creations that Oriental architecture has found possible. Nevertheless, the result is not a national art, but the art of a world-empire; and it is obvious that foreign craftsmen must have been active in the royal services — among them, the Greek sculptor Telephanes of Phocaea (Pliny xxxiv. 68). So, with the collapse of the empire, the imperial art vanishes also: and when, some 500 years later, a new art arose under the Sassanids, whose achievements stand to those of Achae- menid art in much the same relation as the achievements of the two dynasties to each other, we discover only isolated reminiscences of its predecessor.

For the organization and character of the Persian Empire, see Barnabas Brisson, De regio Persarum principatu libri iii. (1590); Heeren, Ideen iiber Politik, Handel und Verkehr der alien Welt, i. ; G. Rawlinson, History oj Herodotus, ii. 555 sqq. ; Five Eastern Mon- archies, iii. ; Eduard Meyer, Geschichte des Altertums, iii. On the Satrapies, cf. Krumbholz, De Asiae minoris satrapiis persicis (1883). See also Mithras.

3. History of the Achaemenian Empire. — The history of the Persian Empire was often written by the Greeks. The most ancient work preserved is that of Herodotus (q.v.), who supplies rich and valuable materials for the period ending in 479 B.C. These materials are drawn partly from sound tradition, partly from original knowledge — as in the account of the satrapies and their distribution, the royal highway, the nations in Xerxes' army and their equipment. They also contain much that is admittedly fabulous: for instance, the stories of Cyrus and Croe- sus, the conquest of Babylon, &c. Forty years later (c. 390 B.C.), the physician Ctesias of Cnidus, who for 17 years (414-398 B.C.) remained in the service of the Great King, composed a great work oh the Persian history, known to us from an extract in Photius and numerous fragments. Ctesias (q.v.) possesses a more precise acquaintance with Persian views and institutions than Herodotus; and, where he deals with matters that came under his own cognisance, he gives much useful information. For the early period, on the other hand, he only proves how rapidly the tradition had degenerated since Herodotus; and here his narrations can only be utilized in isolated cases, and that with the greatest caution. Of more value was the great work of Dinon of Colophon (c. 340), which we know from numerous excellent fragments; and on the same level may be placed a few statements from Heraclides of Cyme, which afford specially important

evidence on Persian institutions. To these must be added the testimony of the other Greek historians (Thucydides, Ephorus, Theopompus, &c, with the histories of Alexander), and, before all, that of Xenophon in the Anabasis and Hellenica. The Cyropaedia is a didactic romance, written with a view to Greek institutions and rarely preserving genuine information on the Persian Empire. Of Oriental sources, only the contem- porary books of Ezra and Nehemiah are of much importance: also, a few statements in the much later Esther romance. Beros- sus's history of Babylon contained much valuable and trust- worthy information, but next to nothing has survived. That the native tradition almost entirely forgot the Achaemenid Empire, has been mentioned above. For a more detailed account

of these sources see separate articles on Herodotus, &c; Ezra; and Nehemiah.

Of modern accounts see especially Th. N6ldeke,Aufsatze zur persischen Geschichte (1887). The works of Marquart, Unter- suchungen zur Geschichte von Eran (2 pts., 1896-1905), abound in daring theories and must be used with caution. On the chronology, cf . Eduard Meyer, Forschungen zur alten Geschichte, ii.

The external history of the empire is treated under the List of the individual kings (see also history sections of Kings. articles Greece; Egypt; &c). The order is as follows:—

Cyrus (558-528); conquered the Medes in 550; king of Babylon from 538.

Cambyses (528-521).

Smerdis (521).

Darius I. (521-485).

Xerxes I. (485-465).

Artaxerxes I. (465-425).

(Xerxes II. and Secydianus or Sogdianus, 425-424.)

Darius II. Nothus (424-404).

Artaxerxes II. (404-359).

Artaxerxes III. Ochus (359-338).

Arses (338-336).

Darius III. (336-330).

The chronology is exactly verified by the Ptolemaic canon, by numerous Babylonian and a few Egyptian documents, and by the evidence of the Greeks. The present article gives only a brief conspectus of the main events in the history of the empire.

Though, unlike Cyrus and Cambyses, Darius made no new expeditions of conquest, yet a great empire, which is not bounded The Wars by another equally great, but touches on many small against tribes and independent communities, is inevitably Greece. driven to expansion. We have already seen that the attempt of Darius to control the predatory nomads in the north led to his expedition against the Scythians; this, again, led to the incorporation of Thrace and Macedonia, whose king Perdiccas submitted. And since a great portion of the Mediterranean coast-line belonged to the empire, further complications resulted automatically. In contrast with the Greeks Carthage took the part of Persia. Darius, indeed, numbers the city — under the name of Karka — among his dominions: as also the Maxyans (Maciya) on the Syrtes (Andreas, Verhandl. d. xiii. oriental. Congresses, Hamburg, 1902, p. 97). But, above all, the Greek cities with their endless feuds and violent internal factions, were incessant in their appeals for intervention. Nevertheless, . Darius left European Greece to itself, till the support accorded to the Toman and Carian insurgents by Athens and Eretria (490 B.C.) made war inevitable. But not only the expeditions of Mardonius (492) and Datis (490), but even the carefully prepared campaign of Xerxes, in conjunction with Carthage, completely failed (480-479). On the fields of Marathon and Plataea, the Persian archers succumbed to the Greek phalanx of hoplites; but the actual decision was effected by Themistocles, who had meanwhile created the Athenian fleet which at Salamis proved its superiority over the Perso-Phoenician armada, and thus precluded beforehand the success of the land-forces.

The wreck of Xerxes' expedition is the turning-point in the history of the Persian Empire. The superiority of the Greeks was so pronounced that the Persians never found courage to repeat their attack. On the

contrary, in 466 B.C. their army and fleet were again defeated by Cimon on the Eurymedon, the sequel being that the Greek provinces on the Asiatic coast, with all the Thracian possessions, were lost. In itself, indeed, this loss was of no great significance to such a vast empire; and the attempts of Athens to annex Cyprus and conquer the Nile valley, in alliance with the revolted Egyptians, ended in failure. Athens, in fact, had not sufficient strength to undertake a serious invasion of the empire or an extensive scheme of conquest. Her struggles with the other Hellenic states constrained her, by the peace of Callias (448), definitely to renounce the Persian war; to abandon Cyprus and Egypt to the king; and to content herself with his promise — not that he would surrender the littoral towns, but that he would abstain from an armed attack upon them. The really decisive point was, rather, that the disasters of Salamis and Plataea definitely shattered the offensive power

of the empire; that the centre of gravity in the world's history had shifted from Susa and Babylon to the Aegean Sea; and that the Persians were conscious that in spite of all their courage they were henceforward in the presence of an enemy, superior in arms as well as in intellect, whom they could not hope to subdue by their own strength.

Thus the great empire was reduced to immobility and stagna- tion — a process which was assisted by the deteriorating influences of civilization and world-dominion upon the character internal of the ruling race. True, the Persians continued state of the to produce brave and honourable men. But the Empire. influences of the harem, the eunuchs, and similar Rebellions. court officials, made appalling progress, and men of energy began to find the temptations of power stronger than their patriotism and devotion to the king. Thus the satraps aspired to inde- pendence, not merely owing to unjust treatment, but also to avarice or favourable conditions. As early as 465 B.C., Xerxes was assassinated by his powerful vizier (chiliarch) Artabanus, who attempted to seize the reins of empire in fact, if not in name. A similar instance may be found in Bagoas (q.v.), after the murder of Artaxerxes III. (338 B.C.). To these factors must be added the degeneration of the royal line — a degeneration inevitable in Oriental states. Kings like Xerxes and more especially Artaxerxes I. and Artaxerxes II., so far from being gloomy despots, were good-natured potentates, but weak, capricious and readily accessible to personal influences. The only really brutal tyrants were Darius II., who was completely dominated by his bloodthirsty wife Parysatis, and Artaxerxes III. who, though he shed rivers of blood and all but exterminated his whole family, was successful in once more uniting

the empire, which under the feeble sway of his father had been threatened with dissolution.

The upshot of these conditions was, that the empire never again undertook an important, enterprise, but neglected more and more its great civilizing mission. In considering, however, the subsequent disorders and wars, it must be borne in mind that they affected only individual portions of the empire, and only on isolated occasions involved more extensive areas in long and serious strife. To most of the provinces the Achae- menid dominion was synonymous with two centuries of peace and order. Naturally, however, the wild tribes of the mountains and deserts, who could be curbed only by strict imperial control, asserted their independence and harassed the neighbouring provinces. Among theˆe tribes were the Carduchians in Zagros, the Cossaeans and Uxians in the interior of Elam, the Cadusians and other non-Aryan tribes in northern Media, the Pisidians, Isaurians and Lycaonians in the Taurus, and the Mysians in Olympus. All efforts to restore order in these districts were fruitless; and when the kings removed their court to Ecbatana, they were actually obliged to purchase a free passage from the mountain tribes (Strabo xi. 524; Arrian iii. 17, 1). The kings (e.g. Artaxerxes II.) repeatedly took the field in great force against the Cadusians, but unsuccessfully. When, in 400 B.C., Xenophon marched with the mercenaries of Cyrus from the Tigris to the Black Sea, the authority of the king was non- existent north of Armenia, and the tribes of the Pontic moun- tains, with the Greek cities on the coast, were completely inde- pendent. In Paphlagonia, the native dynasts founded a power- ful though short-lived kingdom, and the chieftains of the Bithynians were absolutely their own masters. The frontier provinces of India were also lost. Egypt, which had already revolted under Libyan princes in the years 486-484, and again with Athenian help in 460-454, finally asserted its independence in 404. Henceforward the native dynasties repelled every attack, till they succumbed once more before Artaxerxes III. and Mentor of Rhodes.

In the other civilized countries, indeed, the old passion for freedom had been completely obliterated; and after the days of Darius I. — apart from the Greek, Lycian and Phoenician towns — not a single people in all these provinces dreamed of shaking off the foreign dominion. All the more clearly, then, was the inner weakness of the empire revealed by the revolts

of the satraps. These were facilitated by the custom — quite contrary to the original imperial organization' — which entrusted the provincial military commands to the satraps, who began to receive great masses of Greek mercenaries into their service. Under Artaxerxes I. and Darius II., these insurrections were still rare. But when the revolt of the younger Cyrus against his brother (401 B.C.) had demonstrated the surprising ease and rapidity with which a courageous army could penetrate into the heart of the empire— when the whole force of that empire had proved powerless, not only to prevent some 12,000 Greek troops, completely surrounded, cut off from their communica- tions, and deprived through treachery of their leaders, from escaping to the coast, but even to make a serious attack on them— then, indeed, the imperial impotence became manifest. After that, revolts of the satraps in Asia Minor and Syria were of everyday occurrence, and the task of suppressing them was complicated by the foreign wars which the empire had to sustain against Greece and Egypt.

At this very period, however, the foreign policy of the empire gained a brilliant success. The collapse of the Athenian power Later Wars Delore Syracuse (413 B.C.) induced Darius II. to with the order his satraps Tissaphernes and Pharnabazus, Greeks. in Asia Minor, to collect the tribute overdue from Peace of t h e Greek cities. In alliance with Sparta (see AotakMas. p ELOPO nnesian War), Persia intervened in the conflict against Athens, and it was Persian gold that made it possible for Lysander to complete her overthrow (404 B.C.). True, war with Sparta followed immediately, over the division of the spoils, and the campaigns of the Spartan generals in Asia Minor (390-395) were all the more dangerous as they gave occasion to numerous rebellions. But Persia joined the Greek league against Sparta, and in 394 Pharnabazus and Conon annihilated the Lacedaemonian fleet at Cnidus. Thus the Spartan power of offence was crippled; and the upshot of the long-protracted war was that Sparta ruefully returned to the Persian alliance, and by the Peace of Antalcidas (q.v.), concluded with the king in 387 B.C., not only renounced all claims to the Asiatic possessions, but officially proclaimed the Persian suzerainty over Greece. Ninety years after Salamis and Plataea, the goal for which Xerxes had striven was actually attained, and the king's will was law in Greece. In the following decades, no Hellenic state ventured to violate the king's peace, and all the feuds that followed centred round the efforts of the combatants — Sparta, Thebes, Athens arid Argos — to draw the royal powers to their side (see Greece: Ancient History).

But, for these successes, the empire had to thank the internecine strife of its Greek opponents, rather than its own strength. Its feebleness, when thrown on its own resources, is evident from the fact that, during the next years, it failed both to reconquer Egypt and to suppress completely King Evagoras of Salamis in Cyprus. The satrap revolts, moreover, assumed more and more formidable proportions, and the Greek states began once more to tamper with them. Thus the reign of Artaxerxes II. ended, in 359 B.C., with a complete dissolution of the imperial authority in the west. His successor, Artaxerxes Ochus, succeeded yet again in restoring the empire in its full extent. In 3S5 B.C., he spoke the fatal word, which, a second — or rather a third — time, demolished the essentially unsound power of Athens. In 343 he reduced Egypt, and his generals Mentor and Memnon, with his vizier Bagoas (q.v.), crushed once and for all the resistance in Asia Minor. At his death in 338, immedi- ately before the final catastrophe, the empire to all appearances was more powerful and more firmly established than it bad been since the days of Xerxes.

These successes, however; were won only by means of Greek armies and Greek generals. And simultaneously the Greek Progress civilization — diffused by mercenaries, traders, artists, of Greek prostitutes and slaves, — advanced in ever greater influence. f orce- j n Asia Minor and Phoenicia we Can clearly trace the progress of Hellenism (q.v.), especially by the coinage. The stamp is cut by Greek hands and the Greek tongue pre- dominates more and more in the inscription. We can see that

the victory of Greek civilization had long been prepared on every side. But the vital point is that the absolute superiority of the Hellene was recognized as incontestable on both hands. The Persian sought to protect himself against danger, by employ- ing Greeks in the national service and turning Greek policy to the interests of the empire. In the Greek world itself the dis- grace that a people, called to universal dominion and capable of wielding it, should be dependent on the mandate of an im- potent Asiatic monarchy, was keenly felt by all who were not •yet absorbed in the rivalry of city with city. The spokesman of this national sentiment was Isocrates; but numerous other writers gave expression to it, notably, the historian Callisthenes of Olynthus. Union between Greeks, voluntary or compulsory, and an offensive war against Persia, was the programme they

propounded. ,’>vr

Nor was the time for its fulfilment far distant. The new power which now rose to the first rank, created by Philip of Macedon, had no

engrained tendency inimical to the Persian Empire. Its immediate programme was rather MaceOon. Macedonian expansion, at the expense of Thrace and Illyria, and the subjection of the Balkan Peninsula. But, in its efforts to extend its power over the Greek states, it was bpund to make use of the tendencies which aimed at the unifica- tion of Greece for the struggle against Persia: and this ideal demand it dared not reject.

Thus the conflict became inevitable. In 340, Artaxerxes III. and his satraps supported the Greek towns in Thrace — Perinthus and Byzantium — against Macedonian aggression; in 338 he concluded an alliance with Demosthenes. When Philip, after the victory of Chaeronea, had founded the league of Corinth (337) embracing the whole of Greece, he accepted the national programme, and in 336 despatched his army to Asia Minor. That he never entertained the thought of conquering the whole Persian Empire is certain. Presumably, his ambitions would have been satisfied with the liberation of the Greek cities, and, perhaps, the subjection of Asia Minor as far as the Taurus. With this his dominion would have attained much the same compass as later under Lysimachus; farther than this the boldest hopes of Isocrates never went.

But Philip's assassination in 336 fundamentally altered the situation. In the person of his son, the throne was occupied . by a soldier and statesman of genius, saturated with Greek culture and Greek thought, and intolerant of every goal but the highest. To conquer the whole world for Hellenic civilization by the aid of Macedonian spears, and to reduce the whole earth to unity, was the task that this heir of Heracles and Achilles saw before him. This idea of universal conquest was with him a conception much stronger developed than that which had inspired the Achaemenid rulers, and he entered on the project with full consciousness in the strictest sense of the phrase. In fact, if we are to understand Alexander aright, it is fatal to forget that he was overtaken by death, not at the end of his career, but at the beginning, at the age of thirty-three.

VI. The Macedonian Dominion. — How Alexander conquered Persia, and how he framed his world-empire, 1 cannot be related here. The essential fact, however, is that after the victory of Gaugamela (Oct. 1, 33r B.C.) and, still t heareaL more completely, after the assassination of Darius — ■ avenged according to the Persian laws, on the perpetrators — Alexander regarded himself as the legitimate head of the Persian Empire, and therefore adopted the dress and ceremonial of the Persian kings.

With the capture of the capitals, the Persian war was at an end, and the atonement for the expedition of Xerxes was com- plete — a truth symbolically expressed in the burning of the palace at PersepoliSi Now began the world-conquest. For an universal empire, however, the forces of Macedonia and Greece were insufficient; the monarch of a world-empire could not be bound by the limitations imposed on the tribal king of Macedon or the general of a league of Hellenic republics. He must stand as

1 See Alexander the Great ; Macedonian Empire ; Hellen- ism (for later results).

an autocrat, above them and above the law, realizing the theoretical doctrines of Plato and Aristotle, as the true king, who is a god among men, bound no more than Zeus by a law, because ” himself he is the law.” Thus the divine kingship of Alexander derives in direct line, not from the Oriental polities — • which (Egypt apart) know nothing of royal apotheosis — but from these Hellenic theories of the state. Henceforward it becomes the form of every absolute monarchy in a civilized land, being formally mitigated only in Christian states by the assump- tion that the king is not God, but king ” by the grace of God.” The expedition of 332 B.C. to the shrine of Ammon was a pre- liminary to this procedure, which, in 324, was sealed by his official elevation to divine rank in all the republics of Greece. To this corresponds the fact that, instead of acting on the doctrines of Aristotle and Callisthenes, ■ and treating the Macedonians and Greeks as masters, the Asiatics as servants, Alexander had impartial recourse to the powers of all his subjects and strove to amalgamate them. In the Persians particularly he sought a second pillar for his world-empire. Therefore, as early as 330 B.C., he drafted 30,000 young Persians, educated them in Greek customs, and trained them to war on the Mace- donian model. The Indian campaign showed that his Mace- donian troops were in fact inadequate to the conquest of the world, and in the summer of 326 they compelled him to turn back from the banks of the Hyphasis. On his return to Persia, he consummated at Susa (Feb. 324 B.C.) the union of Persian and Macedonian by the great marriage-feast, at which all his superior officers, with some 10,000 more Macedonians, were wedded to Persian wives. The Macedonian veterans were then disbanded, and the Persians taken into his army. Simultane- ously, at the Olympian festival of 324, the command was issued to all the cities of Greece to recognize him as god and to receive the exiles home. 1 In 323 B.C. the preparations for the circum- navigation and subjection of Arabia were complete: the next enterprise being the conquest of the West, and the battle for Hellenic culture against Carthage and the Italian tribes. At that point Alexander died in Babylon on the 13th of June 323 B.C.

Alexander left no heir. Consequently, his death not only ended the scheme of universal conquest, but led to an immediate The Macedonian reaction. The army, which was con-

Kiagtfoms sidered as the representative of the people, took of the over

t ne government under the direction of its 3 ˆ ‘ generals. The Persian wives were practically all discarded and the Persian satraps removed — at least from all important provinces. But the attempt to maintain the empire in its unity proved impracticable; and almost immediately there began the embittered war, waged for several decades by the generals (diadochi), for the inheritance of the great king. 2 It was soon obvious that the eastern rulers, at all events, could not dispense with the native element. Peucestas, the governor of Persis, there played the role of Alexander and won the Persians completely to his side; for which he was dismissed by Antigonus in 315 (Diod. xix. 48). A similar position was attained by Seleucus — the only one of the diadochi, who had not divorced his Persian wife, Apama — in Babylonia, which he governed from 319 to 316 and regained in the autumn of 312. While Antigonus, who, since 315, had striven to win the kingdom of Alexander for himself — was detained by the war with his rivals in the west, Seleucus, with Babylon as his headquarters, con- quered the whole of Iran as far as the Indus. In northern Media alone, which lay outside the main scene of operations and had only been partially subject to the later Achaemenids, the Persian satrap Atropates, appointed by Alexander, main- tained his independence and bequeathed his province to his successors. His name is borne by north Media to the present day — Atropatene, modern Azerbaijan or Adherbeijan (see Media). So, too, in Armenia the Persian dynasty of the

1 The discussion of these events by Hogarth ” The Deification of Alexander the Great,” in the English Historical Review, ii. (,1887), is quite unsatisfactory.

2 See Ptolemies; Seleucid Dynasty.

Hydarnids held its ground; and to these must be added, in the east of Asia Minor, the kingdoms of Pontus and Cappadocia, founded c. 301, by the Persians Mithradates I. and Ariarathes I. These states were fragments of the Achaemenid Empire, which had safely transferred themselves to the Hellenistic state-system. The annexation of Iran by Seleucus Nicator led to a war for the countries on the Indian frontier; his opponent being Sandra- cottus or Chandragupta Maurya (q.v.), the founder seleucus 1. of the great Indian Empire of Maurya (Palimbothra). Nicator, and The result was that Seleucus abandoned to the ˆtiochusi. Indian king, not merely the Indian provinces, but’ even the frontier districts west of the Indus (Strabo xv. 689-724), receiving as compensation 500 elephants, with other presents (Appian, Syr. 55; Justin xv. 4; Plut. Alex. 62; Athen. i. 18 D.). His next expedition was to the west to assist Lysimachus, Ptolemy and

Cassander in the overthrow of Antigonus.

The battle of Ipsus, in 301, gave him Syria and the east of Asia Minor; and from then he resided at the Syrian town of Antiochia on the Orontes. Shortly afterwards he handed over the provinces east of the Euphrates to his son Antiochus, who, in the following years, till 282, exercised in the East a very energetic and beneficial activity, which continued the work of his father and gave the new empire and the Oriental Hellenistic civilization their form. In order to protect his conquests Alexander had founded several cities in Bactria, Sogdiana and India, in which he settled his veterans. On his death, these revolted and endeavoured to return to Greece, but were attacked and cut to pieces by Pithon (Diod. xviii. 7). Of Greek the other Greek towns in Asia scarcely any were Towns in founded by Alexander himself, though the plan traB ‘ adopted by his successors of securing their dominions by building Greek cities may perhaps be due to him (cf. Polyb. x. 27). Most of these new cities were based on older settlements; but the essential point is, that they were peopled by Greek and Macedonian colonists, and enjoyed civic independence with laws, officials, councils and assemblies of their own, in other words, an autonomous communal constitution, under the suzerainty of the empire. A portion, moreover, of the surround- ing land was assigned to them. Thus a great number of the country districts — the Wvr] above mentioned — were transformed into ‘municipal corporations, and thereby withdrawn from the immediate government of the king and his officials (satraps or strategi), though still subject to their control, except in the cases where they received unconditional freedom and so ranked as ” confederates.” The native population of these villages and rural districts, at first, had no civic rights, but were governed by the foreign settlers. Soon, however, the two elements began to coalesce; in the Seleucid Empire, the process seems generally to have been both rapid and complete. Thus the cities became the main factors in the diffusion of Hellenism, the Greek language and the Greek civilization over all Asia as far as the Indus. At the same time they were the centres of commerce and industrial life: and this, in conjunction with the royal favour, and the privileges accorded them, continually drew new settlers (especially Jews), and many of them developed into great and flourishing towns (see further under Hellenism).

Shortly after his conquest of Babylonia, Seleucus had founded a new capital, Seleucia (q.v.), on the Tigris: his intention being at once to displace the ancient Babylon from its former central position, and to replace it by a Greek city. This was followed by a series of other foundations in Mesopotamia, Babylonia and Susiana (Elam). ” Media,”

says Polybius (x. 27), ” was en- circled by a sequence of Greek towns, designed as a barrier against the barbarians.” Among those mentioned are: Rhagae (Rai), which Seleucus metamorphosed into a Hellenic city, Europus, Laodicea, Apamea and Heraclea (Strabo xi. 525: Plin. vi. 43: cf. Media). To these must be added Achaea in Parthia, and, farther to the east, Alexandria Arion in Aria, the modern Herat: also Antiochia Margiana (Strabo xi. 514, 516 Plin. 46, 93), now Merv, and many others. Further, Alexandria in Aradrosia, near Kandahar, and the towns founded by Alexander on the Hindu JCush and in Sogdiana.

Thus an active Hellenic life soon arose in the East; and Greek settlers must have come in numbers and founded new cities, which afterwards formed the basis of the Graeco-Bactrian kingdom. Antiochus’s general Demodamas crossed the Jaxartes and set up an altar to the Didymaean Apollo (Plin. vi. 49). Another general, Patrocles, took up the investigation of the Caspian, already begun by Alexander. In contrast with the better knowledge of an older period, he came to the conclusion that the Caspian was connected with the ocean, and that it was possible to reach India on ship-board by that route (Strabo ii. 74, xi. 518; Plin. vi. 38). A project of Seleucus to connect the Caspian with the Sea of Azov by means of a canal is men- tioned by Pliny (vi. 31). To Patrocles is due the information that an active commerce in Indian wares was carried on with the shores of the Black Sea, via the Caspian (Strabo xi. 509).

While Hellenism was thus gaining a firm footing in all the East, the native population remained absolutely passive. Apart The Persian from the rude mountain tribes, ho national resis- Rellgioa tance was dreamed of for centuries. The Iranians under quietly accepted the foreign yoke, and the higher

Greek Rule. c] asses adopted the external forms of the alien civilization (cf. the dedication of a Bactrian, Hyspasines, son of Mithroaxes, in the inventory of the temple of Apollo in Delos, Dittenberger, Sylloge, 588, 1. 109) even though they were unable to renounce their innate characteristics.’ Eratosthenes, for instance, speaks (ap. Strabo i. 66) in high terms of the Iranians (Ariani), ranking them (as well as the Indians, Romans and Carthaginians) on a level with the Greeks, as regards their capacity for adopting city

civilization. The later Parsee tradition contends that Alexander burned the sacred books of Zoroaster, the Avesta, and that only a few fragments were saved and afterwards reconstructed by the Arsacids and Sassanids. This is absolutely unhistorical. The Persian religion was never attacked by the Macedonians and Greeks. Under their dominion, on the contrary, it expanded with great vigour, not only in the west (Armenia, north Syria and Asia Minor, where it was the official religion of the kings of Pontus and Cappadocia), but also in the east, in the countries of the Indian frontier. That the popular gods — Mithras, Anaitis, &c. — had come to the forefront has already been mentioned. This propagandism, however, was void of all national character, and ran on precisely the same lines as the propagandism of the Syrian, Jewish and Egyptian cults. Only in Persia itself, so far as we can judge from a few scanty traces, the national character of the religion seems to have survived among the people side by side with the memory of their old imperial position.

In 282 B.C. Seleucus took the field against Lysimachus, and

annexed his dominions in Asia Minor and Thrace. In 281 he

, . . . was assassinated in crossing to Europe, and his son Independent . . , , , ,, , , ,

Kingdoms Antiochus I. was left supreme over the whole empire.

in Bactria From that time onward the Seleucid Empire was a “d never at rest. Its gigantic extent, from the Aegean

Parthla. t0 t jje j n(j USj everywhere offered points of attack to the enemy. The Lagidae, especially, with their much more compact and effective empire, employed every means to weaken their Asiatic rivals; and auxiliaries were found in the minor states on the frontier — Atropatene, Armenia, Cappadocia, Pontus and Bithynia, the Galatians, Pergamum, Rhodes and other Greek states. Moreover, the promotion of Greek civilization and city life had created numerous local centres, with separate interests and centrifugal tendencies, struggling to attain com- plete independence, and perpetually forcing new concessions from the empire. Thus the Seleucid kings, courageous as many of them were, were always battling for existence (see Seleucid Dynasty).

These disturbances severely affected the borders of Iran. While the Seleucid Empire, under Antiochus II. Theos (264-247), was being harried by Ptolemy II. Philadelphus, and the king’s attention was wholly engaged in the defence of the western provinces, the Greeks

revolted in Bactria, under their governor Diodotus (q.v.). Obviously, it was principally the need of

protection against the nomadic tribes which led to the founda- tion of an independent kingdom; and Diodotus soon attained considerable power over the provinces north of the Hindu-Kush. In other provinces, too, insurrection broke out (Strabo xi. 575, Justin xli. 4); and Arsaces, a chief of the Parni or Aparni — an Iranian nomad tribe (therefore often called Dahan Scythians), inhabiting the steppe east of the Caspian — made himself master of the district of Parthia (q.v.) in 248 B.C. He and his brother Tiridates (q.v.) were the founders of the Parthian kingdom, which, however, was confined within very modest limits during the following decades. Seleucus II. Callinicus (247-226) successfully encountered Arsaces (or Tiridates), and even expelled him (c. 238) ; but new risings recalled Seleucus to Syria, and Arsaces was enabled to return to Parthia.

Greater success attended Antiochus III., the Great (222-187). At the beginning of his reign (220) he subdued, with the help of his minister Hermias, an insurrection of the Antiochus satrap Molon of Media, who had assumed the royal in., the title and was supported by his brother Alexander, Great. satrap of Persis (Polyb. v. 40 sqq.). He further seized the opportunity of extorting an advantageous peace from King Artabazanes of Atropatene, who had considerably extended his power (Polyb. v. 55). After waging an unsuccessful war with Ptolemy IV. for the conquest of Coele-Syria, but suppressing the revolt of Achaeus in Asia Minor, and recovering the former provinces of the empire in that quarter, Antiochus led a great expedition into the East, designing to restore the imperial authority in its full extent. He first removed (211) the Armenian king Xerxes by treachery (Polyb. viii. 25; John of Antioch, fr. 53), and appointed two governors, Artaxias and Zariadris, in his place (Strabo xi. 531). During the next year he reduced the affairs of Media to order (Polyb. x. 27) ; he then conducted a successful campaign against Arsaces of Parthia (209), and against Euthydemus (q.v.) of Bactria (208-206), who had over- thrown the dynasty of Diodotus (Polyb. x. 28 sqq., 48 sqq., xi. 34; Justin xli. 5). In spite of his successes he concluded peace with both kingdoms, rightly considering that it would be impossible to retain these remote frontier provinces per- manently. He next renewed his old friendship with the Indian king Sophagasenus (Subhagasena), and received from him 150 elephants (206 B.C.). Through Arachosia and Drangiane, in the valley of the Etymander (Helmand), he marched to Carmania and Persis (Polyb. xi. 34). Both here and in Babylonia he re-established the imperial authority, and in 205 undertook a voyage from the mouth of the Tigris, through the Arabian gulf to the flourishing mercantile town

of Gerrha in Arabia (now Bahrein) (Polyb. xiii. 9).

Shortly afterwards, however, his successful campaign against Ptolemy V. Epiphanes led to a war with Rome in which the power of the Seleucid Empire was shattered (190 B.C.), Decay otthe Asia Minor lost, and the king compelled to pay a Seleucid heavy contribution to Rome for a long term of years. Empire. In order to raise money he plundered a wealthy temple of Bel in Elam, but was killed by the inhabitants, 187 B.C. (Diod. xxviii. 3, xxix. 15; Strabo xvi. 744; Justin xxxii. 2; S. Jerome (Hierony- mus) on Dan. xi. 19; Euseb. Chron. i. 253). The consequence of this enfeeblement of the empire was that the governors of Armenia asserted their independence. Artaxias founded the kingdom of Great Armenia; Zariadris, that of Sophene on the Euphrates and the sources of the Tigris (Strabo xi. 531). In other districts, also, rebellions occurred; and in the east, Euthydemus and his successors (Demetrius, Eucratidas, &c.) began the conquest of the Indus region and the Iranian borderland (Arachosia, Aria). (See Bactria; Euthydemus; Eucratidas; Demetrius; Menander.)

But the energetic Seleucids fought desperately against their fate. Antiochus IV. Epiphanes (176-163) restored once more the Eastern dominion, defeated Artaxias of Armenia (Appian, Syr. 45; Diod. xxxi. 17a; S. Jerome on Dan. xi. 40), restored several towns in Babylonia and subdued the Elymaeans. His attempt, however, to plunder the sanctuary of Anaitis failed (Polyb. xxxi. 11; cf. Maccab. i. 6, ii. 1, 13; App. Syr. 66). Persis, also, and

Media were still subject to him. But after his death at Tabae in Persis (163 B.C.; cf. Polyb. xxxi. 11; Maccab. i. 6, ii. 9; Jos. Ant. Jud. xii. 9, 1), the Romans took advantage of the dynastic broils to destroy the Seleucid Empire. They reduced its army and fleet, and favoured every rebellion: among others, that of the Jews. In spite of all, Demetrius I. Soter (161-150) succeeded in suppressing (159) a revolt of Timarchus of Miletus, governor of Babylon, who had occupied Media, assumed the title of ” great king,” and had been recognized by the Romans (Appian, Syr. 45-47; Trogus, Prol. 34; Diod. xxxi. 27 A: cf. the coins of Timarchus). 1

VII. The Parthian Empire of the Arsacids. — Meanwhile, in the east,

the Arsacids had begun their expansion. Phraates I. (c. 175-170) subdued the Mardians in Elburz. His brother Mithradates I. (c. 170-138) had to sustain a difficult war with Eucratides of Bactria, but eventually succeeded in wresting MHhra- from him a few districts on the Turanian frontier. dates I. and Indeed, he penetrated as far as, and farther than, the Phraates ii. j n(j us (Diod. xxxiii. 18; Oros. v. 4, 16). In the west he conquered Media, and thence subdued Babylonia. He further reduced the Elymaeans, sacked their temple in the mountains, and captured the Greek city of Seleucia on the Hedyphon (Strabo xvi. 744; Justin xli. 6). The Seleucids, meanwhile, were harassed by aggravated disorders and insurrections. Nevertheless, in 140, Demetrius II. Nicator took the field in order to save the east, but was defeated and captured. Shortly afterwards Mithradates I. died. His son Phraates II. (c. 138-127) was attacked in 130 by Antiochus VII. Sidetes, the brother of Demetrius II., on which the Parthian king released the latter. Antiochus pressed successfully on, and once more recovered Babylonia, but in 129 was defeated in Media and fell in a desperate struggle. With this battle the Seleucid dominion over the countries east of the Euphrates was definitely lost. The Babylonian towns, especially Seleucia {q.v.), were handed over by Phraates to his favourite, the Hyrcanian Himerus, who punished them severely for their resistance.

During these wars great changes had taken place in eastern Iran. In 159 Mongolian tribes, whom the Chinese call Yue-chi Mithra- an(ˆ ˆ e Creeks Scythians, forced their way into dates 11. and Sogdiana, and, in 139, conquered Bactria (Strabo his Sue- xi. 571; Justin xlii. 1; Trog. Prol. 41; see Bactria). ccssors. From Bactria they tried to advance farther into Iran and India. Entering into an alliance with Antiochus VII., they assailed the Parthian Empire. Phraates II. marched to encounter him, but was himself defeated and slain, and his country ravaged far and wide. His successor Artabanus I. (c. 127-124), the uncle of Phraates, also fell in battle against the Tocharians, the principal Scythian tribe (Justin xlii. 1, 2; Jos. Ant. jr. 66); but his son Mith- radates II., surnamed “The Great” (c. 124-88), defeated the Scythians and restored for a while the power of the Arsacids. He also defeated Artavasdes, the king of Great Armenia; his son Tigranes, a hostage in the hands of the Parthians, was only redeemed by the cession of 70 valleys (Strabo xi. 532). When Tigranes attempted to seize Cappadocia, and the Roman praetor P. Cornelius Sulla advanced against him, Mithradates in 92 B.C. concluded the first treaty between Parthia and Rome (Plut. Sidla, v.; Liv. epit. 70). The dynastic troubles of the Seleucids in Syria gave him an opportunity for successful intervention (Jos. Ant. Jud. xiii. 13, 4; 14, 3). Shortly afterwards he

died; and, with his death, the Arsacid power collapsed for the second time. The possession of the western provinces and the dominant position in western Asia passed to the Armenian Tigranes {q.v.), who wrested from the Parthians Mesopotamia and the suzerainty of Atropatene, Gordyene, Adiabene, Osroene. Simultaneously began a new and severe conflict with the Scythians. Parthian coins, probably dating from this period (Wroth, Catal. of the Coins of Parthia, 1903, p. xxx. and p. 40), mention victorious campaigns of Parthian kings and a conquest of the provinces of Aria, Margiane and (?) Traxiane (cf. Strabo xi. 505). But how

1 For the whole of this period see further Antigonus; Antiochus I.-IV. ; Seleucid Dynasty; Hellenism.

confused the situation was is shown by the fact that in 76 B.C. the octogenarian king Sanatruces was seated on the Parthiarj throne by the Scythian tribe of the Sacaraucians (cf. Strabo xi. 511; Trog. Prol. 42). The names of his predecessors are not known to us. Obviously this period was marked by continual dynastic feuds (cf. Trog. Prol. 42: ” ut varia complurium regum in Parthia successione imperium accepit Orodes qui Crassum delevit”). Not till Sanatruces’ successor Phraates III. (70-57) do we find the kingdom again in a settled state.

A fact of decisive significance was that the Romans now began to advance against Tigranes. In vain Mithradates of Pontus and Tigranes turned to the Parthian king, the latter Conflicts even proffering restitution of the conquered frontier with the provinces. Phraates, though rightly distrusting Romans. Rome, nevertheless concluded a treaty with Lucullus (69 B.C.) and with Pompey, and even supported the latter in his campaign against Tigranes in 66. But after the victory it was manifest that the Roman general did not consider himself bound by the Parthian treaty. When Tigranes had submitted, Pompey received him into favour and extended the Roman supremacy over the vassal states of Gordyene and Osroene; though he had allured the Parthian king with the prospect of the recovery of his old possessions as far as the Euphrates. Phraates complained, and simultaneously attacked Tigranes, now a Roman vassal (64 B.C.). But when Pompey refused reparation Phraates recog- nized that he was too weak to begin the struggle with Rome, and contented himself with forming an alliance with Tigranes, in hopes that the future would bring an opportunity for his revenge (Dio Cass, xxxvi. 3, 5; xxxvii. 5 sqq.; Plut. Luc. 20; Pomp. 33, 38; cf. Sallust’s letter of Mithradates to Arsaces).

Although Phraates III. had not succeeded in regaining the full power of his predecessors, he felt justified, in again assuming the title ” king

of kings” — which Pompey declined to acknowledgeˆ- and even in proclaiming himself as “god” (Phlegon, fr. 12 ap. Phot. cod. 97; and on part of his coins), but in 57 B.C. the ” god ” was assassinated by his sons Orodes and Mithradates.

The Parthian Empire, as founded by the conquests of Mithra- dates I. and restored, once by Mithradates II. and again by Phraates III., was, to all exterior appearance, a con- tinuation of the Achaemenid dominion. Thus the Arsacids now began to assume the old title ” king of kings ” (the shahanshah of modern Persia) , though previously their coins, as a rule, had borne only the legend ” great king.” The official version, preserved by Arrian in his Parthica {ap. Phot. cod. 58: see Parthia), derives the line of these chieftains of the Parnian nomads from Artaxerxes II. In reality, however, the Parthian Empire was totally different from its predecessor, both externally and internally. It was anything rather than a world- empire. The countries west of the Euphrates never owned its dominion, and even of Iran itself not one half was subject to the Arsacids. There were indeed vassal states on every hand, but the actual possessions of the kings — the provinces governed by their satraps — consisted of a rather narrow strip of land, stretch- ing from the Euphrates and north Babylonia through southern Media and Parthia as far as Arachosia (north-west Afghanistan), and following the course of the great trade-route which from time immemorial had carried the traffic between the west of Asia and India. We still possess a description of this route by Isidore of Charax, probably dating from the Augustan period (in C. Miiller, Geographi graeci minores, vol. i.), in which is contained a list of the 18 imperial provinces, known also to Pliny (vi. 112; cf. 41). Isidore, indeed, enumerates nineteen; but, of these, Sacastene formed no part of the Parthian Empire, as has been shown by von Gutschmid.

The lower provinces {i.e. the districts west of Parthia) are: (1) Mesopotamia, with northern Babylonia, from the Euphrates bridge at Zeugma to Seleucia on the Tigris; (2) Apolloniatis, the iwy/ˆcej plain east of the Tigris, with Artemita; (3) Chalonitis, the hill-country of Zagros; (4) Western Media; (5) Cambadene, with Bagistana (Behistun) — the mountainous portions of Media; (6) Upper Media, with Ecbatana; (7) Rhagiane or Eastern Media. Then with the Caspian Gates — the pass between Elburz and the central desert, through which lay the route from west Iran to east Iran — the upper provinces begin; (8) Choarene and (9)

Organiza- tion,

Comisene, the districts on the verge of the desert; (10) Hyrcania; (u) Astabene, with the royal town Asaac on the Attruck (see Parthia) • (12) Parthyene with Parthaunisa, where the sepulchres of the kings were laid; (13) Apavarcticene (now Abiward, with the capital Kelat); (14) Margiane (Merv); (15) Aria (Herat); (16) Anauon, the southern portion of Aria; (17) Zarangiane, the country of the Drangians, on the lake of Hamun; (18) Arachosia, on the Etymander (Helmand), called by the Parthians ” White India ” extending as far as Alexandropolis (Kandahar), the frontier city of the Parthian Empire.

On the lower Etymander, the Sacae had established themselves — obviously on the inroad of the Scythian tribes— and after them the country was named Sacastene (now Sejistan, Seistan). Through it lay the route to Kandahar; and for this reason the district is described by Isidore, though it formed no part of the Parthian Empire.

Round these provinces lay a ring of numerous minor states, which as a rule were dependent on the Arsacids. They might Vassal however, partially transfer their allegiance on the rise States. ?’ a ? ew P°™ er (e « Tigranes in Armenia) or a Roman invasion. Thus it is not without justice that the Arsacid period is described, in the later Persian and Arabian tradition as the period of ” the kings of the part-kingdoms “— among which the Ashkanians (i.e. the Arsacids, from Ashak, the later pronunciation of the name Arshak = * Arsaces) had won the iirst place. This tradition, however, is nebulous in the extreme; the whole list of kings, which it gives, is totally unhistorical ; only the names of one Balash (= Vologaeses) and of the last Ardewan (-Artabanus) having been preserved. The period, from the death of Alexander to the Sassanid Ardashir I., is put by the Persian tradition at 266 years; which was afterwards corrected, after Syro-Grecian evidence, to 523 years. The actual number is 548 years {i.e. 323 bc. to a.d. 226). The statements of the Armenian historians as to this period are also absolutely worthless.

The ten most important of the vassal states were : — ■ l i Z j kln S dom of Osroene (q.v.) in the north-east of Mesopotamia, with Edessa as capital, founded about 130 B.C. by the chieftain of an Arabian tribe, the Orrhoei, which established itself there. »l 2 ‘*T° raust be added the numerous Arabian tribes of

ai u j° P -° tamian dtft ert, under their chiefs, among whom one Alchaudomus comes into prominence in the period of Tigranes and Crassus. Their settlement in Mesopotamia was encouraged by rigranes,

according to Plutarch (Luc. 21) and Pliny (vi. 142) In later times the Arabic town Atra in an oasis on the west of the 1 lgns, governed by its own kings, gained special importance.

3 and 4. To the east of the Tigris lay two kingdoms: Gordyene (or Cordyene), the country of the Carduchians (now Bohtan), a wild mountainous district south of Armenia; and Adiabene (Hadyab) the ancient Assyria, on either side of the Zab (Lvcus).

5. On the farther side of Zagros, adjoining Adiabene on the east,

wa f j h L kl ,” gd , om of A tropatene in north Media, now often simply called Media (q.v.).

While the power of Armenia was at its height under Tigranes (86-69 B.C.) all these states owned his rule. After the victories ot r/ompey, however, the Romans claimed the suzerainty, so that during the next decades and the expeditions of Crassus and Antony they oscillated between Rome and Parthia, though their inclination was generally to the latter. For they were all Orientals and consciously or unconsciously, representatives of a reaction against that Hellenism which had become the heritage of Rome. At the same time the loose organization of the Parthian Empire, afforded them a greater measure of independence than they could hope to enjoy under Roman suzerainty.

6. In the south of Babylonia, in the district of Mesene (the modern Maisan), after the fall of Antiochus Sidetes (129 B.C.), an Arabian prince, Hyspaosines or Spasines (in a cuneiform in- scription of 127, on a clay tablet dated after this year, he is called Aspasine) founded a kingdom which existed till the rise of the Sassaman Empire. Its capital was a city (mod. Mohammerah), hrst founded by Alexander on an artificial hill by the junction of the Eulaeus (Karun) with the Tigris, and peopled by his veterans. The town, which was originally named Alexandria and then rebuilt by Antiochus I. as Antiochia, was now’refortified with dikes by Spasines, and christened Spasinu Charax (” the wall of Spasines “) or simply Charax (Plin. vi. 138 seq.). In the following centuries it was the main mercantile centre on the Tigris estuary.

The kingdom of Mesene, also called Characene, is known to us i?? 1 °c9 aslonal references in various authors, especially Lucian (Macrobii, 16) , as well as from numerous coins, dated by the Seleucian era, which allow us to frame a fairly complete list of the kings. 1 I he Arabian dynasty speedily assimilated itself to the native population;

and most of the kings bear Babylonian— in a few cases Parthian— names. The official language was Greek, till on the destruction of Seleucia (a.d. 164), it was replaced on the coinage by Aramaic. Another Babylonian dynast must have

1 See Saint-Martin, Recherches sur la Mesene et la Characene (1838); Reinaud, Membires sur le royaume de la Mesene (1861); E. Babelon, ” Numism. et chronol. des dynastes de la Characene,” in Journ. internat. d’archM. numism. vol. i. (1898).

been Hadadnadinaches (c. 100 B.C.), who built in Tello the fortified palace which has been excavated by de Sarzec.

7. East of the Tigris lay the kingdom of Elymais (Elam), to which belonged Susa and its modern representative Ahwaz, farther down on the Eulaeus. The Elymaeans, who had already offered a repeated resistance to the Seleucids, were subdued by Mithra- dates I., as we have mentioned above; but they remained a separate state, which often rebelled against the Arsacids (Strabo xvi. 744- cf. Plut. Pomp. 36; Tac. Ann. vi. 50). Of the kings who apparently belonged to a Parthian dynasty, several bearing the name Cammas- cires are known to us from coins dated 81 and 71 B.C. One of these _ is designated by Lucian (Macrobii, 16) ” king of the Parthians “; while the coinage of another, Orodes, displays Aramaic script (Allotte de la Fuye, Rev. num., 4me serie, t. vi. p. 92 sqq., 1902). The kingdom, which is seldom mentioned, survived till Ardashir I In its neighbourhood Strabo mentions ” the minor dynasties of the Sagapenians and Silacenians ” (xvi. 745). The Uxians, moreover, with the Cossaeans and other mountain tribes, maintained their independence exactly as under the later Achae- menids (Strabo xvi. 744; Plin. vi. 133).

8. The district of Persis, also, became independent soon after the time of Antiochus IV., and was ruled by its own kings, who perpetuated the Achaemenian traditions, and on their coins — which bear the Persian language in Aramaic characters, i.e. the so-called Pahlavi — appear as zealous adherents of Zoroastrianism and the Fire-cult (see Persis). They were forced, however, to acknowledge the suzerainty of Parthia, to which they stood in the same position as the Persians of Cyrus and his forefathers to the Median Empire (cf Strabo xv. 728, 733, 736; Lucian, Macrob. 15). In later times, before the foundation of the Sassanid dominion, Persis was dis- integrated into numerous small local states. Even in Carmania we find independent kings, one of whom gave his name to a town Vologesocerta (Balashkert) .

0. The east of Iran— Bactria with Sogdiana, Eastern Arachosia and Gedrosia — was never subject to the Arsacids. Here the Graeco-Bactrian and Graeco-Indian kingdoms held their own, till, in 139 B.C., they succumbed before the invading Mongolian and Scythian tribes (see Bactria and works quoted there). But ”' li I . ndus dis t”ct the Greek kings held their ground for an appre- ciably longer period and, for a while, widely extended their power (see Menander of India). Among the kings then following, only known to us from their coins, there appears a dynasty with Iranian and sometimes peculiarly Parthian names which seems to have reigned in the Punjab and Arachosia. Its best-known representa- tive, Gondophares or Hyndopherres, to whom legend makes the apostle Thomas write, reigned over Arachosia and the Indus dis- trict about A.D. 20. Further, about a.d. 70, the Periplus of the Erythraean Sea mentions that the great commercial town of Minnagar in the Indus Delta was under Parthian kings, ” who spent their time in expelling one another.” Here, then, it would seem there existed a Parthian dynasty, which probably went back to the conquests of Mithradates I. (cf. Vincent A. Smith, “The Indo-Parthian Dynasties from about 120 B.C. to a.d. 100,” in the Zeitschr. der deutschen morgenl. Gesellsch. 60, 1906). Naturally, such a dynasty would not long have recognized the suzerainty of the Arsacids. It succumbed to the Indo-Scythian Empire of the Kushana, who had obtained the sovereignty of Bactria as early as about a.d. 50, and thence pressed onward into India. In the period of the Periplus (c. a.d. 70) the Scythians were already settled in the Indus valley (pp. 38, 41, 48), their dominion reaching its zenith under Kanishka (c. a.d. 123-153).

This empire of the Kushana merits special mention here, on account of its peculiar religious attitude, which we may gather from the coins of its kings, particularly those of Kanishka and his successor Huvishka, on which an alphabet adapted from the Greek is employed (cf. Aurel Stein, ” Zoroastrian Deities on Indo-Scythian Coins, in The Babylonian and Oriental Record, vol. i., 1887). Kanishka, as is well known, had embraced Buddhism, and many of his coins bear the image and name of Buddha. Iranian divinities, how- ever, predominate on his currency : Mithras (Mihro or Helios) ■ the Moon Mah (also Selene) ; Athro, the Fire; Orthragno (Verethragna) • Ptoro = Farna (hvarena), ” the majesty of kingship “; Teiro = Tir (Tistrya the archer “); Nana (Nanaia) ; and others. Here, then, we have a perfect example of syncretism ; as in the Mithras cult in Armenia, Asia Minor, and still further in the Roman Empire. Buddhism and Zoroastrianism have been wedded in the state re- ligion, and, in characteristic Indian fashion, are on the best of terms with one another, precisely as, in the

Chinese Empire at the present day, we find the most varied religions, side by side, and on an equal footing.

10. Originally a part of the Turanian steppe belonged to the Arsacids; it was the starting-point of their power. Soon, however, the nomads (Dahae) gained their independence, and, as we have seen, repeatedly attacked and devastated the Parthian Empire in conjunction with the Tocharians and other tribes of Sacae and Scythians. In the subsequent period, again, we shall frequently meet them. }

It may appear surprising that the Arsacids made no attempt to incorporate the minor states in the empire and

create a great and united dominion, such as existed under the Achaemenids and was afterwards restored by the Sassanids. This fact is the clearest symptom of the inner weakness of Character of their empire and of the small power wielded by the the Parthian ” king of kings.” In contrast alike with its prede- Bmplre. cessors and its successors, the Arsacid dominion was peculiarly a chance formation — a state which had come into existence through fortuitous external circumstances, and had no firm foundation within itself, or any intrinsic raison d’Ure.

Three elements, of widely different kinds, contributed . to its origin and defined its character. It was sprung from a predatory nomad tribe (the Parnian Dahae, Scythians) which had established itself in Khorasan (Parthia), on the borders of civilization, and thence gradually annexed further districts as the political situation or the weakness of its neighbours allowed. Consequently, these nomads were the main pillar of the empire, and from them were obviously derived the great magnates, with their huge estates and hosts of serfs, who composed the imperial council, led the armies, governed the provinces and made and unmade the kings (Strabo xi. 515; Justin xli. 2; the former terming them ovyyevtis, “kinsmen” of the king, the latter, probuli). Of these great families that of Surenas held the privilege of setting the diadem on the head of the new king (Plut. Crass. 21 ; Tac. Ann. vi. 42).

The military organization, moreover, was wholly nomadic in character. The nucleus of the army was formed of armoured horse-

men, excellently practised for long-distance fighting with bow and javelin, but totally unable to venture on a hand-to-hand conflict, their tactics being rather to swarm round the enemy's squadrons and overwhelm them under a hail of missiles. When attacked they broke up, as it seemed, in hasty and complete flight, and having thus led the hostile army to break its formation, they them- selves rapidly reformed and renewed the assault. How difficult it was for infantry to hold their own against these mounted squadrons was demonstrated by the Roman campaigns, especially in broad plains like those of Mesopotamia. In winter, however, the Parthians were powerless to wage war, as the moisture of the atmosphere relaxed their bows. The infantry, in contrast with its earlier status under the Persians, was wholly neglected. On the other hand, every magnate put into the field as many mounted warriors as possible, chiefly servants and bought slaves, who, like the Janis- saries and Mamelukes, were trained exclusively for war. Thus Surenas, in 53 B.C., is said to have put at the king's disposal 1000 mailed horsemen and, in all, 10,000 men, including the train, which also comprised his attendants and harem (Plut. Crass. 21; descrip- tion of the military organization; Dio Cass. 40, 15; Justin xli. 2). In the army of 50,000 mounted men which took the field against Mark Antony there were, says Justin, only 400 freemen.

How vital was the nomadic element in the Parthian Empire is obvious from the fact that, in civil wars, the deposed kings con- The Iranian sls tently took refuge among the Dahae or Scythians Pooulation anc ' were restored by them. But, in Parthia, these nomads were amalgamated with the native peasantry, and, with their religion, had adopted their dress and manners. Even the kings, after the first two or three, wear their hair and beard long, in the Iranian fashion, whereas their predecessors are beardless. Although the Arsacids are strangers to any deep religious interest (in contrast to the Achaemenids and Sassanids), they acknowledge the Persian gods and the leading tenets of Zoroastrianism. They erect fire-altars, and even obey the command to abandon all corpses to the dogs and fowls (Justin xli. 3). The union, moreover, recommended by that creed, between brother and sister — and even son and mother — occurs among them. Conse- quently, beside the council of the nobility, there is a second council of " Magians and wise men " (Strabo xi. 515).

Again, they perpetuate the traditions of the Achaemenid Empire. The Arsacids assume the title " king of kings " and derive their line from Artaxerxes II. Further, the royal apotheosis, so common among them and recurring under the Sassanids, is probably not so much of Greek origin as a development of Iranian views. For at the side of the great

god Ahuramazda there stands a host of sub- ordinate divine beings who execute his will — among these the deified heroes of legend, to whose circle the king is now admitted, since on him Ahuramazda has bestowed victory and might.

This gradual Iranianization of the Parthian Empire is shown by the fact that the subsequent Iranian traditions, and Firdousi in particular, apply the name of the ” Parthian ” magnates (Pahlavan) to the glorious heroes of the legendary epoch. Con- sequently, also, the language and writing of the Parthian period, which are retained under the Sassanids, received the name Pahlavi, i.e. ” Parthian.” The script was derived from the Aramaic.

But to these Oriental elements must be added that of Hellenism, the dominant world-culture which had penetrated into Parthia Relation anc ˆ Media. It was indispensable to every state which towards hoped to play some part in the world and was not so Hellenism, utterly secluded as Persis and Atropatene; and the Arsacids entertained the less thought of opposition as they were destitute of an independent national basis. All their

external institutions were borrowed from the Seleucid Empire: their coinage with its Greek inscriptions and nomenclature; their Attic standard of currency; and, doubtless, a great part of their administration also. In the towns Greek merchants were every- where settled: Mithradates I. even followed the precedent of the Seleucids in building a new city, Arsacia, which replaced the ancient Rhagae (Rai, Europus) in Media. The further the Arsacids ex- panded the deeper they penetrated into the province of Hellenism; the first Mithradates himself assumed, after his great conquests, the title of Philhellen, “the protector of Hellenism,” which was retained by almost ali his successors. Then follow the surnames Epiphanes ” the revealed god,” Dicaeus ” the just,” Euergetes ” the benefactor,” all of them essentially Greek in their reference, and also regularly borne by all the kings. After the conquest of the Euphrates and Tigris provinces it was imperative that the royal residence should be fixed there. But as no one ventured to transfer the royal household and the army, with its hordes of wild horsemen, to the Greek town of Seleucia, and thus disorganize its commerce, the Arsacids set up their abode in the great village of Ctesiphon, on the left bank of the Tigris, opposite to Seleucia, which accordingly retained its free Hellenic constitution (see Ctesiphon and Seleucia). So, also, Orodes I. spoke good Greek, and Greek tragedies were staged at his court (Plut. Crass. 33).

In spite of this, however, the rise of the Arsacid Empire marks the

beginning of a reaction against Hellenism — not, indeed, a conscious or official reaction, but a reaction which was p eac tj oa all the more effective because it depended on the impetus j,„a/ ns f of circumstances working with all the power of a natural Hellenism. force. The essential point is that the East is completely divorced from the Mediterranean and the Hellenic world, that it can derive no fresh powers from that quarter, and that, consequently, the influence of the Oriental elements must steadily increase. This process can be most clearly traced on the coins — almost the sole; memorials that the Parthian Empire has left. From reign to reign the portraits grow poorer and more stereotyped, and the inscriptions more neglected, till it becomes obvious that the engraver himself no longer understood Greek but copied mechanically the signs before his eyes, as is the case with the contemporary Indo-Scythian coinage, and aiso in Mesene. Indeed, after Vologaeses I. (51-77), the Aramaic script is occasionally employed. The political opposi- tion to the western empires, the Seleucids first, then the Romans, precipitated this development. Naturally enough the Greek cities beheld a liberator in every army that marched from the West, and were ever ready to cast in their lot with such — a disposition for which the subsequent penalty was not lacking. The Parthian magnates, on the other hand, with the army, would have little to do with Greek culture and Greek modes of life, which they con- temptuously regarded as effeminate and unmanly. Moreover, they required of their rulers that they should live in the fashion of their country, practise arms and the chase, and appear as Oriental sultans, not as Grecian kings.

These tendencies taken together explain the radical weakness of the Parthian Empire. It was easy enough to collect a great army and achieve a great victory; it was absolutely impossible to hold the army together for any longer period, or to conduct a regular campaign. The Parthians proved incapable of creating a firm, united organization, such as the Achaemenids before them, and the Sassanids after them gave to their empire. The kings themselves were toys in the hands of the magnates and the army who, tenaci- ously as they clung to the anointed dynasty of the Arsacids, were utterly indifferent to the person of the individual Arsacid. Every moment they were ready to overthrow the reigning monarch and to seat another on his throne. The kings, for their part, sought protection in craft, treachery and cruelty, and only succeeded in aggravating the situation. More especially they saw an enemy in every prince, and the worst of enemies in their own sons. Sanguin- ary crimes were thus of everyday occurrence in the royal house- hold; and frequently it was merely a matter of chance whether the father anticipated the son, or the son the

father. The conditions were the same as obtained subsequently under the Mahommedan Caliphate (q.v.) and the empire of the Ottomans. The internal history of the Parthian dominion is an unbroken sequence of civil war and dynastic strife.

For the literature dealing with the Parthian Empire and numismatics, see Parthia, under which heading will be found a complete list of the kings, so far as we are able to reconstitute them.

These conditions elucidate the fact that the Parthian Empire, though founded on annexation and perpetually menaced by hostile arms in both the East and the West, yet Later His- never took a strong offensive after the days of toryottbe Mithradates II. It was bound to protect itself ˆrsacU against Scythian aggression in the East and Bmp,re – Roman aggression in the West. To maintain, or regain, the suzerainty over Mesopotamia and the vassal states of that region, as also over Atropatene and Armenia, was its most imperative task. Yet it always remained on the defensive and even so was

lacking in energy. Whenever it made an effort to enforce its claims, it retreated so soon as it was confronted by a resolute foe.

Thus the wars between Parthia and Rome proceeded, not from the Parthians — deeply injured though they were by the Wars with encroachments of Pompey— but from Rome herself. Crassas and Rome had been obliged, reluctantly enough, to enter Antonlus. U p on the inheritance of Alexander the Great; and, since the time of Pompey, had definitely subjected to her dominion the Hellenistic countries as far as the Euphrates. Thus the task now faced them of annexing the remainder of the Macedonian Empire, the whole East from the Euphrates to the Indus, and of thereby saving Greek civilization (cf. Plut. Comp. Nic. et Crass. 4). The aristocratic republic quailed before such an enterprise, though Lucullus, at the height of his successes, entertained the thought (Plut. Luc. 30). But the ambitious men, whose goal was to erect their own sovereignty on the ruins of the republic, took up the project. With this objective M. Licinius Crassus, the triumvir, in 54 B.C., took the aggressive against Parthia, the occasion being favourable owing to the dynastic troubles between Orodes I., the son of Phraates, III., and his brother Mithradates III. Crassus fell

on the field of Carrhae (June 9, 53 B.C.). With this Mesopotamia was regained by the Parthians, and King Artavasdes of Armenia now entered their alliance. But, apart from the ravaging of Syria (51 B.C.) by Pacorus the son of Orodes, the threatened attack on the Roman Empire was carried into effect neither then nor during the civil wars of Caesar and Pompey. At the time of his assassination Caesar was intent on resuming the expedition of Crassus. The Parthians formed a league with Brutus and Cassius, as previously with Pompey, but gave them no support, until in 40 B.C. a Parthian army, led by Pacorus and the republican general Labienus, harried Syria and Asia Minor. But it was easily repulsed by Ventidius Bassus, the lieutenant of Mark Antony. Pacorus himself fell on the 9th of June 38 B.C. at Gindarus in northern Syria. Antony then attacked the Parthians in 36 B.C., and penetrated through Armenia into Atropatene, but was defeated by Phraates IV. — who in 37 B.C. had murdered his father Orodes I. — and compelled to retreat with heavy losses. The continuation of the war was frustrated by the conflict with Octavian. Armenia alone was again subdued in 34 B.C. by Antony, who treacherously captured and executed King Artavasdes.

Roman opinion universally expected that Augustus would take up the work of his predecessors, annihilate the Parthian dominion, and subdue the East as far as the Augustus. Indians, Scythians and Seres (cf . Horace and the other Augustan poets). [But Augustus disappointed these expectations. His whole policy and the needs of the newly organized Roman Empire demanded peace. His efforts were devoted to reaching a modus vivendi, by which the authority of Rome and her most,vital claims might be peacefully vindicated. This the weakness of Parthia enabled him to effect without much difficulty. His endeavours were seconded by the revolt of Tiridates II., before whom Phraates IV. was compelled to flee (32 B.C.), till restored by the Scythians. Augustus lent no support to Tiridates in his second march on Ctesiphon (26 B.C.), but Phraates was all the more inclined on that account to stand on good terms with him. Consequently in 20 B.C., he restored the standards captured in the victories over Crassus and Antony, and recognized the Roman suzerainty over Osroene and Armenia. In return, the Parthian dominion in Babylonia and the other vassal states was left undisputed.

Thus it was due not to the successes and strength of the Par- thians but entirely to the principles of Roman policy as defined by Augustus that their empire appears as a second great independent power, side by side with Rome. The precedence of the Caesars, indeed, was always admitted by the Arsacids; and- Phraates IV. soon entered into a state of dependency on Rome by sending (9 B.C.) four of his sons as

hostages to Augustus — a convenient method of obviating the danger threatened in their person, without the necessity of killing them. In 4 B.C., however,

Phraates was assassinated by his favourite wife Musa and her son Phraates V. In the subsequent broils a Parthian faction obtained the release of one of the princes interned in Rome as Vonones I. (a.d. 8). He failed, however, to maintain his position for long. He was a stranger to the Parthian customs, and the feeling of shame at dependency on the foreigner was too strong. So the rival faction brought out another .Arsacid, resident among the Scythian nomads, Artabanus II., who easily expelled Vonones — only to create a host of enemies by his brutal cruelty, and to call forth fresh disorders.

Similar proceedings were frequently repeated in the period following. In the intervals the Parthians made several attempts to reassert their dominion over Armenia and there install an Arsacid prince ; but on each occasion vologaeses I. they retreated without giving battle so soon as the Romans prepared for war. Only the dynasty of Atropatene was finally deposed and the country placed under an Arsacid ruler. Actual war with Rome broke out under Vologaeses I. (51-77)1 who made his brother Tiridates king of Armenia. After protracted hostilities, in which the Roman army was commanded by Cn. Domitius Corbulo, a peace was concluded in a.d. 63, confirming the Roman suzerainty over Armenia but recognizing Tiridates as king (see Corbulo). Tiridates himself visited Rome and was there invested with the diadem by Nero (a.d. 66). After that Armenia continued under the rule of an Arsacid dynasty.

These successes of Vologaeses were counterbalanced by serious losses in the East. He was hampered in an energetic campaign against Rome by attacks of the Dahae and Sacae. Hyrcania, also, revolted and asserted its independence under a separate line of kings. A little later, the Alans, a great Iranian tribe in the south of Russia — the ancestors of the present-day Ossets — broke for the first time through the Caucasian passes, and ravaged Media and Armenia — an incursion which they often repeated in the following centuries.

On the other side, the reign of Vologaeses I. is characterized by a great advance in the Oriental reaction against Hellenism. The line of Arsacids which came to the throne in the person of Artabanus II. (a.d. 10) stands in open opposition to the old kings with their leanings to Rome and, at least external, tinge of Hellenism. The new regime obviously laid much more stress on the Oriental character of their state, though Philostratus, in his life of Apollonius of Tyana(who

visited the Parthian court), states that Vardanes I. (a.d. 40-45), the rival king to the brutal Gotarzes (a.d. 40-51), was a cultivated man (Vit. Ap. i. 22, 28, 31 sqq.); and Vologaeses I. is distinguished by the excellent relations which subsisted all his life between himself and his brothers Pacorus and Tiridates, the kings of Media and Armenia. But the coins of Vologaeses I. are quite barbarous, and for the first time on some of them appear the initials of the name of the king in Aramaic letters by the side of the Greek legend. The Hellenism of Seleucia was now attacked with greater deter- mination. For seven years (a.d. 37-43) the city maintained itself in open rebellion (Tac. Ann. xi. 8 seq.), till at last it surrendered to Vardanes, who in consequence enlarged Ctesiphon, which was afterwards fortified by Pacorus (a.d. 78-105: v. Ammian. 23, 6, 23). In the neighbourhood of the same town Vologaeses I. founded a city Vologesocerta (Balashkert), to which he attempted to transplant the population to Seleucia (Plin. vi. 122: cf. Th. Noldeke in Zeitschr. d. deutsch. morgenl. Gesellschaft, xxviii., 100). Another of his foundations was Vologesias (the Arabian Ullaish), situated near Hira on the Euphrates, south of Babylon, which did appreciable damage to the commerce of Seleucia and is often mentioned in inscrip- tions as the destination of the Palmyrene caravans.

After Vologaeses I. follows a period of great disturbances. The literary tradition, indeed, deserts us almost entirely, but the coins, and isolated literary references prove that during the years a.d. 77 to 147, two kings, and sometimes three or more, were often reigning concurrently (Vologaeses II. 77-79, and 111-147; Pacorus 78-c. 105; Osroes 106-129; Mithradates V. 129-147: also Artabanus III. 80-81; Mithradates IV. and his

son Sanatruces II. 115; and Parthamaspates n 6-1 17). Ob- viously the empire can never have been at peace during these years, a fact which materially assisted the aggressive campaigns Wars with of Trajan (113-117). Trajan resuscitated the Trajan and old project of Crassus and Caesar, by which the Marcus empire of Alexander as far as India was to be won urems. ˆ oT w estern civilization. In pursuance of this plan he reduced Armenia, Mesopotamia and Babylonia to the posi- tion of imperial provinces. On his death, however, Hadrian immediately reverted to the Augustan policy and restored the

conquests. Simultaneously there arose in the East the powerful Indo-Scythian empire of the Kushana, which doubtless limited still further the Parthian possessions in eastern Iran.

An era of quiet seems to have returned with Vologaeses III. (147-101), and we hear no more of rival kings. With the Roman Empire a profound peace had reigned since Hadrian (117), which was first disturbed by the attack of Marcus Aurelius and Aelius Verus in 162. This war, which broke out on the question of Armenia and Osroene, proved of decisive significance for the future development of the East, for, in its course, Seleucia was destroyed by the Romans under Avidius Cassius (164). The downfall of the great Greek city sealed the fate of Hellenism in the countries east of the Euphrates. Henceforward Greek culture practically vanishes and gives place to Aramaic; it is significant that in future the kings of Mesene stamped their coinage with Aramaic legends. This Aramaic victory was powerfully aided by the ever-increasing progress of Christianity, which soon created, as is well known, an Aramaic literature Christianity. °^ wmcn the language was the dialect of Edessa, a city in which the last king of Osroene, Abgar IX. (170- 214), had been converted to the faith. After that Greek culture and Greek literature were only accessible to the Orientals in an Aramaic dress. Vologaeses III. is probably also the king Valgash, who, according to a native tradition, preserved in the Dinhart, began a collection of the sacred writings of Zoroaster — the origin of the Avesta which has come down to us. This would show how the national Iranian element in the Parthian Empire was continually gathering strength.

The Roman war was closed in 165 by a peace which ceded north-west Mesopotamia to Rome. Similar conflicts took place in 195-202 between Vologaeses IV. (191-209) and Septimius Severus, and again in 216-217 between Artabanus IV. (200-226) and Caracalla. They failed, however, to affect materially the position of the two empires.

VIII. The Sassanian Empire. — That the Arsacid Empire should have endured some 350 years after its foundation by Ardashir 1. Mithradates I. and Phraates II., was a result, not of internal strength, but of chance working in its external development. It might equally well have so existed for centuries more. But under Artabanus IV. the catastrophe came. In his days there arose in Persis — precisely as Cyrus had arisen under Astyages the Mede — a great personality. Ardashir (Artaxerxes) I., son of Papak (Babek), the descendant of Sasan, was the sovereign of one of the small states into which Persis had gradually fallen. His father Papak had taken possession of the district of Istakhr, which had replaced the old Persepolis, long a mass

of ruins. Thence Ardashir I., who reigned from about a.d. 2r2, subdued the neighbouring poten- tates — disposing of his own brothers among the rest. This proceeding quickly led to war with his suzerain Artabanus IV. The conflict was protracted through several years, and the Parthians were worsted in three battles. The last of these witnessed the fall of Artabanus (a.d. 226), though a Parthian king, Artavasdes — perhaps a son of Artabanus IV. — who is only known to us from his own coins, appears to have retained a portion of the empire for some time longer. The members of the Arsacid line who fell into the hands of the victor were put to death; a number of the princes found refuge in Armenia, where the Arsacid dynasty maintained itself till a.d. 429. The remainder of the vassal states — Carmania, Susiana, Mesene — were ended by Ardashir; and the autonomous desert fortress of Hatra in Mesopotamia was destroyed by his son Shapur

(Sapor) I., according to the Persian and Arabian traditions, which, in this point, are deserving of credence. The victorious Ardashir then took possession of the palace of Ctesiphon and assumed the title ” King of the kings of the Iranians ” (/3a

The new empire founded by Ardashir I. — the Sassanian, or Neo-Persian Empire — is essentially different from that of his Arsacid predecessors. It is, rather, a continua- Sassanian tion of the Achaemenid traditions which were still Wars with alive on their native soil. Consequently the national Rom ?’ impetus — already clearly revealed in the title of the new sovereign — again becomes strikingly manifest. The Sassanian Empire, in fact, is once more a national Persian or Iranian Empire. The religious element is, of course, inseparable from the national, and Ardashir, like all the dynasts of Persis, was an ardent devotee of the Zoroastrian doctrine, and closely connected with the priesthood. In his royal style he assumed the designation ” Mazdayasnian ” (MacSaorvai), and the fire- cult was everywhere vigorously disseminated. Simultaneously the old claims to world dominion made their reappearance. After the defeat of Artabanus, Ardashir, as heir of the Achae- menids, formulated his pretensions to the dominion of western Asia (Dio. Cass. 80, 3; Herodian vi. 2, 4; Zonar. xii. 15; similarly under Shapur II.: Ammian. Marc. xvii. 5, 5). He attacked Armenia, though without permanent success (cf . von Gutschmid in Zeitschr. d. d. morgenl. Ges. xxxi. 47, on the fabulous Armenian account of these wars), and despatched his armies against Roman Mesopotamia. They strayed as far as Syria and Cappadocia. The inner decay of the Roman Empire, and the widespread tendency of its troops to mutiny and usurpation, favoured his enterprise. Nevertheless, the armies of Alexander Severus,

supported by the king of Armenia, succeeded in repelling the Persians, though the Romans sustained severe losses (231- 233). Towards the end of his reign Ardashir resumed the attack; while his son Shapur I. (241-272) reduced Nisibis and Carrhae and penetrated into Syria, but was defeated by shaparl. Gordian III. at Resaena (243). Soon afterwards, however, the Roman Empire seemed to collapse utterly. The Goths defeated Decius (251) and harried the Balkan Peninsula and Asia Minor, while insurrections broke out everywhere and the legions created one Caesar after the other. Then Shapur resumed the war, subdued Armenia and plundered Antioch. The emperor Valerian, who marched to encounter him, was overthrown at Edessa and taken prisoner (260). The Persian armies advanced into Cappadocia; but here Ballista or Balista (d. c. 264) beat them back, and Odenathus (Odainath), prince of Palmyra (q.v.), rose in their rear, defeated Shapur, captured his harem, and twice forced his way to Ctesiphon (263-265). Shapur was in no position to repair the defeat, or even to hold Armenia; so that the Sassanid power failed to pass the bounds of the Arsacid Empire. Nevertheless Shapur I., in contrast to his father, assumed the title ” King of the kings of the Iranians and non-Iranians” (/3acuXei;s fiaaCKkwv ‘Apiav&v ical ‘Avapiapwv; shah an shah Iran we Aniran), thus emphasizing his claim to world dominion. His successors retained the designation, little as it corresponded to the facts, for the single non-Iranian land governed by the Sassanids was, as under the Parthians, the district of the Tigris and Euphrates as far as the Mesopo- tamian desert; western and northern Mesopotamia remained Roman.

The Sassanid ruler is the representative of the ” Kingly Majesty,” derived from Ormuzd, which appears in the Avesta as the angel Kavaem Hvareno, ” the royal glory,” and, according to legend, once beamed in the Iranian kings, unattainable to Organiza- all but those of royal blood. A picture, which frequently °”’ recurs in the rock-reliefs of Ardashir I. and Shapur I., represents the king and the god Ormuzd both on horseback, the latter in the act of handing to his companion the ring of sovereignty. Thus it is explicable that all the Sassanids, as many of the Arsacids before them, include the designation of ” god ” in their formal style. From this developed (as already under the Arsacids) that strict principle of legitimacy which is still vigorous in Firdousi. It applies, however, to the whole royal house, precisely as in the Ottoman Empire of to-day. The person of the individual ruler

is, on the other hand, a matter of indifference. He can readily be removed and replaced by another; but no usurper who was not of the legitimate blood can hope to become the genuine king. Therefore the native tradition carries the Sassanid line back to the Achaemenids and, still further, to the kings of the legendary period. Officially the king is all-powerful, and his will, which is guided by God and bound up in His law, unfettered. Thus, externally, he is surrounded by all the splendour of sovereignty; on his head he wears a great and resplendent crown, with a high circular centre- piece; he is clothed in gold and jewels; round him is a brilliant court, composed of his submissive servants. He sits in dazzling state on his throne in Ctesiphon. All who approach fling them- selves to the ground, life and death depend on his nod. Among his people he is accounted the fairest, strongest and wisest man of the empire; and from him is required the practice of all piety and virtue, as well as skill in the chase and in arms — especially the bow. Ardashir I., moreover, and his successors endeavoured to establish the validity of the royal will by absorbing the vassal states and instituting a firmer organization. Nevertheless they failed to attain the complete independence and power of the Achae- menids. Not strong enough to break up the nobility, with its great estates, they were forced to utilize its services and still further to promote its interests; while their dependence on its good-will and assistance led inevitably to incessant gifts of money, lands and men. This state of affairs had also prevailed under the later Achaemenids, and had materially contributed to the disintegration of the empire and the numerous insurrections of the satraps. But the older Achaemenids held an entirely different position; and hardly a single Sassanid enjoyed even that degree of power which was still retained by the later Achaemenids. It was of fundamental importance that the Sassanian Empire could not make good its claim to world dominion; and, in spite of the title of its kings, it always remained essentially the kingdom of Iran — or rather west Iran, together with the districts on the Tigris and Euphrates. This fact, again, is most closely connected with its military and administrative organization. The external and internal conditions of the empire are in mutual reaction upon one another. The empire, which in extent did not exceed that of the Arsacids with its vassal states, was protected on the east and west by the great „.„, deserts of central Iran and Mesopotamia. For the

a hi 3 ‘ defence of these provinces the mounted archers, who ?T e ” formed the basis of the army, possessed adequate men ‘ strength; and though the Scythian nomads from the east, or the Romans from the

west, might occasionally penetrate deep into the country, they never succeeded in maintaining their position. But the power of the neo-Persian Empire was not great enough for further conquests, though its army was capable and animated by a far stronger national feeling than that of the Parthians. It still consisted, however, of levies from the retinue of the magnates led by their territorial lords; and, although these troops would stream in at the beginning of a war, they could not be kept per- manently together. For, on the one hand, they were actuated by the most varied personal interests and antipathies, not all of which the king could satisfy; on the other hand he Could not, owing to the natural character and organization of his dominions, maintain and pay a large army for any length of time. Thus the great hosts soon melted away, and a war, begun successfully, ended ingloriously, and often disastrously. Under such circum- stances an elaborate tactical organization employing different species of arms, or the execution of a comprehensive plan of cam- paign, was out of the question. The successes of the Sassanids in the east were gained in the later period of their dominion; and the Roman armies, in spite of decay in discipline and military spirit, still remained their tactical and strategical superiors. A great victory might be won — even an emperor might be captured, like Valerian — but immediately afterwards successes, such as those gained against Shapur I. “(who was certainly an able general) by Ballista and Odenathus of Palmyra, or the later victories of Carus, Julian and others, demonstrated how far the Persians were from being on an equality with the Romans. That Babylonia perma- nently remained a Sassanian province was due merely to the geographical conditions and to the political situation of the Roman Empire, not to the strength of the Persians.

Among the magnates six great houses — seven, if we include the royal house — were still regarded as the foremost, precisely as under the Achaemenids, and from these were drawn v hii« t ˆ e generals, crown officials and governors (cf. Procqp. Nobility. p ers _ ;_ 6, 13 S qq.). In the last of these positions we frequently find princes of the blood, who then bear the royal title (shah). Some of these houses — whose origin the legends derive from King Gushtasp {i.e. Vishtaspa), the protector of Zoroaster (Marquart, Zeitschr. d. d. morgenl. Ges. xlix. 635 sqq.), already existed under the Arsacids, e.g. the Suren (Surenas, vide supra, p. 798) and Karen (Carenes, Tac. Ann. xii. 12 sqq.), who had obviously embraced the cause of the victorious dynasty at the correct moment and so re- tained their position. The name Pahlavan, moreover, which denoted the Parthian magnates, passed over into the new empire. Below these there was an inferior nobility, the dikhans (” village-lords “) and the “knights” (aswar) ; who, as among the

Parthians, took the field in heavy scale-armour. To an even greater extent than

under the Arsacids the empire was subdivided into a host of small provinces, at the head of each being a Marzban (” boundary-lord,” ” lord of the marches “). These were again comprised in four great districts. With each of these local potentates the king could deal with as scant consideration as he pleased, always provided that he had the power or understood the art of making himself feared. But to break through the system or replace it by another was impossible. In fact he was compelled to proceed with great caution whenever he wished to elevate a favourite of humbler origin to an office which custom reserved for the nobility. Thus it is all the more worthy of recognition that the Sassanian Empire was a fairly orderly empire, with an excellent legal administration, and that the later sovereigns did their utmost to repress the encroachments of the nobility, to protect the commonalty, and, above all, to carry out a just system of taxation.

Side by side with the nobles ranked the spiritual chiefs, now a far more powerful body than under the Arsacids. Every larger district had its upper Magian {Magupat, mobed, i.e. ” Lord of the Magians “). At their head was the « eC i!™’« supreme Mobed, resident in Rhagae (Rai), who was re- Ueve °P m garded as the successor of Zoroaster. In the new empire, mea ‘ of which the king and people were alike zealous professors of the true faith, their influence was extraordinarily strong (cf. Agathias ii. 26) — comparable to the influence of the priesthood in later Egypt, and especially in Byzantium and medieval Christendom. As has already been indicated, it was in their religious attitudes that the essential difference lay between the Sassanid Empire and the older Iranian states. But, in details, the fluctuations were so manifold that it is necessary at this point to enter more fully into the history of Persian religion (cf. especially H. Gelzer, ” Eznik u. d. Entwickel. des pers. Religions-systems,” in the Zeitschr. f. armen. Philol. i. 149 sqq.).

The Persian religion, as we have seen, spread more and more widely after the Achaemenian period. In the Indo-Scythian Empire the Persian gods were zealously worshipped ; in Armenia the old national religion was almost entirely banished by the Persian cults (Gelzer, ” Zur armen. Gotterlehre,” in Ber. d. sacks. Gesch. d. Wissensch., 1895); in Cappadocia, North Syria and the west of Asia Minor, the Persian gods were everywhere adored side by side with the native deities. It was in the third century that the cult of Mithras, with its mysteries and a theology evolved from Zoroastrianism, attained the widest diffusion in all Latin-speaking provinces of the Roman dominion; and

it even seemed for a while as though the Sol invictus Mithras, highly favoured by the Caesars, would become the official deity-in-chief of the empire. But in all these cults the Persian gods are perfectly tolerant of other native or foreign divinities; vigorous as was their propagandism, it was yet equally far removed from an attack on other creeds. Thus this Parseeism always bears a syncretic character; and the supreme god of Zoroastrian theory, Ahuramazda {i.e. Zeus or Jupiter), in practice yields place to his attendant deities, who work in the world and are able to lead the believer, who has been initiated and keeps the commandments of purity, to salvation.

But, meanwhile, in its Iranian home and especially in Persis, the religion of Zoroaster lived a quiet life, undisturbed by the proceedings of the outside world. Here the poems of the prophet and fragments of ancient religious literature survived, understood by the Magians and rendered accessible to the faithful laity by versions in the modern dialect (Pahlavi). Here the opposition between the good spirit of light and the demons of evil — between Ormuzd and Ahriman — still remained the principal dogma of the creed; while all other gods and angels, however estimable their aid, were but subordinate servants of Ormuzd, whose highest manifestation on earth was not the sun-god Mithras, but the holy fire guarded by his priests. Here all the prescriptions of purity — partly connected with national customs, and impossible of execution abroad — were diligently observed; and even the injunction not to pollute earth with corpses, but to cast out the dead to vulture and dog, was obeyed in its full force. At the same time Ahuramazda preserved his character as a national god, who bestowed on his worshippers victory and world dominion. In the sculptures of the Sassanids, as also in Armenian traditions, he appears on horseback as a war-god. Here, again, the theology was further developed, and an attempt made to annul the old dualism by envisaging both Ormuzd and Ahriman as emanations of an original principle of infinite time (Zervan), a doctrine which long enjoyed official validity under the Sassanids till, in the reign of Chosroes I., ” the sect of Zervanites ” was pronounced heretical. 1 But, above all, the ritual and the doctrine of purity were elaborated and expanded, and there was evolved a complete and detailed system of casuistry, dealing with all things allowed and forbidden, the forms of pollution and the expiation for each, &c, which, in its arid and spiritless monotony vividly recalls the similar prescriptions in the Pentateuch. The consequences of this development were that orthodoxy and literal obedience to all priestly injunctions now assumed an impor- tance far greater than previously ; henceforward, the great command- ment of Zoroastrianism, as of Judaism, is to combat the heresies

1 It may be observed that this innovation was also known to the Mithras-cult of the West, where Zervan appears as aXitv.

of the heathen, a movement which had already had an energetic representative in the prophet himself. Heathenish cults and forbidden manners and customs are a pollution to the land and a deep insult to the true God. Therefore the duty of the believer is to combat and destroy the unbeliever and the heretic. In short, the tolerance of the Achaemenids and the indifference of the Arsacids are now replaced by intolerance and religious persecution.

Such were the views in which Ardashir I. grew up, and in their energetic prosecution he found a potent instrument for the building up of his empire. It has previously been mentioned that Volo- gaeses III. had already begun a collection of the holy writings; and the task was resumed under Ardashir. At his order the orthodox doctrines and texts were compiled by the high priest Jansar; all divergent theories were prohibited and their adherents proscribed. Thus arose the Avesta, the sacred book of the Parsees. Above all, the sacred book of laws, the Vendidad, breathes through- out the spirit of the Sassanian period, in its intolerance, its casuistry degenerating into absurdity, and its soulless monotony. Sub- scription to the restored orthodox doctrine was to the Iranian a matter of course. The schismatics Ardashir imprisoned for a year ; if, at its expiration, they still refused to listen to reason, and remained stiff-necked, they were executed. It is even related that, in his zeal for uniformity of creed, Ardashir wished to extinguish the holy fires in the great cities of the empire and the Parthian vassal states, with the exception of that which burned in the residence of the dynasty. This plan he was unable to execute. In Armenia, also, Ardashir and Shapur, during the period of their occupation, sought to introduce the orthodox religion, destroyed the heathen images — even those of the Iranian gods which were here considered heathen, — and turned the shrines into fire-altars (Gelzer, Ber. sacks. Ges. p. 135, 1895). Shapur I., who appears to have had a broader outlook, added to the religious writings a collection of scientific treatises on medicine, astronomy, mathematics, philo- sophy, zoology, &c, partly from Indian and Greek sources.

This religious development was most strongly influenced by the fact

that, meanwhile, a powerful opponent of Zoroastrianism had arisen with an equally zealous propagandism and an tChHstl- e< l ua l exclusiveness and intolerance. More especially salt ' n tne countr ' es °' tne Tigris and Euphrates, now alto-

•”■ gether Aramaic, Christianity had everywhere gained a

firm footing. 1 But its missionary enterprise stretched over the whole of Iran, and even farther. The time was come when, in the western and eastern worlds alike, the religious question was for large masses of people the most important question in life, and the diffusion of their own creed and the suppression of all others the highest and holiest of tasks. The man who thinks thus knows no com- promise, and so Zoroastrianism and Christianity confronted each other as mortal enemies. Still the old idea that every religion contained a portion of the truth, and that it was possible to borrow something from one and amalgamate it with another, had not yet lost all its power. From such a conception arose the teaching of Mani or Manes. For Manichaeism (q.v.) is an attempt to weld the doctrine of the Gospel and the doctrine of Zoroaster Maaicbae- ; nto a un ;f ornl S y S tem, though naturally not without “”” an admixture of other elements, principally Babylonian

and Gnostic. Mani, perhaps a Persian from Babylonia, is said to have made his first appearance as a teacher on the coronation day of Shapur I. At all events he found numerous adherents, both at court and among the magnates of the empire. The king even inclined to him, till in a great disputation the Magians gained the predominance. None the less Mani found means to diffuse his creed far and wide over the whole empire. Even the heir to the throne, Hormizd I. (reigned 272-273), was favourably disposed to him; but Shapur’s younger son, Bahram I. (273-276), yielded to sacerdotal pressure, and Mani was executed. After that Manichaeism was persecuted and extirpated in Iran. Yet it maintained itself not merely in the west, where its head resided at Babylon — propagating thence far into the Roman Empire — but also in the east, in Khorasan and beyond the bounds of the Sassanian dominion. There the seat of its pon- tiff was at Samarkand; thence it penetrated into Central Asia, where, buried in the desert sands which entomb the cities of eastern Turkestan, numerous fragments of the works of Mani and his disciples, in the Persian language (Pahlavi) and Syrian script, and in an East Iranian dialect, called Sogdian, which was used by the Manichaeans of Central Asia, have been discovered (K. Muller, ” Handschriftenreste in Estrangelo-schrift aus Turfan, in Chinesisch-Turkestan,” in Abh. d. berl. Akad., 1904) ; among them translations of texts of the New Testament (K.

Muller, Berichte der Berl., 1907, p. 260 seq.). In these texts God the Father is identified with the Zervan of Zarathustrism, the devil with Ahriman. The further religious development of the Sassanid Empire will be touched upon later.

1 For the propagation and history of the Christians in the Sassanid Empire, cf. Labourt, Le Ckristianisme dans Vempire perse sous la dynastie sassanide (1904); Harnack, Die Mission und Ausbreitung des Chrisienthums in den ersten drei Jahrhunderlen, 2. Aufl. (1906), Bd. II. p. 121 seq. ; Chabot, Synodicon orientale (1902) (a collection of the acts of the Nestorian synods held under the rule of theSassanids).

Like the Arsacids the kings resided in Ctesiphon, where, out of the vast palace built by Chosroes I., a portion at least of the great hall is still erect. On the ruins of Seleucia, on the opposite bank of the Tigris, Ardashir I. built the city “t’ ™” re of Veh-Ardashir (“good is Ardashir”), to which the later an < IArts – kings added new towns, or rather new quarters. In Susiana Shapur I. built the great city of Gondev-Shapur, which succeeded the ancient capital of the Persian Empire. At the same time the mother-country again gained importance; especially the capital of Persis, Istakhr, which had replaced the former Persepolis (now the ruins of Hajji-abad). Farther in the south-east, Ardashir I. built Gur (now Firuzabad), under the name of Ardashir-khurre (" the glory of Ardashir "). At these places and in Sarwistan, near Shiraz and elsewhere, lie ruins of the Sassanid palaces, which in their design go back to the Achaemenid architecture, blending with it, however, Graeco-Syrian elements and serving in their turn as models for the structures of the Caliphs (see Architecture : § Sassanian). After its long quiescence under the Arsacids native art underwent a general renaissance, which, though not aspiring to the Achaemenian creations, was still of no small importance. Of the Sassanian rock-sculptures some have already been mentioned ; besides these, numerous engraved signet-stones have been preserved. The metal-work, carpets and fabrics of this period enjoyed a high reputation; they were widely distributed and even influenced western art.

In the intellectual life and literature of the Sassanid era the main characteristic is the complete disappearance of Hellenism and the Greek language. Ardashir I. and Shapur I. still appended Greek translations to some of their inscrip- Literature. tions; but all of later date are drawn up in Pahlavi alone. The coins invariably bear a Pahlavi legend — on the obverse the king’s head with his name and title; on the reverse, a fire-altar (generally with the ascription ” fire of Ardashir, Shapur, &c,” -i.e. the fire of the royal palace), and the name of the place of coinage, usually abbreviated. The real missionaries of

culture in the empire were the Aramaeans (Syrians), who were connected with the West by their Christianity, and in their translations diffused Greek literature through the Orient. But there also developed a rather extensive Pahlavi literature, not limited to religious subjects, but containing works in belles lettres, modernizations of the old Iranian sagas and native traditions, e.g. the surviving fabulous history of Ardashir I., ethical tales, &c, with translations of foreign literature, principally Indian, — one instance being the celebrated book of tales Kalilah and Dimnah (see Syriac Literature), dating from Chosroes I., in whose reign chess also was introduced from India.

. Authorities. — Side by side with the accounts of Roman and Greek authors stands the indigenous tradition Which, especially for the later years of the empire, is generally trustworthy. It goes back to a native work, the Khudai nama (" book of lords "), compiled under Chosroes I. and continued to Yazdegerd III. Its narrations are principally preserved in Tabari, though there com- bined with numerous Arabian traditions ; also in the poetical adaptation of Firdousi. To these may be added Syrian accounts, particularly in the martyrologies, which have been excellently treated by G. Hoffmann, Ausziige aus syrischen Akten persischer Mdrlyrer (1880); also the statements of the Armenian historians.

The fundamental work on Sassanian history is Theodor Noldeke's Gesch. der Perser u. Araber zur Zeit der Sassaniden, aus der arabischen Chronik des Tabari (1879, trans, with notes and excursuses chiefly on the chronology and organization of the empire). On this is based Noldeke's Aufsatze zur pers. Gesch. (1887 ; containing a history of the Sassanian Empire, pp. 86 sqq.). The only other works re- quiring mention are: G. Rawlinson, The Seventh Great Oriental Monarchy (1876), and F. Justi's sketch in the Grundriss der iranischen Philologie, vol. ii. (1904). For the geography and numerous details of administration: J. Marquart, " Eranshahr " {Abh. d. gotting. Ges. d. Wissensch., 1901). For the numismatology the works of A. D. Mordtmann are of prime importance, especially his articles in the Zeitschr. d. d. morgenl. Ges. (1879), xxxiii. 113 sqq, and xxxiv. I sqq. (1880), where the inscriptions of the individual kings are also enumerated. Also Noldeke, ibid. xxxi. 147 sqq. (1877). For facsimiles of coins the principal work is J . de Bartholomaei, Collection de monnaies sassanides (2nd ed., St Petersburg, 1875); For the inscriptions: Edward Thomas, "Early Sassanian Inscriptions," Journ. R. A. Soc. vol. ii. (1868) ; West, Pahlavi Literature " in the Grundriss d. iran. Philol. vol. ii. For the monuments : Flandin and Coste, Voyage en Perse (1851); Stolze, Persepolis (1882); Fr. Sarre, Iran. Felsreliefs a. d. Z. der Achaemeniden und Sassaniden (1908).

In foreign policy the problems under the Sassanid kings 2

2 List of kings (after Noldeke, Tabari, p. 4.35). Ardashir I., 226-241. Ardashir II., 379-383.

Shapur I., 241-272. Shapur III., 383-388.

Hormizd I., 272-273. Bahram IV., 388-399.

Bahram I., 273-276. Yazdegerd I., 399-420.

Bahram II., 276-293. Bahram V., Gor. 420-438.

Bahram III., 293. Yazdegerd II., 438-457.

Narseh (Narses), 293-302. Hormizd III., 457-459.

Hormizd II., 302-310. Peroz, 457-484.

Shapur II., 310-379. Balash, 484-488.

remained as of old, the defence and, when possible, the expansion of the eastern and western frontiers. In the first two centuries History °f tne Sassanid Empire we hear practically nothing of the of its relations with the East. Only occasional Sassaaiaa notices show that the inroads of the Oriental nomads mp ‘ had not ceased, and that the extent of the empire had by no means exceeded the bounds of the Parthian dominion — Sacastene (Seistan) and western Afghanistan. Far to the east, on both sides of the Indus, the Kushana Empire was still in existence, though it was already hastening to decay, and about a.d. 320 was displaced from its position in India by the Gupta dynasty. In the west the old conflict for Osroene and northern Mesopotamia (now Roman provinces), with the fortresses of Edessa, Carrhae and Nisibis, still smouldered. Armenia the Sassanids were all the more eager to regain, since there the Arsacid dynasty still survived and turned for protection to Rome, with whom, in consequence, new wars perpetually broke out. In the reign of Bahram II. (276-293), the emperor Cams, burning to avenge the disaster of Valerian, penetrated into Mesopotamia without meeting opposition, and reduced Coche (near Seleucia) and Ctesiphon; but his sudden death, in December of

283, precluded further success, and the Roman army returned home. Bahram, however, was unable to effect any- thing, as his brother Hormizd was in arms, supported by the Sacae and other tribes. (Mamertin, Parxgyr. Maximin. 7. 10; GetieM. Maximin. 5, 17.) He chose, consequently, to buy peace with Diocletian by means of presents. Some years later his uncle and successor, Narses, after subduing his rival Bahram III., occupied Armenia and defeated the emperor Galerius at Callinicum (206). But in the following year he sustained a severe reverse in Armenia, in which he lost his war-chest and harem. He then concluded a peace, by the terms of which Armenia remained under Roman suzerainty, and the steppes of northern Mesopotamia, with Singara and the hill-country on the left bank of the Tigris as far as Gordyene, were ceded to the victor (Ammian. Marc. xxv. 7, 9; Petr. Patr. jr. 13, 14; Rufus brev. 25). In return Narses regained his household. This peace, ratified in 297 and completely expelling the Sassanids from the disputed districts, lasted for forty years.

For the rest, practically nothing is known of the history of the first six successors of Shapur I. After the death of Hormizd II. (302-310), the son of Narses, the magnates imprisoned or put to death his adult sons, one of whom, Hormisdas, later escaped to the Romans, who used him as a pretender in their wars. Shapur II., a posthumous child of the late king, was then raised to the throne, a proof that the great magnates held the sovereignty in their own hands and attempted to order matters at their own pleasure. Shapur, however, when he came to manhood proved himself an independent and energetic ruler.

Meanwhile the Roman Empire had become Christian, the sequel of which was that the Syro-Christian population of Shapur u. Mesopotamia and Babylonia — even more than the Persecution Hellenic cities in former times — gravitated to the of the W est and looked to Rome for deliverance from the

Christians. j nn( ]el yoke. On similar grounds Christianity, as opposed to the Mazdaism enforced officially by the Sassanids, became predominant in Armenia. Between these two great creeds the old Armenian religion was unable to hold its own; as early as a.d. 294 King Tiridates was converted by Gregory the Illuminator and adopted the Christian faith. For this very reason the Sassanid Empire was the more constrained to champion Zoroastrianism. It was under Shapur II. that the compilation of the Avesta was completed and the state orthodoxy perfected by the chief mobed, Aturpad. All heresy was proscribed by the

Kavadh I., 488-531. (Bahram VI., Cobin, Bistam 590-

(Djamasp, 496-498). 596.)

Chosroes (Khosrau) I., Anushir- Kavadh II., Sheroe, 628.

van, 531-579. Ardashir III., 628-630.

Hormizd IV., 579~590. (Shahrbaraz, 630.)

Chosroes II., Parvez, 590-628. (Boran and others, 630-632.)

Yazdegerd III., 632-651.

On most of these kings there are separate articles.

state, defection from the true faith pronounced a capital crime, and the persecution of the heterodox — particularly the Chris- tians — began (cf. Sachall, " Die rechtlichen Verhaltnisse der Christen in Sassanidenreich," in Mitteilungen des Seminars fiir orientalische Sprachen jiir Berlin, Bd. X., Abt. 2, 1907). Thus the duel between the two great empires now becomes simultaneously a duel between the two religions.

In such a position of affairs a fresh war with Rome was inevit- able. 1 It was begun by Shapur in a.d. 337, the year that saw the death of Constantine the Great. The conflict centred round the Mesopotamian fortresses; Shapur thrice besieged Nisibis without success, but reduced several others, as Amida (359) and Singara (360), and transplanted great masses of inhabitants into Susiana. The emperor Constantius conducted the war feebly and was consistently beaten in the field. But, in spite of all, Shapur found it impossible to penetrate deeper into the Roman territory. He was hampered by the attack of nomadic tribes in the east, among whom the Chionites now begin to be mentioned. Year after year he took the field against them (353-358), till finally he compelled them to support him with auxiliaries (Ammian. Marc. 14, 3; 16, 9; 17, 5; 18, 4, 6). With this war is evidently connected the foundation of the great town New-Shapur (Nishapur) in Khorasan.

By the resolution of Julian (363) to begin an energetic attack on the Persian Empire, the conflict, after the lapse of a quarter of a century, assumed a new phase. Julian pressed forward to Ctesiphon but succumbed to a wound; and his successor Jovian soon found himself in such straits, that he could only extricate himself and his army by a disgraceful peace at the close of 363, which ceded the possessions on the Tigris and the great fortress of Nisibis, and pledged Rome to

abandon Armenia and her Arsacid protege, Arsaces III., to the Persian.

Shapur endeavoured to occupy Armenia and introduce the Zoroastrian orthodoxy. He captured Arsaces III. by treachery and compelled him to commit suicide; but the Armenian magnates proved refractory, placed Arsaces' son Pap on the throne, and found secret support among the Romans. This all but led to a new war; but in 374 Valens sacrificed Pap and had him killed in Tarsus. The subsequent invasions of the Goths, in battle with whom Valens fell at Adrianople (375), definitely precluded Roman intervention; and the end of the Armenian troubles was that (c. 390) Bahram IV. and Theodosius the Great concluded a treaty which abandoned the extreme west of Armenia to the Romans and confirmed the remainder in the Persian possession. Thus peace and friendship could at last exist with Rome; and in 408 Yazdegerd I. contracted an alliance with Theodosius II. In Armenia the Persians immediately removed the last kings of the house of ^^en/a. ° Arsaces (430), and thenceforward the main portion of the country remained a Persian province under the control of a marzban, though the Armenian nobles still made repeated attempts at insurrection. The introduction of Zoroastrianism was abandoned; Christianity was already far too deeply rooted. But the sequel to the Roman sacrifice of Armenian interests was that the Armenian Christians now seceded from the orthodoxy of Rome and Constantinople, and organized themselves into an independent national church. This church was due, before all, to the efforts of the Catholicos Sahak (390-439), whose colleague Mesrob, by his translation of the Bible, laid the foundations of an Armenian literature (see Armenian Church).

In the interior of the Sassanian Empire the old troubles broke out anew on the death of Shapur II. (379). At first the magnates raised his aged brother Ardashir II. to the throne, then in 383 deposed him and enthroned Shapur's son as Shapur III. In 388, however, he was assassinated, Yazdegerd 1. as was also his brother, Bahram IV., in 399. But the son of the latter, Yazdegerd I. (399-420), was an energetic and intelligent sovereign, who held the magnates within bounds and severely chastised their attempts at encroachment. He even sought to emancipate himself from the Magian Church,

1 For the succeeding events see also under Rome: Ancient History; and articles on the Roman emperors and Persian kings.

put an end to the persecutions, and allowed the Persian Christians an individual organization. In the Persian tradition he is consequently known as ” the sinner.” In the end he was probably assassinated. So great was the bitterness against him that the magnates would admit none of his sons to the throne. One of them, however, Bahram V., found an auxiliary in the Arab chief Mondhir, who had founded a principality in Hira,

west of the lower Euphrates; and, as he pledged him- Qor _ ” self to govern otherwise than his father, he received

general recognition. This pledge he redeemed, and

he is, in consequence, the darling of Persian tradition, which

bestows on him the title of Gor (” the wild ass “), and is eloquent

on his adventures in the chase and in love. This reversal of

policy led to a Christian persecution and a new war with Rome.

Bahram, however, was worsted; and in the peace of 422 Persia

agreed to allow the Christians free exercise of their religion in

the empire, while the same privilege was accorded to Zoroastrian-

ism by Rome. Under his son, Yazdegerd II. (438-457), who once

more revived the persecutions of the Christians and the Jews,

a short conflict with Rome again ensued (441): while at the same

time war prevailed in the east against the remnants of the

Kushan Empire and the tribe of Kidarites, also named Huns.

Here a new foe soon arose in the shape of the Ephthalites

(Haitab), also known as the ” White Huns,” a barbaric tribe

TbeBphtha- which shortly after a.d. 450 raided Bactria and ter-

iltesor minated the Kushana dominion (Procop. Pers. i. 3).

White Huns. These Ephthalite attacks harassed and weakened

the Sassanids, exactly as the Tocharians had harassed and

weakened the Arsacids after Phraates II. Peroz (457-484) fell

in battle against them; his treasures and family were captured

and the country devastated far and near. His brother Balash

(484-488), being unable to repel them, was deposed and blinded,

and the crown was bestowed on Kavadh I. (488-531), the son

of Peroz. As the external and internal distress still continued

he was dethroned and imprisoned, but took refuge among the

Ephthalites and was restored in 499 by their assistance — like

„ JU , so many Arsacids by the arms of the Dahae and Kavadh I. J J

bacae. To these struggles obviously must be attributed mainly the fact that in the whole of this period no Roman war broke out. But, at the same time, the religious duel had lost in intensity, since, among the Persian Christians, the Nestorian doctrine was now dominant. Peroz had already favoured the diffusion of Nestorianism, and in 483 it was officially adopted by a synod, after which it remained the Christian Church of the Persian Empire, its head being the patriarch of Seleucia — Ctesiphon.

Kavadh proved himself a vigorous ruler. On his return he restored order in the interior. In 502 he attacked the

Romans and captured and destroyed Amida (mod. kite Sect. ‘Diarbekr), but was compelled to ratify a peace

owing to an inroad of the Huns. Toward the close of his reign (527) he resumed the war, defeating Belisarius at Callinicum (531), with the zealous support of the wild Arab Mondhir II. of Hira. On his death his son Chosroes I. concluded a peace with Justinian (532), pledging the Romans to an annual subsidy for the maintenance of the Caucasus fortresses. In his home policy Kavadh is reminiscent of Yazdegerd I. Like him he had little inclination to the orthodox church, and favoured Mazdak, the founder of a communistic sect which had made headway among the people and might be used as a weapon against the nobles, of whom Mazdak demanded that they should cut down their luxury and distribute their superfluous wealth. Another feature

of his programme was the community of wives. The crown-prince, Chosroes, was, on the other hand, wholly orthodox; and, towards the close of his father's reign, in con- junction with the chief Magian, he carried through a sacrifice of the Mazdakites, who were butchered in a great massacre (528). Chosroes I. (531-579), surnamed Anushirvan ("the blessed "), then restored the orthodox doctrine in Aauthirvan. f u ˆ> publishing his decision in a religious edict. At the same time he produced the official exposition of the Avesla, an exegetical translation in the popular tongue

(Pahlavi), and declared its contents binding. Defection from Zoroastrianism was punished with death, and therefore also the proselytizing of the Christians, though the Syrian martyr- ologies prove that the kings frequently ignored these proceedings so long as it was at all possible to do so.

Chosroes I. was one of the most illustrious sovereigns of the Sassanian Empire. From him dates a new and equitable adjust- ment of the imperial taxation, which was later adopted by the Arabs. His reputation as an enlightened ruler stood so high that when Justinian, in 529, closed the school of Athens, the last Neoplatonists bent their steps to him in hopes of finding in him the true philosopher-king. Their disillusionment, indeed, was speedy and complete, and their gratitude was great, when, by the conditions of the armistice of 549, he allowed their return. From 540 onward he conducted a great war against Justinian (527-565), which, though interrupted by several armistices, lasted till the fifty years' peace of 562. The net result, indeed, was merely to restore the status quo; but during the campaign Chosroes sacked Antioch and transplanted the population to a new quarter of Ctesiphon (540). He also extended his power to the Black Sea and the Caucasus; on the other hand, a siege of Edessa failed (544). A second war broke out in 577, chiefly on the question of Armenia and the Caucasus territory. In this Chosroes ravaged Cappadocia in 575; but the campaign in Mesopotamia was unsuccessful. In the interval between these two struggles (570) he despatched assistance to the Arabs of Yemen, who had been assailed and subdued by the Abyssinian Christians; after which period Yemen remained nominally under Persian suzerainty till its fate was sealed by the conquests of Mahomet and Islam.

Meanwhile, about a.d. 560, a new nation had sprung up in the East, the Turks. Chosroes concluded an alliance with them against the Ephthalites and so conquered Bactria south of the Oxus, with its capital Balkh. pe · an ce a t Thus this province, which, since the insurrection the Turks, of Diodotus in 250 B.C., had undergone entirely Sassanid different vicissitudes from the rest

of Iran, was fl.”” ‘ once more united to an Iranian Empire, and the Sassanid dominions, for the first time, passed the frontiers of the Arsacids. This, however, was the limit of their expansion. Neither the territories north of the Oxus, nor eastern Afghanistan and the Indus provinces, were ever subject to them. That the alliance with the Turks should soon change to hostility .and mutual attack was inevitable from the nature of the case; in the second Roman war the Turkish Khan was leagued with Rome. Chosroes bequeathed this war to his son Hormizd IV. (570- 590), who, in spite of repeated negotiations, failed to re-establish peace. Hormizd had not the ability to retain the authority of his father, and he further affronted the Magian priesthood by declining to proceed against the Christians and by requiring that, in his empire, both religions should dwell together in peace. Eventually he succumbed to a conspiracy of his magnates, at whose head stood the general Bahram Cobin, who had defeated the Turks, but afterwards was beaten by the Romans. Hormizd’s son, Chosroes II., was set up against his father and forced to acquiesce in his execution. But immediately new risings broke out, in which Bahram Cobin — though not of the royal line — attempted to secure the crown, while simultaneously a Prince _. ..

Bistam entered the lists. Chosroes fled to the Romans and the emperor Maurice undertook his restoration at the head of a great army. The people flocked to his standard; Bahram Cobin was routed (591) and fled to the Turks, who slew him, and Chosroes once more ascended the throne of Ctesiphon; Bistam held out in Media till 596. Maurice made no attempt to turn the opportunity to Roman advantage, and in the peace then concluded he even abandoned Nisibis to the Persians. Chosroes II. (590-628) is distinguished by the surname of Parvez (” the conqueror “), though, in point of fact, he was immeasurably inferior to a powerful sovereign like his grand- father, or even to a competent general. He lived, however, to witness unparalleled vicissitudes of fortune. The assassination

of Maurice in 602 impelled him to a war of revenge against Rome, in the course of which his armies — in 608 and, again, in 615 and 626— penetrated as far as Chalcedon opposite Constanti- nople, ravaged Syria, reduced Antioch (611), Damascus (613), and Jerusalem (614), and carried off the holy cross to Ctesiphon; in 619 Egypt was

occupied. Meanwhile, the Roman Empire was at the lowest ebb. The great emperor Hefaelius, who assumed the crown in 610, took years to create the nucleus of a new military power. This done, however, he took the field in 623, anrf repaid the Persians with interest. Their armies were everywhere defeated. In 624 he penetrated into Atropatene (Azerbaijan), and there destroyed the great fire-temple; in 627 he advanced into the Tigris provinces. Chosroes at- tempted no resistance, but fled from his residence at Dastagerd to Ctesiphon. These proceedings, in conjunction with the avarice and licence of the king, led to revolution. Chosroes was deposed and slain by his son Kavadh II. (628); but the parricide died in a few months and absolute chaos resulted. A whole list of kings and pretenders — among ; them the General Shahrbaraz and Boran, a daughter of Chosroes— followed rapidly on one another-, till finally the magnates united and, in 632, elevated a child to the throne, Yazdegerd III., grandson of Chosroes. In the interval — presumably during the reign of Queen Boran — peace was concluded with Heraclius, the old frontier being apparently restored. The cross had already been given back to the emperor.

Thus the hundred years' struggle between Rome and Persia, which had begun in 527 with the a*tack of the first Kavadh on Justinian, had run its fruitless course, utterly Conquest, enfeebling both empires and consuming their powers. So it was that room was given to a new enemy who now arose between either state and either religionˆ— the Arabs and Islam. In the same year that saw the coronation of Yazdegerd III.— the beginning of 633— the first Arab' squadrons made their entry into Persian territory. After several encounters there ensued (637) the battle of Kadisiya (Qadisiya, Cadesia), fought on one of the Euphrates canals, where the fate of the Sassanian Empire was decided. A little previously, in the August of 636, Syria had fallen in a battle on the Yarmuk (Hieromax), and in 639 the Arabs penetrated into Egypt. The field of Kadisiya laid Ctesiphon, with all its treasures, at the mercy of the victor. The king fled to Media, where his generals attempted to organize the resistance; but the battle of Nehavend (? 64 1) decided matters there. Yazdegerd sought refuge in one province after the other, till, at last, in 651, he was assassinated in Merv (see Caliphate: § A, § 1).

Thus ended the empire of the Sassanids, no less precipitately and ingloriously than that of the Achaemenids. By 650 the Arabs had occupied every province to Balkh and the Oxus. Only in the secluded districts of northern Media (Tabaristan) , the " generals " of the house of Karen (Spahpat, Ispehbed) maintained themselves for a century as vassals of the caliphs — exactly as Atropates and his dynasty had done before them.

The fall of the empire sealed the fate of its religion. The Moslems officially tolerated the Zoroastrian creed, though occa- sional persecutions were not lacking. But little by little it vanished from Iran, with the exception of a few remnants (chiefly in the oasis of Yezd), the faithful finding a refuge in India at Bombay. These Parsees have preserved but a small part of the sacred writings; but to-day they still number their years by the era which begins on the 16th of June a.d. 632, with the accession of Yazdegerd III., the last king of their faith and the last lawful sovereign of Iran, on whom rested the god-given Royal Glory of Ormuzd.

Authorities. — Besides the works on special periods-quoted above, the following general works should be consulted : Spiegel, Eranische Altertumskunde (3 vols., 1876 sqq.); W. Geiger and Ernst Kuhn, Grundriss der iranischen Philologie herausg., vol. ii. (Literature, History and Civilization, 1896 sqq.); G. Rawlinson, .The Five Great Monarchies, The Sixth Monarchy, The Seventh Monarchy. Further the mutually supplementary work of Th. Noldeke, Aufsatze zur persischen tieschichte (1887, Medes, Persians and Sassanids), and A. v. Gutschmid, Geschichte Irans von Alexander d. Gr. bis zum Untergang der Arsaciden (1888). A valuable work of reference is F. Justi, Iranisches Namenbuch (1895).

The most important works oh the monuments are: Flandin et Costs, Voyage en Perse (6 vols., 1840 sqq.) ; Texier, L'Arm&nie, la Perse, ep la Mesopotamie (2 vols., 1842); Stolze, Persepolis (2 vols., 1882); Sarre, Iranische Felsreliefs (1908).

For works on the external history of Persia see those quoted under articles on Persian kings; also Rome; Greece; Egypt; Syria; &c. (Ed. M.)

B. — Transition Period: from the Fall of the Sassanid Dynasty to the Death of Timur (1405).

With the final defeat of the Sassanids under Yazdegerd III. at the battles of Kadisiya (Kadessia) (637) and Nehavend (641).. Persia ceased to exist as a single political unit. The country passed under a succession of alien rulers Rulers. who Cared nothing for its ancient institutions or its religion. For about 150 years it was governed, first from Medina and afterwards from Bagdad, by officers of the Mahom- medan caliphs whose principal aim it was to destroy the old nationality by the suppression of its religion. The success of this policy was, however, only apparent, especially in Iran, the inhabitants of which adopted Islam only in the most super- ficial manner, and it was from Persia that the blow fell which* destroyed the Omayyad

caliphate and set up the Abbasids in its place (see Caliphate). Even before this event adventurers and dissatisfied Moslem officers had utilized the slumbering hostility of the Persian peoples to aid them in attacks on the caliphs (e.g. Ziyad, son of Abu Sofia n, in the reign of Moawiya I.), and the policy of eastern expansion brought the Arab armies perpetually into the Persian provinces.

In the reign of Merwan I. the Persians (who were mostly Shi'ites) under a Moslem officer named Mokhtar (Mukhtar), whom they regarded as their mahdi, vainly attempted to assert, their independence in Kufa, but were soon defeated. This rising was followed by many more (see Caliphate: §■ B) in which the caliphs were generally successful, and Abdaimalik (d. 705) considerably strengthened the Moslem power by insti- tuting a thorough system of Moslem coins and enforcing Arabic as the official language throughout the empire. In the succeed- ing reign Persia was further subdued by the great conqueror Qoteiba (Qotaiba) b. Moslim, the Arabic governor of Khorasan. Omar II., however, extended to non-Arabic Moslems immunity from all taxes except the zakat (poor-rate) , with the result that a large number of Persians, who still smarted under their defeat under Mokhtar, embraced Islam and drifted into the towns to form a nucleus of sedition under the Shi'ite preachers. In the reign of Yazid II. (720-724) serious risings took place in Khora- san, and in spite of the wise administration of his successor Hisham (d. 743), the disorder continued to spread, fanned by the Abbasids and the Shi'ite preachers. Ultimately in the reign of Merwan II. the non- Arabic Moslems found a leader in AbuMoslim, ; a maula (client) of Persian origin and a henchman of Ibrahim b. Mahommed b. Ali,the Shi'ite imam, who raised a great army, drove the caliph's general Nasr b. Sayyar into headlong flight, and finally expelled Merwan. Thus the Abbasids became masters of Persia and also of the Arab Empire. They had gained their success largely by the aid of the Persians, who began thenceforward to recover their lost sense of nationality ; according to the Spanish author Ibn Hazm the Abbasids were a Persian dynasty which destroyed the old tribal system of the Arabs and ruled despotically as Chosroes had done. At the same' time the Khorasanians had fought for the old Alid family, not for the Abbasids, and with the murder of Abu Moslim discontent again began to grow among the Shi'ites (q.v.). In the reign of Harun al-Rashid disturbances broke out in Khorasan which were temporarily appeased by a visit from Harun himself. Immediately afterwards Rafi'b. Laith, grandson of the Omayyad general Nasr b. Sayyar, revolted in Samarkand, and Harun on his way to attack him died at Tus (809). Harun's sons Amin and Mamun quarrelled over the succession; Amin became caliph, but

Mamun by the aid of Tahir b. Hosain Dhu ‘1-Yamirjain (” the man with two right hands “) and others succeeded in deposing and killing him. Tahir ultimately (820) received the governorship of Khorasan. where he succeeded in establishing

a practically independent Moslem dynasty (the Tahirids) 1 which ruled until about 873 in nominal obedience to Bagdad. From 825 to about 898 a similar dynasty, the Dulafids 2 or Dolafids reigned nominally as governors under the caliphs till they were put down by Motadid. In the reign of the caliph Motasim a serious revolt of Persian Mazdakite sectaries (the Khorrami) in alliance with Byzantium was with difficulty suppressed, as also a rising of Tabaristan under an hereditary chief Maziyar who was secretly supported by the Turkish mercenaries (e.g., Afshin) whom the caliph had invited to his court. To another Turk, Itakh, the caliph Wathiq gave a titular authority over all the eastern provinces. In the reign of the tenth caliph Motawakkil the Tahirids fell before Yakub b. Laith al-Saffar, who with the approbation of the caliph founded a dynasty, the Saffarid (q.v.), in Seistan.

It is convenient at this point to mention several other minor dynasties founded by nominal governors in various parts of Persia and its borderland. From 879 to about 930 Dynasties. tne Sajids ruled in Azerbaijan, while in Tabaristan an Alid dynasty (the Zaidites) was independent from 864 to 928, when it fell before the Samanids. Subsequently descendants of this house ruled in Dailam and Gilan. Through- out this period the caliphate was falling completely under the power of the Turkish officers. Mohtadi, the fourteenth Abbasid caliph, endeavoured vainly to replace them by Persians (the Abna). His successor Motamid was attacked by the Saffarid Yakub who however was compelled to flee (see Caliphate: § C, §15). Yakub’s brother Amr (reigned 878-900) received the vacant position, but was taken prisoner by Isma’il b. Ahmad, the Samanid, and the Saffarids were henceforward a merely nomi- Sam aids na * dynasty under the Samanids (900-1229). The Samanids (q.v.) were the first really important non- Arabic Persian dynasty since the fall of Yazdegerd III. They held sway over most of Persia and Transoxiana, and under their rule scholarship and the arts flourished exceedingly in spite of numerous civil wars. Ultimately they fell before the Ghaznevid

dynasty of Sabuktagin.

In the reign of Motadid (Caliphate: § C, § 16) who, as we have seen, put down the Dolafids, and also checked the Sajids of Azerbaijan in their designs on Syria and Egypt, the Kharijites of Mesopotamia were put down by the aid of the Hamdanites of Mosul, who were to become an important dynasty (see below). Subsequently the caliphate, which had temporarily recovered some of its authority, resumed its downward course, and the great families of Persia once again asserted themselves. In the reign of Qahir (d. 934), a new dynasty arose in Persia, that of the Buyids (Buwayhids). This family was descended from one Abu Shaja Buya, who claimed to be of the old Sassanian house and had become a chieftain in Dailam. He had successively fought for the Samanids and the Ziyarids, 3 a dynasty of Jorjan, and his son Imad addaula (ed-dowleh, originally Abu '1 Hasan Ali) received from Mardawij of the latter house the governorship of Karaj; his second son Rokn addaula (Abu Ali Hasan) subsequently held Rai and Isfahan, while the third, Moizz addaula (Abu '1 Hosain Ahmad) secured Kerman, Ahvaz and even Bagdad.

The reign of the caliph Mottaqi (Caliphate: § C, §21) was a period of perpetual strife between the Dailamites, the Turks and the Hamdanid Nasir addaula of Mosul. In the next reign Moizz addaula took Bagdad (945) and was recognized by the caliph Mostakfi as sultan 4 and amir al-Omara. It was at this

1 Tahir died 822 or 824; Talha d. 828; Abdallah, 828-844; Tahir II., 844-862; Mahommed, 862-873.

- Abu Dolaf Qasim b. Idris-'Ijli (825); 'Abdalaziz (842); Dolaf (873) ; Ahmad (878) ; Omar 893-898).

- The Ziyarid dynasty was founded by Mardawij b. Ziyar (928-935). His successors were Zahir addaula (ud-daula, ed-dowleh) Abu Mansur Washmagir (935-967), Bistun (967-976), Shams al Ma'ali Qabus (976-1012), Falak al Ma'ali Manushahr (1012-1029), Anushirwan (1029-1042). They were Alyite in religion. They were of progressively less importance under the Samanids, and were ultimately expelled by the Ghaznevids.

- This is denied by S. Lane Poole, who points out that they did not use the title on their coins.

Buyids.

Ghaznevids.

time that the three brothers took the titles Imad, Rukn (Rokn), and Moizz addaula. The authority of the family was absolute, though they paid outward respect to the caliphs. Moizz addaula repelled an attack of the Hamdanids of Mosul. The Buyids, and especially Adod addaula (Azud-ed-Dowleh, and similar forms), ruled Bagdad wisely and improved the city by great public works such as the great dike, still known as the Bend Amir on the Kur (Cyrus) near Persepolis. Their sway extended from the Persian Gulf to the Caspian Sea (Caliphate: § C, § 24). Ultimately, however, the Buyid dynasty grew weaker under the quarrels of its members and fell an easy prey to the Ghaz- nevids. In the meantime (999) the Samanids fell before the Ilek-Khans of Turkestan, to the great advantage of the Ghaznevid princes.

For these and other minor dynasties such as the Hasanwayhids of Kurdistan (c. 959-1015) and the Kakwayhids of Kurdistan (1007-1051), see Stockvis, Manuel d'histoire, 1. 113 sqq. (Leiden,

1888).

The centre of force in Persian politics now changes from west to east. Hitherto the ultimate power, at least nominally, had resided in the caliphate at Bagdad, and all the dynasties which have been noticed derived their authority formally from that source. With the rise of the Ghaznevids and later (the Seljuks, the Abbasid caliphate ceased to count as an independent power. As we have seen, the Ghaznevid armies in a brief space destroyed most of the native dynasties of Persia. The first of the house was Alptagin, a Turkish slave of the Samanid Mansur I., who, having quarrelled with his master, took refuge in Afghanistan and founded a semi-independent authority. After his death three unimportant governors of his house held sway, but in 977 the power fell to another former slave, Sabuktagin, who was recognized by the Samanid Nuh II. His son and successor Mahmud (q.v.) was attacked by a brother, Isma'il, and retired from Khorasan (of which he had been governor). The Samanids then fell under the power of the Tatar Ilkhans, but Mahmud returned, triumphed over both the Samanids and the Tatars, and assumed the independent title of sultan with authority over Khorasan, Transoxiana and parts of north-west India. Mahmud was a great conqueror, • and wherever he went he replaced the existing religion by Mahommedanism. He is described as the patron (if a somewhat ungenerous one) of literature; it was under his auspices that Firdousi collected the ancient myths of Persia and produced the great epic Shahnama (Book of the Kings). His descendants held a nominal rule

till 1187, but in 1152 they lost all their extra-Indian territories to the Ghorids, and during the last thirty-five years reigned in diminished splendour at Lahore. Even before this time, however, the supremacy which they enjoyed under Mahmud in Persia had fallen into the hands of the Seljuks who, in the reign of Mas'ud I., son selhtks of Mahmud, conquered Khorasan. In 1037 Seljuk princes were recognized in Merv and Nishapur, and in the ensuing eighteen years the Seljuks conquered Balkh, Jorjan, Tabaristan, Kh'warizm, Hamadan, Rai, Isfahan, and finally Bagdad (1055). The Abbasid caliphs, who still enjoyed a precarious and shadowy authority at the pleasure of Turkish viziers, gladly surrendered themselves to the protection of the Mahommedan Seljuks, who paid them all outward respect.

Thus for the first time since the Arab conquest of the Sassanian realm Persia was ruled by a single authority, which extended its conquests westward into Asia Minor, where it checked the rulers of Byzantium, and eastward to India and Central Asia. The history of this period is treated at length in the articles Caliphate: § C, §§ 26 sqq.; and Seljuks. A bare outline only is required here.

The first three Seljuk rulers were Toghrul Beg, Alp Arslan and Malik Shah. On the death of the last the empire was distracted by civil war between his sons Barkiyaroq, Mahommed and Sinjar, with the result that, although the Seljuks of the direct line maintained nominal supremacy till the death of Sinjar (1157), other branches of the family established themselves in various parts of the empire — Syria, Rum (Asia Minor),

Kerman, and Irak with Kurdistan. Sinjar himself lost all his dominions except Khorasan in wars with the Karakitai. The sultans of Kerman were rarely independent in the full sense, but they enjoyed comparative peace and prosperity till the death of Toghrul Shah (1170), after which their power fell before the Ghuzz tribes; Kerman was finally captured in 1195 by the Khwarizm shahs. Meanwhile an independent dynasty was formed about 1136 in Azerbaijan by the governors (atabegs) appointed by the Seljuks; this dynasty was overthrown by the Khwarizm shahs in 1225. Similar dynasties existed in Laristan and Fars.

The empire of the Seljuks was essentially military. Their authority over their own officers was so precarious that they preferred to entrust the command to Turkish slaves. These officers, however, were far from loyal to their lords. In every part of the empire they gradually superseded the Seljuk princes, and the minor dynasties above mentioned all owed their existence to the ambition of the Turkish regents or atabegs. The last important dynasty in Persia prior to the Mongol invasion was that of the Salgharids in Fars, founded by the descendants of a Turkish general Salaghar, who had formerly been a Turkoman leader and ultimately became chamberlain to Toghrul Beg. The first ruler was Sonkor b. Modud, who made himself inde- pendent in Fars in 1148. The fourth, Sa'd, became tributary to the Khwarizm shahs in 1105, and the fifth acknowledged allegiance to the Mongol Ogotai and received the title Kutbegh Khan. His successors were vassals of the Mongols, and the last, the Princess 'Abish (d. 1287), was the wife of Hulagu's son Mangu Timur.

Before passing on to the Mongol conquerors of Persia it is necessary briefly to notice the shahs of Khwarizm, who have K . frequently been mentioned as overthrowing the minor ' dynasties which arose with the decay of the Seljuks. These rulers were descended from Anushtajin, a Turkish slave of Ghazni, who became cupbearer to the Seljuk Malik Shah, and afterwards governor of Khwarizm (Khiva) in 1077. In 1 138 the third of the line, Atsiz, revolted but was defeated and expelled by Sinjar. Shortly afterwards he returned, firmly established his power, and extended the Khwarizm Empire as far as Jand on the Sihun. The brief reigns of Il-Arslan and Sultan Shah Mahmud were succeeded by that of Tukush (1172-1109) and Ala ed-din Mahommed 1 (1199-1220). The former of these subdued Khorasan, Rai and Isfahan, while the latter brought practically all Persia under his sway, conquered Bokhara, Samarkand and Otrar, capital of the Karakitai, and had even made himself master of Ghazni when his career was stopped by the hordes of the Mongol Jenghiz Khan. In 1231 the last of his house, Jelal ud-din (Jalaluddin) Mangbarti, or Mango-berti, was banished, and thus the empire of the Khwarizm shahs, which for a brief period had included practically all the lands conquered by the Seljuks, passed away.

Thus from the fall of the Samanidsto the invasion of the Mongols five or at most six important dynasties held sway over Persia, while some forty small dynasties enjoyed a measure of local autonomy. During the whole of this period the Abbasid caliphs had been nominally reigning throughout the Mahommedan world with their capital at Bagdad. But with hardly any exceptions they had been the merest puppets, now in the hands of Turkish ministers, now under the protection of

practically independent dynasts. The real rulers of Persia during the years 874-1231 were, as we have seen, the Samanids, the Buyids, the Ghaznevids, the Seljuks, the Salgharids and the Khwarizm shahs. We now come to a new period in Persian history, when the numerous petty dynasties which succeeded the Seljuks were all swallowed up in the great Mongol invasion.

In the later years of the 12th century the] Mongols began their westward march and, after the conquest of the ancient kingdom of the Kajakitai, reached the borders of the territory of the Khwarizm shahs, which was at once overwhelmed. Jenghiz Khan died in 1272, and the Mongol

1 It was this prince who destroyed the Ghorid dynasty, which claimed descent from the legendary Persian monarch Zohak. Except for a brief period of submission to the Ghaznevids (1009- 1099) they ruled at Ghor until 12 15, when they were conquered after a fierce struggle.

Mongols.

Empire stretching from the Caspian to the Yellow Sea was divided up among his sons. Persia itself fell partly in the domain of Jagatai and partly in that of the Golden Horde. The actual governor of Persia was Tului or Tule, whose son Hulagu or Hulaku is the first who can be rightly regarded as the sovereign of Persia. His accession occurred in 1256, and henceforward Persia becomes after 600 years of spasmodic government a national unit. Hulagu at once proceeded to destroy a number of nascent dynasties which endeavoured to establish themselves on the ruins of the Khwarizm Empire; about 1255 he destroyed the dynasty of the Assassins 2 by the capture of their stronghold of Alamut (Eagle's Nest), and finally in 1258 captured Bagdad. The thirty-eighth and last Abbasid caliph, Mostasim, was brutally murdered, and thus the Mahom- medan caliphate ceased to exist even as an emasculated pontifi- cate. The Persian Empire under Hulagu and his descendants extended from the dominions of Jagatai on the north to that of the Egyptian dynasts on the south, and from the Byzantine Empire on the west to the confines of China. Its rulers paid a nominal homage to the Khakhan (Great Khan) in China, and officially recognized this dependence in their title of Ilkhan, i.e. provincial or dependent khan. From 1258 to 1335 the Ilkhans were not seriously challenged. Hulagu fixed his capital at Maragha (Meragha) in Azerbaijan, where he erected an observa- tory for Nasir ud-din Tusi, who at his request prepared the astronomical tables known as the Zidj-i-llkhani. He died in 1265 and was succeeded by his son Abagha or Abaka, who married the daughter of Michael

Palaeologus, the Byzantine ruler. Abagha was a peaceful ruler and endeavoured by wise administration to give order and prosperity to a country torn asunder by a long period of intestine war and the Mongol invasion. He succeeded in repelling two attacks by other Mongolian princes of the house of Jenghiz Khan; otherwise his reign was uneventful. His brother Nikudar (originally Nicolas) Ahmad Khan succeeded him in 1281. This prince was converted to Islam, an event of great moment both to the internal peace and to the external relations of Persia. His persecution of the Christians led them into alliance with the Mongols, who detested Islam; the combined forces were too strong for Nikudar, who was murdered in 1284. The external results were of more importance. The Ilkhans, who had failed in their attempt to wrest Syria from the Mameluke rulers of Egypt, had subsequently endeavoured to effect their object by inducing the European Powers to make a new crusade. The conversion of Nikudar put an end to this policy and Egypt was for some time free from Persian attack (see Egypt: History). The Mongol leaders put on the throne a son of Abagha, by name Arghun. His reign was troubled. His first minister Shams ud-din was suspected of having poisoned Abagha, and was soon put to death. His successor, the amir Bogha, conspired against Arghun and was executed. Under the third minister (1289-1291), a Jewish doctor named Sa'd addaula (ed-Dowleh), religious troubles arose owing to his persecution of the Mahommedans and his favouring the Christians. The financial administratiDn of Sa'd was prudent and successful, if somewhat severe, and the revenue benefited considerably under his care. But he com- mitted the tactical error of appointing a disproportionate number of Jews and Christians as revenue officials, and thus made many enemies among the Mongol nobles, who had him assassinated in 1291 when Arghun was lying fatally ill. It is possible that it was Sa'd's diplomacy which led Pope Nicholas, IV. to send a mission to Arghun with a view to a new crusade. The reign of Arghun was also disturbed by a rebellion of a grandson of Hulagu, Baidu Khan. Arghun died soon after the murder of Sa'd, and was succeeded by his brother Kaikhatu, or Gaykhatu, who was taken prisoner by Baidu Khan and killed (1295). Baidu's reign was cut short in the same year by Arghun's son Ghazan Mahmud, whose reign (1295-1304) was a period of prosperity in war and administration. Ghazan

2 The dynasty of the Assassins or Isma'ilites was founded in 1090 and extended its rule over much of western Persia and Syria (for the rulers see Stockvis, op. cit. i. 131, and article AssassH*).

was a man of great ability. He established a permanent staff to deal with legal, financial and military affairs, put on a firm basis the monetary system and the system of weights and measures, and perfected the mounted postal service. Ghazan fought with success against Egypt (which country had already from 1293 to December 1294 been ruled by a Mongol usurper Kitboga), and even held Damascus for a few months. In 1303, however, his troops were defeated at Merj al-Saffar, and Mongol claims on Syria were definitely abandoned. It was even suggested that the titular Abbasid caliphs (who retained an empty title in Cairo under Mameluke protection) should be reinstated at Bagdad, but this proposal was not carried into effect. Ghazan is historically important, however, mainly as the first Mongol ruler who definitely adopted Islam with a large number of his subjects. He died in 1304, traditionally of anger at the Syrian fiasco, and was succeeded by his brother Uljaitu (Oeljeitu). The chief events of his reign were a success- ful war against Tatar invaders and the substitution of the new city of Sultania as capital for Tabriz, which had been Ghazan's headquarters. Uljaitu was a Shi'ite and even stamped his coins with the names of the twelve Shi'ite imams. He died in 1316, and was succeeded by Abu Sa'id,his son. The prince, under whom a definite peace was made with Malik al-Nasir, the Mameluke ruler of Egypt, had great trouble with powerful viziers and generals which he accentuated by his passion for Bagdad-Khatun, wife of the amir Hosain and daughter of the amir Chupan. This lady he eventually married, with the result that Chupan headed a revolt of his tribe, the Selduz. Abu Sa'id died of fever in 1335, and with him the first Mongol or Ilkhan dynasty of Persia practically came to an end. The real power was divided between Chupan and Hosain the Jelair (or Jalair), or the Ilkhanian, and their sons, known respectively as the Little Hasan (Hasan Kuchuk) and the great Hasan (Hasan Buzurg). Two puppet kings, Arpa Khan, a descendant of Hulagu's brother Arikbuhga, and Musa Khan, a descendant of Baidu, nominally reigned for a few months each. Then Hasan Kuchuk set up one Sati-beg, Abu Sa'id's daughter, and wife successively of Chupan, Arfa Khan and one Suleiman, the last of whom was khan from 1339 to 1343; in the same time Hasan Buzurg set up successively Mahommed, Tugha-Timur and Jahan- Timur. A sixth nonentity, Nushirwan, was a Chupani nominee in 1344, after which time Hasan Buzurg definitely installed himself as the first khan of the Jelairid or Ilkhanian-Jelairid dynasty.

Practically from the reign of Abu Sa'id Persia was divided

under five minor dynasties, (1) the Jelairids, (2) the Mozaffarids,

Minor (3) the Sarbadarids (Serbedarians), (4) the Beni

Dynasties. Kurt, and (5) the Jubanians, all of which ultimately

fell before the armies of Timur.

1. The Jelairid rulers were Hasan Buzurg (1336, strictly 1344- 1356), Owais (135671374). Hosain (1374-1382), Sultan Ahmad (1382-1410), Shah Walad (1410-1411). Their capital was Bagdad, and their dominion was increased under Hasan. Owais added Azerbaijan, Tabriz, and even Mosul and Diarbekr. Hosain fought with the Mozaffarids of Shiraz and the Black Sheep Turkomans (Kara Kuyunli) of Armenia, with the latter of whom he ultimately entered into alliance. On his death Azerbaijan and Irak fell to his brother, Sultan Ahmad, while another brother Bayezid ruled u a o feW m ° nths in P art of Kurdistan. It was about this time that Timur (q.v.) began his great career of conquest, under which the power of the various Persian dynasties collapsed. By 1393 he had conquered northern Persia and Armenia, Bagdad, Mesopo- tamia, Diarbekr and Van, and Ahmad fled to Egypt, where he was received by Barkuk (Barquq) the Mameluke sultan. Barkuk who had already excited the enmity of Timur by slaying one of his envoys, espoused Ahmad's cause, and restored him to Bagdad after Timur s return to his normal capital Samarkand. Timur retaliated and until his death Ahmad ruled only from time to time. In 1406 Ahmad was finally restored, but almost immediately entered upon a quarrel with Kara Yusuf, leader of the Black Sheep Turkomans iu u a ,iV U , y j nh) ' who defeated and k'Hed him in 1410. His nephew Shah Walad reigned for a few months only and the throne was occupied by his widow Tandu, formerly wife of Barkuk, who ruled over Basra, Wasit and Shuster till 1416, paying allegiance to Shah Kukh, the second Timund ruler. Walad's sons Mahmud. Owais and Mahommed, and Hosain, grandson of Sultan Ahmad, successively occupied the throne. The last of these was killed by the Kara

Kuyunli, who had established a dynasty in western Persia after Kara Yusuf's victory in 1410.

2. The Mozaffarids, who ruled roughly from 1313 to 1300 in Fars, Kerman and Kurdistan, were descended from the Amir Mozaffar, or Muzaffar, who held a post as governor under the Ilkhan ruler. His son Mobariz ud-din Mahommed, who followed him in 1313, became governor in Fars under Abu Sa'id, in Ker- man in 1340, and subsequently made himself independent at Fars and Shiraz (1353) and in Isfahan (1356). In 1357 he was deposed and blinded, and though restored was exiled again and died cl l 3 ct • , ls , descendan <- s > except for Jelal ed-din (Jalaluddin) ■ Shah Shuja , the patron of the poet Hafiz, were unimportant, and the dynasty was wiped out by Timur about 1392.

3 'u The Sarbadarids (so called from their motto Sar-ba-dar, " Head to the Gibbet), descendants of Abd al-Razzak, who rebelled in Khorasan about 1337, enjoyed some measure of independence unQ er twelve rulers tlU the Y also wer e destroyed by Timur (c. 1380)

4. The Bern Kurt (or Kart), who had governed in Khorasan from l l*l' be?*™: independent in the early 14th century; they were abolished by Timur (c. 1383).

5. The Jubanians had some power in Azerbaijan from 1337 to 1355. when they were dethroned by the Kipchaks of the house of Jenghiz Khan.

The authority of Timur, which, as we have seen, was dominant throughout Persia from at least as early as 1395 till his death in 1405, was never unchallenged. He passed from one victory to another, but the conquered districts were never really settled under his administration. Fresh risings of the defeated dynasties followed each new enterprise, and he had also to deal with the Mongol hordes whose territory marched with northern Persia. His descendants were for a brief period the overlords of Persia, but after Shah Rukh (reigned 1409-1446) and Ala addaula (1447), the so-called Timurid dynasty ceased to have any authority over Persia. There were Timurid governors of Fars under Shah Rukh, Pir Mahommed (1405-1409), Iskendar (1409-1414), Ibrahim (1415-1434) and Abdallah (1434); in other parts of Persia many of the Timurid family held governor- ships of greater or less importance.

Authorities.— The works relating to Persia will be found under

articles on the maindynasties (Caliphate; Seljuks; Mongols) and the great rulers (Jenghiz Khan; Mahmud of Ghazni- Timur) tor general information and chronology see S. Lane Poole Mohammedan Dynasties (London, 1894); Stockvis, Manuel d'his-

fe? 8w\ (Lelden, l888); Sir H – Howorth . History of the Mongols (1876-1888). (j_ M> M «y

C.—From the. Death of Timur to the Fall of the Safawid Dynasty,

1403-1736.

Timur died in 1405, when in the seventieth year of his age and about to invade China. Besides exercising sovereignty over Transoxiana and those vast regions more or Tae Tlm less absorbed in Asiatic Russia of the 19th century, rides and*" inclusive of the Caucasus, Astrakhan and the Turkomans, lower Volga, and overrunning Mesopotamia, Syria, 140S -' 499 ' Asia Minor, Afghanistan and India, he had at this time left his indelible mark upon the chief cities and provinces of Persia. Khorasan and Mazandaran had submitted to him m 1381, Azerbaijan had shortly after followed their example and Isfahan was seized in 1387. From Isfahan he passed on to Shiraz, and thence returned in triumph to his own capital of Samarkand. Five years later he subdued Mazandaran, and later still he was again at Shiraz, having effected the subjugation of Luristan and other provinces in the west. It may be said that from north to south, or from Astarabad to Hormuz, the whole country had been brought within his dominion.

The third son of Timur, Miran Shah, had ruled over part of Persia in his father's lifetime; but he was said to be insane, and his incapacity for government had caused the loss of Bagdad and revolt in other provinces. His claim to succession had been put aside by Timur in favour of Pir Mahommed, the son of a deceased son, but Khalil Shah, a son of the discarded prince, won the day. His waste of time and treasure upon a fascinating mistress named Shadu '1-Mulk, the " delight of the kingdom," soon brought about his deposition, and in 1408 he gave way to Shah Rukh, who, with the exception of Miran Shah, was the only surviving son of Timur. In fact the uncle and nephew changed places— the one quitting his government of Khorasan

to take possession of the Central-Asian throne, the other conˆ senting to become governor of the vacated Persian province and abandon the cares of the empire at Samarkand. In 1409 Rhalil Shah died; and the story goes that Shadu ‘1-Mulk stabbed herself and was buried with her royal lover at Rai, one of the towns which his grandfather had partly destroyed.

Shah Rukh, the fourth son of Timur, reigned for thirty-eight years, and appears to have been a brave, generous, and enlight- ened monarch. He removed his capital from Samarkand to Herat, of which place he rebuilt the citadel, restoring and im- proving the town. Merv also profited from his attention to its material interests. Sir John Malcolm speaks of the splendour of his court and of his encouragement of science and learning. He sent an embassy to China; and an English version of the travels to India of one of his emissaries, Abd ur-Razzak, is to be found in R. H. Major’s India in the Fifteenth Century (London, Hakluyt Society, 1857). As regards his Persian possessions, he had some trouble in the north-west, where the Turkomans of Asia Minor, known as the Kara Kuyun, 1 or ” Black Sheep,” led by Kara Yusuf 2 and his sons Iskandar and Jahan Shah, had advanced upon Tabriz, the capital of Azerbaijan. On the death of the Shah Rukh in 1446 he was succeeded by his son Ulugh Bey, whose scientific tastes are demonstrated in the •astro- nomical tables bearing his name, quoted by European writers when determining the latitude of places in Persia. He was, moreover, himself a poet and patron of literature, and built a college as well as an observatory at Samarkand. There is no evidence to show that he did much to consolidate his grand- father’s conquests south of the Caspian. Ulugh Bey was put to death by his son Abd ul-Latif, who, six months later, was slain by his own soldiers. Babar — not the illustrious founder of the Mughal dynasty in India, but an elder member of the same house — next obtained possession of the sovereign power, and established himself in the government of Khorasan and the neighbouring countries. He died after a short rule, from habitual intemperance. After him Abu Sa’id, grandson of Miran Shah, and once governor of Fars, became a candidate for empire, and allied himself with the Uzbeg Tatars, seized Bokhara, entered Khorasan, and waged war upon the Turkoman tribe aforesaid, which, since the invasion of Azerbaijan, had, under Jahan Shah, overrun Irak, Fars and Kerman, and pillaged Herat. But he was eventually taken prisoner by Uzun Hasan, and killed in 1468.

It is difficult to assign dates to a few events recorded in Persian history for the eighteen years following the death of Abd ul- Latif; and, were it not for chance European missions, the same difficulty would be felt in dealing with the period after the death of Abu Sa’id up to the

accession of Isma'il Sufi in 1499. Sultan Ahmad, eldest son of Abu Sa'id, reigned in Bokhara; his brother, Omar Sheikh, in Ferghana; but the son of the latter, the great Babar, was driven by the Uzbegs to Kabul and India. More to the purpose is it that Sultan rjosain Mirza, great-grandson of Omar Sheikh, son of Timur, reigned Mirza * n Herat from 1487 to 1506. He was a patron of learned men, among others of the historians Mirk- hond and Khwadamir, and the poets Jami and Hatifi. But at no time could his control have extended over central and western Persia. The nearest approach to a sovereignty in those parts on the death of Abu Sa'id is that of Uzun Hasan, the leader of the Ak Kuyun, or " White Sheep " Turkomans, and conqueror of the " Black Sheep," whose chief, Jahan Shah, he defeated and slew. Between the two tribes there had long been ! a deadly feud. Both were composed of settlers in Asia 'Minor, the " Black Sheep " having consolidated their power at Van, the " White " at Diarbekr.

Sir John Malcolm states that at the death of Abu Sa'id, Sultan Hosain Mirza " made himself master of the empire," 1 They were commonly called Kara Kuyun-lu and the " White Sheep " Turkomans Ak Kuyun-lu, the affix " lu '\ signifying possession, i.e. possession of a standard bearing the image of a black or white sheep.

' According to Erskine, this chief killed Miran Shah, whose dwelling-place was Tabriz.

Utun Hasan.

and, a little later, that " Uzun Hasan, after he had made himself master of Persia, turned his arms in the direction of Turkey "; but the reader is left to infer for himself what the real " empire " of Hosain Mirza, and what the limit of the " Persia " of Uzun Hasan. The second could not well be included in the first, because the Turkomans were in possession of the greater part of the Persian plateau, while the "sultan" was in Herat, to which Khorasan belonged. It may be assumed that an empire like that acquired by Timur could not long be maintained by his descendants in its integrity.

The Turkish adjective uzun, Oils' " l° n g > " applied to Hasan, the Turkoman monarch of Persia (called also by the Arabs Hasanu 't-Tawil), is precisely the qualifying Persian word Jlj3 used in the compound designation of Artaxerxes Longimanus; and Malcolm quotes the statement of a Venetian envoy in evidence that Uzun Hasan was "a tall thin man, of a very open and engaging countenance." This reference, and a further notice in Markham's history, supply the clue to a store of valuable information made available by the publications

of the Hakluyt Society. The narratives of Caterino Zeno, Barbara and Contarini, envoys from Venice to the court of Uzun Hasan, are in this respect especially interesting. Zeno was sent in 147 1 to incite this warlike ruler against the Ottoman sultan, and succeeded in his mission. That the result was disastrous to the shah is not surprising, but the war seems to hold a comparatively unimportant place in the annals of Turkey.

Uzun Hasan had married Despina (Gr. Akcnroiva), daughter of the emperor of Trebizond, Calo Johannes of the house of the Comneni; and Zeno's wife was niece to this Christian princess. The relationship naturally strengthened the envoy's position at the court, and he was permitted to visit the queen in the name of the republic which he represented. Barbara and Contarini met at Isfahan in 1474, and there paid their respects to the shah together. Kum and Tauris or Tabriz (then the capital) were also visited by the Italian envoys following in the royal suite; and the incidental notice of these cities, added to Contarini's formal statement that " the extensive country of Ussun- cassan [sic] is bounded by the Ottoman Empire and by Cara- mania," and that Siras (Shiraz) is comprehended in it, proves that at least Azerbaijan, Irak, and the main part of the provinces to the south; inclusive of Fars, were within the dominions of the reigning monarch.

There is good reason to suppose that Jahan Shah, the Black Sheep Turkoman, before his defeat by Uzun Hasan, had set up the standard of royalty; and Zeno, at the outset of his travels, calls him " king of Persia " s in 1450. Chardin alludes to him in the same sense; but Hasan the Long is a far more prominent figure, and has hardly received justice at the hands of the historian. Indeed, his identity seems to have been lost in the various modes of spelling his name adopted by the older chroniclers, who call him indiscriminately 4 Alymbeius, Asem- beius, Asembec, Assimbeo, or Ussan Cassano. He is said to have earned the character of a wise and valiant monarch, to have reigned eleven years, to have lived to the age of seventy, and, on his death in 1477 or (according to Krusinski and Zeno) 1478, to have been succeeded on the throne of Persia by his son Ya'qub. This prince, who had slain an elder brother, died by poison (1485), after a reign of seven years. The dose was offered to him by his wife, who had been unfaithful to him and sought to set her paramour on his throne.

Writers differ as to the succession to Ya'qub. Zeno's account is that a son named Allamur (called also, Alamut, Alvante, El-wand and Alwung Bey) was the next king, who, besides Persia, possessed Diarbekr and part of greater Armenia near the Euphrates. On the other hand, Krusinski states that, Ya'qub dying childless, his relative

Julaver, one of the grandees of the kingdom, seized the throne, and held possession of it for three years. Baisingar, it is added, succeeded him in 1488 and reigned till 1490, when a young noble- man named Rustan (Rustam?) obtained the sovereign power and exercised it for seven years. This account is confirmed by * See also Ramusio's preface. * Knolles, Purchas, Zeno.

Angiolello, a traveller who followed his countrymen Barbaro and Contarini to Persia; and from the two authorities combined may be gathered the further narration of the murder of Rustam and usurpation of the throne by a certain Ahmad, whose death, under torture, six months afterwards, made way for Alamut, the young son of Hasan. These discrepancies can be reconciled on reference to yet another record bound up with the narratives of the four Italians aforesaid, and of much the same period. In the Travels of a Merchant in Persia the story of Ya'qub's death is supplemented by the statement that " the great lords, hearing of their king's decease, had quarrels among themselves, so that for five or six years all Persia was in a state of civil war, first one and then another of the nobles becoming sultans. At last a youth named Alamut, aged fourteen years, was raised to the throne, which he held till the succession of Sheikh Isma'il." Who this young man was is not specified; but other writers call Alamut and his brother Murad the sons of Ya'qub, as though the relationship were unquestionable.

Now little is known, save incidentally, of Julaver or Rustam; but Baisingar is the name of a nephew of Omar Sheikh, king of Ferghana and contemporary of Uzun Hasan. There was no doubt much anarchy and confusion in the interval between the death of Ya'qub and the restoration, for two years, of the dynasty of the White Sheep. But the tender age of Alamut would, even in civilized countries, have necessitated a regency; and it may be assumed that he was the next legitimate and more generally recognized sovereign. Markham, in designating this prince the last of his house, states that he was dethroned by the renowned founder of the Safawi dynasty. This event brings us to one of the most interesting periods of Persian history, any account of which must be defective without a prefatory sketch of Isma'il Sufi.

The Sufi or Safaivid (Safawi) Dynasty (1499-1736).— Sheikh Saif u ‘d-Din Izhak l — lineally descended from Musa, the seventh imam — was a resident at Ardebil (Ardabil) south- Saitu’d-Dia. vest °* the Caspian, some time during the 14th century. It is said that his reputation for sanctity attracted the attention of Timur, who sought him out in his abode, and was so charmed by the visit that he released, at the holy man’s request, a number of captives of Turkish origin, or Georgians, taken in the wars with Bayezid. The act ensured to the Sheikh the constant devotion and gratitude of these men — a feeling which was loyally maintained by their descendants for the members of his family in successive generations.

His son Sadru’d-Din and grandson Kwaja ‘Ali (who visited Mecca and died at Jerusalem) retained the high reputation of their pious predecessor. Junaid, a grandson of the last, married a sister of Uzun Hasan, and by her had a son named Sheikh Haidar, who married his cousin Martha, daughter Haidar. °^ Uzun Hasan and Queen Despina. Three sons were the issue of this marriage, Sultan ‘Ali, Ibrahim Mirza, and the youngest, Isma’il, the date of whose birth is put down as 1480 for reasons which will appear hereafter. So great was the influence of Sheikh Haidar, and so earnestly did he carry out the principles of conduct which had character- ized his family for five generations, that his name has become, as it were, inseparable from the dynasty of his son Isma’il; and the term ” Haidari ” (leonine) is applied by many persons to indicate generally the Safawids of Persia. The outcome of his teaching was a division of Mahommedanism vitally momentous to the world of Islam. The Persian mind was peculiarly adapted to receive the form of religion prepared for it by the philosophers of Ardebil. The doctrines presented were dreamy and mystic; they rejected the infallibility of human wisdom, and threw suspicion on the order and arrangement of human orthodoxy. There was free scope given for the indulgence of that political imagination which revels in revolution and chafes at prescriptive bondage. As Malcolm remarks, ” the very essence of Sufi-ism is poetry.”

1 According to Langles, the annotator of Chardin, his real designa- tion was Abu ‘1-Fath Izhak, the Sheikh Saifu ‘1-Hakk wu ‘d-Din or ” pure one of truth and religion.”

Those authorities who maintain that Ya’qub Shah left no son to succeed him consider valid the claim to the vacant throne of Sheikh Haidar Sufi. Purchas says that Ya’qub himself, ” jealous of the multitude of Aidar’s disciples and the greatness of his fame, caused him to be secretly murthered “; but Krusinski attributes the act to Rustam a few years later. Zeno, the anony- mous merchant and

Angiolello affirm that the devotee was defeated and killed in battle — the first making his conqueror to be Alamut, the second a general of Alamut's, and the third an officer sent by Rustam named Suleiman Bey. Malcolm, following the Zubdatu 't-tawarikh, relates that Sheikh Haidar was vanquished and slain by the governor of Shirvan. The subsequent statement that his son, Sultan 'Ali, was seized, in company with two younger brothers, by Ya'qub, " one of the descendants of their grandfather Uzun Hasan, who, jealous of the numerous disciples that resorted to Ardebil, confined them to the hill fort of Istakhr in Fars," seems to indicate a second interpretation of the passage just extracted from Purchas, and that there is confusion of persons and incident somewhere. One of the sons here alluded to was Isma'il, whom Malcolm makes to have been only seven years of age when he fled to Gilan in 1492. Zeno states that he was then thirteen, which is much more probable, 2 and the several data available for reference are in favour of this supposition.

The life of the young Sufi from this period to his assumption of royalty in 1499 was full of stirring adventure; and his career as Isma'il I. was a brilliant one. According to i sma ,ni Zeno, who seems to have carefully recorded the events of the time, he left his temporary home on an island of Lake Van before he was eighteen, and, passing into Karabakh, 3 between the Aras and Kur, turned in a south-easterly direction into Gilan. Here he was enabled, through the assistance of a friend of his father, to raise a small force with which to take possession of Baku on the Caspian, and thence to march upon Shemakha in Shirvan, a town abandoned to him without a struggle. Hearing, however, that Alamut was advancing to meet him, he was compelled to seek new levies from among the Jengian Christians and others. At the head of 16,000 men, he thoroughly routed his opponents, and, having cleared the way before him, marched straight upon Tabriz, which at once sur- rendered. He was soon after proclaimed shah of Persia (1499), under the designation which marked the family school of thought.

Alamut had taken refuge at Diarbekr; but his brother Murad, at the head of an army strengthened by Turkish auxiliaries, was still in the field with the object of contesting the paternal crown. Isma'il lost no time in moving against him, and won a new victory on the plains of Tabriz. Murad fled with a small remnant of his soldiers to Diarbekr, the rallying-point of the White Sheep Turkomans. Zeno states that in the following year Isma'il entered upon a new campaign in Kurdistan and Asia Minor, but that he returned to Tabriz without accomplishing his object, having been harassed by the tactics of Ala ud-Daula, a beylerbey, or governor in Armenia and parts of Syria. Another writer

says that he marched against Murad Khan in Irak-i- Ajami and Shiraz. This last account is extremely probable, and would show that the young Turkoman had wished to make one grand effort to save Isfahan and Shiraz (with Kazvin and the neighbouring country), these being, after the capital Tabriz, the most important cities of Uzun rˆasans Persia. His men, however, apparently dismayed at the growing prestige of the enemy, did not support him, and he was defeated and probably slain. There is similar evidence of the death of Alamut, who, it is alleged, was treacherously handed over to be killed by the. shah's own hands.

Isma'il returned again to Tabriz (1501) "and caused great rejoicings to be made on account of his victory." In 1503 he had added to his conquests Bagdad, Mosul and Jezira on the Tigris. The next year he was called to the province of

2 So thinks the editor and annotator of the Italian Travels in Persia, Charles Grey.

5 Possibly Kara-dagh, as being the more direct road.

Gilan to chastise a refractory ruler. Having accomplished his end, he came back to his capital and remained there in rf comparative quiet till 1507. 1 Malcolm's dates are Shaibani. somewhat at variance with the above, for he infers that Bagdad was subdued in that particular year; but the facts remain. All writers seem to agree that in 1508 the king's attention was drawn to an invasion of Khorasan by Shaibani, or Shahi Beg, the Uzbeg, a descendant of Jenghiz and the most formidable opponent of Babar, from whom he had, seven years before, wrested the city of Samarkand, and whom he had driven from Turkestan to Kabul. Since these exploits he had obtained great successes in Tashkent, Ferghana, Hissar, Kunduz, and Khwarizm (Kharezm), and, at the time referred to, had left Samarkand intent upon mischief south and west of the Oxus, had passed the Murghab, and had reached Sarakhs (Ser- rakhs). Isma'il encamped on this occasion at Isfahan, and there concentrated the bulk of his army — strengthening his northern (and probably north-eastern) frontier with large bodies of cavalry, but maintaining an attitude of simple watchfulness. In 1510, when Shaibani had invaded Khorasan the

second time, and had ravaged the Persian province of Kerman, Shah Isma'il asked for redress, referring to the land encroached on as " hereditary "; and Shaibani replied that he did not understand on what was founded the claim " to inherit." Eventually the Persian troops were put in movement, and the Uzbegs, having been divided into small detachments scattered over the country, fell back and retreated to Herat. Their leader repaired to Merv, but Isma'il quickly followed him and enticed him out to battle by taunt and reproach. Shaibani was defeated and fled, but was overtaken in his flight, and put to the sword, together with numerous relatives and companions.

The next remarkable event inlsma'il's reign is his war with Sultan Selim I. Its origin may be traced to the Ottoman emperor's hatred and persecution of all heretical Moslems in his dominions, and the shah's anger at the fanaticism which had urged him to the slaughter of 40,000 Turks suspected to have thrown off the orthodox Sunnite doctrines. The sultan's army advanced into Azer- baijan and western Persia through Tokat and Erzingan. Isma'il had at this time the greater number of his soldiers employed in his newly-conquered province of Khorasan and was driven to raise new levies in Kurdistan to obtain a sufficient force to resist the invasion. It is asserted by some that his frontier then extended westward to Sivas, a city situated in a large high plain watered by the Kizil Irmak, and that hence to Khoi, 90 m. west of Tabriz, he followed the approved and often successful tactics of ravaging and retreating, so as to deprive his advancing enemy of supplies. There is good evidence to show that the Turkish janissaries were within an ace of open revolt, and that but for extraordinary firmness in dealing with them they would have abandoned their leader in his intended march upon Tabriz. In fine, at or near Khoi, the frontier-town of Azerbaijan, the battle (1514) was fought between the two rival monarchs, ending in the defeat of the Persians and the triumphant entry of Selim into their capital.

There are stirring accounts of that action and of the gallant deeds performed by Selim and Isma'il, both personally engaged in it, as well as by their generals. 2 Others maintain that Isma'il was not present at all. 3 It is tolerably certain that the Turks won the day by better organization, superiority of numbers, and more especially the use of artillery. On the side of the Persians the force consisted of little more than cavalry.

WarwHb Selim.

1 Angiolello.

1 Knolles, Malcolm, Creasy, Markham, &c.

3 Zeno. Angiolello says that ” the Sophi monarch had left for Tauris [Tabriz] in order to assemble more troops.” Krusinski infers much to the same effect, for he notes that ” Selim came in person and took Tauris from Ismail, but at the noise of his approach was obliged to retreat with precipitation.” The battle must thus have been fought and the victory gained when the shah was himself ab§ent. Yet Markham quotes a journal which thus records his feats of prowess: ” It was in vain that the brave Shah, with a blow of his sabre, severed a chain with which the Turkish guns were fastened together to resist the shock of the Persian cavalry.”

Selim remained at Tabriz no more than eight days. Levying a contribution at that city of a large number of its skilled artisans whom he sent off to Constantinople, he marched thence towards Karabagh with intent to fix his winter quarters in those parts and newly invade Persia in the spring, but the insubordination of his troops rendered necessary his speedy return to Turkey. His expedition, if not very glorious, had not been unproductive of visible fruits. Besides humbling the power of an arrogant enemy, he had conquered and annexed to his dominions the provinces of Diarbekr and Kurdistan. 4

From 1 514 to 1524, although the hostile feeling between the two countries was very strong, there was no serious nor open warfare. Selim’s attention was diverted from Persia to Egypt; Isma’il took advantage of the sultan’s death in 1510 to overrun and subdue unfortunate Georgia, as Jahan Shah of the ” Black Sheep” had done before him; but Suleiman, who succeeded Selim, was too strong to admit of retaliatory invasion being carried out with impunity at the cost of Turkey.

In 1524 Isma’il died 6 at Ardebil when on a pilgrimage to the tomb of his father. ” The Persians dwell with rapture on his character,” writes Sir John Malcolm, for they deem him ” not only the founder of a great dynasty, but character. the person to whom that faith in which they glory owes its establishment as a national religion.” And he quotes a note handed down by Purchas from a contemporary European traveller which reports of him thus: ” His subjects deemed him a saint, and made use of his name in their prayers. Many disdained to wear armour when they fought under Isma’il; and so enthu- siastic were his soldiers in their new faith that they used to bare their breasts to their enemies and court death, exclaiming ‘ Shiah! Shiah! ‘ to mark the holy cause for which they fought.” Shah Tahniasp, 6 the eldest of the four sons of Isma’il, succeeded to the throne on the death of his father. 7

The principal occur- rences in his reign, placed as nearly as possible in chronological order, were a renewal of war with rahmasp. the Uzbegs, who had again invaded Khorasan, and ” the overthrow of their army (1527); the recovery of Bagdad from a Kurdish usurper (1528); the settlement of an internal feud between Kizil-bash tribes (Shamlu and Tukulu), contending for the custody of the royal person, by the slaughter of the more unruly of the disputants (1529); the rescue of Khorasan from a fresh irruption, and of Herat from a besieging army of Uzbegs (1530); a new invasion of the Ottomans, from which Persia was saved rather by the severity of her climate than by the prowess of her warriors (1533); the wresting of Bagdad from Persia by the sultan Suleiman (1 534) ; the king’s youngest brother’s rebellion

4 It was about this time that Persia again entered into direct relations with one of the states of western Europe. In 15:0 and 15 14 Alphonso d’ Albuquerque, the governor of Portuguese India, sent envoys to Isma’il, seeking an alliance. In 1515, after occupying Hormuz, he despatched a third embassy under Fernao Gomes de Lemos. His object was to utilize the Shi’ite armies in conjunction with the Portuguese fleet for an attack upon the Sunnite powers — Egypt and Turkey — which were then at war with Portugal in the East. See, for further details and authorities, K. G. Jayne, Vasco da Gama and his Successors, pp. 108-110 and App. A. (London, 1910). — Ed.

6 Malcolm says 1523, Krusinski 1525; Angiolello heard of his death at Cairo in August 1524. Krusinski adds that he was forty- five years of age.

6 Angiolello calls him ” Shiacthemes.” As an instance of the absurd transliterating current in France as in England the word ” Ach-tacon ” may be mentioned. It is explained in Chardin’s text to mean ” les h6pitaux a Tauris: c’est-a-dire lieux oH Von fait profusion de vivres.” Chardin’s editor remarks, ” La derniere

Partie de ce mot est meconnaissable, et je ne puis deviner quel mot ersan signifiant profusion a pu donner naissance a la corruption qu’on voit ici.” In other words, the first syllable ” ach ” (Anglice ash) was understood in its common acceptance for “food’ or ” victuals ” ; but ” tacon ” was naturally a puzzler. The solution of the whole difficulty is, however, to be found in the Turco-Persian dJUk *~ & khastah khanah, pronounced by Turks hasta hona, or more vulgarly asta khon and even to a French ear ash-tacon, a hospital, literally a sick-house. This word is undoubtedly current at Tabriz and throughout northern Persia.

7 The other brothers were Ilkhas, Bahrain and Sam Mirza, each having had his particular appanage assigned him.

and the actual seizure of Herat, necessitating the recovery of that city and a march to Kandahar (1536); the temporary loss of Kandahar in the following year (1537), when the governor ceded it to Prince Kamran, son of Babar; the hospitable reception accorded to the Indian emperor Humayun (1543); the rebellion of the shah's brother next in age, Ilkhas, who, by his alliance with the sultan, brought on a war with Turkey (1548); 1 and finally a fresh expedition to Georgia, followed by a revengeful incursion which resulted in the enforced bondage of thousands of the inhabitants (1552).

Bayezid, a son of the Turkish emperor, rebelled, and his army was beaten in 1559 by the imperial troops at Konia in Asia Minor. He fled to Persia and took refuge Turkey. w i tn Shah Tahmasp, who pledged himself to give him a permanent asylum. Suleiman's demand, however, for extradition or execution was too peremptory for refusal, and the prince was delivered up to the messengers sent to take him. Whatever the motive, the act itself was highly appreciated by Suleiman, and became the means of cementing a recently concluded peace between the two monarchs. Perhaps the domestic affliction of the emperor and the anarchy which in his later years had spread in his dominions had, however, more to do with the maintenance of tranquillity than any mere personal feeling. At this time not only was there religious fanaticism at work to stir up the mutual hatred ever existing between Sunni and Shi'ah, but the intrigue of European courts was probably directed towards the maintenance of an hostility which deterred the sultan from aggressive operations north and west of Constantinople. " 'Tis only the Persian stands between us and ruin " is the reported saying of Busbecq, ambassador at Suleiman's court on the part of Ferdinand of Austria; " the Turk would fain be upon us, but he keeps him back."

In 1 56 1 Anthony Jenkinson arrived in Persia with a letter from Queen Elizabeth to the shah. He was to treat with his majesty of " Trafique and Commerce for our English Mar- chants," 2 but his reception was not encouraging, and led to no result of importance.

Tahmasp died in 1576, after a reign of about fifty-two years. He must have been some sixty-six years of age, having f come to the throne at fourteen. Writers describe Deaˆy ‘ ki m as a robust man, of middle stature, wide-lipped, and of tawny complexion. He was not wanting in soldierly qualities; but his virtues were rather negative than decided. The deceased shah had a numerous progeny, and on his death his fifth son, Haidar Mirza, proclaimed himself king, supported in his pretensions by the Kizil-bash tribe of Ustujulu. Another tribe, the Afshar, insisted on the succession of the fourth son, Isma’il. Had it not been that there were two candidates in the field, the contention would have resembled that which arose shortly after Tahmasp’s accession. Finally Isma’il, profiting from his brother’s weak character and the intrigues set on foot against him, obtained his object, and was brought from a prison to receive the crown.

The reign of Isma’il II. lasted less than two years. He was found dead in the house of a confectioner in Kazvin, having left the world either drunk, drugged or poisoned. No steps were taken to verify the circumstances, for the event itself was a cause of general relief and joy. He was succeeded by his eldest brother, Mahommed Mirza, otherwise Mahommed called Mahommed Khudabanda, whose claim to Khuda- sovereignty had been originally put aside on the banda – ground of physical infirmity. He had the good sense to trust his state affairs almost wholly to an able minister; but he was cowardly enough to deliver up that minister into the hands of his enemies. His kingdom was distracted by intestine divisions and rebellion, and the foe

1 Creasy says that ” Suliman led his armies against the Persians in several campaigns (i533 > 1534. 1535. 1548. 1553. 1554). during which the Turks often suffered severely through the difficult nature of the countries traversed, as well as through the bravery and activity of the enemy.” All the years given were in the reign of Tahmasp I.

- Purchas.

Isma’il II.

appeared also from without. On the east his youngest son. ‘Abbas, held possession of Khorasan; on the west the sultan’s troops again entered Azerbaijan and took Tabriz. His eldest son, Hamza Mirza, upheld his fortunes to the utmost of his power, reduced the rebel chieftains, and forced the Turks to make peace and retire; but he was stabbed to death by an assassin. On the news of his death reaching Khorasan, Murshid Kuli Khan, leader of the Ustujulu Kizil-bash, who had made good in fight his claims to the guardianship of ‘Abbas, at

once conducted the young prince from that province to Kazvin, and occupied the royal city. The object was evident, and in accordance with the popular feeling. ‘Abbas, who had been proclaimed king by the nobles at Nishapur some two or three years before this occurrence, may be said to have now undertaken in earnest the cares of sovereignty. His ill-starred father, at no time more than a nominal ruler, was at Shiraz, apparently deserted by soldiers and people. Malcolm infers that he died a natural death, but when 3 or where is not stated.

Shah ‘Abbas the Great commenced his long and glorious reign (1586) by retracing his steps towards Khorasan, which had been reinvaded by the Uzbegs almost imme- t diately after his departure thence with the Kizil-bash Qreat% chief. They had besieged and taken Herat, killed the governor, plundered the town, and laid waste the surrounding country. ‘Abbas advanced to Meshed, but owing to internal troubles he was compelled to return to Kazvin without going farther east. In his absence ‘Abd-ul-Munim Khan, the Uzbeg commander, attacked the sacred city, obtained possession of it while the shah lay helplessly ill at Teheran, and allowed his savage soldiers full licence to kill and plunder. The whole kingdom was perplexed, and ‘Abbas had much work to restore confidence and tranquillity. But circumstances rendered impossible his immediate renewal of the Khorasan warfare. He was summoned to Shiraz to put down rebellion in Fars; and before he could drive out the Uzbegs, he had to secure himself against Turkish inroads threatening from the west. He had been engaged in a war with Murad III. in Georgia. Peace was concluded between the two sovereigns in 1590; but the terms were unfavourable to Persia, who lost thereby Tabriz and one or more of the Caspian ports. A stipulation was included in the treaty to the effect that Persians were not to curse any longer the first three caliphs, — a sort of privilege previously enjoyed by Shi’ites as part and parcel of their religious faith.

In 1597 ‘Abbas renewed operations against the Uzbegs, and succeeded in recovering from them Herat and Khorasan. East- ward he extended his dominions to Balkh, and in the south his generals made the conquest of Bahrain (Bahrein), on the Arabian side of the Persian Gulf, and the territory and islands of the Persian seaboard, inclusive of the mountainous province of Lar. He strengthened his position in Khorasan by planting colonies of Kurdish horsemen on the frontier, or along what is called the ” atak ” or skirt of the Turkoman mountains north of Persia. In 1601 the war with the Ottoman Empire, which had been partially renewed prior to the death of Sultan Murad in 1595, with little success on the Turkish side, was now entered upon by ‘Abbas with more vigour. Taking advantage of the weakness of his

ancient enemy in the days of the poor volup- tuary Mahommed III., he began rapidly to recover the provinces which Persia had lost in preceding reigns, and continued to reap his advantages in succeeding campaigns under Ahmed I., until under Othman II. a peace was signed restoring to Persia the boundaries which she had obtained under the first Isma'il. On the other side Kandahar, which Tahmasp's lieutenant had yielded to the Great Mogul, was recovered from that potentate in 1609.

At the age of seventy, after a reign of forty-two years, 'Abbas died at his favourite palace of Farahabad, on the coast of Mazandaran, on the night of the 27th of January 1628. Perhaps the most distinguished of ail Persian kings, his fame was not merely local but world-wide. At his court were ambassadors from England, Russia, Spain, Portugal, Holland and India. 3 Krusinski says in 1585.

To his Christian subjects he was a kind and tolerant ruler. The establishment of internal tranquillity, the expulsion of interlopers and marauders like Turks and Uzbegs, the intro- duction of salutary laws and the promotion of public works oi utility — these alone would render remarkable his two-score years of enlightened government. With a fine face, " of which the most remarkable features were a high nose and a keen and piercing eye," 1 he is said to have been belov/ the middle height, robust, active, a sportsman, and capable of much endurance. It is, however, to be regretted that this monarch's memory is tarnished by more than one dark deed. The murder of his eldest son, Sufi Mirza, and the cruel treatment of the two younger brothers, were stains which could not be obliterated by an after-repentance. All that can be now said or done in the matter is to repeat the testimony of historians that his grief for the loss of Sufi Mirza was profound, and that, on his death- bed, he nominated that prince's son (his own grandson) his successor.

Sam Mirza was seventeen years of age when the nobles, in fulfilment of the charge c >mmitted to them, proclaimed him

c. .. o *, king under the title of Shah Sufi. He reigned Sban sun. . .... . £

fourteen years, and his reign was a succession 01

barbarities, which can only be attributed to an evil disposition acted upon by an education void of all civilizing influences. When left to his own devices he became a drunkard and a murderer, and is accused of the death of his mother, sister and favourite queen. Among many other sufferers Imam Kuli Khan, con- queror of Lar and Hormuz, the son of one of ‘Abbas’s most famous generals, founder of a college at Shiraz, and otherwise a public benefactor, fell a victim to his savage cruelty. During his reign the Uzbegs were driven back from Khorasan, and a rebellion was suppressed in Gilan; but Kandahar was again handed over to the Moguls of Delhi, and Bagdad retaken from Persia by Sultan Murad— both serious national losses. Taver- nicr, without charging the shah with injustice to Christians, mentions the circumstance that ” the first and only European ever publicly executed in Persia was in his reign.” He was a watchmaker named Rodolph Stadler, who had slain a Persian on suspicion of intrigue with his wife. Offered his life if he became a Moslem, he resolutely declined the proposal, and was decapitated. His tomb is to be recognized at Isfahan by the words ” Cy git Rodolphe ” on a long wide slab. Shah Sufi died (1641) at Kashan and was buried at Kum.

His son, ‘Abbas II., succeeded him. Beyond regaining Kandahar, an operation which he is said to have directed in ‘Abbas 11 P erson w hen barely sixteen, there is not much to mark his life to the outer world. As to foreign relations, he received embassies from Europe and a deputation from the French East India Company; he sought to conciliate the Uzbegs by treating their refugee chiefs with unusual honour and sumptuous hospitality; he kept on good terms with Turkey; he forgave the hostility of a Georgian prince when brought to him a captive; and he was tolerant to all religions — always regarding Christians with especial favour. But he was a drunk- ard and a debauchee, and chroniclers are divided in opinion as to whether he died from the effects of drink or licentious living. That he changed the system of blinding his relatives from passing a hot metal over the open eye to an extraction of the whole pupil is indicative of gross brutality. ‘Abbas II. died (1668) at the age of thirty-eight, after a reign of twenty- seven years, and was buried at Kum in the same mosque as his father.

‘Abbas was succeeded by his son, Shah Sufi II., crowned a second time under the name of Shah Suleiman. Though weak, -ˆ . dissolute and cruel, Suleiman is not without his

panegyrists. Chardin, whose testimony is all the more valuable from the fact that he was contemporary with him, relates many stories characteristic of his temper and habits. He kept up a court at Isfahan

which surprised and delighted his foreign visitors, among whom were ambassadors from European states; and one learned writer, Kaempfer, credits 1 Malcolm.

him with wisdom and good policy. During his reign Khorasan was invaded by the ever-encroaching Uzbegs, the Kipchak Tatars plundered the shores of the Caspian, and the island of Kishm was taken by the Dutch; but the kingdom suffered otherwise no material loss. He died in 1694, in the forty-ninth year of his age and twenty-sixth of his reign.

About a year before his death, he is described by Sanson, 2 a missionary from the French king Louis XIV., as tall, strong and active, ” a fine prince — a little too effeminate for a monarch,” with ” a Roman nose very well proportioned to other parts,” very large blue eyes, and ” a midling mouth, a beard painted black, shav’d round, and well turn’d, even to his ears.” The same writer greatly praises him for his kindness to Christian •missionaries.

Krusinski’s memoir is full of particulars regarding Shah Hosain, the successor of Suleiman. He had an elder and a younger brother, sons of the same mother, but the H 0S ain eldest had been put to death by his father’s orders, and the youngest secreted by maternal precaution lest a similar fate should overtake him. There was, however, a second candidate for power in the person of a half-brother, ‘Abbas. The latter prince was the worthier of the throne, but the other better suited the policy of the eunuchs and those noblemen who had the right of election. Indeed Suleiman himself is reported to have told the grandees around him, in his last days, that ” if they were for a martial king that would always keep his foot in the stirrup they ought to choose Mirza ‘Abbas, but that if they wished for a peaceable reign and a pacific king they ought to fix their eyes upon Hosain.” But he himself made no definite choice.

Hosain was selected, as might have been anticipated. On his accession (1694) he displayed his attachment to religious observances by prohibiting the use of wine — causing all wine- vessels to be brought out of the royal cellars and destroyed, and forbidding the Armenians to sell any more of their stock in Isfahan. The shah’s grandmother, by feigning herself sick and dependent upon wine only for cure, obtained reversal of the edict. For the following account of Shah H osa i n an d his successors to the accession of Nadir Shah, Sir Clements Markham’s account has been mainly utilized.

The new king soon fell under the influence of mullahs, and was led so

far to forget his own origin as to persecute the Sufis. Though good-hearted he was weak and licentious; and once out of the hands of the fanatical party he became Ensnared by women and entangled in harem intrigues. For twenty years a profound peace prevailed throughout the , empire, but it was the precursor of a terrible storm destined to destroy the Safawid dynasty and scatter calamity broadcast over Persia. In the mountainous districts of Kandahar and Kabul the hardy tribes of Afghans had for centuries led a wild and almost independent life. They were divided into two great branches — the Ghilzais of Cihazni and Kabul and the Saduzais of Kandahar and Herat. In 1702 a newly-appointed governor, one Shah Nawaz, called Gurji Khan from having been ” wali ” or ruler of Georgia, arrived at Kandahar with a tolerably large force. He was a clever and energetic man, and had been instructed to take severe measures with the Afghans, some of whom were suspected of intriguing to restore the city to the Delhi emperor. At this time Kandahar had been for sixty years uninterruptedly in the shah’s possession. The governor appears to have given great offence by the harshness of his proceedings, and a Ghilzai chief named Mir Wa’iz, who had complained of his tyranny, was sent a prisoner to Isfahan. This person had much ability and no little cunning. He was permitted to go on a pilgrimage to Mecca, and on his return in 1708 he so gained upon the confidence of the Persian court that he was allowed to go back to his country. At Kandahar he planned a conspiracy against the government, slew Gurji Khan and his retinue, seized the city, defeated two Persian armies sent against him, and died a natural death in 1715. His brother, Mir ‘Abdallah, succeeded him in the government of the Afghans ; but after a few months, Mahmud, a son of Mir Wa’iz, a very young man, murdered his uncle and assumed the title of a sovereign prince.

In the meanwhile the Saduzai tribe revolted at Herat, and declared itself independent in 1717; the Kurds overran the country round Hamadan; the Uzbegs desolated Khorasan; and the Arabs of Muscat seized the island of Bahrein and threatened Bander Abbasi. Thus surrounded by dangers on all sides the wretched shah was bewildered. He made one vain attempt to regain his possessions in the Persian

2 Present State of Persia (London, 1695).

Gulf ; but the Portuguese fleet which had promised to transport his troops to Bahrein was defeated by the imam of Muscat and forced to retreat to Goa.

The court of Isfahan had no sooner received tidings of this disaster than Mahmud, with a large army of Afghans, invaded . . . Persia in the year 1721, seized Kerman, and in the

Invasion f° uow i n g vear advanced to within four days' march of the city of Isfahan. The shah offered him a sum of money to return to Kandahar, but the Afghan answered by advanc- ing to a place called Gulnabad, within 9 m. of the capital. The ill-disciplined Persian army, hastily collected, advanced to attack the rebels. Its centre was led by Sheikh 'Ali Khan, covered by twenty-four field-pieces. The wali of Arabia commanded the right, and the 'itimadu' d-daulah, or prime minister, the left wing. The whole force amounted to 50,000 men, while the Afghans could not count half that number.

On the 8th of March 1722 the richly dressed hosts of Persia appeared before the little band of Afghans, who were scorched and disfigured by their long marches. The wali of Arabia commenced the battle by attacking the left wing of the Afghans with great fury, routing it, and plundering their camp. The prime minister immediately afterwards attacked the enemy's right wing, but was routed, and the Afghans, taking advantage of the confusion, captured the Persian guns and turned them on the Persian centre, who fled in confusion without striking a blow. The wali of Arabia escaped into Isfahan, and Mahmud the Afghan gained a complete victory. Fifteen thousand Persians remained dead on the field. A panic now seized on the surrounding inhabitants, and thousands of country people fled into the city. Isfahan was then one of the most magni- ficent cities in Asia, containing more than 600,000 inhabitants. Mahmud seized on the Armenian suburb of Julfa, and invested the doomed city ; but T an masp, son of the shah, had previously escaped into the mountains of Mazandaran. Famine soon began to press hard upon the besieged, and in September Shah Hosain offered to capitulate. Having been conducted to the Afghan camp, he fixed M h d' tne ro X a ' plume of feathers on the young rebel's turban u" r'tion w ' tn n ' s own naIlc U and 4000 Afghans were ordered to 'occupy the palace and gates of the city. 1 Mahmud entered Isfahan in triumph, with the captive shah on his left hand, and, seating himself on the throne in the royal palace, he was saluted as sovereign of Persia by the unfortunate Hosain. When Tahmasp, the fugitive prince, received tidings of the abdication of his father, he at once assumed the title of shah at Kazvin.

Turkey and Russia were not slow to take advantage of the calami- ties of Persia. The Turks seized on Tiflis, Tabriz and Hamadan, while Peter the Great, whose aid had been sought by the friendless Tahmasp, fitted out a fleet on the Caspian. 2 The Russians occupied Shirvan, and the province of Gilan south-west of the Caspian; 3 and Peter made a treaty with T anmas P II. in July 1722, by which he agreed to drive the Afghans out of Persia on condition that Darband (Derbend), Baku, Gilan, Mazandaran and Astarabad were ceded to Russia in perpetuity. These were all the richest and most important northern provinces of Persia.

Meanwhile the invader, in 1723, invited 300 of the principal Persian nobility to a banquet and massacred them. To prevent their children rising up in vengeance they were all murdered also. Then he proceeded to slaughter vast numbers of the citizens of Isfahan, until the place was nearly depopulated. Not content with this, in February-1725 he assembled all the captives of the royal family, except the shah, in the courtyard of the palace, and caused them all to be murdered, commencing the massacre with his own hand. The wretched Hosain was himself wounded in endeavouring vainly to save his infant son, only five years of age. All the males of the royal family, except Hosain himself, Tahmasp, and two children, are said to have perished. At length the inhuman miscreant Mahmud died, at the early age of twenty-seven, on the 22nd of April 1725. With scarcely any neck, he had round shoulders, a broad face with a flat nose, a thin beard, and squinting eyes, which were generally downcast.

Mahmud was succeeded by his first cousin, Ashraf, the son of Mir ‘Abdallah. He was a brave but cruel Afghan. He gave the dethroned shah a handsome allowance, and strove, by a mild policy, to acquire popularity. In 1727, after a short war, he signed a treaty with the Turks, acknowledging the sultan as chief of the Moslems. But the fortunate star of Tahmasp II. was now be- binning to rise, and the days of Afghan usurpation were numbered. He had collected a small army in Mazandaran, and was supported by Fath ‘Ali Khan, the powerful chief of the Kajar tribe. In 1727

1 We have an account of the Afghan invasion and sack of Isfahan from an eye-witness, Father Krusinski, procurator of the Jesuits at that place, whose interesting work was translated into English in the last century.

2 In 1721 Sultan Hosain sent an embassy to the Russians, seeking aid against the Afghans. In May 1722 a flotilla descended the Volga commanded by Tsar Peter and on the 19th of July the Russian flag

first waved over the Caspian. Gilan was occupied by 6000 men under General Matushkin.

8 The Russians remained in Gilan until 1734, when they were obliged to evacuate it, owing to the unhealthiness of the climate.

the fugitive shah was joined by Nadir Kuli, a robber chief, who murdered Fath ‘Ali, and, having easily appeased the shah, received the command of the royal army. In 1729 Ashraf became – .. alarmed, and led an Afghan army into Khorasan, where /JJLi

he was defeated by Nadir at Damghan, and forced to

of Afghans,

retreat. The Persian general followed close in his rear and again defeated him outside Isfahan in November of the same year. The Afghans fled through the town; and Ashraf, murdering the poor old shah H°sain on his way, hurried with the wreck of his army towards Shiraz. On the 1 6th of November the victorious Nadir entered Isfahan, and was soon followed by the young shah Tahmasp II., who burst into tears when he beheld the ruined palace of his ancestors. His mother, who had escaped the numerous mas- sacres by disguising herself as a slave and performing the most degrading offices, now came forth and threw herself into his arms. Nadir did not give his enemies time to recover from their defeat. He followed them up, and again utterly routed them in January 1730. Ashraf tried to escape to Kandahar almost alone, but was murdered by a party of Baluch robbers; and thus, by the genius of Nadir, his native land was delivered from the terrible Afghan invaders.

The ambition of Nadir, however, was far greater than his loyalty. On pretext of incapacity, he dethroned Tahmasp II. in 1732, and sent him a prisoner into Khorasan, where he was p a n Q f murdered some years afterwards by Nadir’s son while gafawlds. the conqueror was absent on his Indian expedition. For a short time the wily usurper placed Tahmasp’s son on the throne, a little child, with the title of ‘Abbas III., while he con- tented himself with the office of regent. Poor little ‘Abbas died at a very convenient time, in the year 1736, and Nadir then thiew off the mask. He was proclaimed shah of Persia by a vast assemblage on the plain of Moghan.

By the fall of the Safawid dynasty Persia lost her race of national monarchs, considered not only in respect of origin and birthplace but in essence and in spirit. Isma’il, Tahmasp and ‘Abbas, whatever their

faults and failings, were Persian and peculiar to Persians. Regarded in a sober English spirit, the reign of the great ‘Abbas is rendered mythical by crime. But something liberal in the philosophy of their progenitors threw an attractiveness over the earlier Safawid kings which was wanting in those who came after them. The fact is that, two centuries after Shah Isma’il’s accession to the throne, the Safawid race of kings was effete; and it became necessary to make room for a more vigorous if not a more lasting rule. Nadir was the; strong man for the hour and occasion. He had been designated a “robber chief”; but his antecedents, like those of many others who have filled the position, have redeeming points of melodramatic interest*

A map attached to Krusinski’s volumes illustrates the extent of Persian territory in 1728, or one year before Ashraf was finally defeated by Nadir, and some eight years prior to the date on which Nadir was himself proclaimed king. l72S% It shows, during the reign of the Safawids, Tiflis, Erivan, Khoi and Bagdad to have been within the limits of Persia on the west, and in like manner Balkh and Kandahar to have been included within the eastern border. There is,: however, also shown, as a result of the Afghan intrusion and the impotency of the later Safawid kings, a long broad strip of country to the west, including Tabriz and Hamadan, marked ” conquests of the Turks,” and the whole west shore of the Caspian from Astrakan to Mazandaran marked ” conquests of the czar of Muscovy “; Makran, written Mecran, is designated ” a warlike independent nation.” If further allowance be made for the district held by the Afghan invaders as part of their own country, it will be seen how greatly the extent of Persia proper was reduced, and what a work Nadir had before him to restore the kingdom to its former proportions.

But the former proportions had been partly reverted to, and would doubtless have been in some respects exceeded, both in Afghanistan and the Ottoman dominions and on the shores of the Caspian, by the action of this indefatigable general, had not Tahmasp II. been led into a premature treaty with the Turks. Nadir’s anger and indignation had been great at this weak, proceeding; indeed, he had made it the ostensible cause of the shah’s deposition. He had addressed letters to all the military chiefs of the country, calling upon them for support; he had sent an envoy to Constantinople insisting upon the sultan’s restora- tion of the Persian provinces still in his possession — that is,

Georgia and part of Azerbaijan — and he had threatened Bagdad with assault. As regent, he had failed twice in taking the city of the caliphs, but on the second occasion he had defeated and killed its gallant defender, Topal ‘Othman, and he had succeeded in regaining Tiflis, Kars and Erivan. 1

Russia and Turkey, naturally hostile to one another, had taken occasion of the weakness of Persia to forget their mutual quarrels and unite to plunder the tottering kingdom of the Safawid kings. A partition treaty had been signed between these two powers in 1723, by which the czar was to take Astara- bad, Mazandaran, Gilan, part of Shirvan and Daghistan, while the acquisitions of the Porte were to be traced out by a line drawn from the junction of the Aras and Kur rivers, and passing along by Ardebil, Tabriz and Hamadan, and thence to Kermanshah. Tahmasp was to retain the rest of his paternal kingdom on con- dition of his recognizing the treaty. The ingenious diplomacy of Russia in this transaction was manifested in the fact that she had already acquired the greater part of the territory allotted to her, while Turkey had to obtain her share by further con- quest. But the combination to despoil a feeble neighbour was outwitted by the energy of a military commander of a remark- able type.

D. — From the Accession of Nadir Shah, in 1736, to 1884.

Nadir, it has heen said, was proclaimed shah in the plains of Moghan in 1736. Mirza Mahdi relates how this event was

brought about by his address to the assembled Coronation n °kles and officers on the morning of the ” Nau-ruz,”

or Persian New- Year’s Day, the response to that appeal being the offer of the crown. The conditions were that the crown should be hereditary in his family, that the claim of the Safawids was to be held for ever extinct, and that measures should be taken to bring the Shi’ites to accept uniformity of worship with the Sunnites. The mulla bashi (or high priest) objecting to the last, Nadir ordered him to be strangled, a com- mand which was carried out on the spot. On the day following, the agreement having been ratified between sovereign and people, he was proclaimed emperor of Persia. At Kazvin the ceremony of inauguration took place. The ‘edict expressing the royal will on the religious question is dated in June, but the date of coronation is uncertain. From Kazvin Nadir moved to Isfahan, where he organized an expedition against Kandahar, then in the possession of a brother of

Mahmud, the conqueror of Shah Hosain. But before setting out for Afghanistan he took measures to secure the internal quiet of Persia, attacking and seizing in his stronghold the chief of the marauding Bakhtiaris, whom he put to death, retaining many of his men for service as soldiers. With an army of 80,000 men he marched through Khorasan and Seistan to Kandahar, which city he blockaded ineffectually for a year; but it finally capitulated on the loss of the citadel. Balkh fell to Riza Kuli, the king's son, who, moreover, crossed the Oxus and defeated the Uzbegs in battle. Besides tracing out the lines of Nadirabad, a town Since merged in modern Kandahar, Nadir had taken advantage of the time available and of opportunities presented to enlist a large number of men from the Abdali and Ghilzai tribes. It is said that as many as 16,000 were at his disposal. His rejection of the Shi'ite tenets as a state religion seems to have propitiated the Sunnite Afghans.

Nadir had sent an ambassador into Hindustan requesting

the Mogul emperor to order the surrender of certain unruly

Afghans who had taken refuge within Indian terri-

India. tory, Dut no satisfactory reply was given, and

obstacles were thrown in the way of the return of the

embassy. The Persian monarch, not sorry perhaps to find a

plausible pretext for encroachment in a quarter so full of promise

to booty-seeking soldiers, pursued some of the fugitives through

Ghazni to Kabul, which city was then under the immediate

control of Nasr Khan, governor of eastern Afghanistan, for

Mahommed Shah of Delhi. This functionary, alarmed at the

near approach of the Persians, fled to Peshawar. Kabul had

1 Malcolm.

long been considered not only an integral part but also one of the main gates of the Indian Empire; notwithstanding a stout resistance on the part of its commandant, Shir or Shirzah Khan, the place was stormed and carried (1738) by Nadir, who moved on eastward. Mirza Mahdi relates that from the Kabul plain he addressed a new

remonstrance to the Delhi court, but that his envoy was arrested and killed, and his escort compelled to return by the governor of Jalalabad. The same authority notes the occupation of the latter place by Persian troops and the march thither from Gandamak. It was probably through the Khaibar (Khyber) Pass that he passed into the Peshawar plain, for it was there that he first defeated the Imperial forces. The invasion of India had now fairly commenced, and its successful progress and consummation were mere questions of time. The prestige of this Eastern Napoleon was immense. It had not only reached but had been very keenly felt at Delhi before the conquering army had arrived. There was no actual religious war; all sectarian distinction had been disavowed; the contest was between vigorous Mahommedans and effete Mahom- medans. Nadir's way had been prepared by circumstances, and as he progressed from day to day his army increased. There must have been larger accessions by voluntary recruits than losses by death or desertion. The victory on the plain of Karnal, whether accomplished by sheer fighting or the interven- tion of treachery, was the natural outcome of the previous situation, and the submission of the emperor followed as a matter of course.

Delhi must have experienced a sense of relief at the departure of its conqueror, whose residence there had been rendered painfully memorable by carnage and riot. The marriage of his son to the granddaughter of Aurangzeb and the formal restoration of the crown to the dethroned emperor were doubt- less politic, but the descendant of Babar could not easily forget how humiliating a chapter in history would remain to be written against him. The return march of Nadir to Persia is not recorded with precision. On the 5th of May 1739 he left the gardens of Shalamar, and proceeded by way of Lahore and Peshawar through the passes to Kabul. Thence he seems to have returned to Kandahar, and in May 1740 — just one year after his departure from Delhi — he was in Herat displaying the imperial throne and other costly trophies to the gaze of the admiring inhabitants. Sind was certainly included in the cession to him by Mahommed Shah of " all the territories westward of the river Attok, " but only that portion of it, such as Thattah (Tatta), situated on the right bank of the Indus.

From Herat he moved upon Balkh and Bokhara, and received the submission of Abu'1-Faiz Khan, the Uzbeg ruler, whom he restored to his throne on condition that the Oxus should be the acknowledged boundary between the conauests. two empires. The khan of Khwarizm, who had made repeated depredations in Persian territory, was taken prisoner and executed. Nadir then visited the strong fortress of Kelat, to which he was greatly attached as the scene of his boyish

exploits, and Meshed, which he constituted the capital of his empire. He had extended his boundary on the east to the Indus, and to the Oxus on the north.

On the south he was restricted by the Arabian Ocean and Persian Gulf; but the west remained open to his further progress. He had in the first place to revenge the death of his brother Ibrahim Khan, slain by the jy eat Lesghians; and a campaign against the Turks might follow in due course. The first movement was unsuccessful, and indirectly attended with disastrous consequences. Nadir, when hastening to the support of some Afghan levies who were doing good service, was fired at and wounded by a stray assailant; suspecting his son, Riza Kuli, of complicity, he commanded the unfortunate prince to be seized and deprived of sight. From that time the heroism of the monarch appeared to die out. He became morose, tyrannical and suspicious. An easy victory over the Turks gave him but little additional glory; and he readily concluded a r>eace with the sultan wniVV, Krm.»v.t k,.*

insignificant gain to Persia. 1 Another battle won from the Ottoman troops near Diarbekr by Nasr Ullah Mirza, the young prince who had married a princess of Delhi, left matters much the same as before.

The last years of Nadir's life were full of internal trouble. On the part of the sovereign, murders and executions; on that of his subjects, revolt and conspiracy. Such a state of things could not last, and certain proscribed persons plotted the destruction of the half-demented tyrant. He was despatched by Salah Bey, captain of his guards (1747). He was some sixty years of age, and had reigned eleven years. About the time of setting out on his Indian expedition he was described as a most comely man, upwards of 6 ft., tall, well-proportioned, of robust make and constitution; inclined to be fat, but prevented by the fatigue he underwent; with fine, large black eyes and eyebrows; of sanguine complexion, made more manly by the influence of sun and weather; a loud, strong voice; a moderate wine-drinker; fond of simple diet, such as pilaos and plain dishes, but often neglectful of meals altogether, and satisfied, if occasion required, with parched peas and water, always to be procured. 2

During the reign of Nadir an attempt was made to establish a British

Caspian trade with Persia. The names of Jonas Hanway and John Elton were honourably connected with this undertaking; and the former has left most valuable records of the time and country.

From Nadir Shah to the Kajar Dynasty. — After the death of Nadir Shah something like anarchy prevailed for thirteen years in the greater part of Persia as it existed under Shah “Abbas. No sooner had the crime become

Period 0/ Anarchy.

known than Ahmad Khan, chief of the Abdali Afghans, took possession of Kandahar and a certain amount of treasure. By the action of Ahmad Abdali, Afghanistan was at once lost to the Persian crown, for this leader was strong enough to found an independent kingdom. The chief of the Bakhtiaris, Rashid, also with treasure, fled to the mountains, and the conspirators invited ‘Ali, a nephew of the deceased monarch, to ascend the vacant throne. The Bakhtiari encour- aged his brother, ‘Ali Mardan, to compete for the succession to Nadir. The prince was welcomed by his subjects; he told them that the murder of his uncle was due to his own instigation, and, in order to conciliate them, remitted the revenues of the current year and all extraordinary taxes for the two years following.

Taking the title of ‘Adil Shah, or the ” just ” king, he commenced his reign by putting to death the two princes Riza Kuli and Nasr Ullah, as well as all relatives whom he considered his competitors, with the exception of Shah Rukh, son of Riza Kuli, whom he spared in case a lineal descendant of Nadir should at any time be required. But he had not removed all dangerous members of the royal house, nor had he gauged the temper of the times or people. ‘Adil Shah was soon dethroned by his own brother, Ibrahim, and he in his turn was defeated by the adherents of Shah Rukh, who made their leader king.

This young prince had a better and more legitimate title than that of the grandson of Nadir, for he was also grandson, ... on the mother’s side, of the Safawid Shah Husain.

‘Amiable, generous and liberal-minded, and of pre- possessing exterior, he proved to be a popular prince. But he was neither of an age nor character to rule over a people led by turbulent and disaffected chiefs, ever divided by the con- flicting interests of personal ambition. Sa’id Mahommed, son of Mirza Daud, a chief mullah at Meshed, whose mother was the reputed daughter of Suleiman, declared himself king, and imprisoned and blinded Shah

Rukh. Yusuf ‘Ali, the general commanding the royal troops, defeated and slew Suleiman, and replaced his master on the throne, reserving to himself the protectorship or regency. A new combination of chiefs, of which Ji’afir the Kurd and Mir ‘Alam the Arabian are the

1 Creasy says the war broke out in 1743, but was terminated in 1746 by a treaty which made little change in the old arrange- ments fixed under Murad IV.

2 Fraser’s History of Nadir Shah (1742).

principal names handed down, brought about the death of Yusuf ‘Ali and the second imprisonment of Shah Rukh. These events were followed by a quarrel terminating in the supremacy of the Arab. At this juncture Ahmad Shah Abdali reappeared in Persian Khorasan from Herat; he attacked and took posses- sion of Meshed, slew Mir ‘Alam, and, pledging the local chiefs to support the blinded prince in retaining the kingdom of his grandfather, returned to Afghanistan. But thenceforward this unfortunate young man was a mere shadow of royalty, and his purely local power and prestige had no further influence whatever on Persia as a country.

The land was partitioned among several distinguished persons, who had of old been biding their opportunities, or were born of the occasion. Foremost among these was Mahom- med Hasan Khan, hereditary chief of those Kajars confusion. who were established in the south-east corner of the Caspian. His father, Fath ‘Ali Khan, after sheltering Shah Tahmasp II. at his home in Astarabad, and long acting as one of his most loyal supporters, had been put to death by Nadir, who had appointed a successor to his chiefdom from the ” Yukari ” or ” upper ” Kajars, instead of from his own, the ” Ashagha,” or “lower.” 3 Mahommed, with his brother, had fled to the Turkomans, by whose aid he had attempted the recovery of Astarabad, but had not succeeded in regaining a permanent footing there until Nadir had been removed. On the murder of the tyrant he had raised the standard of independence, successfully resisted Ahmad Shah and his Afghans, who sought to check his progress in the interests of Shah Rukh, and even- tually brought under his own sway the valuable provinces of Gilan, Mazandaran and Astarabad 4 — quite a little kingdom in itself. In the large important province of Azerbaijan, Azad Khan, one of Nadir’s generals, had established a separate government; and ‘Ali Mardan, brother of the Bakhtiari chief, took forcible possession of Isfahan, enfpowering Shah Rukh’s governor, Abu‘1-Fath Khan, to act for the new master instead of the old.

Had ‘Ali Mardan declared himself an independent ruler he would have been by far the most important of the three persons named. But such usurpation at the old Safawid capital would have been too flagrant an act for general assent; so he put forward Isma’il, a nephew of Shah Husain, as the representative of sovereignty, and himself as one of his two ministers — the other being Karim Khan, a chief of the Zend Kurds. Shah Isma’il, it need scarcely be said, possessed no real authority; but the ministers were strong men in their way, and the Zend especially had many high and excellent qualities. After a time ‘Ali Mardan was assassinated, and Karim Khan became the sole living power at Isfahan. The story of the period is thus told by R. G. Watson: —

” The three rivals, Karim, Azad and Muhammad Hasan, pro- ceeded to settle, by means of the sword, the question as to which of them was to be the sole master of Persia. A three- „ sided war then ensued, in the course of which each of L* r “l? the combatants in turn seemed at one time sure to be ..’ . ne the final conqueror. Karim, when he had arranged v s ‘ matters at Ispahan, marched to the borders of Mazandaran, where the governor of that province was ready to meet him. After a closely contested battle victory remained with Muhammad Hasan; who, however, was unable to follow up the foe, as he had to return in order to encounter Azad. That leader had in- vaded Gilan, but, on the news reaching him of the victory which the governor of Mazandaran had gained, he thought it prudent to retrace his steps to Sultaniyah. Karim reunited his shattered forces at Tehran, and retired to Ispahan to prepare for a second campaign. When he again took the field it was not to measure himself once more with the Kajar chief, but to put down the pre- tensions of Azad. The wary Afghan, however, shut himself up in Kazvin, a position from which he was enabled to inflict much in- jury on the army of Karim, while his own troops remained unharmed, behind the walls of the town. Karim retired a second time to

3 There were three branches of the Kajar tribe, i.e. the Suldus, Tungkut and Jalaiyar. The last, according to Watson, became settled in Iran and Turan, and seem at first to have given their name to all the tribe.

4 Watson. Malcolm says that Gilan was under one of its own chiefs, Hidaiyat Khan.

Ispahan, and in the following spring advanced again to meet Azad. A pitched battle took place between them, in which the army of Karim was defeated. He retreated to the capital, closely pressed by the foe. Thence he continued his way to Shiraz, but Azad was still upon his traces. He then threw himself upon the mercy of the Arabs of the Garmsir or hot country, near the Persian Gulf, to whom the name of the Afghans was hateful, and who rose in a body to turn upon Azad. Karim, by their aid, once more repaired his losses and advanced on Ispahan, while Muhammad Hasan with fifty thousand men was coming from the opposite direction, ready to encounter either the Afghan or the Zend. The Afghan did not await his coming, but retired to his government of Tabriz.

” The Zend issued from Ispahan, and was a second time defeated in a pitched battle by the Kajar. Karim took refuge behind the walls of Shiraz, and all the efforts of the enemy to dislodge him were ineffectual. Muhammad Hasan Khan in the following year turned his attention to Adarbaijan. Azad was no longer in a posi- tion to oppose him in the field, and he in turn became master of every place of importance in the province, while Azad had to seek assistance in vain — first from the pasha of Baghdad, and then from his former enemy, the tsar of Georgia. Next year the conquering Kajar returned to Shiraz to make an end of the only rival who now stood in his way. On his side were 80,000 men, commanded by a

General who had twice defeated the Zend chief on an equal field. Carim was stilt obliged to take shelter in Shiraz, and to employ artifice in order to supply the place of the force in which he was deficient. Nor were his efforts in this respect unattended with success: seduced by his gold, many of the troops of the Kajar began to desert their banners. In the meantime the neighbour- hood of Shiraz was laid waste, so as to destroy the source from which Muhammad Hasan drew his provisions; by degrees his army vanished, and he had finally to retreat with rapidity to Ispahan with the few men that remained to him. Finding his position there to be untenable, he retreated still farther to the country of his own tribe, while his rival advanced to Ispahan, where he received the submission of nearly all the chief cities of Persia. The ablest of Karim’s officers, Shaikh ‘Ali, was sent in pursuit of the Kajar chief. The fidelity of the commander to whom that chief- tain had confided the care of the pass leading into Mazandaran, was corrupted ; and, as no further retreat was open to him, he found himself under the necessity of fighting. The combat which ensued resulted in his complete defeat, although he presented to his followers

an example of the most determined valour. While attempting to effect his escape he was recognized by the chief of the other branch of the Kajar tribe, who had deserted his cause, and who had a blood-feud with him, in pursuance of which he now put him to death.

” For nineteen years after this event Karim Khan ruled with the title of wakil, or regent, over the whole of Persia, excepting the Karim Khan P rovmce °f Khurasan. He made Shiraz the seat of ‘ his government, and by means of his brothers put down every attempt which was made to subvert his authority. The rule of the great Zend chief was just and mild, and he is on the whole, considering his education and the circumstances under which he was placed, one of the most faultless characters to be met with in Persian history.”

Karim Khan died at his capital in 1779 in the twentieth year of his reign, and, it is said, in the eightieth of his age. He built the great bazaar of Shiraz, had a tomb constructed over the remains of Hafiz, and repaired the ” turbat ” at the grave of Sa’di, outside the walls. He encouraged commerce and agricul- ture, gave much attention to the shores of the Persian Gulf, and carefully studied the welfare of the Armenian community settled in his dominions. In his time the British factory was removed from Bander Abbasi to Bushire.

On Karim’s death a new period of anarchy supervened. His brother, Zaki, a cruel and vindictive chief who, when governor of Isfahan, had revolted against Karim, assumed the government. At the same time he proclaimed Abu ‘1-Fath Khan, second son of the deceased monarch, and his brother Mahommed ‘Ali, joint-successors to the throne. The seizure of the citadel at Shiraz by the adherents of the former, among whom were the more influential of the Zends, may have induced him to adopt this measure as one of prudent conciliation. But the garrison held out, and, to avoid a protracted siege, he had recourse to treachery. The suspicious nobles were solemnly adjured to trust themselves to his keeping, under promise of forgiveness. They believed his professions, tendered their submission, and were cruelly butchered. Zaki did not long enjoy the fruits of his perfidious dealing. The death of Karim Khan had raised two formidable adversaries to mar his peace.

Aga Mahommed, son of Mahommed Hasan, the Kajar chief of Astarabad, a prisoner at large in Shiraz, was in the environs

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of that city awaiting intelligence of the old king’s decease, and,

hearing it, instantly escaped to Mazandaran, there to gather his tribesmen together and compete for the crown of Persia. Taken prisoner by Nadir and barbarously mutilated by ‘Adil Shah, he had afterwards found means to rejoin his people, but had surrendered himself to Karim Khan when his father was killed in battle. On the other hand, Sadik, brother to Zaki, who had won considerable and deserved repute by the capture of Basra from the Turkish governor, abandoned his hold of the conquered town on hearing of the death of Karim, and appeared with his army before Shiraz. To provide against the intended action of the first, Zaki detached his nephew, ‘Ali Murad, at the head of his best troops to proceed with all speed to the north; and, as to the second, the seizure of such families of Sadik’s followers as were then within the walls of the town, and other violent measures, struck such dismay into the hearts of the besieging soldiers that they dispersed and abandoned their leader to his fate. From Kerman, however, where he found an asylum, the latter addressed an urgent appeal for assistance to ‘Ali Murad. This chief, encamped at Teheran when the communication reached him, submitted the matter to his men, who decided against Zaki, but put forward their own captain as the only master they would acknowledge. ‘Ali Murad, leaving the pursuit of Aga Mahcmmed, then returned to Isfahan, where he was received with satisfaction, on the declaration that his one object was to restore to his lawful inheritance the eldest son of Karim Khan, whom Zaki had set aside in favour of a younger brother. The sequel is full of dramatic interest. Zaki, enraged at his nephew’s desertion, marched out of Shiraz towards Isfahan. On his way he came to the town of Yezdikhast, where he demanded a sum of money from the inhabitants, claiming it as part of secreted revenue; the demand was refused, and eighteen of the head men were thrown down the precipice beneath his window; a ” saiyid,” or holy man, was the next victim, and his wife and daughter were to be given over to the soldiery, when a suddenly-formed conspiracy took effect, and Zaki’s own life was taken in retribution for his guilt (1779).

When intelligence of these events reached Kerman, Sadik Khan hastened to Shiraz, proclaimed himself king in place

of Abu 1-Fatb. Khan, whom he declared incompe- .„ „

4. 4. 4. • j i 4. 4.1. r 4.1. ‘All Murad.

tent, to reign, and put out the eyes of the young

prince. He despatched his son Ji’afir to assume the govern- ment of Isfahan, and watch the movements of ‘Ali Murad, who appears to have

been then absent from that city; and he gave a younger son, ‘Ali Naki, command of an army in the field. The campaign ended in the capture of Shiraz and assumption of sovereignty by ‘Ali Murad, who caused Sadik Khan to be put to death.

From this period up to the accession of Aga Mahommed Khan the summarized history of Markham will supply the principal facts required.

‘Ali Murad reigned over Persia until 1785, and carried on a successful war with Aga Mahommed in Mazandaran, defeating him in several engagements, and occupying Teheran a/id Sari. He died on his way from the former place to Isfahan, and was suc- ceeded by Ji’afir, son of Sadik, 1 who reigned at Shiraz, assisted in the government by an able but unprincipled ” kalantar,” or head magistrate, named Hajji Ibrahim. This ruler was poisoned by the agency of conspirators, one of whom, Saiyid Murad, succeeded to the throne. Hajji Ibrahim, however, contriving to maintain the loyalty of the citizens towards the Zend reigning family, the usurper was killed, and Lutf ‘Ali Khan, son of Ji’afir, proclaimed Lutl’AU king. He had hastened to Shiraz on hearing of his ku.„ father’s death and received a warm welcome from the inhabitants. Hajji Ibrahim became his chief adviser, and a new minister was found for him in Mirza Hosain Shirazi. At the time of his accession Lutf ‘Ali Khan was only in his twentieth year, very handsome, tall, graceful, and an excellent horseman. While differing widely in character, he was a worthy successor of Karim Khan, the great founder of the Zend dynasty. Lutf ‘AH Khan had not been many months on the throne when Aga Mahommed, ad- vanced to attack him, and invested the city of Shiraz, but retreated soon afterwards to Teheran, which he had made the capital of his dominions. The young king then enjoyed a short period of peace.

1 A five days’ usurpation of Bakir Khan, governor of Isfahan, is not taken into account.

Afterwards, in 1790, he collected his forces and marched against the Kajars, in the direction of Isfahan. But Hajji Ibrahim had been intriguing against his sovereign, to whose family he owed everything, not only with his officers and soldiers but also with Aga Mahommed, the chief of the Kajars, and arch-enemy of the Zends. Lutf ‘Ali Khan was suddenly deserted by the whole of his army, except seventy

faithful followers; and when he retreated to Shiraz he found the gates closed against him by Hajji Ibrahim, who held the city for the Kajar chief. Thence falling back upon Bushire, he found that the sheikh of that town had also betrayed him. Surrounded by treason on every side, he boldly attacked and routed the chief of Bushire and blockaded Shiraz. His un- conquerable valour gained him many followers, and he defeated an army sent against him by the Kajars in 1792.

Aga Mahommed then advanced in person against his rival. He encamped with an army of 30,000 men on the plain of Mardasht, near Shiraz. Lutf ‘Ali Khan, in the dead of night, suddenly attacked the camp of his enemy with only a few hundred followers. The Kajars were completely routed and thrown into confusion; but Aga Mahommed, with extraordinary presence of mind, remained in his tent, and at the first appearance of dawn his ” muezzin,” or public crier, was ordered to call the faithful to morning prayer as usual. Astonished at this, the few Zend cavaliers, thinking that the wholy army of Kajars had returned, fled with precipitation leaving the field in possession of Aga Mahommed. The successful Kajar then entered Shiraz, and promoted the traitor Hajji Ibrahim to be his vizier. Lutf ‘Ali Khan took refuge with the hospitable chief of Tabbas in the heart of Khorasan, where he succeeded in collecting a few followers; but advancing into Fars, he was again defeated, and forced to take refuge at Kandahar.

In 1794, however, the undaunted prince once more crossed the Persian frontier, determined to make a last effort, and either regain Capture of ‘ s t nrone or die > n the attempt. He occupied the Kerman c ‘ tv ° Kerman, then a flourishing commercial town, half-way between the Persian Gulf and the province of Khorasan. Aga Mahommed besieged it with a large army in 1795, and, after a stout resistance, the gates were opened through treachery. For three hours the gallant young warrior fought in the streets with determined valour, but in vain. When he saw that all hope was gone he, with only three followers, fought his way through the Kajar host and escaped to Bam-Narmashir, the most eastern district of the province of Kerman on the borders of Seistan.

Furious at the escape of his rival, the savage conqueror ordered a general massacre; 20,000 women and children were sold into slavery, and 70,000 eyes of the inhabitants of Kerman were brought to Aga Mahommed on a platter.

Lutf ‘Ali Khan took refuge in the town of Bam ; but the governor of Narmashir, anxious to propitiate the conqueror, basely surrounded him as he was mounting his faithful horse Kuran to seek a more secure

asylum. The young prince fought bravely; but, being badly wounded and overpowered by numbers, he was secured and sent to the camp of the Kajar chief. The spot where he was seized at Bam, when mounting his horse, was marked by a pyramid, formed, by order of his revengeful enemy, of the skulls of the most faithful of his adherents. The most hideous indignities and atrocities were committed upon his person by the cruel Kajar, and finally he was sent to Teheran and murdered, when only in his twenty- sixth year. Every member of his family and every friend was ordered to be massacred by Aga Mahommed; and the successful miscreant thus founded the dynasty of the Kajars at the price of all the best and noblest blood of Iran.

The Zend is said to be a branch of the Lak tribe, dating from the time of the Kaianian kings, and claims to have been charged with the care of the Zend-Avesta by Zoroaster himself. 1 The tree attached to Markham's chapter on the dynasty contains the names of eight members of the family only, i.e. four brothers, one of whom had a son, grandson and great-grandson, and one a son. Four of the eight were murdered, one was blinded, and one cruelly mutilated. In one case a brother murdered a brother, in another an uncle blinded his nephew.

Kajar Dynasty. — Aga Mahommed was undoubtedly one of the most cruel and vindictive despots that ever disgraced a throne. But he was not without care for the honour of his empire in the eyes of Europe and the outer world, and his early career in Mazandaran gave him a deeply-rooted mistrust of Russia, with the officers of which power he was in constant contact. The following story, told by Forster, 2 and varied by a later writer, is characteristic. A party of Russians having obtained permission to build a " counting-house " at Ashraf,

1 Markham. Morier says of Karim Khan's family, " it was a low branch of an obscure tribe in Kurdistan."

2 Journey from Bengal to England (1798), ii. 201 ; see also Markham, pp. 341, 342.

in the bay of that name, erected instead a fort with eighteen

guns. Aga Mahommed, learning the particulars, visited the

spot,- expressed great pleasure at the work done,

invited the officers to dine with him, imprisoned ff* h mmed

them, and only spared their lives when they had

removed the whole of the cannon and razed the fort to the

ground. This occurrence must have taken place about 1782.

Forster was travelling homeward by the southern shores of the Caspian in January 1784, and from him we gather many interesting details of the locality and period. He calls Aga Mahommed chief of Mazandaran, as also of Astarabad and ” some districts situate in Khurasan,” and describes his tribe the Kajar, to be, like the Indian Rajput, usually devoted to the profession of arms. Whatever hold his father may have had on Gilan, it is certain that this province was not then in the son’s possession, for his brother, Ji’afir Kuli, governor of Balfrush (Balfroosh), had made a recent incursion into it and driven Hidaiyat Khan, its ruler, from Reshtto Enzeli, and Aga Mahom- med was himself meditating another attack on the same quarter. The latter’s palace was at Sari, then a small and partly fortified town, thickly inhabited, and with a plentifully-supplied market. As ” the most powerful chief in Persia ” since the death of Karim Khan, the Russians were seeking to put their yoke upon him.

As Aga Mahommed’s power increased, his dislike and jealousy of the Muscovite assumed a more practical shape. His victory over Lutf ‘Ali was immediately followed by an campaign expedition into Georgia. After the death of Nadir against the wali of that country had looked around him Georgia. for the safest means of shaking off the yoke of Persia; and in course of time an opportunity had offered of a promising kind. In 1783, when the strength of the Persian monarchy was concentrated upon Isfahan and Shiraz, the Georgian tsar Heraclius entered into an agreement with the empress Catherine by which all connexion with the shah was disavowed, and a quasi-vassalage to Russia substituted — the said empire extending her aegis of protection over her new ally. Aga Mahommed now demanded that Heraclius should return to his position of tributary and vassal to Persia, and, as his demand was rejected, prepared for war. Dividing an army of 60,000 men into three corps, he sent one of these into Daghestan, another was to attack Erivan, and with the third he himself laid siege to Shusha in the province of Karabakh. The stubborn resistance offered at the last-named place caused him to leave there a small investing force only, and to move on with the remainder of his soldiers to join the corps d’armte at Erivan. Here, again, the difficulties presented caused him to repeat the same process and to effect a junction with his first corps at Ganja, the modern Elisavetpol. At this place he encountered the Georgian army under Heraclius, defeated it, and marched upon Tiflis, which he pillaged, massacring and enslaving 3 the inhabitants. Then he returned triumphant to

Teheran, where (or at Ardebil on the way) he was publicly crowned shah of Persia. Erivan surrendered, but Shusha continued to hold out. These proceedings caused Russia to enter the field. Derbent was taken possession of by Imhov, Baku and Shumakhy were occupied and Gilan was threatened. The death of the empress, however, caused the issue of an order to retire, and Derbent and Baku remained the only trophies of the campaign.

In the meantime Aga Mahommed's attention had been called away to the east. Khorasan could hardly be called an integral part of the shah's kingdom so long as it was under operations even the nominal rule of the blind grandson of in Nadir. But the eastern division of the province Korasan. and its outlying parts were actually in 1 the hands of the Afghans, and Meshed was not Persian in 1796 in the sense that Delhi was British at the outbreak of the Indian Mutiny. Shah Rukh held his position, such as it was, rather under Ahmad

3 Lady Sheil says (1849) ; " I saw a few of these unhappy captives who all had to embrace Mahommedanism, and many of whom had risen to the highest stations, just as the Circassian slaves in Constantinople. ' '

Shah and his successors in Afghanistan than under any other sovereign power. Aga Mahommed determined to restore the whole province to Persia, and, after a brief residence in Teheran on his return from the Georgian expedition, he set out for Meshed. It is important to note that on the occasion of his coronation he had girded on the sabre consecrated at the tomb of the founder of the Safawid — thus openly pledging himself to support the Shi'ite faith.

But there had been continual dissatisfaction in the capital of Khorasan, and constant inroads upon it from without, which the royal puppet was unable to prevent. His popularity was real, but never seemed to have effect outside the limited sphere of personal sympathy and regard. Owing to the frequent revolutions in the holy city the generals of Timur Shah, king of the Afghans, had made three expeditions on Shah Rukh's behalf. Meshed had been taken and retaken as though he were not a resident in it, much less its dejure king. Moreover, his two sons Nadir Mirza and Wali Ni'amat had long been fighting, and the

former was in 1796 the actual ruler of the place. Three years before Timur had died, and his third son, Zaman Shah, by the intrigues of an influential sirdar, Paiyanda Khan, and been proclaimed his successor at Kabul.

Aga Mahommed's entry into Meshed was effected without a struggle on the part of those in possession. The Kajar shah walked on foot to the tomb of Imam Riza, before which he knelt and kissed the ground in token of devotion, and was recognized as a Shi'ite of Shi'ites. Shah Rukh submissively followed in his train. Then began the last act of the local tragedy. The blind king's gradual revelation, under horrible torture, of the place of concealment of his several jewels and treasures, and his deportation and death (of the injuries thus received, at Damghan,' en route to Mazandaran), must be classed among the darkest records of Oriental history.

From Meshed Aga Mahommed sent an envoy to Zaman Shah, asking for the cession of Balkh, and explaining his invasion of Khorasan; but the Afghan monarch was too perplexed with the troubles in his own country and his own insecure position to do more than send an unmeaning reply. It is not shown what was the understood boundary between the two countries at this particular period; but Watson states that on the shah's departure he had received the submission of the whole of Khorasan, and left in Meshed a garrison of 12,000 men.

Aga Mahommed had now fairly established his capital at Teheran. On his return thither in September 1796 he dismissed Death and ms troops for the winter, directing their reassembly Character in the following spring. The re-invasion by Russia of Aga of the provinces and districts he had recently

Mahommed. wre sted from her west of the Caspian had made great progress, but the circumstance does not seem to have changed his plans for the army. Although, when the spring arrived and the shah led his forces to the Aras, the Russians had, it is true, retreated, yet territory had been regained by them as far south as the Talysh. Aga Mahommed had now arrived at the close of his career. He was enabled, with some difficulty, to get his troops across the river, and take possession of Shusha, which had given them so much trouble a year or two before. There, in camp, he was murdered (1797) by his own personal attendants — men who were under sentence of death, but allowed to be at large. He was then fifty-seven years of age, and had ruled over part of Persia for more than eighteen years— over the kingdom generally for about three years, and from his coronation for about one year only.

The brutal treatment he had experienced in boyhood under the orders of ‘ Adil Shah, and the opprobrious name of ” eunuch ” with which he was taunted by his enemies, no doubt contributed to embitter his nature. His contempt of luxury, his avoidance of hyperbole and dislike of excessive ceremony, his protection to commerce and consideration for his soldiers, the reluctance with which he assumed the crown almost at the close of his reign — all these would have been praiseworthy in another man; but on his death the memory of his atrocious tyranny alone survived. Those who have seen his portrait once will recognize

FatbAtt Shah.

the face wherever presented. ” Beardless and shrivelled, ” writes Sir John Malcolm, ” it resembled that of an aged and wrinkled woman, and the expression of his countenance, at no time pleasant, was horrible when clouded, as it very often was, with indignation. He was sensible of this, and could not bear that any one should look at him.”

Aga Mahommed had made up his mind that he should be succeeded by his nephew Fath ‘Ali Shah, son of his full brother, Hosain Kuli Khan, governor of Fars. There was a short interval of confusion after the murder. The remains of the sovereign were exposed to insult, the army was disturbed, the recently captured fort on the left bank of the Aras was abandoned; but the wisdom and resolution of the minister, Hajji Ibrahim, and of Mirza Mahommed Khan Kajar secured order and acceptance of the duly appointed heir. The first, proclaiming his own allegiance, put himself at the head of a large body of troops and marched towards the capital. The second closed the gates of Teheran to all comers until Fath ‘Ali Shah came himself from Shiraz. Though instantly proclaimed on arrival, the new monarch was not crowned until the spring of tlje following year (1798).

The so-called rebellions which followed were many, but not of any magnitude. Such as belong to local history are three in number, i.e. that of Sadik Khan Shakaki, the general whose possession of the crown jewels enabled him, after the defeat of his army at Kazvin, to secure his personal safety and obtain a government; of Hosain Kuli Khaˆ the shah’s brother, which was compromised by the mother’s intervention; and of Mahommed, son of Zaki Khan, Zend, who was defeated on more than one occasion in battle, and fled into Turkish territory. Later, Sadik Khan, having again incurred the royal displeasure, was seized, confined and mercilessly bricked up in his dungeon to die of starvation.

Another adversary presented himself in the person of Nadir Mirza, son of Shah Rukh, who, when Aga Mahommed appeared before Meshed, had taken refuge with the Afghans. Fath ‘Ali sent to warn him of the consequences, but without the desired effect. Finally, he advanced into Khorasan with an army which appears to have met with no opposition save at Nishapur and Turbet, both of which places were taken, and when it reached Meshed, Nadir Mirza tendered his submission, which was accepted. Peace having been further cemented by an alliance between a Kajar general and the prince’s daughter, the shah returned to Teheran.

Now that the narrative of Persian kings has been brought up to the period of the consolidation of the Kajar dynasty and commence- ment of the 19th century, there remains but to summarize the principal events in the reigns of Fath ‘Ali Shah and his immediate successors, Mahommed Shah and Nasru ‘d-Din Shah.

Fath ‘Ali Shah came to the throne at about thirty-two years of age, and died at sixty-eight, after a reign of thirty-six years. Persia’s great aim was to recover in the north-west, as in the north- east of her empire, the geographical limits obtained for her by the Safawid kings; and this was no easy matter when she had to con- tend with a strong European power whose territorial limits touched her own. Fath ‘Ali Shah undertook, at the outset of „, ... his reign, a contest with Russia on the western side of „ .”’ the Caspian, which became constant and harassing Kuss ”’ warfare. Georgia was, clearly, not to revert to a Mahom- medan suzerain. In 1800 its tsar, George, son and successor of Heraclius, notwithstanding his former professions of allegiance to the shah, renounced his crown in favour of the Russian emperor. His brother Alexander indignantly repudiated the act and resisted its fulfilment, but he was defeated by General Lazerov on the banks of the Lora. Persia then re-entered the field. Among the more notable occurrences which followed were a three days’ battle, fought near Echmiadzin, between the crown prince, ‘Abbas Mirza, and General Zizianov, in which the Persians suffered much from the enemy’s artillery, but would not admit they were defeated; un- successful attempts on the part of the Russian commander to get possession of Erivan; and a surprise, in camp, of the shah’s forces, which caused them to disperse, and necessitated the king’s own presence with reinforcements. On the latter occasion the shah is credited with gallantly swimming his horse across the Aras, and setting an example of energy and valour. In the following year ‘Abbas Mirza advanced upon Shishah, the chief of which place and of the Karabagh had declared for Russia; much fighting en- sued, and Erivan was formally taken possession of in the name of

the shah. The Russians, moreover, made a futile attempt on Gilan by landing troops at Enzeli, which returned to Baku, where Zizianov fell a victim to the treachery of the Persian governor. Somewhat later Ibrahim Khalil of Shusha, repenting of his Russophilism, determined to deliver up the Muscovite garrison at that place, but his plans were betrayed, and he and his relatives put to death. Reprisals and engagements followed with varied success; and the crown prince of Persia, after a demonstration in Shirvan, returned to Tabriz. He had practically made no progress; yet Russia, in securing possession of Derbent, Baku, Shirvan, Sheki, Gania, the Talysh and Mugan, was probably indebted to gold as well as to the force of arms. At the same time Persia would not listen to the overtures of peace made to her by the governor-general who had succeeded Zizianov.

Relations had now commenced with England and British India. A certain Mahdi ‘Ali Khan had landed at Bushire, entrusted by _ . the governor of Bombay with a letter to the shah, and

Hh f” ˆ e was f°ll° we d shortly by an English envoy from the T ˆ rˆti governor-general, Captain Malcolm of the Madras Jc army. He had not only to talk about the Afghans

an ranee. j jut a b, out tne p renc h, and the trade of the Persian Gulf. The results were a political and commercial treaty, and a return mission to India from Fath ‘Ali Shah. To him France next sent her message. In 1801 an Armenian merchant from Bagdad had appeared as the bearer of credentials from Napoleon, but his mission was mistrusted and came to nothing. Some five years afterwards Jaubert, after detention and imprison- ment on the road, arrived at Teheran and went back to Europe with a duly accredited Persian ambassador, who concluded a treaty with the French emperor at Finkenstein. On the return of the Persian diplomatist, a mission of many officers under General Gardane to instruct and drill the local army was sent from France to Persia. Hence arose the counter-mission of Sir Harford Jones from the British government, which, on arrival at Bombay in April 1808, found that it had been anticipated by a previously sent mission from the governor-general of India, under Malcolm again, then holding the rank of brigadier-general.

The home mission, however, proceeded to Bushire, a,nd Malcolm's return thence to India enabled Sir Harford to move on and reach the capital in February 1809. A few days before his entry General Gardane had been dismissed, as the peace of Tilsit debarred France from aiding the shah against Russia. Sir Harford concluded a treaty with Persia the month after his arrival at the capital; but the government of India were not content to leave matters in his hands : notwithstanding the anomaly of a double mission, Malcolm was in 1810 again despatched as their own particular envoy. He brought with him Captains Lindsay and Christie to assist the Persians in the war, and presented the shah with some serviceable field- pieces ; but there was little occasion for the exercise of his diplomatic ability save in his non-official intercourse with the people, and here he availed himself of it to the great advantage of himself and his country. 1 He was welcomed by the shah in camp at Ujani, and took leave a month afterwards to return via Bagdad and Basra to India. The next year Sir Harford Jones was relieved as envoy by Sir Gore Ouseley.

Meanwhile hostilities had been resumed with Russia, and in 181 2 the British envoy used his good offices for the restoration of peace, but the endeavour failed. To add to the Persian Renewal of difficulty, in July of this year a treaty was concluded Russ an between England and Russia, and this circumstance ' caused the envoy to direct that British officers should

take no further part in Russo-Persian military operations. Christie and Lindsay, however, resolved to remain at their own risk, and advanced with the Persian army to the Aras. On the 31st of October the force was surprised by an attack of the enemy, and retreated; the next night they were again attacked and routed at Aslanduz. Christie fell bravely fighting at the head of his brigade ; Lindsay saved two of his nine guns ; but neither of the two English- men was responsible for the disaster. Lenkoran was taken by Persia, but retaken by Russia during the next three months; and on the 13th of October 1813, through Sir Gore Ouseley's interven- tion, the Treaty of Gulistan put an end to the war. Persia formally ceded Georgia and the seven provinces before named, with Karabakh. On the death of the emperor Alexander in December 1825 Prince Menshikov was sent to Teheran to settle a dispute which had arisen between the two governments regarding the prescribed frontier. But, as the claim of Persia to a particular district then occupied by Russia could not be admitted, the special envoy was given his conge, and war was recommenced. The chief of Talysh struck the first blow, and drove the enemy from Lenkoran. The Persians then carried all before them ; and the hereditary chiefs of Shirvan, Sheki and Baku returned from exile to co-operate with the

shah's general in the south. In the course of three weeks the only

'The " wakilu '1-mulk," governor of Kerman, told Colonel Goldsmid, when his guest in 1866, that " his father had been Sir John Malcolm's Mihmandar. There never was such a man as Malcolm Sahib.' Not only was he generous on the part of his government, but with his own money also." — (Telegraph and Travel, P- 585O

advanced post held by the governor-general of the Caucasus was the obstinate little fortress of Shusha. But before long all wa# again changed. Hearing that a Russian force of some 9000 men was concentrated at Tiflis, Mahommed Mirza, son of the crown prince, advanced to meet them on the banks of the Zezam. He was defeated ; and his father was routed more seriously still at Ganja. The shah made great efforts to renew the war; but divisions took place in his son's camp, not conducive to successful operations, and new proposals of peace were made. But Russia demanded Erivan and Nakhichevan as well as the cost of the war; and in 1827 the campaign was reopened. Briefly, after successive gains and losses, not only Erivan was taken from Persia but Tabriz also, and finally, through the intervention of Sir John Macdonald, the English envoy, a new treaty was concluded at Turkmanchai, laying down the boundary between Russia and Persia. Among the hard conditions for the latter country were the cession in perpetuity of the khanates of Erivan and Nakhichevan, the inability to have an armed vessel in the Caspian, and the payment of a war indemnity of some £3,000,000.

After Russia, the neighbouring state next in importance to the well-being of Persia was Turkey, with whom she was united on the west by a common line of frontier. Selim had not w arw ith scrupled, in 1804 and 1805, to allow the Russians to _. . make free use of the south-eastern coasts of the Black y '

Sea, to facilitate operations against the shah's troops; and there had been a passage of arms between the king's eldest son, Mahommed 'Ali Mirza, and Suleiman Pasha, son-in-law of the governor-general of Bagdad, which is locally credited as a battle won by the former. But there was no open rupture between the two sovereigns until 1 82 1, when the frontier disputes and complaints of Persian travellers, merchants and pilgrims culminated in a declaration of war. This made 'Abbas Mirza at once seize upon the fortified places of Toprak Kal'ah and Ak Sarai within the limits of the Ottoman Empire, and, overcoming the insufficient force sent against him, he was further enabled to extend his inroads to Mush, Bitlis, and other known localities. The Turkish government retaliated by a counter- invasion of

the Persian frontier on the south. At that time the Pasha of Bagdad was in command of the troops. He was defeated by Mahommed “Ali Mirza, then prince-governor of Kermanshah, who drove his adversary back towards his capital and advanced to its immediate environs. Being attacked with cholera, however, the Persian commander recrossed the frontier, but only to succumb to the disease in the pass of Kirind. In the sequel a kind of desultory warfare appears to have been prosecuted on the Persian side of Kurdistan, and the shah himself came down with an army to Hamadan. Cholera broke out in the royal camp and caused the troops to disperse.

In the north the progress of ‘Abbas Mirza was stopped at Bayazid by a like deadly visitation; and a suspension of hostilities was agreed upon for the winter season. At the expiration of four months the sirdar of Erivan took possession of a Turkish military station on the road to Erzerum, and the crown prince marched upon that city at the head of 30,000 men. The Ottoman army which met him is said to have numbered some 52,000; but victory was on the side of their opponents. Whether the result was owing to the defection of 15,000 Kurds or not the evidence adduced is in- sufficient to decide. In the English records of the period it is stated that the defeat of the Turks was complete.

Profiting from this victory, ‘Abbas Mirza repeated an offer of peace before made without avail to the pasha of Erzerum; and, in order to conciliate him more effectually, he retired within the old limits of the dominions of the shah, his father. But more troubles arose at Bagdad, and other reasons intervened to protract negotia- tions for a year and a half. At length, in July 1823, the Treaty of Erzerum closed the war between Turkey and Persia. It provided especially against a recurrence of the proved causes of war, such as extorting taxes from Persian travellers or pilgrims, disrespect to the ladies of the royal harem and other ladies of rank proceeding to Mecca or Karbala (Kerbela), irregular levies of custom-duties, non-punishment of Kurdish depredators transgressing the boundary, and the like.

With respect to the eastern boundaries of his kingdom, Fath ‘Ali Shah was fortunate in having to deal with a less dangerous neighbour than the Muscovite of persistent policy and The At ban the Turk of precarious friendship. The Afghan, though _ „* equal to the Persian in physical force and prowess, was s ° ” his inferior in worldly knowledge and experience. Moreover, the family divisions among the ruling houses of Afghanistan grew from day to day more destructive to that patriotism and sense of nationality which Ahmad Shah had held out to his countrymen as the sole specifics for becoming a strong people.

The revolt of Nadir Mirza had, as before explained, drawn the shah's attention to Khorasan in the early part of his reign; but, although quiet had for the moment been restored at Meshed by the presence of the royal camp, fresh grounds of complaint were urged against the rash but powerless prince, and recourse was had to extreme measures. Charged with the murder of a holy saiyid, his hands were cut off and his tongue was plucked out, as part of the horrible punishment inflicted on him. It does not appear that Nadir Mirza's cause was ever seriously espoused by the Afghans,

nor that Fath 'AH Shah's claim to Meshed, as belonging to the Persian crown, was actively resisted. But the large Province of Khorasan, of which Meshed was the capital, had never been other than a nominal dependency of the crown since the death of Nadir; and in the autumn of 1830 the shah, under Russian advice, as- sembled a large force to bring into subjection all turbulent and refractory chiefs on the east of his kingdom. Yezd and Kerman were the first points of attack ; Khorasan was afterwards entered by Samnan, or the main road from Teheran. The expedition, led by 'Abbas Mirza, involved some hard fighting and much loss of life; several forts and places were captured, among them Kuchan and Serrakhs; and it may be concluded that the objects contem- plated were more or less attained. An English officer, Colonel Shee, commanded what was called the " British detachment " which accompanied the prince. Thus far as regards Yezd, Kerman and Khorasan. It was otherwise with Herat.

Hajji Firuzu'd-Din, son of Timur Shah, reigned undisturbed in that city from 1800 to 1816. Since Fath 'Ali Shah's accession he and his brother Mahmud had been, as it were, under Persian pro- tection. Persia claimed the principality of Herat as part of the empire of Nadir, but her pretensions had been satisfied by payments of tribute or evasive replies. Now, however, that she marched her army against the place, Firuzu 'd-Din called in the aid of his brother Mahmud Shah of Kabul, who sent to him the famous vizier, Fath Khan Barakzai. The latter, intriguing on his own account, got possession of the town and citadel; he then sallied forth, engaged the Persian forces, and forced them to retire into their own country. In 1824, on a solicitation from Mustafa Khan, who had got temporary hold of Herat, more troops were despatched thither, but, by the use of money or bribes, their departure

was purchased. Some eight or nine years afterwards ‘Abbas Mirza, when at the head of his army in Meshed, invited Yar Mahommed Khan of Herat to discuss a settlement of differences between the two governments. The meeting was unproductive of good. Again the Persian troops advanced to Herat itself under the command of Mahommed Mirza, son of Abbas; but the news of his father’s death caused the com- mander to break up his camp and return to Meshed.

Sir Gore Ouseley returned to England in 1814, in which year Mr Ellis, assisted by Mr Morier — whose ” Hajji Baba ” is the un- failing proof of his ability and deep knowledge of Persian character — negotiated on the part of Great Britain the Treaty of Teheran. England was to provide troops or a subsidy in the event of unpro- voked invasion, while Persia was to attack the Afghans should they invade India. Captain Willock succeeded Morier as charg6 d’affaires in 1815, and since that period Great Britain has always been represented at the Persian court. It was in Fath ‘Ali Shah’s reign that Henry Martyn was in Persia, and completed his able translation of the New Testament into the language of that country. Little more remains to be here narrated of the days of Fath ‘Ali Shah. Among the remarkable occurrences may be noted the murder at Teheran in 1828 of M. Grebayadov, the Russian envoy, whose conduct in forcibly retaining two women of Erivan provoked the interference of the mullas and people. To repair the evil con- sequences of this act a conciliatory embassy, consisting of a young son of the crown prince and some high officers of the state, was despatched to St Petersburg. Shortly afterwards the alliance with Russia was strengthened, and that with England slackened in proportion.

Fath ‘Ali Shah had a numerous family. Agreeably to the Persian custom, asserted by his predecessors, of nominating the heir-apparent from the sons of the sovereign without restriction to seniority, he had passed over the eldest, Mahommed ‘AH, in favour of a junior, ‘Abbas; but, as the nominee died in the lifetime of his father, the old king had proclaimed Mahommed Mirza, the son of ‘Abbas, and his own grandson, to be his successor. Why a younger son had been originally selected, to the prejudice of his elder brother, is differently stated by different writers. The true reason was probably the superior rank of his mother.

Mahommed Shah was twenty-eight years old when he came to the throne in 1 834. He died at the age of forty-two, after a reign M h d °^ aDout thirteen and a half years. His accession was

Stab”””* not P UD ” c ly notified for some months after his grand-

father's death, for it was necessary to clear the way of all competitors, and there were two on this occasion — one 'Ali Mirza, governor of Teheran, who actually assumed a royal title, and one Hasan 'Ali Mirza, governor of Shiraz. Owing to the steps taken by the British envoy, Sir John Campbell, assisted by Colonel Bethune, at the head of a considerable force, supplied with artillery, the opposition of the first was neutralized, and Mahommed Shah, entering Teheran on the 2nd of January, was proclaimed king on the 31st cf the same month. It cost more time and trouble to bring the second to book. Hasan 'AH, " farman-farma," or com- mander-in-chief, and his brother and abettor, had an army at their disposal in Fars. Sir Henry Lindsay Bethune marched his soldiers to Isfahan to be ready to meet them. An engagement which took place near Kumishah, on the road between Isfahan and Shiraz, having been successful, the English commander pushed on to the latter town, where the two rebel princes were seized and imprisoned. Forwarded under escort to Teheran, they were, according to Watson, ordered to be sent on thence as state prisoners to Ardebil, but the

farman-farma died on the way, and his brother was blinded before incarceration. Markham, however, states that both 'AH Mirza and Hasan 'AH were allowed to retire with a small pension, and that no atrocities stained the beginning of the reign of Mahommed Shah. It is presumed that the fate of the prime minister or " kaim-makam," who was strangled in prison, was no more than an ordinary execution of the law. This event, and the prevalence of plague and cholera at Teheran, marked somewhat gloomily the new monarch's first year.

The selection of a premier was one of the first weighty questions for solution. A member of the royal family, the " asafu 'd-daula," governor of Khorasan, left his government to urge his candidature for the post. The king's choice, however, fell on Hajji Mirza Aghasi, a native of Erivan, who in former years, as tutor to the sons of 'Abbas Mirza, had gained a certain reputation for learning and a smattering of the occult sciences, but whose qualifications for statesmanship were craftiness and suspicion. As might have been anticipated, the hajji fell into the hands of Russia, represented by Count Simonich, who urged him to a fresh expedition into Khorasan and the siege of Herat. There was no doubt a plausible pretext for both proposals. The chiefs, Bx Pˆ al « on reduced to temporary submission by 'Abbas Mirza, had a ˆ aln f t again revolted; and Shah Kamran, supported by his " era • vizier, Yar Mahommed, had broken those engagements and pledges on the strength of which Fath 'AH Shah had withdrawn his troops. In addition to these causes of offence he had appropriated the province of Seistan, over which Persia had long professed to hold the rights of

suzerainty. But the king's ambition was to go farther than retaliation or chastisement. He refused to acknowledge any right to separate government whatever on the part of the Afghans, and Kandahar and Ghazni were to be recovered, as belonging to the empire of the Safawid dynasty. The advice of the British envoy was dissuasive in this respect, and therefore distasteful.

Sir John Campbell, in less than a year after the sovereign's installation, went home, and was succeeded as British envoy by Henry Ellis. The change in personnel signified also a transfer of superintendence of the Persian legation, which passed from the government in India to the authorities in England. The expedi- tion was to commence with a campaign against the Turcomans — Herat being its later destination. Such counter-proposals as Ellis had suggested for consideration had been politely put aside, and the case was now more than ever complicated by the action of the Barakzai chiefs of Kandahar, who had sent a mission to Teheran to offer assistance against their Saduzai rival at Herat. Fresh provo- cation had, moreover, been given to the shah's government by the rash and incapable Kamran.

About the close of the summer the force moved from Teheran. The royal camp was near Astarabad in November 1836. Food was scarce : barley sold for ten times the usual price, and wheat was not procurable for any money. The troops were dissatisfied, and, being kept without pay and on short rations, took to plundering. There had been operations on the banks of the Gurgan, and the Turcomans had been driven from one of their strongholds; but little or no pro- gress had been made in the subjection of these marauders, and the Heratis had sent word that all they could do was to pay tribute, and, if that were insufficient, the shah had better march to Herat. A military council was held at Shahrud, when it was decided to return to the capital and set out again in the spring. Accordingly the troops dispersed, and the sovereign's presence at Teheran was taken advantage of by the British minister to renew his attempts in the cause of peace. Although on the present occasion Simonich ostensibly aided the British charge 1 d'affaires M'Neill, who had succeeded Ellis in 1836, no argument was of any avail to divert the monarch from his purpose. He again set out in the summer, and, invading the Herat territory in November 1837, began the siege on the 23rd of that month.

Not until September in the following year did the Persian army withdraw from before the walls of the city; and then the move- ment only took place on the action of the British govern- „. – ment. M'Neill,

who had joined the Persian camp on H»£f<° the 6th of April, left it again on the 7th of June. He had done all in his power to effect a reasonable agreement between the contending parties; but both in this respect and in the matter of a commercial treaty with England, then under negotiation, his efforts had been met with evasion and latent hostility. The Russian envoy, who had appeared among the tents of the besieging army almost simultaneously with his English colleague, no sooner found himself alone in his diplomacy than he resumed his aggressive counsels, and little more than a fortnight had elapsed since M'Neill's departure when a vigorous assault, planned, it is asserted, by Simonich himself, was made upon Herat. The Persians attacked at five points, at one of which they would in all likelihood have been successful had not the Afghans been aided by Eldred Pottinger, a young Englishman, who with the science of an artillery officer combined a courage and determination which inevitably influenced his subordinates. Still the garrison was disheartened; but Colonel Stoddart's arrival on the nth of August to threaten the shah with British intervention put a stop to further action. Colonel Stoddart's refusal to allow any but British mediators to decide the pending dispute won the day; and that officer was able to report that on

the 9th of September Mahommed Shah had ” mounted his horse ” and gone from before the walls of the beleaguered city.

The siege of Herat, which lasted for nearly ten months, was the great event in the reign of Mahommed Shah. The British expedition in support of Shah Shuj’a, which may be called its natural conse- quence, involves a question foreign to the present narrative.

The remainder of the king’s reign was marked by new difficulties with the British government; the rebellion of Aga Khan Mahlati otherwise known as the chief of the Assassins; a new rupture with Turkey; the banishment of the asafu’d-daula, governor of Khorasan, followed by the insurrection and defeat of his son; and the rise of Babiism iq-v.). The first of these only calls for any detailed account. In the demands of the British Government was included the cession by Persia of places such as Farah and Sabzewar, which had been taken during the war from the Afghans, as well if!” 1 y as reparation for the violence offered to the courier of p . . the British legation. M’Neill gave a certain time for hag ana. decision, at the end of which, no satisfactory reply having reached him, he broke off diplomatic relations, ordered the British officers lent to the shah to proceed towards Bagdad en route to India, and retired to Erzerum with the members of his mission. On the Persian side, charges were made against M’Neill, and a special envoy was sent to England to support them. An endeavour was at the same time made to interest the cabinets of Europe in influencing the British government on behalf of Persia. The envoy managed to obtain an interview with the minister of foreign affairs in London, who, in July 1839, supplied him with a statement, fuller than before, of all English demands upon his country. Con- siderable delay ensued, but the outcome of the whole proceedings was not only acceptance but fulfilment of all the engagements contracted. In the meantime the island of Kharak had been taken possession of by an expedition from India.

On the nth of October 1841 a new mission arrived at Teheran from London, under John (afterwards Sir John) M’Neill, to renew diplomatic relations. It was most cordially received by the shah, and as one of its immediate results, Kharak was evacuated by the British-

Indian troops.

There had been a long diplomatic correspondence in Europe on the proceedings of Count Simonich and other Russian officers at Herat. Among the papers is a very important letter from Count Nesselrode to Count Pozzo di Borgo in which Russia declares herself to be the first to counsel the shah to acquiesce in the demand made upon him, because she found ” justice on the side of England ” and ” wrong on the side of Persia.” She withdrew her agent from Kandahar and would ” not have with the Afghans any relations but those of commerce, and in no wise any political interests.”

Aga Khan’s rebellion was fostered by the defection to his cause of a large portion of the force sent against him; but he yielded at last to the local authorities of Kerman and fled the province and country. He afterwards resided many years at Bombay, where, while maintaining among natives a quasi-spiritual character, he was better known among Europeans for his doings on the turf.

The quarrel with Turkey was generally about frontier relations. Eventually the matter was referred to an Anglo-Russian commission, of which Colonel Williams (afterwards Sir Fenwick Williams of Kars) was president. A massacre of Persians at Kerbela might have seriously complicated the dispute, but, after a first burst of indigna- tion and call for vengeance, an expression of the regret of the Ottoman government was accepted as a sufficient apology for the occurrence.

The rebellion of the asafu ‘d-daula, maternal uncle of the shah, was punished by exile, while his son, after giving trouble to his opponents, and once gaining a victory over them, took shelter with the Turcomans.

Before closing the reign of Mahommed Shah note should be taken of a prohibition to import African slaves into Persia, and a com- mercial treaty with England — recorded by Watson as gratifying achievements of the period by British diplomatists. The French missions in which occur the names of MM. de Lavalette and de Sartiges were notable in their way, but somewhat barren of results. In the autumn of 1848 the shah was seized with the malady, or combination of maladies, which caused his death. Gout and ervsipelas had, it is said, 1 ruined his constitution, and he died at his palace in Shimran on the 4th of September. He was buried at Kum, where is situated the shrine of Fatima, daughter of Imam Riza, by the side of his grandfather, Fath ‘AH, and other_ kings of Persia. In person he is described as short and fat, with an aquiline nose and agreeable countenance. 2

On the occasion of his father's death, Nasru 'd-Din Mirza, who had been proclaimed wali 'ahd, or heir apparent, some years before, was absent at Tabriz, the headquarters of his province of Azerbaijan. Colonel Farrant, then charge d affaires on the part of the British government, in the absence of Colonel Sheil, who had succeeded Sir John M'Neill, had, in anticipation of the shah's decease and consequent trouble, sent a messenger to summon him instantly to Teheran. The British officer, moreover, associated himself with Prince Dolgoruki, the representative of Russia, to secure the young prince's accession.

Nasru 'd-DIo Shah.

1 Watson.

2 Markham.

The queen-mother, as president of the council, showed much judgment and capacity in conciliating adverse parties. But the six or seven weeks which passed between the death of the one king and the coronation of the other proved a disturbed interval, and full of stirring incident. The old minister, Hajji Mirza Aghasi, shut himself up in the royal palace with 1200 followers, and had to take refuge in the sanctuary of Shah Abdul-'Azim near Teheran. On the other hand Mirza Aga Khan, a partisan of the asafu 'd-daula, and himself an ex-minister of war, whom the hajji had caused to be banished, was welcomed back to the capital. At Isafahan, Shiraz and Kerman serious riots took place, which were with difficulty suppressed. While revolution prevailed in the city, robbery was rife in the province of Yezd; and from Kazvin the son of 'Ali Mirza otherwise called the " zillu's-sultan," the prince-governor of Teheran, who disputed the succession of Mahommed Shah, came forth to contest the crown with his cousin, the heir-apparent. The last- named incident soon came to an inglorious termination for its hero. But a more serious revolt was in full force at Meshed when, on the 20th of October 1848, the young shah entered his capital and was crowned at midnight king of Persia.

The chief events in the long reign of Nasru 'd-Din, fall under four heads: (1) the insurrection in Khorasan, (2) the insurrection of the Babis, (3) the fall of the amiru 'n-nizam, and (4) the war with England.

It has been stated that the asafu 'd-daula was a competitor with Hajji Mirza Aghasi for the post of premier in the cabinet of Mahommed Shah, that he was afterwards, in the same reign, exiled for rising in

rebellion, and that his son, *l sttl * ec ‘ the salar, took shelter with the Turcomans. Some jchar&san four months prior to the Mahommed Shah’s decease the latter chief had reappeared in arms against his authority; he had gained possession of Meshed itself, driving the prince-governor, Hamza Mirza, into the citadel ; and so firm was his attitude that Yar Mahommed of Herat, who had come to help the government officials, had retired after a fruitless co-operation, drawing away the prince-governor also. The salar now defied Murad Mirza, Nasru ‘d-Din’s uncle, who was besieging the city. In April 1850, after a siege of more than eighteen months, fortune turned against the bold insurgent, and negotiations were opened for the surrender of the town and citadel. Treachery may have had to do with the result, for when the shah’s troops entered the holy city the salar sought refuge in the mosque of Imam Riza, and was forcibly expelled. He and his brother were seized and put to death, the instrument used being, according to Watson, ” the bowstring of Eastern story.” The conqueror of Meshed, Murad Mirza, became afterwards himself the prince-governor of Khorasan.

In the article on Babiism, the facts as to the life of the Bab, Mirza Ali Mahommed of Shiraz, and the progress of the Babiist movement, are separately noticed. The Bab himself was executed „ in 1850, but only after serious trouble over the new Babiism. religious propaganda; and his followers kept up the revolutionary propaganda.

In the summer of 1852 the shah was attacked, while riding in the vicinity of Teheran, by four Babis, one of whom fired a pistol and slightly wounded him. The man was killed, and two others were captured by the royal attendants; the fourth jumped down a well. The existence of a conspiracy was then discovered in which some forty persons were implicated ; and ten of the con- spirators were put to death — some under cruel torture.

Mirza Taki, the amiru ‘n-nizam (vulgarly amir nizam), or com-mander-in-chief, was a good specimen of the self-made man of Persia. He was the son of a cook of Bahram Mirza, Mahommed Shah’s brother, and he had filled high and important „ .. offices of state and amassed much wealth when he was J? ° made by the young shah Nasru ‘d-Din, on his accession, raa a both his brother-in-law and his prime-minister. The choice was an admirable one; he was honest, hard-working, and liberal according to his lights; and the services of a loyal and capable adviser were secured for the new regime. Unfortunately, he did not boast the confidence of the queen-mother; and this circumstance greatly strengthened the hands of those enemies whom an honest minister must ever raise around him in a corrupt

Oriental state. For a time the shah closed his eyes to the accusations and insinuations against him ; but at last he fell under the evil influence of designing counsellors, and acts which should have redounded to the minister's credit became the charges on which he lost his office and his life. He was credited with an intention to grasp in his own hands the royal power; his influence over the army was cited as a cause of danger; and on the night of the 13th of November 1851 he was summoned to the palace and informed that he was no longer premier. Mirza Aga Khan, the " 'itimadu 'd-daulah," was named to succeed him, and had been accordingly raised to the dignity of " sadr'azim." As the hostile faction pressed the necessity of the ex-minister's removal from the capital ; he was offered the choice of the govern- ment of Fars, Isfahan or Kum. He declined all; but, through the mediation of Colonel Sheil, he was afterwards offered and accepted Kashan. Forty days after his departure an order for his execution was signed, but he anticipated his fate by committing suicide.

When England was engaged in the Crimean War of 1854-55 her 1 alliance with a Mahommedan power in no way added to her

popularity or strengthened her position in Persia. The Sunnite Turk was almost a greater enemy to his neighbour the Shi'ite than the formidable Muscovite, who had curtailed him of "" p ' ure so large a section of his territory west of the Caspian. pi a Since Sir John M'Neill's arrival in Teheran in 1841, England. f orma n y t0 rep air the breach with Mahommed Shah, there had been little differences, demands and explanations, and these symptoms had culminated in 1856, the year of the peace with Russia. As to Afghanistan, the vizier Yar Mahommed had in 1842, when the British troops were perishing in the passes, or otherwise in the midst of dangers, caused Kamran to be suffocated in his prison. Since that event he had himself reigned supreme in Herat, and, dying in 185 1, was succeeded by his son Sa 'id Mahommed. This chief soon entered upon a series of intrigues in the Persian interests, and, among other acts offensive to Great Britain, suffered one Abbas Kuli, who had, under guise of friendship, betrayed the cause of the salar at Meshed, to occupy the citadel of Herat, and again place a detachment of the shah's troops in Ghurian. Colonel Sheil remonstrated, and obtained a new engagement of non-

interference with Herat from the Persian government, as well as the recall of Abbas Kuli. In September 1855 Mahommed Yusuf Saduzai seized upon Herat, putting Sa'id Mahommed to death with some of his followers who were supposed accomplices in the murder of his uncle Kamran. About this time Kohan Dil Khan, one of the chiefs of Kandahar, died, and Dost Mahommed of Kabul annexed the city to his territory. Some relations of the deceased chief made their escape to Teheran, and the shah, listening to their complaint, directed the prince-governor of Meshed to march across to the eastern frontier and occupy Herat, declaring that an invasion of Persia was imminent. Negotiations were useless, and on the 1st of November 1856 war against Persia was declared.

In less than three weeks after its issue by proclamation of the governor-general of India, the Sind division of the field force left Karachi. On the 13th of January following the Bombay govern- ment orders notified the formation of a second division under Lieut. General Sir James Outram. Before the general arrived the island of Kharak and port of Bushire had both been occupied, and the fort of Rishir had been attacked and carried. After the general's arrival the march upon Borazjan and the engage ment at Khushab — two places on the road to Shiraz — and the operations at Muhamrah and the Karun River decided the cam- paign in favour of England. On the 5th of April, at Muhamrah, Sir James Outram received the news that the treaty of peace had been signed in Paris, where Lord Cowley and Farrukh Khan had conducted the negotiations. The stipulations regarding Herat were much as before ; but there were to be apologies made to the mission for past insolence and rudeness, and the slave trade was to be sup- pressed in the Persian Gulf. With the exception of a small force retained at Bushire under General John Jacob for the three months assigned for execution of the ratifications and giving effect to certain stipulations of the treaty with regard to Afghanistan, the British troops returned to India, where their presence was greatly needed, owing to the outbreak of the Mutiny.

The question of constructing a telegraph in Persia as a link in the overland line to connect England with India was broached in Teheran by Colonel Patrick Stewart and Captain Anglo- Champain, officers of engineers, in 1862, and an agree- ' D< " a f I j ment on the subject concluded by Edward Eastwick, graph Line. wnen cnar ge d'affaires, at the close of that year. Three years later a more formal convention, including a second wire, was signed by the British envoy Charles Alison and the Persian foreign minister; meantime the work had been actively carried on, and communication opened on the one side between Bushire and Karachi and the Makran coast by cable, and on

the other between Bushire and Bagdad via Teheran. The untrustworthy character of the line through Asiatic Turkey caused a subsequent change of direction ; and an alternative line — the Indo-European — from London to Teheran, through Russia and along the eastern shores of the Black Sea, was constructed, and has worked well since 1872, in conjunction with the Persian land telegraph system and the Bushire-Karachi line.

The Seistan mission, under Major-General (afterwards Sir Fred- eric) Goldsmid, left England in August 1870, and reached Teheran on the 3rd of October. Thence it proceeded to Isfahan, from which city it moved to Baluchistan, instead of seeking its original destina- tion. Difficulties had arisen both in arranging the preliminaries to arbitration and owing to the disordered state of Afghanistan, and it was therefore deemed advisable to commence operations by settling a frontier dispute between Persia and the Kalat state. Unfortunately, the obstructions thrown in the way of this settle- ment by the Persian commissioner, the untoward appearance at Bampur of an unexpected body of Kalatis, and the absence of definite instructions marred the fulfilment of the programme sketched out; but a line of boundary was proposed, which was afterwards accepted by the litigants. In the following year the same mission, accompanied by the same Persian commissioner, proceeded to Seistan, where it remained for more than five weeks, prosecuting its inquiries, until joined by another mission from India, under Major-General (afterwards Sir Richard) Pollock, accompanying the Afghan commissioner. Complications then

ensued by the determined refusal of the two native officials to meet in conference; and the arbitrator had no course available but to take advantage of the notes already obtained on the spot, and return with them to Teheran, there to deliver his decision. This was done on the 19th of August 1872. The contending parties appealed to the British secretary of state for foreign affairs, as provided by previous understanding; but the decision held good, and was eventually accepted on both sides.

Nasru ‘d-Din Shah, unlike his predecessors, visited Europe — in 1873 and in 1879. On the first occasion only he extended his journey to England, and was then attended by his ” sadr “azim,” or prime minister, Mirza Husain Khan, an able and enlightened adviser, and a Grand Cross of the Star of India. His second visit was to Russia, Germany, France and Austria, but he did not cross the Channel. (F. J. G.;X.)

E. — Persia from 1884 to iqoi. In 1865 the shah had mooted the idea

of a Persian naval flotilla in the Persian Gulf, to consist of two or three steamers manned by Arabs and commanded by English naval _. c . . officers; but the idea was discountenanced by the ofthe British government, to whom it was known that the Persian project really concealed aggressive designs upon ° utt the independence of the islands and pearl fisheries of Bah- rein (Curzon, Persia, ii. 294). Fifteen or sixteen years later it was repeatedly pointed out to the authorities that the revenues from the customs of the Persian Gulf would be much increased if control were exercised at all the ports, particularly the small ones where smuggling was being carried on on a large scale, and in 1883 the shah decided upon the acquisition of four or five steamers, one to be purchased yearly, and instructed the late ‘Ali Kuli Khan, Mukhber ad-daulah, minister of telegraphs, to obtain designs and estimates from British and German firms. The tender of a well-known German firm at Bremerhaven was finally accepted, and one of the minister’s sons then residing in Berlin made the necessary contracts for the first steamer. Sir Ronald Thomson, the British representative in Persia, having at the same time induced the shah to consider the advantages to Persia of opening the Karun River and connecting it with Teheran by a carriageable road, a small river steamer for con- trolling the shipping on the Karun was ordered as well, and the construction of the road was decided upon. Two steamers, the ” Susa ” and the ” Persepolis,” were completed in January 1885 at a cost of £32,000, and despatched with German officers and crew to the Persian Gulf. When the steamers were ready to do the work they had been intended for, the farmer, or farmers, of the Gulf customs raised difficulties and objected to pay the cost of maintaining the “Persepolis “; the governor of Muham- rah would not allow any interference with what he considered his hereditary rights of the shipping monopoly on the Karun, and the objects for which the steamers had been brought were not attained. The ” Persepolis ” remained idle at Bushire, and the ” Susa ” was tied up in the Failieh creek, near Muham- rah. The scheme of opening the Karun and of constructing a carriageable road from Ahvaz to Teheran. was also abandoned.

Frequent interruptions occurred on the telegraph line between Teheran and Meshed in 1885, at the time of the ” Panjdeh incident,” when the Russians were advancing towards Afghanistan and Sir Peter Lumsden was on the Afghan frontier; and Sir Ronald Thomson concluded an agreement with the Persian government for the line to be kept in working order by an English inspector, the Indian government paying a share not exceeding 20,000 rupees per annum of the cost of maintenance, and an English signaller being stationed at

Meshed. Shortly afterwards Sir Ronald Thomson left Persia (he died on the 15th of November 1888), and Arthur (afterwards Sir Arthur) Nicolson was appointed charge d'affaires. During the latter's tenure of office an agreement was concluded between the Persian and British governments regarding the British telegraph settlement at Jask, and the telegraph conventions of 1868 and 1872 relative to telegraphic communication between Europe and India through Persia, in force until the 1st of January 1895, were pro- longed until the 31st of January 1905 by two conventions dated the 3rd of July 1887. Since then these conventions have been prolonged to 1925.

Ayub Khan, son of Shir Ali (Shere Ali) of Afghanistan, who had taken refuge in Persia in October 1881, and was kept interned in Teheran under an agreement, concluded on the 17th of April 1884, between Great Britain and Persia, with a pension of £8000 per annum from the British government escaped on the 14th of August 1887. After a futile attempt to enter Afghan territory and raise a revolt

against the Amir Abdur Rahman, he gave himself up to the British consul-general at Meshed in the beginning of November, and was sent under escort to the Turkish frontier and thence via Bagdad to India. Yahya Khan, Mushir-ad-daulah, the Persian minister for foreign affairs (died 1892), who was supposed to have connived at Ayub Khan's escape in order to please his Russian friends, was dismissed from office.

In December 1887 Sir Henry Drummond Wolff was appointed minister to Persia. The appointment greatly pleased the Persian court, and the shah lent a willing ear to his advocacy for the development of trade and commerce, construction of roads, abolition of various restrictions hampering Persian merchants, &c. The shah soon afterwards (May 26, 1888) issued a proclamation assuring freedom of life and property to all his subjects, and (Oct. 30) declared the Karun river open to international navigation up to Ahvaz. At about the same time he appointed Amin-es-Sultan, who had been prime-minister since 1884, Grand Vizier (Sadr "azim) In the same year (June 25) the first railway in Persia, a small line ot 5i miles from Teheran to Shah-abdul-Azim, was opened under

qo a "|P lces of a Belgian company. A few months later (Jan. 30, 1889) Baron Julius de Reuter — in consideration of giving up the

rights which he held by his concession obtained in 1873 — became the owner of a concession for the formation of a Persian State Bank, with exclusive rights of issuing bank-notes and working the mines of iron, copper, lead, mercury, coal, petroleum, manganese, borax, and asbestos in Persia. Russia now insisted upon what she considered a corresponding advantage; and Prince Dolgoruki, the Russian minister, obtained in February 1889 a document from the shah which gave to Russia the refusal of any railway concession in Persia for a period of five years. The Persian State Bank was established by British royal charter, dated the 2nd of September 1889, and started business in Persia (Oct. 23) as the ” Imperial Bank ol Persia. The railway agreement with Russia was changed in November 1890 into one interdicting all railways whatsoever in Persia.

In April 1889 the shah set out upon his third voyage to Europe. After a visit to the principal courts, including a stay of a month Shah’s m En g land > where he was accompanied by Sir Henry VisH to D ™mmond Wolff, he returned to his capital (Oct. 20). Europe, ˆ Henry returned to Persia soon afterwards, and in 1889. March of the following year the Persian government

granted another important concession, that of a tobacco monopoly to British capitalists. In the autumn bad health obliged the British minister to leave Persia. It was during his stay in England that the shah, for two or three days without his grand vizier, who was mourning for the death of his brother, listened to bad advice and granted a concession for the monopoly of lotteries in Persia to a Persian subject. The latter ceded the concession to a British syndicate for £40,000. Very soon afterwards the shah was made aware of the evil results of this monopoly, and withdrew the con- cession, but the syndicate did not get the money paid for it returned. I his unfortunate affair had the effect of greatly discrediting Persia on the London Stock Exchange for a long time. The concession tor the tobacco monopoly was taken up by the Imperial Tobacco Corporation (1891). The corporation encountered opposition fostered by the clergy and after a serious riot at Teheran (Jan. 4, 1892) the Persian government withdrew the concession and agreed to pay an indemnity of £500,000 (April 5, 1892). In order to pay this amount Persia contracted the 6 % lean of £500,000 through the Imperial Bank of Persia, which was redeemed in 1900 out of the proceeds of the Russian 5% loan of that year. (For details oi the tobacco concession and an account of the events which led to its withdrawal, see E. Lorini, La Persia economica, Rome 1900 PP- 164-169; and Dr Feuvrier, Trois ans d, la cour de Perse, Paris’ 1899, ch. v., the latter ascribing the failure of the tobacco monopoly to Russian intrigue.)

In November 1889 Malcolm Khan, Nizam-ul-Mulk, who had been Persian representative to the court of Great Britain since October 1872, was recalled, and Mirza Mahommed ‘Ali Khan, consul- general at Tifhs, was appointed in his stead, arriving in London the following March. In 1890 the scheme of a carriageable road from Teheran to Ahvaz was taken up again ; the Imperial Bank of Persia obtained a concession, and work of construction was begun in the same year, and continued until 1893. In this year, too the mining rights of the Imperial Bank of Persia were ceded to’ the Persian Bank Mining Rights Corporation, and a number of engineers were sent out to Persia. The total absence of easy means of com- munication, the high rates of transport, and the scarcity of fuel and water in the mineral districts made profitable operations impossible, and the corporation liquidated in 1894, after havine expended a large sum of money.

Great excitement was caused in the summer of 1891 by the report that an English girl, Kate Greenfield, had been forcibly carried Kate a T ay ™ r ? n \ her pother’s house at Tabriz by a Kurd.

Greenfield A he ? ntlsh authorities demanded the girl’s restitu- Case. ” on , . f ™ m L P e Persian government. The Kurd, a

, c "™ ,s l su °! ec V e (us ? d to £ ive U P the g’ r l. and took

her to Saujbulagh. The Turkish authorities protected him and serious complications were imminent; but finally an interview between the girl and the British agent was arranged, and the matter

was promptly settled by her declaring that she had left her mother’s house of her own accord, and was the wife of the Kurd. It also became known that she was the daughter of a British-protected Hungarian named Griinfeld, who had died some years since, and an American lady of Tabriz.

Sir Frank Lascelles, who had been appointed minister to Persia in July, arrived at Teheran in the late autumn of 1891. In the following year Persia had a visitation of cholera. In Teheran and surrounding villages the number of fatal cases exceeded 28,000, or about 8% of the population. In 1893 the epidemic appeared again, but in a milder form. In June 1893 Persia ceded to Russia the small but very fertile and strategically important district of Firuza and the adjacent lands between Baba Durmaz and Lutfabad on the northern frontier of Khorasan, and received in exchange the ˆimportant village of Hissar

and a strip of desert ground near Abbasabad on the frontier of Azerbaijan, which had become Russian territory in 1828, according to the Treaty of Turkmanchai.

Sir Frank Lascelles left Persia in the early part of 1894, and was succeeded by Sir Mortimer Durand, who was appointed in July and arrived in Teheran in November. In the following year the shah, by a firman dated the 12th of Frei “* May gave the exclusive right of exploring ancient sites Archae °- m Persia to the French government, with the stipula- ‘°8 lca ‘ tion that one-half of the discovered antiquities, except- CoDCessy oii- ing those of gold and silver and precious stones, should belong to the French government, which also had the preferential right of acquiring by purchase the other half and any of the other anti- quities which the Persian government might wish to dispose of. In 1897 M. J. de Morgan, who had been on a scientific mission in Persia some years before and later in Egypt, was appointed chief of a mission to Persia, and began work at Susa in December.

On the 1st of May 1896 Nasur ‘d-Din Shah was assassinated while paying his devotions at the holy shrine of Shah-abdul-Azim Five days later he would have entered the fiftieth (lunar) year of his reign, and great preparations for duly cele- Assaaslaa- brating the jubilee had been made throughout the tion of the country. The assassin was a small tradesman of Shah ‘ ,S96 – Kerman named Mirza Reza, who had resided a short time in Con- stantinople and there acquired revolutionary and anarchist ideas from Kemalu ‘d-Din, the so-called Afghan sheikh, who, after being very kindly treated by the shah, preached revolution and anarchy at Teheran, fled. to Europe, visited London, and finally took up his residence in Constantinople. Kemalu ‘d-Din was a native of Hamadan and a Persian subject, and as the assassin repeatedly stated that he was the sheikh’s emissary and had acted by his orders, the Persian government demanded the ex- tradition of Kemal from the Porte; but during the protracted negotiations which followed he died. Mirza Reza was hanged on the 1 2th of August 1896. There were few troubles in the country when the news of the shah’s death became known Serious rioting arose only in Shiraz and Fars, where some persons lost their lives and a number of caravans were looted. European firms who had lost goods during these troubles were afterwards indemnified by the Persian government. The new shah, Muzaffar- ud-Dm (born March 25, 1853), then governor- general of Azerbaijan, residing at Tabriz, was enthroned there on the day of his father’s death, and proceeded a few days later, accompanied by the British and Russian consuls, to Teheran, where he arrived on the 8th of June.

An excessive copper coinage during the past three or four years had caused much distress among the poorer classes since the beginning of the year, and the small trade was almost paralysed. Immediately after his accession the shah C""*ncy decreed that the coining of copper money should D,fflcaU ˆ. cease and the excess of the copper coinage be withdrawn from circulation. In order to reduce the price of meat, the meat tax which had existed since ancient times was abolished. The Imperial Bank of Persia, which had already advanced a large sum of money and thereby greatly facilitated the shah's early departure from labnz and enabled the grand vizier at Teheran to carry on the government, started buying up the copper coinage at all its branches and agencies. The nominal value of the copper money was 20 shahis equal to 1 kran, but in some places the copper money cir- cu ated at the rate of 80 shahis to the kran, less than its intrinsic value; at other places the rates varied between 70 and 25 shahis ■ and the average circulating value in all Persia was over 40 If government had been able to buy up the excess at 40 and reissue it gradually after a time at its nominal value when the people required it, the loss would have been small. But although the transport of copper money from place to place had been strictly prohibited dishonest officials found means to traffic in copper money on their own account, and by buying it where it was cheap and forwarding it to cities where it was dear, the bank bought it at high rates, thus rendering the arrangement for a speedy withdrawal of the excess at small cose to government futile. It was only in 1899 that the distress caused by the excessive copper coinage ceased, and then only at very great loss to government. The well-intentioned abolition of the tax on meat also had not the desired result, for bv a system of cornering " the price of meat rose to more than it was before.

tor British Loan in

1898.

In the autumn of 1896 the grand vizier (Amin-es-Sultan) en- countered much hostility from some members of the shah's . entourage and various high personages. Amin-ad- Ch S ' daulah was appointed chief administrator (vizier) of 1896ˆ1898 Azerbaijan and sent to Tabriz. Shortly afterwards the grand vizier found it impossible

to carry on his work, resigned, and retired to Kum (Nov. 24), and the shah formed a cabinet composed for the greater part of the leading members of the opposition to the grand vizier. After three months of the new regime affairs of state fell into arrears, and the most important department, that of the interior, was completely disorganized. The shah accordingly recalled Amin-ad-daulah from Tabriz (Feb. 1897), and appointed him minister president (rai's-i-vuzara) and minister of the interior. In June Amin-ad-daulah was made prime minister (vizir 'azim) and given more extended powers, and in August raised to the dignity of grand vizier (sadr 'azim). Nasru '1-Mulk was appointed minister of finance (Feb. 1898), and made an attempt to introduce a simple system of accounts, establish a budget, reorganize the revenue department, made a new assess- ment of the land-tax, &c. ; but resistance on the part of the officials rendered it abortive.

In the latter part of 1897 E. Graves, the inspector of the English telegraph line from Jask eastwards, was brutally murdered by Baluchis, and the agents of the Persian government sent to seize the murderers were resisted by the tribes. A considerable district breaking out into open revolt, troops under the command of the governor-general of Kerman were despatched into Baluchistan. The port of Fannoch was taken in March 1898, and order was restored. One of the murderers was hanged at Jask (May 31).

Various attempts to obtain a foreign loan had been made during the previous year, but with the sole result of discrediting the Persian government in Europe. In the beginning of Abortive jgˆg t ˆ e s h a h's medical advisers strongly recommended ˆˆ M a cure of mineral waters in Germany or France, and as his departure from Persia without paying the arrears to the army and to thousands of functionaries, or providing a sufficient sum for carrying on the govern- ment during his absence, would have created grave discontent, serious negotiations for a loan were entered upon. It was estimated that £1,000,000 would be required to pay all debts, including the balance of the 1892 loan, and leave a surplus sufficient for carrying on the government until the shah's return. London capitalists offered to float a loan for £1 ,250,000 at 5 % and on the guarantee of the customs of Fars and the Persian Gulf ports, and to give £1,025,000, or 82% to the Persian government. They stipulated for a kind of control over the custom-houses by placing their own agents as cashiers in them. This stipulation was agreed to in prin- ciple by the grand vizier, Amin ad-daulah, who in March, in order to meet some pressing demands on the treasury borrowed £50,000 on the customs receipts of Kermanshah and Bushire, and agreed to the lenders, the Imperial Bank of Persia's

agents, being placed as cashiers in the custom-houses of both cities. He encountered, however, much opposition from the other ministers. Further negotiations ensued, and the shah's visit to Europe was abandoned. The assistance of the British government not being forthcoming, the grand vizier's position became more and more difficult, and on the 5th of June he had to resign. Muhsin Khan, Mushir-ad- daulah, minister for foreign affairs, then became president of the cabinet, and continued the negotiations, but could not bring hem to a successful issue. Moreover, the Persian government, finding that the previous estimate of the money required for paying its debts was about 50 % below the mark, now asked for double the amount offered by the London capitalists, without, however, proportionately increasing the guarantee. This disorganized all previous arrangements, and the negotiations for a London loan came to an end for a time at the end of July, leaving in the minds of the Persians the unfortunate impression that the British government had done nothing to aid them.

On the 9th of July the former grand vizier, Amin-es-Sultan, was recalled from Kum, where he had resided since November 1896, arrived at Teheran three days later, and was reinstated as grand vizier on the 10th of August. His immense popularity, his friendly relations with the clergy, and some temporary advances from the banks, tided over difficulties for some time. The reform of the customs department was now (Sept. 1898) taken up seriously, and the three Belgian custom-house officials who had been engaged by Amin-ad-daulah in the beginning of the year were instructed to collect information and devise a scheme for the reorganization of the department and the abolition of the farm system. In March 1899 the custom-houses of the provinces of Azerbaijan and Kerman- shah were given over to the Belgians. The results of this step were so satisfactory that government was induced to abolish the farm system and set up the new regime in the other provinces in March 1900, and a number of other Belgian custom-houses officials were engaged.

In September, when renewed negotiations for a loan from London were not appearing to progress favourably, and the long-thought- of visit to Europe was considered to be absolutely necessary in the following year, the shah issued a firman authorizing the Russian Banque des Prets de Perse to float a loan. Shortly after this it wa«

said that the London capitalists were willing to lend £1 ,250,000 without insisting upon the objectionable control clause; but the proposal came too late, and on the 30th of January „ 1900, the Russian government had permitted the issue Loaao" of a loan for 22j million roubles (£2,400,000) at 5%, 1900. guaranteed by all the

customs receipts of Persia, ex- cepting those for Fars and the Persian Gulf ports. Only in the event of any default of paying instalments and interests was the bank m be given control of the custom-houses. Persia received 85 % of the nominal capital, and the Russian government guar- anteed the bondholders. Money was immediately remitted to Teheran, and nearly all the arrears were paid, while the balance of the 1892 London 6% loan was paid off by direct remittance to London.

Sir Mortimer Durand left Teheran in the early spring, and pro- ceeded to Europe on leave. On the 12th of April the shah, accom- panied by the grand vizier and a numerous suite, started on his voyage to Europe. The affairs of State Sbah's during his absence were entrusted to a council of Visits to ministers, under the presidency of his second son, Europe, Malik Mansur Mirza,_Shua-es-Sultaneh, who had made l °00, 1902. a long stay on the Continent the year before.

After a residence of a month at Contrexeville, the shah proceeded (July 14) to St Petersburg, and thence to Paris (July 29), intending to go to London on the 8th of August. But on account of the mourning in which several courts were thrown through the death of the king of Italy (July 29) and the duke of Saxe-Coburg-Gotha (July 30), the visits to England, Germany and Italy were abandoned. On the 2nd of August an anarchist made an attempt upon the shah's life in Paris.

F. — Russo- British Rivalry (igo2-igoy) and the Persian Revolution (igo6-igog).

In 1902 Muzaffar-ud-Dln Shah revisited the principal European capitals, and was received by King Edward VII. at Portsmouth in August. A mission headed by Viscount Downe was after- wards despatched to Persia, to invest the shah with the order of the Garter, a ceremony which took place in Teheran on the 2nd of February 1903. A week later, a new commercial treaty was concluded between Great Britain and Persia, which instituted various reforms in the custom's service, secured to both countries the " most-favoured-nation " treatment, and substituted specific import and export duties for the charge of 5% ad valorem provided for in the treaty of 1857. These provisions to some extent counterbalanced the losses inflicted on British trade by the Russo-Persian commercial treaty signed in 1903, which had seriously damaged the Indian tea trade, and had led to a rapid extension of Russian influence. Between 1899 and 1903 the Russian Bank had lent Persia £4,000,000, of which fully half was paid to the shah for his personal requirements. Russian concessionnaires were given the right to build roads from Tabriz to Teheran (1902) and from Tabriz to Kazvin (1903); and the Russian Bank opened new

branches in Seistan — an example followed in 1903 by the Bank of Persia. It was, however, in the Persian Gulf that the rivalry between Great Britain and Russia threatened to become dangerous. Great Britain had almost a monopoly of maritime commerce in the Gulf, and was alone responsible for buoying, lighting and policing its waters. The British claim to political supremacy in this region had thus a solid economic basis; it had been emphasized by the British action at Kuwet (q.v.) in 1899, and by the declaration made in the House of Lords by Lord Lansdowne, as secretary of state for foreign affairs, to the effect that Great Britain would resist by all means in its power the attempt of any other nation to establish itself in force on the shores of the Gulf. On the 16th of November 1903, Lord Curzon, the viceroy of India, sailed from Karachi for the Persian Gulf. His ship, the " Hardinge," was escorted by four cruisers, and the voyage was regarded as a political demonstration, to be interpreted in connexion with Lord Lansdowne's declaration. At Bushire, on the 1st of December, the Persian governor of Fars, Ala ad-daula, com- mitted a breach of diplomatic etiquette which induced Lord Curzon to sail away without landing. This incident was con- sidered by some British observers to have been brought about by Russian intrigue, and the fact that Ala ad-daula was dis- missed in 1904, after the Japanese had achieved several initial successes in the Russo-Japanese war, was held to confirm this opinion. But Russian financial and commercial influence ip

Persia continued to increase; in December 1904 a special mission under Mirza Riza Khan was received in audience by the tsar; and in May 1905 Muzaffar-ud-Din Shah himself left Persia to visit the courts of Vienna and St Petersburg.

The Seistan Mission of 1902-1905. — A dispute as to the frontier between Afghanistan and Seistan arose in 1902. The boundary delimited by the Seistan mission of 1870-1872, and known as the " Goldsmid line," was drawn along the course of the river Helmund. "Between 1872 and 1902 the Helmund took a more westerly direction; no boundary marks had been erected, and a wide strip of territory remained in dispute. The Persians claimed that the boundary was the old bed of the river, the Afghans that it was the new bed; and in accordance with the treaty of 1857 both parties asked the British

government to arbitrate. In January 1903, Colonel Arthur Henry MacMahon, who had previously delimited the frontier between Afghanistan and British India, was despatched from Quetta. The Persian officials were at first hostile, but their opposition, which was attributed to Russian influence at Teheran, was eventually overcome, and Colonel MacMahon (who was knighted in 1906) delivered his final award, sustaining the Persian contention, in February 1905.

British Commercial Missions. — Owing to the success of the Maclean mission, which visited and reported upon the markets and trade-routes of north-western Persia in 1903, under the direction of the Board of Trade, a similar mission was sent to southern Persia in 1904, under the auspices of the Upper India Chamber of Commerce, the Bengal Chamber and the Indian Tea Cess Company. The report of this mission (by Gleadowe- Newcomen) was published in 1906. After showing that civilized government was practically non-existent in the regions visited, it suggested as the chief remedy the conclusion of a Russo- British convention, and the division of Persia into ” spheres of influence.”

Russo-British Convention of 190J. — The political situation created by the Russo-Japanese War and by an internal crisis in Persia itself rendered possible such an agreement between the two rival powers, and a Russo-British convention was signed on the 31st of August 1907. Its chief provisions, in regard to Persia, are as follows: (1) north of a line drawn from Kasr-i- Shirin, Isfahan, Yezd and Kakh to the junction of the Russian, Persian and Afghan frontiers Great Britain undertook to seek no political or commercial concession, and to refrain from opposing the acquisition of any such concession by Russia or Russian subjects; (2) Russia gave to Great Britain a like under-taking in respect of the territory south of a line extending from the Afghan frontier to Gazik, Birjend, Kerman and Bander Abbasi; (3) the territory between the lines above-mentioned was to be regarded as a neutral zone in which either country might obtain concessions; (4) all existing concessions in any part of Persia were to be respected; (5) should Persia fail to meet its liabilities in respect of loans contracted, before the signature of the convention, with the Persian Banque d’Escompte and de Prets, or with the Imperial Bank of Persia, Great Britain and Russia reserved the right to assume control over the Persian revenues payable within their respective spheres of influence. With this convention was published a letter from the British secretary of state for foreign affairs (Sir E. Grey), stating (1) that the Persian Gulf lay outside the scope of the convention, (2) that Russia admitted the special interests of Great Britain in the Gulf, and (3) that these interests were to be maintained by Great Britain as before.

The Persian Constitution. — The misgovernment and disorder which were revealed to Europe by the Gleadowe-Newcomen report, and by such sporadic outbreaks as the massacre of the Babis in Yezd (1903), had caused widespread discontent in Persia. In 1905, partly owing to the example shown by the revolutionary parties in Russia, this discontent took the form of a demand for representative institutions. On the 5th of August 1906, Muzaffar-ud-Din Shah issued a rescript in which he under- took to form a national council (Majlis) representing the whole people (see above, Constitution) . The Majlis was duly elected,

and was opened by the shah in person on the 7th of October 1906. In January 1907 the shah died, and was succeeded by his eldest son, Mahommed ‘Ali Mirza, who on the nth of February published a message to his people, pledging himself to adhere to the new constitution.

The Revolution. — On the 12th of November the shah visited the Majlis, and repeated his pledge, but during December a riot in Teheran developed into a political crisis, in which the shah’s troops were employed against the civil population. The Majlis issued a manifesto to the powers, declaring that the shah intended to overthrow the constitution, and demanding inter- vention. The Russian and British ministers in Teheran urged Mahommed ‘Ali to maintain the constitution, and he sent a message to the Majlis, promising compliance with its demands and agreeing to place the whole army under the control of the ministry of war. These concessions allayed the prevailing unrest for a time, but the Royalist and Nationalist parties continued secretly to intrigue against one another, and in February 1908, while the shah was driving in Teheran, two bombs were exploded under his motor-car. Two persons were killed, but the shah was unhurt, and the Majlis formally con- gratulated him on his escape. A prolonged ministerial crisis, in April and May, was attributed by the Nationalists to the influence of reactionary courtiers, and by the Royalists to the influence of the Anjumans, or political clubs, which were alleged to control the Nationalist majority in the Majlis. Early in June the Majlis urged the shah to dismiss the courtiers under suspicion. Mahommed ‘Ali consented, but withdrew from Teheran; and on his departure the royal bodyguard of so-called ” Cossacks ” — Persian soldiers officered by Russians in the shah’s service — at once came into conflict with the Nation- alists. The house of parliament was bombarded, and when the Majlis appointed commissioners to discuss terms, the shah issued a manifesto dissolving the Majlis, and entrusted the restoration of order in Teheran to military administrators. He also proposed to substitute

for the elected Majlis a council of forty members, nominated by himself; but under pressure from Great Britain and Russia he promised to abandon this scheme and to order another general election. Meanwhile, civil war had broken out in the provinces; Kurdish raiders had sacked many villages near Tabriz; Persian brigands had attacked the Russian frontier-guards on the borders of Transcaucasia, and the indemnity demanded by the tsar's government was not paid until several Persian villages had been burned by Russian troops. This incident, combined with the employment of the so-called Cossacks, evoked a protest from the Nationalists, who asserted that Russia was aiding the Royalists; the accusation was true only in so far as it referred to the conduct of certain Russian officials who acted without the consent of the Russian government. Early in 1909, indeed, a Russian force of 2600 men was sent to watch events near Tabriz, and if necessary to intervene in favour of the Nationalists who held the town, and had for some months been besieged by the shah's troops. The presence of the Russians ultimately induced the Royalists to abandon the siege. In January of the same year the revolution spread to Isfahan, where the Bakhtiari chiefs made common cause with the Nationalists, deposed the Royalist governor and marched on the capital. In May and June the shah issued proclamations declaring his fidelity to the constitution, and promising an amnesty to all political offenders; but he was powerless to stay the advance of the combined Bakhtiari and Nationalist troops, who entered Teheran on the 13th of July. After severe street fighting the Cossacks deserted to the rebels, and the shah took refuge in the Russian legation (July 15). This was interpreted as an act of abdication; on the same day the national council met, and chose Mahommed "Ali's son, Sultan Ahmad Mirza, aged thirteen, as his successor. Asad ul-Mulk, head of the Kajar tribe, was appointed regent. On the 9th of September 1909, the ex-shah departed for his place of exile in the Crimea, escorted by Russian Cossacks and Indian sowars. On the 15th of November a newly elected Majlis was formally opened by the shah.

LANGUAGE AND LITERATURE]

PERSIA

Sanskrit. Gatha. Later Zend.

abhi (near) aibi aiwi

Iha (work) Izha izha.

I he clearest evidence of the extreme age of the language of the gathas

is its striking resemblance to the oldest Sanskrit, the language of the Vedic poems. The gatha language (much more than the later Zend) and the language of the Vedas have a close resemblance exceeding that of any two Romanic languages; they seem hardly more than two dialects of one tongue. Whole strophes of the gathas can be turned into good old Sanskrit by the application of certain phonetic laws ; for example —

” mat . va o padaish yafrasruta izhayao pairijasai mazda ustanazasto at vao asha aredrahyaca nemangha at vao vangehush manangho hunaretata,” becomes in Sanskrit —

” mana vah padaih ya pracruta ihayah parigachai medha uttanahastah at va rtena radhrasyaca namasa * at vo vasor manasah sunrtaya.” 1

The language of the other parts of the Avesta is more modern but not all of one date, so that we can follow the gradual decline of Zend in the Avesta itself. The later the date of a text, the simpler is the grammar, the more lax the use of the cases. We have no chronological points by which to fix the date when Zend ceased to be a living language; no part of the Avesta can well be put later than the 5th or 4th century B.C. Before Alexander’s time it is said to have been already written out on dressed cowhides and preserved in the state archives at Persepolis.

The followers of Zoroaster soon ceased to understand Zend. For this reason all that time had spared of the Avesta was translated into Middle Persian or Pahlavi (g.o.)‘under the Sassanians. This translation, though still regarded as canonical by the Parsees, shows a very imperfect knowledge of the original language. Its value for modern philology has been the subject of much needless contro- versy amongst European scholars. It is only a secondary means towards the comprehension of the ancient text, and must be used W – j j discrimination. A logical system of comparative exegesis, aided by constant reference to Sanskrit, its nearest ally, and to the other Iranian dialects, is the best means of recovering the lost sense of the Zend texts.

The phonetic system of Zend consists of simple signs which express the different shades of sound in the language with great precision. In the vowel-system a notable feature is the presence of the short vowels e and 0, which are not found in Sanskrit and Old Persian; thus the Sanskrit santi, Old Persian hantiy, becomes henti in Zend. The use of the vowels is complicated by a tendency to combinations of vowels and to epenthesis, i.e. the transposition of weak vowels into the next

syllable; e.g. Sanskrit bharati, Zend baraiti _ (he carries) ; Old Persian margu, Zend' mdurva (Merv) ; Sanskrit rinaktl, Zend irinakhti. Triphthongs are not uncommon' e.g. Sanskrit acvebhyas (dative plural of acva, a horse) is in Zend aspaeibyo ; Sanskrit krnoti (he does), Zend kerenaoiti. Zend has also a great tendency to insert irrational vowels, especially near liquids; owing to this the words seem rather inflated; e.g. savya (on the left) becomes in Zend havaya ; bhrajati (it glitters), Zend barazaiti; gna (ywri), Zend gena. In the -consonantal system we are struck by the abundance of sibilants (s and sh, in three forms of modification, z and zh) and nasals (five in number), and by the complete absence of /. A characteristic phonetic change is that of rt into sh; e.g. Zend asha for Sanskrit rta, Old Persian arta (in Artaxerxes); fravashi for Pahlavi fravardtn, New Persian ferver (the spirits of the dead). The verb displays a like abundance of primary forms with Sanskrit, but the conjugation by periphrasis is only slightly developed. _ The noun has the same eight cases as in Sanskrit. In the gathas there is a special ablative, limited, as in Sanskrit, to the " a " stems, whilst in later Zend the ablative is extended to all the stems indifferently.

We do not know in what character Zend wasi written before the time of Alexander. From the Sassanian period we find an alpha- betic and very legible character in use, derived from Sassanian Pahlavi, and closely resembling the younger Pahlavi found in books. Ihe oldest known manuscripts are of the 14th century a.d 2

Although the existence of the Zend language was known to the Oxford scholar Thomas Hyde, the Frenchman Anquetil Duperron who went to the East Indies in 1755 to visit the Parsee priests, was the first to draw the attention of the learned world to the subject Scientific study of Zend texts began with E. Burnouf, and has

since then made rapid strides, especially since the Vedas have opened to us a knowledge of the oldest Sanskrit

2. Old Perstan.— This is the language of the ancient Persian* properly so-called , » in all probability th! mother-tongue of Sk Persian of the Pahlavi texts, and of New Persian. We „,' , know Old Persian from the rock-inscriptions of the OUP * n " aa – Achaemenians, now fully deciphered. Most of them, and these the longest, date from the time of Darius, but we have speci- mens as late as Artaxerxes Ochus. In the latest inscriptions the language is already much degraded; but on the whole it is almost as antique as Zend, with wflich it has many points

in common ˆinstance, if we take a sentence from an inscription of Darius

” Auramazda hya imam bumim ada hya avam asmanam ada hya

Sfch5 yam ,- a , ya Sly u tlm ada mar tiyahy5 hya Darayavaum

khshayathiyam akunaush aivam paruvnam khshayathiyam,”

it would be in Zend —

With verses of my making, which are now heard, and with prayerful hands, I come before thee, Mazda, and with the sincere humility of the upright man and with the believer’s song of praise ” ‘Grammars by F. Spiegel (Leipzig, 1867) and A. V. W. Jackson (Stuttgart, 1892); Dictionary by F. Justi (Leipzig, 1864); editions of the Avesta by N. L. Westergaard (Copenhagen, 1852) and C. F Geldner (Stuttgart 1886-1895; also in English); translation into German by Spiegel (Leipzig, 1852), and into English by Darmesteter (Oxford, 1880) in Max Muller’s Sacred Books of the East.

” AhurS mazdao yo imam bumlm adat yo aom asmanem adat yo mashim adat yo shaitim adat mashyahe yo darayatvohum khshaetem akerenaot oyum pourunam khshaetem.” 4

The phonetic system in Old Persian is much simpler than in Zend; we reckon twenty-four letters in all. The short vowels e are wanting; in their place the old ” a ” sound still appears as m Sanskrit, e.g. Zend bagem, Old Persia’n bagam, Sanskrit bhagam; Old Persian hamarana, Zend hamerena, Sanskrit samarana As regards consonants, it is noticeable that the older z (soft s) still preserved m Zend passes into rf-a rule that still holds in New rersian ; compare —

Sanskrit Zend. Old Persian. New Persian.

hasta (hand) zasta dasta dast

jrayas(sea) zrayo daraya darya

aham (I) azem adam

Also Old Persian has no special I. Final consonants are almost entirely wanting In this respect Old Persian goes much farther than the kindred idioms, e.g. Old Persian abara, Sanskrit abharat Zend abarat, tyepj: nominative baga, root-form baga-s, Sanskrit bhagas. The differences in declension between Old Persian and Zend are

unimportant.

Old Persian inscriptions are written in the cuneiform character ot the simplest form, known as the ” first class.” Most of the inscriptions have besides two translations into the more compli- cated kinds of cuneiform character of two other languages of the Persian Empire. One of these is the Assyrian; the real nature of the second is still a mystery. The interpretation of the Persian cuneiform, the character and dialect of which were equallv unknown, was begun by G. F. Grotefend, who was followed by E. Burnouf, Sir Henry Rawhnson and J. Oppert. The ancient Persian inscriptions have been collected in a Latin translation

rnlarle r d m ed ar T a 8 n 8Tf ‘ tT* £ R Sp – iegd (Leip2ig ‘ l862; new and enlarged ed., 1881). The other ancient tongues and dialects of

this family are known only by name; we read of peculiar idioms

in Sogdiana Zabulistan, Herat, &c. It is doubtful whether the

languages of the Scythians, the Lycians and the Lydians, of which

hardly anything remains, were Iranian or not.

After the fall of the Achaemenians there is a period of five centuries, from which no document of the Persian laneuaee has come down to us. 6 5

Under the Arsacids Persian nationality rapidly declined ■ all that remains to us from that period— namely, the inscriptions on coins — is in the Greek tongue. Only towards the end of the Parthian dynasty and after the rise of the Sassanians, under whom the national traditions were again cultivated in Persia, do we recover the lost traces of the Persian language in the Pahlavi inscriptions and

3- Middle Persian.— The singular phenomena presented bv Pahlavi writing have been discussed in a separate article (see Fahlavi). The languages which it disguises rather „ MM than expresses— Middle Persian, as we may call it— „ , presents many changes as compared with the Old Persian ””*”” of the Achaemenians. The abundant grammatical forms of the ancient language are much reduced in number; the case-ending is lost; the noun has only two inflexions, the singular and the plural- the cases are expressed by prepositions— e.g. ruban (the soul), nom’ and ace. sing., plur. rubanan; dat. vol or avo ruban, abl. min or az ruban. Even distinctive forms for gender are entirely abandoned e.g. the pronoun’aw signifies “he,” “she,” “it.” In

the verb compound forms predominate. In this respect Middle Persian is almost exactly similar to New Persian.

And perhaps of the Medes. Although we have no record of the Median language we cannot regard it as differing to any great extent from the Persian. The Medes and Persians were two closely-connected races. There is nothing to justify us in looking lor the true Median language either in the cuneiform writings of the second class or in Zend.

4 ” Ormuzd, who created this earth and that heaven, who created man and man’s dwelling-place, who made Darius king, the one and only king of many.”

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Language and Literature

I. Persian (Iranian) Languages. — Under the name of Persian is included the whole of that great family of languages occupying a field nearly coincident with the modern Iran, of which true Persian is simply the western division. It is therefore common and more correct to speak of the Iranian family. The original native name of the race which spoke these tongues was Aryan. King Darius is called on an inscription ” a Persian, son of a Persian, an Aryan of Aryan race “; and the followers of the Zoroastrian religion in their earliest records never give themselves any other title but Airyavo danghavo, that is to say, ” Aryan races.” The province of the Iranian language is bounded on the west by the Semitic, on the north and north-east by the Ural-altaic or Turanian, and on the south-east by the kindred language of India.

The Iranian languages form one of the great branches of the Indo-European stem, first recognized as such by Sir William Jones and Friedrich Schlegel. The Indo-European Languages. or Indo-Germanic languages are divided by Brug- mann into (1) Aryan, with sub-branches (a) Indian, (b) Iranian; (2) Armenian; (3) Greek; (4) Albanian; (5) Italic; (6) Celtic; (7) Germanic, with sub-branches (a) Gothic, (b) Scandinavian, (c) West Germanic; and (8) Balto-Slavonic. (See Indo-European.) The Aryan family (called by Professor Sievers the ” Asiatic base-language “) is subdivided into (1) Iranian (Eranian, or Erano-Aryan) languages, (2) Pisacha, or non-Sanskritic Indo-Aryan languages, (3) Indo-Aryan, or Sans- kritic Indo-Aryan languages (for the last two see Indo-Aryan) ; Iranian being also grouped into Persian and non-Persian.

The common characteristics of all Iranian languages, which distinguish them especially from Sanskrit, are as follows: —

I. Changes of the original s into the spirant h. Thus —

Sanskrit. sindhu (Indus) sarva (all) sama (whole) santi (sunt)

Zend.

hindu

haurva

hama

henti

Old Persian. hindu haruva hama hantiy

2. Change of the original aspirates gh, dh, bh (= x, corresponding medials —

Sanskrit. Zend. Old Persian.

bhumi (earth) bumi bumi

dhita (fferos) data data

gharma (heat) garema garma

3. k, t, p before a consonant are changed into the spirants kh, th, f—

Sanskrit. Zend. Old Persian. New Persian.

prathama (first) fratema fratama fradum (Parsi)

kratu (insight) khratu …. khirad.

New Persian.

hind

har

ham

hend. 9,) into the

New Persian. bum dad garm.

4. The development of soft sibilants —

Sanskrit. Zend. Old Persian. New Persian.

Asuro Medhas 1 Ahuro Mazdao Auramazda Ormuzd bahu (arm) bazu …. bazu

hima (hiems) zima …. zim.

Our knowledge of the Iranian languages in older periods is too fragmentary to allow of our giving a complete account of this family and of its special historical development. It will be sufficient here to distinguish the main types of the older and the more recent periods. From antiquity we have sufficient knowledge of two dialects, the first belonging to eastern Iran, the second to western. 1. Zend or Old Bactrian. — Neither of these two titles is well chosen. The name Old Bactrian suggests that the language was limited to the small district of Bactria, or at least that it was spoken there — which is, at the most, only an Zend.

hypothesis. Zend, again (originally azaintish), is not the name of a language, as Anquetil Duperron supposed, but means ” inter- pretation ” or ” explanation,” and is specially applied to the medieval Pahlavi translation of the Avesta. Our ” Zend-Avesta ” does not mean the Avesta in the Zend language, but is an incorrect transcription of the original expression ” Avistak va zand,” i.e. ” the holy text (Avesta) together with the translation.” But, since we still lack sure data to fix the home of this language with any certainty, the convenient name of Zend has become generally established in Europe, and may be provisionally retained. But the home of the Zend language was certainly in eastern Iran; all attempts to seek it farther west — e.g. in Media 2 — must be regarded as failures.

Zend is the language of the so-called Avesta, 3 the holy book of the Persians, containing the oldest documents of the religion of Zoroaster. Besides this important monument, which is about twice as large as the Iliad and Odyssey put together, we only possess very scanty relics of the Zend language in medieval glosses and scattered quotations in Pahlavi books. These remains, however, suffice to give a complete insight into the structure of the language. Not only amongst Iranian languages, but amongst all the languages of the Indo-European group, Zend takes one of the very highest places in importance for the comparative philologist. In age it almost rivals Sanskrit; in primitiveness it surpasses that language in many points; it is inferior only in respect of its less extensive literature, and because it has not been made the subject of system- atic grammatical treatment. The age of Zend must be examined in connexion with the age of the Avesta. In its present form the Avesta is not the work of a single author or of any one age, but embraces collections produced during a long period. The view which became current through Anquetil Duperron, that the Avesta is throughout the work of Zoroaster (in Zend, Zarathushtra) , the founder of the religion, has long been abandoned as untenable. But the opposite view, that not a single word in the book can lay claim to the authorship of Zoroaster, also appears on closer study too

sweeping. In the Avesta two stages of the language are plainly distinguishable. The older is represented in but a small part of the whole work, the so-called Gathas or songs. These songs form the true kernel of the book Yasna ; i they must have been in exist- ence long before all the other parts of the Avesta, throughout the whole of which allusions to them occur. These gathas are what they claim to be, and what they are honoured in the whole Avesta as being — the actual productions of the prophet himself or of his time. They bear in themselves irrefutable proofs of their authen- ticity, bringing us face to face not with the Zoroaster of the legends but with a real person, announcing a new doctrine and way of salvation, no supernatural Being assured of victory, but a mere man, struggling with human conflicts of every sort, in the midst of a society of fellow-believers yet in its earliest infancy. It is almost impossible that a much later period could have produced such unpretentious and almost depreciatory representations of the deeds and personality of the prophet. If, then, the gathas reach back to the time of Zoroaster, and he himself, according to the most probable estimate, lived as early as the 14th century B.C., the oldest component parts of the Avesta are hardly inferior in age to the oldest Vedic hymns. The gathas are still extremely rough in style and expression ; the language is richer in forms than the more recent Zend; and the vocabulary shows important differences. The pre- dominance of the long vowels is a marked characteristic, the constant appearance of a long final vowel contrasting with the preference for a final short in the later speech.

1 Name of the supreme god of the Persians.

2 Cf. I. Darmesteter, Etudes iraniennes, i. 10 (Paris, 1883).

3 This, and not Zend-Avesta, is the correct title for the original text of the Persian Bible. The origin of the word is doubtful, and we cannot point to it before the time of the Sassanians. Perhaps it means ” announcement,” ” revelation.”

4 The Avesta is divided into three parts: (1) Yasna, with an appendix, Visparad, a collection of prayers and forms for divine service; (2) Vendidad, containing directions for purification and the penal code of the ancient Persians; (3) Khordah-Avesta, or the Small Avesta, containing the Yasht, the contents of which are for the most part mythological, with shorter prayers for private devotion.

New Persian. maTg Feridiin ab

khod ruz az.

koh

gah

cihar

bandah

sipah

diham.

New Persian. mai boi pai kai.

4. New Persian.— The last step in the development of the language is New Persian, represented in its oldest form by Firdousi. v In grammatical forms it is still poorer than Middle

” ew Persian; except English, no Indo-European language

Persian. nag SQ f ew j n fl ex i onS; but this is made up for by the subtle development of the syntax. The structure of New Persian has hardly altered at all since the Shdhnama; but the original purism of Firdousi, who made every effort to keep the language free from Semitic admixture, could not long be maintained. Arabic literature and speech exercised so powerful an influence on New Persian, especially on the written language, that it could not withstand the admission of an immense number of Semitic words. There is no Arabic word which would be refused acceptance in good Persian. But, nevertheless, New Persian has remained a language of genuine Iranian stock.

Among the changes of the sound system in New Persian, as contrasted with earlier periods, especially with Old Persian, the first that claims mention is the change of the tenues k, t,p, c, into g, d, b, z. Thus we have —

Old Persian or Zend. Pahlavi.

mahrka (death) mark

Thraetaona Fritun

ap (water) ap

hvato (self) kh5t

raucah (day) roj

haca 3.)

A series of consonants often disappear in the spirant ; thus-

Old Persian or Zend. Pahlavi. New Persian

kaufa (mountain) _ kof

gathu (place), Z. gatu gas

cathware (four) ....

bafidaka (slave) bandak

spada (army) ....

dadami (I give) ....

Old d and dh frequently become y —

Old Persian or Zend. Pahlavi.

madhu (wine) ....

baodho (consciousness) bod

padha (foot) ....

kadha (when) ....

Old y often appears as j: Zend yama (glass), New Persian jam; yavan (a youth), New Persian javan. Two consonants are not allowed to stand together at the beginning of a word ; hence vowels are frequently inserted or prefixed, e.g. New Persian sitadan or istadan (to stand), root sta; biradar (brother), Zend and Pahlavi bratar. 1

Amongst modern languages and dialects other than Persian which must be also assigned to the Iranian family may be Modern mentioned :—

Dialects. t Kurdish, a language nearly akin to New Persian,

with which it has important characteristics in common. It is chiefly distinguished from it by a marked tendency to shorten words at all costs, e.g. Kurd, bera (brother) = New Persian biradar; Kurd, dim (I give) = New Persian diham; Kurd, spl (white) = New Persian siped.

2. Baluch, the language of Baluchistan, also very closely akin to New Persian, but especially distinguished from it in that all the old spirants are changed into explosives, e.g. Baluch vab (sleep) = Zend hvafna; Baluch kap (slime) = Zend kafa, New Persian kaf; Baluch hapt (seven) = New Persian haft.

3. Ossetic, true Iranian, in spite of its resemblance in sound to the Georgian. 2

4. Pushtu (less accurately Afghan), which has certainly been increasingly influenced by the neighbouring Indian languages in inflexion, syntax and vocabulary, but is still at bottom a pure Iranian language, not merely intermediate between Iranian and Indian.

The position of Armenian remains doubtful. Some scholars attribute it to the Iranian family; others prefer to regard it as a separate and independent member of the Indo-European group. Many words that at first sight seem to prove its Iranian origin are only adopted from the Persian. 3 (K. G.)

II. Modern Persian Literature. — Persian historians are greatly at variance about the origin of their national poetry. ,Most of them go back to the 5th Christian century and ascribe to one of the Sassanian kings, Bahram V. (420-439), the invention of

1 Grammars of New Persian, by M. Lumsden (Calcutta, 1810), A. B. Chodzko (Paris, 1852; new ed., 1883), D. Forbes (1869), J. A. Vullers (Giessen, 1870), A. Wahrmund (Giessen, 1875), C. Salemann and V. Zhukovski (Leipzig, 1889); J. T. Platts (pt. i. 1984). For the New Persian dialects see Fr. Muller, in the Sitzungsber. der wien. Akad., vols, lxxvii., lxxviii.

2 Cf. Hiibschmann, in Kuhn's Zeitschrift, xxiv. 396.

3 Cf . P. de Lagarde, Armenische Studien (Gottingen, 1877); H. Hiibschmann, Armenische Studien (Leipzig, 1883).

metre and rhyme; others mention as author of the first Persian poem a certain Abulhafs of Soghd, near Samarkand. In point of fact, there is

no doubt that the later Sassanian rulers fostered the literary spirit of their nation (see Pahlavi). Pahlavi books, however, fall outside of the present subject, which is the literature of the idiom which shaped itself out of the older Persian speech by slight modifications and a steadily increasing mixture of Arabic words and phrases in the 9th and 10th centuries of our era, and which in all essential respects has remained the same for the last thousand years. The death of Harun al-Rashid in the beginning of the 9th century, which marks the commence- ment of the decline of the caliphate, was at the same time the starting-point of movements for national independence and a national literature in the Iranian dominion, and the common cradle of the two was in the province of Khorasan, between the Oxus and the Jaxartes. In Merv, a Khorasanian town, a certain ‘Abbas composed in 809 a.d. (193 a.h), according to the oldest biographical writer of Persia, Mahommed ‘AufI, the Earliest first real poem in modern Persian, in honour of the Modem Abbasid prince Mamun, Harun al-Rashld’s son, who Persian had himself a strong predilection for Persia, his •

mother’s native country, and was, moreover, thoroughly imbued with the freethinking spirit of his age. Soon after this, in 820 (205 a.h.), Tahir, who aided Mamun to wrest the caliphate from his brother Amln, succeeded in establishing the first semi- independent Persian dynasty in Khorasan, which was overthrown in 872 (259 a.h.) by the Saffarids.

The development of Persian poetry under these first native dynasties was slow. Arabic language and literature had gained too firm a footing to be supplanted at once by a new literary idiom still in its infancy; nevertheless the few poets who arose under the Tahirids and Saffarids show already the germs of the characteristic tendency of all later Persian literature, which aims at amalgamating the enforced spirit of Islamism with their own Aryan feelings, and reconciling the strict deism of the Mahommedan religion with their inborn loftier and more or less pantheistic ideas; and we can easily trace in the few fragmentary verses of men like Hanzala, Hakim Firuz and Abu Sallk those principal forms of poetry now used in common by Forms of all Mahommedan nations — the forms of the qasida Eastern (the encomiastic, elegiac or satirical poem), the p 9 etr y- ghazal or ode (a love-ditty, wine-song or religious hymn), the rubai or quatrain (our epigram, for which the Persians invented a new metre in addition to those adopted from the Arabs), and the mathnawi or double-rhymed poem (the legitimate form for epic and didactic poetry) . The first who wrote such a mathnawi was Abu Shukur of Balkh, the oldest literary representative of the third dynasty of Khorasan, the Samanids, who

had been able in the course of time to dethrone the Saffarids, and to secure the government of Persia, nominally still under the supremacy of the caliphs in Bagdad, but in fact with full sovereignty. The undisputed reign of this family dates from the accession of Amir Nasr II. (913-942; 301-331 a.h.), who, more than any of his predecessors, patronized arts and sciences in his dominions. The most accomplished minstrels of his time were minstrels Mahommed FaraladI (or Faralawl); Abu '1-' Abbas of 10th of Bokhara, a writer of very tender verses; Abu Century. '1-Muzaffar Nasr of Nlshapur; Abu. 'Abdallah Mahommed of Junaid, equally renowned for his Arabic and Persian poetry; Ma'nawl of Bokhara, full of original thoughts and spiritual subtleties; KhusrawanI, from whom even Firdousi condescended to borrow quotations; Abu '1-Hasan Shahid of Balkh, the first who made a diwan ox ˆalphabetical collection of his lyrics; and RudagI (or RudakI), the first classic genius of Persia, who im- pressed upon every form of lyric and didactic poetry its peculiar stamp and individual character (see Rudagi). His graceful and captivating style was imitated by Hakim Khabbaz of Nlshapur, a great baker, poet and quack; Abu. Shu'aib Salih of Herat, who left a spirited little song in honour of a young Christian maiden ; Raunaqi of Bokhara; Abu'1-Fath of Bust, who was also a good Arabic poet; the amir Abu '1-Hasan 'AH Alagatchl, who handled the pen as skilfully as the sword; 'Umara of Merv, a famous

Tabari.

Dttkiki.

astronomer; and Kisa'i, a native of the same town, a man of stern and ascetic manners, who sang in melodious rhythm the praise of "All and the twelve imams. All these poets flourished under the patronage of the Samanid princes, who also fostered the growing desire of their nation for historical and antiquarian researches, for exegetical and medical studies. Mansur L, the grandson of Rudagi's patron, ordered (963; 352 a.h.) his vizier Bal'aml to translate the famous universal history of Tabari (838-923 a.d.) from Arabic into Persian; and this Ta'rikh-i-Tabari, the oldest prose work in modern Persian, is not merely remarkable from a philological point of view, it is also the classic model of an easy and simple style (French trans, by L. Dubeux

and H. Zotenberg, 1867-1874). The same prince employed the most learned among the ulema of Transoxiana for a translation of fabarl's second great work, the Tafsir, or commentary on the Koran, and accepted the dedication of the first Persian book on medicine, a pharma- copoeia by the physician Abu Mansur Muwaffaq b. 'All of Herat (edited by Seligmann, Vienna, 1859), which forms a kind of connecting link between Greek and Indian medicine. It was soon after further developed by the great Avicenna (d. 1037; 428 a.h.), himself a Persian by birth and author of pretty wine- songs, moral maxims, psychological tracts, and a manual of philosophic science, the Ddnishndma-i-Ala'i, in his native tongue.

A still greater impulse was given, both to the patriotic feelings and the national poetry of the Persians, by Mansur's son and suc- cessor. Prince Niih II., who ascended the throne in 976 (365 a.h.). Full of enthusiasm for the glorious past of the old Iranian kingdom, he charged his court poet Daklkl (Daqiqi), who openly professed in his ghazals the Zoroastrian creed, to turn the Khodd'lnama, or " Book of Kings," into Persian verse. Shortly after commencing this work Dakiki was murdered in the prime of life; his death was soon followed by the fall of the Samanid dynasty itself. But Dakiki's great enterprise was not abandoned; a stronger hand, a higher genius, was to continue and to complete it, and this genius was found in FirdousI (040-1020; 328-411 a.h.), with whom we enter the golden age of the national epopee in Persia (see FirdousI). In ion, after thirty-five years of unremitting labour, he accomplished his gigantic task, and wrote the last dis- tichs of the immortal Shahndma, that " glorious monument of Eastern genius and learning," as Sir W. Jones calls it, " which, if ever it should be generally understood in its original language, will contest the merit of invention with Homer itself." The Shdh- imitatlons otndma, from the very moment of its appearance, the "Shah- exercised such an irresistible fascination upon all aSma. ' minds that there was soon a keen competition among the younger poets as to who should produce the most successful imitation of that classic model; and this competi- tion has gone on under different forms through all the following centuries, even to the most recent times. First of all, the old popular traditions, so far as they had not yet been exhausted by FirdousI, were ransacked for new epic themes, and a regular cycle of national epopees gathered round the Book of Kings, drawn almost exclusively from the archives of the princes of Sejistan, the family of Firdousl's greatest hero, Rustam. The first and most ambitious of these competitors seems to have been Asadl's own son, 'All b. Ahmad al-Asadl, the author of the oldest Persian glossary, who completed in 1066 (458 a.h.), in upwards of 9000 distichs, the Garshdspndma, or

marvellous story of the warlike feats and love adventures of Garshasp, one of Rustam's ancestors. The heroic deeds of Rustam's grandfather were celebrated in the Sdmndma, which almost equals the Shahndma in length; those of Rustam's two sons, in the J ahdgairndma and the Fardmurzndma; those of his daughter, an amazon, in the Brunhild style of the German Nibelunge, in the Bdnu Gushdspndma;those of his grandson in the Barsundma; those of his great-grandson in the Shahriydrndma (ascribed to Mukhtarl and dedicated to Mas'ud Shah, who is probably identical with Mas'ud b. Ibrahim, Sultan Mahmiid's great- grandson, 1099-1 114; 492-508 a.h.); and the wonderful exploits

FirdousI.

of a son of Isfandiyar, another hero of the Shahndma, in the Bahmanndma.

When these old Iranian sources were almost exhausted, the difficulty was met in various ingenious ways. Where some slight historical records of the heroic age were still obtainable poetical imagination seized upon them at once; where no tradi- tions at all were forthcoming fiction pure and simple asserted its right; and thus the national epopee gave way to the epic story, and — substituting prose for verse — -to the novel and the fairy tale. Models of the former class are the various Iskandarndmas, or " Books of Alexander the Great," the oldest and most original of which is that of NizamI of Ganja, the modern Elizavetpol (completed about 1262; 599 a.h.); the latter begins with the Kitdb-i-Samak 'Iydr, a novel in three volumes (about n 89; 585 a.h.), and reaches its climax in the Bustdn-i-Khayal, or " Garden of Imagination," a prose romance of fifteen large volumes, by Mahommed Taki Khayal, written between 1742 and 1756 (1135 and 1169 a.h.). Some writers, both in prose and verse, turned from the exhausted fields of the national glory of Persia, and chose their subjects from the chivalrous times of their own Bedouin conquerors, or even from the Jewish legends of the Koran. Of this description are the Anbiydndnta, or history of the pre-Mahommedan prophets, by Hasan! Shabistari 'Ayani (before the 8th century of the Hegira); Ibn Husam's Khdwarndma (1427; 830 a.h.), of the deeds of 'All; Badhil's TJ.amla-i-J}aidari, which was completed by Najaf (1723; 1135 A.H.), or the life of Mahommed and the first four caliphs; K&zim's Farahndma-i-Fdtima, the book of joy of Fatima, Mahomet's daughter (1737; 1150 a.h.) — all four in the epic metre of the Shahndma; and the prose stories of Jfdlim Td'i, the famous model of liberality and generosity in pre- Islamitic times; of Amir ffamzah, the uncle of Mahomet; and of the Mu'jizdt-i-Musawi, or the miraculous deeds of

Moses, by Mu'tn-almiskln (died about 1501; 907 a.h.).

Quite a different turn was taken by the ambition of another class of imitators of FirdousI, especially during the last four centuries of the Hegira, who tried to create a new heroic epopee by celebrating in rhythm and rhyme stirring events of recent date. The gigantic figure of Timur inspired Hatifi (d. 1521; 927 a.h.) with his Timurndma; the stormy epoch of the first Safawid rulers, who succeeded at last in reuniting for some time the various provinces of the old Persian realm into one great monarchy, furnished KasimI (died after 1560; 967 a.h.) 1 with the materials of his Shahndma, a poetical history of Shah Isma'Il and Shah Tahmasp. Another Shahndma, celebrating Shah 'Abbas the Great, was written by Kamali of Sabzevar; and even the cruelties of Nadir Shah were duly chronicled in a pompous epic style in Tshrati's Shdhnama-i- Nddiri (1749; 1162 a.h.). But all these poems are surpassed in length by the 33,000 distichs of the Shdhinshdhnama by the poet-laureate of Fath 'All Shah of Persia (1797-1834), and the 40,000 distichs of the Georgendma, a poetical history of India from its discovery by the Portuguese to the conquest of PoOna by the English in 18 17. In India this kind of epic versifica- tion has flourished since the beginning of Humayun's reign (i53o-i556);e.g. the Zafarndma-i-Shdhjahdni byKuds! (d. 1646; 1056 a.h.); the Shdhinshdhndma by Talib Kalim (d. 1651; 1061 a.h.), another panegyrist of Shah Jahan; Atashl's 'Adil- ndma, in honour of Shah Mahommed 'Adil of Bijapur, who ascended the throne in 1629 (1039 a.h.) or 1627; the Tawdrikh-i-K.ull Kutbshdh, a metrical history of the Kutb shahs of Golconda; and many more, down to the Fathndma-i-TipU Sultan by Ghulam Hasan (1784; 1198 a.h.).

But the national epopee was not the only bequest the great FirdousI left to his nation. This rich genius gave also the first impulse to romantic, didactic and mystic poetry; and even his own age produced powerful co-operators in these three most conspicuous departments of Persian literature. Romantic fiction, which achieved its highest triumph Fiction. in Ni?ami of Ganja's (1141-1203; 535-599 a.h.) brilliant pictures of the struggles and passions in the human heart 1 After 1572 (979 a.h.) according to H. E. in Grundriss, ii. 237.

Later Epics.

(see Nizami), sent forth its first tender shoots in the numerous love stories of the Shahndma, the most fascinating of which is that of Zal and Rtidabeh, and developed almost into full bloom in Firdousl's second great mathnawi Yusuf u Zalikha, which the aged poet wrote after his flight from Ghazni, and dedicated to the reigning caliph of Bagdad, al Qadir billah. It represents the oldest poetical treatment of the Biblical story of Joseph, which has proved so attractive to the epic poets of Persia, among others to 'Am'ak of Bokhara (d. 1149), who was the first after FirdousI to write a Yusuf u Zalikha to Jam! (d. 1492); Mauji Kasim Khan, Humayun's amir (d. 1571), Nazim of Herat (d. 1670), and Shaukat, the governor of Shiraz under Fath 'All Shah. Perhaps prior in date to Firdousl's Yusuf was his patron 'Unsurl's romance, Wamik u Adhrd, a popular Iranian legend of great antiquity, which had been first written in verse under the Tahirid dynasty. This favourite story was treated again by Fasihl JurjanI (5th century of the Hegira), and by many modern poets — as Damlri, who died under the Safawi shah Mahommed (1577- 1586; 985-994 a.h.), Nami, the historiographer of the Zand dynasty, and Hosain of Shiraz under Fath 'All Shah, the last two flourishing towards the beginning of the present century. Another love story of similar antiquity formed the basis of Fakr-uddin As'ad Jorjani's Wis u Rdmin, which was composed in Isfahan about 1048 (440 a.h.) — a poem remarkable not only for its high artistic value but also for its resemblance to Gottfried von Strassburg's Tristan und Isolt.

The last-named Persian poet was apparently one of the earliest eulogists of the Seljuks, and it was under this Turkish dynasty Encomiasts that lyrical romanticism rose to the highest pitch. and What FirdousI and the court-poets of Sultan Mahmud

Satirists. na£ j commence(j j w h a t Abu '1-Faraj RunI of Lahore and Mas'ud b. Sa'd b. Salman (under Sultan Ibrahim, 1059- 1099) had successfully continued, reached its perfection in the famous group of panegyrists who gathered in the first half of the 6th century of the Hegira round the throne of Sultan Sinjar, and partly also round that of his great antagonist, Atsiz, shah of Khwarizm. This group included Adlb Sabir, who was drowned by order of the prince in the Oxus about 1145 (540 a.h.), and his pupil Jauharl, the goldsmith of Bokhara; Amir Mu'izzl, the king of poets at Sin jar's court, killed by astray arrow in 1147 (542 a.h.), Rashld Watwat (the Swallow) who died in 1182 (578 a.h.), and left, besides his kasidas, a valuable treatise on poetry (Hadd'ik-essihr) and a metrical translation of the sentences of 'All, 'Abd-alwasi' Jaball, who sang at first, like his contem- porary Hasan Ghaznawi (d. 1169; 565 a.h.), the praise of the Ghaznevid shah Bahram, but afterwards bestowed his eulogies upon

Sinjar, the conqueror of Ghazni; and Auljad-uddin Anwari, the most celebrated kaslda-writer of the whole Persian literature. Anwari (died between 1189 and 1191; 585 and 587 a.h.), who in early life had pursued scientific studies in the madrasa of Tus, and who ranked among the foremost astronomers of his time, owes his renown as much to the inexhaustible store of poetical similes and epitheta ornantia which he showered upon Sinjar and other royal and princely personages, as to his cutting sar- casms, which he was careful to direct, not against individuals, but against whole classes of society and the cruel wrong worked by an inexorable fate — thus disregarding the example of FirdousI, whose attack upon Sultan Mahmud for having cheated him out of the reward for his epopee is the oldest and most finished specimen of personal satire. This legitimate branch of high art, however, soon degenerated either into the lower forms of parody and travesty — for which, for instance, a whole group of Transoxanian writers, Suzanl of Samarkand (d. 11 74; 569 a.h.) and his contemporaries, Abu 'AH ShatranjI of the same town, Lami' of Bokhara, and others gained a certain literary reputation — or into mere comic pieces and jocular poems like the " Pleasantries " (Hazliyydt) and the humorous stories of the " Mouse and Cat " and the " Stone-cutter " (Sangtarash) by 'Ubaid Zakani (d. 1370; 772 a.h.). Anwari's greatest rival was KhakanI (d. 1199; 595 a.h.), the son of a carpenter in ShlrvSn, and panegyrist of the shahs of Shlrvan, usually called the Pindar of the East. To European taste only the shorter

epigrams and the double-rhymed poem TuhfatuTirakain, in which KhakanI describes his journey to Mecca and back, give full satisfaction. Among his numerous contemporaries and followers may be noticed Mujlr-uddin BailakanI (d. n 98; 594 a.h.); Zahir FaryabI (d. 1202; 598 a.h.) and Athlr Akhslkati (d. 1211; 608 a.h.) — all three panegyrists of the atabegs of Azerbaijan, and especially of Sultan Kizil Arslan — Kamal-uddln Isfaha.nl, tortured to death by the Moguls in 1237 (635 a.h.), who sang, like his father Jamal-uddln, the praise of the governors of Isfahan, and gained the epithet of the " creator of fine thoughts " (Khallak-ulma'anl) ; and Saif-uddin Isfarangi (d. 1267; 666 a.h.), a favourite of the shahs of Khwarizm.

Fruitful as the 6th and 7th centuries of the Hegira were in panegyrics, they attained an equally high standard in didactic and mystic poetry. The origin of both can again Didactic ana be traced to FirdousI and his time. In the ethical Mystic reflections, wise maxims and moral exhortations Poet O'- scattered throughout the Shahndma the didactic element is plainly visible, and equally plain in it are the traces of that mystical tendency which was soon to pervade almost all the literary productions of Persian genius. But the most character- istic passage of

the epopee is the mysterious disappearance of Shah Kaikhosrau, who suddenly, when at the height of earthly fame and splendour, renounces the world in utter disgust, and, carried away by his fervent longing for an abode of everlasting tranquillity, vanishes for ever from the midst of his companions. The first Persian who employed poetry exclusively for the illustration of Sufic doctrines was Firdousl's con- „ ff p oets temporary, the renowned sheikh Abu Sa'Id b. Abu 1-Khair of Mahna in Khorasan (968-1049; 357-440 a.h.), the founder of that specific form of the ruba'I which gives the most concise expression to religious and philosophic aphorisms — a form which was further developed by the great free- thinker 'Omar b. Khayyam (q.v.), and Afdal-uddln Klash (d. 1307; 707 A.H.). The year of Abu Sa'Id's death is most likely that of the first great didactic mathnawi, the Rilshan. a'indma, or " Book of Enlightenment," by Nasir Khosrau (q.v.), a poem full of sound moral and ethical maxims with slightly mystical tendencies. About twenty-five years later the first theoretical handbook of Suflsm in Persian was composed by 'All b. 'Uthman al-Jullabl al-Hujwirl in the Kashf-ulmahjub, or, " Revelation of Hidden Things," which treats of the various schools of Sufis, their teachings and observances. A great saint of the same period, Sheikh 'Abdallah Ansari of Herat (1006- 1089; 396-481 a.h.), assisted in spreading the pantheistic move- ment by his Mundjdt or " Invocations to God," by several prose tracts, and by an important collection of biographies of eminent Sufis, based on an older Arabic compilation, and serving in its turn as groundwork for Jami's excellent Nafahdt-aluns (completed in 1478; 883 a.h.). He thus paved the way for the publication of one of the earliest textbooks of the whole sect, the Jfadikat- ulhakikat, or " Garden of Truth " (1130; 525 a.h.), by Hakim Sana. 'I of Ghazni, to whom all the later Stifle poets refer as their unrivalled master in spiritual knowledge. As the most uncom- promising Sufis appear the greatest pantheistic writer of all ages, Jelal ud-din RumI (1207-1273; 604-672 a.h.; see Rumi), and his scarcely less renowned predecessor Farid ud-dln 'Attar, who was slain by the Moguls at the age of 114 lunar years in 1230 (627 a.h.). This prolific writer, having performed the pilgrim- age to Mecca, devoted himself to a stern ascetic life, and to the composition of Sufic works, partly in prose, as in his valuable " Biography of Eminent Mystic Divines," but mostly in the form of mathnawls (upwards of twenty in number), among which the Pandndma, or " Book of Counsels," and the Mantik-uttair, or the "Speeches of Birds," occupy the first rank. In the latter, an allegorical poem, interspersed with moral tales and pious contemplations, the final absorption of the Sufi in the deity is most ingeniously illustrated.

In strong contrast to these advanced Sufis stands the greatest moral

teacher of Persia, Sheikh Sa'dl of Shiraz (died about 1 10 lunar years old in 1292; 691 a.h.; see Sa'di), whose two best known works are the Bustdn, or " Fruit-garden," and

Lyric Poetry.

the Gulistan, or " Rose-garden." However, both have found comparatively few imitations — the former in the Daslurnama, Sa>l// or " Book of Exemplars," of Nizari of Kohistan

(d. 1320; 720 A.H.), in the Dah Bab, or " Ten Letters," of Katibi (d. 1434; 838 a.h.), and in the Gulzdr, or " Rose-bower," of HairatI (murdered 1554; 961 a.h.); the latter in Mu'In-uddln Juwaini's Nigdristdn, or " Picture-gallery " (1335; 735 a.h.) and Jami's Bahdrisldn, or "Spring-garden" (1487; 892 a.h.); whereas an innumerable host of purely Suflc compositions followed in the wake of Sana'I's, 'Attar's and Jelal ud-din Ruml's mathnawis. It will suffice to name a few of the most conspicuous. The SD/fc Works Lama at, or " Sparks," of 'Iraki (d. between 1287 and 1309; 686 and 709 a.h.), the Zad-ulmusafirin, or " Store of the Wayfarers," by HusainI (d. 1318; 718 a.h.), the Gulshan-i-Rdz, or " Rose-bed of Mystery," by Mahmud Shabis- tari (d. 1320; 720 a.h.), the Jdm-i-Jam, or " Cup of Jamshld," by AuhadI (d. 1338; 738 a.h.), the Anis-td 'Arifin, or "Friend of the Mystics," by Kasim (Qasim)-i-Anwar (d. 1434; 837 a.h.), and others; 'Assar's Mihr u Mushtari, or " Sun and Jupiter " ^1376; 778 a.h.), 'Ariffs Gili u Chaugdn, or "The Ball and the Bat " (1438; 842 a.h.), Ifusn u Dil, or " Beauty and Heart," by Fattahl of Nlshapur(d. 1448; 852.A.H.), Sham' u Parwdna, or " The Candle and the Moth," by Ahll of Shlraz (1489; 894 a.h.), Shah u Gadd, or " King and Dervish," by Hilali (put to death I 53 2 ! 939 a.h.), Baha-ud-din 'Amill's (d. 1621; 1030 a.h.) Nan u Halivd, or " Bread and Sweets," Shir u Shakar, or " Milk and Sugar," and many more.

During all these periods of literary activity, lyric poetry, pure and simple, had by no means been neglected; almost all the renowned poets since the time of Rudagi had sung in endless strains the pleasures of love and wine, the beauties of nature, and the almighty power of the Creator; but it was left to the incomparable genius of Hafiz (d. 1389; 791 a.h.; see Hafiz) to give to the world the most perfect models of lyric composition; and the lines he had laid down were more or less strictly followed by all the ghazal-writers of the 9th

and 10th centuries of the Hegira — by Salman of Sawa (d. about 1377; 779 a.h.), who excelled besides in kaskla and mathnawl; Kamal Khujandl (d. 1400; 803 a.h.), Hafiz's friend, and protege of Sultan Hosain (1374-1382 a.d.); Mahommed Shlrln Maghrib! (d. at Tabriz in 1406; 809 a.h.), an intimate friend of Kamal; Ni'mat-ullah Wall (d. 1431; 834 a.h.), the founder of a special religious order; Kasim-i-Anwar (see above); Amir Shahl (d. 1453; 857 a.h.), of the princely family of the Sarbadars of Sabzewar; Banna'I (d. 1512; 918 a.h.), who also wrote a romantic poem, Bahrdm u Bihruz; Baba Fighani of Shlraz (d. 1519; 925 a.h.), usually called the " Little Hafiz "; NargisI (d. 1531; 938 a.h.); Lisani (d. 1534; 941 a.h.), who himself was imitated by Damlr! of Isfahan, Muhtasham Kashi and Wahshl Bank! (all three died in the last decade of the 10th century of the Hegira); Ahli of Shlraz (d. 1535; 942 a.h.), author of the Sihr-i-J}aldl, or "Lawful Witchcraft," which, like Katlbl's (d. 1434; 838 a.h.) Majma'ulbahrain, of the "Con fluence of the Two Seas," can be read in two different metres; Nau'i (d. 1610; 1019 a.h.), who wrote the charming romance of a Hindu princess who burned herself in Akbar's reign with her deceased husband on the funeral pile, called Suz u Guddz, or " Burning and Melting," &c. Among the immediate predeces- sors of Hafiz in the 8th century of the Hegira, in which also Ibn Yamin, the great kit'a-writer, 1 flourished, the highest fame was gained by the two poets of Delhi, Amir Hasan and Amir Khosrau. The latter, who died in 1325 (725 a.h.), two years before his friend Hasan, occupies the foremost place among all the Persian poets of India by the richness of his imagination, his graphic style, and the historical interest attached to his writings. Five extensive dlwans testify to his versatility in all branches of lyric poetry, and nine large mathnawis to his mastership in the epic line. Four of the latter are poetical accounts of the reigns of

1 A kk'a or mukatta'a is a poem containing moral reflections, and differs from the fcasida and ghazal only by the absence of a maˆla' or initial distich.

the emperors of Delhi, 'Ala-uddln Khilji (1296-1316), his pre- decessor Feroz Shah and his successor Kutb-uddln Mubarek Shah — the Miftdh-uljutuh, or " Key of Victories," the Kirdn- ussa'dain, or " The Conjunction of the Two Lucky Planets," the Nuh Sipihr, or " Nine Spheres," and the love-story of Khidrkhdn u Duwalrani. His other five mathnawis formed the first attempt ever made to imitate Nizami's famous Khamsah, or five romantic epopees, and this attempt turned out so well that henceforth almost all epic poets wrote quintuples of a

similar description. Khwaju KirmanI (d. 1352; 753 a.h.) was the next aspirant to Nizami's fame, with five mathnawis, among which Humdi u Humayiln is the most popular, but he had to yield the palm to 'Abd urrahman Jam! (1414-1492; 817-898 a.h.), the last classic poet of Persia, in whose genius were . summed up all the best qualities of his great r3rede- £, ater p oe t&, cessors. Many poets followed in Jami's footsteps, first of all his nephew Hatifl (see above), and either wrote whole khamsahs or imitated at least one or other of Nizami's epopees; thus we have a Laila u Majnun, for instance, by MaktabI (1490), Hilali (see above), and Ruh-ulamln (d. 1637). But their efforts could not stop the growing corruption of taste, and it was only at the court of the Mogul emperors, particularly of the great Akbar (1556-1605), who revived Sultan Mahmud's " round table," that Persian literature still enjoyed some kind of " Indian summer " in poets like Ghazall of Mashhad or Meshed (d. 1572); 'Urfi of Shlraz (d. 1591), who wrote spirited kasldas, and, like his contemporaries Wahshl and Kauthari, a mathnawl, Farhdd u Shirin; and FaidI (d. 1595), the author of the romantic poem, Nal u Daman, who also imparted new life into the ruba'I. In Persia proper only Zulall, whose clever romance of " Sultan Mahmud and his favourite Ayaz " (1592) is widely read in the East, Sa'ib (d. 1677), who is commonly called the creator of a new style in lyric poetry, and, among the most modern, Hatif of Isfahan, the singer of sweet and tasteful odes (died about 1785), deserve a passing notice.

But we cannot conclude our brief survey of the national literature of Persia without calling attention to the rise of the drama, which has only sprung up in the beginning of The Drama the nineteenth century. Like the Greek drama and the mysteries of the European middle ages, it is the offspring of n purely religious ceremony, which for centuries has been performed annually during the first ten days of the month Muharram — the recital of mournful lamentations in memory of the tragic fate of the house of the caliph 'All, the hero of the ShI'itic Persians. Most of these passion-plays deal with the slaughter of 'All's son Hosain and his family in the battle of Kerbela. But lately this narrow range of dramatic subjects has been considerably widened, Biblical stories and even Christian legends have been brought upon the Persian stage; and there is a fair prospect of a further development of this most interesting and important movement. (See further Drama: Persian.)

In the various departments of general Persian literature not touched upon in the foregoing pages the same wonderful activity has prevailed as in the realm of poetry and fiction, Historical since the first books on history and medicine appeared works. under the Samanids (see above). The most important section is that of historical works, which,

although deficient in sound criticism and often spoiled by a highly artificial style, supply us with most valuable materials for our own research. Quite unique in this respect are the numerous histories of India, from the first invasion of Sultan Mahmud of Ghazni to the English conquest, and even to the first decades of the present century, most of which have been described and partly translated in the eight volumes of Sir H. M. Elliot's History of India (1867-1878). Persian writers have given us, besides, an immense variety of universal histories of the world, with many curious and note- worthy data (see, among others, Mlrkhond's and Khwandamlr's works under MIrkhond); histories of Mahomet and the first caliphs, partly translated from Arabic originals, which have been lost; detailed accounts of all the Persian dynasties, from the Ghaznevids to the still reigning Kajars, of Jenghiz Khan and the Moguls (in Juwaini's and Wassaf's elaborate Ta'rlkhs), and

of Tlmur and his successors (see an account of the Zafarndma under Petis de la Croix) ; histories of sects and creeds, especially the famous DoMstdn, or " School of Manners " (translated by Shea and Troyer, Paris 1843); and many local chronicles of Iran and TurSn. Next in importance to history rank geography, cosmography, and travels (for instance, the Nuzhat-ulkulub, by Hamdallah Mustaufi, who died in 1340, and the translations of Istakhri's and Kazvmi's Arabic works), and the various tadhkiras or biographies of Sufis and poets, with selections in prose and verse, from the oldest of 'AufI (about 1220) to the last and largest of all, the M akhzan-ulghara'ib, or " Treasure of Marvellous Matters" (completed 1803), which contains biographies and specimens of more than 3000 poets. We pass over the well-stocked sections of philosophy, ethics and politics, of theology, law and Suflsm, of mathematics and astronomy, of medicine (the oldest thesaurus of which is the " Treasure of the shah of Khwarizam," 1×10), of Arabic, Persian and Turkish grammar and lexicography, and only cast a parting glance at the rich collection of old Indian folk-lore and fables preserved in the Persian version

of Kalllah u Dimnah (see Rudagi), of the Sindbdd- Fo/AWbre nama, the Tutinama, or ” Tales of a Parrot,” and

others, and at the translations of standard works of Sanskrit literature, the epopees of the Rdmdyana and Mahabharata, the Bhagavad-Gita, the Yoga-Vasishtha, and numerous Purdnas and Upanishads, for which we are mostly indebted to the emperor Akbar’s indefatigable zeal.

Authorities. — The standard modern discussions of Persian literature are those of E. G. Browne, Literary History of Persia (1902, seq.), and Hermann Ethe, in vol. ii. of Geiger and Kuhn’s Grundriss der iranischen Philologie (Strassburg, 1906) ; also the latter’s Hbfische und romantische Poesie der Perser (1887), and Mystisck9t didaktische und lyrische Poesie und das spatere Schriftthum der Perser (1888). See also P. Horn, Geschichte der persischen Litteralur (1901). Concise sketches of Persian poetry are contained in Sir G. Ouseley’s Biographical Notices of Persian Poets (1846); in G. L. Fliigel’s article in Ersch and Gruber’s Allgemeine Ency- klopddie (1842); in N. Bland’s papers in the ‘Journ. of the Roy. As. Soc, vii. 345 seq. and ix. 122 seq.; and in C. A. C. Barbier de Meynard’s Poesie en Perse (Paris, 1877). Real mines of informa- tion are the catalogues of A. Sprenger (Calcutta, 1854); W. H. Morley (London, 1854); Flugel (3 vols., Vienna, 1865); and C. Rieu (3 vols., London, 1879-1883). For the first five centuries of the Hegira compare Ethe’s editions and metrical translations of ” Rfldagi’s Vorlaufer und Zeitgenossen,” in Morgenlandische Forschungen (Leipzig, 1875); of Kisa’i’s songs, Firdousl’s lyrics, and Abu Sa’id b. Abu ‘1-Khair’s ruba’is, in Sitzungsberichte der bayr. Akademie (1872, p. 275 seq.; 1873, p. 622 seq.; 1874, p. 133 seq.; 1875, p. 145 seq.; and 1878, p. 38 seq.); of Avicenna’s Persian poems, in Gbttinger Nachrichten (1875, p. 555 seq.) ; and of Asadi and his munazarat, in ” Persische Tenzonen,” Verhandlungen des $ten Orientalisten-Congresses (Berlin, 1882, pt. ii., first half, p. 48 seq.); H. Zotenberg’s Chronique de Tabari (Paris, 1867-1874); Jurjani’s Wis u Ramln, ed. in the Bibl. Indica (1864) (trans, into German by C. H. Graf in Zeitschrift der morgenldndischen Gesellschaft, xxiii. 375 seq-); and A. de B. Kasimirski’s Specimen du dvwan de Menout- chehri (Versailles, 1876). On Khakani, see N. de Khanykoff’s ” M6moire,” in Journal asiatique, 6th series, vol. iv. p. 137 seq. and vol. v. p. 296 seq., and C. Salemann’s edition of his ruba’is, with Russian trans. (Petersburg, 1875); on Farid uddin ‘Attar, S. de Sacy’s edition of the Pandnama (Paris, 1819), and Garcin de Tassy’s Mantifr-uttair (Paris, 1857); on the Gulshan-i-raz, E. H. Whinfield’s edition (London, 1880); and on Amir Khosrau’s mathnawis, the abstracts given in Elliot’s History of India, iii. 524 seq.

German translations of Ibn Yamin were published by O. Schlechta-Wssehrd, Bruchstucke (Vienna, 1852); of Jaml's minor poems, by V. von Rosenzweig (Vienna, 1840); by F. Rtickert, in Zeitschrift fur die Kunde des Morgenlandes, vols. v. and vi., and Zeitschrift der d. morgenl. Gesellsch., vols, ii., iv., v., vi., xxiv., xxv. and xxix. ; and by M. Wick- erhauser (Leipzig, 1855, and Vienna, 1858); German translation of Yusufu Zalikha, by Rosenzweig (Vienna, 1824), English by R. T. H. Griffith (London, 1881); French translation of Laila u Majnun, by A. L. de Ch6zy (Paris, 1 805) , German by A. T. Hartmann (Leipzig, 1807); Hilali's " Konig und Derwisch," by Ethe\ in Morgenldnd. Stud. (Leipzig, 1870, p. 197 seq.). On the Persian drama, compare J. A. de Gobineau's Religions et philosophies dans I'Asie centrale (Paris, 1866); A. Chodzko's Thedtre person (new ed., Paris, 1878); and Ethe\ " Persische Passionspiele," in Morgenldnd. Stud., p. 174 seq.

(H. E.)

PERSIGNY, JEAN GILBERT VICTOR FIALIN, Ducde (1808- 1872), French statesman, was born at Saint-German Lespinasse (Loire) on the nth of January 1808, the son of a receiver of taxes. He was educated at Limoges, and entered the cavalry

school at Saumur in 1826, becoming marechal des logis in the 4th Hussars two years later. The share taken by his regiment in supporting the revolution of 1830 was regarded as insub- ordination, and next year Fialin was dismissed from the army. He became a journalist, and in 1833 became a strong Bonapartist, assuming the title of comte de Persigny, said to be dormant in his family. He planned the attempt on Strassburg in 1836 and that on Boulogne in 1840. At Boulogne he was arrested and condemned to twenty years' imprisonment in a fortress, shortly afterwards commuted into mild detention at Versailles, where he wrote a book to prove that the Pyramids were built to prevent the Nile from silting up. This was published in 1845 under the title, De la Destination et de Vutilitt permanente des Pyramides. At the revolution of 1848 he was arrested by the provisional government, and on his release took a prominent part in securing the election of Louis Napoleon to the presidency. With Morny and the marshal Saint Arnaud he plotted the restoration of the empire, and was a devoted servant of Napoleon III. He succeeded Morny as minister of the interior in January 1852, and later in the year became senator. He resigned office in 1854, being appointed next year to the London embassy, which he occupied with a short interval (1858-1859) until i860, when he resumed the portfolio of the interior. But the growing influence of his rival Rouher provoked his resignation in 1863, when

he received the title of duke. A more dangerous enemy than Rouher was the empress Eugenie, whose marriage he had opposed and whose presence in the council chamber he deprecated in a memorandum which fell into the empress's hands. He sought in vain to see Napoleon before he started to take over the command in 1870, and the breach was further widened when master and servant were in exile. Persigny returned to France in 1871, and died at Nice on the nth of January 1872.

See Memoires du due de Persigny (2nd ed., 1896), edited by H. de Laire d'Espagny, his former secretary; an eulogistic life, Le Due de Persigny (1865), by Delaroa; and Emile Ollivier's Empire libiral (1895, &c).

PERSIMMON, the name given to the fruits of Diospyros virginiana in the United States. The tree which bears them belongs to the order Ebenaceae, is usually from 30 to 50 ft. in height, and has oval entire, leaves, and unisexual flowers on short stalks. In the male flowers, which are numerous, the stamens are sixteen in number and arranged in pairs; the female flowers are solitary, with traces of stamens, and a smooth ovary with one ovule in each of the eight cells — the ovary is surmounted by four styles, which are hairy at the base. The fruit-stalk is very short, bearing a subglobose fruit an inch or rather more in diameter, of an orange-yellow colour, and with a sweetish astrin- gent pulp. It is surrounded at the base by the persistent calyx- lobes, which increase in size as the fruit ripens. The astringency renders the fruit somewhat unpalatable, but after it has been subjected to the action of frost, or has become partially rotted or " bletted " like a medlar, its flavour is improved. The fruit is eaten in great quantities in the southern states of America, and is also fermented with hops, corn-meal or wheat-bran into a sort of beer or made into brandy. The wood is heavy, strong and very close-grained and used in turnery. The tree is very common in the South Atlantic and Gulf states, and attains its largest size in the basin of the Mississippi. It was brought to England before 1629 and is cultivated, but rarely if ever ripens its fruit. It is easily raised from seed and can also be propagated from stolons, which are often produced in great quantity. The Chinese and Japanese cultivate another species, the Diospyros Kaki, of which there exist numerous ill-defined varieties. The fruits are larger than those of the American kind, variable in shape, but have similar properties. An astringent fluid, known as shibu, rich

PERSIS (mod. Fars, q.v.), the south-western part of Iran (Persia), named from the inhabitants, the Iranian people of the Parsa (Fars) ; their name was pronounced by the Ionians Persai, with change from a

to e, and this form has become dominant

in Greek and in the modern European languages. The natural features of Persis are described very exactly by Nearchus, the admiral of Alexander the Great (preserved by Arrian Indie. 40 and Strabo xv. 727). The country is divided into three parts, of very different character and climate: the coast is sandy and very hot, without much vegetation except date palms; it has no good harbours, and the climate is very unwholesome; the population is scanty. About 50 m. from the coast rise the chains of the mountains, through which some steep passes lead into the interior valleys (called KoCkri Hepcris, Strabo xv. 729), which lie about 5000 ft. above the sea. Here the climate is temperate, the country watered by many rivers and lakes, the soil fertile, the vegetation rich, the cattle numerous. These regions, which were thickly populated, form the real Persis of history. ” This land Persis,” says Darius, in an inscription at Persepolis, ” which Ahuramazda has given to me, which is beautiful and rich in horses and men, according to the wilt of Ahuramazda and myself it trembles before no enemy.” The third part is the north, which belongs to the central plateau, still much higher, and therefore rough and very cold in the winter. Towards the north-west it borders on the Median district of Paraetacene (about Isfahan); towards the north and north-east it soon passes into the great desert, of which only the oasis of Yezd (Isatichai in Ptolem. vi. 4, 2) is inhabitable. In the east, Persis proper is separated by a desert (Laristan) from the fertile province of Carmania (Kerman), a mountainous region inhabited by a Persian tribe. To Carmania belonged also the coast, with the islands and harbours of Hormuz and Bander Abbasi. In the west Persis borders on the mountains and plains of Elam or Susiana. For the ancient topography cf. Tomaschek, ” Beitrage zur historischen Topographie von Persien,” in Silzungsber. der Wiener Akademie, phil. CI. cii. cviii. exxi.

The Persians are not mentioned in history before the time of Cyrus; the attempt to identify them with, the Parsua, a district in the Zagros chains south of Lake Urmia, often mentioned by the Assyrians, is not tenable. The Parsua are perhaps the non- Arian tribe IIdp

The Persians of Cyrus (see Persia: Ancient History) were a vigorous race of husbandmen, living in a healthy climate, accustomed to hardship, brave and upright; many stories in Herodotus (especially ix.

122) point the contrast between their simple life and the effeminate nations of the civilized countries of Asia. They were firmly attached to the pure creed of Zoroaster (cf. Herod, i. 131 sqq. and the inscriptions of Darius). When Darius had killed the usurper Smerdis and gained the crown, a new usurper, Vahyazdata, who likewise pretended to 1 To the Pateiskhoreis belongs the lance-bearer of Darius, ” Gobryas (Gaubaruva) the Patishuvari,” mentioned in his tomb- inscription; they occur also in an inscription of Esarhaddon as Patush-ara, eastwards of Media, in Choarene at the Caspian gates; the Kyrtii are the Kurds.

be Smerdis, the son of Cyrus, rose in Yautiya, but was defeated in two battles by Darius’s generals and put to death (Behistun inscription) . Cyrus had built his capital with his palace and tomb, in Pasargadae (q.v.). Darius founded a new city about 30 m. farther south on the left bank of the Pulwar, near its confluence with the Kur, with a large terrace, on which his magnificent palace and that of his son Xerxes were built. As Pasargadae was named after the tribe in whose district it lay, so the new capital is by the Persians and Greeks simply called ” the Persians “; later authors call it Persepolis (q.v.), ” the Persian city.” Another Persian palace lay in Taoke, near the coast (Strabo xv. 728; Arrian Ind. 39; Dionys. Perieg. 1069); Gabae, which Strabo mentions besides, is Isfahan in Paraetacene and belonged already to Media.

Both in Persepolis and Pasargadae large masses of gold and silver from the tribute of the subject nations were treasured, as in Susa and Ecbatana. But Persis lies too far off from the centre of the Asiatic world to be the seat of government. Like Arabia and similar countries, it could exercise a great momentary influence in history and produce a sudden change throughout the world; but afterwards it would sink into local insignificance. So the Persian kings fixed their residence at Susa, which is always considered as the capital of the empire (therefore Aeschylus wrongly considers it as a Persian town and places the tomb of Darius here). After the reign of Xerxes, Persis and Persepolis became utterly neglected, in spite of occasional visits, and even the palaces of Persepolis remained in part unfinished. But the national feeling of the Persians remained strong. When Alexander had won the victory of Arbela, and occupied Babylon and Susa, he met (in the spring of 330) with strong resistance in Persia, where the satrap Ariobarzanes tried to stop his progress at the ” Persian gates,” the pass leading up to Persepolis. Here he set fire to the cedar roof of the palace of Xerxes as a symbol that the Greek war of revenge against the Persians had come to an end. Our best information tells us that he soon had the fire extinguished (Plut. Alex. 38); the story of Thais is a pure fiction, and we may well believe that he repented the damage he

had done (Arrian vi. 50, 1).

Alexander had planned to amalgamate the former rulers of the world with his Macedonians; but his death was followed by a Macedonian reaction. Peucestas, the new satrap of Persis, followed the example of Alexander, and thus gained a strong hold on his subjects (Diod. xix. 48) ; nor did Seleucus, to whom the dominion of the east ultimately passed (from 311 onwards), disdain the aid of the Persians; he is the only one . among the Diadochi who retained his Persian wife, Apame, daughter of Spitamenes. At the same time Seleucus and his son Antiochus I. Soter tried to introduce Hellenism into Persis. Of Greek towns which they founded here we know Alexandria in Carmania (Plin. vi. 107; Ptol. vi. 8, 14; Ammian. Marc. 23, 6, 49), Laodicea in the east of Persis (Plin. 6, 115), Stasis, ” a Persian town on a great rock, which Antiochus, the son of Seleucus, possessed ” (Steph. Byz. s.v.), Antiochia in Persis, founded apparently by Seleucus I. and peopled by Antiochus I. with immigrants called together from all Greece, as we learn from a psephisma passed by ” boule and demos ” of this town in 206 in honour of Magnesia on the Maeander (Kern, Inschrijten von Magnesia am Maeander, No. 6i = Dittenberger, Orientis gr. inscr. 233, where they are mentioned together with a great many Seleucid towns in Susiana and Babylonia, and compare Kern, No. i8 = Dittenberger, No. 231). An insurrection of the Persians against Seleucus (II.) is mentioned in two stratagems of Polyaenus (vii. 39. 40). When in 221 Molon, the satrap of Media, rebelled against Antiochus III., his brother Alexander, satrap of Persis, joined him, but they were defeated and killed by the king. Persis remained a part of the Seleucid empire down to Antiochus IV. Epiphanes, who at the end of his reign restored once more the authority of the empire in Babylonia, Susiana and Persis; perhaps a battle, in which the satrap Numenius of Mesene (southern Babylonia) defeated the Persians on the shore of Carmania on sea and land (Plin. vi. 152), belongs to this time. But after the death of Antiochus IV. (164) the

Seleucid Empire began to dissolve. While the central pro- vinces, Media and northern Babylonia, were conquered by the Parthians, Mesene, Elymais and Persis made themselves independent.

Persis never became a part of the empire of the Arsacids, although her kings recognized their supremacy when they were strong (Strabo xv. 728, 736). From the periplus of the Ery- thraean Sea 33-37 we learn

that their authority extended over the shores of Carmania and the opposite coasts of Arabia. A Persian king, Artaxerxes, who was murdered by his brother Gosithros at the age of 93 years, is mentioned in a fragment of Isidore of Charax (Lucian, Macrobii, 15). Other names occur on their coins, the oldest of which are imitations of Seleucid coins, and were perhaps struck by local dynasts under their supremacy; most of the others show the king's head with the Persian tiara, and on the reverse a fire-altar with the adoring king before it, a standard (perhaps the famous banner of the smith Kavi, which became the standard of Iran under the Sassanids), and occasionally the figure of Ahuramazda; they were first explained by A. D. Mordtmann in Zeitschrift fur Numismatik, iii., iv. and vii.; cf. Grundriss der iranischen Philol. ii. 486 seq. The legends are in Aramaic characters and Persian (Pahlavi) language; among them occur Artaxerxes, Darius (from a dynast of this name the town Darabjird, " town of Darius," in eastern Persia seems to derive its name), Narses, Tiridates, Manocihr and others; the name Vahuburz seems to be identical with Oborzos, mentioned by Polyaenus vii. 40, who put down a rebellion of 3000 settlers (ko.toi.koi.) in Persis. From the traditions about Ardashir I. we know that at his time there were different petty kingdoms and usurpers in Persis; the principal dynasty is by Tabari called Bazrangi. The coins demonstrate that Hellenism had become quite extinct in Persis, while the old historical and mythical traditions and the Zoroastrian religion were supreme. There can be no doubt that at this time the true form of Zoroastrianism and the sacred writings were preserved only in Persis, whereas everywhere else (in Parthia, in the Indo-Scythian kingdoms of the east and in the great propagandist movement in Armenia, Syria and Asia Minor, where it developed into Mithraism) it degenerated and was mixed with other cults and ideas. So the revival of Zoroastrianism came from Persis. When Ardashir I. attempted to restore the old empire of Cyrus and Darius, and in 212 a.d. rose against the Parthian king, Artabanus, his aim was religious as well as political. The new Sassa.nid Empire which he founded enforced the restored religion of Zoroaster (Zarathustra) on the whole of Iran.

The new capital of Persis was Istakhr on the Pulwar, about 9 m. above Persepolis, now Hajjiabad, where even the pre- decessors of Ardashir I. are said to have resided. It was a great city under the Sassanids, of which some ruins are extant. But it shared the fate of its predecessor; when the empire was founded the Sassanids could no longer remain in Persis but transferred their headquarters to Ctesiphon. (Ed. M.)

PERSIUS, in full Aulus Persius Flaccus (a.d. 34-62), Roman poet and satirist. According to the Life contained in the MSS., Persius was a

native of Volaterrae, of good stock on both parents' side. When six years old he lost his father, and his step-father died in a few years. At the age of twelve Persius came to Rome, where he was taught by Remmius Palaemon and the rhetor Verginius Flavus. Four years later began a close intimacy with the Stoic Cornutus. In this philosopher's pupil Lucan, Persius found a generous admirer of all he wrote. Still in early youth he became the friend of the lyric poet Caesius Bassus, whilst with Thrasea Paetus (whose wife Arria was a relative) he had a close friendship of ten years' duration and shared some travels. Seneca he met later, and was not attracted by his genius. In his boyhood Persius wrote a tragedy dealing with an episode of Roman history, and a work, the title of which is rendered uncertain by corruption in our MSS. Pithou's generally accepted reading makes the subject that of travel; the excursions with Thrasea however must have taken place after boyhood. The perusal of Lucilius revealed to Persius his

vocation, and he set to work upon a book of satires. But he wrote seldom and slowly; a premature death (uitio stomachi) prevented the completion of his task. He is described as possessed of a gentle disposition, girlish modesty and personal beauty, and living a life of exemplary devotion towards his mother Fulvia Sisenna, his sister and his aunt. To his mother and sister he left a considerable fortune. Cornutus suppressed all his work except the book of satires in which he made some slight alterations and then handed it over to Bassus for editing. It proved an immediate success.

The scholia add a few details — on what authority is, as generally with such sources, very doubtful. The Life itself, though not free from the suspicion of interpolation and undoubtedly corrupt and disordered in places, is probably trustworthy. The MSS. say it came from the commentary of Valerius Probus, no doubt a learned edition of Persius like those of Virgil and Horace by this same famous " grammarian " of Berytus, the poet's contemporary. The only case in which it seems to conflict with the Satires themselves is in its statement as to the death of Persius's father. The declaiming of a suasoria in his presence (Sat. 3. 4 sqq.) implies a more mature age than that of six in the performer. But pater might here mean "step-father," or Persius may have forgotten his own auto- biography, may be simply reproducing one of his models. The mere fact that the Life and the Satires agree so closely does not of course prove the authenticity of the former. One of the points of harmony is, however, too subtle for us to believe that a forger evolved it from the works of Persius. It requires indeed a thoughtful reading of the Life before we realize how distinct is the impression it gives of a " bookish " youth, who has never strayed far, at least in spirit, from the domestic hearth and his women-folk. And of

course this is notoriously the picture drawn by the Satires. So much better does Persius know his books than the world that he draws the names of his characters from Horace. A keen observer of what occurs within his narrow horizon, he cannot but discern the seamy side of life (cf. e.g. such hints as Sat. iii. no); he shows, however, none of Juvenal's undue stress on unsavoury detail or Horace's easy-going acceptance of human weaknesses. The sensitive, home- bred nature of Persius shows itself perhaps also in his frequent references to ridicule, whether of great men by street gamins or of the cultured by Philistines.

The chief interest of. Persius's work lies in its relation to Roman satire, in its interpretation of Roman Stoicism, and in its use of the Roman tongue. The influence of Horace on Persius can, in spite of the silence of the Life, hardly have been less than that of Lucilius. Not only characters, as noted above, but whole phrases, thoughts and situations come direct from him. The resemblance Only emphasizes the difference between the caricaturist of Stoicism and its preacher. Persius strikes the highest note that Roman satire reached; in earnestness and moral purpose rising far superior to the political rancour or good natured persiflage of his predecessors and the rhetorical indignation of Juvenal, he seems a forerunner of the great Christian Apologists. From him we learn a lesson Seneca never taught, how that wonderful philosophy could work on minds that still preserved the depth and purity of the old Roman gravilas. When the Life speaks of Seneca's genius as not attracting Persius, it presumably refers to Seneca the philosopher. Some of the parallel passages in the works of the two are very close, and hardly admit of explanation by assuming the use of a common source. With Seneca, Persius censures the style of the day, and imitates it. Indeed in some of its worst failings, straining of expression, excess of detail, exaggeration, he outbids Seneca, whilst the obscurity, which makes his little book of not seven hundred lines so difficult to read and is in no way due to great depth of thought, compares very ill with the terse clear- ness of the Epistolae morales. A curious contrast to this ten- dency is presented by his free use of " popular " words. As of Plato, so of Persius we hear that he emulated Sophron; the authority is a late one (Lydus, De mag. 1. 41), but we can at least recognize in the scene that opens Sat. 3. kinship with such work as Theocritus' Adoniazusae and the Mimes of Herodas.

Persius's satires are composed in hexameters, except for the scazcns of the short prologue above referred to, in which he half ironically asserts that he writes to earn his bread, not because he is inspired. The first satire censures the literary tastes of the day as a reflection of the

decadence of the national morals. The theme of Seneca's 114th letter is similar. The description of the recitator and the literary twaddlers after dinner is vividly natural, but an interesting passage which cites specimens of smooth versification

and the languishing style is greatly spoiled by the difficulty of appreciating the points involved and indeed of distributing the dialogue (a not uncommon crux in Persius). The remaining satires handle in order (2) the question as to what we may justly ask of the gods (cf. Plato's second Alcibiades), (3) the importance of having a definite aim in life, (4) the necessity of self-knowledge for public men (cf. Plato's first Alcibiades), (5) the Stoic doctrine of liberty (introduced by generous allusions to Cornutus' teaching), and (6) the proper use of money. The Life tells us that the Satires were not left complete; some lines were taken (presumably by Cornutus or Bassus) from the end of the work so that it might be quasi finitus. This perhaps means that a sentence in which Persius had left a line imperfect, or a paragraph which he had not com- pleted, had to be omitted. The same authority says that Cornutus definitely blacked out an offensive allusion to the emperor's literary taste, and that we owe to him the reading of the MSS. in Sat. i. 121, — " auriculas asini quis non [for Mida rex] habet ! " Traces of lack of revision are, however, still visible; cf. e.g. v. 176 (sudden transition from ambition to superstition) and vi. 37 (where criticism of Greek doctores has nothing to do with the context). The parallels to passages of Horace and Seneca are recorded in the commentaries : in view of what the Life says about Lucan, the verbal resemblance of Sat. iii. 3 to Phars. x. 163 is interesting. Examples of bold language or metaphor: i. 25, rupto iecore exierit caprificus, 60, linguae quantum sitiat cants; iii. 42, intus palleat, 81, silentia rodunt; v. 92, ueteres auiae de pulmone reuello. Passages like iii. 87, 100 sqq. show elaboration carried beyond the rules of good taste. " Popular " words: baro, cedo, ebullire, gluto, lallare, mamma, muttire, obba, palpo, stloppus. Fine lines, &c, in i. 116 sqq., ii. 6 sqq., 61 sqq., 73 sqq., iii. 39 sqq.

Authorities. — The MSS. of Persius fall into two groups, the one represented by two of the best of them, the other by that of Pithoeus, so important for the text of Juvenal. Since the publication of J. Bieger's de Persii cod. pith, rede aestimando (Berlin, 1890) the tendency has been to prefer the tradition of the latter.

The important editions are: (1) with explanatory notes: Casaubon (Paris, 1605, enlarged edition by Diibner, Leipzig, 1833); O. Jahn (with the scholia and valuable prolegomena, Leipzig, 1843); Conington (with translation; 3rd ed., Oxford, 1893) ; B. L. Gildersleeve (New York, 1875); G. Nemethy (Buda-Pesth, 1903); (2) with critical notes: Jahn-BOcheler (3rd ed., Berlin, 1893); S. G. Owen (with Juvenal, Oxford, 1902). Translations into English by Dryden (1693) ; Conington (loc. cit.) and Hemphill (Dublin, 1901). Criticism, &c, in Martha, Les Moralistes sous I'empire romain (5th ed., Paris, 1886); Nisard, Poeles latins de la decadence (Paris, 1834); Hirzel, Der Dialog (Leipzig, 1895); Saintsbury, History of Criticism, i. 248; Henderson, Life and Principate of the Emperor Nero (London, 1903) ; and the histories of Roman literature (especially Schanz, §§ 382 sqq.). A Bibliography of Persius, by M. H. Morgan (Cam- bridge, U.S.A., 1893). (W. C. Su.)

PERSON, OFFENCES AGAINST THE. This expression is used in English law to classify crimes involving some form of assault or personal violence or physical injury, i.e. offences affecting the life, liberty or safety of an individual: but it is also extended to certain offences against morality which cannot technically be described as assaults. The bulk of the offences thus classified, so far as their definition or punishment depends upon statute law, are included in the Offences Against the Person Act 1861 (24 & 25 Vict. c. 100), and in the Criminal Law Amendment Acts of 188c and 1885, and the Prevention of Cruelty to Children Act 1904. The classification in these statutes is not scientific: e.g. bigamy is within the act of 1861 (s. 57), and certain offences involving assault, e.g. robbery, are to be found in other statutes. The particular offences dealt with by the acts above named are discussed under their appropriate titles, e.g. abortion, assault, bigamy, homicide, rape, &c. In the Indian penal code most of the offences above referred to fall under the head " offences against the human body " (ch. xvi.). In his Digest of the Criminal Law Sir James Stephen includes most of these offences under the title " offences against the person, the conjugal and parental rights, and the reputation of individuals," a classification also to be found in the English draft code of 1880 and adopted in the Queensland code of 1899. In working out this classification offences not involving assault are relegated to another and perhaps more appropriate title, " offences against morality."

PERSONALITY (from Lat. persona, originally an actor's mask, from personare, 1 to sound through), a term applied in

•So Gabius Bassus in Gell. Noct. Alt. v. 7, 1. Since, however, it is

difficult to explain persona from personare (Skeat suggests by analogy from irpbjunrov the Greek equivalent !), Walde, in

philosophy and also in common speech to the identity or indi- viduality which makes a being (person) what he is, or marks him off for all that he is not. The term ” person,” which is technically used not only in philosophy but also in law, is applied in theology (Gr. Tpoo- wirov) to the three hypostases of the Trinity. It was first introduced by Tertullian, who implied by it a single individual; the Father, the Son and the Holy Ghost were three personae though of one and the same substance (unitas subslantiae) . The nature of this unity in difference exercised the minds of the early Christian theologians, and was the subject of many councils and official pronouncements, accord- ing as emphasis was laid on the unity or on the separateness of the persons. There was perpetual schism between the Unitarians and Trinitarians (see for example Sabellius). The natural sense of the word ” person ” is undoubtedly individuality; hence those who found a difficulty in the philosophic conception of the three-in-one naturally tended to lay emphasis on the distinctions between the members of the Trinity (see Heresy; Monarchianism; Logos, &c). A further theological question arises in connexion with the doctrine of immortality (q.v.), and it is argued that immortality is meaningless unless the soul of the dead man is self-conscious throughout.

In philosophy the term has an important ethical significance. The Greek moralists, attaching little importance to individual citizens as such, found the highest moral perfection in the sub- ordination of the individual to the state. Man, as itoKltlkov ˆSiov, is good only when he is a good 7roAmjs. Subsequent ethical systems on the contrary have laid stress on the moral worth of personality, finding the summum bonum in the highest realization of the self. This view is specially characteristic of the Neo-hegelian school (e.g. T. H. Green), but it belongs also in various degrees to all intuitional and idealistic systems. Utilitarian universalistic hedonism and evolutionist ethics so far resemble the Greek theory that they tend to minimize the importance of personality, by introducing ulterior reasons (e.g. the perfection of the social organism, of humanity) as the ultimate sanctions of moral principles, whereas the intuitionists by making the criterion abstract and absolute limit goodness to personal obedience to the a priori moral law.

Still more important problems are connected with the psychological significance of personality. What is the origin and character of the consciousness of the self? The conscious- ness of the identity of another person is comparatively simple; but one’s own individuality

consists partly in being aware of that individuality; a man cannot use the word ” I ” unless he is conscious of the unity of his ” self,” and yet there is involved in the word ” I ” something more than this consciousness. In what does the unity of the ” self ” consist prior to its being recognized in consciousness; how does the consciousness arise? The answer to this problem is to be found — in so far as it can be found — in the subject-object relation, in the distinction between the external world and the subjective processes of knowing and willing which that relation involves. I will something, and afterwards perceive a corresponding change within the unity of my external world. Hence, we may sup- pose, arises the consciousness of a permanent self and not-self. It should be observed that self-consciousness varies according to the intellectual development, and the term ” personality ” is usually connected only with the self-consciousness of an advanced type, not, for example, with that of an animal. Even among human beings there is considerable difference. The. most elementary form of human self-consciousness includes in the self not only the soul but also the body, while to the developed self-consciousness the physical self is part of the external or objective world. Finally it is necessary to refer to the Kantian distinction of the pure and the empirical ego, the latter (” the Me known “) being an object of thought to the former (” the I knowing “).

From the use of the term ” person ” as distinguishing the

Lateinisches etymologisches Worterbuch (1906), suggests a derivation from Greek fowij, a zone. In Roman law persona was one who had civil rights. For the ecclesiastical persona ecclesiae, see Parson.

self from the not-self arises the phrase ” personal equation ” for those peculiar characteristics or idiosyncrasies which have to be taken into account in estimating the value of an individual judgment or observation. This phrase, which is commonly used in any connexion, was first applied to the errors detected in the astronomical observations of a Greenwich observer named Kinnebrook in 1795. The recognized fact that the greater or less inaccuracy is habitual to individual observers has been investigated, e.g. by Bessel (Abhandlungen, iii. 300) and by Wundt (Physiol. Psychol.), and machines have been devised which make allowance for the error caused by the personal equation (see Micrometer).

For the psychological problem, see Psychology. For the problems connected with sub-conscious action, &c, see Subliminal Self; Trance; Hypnotism; Telepathy.

PERSONAL PROPERTY, one branch of the main division of the English law of property, the other being ” real property.” The division of property into real and personal represents in a great measure the division into immovable and movable incidentally recognized in Roman law and generally adopted since. ” Things personal,” according to Blackstone, ” are goods, money, and all other movables which may attend the owner’s person wherever he thinks proper to go ” (Comm. ii. 16). This identification of things personal with movables, though logical in theory, does not, as will be seen, perfectly express the English law, owing to the somewhat anomalous position of chattels real. In England real property is supposed to be superior in dignity to personal property, which was originally of little importance from a legal point of view. This view is the result of feudal ideas, and had no place in the Roman system, in which immovables and movables were dealt with as far as pos- sible in the same manner, and descended according to the same rules. The main differences between real and personal property which still exist in England are these. (1) In real property there can be nothing more than limited ownership; there can be no estate properly so called in personal property, and it may be held in complete ownership. There is nothing corresponding to an estate-tail in personal property; words which in real property would create an estate-tail will give an absolute interest in personalty. A life-interest may, however, be given in personalty, except in articles quae ipso usu consumuntur. Limitations of personal property, equally with those of real property, fall within the rule against perpetuities. (2) Personal property is not subject to various incidents of real property, such as rent, dower or escheat. (3) On the death of the owner intestate real property descends to the heir; personal property is divided according to the Statute of Distributions. (4) Real property as a general rule must be transferred by deed; personal property does not need so solemn a mode of transfer. (5) Contracts relating to real property must be in writing by the Statute of Frauds, 29 Car. II. c. 3, s. 4; contracts relating to personal property need only be in writing when it is expressly so provided by statute, as, for instance, in the cases falling under s. 17 of the Statute of Frauds. (6) A will of lands need not be proved, but a will of personalty or of personal and real property together must be proved in order to give a title to those claiming under it. (7) Devises of real estate fall as a rule within the Mortmain Acts (see Charity and Charities; Corporation); bequests of personal property, other than chattels real, are not within the act. (8)

Mortgages of real property need not generally be registered; mortgages of personal property for the most part require registration under the Bills of Sale Acts (see Pledge, and Bill of Sale).

Personal estate is divided in English law into chattels real and chattels personal; the latter are again divided into choses in possession and choses in action (see Chattel; Chose).

Interest in personal property may be either absolute or qualified. The latter case is illustrated by animals ferae naturae, in which property is only coextensive with detention. Personal property may be acquired by occupancy (including the accessio, commixtio, and confusio of Roman law), by invention, as patent and copy- right, or by transfer, either by the act of the law (as in bankruptcy,

judgment and intestacy), or by the act of the party (as in gift, contract and will).

There are several cases in which, by statute or otherwise, property is taken out of the class of real or personal to which it seems naturally to belong. By the operation of the equitable doctrine of conversion money directed to be employed in the purchase of land, or land directed to be turned into money, is in general regarded as that species of property into which it is directed to be converted. An example of property prima facie real which is treated as personal is an estate pur autre vie, which, since 14 Geo. II. c. 20, s. 9, 1 740-1 741 (now replaced by the Wills Act 1837, s. 6) is distributable as personal property in the absence of a special occupant. Examples of property prima facie personal which is treated as real are fixtures, heirlooms, such as deeds and family portraits, and shares in some of the older companies, as the New River Company, which are real estate by statute. In ordinary cases shares in companies are per- sonal property, unless the shareholders have individually some interest in the land as land.

The terms heritable and movable of Scots law to a great extent correspond with the real and personal of English law. The main points of difference are these. (1) Leases are heritable as to the succession to the lessee, unless the destination expressly exclude heirs, but are movable as to the Ask. (2) Money due on mortgages and securities on land is personalty in England. At common law in Scotland debts secured on heritable property are themselves heritable. But by the Titles to Land Consolidation (Scotland) Act 1868, s. 117, heritable securities are movable as far as regards the succession of the creditor, unless executors are expressly ex- cluded. They still, however, remain

heritable quoad fiscum, as between husband and wife, in computing legitim, and as far as regards the succession of the debtor. (3) Up to 1868 the heir of heritage succeeded to certain movable goods called heirship movables, which bore a strong likeness to the heirlooms of English law. This right of the heir was abolished by the act of 1868, s. 160. (4) Annuities, as. having tractum futuri temporis, are heritable, and an obligation to pay them falls upon the heir of the deceased (Watson, Law Diet. s.v. ” Annuities “).

The law in the United States agrees in most respects with that of England. Heirlooms are unknown, one reason being, no doubt, that the importance of title-deeds is much less than it is in England, owing to the operation of the Registration Acts. Long terms in some states have annexed to them the properties of freehold estates. In some states estates pur autre vie descend like real property; in others an estate pur autre vie is deemed a freehold only during the life of the grantee; after his death it becomes a chattel real. In yet other states the heir has a scintilla of interest as special occupant (Kent, Comm. iv. 27). In some states railway rolling-stock is considered as purely personal, in others it has been held to be a fixture, and so to partake of the nature of real property. Shares in some of the early American corporations were, like New River shares in England, made real estate by statute, as in the case of the Cape Sable Company in Maryland (Schouler, Law of Personal Property, i.). In Louisiana animals employed in husbandry are, and slaves were, regarded as immovables. Pews in churches are generally real property, but in some states they are made personal property by statute. The assignment of choses in action is generally permitted, and is in most states regulated by statute. (J. W.)

PERSONATION, in English law, a form of fraud consisting in a false representation by one person (by words or conduct) that he is another person living or dead. It is not an offence by the common law unless the representation is made on oath under circumstances constituting the offence of perjury, or unless the representation if not made on oath is made under circumstances amounting to a common law cheat. Personation has been made an offence by statute in the following cases: (1) where it amounts to a false pretence by words or conduct, and is done with intent to defraud, and property is by such false pretence obtained, 24 & 25 Vict. c. 96 ss. 88-90 (see False Pretences); (2) in the case of false and deceitful personation of any person or of the heir, executor, administrator, wife, widow, next of kin or relative of any person with intent fraudulently to obtain any land, estate, chattel, money, valuable security or property (37 & 38 Vict. c. 36 s. 1); (3) in the case of personation of votes at elections (see Corrupt

Practices).

The first of these offences is a misdemeanour only; the second is a felony punishable by penal servitude for life. The second offence was created in 1874 in consequence of the Tichbome case, in which under the law as it then stood it had been necessary

to prosecute the claimant for perjury. Besides the enactments above referred to there are also a number of provisions for dealing with the personation of sailors, soldiers, pensioners and owners of stock in the public funds or shares in joint-stock companies, and of persons who falsely acknowledge in the name of another recognizances, deeds or instruments, before a court or person authorized to take the acknowledgment.

PERSPECTIVE (Lat. perspicere, to see through), in mathematics the name given to the art of representing solid objects by a plane drawing which affects the eye as does the object itself. In the article Projection it is shown that if all points in a figure be projected from a fixed centre to a plane, each point on the projection will be the projection of all points on the projecting ray. A complete representation by a single projection is there- fore possible only when there is but one point to be projected on each ray. This is the case by projecting from one plane to another, but it is also the case if we project the visible parts of objects in nature; for every ray of light meeting the eye starts from that point in which the ray, if we follow its course from the eye backward, meets for the first time any object. Thus, if we project from a fixed centre the visible part of objects to a plane or other surface, then the outlines of the projection would give the same impression to the eye as the outlines of the things projected, provided that one eye only be used and that this be at the centre of projection. If at the same time the light emanat- ing from the different points in the picture could be made to be of the same kind — that is, of the same colour and intensity and of the same kind of polarization — as that coming from the objects themselves, then the projection would give sensibly the same impression as the objects themselves. The art of obtaining this result constitutes a chief part of the technique of a painter, who includes the rules which guide him under the name of perspective, distinguishing between linear and aerial perspective — the former relating to the projection, to the drawing of the outlines, the latter to the colouring and the shading off of the colours in order to give the

appearance of distance. Here we deal only with the former, which is in fact a branch of geometry consisting in the applications of the rules of projection.

§ I. Our problem is the following: There is given -a figure in space, tlie plane of a picture, and a point as centre of projection; it is required to project the figure from the point to the plane.

From what has been stated about projection (q.v.) in general it follows at once that the projection of a point is a point, that of a line a line. Further, the projection of a point at infinity in a line is in general a finite point. Hence parallel lines are projected into a pencil of lines meeting at some finite point. This point is called the vanishing point of the direction to which it belongs. To find it, we project the point at infinity in one of the parallel lines; that is, we draw through the eye a line in the given direction. This cuts the picture plane in the point required.

Similarly all points at infinity in a plane are projected to a line (see Projection: § 6) which is called the vanishing line of the plane and which is common to all parallel planes.

All lines parallel to a plane have their vanishing points in a line, viz. in the vanishing line of the plane.

All lines parallel to the picture plane have their vanishing points at infinity in the picture plane; hence parallel lines which are

parallel to the picture plane appear in the projection as parallel lines in their true direction.

The projection of a line is determined by the projection of two points in it, these being very often its vanishing point and its trace on the picture plane. The projection of a point is determined by the projection of two lines through it.

These are the general rules which we now apply. We suppose the picture plane to be vertical.

§ 2. Let (fig. i) S be the

centre of projection, where

the eye is situated, and which

in perspective is called the point of sight, ABKL the picture

plane, ABMN a horizontal plane on which we suppose the objects

to rest of which a perspective drawing is to be made. The lowest plane which contains points that are to appear in the picture is generally selected for this purpose, and is therefore called the ground plane, or sometimes the geometrical plane. It cuts the picture plane in a horizontal line AB called the ground line or base line or fundamental line of the picture. A horizontal line SV, drawn through the eye , S perpendicular to the picture, cuts the latter at a point V called the centre of the picture or the centre of vision. The distance SV of the eye from the picture is often called the distance simply, and the height ST of the eye above the ground the height of the eye.

The vanishing line of the ground plane, and hence of every horizontal plane, is got by drawing the projecting rays from S to the points at infinity in the plane — in other words, by drawing all horizontal rays through S. These lie in a horizontal plane which cuts the picture plane in a horizontal line DD' through the centre of vision V. This line is called the horizon ' in the picture. It contains the vanishing points of all horizontal lines, the centre of vision V being the vanishing point of all lines parallel to SV, that is perpendicular to the picture plane. To find the vanishing point of any other line we draw through S the ray projecting the point at infinity in the line; that is, we draw through S a ray parallel to the line, and determine the point where this ray cuts the picture plane. If the line is given by its plan on the ground plane, and its elevation on the picture plane, then its vanishing point can at once be deter- mined; it is the vertical trace of a line parallel to it through the eye (cf. Geometry: § Descriptive, § 6).

§ 3. To have construction in a single plane, we suppose the picture plane turned down into the ground plane; but before this is done the ground plane is pulled forward till, say, the line MN takes the place of AB, and then the picture plane is turned down. By this we keep the plan of the figure and the picture itself separate. In this new posi- tion the plane of the picture will be that of the paper (fig. 2). On it are marked the base line AB, the centre of vision V, and the horizon DD', and also the limits ABKL of the actual picture. These, however, need not necessarily be marked. In the plan the picture plane must be supposed to pass through A1B1, and to be perpendicular to the ground plane. If we further sup- pose that the horizontal plane through the eye which

cuts the picture plane in the horizon DD' be turned down about the

horizon, then the centre of sight will come to the point S, where, VS equals the distance of the eye.

To find the vanishing point of any line in a horizontal plane; we have to draw through S a line in the given direction and see where it cuts the horizon. For instance to find the vanishing points of the two horizontal directions which make angles of 45 ° with the horizon, we draw through S lines SD and SD' making each an angle of 45 with the line DD . These points can also be found by making VD and VD' each equal to the distance SV. The two points D, D' are therefore called the distance points.

§ 4. Let it now be required to find the perspective P of a point Pi (figs. I and 2) in the ground plane. We draw through Pi two lines of which the projection can easily be found. The most con- venient lines are the perpendicular to the base line, and a line making an angle of 45 ° with the picture plane. These lines in the ground plane are P1Q1 and P1R1. The first cuts the picture at Qi or at Q, and has the vanishing point V; hence QV is its perspective. The other cuts the picture in R lF or rather in R, and has the vanish- ing point D; its perspective is RD. These two lines meet at P, which is the point required. It [will be noticed that the line QR = QiRi = QiPi gives the distance of the point P behind the picture plane. Hence if we know the point Q where a perpendicular from a point to the picture plane cuts the latter,' and also the distance of the point behind the picture plane, we can find its perspective. We join Q to V, set off QR to the right equal to the distance of the point behind the picture plane, and join R to the distance point to the left ; where RD cuts QV is the point P required. Or we set off QR' to the left equal to the distance and join R' to the distance point D' to the right.

If the distance of the point from the picture should be very great, the point R might fall at too great a distance from Q to be on the drawing. In this case we might set off QW equal to the »th part of the distance and join it to a point E, so that VE equals the nth part of VD. Thus if QW = |QR and VE = |VD, then WE will again pass through P. It is thus possible to find for every point in the ground plane, or in fact in any horizontal plane, the perspective;

for the construction will not be altered if the ground plane be replaced by any other horizontal plane. We can in fact now find the perspective of every point as soon as we know the foot of the per- pendicular

drawn from it to the picture plane, that is, if we know its elevation on the picture plane, and its distance behind it. For this reason it is often convenient to draw in slight outlines the elevation of the figure on the picture plane.

Instead of drawing the elevation of the figure we may also proceed as follows. Suppose (fig. 3) Ai to be the projection of the plan of a point A. Then the point A lies vertically above Ai because vertical lines appear in the perspective as vertical lines (§1). If then the line VAi cuts the figure plane at Q, and we erect at Q a perpendicular in the picture plane to its base and set off on it QA2 equal to the real height of the point A above the ground plane,

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Fig. 3.

then the point A 2 is the elevation of A and hence the line A 2 V will pass through the point A. The latter thus is determined by the intersection of the vertical line through Ai and the line A2V.

This process differs from the one mentioned before in this that the construction for finding the point is not made in the horizontal plane in which it lies, but that its plan is constructed in the ground plane. But this has a great advantage. The perspective of a horizontal plane from the picture to the line at infinity occupies in the picture the space between the line where the plane cuts the picture and the horizon, and this space is the greater the farther the plane is from the eye, that is, the farther its trace on the picture plane lies from the horizon. The horizontal plane through the eye is projected into a line, the horizon; hence no construction can be performed in it. The ground plane on the other hand is the lowest horizontal plane used. Hence it offers most space for constructions, which consequently will allow of greater accuracy.

§ 5. The process is the same if we know the co-ordinates of the point, viz. we take in the base line a point O as origin, and we take the base line, the line OV, and the perpendicular OZ as axes of co-ordinates. If we then know the co-ordinates x, y, 2 measured in these directions, we make OQ = x, set off on QV a distance QA such that its real length QR = y, make QA 2 =c, and we find A as before. This process might be simplified by setting off to begin with along OQ and OZ scales in their true dimensions and along OV a scale obtained by projecting the scale on OQ from D to the line OV.

§ 6. The methods explained give the perspective of any point in space. If lines have to be found, we may determine the perspec- tive of two points in them and join these, and this is in many cases the most convenient process. Often, however, it will be advantageous to determine the projection of a line directly by finding its vanishing point. This is especially to be recommended when a number of parallel lines have to be drawn.

The perspective of any curve is in general a curve. The projec- tion of a conic is a conic, or in special cases a line. The perspec- tive of a circle may be any conic, not necessarily an ellipse. Similarly the perspective of the shadow of a circle on a plane is some conic.

§ 7. A few words must be said about the determination of shadows in perspective. The theory of their construction is very simple. We have given, say, a figure and a point L as source of light. We join the point L to any point of which we want to find the shadow and produce this line till it cuts the surface on which the shadow falls. These constructions must in many cases first be performed in plan and elevation, and then the point in the shadow has to be found in perspective. The constructions are different according as we take as

the source of light a finite point (say, the flame of a lamp), or the sun, which we may suppose to be at an infinite distance.

If, for instance, in fig. 3, A is a source of light, EHGF a vertical wall, and C a point whose shadow has to be determined, then the shadow must lie on the line joining A to C. To see where this ray meets the floor we draw through the source of light and the point C a vertical plane. This will cut the floor in a line which contains the feet Ai, Ci of the perpendiculars drawn from the points A, C to the floor, or the plans of these points. At C, where the line A1C1 cuts AC, will be the shadow of C on the floor. If the wall EHGF prevents the shadow from falling on the floor, we determine the intersection K of the line A1C1 with the base EF of the wall and draw a vertical through it, this gives the intersection of the wall with the vertical plane through A and C. Where it cuts AC is the shadow C* of C on the wall.

If the shadow of a screen CDD1C1 has to be found we find the shadow D' of D which falls on the floor; then DiD' is the shadow of DiD and D'C is the shadow on the floor of the line DC. The shadow of DiD, however, is intercepted by the wall at L. Here then the wall takes up the shadow, which must extend to D" as the shadow of a line on a plane is a line. Thus the shadow of the screen is found in the shaded part in the figure.

§ 8. If the shadows are due to the sun, we have to find first the perspective of the sun, that is, the vanishing point of its rays. This will always be a point in the picture plane; but we have to distin- guish between the cases where the sun is in the front of the picture, and so behind the spectator, or behind the picture plane, and so in front of the spectator. In the second case only does the vanishing point of the rays of the sun actually represent the sun itself. It will be a point above the horizon. In the other case the vanishing point of the rays will lie below the horizon. It is the point where a ray of the sun through the centre of sight S cuts the picture plane, or it will be the shadow of the eye on the picture. In either case the ray of the sun through any point is the line joining the perspec- tive of that point to the vanishing point of the sun's rays. But in the one case the shadow falls away from the vanishing point, in the other it falls towards it. The direction of the sun's rays may be given by the plan and elevation of one ray.

For the construction of the shadow of points it is convenient first to draw a perpendicular from the point to the ground and to find its shadow on the ground. But the shadows of verticals from a point at infinity will be parallel ; hence they have in perspective a vanishing

point Li in the horizon. To find this point, we draw that vertical plane through the eye which contains a ray of the sun. This cuts the horizon in the required point Liand the picture plane in a vertical line which contains the vanishing point of the sun's rays themselves. Let then (fig. 4) L be the vanishing point

Fig. 4. of the sun's rays, Li be that of their projection in a horizontal plane, and let it be required to find the shadow of the vertical column AH. . We draw ALi and EL; they meet at E', which is the shadow of E. Similarly we find the shadows of F, G, H. Then E'F'G'H' will be the shadow of the quadrilateral EFGH. For the shadow of the column itself we join E' to A, &c, but only mark the outlines; F'B, the shadow of BF, does not appear as such in the figure.

If the shadow E has to be found when falling on any other surface we use the vertical plane through E, determine its intersection with the surface, and find the point where this intersection is cut by the line EL. This will be the required shadow of E.

§ 9. If the picture is not to be drawn on a vertical but on another plane — say, the ceiling of a room — the rules given have to be slightly modified. The general principles will remain true. But if the picture is to be on a curved surface the constructions become somewhat more complicated. In the most general case conceivable it would be necessary to have a representation in plan and eleva- tion of the figure required and of the surface on which the projection has to be made. A number of points might also be found by calculation, using co-ordinate geometry. But into this we do not enter. As an example we take the case of a panorama, where the surface is a vertical cylinder of revolution, the eye being in the axis. The ray projecting a point A cuts the cylinder in two points on opposite sides of the eye, hence geometrically speaking every point has two projections; of these only the one lying on the half ray from the eye to the point can be used in the picture. But the other has sometimes to be used in constructions, as the projection of a line has to pass through both. Parallel lines have two vanish- ing points which are found by drawing a line of the given direction through the eye; it cuts the cylinder in the vanishing points required. This .operation may be performed by drawing on the ground the plan of the ray through the foot of the axis, and through the point where it cuts the cylinder a vertical, on which the point required must lie. Its height above is easily found by making a drawing of a vertical section on a reduced scale.

Parallel planes have in the same manner a vanishing curve. This will

be for horizontal planes a horizontal circle of the height of the eye above the ground. For vertical planes it will be a pair of generators of the cylinder. For other planes the vanishing curves will be ellipses having their centre at the eye.

The projections of vertical lines will be vertical lines on the

cylinder. Of all ether lines they will be ellipses with the centre at the eye. If the cylinder be developed into a plane, then these ellipses will be changed into curves of sines. Parallel lines are thus represented by curves of sines which have two points in common. There is no difficulty in making all the constructions on a small scale on the drawing board and then transferring them to the cylinder.

§ 10. A variety of instruments have been proposed to facilitate perspective drawings. If the problem is to make a drawing from nature then a camera obscura or, better, Wollaston's camera lucida may be used. Other instruments are made for the construction of perspective drawings. It will often happen that the vanishing point of some direction which would be very useful in the construc- tion falls at a great distance off the paper, and various methods have been proposed of drawing lines through such a point. For some of these see Stanley's Descriptive Treatise on Mathematical Drawing Instruments. (O. H.)

PERSPIRATION (Lat. per, through, and spirare, to breathe), the excretion of sweat from the sweat-glands of the skin. Sweat is a clear colourless neutral or slightly alkaline fluid containing 2% of solids. Under pathological conditions, sugar urea and other substances are found. The secretion of sweat is constantly going on, the activity of the sweat-glands being under control of the central nervous system. The only func- tion of sweat is the regulation of the heat discharge from the body. The chief morbid conditions of the sweat-glands are excessive sweating (Hyperidrosis) and foetid sweating {Bromi- drosis). Excessive sweating is a symptom observed in various diseases, such as tuberculosis and rheumatic fever, but it may exist apart from such conditions, and either be general, affecting the whole body, or confined to a part, such as the axillae, head, hands, feet, or, as in some rare instances, the one half of the body. Excessive perspiration may often be prevented by the cold bath, and by tonics, such as iron, quinine, strychnia, &c. Locally, the use of astringent lotions of vinegar or a weak solution of lead will also be of service. Foetid sweating most

frequently affects the feet, specially in those who have much fatigue, and is apparently due to rapid decomposition in the perspiration which has saturated the stockings; these should be frequently changed and the feet washed several times a day, dried carefully, and dusted with some antiseptic powder.

PERTAB (or Partab) SINGH, Sir, maharaja of Idar (1844-), native Indian soldier and statesman, belonging to the Rah tor Rajputs of the Jodha class, was born in 1844, being the son of Maharaja Takht Singh, ruler of Marwar (or Jodhpur). In 1878 and again in 1879 he was chief minister of Jodhpur. In the following year he accompanied the British mission to Afghanistan, and on his return he carried out many judicious reforms and administered Jodhpur with remarkable success. He visited England to take part in the celebration of the 1887 Jubilee of Queen Victoria's reign. He served on the staffs of Sir William Lockhart and General Elles in the Tirah and Momand expeditions in 1897-98, was slightly wounded, was mentioned in despatches, and promoted to the rank of full colonel. He won the reputation of being one of the keenest sportsmen and the best riders that even Rajputana has produced. When it was decided to send a force from India to China in 1900 to relieve the foreign embassies besieged in Peking, Sir Pertab Singh at once offered the services of the Jodhpur Lancers, and himself accompanied them. His father rendered good services to the British government in the Mutiny, and Pertab Singh always cherished the memory of the protection given to Jodhpur by the East India Company in 1818. His services to the empire in India were universally recognized. From Queen Victoria he received the honour of knighthood and the Bath and the Star of India; from King Edward VII. the distinction of "aide-de-camp"; and the university of Cambridge gave him the degree of LL.D. From his own state of Jodhpur he obtained the title of Maharaja-Dhiraj. In 1901 he succeeded to the rulership of the state of Idar.

PERTH, EARLS AND DUKES OF. The Scottish title of earl of Perth was bestowed upon James, 4th Lord Drummond (d. 1611) in 1605. His ancestor Sir John Drummond (d. 1519) had been created Lord Drummond in 1488. The 1st earl's great- oephew, James, 4th earl and 1st duke of Perth (1648-1716),

was a son of James, the 3rd earl (c. 1615-1675). When John Maitland, duke of Lauderdale, was virtually the dictator of Scotland, Perth was among his opponents, and after Lauderdale's retirement in 1680 he was one of the committee of seven which managed Scottish affairs. He was made justice-general and extra- ordinary lord of session in 1682, and was lord chancellor of Scotland from 1684 to 1688. As a convert

to Roman Catholi- cism after the death of Charles II., he stood high in the favour of James II. Perth, who is credited with the introduction of the thumbscrew,was very unpopular with the Scottish people, and dur- ing the Revolution of 1688 he was imprisoned at Stirling. Released from captivity in 1693 he joined James II. at St Germains, and was made duke of Perth, a titular dignity only after the exiled king's death in 1701. His son James (c. 1675-1720) was with James II. in Ireland, and led the cavalry at the battle of Sheriff- muir. He was attainted in 1715, but claimed the dukedom of Perth after his father's death. His son James (1713-1746), regarded by friends and dependants as the 3rd duke of Perth, fought for the Young Pretender at Prestonpans and Culloden. His brother and heir, John, the 4th duke (c. 1716-1747), also joined Charles Edward, and fought at Falkirk and Culloden. The titular dukedom became extinct when the sixth holder, Edward, another son of the 1st duke, died in 1760.

The earldom was then claimed by Edward's cousin, James Lundin (1 707-1 781), a grandson of the 1st titular duke of Melfort, who was a brother of the 1st duke of Perth and took the name of Drummond. His son James (1744-1800) secured the Drum- mond estates in 1783, and was created a British peer as Lord Perth and Baron Drummond in 1797. On his death without sons in July 1800 his barony became extinct, but the claim to the earldom of Perth was inherited by his kinsman, the 4th titular duke of Melfort, and his descendants (see below). The Drummond estates, however, passed to the baron's daughter Clementina (d. 1865), afterwards the wife of Peter Robert, 20th Lord Willoughby de Eresby, and thence to her descendant the earl of Ancaster.

The 1st duke's brother, John (c. 1650-1715), earl of Melfort, rose to favour under Charles II. about the same time as his brother; like him, too, he became a Roman Catholic in 1686. In 1684 he was made secretary of state for Scotland; in 1686 he was created earl of Melfort by James II., and during his reign he took a leading part in Scottish affairs. After the Revolution of 1688 his great influence with James II. and with Mary of Modena drew upon him the hatred both of the French and of the Irish. He was with James II. at St Germains, but lost his former ascendancy, and died in Paris on the 25th of January 1715. In 1694 he was made duke of Melfort, and all his titles were held under the singular condition that they should descend to the children of his second wife, Euphemia (d. 1743), daughter of Sir Thomas Wallace, in preference to his children by his first wife, Sophia Lundin, who were Protestants. In 1 701 Melfort was recognized as a French peer, the due de Melfort, by Louis XIV. In 1695 he had been attainted, but his titles were claimed by John (1682-1754), his eldest son by his

second wife, who shared in the rising of 1715- In 1800 John's grandson, James Louis, 4th titular duke of Melfort, claimed the earldom of Perth. This claim was unsuccessful, but in 1853 George (1807-1902), nominally 6th duke of Melfort, obtained a reversal of the various attainders, and his own recognition as earl of Perth and Melfort. The succeeding earl was his kinsman, William Huntly Drummond, Viscount Strathallan (1871-).

See Sir R. Douglas, The Peerage of Scotland ; and Histories of Noble British Families, vol. ii., edited by H. Drummond (1846).

PERTH, the capital of Western Australia, situated on the Swan River, 12 m. by rail from the sea at Fremantle, and about 1700 m. W.N.W. of Melbourne. It is the seat of both Anglican and Roman Catholic bishops, and has two cathedrals. The fashionable street is St George's Terrace; in it are situated the public library, the government boys' school, the stock exchange, the town-hall, the government offices and the parliament build- ings. Between it and the broad reach of the river known as Perth Water lie the governor's residence and domain. The

town-hall, built entirely by convict labour, stands on an emi- nence in the very heart of the city; opposite to it are the govern- ment offices, housed in a four-storeyed structure in the style of the French Renaissance. The mint, opened in 1899, is a massive freestone building. There are a public library, built as a memorial of Queen Victoria's Jubilee in 1887, a Scots college, two good theatres, a mechanics' institute, a museum, and a fine Wesleyan church-house, known as Queen's Hall. The Perth Park, containing about 1200 acres, is connected by tram with the city, and in it is a well-equipped observatory. There are several smaller parks and squares in the city, while the esplanade gardens are a feature of the place, being thrown out like a pier into Perth Water. There is a good cricket ground, and three race-courses are in easy reach. South Perth, on the other side of the river, is connected by bridges and steam ferry; and adjoining the city on the north-west are the suburban municipalities of Leederville and Subiaco. Outlying suburbs are Belmont, Victoria Park, Burswood, Claremont, Cottesloe, Peppermint Grove and Bayswater. The city is lighted by electricity, and has a good service of electric trams. Perth has an agreeable climate, the mean temperature is 64-9° F., and the average rainfall 33 in. Perth was founded in 1829, received its municipal charter in 1856, and was created a city in 1880. Between

1891 and 1901 the growth of the city was remarkedly rapid; in 1891 the population was only 8447, but in 1901 it had grown to 27,471 in the city proper, and to 36,199 including the suburbs.

PERTH, a city, and royal, municipal and police burgh, and county town of Perthshire, Scotland, 32 m. N. by W. of Edin- burgh direct, and 47! m. by the North British railway, via the Forth Bridge and Kinross Junction. Pop. (1901), 33,566. It is situated on the right bank of the Tay, between the meadows of the North Inch (98 acres) and those of the South Inch (72 acres), both laid out as public parks. The river is crossed by St John's Bridge of nine arches, completed in 1772 from the designs of John Smeaton and widened a century later; by Victoria Bridge, a modern structure connecting South Street with Dundee Road; and farther south (at the end of Tay Street) by a footway alongside of the viaduct belonging to the Caledonian railway. Of earlier bridges one, which crossed at High Street, was swept away by the flood of 1621, and another, constructed by General Wade in 17 23-1 733, was apparently the predecessor of Smeaton's bridge. On the left bank of the river lie the suburb of Bridgend and Kinnoull Hill (729 ft.). To the south are the wood-clad heights of Moncrieffe Hill (725 ft.), Magdalenes Hill (596 ft.), Kirkton Hill (540 ft.) and Craigie Wood (407) ft. In the river are Friarton or Moncrieffe Island and the Stanners.

Notwithstanding the importance of Perth in former times, almost the sole relic of the past is the church of St John the Baptist, a large Decorated cruciform building surmounted by a massive square central tower 155 ft. high. The original edifice is believed to have been erected in the time of Columba, but the transept and nave of the existing structure date from the early part of the 13th century, the choir from the 15th. The church was restored in 1891, and' is now divided into the East, Middle and West churches. The silver-gilt communion cup used in the Middle Church is said to have been presented by Queen Mary. In May 1559 John Knox preached in St John's his famous sermon in denunciation of idolatry. The Dominican or Blackfriars' monastery, founded by Alexander II. in 1231, occupied a site near the west end of St John's Bridge; in what is now King Street stood the Carthusian monastery, founded by James I. in 1425; the Franciscan or Greyfriars' monastery, founded in 1460 by Laurance, first Lord Oliphant, stood on the present Greyfriars' cemetery; the Carmelite or Whitefriars' monastery, founded in 1260, stood west of the town. The tombstone of James I. and his queen, who were buried in the Charterhouse, was afterwards removed to St John's East Church. During the period between the beginning of the 12th century and the assassination of James I. in 1437, many of the Scottish parlia-

ments were held in Perth. The building in which they met stood off High Street and was only cleared away in 1818, its

site being occupied by the Freemasons' Hall. The earl of Gowrie's palace, built in 1520, stood in spacious grounds near the river and was removed in 1805 to provide room for the county buildings. The castle of Perth stood on the north of High Street, not far from St John's. It was probably built about 860 and demolished about 1400. The Spey or Spy tower, the most important fortress on the city wall, guarded the south gate close to the river, but it was taken down early in the 19th century. The market cross, erected in High Street in 1669 to replace the older cross which Cromwell destroyed, was removed in 1765 as an obstruction. The huge fortress, 466 ft. square, which Cromwell erected in 1651 on the South Inch, close to the river and the Greyfriars' burying-ground, was demolished in 1663. The house of Catherine Glover, the " Fair Maid of Perth," still stands in Curfew Row. James VI. 's Hospital, founded in 1569, occupies the site of the Carthusian monastery, the original structure having been pulled down by Cromwell's orders. The pensioners now live out and the hospital has been converted into artisans' dwellings. Among modern public buildings the principal are St Ninian's Episcopal Cathedral, in the Early Middle Pointed style, an important example (completed 1890) of the work of William Butterfield (1814-1900); the municipal buildings (1881); the city-hall; the Marshall Memorial Hall (1823), housing the public library and the museum of the Perth Literary and Antiquarian Society; the Perthshire natural history museum; the Sandeman public library (1898), founded by a bequest of Professor Sandeman of Owens College, Manchester. The general prison for Scotland, south of the South Inch, was originally erected in 1812 as a depot for French prisoners, but was remodelled as a convict prison in 1840 and afterwards enlarged. North-west of the city are the military barracks built in 1793- 1794. Besides the regula'r elementary schools there are the Perth Academy (1807) with which was subsequently amalgamated the Burgh Grammar School, an institution supposed to date from the 12th century; Sharp's institute (i860); the Stewart's free school, an industrial school for girls, and the Fechney industrial school. The charitable institutions comprise the royal infirmary, in the Italian style, considerably enlarged since its foundation in 1836; the Murray royal lunatic asylum in Bridgend; the Hillside House in Kinnoull and the small-pox hospital.

From the south the city is entered by the North British railway and the Caledonian railway (which also runs west . to St Fillans, east to Dundee and north-west to Aberdeen); and from the north by the Highland railway, the three systems utilizing a general station in the

south-west of the town. During the season there is communication with Dundee and other river ports by steamer. The navigation of the stream is considerably obstructed by sandbanks, but vessels of 200 tons can unload at the quays, which, with the town and Friarton harbours, lie below the South Inch. The greatest tidal rise is 13 ft. The chief imports are Baltic timber, coal, salt and manure; and the exports, manufactured goods, grain, potatoes and slates. Perth has long been famous for its dyeing and bleaching, the bleach-fields being mostly situated outside of the city, in convenient proximity to the Tay and Almond. The other leading industries include manufactures of gauge-glasses, ink, muslins, India shawls, jute goods, woollens and winceys, floorcloth, and boots and shoes. There are iron foundries, breweries, distilleries, rope and sail works, coach- building yards, steam joinery works, and brick and tile works. The salmon fisheries of the Tay yield a substantial revenue. Perth is under the jurisdiction of a town council, with a lord provost and bailies, and returns one member to parliament.

History. — During the time that it was occupied by the Romans, a period estimated at 320 years, the city was called Victoria; but shortly after their withdrawal it seems to have borne the Celtic appellation of Aber-tha (" at the mouth of the Tay "). The transition to the latinized form Bertha and later to Perth (the Gaelic name being Peart) appears obvious. On the conversion of the original Pictish inhabitants and the dedication of the first church to St John the Baptist, the town

was designated St Johnstoun, and it continued to be known indifferently by this name and that of Perth down to the 17th century. Roman remains have often been found in excavations carried out within the existing boundaries, which suggests that the Roman settlement was at least twenty feet below the present surface. The obscurity of the early annals of the town is explained by the circumstance that Edward I. caused the records to be removed. Perth is stated to have been a burgh in 11 06 and was made a royal burgh by William the Lion in 1 2 10. During the Scottish wars of the Independence its fortifications were strengthened by Edward I. (1298). Robert Bruce several times ineffectually attempted to seize it, but in 1311 he succeeded in scaling the walls during a night attack. This was the fourth and most brilliant of the seven sieges which the city has sustained. Taken by Edward III. in 1335, it was recaptured in 1339. In 1396 the combat between the Clan Chattan and the Clan Quhele,

described in Scott's Fair Maid of Perth, took place on the North Inch in presence of Robert III. and his queen, Annabella Drummond. The Blackfriars' monas- tery was the scene of the murder of James I. by Walter, earl of Atholl, in 1437. In consequence Perth lost its status as capital, in which it had succeeded to Scone, and the Parliament Courts were transferred to Edinburgh in 1482. Cowrie Palace was the scene of the mysterious " Gowrie " conspiracy against James VI. in 1600. The town was taken by Montrose in 1644, by Cromwell in 1651, and was occupied by Viscount Dundee in 1689. In 1715 the Old Pretender was proclaimed king at the Mercat Cross (Sept. 16), and the chevalier himself appeared in the city in the following January, only to leave it precipitately on the approach of the earl of Argyll. Prince Charles Edward spent a few days in Perth from the 3rd of September 1745. In both rebellions the magistrates took the side of the Crown and were supported by the townsfolk generally, the Jacobites drawing their strength mainly from the county noblemen and gentry with their retainers. Since then the city has devoted itself to the pursuits of trade and commerce. Perth was visited by plague in 1512, 1585-1587, 1608 and 1645; by cholera in 1832; and the floods of 1210,1621, 174Q, 1773 and 1814 were exceptionally severe.

Authorities. — Maidment, The Chronicle of Perth from 1210 to 1668 (1831); Penney , Traditions of Perth (1836) ; Lawson, The Book of Perth (1847); Peacock, Perth, its Annals and Archives (1849); Samuel Cowen, The Ancient Capital of Scotland (1904).

PERTH AMBOY, a city and port of entry of Middlesex county, New Jersey, U.S.A., at the mouth of the Raritan river, on Ruritan Bay and Staten Island Sound, about 15 m. S. by W. of Newark. Pop. (1910 census) 32,121. It is served by the Pennsylvania, Lehigh Valley, Central of New Jersey and Staten Island Rapid Transit railways, and by boats to New York City. It is connected by a railway bridge (C.R.R. of N.J.) and by a foot and wagon bridge with South Amboy, on the south shore of the Raritan. Perth Amboy has a good harbour, shipyards and dry-docks. In the city still stands Franklin Palace (erected in 1764-17 74), the home of William Franklin (1729-1813), a natural son of Benjamin Franklin and the last royal governor of New Jersey. In the vicinity is the Bartow House, in which William Dunlap (1766-1839), the art historian, made his first drawings. Other buildings of historic interest are the Parker Castle (c. 1729), a centre of Loyalist influence at the time of the War of Independence, and the Kearny Cottage, the home of " Madam Scribblerus," a half- sister of Captain James Lawrence. The city has various manu- factures, the factory product in 1905 being valued at $34,800,402. Clay is obtained in the vicinity, and large shipments of coal are made. Perth Amboy

was founded in 1683. It was at first called Amboy after the original Indian name; in 1684 the proprietors named it Perth in honour of James, earl of Perth (1648-1716), one of their number, and a few years later the two names were combined. From 1686 until the end of the pro- prietary government in 1702 Perth Amboy was the capital of the province of East Jersey, and during the period of royal

government the general assembly and supreme court of New Jersey met alternately here and at Burlington. Perth Amboy was incorporated as a city in 17 18, and received a new charter in 1784, and another in 1844, the last being revised in 1870. The township of Perth Amboy was incorporated in 1693 and in 1844 was included in the city.

PERTHES, FRIEDRICH CHRISTOPH (1772-1843), German publisher, nephew of Johan Georg Perthes (q.v.), was born at Rudolstadt on the 21st of April 1772. At the age of fifteen he became an apprentice in the service of Adam Friedrich Bohme, a bookseller in Leipzig, with whom he remained for about six years. In Hamburg, where he settled in 1793 as an assistant to the bookseller B. G. Hoffmann, he started in 1796 a bookselling business of his own, and in 1798 he entered into partnership with his brother-in-law, Johann Heinrich Besser (1775-1826). By his marriage in 1797 with a daughter of the poet, Matthias Claudius, he was brought into intimate relation with a group of Protestant writers, who exercised a powerful influence on the growth of his religious opinions. This, however, did not prevent him from being on friendly terms with a number of eminent Roman Catholic authors. Perthes was an ardent patriot; and during the period of Napoleon's supremacy he distinguished himself by his steady resistance to French preten- sions. His zeal for the national cause led him, in 1810-1811, to issue Das deutsche Museum, to which many of the foremost publicists in Germany contributed. For some time the French made it impossible for him to live in Hamburg; and when, in 1814, he returned to that city he found that his business had greatly diminished. In 1821, his wife having died, he left Hamburg, transferring his business there to his partner, and went to Gotha, where he established what ultimately became one of the first publishing houses in Germany. It was owing to his initiation that the Borsenverein der deutschen Buchhandler (Union of Ger- man Booksellers) in Leipzig was founded in 1825. When the foundation-stone of the fine building of the Union was laid in 1834, Perthes was made an honorary freeman of the city of Leipzig, and in 1840 the university of Kiel conferred upon him the degree of doctor of philosophy. Perthes died at Gotha on the 18th of May 1843. His Life was written by his son, Klemens Theodor Perthes (1809-1867), professor of law in the university of Bonn, and author of Das deutsche

Staatsleben vor der Revolution (Hamburg and Gotha, 1845), an d D as Herbergswesen der Handwerksgesellen (Gotha, 1856, and again 1883), whose son Hermann Friedrich Perthes (1840-1883) was the founder of the Fridericianum at Davos Platz. The publishing business at Gotha was carried on by Perthes's younger son, Andreas, (1813-1890) and his grandson, Emil (1841-), until 1889, when it was handed over to a company.

See also O. Adler, Friedrich and Karoline Perthes (Leipzig, 1900).

PERTHES, JOHAN GEORG JUSTUS (1 749-1816), German publisher, was born at Rudolstadt on the nth of September 1749. In 1785 he founded at Gotha the business which bears his name (Justus Perthes). In this he was joined in 1814 by his son Wilhelm (1793-1853), who had been in the establishment of Justus' nephew, Friedrich Christoph Perthes, at Hamburg. On the death of Justus at Gotha on the 2nd of May 1816, Wilhelm took entire control of the firm. He laid the foundation of the geographical branch of the business, for which it is chiefly famous, by publishing the Hand-atlas (181 7-1823) of Adolf Stieler (1775-1836). Wilhelm Perthes engaged the collaboration of the most eminent German geographers of the time, including Heinrich Berghaus, Christian Gottlieb Reichard (1758-1837), who was associated with Stieler in the compilation of the atlas, Karl Spruner (1803-1892) and Emil von Sydow (1812-1873). The business passed to his son Bernard Wilhelm Perthes (182 1- [image] who was associated with August Petermann (under whose direction the well-known penodical Petermanns Mitteilungen was founded) and Bruno Hassenstein (1839-1902); and subse- quently to his son Bernard (1857-). In 1863 the firm first issued the Almanack de Gotha, a statistical, historical and genealogical annual (in French) of the various countries of the

world; and in 1866 the elaborate Geographisches Jahrbuch was produced under the editorship of Ernst Behm (1830-1884), on whose death it was continued under that of Professor Hermann Wagner.

PERTHSHIRE, an inland county of Scotland, bounded N. by the shires of Inverness and Aberdeen; E. by Forfarshire; S.E. by the Firth of Tay and the counties of Fife and Kinross; S. by the shires of Clackmannan and Stirling; S.W. by the coun- ties of Stirling and Dumbarton; W. by Argyllshire and N.W. by Inverness-shire. It is the fourth largest county

in Scotland, having an area of 1,59s, 774 acres, or 2493-4 sq. m., including the island of Mugdrum in the Firth of Tay. By far the greater part of the county is mountainous. Including the hills on the confines of Inverness-shire and Argyllshire, there are at least fifty mountains exceeding 3000 ft. in height. Of these the most familiar are Ben Lawers (3984 ft.) near Loch Tay, Ben More (3843) east of Crianlarich, Ben Lui (3708) on the Argyllshire border, Schiehallion (3547) south of Loch Rannoch, Ben Vannoch (3125) west of Loch Lyon, and Ben Chonzie (3048) near the head of Glen Almond. Of the immense number of hills of lesser altitude there may be mentioned four that have been popularized by the Lady of the Lake — Ben Ledi (2875) and Uam Var (2179) near Callander, and Ben Venue (2393) and Ben A'an (1750), guardians of the Trossachs. The Ochils divide Perthshire from the shires of Clackmannan, Kinross and Fife. The chief stream is the Tay, which rises on the Argyllshire frontier and discharges into the North Sea off Buddon Ness, after a course of 117m., being thus the longest river in Scotland. Its head-waters are the Fillan and Dochart, and among its affluents are, on the right, the Bran, Almond and Earn and, on the left, the Lyon, Tummel, rising in Argyllshire and receiving the Garry on its left, and Isla. The Earn flows out of Loch Earn and enters the Firth of Tay 6| m. below Perth. The Forth, the principal natural boundary of the shire on the south, properly belongs to Stirlingshire, in which it rises, but its leading left-hand affluents are Perthshire rivers, namely, the Teith, the Goodie, issuing from the lake of Menteith, and the Allan, rising in the Ochils near Sheriffmuir. All the lakes are narrow , scarcely one exceeding a mile in width. Loch Ericht, belonging partly to Inverness-shire, is 14! m. long. Loch Tay (145 m. long), situated about the centre, is the largest lake in the county. In the south are the series of lakes which the Lady of the Lake has rendered famous — Loch Vennachar (4! m. long), Loch Achray (1 J- m. long), Loch Katrine (about 8 m. long) ; to the west of Aberfoyle is Loch Ard (3 m. long) and to the east Lake Men- teith (i| m. long). Nearly all the glens possess striking natural features, among them, from south to north, being Glens Artney, Almond, Dochart, Ogle, Lochay, Lyon, Garry, Shee, Bruar and Tilt; while the Trossachs, Killiecrankie, Birnam and Leny are the loveliest passes in the Highlands. The low-lying country is represented mainly by Strathmore, Strath Gartney, Strath- allan, noted for its annual " gathering " or games, Strathearn, Strath Bran, Strath Tay and Strath Fillan, but more particularly by the fertile alluvial belts of the Carse of Gowrie, on the northern shore of the Firth of Tay, and the Carse of Stirling. The Moor of Rannoch on the borders of Argyllshire is a sterile boulder-strewn waste, and Flanders Moss, to the south-east of Lake Menteith, is a vast boggy tract, which is, however, being gradually

reclaimed and brought under cultivation.

Geology. — The Highland portion of this county is built up of a great series of schists and metamorphosed rocks grouped as ” Dal- radian ” or Eastern schists. The general direction of the strike of these rocks is W.S.W.E.N.E. They are cut off from the Old Red Sandstone, which occupies most of the remainder of the county, by the great fault which traverses the county somewhat to the north of Aberfoyle and Crieff. But for some distance north and e»e. t of Crieff the boundary between these two formations is an unconformable one. In the neighbourhood of the fault line the Highland schists are less metamorphosed than they are farther north ; about Comrie and Callander they consist of shales, greywackes and igneous rocks with radiolarian cherts’and black shales that are sug gestive of the rocks of Arenig age in south Scotland. At Aberfoyle, Comrie and Dunkeld roofing slates are worked and massive lime- stones occur in Glen Tilt, Pitlochry, Callander, Blair Atholl, Loch Rannoch and other places. A gritty series comes on above the

slates and is well seen capping the summit of Ben Vorlich. A great variety of schists form the bulk of the series; but granite masses appear in their midst as at Loch Rannoch, Loch Ericht and Glen Tilt, and there are numerous acid and intermediate dikes which are themselves traversed by later basaltic dikes. The Old Red Sandstone consists in the lower portion mainly of coarse volcanic agglomerates and lava flows followed by conglomerates, sandstones and marls. The lowest beds are exposed along the crest of the Ochil Hills which like the Sidlaw Hills are anticlinal in structure, while between the Ochils and the Highland fault the rocks are folded into syncline; near the fault they become very steeply inclined and even inverted, and it is interesting also to note that the sediments become coarser as the fault is approached. The Upper Old Red Sandstone is well exposed near the Bridge of Earn and it extends beneath the marine platform of the Carse of Gowrie. The rocks are mainly red sandstones and marls, let down between two parallel east and west faults but between the Bridge of Earn and Forgandenny, west of the tract, they are seen to rest unconformably upon the lower division. Small outliers of Car- boniferous rocks (lower) occur on the north of the Ochils. The marks of ice action left by the Glacial epoch are abundant and striking in Perthshire; moraines are common in the Highland glens, as those at the head of the Glengarry on borders of Loch Katrine; ice-scratched surfaces are found on the Sidlaw Hills, the Ochils, Kinnoull Hill and elsewhere; and erratic blocks of stone, such as ” Samson’s Putting Stone,” a mass of Highland schist resting on a hill of Old Red Sandstone near Coilantogle, are widely distributed. Old high level

marine beaches form terraces far up several of the larger streams, and the Carse of Gowrie, as already indicated, is formed by the beach at the 50-ft. level. The gravel cones poured out at the mouths of many of the glens which open on the south of the Ochils on to the 100-ft. or 50-ft. beaches are often the site of villages.

Climate and Agriculture. — The mountainous territory is extremely wet, the rainfall for the year varying from 93 in. in Glengyle at the head of the Loch Katrine to 37 in. at Pitlochry and 23 in. at Perth. Winter and autumn are the rainiest seasons. The temperature is remarkably constant everywhere, averaging 47 ° F. for the year, January being the coldest month (36-5° F.) and July the hottest (59° F.). Only a little more than one-fifth of the total area is under cultivation, and of this nearly one-third is in permanent pasture, while in addition there are about 930,000 acres of hill pasturage. The arable land is chiefly in the drier regions of the east and south-east, the soil for the most part being fertile. Light soils prevail in the lower undulating districts; clay and alluvial land occur in the Carse of Gowrie, the Carse of Stirling and the lower reach of Strathearn below and above Bridge of Earn. The best heavy carse land is very rich and productive, but requires to be thoroughly worked, limed and manured, being well adapted for wheat. A considerable area is occupied by orchards, the light quick soil of Tayside and the upper districts of Menteith being admirably fitted for apples. The number of holdings is slightly in excess of 5000 and of these the majority are under 50 acres each, chiefly in the Highland valleys and near the villages and small towns. Of grain, oats is the predominating crop, but barley and wheat are also grown. Two-thirds of the area devoted to green crops is occupied by turnips, the rest by potatoes. Most of the horses raised, chiefly Clydesdales, are used solely for agricultural purposes. Although dairy-farming is not an important industry, a large number of cows, principally Ayrshires, are kept on the lowland farms, the herds of the straths and mountain pastures being most usually West Highlands or Kyloes. Perthshire, next to Argyllshire, still carries the heaviest flocks in Scotland. _ Black- faced is the principal breed in the Grampians, but there is also a large number of Cheviots and South Downs, and Leicesters are common on the lower runs. Only one-seventeenth of the surface is under wood. This is well up to the proportion of the other Scottish counties, but compares unfavourably with the conditions existing in 1812, when 203,880 acres were under wood, of which 61,164 were planted and 142,716 natural. In Breadalbane and Menteith there are remains of the ancient Caledonian forest. Perthshire affords exceptional facilities for sport with rod and gun. The fochs and rivers abound with salmon and trout, while hardly

any of the streams have suffered pollution from industries or manufactures. The deer forests, exceeding 100,000 acres in area, are frequented by red deer and roe deer, and on the extensive moors and in the woods are found grouse, pheasants, partridge, capercailzie, woodcock, ptarmigan and hares.

Industries. — The shire is famous for its dyeing and bleaching works, which are situated in Perth and its vicinity ; but, apart from these, there are flax and jute mills at Rattray and cotton mills at Stanley, Deanston and Crieff; woollens, linen, jute and tartans are woven at Dunblane, Alyth, Blairgowrie, Coupar-Angus, Auchter- arder and Crieff; tanning is carried on at Blackford, Coupar-Angus and Crieff; there are breweries and distilleries at various places, as at Auchterarder and Logierait; granite, freestone, limestone and slate are quarried at different centres; and there are sawmills and flour-mills.

Communications. — The Caledonian railway main line to Aberdeen enters the county near Dunblane and runs in a north-easterly

direction via Perth. At Crieff junction it sends off a branch to Crieff and at Perth branches to Dundee and Lochearnhead. The Stirling to Oban line of the same company crosses the shire from Dunblane to Tyndrum. The Highland railway runs northwards from Perth, and has a branch at Ballinluig to Aberfeldy. Branches of the North British railway reach Perth from Mawcarse in Kinross- shire and Ladybank in Fifeshire; part of the branch from Buchlyvie on the Forth and Clyde line runs to Aberfoyle, and the West Highland railway skirts the extreme west of the shire. At several points coaches supplement the rail. In the tourist season steamers ply on Loch Tay and Loch Katrine, and there is a service on the Tay between Perth and Dundee.

Population and Administration. — In 1891 the population amounted to 122,185 and in 1901 to 123,283, or 49 persons to the sq. m. The rate of increase was the smallest of any Scottish county for the decade. In 1901 there were 78 persons speaking Gaelic only and 11,446 Gaelic and English. The chief towns are Perth (pop. 32,873), Crieff (5208), Blairgowrie (3378), Dunblane (2516), Auchterarder (2276), Coupar-Angus (2064), Rattray (2019). Among lesser centres may be mentioned Aber- feldy (1508), a favourite resort on the Tay, well known for the falls of Moness, mentioned in Robert Burns's song " The Birks of Aberfeldy "; Abernethy (623), the seat of an early bishopric,

retaining one of the three ancient round towers in Scotland; Alyth (1965); Callander (1458); Comrie (1118), a holiday resort on the Earn; Pitlochry (1541); and Stanley (1035), on the Tay. Of old the county was divided into hereditary jurisdictions, which were abolished in 1748, and in 1795 the county was divided into districts for administrative purposes, a system which obtained until 1889, when county and district councils were established. The sheriffdom is divided into an eastern and western district, the seat of the one being Perth and the other Dunblane. For parliamentary purposes the county is also divided into an eastern and a western division, and the city of Perth returns a member. The shire is under school-board jurisdiction, and there are secondary schools at Perth and Crieff, and Trinity College in Glen Almond is a well-known public school on the English model.

History. — In 83 Agricola explored the lands beyond the Forth and in the following year penetrated to the Grampians, defeating the Caledonians under Galgacus with great slaughter. The site of this battle is conjectured by William Forbes Skene to have been near Meikleour, south of Blairgowrie, but other writers have referred it to Dalginross, near Comrie; to Ardoch (where there are the most perfect remains of a Roman encampment in the British Isles) ; and even as far north as Raedykes, near Stone- haven in Kincardineshire. The Romans did not pursue their victory, and the Picts were left undisturbed for a considerable period. At this time, according to Ptolemy, the territory now known as Perthshire was occupied by three tribes — the Damnonii, the Venicones and the Vacomagi. The Damnonii held Menteith, Strathearn and Fothrif (the western part of modern Fife and Kinross), with Alauna (Allan), just above Stirling, Lindum (Ardoch) and Victoria (believed by some authorities to be Lochore in Fifeshire, and by others to be Perth city), as their chief towns. The Venicones inhabited north-western Fife and the adjoining tract of Perthshire, with Orrea (probably Abernethy) as their chief town and a station at Ardargie. The Vacomagi dwelt in the Highland region, with stations at Inch-tuthil (a peninsula in the Tay above Kinclaven) and Banatia (Buchanty on the Almond). The growing lawlessness of the southern Picts and their frequent raids in the more settled country in the south at last compelled the attention of the emperor Severus. He arrived in Britain in 208, but though he led a strong army to the shores of the Moray Firth, he was unable effectually to subdue the tribesmen. The road he constructed ran from Stirling to Ardoch (where there are notable remains) and thence by Strageath, near Muthill, where it branched north-westwards to Dalginross and Buchanty, and north-eastwards to Perth and so to the Grampians. When the Romans finally withdrew

from Britain, the Picts established their capital first at Abernethy and then at Forteviot. Aber- nethy was the centre of the Celtic church after the conversion of the natives by Ninian, Palladius and other missionaries in the

5th and 6th centuries. On the burning of Forteviot by the Norsemen in the 8th century, the seat of Pictish government was removed to Scone. In the latter half of the 9th century Dunkeld — to which Kenneth Macalpine had brought some of the relics of Columba from Iona — became the scene of monastic activity, the abbot succeeding to the position of the abbot of Iona, and exercising great influence for nearly a hundred years. The Danes periodically harried the land, but a crushing defeat at Luncarty in 961 put an end to their inroads in this quarter. In 1054 Macbeth was defeated at Dunsinane by Siward, earl of Northumberland, who had invaded Scotland in the interest of his kinsman, Duncan's son, who, on the death of the usurper three years later, ascended the throne as Malcolm III., called Canmore. With Malcolm's accession the Celtic rule of the monarchy of Scone came to an end. Nevertheless, the Scottish sovereigns (excepting James II., James III. and Mary) continued to be crowned at Scone, which also retained the position of capital until the beginning of the 12th century, when it was displaced by Perth. From the time of Alexander I. (d. 1124), therefore, the history of the shire is merged in that of the county town, with the exception of such isolated incidents as the removal of the Coronation Stone from Scone to Westminster in 1296, the defeat of Robert Bruce at Methven in 1306, the battle of Dupplin in 1332, the victory of Dundee at Killiecrankie in 1689 and the indecisive contest at Sheriffmuir in 1715. Among archaeological remains may be mentioned the hill-fort on Dunsinane; the ship-barrow of the vikings at Rattray, weems (or earth-houses) in the parishes of Monzie, Alyth and Bendochy; the witch-stone near Cairnbeddie, one of the numerous spots where Macbeth is alleged to have met the witches, but probably a sepulchral memorial of some forgotten battle; standing stones near Pitlochry, and an extraordinary assemblage of sculptured stones at Meigle.

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PERTINAX, PUBLIUS HELVIUS (a.d. 126-193), Roman emperor, the son of a charcoal-burner, was born at Alba Pompeia in Liguria. From

being a teacher of grammar he rose through many important offices, both civil and military, to the consulate, which he held twice. Chosen, at an advanced age and against his will, on the 1st of January 193, to succeed Commodus, he was himself assassinated in a mutiny of the soldiers, on the 28th of March 193.

PERTZ, GEORG HEINRICH (1795-1876), German historian, was born at Hanover on the 28th of March 1795. From 1813 to 1818 he studied at Gottingen, chiefly under A. H. L. Heeren. His graduation thesis, published in 1819, on the history of the Merovingian mayors of the palace, attracted the attention of Baron Stein, by whom he was engaged in 1820 to edit the Carol- ingian chroniclers for the newly-founded Historical Society of Germany. In search of materials for this purpose, Pertz made a prolonged tour through Germany and Italy, and on his return in 1823 he received at the instance of Stein the principal charge of the publication of Monumenta germaniae hislorica, texts of all the more important historical writers on German affairs down to the year 1500, as well as of laws, imperial and regal archives, and other valuable documents, such as letters, falling within this period. Pertz made frequent journeys of explora- tion to the leading libraries and public record offices of Europe, publishing notes on the results of his explorations in the Archiv. der Gesellsch. f. deutsche Geschichtskunde (1824-1872). In 1823 he had been made secretary of the archives, and in 1827 principal keeper of the royal library at Hanover; from 1832 to 1837 he edited the Hannoverische Zeitung, and more than once sat as a representative in the Hanoverian second chamber. In 1842 he was called as chief librarian to Berlin, where he shortly afterwards was made a privy councillor and a member of the Academy of Sciences. He resigned all his appointments in

1874, and on the 7th of October 1876 died at Munich while attending the sittings of the historical commission.

The Monumenta began to appear in 1826, and at the date of his resignation 24 volumes folio {Scriptores, Leges, Diplomata) had appeared. This work for the first time made possible the existence of the modern school of scientific historians of medieval Germany. In connexion with the Monumenta Pertz also began the publication of a selection of sources in octavo form, the Scriptores rerum germanicarum in usum scholarum ; among his other literary labours may be mentioned an edition of the Gesam- melte Werke of Leibnitz,

and a life of Stein (Leben des Ministers Freiherrn vom Stein (6 vols., 1849-1855); also, in an abridged form, Aus Steins Leben (2 vols., 1856).

PERU

Scale

Reference to Departments & Provinces

1. Turabez (Province)

2. Piura ,

3. Lambayeque

4. Cajamarca

5. Amazonas

6. Loreto

7. San Martin

8. Libertad

9. Ancachs

10. Huanuco

11. Callao (Province)

12. Lima

13. Junin

14. Huancavefica

15. Ica

16. Ayacucho

17. Apurimac

18. Cuzco

19. Puno

20. Arequipa

21. Moquegna (Province)

PERU (apparently from Biru, a small river on the west coast of Colombia, where Pizarro landed), a republic of the Pacific coast of South America, extending in a general N.N.W.-S.S.E. direction from lat. 3″ 21′ S. to about 18 S., with a sea-coast of 1240 m. and a width of 300 to 400 m., exclusive of territories in dispute. Its area in 1906, including Tacna and Arica, and other disputed territories occupied by neighbouring states, was officially estimated at 1,732,422 sq. kilometers, or 676,638 sq. m.; exclusive of these territories, the area of Peru is variously

estimated at 439,°°° to 480,000 sq. m., the Gotha measurements being 1,137,000 sq. kilometers, or 439,014 sq. m.

With the exception of parts of the Ecuador, Brazil and Bolivia frontiers, all the boundary lines have been disputed and referred to arbitration — those with Colombia and Ecuador to the king of Spain, and that with Bolivia to the president of Argentina, on which a decision was rendered on the 9th of July 1909. There have been misunderstandings with Ecuador in regard to some small areas in the Chira valley, but it may be assumed that the line is fixed between Santa Rosa (3 21′ S.) on the Gulf of Guayaquil, and the Chinchipe river, a tributary of the

Marafion. At the junction of the Cauches with that river, that Ecuadorean line descends the Chinchipe to the Marafion, and the Peruvian ascends to a point where it is intersected by a line following the eastern Cordillera northward to the head-waters of the Caqueta, or Japura, which forms the northern boundary down to the Brazilian frontier. This claim covers all eastern Ecuador and a large part of south-eastern Colombia. In 1903 there were encounters between small bodies of Peruvian and Ecuadorean troops on the disputed frontier. After arbitration by the king of Spain had been agreed upon, the question was con- sidered by two Spanish com- missions, and modifications favouring Peru were recom- mended. These became known prematurely, and in May 19 10 war was threatened between Peru and Ecuador in spite of an offer of mediation by the United States, Brazil and Argentina under the Hague Convention.

From the Japura southward to the Amazon, in 4 13′ 21″ S., 69° 35′ W., and thence up the Javary, or Yavari, to its source in 7 8′ 4 “_S., 73° 46′ 3°” W., as determined by a mixed commission, the line has

been definitely settled. From near the source of the Javary, or lat. 7° 1′ 17″ S., a line running eastward to the Madeira in lat. 6° 52′ is" S., which is half the distance between the mouth of the Mamore and the mouth of the Madeira, divides the Spanish and Portuguese possessions in this part of South America, according to the pro- visions of the treaty of San Ildefonso of 1777. This line has been twice modified by treaties between Bolivia and Brazil, but without the consent of Peru, which claimed all the territory eastward to the Madeira between the above-mentioned line and the Beni-Madidi rivers, the line of demarcation following the Pablo-bamba, a small tributary of the Madidi, to its source, and thence in a straight line to the village of Conima, on Lake Titicaca. The dispute with Brazil relates to the territory acquired by that republic from Bolivia in 1 86 7 and 1 903 , and was to be settled, according to an agreement

Emery Walker sc.

PERU

of 1908, by direct negotiation if possible, or, failing this, by arbitration. The decision of the president of Argentina of the pth of July 1909, in regard to the remainder of this extensive territory, was a compromise, and divided it into two nearly equal parts. The line adopted starts from Lake Suches, the source of a small river of that name flowing into the north of Lake Titicaca, crosses the Cordillera by the Palomani to the Tambopata river, follows that stream to the mouth of the Lanza, thence crosses to the source of the Heath river, which forms the dividing line down to its junction with the Madre de Dios, descends that river to the mouth of the Torosmonas, thence in a straight line north-westerly to the intersection of the Tahua- manu river by the 69th meridian, and thence north on that meridian to the Brazilian frontier. This decision at first gave offence to the Bolivians, but friendly overtures from Peru led to its acceptance by both parties with the understanding that modifications would be made in locating the line wherever actual settlements had been made by either party on territory awarded to the other. With Chile the dejure line is that of the Camarones ravine which separated the old department of Moquegua (includ- ing the provinces of Tacna and Arica) from that of Tarapaca. The de facto line is that of the Sama river (usually dry), which opens on the coast a little south of Sama point, near 18° S., Chile retaining possession of the two above-mentioned provinces in violation of the treaty of Ancon, which she forced upon her defeated antagonist.

Physical Geography— Peru is divided longitudinally into three well-defined regions, the coast, the sierra and the montafia. The coast,

extending from the base of the Western or Maritime Cor- dillera to the Pacific Ocean, consists of a sandy desert crossed at intervals by rivers flowing through narrow, fertile valleys. The sierra is the region of the Andes, and is about 250 m. in width. It contains stupendous chains of mountains, elevated plains and table-lands, warm and fertile valleys and ravines. The montafia is the region of tropical forests within the valley of the Amazon, and skirts the eastern slopes of the Andes.

The coast has been upraised from the ocean at no very distant geological epoch, and is nearly as destitute of vegetation as the The Coast. Afrlcan Sahara. It is watered, however, by fifty streams whlcn cross the desert at intervals. Half ot these have their origin in the summits of the Andes, and run with a permanent supply of water into the ocean. The others rising in the outer range, which does not reach the snow-line and receives less moisture, carry a volume of water to the sea during the rainy season, but for the rest of the year are nearly dry The absence of rain here is ascribed to the action of the lofty uplands u u ,, ndes on the trade-wind, and to the influence of the cold Humboldt current sweeping northward along the west coast of the continent. The south-east trade-wind blows obliquely across the Atlantic Ocean until it reaches Brazil. By this time it is heavily laden with vapour, which it continues to bear along across the continent depositing it and supplying the sources of the Amazon and La Plata. When the wind rises above the snow-capped Andes the last particle of moisture is wrung from it that a very low temperature can extract. Passing the summit of that range, it rushes down as a cool and dry wind on the Pacific slopes beyond. Meeting with no evaporating surface, and with no temperature colder than that to which it is subjected on the mountain-tops, this wind reaches the ocean before it becomes charged with fresh moisture. The constantly prevailing wind on the Peruvian coast is from the south, which is a cold wind from the Humboldt current As it moves north it becomes gradually warmed and takes up moisture instead of depositing it as rain. From November to April there are usually constant dryness, a clear sky, and con- siderable, though by no means oppressive, heat. From June to September the sky is obscured for weeks together by fog, which is often accompanied by drizzling rain called garua. At the time when it is hottest and driest on the coast it is raining heavily in the Andes, and the rivers are full. When the rivers are at their lowest, the garua prevails on the coast. The climate of various parts of the coast, however, is modified by local circumstances.

The Western Cordillera, overhanging the Peruvian coast, contains a long line ot volcanic mountains, most of them inactive, but their presence is probably connected with the frequent and severe

earthquakes, especially in the southern section of the coast. Since 1570 seventy violently destructive earthquakes have been recorded on the west coast of South America, but the register is incomplete in its earlier part. The most terrible was that of 1746, which destroyed Callao, on the 28th of October, and there were 220 shocks in the following twenty-four hours. The town was overwhelmed by a vast wave which rose 80 ft.; and the shocks continued until the following Februarv. On the 13th of August 1868 an earthquake

nearly destroyed Arequipa, and great waves rolled in upon the ports of Arica and Iquique. On the 9th of May 1877 nearly all the southern ports were overwhelmed.

The deserts between the river-valleys vary in extent, the largest being more than 70 m. across. On their western margin steep cliffs generally rise from the sea, above which is the tablazo or plateau, in some places slightly undulating, in others with ridges of considerable height rising out of it. The surface is generally hard, but in many places there are large accumulations of drifting sea-sand. The sand usually forms isolated hillocks, called medanos, of a half-moon shape, having their convex sides towards the trade- wind. They are from 10 to 20 ft. high, with an acute crest, the inner side perpendicular, the outer with a steep slope. Sometimes, especially at early dawn, there is a musical noise in the desert, like the sound of distant drums, which is caused by the eddying of grains of sand in the heated atmosphere, on the crests of the medanos.

_ Apparently the deserts are destitute of all vegetation ; yet three kinds of herbs exist, which bury themselves deep in the earth, and survive long periods of drought. One is an amar- _ anthaceous plant, whose stems ramify through the Flora.

sandhills; the other two are a Martynia and an Aniseia, which maintain a subterranean existence during many years, and only produce leafy stems in those rare seasons when sufficient moisture penetrates to the roots. In a few hollows which are reached by moisture the trees of the desert find support, the algarrobo (Prosopis horrida), a low tree of very scraggy growth, the vichaya (Capparis crotonoides)., and the zapote del perro (Colico- dendrum scabridum), mere shrubs. Near the Cordillera and on its lower slopes a tall branched cactus is met with, and there are Sahcornias and Salsolas near the coast. But, when the mists set m, the low hills near the coast bordering the deserts, which are called lomas, undergo a change as if

by magic. A blooming vege- tation of wild flowers for a short time covers the barren hills. Near Lima one of the low ranges is brightened by the beautiful yellow hly called amancaes (Ismene Amancaes). The other flowers of the lomas are the papita de San Juan (Begonia geranifolia) , with red petals contrasting with the white inner sides, valerians, the beautiful Bomarea ovata, several species of Oxalis, Solanum and crucifers. But this carpet of flowers is very partially distributed and lasts but a short time.

The valleys form a marvellous contrast to the surrounding desert. A great mass of pale-green foliage is usually composed of the algarrobo trees, while the course of the river is marked by lines or groups of palms, by fine old willows {Salix humboldtiana) , fruit-gardens, and fields of cotton, Indian corn, sugar-cane and alfalfa (lucerne). In some valleys there are expanses of sugar-cane, in others cotton, whilst in others vineyards and olive-yards pre- dominate. The woods of algarrobo are used for pasture, cattle and horses enjoying the pendulous yellow pods.

For purposes of description the coast-region of Peru may be divided into five sections, beginning from the north: (1) the Piura region; (2) the Lambayeque and Trujillo section; _ .. .

(3) the Santa valleys; (4) the section from Lima to Nasca ; f”*™” 8 ”’ (5) the Arequipa and Tacna section. the Coast ‘

(1) The great desert-region of Piura extends for nearly 200 m. from the Gulf of Guayaquil to the borders of the Morrope Valley and is traversed by three rivers— the Tumbes, Chira and Piura’ the two former receiving their waters from the inner Cordillera’ and breaking through the outer range. It is here that the coast of South America extends farthest to the westward until it reaches Capes Blanco and Parifia, and then turns southward to the Bay of Paita The climate of Piura is modified by the lower latitude, and also by the vicinity of the forests of Guayaquil. Fog and garua are much less frequent than in the coast-region farther south, while rain sometimes falls. At intervals of three or four years there are occasional heavy showers of rain from February to April. (2) The second section of the coast-region includes the valleys of the Morrope the Chiclayo, and Lambayeque, the Sana, the Jequetepeque the Chicama, Moche, Viru and Chao. With the intervening , deserts this section extends over 200 m. All these valleys, except Morrope and Chao, are watered by rivers which have their sources far in the recesses of the mountains, and which furnish an abundant supply in the season when irrigation is needed. (3) The third section, also extending for 200 m., contains the valleys of Santa,

Nepena, Casma, Huarmey, Fortaleza, Pativilca, Supe and Huaura The river Santa, which rises in the lake of Conococha, 12,907 ft above the sea, and has a length of 180 m., is remarkable for its long course between the outer and central ranges of the Andes In a trough known as the " Callejon de Huaylas," 100 m. in length It then breaks through in a deep gorge, and reaches the sea after a course of 35 m. over the coast-belt, and after fertilizing a rich valley. The Santa and Nepena valleys are separated by a desert 8 leagues in width, on the shores of which there is a good anchorage in the bay of Ferrol, where the port of Chimbote is the terminus of a railway. The Nepena, Casma, Huarmey, Fortaleza and Sup6 rivers rise on the slope of an outer range called the Cordillera Negra, and are consequently dry during the great part of the year. Wells are dug in their beds, and the fertility of the valleys is thus main- tained. The Pativilca (or Barranca) river and the Huaura break

through the outer range from their distant sources in the snowy Cordillera, and have a perennial supply of water. There are 9 leagues of desert between the Nepena and Casma, 16 between the Casma and Huarmey, and 18 between the Huarmey and Fortaleza. The latter desert, much of which is loose sand, is called the Pampa de Mata Cavallos, from the number of exhausted animals which die there. Between the Supe and Pativilca is the desert called the Pampa del Medio Mundo. (4) The next coast-section extends for over 300 m., from Chancay to Nasca, and includes the rivers of Chancay or Lacha, of Carabayllo, Rimac, Lurin, Mala, Canete, Chincha, Pisco or Chunchanga, lea and Rio Grande. Here the maritime range approaches the ocean, leaving a narrower strip of coast, but the fertile valleys are closer and more numerous. Those of Carabayllo and Rimac are connected, and the view from the Bay of Callao extends over a vast expanse of fertile plain bounded by the Andes, with the white towers of Lima in a setting of verdure. Lurin and Mala are smaller valleys, but the great vale of Canete is one green sheet of sugar-cane ; and narrow strips of desert separate it from the fertile plain of Chincha, and Chincha from the famous vineyards of Pisco. The valleys of lea, Palpa, San Xavier and Nasca are rich and fertile, though they do not extend to the sea ; but between Nasca and Acari there is a desert 60 m. in width. (5) The Arequipa and Tacna section extends over 350 m. and comprises the valleys of Acari, Atequipa, Atico, Ocofia, Majes or Camana, Quilca, with the interior valley of Arequipa, Tambo, Ilo or Moquegua, It6 or Locumba, Sama, Tacna, and Azapa or Arica. Here

the Western Cordillera recedes, and the important valley of Arequipa, though on its western slope, is 7000 ft. above the sea and 90 m. from the coast. Most of the rivers here have their sources in the central range, and are well supplied with water. The coast-valleys through which they flow, especially those of Majes and Locumba, are famous for their vineyards, and in the valley of Tambo there are extensive olive plantations.

The coast of Peru has few protected anchorages, and the headlands are generally abrupt and lofty. These and the few islands are Island frequented by sea-birds, whence come the guano- s ‘ deposits, the retention of ammonia and other fertilizing properties being due to the absence of rain. The islets off the coast are all barren and rocky.

The most northern is Foca, in 5° 13′ 30″ S., near the coast to the south of Paita. The islands of Lobos de Tierra and Lobos de Afuera (2) in 6° 27′ 45″ S. and 6° 56′ 45″ S. respectively, are off the desert of Sechura, and contain deposits of guano. The two Afuera islands are 60 and 36 m. respectively from the coast at the port of San Jos6. The islets of Macabi, in 7° 49′ 20″ S., also have guano deposits, now practically exhausted. The two islets of Guanape, surrounded by many rocks, in 8° 34′ S., contain rich deposits. Chao rises 450 ft. above the sea, off the coast, in 8° 46′ 30″ S. Corcobado is in 8° 57′ S. La Viuda is off the port of Casma, in 9 23′ 30″ S. ; and Tortuga is 2 m. distant to the north. Santa Islet lies off the bay of Cosca, in 9 1′ 40”, and the three high rocks of Ferrol in 9° 8′ 30″ S. Farther south there is the group of islets and rocks called Huaura, in II°27’S., the chief of which are El Pelado, Tambillo, Chiquitana, Bravo, Quitacalzones and Mazorque. The Hormigas are in 11° 4′ S. and ii° 58’, and the Pescadores in 1 1 ° 47′ S. The island of San Lorenzo, in 12 4′ S., is a lofty mass, 4! m. long by 1 broad, forming the Bay of Callao; its highest point is 1050 ft. Off its south-east end lies a small but lofty islet called Fronton, and to the south-west are the Palomitas Rocks. Horadada Islet, with a hole through it, is to the south of Callao Point. Off the valley of Lurin are the Pachacamac Islands, the most northern and largest being half a mile long x The next, called San Francisco, is like a sugar-loaf, perfectly rounded at the top. The others are mere rocks. Asia Island is farther south, 17 m. north-west of Cerro Azul, and about a mile in circuit. Pisco Bay contains San Gallan Island, high, with a bold cliff outline, 2§ m. long by 1 broad, the Ballista Islets, and farther north the three famous Chincha Islands, whose vast guano deposits are now exhausted. South of the entrance to Pisco Bay is Zarate Island, and farther south the white level islet of Santa Rosa. The Infiernillo rock is quite black, about 50 ft. high, in the form of a sugar-loaf, a mile west of the point of Santa Maria, which is near the mouth of the lea river.

Alacran is a small islet off the lofty ” morro ” of Arica. All these rocks and islets are barren and uninhabitable. The more common sea-birds are the Sula variegata or guano-bird, a large gull called the Larus modestus, the Pelecanus thayus, and the Sterna Ynca, a beautiful tern with curved white feathers on each side of the head. The rarest of all the gulls is also found on the Peruvian coast, namely, the Xema furcatum. Sea-lions (Otaria forsteri) are common on the rocky islands and promontories. The region of the Cordilleras of the Andes is divided into puna, or lofty uninhabited wilderness, and sierra, or inhabitable moun- „, tain slopes and valleys. This great mountain-system,

erra. running south-east to north-west, consists of three chains or Cordilleras. The two chains, which run parallel and near each other on the western side, are of identical origin, and have been separated by the ‘action of water during many centuries. On these chains are the volcanoes and many thermal springs. The narrow space between them is for the most part, but not always, a cold and lofty region known as the puna containing alpine lakes — the sources of the coast-rivers. The great eastern chain, rising from

the basin of the Amazon and forming the inner wall of the system, is of distinct origin. These three chains are called the Western or Maritime Cordillera, the Central Cordillera and the Andes. Paz Soldan and other Peruvian geographers give the name of Andes, par excellence, to the Eastern Cordillera.

The Maritime Cordillera of Peru has no connexion with the coast ranges of Chile, but is a continuation of the Cordillera Occidental of Chile, which under various local names forms the eastern margin of the coastal desert belt from Atacama northward into Peru. It contains a regular chain of volcanic peaks overlooking the coast- region of Tarapaca. Chief among them are the snowy peak of Lirima (19,128 ft.) over the ravine of Tarapaca, the volcano of Isluga overhanging Camina, the Bolivian peak of Sajama, and Tocora (19,741 ft.) near the Bolivian frontier. In rear of Moquegua there is a group of volcanic peaks, clustering round those of Ubinas and Huaynaputina. A great eruption of Huaynaputina began on the 15th of February 1600 and continued until the 28th. But generally these volcanoes are quiescent. Farther north the Misti volcano rises over the city of Arequipa in a perfect cone to a height of over 20,013 ft., and near its base are the hot sulphur and iron springs of Yura. The peak of Sarasara, in Parinacochas (Ayacucho) is 19,500 ft. above the sea, and in the mountains above Lima the passes attain a height of more than 15,000 ft. In latitude io° S. the maritime chain separates into two branches,

which run parallel to each other for 100 m., enclosing the remarkable ravine of Callejon de Huaylas — the eastern or main branch being known as the Cordillera Nevada and the western as the Cordillera Negra. On the Nevada the peak of Huascan reaches a height of 22,051 ft. The Huandoy peak, above Carhuaz, rises to 21,088 ft. ; the flualcan peak, overhanging the town of Yungay, is 19,945 ft. high; and most of the peaks in this part of the chain reach a height of 19,000 ft. During the rainy season, from October to May, the sky is generally clear at dawn, and the magnificent snowy peaks are clearly seen. But as the day advances the clouds collect. In most parts of the Peru- vian Andes the line of perpetual snow is at 16,400 ft. ; but on the Cor- dillera Nevada, above the Callejon de Huaylas, it sinks to 15,400 ft. This greater cold is caused by the intervention of the Cordillera Negra, which intercepts the warmth from the coast. As this lower chain does not reach the snow-line, the streams rising from it are scanty, while the Santa, Pativilca and other coast-rivers which break through it from sources in the snowy chain have a greater volume from the melted snows. At the point where the river Santa breaks through the Cordillera Negra that range begins to subside, while the Maritime Cordillera continues as one chain to and beyond the frontier of Ecuador.

The Central Cordillera is the true water-parting of the system. No river, except the Maranon, breaks through it either to the east or west, while more than twenty coast streams rise on its slopes and force their way through the maritime chain. The Central Cordillera consists mainly of crystalline and volcanic rocks, on each side of which are aqueous, in great part Jurassic, strata thrown up almost vertically. In 14 30′ S. the central chain is connected with the Eastern Andes by the transverse mountain-knot of Vilcafiota, the peak of that name being 17,651 ft. above the sea. The great inland basin of Lake Titicaca is thus formed. The central chain continues to run parallel with the Maritime Cordillera until, at Cerro Pasco, another transverse knot connects it with the Andes in io° 30′ S. lat. It then continues northward, separating the basins of the Maranon and Huallaga; and at the northern frontier of Peru it is at length broken through by the Maranon flowing eastward.

The Eastern Andes is a magnificent range in the southern part of Peru, of Silurian formation, with talcose and clay slates, manjf quartz veins and eruptions of granitic rocks. Mr Forbes says that the peaks of Illampu (21,709 ft.) and Illimani (21,014 ft-) m Bolivia are Silurian and fossiliferous to their summits. The eastern range is cut through by six rivers in Peru, namely, the Maranon and Hual- laga, the Perene, Mantaro, Apurimac, Vilcamayu and Paucartambo, the last five being

tributaries of the Ucayali. The range of the Andes in south Peru has a high plateau to the west and the vast plains of the Amazonian basin to the east. The whole range is highly auriferous, and the thickness of the strata is not less than 10,000 ft. It is nowhere disturbed by volcanic eruptions, except at the very edge of the formation near Lake Titicaca, and in this respect it differs essentially from the Maritime Cordillera. To the eastward numerous spurs extend for varying distances into the great plain of the Amazons.

The Andes lose their majestic height to the northward; and beyond Cerro Pasco the eastern chain sinks into a lower range between the Huallaga and Ucayali. But throughout the length of Peru the three ranges are clearly defined.

For purposes of description the sierra of Peru may be divided into four sections, each embracing portions of all three ranges. The first, from the north, comprises the upper basins s ˆ. t of the Maranon and the Huallaga, and is 350 m. long by &£££' . 100 broad. The second extends from the Knot of Cerro Pasco to Ayacucho, about 200 m., including the Lake of Chinchay-cocha and the basin of the river Xauxa. The third or Cuzco section extends 250 m. to the Knot of Vilcafiota with the basins of the Pampas, Apurimac, Vilcamayu and Paucartambo. The fourth is the basin of Lake Titicaca.

Lake Junin, or Chinchay-cocha, in the second section, is 36 m. long by 7 m. broad, and 13,232 ft. above the sea. Its marshy banks afe overgrown with reeds and inhabited by numerous water- fowl. From this lake the river Xauxa flows southwards through a populous valley for 150 m. before entering the forests. Lake Titicaca (see Bolivia), in the fourth or most southern section, is divided between Peru and Bolivia. It receives a number of short streams from the ranges shutting in the upper end of the valley; the largest is the Ramiz, formed by the two streams of Pucara and Azangaro, both coming from the Knot of Vilcafiota to the north. The Suches, which has its source in Lake Suches, falls into Lake Titicaca on the north-west side, as well as the Yllpa and Ylave. The principal islands are Titicaca and Coati (at the south end near the peninsula of Copacabana), Campanaria (9 m. from the east shore), Soto and Esteves. There are two other lakes in the Collao, as the elevated region round Titicaca is called. Lake Arapa, a few miles from the northern shore of Titicaca, is 30 m. in circumference. Lake Umayo is on higher ground to the westward. The

lake in Peru which is third in size is that of Parinacochas on the coast watershed, near the foot of the snowy peak of Sarasara. It is 12 m. long by 6 broad, but has never been visited and' described by any modern traveller. The smaller alpine lakes, often forming the sources of rivers, are numerous.

The great rivers of the sierra are the Maranon, rising in the lake of Lauricocha and flowing northward in a deep gorge between the Maritime and Central Cordilleras for 350 m., when it forces its way through the mountains at the famous Pongo de Manseriche and enters the Amazonian plain. The Huallaga rises north of Cerro Pasco, and, passing Huanuco, flows northwards on the other side of the Central Cordillera for 300 m. It breaks through the range at the Pongo de Chasuta and falls into the Maranon. The other great rivers are tributaries of the Ucayali. The Pozuzu, flowing east- ward from the Knot of Cerro Pasco, joins the Pachitea, which is the most important northern affluent of the Ucayali. The Xauxa, becoming afterwards the Mantaro, receives the drainage of Xauxa, Huancavelica and Ayacucho. The southern valleys of this part of the sierra furnish streams which form the main rivers of Pampas, Pachachaca and Apurimac. These, uniting with the Mantaro, form the Ene, and the Ene and Perene (which drains the province of Tambo) form the Tambo. The Vilcamayu rises on the Knot of Vilcafiota, flows north through a lovely valley, received the Yanatilde and Paucartambo on its right bank, and, uniting with the Tambo, forms the Ucayali. Most of these main streams flow through pro- found gorges in a tropical climate, while the upper slopes yield products of the temperate zone, and the plateaus above are cola and bleak, affording only pasture and the hardiest cereals.

The great variety of elevation within the sierra produces vege- tation belonging to every zone. There is a tropical flora in the deep gorges, higher up a sub-tropical, then a temper- ci rra " w ate ' t ' len a su b- arc tic flora. In ascending from the Flora ana coas t- V alleys there is first an arid range, where the fauna. great-branched cacti rear themselves up among the rocks. ˆPfcrther inland, where the rains are more plentiful, is the native home of the potato. Here also are other plants with edible roots — the oca (Oxalis tuber osa), ulluca (Ullucus tuber osus), ma\ia (Tropoeolwn tuberosum), and learco (Polymnia sonchifolia) . Among the first wild shrubs and trees that are met with are the chilca (Baccharis Feuillei), with a pretty yellow flower, the Mutisia acuminata, with beautiful red and orange flowers, several species of Senecio, calceolarias, the Schinus molle, with its graceful branches and bunohes of red berries, and at higher elevations the lambras (Alnus acuminata), the sauco (Sambucus peruviana), the

quenuar (Buddleia incana), and the Polylepis racemosa. The Buddleia, locally called oliva silvestre, flourishes at a height of 12,000 ft. round the shores of Lake Titicaca. The most numerously represented family is the Compositae, the grasses being next in num- ber. The temperate valleys of the sierra yield fruits of many kinds. Those indigenous to the countiy are the delicious chin- tnoyas, paltas or alligator pears, the paccay, a species of Inga, the lucma, and the granadilla or fruit of the passion-flower. Vineyards and sugar-cane yield crops in the warmer ravines; the sub-tropical valleys are famous for splendid crops of maize; wheat and barley thrive on the mountain slopes; and at heights from 7000 to 13,000 ft. there are crops of quinua {Chenopodium quinua). In the loftiest regions the pasture chiefly consists of a coarse grass (Stipa ychu), of which the llamas eat the upper blades and the sheep browse on the tender shoots beneath. There are also two kinds of shrubby plants, a thorny Composita called ” ccanlli ” and another, called ‘ tola,” which is a resinous Baccharis and is used for fuel.

The animals which specially belong to the Peruvian Andes are the domestic llamas and alpacas and the wild vicunas. There are deer, called taruco (Cervus antisensis) ; the viscacha, a large rodent ; a species of fox called atoc ; and the puma (Felis concolor) and ucumari or black bear with a white muzzle, when driven by hunger, wander into the loftier regions. The largest bird is the condor, and there is another bird of the vulture tribe, with a black and white wing feather formerly used by the Incas in their head-dress, called the coraquenque or alcamari. The pito is a brown speckled creeper which flutters about the rocks. There is a little bird, the size of a starling, with brown back striped with black, and white breast, which the

Indians call yncahualpa; it utters a monotonous sound at each hour of the night. A partridge called yutu frequents the long grass. On the lakes there is a very handsome goose, with white body and dark-green wings shading into violet, called huachua, two kinds of ibis, a large gull (Larus serranus) frequenting the alpine lakes in flocks, flamingoes called parihuana, ducks and water-hens. Many pretty little finches fly about the maize-fields and fruit-gardens, and a little green parakeet is met with as high as 12,000 ft. above the sea.

The third division of Peru is the region of the tropical forests, at the base of the Andes, and within the basin of the Amazon. It is traversed by great navigable rivers. The Maranon, „ „««,■«. having burst through the defile of the Pongo de Man momaa *’ seriche (575 ft. above sea level), and the Huallaga through that of Chasuta, enter the forests and unite after separate courses of about 600 and 400 m., the united flood then flowing eastward to the Brazilian frontier. After 150

m. it is joined by the Ucayali, a great navigable river with a course of 600 m. The country between the Huallaga and the Ucayali, traversed by the Eastern Cordillera, is called the Pampa del Sacramento, and is characterized by exten- sive grassy plains. The forests drained by the Maranon, Huallaga and Ucayali form the northern portion of the Peruvian montana. The southern half of the montana is watered by streams flowing from the eastern Andes, which go to form the river Madre de Dios or Amaru -mayu, the principal branch of the river Beni, which falls into the Madeira. The region of the Peruvian montana, which is 800 m. long from the Maranon to the Bolivian frontier, is naturally divided into two sections, the sub-tropical forests in the ravines and on the eastern slopes of the Andes, and the dense tropical forests in the Amazonian plain. The sub-tropical section is impor- tant from the value of its products and interesting from the grandeur and beauty of its scenery. Long spurs run off from the Andes, gradually decreasing in elevation, and it is sometimes a distance of 60 or 80 m. before they finally subside into the vast forest-covered plains of the Amazon basin. Numerous rivers flow through the valleys between these spurs, which are the native home of the quinine-yielding cinchona trees. The most valuable species, called C. Calisaya, is found in the forests of Caravaya in south Peru and in those of Bolivia. The species between Caravaya and the head- waters of the Huallaga yield very little of the febrifuge alkaloid. But the forests of Huanuco and Huamalios abound in species yield- ing the grey bark of commerce, which is rich in cinchonine, an alkaloid efficacious as a febrifuge, though inferior to quinine. With the cinchona trees grow many kinds of melastomaceae, especially the Lasiandra, with masses of purple flowers, tree-ferns and palms. In the warm valleys there are large plantations of coca (Erythro- xylon Coca), the annual produce of which is stated at 15,000,000 lb. The other products of these warm valleys are excellent coffee, cocoa, sugar, tropical fruits of all kinds, and gold in abundance. In the vast untrodden forests farther east there are timber trees of many kinds, incense trees, a great wealth of rubber trees of the Hevea genus, numerous varieties of beautiful palms, sarsaparilla, vanilla, ipecac- uanha and copaiba. The abundant and varied fauna is the same as that of the Brazilian forests.

Geology^ — The Eastern Cordillera, which, however, is but little known, appears to consist, as in Bolivia, chiefly of Palaeozoic rocks; the western ranges of the Andes are formed of Mesozoic beds, together with recent volcanic lavas and ashes ; and the lower hills near the coast are composed of granite, syenite and other crystalline rocks, sometimes accompanied by limestones and sandstones, which are probably of Lower Cretaceous age, and often covered by marine

Tertiary deposits. Thus the orographical features of the country correspond broadly with the geological divisions.

The constitution of the Mesozoic band varies. Above ‘Lima the western chain of the Andes is composed of porphyritic tuffs and massive limestones, while the longitudinal valley of the Oroya is hollowed in carbonaceous sandstones. From the analogy of the neighbouring countries it is possible that some of the tuffs may be Jurassic, but the other deposits probably belong for the most part to the Cretaceous system. The carbonaceous sandstone contains Gault fossils. Like the similar sandstone in Bolivia, it includes seams of coal and is frequently impregnated with cinnabar. It is in this sandstone that the rich mercury mines of Huancavelica are worked.

Farther north, in the department of Ancachs, the Mesozoic belt is composed chiefly of sandstones and shales, and the limestones which form so prominent a feature above Lima seem to have disappeared. The Cordillera Negra in this region is in many places cut by numerous dikes of diorite, and it is near these dikes that silver ores are chiefly

1 See L. Crosnier, ” Notice geologique sur les departements de Huancavelica et d’Ayacucho,” Ann. des mines, 5th series, vol. ii. pp. 1-43, PI. 1 (1852); A. Raimondi, El Departamento de Ancachs y sus riquezas minerales (Lima, 1873); G. Steinmann, ” Ueber Tithon und Kreide in den peruanischon Anden,” Neues Jahrb. (1882), vol. ii. pp. 130-153, Pis. 6-8; K. Gerhardt, ” Beitrag zur Kenntniss der Kreideformation in Venezuela und Peru,” Neues Jahrb., Beil.-Bd.XI. (1897), pp. 65-117, Pis. 1,2; J.Grzybowski, “DieTertiarablagerungen des nordlichen Peru und ihre Molluskenfauna,” Neues Jahrb., Beil.-Bd. XII. (1899), pp. 610-664, Pis. 15-20.

found. In the Cordillera Nevada the Mesozoic rocks which form the chain are often covered by masses of modern volcanic rock. Similar rocks are also found in the Cordillera Negra, but the volcanic centres appear to have been in the Sierra Nevada.

Population. — The first trustworthy enumeration of the people of Peru was made in 1793, when there were 617,700 Indians, 241,225 mestizos (Indian and white inter-mixture), 136,311 Spaniards, 40,337 negro slaves and 41,404 mulattoes, making a total of 1,076,977, exclusive of the wild Indians of the montana. Viceroy Toledo’s

enumeration of the Indians in 1575 gave them a total of 8,000,000, the greater part of whom had been sacrificed by Spanish cruelty. Others had withdrawn into the mountains and forests, and in the native villages under Spanish administra- tion the birth rate had dropped to a small part of what it had been because- the great bulk of the male population had been segregated in the mines and on the estates of the conquerors. This tells a story of depopulation under Spanish rule, to which the abandoned terraces (andenes) on the mountain sides, once highly cultivated, bear testimony. Several diverse totals have been published as the result of the census taken in 1876, which is considered imperfect. One estimate places the total at 2,660,881, comprising about 13-8% whites, 57-6% Indians, 1-9% negroes, 1-9% Asiatics, chiefly Chinese, and 24-8% mixed races. In 1906 estimates were made under official auspices (see A. Garland, Peru in igo6, Lima, 1907), which gave the population as 3,547,829, including Tacna (8000). It is believed, however, that this and other larger estimates are excessive. There is no considerable immigration.

The population of Peru is mixed, including whites, Indians, Africans, Asiatics, and their mixtures and sub-mixtures. The dominant race is of Spanish origin, to a considerable extent mixed with Indian blood. The Indians are in great part descendants of the various tribes organized under the rule of the Incas at the time of the Spanish conquest. There are two distinct general types — the coast tribes occupying the fertile river valleys, who are employed on the plantations, in domestic service in the cities, or in small industries of their own, no longer numerous; and the sierra tribes, who are agriculturists, miners, stock-breeders and packers, still comparatively numerous. In addition to these are the tribes of wild Indians of the montana region, or eastern forests, who were never under Inca rule and are still practically independent. Their number is estimated at 150,000 to 300,000, divided into 112 tribes, and differing widely in habits, customs and material condition. Some live in settled communities and roughly cultivate the soil. Others are hunters and fishermen and are nomadic in habit. Others are intractable forest tribes, having no relations with the whites. The sierra or upland Indians, the most numerous and strongest type, belong largely to the Quichua and Aymara families, the former inhabiting the regions northward of Cuzo, and the latter occupying the Titicaca basin and the sierras of Bolivia. These Indians are generally described as Cholos, a name sometimes mistakenly applied to the mestizos, while the tribes of the eastern forests are called Ckunchos, barbaros, or simply Indians. The Cholos may be roughly estimated at about 1,800,000 and form by far the larger part of the sierra population. Practically all the industries and occupations

of this extensive region depend upon them for labourers and servants.

The mestizos are of mixed Spanish and Indian blood. There are two general classes — the costefios or those of the coast, and the serranos or those of the sierras. The mestizos of the coast are usually traders, artisans, overseers, petty officers and clerks, and small politicians. In the sierras they have the same general occupations, but there are no social bars to their advancement, and they become lawyers, physicians, priests, merchants, officials and capitalists. The African and Asiatic elements furnish only about 2 % each of the population. The Africans were introduced as slaves soon after the conquest, because the coast Indians were physically incapable of performing the work required of them on the sugar estates. All the heavy labour in the coast provinces was performed by them down to 1855, when African slavery was abolished. They have since preferred to live in the towns,

although many continue ©n the plantations. The first Chinese coolies were introduced in 1849 to supply labourers on the sugar estates, which had begun to feel the effects of the suppression of the African slave traffic. At first the coolies were treated with cruelty. The scandals that resulted led to investigations and severe restrictions, and their employment now has become a matter of voluntary contract, usually for two years, in which fair dealing and good treatment are the rule. Many Chinese are also settled in the coast cities. Commercial relations have also been opened with Japan, and a small Japanese colony has been added to the population. The Spanish and African cross is to be seen in the mulattoes, quadroons and octoroons that inhabit the warm coast cities. Other race mixtures consist of the zambos (the African-Indian cross), an Asiatic graft upon these various crosses, and an extremely confusing intermixture of the various crosses, for which the Spanish races have descriptive appellations. The foreign population is chiefly concentrated in Lima and Callao, though mining and other industries have drawn small contingents to other places.

Education. — Universities and colleges were founded in Peru soon after the conquest, and Lima, Cuzco, Arequipa and Chuquisaca (now the Bolivian town of Sucre) became centres of considerable intellectual activity. Something was done for the education of the sons of the Indian " nobility," schools being created at Lima and Cuzco. The university of San Marcos at Lima is the oldest collegiate institution in the New World, originating in a grant from Charles V. in 1551 to the Dominicans for the establishment of a college in their monastery at Lima. Its present name, however, was not adopted until 1574, two

years after its first secular rector had been chosen. The college of San Carlos was founded in 1770, and the school of medicine in 1792. At Cuzco the university of San Antonio Abad was founded in 1598, and the college of San Geronimo at Arequipa in 1616. The instruction given in these institutions was of the religious-scholastic character of that time, and was wholly under the supervision of the Church. Independence opened the way for a larger measure of intellectual and educational progress, especially for the lower classes. As organized under the law of the 5th of December 1905, primary instruction is free and nominally obligatory, and is under the control of the national government. The primary schools are divided into two grades : a free elementary course of two years, and a higher course of three years, in a school called the ” scholastic centre,” in which learning a trade is included. There were 1508 elementary schools and 862 scholastic centres in 1906. There are, besides these, a large number of private schools, which in 1906 carried about 22,000 pupils on their rolls, or three times the num- ber in the public primary schools. To provide teachers six normal schools have been established, two of which (one for males and one for females) are in Lima. For intermediate or secondary instruction there are 23 national colleges for boys in the various departmental capitals, and three similar colleges for girls, in Ayacucho, Cuzco and Trujillo. In these the majority of pupils were under the direc- tion of Belgian and German instructors. The private schools of this grade are still more numerous, and there are a number of special schools that belong to the same category. For higher instruction there are four universities: the Universidad Mayor de San Marcos at Lima, and three provincial institutions at Arequipa, Cuzco and Trujillo. All these have faculties of letters and law, and San Marcos has in addition faculties of theology, medicine, mathematics and science, philosophy and administrative and political economy. The professional schools include a school of civil and mining engineer- ing at Lima (created 1876), a military school at Chorrillos under the direction of French instructors, a naval school at Callao, nine episcopal seminaries (one for each diocese), a national agricultural school in the vicinity of Lima (created 1902), and a few commercial schools. There is also a correctional school at Lima devoted to the education and training of youthful delinquents.

Science and Literature. — Towards the end of the 18th century scientific studies began to receive attention in Peru. M. Godin, a member of the French commission for measuring an arc of the meridian near Quito, became professor of mathematics at San Marcos in 1750; and the botanical expeditions sent out from Spain gave further zest to scientific research. Dr Gabriel Moreno (d. 1809), a

native of Huamantanga in the Maritime Cordillera, studied under Dr Jussieu, and became an eminent botanist. Don Hipolito Unanue, born at Arica in 1755, wrote an important work on the climate of Lima and contributed to the Mercurio peruano. This periodical was started in 1 79 1 at Lima, the contributors forming a society called ” amantes del pais,” and it was completed in eleven volumes*. It contains many valuable articles on history, topography, botany, mining, commerce and statistics. An ephemeris and guide to Peru was begun by the learned geographer Dr Cosme Bueno, and continued by Dr Unanue, who brought out his guides at Lima from 1793 to 1798. In 1794 a nautical school was founded at Lima, with Andres Baleato as instructor and Pedro Alvarez as teacher of the use of instruments. Baleato also constructed a map of Pern.

A list of Peruvian authors in viceregal times occupies a long chapter in the life of St Toribio 1 by Montalvo; and the bibliographical labours of the Peruvian Leon Pinelo are still invaluable to Spanish students. The most prolific author of colonial times was Dr Pedro de Peralta y Barnuevo, who wrote more than sixty works, including an epic poem entitled Lima fundada.

The topographical labours of Cosme Bueno and Unanue were ably continued at Lima by Admiral Don Eduardo Carrasco, who compiled annual guides of Peru from 1826. But the most eminent Peruvian geographer is Dr Don Mariano Felipe Paz Soldan (1821- 1886), whose Geografia del Peru appeared in 1861. His still more important work, the Diccionario geografico estadistico del Peru (1877), is a gazetteer on a most complete scale. In 1868 appeared his first volume of the Historia del Peru independiente, and two others have since been published. His Historia de la guerra del Pacifico is the Peruvian version of that disastrous war. The earlier history of Peru has been written in three volumes by Sebastian Lorente (d. 1884); Mariano Rivero has discussed its antiquities; and Manuel Fuentes has edited six volumes of memoirs written by Spanish viceroys. But the most valuable and important historical work by a modern Peruvian is General Mendiburu’s (1805-1885) Diccionario historico-biografico del Peru, a monument of patient and conscien- tious research, combined with critical discernment of a high order. As laborious historical students, Don Jos6 Toribio Polo, the author of an ecclesiastical history of Peruvian dioceses, and Don Enrique Torres Saldamando, the historian of the Jesuits in Peru, have great merit. Among good local

annalists may be mentioned Juan Gilberto Valdivia, who has written a history of Arequipa, and Pio Benigno Mesa, the author of the Annals of Cuzco.

The leading Peruvian authors on constitutional and legal subjects are Dr Jos6 Santistevan, who has published volumes on civil and criminal law; Luis Felipe Villaran (subsequently rector of the univer- sity at Lima), author 01 a work on constitutional right ; Dr Francisco Garcia Calderon (once president of Peru), author of a dictionary of Peruvian legislation, in two volumes ; Dr Francisco Xavier Mariategui, one of the fathers of Peruvian independence; and Dr Francisco de Paula Vigil (1 792-1 875), orator and statesman as well as author, whose work, Defensa de los gobiernos, is a noble and enlightened statement of the case for civil governments against the pretensions of the court of Rome. Manuel A. Fuentes, an able statistician and the author of the Estadistica de Lima, has also written a manual of parliamentary practice. Perhaps the most important work on Peru of modern times is that of the Italian savant Antonio Raimondi (1825-1890), who spent the greater part of his life in studying the topography and natural resources of the country. Only four volumes had been published at the time of his death, but he left a mass of papers and manuscripts which the government has put in the hands of the Geographical Society of Lima for publication. His great work is entitled El Peru: estudios mineralogicos , &c. (3 vols., Lima, 1890-1902), and one separate volume on the depart- ment of Ancachs. Peruvian literature since the independence has also attained high merit in the walks of poetry and romance. The Guayaquil author, Olmedo, who wrote the famous ode on the victory of Junin, and the Limenians Felipe Pardo and Manuel Segura are names well known wherever the Spanish language is spoken. Both died between i860 and 1870. The comedies of Segura on the customs of Lima society, entitled Un Paseo a Amancaes and La Saya y Manto, have no equal in the dramatic literature of Spanish America and few in that of modern Spain. From 1848 date the first poetical efforts of Arnaldo Marquez, who is distinguished for his correct diction and rich imagination, as is Nicolas Corpancho for his dramas and a volume of poems entitled Brisas, Adolfo Garcia for a beautiful sonnet to Bolivar, which was published at Havre in 1870, in his one volume of poems, and Clemente Althaus for his produc- tivity and style. Pedro Paz Soldan was a classical scholar who published three volumes of poems. Carlos Augusto Salaverry is known as one of Peru's best lyrical poets, and Luis Benjamin Cisneros for his two novels, Julia and Edgardo. Trinidad Fernandez and Constantino Carrasco were two poets of merit who died young, the principal work of the latter being his metrical version of the Quichua drama,

OUantay. Jos6 Antonio Lavalte and Narciso Arestegui are chiefly known as novelists. In his youth Ricardo Palma published three books of poems, entitled Armonias, Verbos y Gerundios and Pasionarias, and then, since 1870, devoted his great literary talents to writing the historical traditions of Peru, of which six volumes were published. At the outbreak of the war with Chile he was vice-director of the national library at Lima, which was wantonly pillaged by the Chilean forces. After the evacuation of Lima by the Chileans Palma devoted his life to the recovery of his scattered books and the acquisition of new collections, and he had the satisfaction before his death of re-opening the library, which had obtained about 30,000 volumes, or three-fourths of the number on its shelves before the Chilean invasion.

Of the aboriginal inhabitants of Peru much has been written. The important work of Mariano Eduardo Rivero, of Arequipa, 1 The city of Lima produced two saints, the archbishop St Toribio, who flourished from 1578 to 1606, and Santa Rosa, the patron saint of the city of the kings (1586-1616), whose festival is cele- brated on the 26th of August.

assisted by J. J. von Tschudi, on the antiquities of Peru (Antigue-dades peruanas, Vienna, 1841; Eng. trans., New York, 1853) haii been followed by other investigators into the language, literature, customs and religion of the Incas. The best known of these are Jose Sebastian Barranca, the naturalist and antiquary, Jose Fernandez Nodal, and Gavino Pacheco Zegarra of Cuzco, who published translations of the Inca drama of OUantay, and Leonardo Villar, of Cuzco.

Among Peruvian naturalists since the advent of the republic, the most distinguished have been Mariano Eduardo Rivero, the geologist, mineralogist and archaeologist, and his friend and colleague Nicolas de Pierola, authors of Memorial de ciencias naturales. The Lima Geographical Society (founded in 1888) is perhaps the best and most active scientific organization in the republic. Its special work covers national geographical exploration and study, archae- ology, statistics and climatology, and its quarterly bulletins contain invaluable information. The society receives a government subsidy, and its rooms in the national library in Lima are the principal centre of scientific study in Peru. It had an active membership of 163 in 1906, besides 172 honorary and corresponding members. The historical institute of Peru, also at Lima, is charged by the government, from which it receives a liberal subsidy, with the work of collecting, preparing and publishing documents relating to Peru- vian history, and of preserving objects of archaeological and historic character. Its museum, which is of great historical and artistic value and includes a collection of portraits of the Peruvian viceroys and presidents, is in the upper floors of the Exposition Palace. Another subsidized national society is the athenaeum, which was founded in 1877 as the " literary club," and reorganized in 1887 under its present title. Its purpose is to foster learning and literary effort, and it is a popular and prominent feature in the intellectual life of the country.

Religion. — According to the constitution of i860 "the nation professes the apostolic Roman Catholic religion ; the state protects it, and does not permit the public exercise of any other." There is a certain degree of tolerance, however, and the Anglican and some of the evangelical churches are permitted to establish missions in the country, but not always without hostile demonstrations from the Catholic priesthood. There are Anglican churches in Lima and Cuzco, belonging to the diocese of the Bishop of the Falkland Islands ; but their existence is illegal and is ignored rather than permitted. In its ecclesiastical organization Peru is divided into nine dioceses: Lima, which is an archbishopric, Arequipa, Puno, Cuzco, Ayacucho, Huanuco, Huaraz, Trujillo and Chachapoyas. These dioceses are subdivided into 613 curacies, presided over by curas, or curate- vicars. Each diocese has its seminary for the education of the priest- hood, that of Arequipa being distinguished for its influence in church affairs. Arequipa, like Cordoba and Chuquisaca, is a stronghold of clericalism and exercises a decisive influence in politics as well as in church matters. There are a number of fine churches in Lima and in the sees of the various dioceses. Monasteries and nunneries are numerous, dating back to the l6thand 17th centuries, but their influence is now

less potent than in those days and the monastic population is not so large. In modern times many of the convents have been devoted to educational work especially for girls, which is an obstacle to the successful development of a public school system in the country.

Political Divisions. -ˆThe empire of the Incas was divided into four main divisions, Chinchay-suyu to the north of Cuzco, Anti-suyu to the east, Colla-suyu to the south and Cunti-suyu to the west, the whole empire being called Ttahuantin-suyu, 01′ the four governments. Each was ruled by a viceroy, under whom were the ” huaranca-camayocs,” or officers ruling over thousands, and inferior officers, in regular order, over 500, iop, 50 and 10 men. All disorders and irregularities were checked by the periodical visits of the tucuyricocs or inspectors. The Spanish conquest destroyed this complicated system. In 1569 the governor, Lope Garcia de Castro, divided Peru into corregi- mientos under officers named corregidors, of whom there were 77, each in direct communication with the government at Lima. An important administrative reform was made in 1784, when Peru was divided into 7 intendencias, each under an officer called an intendente. These intendencias included about 6 of the old corregimientos, which were called partidos, under officers named subdelegados. Thus the number of officers reporting direct to Lima was reduced from 77 to 7, a great improvement. The republic adopted the same system, calling the intendencias departments, under a prefect, and the partidos provinces, under a sub-prefect. Peru is divided into 18 departments, 2 littoral provinces, and what is called the constitutional province of Callao. This is exclusive of Tacna and its 3 provinces. The departments, which contain 98 provinces, with their areas, capitals and estimated populations of 1906, are as follow: the

list being arranged to show the coast, sierra and montafia divisions: —

Departments.

Area sq. m.

Estimated pop., 1906.

Capital.

Estimated pop., 1906.

Coast: —

Piura .

14,849

154,080

Piura .

9,100

Lambayeque .

4.615

93,070

Chiclayo .

10,000

Libertad .

10,209

188,200

Trujillo

6,500

Ancachs .

16,567

317.050

Huaraz

13,000

Lima .

I3-3H

250,000

Lima (1903) .

140,000

Ica (or Yea)

8,721

68,220

Ica

6,000

Arequipa .

21,953

I7L750

Arequipa

28,000

Sierra : —

Cajamarca .

12,542

333,310

Cajamarca

9,000

Huanuco.

14,028

108,980

Huanuco .

6,000

Junin.

23,354

305.700

Cerro de Pasco

10,000

Huancavelica

9,254

167,840

Huancavelica

6,000

Ayacucho

18,190

226,850

Ayacucho . .

15,000

Apurimac

8,189

I33.OO0

Abancay .

2,400

Cuzco.

156,317

328,980

Cuzco .

23,000

Puno .

41,211

403,000

Puno .

4.500

Montana: — –

Amazonas ,

13,947

53,ooo

Chachapoyas .

4,500

Loreto

238-493

120,000

Iquitos

6,000

San Martin .

30,745

33,000

Moyobamba

7,500

Littoral

Provinces: —

Tumbez .

1,981

8,000

Tumbez .

2,300

Callao

14-2

33,879

Callao (1905).

31,128

Moquegua .

5.550ˆ

31,920

Moquegua

5,000

Apart from the departmental capitals there are few towns of size and importance. The so-called coast towns are commonly at some distance from the seashore, and their shipping ports are little more than a straggling collection of wretched habitations in the vicinity of the landing-stage and its offices and ware- houses. Callao (q.v.) is a noteworthy exception, and Paita and Pisco are something more than the average coast village. Near Lima, on the south, there are three bathing resorts, Chorrillos, Miraflores and Barranco, which have handsome residences and large populations in the bathing season. North of Lima is the port and bathing resort of Ancon, in an extremely arid locality but having a fine beach, a healthy climate and a considerable population in the season. The towns of the coast region are usually built on the same general plan, the streets crossing each other at right angles and enclosing squares, or quadras. In the sierra there is the same regular plan wherever the site is level enough. High-pitched red tiled roofs take the place of the flat roofs of the coast. The upper storey often recedes, leaving wide corridors under the overhanging eaves, and in the ” plazas ” there are frequently covered arcades. In addition to the capitals of the departments, Tarma (about

4000) and Xauxa, or Jauja (about 3000), are important towns of this region. In the montafia there are no towns of importance other than the capitals of the departments and the small river ports.

Communications. — The problem of easy and cheap transportation between the coast and the interior has been a vital one for Peru, for upon it depends the economic development of some of the richest parts of the republic. The arid character of the coastal zone, with an average width of about 80 m., permits cultivation of the soil only where water for irrigation is available. Only in the sierra and montafia regions is it possible to maintain a large popu- lation and develop the industries upon which their success as a nation depends. During colonial times and down to the middle of the 19th century pack animals were the only means of trans- portation across the desert and over the rough mountain trails. Railway construction in Peru began in 1848 with a short line from Callao to Lima, but the building of railway lines across the desert to the inland towns of the fertile river valleys and the Andean foot-hills did not begin until twenty years later. These roads added much to the productive resources of the country, but their extension to the sierra districts was still a vital necessity. Under the adminis- tration (1868-1872) of President Jose Balta the construction of two transandean and several coastal zone railways was begun, but their completion became impossible for want of funds. Balta's plans covered 1281 m. of state railways and 749 m. of private lines, the estimated cost to be about £37,500,000 — a sum far beyond the resources of the republic. The two transandean lines were the famous Oroya railway, running from Callao to Oroya (1893), which crosses the Western Cordillera at an elevation of 15,645 ft.,

and later on to Cerro de Pasco (1904), the Goillarisquisga coal mines (1904) and Hauri (1906) ; and the southern line from Mollendo to Lake Titicaca, which reached Arequipa in 1869, Puno in 1871 and Checcacupe (Cuzco branch) in 1906. Surveys were completed in 1909 for an extension of the Oroya line from a point on its Cerro de Pasco branch eastward to the Ucayali, and another transandean line frequently discussed is projected from Paita across the Andes to Puerto Limon, on the Maranon — a distance of 410 m.

The most important means of communication in the republic is that of its river system, comprising, as it does, the navigable channels of the Maranon, or upper Amazon, and its tributaries. It is officially estimated that this system comprises no less than 20,000 m. of connected riverways navigable at high water for all descriptions of boats, or 10,000 m. for steamers of 20 to 2 ft. draught, which is reduced to 5800 m. at low water. The rivers forming this system are

the Maranon from Puerto Limon to Tabatinga on the Brazilian frontier (484 m.), the Japura, Putumayo, Javary, Napo, Tigre, Huallaga, Ucayali, Pachitea, Jurua, Purus, Acre, Curaray and Aguarico all navigable over parts of their courses for steamers of 4 to 8 ft. draught in periods of high water. As for the Maranon, it is claimed that steamers of 20 ft. draught can ascend to Puerto Limon at all seasons of the year. The inclusion of the upper waters of the Brazilian rivers Jurua, Puriis and Acre is pro forma only, as they are wholly under Brazilian jurisdiction. Practically the whole of the region through which these rivers run — the montafia of Peru — is undeveloped, and is inhabited by Indians, wjth a few settlements of whites on the river courses. Its chief port is Iquitos, on the Maranon, 335 m. above the Brazilian frontier and 2653 m. from the mouth of the Amazon. It is visited by ocean-going steamers, and is the centre of the Peruvian river transportation system. The second port in importance is Yurimaguas, on the Huallaga, 143 m. from the mouth of that river and 528 m. from Iquitos, with which it is in regular communication. There are small ports, or trading posts, on all the large rivers, and occasional steamers are sent to them with supplies and to bring away rubber and other forest products. Of the rivers farther south, which discharge into the Amazon through the Madeira, the Madre de Dios alone offers an extended navigable channel, together with some of its larger tributaries, such as the Heath and Chandless. Of a widely different character is the navigation of Lake Titicaca, where steamers ply regularly between Puno and Guaqui, the latter on the south-east shore in railway connexion with La Paz, the capital of Bolivia. This is one of the most remarkable steamer routes in the world, being 12,370 ft. above sea- level. The lake is 165 m. long and from 70 to 80 m. wide and has a number of small Indian villages on its shores.

There are two submarine cable lines on the Peruvian coast— the (American) Central and South American Co. extending from Panama to Valparaiso, and the (British) West Coast Cable Co., subsidiary to the Eastern Telegraph Co., with a cable between Callao and Valparaiso. The inland telegraph service dates from 1864, when a short line from Callao to Lima was constructed, and state ownership from 1875, when the government assumed control of all lines within the republic, some of which were subsequently handed over to private administration. They connect all the important cities, towns and ports, but cover only a small part of the republic. The cost of erecting and maintaining telegraph lines in the sierra and montafia regions is too great to permit their exten- sive use, and the government is seeking to substitute wireless telegraphy. From Puerto Bermudez, on the Pachitea or Pichis river, the terminus of a government road and telegraph line,

a wireless system connects with Massisea on the Ucayali, and thence with Iquitos, on the Maranon— a distance of 930 m. by steamer, which is much shortened by direct communication between the three radiographic stations. This service was opened to Iquitos on the 8th of July 1908, the first section between Puerto Bermudez and Massisea having been pronounced a success. The Peruvian telegraph system connects with those of Ecuador and Bolivia. The use of the telephone is general, 5236 m. being in operation in 1906. The postal service is unavoidably limited and defective, owing to the rugged character of the country, its sparse population, and the large percentage of illiterates. On the coast, however, in and near the large cities and towns, it compares well with other South American countries. Peru belongs to the international postal union, and had in 1906 a money order and parcels exchange with seven foreign states. A noteworthy peculiarity in the foreign mail service is that an extra charge of 2 cents for each letter and 1 cent for each post-card is collected when they are sent across the isthmus of Panama. No charge is made for the transmission of newspapers within the republic. The letter rate is 5 cents silver for 15 grams, or 10 cents to foreign countries in the postal union.

Commerce. — Owing to political disorder, difficulty in land communications, and the inheritance of vicious fiscal methods from Spanish colonial administration, the commercial development of Peru has been slow and erratic. There are many ports on the coast, but only eight of them are rated as first class, viz. Paita, Eten, Pacasmayo, Salaverry, Callao, Pisco, Mollendo and Ilo, five of which are ports of call for foreign coasting steamers. The inland port of Iquitos, on the Maranon, is also rated as first class, and enjoys special privileges because of its distance from the national

capital. The second-class ports are Tumbez, Talara, Pimentel, Chimbote, Samanco, Casma, Huacho, Cerro-Azul, Tambo de Mora, Lomas and Chala, on the coast, Puno on Lake Titicaca, and Leticia on the Amazon near the western mouth of the Javary. Callao (q-v.) is the chief port of the republic and monopolizes the greater part of its foreign trade. Its harbour, one of the best on the west coast of South America, has been greatly improved by the port works begun under the administration of President Balta. Paita and Chimbote have good natural harbours, but the others, for the most part, are open roadsteads or unsheltered bays. Mollendo is a shipping port for

Bolivian exports sent over the railway from Puno. There were 12 foreign steamship lines trading at Peruvian ports in 1908, some of them making regular trips up and down the coast at frequent intervals and carrying much of its coastwise traffic. Foreign sailing vessels since 1886 have not been permitted to engage in this traffic, but permission is given to steam- ships on application and under certain conditions. The imports were valued in 1907 at 55,147,870 soles (10 soles = £i stg.) and the exports at 57,477,320 soles — the former showing a considerable increase and the latter a small decrease in comparison with 1906. The exports consist of cotton, sugar, cocaine, hides and skins, rubber and other forest products, wool, guano and mineral products. The most important export is sugar, the products of the mines ranking second. The largest share in-Peru's foreign trade is taken by Great Britain, Chile ranking second and the United States third.

Products. — Although her mining industries have been the longest and most widely known, the principal source of Peru's wealth is agriculture. This seems incompatible with the arid character of the country and the peculiar conditions of its civilization, [but irrigation has been successfully employed in the fertile valleys of the coast.

Agriculture. — Sugar-cane is cultivated in most of the coast valleys, and with exceptional success in those of the Canete, Rimac, Chancay, Huaura, Supe, Santa, Chicama, Pacasmayo and Chiclayo. Some of the large estates are owned and worked by British subjects. The industry was nearly ruined by the Chileans in 1880, but its recovery soon followed the termination of the war and the output has been steadily increasing. At the outbreak of the war the production was about 80,000 tons; in 1905 the production of sugar and molasses amounted to 161,851 metric tons, of which 134,344 were exported. In 1906 the total production reached 169,418 metric tons. Next in importance is cotton, which is grown along the greater part of the Peruvian coast, but chiefly in the depart- ments of Piura, Lima and lea. Four kinds are produced: rough cotton or " vegetable wool," sea island, brown or Mitafifi, and smooth or American. Production is steadily increasing, the export having been 8000 metric tons in 1900, 17,386 in 1905 and 20,000 in 1906. Local consumption required about 2500 tons in 1905. Rice is an important crop in the inundated lands of Lambayeque and Libertad. It is a universal article of food in Peru, and the output is consumed in the country. Maize is another important food product which is generally cultivated along the coast and in the lower valleys of the sierra. In some places two or three crops a year are obtained. It is the staple food everywhere, and little is exported. It is largely used in the manufacture of chicha, a fer- mented drink popular among the

lower classes. Tobacco is grown in the department of Piura, and in the montana departments of Loreto, Amazonas and Cajamarca. The local consumption is large and the export small. Another montana product is coffee, whose suc- cessful development is prevented|by difficult transport. A superior quality of bean is produced in the eastern valleys of the Andes, especially in the Chanchamayo valley. Cacao is another montana product, although like coffee it is cultivated in the warm valleys of the sierra, but the export is small. With cheap transport to the coast the production of coffee and cacao must largely increase. Coca (Erythroxylon coca) is a product peculiar to the eastern Andean slopes of Bolivia and Peru, where it has long been cultivated for its leaves. These are sun-dried, packed in bales, and distributed throughout the sierra region, where coca is used by the natives as a stimulant. The Cholos are never without it, and with it are able to perform incredible tasks with little food. The common manner of using it is to masticate the dried leaves with a little lime. Cocaine is also derived from coca leaves, and a considerably quantity of the drug is exported. The coca shrub is most successfully cultivated at an elevation of 5000 to 6000 ft. Fruits in great variety are grown everywhere in Peru, but beyond local market demands their commercial production is limited to grapes and olives. Grapes are produced in many of the irrigated valleys of the coast, such as Chincha, Lunahuana, lea, Vitor, Majes, Andaray, Moquegua and Locumba, and the fruit is manufactured into wines and brandies. Excellent clarets and white wines are produced, and the industry is steadily increasing. Olives were introduced early in colonial times and are cultivated in several coast valleys, especially in the provinces of Camana (Arequipa) and Moquegua. The fruit is commonly used for the manufacture of oil, which is consumed in the country, and only a small part is exported. Were large markets available, other fruits such as oranges, lemons, limes and bananas would undoubtedly be extensively cultivated. In the sierra region, wheat, barley, oats, quinua (Chenopodium quinoa),

alfalfa ; Indian corn, oca (Oxalis tuberosa) and potatoes are the principal products. Wheat is widely grown but the output is not large. Barley and oats are grown for forage, but for this purpose alfalfa has become the staple, and without it the mountain pack- trains could not be maintained. Quinua is an indigenous plant, growing at elevations of 13,500 ft. and more; its grain is an important food among the upland natives. Potatoes are grown everywhere in the sierras, and with quinua are the only crops that can be raised for human food above 13,000 ft. Yuca [Manihot utilissima), known as cassava in the West Indies and mandioca in Brazil, is also widely cultivated for food

and for the manufacture of starch.

There are good pastures in the sierras, and cattle have been successfully reared in some of the departments since the early years of Spanish occupation, chiefly in Ancachs, Cajamarca, Junin, Ayacucho, Puno, and some parts of Cuzco. The development of alfalfa cultivation is extending the area of cattle-breeding somewhat and is improving the quality of the beef produced. The cattle are commonly small and hardy, yes ‘ and, like the Mexican cattle, are able to bear unfavourable conditions. Sheep are reared over a somewhat wider range, exclusively for their wool. The ” natives,” or descendants of the early importations, are small, long-legged animals whose wool is scanty and poor. Since the end of the 19th century efforts have been made to improve the stock through the importation of merinos, with good results. Sheep ranges under the care of Scottish shep- herds have also been established in the department of Junin, the stock being imported from southern Patagonia, England and Australia. Goats are raised in Piura and Lambayeque for their skins and fat, and swine-breeding for the production of lard has become important in some of the coast valleys immediately north of Lima. Horses are reared only to a limited extent, although there is a demand for them for military purposes. The government is seeking to promote the industry through the importation of breeding mares from Argentina. Mules are bred in Piura and Apurimac, and are highly esteemed for mountain travel. The chief breeding industry is that of the llama, alpaca and vicuna — animals of the Auchenia family domesticated by the Indians and bred, the first as a pack animal, and the other two for their wool, hides and meat. The llama was the only beast of burden known to the South American natives before the arrival of the Spaniards and is highly serviceable on the difficult trails of the Andes. The alpaca and vicuna are smaller and weaker and have never been used for this service, but their fine, glossy fleeces were used by the Indians in the manufacture of clothing and are still an important commercial asset of the elevated table-lands of Peru and Bolivia. The export of wool in 1905 exceeded 3,300,000 lb. The rearing of these animals requires much patience and skill, in which no one has been able to match the Indian breeders of the Andean plateaus.

The natural products of Peru include rubber, cabinet woods in great variety, cinchona or Peruvian bark and other medicinal products, various fibres, and guano. There are two p a rest kinds of rubber supplied by the Peruvian montana pftK/ uc

From guano an immense revenue was derived during the third quarter of the 19th century and it is still one of the largest exports. The guano

beds a,e found on the barren islands of the Guano Pacific coast. They were developed commercially during the administration (1845-1851) of President Ramon Castilla, at the same time that the nitrate deposits of Tarapaca became a

commercial asset of the republic. The large revenues derived from these sources undoubtedly became a cause of weakness and demoralization and eventually resulted in bankruptcy and the loss of Tarapaca. The deposits have been partially exhausted by the large shipments of over a half-century, but the export in 1905 was 73,369 tons, valued at £285,729.

Mining. — Mining was the chief industry of Peru under Spanish rule. The Inca tribes were an agricultural and pastoral people, but the abundance of gold and silver in their possession at the time of the conquest shows that mining must have received considerable attention. They used these precious metals in decorations and as ornaments, but apparently attached no great value to them. The use of bronze also shows that they must have worked, perhaps super- ficially, some of the great copper deposits. Immediately following the Spanish invasion the Andean region was thoroughly explored, and with the assistance of Indian slaves thousands of mines were opened, many of them failures, some of them becoming famous. There was a decline in mining enterprise after the revolt of the colonists against Spanish rule, owing to the unsettled state of the country, and this decline continued in some measure to the end of the century. The mining laws of the colonial regime and political disorder together raised a barrier to the employment of the large amount of capital needed, while the frequent outbreaks of civil war made it impossible to work any large enterprise because of its interference with labour and the free use of ports and roads. The Peruvians were impoverished, and under such conditions foreign capital could not be secured. In 1876 new mining laws were enacted which gave better titles to mining properties and better regulations for their operation, but the outbreak of the war' with Chile at the end of the decade and the succeeding years of disorganization and partisan strife defeated their purpose. Another new mining code was adopted in 1901, and this, with an improvement in political and economic conditions, has led to a renewal of mining enterprise.

Practically the whole Andean region of Peru is mineral-bearing — • a region 1500 m. long by 200 to 300 m. wide. Within these limits are to

be found most of the minerals known — gold, silver, quick- silver, copper, lead, zinc, iron, manganese, wolfram, bismuth, thorium, vanadium, mica, coal, &c. On or near the coast are coal, salt, sulphur, borax, nitrates and petroleum. Gold is found in lodes and alluvial deposit ; the former on the Pacific slope at Salpo, Otuzco, Huaylas, Yungay, Ocros, Chorrillos, Cafiete, lea, Nasca, Andaray and Arequipa, and on the table-lands and Amazon slope at Pataz, Huanuco, Chuquitambo, Huancavelica, Cuzco, Cota- bambas, Aymares, Paucartambo, Santo Domingo and Sandia ; the latter wholly on the Amazon slope, in the country about the Pongo de Manseriche and at Chuquibamba, both on the upper Marafion, in the districts of Pataz, Huanuco, Aymares and Anta- bamba (Apurimac), Paucartambo and Quippicauchi (Cuzco), and Sandia and Carabaya (Puno). The last two are most important and, it is believed, were the sources from which the Incas derived the greater part of their store. The alluvial deposits are found both in the beds of the small streams and in the soil of the small plains or pampas. The Aporoma deposit, in the district of Sandia, is the best known. Long ditches with stone-paved sluices for washing this mineral-bearing material have long been used by the Indians, who also construct stone bars across the beds of the streams to make riffles and hold the deposited grains of gold. Modern methods of hydraulic mining have been introduced to work the auriferous banks of Poto; elsewhere antiquated methods only are employed. The upper valley of the Marafion has undeveloped gold-bearing lodes. The number of mines worked is small and there is not much foreign capital invested in them. The gold ores of Peru are usually found in ferruginous quartz. The production in 1906 was valued at £170,355.

Peru has been known chiefly for its silver mines, some of which have been marvellously productive. The Cerro de Pasco district, with its 342 mines, is credited with a production, in value, of £40,000,000 between 1784 and 1889, and is still productive, the output for 1906 being valued at £972,958. The principal silver- producing districts, the greater part on the high table-lands and slopes of the Andes, are those of Salpo, Hualgayoc, Huari, Huallanca, Huaylas, Huaraz, Recuay, Cajatambo, Yauli, Cerro de Pasco, Morococha, Huarochiri, Huancavelica, Quespisisa, Castro- virreyna, Lucanas, Lampa, Caylloma and Puno, but there are hundreds of others outside their limits. Silver is generally found as red oxides (locally called rosicler), sulphides and argentiferous galena. Modern machinery is little used and many _ mines are practically unworkable for want of pumps. In the vicinity of some of the deposits of argentiferous galena are large coal beds, but timber is scarce on the table-lands. The dried dung of the llama (taquia) is generally used as fuel, as in pre-Spanish times, for roasting

ores, as also a species of grass called ichu (Stipa incana), and a singular woody fungus, called yareta (Azorella umbellifera) , found growing on the rocks at elevations exceeding 12,000 ft. The methods formerly employed in reducing ores were lixiviation and amalgamation with quicksilver, but modern methods are gradually coming into use. Quicksilver is found at Huancavelica, Chonta (Ancachs), and in the department of Puno. The mine first named has been worked since 1566 and its total production is estimated at 60,000

tons, the annual product being about 670 tons for a long period. The metal generally occurs as sulphide of mercury (cinnabar), but the ores vary greatly in richness — from 2\ to 20%. The annual production has fallen to a small fraction of the former output, its value in 19O5 being only £340, and in 1906 £495.

The copper deposits of Peru long remained undeveloped through want of cheap transport and failure to appreciate their true value. The principal copper-bearing districts are Chimbote, Cajamarca, Huancayo, Huaraz, Huallanca, Junin, Huancavelica, lea, Arequipa, Andahuaylas and Cuzco — chiefly situated in the high, bleak regions of the Andes. The Junin district is the best known and includes the Cerro de Pasco, Yauli, Morococha and Huallay groups of mines, all finding an outlet to the coast over the Oroya railway. These mines are of recent development, the Cerro de Pasco mines having been purchased by American capitalists. A smelting plant was erected in the vicinity of Cerro de Pasco designed to treat 1000 tons of ore daily, a railway was built to Oroya to connect with the state line terminating at that point, and a branch line 62 m. long was built to the coal-mines of Goillarisquisga. The Cerro de Pasco mines are supposed by some authorities to be the largest copper deposit in the world. In addition to the smelting works at Cerro de Pasco there are other large works at Casapalca, between Oroya and Lima, which belong to a British company, and smaller plants at Huallanca and Huinae. The production of copper is steadily increasing, the returns for 1903 being 9497 tons and for 1906 13,474 tons, valued respectively at £476,824 and £996,055. Of other metals, lead is widely distri- buted, its chief source being a high grade galena accompanied by silver. Iron ores are found in Piura, the Huaylas valley, Aya, and some other places, but the deposits have not been worked through lack of fuel. Sulphur deposits exist in the Sechura desert region, on the coast, and extensive borax deposits have been developed in the department of Arequipa. Coal has been found in extensive beds near Piura, Salaverry, Chimbote, Huarmey and Pisco on the coast, and at Goillarisquisga, Huarochiri and other places in the interior. Both anthracite and bituminous deposits have been found. Most of the deposits are isolated and have

not been developed for want of transport. Petroleum has been found at several points on the coast in the department of Piura, and near Lake Titicaca in the department of Puno. The most productive of the Piura wells are at Talara and Zorritos, where refineries have been established. The crude oil is used on some of the Peruvian railways.

The number of mining claims (pertenencias) registered in 1907 was 12,858, according to official returns, each subject to a tax of 30 soles, or £3, per annum, the payment of which secures complete ownership of the property. The claims measure 100X200 metres (about 5 acres) in the case of mineral veins or lodes, and 200X200 metres (about 10 acres) for coal, alluvial gold and other deposits. The labourers are commonly obtained from the Cholos, or Indian inhabitants of the sierras, who are accustomed to high altitudes, and are generally efficient and trustworthy.

Manufactures. — The manufacturing industries of Peru are confined chiefly to the treatment of agricultural and mineral products — the manufacture of sugar and rum from sugar cane, textiles from cotton and wool, wine and spirits from grapes, cigars and cigarettes from tobacco, chocolate from cacao, kerosene and benzine from crude petroleum, cocaine from coca, and refined metals from their ores. Many of the manufacturing industries are carried on with difficulty and maintained only by protective duties on competing goods. The Incas had made much progress in weaving, and specimens of their fabrics, both plain and coloured, are to be found in many museums. The Spanish introduced their own methods, and their primitive looms are still to be found among the Indians of the interior who weave the coarse material from which their own garments are made. Modern looms for the manufacture of woollens were introduced in 186 1 and of cotton goods in 1874. There* are large woollen factories at Cuzco and Lima, the Santa Catalina factory at the latter place turning out cloth and cashmere for the army, blankets, counterpanes and underclothing. There are cotton factories about Lima, at lea and at Arequipa. Besides the wine industry, an irregular though important industry is the manufacture of artificial or counterfeit spirits and liqueurs in Callao and Lima. There are breweries in Arequipa, Callao, Cuzco and Lima, and the consumption of beer is increasing. There are large cigarette factories in Lima, and others in Arequipa, Callao, Piura and Trujillo. The plaiting of Panama hats from the specially prepared fibre of the ” toquilla ” palm is a domestic industry among the Indians at Catacoas (Piura) and Eten (Lambayeque). Coarser straw hats are made at other places, as well as hammocks, baskets, &c.

Government.— Peru is a centralized republic, whose supreme law is

the constitution of i860. Like the other states of South America its constitution provides for popular control of legislation and the execution of the laws through free elections and comparatively short terms of office, but in practice these safeguards are often set aside and dictatorial methods super- sede all others. Nominally the people are free and exercise

sovereign rights in the choice of their representatives, but the ignorance of the masses, their apathy, poverty and dependence upon the great land proprietors and industrial corporations practically defeat these fundamental constitutional provisions. Citizenship is accorded to all Peruvians over the age of 21 and to all married men under that age, and the right of suffrage to all citizens who can read and write, or possess real estate or workshops, or pay taxes. In all cases the exercise of citizenship is regulated by law.

The government is divided into three independent branches, legislative, executive and judicial, of which through force of circumstances the executive has become the dominating power. The executive branch consists of a president and two vice- presidents elected for terms of four years, a cabinet of six ministers of state appointed by the president, and various subordinate officials who are under the direct orders of the president. The president is chosen by a direct popular election and cannot be re-elected to succeed himself. He must be not less than 35 years of age, a Peruvian by birth, in the enjoyment of all his civil rights, and domiciled in the republic ten years preceding the election. The immediate supervision and despatch of public administrative affairs is in the hands of the cabinet ministers — interior, foreign affairs, war and marine, finance and commerce, justice and public instruction, and public works and promotion (Jomento). The execution of the laws in the depart- ments and provinces, as well as the maintenance of public order, is entrusted to prefects and sub-prefects, who are appoin- tees of the president. A vacancy in the office of president is filled by one of the two vice-presidents elected at the same time and under the same conditions. Inability of the first vice-president to assume the office opens the way for the second vice-president, who becomes acting president until a successor is chosen. The vice-presidents cannot be candidates for the presidency during their occupancy of the supreme executive office, nor can the ministers of state, nor the general- in-chief of the army, while in the exercise of their official duties.

The legislative power is exercised by a national Congress — senate and chamber of deputies — meeting annually on the 28th of July in ordinary session for a period of 90 days. Sena- tors and deputies are inviolable in the exercise of their duties, and cannot be arrested or imprisoned during a session of Congress, including the month preceding and following the session, except in flagrante delicto. Members of Congress are forbidden to accept any employment or benefit from the executive. Senators and deputies are elected by direct vote — the former by depart- ments, and the latter in proportion to the population. With both are elected an equal number of substitutes, who assume office in case of vacancy.

Departments with eight and more provinces are entitled to four senators, those of four to seven provinces three senators, those of two to three provinces two senators, and those of one province one senator. The deputies are chosen to represent 15,000 to 30,000 population each, but every province must have at least one deputy. Both senators and deputies are elected for terms of six years, and both must be native-born Peruvian citizens in the full enjoyment of their civil rights. A senator must be 35 years of age, and have a yearly income of $1000. The age limit of a deputy is 25 years, and his income must be not less than $500. In both chambers the exercise of some scientific profession is accepted in lieu of the pecuniary income. No member of the executive branch of the government (president, cabinet minister, prefect, sub-prefect, or governor) can be elected to either chamber, nor can any judge or ” fiscal ” of the supreme court, nor any member of the ecclesiastical hierarchy from his diocese, province or parish, nor any judge or _” fiscal ” of superior and first-instance courts from their judicial districts, nor any military officer from the district where he holds a military appointment at the time of election. No country is provided with more and better safeguards against electoral and official abuses than is Peru, and yet few countries suffered more from political disorder during the 19th century. The president has no veto power, but has the right to return a law to Congress with comments within a period of ten days. Should the act be again passed without amendments it becomes law; if, however, the suggested amendments are accepted the act must go over to the next session. Congress may also sit as a court of impeachment — the senate hearing and deciding the case, and the chamber acting as prosecutor. The president, ministers of state and judges of the supreme court may be brought before this court.

Justice. — The judiciary is composed of a supreme court, superior courts and courts of first instance, and justices of the peace. The supreme court is established at the national capital and consists of II

judges and 2 ” fiscals ” or prosecutors. Ihe judges are selected by Congress from lists of nominees submitted by the exe- cutive. The judges of the superior courts are chosen by the presi- dent from the list of nominees submitted by the supreme court. Questions of jurisdiction between the superior and supreme courts, as well as questions of like character between the supreme court and the executive, are decided by the senate sitting as a court. The courts of first instance are established in the capitals of provinces and their judges are chosen by the superior courts of the districts in which they are located. The independence of the Peruvian courts has not been scrupulously maintained, and there has been much criticism of their character and decisions.

The national executive appoints and removes the prefects of the departments and the sub-prefects of the provinces, and the prefects appoint the gobiernadores of the districts. The police officials throughout the republic are also appointees of the presi- dent and are under his orders.

Army. — After the Chilean War the disorders fomented by the rival military officers led to a desire to place the administration of public affairs under civilian control. This led to a material reduction in the army, which, as reorganized, consists of 4000 officers and men, divided into seven battalions of infantry of 300 men each, seven squadrons of cavalry of 125 men each, and one regiment of mountain artillery of 590 men, with six batteries of mountain guns. The reorganization of the army was carried out by 10 officers and 4 non-coms, of the French army, known as the French military mission, who are also charged with the direction of the military school at Chorrillos and all branches of military instruction. There are a military high school, preparatory school, and ” school of application ” in connexion with the training of young officers for the army. The head of the mission is chief of staff. Formerly the Indians were forcibly pressed into the service and the whites filled the positions of officers, in great part untrained. Now military service is obligatory for all Peruvians between the ages of 19 and 50, who are divided into four classes, first and second reserves (19 to 30, and 30 to 35 years), supernumeraries (those who have purchased exemption from service in the regular army), and the national guard (35 to 50 years). The regular force is maintained by annual drawings from the iists of young men 19 years of age in the first reserves, who are required to serve four years. The direction of military affairs is entrusted to a general staff, which was reorganized in 1904 on the lines adopted by the great military powers of Europe. The republic is divided into four military districts with headquarters at Piura, Lima, Arequipa and Iquitos, and these into

eleven circumscriptions. The mounted police force of the republic is also organized on a military basis.

Navy. — The Peruvian navy was practically annihilated in the war with Chile, and the poverty of the country prevented for many years the adoption of any measure for its rebuilding. In 1908 it consisted of only five vessels. The naval school at Callao is under the direction of an officer of the French navy. In addition to the foregoing the government has a few small river boats on the Marafion and its tributaries, which are commanded by naval officers and used to maintain the authority of the republic and carry on geographical and hydrographical work.

Finance. — The financial record of Peru, notwithstanding her enormous natural resources, has been one of disaster and discredit. Internal strife at first prevented the development of her resources, and then when the export of guano and nitrates supplied her treasury with an abundance of funds the money was squandered on extrava- gant enterprises and in corrupt practices. This was followed by the loss of these resources, bankruptcy, and eventually the surrender of her principal assets to her foreign creditors. The government then had to readjust expenditures to largely diminished resources; but the obligation has been met intelligently and courageously, and since 1 895 there has been an improvement in the financial state of the country. The public revenues are derived from customs, taxes, various inland and consumption taxes, state monopolies, the government wharves, posts and telegraphs, &c. The customs taxes include import and export duties, surcharges, harbour dues, warehouse charges, &c. ; the inland taxes comprise consumption taxes on alcohol, tobacco, sugar and matches, stamps and stamped paper, capital and mining properties, licences, transfers of property, &c. ; and the state monopolies cover opium and salt. In 1905 a loan of £600,000 was floated in Germany for additions to the navy. The growth of receipts and expenditures is shown in the following table : —

1904.

1906.

1908.

Expenditure

£1,990,568 £1,884,949

£2,527,766 £2,178,252

£2,997.433 £3.043.032

The revenues of 1896 were only £1,128,714.

The foreign debt began with a small loan of £1,200,000 in London in 1822, and another of £1,500,000 in 1825 of which only £716,516 was placed. At the end of the war, these loans, and sums owing to Chile and Colombia, raised the foreign debt to £4,000,000. If

1830 the debt and accumulated interest owing in London amounted to £2,310,767, in addition to which there was a home debt of I 7 > 1 83,397 dollars. In 1848 the two London loans and accumulated interest were covered by a new loan of £3,736,400, and the home debt was partially liquidated, the sale of guano giving the treasury ample resources. Lavish expenditure followed and the government was soon anticipating its revenues by obtaining advances from guano consignees, usually on unfavourable terms, and then floating loans. There was another conversion loan in 1862 in the sum of £5,500,000 and in 1864 still another loan of this character was issued, nominally for £10,000,000, of which £7,000,000 only were issued. Then followed the ambitious schemes of President Balta, which with the loans of 1870 and 1872 raised the total foreign debt to £49,000,000, on which the annual interest charge was about £2,500,000, a sum wholly beyond the resources of the treasury. In 1876 interest payments on account of this debt were suspended and in 1 879-1 882 the war with Chile deprived Peru of her principal sources of income — the guano deposits and the Tarapaca nitrates. In 1889 the total foreign debt, including arrears of interest, was £54,000,000, and in the following year a contract was signed with the Peruvian Corporation, a company in which the bondholders became shareholders, for the transfer to it for 66 years of the state railways, the free use of certain ports, the right of navigation on Lake Titicaca, the exploitation of the remaining guano deposits up to 3,000,000 tons, and thirty-three annual subsidies of £80,000 each, in consideration of the cancellation of the debt. Some modi- fications were later made in the contract, owing to the government's failure to meet the annual subsidies and the corporation's failure to extend the railways agreed upon. This contract relieved Peru of its crushing burden of foreign indebtedness, and turned an apparently heavy loss to the bondholders into a possible profit. In 1910 the foreign debt stood at £3,140,000, composed of (1) Peruvian Corporation £2,160,000; (2) wharves and

docks, £80,000; (3) loan of 1905, £500,000; (4) loan of 1906, £400,000.

Currency. — The single gold standard has been in force in Peru since 1897 and 1898, silver and copper being used for subsidiary coinage. The monetary unit is the Peruvian pound {libra) which is uniform in weight and fineness with the British pound sterling. Half and fifth pounds are also coined. The silver coinage consists of the sol (100 cents), half sol (50 cents), and pieces of 20 {peseta), 10 and 5 cents; and the copper coinage of I and 2 cents. The single standard has worked well, and has contributed much toward the recovery of Peruvian commerce and finance. The change from the double standard was effected without any noticeable disturbance in commercial affairs, but this was in part due to the precaution of making the British pound sterling legal tender in the republic and establishing the legal equivalent between gold and silver at 10 soles to the pound. The coinage in 1906-1907 was about £150,000 gold and £65,000 silver, and the total circulation in that year was estimated at £1,400,000 in gold coin and £600,000 in silver coin. Previous to the adoption of the single gold standard in 1897 the monetary history of Peru had been unfortunate. The first national coinage was begun in 1822, and the decimal system was adopted in 1863. Although the double standard was in force, gold was practically demonetized by the monetary reform of 1872 because of the failure to fix a legal ratio between the two metals. Experience with paper currency has been even more disastrous. During the administration (1 872-1 876) of President Pardo the government borrowed heavily from the banks to avoid the suspension of work on the railways and port improvements. These banks enjoyed the privilege of issuing currency notes' to the amount of three times the cash in hand without regard to their commercial liabilities. A large increase in imports, caused by fictitious prosperity and inability to obtain drafts against guano shipments, led to the exportation of coin to meet commercial obligations, and this soon reduced the currency circulation to a paper basis. The government being unable to repay its loans from the banks compelled the latter to suspend the conversion of their notes, which began to depreciate in value. In 1875 the banks were granted a moratorium, to enable them to obtain coin, but without result. The government in 1 877 contracted a new loan with the banks and assumed responsibility for their outstanding emissions, which are said to have aggregated about 100,000,000 soles, and were worth barely 10% of their nominal value. At last their depreciation reached a point where their acceptance was generally refused and silver was imported for com- mercial needs, when the government suspended their legal tender quality and

allowed them to disappear.

Weights and Measures. — The French metric system is the official standard of weights and measures and is in use in the custom-houses of the republic and in foreign trade, but the old units are still commonly used among the people. These are the ounce, 1-104 oz – avoirdupois; the libra, 1-014 ft > avoirdupois; the quintal, 101-44 lb avoirdupois; the arroba, 25-36 lb avoirdupois; ditto of wine, 6-70 imperial gallons; the gallon, -74 of an imperial gallon; the vara, -927 yard ; and the square vara, -859 square yard. (A. J. L.)

History.— Cyclopean ruins of vast edifices, apparently never completed, exist at Tiahuanaco near the southern shore of Lake Titicaca. Remains of a similar character are found at Huaraz

in the north of Peru, and at Cuzco, Ollantay-tambo and Huinaque between Huaraz and Tiahuanaco. These works appear to hav« been erected by powerful sovereigns with unlimited command of labour, possibly with the object of giving employment to subjugated people, while feeding the vanity or pleasing the taste of the conqueror. Of their origin nothing is historically known. It is probable, however, that the settlement of the Cuzco valley and district by the Incas or ” people of the sun ” took place some 300 years before Pizarro landed in Peru. The conquering tribe or tribes had made their way to the sierra from the plains, and found themselves a new land sheltered from attack amidst the lofty mountains that hem in the valley of Cuzco and the vast lake basin of Titicaca, situated 12,000 ft. above the sea level. The first historical records show us these people already possessed of a considerable civilization, and speaking two allied languages, Aymara and Quichua. The expansion of the Inca rule and the formation of the Peruvian Empire was of modern growth at the time of the Spanish conquest, and dated from the victories of Pachacutic Inca who lived about a century before Huayna Capac, the Great Inca, whose death took place in 1526, the year before Pizarro first appeared on the coast. His con- solidated empire extended from the river Ancasmayu north of Quito to the river Maule in the south of Chile. The Incas had an elaborate system of state-worship, with a ritual, and fre- quently recurring festivals. History and tradition were pre- served by the bards, and dramas were enacted before the sovereign and his court. Roads with post-houses at intervals were made over the wildest mountain-ranges and the bleakest deserts for hundreds of miles. A well-considered system of land-tenure and of colonization provided for the wants of all classes of the people. The administrative details of government were minutely and carefully organized, and accurate statistics were kept by means of the ” quipus ” or system of knots. The

edifices displayed marvellous building skill, and their workman- ship is unsurpassed. The world has nothing to show, in the way of stone-cutting and fitting, to equal the skill and accuracy displayed in the Inca structures of Cuzco. As workers in metals and as potters they displayed infinite variety of design, while as cultivators and engineers they excelled their European con- querors. (For illustrations see America, Plate V.)

The story of the conquest has been told by Prescott and Helps, who give ample references to original authorities; it will be sufficient here to enumerate the dates of the leading events. On the 10th of March 1526 the p/ˆrof * contract for the conquest of Peru was signed by Francisco Pizarro, Diego de Almagro and Hernando de Luque, Caspar de Espinosa supplying the funds. In 1527 Pizarro, after enduring fearful hardships, first reached the coast of Peru at Tumbez. In the following year he went to Spain, and on the 26th of July 1529 the capitulation with the Crown for the conquest of Peru was executed. Pizarro sailed from San Lucar with his brothers in January 1530, and landed at Tumbes in 1531. The civil war between Huascar and Atahualpa, the sons of Huayna Capac, had been fought out in the meanwhile, and the victorious Atahualpa was at Cajamarca on his way from Quito to Cuzco. On the 15th of November 1532 Pizarro with his little army, made his way to Cajamarca, where he received a friendly welcome from the Inca, whom he treacherously seized and made prisoner. He had with him only 183 men. In February 1533 his colleague Almagro arrived with reinforce- ments. The murder of the Inca Atahualpa was perpetrated on the 29th of August 1533, and on the 15th of November Pizarro entered Cuzco. He allowed the rightful heir to the empire, Manco, the legitimate son of Huayna Capac, to be solemnly crowned on the 24th of March 1534. Almagro then undertook an expedition to Chile, and Pizarro founded the city of Lima on the 18th of January 1535. In the following year the Incas made a brave attempt to expel the invaders, and closely besieged the Spaniards in Cuzco during February and March. But Almagro, returning from Chile, raised the siege on the 18th of April 1537. Immediately afterwards a dispute arose between the brothers, Francisco, Juan and Gonzalo Pizarro and Almagro

as to the limits of their respective jurisdictions. An interview took place at Mala, on the sea-coast, on the 13th of November 1537, which led to no result, and Almagro was finally defeated in the battle of Las

Salinas near Cuzco on the 26th of April 1 538. His execution followed. His adherents recognized his young half-caste son, a gallant and noble youth generally known as Almagro the Lad, as his successor. Bitterly discontented, they conspired at Lima and assassinated Francisco Pizarro on the 26th of June 1541. Meanwhile Vaca de Castro had been sent out as governor of Peru by Charles V., and on hearing of the murder of Pizarro he assumed the government of the country. On the 16th of September 1542 he defeated the army of Almagro the Lad in the battle of Chupas near Guamanga, and the boy was beheaded at Cuzco.

Charles V. enacted the code known as the ” New Laws ” in 1542. ” Encomiendas,” or grants of estates on which the CMl Wars, inhabitants were bound to pay tribute and give personal service to the grantee, were to pass to the Crown on the death of the actual holder; a fixed sum was to be assessed as tribute; and forced personal service was forbidden. Blasco Nunez de Vela was sent out, as first viceroy of Peru, to enforce the ” New Laws.” Their promulgation aroused a storm among the conquerors. Gonzalo Pizarro rose in rebellion, and entered Lima on the 28th of October 1544. The viceroy fled to Quito, but was followed, defeated and killed at the battle of Anaquito on the 18th of January 1546. The ” New Laws ” were weakly revoked, and Pedro de la Gasca, as first president of the Audiencia (court of justice) of Peru, was sent out to restore order. He arrived in 1547, and on the 8th of April 1548 he routed the followers of Gonzalo Pizarro on the plain of Sacsahuaman near Cuzco. Gonzalo was executed on the field. La Gasca made a redistribution of ” encomiendas ” to the loyal conquerors, which caused great discontent, and left Peru before his scheme was made public in January 1550. On the 23rd of September 1551 Don Antonio de Mendoza arrived as second viceroy, but he died at Lima in the following July. The country was then ruled by the judges of the Audiencia, and a formidable insurrection broke out, headed by Francisco Hernan- dez Giron, with the object of maintaining the right of the conquerors to exact forced service from the Indians. In May 1554 Giron defeated the army of the judges at Chuquinga, but he was hopelessly routed at Pucara on the nth of October 1554, captured, and on the 7th of December executed at Lima. Don Andres Hurtado de Mendoza, marquis of Canete, entered Lima as third viceroy of Peru on the 6th of July 1555, and ruled with an iron hand for six years. All the leaders in former disturbances were sent to Spain. Corregidors, or governors of districts, were ordered to try summarily and execute every turbulent person within their jurisdictions. All unemployed persons were sent on distant expeditions, and moderate ” en- comiendes ” were granted to a few deserving officers. At the same

time the viceroy wisely came to an agreement with Sayri Tupac, the son and successor of the Inca Manco, and granted him a pension. He took great care to supply the natives with priests of good conduct, and promoted measures for the estab- lishment of schools and the foundation of towns in the different provinces. The cultivation of wheat, vines and olives, and European domestic animals were introduced. The next viceroy was the Conde de Nieva (1 561-1564). His successor, the licentiate Lope Garcia de Castro, who only had the title of governor, ruled from 1564 to 1569. From this time there was a succession of viceroys until 1824. The viceroys were chief magistrates, but in legal matters they had to consult the Audi- encia of judges, in finance the Tribunal de Cuentas, in other branches of administration the Juntas de Gobierno and de Guerra.

Don Francisco de Toledo, the second son of the count of Oropesa, entered Lima as viceroy on the 26th of November 1569. Toledo's Fearing that the little court of the Inca Tupac Amaru Admlnlstra- (who had succeeded his brother Sayri Tupac) might

"• become a focus of rebellion, he seized the young

prince, and unjustly beheaded the last of the Incas in the square

of Cuzco in the year 1571. After a minute personal inspection of every province in Peru, he, with the experienced aid of the learned Polo de Ondegardo and the judge of Matienza, estab- lished the system under which the native population of Peru was ruled for the two succeeding centuries. His Libro de Tasos fixed the tribute to be paid by the Indians, exempting all men under eighteen and over fifty. He found it necessary, in order to secure efficient government, to revert in some measure to the system of the Incas. The people were to be directly governed by their native chiefs, whose duty was to collect the tribute and exercise magisterial functions. The chiefs or " curacas " had subordinate native officials under them called " pichca-pachacas " over 500 men, and " pachacas " over 100 men. The office of curaca or cacique was made hereditary, and its possessor enjoyed several privileges. Many curacas were descended from the imperial family of the Incas, or from great nobles of the Incarial court. In addition to the tribute, which was in accordance with native usage, there was the " mita," or forced labour in mines, farms and manufactories. Toledo enacted that one-seventh of the male population of a village should be subject to conscription for this service, but they were to be paid, and were not to be taken beyond a specified distance from their homes.

The Spanish kings and viceroys desired to protect the people from

tyranny, but they were unable to prevent the rapacity and lawlessness of distant officials and the country was depopulated by the illegal methods of enforcing royalty. the mita. Toledo was succeeded in 1581 by Don Martin Henriquez, who died at Lima two years afterwards. The Spanish colonies suffered from the strict system of monopoly and protection, which was only slightly relaxed by the later Bourbon kings, and from the arbitrary proceedings of the Inquisition. Between 1581 and 1776 as many as fifty-nine heretics were burned at Lima, and there were twenty-nine ” autos “; but the Inquisition affected Europeans rather than natives, for the Indians, as catechumens, were exempted from its terrors. The curacas sorrowfully watched the gradual extinc- tion of their people by the operation of the mita, protesting from time to time against the exactions and cruelty of the Spaniards. At length a descendant of the Incas, who assumed the name of Tupac Amaru, rose in rebellion in 1780. The insurrection lasted until July 1783, and cruel executions followed its suppression. This was the last effort of the Indians to throw off the Spanish yoke and the rising was by no means general. The army which overthrew Tupac Amaru consisted chiefly of loyal Indians, and the rebellion was purely anti-Spanish, and had no support from the Spanish population. The movement for independence, which slowly gained force during the opening decade of the 19th century, did not actually become serious until the conquest of Spain by the French in 1807-1808. The Creoles (Criallos) or American-born Spaniards had for long been aggrieved at being shut out from all important official positions, and at the restric- tions placed upon their trade, but the bulk of the Creole popula- tion was not disloyal.

Peru was the centre of Spanish power, and the viceroy had his military strength concentrated at Lima. Consequently the insurrections in the more distant provinces, such as Chile and Buenos Aires, were the first to declare

Peru Inde- pendent,

themselves independent, in 1816 and 181 7. But the destruction of the viceroy’s power was essential to their continued independent existence. The conquest of the Peruvian coast must always depend on the command of the sea. A fleet of armed ships was fitted out at Valparaiso in Chile, under the command of Lord Cochrane (afterwards earl of Dundonald) and officered by Englishmen. It convoyed an army of Argentine troops, with some Chileans, under the command of the Argentine general, San Martin, which landed on the coast of Peru in September 1820. San Martin was enthusiastically received, and the independence of Peru was proclaimed at Lima after the viceroy had

withdrawn (July 28, 1821). On the 20th of September 1822 San Martin resigned the protectorate, with which he had been invested, and on the same day the first

congress of Peru became the sovereign power of the state. After a short period of government by a committee of three, the congress elected Don Jose de la Riva Aguero to be first president of Peru en the 28th of February 1823. He displayed great energy in facing the difficulties of a turbulent situation, but was unsuccessful. The aid of the Colombians under Simon Bolivar was sought, and Aguero was deposed.

Bolivar arrived at Lima on the 1st of September 1823, and began to organize an army to attack the Spanish viceroy in the interior. On the 6th of August 1824 the cavalry action of Junin was fought with the Spanish forces under the command of a French adventurer, General Canterac, near the shores of the lake of Chinchay-cocha. It was won by a gallant charge of the Peruvians under Captain Suarez at the critical moment. Soon afterwards Bolivar left the army to proceed to the coast, and the final battle of Ayacucho (Dec. 9, 1824) was fought by his second in command, General Sucre. The viceroy and all his officers were taken prisoners, and the Spanish power in Peru came to an end.

General Bolivar ruled Peru with dictatorial powers for more than a year, and though there were cabals against him there can be little doubt of his popularity. He was summoned back to Colombia when he had been absent for five years and, in spite of protests left the country on the 3rd 6f September 1826, followed by all the Colombian troops in March 1827.

General Jose de Lamar, who commanded the Peruvians at Ayacucho, was elected president of Peru on the 24th of August 1827, but was deposed, after waging a brief but Presidents, disastrous war with Colombia on the 7th of June 1820. General Agustin Gamarra, who had been in the Spanish service, and was chief of the staff in the patriot army at Ayacucho, was elected third president on the 31st of August 1829.

For fifteen years, from 1829 to 1844, Peru was painfully feeling her way to a right use of independence. The officers who fought at

Ayacucho, and to whom the country felt natural gratitude, were all-powerful, and they had not learned to settle political differences in any other way than by the sword. Three men, during that period of probation, won a prominent place in their country's history, Generals Agustin Gamarra, Felipe Santiago Salaverry, and Andres Santa Cruz. Gamarra, born at Cuzco in 1785, never accommodated himself to constitutional usages; but he attached to himself many loyal and devoted friends, and, with all his faults he loved his country and sought its welfare according to his lights. Salaverry was a very different character. Born at Lima in 1806, of pure Basque descent, he joined the patriot army before he was fifteen and displayed his audacious valour in many a hard-fought battle. Feeling strongly the necessity that Peru had for repose, and the guilt of civil dissension, he wrote patriotic poems which became very popular. Yet he too seized the supreme power, and perished by an iniquitous sentence on the 18th of February 1836. 1 Andres Santa Cruz was an Indian statesman. His mother was a lady of high rank, of the family of the Incas, and he was very proud of his descent. Unsuccessful as a general in the field, he nevertheless possessed remarkable administrative ability and for nearly three years (1836-1839) realized his lifelong dream of a Peru-Bolivian confederation. 2 But the strong-handed inter- vention of Chile on the ground of assistance rendered to rebels, but really through jealousy of the confederation, ended in the defeat and overthrow of Santa Cruz, and the separation of Bolivia from Peru. But Peruvian history is not confined to the hostilities of these military rulers. Three constitutions were framed— in 1828, 1833 and 1839. Lawyers and orators are never wanting in Spanish-American states, and revolution succeeded revolution in one continuous struggle for the spoils

1 The romance of his life has been admirably written by Manuel Bilbao (isted., Lima, 1 853; 2nd ed., Buenos Aires, 1867).

2 The succession of presidents and supreme chiefs of Peru from 1829 to 1844 was as follows: 1829-1833, Agustin Gamarra; 1834-1835, Luis Jose Orbegoso; 1835-1836, Felipe Santiago Sala- verry; 1836-1839, Andres Santa Cruz; 1839-1841, Agustin Gamarra; 1841-1844, Manuel Menendez.

of office. An exception must be made of the administration of General Ramon Castilla, who restored peace to Peru, and showed himself to be an honest and very capable ruler. He was elected constitutional president on the 20th of April 1845. Ten years of peace and increasing prosperity followed. In 1849 the regular payment of the interest of the public debt was commenced, steam communication was established along the Pacific coast, and a railroad was made from Lima to Callao.

After a regular term of office of six years of peace and moral and material progress Castilla resigned, and General Jose Echenique was elected president. But the proceedings of Echenique's government in connexion with the consolidation of the internal debt were disapproved by the nation, and, after hostilities which lasted for six months, Castilla returned to power in January 1855. From December 1856 to March 1858 he had to contend with and subdue a local insurrection headed by General Agostino Vivanco, but, with these two exceptions, there was peace in Peru from 1844 to 1879, a period of thirty-five years. Castilla retired at the end of his term of office in 1862, and died in 1868. On the 2nd of August 1868 Colonel Juan Balta was elected president. With the vast sum raised from guano and nitrate deposits President Balta commenced the execution of public works, principally railroads on a gigantic scale. His period of office was signalized by the opening of an international exhibition at Lima. He was succeeded (Aug. 2, 1872) by Don Manuel Pardo (d. 1878), an honest and enlightened statesman, who did all in his power to retrieve the country from the financial difficulty into which it had been brought by the reckless policy of his predecessor, but the con- ditions were not capable of solution. He regulated the Chinese immigration to the coast-valleys, which from i860 to 1872 had amounted to 58,606. He promoted education, and encouraged literature. On the 2nd of August 1876 General Mariano-Ignacio Prado was elected. (C. R. M.;X.)

On the 5th of April 1879 the republic of Chile declared war upon Peru, the alleged pretext being that Peru had made an offensive treaty, directed against Chile, with Bolivia, war with a country with which Chile had a dispute ; but the Chile, 1879- publication of the text of this treaty made known ,882 ' the fact that it was strictly defensive and contained no just cause of war. The true object of Chile was the conquest of the rich Peruvian province of Tarapaca, the appropriation of its valuable guano and nitrate deposits, and the spoliation of the rest of the Peruvian coast. The military events of the war, calamitous for Peru, are dealt with in the article Chile- Peruvian War. Suffice it here to note that, after the crushing defeat of the Peruvian forces at Arica (June 7, 1880) Senor Nicolas de Pierola assumed dictatorial powers, with General Andres Caceres as commander-in-chief, but the defeats at Chorrillos (Jan. 13, 1881) and Miraflores (Jan. 15) proved the Chilean superiority, and put Lima at their mercy though desultory fighting was maintained by the remnants of the Peruvian army in the interior, under direction of General Caceres. An attempt was made to constitute a government with Senor Calderon as president of the republic and General Caceres as first vice-president. The negotiations between this nominal administration and the Chilean authorities for a

treaty of peace proved futile, the Chilean occupation of Lima and the Peruvian seaboard continuing uninterruptedly until 1883. In that year Admiral Lynch, who had replaced General Baquedano in command of the Chilean forces after the taking of Lima, sent an expedition against the Peruvians under General Caceres, and defeated the latter in the month of August. , The Chilean authorities now began preparations for the evacuation of Lima, and to enable this measure to be effected a Peruvian administra- tion was organized with the support of the Chileans. General Iglesias was nominated to the office of president of the republic, and in October 1883 a treaty of peace, known as the treaty of Ancon, between Peru and Chile was signed. The Chilean army of occupation was withdrawn from Lima on the 22nd of October

1883, but a strong force was maintained at Chorrillos until July

1884, when the terms of the treaty were finally approved. The

principal conditions imposed by Chile were the absolute cession by Peru of the province of Tarapaca, and the occupation for a period of ten years of the territories of Tacna and Arica, the ownership of these districts to be decided by a popular vote of the inhabitants of Tacna and Arica at the expiration of the period named. A further condition was enacted that an indemnity of 10,000,000 soles was to be paid by the country finally remaining in possession — a sum equal to about £1,000,000 to-day. The Peruvians in the interior refused to recognize President Iglesias, and at once began active operations to over- throw his authority on the final departure of the Chilean troops. Affairs continued in this unsettled state until the middle of 1885, Caceres meanwhile steadily gaining many adherents to his side of the quarrel. In the latter part of 1885 President Iglesias abdicated.

Under the guidance of General Caceres a junta was then

formed to carry on the government until an election for the

, presidency should be held and the senate and cham-

Power. ber °^ deputies constituted. In the following year

(1886) General Caceres was elected president of the republic for the usual term of four years. The task assumed by the new president was no sinecure. The country had been thrown into absolute confusion

from a political and administra- tive point of view, but gradually order was restored, and peaceful conditions were reconstituted throughout the republic. The four years of office for which General Caceres was elected passed in uneventful fashion, and in 1890 Senor Morales Bermudez was nominated to the presidency, with Senor Solar and Senor Borgofio as first and second vice-presidents. Matters continued without alteration from the normal course until 1894, and in that year Bermudez died suddenly a few months before the expiration of the period for which he had been chosen as presi- dent. General Caceres secured the nomination of the vice- president Borgofio as chief of the executive for the unexpired portion of the term of the late president Bermudez. This action was unconstitutional, and was bitterly resented by the vice-president Solar, who by right should have succeeded to the office. Armed resistance to the authority of Borgofio was immediately organized in the south of Peru, the movement being supported by Senores Nicolas de Pierola, Billinghurst, Durand and a number of influential Peruvians. In the month of August 1894 General Caceres was again elected to fill the office of presi- dent, but the revolutionary movement rapidly gained ground. President Caceres adopted energetic measures to suppress the outbreak: his efforts, however, proved unavailing, the close of 1894 finds the country districts in the power of the rebels and the authority of the legal government confined to Lima and other cities held by strong garrisons. Early in March 1895 the insur- gents encamped near the outskirts of Lima, and on the 17th, 1 8th and 19th of March severe fighting took place, ending in the defeat of the troops under General Caceres. A suspension of hostilities was then brought about by the efforts of H.B.M. consul. The loss on both sides to the struggle during these two days was 2800 killed and wounded. President Caceres, finding his cause was lost, left the country, a provisional government under Senor Candamo assuming the direction of public affairs.

On the 8th of September 1895 Senor Pierola was declared president of the republic for the following four years. The

Peruvians were now heartily tired of revolutionary President, disturbances, and an insurrectionary outbreak in

the district of Iquitos met with small sympathy, and was speedily crushed. In 1896 a reform of the electoral law was sanctioned. By the provisions of this act an electoral committee was constituted, composed of nine members, two of these nominated by the senate, two by the chamber of deputies, four by the supreme court, and one by the president with the consent of his ministers. To this committee was entrusted the task of the examination of all election returns, and

of the pro- clamation • of the names of successful candidates for seats in congress. Another reform brought about by Pierola was a measure introduced and sanctioned in 1897 for a modification of the marriage laws. Under the new act marriages of non-

Catholics solemnized by diplomatic or consular officers or by ministers of dissenting churches, if properly registered, are valid, and those solemnized before the passing of this act were to be valid if registered before the end of 1899. Revolutionary troubles again disturbed the country in 1899, when the presi- dency of Senor Pierola was drawing to a close. In consequence of dissensions amongst the members of the election committee constituted, by the act of 1896, the president ordered the suppres- sion of this body. A group of malcontents under the leadership of one Durand, a man who had been prominent in the revolution against General Caceres in 1894-95, conspired against the authorities and raised several armed bands, known- locally as montaneras. Some skirmishes occurred between these insur- gents and the government troops, the latter generally obtaining the advantage in these encounters.

In September 1899 President Pierola vacated the presidency in favour of Senor Romafia, who had been elected to the office as a popular condidate and without the exercise of any undue official influence. President Romafia p°^Jent was educated at Stonyhurst in England, and was a civil engineer by profession. The principal political problem before the government of Peru was the ownership of the terri- tories of Tacna and Arica. The period of ten years originally agreed upon for the Chilean occupation of these provinces expired in 1894. At that date the peace of Peru was so seriously disturbed by internal troubles that the government was quite unable to take active steps to bring about any solution of the matter. After 1894 negotiations between the two governments were attempted from time to time, but without any satisfactory results. The question hinged to a great extent on the qualifica- tion necessary for the inhabitants to vote, in the event of a plebiscite being called to decide whether Chilean ownership was to be finally established or the provinces were to revert to Peruvian sovereignty. Peru proposed that only Peruvian residents should be entitled to take part in a popular vote; Chile rejected this proposition, on the ground that all residents in the territories in question should have a voice in the final decision. The agreement between Chile and Bolivia, by which the disputed provinces were to be handed over to the latter country if Chilean possession was recognized, was also a stumbling-block, a strong feeling existed among Peruvians against this proceeding. It was not so much the value of Tacna and Arica that put diffi- culties in the way of a settlement as the fact that the national

pride of the Peruvians ill brooked the idea of permanently losing all claim to this section of country. The money, about £1 ,000,000, could probably have been obtained to indemnify Chile if occasion for it arose.

The question of the delimitation of the frontier between Peru and the neighbouring republics of Ecuador, Colombia, and Brazil also cropped up at intervals. A treaty was signed with Brazil 1876, by which certain physical features were accepted by both countries as the basis for the boundary. In the case of Ecuador and Colombia a dispute arose in 1894 concerning the ownership of large tracts of uninhabited country in the vicinity of the headwaters of the Amazon and its tributaries. An agreement was proposed between Peru and Ecuaaor in connexion with the limits of the respective republics, but diffi- culties were created to prevent this proposal from becoming an accomplished fact by the pretensions put forward by Colom- bia. The latter state claimed sovereignty over the Napo and Marafion rivers on the grounds of the ecclesiastical jurisdiction exercised over this section of territory during the period of Spanish dominion, the government of Colombia asserting that these ecclesiastical rights to which Colombia became entitled after her separation from the Spanish crown carried also the right of absolute ownership. In a treaty signed by the three interested states in 1895 a compromise was effected by which Colombia withdrew a part of the claim advanced, and it was agreed that any further differences arising out of this frontier question should be submitted to the arbitration of the Spanish crown. The later development of the boundary ques- tion is dealt with at the outset of this article.

Senor Manuel Candamo succeeded Senor Romana as president in 1903. In the following year he died, and on the 24th of September 1904 Senor Jose Pardo was installed in the presiden- tial chair. In 1908 there were some insurrectionary movements at Lima and an attempt was made to assassinate President Pardo, but they were, however, suppressed without a serious outbreak. Senor Augusto Leguiva became president on the 24th of September 1908. (C. E. A.; G. E.)

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PERU, a city of La Salle county, Illinois, U.S.A., in the north-central part of the state, on the N. bank of the Illinois River, about 100 m. S.W. of Chicago and 1 m. W. of La Salle, a terminus of the Illinois & Michigan Canal. Pop. (1900), 6863 (2095 foreign – born) ; (1910), 7984. It is served by the Chicago, Burlington & Quincy and the Chicago, Rock Island & Pacific railways. The city is built on the face and top of a series of river bluffs. It is the seat of St Bede College (Roman Catholic, opened in 1891), conducted by Benedictine fathers. In a large public park there is a bronze monument in memory of the soldiers of Peru who died in the Civil War. There are extensive coal-mines in the vicinity; and the city includes various manufactures. Peru was first settled about 1827, was incorporated in 1845, and re-incorporated in 1890.

PERU, a city and the county-seat of Miami county, Indiana, U.S.A., about 75 m. N. of Indianapolis, on the Wabash River. Pop. (1910 U.S. census), 10,910. Peru is served by the Chicago Cincinnati & Louisville, the Lake Erie & Western and the Wabash railways (each of which maintains shops here), and by electric lines to Indianapolis, Warsaw and other cities. The city has a Carnegie library, a railway Young Men's Christian Association, and a hospital for the employes of the Wabash railroad. There is a city park on the river, and 9 m. east of the city is Boyd park, an amusement resort. Peru is an important grain and produce market, and has various manufactures.

In 1905 the value of the factory products was $1,703,41.7 (2 7'3% more than in 1900). Petroleum is found in the vicinity. Peru was settled in 1834 and was chartered as a city in 1867.

PERUGIA (anc. Perusia), a city and archiepiscopal see of Italy, the capital of the province of Perugia (which forms the entire compartimento of Umbria) situated 1444 ft. above sea- level. Pop. (1906), 22,321 (town); 65,527 (commune). The town is finely situated upon a group of hills nearly 1000 ft. above the valley of the Tiber. Its outline is very irregular; from the centre of the town, at the junction of several ridges, parts of it extend for a considerable distance along their summits, being divided from one another by deep valleys. This is the extent enclosed by the medieval walls ; within them are considerable remains of the lofty terrace walls of the Eutruscan period. The so-called Arco di Augusto is a town gate with a Decorated superstructure, perhaps of the Etruscan period, bearing the inscription Augusta Perusia; above this again is a Renaissance loggia. The superstructure of a similar gate (Porta Marzia), which was removed in 1540 to make way for the citadel, but is depicted in a fresco by Benedetto Bonfigli (between 1461 and 1477), was re-erected in the substruction walls of

the citadel itself. It bears the inscription Colonia Vibia Augusta Perusia, so that the town must have become a colony in the reign of the emperor C. Vibius Trebonianus Gallus (a.d. 251-253), who was a native of it. Four other gates of the Etruscan period can still be traced (F. Noack in Romische Mitteilungen, 1897, 166 sqq). In the garden of the church of S. Elisabeth was found in 1876 a fine mosaic in black on a white ground representing Orpheus in the midst of the beasts (JSfotizie degli scavi, 1876, 181; 1877 309). The citadel was erected by Pope Paul III. in 1 540-1546, after the plans of Antonio da Sangallo the younger, and demolished in i860 (see Bacile di Castiglione in L 'Arte, 1903, 347). The Piazza del Duomo is at the north of the Corso. On one side stands the cathedral of San Lorenzo, a Gothic structure of the 14th and 15th centuries, in the plan of a Latin cross, with nave and aisles of equal height ; on the other the Palazzo del Municipio, presenting two fine Gothic facades, of the 14th century (though the building was not completed till 1443), with the figures of the Perugian griffin and the Guelph lion above the outside stair; and in the centre the marble fountain constructed in 1 277-1 280 by Arnolfo di Cambio, and adorned with statues and statuettes by Niccolo and Giovanni Pisano. The cathedral contains the burial-place of Urban IV. and Martin IV. — the remains of Inno- centlll. were removed to Rome in 1892 and placed in the basilica of S. Giovanni in Laterano — and the Virgin's wedding -ring; and at the north-east corner is a sitting statue of Pope Julius III. by Vincenzo Danti, erected in 1555 by the people of Perugia in gratitude for the restoration of their civic privileges. On the decoration of the Sala del Cambio, or old exchange, Perugino put forth the full force of his genius. Most of the movable paintings have since 1863 been collected in the Pinacoteca Vannucci, established in the Palazzo del Municipio; besides a considerable number of pieces by Perugino, there are specimens of Niccolo Alunno, Bonfigli, Pinturicchio, &c. A very interest- ing and important exhibition of Umbrian art was held here in 1907. The pictures, the needlework with some splendid pieces of embroidery from S. Francesco at Assisi, the vestments of Pope Benedict XI., and the majolica of Perugia and Deruta, a village 10 m. south, were especially noteworthy (see U. Gnoli, L' Arte umbra alia mostra di Perugia, Bergamo, 1908). The illuminated MSS. of the communal library, the cathedral and the church of S. Pietro, from the 7th century onwards, were also exhibited.

The formation of the Pinacoteca Vannucci has impaired the interest of several churches but in others it remains undiminished. San Domenico, a Gothic edifice originally designed by Giovanni Pisano but rebuilt in 16 14, contains the monument of Pope Benedict XI.

(attributed, but probably wrongly, to Giovanni Pisano by Vasari), and in its east front a Gothic window with stained glass by Fra Bartolommeo of Perugia (1441). San Pietro de' Cassinensi (outside the Porta Romana) is a basilica

with nave and aisles, founded in the beginning of the nth century by San Pietro Vincioli on the site of a building of the 6th century, and remarkable for its conspicuous spire, its ancient granite and marble columns, its walnut stall- work of 1535 by Stefano de' Zambelli da Bergamo, and its numerous pictures (by Perugino, &c). The oratory of S. Bernardino has an early Renaissance polychrome facade, richly sculptured, of 1457-1461, by Agostino d'Antonio di Duccio of Florence. S. Severo con- tains Raphael's first independent fresco (1505), much damaged by restoration. The circular church of S. Angelo, with sixteen antique columns in the interior, probably dates from the middle of the 6th century. The university dates from 1307, and has faculties of law, science and medicine; it had 318 students in 1902-1903. It contains an important museum of Etruscan and Roman antiquities. Three miles to the S.S.E. the Etruscan necropolis of the ancient city was discovered in 1870. The large tomb of the Volumni (3rd century b. c.) hewn in the rock, with its carved cinerary urns, is interesting.

The ancient Perusia first appears in history as one of the twelve confederate cities of Etruria. It is first mentioned in the account of the war of 310 or 309 B.C. between the Etruscans and the Romans. It took, however, an important part in the rebellion of 295, and was reduced, with Vulsinfi and Arretium, to seek for peace in the following year. In 216 and 205 it assisted Rome in the Hannibalic war, but afterwards it is not mentioned until 41-40 B.C., when L. Antonius took refuge there, and was reduced by Octavian after a long siege. A number of lead bullets used by slingers have been found in and around the city (Corpus inscr. lat. xi. 121 2). The city was burnt, we are told, with the exception of the temples of Vulcan and Juno — the massive Etruscan terrace-walls, naturally, can hardly have suffered at all — and the town, with the territory for a mile round, was allowed to be occupied by whoever chose. It must have been rebuilt almost at once, for several bases exist, inscribed Augusta sacr{um) Perusia restituta; but, as we have seen, it did not become a colony until A.D. 251-253. It is hardly men- tioned except by the geographers until the middle of the 6th century, when it was captured by Totila after a long

siege. In the Lombard period it is spoken of as one of the principal cities of Tuscia. In the 9th century, with the consent of Charles the Great and Louis the Pious, it passed under the popes; but for many centuries the city continued to maintain an indepen- dent life, warring against many of the neighbouring lands and cities — Foligno, Assisi, Spoleto, Montepulciano, &c. It remained true for the most part to the Guelphs. On various occasions the popes found asylum within its walls, and it was the meeting-place of the conclaves which elected Honorius II. (1124), Honorius IV. (1285), Celestine V. (1294), and Clement V. (1305). But Perugia had no mind simply to subserve the papal interests. At the time of Rienzi's unfortunate enterprise it sent ten ambassadors to pay him honour; and, when papal legates sought to coerce it by foreign soldiers, or to exact con- tributions, they met with vigorous resistance. In the 15th century power was at last concentrated in the Baglioni family, who, though they had no legal position, defied all other authority. Gian Paolo Baglioni was lured to Rome in 1520 and beheaded by Leo X.; and in 1534 Rodolfo, who had slain a papal legate, was defeated by Pier Luigi Farnese, and the city, captured and plundered by his soldiery, was deprived of its privileges. The citadel was begun six years later " ad coercendam Perusi- norum audaciam." In 1797 Perugia was occupied by the French; in 1832, 1838 and 1854 it was visited by earthquakes; in May 1849 it was seized by the Austrians; and, after a futile insurrection in 1859, it was finally united, along with the rest of Umbria, to Piedmont, in i860.

See G. Conestabile, I Monumenti di Perugia etrusca e romana (Perugia, 1855) ; M. Symonds and L. Duff Gordon, Perugia (" Medi- eval Towns Series"), (1898); R. A. Gallenga Stuart, Perugia (Bergamo, 1905; W. Heywood, Hist, of Perugia (1910). (T. As.)

PERUGINO, PIETRO (1446-1524), whose correct family name was Vannucci, Italian painter, was born in 1446 at Citta della Pieve in Umbria, and belongs to the Umbrian school of

painting. The name of Perugino came to him from Perugia, the chief city of the neighbourhood. Pietro was one of several children born to Cristoforo Vannucci, a member of a respectable family settled at Citta della Pieve. Though respectable, they seem to have been poor, or else, for some reason or other, to have left Pietro uncared for at the opening of his career. Before he had completed his ninth year the boy was articled to a master, a painter at Perugia. Who this may have been is very uncertain; the painter is spoken of as wholly mediocre, but sympathetic for the great things in his art. Benedetto Bonfigli is generally surmised; if he is rejected as being above mediocrity, either Fiorenzo di Lorenzo or Niccolo da Foligno may possibly have been the

man. Pietro painted a little at Arezzo ; thence he went to the headquarters of art, Florence, and frequented the famous Brancacci Chapel in the church of the Carmine. It appears to be sufficiently established that he studied in the atelier of Andrea del Verrocchio, where Leonardo de Vinci was also a pupil. He may have learned perspective, in which he par- ticularly excelled for that period of art, from Piero de' Fran- ceschi. The date of this first Florentine sojourn is by no means settled; some authorities incline to make it as early as 1470. while others, with perhaps better reason, postpone it till 1479. Pietro at this time was extremely poor; he had no bed, but slept on a chest for many months, and, bent upon making his way, resolutely denied himself every creature comfort.

Gradually Perugino rose into notice, and became famous not only throughout Italy but even beyond. He was one of the earliest Italian painters to practise oil-painting, in which he evinced a depth and smoothness of tint, which elicited much remark; and in perspective he applied the novel rule of two centres of vision. Some of his early works were extensive frescoes for the Ingesati fathers in their convent, which was destroyed not many years afterwards in the course of the siege of Florence; he produced for them also many cartoons, which they executed with brilliant effect in stained glass. Though greedy for gain, his integrity was proof against temptation; and an amusing anecdote has survived of how the prior of the Ingesati doled out to him the costly colour of ultramarine, and how Perugino, constantly washing his brushes, obtained a surreptitious hoard of the pigment, which he finally restored to the prior to shame his stingy suspiciousness. A good speci- men of his early style in tempera is the circular picture in the Louvre of the " Virgin and Child enthroned between Saints."

Perugino returned from Florence to Perugia, and thence, towards 1483, he went to Rome. The painting of that part of the Sixtine Chapel which is now immortalized by Michelangelo's " Last Judgment " was assigned to him by the pope; he covered it with frescoes of the "Assumption," the " Nativity," and " Moses in the Bulrushes." These works were ruthlessly destroyed to make a space for his successor's more colossal genius, but other works by Perugino still remain in the Sixtine Chapel; " Moses and Zipporah " (often attributed to Signorelli), the " Baptism of Christ," and " Christ giving the Keys to Peter." Pinturicchio accompanied the greater Umbrian to Rome, and was made his partner, receiving a third of the profits; he may probably have done some of the Zipporah subject.

Pietro, now aged forty, must have left Rome after the comple- tion of

the Sixtine paintings in i486, and in the autumn of that year he was in Florence. Here he figures by no means advan- tageously in a criminal court. In July 1487 he and another Perugian painter named Aulista di Angelo were convicted, on their own confession, of having in December waylaid with staves some one (the name does not appear) in the street nearS. Pietro Maggiore. Perugino limited himself, in intention, to assault and battery, but Aulista had made up his mind for murder. The minor and more illustrious culprit was fined ten gold florins, and the major one exiled for life.

Between i486 and 1499 Perugino resided chiefly in Florence, making one journey to Rome and several to Perugia. He was in many other parts of Italy from time to time. He had a regular shop in Florence, received a great number of commissions, and continued developing his practice as an oil-painter, his

system of superposed layers of colour being essentially the same as that of the Van Eycks. One of his most celebrated pictures, the ” Pieta ” in the Pitti Gallery, belongs to the year 1495. From about 1498 he became increasingly keen after money, frequently repeating his groups from picture to picture, and leaving much of his work to journeymen. In 1499 the gild of the cambio (money-changers or bankers) of Perugia asked him to undertake the decoration of their audience-hall, and he accepted the invitation. This extensive scheme of work, which may have been finished within the year 1500, comprised the painting of the vault with the seven planets and the signs of the zodiac (Perugino doing the designs and his pupils most probably the executive work) and the representation on the walls of two sacred subjects — the ” Nativity ” and ” Transfiguration ” — the Eternal Father, the four virtues of Justice, Prudence, Temperance and Fortitude, Cato as the emblem of wisdom, and (in life size) numerous figures of classic worthies, prophets and sibyls. On the mid-pilaster of the hall Perugino placed his own portrait in bust-form. It is probable that Raphael, who in boyhood, towards 1496, had been placed by his uncles under the tuition of Perugino, bore a hand in the work of the vaulting. It may have been about this time (though some accounts date the event a few years later) that Vannucci married a young and beautiful wife, the object of his fond affection; he loved to see her handsomely dressed, and would often deck her out with his own hands. He was made one of the priors of Perugia in 1501. While Perugino, though by no means stationary or unpro- gressive as an

executive artist, was working contentedly upon the old lines and carrying out the ancient conceptions, a mighty wave of new art flooded Florence with its rush and Italy with its rumour. Michelangelo, twenty-five years of age in 1500, following after and distancing Leonardo da Vinci, was opening men's eyes and minds to possibilities of achievement as yet unsurmised. Vannucci in Perugia heard Buonarroti bruited abroad, and was impatient to see with his own eyes what the stir was all about. In 1504 he allowed his apprentices and assistants to disperse, and returned to Florence. Though not openly detracting, he viewed with jealousy and some grudging the advances made by Michelangelo; and Michelangelo on his part replied, with the intolerance which pertains to superiority, to the faint praise or covert dispraise of his senior and junior in the art. On one occasion, in company, he told Perugino to his face that he was " a bungler in art " (gojfo nelV arte). Van- nucci brought, with equal indiscretion and ill success, an action for defamation of character. Put on his mettle by this mortifying transaction, he determined to show what he could do, and he produced the chef-d' ceuvre of the '.' Madonna and Saints " for the Certosa of Pavia. The constituent parts of this noble work have now been sundered. The only portion which remains in the Certosa is a figure of God the Father with cherubim. An " Annunciation " has disappeared from cognisance; three compartments — the Virgin adoring the infant Christ, St Michael, and St Raphael with Tobias — are among the choicer treasures of the National Gallery, London. The current story that Raphael bore a hand in the work is not likely to be true. This was succeeded in 1505 by an " Assumption," in the Cappella dei Rabatta, in the church of the Servi in Florence. The painting may have been executed chiefly by a pupil, and was at any rate a failure: it was much decried; Perugino lost his scholars; and towards 1506 he once more and finally abandoned Florence, going to Perugia, and thence in a year or two to Rome.

Pope Julius II. had summoned Perugino to paint the Stanza in the Vatican, now called that of the Incendio del Borgo; but he soon preferred a younger competitor, that very Raphael who had been trained by the aged master of Perugia; and Vannucci, after painting the ceiling with figures of God the Father in different glories, in five medallion-subjects, found his occupation gone; he retired from Rome, and was once more in Perugia from 1 51 2. Among his latest works one of the best is the extensive altar-piece (painted between 1512 and 1517) of S. Agostino in Perugia; the component parts of it are now dispersed in various galleries.

Perugino's last frescoes were painted for the monastery of S. Agnese in Perugia, and in 1522 for the church of Castello di Fortignano hard by.

Both series have disappeared from their places, the second being now in the Victoria and Albert Museum. He was still at Fontignano in 1524 when the plague broke out, and he died. He was buried in unconsecrated ground in a field, the precise spot now unknown. The reason for so obscure and unwonted a mode of burial has been discussed, and religious scepticism on the painter's own part has been assigned as the cause; the fact, however, appears to be that, on the sudden and widespread outbreak of the plague, the panic-struck local authorities ordained that all victims of the disorder should be at once interred without any waiting for religious rites. This leads us to speak of Perugino's opinions on religion. Vasari is our chief, but not our sole, authority for saying that Vannucci had very little religion, and was an open and obdurate disbeliever in the immortality of the soul. For a reader of the present day it is easier than it was for Vasari to suppose that Perugino may have been a materialist, and yet just as good and laudable a man as his orthodox Catholic neighbours or brother-artists; still there is a strong discrepancy between the quality of his art, in which all is throughout Christian, Catholic, devotional, and even pietistic, and the character of an anti-Christian con- temner of the doctrine of immortality. It is difficult to reconcile this discrepancy, and certainly not a little difficult also to suppose that Vasari was totally mistaken in his assertion; he was born twenty years before Perugino's death, and must have talked with scores of people to whom the Umbrian painter had been well known. We have to remark that Perugino in 1494 painted his own portrait, now in the Uffizi Gallery of Florence, and into this he introduced a scroll lettered " TimeteDeum." That an open disbeliever should inscribe himself with " Timete Deum " seems odd. The portrait in question shows a plump face, with small dark eyes, a short but well-cut nose, and sensuous lips; the neck is thick, the hair bushy and frizzled, and the general air imposing. The later portrait in the Cambio of Perugia shows the same face with traces of added years. Perugino died possessed of considerable property, leaving three sons.

Among the very numerous works of Perugino a few not already named require mention. Towards 1496 he painted the " Cruci- fixion," in S. Maria Maddalena dei Pazzi, Florence. The attribu- tion to him of the picture of the marriage of Joseph and the Virgin Mary (the " Sposalizio ") now in the museum of Caen, which served indisputably as the original, to a great extent, of the still more famous " Sposalizio " which was painted by Raphael in 1504, and which forms a leading attraction of the Brera Gallery in Milan, is now questioned, and it is assigned to Lo Spagna. A vastly finer work of Perugino's is the " Ascension of Christ," which, painted a littler earlier for S. Pietro of

Perugia, has for years past been in the museum of Lyons; the other portions of the same altar-piece are dispersed in other galleries. In the chapel of the Disciplinati of Citta della Pieve is an ” Adoration of the Magi,” a square of 21 ft. containing about thirty life-sized figures; this was executed, with scarcely credible celerity, from the 1st to the 25th of March (or thereabouts) in 1505, and must no doubt be in great part the work of Vannucci’s pupils. In 1507, when the master’s work had for years been in a course of decline and his performances were generally weak, he produced, nevertheless, one of his best pictures — the ” Virgin between St Jerome and St Francis,” how in the Palazzo Penna. In S. Onofrio of Florence is a much lauded and much- debated fresco of the ” Last Supper,” a careful and blandly correct but not inspired work; it has been ascribed to Perugino by some connoisseurs, by others to Raphael; it may more probably be by some different pupil of the Umbrian master.

Authorities. — In addition to Crowe and Cavalcaselle, see Di Pietro Perugino e degli scolari (1804); Mezzanotte, Vita, &c, di Pietro Vannucci (1836); Mariotti, Lettere pittoriche Perugine (1788); Claude Phillips (in The Portfolio) (1893) ; G. C. Williamson, Perugino (1900 and 1903). (W. M. R.)

PERUKE, an artificial head of hair, a wig. The word is from Fr. perruque, an adaptation of Ital. perruca or parrucca. This is usually taken to be from Ital. pelo, hair; Lat. pilus. Span, peluca, wig, and Sardinian pilucca, lock or tuft of hair, support this view. In the 17th century the English forms which the French word took, such as perruck or perug, were corrupted into perwyke, and thence into perewyk, perewig, and lastly ” periwig,” which again was shortened into ” wig,” the

common term for all types of artificial heads of hair. Periwig is sometimes confined to the heavy full-bottomed wigs worn from the reign of Charles II. to the introduction of the light, tailed wig of the 18th century.

PERUZZI, BALDASSARE (1481-1536), Italian architect and painter of the Roman school, was born at Ancajano, in the diocese of Vol terra, and passed his early life at Siena, where his father resided. While quite young Peruzzi went to Rome, and there studied architecture and painting; in the latter he was at first a follower of Perugino. The choir

frescoes in Sant' Onofrio on the Janiculan Hill, usually attributed to Pinturicchio, are by his hand. One of the first works which brought renown to the young architect was the villa on the banks of the Tiber in Rome now known as the Farnesina, 'originally built for the Sienese Agcstino Chigi, a wealthy banker. This villa, like all Peruzzi's works, is remarkable for its graceful design and the delicacy of its detail. It is best known for the frescoes painted there by Raphael and his pupils to illustrate the stories of Psyche and Galatea. One of the loggie has frescoes by Peruzzi's own hand — the story of Medusa. On account of his success Peruzzi was appointed by Leo X. in 1520 architect to St Peter's at a salary of 250 scudi; his design for its comple- tion was not, however, carried out. During the sack of Rome in 1527 Peruzzi barely escaped with his life, on condition of his painting the portrait of Constable de Bourbon, who had been killed during the siege (see Vasari). From Rome he escaped to Siena, where he was made city architect, and designed fortifica- tions for its defence, a great part of which still exist. Soon afterwards he returned to Rome, where he made designs for a palace for the Orsini family, and built the palaces Massimi and Vidoni, as well as others in trie south of Italy. He died in 1536, and was buried by the side of Raphael in the Pantheon.

Peruzzi was an eager student of mathematics and was also a fair classical scholar. Like many of the great artists of his time, he was remarkable for the varied extent of his knowledge and skill. A most able architect, a fair painter, and a scientific engineer, he also practised minor arts, such as stucco-work in relief, sgraffito, and the decorative painted arabesques which the influence of Raphael did so much to bring into use. His best existing works in fresco are in the Castel di Belcaro and the church of Fontegiusta in Siena. For Siena Cathedral he also designed a magnificent wooden organ-case, painted and gilt, rich with carved arabesques in friezes and pilasters; he also designed the high altar and the Cappella del Battista.

His chief pupil was the architect Serlio, who, in his work on architecture, gratefully acknowledges the great debt he owed to Peruzzi's instruction. The English National Gallery possesses an interesting drawing by his hand. The subject is the " Adora- tion of the Magi," and it is of special value, because the heads of the three kings are portraits of Michelangelo, Raphael, and Titian. The Uffizi and the library at Siena contain a number of Peruzzi's designs and drawings, many of which are now of priceless value, as they show ancient buildings which have been destroyed since the 16th century.

Authorities. — Vasari, Vita di Baldassare Peruzzi (Milanesi's ed., 1882), iv. 489; Milizia, Memorie degli architetti (1781, i. 210-215);

Delia Valle, Lellere senesi (1782-1786); Gaye, Carteggio inedito d' artisti (1839-1840); Lanzi, Storia pittorica (1804); and Platner, Beschreibung der Stadt Rom (1830-1842).

PERVIGILIUM 1 VENERIS, the Vigil of Venus, a short Latin poem. The author, date, and place of composition are unknown. The poem probably belongs to the 2nd or 3rd century a.d. An article signed L. Raquettius in the Classical Review (May 1905) assigns it to Sidonius Apollinaris (5th cent.) It was written professedly in early spring on the eve of a three-nights' festival of Venus (probably April 1-3). It describes in poetical language the annual awakening of the vegetable and animal world through the goddess. It consists of ninety-three verses in trochaic septenarii, and is divided into strophes of unequal length by the refrain:

" Cras amet qui nunquam amavit; quiquc amavit eras amet."

1 Pervigilium was the term for a nocturnal festival in honour of some divinity, especially Bona Dea.

Editio princeps (1577); modern editions by F. Bucheler (1859), A. Riese, in Anthologia latina (1869), E. Bahrens in Unedierte latein-ische Gedichte (1877); S. G. Owen (with Catullus, 1893). There are translations into English verse by Thomas Stanley (1651) and Thomas Parnell, author of The Hermit; on the text see J. W. Mackail in Journal of Philology (1888), vol. xvii.

PESARO (anc. Pisaurum, q.v.), a city and seaport of the Marches, Italy, the capital of the province of Pesaro and Urbino, situated on the coast of the Adriatic 37 m. N.W. of Ancona by rail, on the right bank of the Foglia, the ancient Pisaurus. The ground on which it is built is only from 10 to 40 ft. above the sea, but it is surrounded by hills — on the E. by Monte Ardizio, on the W. by Monte Accio or San Bartolo, which derives one of its names from the tradition that the Roman dramatist L. Attius was born and buried on the spot. Upon this hill stands the Villa Imperiale, the foundation stone of which was laid by the emperor Frederick III., built by the Sforza, and decorated with fine stucco ceilings and wall paintings and pavements of majolica plaques. A new palace was begun in 1530 by the Genga for Eleonora Gonzaga, but never finished. The city walls were in 1830 transformed into a public promenade. Besides the ancient cathedral of the Annunciation (restored since i860) with a 12th-century mosaic pavement, there are a number of smaller churches, several with Gothic portals. One of these, the church of San Francesco, now used as a cathedral, contains the " Coronation of the Virgin " by Giovanni Bellini, the largest and

most important of his works outside Venice. The most conspicuous buildings are the prefecture (a palace originally erected in 1455-1465 by the Dalmatian architect Luciano da Laurana for the Sforza, and restored by Francesco Maria della Rovere in the 16th century, the Rossini theatre (opened in 181 8), the fortress of Rocca Costanzia (built by Costanzo Sforza in 1474, Laurana being the architect), and the large lunatic asylum. The composer Gioacchino Rossini, who was a native of Pesaro, left all his fortune to found a musical lyceum in the city, and his statue by Marochetti (1864) stands near the railway station. The Olivieri library (established by the antiquary of that name, author of Marmora pisaurensia, &c.) contains about 14,000 volumes, MSS. of Tasso, &c, inscriptions and various antiquities, and a very fine collection of majolica (one of the best in Italy) from the old Urbino and other manufactories. The Museo Mosca, left by its owner to the town, contains important collec- tions of faience, furniture, &c. Among the industries of Pesaro are the growing, spinning and weaving of silk, tanning, iron- founding, and the manufacture of glass and pottery. It is also the centre of a rich agricultural district. The harbour is of no great importance, but there is a small export trade in wine, olives, silk and glass. Pop. (1901), 14,768 (town); 24,823 (commune).

Destroyed by Vitiges the Goth, the town was restored and strengthened by Belisarius, and afterwards along with Ancona, Fano, Senigallia, and Rimini formed the Pentapolis Maritima. In the course of the 13th century Pa-saro was sometimes under the government of the popes, sometimes under that of the emperors; but the Malatesta family, which first took root in the city about 1285; gradually became the real masters of the place In 1445 they sold their rights to Francesco Sforza; and in 1512, through the influence of Julius II., the Sforza were supplanted by his nephew Francesco Maria, duke of Urbino. Leo X. took the city away from Francesco and gave it to Lorenzo de' Medici; but on Lorenzo's death Francesco was restored and Pesaro became the ordinary residence of the dukes of Urbino till tne death of Francesco Maria II. in 163 1, when it reverted to the States of the Church. It has formed part of the present kingdom of Italy since i860. Terenzio Mamiani della Rovere, poet and statesman, was born at Pesaro in 1800.

PESCADORES (i.e. fishers,) a group of islands (called by the Japanese Hoko to or Hoko Gunto) lying 30 m. west of Formosa, from which they are separated by the Pescadores Channel, about the tropic of Cancer. The islands number 48 (21 inhabited), have a coast-line of 98-67 miles, a total area of 85 • 50 sq. m. , and a population of about 5 5,000, principally Chinese. Flat and with unproductive soil, they are swept during one

half of the year by violent N.E. winds, and also lie full in the path of the numerous typhoons that rush up the Strait of Formosa. Meteorological observations taken by the Japanese during a period of three years show that the annual average number of stormy days is 237. The anchorage is at Mako (Makyu or Makun) on the principal island of Penghu. The chief industry is fishing (whence the old Spanish name which has come into general use) and dried fish are exported.

PESCARA, FERNANDO FRANCESCO DAVALOS, Marquis of (1489-1525), Italian condottiere, was born at Naples, his family being of Spanish origin. Rodrigo (Ruy) Lopez Davalos, his great-grandfather, a noble of Toledo, who had taken an active part in the civil wars of Castile in the reign of John II. (1407-1454), had been driven into exile, and died at Valencia. Iiiigo (Ignatius), his son, entered the service of Alphonso of Aragon and Naples, followed his master to Italy, and there, making an advantageous marriage with a lady of the family of Aquino, was created marquis of Pescara. His son Alphonso, who succeeded him in the marquisate, married a lady of the Sicilian branch of the Spanish family of Cardona, and when he was treacherously killed, during a French invasion of Naples, his only son Fernando, or Ferrante, was a child in arms. At the age of six the boy was betrothed to Vittoria Colonna (q.v.), daughter of the general Fabrizio Colonna, and the marriage was celebrated in 1500. His position as a noble of the Aragonese party in Naples made it incumbent on him to support Ferdinand the Catholic in his Italian wars. In 151 2 he commanded a body of light cavalry at the battle of Ravenna, where he was wounded and taken prisoner by the French. Thanks to the intervention of one of the foremost of the French generals, the Italian J. J. Trivulzio, who was his connexion by marriage, he was allowed to ransom himself for 6000 ducats. He commanded the Spanish infantry at the battle of La Morta, or Vicenza, on the 7th of October 1513. It was on this occasion that he called his men before the charge to take care to step on him before the enemy did if he fell. From the battle of Vicenza in 1 5 13, down to the battle of La Bicocca on the 29th of April 1522, he continued to serve in command of the Spaniards arid as the colleague rather than the subordinate of Prosper Colonna. It was only by the accident of his birth at Naples that Pescara was an Italian. He considered himself a Spaniard, spoke Spanish at all times, even to his wife, and was always surrounded by Spanish soldiers and officers. His opinion of the Italians

as fighting men was unfavourable and was openly expressed. After the battle of La Bicocca Charles V. appointed Prosper Colonna commander-in-chief. Pescara, who considered himself aggrieved, made a journey to Valladolid in Spain, where the emperor then was, to state his own claims. Charles V., with whom he had long and confidential interviews, persuaded him to submit for the time to the superiority of Colonna. But in these meetings he gained the confidence of Charles V. His Spanish descent and sympathies marked him out as a safer commander of the imperial troops in Italy than an Italian could have been. When Francis I. invaded Italy in 1524 Pescara was appointed as lieu- tenant of the emperor to repel the invasion. The difficulties of his position were very great, for there was much discontent in the army, which was very ill paid. The tenacity, patience and tact of Pescara triumphed over all obstacles. His influence over the veteran Spanish troops and the German mercenaries kept them loyal during the long siege of Pavia. On the 24th of February 1525 he defeated and took prisoner Francis I. by a brilliant attack. Pescara's plan was remarkable for its audacity and for the skill he showed in destroying the superior French heavy cavalry by assailing them in flank with a mixed force of harquebusiers and light horse. It was believed that he was dissatisfied with the treatment he had received from the emperor; and Girolamo Morone, secretary to the duke of Milan, approached him with a scheme for expelling French, Spaniards and Germans alike from Italy, and for gaining a throne for himself. Pescara may have listened to the tempter, but in act he was loyal. He reported the offer to Charles V. and put Morone into prison. His health however had begun to give

way under the strain of wounds and exposure; and he died at Milan on the 4th of November 1525. Pescara had no children; his title descended to his cousin the marquis del Vasto, also a distinguished imperial general.

Authorities. — -The life of Pescara was written in Latin by Paolo Giovio, and is included in the Vitae illustrium virorum, printed at Basel 1578. Giovio's Latin Life was translated by L. Domenichi, the translator of his other works, and published at Florence, 1551. The Spanish Historia del fortissimo y prudentissimo capitan Don Hernando de Avalos, by El Maestro P. Valles (Antwerp, 1553), is also a translation of Giovio. See also Mignet, Rivalite de Francois I cr et de Charles Quint (Paris, 1875), which gives references to all authorities. (D'H.)

PESCARA, a river of Italy, formed by the confluence of the Gizio and Aterno, and flowing into the Adriatic at the small town of Pescara.

This town occupies the site of the ancient Aternum, the terminus of the Via Claudia Valeria, and up to 1867 a fortress of some importance. The railway from Sulmona follows the Pescara valley and joins the coast line to Brindisi at Pescara. In this valley, 22 m. from the sea, was the site of the ancient Interpromium, a town belonging probably to the Paeligni; and not far off is the very fine Cistercian abbey church of S. Clemente di Casauria, founded by the emperor Louis II. in 871. The present building belongs to the 12th century. The sculptures of the portals, the pulpit, the Paschal candelabrum, &c, and the bronze doors of this period are important. The chronicle of the abbey, of the end of the 12th century, is in the Bibliotheque nationale at Paris.

See V. Bindi, Monumenti degli A bruzzi (Naples, 1 889) , pp. 405 sqq. ; P. L. Calore in Archivio storico dell' arte (Rome, 1891), iv. 9 sqq.

PESCHIERA SUL GARDA, a fortress of Venetia, Italy, in the province of Verona, on an island in the Mincio at its outlet from the lake of Garda, 77 m. by rail E. of Milan. It was one of the famous fortresses of the Quadrilateral, the chief bulwark of the Austrian rule in Italy until 1866 (Mantua, Legnago and Verona being the other three) and has played a prominent part in all the campaigns conducted in north Italy, more especially during the Napoleonic wars. It was taken by the Piedmontese from the Austrians, after a gallant defence by General Rath lasting six weeks, on the 30th of May 1848, and since that date has been in Italian hands.

PESCIA, a town of Tuscany, Italy, in the province of Lucca, from which it is 15 m. E.N.E. by rail, 203 ft. above sea-level. Pop. (1901), 12,400 (town); 18,000 (commune). The cathedral, restored in 1693, contains the fine chapel of the Turini family, built for Baldassare Turini (d. 1540) by Giuliano di Baccio of Florence, with his tomb by Raffaello da Montelupo. The town also has some buildings by Lazzaro Buggiano, the pupil and adoptive son of Brunelleschi. It has silk and paper manu- factures.

PESETA, a silver coin and unit of value, the Spanish equivalent of the French, Belgian and Swiss franc, the Italian lira and the Greek drachma in the Latin monetary union. The peso (Lat. pensum, weight), of which peseta is a diminutive, was a Spanish coin of gold, peso de oro, or silver, peso de plata, once current in Spain and her colonies, and now the name of a silver coin of many South American states. The peso is also the name of the Mexican dollar.

PESHAWAR, a city of British India, the capital of the North-West Frontier Province, giving its name to a district. The city is situated

near the left bank of the river Bara, nm. from Jamrud at the entrance of the Khyber Pass, the railway station being 1588 m. north-west of Calcutta; pop. (1901), 95,147. Two miles west of the native city are the cantonments, forming the principal military station of the North-West Frontier Province. Peshawar lies within a horseshoe ring of hills on the edge of the mountain barrier which separates India from Afghanistan, and through it have passed nearly all the invaders from the north. The native quarter is a huddle of flat-roofed houses within mud walls, crowded along narrow, crooked alleys; there is but one fairly wide street of shops. Here for many centuries the Povindahs, or Afghan travelling merchants, have brought their caravans from Kabul, Bokhara and Samarkand every autumn. They

bring horses, wool, woollen stuffs, silks, dyes, gold-thread, fruits, precious stones, carpets and poshtins (sheepskin clothing) , fighting and buying their way to the British border where, leaving their arms, they are free to wander at will to Delhi, Agra and Calcutta. The chief speciality of Peshawar consists of bright-coloured scarves called lungis; wax-cloth and orna- mental needle-work are also local products, as well as knives and small arms.

The district of Peshawar has an area of 2611 sq. m.; pop. (1001), 788,707, showing an increase of io-8% in the decade. Except on the south-east, where the Indus flows, it is encircled by mountains which are inhabited by the Mohmand, Utman Khel and Afridi tribes. The plain consists of alluvial deposits of silt and gravel. The district is naturally fertile and well watered, and is irrigated by the Swat River Canal. The principal crops are wheat, barley, maize, millets and oil-seeds, with a little cotton and sugar-cane. Peshawar also produces a fine variety of rice, known as ” Bara rice,” after the river which irrigates it. The North-Western railway crosses the district from Attock, and has been extended from Peshawar city to Jamrud for military purposes. The district is chiefly inhabited by Pathans; there are some Hindus engaged in trade as bankers, merchants and shop-keepers.

In early times the district of Peshawar seems to have had an essentially Indian population, for it was not till the 1 5th century that its present Pathan inhabitants occupied it. Under the name of Gandhara it was a centre of Buddhism, and especially Graeco-Buddhism. Rock-edicts of Asoka still exist at two places; and a stupa

excavated in 1909 was found to contain an inscription of Kanishka, as well as relics believed to be those of Buddha himself. The last of the Indian Buddhist kings was conquered by Mahmud of Ghazni in 1009. The Mogul emperors always found difficulty in maintaining their authority over the Afghan border tribes, who finally established their independence during the reign of Aurangzeb. Peshawar was a favourite residence of the Afghan dynasty founded by Ahmed Shah Durrani, and here Mountstuart Elphinstone came as ambassador to Shah Shujah in 1809. A few years later Ranj > t Singh crossed the Indus, and after much hard fighting Sikh authority was firmly established under General Avitabile in 1834.. In 1848 the whole of the Punjab passed to the British. During the Mutiny, after the sepoy regiments had been disaimed, Peshawar was a source of strength rather than of danger, though Sir John Lawrence did at one time contemplate the necessity of surrender- ing it to the Afghans, in order to preserve the rest of Northern India.

PESHIN, or Pishin, a district of Baluchistan. Area 2717 sq.m. Pop. (1901), 50,200. It consists of a large plain surrounded on three sides by hills, which formerly belonged to Afghan- istan but was ceded to the British by the treaty of Gandamak in 1879. This plain is of considerable strategic importance, as it forms the focus of a great number of routes leading from Sind and the Punjab frontier districts to Kandahar, and is intersected by the Sind-Peshin railway. The agricultural wealth of Peshin, and consequently its revenues, have increased greatly under British administration.

PESHITTO, or Peshito (i.e. ” simple “), the standard version of the Bible in the Syriac language. It was long supposed to be the original Syriac version, but is now generally recognized as representing a revision made by Rabbula, bishop of Edessa, early in the 5th century, an attempt at standardizing the Syriac text such as Jerome had made for the Latin in his Vulgate. (See Bible.)

PESHWA (Persian for “leader,” “guide”), the title of the head of the Mahratta confederacy in India. Originally the peshwa was only prime minister, but afterwards he supplanted his master and became chief of the state, founding an hereditary dynasty, with the capital at Poona. The last peshwa, Baji Rao, came into collision with the British, and was dethroned in 1818. His adopted son, Nana Sahib, took a leading part in the Mutiny of 1857, in revenge for being deprived of what he considered his rights.

PESSIMISM (from Lat. pessimus, worst), a word of modern coinage, 1 denoting an attitude of hopelessness towards life, a vague general

opinion that pain and evil predominate in human affairs. It is the antithesis of ” optimism,” which denotes the view that on the whole there is a balance of good and pleasure, or at least that in the long run good will triumph. Between optimism and pessimism is the theory of ” meliorism,” according to which the world on the whole makes progress in goodness. The average man is pessimist or optimist not on theoretical grounds, but owing to the circumstances of his life, his material prosperity, his bodily health, his general temperament. Perhaps the most characteristic example of unsystematic pessimism is the language of Ecclesiastes, who concludes that ” all is vanity.”

Pessimism and optimism have, however, been expressed in systematic philosophical forms, a brief summary only of which need here be given. Such systems have been elaborated chiefly by modern thinkers, but the germs of the ideas are found widely spread in the older Oriental philosophies and in pre-Christian European thought. Generally speaking, pessimism may be found in all pantheistic and materialistic systems. It is im- portant, however, to point out an essential distinction. The thinker who sees man confronted by the infinite non-moral forces presumed by natural pantheism inevitably predominating over the finite powers of men may appear to the modern Christian ‘ theologian or to the evolutionist as a hopeless pessimist, and yet may himself have concluded that, though the future holds out no prospect save that of annihilation, man may yet by prudence and care enjoy a considerable measure of happiness. Pessimism, therefore, depends upon the individual point of view, and the term is frequently used merely in a condemnatory sense by hostile critics. The attitude of a man who denies the doctrine of immortality and rejoices in the denial is not strictly pessimistic. A Christian again may be pessimistic about the present; he must logically be optimistic about the future — a teleological view of the universe implies optimism on the whole; the agnostic may be indifferent to, or pessimistic, regarding the future, while exceedingly satisfied with life as he finds it.

This complex view of life is exemplified by Plato, whose general theory of idealism is entirely optimistic. In analysing the world of phenomena he necessarily takes a pessimistic view because phenomena are merely imitations more or less removed from reality, i.e. from the good. Yet the idealistic postulate of a summum bonum is in result optimistic, and this view predomin- ated among the Stoics and the Neoplatonists. The Epicureans, on the other hand, were empirical pessimists. Man is able to derive a measure of enjoyment from life in spite of the non- existence of the orthodox gods; yet this enjoyment is on the whole negative, the avoidance of pain. A similar

view is that of the ancient sceptics.

Oriental pessimism, at least as understood by Europeans, is best exemplified in Buddhism, which finds in human life sorrow and pain. But all pain and sorrow are incidental to the human being in his individual capacity. He who will cast aside the ” Bonds,” the ” Intoxications,” the ” Hindrances,” and tread the Noble Eightfold Path (see Buddhism) which leads to Nirvana, will attain the ideal, the ” Fruit of Arahatship,” which is described in terms of glowing praise in the Pali hymns. This, the original doctrine of the Buddha, though not adopted in the full sense by all his followers, is in fact at least as optimistic as any optimism of the West. To call it ” pessimism ” is merely to apply to it a characteristically Western principle according to which happiness is impossible without personality. The true Buddhist on the contrary looks forward with enthusiasm to this absorption into eternal bliss.

In Europe on the whole the so-called pessimistic attitude was commoner in the Teutonic north than in the Mediterranean basin. But even here the hopefulness as regards a future life, in which the inequalities of the present would be rectified, com- pensated for the gloomy fatalism with which the present was

1 The earliest example – given in the New English Dictionary is in S. T. Coleridge’s Letters (1794).

regarded. The advent of Christianity, with its categorical assertion of future happiness for the good, to a large extent did away with pessimism in the true sense. In Leibnitz we find a philosophic or religious optimism, which saw in the universe the perfect work of a God who from all possibilities selected the best. Kant, though pessimistic as regards the actual man, is optimistic regarding his moral capacity. To Hegel similarly the world, though evil at any moment, progresses by conflict and suffering towards the good.

Passing over the Italian Leopardi we may notice two lead- ing modern pessimists, Schopenhauer and von Hartmann. Schopenhauer emphasizes the pessimistic side of Hegel’s thought. The universe is merely blind Will, not thought; this Will is irrational, purposeless and therefore unhappy. The world being a picture of the Will is therefore similarly unhappy. Desire is a state of unhappiness, and the

satisfaction of desire is therefore merely the removal of pain. Von Hartmann's doctrine of the Unconscious is in many respects similar to Schopenhauer's doctrine of the Will. The Unconscious which combines Will and Reason is, however, primarily Will. The workings of this Will are irrational primarily, but, as in its evolution it becomes more rationalized and understands the whole meaning of the Weltschmerz, it ultimately reaches the point at which the desire for existence is gone. This choice of final nothingness differs from that of Schopenhauer in being collective and not individual. The pessimism of Schopenhauer and Hartmann does not, however, exclude a certain ultimate mysticism, which bears some analogy to that of Buddhism.

Pessimism is naturally connected with materialist, optimism with idealist, views of life. The theories of the modern evolution- ist school, however, have introduced into materialistic theory a new optimistic note in doctrines such as that of the survival of the fittest. Such doctrines regard the progress of humanity as on the whole tending to the greater perfection, and are markedly optimistic in contrast with earlier theories that progressive differentiation is synonymous with progressive decay. Similarly the cynical contempt which Nietzsche shows for morality and the conventional virtues is counterbalanced by the theory of the Ubermensch, the highest type of manhood which by struggle has escaped from the ordinary weaknesses of normal humanity.

See James Sully, Pessimism: A History and a Criticism (1877); Caro, Le Pessimisme au xix" siecle (1878); Saltus, The Anatomy of Negation (1886); Tulloch, Modern Theories on Philosophy and Religion (1884); William James, The Will to Believe; Diihring, Der Werth des Lebens (1865); Meyer, Weltelend und Weltschmerz (1872); E. Pfleiderer, Der moderne Pessimismus (1875); Agnes Taubert (Hartmann), Der Pessimismus und seine Cegner (1873); Gass, Optimismus und Pessimismus (1876); Rehmke, Die Philos. des Weltschmerzes (1876); Huber, Der Pessimismus (1876); von Golther, Der moderne P. (1878); Paulsen, Schopenhauer, Hamlet, Mephisto- pheles (1900); Kowalewski, Studien zur Psychologie des P. (1904).

PESSINUS (Jleoaivovs, Hcglvovs), an ancient city of Galatia in Asia Minor, situated on the lowest southern slope of Mt Dindymus, on the left bank of the river Sangarius, not far from its source. The ruins, discovered by Texier, lie round the village of Bala-Hissar, 8 or 9 m. S.E. of Sivri-Hissar. They include a theatre in partial preservation, but they have been mostly carried off to Sivri-Hissar, which is largely built out of them. Originally a Phrygian city, probably on the Persian " Royal Road," it became the capital of the Gallic tribe Tolistobogii and

the chief commercial city of the district. It contained the most famous sanctuary of the mother of the gods (Cybele), who here went by the name of Agdistis, and was associated with the god Attis, as elsewhere with Sabazius, &c. Her priests were also princes, who bore rule not only in the city (the coinage of which, beginning about 100 B.C., was for long issued by them) but also in the country round, deriving a large revenue from the temple estates; but in the time of Strabo (a.d. 19-20) their privileges were much diminished. The high-priest always bore the god's name Attis. In the crisis of the second Punic War (205 B.C.), when the Romans lost faith in the efficacy of their own religion to save the state, the Senate, in compliance with an oracle in the Sibylline books to the effect that the foreign

foe could be driven from Italy if the Idaean Mother (Cybele) were brought from Pessinus to Rome, sent ambassadors to the town, who obtained the sacred stone which was the symbol of the goddess and brought it to Rome, where the worship of Cybele was established. But the goddess continued to be worshipped in her old home; her priests, the Galli, went out to welcome Manlius on his march in 189 B.C., which shows that the town was not yet in the hands of the Tolistobogii. Soon after this a splendid new temple of the goddess was built by the Pergamenian kings. Some time before 164 B.C. Pessinus fell into the power of the Gauls, and the membership of the priestly college was then equally divided between the Gauls and the old priestly families. Like Ancyra and Tavium, Pessinus was Romanized first and Hellenized afterwards. Only about a. d. 165 did Hellenic ways and modes of thought begin to be assumed; before that we find a deep substratum of Celtic feeling and ways, on which Roman elements had been superimposed without filtering through a Hellenic medium. Christianity was introduced late; it cannot be traced before the 4th century. When Galatia was divided into two provinces (a.d. 386-395) Pessinus was made the capital of Galatia Secunda or Salutaris, and it became a metropolitan bishopric. After the 16th century it disappears from history, being supplanted, from the begin- ning of the period of Saracen invasion, by the impregnable fortress Justinianopolis (Sivri-Hissar), which became the capital and the residence of the bishop, thenceforward called " arch- bishop of Pessinus or of Justinianopolis." (J. G. C. A.)

PESTALOZZI, JOHANN HEINRICH (1746-1827), Swiss educational reformer, was born at Zurich on the 12th of January 1746. His father died when he was young, and he was brought up by his mother. At the university of Zurich he was associated with Lavater and the party of reform. His earliest years were spent in schemes for improving the condition of the people. The death of his friend Bluntschli turned him

however from politics, and induced him to devote himself to education. He married at twenty-three and bought a piece of waste land at Neuhof in Aargau, where he attempted the cultivation of madder. Pestalozzi knew nothing of business, and the plan failed. Before this he had opened his farm-house as a school; but in 1780 he had to give this up also. His first book published at this time was The Evening Hours of a Hermit (1780), a series of aphorisms and reflections. This was followed by his master- piece, Leonard and Gertrude (1781), an account of the gradual reformation, first of a household, and then of a whole village, by the efforts of a good and devoted woman. It was read with avidity in Germany, and the name of Pestalozzi was rescued from obscurity. The French invasion of Switzerland in 1798 brought into relief his truly heroic character. A number of children were left in Canton Unterwalden on the shores of the Lake of Lucerne, without parents, home, food or shelter. Pestalozzi collected a number of them into a deserted convent, and spent his energies in reclaiming them. During the winter he personally tended them with the utmost devotion, but in June 1799 the building was required by the French for a hospital, and his charges were dispersed. In 1801 Pestalozzi gave an exposition of his ideas on education in the book How Gertrude teaches her Children. His method is to proceed from the easier to the more difficult. To begin with observation, to pass from observation to conscious- ness, from consciousness to speech. Then come measuring, drawing, writing, numbers, and so reckoning. In 1799 he had been enabled to establish a school at Burgdorf, where he remained till 1804. In 1802, he went as deputy to Paris, and did his best to interest Napoleon in a scheme of national education; but the great conqueror said that he could not trouble himself about the alphabet. In 1805 he removed to Yverdun on the Lake of Neuchatel, and for twenty years worked steadily at his task. He was visited by all who took interest in education — Talleyrand, Capo d'lstria, and Mme de Stael. He was praised by Wilhelm von Humboldt and by Fichte. His pupils included Ramsauer, Delbriick, Blochmann, Carl Ritter, Frobel and Zeller. About 1815 dissensions broke out among the teachers of the school, and Pestalozzi 's last ten years were

chequered by weariness and sorrow. In 1825 he retired to Neuhof, the home of his youth; and after writing the adventures of his life, and his last work, the Swan's Song, he died at Brugg on the 17th of February 1827. As he said himself, the real work of his life did not lie in

Burgdorf or in Yverdun" It lay in the principles of education which he practised, the development of his observation, the training of the whole man, the sympathetic application of the teacher to the taught, of which he left an example in his six months' labours at Stanz. He had the deepest effect on all branches of education, and his influence is far from being exhausted.

Pestalozzi's complete works were published at Stuttgart in 1819-1826, and an edition by Seyffarth appeared at Berlin in 1 881. Volumes on his life and teaching have been written by De Guimps (1889), Barnard (1862), Kriisi (1875) and Pinloche (1901).

PETALITE, a mineral species consisting of lithium aluminium silicate, LiAl(Si 2 05)2. The monoclinic crystals approach spodu- mene (q.v.) in form, which is also a lithium aluminium silicate with the formula LiAUSiOs^. There is a perfect cleavage parallel to the basal plane, and the mineral usually occurs in platy cleavage masses; on this account it was named, from Gr. ireraXov (a leaf). The hardness is 6-| and the specific gravity 2-4 (that of spodumene being 3-16). The mineral is colourless or occasion- ally reddish, varies from transparent to translucent, and has a vitreous lustre. It was discovered in 1800 as cleavage masses in an iron mine on the island of Uto in the Stockholm archipelago, where it is associated with lepidolite, tourmaline (rubellite and indicolite) and spodumene. A variety known as " castor " is found as transparent glassy crystals associated with pollux (q.v.) in cavities in the granite of Elba. (L.J.S.)

PETARD (Fr. petard, peter, to make a slight explosion), a device formerly used by military engineers for blowing in a gate or other barrier. It consisted of a small metal or wooden case, usually of sugar-loaf shape, containing a charge of powder and fired by a fuse.

PETAU, DENYS (1583-1652), Jesuit scholar, better known as Dionysius Petavitjs, was born at Orleans on the 21st of August 1583. Educated at Paris University, he came under the influence of Isaac Scaliger, who directed his attention towards the obscurer fathers of the Church. In 1603 he was appointed to a lectureship at the university of Bourges, but resigned his place two years later, in order to enter the Society of Jesus. For many years he was professor of divinity at the College de Clermont, the chief Jesuit establishment in Paris; there he died on the i ith of December 1652. He was one of the most brilliant scholars in a learned age. Carrying on and improving the chronological labours of Scaliger, he published in 1627 an Opus de doctrina temporum, which has been often reprinted. An abridgment of this work, Rationarium temporum, was translated into French and

English, and has been brought down in a modern reprint to the year 1849. But Petau's eminence chiefly rests on . his vast, but unfinished, De theologicis dogmatibus, the first systematic attempt ever made to treat the development of Christian doctrine from the historical point of view.

PETCHENEGS, or Patzinaks, a barbarous people, probably of Turkish race, who at the end of the 9th century were driven into Europe from the lower Ural, and for about 300 years wandered about the northern frontier of the East Roman Empire. (See Turks).

PETER (Lat. Petrus from Gr. 7rerpos, a rock, Ital. Pietro, Piero, Pier, Fr. Pierre, Span. Pedro, Ger. Peter, Russ. Petr), a masculine name, derived from the famous surname bestowed by Christ upon his apostle Simon (" Thou art Peter and upon this rock will I build my church," Matt. xiv. 17-19). The name has consequently been very popular in Christian countries. It is noteworthy, however, that, out of deference to the " prince of the apostles " and first bishop of Rome, the name has never been assumed by a pope. The biographies which follow are arranged in the order: (1) the apostle; (2) kings; (3) other eminent men.

PETER, ST, the chief of the Twelve Apostles. He is known also by other names : (a) " Simon " (21/jxav) in Mark four times and Luke seven times. This use is only found in narrative

before the story of the mission of the apostles: it is also found in speeches; Matthew once, Mark once and Luke twice. (b) " Simon who is called Peter " is found in Matthew twice and Acts four times, (c) " Simon Peter " is found in Matthew once, Luke once, John seventeen times (and perhaps also in 2 Peter i. 1, where the text varies between Simon and Symeon. (d) " Peter " is found in Matthew nineteen times, Mark eighteen times, Luke sixteen times, Acts fifty-one times, John fifteen times, Galatians twice, 1 Peter once, (e) " Cephas " is found in John once, Galatians four times, 1 Corinthians four times. (/) Symeon (Lvudiv) is found in Acts once. It appears that the apostle had two names, each existing in a double form — Greek and Hebrew, Symeon (riyw) which was Graecized according to the sound into Simon, and Cephas («?'?) which was Graecized according to the meaning into Peter (Herpos) . Symeon and Simon are both well-known names in Aramaic and Greek respectively, but Cephas and Peter are previously unknown. Symeon was no doubt his original Aramaic name, and the earliest gospel, Mark, which has some claim specially to reproduce Petrine tradition, is careful to employ Simon until after the name Peter had been given, and not then to use it again. The Gospels agree

in regarding Cephas or Peter as an additional name, which was given by Christ. But they differ as to the occasion. According to Mark iii. 13 sqq. it was given on the occasion of the mission of the Twelve. According to John i. 42 it was given at his first call. According to Matt. xvi. 13 sqq. it was given after the recognition of Jesus as Messiah at Caesarea Philippi. This last account is the only one which describes any circumstances (for a further discussion see § 3 (2) below).

According to the Gospels Peter was the son of John (‘Iwavys, John i. 42, xxi. 15 seq.) or Jonas (‘Icovas, Matt. xxvi. 17). According to Mark i. 29 he was a fisherman of Capernaum, but John i. 44 describes him and his brother Andrew as of Bethsaida. From Mark i. 30 he is seen to have been married, and 1 Cor. ix. 5 suggests (but another interpretation is possible) that his wife went with him on his missionary journeys. – In 1 Pet. v. 13 Mark is referred to as his son, but this is usually interpreted of spiritual kinship. According to legend (Acta Nerei et Achillei, and Acta Philippi) he had a daughter Petronilla, but there is no reason for thinking that this is historical.

The Gospel narratives are unanimous in describing Peter as one of the first disciples of Christ, and from the time of his call he seems to have been present at most of the chief H j story la incidents in the narrative. He formed together the Gospels with the sons of Zebedee to some extent an inner up to the circle within the Twelve, and this favoured group *^” rrec ” is specially mentioned as present on three occasions — the raising of the daughter of Jairus (Mark v. 22-43; Matt. ix. 18-36; Luke viii. 41-56), the transfiguration (Mark ix. 2 sqq.; Matt. xvii. 1 sqq.; Luke ix. 28 sqq.) and the scene in the Garden at Gethsemane (Mark xiv. 32 sqq.; Matt. xxvi. 36 sqq.). He is also specially mentioned in connexion with his call (Mark i. 16-20; Matt. iv. 18 sqq.; Luke v. 1 sqq.; John i. 40 sqq.); the healing of his wife’s mother (Mark i. 21 sqq.; Matt. viii. 14 sqq.; Luke iv. 38 sqq.); the mission of the Twelve Apostles (Mark iii. 13 sqq.; Matt. x. 1 sqq.; Luke vi. 12 sqq.); the storm on the Lake of Galilee (Mark vi. 45 sqq.; Matt. xiv. 22 sqq.; John vi. 16 sqq.); the Messianic recognition at Caesarea Philippi (Mark vii. 27 sqq.; Matt. xvi. 16 sqq.; Luke ix. 18 sqq.); the incident of the payment of tribute by the coin found in the fish caught by Peter (Matt. xvii. 25 sqq.) and with various questions leading to parables or their expla- nations (Mark xiii. 36 sqq.; Luke xii. 41; Matt, xviii. 21 sqq.; Mark x. 28; Matt. xix. 27; Luke xviii. 28). In the week of the Passion he appears in connexion with the incident of the withered fig-tree (Mark xi. 21; Matt. xxi. 20); as introducing the eschatological discourse (Mark xiii. 3 sqq.); and as promi- nent during the Last Supper (Luke xxii. 8 sqq.; John xiii. 4 sqq.; Mark xiv. 27 sqq.; Matt.

xxvi. 31 sqq.). He

was present in Gethsemane, and tried to offer some resistance to the arrest of Jesus (Mark xiv. 47; Matt. xxvi. 51; Luke xxii. 50; John xviii. 10). After the arrest he followed the Lord to the scene of the trial, but denied him and fled. The message of the young man at the tomb (Mark xvi. 4) was especially addressed to Peter and it is clear that the genuine conclusion of Mark must have contained an account of an appearance of the risen Lord to him.

Out of this mass of incidents the following are central and call for closer critical consideration.

1. The Call of St Peter.— (Mark i. 16-20; Matt. iv. 18-22; Luke v. 1-11; John i. 40-42). The account in Matthew is practically identical with that in Mark and is no doubt taken from the Marcan source, but Luke and John have different traditions. The main points are as follows: according to Mark, at the beginning of the Galilean ministry Jesus saw Peter and Andrew fishing. He called them, and they joined him. After this he went with them to Capernaum, preached in the syna- gogue, and healed Peter's wife's mother. Luke, who certainly used Mark, has partly rearranged this narrative and partly rejected it in favour of a different version. According to him the visit to Capernaum and the healing of the wife's mother preceded the call of Peter, and this was associated with a tradition of a miraculous draught of fishes. The advantage of the Lucan reconstruction, so far as the first part is concerned, is that it supplies a reason for Peter's ready obedience, which is somewhat difficult to understand if he had never seen Jesus before. But it seems probable that this is the motive which led to the redac- torial change in Luke, and that the Marcan account, which is traditionally connected with Peter, ought to be followed. With regard to the narrative of the miraculous draught of fishes, the matter is more complicated. Luke obviously preferred this narrative to the Marcan account, but the fact that the same story comes in John xxi. suggests that there was an early tradition of some such incident of which the actual occasion and circumstances were undetermined. Luke preferred to connect it with the call of Peter, the writer of John xxi. with his restitution: probably both are of the nature of redactorial guesses, and the Marcan account must be regarded as preferable to either. The Johannine account of the call of Peter is quite different. According to this it took place immediately after the baptism of Jesus, in Judaea

not in Galilee. It is connected with the giving of the name Peter, which in Mark was not given until much later.

2. The Confession of Peter at Caesarea Philippi. — (Mark viii. 27-33; Matt. xvi. 13-23; Luke ix. 18-22). According to Mark, Peter, in answer to the question of Jesus, recognized that He was the Messiah, but protested against the prophecy of suffering which Jesus then added. This narrative is followed, with the exception of the last part, by Luke, who as usual is inclined to omit anything which could be regarded as derogatory to the Apostles. Matthew also uses the Marcan narrative, but adds to it a new section from some other source which suggests that the name of Peter was conferred on this occasion — not, as Mark says, at the first mission of the Twelve — and confers on him the keys of the kingdom of heaven and the right of binding and loosing. This must be probably i interpreted as a reference to the prophecy concerning Eliakim in Isa. xxii. 22, and to technical use of the words ” binding ” and ” loosing ” by the scribes in authoritative decisions as to the obligations of the law. It thus confers on Peter a position of quite unique authority. It must, however, be noted that the power of binding and loosing is given in Matt, xviii. 18 to the whole body of disciples. This seems to be an alternative version, also found only in Matthew. The question of the historical character of the Matthaean addition to the Marcan narrative is exceedingly difficult; but it

■See, however, A. Sulzbach’s article in the Zeitschr. f. N.T. Wiss. (1903), p. 190. He thinks there is an allusion to a room in the Temple where the great key was kept ; this room was called Kephas, because the key was placed in a recess closed by a stone. There is also a valuable article by W. Kohler in the Archiv fiir Religionswiss. treating the question of the keys from the point of view of compara- tive religion.

is hard to think that if it were really authentic it would have been omitted from all the other gospels, and it perhaps belongs to the little group of passages in Matthew which seem to represent early efforts towards church legislation, rather than a strictly historical narrative. Besides it is noticeable that in one other point Matthew has slightly remodelled the Marcan narrative. According to the latter Jesus asked, ” Whom say men that I am?” and Peter replied “the Messiah,” without qualification. But in Matthew the question is changed into ” Whom say men that the Son of Man is?” and, whatever may be the original meaning of the phrase ” the son of man ” it cannot be doubted that in the gospels it means Messiah. Thus the simple answer of Peter in Mark would be meaningless, and it is replaced by ” The Messiah, the son of the living God,” which is no longer a recognition of the Messiahship of

Jesus (this is treated in Matthew as an already recognized fact, cf. x. 23, xii. 40, &c), but is a definition and an exaltation of the nature of the Messiah. 3. The Conduct of Peter after the Betrayal. — The consideration of this point brings one into touch with the two rival traditions as to the conduct of the disciples after the betrayal and cruci- fixion of the Lord — the Galilean and the Jerusalem narratives. There is one incident which must in any case be accepted as it is found in both narratives. This is the denial of Peter. It appears that Peter did not stay with the disciples and neither returned home immediately to Galilee (according to the Galilean tradition) nor sought hiding in Jerusalem (according to the Jerusalem tradition), but followed the Lord at a distance and was a witness of at least part of the trial before the Sanhedrim. He was detected and accused of being a disciple, which he denied, and so fulfilled the prophecy of Jesus that he would deny Him before the cock crowed.

But putting this incident aside, the Galilean and Jerusalem traditions do not admit of reconciliation with one another. The former is represented by Mark. According to it the disciples all fled after the betrayal (though Peter waited until after the denial), and afterwards saw the risen Lord in Galilee. The details of this narrative are unfortunately lost, as the genuine conclusion of Mark is not extant. But Mark xiv. 28 and xvi. 7 clearly imply a narrative which described how the disciples returned to Galilee, there saw the risen Lord, and perhaps even how they then returned to Jerusalem in the strength of their newly recovered faith, and so brought into existence the church of Jerusalem as we find it in the Acts. It is also clear from Mark xvi. 7 that Peter was in some special way connected with this appearance of the risen Lord, and this tradition is confirmed by r Cor. xv. 5, and perhaps by Luke xxiv. 34.

The Jerusalem narrative is represented especially by Luke and John (excluding John xxi. as an appendix). According to this the disciples, though they fled at the betrayal, did not return to their homes, but remained in Jerusalem, saw the risen Lord in that city, and stayed there until after the day of Pente- cost. Attempts to reconcile these two narratives seem to be found in Matthew and in John xxi.

Obviously the choice which has to be made between these traditions cannot be adequately discussed here: it must suffice to say that intrinsic and traditional probability seem to favour the Galilean narrative. If so, one must say that after the denial Peter returned to Galilee — probably to resume his trade of fishing — and he there saw the risen Lord. This appearance is referred to in 1 Cor. xv. 5, and was certainly described in the lost conclusion of Mark. An account of it is

preserved in John xxi., but it is here connected — probably wrongly — with a miraculous draught of fishes, just as the account of his call is in Luke.

Immediately after the resurrection there is a missing link in the history of Peter. We know that he saw the risen Lord, and, according to the most probable view, that this m story was in Galilee; but the circumstances are unknown, after the and we have no account of his return to Jerusalem, Resurrection as at the beginning of the Acts the disciples are all according to in Jerusalem, and the writer, in contradiction to the *? e , A f? s M ” 1 Marcan or Galilean narrative, assumes that they had never left it. The first part of the Acts is largely concerned with

the work of Peter. He appears as the recognized leader of the Apostles in their choice of a new member of the Twelve to take the place of Judas Iscariot (Acts i. 15 sqq.); on the day of Pentecost he seems to have played a prominent part in explaining the meaning of the scene to the people (Acts ii. 14 sqq.) ; and soon afterwards was arrested by the Jews on the charge of being a ring- leader in the disorders caused by the healing of the lame man at the ” Beautiful ” gate of the temple, but was released. After this he appears as the leader of the apostles in the story of Ananias and Sapphira, who perished at his rebuke for their duplicity (Acts v. 1-11). The last episode of this period is another arrest by the priests, which ended in his being scourged and released (Acts v. 17 sqq.).

After this Peter’s attention was directed to the growth of Christianity in Samaria, and he and John made a journey of inspection through that district, laying hands on those who had been baptized in order that they might receive the Holy Spirit. Here Simon Magus (q.v.) was encountered. He was a magician who had been converted by Philip and baptized; he desired to obtain the power of conferring the Spirit, and offered Peter money for this purpose, but was indignantly repulsed. After this Peter and John returned to Jerusalem.

During the following stay in Jerusalem, the duration of which is not defined, Peter was visited by Paul (Acts ix. 26-29; Gal. i. 18), and a comparison of the chronological date afforded by Gal. i. and ii. points to a year not earlier than 33 (Harnack) or later than 38 (C. H. Turner) for this meeting. According to Galatians, Paul saw none of the apostles

on this occasion except Peter and James : it is therefore probable that none of the others were then in Jerusalem.

After this Peter made another journey, visiting especially Lydda, Joppa and Caesarea. His stay at Lydda was marked by the healing of Aeneas (Acts ix. 32-4) and at Joppa by the resuscitation of Tabitha or Dorcas. While at Joppa he stayed with Simon the tanner, and thence was summoned to Caesarea to Cornelius the centurion. He hesitated whether to go, but was persuaded by a vision and the injunction to call nothing unclean which God had cleansed. Cornelius was accordingly baptized. This is an important incident, as being the first ad- mission of a Gentile into the church: but he was already ” God-fearing,” o(Hovii£vos top 6eov (Acts x. 1), which probably denotes some sort of connexion with the Jewish synagogue, though it is difficult to say exactly what it was. After this inci- dent Peter returned to Jerusalem. The members of the Church were somewhat shocked at the reception of a Gentile: their view apparently was that the only road to Christianity was through Judaism. They were, however, persuaded by Peter’s speech (Acts xi. 4-17) ; but it is uncertain how far their concession went, and in the light of subsequent events it is probable that they still regarded circumcision as a necessary rite for all Christians.

After the return of Peter to Jerusalem the most important events were the famine at Jerusalem, and the persecution of the Church by Herod. During the latter Peter was put in prison (Acts xii. 3 sqq.), but was released by an angel; he first went to the house of Mary, the mother of John Mark, and afterwards went to ” another place.” This expression has been interpreted to mean another town, and even to be an implied reference to Rome. This last suggestion, improbable though it be, is his- torically important. The persecution of Herod seems to have been in his last year, which was probably a.d. 43-44. There was a marked tendency to make the duration of Peter’s episcopate at Rome twenty-five years: and a combination of this tendency with the explanation that the erepos totos was Rome probably is the origin of the traditional dating of the martyrdom of Peter in a.d. 67-68. There is, however, no justification for this view, and erepos totos need not mean more than another house in Jerusalem.

The famine referred to in Acts xi. 27 sqq. probably began before the death of Herod, but it continued after his death, and the relief sent by the church at Antioch to Jerusalem through Paul and Barnabas probably arrived about the year 45. It is not stated in the Acts that Peter was present, and it is therefore

usually assumed that he. was absent, but Sir W. M. Ramsay has argued in his St Paul the Traveller that the visit of Paul to Jerusalem with the famine relief is the meeting between Paul and Peter referred to in Gal. ii. as the occasion of an agreement between them as to the preaching of the gospel to Jews and Gentiles. This view is not generally accepted, but it has the great advantage of avoiding the difficulty that otherwise Paul in Gal. ii. 1 sqq. must describe as his second visit to Jerusalem what was really his third. According to Ramsay, then, Peter was present during the famine, and made a private agreement with Paul that the latter should preach to the Gentiles, and so far Gentile Christianity was recognized, but the conditions of the intercourse between Gentile and Jewish Christians were not defined, and the question of circumcision was perhaps not finally settled. According to the more popular view the description in Gal. ii. applies to Acts xv. the so-called council of Jerusalem. This council met after the first missionary journey (c. a.d. 49) of Paul to discuss the question of the Gentiles. Peter, who was present, adopted the view that Gentile Christians were free from the obligation of the law, and this view was put into the form of the so-called Apostolic decrees by James (Acts xv. 23 sqq.).

The next information which we have about Peter is given in Gal. ii. 11 sqq. According to this he went to Antioch and at .first accepted the Gentile Christians, but afterwards drew back and was rebuked by Paul. On the ordinary interpretation this must have taken place after the council, and it is exceedingly difficult to reconcile it with the attitude of Peter described in Acts xv., so that Mr C. H. Turner thinks that in this respect the account in Gal. ii. is not chronological, and places the visit of Peter to Antioch before the council. If, however, we take the theory of Sir W. M. Ramsay the matter is simpler. We thus get the compact between Paul and Peter during the famine, then a visit of Peter to Antioch, during which Peter first adopted and afterwards drew back from the position which he had agreed to privately.

This vacillation may then have been one of the causes which led up to the council, which may have been held before, not, as is usually thought, after the sending of the Epistle History to the Galatians. For this we have no knowledge after the of details for which the same certainty can be claimed. Councilor There are, however, various traditions of importance. erus em ‘ The following points are noteworthy. 1 Cor. i. 12 suggests the possibility that Peter went to Corinth, as there was a party there which used his name. It is, however, possible that this party had merely’adopted the principles which, as they had been told, perhaps falsely, were supported by the leader of the Twelve. Dionysius of Corinth (c. 1 70) states that Peter

was in Corinth. This may represent local tradition or may be an inference from 1 Cor. i. 12. 1 Peter suggests a ministry in the provinces of Asia Minor. There is, of course, nothing improb- able in this, and even if 1 Peter be not authentic, it is early evidence for such a tradition, but it is also possible that Peter wrote to converts whom he had not personally made. This tradition is found in Origen (Eus. H.E. iii. 1), Epiphanius (Haer. xxvii., vi.), Jerome (De Vir. ill. 1) and other later writers; but it is possible that it is merely an inference from the epistle. Early tradition connects Peter with Antioch, of which he is said to have been the first bishop. The first writer to mention it is Origen {Horn. vi. in Lucam), but it is also found in the Clementine Homilies and Recognitions (Horn. 20, 23; Recog. 10, 68) and probably goes back to the lists of bishops which were drawn up in the 2nd century. Other important references to this tradition are found in Eus. H.E. iii. 26, 2; Apost. Const, vii. 46; Jerome, De Vir. ill. 1; Chronicon paschale; and Liber pontificalis. The tradition of work in Antioch may well be historical. Otherwise it is a rather wild elaboration of Gal. ii. 11. The most important and widespread tradition is that Peter came to Rome; and though this tradition has often been bitterly attacked, it seems r to be probable that it is at least in outline quite historical. The evidence for it is earlier and better than that for any other tradition, though it is not quite convincing.

The earliest witness to a residence of Peter in Rome is probably

i Peter, for (see Peter, Epistles of) it is probable that the reference to Babylon ought to be interpreted as meaning Rome. If so, and if the epistle be genuine, this is conclusive evidence that Peter was in Rome. Even if the epistle be not genuine it is evidence of the same tradition. Nor is corroboration lacking: Clement (c. a.d. 97) refers to Peter and Paul as martyrs (1 Clem. 5-6) and says that ” To these men . . . there was gathered a great company of the elect who . . . became an example to us.” This points in two ways to a martyrdom of Peter in Rome, (1) because Peter and Paul are co-ordinated, and it is generally admitted that the latter suffered in Rome, (2) because they seem to be joined to the great company of martyrs who are to be an example to the Church in Rome. Similarly Ignatius (c. a.d. 115) says to the Romans (Rom. iv.), ” I do not command you as Peter and Paul.” The suggestion obviously is that the Romans had been instructed by these Apostles. By the end of the 2nd century the tradition is generally known: Irenaeus (3, 1, 1), Clement of Alexandria (comment, on 1

Peter) , Origen (Horn. vi. in Lucam), Tertullian (Scorp. 15, and several passages) are explicit on the point, and from this time onwards the tradition is met with everywhere. There is also a tradition, found in Irenaeus (3, 1, 1) and in many later writers, and supported by 1 Pet. v. 13, and by the statements of Papias (Eus. H.E. 3, 39, 15) that Mark acted as Peter's assistant in Rome and that his. gospel is based on recollections of Peter's teaching.

This evidence is probably sufficient to establish the fact that Peter, like Paul, had a wide missionary career ending in a violent death at Rome, though the details are not recoverable. The chronological question is more difficult both as regards the beginning and the end of this period of activity.

The Acts, in describing the visits of Peter to Samaria, Joppa, Lydda and Caesarea, justify the view that his missionary activity began quite early. Gal. ii. 11 and I Cor. ix. 5 show Chronology tnat Acts minimizes rather than exaggerates this of Peter's activity; the Antiochian tradition probably repre- wider sents a period of missionary activity with a centre Workˆ attry at Antioch; similarly the tradition of work in Asia is possibly correct as almost certainly is that of the visit to Rome. But we have absolutely no evidence justifying a chronological arrangement of these periods. Even the silence of Paul in the epistles of the captivity proves nothing except that Peter was not then present; the same is true of 2 Tim. even if its authenticity be undoubted.

The evidence as to the date of his death is a little fuller, but not quite satisfactory. The earliest direct witness is Tertullian, who definitely states that Peter suffered under Nero by cruci- fixion. Origen also relates the latter detail and adds that at his own request Peter was crucified head downwards. Probably John xxi. 18 seq. is a still earlier reference to his crucifixion. Fuller evidence is not found until Eusebius, who dates the arrival of Peter at Rome in 43 and his martyrdom twenty-five years later. But the whole question of the Eusebian chronology is very confused and difficult, and the text of the Chronicon is not certain. The main objection to this date is based partly on general probability, partly on the language of Clement of Rome. It is more probable on general grounds that the martyr- dom of Peter took place during the persecution of Christians in 64, and it is urged that Clement's language refers to this period. It is quite possible that an error of a few years has crept into the Eusebian chronology, which is probably largely based on early episcopal lists, and therefore many scholars are inclined to think that 64 is a more probable date than 67. As a rule ihe dis- cussion has mainly been between these two dates, but Sir W. M. Ramsay, in his Church in the Roman Empire, has

adopted a different line of argument. He thinks that 1 Peter was written c. a.d. 80, but that it may nevertheless be Petrine; therefore he lays stress on the fact that whereas the tradition that Peter was in Rome is early and probably correct, the tradition that he was martyred under Nero is not found until much later. Thus he thinks it possible that Peter survived until c. 80, and was martyred under the Flavian emperors. The weak point of this theory is that Clement and Ignatius bring Peter and Paul

together in a way which seems to suggest that they perished, if not together, at least at about the same time. If this view be rejected and it is necessary to fall back on the choice between 64 and 67, the problem is perhaps insoluble, but 64 has somewhat more intrinsic probability, and 67 can be explained as due to an artificial system of chronology which postulated for Peter an episcopate of Rome of twenty-five years — a number which comes so often in the early episcopal lists that it seems to mean little more than ” a long time,” just as ” forty years ” does in the Old Testament. On the whole 64 is the most probable date, but it is very far from certain: the evidence is insufficient to justify any assurance.

For further information and discussion see especially Harnack’s Chronologie, and Bishop Chase’s article in Hastings’s Dictionary of the Bible. The latter is in many ways the most complete statement of the facts at present published.

Caius, who lived in the beginning of the 3rd century (see Eus. H. E. 2, 25), stated that the rpoiraia (i.e. probably the burial place, not that of execution) of Peter and Paul were on the Vatican. This is also found in the Acta Petri, *fp e ° t r * r ve 84 (in the Lib. Pont., ed. Duchesne, p. 52 seq., 118 sqq.). From this place it appears that the relics (whether genuine or not) were moved to the catacombs in a.d. 258 (cf . the Depositis martyrum, and see Lightfoot’s Clement, i. 249) ; hence arose the tradition of an original burial in the catacombs, found in the Hieronymian Martyrology.

For further information and investigations see Duchesne, Liber pontificalis ; Lipsius, Die Apokr. Apostelgesch.; and Erbes ” Die Todestage der Apostel Paulus u. Petrus,” in Texte und Unter-suchungen, N.F., iv. 1. (K. L.)

PETER I., called ” the Great ” (1672-1725), emperor of Russia, son of the tsar Alexius Mikhailovich and Natalia Naruishkina, was born at Moscow on the 30th of May 1672. His earliest teacher (omitting the legendary Scotchman Menzies) was the dyak, or clerk of the council,

Nikita Zotov, subsequently the court fool, who taught his pupil to spell out the liturgical and devotional books on which the children of the tsar were generally brought up. After Zotov's departure on a diplomatic mission, in 1680, the lad had no regular tutor. From his third to his tenth year Peter shared the miseries and perils of his family. His very election (1682) was the signal for a rebellion. He saw one of his uncles dragged from the palace and butchered by a savage mob. He saw his mother's beloved mentor, and his own best friend, Artamon Matvyeev, torn, bruised and bleeding, from his retaining grasp and hacked to pieces. The haunting memories of these horrors played havoc with the nerves of a supersensitive child. The convulsions from which he suffered so much in later years must be partly attributed to this violent shock. During the regency of his half-sister Sophia (1682-1689) he occupied the subordinate position of junior tsar, and after the revolution of 1689 Peter was sjtill left pretty much to himself. So long as he could indulge freely in his favourite pastimes — ship- building, ship-sailing, drilling and sham fights — he was quite content that others should rule in his name. He now found a new friend in the Swiss adventurer, Francois Lefort, a shrewd and jovial rascal, who not only initiated him into all the mysteries of profligacy (at the large house built at Peter's expense in the German settlement), but taught him his true business as a ruler. His mother's attempt to wean her prodigal son from his dangerous and mostly disreputable pastimes, by forcing him to marry the beautiful but stupid Eudoxia Lopu- khina (Jan. 27, 1689), was a disastrous failure. The young couple were totally unsuited to each other. Peter practically deserted his unfortunate consort a little more than a year after their union.

The death of his mother (Jan. 25, 1694) left the young tsar absolutely free to follow his natural inclinations. Tiring of the great lake at Pereyaslavl, he had already seen the sea for the first time at Archangel in July 1683, and on the 1st of May 1694 returned thither to launch a ship built by himself the year before. Shortly afterwards he nearly perished during a storm in an adventurous voyage to the Solovetsky Islands in

the White Sea. His natural bent was now patent. From the first the lad had taken an extraordinary interest in the technical and mechanical arts, and their application to military and naval science. He was taught the use of the astrolabe (which Prince Yakov Dolgoruki, with

intent to please, had brought him from Paris) by a Dutchman, Franz Timmerman, who also instructed him in the rudiments of geometry and fortifications. He had begun to build his own boats at a very early age, and the ultimate result of these pastimes was the creation of the Russian nauy. He had already surrounded himself with that characteristically Petrine institution ” the jolly company,” or ” the company,” as it was generally called, consisting of all his numerous personal friends and casual acquaintances. ” The company ” was graduated into a sort of mock hierarchy, political and ecclesi- astical, and shared not only the orgies but also the labours of the tsar. Merit was the sole qualification for promotion, and Peter himself set the example to the other learners by gradually rising from the ranks. In 1695 he had only advanced to the post of ” skipper ” in his own navy and of ” bombardier ” in his own army. It was, however, the disreputable Lefort who, for the sake of his own interests, diverted the young tsar from mere pleasure to serious enterprises, by persuading him first to undertake the Azov expedition, and then to go abroad to complete his education.

By this time the White Sea had become too narrow for Peter, and he was looking about him for more hospitable waters. The Baltic was a closed door to Muscovy, and the key to it was held by Sweden. The Caspian remained; and it had for long been a common saying with foreign merchants that the best way of tapping the riches of the Orient was to secure possession of this vast inland lake. But so long as the Turks and Tatars made the surrounding steppes uninhabitable the Caspian was a possession of but doubtful value. The first step making for security was to build a fleet strong enough to provide against the anarchical condition of those parts; but this implied a direct attack not only upon the Crimean khan, who was mainly responsible for the conduct of the Volgan hordes, but upon the khan’s suzerain, the Turkish sultau. Nevertheless Peter did not hesitate. War against Turkey was resolved upon, and Azov, the chief Turkish fortress in those regions, which could be approached by water from Moscow, became the Russian objective. From the 8th of July to the 22nd of September 1695 the Muscovites attempted in vain to capture Azov. On the 22nd of November Peter re-entered Moscow. His first military expedition had ended in unmitigated disaster, yet from this disaster is to be dated the reign of Peter the Great.

Immediately after his return he sent to Austria and Prussia for as many sappers, miners, engineers and carpenters as money could procure. He meant to build a fleet strong enough to prevent the Turkish fleet from relieving Azov. The guards and all the workmen procurable were driven, forthwith, in bands, to all the places among

the forests of the Don to fell timber and work day and night, turning out scores of vessels of all kinds. Peter himself lived among his workmen, himself the most strenuous of them all, in a small two-roomed wooden hut at Voronezh. By the middle of April two warships, twenty- three galleys, four fireships and numerous smaller craft were safely launched. On the 3rd of May ” the sea caravan ” sailed from Voronezh, ” Captain Peter Aleksyeevich ” commanding the galley-flotilla from the galley ” Principium,” built by his own hand. The new Russian fleet did all that was required of it by preventing the Turks from relieving Azov by water; and on the 18th of July the fortress surrendered. Peter now felt able to advance along the path of progress with a quicker and a firmer step. It was resolved to consolidate the victory by establishing a new naval station at the head of the Sea of Azov, to which the name of Taganrog was given. But it was necessary to guarantee the future as well as provide for the present. Turkey was too formidable to be fought single-handed, and it was therefore determined to send a grand embassy to the principal western powers to solicit their co-operation against the Porte. On the 10th of March 1697 this embassy, under the xxi. 10

leadership of Lefort, set out on its travels. Peter attached himself to it as a volunteer sailorman, “Peter Mikhailov,” so as to have greater facility for learning ship-building and other technical sciences. As a political mission it failed utterly, the great powers being at that period far more interested in western than in eastern affairs. But personally Peter learnt nearly all that he wanted to know — gunnery at Konigsberg, ship- building at Saardam and Deptford, anatomy at Leiden, engrav- ing at Amsterdam — and was proceeding to Venice to complete his knowledge of navigation when the revolt of the stryeltsy, or musketeers (June 1698), recalled him to Moscow. This revolt has been greatly exaggerated. It was suppressed in ah hour’s time by the tsar’s troops, of whom only one man was mortally wounded; and the horrible vengeance (September- October 1698) which Peter on his return to Russia wreaked upon the captive musketeers was due not to any actual fear of these antiquated warriors, but to his consciousness that behind them stood the reactionary majority of the nation who secretly sympathized with, though they durst not assist, the rebels.’

Peter’s foreign tour had more than ever convinced him of the inherent superiority of the foreigner. Imitation had necessarily to begin with externals, and Peter at once fell foul of the long beards and Oriental costumes which symbolized the arch-conservatism of old Russia. On the 26th of April 1698 the chief men of the tsardom were assembled round his wooden hut at Preobrazhenskoye, and Peter with his own hand deliber- ately clipped off the beards and moustaches of his chief

boyars. The ukaz of the 1st of September 1698 allowed as a compromise that beards should be worn, but a graduated tax was imposed upon their wearers. The wearing of the ancient costumes was forbidden by the ukaz of the 4th of January 1700; thenceforth Saxon or Magyar jackets and French or German hose were prescribed. That the people themselves did not regard the reform as a trifle is plain from the numerous rebellions against it. By the ukaz of the 20th of December 1699 it was next commanded that henceforth the new year should not be reckoned, as heretofore, from the 1st of September, supposed to be the date of the creation, but from the first day of January, anno domini.

The year 1700 is memorable in Russian history as the starting- point of Peter's long and desperate struggle for the hegemony of the north. He had concluded peace with the Porte (June 13, 1700) on very advantageous terms, in order to devote himself wholly to a war with Sweden to the end that Russia might gain her proper place on the Baltic. The possession of an ice-free seaboard was essential to her natural development ; the creation of a fleet would follow inevitably upon the acquisition of such a seaboard; and she could not hope to obtain her due share of the trade and commerce of the world till she possessed both. Ali the conjunctures seemed favourable to Peter. The Swedish govern- ment was in the hands of an untried lad of sixteen; and the fine fleets of Denmark, and the veteran soldiers of Saxony, were on the same side as the myriads of Muscovy. It seemed an easy task for such a coalition to wrest the coveted spoil from the young Charles XII.; yet Peter was the only one of the three conspirators who survived the Twenty-one Years' War in which they so confidently embarked during the summer of 1701. He was also the only one of them who got anything by it. Charles's "immersion in the Polish bog" (1702-1707), as Peter phrased it, enabled the tsar, not without considerable expense and trouble, to conquer Ingria and lay the foundations of St Petersburg. In these early days Peter would very willingly have made peace with his formidable rival if he had been allowed to retain these comparatively modest conquests. From 1707 to 1709 the wai on his part was purely defensive; Charles would not hear of peace till full restitution had been made and a war indemnity paid, while Peter was fully resolved to perish rather than sur- render his " paradise," Petersburg. After Pultava (June 26, 1709), Peter, hitherto commendably cautious even to cowardice, but now puffed up with pride, rashly plunged into as foolhardy an enterprise as ever his rival engaged in. The campaign of the Pruth (March to July 1711) must have been fatal to the

tsar but for the incalculable behaviour of the omnipotent grand vizier, who let the Russian army go at the very instant when it lay helpless in the hollow of his hand. Even so, Peter, by the peace of the Pruth, had to sacrifice all that he had gained by the Azov expedition fifteen years previously. On receiving the tidings of the conclusion of the peace of Nystad (August 30, 1 721), Peter declared, with perfect justice, that it was the most profitable peace Russia had ever concluded. The gain to Russia was, indeed, much more than territorial. In surrendering the pick of her Baltic provinces, Sweden had surrendered along with them the hegemony of the north, and all her pretensions to be considered a great power.

The Great Northern War was primarily a training school for a backward young nation, and in the second place a means of multiplying the material resources of a nation as poor as she was backward. During the whole course of it the process of internal domestic reformation had been slowly but unceasingly ‘proceeding. Brand-new institutions on Western models were gradually growing up among the cumbrous, antiquated, worn- out machinery of old Muscovy; and new men, like Menshikov, Goloykin, Apraksin, Osterman, Kurakin, Tolstoy, Shafirov, Prokopovich, Yaguszhinsky, Yavorsky, all capable, audacious, and brimful of new ideas, were being trained under the eye of the great regenerator to help him to carry on his herculean task. At first the external form of the administration remained much the same as before. The old dignities disappeared of their own accord with the deaths of their holders, for the new men, those nearest to Peter, did not require them. ” The Administrative Senate ” was not introduced till 1711, and only then because the interminable war, which required Peter’s prolonged absence from Russia, made it impossible for him to attend to the details of the domestic administration. Still later came the ” Spiritual Department,” or ” Holy Synod ” (January 1721), which superseded the ancient patriarchate. It was established, we are told, ” because simple folks cannot distinguish the spiritual power from the sovereign power, and suppose that a supreme spiritual pastor is a second sovereign, the spiritual authority being regarded as higher and better than the temporal.” From the first the regenerator in his ukazes was careful to make everything quite plain. He was always explaining why he did this or that, why the new was better than the old, and so on; and we must recollect that these were the first lessons of the kind the nation had ever received. The whole system of Peter was deliberately directed against the chief evils from which old Muscovy had always suffered, such as dissipation of energy, dislike of co-operation, absence

of responsi- bility, lack of initiative, the tyranny of the family, the insignifi- cance of the individual. The low social morality of all classes, even when morality was present at all, necessitated the regenera- tion of the nation against its will, and the process could therefore only be a violent one. Yet the most enlightened of Peter's contemporaries approved of and applauded his violence; some of them firmly believed that his most energetic measures were not violent enough. Thus Ivan Poroshkov, Peter's contempor- ary, the father of Russian political economy, writes as follows: " If any land be over-much encumbered with weeds, corn cannot be sown thereon unless the weeds first be burned with fire. In the same way, our ancient inveterate evils should also be burnt with fire." Peter himself carried this principle to its ultimate limits in dealing with his unfortunate son the Tsarevich Alexius (q.v.). From an ethical and religious point of view the deliberate removal of Alexius was an abominable, an inhuman crime: Peter justified it as necessary for the welfare of the new Russia which he had called into existence.

The official birthday of the Russian empire was the 22nd of October 1721, when, after a solemn thanksgiving service in the Troitsa Cathedral for the peace of Nystad, the tsar pro- ceeded to the senate and was there acclaimed: " Father of the Fatherland, Peter the Great, and Emperor of All Russia." Some Russians would have preferred to proclaim Peter as emperor of the East; but Peter himself adopted the more patriotic title.

Towards the end of the reign the question of the succession to the throne caused the emperor some anxiety. The rightful heir, in the natural order of primogeniture, was the little grand duke Peter, son of the Tsarevich Alexius, a child of six; but Peter decided to pass him over in favour of his own beloved consort Catherine. The usiav, or ordinance of 1722, heralded this unheard-of innovation. Time-honoured custom had hitherto reckoned primogeniture in the male line as the best title to the Russian crown; in the ustav of 1722 Peter denounced primogeniture in general as a stupid, dangerous, and even unscriptural practice of dubious origin. The ustav was but a preliminary step to a still more sensational novelty. Peter had resolved to crown his consort empress, and on the 15th of November 1723 he issued a second manifesto explaining at some length why he was taking such an unusual step. That he should have considered any explanation necessary demon- strates that he felt himself to be treading on dangerous ground. The whole nation listened aghast to the manifesto. The corona- tion of a woman was in the eyes of the Russian people a scandalous innovation in any case, and the proposed coronation was doubly scandalous in view of the base and

disreputable origin of Catherine herself (see Catherine I.). But Peter had his way, and the ceremony took place at Moscow with extraordinary pomp and splendour on the 7th of May 1724.

During the last four years of his reign Peter's policy was predominantly Oriental. He had got all he wanted in Europe, but the anarchical state of Persia at the beginning of 1722 opened up fresh vistas of conquest. The war which lasted from May 1722 to September 1723 was altogether successful, resulting in the acquisition of the towns of Baku and Derbent and the Caspian provinces of Gilan, Mazandaran and Astarabad. The Persian campaigns wore out the feeble health of Peter, who had been ailing for some time. A long and fatiguing tour of inspection over the latest of his great public works, the Ladoga Canal, during the autumn of 1724, brought back another attack of his paroxysms, and he reached Peters- burg too ill to rally again, though he showed himself in public as late as the 16th of January 1725. He expired in the arms of his consort, after terrible suffering, on the 28th of January 1725.

Peter's claim to greatness rests mainly on the fact that from first to last he clearly recognized the requirements of the Rus- sian nation and his own obligations as its ruler. It would have materially lightened his task had he placed intelligent foreigners at the head of every department of state, allowing them gradually to train up a native bureaucracy. But for the sake of the independence of the Russian nation he resisted the temptation of taking this inviting but perilous short-cut to greatness. He was determined that, at whatever cost, hardship and incon- venience, Russia should be ruled by Russians, not by foreigners; and before his death he had the satisfaction of seeing every important place in his empire in the hands of capable natives of his own training. But even in his most sweeping reforms he never lost sight of the idiosyncrasies of the people. He never destroyed anything which he was not able to replace by something better. He possessed, too, something of the heroic nature of the old Russian bogatuirs, or demigods, as we see them in the skazki and the builinui. His expansive nature loved width and space. No doubt this last of the bogatuirs possessed the violent passions as well as the wide views of his prototypes. All his qualities, indeed, were on a colossal scale. His rage was cyclonic: his hatred rarely stopped short of extermination. His banquets were orgies, his pastimes convulsions. He lived and he loved like one of the giants of old. There are deeds of his which make humanity shudder, and no man equally great has ever descended to such depths of cruelty and treachery. Yet it may generally be allowed that a strain of nobility, of which we occasionally catch illuminating glimpses, extorts from time to time an all-forgiving admiration.

Strange, too, as it may sound, Peter the Great was at heart profoundly religious. Few men have ever had a more intimate persuasion that they were but instruments for good in the hands of God.

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PETER II. (17 1 5-1 730), emperor of Russia, only son of the Tsarevich Alexius, was born on the 18th of October 1715. From his childhood the orphan grand duke was kept in the strictest seclusion. His grandfather, Peter the Great, systemati- cally ignored him. His earliest governesses were the wives of a tailor and a vintner from the Dutch settlement; a sailor called Norman taught him the rudiments of navigation; and, when he grew older, he was placed under the care of a Hungarian refugee, Janos Zeikin, who seems to have been a conscientious teacher. During the reign of Catherine I. Peter was quite ignored; but just before her death it became clear to those in power that the grandson of Peter the Great could not be kept out of his inheritance much longer. The majority of the nation and three-quarters of the nobility were on his side, while his uncle, the emperor Charles VI., through the imperial ambassador at St Petersburg, Rabutin, persistently urged his claims. The matter was arranged between Menshikov, Osterman and Rabu- tin; and on the 18th of May 1727 Peter II., according to the terms of the supposed last will of Catherine I., was proclaimed sovereign autocrat. The senate, the privy council and the guards took the oath of allegiance forthwith. The education of the young prince was wisely entrusted to the vice-chancellor Osterman. Menshikov, who took possession of Peter II. and lodged him in his own palace on the Vasily island, had intended to marry Peter to his daughter Maria; the scheme was frus- trated by his

fall (Sept. 21, 1727); but Peter only fell into the hands of the equally unscrupulous Dolgoruki, who carried him away from Petersburg to Moscow. Peter's coronation was celebrated at that city on the 25th of February 1728. He was betrothed to Catherine, second daughter of Alexis Dolgoruki, and the wedding was actually fixed for the 30th of January 1730; but on that very day the emperor died of small-pox.

PETER III. (1728-1762), emperor of Russia, only son of Charles Frederick, duke of Holstein-Gottorp, and of Anne, eldest surviving daughter of Peter the Great, was born at Kiel on the 21st of February 1728. In December 1741 he was adopted by his aunt, Elizabeth Petrovna, as soon as she was safely estabˆ lished on the Russian throne, and on the 18th of November 1742 was received into the Orthodox Church, exchanging his original name of Karl Peter Ulrich for that of Peter Fedorovich. On the 21st of August 1745, by the command of his aunt, he married the princess Sophia Augusta Frederica of Anhalt- Zerbst, who exchanged her name for that of Catherine Aleksye- evna. The union between a prince who physically was some- thing less than a man and mentally little more than a child, and a princess of prodigious intellect and an insatiable love of enjoyment, was bound to end in a catastrophe. But there is no foundation for the stories of Peter's neglect and brutality. It took the spouses five years to discover that their tastes were divergent and their tempers incompatible. Even when Peter III. succeeded his aunt on the 5th of January 1762, he paid off all the debts that Catherine had contracted without inquiring what they were for. On her birthday, in April, he made her a present of domains worth £10,000 per annum, though he had already readjusted her establishment on a truly imperial scale. A great deal has been made of Peter's infidelity towards his consort; but the only one who really suffered from his liaison with the ugly, stupid and vixenish countess Elizabeth Vorontsova was the unfortunate emperor. So far from being scandalized by the juxtaposition of " Das Fraulein " in the Winter Palace,

Catherine accepted it as a matter of course, provided that her own relations with the handsome young guardsman, Gregory Orlov, were undisturbed. Nor was Peter's behaviour to his consort in public of the outrageous character we have been led to suppose. Peter, in fact, was too good-natured and incon- sequent to pursue, or even premeditate, any deliberate course of ill treatment. No personal wrongs, but the deliberate deter- mination of a strong-minded, capable woman to snatch the reins of government from the hands of a semi-imbecile, was the cause of Peter's overthrow, and his stupendous blunders supplied Catherine with her opportunity. Peter's foreign policy was the

absolute reversal of the policy of his predecessor. He had not been on the throne for two months when he made pacific overtures to the wellnigh vanquished king of Prussia, whom he habitually alluded to as ” the king my master.” Peter’s enthusiastic worship of Frederick resulted in a peace (May 5) and then (June 19) in an offensive and defensive alliance between Russia and Prussia, whereby Peter restored to Prussia all the territory won from her by Russia during the last five years at such an enormous expense of men and money, and engaged to defend Frederick against all his enemies. This was followed up by a whole series of menacing rescripts addressed by Peter to the court of Vienna, in which war was threatened unless Austria instantly complied with all the demands of the king of Prussia. Finally he picked a quarrel with Denmark for not accepting as an ultimatum the terms to be submitted by Russia to a peace conference to meet at Berlin for the purpose of adjusting the differences between the two powers. On the 6th of July the Russian army received orders to invade Denmark by way of Mecklenburg. This advance was only arrested, when the opposing forces were almost within touch of each other, by the tidings that a revolution had taken place at St Petersburg, and that Peter III. was already a prisoner in the hands of his consort. The coup d’etat of the 9th of July 1762 properly belongs to the history of Catherine II. (q.v.). Here only a few words must be said as to the mysterious death of Peter at the castle of Ropsha, to which he was removed imme- diately after his surrender. Here he remained from the evening of the 9th to the afternoon of the 18th of July. At first Catherine and her counsellors could not make up their minds what to do with ” the former emperor.” Imprisonment in Schliisselburg for life, or repatriation to Holstein, were proposed only to be rejected as dangerous. The Orlovs had even stronger motives than Catherine for suppressing the ex-emperor, for Gregory Orlov aspired to win the hand as well as the heart of his imperial mistress, and so long as Catherine’s lawful husband lived, even in a prison, such a union would be impossible. The available evidence points to the irresistible conclusion that on the after- noon of the 18th of July 1762, Peter III., with his consort’s con- nivance, was brutally murdered at Ropsha by Alexius Orlov, Theodore Baryatinski, and several other persons still unknown. See R. N. Bain, Peter III., Emperor of Russia (London, 1902); V. A. Bilbasov, History of Catherine II. (Rus.), vol. i. (Berlin, 1900). (R. N. B.)

PETER (Pedro), the name of several Spanish kings.

Peter I., king of Aragon (d. 1104), son of Sancho Ramirez, the third in order of the historic kings of Aragon, belonged to times anterior to the authentic written history of his kingdom; and little is known of him

save that he recovered Huesca from the Mahommedans in 1096.

Peter II., king of Aragon (1174-1213), son of Alphonso II. and his wife Sancia, daughter of Alphonso VIII. of Castile, was born in 11 74. He had a very marked and curious personal character. As sovereign of lands on both sides of the Pyrenees, he was affected by very different influences. In his character of Spanish prince he was a crusader, and he took a distinguished part in the great victory over the Almohades at the Navas de Tolosa in 1 21 2. But his lands to the north of the Pyrenees brought him into close relations with the Albigenses. He was a favourer of the troubadours, and in his ways of life he indulged in the laxity of Provencal morals to the fullest extent. We are told in the chronicle written by Desclot soon after his time,

that Peter was only trapped into cohabiting with his wife by the device which is familiar to readers of Measure for Measure. In the year after the battle of the Navas de Tolosa he took up arms against the crusaders of Simon of Montfort, moved not by sympathy with the Albigenses, but by the natural political hostility of the southern princes to the conquering intervention of the north under pretence of religious zeal. His son records the way in which he spent the night before the battle of Muret with a crudity of language which defies translation, and tells us that his father was too exhausted in the morning to stand at Mass, and had to be lifted into the saddle by his squires. Peter none the less showed the greatest personal valour, and his body, recognizable by his lofty stature and personal beauty, was found on the field after the rout (Sept. 12, 12 13).

See Chronicle of James I. of Aragon, translated by J. Forster (London, 1883) ; and Life and Times of James the First the Conqueror, by F. Darwin Swift (Oxford, 1894).

Peter III., king of Aragon (1236-1286), son of James the Conqueror, and his wife Yolande, daughter of Andrew II. of Hungary, was born in 1236. Having married Constance, daughter of Manfred of Beneventum, he came forward as the representative of the claims of the Hohenstaufen in Naples and Sicily against Charles, duke of Anjou. Peter began the long strife of the Angevine and Aragonese parties in southern Italy. His success in conquering Sicily earned him the surname of ” the Great.” He! repelled an invasion of Catalonia undertaken by the king of France in support of Charles of Anjou, and died

on the 8th of November 1286.

For the personal character of Peter III., the best witness is the Chronicle of Ramonde Muntanez— reprinted in the original Catalan by R. Lanz, Literarischer Verein in Stuttgart, vol. vii. (1844), and in French by Buchon, Coll. des chroniques nationales (Pans, 1824- 1828). See also O. Cartellieri, Peter von Aragon und die Sizilian- ische Vesper (Heidelberg, 1904).

Peter IV., king of Aragon (d. 1387), son of Alphonso IV. and his wife Teresa d'Ente<;a, is known as " The Ceremonious " and also as " he of the dagger." He acquired the first title by the rigid etiquette he enforced, as one means of checking the excessive freedom of his nobles. The second name was given him because he wounded himself with his dagger in the act of cutting to pieces the so-called " charter of the Union," which authorised the rebellions of his nobles, and which he forced them to give up, after he had routed them at the battle of Epila in 1348. Of no man of the 14th century can it be more truly said that his life was a warfare on earth. He had first to subdue his nobles, and to reannex the Balearic Islands to the crown of Aragon. When he had made himself master at home, he had to carry on a long and fierce contest with his namesake Peter the Cruel of Castile, which only terminated when Henry of Trastamara succeeded, largely with Aragonese help, in making himself king of Castile in 1369. Peter succeeded in making himself master of Sicily in 1377, but ceded the actual possession of the island to his son Martin. He was three times married: to Mary, daughter of Philip of Evreux, king of Navarre; to Eleanor, daughter of Alphonso IV. of Portugal; and to Eleanor, daughter of Peter II. of Sicily, his cousin. The marriage of his daughter by his third marriage, Eleanor, with John I. of Castile, carried the crown of Aragon to the Castilian line when his male representatives became extinct on the death of his son Martin in 1410.

See Zurita, Anales de Aragon (Saragossa, 1610).

Peter, " the Cruel," king of Castile (1333-1369), son of Alphonso XI. and Maria, daughter of Alphonso IV. of Portugal, was born in 1333. He earned for himself the reputation of monstrous cruelty which is indicatd by the accepted title. In later ages, when the royal authority was thoroughly established, there was a reaction in Peter's favour, and an alternative name was found for him. It became a fashion to speak of him as El Jusliciero, the executor of justice. Apologists were found to say that he had only killed men who themselves would not submit to the law or respect the rights of others. There is this amount of foundation for the plea, that the chronicler Lopez de Ayala, who

fought against him, has confessed that the

king's fall was regretted by the merchants and traders, who enjoyed security under his rule. Peter began to reign at the age of sixteen, and found himself subjected to the control of his mother and her favourites. He was immoral, and unfaithful to his wife, as his father had been. But Alphonso XL did not imprison his wife, or cause her to be murdered. Peter certainly did the first, and there can be little doubt that he did the second. He had not even the excuse that he was passionately in love with his mistress, Maria de Padilla; for, at a time when he asserted that he was married to her, and when he was undoubtedly married to Blanche of Bourbon, he went through the form of marriage with a lady of the family of Castro, who bore him a son, and then deserted her. Maria de Padilla was only the one lady of his harem of whom he never became quite tired. At first he was controlled by his mother, but emancipated himself with the encouragement of the minister Albuquerque and became attached to Maria de Padilla. Maria turned him against Albuquerque. In 1354 the king was practically coerced by his mother and the nobles into marrying Blanche of Bourbon, but deserted her at once. A period of turmoil followed in which the king was for a time overpowered and in effect imprisoned. The dissensions of the party which was striving to coerce him enabled him to escape from Toro, where he was under observation, to Segovia. From 1356 to 1366 he was master, and was engaged in continual wars with Aragon, in which he showed neither ability nor daring. It was during this period that he perpetrated the series of murders which made him odious. He confided in nobody save the Jews, who were his tax-gatherers, or the Mahommedan guard he had about him. The profound hatred of the Christians for the Jews and Mudejares, or Mahommedans settled among them, dates from the years in which they were the agents of his unbridled tyranny. In 1366 he was assailed by his bastard brother Henry of Trastamara at the head of a host of soldiers of fortune, and fled the kingdom without daring to give battle. Almost his last act in Spain was to murder Suero, the archbishop of Santiago, and the dean, Peralvarez. Peter now took refuge with the Black Prince, by whom he was restored in the following year. But he disgusted his ally by his faithless- ness and ferocity. The health of the Black Prince broke down, and he left Spain. When thrown on his own resources, Peter was soon overthrown by his brother Henry, with the aid of Bertrand du Guesclin and a body of French free companions. He was murdered by Henry in du Guesclin's tent on the 23rd of March 1369. His daughters by Maria de Padilla, Constance and Isabella, were respectively married to John of Gaunt, and Edmund, duke of York, sons of Edward III., king of England.

The great original but hostile authority for the life of Peter the Cruel is the Chronicle of the Chancellor Pero Lopez de Ayala (Madrid .1779-1780). A brilliantly written Life is that by Prosper Mˆrimee, Hist, de Don Pldre I., roi de Castille (Paris, 1848). (D. H.)

PETER DES ROCHES (d. 1238), bishop of Winchester under John and Henry III., and conspicuous among the foreign favour- ites to whom these sovereigns owed much of their unpopularity, was a Poitevin by extraction. He received the office of chamber- lain towards the close of Richard's reign, and under Richard's successor became an influential counsellor. In 1205, doubtless through John's influence, he was elected to the see of Winchester. His election was disputed but, on appeal, confirmed by Pope Innocent III., who honoured Peter by consecrating him in person. None the less, the new bishop stood by his royal patron during the whole period of the interdict. In 1213 he was made justiciar in succession to Geoffrey Fitz Peter. This promotion was justified by the fidelity with which Peter supported the king through the barons' war. At the battle of Lincoln (121 7) Peter led a division of the royal army and earned some distinc- tion by his valour; but he played a secondary part in the government so long as William Marshal held the regency. After Marshal's death (1219) Peter led the baronial opposition to Hubert de Burgh, with varying success. At first the justiciar was successful. In 1221 Peter meditated going on crusade; 1 2 23-1 2 24 saw his party broken up by Hubert's energetic measures; in 1227 was himself dismissed from his office and

turned his back on England to join the crusade of the emperor Frederick II. He was absent from England until 1231; but in the meantime enhanced his reputation both as a soldier and diplomatist. After the fall of De Burgh he kept in the back- ground, but offices and honours were heaped on his dependants, especially on his nephew, Peter des Rievaulx, and other Poitevins. This foreign party triumphed over the revolt which was headed by Richard Marshal in 1233. But the primate, Edmund Rich, voiced the general feeling when he denounced Peter as a mischief maker, and demanded that he should be dismissed from court. The king complied, and threatened the bishop with charges of malversation. Peter was how- ever permitted to leave the country with a pardon (123 5); he conciliated Gregory IX. by rendering efficient aid in a war with the citizens of Rome (1235); and in the next year returned without molestation to his see. He was invited to go as the king's envoy to the court of Frederick II., but

refused apparently on the score of ill health. His public reconciliation with De Burgh (1236), effected through the mediation of the papal legate, provided a dramatic close to their long rivalry, but had no political significance, since both were now living in retirement. Peter died in 1238, and was buried at Winchester. He was undoubtedly a man of a winning personality, a good diplomat and financier, a statesman whose unpopularity was due in some measure to his freedom from the insularity of the Englishmen, against whom he matched himself. But his name is associated with a worthless clique of favourites, and with the first steps which were taken by Henry III. to establish a feeble and corrupt autocracy.

See C. Petit Dutaillis, Vie et regne de Louis VIII. (Paris, 1894); Lecointre Dupont, Pierre des Roches (Poitiers, 1868); Stubbs's Constitutional History of England, vol. ii. ; H. W. C. Davis, England under the Normans and Angevins (1905) ; T. F. Tout in the Political History of England, vol. iii. (1905). (H. W. C. D.)

PETER LOMBARD (c. 1100-c. 1160), bishop of Paris, better known as M agister sententiarum, the son of obscure parents, was born about the beginning of the 12th century, at Novara (then reckoned as belonging to Lombardy). After receiving his education at Bologna, he removed to France, bearing a recommendation to Bernard of Clairvaux, who first placed him under Lotolf at Reims, and afterwards sent him to Paris with letters to Gilduin, the abbot of St Victor. He soon became known as a teacher, and obtained a theological chair in the cathedral school. His famous textbook, the Sententiae, was written between 1145 and 11 50. On the 29th of June 1159 he became bishop of Paris. The accounts of his bishopric are satisfactory. There is a charge that he was guilty of simony, having received his office through the favour of Philip, brother of Louis VII., his former pupil. The date of his death is uncertain. According to one account he died on the 20th of July 1 1 60, and as Maurice de Sully became bishop that year the statement seems probable. Yet there is evidence for a later date, and he may have been set aside for simony.

His famous theological handbook, Sententiarum libri qualuor, is, as the title implies, primarily a collection of opinions of the fathers, " sententiae patrum." These are arranged, professedly on the basis of the aphori c m of Augustine, Lombard's favourite author- ity, that " omnis doccrina vel rerum est vel signorum," into four books, of which the first treats of God, the second of the creature, the third of the incarnation, the work of redemption, and the virtues, and the fourth of the seven sacraments and eschatology. The Sententiae show the influence of Abelard, both in method and arrangement, but lack

entirely the daring of Sic et Non. Compared with that book they are tame. Gratian's Concordia discordantium canonum, as he called his Decretum, was another strong influence, Lombard doing in a sense for theology what Gratian did for the canon law. The influence of Hugh of St Victor is also marked. The rela- tion to the " sentences " of a Gandulph of Bologna (still unpublished) has not been established. The most important thing in the book was its crystallization of the doctrine concerning the sacramental system, by the definite assertion of the doctrine of the seven sacraments, and the acceptance of a definition of sacrament, not merely as "a sign of a sacred thing," but as itself " capable of conveying the grace of which it is the sign." The sentences soon attained immense popularity, ultimately becoming the text-book in almost every theological school, and giving rise to endless commentaries, over 180 of these being written in England. In 1300 the theological professors

of Paris agreed in the rejection of sixteen propositions taken from Lombard, but their decision was far from obtaining universal currency.

Besides the Sententiae, Lombard wrote numerous commentaries (e.g. on the Psalms, Canticles, Job, the Gospel Harmony, and the Pauline Epistles), sermons and letters, which still exist in MS. The Glossae seu commentarius in psalmos Davidis, were first published at Paris in 1533.

Lombard's collected works have been published in J. P. Migne's Patrologie latine, Tome 191 and 192. See also Denifle and Chatelain, Chartularium universitalis parisiensis, Tome i. (Paris, 1889) ; Protois, Pierre Lombard, son epoque, sa vie, ses ecrits, son influence (Paris, 1881) ; Kogel, Petrus Lombard in seiner Stellung zur Philosophic des Mittelalters (Leipzig, 1897); A. Harnack, Dogmengeschichte, Bd. iii. (1890; Eng. trans. 1894-1899); and the article in Herzog-Hauck's Realencyklopadie, Bd. xi. (Leipzig, 1902).

PETER OF AIGUEBLANCHE (d. 1268), bishop of Hereford, belonged to a noble family of Savoy and came to England in 1236 with his master, William of Savoy, bishop of Valence, being in attendance on Eleanor of Provence, the bride of Henry III. A year or two later he is found residing permanently in England as a member of the king's court; before 1239 he was archdeacon of Salop, and in 1240 he was chosen bishop of Hereford. In 1255 Peter acted as Henry's principal agent in the matter of accepting the kingdom of Sicily from Pope Alexander IV. for his son Edmund, and his rapacious and dishonest methods of raising money for this foolish enterprise added not a little to the

unpopularity which surrounded the king and his foreign favourites. When civil war broke out between Henry and his barons the bishop remained loyal to his master, and whilst residing, almost for the first time, at Hereford he was taken prisoner in May 1263. He was, however, released when the king and his enemies came to terms, and after a stay in France he retired to Savoy, where he died on the 27 th of November

1268.

See F. Mugnier, Les Savoyards en Angleterre au XIII” siecle et Pierre a” Aigueblanche (Chambery, 1890).

PETER OF BLOIS [Petrus Blesensis] (c. 1135-c 1205), French writer, the son of noble Breton parents, was born at Blois. He studied jurisprudence at Bologna and theology in Paris, and in 1167 he went to Sicily, where he became tutor to the young king William II., and keeper of the royal seal (sigil- larius). But he made many enemies and soon asked permission to leave the country; his request was granted and about n 70 he returned to France. After spending some time teaching in Paris and serving Rotrou de Perche, archbishop of Rouen, as secretary, Peter entered the employ of Henry II. of England about 1 1 73. He quickly became archdeacon of Bath and soon afterwards chancellor, or secretary, to Richard, archbishop of Canterbury, and to Richard’s successor, Baldwin, being sent on two occasions to Italy to plead the cause of these prelates before the pope. After the death of Henry II. in 1189, he was for a time secretary to his widow, Eleanor, in Normandy; he obtained the posts of dean of Wolverhampton and archdeacon of London, but he appears to have been very discontented in his later years. He died some time after March 1204.

Peter’s writings fall into four classes, letters, treatises, sermons and poems. His Epistolae, which were collected at the request of Henry II., are an important source for the history of the time; they are addressed to Henry II. and to various prelates and scholars, including Thomas Becket and John of Salisbury. His treatises include De Ierosolymitana peregrinatione acceleranda, an exhortation to take part in the third crusade, and Dialogus inter regem Henricum II. et abbatem Bonaevallensem; his extant sermons number 65 and his poems are unimportant. Peter’s works have been printed in several collections, including the Patrologia of J. P. Migne and the Historiae francorum scriptores of A. Duchesne. Of separate editions the best are those by Pierre de Goussainville (Paris, 1667) and J. A. Giles (Oxford, 1846-1847).

See the Histoire litteraire de la France, Tome xv. ; W. Stubbs, Lectures on Medieval and Modern History (Oxford, 1886); Sir T. D. Hardy, Descriptive Catalogue of Materials relating to the History of Great Britain (1862-1867), and C. L. Kingsford in vol. xlv. of the Dictionary of National Biography (1896).

PETER OF COURTENAY (d. 1219), emperor of Romania (or Constantinople), was a son of Peter of Courtenay (d. 1183), and a grandson of the French king, Louis VI. Having, by a first marriage, obtained the counties of Nevers and Auxerre, he took

for his second wife, Yolande (d. 1219), a sister of Baldwin and Henry of Flanders, who were afterwards the first and second emperors of the Latin Empire of Constantinople. Peter accom- panied his cousin, King Philip Augustus, on the crusade of 1190, fought against the Albigenses, and was present at the battle of Bouvines in 12 14. When his brother-in-law, the emperor Henry, died without sons in 12 16, Peter was chosen as his successor, and with a small army set out from France to take possession of his throne. Consecrated emperor at Rome, in a church outside the walls, by Pope Honorius III. on the 9th of April 1 217, he borrowed some ships from the Venetians, prom- ising in return to conquer Durazzo for them; but he failed in this enterprise, and sought to make his way .to Constantinople by land. On the journey he was seized by the despot of Epirus, Theodore Angelus, and, after an imprisonment of two years, died, probably by foul means. Peter thus never governed his empire, which, however, was ruled for a time by his wife, Yolande, who had succeeded in reaching Constantinople. Two of his sons, Robert and Baldwin, became in turn emperors of Constantinople.

PETER OF DUISBURG (d. c. 1326), German chronicler, was born at Duisburg, and became a priest-brother of the Teutonic Order. He wrote the Chronicon terrae Prussiae, dedicated to the grand-master, Werner bf Orseln, which is one of the chief authorities for the history of the order in Prussia. There is a rhyming translation in German by Nicholas of Jeroschin, which, together with the original, is published in Bd. I. of the Scriptores rerum prussicarum (Leipzig, 1861).

See M. Toppen, Geschichte der preussischen Historiographie (Berlin, 1853) ; a “d W. Fuchs, Peter von Duisburg und das Chronicon olivense (Konigsberg, 1884).

PETER OF MARICOURT (13th century), a French savant, to whom his disciple, Roger Bacon, pays the highest tribute in his opus tertium and other works. According to Bacon he was a recluse who devoted himself to the study of nature, was able to work metals, invented armour and assisted St Louis in one of his expeditions more than his whole army. According to Emile Charles {Roger Bacon sa vie, ses ouvrages, ses doctrines, 1861), Peter of Maricourt is the Pierre Peregrin (or Pelerin) de Maricourt (Meharicourt in Picardy), known also as Petrus Peregrinus of Picardy, one of whose letters, De magnete, is partly reproduced in Libri's Hist, des sciences matMmatiques en Italie (1838), ii.

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PETER OF SAVOY (c. 1203-1268), earl of Richmond, younger son of Thomas I. (Tommaso), count of Savoy, was born at Susa. After spending some years as an ecclesiastic he resigned his preferments, and in 1234 married his cousin Agnes, daughter and heiress of Aymon II., lord of Faucigny. Accepting an invitation from the English king, Henry III., who had married his niece, Eleanor of Provence, Peter came to England in 1240, and was created earl of Richmond, receiving also large estates and being appointed to several important offices. During several visits to the continent of Europe Peter had largely increased his possessions in Vaud and the neighbourhood, and returning to England in 1252 he became associated with Simon de Montfort, retaining at the same time the king's friendship. Having been employed by Henry to negotiate with the pope and with Louis IX. of France, he supported Earl Simon in his efforts to impose restrictions upon the royal power; but, more moderate than many members of the baronial party, went over

to Henry's side in 1 260, and was consequently removed from the council. In 1263 he left England, and when his nephew, Boniface, count of Savoy, died in the same year he assumed the title of count of Savoy. This was also claimed by another nephew, Thomas; but Peter compelled the inhabitants of Turin to submit to him and secured possession of the county. He died on the 16th or 17th of May' 1268, leaving an only child, Beatrice (d. 13 10). Peter gave to the castle of Chillon its present form, and his name to the Savoy palace in London. He has been called le petit Charlemagne, and was greatly praised for his valour and his wisdom.

See L. Wursteraberger, Peter der Zweite, Graf von Savoyen (Zurich, 1858); F. Mugnier, Les Savoyards en Angleterre (Chambfiry, 1890); and C. Bemont, Simon de Montfort (Paris, 1884).

PETER THE HERMIT, a priest of Amiens, who may, as Anna Comnena says, have attempted to go on a pilgrimage to Jerusalem before 1096, and have been prevented by the Turks from reaching his destination. It is uncertain whether he was present at Urban's great sermon at Clermont in 1095; but it is certain that he was one of the preachers of the crusade in France after that sermon, and his own experience may have helped to give fire to his eloquence. He soon leapt into fame as an emotional revivalist preacher: his very ass became an object of popular adoration; and thousands of peasants eagerly took the cross at his bidding. The crusade of the pauperes, which forms the first act in the first crusade, was his work; and he himself led one of the five sections of the pauperes to Constantinople, starting from Cologne in April, and arriving at Constantinople at the end of July 1096. Here he joined the only other section which had succeeded in reaching Constantinople — that of Walter the Penniless; and with the joint forces, which had made themselves a nuisance by pilfering, he crossed to the Asiatic shore in the beginning of August. In spite of his warnings, the pauperes began hostilities against the Turks; and Peter returned to Constantinople, either in despair at their recklessness, or

in the hope of procuring supplies. In his absence the army was cut to pieces by the Turks; and he was left in Constantinople without any followers, during the winter of 1096-1097, to wait for the coming of the princes. He joined himself to their ranks in May 1097, with a little following which he seems to have collected, and marched with them through Asia Minor to Jerusalem. But he played a very subordinate part in the history of the first crusade. He appears, in the beginning of 1098, as attempting to escape from the privations of the siege of Antioch — showing himself, as Guibert of Nogent says, a ” fallen star.” In the middle of the year he was sent by the princes to invite Kerbogha to settle all differences by a duel; and in 1099 he appears as treasurer of the alms at the siege of Area (March), and as leader of the supplicatory processions in Jerusalem which preceded the battle of Ascalon (August). At the end of the year he went to Laodicea, and sailed thence for the West. From this time he disappears; but Albert of Aix records that he died in n 51, as prior of a church of the Holy Sepulchre which he had founded in France.

Legend has made Peter the Hermit the author and originator of the first crusade. It has told how, in an early visit to Jeru- salem, before 1096, Christ appeared to him in the Church of the Sepulchre, and bade him preach the crusade. The legend is without any basis in fact, though it appears in the pages of William of Tyre. Its origin is, however, a matter of some interest. Von Sybel, in his Geschichte des ersten Kreuzzuges, suggests that in the camp of the pauperes (which existed side by side with that of the knights, and grew increasingly large as the crusade told more and more heavily in its progress on the purses of the crusaders) some idolization of Peter the Hermit had already begun, during the first crusade, parallel to the similar glorification of Godfrey by the Lorrainers. In this idolization Peter naturally became the instigator of the crusade, just as Godfrey became the founder of the kingdom of Jerusalem and the legislator of the assizes. This version of Peter’s career seems as old as the Chanson des chetifs, a poem which Raymond of Antioch caused to be composed in honour of the Hermit and his followers, soon after 1130. It also appears in the pages of Albert of Aix, who wrote somewhere about 1130; and from Albert it was borrowed by William of Tyre. The whole legend of Peter is an excellent instance of the legendary amplification of the first crusade — an amplification which, beginning during the crusade itself, in the ” idolizations ” of the different camps (idola cas- trorum, if one may pervert Bacon), soon developed into a regular saga. This saga found its most piquant beginning in the Hermit’s vision at Jerusalem, and there it accordingly began — alike in Albert, followed by William of Tyre and in the Chanson des chetifs, followed

by the later Chanson d'Antioche.

The original authorities for the story of Peter the Hermit are: for the authentic Peter, Anna Comnena and the Gesta Francorum;

for the legendary Peter, Albert of Aix. The whole career of the Hermit has been thoroughly and excellently discussed by H. Hagen- meyer, Peter der Heremite (Leipzig, 1879). (E. Br.)

PETER THE WILD BOY (fl. 1725-1785), a Hanoverian imbecile of unknown parentage, who, having been found living wild in the woods near Hanover in 1725, was brought to England by order of George I., whose interest had been aroused in the unfortunate youth. An extraordinary amount of curiosity and speculation concerning Peter was excited in London, and the craze was the subject of a biting satire by Swift, and of another entitled The Most Wonderful Wonder that ever appeared to the Wonder of the British Nation, which has been attributed to Swift and Arbuthnot; Defoe also wrote on the subject, and Lord Monboddo in his Origin and Progress of Language presents the idiot Peter as an illustration of his theory of the evolution of the human species. He lived to an advanced age, was seen by Lord Monboddo in 1782, and died in 1785.

See Henry Wilson, The Booh of Wonderful Characters (London, 1869).

PETER, EPISTLES OF, the two books of the New Testament traditionally ascribed to the apostle Peter.

1 Peter This epistle is addressed to " the elect who are sojourners of the Dispersion [Diaspora] in Pontus, Galatia, Cappadocia, Asia and

Bithynia.” The ” Diaspora ” was the name generally given to the Jews who were ” scattered abroad.” This suggests that the letter was intended for Jewish Christians in the provinces mentioned. But i. 14, 18; ii. 9, 10; iv. 3 point rather to Gentile Christians, and it is better to take this view, and interpret the ” Diaspora ” metaphorically as referring to the isolated position of Christians among the heathen. The general impression made by the epistle is that the central idea was to strengthen the courage of the recipients, who were likely to undergo per- secution, and to enjoin on them conduct which would remove all reasonable excuse for thinking that Christianity ought to be regarded as a crime.

Ch. i. 3-12 is an introduction of praise to God that he had caused the recipients of the epistle to be born again to the living hope in a glorious salvation. The rest of the epistle may be divided into three parts : (a) i. 13— ii. 10, mainly hortatory injunctions to live holy lives in accordance with this new birth, and to grow up as God’s people in communion with Christ ; ifi) ii. 11-iv. 6, particular directions as to the line of conduct to be pursued towards the Gentiles and towards those in authority, with special reference to the relations of slaves to masters, of wives and husbands to each other, and of Christians to one another ; to the first of these a passage is appended dealing with the sufferings of Christ as an example (ii. 21-25), an d the whole is completed by an exhortation to meekness and patience in suffering, in the light of the sufferings of Christ and the blessings given by them both to the living and to the dead ; (7) iv. 7-v. 1 1 , has less cohesion. It begins with exhortations not to forget prayer and love, then the believers are warned to be careful to suffer only as Christians, not as breakers of the laws. The elders and the younger men are reminded of their duties to the community and to one another. The whole is brought to a close with an exhortation to all to fight manfully against the devil and to trust in God.

Date and Authorship. — These two questions are so closely connected that they cannot be considered separately. The external evidence of tradition is that the epistle was written by St Peter. This can be traced back to Irenaeus (iv. 9, 2) and Clement of Alexandria (Strom, iii. 18, no), and it is thought by many writers that 2 Peter iii. 1, even if it be not itself Petrine, is good evidence that the writer regarded 1 Peter as apostolic. Evidence for its use, without mention of its name, may be found in Polycarp, but probably not in the other apostolic fathers (cf. The N.T. in the Apostolic Fathers, Oxford, 1905, p. 137). It is, however, possible that Papias made use of it. It is doubtful whether Justin Martyr used it, but probable that it was known to Theophilus of Antioch. It is not mentioned in the canon of Muratori. Thus external

evidence, though unanimous in favour of the Petrine authorship, is not sufficient to settle the question. The internal evidence consists of (a) evidence bearing on the date in connexion with the persecution of Christians, 03) evidence establishing the relation of the epistle to other

documents in early Christian history, and (7) evidence concerning St Peter personally.

(a) It is clear from I Peter i. 6, ii. 12, iv. 12-19, v – 9. that the epistle was written during a time of persecution. The question which is doubtful is to which persecution the description best applies. The traditional opinion was that the persecution referred to was that under Nero. But it has been argued that the Neroine persecution according to Tacitus (Ann. xv. 44) was not a persecution of Christians as such, but was rather the result of false accusation. Moreover there is no proof that there was any persecution of Christians at this time outside Rome, and I Peter alludes to per- secution in the provinces of Asia Minor. Therefore many critics have felt obliged to bring the epistle into connexion with the epistle of Pliny to Trajan, written c. 112, and asking for advice as to the procedure to be followed in trials of Christians. This is. the earliest evidence which implies organized persecution in the provinces in question, and therefore Holtzmann, Weizsacker and others regard this as fixing the date of the epistle in the beginning of the 2nd century, and excluding the Petrine authorship. Against this view it may be argued that the epistle describes the beginning of per- secution. The writer still hopes that Christians will not be obliged to suffer ” for the name ” and is clearly aware of false accusations of crime. On the other hand Pliny’s letter implies a time when Christianity was in itself a crime and was recognized as such. Thus it is urged, probably correctly, that the epistle belongs to the beginning of a period of which Pliny’s letter marks a later develop- ment, and we can only say that c. 112 is the terminus ad quern. The terminus a quo is more difficult to find. We do not know with cer- tainty when Christianity became a recognized offence, and scholars have supported various hypotheses. T. Mommsen, Hardy and Sanday think that even under Nero it was criminal to be a Christian ; Neumann thinks that this was first the case under Domitian; Sir W. M. Ramsay believes that this attitude was one of the results of the Jewish War of 70, and ascribes it to Vespasian. If the Domitianic date be adopted the Petrine authorship is almost excluded, and it. is difficult to reconcile the traditional date of St Peter’s martyrdom with Ramsay’s theory.

(/S) The relations of I Peter to other books in early Christian literature is shown in the following table : —

1 Pet.

Rom.

1

Pet.

Eph.

1 Pet.

Jas.

1 Pet. Polycarp.

i. 14 — xii. 2 ii. 5 — xii. 1 ii. 6-10 — ix. 32

i.

i. ii.

1 seq

H

18

— i. 3seq.

— “• 3 — vi. 5

i. 1 — i. i. 6 seq. — i. i. 24 — i.

1

2 seq.

10

i. 8— i. 3 1. 13— ii. 1 i. 21 — ii. 1

11. 13

— Xlll. 1

111.

1

— v. 22

1. 23 — 1.

18

11. 11 — v. 3

111. 9

— xii. 17

111.

22

— 1.20

iv. 8 — v.

20

11. 12 X. 2

111. 22

— vm. 34

v.

5

V. 21

v. 5 seq. — iv.

6,10

11. 21 — vm. 1,2

iv. 3

— Xlll. 1 1

111. 9 — 11. 2

iv. 7 iv. 9 iv. 10

Xlll. 12

— xiii. 13 — xii. 6

iv. 7 — vn. 2 iv. 16 — viii. 2

From this table it is sufficiently plain that 1 Peter is closely connected with Romans, Ephesians, James and Polycarp. The majority of scholars are agreed that in the case of Romans the dependence is on the side of I Peter, and in the case of Polycarp on the side of Polycarp. There is less agreement as to Ephesians and James, though in the former case the general opinion favours the dependence of 1 Peter, in the latter case its priority. In England, however, the priority of James has been supported by Mayor and Hort. In the light of the established use of Romans it is possible that I Peter also used other Pauline epistles and some scholars have seen special traces of the influence of 1 Cor. and Gal. (for a list of these cf. Holtzmann, Einleitung in das N.T., 3, p. 314). It has been argued that the use of the Pauline epistles is improbable for Peter, but this is a subjective argument which is not decisive.

(7) According to tradition Peter was martyred in Rome, and it is

probable that this was in the Neroine persecution. If this be so, the year 64 is the terminus ad quern of the letter, if it be authentic. Ramsay, however, thinks that Peter may have survived this persecution and suffered at the beginning of the persecutions which, he thinks, were initiated by the Flavian emperors (see Peter, St : § 5, 4 and 6).

The whole question of authorship and date is thus a complex of smaller problems, many of which do not seem to admit of any definite answer. If St Paul's epistle to the Ephesians be genuine, and it were really known to the writer of 1 Peter, and if Peter were martyred in 64, the theory of Petrine authorship demands that it was written by Peter between 59 and 64. On the Petrine hypothesis this is the most probable view. The weak point is that it assumes a great spread of Christianity in the provinces of Asia Minor outside the activity of Paul, and that the official persecution of Christians as" such began throughout the Roman Empire under Nero, for neither of which is there

corroborative evidence. On the non-Petrine hypothesis a date is demanded some time before the letter of Pliny; this suits the internal evidence better than any possible on the Petrine hypothesis, but it fails to explain the really considerable and early evidence for the Petrine authorship, and necessitates some purely hypothetical suggestion, such as Harnack's view that the epistle was originally anonymous, and that the opening and closing sentences (i. i sqq., v. 12 sqq.) were added between a.d. 150 and 175, perhaps by the writer of 2 Peter.

The Provenance of the Epistle. — This is defined in 1 Peter v. 13 as Babylon. It has sometimes been argued that this is Babylon in Mesopotamia, in which there were, until the time of the em- peror Caius, many Jews; but no good tradition connects St Peter with the evangelization of Mesopotamia, and this district would have had little in common with the Graeco-Roman world of Asia Minor. Another suggestion is that the Egyptian Babylon is meant (Old Cairo); but in the 1st century this was probably merely a fortress. Thus there is an overwhelming weight of opinion in favour of the view that Rome, the Babylon of Apocalyptic literature, is intended. This also agrees with the tradition in 2 Tim. iv. 1 1 , which (cf. 1 Pet. v. 13) suggests that St Mark was in Rome.

Reception in the Canon. — 1 Peter seems to have been the earliest of the Catholic epistles to obtain recognition. By the year 200 it was accepted everywhere except in two places — the church of Edessa, which did not receive the Catholic epistles until the 5th century, and, if the canon of Muratori is to be trusted, the church of Rome. It should, however, be noted that Zahn emends the text of the Muratorianum (rather violently) so as to include the epistle (see also Bible: New Testament Canon.)

The Theology of 1 Peter. — The simplicity of the theology is marked, and affords an argument for an early date. Jesus is the Messiah of whom the prophets had spoken, and the ” Spirit of Christ ” is identified with the spirit which was in them. His suffering for sin had rescued the elect, and was also an example for Christians to follow. After his death he preached to the ” spirits in prison.” The source of Christian life is on the one hand belief in God who raised the Messiah from the dead, and on the other hand baptism which ” saves . . . through the resurrection of Jesus Christ.” The members of the community are ” a royal priesthood, a holy nation ” — i.e. inherit the promises made to the Jews, but this inheritance is bound up with the strongly eschatological doctrine that Christians are strangers in the world, the end of which is at hand.

The Church Organization of 1 Peter. — This also is very simple and primitive, and closely based on the Jewish model. The leaders are called presbyters or elders, and their duty is to act as shepherds to the flock. Beyond this there is no sign of a developed organization : each is to act in accordance with the gift (xapicryuo) which he has received. There is no trace of a specially set apart ministry either for the service of the community or for teaching, as to which the only limitation given is ” If any man speak let him speak as the oracles of God,” i.e. probably, in accordance with the Old Testament.

2 Peter

This epistle may be divided into five parts. (1) The writer who describes himself as ” Simon (var. lect. Symeon) Peter, a servant and apostle of Jesus Christ,” exhorts his readers to become perfect in knowledge and virtue, so as to enter the kingdom of Christ (i. 3-1 1). (2) He then explains his desire once more to testify to the power of Jesus, and bases his testimony partly on his own experience in the Holy Mount (apparently a reference to the Transfiguration), and partly on the ” word of prophecy” (i. 12-21). (3) The mention of prophecy leads him to deal with the question of false prophets, who are accused of false doctrine and immoral practices. In this section is incorporated

almost the whole of the epistle of Jude (ii. 1-22). (4) He then discusses a special feature of the false teaching, viz. doubts thrown on the Parousia, the certainty of which for the future he defends (iii. 1-13). Finally he warns his hearers that they must be found spotless at the Parousia, and emphasizes the agreement of his teaching with St Paul's (iii. 14-18).

The main object of the epistle is to be seen in the attack made on the false teachers, and in the defence of the certainty of the Parousia of the Lord.

Authorship. — The traditional view is that it was written by St Peter from Rome after 1 Peter. This view is however untenable for the following reasons. (1) The epistle is not quoted by any writer of the 2nd century, and Origen, who is the first to mention it as Petrine, admits that its authorship was disputed. (2) The style and language differ greatly from that of 1 Peter: this argument may however fairly be met by the suggestion that it is improbable that he wrote Greek with ease, and that he may have used a variety of amanuenses. (3) The growth of immorality and false teaching to which it witnesses seems irreconcilable with a very primitive period of church life.

(4) It has incorporated the greater part of Jude in a whole- sale manner difficult to reconcile with apostolical authorship.

(5) It seems to attribute a position of scriptural authority to the Pauline epistles, and this is improbable either in the mouth of Peter, or during the 1st century.

Any one of these arguments would be weighty by itself; in combination they form an irresistible cumulative argument against the Petrine authorship of 2 Peter.

Date. — If the Petrine authorship be abandoned, the terminus ad quern of the epistle is its use by Origen (or, just possibly, by Clement of Alexandria), and the terminus a quo is fixed by the following considerations: (1) the activity of an immoral Gnosticism; (2) the attainment by the Pauline epistles of great authority, and their perversion by heretics; (3) the use made of the epistle of Jude.

It is difficult to define the exact date to which these indications point, but there is a general agreement that it must be sought in the 2nd century, and perhaps the decades immediately before and after the year a.d. 150 are the most probable.

Place of Origin. — There is hardly any evidence on this point: but the

most probable place seems to be Egypt, as the letter has points of connexion with Philo, Clement of Alexandria and the Apocalypse of Peter, and seems first to have been used in the church of Alexandria. It should however be noted that Deiss- mann argues on lexical grounds in favour of Asia Minor [Bibel Stud. pp. 277-284).

Relation to other Early Christian Documents. — The documents with which 2 Peter has the greatest affinities are the epistle of Jude, and the Apocalypse of Peter, of which a fragment was found in Akhmim in 1892 by M Bouriant. In each case the affinity is very close, and is capableof more than one explanation. Roughly speaking 2 Peter ii. reproduces Jude: it is possible therefore either that Jude is an epitome of 2 Peter or that the writer of 2 Peter used Jude. The former hypothesis has a few supporters, notably T. Zahn and Spitta, but most writers are emphatic in thinking that 2 Peter has incorporated Jude, and this view is almost certainly correct (see Jude, Epistle oe). The connexion with the Apocalypse of Peter is more complicated: the evidence of a comparison between the two documents (which is made in full in F. H. Chase's article in Hastings's Dictionary of the Bible) is to show that either one document is dependent on the other, or both were written by the same person, or both come from the same circle. Of these theories there is least to be said for the dependence of the Apocalypse on 2 Peter, and perhaps most for the dependence of 2 Peter on the Apocalypse. Reception in the Canon. — 2 Peter was the last of the Catholic epistles to be accepted as canonical. It was first regarded as such in Alexandria, perhaps originally in connexion with the Apocalypse of Peter rather than with 1 Peter. Thence it passed into the canon used by the church of Constantinople, in the 4th century made its way into the Roman canon, and in the 6th was accepted last of all by the Syria church (see also Bible: New Testament Canon).

The Theology of 2 Peter. — The theology of the epistle is specially marked by two characteristics — its high Christology and its eschato- logical character. Christ is referred to as " our God and Saviour," and the fatherhood of God is apparently only regarded as referring to the Divine Son. The work of Christ was the redemption of the elect, and this redemption awaits its consummation in the Parousia. This is the central point of the teaching of the epistle and is obviously directed against that of the false prophets. The I writer looks forward to the destruction of the present world by fire,

when the wicked, whether angels or men, who have been reserved for judgment will be finally condemned, and a new era of happiness for the elect will begin.

Church Organization. — There is very little in 2 Peter which throws light on church organization. From his silence it would appear that the monarchial episcopacy did not yet exist in the church to which the writer belonged, and perhaps the prophets were still the chief guides, but the argument from silence cannot be pressed. In any case the growth of false and immoral prophets, which ultimately led to the obsolescence and suppression of this order, was far advanced and was one of the reasons which led to the writing of the epistle.

Authorities. — Besides the books and articles already mentioned the following are important: F. H. Chase, ” Peter “and ” Epistles of Peter” in Hastings’s Diet. Bible; P. W. Schmiedel, “Simon Peter ” in the Ency. Bib. ; Lightfoot, 5. Clement of Rome, 1, 201-315 and 11, 481-502; Harnack, Altchr. Litt. and Chronologie I (the rele- vant sections). The relevant sections in the Introductions of Holtzmann, T. Zahn, Jiilicher, Salmon, Weiss and Moffat. The commentaries of Bigg, Mayor, F. Spitta, Kiihl (in Meyer’s Commen- tary), von Soden (in Holtzmann’s Commentary), and Weiss.

(K. L.) PETERBOROUGH, a town and port of entry of Ontario, Canada, and capital of Peterborough county, situated 70 m. N.E. of Toronto, on the Otonabee river and the Grand Trunk and Canadian Pacific railways. Pop. (1901), 11,239. The five falls of the Otonabee at this point, with a total descent of 50 ft., furnish power for a large and increasing number of manufacturing establishments, whilst its canalization as part of the Trent canal gives communication with Lake Ontario and Georgian Bay. Peterborough has an electric railway, and con- tains important manufactories of electrical machinery and •supplies, iron and steel bridges, agricultural implements and cordage, saw, flour and woollen mills.

PETERBOROUGH, a city and municipal and parliamentary borough of Northamptonshire, England, 76 m. N. from London by the Great Northern railway; served also by the London & North Western, Great Eastern and Midland railways. Pop. (1891), 25,171; (1901), 30,872. It is built chiefly along the river Nene, on the north side, and on the western border of the Fen country.

The cathedral of St Peter is the third church that has occupied the site; the first, founded under Penda, king of the Mercians, about 656, was entirely destroyed by the Danes in 870, and the second, founded in

King Edgar's reign, was accidentally burnt in 1 1 16. The present building, founded in the following year, was, inclusive of the west front, 120 years in building, being consecrated on the 4th of October 1237. It embraces in all, however, eight periods of construction, and in no other building can the transition be better studied through the various grades of Norman to Early English, while the later addition is an admirable example of Perpendicular.

The erection proceeded as usual from east to west, and, while an increase in elegance and elaboration is observable in the later parts, the character of the earlier buildings was so carefully kept in mind that no sense of incongruity is produced. A series of uniform Decorated windows were added throughout the church in the 14th century, and their effect is rather to enhance than detract from the unity of design. The choir, early Norman, terminating in an apse, was founded in 11 17 or 11 18 by John de Sais or Sez, and dedicated in 1 1 40 or 1 143; the aisles of both transepts and the whole of the south transept were built by Martin of Bee, 1 140-1 155 ; the remaining portions of the transepts and the central tower, of three stories, were completed by William de Waterville, 1155-1175; the nave, late Norman, was completed by Abbot Benedict, 1177-1193, who added a beautiful painted roof of wood ; the western transepts, transitional Norman, were the work of Abbot Andrew, 1 193-1200; the western front, actually a vast portico of three arches, the unique feature of the building, and one of the finest specimens of Early English extant, must have been built between 1200 and 1250, during which period there were several abbots; but there exists no record of its reconstruction. The lady chapel, built parallel with the choir by William Parys, prior, was consecrated in 1290; the bell-tower was erected by Abbot Richard between 1260 and 1274; the south-west spire, the pinnacles of the flanking tower of the west portal, and the enlargement of the windows of the nave and aisles were the work of Henry de Morcot in the beginning of the 14th century; the " new building " or eastern chapel in the Perpendicular style, begun in 1438, was not completed till 1528. In 1541 the church was converted into a cathedral, the abbot being made the first bishop. The extreme length of the building is 471 ft., and of the nave 21 1 ft., the breadth of the west front being 156; the height of the central tower, as reconstructed in the 14th century, was 150, that of the

spires and tower of the west front is 156 ft. In 1643 the building was defaced by the soldiers of Cromwell, who destroyed nearly all the brasses and monuments, burnt the ancient records, levelled the altar and screen, defaced the windows, and demolished the cloisters. To obtain materials for repairs the lady chapel was taken down. In the

latter part of the 18th century the church was repaved. In 1 83 1 a throne, stalls and choir-screen were erected and other restorations completed. On account of the insecure state of the central tower in 1883 it was taken down; and its reconstruction, exactly as it stood with the exception of the four corner turrets added early in the 19th century, was completed in 1886. The choir was reopened in 1889 after being closed, for thorough restoration, for six years.

In 1895 the restoration of the west front and other parts was begun in the face of considerable adverse criticism; but the work was carried on with the utmost care. During the carrying out of this work many interesting discoveries were made, the most important being the site of the cruciform Saxon church, enclosed within a crypt under the south transept. Catherine of Aragon was interred in the cathedral in 1536, and Mary Queen of Scots in 1587, but the body of the Scottish queen was removed to Westminster Abbey in 1612. Both interments were superintended by Robert Scarlett the sexton, commonly known as ” Old Scarlett,” whose portrait, a copy of the original, hangs in the west transept. He died in 1594 at the age of 98. Of the monastic buildings there are some interesting remains. The cathedral is approached by a Norman gateway, above which is the chapel of St Nicholas, built by Abbot Benedict, and now used as the music school, and on the left the chapel of St Thomas a Becket, built by Abbot Ashton in the 15th century as it stands, but originally Norman. The gateway to the bishop s palace, for- merly the abbot’s house, was built by Abbot Godfrey de Croyland in 1319, and the deanery gate by Abbot Kirton about 1520. One of the canonry houses is formed partly from a hall of the 13th century.

Peterborough is included for civil purposes in the parish of St John the Baptist, but for ecclesiastical purposes it is divided into four, the additional parishes being St Mary’s Boongate (1857), St Mark’s (1858) and St Paul’s (1869). The old parish church of St John originally stood to the east of the cathedral, but was rebuilt on its present site in the centre of the city (1401-1407) in Perpendicular style. The educational establishments include the Henry VIII. grammar or chapter school, which used the chapel of St Thomas a. Becket until 1885; the St Peter’s training college for schoolmasters for the dioceses of Peterborough, Ely and Lincoln, erected from designs of Sir Gilbert Scott (1864); and Deacon’s and Ireland’s charity school, established in 1721 for the clothing and educating of twenty poor boys. The principal public building is the market house (1671), used as a town-hall. The modern prosperity and rapid growth of the town are chiefly due to the trade caused by the junction of so many railway lines. Adjoining the town are extensive works and sheds connected with the

Great Northern and Midland railways. The principal manufacture is that of agricultural implements. The parliamentary borough returns one member (since 1885). The municipal borough, incorporated in 1874, is under a mayor, 6 aldermen and 18 councillors. Area, i8r8 acres. The soke or liberty of Peterborough, with a population of 41,122, constitutes a separate administrative county (1888). The diocese of Peterborough includes the whole of Rutland, nearly all Leicestershire and Northamptonshire, and small portions of Derbyshire and Huntingdonshire.

Peterborough {Burgh, Burgus sancti Petri) is proved by its original name Medehamstede to have been a Saxon village before 655 when Saxulf, a monk, founded the monastery on land granted to him for that purpose by Penda, king of Mercia. Its name was altered to Burgh between 992 and 1005 after Abbot Kenulf had made a wall round the minister, but the town does not appear to have been a borough until the 12th century. The burgesses received their first charter from " Abbot Robert," probably Robert of Sutton (1262-1273). Until the 19th century the dean and chapter, who succeeded the abbot as lords of the manor, appointed a high bailiff, and the constables and other borough officers were elected at their court leet. but the borough was incorporated in 1874 under the government of a mayor, 6 aldermen and 18 councillors. Among the privileges claimed by the abbot as early as the 13th century was that of having a prison for felons taken in the soke and borough. In 1576 Bishop Scamble sold the lordship of the hundred of Nassaburgh, which is coextensive with the soke, to Queen Elizabeth, who

gave it to Lord Burghley, and from that time until the 19th century he and his descendants, marquesses of Exeter, had a separate gaol in Peterborough for prisoners arrested in the soke. The trades of weaving and woolcombing were carried on in Peterborough in the 14th century. The abbot formerly held four fairs, of which two, one called St Peter's fair, granted in 1 1 89 and now held on the second Tuesday and Wednesday in July, and the other called the Bridge fair, granted in 1439 and held on the first Tuesday, Wednesday and Thursday in October, still survive and were purchased by the corporation from the ecclesiastical commissioners in 1876. Peterborough sent two members to parliament for the first time in 1547.

PETERBOROUGH AND MONMOUTH, CHARLES MOR- DAUNT, Earl

of (c. 1658-1735), English soldier and statesman, was born about 1658. His father, John Mordaunt, was created Viscount Mordaunt of Avalon and Baron Mordaunt of Reigate, Surrey, in 1659 ; J his mother was Elizabeth, the daughter and sole heiress of Thomas Carey, the second son of Robert Carey, 1st earl of Monmouth. 2 He matriculated at Christ Church, Oxford, on the nth of April 1674. When about sixteen years of age he joined Sir John Narborough's fleet in the Mediterranean, and won his first distinction in arms in the destruction of the dey's fleet under the very guns of Tripoli. His father died on the 5th of June 1675, and Charles Mordaunt succeeded to the peerage as Viscount Mordaunt. On his return from the second expedi- tion to Tangier he plunged into active political life as a zealous Whig and an unswerving opponent of the duke of York. But his continued hostility to James II. forced him to repair to Holland in 1686, when he proposed to William of Orange to invade England. The disposition of the cold and cautious William had little in common with the fierce and turbulent Mordaunt. His plan was rejected, though the prudent prince of Orange deemed it judicious to retain his services. When William sailed to Torbay his friend accompanied him, and when the Dutch prince was safely established on the throne of England honours without stint were showered upon Lord Mordaunt. He was sworn of the privy council on the 14th of February 1689, on the 8th of April of the same year appointed first lord of the treasury, and a day later advanced in the peerage by creation as earl of Monmouth.

In less than a year he was out of the treasury, but he still remained by the person of his monarch and was with him in his dangerous passage to Holland in January 1691. He was one of the eighteen peers who signed the protest against the rejection, on the 7th of December 1692, of the motion for the appointment of a committee to inquire into the conduct of the war, and although William had refused his consent to a bill for triennial parliaments in the previous session, Lord Monmouth did not shrink from reintroducing it in December 1693. This led to a disagreement with the court, though the final breach did not take place until January 1697, when Monmouth was accused of complicity in Sir John Fenwick's conspiracy and of the use of " undutiful words " towards the king. He was committed to the Tower, staying in confinement until the 30th of March 1697, and deprived of his employments. Some consolation for these troubles came to him on the 19th of June of the same year, when he succeeded to the earldom of Peter- borough, by the death of his uncle Henry Mordaunt, 2nd earl.

The four years after his release from the Tower were mainly passed in retirement, but on the accession of Anne he plunged into political life again with avidity. His first act was to draw down on himself in

February 1702 the censure of the House of Commons for the part which he took in the attempt to secure the return of his nominee for the borough of Malmesbury. Through the fear of the ministry that his restless spirit would drive him into opposition to its measures if he stayed at home, he was appointed early in 1705 to command an expedition of

1 A barony of Mordaunt by writ had existed in the family since 1529, and the viscount was the second son of the fifth of these barons, who in 1628 was created earl of Peterborough, the elder son Henry being second earl.

1 Cr. 1626. This peerage became extinct in 1661 on the death of the 2nd earl.

English and Dutch troops in Spain. He was created the sole commander of the land forces in April 1705 and joint-commander with Sir Cloudesley Shovel of the fleet on the 1st of May, after he had been reinstated a member of the privy council on the 29th of March. He arrived at Lisbon on the 20th of June 1705, sailed for Barcelona (Aug. 1705) on an expedition for the conquest of Catalonia, and began to besiege that town. For some weeks the operations were not prosecuted with vigour and Peterborough urged that the fleet should transport the troops to Italy, but the energetic counsels of the Archduke Charles at last prevailed and by the 14th of October the city fell into his hands. On the 24th of January 1706 he entered Valencia in triumph, but these movements had weakened the garrison at Barcelona, which was now besieged by a superior French force under Tesse. The garrison, commanded by the archduke, defended their positions with great bravery, but would have been obliged to surrender had not the fleet of Sir John Leake, answering the appeals of Charles but contrary to the original orders of Peterborough, come to their assistance on the 8th of May, whereupon the French raised the siege on the nth of May. It is difficult to understand the action of Peterborough during this campaign, unless on the supposition that he was out of sympathy with the movement for placing an Austrian prince on the throne of Spain. When Charles deter- mined upon uniting with Lord Galway's troops and marching to Madrid, the advice of Peterborough again hindered his progress. At first he urged an advance by Valencia as supplies had there been collected, then he withdrew this statement; afterwards he delayed for some weeks to join Galway, who was in need of succour, but ultimately reached the camp on the 6th of August. The leaders of the army differed in their views, and Lord Peterborough was recalled to England to explain his conduct (March 1707).

On his return to England in August he allied himself with the Tories, and received his reward in being contrasted, much to his advantage, with the Whig victor of Blenheim and Malplaquet. The differences between the three peers, Peterborough, Galway and Tyrawley, who had served in Spain, formed the subject of angry debates in the Lords, when the majority declared for Peterborough; after some fiery speeches the resolution that he had performed many great and eminent services was carried, and votes of thanks were passed to him without any division (January and February 1708). His new friends were not desirous of detaining him long on English soil, and they sent him on a mission to Vienna, where he characteristically engaged the ministry in pledges of which they disapproved. His resentment at this disagreement was softened by the com- mand of a cavalry regiment, and by his appointment as a Knight of the Garter (Aug. 3 and 4, 1713). With the accession of George I. Lord Peterborough's influence was gone. Worn out with suffering, he died at Lisbon on the 25th of October 1735. His remains were brought to England, and buried at Turvey in Bedfordshire on the 21st of November.

Lord Peterborough was short in stature and spare in habit of body. His activity knew no bounds. He was said to have seen more kings and postilions than any man in Europe, and the whole point of Swift's lines on " Mordanto " consisted in a description of the speed with which he hastened from capital to capital. He was eloquent in debate and intrepid in war, but his influence in the senate was ruined through his inconsistency, and his vigour in the field was wasted through his want of union with his colleagues. His first wife, Carey, daughter of Sir Alexander Fraser of Dores, Kincardineshire, died on the 13th of May 1709, and was buried at Turvey. Some years later (1722) he secretly married Anastasia Robinson (c. 169 5-1 7 5 5), a famous dramatic singer (from 17 14) of great beauty and sweet- ness of disposition, daughter of Thomas Robinson (d. 1722), a portrait painter; but she was at first unrecognized as his wife, and lived apart from him (regarded merely as his mistress) with her two sisters at Parson's Green. She remained on the operatic stage, till 1724. It was only a few months before his death that (after a second marriage ceremony) she

was introduced to society as the countess of Peterborough. He had a son John (1681-1710) who predeceased him, and was therefore succeeded in the title by his grandson Charles (1710- 1779), whose

son Charles Henry (1758-1814), 5th earl, died unmarried, the honours becoming extinct, except for the barony of Mordaunt. which passed to a collateral branch and fell into abeyance in 1836.

Bibliography. — The best accounts of the career of Peterborough are in the life by William Stebbing (1890), and the War of the Succession in Spain, by Colonel the Hon. Arthur Parnell (1905). The earlier lives are founded on the memoir of Captain George Carleton (1728), which was analysed by Colonel Parnell, and dis- missed as a fictitious narrative inspired by Swift, in the Eng. Hist. Rev. (1891), vi. 97-151). (W. P. C.)

PETERHEAD, a municipal and police burgh, and seaport of Aberdeenshire, the most easterly town in Scotland. Pop. (1901), 11,794. It is situated about 33 m. by road E.N.E. of Aberdeen and 44J m. by rail, via Maud Junction, on the Great North of Scotland railway, from which there is a branch line. The town is built of the red granite for which it is famous, and the quarrying of which for home and foreign use constitutes an important industry. Among the principal buildings are the town-house (1788), with a spire 125 ft. high, and the Arbuthnot museum and art gallery. In front of the town-hall is a statue to Field Marshal Keith (born at Inverugie Castle, 2 m. north-west, in 1696), which was presented to the burgh in 1868 by William I. of Prussia, afterwards German emperor. Peterhead is one of the Elgin district group of parliamentary burghs, with Banff, Cullen, Elgin, Inverurie and Kintore. It formerly had an extensive trade with the ports of the Baltic, the Levant and America, and was once a sub-port to Aberdeen, but was made independent in 1832. It was also for a long period the chief seat of the Greenland trade, but the Arctic seal and whale fishery is now extinct. The north and south harbours lie between the town and Keith Inch — a suburb at the extremity of the peninsula on part of which the town is built — and the isthmus dividing them is pierced by a canal crossed by an iron swing-bridge. In the north harbour are two graving docks. A third harbour has been built, the area of the three basins amounting to 21 acres. In addition to the granite quarrying and polishing, the leading industries are ship- and boat-building, agricultural implement works and woollen manufactures. The herring fleet possesses more than 600 boats and the annual catch averages nearly £200,000. About a mile to the south is the convict prison for Scotland. Since 1886 the prisoners have been employed upon the construction of a vast harbour of refuge, for which the breakwater extends from Boddam Point northwards across the bay. This great undertaking (intended to be completed in 1921) was designed by Sir John Coode (d. 1892). Peterhead is the terminus of a cable to Norway. About 6 m. south of Peterhead are the famous

Bullers, or Roarers, of Buchan, an enormous rocky cauldron into which the waves pour through a natural arch of granite, with incredible violence, in a storm.

The town and lands belonged of old to the Abbey of Deer, built in the 13th century by William Comyn, earl of Buchan; but when the abbey was erected into a temporal lordship in the family of Keith the superiority of the town passed to the earl marischal, with whom it continued till the forfeiture of the earldom in 1716. The town and lands were purchased in 1720 by a fishing company in England and, on their failure, by the Merchant Maidens' Hospital of Edinburgh for £3000, who are still the overlords. Peterhead, made a burgh of barony in 1593 by George Keith, fifth earl marischal, was the scene of the landing of the Pretender on Christmas Day 171 5.

PETERHOF, a town of Russia, in the government of St Petersburg, 18 m. W. of the capital, on the south coast of the Gulf of Finland. It was founded in 1711 and has grown up round the palace built by Peter the Great in 1720; pop., 11,300. Peterhof is almost exclusively a residential town, but gem-cutting and the manufacture of agricultural implements are carried on. The palace has undergone alterations and additions, e.g. by Catharine II., but retains a distinct Petrine stamp.' It is built

on a height 50 ft. above the sea, and contains portraits of the Russian imperial family and other pictures. A statue of Peter the Great was set up near the palace in 1883, and one of Francis I. of France in 1896, a gift from the town of Havre to Nicholas II. Peterhof is connected with Oranienbaum on the west and with Stryelna on the east by series of gardens and villas.

PETERMANN, AUGUST HEINRICH (1822-1878), German cartographer, was born at Bleicherode, near Nordhausen, on the 18th of April 1822. At the age of seventeen he entered the Geographical School of Art in Potsdam, and in 1845 proceeded to Edinburgh to assist Dr Keith Johnston in the production of an English edition of the Physical Atlas of Berghaus. In 1847 he came to London, and published among other works, an account of Barth's expedition to Central Africa (1855). In 1854 he became director of the geographical institute of Justus Perthes in Gotha, and editor of the well-known Petermanns Mitteilungen. His work did much towards elucidating the geography of the interior of Africa and of the North Polar regions. Queen Victoria, at the suggestion of Bunsen, appointed him physical geographer-royal. Petermann died by his own hand at Gotha on the 25th of September 1878.

PETERS (or Peter), HUGH (1 598-1660), English Independent divine, son of Thomas Dyckwoode, alias Peters, descended from a family which had quitted the Netherlands to escape religious persecution, and of Martha, daughter of John Treffry of Treffry in Cornwall, was baptized on the 29th of June 1598, and was educated at Trinity College, Cambridge. Having experienced conversion, he preached in Essex; returning to London he took Anglican orders and was appointed lecturer at St Sepulchre's. He entertained, however, unorthodox opinions, and eventually left England for Holland. He visited Gustavus Adolphus in Germany about 1632, and afterwards became the minister of the English church at Rotterdam. Here his unorthodox leanings again attracted attention, and Peters made a further move to New England. He was connected with John Winthrop through his wife, and had already formed several friendships with the American colonists. He arrived at Boston in October 1635 and was given charge of the church at Salem. He took a leading part in the affairs of the colony, and interested himself in the founding of the new colony in Connecticut. In 1641 he returned to England as agent of the colony, but soon became involved in the political troubles which now began. He became chaplain to the forces of the adventurers in Ireland, and served in 1642 in Lord Forbes's expedition, of which he wrote an account. On his return he took a violent part in the campaign against Laud, and defended the doctrines of the Independents in a preface to a tract by Richard Mather entitled " Church Govern- ment and Church Covenant discussed . . ." (1643). He gained great reputation as a preacher by his discourses and exhorta- tions at public executions, and as army chaplain. In the latter capacity he accompanied Lord Warwick's naval expedition to Lyme in 1644 and Fairfax's campaigns of 1645 an d 1646, when his eloquence is said to have had a marvellous effect in inspiring the soldiers and winning over the people. At the conclusion of the war, Peters, though greatly disliked by the Presbyterians and the Scots, had attained great influence as leader of the Independents. In his pamphlet " Last Report of the English Wars " (1646) he urged religious toleration, an alliance with foreign Protestants, and an active propagation of the gospel. In the dispute between the army and the parliament he naturally took the side of the former, and after the seizure of the king by the army in June 1647 had interviews with Charles at Newmarket and Windsor, in which he favourably impressed the latter, and gave advice upon the best course to pursue. He performed useful services in the second Civil War, procured guns for the besiegers at Pembroke, raised troops in the midlands, and arranged the surrender of the duke of Hamilton at Uttoxeter. Though at the Restoration he denied any complicity in the king's death, it is certain that in his sermons he justified and

supported the trial and sentence. In August he accompanied Cromwell to Ireland, and was present at the fall of Wexford,

while later he assisted the campaign by superintending from England the despatch to Cromwell of supplies and reinforce- ments, and was himself destined by Cromwell for a regiment of foot. In 1650 he was in South Wales, endeavouring to bring over the people to the cause, and subsequently was present at the battle of Worcester. At the conclusion of the war Peters was appointed one of the preachers at Whitehall and became a person of influence. Parliament had already voted him an annuity of £200, and Laud's library or a portion of it had been handed over to him in 1644. He was one of the committee of twenty-one appointed to suggest legal reforms, and he published his ideas on this subject, which included a register of wills and land titles and the destruction afterwards of the ancient records, in his tract, " Good Work for a Good Magistrate " (in 1651), answered by R. Vaughan and Prynne. He strongly disapproved of the war with Holland, and his interference brought upon him some sharp reprimands. In July 1658 he was sent to Dunkirk to provide apparently for the spiritual wants of the garrison. He preached the funeral sermon on Cromwell, and after the latter's death took little part in political events, though strongly disapproving of the removal of Richard. He met Monck at St Albans on the latter's march to London, but met with no favour from the new powers, being expelled from his lodgings at Whitehall in January 1660. On the nth of May his arrest was ordered. On the 18th of June he was ex- cepted from the Act of Indemnity and apprehended on the 2nd of September at Southwark. He sent in a defence of himself to the Lords, denying any share in the king's death. He was, however, tried on the 13th of October and found guilty of high treason. His execution took place at Charing Cross on the 16th of October, when he behaved with great fortitude, and was undismayed by the mangling of the body of John Cook, his fellow sufferer, upon which he was forced to look. Before his death he wrote " A Dying Father's Last Legacy " to his only child, Elizabeth, in which he gave a narrative of his career.

His death was viewed with greater rejoicings than perhaps attended that of any of the regicides, which is the more sur- prising as Peters possessed many amiable qualities, and several acts of kindness performed by him on behalf of individual Royalists are recorded. But he had incurred great unpopularity by his unrestrained speech and

extreme activity in the cause. He was a man, however, of a rough, coarse nature, without tact or refinement, of strong animal spirits, undeterred by difficulties which beset men of higher mental capacity, whose energies often outran his discretion, intent upon the realities of life and the practical side of religion. His conception of religious controversy, that all differences could be avoided if ministers could only pray together and live together, is highly characteristic, and shows the largeness of his personal sym- pathies and at the same time the limits of his intellectual imagination. Peters married (1) Elizabeth, daughter of Thomas Cooke of Pebmarsh in Essex and widow of Edmund Read, and (2) Deliverance Sheffield, by whom he had one daughter, Elizabeth.

PETERS, KARL (1856-), German traveller in' Africa, one of the founders of German East Africa, was born at Neuhaus on the Elbe on the 27th of September 1856, the son of a Lutheran clergyman. He studied at Gottingen, Tubingen and Berlin, and in 1879 was awarded a gold medal by the Berlin University for his Frieden zu Venedig. After visiting London to study English principles of colonization, he returned to Berlin and promoted the German Colonization Society (Deutsche Kolonial- verein). In the autumn of 1884 he proceeded with two com- panions to East Africa, and concluded in the name of his society treaties with the chiefs of Useguha, Nguru, Usagara and Ukami. Returning to Europe early in 1885, he formed the German East Africa Company, which speedily obtained an imperial charter. The story of this enterprise, the first step in the formation of a German colony in East Africa, is told under Afeica, § 5. In 1888 Peters undertook an expedition from the east coast of Africa, avowedly for the relief of Emin Pasha. This expedition was not sz actioned by the German government and was regarded

by the British authorities as a filibustering exploit. One of its objects was to extend the sphere of German influence, and, reach- ing Uganda early in 1890, Peters concluded a treaty with the king of that country in favour of Germany. He left Uganda hastily on the approach of a representative of the British East Africa Company, and on reaching Zanzibar learned that his treaty was useless, as an agreement had been come to between Germany and Great Britain whereby Uganda was left in the British sphere. On his return to Germany Peters was received with great honours, and in 1891 published an account of his expedition entitled Die deuts,che Emin Pasha Expedition, which was translated into English. In 1891 he went out again to East Africa as imperial high commissioner for the Kilimanjaro district, and in 1892 was cne of the commissioners for delimiting the Anglo- German boundary in that region. In June 1892 accusations were brought

against him of excesses in his treatment of the natives, and after three investigations had been held he was, in 1897, deprived of his commission for " misuse of official power." (He was regranted his title of imperial commissioner in 1906.) During 1893-1895 Peters was employed in the colonial office at Berlin. In 1896 he removed to London, where he occupied himself in schemes for exploiting parts of Rhodesia and Portuguese East Africa. In the interests of a company he formed, Peters explored the Fura district and Macombe's country on the Zambezi, where in 1899 he discovered ruins of ancient cities and deserted gold mines. He returned in T901 and gave an account of his explorations in The Eldorado of the Ancients (1902). In 1905 he again visited the region between the Zambezi and Sabi rivers.

Besides the books already mentioned and some smaller treatises Peters published a philosophic work entitled Willenswelt und Welt- wille (1883), and a disquisition on early gold production entitled Das goldene Ophir Salomos (1895), translated into English in 1898.

PETERSBURG, a city and port of entry of Virginia, U.S.A., on the Appomattox river, at the head of navigation, about 11 m. from its mouth, and 22 m. S. of Richmond. Pop. (1890), 22,680; (1900), 21,810, (10,751 negroes); (1910), 24,127. It is served by the Atlantic Coast Line, the Seaboard Air Line and the Norfolk & Western railways. The river, which is here spanned by two steel bridges and one frame bridge, is navigable to this point for vessels of 8 ft. draught at mean high water, and has been greatly improved by the Federal government, which in 1909 was engaged in deepening the whole channel to 12 ft. at mean high water and in excavating at Petersburg a new channel into which to deflect the river. In and about the city there is much of historic and scenic interest. At Blandford, a suburban hamlet, is the picturesque old Blandford church, erected about 1734. Petersburg has two public parks, and among its institu- tions are a home for the sick (1886), an orphanage for girls and another for negroes, the state central hospital for the insane (negroes), the southern female college (non-sectarian, 1863), the university school for boys, the Bishop Payne divinity school (Protestant Episcopal) for negroes, and the Virginia normal and industrial institute (opened in 1883), also for negroes. There are two national cemeteries near Petersburg — Poplar Grove (about 4 m. south), containing about 6200 graves, and City Point (about 9 m. east), containing about 5100 graves; and in Blandford cemetery there are about 30,000 graves of Confederate dead. In this cemetery General William Phillips is buried, and there is a monument to Captain McRae, commander of the " Petersburg Volunteers," whose bravery in 1812-1813 prompted President Madison to call Petersburg the " Cockade City." The falls

above the city furnish abundant water-power, and the city has various manufactures. The factory product was valued at $5,890,574 in 1905, 11-3% more than in 1900; in both 1900 and 1905 Petersburg ranked fourth among the cities of the state in the value of factory products. From Petersburg are shipped quantities of trunks and bags, peanuts, tobacco and cotton. In 1909 the foreign trade, wholly imports, was valued at $360,774. The city was formerly in Chesterfield, Dinwiddie and Prince George counties, but is now independent , of county governmentˆ

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An Indian village formerly stood on or near the site of the present city, and Fort Henry was built here by the whites in 1645. Petersburg was founded in 1733 by Colonel William Byrd (1674-1744) and Peter Jones, and was named (first Peter's Point, and then Petersburg) in honour of the latter; in 1748 it was incorporated as a town. On the 25th of April 1781 a skirmish was fought in front of Petersburg between a British force of about 3000 under General William Phillips (i73i?-i78i) and about one-third of that number of American militia under Baron Friedrich Wilhelm von Steuben; the Ameiicans were defeated, and the British occupied the town. In the following month the British again entered Petersburg (General Phillips dying here on the 13th), but they were soon dislodged by Lafayette who shelled the town. General Winfield Scott was born near Petersburg, and practised law here for two years before he entered the army. Petersburg was chartered as a city in 1850.

Petersburg Campaign (1864-65). The name of Peters- burg is associated with operations in the American Civil War, which formed the sequel of the Wilderness Campaign (q.v.) and the last act in the struggle between the armies of Grant and Lee for supremacy. Petersburg (see above) and Richmond, Virginia, connected by rail and covered north, east and south by forty miles of entrenchments, formed the salients of a vast fortress, into which reinforcements and supplies could be poured from the rear by means of the James Canal, the Virginia Central, the Lynchburg, the Danville and the Weldon railroads — the latter bringing up to Petersburg from Wilmington (225 m. distant) the cargoes of blockade runners. Petersburg became a strategic point as soon as Grant determined to carry the army of the Potomac — defeated at Cold Harbor on the Chicka- hominy (see Wilderness Campaign) — south of Richmond, and, being joined by Butler's Army of the James (momentarily checked in the Bermuda

Hundred Peninsula by a small army under Beauregard), to operate from the east, depending on the James river, as his line of supply, while the policy of the Confederate president was to employ Robert E. Lee's army to protect his capital. Petersburg was nearer than Richmond to the navigable part of the James River— City Point is only 10 m. distant — and the capture of Petersburg would involve the fall of Richmond and the capitulation or flight of Lee's army.

As early as the gth of June 1864, while the main armies were still north of the James and Petersburg was garrisoned by a brigade under General Wise, a Federal expedition from the Army of the James approached the city. General Gillmore on the City Point road discovered strong earthworks, and General Kautz attacking on the Jerusalem Plank road experienced a repulse: the total force of the Federals was 4500, and Wise's brigade (2400) had been quickly reinforced from Beauregard's central position at Bermuda Hundred. A week later a more serious attempt was made to break through the defences, while General Lee's main army was detained north of Richmond. Grant detached the II. and XVIII. corps under Generals Smith and Hancock, who were to unite and operate along the City Point railroad and capture the outer line of works about 2 m. from Petersburg while a demonstration was made along the Norfolk railroad by cavalry under Kautz. On the 15th of June Smith attacked and captured five redans before Hancock came up, and when next day Burnside's corps (IX.) arrived and General Meade assumed control of the three corps, he attacked again at 6 p.m. On the 17th of June Warren's (V.) corps arrived, and Meade made a third assault with two corps (V., IX.). On the 18th of June the attack was renewed with three corps (II., V., IX.) late in the afternoon, and the results of the four days' fighting were so far satisfactory that ground was won which could be entrenched and held against any sortie of the Petersburg garrison. Probably on the 18th of June the town of Petersburg might have been captured by Meade, for at this crisis General Lee was in temporary eclipse. For four days Lee had refused to credit any report to the effect that Grant was crossing the James: his cavalry could not ascertain that the enemy in his

front at Malvern Hill (VI. corps and Wilson's cavalry division), despite its menacing attitude towards Richmond, was only a flank guard for a movement to the south.

It was late on the 17th of June when General Beauregard, who had for three days valiantly held his main lines south of Richmond with some 14,000 infantry against three Federal corps, succeeded in convincing General Lee that the main army was again (as in 1862 on the

Chickahominy) in the wrong place at the wrong time. But when at last the Confederate leader was aroused to a sense of his danger he soon filled every road with divisions marching to save Petersburg: they marched all night; they slept in the trenches on arrival, and on the 19th of June these rein- forcements convinced GeneralMeade that his main attack between the Appomattox river and the Jerusalem Plank iioad was delivered a day too late. At a cost of 10,000 casualties Meade had gained half a mile of ground, but the Confederates in falling back had concentrated, and now that the new plan of operations was exposed and the main bodies were again face to face the power of defensive tactics reasserted itself.

Yet June was not to close without adding some 8000 men to the Federal casualties, for in addition to daily losses by sharp- shooting along the front, over 5000 men fell or were captured in operations directed against the southern railroads. Grant had resolved to deprive his enemy of these lines of supply: his plan was to prolong his line of investment westward and construct redoubts (such as Fort Davis, Fort Steadman and Fort Sedgwick) as a continual menace to the Confederate garrison and a defence against sorties, while his cavalry and portions of five corps (II., V., VI., IX. and XVIII.) engaged in enterprises which it was hoped would tempt General Lee to fight outside his works. A decisive victory in the field, a successful assault on the defences between Richmond and Petersburg, or the complete destruction of the railroads, would precipitate disaster to the South, and of these three methods the last would be the surest in its effects. But such a method was necessarily slow. General Wilson's cavalry (5500) destroyed 30 m. of the Lynchburg or South Side railroad, and 30 m. of the Danville railroad, together with Burkesville Junction and Ream's Station on the Weldon rail- road; but Wilson was caught by the Confederate cavalry 100 m. from Petersburg and escaped only by destroying his wagons and limbers and abandoning twelve guns. Even the Virginia Central railroad could not be held by the Federals after Sheridan with the main body of the cavalry had been called back to White House on the Pamunkey to escort a great convoy.

By the end of June the whole of the rival forces were concen- trated about the Richmond-Petersburg defences, and General A. P. Hill had already sallied out on the 21st of June to drive the II. corps from the Weldon railroad. Federal policy and Federal strategy, surmounting the crisis of Cold Harbor, were, however, at last in unison. Grant had a free hand in respect both of his dispositions and his resources in men and money, and had resolved to use unsparingly the resources placed at his disposal. Early in July Grant, however, found himself compelled to detach a corps (VI.) to strengthen the garrison at Washington, for

General Early had frustrated Hunter's attempt against Lynchburg (see Shenandoah Valley), driving Hunter into West Virginia, and then, pushing down the Shenandoah and across the Potomac, had arrived within a day's march of the Federal capital. Ihis operation checked Grant's enterprises about Petersburg and restricted the Federal front to the ground east of the Weldon railroad.

On the 25th of July Grant resolved to weaken the enemy on his front by a demonstration north of the James, and accordingly moved a corps (II.) and two cavalry divisions across the river to Malvern Hill under cover of Foster's corps (X.). But Lee possessed the inner line, and the Federal detachment found two cavalry divisions in its front, and the Richmond defences had been strengthened by three divisions of infantry. The expedi- tion then returned to take part in a fresh enterprise, which ended disastrously to the Federals. A Confederate redan faced Burnside's IX. corps 100 yds. distant, and this strong work was

to be destroyed by mining operations. The mine was fired and produced a crater 150 ft. long, 60 ft. wide and 25 ft. deep, into which the Federals poured (see Fortification and Siegecraft). But the troops could be got no farther before the Confederate counter-attack was upon them, and Burnside's corps lost 4300

In August Sheridan was detached to operate against General Early in the Shenandoah Valley, and in order to prevent Lee rein- forcing Early another demonstration against Richmond was planned. But Lee again strengthened his left and the result of the fighting was a loss to the Federals of nearly 3000 men. Meanwhile another attack on the Weldon railroad by Warren's corps was met by General A. P. Hill on the 20th of August, and the possession of the railroad cost the Federals 3000 men. A further attempt on this railroad by Hancock's II. corps and Gregg's cavalry division at a point 3 m. south of Ream's Station was foiled by A. P. Hill, now aided by Hampton's two cavalry divisions, and the Federals here lost 2372 men and nine guns. The Confederates therefore still retained possession of the railroad to a point within one day's hauling by wagon to Petersburg. During September another Federal enter- prise north of the James with two corps (X.and XVIII.) resulted in the capture of Fort Harrison near Chaffin's Bluff, and when General Lee reinforced his left and counter-attacked his troops were repulsed with heavy loss. The Federals lost

over 2000 men and failed in the attempt to take Fort Gilmer, Confederate gunboats below Rich- mond aiding in the defence. While this operation was in progress on the Confederate left under General Grant's personal supervision General Lee was apprised of attacks on his extreme right at Peebles Farm by four divisions, which captured a Confederate redoubt covering the junction of two routes to the south-west. General A. P. Hill prevented a further advance of the enemy by a vigorous counter-attack which caused Warren and Parke (IX.) a loss of 2000 men, of whom nearly three fourths allowed themselves to be captured ; for the ranks, since the losses of the May battles, had been swamped with drafted and substitute recruits of poor quality and almost insignificant training. The Federals had, however, by these opera- tions pushed their entrenchments beyond the Weldon railroad westward and established new works within a mile of the Con- federate right. A minor engagement north of the Tames on the 7th of October between the Confederates and troops of the Army of the James was without result. At the end of the month, however, General Grant resolved to make a serious effort to bring the South Side railroad within his lines and deprive the enemy of this important line of supply. Parke (IX.), Warren (V.) and Hancock (II.) took each some 1 1 ,000 infantry with four days' rations on pack animals. Gregg's cavalry (3000) were attached for the operation, and both Grant and Meade accompanied the troops. General A. P. Hill encountered this force with three divisions (14,000) and Hampton's cavalry (5500), and he contrived to hold two corps with one division and attack Hancock (II.) with his main body. The Federals were stopped when 6 m. from the railway, and Hancock lost 1500 men at Hatcher's Run on the 27th of October.

General Lee meanwhile had been called to Chaffin's Bluff, where again Butler was demonstrating with the Army of the James (X. and XVIII.) on the approaches to Richmond. But General Longstreet signalized his return to duty with the Army of Northern Virginia by driving Butler off with a loss of over 1000 men (action of Fair Oaks, Oct. 27). General Warren in December con- trived to evade A. P. Hill and destroy the Weldon rail- road at a point on the Meherrin river 40 m. from Petersburg.

There seemed now little to tie Lee to the lines he had so painfully constructed, for his army was without coffee, tea or sugar, and though of foreign meat they had 3§ million rations and of bread 2 J million rations in reserve, the troops lived chiefly on corn-bread. A. P. Hill on the right held on from Hatcher's Run to Fort Gregg, whence Gordon and Anderson prolonged to the left as far as the Appo- mattox River, and Long- street continued the line northwards along the Bermuda

front across the James as far as White Oak Swamp (37 m. in all). The winter was very severe, and the continual

trench-work and outpost duty overtaxed the patriotism of Lee's 50,000 infantry and stimulated desertion. Supplies were brought in by wagons, as the rolling stock on the railways was worn, and on the 5th of February 1865 General Gregg moved out to the Boydton Plank road to intercept the Confederate convoys. He was sup- ported by Warren, while Humphreys's (II.) corps connected the detachment with the left of the Federal entrenchments. Gregg failed to locate the wagons, and General Lee, hearing of the expedi- tion, sent out A. P. Hill and Gordon, who drove him back with a loss of 1500 men. Sheridan, after driving Early from the Valley in October, destroyed the railways about Staunton, Charlottesville, Gordonsvillt and Lynchburg, and even rendered the James Canal useless as a line of supply.

Grant recalled Sheridan to the main army in March, and at the end of the month prepared for a turning movement westward with the object of drawing Lee out of his lines. General Lee had anticipated such an attempt, and had resolved to abandon his lines and unite with Johnston in North Carolina, but the roads were not

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yet in a state for the movement of artillery and wagons, and it was to gain time that he now ventured upon a bold offensive stroke — a night attack upon a strong point in the Federal right called Fort Stedman — the success of which might cause Grant to call in the

detachments on his left and so facilitate the proposed movement of the Confederates towards Danville. General Gordon was selected to conduct the operation and his corps was strongly reinforced for the occasion. The opposing lines east of Petersburg were only 150 yds., and the sentries of each side 50 yds. apart. Gordon's men dashed across the intervening space at 4.30 a. m. on the 25th March, surprised the garrison and occupied Fort Stedman, but when day- light broke and the Federal guns could be brought to bear the fort was found to be untenable. Parke's corps (IX.) recaptured the work at a cost of 1000 men, and Gordon fell back, leaving nearly 2000 men in the hands of the Federals. The encounter would have proved a more desperate one if reinforcements on both sides had arrived in time, but Gordon had cut the telegraph which connected Fort Stedman with Grant's headquarters at City Point,_ and the Confederate train service broke down and delayed the arrival from Richmond of reinforcements for Gordon. Meanwhile, 6 m. west- ward, Humphreys' corps (II.) attacked A. P. Hill's defences and gained some local success, seizing the Confederate picket line between the Weldon railroad and the Boydton Plank road, which was at once occupied and strengthened by the Federals. The Federals

had resolved to attempt. Grant meanwhile had ordered Warren to support Sheridan in an attack on Pickett at daybreak. Sheridan advanced on the 1st of April and at 3 p.m. issued his orders for attack, explaining verbally a diagram he had prepared for the use of divisional commanders. Pickett held a front of 2 m. with a division of cavalry on either flank and Rosser's cavalry guarding the baggage behind Hatcher's Run, and when attacked at 4 p.m. he was with Rosser ij m. in rear. Before Pickett was made aware of a battle being in progress his left was destroyed. General Lee seems to have made no arrangements to support Pickett in this direction. Pickett's right was defended by W. H. F. Lee against the attack of Custer's cavalry division. The position was finally carried by Sheridan's cavalry under Devin dismounting and storming the entrenchments frontally, taking three guns and 100 prisoners. Warren's corps claimed to have captured a battery and 3244 prisoners. Yet Sheridan was dissatisfied with Warren's conduct of the battle and deprived him of his command. Pickett's routed brigades were rallied at the South Side railroad and incor- porated with General Anderson's command. But the Confederates had lost White Oak road, and unless General Lee was capable of a vigorous counterstroke on his extreme right it was evident he must also lose the South Side railroad. Grant, fearing such an enterprise, at once reinforced Sheridan and ordered Humphreys' corps (II.) to attack in his front if necessary to prevent Lee moving

troops

lost 2000 men and the Confederates perhaps twice as many on the 25th of March.

At this time Sherman visited Grant at City Point and proposed to move at the end of ten days on Burkesville Junction and so cut off Lee from Danville and Lynchburg; it was while Sherman was pre- paring for this operation that Grant finished the campaign. Secure behind his formidable entrenchments, Grant had no fear for his base on the James river, and transferred large bodies of troops to his left without Lee's knowledge. Sheridan was instructed on the 29th of March to gain the enemy's right and rear, moving by Din- widdieCourt-Houseandacross Hatcher's Run. Butthe Confederates were on the alert ; A. P. Hill extended his right, and Fitzhugh Lee's cavalry was brought to Sutherland Station. Sheridan had already encountered the cavalry divisions of W. H.F.Lee and Rosser on the south side of Stony Creek. Warren's corps, moving up the Quaker road, met a force under R. H. Anderson and drove it back to its works on White Oak road. Sheridan got into a flat country of dense forest, tangled undergrowth, streams and swamps, and the soil of clay and sand was impassable for wagons and guns until he had corduroyed the route. On the 29th of March General Lee perceived that the object of Grant was to seize the routes south of the Appomattox river, by which a movement south-west could be made to unite with Johnston's army, and he endeavoured to cover these roads, including the South Side railway, without losing his hold upon his works about Richmond and Petersburg, but in such a contest it was evident that numbers must prevail.

Sheridan's cavalry had reached Five Forks on the White Oak road on the 31st of March, and on his right Humphreys and Warren (II. and V.) held the Confederates to their works along Hatcher's Run astride the Boydton Plank road; yet General Lee was able to concentrate his three cavalry divisions, and supported them by Pickett's five infantry brigades. Sheridan was attacked and driven south as far as Dinwiddie Court- House; but Humphreys and Warren held their ground (action of White Oak Ridge) at a cost of 2000 men. Pickett and the cavalry fell back to Five Forks during the night and hastily entrenched, for he had been ordered by General Lee to defend this position ; since the Boydton Plank road could no longer be held, the possession of White Oak road and the South Side railway became necessary for the flank movement which Lee

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westward, but Lee made no effort, and so Sheridan was free to operate farther in the direction of the enemy's right and rear, while Humphreys held the enemy in his front. Sheridan remained in- active for a few days, and Lee hoped still to gain time for the roads to dry before evacuating his lines and removing his stores and ammunition by wagons towards Lynchburg.

But a crisis was approaching. Sheridan's success at Five Forks induced Grant to deliver a general assault on the 2nd of April. The Confederate lines were bombarded all night, and on the 2nd of April with Wright's corps (VI.), Grant attacked the weakest part of Lee's line and broke through, losing 1 100 men in fifteen minutes. A. P. Hill was killed and his corps broke and was cut off from Peters- burg. At the same time Parke's corps (IX.), on the right of the VI., attacked the eastern front near Fort Stedman but was repulsed by General Gordon; then Humphreys' corps (II.) on the left attacked a Confederate division under General Cook and forced it to retreat to the South Side railroad, where at Sutherland Station a final attack dispersed it. Wright, supported by General Ord (command- ing the army of the James) , afterwards won the strong redoubts called Fort Whitworth and Fort Gregg, and thus in a day the Confederate right had been destroyed from Five Forks to a point some two or three miles west of the Weldon railroad; 10 m. of works had been abandoned, and if Grant had been able to press his advantage at once the campaign must have ended. But Grant was not aware of the enemy's plight, and so resolved to wait until the morrow before completing his victory.

Meanwhile Lee perceived that the hour had come at last when Richmond must fall, and at 3 p.m. he had issued orders for the march of the remains of his army to Lynchburg via Amelia Court-House, a march which evidently must partake of the character of a forlorn hope, hastily planned, ill prepared and undertaken by troops whom the disasters and hardships of the past six months had weakened physically and morally. Yet if General Lee had negotiated a peace on the 2nd of April military history would have lost one of the finest examples of the strategic pursuit. Lee's proposed movement involved the transfer of the army and its baggage 100 m. on bad roads across the front of an enemy, and nothing but mis- chance could prevent the Federals intercepting Lee's columns by 3 shorter route and seizing the South Side railroad, on which supplies

were to be forwarded from Lynchburg to meet the retreating army at Appomattox Station, Pamplin's Station or Farmville Station. The Appomattox River must be crossed two or three times at its bends. Various creeks and swamps must be bridged, and the bridges destroyed after crossing. The wagons must move on separate roads so as to be covered by the columns during marches and combats and the infantry were to follow the artillery on the roads. Long- street, Gordon and Mahone's division from Richmond all crossed the Appomattox at Goode's Bridge. Ewell from Richmond crossed the Appomattox by the Danville railroad bridge north of Goode's Bridge. Anderson commanded the flank guard which moved south of the Appomattox with Fitzhugh Lee's cavalry. Lee gained a day's start by moving at 8 p.m., for Grant was making preparations to attack the entrenchments next day (April 3), but the start was lost in waiting for President Davis and the government to escape from Richmond. Sheridan's cavalry got in touch with Lee's flank-guard early on the 3rd of April near Namozine Creek, and at nightfall the Federal advance-guard was at Deep Creek. On the 4th of April Sheridan reached the Danville railroad at Jetersville, and on the 5th of April, when Lee had halted at Amelia Court-House on the railroad to get supplies, the Federals had three corps (II., V., VI.) in support of Sheridan 8 m. nearer than Lee to Sailor's Creek, the point where he must again cross the Appomattox.

Interception was now a fait accompli, though neither side suspected it. Lee was unaware of the enemy's proximity, and Grant believed that Lee would remain at Amelia Court-House, but Lee moved west, crossing Flat Creek at sunset on the 5th of April, to the Lynchburg railroad (Longstreet, marching all night, reached Rice's Station at sunrise on the 6th of April), while the Federals moved northwards on the same day to attack Lee at Amelia Court-House, and on discovering Lee's evasion the three Federal corps effected a wheel to the left and advanced on Deatonsville after bridging Flat Creek. Meanwhile the Federal cavalry under H. E. Davies had located a con- voy at Painesville, dispersed its escort (Gary's cavalry) and burned the wagons, but had in turn been attacked by Fitzhugh Lee's cavalry at Amelia Springs and driven back on the main body at Flat Creek. Fitzhugh Lee had then marched to join Longstreet at Rice's Station. The rearguard of Lee's army was Gordon's command, which was at Amelia Springs after Ewell's command had passed through at 8 a.m. on the 6th of April. Lee's army stretched out for 15 m., and when its advance-guard was at Rice's Station its rearguard was still at Amelia Court-House. Rice's Station is 62 m. from Lynch- burg. Here Longstreet waited all day for Anderson, Ewell and Gordon to close up, and then at night he moved 8 m. to Farm- ville Station (68 m. south-

west of Richmond), where 80,000 rations had been railed from Lynchburg; then Longstreet crossed the Appo- mattox, and on the 7th of April moved forward towards Lynchburg, covered by Fitzhugh Lee's cavalry. Meanwhile the remainder of Lee s army had been practically destroyed within a few miles of the point where Longstreet had halted. Sheridan's cavalry and two corps (II., VI.) had caught the commands of Anderson, Ewell and Gordon, entangled with the trains of the army attempting the passage of Sailor's Creek; and General Ord would even have attacked Long- street (whom he had located late at night) had his march been delayed.

Complete disorganization and demoralization seem to have taken hold of the Confederates on this fatal day, and General Lee was once more in eclipse. The Federal cavalry headed the column, the infantry attacked it, and Ewell became the victim of tactical envelopment after Anderson had been defeated and Gordon had failed to save the trains of the army. Surrender or massacre being the alternatives, Ewell surrendered, and here in fact the career of the army of Northern Virginia ended, as Grant plainly saw, for a t 5-30 p.m. he addressed a demand to Lee for his capitulation. But Lee clung to his diminished forces for another 48 hours. Long- street in crossing at Farmville had burnt the bridges and thus delayed Ord in pursuit; but Gordon and Mahone, who had crossed at High Bridge (the railroad bridge), failed to check Humphreys' corps (II.), and so were compelled to take up a position of defence on the north bank until darkness enabled them to slip away. General Lee was with this remnant of the army. Meanwhile Sheridan with the cavalry and two corps (V., XXIV.) had hastened along the South Side railroad, seizing the supplies waiting for Lee at Pamplin's Station, and then moving on another 12 m. to Appomattox Station. At nightfall he found that he was astride the enemy's line of operation, which was also his line of supply, and so General Lee would be compelled to give battle or capitulate on the morrow.

General Lee, quitting Farmville heights on the night of the 7th of April changed the order of march during the next day, so that Gordon (8000) was in the van and Longstreet (15,000) furnished the rear-guard; Ewell's corps was now represented by 300 effectives. The cavalry still numbered some 1600 sabres. Lee's column was pursued along the Lynchburg Road by two Federal Corps (II., VI.), which marched 26 m. in 18 i hours, and at midnight halted within 3 m. of Longstreet, who had entrenched near Appomattox Court- House, facing east and covering the road on which Gordon's corps and the cavalry was to press forward to Lynchburg at daylight. But Gordon on the morning of the 9th of April found Sheridan's cavalry in his front, and in accordance with plans made overnight he com- menced an

attack, driving the Federals back until he encountered

at 10 a.m. two corps of infantry (V., XXIV.) under General Ord, who had marched 29 m. in order to support Sheridan at the crisis; and when at the same moment Longstreet was threatened by Humphreys and Wright (II., VI.) the situation had arisen which General Lee considered would justify surrender, an event which had been anticipated on both sides as the result of the fighting about Farmville on the 6th and 7th of April.

The closing operations from the 29th of March to the 9th of April were all in favour of the Federals, but, nevertheless, the historian counts their losses during this period as nearly 10,000 in the five corps and cavalry which constituted General Grant's field army. On the 9th of April, at the Appomattox Court-House, the two leaders exchanged formal documents by which 2862 officers and 25,494 enlisted men were paroled, all that remained in the field of some 55,000 Confederates who were drawing rations on the 20th of February as the army of Northern Virginia. (G. W. R.)

PETERSFIELD, a market town in the Petersfield parlia- mentary division of Hampshire, England, 55 m. S.W. from London by the London & South Western railway. Pop. of urban district (1901), 3265. The church of St Peter retains some ornate Norman work. The picturesque market-place contains an equestrian statue of] William III.

Ecclesiastically a chapelry of Buriton, Petersfield (Peterfelde) owes its origin as a borough to the charter granted by William, earl of Gloucester, in the reign of Henry II. and confirmed later by his widow, Ha wise. Petersfield is not mentioned in Domesday, but it was probably then included in the manor of Mapledurham. It was a mesne borough possessing by its first charter the liberties and customs of Winchester together with a merchant gild. These grants were confirmed by John in 1198 and in 141 5 Henry V. in addition freed the burgesses from all tolls. No charter of incorporation has been found. Gradually privileges and rights other than those of a mesne borough were usurped by the mayor and burgesses, but were recovered by a suit brought against them by Thomas Hanbury, owner of the borough, in 161 1. A mayor continued to be elected until 1885. Petersfield was represented in parliament in. 1307. No return was then made until 1552-1553, from which date two members were regularly returned. In 1832 the number was reduced to one, and in 1885 the representation was merged in that of the county. Three-day fairs at the feasts of St Peter and 'St Andrew were granted in 1255. In 1892 the summer fair then held on the 10th of July was abolished.

The autumn fair now held on the 6th of October is for both business and pleasure. The market, which dates from before 1373, formerly held on Saturday, is now held on alternate Wednesdays. In the 1 6th century Petersfield had important cloth and leather manufactures.

PETER'S PENCE, Rome Scot, or Rom-feoh, a tax of a penny on every hearth, formerly paid annually to the popes; now represented by a voluntary contribution made by the devout in Roman Catholic churches. Its date of origin is doubtful. The first written evidence of it is contained in a letter of Canute (103 1) sent from Rome to the English clergy. At this time it appears to have been levied on all families possessed of land worth thirty pence yearly rental, out of which they paid one penny. Matthew Paris says the tax was instituted by Off a, king of Mercia (757-796) for the upkeep of the English school and hostel at Rome. Layamon, however, declares that Ina, king of Wessex (688-725), was the originator of the idea. At the Norman Conquest it appears to have fallen into arrears for a time, for William the Conqueror promised the pope in 1076 that it should be regularly paid. By a bull of Pope Adrian IV. the tax was extended to Ireland. In 1213 Innocent III. com- plained that the bishops kept 1000 marks of it, only forwarding 300 to Rome. In 1306 Clement V. exacted a penny from each household instead of the £201, 9s. at which the tax appears to have been then fixed. The threat of withholding Peter's pence proved more than once a useful weapon against recalci- trant popes in the hands of English kings. Thus in 1366 and for some years after it was refused on the ground of the pope's obstinacy in withholding his consent to the statute of praemunire. During the 10th century the custom of Peter's pence was intro- duced into Poland, Prussia and Scandinavia, and in the nth century Gregory VII. attempted to exact it from France and

Spain. The tax was fairly regularly paid by the English until 1 534, when it was abolished by Henry VIII.

PETERWARDEIN (Hung. Petervarad, Serv. Petrovaradin) , a royai free town and fortress of Hungary in the county of Syrmia, Croatia-Slavonia; situated on a promontory formed by a loop of the Danube, 62 m. N.W. of Belgrade by rail. Pop. (1900), 5019. It i s connected with Neusatz on the opposite bank by a bridge of boats, a railway bridge and a steam ferry. The fortifications consist of the upper fortress, on a lofty serpen- tine rock rising abruptly from the plain on

three sides, and of the lower fortress at the northern base of the rock. The two fortresses can accommodate a garrison of 10,000 men. In the lower fortress is the town, with a military hospital, and an arsenal containing trophies captured from the Turks. Peter- wardein, the " Gibraltar of Hungary," is believed to represent the Roman Acumincum, and received its present name from Peter the Hermit, who here in 1096 marshalled the levies of the first crusade. It was captured by the Turks in 1526 and retained by them for 160 years. In 1716 it witnessed a signal defeat inflicted on the Turks by Prince Eugene. During the revolu- tionary struggles of 1848-49 the fortress was held by the insurgents for a short time.

PETHERICK, JOHN (1813-1882), Welsh traveller in East Central Africa, was born in Glamorganshire, and adopted the profession of mining engineer. In 1845 he entered the service of Mehemet AH, and was employed in examining Upper Egypt, Nubia, the Red Sea coast and Kordofan in an unsuccessful search for coal. In 1848 Petherick left the Egyptian service and established himself at El Obeid, the capital of Kordofan, as a trader, dealing largely in gum arabic. He was at the same time made British consular agent for the Sudan. In 1853 he removed to Khartum and became an ivory trader. He travelled extensively in the Bahr-el-Ghazal region, then almost unknown, exploring the Jur, Yalo and other affluents of the Ghazal. In 1858 he penetrated to the Niam-Niam country. His additions to the knowledge of natural history were considerable, among his discoveries being the Cobus maria (Mrs Gray's waterbuck) and the Balaeniceps rex (white-headed stork). Petherick returned to England in 1859 where he made the acquaintance of J. H. Speke, then arranging for his expedition to discover the source of the Nile. While in England Petherick married, and published an account of his travels. He returned to the Sudan in 1 86 1, accompanied by his wife and with the rank of consul. He was entrusted with a mission by the Royal Geographical Society to convey to Gondokoro relief stores for Captains Speke and Grant. Petherick got boats to Gondokoro in 1862, but Speke and Grant had not arrived. Having arranged for a native force to proceed south to get in touch with the absentees, a task successfully accomplished, Mr and Mrs Petherick under- took another journey in the Bahr-el-Ghazal, making important collections of plants and fishes. They regained Gondokoro (where one of their boats with stores was already stationed) in February 1863, four days after the arrival of Speke and Grant, who had meantime accepted the hospitality of Mr (afterwards Sir) Samuel Baker. The charge that Petherick failed to meet his engagement to those travellers is unsubstantiated. A further charge that Petherick had countenanced and even taken part in the slave trade was subsequently

shown to have no foun- dation (Petherick in fact had endeavoured to stop the traffic), but it led Earl Russell, then secretary for foreign affairs, to abolish the British consulate at Khartum (1864). In 1865 the Pethericks returned to England, and in 1869 published Travels in Central Africa and Explorations of the Western Nile Tributaries, in which book are set out the details of the Speke controversy. Petherick died in London, on the 15th of July 1882.

PETION DE VILLENEUVE, JEROME (1756-1794), French writer and politician, was the son of a procureur at Chartres. He became an avocat in 1778, and at once began to try to make a name in literature. His first printed work was an essay, Sur les moyens de prevenir I 'infanticide, which failed to gain the prize for which it was composed, but pleased Brissot so much that he printed it in vol. vii. of his Bibliothegue philosophique

des legislaleurs. Petion's next works, Les Lois civiles, and Essai sur le mariage, in which he advocated the marriage of priests, confirmed his position as a bold reformer, and when the elections to the States-General took place in 1789 he was elected a deputy to the Tiers Etat for Chartres. Both in the assembly of the Tiers Etat and in the Constituent Assembly Petion showed himself a radical leader. He supported Mirabeau on the 23rd of June, attacked the queen on the 5th of October, and was elected president on the 4th of December 1790. On the 15th of June 1791 he was elected president of the criminal tribunal of Paris. On the 21st of June 1791 he was chosen one of three commissioners appointed to bring back the king from Varennes, and he has left a fatuous account of the journey. After the last meeting of the assembly on the 30th of September 1791 Robespierre and Petion were made the popular heroes and were crowned by the populace with civic crowns. Petion received a still further proof of the affection of the Parisians for himself on the 16th of November 1791, when he was elected second mayor of Paris in succession to Bailly. In his' mayoralty he exhibited clearly his republican tendency and his hatred of the old monarchy, especially on the 20th of June 1792, when he allowed the mob to overrun the Tuileries and insult the royal family. For neglecting to protect the Tuileries he was suspended from his functions by the Directory of the department of the Seine, but the leaders of the Legislative Assembly felt that P6tion's cause was theirs, and rescinded the suspension on the 13th of July. On the 3rd of August, at the head of the munici- pality of Paris, Petion demanded the dethronement of the king. He was elected to the Convention for Eure-et-Loir and became its first president. L. P. Manuel had the folly to propose that the president of the Assembly should have the same authority as the president of the

United States; his proposition was at once rejected, but Petion got the nickname of " Roi Petion," which contributed to his fall. His jealousy of Robespierre allied him to the Girondin party, with which he voted for the king's death and for the appeal to the people. He was elected in March 1793 to the first Committee of Public Safety; and he attacked Robespierre, who had accused him of having known and having kept secret Dumouriez's project of treason. His popularity however had waned, and his name was among those of the twenty-two Girondin deputies proscribed on the 2nd of June. Petion was one of those who escaped to Caen and raised the standard of provincial insurrection against the Convention; and, when the Norman rising failed, he fled with M. E, Guadet, F. A. Buzot, C. J. M. Barbaroux, J. B. Salle and Louvet de Couvrai to the Gironde, where they were sheltered by a wig- maker of Saint Emilion. At last, a month before Robespierre's fall in June 1794, the escaped deputies felt themselves no longer safe, and deserted their asylum; Louvet found his way to Paris, Salle and Guadet to Bordeaux, where they were soon taken; Barbaroux committed suicide; and the bodies of Petion and Buzot, who also killed themselves, were found in a field, half- eaten by wolves.

See Memoires inedits de Petion et memoires de Buzot et de Barbaroux, accompagnis de notes inedites de Buzot et de nombreux documents inedits sur Barbaroux, Buzot, Brissot, &c, precedes d'une introduction par C. A . Dauban (Paris, 1 866) ; CEuvres de Petion (3 vols., 1792); F. A. Aulard, Les Orateurs de la Constituante (Paris,

1882).

PETIS DE LA CROIX, FRANCOIS (1653-1713), French Orientalist, was born in Paris in 1653. He was son of the Arabic interpreter of the French court, and inherited this office at his father's death in 1695, afterwards transmitting it to his own son, Alexandre Louis Marie, who also distinguished himself in Oriental studies. At an early age he was sent by Colbert to the East; during the ten years he spent in Syria, Persia and Turkey he mastered Arabic, Persian and Turkish, and also collected rich materials for future writings. He served a short time as secretary to the French ambassador in Morocco, and accompanied as interpreter the French forces sent against Algiers, contributing to the satisfactory settlement of the treaty of peace, which was drawn up by himself in Turkish and ratified in 1684. He conducted the negotiations with Tunis and Tripoli

in 1685, and those with Morocco in 1687; and the zeal, tact and linguistic knowledge he manifested in these and other transactions with Eastern courts were at last rewarded in 1692 by his appointment to the Arabic chair in the College Royal de France, which he filled until his death in 17 13.

He published Conies turcs (Paris, 1707), and Les Mille et un jours (5 vols., Paris, 1710-1712); an Armenian Dictionary and an Account of Ethiopia. But the lasting monument of his literary fame is his excellent French version of Sharaf-uddin 'All Yazdi's Zafarnama or History of Timur (completed 828 A.H. ; A.D. 1425), which was given to the world nine years after his death (4 vols., Paris, 1722; Eng. trans, by J. Darby, London, 1723). This work, one of the rare specimens of a fairly critical history Persia can boast of, was compiled under the auspices of Mirza Ibrahim Sultan, the son of Shah Rukh and grandson of the great Timur. The only error committed by Petis de la Croix in his otherwise very correct transla- tion is that he erroneously ascribed the important share which Ibrahim Sultan had in the Zafarnama to Timur himself.

PETIT, SIR DINSHAW MANECKJI, Bart. (1823-1901), Parsee philanthropist, was born on the 30th of June 1823. As broker to European firms he amassed a large fortune during the period of speculation in Bombay at the time of the American Civil War. In 1886 he became a member of the governor- general's legislative council. He devoted his wealth to philan- thropic objects, among the public and private charities which he endowed being the Towers of Silence and fire temples of the Parsees, a hospital for animals, a college for women, and the Petit hospital. He was knighted in 1887, created a baronet in 1890, and died in February 1901.

PETIT DE JULLEVILLE, LOUIS (1841-1900), French scholar, was born in Paris on the 18th of July 1841. Educated at the Ecole Normale Superieure, and at the French school at Athens, he received his doctorate in literature in 1868. After holding various posts as a teacher he became professor of French medieval literature and of the history of the French language in the university of Paris in 1886. He died on the 28th of August 1900.

His most important works are: Histoire du the'dtre en France, including Les Mysthres (2 vols., 1880); Les Comediens en France au moyen age (1885); La Comedie et les mceurs en France au moyen age (1886); Repertoire du theatre comique en France au moyen dge (1886) ; and Le Theatre en France, histoire de la littirature dramatique depuis ses origines jusqu'd nos jours (1889). Petit de Julleville was also the general editor of the Histoire de la langue et de la litlerature

francaise (8 vols., 1896-1900), to which he himself con- tributed some valuable chapters.

PETITION (Lat. for ” seeking ” or ” praying “), a term meaning generally a prayerful request, and in its more important constitutional aspect an application for redress by a person aggrieved to an authority capable of relieving him. It may be made in the United Kingdom to the Crown or its officers, or to either house of parliament, or in certain cases to courts of justice.

Petitions to the Crown. — The right of petitioning the Crown was recognized indirectly as early as Magna Carta in the famous clause, Nuili vendemus, nulli negabimus aut differemus, rectum vcl justitiam (25 Edw. I. c. 29), and directly at various periods later, e.g. in the articles of the Commons assented to by Henry IV., by which the king was to assign two days in the week for petitions (Rot. Pari. 8 Hen. IV., p. 585). The case of the seven bishops in 1688 confirmed the right, and finally the Bill of Rights in 1689 declared ” that it is the right of the subjects to petition the king, and all commitments and prosecutions for such petition- ing are illegal.” Petitions to the Crown appear to have been at first for the redress of private and local grievances, or for remedies which the courts of law could not grant (May, Pari. Pr., nth ed., 522). As equity grew into a system, petitions of this kind not seeking legislative remedies tended to become superseded by bills in chancery. Statutes were originally drawn up by the judges at the close of the session of parliament from the petitions of the Commons and the answers of the Crown. Under this system of drafting it was found that the tenor of the petition and answer were not always stated correctly. To obviate this inconvenience demands for legislation came in the reign of Henry VI. to be drawn up in the form of bills which the Crown could accept or reject, but could not alter (see Anson, Law and Custom of the

Constitution, 3rd. ed., vol. i. p. 241). In the same reign the words ” by authority of parliament ” were added to the words of enactment, and from the time of Henry VII. public legislation has been by bill and not by petition. A relic of the old form of statute founded upon petition still remains however in the preamble of Appropriation Acts and other statutes creating a charge upon the public revenue. It runs thus: ” We, your majesty’s most dutiful and loyal subjects, the Commons of the United Kingdom … do most humbly beseech your majesty that it may be enacted; and be it enacted,” &c, from this point following the enacting words common to all statutes. The Crown may refer petitions presented to it to be adjudicated upon by a delegated authority. This course is pursued in the case of claims to peerages and offices of

honour, which are referred to the House of Lords, and by that house to its committee for privi- leges, and in the case of petitions to the Crown in council, which are usually referred to the judicial committee. The Crown may delegate the power of receiving petitions in the first instance.

Petitions to Parliament. — Petitions to either house of the legislature seem to have been later in origin than petitions to the Crown. They are not referred to in the Bill of Rights, but the right of petition is a convention of the constitution. Petitions to the Lords or the whole parliament can be traced back to Henry III. No petition to the Commons has been found earlier than Richard II.; but from the time of Henry IV. petitions to the Commons have been freely made. The political importance of petitioning dates from about the reign of Charles I. The develop- ment of the practice of petitioning had proceeded so far in the reign of Charles II. as to lead to the passing in 1662 of an act (13 Car. II. c. 5) against " tumultuous petitioning," which is still on the statute book. It provides that no petition or address shall be presented to the king or either house of parliament by more than ten persons; nor shall any one procure above twenty persons to consent or set their hands to any petition for alteration of matters established by law in church or state, unless with the previous order of three justices of the county, or the major part of the grand jury. And in 181 7 (57 Geo. III. c. 19, s. 23) meetings within a mile from Westminster Hall for the purpose of considering a petition to both houses or either house of parlia- ment while either house is sitting were declared to be unlawful assemblies. Up to 1688 petitions to either house usually dealt only with some specific grievance. From that time dates the present practice of petitioning with regard to general measures of public policy. Petitions to the Houses of Lords or Commons must be framed in the form prescribed by the standing orders, must be properly superscribed, and must conclude with a prayer (May, Pari. Pr., nth ed., 524, 525). They may be sent free by post to members of either house if they fulfil certain conditions as to weight, &c, (loc. cit. p. 531).

Petitions to the Commons must be in writing, must contain none but genuine signatures, and must be free from disrespectful language or imputations upon any tribunal or constituted authority. They must be presented by a member of the house, except petitions to the House of Commons from the corporation of London, which may be presented at the bar by the sheriffs, and from the corpora- tion of Dublin, which may be presented by the lord mayor. There is no means of compelling a member to present a petition. The rules as to petitions to the House of Lords are similar. The lord who presents a petition is required to

read it to see whether in form and contents it is fit for presentation. In the Lords receivers and triers of petitions from Great Britain and Ireland and from Gascony and the lands and countries beyond the sea were appointed until 1886, though their functions had long been obsolete. Applications for leave to bring before either house bills for private or local and

Cersonal matters must under the standing orders of both houses e made by petition ; and the same rule obtains as to applications for leave to be heard in opposition to such bills.

See Clifford, History of Private Bill Legislation (1887); May, Pari. Pr., (nth ed.), c. xxv.

Petitions to Courts of Justice.- — Strictly speaking, these are an indirect mode of petitioning the Crown, for in the theory of English law the Crown is the fountain of justice. But it is more convenient to treat them separately, as they now form a part of the practice of the courts. Appeals to the House of Lords and the privy council are prosecuted by petition of appeal. The

original jurisdiction of the privy council to deal with petitions is confined to proceedings under certain statutes, such as the Endowed Schools Acts, the Public Schools Acts, the Universities Acts and the Patents Acts. In most cases the petitions are referred to the judicial committee of the council. Petitions may be addressed to the lord chancellor in a few instances, e.g. for the removal of coroners or county court judges. The House of Lords at one time claimed original jurisdiction in civil and criminal matters, As to civil matters the claim is abandoned; as to criminal matters it is now limited to impeachment for crime by the Commons on the trial for treason or felony of persons having privilege of peerage.

The most important use of petitions in England is in the High Court of Justice. In the chancery division petitions are presented either as interlocutory proceedings in the course of an action, or as original proceedings where no litigation exists — as being a more speedy form of remedy than an action. The cases in which a peti- tion is admissible and the procedure therein, are in the main regu- lated by orders 52 and 55 of the rules of the supreme court. Evidence in support of petitions is usually by affidavit. Petitions in the course of an action are

presented to the court in which the action is brought. Examples of original petitions are those under the Lands Clauses Acts, the Trustee Acts and the Companies Acts. For many proceedings under these acts a simpler and cheaper form of proceeding by summons has been substituted for that by petition. The matters above-mentioned are usually dealt with by the chancery division as successor of the court of chancery. Peti- tions are also in use in other courts having equitable jurisdiction, e.g. the chancery courts of the counties palatine of Lancaster and Durham and the county courts as to cases falling within § 67 of the County Courts Act 1888, and as to cases within county court jurisdiction under the Settled Land Acts or the Guardianship of Infants Act 1886 (County Court Rules, O. 38). In a few cases petitions may be brought by way of appeal, e.g. under the Charitable Trusts Act i860. In the king's bench division the only use of petitions appears to be to initiate proceedings in bankruptcy. Leave to sue in formd pauperis used to be given on petition but is now usually dealt with summarily. In the probate, &c, division proceedings in matrimonial causes, &c, are begun by petition, but the course of the proceedings closely resembles those of an ordinary action.

Scotland. — In Scotland petitions in the Court of Session are either original or in a pending action. Original petitions are presented to one of the divisions of the inner house, unless they relate to matters mentioned in 20 & 21 Vict. c. 56, s. 4, when they are brought before the junior lord ordinary, or unless, by special statutory pro- vision, they may be brought before any lord ordinary, as in the case of petitions under the " Conjugal Rights (Scotland) Amendment Act 1861," or the Trusts (Scotland) Act 1867. A petition and complaint is a process of a quasi-criminal nature by which certain matters of summary and extraordinary iurisdiction are brought under the notice of the Court of Session. It lies against magistrates and officers of the law for breach of duty against parties guilty of contempt of court, &c. The concurrence of the lord advocate is necessary to a petition and complaint (see Mackay, Court of Session Practice, ii. 439).

Ireland. — The law of Ireland as to petitions is in substance the same as that of England with certain differences of detail as to the cases in which petitions may be made to courts of justice.

United States. — In the United States before the Civil War questions arose as to the right of petitioning Congress, particularly with refer- ence to petitions for the restriction of slavery which at that time was contended to be a matter of state and not of federal concern (see Cooley, Constitutional Limitations, 6th ed., 1890, 426). The right of petitioning the United States government is now secured by the first

amendment to the United States constitution (ratified in 1789-1791), which provides that ” Congress shall make no law . . . abridging . . . the right of the people peaceably to assemble and to petition the government for a redress of grievances.” In the view of the Supreme Court this amendment ” assumes the existence of the right of the people to assemble for lawful purposes and protects it against encroachment by Congress. The right was not created by the amendment; neither was its continuance guaranteed except as against congressional interference. For their protection in its enjoyment, therefore, the people must look to the states. The power for that purpose was originally placed there, and has never been surrendered. The right of the people peaceably to assemble for the purpose of petitioning Congress for a redress of grievances, or for anything else connected with the powers or duties of the national government is an attribute of national citizen- ship, and as such under the protection of and guaranteed by the United States. The very idea of a government republican in form implies a right on the part of its citizens to meet peaceably for consultation in respect to public affairs and to petition for a redress of grievances ” (U.S. v. Cruikshank, 1875; 92 U.S. 542, 552).

A Bill of Rights is incorporated in the constitutions of many states of the Union, and is made part of the supreme law of

the states (see Hough, American Constitutions, ii. 571). Petitions can be presented to the federal or state courts of justice under much the same circumstances as in England. ” It is a general rule in such cases that an affidavit should be made that the facts therein contained are true as far as known to the petitioner, and that those facts which he states as knowing from others he believes to be true ” (Bouvier, Law Diet.).

British Possessions. — There is a right of petition to the king for the review of decisions (in matters criminal or civil) of courts of justice in the Channel Islands or Isle of Man, and in all other parts of the empire outside the British islands and of British courts ir foreign countries. This right is cut down by imperial or colonia legislation in the case of Canada and Australia, see Tarring, Lav. Relating to Colonies (3rd ed., 1906) c. v.

The term Petition of Right, in English law, is used in two senses. (1) It denotes the statute of 1625 (3 Car. I. c. 1), a parliamentary declaration of the liberties of the people. (2) It also and more usually is employed to describe a mode of prosecuting a claim by a subject against the Crown, said to owe its origin to Edward I. Petition of right

in this sense lies (a) to obtain restitution of real or personal property of the subject which has found its way into the hands of the Crown, or compensation if restitution cannot be made; (b) to recover damages for breach of a contract made on behalf of the Crown, whether the breach is due to the acts or the omissions of servants of the Crown. Where the Crown is in possession of property of the suppliant, and the title of the Crown appears by record, as by inquest of office, the remedy is somewhat different and is called monstrans de droit. Petition of right does not lie in respect of engagements in the naval, military or civil service of the Crown, which are as a general rule made " during pleasure," nor for breach of public duty, e.g. failure to perform treaty obligations, nor for trespass or negligence or other torts by Crown servants. Where such acts are wrongful the remedy is by action against the official as an individual and not in his official capacity {Raleigh v. Goschen, 1898, L.R. 1 ch. 73).

The procedure on a petition of right is either at common law or by statute. At common law the petition went through its earliest stages in the chancery. It suggests such a right as controverts the title of the Crown, and the Crown endorses upon the petition Soil droit fait al partie. Thereupon a commission is issued to inquire into the truth of the suggestion. After the return to the commission, the attorney-general pleads or demurs, and the merits are then determined as in actions between subject and subject. If the right be determined against the Crown, judgment of amoveas manus is given in favour of the suppliant. The Petition of Right Act i860 (23 & 24 Vict. c. 34, extended to Ireland in 1873, 36 & 37 Vict. c. 69) preserves to the suppliant his right to proceed at common law, but gives an alternative remedy. The procedure is regulated by the act of i860, and as to England also by rules made under that act on the 1st of February 1862. The petition is left with the secretary of state for the home department for the consideration of his majesty, who if he thinks fit grants his fiat that right be done. The fiat is sealed in the home office and issued to the suppliant who files it in the central office of the High Court of Justice, and a sealed copy is served upon the solicitor to the treasury, with a demand for a plea or answer on behalf of the Crown. The subse- quent proceedings including those as to disclosing relevant docu- ments are assimilated as far as possible to those in an ordinary action. A judgment in favour of the suppliant is equivalent to a judgment of amoveas manus ouster le main. Costs are payable to and by the Crown. A petition of right is usually tried in the chancery or king's bench divisions; but where the subject-matter of the petition arises out of the exercise of belligerent rights on behalf of the Crown, or would be cognizable in a prize court if the matter were in dispute

between private persons, the suppliant may at his option intitule his petition in the admiralty division, and the lord chancellor may direct the prosecution in that division of peti- tions of right under the act of i860 even when they are not so intituled (27 & 28 Vict. c. 25, s. 52).

The law as to petition of right applies to Ireland but not to Scotland, and a right to present such a petition appears to exist in colonies whose law is based on the common law of England. But in many colonies legislation has been passed with respect to suits against government which makes it unnecessary to resort to a petition of right.

PETITIO PRINCIPII, or Begging the Question (Gr. to h> a.pxfj \aixˆavav,Tb e£ apxˆs alTeiadai), in logic, the fourth of Aristotle's fallacies e£a) rrjs Xe£ecos or extra dictionem. Strictly this fallacy belongs to the language of disputation, when the questioner seeks {petit) to get his adversary to admit the very matter in question. Hence the word principium gives a wrong impression, for the fallacy consists not in seeking for the

admission of a principle which will confute the particular pro- position — a perfectly legitimate form of refutation — but in luring the adversary into confessing the contradictory. In the ordinary use, however, " begging the question " consists in assuming in the premises the conclusion which it is desired to prove. '

PETITOT, JEAN (1608-1691), French-Swiss enamel painter, was born at Geneva, a member of a Burgundian family which had fled from France on account of religious difficulties. His father, Faulle, was a wood carver; his mother's name was Etienette Royaume. Jean was the fourth son, and was apprenticed to a jeweller goldsmith named Pierre Bordier, with whom he struck up a close friendship. The two friends, dissatisfied with the progress they made in Geneva, went into France, and after working for a while with Toutin came to England with letters of introduction to Turquet de Mayern, physician to Charles I., who presented them to the king, for whom they made a St George for the badge of the order and carried out many com- missions for portraits; amongst others preparing two large ones representing Rachel de Ruvigny, countess of Southampton, now at Chatsworth, and Mary Villiers, duchess of Richmond and Lennox, dated 1643, a t one time in the possession of the Crown and now in the Pierpont Morgan

collection. On the execution of the king, Petitot left England for Paris with the royal household, Bordier remaining in England and carrying out certain important commissions for Cromwell and the parliament. On reaching Paris, Petitot entered into partnership with a goldsmith, Jacques Bordier, a cousin of Pierre, and it seems probable from recent research in contemporary documents that the enamel portraits attributed to Petitot were really the work of the two partners collaborating, the actual drawing being the work of Petitot, while for the enamel process Bordier was mainly responsible. The two painters were given apartments in the Louvre, received numerous commissions from Louis XIV., and painted portraits of almost every person of importance in his brilliant court. The friendship between the two lasted for thirty-five years, and was only put an end to by Bordier's death. The enamellers rendered special political services in France for the republic of Geneva, and were practically regarded as the official representatives of the republic, receiving warm thanks from the Syndics for their diplomatic work. On the revocation of the Edict of Nantes, 1685, pressure was brought to bear upon Petitot that he should change his religion. The king protected him as long as possible, and when he was arrested, with his niece, Anne Bordier, sent Bossuet, bishop of Meaux, to convince the old man of the error of his ways. Eventually, in poor health and great despair, Petitot placed his signature to an act of abjuration, and Louis XIV., unwilling to acknowledge the true reason for the imprison- ment of Petitot and for his liberation, informed one of his sons, who came to thank him for the pardon given to his father, that he was willing to fall in for once with " the whim of an old man who desired to be buried with his ancestors." In 1687 therefore Petitot left Paris to return to Geneva, and, after a long and tedious inquiry, was absolved by the consistory of the church of Geneva from the crime of which they considered he had been guilty, and received back to the Huguenot communion in the church of St Gervais. In Geneva he received a very important com- mission from John Sobieski, king of Poland, who required portraits of himself and his queen. This was followed by number- less other commissions which the painter carried out. He died of paralysis on the 3rd of April 1601, while in the very act of painting on the enamel a portrait of his faithful wife.

Petitot married in 1651 Marguerite Cuper, and Jacques Bordier married in the same year her younger sister Anne Madeleine. He had seventeen children, and for their benefit wrote out a little octavo volume containing some genealogical information, two delightful portraits, one of himself and one of his wife, and many pages occupied with prayers, meditations and religious advice. He also prepared a

second manuscript volume of prayers and meditations for the use of his family, and from these two books and the records of the Huguenot societies of France and England information has been obtained respecting the painter and his family.

Of the works of Petitot the most important collection is in the Jones Bequest at the Victoria and Albert Museum. There are many in the Louvre, sixteen at Chantilly, seventeen at Windsor, and others in the collections of Earl Beauchamp, the duke of Rut- land, the duke of Richmond, the earl of Dartrey, Mr Alfred de Rothschild and the late Baroness Burdett-Coutts. Amongst Lord Dartrey's examples are portraits of Petitot and of his son, and two of the wife of Jean Petitot the younger. A second portrait of the artist belongs to the queen of Holland, and another is in the collection of the late Mr Stroehlin of Geneva. In Mr Pierpont Morgan's collection there are many exceedingly fine examples, but especially three drawings on paper, the only three which appear to have survived, and the large signed miniature of the duchess of Richmond already mentioned, the largest work Petitot ever executed save the one at Chatsworth.

See Petitot et Bordier, by Ernest Stroehlin (Geneva, 1905) ; " Some New Information respecting Jean Petitot," by G. C. Williamson, Nineteenth Century and After (January 1908), pp. 98-110; the privately printed Catalogue of the Collection of Mr J. Pierpont Morgan, vol. iii.; The History of Portrait Miniatures, by G. C. Williamson, vol. ii. (London, 1904). (G. C. W.)

PETITOT, JEAN LOUIS (1652-c. 1730), French enamel painter, was the eldest son of Jean Petitot (q.v.), and was instructed in enamelling by his father. Some of his works so closely resemble those of the elder Petitot that it is difficult to distinguish between them, and he was really the only serious rival his father ever had. He settled for a while in London, where he remained till 1682, and painted many enamel portraits of Charles II. In 1682 he removed to Paris, but in 1695 was back again in London, where he remained until the time of his death.

His portrait by Mignard is in the museum at Geneva, and another in enamel by himself in the collection of the earl of Dartrey, who also owns two of his wife, Madeleine Bordier, whom he married in 1683. Another portrait believed to represent him is in the col- lection of Mr Pierpont Morgan. (G. C. W.)

PETITS-CHEVAUX (Fr. for " little horses"), a gambling game played with a mechanical device consisting of a board perforated with a number of concentric circular slits, in which revolve, each

independently on its own axis, figures of jockeys on horseback, distinguished by numbers or colours. The bystanders having staked their money according to their choice on a board marked in divisions for this purpose, the horses are started revolving rapidly together by means of mechanism attached to the board, and the horse which stops nearest a marked goal wins, every player who has staked on that horse receiving so many times his stake. Figures of railway trains and other objects sometimes take the place of horses. In recent years there has been a ten- dency to supplant the petits ekevaux at French resorts by the boule or ball game, on the same principle of gambling; in this a ball is rolled on a basin-shaped table so that it' may eventually settle in one of a number of shallow cups, each marked with a figure.

PETO, SIR SAMUEL MORTON, Bart. (1809-1889), English contractor, was born at Woking, Surrey, on the 4th of August 1809, and was at an early age apprenticed to his uncle, a London builder, who on his death in 1830 bequeathed the business to Peto and another nephew, Thomas Grissell. The partnership between Peto and Grissell lasted till 1846, amongst the many London buildings erected by the firm being the Reform Club, the Lyceum and St James's theatres, and the Nelson column. Peto afterwards entered into partnership with Edward Ladd Betts (1815-1872), and between 1846 and 1872 Messrs Peto & Betts carried out many large railway contracts at home and abroad, notably the more important portions of the South-Eastern and of the London Chatham & Dover lines, and, in conjunction with Thomas Brassey, the Grand Trunk railway of Canada, and the London Tilbury & Southend railway. In 1854-1855 Peto and Brassey constructed a railway in the Crimea between Balaclava and the British entrenchments before Sebastopol, charging the British government only the actual out-of-pocket expenses, and for his services in this matter Peto was in 1855 made a baronet. Peto entered parliament as a Liberal in 1847, and, with a few years' interval, continued there till 1868, when, his firm having been compelled to suspend payment in the financial crisis of 1866, he was forced to resign his seat, though both Mr Disraeli and Mr Gladstone publicly eulogized his personal character. He died on the 13th of November 1889.

PETOFI, ALEXANDER (1823-1849), Hungarian lyric poet, was born at Kis-K6roso, Pest county, on New Year's Day, 1823. The family received its diploma of nobility from the emperor Leopold in 1688, but the ultra-patriotic Alexander early changed the old family name,

Petrovics, which pointed to a Croatian origin, into the purely Magyar form of Petofi. The lad's early days were spent at Felegyhaz and Szabadszallas, the most Hungarian parts of Hungary, where he got most of his early education, including a good grounding in Latin. German he learnt subsequently at Pesth, and French he taught himself. He began writing verses in his twelfth year, while a student at the Aszod gymnasium, where he also displayed a strong predilection for the stage, to the disgust of his rigorous father, who formally disowned his son, early in 1839, for some trifling peccadillo, and whose tyrannical temper became downright furious when a series of misfortunes ruined him utterly in 1840. For the next three years Petofi led the wretched life of a strolling player, except for a brief interval when, to escape starvation, he enlisted as a common soldier in an infantry regiment. During the greater part of 1842 we find him a student at the Calvinist College at Papa, where he made the acquaintance of young Jokai, and wrote the poem " Borozo," which the great critic Bajza at once inserted in the leading literary review, the Athenaeum (May 22, 1842). In November of the same year the restless poet quitted Papa to join another travelling troupe, playing on one occasion the Fool in King Lear, and after wandering all over Hungary and suffering incredible hardships, finally settled down at Pesth (1844), where for a time he supported himself by all sorts of literary hack-work. Nevertheless, in the midst of his worst privations he had read voraciously, and was at this time profoundly influenced by the dominant Romanticism of the day; while, through Tieck, he learnt to know and value the works of Shakespeare. His first volume of original poems was published in 1844 by the Society Nemzeti Kor, through the influence of the poet Vorosmarty, when every publisher had refused his MS., and the seventy-five florins which he got for it had become a matter of life or death to him. He now became a regular contributor to the leading papers of Pesth, and was reconciled to his parents, whom he practically supported for the rest of their lives out of his literary earnings. His position, if not exactly brilliant, was now at least secure. The little volume published by the Nemzeti Kor was followed by the parody, A Helyseg Kalapdcsa (1844); the romantic epic J duos Vitez (1844); Ciprislombok Etelke Sirjdrdl, a collection of passionate elegies over his lost love, Etelke Csapo (1845); Uti Jegyzetek, an imitation of Heine's Reisebilder (1845); Szerelem Gybngyei (1845); Felhok (1846); Szerelme es hdzass&ga (1846), and many other volumes. The first edition of his collected poems appeared in 1847. Petofi was not yet twenty-five, and, despite the protests of the classicists, who regarded him with cold dislike, the best heads in Hungary, poets like Vorosmarty and critics like Szemere, already paid him the homage due to the prince of Magyar lyrical poets. The great

public was enthusiastic on the same side, and posterity, too, has placed him among the immortals. Petofi is as simple and genuine a poet of nature as Wordsworth or Christian Winther, and his erotics, inspired throughout by a noble idealism, have all Byron's force and fervour, though it is perhaps in his martial songs that Petofi's essentially passionate and defiant genius asserts itself most triumphantly. On the 8th of September 1847 Petofi married Julia Szendrey, who bore him a son. When the revolutionary war broke out, he espoused the tenets of the extreme democratic faction with a heat and recklessness which estranged many of his friends. He took an active part in the Transylvanian campaigns of the heroic Bern; rose by sheer valour to the rank of major; was slain at the battle of Segesvar (July 31, 1849), and his body, which was never recovered, is supposed to have been buried in the common grave of the fallen honveds in the churchyard of Feheregyhaz. The first complete edition of Petofi's poems appeared in 1874. The best critical edition is that of Haras, 1894. There are numerous indifferent German translations.

See Ferenczi, Petofi EJetrajza; Fischer, Petofi's Leben und Werke > (R. N. B.)

PETOSKEY, a city and the county-seat of Emmet county. Michigan, U.S.A., on Little Traverse Bay, an arm of Lake Michigan, at the mouth of Bear Creek, in the north-west part of the lower peninsula. Pop. (1890), 2872; (1900), 5285, of whom 856 were foreign-born; (1904), 5186; (i9io),4778. It is served by the Pere Marquette and the Grand Rapids & Indiana rail- ways and by steamboat lines to Chicago, Detroit, Buffalo and other lake ports. Bear Creek furnishes considerable water-power, and among the manufactures are lumber, paper, leather and foundry and machine-shop products. Petoskey was settled about 1874, was incorporated as a village in 1879, was chartered as a city in 1895, and in 1902 replaced Harbor Springs as county-seat. It was named after an Ojibwa Indian chief.

PETRA (f/ Uerpa= the rock), a ruined site, 30° 19′ N. and 35° 31′ E., lying in a basin among the mountains which form the eastern flank of Wadi el-'Araba, the great valley running from the Dead Sea to the Gulf of 'Akaba. The descriptions of Strabo (xvi. p. 779), Pliny (N.H. vi. 32) and other writers leave no doubt as to the identity of this site with the famous capital of the Nabataeans (q.v.) and the centre of their caravan trade. Walled in by towering rocks and watered by a perennial stream, Petra not only possessed the advantages of a fortress but controlled the main commercial routes which passed through it to Gaza in the west, to Bostra and Damascus in the north, to Elath and Leuce Come on the Red Sea, and across the desert to the Persian Gulf.

From the ‘Araba travellers approach by a track which leads round Jebel Harun (Mt Hor) and enters the plain of Petra from the south; it is just possible to find a way in from the high plateau on the north; but the most impressive entrance is from the east, down a dark and narrow gorge, in places only 10 or 12 ft. wide, called the Sik, i.e. the shaft, a split in the huge sandstone rocks which serves as the waterway of the Wadi Musa. Near the end of the defile stands the most elaborate of the ruins, el-Hazne or ” the Treasury of Pharaoh,” not built but hewn out of the cliff; a little farther on, at the foot of the mountain called en-Nejr, comes the theatre, so placed as to bring the greatest number of tombs within view; and at the point where the valley opens out into the plain the site of the city is revealed with striking effect. Almost enclosing it on three sides are rose-coloured mountain walls, divided into groups by deep fissures, and lined with rock- cut tombs in the form of towers. The stream of Wadi Musa crosses the plain and disappears among the mountains opposite; on either bank, where the ground is fairly level, the city was built, covering a space of about ij sq. m. Among the ruins on the south bank stand the fragments of a temple called Kasr Fir’aun of late Roman date; just beyond this rises a rocky height which is usually regarded as the acropolis.

A position of such natural strength must have been occupied early, but we have no means of telling exactly when the history of Petra began; the evidence seems to show that the city was of relatively late foundation, though a sanctuary (see below) may have existed there from very ancient times. This part of the country was assigned by tradition to the Horites, i.e. probably ” cave-dwellers,” the predecessors of the Edomites (Gen. xiv. 6, xxxvi. 20-30; Deut. ii. 12) ; the habits of the original natives may have influenced the Nabataean custom of burying the dead and offering worship in half-excavated caves. 1 But that Petra itself is mentioned in the Old Testament cannot be affirmed with certainty; for though Petra is usually identified with Sela’ 2 which also means ” a rock,” the reference in Judges i. 36; Isa. xvi. 1, xlii. 1 1 ; Obad. 3, is far from clear. 2 Kings xiv. 7 seems to be more explicit; in the parallel passage, however, Sela’ is understood to mean simply ” the rock” (2 Chr. xxv. 12, see LXX). Hence many authorities doubt whether any town named Sela’ is men- tioned in the Old Testament. 3 What, then, did the Semitic

1 Buhl, Gesch. der Edomiter (1893), p. 52.

2 E.g. by Driver, Deut. p. 38; Noldeke, Ency. Bibl. col. 1 185; Ed. Meyer, Die Israeliten u. ihre Nachbarstamme, p. 357.

3 Buhl, p. 35 sqq., G. F. Moore, Judges, p. 55 seq., Oxford Hebr. Lex. s. v.]ha ; T. K. Cheyne, Ency. Bibl. s. v. Sela ; A. Jeremias,

I Das A. T. im Lichte d. alten Orients, p. 457.

inhabitants call their city? Eusebius and Jerome (Onom. sacr. 286, 71. 145, 9; 228, 55. 287, 94), apparently on the authority of Josephus (Ant. iv. 7, 154, 7), assert that Rekem was the native name. But in the Aramaic versions Rekem is the name of Kadesh; Josephus may have confused the two places. Some- times the Aramaic versions give the form Rekem- Geya, which recalls the name of the village El-ji, south-east of Petra; the capital, however, would hardly be defined by the name of a neighbouring village. The Semitic name of the city, if it was not Sela", must remain unknown. 1 The passage in Diodorus Siculus (xix. 94-97) which describes the expeditions which Antigonus sent against the Nabataeans in 312 B.C. is generally understood to throw some light upon the history of Petra, though it must be admitted that the petra referred to as a natural fortress and place of refuge cannot be a proper name, and the description at any rate implies that the town was not yet in existence. Briinnow thinks that " the rock " in question was the sacred mountain en-Nejr (above); but Buhl suggests a conspicuous height about 16 m. north of Petra, Shobak, the Mont-royal of the Crusaders. 2 More satisfactory evidence of the date at which the earliest Nabataean settlement began is to be obtained from an exami- nation of the tombs. Two types may be distinguished broadly, the Nabataean and the Graeco-Roman. The Nabataean type starts from the simple pylon-tomb with a door set in a tower crowned by a parapet ornament, in imitation of the front of a dwelling-house; then, after passing through various stages, the full Nabataean type is reached, retaining all the native features and at the same time exhibiting characteristics which are partly Egyptian and partly Greek. Of this type there exist close parallels in the tomb-towers at el-Hejr in north Arabia, which bear long Nabataean inscriptions, 3 and so supply a date for the corresponding monuments at Petra. Then comes a series of tomb- fronts which terminate in a semicircular arch, a feature derived from north Syria, and finally the elaborate facades, from which all trace of native style has vanished, copied from the front of a Roman temple. The exact dates of the stages in this develop- ment cannot be fixed, for strangely enough few inscriptions of any length have been found at Petra, 4 perhaps because they have perished with the stucco or cement which was used upon many of the buildings. We

have, then, as evidence for the earliest period, the simple pylon-tombs, which belong to the pre-Hellenic age; how far back in this stage the Nabataean settlement goes we do not know, but not farther than the 6th century B.C. A period follows in which the dominant civilization combines Greek, Egyptian and Syrian elements, clearly pointing to the age of the Ptolemies. Towards the close of the 2nd century B.C., when the Ptolemaic and Seleucid kingdoms were equally depressed, the Nabataean kingdom came to the front; under Aretas III. Philhellene, c. 85-60 B.C., the royal coins begin; at this time probably the theatre was excavated, and Petra must have assumed the aspect of a Hellenistic city. In the long and pros- perous reign of Aretas IV. Philopatris, 9 b.c.-a.d. 40, the fine tombs of the el-IJejr type may be dated, perhaps also the great High-place. Then the city became more and more Romanized. In a.d. 106, when Cornelius Palma was governor of Syria, "Arabia belonging to Petra," 6 was absorbed into the Roman Empire, and the native dynasty came to an end. But the city continued to flourish. It was visited in a.d. 131 by Hadrian, and stamped Adriane Petra on its coins in gratitude for the emperor's benefactions; the superb Hazne, probably a temple for the worship of Isis, and the Der, which resembles the Hazne in design, belong to this period. A century later, in the time of Alexander

1 Yakut gives the name Sal' to a fortress in Wadi Musa, Noldeke, ZDMG. xxv. 259 seq. (1871).

2 Briinnow, Die Frov. Arabia, i. 190; Buhl, op. cit. p. 34.

3 CIS. ii. 197-226; Cooke, North-Semitic Inscriptions, 78-91, &c.

4 Four important Nabat. inscrr. have been found, of which three are dated, viz. NSI. p. 250, n = CIS. ii. 349, 16th year of Aretas III., i.e. B.C. 70, so also CIS. ii. 442; NSI. 94 and 95 = CIS. ii. 350 and 354, the latter dated the 29th year of Aretas IV., i.e. a.d. 20. The other Nabat. inscrr. are mostly graffiti, scratched on the rocks by visitors or worshippers at the holy places; CIS.

"■355-441. 444-464-

6 This is the meaning of Arabia Petraea. Dio Cass, lxviii. 14.

Severus (a.d. 222-235), when the city was at the height of its splendour, the issue of coinage comes to an end, and there is no more building of sumptuous tombs, owing apparently to some sudden catastrophe, such as an invasion by the neo-Persian power under the Sassanid dynasty. Meanwhile as Palmyra (fl. a.d. 130-270) grew in

importance and attracted the Arabian trade away from Petra, the latter declined; it seems, however, to have lingered on as a religious centre; for we are told by Epiphanius (c. a.d. 315-403) that in his time a feast was held there on the 25th of December in honour of the virgin Chaabou and her offspring Dusares (Haer. 51).

The chief god of Petra was Dhu-shara (Aoucrdpr/s), i.e. the lord or owner of Shard; 6 he was worshipped under the form of a black rectangular stone, a sort of Petraean Ka'aba (Suidas Lex. s.v. ®eos "Apr;?, and cf. Epiphan. above). Associated with Dhu-shara was Allat, the chief goddess of the ancient Arabs. Sanctuary chambers may be seen at various points in the site of Petra, and many places of sacrifice open to the sky are met with among the tombs, marked by remains of altars. But most eminent of all was the great High-place which has recently been discovered on en-Nejr (or Zibb 'atuf). It consists of a rock-hewn altar of burnt-offering with a place for killing the victims beside it and a shallow court, perhaps intended to hold water, in front: the most complete specimen of an ancient Semitic sanctuary that is known. 7 Not far off are two obelisks cut out of the solid rock which has been removed to the level of their bases; these were either idols of Dhu-shara and Allat, or more probably were designed to mark the limits of the haram of the sanctuary. West .of the obelisks are three other places of sacrifice; and on the rocks below worshippers have carved their names (CIS. ii. 390-404). En-Nejr, with the theatre at its foot, must have been the sacred mountain, the original sanctuary of Petra, perhaps " the very high mountain of Arabia called Dusare after the god Dusares " referred to by Steph. Byz. (s.v. Aovcapri). Christianity found its way into Petra in early times; Athanasius mentions a bishop of Petra (Herpuv rqs 'Apaj3tas, ad Antioch. 10) named Asterius; at least one of the tombs (the " tomb with the urn") was used as a church; an inscription in red paint records its consecration " in the time of the most holy bishop Jason" (a.d. 447). The Christianity of Petra, as of north Arabia, was swept away by the Mahommedan conquest in a.d. 629-632. Under the Latin kingdom Petra was occupied by Baldwin I. and formed the second fief of the barony of Krak with the title Chateau de la Valee de Moyse or Sela; it remained in the hands of the Franks till 1189; fragments of the Crusaders' citadel are still standing near the High-place on en-Nejr.

The ruins of Petra were an object of curiosity in the middle ages and were visited by the Sultan Bibars of Egypt towards the close of the 13th century. The first European to describe them was Burckhardt (1812). All former descriptions are now superseded by the magnificent work of Briinnow and Domaszewski, Die Pro- vincia Arabia (1904), who have minutely surveyed the whole site, classified the tombs, and

compiled the accounts of earlier investi- gations; and by the independent researches of Dalman, Petra und seine Felsheiligtumer (1908), and of Musil, Arabia Petraea (1907-1908). The Corpus Inscr. Sem. ii. 305 sqq., should be consulted, and the descriptions in Baedeker- Socin's Palestina (7th edition), and Revue biblique for 1897, 1898, 1903. (G. A. C.*)

PETRARCH (1304-1374). Francesco Petrarca, the great Italian poet and first true reviver of learning in medieval Europe, was born at Arezzo on the 20th of July 1304. His father Petracco held a post of notary in the Florentine Rolls Court of the Riformagioni; but, having espoused the same cause as Dante during the quarrels of the Blacks and Whites, Petracco was expelled from Florence by that decree of the 27th of January 1302 which condemned Dante to lifelong exile. With his wife he

6 The whole range in which Petra lies is called Jebel esh-Sharat, but it is doubtful whether the name of the god was derived from that of the mountain, see Ed. Meyer, loc. cit. p. 268 and Cooke, NSI. p. 218.

7 First mentioned by E. L. Wilson (1891), rediscovered by G. L. Robinson (1900), described by S. I. Curtis, P. E. F. Q. St. 1900), and Savignac, Rev. bibl. (1903) ; with full plan and photo- graphs).

took refuge in the Ghibelline township of Arezzo; and it was here, on the very night when his father, in company with other members of the White party, made an unsuccessful attempt to enter Florence by force, the Francesco first saw the light. He did not remain long in his birthplace. His mother, having obtained permission to return from banishment, settled at Incisa, a little village on the Arno above Florence, in February 1305. Here Petrarch spent seven years of boyhood, acquiring that pure Tuscan idiom which afterwards he used with such consummate mastery in ode and sonnet. Here too, in 1307, his brother Gherardo was born. In 1312 Petracco set up a house for his family at Pisa ; but soon afterwards, finding no scope there for the exercise of his profession as jurist, he removed them all in 13 13 to Avignon. This was a step of no small importance for the future poet-scholar. Avignon at that period still belonged to Provence, and owned King Robert of Naples as sovereign. But the popes had made it their residence after the insults offered to Boniface VIII. at Anagni in 1303. Avignon was therefore the centre of that varied society which the high

pontiffs of Christendom have ever gathered round them. Nowhere else could the youth of genius who was destined to impress a cosmopolitan stamp on medieval culture and to begin the modern era have grown up under conditions more favourable to his task. At Incisa and at Pisa he had learned his mother-tongue. At Car- pentras, under the direction of Convennole of Prato, he studied the humanities between the years 1315 and 1319. Avignon, at a distance from the party strife and somewhat parochial politics of the Italian commonwealths, impressed his mind with an ideal of civility raised far above provincial prejudices. Petrarch's real name according to Tuscan usage was Francesco di Petracco. But he altered this patronymic, for the sake of euphony, to Petrarca, proving by this slight change his emanci- pation from usages which, had he dwelt at Florence, would most probably have been imposed on him. Petracco, who was very anxious that his eldest son should become an eminent jurist, sent him at the age of fifteen to study law at Montpellier. Like Ovid and many other poets, Petrarch felt no inclination for his father's profession. His intellect, indeed, was not incapable of understanding and admiring the majestic edifice of Roman law; but he shrank with disgust from the illiberal technicalities of practice. There is an authentic story of Petracco's flinging the young student's books of poetry and rhetoric upon the fire, but saving Virgil and Cicero half-burned from the flames at his son's passionate entreaties. Notwithstanding Petrarch's firm determination to make himself a scholar and a man of letters rather than a lawyer, he so far submitted to his father's wishes as to remove about the year 1323 to Bologna, which was then the headquarters of juristic learning. There he stayed with his brother Gherardo until 1326, when his father died, and he returned to Avignon. Banishment and change of place had already diminished Petracco's fortune, which was never large; and a fraudulent administration of his estate after his death left the two heirs in almost complete destitution. The most precious remnant of Petrarch's inheritance was a MS. of Cicero. There remained no course open for him but to take orders. This he did at once on his arrival in Provence; and we have good reason to believe that he advanced in due time to the rank of priest. A great Roman noble and ecclesiastic, Giacomo Colonna, after- wards bishop of Lombez, now befriended him, and Petrarch lived for some years in partial dependence on this patron.

On the 6th of April 1327 happened the most famous event of Petrarch's history. He saw Laura for the first time in the church of St Clara at Avignon. Who Laura was remains uncertain still. That she was the daughter of Audibert de Noves and the wife of Hugh de Sade rests partly on tradition and partly on documents which the abbe de Sade

professed to have copied from originals in the 18th century. Nothing is now extant to prove that, if this lady really existed, she was the Laura of the Canzoniere, while there are reasons for suspecting that the abbe was either the fabricator of a romance flattering to his own family, or the dupe ot some previous impostor. We may, however, reject the sceptical hypothesis that Laura was a mere figment of Petrarch's

fancy; and, if we accept her personal reality, the poems of her lover demonstrate that she was a married woman with whom he enjoyed a respectful and not very intimate friendship.

Petrarch's inner life after this date is mainly occupied with the passion which he celebrated in his Italian poems, and with the friendships which his Latin epistles dimly reveal to us. Besides the bishop of Lombez he was now on terms of intimacy with another member of the great Colonna family, the cardinal Giovanni. A German, Ludwig, whom he called Socrates, and a Roman, Lello, who received from him the classic name of Laellius, were among his best-loved associates. Avignon was the chief seat of his residence up to the year of 1333, when he became restless and undertook his first long journey. On this occasion he visited Paris, Ghent, Liege, Cologne, making the acquaintance of learned men and copying the manuscripts of classical authors. On his return to Avignon he engaged in public affairs, pleaded the cause of the Scaligers in their lawsuit with the Rossi for the lordship of Parma, and addressed two poetical epistles to Pope Benedict XII. upon the restoration of the papal see to Rome. His eloquence on behalf of the tyrants of Verona was successful. It won him the friendship of their ambassador, Azzo di Correggio — a fact which subsequently influenced his life in no small measure. Not very long after these events Petrarch made his first journey to Rome, a journey memorable from the account which he has left us of the impression he received from its ruins.

It was some time in the year 1337 that he established himself at Vaucluse and began that life of solitary study, heightened by communion with nature in her loneliest and wildest moods, which distinguished him in so remarkable a degree from the common herd of medieval scholars. Here he spent his time partly among books, meditating on Roman history, and preparing himself for the Latin epic of Africa. In his hours of recreation he climbed the hills or traced the Sorgues from its fountain under those tall limestone cliffs, while odes and sonnets to Madonna Laura were committed from his memory to paper. We may also refer many of his most important treatises in prose, as well as a large portion of his Latin correspondence, to the

leisure he enjoyed in this retreat. Some woman, unknown to us by name, made him the father of a son, Giovanni, in the year 1337; and she was probably the same who brought him a daughter, Francesca, in 1343. Both children were afterwards legitimized by papal bulls. Meanwhile his fame as a poet in the Latin and the vulgar tongues steadily increased, until, when the first draughts of the Africa began to circulate about the year 1339, it became manifest that no one had a better right to the laurel crown than Petrarch. A desire for glory was one of the most deeply-rooted passions of his nature, and one of the points in which he most strikingly antici- pated the humanistic scholars who succeeded him. It is not, therefore, surprising to find that he exerted his influence in several quarters with the view to obtaining the honours of a public coronation. The result of his intrigues was that on a single day in 1340, the 1st of September, he received two invitations, from the university of Paris and from King Robert of Naples respec- tively. He chose to accept the latter, journeyed in February 1341 to Naples, was honourably entertained by the king, and, after some formal disputations on matters touching the poet's art, was sent with magnificent credentials to Rome. There, in the month of April, Petrarch assumed the poet's crown upon the Capitol from the hand of the Roman senator amid the plauditsof the people and the patricians. The oration which he delivered on this occasion was composed upon these words of Virgil: — " Sed me Parnassi deserta per ardua dulcis Raptat amor."

The ancient and the modern eras met together on the Capitol at Petrarch's coronation, and a new stadium for the human spirit, that which we are wont to style Renaissance, was opened.

With the coronation in Rome a fresh chapter in the biography of Petrarch may be said to have begun. Henceforth he ranked as a rhetorician and a poet of European celebrity, the guest of princes, and the ambassador to royal courts. During the spring months of 1341 his friend Azzo di Correggio had succeeded in freeing Parma from subjugation to the Scaligers, and was laying

the foundations of his own tyranny in that city. He invited Petrarch to attend him when he made his triumphal entry at the end of May; and from this time forward for a considerable period Parma and Vaucluse were the two headquarters of the poet. The one he called his Transalpine, the other his Cisalpine Parnassus. The events of the next

six years of his life, from May 1341 to May 1347, may be briefly recapitulated. He lost his old friend the bishop of Lombez by death and his brother Gherardo by the entrance of the latter into a Carthusian monastery. Various small benefices were conferred upon him; and repeated offers of a papal secretaryship, which would have raised him to the highest dignities, were made and rejected. Petrarch remained true to the instinct of his own vocation, and had no intention of sacrificing his studies and his glory to ecclesiastical ambition. In January 1343 his old friend and patron Robert, king of Naples, died, and Petrarch was sent on an embassy from the papal court to his successor Joan. The notices which he has left us of Neapolitan society at this epoch are interesting, and, it was now, perhaps, that he met Boccaccio for the first time. The beginning of the year 1345 was marked by an event more interesting in the scholar's eyes than any change in dynasties. This was no less than a discovery at Verona of Cicero's Familiar Letters. It is much to be regretted that Petrarch found the precious MS. so late in life, when the style of his own epistles had been already modelled upon that of Seneca and St Augustine.

In the month of May 1347 Cola di Rienzi accomplished that extraordinary revolution which for a short space revived the republic in Rome, and raised this enthusiast to titular equality with kings. Petrarch, who in politics was no less visionary than Rienzi, hailed the advent of a founder and deliverer in the self-styled tribune. Without considering the impossibility of restoring the majesty of ancient Rome, or the absurdity of dignifying the medieval Roman, rabble by the name of Populus Romanus, he threw himself with passion into the republican movement, and sacrificed his old friends of the Colonna family to what he judged a patriotic duty.

Petrarch built himself a house at Parma in the autumn of 1347. Here he hoped to pursue the tranquil avocations of a poet honoured by men of the world and men of letters throughout Europe, and of an idealistic politician, whose effusions on the questions of the day were read with pleasure for their style. But in the course of the next two years this agreeable prospect was overclouded by a series of calamities. Laura died of the plague on the 6th of April 1348. Francesco degli Albizzi, Mainardo Accursio, Roberto de' Bardi, Sennuccio del Bene, Luchino Visconti, the cardinal Giovanni Colonna and several other friends followed to the grave in rapid succession. All of these had been intimate acquaintances and correspondents of the poet. Friendship with him was a passion; or, what is more true perhaps, he needed friends for the maintenance of his intellectual activity at the highest point of its effectiveness. Therefore he felt the

loss of these men acutely. We may say with certainty that Laura's death, accompanied by that of so many distinguished associates, was the turning-point in Petrarch's inner life. He began to think of quitting the world, and pondered a plan for establishing a kind of humanistic convent, where he might dedicate himself, in the company of kindred spirits, to still severer studies and a closer communion with God. Though nothing came of this scheme, a marked change was henceforth perceptible in Petrarch's literary compositions. The poems written In Morte di Madonna Laura are graver and of more religious tone. The prose works touch on retrospective topics or deal with subjects of deep meditation. At the same time his renown, continually spreading, opened to him ever fresh relations with Italian despots. The noble houses of Gonzaga at Mantua, at Carrara at Padua, of Este at Ferrara, of Malatesta at Rimini, of Visconti at Milan, vied with Azzo di Correggio in entertaining the illustrious man of letters. It was in vain that his correspon- dents pointed out the discrepancy between his professed zeal for Italian liberties, his recent enthusiasm for the Roman republic, and this alliance with tyrants who were destroying the freedom of the Lombard cities. Petrarch remained an incurable rhetori-

cian; and, while he stigmatized the despots in his ode to Italy and in his epistles to the emperor he accepted their hospitality. They, on their part, seem to have understood his temoerament, and to have agreed to recognize his political theories as of no practical importance. The tendency to honour men of letters and to patronize the arts which distinguished Italian princes throughout the Renaissance period first manifested itself in the attitude assumed by Visconti and Carraresi to Petrarch.

When the jubilee of 1350 was proclaimed, Petrarch made a pilgrimage to Rome, passing and returning through Florence, where he established a firm friendship with Boccaccio. It has been well remarked that, while all his other friendships are shadowy and dim, this one alone stands out with clearness. Each of the two friends had a distinguished personality. Each played a foremost part in the revival of learning. Boccaccio carried his admiration for Petrarch to the point of worship Petrarch repaid him with sympathy, counsel in literary studies, and moral support which helped to elevate and purify the younger poet's over- sensuous nature. It was Boccaccio who in the spring of 1351 brought to Petrarch, then resident with the Carrara family at Padua, an invitation from the seigniory of Florence to accept the rectorship of their recently founded university. This was accompanied by a diploma of restoration to his rights as citizen and restitution of his patrimony. But, flattering as was the offer, Petrarch

declined it. He preferred his literary leisure at Vaucluse, at Parma, in the courts of princes, to a post which would have brought him into contact with jealous priors and have reduced him to the position of the servant of a common- wealth. Accordingly, we find him journeying again in 13 51 to Vaucluse, again refusing the office of papal secretary, again plan- ning visionary reforms for the Roman people, and beginning that curious fragment of an autobiography which is known as the Epistle to Posterity. Early in 1353 he left Avignon for the last time, and entered Lombardy by the pass of Mont Genevre, making his way immediately to Milan. The archbishop Giovanni Visconti was at this period virtually despot of Milan. He induced Petrarch, who had long been a friend of the Visconti family, to establish himself at his court, where he found employment for him as ambassador and orator. The most memorable of his diplomatic missions was to Venice in the autumn of 1353. Towards the close of the long struggle between Genoa and the republic of St Mark the Genoese entreated Giovanni Visconti to mediate on their behalf with the Venetians. Petrarch was entrusted with the office; and on the 8th of November he delivered a studied oration before the doge Andrea Dandolo and the great council. His eloquence had no effect; but the orator entered into relations with the Venetian aristocracy which were afterwards extended and confirmed. Meanwhile, Milan continued to be his place of residence. After Giovanni's death he remained in the court of Bernabo and Galeazzo Visconti, closing his eyes to their cruelties and exactions, serving them as a diplomatist, making speeches for them on ceremonial occasions, and partaking of the splendid hospitality they offered to emperors and princes. It was in this capacity of an independent man of letters, highly placed and favoured at one of the most wealthy courts of Europe, that he addressed epistles to the emperor Charles IV. upon the distracted state of Italy, and entreated him to resume the old Ghibelline policy of Imperial interference. Charles IV. passed through Mantua in the autumn of 1354. There Petrarch made his acquaintance, and, finding him a man unfit for any noble enter- prise, declined attending him to Rome. When Charles returned to Germany, after assuming the crowns in Rome and Milan, Petrarch addressed a letter of vehement invective and reproach to the emperor who was so negligent of the duties imposed on him by his high office. This did not prevent the Visconti sending him on an embassy to Charles in 1356. Petrarch found him at Prague, and, after pleading the cause of his masters, was despatched with honour and the diploma of count palatine. His student's life at Milan was again interrupted in 1360 by a mission on which Galeazzo Visconti sent him to King John of France. The tyrants of Milan were aspiring to royal alliances; Gian Galeazzo Visconti had been married

to Isabella of France;

Violante Visconti, a few years later, was wedded to the English duke of Clarence. Petrarch was now commissioned to congratu- late King John upon his liberation from captivity to England. This duty performed, he returned to Milan, where in 1361 he received news of the deaths of his son Giovanni and his old friend Socrates. Both had been carried off by plague.

The remaining years of Petrarch's life, important as they were for the furtherance of humanistic studies, may be briefly con- densed. On the nth of May 1362 he settled at Padua, from the neighbourhood of which he never moved again to any great distance. The same year saw him at Venice, making a donation of his library to the republic of St Mark. Here his friend Boccaccio introduced to him the Greek teacher Leontius Pilatus. Petrarch, who possessed a MS. of Homer and a portion of Plato, never acquired the Greek language, although he attempted to gain some little knowledge of it in his later years. Homer, he said, was dumb to him, while he was deaf to Homer; and he could only approach the Iliad in Boccaccio's rude Latin version. About this period he saw his daughter Francesca happily married, and undertook the education of a young scholar from Ravenna, whose sudden disappearance from his household caused him the deepest grief. This youth has been identified, but on insufficient grounds, with that Giovanni Malpaghini of Ravenna who was destined to form a most important link between Petrarch and the humanists of the next age of culture. Gradually his oldest friends dropped off. Azzo di Correggio died in 1362, and Laelius, Simonides, Barbato, in the following year. His own death was reported in 1365; but he survived another decade. Much of this last stage of his life was occupied at Padua in a controversy with the Averroists, whom he regarded as dangerous antagonists both to sound religion and to sound culture. A curious treatise, which grew in part out of this dispute and out of a previous duel with physicians, was the book Upon his own Ignorance and that of many others. At last, in 1369, tired with the bustle of a town so big as Padua, he retired to Arqua., a village in Euganean hills, where he continued his usual train of literary occupations, employing several secretaries, and studying unremittingly. All through these declining years his friendship with Boccaccio was maintained and strengthened. It rested on a solid basis of mutual affection and of common studies, the different tempera- ments of the two scholars

securing them against the disagree- ments of rivalry or jealousy. One of Petrarch's last compositions was a Latin version of Boccaccio's story of Griselda. On the 18th of July 1374 his people found the old poet and scholar dead among his books in the library of that little house which looks across the hills and lowlands towards the Adriatic.

When we attempt to estimate Petrarch's position in the history of modern culture, the first thing which strikes us is that he was even less eminent as an Italian poet than as the founder of Humanism, the inaugurator of the Renaissance in Italy. What he achieved for the modern world was not merely to bequeath to his Italian imitators masterpieces of lyrical art unrivalled for perfection of workmanship, but also, and far more, to open out for Europe a new sphere of mental activity. Stand- ing within the threshold of the middle ages, he surveyed the kingdom of the modern spirit, and, by his own inexhaustible industry in the field of scholarship and study, he determined what we call the revival of learning. By bringing the men of his own generation into sympathetic contact with antiquity, he gave a decisive impulse to that European movement which restored freedom, self-consciousness, and the faculty of progress to the human intellect. He was the first man to collect libraries, to accumulate coins, to advocate the preservation of MSS. For him the authors of the Greek and Latin world were living men — more real, in fact, than those with whom he corresponded; and the rhetorical epistles he addressed to Cicero, Seneca and Varro prove that he dwelt with them on terms of sympathetic intimacy. So far-reaching were the interests controlled by him in this capacity of humanist that his achievement as an Italian lyrist seems by comparison insignificant.

Petrarch's ideal of humanism was essentially a noble one. He regarded the orator and the poet as teachers, bound to

complete themselves by education, and to exhibit to the world an image of perfected personality in prose and verse of studied beauty. Self-culture and self-effectuation seemed to him the highest aims of man. Everything which contributed to the formation of a free, impassioned, liberal individuality he regarded as praiseworthy. Everything which retarded the attainment of that end was contemptible in his eyes. The authors of antiquity, the Holy Scriptures and the fathers of the Church were valued by him as one common source of intellectual enlightenment. Eminently religious, and orthodox in his convictions, he did not seek to substitute a pagan for the Christian ideal. This was left for the scholars of the 15 th and 16th centuries in Italy. At the same time, the Latin orators, historians and poets were venerated by him as depositories of a tradition only second

in importance to revelation. For him there was no schism between Rome and Galilee, between classical genius and sacred inspiration. Though the latter took the first rank in relation to man's eternal welfare, the former was necessary for the perfection of his intellect and the civilization of his manners. With this double ideal in view, Petrarch poured scorn upon the French physicians and the Italian Averroists for their illiberal philistinism, no less than for their materialistic impiety. True to his conception of independent intellectual activity, he abstained from a legal career, refused important ecclesiastical office, and contented himself with paltry benefices which implied no spiritual or administrative duties, because he was resolved to follow the one purpose of his life — self-culture. Whatever in literature revealed the hearts of men was infinitely precious to him; and for this reason he professed almost a cult for St Augustine. It was to Augustine, as to a friend or a confessor, that he poured forth the secrets of his own soul in the book De contemptu mundi.

In this effort to realize his truest self Petrarch was eminently successful. Much as he effected by restoring to the world a sound conception of learning, and by rousing that genuine love and curiosity which led to the revival, he did even more by im- pressing on the age his own full-formed and striking personality. In all things he was original. Whether we regard him as a priest who published poem after poem in praise of an adored mistress, as a plebeian man of letters who conversed on equal terms with kings and princes, as a solitary dedicated to the love of nature, as an amateur diplomatist treating affairs of state with pompous eloquence in missives sent to popes and emperors, or again as a traveller eager for change of scene, ready to climb mountains for the enjoyment of broad prospects over spreading champaigns; in all these divers manifestations of his peculiar genius we trace some contrast with the manners of the 14th century, some emphatic anticipation of the 16th. The defects of Petrarch's character were no less striking than its qualities, and were indeed their complement and counterpart. That vivid conception of intellectual and moral self-culture which determined his ideal took the form in actual life of all-absorbing egotism. «He was not content with knowing himself to be the leader of the age. He claimed autocracy, suffered no rival near his throne, brooked no contradiction, demanded unconditional submission to his will and judgment. Petrarch was made up of contradictions. Praising solitude, playing the hermit at Vaucluse, he only loved seclusion as a contrast to the society of courts. While he penned dissertations on the futility of fame and the burden of celebrity he was trimming his sails to catch the breeze of popular

applause. No one professed a more austere morality, and few medieval writers indulged in cruder satire on the female sex; yet he passed some years in the society of a concubine, and his living masterpiece of art is the apotheosis of chivalrous passion for a woman. These discords of an un- decided nature displayed themselves in his political theories and in his philosophy of conduct. In one mood he was fain to ape the antique patriot; in another he affected the monastic saint. He was clamorous for the freedom of the Roman people; yet at one time he called upon the popes to re-establish themselves in the Eternal City; at another he besought the emperor to make it his headquarters; at a third he hailed in Rienzi the founder of a new republic. He did not perceive that all these plans were

incompatible. His relations to the Lombard nobles were equally at variance with his professed patriotism; and, while still a housemate of Visconti and Correggi, he kept on issuing invectives against the tyrants who divided Italy. It would not be difficult to multiply these antitheses in the character and the opinions of this singular man. But it is more to the purpose to remark that they were harmonized in a personality of potent and enduring force.

The point to notice in this complex personality is that Petrarch's ideal remained always literary. As philosopher, poli- tician, historian, essayist, orator, he aimed at lucid and harmo- nious expression — not, indeed, neglecting the importance of the material he undertook to treat, but approaching his task in the spirit of an artist rather than a thinker or a man of action. This accounts for his bewildering versatility, and for his apparent want of grasp on conditions of fact. Viewed in this light Petrarch anticipated the Italian Renaissance in its weakness — that philosophical superficiality, that tendency to ornate rhetoric, that preoccupation with stylistic trifles, that want of profound conviction and stern sincerity, which stamp its minor literary products with the note of mediocrity. Had Petrarch been possessed with a passion for some commanding principle in politics, morality or science, instead of with the thirst for self- glorification and the ideal of artistic culture, it is not wholly impossible that Italian humanism might have assumed a manlier and more conscientious tone. But this is not a question which admits of discussion; for the conditions which made Petrarch what he was were already potent in Italian society. He did but express the spirit of the period he opened; and it may also be added that his own ideal was higher and severer

than that of the illustrious humanists who followed him.

As an author Petrarch must be considered from two points of view — first as a writer of Latin verse and prose, secondly as an Italian lyrist. In the former capacity he was speedily out- stripped by more fortunate scholars. His eclogues and epistles and the epic of Africa, on which he set such store, exhibit a comparatively limited command of Latin metre. His treatises, orations, and familiar letters, though remarkable for a prose style which is eminently characteristic of the man, are not distinguished by purity of diction. Much as he admired Cicero, it is clear that he had not freed himself from current medieval Latinity. Seneca and Augustine had been too much used by him as models of composition. At the same time it will be conceded that he possessed a copious vocabulary, a fine ear for cadence, and the faculty of expressing every shade of thought or feeling. What he lacked was that insight into the best classical masterpieces, that command of the best classical diction, which is the product of successive generations of scholarship. To attain to this, Giovanni da Ravenna, Colluccio Salutato, Poggio and Filelfo had to labour, before a Poliziano and a Bembo finally prepared the path for an Erasmus. Had Petrarch been born at the close of the 15th instead of at the opening of the 14th century there is no doubt that his Latinity would have been as pure, as versatile, and as pointed as that of the witty stylist of Rotterdam.

With regard to his Italian poetry Petrarch occupies a very different position. The Rime in Vita e Morle di Madonna Laura cannot become obsolete, for perfect metrical form has here been married to language of the choicest and the purest. It is true that even in the Canzoniere, as Italians prefer to call that collec- tion of lyrics, Petrarch is not devoid of faults belonging to his age, and affectations which have imposed themselves with disastrous effect through his authority upon the literature of Europe. He appealed in his odes and sonnets to a restricted audience already educated by the chivalrous love-poetry of Provence and by Italian imitations of that style. He was not careful to exclude the commonplaces of the school, nor anxious to finish a work of art wholly free from fashionable graces and from contemporary conceits. There is therefore a certain element of artificiality in his treatment; and this, since it is easier to copy defects than excellencies, has been perpetuated with wearisome monotony by versifiers who chose him for their model. But, after, rnaking due allowance for peculiarities, the abuse of which has brought

the name of Petrarchist into contempt, we can agree with Shelley that the lyrics of the Canzoniere ” are as spells which unseal the inmost enchanted fountains of the delight which is the grief of love.” Much

might be written about the peculiar position held by Petrarch between the metaphysical lyrists of Tuscany and the more realistic amorists of succeeding generations. True in this respect also to his anticipation of the coming age, he was the first Italian poet of love to free himself from allegory and mysticism. Yet he was far from approaching the analysis of emotion with the directness of a Heine or De Musset. Though we believe in the reality of Laura, we derive no clear conception either of her person or her character. She is not so much a woman as woman in the abstract; and perhaps on this very account the poems written for her by her lover have been taken to the heart by countless lovers who came after him. The method of his art is so generalizing, while his feeling is so natural, that every man can see himself reflected in the singer and his mistress shadowed forth in Laura. The same criticism might be passed on Petrarch's descriptions of nature. That he felt the beauties of nature keenly is certain, and he frequently touches them with obvious appreci- ation. Yet he has written nothing so characteristic of Vaucluse as to be inapplicable to any solitude where there are woods and water. The Canzoniere is therefore one long melodious monody poured from the poet's soul, with the indefinite form of a beautiful woman seated in a lovely landscape, a perpetual object of delight- ful contemplation. This disengagement from local circumstance without the sacrifice of emotional sincerity is a merit in Petrarch, but it became a fault in his imitators. Lacking his intensity of passion and his admirable faculty for seizing the most evanescent shades of difference in feeling, they degenerated into colourless and lifeless insipidities made insupportable by the frigid repeti- tion of tropes and conceits which we are fain to pardon in the master.

Petrarch did not distinguish himself by love-poetry alone in the Italian language. His odes to Giacomo Colonna, to Cola di Rienzi and to the princes of Italy display him in another light. They exhibit the oratorical fervour, the pleader's eloquence in its most perfect lustre, which Petrarch possessed in no less measure than subjective passion. Modern literature has nothing nobler, nothing more harmonious in the declamatory style than these three patriotic effusions. Their spirit itself is epoch-making in the history of Europe. Up to this point Italy had scarcely begun to exist. There were Florentines and Lombards, Guelfs and Ghibellines; but even Dante had scarcely conceived of Italy as a nation, independent of the empire, inclusive of her several component commonwealths. To the high conception of Italian nationality, to the belief in that spiritual unity which underlay her many discords and divisions, Petrarch attained partly through his disengagement from civic and local partisanship, partly through his

large and liberal ideal of culture.

The materials for a life of Petrarch are afforded in abundance by his letters, collected and prepared for publication under his own eyes. These are divided into Familiar Correspondence, Correspond- ence in Old Age, Divers Letters and Letters without a Title; to which may be added the curious autobiographical fragment entitled the Epistle to Posterity. Next in importance rank the epistles and eclogues in Latin verse, the Italian poems and the rhetorical ad- dresses to popes, emperors, Cola di Rienzi and some great men of antiquity. For the comprehension of his character the treatise De contemptu tnundi, addressed to St Augustine and styled his Secret, is invaluable. Without attempting a complete list of Petrarch's works, it may be well to illustrate the extent of his erudition and his activity as a writer by a brief enumeration of the most im- portant. In the section belonging to moral philosophy, we find De remediis utriusque fortunae, a treatise on human happiness and unhappiness; De vita solitaria, a panegyric of solitude; De otio religiosorum, a similar essay on monastic life, inspired by a visit to his brother Gherardo in his convent near Marseilles. On historical subjects the most considerable are Rerum memorandarum libri, a miscellany from a student's commonplace-book, and De viris illustrious, an epitome of the biographies of Roman worthies. Three polemical works require mention : Contra cujusdam anonymi Gdlli calumnias apologia, Contra medicum quendam invectivarum libri, and De sui ipsius et multorum ignorantia — controversial 'and sarcastic compositions, which grew out of Petrarch's quarrels with the physicians of Avignon and the Averroists of Padua. In this connexion it might also be well to mention the remarkable

satires on the papal court, included in the Epistolae sine titulo. Five public orations have been preserved, the most weighty of which, in explanation of Petrarch's conception of literature, is the speech delivered on the Capitol upon the occasion of his coronation. Among his Latin poems Africa, an epic on Scipio Africanus, takes the first place. Twelve Eclogues and three books of Epistles in verse close the list. In Italian we possess the Canzoniere, which includes odes and sonnets written for Laura during her lifetime, those written for her after her death, and a miscellaneous section containing the three patriotic odes and three famous poetical invectives against the papal court. Besides these lyrical composi- tions are the semi-epical or

allegorical Trionfi — Triumphs of Love, Chastity, Death, Fame, Time and Divinity, written in terza rima of smooth and limpid quality. Though these Triumphs, as a whole, are deficient in poetic inspiration, the second canto of the Trionfo della morle, in which Petrarch describes a vision of his dead love Laura, is justly famous for reserved passion and pathos tempered to a tranquil harmony.

The complete bibliography of Petrarch forms a considerable volume. Such a work was attempted by Domenico Rossetti (Trieste, 1828). It will be enough here to mention the Basel edition of 1581, in folio, as the basis for all subsequent editions of his collected works. Among editions of the Canzoniere special mention may be made of those of Marsand (Padua, 1820), Leopardi in Le Monnier's collection, Mestica (1895), and Cardnui (1899). Nor must Fracassetti's Italian version of the Letters (published in 5 vols, by Le Monnier) be neglected. De Sade's Life of the poet (Amster- dam, 1 764-1 767) marks an epoch in the history of his numerous biographies; but this is in many important points untrustworthy, and it has been superseded by Gustav Koerting's exhaustive volume on Petrarcas Leben una Werke (Leipzig, 1878). Georg Voigt's Wiederbelebung des classischen Alterthums (Berlin, 1859) contains a well-digested estimate of Petrarch's relation to the revival of learning. Meziere's Petrarque (1868) is a monograph of merit. English readers may be referred to a little book on Petrarch by Henry Reeve, and to vols. ii. and iv. of Symond's Renaissance in Italy. See also Maud F. Jerrold, Francesco Petrarca, poet and humanist (1909). (J. A. S.)

PETRE, SIR EDWARD (1631-1699), Jesuit confessor of King James II. of England, was born in Paris. He was the son of Sir Francis Petre, Bart., of Cranham, head of a junior branch of the family of the Barons Petre, and his wife Elizabeth Gage, daughter of Sir John Gage, both strong Roman Catholics. In 1649 he was sent for his education to the Jesuit College at St Omer, and he entered the order under the name of Spencer in 1652, but did not receive the full orders till 1671. In 1679 he succeeded his elder brother in the title and family estates. On the accession of James II. in 1685 he was chosen as confessor by the king, who looked upon him as " a resolute and undertaking man." During the whole of the king's reign Petre was one of his advisers who did the most to encourage him in the policy which ended by producing the revolution of 1688. The king contemplated making him archbishop of York, as the see was then vacant, but the pope, Innocent XL, who was not friendly to the order, would not grant a dispensation to hold it, and even directed Petre's superiors to rebuke him for his excessive am- bition. In 1687 lie was made privy councillor. When the revolution broke out Petre was compelled to flee disguised as a

woman. After his flight he had no further relations with James II. After a visit to Rome, he became head of the Jesuit College at St Omer in 1693, from whence he was transferred to Walten in Flanders in 1697. He died on the 15th of May 1699. A younger brother Charles (1644-1712) was also a member of the order.

PETRE, SIR WILLIAM (c. 1505-1572), English politician, was a son of John Petre, a Devon man, and was educated at Exeter College, Oxford, afterwards becoming a fellow of All Souls' College. He entered the public service in early life, owing his introduction therein doubtless to the fact that at Oxford he had been tutor to Anne Boleyn's brother, George Boleyn, Viscount Rochford, and began his official career by serving the English government abroad. In 1536 he was made deputy, or proctor, for the vicar-general, Thomas Cromwell, and as such he presided over the convocation which met in June of this year. In 1543 Petre was knighted and was appointed a secretary of state; in 1545 he was sent as ambassador to the emperor Charles V. A very politic man, he retained his position under Edward VI. and also under Mary, forsaking the protector Somerset at the right moment and winning Mary's goodwill by

favouring her marriage with Philip II. of Spain. He resigned his secretaryship in 1557, but took some part in public business under Elizabeth until his death at his residence, Ingatestone, Essex, on the 13th of January 1572.

His son John Petre (1549-1613) was created Baron Petre of Writtle in 1603. The 2nd baron was his son William (1575- 1637), whose grandson was William, the 4th baron (c. 1626- 1684). Denounced by Titus Oates as a papist, the last named was arrested with other Roman Catholic noblemen in 1678 and remained without trial in the Tower of London until his death. His brother John (1629-1684) was the 5th lord, and the latter's nephew, Robert (1689-1713), was the 7th lord. It was Robert's action in cutting a lock of hair from a lady's head which led Pope to write his poem " The Rape of the Lock." The Petres have been consistently attached to the Roman Catholic faith, William Joseph, the 13th baron (1847-1893), being a priest of the Roman church, and the barony is still (1911) in existence. One of the 1st baron's grandsons was William Petre (1602-1677), who trans- lated the Flos sanctorum of Pedro de Ribadeneira as Lives of the Saints (St Omer, 1699; London, 1730).

See Genealogical Collections illustrating the History of Roman Catholic Families of England, vol. i., edited by J. J. Howard and H. F. Burke.

PETREL, the general name of a group of birds (of which more than 100 species are recognized), derived from the habit which some of them possess of apparently walking on the surface of the water as the apostle St Peter (of whose name the word is ‘a diminutive form) is recorded (Matt. xiv. 29) to have done. The petrels, all of which are placed in the family Procellariidae,.vrere formerly associated with the Laridae (see Gull), but they are now placed as the sole members of the suborder Tubinqres (the name denoting the characteristic tubular structure, of their nostrils) and of the order Procellariiformes (see Bikd). .They are subdivided into four groups or subfamilies: (1) Pelecanoidinae (or Halodrominae) , containing some three or four species known as diving-petrels, with habits very different from others of the family, and almost peculiar to high southern latitudes from Cape Horn to New Zealand; (2) Procellariinae, or petrels proper (and shearwaters); (3) Diomedeinae, or albatrosses (see Mallemuck); and (4) Oceanitinae, containing small sooty-black birds of the genera Cymodroma, Pealea, Pelagodroma, Garrodia and Oceanites, the distinctive nature of which was first recognized by Coues in 1864.

Petrels are archaic oceanic forms, wun gieat powers of flight, dispersed throughout all the seas and oceans of the world, and some species apparently never resort to land except for the pur- pose of nidification, though nearly all are liable at times to be driven ashore, and often very far inland, by gales of wind. 1 It would also seem that during the breeding-season many of them are wholly nocturnal in their habits, passing the day in holes of the ground, or in clefts of the rocks, in which they generally nestle, the hen of each pair laying a single white egg, sparsely speckled in a few species with fine reddish dots. Of those species that frequent the North Atlantic, the common Storm- Petrel, Procellaria pelagica, a little bird which has to the ordinary eye rather the look of a Swift or Swallow, is the ” Mother Carey’s chicken ” of sailors, and is widely believed to be the harbinger of bad weather; but seamen hardly discriminate between this and others nearly resembling it in appearance, such as Leach’s or the Fork-tailed Petrel, Cymochorea leucorrhoa, a rather larger but less common bird, and Wilson’s Petrel, Ocean- ites oceanicus, the type of the Family Oceanitidae mentioned above, which is more common on the American side. But it is in the Southern Ocean that Petrels most abound, both as species and as individuals. The Cape-Pigeon or Pintado Petrel, Daption capensis, is one that has long been well known to mariners and other wayfarers on the great waters, while those who voyage to or from Australia, whatever be the route they take, are

1 Thus Oestrelata haesitata, the Capped Petrel, a species whose proper home seems to be Guadeloupe and some of the neighbouring West-Indian Islands, has occurred in the State of New York, near Boulogne, in Norfolk, and in Hungary (Ibis, 1884, p. 202).

certain to meet with many more species, some, as Ossifraga gigantca, as large as Albatrosses, and several of them called by sailors by a variety of choice names, generally having reference to the strong smell of musk emitted by the birds, among which that of ” Stink-pot ” is not the most opprobrious. None of the Petrels are endowed with any brilliant colouring — sooty- black, grey of various tints (one of which is often called ” blue “), and white being the only hues the plumage exhibits. The distribution of the several species of Petrels in the Southern Ocean has been treated by A. Milne-Edwards in the Annates des sciences naturelles for 1882 (6th series Zoologie, vol. xiii. art. 4, pp. 1-22). (A. N.)

PETRIE, GEORGE (1700-1866), Irish antiquary, was the son of James Petrie, a native of Aberdeen, who had settled in Dublin as a portrait and miniature painter. He was born in Dublin in January 1790, and was educated as an artist. Besides attaining considerable reputation as a painter of Irish landscape, he devoted much time to the illustration of the antiquities of the country. In 1828 he was appointed to conduct the antiquarian and historical section of the ordnance survey of Ireland. In 1832 he became editor of the Dublin Penny Journal, a periodical designed to disseminate information among the masses, to which he contributed numerous articles on the history of the fine arts in Ireland. Petrie may be regarded as the first scientific in- vestigator of Irish archaeology, his contributions to which are also in themselves of much importance. His Essay on Round Towers, for which in 1830 he received the prize of the Irish Academy, still ranks as a standard work. Among his other ‘ contributions to Irish archaeology are his Essay on the Military Architecture 0] Ireland and his History and Antiquities of Tar a Hill. He died on the 17th of January 1866.

See the Life and Labours in Art and Archaeology of George Petrie, by William Stokes (1868).

PETRIE, WILLIAM MATTHEW FLINDERS (1853-), English egyptologist, was born at Charlton on the 3rd of June 1853, being the

son of William Petrie, C.E. His mother was the daughter of Captain Matthew Flinders, the Australian explorer. He took an early interest in archaeological research, and between 1875 and 1880 was busily engaged in studying ancient British remains at Stonehenge and elsewhere; in 1880 he published his book on Stonehenge, with an account of his theories on this subject. He was also much interested in ancient weights and measures, and in 1875 published a work on Inductive Metrology. In 1881 he began a long series of important surveys and excava- tions in Egypt, beginning with the pyramids at Giza, and follow- ing up his work there by excavations at the great temple at Tanis (1884), and discovering and exploring the long-lost Greek city of Naucratis in the Delta (1885), and the towns of Am and Daphnae (1886), where he found important remains of the time when they were inhabited by the Pharaohs. Between 1888 and 1890 he was at work in the Fayum, opening up Hawara, Kahun and Lachish; and in 1891 he discovered the ancient temple at Medum. Much of this work was done in connexion with the Palestine Exploration Fund. By this time his reputation was estab- lished. He published in 1893 his Ten Years' Diggings in Egypt, was given the honorary degree of D.C.L. by Oxford, and was appointed Edwards Professor of Egyptology at University College, London. In 1894 he founded the Egyptian Research Account, which in 1905 was reconstituted as the British School of Archaeology in Egypt (not to be confused with the Egypt Exploration Fund, founded 1892). Perhaps the most important work which the School has accomplished has been the investi- gation of the site of Memphis (q.v.)

The extent as well as the chronological order of Professor Petrie's excavations may best be shown by a list of his works.

Works. — His chief general works on Egyptian subjects are, Ten Years' Diggings in Egypt (1893); History of Egypt (1894— 1905); Egyptian Tales (1895); Religion and Conscience in Ancient Egypt (1898); Syria and Egypt (1898); Royal Tombs of the First Dynasty (1900); Royal Tombs of the Earliest Dynasties (1901); Hyksos and Israelite Cities (1906) ; Religion of Ancient Egypt (1906) ; Personal Religion in Egypt (1908). On particular sites, Pyramids and Temples of Gizeh (1883); Tanis I. (1885); Nankratis I. (1886); Hawara (1889); Kahun (1890); Illahun (1891); Medum (1892);

Tell el Amarna (1895); Koplos (1896); Nogada (1896); Six Temples at Thebes (1897) ; Deshasheh (1897) ; Dendereh (1900) ; Diospolis (1901); Abydos I. (1902); Abydos II. (1903); Ehnasya (1904); Egyptians in Sinai and Researches in Sinai (1906); Gizeh and Rifeh (1907) ; Athribis (1908) ; Memphis and Qurneh (1909).

PETRIOU (also called Cha-chang-sao) , a town and port of Siam, in the division of Pachim, about 45 m. E. of Bangkok. It is the centre of that part of southern Siam which is watered by the Bang Pakong River. It is built on low-lying, swampy ground, about 10 m. from the mouth of the above river. The population is about 10,000, mixed Siamese and Chinese, the latter slightly predominating. Rice-mills give employment to a large number of indentured Chinese coolies, but the inhabi- tants are chiefly engaged in agriculture. A railway connecting with Bangkok was opened in the spring of 1908.

PETROLEA, a town and port of entry in Lambton county, Ontario, Canada, situated 42 m. W. of London on Bear Creek, an affluent of Sydenham River, and on the Grand Trunk and Michigan Central railways. Pop. (1901), 4135. It is in the midst of the oil region of Canada, and numerous wells in the vicinity have an aggregate output of about 30,000,000 gallons of crude oil per annum, much of which is refined in the town.

PETROLEUM (Lat. petra, rock, and oleum, oil), a term which, in its widest sense, embraces the whole of the hydrocarbons, gaseous, liquid and solid, occurring in nature (see Bitumen). Here the application of the term is limited to the liquid which is so important an article of commerce, though references will also be made to natural gas which accompanies petroleum. Descriptions of the solid forms will be found in the articles on asphalt or asphaltum, albertite, elaterite, gilsonite, hatchettite and ozokerite. Particulars of the shales which yield oil on destructive distillation are given in the article on paraffin.

Ancient History. — Petroleum was collected for use in the most remote ages of which we have any records. Herodotus de- scribes the oil pits near Ardericca (near Babylon), and the pitch spring of Zacynthus (Zante), whilst Strabo, Dioscorides and Pliny mention the use of the oil of Agrigentum, in Sicily, for illumination, and Plutarch refers to the petroleum found near Ecbatana (Kerkuk). The ancient records of China and Japan are said to contain many allusions to the use of natural gas for lighting and heating. Petroleum (” burning water “) was known in Japan in the 7 th century, whilst in Europe the gas springs of the north of Italy led to the adoption in 1226 by the municipality of Salsomaggiore of a salamander surrounded by flames as its emblem. Marco Polo refers to the oil springs of Baku towards the end of the 13th century ; the medicinal proper- ties of the oil of Tegernsee in Bavaria gave it the name of ” St Quirinus’s Oil ” in 1436; the oil of Pechelbronn, Elsass, was dis- covered in 1498, and the ” earthbalsam ” of Galicia was known in 1506. The earliest mention of American petroleum occurs in Sir Walter Raleigh’s account of the

Trinidad pitch-lake in 1595; whilst thirty-seven years later, the account of a visit of a Franciscan, Joseph de la Roche d'Allion, to the oil springs of New York was published in Sagard's Histoire du Canada. In the 17 th century, Thomas Shirley brought the natural gas of Wigan, in Shropshire, to the notice of the Royal Society. In 1 7 24 Hermann Boernaave referred to the oleum terrae of Burma, and "Barbados tar" was then well known as a medicinal agent. A Russian traveller, Peter Kalm, in his work on America, published in 1748, showed on a map the oil springs of Pennsyl- vania, and about the same time Raicevich referred to the " liquid bitumen " of Rumania.

Modern Development and Industrial Progress. — The first commercial exploitation of importance appears to have been the distillation of the oil at Alfreton in Derbyshire by James Young, who patented his process for the manufacture of paraffin in 1850. In 1853 and 1854 patents for the preparation of this substance from petroleum were obtained by Warren de la Rue, and the process was applied to the " Rangoon oil " brought to Great Britain from Yenangyaung in Upper Burma. The active growth of the petroleum industry of the United States began in 1859, though in the early part of the century the petroleum of Lake Seneca, N.Y., was used as an embrocation under the

name of "Seneca oil," and the "American Medicinal Oil" of Kentucky was largely sold after its discovery in 1829. The Pennsylvania Rock Oil Company was formed in 1854, but its operations were unsuccessful, and in 1858 certain of the mem- bers founded the Seneca Oil Company, under whose direction E. L. Drake started a well on Oil Creek, Pennsylvania. After drilling had been carried to a depth of 69 feet, on the 28th of August 1859, the tools suddenly dropped into a crevice, and on the following day the well was found to have " struck oil." This well yielded 25 barrels a day for some time, but at the end of the year the output was at the rate of 15 barrels. The pro- duction of crude petroleum in the United States was officially reported to have been 2000 barrels in 1859, 4,215,000 barrels in 1869, 19,914,146 barrels in 1879, 35,163,513 barrels in 1889, 57,084,428 barrels in 1899, and 126,493,936 barrels in 1906. From Oil Creek, development spread first over the eastern United States and then became general, subsequently embracing Canada (1862), recently discovered fields being those of Illinois, Alberta and California (44,854,737 barrels in 1908).

For about 10 years Pennsylvania was the one great oil pro- ducer of the world, but since 1870 the industry has spread all over the globe. From the time of the completion on the Baku field of the first flowing well (which was unmanageable and resulted in the loss of the greater part of the oil), Russia has ranked second in the list of producing countries, whilst Galicia and Rumania became prominent in 1878 and 1880 respectively. Sumatra, Java and Borneo, where active development began in 1883, 1886 and 1896, bid fair to rank before long among the chief sources of the oil supplies of the world. Similarly, Burma, where the Burmah Oil Company have, since 1890, rapidly extended their operations, is rising to a position of importance. Oil fields are being continually opened up in other parts of the world, and whilst America still maintains her position as the largest petroleum producer, the world's supplies are now being derived from a steadily increasing number of centres.

Physical and Chemical Properties. — Although our information respecting the chemical composition of petroleum has been almost entirely gained since the middle of the 18th century, a considerable amount of empirical knowledge of the substance was possessed by chemists at an earlier date, and there was much speculation as to its origin. In his Sylva sylvarum (1627), Francis Bacon states that " the original concretion of bitumen is a mixture of a fiery and watery substance," and observes that flame " attracts " the naphtha of Babylon " afar off." P. J. Macquer (1764), T. O. Bergman (1784) Charles Hatchett (1798) and others also expressed views with regard to the constitution and origin of bitumens. Of these early writers, Hatchett is the most explicit, the various bituminous substances being by him classified and defined. Jacob Joseph Winterl, in 1788, appears to have been the first to examine petroleum chemically, but the earliest systematic investigation was that carried out by Professor B. Silliman, Jun., in 1855, who then reported upon the results which he had obtained with the " rock oil or petroleum " of Venango county, Pennsylvania. This report has become a classic in the literature of petroleum. The physical properties of petroleum vary greatly. The colour ranges from pale yellow through red and brown to black or greenish, while by reflected light it is, in the majority of cases, of a green hue. The specific gravity of crude petroleum appears to range from -771 to 1-06, and the flash point from below o° to 37o°F. Viscosity increases with density, but oils of the same density often vary greatly; the coefficient of expansion, on the other hand, varies inversely with the density, but bears no simple relation to the change of fluidity of the oil under the influence of heat, this being most marked in oils of paraffin base. The calorific power of Baku oil

appears to be highest, while this oil is poorest in solid hydrocarbons, of which the American petroleums contain moderate quantities, and the Upper Burma oils the largest amount. The boiling point, being determined by the character of the constituents of the oil, necessarily varies greatly in different oils, as do the amounts of distillate obtained from them at specified temperatures.

Even prior to the discovery of petroleum in commercial quantities, a number of chemists had made determinations of the chemical composition of several different varieties, and these investigations, supplemented by those of a later date, show that petroleum consists of about 84 % by weight of carbon with 12% of hydrogen, and varying proportions of sulphur, nitrogen and oxygen. The principal elements are found in various combina- tions, the hydrocarbons of the Pennsylvania oils being mainly paraffins (q.v.), while those of Caucasian petroleum belong for the most part to the naphthenes, isomeric with the defines (q.v.).

Paraffins are found in all crude oils, and defines in varying proportions in the majority, while acetylene has been found in Baku oil; members of the benzene group and its derivatives, notably benzene and toluene, occur in all petroleums. Naph- thenes are the chief components of some oils, as already indicated, and occur in varying quantities in many others. Certain crude oils have also been found to contain camphenes, naphthalene and other aromatic hydrocarbons. It is found that transparent oils under the influence of light absorb oxygen, becoming deeper in colour and opalescent, while strong acidity and a penetrating odour are developed, these changes being due to the formation of various acid and phenylated compounds, which are also occasionally found in fresh oils. The residues from petroleum distillation have been shown to contain very dense solids and liquids of high specific gravity, having a large proportion of carbon and possessed of remarkable fluorescent properties.

Natural gas is found to consist mainly of the lower paraffins, with varying quantities of carbon dioxide, carbon monoxide, hydrogen, nitrogen and oxygen, in some cases also sulphuretted hydrogen and possibly ammonia. This mixture dissolves in petroleum, escaping when the oil is stored, and conversely it invariably carries a certain amount of water and oil, which is deposited on compression.

Occurrence. — Bitumen is, in its various forms, one of the most widely-distributed of substances, occurring in strata of every geological age, from the lowest Archean rocks to those now in process

of deposition, and in greater or less quantity throughout both hemispheres, from Spitzbergen to New Zealand, and from California to Japan. The occurrence of commercially valuable petroleum is, however, comparatively limited, hitherto exploited deposits being confined to rocks younger than the Cambrian and older than the Quaternary, while the majority of developed oil- fields have been discovered north of the equator.

The main requisites for a productive oil or gas field are a porous reservoir and an impervious cover. Thus, while the mineral may be formed in a stratum other than that in which it is found, though in many cases it is indigenous to it, for the formation of a natural reservoir of the fluid (whether liquid or gas) it is necessary that there should be a suitable porous rock to contain it. Such a rock is typically exemplified by a coarse-grained sandstone or con- glomerate, while a limestone may be naturally porous, or, like the Trenton limestone of Ohio and Indiana, rendered so by its conversion into dolomite and the consequent production of cavities due to shrinkage — a change occurring only in the purer limestones. Similarly it is necessary, in view of the hydrostatical relations of water and mineral oils, and the volatile character of the latter, that the porous stratum should be protected from water and air by an overlying shale or other impervious deposit. Water, often saline or sulphurous, is also found in these porous rocks and re- places the oil as the latter is withdrawn.

In addition to these two necessary factors, structural conditions play an important part in determining the accumulation of oil and gas. The main supplies have been obtained from strata unbroken and comparatively undisturbed, but the occurrence of anticlinal or terrace structure, however slightly marked or limited in extent, exerts a powerful influence on the creation of reservoirs of petroleum. These tectonic arches often extend for long dis- tances with great regularity, but are frequently crossed by sub- sidiary anticlines, which themselves play a not unimportant part in the aggregation of the oil. Owing to difference of density the oil and water in the anticlines separate into two layers, the upper consisting of oil which fills the anticlines, while the water remains in the synclines. Any gas which may be present rises to the summits of the anticlines. When the slow folding of the strata is accom- panied by a gradual local descent, a modified or ” arrested ” anticlinal structure, known as a ” terrace ” is produced, the up- heaving action at that part being sufficient only to arrest the descent which would otherwise occur. The terraces may thus be regarded as flat and extended anticlines. They need not be horizontal, and sometimes have a dip of a few feet per mile, as in the case of the Ohio and Indiana oil fields, where the amount varies from

one to ten feet. These slight differences in level, however, are found to have a most powerful effect in the direction already mentioned.

It is evident that accurate knowledge of the character and structure of the rock-formations in petroliferous territories is of the greatest importance in enabling the expert to select favourable sites for drilling operations; hence on well-conducted petroleum- properties it is now customary to note the character and thickness of the strata perforated by the drill, so that a complete section may be prepared from the recorded data. In some cases the depths are stated with reference to sea-level, instead of being taken from the surface, thus greatly facilitating the utilization of the records.

Oil and gas are often met with in drilled wells under great pressure, which is highest as a rule in the deepest wells. The closed pressure- in the Trenton limestone in Ohio and Indiana is about 200-30001. per sq. in., although a much higher pressure has been registered in many wells. The gas wells of Pennsylvania indicate about double the pressure of those drilled in the Trenton limestone, 600-800 lb. not being unusual, and even 1000 lb having been recorded. The extremely high pressure under which oil is met with in wells drilled in some parts of the Russian oil fields is a matter of common knowledge, and a fountain or spouting well resulting therefrom is one of the “sights” of the country. A famous fountain in the Groznyi oil field in the northern Caucasus, which began to flow in August 1895, was estimated to have thrown up during the first three days 1,200,000 poods (over 4,500,000 gallons, or about 18,500 tons) of oil a day. It flowed continuously, though in gradually diminishing quantity, for fifteen months; afterwards the flow became intermittent. In April 1897 there was still an occasional outburst of oil and gas.

Three theories have been propounded to account for this pressure : —

1. That it results from the weight of the overlying strata.

2. That it is due to water-pressure, as in artesian wells (” hydro- static ” or ” artesian ” theory).

3. That it is caused by the compressed condition of the gradually accumulating gas.

Of these the first has been proved untenable, and while in some

instances (e.g. certain wells in Ohio), the second has held good, the third appears to be the most widely applicable.

The conditions of formation and accumulation of petroleum point to the fact that the principal oil fields of the world are merely reservoirs, which will become exhausted in the course of years, as in the case of the decreasing yield of certain of the American fields. But new deposits are continually being exploited, and there may be others as yet unknown, which would entirely alter any view that might be expressed at the present time in regard to the probable duration of the world's supply of oil and gas.

As already stated, every one of the great geological systems appears to have produced some form of bitumen, and in the follow- ing table an attempt has been made to classify on this basis the various localities in which petroleum or natural gas has been found in large or small quantities: —

Recent. — Lancashire (Down Holland Moss), Holland, Sweden, Sardinia, Kaluga (Russia), Red Sea, Mediterranean.

Pleistocene. — Schleswig-Holstein, Minnesota, Illinois, Louisiana.
Pliocene. — Spain, Italy, Albania, Croatia, Hungary, Hesse, Hanover, Transcaspia, Algeria, Florida, Alabama, California, Mexico, Peru, Victoria, New Zealand.

Miocene. — France, Switzerland, Spain, Italy, Sicily, Greece, Rumania, Turkey-in-Europe, Styria, Slavonia, Hungary, Transyl- vania, Galicia, Lower Austria, Wurttemberg, Brandenberg, West Prussia, Crimea, Kuban, Terek, Kutais, Tiflis, Elizabetpol, Siberia, Transcaspia, Mesopotamia, Persia, Assam, Burma, Anam, Japan, Philippine Islands, Borneo, Sumatra, Java, Algeria, Egypt, British Columbia, Alaska, Washington, California, Colorado, Texas, Louisiana, Barbados, Trinidad, Venezuela, Peru, South Australia, Victoria, New Zealand.

Oligocene. — France, Spain, Greece, Rumania, Hungary, Transyl- vania, Galicia, Bavaria, Elsass, Rhenish Bavaria, Hesse, Saxony, Crimea, Daghestan, Tiflis, Baku, Alaska, California, Florida.

Eocene. — Devonshire (retinasphalt), France, Spain, Italy, Asia Minor, Montenegro, Bosnia and Herzegovina, Rumania, Dalmatia, Istria, Hungary, Transylvania, Galicia, Moravia, Bavaria, Elsass, Kutais, Armenia, Persia, Baluchistan, Afghanistan, Punjab, Assam, Sumatra, Algeria, Egypt, Maryland, Colorado, Utah, Nevada, California, Louisiana, Texas, Cuba, Colombia, Brazil.

Cretaceous. — Holland, France, Switzerland, Spain, Italy, Sicily, Greece, Hungary, Silesia, Moravia, Westphalia, Brunswick, Hanover, Schleswig-Holstein, (German) Silesia, Poland, Kutais, Uralsk, Turkestan, Armenia, Syria, Arabia, Persia, Tunis, Egypt, West Africa, British Columbia, Alberta, Assiniboia, Athabasca, Manitoba, New Jersey, South Dakota, – Washington, Montana, Oklahoma, Utah, Wyoming, Colorado, California, New Mexico, Arkansas, Texas, Louisiana, Mexico, Hayti, Trinidad, Colombia, Argentina [?], New Zealand.

Neocomian. — Sussex, France, Switzerland, Spain, Hungary, Transylvania, Bukowina, Galicia, Hesse, Baden, Hanover, Bruns- wick, California, Texas, Mexico, Bolivia, Argentina.

Jurassic. — Yorkshire, Somerset, Buckingham, France, Switzer-

land, Spain, Italy, Lower Austria, Baden, Elsass, Hesse, Hanover, Brunswick, Sizran, Tiflis, Siberia, Persia, Madagascar, Alaska, Wyoming, Colorado, Mexico, Argentina.

Triassic. — Yorkshire, Staffordshire, France, Portugal, Spain, Italy, Montenegro, Upper Austria, Tyrol, Bavaria, Wurttemberg, Baden, Elsass, Lothringen, Rhenish Bavaria, Rhenish Prussia, Hanover, Brunswick, Sweden, Spitzbergen, Punjab, China, Trans- vaal, Cape Colony, Connecticut, New Jersey, Virginia, North Caro- lina, Wyoming, Argentina, New South Wales, Queensland.

Permian. — Yorkshire, Denbigh, Moravia, Bohemia, Baden, Saxony, Vologda, Afa, Kazan, Simbirsk, Samara, Kansas, Wyoming, Oklahoma, Texas (Permo-Carboniferous).

Carboniferous. — Scotland, North of England, and Midlands, Wales, France, Belgium, Carniola, Moravia, Elsass, Saxony, Perm, Sizran, China, Cape Colony, Nova Scotia, Newfoundland, Pennsyl- vania, West Virginia, Ohio, Michigan, Indiana, Illinois, Iowa, Missouri, Tennessee, Kentucky, Alabama, Kansas, Arkansas Colorado, Oklahoma, Tasmania, Victoria (Permo-Carboniferous), West Australia (Permo-Carboniferous).

Devonian. — Scotland, Devonshire, Spain, Hanover, Archangel, Vitebsk, Athabasca, Mackenzie, Ontario, Quebec, New Brunswick, Newfoundland, New York, Pennsylvania, West Virginia, Ohio, Michigan, Wisconsin, Kentucky.

Silurian. — Shropshire, Wales, Bohemia, Sweden, Esthonia, Manitoba, Ontario, Quebec, Newfoundland, New York, Pennsyl- vania [?], Ohio,

Michigan, Indiana, Illinois, Minnesota, Tennessee, Kentucky, Georgia, Alabama, Oklahoma, New Mexico, New Caledonia.

Cambrian. — Shropshire, New York. Archean. — France, Norway, Sweden, Ontario. In this list, while certain occurrences in rocks of undetermined age in little-known regions have been omitted, many of those included are of merely academic interest, and a still larger number indicate fields supplying at present only local needs. All have been arranged in geographical order without reference to productive capacity or importance. It should be pointed out that the deposits which have been hitherto of chief commercial importance occur in the old rocks (Carboniferous to Silurian) on the one hand, and in the comparatively new Tertiary formations on the other, the intermediate periods yielding but little or at any rate far less abundantly.

Origin. — The question of the origin of petroleum (and natural gas), though for the first half of the 19th century of little more than academic interest, has engaged the attention of naturalists and others for over a hundred years. As early as 1804, Humboldt expressed the opinion that petroleum was produced by distillation from deep-seated strata, and Karl Reichenbach in 1834, suggested that it was derived from the action of heat on the turpentine of pine-trees, whilst Brunet, in 1838, adumbrated a similar theory of origin on the ground of certain laboratory experiments. The theories propounded may be divided into two groups, namely, those ascribing to petroleum an inorganic origin, and those which regard it as the result of the decomposition of organic matter.

M. P. E. Berthelot was the first to suggest, in 1866, after con- ducting a series of experiments, that mineral oil was produced by purely chemical action, similar to that employed in the manu- facture of acetylene. Other theories of a like nature were brought forward by various chemists, Mendeleeff, for example, ascribing the formation of petroleum to the action of water at high tempera-, tures on iron carbide in the interior of the earth.

On the other hand, an overwhelming and increasing majority of those who have studied the natural conditions under which petroleum occurs are of opinion that it is of organic origin. The earlier sup- porters of the organic theory held that it was a product of the natural distillation of coal or carbonaceous matter; but though in a few instances volcanic intrusions appear to have converted coal or allied substances into oil, it seems that terrestrial vegetation does not generally give rise to petroleum. Among those who have considered that it is derived from the decomposition of both animal and vegetable

marine organisms may be mentioned J. P. Lesley, E. Orton and S. F. Peckham, but others have held that it is of exclusively animal origin, a view supported by such occurrences as those in the orthoceratities of the Trenton limestone, and by the experiments of C. Engler, who obtained a liquid like crude petroleum by the distillation of menhaden (fish) oil. Similarly there is a difference of opinion as to the conditions under which the organisms have been mineralized, some holding that the process has taken place at a high temperature and under great pressure; but the lack of practical evidence in nature in support of these views has led many to conclude that petroleum, like coal, has been formed at moderate temperatures, and under pressures varying with the depth of the containing rocks. This view is supported by the fact that petroleum is found on the Sardinian and Swedish coasts as a product of the decomposition of seaweed, heated only by the sun, and under atmospheric pressure.

Consideration of the evidence leads us to the conclusion that, at least in commercially valuable deposits, mineral oil has generally been formed by the decomposition of marine organisms, in some cases animal, in others vegetable, in others both, under practically normal conditions of temperature and pressure.

PETROLEUM

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Derrick.

Extraction (Technically termed Production.) — The earliest system adopted for the collection of petroleum appears to have consisted in skimming the oil from the surface of the water upon Mth /* which it had accumulated, and Professor Lesley states Methods. that at p amt Creek, in Johnson county, Kentucky, a Mr George and others were in the habit of collecting oil from the sands, ” by making shallow canals loo or 200 ft. long, with an up- right board and a reservoir at one end, from which they obtained as much as 200 barrels per year by stirring the sands with a pole.” It is said that at Echigo in Japan, old wells, supposed to have been dug several hundred years ago, are existent, and that a Japanese history — called Kokushiriyaku, states that ” burning water ‘ was obtained in Echigo about a.d. 615.

The petroleum industry in the United States may be considered to date from the year 1859, when the first well avowedly drilled for the

production of oil was completed by E. L. Drake. The United -j-jˆ p resent method of drilling has been evolved from 3 eSw the artesian well system previously adopted for obtain- ing brine and water. The drilling of petroleum wells is carried on by individuals or companies, either on lands owned by them, or on properties whose owners grant leases, usually on condition that a certain number of wells shall be sunk within a stated period, and that a portion of the oil obtained (usually from one-tenth to one-fourth) shall be appropriated as royalty to the lessor. Such leases are often transferred at a larger royalty, especially after the territory has been proved productive. The ” wild-cat ” wells, sunk by speculators on untested territory or on lands which had not previously proved productive, played an important part in the earlier mapping out of the petroleum fields. To discourage the sinking of wells on land immediately adjoining productive territory, it has been usual to drill along the borders of the land as far as practicable, in order to first obtain the oil which might otherwise be raised by others; and on account of the small area often con- trolled by the operator, the number of wells drilled has frequently been far in excess of the number which might reasonably be sunk. Experience has proved that in some of the oil fields of the United States one well to five acres is as close as they should be drilled. _ •

After the selection of the site, the first operation consists in the erection of the rig. The chief portion of this rig is the derrick, which consists of four strong uprights or legs held in position by ties and braces, and resting on strong wooden sills, which are preferred, as a foundation, to masonry. For drilling the deeper wells, the derrick, on account of the length of the ” string ” of drilling tools, is usually at least 70 ft. high, about 20 ft. wide at the base, and 4 ft. wide at the sum- mit. The whole derrick is set up by keys, no mortices or tenons being used, and thus the complete rig may be readily taken down and set up on a new site. The samson-post, which supports the walking beam, and the jack-posts, are dove-tailed and keyed into the sills. The samson-post is placed flush with one side of the main sill, the band-wheel jack-post being flush with the other side, so that the walking-beam, which imparts motion to the string of tools, works parallel with the main sill.

The boiler generally used is of the locomotive type and is usually stationary, though sometimes a portable form is preferred. It is either set in the first instance at some distance from the engine and well, or is subsequently removed sufficiently far away before the drill enters the oil-bearing formation, and until the oil and gas are under control, in order to minimize the risk of fire. A large boiler frequently supplies the engines of several wells. The engine, which is provided with

reversing gear, is of 12 or 15 horse-power and motion is communicated through a belt to the band-wheel, which operates the walking-beam by means of a crank. The throttle-valve is opened or closed by turning a grooved vertical pulley by means of an endless cord, called the telegraph, passing round another pulley fixed upon the ” headache-post,” and is thus under the control of the driller working in the derrick. The head- ache-post is a vertical wooden beam placed on the main sill directly below the walking-beam, to receive the weight of the latter in case of breakage of connexions. The position of the reversing link is altered by means of a cord, passing over two pulleys, fixed re- spectively in the engine-house and on the derrick. At one end of the band-wheel shaft is the bull-rope pulley, and upon the other end is a crank having six holes to receive a movable wrist-pin, the length of stroke of the walking-beam being thus adjusted. The revolution of the bull-wheels is checked by the use of a powerful hand-brake.

The band-wheel communicates .motion to the walking-beam, while drilling is in progress, through the crank and a connecting- rod known as the pitman ; to the bull-wheels, while the tools are being raised, by the bull-rope; and to the sand-pump reel, by a friction pulley, while the sand-pump is being used. It is therefore necessary that the machinery should be so arranged that the con- nexions may be rapidly made and broken. The sand-pump reel is set in motion bv pressing a lever, the reel being then brought inlo contact with the face of the band- wheel. The sand-pump descends bv gravitation, and its fall is checked by pressing back the l< >ver, so as to throw the reel against a post which serves as a brake.

The drilling tools are suspended by an untarred manila rope, 2 in. in diameter, passing from the bull-wheel shaft over a grooved wheel known as the crown-pulley, at the summit of the derrick. The string of drilling tools consists of two z, . % parts separated by an appliance known as the jars. tools. This piece of apparatus was introduced by William Morris in 1 831, and consists of a long double link with closely-fitting jaws which, however, slide freely up and down. It may be compared to a couple of elongated and flattened links of chain. The links are about 30 in. long and are interposed between the heavy iron auger- stem carrying the bit and the upper rod, known as the sinker-bar. Their principal use is to give a sharp jar to the drill on the up-stroke so that the bit is dislodged if it has become jammed in the rock. In addition to the appliances mentioned the tools comprise reamers to enlarge the bore of the well, the winged-substitute which is fitted above the bit to prevent it from glancing off, and above the round reamer to keep it in ulace, a temper-screw with clamps and wrenches.

Sand-pumps and bailers are also required to remove detritus, water and oil from the bore-hole.

The action of the jars and temper-screw has been described by John F. Carll as follows: ” Suppose the tools to have been just run to the bottom of the well, the jars closed and the cable slack. The men now take hold of the bull-wheels and draw up the slack until the sinker-bar rises, the ‘ play ‘ of the jars allowing it to come up 13 in. without disturbing the auger-stem. When the jars come together they slack back about 4 in., and the cable is in position to be clamped in the temper-screw. If now the vertical movement of the walking-beam be 24 in., when it starts on the up-stroke the sinker-bar rises 4 in., and the cross-heads come together with a smart blow, then the auger-stem is picked up and lifted 20 in. On the down-stroke, the auger-stem falls 20 in., while the sinker- bar goes down 24 in. to telescope the jars for the next blow coming up. A skilful driller never allows his jars to strike on the down- stroke, they are only used to jar down when the tools stick on some obstruction in the well before reaching the bottom, and in fishing operations. An unskilful workman sometimes ‘ loses the jar ‘ and works for hours without accomplishing anything. The tools may be standing at the bottom while he is playing with the slack of the cable or they may be swinging all the time several feet from the bottom. As the jar works off, or grows more feeble, by reason of the downward advance of the drill, it is ‘ tempered ‘ to the proper strength by letting down the temper-screw to give the jars more play. The temper-screw forms the connecting link between the walking-beam and cable, and it is ‘ let out ‘ gradually to regulate the play of the jars as fast as the drill penetrates. When its whole length is run down, the rope clamps play very near the well-mouth. The tools are then withdrawn, the well is sand-pumped, and pre- parations are made for the next ‘ run.’ ”

The ordinary sand-pump or bailer, consists of a plain cylinder of light galvanized iron with a bail at the top and a stem-valve at the bottom. It is usually about 6 ft. in length but is sometimes as much as 15 or 20 ft., and as its valve-stem projects downwards beyond the bottom, it empties itself when rested upon the bottom of the waste-trough.

The operation of drilling is frequently interrupted by the occur- rence of an accident, which necessitates the use of fishing tools. If the fishing operation is unsuccessful the well has to be abandoned, often after months of labour, unless it is found possible to drill past the tools which have been lost. In readiness for a fracture of the drilling tools or of the cable, special appliances known as fishing tools are provided. These are so numerous and varied in form that a description would be

impossible within the scope of this article. The fishing tools are generally attached to the cable, and are used with portions of the ordinary string of tools, but some arc fitted to pump-rods or tubing, and others to special rods.

The drilling of a well is commonly carried out under contract, the producer erecting the derrick and providing the engine and boiler while the drilling contractor finds the tools, and is responsible for accidents or failure to complete the Dj[’” la g tne well. The drilling ” crew ” consists of two drillers ” e “* and two tool-dressers, working in pairs in two ” tours ” (noon to midnight and midnight to noon).

The earlier wells in Pennsylvania consisted of three sections, the first formed of surface clays and gravels, the second of stratified rocks containing water, and the third of stratified rocks, including the oil-sands, usually free from water. The conductor, which was a wooden casing of somewhat greater internal diameter than the maximum bore of the well, passed through the first of these divisions, and casing was used in the second to prevent percolation of water into the oil-bearing portion. In later wells the conductor has been replaced with an 8-in. wrought-iron drive-pipe, terminating in a steel shoe, which is driven to the bed-rock, and a 7f-in. hole is drilled below it to the base of the lowest water-bearing stratum. The bore is then reduced to 5f-“‘n., and a bevelled shoulder being made in the rock, a 5}- in. casing, having a collar to fit water-tight on the bevel shoulder, is inserted. The well is then completed with a ˆ” in. bit. As the water is shut off before the portion of the well below the water-bearing strata i« bored the remainder of the drilling is conducted with only sufficient water in the well to

admit of sand-pumping. The drill is thus allowed to fall freely, instead of being partly upheld by the buoyancy of the water, as in earlier wells.

Wells in Pennsylvania now range in depth from 300 ft. to 3700 ft. Four strings of iron casing are usually employed, having the following diameters: 10 in., 8\ in., 6\ in. and 5 in., the lengths of tube forming the casing being screwed together. Contractors will often undertake to drill wells of moderate depth at 90 cents to $1 per foot, but the cost of a deep well may amount to as much as $7000.

The rotary system of drilling which is in general use in the oil- fields of the coastal plain of Texas is a modification of that invented notary ˆy Fauvelle in 1845, and used in the early years of the System industry in some of the oil-producing countries of ‘ Europe. It is one of the most rapid and economical which can be employed in soft formations, but where hard rock is encountered it is almost useless. The principle of this system consists essentially in the use of rotating hollow drilling rods or casing, to which is attached the drilling-bit and through which a continuous stream of water, under a pressure of 40 to 100 lb. per sq. in., is forced.

The yield of petroleum wells varies within very wide limits, and the relative importance of the different producing districts is also Yield of constantly changing. I. C. White, state geologist_ of Wells. West Virginia, estimates that in fairly good producing

sand a cubic foot of rock contains from 6 to 12 pints of oil. He assumes that in what is considered a good producing district the amount of petroleum which can be obtained from a cubic foot of rock would not be more than a gallon, and that the average thickness of the oil-bearing rock would not exceed 5 ft. Taking these figures as a basis, the total yield of oil from an acre of petroliferous territory would be a little over 5000 barrels of 42 U.S. gallons.

A flow of oil may often be induced in a well which would otherwise require to be pumped, by preventing the escape of gas which issues with the oil, and causing its pressure to raise the oil. The device employed for this purpose is known as the water-packer, and consists in its simplest form of an india-rubber ring, which is applied between the tubing and the well-casing, so that upon compression it makes a tight joint. The gas thus confined in the oil-chamber forces the oil up the tubing.

For pumping a well a valved working-barre.1 with valved sucker is attached to the lower end of the tubing, a perforated ““anchor ” being placed below. The sucker carries a series of three or four leather cups, which are pressed against the inner surface of the working barrel by the weight of the column of oil. The sucker is connected by a string of sucker-rods with the walking- beam. There is usually fixed above the sucker a short iron valve- rod, with a device known as a rivet-catcher to prevent damage to the pump by the dropping of rivets from the pump-rods.

On the completion of drilling, or when the production is found to decrease, it is usual to torpedo the well to increase the flow. To rpe(Jo

i no- The explosive employed is generally nitroglycerin, Wells an tne amount used has been increased from the

original 4 to 6 quarts to 60, 80, 100 and even 200 quarts. It is placed in tin canisters of about 35 to 5 in. in diameter and about 10 ft. in length. The canisters have conical bottoms and fit one in the other. They are consecutively filled with nitro- glycerin, and are lowered to the bottom of the well, one after the other, by a cord wound upon a reel, until the required number have been inserted. Formerly the upper end of the highest canister was fitted with a ” firing-head,” consisting of a circular plate of iron, slightly smaller than the bore of the well, and having attached to its underside a vertical rod or pin carrying a percussion cap. The cap rested on the bottom of a small iron cylinder containing nitroglycerin. To explode the charge an iron weight, known as a go-devil, was dropped into the well, and striking the disk exploded the cap and fired the torpedo. Now, however, a miniature torpedo known as a go-devil squib, holding about a quart of nitro- glycerin, and having a firing-head similar to that already described, is almost invariably employed. The disk is dispensed with, and the percussion cap is exploded by the impact of a leaden weight running on a cord. The squib is lowered after the torpedo, and, when exploded by the descent of the weight, fires the charge. It must be borne in mind that although the explosion may increase the production for a time, it is by no means certain that the actual output of a well is increased in all such cases, though from some wells there would be no production without the use of the torpedo.

The petroleum industry in Canada is mainly concentrated in the district of Petrolea, Ontario. On account of the small [Millar In depth of the wells, and the tenacious nature of the Canada. principal strata bored through, the Canadian method of drilling differs from the Pennsylvanian or American system in the following particulars: —

1. The use of slender wooden boring-rods instead of a cable.

2. The employment of a simple auger instead of a spudding-bit.

3. The adoption of a diffeient arrangement for transmitting motion.

4. The use of a lighter set of drilling tools.

Although petroleum wells in Russia have not the depth of many

of those in the United States, the disturbed character of the strata. with consequent liability to caving, and the occurrence of hard concretions, render drilling a lengthy and expensive Drilling la

operation. It is usual to begin by making an excava- R uss i a4 tion 8 ft. in diameter and 24 ft. in depth, and lining the sides of this with wood or brick. The initial diameter of the well drilled from the bottom of this pit is in some instances as much ae 36 in., bore-holes of the larger size being preferred, as they are less liable to become choked, and admit of the use of larger bailers for raising the oil.

The drilling of wells of large size requires the use of heavy tools and of very strong appliances generally. The system usually adopted is a modification of the Canadian system already described, the boring rods being, however, of iron instead of wood, but the cable system has also to some extent been used. For the ordinary 2-in. plain-laid manila cable a wire rope has in some cases been successfully substituted.

Rivetted iron casing, made of ˆ-in. plate, is employed, and is constantly lowered so as to follow the drill closely, in order to prevent caving. Within recent years, owing to the initiative of Colonel English, a method of raising oil by the agency of com- pressed air has been introduced into the Baku oil-fields.

In Gahcia the Canadian system is nearly exclusively adopted. In some instances under-reaming is found necessary. This consists in the use of an expanding reamer by means of which Orllloglg the well may be drilled to a diameter admitting of the Qajida. casing descending freely, which obviously could not be accomplished with an ordinary bit introduced through the casing. Of late years the under-reamer has been largely superseded by the eccentric bit.

The Davis calyx drill has also been employed for petroleum drilling. This apparatus may be described as a steel-pointed core- drill. The bit or cutter consists of a cylindrical Tne Ca i yx metallic shell, the lower end of which is made, by a £j r ;// # process of gulleting, into a series of sharp teeth, which are set in and out alternately. The outward set of teeth drill the hole large enough to permit the drilling apparatus to descend freely, and the teeth set inwardly pare down the core to such a diameter as will admit of the body of the cutter passing over it without seizing. The calyx is a long tube, or a series of connected tubes, situated above the core barrel, to which it is equal in diameter.

In conclusion it may be stated that the two systems of drilling for petroleum with which by far the largest amount of work has been, and is being done, are the American or rope comparison system, and the Canadian or rod system. The former of systems. is not only employed in the United States, but is in use in Upper Burma, Java, Rumania and elsewhere. The latter was introduced by Canadians into Galicia and,

with certain modifi- cations, has hitherto been found to be the best for that country. A form of the rod system is used in the Russian oil-fields, but owing to the large diameter of the wells the appliances differ from those employed elsewhere.

The wells from which the supplies of natural gas are obtained in the United States are drilled and cased in the same manner as the oil wells.

Transport and Storage. — In the early days of the petroleum industry the oil was transported in the most primitive manner. Thus, in Upper Burma, it was conveyed in earthenware vessels from the wells to the river bank, where it was poured into the holds of boats. It is interesting to find that a rude pipe-line formerly existed in this field for conveying the crude oil from the wells to the river; this was made of bamboos, but it is said that the loss by leakage was so great as to lead to its immediate abandonment on completion. In Russia, until 1875, the crude oil was carried in barrels on Persian carts known as ” arbas.” These have two wheels of 8J to 9 ft. in diameter, the body carrying one barrel, while another is slung beneath the axle. In America, crude petroleum was at first transported in iron-hooped barrels, holding from 40 to 42 American gallons, which were carried by teamsters to Oil Creek and the Allegheny River, where they were loaded on boats, these being floated down stream whenever sufficient water was present — a method leading to much loss by collision and grounding. Bulk barges were soon introduced on the larger rivers, but the use of these was partially rendered unnecessary by the introduction of railways, when the oil was at first transported in barrels on freight cars, but later in tank-cars. These at first con- sisted of an ordinary truck on which were placed two wooden tub-like tanks, each holding about 2000 gallons ; they were replaced in 1 87 1 by the modern type of tank-car, constructed with a hori- zontal cylindrical tank of boiler plate.

The means of transporting petroleum in bulk commonly used at the present day is the pipe-line system, the history of which dates from i860. In that year S. D. Karns suggested laying a 6-in. pipe from Burning Springs to Parkersburg, West Virginia, a distance of 36 m. ; but his proposal was never carried into effect. Two years later, however, L. Hutchinson of New York, laid a short line from the Tarr Farm wells to the refinery, which passed over a hill, the oil being moved on the syphon principle, and a year later con- structed another three miles long to the railway. These attempts were, however, unsuccessful, on account of the excessive leakage

at the joints of the pipes. With the adoption of carefully fitted screw-joints in 1865 the pipe line gradually came into general use, until in 1891 the lines owned by the various transit companies of Pennsylvania amounted in length to 25,000 m

The pumps employed to force the oil through the pipes were at first of the single-cylinder or ” donkey ” type, but these were found to cause excessive wear — a defect remedied by the use of the Worthington pump now generally adopted. The engines used on the main 6-in. lines are of 600 to 800 h.p., while those on the small-diameter local lines range from 25 to 30 h.p.

Tanks of various types are employed in storing the oil, those at the wells being circular and usually made of wood, with a content of 250 barrels and upwards. Laige tanks of boiler-plate are used to receive the oil as it comes through the pipe-lines Those adopted by the National Transit Company are 90 ft. in diameter and 30 ft. high, with slightly conical wooden roofs covered with sheet iron; their capacity is 35,000 barrels, and they are placed upon the carefully levelled ground without any foundation.

Kerosene is transported in bulk by various means; specially constructed steel tank barges are used on the waterways of the United States, tank-cars on the railroads, and tank-wagons on the roads. The barrels employed in the transport of petroleum pro- ducts are made of well-seasoned white-oak staves bound by six or eight iron hoops. They aie coated internally with glue, and painted in the well-known colours, blue staves and white heads. The tins largely used for kerosene are made by machinery and contain 5 American gallons. They are hermetically sealed for transport.

In Canada, means of transport similar to those already described are employed, but the reservoirs for storage often consist of excava- tions in the soft Erie clay of the oil district, the sides of which are supported by planks.

The primitive methods originally in use in the Russian oil-fields have already been described; but these were long ago supeiseded by pipe-lines, while a great deal of oil is carried by tank steamers on the Caspian to the mouth of the Volga where it is transferred to barges and thence at Tzaritzin to railway tank-cars. The American type of

storage-tank is generally employed, in conjunction with clay-lined reservoirs.

Natural gas is largely used in the United States, and for some time, owing to defective methods of storage, delivery and con- sumption, great waste occurred. The improvements introduced in 1890 and 1891. whereby this state of affairs was put an end to, consisted in the introduction of the principle of supply by meter, and the adoption of a comprehensive system of reducing the initial pressure of the gas, so as to diminish loss by leakage. For the latter purpose, Westinghouse gas-regulators are employed, the positions of the regulators being so chosen as to equalize the pressure throughout the service. The gas is distributed to the consumer from the wells in wrought-iron pipes, ranging in diameter from 20 in. down to 2 in. Riveted wrought-iron pipes 3 ft. in diameter are also used. The initial pressure is sometimes as high as 400 lb to the sq. in., but usually ranges from 200 to 300 lb. The most common method of distribution in cities and towns is by a series of pipes from 12 in. down to 2 in. in diameter, usually carrying a pressure of about 4 oz. to the sq. in. To these pipes the service-pipes leading into the houses of the consumers are connected. Refining of Petroleum. — The distillation of petroleum, especially of such as was intended for medicinal use, was regularly carried on in the 18th century, and earlier. V. I. Ragozin states in his work on the petroleum industry that -Johann Lerche, who visited the Caspian district in 1735, found that the crude Caucasian oil required to be distilled to render it satisfactorily combustible, and that, when distilled, it yielded a bright yellow oil resembling a spirit, which readily ignited. As early as 1823 the brothers Dubinin erected a refinery in the village of Mosdok, and in 1846 applied to Prince Woronzoff for a subsidy for extending the use of petroleum-distillates in the Caucasus. In their application, which was unsuccessful, they stated that they had taught the Don Cossacks to ” change black naphtha into white,” and showed by a drawing, pieserved in the archives cf the Caucasian government, how this was achieved. They used an iron still, set in brickwork, and from a working charge of forty ” buckets ” of crude petroleum obtained a yield of sixteen buckets of ” white naphtha.” The top of the still had a removable head, connected with a condenser consisting of a copper worm in a barrel of water. The ” white naphtha ” was sold at Nijni Novgorod without further treatment.

Some of the more viscous crude oils obtained in the United States are employed as lubricants under the name of ” natural oils,” either without any treatment or after clarification by subsi- dence and filtration through animal charcoal. Others are deprived of a part of their more volatile constituents by spontaneous evaporation, or by

distillation, in vacuo or otherwise, at the lowest possible temperature. Such are known as ” reduced oils.”

In most petroleum-producing countries, however, and particu- larly where the product is abundant, the crude oil is fractionally distilled, so as to separate.it into petroleum spirit of various grades, burning oils, gas oils, lubricating oils, and (if the crude oil yields that product) paraffin. The distillates obtained are usually purified by treatment, successively, with sulphuric acid and solution of caustic soda, followed by washing with watet.

Crude petroleum was experimentally distilled in the United States in 1833 by Prof. Siliiman (d. 1864), and the refining of petroleum in that country may be said to date from about the year 1855, when Samuel M. Kier fitted up a small refinery with a five-barrel still, for the treatment of the oil obtained from his father’s salt- wells. At this period the supply of the raw material was insuf- ficient to admit of any important development in the industry, and before the drilling of artesian wells for petroleum was initiated by Drake the ” coal-oil ” or shale-oil industry had assumed con- siderable proportions in the United States. Two large refineries, one on Newtown Creek, Long Island, and another in South Brooklyn, also on Long Island, were in successful operation when the abundant pioduction of petroleum, which immediately followed the completion of the Drake well, placed at the disposal of the refiner a materia! which cculd be worked more profitably than bituminous shale. The existing refineries were accordingly altered so as to adapt them for the refining cf peti oleum; but in the manufacture of burning oil fiom petroleum the small stills which had been in use in the distillation of shale-oil wete at first employed.

In the earlier refineries the stills, the capacity of which varied from 25 to 80 barrels, usually consisted of a vertical cylinder, constructed of cast- or wrought-iron, with a boiler-plate bottom and a cast-iron dome, on which the ” goose-neck ” was bolted. The charge was distilled almost tc dryness, though the operation was not carried far enough to cause the residue to ” coke.” The operation was, however, completely revolutionized in the United States by the introduction of the ” cracking process,” and by the division of the distillation into two parts, one consisting in the removal of the more volatile constituents of the oil, and the other in the distillation (which is usually conducted in separate stills) of the residues from the first distillation, for the pioduction of lubricating oils and paraffin.

Various arrangements have been proposed and patented for the

continuous distillation of petroleum, in which crude oil is supplied to a range of stills aˆ, fast as the distillates pass off. The system is largely employed in Russia, and its use has been frequently attempted in the United States, but the results have not been satisfactoiy, on account, it is said, of the much greater quantity of dissolved gas contained in the American oil, the laiger proportion of kerosene which such oil yields, and the less fluid character of the residue.

In the United States a horizontal cylindrical still is usually employed in the distillation of the spirit and kerosene, but what is known as the ” cheese-box ” still has also been largely used. American stills of the former type are constructed of wrought-iron or steel, and are about 30 ft. in length by 12 ft. 6 in. in diameter, with a dome about 3 ft. in diameter, furnished with a vapour-pipe 15 in. in diameter The charge for such a still is about 600 barrels. The stills were formerly completely bricked in, so that the vapours should be kept fully heated until they escaped to the condenser, but since the introduction of the ” cracking process,” the upper part has usually been left exposed to the air. The cheese-box still has a vertical cylindrical body, which may be as much as 30 ft. in diameter and 9 ft. in depth, connected by means of three vertical pipes with a vapour-chest furnished with a large number, frequently as many as forty, of 3-in. discharge-pipes arranged in parallel lines. The stills employed in Russia and Galicia are usually smaller than those already described.

The ” cracking ” process, whereby a considerable quantity of the oil which is intermediate between kerosene and lubricating oil is converted into hydrocarbons of lower specific gravity and boiling-point suitable for illuminating purposes, is one of great scientific and technical interest. It is generally understood that the products of fractional distillation, even in the laboratory, are not identical with the hydrocarbons present in the crude oil, but are in part produced by the action of heat upon them. This was plainly stated by Professor Siliiman in the earliest stages of develop- ment of the American petroleum industry. An important paper bearing on the subject was published in 1871, by T. E. Thorpe and J. Young, as a preliminary note on their experiments on the action of heat under pressure on solid paraffin. They found that the paraffin was thus converted, with the evolution of but little gas, into hydrocarbons which were liquid at ordinary temperatures. In an experiment on 3500 grams of paraffin pioduced from shale (melting point 44”5 ° C.) they obtained nearly 4 litres of liquid hydro- carbons, which they subjected to fractional distillation, and on examining the fraction distilling below 100 C, they found it to consist mainly of olefines. The hydrocarbon C20H42. for example, might be resolved into CsHˆ + CisHso, or CeHu + CuHis, or

C7H16 + C13H26, &c, the general equation of the decomposition being—

C„H 2tl + .2 (paraffin) = C»_pH2(n_j,) + j (paraffin) -fC p H2 P (define).

The product actually obtained is a mixture of several paraffins and several olefines.

The cracking process practically consists in distilling the oils at a temperature higher than the normal boiling point of the con- stituent* which it is desired to decompose. This may be brought about by a distillation under pressure, or by allowing the condensed distillate to fall into the highly heated residue in the still. The result of this treatment is that the comparatively heavy oils

undergo dissociation, as shown by the experiments of Thorpe and Young, into specifically lighter hydrocarbons of lower boiling points, and the yield of kerosene from ordinary crude petroleum may thus be greatly increased. A large number of arrangements for carrying out the cracking process have been proposed and patented, probably the earliest directly bearing on the subject being that of James Young, who in 1865 patented his ” Improvements in treating hydrocarbon oils.” In this patent, the distillation is described as being conducted in a vessel having a loaded valve or a partially closed stop-cock, through which the confined vapour escapes under any desired pressure. Under such conditions, distillation takes place at higher temperatures than the normal boiling-points of the constituent hydrocarbons of the oil, and a partial cracking results. The process patented by Dewar and Redwood in 1889 consists in the use of a suitable still and condenser in free communication with each other — i.e. without any valve between them — the space in the still and condenser not occupied by liquid being charged with air, carbon dioxide or other gas, under the required pressure, and the condenser being provided with a regulated outlet for con- densed liquid. An objectionable feature of the system of allowing the vapour to escape from the still to the condenser through a loaded valve, viz : the irregularity of the distillation, is thus removed, and the benefits of regular vaporization and condensation under high pressure are obtained. In the American petroleum refineries it is found that sufficient cracking can be produced by slow distillation in stills of which the upper part is sufficiently cool to allow

of the condensation of the vapours of the less volatile hydrocarbons, the condensed liquid thus falling back into the heated body of oil.

In the earlier stages of the development of the manufacture of mineral lubricating oils, the residues were distilled in cast-iron stills, and the lubricating properties of the products thus obtained were injured by overheating. The modern practice is to employ horizontal cylindrical wrought-iron or steel stills, and to introduce steam into the oil. The steam is superheated and may thus be heated to any desired temperature without increase of pressure, which would be liable to damage the still. The steam operates by carrying the vapours away to the condenser as fast as they are generated, the injury to the products resulting from their remaining in contact with the highly-heated surface of the still being thus prevented.

In order to separate the distillate into various fractions, and to remove as much of it as possible free from condensed steam, it is now usual to employ condensing appliances of special form with outlets for running off the different fractions.

The process of distillation of lubricating oils under reduced atmospheric pressure is now in very general use, especially for obtaining the heavier products. The vapours from the still pass through a condenser into a receiver, which is in communication with the exhauster.

The products obtained by the distillation of petroleum are not in a marketable condition, but require chemical treatment to remove acid and other bodies which impart a dark colour as well as an unpleasant odour to the liquid, and in the case of lamp-oils, reduce the power of rising in the wick by capillary attraction.

At the inception of the industry kerosene came into the market as a dark yellow or reddish-coloured liquid, and in the first instance, the removal of colour was attempted by treatment with soda lye and lime solution. It was, however, found that after the oil so purified had been burned in a lamp, for a short time, the wick became encrusted, and the oil failed to rise properly. Eichler, of Baku, is stated to have been the first to introduce, in Russia, the use of sulphuric acid, followed by that of soda lye, and his process is in universal use at the present time. The rationale of this treatment is not fully understood, but the action appears to consist in the separation or decomposition of the aromatic hydrocarbons, fatty and other acids, phenols, tarry bodies, &c, which lower the quality of the oil, the sulphuric acid removing some, while the caustic soda takes out the remainder, and neutralizes the acid

which has been left in the oil. This treatment with acid and alkali is usually effected by agitation with compressed air. Oils which contain sulphur-compounds are subjected to a special process of refining in which cupric oxide or litharge is employed as a desulphurizing agent.

Testing. — A large number of physical and chemical tests are applied both to crude petroleum and to the products manufactured therefrom. The industry is conducted upon a basis of recognized standards of quality, and testing is necessary in the interests of both refiner and consumer, as well as compulsory in connexion with the various statutory and municipal regulations.

In the routine examination of crude petroleum it is customary to determine the specific gravity, and the amount of water and earthy matter in suspension; the oil is also frequently subjected to a process of fractional distillation in order to ascertain whether there has been any addition of distilled products or residue. Petroleum spirit is tested for specific gravity, range of boiling- points, and results of fractional distillation. To illuminating oil or kerosene a series of tests is applied in order that the colour, odour, specific gravity and flash-point or fire-test may be recorded. In the testing of mineral lubricating oils the viscosity, flash-point,

" cold-test," and specific gravity are the characters of chief importance. Fuel oil is submitted to certain of the foregoing tests and in addition the calorimetric value is determined. Paraffin wax is tested for melting-point (or setting-point), and the semi- refined product is further examined to ascertain the percentage of oil, water and dirt present.

• In civilized countries provision is made by law for the testing of the flash-point or fire-test of lamp-oil (illuminating oil or kerosene), the method of testing and the minimum limit of flash-point or fire-test being prescribed (see below, Legislation).

The earliest form of testing instrument employed for this purpose was that of Giuseppe Tagliabue of New York, which consists of a glass cup placed in a copper water bath heated by a spirit lamp. The cup is filled with the oil to be tested, a thermometer placed in it and heat applied, the temperatures being noted at which, on passing a lighted splinter of wood over the surface of the oil, a flash occurs, and after further heating, the oil ignites. The first temperature is known as the flash-point, the second as the " fire-test." Such an apparatus, in which the oil-cup is uncovered, is known as an open-test instrument. In Saybolt's Electric Tester (1879) ignition is effected by a spark from an

induction-coil passing between platinum points placed at a fixed distance above the oil.

Before long, however, it was found that the open-cup tests (though they are employed in the United States and elsewhere at the present time) were often very untrustworthy. Accordingly Keates proposed the substitution of a closed cup in 1871, but his suggestions were not adopted. In 1875 Sir Frederick Abel, at the request of the British Government, began to investigate the matter, and in August 1879 the " Abel test " was legalized. This apparatus has an oil-cup consisting of a cylindrical brass or gun- metal vessel, the cover of which is provided with three rectangular holes which may be closed and opened by means of a perforated slide moving in grooves; the movement of the slide causes a small oscillating colza- or rape-oil lamp to be tilted so that the flame (of specified size) is brought just below the surface of the lid. The oil-cup is supported in a bath or heating-vessel, consisting of two flat-bottomed copper cylinders, to contain water, heated by a spirit lamp, and provided with an air-space between the water-vessel and the oil-cup. Thermometers are placed in both oil-cup and water-bath, the temperature of the latter being raised to 130 at the commencement of the test, while the oil is put in at about 6o° F. Testing is begun when the temperature reaches 66° by slowly drawing the slide open and reclosing it, the speed being regulated by the swing of a pendulum supplied with the instrument. It has been found that variations in barometric pressure affect the flash-point and accordingly corrections have to be made in obtaining strictly comparative results at different pressures. The Abel-Pensky instrument, used in India and in Germany, differs only in being provided with a clockwork arrangement for moving the slide. Numerous other forms of open-test and close-test instruments have from time to time been devised, some of which are in use in the United States and in other countries.

It is still customary to determine the open flash-point and fire- test of lubricating oils, but the close flash-point is also usually ascer- tained, a modification of the Abel or Abel-Pensky apparatus, known as the Pensky-Martens, having been devised for the purpose. This instrument is so constructed that the higher temperature needed can be readily applied, and it is fitted with a stirrer to equalize the heating of the contents of the oil-cup.

For the testing of the viscosity of lubricating oils the Boverton Redwood standardized viscometer is generally employed in Great Britain. By means of this instrument the time occupied in the flow of a measured quantity of the oil through a small orifice at a given

temperature is measured.

Uses. — Petroleum has very long been known as a source of light and heat, while the use of crude oil for the treatment of wounds and cutaneous affections, and as a lubricant, was even more general and led to the raw material being an article of commerce at a still earlier date. For pharmaceutical purposes crude petroleum is no longer generally used by civilized races, though the product vaseline is largely employed in this way, and emulsions of petroleum have been administered internally in various pectoral complaints ; while the volatile product termed rhigolene has been largely used as a local anaesthetic.

For illuminating purposes, the most extensively-used product is kerosene, but both the more and the less volatile portions of petroleum are employed in suitable lamps. Petroleum products are also largely utilized in gas manufacture for, (1) the production of " air-gas," (2) the manufacture of oil-gas, and (3) the enrich- ment of coal-gas. For heating purposes, the stoves employed are practically kerosene lamps of suitable construction, though gasoline is used as a domestic fuel in the United States. The use of petroleum as liquid fuel is dealt with under Fuel, as is the employment of its products in motors, which has greatly

ino eased the demand for petroleum spirit. Petroleum has largely superseded other oils, and is still gaining ground, as a lubricant for machinery and railway rolling-stock, either alone or in admixture with fixed oils. The more viscous descriptions of mineral oils have also been found suitable for use in the Elmore process of ore-concentration by oil.

Legislation. — Since the inception of the petroleum industry, most civilized countries have prescribed by law a test of flash-point or inflammability, designed in most cases primarily to afford a definition of oils for lighting purposes which may be safely stored without the adoption of special precautions. In the United Kingdom the limit has, for the purpose in question, been fixed by the legislature at 73° F., by the " Abel-test," which is the equivalent of the former standard of 100 F. by the " open-test." While the subject of the testing of petroleum for legislative purposes has been investigated in Great Britain by committees of both branches of the legislature, with a view to change

in the law, the standard has never been raised, since such a course would tend to reduce the available supply and thus lead to increase in price or deterioration in quality. Moreover the chief object of the Petroleum Acts passed in the United Kingdom has hitherto been to regulate storage, and it has always been possible to obtain oils either of higher or lower flash-point, when such are preferred, irrespective of the legal standard, in addition to which it may be asserted that in a properly constructed lamp used with reasonable care the ordinary oil of commerce is a safe illuminant. The more recent legislation with regard to ” petroleum spirit ” relates mainly to the quantity which may be stored for use on ” light locomotives.”

The more important local authorities throughout the country have made regulations under the powers conferred upon them by the Petroleum Acts, with the object of regulating the ” keeping, sale, conveyance and hawking ” of petroleum products having a flash-point below 73 ° F., and the Port of London authority, together with other water-way and harbour authorities in the United King- dom, have their own by-laws relating to the navigation of vessels carrying such petroleum.

In other countries the flash-pomt standards differ considerably, as do the storage regulations. In France, the standard is 35 C. (Granier tester, equivalent to 98° F.), and according to their flash- point, liquid hydrocarbons are divided into two classes (below and above 35 C), considered differently in regard to quantities storable and other regulations. In Germc.iy, the law prescribes a close-test of 2i° C, equal to about 70 F., whilst in Russia the standard is 28 C, equal to 84-4° F., by the close-test; in both these countries the weights of petroleum which may be stored in specified buildings are determined by law. In the United States, various methods of testing and various minimum standards have been adopted. In Pennsylvania, the prescribed limit is a ” fire-test ” of no F., equivalent to about 70 F., close-test, while in the State of New York it is ioo° F., close-test.

See Sir Boverton Redwood’s Petroleum and its Products (2nd ed., London, 1906) ; A. Beeby Thompson, Petroleum Mining (1910) ; L. C. Tassart, Exploitation du Petrole (1908) ; C. Engler and H. Hofer, Das Erdol, 5 vols. (1909 seer,.) ; A. B. Thompson, The Oil Fields of Russia (1908) ; and J. D. Henry, Oil Fields of the Empire (1910). (B. R.)

PETROLOGY, the science of rocks (Gr. irerpos), the branch of geology which is concerned with the investigation of the composition, structure and history of the rock masses which make up the accessible portions of the earth’s crust. Rocks have been defined as ” aggregates

of minerals." They are the units with which the geologist deals in investigating the structure of a district. Some varieties cover enormous areas and are among the commonest and most familiar objects of nature. Granite, sandstone, clay, limestone, slate often form whole provinces and build up lofty mountains. Such unconsolidated materials as sand, gravel, clay, soil are justly included among rocks as being mineral masses which play an important role in field geology. Other rock species are of rare occurrence and may be known in only one or two localities in distant parts of the earth's surface. Nearly all rocks consist of minerals, whether in a crystalline or non-crystalline state, but the insoluble and imperishable parts of the skeletons of animals and plants may constitute a considerable portion of rocks, as for example, coral limestone, lignite beds and chalk.

Treatment of the Subject. — In this paragraph the subject matter of the science of petrology is briefly surveyed ; the object is to point out the headings under which particular subjects are treated (there is a separate article on the terms printed in italics). General questions as to the nature, origin and classification of rocks and the methods of examination are discussed in the present article; mineralogy comprises similar matter respecting the component minerals; metamerphism, metasomatism, pneumatolysis and the

formation of concretions are agencies which effect rocks and modify them. Three classes of rocks are recognized: the igneous, sedimentary and metamorphic. The plutonic, or deep-seated rocks, which cooled far below the surface, and occur as batholites, bosses, laccolites, and veins, include the great classes granite, syenite, diorite, gabbro and peridotite; related to the granites are aplite, greisen, pegmatite, schorl rock and micropegmatite ; to the syenites, borolanite, monzonite, nepheline-syenite and ijolite; to the diorites, aphanite, napolecnite and tonalite; to the gabbros, pyroxenite and theralite, and to peridotites, picriie and serpentine. The hypabyssal intrusive rocks, occurring as sills, veins, dikes, necks, &c, are represented by por- phyry and porphyrite (including bostonite, felsite and quartz-por- phyry), diabase and lamprophyre ; some pitchstones belong to this group and contain crystallites and spherulites. The volcanic rocks, found typically as lava flows, include rhyolite and obsidian (with, sometimes perlite), trachyte and phonolite (and leucitophyre which is treated under leucite), andesite and daciie, basalt (with the related dolerite, variolite and tachylyte), nephelinite and tephrite. Among sedimentary rocks we recognize a volcanic group (including tuff, agglomerate and some kinds of pumice) ; an arenaceous series such as sand (some with glauconite), sandstone, quartzile, greywacke and gravel; an argillaceous group including clay,

firebrick, phyllite, laterite shale and slate; a calcareous series with chalk, limestone (often forming stalactites and stalagmites) , dolomite and marls or argillaceous limestones (flint occurs as nodules in chalk) ; the natural phosphates may be mentioned here. The metamorphic rocks are commonly gneisses and schists (including mica-schist) ; other types are amphiho- lite, charnockite, eclogite, epidiorite, epidosite, granulite, itacolumite, hornfels, mylonite and the scapolite rocks.

Composition. — Only the commonest minerals are of impor- tance as rock formers. Their number is small, not exceeding a hundrod in all, and much less than this if we do not reckon the subdivisions into which the commoner species are broken up. The vast majority of the rocks which we see around us every day consist of quartz, felspar, mica, chlorite, kaolin, calcite, epi- dote, olivine, augite, hornblende, magnetite, haematite, limonite and a few other minerals. Each of these has a recognized position in the economy of nature. A main determining factor is the chemical composition of the mass, for a certain mineral can be formed only when the necessary elements are present in the rock. Calcite is commonest in limestones, as these consist essentially of carbonate of lime; quartz in sandstones and in certain igneous rocks which contain a high percentage of silica. Other factors are of equal importance in determining the natural association or paragenesis of rock-making minerals, principally the mode of origin of the rock and the stages through which it has passed in attaining its present condition. Two rock masses may have very much the same bulk composition and yet consist of entirely different assemblages of minerals. The tendency is always for those compounds to be formed which are stable under the conditions under which the rock mass originated. A granite arises by the consolidation of a molten magma (a fused rock mass; Gr. jj.kyy.a., from nkoaav, to knead) at high temperatures and great pressures and its component minerals are such as are formed in such circumstances. Exposed to moisture, carbonic acid and other subaerial agents at the ordinary temperatures of the earth's surface, some of these original minerals, such as quartz and white mica are permanent and remain unaffected; others " weather " or decay and are replaced by new combina- tions. The felspar passes into kaolin, muscovite and quartz, and if any black mica (biotite) has been present it yields chlorite, epidote, rutile and other substances. These changes are accom- panied by disintegration, and the rock falls into a loose, inco- herent, earth)' mass which may be regarded as a sand or soil. The materials thus formed may be washed away and deposited as a sandstone or grit. The structure of the original rock is now replaced by a new one; the mineralogical constitution is

profoundly altered; but the bulk chemical composition may not be very different. The sedimentary rock may again undergo a metamorphosis. If penetrated by igneous rocks it may be recrystallized or, if subjected to enormous pressures with heat and movement, such as attend the building of folded mountain chains, it may be converted into a gneiss not very different in mineralogical composition though radically different in structure to the granite which was its original state.

Structure. — The two factors above enumerated, namely the chemical and mineral composition of rocks, are scarcely of greater

importance than their structure, or the relations of the parts of which they consist to one another. Regarded from this standpoint rocks may be divided into the crystalline and the fragmental. Inorganic matter, if free to take that physical state in which it is most stable, always tends to Rocks. ” e crystallize. Crystalline rock masses have con- solidated from solution or from fusion. The vast majority of igneous rocks belong to this group and the degree of perfection in which they have attained the crystalline state depends primarily on the conditions under which they solidified. Such rocks as granite, which have cooled very slowly and under great pressures, have completely crystallized, but many lavas were poured out at the surface and cooled very rapidly; in this latter group a small amount of non-crystalline or glassy matter is frequent. Other crystalline rocks such as rock-salt, gypsum and anhydrite have been deposited from solution in water, mostly owing to evaporation on exposure to the air. Still another group, which includes the marbles, mica-schists and quartzites, are recrystallized, that is to say, they were at first fragmental rocks, like limestone, clay and sandstone and have never been in a molten condition nor entirely in solution. Certain agencies however, acting on them, have effaced their primitive structures, and induced crystallization, This is a kind of metamorphism.

The fragmental structure needs little explanation; wherever rocks disintegrate fragments are produced which are suitable for the formation of new rocks of this group. The Rocks*” original materials may be organic (shells, corals, plants) or vitreous (volcanic glasses) or crystalline (granite, marble, &c); the pulverizing agent may be frost, rain, running water, or the steam explosions which shatter the lava within a volcanic crater and produce the fragmental rocks known as

volcanic ash, tuffs and agglomerates. The materials may be loose and incoherent (sand, clay, gravel) or compacted by pressure and the deposit of cementing substances by percolat- ing water (sandstone, shale, conglomerate). The grains of which fragmental rocks are composed may be coarse or fine, fresh or decayed, uniform or diverse in their composition; the one feature which gives unity to the class is the fact that they are all derived from pre-existing rocks or organisms. Because they are made up of broken pieces these rocks are often said to be ” clastic.”

Origin of Rocks. — The study of the structure of rocks evidently leads us to another method of regarding them, which is more fundamental than those enumerated above, as the structure depends on the mode of origin. Rocks are divided into three great classes, the Igneous, the Sedimentary and the Metamorphic. The igneous (Lat. ignis, fire) rocks have all consoli- Rocks”. S dated from a state of fusion. Some of them are crystalline or ” massive “; others are fragmental. The massive igneous rocks include a few which are nearly com- pletely vitreous, and still more which contain a small amount of amorphous matter, but the majority are completely crystal- lized. Among the best known examples are obsidian, pumice, basalt, trachyte, granite, diorite. The fragmental igneous rocks consist of volcanic ashes more or less firmly compacted. The sedimentary rocks form a second group; they Bocks’” “^ nave au > been laid down as deposits on the earth’s surface subject to the conditions of temperature, moisture arid pressure which obtain there. They include fragmental and crystalline varieties. The former consist of the debris of pre-existing rocks, accumulated in seas, lakes or dry land and more or less indurated by pressure and cementing substances. Gravel, sand and clay, conglomerate, sandstone, shale are well-known examples. Many of them are fossiliferous as they contain fragments of organisms. Some are very largely made up of remains of animals or plants, more or less altered by mineralization. These are sometimes placed into a special group as rocks of organic origin; limestone, peat and coal are typical of this class. The crystalline sediments are such as rock-salt and gypsum, deposits of saline lakes or isolated portions of the sea. They were formed under conditions

unfavourable to life and hence rarely contain fossils. The metamorphic rocks are known to be almost entirely altered igneous or sedimentary masses. Metamorphism consists in the destruction of the original structures hlc r^^ and the development of new minerals. The chemical composition of the rocks however suffers little change. The rock becomes as a rule more crystalline; but all stages in the process may be found and in a metamorphosed sediment, e.g. a sandstone, remains of the original sand grains and primary fragmental structure may be

observed, although extensive recrystallization has taken place. The agencies which produce metamorphism are high temperatures, pressure, interstitial moisture and in many cases movement. The effects of high temperatures are seen best in the rocks surrounding great out- crops of intrusive granite, for they have been baked and crystal- lized by the heat of the igneous rock (thermo-metamorphism). In folded mountain chains where the strata have been greatly compressed and their particles have been forced to move over one another a different type of metamorphism prevails (regional or dynamic metamorphism).

Methods of Investigation. — The macroscopic (Gr. fiaKpbs, large) characters of rocks, those visible in hand-specimens without the aid of the microscope, are very varied and difficult to describe accurately and fully. The character*. geologist in the field depends principally on them and on a few rough chemical and physical tests; and to the practical engineer, architect ancj quarry-master they are all-important. Although frequently insufficient in themselves to determine the true nature of a rock, they usually serve for a preliminary classification and often give all the information which is really needed. With a small bottle of acid to test for carbonate of lime, a knife to ascertain the hardness of rocks and minerals, and a pocket lens to magnify their structure, the field geologist is rarely at a loss to what t group a rock belongs. The fine grained species are often indeterminable in this way, and the minute mineral components of all rocks can usually be ascertained only by microscopic examination. But it is easy to see that a sandstone or grit consists of more or less rounded, waterworn sand-grains and if it contains dull, weathered particles of felspar, shining scales of mica or small crystals of calcite these also rarely escape observation. Shales and clay rocks generally are soft, fine grained, often laminated and not infrequently contain minute organisms or fragments of plants. Limestones are easily marked with a knife-blade, effervesce readily with weak cold acid and often contain entire or broken shells or other fossils. The crystalline nature of a granite or basalt is obvious at a glance, and while the former contains white or pink felspar, clear vitreous quartz and glancing flakes of mica, the other will show yellow-green olivine, black augite and grey striated plagioclase.

But when dealing with unfamiliar types or with rocks so fine grained that their component minerals cannot be determined with the aid of a lens, the geologist is obliged to have recourse to more delicate and searching methods of characters. investigation. With the aid of the blowpipe (to test the fusibility of detached crystals), the goniometer, the magnet, the magnifying glass and the specific gravity balance, the

earlier travellers attained surprisingly accurate results. Examples of these may be found in the works of von Buch, Scrope, Darwin and many others. About the end of the 18th century, Dolomieu examined crushed rock powders under the microscope and Cordier in 1815 crushed, levigated and investi- gated the finer ground-mass of igneous rocks. His researches are models of scrupulous accuracy, and he was able to announce that they consisted essentially of such minerals as felspar, augite, iron ores and volcanic glass, and did not differ in nature from the coarser grained rocks. Nicol, whose name is associated with the discovery of the Nicol's prism, seems to have been the first to prepare thin slices of mineral substances, and his methods were applied by Witham (1831) to the study of plant petri- factions. This method, of such far-reaching importance in petrology, was not at once made use of for the systematic

investigation of rocks, and it was not till 1858 that Sorby pointed out its value. Meanwhile the optical study of sections of crystals had been advanced by Sir David Brewster and other physicists and mineralogists and it only remained to apply their methods to the minerals visible in rock sections. Very rapid progress was made and the names of Zirkel, Allport, Vogelsang, Schuster, Rosenbusch, Bertrand, Fouque and Levy are among those of the most active pioneers in the new field of research. To such importance have microscopical methods attained that textbooks of petrology at the present time are very largely devoted to a description of the appearances presented by the minerals of rocks as studied in transparent micro-sections. A good rock-section should be about one-thousandth of an inch in thickness, and is by no means very difficult to make. A thin „.. splinter of the rock, about as large as a halfpenny may

sections. k e ta] cen . ; t s h ou id be as fresh as possible and free from obvious cracks. By grinding on a plate of planed steel or cast iron with a little fine carborundum it is soon rendered flat on one side and is then transferred to a sheet of plate glass and smoothed with the very finest emery till all minute pits and roughnesses are removed and the surface is a uniform plane. The rock-chip is then washed, and placed on a copper or iron plate which is heated by a spirit or gas lamp. A microscopic glass slip is also warmed on this plate with a drop of viscous natural Canada balsam on its surface. The more volatile ingredients of the balsam are dispelled by the heat, and when that is accomplished the smooth, dry, warm rock is pressed firmly into

contact with the glass plate so that the film of balsam intervening may be as thin as possible and free from air-bubbles. The preparation is allowed to cool and then the rock chip is again ground down as before, first with carborundum and, when it becomes transparent, with fine emery till the desired thickness is obtained. It is then cleaned, again heated with a little more balsam, and covered with a cover glass. The labour of grinding the first surface may be avoided by cutting off a smooth slice with an iron disk armed with crushed diamond powder. A second application of the slitter after the first face is smoothed and cemented to the glass will in expert hands leave a rock-section so thin as to be already transparent. In this way the preparation of a section may require only twenty minutes.

The microscope employed is usually one which is provided with a rotating stage beneath which there is a polarizer, while above the „ objective or the eyepiece an analyser is mounted ; alter-

Microscope. nat ; ve i y t y le sta g e ma y be fixed and the polarizing and analysing prisms may be capable of simultaneous rotation by means of toothed wheels and a connecting-rod. If ordinary light and not polarized light is desired, both prisms may be withdrawn from the axis of the instrument; if the polarizer only is inserted the light transmitted is plane polarized; with both prisms in position the slide is viewed between ” crossed nicols.” A microscopic rock- section in ordinary light if a suitable magnification (say 30) be employed is seen to consist of grains or crystals varying in colour, „. . size and shape. Some minerals are colourless and trans- tMi”i P arent (quartz, calcite, felspar, muscovite, &c), others of minerals. arg ye ji ow or brown (rutilc, tourmaline, biotite), green (diopside, hornblende, chlorite), blue (glaucophane), pink (garnet), &c. The same mineral may present a variety of colours, in the same or different rocks, and these colours may be arranged in zones parallel to the surfaces of the crystals. Thus tourmaline may be brown, yellow, pink, blue, green, violet, grey or colourless, but every mineral has one or more characteristic, because most common tints. The shapes of the crystals determine in a general way the outlines of the sections of them presented on the slides. If the mineral has one or more good cleavages they will be indicated by systems of cracks (see PI. III.). The refrac- tive index is also clearly shown by the appearance of the sections, which are rough, with well-defined borders if they have a much stronger refraction than the medium in which they are mounted. Some minerals decompose readily and become turbid and semi- transparent (e.g. felspar) ; others remain always perfectly fresh and clear (e.g. quartz), others yield characteristic secondary products (such as green chlorite after biotite). The inclusions in the crystals are of great interest ; one mineral may

enclose another, or may con- tain spaces occupied by glass, by fluids or by gases.

Lastly the structure of the rock, that is to say, the relation of its components to one another, is usually clearly indicated, whether it be fragmental or massive ; the presence of glassy matter in contradistinction to a completely crystalline or ” holo-crystalline ” condition; the nature and origin of organic fragments; banding, foliation or lamination; the pumiceous or porous structure of many lavas; these and many other characters, though often not visible in the hand specimens of a rock, are rendered obvious by the examination of a microscopic section. Many refined methods of observation may be introduced, such as the measurement of the size of the elements of the rock by the help of micrometers; their relative proportions by means of a glass plate ruled in small squares; the angles between cleavages or faces seen in section by the use of the rotating graduated stage, and the estimation of the

Pleochro- ism.

Micro- Structure.

refractive index of the mineral by comparison with those of different mounting media.

Further information is obtained by inserting the polarizer and rotating the section. The light vibrates now only in one plane, and in passing through doubly refracting crystals in the slide is, speaking generally, broken up into two rays, which vibrate at right angles to one another. In many coloured minerals such as biotite, hornblende, tourmaline, chlorite, these two rays have different colours, and when a section con- taining any of these minerals is rotated the change of colour is often very striking. This property, known as ” pleochroism ” (Gr. TrXekoe, more; xpˆs. colour), is of great value in the determination of rock-making minerals. It is often especially intense in small spots which surround minute enclosures of other minerals, such as zircon and epidote; these are known as ” pleochroic halos.”

If the analyser be now inserted in such a position that it is crossed relatively to the polarizer the field of view will be dark where there are no minerals, or where the light passes through isotro- Dou hj e pic substances such as glass, liquids and cubic crystals. n e f ract i on All other crystalline bodies, being doubly refracting, will appear bright in some position as the stage is rotated. The only exception to this rule is provided by sections which are perpendicular to the optic axes of

birefringent crystals; these remain dark or nearly dark during a whole rotation, and as will be seen later, their investigation is of special importance. The doubly refracting mineral sections, however, will in all cases appear black in certain positions as the stage is cw/ nc tf on rotated. They are said to be “extinguished” when this takes place. If we note these positions we may measure the angle between them and any cleavages, faces or other structures of the crystal by means of the rotating stage. These angles are characteristic of the system to which the mineral belongs and often of the mineral species itself (see Crystallography). To facilitate measurement of extinction angles various kinds of eyepieces have been devised, some having a stauroscopic calcite plate, others with two or four plates of quartz cemented together; these are often found to give more exact results than are obtained by observing merely the position in which the mineral section is most completely dark between crossed nicols.

The mineral sections when not extinguished are not only bright but are coloured and the colours they show depend on several factors, the most important of which is the strength of the double refraction. If all the sections are of the same thickness as is nearly true of well- made slides, the minerals with strongest double refraction yield the highest polarization colours. The order in which the colours are arranged is that known as Newton’s scale, the lowest being dark grey, then grey, white, yellow, orange, red, purple, blue and so on. The difference between the refractive indexes of the ordinary and the extraordinary ray in quartz is -009, and in a rock-section about 5ˆb of an inch thick this mineral gives grey and white polarization tints; nepheline with weaker double refraction gives dark grey; augite on the other hand will give red and blue, while calcite with still stronger double refraction will appear pinkish or greenish white. All sections of the same mineral, however, will not have the same colour; it was stated above that sections perpendicular to an optic axis will be nearly black, and, in general, the more nearly any section approaches this direction the lower its polarization colours will be. By taking the average, or the highest colour given by any mineral, the relative value of its double refraction can be estimated ; or if the thickness of the section be precisely known the difference between the two refractive indexes can be ascertained. If the slides be thick the colours will be on the whole higher than in thin slides.

It is often important to find out whether of the two axes of elas- ticity (or vibration traces) in the section is that of greater elasticity (or lesser refractive index). The quartz wedge or selenite plate enables us to do this. Suppose a doubly refracting mineral section so placed that it is “extinguished”; if now it is rotated through 45 it will be brightly

illuminated. If the quartz wedge be passed across it so that the long axis of the wedge is parallel to the axis of elasticity in the section the polarization colours will rise or fall. If they rise the axes of greater elasticity in the two minerals are parallel ; if they sink the axis of greater elasticity in the one is parallel to that of lesser elasticity in the other. In the latter case by pushing the wedge sufficiently far complete darkness or compensation will result. Selenite wedges, selenite plates, mica wedges and mica plates are also used for this purpose. A quartz wedge also may be calibrated by determining the amount of double refraction in all parts of its length. If now it be used to produce compensation or complete extinction in any doubly refracting mineral section, we can ascertain what is the strength of the double refraction of the section because it is obviously equal and opposite to that of a known part of the quartz wedge.

A further refinement of microscopic methods consists of the use of strongly convergent polarized light (konoscopic methods). This is obtained by a wide angled achromatic condenser above the polarizer, and a high power microscopic objective. Those sections are most useful which are perpendicular to an optic axis, and conse- quently remain dark on rotation. If they belong to uniaxial crystals they show a dark cross or convergent light between crossed nicols,

the bars of which remain parallel to the wires in the field of the eye-piece. Sections perpendicular to an optic axis of a biaxial mineral under the same conditions show a dark bar which on rotation becomes curved to a hyperbolic shape. If the section is perpendicu- lar to a ” bisectrix ” (see Crystallography) a black cross is seen which on rotation opens out to form two hyperbolas, the apices of which are turned towards one another. The optic axes emerge at the apices of the hyperbolas and may be surrounded by coloured rings, though owing to the thinness of minerals in rock sections these are only seen when the double refraction of the mineral is strong. The distance between the axes as seen in the field of the microscope depends partly on the axial angle of the crystal and partly on the numerical aperture of the objective. If it is measured by means of an eye-piece micrometer, the optic axial angle of the mineral can be found by a simple calculation. The quartz wedge, quarter mica plate or selenite plate permit the determination of the positive or negative character of the crystal by the changes in the colour or shape of the figures observed in the field. These operations are precisely similar to those

employed by the mineralogist in the examination of plates cut from crystals. It is sufficient to point out that the petrological microscope in its modern development is an optical instrument of great precision, enabling us to determine physical constants of crystallized substances as well as serving to produce magnified images like the ordinary microscope. A great variety of accessory apparatus has been devised to fit it for these special uses.

The separation of the ingredients of a crushed rock powder from one to another in order to obtain pure samples suitable Separation f° r analysis is also extensively practised. It may ofCompo- be effected by means of a powerful electro-magnet nents. t h e strength of which can be regulated as desired. A weak magnetic field will attract magnetite, then haematite and other ores of iron. Silicates containing iron will follow in definite order and biotite, enstatite, augite, hornblende, garnet and similar ferro-magnesian minerals may be succes- sively abstracted; at last only the colourless, non-magnetic compounds, such as muscovite, calcite, quartz and felspar, will remain. Chemical methods also are useful. A weak acid will dissolve calcite from a crushed limestone, leaving only dolomite, silicates or quartz. Hydrofluoric acid will attack felspar before quartz, and if employed with great caution will dissolve these and any glassy material in a rock powder before dissolving augite or hypersthene. Methods of separation by specific gravity have a still wider application. The simplest of these is levigation (Lat. levigare, to make smooth, levis) or treatment by a current of water; it is extensively employed in the mechanical analysis of soils and in the treatment of ores, but is not so successful with rocks, as their components do not as a rule differ very greatly in specific gravity.

Fluids are used which do not attack the majority of the rock- making minerals and at the same time have a high specific gravity. Solutions of potassium mercuric iodide (sp. gr. 3-196), cadmium borotungstate (sp. gr. 3-30), methlyene iodide (sp. gr. 3-32), bromo- form (sp. gr. 2-86), or acetylene bromide (sp. gr. 3-00) are the prin- cipal media employed. They may be diluted (with water, benzene, &c.) to any desired extent and again concentrated by evaporation. If the rock be a granite consisting of biotite (sp. gr. 3-1), muscovite (sp. gr. 2-85), quartz (sp. gr. 2-65), oligoclase (sp. gr. 2-64) and orthoclase (sp. gr. 2-56) the crushed minerals will all float in methylene iodide; on gradual dilution with benzene they will be precipitated in the order given above. Although simple in theory these methods are tedious in practice, especially as it is common for one rock-making mineral to enclose another. But expert handling of fresh and suitable rocks yields excellent results and much purer powders may be obtained by this

means than by any other.

Although rocks are now studied principally in microscopic sections the investigation of fine crushed rock powders, which Examlaa- was the first branch of microscopic petrology to tion of Rock receive attention, is by no means discontinued. Powders, phe modern optical methods are perfectly applicable to transparent mineral fragments of any kind. Minerals are almost as easily determined in powder as in section, but it is otherwise with rocks, as the structure or relation of the components to one another, which is an element of great im portance in the study of the history and classification of rocks, is almost completely destroyed by grinding them to powder.

In addition to naked-eye and microscopic investigations chemical methods of research arc of the greatest practical utility to the petrographer. The crushed and separated powders, obtained by the processes described above, may be

analysed and thus the chemical composition of the minerals in the rock determined qualitatively or quantitatively. The chemical testing of microscopic sections and minute grains by the help of the microscope is a very JJ 1 " elegant and valuable means of discriminating between the mineral components of fine-grained rocks. Thus the presence of apatite in rock-sections is established by covering a bare rock-section with solution of ammonium molybdate; a turbid yellow precipitate forms over the crystals of the mineral in question (indicating the presence of phosphates). Many silicates are insoluble in acids and cannot be tested in this way, but others are partly dissolved, leaving a film of gelatinous silica which can be stained with colouring matters such as the aniline dyes (nepheline, analcite, zeolites, &c).

Complete chemical analyses of rocks are also widely made use of and are ot the first importance, especially when new species are under description. Rock analysis has of late years (largely under the influence of the chemical laboratory of the United States Geological Survey) reached a high pitch of refinement and complexity. As many as twenty or twenty-five components may be determined, but for practical purposes a knowledge of the relative proportions of siiica, alumina, ferrous and ferric oxides, magnesia, lime, potash, soda and water will carry us a long way in determining the position to which a rock is to be assigned in any of the conventional classifica- tions. A chemical analysis is in itself usually sufficient to indicate whether a rock is igneous or sedimentary and in either case to show with considerable accuracy to what subdivision of these classes it belongs. In the case of metamorphic rocks it often establishes whether the

original mass was a sediment or of volcanic origin.

The specific gravity of rocks is determined in the usual way by means of the balance and the pyenometer. It is greatest in those rocks which contain most magnesia, iron and heavy metals; least in rocks rich in alkalis, silica and water. p> ec '» c It diminishes with weathering, and generally those rocks gravity. which are highly crystalline have higher specific gravities than those which are wholly or partly vitreous when both have the same chemical composition. The specific gravity of the commoner rocks ranges from about 2-5 to 3-2.

The above methods of investigation, naked eye, physical, microscopical, chemical, may be grouped together as analytical in contradistinction to the synthetic investigation of rocks, which proceeds by experimental work to ". reproduce different rock types and in this way to y " SSS ' elucidate their origin and explain their structures. In many cases no experiment is necessary. Every stage in the origin of clays, sands and gravels can be seen in process around us, but where these have been converted into coherent shales, sand-stones and conglomerates, and still more where they have experienced some degree of metamorphism, there are many obscure points about their history upon which experiment may yet throw light. Up to the present time these investigations have been almost entirely confined to the attempt to reproduce igneous rocks by fusion of mixtures of crushed minerals or of chemicals in specially contrived furnaces. The earliest researches of this sort are of those of Faujas St Fond and of de Saussure, but Sir James Hall really laid the foundations of this branch of petrology. He showed (1798) that the whinstones (diabases) of Edinburgh were fusible and if rapidly cooled yielded black vitreous masses closely resembling natural pitchstones and obsidians; if cooled more slowly they consolidated as crystalline rocks not unlike the whinstones themselves and containing olivine, augite and felspar (the essential minerals of these rocks). Many years later Daubree, Delesse and others carried on similar experiments, but the first notable advance was made in 1878, when Fouque and Levy began their researches.

They succeeded in producing such rocks as porphyrite, leucite-tephrite, basalt and dolerite, and obtained also various structural modifications well known in igneous rocks, e.g. the porphyritic and the ophitic (Gr. 60is, serpent). Incidentally they showed that while many basic rocks (basalts, &c.) could be perfectly imitated in the laboratory, the acid rocks could not, and advanced the explana- tion that for the crystallization of the latter the gases never absent i" 1 natura ' roc ' i magmas were indispensable mineralizing agents. It has

subsequently been proved that steam, or such volatile sub- stances as certain borates, molybdates, chlorides, fluorides, assist in the formation of orthoclase, quartz and mica (the minerals of granite). Sir James Hall also made the first contribution to the experimental study of metamorphic rocks by converting chalk

PETROLOGY

Plate I.

“*£& A

Fig. i. —BANDED OBSIDIAN, KIRGHIZ Fig. 2.— FLU DAL RHYOLITE, Fig

HLNOARi (-X 15). This “rock has a damascened pattern owing

In the centre are crystals of felspar, rather to the irregular mingling of streams of brown

brown and colourless glass which have been turbid through weathering. The matrix is and of colourless glass. It is nearly quite

arranged in stripes by the fluxion movement partly gtassv, partly felsitic, and shows the free from minute crystals. of the viscous mass before solidification, effects of streaming movements with eddies The glass is rendered granular by very minute behind the felspar crystals.

BANDED OBSIDIAN, KIRGHIZ

(X25), The rock consists of alternate bands of

-OBSIDIAN, MEXICO (x 15).

“ic. 4- PERLITIC OBSIDIAN, TOKAI, Fig. 5.— PERLITIC PITCIISTONE, Fig. 6.— OBSIDIAN, ICELAND (x 17).

HUNGARY (x 15). MEISSEN, GERMANY (x 15). , ., , , , . „ ..

v K ” In the clear glassy base there are rounded

The clear glassy rock is traversed by a large The pcrlitic, rounded cracks are very yellow spots (spherulites) arranged in fluxion number of cracks, some long and straight, clearly seen, because the rock is decomposing streams. v;hile others are_ nearly circular. These are and becoming slightly opaque along them, rendered more distinct by the deposit of thin At the top there is a corroded crystal of felspar, films of

secondary limonite in them. The showing cleavage, with large circular en- cracks are due to contraction on cooling. closures of brownish glass.

Fig. 7.— SPHERULITIC RHYOLITE, HLINIK, HUNGARY (x 10).

The white, angular patches are crystals of quartz and of sanidine felspar. Between them there is a yellowish glass showing circular areas with a well-defined radiate fibrous structure (spherulites).

Fig. 8.— SPHERVLITIC FELSITE, ARRAN, SCOTLAND (x 10).

The round spherulites of this rock are large and sometimes composite; their radiate structure is obvious. This is a devitrified pitchstone, no longer glassy but finelycrystal- line, and at the centres of the spherulites there are spaces occupied by a secondary deposit of quartz.

Fig. 9.- PORPHYRITIC AND FLUIDAL RHYOLITE, HUNGARY (x 12).

The ground mass is partly glassy, partly felsitic, and _ shows fluxion-banding. The large quartz is a double hexagonal pyramid, but Its edges and corners are rounded by corrosion and large irregular areas of glass penetrate to its centre.

PETROLOGY

Fig. i.— PGRPHYRITIC PITCHSTONE, SCUIR OF EIGG, SCOTLAND (xio).

A large porphyrinic felspar crystal is seen lying in a pale-brown glassy base and con- taining many glass inclusions of irregular shape. The felspar, in one margin especially,

shows corroded outlines.

Fig. 4. GRANITE RUBiSLAW, ABER DEEN (X IO).

This is a non-porphyritic, noncrystalline rock. Among its components the crystals of dark mica are conspicuous, and with them occur also a few plates of white mica, with perfect cleavage. The slightly turbid or granular substance is felspar, a littk: de- composed, and the large, clear spaces are crystals of quartz.

Fig. 2.— TRACHYTE, OROTAVA, TENE- RIFFE (x 12).

There are larger porphyritic felspars of the first generation, and smaller ones of later origin composing part of the ground-mass, which

also contains a considerable amount of yellow vitreous material.

Fig. 5.— HORNBLENDE-GRANITE, DALBEATTIE, SCOTLAND (x 15).

The dark crystal with fine parallel lines of cleavage is biotite; the others, with two less perfect cleavages, are hornblende. At the top there is a long rod-shaped grain of sphene. The granular-looking substance is felspar, and the quartz, as usual, is clear and Transparent.

Fig. 3.— TRACHYTE, PERLENHARDT, GERMANY (x 10).

In this rock there are porphyritic crystals of felspar and of dark brown biotite (nearly black in the photograph), with a few of green augite and magnetite. The ground-mass is

finely crystalline.

Fig. 6.— GRAPHIC GRANITE, BODEN- MAIS, BAVARIA (x to).

This rock consists of angular patches of clear quartz scattered through a striated dull matrix of felspar. The different quartz areas have all the same optical orientation, as if they were parts of a single crystal.

Fig. 7.— LUXCLLIANITE, LCXLLYAN, CORNWALL (X15).

In this variety of tourmaline-granite there are many blue needles of tourmaline, grouped in stellate clusters which are embedded in a matrix of clear quartz. These pointed needles diverge from the surfaces 01 larger grains of tourmaline.

Fig. 8.— GRANOPHYRE, BRAEMAR, SCOTLAND (X37).

This photograph is taken between crossed nicols to show the graphic structure of the ground-mass, similar to that of Fig. 6, but on a much finer scale. The quartz towards the centre of the field appears as white, angular areas, embedded in a grey matrix of felspar, and each mineral reacts in a uniform fashion to polarized light over an area of moderate extent.

Fig. 9.— DIORITE, HODRITCH, HUN- GARY (x 10).

The dark crystals are green hornblende, and show the outlines which are characteristic of that mineral. The cloudy grey substance between them is felspar in a somewhat weathered state.

into marble by heating it in a closed gun-barrel, which prevented the escape of the carbonic acid at high temperatures. Adams and Nicholson have carried this a stage farther by subjecting marble to great pressure in hydraulic presses and have shown how the foliated structures, frequent in natural marbles, may be produced artificially.

Rock Classification. — The three great classes of rocks above enumerated — the igneous, the sedimentary and the metamorphic — are subdivided into many eroups which to a small extent resemble the genera and species under which the naturalist classifies the members of the animal kingdom. There are, however, no hard and fast boundaries between allied rocks. By increase or diminution in the proportions of their constituent minerals they pass by every gradation into one another; the distinctive structures also of one kind of rock may often be traced gradually merging into those of another. Hence the definitions adopted in establishing rock nomenclature merely correspond to selected points (more or less arbitrary) in a continuously graduated series. This is frequently urged as a reason for reducing rock classification to its simplest possible terms, and using only a few generalized rock designations. But it is clear that many apparently trivial differences tend regularly to recur, and have a real significance, and so long as any variation can be shown to be of this nature it deserves recognition.

The igneous rocks (crystalline and fragmental) form a well-defined group, differing in origin from all others. The crystalline or massive varieties may occur in two different ways; the lavas have Igneous been poured out at the surface and have consolidated Rocks. after ejection, underj conditions which are fairly well understood, seeing that they may be examined at active volcanoes in many parts of the world; the intrusive rocks, on the other hand, have been injected from below into cracks and fissures in the strata and have cooled there beneath masses which conceal them from view till exposed by denudation at a subsequent period. The members of these two groups differ in many respects from one another, so that it is often possible to assign a rock to one or other of them on mere superficial inspection. The lavas (or effusive rocks), having cooled rapidly in contact with the air, are mostly finely crystalline or have at least fine-grained ground-mass representing Lavas or t j iat p art Q f tne v ; scous semi-crystalline lava flow which Effusive was st j|| liquid at th e moment of eruption. At this Types. time they were exposed only to atmospheric pressure, and the steam and other gases, which they contained in great quantity, were free to escape; many important modifications arise from this, the

most striking being the frequent presence of numerous steam cavities (vesicular structure) often drawn out to elongated, shapes subsequently filled up with minerals by infiltration (amygdaloidal structure). As crystallization was going on while the mass was still creeping forward over the surface of the earth, the latest formed minerals (in the ground-mass) are commonly arranged in subparallel winding lines following the direction of movement (fluxion or fluidal structure) (see PI. I. figs. 2 and 9, PI. II. fig. 2), and the larger early minerals which had previously crystallized may show the same arrangement. Most lavas have fallen considerably below their original temperatures before they are emitted. In their behaviour they present a close analogy to hot solutions of salts in water, which, when they approach the saturation temperature, first deposit a crop of large, well-formed crystals (labile stage) and subsequently precipitate clouds of smaller less perfect crystalline particles (metastable stage). In igneous rocks the first generation of crystals generally forms before the lava has emerged to the surface, that is to say, during the ascent from the subterranean depths to the crater of the volcano. It has frequently been verified by observation that freshly emitted lavas contain large crystals borne along in a molten, liquid mass. The large, well-formed, early crystals are said to be porphyritic (PI. 1 1 1, figs. 1,2,3) ; the smaller crystals of the surrounding matrix or ground-mass belong to the post-effusion stage. More rarely lavas are completely fused at the moment of ejection; they may then cool to form a non-porphyritic, finely crystalline rock, or if more rapidly chilled may in large part be non-crystalline or glassy (vitreous rocks such as obsidian, tachylyte, pitchstone (PI. I. figs. 1, 4, 5). A common feature of glassy rocks is the presence of rounded bodies (spherulites: Gr. oaif>a, ball), consisting of fine diver- gent fibres radiating from a centre (PI. I. figs. 7, 8); they consist of imperfect crystals of felspar, mixed with quartz or tridymite; similar bodies are often produced artificially in glasses which are allowed to cool slowly. Rarely these spherulites are hollow or consist of con- centric shells with spaces between (lithophysae : Gr. XWos, stone; v6a, bellows). Perlitic structure, also common in glasses, consists in the presence of concentric rounded cracks owing to contraction on cooling (see Perlite).

The phenocrysts (Gr. cfraLveii', to show; upvaraWov, crystal) or por- phyritic minerals are not only larger than those of the ground- mass. As the matrix was still liquid when they formed they were free to take perfect crystalline shapes, not being interfered with by

the pressure of adjacent crystals. They seem to have grown rapidly, as they are often filled with enclosures of glassy or finely crystalline material like that of the ground-mass (PI. II. fig. 1). Microscopic

examination of the phenocrysts often reveals that they have had a complex history. Very frequently they show successive layers of different composition, indicated by variations in colour or other optical properties; thus augite may be green at the centre and various shades of brown outside this; or may be pale green centrally and darker green with strong pleochroism (aegirine) at the periphery. In the felspars the centre is usually more basic and richer in lime than the surrounding faces, and successive zones may often be noted, each less basic than those which lie within it. Phenocrysts of quartz (and of other minerals), instead of sharp, perfect crystalline faces, may show rounded corroded surfaces (PL I. fig. 9), with the points blunted and irregular tongue-like projections of the matrix into the substance of the crystal. It is clear that after the mineral had crystallized it was partly again dissolved or corroded at some period before the matrix solidified. Corroded phenocrysts of biotite and hornblende are very common in some lavas; they are surrounded by black rims of magnetite mixed with pale green augite. The hornblende or biotite substance has proved unstable at a certain stage of consolidation and has been replaced by a paramorph of augite and magnetite which may be partially or completely sub- stituted for the original crystal but still retains its characteristic outlines.

Let us now consider the characteristics of a typical deep-seated rock like granite or diorite (PI. II. figs. 4, 5, 9). That these are igneous is proved by the manner in which they have burst through the superincumbent strata, filling the ^^ tonlc . or cracks with ramifying veins; that they were at a very Abyssal high temperature is equally clear from the changes which Ty P es – they have induced in the rocks in contact with them. But as their heat could dissipate only very slowly, because of the masses which covered them, complete crystallization has taken place and no vitreous rapidly chilled matter is present. As they have had time to come to rest before crystallizing they are not fluidal. Their contained gases have pot been able to escape through the thick layer of strata beneath which they were injected, and may often be ob- served occupying cavities in the minerals, or have occasioned many important modifications in the crystallization of the rock. Because their crystals are of approximately equal size these rocks are said to be granular; there is typically no distinction between a first generation of large well-shaped crystals and a fine-grained ground-mass. Their minerals have formed, however, in a definite order, and each has had a period of crystallization which maybe very distinct or may have coincided with or overlapped the period of formation of some of the other ingredients. The earlier have originated at a time when most of the rock was still liquid and are

more or Jess perfect ; the later are less regular in shape because they were compelled to occupy the interspaces left between the already formed crystals (PI. II. figs- 5. 9)- The former are said to be idiomorphic (or automorphic), the latter are anidiomorphic (allotniomorphic, xenomorphic). 1 There are also many other characteristics which serve to distinguish the members of these two groups. Orthoclase, for example, is the typical felspar of granite, while its modification sanidine occurs in lavas of similar composition. The same distinction holds between elaeolite and nepheline. Leucite is common in lavas, very rare in plutonic rocks. Muscovite is confined to the intrusives. These differences show the influence of the physical conditions under which consolidation takes place.

There is a certain class of intrusive rocks which have risen upwards towards the surface, but have failed to reach it, and have solidified in fissures as dikes and intrusive sills at no great depth. To this type the name intrusive (or hyp- lairuslve ° r abyssal) is often given in distinction to the plutonic (or hypabyssal abyssal) which formed at greater depths. As might T yP es – be expected, they show structures intermediate between those of the effusive and the plutonic rocks. They are very commonly por- phyritic, not rarely vitreous, and sometimes even vesicular. In fact many of them _ are indistinguishable petrologically from lavas of similar composition.

The attempt to form a special group of hypabyssal (intrusive and dike) rocks has met with much criticism and opposition. Such a group certainly cannot rank as equally important and equally well characterized with the plutonic and the effusive. But there are many kinds of rock which are not found to occur normally in any other manner. As examples we may cite the lamprophyres, the aplites and the porphyrites. These never occur as lava flows or as great plutonic bosses; if magmas of the same composition as these rocks occur in either of these ways they consolidate with different assemblages of minerals and different structures.

In subdividing the plutonic, the hypabyssal and the effusive rocks, the principle is followed of grouping those together which resemble one another in mineral con- Subdivisions stitution and in chemical composition. In a broad °J g ?^ > . us sense these two properties are interdependent. Rock Class.

1 Idiomorphic, having its own characteristic form, Gr. Wktc, belonging to one's self, (alrros),)top4 > -fi (form); allotriomorphic, from Gr. aWorpws, belonging to another (ciAAos), a stranger (£b > os)*

Mineral Constitu- tion.

The commoner rock constituents are nearly all oxides; chlorine, sulphur and fluorine are the only important exceptions to this and _. . . their total amount in any rock is usually much less than hart ”’/o- F ” W – Clarke has calculated that a little more v ar ers ‘ than 47 % of the earth’s crust consists of oxygen. It occurs principally in combination as oxides, of which the chief are silica, alumina, iron oxides, lime, magnesia, potash and soda. The silica functions principally as an acid, forming silicates, and ,all the commonest minerals of igneous rocks are of this nature. From a computation based on 1672 analyses of all kinds of rocks Clarke arrived at the following as the average percentage composition: Si0 2 = 59-71, Al 2 O s = 15-41. Fe 2 3 = 2-63, FeO = 3-52, MgO = A-36, CaO = 4-90, Na 2 = 3-55, K 2 = 2-8o, H 2 = i-52,Ti0 2 = o-6o,P 2 6 = 0-22, total 99-22 %. All the other constituents occur only in very small quantities, usually much less than 1 %.

These oxides do not combine in a haphazard way. The potash and soda, for example, with a sufficient amount of alumina and silica, combine to produce felspars. In some cases they may take other forms, such as nepheline, leucite and mus- covite, but in the great majority of instances they ire found as felspar. The phosphoric acid with lime forms apatite. The titanium dioxide with ferrous oxide gives rise to ilmenite. Part of the ! : me forms lime felspar. Magnesia and iron oxides vv-ith silica crystallize as olivine or enstatite, or with alumina and lime form the complex ferro-magnesian silicates of which the pyroxenes, amphiboles and biotites are the chief. Any excess of silica above what is required to neutralize the bases will separate out as quartz; excess of alumina crystal- lizes as corundum. These must be regarded only as general tendencies, which are modified by physical conditions in a manner not as yet understood. It is possible by inspection of a rock analysis to say approximately what minerals the rock will contain, but there are numerous exceptions to any rule which can be laid down.

Hence we may say that except in acid or siliceous rocks containing 66 % of silica and over, quartz will not be abundant. In basic rocks (containing 60% silica or less) it is rare and accidental. If magnesia and iron be above the average while silica is low olivine may be expected; where silica is present in greater quantity other ferro-

magnesian minerals, such as augite, hornblende, enstatite or biotite, occur rather than olivine. Unless potash is high and silica relatively low leucite will not be present, for leucite does not occur with free quartz. Nepheline, likewise, is usually found in rocks with much soda and comparatively little silica. With high alkalis soda-bearing pyroxenes and amphiboles may be present. The lower the percentage of silica and the alkalis the greater is the prevalence of lime felspar as contracted with soda or potash felspar. Clarke has calculated the relative abundance of the principal rock-forming minerals with the following results: Apatite = 0-6, titanium minerals = 1-5, quartz = 12-0, felspars = 59-5, biotite = 3-8, hornblende and pyroxene = 1 6-8, total = 94-2%. This, however, can only be a rough approximation. The other determining factor, namely the physical conditions attending con- solidation, plays on the whole a smaller part, yet is by no means negligible, as a few instances will prove. There are certain minerals which are practically confined to deep-seated intrusive rocks, e.g. microcline, muscovite, diallage. Leucite is very rare in plutonic masses; many minerals have special peculiarities in microscopic character according to whether they crystallized in depth or near the surface, e.g. hypersthene, orthoclase, quartz. There are some curious instances of rocks having the same chemical composition but consisting of entirely different minerals, e.g. the hornblendite of Gran, in Norway, containing only hornblende, has the same com- position as some of the camptonites of the same locality which con- tain felspar and hornblende of a different variety. In this connexion we may repeat what has been said above about the corrosion of porphyritic minerals in igneous rocks. In rhyolites and trachytes early crystals of hornblende and biotite may be found in great numbers partially converted into augite and magnetite. The horn- blende and biotite were stable under the pressures and other con- ditions which obtained below the surface, but unstable at higher levels. In the ground-mass of these rocks augite is almost universally present. But the plutonic representatives of the same magma, granite and syenite contain biotite and hornblende far more commonly than augite.

Those rocks which contain most silica and on crystallizing yield free quartz are erected into a group generally designated the ” acid ” . . . rocks. Those again which contain least silica and most

Intermediate” 13 ^^’ 3 anc ‘ ‘ ron ‘ so tnat q uar tz is absent while olivine and Basic ‘ s usua “y abundant, form the ” basic ” group. The Igneous ” intermediate ” rocks include those which are character- Rocks. ‘ ze d by tne general absence of both quartz and olivine.

An important subdivision of these contains a very high percentage of

alkalis, especially soda, and consequently has minerals such as nepheline and leucite not common in other rocks. It is often separated from the others as the ” alkali ” or ” soda ” rocks,

and there is a corresponding series of basic rocks. Lastly a small sub-group rich in olivine and without felspar has been called the ” ultrabasic ” rocks. They have very low percentages of silica but much iron and magnesia.

Except these last practically all rocks contain felspars or fels- pathoid minerals. In the acid rocks the common felspars are ortho- clase, with perthite, microcline, oligoclase, all having much silica and alkalis. In the basic rocks labradorite, anorthite and bytownite prevail, being rich in lime and poor in silica, potash and soda. Augite is the commonest ferro-magnesian of the basic rocks, but biotite and hornblende are on the whole more frequent in the acid.

The rocks which contain leucite er nepheline, either partly or wholly replacing felspar are not included in this table. They are essentially of intermediate or of basic character. We might in con- sequence regard them as varieties of syenite, diorite, gabbro, &c,

Commonest Minerals.

Acid.

Intermediate.

Basic.

Ultrabasic.

Quartz Orthoclase (and Oligo- clase), Mica, Hornblende,

Augite.

Little or no Quartz.

No Quartz

Plagioclase

Augite,

Olivine.

No Felspar Augite,

Hornblende, Olivine.

Orthoclase

Hornblende,

Augite,

Biotite.

Plagioclase

Hornblende,

Augite,

Biotite.

Plutonic or”! A b y s s a 1 V type._ |

Intrusive or~l Hypabys- V sal type.)

Lavas orl Eff usi ve !- type. J

Granite.

Quartz- porphyry.

Rhyolite, Obsidian.

Syenite.

Orthoclase- porphyry.

Trachyte.

Diorite.

Porphyrite.

Andesite.

Gabbro. Dolerite. Basalt.

Peridotite.

Picrite.

Limburgite.

in which felspathoid minerals occur, and indeed there are many transitions between syenites cf ordinary type and nepheline — or leucite — syenite, and between gabbro or dolerite and theralite or essexite. But as many minerals develop in these ” alkali ” rocks which are uncommon elsewhere, it is convenient in a purely formal classification like that which is outlined here to treat the whole assemblage as a distinct series.

Nepheline and Leucite-bearing Rocks.

Commonest Minerals.

Plutonic

type. Intrusive

type. Effusive

type or

Lavas.

Alkali Felspar, Nepheline or Leu- cite, Augite.Horn-

blende, Biotite.

Nepheline-syenite. Leucite-syenite. Nepheline- porphyry

Phonolite, Leucitophyre.

Soda Lime Felspar Nepheline or Leu- cite, Augite, Horn- blende (Olivine)

Nepheline or

Leucite, Augite,

Hornblende,

Olivine.

Essexite and Theralite.

Tephrite and Basanite.

Ijolite and Missourite.

Nepheline-

basalt. Leucite-basalt

L

This classification is based essentially on the mineralogical constitution of the igneous rocks. Any chemical distinctions between the different groups, though implied, are relegated to a subordinate position. It is admittedly artificial but it has grown up with the growth of the science and is still adopted as the basis on which more minute subdivisions are erected. The subdivisions are by no means of equal value. The syenites, for example, and the perido- tites, are far less important than the granites, diorites and gabbros. Moreover, the

effusive andesites do not always correspond to the plutonic diorites but partly also to the gabbros. . As the different kinds of rock, regarded as aggregates of minerals, pass gradually into one another, transitional types are very common and are often so important as to receive special names. The quartz-syenites and nordmarkites may be interposed between granite and syenite, the tonalites and adamellites between granite and diorite, the monzon- ites between syenite and diorite, norites and hyperites between diorite and gabbro, and so on.

There is of course a large number of recognized rock species not included in the tables given. These are of two kinds, either belong- ing to groups which are subdivisions of those enumerated (bearing the same relation to them that species do to genera) or rare and exceptional rocks that do not fall within any of the main subdivisions proposed. The question may be asked — When is a rock entitled to be recognized as belonging to a distinct species or variety and deserving a name for itself? It must, first of all, be proved to occur in considerable quantity at some locality, or better still at a series of localities or to have been produced from different magmas at more than one period of the earth's history. In other words, it must not be a mere anomaly. Moreover, it should have a dis- tinctive mineral constitution, differing from other rocks, or some- thing individual in the characters of its minerals or of its structures. It is often surprising how peculiar types of rock, believed at first

to be unique, turn up with identical features in widely scattered regions, alnbite, for example, occurs in Norway, Scotland, Montreal, British Columbia, New York and Brazil, tinguaite in Scotland, Norway, Brazil, Montana, Portugal, &c. This indicates that underlying all the variations in mineralogical, structural and chemical properties there are definite relationships which tend to repeat themselves, producing the same types whenever the same conditions are present.

Although in former years the view was widely current, especially in Germany, that igneous rocks belonging to different geological epochs should receive different names, it is now admitted on all sides that this cannot be upheld.

In 1902 a group of American petrographers brought forward a proposal to discard all existing classifications of igneous rocks and to substitute for them a " quantitative" classification based on chemical

analysis. They showed how vague and often un- scientific was much of the existing terminology and argued that as the chemical composition of an igneous rock was its most funda- mental characteristic it should be elevated to prime position. Geological occurrence, structure, mineralogical constitution, the hitherto accepted criteria for the discrimination of rock species were relegated to the background. The completed rock analysis is first to be interpreted in terms of the rock-forming minerals which might be expected to be formed when the magma crystallizes, e.g. quartz felspars of various kinds, olivine, akermannite, fels- pathoids, magnetite, corundum and so on, and the rocks are divided into groups strictly according to the relative proportion of these minerals to one another. There is no need here to describe the minutia of the process adopted as the authors have stated them very clearly in their treatise {Quantitative Classification of Igneous Rocks, Chicago, 1902), and there is no indication that even in the United States it will ever displace the older classifications.

We can often observe in a series of eruptives belonging to one period and a restricted area certain features which distinguish Con . them as a whole more or less completely from other

aanvuinity. similar assemblages. Such groups are often said to be consanguineous, and to characterize a definite ” petrological province. ” Excellent examples of this are furnished by the Devonian igneous rocks of southern Norway as described by Brogger, the Tertiary rocks of the Hebrides (Harker), the Italian, lavas studied by H. S. Washington. On a larger scale the volcanoes which girdle the Pacific (Andes, Cordillera, Japan, &c), and those which occur on the volcanic islands of the Atlantic, show the same phenomena. Each of these groups has been formed presumably from a single deep-seated magma or source of supply and during a period which while necessarily prolonged was not of vast duration in a geological sense.

On the other hand, each of the great suites of eruptive rocks which constitute such a petrological province embraces a great Differentia- ran S e °f types. Prolonged eruptions have in a few tion. cases a somewhat monotonous character, owing to the

predominance of one kind of rock. Thus the lavas of the Hawaiian Islands are mostly basaltic, as are those of Oregon, Washington and the Deccan, all of which form geological masses of enormous magnitude. But it is more usual to find basalts, andesites, trachytes, dacites and many other rocks occurring in a single eruptive complex. The process by which a magma splits up into a variety of partial products is known as ” differentiation.” Its importance from the

standpoint of theoretical petrology is very great, but as yet no adequate explanation of it has been offered. Differentiation may show itself in two ways. In the first type the successive emissions from a volcanic focus may differ consider- ably from one another. Thus in the Pentland Hills, near Edinburgh, the lavas which are of lower Devonian age, were first basaltic, then andesitic, trachytic and dacitic, and finally rhyolitic, and this succession was repeated a second time. Yet they all must have come from the same focus, or at any rate from a group of foci very closely connected with one another. Occasionally it is found that the earlier lavas are of intermediate character and that basic alternate with acid during the later stages of the volcanic history.

Not less interesting are those cases in which a single body of rock has in consolidation yielded a variety of petrographical types often widely divergent. This is best shown by great plutonic bosses which may be regarded as having once been vast subterranean spaces filled with a nearly homogeneous liquid magma. Cooling took place gradually from the outer surfaces where the igneous rock was in contact with the surrounding strata. The resultant laccolite (Gr. Xd«os, pit, crater, X £0os, stone), stock or boss, may be a few hundred yards or many miles in diameter and often contains a great diversity of crystalline rocks. Thus peridotite, gabbro, diorite, tonalite and granite, are often associated, usually in such a way that the more basic are the first formed and lie nearest the external surfaces of the mass. The reverse sequence occurs occasionally, the edges being highly acid while the central parts consist of more basic rocks. Sometimes the later phases pene trate into and vein the earlier; evidently there has been some movement due to temporary increase of pressure when part of the laccolite was solid and part still in a liquid state. This links these phenomena with those above described where successive emissions of different character have proceeded outwards from the focus.

According to modern views two explanations of these facts are possible. Some geologists hold that the different rock facies found in association are often due to local absorption of surrounding rocks by the molten magma (” assimilation “). Effects of this kind are to be expected, and have been clearly proved in many places. There is, however, a general reluctance to admit that they are of great importance. The nature and succession of the rock species do not as a rule show any relation to the sedimentary or other materials which may be supposed to have been dissolved; and where solution is known to have gone on the products are usually of abnormal character and easily distinguishable from the common rock types.

Hence it is generally supposed that differentiation is to be ascribed to some physical or chemical processes which lead to the splitting up of a magma into dissimilar portions, each of which consolidates as a distinct kind of rock. Two factors can be selected as probably most potent. One important factor is cooling and another is crystallization. According to physico-chemical laws the least soluble substances will tend to diffuse towards the cooling surfaces (Ludwig-Sorcts's principle). This is in accordance with the majority of the observed facts and is probably a vera causa of differentiation, though what its potency may be is uncertain. As a rock solidifies the minerals which crystallize follow one another in a more or less well-defined order, the most basic (according to Rosenbusch's law) .being first to separate out. That in a general way the peripheral portions of a laccolite consist mainly of those early basic minerals suggests that the sequence of crystallization helps largely in determining the succession (and consequently the distribution of rock species in a plutonic complex). Gravity also may play a part, for it is proved that in a solution at rest the heaviest components will be concentrated towards the base. This must, however, be of secondary importance as in laccolites the top portions often consist of more basic and heavier varieties of rock than the centres. It has also been argued that the earliest minerals being heaviest and in any case denser than the fused magma around them, will tend to sink by their own weight and to be congregated near the bottom of the mass. Electric currents, magnetic attraction and convection currents have also been called in to account for the phenomena observed. Magmas have also been compared to liquids which, when they cool, split up into portions no longer completely soluble in one another (liquation hypothesis). Each of these partial magmas may dissolve a portion of the others and as the temperature falls and the conditions change a range of liquids differing in composition may be supposed to arise.

All igneous magmas contain dissolved gases (steam, carbonic acid, sulphuretted hydrogen, chlorine, fluorine, boric acid, &c). Of these water is the principal, and was formerly believed to have percolated downwards from the earth's surface to the heated rocks below, but is now generally admitted to be an integral part of the magma. Many peculiarities of the structure of the plutonic rocks as contrasted with the lavas may reasonably be accounted for by the operation of these gases, which were unable to escape as the deep-seated masses slowly cooled, while they were promptly given up by the superficial effusions. The acid plutonic or intrusive rocks have never been reproduced by laboratory experiments, and the only successful attempts to obtain their minerals artificially have been those in which

special provision was made for the retention of the ” mineralizing ” gases in the crucibles or sealed tubes employed. These gases often do not enter into the composition of the rock- forming minerals, for most of these are free from water, carbonic acid, &c. Hence as crystallization goes on the residual liquor must contain an ever-increasing proportion of volatile constituents. It is conceivable that in the final stages the still uncrystallized part of the magma has more resemblance to a solution of mineral matter in superheated steam than to a dry igneous fusion. Quartz, for example, is the last mineral to form in a granite. It bears much of the stamp of the quartz which we know has been deposited from aqueous solution in veins, &c. It is at the same time the most infusible of all the common minerals of rocks. Its late formation shows that in this case it arose at comparatively low temperatures and points clearly to the special importance of the gases of the magma as determining the sequence of crystallization.

When solidification is nearly complete the gases can no longer be retained in the rock and make their escape through fissures towards the surface. They are powerful agents in attacking the minerals of the rocks which they traverse, and instances of their operation are found in the kaolinization of granites, tourmaliniza- tion and formation of greisen, deposit of quartz veins, stanniferous and auriferous veins, apatite veins, and the group of changes known as propylitization. 1 These ” pneumatolytic ” (Gr. irvev/ia, spirit, vapour, \ieiu, to loose, dissolve) processes are of the first importance in the genesis of many ore deposits. They are a real part of the history of the magma itself and constitute the terminal phases of the volcanic sequence.

The complicated succession from basic (or ultrabasic) to acid types exemplified in the history of many magmas is reflected with

1 The term ” propylite ” (Gr. irp6irv\ov, a gateway) was given by Richthofen to a volcanic rock which is supposed to have marked a new epoch in volcanic geology (see Andesite).

astonishing completeness in the history of individual products. In each class of rock crystallization follows a definite course. The ˆ first minerals to separate belong to a group known CrystaJHza- as the “P”” 01 ” accessories ; this includes zircon, apatite, t fo a sohene iron oxides; then follow in order olivine, augite,

hornblende, biotite, plagioclase, felspar (beginning with the varieties most rich in lime and ending with those which contain most soda), orthoclase, microcline and quartz (with micropegmatite). Many exceptions to this rule are known; the same mineral may crystallize at two different periods ; two or more minerals may crystallize simultaneously or the stages in which they form may overlap. But the succession above given holds in the vast majority of cases. Expressed in this way: the more basic minerals precede the less basic ; it is known as Rosenbusch's law.

Types of Structure. — In some rocks there seems to be little tendency for the minerals to envelop one another. This is true of many gabbros, aplites and granites (PI. Ill, fig. 7). The grains then lie side by side, with the faces of the latter moulded on or adapted to the more perfect crystalline outlines of the earlier. More commonly some closer relationship exists between them. When the smaller idiomorphic crystals of the first-formed are scattered irregularly through the larger and less perfect crystals of later origin, the Polkilltlc structure > s said to be poikilitic (Gr. mint\os, many- • coloured, mottled). A variety of this, known as ophitic (PI. Ill, fig. 6), is very characteristic of many dolerites and diabases, in which large plates of augite enclose many small laths of plagio- clase felspar. Biotite and hornblende frequently enclose felspar ophitically; less commonly iron oxides and sphene do so. In pcri- dotites the " lustre-mottled " structure arises from pyroxene or hornblende enveloping olivine in the same manner (PI. Ill, fig. 8). In these cases no crystallographic relation exists between the two minerals (enclosing and enclosed).

But often the surrounding mineral has been laid down on the surface of the other in such a way that they have certain crystalline Parallel faces or axes parallel to one another. This is known Growths. as " P ara H e l growth." It is best seen in zoned crystals of plagioclase felspar, which may range in composition from anorthite to oligoclase, the more acid layers being deposited regularly on the surfaces of the more basic. Biotite and muscovite, hornblende and augite, enstatite and diallage, epidote and orthite, very frequently are associated in this way.

When two minerals crystallize simultaneously they may be intergrown in " graphic " fashion. The best example is quartz Graphic anc ˆ orthoclase occurring together as micropegmatite Inter- ˆ' ˆ' ˆ gs ' ˆ an ˆ ˆ). The quartz forms angular

growths, patches in the felspar, which though separated have the same crystalline orientation and one position of extinction, while the

felspar on its part behaves in the same way. Two porous crystals thus interpenetrate but the scattered parts of each mineral maintain their connexion with the others. There may be also a definite relation between the crystalline axes of the two crystals, though this is not known in all cases. Augite also occurs in graphic intergrowth with hornblende, olivine and felspar; and hornblende, cordierite, eoidote and biotite in graphic inter- growth with quartz.

Physical Chemistry of Igneous Rocks. — The great advances that have been made in recent years in our knowledge of physical chemistry have very important bearings on petrological investiga- tions. Especially in the study of the genesis of igneous rocks we anticipate that by this means much light will be thrown on problems which are now very obscure and a complete revolution in our ideas of the conditions which affect crystallization may yet be the con- sequence. Already many important results have been gleaned. As yet little work of an exact and quantitative nature has been done on actual rocks or on mixtures resembling them in composition, but at the Carnegie Institution in Washington, an elaborate series of experiments in the synthesis of minerals and the properties of mixtures' of these is being carried on, with all the refinements which modern science can suggest. The work of Doelter and of Vogt may also be mentioned in this connexion. At the same time the mathematical theory of the physical processes involved has received much attention, and serves both to direct and to elucidate the experimental work. ' '

A fused mixture of two minerals may be regarded as a solution

of one on the other. If such a solution be cooled down, crystalliza-

tion will generally set in and if the two components be

*f". asas independent (or do not form mixed crystals) one of

o u ons. t y iem ma y b e expected to start crystallizing. On further

cooling, more of this mineral will separate out till at last a residue

is left which contains the two components in definite proportions.

This mixture, which is known as the eutectic mixture, has the lowest

melting-point of any which can be formed from these minerals.

If heat be still abstracted the eutectic will consolidate as a whole;

its two mineral components will crystallize simultaneously. At

any given pressure the composition of the eutectic mixture in such

a case is always the same.

Similarly, if there be three independent components (none of which forms mixed crystals with the others), according to their relative amounts and to the composition of the eutectic mixture one will begin to crystallize ; then another will make its appearance

in solid form, and when the excess of these has been removed, the ternary eutectic (that mixture of the three which has the lowest melting-point) will be produced and crystallization of all three components will go on simultaneously.

These processes have without doubt a very close analogy to the formation of igneous rocks. Thus in certain felsites or por- phyries which may be considered as being essentially mixtures of quartz and felspar, a certain amount of quartz has crystallized out at an early period in the form of well-shaped porphyritic crystals, and thereafter the remainder of the rock has solidified as a very fine-grained, cryptocrystalline or sometimes micrographic ground- mass which consists of quartz and felspar in intimate intermixture. The latter closely resembles a eutectic, and chemical studies have proved that within somewhat narrow limits the composition of these felsitic ground-masses is constant.

But the comparison must not be pushed too far, as there are always other components than quartz and felspar (apatite, zircon, biotite and iron oxides being the most common), and in rocks of this type the gases dissolved in the magma play a very important part. As crystallization goes on, these gases are set free and their pressure must increase to some extent. Moreover, the felspar is not one mineral but two or perhaps three, there being always soda felspar and potash felspar and usually also a small amount of lime felspar in these porphyries.

In a typical basic rock the conditions are even more complex. A dolerite, for example, usually contains, as its last products of crystallization, pyroxene and felspar. Of these the latter consists of three distinct species, the former of an unknown number ; and in each case they can form mixed crystals, to a greater or less extent with one another. From these considerations it will be clear that the properties of solutions of two or three independent components, do not

necessarily explain the process of crystallization in any igneous rock.

Very frequently in porphyries not only quartz but felspar also is present in large well-formed early crystals. Similarly in basalts, augite and felspar may appear both as phenocrysts and as com- ponents of the ground-mass. As an explanation of this it has been suggested that supersaturation has taken place. We may suppose that the augite which was in excess of the proportion necessary to form the felspar-augite, eutectic mixture, first separated out. When the remaining solution reached the eutectic composition the felspar did not at once start crystallizing, perhaps because nuclei are necessary to initiate crystal-growth and these were not at hand; augite went on crystallizing while felspar lagged behind. Then felspar began and as the mixture was now supersaturated with that mineral a considerable amount of it was rapidly thrown out of the solution. At the same time there would be a tendency for part of the augite, already crystallized, to be dissolved and its crystals would be corroded, losing their sharp and perfect edges, as is often observed in rocks of this group. When the necessary adjustments had been made the eutectic mixture would be established and thereafter the two minerals would consolidate simultaneously (or nearly so) till crystallization was complete.

There is a good deal of evidence to show that supersaturation is not unimportant in igneous magmas. The frequency with which they form glasses proves that under certain conditions the molten rocks are highly viscous. Much will depend also on the presence, accidental or otherwise, of nuclei on which a mineral substance can be deposited. It is known that minerals differ in their tendency to crystallize, some doing so very readily while others are slow and backward. The rate at which crystallization goes on depends on many factors, and there are remarkable differences in this respect between minerals.

On the other hand, there is plenty of evidence to show that supersaturation, though probably one of the causes, is not the prin- cipal cause of the appearance of more than one mineral in two generations of crystals. In some of the quartz-porphyries, for example, there are phenocrysts not only of quartz and felspar but also of micropegmatite. These prove that quartz and felspar were not crystallizing successively or alternately but simultaneously.

The great majority of the minerals found in igneous rocks are not of simple composition, but are mixtures of various elementary minerals in very different proportions. This enormously compli- cates the theoretical problems of consolidation. It has been found, for example, that in the case of three minerals — one of which is independent,

while the two others can form mixed crystals — there is a large number of possible sequences; and, what is very important, one mineral may separate out entirely at an early stage, or its crystallization may be interrupted and not continuous. The ternary eutectic, which is produced by a mixture of three independent minerals, may not in such a case be the last substance to crystallize, and may not be present at all. This is very much in accordance with the observed facts of petrology; for usually in a rock there is one mineral which indubitably was the last of all to finish crystal- lizing and contained no appreciable quantity of the others.

As yet we know little about such important questions as the composition of the eutectic mixtures of rock-minerals, their latent heat of fusion, specific heats, mutual solubilities, inversion tempera- tures, &c. Until we are in possession of a large body of accurate information on such points as these the theoretical treatment of

the processes involved in the formation of igneous rocks cannot be successfully handled. But every day sees an increase in the amount of data available, and encourages us to believe that sooner or later some of the simpler igneous rocks at any rate will be completely explicable on physico-chemical principles.

Rock masses of igneous origin have no sooner consolidated than

they begin to change. The gases with which the magma is charged

are slowly dissipated, lava-flows often remain hot and

f steaming for many years. These gases attack the com-

™ ” c ponents of the rock and deposit new minerals in cavities Changes. an[j g ssures _ fjjg beautiful zeolites, so well known to collectors of minerals, are largely of this origin. Even before these ” post- volcanic ” processes have ceased atmospheric decom- position begins. Rain, frost, carbonic acid, oxygen and other agents operate continuously, and do not cease till the whole mass has crumbled down and most of its ingredients have been resolved into new products. In the classification of rocks these secondary changes are generally considered unessential; rocks are classified and described as if they were ideally fresh, though this is rarely the case in nature.

Epigenitic change (secondary processes) may be arranged under a number of headings, each of which is typical of a group of rocks „ . or rock-forming minerals, though usually more than

cod aiy ong j t jj ese alterations will be found in progress in thˆ

Changes.

same rock. Silicification, the replacement of the minerals

by crystalline or crypto-crystalline silica, is most common in acid rocks, such as rhyolite, but is also found in serpentine, &c. Kaolinization is the decomposition of the felspars, which are the commonest minerals of igneous rocks, into kaolin (along with quartz, muscovite, &c.) ; it is best shown by granites and syenites. Serpentinization is the alteration of olivine to serpentine (with magnetite) ; it is typical of peridotites, but occurs in most of the basic rocks. In uralitization secondary hornblende replaces augite; this occurs very generally in diabases; chloritization is the alteration of augite (biotite or hornblende) to chlorite, and is seen in many diabases, diorites and greenstones. Epidotization occurs also in rocks of this group, and consists in the development of epidote from biotite, hornblende, augite or plagioclase felspar.

The sedimentary rocks, which constitute the second great group, have many points in common that distinguish them from the igneous and the metamorphic. They have all originated on the surface of the earth, and at the period of their formation were exposed only to the temperature of the air and to atmo- spheric pressure (or the pressures which exist at the bottoms of seas and lakes) . Their minerals are in most cases not susceptible to change when exposed to moist air or sea, and many of them are hydrated (chlorite, micas, &c), or oxidized (iron ores), or contain carbonic acid (calcite, dolomite). The extent, however, to which this is the case depends largely on the rapidity with which they have accumulated; coarse rocks quickly piled up often consist of materials only partly weathered. When crystalline, the sedimentary rocks are usually soluble at low temperatures. The members of this group occur in beds or strata, hence they are often known as the stratified rocks; the upper beds are always of later formation than those which underlie them, except (as may happen when great disturbance has taken place) the whole series is inverted or overturned. Many of the stratified rocks have been formed by the agency of moving water (rivers, currents, &c.) and are grouped together as ” aqueous ” rocks; others have been deposited by the wind in deserts, on sandy beaches, &c. (these are ” aeolian “)■ Others are

the remains of animals or of plants, modified by the action of time, pressure and percolating water. Lastly, we find beds of crystalline nature, such as rock-salt and gypsum, which have been formed by the desiccation of saline waters; other crystalline stratified rocks, such as dolomite and many bedded iron-stones, are replacement products due to the introduction of mineral matter in solution, which replaced the original rock mass partially or wholly.

When the rocks exposed at the earth's surface give way before the attack of the agencies of denudation, they crumble down and are resolved into two parts. One of these consists of solid material (sand, clay and angular debris) insoluble in carbonated waters; the other part is dissolved and washed away. The undissolved residues, when they finally come to rest, form clastic sedimentary rocks (sandstone, conglomerate, shale, &c). The dissolved por- tions are partly transferred to the sea, where they help to increase its store of salts, and may again be precipitated as crystalline sedimentary rocks; but they are also made use of by plants and by animals to form their skeletal and vital tissues. From this latter portion the rocks of organic origin are built up. These

may also contain certain ingredients derived from the atmosphere (nitrogen, carbon in coals, &c).

We have thus three types of sediments of distinct origin, which may be named the clastic (or fragmental), the crystalline and the organic.

The clastic materials may accumulate in situ, and then differ chiefly in their disintegrated and weathered state from the parent rock masses on which they rest. The best example of c , . these are the soils, but in elevated regions angular broken as ”

rock often covers large areas. More usually they are transported by wind or water, and become sorted out according to their size and density. The coarsest debris comes first to rest and is least worn and weathered; it includes screes, gravels, coarse sands, &c, and consolidates as conglomerates, breccias and pebbly grits. The bedding of these rocks is rudimentary and imperfect, and as each bed is traced along its outcrop it frequently changes its character with the strata on which it rests. The most finely divided sediment travels farthest, and is laid down in thin uniform sheets of wide extent. It is known as mud and clay; around the shores of our continents, at distances of a hundred miles and more from land, great sheets of mud are spread over the ocean floors. This mud contains minute particles of quartz and of felspar, but consists essentially of finely divided scaly minerals,

which by their small size and flat shape tend to remain suspended in water for a very long time. Chlorite, white micas and kaolin are the best examples of this class of substances. Wind action is even more effective than water in separating and removing these fine particles. They to a very large extent escape mechanical attrition, because they are transported in suspension and are not swept along the ground or the bottom of the sea; hence they are mostly angular. Fragments of intermediate magnitudes (from j-J-j of an inch to \ of an inch) are classed as sands. They consist largely of quartz, because it does not weather into scaly minerals like felspar, and having but a poor cleavage does not split up into flakes like mica or chlorite. These quartz grains have been rolled along and are usually rounded and worn (PI. IV., fig. i). More or less of garnet felspar, tourmaline, zircon, rutile, &c, are mixed with the quartz, because these are hard minerals not readily decomposed.

The mechanical sorting by the transporting agencies is usually somewhat incomplete, and mixed types of sediment result, such as gravels containing sand, or clays with coarser arenaceous particles. Moreover, successive layers of deposit may not always be entirely similar, and alternations of varying composition may follow one another in thin laminae: e.g. laminae of arenaceous material in beds of clay and shale. Organic matter is frequently mingled with the finer-grained sediments.

These three types have been named the psephitic (or pebbly; Gr. iAtjˆos, pebble); psammitic (or sandy, Gr. \J/o.mm>s, sand), and pelitic (or muddy: Gr. TvqXbs, mud).

Two groups of clastic sediments deserve special treatment. The pyroclastic (Gr. irdp, fire, and kAootos, broken) rocks of volcanic origin, consist mostly of broken pieces of lava (bombs, ash, &c.) (PI. IV. fig. 2), and only accidentally contain other rocks or fossils. They are stratified, and may be coarse or fine, but are usually much less perfectly sorted out, according to their fineness, than ordinary aqueous or aeolian deposits. The glacial clays (boulder clays), representing the ground moraines of ancient glacievs and ice sheets, are characterized by the very variable size of their ingredients and the striated, blunted sub-angular form of the larger rock frag- ments. In them stratification is exceptional and fossils are very rare.

The crystalline sedimentary rocks have been deposited from solu- tion in water. The commonest types, such as rock-salt, gypsum, anhydrite, carnallite, are known to have arisen by the „ . „ evaporation of enclosed saline lakes exposed to a dry ˆ s a ae ‘ atmosphere. They

occur usually in beds with layers of red clay and marl; some limestones have been formed by calcareous waters containing carbonate of lime dissolved in an excess of carbonic acid ; with the escape of the volatile gas the mineral matter is pre- cipitated (sinters, Sprudelstein, &c). Heated waters on cooling may yield up part of their dissolved mineral substances; thus sili- ceous sinters are produced around geysers and hot springs in many parts of the world. There seems no reason to separate from these the veinstones which fill the fissures by which these waters rise to the surface. They differ from those above enumerated in being more perfectly crystallized and in having no definite stratification, but only a banding parallel to the more or less vertical walls of the fissure. Another subdivision of this class of rocks is due to recrystal- lization or crystalline replacement of pre-existing sediments. Thus limestones are dolomitized or converted into ironstones, flints and cherts, by percolating waters which remove the lime salts and substitute for them compounds of iron, magnesia, silicon, and so on. This may be considered a kind of metamorphism ; it is generally known as metasomatism (q.v.).

The rocks of organic origin may be due to animals or plants. They are of great importance, as limestones and coals belong to this group. They are the most fossiliferous of all _ , rocks; but clastic sediments are often rich in fossils ^* a though crystalline sediments rarely are. They may be sub- divided, according to their dominant components, into calcareous,

Cement* (ton.

carbonaceous, siliceous, ferruginous, and so on. The calcareous organic rocks may consist principally of foraminifera, crinoids, corals, brachiopoda, mollusca, polyzoa, &c. Most of them, however, contain a mixture of organisms. By crystallization and metaso- matic changes they often lose their organic structures ; metamorphism of any kind has the same effect. The carbonaceous rocks are essentially plant deposits; they include peat, lignite and coal. The siliceous organic rocks include radiolarian and diatom oozes; in the older formations they occur as radiolarian cherts. Flint nodules owe their silica to disseminated fossils of this nature which have been dissolved and redeposited by concretionary action. Some kinds of siliceous sinter may be produced by organisms in- habiting hot silicated waters. Calcareous oolites in the same way may have arisen through the

agency of minute plants. Bog iron ores also may be of organic rather than of merely chemical origin. The phosphatic rocks so extensively sought after as sources of fertil- izing agents for use in agriculture are for the most part of organic origin, since they owe their substance to the remains of certain varieties of animals which secrete a phosphatic skeleton; but most of them no longer show organic structures but have been converted into nodular or concretionary forms.

All sediments are at first in an incoherent condition {e.g. sands, clays and gravels, beds of shells, &c), and in this state they may remain for an indefinite period. Millions of years have elapsed since some of the early Tertiary strata gathered on the ocean floor, yet they are quite friable (e.g. the London Clay) and differ little from many recent accumulations. There are few exceptions, however, to the rule that with increasing age sedimentary rocks become more and more indurated, and the older they are the more likely it is that they will have the firm consistency generally implied in the term ” rock.” The pressure of newer sediments on underlying masses is apparently one cause of this change, though not in itself a very powerful one. More efficiency is generally ascribed to the action of percolating water, which takes up certain soluble materials and redeposits them in pores and cavities. This operation is probably accelerated by the increased pressure produced by superincumbent masses, and to some extent also by the rise of temperature which inevitably takes place in rocks buried to some depth beneath the surface. The rise of temperature, however, is never very great; we know more than one instance of sedimentary deposits which have been buried beneath four or five miles of similar strata (e.g. parts of the Old Red Sandstone), yet no perceptible difference in condition can be made out between beds of similar composi- tion at the top of the series and near its base. The redeposited cementing material is most commonly calcareous or siliceous. Limestones, which were originally a loose accumulation of shells, corals, &c, become compacted into firm rock in this manner; and the process often takes place with surprising ease, as for example in the deeper parts of coral reefs, or even in wind-blown masses of shelly sand exposed merely to the action of rain. The cementing substance may be regularly deposited in crystalline continuity on the original grains, where these were crystalline; and even in sand- stones (such as Kentish Rag) a crystalline matrix of calcite often envelopes the sand grains. The change of aragonite to calcite and of calcite to dolomite, by forming new crystalline masses in the interior of the rock, usually also accelerates consolidation. Silica is less easily soluble in ordinary waters, but even this ingredient of rocks is dissolved and redeposited with great frequency. Many sandstones are held together

by an infinitesimal amount of colloid or cryptocrystalline silica; when freshly dug from the quarry they are soft and easily trimmed, but after exposure to the air for some time they become much harder, as their siliceous cement sets and passes into a rigid condition. Others contain fine scales of kaolin or of mica. Argillaceous materials may be compacted by mere pressure, like graphite and other scaly minerals. Oxides and carbonates of iron play a large part in many sedimentary rocks and are especially important as colouring matters. The red Sands and . limestones, for example, which are so abundant, contain

o ration. sma j[amoun t s of ferric oxide (haematite), which in a finely divided state gives a red hue of all rocks in which it is present;. Limonite, on the other hand, makes rocks yellow or brown; oxides of manganese, asphalt and other carbonaceous substances are the cause of the black colour of many sediments. Bluish tints result sometimes from the presence of phosphates or of fluorspar; while green is most frequently seen in rocks which contain glauconite or chlorite.

Metamorphic Rocks. — The metamorphic rocks, which form the third great subdivision, are even more varied than the igneous and tho sedimentary. They include representatives of nearly all kinds of the other two classes, their common characteristic being that they have all undergone considerable alterations in structure or in mineral composition. The agencies of meta- morphism (q.v.) are of two kinds — thermal and regional. In the former case contact with intrusive igneous masses, such as granite, laccolites or dikes, have indurated and recrystallized the original rock. In the second case the actions are more

complex and less clearly understood; it is evident that pressure and interstitial movement have had a powerful influence, possibly assisted by rise of temperature. In thermal or contact alteration the rocks are baked, indurated, and often in large measure recrystallized. In regional metamorphism recrystal- lization also goes on, but the final products are usually schists and gneisses. It is as a rule not difficult to distinguish the two classes of metamorphic rocks at a glance, and they may conveniently be considered separately.

When a rock is contact altered by an igneous intrusion it very frequently becomes harder, more crystalline and more lustrous, owing to the development of many small crystals in its mass. Many altered rocks of this type were formerly T “* rn, °” called hornstones, and the term hornfdses (Ger. m ˆ amor ‘ Hornfels) is often used by geologists to signify those p sm ‘ fine grained, compact, crystalline products of thermal metamor- phism. A shale becomes a dark argillaceous

hornfels, full of tiny plates of brownish biotite; a marl or impure limestone changes to a grey, yellow or greenish lime-silicate-hornfels, tough and splintery, with abundance of augite, garnet, wollastonite and other minerals in which lime is an important component. A diabase or andesite becomes a diabase hornfels or andesite hornfels with a large development of new hornblende and biotite and a partial recrystal- lization of the original felspar. A chert or flint becomes a finely crystalline quartz rock; sandstones lose their clastic structure and are converted into a mosaic of small close-fitting grains of quartz.

If the rock was originally banded or foliated (as, for example, a laminated sandstone or a foliated calc-schist) this character may not be obliterated, and a banded hornfels is the product ; fossils even may have their shapes preserved, though entirely recrystallized, and in many contact altered lavas the steam cavities are still visible, though their contents have usually entered into new combinations to form minerals which were not originally present. The minute structures, however, disappear, often completely, if the thermal alteration is very profound; thus small grains of quartz in a shale are lost or blend with the surrounding particles of clay, and the fine ground-mass of lavas is entirely reconstructed.

By recrystallization in this manner peculiar rocks of very distinct types are often produced. Thus shales may pass into cordierite rocks, or may show large crystals of andalusite (and chiastolite, PI. IV., fig. 9), staurolite, garnet, kyanite and sillimanite. A consider- able amount of mica (both muscovite and biotite) is simultaneously formed, and the resulting product has a close resemblance to many kinds of schist. Limestones, if pure, are often turned into coarsely crystalline marbles (PI. IV., fig. 4); but if there was an admixture of clay or sand in the original rock such minerals as garnet, epidote, idocrase, wollastonite, will be present. Sandstones when greatly heated may change into coarse quartzites composed of large clear grains of quartz. These more intense stages of alteration are not so commonly seen in igneous rocks, possibly because their minerals, being formed at high temperatures, are not so easily transformed or recrystallized.

In a few cases rocks are fused and in the dark glassy product minute crystals of spinel, sillimanite and cordierite may separate out. Shales are occasionally thus altered by basalt dikes, and fels- pathic sandstones may be completely vitrified. Similar changes may be induced in shales by the burning of coal seams or even by an ordinary furnace.

There is also a tendency for interfusion of the igneous with the

sedimentary rock. Granites may absorb fragments of shale or pieces of basalt. In that case hybrid rocks arise which have not the characters of normal igneous or sedimentary rocks. Such effects are scarce and are usually easily recognized. Sometimes an invading granite magma permeates the rocks around, filling their joints and planes of bedding, &c, with threads of quartz and felspar. This is very exceptional, but instances of it are known and it may take place on a large scale.

The other type of metamorphism is often said to be regional; sometimes it is called dynamic, but these terms have not strictly the same connotation. It may be said as a rule to make _ the rock more crystalline and. at the same time to give *J e £' ona ' it a foliated, schistose or gneissic structure. This latter M f*8 mor " consists in a definite arrangement of the minerals, so that p sm ' such as are platy or prismatic (e.g. mica and hornblende, which are very common in these rocks) have their longest axes arranged parallel to one another. For that reason many of these rocks split readily in one direction (schists). The minerals also tend to aggregate in bands ; thus there are seams of quartz and of mica in a mica schist, very thin, but consisting essentially of one mineral. These seams are called folia (leaflets) , and though never very pure or very persis- tent they give the rock a streaked or banded character when they are seen edgewise (PI. IV. figs. 6, 7, 8). Along the folia composed of the soft or fissile minerals the rocks will sever most readily, and the freshly split specimen will appear to be faced or coated with this mineral; for example, a piece of mica schist looked at face wise might be supposed to consist entirely of shining scales of mica. On the edge of the specimen, however, the white folia of granular quartz

PETROLOGY

Plate IIL

Fig. i.— PHONOLITE, TEPLITZER Fig. 2.— LEUCITOPHYRE, RIEDEN,

SCHLOSSBERG, BOHEMIA (x 12). EIFFEL, GERMANY (x 15)

The large white crystal is felspar, the A porphyritic clear crystal of leuclte lies smaller ones are nepheline having six-sided near the centre of the field; towards the and four-sided sections. The dark mineral margins are nosean crystals with clear centres in the ground-mass is aegirine. and broad black edges. The black spots are

aegirine and aegirine-augite, and in the ground-mass small prisms of white nepheline may be seen.

Fig. 4 -HYPERSTHENE-ANDESITE, ALWYN, CHEVIOTS, ENGLAND (x 10).

A porphyritic rock with phenocrysts of white plagioelase felspar and of pale-brown augite and hypersthene in a fine ground-mass, partly glassy.

Fig. 3.— LEUCITE-BASANITE,VESUVIUS

(x8).

The rounded central crystal is leucite, showing zones of inclusions and well-marked cracks; below it is a dark-brown augite, and olivine occurs near the bottom of the field. There are numerous rectangular white sections of plagioelase felspar. The dark ground- mass is partly vitreous.

Fig. 5.— OLIVINE-BASALT, CRAIG-

LOCKART, EDINBURGH, SCOTLAND

(x 10).

Two large crystals of augite above and below, and of olivine (right and left) lie in a crystalline ground-mass of plagioelase fel- spar, augite, and magnetite. The olivine has been altered to fibrous green serpentine, and the pseudomorphs show traces of the original cleavage cracks.

Fig. 6— OPHITIC OLIVINE-DOLERITE DUN FION, ARRAN, SCOTLAND.

The white mineral is plagioelase felspar, which penetrates a large dark crystal of augite in ophitic manner. At the bottom of the field there are a few grains of olivine, colourless, but with strongly marked cracks.

Fig. 7.— OLIVINE-GABBRO, VOLPERS- DORF, SILESIA (x ioj.

Felspar occurs towards the edges of the field and surrounds a cluster of diallage (with

strong, dark, parallel lamination) and of oli- vine (covered with ajjlack network of second- ary magnetite).

Fig. 8— PERIDOTITE, ELBA (x 10).

The rounded crystals arc olivine, weathering as usual to magnetite and serpentine along its cracks and borders. The dark interstitial substance is enstatite weathered to bastite.

Fig. 9.— SERPENTINE, COLMONELL, AYRSHIRE, SCOTLAND (x 12).

In this rock the process of serpentinization, seen in the previous figure, is complete. No olivine remains, but a meshwork of magnetite indicates the position of the cracks in the original crystals.

Pt.ate IV.

PETROLOGY

Fig. i. — PEBBLY GRIT, BANFF. SCOT- LAND (x 12).

The white pebbles are quartz with irregular cracks and streaks of fluid inclusions. The matrix is a dark, semi-opaque mixture of clay and small sand-grains.

Fig. 2.— VOLCANIC TUFF, ARTHUR'S SEAT, EDINBURGH (x 8).

A fragmental volcanic rock with small lapilh of basalt; these are vesicular and contain little felspar crystals. Broken fel- spars also lie scattered through the rock.

F1G.3.CRINOIDAL LIMESTONE, (CAR BONIFEROUS), CLIFTON, NEAR BATH, ENGLAND (x 10).

The oolitic grains are round or oval, with concentric zoning; in their interior there is sometimes a shell fragment or other nucleus. The interstitial matrix is clear, granular, crystalline calcite.

F^^T 7 ":

Fig. 4

ITALY

A section of well-known statuary marble which consists entirely of calcite in small irregular crystals closely fitted together.

S"""8i _.» – "*: * – '.:

Fig. 5.— OOLITIC CHERT (CAMBRIAN) SUTHERLANDSHIRE, SCOTLAND

(x 15)-

Fig. 6.—MYLONITE DURNESS, SUTHERLANDSHIRE (xf8).

..... , , ,. . ,. , This well-banded rock was once a crystalline

i his has been once an oolitic limestone, but gneiss which has been greatly crushed by

the calcite has been entirely replaced by silica earth-movements, and has been ground down

with perfect preservation of the oolitic into a fine aggregate of quartz, felspar, and

structure. m ica. The banding is due to internal flow

under great pressure.

Fig. -.SLATE, WADEBRIDGE, CORN WALL (x 20).

A fine-grained clav rock with small clear spots of quartz and minute scales of mica, chlorite, &c. The parallel arrangement of the latter is the cause of cleavage. Obscure dark lines cut across the rock and indicate the development of a secondary cross-cleavage or slip-cleavage.

Fig. 8.— MICA-SCHIST, BLAIR-ATHOLL. PERTHSHIRE, SCOTLAND (X32).

A clay rock like the preceding one, but more metamorphic and coarsely crystalline. The clear spots are quartz and the bladed mineral between them is brown and white mica (biotite and muscovite) .

Fig. 9. -CHIASTOLITE-SLATE, SKIDDAW, CUMBERLAND (x 17).

A clay rock affected by contact meta- morphism attended by the production of needles of chiastolite, which have in transverse section a diamond-shape with dark enclosures at their centres and a dark cross radiating to their corners.

will be visible. In gneisses these alternating folia are thicker and less regular than in schists; they are often lenticular, dying out rapidly.

Gneisses also, as a rule, contain more felspar than schists do, and they are tougher and less fissile. Contortion or crumpling (PI. IV. fig. 6) of the foliation is by no means uncommon, and then the splitting faces are undulose or puckered. The origin of schistosity or foliation is not perfectly understood, but it is clear that in many cases it is due to pressure, acting in a direction perpendicular to the banding, and to interstitial movement or internal flow arranging the mineral particles while they are crystallizing.

Rocks which were originally sedimentary and rocks which were undoubtedly igneous are converted into schists and gneisses, and if originally of similar composition they may be very difficult to distinguish from one another if the metamorphism has been great. A quartz-porphyry, for example, and a fine felspathic sandstone, may both be converted into a grey or pink mica-schist. Usually, however, we may distinguish between sedimentary and igneous schists and gneisses. Often the metamorphism is progressive, and if the whole district occupied by these rocks be searched traces of bedding, of clastic structure, unconformability or other evidence may be obtained showing that we are dealing with a group of altered sediments. In other cases intrusive junctions, chilled edges, con- tact alteration or porphyritic structure may prove that in its original condition a metamorphic gneiss was an igneous rock. The last appeal is often to the chemist, for there are certain rock types which occur only as sediments, while others are found only among igneous masses, and, however advanced the metamorphism may be, it rarely modifies the chemical composition of the mass very greatly. Such rocks, for example, as limestones, calc-schists, dolomites, quartzites and aluminous shales have very definite chemical characters which distinguish them even when completely recrystallized.

The schists and gneisses are classified according to the minerals they consist of, and this depends principally on their chemical composition. We have, for example, a group of metamorphic limestones, marbles, calc-schists and cipolins, with crystalline dolomites; many of these contain silicates such as mica, tremolite, diopside, scapolite, quartz and felspar. They are derived from calcareous sediments of different degrees of purity. Another group is rich in quartz (quartzites, quartz schists and quartzose gneisses), with variable amounts of white and black mica, garnet, felspar, zoisite and hornblende. These were once sandstones and arenaceous rocks. The graphitic schists may readily be believed to represent sediments once containing coaly matter or plant remains; there are also schistose ironstones (haematite-schists), but metamorphic beds of salt or gypsum are exceedingly uncommon. Among schists of igneous origin we may mention the silky calc-schists,

the foliated serpentines (once ultrabasic masses rich in olivine), and the white mica-schists, porphyroids and banded halleflintas, which have been derived from rhyolites, quartz-porphyries and acid tuffs. The majority of mica-schists, however, are altered clays and shales, and pass into the normal sedimentary rocks through various types of phyllite and mica-slates. They are among the most common metamorphic rocks; some of them are graphitic and others calcareous. The diversity in appearance and composition is very great, but they form a well-defined group not difficult to recognize, from the abun- dance of black and white micas and their thin, foliated, schistose character. As a special subgroup we have the andalusite-, stauro- lite-, kyanite- and sillimanite-schists, together with the cordierite- gneisses, which usually make their appearance in the vicinity of gneissose granites, and have presumably been affected by contact alteration. The more coarsely foliated gneisses are almost as frequent as the mica-schists, and present a great variety of types differing in composition and in appearance. They contain quartz, one or more varieties of felspar, and usually mica hornblende or augite, often garnet, iron oxides, &c. Hence in composition they resemble granite, differing principally in their foliated structure. Many of them have ” augen ” or large elliptical crystals, mostly felspar bu1? sometimes quartz, which are the crushed remains of porphyritic minerals; the foliation of the matrix winds around these augen, closing in on each side. Most of these augen gneisses are metamorphic granites, but sometimes a conglomerate bed simulates a gneiss of this kind rather closely. There are other gneisses, which were derived from felspathic sandstones, grits, arkoses and sedi- ments of that order; they mostly contain biotite and muscovite, but the hornblende and pyroxene gneisses are usually igneous rocks allied in composition to the hornblende-granites and quartz-diorites. The metamorphic forms of dolerite, basalt and the basic igneous rocks generally have a distinctive facies as their pyroxene and olivine are replaced by dark green hornblende, with often epidote, garnet and biotite. These rocks have a well developed foliation, as the prismatic hornblendes lie side by side in parallel arrangement. The majority of amphibolites, hornblende-schists, foliated epidiorites and green schists belong to this group. Where they are least altered they pass through chloritic schists into sheared diabases, Baser gabbros and other rocks in which remains of the original igneous minerals and structures occur in greater or less profusion. Bibliography. — Most text-books of geology treat of petrology in more or less detail (see Geology: § Bibliography). Elementary books on petrology include F. H. Hatch, Petrology (5th ed., London, 1909) ; L. V. Pirsson, Rocks and Rock-minerals (New York, 1908) ;

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PETRONEL, a 16th or 17th century fire-arm, defined by R. Barret (Theorike and Practike of Modem Wanes, 1 598) as a " horseman's peece." It was the fire-arm which developed on the one hand into the pistol and on the other into the carbine. The name (Fr. pelrinel for poitrinal) was given to the weapon either because it was fired with the butt resting against the chest (poitrine, Lat. pectus) or because it was carried slung from a belt across the chest.

PETRONIUS (G. (P) 1 Petronius Arbiter), Roman writer of the Neronian age. His own work, the Satirae, tells us nothing directly of his fortunes, position, or even century. Some lines of Sidonius Apollinaris refer to him and are often taken to imply that he lived and wrote at Marseilles. If, however, we accept the identification of this author with the Petronius of Tacitus, Nero's courtier, we must suppose either that Marseilles was his birthplace or, as is more likely, that Sidonius refers to the novel itself and that its scene was partly laid at Marseilles. The chief personages of the story are evidently strangers in the towns of southern Italy where we find them. Their Greek-sounding names (Encolpius, Ascyltos, Giton, &c.) and literary training accord with the characteristics of the old Greek colony intheist century a.d. The high position among Latin writers ascribed by Sidonius to Petronius, and the mention of him beside Menander by Macrobius, when compared with the absolute silence of Quintilian, Juvenal and Martial, seem adverse to the opinion that the Satirae was a work of the age of Nero. But Quintilian was concerned with writers who could be turned to use in the

1 The MSS. of the Satirae give no praenomen. Tacitus's Petronius is Gaius, though the elder Pliny and Plutarch call him Titus. The name Arbiter, given him by later writers, is not an ordinary cog- nomen; it may have been bestowed on him by contemporaries from the fact that his judgment was regarded as the criterion of good taste.

education of an orator. The silence of Juvenal and Martial may be

accidental or it is possible that a work so abnormal in form and substance was more highly prized by later generations than by the author's contemporaries.

A comparison of the impression the book gives us of the character and genius of its author with the elaborate picture of the courtier in Tacitus certainly suggests the identity of the two. Tacitus, it is true, mentions no important work as the composition of his C. Petronius; such a work as the Satirae he may have regarded as beneath that dignity of history which he so proudly realized. The care he gives to Petronius's portrait perhaps shows that the man enjoyed greater notoriety than was due merely to the part he played in history. " He spent his days in sleep, his nights in attending to his official duties or in amusement, by his dissolute life he had become as famous as other men by a life of energy, and he was regarded as no ordinary profligate, but as an accomplished voluptuary. His reckless freedom of speech, being regarded as frankness, procured him popularity. Yet during his provincial governorship, and later when he held the office of consul, he had shown vigour and capacity for affairs. Afterwards returning to his life of vicious indulgence, he became one of the chosen circle of Nero's intimates, and was looked upon as an absolute authority on questions of taste {arbiter eleganliae) in connexion with the science of luxurious living." 1 Tacitus goes on to say that this excited the jealousy of Tigellinus, an accusation followed, and Petronius committed suicide in a way that was in keeping with his life and character. He selected the slow process of opening veins and having them bound up again, whilst he conversed on light and trifling topics with his friends. He then dined luxuriously, slept for some time, and, so far from adopting the common practice of flattering Nero or Tigellinus in his will, wrote and sent under seal to Nero a document which professed to give, with the names of his partners, a detailed account of the abominations which that emperor had practised.

A fact confirmatory of the general truth of this graphic portrait is added by the elder Pliny, who mentions that just before his death he destroyed a valuable murrhine vase to prevent its falling into the imperial hands. Do the traits of this picture agree with that impression of himself which the author of the Satirae has left upon his work ? That we possess therein part of the document sent to Nero is an impossible theory. Our fragments profess to be extracts from the fifteenth and sixteenth books of the Satirae: Petronius could not have composed one-tenth even of what we have in the time in which he is said to have composed his memorial to Nero. We may be sure too that the latter was very frank in its language, and treated Nero with far greater severity than the Banquet treats Trimalchio. On the other

hand, it is clear that the creator of Trimalchio, Encolpius and Giton had the experience, the inclinations and the literary gifts which would enable him to describe with forcible mockery the debaucheries of Nero. And the impression of his personality does in another respect corre- spond closely with the Petronius of the Annals — in the union of immoral sensualism with a rich vein of cynical humour and admirable taste.

The style of the work, where it does not purposely reproduce the solecisms and colloquialisms of the Vulgar rich, is of the purest Latin of the Silver age. 8 Nor would there be any point in the verses on the capture of Troy and the Civil War at any

1 Ann. xvi. 1 8.

2 The false taste in literature and expression fostered by the declamationes is condemned by both Persius and Petronius on the same grounds. Cf. too Pers. i. 121, hoc ego apertum, hoc ridere meum, tarn nil, nulla tibi uendo Made with Sat. 52, meum intellegere nulla pecunia uendo; Pers. ii. 9, si ebulliat patruus, praeclarum funus, el si sub rastro crepet argenti miki seria with Sat. 88, Alius donum promittit, si propinquum divitem extulerit, alius si thesaurum ejf oderit and 42, homo animam ebulliit; Pers. iv. 26, arat . . . quantum non milvus oberrat with Sat. 37, fundos habet qua milvi volant. Both use the rare word baro. Animam ebullire occurs in Seneca's Apocolo- cyntosis, and the verbal resemblances illustrate perhaps rather the common use by both writers of the vulgar style. Cf . for resemblances to the style of the younger Seneca and the date of the work in general, Studer, Rh. Mus. (1843).

other era than that in which Nero's Troica and Lucan's Pharsalia were fashionable poems. The reciting poet indeed is a feature of a later age also, as we learn from Martial and Juvenal. But we know from Tacitus that the luxury of the table, so conspicuous in Trimalchio's Banquet, fell out of fashion after Nero {Ann. 3. 55). Of the work itself there have been preserved 141 sections of a narrative, in the main consecutive, although interrupted by frequent gaps. The name Satirae, given in the best MSS., implies that it belongs to the type to which Varro, imitating the Greek Menippus, had given the character of a medley of prose and verse composition. But the string of fictitious narra- tive by which the medley is held together is something quite new in Roman literature. This careless prodigal was so happily inspired in his devices for amusing himself as to introduce to Rome and thereby transmit to modern times the novel based on the ordinary experience of contemporary life 3 — the pre- cursor of such novels as

Gil Bias and Roderick Random. There is no evidence of the existence of a regular plot in the fragments, but we find one central figure, Encolpius, who professes to narrate his adventures and describe all that he saw and heard, whilst allowing various other personages to exhibit their peculiarities and express their opinions dramatically.

The fragment opens with the appearance of the hero, Encolpius, who seems to be an itinerant lecturer travelling with a companion named Ascyltos and a boy Giton, in a portico of a Greek town, in Campania. An admirable lecture on the false taste in literature, resulting from the prevailing system of education, is replied to by a rival declaimer, Agamemno, who shifts the blame from the teachers to the parents. The central personages of the story next go through a series of questionable adventures, in the course of which they are involved in a charge of robbery. A day or two after they are present at a dinner given by a freedman of enormous wealth, Trimalchio, who entertained with ostentatious and grotesque extravagance a number of men of his own rank but less prosperous. We listen to the ordinary talk of the guests about their neighbours, about the weather, about the hard times, about the public games, about the education of their children. We recognize in an extravagant form the same kind of vulgarity and pretension which the satirist of all times delights to expose in the illiterate and ostentatious millionaires of the age. Next day Encolpius separates from his companions in a fit of jealousy, and, after two or three days' sulking and brooding on his revenge, enters a picture gallery, where he meets with an old poet, who, after talking sensibly on the decay of art and the inferior- ity of the painters of the age to the old masters, proceeds to illustrate a picture of the capture of Troy by some verses on that theme. This ends in those who are walking in the adjoining colonnade driving him out with stones. The scene is next on board ship, where Encolpius finds he has fallen into the hands of some old enemies. They are shipwrecked, and Encolpius, Giton and the old poet get to shore in the neighbourhood of Crotona, where, as the inhabitants are notorious fortune-hunters, the adventurers set up as men of fortune. The fragment ends with a new set of questionable adven- tures, in which prominent parts are played by a beautiful enchantress named Circe, a priestess of Priapus, and a certain matron who leaves them her heirs, but attaches a condition to the inheritance which even Encolpius might have shrunk from fulfilling. 4 If we can sup- pose the author of this work to have been animated by any other motive than the desire to amuse himself, it might be that of convinc- ing himself that the world in general was as bad as he was himself. Juvenal and Swift are justly regarded as among the very greatest of satirists, and their estimate of human nature is perhaps nearly as

unfavourable as that of Petronius; but their attitude towards human degradation is not one of complacent amusement; their realism is the realism of disgust, not, like that of Petronius, a realism of sympathy. Martial does not gioat over the vices of which he writes with cynical frankness. He is perfectly aware that they are vices, and that the reproach of them is the worst that can be cast on any one. And, further, Martial, with all his faults, is, in his affections, his tastes, his relations to others, essentially human, friendly, generous, true. There is perhaps not a single sentence in Petronius which implies any knowledge of or sympathy with the existence of affection, conscience or honour, or even the most elementary goodness of heart.

3 For the whole question of possible predecessors and Petronius's relation to the extant Greek romances see W. Schmid, " Der griechische Roman " in Jahrbiicher fur das Mass. Altertum, &c. (1904). One would certainly have expected the realistic tendency which appears in the New Comedy, the Characters of Theophrastus and the Mimes, to have borne this fruit before the first century of our era.—(W. C. Su.)

4 Omnes qui in testamento meo legata habent praeter libertos meos, hac conditione percipient quae dedi, si corpus meum in partes conciderint et astante populo comederint (141).

Tha work has reached us in so fragmentary and mutilated a shape that we may of course altogether have missed the key to it; it may have been intended by its author to be a sustained satire, written in a vein of reserved and powerful irony, of the type realized in our modern Jonathan Wild or Barry Lyndon. Otherwise we must admit that, in the entire divorce of intellectual power and insight from any element of right human feeling, the work is an exceptional pheno- menon in literature. For, as a work of original power, of humorous representation, of literary invention and art, the fragment deserves all the admiration which it has received. We recognize the arbiter elegantiae in the admirable sense of the remarks scattered through it on education, on art, on poetry and on eloquence. There is a true feeling of nature in the description of a grove of plane-trees, cypresses and pines:

" Has inter ludebat aquis errantibus amnis Spumeus et querulo vexabat rore lapillos." And some of the shorter pieces anticipate the

terseness and elegance of Martial. The long fragment on the Civil War does not seem to be written so much with the view of parodying as of entering into rivalry with the poem of Lucan. In the epigram extemporized by Trimalchio late on in the banquet: ” Quod non expectes, ex transverso fit — Et supra nos Fortuna negotia curat, Quare da nobis vina Falerna, puer,” we have probably a more deliberate parody of the style of verses produced by the illiterate aspirants to be in the fashion of the day. We might conjecture that the chief gift to which Petronius owed his social and his literary success was that of humorous mimicry. In Trimalchio and his various guests, in the old poet, in the culti- vated, depraved and moody Encolpius, in the Chrysis, Quartilla, Polyaenis, &c, we recognize in living examples the play of those various appetites, passions and tendencies which satirists deal with as abstract qualities. Another gift he possesses in a high degree, which must have availed him in society as well as in literature — the gift of story-telling ; and some of the stories which first appear in the Satirae — e.g. that of the Matron of Ephesus — have enjoyed a great reputation in later times. His style, too, is that cf an excellent talker, who could have discussed questions of taste and literature with the most cultivated men of any time as well as amused the most dissolute society of any time in their most reckless revels. One phrase of his is often quoted by many who have never come upon it in its original context, ” Horatii curiosa felicitas.”

Authorities. — Until about 1650 only part of the Banquet of Trimalchio, with the other fragments of the work, was known. The best MS. of this type is a Leiden MS., a copy by Scaliger of one which seems to have belonged to Cujacius. Marinus Statilius (see, however, Ellis, Journal of Philology, 12, p. 266) discovered at Trau in Dalmatia a MS. containing the whole Banquet, which was first published at Padua in 1664.

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(W. Y. S.; W. C. Su.).

PETROPAVLOVSK, a town of West Siberia, in the govern- ment of Akmolinsk, on the right bank of the Ishim river, and on the great Siberian highway, 170 m. by rail W. of Omsk. The population, 7850 in 1865, was 21,796 in 1900, of whom one-third were Mahommedan Kirghiz. The town carries on an active trade in cattle, furs, tea, wool, skins, cottons, woollen stuffs, corn, metals, metallic wares and spirits. The small fort of Petropavlovsk was founded in 1752, and was the military centre of the Ishim line of fortifications.

Petropavlovsk is also the name of a Russian seaport in Kam- chatka, on the eastern shore of the Bay of Avacha.in 53 N. and 158 44′ E. Its harbour, one of the best on the Pacific, is little used, and the town consists merely of a few huts with some 400 inhabitants. Its naval institutions were transferred to Nikolayevsk after the attack of the Anglo French fleet in 1854.

PETROPOLIS, a city of the state of Rio de Janeiro, Brazil, in an elevated valley of the Serra de Estrella, 2634 ft. above sea-level and 27 m. N. of the city of Rio de Janeiro, with which it is connected by a combined railway and steamship line, and

also by a longer railway line. Pop. of the municipality (1900), 29,331, a large percentage being summer residents, as tl.e census was taken late in December; (1902, municipal census;, 18,373. Petropolis is served by the Principe do Grao Paii railway, now a part of the Leopoldina system, which connects with Rio de Janeiro and Nictheroy on the coast, and with the station of Entre Rios on the Central of Brazil railway, lis altitude gives the city a cool invigorating climate, making it a favourite summer residence for the well-to-do classes of Rio. The rainfall is abundant, and especially so in summer (December to March) when the humidity is extreme. Vegetation is luxu- riant and comprises a great variety of tropical and sub-tropical species. The city is built in a large, irregularly shaped basin formed by streams which converge to form the Piabanha river, a tributary of the Parahyba do Sul. Among the public buildings are the old imperial palace, a modern summer resi- dence of the national executive and a municipal hall. Although Petropolis is not a commercial centre, its water-power and cool climate are making it an important manufacturing town. Among the products are cotton fabrics and garments, beer, and Camembert

and Brie cheeses.

Petropolis was founded in 1845 by Julius Frederick Koler under the auspices of the emperor of Brazil, Dom Pedro II., on lands purchased by his father, Dom Pedro I., in 1822. The place was previously known as Corrego Secco, which Dr George Gardner described in 1837 as ” a small, miserable village.” The first emperor planned to establish there a German colon}-, but the plan was not realized until 1845, when about 2700 colonists from Germany were located there. Its growth was slow, but the choice of the place by the emperor as a summer residence drew thither many of the wealthy residents of the capital. The Maua railway was opened to the foot of the serra (Raiz da Serra) in 1854, and the macadamized road up the serra to the town in 1856. The mountain section of the railway, on the Riggenbach system, was completed in 1883. Petropolis has since become the summer residence of the diplomatic corps and of the higher officials of the Federal government, and was the capital of the state of Rio de Janeiro from 1893 to 1903. PETROVSK, a seaport of Russia in Transcaucasia, on the Caspian Sea, in the province of Daghestan, 180 m. by rail E. of Vladikavkaz, and 235 m. N.W. from Baku. Pop. 9806. The town has become the port of embarcation for Krasnovodsk. the Transcaspian territory, and the Central Asian khanates. There are naphtha wells; and the hot sulphur baths at Ak-gol and Taiga, close by, attract many visitors in summer.

PETROVSK, a town of eastern Russia, in trie government of Saratov, on the Medvyeditsa, a tributary of the Don, 60 m. N.W. of the town of Saratov. Pop. (1864), 10,128; (1897), 13,212. It was founded by Peter the Great in 1098 as a defence against the Kuban Tatars. Its industrial establishments include distilleries, tanneries, tallow and brickworks.

PETROZAVODSK, a town and episcopal see of Russia, capital of the government of Olonets, on the west shore of Lake Onega, 190 m. N.E. of St Petersburg. Pop. (1865), 11,027; (1897), 12,521. Two cathedrals, built towards the end of the 18th century, a mining school, an ecclesiastical seminary and a government cannon-foundry are the chief public buildings and institutions. Peter the Great founded ironworks here in 1703, but they continued in operation only twenty-four years. The cannon-foundry was instituted in 1774. Petrozavodsk became the capital of the government of Olonets in 1802.

PETRUCCI, PANDOLFO (d. 1512), tyrant of Siena, spent the greater part of his youth in exile, on account of the civil strife by which his native town of Siena was torn; but on the triumph of the party of the Noveschi (those who supported the Council of Nine) in 1487 he was

able to return home. On the death of his brother Giacopo, one of the most powerful men in the city, Pandolfo succeeded to all the latter's offices and emoluments (1497), thus becoming in fact if not in name master of Siena. By his marriage with Aurelia, daughter of Nicola Borghese, another very influential citizen, he still further strengthened his authority. But he soon began to abuse his power by selling public office:, to

the highest bidders, or conferring them on his followers. A plot was made to murder him, but he discovered the conspiracy in time, and his own father-in-law, who had been leader of the movement, was put to death. In 1498 he prevented the out- break of war with Florence over the possession of Montepulciano, which had been a bone of contention between the two cities for over a hundred years. His attitude towards Cesare Borgia was exceedingly astute; at first he assisted him, and obtained from him with the favour of the French king the cession of Piombino; but having subsequently aroused the suspicions of Borgia, the latter attempted to suppress Petrucci by inviting him to the fatal meeting of Senigallia. The Sienese tyrant, however, did not fall into the trap, and although Borgia in 1502 obliged him to quit Siena, he returned two months later, more powerful than before. Petrucci supported Pisa in the war against Florence, but eventually, through the intervention of the pope and of the king of Spain, he made peace with the latter city, to which he gave back Montepulciano in 1512. As a reward for this action Pope Julius II. created his nephew cardinal. During his last days Petrucci abdicated his authority in favour of his son Borghese. He died at San Quirico di Osenna on the 21st of May 1512.

See Pecci, Memorie storico-critiche di Siena (Siena, 1755); U. G. Mondolfo, P. Petrucci signere di Siena (Siena, 1899).

PETRUS AUREOLUS (Oriol), scholastic philosopher and monk of the Franciscan order, lived in the latter half of the 13th century, and died in Paris in 13 21 just after his appointment as archbishop of Aix. He was one of the first to attack the realist doctrines of Duns Scotus, and is interesting mainly as the precursor of William of Occam in his revival of Nominalism. His ability earned for him the titles of Doctor Facundus and Doctor Abundans.

PETTENKOFEN, AUGUST VON (1821-1889), Austrian painter, born in

Vienna, was brought up on his father's estate in Galicia. Having decided to give up the military career on which he had started, he devoted himself to painting, taking for his subjects the simple scenes of the life on the dreary Puszta. His paintings are treasured for their fine qualities of colour, and for the sincerity with which the artist sets before us the uneventful melancholy life of Hungarian peasants and gipsies — without any theatrical pathos or forced humour. He was the inventor of the Pettenkofen box, an appliance for dissolving and redistributing cracked or discoloured varnish without friction or the dangerous use of chemicals. He died in Vienna in 1889.

PETTENKOFER, MAX JOSEPH VON (1818-1901), Bavarian chemist and hygienist, was born on the 3rd of December 1818 at Lichtenheim, near Neuburg. He was a nephew of Franz Xaver Pettenkofer (1783-1850), who from 1823 was surgeon and apothecary to the Bavarian court and was the author of some chemical investigations on the vegetable alkaloids. He studied pharmacy and medicine at Munich, where he graduated M.D. in 1843, and after working under Liebig at Giessen was appointed chemist to the Munich mint in 1845. Two years later he was chosen extraordinary professor of chemistry in the medical faculty, in 1853 he received the ordinary professorship, and in 1865 he became also professor of hygiene. In 1894 he retired from active work, and on the 10th of February 1901 he shot him- self in a fit of depression at his home on the Starnberger See, near Munich. In his earlier years he devoted himself to chemistry, both theoretical and applied, publishing papers on the prepara- tion of gold and platinum, numerical relations between the atomic weights of analogous elements, the formation of aventurine glass, the manufacture of illuminating gas from wood, the preser- vation of oil-paintings, &c. The reaction known by his name for the detection of bile acids was published in 1844. In his widely used method for the quantitative determination of carbonic acid the gaseous mixture is shaken up with baryta or lime water of known strength and the change in alkalinity ascertained by means of oxalic acid. But his name is most familiar in connexion with his work in practical hygiene, as an apostle of good water, fresh air and proper sewage disposal. His attention was drawn to this subject about 1850 by the unhealthy condition of Munich.

Pettenkofer gave vigorous expression to his views on hygiene am disease in numerous books and papers; he was an editor of thi Zeitschrift fur Biologie from 1865 to 1882, and of the Archiv fii Hygiene from 1883 to 1894.

PETTICOAT, an underskirt, as part of a woman’s dress. Th< petticoat, i.e. " petty-coat " or small coat, was originally a shor garment for the upper part of the body worn under an oute: dress; in the Promptorium parvulorum the Latin equivalent ii lunicula. It was both a man's and a woman's garment, and wai in the first case worn as a small coat under the doublet and by women apparently as a kind of chemise. It was however, early applied to the skirt worn by women hanging from the waist, whether as the principal lower garment or as an underskirt. In the middle of the 17th century the wide breeches with heavy lace or embroidered ends worn by men were known as " petticoat breeches," a term alsc applied to the loose canvas or oilskin overalls worn by

fishermen.

PETTIE, JOHN (1839-1893), Scottish painter, was born in Edinburgh on the 17th of March 1839, the son of Alexander and Alison Pettie. In 1852 the family removed to East Linton, Haddingtonshire, and a portrait by the lad of the village carrier and his donkey overcame his father's objections to art as a career for his son. When sixteen he entered the Trustees' Academy in Edinburgh, working under Robert Scott Lauder with W. Q. Orchardson, J. MacWhirter, W. M'Taggart, Peter Graham, Tom Graham and G. P. Chalmers. His first exhibits at the Royal Scottish Academy were " A Scene from the Fortunes of Nigel " — one of the many subjects for which he sought inspiration in the novels of Sir Walter Scott — and two portraits in 1858, followed in 1859 by " The Prison Pet." To the Royal Academy in i860 he sent "The Armourers"; and the success of this work and ot " What d'ye Lack, Madam ? " in the following year, encouraged him to settle in London (1862), where he joined Orchardson. In 1866 he was elected an Associate of the Royal Academy, and in 1874 received full academical honours in succession to Sir Edwin Landseer. His diploma picture was "Jacobites, 1745-" Pettie was a hard and rapid worker, and, in his best days, a colourist of a high order and a brilliant executant. In his early days he produced a certain amount of book illustration. His connexion with Good Words began in 1861, and was continued till 1864. With J. MacWhirter he illustrated The Postman's Bag (Strahan, 1862), and Wordsworth's Poetry for the Young (Strahan, 1863). His principal paintings, in addition to those already mentioned, are " CromweU's Saints " (1862); " The Trio " (1863); " George Fox refusing to take the Oath " (1864); " A Drumhead Court- martial "(1865); "The Arrest for Witchcraft " (1866); "Treason" (1867, now in the Mappin Art Gallery, Sheffield) ; " Tussle with a Highland Smuggler " (1868); " The Sally " (1870); " Terms to the Besieged " (1872); " The Flag of Truce " (1873); " Ho! Ho ! Old Noll" and "A State Secret" (1874); "A Sword and Dagger Fight" (1877); " The Death Warrant " (1879); " Monmouth and James II."(i882); " The Vigil " (1884, in the Chantrey Collec- tion, National Gallery of British Art); " Challenged " (1885); "The Chieftain's Candlesticks " (1886); "Two Strings to Her Bow " (1887); " The Traitor " and " Sir Charles Wyndham as David Garrick " (1888); and " The Ultimatum " and " Bonnie Prince Charlie " (1892). Pettie died at Hastings on the 21st of February 1893. In J 894 a selection of his work was included in the Winter Exhibition of the Royal Academy. His portrait by himself is in the Tate Gallery.

John Pettie, R.A. (London, 1908), by his nephew Martin Hardie, gives the story of his life, a catalogue of his pictures, and fifty reproductions in colours.

PETTY, SIR WILLIAM (1623-1687), English statistician and political economist, born on the 26th of May 1623, was the son of a clothier at Romsey in Hampshire, and received his early education at the grammar school there. About the age of fifteen he went to Caen (Normandy), taking with him a little stock of merchandise, on which he traded, and so maintained himself whilst learning French, improving himself in Latin and Greek, and studying mathematics and other sciences. On his return to England he seems to have had for a short time a place

in the royal navy. He went abroad again in 1643, and remained for three years in France and the Netherlands, pursuing his studies. In Paris he read Vesalius with Hobbes, who was then preparing his Tractalus opticus, and it is said that Petty drew the diagrams for him. In 1647 Petty obtained a patent for the invention of double writing, i.e. a copying machine. In politics he espoused the side of the parliament. His first publication was a letter to Samuel Hartlib in 1648, entitled Advice for the Advancement of some Particular Parts of Learning, the object of which was to recommerid such a change in education as would give it a more practical character. In the same year he took up his residence at Oxford, where he was made deputy professor of anatomy, and where he gave instruction in that science and in chemistry. In 1649 he obtained the degree of doctor of physic, and was soon after elected a fellow of Brasenose College. He gained some notoriety in 1650 by restoring to life a woman who had been hanged for infanticide. In 165 1 he was made professor of anatomy at Oxford, and also became professor of music at Gresham College. In 1652 he went to Ireland, having been appointed physician to the army in that country. In 1654, observing that the admeasurement and division of the lands forfeited in 1641 and granted to the soldiers had been ” most inefficiently and absurdly managed,” he entered into a contract to execute a fresh survey, which he completed in thirteen months. 1 By this he gained £9000, and part of the money he invested profitably in the purchase of soldiers’ debentures. He thus became possessor of so large a domain in the county of Kerry that, according to John Aubrey, he could behold from Mt Mangerton 50,000 acres of his own land. He set up iron- works in that neighbourhood, opened lead-mines and marble- quarries, established a pilchard fishery, and commenced a trade in timber. Besides the office of commissioner of distribution of the lands he had surveyed, he held that of secretary to the lord-lieutenant, Henry Cromwell, and was also during two years

clerk of the council. In January 1658 he was elected to Richard Cromwell's parliament as member for West Looe in Cornwall. After the Restoration he returned to England and was favourably received and knighted by Charles II., who was " much pleased with his ingenious discourses," and who, it is said, intended to create him earl of Kilmore. He obtained from the king a new patent constituting him surveyor-general of Ireland. In 1663 he attracted much notice by the success of his invention of a double- bottomed ship, which twice made the passage between Dublin and Holyhead, but was afterwards lost in a violent storm. He was one of the first members of the Royal Society, and sat on its council. He died in London on the 16th of December 1687, and was buried in the church of his native place. His will, a curious and characteristic document, is printed in Chalmers's Biographical Dictionary.

His widow, Elizabeth (d. 1708), daughter of Sir Hardress Waller (1604-1666), the Irish Cromwellian soldier and regicide, was created Baroness Shelburne by James II. in 1688; and her two sons were successively created earls of Shelburne, but on their death without issue the Petty estates passed to their sister, Anne, and after her marriage to the 1st earl of Kerry the Shelburne title was revived in her son's favour (see under Lansdowne, 1st Marquess).

Petty's Irish survey was based on a collection of social data which entitles him to be considered a real pioneer in the science of comparative statistics. He was also one of the first in whom we find a tendency to a view of industrial phenomena which was at variance with the then dominant mercantilist ideas, and he exhibits a statesmanlike sense of the elements in which the strength of a nation really consists. Roscher names him as having, along with Locke and Dudley North, raised the English school to the highest point it attained before the time of Hume.

1 The survey executed by Petty was, somewhat whimsically, called the " Down Survey," because the results were set down in maps; it is called by that name in Petty's will. He left in MS. a lull account of the proceedings in connexion with it, which was rflited by Sir Thomas A. Larcom for the Irish Archaeological Society in 1851. The maps, some of which were injured by a fire in 1711, are preserved in the Public Record Office, Dublin.

His Treatise of Taxes and Contributions contains a clear state- ment of the doctrine that price depends on the labour necessarj for production. Petty is much concerned to discover a fixed unit of value, and he thinks he has found it in the necessary sustenance of a man for a day.

He understands the cheapening effect of the division of labour. He states correctly the notion of ” natural and true ” rent as the remainder of the produce of land after payment of the cost of production; but he seems to have no idea of the ” law of diminishing returns.” He has much that is just on the subject of money: he sees that there may be an excess of it as well as a deficiency, and regards the prohibition of its exportation as contrary to sound policy. But he errs in attributing the fall of the rate of interest which takes place in the progress of industry to the increase in the quantity of money. He protested against the fetters imposed on the trade of Ireland, and advocated a union of that country with Great Britain. Whilst the general tendency in his day was to represent England as in a state of progressive decline — an opinion put forward particularly in the tract entitled Britannia languens — Petty declared her resources and prospects to be not inferior to those of France.

A complete list of his works is given in the Athenae oxonienses. The most important are: the Treatise of Taxes and Contributions (1662, 1667 and 1685); Political Arithmetic, presented in MS. to Charles II., but, because it contained matter likely to be offensive to France, kept unpublished till 1691, when it was edited by Petty’s son Charles; Quantulumcunque, or a Tract concerning Money (1682); Observations upon the Dublin Bills of Mortality in 1081 and the State of that City (1683) ; Essay concerning the Multiplication of Mankind (1 686) ; Political A natomy of Ireland (1 69 1) . Several papers appeared in the Philosophical Transactions. See Economic Writings of Sir William Petty, ed. C. H. Hull (2 vols., 1899).

PETTY-OFFICER, the title in the navy of a large number of minor (Fr. petit, small) officers, of less than commissioned or warrant rank — such as the master-at-arms, sailmaker, caulker, armourer, cook, &c. They were originally named, and removable, by the captain.

PETUNIA, in botany, a genus of plants belonging to the natural order Solanaceae and containing about 16 species, chiefly South American (southern Brazil and Argentina). The garden forms are derived from the white-flowered P. nyctaginiflora and the violet- or purple-flowered P. violacea. The varieties of petunia, especially the double forms, make admirable specimens for pot culture.

Named or specially fine varieties are propagated by cuttings taken from stock plants kept through the winter on a dry warm shelf, and moved into a brisk moist heat in early spring ; the young shoots are planted in pans Or pots filled with sandy soil, and, aided by a brisk bottom heat, strike root in a few days. They are then potted singly

into thumb-pots, and when once established are gradually hardened off, and afterwards repotted as required. The shoots should be topped to make bushy plants, and their tops may be utilized as cuttings. The single varieties are raised from seeds sown in light sandy soil in heat, in the early spring, and very slightly covered. The plants need to be prickedtiut or potted off as soon as large enough to handle. Good strains of seeds supply plants suitable for bedding; but, as they do not reproduce themselves exactly, any sorts particularly required must be propagated, like the double ones, from cuttings.

PETWORTH, a market town in the Horsham parliamentary division of Sussex, England, 55 m. S.S.W. from London by the London, Brighton & South Coast railway. Pop. (1901), 2503. The church of St Mary is Perpendicular, and contains numerous memorials of members of the Percy family and others. Petworth House, situated in a beautiful park, dates from the 1 8th century, and contains a magnificent collection of pictures. At Bignor in the neighbourhood are remains of an important and splendidly adorned Roman villa.

The first mention of Petworth (Peartingawyrth, Peteorde, Puetewird, Pedewurde, Putteworth, Pytteworth, Petteworth) occurs in a grant by Eardwulf, king of Northumbria, to St Peter's Church, about 791. In the time of Edward the Confessor Petworth was an allodial manor held by his queen Edith, and in 1086 Robert Fitz-Tetbald held it of Roger Montgomery, earl of Shrewsbury. It then included a church and a mill, and was rated at nine hides. Through Queen Adelisa, Petworth came first into the hands of

her steward, Reginald de Wyndsor, and was afterwards given I to her brother Josceline, who held it of the honour of Arundel. I Josceline married Agnes de Percy and assumed the surname of Percy. The honour and manor of Petworth followed the descent of this family until 1708. In 1377 Henry Percy was created earl of Northumberland. The only daughter of the last earl married Charles, duke of Somerset, in 1682, and Petworth descended through their daughter Catherine to the earls of Egremont. The adopted son of the third earl was created Baron Leconfield in

1850-

PEUTINGER KONRAD (1465-1547), German humanist and

antiquarian, was born at Augsburg. In 1497 he was town clerk of his native place, and was on intimate terms with the emperor Maximilian. He was one of the first to publish Roman inscrip- tions, and his name remains associated with the famous Tabula peutingcriana (see Map), a map of the military roads of the western Roman Empire, which was discovered by Konrad Celtes, who handed it over to Peutinger for publication. Peutinger also edited the Historia Gothorum of Jordanes, and the Historia gentis Langobardorum of Paulus Diaconus.

The Tabula peutingeriana was first published as a whole by F. de Scheyb (1753); later editions by E. Desjardins (1869- 1874) and C. Miller (1888); see also E. Paulus, Erklarung der Peu- tinger Tafel (1867); and Teuffel-Schwabe, Hist, of Roman Literature (Eng. trans., 1900).

PEVENSEY, a village in the Eastbourne parliamentary division of Sussex, England, 65 m. S.S.E. from London by the London, Brighton & South Coast railway. Pop. (1901), 468. The village is a member of the Cinque Ports, but the sea has receded a mile from it in historic times. The outer wail, with solid towers, of the celebrated castle, is of Roman construc- tion, and originally enclosed a complete oval; it is generally considered to have enclosed the strong town of Anderida. Within rise the fine ruins, principally of the 13th century, but in part Norman, of the castle proper, with a keep and four massive round towers. The church of St Nicholas, close to the castle, shows beautiful Early English work. It has been supposed that Pevensey was the scene oi the landing of Caesar in 55 B.C., but the question is disputed.

The name of Pevensey (Paevenisel, Pevensel, Pevenes, Pemsey) first occurs in a grant of land there by the south Saxon Duke Berthuald to the abbey of St Denis in 795. In later Saxon times, at least by the reign of Edward the Confessor, it was a royal borough and had a harbour and a market. Its early importance was due to its fencible port. It was the landing place of William the Norman on his way to conquer, and was the caput of the rape of Pevensey, which was granted by William to the earl of Mortain and subsequently became the Honour of the Eagle. Some time before the reign of Edward I. the town of Pevensey was made a member of Hastings and shared the liberties of the Cinque Ports, but apart from them it possesses no charter. It was governed by a bailiff and twelve jurats, elected annually, until by an act of 1883 it ceased to exist as a borough. Its seal dates apparently from the reign of Henry III. The gradual decline of Pevensey was complete in the 15th century and was caused by the recession of the sea and consequent loss of the harbour.

PEW (Mid. Eng. puwe, through 0. Fr. puya, put, mod. puy, in the sense of hill, cf. appuyer, to lean against; from Lat. podium, a high place, balcony; Gr. ttoSlov, pedestal, irovs, foot), a term, in its most usual meaning, for a fixed seat in a church, usually enclosed, slightly raised from the floors, and composed of wood framing, mostly with ornamented ends. Some bench ends are certainly of Decorated character, and some have been considered to be of the Early English period. They are sometimes of plain oak board, 2ˆ to 3 in. thick, chamfered, and with a necking and finial generally called a poppy head; others are plainly panelled with bold cappings; in others the panels are ornamented with tracery or with the linen pattern, and sometimes with running foliages. The large pews with high enclosures, curtains, &c, known familiarly as ” horse-boxes,” and common in English parish churches during the 18th and early part of the 19th centuries, have nearly all been cleared away. The parish church

of Whitby, in Yorkshire, is perhaps the best surviving example of an unaltered interior.

The Latin word podium was particularly applied to a balcony or parapet next to the arena in the Roman theatre where the emperor and other distinguished persons sat. According to Du Cange (Glossarium, s.v. podium), it is found in medieval Latin for a bench (subsellium) for the minor canons at a church in Lyons (1343), and also for a kneeling stool in a monastic church. The word ” pew ” in English was often used for a stall for the minister, for a reading desk, or for a pulpit. The floor space of the nave and tran- septs of medieval churches was usually .open, mats being sometimes provided for kneeling, and if any fixed seats were provided these would be for the patrons of the church or for distinguished people. Some enclosed seats, however, seem to have been reserved for women, as is seen in Piers Plowman, ch. vii. 144, ” Among wyves and wodewes ich am ywoned sitte yparroked in puwes.” They did not come into general use till the middle of the 15th or beginning of the 16th century (see Gasquet, Parish Life in Medieval England, (1906, pp. 62 and 133). Over the few seats thus allotted dispute arose and attempts were made to appropriate them. Thus the constitutions for the synod of Exeter, drawn up by Bishop Peter Quivel in 1287, forbid any one ” to claim any sitting in the church as his own. . . . Whoever first comes to pray, let him take what place he wishes in which to pray.”

At common law all seats in a parish church are for the common use of all the parishioners, and every parishioner has a right to a seat without paying for it. The disposition of the seats is in the discretion of the churchwardens acting for the ordinary for the purpose of

orderly arrangement (as to the exercise of this dis- cretion see Reynolds v. Monckton, 1841, 2 M. & R. 384), and this can be exercised in cases where all the seats are free {Asher v. Calcraft, 1887, 18 Q.B.D. 607). The right to a seat does not belong to a non-parishioner. As against the assignment and disposition of seats by the ordinary, acting through the church- wardens, two kinds of appropriation can be set up (a) by the grant of a faculty by the ordinary, and (b) by prescription, based on the presumption of a lost facidty. Such faculties are rarely granted now; they were formerly common; the grant was to a man and his family ” so long as they remain inhabitants of a certain house in the parish “; the words ” of a certain house ” are now usually omitted. The claim to a pew by prescription must be in respect of a house in the parish; the right is subject to the burden of repairing the pew; it is not an easement, nor does the Prescription Act 1832 apply to it (see for the whole subject of a claim by prescription Phillips v. Halliday, 1891, A.C. 228). The letting of pews in parish churches became common in the 16th century, but there are some earlier instances of the use, for example at St Ewens, Bristol, in 1455 (Churchwardens’ Accounts, Sir J. Maclean, Trans. Bristol and Gloucester Archaeol. Assoc, vol. xv., 1890-1891). The taking of pew rents in parish churches is illegal (Lord Stowell, in Walter v. Gunner, 1798, 3 Hag. Consist. 817); but under the various Church Building Acts seats may be let and rents charged to pay the salary of the minister, &c.

See A. Heales, History and Law of Church Seats and Pews (1872) ; Phillimore, Eccles. Law (1896), ii. 1424 seq.

PEWTER, a general name used to denote a number of alloys of various metals in diverse proportions, the sole common feature of which lies in the fact that tin is always the chief constituent. The etymology of the word is doubtful, but it is probably an English modification of spelter, which was adopted with more or less local alteration by the continental European nations, who at an early period were eager purchasers of the ware, becoming peauler in Dutch, peutre, peautre or piautre in French, peltro in Italian and peltre in Spanish. Roman pewter, the oldest known, which has been disinterred at various places in England and elsewhere, was composed of tin and lead alone, for the occasional traces of iron are believed to be accidental, in proportions which, though varying considerably, group themselves around two definite formulae, one containing 71-5 parts of tin to 27-8 of lead, the other 78-2 of tin to 21-7 of lead, or one libra of tin to 4j and 3 unciae of lead respectively. On the European continent in the middle ages, some ten centuries later than the supposed date of the Roman pewter found in Britain, when we first get definite records of

the composition of pewter, lead remained the chief, if not the only secondary ingredient. In 1437 the pewterers of Montpelier added 4 parts of lead to 96 of tin,

when making dishes and porringers 10 parts of lead to 90 of tin for salt-cellars and ewers; those of Limoges used 4 parts of lead to 100 of tin; at Nuremberg in 1576 it was ordained that not more than 1 lb of lead should be mixed with every 10 lb of tin; in France during the 18th century a limit of 15% of lead was imposed, while at the present time 16-5 % with a margin of 1-5 for errors is regarded as safe for the storage of wine and consequently legal.

In England the earliest known ordinances for the regulation of the craft were drawn up in 1348 and received the approval of the mayor and aldermen. From them we learn that for rounded vessels lead might be mixed with the tin in the pro- portion of 26 lb to each hundredweight, though this quantity appears to have been found excessive, since in 1351 a pewterer was punished because his alloy contained more than 16 lb to the hundredweight, unless this be a clerical error in the contemporary records of the Pewterers' Company. Articles made of this material were to be known as " vessels of tyn for ever " but the alloy soon came to be known as " ley." Another formula, however, authorized in the same document, would appear to have been at that time an exclusively English secret, to which was presumably due the universal recognition of the superiority of the island wares which is so notable a fact in the history of pewter. It was known as " fyne peauter " and used for dishes, saucers, platters, chargers, and for all " things that they make square," such as cruets, chrismatories, &c, which owing either to the rough usage they would be submitted to, or to the sharpness of their angles, called for greater toughness in the material. The recipe for this alloy as originally propounded was as much brass to the tin " as it wol receiuve of his nature," but the lack of precision in this perhaps rendered it difficult to distinguish accidental variations from deliberate adulteration, and in 1474-1475 it was resolved that 26 lb of brass must be mixed with every hundredweight of tin. The penalties for infringement of the rules were severe and frequently enforced, but in spite of them alterations and improvements crept in. The chief and perhaps the earliest of these was the addition of a certain proportion of bismuth, or as it was then called " tin glass." When this was first used is not recorded, but by 1561 it was accepted as a matter of course; in 1630 a

maker ” was found in fault for not sufficiently tempering his metal with tin glass”; and in 1653 it was ordered that 3 lb weight of tin glass at least must be mixed with every 1000 lb of tin. Anti- mony was subsequently introduced — though there is no mention of it in the records of the Pewterers’ Company — sometimes alone as in tin and temper (i-6 to 150 parts) and trifle (17 parts to 83 of tin), sometimes with other metals as in hard metal (96 parts of tin, 8 of antimony and 2 of copper), a mixture very closely resembling that still used under the name of ” Brit- annia metal,” and in plate pewter (100 parts of tin, 8 of antimony, 4 of copper and 4 of bismuth). The wares were originally fash- ioned iu two ways, by hammering or by casting, and the workers in each were strictly differentiated, the former, who worked in fine pewter, being known as Sadware men, the latter who used ” ley ” as Hollow-ware men. A third class, known as Triflers, from the alloy they were limited to, probably at first only manu- factured such small articles of domestic use or ornament as did not definitely fall under either of the other headings, but from an authorized list of wares, drawn up by a committee of Triflers in 161 2, it is clear that the barrier between them and the Hollow- ware men had been largely broken down. Another method of working pewter which seems to have been introduced later, and never followed to any great extent, was spinning, by which the vessel was shaped in a mould on a wheel by the mere pressure of a Dlunt tool, the softness of the metal allowing of its flowing sufficiently for this purpose.

Pewter first appears in history in 1074, when a synod at Rouen permitted its use as a substitute for gold or silver in church vessels, a concession accepted also at Winchester two years later, again withdrawn in 1175, but once more tacitly adopted some twenty years after. The records of its domestic use commence with the caldrons employed for boiling the meat at the coronation of

Edward I. in 1274, though we gather that the trade was even then flourishing in Paris and Bruges, whence during the following century it extended to Augsburg, Nuremberg, Poitiers, Mons and other continental centres. Confined at first to the more wealthy classes, we can trace as time goes on its extension lower and lower in the social scale, until at the end of the 17th century its use was almost universal. Thenceforward its vogue steadily declined. The growing cheapness of glass and chinaware and the invention of more showy metals brought upon it by degrees the fatal stigma of vulgarity, until with very few exceptions its manufacture entirely ceased.

Artistically, pewter was at its best when its makers were least conscious of the art revealed in it, thinking more of the durability and

appropriateness to purpose of their wares than of their decorative qualities. Though intentionally ornamental vessels may be found earlier, it was not until the 18th century that the pewterers set themselves to slavishly copying the designs and methods of the silversmiths, whether suitable to their material or not, and thereby undoubtedly hastened their own downfall.

Of recent years pewter has taken its place among the articles sought after by collectors, and its cost has so materially and rapidly increased that the manufacture of vessels, guaranteed of course genuinely antique, bids fair to become once more a paying industry. Unfortunately the various enactments compelling each maker to stamp his ware with a definite touch- mark seem at all times to have been very generally evaded or ignored, and experience alone is therefore the only safe guide to distinguishing new from old.

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PEZENAS, a town of southern France, in the department of Herault 33 m. W.S.W. of Montpellier on the southern railway. Pop. (1906), 6432. The commerce in cognac, spirits and wines is so important that the prices current for these at the weekly sales are registered throughout .the wine marts of France and Europe. There is a handsome monument to Moliere, who lived at Pezenas several years and produced his first plays there in 1655 and 1656. A gateway (15th century) and old mansion of the 15th and 16th centuries are of interest.

Pezenas (Piscennae) was founded by the Gauls. In the 10th century it became the capital of a countship subsequently held by important families including those of Montmorency, Conde and. Conti. In the 17th century the town was on several occasions the meeting place of the estates of Languedoc.

PFAFF, JOHANN FRIEDRICH (1765-1825), German mathe- matician,

was born on the 22nd of December 1765 at Stuttgart. He received his early education at the Carlsschule, where he met F. Schiller, his lifelong friend. His mathematical capacity was early noticed; he pursued his studies at Gottingen under Abraham Gotthelf Kastner (1719-1800), and in 1787 he went to Berlin and studied practical astronomy under J. E. Bode. In 1788 Pfaff became professor of mathematics in Helmstedt, and so continued until that university was abolished in 18 10. From that time till his death on the 21st of April 1825 he held the chair of mathe- matics at Halle. Pfaff's researches bore chiefly on the theory of series, to which he applied the methods of the so-called combina- torial school of German mathematicians, and on the solution of differential equations. His two principal works are Disquisitiones analytical maxime ad calculum integralem et doctrinam serierum pertinentes (4to., vol. i., Helmstedt, 1797) and " Methodus generalis, acquationes differentiarum particularum, necnon aequationes differentiates vulgares, utrasque primi ordinis inter quotcumque variabiles, complete integrandi " in Abh. d. Berl. Acad. (1814-1815). The former work contains Pfaff's discussion

of a certain differential equation which generally bears his name, but which had originally been treated in a less complete manner by L. Euler (see Differential Equations). The latter work contains an important addition to the theory of partial differential equations as it had been left by J. L. Lagrange.

His brother, Johann Wilhelm Andreas Pfaff (1774-1835), was professor of pure and applied mathematics successively at Dorpat, Nuremberg, Wiirzburg and Erlangen. Another brother, Christian Heinrich Pfaff (1773-1852), graduated in medicine at Stuttgart in 1793, and from 1801 till his death was professor of medicine, physics and chemistry at the university of Kiel.

PFALZBURG, a town of Germany, in the imperial province of Alsace-Lorraine, lies high on the west slopes of the Vosges, 25 m. N.W. of Strassburg by rail. Pop. (1905), 3716. It contains an Evangelical and a Roman Catholic church, a synagogue and a teachers' seminary. Its industries include the manufacture of gloves, straw hats and liqueurs, and also quarrying.

The principality of Pfalzburg, of which this town was the capital, originally a part of Luxemburg, afterwards belonged in turn to the

bishop of Metz, the bishop of Strassburg and the duke of Lorraine, and passed into the possession of France in 1 66 1. The town was of importance as commanding the passes of the Vosges, and was strongly fortified by Vauban in 1680. The works resisted the Allies in 1814 and 181 5, and the Germans for four months in 1870, but they were taken on the 12th of December of that year. They have since been razed.

PFEIFFER, FRANZ (181 5-1868), German scholar, was born at Bettlach near Soleure on the 27th of February 1815. After studying at the university of Munich he went to Stuttgart, where in 1846 he became librarian to the royal library. In 1856 Pfeiffer founded the Germania, a quarterly periodical devoted to German antiquarian research. In 1857, having established his fame as one of the foremost authorities on German medieval literature and philology, he was appointed professor of these subjects at the university of Vienna; and in i860 was made a member of the Imperial Academy of Sciences. He died at Vienna on the 29th of May 1868.

Among the many writings edited by him may be mentioned the Barlaam und Josaphat of Rudolf von Ems (1843), the Edelstein of Ulrich Boner (1844), Die deutschen Mystihsr des 14. Jahrhunderts (1845-1857; new ed., 1906), the Buck der Natur of Konrad von Megenberg, a 14th-century writer (1861), Die Predigten des Berthold von Regensburg (1862), and the poems of Walther von der Vogel-weide (1864; 6th ed. by K. Bartsch, 1880). Of his independent writings the most important are Zur deutschen Literaturgeschichte, Ober Wesen und Bildung der hofischen Sprache in mittelhochdeutscher Zeit, Der Dichter des Nibelungenliedes, Forschung und Kritik auf dem Gebiete des deutschen Altertums, and Altdeutsches Vbungsbuch. A biographical sketch by Karl Bartsch is in Uhlands Briefwechsel mil Freiherrn von Lassberg, edited by Franz Pfeiffer (1870).

PFEIFFER. IDA LAURA (1797-1858), Austrian traveller, daughter of a merchant named Reyer, was born at Vienna on the 14th of October 1797. In 1820 she married Dr Pfeiffer, a lawyer of Lemberg, who subsequently incurred official persecu- tion and was reduced to poverty. In her later life Mme Pfeiffer devoted her limited means to travel. In 1842 she visited Palestine and Egypt, and published an account of her journey in Rcise ciner Wienerin in das Heilige Land (Vienna, 1843). In 1845 she set out to Scandinavia and Iceland, describing her tour in two volumes, Reise nach dem skandinavischen Norden und der Insel Island (Pest, 1846). In 1846 she started on a journey round the world, visiting Brazil, Chile and other countries of South America, Tahiti, China, India, Persia, Asia Minor and Greece,

and reaching home in 1848. The results were published in Eine Frauenfahrt um die Well (Vienna, 1850). In 1851 she went to England and thence to South Africa, intending to penetrate into the interior; this proved impracticable, but she proceeded to the Malay Archipelago, spending eighteen months in the Sunda Islands and the Moluccas. After a visit to Australia, Madame Pfeiffer proceeded to California, Oregon, Peru, Ecuador, New Granada, the Missiones Territory, and north again to the Great Lakes, reaching home in 1854. Her narrative, Meine zweite Weltreise, was published at Vienna in 1856. In May of the same year she set out to explore Madagascar, where at first she

was cordially received by the queen. But she unwittingly allowed herself to be involved in a plot to overthrow the govern- ment, and was expelled the country. She died at Vienna on the 27th of October 1858.

The Reise nach Madagascar was issued in 1861 (Vienna), with a biography by her son.

PFLEIDERER, OTTO (1839-1908), German Protestant theo- logian, Was born at Stetten near Cannstadt in Wiirttemberg on the 1st of September 1839. From 1857 to 1861 he studied at Tubingen under F. C. Baur; and afterwards in England and Scotland. He then entered the ministry, became repetent at Tiibingen, and for a short time held a pastorate at Heilbronn (1868). In 1870 he became chief pastor and superintendent at Jena and soon afterwards professor ordinarius of theology, but in 1875 he was called to the chair of systematic theology at Berlin, having made his name by a series of articles on New Testa- ment criticism and Johannine and Pauline theology, which appeared in Adolf Hilgenfeld's Zeitschrijt fur wissenschaflliche Theologie, and by his Der Paulinismus, published in 1873 (2nd ed., 1890; Eng. trans., Paidinism: a Contribution to the History oj Primitive Christian Theology, 2 vols., 1873, &c). Das Urchris- tentum, seine Schriften und Lehren, in geschichtlichem Zusam- menhang beschrieben was published in 1878 and considerably enlarged for a second edition in 1902 -(Eng. trans., 1906). In 1890 appeared The Development of Theology since Kant, and its Progress in Great Britain since 182$, which was written far publication in England. A more elaborate work was his Religionsphilosophie auf geschichtlichen Grundlage (1878; 2nd ed., enlarged, 1883-1884; Eng. trans., from 2nd German ed., The Philosophy of Religion on the Basis of its History, 4 vols., 1886- 1888). " The Influence of the Apostle Paul on the Development of Christianity " was the title of a course of Hibbert Lectures given in London in 1885. In 1894 he delivered the GifTord

Lectures at Edinburgh, the subject being ” The Philosophy and Development of Religion.” His later publications included: The Early Christian Conception of Christ (1905), Die Entstehung des Christentums (1905; Eng. trans., 1906), Religion und Religionen (1906; Eng. trans., 1907), and Die Entwicklung des Christentums (1907). He died on the 18th of July 1908, at Gross Lichterfelde, near Berlin. In New Testament criticism Pfleiderer belonged to the critical school which grew out of the impulse given by F. C. Baur. But, like other modern German theologians, he showed a greater disposition to compromise. All his work shows a judicial tone of mind, and is remarkable for the charm of its style.

Pfleiderer’s younger brother Edmund (1842-1902) dis- tinguished himself both in philosophy and theology. He too entered the ministry (1864) and during the Franco-German War served as army chaplain, an experience described in his Erlebnisse tines Feldgeistlichen (1890). He was afterwards appointed professor ordinarius of philosophy at Kiel (1873), and in 1878 he was elected to the philosophical chair at Tubingen. He published works on Leibnitz, empiricism and scepticism in Hume’s philosophy, modern pessimism, Kantic criticism, English philosophy, Heraclitus of Ephesus and many other subjects.

PFORTA, or Schulpforta, formerly a Cistercian monastery dating from 1140, and now a celebrated German public school. It is in the Prussian province of Saxony, on the Saale, 2 m. S.W. of Naumburg. The remains of the monastery include the 13th century Gothic church, recently restored, the Romanesque chapel (12th century) and other buildings now used as dormi- tories, lecture rooms, &c. There is also the Fiirstenhaus, built in 1573. Schulpforta was one of the three Fiirstenschulen founded in 1543 by Maurice duke, and later elector, of Saxony, the two others being at Grimma and at Meissen. The property of the dissolved monastery provided a good revenue for the new educa- tional foundation, which now amounts to about £15,000 a year. Free education is provided for 140 boys, the total number of pupils being 185. After being in the possession of Saxony, Pforta passed to Prussia in 181 5, and since this date the school has been entirely reorganized.

PFORZHEIM, a town of Germany, in the grand duchy of Baden, at the confluence of the Nagold and the Enz, on the northern margin of the Black Forest, 19 m. S.E. of Karlsruhe by rail, and at the junction of

lines to Wildbad and Ettlingen. Pop. (1895), 33,345; (1905), 59,395, most of whom are Protestants. Its most interesting buildings are the old palace of the margraves of Baden, and the Schlosskirche, the latter an edifice of the i2th-i5th centuries, containing the tombs and monliments of the margraves. Pforzheim is the chief centre in Germany for the manufacture of gold and silver ornaments and jewelry, an industry which gives employment to about 22,000 hands, besides which there are iron and copper works, and manu- factures of chemicals, paper, leather, machinery, &c. A brisk trade is maintained in timber, cattle and agricultural produce.

Pforzheim (Porta Hercyniae) is of Roman origin. From about 1300 to 1565 it was the seat of the margraves of Baden. It was taken by the troops of the Catholic League in 1624, and was destroyed by the French in 1689. The story of the 400 citizens of Pforzheim who sacrificed themselves for their prince after the battle of Wimpfen in May 1622 has been relegated by modern historical research to the domain of legend.

See Coste, Die 400 Pforzheimer (1879); Brombacher, Der Tod der 400 Pforzheimer (Pforzheim, 1886); Stolz, Geschichte der Stadt Pforzheim (Pforzheim, 1901).

PHAEDO, Greek philosopher, founder of the Elian school, was a native of Elis, born in the last years of the 5th century B.C. In the war of 401-400 between Sparta and Elis he was taken prisoner and became a slave in Athens, where his beauty brought him notoriety. He became a pupil of Socrates, who conceived a warm affection for him. It appears that he was intimate with Cebes and Plato, and he gave his name to one of Plato's dialogues. Athenaeus relates, however, that he resolutely declined responsi- bility for any of the views with which Plato credits him, and that the relations between him and Plato were the reverse of friendly. Aeschines also wrote a dialogue called Phaedo. Shortly after the death of Socrates Phaedo returned to Elis, where his disciples included Anchipylus, Moschus and Pleistanus, who succeeded him. Subsequently Menedemus and Asclepiades transferred the school to Eretria, where it was known as the Eretrian school and is frequently identified {e.g. by Cicero) with the Megarians. The doctrines of Phaedo are not known, nor is it possible to infer them from the Platonic dialogue. His writings, none of which are preserved, were in the form of dialogues. As to their authenticity nothing is known, in spite of an attempt at selection by Panaetius (Diog. Laert. ii. 64), who maintains that the Zopyrus and the Simon are genuine. Seneca has preserved one of his dicta (Epist. 94. 41), namely that one method of acquiring virtue is to frequent the society of good men.

See Wilamowitz, Hermes, xiv. 189 seq.

PHAEDRA, in Greek legend, daughter of Minos and Pasiphae. With her sister Ariadne she was carried off by Theseus to Athens, and became his wife. On the way to Eleusis she met Hippolytus, son of Theseus by a former wife (Hippolyte, queen of the Ama- zons, or her sister Antiope), and fell in love with him. Finding her advances rejected, she hanged herself, leaving behind a letter in which she accused Hippolytus of having made dis- honourable proposals. The same story, in the main, is told of Bellerophon and Anteia. It formed the subject of tragedies by Sophocles, Euripides (two, one of which is extant), Seneca and Racine.

PHAEDRUS, Roman fabulist, was by birth a Macedonian and lived in the reigns of Augustus, Tiberius, Gaius and Claudius. According to his own statement (prologue to book iii.), not perhaps to be taken too literally, he was born on the Pierian Mountain, but he seems to have been brought at an early age to Italy, for he mentions that he read a verse of Ennius as a boy at school. According to the heading of the chief MS. he was a slave and was freed by Augustus. He incurred the wrath of Sejanus, the powerful minister of Tiberius, by some supposed allusions in his fables, and was brought to trial and punished. We learn this from the prologue to the third book, which is dedicated to Eutychus, who has been identified with the famous

charioteer and favourite of Gaius. The fourth book is dedicated to Particulo, who seems to have dabbled in literature. The dates of their publication are unknown, but Seneca, writing between a.d. 41 and 43 (Consol. ad Polyb. 27), knows nothing of Phaedrus, and it is probable that he had published nothing then. His work shows little or no originality; he simply versified in iambic trimeters the fables current in his day under the name of “Aesop,” interspersing them with anecdotes drawn from daily life, history and mythology. He tells his fable and draws the moral with businesslike directness and simplicity; his language is terse and clear, but thoroughly prosaic, though it occasionally attains a dignity bordering on eloquence. His Latin is correct, and, except for an excessive and peculiar use of abstract words, shows hardly anything that might not have been written in the ‘ Augustan age. From a literary point of view Phaedrus is inferior to Babrius, and to his own imitator, La Fontaine; he lacks the quiet picturesqueness and pathos of the former, and the exuberant vivacity and humour of the latter. Though he frequently refers to the envy and detraction which pursued him, Phaedrus seems to have attracted little attention in antiquity. He is mentioned by» Martial (iii. 20, 5), who imitated some of his verses, and by Avianus. Prudentius must have

read him, for he imitates one of his lines (Prud. Cath. vii. 115; cf. Phaedrus, iv. 6, 10).

The first edition of the five books of Phaedrus was published by Pithou at Troyes in 1 596 from a manuscript now in the possession of the marquis of Rosanbo. In the beginning of the 18th century there was discovered at Parma a MS. of Perotti (1430-1480), arch- bishop of Siponto, containing sixty-four fables of Phaedrus, of which some thirty were new. These new fables were first published at Naples by Cassitto in 1808, and afterwards (much more correctly) by Jannelli in 1809. Both editions were superseded by the dis- covery of a much better preserved MS. of Perotti in the Vatican, published by Angelo Mai in 1831. For some time the authenticity of these new fables was disputed, but they are now generally accepted, and with justice, as genuine fables of Phaedrus. They do not form a sixth book, for we know from Avianus that Phaedrus wrote five books only, but it is impossible to assign them to their original places in the five books. They are usually printed as an appendix. In the middle ages Phaedrus exercised a considerable influence through the prose versions of his fables which were current, though his own works and even his name were forgotten. Of these prose versions the oldest existing seems to be that known as the ” Anony- mus Nilanti,” so called because first edited by Nilant at Leiden in 1709 from a MS. of the 13th century. It approaches the text of Phaedrus so closely that it was probably made directly from it. Of the sixty-seven fables which it contains thirty are derived from lost fables of Phaedrus. But the largest and most influential of the prose versions of Phaedrus is that which bears the name of Romulus. It contains eighty-three fables, is as old as the 10th century, and seems to have been based on a still earlier prose version, which, under the name of ” Aesop,” and addressed to one Rufus, may have been made in the Carolingian period or even earlier. About this Romulus nothing is known. The collection of fables in the Weissenburg (now Wolfenbuttel) MS. is based on the same version as Romulus. These three prose versions contain in all one hundred distinct fables, of which fifty-six are derived from the existing and the remaining forty-four presumably from lost fables of Phaedrus. Some scholars, as Burmann, Dressier and L. Miiller, have tried to restore these lost fables by versifying the prose versions. The collection bearing the name of Romulus became the source from which, during the second half of the middle ages, almost all the collections of Latin fables in prose and verse were wholly or partially drawn. A 12th-century version of the first three books of Romulus in elegiac verse enjoyed a wide popularity, even into the Renaissance. Its author (generally referred to since the edition of Nevelet in 1610 as the ”

Anonymus Neveleti “) was long unknown, but Hervieux has shown grounds for identifying him with Walther of England, chaplain to Henry II. and afterwards archbishop of Palermo.

Another version of Romulus in Latin elegiacs was made by Alex- ander Neckam, born at St Albans in 1157. Amongst the collections partly derived from Romulus the most famous is probably that in French verse by Marie de France. About 1200 a collection of fables in Latin prose, based partly on Romulus, was made by the Cistercian monk Odo of Sherrington ; they have a strong medieval and clerical tinge. In 1370 Gerard of Minden wrote a poetical version of Romulus in Low German.

Since Pithou’s edition in 1596 Phaedrus has been often edited and translated ; among the editions may be mentioned those of Burmann (1718 and 1727), Bentley (1726), Schwabe (1806), Berger de Xivrey (1830), Orelli (1832), Eyssenhardt (1867), L. Miiller (1877) Ty ” (1885), and above all that of L. Havet (Paris, 1895).

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medieval versions of Phaedrus and their derivatives see L. Roth, in Philologus, i. 523 seq. ; E. Grosse, in Jahrb. f. class. Philol., cv. (1872); and especially the learned work of Hervieux, Les Fabulistes latins depuis le siccle d’Augusle jusqu’a la fin du moyen Age (Paris, 1 884), ‘who gives the Latin texts of all the medieval imitators (direct and indirect) of Phaedrus, some of them being published for the first time. (J. P. P.)

PHAER (or Phayer), THOMAS (15107-1560), English trans- lator of Virgil, was educated at Oxford and at Lincoln’s Inn. He published in 1535 Nalura brevium, and in 1543 Newe Boke of Presidents. He says on the title-page of his version of the Aeneid that he was ” solicitor to the king and queen’s majesties, attending their honourable council in the marches of Wales.” He settled at Kilgarran in Pembrokeshire, and combined the study of medicine with his legal practice. He wrote several medical works, and was admitted M.D. of Oxford in 1559. He contributed to Sackville’s Mirrour for Magistrates, “Howe Owen Glendower, being seduced by false prophecies, toke upon him to be Prince of Wales.” In 1558 appeared The Seven First Bookes of the Eneidos of Virgil converted into English Meter. He had completed two

more books in April 1560 and had begun the tenth, but he died in the autumn of that year, leaving his task incomplete. The translation was finished by Thomas Twyne in 1584. Phaer's translation, which was in rhymed fourteen- syllabled lines, was greatly admired by his contemporaries, and he deserves credit as the first to attempt a complete version, the earlier renderings of Surrey and Gawain Douglas being fragmentary although of greater poetic value.

PHAfiTHON (Gr. 4>aiduv, shining, radiant), in Greek mytho- logy, the son of Helios the sun-god, and the nymph Clymene. He persuaded his father to let him drive the chariot of the sun across the sky, but he lost control of the horses, and driving too near the earth scorched it. To save the world from utter destruction Zeus killed Phaethon with a thunderbolt. He fell to earth at the mouth of the Eridanus, a river of northern Europe (identified in later times with the Po), on the banks of which his weeping sisters, the Heliades, were transformed into poplars and their tears into amber. This part of the legend points to the mouth of the Oder or Vistula, where amber abounds. Phaethon was the subject of a drama of the same name by Euripides, of which some fragments remain, and of a lost tragedy of Aeschylus (Heliades) ; the story is most fully told in the Metamorphoses of Ovid (i. 750-ii. 366 and Nonnus, Dionysiaca, xxxviii). Phaethon has been identified with the sun himself and with the morning star (Phosphorus). In the former case the legend is supposed to represent the sun sinking in the west in a blaze of light. His identification with the morning star is supported by Hyginus (Astron. ii. 42), where it is stated that the morning (and evening) star was the son of Cephalus and Eos (the father and mother of Phaethon according to Hesiod, Theog. 984-986). The fall of Phaethon is a favourite subject, especially on sarcophagus reliefs, as indicating the transitoriness of human life.

See G. Knaack, " Quaestiones Phaethonteae," in Philologische Untersuchungen (1885); F. Wieseler, Phaethon (1857); Wilamowitz- M Ollendorff and C. Robert in Hermes, xviii. (1883); Frazer's Pausanias, ii. 59; S. Reinach, Revue del' hist, des religions, lviii. (1908).

PHAGOCYTOSIS (Gr. ayuv, to eat, devour, and (euros, cell). Many cells of the body possess the property of engulfing particles, a character to be associated with their power of performing amoeboid movement. This property is termed phagocytosis. Primarily this phagocytic power was simply the means by which the cell took within its cell body food particles which were ultimately digested and assimilated. In the higher organisms, however, this property has been developed for different purposes, and in pathology at the present day a meaning wider than that above given is often included in the term.

The particle having been taken into the cell, one of three things may happen. (1) The particle may consist of digestible material, in which case the cell secretes a digestive fluid, a food vacuole is formed, the particle is gradually dissolved by the secretion and the products absorbed into the cell substance. (2) The particle may be indigestible, in which case it is retained within the cell

body for a time and ultimately discharged. The particle englobed may comprise almost any material, but if it is to serve as a food it must be of animal or vegetable origin. At the time of ingestion it may be dead or living. In the case in which it is living the organism is first killed and then digested, or (3) the organism may prove resistant, in which case it may multiply and finally destroy the cell, when a number of organisms are set free. This is one of the means by which, in the higher organisms, a local infection may become distributed through the organism. The digestion effected within a cell is fermentative in character. Thus a proteolytic ferment has been prepared from the bodies of amoebae — the ferment possessing fairly active properties both in acid, neutral or alkaline media, but especially in the latter.

In studying the process of phagocytosis generally much infor- mation may be gained as to its general characters by the study of the processes of intracellular digestion in the simpler Inverte- brates, a study largely extended by Metchnikoff and his co- workers in the elaboration of Metchnikoff ‘s view of the nature of immunity. Thus, to take an instance from the sponges. Food substances, in the form of minute organisms, which have penetrated the pores of the sponge are seized by the ciliated or amoeboid cells lining those spaces, and are then killed and digested. In this case also the process of digestion is proved to be fermentative. It is teadily understandable that we should find such cells on the external surface of an organism or on the surface lining the alimentary tract, particularly in the latter position. But in addition there are many cells within the body in which phagocytic power is retained and markedly developed. Such cells may be fixed or wandering cells. They are employed for removing foreign material or debris which may occur within a tissue. For instance, as the result of an injury, inflammatory process, &c, cells and other structures of a tissue may be destroyed. One of the processes of repair consists in the removal of the resulting debris, which is effected by phagocytes. A similar process is seen with red blood corpuscles which may have escaped into a tissue through rupture of capillaries. Foreign particles accidentally gaining admission to a tissue are in many cases removed in a similar manner, e.g. soot particles which have passed through the respiratory surface are then largely removed by phagocytes and carried to the bronchial lymphatic glands. Very commonly living

organisms effect an entrance through wound surfaces, the alimentary surface, &c, and one of the processes employed for their destruction and removal is that of phagocytosis.

As an illustration of the removal of foreign red blood corpuscles we may take the experiments of Metchnikoff in which a small drop of defibrinated blood of the goose was injected under the skin of a snail. The corpuscles quickly spread through the haemolymph of the snail, which by itself, however, effects no change in them. At the end of several hours exami- nation shows that the leucocytes of the snail have englobed a large number of the red corpuscles. The following day intact corpuscles can still be found in the haemolymph, but the major number have already been devoured by the leucocytes. When taken up by a phagocyte the red corpuscle becomes round and its wall permeable. A vacuole is formed around the corpuscle, in which dissolved haemoglobin can be seen; a part of this haemoglobin also passes into the nucleus of the red corpuscle, proving that it too has been profoundly altered. Many of the nuclei are discharged. After some time the only parts of the corpuscle remaining are pieces of the nucleus and the peripheral layer of the corpuscle. Frequently the phagocytes, after having devoured one or several red corpuscles, themselves become a prey to their fellows. Analogous changes are observed in the tissues of a mammal when blood which has been extravasated is being removed, e.g. after a bruise. The first effect of the haemorrhage is an exudative inflammation, during which leucocytes arrive in large numbers and engulf the corpuscles. In the process of digestion which follows the haemoglobin is altered and new pigments formed from it. In mammals this pigment is dark red or brownish, in the pigeon it is green. Finally the corpuscles are completely digested. Analogous phenomena may be observed

in connexion with the removal of cell debris resulting from any injury. Numbers of phagocytes may be found at work in this direction, for instance in the pus formed within an aseptic abscess. Hence we may regard the phagocytes as acting as the scavengers of the tissues.

In the instances we have been dealing with the phagocytes are chiefly of the class of wandering cells and are brought to the seat of their activity by the blood. In examining any tissue where the process is going on it is seen that the phagocytes have accumulated there in large numbers. They have been attracted to the damaged area. The

mechanism which effects this attrac- tion is a chemical one — chemiotaxis. At the seat of the change chemical substances are produced which act upon the phagocytes, causing them to migrate towards the source — positive chemio- taxis. Apparently the material dissolving from cell debris can act in this manner. Thus if a capillary tube filled with a tissue extract be inserted under the skin of an animal, within a short time it will be found to be surrounded with numbers of leuco- cytes, which may also ha-ve encroached into the tube itself. As in other instances of chemiotaxis the same chemical stimulus in a higher concentration may repel the cells — negative chemio- taxis. Instances of this are especially frequent in relation to micro-organisms and phagocytes, to which we may now turn.

That phagocytes can paralyse, kill and digest many micro- organisms is the main fact in Metchnikoff's theory of the nature of immunity. The reaction may be readily studied by injecting a small quantity of a fluid culture of some mildly pathogenic organism into the peritoneal cavity of an animal, and in the course of an hour or so examining a smear from the surface of the omentum, when an abundance of phagocytes enclosing the organ- ism in different stages of digestion will be found. Or we may adopt Leishman's method, in which a few drops of human blood are diluted with saline solution and centrifuged. The layer of white corpuscles is pipetted off, suspended in serum, and a minute drop of a suspension of a pathogenic organism is added. The preparation is then incubated at 37 C. for a quarter of an hour. Upon examining a drop of this mixture a number of bacteria are found within the phagocytes. Thus this attack and destruction of bacteria by phagocytes may take place within the body or by cells removed from the body. Whether or no a phagocyte can engulf bacteria is dependent upon a number of factors — partly specific properties of the phagocyte, partly factors varying with the constitution of the body serum. Thus Wright and Douglas, employing Leishman's method, have proved that leucocytes do not take up bacteria freely unless the serum in which they are suspended contain opsonins. They found, for example, that leucocytes taken from a patient suffering from a pyococci infection if suspended in normal human serum take up the cocci abundantly, whereas if the same leucocytes are suspended under similar conditions in the patient's own serum the reaction may be almost absent. Further, leucocytes taken from a normal individual and suspended in the patient's serum are practically inactive, while the same phagocytes in normal serum are very active. Exactly how the substance in the serum acts is undecided, but it has been proved that there are in serum substances which become fixed to bacteria and which render them an easier prey to the phagocytes. This specific

opsonin is used up when the bacteria are added to the serum, so that if the bacteria are subsequently removed the serum is no longer active. There is evidence too that there is a multiplicity of opsonins. As to the origin of the opsonins we have no certain evidence. It is suggested that they are a secretion from the leucocytes themselves and that it is an evidence of another and preliminary mode of attack possessed by the leucocyte, viz. the discharge of a secre- tion from the cell which is to damage or paralyse the bacterium and thus enable the phagocyte to engulf it.

The mechanism of destruction of a bacterium once it has been taken up by a phagocyte is probably, just as in the instance of dead cellular material, one of intracellular digestion. The bacterium before being engulfed is probably inert in most instances, though it may yet prove too strong for the phagocyte. The next stage we can trace is the formation of a vacuole around

the organism, or, if the latter be large, around a part of the organism, and the part thus surrounded quickly shows signs of destruction. For instance, its staining reactions become weaker. When a part only of the organism is surrounded by a vacuole the part thus surrounded soon ceases to stain, while the remain- ing part stains normally, and we thus have a marked contrast evidencing the two stages.

In the next place we must ask which are the cells possessing phagocytic powers ? Leaving apart the cells lining the alimentary tract (because we know practically nothing of their power in this respect) a number of free cells possess amoeboid properties as well as also a number of fixed cells. These latter are attached to certain spots of a tissue, but are capable of throwing out processes which can seize upon particles of foreign matter or even upon certain elements of the same organism. Of this category Metchnikoff distinguishes the nerve cells, the large cells of the spleen pulp and of lymph glands, certain endothelial cells, the neuroglia cells, and perhaps certain cells of connective tissues. All these elements can under certain conditions act as phago- cytes, and with the exception of the nerve cells all are of meso- blastic origin. Those of greater importance on account of their greater activity in this respect are the large splenic and lymph cells, the neuroglia cells and certain endothelial cells. With regard to the wandering cells Metchnikoff considers that some are certainly non-phagocytic, for instance the lymphocytes. Accord- ing to Metchnikoff it is only when these cells become older and have developed a nucleus rich in chromatin and an abundant cell body that these cells develop phagocytic properties. This is the large hyaline leucocyte. The polymorphonuclear and the eosinophil leucocyte are both phagocytes.

Metchnikoff there- fore divides the phagocytes into two classes — the microphages, comprising the polymorphonuclear and the eosinophil cell, and the macrophages, containing the large hyaline cell, the cell of the splenic pulp, the endothelial cell and the neuroglia cell. From further observation of these cells he concludes that the micro- phages are chiefly concerned in opposing the micro-organisms of acute infections, whereas the macrophages are chiefly concerned in combating chronic infections. It is the macrophage also which is concerned in removing cell debris, e.g. red corpuscles from a haemorrhage or the red corpuscles of another animal which may have been introduced experimentally.

Metchnikoff and his co-workers have shown that the two principal groups of leucocytes are generally spread throughout the vertebrates. Thus instances of each kind are found even in the lamprey, though here their staining properties are feebler; also cells which show but small differences from the analogous cells of mammals are found in the alligator. (T. G. Br.)

PHALANGER, a book-name applied to the more typical representatives of the group of diprotodont marsupial mammals, including the cuscuses of tne Moluccas and Celebes, and the so- called opossums of Australia, and thus collectively the whole family Phalangeridae. (See Marstjpialia.)

Phalangers generally are small or medium-sized woolly- coated marsupials, with Jong, powerful, and often prehensile tails, large claws, and opposable nailless first hind toes. They seem in the day to be dull and sleepy, but are alert at night. They live mostly upon fruits, leaves and blossoms, although a few feed habitually upon insects, and all relish, in confinement, an occasional bird or other small animal. Several possess flying- membranes stretched between their fore and hind limbs, by the help of which they can make long and sustained leaps through the air, like flying-squirrels; but the possession of these flying- membranes does not seem to be any indication of special affinity, the characters of the skull and teeth sharply dividing the flying forms and uniting them with other species of the non-flying groups. The skull (see fig. 1) is, as a rule, broad and flattened, . with the posterior part swollen out laterally owing to the numerous air-cells situated in the substance of the squamosal •bones. The dental formula is very variable, especially as regards the premolars, of which some at least in each genus are reduced to functionless rudiments, and may even vary in number on the two sides of the jaw of the same individual. The incisors are

always f, the lower one very large and inclined forwards, and the canines normally f, of which the inferior is always minute, and in one genus generally absent. The molars number either § or -f. All the species here discussed are included in the sub-family Phalangerinae, of which the distinctive features, as well as those of the family Phalangerinae, are referred to under Marsupialia.

The most generalized representatives of the group appear to be the ring-tailed phalangers, constituting the genus Pseudochirus, which is common to Australia, Tasmania and New Guinea, and

Fig. i. — Skull of Grey Cuscus {Phalanger orientalis).

includes at least half a score of species. The dentition is generally i. |, c. I, p. + m. ?, but one upper incisor and the canine may be wanting. The crowns of the molars show a crescentictstructure, but they are said to retain the three primitive cusps, which are fused in the other genera. The prehensile tail has its tip naked for a short distance, and the whole of the terminal third and the under surface of the remainder short-haired, the tip being generally white. The hair is thick and woolly, and generally yellowish-olive in colour. These phalangers are the ring-tailed opossums of the Australians. From this genus is apparently derived the taguan flying-squirrel, or flying-phalanger {Petauroides volans), which ranges from Queensland to Victoria, and is the largest of the flying group. Its dentition is essentially similar to that of Pseudochirus, although there is one pair less of cheek-teeth, and the bushy tail is naked and prehensile at the tip. Reverting to the non-flying species, we have Gymnobelideus leadbeateri, a small animal from Victoria representing a genus by itself, with the same dental formula as Pseudochirus, but cheek-teeth of a different type, the ears naked (instead of hairy) behind, glands on the chest and between the ears, and the tail long and evenly bushy to the tip. From this are evidently derived the flying-phalangers — flying-squirrels — of the genus Petaurus, which differ merely in the possession of a parachute, and are represented by several species, ranging from Australia (exclusive of Tasmania) to the Aru Islands, New Guinea, and New Ireland. Of the yellow-bellied species, P. australis, the habits are described by J. Gould as follows: ” This animal is common in all the brushes of New South Wales, particularly those which stretch along the coast from Port Philip to Moreton Bay. In these vast forests trees of one kind or another are perpetually flowering, and thus offer a never-

failing supply of the blossoms upon which it feeds; the flowers of the various kinds of gums, some of which are of great magnitude, are the principal favourites. Like the rest of the genus, it is nocturnal in its habits, dwelling in holes and in the spouts of the larger branches during the day, and dis- playing the greatest activity at night while running over the small leafy branches, frequently even to their very extremities, in search of insects and the honey of the newly opened blossoms. Its structure being ill adapted for terrestrial habits, it seldom descends to the ground except for the purpose of passing to a tree too distant to be attained by springing from the one it wishes to leave. The tops of the trees are traversed by this animal with as much ease as the most level ground is by such as are destined for terra firma. If chased or forced to flight it ascends to the highest branch and performs the most enormous leaps, sweeping from tree to tree with wonderful address; a slight elevation gives its body an impetus which with the expansion of its membrane enables it to pass to a considerable distance, always ascending a little at the extremity of the leap; by this ascent the animal is prevented from receiving the shock which it would otherwise sustain."

A second species, P. sciureus, m some ways one of the most beautiful of all mammals, is shown in fig. 2.

A precisely similar relationship exists between the tiny feather- tailed phalanger, Distoechurus pennatus, of New Guinea, and the equally minute pigmy flying-phalanger or flying-mouse, Acrobates pygmaeus, of Queensland, New South Wales and Victoria; both being characterized by the hairs of the tail forming a vane on each side, as well as by tufts of long hairs at the base of the thinly-

haired ears. There are six pairs of cheek-teeth, of which the last three are small and rounded, with blunted cusps, while the anterior teeth are sharp and of insectivorous type. The pigmy flying- phalanger feeds on honey from flowers and insects.

To some extent intermediate in structure between Acrobates and Petaurus, although withouj: a parachute, are the beautiful little dormouse-phalangers, as typified by Dromicia nana, which range from Western Australia and Tasmania to New Guinea. They appear to be a generalized type, which has died out where they have come into competition with the more specialized forms. Although unable to fly they are exceedingly active, and take long leaps from bough to bough; externally they are characterized by their dormouse-

FlG. 2. — Squirrel Flying-Phalanger (Petaurus sciureus).

like form, large, thin, and nearly naked ears, without tufts inside or at the base, sharp and rudimentary front claws and long sharp hind ones, and mouse-like tail, which is furry at the base, then scaly, and naked and prehensile at the tip. There may be either six or seven pairs of cheek-teeth, of which the hinder carry four small smooth cusps, and the first upper incisor is much longer than the other two. The striped phalangers (Dactylopsila) are larger animals, of the approximate size of a squirrel, easily recognized by the longitudinal yellow and black striping of the fur, and the slender and elongated fourth front toe. The typical D. trivirgata is common to north Australia and New Guinea, but D. palpator, which has the fourth toe still more elongated, is exclusively Papuan. They have seven pairs of cheek-teeth, of which the four last are oblong and four-cusped ; and the first lower incisor is longer than in any other phalanger. They apparently feed on both leaves and grubs, probably extracting the latter from crannies with the elon- gated toe. The tail is more or less bare on the under side of the tip.

The last group of the sub-family is represented firstly by the cuscuses, or cususes (Phalanger), which are arboreal animals of the approximate size of cats, and range from the Solomon Islands through New Guinea and the Moluccas to Celebes, being, in fact, the only Old World marsupials found westwards of New Guinea. Externally they are characterized by their thick woolly fur, short or medium ears, which are hairy outside, and sometimes inside as well, by the naked and striated soles of the feet, and the long and markedly prehensile tail, of which the basal half is furred like the body, and the terminal half entirely naked. The number of cheek- teeth varies, owing to the frequent absence of some of the front ones, but there are generally seven pairs, of which the last four carry crescents internally and cusps externally. About ten species are known, of which the grey cuscus (P. orientalis) of Amboyna and Timor was discovered about 300 years ago, and was thus the first known Old World marsupial. In the spotted cuscus (P. maculatus) the males are marked with orange and white, while the females are uniformly greyish. Cuscuses are sleepy animals, feeding mainly on leaves, but also devouring birds and small mammals.

Nearly allied to the cuscuses are the typical Australian phalangers, or opossums, forming the genus Trichosurus. They differ from the cuscuses, among other features, by the thick and non-tapering tail being covered with bushy hair up to the extreme tip, which is naked, as is a narrow line along the middle of the terminal third

(or rather more) of the lower surface, by the presence of a gland on the chest, and by the soles of the hind feet being hairy. In the skull the upper canine is separated from the outermost incisor, instead of close to it as in the cuscuses (fig. i). The best-known species is the brush-tailed phalanger, or brush-tailed opossum (T. vulpecula), of Australia, an animal of the size of a small fox, represented in Tasmania by the brown phalanger (T. vulpecula fuliginosus). The short-eared phalanger (T. canina) represents the group in Southern Queensland and New South Wales. The dental formula in both is t. f , c. I, p. |, m. f. These animals are wholly arboreal and mainly nocturnal in their habits; and it is these which form the chief game in ” opossum-shooting ” among the gum-trees by moonlight. The long-snouted phalanger is referred to under Marsupialia.

(R. L.*)

PHALANX (Gr. ˆaXcryi;, of unknown origin), the name, in Greek history of the arrangement of heavy-armed infantry in a single close mass of spearmen (see Army: History). In anatomy, the Latin plural phalanges is the term applied to the bones of the finger and toe, and in botany to a group of united stamen clusters. The term ” phalanx ” was adopted by F. C. M. Fourier (q.v.) as the name of the socialistic community living in a ” phalanstery.”

PHALARIS, tyrant of Acragas (Agrigentum) in Sicily, c. 570- 554 B.C. He was entrusted with the building of the temple of Zeus Atabyrius in the citadel, and took advantage of his position to make himself despot (Aristotle, Politics, v. 10). Under his rule Agrigentum seems to have attained considerable prosperity. He supplied the city with water, adorned it with fine buildings, and strengthened it with walls. On the northern coast of the island the people of Himera elected him general with absolute power, in spite of the warnings of the poet Stesichorus (Aristotle, Rhetoric, ii. 20). According to Sui’das he succeeded in making himself master of the whole of the island. He was at last overthrown in a general rising headed by Telemachus, the ancestor of Theron (tyrant c. 488-472), and burned in his brazen bull.

After ages have held up Phalaris to infamy for his excessive cruelty. In his brazen bull, invented, it is said, by Perillus of Athens, the tyrant’s victims were shut up and, a fire being kindled beneath, were roasted alive, while their shrieks represented the bellowing of the bull. Perillus himself is said to have been the first victim. There is hardly room to doubt that we have here a tradition of human sacrifice in

connexion with the worship of the Phoenician Baal (Zeus Atabyrius) such as prevailed at Rhodes; when misfortune threatened Rhodes the brazen bulls in his temple bellowed. The Rhodians brought this worship to Gela, which they founded con- jointly with the Cretans, and from Gela it passed to Agrigentum. Human sacrifices to Baal were common, and, though in Phoenicia proper there is no proof that the victims were burned alive, the Carthaginians had a brazen image of Baal, from whose down- turned hands the children slid into a pit of fire; and the story that Minos had a brazen man who pressed people to his glowing breast points to similar rites in Crete, where the child-devouring Minotaur must certainly be connected with Baal and the favourite sacrifice to him of children.

The story of the bull cannot be dismissed as pure invention. Pindar (Pythia, i. 1 85), who lived less than a century afterwards, expressly associates this instrument of torture with the name of the tyrant. There was certainly a brazen bull at Agrigentum, which was carried off by the Carthaginians to Carthage, whence it was again taken by Scipio and restored to Agrigentum. In later times the tradition prevailed that Phalaris was a naturally humane man and a patron of philosophy and literature. He is so described in the declamations ascribed to Lucian, and in the letters which bear his own name. Plutarch, too, though he takes the unfavourable view, mentions that the Sicilians gave to the severity of Phalaris the name of justice and a hatred of crime. Phalaris may thus have been one of those men who combine justice and even humanity with religious fanaticism (Sui'das, s.v. ; Diod. Sic. ix. 20, 30, xiii. 90, xxxii. 25; Polybius vii. 7, xii. 25; Cicero, De Officiis, ii. 7, iii. 6).

The letters bearing the name of Phalaris (148 in number) are now chiefly remembered for the crushing exposure they received at the hands of Richard Bentley in his controversy with the Hon. Charles Boyle, who had published an edition of them in 1695. The first edition of Bentley's Dissertation on Phalaris appeared in 1697, and the second edition, replying to the answer which Boyle published in 1698, came out in 1699. From the mention in the letters of towns (Phintia, Alaesa and Tauromenium) which did not exist in the time of Phalaris, from the imitations of authors (Herodotus, Democritus, Euripides, Callimachus) who wrote long after he was dead, from the reference to tragedies, though tragedy was not yet invented in the lifetime of Phalaris, from the dialect, which is not

Dorian but Attic, nay, New or Late Attic, as well as from absurdities in the matter, and the entire absence of any reference to them by any writer before Stobaeus (c. a.d. 500), Bentley sufficiently proved that

the letters were written by a sophist or rhetorician (possibly Adrianus of Tyre, died c. a.d. 192) hundreds of years after the death of Phalaris. Sui'das admired the letters, which he thought genuine, and in modern times, before their exposure by Bentley, they were thought highly of by some (e.g. Sir William Temple in his Essay on Ancient and Modern Learning), though others, as Politianus and Erasmus, perceived that they were not by Phalaris. The latest edition of the Epistles is by R. Hercher, in Epistolographi graeci (1873), and of Bentley's Dissertation byW.Wagner (with introduction and notes, 1883) ; see especially R. C. Jebb, Life of Bentley (1882).

PHALLICISM, or Phallism (from Gr. #a\A6s), an anthropo- logical term applied to that form of nature worship in which adoration is paid to the generative function symbolized by the phallus, the male organ. It is common among primitive peoples, especially in the East, and had been prominent also among more advanced peoples, e.g. the Phoenicians and the Greeks. In its most elementary form it is associated with frankly orgiastic rites. This aspect remains in more advanced forms, but gradually it tends to give place to the joyous recog- nition of the principle of natural reproduction. In Greece for example, where phallicism was the essence of the Dionysiac worship and a phallic revel was the origin of comedy (see also Hermes), the purely material and the symbolical aspects no doubt existed side by side; the Orphic mysteries had to the intellectual Greeks a significance wholly different from that which they had to the common people. Phallic worship is specially interesting as a form of sympathetic magic: observing the fertilizing effect of sun and rain, the savage sought to promote the growth of vegetation in the spring by means of symbolic sexual indulgence. Such were the rites which shocked Jewish writers in connexion with the worship of Baal and Astaroth (see Baal, and cf. Atargatis, Ishtar). The same principle is at the root of the widespread nature worship of Asia Minor, whose chief deity, the Great Mother of the Gods (q.v.), is the personifi- cation of the earth's fertility: similarly in India worship is paid to divine mothers. Generally it should be observed that phallic worship is not specially or perhaps primarily paid to male deities, though commonly the more important deity is accompanied by a companion of the other sex, or is itself androgynous, the two symbols being found together.

In the Dionysiac rites the emblem was carried at the head of the processions and was immediately followed by a body of men dressed as women (the ithy phalli) . In Rome the phallus was the most common amulet worn by children to avert the evil eye: the Latin word was fascinum (cf. Pliny, Nat. Hist. xix. 50, satyrica signa; Varro, Ling. Lat. vii. 97, ed. Muller). Pollux says that such emblems were placed by

smiths before their forges. Before the temple of Aphrodite at Hierapolis (q.v.) were two huge phalli (180 ft. high), and other similar objects existed in all parts of the ancient world both in statuary and in painting. Among the Hindus (see Hinduism) the phallus is called linga or lingam, with the female counterpart called yoni; the linga symbolizes the generative power of Siva, and is a charm against sterility. The rites classed together as Sakti puja represent the adoration of the female principle. In Mexico, Central America, Peru and other parts of America phallic emblems are found. The tendency, however, to identify all obelisk-like stones and tree-trunks, together with rites like circumcision, as remains of phallic worship, has met with much criticism (e.g. Robertson Smith, Religion of the Semites, 2nd ed., pp. 456 sqq.) ; ˆ

For authorities see works quoted under Religion: §§ A and B ad fin.

PHALTAN, a native state of India, in the central division of Bombay, ranking as one of the Satara jagirs. Area, 397 sq. m.; pop. (1901), 45,739, showing a decrease of 31% in the decade. The estimated revenue is £13,000, and the tribute £640. The chief, whose title is nimbalkar, is a Mahratta, tracing his descent to a grantee from a Delhi emperor in the 14th century. The town of Phaltan is 37 m. north-east of Satara; pop. (1901),

PHANARIOTES, a name derived from Phanar, the chief Greek quarter at Stamboul, where the oecumenical patriarchate is situated, and applied to those members of families resident in the Phanar quarter who between the years 171 1 and 1821 were appointed hospodars of the Danubian principalities; that period of Moldo-Wallachian history is also usually termed the Phanariote epoch. It is not to be understood as marking the introduction into the principalities of the Greek element, which had already established itself firmly in both provinces, to both of which Greek princes had been appointed before the 18th century. But whereas the Greek families of earlier introduction gradually became merged in their country of adoption, the later immigrants retained their separate nationality and grew to be powerful agents for furthering the spread of Graecism in the principalities. The person raised to the princely dignity was usually the chief dragoman of the Sublime Porte, and was consequently well versed in

contemporary politics and the statecraft of the Otto- man government. The new prince, who was compelled to pur- chase his elevation with a heavy bribe, proceeded to the country which he was selected to govern, and of the language of which he was in nearly every case totally ignorant, accompanied by a horde of needy hangers-on; he and his acolytes counted on re- couping themselves in as short a time as possible for their initial outlay and in laying by a sufficiency to live on after the termina- tion of the prince's brief authority. It was the interest of the Porte to change the princes as often as possible, as the accession donation thus became due more frequently. When, owing to the numerous cases of treachery among the princes, the choice became limited to a few families the plan was hit upon of frequently shifting the prince from one province to the other: the prince of Wallachia, the richer of the two principalities, was always ready to pay a handsome douceur to avert his transfer to Yassy; the prince of Moldavia was equally ready to bribe his supporters at Constantinople to secure his appointment to Wallachia. To raise funds to satisfy the rapacity of the Porte the princes became past masters in the art of spoliation, and the inhabitants, liable to every species of tax which the ingenuity of their Greek rulers could devise, were reduced to the last stage of destitution. The active part taken by the Greek princes in the revolt of 1820-21 induced the Porte to revert to the appointment of native princes.

PHAN1AS, of Eresus in Lesbos, Greek philosopher, important as an immediate follower of and commentator on Aristotle, came to Athens about 332 B.C., and joined his compatriot, Theophrastus, in the Peripatetic school. He wrote works entitled Analytica, Categoriae and De inter pretalione, which were either paraphrases or critical commentaries, and seem to have added little to Aristotle's own writings. Alexander of Aphrodisias refers to a work irpbs Aibdupov, and Athenaeus quotes from another treatise, Against the Sophists. Outside philosophy, he and Theophrastus carried on the physical investigations of Aristotle; Athenaeus frequently quotes from a work on botany which manifests great care in definitions and accuracy of obser- vation. From Plutarch {Life of Themistocles) we learn that he was regarded as an historian of importance. The chief of his historical works is the Prytaneis Eresii, which was either a history of his native place or a general history of Greece arranged according to the period of the Eresian magistracy. He wrote also works on the Tyrants of Sicily and on tyranny in general. The value of these books is attested by the frequency with which they are quoted on questions of chronology {e.g. by Plutarch, Sui'das, Athenaeus). To the history of Greek literature he contributed works on the poets and on the Socratics, both

of which are quoted.

He must be distinguished from another Phanias, a Stoic philo- sopher, disciple of Posidonius. Diogenes Laertius mentions a work of his wherein he compares Posidonius with Panaetius in arguing from physical principles.

PHANOCLES, Greek elegiac poet, probably flourished about the time of Alexander the Great. His extant fragments show resemblances in style and language to Philetas, Callimachus and Hermesianax. He was the author of a poem on paederasty. A lengthy fragment in Stobaeus {Florilegium, 64) describes

the love of Orpheus for the youthful Calais, son of Boreas and his subsequent death at the hands of the Thracian women. It is one of the best extant specimens of Greek elegiac poetry.

See N. Bach, Philetae, Hermesianaciis , et Phanodis reliquiae (1829) ; L. Preller, Ausgewdhlte Aufsdtze aus dem Gebiete der classischen Alterthumsivissenschaft (1864).

PHANTASMAGORIA, a name invented by a certain Philipstal in 1802 (from Gr. 4>avTacrfj.a, phantasm, apparition; and ayopa, assembly) for a show or exhibition of optical illusions produced by means of the projecting lantern {q.v.). The word has since been applied to any rapidly or strikingly changing scene, and especially to a disordered or fantastic scene or picture of the imagination.

PHARAOH (Par'oh), the Hebraized title of the king of Egypt {q.v.), in Egyptian Per-'o; Pheron in Herodotus represents the same. Its combination with the name of the king, as in Pharaoh- Necho, Pharaoh-Hophra, is in accordance with contemporary native usage: the name of the earlier Pharaoh Shishak (Sheshonk) is rightly given without the title. In hieroglyphic a king bears several names preceded by distinctive titles. In the IVth Dynasty there might be four of the latter: (1) W\ identifying

him with the royal god Horus; the name is commonly written

in a frame |ij;|; m| representing the facade of a building,

perhaps a palace or tomb, on which the falcon stands. (2)

connecting him with the vulture and uraeus god-

desses, Nekhabi and Buto of the south and north. (3)

a hawk on the symbol of gold, signifying the victorious Horus.

(4) riiF) the old titles of the rulers of the separate king- ed a

doms of Upper and Lower Egypt, to be read stni, ” butcher(?) ” and byti, ” beekeeper (?) ” The personal name of the king followed (4), and was enclosed in a cartouche (. > ap- parently symbolizing the. circuit of the sun which alone bounded the king’s rule. Before the IVth Dynasty the car- touche is seldom found: the usual title is (1), and (3) does not occur. In the Vth Dynasty the custom began of giving the king at his accession a special name connecting him with the sun : this was placed in the cartouche after (4), and a fifth title was

added: (5) ˆ5 = i Si-re, ” son of the Sun-god,” to precede

Si-re,

a cartouche containing the personal name. The king was briefly spoken of by his title stni (see 4), or hnm-f, “his service,” or Ity, ” liege-lord.” These titles were preserved in the sacred writing down to the latest age. An old term for the royal palace establishment and estate was Per-‘o, ” the Great House, ” and this gradually became the personal designation of Pharaoh (cf. the Grand Porte), displacing all others in the popular language. (F. Ll. G.)

PHARI, a town of Tibet. It is supposed to be the highest and coldest town in the world, being 15,000 ft. above the sea. As it commands the road between the Chumbi Valley and Lhasa and also one of the chief passes into Bhutan, Phari is of considerable military importance, and is defended by a large fort or Jong, which was occupied by the British expedition of 1904. Phari Jong is supposed to have been built about 1500 A.D., and was enlarged or rebuilt in 1792, under Chinese advice, as a defence against the British. It has the appearance of a medieval castle, and seems to have been built in imitation of the European style.

PHARISEES, a sect of the Jews first mentioned by Josephus, in his account {Ant. xiii. 5, 9) of the reign of Jonathan, the brother and successor of Judas Maccabaeus. The name, which may be translated ” Separatists,” indicates their devotion to the ideal, enforced by Ezra and Nehemiah upon the reluctant Jews, of a nation separate from all other nations in virtue of its

peculiar relation to Yahweh (Neh. ix.). This ideal nation consisted of all who were prepared to obey the Law of Moses, irrespective of their natural descent. Consequently the Pharisees, who seem to have been an order of religious teachers, were concerned to make converts (proselytes), and some of their greatest teachers were of non-Jewish parentage. They were also concerned to insist upon the strict observance of the Law, so far as it was compatible with the exigencies of ordinary life, and to train disciples who should set”~a proper example to the mass of the people.

The ideal of separation descended from the Great Synagogue (Assembly) of the time of Ezra to the Synagogue of the Hasi- daeans (Assidaeons), who allied themselves with Judas Macca- baeus when his followers decided to suspend the law of the Sabbath, in order that the true Jews might preserve themselves from annihilation and survive to keep the Law as a whole. This action of the Hasidaeans is clearly the practical outcome of the principle which Josephus describes in the language of philosophy as the characteristic of the Pharisees — ” some things and not all are the work of Fate ” (Ant. xiii. 5, 9). Fate is the Stoic term for God; and these forerunners of the Pharisees judged that the time had come for them to take action rather than to wait passively on God. But then and always the prime concern of the Pharisees was the extension of God’s sovereignty (the Kingdom of God) throughout the world. God’s will, which all men should obey, was revealed in the Law, and though He might appoint governors over them, He remained their King, and no governor who was not a prophet — God’s mere mouthpiece — could com- mand their unquestioning obedience. When Judas reconquered Jerusalem and re-dedicated the desecrated Temple, his work, from the Pharisees’ point of view, was done. The Temple- worship was part and parcel of the Divine plan, and a legitimate High Priest was necessary. Alanius was, therefore, welcomed by the Hasidaeans, and only his treacherous murder of sixty of their number taught them that any Syrian nominee was their enemy. Later they acquiesced in the election of Simon to the high-priesthood with the condition ” until there should arise a faithful prophet “; but some of them remonstrated against the combination of the sacred office with the position of political ruler in the person of John Hyrcanus as contrary to the precedent set by Moses at his death. When Alexandra came to the throne the Pharisees were the real rulers and imposed upon the people the deductions from the written Law which formed the growing body of their oral tradition. Their reign was long enough to establish this tradition in respect of ritual, and even when this golden age — as it seemed to later Scribes — was over they exercised a paramount influence upon the common people. They

had learned to read God's will in the events of history, and deduced (for example) the doctrine of the resurrection of the dead from the death of the martyrs under Antiochus Epiphanes and Alcimus. And what they learned from current history and from the ancient history of the nation recorded in Scripture they taught in the synagogues, which corresponded not merely to the parish churches but also to the schools — day schools and Sunday schools — of to-day. Apart from their control of public education, their power was enhanced by their efforts to better the position of women, and by their notorious leniency in the matter of punishments. Everything — the repeated statements of Josephus and the facts of Jewish history after a.d. 70 — goes to show that the Pharisees moulded the religion of the people. Attempts have been made in modern times to represent the Apocalyptists as opposed to the Pharisees and as occupying the position in popular estimation which Josephus ascribes to the Pharisees. But for such representations there is no solid ground. Superficially the language of apocalypses differs from that of rabbinic deci- sions., and where the seer takes a comprehensive view of the ages the rabbi legislates for particular cases. But even in the Talmud the reign of Alexandra is described in apocalyptic language such as is commonly applied to the future age, and if allowance be made for the symbolism proper to revelations it is clear that essentially the scribe and the seer have the same purpose and even the same doctrines. The Pharisees were occupied with the

piecemeal realization of the dreams of their supposed opponents, which gain a vague glory from their being far off.

The gospels generally have left upon the minds of men an impression unfavourable to the Pharisees. They contain de- nunciations attributed to our Lord and assigned — with obvious injustice in some cases — to the scribes of this sect. It is to be remembered that the Pharisees were the only sect of the Jews who survived in Christian times and that the Pharisees were never a homogeneous body possessed of a definite policy or body of doctrine. Moreover it is clear that our Lord denounced not all the Pharisees but the hypocrites only, as did the rabbis whose sayings are reported in the Talmud and other Jewish books. Again the third gospel in particular betrays relations between the Pharisees and Jesus very different from those of the common Christian view, which conjures up an impossible picture of an absolute breach between the Prophet of Nazareth and the whole corporation of the Pharisees as a result of a quarrel with certain members of that dissident sect of independent thinkers. Gamaliel and his pupil St Paul Are better representa- tives of the non-hypocritical Pharisee; and the Pauline Epistles or the writings of Philo are the best extant examples of the manner and matter of their teaching. As for the denunciations,

apart from the charge of insincerity, it appears that the scribes in question are pilloried for the defects — or the excesses — of their qualities. Indeed they are corroborative evidence for the reverence with which the Pharisees were regarded by the people generally, and for the zeal with which they strove to fulfil God's will as contained in the Law and elucidated by the Tradition. (J. H. A. H.)

PHARMACOLOGY. Systematic writers on the subject differ considerably in the exact meaning which they attach to the term pharmacology (hpixa.Kov, a drug; X670S, a discourse), some making it much more comprehensive than others. Binz, for instance, defines it as treating of the origin, nature, chemical and physical qualities, physiological actions, and therapeutical uses of drugs; in France and in Italy it is restricted to the mere description of medicines and their preparations, the action and uses of which as refnedies are included in the term therapeutics. In English-speaking countries, and by the majority of German writers, the meaning is now restricted to the study of the action of chemical substances (as apart from foods) on all kinds of animals, from bacteria up to man; it is, in fact, a comparative study of the action of chemical bodies on invertebrate and verte- brate animals. One of its practical aims is to obtain a wide and accurate knowledge of remedial substances in relation to their application in the treatment of disease, while another is to discover new or improved remedies. This meaning of the word has now become fixed in the English language by use and wont. The term pharmaco-dynamics (4>a.p/xaKov, dvvafjus, power), which is etymologically more correct, is often used as its equiva- lent, but it has never become widely adopted. The study of pharmacological actions was at first almost entirely confined to those of remedial agents, and especially to the remedies in the different national pharmacopoeias, but in many cases it has now been extended to substances which are not used for curative purposes. The introduction into practical use of many medi- cines, such as paraldehyde, phenazone and strophanthus, has followed the study of their actions on animals, and this tends to be more and more the case. Pharmacology is a branch of biology; it is also closely connected with pathology and bacteri- ology, for certain drugs produce structural as well as functional changes in the tissues, and in germ diseases the peculiar symptoms are caused by foreign substances (toxins) formed by the infective organisms present in the body. The effects of many of these toxins bear a close resemblance to the action of certain well- known drugs, as in the case of tetanus toxin and strychnine, and are studied by the same methods of observation and research. It is impossible also to dissociate pharmacology from clinical therapeutics; the former investigates the agents which are used in the

treatment of disease, the latter is concerned with their remedial powers and the conditions under which they are to be used. Hence the word ” pharmaco-therapy ” has come into

use, and most of the newer standard textbooks combine together the consideration of pharmacology and therapeutics. Pharma- cology is also related to toxicology, as many remedial and other agents are more or less poisonous when given in large doses, but it does not include the detection, tests, and the other strictly medico-legal aspects of poisoning.

Pharmacology proper began as the result of the application of strictly experimental methods to physiology. The discovery (early in the 19th century) that plants owe their remedial and poisonous qualities to small quantities of definite active principles, such as alkaloids and neutral bodies, which can be extracted in a chemically pure condition, had also a very important effect on its development. We meet first with experiments made by investigators who perceived that observa- tions on man and animals might lead to a better understanding of the action of drugs. In 1676 Wepfer and Conrad Brunner demonstrated on dogs the tetanizing action of nux vomica, and similar rough experiments were repeated from time to time with other substances by later investigators. In 1755 Menghini published an elaborate study of the action of camphor on a great variety of different kinds of animals. Albert von Haller (b. 1 70S) sought to elucidate the action of remedies by observations on healthy men, and in 1767 William Alexander made experi- ments on himself with drugs, which were, however, brought to an abrupt termination by his nearly killing himself, In 1776 Daries, by observations on himself and on cats, established the mydriatic action of belladonna and other atropaceous plants. Hitherto no attempt had been made to determine what particular parts of the body were especially affected by drugs, but Fontana showed, in his great work (Florence, 1765) on the venom of the viper and on other poisons, that the general symptoms were brought about by an action on particular organs. He performed more than six thousand experiments, more than four thousand of which were on animals, and he determined the effects on the heart and other important structures. These analytical methods of research were well known to the second Monro in Edinburgh, and to his pupils, one of whom, William Alexander, wrote

a thesis m 1790 entitled ” De partibus corporis animalis quae viribus opii parent.” His methods were doubtless known also to the French physiologist Magendie, who improved upon them, and who in 1809 published a research on the Upas Tieute and other strychnine-containing plants, in which he showed that their effects were due to an action on the spinal cord. The researches of his pupil, Claude Bernard, on curare, were equally exact and logical, and have served as the model for many subsequent investigations. In consequence, from the time of Magendie pharmacology may be said to have been put on a more exact basis. By the middle of the 19th century there were many workers on the subject, and the actions of such drugs as digitalis, morphine, alcohol, and many others had been frequently and minutely investigated. About this time Buchheim, professor of materia medica in Dorpat from 1846 to 1879, founded the first pharmaco-logical laboratory on modern lines in Europe, and he introduced a more rational classification of drugs than had hitherto been in use, arranging them in groups according to their pharmaco- logical actions. In the herbals and older treatises on materia medica and therapeutics no explanation is usually offered of the action of medicines, and in such works as that of Cullen (1789) only a few of the more obvious actions are occasionally explained according to the current theories of physiology and pathology. In works such as Pareira’s Elements of Materia Medica and Thera- peutics (1842), the physiological effects of medicines are usually described, but very briefly as compared with the materia medica. At the present day most textbooks dealing with medicinal agents and treatment devote a large part of their space to pharma- cology, and a corresponding change has taken place in the teaching of the subject in univeisities and medical schools. Since Magendie’s time numerous papers dealing with pharmaco- logical subjects have appeared in the Journal of Anatomy and Physiology, the Journal of Physiology, Virchow’s Archiv, and the principal medical periodicals of all countries. In 1873 the Archiv filr experimentelle Patholvgie und Pharmakologie first appeared,

in 1895 the Archives Internationales de Pharmakodynamie, and in 1909 The Journal of Pharmacology and Therapeutics “(pub- lished at Baltimore, U.S.A.), all of which are chiefly or entirely devoted to pharmacology.

The methods of research are essentially those employed by physiologists, the action of substances being studied in the usual way on bacteria, leucocytes, frogs, rabbits and other animals. Not only are the general symptoms investigated, but it is neces- sary to carry out experiments on the nerves, muscles, circulation, secretions, &c, so as to get a more exact knowledge of the reasons of the general action. It

is true that many of these animals react somewhat differently to drugs, both as regards each other and as regards man, but for the most part the differences are quantitative rather than qualitative. After carrying out a series of observations on animals, the drug can be assigned to its special group, and a good idea can be obtained of its possible practical value or the reverse; hence there is a saving of time and an avoidance of the necessity of testing its effects on man. The action of a drug may be called direct when it acts on any part to which it is immediately applied, or which it may reach through the blood; and indirect when one organ Drug”.” is affected secondarily to another, as, for instance, in strychnine poisoning when the muscles are violently contracted as the result of the action of the alkaloid upon the spinal cord. In a few cases the action is merely physical, but most frequently it is chemical in its nature, and is exerted on the living cell, the activity of which is either stimulated or depressed. In some cases the substances actually enter into a chemical combination with the protoplasm, which may be temporary or (much less frequently) permanent; in other cases they seem simply to modify or disturb the usual chemical activity of the cells. Pro- longed or excessive stimulation invariably leads to depression or paralysis, the tissues becoming fatigued, and from this con- dition they may recover or they may not. When we come to consider more in detail the results of these actions we find that the various secretions of the body, such as the sweat, gastric juice, bile, milk, urine, &c, may be increased or diminished; that the heart may have its muscular or nervous apparatus stimulated or depressed; that the nerve-centres in the brain, medulla and spinal cord may be rendered more sensitive or the reverse; and that the general metabolism of the body may be altered in various ways. In addition, the fluid constituents, such as the lymph and blood, may have their composition and bulk considerably altered, while the special senses, the tempera- ture, and, in short, every function and tissue, may be more or less affected.

Some drugs given in excess are poisons to all forms of proto- plasm, but when given in doses much short of the lethal they usually exhibit a distinct tendency to affect specially, and at an early period, certain organs or tissues, and hence result differences in action; others may act only on certain organs, leaving the others practically untouched. It is often possible by appropriate dosage to contrive that these special parts or organs may be affected and the rest of the body left practically intact, and it is by taking advantage of these selective actions that remedial or therapeutical effects are usually obtained. Some substances have a very wide range of action, and involve a great variety of structures, while others, such as purgatives, have a very

limited sphere. The action of drugs is often modified by circumstances peculiar to the individuals or animals to whom they are administered. In man the most important of these circumstances is age, but speaking broadly this is really a question of bulk, the child being affected like the adult, but by smaller doses. There are exceptions to this, however, as children are more affected in proportion by opium and some other substances, and less by mercury and arsenic. In old age also the nervous system and the tissues generally do not react so readily as in youth. Habit, race, personal temperament, emotional conditions, disease, the time and circumstances of administration, and other accidental causes may also modify the action in man. Some species of animals are much more susceptible to the action of certain drugs than others, a condition which depends on obvious

or unknown structural or metabolic differences. In the same way some individuals show a special tendency to poisoning by- doses of certain drugs which are harmless to the great majority of mankind, and hence we get unexpected or unusual results, these arising from special susceptibility on the part of certain organs. These idiosyncrasies are not confined to drugs, but are seen with a few articles of food, such as eggs and shellfish. It is well known that the habitual consumption of certain drugs, such as tobacco, Indian hemp, opium, arsenic, alcohol and many others, gradually induces a condition of tolerance to their effects, so that large doses can be taken without causing symp- toms of poisoning. In all cases, however, there is a limit, and after it is reached the ordinary effects of these substances are seen. Some individuals, however, never become tolerant, and show poisonous effeGts on each repetition of the dose. The degree of tolerance often differs in individuals at different times and in different circumstances, and may become lost by breaking off the habit for a short time. The explanation generally given is that the nerve and other cells become accustomed to the drug, so that they cease to react, or that an antitoxin is formed which antagonizes the poison, or that the poison is rapidly destroyed in the body. Recent researches on arsenic and atropine, however, point to the leucocytes as playing an important part in the production of tolerance, as these gradually become capable of ingesting large amounts of the foreign substances, and thus render them more or less harmless to the tissues, until they are gradually excreted from the body. When the amount is too large to be dealt with by the leucocytes, poisoning seems to occur even in the most habituated. Tolerance is therefore analogous to, but not identical with,

the immunity which takes place with the toxins of infectious diseases and snake poison. Certain substances, notably digitalis, lead, mercury and strychnine, exhibit what is called a cumulative action — that is to say, when small quanti- ties have been taken over a period of time, poisoning or an excessive action suddenly ensues. The explanation in these cases is that the drug is absorbed more rapidly than it is excreted, hence there is a tendency to accumulation in the body until a point is reached when the amount becomes poisonous.

Bodies which have a close resemblance in their chemical con- stitution exhibit a similar resemblance in their pharmacological action, and as the constitution of the substance becomes modified chemically so does its action pharmacologically. Numerous researches have demonstrated these points with regard to individual groups of substances, but hitherto it has not been possible to formulate any fixed laws regarding the relationship between chemical constitution and physiological action.

When drugs are swallowed no absorption may take place from the alimentary canal; but, as a rule, they pass from there into the blood. Absorption may also take place from the skin, from the rectum, from the respiratory passages, or from wounds, and from direct injection into the subcutaneous tissue or into a blood vessel. Very rarely, as in the case of silver salts, excre- tion does not take place; but usually the drug is got rid of by the ordinary channels of elimination. Just as drugs act upon the tissues, so they themselves are in many cases reacted upon, and broken up or altered. While in the alimentary canal they are subjected to the action of the digestive fluids and the varied contents of the stomach and intestines, and after absorption they come under the influence of the constituents of the blood and lymph, and of the chemical action of the tissue cells. In- organic bodies, such as metals, may enter into albuminous combinations which may greatly modify their effects, and organic substances may be split up into simpler compounds by oxidation or reduction, or may be rendered more complex by synthesis.

The antagonism between certain drugs has been much studied in relation to their use as antidotes in poisoning, the aim being to counteract the effects rather than to obtain a direct physiological antagonistic action. Substances which directly antagonize each other by acting on the same tissue are few in

number, but there are numerous instances in which the effects or symptoms may be obviated by acting on another tissue. Thus curare may stop strychnine convulsions by paralysing the terminations of

motor nerves, and chloroform may exercise the same effect by abolishing the irritability of the spinal cord. If two poisons act on the same tissue, one stimulating and the other paralysing it, the paralysing substance removes the action of the stimulant substance, not by bringing the tissue back to its normal state, but by abolishing its excitability; hence, although life may be saved by such an action, yet it can only be so within certain limits of dosage, because the antagonism is never complete at every point.

Speaking in the widest sense, every substance has an action on living protoplasm, but for convenience pharmacological substances have come to be limited to those which are used as drugs, or which have a distinct action upon the animal organism. Such substances are derived from (i) the chemical elements and their compounds; (2) plants; and (3) animals. The first class includes such substances as iodine, mercury, iron, carbon, and their various compounds, and such bodies as alcohol, chloroform and chloral, all of which are found in nature or can be prepared by ordinary chemical processes of manufacture. From plants many substances are obtained which at the present time we are unable to make in the chemical laboratory, and of the constitution or composition of which we are in many cases ignorant. Some of these, such as resins, gums, essential oils and fats, are readily obtained as natural exudations or by very simple manipulations, while others, such as the alkaloids, glucosides and vegetable acids, often require to be extracted by very complex processes. Substances ob- tained from animals include gland secretions, pepsin and other ferments, musk, cod-liver oil, &c, and to these may be added various antitoxins. The classification of substances having pharmacological actions presents so many difficul- ties that no satisfactory or universally adopted tion- method has yet been proposed. Our knowledge presents so many gaps, and the mode of action of many remedies is so obscure and imperfectly understood, that any arrange- ment adopted must be more or less tentative in character. The close alliance between pharmacology, therapeutics and clinical medicine has induced many authors to treat the subject from a clinical point of view, while its relationships to chemistry and physiology have been utilized to elaborate a chemical and physiological classification respectively as the basis for system- atic description. Certain writers in despair have adopted an alphabetical arrangement of the subject, while others have divided it up into inorganic, vegetable and animal substances. These last-mentioned methods are far behind our present state of knowledge, and need not be discussed here. The objection to a strictly chemical classification is, that while many sub- stances closely allied chemically have a somewhat similar action in certain respects, yet in others they

differ very widely — a striking example of which is given in the case of sodium and potassium. A physiological classification according to an action on the brain, heart, kidney or other important organ becomes still more bewildering, as many substances produce the same effects by different agencies, as, for instance, the kidneys may be acted upon directly or through the circulation, while the heart may be affected either through its muscular substance or its nervous apparatus. A clinical or therapeutical classification into such divisions as anaesthetics, expectorants, bitters, and so on, according to their practical applications, also leads to difficulties, as many drugs are employed for numerous purposes. The ideal method of grouping pharmacological substances would be in reference to their chemical action on living proto- plasm, but as yet our knowledge is too scanty for this. At the present time the method adopted by Buchheim, or some modification of it, is the most scientific. As the result of painstaking investigations he grouped together all those sub- stances having similar actions, giving to each group the name of its best-known or most thoroughly investigated member. Once the groups were more or less fixed any new substance could, when

its action was determined, be referred to its own group, and thus be placed or classified. As few substances are absolutely identical in action, but only broadly similar, it is often difficult to divide sharply one group from another. In a resume it is manifestly impossible to pass in review every pharmacological substance, and we shall therefore confine ourselves to those groups which are of practical importance. Many individual drugs are described under their own headings.

Group I. Acids. — This includes sulphuric, hydrochloric, nitric, phosphoric, tartaric, citric, acetic and lactic acids, all of which owe their action to their acidity. Many of the other acids, such as carbolic and salicylic, have specific effects which have no relationship to their acid reaction. The concentrated acids have an intense local action, varying from complete destruction of the tissues to more or less irritation. When considerably diluted they are only slightly irritating; externally applied and in the stomach they have an antiseptic action; they increase the secretion of saliva, and thus assuage thirst. In the intestine they combine with ammonia and other alkalis present, and are absorbed into the blood as neutral salts, being excreted chiefly in the urine. In small doses they some- what increase general

metabolism. Boric acid only belongs partially to this group, as it and its compound borax have certain specific actions in addition.

Group II. Alkalis. — This includes caustic potash, caustic soda, solution of ammonia, their carbonates and bicarbonates, borax, soaps, lithium carbonate and citrate, quicklime, slaked lime, chalk, magnesia and magnesium carbonate. All these substances, apart from any other actions, exert a similar effect upon the body in virtue of their alkalinity. When they are taken internally in small amounts they neutralize the acids in the stomach and other parts of the alimentary canal, and at the same time they increase the normal acid secretion of the stomach. After absorption into the blood, which they make somewhat more alkaline, they are excreted chiefly in the urine, to which they impart an alkaline reaction if given in sufficient quantity. Some of them by stimulating the kidney cells act as diuretics, but others apparently lack this action. Caustic potash and caustic soda are locally very irritating, and destroy the tissues, but lose this quality when combined with acids as in the case of their carbonates, bicarbonates and borax. Quicklime is also caustic, but magnesia is bland and unirritating. Weak solutions applied locally saponify fats, soften the epiderm»6, and thus act as slight stimulants and cleansers of the skin. Calcium salts form insoluble soaps with fats, and combine with albumen in a manner which makes them soothing and astringent rather than irritating. Apart from alkaline effects, these metals differ considerably pharmacologically. Potassium and lithium have a depressing action upon the nervous system, ammonium salts have a stimulating action, while sodium practically speaking is indifferent. Calcium and magnesium have actions somewhat similar to that of potassium. Most of these substances are normal constituents of the body, and indispensable for healthy existence. They are contained in sufficient amount in our ordinary dietary to supply the needs of the organism.

Group III. Easily absorbed Salts. — Sodium chloride may be taken as the type of those salts which diffuse readily, and are therefore easily absorbed. Sodium nitrate, potassium nitrate, potassium chloride, ammonium chloride, the alkaline iodides and bromides, also belong partly to this group, although most of them have also specific actions. Locally they cause considerable irritation, and when swallowed in concentrated solution may cause vomiting. From the stomach and intestines they are rapidly absorbed, and rapidly excreted from the blood, increasing all secretions and the general metabolism. These effects are apparently due to their irritating action upon individual cells.

Group IV. Salts absorbed with difficulty. — This group includes the sulphates of sodium, potassium and magnesium, the acetate and tartrate of potash, citrate of magnesium, sodium phosphate, sodium tartrate and similar salts. Locally their action is slight, but when taken internally, dissolved in water, they are not absorbed from the alimentary canal except in very limited amount. They therefore remain for the most part in the intestine, and as they attract and retain large quantities of water, and at the same time siightly stimulate the mucous membrane, they come to have a purgative action and form the well-known group of saline cathartics. The small portion which is absorbed exerts a diuretic action.

Group V. Heavy Metals. — These include iron, manganese, aluminium, chromium, zinc, copper, silver, gold, platinum, lead, mercury, and probably antimony, arsenic and bismuth. Although some of these differ very greatly in their actions after absorption, still locally they have certain effects in common due chiefly to their chemical action on albumen. Their soluble salts combine with albumen and preserve it, strong solutions being extremely irritant or caustic, while weaker ones are astringent simply, or even soothing. They are all antiseptics. Their insoluble compounds are much less active locally than the soluble, and in many cases are only effective to the extent to which they are dissolved by the secretions. Some metals are only absorbed from the alimentary canal to such

a very limited amount that they exert no general action, while others readily pass into the blood and give rise to more or less marked effects. All of them injected into the blood in large doses act as muscle and nerve poisons, and during their excretion by the kidney usually irritate it severely, but only a few are absorbed in sufficient amount to produce similar effects when given by the mouth. When iron is injected directly into a vein it depresses the heart's action, the blood pressure and the nervous system, and during its excretion greatly irritates the bowel and the kidneys. When taken by the mouth, however, no such actions are seen, owing to the fact that very minute quantities are absorbed and that these become stored in the liver, where they are converted into organic compounds and ultimately go to form haemoglobin. Soluble salts of manganese, aluminium, zinc, copper, gold, platinum and bismuth have, when given by the mouth, little action beyond their local astringent or irritating effects ; but when injected into a blood vessel they all exert much the same depressing effect upon the heart and nervous system. Silver resembles them closely, but differs by the circumstance that it is deposited permanently in minute granules in the tissues, and, without affecting the general health, stains the skin of a bluish colour (argyria).

Mercury and lead are absorbed from the bowel in considerable quantities, and are capable of inducing acute irritant poisoning as well as chronic poisoning. Lead poisons the muscular and nervous systems, and gives rise to paralysis, wasting, colic and other symptoms, while in the case of mercury, tremors, salivation, anaemia and very marked cachexia are induced. Arsenic and antimony do not form combinations with albumen, but they both greatly depress the central nervous system and circulation; and, if their action be long continued in large doses, they cause fatty degeneration of the viscera and disappearance of glycogen from the liver. Locally they are both very irritating, and antimony has a special tendency to cause vomiting.

Group VI. Halogens. — This group includes iodine, bromine and chlorine, in their free state or as compounds. Locally they are all three strongly irritant or caustic, owing to their chemical action on albumen. They are in addition powerful germicides, and by splitting up water may act as oxidizing agents. Owing to their strong affinity for the hydrogen of organic compounds they often act as bleachers and deodorizers. Iodine has a special interest, as it is a necessary constituent of food, and is present in the secretion of the thyroid gland. Apart from certain conditions of ill health, the iodides, as such, have no very marked influence on the healthy body beyond their saline action. Alkaline bromides, in addition to their saline action, have in sufficient doses a depressing effect upon the central nervous system, and less markedly upon the heart. Chlorine compounds are not known to exercise any action of a similar kind.

Group VII. Sulphur. — Sulphur itself has no action, but when brought into contact with the secretions it forms sulphides, sulphites and sulphuretted hydrogen, and thereby becomes more or less irritant and antiseptic. In the bowel its conversion into sulphides causes it to act as a mild laxative. Baths containing sulphuretted hydrogen or alkaline sulphides have a slightly irritating effect upon the skin, and stimulate the general metabolism.

Group VIII. Phosphorus. — This includes phosphides, and, according to some authorities, hypophosphites. Phosphorus is present in all cells, in considerable quantity in the nervous tissue, and in the bones as phosphates. It is therefore, in some form or other, a necessary part of dietary. When taken by the mouth phosphorus is an irritant poison in large doses; in small doses the only effects noticeable consist in an increased formation of bony and connective tissue, although it is also supposed to exert a gently stimulating effect upon the nervous system.

Group IX. Oxygen. — When pure oxygen is inhaled the only effect is a

slight increase of the amount of the gas in the blood, but this has no particular physiological effect. The pharmacological action of hydrogen peroxide (H2O2), potassium permanganate, powdered charcoal and some other oxidizing agents depends on the readiness with which they give up oxygen.

Group X. Carbonic Acid. — Carbonic acid gas, carbonic oxide (CO) and some other irrespirable gases produce their effects practi- cally by asphyxiation. When dissolved in wafer, however, carbonic acid gas is a gentle stimulant to the mouth, stomach and bowel, the mixture being absorbed more rapidly than plain water; hence its greater value in assuaging thirst. Nitrous oxide (laughing gas) was at one time believed to act simply by cutting off the supply of oxygen to the tissues, but it also has a specific effect in producing paralysis of certain parts of the central nervous system, and hence its value as an anaesthetic; when given in small amounts mixed with air it produces a condition of exhilaration.

Group XL Water. — Water acts directly as a diluent and solvent. It therefore increases all the secretions, especially those of the skin and kidneys, while it also stimulates the general metabolism of the body and the excretion of nitrogenous products. Mineral waters act in the same way, but their effects are very much modified by, and depend largely upon, other constituents, such as alkaline salts, iron, arsenic, sulphides, carbonic acid, &c.

Group XII. Tannic Acid. — Tannic acid is present in small quantities in the great majority of plants, but in notable quantity in gall-nuts, oak bark, bearberry leaves, rhatany root, catechu, kino,

red gum, bael fruit, logwood and witch hazel, all of which are largely used as medicines. In these the variety of tannic acid is not exactly the same, but although there are slight chemical differ- ences, they all possess the power of tanning raw hides and of pre- serving albuminous tissues. The action of tannic acid is strictly local, and depends upon its power of precipitating albumen and of destroying germs. It thus acts as an astringent on all mucous membranes. After absorption into the blood it loses this effect, as it is partly broken up into gallic acid and partly combined with alkalis, both of which changes nullify its action upon albumen.

Group XIII. Local Irritants. — Although some of the drugs already considered have a local irritant action, they produce other more import? nt effects, but the substances here ranged under this heading depend entirely for their action on their local irritant effects.

a. Those which act upon the alimentary canal: Simple bitters such as quassia wood, columbo root, taraxacum, gentian, chiretta, and many others, irritate gently the mucous membrane of the stomach and bowels, and by increasing the secretions improve the appetite and digestion. The aromatic bitters such as chamo- mile flowers, cascarilla bark, hops, orange peel and others contain in addition small quantities of essential oils which increase their local action. The active principles in some of these bitters have been isolated pure, and have been found to be alkaloids or neutral compounds. Substances like pepper, cayenne pepper, mustard, horse-radish and ginger irritate the stomach and bowel much in the same way, but are more pungent, and are consequently used as condiments. Some of these have a similar but less marked effect upon the skin. The large number of vegetable substances used as purgatives owe their action to an irritating effect upon the mucous membrane and the neuro-muscular apparatus of the bowel, whereby the secretions and peristalsis are more or less increased, as the result of which diarrhoea ensues. Some of them cause so much irritation that the discharge is very watery (hydragogue cathartics), while others, for example aloes, by acting gently on the lower part of the bowel and on its muscular coat, produce simply a laxative effect. A few of them, such as aloin and colocynthin, are also purgative when injected subcutaneously or into the blood, probably owing to their being excreted into the intestinal canal.

b. Those which act on the skin: The best known of these is cantharides (Spanish fly), the active principle of which is a colour- less crystalline body — cantharidin — which is extremely irritating. On a mucous membrane or a delicate skin it exerts an irritant action, which occurs more quickly than on a thickened epidermis, such as the scalp, and according to the strength and period of application there may result redness, a blister, or an ulcer. Many other substances, such as chrysarobin, mustard, pepper, &c, are also capable of irritating the skin, the effect produced varying from mere dilatation of the cutaneous vessels to destruction of tissue.

Group XIV. Male-fern.— This includes the male-fern, santonin, cusso, pomegranate bark, pumpkin seeds and many other substances containing active principles which have a specific poisonous action on intestinal parasitic worms. Apart from this their actions vary considerably, but are of little practical importance.

Group XV. Ethereal Oils. — This includes a very large number of substances which owe their action to the fact that they contain ethereal or essential oils. The best known of these are cloves, pimento (allspice), myrtle, eucalyptus, caraway, fennel, dill, cori- ander, rosemary, lavender, peppermint, spearmint, nutmeg, cinna- mon, sandal-wood, turpentine, juniper berries, valerian and sumbul. In this group may be included the oleo-resins, such as copaiba, cubebs and Canada balsam; the gum-resins, such as asafetida, myrrh, ammoniacum and galbanum; and the true balsams, such as benzoin, storax, balsam of Tolu and balsam of Peru. The resins when taken internally have much the same action as essential oils, which are closely allied chemically, while the benzoic and cinnamic acids in the balsams modify their actions very slightly. Although individual essential oils may differ somewhat in action, chemically and pharmacologically they are fundamentally similar. They all have a poisonous action on protoplasm, which makes them useful in medicine as antiseptics, disinfectants, germicides, anti-fermenta- tives and parasiticides; when locally applied they are more or less irritating, and, when very dilute, astringent. When swallowed in small doses they slightly irritate the mouth and gastric mucous membrane, increasing the secretions and producing a feeling of warmth. At the same time they increase the movements of the stomach, and also in this way hasten digestion, an action which extends to the upper part of the bowel. They are readily absorbed into the blood, and they are excreted chiefly by the kidneys in a more or less altered form, and probably also by the different mucous membranes, and even by the skin. After absorption their action, speaking generally, is exerted on the brain and spinal cord, and is at first slightly stimulant and afterwards depressing, even to the causing of sleepiness and stupor. Locally applied they depress the terminations of sensory nerves, and may thereby lessen pain. On the heart and circulation the effects are stimulant unless large doses are given, when the pulse becomes slow and blood-pressure much lessened. During excretion they irritate the kidneys and the sweat-glands, and thereby increase the excretion of urine and of sweat. They also increase the number of leucocytes in the blood,

and the more irritating of them increase the flow of blood to the pelvic organs, and may thus stimulate the uterus, or in large doses cause abortion. The various camphors, such as laurel camphor, Borneo camphor, menthol and cumarin, are oxidized derivatives of essential oils, and differ only superficially from them in their action. Group XVI. Phenol. — This includes a very large number of bodies chemically allied to benzol, such as carbolic acid, sulpho- carbolates,

creosote, wood tar, coal tar, oil of cade, thymol, salicylic acid, benzoic acid, naphthol, hydroquinon, cresol, guaiacol, ichthyol, saccharin and many others. These all resemble carbolic acid more or less closely, and may Be described as general protoplasm poisons. Locally their destructive and irritating effects vary a good deal, but even when very dilute they all have a marked poisonous action on bacteria, white blood corpuscles, yeast and similar organisms. After absorption most of them exercise a depressing effect upon the nervous system, and are capable of reducing high temperature. They are mostly excreted in the urine.

Group XVII. Alcohol. — This group also includes a very large number, of chemical bodies, only a few of which are mentioned here. Ethyl alcohol is taken as a type of the action of methyl alcohol, amyl alcohol, propyl alcohol, ether, acetic ethe-r, paraldehyde, sulphonal, chloroform, methyl chloride, ethyl chloride, chloral hydrate, butylchloral hydrate, and almost any number of derivatives from these. Some of them are so volatile that they produce their effects when inhaled, others when sprayed upon the skin cause intense cold and then anaesthesia; but taken in the broadest sense the action of all of them after absorption into the blood is very similar, and is exerted upon the central nervous system, more especi- ally the cerebrum. In all cases there is a longer or shorter period of excitement, followed by intoxication or narcosis, and with large doses this passes into paralysis and death from depression of the respiratory centre or of the heart. Small doses of any of them dilate the blood vessels from an action on the vaso-motor centre in the medulla oblongata, as a result of which the heart beats more rapidly and the blood circulates more freely; but larger doses have a general depressing effect upon the circulatory system. Under their action more heat is lost from the body, the general metabolism is diminished and the temperature falls. With some of them, such as chloral and chloroform, the stimulation period is short compared with the narcotic period, while with others, such as ether, the reverse is the case.

Group XVIII. Nitrites. — This group contains amyl nitrite, ethyl nitrite, methyl nitrite, nitroglycerin, sodium and potassium nitrites, erythrol-tetranitrate, and many other compounds con- taining nitrous or nitric acid. The latter becomes reduced to nitrous in the body, and thereby exercises its characteristic effects. These consist chiefly in an action upon non-striped muscle, vaso- motor centres, blood vessels and the blood. When they are given by inhalation or by the mouth their first effect is to produce marked dilatation of the small arteries, with a fall of blood-pressure and a greatly increased rapidity of the heart's action. At the same time the non-striped muscles slightly lose their tonicity,

and when very large doses are given the haemoglobin of the blood becomes converted into the chocolate-coloured methaemoglobin. The volatile members of the group act much more rapidly and more transiently than the others.

Group XIX. Alkaloids.- — This embraces a very large number of important pharmacological substances, which differ a good deal in the details of their action, but they all act upon muscle and nerve tissue. Some of them affect only certain portions of the nervous system, others have a much wider range of action; they may act in cither case as stimulants or as depressants, and hence the symptoms produced by them vary very greatly.

1. Morphine and the other opium alkaloids (codeine, narcotine, laudanine, &c.) have two prominent actions-a narcotic followed by a tetanic action. In morphine, on the higher animals at least, the narcotic action is very marked, the tetanizing action slightly so; while in thebaine there is little narcotic effect, but a tetanizing action like that of strychnine. Morphine exercises its effects chiefly upon the cerebrum and the medulla oblongata in man. It has in addition a markedly depressing action upon the respiratory centre, it lessens all the secretions except the sweat, and diminishes bowel peristalsis and the size of the pupil. Men are much more affected by it than birds, rabbits, dogs and most other animals. Cats, however, show marked symptoms of cerebral excitement and increase of the reflexes. Compared with morphine, codeine and the other alkaloids are only slightly narcotizing.

2. Strychnine and brucine very closely resemble each other in action, and under this heading curarine may also be included. These bodies stimulate the grey matter in the spinal cord and cause tetanic convulsions. In the case of curare these are masked almost at once by paralysis of the terminations of the motor nerves.

3. Caffeine is the active principle in tea, coffee, kola, mate and guarana; while theobromine, a body closely allied to it, is found in cocoa and chocolate. They both stimulate the grey nerve-cells in the brain and cord, this being the foundation of their dietetic value and their use as nervine stimulants. They also markedly increase the secretion of urine by stimulating the secreting cells of the kidneys.

4. Cocaine is the active principle of the coca leaf, which is chewed

as a stimulant-narcotic in Peru and Bolivia. Small doses excite the nervous system, while larger doses are depressing. The chief action of cocaine from a practical point of view is its power of paralysing the terminations of sensory nerves.

5. Atropine, hyoscyamine, homatropine, duboisine, daturine and some other bodies have a paralysing action upon the ends of the motor and secretory nerves. They therefore lessen al! the secretions, and among other actions dilate the pupil and increase the rapidity of the heart by paralysing the vagus. In addition they have a stimulating action on the central nervous system.

6. Nicotine, piturine and lobeline are the active principles of tobacco and other substances which are smoked as stimulant narcotics. In large doses they are powerful nerve poisons, but as usually taken they exercise a gently stimulant effect upon the nervous system. Pilocarpine has an action closely allied to that of nicotine, but as it is much less poisonous (the effects produced by small doses being chiefly excessive sweating and salivation), it is capable of being utilized in medicine. Muscarine has a very close resemblance in action to pilocarpine.

7. Physostigmine, the active principle of the Calabar bean, acts chiefly as a stimulant to voluntary and involuntary muscles, and at the same time exercises a depressing effect upon the spinal cord. It contracts the pupil.

8. Conine, gelseminine and sparteine all exert a paralysing effect on the terminations of the motor nerves, to the implication of which the weakened gait and other symptoms are due.

9. Aconitine, delphinine and many of their derivatives have a very widespread depressing action on muscle and nerve.

10. Apomorphine is essentially a muscle poison, but owing to the fact that minute doses stimulate the vomiting centre and cause emesis before any other symptoms are observable, its emetic action is the most prominent effect in man.

11. Emetine acts as a gradual depressant to the nervous system in animals. In man its chief effect is its emetic action, which seems to be due entirely to local irritation of the stomach.

12. Quinine. Several of the other alkaloids found in cinchona bark act

very much like quinine. They all depress the conducting power and the grey matter of the spinal cord, and to a much less extent that of the brain. They lessen the general metabolism and lower febrile temperature. The cinchona alkaloids have a specific- ally poisonous effect on the parasites of malaria when present in human blood, and are poisonous to all low organisms.

13. Phenacetin, acetanilide, phenazone and many similar bodies act as antipyretics in virtue of an action on the heat-regulating centres in the cerebrum.

Gkoup XX. Digitalis. — This group-name has been given to a large number of substances which have an action similar to that of the foxglove leaves, including the active principles of strophanthus, squill, Urechites suberecta, Convallaria majalis, Nerium Oleander, Helleborus niger, Antiaris toxicaria (the upas tree), and several others. The active principles of these vary a good deal in chemical composition, but they are all non-nitrogenous neutral bodies. Their action is exerted upon muscle, and chiefly upon the muscle of the heart and blood vessels. The individual muscle-fibres con- tract and expand more perfectly, and thus the diastole and systole of the heart are rendered more complete, the pulse is slowed, and the blood-pressure is raised. The slowing of the heart is partly brought about by an action on the vagus centre.

Group XXI. Picrotoxin. — In large doses the action of picrotoxin is exerted chiefly on the medullary nerve centres, whereby irregular tonic-clonic convulsions are produced; in minute doses it stops the secretion of sweat.

Group XXII. Saponin. — Saponin and many allied bodies form an abundant soapy-looking froth when shaken up with water, and they are contained in a very large number of plants, the chief of which are the Quillaia saponaria, Polygala senega, sarsaparilla, and others, known collectively as soapworts. They all act as local irritants in the alimentary canal, and after absorption are more or less depressing to the muscular and nervous systems. They produce slight nausea and increased secretion of mucus.

Group XXIII. Cyanogen. — This includes compounds of cyano- gen such as hydrocyanic (prussic) acid, cyanides of potassium, sodium. &c, cherry-laurel water, amygdalin, bitter almonds and other chemical and vegetable substances which readily yield hydro- cyanic acid. Hydrocyanic acid is a general protoplasmic poison, all the lower organisms being very susceptible to its action, while in the higher

animals it speedily depresses or paralyses all forms of nerve tissue. It enters into combination with haemoglobin, forming a bright scarlet compound and interfering with respiration. It kills by its paralysing effect on the motor ganglia of the heart and on the respiratory centre.

Group XXIV. Ferments. — These include such bodies as pepsin, diastase, the pancreatic ferments, papain, the pine-apple ferment, taka-diastase and others, and serve to convert starch into sac- charine substances, or albumen into peptone and albumoses.

Group XXV. Animal Glands and Secretions. — Of these the thyroid gland, the suprarenal bodies, the spleen, the bile, the bone marrow, the ovaries and some others have been investigated fully. Speaking generally, when given in small doses their action on the

healthy organism is slight or nil, but in disease some of them are capable of acting as substitutes for deficient secretions.

Group XXVI. Antitoxins. — These are substances which antago- nize the toxins formed in the body by pathogenic organisms, the toxins of snake venom and other animal poisons, and vegetable toxins such as abrin, ricin, &c. A healthy person can be rendered insusceptible by gradually accustoming him to increasing doses of these poisons, and this immunity is due to antitoxins which are found in the blood-serum and which are products of the blood cells. The nature of these antitoxic substances is not definitely known, but they combine with and destroy the poisons. In specific germ diseases a similar antitoxin forms, and in cases which recover it counteracts the toxin, while the germs are destroyed by the tissues. Antitoxins can be prepared by immunizing a large animal, such as a horse, by injecting gradually increasing doses of specific toxins into its subcutaneous tissue. In due time the horse is bled, the serum is filtered free of blood corpuscles, and then constitutes the anti- toxic serum, which can be standardized to a certain potency. Such serums are injected subcutaneously in diphtheria, tetanus, strepto- coccic infections, plague, snake-poisoning, cholera and other similar diseases. They do not as a rule harm healthy men even in large quantities, but when repeated they often cause serious symptoms due to the body becoming more sensitive to the action of the horse- serum in which they are contained.

Group XXVII. Neutral Fats. — This includes cod-liver oil, almond oil, olive oil, lard, &c, all of which act as foods when taken internally, and have a merely physical emollient action when applied externally. Lanolin, linseed oil, wax, spermaceti, &c, also belong to this group. The paraffins, glycerin and vaseline, although not fats, have much the

same effect when applied externally, but they are not nutritive.

Group XXVIII. Sugars, Starches, Gums, Gelatin, &c. — Although these and allied bodies are used in various ways as remedies, their action is for the most part purely mechanical or dietetic.

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(R. S.*)

Terminology in Therapeutics. It may be useful to give here a general explanation of the common names used in the therapeutic classification of drugs. It is convenient to divide drugs and other substances used in medicine into groups according to the part of the system on which they chiefly act, though, as stated above, many drugs act in more than one manner and could come under several groups.

I. Drugs acting on the blood vessels, which either dilate the vessels when taken internally or applied locally, or contract the superficial arterioles. Irritants (Lat. irritare, to excite) include: Rubefacients (Lat. rubefacere, to make red), which cause the skin to become red from dilatation of the blood vessels; Vesicants (Lat. vesica, a bladder), which irritate sufficiently to cause the blood-serum to exude and form vesicles or blisters, e.g. cantharides; Pustulants (Lat. pustula, a blister), still more powerful in their effects, causing the blisters to become filled with pus, e.g. croton oil. Escharctics (Gr. kaxi-pa, hearth, brazier; hence mark of a burn, ” scar “) or Caustics (Gr. Kaieiv, to burn), cause the death of the part, e.g. silver nitrate and nitric acid. The term counter- irritant is used when an irritant is applied to the skin for the pur- pose of relieving pain or congestion by dilating the

superficial vessels. Drugs which contract the vessels and diminish exudation comprise Astringents (Lat. astringere, to draw close), while Styptics ((tt(}uv, to contract) or Haemostatics (Gr. alpa, blood, ararLnds, causing to stand) are substances applied either locally or internally in order to arrest bleeding; cold, adrenalin, ergot and the per-salts of iron may be taken as examples.

II. Drugs acting on the digestive tract. Sialogogues (Gr. olaKov, spittle, &7«y < 5s, leading) increase the flow of saliva, e.g. mercury; Antisialogogues decrease the flow, e.g. belladonna. Aromatics (Gr. &pwna, spice) or Bitters increase the flow of the gastric juice. Stomachics (Gr. aronaxos) have the same effect. The term Carminatives (Lat. carminare, to card wool), adopted from the old medical theory of humours, is generally applied to pungent substances which help to expel gas from the stomach by stimulating the movement

of its contents. Emetics (Gr. tueros, vomiting) are substances given tor the purpose of causing vomiting, e.g. ipecacuanha or apomorphine. Anti-emetics or Sedatives (Lat. sedare, to compose) arrest vomiting either by their central or local action, e.g. opium, cocaine or cerium oxalate. Purgatives (Lat. purgare, to cleanse) aid the onward passage of the contents of the intestinal canal, either by increasing the contractions of its muscular coat as laxatives (Lat. laxare, to loosen), e.g. as magnesia, or by increasing the flow of fluid. Some are termed drastics (Gr. Spaarubs, active) or cathartics (Gr. KoBapriKhs, cleansing), which produce watery evacuations. Cholagogues (Gr. x °^7 > bile, &ya > ybs, leading) are purgatives which act by increasing the flow of bile, either by causing an increased secretion (e.g. podophyllum) or by sweeping it onwards by stimulating the intestinal contractions (e.g. calomel).

III. Drugs acting on parasites. Anthelmintics (Gr. ivrl, against, eSuivs, ikpivdos, a worm) are drugs which kill parasites inhabiting the intestine. The term vermicide (Lat. vermis, worm, caedere, to kill) is applied to drugs which directly kill the entozoa, while vermifuge (Lat. vermis, worm, fugare, to put to flight) is applied to the purgative usually given after the vermicide for the purpose of expelling the worm. Parasiticides or anti-par asitics destroy parasites; the terms are usually restricted to those acting on skin- parasites as contrasted with intestinal ones.

IV. Drugs acting on the urinary system. Diuretics (Gr. hik, through, ovpov, the urine) increase the flow of urine, while lithon- triptics (Gr. \Wos, stone, rpifieiv, to rub, grind down) are drugs given to prevent the formation of urinary calculi.

V. Drugs acting on the generative system. Aphrodisiacs (Gr. ‘ ‘ KpoblTri, the goddess of love) increase the action of the generative centre in the spinal cord; Anaphrodisiacs decrease its action. Ecbolics (Gr. UflaWeiv, to throw out) or oxytocics (Gr. 6£0s, sharp, quick, tokos, parturition) stimulate uterine action. Emmena- gogues (Gr. ip.p.rjva, menses, kyoiym, leading) are substances which increase the menstrual flow. Galactogogues (Gr. 7d\a, milk) in- crease the secretion of milk, while antigalactogogues {e.g. belladonna) have the opposite effect.

VI. Drugs acting on the respiratory system. Expectorants increase the bronchial secretions; antispasmodics relax the spasm of the muscular coat of the bronchial tubes, e.g. stramonium. This latter term is also used for drugs which act as general depressants.

VII. Drugs or substances acting on the bodily heat. Anti- pyretics (Gr. i.vTi, against, wvperbs, fever) either increase the heat loss or diminish its production; e.g. phenacetin, cold water, &c.

VIII. Drugs or substances acting on the skin. Diaphoretics (Gr. hia4>optiv, to carry through) increase the amount of sweat, either by acting directly on the sweat centres or on the nerve terminals. The word Sudorific (Lat. sudor, sweat) is applied to them when they act very powerfully. Anhidroses or Antihidrotics (Gr. l&puK, sweat) diminish the secretion of sweat. Emollients (Lat. mollis, soft) are substances which soften and protect the parts. Demulcents (Lat. demulcere, soften), soothe the skin or mucous membrane.

IX. Drugs acting on metabolism. Alteratives are drugs which alter the course of a disease, the mode of action being unknown. Tonics are drugs which increase the muscular tone of the body by acting either on the stomach, heart, spinal cord, &c.

X. Drugs acting on the blood. Antitoxins arc organic products designed to neutralize the formation of the toxins of certain dis- eases in the blood. Toxins are also injected in order to stimulate the blood plasma to form antitoxins (see Bacteriology). Anti- periodics inhibit a disease having periodic recurrences; e.g. quinine in malaria. Haematinics are drugs which increase the amount of haemoglobin in the blood.

XI. Drugs acting on the nervous system. Anaesthetics {a. v.) diminish sensibility, either central or peripheral; Anodynes (Gr. a.v-, priv., bliivri, pain) relieve pain only, but, as in Analgesics (Gr. aXYijuis, sense of pain), sensibility is unaltered. Stimulants are those which lead to excitation of the mental faculties and in quantity may lead to delirium and incoherence. Hypnotics (Gr. Sxj-os, sleep) or Soporifics (Lat. sopor, a deep sleep) are drugs which produce sleep without causing cerebral excitement. Narcotics (Gr. vb.pK.Ti, numbness) are those which besides producing sleep may in large doses depress the functions of respiration and circulation.

XII. Drugs which arrest the progress of putrefaction. This is either by inhibiting the growth of micro-organisms {Antiseptics) or by destroying them when present {Disinfectants). (H. L. H.)

PHARMACOPOEIA (lit. the art of the (papnaKoiroios, or drug-compounder), in its modern technical sense, a book containing directions for the identification of simples and the preparation of compound medicines, and published by the authority of a government or of a medical or pharmaceutical society. The name has also been applied to similar compendiums issued by private individuals. The first work of the kind published under government authority appears to have been that of Nurem- berg in 1542; a passing student named Valerius Cordus showed xxi. 12

a collection of medical receipts, which he had selected from the writings of the most eminent medical authorities, to the phy- sicians of the town, who urged him to print it for the benefit of the apothecaries, and obtained for his work the sanction of the senatus. An earlier work, known as the Antidotarium florentinum, had been published under the authority of the college of medicine of Florence. The term ” pharmacopoeia” first appears as a distinct title in a work published at Basel in 1561 by Dr A. Foes, but does not appear to have come into general use until the beginning of the 17th century. Before 1542 the works principally used by apothecaries were the treatises on simples by Avicenna and Serapion; the De synonymis and Quid pro quo of Simon Januensis; the Liber servitoris of Bulchasim Ben Aberazerim, which described the pre- parations made from plants, animals and minerals, and was the type of the chemical portion of modern pharmacopoeias; and the Antidotarium of Nicolaus de Salerno, containing Galenical compounds arranged alphabetically. Of this, last work there were two editions in use — Nicolaus magnus and Nicolaus parvus: in the latter several of the compounds described in the larger edition were omitted and the formulae given on a smaller scale. Until 161 7 such drugs and medicines as were in common use were sold in

England by the apothecaries and grocers. In that year the apothecaries obtained a separate charter, and it was enacted that no grocer should keep an apothecary's shop. The preparation of physicians' prescriptions was thus confined to the apothecaries, upon whom pressure was brought to bear to make them dispense accurately, by the issue of a pharmacopoeia in May 1618 by the College of Physicians, and by the power which the wardens of the apothecaries received in common with the censors of the College of Physicians of examining the shop* of apothecaries within 7 m. of London and destroying all the compounds which they found unfaithfully prepared. This, the first authorized London Pharmacopoeia, was selected chiefly from the works of Mezue and Nicolaus de Salerno, but it was found to be so full of errors that the whole edition was cancelled, and a fresh edition was published in the following December. At this period the compounds employed in medicine were often heterogeneous mixtures, some of which contained from 20 to 70, or more, ingredients, while a large number of simples were used in consequence of the same substance being supposed to possess different qualities according to the source from which it was derived. Thus crabs' eyes, pearls, oyster-shells and coral were supposed to have different properties. Among other ingredi- ents entering into some of these formulae were the excrements of human beings, dogs, mice, geese and other animals, calculi, human skull and moss growing on it, blind puppies, earthworms, &c. Although other editions of the Loudon Pharmacopoeia were issued in 1621, 1632, 1639 and 1677, it was not until the edition of 1721, published under the auspices of Sir Hans Sloane, that any important alterations were made. In this issue many of the ridiculous remedies previously in use were omitted, although a good number were still retained, such as dogs' excrement, earthworms, and moss from the human skull; the botanical names of herbal remedies were for the first time added to the official ones; the simple distilled waters were ordered of a uniform strength; sweetened spirits, cordials and ratifias were omitted as well as several compounds no longer used in London, although still in vogue elsewhere. A great improve- ment was effected in the edition published in 1746, in which only those preparations were retained which had received the approval of the majority of the pharmacopoeia committee; to these was added a list of those drugs only which were supposed to be the most efficacious. An attempt was made to simplify further the older formulae by the rejection of superfluous ingredients. In the edition published in 1788 the tendency to simplify was carried out to a much greater extent, and the extremely compound medicines which had formed the principal remedies of physicians for 2000 years were discarded, while a few powerful drugs which had been

considered too dangerous to be included in the Pharmacopoeia of 1765 were restored to theii previous position. In 1809 the French chemical nomenclatuie

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was adopted, and in 1815 a corrected impression of the same was issued. Subsequent editions were published in 1824, 1836 and 1831.

The first Edinburgh Pharmacopoeia was published in 1699 and the last in 1841; the first Dublin Pharmacopoeia in 1807 and the last in 1850.

The preparations contained in these three pharmacopoeias were not all uniform in strength, a source of much inconvenience and danger to the public, when powerful preparations such as dilute hydrocyanic acid were ordered in the one country and dispensed according to the national pharmacopoeia in another. In consequence of this inconvenience the Medical Act of 1858 ordained that the General Medical Council should cause to be published a book containing a list of medicines and compounds, to be called the British Pharmacopoeia, which should be a substitute throughout Great Britain and Ireland for the separate pharmacopoeias. Hitherto these had been published in Latin. The first British Pharmacopoeia was published in the English language in 1864, but gave such general dissatisfaction both to the medical profession and to chemists and druggists that the General Medical Council brought out a new and amended edition in 1867. This dissatisfaction was probably owing partly to the fact that the majority of the compilers of the work were not engaged in the practice of pharmacy, and therefore competent rather to decide upon the kind of preparations required than upon the method of their manufacture. The necessity for this element in the construction of a pharmacopoeia is now fully recognized in other countries, in most of which pharmaceutical chemists are represented on the committee for the preparation of the legally recognized manuals.

National pharmacopoeias now exist in the following countries: Austria, Belgium, Chile, Denmark, France, Germany, Great Britain, Greece, Holland, Hungary, India, Japan, Mexico, Norway, Portugal, Russia, Spain, Sweden, Italy, Switzerland, the United States of America and Venezuela. All the above-mentioned were issued under the authority of government, and their instructions have the force of law in their respective countries, except that of the United States, which was prepared by commissioners appointed by medical and pharmaceutical societies, and has no other authority, although generally accepted as the national textbook.

The French Codex has probably a more extended use than any other pharmacopoeia outside its own country, being, in connexion with Dorvault's L'Officine, the standard for druggists in a large portion of Central and South America; it is also official in Turkey. The sum-total of the drugs and preparations it contains is about 1250, or double the average of other modern pharmacopoeias. The progress of medical knowledge has led to a gradual but very perceptible alteration in the contents of the pharmacopoeias. The original very complex formulae have been simplified until only the most active ingredients have been retained, and in many cases the active principles have to a large

extent replaced the crude drugs from which they were derived. From time to time such secret remedies of druggists or physicians as -have met with popular or professional approval have been represented by simpler official preparations.

The rapid increase in medical and pharmaceutical knowledge renders necessary frequent new editions of the national pharma- copoeias, the office of which is to furnish definite formulae for pre- parations that have already come into extensive use in medical practice, so as to ensure uniformity of strength, and to give the characters and tests by which their purity and potency may be determined. But each new edition requires several years to carry out numerous experiments for devising suitable formulae, so that the current Pharmacopoeia can never be quite up to date. This difficulty has hitherto been met by the publication of such non- official formularies as Squire's Companion to the Pharmacopoeia and Martindale's Extra Pharmacopoeia, in which all new remedies and their preparations, uses and doses are recorded, and in the former the varying strengths of the same preparations in the different pharmacopoeias are also compared. The need of such works to supplement the Pharmacopoeia is shown by the fact that they are even more largely used than the Pharmacopoeia itself, the first having been issued in 18 and the second in 13 editions at compara- tively short intervals. In England the task of elaborating a new Pharmacopoeia is entrusted to a body of a purely medical character, and legally the pharmacist has not, as in other countries, a voice in the matter, notwithstanding the fact that, although the medical practitioner is naturally the best judge of the drug or preparations that will afford the best therapeutic result, he is not so competent as the pharmacist to say how that preparation can be produced in the most effective and satisfactory manner, nor how the purity of drugs can be tested. In the preparation of the fourth edition of

the British Pharmacopoeia in 1898 some new departures were made. A committee of the Pharmaceutical Society of Great Britain was appointed at the request of the General Medical Council to advise on pharmaceutical matters and the valuable assistance rendered by it is acknowledged in the preface of that work. A census of prescriptions was taken to ascertain the relative frequency with which different preparations and drugs were used in prescriptions, and suggestions and criticisms were sought from various medical and pharmaceutical bodies at home and in the colonies. As regards the purely pharmaceutical part of the work a committee of refer- ence in pharmacy, nominated by the pharmaceutical societies of Great Britain and Ireland, was appointed to report to the Pharma- copoeia

Committee of the Medical Council.

Some difficulty has arisen since the passing of the Adulteration of Food and Drugs Act concerning the use of the Pharmacopoeia as a legal standard for the drugs and preparations contained in it. The Pharmacopoeia is defined in the preface as only " intended to afford to the members of the medical profession and those engaged in the preparation of medicines throughout the British Empire one uniform standard and guide whereby the nature and composi- tion of substances to be used in medicine may be ascertained and determined." It is obvious that it cannot be an encyclopaedia of substances used in medicine, and can only be used as a standard for the substances and preparations contained in it, and for no others. It has been held in the Divisional Courts (Dickins v. Randerson) that the Pharmacopoeia is a standard for official pre- parations asked for under their pharmacopoeial name. But there are many substances in the Pharmacopoeia which are not only employed in medicine, but have other uses, such as sulphur, benzoin, tragacanth, gum arabic, ammonium carbonate, beeswax, oil of turpentine, linseed oil, and for these a commercial standard of purity as distinct from a medicinal one is needed, since the prepara- tions used in medicine should be of the highest possible degree of purity obtainable, and this standard would be too high and too expensive for ordinary purposes. The use of trade synonyms in the Pharmacopoeia, such as saltpetre for purified potassium nitrate, and milk of sulphur for precipitated sulphur, is partly answerable for this difficulty, and has proved to be a mistake, since it affords ground for legal prosecution if a chemist sells a drug of ordinary commercial purity for trade purposes, instead of the purified preparation which is official in the Pharmacopoeia for medicinal use. This would not be the case if the trade synonym were omitted. For many drugs and chemicals not in the Pharmacopoeia there is no standard of purity that can be used under the Adulteration of Food and Drugs Act, and for these, as well as for the commercial quality of those drugs and essential oils which are also in the Pharmacopoeia, a legal standard of commercial purity is much needed. This subject formed the basis of discussion at several meetings of the Pharmaceutical Society, and the results have been embodied in a work entitled Suggested Standards for Foods and Drugs, by C. G. Moor, which indicates the average degree of purity of many drugs and chemicals used in the arts, as well as the highest degree of purity obtainable in commerce of those used in medicine. An important step has also been taken in this direction by the publication under the authority of the Council of the Pharmaceutical Society of Great Britain of the British Pharmaceutical Codex, in which the characters of and

tests for the purity of many non- official drugs and preparations are given as well as the character of many glandular preparations and antitoxins that have come into use in medicine, but have not yet been introduced into the Pharmacopoeia. This work may also possibly serve as a standard under the Adulteration of Food and Drugs Act for the purity ancj strength of drugs not included in the Pharmacopoeia and as a standard for the commercial grade of purity of those in the Pharma- copoeia which are used for non-medical purposes.

Another legal difficulty connected with modern pharmacopoeias is the inclusion in some of them of synthetic chemical remedies, the processes for preparing which have been patented, whilst the substances are sold under trade-mark names such as veronal. The scientific chemical name is often long and unwieldy, and the physician prefers when writing a prescription to use the shorter name under which it is sold by the patentees. In this case the pharmacist is compelled to use the more expensive patented article and the patient complains of the price. If he uses the same article under its pharmacopoeial name when the patented article is pre- scribed he lays himself open to prosecution by the patentee for infringement of patent rights. The only plan, therefore, is for the physician to use the chemical name (which cannot be patented) as given in the Pharmacopoeia, or — for those synthetie remedies not included in the Pharmacopoeia — to use the scientific and chemical name given in the British Pharmaceutical Codex.

International Pharmacopoeia. — Increased facilities for travel have brought into greater prominence the importance of an approach to uniformity in the formulae of the more powerful remedies, in order to avoid danger to patients when a prescription is dispensed in a different country from that in which it was written. Attempts have been made by international pharmaceutical and medical conferences to settle a basis on which an international pharmacopoeia could be prepared, but, owing to national jealousies and the attempt to include too many preparations in such a work it has not as yet

been produced. The standardization of preparations of patent medicines, as regards the amount of active principles they contain, can only conveniently and economically be done in operating on large quantities, and must naturally lead to the preparations being standardized at wholesale houses, who issue a guarantee with them ;

but it is not yet certain that deterioration may not take place after standardization, in such as those of ergot or digitalis, so that it is somewhat questionable whether the standardization is of permanent value in all cases. Probably more dependence is to be placed on careful selection of the drug, and skill in its preparation and preservation by the retail pharmacist, who should be personally responsible for the quality and purity of the preparations he sells. Although the attempt to form an international pharmacopoeia has failed, a project for an imperial pharmacopoeia which should be adapted to the general and local requirements of all parts of the British Empire has met with better success. With the aid of the medical and pharmaceutical authorities in each of the seventy administrative divisions of the British Empire an Indian and Colonial addendum to the British Pharmacopoeia of 1898 was compiled and published in 1900 in which each article receives official sanction in the countries indicated at the foot of the monographs. This was regarded as a preparatory step to the publication of a complete imperial pharmacopoeia.

Several unofficial universal pharmacopoeias have been published in England and in France, which serve to show the comparative strength of parallel preparations in different countries. The metric or decimal mode of calculation and the centigrade scale of tempera- ture are adopted in all pharmacopoeias except those of Great Britain (in which the metric equivalents are now given) and in some instances of Greece. The majority omit chemical formulae. An alphabetical arrangement is followed in all. The maximum doses of preparations are given in several pharmacopoeias and the physician must indicate on his prescription, if he exceeds this limit, by using a note of exclamation after each article, that he purposely intends such a dose to be employed. The great increase of medical literature and international exchange of medical journals has led to the adoption in almost every country of all the really valuable remedial agents, and the more extended use of active principles has given rise to an approximation in strength of their solutions. The difficulty of nomenclature could probably be overcome by a list of synonyms being given with each article, and that of language by the use of Latin. The greatest stumbling-blocks in the way of uniformity are the tinctures and extracts — a class of preparations containing many very powerful drugs, but in which the same name does not always indicate the same thing; thus, extract of aconite signifies an extract of the root in the pharmacopoeias of the United States, Japan and Russia, extract of the leaves in the Danish and Portuguese, inspissated juice of the fresh leaves in the Greek, and alcoholic extract of the root in that of Spain

and Italy, and alcoholic extract of the dried leaves in the Chilean pharmacopoeias. It appears probable, however, that the growth of pharmaceutical chemistry will indicate, in time, which of those in use form the most active and trustworthy preparations, while the general adoption of the metric system will lead to clearer approximation of strength than hitherto. The method adopted by the Portuguese Pharma- copoeia comes nearest to that uniformity which is so desirable in such preparations, as the tinctures of the fresh plants are all pre- pared with equal parts of the drug and alcoholic menstruum ; simple tinctures in general, with unfortunately a few exceptions, with one part of the drug in five parts of alcohol of given strength; ethereal tinctures are in the proportion of one part in ten; and the tinctures of the alkaloids and their salts contain one part of the alkaloid in ninety-nine of menstruum.

Homoeopathic and eclectic practitioners as well as dentists have also their special pharmacopoeias.

See Bell and Redwood, Progress of Pharmacy (London, 1880) ; Scherer, Literatura pharmacopoearum (Leipzig and Sorau, 1822); Flint, Report on the Pharmacopoeias of all Nations (Washington, 1883). (E. M. H.)

PHARMACOSIDERITE, a mineral species consisting of hydrated basic ferric arsenate, 2FeAs04-Fe(OH) 3 5H 2 0. Crys tals have the form of small, sharply defined cubes of an olive- or grass-green colour, and occur together in considerable numbers on the matrix of the specimens. On account of its cubic form the mineral was early known as ” cube ore ” (Ger., Wurjelerz); the name pharmacosiderite, given by J. F. L. Hausmann in 1813, alludes to the arsenic and iron present (apfj.aKov, poison, and ai5r)pos, iron). The faces of the cube are striated parallel to one diagonal, and alternate corners are sometimes replaced by face of a tetrahedron. The crystals are feebly doubly refracting, and in polarized light exhibit a banded structure parallel to the cube faces. The hardness is 2-|- and the specific gravity 2-8. Recent analyses prove the presence of a small but variable amount of potassium (K 2 0, 2-68— 4-13%) in the Cornish crystals, though in those from Hungary there is

only a trace; this constituent appears to take the place of basic hydrogen in the above formula. A curious property is to be observed when a crystal of pharmacosiderite is placed in a solution of ammonia — in a few minutes the green colour changes throughout the whole crystal to red; on placing the red crystal in dilute hydrochloric acid the green colour is restored. Natural crystals are sometimes honey-

yellow to brown in colour, but this appears to be due to alteration.

Pharmacosiderite is a mineral of secondary origin, the crystals occurring attached to gozzany quartz in the upper part of veins of copper ore. It was found in some abundance at the end of the 18th century in the copper mines of the St Day district in Cornwall, and has since been found at a few other localities, for example, at. Konigsberg near Schemnitz in Hungary, and in the Tintic district in Utah. (L. J. S.)

PHARMACY, a term which in the original Greek form signified the use of any kind of drug (), potion or spell, and hence also poison and witchcraft. In the modern signification it is applied to the act of preparing, preserving and compounding medicines, according to the prescriptions of physicians. It was used first in this sense in 1597.

In the earliest periods of the world's history of which we have any record, this art, like that of the perfumer, was practised by a special class of the priesthood, as in the case of Eleazar (Num. iv. 16), and that of medicine by another class (Lev. xiii.).

Egyptian inscriptions indicate that the physician-priests sent their prescriptions to be dispensed by the priests of Isis when, accompanied by the chanter of incantations and spells, they visited the sick 1 . A papyrus of Sent, 3300 B.C., gives directions as to the preparation of prescriptions. In the Ebers papyrus, 1550 B.C., mention is made of blisters, ointments, clysters, mineral and vegetable drugs. The art of the apothe- cary is alluded to very early in the Old Testament history (Exod. xxx. 25-35 an d in xxxvii. 20) and again in the time of Solomon (Eccles. x. 9), but this word, which is translated par fumeur in the French version, only indicates that the preparation of fragrant unguents and incense formed, even at that early date, a part of pharmacy, since the drugs mentioned, viz. galbanum, myrrh, stacte, frankincense, calamus, cassia and cinnamon, were all of them used in perfumes, even the myrrh being probably the kind distinguished at the present time in the Bombay market as perfumed myrrh or bissabol, which still forms an ingredient of the joss sticks used as incense in the temples in China. The myrrh mentioned in Gen. xxxvii. 35 is described under another Hebrew word, and refers to ladanum, a fragrant resin produced in Cyprus, and the use of this drug, as well as that of cinnamon and cassia, indicates even at that early period a knowledge of the products of Somaliland, Arabia and the East Indies and the existence of trade between the farther East and Egypt. In China also at a very early period the art of pharmacy was practised. Ching-Hong, a contem- porary of Menes I. of Egypt, was learned in the art, and made decoctions and extracts of plants. The materia medica of the Chinese

at the present date affords an excellent illustration of the changes that have taken place in the use of drugs, and of the theories and superstitions that have guided the selection of these from the earliest ages, inasmuch as it still comprises articles that were formerly used in medicine, but have now been utterly discarded. Thus the doctrine of signatures, is evident in the use of the celebrated Ginseng root of China, which, like that of the mandrake (Gen. xxx. 14-16), owed its employment to the fact that the root often divides into branches resembling the arms and legs of a man, and this resemblance gave rise to the belief that it conferred strength and virility. The same belief is shown in the botanical names applied to many plants, e.g. Pulmonaria, Hepatica, Scrophularia, and others.

The astrological belief that plants, animals and minerals are under the influence of the planets is shown in the older names of some of the metals, e.g. Saturn for lead, Venus for copper, and Mars for iron, and the belief that the colours of flowers

1 The Egyptians believed that the medicinal virtues of plants were due to the spirits who dwelt within them.

indicated the particular planet they were under led to their use in diseases and for constitutions supposed to be under the same planet. Physicians to this day head their prescriptions with a sign that originally meant an invocation to Jupiter, but now represents the word recipe.

The belief, which is still held by the Chinese, that the excrements of animals retain the properties and peculiarities of the animals from which they are derived, led to the use in medicine of these disgusting remedies, which are still sold in drug shops in China, and were only omitted from the English Pharmacopoeia as late as 1 7 2 1 . At that date the science of chemistry was very imperfectly known, and the real constituents of ordinary remedies so little understood that different virtues were attributed to different pro- ducts containing the same constituents. Thus, prepared oyster- shells, coral, pearls, crabs' " eyes " and burnt hart's horn were regarded as specifics in different complaints, in ignorance of the fact that they all contain, as the chief ingredients, calcium phosphate and carbonate. The celebrated Gascoigne's powder, which was sold as late as the middle of the 19th century in the form of balls like sal prunella, consisted of equal parts

of crabs' " eyes," the black tips of crabs' claws, Oriental pearls, Oriental bezoar and white coral, and was administered in jelly made of hart's horn, but was prescribed by physicians chiefly for wealthy people, as it cost about forty shillings per ounce. Superstition also entered largely into the choice of remedies. Thus various parts of criminals, such as the thigh bone of a hanged man, moss grown on a human skull, &c, were used, and even the celebrated Dr Culpeper in the 17th century recommended " the ashes of the head of a coal black cat as a specific for such as have a skin growing over their sight."

In course of time the knowledge of drugs, and consequently the number in use, gradually increased, and some of the prepara- tions made in accordance with the art attained a celebrity that lasted for centuries. Thus diachylon plaster was invented by Menecrates in a.d. i, and .was used by him for the same purposes as it is employed to-day. An electuary of opium, known as Mithradatum, was invented by Mithradates VI., king of Pontus, who lived in constant fear of being poisoned, and tested the effects of poisons on criminals, and is said to have taken poisons and their antidotes every day in the year. The prescription for the general antidote known as Mithradatum was found with his body, together with other medical MSS., by Pompey, after his victory over that king. The prescription was improved by Damocrates and Andromachus, body physicians to Nero. The first was subsequently known as Mithradatum Damocratis, and the second as Theriaca Andromachi, the name Theriaca or Tiriaca being derived from the snake called Tyrus, the flesh of which was added to it by Andromachus. The former con- tained 55, or, according to some formulae, 72 ingredients, and occurs in all the dispensatories, from that of Corvus Valerius up to the pharmacopoeias of the 19th century; and aromatic preparations of opium are still used, under the name of Theriaka in Persia. The Theriaca prepared at Venice had the highest reputation, probably because in Venice the component parts were exposed to the inspection of wise men and doctors for two months, to determine whether they were or were not fit for use. The apothecaries' ordinance at Nuremberg provided that no Theriaca should in future be branded with the seal of the city unless it had been previously examined and declared worthy of the same by the doctors of medicine, and that every druggist must know the age of the Theriaca he sold. Inasmuch as its action changed very materially with age, " the buyer should in all instances be informed, so that he may not be deceived." The last public preparation of Theriaca took place at Nurem- berg in 1754.

In a.d. 77-78 Dioscorides of Anazarba, in Cilicia, wrote his great work on materia medica, which still remains the most important work on

the plants and drugs used in ancient times (of which about 400 were enumerated) and until the 17th century was held as the most valuable guide to medicinal plants and drugs extant. Nearly 100 years afterwards Galen, the imperial physician at Rome (a.d. 131-200), who was learned in surgery,

pharmacy and materia medica, added about 200 more plants to those described by Dioscorides.

Galen believed in the doctrine of humours originated by Hippocrates, which supposes the condition of the body to depend upon the proper mixture of the four elements, hot, cold, moist and dry, and that drugs possess the same elementary qualities, and that on the principle of contraries one or other was indicated, e.g. a cooling remedy for a feverish state. This doctrine was held for many centuries, and drugs are classed by all the old herbalists as having one or other of these qualities in a greater or less degree. Galen is said to have invented hiera-picra, which he employed as an anthelmintic; it is still used in England as a domestic remedy. In the 6th century Alexander of Tralles used colchicum for gout, iron for anaemia, and rhubarb in liver weakness and dysentery. The practice of pharmacy was extended by the Arabian physicians, and the separation of it from medicine was recognized in the 8th, and legalized in the nth century. The practice of “polypharmacy,” ortheuseof a large number of ingredients in prescriptions, which was common in the middle ages, was greatly due to the view enunciated by Alkekendo, and held by one of the Arabian schools of medicine: that the activity of medicine increases in a duplicate ratio when compounded with others; and it was only in the first half of the 18th century that the practice was altogether discontinued in the pharmacopoeias, although the theory was shown to be incorrect by Averroes in the 12th century.

The establishments for dispensing medicines at Cordova, Toledo and other large towns under Arab rule, were placed under severe legal restrictions. Frederick II. in a.d, 1233 passed a law, which remained in force for a long time in the two Sicilies, by which every medical man was required to give information against any pharmacist who should sell bad medicine. The pharmacists were divided into two classes, the stationarii, who sold simple drugs and non-magisterial preparations at a tariff determined by competent authorities, and the confectionarii, whose business it was to dispense scrupulously the prescrip- tions of medical men; all pharmaceutical establishments were placed under the surveillance of the college of medicine. In the monastic period pharmacy was to a great extent under the control of the religious orders, particularly the Benedictines, who, from coming into contact

with the Arabian physicians, devoted themselves to pharmacy, pharmacology and therapeutics; but, as monks were forbidden to shed blood, surgery fell largely into the hands of barbers, so that the class of barber-surgeons came into existence, and the sign of their skill in blood-letting still appears in provincial districts in England in the form of the barber's pole, representing the application of bandages.

In England the separation between medicine and pharmacy was somewhat later than on the continent of Europe. The earliest record of an apothecary's shop in London was in 1345. The status of the apothecary, as subordinate to the physician in the time of Henry VIII., is evident from the following, out of 21 rules laid down by a prominent apothecary, who was a cousin of Anne Boleyn: " His garden must be at hand, with plenty of herbs and seeds and roots. He must read Dioscorides. He must have mortars, pots, filters, glasses and boxes clean and sweet. He must have two places in the shop, one most clean for physic, and the base place for chirurgic stuff. He is neither to increase nor to diminish the physician's prescription; he is neither to buy nor to sell rotten drugs. He is only to meddle in his own vocation; and to remember that his office is only to be the physician's cook."

The drugs used by the physicians and apothecaries were purchased from the grossarii or sellers in gross, who were sub- sequently called grocers, some of whom specialized as druggists and others as chymists or chemists. The apothecaries, who were the pharmacists of those days, were not represented by any corporate body, but in the reign of King James I., in 1606, were incorporated with the Company of Grocers. This arrange- ment was not, however, approved of by the physicians, who obtained in 161 7 a separate charter for the apothecaries, to the number of 114, which was the number of physicians then

practising in London. At the same time it was enacted that no grocer should keep an apothecary's shop, and that no surgeon should sell medicines, and that the physicians should have the power to search the shops of the apothecaries within 7 m. of London under a penalty of £100 in case of a refusal to permit it. Soon after the apothecaries were formed into a separate company they took into consideration means to prevent the frauds and adulterations practised by the grocers and druggists, and, to remedy the evil, established a manufactory of their own in 1626 so that they might make preparations for their own

members. The frauds and adulterations were probably due in part to the apothecaries, for Dr Merrit, a collegiate physician of London, stated that " such chymists which sell preparations honestly made complain that few apothecaries will go to the price of them." The medicinal preparations which required the aid of a furnace, such as mineral earths, were undertaken by the chymists, who probably derived their name from the Alchymists, who flourished from the 14th to the 16th centuries. When the word was discovered to be derived from an Arabic prefix and a Greek word the prefix was dropped. In the 19th century the word chymist became altered to chemist, although the original spelling is still continued to a small extent. The curious signs on the coloured carboys in chemists' windows, which were commonly to be seen until the middle of the 19th century, were signs used by the alchemists to indicate various chemical substances. In 1694 the apothecaries had increased from 114 to nearly 1000, and many of them, having acquired a knowledge of the uses of medicine, began to prescribe medicines for their customers and to assume the functions of the physician, who retorted in 1697 by establishing dispensaries, where medicines could be procured at their intrinsic value, or at cost price. The assistants employed at these dispensaries after a time appear to have gone into business on their own account, and in this way the dispensing chemists, as a class, appear to have originated.

In 1748 the Apothecaries' Corporation obtained a charter empowering them to license apothecaries to sell medicines in London, or within 7 m., and intended to use it to restrain chemists and druggists from practising pharmacy, and to prohibit physicians and surgeons from selling the medicines they prescribed; but the apothecaries, by paying increased attention to medical and surgical practice, had not only alien- ated the physicians and surgeons, but materially strengthened the position of chemists and druggists as dispensers of pre- scriptions. When a further attempt was made in 181 5 to bring a bill into parliament including provisions for prohibiting the practice of pharmacy by uneducated persons, and giving power to examine dispensing chemists, the latter became alarmed, and, finding that the provisions of the bill were entirely in the interests of the apothecaries, and directed against chemists and druggists, the latter took measures to oppose it in parliament, which were so far successful as to prevent apothecaries from interfering in any way with, or obtaining any control over, chemists and druggists. In 1841 another attempt was made by the apothecaries to control the trade of chemists and druggists on the ground that no adequate examination or education in pharmacy existed, and that such should be instituted, and be

controlled by the apothecaries and physicians, but the latter disclaimed any desire to take an active part in the matter. The chemists and druggists, recognizing that no institution for the systematic education and examination of chemists and druggists existed in England, and that no proof could be given that each individual possessed the necessary qualifications, decided that this objection must be met, and that pharmacy must be placed upon a more scientific footing. They therefore resolved upon the foundation of a voluntary society, under the title of the Pharma- ceutical Society of Great Britain, " for advancing the know- ledge of chemistry and pharmacy, and promoting a uniform system of education for those who should practise the same, also for protecting the collective and individual interests and privi- leges of all its members, in the event of any hostile attack in parliament or elsewhere." This society was instituted in 1841, t'.ie original founders being chemists and druggists in the

metropolis and provincial towns. On the 18th of February 1843 a royal charter of incorporation was granted to the society, and a permanent status was thus acquired. Chemists in business before the granting of the charter were entitled to join the society as members, but those who wished to join it subsequently could do so only on condition of passing an examination for the purpose of testing their knowledge of pharmacy. A school of pharmacy was instituted, and a museum and library were started. The chemical laboratory in connexion with the school was, when first instituted, the only one in England for teaching purposes, and the museum is now reputed to be the best pharmaceutical one in the world, the library now containing about 13,000 volumes.

The examinations are three in number. The first is of a pre- liminary character, qualifying for registration as a student or apprentice; in lieu of this examination, certificates of matriculation at a university, and those of certain other educational bodies, are accepted. The second examination qualifies for registration as a chemist and druggist. This is known as the minor examination, and must be passed before anyone can legally dispense, compound and sell scheduled poisons. The subjects included are systematic botany, vegetable morphology and physiology, chemistry, physics, materia medica, pharmacy, dispensing, posology, the reading of prescriptions, and a knowledge of poisons and their antidotes. The Poisons and Pharmacy Act of 1908 (section 4) has given the society power to regulate the preliminary training, arrange a curriculum, and divide the qualifying examination into two parts, so that an approximation to the standard of pharmaceutical education on the Continent is likely to take place within a short

period. Degrees in science and pharmacy are granted by the universities of Manchester and Glasgow, and other universities were in 1910 considering the question of granting degrees.

The third, or major examination, which qualifies for registration as a pharmaceutical chemist, is not, like the minor, a compulsory one, but ranks as an honours examination. The education for this examination has kept pace with the rapid advances of science, all the following subjects now receiving attention: the microscopical structure of plants and drugs, so as to detect adulterations and impurities in powdered drugs; organic and quantitative analysis, including those of food and drugs, water, soils, gas and urine ; optics, so as to enable them to carry out the prescriptions of oculists; spectrum analysis; the use of the polariscope and ref ractometer ; the method of applying Rontgen rays; the preparation of glandular secretions and antitoxins; and the chemistry of remedies for the fungoid diseases and insect pests of plants.

Those who have passed this examination are competent to perform analysis of all kinds, and generally obtain the preference for various appointments, such as head dispensers in government or other large hospitals, or as analysts. The society has also established a chemical research laboratory, in which much useful work has been done in connexion with the national pharmacopoeia under the direction of the Pharmacopoeia Committee of the Medical Council.

A pharmacy act, which was passed in 1852, established a distinction between registered and examined, and unregistered and unexamined chemists and druggists, creating a register of the former under the name of pharmaceutical chemists, so that the public might discriminate between the two classes. A subsequent pharmacy act, passed in 1868, added a register of chemists and druggists, and rendered it unlawful for any unregistered person to sell or keep open shop for selling the poisons mentioned in the schedule of this act. The adminis- tration of the act was entrusted to the pharmaceutical society, and the duty of prosecuting unauthorized practitioners has been performed by the society ever since, without any pecu- niary assistance from the state, although the legal expenses involved in prosecution amount to a considerable portion of its income.

The Poisons and Pharmacy Act of 1908 extended the schedule of poisons instituted by the act of 1868, and it now includes arsenic, aconite, aconitine and their preparations; all poisonous vegetable alkaloids, and their salts and poisonous derivatives; atropine and its salts and their preparations; belladonna and all preparations or

admixtures (except belladonna plasters) con- taining O'l % or more of belladonna alkaloid; cantharides and its poisonous derivatives; any preparation or admixture of coca-leaves containing o-i % or more of coca alkaloids; corrosive sublimate; cyanide of potassium and all poisonous cyanides and their preparations; tartar emetic, nux vomica, and all

preparations or admixtures containing 0-2% or more of strychnine; opium and all preparations and admixtures contain- ing 1% or more of morphine; picro-toxine ; prussic acid and all preparations and admixtures containing o- 1 % or more of prussic acid; savin and its oil, and all preparations or admixtures containing savin or its oil. None of these may be sold to any person who is unknown to the seller, unless introduced by a person known to the seller, and not until after an entry is made in a book kept for the purpose, stating, in the prescribed form, the date of sale, name and address of purchaser, the name and quantity of the article sold, and the purpose for which it is stated by the purchaser to be required. The signature of the purchaser and introducer (if any) must be affixed to the entry.

The following poisons may not be sold, either retail or wholesale, unless distinctly labelled with the name of the article, and the word poison, with the name and address of the seller: — Almonds, essential oil of (unless deprived of prussic acid). Anti- monial wine. Cantharides, tincture and all vesicating liquids, preparations or admixtures of. Carbolic acid, and liquid pre- parations of carbolic acid and its homologues containing more than 3 % of those substances, except preparations for use as sheep-wash or for any other purpose in connexion with agriculture or horti- culture, contained in a closed vessel distinctly labelled with the word " poisonous," the name and address of the seller, and a notice of the special purposes for which the preparations are intended. Chloral hydrate. Chloroform, and all preparations or admixtures containing more than 20 % of chloroform. Coca, any preparation or admixture of, containing more than o > i% but less than 1% of coca alkaloids. Digitalis. Mercuric iodide. Mercuric sulpho- cyanide. Oxalic acid. Poppies, all preparations of, excepting red poppy petals and syrup of red poppies (Papaver Rhoeas). Precipi- tate, red, and all oxides of mercury. Precipitate, white. Stro- phanthus. Sulphonal. All preparations or admixtures which are not included in part I of the schedule, and contain a poison within the meaning of the pharmacy acts, except preparations or admix- tures, the exclusion of

which from this schedule is indicated by the words therein relating to carbolic acid, chloroform and coca, and except such substances as come within the provisions of section 5 of the act.

It has been erroneously represented by interested persons that the Pharmaceutical Society desires a monopoly of the sale of poisons. This is not the case. Any poisonous substance that is not included in the schedules can be sold by anyone, as, for instance, red lead, sulphate of copper, &c. The duty of the Pharmaceutical Society is a purely legal one, and relates only to the schedules of poisons framed by the government to protect the public by rendering it a difficult matter to obtain the poisons most frequently used for criminal purposes. In continental countries the laws are even more stringent.

In response to an agitation originated by certain manufacturers (one of whom was a member of parliament), who were prosecuted for omitting to label arsenical and nicotine preparations as poisons, as required by the Pharmacy Act of 1868, a new act was passed in 1908, by which persons, without any training in toxicology, and being neither pharmaceutical chemists, nor chemists and druggists, may be granted licences by local authorities to sell poisonous substances used exclusively in agriculture or horticulture, for the destruction of insects, fungi or bacteria, or as sheep dips or weed- killers, but: which are poisonous by reason of containing the scheduled poisons, arsenic or nicotine, &c. One condition concerning the granting of such licences has been, it is said, deliberately ignored in many towns, viz. that the local authority, before granting a licence, ” shall take into consideration whether, in the neighbour- hood, the reasonable requirements of the public are satisfied with regard to the purchase of poisonous substances, and. also any objections they may receive from the chief officer of police, or from any existing vendors of the substances to which the application relates.” It is left to the Pharmaceutical Society to take legal action against any infringement of the law, although it is obvious that this should be carried out at the government expense, since it is for the benefit of a section of the public, and obviously to the loss of the members of the Pharmaceutical Society. Moreover, the present act nullifies the object of the previous act of 1868, which was to reduce the facilities for obtaining poisons. The fact that a voluntary society with limited funds must contest the illegal decisions of local councils, without government support, seems likely to render this portion of the act of 1908 a dead letter.

At the time of the passing of the Pharmacy Act of 1852 co-operative associations did not come under consideration, and no provision was

made concerning them as regards the title of chemist, or as to any action such associations might take to evade the law. It has been decided in the law courts that a limited liability company

is not a person in the eye of the law, and therefore does not come under the operation of the act of 1868. The result of this decision was that any chemist who failed to pass the qualifying examination could constitute himself with a few others, even if ignorant of pharmacy, into a limited liability company, which would then have been outside the powers of the act, and not subject to its provisions. This false position was remedied by the act of 1908, which brings companies into line with individuals.

On the continent of Europe the dispensing of prescriptions is confined to pharmacists (pharmaciens and apothc- kers). They are not allowed to prescribe nor the „ re/ f n „,

,. , ,. , . , ,. Regulations.

medical men to dispense, except under special licence, and then only in small villages, where the pharmacist could not make a living. The principle of ” one man one shop ” is general; a pharmacist may not own more than one shop in the same town. In Holland he may not enter into any agreement, direct or indirect, with a medical man with regard to the supply of medi- cines. In Austria, Germany, Italy, Rumania and Russia the number of pharmacies is limited according to the population. In France, Switzerland, Belgium and Holland the number is not limited, and every qualified pharmacist has the right to open a shop or buy a pharmacy. Where the number of pharmacies is limited by law prescriptions may only be dispensed at these establishments. The original prescription is kept by the pharmacist for either three or ten years, according to the country, and a certified copy given to the patient, written on white paper if for internal use, or on coloured paper (usually orange yellow) if for external use. The price of the drugs and the tariff for dispensing prescriptions is fixed by govern- ment authority. In Russia a prescription containing any of the poisons indicated in the schedules A and B in the Russian pharmacopoeia may not be repeated, except by order of the doctor. The use of pharmacopoeia preparations made by manufacturers is allowed, but the seller is held responsible for their purity and strength. The prices charged for dispensing are lower in countries where the number of pharmacies is limited by law, the larger returns enabling the profit to be lessened.

The educational course adopted in different countries varies as to the

details of the subjects taught. The preliminary, or classical examination, is usually that of university matriculation, or its equivalent. The period of study is eighteen months in Denmark or Norway, and two in Austria, Finland, Germany, Portugal, Russia, Sweden and Switzerland, three in Belgium, France, Greece and Italy, four to six in Holland, and five in Spain. In Great Britain the period of study is voluntary, and usually occupies only one year. Two or three years of appren- ticeship is required in most countries, including Great Britain, but none in Belgium, Greece, Italy or Spain.

The subject of patent medicines is but little understood by the general public. Any medicine, the composition of which is kept secret, but which is advertised on the label for the cure of diseases, must in Great Britain bear a patent Medicines medicine stamp equal to about one-ninth of its face value. The British Medical Association published in 1907 a work on Secret Remedies; what they cost and what they contain. The analyses published in this work show that nearly all the widely advertised secret remedies contain only well-known and inexpen- sive drugs. The Pharmaceutical Society on the other hand has also published a Pharmaceutical Journal Formulary, including several hundred formulae of proprietary medicines sold by pharmacists, so that it is now possible for any medical man to ascertain what they contain. The government accepts all the therein published formulae as ” known, admitted and approved ” remedies, and therefore not requiring a patent medicine stamp. In this way widely advertised secret remedies can be replaced by medicines of known composition and accepted value in any part of the world. Most, continental countries have issued stringent laws against the sale of secret remedies, and these have been lately strengthened in Germany, France and Italy. In Switzerland secret remedies cannot be advertised without submitting the formula and a sample of the remedy to the board of health. (E. M. H.)

PHARNABAZUS, Persian soldier and statesman, the son of Pharnaces, belonged to a family which from 478 governed the satrapy of Phrygia on the Hellespont, from its headquarters at Dascylium, and, according to a discovery by Th. Noldeke, was descended from Otanes, one of the associates of Darius in the murder of Smerdis. Pharnabazus first appears as satrap of this province in 413, when, having received orders from Darius II. to send in the outstanding tribute of the Greek cities on the coast, he, like Tissaphernes of Caria, entered into

negotiations with Sparta and began war with Athens. The conduct of the war was much hindered by the rivalry between the two satraps, of whom Pharnabazus was by far the more energetic and up- right. After the war he came into conflict with Lysander (q.v.: see also Peloponnesian War), who tried to keep the Greek cities under his own dominion, and became one of the causes of his overthrow, by a letter which he sent to the ephors at Sparta (Plut. Lys. 19; Ncpos, Lys. 4; Polyaen. vii. 19). He received Alcibiades at his court and promised him means to go up to the king to reveal the intrigues of Cyrus, but when the Spartans insisted on his death he yielded to their demand for his assassi- nation (Plut. Alcib. 37 sqq.; Diod. xiv. n). When in 399 the war with Sparta broke out he again tried to conduct it strenu- ously. With the help of Conon and Evagoras of Salamis he organized the Persian fleet, and while he was hard pressed on land by Agesilaus he prepared the decisive sea-battle, which was fcught in August 394 at Cnidus under his and Conon's command, and completely destroyed the Spartan fleet. He sent support to the allies in Greece, by which the walls of the Peiraeus were rebuilt . But in the war on land he struggled in vain against the lethargy and disorganization of the Persian Empire; and when at last, in 387, in consequence of the embassy of Antalcidas to Susa, the king decided to conclude peace with Sparta and to enter again into close alliance with her, Pharnabazus, the principal opponent of Sparta, was recalled from his command in high honours, to marry Apame, a daughter of the king (Plut. Arlax. 27). In 385 he was one of the generals sent against Egypt, and in 377 he was ordered to prepare a new expedition against the valley of the Nile. The gathering of the army took years, and when in 373 all was ready, his attempt to force the passage of the Nile failed. A conflict with Iphicrates, the leader of the Greek mercenaries, increased the difficulties; at last Pharna- bazus led the army back to Asia. From these campaigns date the silver coins with the name of Pharnabazus in Aramaic writing. When he died is not known.

In the time of Alexander we meet with a Persian general Pharna- bazus, son of Artabazus (Arrian ii. 1 seq.), who probably was the grandson of the older Pharnabazus.

The name Pharnabazus is also borne by a king of Iberia (Georgia) on the Caucasus, where the dynasty seems to have been of Persian origin, defeated by a general of Marcus Antonius (Mark Antony) in 36 B.C. (Dio Cass. xlix. 24). In the Georgian dynasty the name occurs as late as the 19th century. (Ed. M.)

PHARYNGITIS. The pharynx, or upper portion of the gullet (seen to a large extent on looking at the back of the mouth) is frequently the seat

of a chronic inflammatory condition, usually associated with derangements of the digestive organs, or with syphilis or gout; sometimes it is due to much speaking or to excessive tobacco-smoking — especially of cigarettes. On in- spection, the inflamed mucous membrane is seen unduly red and glazed, and dotted over with enlarged follicles. The con- dition produces considerable irritation and ” dryness,” with cough and discomfort, which may eventually become chronic. Treatment consists in removing all sources of irritation, in rectifying gastric disturbance, and in the application of the electric cautery, of astringent lotions or of mild causlic solutions. The pain may be relieved by spraying with certain anodyne solutions. In the case of adenoid growths (see Adenoids) there is often an associated granular appearance of the pharynx, due to enlargement of the minute glands of the mucous membrane. The inflamed pharynx of the orator (” clergyman’s sore-throat “) may be put right by lessons in elocution or by complete rest for a time. The gouty throat may call for a change of diet, or for a stay at one of the watering-places where early rising, moderate

food, regular exercise and the drinking of laxative waters join in restoring health. (E. O.*)

PHARYNX (Gr. apvyˆ, throat), in anatomy, the cavity into which both the nose and mouth lead, which is prolonged into the oesophagus or gullet below, and from which the larynx or air tube comes off below and in front; it therefore serves as a passage both for food and air. It may be likened to an empty sack turned upside down and narrowing toward its mouth. The back and sides of the sack are formed by the three constrictor muscles of the pharynx, each of which overlaps the outer surface of the one above it, and these are lined internally by thick mucous membrane. The upturned bottom of the sack is attached firmly to the base of the skull and the internal ptery- goid plates, so that this part cannot collapse, but below the anterior and posterior walls are in contact, and a transverse section of the pharynx is a mere slit.

From the front wall, on a level with the floor of the nose and roo* of the mouth, a slanting shelf of muscular and glandular tissue covered with mucous membrane, projects downward and backward into the cavity, and divides it into an upper part or naso-pharynx and a lower or oral pharynx (see fig.). This shelf is the soft palate, and from the middle of its free border hangs a worm-like projection, of variable length but averaging about half an inch, the uvula. The whole of the front wall of the naso-pharynx is wanting, and here the cavity opens into the nose through the posterior nasal apertures (see Olfactory

System). On each side of the naso- pharynx, and therefore above the soft palate, is the large triangular opening of the Eustachian tube through which air passes to the tympanum (see Ear). Behind this opening, and reaching up to the roof of the naso-pharynx, is a mass of lymphoid tissue, most marked in children, known as the pharyngeal tonsil. This tissue, when it hypertrophies, causes the disease known as ” adenoids.”

From the mid-line of the roof of the pharynx a small pouch, the bursa pharyngea, best seen in childhood, projects upward, while on each side, above and behind the opening of the Eustachian tube, is a depression known as the lateral recess of the pharynx. The oral pharynx communicates with the naso-pharynx by the pharyngeal isthmus behind the free edge of the soft palate. Above and in front it is continuous with the cavity of the mouth, and the demarcation between the two is a ridge of mucous membrane on each side running from the soft palate to the side of the tongue, and caused by the projection of the palato-glossus muscle. This is known as the anterior pillar of the fauces or anterior palatine arch. About half an inch behind this ridge is another, made by the palato-pharyngeus muscle, which gradually fades away in the side of the pharynx below. This is the posterior pillar of the fauces or posterior palatine arch, and between it and the anterior is the fossa (tonsilar sinus) in which the tonsil lies.

The Tonsil is an oval mass of lymphoid tissue covered by mucous membrane which dips in to form mucous crypts; externally its position nearly corresponds to that of the angle of the jaw. It is very vascular, deriving its blood from five neighbouring arteries. Below the level of the tonsil the anterior wall of the pharynx is formed by the posterior or pharyngeal surface of the tongue {q.v.), while below that is the epiglottis and upper opening of the larynx which is bounded laterally by the aryteno-epiglottic folds (see Respiratory System). On the lateral side of each of these folds is a pear-shaped fossa known as the sinus pyriformis. Below this the pharynx narrows rapidly until the level of the lower border of the cricoid cartilage in front and of the sixth cervical vertebra behind is reached ; here it passes into the oesophagus, having reached a total length of about five inches.

The mucous membrane of the naso-pharynx, like that of the rest of the respiratory tract, is lined by ciliated columnar epithelium, but in the oral pharynx the epithelium is of the stratified squamous variety. Numerous racemose glands are present (see Epithelial Tissues), as well as patches of lymphoid tissue especially in child- hood. Outside the mucous membrane and separating it from the constrictor muscles is

the pharyngeal aponeurosis, which blends above with the periosteum of the base of the skull.

Embryology. — The pharynx is partly formed from the ecto- dermal stomatodaeal invagination (see Embryology and Mouth) and partly from the fore gut, which is the cephalic part of the entodermal mesodaeum. Up to the fifteenth day (see Mouth), the bucco-pharyngeal membrane separates these structures, and, though no vestiges of it remain, it is clear that the upper and front part of the naso-pharynx is stomatodaeal while the rest is mesodaeal. The five visceral arches with their intervening clefts or pouches surround the pharynx, and the Eustachian tube is a remnant of the first of these. The second pouch is represented in the adult by the tonsilar sinus, and until lately the lateral recess of the pharynx was looked upon as part of the same, but it has now been shown to be an independent diverticulum. The sinus pyriformis proba.bly represents that part of the fourth groove from which the lateral lobes of the thyroid body are derived.

The Bursa pharyngea was at one time looked upon as the place whence the pituitary body had been derived from the roof of the pharynx, but this is now disproved and its meaning is unknown The tonsil is formed in the second branchial cleft or rather pouch, for the clefts are largely incomplete in man, about the fourth month; its lymphoid tissue, as well as that elsewhere in the pharynx, is formed from lymphocytes in the subjacent mesenchyme (see Em- bryology), though whether these wander in from the blood or are derived from original mesenchyme cells is still doubtful. The

Middle turbinated

Middle meatus of nose

Inferior meatus of nose

Superior meatus of nose

Sphenoidal sinus

Inferior turbinated bone

Geniohyoid

Lymphoid follicle

Hyoid bone

(From Ambrose Birmingham, Cunningham's Text Book of Anatomy.)

Sagittal Section through Mouth, Tongue, Larynx, Pharynx and Nasal Cavity. The section is slightly oblique, and the posterior edge of the nasal septum has been pre- served. The specimen is viewed slightly from below, hence in part the low position of the inferior turbinated bone.

development of the ventral part of the pharynx is dealt with in the articles Tongue and Respiratory System.

For literature see Quain's Elements of Anatomy, vol. i. (London, 1908), and J. P. McMurrich, Development of the Human Body (London, 1906).

Comparative Anatomy. — In the lower, water-breathing, verte- brates the pharynx is the part in which respiration occurs. The water passes in through the mouth and out through the gill slits where it comes in contact with the gills or branchiae.

The lowest subphylum of the phylum Chordata, to which the term Adelochorda is sometimes applied, contains a worm-like creature Balanoglossus, in which numerous rows of gill slits open from the pharynx, though Cephalodiscus, another member of the same subphylum, has only one pair of these.

In the subphylum Urochorda, to which the Ascidians or sea- squirts belong, there are many rows of gill slits, as there are also in the Acrania, of which Amphioxus, the lancelet, is the type. In all these lower forms there are no true gills, as the blood-vessels lining the large number of slits provide a sufficient area for the exchange of gases.

Iii the Cyclostomata a reduction of the number of gill slits takes place, and an increased area for respiration is provided by the gill pouches lined by pleated folds of entodermal mucous membrane;

these form the simplest type of true internal gills. In the larval lamprey (Ammocoetes) there are eight gill slits opening from the pharynx, but in the adult (Petromyzon) they are reduced to seven, and a septum grows forward separating the ventral or branchial part of the pharynx from the dorsal or digestive part. Both these tubes, however,

communicate near the mouth.

In fishes there are usually five pairs of gill slits, though a rudimentary one in front of these is often present and is called the spiracle. Occasionally, as in Hexanchus and Heptanchus, there may be six or seven slits, and the evidence of comparative anatomy is that fishes formerly had a larger number of gill slits than at present.

In the Teleostomi, which include the bony fishes, there is an external gill cover or operculum.

In the Dipnoi or mud fish the work of the gills is shared by that of the lungs, and in the African form, Protopterus, external gills, developed from the ectodermal parts of the gill slits, first appear. In the tailed Am- phibians (Urodela) the first and fifth gill clefts are never perforated and are therefore in the same condition as all the gill clefts of the human embryo, while in the gilled salamanders (Necturus and Proteus) only two gill clefts remain patent. The gills in all the Amphibia are external and of ecto- dermal origin, but in the Anura (frogs and toads) these are succeeded before the meta- morphosis from the tadpole stage by internal gills, which, unlike those of fish, are said to be derived from the ectoderm.

In the embryos of the Sauropsida (reptiles and birds) five gill clefts are evident, though the posterior two are seldom at any time perforated, while in the Mammalia the rudi- ments of the fifth cleft are no longer found in the embryo, and in man, at all events, none of them are normally perforated except that part of the first which forms the Eustachian tube. It will thus be seen that in the process of phylogeny there is a gradual suppression of the gill clefts beginning at the more posterior ones.

The soft palate is first found in crocodiles as a membranous structure, and it becomes muscular in mammals. The bursa pharyngea and pharyngeal tonsil are found in several of the lower mammals. In the sheep the latter is particularly large.

For literature and further details, see R. Wiedersheim's Comparative Anatomy of Vertebrates, translated by W. N. Parker (London, 1907) ; also Parker and Haswell's Zoology (London, 1897). (F. G. P.)

PHEASANT (Mid. Eng. fesattnt and

fesaun; Ger. fasan and anciently fasant;

Fr. faisan — all from the Lat. phasianus

or phasiana, sc. avis), the bird brought from

the banks of the river Phasis, now the Rioni,

in Colchis, where it is still abundant, and

introduced, according to legend, by the

Argonauts into Europe. Judging from the

recognition of the remains of several species referred to the genus

Phasianus both in Greece and in France, 1 it seems not impossible

that the ordinary pheasant, the P. colchicus of ornithclogists,

may have been indigenous to this quarter of the globe. If it was

introduced into England, it must almost certainly have been

brought by the Romans; 2 for, setting aside several earlier records

of doubtful authority, 3 Stubbs has shown that by the regulations

of King Harold in 1059 unus phasianus is prescribed as the

1 These are P. archiaci from Pikermi, P. altus and P. medius from the lacustrine beds of Sansan, and P. desnoyersi from Touraine, see A. Milne Edwards, Ois.foss. de la France (ii. 229, 239-243).

2 Undoubted remains have been found in excavations at Silchester.

3 Among these perhaps that worthy of most attention is in Probert's translation of The Ancient Laws of Cambria (ed. 1823, pp. 367, 368), wherein extracts are given from Welsh triads, pre- sumably of the age of Howel the Good, who died in 948. One of them is, " There are three barking hunts: a bear, a squirrel and a pheasant." The explanation is, " A pheasant is called a barking hunt, because when the pointers come upon it and chase it, it takes to a tree, where it is hunted by baiting." The present writer has not been able to trace the manuscript containing these remarkable

Posterior edge of nasal septum

Orifice of Eustachian tube

,'ii \Bursa pharyngea

Part of the pharyngea! tonsil

Lateral recess of pharynx

Levator cushion

Salpingo- pharyngeal fold Glands in soft palate

Anterior palatine arch Supra tonsillar

Plica triangularis Tonsil

Posterior palatine arch

Epiglottis

Aryteno- epiglottic fold

Cricoid cartilage

alternative of two partridges or other birds among the ” pitantiae” (rations or commons, as we might now say) of the canons of Waltham Abbey, and, as W. B. Dawkins has remarked (Ibis, 1869, p. 358), neither Anglo-Saxons nor Danes were likely to have intro- duced it into England. It seems to have been early under legal protection, for, according to Dugdale, a licence was granted in the reign of Henry I. to the abbot of Amesbury to kill hares and pheasants, and from the price at which the latter are reckoned in various documents, we may conclude that they were not very abundant for some centuries, and also that they were occasion- ally artificially reared and fattened, as appears from Upton, 1 who wrote about the middle of the 1 5th century, while Henry VIII. seems from his privy purse expenses to have had in his household in 1532 a French priest as a regular ” fesaunt breder,” and in the accounts of the Kytsons of Hengrave in Suffolk for 1607 mention is made of wheat to feed pheasants, partridges and quails.

The practice of bringing up pheasants by hand is now ex- tensively followed, and the numbers so reared vastly exceed those that are bred at large. The eggs are collected from birds that are either running wild or kept in pens, and are placed under domestic hens; but, though these prove most attentive foster- mothers, much additional care on

the part of their keepers is needed to ensure the arrival at maturity of the poults; for, being necessarily crowded in a comparatively small space, they are subject to several diseases which often carry off a large proportion, to say nothing of the risk they run by not being provided with proper food, or by meeting an early death from various predatory animals attracted by the assemblage of so many helpless victims. As they advance in age the young pheasants readily take to a wild life, and indeed can only be kept from wandering in every direction by being plentifully supplied with food, which has to be scattered for them in the coverts in which it is desired that they should stay. The pro- portion of pheasants artificially bred that ” come to the gun ” would seem to vary enormously, not only irregularly according to the weather, but regularly according to the district. ‘ In the eastern counties of England, and some other favourable localities, perhaps three-fourths of those that are hatched may be satis- factorily accounted for; but in many of the western counties, though they are the objects of equal or even greater care, it would seem that more than half of the number that live to grow their feathers disappear inexplicably before the coverts are beaten. For the sport of pheasant-shooting see Shooting.

Formerly pheasants were taken in snares or nets, and by hawking; but the crossbow was also used, and the better to obtain a ” sitting shot,” — for with that weapon men had not learnt to ” shoot flying ” — dogs appear to have been employed in the way indicated by the lines under an engraving by Hollar, who died in 1677: —

” The Feasant Cocke the woods doth most frequent, Where Spaniells spring and pearche him by the sent.” 2

Of the many other species of the genus Phasianus, two only can be dwelt upon here. These are the ring-necked pheasant of China, P. torqualus, easily known by the broad white collar, whence it has its name, as well as by the pale greyish-blue of its upper wing-coverts and rump and the light buff of its flanks, and the P. versicolor of Japan, often called the green pheasant

statements so as to find out the original word rendered ” pheasant ” by the translator; but a reference to what is probably the same passage with the same meaning is given by Ray (Synops. meth. animalium, pp. 213, 214) on the authority of Llwyd or Lloyd, though there is no mention of it in Wotton and Clarke’s Leges Wallicae (1730). A charter (Kemble, Cod. diplom. iv. 236), pro- fessedly of Edward the Confessor, granting the wardenship of certain forests in Essex to Ralph Peperking, speaks of ” fesant hen ” and ” fesant cocke,” but is now

known to be spurious.

1 In his De studio militari (not printed till 1654) he states (p. 195) that the pheasant was brought from the East by ” Palladius ancorista.”

2 Quoted by the writer (Broderip ?) of the article “Spaniel” in the Penny Cyclopaedia. The lines throw light on the asserted Welsh practice mentioned in a former note.

from the beautiful tinge of that colour that in certain lights pervades almost the whole of its plumage, and, deepening into dark emerald, occupies all the breast and lower surface that in the common and Chinese birds is bay barred with glossy black scallops. Both of these species have been introduced into England, and cross freely with P. colchicus, while the hybrids of each with the older inhabitants of the woods are not only perfectly fertile inter se, but cross as freely with the other hybrids, so that birds are frequently found in which the blood of the three species is mingled. The hybrids of the first cross are generally larger than either of their parents, but the superi- ority of size does not seem to be maintained by their descendants. White and pied varieties of the common pheasant, as of most birds, often occur, and with a little care a race or breed of each can be perpetuated. A much rarer variety is sometimes seen; this is known as the Bohemian pheasant, not that there is the least reason to suppose it has any right to such an epithet, for it appears, as it were, accidentally among a stock of the pure P. colchicus, and offers an example analogous to that of the Japan peafowl (see Peacock), being, like that breed, capable of perpetuation by selection. Two other species of pheasant have been introduced to the coverts of England — P. reevesi from China, remarkable for its very long tail, white with black bars, and the copper pheasant, P. soemmerringi, from Japan. The well-known gold and silver pheasants, P. pictus and P. nycthe- merus, each the type of a distinct section or subgenus, are both from China and have long been introduced into Europe, but are only fitted for the aviary. To the former is allied the still more beautiful P. amherstiae, and to the latter about a dozen more species, most of them known to Indian sportsmen by the general name of ” kaleege.” The comparatively plain pucras pheasants, Pucrasia, the magnificent monauls, Lophophorus, and the fine snow-pheasants, Crossoptilum — of each of which genera there are several species, may also be mentioned.

All the species known at the time are beautifully figured from drawings by J. Wolf in D. G. Elliot’s Monograph of the Phasianidae (2 vols., fol., 1870-1872) — the last term being used in a somewhat

general sense. With a more precise scope W. B. Tegetmeier's Pheasants: their Natural History and Practical Management (4th ed., 1904) is to be commended as a very useful work. (A. N.)

PHEIDIAS, son of Charmides, universally regarded as the greatest of Greek sculptors, was born at Athens about 500 B.C. We have varying accounts of his training. Hegias of Athens, Ageladas of Argos, and the Thasian painter Polygnotus, have all been regarded as his teachers. In favour of Ageladas it may' be said that the influence of the many Dorian schools is certainly to be traced in some of his work. Of his life we know little apart from his works. Of his death we have two discrepant accounts. According to Plutarch he was made an object of attack by the political enemies of Pericles, and died in prison at Athens. According to Philochorus, as quoted by a scholiast on Aristophanes, he fled to Elis, where he made the great statue of Zeus for the Eleans, and was afterwards put to death by them. For several reasons the first of these tales is preferable.

Plutarch gives in his life of Pericles a charming account of the vast artistic activity which went on at Athens while that statesman was in power. He used for the decoration of his own city the money furnished by the Athenian allies for defence against Persia: it is very fortunate that after the time of Xerxes Persia made no deliberate attempt against Greece. " In all these works," says Plutarch, " Pheidias was the adviser and overseer of Pericles." Pheidias introduced his own portrait and that of Pericles on the shield of his Parthenos statue. And it was through Pheidias that the political enemies of Pericles struck at him. It thus abundantly appears that Pheidias was closely connected with Pericles, and a ruling spirit in the Athenian art of the period. But it is not easy to go beyond this general assertion into details.

It is important to observe that in resting the fame of Pheidias upon the sculptures of the Parthenon we proceed with little evi- dence. No ancient writer ascribes them to him, and he seldom, if ever, executed works in marble. What he was celebrated

for in antiquity was his statues in bronze or gold and ivory. If Plutarch tells us that he superintended the great works of Pericles on the Acropolis, this phrase is very vague. On the other hand, inscriptions prove that the marble blocks intended for the pedimental statues of the Parthenon were not brought to Athens until 434 B.C., which was

probably after the death of Pheidias. And there is a marked contrast in style between these statues and the certain works of Pheidias. It is therefore probable that most if not all of the sculptural decoration of the Parthenon was the work of pupils of Pheidias, such as Alcamenes and Agoracritus, rather than his own.

The earliest of the great works of Pheidias were dedications in memory of Marathon, from the spoils of the victory. At Delphi he erected a great group in bronze including the figures of Apollo and Athena, several Attic heroes, and Miltiades the general. On the Acropolis of Athens he set up a colossal bronze image of Athena, which was visible far out at sea. At Pellene in Achaea, and at Plataea he made two other statues of Athena, also a statue of Aphrodite in ivory and gold for the people of Elis. But among the Greeks themselves the two works of Pheidias which far outshone all others, and were the basis of his fame, were the colossal figures in gold and ivory of Zeus at Olympia and of Athena Parthenos at Athens, both of which belong to about the middle of the 5th century. Of the Zeus we have unfortunately lost all trace save small copies on coins of Elis, which give us but a general notion of the pose, and the character of the head. The god was seated on a throne, every part of which was used as a ground for sculptural decoration. His body was of ivory, his robe of gold. His head was of somewhat archaic type: the Otricoli mask which used to be regarded as a copy of the head of the Olympian statue is certainly more than a century later in style. Of the Athena Parthenos two small copies in marble have been found at Athens (see Greek Art, fig. 38) which have no excellence of workmanship, but have a certain evidential value as to the treatment of their original.

It will be seen how very small is our actual knowledge of the works of Pheidias. There are many stately figures in the Roman and other museums which clearly belong to the same school as the Parthenos; but they are copies of the Roman age, and not to be trusted in point of style. A. Furtwangler proposes to find in a statue of which the head is at Bologna, and the body at Dresden, a copy of the Lemnian Athena of Pheidias; but his arguments (Masterpieces, at the beginning) are anything but conclusive. Much more satisfactory as evidence are some 5th century torsos of Athena found at Athens. The very fine torso of Athena in the ficole des Beaux Arts at Paris, which has unfortunately lost its head, may perhaps best serve to help our imagination in reconstructing a Pheidian original.

As regards the decorative sculptures of the Parthenon, which the Greeks rated far below their colossus in ivory and gold, see the article

Parthenon.

Ancient critics take a very high view of the merits of Pheidias. What they especially praise is the ethos or permanent moral level of his works as compared with those of the later ” pathetic ” school. Demetrius calls his statues sublime, and at the same time precise. That he rode on the crest of a splendid wave of art is not to be questioned: but it is to be regretted that we have no morsel of work extant for which we can definitely hold him responsible. (P. G.)

PHEIDON (8th or 7th century B.C.), king of Argos, generally, though wrongly, called ” tyrant.” According to tradition he flourished during the first half of the 8th century B.C. He was a vigorous and energetic ruler and greatly increased the power of Argos. He gradually regained sway over the various cities of the Argive confederacy, the members of which had become practically independent, and (in the words of Ephorus) ” re- united the broken fragments of the inheritance of Temenus.” His object was to secure predominance for Argos in the north of Peloponnesus. According to Plutarch, he attempted to break the power of Corinth, by requesting the Corinthians to send him 1000 of their picked youths, ostensibly to aid him in

war, his real intention being to put them to death; but the plot was revealed. Pheidon assisted the Pisatans to expel the Elean superintendents of the Olympian games and presided at the festival himself. The Eleans, however, refused to recognize the Olympiad or to include it in the register, and shortly afterwards, with the aid of the Spartans, who are said to have looked upon Pheidon as having ousted them from the headship of Greece, defeated Pheidon and were reinstated in the possession of Pisatis and their former privileges. Pheidon is said to have lost his life in a faction fight at Corinth, where the monarchy had recently been overthrown. The affair of the games has an important bearing on his date. Pausanias (vi. 22, 2) definitely states that Pheidon presided at the festival in the 8th Olympiad (i.e. in 748 B.C.), but in the list of the suitors of Agariste, daughter of Cleisthenes of Sicyon, given by Herodotus, there occurs the name of Leocedes (Lacedas), son of Pheidon of Argos. Accord- ing to this, Pheidon must have flourished during the early part of the 6th century. It has therefore been assumed that Herodotus confused two Pheidons, both kings of Argos. The suggested substitution in the text of Pausanias of the 28th for the 8th Olympiad (i.e. 668 instead of 748) would not bring it into agreement with Herodotus, for even then Pheidon’s son could not have been a suitor in 570 for the hand of Agariste. But the story of Agariste’s wooing resembles romance and has slight chronological value. On the whole, modern authorities

assign Pheidon to the first half of the 7th century. Herodotus further states that Pheidon established a system of weights and measures throughout Peloponnesus, to which Ephorus and the Parian Chronicle add that he was the first to coin silver money, and that his mint was at Aegina. But according to the better authority of Herodotus (i. 04) and Xenophanes of Colophon, the Lydians were the first coiners of money at the beginning of the 7th century, and, further, the oldest known Aeginetan coins are of later date than Pheidon. Hence, unless a later Pheidon is assumed, the statement of Ephorus must be considered unhistorical. No such difficulty occurs in regard to the weights and measures; it is generally agreed that a system was already in existence in the time of Pheidon, into which he introduced certain changes. A passage in the Aristotelian Constitution of Athens (x. 2) states that the measures used before the Solonian period of reform were called " Pheidonian."

See Herodotus vi. 127; Ephorus in Strabo viii. 358, 376; Plutarch, Amatoriae narrationes , 2; Marmor parium, ep. 30; Pollux ix. 83; Nicolaus Damascenus, frag. 41 (in C. W. Muller's Frag. hist, graecorum, iii.) ; G. Grote, History of Greece, pt. ii. ch. 4; B. V. Head, Historia Numorum (1887); F. Hultsch, Griechische und romische Metrologie (1882); G. Rawlinson's Herodotus, appendix, bk. i., note 8. On the question of Pheidon's date, see J. B. Bury, History of Greece, ii. 468 (1902) ; J. P. Mahaffy, Problems in Greek History, ch. 3 (1892); J. G. Frazer's note on Pausanias vi. 22, 2; and especi- ally G. Busolt, Griechische Geschichte (2nd ed., 1893), ch. iii. 12. C. Trieber, Pheidon von Argos (Hanover, 1880) , and J. Beloch, in Rheinisches Museum, xlv. 595 (1890), favour a later date, about

580.

PHELPS, AUSTIN (1820-1890), American Congregational minister and educationalist, was born on the 7th of January 1820 at West Brookfield, Massachusetts, son of Eliakim Phelps, 1 a clergyman, who, during the boyhood of his son was principal of a girls' school in Pittsfield, Massachusetts, and later pastor of a Presbyterian church in Geneva, New York. The son studied at Hobart College in 1833-1835, then at Amherst for a year, and in 1837 graduated at the university of Pennsylvania. He studied theology at Union Theological Seminary, at the Yale Divinity School, and at Andover, and was licensed to preach in 1840 by the Third Presbytery of Philadelphia. He was pastor of the Pine Street (Congregational) Church in Boston in 1842-1848, and in 1848-1879 was professor of sacred rhetoric and homiletics at Andover Theological Seminary, of which he was president from 1869 to 1879, when his failing health forced him to resign. He died on the 13th of

October 1890 at Bar Harbor, Maine. His Theory of Preaching (1881) and English

1 Eliakim Phelps afterwards lived in Stratford, Herkimer county, New York, where his house was ” possessed ” and was long a place of curious interest to students of ” spiritualism.”

Style in Public Discourse (1883) became standard textbooks; and personally he was a brilliant preacher. He married in 1842 Elizabeth Stuart (1815-1852), eldest daughter of Moses Stuart, then president of Andover; she was the author of the popular story Sunnyside (1851) and of other books. In 1854 he married her sister, who died only eighteen months later; and in 1858 he married Mary A. Johnson, of Boston.

With Professors E. A. Park and D. L. Furber he edited Hymns and Choirs (i860), and with Professor Park and Lowell Mason The Sabbath Hymn Book (1859). The Still Hour (1859), a summary of a series of sermons on prayer, is a devotional classic. His other works are: The New Birth (1867), portraying conversion (in some instances) as a gradual change; Sabbath Hours (1874); Studies of the Old Testament (1878) ; Men and Books (1882) ; My Portfolio (1882) ; My Study (1885) ; and My Note Book (1890).

See Austin Phelps: A Memoir (New York, 1891), by his daughter, Elizabeth Stuart Phelps- Ward.

PHELPS, EDWARD JOHN (1822-1900), American lawyer and diplomat, was born on the nth of July 1822 at Middlebury, Vermont. He graduated from Middlebury College in 1840, was a schoolmaster for a year in Virginia, and was admitted to the bar in 1843. He began practice at Middlebury, but in 1845 removed to Burlington, Vermont. From 1851 to 1853 he was second comptroller of the United States Treasury, and then practised law in New York City until 1857, when he returned to Burlington. Becoming a Democrat after the Whig party had ceased to exist, he was debarred from a political career in his own state, where his party was in the minority, but he served in the state constitutional convention in 1870, and in 1880 was the Democratic candidate for governor of his state. He was one of the founders of the American Bar Association, and was its president in 1 880-1 881. From 1881 until his death he was Kent Professor of Law in Yale University.

He was minister to Great Britain from 1885 to 1889, and in 1893 served as senior counsel for the United States before the international tribunal at Paris to adjust the Bering Sea controversy. His closing argument, requiring eleven days for its delivery, was an exhaustive review of the case. Phelps lectured on medical jurisorudence at the university of Vermont in 1881- 1883, and on constitutional law at Boston University in 1882- 1883, and delivered numerous addresses, among them that on ” The United States Supreme Court and the Sovereignty of the People ” at the contennial celebration of the Federal Judiciary in 1890 and an oration at the dedication of the Bennington Battle Monument, unveiled in 1891 at the centennial of Vermont’s admission to the Union. In politics Phelps was always Conservative, opposing the anti-slavery movement before i860, the free-silver movement in 1896, when he supported the Republican presidential ticket, and’ after 1898 becoming an ardent ” anti-expansionist.” He died at New Haven, Connecticut, on the 9th of March 1900.

See the Orations and Essays of Edward John Phelps, edited by J. G. McCullough, with a Memoir by John W. Stewart (New York, 1901) ; and ” Life and Public Services of the Hon. Edward J. Phelps,” by Matthew H. Buckham, in Proceedings of the Vermont Historical Society (Burlington, Vt., 1901).

PHELPS, SAMUEL (1804-1878), English actor and manager, was born at Devonport on the 13th of February 1804. He was early thrown upon his own resources, and worked in various newspaper offices. Shortly after his marriage in 1826 to Sarah Cooper (d. 1867), he accepted a theatrical engagement in the York circuit at eighteen shillings a week, and afterwards appeared in south of England towns in prominent tragic roles, attracting sufficient attention to be spoken of as a rival to Kean He made his first London appearance on the 28th of August 1837 as Shylock .at the Haymarket. After a short season there he was with Macready for about six years at Covent Garden, the Haymarket and Drury Lane successively. , In 1844 he became co-lessee of Sadler’s Wells Theatre with Thomas L. Greenwood and Mrs Mary Amelia Warner (1804- 1854). Greenwood supplied the business capacity, Phelps was the theatrical manager, and Mrs “Warner leading lady. In this position Phelps remained for twenty years, during which time he raised the Sadler’s Wells house to an important position,

and himself appeared in a very expensive and varied repertory. Thirty-four of Shakespeare’s plays were presented there under his direction, with great educational effect, both on public and players. In 1861 Greenwood retired from the partnership, and Phelps, unable to cope

with the business of management, retired from it in the following year. For the next fifteen years he acted under various managements, achieving considerable success in some of Halliday's dramatic versions of Scott's novels, such as The Fortunes of Nigel and Ivanhoe. His last appear- ance was in 1878 as Wolsey in Henry VIII., and he died on the 6th of November 1878. He was a sound and capable actor, rather than one of any marked genius; and, in spite of his predilection for tragedy, was most successful in such characters of comedy as called for dry humour. Perhaps Sir Pertinax Macsycophant in Charles Macklin's The Man of the World was his finest impersonation. He published an annotated edition of Shakespeare's plays (2 vols., 1852-1854).

PHELYPEAUX, a French family of Blesois. Its two principal branches were those of the siegneurs of Herbault, La Vrilliere and Saint Florentin, and of the counts of Pontchartrain and Maurepas. Raimond Phelypeaux, seigneur of Herbault and La Vrilliere (d: 1629), was treasurer of the Epargne in 1599, and became secretary of state in 1621. His son Louis succeeded him in this latter office, and died in 1681. Balthazar Phely- peaux, marquis de Chateauneuf (d. 1700), and Louis, marquis de La Vrilliere (d. 1725), respectively son and grandson of Louis, were also secretaries of state. Louis Phelypeaux (1705- 1777), count of Saint Florentin and afterwards duke of La Vrilliere (1770), succeeded his father as secretary of state; became minister of the king's household in 1749, a minister of state in 1751, and discharged the functions of minister of foreign affairs on the disgrace of Choiseul (1770). He incurred great unpopularity by his abuse of lettres de cachet, and had to resign in 1775. Raimond Balthazar Phelypeaux, seigneur du Verger, a member of the La Vrilliere branch, was sent as ambassador to Savoy in 1700, where he discovered the intrigues of the duke of Savoy, Victor Amadeus II., against France; and when war was declared he was kept a close prisoner by the duke (1703-1704). At the time of his death (1713) he was governor- general in the West Indies. The branch of Pontchartrain- Maurepas was founded by Paul Phelypeaux (1 569-1621), brother of the first-mentioned Raimond; he became secretary of state in 1610.

PHENACETIN, C 2 H 5 0-C 6 H 4 'NHCOCH 3 (para-acetamino-phenetol), a drug prepared by acetylating para-phenetidin, or by heating para-acetylaminophenol and potassium ethyl sulphate with alcoholic soda to 150 C. Para-phenetidin is prepared by treating the sodium salt of para-nitrophenol with ethyl iodide, and reducing the nitrophenetol to para-phenetidin or aminophenetol. The yield may be doubled by diazotizing para-phenetidin, coupling with phenol, ethylating and reducing:

EtO-C e H 4 -NH 2 -ˆEtO-C 6 H4-N20H-ˆEtO-C 6 H 4 -N 2 -C e H-OH-ˆ EtO-C 6 H4-N2-C 6 H 4 OEtˆ2EtO-C 6 H4-NH 2 .

It crystallizes from water in colourless plates, melting at 135 C. It is. soluble in about 70 parts of hot and in about 1400 parts of cold water.

Several compounds related to phenacetin have been intro- duced into medicine. Triphenin is propylphenetidin; lacto- phenin is lactylphenetidin; pyrantin is para-ethoxyphenyl succinimide, EtO-C 6 H 4 -N[CO'CH 2] 2 ; salophen or saliphenin is salicylphenetidin; amygdophenin is mandelylphenetidin. In addition, several other derivatives have been suggested which have a greater solubility than phenacetin, e.g. phesin, which is the sodium salt of phenacetin sulphonic acid, apolysin and citrophen (citrophenin), which are citric acid derivatives of para-phene- tidin, &c.

Phenacetin is contained in both the British and United States pharmacopoeia, in the latter under the name of acetphenetidin. The dose is 5 to 10 grs. given in cachets or in suspension. When the drug is carelessly made it may contain impurities, producing considerable irritation of the kidneys. The physiological action of phenacetin consists in a sedative action on the sensory tracts of the spinal cord, and a depressant action on the heart, where it

tends to paralyse the action of the cardiac muscle. Upon the bodily heat it exercises a marked effect, decreasing the action of the heat-producing centre as well as increasing the dissipation of heat, and thus causing a marked fall in temperature. In toxic doses the blood becomes dark and blackish from the formation of methaemoglobin, and the urine is changed in colour from the passage of altered blood. The chief therapeutic use of phenacetin is as an antineuralgic, and it is of service in migraine, rheumatism of the sub-acute type, intercostal neuralgia and locomotor ataxia.

PHENACITE, a mineral consisting of beryllium orthosilicate, Be 2 Si0 4 , occasionally used as a gem-stone. It occurs as isolated crystals, which are rhombohedral with parallel-faced hemihedrism, and are either lenticular or prismatic in habit: the lenticular habit is determined by the development of faces of several obtuse rhombohedra and the absence of prism faces (the accom- panying figure is a plan of such a crystal viewed along the triad, or principal,

axis). There is no cleavage, and the fracture is conchoidal. The hardness is high, being 75- 8; the specific gravity is 2-98. The crystals are sometimes perfectly colourless and transparent, but more often they are greyish or yellowish and only translucent; occasion- ally they are pale rose-red. In general appearance the mineral is not unlike quartz, for which indeed it had been mistaken; on this account it was named, by N. Nordenskiold in 1833, from Gr. evaˆ (a deceiver).

Phenacite has long been known from the emerald and chryso- beryl mine on the Takovaya stream, near Ekaterinburg in the Urals, where large crystals occur in mica-schist. It is also found with topaz and amazon-stone in the granite of the Ilmen mountains in the southern Urals and of the Pike's Peak region in Colorado. Large crystals of prismatic habit have more recently been found in a felspar quarry at Kragero in Norway. Framont near Schirmeck in Alsace is another well-known locality. Still larger crystals, measuring 12 in. in diameter and weighing 28 lb, have been found at Greenwood in Maine, but these are pseudomorphs of quartz after phenacite.

For gem purposes the stone is cut in the brilliant form, of which there are two fine examples, weighing 43 and 34 carats, in the British Museum. The indices of refraction (co = 1-6540, € = 1-6527) are higher than those of quartz, beryl or topaz; a faceted phenacite is consequently rather brilliant and may sometimes be mistaken for diamond. (L. J. S.)

PHENACODUS, one of the earliest and most primitive of the ungulate mammals, typifying the family Phenacodontidae and the sub-order Condylarthra. The typical Phenacodus primaevus, of the Lower or Wasatch Eocene of North America, was a relatively small ungulate, of slight build, with straight limbs each terminating in five complete toes, and walking in the digitigrade fashion of the modern tapir. The middle toe was the largest, and the weight of the body was mainly supported on this and the two adjoining digits, which appear to have been encased in hoofs, thus foreshadowing the tridactyle type common in perissodactyle and certain extinct groups of ungulates. The skull was small, with proportionately minute brain; and the arched back, strong lumbar vertebrae, long and powerful tail, and comparatively feeble fore-quarters all proclaim kinship with the primitive creodont Carnivora (see Creodonta), from which Phenacodus and its allies, and through them the more typical Ungulata, are probably derived. All the bones of the limbs are separate, and those of the carpus and tarsus do not alternate; that is to say, each one in the upper row is placed im- mediately above the corresponding one in the row below. The full series of forty-four teeth was developed; and the

upper molars were short-crowned, or brachyodont, with six low cones, two internal, two intermediate and two external, so that they were of the typical primitive bunodont structure. In habits the animal was cursorial and herbivorous, or possibly carnivorous.

In the Puerco, or Lowest Eocene of North America the place of the above species was taken by Euprotogonia puercensis, an animal only half the size of Phenacodus primaevus, with the terminal joints of the limbs intermediate between hoofs and claws, and the first and fifth toes taking their full share in the support of the weight of the body. These two genera may be regarded as forming the earliest stages in the evolution of the horse, coming below Hyracotherium (see Equidae).

As ancestors of the Artiodactyle section of the Ungulata, we may look to forms more or less closely related to the North American Lower Eocene genera Mioclaenus and Pantolestes, respectively typifying the families Mioclaenidae and Panto- lestidae. They were five-toed, bunodont Condylarthra, with a decided approximation to the perissodactyle type in the struc- ture of the feet. A third type of Condylarthra from the North American Lower Eocene is represented by the family Menisco- theriidae, including the genera Meniscotherium and Hyracops. These, it is suggested, may have been related to the ancestral Hyracoidea. Teeth and jaws probably referable to the Condyl- arthra have been obtained in European early Tertiary forma- tions. All Ungulata probably originated from Condylarthra.

See H. F. Osborn, Skeleton of Phenacodus primaevus; comparison with Euprotogonia, Bull. Amer. Mus. x. 159. (R. L.*)

PHENANTHRENE, C 14 H 10 , a hydrocarbon isomeric with anthracene, with which it occurs in the fraction of the coal tar distillate boiling between 2 7o°-4oo° C. It may be separated from the anthracene oil by repeated fractional distillation, followed by fractional crystallization from alcohol (anthracene being the less soluble), and finally purified by oxidizing any residual anthracene with potassium bichromate and sulphuric acid (R. Anschutz and G. Schultz, Ann., 1879, 196, p. 35); or the two hydrocarbons may be separated by carbon bisulphide, in which anthracene is insoluble. It is formed when the vapours of toluene, stilbene, dibenzyl, prtho-ditolyl, or coumarone and benzene are passed through a red-hot tube; by distilling morphine with zinc dust; and, with anthracene, by the action of sodium on ortho-brombenzyl bromide (C. L. Jackson and J. F. White, Amer. Chem. Jour., 1880, 2, p. 391). It crystallizes in colourless plates or needles, which melt at 99 C. Its solutions in

alcohol and ether have a faint blue fluorescence. When heated to 250° C. with red phosphorus and hydriodic acid it gives a hydride C14 H24. It is nitrated by nitric acid and sulphon- ated by sulphuric acid. With picric acid it forms a sparingly soluble picrate, which melts at 145 C. On the condition of phenanthrene in alcoholic solution see R. Behrend, Zeit. phys. Chem., 1892, 9, p. 405; 10, p. 265. Chromic acid oxidizes phenanthrene, first to phenanthreˆc-quinone, and then to diphenic acid, H0 2 C-C6H4-C 6 H4-C0 2 H.

Phenanthrene-quinone, [CelLyCOˆ, crystallizes in orange needles which melt at 198 C. It possesses the characteristic properties of a diketone, forming crystalline derivatives with sodium bisulphite and a dioxime with hydroxylamine. It is non- volatile in steam, and is odourless. Sulphurous acid reduces it to the corresponding dihydroxy compound. It combines with ortho-diamines, in the presence of acetic acid, to form phenazines.

On the constitution of phenanthrene see Chemistry : § Organic.

PHENAZINE (Azophenylene), G 2 H 8 N 2 , in organic chemistry, the parent substance of many dyestuffs, e.g. the eurhodines, toluylene red, indulines and safranines. It is a dibenzopara- diazine having the formula given below. It may be obtained by distilling barium azobenzoate (A. Claus, Ber., 1873, 6, p. 723); by passing aniline vapour over lead oxide, or by the oxidation of dihydrophenazine, which is prepared by heating pyrocatechin with orthophenylene diamine (C. Ris, Ber., 1886, 19, p. 2206). It is also formed when ortho-aminodiphenylamine is distilled over lead peroxide (O. Fischer and E. Hepp). It crystallizes in yellow needles which melt at 171° C, and are only sparingly soluble in alcohol. Sulphuric acid dissolves it, forming a deep- red solution. The more complex phenazines, such as the naphthophenazines, naphthazines and naphthotolazines, may be prepared by condensing ortho-diamines with ortho-quinones (O. Hinsberg, Ann., 1887, 237, p. 340); by the oxidation of an ortho-diamine in the presence of a-naphthol (O. Witt), and by

the decomposition of ortho-anilido-(toluidido &c.)-azo com- pounds with dilute acids. If alkyl or aryl-ortho-diamines be used azonium bases are obtained. The azines are mostly yellow in colour, distil unchanged and are stable to oxidants. They add on alkyl iodides readily, forming alkyl azonium salts.

By the entrance of amino or hydroxyl groups into the molecule dyestuffs are formed. The mono-amino derivatives or eurhodines are obtained when the arylmonamines are condensed with ortho- amino zo compounds; by condensing quinone dichlorimide or para-nitrosodimethyl aniline with monamines containing a free para position, or by oxidizing ortho-hydroxydiaminodiphenylamines (R. Nietzki, Ber., 1895, 28, p. 2976; O. Fischer, ibid., 1896, 29, p. 1874). They are yellowish-red solids, which behave as weak bases, their salts undergoing hydrolytic dissociation in aqueous solution. When heated with concentrated hydrochloric acid the amino group is replaced by the hydroxyl group and the phenolic eurhodols are produced.

The symmetrical diaminophenazine is the parent substance of the important dyestuff toluylene red or dimethyldiaminotoluphen- azine. It is obtained by the oxidation of orthophenylene diamine with ferric chloride; when a mixture of para-aminodimethylaniline and meta-toluylenediamine is oxidized in the cold, toluylene blue, an indamine, being formed as an intermediate product and passing into the red when boiled; and also by the oxidation of dimethyl- paraphenylene diamine with metatoluylene diamine. It crystal- lizes in orange-red needles and its alcoholic solution fluoresces strongly. It dyes silk and mordanted cotton a fine scarlet. It is known commercially as neutral red. For the phenazonium salts see Safranine.

Phenazone is an isomer of phenazine, to which it bears the same relation that phenanthrene bears to anthracene. It is formed by reducing diortho-dinitrodiphenyl with sodium amalgam and methyl alcohol, or by heating diphenylene-ortho-dihydrazine with hydro-chloric acid to 150 C. It crystallizes in needles which melt at 156 C. Potassium permanganate oxidizes it to pyridazine tetra- carboxylic acid.

Phenazine.

Phenazone.

PHENOLPHTHALEIN, in organic chemistry, a compound derived from phthalophenone, or diphenyl phthalide (formula I.), the anhydride of triphenyl-carbinol-ortho-carboxylic acid, which is obtained by condensing phthalyl chloride with benzene in the presence of aluminium chloride. The phthaleins are formed from this anhydride by the entrance of hydroxyl or amino groups into the two phenyl residues, and are prepared by condensing phenols with phthalic anhydride, phenol itself giving rise to phenolphthalein (formula II.) together with a small quantity of fiuorane (formula III.), whilst

resorcin under similar conditions yields fluorescein (g.v.). The phthaleins on reduction yield phthalines, which are derivatives of triphenyl- methane carboxylic acid; these reduction products are colourless and may be regarded as the leuco-compounds of the phthaleins, 1 bus phenolphthalein itself gives phenolphthaline (formula IV.). Dehydrating agents usually convert the phenolphthalines into anthraquinone derivatives.

C,H,

/

CPh 2 .

Vo /

O, C 6 H 4

/

C(C e H 4 -OH) 2 . s CO

O, C 6 H 4

/

C[C 6 H 4] 2 0.

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o

I. Diphenylphthalide, II. Phenolphthalein, III. Fiuorane.

/CH(C 6 H 4 -OH)2 C„H<

IV. Phenolphthaline.

Phenolphthalein is obtained when phenol and phthalic anhydride are heated with concentrated sulphuric acid. It crystallizes in colourless crusts and is nearly insoluble in water, but dissolves in dilute solutions of the caustic alkalis with a fine red colour, being reprecipitated from these solutions by the addition of mineral acid. It dissolves in concentrated caustic alkalis to a colourless solution which probably contains salts of a non-quinonoid character. This difference in

behaviour has led to considerable discussion (see H. Meyer, Monats., 1899, 20, p. 337; R. Meyer, Ber., 1903, 36, p. 2949 ; A. G. Perkin and Green, Jour. Chem. Soc, 1904, p. 398). On fusion with caustic alkali, phenolphthalein yields benzoic acid and para-dihydroxybenzophenone, which shows that in the original condensation the phthalic acid residue has taken the para position to the hydroxyl groups of the phenol.

Fiuorane is a product of the condensation of the phthalic acid residue in the ortho position to the hydroxyl groups of the phenol,

anhydride formation also taking place between these hydroxyl groups. It dissolves in concentrated sulphuric acid with a yellowish- green fluorescence. The rhodamines, which are closely related to the phthaleins, are formed by the condensation of the alkyl meta-aminophenols with phthalic anhydride in the presence of sulphuric acid. Their salts are fine red dyes.

PHENOMENON (Gr. 4>aivbntvov, a thing seen, from (palveadai, to appear), in ordinary language a thing, process, event, &c, observed by the senses. Thus the rising of the sun, a thunder- storm, an earthquake are natural ” phenomena.” From this springs the incorrect colloquial sense, something out of the common, an event which especially strikes the attention; hence such phrases as ” phenomenal ” activity. In Greek philosophy phenomena are the changing objects of the senses as opposed to essences (to, avra) which are one and permanent, and are therefore regarded as being more real, the objects of reason rather than of senses which are ” bad witnesses.” In modern philosophy the phenomenon is neither the ” thing-in-itself,” nor the noumenon (q.v.) or object of pure thought, but the thing- in-itself as it appears to the mind in sensation (see especially Kant; and Metaphysics). In this sense the subjective character is of prime importance. Among derivative terms are ” Pheno- menalism” and “Phenomenology.” Phenomenalism is either (1) the doctrine that there can be no knowledge except by phenomena, i.e. sense-given data, or (2) the doctrine that all known things are phenomena, i.e. that there are no ” things-in- themselves.” ” Phenomenology ” is the science of phenomena: every special science has a special section in which its particular phenomena are described. The term was first used in English in the 3rd edition of the Ency. Brit, in the article ” Philosophy ” by J. Robison. Kant has a special use of the term for that part of the Metaphysic oj Nature which considers motion and rest as predicates of a judgment about things.

PHERECRATES, Greek poet of the Old Attic Comedy, was a contemporary of Cratinus, Crates and Aristophanes. At first an actor,

he seems to have gained a prize for a play in 438 B.C. The only other ascertained date in his life is 420, when he pro- duced his play The Wild Men. Like Crates, whom he imitated, he abandoned personal satire for more general themes, although in some of the fragments of his plays we find him attacking Alcibiades and others. He was especially famed for his inven- tive imagination, and the elegance and purity of his diction are attested by the epithet aTrncwraros (most Attic) applied to him by Athenaeus and the sophist Phrynichus. He was the inventor of a new metre, called after him Pherecratean, which frequently occurs in the choruses of Greek tragedies and in Horace.

A considerable number of fragments from his 16 (or- 13) plays has been preserved, collected in T. Kock, Comicorum Atticorum Fragmenta, i. (1880), and A. Meineke, Poetarum Comicorum Grae- corum Fragmenta (1855).

PHERECYDES OF LEROS, Greek mythographer, fl. c. 454 B.C. He is probably identical with Pherecydes of Athens, although the two are distinguished by Sui'das (also by I. Lipsius, Quaestiones logographicae, 1886). He seems to have been born in the island of Leros, and to have been called an Athenian because he spent the greater part of his life and wrote his great work there. Of his treatises, On Leros, On Iphigeneia, On the Festivals of Dionysus, nothing remains; but numerous fragments of his genealogies of the gods and heroes, variously called 'Icrropiat, TeveaXoyiai, Avroxdbves, in ten books, written in the Ionic dialect, have been preserved (see C. W. Muller's Frag, hist, graec, vol. i. pp. xxxiv., 70). He modified the legends, not with a view to rationalizing them, but rather to adjust them to popular beliefs. He cannot, therefore, be classed with Hecataeus, whose method was far more scientific.

See C. Liitke, Pherecydea (diss. Gottingen, 1893); W. Christ, Geschichte der griechischen Litteratur (1898) ; and specially H. Bertsch, Pherekydeische Studien (1898).

PHERECYDES OF SYROS, Greek philosopher (or rather philosophical theologian) , flourished during the 6th century B.C. He was sometimes reckoned one of the Seven Wise Men, and is said to have been the teacher of Pythagoras. With the possible

exception of Cadmus (q.v.) of Miletus, he was the first Greek prose-

writer. He belonged to the circle of Peisistratus at Athens, and was the founder of an Orphic community. He is characterized as ” one of the earliest representatives of a half-critical, half -credulous eclecticism “. (Gomperz). He was credited with having originated the doctrine of metempsychosis (q.v.), while Cicero and Augustine assert that he was the first to teach the immortality of the soul. Of his astronomical studies he left a proof in the ” heliotropion,” a cave at Syros which served to determine the annual turning-point of the sun, like the grotto of Posillipo (Posilipo, Posilippo) at Naples, and was one of the sights of the island.

In his cosmogonic treatise on nature and the gods, called Htvrkuvxo’i (Preller’s correction of Sui’das, who has iirTaixvxos) from the five elementary or original principles (aether, fire, air, water, earth; Gomperz substitutes smoke and darkness for aether and earth), he enunciated a system in which science, allegory and mythology were blended. In the beginning were Chronos, the principle of time; Zeus (Zas), the principle of life; and Chthonie, the earth goddess. Chronos begat fire, air and water, and from these three sprang numerous other gods. Smoke and darkness appear in a later tradition. A fragment of the ” sacred marriage ” of Zas and Chthonie was found on an Egyptian papyrus at the end of the 19th century.

See H. Diels, Fragmente der Vorsokratiker (1903); also O. Kern, De Orphei, Epimenidis, Pherecydis Iheogoniis (i838); D. Speliotopoulos, Xltpi pi ,u (Athens, 1890); T. Gomperz, Greek Thinkers (Eng. trans.), i. 85; B. P. Grenfell, New Classical Fragments (1897); H. Weil, Etudes s’ur Vantiquite grecque (1900).

PHIGALIA, or Phigaleia (QiyaXia or ®iya\eLa; mod. Pavlitsa), an ancient Greek city in the south-west angle of Arcadia, situated on an elevated rocky site, among some of the highest mountains in the Peloponnesus — the most conspicuous being Mt Cotylium and Mt Elasum; the identification of the latter is uncertain.

In 659 B.C. Phigalia was taken by the Lacedaemonians, but soon after recovered its independence by the help of the Orasthasians. During the struggle between Achaeans and Aetolians in 221 B.C. it was held by Dorimachus, who left it on the approach of Philip V. of Macedon. In common with the other cities of Arcadia, it appears from Strabo to have fallen into utter decay under the Roman rule. Several curious cults were preserved near Phigalia, including that of the fish- tailed goddess Eurynome and the Black Demeter with a horse’s head, whose image was renewed by Onatas. Notices of it in Greek history are rare and scanty. Though its existing ruins and the description of Pausanias

show it to have been a place of considerable strength and importance, no autonomous coins of Phigalia are known. Nothing remains above ground of the temples of Artemis or Dionysus and the numerous statues and other works of art which existed at the time of Pausanias's visit, about a.d. 170. A great part of the city wall, built in fine Hellenic masonry, partly polygonal and partly isodomous, and a large square central fortress with a circular projecting tower, are the only remains now traceable — at least without the aid of excavation. The walls, once nearly 2 m. in circuit, are strongly placed on rocks, which slope down to the little river Neda.

One very important monument still exists in a fairly perfect state; this is a temple dedicated to Apollo Epicurius (the Pre- server), built, not at Phigalia itself, but at Bassae, 5 or 6 m. away, on the slope of Mt Cotylium; it commemorates the aid rendered by Apollo in stopping a plague which in the 5th century B.C. was devastating Phigalia. This temple is mentioned by Pausanias (viii. 41) as being (next to that of Tegea) the finest in the Peloponnesus, " from the beauty of its stone and the symmetry of its proportions." It was designed by Ictinus, who, with Callicrates, was joint architect of the Parthenon at Athens. Though visited by Chandler, Dodwell, Gell, and other English travellers, the temple was neither explored nor measured till 1811-1812, when C. R. Cockerell and some other archaeologists spent several months in making excavations there. After nearly fifty years' delay, Professor Cockerell published the results of these labours, as well as of his previous work at Aegina, in Temples of Aegina and Bassae (i860), one of the most careful

and beautifully illustrated archaeological works produced. The labours of Cockerell and his companions were richly rewarded; not only were sufficient remains of the architectural features discovered to show clearly the whole design, but the internal sculptured frieze of the cella was found almost perfect. This and other fragments of its sculpture are now in the British Museum. The colonnade of the temple has been recently restored by the Greek authorities.

The figure shows the plan of the temple, which is of the Doric order, but has an internal arrangement of its cella unlike that of any other known temple. It stands on an elevated and partly artificial plateau, which commands an extensive view of the oak-clad mountains of Arcadia, reaching away to the blue waters of the Messenian Gulf. Unlike other Doric temples, which usually stand east and west, this is placed north and south; but it has a side entrance on the east. It is hexastyle, with fifteen columns on its flanks; thirty-four out of the thirty-eight columns of the peristyle are still standing, with the greater

part of their architrave, but the rest of the entablature and both pediments have fallen, together with the greater part of the internal columns of the cella. It will be seen from the plan that these are very strangely placed, apparently without symmetry, as regards the interior, though they are set regularly op- posite the voids in the peristyle.

With the exception of one at the south end, which is Corinthian, the internal columns are of the Ionic order, and are engaged with the cella- wall, forming a scries of recesses, which may have been designed to contain statues. Another peculi- arity of this interior is that these columns reach to the top of the cella in one order, not in two ranges of columns, one over the other, as was the usual Doric fashion. These inner columns carried an Ionic entablature, of which the frieze now in the British Museum formed a

part. The pediments and external metopes of the peristyle appear to have contained no sculpture, but the metopes within the peristyle on the exterior of the cella had sculptured subjects; only a few fragments of these were, however, discovered. The position occupied by the great statue of Apollo is a difficult problem. Cockerell, with much probability, places it in the southern portion of the cella, facing the eastern side door, so that it would be lighted up by the rays of the rising sun. The main entrance is at the northern end through the pronaos, once defended by a door in the end of the cella and a metal screen, of which traces were found on the two columns of the pronaos. There was no door between the posticum and the cella. The general proportions of the fronts resemble those of the Theseum at Athens, except that the entablature is less massive, the columns thicker, and the diminution less — all proportionally speaking. In plan the temple is long in proportion to its width — measuring, on the top of the stylobace, 125 ft. 7 in. by 48 ft. 2 in., while the Theseum (built probably half a century earlier) is about 104 ft. 2 in. by 45 ft. 2 in.

The material of which the temple is built is a fine grey limestone (once covered with painted stucco), except the roof -tiles, the capitals of the cella columns, the architraves, the lacunaria (ceilings) of the posticum and pronaos, and the sculpture, all of which are of white marble. The roof-tiles, specially noticed by Pausanias, are remarkable for their size, workmanship, and the beauty of the Parian-marble of which they are made. They measure 2 ft. 1 in. by 3 ft. 6 in., and are fitted together in the most careful and ingenious manner. Unlike those of the Parthenon and the temple of Aegina, the aptiol or ” joint- tiles ” are worked out of the same piece of marble as the flat ones, for the sake of more perfect fitting and greater security against wet. Traces of

painting on various architectural members were found by Cockerell, but they were too much faded for the colours to be distinguished. The designs are the usual Greek patterns — the fret, the honeysuckle, and the egg and dart.

The sculpture is of the greatest interest, as being designed to decorate one of the finest buildings in the Peloponnesus in the latter half of the 5th century B.C.; see Brit. Mus. Catalogue of Sculpture, vol. i The frieze, now in the British Museum, is complete; it is nearly 101 ft. long by 2 ft. high, carved in relief on twenty-three slabs of marble 4i to 5 in. thick. The subjects are the battle of the Lapithae , and the Centaurs, and that between the Amazons and the Greeks, the

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Plan of the Temple at Bassae.

two favourite subjects in Greek plastic art of the best period. They are designed with wonderful fertility of invention, and life-like realism and spirit ; the composition is arranged so as to form a series of diagonal lines or zigzags m , thus forming a pleasing contrast to the unbroken horizontal lines of the cornice and architrave. The various groups are skilfully united together by some dominant line or action, so that the whole subject forms one unbroken com- position.

The relief is very high, more than 35 in. in the most salient parts, and the whole treatment is quite opposite to that of the Parthenon frieze, which is a very superior work of art to that at Bassae. Many of the limbs are quite detached from the ground; the drill has been largely used to emphasize certain shadows, and in many places, for want of due calculation, the sculptor has had to cut into the flat background behind the figures. From this it would appear that no finished clay-model was prepared, but that the relief was sculptured with only the help of a drawing. The point of sight, more than 20 ft. below the bottom of the frieze, and the direction in which the light fell on it have evidently been carefully considered. Many parts, invisible from below, are left comparatively rough. The workman- ship throughout is unequal, and the hands of several sculptors can be detected. On the whole, the execution is not equal to the beauty of the design, and the whole frieze is somewhat marred by an evident desire to produce the maximum of effect with the least possible amount of labour — very different from the almost gem-like finish of the Parthenon frieze. Even the design is inferior to the Athenian one; most of the figures are ungracefully short in their proportions, and there is a great want of refined beauty in many of the female hands and faces. It is in the fire of its varied action and its subtlety of expression that this sculpture most excels. The noble movements of the heroic Greeks form a striking contrast to the feminine weakness of the wounded Amazons, or the struggles with teeth and hoofs of the brutish Centaurs; the group of Apollo and Artemis in their chariot is full of grace and dignified power. The marble in which this frieze is sculptured is somewhat coarse and crystalline; the slabs appear not to have been built into their place but fixed afterwards, with the aid of two bronze bolts driven through the face of each.

Of the metopes, which were 2 ft. 8 in. square, only one exists nearly

complete, with eleven fragments; the one almost perfect has a relief of a nude warrior, with floating drapery, overcoming a long-haired bearded man, who sinks vanquished at his feet. The relief of these is rather less than that of the frieze figures, and the work is nobler in character and superior in execution.

In addition to the works mentioned in the text, see Leake, Morea (i. 490 and ii. 319; Curtius, Peloponnesos. i. 319; Ross, Reisen in Peloponnesos; Stackelberg, Der Apollo-Tempel zu Bassae (1826); Lenormant, Bas-reliefs du Parthenon et de Phigalie (1834); and Histories of Sculpture mentioned under Greek Art.

(J.H. M.;E.Gr.)

PHILADELPHIA, the Greek name (1) of a city in Palestine in the land of Ammon (see Ammonites), and (2) of a city so-called in honour of Attalus II. of Pergamum, the modern Ala-Shehr

PHILADELPHIA, the third city in population in the United States, the chief city of Pennsylvania, and a port of entry, co-extensive with Philadelphia county, extending W. from the Delaware river beyond the Schuylkill River, and from below the confluence of the Delaware and Schuylkill rivers N.E. about 23 m. along the Delaware river and Poquessing Creek. Independence Hall, which is a few squares east by south of the city hall, is in 39 56′ 57-5″ N. and 75° 8′ 54-75″ W. The port is about 102 m. from the Atlantic Ocean, and the city hall is 90 m. by rail S.S.W. of New York and 135 m. N.E. of Washington. The city has an area of 132-7 sq. m. At the southern extremity are lowlands protected by dikes from the tide; the business centre between the rivers is about 40 ft. higher but level; the district west of the Schuylkill is generally rolling; and in the upper district the surface rises from the Delaware toward the north- west until in the extreme north-west is a picturesque district overlooking Wissahickon Creek from hills exceeding 400 ft. in height.

Population. — When the first United States census was taken, in 1790, Philadelphia was the second largest city in the Union, and had a population of 28,522. It held this rank until 1830, when it was exceeded in size by Baltimore as well as by New York. In 1850 it was smaller also than Boston; but in 1854 the Consolidation Act extended its boundaries so as to include all Philadelphia county and in i860 the city had risen again to second rank. This rank it held until 1890 when, although its population had grown to 1,046,964, it was 50,000 less than that of Chicago. In 1900, with a population of 1,293,679, it

was still farther behind both New York and Chicago. In 1900, of the total population, 998,357, or 77-18%, were native-born, as against only 63% native-born in New York and 65-43% native-born in Chicago. Of Philadelphia's native-born white population, however, 414,093, or 44-24%, were of foreign- born parentage. The foreign-born population included 98,427 born in Ireland, 71,319 born in Germany, 36,752 born in England, 28,951 born in Russia (largely Hebrews), 17,830 born in Italy, 8479 born in Scotland and 5154 born in Austria; and the coloured consisted of 62,613 negroes, 1165 Chinese, 234 Indians and 12 Japanese. In i9iothe population was 1,549,008. Streets. — With the exception of a limited number of diagonal thoroughfares and of streets laid out in outlying districts in conformity with the natural contour of the ground the plan of the city is regular. Market Street — which Penn called High Street — is the principal thoroughfare east and west, Broad Street the principal thoroughfare north and south, and these streets in- tersect at right angles at City Hall Square in the business centre. The streets parallel with Broad are numbered from First or Front Street west from the Delaware River to Sixty-Third Street, taking the prefix " North " north of Market Street and the prefix " South " south of it; the streets parallel with Market are named mostly from trees and from the governors and counties of Pennsylvania.

The wholesale district is centred at the east end of Market Street near the Delaware river. The best retail shops are farther west on the south side of Chestnut Street and on Market and Arch streets. Most of the leading banks and trust companies are on Chestnut Street and on Third Street bet ween Chestnut and Walnut streets. Several of the larger office buildings and the stations of the Pennsylvania and the Philadelphia & Reading railways are in the vicinity of the city hall; here too, are the Baldwin Locomo- tive Works. The large textile mills, the great coal wharves and the Cramp Ship- Yards are to the north-east along the Delaware, and in districts west of these are the leading manu- factories of iron and steel. There are large sugar refineries in the south-eastern part of the city. Rittenhouse Square, a short distance south-west of the city hall, is the centre of the old aristocratic residential district, and the south side of Walnut Street between Fourteenth and Nineteenth streets is a fashion- able parade. There are fine residences on North Broad Street and on some of the streets crossing it, and many beautiful villas in the picturesque suburbs of the north-west. The most con- gested tenements, occupied largely by Italians, Hebrews and negroes, are along the alleys between the rivers and south of Market Street, often in the rear of some of the best of the older residences.

The principal structure is the city hall (or ” Public Buildings “) one of the largest buildings in the world in ground space (45 acres). It rises 548 ft. to the top of a colossal bronze statue (37 ft. high) of William Penn (by Alexander Calder) surmounting the tower. It accommodates the state and county courts as well as the municipal and county offices. The foundation stone was laid in August 1872. On its first floor is Joseph A. Bailly’s statue of Washington, which was erected in front of Indepen- dence Hall in 1869. About the Public Buildings are statues of Generals McClellan and Reynolds, President McKinley, and Joseph Leidy and St Gaudens’s ” Pilgrim.” On all sides are great buildings: on the north the masonic temple (1868-1873); on the south the stately Betz Building; on the west the enormous Broad Street station cf the Pennsylvania railway. The Penn- sylvania Academy of Fine Arts and the Oddfellows’ Temple are among other notable buildings in the vicinity. The post office, facing Ninth Street and extending from Market Street to Chestnut Street, was opened in 1884; in front is a seated statue of Benjamin Franklin, by John J. Boyle. The mint is at the corner of Sixteenth and Spring Garden streets. The custom-house, on Chestnut Street, was designed by William Strickland (1787-1854), in his day the leading American architect. It was modelled after the Parthenon of Athens, was built for the Second United States Bank, was completed in 1824, and was put to its present use in 1845. Other prominent buildings of

which Strickland was the architect are the stock exchange, St Paul’s Protestant Episcopal Church, St Stephen’s Church, the almshouse and the United States Naval Asylum. The main building of Girard College (on Girard Avenue, between North 19th and North 25th streets), of which Thomas Ustick Walter (1804 1887), a pupil of Strickland’s, was the architect, is one of the finest specimens of pure Greek architecture in America. Near the Schuylkill river, in West Philadelphia, are the buildings of the university of Pennsylvania. Its free museum of science and art, at South 23rd and Spruce, on the opposite side of the river, was built from the designs of Walter Cope, Frank Miles Day and Wilson Eyre, and its north-western part was first opened in 1899. Tall steel-frame structures, of which the Betz Building, completed in 1893, was the first, have become numerous. The Roman Catholic Cathedral of St Peter and St Paul, east of Logan Square, was begun in 1846 and was eighteen years in building. The Arch Street Methodist Episcopal Church is one of the most handsome churches in the city. The South Memorial Church of the Advocate (1897), on North 18th and

Diamond streets, is a reproduction on a smaller scale of Amiens Cathedral.

Perhaps the most famous historical monument in the United States is Independence Hall, on Chestnut Street between Fifth and Sixth streets, designed for the state house by Andrew Hamilton (c. 1676-1741), speaker of the assembly, and was used for that purpose until 1799. The foundations were laid in 1731 and the main building was ready for occupancy in 1735, although the entire building was not completed until 1751. The steeple was taken down in 1774 but was restored by Strickland in 1828, and further restorations of the building to its original condition were effected later. In the east room on the first floor of this building the second Continental Congress met on the 10th of May 1775, George Washington was chosen commander-in-chief of the Continental army on the 15th of June 1775, and the Declaration of Independence was adopted on the 4th of July 1776. The room contains much of the furniture of those days, and on its walls are portraits of forty-five of the fifty-six signers ‘ of the Declaration and a portrait of Washington by Peale. At the head of the stairway is the famous Liberty bell, which bears the inscription, ” Proclaim liberty through all the land unto all the inhabitants thereof ” and is supposed (without adequate evidence) to have been the first bell to announce the adoption of the Declaration of Independence. It was cast in England in 1752, was cracked soon after it was brought to America, was recast with more copper in Philadelphia, and was cracked again in 1835 while being tolled in memory of Chief Justice John Marshall, and on the 22nd of February 1843 this crack was so increased as nearly to destroy its sound. On the second floor is the original of the charter which William Penn granted to the city in 1701 and the painting of Penn’s treaty with the Indians by Benjamin West. The building has been set apart by the city, which purchased it from the state in 1816, as a museum of historical relics. On the north-west corner of Independence Square is old Congress hall, in which Congress sat from 1790 to 1800, and in which Washington was inaugurated in 1793 and Adams in 1797. At the north-east corner is the old city-hall, on the second floor of which the Supreme Court of the United States sat from 1791 to 1900. A short distance east of Independence Square in Carpenters’ Hall, in which the first continental congress assembled on the 5th of September 1774 and in which the national convention in 1787 framed the present constitution of the United States; the building was also the headquarters of the Pennsylvania committee of correspondence, the basement was used as a magazine for ammunition during the War of Independence, and from 1791 to 1797 the whole of it was occupied by the First United States Bank. The Carpenters’

Company (established in 1724) erected the building in 1770, and since 1857 has preserved it wholly for its historic associations. On Arch Street near the Delaware is preserved as a national monument the house in which Betsy Ross, in 1777, made what has been called the first United States flag, in accor- dance with the resolution of Congress of the 14th of June. Not

far from this house is Christ Church (Protestant Episcopal), a fine colonial edifice designed mainly by Dr John Kearsley (1684-1772). The corner stone was laid in 1727, but the steeple, in part designed by Benjamin Franklin and containing a famous chime of eight bells, was not completed until 1754. The interior was restored to its ancient character in 1882, the pews of Washington and Franklin are preserved, and a set of com- munion plate presented to the church by Queen Anne in 1708 is used on great occasions. In the churchyard are the graves of Benjamin Franklin, Robert Morris, Brigadier- General John Forbes, John Penn, Peyton Randolph, Francis Hopkinson and Benjamin Rush. St Peter's, the second Protestant Episcopal Church in the city, has a massive tower and a simple spire; within are the original pews. In the south-east part of the city near the Delaware is the ivy-clad Old Swedes' Church, built of brick in 1698-1700. The house which William Penn built about 1683 for his daughter Letitia was removed to Fairmount Park and rebuilt in 1883. In Germantown (q.v,), a suburb which was annexed in 1854, are several other historic buildings. The dominant feature of the domestic architecture is the long rows, in street after street, of plain two-storey or three-storey dwellings of red (" Philadelphia ") pressed brick with white marble steps and trimmings, and with white or green shutters, each intended for one family.

Parks. — Fairmount Park extends along both banks of the Schuyl- kill for about 5 m. and from the confluence of the Schuylkill and Wissahickon Creek it continues up the latter stream through a romantic glen for 6 m. Its area is about 3418 acres. Five acres of an estate belonging to Robert Morris during the War of Indepen- dence and known as " Fair Mount," or " The Hills," were purchased by the municipality for " a city waterworks and for park purposes " in 1812, and from this beginning the park grew to its present dimen- sions by purchases and gifts. The principal buildings in the park are : the McPherson mansion, once the property of Benedict Arnold and in October 1780 confiscated by the committee of safety; the Peters (or Belmont) Mansion, built in 1745 and much frequented by the notables of the Revolutionary and early national period; the birth-place of David Rittenhouse, the astronomer, and a monas- tery of the German pietists, both on the banks of Wissahickon; and memorial hall and

horticultural hall, both survivals of the centennial exhibition of 1876. On Lemon Hill, near the south end of the park, stands the Robert Morris mansion; in the vicinity is the cabin which was General U. S. Grant's headquarters at City Point, Virginia, during the winter of 1 864-1 865. Near the Columbia Avenue entrance to the park and near the East Park Reservoir are the children's playhouse and playground, endowed by the will of Mrs Sarah A. Smith (d. 1895). At the Green Street entrance is an imposing monument to Washington, designed by Rudolph Siemer- ing and erected by the Society of the Cincinnati in 1896-1897, with a bronze equestrian statue. The Smith Memorial entrance, white granite with bronze statues, was erected in memory of the officers of the Civil War. The park also contains 1 a monument to Lincoln by Randolph Rogers; an equestrian statue of Grant by Daniel Chester French and Edward C. Potter ; an equestrian statue of Major-General James Gordon Meade by Alexander Milne Calder; an equestrian statue of Joan of Arc by Emmanuel Fremiet ; an heroic bust of James A. Garfield by Augustus St Gaudens; statues of Columbus, Humboldt, Schiller and Goethe; a Tam O' Shanter group of four figures in red sandstone by James Thom; John J. Boyle's " Stone Age in America " ; Cyrus Edwin Dallin's " Medicine Man " ; Wilhelm Wolff's " Wounded Lioness " (at the entrance to the Zoological Gardens); Albert Wolff's "Lion Fighter"; Auguste Nicolas Cain's " Lioness bringing a Wild Boar to her Cubs " ; Edward Kemeys's " Hudson Bay Wolves "; Frederick Remington's " Cow Boy "; and several artistic fountains, and a Japanese temple-gate. In the down-town district, Franklin, Washington, Rittenhouse and Logan squares, equidistant from the city-hall, have been reserved for public parks from the founding of the city; in Ritten- house Square is the bronze " Lion and Serpent " of A. L. Barye. In Clarence H. Clark Park, West Philadelphia, is Frank Edwin Elwell's group " Dickens and Little Nell." In Broad and Spring Garden streets opposite the Baldwin Locomotive Works is Herbert Adams's statue of Matthias William Baldwin (1795-1866), founder of the works. Close to the bank of the Delaware, some distance N.N.E. of the city-hall, is the small Penn Treaty Park with a monument to mark the site of the great elm tree under which Penn, according to tradition, negotiated his treaty with the Indians in 1683. In the south-west part of the city, along the Schuylkill, is Bartram's botanical garden (27 acres), which the city

1 Many of the statues and other works of art in Fairmount and other parks are the gift of the Fairmount Park Art Association (1871; reorganized in 1888 and IQ06).

added to its park system in 1891 ; in it is the stone house, with ivy-covered walls, which the famous botanist built with his own hands. Through the efforts of the City Park Association, organized in 1888, a number of outlying parks, connecting parkways and small triangular or circular parks, have been placed on the city plan. Among these are League Island Park (300 acres), opposite the United States navy yard on League Island; Penny Pack Creek Park (about 1200 acres), extending 6J m. along Penny Pack Creek, in the north-east; Cobb's Creek Park, extending about 4 m. along the west- ern border ; Fairmount Parkway, 300 ft. wide on a direct line south- east from Fairmount Park to Logan Square and somewhat narrower from Logan Square to the city-hall ; and Torresdale Parkway (300 ft. wide and io£ m. long), from Hunting Park, <0 m. north of the city- hall, along a direct line north-east to the city limits. A plaza at the intersection of Broad and Johnson streets, radiating streets therefrom, and the widening of Broad Street to 300 ft. from this plaza to League Island Park are also on the city plan. Laurel Hill cemetery, on a high bank of the Schuylkill and contiguous to Fairmount Park, is the city's principal burying ground; in it are the tombs of Dr Elisha Kent Kane, the Arctic explorer, and Major- General Meade.

Theatres.- — The first Shakespearean performance in the United States was probably at Philadelphia in 1749; another company played there in 1754 and 1759; and in 1766 was built the Old South- wark theatre, in which Major John Andr6 and Captain John Peter De Lancey acted during the British occupation of the city, and which after twenty years of illegal existence was opened " by authority " in 1789. The Walnut Street theatre (1808) is said to be the oldest play-house in the United States. Other theatres are the Garrick, the large Academy of Music, the Chestnut Street opera house, the Lytic, the Adelphi, the Park and the German.

Clubs. — Among social clubs are the Union League, the University (1881), the Philadelphia, the City, the Markham, the Manufacturers (1887), the Rittenhouse, the Lawyers, the Clover, the Pen and Pencil, the Art, the Mercantile, several country clubs and athletic clubs (notably the Racket), and the foremost cricket clubs in the United States, the Belmont, the Philadelphia, the Keystone, the Merion (at Haverford), and the Germantown (at Manheim).

Museums, Learned Societies and Libraries. — In the southern part of Fairmount Park is a zoological garden with an excellent collection. Its site is the former estate of John Penn, grandson of William Penn. The

collection is an outgrowth of the museum, the first in the United States, opened by Charles Willson Peale in Independence Hall in 1802. It is now owned by the Zoological Society (incorporated in 1859) and was opened in 1874. Other museums in Fairmount Park are : the botanical collection in horticultural hall ; and in memorial hall the general art collections of the Pennsylvania Museum and School of Industrial Arts and the Wilstach collection of paintings (about 500), including examples of the Italian schools from the 15th to the 17th centuries and of modern French and American painters. Bartram's botanical garden, mentioned above as a city park, was established in 1728 by John Bartram (1699-1777) and is the oldest botanical garden in America. The Philadelphia Commercial Museums, founded in 1894, is a notable institution for promoting the foreign commerce of the United States, having a collection of raw materials and manufactured products from all countries, a laboratory and a library. The institution investigates trade condi- tions and the requirements of markets in all parts of the world, maintains a bureau of information, issues a weekly bulletin for American exporters and a monthly publication for foreign buyers, and has published several " foreign commercial guides " and other commercial works. The museum is maintained chiefly by municipal appropriations and by fees. Its control is vested in " The Board of Trustees of the Philadelphia Museums," composed of fourteen citizens of Philadelphia chosen for life and eight ex officio members who are the incumbents of the leading state and municipal offices. There are home and foreign advisory boards, and the immediate management is under a director. In 1727 Franklin, then in his twenty-second year, formed most of his " ingenious acquaintance into a club," which he called the Junto, " for mutual improvement," and out of the Junto grew in 1 73 1 the library of the Library Company of Philadelphia, which he spoke of as the " mother of all North American subscription libraries," but which was not the first sub- scription library in North America. The Library Company of Philadelphia absorbed in 1769 the Union Library, which had been founded some years before; and in 1792 the Loganian library, a valuable collection of classical and other works provided for under the will of James Logan, a friend of Penn, was transferred to it. Subsequently it acquired by bequest the libraries of the Rev. Samuel Preston of London and of William Mackenzie of Philadelphia. Among the rarities in the latter was a copy of Caxton's Golden Legend (i486). In 1869 the Library Company was made the beneficiary, under the will of Dr James Rush (1786-1869), of an estate valued at about a million dollars, and with this money the Ridgway branch was established in 1878. The library has owned its building since 1790 ; the building on the present site was opened in 1880 and was enlarged

in 1889.

The American Philosophical Society, founded by Franklin in 1743, is the oldest and the most famous academy of science in America. Its organization was the immediate consequence of a circular by

Franklin entitled, A Proposal for Promoting Useful Knowledge among the British Plantations in America. In 1769 it united with (and officially took the name of) ” The American Society held at Philadelphia for Promoting Useful Knowledge.” Among its early presidents were Franklin, Rittenhouse and Jefferson. It has a valuable library — about 50,000 vols. — containing the great mass of the correspondence of Franklin; here, too, are many interesting relics, among them the chair in which Jefferson sat while writing the Declaration of Independence and an autograph copy of the Declaration. The society has published 27 quarto vols, of Transactions (1771-1908); its Proceedings have been published regularly since 1838, and in 1884 those from 1744 to 1838, compiled from the manuscript minutes, were also published. The Academy of Natural Sciences of Philadelphia, founded in 1812, has been noted for its collection of birds since it acquired, in 1846, the collection of the due de Rivoli numbering more than 12,000 specimens; several smaller collections have since been added. The academy has a notable collection of shells and fossils and the ” types ” of Leidy, Cope, Say, Conrad and other naturalists, and a library. It is composed of the following “sections “: biological and microscopical (1868), entomological (1876), botanical (1876), mineralogical and geological (1877) and ornithological (1891). It has published a Journal since 1817 and its Proceedings since 1841, and periodicals on entomology, conchology and ornithology. To a few young men and women it gives training in scientific investigation without charge. The Pennsylvania Historical Society, organized in 1824, has a valuable collection of historical material, including the papers of the Penn family and the Charlemagne Tower collection of American colonial laws, and many early American printed handbills and books (especially of Bradford, Franklin and Christopher Saur), portraits and lelics. With the proceeds of the society’s publication fund the Pennsylvania Magazine of History and Biography has been published since 1877. The Numismatic and Antiquarian Society of Phila- delphia, organized in 1858, is the oldest numismatic organization in the United States; it has a collection of coins, and since 1865 it has published its Proceedings. The College of Physicians and Surgeons has an excellent medical library. The free library of Philadelphia (established 1 891) includes a main library and several branches. Other important libiaries are that of the univeisity of Pennsylvania, the Mercantile, that of Franklin Institute, that of the

Law Associa- tion of Philadelphia, the Athenaeum, that of the German Society of Pennsylvania, and Apprentices'. The free museum of science and art of the university cf Pennsylvania has valuable archaeological collections, notably the American and the Babylonian collections made by university expeditions.

Schools. — William Penn in his frame of government provided for a committee of manners, education and art. The assembly, in March 1683, passed an act which provided that all children should be taught to read and write by the time they were twelve years of age, that then they should be taught some useful trade, and that for every child not so taught the parent or guardian should be fined five pounds. At a meeting of the provincial council held in Philadelphia in 1683 the governor and council appointed as school- master, Enoch Flower, who for twenty years had held that position in England. But schools were left almost wholly to private initiative until 1818. The first grammar school, commonly known in its early years as the Friends' free school, was established in 1689 under the care of the celebrated George Keith; although maintained by the Friends it was open to all, and for more than sixty years was the only public place for free instruction in the province. It was chartered by Penn in 1701, 1708 and 1711, in time became known as the William Penn Charter School, and is still a secondary school on Twelfth Street. In 1740 a building was erected for a " charity school " and for a " house of worship," but the school had not been opened when, in 1749, Franklin published his Proposals relating to the Education of Youth in Pensilvania. Under the influence of this publication a new educational association was formed which purchased the building and in January 1751 opened in it an institution that was chartered as an " academy and charitable school " in 1753, was rechartered as a college and academy in 1755, and became the university of Pennsylvania by act of the state legislature passed in 1791. The university occupied the site of the present post office from 1802 until 1872, but was then removed to grounds near the western bank of the Schuylkill.

The foundation of the present public school system was laid in 1818 by an act of the legislature which constituted the city and county of Philadelphia the first school district of Pennsylvania and provided for the establishment therein of free schools for indigent orphans and the children of indigent parents; the same act author- ized the establishment of a model school for the training of teacheis, which was the pioneer school for this purpose in America. In 1834 free elementary schools were authorized for all children of school age, and since then the system has developed until it embraces the Central High School for boys, which has a semi-collegiate course with a

department of pedagogy and confers the degrees of B.A. and B.S. ; a Normal High School for girls, into which the model school was converted in 1848, in which most of the teachers of the city are trained and which only graduates of the Girls' High School are permitted to enter; the William Penn High School for girls (opened 1909) with academic, commercial, applied arts,

household science and library economy departments; a School of industrial arts; two manual training schools; about one hundred night schools (attended mainly by adults) ; several special schools for habitual truants or insubordinate and disorderly children ; and a number of vacation schools and playgrounds for the summer season. In 1909 district high schools were planned as a part of the public school system. The city has also many private high schools and academies.

Besides the university of Pennsylvania and the Central High School for boys the collegiate institutions are La Salle College (Roman Catholic; opened in 1867) and the Temple University (non- sectarian; chartered in 1888 as Temple College after four years of teaching; in 1891 received the power to confer degrees); which is designed especially for self-supporting men and women and was founded by Russell Hermann Conwell (b. 1842), a lawyer and jour- nalist, who entered the Baptist ministry in 1879, was pastor of the Grace Baptist Church of Philadelphia in 1881-1891, became pastor of the Grace Baptist Temple, in 1 891, and was a public lecturer. He was the first president of the Temple College, which was begun in connexion with the work of his church. Temple University offers instruction both day and evening, has classes from the kinder- garten to the highest university grades, and courses in business, civil engineering, domestic art and domestic science, physical training, pedagogy and music; it has a theological school (1893), a law school (1894), a medical school (1901) and a school of pharmacy(i902) ; and in 1907 the Philadelphia Dental College, one of the best known dental schools in the country, joined the university. In 1893 a trust fund left by Hyman Gratz was used to found the Gratz College for the education of teachers in Jewish schools and for the study of the Hebrew language, and Jewish history, literature and religion; the college is under the control of the Kaal Kidosh Mikoe Israel of Philadelphia. Bryn Mawr College (o.v.), one of the leading institutions in America for the higher education of women, is a few miles beyond the city limits. Schools of medicine, for

which Phila- delphia has long been noted, include the department of medicine of the university of Pennsylvania (opened in 1765); Jefferson Medical College (1825); the Woman's Medical College (1850), the first chartered school of medicine for women to confer the degree of M.D. ; the Medico-Chirurgical College (1881) ; Hahnemann (homoeo- pathic) Medical College (1888); and the department of medicine of Temple University (1901). Among other professional schools are the department of law of the university of Pennsylvania (1790), the law school of Temple University (1894); the divinity school of the Protestant Episcopal Church (1862); the Lutheran theological Seminary (1864); Saint Vincent's (Theological) Seminary (R.C., 1868); the theological school of Temple University (non-sectarian, 1893); Pennsylvania College of Dental Surgery (1856); Philadelphia Dental College (1863; since 1907 a part of Temple University); the department of dentistry of the university of Pennsylvania (1878); the department of dentistry of the Medico-Chirurgical College (1897); the Philadelphia College of Pharmacy (1821); the department of pharmacy of the Medico-Chirurgical College (1898); and the school of pharmacy of Temple University (1902). Girard College (see Girard, Stephen) is a noted institution for the educa- tion of poor white orphan boys. The Pennsylvania Academy of the Fine Arts, founded in 1805 in Independence Hall, was the first art school in America; it occupies a fine building on Broad and Cherry streets, with a gallery of about 500 paintings, including examples of early American masters (especially Gilbert Stuart, of whom it has the largest collection), of modern American artists (especially in the Temple collection), and, in the collection of Henry C. Gibson, of French landscapes. The Drexel Institute of Arts and Sciences, founded in 1891 by Anthony J. Drexel and endowed by him with $2,000,000, occupies a beautiful building (Chestnut Street and 32nd ; opened in 1891) and embraces the following departments: archi- tecture, science and technology, commerce and finance, domestic science, domestic arts, library school, English language and literature, history, civil government and economics, physical training, evening classes, department of free public lectures and concerts, library and reading room, and museum and picture gallery. The institution bestows free scholarships on a considerable number of students and charges the others very moderate fees. Its building houses a library, a collection of rare prints and autographs, and a museum with a picture gallery and exhibits of embroidery, textiles, ceramics, wood and metal work, &c. The Pennsylvania Museum and School of Industrial Art founded in 1876 and opened in 1877, has schools at Broad and Pine streets- — the museum is housed in Memorial Hall in Fairmount Park. The school is a pioneer in America; it was originally a school of applied art, but in

1884 the Philadelphia textile school was established as another department. The Wagner Free Institute of Science, founded by William Wagner in 1855, has a library and a natural history museum, provides free lectures on scientific subjects, and publishes Transactions, containing scientific memoirs. The Franklin Institute for the promotion of mechanic arts (1824) has a technical library (with full patent records of several nations); since 1824 it has held exhibitions of manufactures; it has published since 1826 the Journal of the Franklin Institute; the institute provides lecture courses and has night schools of drawing, machine design and naval architecture. The Spring Garden Insti- tute (1851), with day classes in mechanical drawing, handiwork,

and applied electricity, and night classes in those subjects and in freehand and architectural drawing; the Philadelphia School of Design for Women (1836), of which Emily Sartain, a daughter of John Sartain, became principal in 1886; and a school of horology (1894) are other manual and industrial training schools within the city, and not far beyond the city limits is the Williamson Free School of Mechanical Trades (1888), endowed by Isaiah Vansant Williamson (1803-1889) with more than $5,000,000 for the free training of bricklayers, machinists, carpenters, pattern makers, stationary engineers and other mechanics. The Lincoln Institution and Educational Home until 1907 was devoted mainly to the education of Indians.

Newspapers and Periodicals. — The American Weekly Mercury was the first newspaper published in Philadelphia and the third in the colonies. It was first issued on the 22nd of December 1719 by Andrew Sowle Bradford, a son of William Bradford, the first printer in the Middle Colonies, and was the first newspaper in these colonies. The second newspaper in the city and in the province was the Universal Instructor in all Arts and Sciences and Penn- sylvania Gazette. It was established in 1728 by Samuel Keimer, but less than a year afterwards it became the property of Benjamin Franklin and Hugh Meredith, who shortened its title to the Penn- sylvania Gazette. The only one of the newspapers established during the colonial era which survived the 19th century was the Pennsylvania Packet or General Advertiser, which was started in 1771 by John Dunlap, and during the War of Independence was published semi-weekly, with occasional " postscripts " of important news; in 1839 it was absorbed by the North American (1829), with which the United States Gazette (1789) was united in 1847 and which is still published as the North American. The Aurora and General Adver- tiser, established in 1790 by Benjamin Franklin Bache (1769-1798), a grandson of Franklin, was a notorious anti-Federalist organ in its early years. A pioneer among newspapers

at modern prices is the Public Ledger, founded in 1836, and in 1864 purchased by George William Childs. Other prominent daily papers now published are the Inquirer (Republican; 1829), the Press (Republican; 1857), the Record (Independent Democrat; 1870), the Demokrat (German; 1838), the Evening Bulletin (Republican; established in 1815 as the American Sentinel), the Evening Item (1847), the Evening Telegraph (I ndependent Republican ; 1 864) , and the Tageblatt (Labour ; German ; 1877). Many of the earlier literary periodicals of America were published in Philadelphia ; among them were the American Magazine (1757-1758 and 1769), Thomas Paine's Pennsylvania Magazine (1775-1776), the Columbian Magazine (1786-1790; called the Universal Asylum in 1790) which was edited by Matthew Carey and by A. J. Dallas, the excellent American Museum (1787-1792 and 1798), with which Carey was connected, the Port Folio (1801-1827; edited until 1812 by Joseph Dennie) and the Analectic (1802-1812) which succeeded Select Reviews and Spirit of the Foreign Magazines (1809), of which Washington Irving was editor in 1813-1814, and to which Paulding and Verplanck contributed, and the American Quarterly Review (1827-1837). Among others were: Godey's Lady's Book (1830-1877), for which Poe, Irving, Longfellow, Willis and others wrote; and Graham's Lady's and Gentleman's Magazine (1840-1859), with the contributors just named and Cooper, JohnG. Saxe, E. P. Whipple and others. Lippincott's Magazine (1868) is a monthly, best known for its fiction. The Saturday Evening Post, which has the largest circulation of the weekly publications, and the Ladies' Home Journal (1883), the semi-monthly with the largest circulation, are owned by the same company. The Farm Journal (1877) is a well-known agricultural monthly.

Trusts, Charities, &c. — Girard College and thirty-eight other charities are maintained out of the proceeds of as many trusts, which are administered by a board of directors composed of twelve members, appointed by the courts of common pleas, and the mayor, president of the select council, and president of the common council as ex-officio members. In 1907 the invested capital of the Girard Trust alone amounted to $24,467,770 and the income from it was $1,988,054. The total capital of all the minor trusts in the same year was $1,583,026 and the income from this was $56,730. Among the minor trust funds are: Wills Hospital (established in 1825); Benjamin Franklin Fund (1790) for aiding young married artificers; Thomas D. Grover Fund (1849) for providing the poor with fuel and food; Mary Shields Almshouse Fund (1880); and the John Scott Medal Fund (1816) for bestowing medals upon young inventors. To Franklin Philadelphia is largely indebted for the Pennsylvania hospital, the first

hospital in the United States, which was projected in 1 75 1 and is one of the foremost of nearly one hundred such institu- tions in the city. The municipal hospital for contagious diseases and hospitals for the indigent and the insane are maintained by the municipality, but most of the other institutions for the sick are maintained by medical schools and religious sects. Municipal charities are under the supervision of the department of public health and charities. Philadelphia is the seat of the state peniten- tiary for the eastern district, in which, in 1829, was inaugurated the ” individual ” system, i.e. the separate imprisonment and dis- criminating treatment of criminals with a view to effecting their reform.

Transportation and Commerce. — Nearly every street in the business centre and about one-third of the streets throughout the

built-up portion of the city have a single track of electric railway (overhead trolley), and most of the wider ones, except Broad Street, which has none, have a double track. A subway line has been opened for a short distance under Market Street, and other subway lines, as well as elevated lines, have been projected. The entire system, embracing in 1909 a total of 624-21 m., is operated by the Philadelphia Rapid Transit Company. Several inter-urban electric lines afford cheap service to neighbouring towns and cities. The extensive railway system under the control of the Pennsylvania railway together with the Baltimore & Ohio railway affords transportation facilities north to New York, south to Baltimore, Washington and the south, west to the bituminous coalfields of Pennsylvania, the grain fields of the Middle West, and to Pittsburg, Cleveland, Cincinnati and Chicago. The Philadelphia & Reading railway connects the city with the great anthracite coal region, and both the Philadelphia & Reading and the Pennsylvania control a line to Atlantic City. The Schuylkill is navigable for small craft to the ” Fall line,” about 7! m. above its mouth and for vessels drawing 26 ft. to the oil refineries at Point Breeze, 3 m. from the mouth ; from Point Breeze to the head of navigation the channel depth varies from 14 to 22 ft. The Delaware river is navigable to Trenton, New Jersey, about 30 m. above the upper end of the port of Philadelphia, and although in its natural condition this river was only 17 ft. deep at low water in its shallowest part below the port this depth was increased between 1836 and 1899 to 26 ft. (except in three shoal stretches), and a project of the Federal govern- ment was adopted in 1899 for increasing the depth to 30 ft.

and the width to 600 ft. In 1905 the city of Philadelphia and the state of Pennsylvania appropriated $750,000 for the improvement of the river between the city and the southern boundary of the state. 1 Steamships ply regularly between Philadelphia and several European ports, ports in the West Indies, and ports of the United States.

The port extends from the Pennsylvania railway terminal at Greenwich Point up the Delaware River to the Philadelphia & Reading terminal at Port Richmond, a distance of about 8 m., and there are minor harbour facilities on the Schuylkill. The natural facilities, together with the improvements that have been made, were long offset by an inefficient port administration under an antiquated law of 1803 which permitted the wharves to pass largely under private control; but in 1907 the old board of port wardens was abolished and in its place was 1 created a municipal department of wharves, docks and ferries.

Until the opening of the Erie Canal, in 1825, Philadelphia was the emporium of the United States; it was then displaced by New York. Some years later Philadelphia lost its lucrative China trade, and its decline in commercial importance continued until 1883, when the value of its imports amounted to only $32,811,045, the value of its exports to only $38,662,434, and the city was out- ranked in foreign trade by New York, Boston, San Francisco and New Orleans. By 1900, however, the value of its imports had risen to $49,191,236 and the value of its exports to $81,327,704; in 1909 the value of the imports was $78,003,464, an amount less than one-eleventh that of New York, but exceeded only by New York and Boston, and the value of the exports was $80,650,274, an amount less than one-eighth that of New York, but exceeded only by New York, Galveston and New Orleans. The principal imports are sugar, drugs and chemicals, goatskins, wool, tobacco, jute and burlap, and cotton goods, iron ore, manufactured iron, hides and bananas; the principal exports are iron (manufac- tured), steel, petroleum, wheat, flour, lard, cattle and meat pro- ducts. The proximity of the city to New York, whence many of its products are shipped, makes the statistics of its direct imports and exports no true index of its commercial importance.

Manufactures. — Philadelphia has always been one of the foremost manufacturing centres in the United States, and in 1905 it was outranked only by New York and Chicago. 2 The total value of its factory product was $519,981,812 in 1900, and $591,388,078 in 1905. Measured by the value of the products, Philadelphia ranked first among the cities of the country in 1905 in refining sugar and molasses ($37,182,504; 13-4% of the total of the country) and in the manu-

facture of carpets and rugs ($25,232,510; 41% of the total of the country), leather ($23,903,239; 9-5% of the total of the country), hosiery and knit goods ($15,770,873; 11-5% of the total of the country), woollen goods ($12,239,881; 8-6% of the total of the country), and felt hats ($5,847,771; 16% of the total of the country) ; second in the manufacture of worsted goods ($26,964,533; 16% of the total of the country) and in dyeing and finishing textiles ($4,371,006; 8-6% of the total of the country); and third in the manufacture of clothing ($31,031,882; 5-1% of the total of the country) and silk goods ($5,079,193; 3-8% * > f the total of the country). Other large industries are the manufacture of foundry and machine-shop products, cotton goods, malt liquors, iron and steel, chemicals, cigars and cigarettes, soap, confectionery, furniture,

paints, boots and shoes, electrical apparatus, and cordage and twine, and among notable individual establishments are the Baldwin Locomotive Works, the Cramp Ship- Yards and the Disston or Keystone Saw Works. There are petroleum refineries at Point Breeze near the mouth of the Schuylkill ; petroleum is piped to them from the north-west part of the state.

Water Supply. — The first municipal waterworks, installed in 1 799-1 801, pumped water by steam power from the Schuylkill into an elevated tank in Centre Square, where the city-hall now stands; this was one of the earliest applications of steam to municipal water pumping. In 1812-1815 new steam works were installed on Quarry Hill, or Fairmount; in 1819-1822 pumping works operated by water power were substituted for those operated by steam; and it was in great part for the preservation of the purity of the water supply that Fairmount Park was created. The park, however, did not serve its purpose in this respect. The water was impure and inadequate: additional works were installed from time to time, mostly on the Schuylkill, whence water was pumped by steam to reservoirs from which distribution was made by gravity ; and to meet the increasing demands new filtration works and accessories were installed in 1901-1908. These take the water mainly from the Delaware river.

Government and Finances. — Inasmuch as it has been proved that in 1683 there was in use in Philadelphia a seal bearing the inscription ” Philadelphia .83. William. Penn. Proprietor, and. Governor ” and in all respects different from the provincial seal or the county seal, it seems that there was then a distinct government for the city. In July 1684 the provincial council, presided over by William Penn, appointed a committee to draft a borough charter, but there is no record of the work of this committee, and it is uncertain what the government of

Phila- delphia was for the next seventeen years. 3 In 1701 Penn himself issued a charter creating a close corporation modelled after the English borough and under this the city was governed until the War of Independence. Upon the annulment of the Penn charter by the Declaration of Independence, government by commissions was established, but in 1789 a new charter was granted and, although the government has since undergone many and great changes, it is by virtue of this charter that the city remains a corporation to-day. The Consolidation Act of 1854 extended the boundaries to the county lines without destroying the county government, changed the corporate name from " Mayor, Aldermen, and Citizens of Philadelphia " to " the City of Philadelphia," created the offices of controller and receiver of taxes, and considerably modified the powers and duties of the corporation and its officers. The Bullitt Act, passed in 1885. to go into effect in 1887, and since 1885 amended and supplemented, is a new charter except in name; particularly notable is its transfer of the balance of power from the councils and various self-perpetuating commissions to the mayor.

The mayor is elected for a term of four years and is not eligible to the office for the next succeeding term. With the advice and consent of the select council he appoints the directors of the departments of public safety, public works, 4 health and charities, supplies and (since 1907) wharves, docks and ferries, and the three members of the civil service commission. He may appoint three persons to examine any department and for reasons given in writing may remove any officer whom he has appointed. His veto power extends to items in appropriation bills, but any item or ordinance may be passed over his veto within five days of such veto by an affir- mative vote of three-fifths of the members elected to each council. The select council is composed of one member from each of the 47 wards, and In the common council each ward has one member for every four thousand names on the last completed assessment list (including names of those paying poll taxes as well as those paying taxes on real or personal property) ; in 1909 there were 80 members of the common council. The several administrative departments

'The city had previously expended $1,555,000 on the improve- ment of the Delaware and Schuylkill rivers.

2 The Philadelphia Museums claim that excluding slaughter- house and sweat-shop products the value of Philadelphia's manu- factured products is greater than that of any other city in the country.

3 A document purporting to be a charter, bearing the date of the 20th

of May 1691, and signed by Thomas Lloyd, deputy-governor, was discovered in 1887, but the great seal is missing and there is no evidence that the charter was even in operation. The minutes of ” a meeting of the Council held at Philadelphia on the third day of Sixth Month 1691 ” mention ” Humphrey Morrey the present Mayor of the city of Philadelphia ” ; and this would seem to show that there was a regular municipal government in 169 1. See Philadelphia: Its Founding and Seals: Report of the Committee . . . to determine the Year of the Physical and Legal Founding of the City of Philadelphia (Philadelphia, 1908).

4 In 1905 the state legislature took the appointment of these officers from the mayor and vested it in the councils, but this legislation was repealed in 1906.

are: public safety, public works, receiver of taxes, city treasurer, city controller, law, education, charities and corrections, sup- plies, wharves, docks and ferries, civil service commission and sinking fund commission (composed of the mayor, the city controller and a commissioner elected by a majority vote of the city councils). Members of the select council are elected for three years — one-third each year; members of the common council for two years — one half each year ; and the receiver of taxes, the city treasurer, the city controller, and the city solicitor, who is the head of the department of law, for a term of three years. The police constitute a bureau of the department of public safety, and at their head is a superintendent appointed by the director of the depart- ment with the approval of the select council. The department of education is administered by a central board appointed (at large) by the judges of the courts of common pleas.

The assessed value of taxable property in the city increased from Si53-369. 48 in 1856 to $536,667,834 in 1880, to $880,935,265 in 1900, and to $1,358,675,057 in 1910. The city’s yearly expenditure increased from $5,170,680 in 1856 to $14,640,479 in 1880, to $30,628,246 in 1900, and to $48,012,630 in 1909. The principal items of expenditure in 1909 were: for public schools $8,242,218; for the bureau of water, $2,827,200; for streets and highways, $4,219,260; for police, $3,810,535; and for protection against fire, $1.873, 7 2 °- The receipts for the same year were $44,372,927, of which $18,851,442 were from the property tax (municipal and state),

and $4,396,124 were from the water tax. The city's indebted- ness increased rapidly for a period of twenty-five years following consolidation. At the beginning of 1856 the funded debt was $16,781,470, by the beginning of 1870 it had grown to $42,401,933, and by the beginning of 1880 to $70,970,041. By the new state constitution adopted in 1873 no municipality is permitted to create a debt exceeding 7% of the assessed value of its taxable property, 1 in 1879 the state legislature passed an act to prevent the city from living beyond its income, and as a consequence of these restrictions the funded debt, less loans held by the sinking fund, was reduced by the beginning of 1895 to $33,139,695. The great expense of installing the new filter plant, developing the park system, and making other improvements has, however, caused it to grow again ; at the beginning of 1910 the total funded debt was $95,483,820 and the net funded debt was $84,901,620.

History. — The patent granted to William Penn for the territory embraced within the present commonwealth of Pennsylvania was signed by Charles II. on the 4th of March 1681 and Penn agreed that " a quantity of land or ground plat should be laid out for a large town or city in the most convenient place upon the river for health and navigation," and that every purchaser of 500 acres in the country shall be allowed a lot of 10 acres in the town or city, " if the place will allow it." In September Penn appointed William Crispin, Nathaniel Allen and John Bezan a commission to proceed to the new province and lay out the city, directing them to select a site on the Delaware where " it is most navigable, high, dry and healthy; that is where most ships can best ride, of deepest draught of water, if possible to load or unload at the bank or key side without boating or lightering of it." Crispin, a kinsman of the pro- prietor, died on the voyage out, but William Heage had been named a fourth commissioner some time after the appointment of the others and the three survivors arrived in the province toward the close of the year. They had been preceded by Penn's cousin, Captain William Markham, as deputy-governor, and were soon followed by the surveyor-general, Thomas Holme. Although the Swedes had established a settlement at the mouth of the Schuylkill not later than 1643 and the site now selected by the commissioners was held by three brothers of the Swaenson family, these brothers agreed to take in exchange land in what is now known as Northern Liberties, and as early as July 1682 Holme, according to modified instructions from Penn for making the lots smaller than originally intended, laid out the city extending from the Delaware river on the east to the Schuylkill river on the west, a distance of about 2 m., and from Vine Street on the north to Cedar (now South) Street on the

south, a distance of about 1 m. Penn landed at New Castle on the Delaware on the 27th of October 1682 and two days later came up as far as Upland, now Chester, 13 m. south of Philadelphia, but when he came to his newly founded city is not known. He is known, however, to have presided at a meeting of the pro- vincial council held here on the 10th of March 1683, and from that time Philadelphia was the capital of Pennsylvania until 1 If the debt of a city already, exceeded the 7 % limit it could be increased only by permission of the legislature.

1799, when Lancaster became the capital. During nearly the whole of this period it was also the most important city com- mercially, politically and socially in the colonies. Quaker influence remained strong in the city, especially up to the be- ginning of the 19th century; and it was predominant in Phila- delphia long after it had given way before the Scotch-Irish in the rest of Pennsylvania. But even in Philadelphia the academy (later the university of Pennsylvania) soon came under the control of the Protestant Episcopal Church. The first Contin- ental Congress met in Carpenters' Hall on the 5th of September 1774; the second in the old state house (Independence Hall) on the 10th of May 1775; and throughout the War of Indepen- dence, except from the 26th of September 1777 to the 18th of June 1778, when it was in possession of the British, 2 Philadelphia was the virtual capital of the colonies; it was a brilliant social city, especially during the British possession. The national convention which framed the present constitution of the United States sat in Philadelphia in 1787, and from 1790 to 1800 the city was the national capital. Here Benjamin Franklin and David Rittenhouse made their great contributions to science, and here Washington delivered his farewell address to the people of the United States. Here, in July and August 1789, the clerical and lay delegates from the Protestant Episcopal Churches in the United States met and formally organized the Protestant Episcopal Church in the United States. Here the first bank in the colonies — the Bank of North America — was opened in 1 781, and here the first mint for the coinage of the money of the United States was established in 1792. The city was visited with an epidemic of yellow fever in 1793 and again in 1798; and in 1832 nearly 1000 inhabitants died of Asiatic cholera.

The original boundaries remained unchanged for 172 years, but the adjoining territory as it became populated was erected into corporated districts in the following order: Southwark (1762), Northern Liberties (1771), Moyamensing (1812), Spring Garden (1813), Kensington (1820), Penn (1844), Richmond (1847), West Philadelphia (1851) and Belmont (1853). In 1854 all these districts, together with the boroughs

of Germantown, Frankford, Manayunk, White Hall, Bridesburg and Aramingo, and the townships of Passyunk, Blockley, Kingsessing, Roxborough, Germantown, Bristol, Oxford, Lower Dublin, Moreland, Byberry, Delaware and Penn was abolished and the boundaries of Philadelphia were extended to the county lines by a single act of the state legislature. The consolidation was in part the outcome of a demand for efficiency in preserving order. There had been occasional outbreaks of disorder: on the 17th of May 1838 an anti-abolition mob had burned Pennsylvania Hall, which had been dedicated three days before to the discussion of abolition, temperance and equality; in May 1844 anti- Catholic rioters had burned St Michael's and St Augustine's churches, and minor riots had occured in 1835, 1842 and 1843. Philadelphia was from the first strongly anti-slavery in sentiment, and it was here in December 1833 that the American Anti- Slavery Society was organized, and in 1856, on the anniversary of the battle of Bunker Hill, that the first national convention of the Republican party met. During the Civil War the arsenal and the Southwark navy yard were busy manufacturing material for the Federal armies, the city was crowded with wounded soldiers, and here in 1864 was held the great sanitary fair for the benefit of the United States sanitary commission, an organiza- tion for the relief and care of wounded and sick soldiers. In 1876, the centennial year of American independence, a great exhibition of the industries of all nations was held in Fairmount Park from the 10th of May to the 10th of November, and about fifty buildings were erected for the purpose. In October 1882 the city celebrated the bi-centennial of the landing of William Penn, and in October 1908 the 225th anniversary of its foundation.

s Lord Howe, who had been in command of the British, embarked for England on the 24th of May, and on the 18th of this month was held for his farewell entertainment the famous Mischianza, a feast of gaiety with a tournament somewhat like those common in the age of chivalry, which was in large part planned by Captain John Andre.

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York, 1900); T. Williams, ” Philadelphia,” in L. P. Powell’s Historic Towns of the Middle States (New York, 1899) ; F. M. Etting, An Historical Account of the Old Slate House (Philadelphia, 1891); E. K. Price, History of the Consolidation of Philadelphia- (Philadelphia, 1873); and Agnes Repplier, Philadelphia, the Place and People (New York, 1898).

PHILADELPHIANS, a sect of religious mystics, founded in London in the latter part of the 17th century. In 1652 Dr John Pordage (1607-1681), rector’ of Bradfield, Berkshire, gathered together a few followers of Jakob Boehme, the chief of whom was Jane Lead or Leade {ne’e Ward; 1623-1704). Pordage was ejected from his living by the Triers in 1655, but was restored in 1660. Mrs Leade had been from girlhood of a mystical temperament, and experienced phantasms which she recorded in a diary entitled A Fountain of Gardens, beginning in 1670, in which year the Philadelphian society was definitely organized. She drew up for it ” The Laws of Paradise,” which show that the enterprise was designed ” to advance the Kingdom of God by improving the life, teaching the loftiest morality, and enforc- ing the duty of universal brotherhood, peace and love.” Its members had a strong faith in what they called the ” Divine Secrets,” the wonders of God and nature, the profound spiritual experiences of regeneration and soul-resurrection, and the second Advent. In 1693 some of Mrs Leade’s writings were translated into Dutch, and by this means and her acquaintance with Francis Lee (1661-1-10), an Oxford scholar who studied medicine at Leiden and became her son-in-law, a connexion was opened up with Germany and Holland. In 1703 the Phila- delphians drew up their confession, but they made no further progress and soon declined. The Holland branch withdrew, and the English government forbade the society to meet. For many years, however, a considerable number of people regarded Mrs Leade’s visions, which were published in a long series of writings, as proofs of her divine calling. In her later years she had a severe struggle with poverty, which was relieved by a pension granted by Baron Kniphausen.

PHILAE, an islet in the Nile above the First Cataract, of great beauty and interest, but since the completion of the Assuan dam in 1902 submerged except for a few months yearly during High Nile (July to October), when the water is allowed to run freely through the sluices of the Assuan dam. Philae is the nearest island to the point where the ancient desert road from Assuan rejoins the river south of the cataract. It marks also the end of the cataract region. Below it the channel is broad and straight with rocky granite islands to the west. The name in Egyptian was Pilak, ” the angle (?) island “: the Arabs call it Anas el

Wagud, after the hero of a romantic tale in the Arabian Nights. Ancient graffiti abound in all this district, and on Bigeh, a larger island adjoining Philae, there was a temple as early as the reign of Tethmosis III. The name of Amasis II. (570-535 b.c.) is said to have been found at Philae, and it is possible that there were still older buildings which have been swallowed up in later constructions. About 350 B.C. Nekhtnebf, the last of the native kings of Egypt, built a temple to Isis, most of which was destroyed by floods. Ptolemy Philadelphus reconstructed some of this work and began a large temple which Ptolemy Euergetes I. completed, but the decoration, carried on under later Ptolemies and Caesars, was never finished. The temple of Isis was the chief sanctuary of the Dodecaschoenus, the portion of Lower Nubia generally held by the Ptolemies and Romans. The little island won great favour as a religious resort, not only for the Egyptians and the Ethiopians and others who frequented the border district and the market of Assuan, but also for Greek and Roman visitors. One temple or chapel after another sprang up upon it dedicated to various gods, including the Nubian Mandulis. Ergamenes (Arkamane), king of Ethiopia, shared with the Ptolemies in the building. Besides

the temple of Isis with its birth-temple in the first court, there were smaller temples or shrines of Arsenuphis, Mandulis, Imuthes, Hathor, Harendotes (a form of Horus) and Augustus (in the Roman style), besides unnamed ones. There were also monu- mental gateways, and the island was protected by a stone quay all round with the necessary staircases, &o, and a Nilometer. The most beautiful of all the buildings is an unfinished kiosque inscribed by Trajan, well known under the name of ” Pharaoh’s Bed.” Graffiti of pilgrims to the shrine of Isis are dated as late as the end of the 5th century a.d. The decree of Theodosius (a.d. 378) which suppressed pagan worship in the empire was of little effect in the extreme south. In a.d. 453 Maximinus, the general of the emperor Marcian, after inflicting a severe defeat on the Nobatae and Blemmyes who were settled in Lower Nubia, and thence raided Upper Egypt, made peace on terms which included permission for these heathen tribes to visit the temple and even to borrow the image of Isis on certain occasions. It was not till the reign of Justinian, a.d. 527-563, that the temple of Philae was finally closed, and the idols taken to Constantinople. Remains of Christian churches were disclosed by the thorough exploration carried out in 1895-1896 in view of the Barrage scheme, under the direction of Captain Lyons. The accumula- tions of rubbish on the island were cleared away and the walls and foundations of the stone buildings were all repaired and strengthened before the dam was completed. The annual flooding now

appears to be actually beneficial to the stonework, by removing the disintegrating salts and incrustations. The tops of most of the buildings and the whole nucleus of the temple of Isis to the floor remained all the year round above the water level until the dam was raised another 26 ft. — a work begun in 1907— when the temples were entirely submerged except during July-October. But the beauty of the island and its ruins and palm trees, the joy of travellers and artists, is almost gone.

See H. G. Lyons, A Report on the Island and Temples of Philae (Cairo, 1896), with numerous plans and photographs; a second report, A Report on the Temples of Philae (1908), deals with the condition of the ruins as affected by the immersions occasioned by the filling of the Assuan dam; Baedeker's Egypt; and on the effects of the submersion, &c, reports in Annates du service des anttquttes, vols. iv. v. (F. Ll. (j.J

PHILARET [Theodore Nikitich Romanov] (?i553-i633), patriarch of Moscow, was the second son of the boyar Nikita Romanovich. During the reign of his first cousin Theodore I. (1 584-1 598), Theodore Romanov distinguished himself both as a soldier and a diplomatist, fighting against the Swedes in 1590, and conducting negotiations with the ambassadors of the emperor Rudolph II. in 1 593-1 594- On the death of the childless tsar, he was the popular candidate for the vacant throne; but he acquiesced in the election of Boris Godunov, and shared the disgrace of his too-powerful family three years later, when Boris compelled both him and his wife, Xenia Chestovaya, to take monastic vows under the names of Philaret and Martha respec- tively. Philaret was kept in the strictest confinement in the Antoniev monastery, where he was exposed to every conceivable indignity; but when the pseudo-Demetrius overthrew the Godunovs he released Philaret and made him metropolitan of Rostov (1605). In 1609 Philaret fell into the hands of pseudo- Demetrius II., who named him patriarch of all Russia, though his jurisdiction only extended over the very limited area which acknowledged the impostor. From 1610-1618 he was a prisoner in the hands of the Polish king, Sigismund III., whom he refused to acknowledge as tsar of Muscovy on being sent on an embassy to the Polish camp in 1610. He was released on the conclusion of the truce of Deulino (Feb. 13, 1619), and on the 2nd of June was canonically enthroned patriarch of Moscow. Henceforth, till his death, the established government of Muscovy was a diarchy. From 1619 to 1633 there were two actual sovereigns, Tsar Michael and his father, the most holy Patriarch Philaret. Theoretically they were co-regents, but Philaret frequently transacted affairs of state without consulting the tsar. He replenished the treasury by a more equable and rational system of assessing and collecting the taxes. His

most important

domestic measure was the chaining of the peasantry to the soil, a measure directed against the ever increasing migration of the down-trodden serfs to the steppes, where they became free- booters instead of tax-payers. The taxation of the tsar's slyuzhnuie lyudi, or military tenants, was a first step towards the proportional taxation of the hitherto privileged classes. Philaret's zeal for the purity of orthodoxy sometimes led him Wo excesses: but he encouraged the publication of theological works, formed the nucleus of the subsequently famous Patri- archal Library, and commanded that every archbishop should establish a seminary for the clergy, himself setting the example. Another great service rendered by Philaret to his country was the reorganization of the Muscovite army with the help of foreign officers. His death in October 1633 put an end to the Russo- Polish War (1632-33), withdrawing the strongest prop from an executive feeble enough even when supported by all the weight of his authority.

See R. N. Bain, The Firsl Romanovs (London, 1905) ; S. M. Solovev, Hist, of Russia (Rus.), vol. ix. (St Petersb. 1895, &c.) (R. N. B.)

PHILATELY (Gr. l\os, loving, and areX-qs, free of tax), the study and collection of postage-stamps and other marks of pre- payment issued by post-offices. The fancy for collecting postage- stamps began a short time after the issue of the first British penny and two-penny stamps in 1840 (see Post and Postal Service). Dr Gray, an official of the British Museum, began collecting them soon after their appearance, and an advertise- ment in an issue of The Times of 1841 asks for gifts of cancelled stamps for a young lady. In 1842 the new hobby was ridiculed in Punch. It was not until about i860, however, that stamp collecting began to be systematically carried on with full regard to such minutiae as the different kinds of paper, water-marks, perforation, shade of colour and distinctive outline. About 1862 a teacher in Paris directed that foreign stamps should be collected and pasted upon the pages of his pupils' atlases and geographies according to countries, and this may have been the first form of the systematic classification of stamps in a collection. Of existing collections the oldest were begun between 1853 and i860, by which year French collectors had assumed especial prominence. Professional dealers now made their appearance, and in 1861 philatelic literature, now of vast extent, was in- augurated by the publication in Strasburg of a

catalogue of stamps issued up to that time. The Paris collectors were the first to classify stamps, measure them by the gauge, note the water-marks and separate the distinct issues of each country. Collecting with due regard to the relationship of different issues is called plating. The first English catalogue was issued in 1862, followed in December of the same year by The Stamp Collector's Review and Monthly Advertiser, published in Liverpool, the first philatelic periodical, the second, The Stamp Collector's Magazine, appearing in 1863. In 1863 also appeared Le Timbre- Poste, a Brussels journal. Up to 1910 over 800 philatelic periodicals had appeared.

Although small bodies of enthusiasts had banded together in England, France and the United States for the study and collection of postage-stamps as early as 1865, it was not until 1869 that the first great club, the Philatelic Society of London, still the most important in the world, was founded. Other societies in Great Britain are the Junior Philatelic of London, and those of Birmingham, Manchester, Edinburgh and Leith. The leading society in America is. the American Philatelic Association; in France the Societe francaise de timbrologie; in Germany the Internationaler Philatelislen-Verein. More than 400 such organizations are now in existence, the majority of them in the United States and Germany. At a philatelic con- gress, held in London in 19 10, the formation of a universal union of philatelic societies " to discourage unnecessary or speculative issues " was considered.

Not only the stamps themselves were collected, but " entires," i.e. postcards, envelopes with the stamps still adhering, &c. Marks of prepayment at last became so numerous that, about 1880, specialists began to appear, who restricted their collections to the stamps of some particular country or continent, or to

postcards or newspaper-wrappers alone. The most extensive and valuable stamp collection in the world, that of Baron P. von Ferrary of Paris, was begun about 1865. This collection, which cost its owner at least £250,000, contains a cancelled and an uncancelled specimen of each stamp. The next greatest collection is that bequeathed to the British nation in 1891 by T. K. Tapling, M.P., now in the British Museum. Among other important collections may be mentioned those in the German Postal Museum in Berlin, of King George V. of England, W. B. Avery, H. J. Duveen and the earl of Crawford. The largest sum realized for an entire collection was £27,500, which was paid for that of M. P. Castle, consisting of European stamps only. The value of a stamp depends partly upon its age, but much more upon its rarity, which again is dependent upon the number of the particular stamps originally issued. Most stamps have a quoted value, but some possess

a conventional value only, such as those of which only one or two specimens are known to exist ; for instance, the one-cent stamp of the 1856 issue of British Guiana (one known copy); the Italian 15 centesimi stamp of 1865 converted by an overprint into 20 centesimi (one copy); the Cape of Good Hope triangular, printed by mistake on paper intended for stamps of other colonies (four copies) ; and the 2 cent stamps of the earliest issue of British Guiana (ten copies). The best known of the very rare stamps are the id. and 2d. ” Post- Office ” Mauritius, for which higher prices have been paid than for any other stamps, although 23 copies are known to exist out of the 1000 issued. For a fine specimen of these Mauritius stamps £2000 has been offered. Two of them have been sold for £2400. Philatelic exhibitions such as those held in London in 1890 and 1897 and in Manchester in 1909 have proved popular.

” Reprints ” are reimpressions, taken from the original plates, of obsolete stamps, and have a much smaller value than speci- mens of the original issue. Forgeries of the rarer stamps are common but are easily detected. Modern postage-stamp albums are often beautiful specimens of the printer’s art, reproductions of every known stamp being given in the original colours.

See W. J. Hardy and E. D. Bacon, The Stamp Collector (London, 1898); Oliver Firth, Postage Stamps and Their Collection, (1897); F. J. Melville, A B C of Stamp Collecting (1903) ; Caiman and Collin, Catalogue for Advanced Collectors (New York, 1902) ; Hastings E. Wright and A. B. Creeke, History of the Adhesive Stamps of the British Isles (London, 1899) ; J. K. Tiffany, Stamp Collector’s Library Companion (Chicago, 1889); Luff, The Postage Stamps of the United States (New York, 1902) ; W. E. Daniells, History of British Post-marks (London, 1898); L. Salefranque, Le Timbre a travers Vhistoire (Rouen, 1890) ; R. Senf , Illustrierter Postwerthzeichenkatalog (Leipzig, annually) ; Krotzsch, Permanentes Handbuch der Postfreimarkenkunde (Leipzig, annually) ; periodicals : The London Philatelist (monthly) ; Illustrierte Brief marken-Zeitung (Leipzig).

PHILEMON (c. 361-263 B.C.), Greek poet of the New Comedy, was born at Soli in Cilicia, or at Syracuse. He settled at Athens early in life, and his first play was produced in 330. He was a contemporary and rival of Menander, whom he frequently vanquished in poetical contests. Posterity reversed the verdict and attributed Philemon’s successes to unfair influence. He made a journey to the east, and resided at the court of Ptolemy, king of Egypt, for some time. Plutarch (De Cohibenda Ira, 9) relates that on his journey he was driven by a storm to Cyrene, and fell into the hands of its king Magas, whom he

had formerly satirized. Magas treated him with contempt, and finally dis- missed him with a present of toys. Various accounts of his death are given; a violent outburst of laughter, excess of joy at a dramatic victory, or a peaceful end while engaged in composing his last work (Apuleius, Florida, 16; Lucian, Macrob. 25; Plutarch, An Seni, p. 725). Of the ninety-seven plays which he is said to have composed, the titles of fifty-seven and considerable fragments have been preserved. Some of these may have been the work of his son, the younger Philemon, who is said to have composed fifty-four comedies. The Merchant and The Treasure of Philemon were the originals respectively of the Mercator and Trinummus of Plautus, The fragments preserved by Stobaeus, Athenaeus and other writers contain much wit and good sense. Quintilian (Instit. x. 1, 72)

assigned the second place among the poets of the New Comedy to Philemon, and Apuleius, who had a high opinion of him, has drawn a comparison between him and Menander.

See A. Meineke, Menandri et Philemonis reliquiae (1823, including Bentley's emendations) ; T. Kock, Comicorum graecorum fragmenta, vol. iii. (1884).

PHILEMON, EPISTLE TO, a scripture of the New Testament. Onesimus, a slave, had robbed (vv. n, 18-19) an d run away from his master Philemon, a prosperous and influential Christian citizen of Colossae (Col. iv. 9), either offence rendering him liable to be crucified. Voluntarily or accidentally, he came across Paul, who won him over to the Christian faith. In the few tactful and charming lines of this brief note, the apostle sends him back to his master with a plea for kindly treatment. After greeting Philemon and his wife, with Archippus (possibly their son) and the Christians who met for worship at Philemon's house (vv. 1-2), Paul rejoices over (w. 4-7) his correspondent's character; it encourages him to make an appeal on behalf of the unworthy Onesimus (8-21), now returning (Col. iv. 9) along with Tychicus to Colossae, as a penitent and sincere Christian, in order to resume his place in the household. With a line or two of personal detail (22-25) the note closes.

Rome would be a more natural rendezvous for fugitivarii (runaway slaves) than Caesarea (Hilgenfeld and others), and it is probable that Paul wrote this note, with Philippians and Colossians, from the

metropolis. As Laodicea is close to Colossae it does not follow, even if Archippus be held to have belonged to the former town (as Lightfoot argues from Col. iv. 13-17), that Philemon's residence must have been there also (so A. Maier, Thiersch, Wieseler, &c). Paul cannot have converted Philemon at Colossae (Col. ii. 1), but elsewhere, possibly at Ephesus; yet Philemon may have been on a visit to Ephesus, for, even were the Ephesian Onesimus of Ignatius (Eph. ii.) the Onesimus of this note, it would not prove that he had always lived there. No adequate reason has been shown for suspecting that the note is interpolated at any point. The association of Timotheus with Paul (v. 1) does not involve any official tinge, which would justify the deletion of nal Tifiodeos b aSeKcjm nov in that verse, and of fifiuv in vv. 1-2 (so Holtzmann), and Hausrath's suspicions of the allusion to Paul as a prisoner and of v. 12 are equally arbitrary. The construction in vv. 5-6 is difficult, but it yields to exegetical treatment (cf. especially Haupt's note) and does not involve the interpolation of matter by the later redactor of Colossians and Ephesians (Holtzmann, Hausrath 1 and Bruckner, Reihenfolge d. paul. Brief e, 200 seq.).

The brevity of the note and its lack of doctrinal significance prevented it from gaining frequent quotation in the early Christian literature, but it appears in Marcion's canon as well as in the Muratorian, whilst Tertullian mentions, and Origen expressly quotes it. During the 19th century, the hesitation about Colossians led to the rejection of Philemon by some critics as a pseudonymous little pamphlet on the slave question — an aberration of literary criticism (reproduced in Ency. Bib., 3693 seq.) which needs simply to be chronicled. It is interesting to observe that, apart from the letter of commendation for Phoebe (Rom. xvi.), this is the only letter in the New Testa- ment addressed, even in part, to a woman, unless the second epistle of John be taken as meant for an individual.

Bibliography. — In addition to most commentaries on Colossians and to Dr M. R. Vincent's edition of Philippians, compare special exegetical studies by R. Rollock (Geneva, 1602), G. C. Storr (1781), J. K. I. Demme, Erkldrung d. Philemon-Brief es (1844); H. A. Peter- mann, Ad fidem versionum . . . cum earum textu orig. graece (Berlin, 1844); M. Rothe, Pauli ad Philem. epistolae interpretatio historico-exegetica (Bremen, 1844); and H. J. Holtzmann, Zeitschrift fur 'wissen. Theologie (1873), pp. 428 sqq., besides the essays of J. G. C. Klotzsch, De occasione et indole epistolae ad Philem. (1792); D. H. Wildschut, De vi dictionis et sermonis elegantia in epistola ad Philem. (1809) ; and J. P. Esser, Der Brief an Philemon (1875). An up-to-date survey of criticism is furnished by Dr J. H. Bernard in Hastings's Dictionary of the Bible, iv. 832-834, and a good exposition may be

found in Z. Weber's Der Brief an d. Philemon, ein Vorbild fur die

1 History of the New Testament Times (1895), ' v – 122-123. See, on this, Schenkel's Bibel-Lexikon, iv. 531-532.

chrisil. Behandlung sozialer Fragen (1896), as well as in Dr A. H. Drysdale's devotional commentary (London, 1906). (J. Mi.)

PHILEMON and BAUCIS, the hero and heroine of a beautiful story told by Ovid (Metam. viii. 610-715), the scene of which is laid in Phrygia. Zeus, accompanied by Hermes, visited earth in human form; tired and weary, they sought shelter for the night, but all shut their doors against them except an aged couple living in a humble cottage, who afforded them hospitality. Before their departure the gods revealed themselves, and bade their hosts follow them to the top of a mountain, to escape the punishment destined to fall on the rest of the inhabitants. The country was overwhelmed by a flood; the cottage, which alone remained standing, was changed into a magnificent temple. The gods appointed Philemon and Baucis priest and priestess, and granted their prayer that they might die together. After many years they were changed into trees — Philemon into an oak, Baucis into a lime. The story, w,hich emphasizes the sacred duty of hospitality, is probably of local Phrygian origin, put together from two widely circulated legends of the visits of gods to men, and of the preservation of certain individuals from the flood as the reward of piety. It lingers in the account (Acts xiv.) of the healing of the lame man by Paul at Lystra, the inhabitants of which identified Paul and Barnabas with Zeus and Hermes, " come down in the likeness of men."

Similar stories are given in J. Grimm, Deutsche Mythologie (Eng. trans., 1883, ii. 580, and iii. 38).

PHILES, MANUEL (c. 1275-1345), of Ephesus, Byzantine poet. At an early age he removed to Constantinople, where he was the pupil of Georgius Pachymeres, in whose honour he composed a memorial poem. Philes appears to have travelled extensively, and his writings contain much information concern- ing the imperial court and distinguished Byzantines. Having offended one of the emperors by indiscreet remarks published in a chronography, he was thrown into prison and only released after an abject apology. Philes is the counterpart of Theodoras Prodromus in the time of the Comneni; his character, as shown in his poems, is that of a begging poet, always pleading poverty, and ready to descend to the grossest flattery to obtain the favour- able notice of the great. With one unimportant exception, his productions are in verse, the greater part in

dodecasyllabic iambic trimeters, the remainder in the fifteen-syllable ” political ” measure.

Philes was the author of poems on a great variety of subjects : on the characteristics of animals, chiefly based upon Aelian and Oppian, a didactic poem of some 2000 lines, dedicated to Michael Palaeo- logus; on the elephant; on plants; a necrological poem, probably written on the death of one of the sons of the imperial house; a panegyric on John Cantacuzene, in the form of a dialogue; a con- versation between a man and his soul; on ecclesiastical subjects, such as church festivals, Christian beliefs, the saints and fathers of the church ; on works of art, perhaps the most valuable of all his pieces for their bearing on Byzantine iconography, since the writer had before him the works he describes, and also the most successful from a literary point of view; occasional poems, many of which are simply begging letters in verse.

Editions: the natural history poems in F. Lehrs and F. Diibner, Poetae bucolici et didactici (Didot series, 1846); Manuelis Philae Carmina inedita, ed. A. Martini (1900) ; Manuelis Philae Carmina ed. E. Miller (1855-1857). See also C. Krumbacher, Geschichte der byzantinischen Liiteratur (1897).

PHILETAS of Cos, Alexandrian poet and critic, flourished in the second half of the 4th century B.C. He was tutor to the son of Ptolemy I. of Egypt, and also taught Theocritus and the grammarian Zenodotus. His thinness made him an object of ridicule; according to the comic poets, he carried lead in his shoes to keep himself from being blown away. Oˆer-study of Megarian dialectic subtleties is said to have shortened his life. His elegies, chiefly of an amatory nature and singing the praises of his mistress Battis (or Bittis), were much admired by the Romans. He is frequently mentioned by Ovid and Propertius, the latter of whom imitated him and preferred him to his rival Callimachus, whose superior mythological lore was more to the taste of the Alexandrian critics. Philetas was also the author of a vocabulary called “Atclkto., explaining the meanings of rare

and obscure words, including words peculiar to certain dialects; and of notes on Homer, severely criticized by Aristarchus.

Fragments edited by N. Bach (1828), and T. Bergk, Poetae lyrici graeci; see also E. W. Maass, De tribus Philetae carminibus (1895).

PHILIDOR, FRANCOIS ANDRfi DANICAN (1726-1795), French composer and chess-player, was born at Dreux, on the 7th of September 1726, of a musical family. The family name was Danican, but that of Philidor, added in the middle of the 17th century, eventually supplanted the older name. Francois Andre received a musical education as a member of the corps of pages attached to the orchestra of the king; and subsequently he earned his living by giving lessons and copying music. Much of his time was, however, devoted to chess, at which he soon became an expert. He spent many years in travelling on the Continent and in England, meeting and defeating the most noted players of the time, and is regarded as the strongest player and greatest theoretician of the 18th century. Returning to France in 1754, he resolved to devote himself seriously to musical composition, and after producing several works of minor im- portance brought out at Paris, in the year 1759, his successful light opera, Blaise le Savetier, which was followed by a' number of others, notably Le Soldat magicien (1760), Le Jardinier et son seigneur (1761), Le S order (1762), and Tom Jones (1764). He died in London on the 31st of August 1795.

PHILIP (Gr. "KAmtttoj, fond of horses, from 4>i\elv, to love, and wnros, horse; Lat. Philippus, whence e.g. M. H. Ger. Philippes, Dutch Filips, and, with dropping of the final s, It. Filippo, Fr. Philippe, Ger. Philipp, Sp. Felipe), a masculine proper name, popularized among the Christian nations as having been that of one of the apostles of Christ. Notices of distinguished men who have borne this name are arranged below in the following order: (1) Biblical; (2) Kings of Macedonia, France, Germany and Spain; (3) other rulers.

PHILIP, one of the twelve apostles, mentioned fifth in all the lists (Matt. x. 3; Mark iii. 18; Luke vi. 14; Acts i. 13). He is a mere name in the Synoptists, but a figure of some prominence in the Fourth Gospel. There he is said to have been " of Beth- saida, the city of Andrew and Peter," and to have received his call to follow Jesus at Bethany, having previously been, it would seem, a disciple of the Baptist (John i. 43, 44; cf. 28). Philip was at that time the means of bringing Nathanael to Jesus (John i. 45), and at a later date he, along with Andrew, carried the request of the inquiring Greeks to the Master (John xii. 22). Philip and Andrew alone are mentioned by name in connexion with the feeding of the five thousand (John vi. 5, 7), and Philip is also one of the few interlocutors in John .xiv. Slight though these references are, all agree in presenting Philip as of an inquir- ing and calculating character, slow to take the initiative, but, when convinced of the path of duty, thoroughly loyal in following it. After the resurrection he was present at the election of Matthias as successor

to Judas, but he does not again appear in the New Testament history; it is, however, implied that he still continued in Jerusalem after the outbreak of the first persecution.

Little reliance can be placed on the traditional accounts of Philip, owing to the evident confusion that had arisen between him and the evangelist of the same name, who appears in the book of Acts (see below). According to Polycrates, bishop of Ephesus, in his controversial letter written to Victor of Rome towards the end of the 2nd century (ap. Euseb. H. E., iii. 31, v. 24), the graves of Philip "of the twelve apostles," and of his two aged virgin daughters were in (the Phrygian) Hierapolis; a third daughter, " who had lived in the Holy Ghost," was buried at Ephesus. With this may be compared the testimony of Clement of Alexandria, who incidentally (Strom, iii. 6) speaks of " Philip the Apostle " as having begotten children and as having given daughters in marriage. On the other hand, Proclus, one of the interlocutors in the " Dialogue of Caius," a writing of somewhat later date than the letter of Polycrates, mentions (ap. Euseb. H. E., iii. 31) " four prophetesses, the daughters of Philip at Hierapolis in Asia, whose tomb and that of their father are to be seen there," where the mention of the

daughters prophesying identifies the person meant with the Philip of Acts (cf. Acts xxi. 8). The reasons for setting aside this latter identification, and for holding that the Philip who lived at Hierapolis was the Apostle are clearly stated by Lightfoot, Colossians (2) note 3, p. 45 seq., and fresh confirmation of his view has recently been afforded by the discovery of an inscription at Hierapolis, showing that the church there was dedicated to the memory " of the holy and glorious apostle and theologian Philip " (Ramsay, Cities and Bishoprics of Phrygia, vol. i., pt. ii. p. 552). .

See also Corssen, " Die Tochter des Philippus " in the Zeitschrift fur die neutestamentliche Wissenschaft (1901), p. 289 sqq. The othei view, that the Philip of Hierapolis is the Philip of Acts, is taken by Zahn, Forschungen zur Geschichte des neutestamentlichen Kanons (1900), vi. 158 sqq.

A later stage of the tradition regarding Philip appears in various late apocryphal writings which have been edited by Tischendorf in his Acta apostolorum apocrypha, and in his Apocalypses apocryphae. According to the Acta Philippi, a work belonging at the earliest to the close of the 4th century (see Zahn, op. cit. p. 18 sqq.), Philip, with Bartholomew and his own sister Mariamne, exercised a widespread missionary activity, preaching not only throughout Asia Minor, but

also in Hellas the city of the Athenians, in Scythia, and in Gaul, &c. According to one account he died a natural death; according to another he was hanged or crucified, head downwards. An apocryphal gospel, which describes the progress of the soul through the next world, bears his name (Hennecke, Neutestamentliche Apokryphen, 1904, p. 40 seq.).

Since the 6th century Philip has been commemorated in the West, along with St James the Less, on the 1st of May, their relics being deposited in the same church in Rome; in the Eastern Church Philip's day is the 14th of November, and that of James the Less the 23rd of October.

PHILIP, " the evangelist," is first mentioned in the Acts (vi. 5) as one of " the seven " who were chosen to attend to certain temporal affairs of the church in Jerusalem in conse- quence of the murmurings of the Hellenists against the Hebrews. After the martyrdom of Stephen he went to " the city of Samaria," where he preached with much success, Simon Magus being one of his converts. He afterwards instructed and baptized the Ethiopian eunuch on the road between Jerusalem and Gaza; next he was " caught away " by the Spirit and " found at Azotus " (Ashdod), whence " passing through he preached in all the cities till he came to Caesarea " (Acts viii.). Here some years after- wards, according to Acts xxi. 8, 9, where he is described as " the evangelist " (a term found again in the New Testament only in Eph. iv. 11; 2 Tim. iv. 5), he entertained Paul and his com- panion on their way to Jerusalem; at that time " he had four daughters which did prophesy." At a very early period he came to be confounded with the apostle Philip (see above) ; the confusion was all the more easy because, as an esteemed member of the apostolic company, he may readily have been described , as an apostle in the wider sense of that word (see further Salmon, Inlrod. to the New Testament, 7th ed., p. 3 13 sqq.) . A late tradition describes him as settling at Tralles in Asia Minor, where he be- came the overseer or ruler of the church. " Philip the deacon " is commemorated on the 6th of June.

PHILIP I., king of Macedonia, a semi-legendary prince, son of Argaeus, was, according to Herodotus (viii. 137-139) and Thucydides (ii. 100), the third of the Macedonian kings. In the texts of Dexippus and Eusebius he ranks sixth, Caranus, Coenus and Thurimas (or Turimmas) being there regarded as the pre- decessors of Perdiccas I., whom Herodotus and Thucydides regard as the first king of Macedonia. Eusebius and Dexippus assign to Philip I. a reign of 38 and 35 years respectively. There is, however, no real evidence for his existence. (E. E. B.)

PHILIP II. (382-336 B.C.), king of Macedonia, the son of Amyntas II., and the Lyncestian Eurydice, reigned 359-336. At his birth the Macedonian kingdom, including the turbulent peoples of the hill-country behind, was very imperfectly con- solidated. In 370 Amyntas died, and the troubled reign of

Philip's eldest brother, Alexander II., was cut short in 368 by his assassination. His murderer, Ptolemy of Alorus, ruled as regent for the young Perdiccas, Amyntas's second son. In 367 Philip was delivered as hostage to the Thebans, then the leading power of Greece (by whom does not seem clear). During the three years he spent at Thebes the boy no doubt observed and learnt much. When he returned to Macedonia (364) Perdiccas had succeeded in getting rid of Ptolemy; but he fell in 360-359 before an onset of the hill tribes instigated by the queen-mother Eurydice, leaving only an infant son. Various pretenders sprang up and the kingdom fell into confusion. Philip seized the throne and drove back his rivals. He now began the great task of his life — the creation of the Macedonian national army. The first experiment he made with this new organism was brilliantly successful. The hill tribes were broken by a single battle in 358, and Philip established his authority inland as far as Lake Ochrida. In the autumn of the same year he took the Athenian colony, Amphipolis, which commanded the gold-mines of Mt Pangaeus. Their possession was all-important for Philip, and he set there the new city, called after him, Philippi. Athens was temporarily pacified by assurances that Amphipolis would be handed over to her later on. The work of fashioning the Macedonian army occupied Philip for the next few years, whilst his diplomacy was busy securing partisans within the states of Greece. He avoided as yet a forward policy, and having taken Pydna and Potidaea soon after Amphipolis, he made them over to the Olynthian confederation (see Olynthus). His marriage with the fierce witch-woman, Olympias, daughter of the Epirote king, falls in this period, and in 356 she bore him his greater son, Alexander. In 353 Philip was ready for strong action. He first attacked Abdera and Maronea, on the Thracian sea-board, and then took Methone, which belonged to Athens. An overt breach with Athens was now inevitable. In the same summer he in- vaded Thessaly, where the Aleuadae of Larissa ranged themselves on his side against the tagus Lycophron," tyrant " of Pherae. Pherae called in the help of the Phocian mercenaries, who had profaned Delphi, and Philip met with a check. He had, however, the advantage of now being able to present himself

to the Greeks as the champion of Apollo in a holy war, and in 352 the Mace- donian army won a complete victory over the Pheraeans and Phocians. This battle made Philip tagus of Thessaly, and he claimed as his own Magnesia, with the important harbour of Pagasae. Hostilities with Athens did not yet take place, but Athens was threatened by the Macedonian party which Philip's gold created in Euboea.

From 352 to 346 Philip did not again come south. He was active in completing the subjugation of the Balkan hill-country to the west and north, and in reducing the Greek cities of the coast as far as the Hebrus (Maritza). For the chief of these, indeed, Olynthus, he continued to profess friendship till its neighbour cities were in his hands. Then, in 349, he opened war upon it. Athens, to whom Olynthus appealed, sent no adequate forces, in spite of the upbraidings of Demosthenes (see his Olynthiacs) , and in the spring of 347 Olynthus fell. Philip razed it to the ground (see Olynthus). Macedonia and the regions adjoining it having now been securely consolidated, Philip celebrated his " Olympian " games at Dium. In 347 Philip advanced to the conquest of the eastern districts about the Hebrus, and compelled the submission of the Thracian prince Cersobleptes. Meanwhile Athens had made overtures for peace (see the 'De falsa legatione of Demosthenes), and when Philip, in 346, again moved south, peace was sworn in Thessaly. The time was come for Philip to assert himself in Greece, and the Phocians, who still dominated Delphi and held Thermopylae, could furnish a pretext to the champion of Pan-Hellenism and Apollo. The Phocian mercenaries at Thermopylae were bought off and Philip crossed into central Greece. Here he made Thebes his ally and visited the Phocians with crushing vengeance. The Pythian games of 346 were celebrated at the delivered Delphi under Philip's presidency. Pan-Hellenic enthusiasts already saw Philip as the destined captain-general of a national crusade against Persia (Isocrates, Philippus, about 345). And

such a position Philip had determined to secure: the Macedonian agents continued to work throughout the Greek states, and in the Peloponnesus Sparta soon found herself isolated. Euboea,, too, submitted to Macedonian influence, and even received some garrisons. But more work had to be done in the Balkan high- lands. In 344, or one of the following years, the Macedonian arms were carried across Epirus to the Adriatic. In 342 Philip led a great expedition north " comparable to nothing in antiquity since Darius' famous march to Scythia." In 341 his army was still campaigning in eastern Thrace, when Philip felt compelled to show his presence in Thessaly. During these years, although Athens had not overtly broken the peace of 346, there had been various diplomatic bickerings and hostile intrigues

between the two powers (cf. the Philippics of Demosthenes). Athens had even sent emissaries to the Persian court to give warning of the proposed national crusade. She now egged on the cities of the Propontis (Byzantium, Perinthus, Selymbria). who felt themselves threatened by Philip's Thracian conquests, to declare against him. The sieges of Perinthus and Byzantium (340, 339) ended in Philip's meeting with a signal check, due in some measure to the help afforded the besieged cities by Athens and her allies. Philip's influence all over Greece was compromised. But before marching south he led another expedition across the Balkans into the country now called Bulgaria, and returned to Pella with much spoil but severely wounded in the thigh. In 338 he once more crossed into central Greece. The pretext was the con- tumacy shown by the Locrian town Amphissa to the rulings of the Amphictyonic Council. Philip's fortification of Elatea filled Athens with alarm. Thebes was induced to join Athens; so were some of the minor Peloponnesian states, and the allies took the field against Philip. This opposition was crushed by the epoch-making battle of Chaeroneia, which left Greece at Philip's feet. In the following year (337) Philip was in the Peloponnesus, and a congress of the Greek states at the Isthmus (from which, however, Sparta held sullenly aloof) recognized Philip as captain-general for the war against Persia. Philip returned to Macedonia to complete his preparations ; an advanced force was sent into Asia in the spring of 336. But Philip's plans were suddenly blasted by his assassination in the same year during the marriage festival of his daughter at Aegae, the old capital of Macedonia. He left, however, in the Macedonian army a splendid instrument which enabled his son within ten years to change the face of the world.

Philip stands high among the makers of kingdoms. Restless energy, determination, a faculty for animating and organizing a strong people, went with unscrupulous duplicity and a full- blooded vehemence in the pleasures of sense. Yet Philip was not untouched by ideal considerations, as is proved by the respect, no doubt sincere, which he showed for Hellenic culture, by the forbearance and deference with which he treated Athens, the sacred city of that culture and his mortal foe. A special interest belongs to the Macedonian kingdom as it was shaped by Philip, since it forestalls a system which was not to find the time ripe for it in European history till many centuries later — the national kingdom quickened with the culture developed by the ancient city-states. The national kingdoms founded by the Northern races, after the fall of the Roman Empire, under the influence of the classical tradition, are the beginnings of the modern European system; Philip of Macedon foreshadows Theodoric, Charlemagne and William

the Conqueror. But this first national kingdom within the sphere of Greek culture could not ultimately live between the surge of the Northern barbarians and the Roman power.

See the authorities under Greece: History. A vivid and masterly sketch of Philip's personality and work is given in D. G. Hogarth's Philip and Alexander (1897). (E. R. B.)

PHILIP III. [Arrhidaeus], king of Macedonia, was the feeble-minded son of Phiiip II. of Macedonia by a Thessalian wife. He was chosen by the Macedonian army at Babylon in 323 to be nominal king conjointly with the infant Alexander, and was killed in Macedonia by order of Olympias (317). (See Macedonian Empire.)

PHILIP IV., king of Macedonia, was the son of Cassander, king of Macedonia: he reigned only one year (297-296).

PHILIP V., king of Macedonia, son of Demetrius II. and Chryse'is, was an infant at his father's death in 230-229. His cousin, Antigonus Doson, administered the kingdom as regent till his death in 221-220, when Philip was eighteen years old. Philip now ascended the throne and reigned till 179. His reign was occupied in the vain struggle to maintain the old Macedonian supremacy in the Balkan Peninsula, which became hopeless after the intervention of Rome and the decisive battle of Cynoscephalae (197). See Rome: History, § II. " The Republic " (period B, § b). (E. R. B.)

PHILIP I. (1052-1108), king of France, eldest son of Henry I. of France and Anne, daughter of Jaroslav I. (d. 1054), grand duke of Kiev, came to the throne, when a child of eight, by the death of his father on the 4th of August 1060. He had been crowned at Reims, in the presence of a number of magnates, on the 23rd of May 1059. Philip passed most of his early years in and around Paris, where the castles of lawless barons, such as that of Montlhery, threatened even his personal safety. His minority came to an end in 1066. In the long reign that fol- lowed he showed no great ability or energy, and a looseness of morals which embroiled him with the Church. Before he was fifty years of age he became " fond of nothing but good cheer and sleep." But he increased the lands of his house around Paris, maintained order in them, and held his own against William I. and William II. of England, whose power in France far exceeded his own. This he accomplished for the most part by taking advantage of the quarrels among his vassals. When Baldwin VI. of Flanders died, in 1070, his son Ar'nulf was

attacked by his uncle Robert the Frisian, count of Holland. Philip interfered, at the prayer of Arnulf's mother, Richildis; but the allies were defeated near Cassel on the 22nd of February 107 1 and Arnulf slain. After a second war peace was sealed, apparently, by the marriage of Philip to Robert's step-daughter Bertha, daughter of Gertrude of Saxony and Florence, count of Holland. In 1074 a new rupture led to Philip seizing Corbie, part of the dower of his aunt Adele, who had married Baldwin IV. of Flanders. By this he secured a sort of outpost in the direction of Flanders. The other main episodes of his reign were the quarrel over the Angevin inheritance and his wars with the dukes of Normandy. In the struggle between Fulk Rechin and his brother Geoffrey the Bearded for the inheritance of their uncle, Geoffrey Martel (d. 1060), count of Anjou, Philip received from Fulk in 1069, as the price of his neutrality, Chateau Landon and the Gatinais. This acquisition linked the county of Sens, acquired in 1055, with the rest of the domain round Paris, Melun and Orleans. War with William I. was chronic but intermittent. In 1076 Philip forced him to raise the siege of Dol in Brittany. Peace was made in 1077, and in December 1079 they together besieged Robert Curthose in the castle of Gerberoy. On the 8th of May 1080 the siege was raised and peace made. War with William began again in 108 1 over the county of Vexin, which Philip had seized on the retirement of its count, Simon of Valois, to a monastery in 1076. William demanded reparation for the raid of Philip's vassals and the cession of Pontoise, Chaumont-en-Vexin and Mantes, but died after sacking Mantes in the same year. In 1098 there was war between Philip and William Rufus in both Maine and the Vexin. William came in person from Maine to lead the attack in the Vexin in September, and crossed the Seine, penetrating to within 30 m. of Paris on the west; but the campaign brought no results. In his last years Philip left the duty of repelling the attacks of his Norman and other enemies to his son Louis, associating him with himself, as " king-designate," some time between the 24th of May 1098 and the 25th of September 1100. It was his second marriage which was the cause of Philip's greatest difficulties. On the 15th of May 1092 he carried off Bertrada, daughter of Simon, baron de Montfort, wife of Fulk Rechin, and prepared to marry her, though his wife Bertha was still living. The bishops, headed by Ivo, bishop of Chartres, refused to attend the ceremony of marriage, but one was found

to perform it. Philip's open simony had long been a cause of friction with the papacy. When he added bigamy and adultery, Urban II. excommunicated him. The bishop of Chartres, in consequence, refused to bring his vassals to help Philip's ally, Robert, duke of Normandy,

against his brother William in 1094. Bertha died in that year, but Fulk was still living, and the sentence was renewed at the council of Autun on the 15th of October. Philip replied by summoning the bishops to Paris to try Ivo of Chartres for treason. He gained a respite from the papal sentence by promises of submission, but the sentence was renewed by Urban at the council of Clermont in 1095, in 1096, and in 1097, and at Poitiers in 1101, despite the protest of William IX., count of Poitiers, who entered the church with his knights to prevent his suzerain from being excommunicated on his lands. Philip was reconciled with the Church in 1104, and took an oath not to have any converse or society with Bertrada except in the presence of " non-suspect " persons. But they seem to have gone on living together, and even visited Fulk Rechin (Bertrada's husband) in company on the 15th of October 1 106. Philip died at the end of July 1108.

His reign is chiefly remarkable for the steady growth of the royal domain. In addition to the gains mentioned, he bought in 1 101 a large slice of territory, including Bourges and Dun-le- Roi, from Eudes Arpin, viscount of Bourges, who was going on the crusade; and toward the end of his reign took Montlhery, whose lord beset the southern approach to Paris. By his first queen he had four children: Louis VI., who succeeded him; Henry, who died young; Charles; and Constance, who married Hugh I., count of Champagne, and later Bohemund I., prince of Antioch. By Bertrada de Montfort he had three children: Philip, count of Montes; Fleury or Florus, who married the heiress of Nangis; and Cecilia, who married, first Tancred, prince of Galilee and Antioch, and secondly Pons de Saint Gilles, count of Tripoli.

The materials for the reign of Philip I. are in the Recueil des historiens des Gaules et de la France, vols. xi. to xvi. See especially the critical examination by Dom Brial of the historians who have spoken of Philip I. at the beginning of vol. xvi Consult also E. A. Freeman, Norman Conquest, iv., passim, and William Rufus, ii. 165-302; A. Luchaire, Louis le Gros (Paris, 1890), and " Les Premiers Capetiens " in E. Lavisse's Histoire de France (II. ii., pp. 168-175). More recent is the Recueil des actes de Philippe I., edited by M. Pron (1908), and B. Monod's Essai sur les rapports de Pascal II. avec Philippe I. (Paris, 1907). For notices of the principal chronicles of the time see A. Molinier, Les Sources de I'histoire de France (II., esp. p. 307 et seq.).

PHILIP II. (1165-1223), known as Philip Augustus, king of France, son of Louis VII. and Adela, daughter of Theobald II., count of Champagne, was born on the 21st of August 1165. On the 1st of November n 79 he was associated with his father as king by being crowned at Reims, and at once his father's illness threw the

responsibility of government on him, the death of Louis on the 19th of September 1180 leaving him sole king.

The boy-king found himself and his kingdom in a difficult and humiliating position. His long strip of royal domain was hemmed in by the Angevin Empire on the west and by the kingdom of Aries on the south-east. Henry II. of England was feudal lord of the greater part of France, practically all west of a line which began at Dieppe and ended at the foot of the Pyrenees more than half-way across to the Mediterranean, while at one point it nearly touched the Rhone. Philip's predecessors had consolidated the Capetian power within these narrow limits, but he himself was overshadowed by the power of his uncles, William, archbishop of Reims; Henry I., count of Champagne; and Theo- bald V., count of Blois and Chartres. He secured an ally against them, and an addition to the royal domain, by marrying, on the 28th of April 1 180, Isabella or Elizabeth, daughter of Baldwin V., count of Hainaut, and of Marguerite, sister of Philip of Alsace, the reigning count of Flanders, who ceded Arras, St Omer, Aire and Hesdin, and their districts, as Isabella's dowry, a district afterwards called Artois. On the 28th of June 1180 Philip made a treaty with Henry II. at Gisors, and his reign thus opened auspiciously. But from 1181 to 1185 he had to struggle against a feudal league of his Champagnard uncles and other great

barons, whose most active member was Stephen I., count of Sancerre (1152-1191). Though attacked from both north and south, the king's activity enabled him to compel the count of Sancerre to implore peace in 1181. On the death of Isabel of Vermandois, wife of Count Philip of Flanders, in 1182, Philip claimed Vermandois and seized Chaune and St Quentin, and forced his father-in-law, Baldwin of Hainaut, to support him by threatening to divorce Queen Isabel. The count of Flanders was obliged to sign the treaty of Boves in July 1185, which gave the king, in addition to the expectation of Artois, his wife's dower, sixty-five castles in Vermandois and the town of Amiens. By 1 1 86 Hugh, duke of Burgundy, the only member of the coalition not yet subdued, was forced to submit. Then, secure at home, the king turned against Henry II., and by the truce of Chateauroux in June 1187, gained Issoudun and the seigniory of Freteval in the Vendomois. Though the truce was for two years, Philip assembled an army in 1188 to invade Normandy, demand- ing Gisors and the conclusion of the marriage which had been arranged between his sister Alice and

Richard of England, who had meanwhile deserted his father. But the news came that Saladin had taken Jerusalem and Richard took the cross. Shortly afterwards Philip took advantage of a rising against his quondam friend Richard, who was duke of Aquitaine, to seize the county of Berry. At a conference at Bonmoulins on the 1 8th of November Richard again abandoned his father, and after a second conference at La Ferte Bernard, Philip invaded Maine and forced Henry II. to conclude the treaty of Azay on the 4th of July 1 189, by which the English king did homage and sur- rendered the territories of Gracy and Issoudun. Henry died two days later. Pledges of mutual good faith and fellowship were renewed between Philip and Richard of England on the 30th of December 1189, and they both prepared to go on the crusade. Before setting out Philip arranged for the government of France during his absence by his famous testament of 1190, by which he proposed to rule France as far as possible from Palestine. The power of the regents, Adela, the queen-mother, and William, archbishop of Reims, was restricted by a council composed mostly of clerks who had the king's confidence. An annual report on the state of the kingdom was to be sent him. On the way to Palestine the two kings quarrelled. At the siege of Acre Philip fell ill, and on the 22nd of July, nine days after its fall, he an- nounced his intention of returning home. He. reached Paris at Christmas 1191, having concluded on his way an alliance with the emperor Henry VI. against Richard, despite his pledges not to molest his lands. When Leopold I., duke of Austria, took Richard prisoner and delivered him to the emperor, Philip did his utmost by offers of money to prolong his captivity, and, allied with the English king's brother John, attacked Richard's domains, but upon Richard's return the Normans rallied enthusi- astically to his aid. Philip was defeated at Freteval on the 3rd of July 1 194, but he continued the war, generally with ill success, for the next five years. Again a formidable coalition was formed against him, including Baldwin IX., count of Flanders and Hain- aut, Renaud of Dammartin, count of Boulogne, Louis, count of Blois, and Raymond VI. , count of Toulouse. In Germany, Otto of Brunswick, afterwards the emperor Otto IV., allied himself with Richard, while Philip was supported by Otto's rival, Philip of Swabia. Richard's death, in April 1199, removed his arch- enemy, and Richard's successor, John, concluded the treaty of Le Goulet with Philip on the 22nd of May 1200, ceding to him the county of Evreux, Gracy and Issoudun, and the suzerainty of Berry and Auvergne. John renounced his suzerainty over Brittany and the guardianship of his nephew, Arthur; he engaged not to aid the count of Flanders or Otto IV. without Philip's consent, paid him a relief of 20,000 marks, and recognized himself as his vassal for his continental fiefs. Philip's son Louis, after- wards Louis VIIL,

married Blanche of Castile, John's niece. But in 1 202 the war was renewed, John having seized some castles from the family of Lusignan, whose head was the count of La Marche, and taken for his queen a prospective bride, Isabelle Taillefer, from Hugh, son of Hugh IX., count of La Marche. At an interview at Le Goulet on the 25th of March, Philip demanded

the cession of Anjou, Poitou and Normandy to his ward, Arthur. John refused; he was summoned to Paris before the royal judges, and failing to appear was sentenced at the end of April 1202 to lose all his fiefs. Brittany, Aquitaine and Anjou were conferred on Arthur. Philip invaded Normandy, took Lyons- la-Foret and Eu, and, establishing himself in Gournay, besieged Arques. But John, joined by William des Roches and other lords of Maine and Poitou, jealous at the increase of Philip's power, defeated and took Arthur prisoner at Mirebeau. Philip abandoned the siege of Arques in a fit of fury, marched to the Loire, burning everywhere, and then returned to Paris. But John soon alienated the Poitevin barons, and William des Roches signed a treaty with Philip on the 22nd of March 1203. Then Philip continued his great task, the conquest of Normandy, capturing the towns around the fortress of Chateau-Gaillard which Richard had built to command the valley of the Seine. Pope Innocent III. tried to bring about peace, but Philip was obdurate, and after murdering Arthur of Brittany John took refuge in England in December 1203. The fall of Chateau-Gaillard, after a siege which lasted from September 1203 to April 1204, decided the fate of Normandy. Rouen, bound by ties of trade to Eng- land, resisted for forty days; but it surrendered on the 24th ol June 1 204. The conquest of Maine, Touraine, Anjou and Poitou in 1204 and 1205 was little more than a military promenade, though the castles of Loches and Chinon held out for a year. Philip secured his conquest by lavishing privileges on the con- vents and towns. He left the great lords, such as William des Roches, in full possession of their feudal power. In 1206 he marched through Brittany and divided it amongst his adherents. A truce for two years was made on the 26th of October 1 206 by which John renounced all claims in Normandy, Maine, Brittany, Touraine and Anjou, but it did not last six months. Then Poitou was thoroughly subdued, and another truce was made in 1208, little more than southern Saintonge and Gascony being left in the hands of John. Philip had reduced to a mere remnant the formidable continental empire of the Angevins, which had threatened the existence of the Capetian monarchy. 1

Philip then undertook to invade England. In the assembly of Soissons on the 8th of April 12 13 he made every preparation for carrying out the sentence of deposition pronounced by the pope against John. He

had collected 1 500 vessels and summoned all his barons when Innocent III., having sufficiently frightened John, sent Pandulf with the terms of submission, which John accepted on the 13th of May.

Disappointed of his hopes of England, Philip turned his arms against Ferdinand, count of Flanders. Ferdinand, son of Sancho I., king of Portugal, owed his county to Philip, who, hoping to find him a docile protegeˆ, had married him to Jeanne, heiress of Flanders, daughter of Count Baldwin IX., who became emperor of the East, using the weak Philip of Namur, her guar- dian, to accomplish that end. They were married in January 1 2 1 2. On the morrow of the marriage Louis, afterwards Louis VIIL, seized Aire and St Omer in right of his mother, Isabella, and on this account Ferdinand refused his feudal duty in the English expedition. Moreover, the trade interests of his subjects, who got their raw wool from England, drew him to an alliance with England. Philip's attack brought this about on the 22nd of May 1 2 13. He invaded Flanders and took the chief towns within a week ; but he had part of his fleet burned by the English at Damme, and had to burn the rest to save it from falling into their hands. He returned to Paris, and Ferdinand retook most of the towns which had been taken by the king. A war of fire and pillage began, in which Philip and his son Louis burned their way through Flanders, and Ferdinand did the same through Artois.

In 1214 came the great crisis of Philip's life. All the forces against which he had been struggling united to overwhelm him. Paris was to be attacked from Flanders and Guienne at the same time. A league including his rebel vassals, Renaud of Dammartin, count of Boulogne, and Ferdinand, count of Flanders, with the emperor Otto IV. and a number of German princes of the Rhine region, had been formed in the north-east, while John of England

made one more attempt to recover his heritage at the head of an army of mercenaries aided by the fickle baronage of Poitou. John landed at La Rochelle on the 16th of February 12 14, and was at first successful. On the 19th of June he laid siege to La Roche-aux-Moines, the fortress which defended Angers and com- manded the Loire valley; but on the approach of a royal army under Prince Louis on the 2nd of July his Poitevin barons refused to risk a pitched battle, and he fled hastily to La Rochelle. The Angevin Empire in France was lost. Meanwhile Philip himself won his greatest victory at the bridge of Bouvines, among the

morasses of Flanders. At first taken by surprise, he turned the abortive attack into a complete rout. Renaud and Ferdinand were taken prisoner, and Otto IV. fled from the battlefield. The army of the allies was utterly destroyed (July 27, 12 14). Nothing shows the progress of the Capetian monarchy more than the enthusiasm and joy of the people of France, as described by William the Breton, over this crowning victory. The battle of Bouvines, a decisive battle for the history of Germany as well as for France and England, sealed the work of Philip Augustus. The expedition of his son Louis to conquer England can hardly be considered as an incident of his reign, though he was careful to safeguard the rights of the French Crown. More important was the Albigensian crusade, in which he allowed Louis to take part, though he himself, preoccupied with the king of England, had refused time after time to do anything. He treated Simon de Montfort as if he were a royal bailli; but it was not in virtue of any deep-laid scheme of his that in the end Amaury de Mont- fort, Simon's son, resigned himself to leave his lands to the Crown of France, and gave the Crown a power it had never before possessed in Languedoc.

Even more than by his conquests Philip II. marks an epoch in French history by his work as an organizer and statesman. He surrounded himself with clerks and legists of more or less humble origin, who gave him counsel and acted as his agents. His baillis, who at first rather resembled the itinerant justices of Henry II. of England, were sent into the royal domain to super- vise the conduct of the privdts and hear complaints, while in the newly acquired lands in the south local feudal magnates were given similar powers with the title of senechal. Feudal service was more and more compounded for by a money payment, while additional taxes were raised, all going to pay the mercen- aries with whom he fought Richard I. and John. The extension of the system of sauvegarde, by which abbeys, towns or lay vassals put themselves under the special protection of the king, and that of pariage, by which the possessor surrendered half the interest in his estate to the king in return for protection or some further grant, increased the royal power. The small barons were completely reduced to submission, whilst the greater feudatories could often appoint a castellan to their own castles only after he had taken an oath to the king. Philip supported the clergy against the feudal lords, and in many cases against the burgesses of the towns, but rigidly exacted from them the performance of their secular duties, ironically promising to aid the clergy of Reims, who had failed to do so, " with his prayers only " against the violence of the lords of Rethel and Roucy. He clung to his right of regale, or enjoyment of the revenues of bishoprics during their vacancy, though it was at times com- muted for a fixed

payment. The attempt to raise a tithe for the crusade in n 89 failed, however, before a general resistance owing to an unfair assessment.

It has been said with some justice that Philip II. was the first king of France to take the bourgeoisie into partnership. He favoured the great merchants, granting them trade privileges and monopolies. The Jews he protected and plundered by turns, after the fashion of medieval kings. Amongst the subject towns administered by prevdts a great extension of the ” custom of Lorris ” took place during his reign. But it is as the ally and protector of the communes that he takes his almost unique place in French history. Before him they were resisted and often crushed; after him they were exploited, oppressed, and finally destroyed. In the case of Senlis he extended the jurisdiction of the commune to all crimes committed in the district. It is

true that he suppressed some communes in the newly conquered fiefs, such as Normandy, where John had been prodigal of privileges, but he erected new communes in his own private domain, quite contrary to the custom of other kings. He seems to have regarded them as a kind of garrison against feudal unruliness, while the rents they furnished increased his financial resources. He created no new types of commune, however, except Peronne, which received a maximum of political inde- pendence, the twenty-four electors, who named the juris and other officers, being elected by the corps de metiers.

The newly organized powers of the Crown were in evidence everywhere, interfering in the family affairs of the great feuda- tories and taking advantage of minorities, such as that of Theobald IV. of Champagne. The great feudatories accepted his legislation on dower in 12 14 and 1219 and the Uablissemenl of 1 209 making co-heirs of fiefs hold direct from the king and not from one of their number. The Tournois was substituted for the Angevin money in Normandy after 1204. The army which safeguarded this active monarchy consisted chiefly of mercenaries. The old feudal ost was but rarely convoked. The communes, though they appear as taking part in the battle of Bouvines, com- pounded for their service by a money payment as early as n 94. Philip’s policy of building up a strong monarchy was pursued with a steadiness of aim which excluded both enthusiasm and scruple. But he seems to have prided himself on a certain human- ity , or even generosity of temper, which led him to avoid putting his enemies to death, though he did not scruple to condemn Renaud of Dammartin to the most inhuman of imprisonments. He was impulsive and could display extraordinary activity at times, but he possessed also a certain coldness and caution. He shrank from no trickery in carrying out his ends, and had no room for pity. He could not even

trust his own son with any power, and was brutal in his relations with his queen, Ingeborg. He is described by Paien Gatineau as ” a well-knit, handsome man, bald (from his illness at Acre), of agreeable face and ruddy complexion, loving good cheer, wine and women. Generous to his friends, he was miserly to those who displeased him; very skilled in the art of the engineer, catholic in his faith, far-seeing, obstinate in his resolution. His judgment was sound and quick. He was also quick in his anger, but easily appeased.” As the result of his steadiness of aim and patient sagacity, at the end of his reign the Crown was victorious over the feudal nobility and the royal domain extended to the frontiers along with royal authority. Artois, the Amienois, Valois, Vermandois, the greater part of the Beauvaisis, Normandy, Maine, Anjou, Touraine, and an important part of Poitou and Saintonge, were added to the domain during his reign. The number of privotes was increased from thirty-eight to ninety-four, and the royal revenue increased from 19,000 livres a month to 1200 livres a day.

Philip Augustus died on the 14th of July 1223. He was thrice married. His first wife, Isabella, by whom he had one son, Louis, died in 1189 or 1190. After her death he married Ingib- jorg or Ingeborg (q.v.), daughter of Valdemar I. of Denmark. This unlucky marriage was negotiated, it is said, chiefly to acquire the old claims of Denmark over England, to be used as a weapon against Richard I. However that may be, he soon repudiated this Danish princess, for whom he seems to have conceived an unconquerable aversion on the very morrow of his marriage to her, and in 1196, in defiance of the pope, who had refused to nullify his union with Ingeborg, married Agnes, daughter of Bertold IV., duke of Meran. This led to his excommunication and brought the interdict upon France, and did more to weaken him than any other act of his. In 1 200 he was forced to put away Agnes and to recognize Ingeborg as his lawful wife, but he kept her in prison until 12 13. By Agnes (d. 1201) he had a son Philip, called ” Hurepel,” count of Clermont, and a daughter Mary, who married Philip, count of Namur (d. 1213), and then Henry II., duke of Brabant. Ingeborg lived until 1236.

See A. Luchaire in E. Lavisse’s Histoire de France, tome iii. 83-284 (Paris, 1904), and literature there indicated; L. Deslisle, Catalogue des actes de Philippe Auguste (Paris, 1856 and 1901); A. Cartellieri, Philip II. August, Bd. I. Bis zum Tode Ludwigs VII.

PHILIP III.— IV. (FRANCE)

(Leipzig, 18991, Bd. II. Der Kreuzzug (1906); and W. H. Hutton, Philip August-os (in the Foreign Statesmen series, London, 1896). A. Molinier, Les Sources de Vhistoire de France (tome iii. pp. 1-38), gives a complete bibliography of the sources for Philip's reign, including the history of the Third Crusade.

PHILIP III. (1245-1285), surnamed "the Bold " (le Hardi), king of France, son of Louis IX. and Margaret, daughter of Raymond -Berenger IV., count of Provence, was born on the 3rd of April 1245. His funeral monument at St Denis depicts a man with beardless, square-cut features, but lacking character and animation. The authenticity of this effigy is fairly well borne out by what is known of him from other sources. He had many of the virtues of St Louis, but neither decision of character nor devotion to duty. He was pious, charitable, of unimpeach- able morality, quick-tempered but placable, no great scholar, and only energetic as a hunter. The absence in him of the qualities that fit a man to rule made his court the arena of intriguing factions, which in reality ruled France during his reign of fifteen years. Matthew of Vendome, abbot of St Denis, an old servant of Louis IX., acted as Philip's counsellor, so the chroniclers state, throughout the reign; but he is only a shadowy figure, and it is difficult to reconcile the statement that " everything was done according to his will " with the known facts. It was probably with administration, and not policy, that Matthew was chiefly concerned. In one instance at least his advice was openly flouted. Coming to the throne by the death of his father on the 25th of August 1270, Philip began his reign by falling entirely under the influence of Pierre de la Brosse, who had been surgeon and valet-de-chambre to his father, upon whom he lavished lands and honours, making him lord (sieur) of Langeais, Chatillon-sur-Indre and Damville. Even Edward I. of England and William Dampierre, count of Flanders, strove to win his favour by gifts. But his fall was assured when Philip, who in 1271 lost his first wife, Isabella, daughter of James I., king of Aragon, married in 1274 Marie, daughter of Henry III., duke of Brabant. She was young and beautiful, and supplied a centre round which those who wished the downfall of the favourite grouped them- selves. In June 1278 he was charged with various crimes, including one of poisoning the king's eldest son, and hanged at Montfaucon. His death left the parties of Marie, the queen, and Margaret, the queen-mother, to struggle for the mastery. The first subject of dispute was the inheritance of the count of Provence, Raymond-Berenger IV., father of Margaret and of Eleanor, wife of Henry III. of England. Upon his death, in 1245, his youngest daughter, Beatrice, wife of Charles of Anjou, the king's uncle, succeeded to his lands, to the exclusion of her elder sisters, who claimed some portion

of them for themselves. In 1 281 war nearly broke out on this question. Margaret and her friends formed the league of Macon against Charles of Anjou, but the king managed to keep them at peace. The settlement of the claims of the king of England in Aquitaine by the treaty of Amiens in 1279 was a victory for the party of Margaret.

Agenais and southern Saintonge, which fell to the Crown by the death of Alfonse of Poitiers in 1276, as part of his vast possessions in Aquitaine and Languedoc, were ceded to Edward I. of England in accordance with the treaty of Paris 1259. Another portion of the heritage of Alfonse, the Venaissin, was ceded to the papacy to redeem an old promise. In general the strong will of Charles of Anjou directed Philip's policy. He secretly urged his nephew's candidature for the imperial crown, left vacant by the death of Richard of Cornwall, king of the Romans, in 1272, but without success. In May 1275 the party of Marie secured for Philip, the king's second son, the hand of Jeanne, the heiress of Navarre and Champagne, along with the guardianship of the kingdom of Navarre during the minority of Jeanne. But early in 1276 Jeanne's mother, Blanche, the widow of Henry III. of Navarre and Champagne, married Edmund, first earl of Lancaster, brother of Edward I.; and she and her English husband kept Champagne until, in 1284, Jeanne came of age.

An expedition of Philip against Castile in aid of the children of his sister, Blanche, proved abortive. Regardless of this warning, he was induced in 1284 to take up the quarrel of his

uncle Charles in Sicily, after the Sicilian Vespers in 1282. Two assemblies of barons and prelates were held at Bourges in Novem- ber 1283 and February 1284 to deliberate on the question. This was a mere matter of form; Marie of Brabant and her party had decided the matter beforehand, and the crown of Aragon, which the French pope Martin IV. had declared forfeited by Peter, was accepted for Charles of Valois, Philip's third son. The project was strongly opposed by Matthew of Venddme, who was in correspondence with the king of England on the subject. It was the first warlike expedition undertaken by the house of Capet outside France. It proved a disastrous failure. The French army laid siege to Gerona on the 26th of June 1285. The town surrendered on the 7th of September, but disease and the defeat of the fleet by the Aragonese navy at Las Farmiguas Islands led to a retreat, during which, on the 5th of October, the king died. In the same month the garrison placed at Gerona surrendered. It is typical of Philip's character and career that he should die thus, in an expedition undertaken against the interests of his kingdom, at the instigation of his ambitious uncle.

Philip was twice married. On the 28th of May 1262 he married Isabella, daughter of James I., king of Aragon, who died in 1 271. By her he had four children: Louis, who died in 1276; Philip, born in 1268; Charles of Valois, born on the 12th of March 1270; and Robert, who died young. By his second wife, Marie (d. 1322), daughter of Henry III. of Brabant, whom he married in 1274, he had three children: Louis, count of Evreux; Margaret, who married in 1299 Edward L, king of England; and Blanche, who married Rudolph III., duke of Austria.

See Ch. V. Langlois, Le Regne de Philippe le Hardi (Paris, 1887); and in E. Lavisse's Histoire de France, tome iii., ii. 113-117 (Paris, 1901); Fr. Walter, Die Politik der Kurie unter Gregor X. (Berlin, 1894); Registers of Gregory X. and Nicholas III., published by the French school at Rome; R. Sternfeld, Ludwigs des Heiligen Kreuzzug nach Tunis und die Politik Karls I. von Sizilien (1896) ; P. Fournier, Le Royaume d'Arles (Paris, 1891). For complete bibliography of sources see A. Molinier, Les Sources de Vhistoire de France, tome iii. 171-187 (Paris, 1903).

PHILIP IV. (1268-1314), called " le Bel " or " the Fair," king of France, was the son of Philip III. and his wife, Isabella of Aragon. His reign, which began in October 1285, is one of the most momentous in the history of medieval Europe, yet it belongs rather to the history of France and to that of the papacy than to the biography of the king. Little is known of the personal part played by Philip in the events associated with his name, and later historians have been divided between the view which regards him as a handsome, lethargic nonentity and that which paints him as a master of statecraft who, under a veil of phlegmatic indifference and pious sentiment, masked an inflexible purpose, of which his ministers were but the spokesmen and executors. The first view seems to be borne out by the language of contemporary chroniclers. To his enemy, Bernard Saisset, he was neither man nor beast, but a statue, " the handsomest man in the world, but unable to do anything but stare fixedly at people without saying a word." Guillaume de Nogaret, his minister, draws a far more flattering picture, enlarging on his charm, his amiability, his modesty, his charity to all men, and his piety; and the traits of this over-coloured portrait are more or less repeated by Yves, a monk of St Denis. There is, however, no word of any qualities of will or initiative. All of which suggests a personality mentally and physically phlegmatic, a suggestion strengthened by the fact that Bartholomaeus de Neocastro (quoted by Wenck) describes him as corpulent in 1290.

Yet this was the king who with equal implacability brought the

papacy under his yoke, carried out the destruction of the powerful order of the Temple, and laid the foundations of the national monarchy of France. In this last achievement Professor Finke finds the solution of a problem which Langlois had declared to be insoluble. In 1302, in the midst of a hostile assembly, Philip cursed his sons should they consent to hold the Crown of any one but God 1 ; and in this isolated outburst he sees the key to his character. ” Philip was not a man of violent initiative, the planner of daring and fateful operations; otherwise there 1 Wenck, p. 49.

would have been some signs of it. His personality was that of a well-instructed, outwardly cold, because cool and calculating man, essentially receptive, afire for only one idea: the highest possible development of the French monarchy, internally and externally, as against both the secular powers and the Church. His merit was that he carried through this idea in spite of dangers to himself and to the state. A resolution once arrived at he carried out with iron obstinacy.” Certainly he was no roi faineant. His courage at the battle of Mons-en-Pevele was the admiration of friend and foe alike. It was against the advice of his tutor, Aegidius Colonna, that on coming to the throne he chose as his counsellors men of the legal class, and the names of his great ministers — Guillaume de Nogaret, Enguerrand de Marigny, Pierre Flotte (d. 1302) — attest the excellent quality of his judgment. He was, too, one of the few monarchs who have left to their successors reasoned programmes of reform for the state.

The new materials from the Aragonese archives, published by Finke, give the same general impression of ” uncanny ” reticence on Philip’s part; when other contemporary kings would have spoken he keeps silence, allowing his ministers to speak for him. Isolated passages in some of the Aragonese letters included in the collection, however, throw a new light on contemporary estimate of his character, describing him as all-powerful, as ” pope and king and emperor in one person.” x

The reign of Philip IV. is of peculiar interest, because of the intrusion of economic problems into the spheres of national politics and even of religion. The increased cost of government and the growing wealth of the middle class, rather than the avarice of the king and the genius of his ministers, were respon- sible for the genesis and direction of the new order. The greatest event of the reign was the struggle with Pope

Boniface VIII. (q.v.). The pope, in his opposition to the imposition of royal taxation upon the clergy, went so far in the bull Clericis laicos of 1296 as to forbid any lay authority to demand taxes from the clergy without his consent. When Philip retaliated by a decree forbidding the exportation of any coin from France, Boniface gave way to save the papal dues, and the bulls issued by him in 1297 were a decided victory for the French king. Peace between the two potentates followed until 1301. After the arrest, by Philip's orders, of Bernard Saisset (q.v.), bishop of Pamiers, in that year, the quarrel flamed up again: other causes of difference existed, and in 1302 the pope issued the bull Unam sanctam, one of the most extravagant of all statements of papal claims. To ensure the support of his people the king had called an assembly of the three estates of his kingdom at Paris in April 1302; then in the following year Guillaume de Nogaret seized the person of the pope at Anagni, an event immortalized by Dante. Boniface escaped from his captors only to die (October n), and the short pontificate of his saintly successor, Benedict XL, was occupied in a vain effort to restore harmony to the Church. The conclave that met at Perugia on his death was divided between the parti- sans of the irreconcilable policy of Boniface VIII. and those of a policy of compromise with the new state theories represented by France. The election was ultimately determined by the diplo- macy and the gold of Philip's agents, and the new pope, Clement V., was the weak-willed creature of the French king, to whom he owed the tiara. When in 1309 the pope installed himself at Avignon, the new relation of the papacy and the French monarchy was patent to the world. It was the beginning of the long " Babylonish captivity " of the popes. The most notable of its first-fruits was the hideous persecution of the Templars (q.v.), which began with the sudden arrest of the members of the order in France in 1307, and ended with the suppression of the order by Pope Clement at the council of Vienne in 13 13.

It is now tolerably clear that Philip's motives in this sinister proceeding were lack of money, and probably the deliberate

1 Finke, ii. no. 78, p. 122. Anon, to the commanderies of Gardeyne and Ascho: " Pus el es rey et papa et emperador ! Car toe lo mon sap, quel papa no es negun et que el fa tot go ques vol del papa et de la esglea."

wish to destroy a body which, with its privileged position and international financial and military organization, constituted a possible menace to the state. He had already persecuted and plundered the Jews and the Lombard bankers, and repeated recourse to the debasing of the coinage had led to a series of small risings. But

under his rule something was done towards systematizing the royal taxes, and, as in England, the financial needs of the king led to the association of the people in the work of government.

In 1294 Philip IV. attacked Edward I. of England, then busied with the Scottish War, and seized Guienne. Edward won over the counts of Bar and of Flanders, but they were defeated and he was obliged to make peace in 1297. Then the Flemish cities rose against the French royal officers, and utterly defeated the French army at Courtrai in 1302. The reign closed with the French position unimproved in Flanders, except for the transfer to Philip by Count Robert of Lille, Douai and Bethune, and their dependencies. Philip died on the 29th of November 1314. His wife was Jeanne, queen of Navarre (d. 1304), through whom that country passed under the rule of Philip on his marriage in 1284; three of his sons, Louis X., Philip V. and Charles IV., succeeded in turn to the throne of France, and a daughter, Isabella, married Edward II. of England.

See the Chronique of Geoffrey of Paris, edited by M. Bouquet, in vol. xxii. of the Recueil des historiens des Gaules et de la France. Of modern works see E. Boutaric, La France sous Philippe le Bel (1861); G. Digard, Philippe le Bel et le Saint-Siege (1900); C. V. Langlois in E. Lavisse's Histoire de France, vol. iii. (1901) ; K. Wenck, Philipp der Schone von Frankreich (Marburg, 1905) ; H. Finke, Papsttum und Untergang des Templerordens, 2 vols. (Mtinster i. W. 1907), esp. I. ch. ii.

PHILIP V. (c. 1294-1322), " the Tall," king of France, second son of Philip the Fair and Jeanne of Navarre, received the county of Poitiers as an appanage, and was affianced when a year old to Jeanne, daughter and heiress of Otto IV., count of Burgundy. The marriage took place in 1307 when he was thirteen years of age. When his elder brother, Louis X., died, on the 5th of July 1316, leaving his second wife, Clemence of Hungary, with child, Philip was appointed regent for eighteen years by the parliament of Paris, even in the event of a male heir being born. Clemence's son, born on the 15th of November, lived only four days, and Philip immediately proclaimed himself king, though several of the great barons declared that the rights of Jeanne, daughter of Louis X. by his first wife, Margaret of Burgundy, ought to be examined before anything else was done. The coronation at Reims, on the 9th of January 1317, took place with the gates of the city closed for fear of a surprise. The states-general of the 2nd of February 13 17, consisting of the nobles, prelates, and the burgesses of Paris, approved the coronation of Philip, swore to obey him, and declared that women did not succeed to the Crown of France. The university of

Paris approved this declaration, but its members did not take the oath. The Salic law was not involved, and it was later that the lawyers of the 14th century tried to connect this principle to an article of the Salic law, which accords inheritance in land (i.e. property) to males. In the Frankish law the article refers to private property, not to public law. The death of Philip's son Louis, in 1317, disarmed the opposition of Charles, count of La Marche, who now hoped to succeed to the Crown himself. Odo or Eudes IV., duke of Bur- gundy, was married to Jeanne, Philip's daughter, and received the county of Burgundy as her dower. The barons all did homage except Edward II. of England, and Philip's position was secured. The war with Flanders, which had begun under Philip IV. the Fair, was brought to an end on the 2nd of June 1320. The revolt of the Pastoureaux who assembled at Paris in 1320 to go on a crusade was crushed by the seneschal of Carcassonne, whither they marched. One of the special objects of their hatred, the Jews, were also mulcted heavily by Philip, who extorted 150,000 livres from those of Paris alone. He died at Long- champ on the night of the 2nd of January 1322.

Philip was a lover of poetry, surrounded himself with Provencal poets and even wrote in Provencal himself, but he was also one of the most hard-working kings of the house of Capet. The

insecurity of his position made him seek the support of national assemblies and of provincial estates. His reign in some ways resembled that of Edward I. of England. He published a series of ordinances organizing the royal household and affecting the financial administration, the " parlement " and the royal forests. He abolished all garrisons in the towns except those on the frontier and provided for public order by allowing the inhabitants of his towns to arm themselves under the command of captains. He tried hard to procure a unification of coinage and weights and measures, but failed owing to the opposition of the estates, who were afraid of the new taxation necessary to meet the loss involved in raising the standard of the coinage, and who held to their local measures and currency partly from conservatism, partly as a relic of local liberty. Philip as a reformer was in many ways before his time, but his people failed to understand him, and he died under the reproach of extortion.

See P. Lehugeur, Histoire de Philippe le Long (Paris, 1897); E. Lavisse, Histoire de France (Tome III, 2); and sources indicated in A. Molinier,

Repertoire des sources de I'histoire de France (Paris,

1903)-

PHILIP VI. (1 293-1350), king of France, was the son of Charles of Valois, third son of Philip III., the Bold, and of Margaret of Sicily, and was thus the nephew of Philip IV., the Fair, whose sons, Louis X., Philip V. and Charles IV., died successively without leaving male heirs. He succeeded to the throne on the death of his cousin, Charles IV., in 1328. Before his accession Philip had enjoyed considerable influence, for he was count of Valois, Anjou, Maine, Chartres and Alencon. He had married in 1313 Jeanne (d. 1348), daughter of Robert II. of Burgundy, a determined woman who was long known as the real ruler of France. An expedition to Italy in 1319-20 against Gal6as Visconti brought him little glory; he was more successful in a small expedition to Guienne, undertaken against a revolted vassal who was supported by the English.

When Charles IV. died, in February 1328, his wife was enceinte, and it became necessary to appoint a regency until the birth of the child, who would, if a son, succeed to the throne. At the assembly of barons called to choose a regent, Edward III. of England, the nephew and nearest male relation of Charles IV., put in a claim. Edward III., however, descended from the royal house of France by his mother Isabel, and the barons, probably actuated by an objection to the regency of an English king, decided that neither a woman, " nor by consequence her son, could succeed to the kingdom of France," and Philip oi Valois, in spite of his belonging to a junior branch of the family, was elected regent. On the birth of a girl to the queen widow the regency naturally led to the throne of France, and Philip was crowned at Reims on the 29th of May 1328. Navarre had not accepted the regency, that kingdom being claimed by her husband for Jeanne, countess of Evreux, the eldest daughter of Louis X., the count of Evreux himself being, like Philip of Valois, a grandson of Philip the Bold. The new king secured the friendship of the count by allowing Jeanne's claim to Navarre, in return for a renunciation of any right to Champagne. Edward III. of England, after more than one citation, tendered verbal homage for part of Guienne at Amiens in 1329, but he declined to place his hands between those of Philip VI., and thus formally to acknowledge him as his liege lord. Two years later, however, he forwarded the acknowledgment by letters patent. Meanwhile Philip VI. had won a victory, which he turned into a massacre, at Cassel (August 23, 1328) over Bruges and the other towns of West Flanders, which under the leadership of Jakob van Artevelde had thrown off the authority of their count, Louis of Nevers. The count of

Flanders was reinstated, and maintained his authority by a reign of terror.

Much harm was done to Philip VI. ‘s authority by the scandal arising out of the prosecution of Robert of Artois, count of Beaumont, who was the king’s brother-in-law. The count had presented to the parlement of Paris forged deeds in support of his claim to the county of Artois, held by his aunt, Mahaut, countess of Burgundy. The sudden death of Mahaut, and of her daughter and heiress, Jeanne, widow of Philip V., lent colour

to other suspicions, and Robert was driven from France and his goods confiscated. He found refuge, first in Brabant and then at the English court, where he was received as a relative and a victim of false accusations.

Philip VI. enjoyed powerful alliances. In Italy he was allied with his uncle, Robert of Anjou, king of Sicily, and with his former enemy, Galeas Visconti; in the north with the duke of Brabant and the princes of the Netherlands; on the east with the reigning princes of Lorraine and Savoy; with the king of Bohemia and with Pope John XXII. at Avignon, and his successor, Benedict XII. In 1336 it seemed that the Crusade, for which Philip VI. had long been preparing, would at last start; but the relations with Edward III. of England, which had always been strained, became worse, and within a year France was embarked on the struggle of the Hundred Years’ War. The causes which led to war, the conflict for commercial supremacy in Flanders, disputed rights in Guienne, the help given by France to the Scots, arid the unnatural situation of an English king who was also a vassal of the French Crown are dealt with elsewhere (see France: History). The immediate rupture in Flanders was due chiefly to the tyranny of the count of Flanders, Louis of Nevers, whom Philip VI. had reinstated. Edward III. had won over most of Philip’s German and Flemish allies, and the English naval victory at Sluys (June 24, 1340), in which the French fleet was annihilated, effectually restored English preponderance in Flanders. A truce followed, but this was disturbed after a short duration by the disputed succession to the duchy of Brittany. Edward III. supported John of Montfort; Philip IV. his own nephew, Charles of Blois. A truce made at Malestroit in 1343 at the invitation of the pope, was rudely broken by Philip’s violence. Olivier de Clisson, who with fourteen other Breton gentlemen, was suspected of intrigue with Edward III., was invited to a great tournament in Paris. On their arrival they were seized by Philip’s orders, and without form of trial beheaded. Then followed Edward III.‘s invasion of Normandy and the campaign of Crecy (q.v.). Philip’s army was

destroyed ; he himself was wounded and fled from the field. He sought in vain to divert Edward from the siege of Calais by supporting the Scots in their invasion of England; but eventually a truce was arranged, which lasted until 1351. Philip VI. died at Nogent-le-roi on the 12th of August 1350.

Philip VI. met his necessities by the imposition of the hated gabelle or salt tax, which was invented by his legal advisers. The value of the coinage fluctuated continuously, to the great hindrance of trade; and although at a meeting of the States- General it was asserted that the king could levy no extraordinary taxes without the consent of the estates, he obtained heavy subsidies from the various provinces. Towards the close of his reign he acquired from Humbert II., comte de Vienne, the pro- vince of Dauphine, and Montpellier from the king of Majorca. These acquisitions made the ultimate annexation of Provence a certainty. Philip married a second wife, Blanche of Navarre. By his first wife he left two sons — his successor, John II., and Philip of Orleans, count of Valois.

See Continuations de la chronique de Guillaume de Nangis edited in 1843 by Geraud for the Soc. de I'hist. de France; Grandes chroniques de Saint Denis, vol. v. (1837), edition by Paulin Paris; E. Deprez, Les Preliminaires de la guerre de cent ans, 1328-1342 (Paris, 1902), based on texts from the English Record Office and the Vatican; Paul Viollet, Histoire des institutions politiques de la France vol. ii. (Paris, 1898); and E. Lavisse, Hist, de France, vol. iv. pt. i. (1902), by A. Colville. Further references will be found, in Nos. 3095-31 12 and 3165-3240 of A. Molinier's Sources de I'histoire de France, vol. iv. (Paris, 1904).

PHILIP (c. 1177-1208), German king and duke of Swabia, the rival of the emperor Otto IV., was the fifth and youngest son. of the emperor Frederick I. and Beatrix, daughter of Renaud III., count of Upper Burgundy, and consequently brother of the emperor Henry VI. He entered the church, was made provost of Aix-la-Chapelle, and in 1190 or 1191 was chosen bishop of Wurzburg. Having accompanied his brother Henry to Italy in 1 1 91, Philip forsook his ecclesiastical calling, and, travelling again to Italy, was made duke of Tuscany in n 95 and received

an extensive grant of lands. In 1196 he became duke of Swabia, on the death of his brother Conrad; and in May 1197 he married Irene,

daughter of the eastern emperor, Isaac Angelus, and widow of Roger II., king of Sicily, a lady who is described by Walther von der Vogelweide as ” the rose without a thorn, the dove without guile.” Philip enjoyed his brother’s confidence to a very great extent, and appears to have been designated as guardian of the young Frederick, afterwards the emperor Frederick II., in case of his father’s early death. In 1197 he had set out to fetch Frederick from Sicily for his coronation when he heard of the emperor’s death and returned at once to Germany. He appears to have desired to protect the interests of his nephew and to quell the disorder which arose on Henry’s death, but events were too strong for him. The hostility to the kingship of a child was growing, and after Philip had been chosen as defender of the empire during Frederick’s minority he con- sented to his own election. He was elected German king at Muhlhausen on the 8th of March 1198, and crowned at Mainz on the 8th of September following. Meanwhile a number of princes hostile to Philip, under the leadership of Adolph, arch- bishop of Cologne, had elected an anti-king in the person of Otto, second son of Henry the Lion, duke of Saxony. In the war that followed, Philip, who drew his principal support from south Germany, met with considerable success. In n 99 he received further accessions to his party and carried the war into his opponent’s territory, although unable to obtain the support of Pope Innocent III., and only feebly assisted by his ally Philip Augustus, king of France. The following year was less favourable to his arms; and in March 1201 Innocent took the decisive step of placing Philip and his associates under the ban, and began to work energetically in favour of Otto. The two succeeding years were still more unfavourable to Philip. Otto, aided by Ottakar I . , king of Bohemia, and Hermann L, landgrave of Thuringia, drove him from north Germany, thus compelling him to seek by abject concessions, but without success, reconciliation with Innocent. The submission to Philip of Hermann of Thuringia in 1 204 marks the turning-point of his fortunes, and he was soon joined by Adolph of Cologne and Henry I., duke of Brabant. On the 6th of January 1205 he was crowned again with great ceremony by Adolph at Aix-la-Chapelle, though it was not till 1 207 that his entry into Cologne practically brought the war to a close. A month or two later Philip was loosed from the papal ban, and in March 1208 it seems probable that a treaty was concluded by which a nephew of the pope was to marry one of Philip’s daughters and to receive the disputed dukedom of Tuscany. Philip was preparing to crush the last flicker of the rebellion in Brunswick when he was murdered at Bamberg, on the 21st of June 1208, by Otto of Wittelsbach, count palatine in Bavaria, to whom hˆ had refused the hand of one of his daughters. He left no sons, but four daughters; one of whom, Beatrix,

afterwards married his rival, the emperor Otto IV. Philip was a brave and handsome man, and contemporary writers, among whom was Walther von der Vogelweide, praise his mildness and generosity.

See W. von Giesebrecht, Geschichte der deutschen Kaiserzeit, Bd. V. (Leipzig, 1888) ; E. Winkelmann, Philipp von Schwaben und Otto IV. von Braunschweig (Leipzig, 1873-1878) ; 0. Abel, Konig Philipp der Hohenstaufen (Berlin, 1852); Regesta imperii. V., edited by J. Ficker (Innsbruck, 1881); R. Schwemer, Innocenz III. und die deulsche Kirche wahrend des Thronstreites von 1198-1208 (Strassburg, 1882) ; and R. Riant, Innocent III., Philippe de Souabe, el Bontface de Montferrat (Paris, 1875).

PHILIP I., the Handsome (1478-1506), king of Spain, son of the emperor Maximilian I., and husband of Joanna the Mad, daughter of Ferdinand and Isabella, was the founder of the Habsburg dynasty in Spain, and was born at Bruges on the 22nd of July 1478. In 1482 he succeeded to the Burgundian possessions of his mother Mary, daughter of Charles the Bold, under the guardianship of his father. In 1496 he married Joanna. The marriage was one of a set of family alliances with Austria and Portugal designed to strengthen Spain against France. The death of John, the only son of Ferdinand and Isabella, opened the succession to the Spanish Crown to Joanna. In

1502 she and her husband received the homage of the cortes of Castile and of Aragon as heirs. Philip returned to Flanders before the close of the year. His life with Joanna was rendered extremely unhappy by his infidelity and by her jealousy, which, working on a neurotic temperament, precipitated her insanity. The princess gave way to paroxysms of rage, in which she was guilty of acts of atrocious violence. Before her mother's death, in 1504, she was unquestionably quite insane, and husband and wife lived apart. When Isabella died, Ferdinand endeavoured to lay hands on the regency of Castile, but the nobles, who disliked and feared him, forced him to withdraw. Philip was summoned to Spain, where he was recognized as king. He landed, with his wife, at Corunna on the 28th of April 1506, accompanied by a body of German mercenaries. Father and son-in-law had interviews at Remesal, near Pueblo de Senabria, and at Renedo, the only result of which was an indecent family quarrel, in which Ferdinand professed to defend the interests of his daughter, who he said was imprisoned by her husband. A civil war would probably have broken out between them; but Philip, who had only been in Spain long enough to prove his incapacity, died suddenly at Burgos, apparently of typhoid fever, on the 25th of September 1506. His wife refused for long to allow his body to be buried or to part from it. Philip was the father of the

emperors Charles V. and Ferdinand I.

PHILIP II. (1527-1598) king of Spain, was born at Valladolid on the 21st of May 1527. He was the son of the emperor Charles V., and of his wife Isabella of Portugal, who were first cousins. Philip received his education in Spain. His tutor, Dr Juan Martinez Pedernales, who latinized his name to Siliceo, and who was also his confessor, does not appear to have done his duty very thoroughly. The prince, though he had a good command of Latin, never equalled his father as a linguist. Don Juan de Zufiiga, who was appointed to teach him the use of arms, was more conscientious; but he had a very poor pupil. From his earliest years Philip showed himself more addicted to the desk than the saddle and to the pen than to the sword. The emperor, who spent his life moving from one part of his wide dominions to another and in the camps of his armies, watched his heir's education from afar. The trend of his letters was to impress on the boy a profound sense of the high destinies to which he was born, the necessity for keeping his nobles apart from all share in the conduct of the internal government of his kingdom, and the wisdom of distrusting counsellors, who would be sure to wish to influence him for their own ends. Philip grew up grave, self-possessed and distrustful. He was beloved by his Spanish subjects, but utterly without the power of ' attracting men of other races. Though accused of extreme licentiousness in his relations with women, and though he lived for years in adultery with Dona Maria de Osorio, Philip was probably less immoral than most kings of his time, including his father, and was rigidly abstemious in eating and drinking. His power of work was unbounded, and he had an absolute love of reading, annotating and drafting despatches. If he had not become sovereign of the Low Countries, as heir of Mary of Bur- gundy through his father, Philip would in all probability have devoted himself to warfare with the Turks in the Mediterranean, and to the conquest of northern Africa. Unhappily for Spain, Charles, after some hesitation, decided to transmit the Nether- lands to his son, and not to allow them to go with the empire. Philip was summoned in 1548 to Flanders, where he went un- willingly, and was ill regarded. In 1551 he was back in Spain, and intrusted with its government. In 1 543 he had been married to his cousin Mary of Portugal, who bore him a son, the unhappy Don Carlos, and who died in 1545. In 1554, when Charles was meditating his abdication, and wished to secure the position of his son, he summoned Philip to Flanders again, and arranged the marriage with Mary, queen of England, who was the daughter of his mother's sister, in order to form a union of Spain, the Netherlands and England, before which France would be power- less. The marriage proved barren. The abdication of his father on the 16th

of January 1556 constituted Philip sovereign of Spain with its American possessions, of the Aragonese inheritance

in Italy, Naples and Sicily, of the Burgundian inheritance — the Netherlands and Franche Comt6, and of the duchy of Milan, tfhicb his father separated from the empire for his benefit. It was a legacy of immense responsibilities and perils, for France was bound in common prudence to endeavour to ruin a power which encircled her on every side save the sea and threatened her independence. France was for a time beaten at the battles of St Quentin and Gravelines, and forced to make the Peace of Cateau Cambresis (April 2, 1559)- But the death of Mary of England on the 17th of November 1558 had deprived Philip of English support. The establishment of Elizabeth on the English throne put on the flank of his scattered dominions another power, forced no less than France by unavoidable political necessities to be his enemy. The early difficulties of Elizabeth's reign secured him a deceitful peace on that side for a time. His marriage with Elizabeth of Valois on the 22nd of June 1550, and the approach of the wars of religion, gave him a temporary security from France. But the religious agitation was affecting his own Flemish possessions, and when Philip went back to Spain, in August 1559, he was committed to a life- long struggle in which he could not prove victorious except by the conquest of France and England.

If Philip II. had deserved his name of the Prudent he would have made haste, so soon as his father, who continued to inter- vene in the government from his retreat at Yuste in Estremadura, was dead, to relieve himself of the ruinous inheritance of the Low Countries. It was perhaps impossible for him to renounce his rights, and his education, co-operating with his natural disposition, made it morally impossible for him to believe that he could be in the wrong. Like the rest of his generation, he was convinced that unity of religion was indispensable to the mainten- ance of the authority of the State and of good order. Family pride, also, was carried by him to its highest possible pitch. Thus external and internal influences alike drove him into con- flict with the Netherlands, France and England; with the first because political and religious discontent combined to bring about revolt, which he felt bound in duty to crush; with the second and third because they helped the Flemings and the Hollanders. The conflict assumed the character of a struggle between Pro- testantism and Roman Catholicism, in which Philip appeared as the champion of the

Church. It was a part he rejoiced to play. He became, and could not but become, a persecutor in and out of Spain; and his persecutions not only hardened the obstinacy of the Dutch, and helped to exasperate the English, but they provoked a revolt of the Moriscoes, which impoverished his kingdom. No experience of the failure of his policy could shake his belief in its essential excellence. That whatever he did was done for the service of God, that success or failure depended on the inscrutable will of the Almighty and not on himself, were his guiding convictions, which he transmitted to his successors. The ” service of God and his majesty ” was the formula which expressed the belief of the sovereign and his subjects. Philip must therefore be held primarily responsible for the insane policy which brought Spain to ruin. He had a high ideal of his duty as a king to his own people, and had no natural preference for violent courses. The strong measures he took against disorderly elements in Aragon in 1591 were provoked by extreme misconduct on the part of a faction. When he enforced his claim to the crown of Portugal (1 570-1 581) he preferred to placate his new subjects by paying attention to their feelings and their privileges. He even made dangerous political concessions to secure the support of the gentry. It is true that he was ready to make use of assassination for political purposes; but he had been taught by his lawyers that he was ” the prince,” the embodied state, and as such had a right to act for the public good, legibus solulus. This was but in accordance with the temper of the times. Coligny, Lord Burghley and William the Silent also entered into murder plots. In his private life he was orderly and affectionate to his family and servants. He was slow to withdraw the confi- dence he had once given. In the painful episode of the imprison- ment and death of his firstborn son, Don Carlos, Philip behaved honourably. He bore the acute agony of the disease which xxi. 13

killed him with manly patience, and he died piously at the Escorial on the 13th of September 1598.

As an administrator Philip had all the vices of his type, that ol the laborious, self-righteous man, who thinks he can supervise everything, is capable of endless toil, and jealous of his authority, and who therefore will let none of his servants act without his instructions. He set the example of .the unending discussions in committee and boundless minute writing which finally choked the Spanish administration.

The Histoire de Philippe II. of M. H. Forneron (Paris, 1881), contains many references to authorities and is exhaustive, but the author has some violent prejudices. Philip II., by Martin Hume (London, 1897), is

more just in its treatment of Philip's personal character, and gives a useful bibliography. The main sources for the political history are the Documentos Ineditos para la historia de Espana (Madrid, 1842, &c), vols, i., iii., vi., vii., xv., xxi., xxiv., xl., xcviii., ci., ciii., ex., cxi. and others; L. P. Gachard, Actes des etats generaux des Pays Bas, 1576-1585 (Brussels, 1861-1866); and the Calendars of State Papers, Foreign Series, Elizabeth (London, 1863-1901). See also Martin Hume, Two English Queens and Philip (1908).

PHILIP III. (1578-1621), king of Spain, son of Philip II. and his fourth wife, Anne, daughter of the emperor Maximilian II., was born at Madrid on the 14th of April 1578. He inherited the beliefs of his father, but no share of his industry. The old king had sorrowfully confessed that God had not given him a son capable of governing his vast dominions, and had foreseen that Philip III. would be led by his servants. This calculation was exactly fulfilled. The new king put the direction of his govern- ment entirely into the hands of his favourite, the duke of Lerma, and when he fell under the influence of Lerma's son, the duke of Uceda, in 1518, he trusted himself and his states to the new favourite. The king's own life was passed amid court festivities, on which enormous sums of money were wasted, or in the practice of childish piety. It was said that he was so virtuous as hardly to have committed a venial sin. He cannot be justly blamed for having been born to rule a despotic monarchy, without even the capacity which would have qualified him to manage a small estate. He died at Madrid on the 31st of March 1621. The story told in the memoirs of the French ambassador Bassom- pierre, that he was killed by the heat of a brasero (a pan of hot charcoal), because the proper official to take it away was not at hand, is a humorous exaggeration of the formal etiquette of the court.

R. Watson and W. Thompson, History of Philip III. (1786), give the most available general account of his reign; see also the continuation of Mariana's History of Spain by Minana (Madrid,

1817-1822).

PHILIP IV. (1605-1665), king of Spain, eldest son of Philip III. and his wife Margaret, sister of the emperor Ferdinand II., was born at Valladolid on the 8th of April 1605. His reign, after a few passing years of barren successes, was a long story of political and military decay and disaster. The king has been held responsible for the fall of Spain, which was, however, due in the main to internal causes beyond the control of the most despotic ruler, however capable he had been. Philip certainly possessed more energy, both mental and physical,

than his father. There is still in existence a translation of Guicciardini which he wrote with his own hand in order to qualify himself for government by acquiring a knowledge of political history. He was a fine horseman and keen hunter. His artistic taste was shown by his patronage of Velasquez, and his love of letters by his favour to Lope de Vega, Calderon, and other dramatists. He is even credited, on fairly probable testimony, with a share at least in the composition of several comedies. His good intentions were of no avail to his government. Coming to the throne at the age of sixteen, he did the wisest thing he could by allowing himself to be guided by the most capable man he could find. His favourite, Olivares, was a far more honest man than the duke of Lerma, and was more fit for the place of prime minister than any Spaniard of the time. But Philip IV. had not the strength of mind to free himself from the influence of Olivares when he had grown to manhood. The amusements which the favourite had encouraged became the business of the

king's life. When, in 1643, the disasters falling on the monarchy on all sides led to the dismissal of Olivares, Philip had lost the power to devote himself to hard work. After a brief struggle with the task of directing the administration of the most ex- tensive and the worst organized monarchy in Europe, he sank back into his pleasures and was governed by other favourites. His political opinions were those he had inherited from his father and grandfather. He thought it his duty to support the German Habsburgs and the cause of the Roman Catholic Church against the Protestants, to assert his sovereignty over Holland, and to extend the dominions of his house. The utter exhaustion of his people in the course of a hopeless struggle with Holland, France and England was seen by him with sympathy, but he considered it an unavoidable misfortune and not the result of his own errors, since he could not be expected to renounce his rights or to desert the cause of God and the Church. In public he maintained a bearing of rigid solemnity, and was seen to laugh only three times in the course of his life. But in private he indulged in horseplay and very coarse immorality. His court was grossly vicious. The early death of his eldest son, Baltasar Carlos, was unquestionably due to debauchery encouraged by the gentlemen entrusted by the king with his education. The lesson shocked the king, but its effect soon wore off. Philip IV. died broken-hearted on the 17th of September 1665, expressing the hope that his surviving son, Carlos, would be more fortunate than himself.

The best accounts of Philip IV. will be found in the Estudios del reinado de Felipe IV., by Don A. Canovas del Castillo (Madrid, 1889), and in the introduction by Don F. Silvela to his edition of the Cartas de Sor Maria de Agreda y del rey Felipe IV. (Madrid,

1885-1886).

PHILIP V. (1683-1746), king of Spain, founder of the present Bourbon dynasty, was the son of the Dauphin Louis and his wife, Maria Anna, daughter of Ferdinand Maria, elector of Bavaria. He was born at Versailles on the 19th of December 1683. On the extinction of the male line of the house of Habs- burg in Spain he was named heir by the will of Charles H. He had shared in the careful education given to his elder brother, Louis, duke of Burgundy, by Fenelon, and was himself known as duke of Anjou. Philip was by nature dull and phlegmatic. He had learnt morality from Fenelon's teaching, and showed himself throughout his life strongly adverse to the moral laxity of his grandfather and of most of the princes of his time. But his very domestic regularity caused him to be entirely under the influence

of his two wives, Maria Louisa of Savoy, whom he married in 1702, and who died in February 1714, and Elizabeth Farnese of Parma, whom he married in December of the same year, and who survived him. He showed courage on the field of battle, both in Italy and Spain, during the War of the Spanish Succession, and was flattered by his courtiers with the title of El Animoso, or the spirited. But he had no taste for military adventure. If he had a strong passion, it was to provide for his succession to the throne of France, if his nephew, Louis XV., should die, and he indulged in many intrigues against the house of Orleans, whose right to the succession was supposed to be secured by Philip's solemn renunciation of all claim to the French throne, when he became king of Spain. It was in pursuit of one of these intrigues that he abdicated in 1724 in favour of his son Louis. But Louis died in a few months, and Philip returned to the throne. At a later period he tried to abdicate again, and his wife had to keep him in a species of disguised confinement. Throughout his life, but particularly in the later part of it, he was subject to prolonged fits of melan- cholia, during which he would not even speak. He died of apoplexy on the 9th of July 1746.

The best account of Philip's character and reign is still that given by Coxe in his Memoirs of the Kings of Spain of the House of Bourbon (London, 1815).

PHILIP THE BOLD (1342-1404), duke of Burgundy, fourth son of John II. of France and Bonne of Luxemburg, was born on the 15th of January 1342. He earned his surname by his bravery while fighting by his father's side on the field of Poitiers. After the defeat of King John he accompanied him into captivity

in England. In 1360 he received the title of duke of Touraine, and in June 1363 was entrusted with the government of Burgundy, which John had united to the crown at the death of the last duke of the Capetian family, Philip of Rouvre, in 1361. In September 1363 John bestowed on Philip the title of duke of Burgundy, together with that of first peer of France. John was anxious not to displease the Burgundians, who were accus- tomed to their independence; and, moreover, with Philip as duke of Burgundy he was in a better posture to resist the king of Navarre, Charles the Bad, who laid claim to the duchy. The donation, which was at first kept secret in spite of a request made in 1363 for its confirmation by the emperor Charles IV., was ratified at the accession of Charles V. of France; but in consequence of Philip's preoccupation with the Grand Com- panies, which had invaded France, it was not until November 1364 that he definitely took possession of the duchy. Charles continued to show

favour to his brother, appointing him (in 1366) his lieutenant in Champagne and marrying him to Margaret, daughter and heiress of Louis of Male, count of Flanders, and widow of Philip of Rouvre. Edward III. of England was negotiating for the marriage of this princess with his son Edmund, earl of Cambridge; but Charles prevailed upon Pope Urban V. to refuse the dispensation necessary on grounds of kinship, and even consented to give up Lille, Douai and Orchies to Flanders on condition that Margaret should marry his brother. Philip eventually won the day, thanks to the support of the late count's mother, and the marriage took place with high revel at Ghent on the 19th of June 1369.

During the succeeding years Philip proved a faithful ally to Charles. He took part in the almost bloodless campaign against the duke of Lancaster, who had landed at Calais; in 1377 he took several towns in French Flanders from the English; and in 1379 relieved Troyes, which had been besieged by the English. On Charles's death Philip found himself, with his brothers, the dukes of Anjou and Berry, in charge of the govern- ment of France in the name of Charles VI., who was a minor; and in the absence of the duke of Anjou, who left France in 1382 to conquer the kingdom of Naples, Philip occupied the most powerful position in the realm. He persuaded the young king to intervene in Flanders, where the citizens of Ghent, whose rebellious spirit had necessitated Philip's intervention in 1379, had again revolted under Philip van Artevelde and had expelled Louis of Male. On the 27th of November 1382 the Franco-Burgundian chivalry crushed the rebels at Rosebecke, and on his return the duke of Burgundy took part in repress- ing the popular movements which had broken out in Paris and other French towns. In 1383 an insurrection in Flanders supported by England gave rise to another French expedition; but in January 1384 the death of Louis of Male made Philip master of the countships of Flanders, Artois, Rethel and Nevers; and in the following year the citizens of Ghent decided to submit. At this period Philip sought to ingratiate himself with the emperor, who was a near neighbour, and of whom he held a part of his dominions, by giving two of his daughters in marriage to two princes of the house of Bavaria; he also took an important part in bringing about the marriage of a princess of the same family, Isabel, to King Charles VI.

Hostilities, however, were renewed between France and England. A formidable expedition was prepared under the direction of the duke of Burgundy, and a fleet of 1400 sail assembled at Sluys; but the enterprise failed owing to the dilatoriness ofthe duke of Berry. The fatiguing and inglorious expedition in the Netherlands, into which the duke dragged Charles for the purpose of supporting his kinswoman,

Joan of Brabant, against the duke of Gelderland, shook Philip's credit with his nephew, who on his return declared himself of age and confided the government to the ancient councillors of his father, the " Marmousets." The king's madness (1392) restored his uncles to power, and particularly Philip, who after assuring peace by treating with the duke of Brittany and by concluding a truce of twenty-eight years with England, made strenuous efforts to put an end to the Great Schism, visiting Pope Benedict XIII.

at Avignon in 1395 in the hope of obtaining a voluntary resignation from him. But the growing influence of the king's brother, Louis of Orleans, who was on terms of great intimacy with Queen Isabel and was accused of being her lover, was a serious obstruction. Discord broke out in the council, and but for the intervention of the dukes of Berry and Bourbon the two princes would have come to an open struggle. For a brief period Philip was dispossessed of authority, but he regained it in 1402 and kept it till his death, which took place on the 27th of April 1404. The cathedral of St Benigne at Dijon contains his remains, and his tomb (formerly in the Chartreuse of Dijon) is now in the museum in the H6tel-de-ville.

Although he had to curb the independent spirit of the seigneurs of Franche-Comte, and in spite of frequent collisions with his vassals in Flanders and with the citizens of Besancon (who in 1386 extracted from him a promise to respect their privileges), Philip appears to have governed his territories with sagacity and a certain moderation, and he was particularly successful in employing the resources of France in the interests of Burgundy. He granted numerous privileges to the inhabitants of Dijon, and created in 1386 two chambres des comptes, one at Dijon and the other at Lille. He was, in the phrase of a contemporary, " kindly and amiable to high and low and those of middle rank, liberal as an Alexander, noble and pontifical, in court and state magnificent." But his liberality and his love of display involved him in enormous expense, and he left so many debts that his widow was compelled to renounce her personal estate to avoid the responsibility of discharging them. By his wife Margaret (d. 1405) he had a numerous family: John the Fearless, who succeeded him; Charles and Louis, who both died in infancy; Anthony, count of Rethel, and Philip, count of Nevers, both killed at Agincourt; Margaret, who married William of Bavaria, count of Ostrevant; Catherine, wife of Leopold, duke of Austria; Mary, wife of Amadeus

VIII. of Savoy; and Bonne, who was betrothed to John of Bourbon and died young.

(R. Po.)

PHILIP THE GOOD (1396-1467), duke of Burgundy, son of John the Fearless, duke of Burgundy, and Margaret of Bavaria, was born at Dijon on the 13th of June 1396, and succeeded his father on the 10th of September 1419. The natural outcome of the assassination of John the Fearless (q.v .) was to drive his suc- cessor to the English side. In 1419 Philip signed with Henry V. of England the treaty of Arras, by which he recognized Henry as regent and future heir of the kingdom of France, and in 1420 gave his adherence to the treaty of Troyes. Early in December 1420 Philip entered Paris with the king of England, and sub- sequently took part in the defeat of the French at Mons-en-Vimeu. By a treaty concluded by Philip at Amiens in April 1423 with the dukes of Brittany and Bedford, John, duke of Bedford, married Philip's sister Anne, and Arthur of Brittany, earl of Richmond, became the husband of Philip's sister Mar- garet. A few years later discord arose among the allies. When the duke of Bedford besieged Orleans the inhabitants offered to surrender, but to the duke of Burgundy; whereupon Bedford retorted that " he did not beat the bushes for others to take the birds." When this speech reached Philip's ears he withdrew his troops in dudgeon, and concluded a truce with France (1429). Bedford, however, succeeded in conciliating him by promises and presents, and in 1430 Philip took part in the campaign against Compiegne.

But another conflict arose between the duke of Burgundy and the English. Jacqueline, countess of Hainaut, the divorced wife of the duke of Brabant and the heiress of Holland and Zeeland, had married the duke of Gloucester, who attempted to take forcible possession of his wife's territories. Philip, however, himself claimed Brabant as having been bequeathed to him by his cousin Philip, the late duke, with the result that the Burgundians repulsed the troops of the duke of Gloucester, and Jacqueline was forced to recognize the duke of Burgundy as her lieutenant and heir. Moreover, the duchess of Bedford had died in 1433. Charles VII., who in spite of the efforts of the cardinal of Ste-Croix and the conferences held by him at

Auxerre and Semur had hitherto refused to return to France, finally decided to take part in the conferences which were opened at St Vaast d' Arras on the 6th of August 1435, and to which the whole of Christendom attached very high import- ance, all the princes of Europe and the pope and the council of Basel being represented.

Philip consented to a reconcilia- tion with the king of France, and agreed to recognize him as his legitimate sovereign on condition that he should not be required to pay him homage during his lifetime. Charles, on his part, solemnly craved pardon for the murder of John the Fearless through the mouth of the dean of the church in Paris, and handed over to the duke the counties of Macon, Auxerre, Bar-sur-Seine and Ponthieu, and the towns on and near the Somme (Roye, Montdidier, Peronne), reserving the option of redeeming the Somme towns for 400,000 gold crowns. Philip proved a faithful ally of the king, aiding him in re-entering Paris and preparing an expedition against Calais, which, however, failed through the ill-will of his Flemish subjects (1436). In 1440 he paid the ransom of Charles of Orleans (the son of his father's old enemy), who had been a prisoner in England since the battle of Agincourt; received him with great honour at Gravelines; and married him to Mary of Cleves, upon whom he bestowed a handsome dowry. In 1442 Philip entered into a conspiracy to give the duke of Orleans a larger share in the affairs of the kingdom. To Rene of Anjou, the duke of Lor- raine, he showed himself less generous, setting up another claimant to the duchy of Lorraine in the person of Anthony of Vaudemont, and taking Rene prisoner in 143 1; it was not until 1436 that he consented definitively to release Rene on con- dition that he should abandon several strong places and pay an enormous ransom. In 1445, at the conferences of Chalons-sur- Marne, the duchess of Burgundy renounced these claims in her husband's name in order to assure the execution of the treaty of Arras.

Philip was frequently disturbed by the insubordination of the Flemish communes. He had to quell seditions at Liege (1430), Ghent (1432) and Antwerp (1435). In 1438 he was driven with the duchess out of Bruges by the revolted citizens, a revolt which he repressed with great severity. In 1448 the citizens of Ghent rose in rebellion, but, disappointed of French support, they were defeated at Ruppelmonde and in 1453 were overwhelmed at the battle of Gavre, where they left 20,000 dead on the field. At a banquet shortly afterwards Philip vowed that he would lead a crusade against the Turks, who had seized Constantinople, and the knights of his court swore to follow his example. 1 The expedition, however, did not take place, and was but a pretext for levying subsidies and for knightly entertainments. In 1459 Philip sent an embassy under the duke of Cleves into Italy to take part in the con- ferences preparatory to a fresh expedition against the Turks, but this enterprise likewise fell to the ground. In 1456 the duke of Burgundy had given an asylum to the Dauphin Louis (afterwards Louis XL), who had quarrelled with his father and had been forced to

leave France. The ” fox who would rob his host’s hen-roost,” as the old king called Louis, repaid his protector by attempting to sow discord in the ducal family of Burgundy, and then retired to the castle of Genappe in Brabant. At Charles VII. ‘s death, however, Philip was one of the first to recognize the new king, and accompanied him to Paris. During the journey Louis won over the seigneurs of Croy, the principal counsellors of the duke of Burgundy, and persuaded Philip to allow him to redeem the Somme towns for the sum stipulated in the treaty of Arras. This proceeding infuriated Philip’s son Charles, count of Charo- lais, who prevailed upon his father to break his pledge and declare war on the king of France. On the 12th of April 1465 Philip handed over to his son the entire administration of his

1 This was the singular vow known as ” the vow of the pheasant,” from the fact that Philip placed his hand solemnly on a pheasant, which had been brought to him by his herald, and vowed that he would fight the Turks and challenge their sultan to single combat.

estates. The old duke died at Bruges on the 15th of June 1467, and was buried at Dijon.

Philip was a great lover of pomp and luxury and a friend of letters, being the patron of Georges Chastelain, Olivier de la Marche and Antoine de la Salle, and the founder of the col- lection of MSS. known as the ” Bibliotheque de Bourgogne ” (now at Brussels), and also of the university of D61e (1421). He administered his estates wisely; promoted commerce and industry, particularly in Flanders; and left his son a well- lined treasury. He was thrice married: in 1409 to Michelle (d. 1422), daughter of Charles VI. of France; in 1424 to Bonne of Artois (d. 1425); and in 1429 to Isabel (d. 1472), daughter of John I., king of Portugal. On the occasion of his third marriage Philip founded the order of the Golden Fleece. He was succeeded by Charles, afterwards known as Charles the Bold, his only sur- viving son by Isabel. He had several illegitimate children, among them being Corneille, called the Grand Bastard, who was killed in 1452 at the battle of Ruppelmonde.

(R. Po.) PHILIP, Landgrave of Hesse (1504-1567), son of the landgrave William II., was born at Marburg on the 13th of November 1504. He became landgrave on his father’s death in 1509, and having been declared of age in 1518, was married in 1523 to Christina, daughter of

George, duke of Saxony (d. 1539). In 1522 and 1523 he assisted to quell the rising of Franz von Sickingen (q.v.), who had raided Hesse five years previously, and in 1525 he took a leading part in crushing the rebellion of the peasants in north Germany, being mamly responsible for their defeat at Frankenhausen. About this time Philip adopted the reformed faith, of which he was after- wards the zealous and daring defender. Indifferent to theo- logical, or even to patriotic, considerations, his plans to protect the reformers rested upon two main principles — unity among the Protestants at home and military aid from abroad. The schemes he put forward as one of the heads of the league of Schmalkalden, aimed primarily at overthrowing the house of Habsburg; to this end aid was sought from foreigner and native, from Protestant and Catholic alike. Envoys were sent repeatedly to France, England and Denmark; Turkey and Venice were looked to for assistance; the jealousy felt towards the Habsburgs by the Bavarian Wittelsbachs was skilfully fomented; and the German Protestants were assured that attack was the best, nay the only, means of defence. Before the formation of the league of Schmalkalden Philip was very intimate with Zwingli, and up to the time of the reformer's death, in 1531, he hoped that material aid would be forthcoming from his followers. In 1526 he had aided John the Constant, elector of Saxony, to form an alliance of reforming princes; and in 1529 he called together the abortive conference at Mar- burg, hoping thus to close the breach between Lutherans and Zwinglians. More aggressive was his action in 1528. De- ceived by the forgeries of Otto von Pack (q.v.), he believed in the existence of a conspiracy to crush the reformers, and was only restrained from attacking his enemies by the influence of John of Saxony and Luther. He succeeded, however, in com- pelling the archbishop of Mainz and the bishops of Wurzburg and Bamberg to contribute to the cost of his mobilization. Philip was freely accused of having employed Pack to concoct the forgery; and, although this charge is doubtless false, his eager acceptance of Pack's unproved statements aroused con- siderable ill-feeling among the Catholics, which he was not slow to return. In 1529 the landgrave signed the "protest " which was presented to the diet at Spires, being thus one of the original " Protestants; " in 1530 he was among the subscribers to the confession of Augsburg; and the formation of the league of Schmalkalden in the same year was largely due to his energy. His next important undertaking, the restoration of Ulrich, duke of Wurtemberg (q.v.) to his duchy, was attended with conspicuous success. Wurtemberg had passed into the posses- sion of the Habsburgs, but after Philip's brief and victorious campaign in 1534 the humiliation of Charles V. and his brother, the German king, Ferdinand I., was so complete that it was

said the landgrave had done more for Protestantism by this enterprise than a thousand of Luther's books would do. After this victory Philip entertained the idea of coming to terms with Charles V. on the basis of extensive concessions to the Protestants; but he quickly returned to his former plans for leading a general attack on the Habsburgs. The Concord of Wittenberg, made in 1536, was favourable for these schemes, but after five years spent in assiduous preparation war was prevented by the serious illness of the landgrave and the lukewarmness of his allies. Recovering from his malady, he had returned to his intrigues when an event happened which materially affected the fortunes of the Reformation. His union with Christina was not a happy one, and having fixed his affections upon Margaret von der Saal (d. 1566), he obtained an opinion from Protestant theologians that bigamy was not forbidden by Holy Writ. Luther and Melancthon at length consented to the marriage, but stipulated that it should be kept secret, and it was celebrated in March 1540. The marriage, however, became known, and a great outcry arose against Philip, whose friends quickly deserted him. He objected to Luther's counsel to deny the existence of a second marriage; abused John Frederick, elector of Saxony, for not coming to support him; and caused bigamy to be publicly defended. Alarmed, however, by the strength of his enemies, and by their evident determination to punish him as a bigamist, he in June 1541 made a treaty with Charles V. at Regensburg. In return for a general pardon he undertook to break off relations with France and England and loyally to support the emperor.

During these years Philip had been forwarding the progress of the Reformation in Hesse. This was begun about 1526, when an important synod was held at Homburg; the university of Marburg was founded in the interests of the reformers in 1527; and after the diet of Spires in 1529 the work was conducted with renewed vigour. The Catholic worship was suppressed, and the secularized church revenues supplied an endowment of the new university.

The peace between the emperor and the landgrave was soon broken. In 1542 Philip persuaded the league of Schmalkalden to attack Henry II., duke of Brunswick- Wolfenbuttel, ostensibly in the interests of the Protestant towns of Brunswick and Goslar. The duchy was quickly overrun, and Henry — a Catholic prince — driven out; but the good understanding between the emperor and the landgrave was destroyed, and the relations between Protestants and Catholics became worse than before. Nor was the fissure in the Protestant ranks closed, and Charles took advantage of this disunion to conquer Gelderland and to mature his preparations for overthrowing the league of Schmalkalden. Unlike John Frederick of Saxony, Philip divined, or partly divined, the

emperor's intentions, and urged repeatedly that the forces of the league should be put in order. This advice passed unheeded, and when Charles suddenly showed his hand, and in July 1 546 issued the imperial ban against the landgrave and the elector, it was seen that the two princes were almost isolated. Fighting began along the upper Danube, and when indecision and want of funds had ruined the league's chances of success, Philip returned to Hesse and busied himself with seeking help from foreign powers; while in April 1547 John Frederick was captured at Miihlberg. After this defeat the landgrave was induced to surrender to Charles in June by his son-in-law, Maurice, now elector of Saxony, and Joachim II., elector of Brandenburg, who promised Philip that he should be pardoned, and were greatly incensed when the emperor refused to assent to this condition. There is, however, no truth in the story that the word einiges was altered by an imperial servant into ewiges, thus making the phrase " without any imprisonment " in the treaty of surrender to read " without perpetual imprisonment." Philip was sentenced to detention for fifteen years, and as he was heartily disliked by Charles his imprisonment was a rigorous one, and became still more so after he had made an attempt to escape. His acceptance of the Interim in 1 548 did not bring him freedom; but this came in consequence of the humiliation of

Charles V. at the hands of Maurice in 1552; and after the con- clusion of the peace of Passau in this year he returned to Hesse. Although less active than formerly, the landgrave did not cease to intrigue on behalf of the Protestants while continuing the work of reforming and organizing the Church in Hesse. In 1562 he aided the Huguenots with troops, and he was frequently in communication with the insurgents in the Netherlands; but his efforts to form a union of the Protestants were fruitless. Philip, who is sometimes called the Magnanimous, died at Cassel on the 31st of March 1567. By Christina he had four sons and five daughters, and according to his directions the landgraviate was partitioned at his death between his sons. He had also by Margaret von der Saal seven sons, who were called counts of Dietz, and one daughter.

See Ch. von Rommel, Philipp der Grossmiithige (Giessen, 1830); Briefwechsel Landgraf Philipps mit Bucer, edited by M . Lenz (Leipzig, 1881-1890); Politisches Archiv des Landgrafen Philipp, edited by F. Kiich (Leipzig, 1904) ; L. G. Mogen, Historia captivitatis Philippi

Magnanimi (Frankfort, 1766); W. Falckenheiner, Philipp der Grossmiithige im Bauernkriege (Marburg, 1887) ; H. Schwarz, Landgraf Philipp von Hessen und die Packschen Handel (Leipzig, 1 881) ; J. Wille, Philipp der Grossmiithige von Hessen und die Restitution Ulnchs von Wiirttemberg (Tubingen, 1882); W. W. Rockwell Die Doppelehe des Landgrafen Philipp von Hessen (Marburg, 1904) ; A. Heidenhain, Die Unions politik Philipps von Hessen (Halle, 1890); K. Varrentrapp, Landgraf Philipp von Hessen und die Universitdt Marburg (Cassel, 1904) ; Von Drach and Konnecke, Die Bildnisse Philipps des Grossmuligen (Cassel, 1905) ; Festschrift zum Geddchtnis Philipps, published by the Verein fur hessische Geschichte und Landeskunde (Cassel, 1904) ; and Philipp der Grossmiltige, Beitrdge zur Geschichte seines Lebens und seiner Zeit, published by the Historischer Verein fur das Grossherzogtum Hessen (Marburg, 1904).

PHILIP, JOHN (1775-1851), British missionary in South Africa, was born on the 14th of April 1775, at Kirkcaldy, Fife, the son of a schoolmaster in that town. After having been apprenticed to a linendraper, and for three years a clerk in a Dundee business house, he entered the Hoxton (Congregational) Theological College, and in 1804 was appointed to a Congregational chapel in Aberdeen. In 1818 he joined the Rev. John Campbell in his second journey to South Africa to inspect the stations of the London Missionary Society, and reported that the conduct of the Cape Colonists towards the natives was deserving of strong reprobation. In 1822 the London Missionary Society appointed him superintendent of their South African stations. He made his headquarters at Cape Town, where he also established and undertook the pastorate of the Union Chapel. His indignation was aroused by the barbarities inflicted upon the Hottentots and Kaffirs (by a minority of the colonists), and he set himself to remedy their grievances; but his zeal was greater than his knowledge. He misjudged the character both of the colonists and of the natives, his cardinal mistake being in regarding the African as little removed from the European in intellect and capacity. It was the period of the agitation for the abolition of slavery in England, where Philip's .charges against the colonists and the colonial government found powerful support. His influence was seen in the ordinance of 1828 granting all free coloured persons at the Cape every right to which any other British subjects were entitled. During 1826-1828 he was in England, and in the last-named year he published Researches in South Africa, containing his views on the native question. His recommendations were adopted by the House of Commons, but his unpopularity in South Africa was great, and in 1830 he was convicted of libelling a Cape official. The

British govern- ment, however, caused the Cape government to conform to the views of Philip, who for over twenty years exercised a powerful, and in many respects unfavourable, influence over the destinies of the country. One of Philip's ideals was the curbing of colonial " aggression " by the creation of a belt of native states around Cape Colony. In Sir Benjamin D'Urban Philip found a governor anxious to promote the interests of the natives. When however at the close of the Kaffir War of 1834-35 D'Urban annexed the country up to the Kei River, Philip's hostility was aroused. He came to England in 1836, in company with a Kaffir convert and a Hottentot convert, and aroused public opinion against the Cape government. His views

triumphed, D'Urban was dismissed, and Philip returned to the Cape as unofficial adviser to the government on all matters affecting the natives. For a time his plan of buffer states was carried out, but in 1846 another Kaffir rising convinced him of the futility of his schemes. The Kaffir chief who had accom- panied him to England joined the enemy; and many of his converts showed that his efforts on their behalf had effected no change in their character. This was a blow from which he did not recover. The annexation of the Orange River Sovereignty in 1848 followed, finally destroying his hope of maintaining independent native states. In 1849 he severed his connexion with politics and retired to the mission station at Hankey, Cape Colony, where he died on the 27th of August 1851.

See South Africa : History ; G. M'C. Theal's History of SouthAfrica since iJq$ (London, ed. 1908); Missionary Magazine (1836-1851); R. Wardlaw's Funeral Sermon, 1852.

PHILIP, KING (c. 1639-1676), chief sachem of the Wam- panoag Indians in America, and the son of Massasoit (d. 1662) — as the English, mistaking this title (great chief) for a proper name, called Woosamequin (Yellow Feather) — who for forty years was the friend and ally of the English colonists at Plymouth. To Massasoit's two sons, Wamsutta and Metacomet, the English gave the names respectively of Alexander and Philip. Alexander succeeded his father as sachem, and in the same year, while in Marshfield, whither he had gone to explain certain alleged unfriendly acts toward the English, was taken ill; he died on his way home. Philip, who succeeded Alexander, suspected the English of poisoning his brother. The English had grown stronger and more numerous, and had begun to meddle in the internal affairs of the Indians. In 1667 one of Philip's Indians accused him to the English of attempting to betray them to the French or Dutch, but this charge was not proved. In 1671 the Plymouth authorities demanded that the Wampanoags should surrender their arms; Philip consented,

but his followers failed to comply, and measures were taken to enforce the promise. Philip thereupon went before the general court, agreed to pay an annual tribute, and not to sell lands or engage in war with other Indians without the consent of the Plymouth government. In 1674, when three Wampanoags were executed at Plymouth for the alleged murder of Sassamon, an Indian convert who had played the part of informer to the English, Philip could no longer hold his followers in check. There were outbreaks in the middle of June 1675, and on the 24th of June the massacre of whites began. There was no concerted movement of the various tribes and the war had not been previously planned. The Nipmuck Indians rose in July; the tribes along the Connecticut river in August; those in the present states of Maine and New Hampshire in September and October, and the Narragansets in December, when (on the 19th) they were attacked and seriously crippled, in what is now the township of South Kingstown, Rhode Island, by the English (under Governor Josiah Winslow of Plymouth), who suspected their loyalty.

The colony of Connecticut took quick measures of defence, guarded its frontier, maintained its alliance with the Mohegans, and suffered little injury. Massachusetts and Plymouth were slower in acting and suffered great loss. Rhode Island raised no troops, and suffered severely. Early in the autumn Philip ˆ went nearly as far west as Albany in an unsuccessful attempt to get aid from the French and the Mohawks and supplies from the Dutch traders. At Deerfield on the 18th of September about 60 English were killed and the settlement was abandoned. In the spring of 1676 it became evident that the Indian power was waning. The warriors had been unable to plant their crops; they were weaker numerically and more poorly armed than the English, and the latter had also made an alliance with the friendly Naticks and the Niantiqs. On the 1st of August 1676 Philip's wife and nine-year old son were captured, and on the nth of August an Indian traitor guided the English to the sachem's hiding place in a swamp at the foot of Mount Hope (in what is now the township of Bristol, Rhode Island), where early the next morning he was surprised, and while trying to escape was killed by an Indian. The head of Philip was sent to Plymouth and set

on a pole in a public place, where it remained for a quarter of a century; his right hand was given to his slayer, who preserved it in rum and won many pennies by exhibiting it in the New England

towns. The struggle was now over in southern New England, but it continued along the north-eastern frontier till the spring of 1678, and nearly every settlement beyond the Piscataqua was destroyed. In the colonies of Plymouth, Massachusetts, Rhode Island and Connecticut six hundred men (or about 9% of the fighting population),' besides many women and children, had been killed; thirteen settlements had been completely destroyed, and about forty others were partly burned. Plymouth had incurred a debt greater than the value of the personal property of her people. The Indians suffered even worse: in addition to the large number of men, women and children slain, great numbers, among them the wife and son of Philip, were sold into slavery in the Spanish Indies and the Bermudas. Many others migrated from New England to New York ; and the few remaining Indians, feeble and dispirited, were no longer a power to be reckoned with. Philip was an Indian patriot and statesman, not a warrior; he united the tribes in their resistance to the colonists, but was not a great leader in battle.

See George M. Bodges, Soldiers in King Philip's War (Leo- minster, Mass. ; 1896); John Gorham Palfrey, History of New England, vol. iii. (Boston, 1864); and especially George W. Ellis and John E. Morris, King Philip's War (New York, 1906). See also Entertaining Passages Relating to King Philip's War (Boston, 1716; new edition, edited with notes by H. M. Dexter, Boston, 1865), the account by Colonel Benjamin Church (1639-1718), one of the principal leaders of the English, of the warfare in south-eastern New England, in which he took part; it is one of the most famous and realistic accounts of early Indian warfare.

PHILIPPA OF HAINAUT (c. 1314-1369), queen of the English king Edward III., was the daughter of William the Good, count of Holland and Hainaut, and his wife Jeanne de Valois, grand- daughter of Philip III. of France. Edward visited the court of Count William in 1326 with his mother Isabella, who immediately arranged a marriage between him and Philippa. After a dispen- sation had been obtained for the marriage of the cousins (they were both descendants of Philip III.) Philippa was married by proxy at Valenciennes in October 1327, and landed in England in December. She joined Edward at York, where she was married on the 30th of January 1328. Her marriage dower had been seized by the queen dowager Isabella to pay a body of Hainauters, with whose help she had compassed her husband's deposition. The alliance ensured for Edward in his French wars the support of Philippa's influential kindred; and before starting on his French campaign he secured troops from William the Good, as well as from the count of Gelderland, the count of Julick, and the emperor Louis the Bavarian. Her mother Jeanne de Valois, visited her in 1331

and further cemented the community of interests between England and Flanders. Before 1335 Philippa had established a small colony of Flemish weavers at Norwich, and she showed an active interest in the weaving trade by repeated visits to the town. She also encouraged coal- mining on her estates in Tynedale. Her eldest son, Edward the Black Prince, was born in 1330, and she subsequently bore six sons and five daughters. In November 1342 she became guardian of John of Gaunt and her younger children, with their lands. Her agents are said to have shown great harshness in collecting the feudal dues with which to supply her large household. The anecdotes of her piety and generosity which have been preserved are proof, however, of her popularity. She interceded in 133 1 with the king for some carpenters whose careless work on a platform resulted in an accident to herself and her ladies, and on a more famous occasion her prayers saved the citizens of Calais from Edward's vengeance. There is a generally accepted story, based on the chronicles of Jehan le Bel and Froissart, that she summoned the English forces to meet the Scottish invasion of 1346, and harangued the troops before the battle of Neville's Cross. She certainly exercised considerable influence over her husband, whom she constantly accompanied on his campaigns; and her death on the 15th of August 1369 was a misfortune for the kingdom at large, since Edward from that time came under

the domination of the rapacious Alice Perrers. Philippa was the patron and friend of Froissart, who was her secretary from 1361 to 1366. Queen's College, Oxford, was not, as is stated in Skelton's version of her epitaph, founded by her, but by her chaplain, Robert of Eglesfield. Her chief benefactions were made to the hospital of St Katharine's by the Tower, London.

See Agnes Strickland, Lives of the Queens of England, vol. i. In addition to the account given in his Chroniques, Froissart wrote a formal eulogy of her, which has been lost.

PHILIPPEVILLE, a seaport of Algeria, chief town of an arrondissement in the department of Constantine, and 54 m. N. by E. of that city, on the Bay of Stora, in 36° 53′ N. 6° 54′ E. It is connected by railway with Constantine, Batna and Biskra. The town derives its importance from being the port of Constan- tine. The harbour works, with every vessel in port, having been destroyed by a storm in 1878, a more commodious harbour was built, at a cost of about £1,200,000. From Cape Skikda, on the east a mole or breakwater projects 4592 ft. to the W.N.W., while from Chateau Vert on the west another mole runs out 13 1 2 ft. to the north, leaving an entrance to the port about 656 ft. wide. The protected area comprises an outer and an inner basin. The

depth of water at the entrance is about 33 ft., along- side the quays about 20 ft. The quays are faced with blocks of white marble brought from the quarries at Filfila, 16 m. distant. Pop. (1906), of the town 16,539, of the commune 26,050, of the arrondissement, which includes 12 communes, 147,607.

Philippeville occupies the site of successive Phoenician and Roman cities. By the Romans, under whom it attained a high state of prosperity, it was named Rusicada. In the middle ages the town ceased to be inhabited. The site was purchased from the Arabs by Marshal Valee in 1838 for £6. Some parts of the Roman theatre remain, but the stones of the amphitheatre, which stood without the walls of the modern town, and which the French found in an almost perfect state of preservation, were used by them for building purposes, and the railway was cut through the site. On a hill above the town are the Roman reservoirs, which have been restored and still supply the town with water. They are fed by a canal from the Wadi Beni Meleh. The Roman baths, in the centre of the modern town, serve as cellars for military stores.

PHILIPPI (Turk. Filibejik), a city of ancient Macedonia, on a steep hill near the river Gangites (mod. Angista), overlooking an extensive plain and at no great distance from the coast of the Aegean, on the highway between Neapolis (Kavalla) and Thessa- lonica. Originally called Crenides (Fountains), it took its later name from Philip II. of Macedon, who made himself master of the neighbouring gold mines of the Hill of Dionysus, and fortified the city as one of his frontier-towns. In 42 B.C., after the victory gained over the senatorial party by Octavius and Antony, it became a Roman colony, Colonia Julia Philippensis, which was probably increased after the battle of Actium {Col. Aug. Julia Phil.). The inhabitants received the Jus Italicum, and Philippi was one of the specially designated ” first cities ” (Acts xvi. 12; see Marquardt, Rom. Staatsverwaltung. i. 187). The city was twice visited by St Paul, whose Epistle to the Philippians was addressed to his converts here. The site, now uninhabited, is marked by ruins — the substructions of an amphitheatre, parts of a great temple — which have furnished interesting inscriptions. A little to the east is the huge stone monument of C. Vibius, known to the Turks as Dikelitashlar and to the Greeks as the Manger of Bucephalus.

See Heuzey and Daumet, Mission arch, en Macedoine, Paris (1865), and other authorities in bibliography of Macedonia ; Corp. Inscr. Lat. iii. 1. (J. D. B.)

PHILIPPIANS, EPISTLE TO THE, a book of the New Testa- ment.

Communications had already passed between the Chris- tians of Philippi and Paul, not only when he was at Thessalonica (iv. 15-16), but at some subsequent period (iv. 18), when Epaph- roditus had brought him a present of money from them. It is possible that this gift was accompanied by a letter. At any rate the extant epistle is the answer to one received from the Philippian Christians, who had evidently desired information about the

apostle's health and prospects (i. 12), assured him of their prayers (i. 19), and wondered whether he, their pride and glory (nauxruxa), would return to them (i. 25 seq.).

After a brief greeting (i. 1, 2), Paul assures them of his loving interest in their present attainments and future progress in the faith of the gospel (i. 3-1 1); then, relieving their anxiety about his own prospects, he expresses the confident hope that he will be released and thus be able to return to them (i. 12-26). Meantime they were to avoid any pride or factiousness which might break their unity 1 as a church (i. 27-ii. 18), and they are promised a visit from two of Paul's coadjutors, 2 who are well known to them (ii. 19-30). At this point the letter suddenly swerves 3 into a passionate warning against some errorists of Judaism (iii. i-iv. 1), after which the appeal for unity at Philippi is reiterated (iv. 2-9),* and the epistle closes with some personal details (iv. 10—23).

Paul is a prisoner when he writes, and the place of composition may therefore be Caesarea or Rome (Acts xxviii. 16, 30-31). The evidence upon the whole seems to point to the latter. The phrase olda Kaiaapos (iv. 22) suits Rome better than Caesarea, and, while irpaiTupiov (i. 13) does not necessarily imply the capital, it is most naturally understood of Rome. 5 But the whole tone of the epistle suggests that Paul expected a speedy end to his case. Now at Caesarea this was out of the question. His appeal to Caesar involved a protracted process, and it is very difficult to put expressions like those e.g. of ii. 23 into such a situation. The critical outlook of Philippians does not corre- spond with the position of the apostle at Caesarea, nor can the latter town be said to have been a centre of vigorous Christian propaganda (i. 17). Finally, the contention that no visit of Timothy to Rome is known is an argument from silence which is of little more weight than the plea of Spitta that the cupidity of Felix (Acts xxiv. 26) was excited by the arrival of the money from Philippi (Phil. iv. 16).

A further examination of the epistle shows that it must have been written towards the close of the Surla ohy of Acts xxviii. 30, not in the earlier part of the Roman captivity. Paul is on the edge and eve of the great decision. Behind him (i. 12-13) lies a period during which considerable progress has been made in the local preaching and extension of the gospel, nor does the language of the apostle suggest that this fresh departure in the propaganda was stimulated by the mere novelty of his arrival. Furthermore, the relations between the Philippians and himself presuppose, on any fair estimate, an interval of time which cannot be crushed into a few months. News of his arrival must have reached them; money was collected (ii. 25, iv. 18) and then forwarded by Epaphroditus, who fell sick after he reached the capital; news of this again floated back to Philippi, and subsequently Paul heard of the Philippians' concern (ii. 26). Not till then did he compose this letter.

Philippians is thus the last extant letter we possess from Paul, unless some of the notes embedded in the pastoral epistles are to be dated subsequent to its composition. It unites the close of his career in Rome with the beginning of his mission work in Europe (iv. 15; cf. Acts xvi. 12), and illustrates not merely the situation of the apostle at Rome, but the terms of exceptional affection which existed from first to last between him and the

1 For the strong Christian consciousness of solidarity, presupposed in the Philippians, see Von Dobschutz's Christian Life in the Primitive Church (1904), pp. 93 seq.

2 The touch of acerbity in ii. 21 (after i. 14) is probably to be explained by the fact that " Paul had found some of the brethren reluctant to undertake a journey to Macedonia, or to perform some other service which he desired, and the words only express the momentary disappointment of a man who was imprisoned and ready to die for the gospel " (Drummond). Cf. Renan's Antichrist (Eng. trans, p. 48).

3 The so-called logion in (Justin's?) De resurrect. 9: dpriatv kv ovpavu) 7-qv haTo'iK-qatv vTrapxeiv, seems a mere echo of iii. 20.

4 On iv. 8 Yon Soden notes {History of Early Christian Literature, p. 114) that " it is as if we heard the ripple of the waves at the meeting of the two streams which have their source in Zion and the Parthenon."

5 If the expression meant {a) the praefecti praetorio or officials

charged with the care of prisoners under trial, i.e. the supreme imperial court, or (b) the praetorian guard, or © their barracks, this would almost follow. But conceivably it might mean the palace, i.e. of Herod (Acts xxiii. 35). The balance of probabilities falls, however, in favour of the court hypothesis.

Macedonian churches. The main argument for putting it earlier is derived from the admitted affinities between it and Romans, the Colossian and Ephesian epistles containing, it is held, a more advanced christology (so Lightfoot especially, and Hort, Judaistic Christianity, pp. 11 5-1 29). But such considerations are not decisive. Paul wrote from time to time, not in the execution of a literary plan, but as different objects or interests called out his powers. The Philippians did not require, and therefore did not receive, the same elaborate warnings as the Asiatic churches. Hence on the one hand it is unreal to lay stress on coincidences with Romans, as if these necessarily implied that both epistles must have been composed shortly after one another, while again the further stage of thought on Christ and the Church, which is evident in Colossians, does not prove that the latter must have followed the former. Upon the whole, the internal evidence of the epistle strongly favours its position as the last of the captivity epistles.

The attempts made during the 19th century to disprove the Pauline authorship now possess merely an historic interest, nor have the various hypotheses of more or less extensive inter- polation won any serious support. 6 More significance attaches to the view that the epistle is made up of two separate notes, written to Philippi at different times. The fusion of the two is found in the abrupt hiatus of iii. 1, and evidence is led from supposed inconsistencies between the earlier and the latter parts of the epistle. But the flexibility of a letter-writer, under different moods of feeling, which would naturally lead to rapid transitions, may be adduced as some explanation of the latter phenomena. The exegesis does not absolutely necessitate a parti- tion of the epistle, which (so Heinrichs and Paulus) would make iii. i-iv. 20 a special letter addressed to some inner circle of the apostle's friends (in spite of iv. 10 seq.), or take iii.-iv. (Hausrath, History of N. T. Times, iv. 162 seq. and Bacon, Story of St Paul, pp. 367 seq.) as earlier than i.ii. Besides, as Pfleiderer points out, the hypothesis is shipwrecked on the difficulty of imagining that " each of the epistles had but one essential part: the first, in particular, lacking an expression of thanks for the gift from the Philippians, which must nevertheless, according to ii. 25, have already taken place." In his letter to the Philippians (iii. 2) Poly carp indeed observes that Paul wrote lirtCToXas to them; but, even if the plural could not be taken as

equivalent to a single despatch, it would not necessarily support the partition theory of the canonical Philippians. Polycarp may have known of more than one Pauline note to Philippi, no longer extant, or he may be referring loosely to 2 Thessalonians, which was ad dressed to a neighbouring Macedonian church. The exegetical arguments are, in short, the final court of appeal, and their verdict tells rather in favour of the epistle's integrity. The simplest account of iii. 1 is to suppose that Paul started afresh to complete or supplement what he had already written, possibly because some fresh tidings from Philippi had reached him in the interval. Psychologically the change from ii. 19 seq., with its note of fare- well, to the impassioned outburst of iii. 2 seq., is not incredible in an informal letter from a man like Paul. The hiatus is striking, but it cannot be held to necessitate an editorial dovetailing of two separate epistles. It is doubtful, therefore, if the ingenious attempts to analyse Philippians have proved much more con- vincing than the similar movement of literary criticism upon the first Philippic of Demosthenes, where research has swung back in the main to a conservative position (cf. A. Baron in Wiener Studien, 1884, 173-205).

The first clear echoes of the epistle are heard in Polycarp, though it was probably known to Clement of Rome and Ignatius (cf. the evidence tabulated in The New Testament in the Apostolic 6 To the details furnished in the present writer's Historical New Testament (2nd ed., 1901, pp. 634-635) may be added references to Volter's Paulus u. seine Briefe (1905), pp. 286-323, Belser's Einlei- tung in der N. T. (2nd ed., 1905), pp. 555 seq., and Schmiedel's paragraphs in Ency. Bib. (3147-3148). Pfleiderer (Primitive Christianity, i. 254 seq.) now hesitates on ii. 6 seq. alone like Bruckner and Schmiedel. The objections to Paul's authorship on the score of style and grammar are finally set aside by the philologist N'igeli in Der Wortschatz des Apostels Paulus 1905), pp. 80-82.

Fathers, 1905, pp. 53 seq., 71 seq., 94 seq., with R. J. Knowling's Testimony of St Paul to Christ, pp. 1 1 1 seq. and Gregory's Canon and Text of N. T., 1907, pp. 205-206).

Bibliography. — The ablest among recent editions of the Greek text are those of R. A. Lipsius (Hand-Commentar zum N. T., 2nd ed., 1892), E. Haupt (in Meyer' sKommentar, 1902) and H. A. A. Kennedy (Expositor's Greek Testament, 1903), to which may be added the older

commentaries of C. J. Ellicott (5th ed., 1888), J. B. Lightfoot (6th ed., 1 891) and A. Klopper (1893), which in some respects are not yet superseded. Other modern editions by M. R. Vincent {Internal. Crit. Commentary, 1897), H. C. G. Moule {Cambridge Greek Testament, 1897) and J. M. S. Baljon (1904) are worthy of notice, as well as the Roman Catholic commentaries by P. Beelen (Louvain, 1852) and A. Bisping (1866). The earlier work on the epistle is adequately summarized by B. Weiss in his Der Philipper- brief ausgelegt u. die Geschichte seiner Auslegung kritisch dargestellt (1859). There are brief popular commentaries in German by A. Neander (Eng. trans., 1 85 1, Edinburgh), K. Braune (in Lange's Bibel- Werk, 2nd ed., 1875), Von Soden (1890), K. J. Miiller (1899) and W. Lueken (in Die Schriflen des N. T., 1906); in English by C. J. Vaughan, M. F. Sadler (1889), J. Agar Beet, G. C. Martin {Century Bible) and Principal Drummond (Internat. Handbooks to N. T., 1899). In addition to the literature cited in the course of this article, consult the general studies by M. Hasselmann (Analyse pragmatique de Vipitre aux Phil., 1862) ; A. Sabatier (Encycl. des sciences relig. x. 569-573) ; J. Gibb (Hastings's Diet. Bible, iii. 840-844); Sir W. M. Ramsay (St Paul the Traveller, ch. x., xv. § 4) and R. R. Smith (The Epistle of St. Paul's First Trial, Cam- bridge, 1899) ; besides the older essays of Rettig (Quaesliones philip- pienses, Giessen, 1831) and C. Miiller (Comment, de locis quibusdam epistolae ad Phil., 1844). The case against the Pauline authorship was stated most fully by F. C. Baur (Paulus, Eng. trans., ii. 45 seq. and in Theol. Jahrb., 1849, pp. 501 seq., 1852, pp. 133 seq.) ; E. Hinsch (Zeitschrift fur wiss. Theol., 1873, pp. 59 seq.); S. Hoekstra (Theol. Tijdschrift, 1875, pp. 416 seq.); J. P. Straatman (De Gemeente te Rome, 1878, pp. 201 seq.); C. Holsten (Jahrb. fur protest. Theologie, 1875, pp. 425 seq. 1876, pp. 58 seq., 282 seq.); and Van Manen (Handeleiding voor de oudchrist. Letterkunde, 1900, pp. 49-51, 82-84; also in Ency. Bib., 3703-3713). The most thorough replies have been those of Lunemann (Pauli ad Philipp. epistola contra Baurium defensa, 1847); Ernesti (Studien und Kritiken, 1848, pp. 858-924, 1851, pp. 591-632); B. Bruckner (Epistola ad Phil. Paulo auctori vindicata contra Baurium, 1848); A. Resch (De V Authent. de Vipitre aux Ph., 1850); Grimm (Zeitschrift fitr wiss. Theologie, 1873, pp. 33 seq.); Hilgenfeld (ibid., 1884, pp. 498 seq.); C. Weizsacker (Apostolic Age, i. 218 seq., 279 seq., ii. 131) and Clemen (Paulus, i. 130-138). The religious ideas of the epistle are best stated in English by Principal Rainy (Philippians, Expositor's Bible) and H. C. G. Moule (Philippian Studi-es, 1897). Of the numberless monographs on ii. 6 seq., the most full is Tholuck's Disputatio chrislologica de loco Pauli, Phil. ii. 6-g; and discussions of special excellence may be found in A. B. Bruce, The Humiliation of Christ (3rd ed., 1889, pp. 15 seq., 357

seq.); Weiffenbach's Zur Auslegung d. Stelle Phil, ii. 5-11 (Karlsruhe, 1884); and E. H. Gifford, The Incarnation (reprinted from the Expositor, 1896). (J. Mt.)

PHILIPPICS, in classical literature, a series of orations delivered by Demosthenes against Philip of Macedon. The name was applied to the speeches of Cicero against Mark Antony, and " Philippic " has passed into general use in the sense of an impassioned invective or declamation.

PHILIPPICUS, East Roman emperor, 71 1-7 13, was the son of the patrician Nicephorus, and became distinguished as a soldier under Justinian II. His proper name, which indicates his Armenian origin, was Bardanes. Relying on the support of the Monothelite party, he made some pretensions to the throne on the outbreak of the first great rebellion against Justinian; these led to his relegation to Cephalonia by Tiberius Absimarus, and subsequently to his banishment, by order of Justinian, to Cherson. Here Bardanes, taking the name of Philippicus, successfully incited the inhabitants to revolt, and on the assas- sination of Justinian he at once assumed the purple. Among his first acts were the deposition of Cyrus, the orthodox patriarch of Constantinople, in favour of John, a member of his own sect, and the summoning of a conciliabulum of Eastern bishops, which abolished the canons of the sixth general council. Meanwhile Terbelis, king of the Bulgarians, plundered up to the walls of Constantinople, and shortly afterwards the Saracens made similar inroads from the Asiatic side. The reign of Philippicus was brought to a close through a conspiracy headed by two of his generals, who caused him to be blinded.

See Gibbon, Decline and Fall of the Roman Empire (ed. Bury, London, 1896), v. 183-184.

PHILIPPINE ISLANDS, or The Philippines, an archipelago belonging to the United States of America, situated about 500 m. off the S.E. coast of Asia between 4° 40′ and 21 10′ N. and between 116° 40′ and 126 34′ E. It is bounded W. arid N. by the China Sea, E. by the Pacific Ocean, and S. by the Celebes Sea and the coastal waters of Borneo. Of the large islands, Luzon (40,969 sq. m.) is the most northerly, and Mindanao (36,292 sq. m.), the most southerly. Between Luzon and Mindanao are Samar (5031 sq. m.), Negros (4881 sq. m.), Panay (4611 sq. m.), Mindoro (3851 sq. m.), Leyte (2722 sq. m.), Cebu (1762 sq. m.), Bohol (1441 sq. m.) and Masbate (1236 sq. m.). Farther west and separated from the southern portion of this chain is the long narrow island of Palawan or Paragua (4027 sq. m.). The total land

area of the Philippines is about 115,026 sq. m., and 92% of this is included in the eleven islands named above. There are twenty others, which have an area ranging from 106 sq. m. to 682 sq. m., and the total number of islands enumerated within the archipelago is 3141; of these 2775 contain less than 1 sq. m. each.

Physical Features. — The islands are mainly of volcanic origin, and their surface is much broken by hills, isolated volcanoes and mountain ranges, trending north and south, north-west and south- east, or north-east and south-west. Extending for 350 m. along the east coast of central and northern Luzon is the Sierra Madre range, rising in occasional peaks to more than 4500 ft. and seldom less than 3500 ft. On the west coast are the Caraballos Occidentales north from the Gulf of Lingay6n and the Zambales southward from that gulf to Manila Bay. The Caraballos Occidentales range is very complex; the central ridge is in some parts a rolling plateau, but it rises in Mt Data to 7364 ft., and numerous lofty spurs project from it. Much of the Zambales range has an average height of 4000 ft. or more, and several peaks are more than 5000 ft. high. Between the Sierra Madre and Caraballos Occidentales is the valley of the Cagayan river, about 50 m. wide, and east of the Zambales range is a lowland basin, about 150 m. long and 50 m. wide, and not more than 100 ft. above the sea except near its centre, where the extinct volcano of Arayat rises to 3564 ft. The greater part of southern Luzon is occupied by isolated volcanoes and irregular masses of hills and mountains. Mt Mayon (7916 ft.), near the south-eastern extremity, is an active volcano with an almost perfect cone. Of less prominence are Mt Banajao (7382 ft.), Mt lsarog (6634 ft.) and Mt Masaraga (5244 ft.). The island of Min- danao is traversed north to south by mountain ranges, which rise in their summits to heights exceeding 4000 ft. That along the east coast is longest and least broken, and between it and the next range inland is the level valley of the Agusan river, from 40 to 50 m. wide. Farther west and south-west is the valley of the Rio Grande Mindanao, the largest river on the island, and between the lower course of this river and the south coast is a mountain range with a north-west and south-east trend. On the east border of the south portion of the basin of the Rio Grande Mindanao is Mt Apo (10,312 ft.), an extinct volcano and the highest elevation in the archipelago.

Each of the larger islands between Luzon and Mindanao, except Samar and Bohol, is traversed longitudinally by a single mountain range with occasional spurs. In Leyte there are several isolated volcanic cones, two of which, in the north part, exceed 4000 ft. In Mindoro the range is broad, extending from coast to coast, and it culminates in Mt Halcon (about 8800 ft.). In Negros is Mt Canlaon (8192 ft.), a volcano,

and several summits exceeding 6000 ft. In Panay is Mt Madiaas (7264 ft.) and several other peaks exceeding 4000 ft. The highest peaks in Masbate are about 2500 ft. high, and in Cebii not much more than 2000 ft. In Samar there are irregular masses of hills. The southern portion of Bohol is very hilly, but the northern portion is more level. Palawan, 275 m. long and about 15 m. wide, is traversed throughout its length by a range of mountains with an average height of 4000 to 5000 ft. and a few summits about 6000 ft. high. Submarine mountain ranges connect not only the islands within the archipelago, but also the archipelago itself with Borneo and Celebes, so that only shallow channels connect the interior waters with the Pacific Ocean and the China Sea. The coast-line of the Philippines, more than 11,000 m. in length, is fringed with coral reefs and broken by numerous gulfs and bays.

The Cagayan river, in north Luzon, is the largest in the archi- pelago. It is about 220 m. long and drains to the northward about 10,000 sq. m., or nearly one-fourth of the island. The Rio Grande de Mindanao (known in its upper course as the Rio Pulangua) drains to the south and west a larger area in central and southern Mindanao and is second in size. It and the Agusan, which drains to the northward the mountain valley in east Mindanao, are each over 200 m. in length. The principal rivers of the lowland basin of central Luzon are the Pampanga and the Agno. The Pampanga rises in the highlands on the north-east border, flows south by west, and discharges through several channels into Manila Bay. The

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Agno rises in the mountains on the north border, flows south, south-west and north-west, and discharges through several channels into the Gulf of Lingayen. Each of these has a great number of small tributaries, and along the coast of this lowland basin are many small tide water stieams. The Pasig is a short but commer- cially important stream connecting Laguna de Bay with Manila Bay. The Rio Bicol, which rises in Lake Bato and flows N.N.W. into San Miguel Bay, is the principal river of south Luzon. Samar, Panay, Negros, Leyte, Bohol

and Cebu are drained by many streams, and a few of those in Samar, Panay and Negros are of considerable size.

In the lowland basin of central Luzon, 6 m. inland from Manila Bay, is Laguna de Bay, the largest body of fresh water in the Philippines. It is 32 m. long from north-west to south-east and its coast-line, broken on the north by two hilly peninsulas, is 108 m. long. Lake Taal, a few miles south-west of Laguna de Bay, occupies the crater of a great volcano. It 1 is 17! m. long and 12 m. wide. The country rises gently to it on all sides, and on an island near its centre is the active volcano of Taal, 1050 ft. high. In north Luzon is Lake Cagayan. In Mindanao there are lakes Lanao, Liguasan and Buluan in the west-central portion and lakes Mainit, Pinaya, Dagun, Sadocum and Linao in the valley of the Agusan. There are small lakes in some of the other islands.
Geology. — The Philippines appear to be the remnants of a somewhat complex system of mountain arcs, which from their similarity of form and direction seem to be in some way connected with the mountain ranges of Annam. The oldest rocks exposed are gneiss, talc-schist and serpentine, with intrusive masses of gabbro and diabase. These are overlaid by a limestone, upon which rests con- formably a series of sandstones with coal seams. The age of these beds is unknown. In some of the islands nummulitic limestone (Eocene) occurs. Coral limestones, probably of Middle Tertiary age, are also found, sometimes 4000 ft. above the sea, and marine deposits of a very late geological period occur near the coast and in the low-lying depressions. Volcanic rocks of modern date cover extensive areas, especially in the southern part of Luzon and in Mindanao. In Luzon trachytic tuffs are sometimes interstratified with nummulitic limestone, thus showing that the eruptions had already begun in the Eocene period.

Volcanoes and Earthquakes. — There are twelve active volcanoes in the archipelago. They are Babuyan Claro, Camiguin de Babuyanes and Didicas in the Babuyanes Islands off the north coast of Luzon; Cagua or Caua in north Luzon,; Taal, Mayon and Bulusan in south Luzon; Canlaon and Magaso in Negros; Camiguin de Mindanao in the island of Camiguin, off the north coast of Mindanao; and Apo and Calayo in Mindanao. Only a few eruptions have been recorded of any of these, however, except Taal and Mayon, and there has been no great eruption of Taal since 1754. But there were 26 eruptions of Mayon in the 19th century, and those of 1814 and 1897 were of great violence. That of 1897 began practically without warning on the 23rd of June, became alarming on the 24th and destructive on the 25th, and ceased on the 30th. Streams of lava completely destroyed several villages and injured others, as well as the town of San Fernando. The lava flow

extended more than 7 m. eastward, and a rain of ashes extended 100 m. to the east and 75 m. to the west. There are eight other volcanoes, which although extinct or dormant have well-preserved cones. They are Arayat, Banajao, San Cristobal, Isarog and Malinao in south Luzon, and Macaturin and Matutum in Mindanao.

Earthquakes are frequent and occasionally violent. In the seven years 1902-1908 the microseismograph at Manila recorded 796 local earthquakes. In the 47 years ending March 1909 the various regions of the archipelago were visited by about 60 strong earthquakes; 16 of these, in ten different regions, occurred in the decade from 1890 to 1900. There were 8 in the year 1897 alone, and one of these ruined the town of Zamboanga in west Mindanao and caused considerable loss of life by falling buildings and immense sea waves. A new island appeared at this time off the coast of Borneo, near Labuan. The principal centres of disturbance are in the valley of the Agusan, in the region of Mayon volcano, in the region of Taal volcano, on Masbate Island, and along the north shore of Luzon. The islands of Cebu, Bohol, Negros and Palawan are rarely shaken.

Fauna.— The Philippines, politically speaking, and the Philip- pines, zoologically speaking, are not identical areas; Balabac, Palawan and the Calamianes being characterized by the occurrence of numerous Bornean forms which are conspicuously absent from the remaining islands. Although the Philippines are commonly held to form an eastern extension of the Indo-Malayan sub-region, there is a large amount of specialization in the fauna of the islands eastward of the Palawan group. Mammals are scarce. No mar- supials occur. The edentates are represented by the pangolin (Manis sp.?) of the Palawan group. In the seas are found the dolphin, cachalot and dugong. Wild hogs of at least two species occur. The beautiful axis deer of Sulu has apparently been brought there by man. Red or brown deer occur in Basilan, Mindanao, Leyte, Samar and the Calamianes Islands. The number of species and their respective ranges have not been satisfactorily determined. In Masbate, Panay, Guimaras and Negros there is a dark-coloured species marked with buff spots. Deer are absent in Palawan, Tawi Tawi, Tablas, Romblon, Sibvyan and Siquijor. Humped

cattle are raised on most of the islands. They are killed for their flesh, hides and horns, and little attention is paid to their milk- giving properties. The water-buffalo, or caraboa, occurs in a wild state in Luzon, Mindoro, the Calamianes group, Masbate, Negros and Mindanao, but the wild herds are believed to have originated from domesticated animals. The domesticated water- buffalo is sluggish in

its movements, and will not work through the heat of the day; but it is a wonderful swimmer, and makes its way through the worst quagmire with ease. It is universally used as a draught animal and beast of burden. The most inter- esting of the ruminants is the timarau (Bubalus mindorensis, Heude), peculiar to Mindoro. Unlike the water-buffalo, it does not bathe in water or wallow in mud. It is extremely wild, feeding by night and sleeping by day in the densest jungle. It sometimes charges the hunter without provocation, and is very dangerous when wounded. It attacks and kills the much larger wild buffalo. All attempts to domesticate it have failed. A chevrotain is found in Balabac. The house rat, introduced by man, is a common nuisance, and mice occasionally seriously damage sugar-cane and rice. Squirrels are confined to the eastern chain of islands from Basilan to Samar and to the Palawan-Calamianes group. In the southern islands there is a tiny species, the size of a mouse. Very large flying-squirrels are found in Palawan and Mindanao. Squirrel- shrews occur in the Palawan-Calamianes group, and true shrews at various points in the archipelago. Among the Carnivores are the binturong ‘and an otter, both found in the Palawan- Calamianes group; two civet cats, which range throughout the archipelago, and a wild cat of small size, which has been found in Palawan, Panay, Negros and Luzon. Bats are very numerous, and a number of the species are peculiar to the Philippines. Galeopithecus and Tarsius range from Basilan to Samar; the former occurs also in Bohol. In spite of all .that has been said to the contrary, but one species of monkey (Macacus philippinensis, Geoff.) has been discovered in the Philippines. It occurs on every island of any importance. Its flesh is occasionally eaten by the natives. Albino specimens of this monkey are not uncommon, but the pure white monkeys, not albinos, said to inhabit Mindanao, are mythical. The large fruit bats (Pteropus) occur in immense colonies, and are sometimes eaten by the natives.

Especial importance attaches to the unexpected discovery by Whitehead of a new and peculiar mammalian fauna, inhabiting a small plateau on the top of Mt Data, in north Luzon, at an altitude of more than 7000 ft. Specimens of 15 species were obtained, embracing 5 new genera {Calaemomys, Chrotomys, Rhynchomys, Batomys and Carpomys). Eight of the species were new and strikingly peculiar. Their zoological relationships are probably with Celebes and with Australia. Other discoveries include a few new squirrels and bats, and the occurrence of a lemur (Nyclicebus tardigradus) in Tawi Tawi.

The islands are as rich in birds as they are poor in mammals, the total number of species recorded up to 1906 being 693, of which about one-half are peculiar to the Philippines. A study of their geographical

distribution has demonstrated that the islands may be divided into fairly well-marked groups, in each of which the birds show a degree of specialization closely correlated with diversity of environment and completeness and probable duration of separation from adjacent groups. Balabac, Palawan and the Calamianes show a very strong Bornean element. Mindoro stands by itself. Luzon and the small neighbouring islands have 51 peculiar forms. A close relationship exists between the birds of the entire eastern chain of islands. Numerous genera and some families which are absent from the central islands range from Luzon to Basilan. These genera usually have distinct representative species in Luzon, Samar and Leyte, Mindanao, and in some cases in Basilan also. The greatest differences occur between Luzon and Samar and Leyte. The latter islands have 22 peculiar species.

Sulu and Tawi Tawi belong zoologically to the Philippines, but have 12 well-marked peculiar species, and many of the character- istic Mindanao-Basilan forms are lacking. Panay, Guimaras, Negros and Masbate constitute a sharply defined area, characterized not only by the occurrence of 30 peculiar species, but by the absence of important genera, and even whole families represented in the eastern islands. Most of the mammals characteristic of the latter region are lacking. It is a curious fact that Cebu stands quite by itself, although the deep channel separating it from Negros narrows at one point to about 4 m. Cebu possesses 9 striking species of birds not known to exist elsewhere, and lacks many of the characteristic forms of the central and eastern islands. The zoological position of Bohol has not been satisfactorily determined, but all existing evidence indicates that it must be grouped with Samar and Leyte.

Among the more interesting birds may be mentioned the ” mound builder ‘ {Megapodius cumingi, Dillwyn), which buries its large eggs in the soft sand along the sea beach, or under great mounds of earth and dead leaves, often at a depth of three or more feet below the surface. The young are forced to dig their way out and shift for themselves. The eggs are highly prized by the natives. The jungle fowl abounds. There are 35 species of pigeons and doves., many of them most beautifully coloured and all edible. Snipe, , plover, turnstones and other shore birds are abundant durinc

the cool season, and herons, bitterns and ducks at all times. The birds

of prey, 45 species, of which 22 are peculiar to the group, vary in size from a tiny falcon not larger than a sparrow (Micro- hierax) , to an immense monkey-catching eagle (Pithecophaga gefferyi, Grant), which is strong enough to seize monkeys as they leap from tree to tree. There are 21 species of kingfishers, 15 being peculiar. Of the 12 species of hornbills not one occurs outside of the Philippines. Frog-mouths, bee-birds, night-hawks and swifts are found in considerable variety. One of the last {Collocalia troglodytes, Gray) constructs the edible nests so highly prized by the Chinese. The best nests are obtained on the precipi- tous sides of the Perion de Coron, between Culion and Busuanga.

There may also be mentioned 21 cuckoos, I cockatoo, 20 parrots and parakeets, 20 woodpeckers, barbets, broadbills, starlings, orioles, weaver-finches, larks, nuthatches, 28 beautifully coloured sun-birds, and 23 flower-peckers, titmice, shrikes, swallow-shrikes, tailor-birds, thrushes, fruit-thrushes, fairy blue-birds, fire-birds, 42 fly-catchers, 4 swallows, and 5 species of most beautifully coloured ant-thrushes, as well as a large number of birds for which English names cannot be readily supplied.

Reptiles and batrachians are abundant, but have been little studied. Pythons occur throughout the group, and sometimes attain enormous size. There are numerous venomous serpents, but the mortality from snake-bite is low. Geckoes may be seen on the walls and ceilings of any house. Flying lizards abound in the forests. Large iguanas are numerous. Their eggs are prized by the natives, and the flesh of one species, known as ibit or pelubid, is highly esteemed. Crocodiles are extremely numerous in many of the streams, and are occasionally found in the sea along the coasts. Specimens have been obtained measuring 18 ft. in length. Land turtles of small size are common. Very large sea turtles arc often captured by the fishermen, and their flesh is highly appre- ciated as an article of food. A considerable business is done in tortoise-shell. Frogs occur in great variety. One small species appears in immense numbers with the oncoming of the rainy season, and at night the noise of its outcry almost deadens other sounds.

Fishes, especially marine fishes, are numerous and varied. About 500 species of food fishes have been found, and common among them are the bangos or milkfish, the banak or mullet, mackerel, herring, anchovies, groupers, snappers, pompano, tarpon and bonito. The ” dalag,” which is found in the paddy-fields during the wet season, is a favourite with the natives.

The Philippines are famous for the variety, beauty and abun- dance of their land molluscs. Fresh-water and marine molluscs are also very numerous. While most of the species are of interest chiefly to the conchologist, there are a number of edible forms. The shells of Placuna placenta, L., split into thin flat plates and, cut into small squares, are almost universally used in place of window glass. The valves of the giant clam (Tridachna) some- times attain a length of 5 ft. and weigh hundreds of pounds. Pearl- oysters are abundant in the southern waters of the archipelago. Pearl-fishing is an important industry in the Sulu Islands. The shells of the pearly nautilus are commonly used by the Visayans for drinking cups. From the great opercula of certain marine forms bracelets and other ornaments are carved, while the hard serrated edges of other species are sometimes employed in place of knives for harvesting rice. The land molluscs have been thoroughly classified, but much still remains to be done with the marine species.

Arthropoda are very abundant and as yet little known. Shrimps, crabs and lobsters form an important source of food supply. Mos- quitoes are numerous in the wet lowlands. Bees are abundant, and wild honey and wax are gathered in considerable quantities. The number of species of ants is very large. Some of them infest dwelling-houses and swarm over the food. The termites, or so- called ” white ants,” inflict great damage on wooden buildings. Plagues of locusts occasionally, during a drought, ruin growing crops ; in damp wet weather these insects are destroyed by a fungus growth (Empusa gryllae) within their bodies.

Land-leeches swarm in the damp lowland forests. The coral beds of Mindanao and the Sulu Archipelago are of unsurpassed beauty, and Guimaras, Cebii and Siquijor are completely covered with a thick cap of coral limestone.

Flora. — The rich and varied flora of the Philippines is essentially Malayan, intermixed with Chinese and Australian elements, but with sufficient individuality to constitute a sub-region, there being at least 769 species peculiar to the archipelago. More than two- thirds of the land surface is covered with forests. In the lowlands and on the lower mountain slopes the forests are composed chiefly of broad-leaved trees, common among which are the bamboo, the coco and other palms, and the banyan tree; but on the higher mountain slopes pines are most abundant. About 750 species of wood are of commercial or local value, among them are woods well suited for structural purposes, inside finishing, cabinet work and carriage making. Plants valuable for their fibre number about 300, and among them is the abaca. (Musa

texilis), from the leaves of which Manila hemp is made. There are gutta-percha, india-rubber and other trees and plants yielding gums, the banana, mango, and many other trees and plants yielding fruits; and various trees and plants yielding nuts, spices, oils and medicines.

Climate. — A uniformly high temperature, excessive humidity, heavy rainfalls and violent tropical storms, known as typhoons or bagiiios, are characteristic of the Philippine climate. At Manila the mean annual temperature is about 8o° F., the range of mean monthly temperature 6-48°, from 77 in January to 83-48° in May; and the range of extremes (during the period from 1881 to 1902) 39-96° from 60-08° in January 1881 to 100-04° in May 1889. In accordance with the monthly variations in temperature at Manila the year is divided into three seasons: temperate (November, December, January and February), hot (April, May and June) and intermediate (March, July, September and October). Throughout the archipelago the mean annual temperature varies much more with the altitude than with the latitude, but the range in mean monthly temperatures increases from 3-96° F. at Davao, Mindanao, in 7° 1′ N. to 12-6° at Santo Domingo, Batan Islands, in 20° 28′ N. The equability of the temperature also decreases appre- ciably from the sea-coast to the interior. The maximum daily range of temperature at Manila varies from 13-8° in June to 17-7° in December. At Manila the monthly average of relative humidity ranges from 70-7° in April to 85-5° in September, and the annual average is 79-4°. The mean annual rainfall in this city is about 76 in., and nearly three-fourths of it is from the middle of June to the middle of October, when the winds blow from the south-west. During the period from 1865 to 1902 the annual rain- fall varied from 35-6 in. in 1885 to 117-3 m – i n I ˆ(>7 when in the month of September alone there was a fall of 57-8 in. In July, August and September two-thirds of the days are rainy, but in February, March and April only one-tenth of them are rainy. On the Pacific coast of Luzon, Samar, Leyte and Mindanao the rainy season is from November to May, when the winds blow from the east or the north-east. In the year ending August 1903 the amounts of rainfall at 41 observation stations widely distributed throughout the archipelago varied from 16-2 in. at Zamboanga in west Mindanao to 152 in. at Masinloc, on the west coast of central Luzon. The Philippines are visited on the average by twenty or more typhoons annually. About one-fifth of them occur in September. During January, February, March and April they are rare; in May, June and July they become increasingly common, and in August there is a falling off in the number, L which reaches its maximum in September, gradually decreasing in October, November and De- cember. In the famous typhoon of the 20th of October 1882,

the vortex of which passed over Manila, an immense amount of damage was done in the city. Two thousand persons lost their lives in Samar and Leyte during the great storm of 1897. The typhoon warnings sent out from the Manila observatory annually save heavy loss of life and property.

Soil. — The soil, usually of a reddish-brown colour, is for the most part disintegrated lava mixed with decayed vegetation; occasion- ally there is also a mixture of disintegrated coral limestone.

Agriculture. — Agriculture is the principal industry. In 1903 about 40 % of the working population were engaged in agricultural pursuits. The industry is, however, in a primitive condition. The native farmers are lazy and slow to appreciate the advantages of the methods recommended by the Americans. Only 9-5 % of all the land in the archipelago was included in ” farms ” in 1903, and less than one-half of the farm land was under cultivation. La Laguna, Luzon, was the only province in which more than 50 % of the land was included in ” farms,” and Cebu the only island in which more than 25 % of the land was included in farms; in the large island of Mindanao only 1-4 %, in Masbate only 1-6 %, and in Mindoro only 3-9 %. There were 815,453 ” farms ” or individual holdings, but more than one-fifth of these were small parcels or gardens containing less than an acre each ; about one-half contained less than 2\ acres each, and the average size was 8-57 acres. More than four-fifths of them were worked by owners, and the remainder chiefly by share tenants. The principal crops are hemp (abaca), sugar, tobacco, coco-nuts and rice. Most of the hemp (538,200 acres in 1902) is grown in south Luzon and in Samar and Leyte, but smaller crops are produced in Cebii, Mindoro, Marinduque, north Mindanao and south Negros; the crop became of commercial importance about 1855, and in 1907 the yield for export amounted to 112,895 tons. About two-thirds of the sugar is produced in Negros, but it is an important crop in the provinces of Pampanga and Tarlac, within the lowland basin of Luzon, also in the province of Batangas on the south coast of Luzon, in the south and east of Panay, and in Cebu. The production increased from about 6000 tons in 1855 to 300,000 tons in 1893, and for many years prior to 1887 it was a more important crop than hemp, but since the American occupation the crop has been smaller. The total acreage in 1902 was 177,620 acres, and in 1907 the yield for export was 118,395 tons. Approximately one-half of the tobacco, 77,‘632 acres yielding 37,485 lb in 1902, is grown in the valley of the Cagayan river, and most of the remainder, which is of inferior quality, in the neighbouring provinces of Union, Ilocos Norte and Abra, and in Panay, Cebu, Masbate and Negros. The natives chew betel nuts instead of tobacco, and to the production of

these nuts they devote more than 60,000 acres. The rich soil of the lowlands of the pro- vince of Laguna is especially well adapted to the culture of the coco-nut palm, and since the American occupation considerable land in this province that had formerly been devoted to sugar

has been planted with these trees. They thrive well also in most low districts along the coasts; in 1902 about 375,000 acres were devoted to the culture of them.

Rice is the staple food of the natives. When the Philippines were discovered by the Spaniards it was the only cultivated crop of importance, and until the 19th century it was the chief article of export, but as the culture of the more profitable crops of hemp, sugar and coco-nuts was extended it became an article of import. As late as 1902, however, about one-half of the land under cultiva- tion was sown to rice. It is grown most extensively in the lowlands of the south half of Luzon, in north Panay and in Negros, but the culture of either the lowland or the upland varieties for local con- sumption is very general. In some districts Indian corn is the staple food instead of rice, and the production of this cereal in small quantities for livestock is general. It is grown most extensively in the valley of the Cagayan river, in 1902 the total acreage in the archipelago was about 254,470. For several years prior to 1891, coffee, grown principally in the provinces of Cavite, Batangas and Lepanto-Bontoc, Luzon, was nearly as important a crop as tobacco, but between 1891 and 1898 most of the coffee plantations were destroyed by insects and disease. A small quantity of coffee is grown in the province of Benguet, Luzon, and is of superior quality. Cotton, the cultivation of which was discouraged by the Spanish government as a means of increasing the cultivation of tobacco, is a very small crop, except in the provinces of Ilocos Norte, and Ilocos Sur on the west coast of north Luzon; in 1902 there were in these provinces about 5525 acres of cotton. Many tropical fruits grow wild but their quality is often inferior; those cultivated most extensively are mangoes and bananas. Grapes, blackberries, figs and strawberries have been introduced from the United States and are grown successfully in the province of Benguet. The natives oare little for the garden vegetables common to Europe and America, but in the vicinity of Manila and other large centres of population the Chinese grow many of these for consumption by European and American inhabitants.

With the exception of the water-buffalo, which is indispensable for agricultural purposes, the domestic animals are very inferior in quality and few in numbers. The horses, which are of Mexican, Spanish and Chinese origin, are small and poorly cared for; some American horses have been introduced for the purpose of improving the breed. The neat cattle, which are of Australian and Indian origin, are raised chiefly for beef, their hides and their horns; about nine-tenths of them were destroyed by the rinderpest and the war at the close of the 19th century. Swine are numerous but they are of a kind known in the United States as ” razorbacks.” There are many goats but only a few. sheep. In one district near Manila duck-raising is of considerable importance, but the principal branch of the poultry industry consists in the raising of game-cocks for cock-fighting, which is the national sport.

Mineral Resources. — Numerous mineral deposits have been discovered, but little has been determined with respect to their value. Sub-bituminous coal is widely distributed. That near the surface is generally poor in quality and the difficulties of deep mining may be great because of folds and faults in the rocks. There are, however, promising fields near Danao, in Cebu; on the island of Polillo, off the east coast of Luzon; in the south part of Mindoro; on Batan Island, off the south-cast coast of Luzon; on Dinagat Island, off the north coast of Mindanao; and in the north-east corner of Negros. Gold has been found in small quantities in nearly all the provinces. There is some rude gold mining by the natives. As the result of favourable indications extensive gold-mining operations have been instituted in the provinces of Benguet and Ambos Camarines in Luzon, and on the island of Masbate. Copper is scarcely less widely distributed than gold, but the production of it awaits smelters and better facilities for transportation. There are extensive deposits of iron ore (magnetite and hematite) in the province of Bulacan, Luzon. Iron ore has been found in other provinces of Luzon and in the islands of Cebu, Panay and Marin- duque. There are outcrops of lead in Marinduque and Cebu, and in Marinduque considerable silver is associated with the lead. Among other minerals are sulphur, lime, gypsum and phosphate.

Manufactures. — The manufacturing industry consists mainly in preparing agricultural products for market, and in the production by the natives of wearing apparel, furniture, household utensils, and other articles required to supply their primitive wants. The most important factories are those for the manufacture of cigars and cigarettes, but most cigars and some of the cigarettes are made by hand. In the manufacture of sugar most of the mills in use extract only about three-fourths of the juice from the cane; in 1902 about 73 % of

it was manufactured by 528 mills operated by steam ; ‘7 % by 470 mills operated by hand or by a carabao; and 10 % by 77 mills operated by water-power. In the principal rice-producing districts the rice is threshed and cleaned by machines, but in other districts more primitive methods are employed. Most of the cloth which the natives wear the women weave in their own homes. There are three principal varieties: sinamay, which is made from selected hemp fibres and is worn by both men and women ; jusi, which is made from a mixture of hemp and pineapple-plant fibres with or without the addition of some cotton and silk and is used

for making women’s dresses and men’s shirts; pina, which is made from the fibres in the leaf of the pineapple-plant and is used for making women’s garments, handkerchiefs and scarfs. Nipa, made from the fibre of the agave or maguey plant and worn by women, is less common. Hats are made of palm leaves, alaca leaves, banana leaves, split bamboo and various grasses. Mats, rugs and carpets are made principally of split bamboo; chairs and beds of balinag and other woods and of rattan. Alcohol is distilled from nipa, coco-nuts, buri {Corypha umbraculifera) , cauong (Caryota onusta), pugahan {Caryota urens) and Indian corn. Other manufactures of the natives include vehicles of various kinds, harnesses, indigo, coco-nut oil, soap, salt and lime.

Communications and Commerce. — The first railway in the Philippines was the line from Manila to Dagnpan (120 m.) which was built by an English corporation under a guaranty of the Spanish government and was opened in 1892. There was no further construction for ten years. But in 1902 and 1903 the Philippine government, as established in 1902 by an act of the Congress of the United States, granted franchises for the extension of the Manila-Dagupan railway to Cabanatuan (55 m.) and to Antipolo (24 m.). The first of these branches was completed in 1905, the second in 1906. In February 1905 Congress authorized the Philippine government to aid and encourage the construction of railways by guaranteeing 4 % interest on bonds ; the duty on imported materials used in the construction of railways and the internal revenue on Philippine forest products used for that purpose have also been removed. With this assistance the Manila Railroad Company, organized under the laws of the state of New Jersey, agreed to construct about 600 m. of railway in Luzon; and the Philippine Railroad Company, organized under the laws of the state of Connecticut, agreed to construct about 300 m. in Panay, Cebu and Negros. In 1909 there were in operation more than 300 m. in Luzon, 60 m. in Cebii and 50 m. in Panay. At the beginning of the American occupation the roads were very bad and in many of the

islands there were none; but in 1909 there were at least 400 m. of good roads. The Cagayan river, which is navigable for native boats 160 m. from its mouth, and for rafts 40 m. farther up, is an important highway of commerce in north Luzon. Many miles of inland water communication with small boats or bamboo rafts are afforded by the Pampanga, Agno, Abra, Pasig and Bicol rivers in Luzon, and by the Agusan and Rio Grande de Mindanao in Mindanao. There are few harbours which admit vessels drawing more than 15 ft. of water, but many which admit smaller vessels, and at the close of 1909 there were 151 steamboats and 424 sailboats engaged in the coasting trade. Manila is the principal port of entry, and since the American occupation Manila harbour has been made accessible to vessels drawing 30 ft. of water. Cebu in Cebu and Iloilo in Panay are ports of entry second and third in rank, although small in com- parison with Manila ; there are others of minor importance.

The foreign commerce of the Philippines consists chiefly in the exportation of Manila hemp, dried coco-nut meat (copra), sugar and tobacco, both in the leaf and in cigars and cigarettes; and in the importation of cotton goods, rice, wheat-flour, fresh beef, boots and shoes, iron and steel, illuminating oil, liquors, paper and paper goods. The value of the exports increased from $19,751,068 in the year ending the 30th of June 1900 to $32,816,567 in the year ending the 30th of June 1908, and the value of the imports increased during the same period from $20,601,436 to $30,918,357. A very large part of the trade is with the United States and Great Britain. The imports from Great Britain exceed those from the United States, but the exports to the United States are much greater than those to Great Britain, and the total trade with the United States is greater than that with any other country. In 1909 8-05 % of the imports were from the United States and 17-8 % of the exports were to the United States; in 1908 16-4 % of the imports were from the United States and 31-4 % of the exports were to the United States. In 1909 free trade was established between the United States and the Philippines in all goods which are the growth, product or manufacture of these countries, with the exception of rice, except that a limit to the free importation from the Philippines to the United States in any one year is fixed on cigars at 15,000,000; on wrapper tobacco and on filler tobacco, when mixed with more than 15 % of wrapper tobacco, at 300,000 lb; on filler tobacco at 1 ,000,000 lb and on sugar at 300,000 gross tons. In the case of manufactures the law provides that only those articles which do not contain more than 20 % in value of foreign materials shall be admitted free. 1 ,

Population. — The total population of the archipelago as enumerated

in the census of 1903 was 7,635,426. Of this number 6,987,868 were classed as civilized and 647,740 as wild; 7,579,288 or 99-2% were native-born and 56,138 were foreign- born; 7,539,632 were of the Malayan or brown race, 42,097 were of the yellow race, 24,016 were of the black race, 14,271 were of the white race, and 15,419 were of mixed races. Of the black race 23,511, or 97-8%, were Negritos, who are believed to be the aborigines of the Philippines. Nearly all of them live in a primitive state in the interior of Luzon, Panay, Mindanao and

Negros. They are very short of stature, 4 ft. 10 in. being about the average height of a full-grown man, and the women are shorter. Their colour is black, their skull decidedly round, their hair thick and frizzly, their legs thin and almost without calves, and their toes so prehensile that they can use them nearly as well as their fingers. They tattoo themselves and wear very little clothing, usually only a geestring. They have no fixed abodes but roam about in groups of a few families. They are skilful with the bow and in throwing stones, and they can easily kindle a fire, even in the wet season, by rubbing together two pieces of dry bamboo. Their food consists principally of game, roots and wild fruits. The women, who do all the work, collect wax and honey, which are their principal staples in trade. Few Negritos live to be fifty years of age. The brown race, which came from the south in successive waves of immigration beginning in prehistoric times, is composed of twenty-three distinct tribes varying widely in culture, language and appearance; their languages however belong to one common stock and there is a general resemblance in physical features and in quality of mind. The great bulk of the population, approximately 90%, is included in seven Christian tribes as follows: Visayan, 3,219,030; Tagalog, 1,460,695; Ilocano, 803,942; Bicol, 566,365; Pangasinan, 343,686; Pampangan, 280,984; and Cagayan, 159,648. The Visayans are the principal inhabitants of the islands in the central part of the archipelago (Panay, Cebii, Negros, Leyte, Bohol, Samar, Masbate and Paragua) and on the north and east coasts of Mindanao ; they were perhaps the most civilized people in the archipelago when discovered by the Spaniards, by whom they were originally called Pintados because they were in the habit of painting their bodies; but since then their progress has been less rapid than that of the Tagalogs — who constitute the bulk of the population of Manila and central Luzon and the majority of the population of Mindanao — who are now the most cultured of the brown races in the Philippines. Most of the Ilocanos are in the western half of north

Luzon; most of the Bicols in south Luzon; most of the Pangasinans in the province of Pangasinan, which borders on the Gulf of Lingayen; most of the Pampangans in the province of Pampanga, which borders the north share of Manila Bay; and most of the Cagayans in the valley of the Cagayan river. More than three-fourths of the wild population is included in the Moro, Igorot and Negrito tribes. The Igorots (197,938 wild and 13,582 civilized) are the chief representatives of the early Malay immigration to the archipelago. They are the principal inhabitants of the provinces of Lepanto-Bontoc and Benguet in north Luzon and are numerous in the mountain districts of neighbour- ing provinces. Among the wildest of them head-hunting is still a common practice; but the majority are industrious farmers laying out their fields on artificial terraces and constructing irrigation canals with remarkable skill. The Moros (275,224 wild and 2323 civilized) were the last of the Malays to migrate to the islands; they came after their conversion to the Mahom- medan religion, and their migration continued until the Spanish conquest. More than one-half of them are in Mindanao and they are the principal inhabitants of the small islands of Jolo, Basilan, Siassi and Tawi Tawi south-west of Mindanao. Slavery is common among them. They are generally miserably poor, cruel and haughty. Nearly three-fourths of the foreign-born and 97-5% of the representatives of the yellow race come from China. The mixture of the races is principally that of the Chinese with the Malays or the Spaniards with the Malays. More than half the representatives of the white race (1903) were Americans. Most of the inhabitants five in groups of villages. In 1903 there were 13,400 villages and nearly three-fourths of them contained fewer than 600 inhabitants each. Laoag in north Luzon with a population of 19,699, Iloilo in Panay with a population of 19,054, Cebu with a population of 18,330, and Nueva Caceres in south Luzon (10,201), were the only towns with a population exceed- ing 10,000; and Manila (219,928) was the only city. After the 1903 census many towns were enlarged by annexation of suburbs. Government. — At .the beginning of the American occupation, in August 1898, a purely military government was established; but in May 1899 the military authorities began the re-establish-

ment of civil courts, and in July of the same year they began the organization of civil municipal governments. To continue the work of organizing and establishing civil government the president of the United States appointed in February 1900 a Philippine Commission of five members, with William H. Taft as chairman. On the 1st of September 1900 this body assumed the legislative functions of the central government at Manila; on the 4th of July 1901 the executive

authority was, by order of the president, transferred from the military governor to Judge Taft, whom he had appointed civil governor; on the 6th of September 1901 the Philippine Commission, by authority of the president, established the four executive departments, of interior, commerce and police, finance and justice, and public instruction; and on the 29th of October 1901 the president appointed a vice-governor. The Congress of the United States, in an act approved on the 1st of July 1902, ratified and confirmed the government as thus established, but required that future appointments by the president of the governor, vice-governor, members of the com- mission and heads of the executive departments should be made with the consent of the Senate. The organic act contained a bill of rights, provided for the establishment of a popular assembly two years after the completion of a census of the Philippines, and more definitely provided for the organization of the judiciary. The first popular assembly, of 80 members, was opened at Manila on the 16th of October 1907, and since then the legislature has been composed of two branches, the Philippine Commission (five Americans and four, formerly three, Filipinos), and the Philippine Assembly. The members of the Assembly are elected by districts (the population of which is approximately equal) for a term of two years. A voter must be twenty-three years of age, must have been a resident of the municipality for six months, must not be a citizen or subject of any foreign country, and must possess at least one of the following qualifications: have been an office-holder under Spanish rule, own real estate worth 500 pesos, pay taxes amounting annually to 30 pesos, or be able to speak, read and write either Spanish or English. The legislature meets annually; a regular session is limited to 90 days, and a special session to 30 days.

Justice is administered principally by a supreme court, courts of first instance, and courts of justices of the peace. The supreme court consists of seven members, four Americans and three Filipinos; and the chief justice and associate justices of the supreme court are appointed by the president of the United States with the consent of the Senate. The judges of the courts of first instance are appointed by the governor with the consent of the Philippine Commission. A judgment of the supreme court of the Philippines which affects any statute, treaty, title, right or privilege of the United States may be reversed, modified or affirmed by the Supreme Court of the United States; an appeal to the Supreme Court of the United States may also be had in any cause in which the value in controversy exceeds $25,000. The most common form of provincial government is that by a governor, who is elected biennially by the municipal councillors in convention, and a secretary, a treasurer, a supervisor, and a fiscal or prosecuting

attorney, who are appointed by the Philip- pine Commission. Each municipality is governed by a president, a vice-president, and a municipal council, all of whom are elected biennially by the qualified electors of the municipality. The Philippine ” municipality ” is an administrative area, often sparsely settled, is often called a town, and may be compared to a New England township; the municipalities are the units into which the provinces are divided. Each municipality is made up of barrios or small villages (about 13,400 in the entire archipelago) and of one, or more, more thickly peopled areas, each called a poblacion, and resembling the township ” centre ” of New England.

Education. — The establishment of an efficient system of elementary schools has been an important part of the work of the American administration. Under Spanish rule the Church established colleges and seminaries for training priests, but the Spanish system of secular schools for elementary instruction, established in 1863, accomplished little; the schools were taught by unqualified native teachers and the supervision of them was very lax. The American

system, established by the Philippine Commission in 1901, provides a course of instruction (in the English language) for 11 years: 4 primary, 3 intermediate and 4 secondary. In the intermediate and secondary departments there is a choice of six courses; general, teaching, farming, toolwork, housekeeping and household arts and business. The administrative head of the system Is the director of education, who is appointed by the commission, and who arranges the course of study, approves the plans for school houses, determines in what towns secondary schools shall be established and in what towns American teachers shall teach, divides the archipelago into school divisions .and appoints a division superintendent in each, and supervises the examination of teachers and the application of insular school funds. Associated with him is an advisory board also appointed by the commission. In each school division, of which there were 35 in 1908, the division superintendent appoints the native teachers, prepares for the municipal councils estimates of school expenses, and approves all expenditures from municipal school funds. In each municipality there is a school board con- sisting of the president of the municipality and from four to six other members as the division superintendent shall determine : one-half of them are elected by the municipal council and one-half are appointed by the division superintendent. In 1902 there

were 928 American teachers employed in the Philippine schools; the employment of American teachers is only a temporary policy, however, and by 1908 the number has been reduced to 795. In 1910 there were more than 6000 Filipino teachers who were teaching English to more than 500,000 pupils. The total number of children of school age in the islands probably reaches 2,000,000. The insular government also makes annual appropriations for the maintenance of Filipino students at educational institutions in the United States ; in 1908 the number so provided for was 130. Besides the elementary schools there are at Manila the Philippine Normal School, the Philippine School of Arts and Trades, the Philippine School of Commerce and the school for the instruction of the deaf and blind, and in 1908 the Philippine legislature passed an act for the establishment of a university of the Philippines.

Finance. — Revenue is derived largely from customs duties and internal revenue taxes. In 1909 the receipts were $22,739,000, the expenditure $23,337,000, and the total bonded indebtedness $16,000,000. (N. D. M.)

History. — The Philippine Islands were discovered by Magellan in March 1 5 2 1 . The first island on which he landed was Malhou, between Samar and Dina&at. Then sailing south he touched at Mindanao, from which he sailed north-west, past Bohol to Cebu. Here he found a good harbour in the bay on which the city of Cebu now stands. He made an alliance with the natives, who undertook to supply him with provisions. With his new allies he crossed to the little island of Mactan, where he was killed in a skirmish. A Portuguese by birth, he had been sailing in the employ of King Charles I. of Spain (the emperor Charles V.), with the object of proving that the Moluccas lay within that part of the world which Pope Alexander VI. and the treaty of Torde- sillas (June 7, 1494) had given to Spain and not to Portugal. Magellan named his discovery the Archipelago of San Lazarus. The Spaniards, however, called the group the Islas de Ponienle (Western Islands). The Portuguese called them the Islas de Oriente. The distinction was not accidental. To the Portuguese they constituted the eastern boundary of their world. From the Spanish point of view the islands were on the extreme western verge of the national domain. In 1529, by the treaty of Zara- gosa, Spain relinquished to Portugal all claims to the Moluccas and agreed that no Spaniard should trade or sail west of a meridian drawn 297 leagues east of the Moluccas. This was a plain renunciation of any rights over the Philippines, which lie several degrees west of the Moluccas. This fact, however, was ignored and in 1542 an attempt to conquer the Philippines was made by Ruy Lopez de Villabos (c. 1500-1544).

Villabos chose to honour the heir-apparent of the Spanish throne by naming some of the islands which he discovered, west and north of Magellan's discovery, the Islas Filipinas. After the accession of Philip II. (1555-1598) a much more important expedition was fitted out on the Mexican coast, under the direction of the distinguished conquistador, Miguel Lopez de Legaspi (1524-1572). In the sailing directions, issued in 1561, for the use of this expedition the phrase " las Islas Filipinas " was used as applying to the entire archipelago. Starting on the 2nd of November 1564, from Navidad, with four ships built and equipped on the spot, Legaspi began an enterprise which entitles him to a place among the greatest of colonial pioneers. He was accompanied by five Augustinian friars and four hundred men. In 1565 he founded,

on the island of Cebu, San Miguel, the first permanent Spanish settlement in the islands, destined to become the Villa de Santf- simo Nombre de Jesus, later the city of Cebu. In 1571 the city of Manila was founded and became the insular capital. Legaspi's conquest of the islands was facilitated by the fact that there were no established native states, but rather a congeries of small clan-like groups, the headship of which was hereditary. Legaspi was reinforced from time to time by small contingents of troops and friars. Although he encountered enormous obstacles, including famine and mutiny, the hostility and treachery of the natives and of foreigners, and the neglect of the home govern- ment, he laid a sure foundation for permanent Spanish occupation. By a combination of tact, courage and resourcefulness he won the hearts of the natives, repelled the Portuguese and, notwithstand- ing the great distance from Spain, established the new colony on a practical basis. Before his death in 1572 he had explored and pacified a large part of the island territory, had established trade, and had arrested the progress of Mahommedanism.

The conquest of the Philippines was essentially a missionary conquest. Inspired by apostolic zeal the friars braved the terrors of life in the remote villages, raised the natives The Friars from barbarianism and taught them the forms of and the Christianity. As a result of their labours the Chris- oftlcia,s – tian Filipinos stand unique as the only large mass of Asiatics converted to Christianity in modern times. The friars promoted • the social and economic advancement of the islands, cultivated the native taste for music, introduced improvements in agricul- ture and imported Indian corn and cacao from America. Tobacco was introduced by the government.

The colonial government was patterned on that of Spanish America.

The powers of the governor-general were limited only by the audiencia or supreme court, of which he was presi- dent, and by the residencia or official investigation at the expira- tion of his term. The islands were subdivided into provinces under alcaldes majores who exercised both executive and judicial functions. The favouritism and corruption that honeycombed the civil service of Spain frequently resulted in placing in respon- sible positions persons who were entirely unfit. Hairdressers were made into alcaldes, and sailors were transformed into gobernadors by the miraculous grace of royal decrees. The provinces were subdivided into pueblos, each under a native gobernadorcillo, elected annually. The permanent offices could be bought, sold and inherited. The mistake was made of paying very low salaries to the officials, who took this as a justification for illegal exactions. The difficulty of securing proper officials gradually resulted in the more important civil functions being handed over to the friars, who frequently exercised a benevolent despotism. In more than half of the twelve hundred villages there was no other Spaniard beside the priest. The Spanish language was practically unknown. It was far easier for the monks to learn the native dialects than to teach their parishioners Spanish. For two centuries and a half after the conquest there is little narrative history worth recording. There were border wars with rebellious savage tribes, attacks made by Chinese pirates seeking plunder or refuge, volcanic eruptions, earth- quakes, tornadoes and the periodical visits of marauders from the southern islands.

In 1762, however, as an incident of the war between Spain and England, a British fleet of thirteen ships, under the command of Admiral Samuel Cornish (d. 1770) and Brigadier- British General William Draper (1721-1787), was sent to Occupation the Philippines. The available Spanish army con- »t Manila. sisted of about 600 men, while the attacking force numbered 6830. After a bombardment, Manila fell and on the 5th of October the British entered the city. By the terms of the capitulation the whole of the archipelago was surrendered to the British and an indemnity of 4,000,000 pesos was to be paid. As there was no governor-general at the time, the British were obliged to treat with the acting-governor, the Archbishop Manuel Antonio Rojo; but his authority was set aside by a war-party who rallied around Simon Anda y Salazer, a member of the audiencia. Anda proclaimed himself governor-general and practically

succeeded in confining the British to Manila. At the close of the war the Philippines were returned to Spain. Manila was evacuated in March 1764.

For the first quarter of a century after the Spanish conquest the islands were allowed free trade. Then came the familiar Economic restrictions, limiting commerce to a fixed amount Develop- annually, and effectively checking economic develop- m « ,t ment. In r59i direct trade between the Philippines

and South America was prohibited. In 1593 trade between the Philippines and Mexico, the only route open between the colony and Spain, was limited to two ships annually, the ships not to exceed 300 tons burden. The result was that the command of the Acapulco galleon was rarely worth less than $50,000. The passenger fare from Manila to Acapulco, at the end of the 18th century, was $1000. This monopoly lasted until the Mexican War of Independence forced the Spanish government to regard the Philippines as being in the East instead of the West. Spain's colonial policy was not based on an exaltation of the commercial ideal. However much the administrators may have fallen short in actual practice, the Spanish ideal was to preserve and civilize the native races, rather than to establish lucrative trading posts where the natives might be easily exploited. In America the laws which provided elaborate safeguards for the protection of the Indians were, to a large degree, nullified by the lust for gold and silver and the consequent demand for labourers in the mines. In the Philippines the humane policy of the home government had no such powerful obstacles to contend with. Business was not developed. The natives were allowed to live the indolent life of the tropics. Compared with the results of English or Dutch colonization the conversion and civilization of the Filipinos is a most remarkable achievement. Notwithstanding the undeniable vices, follies and absurd illiberalities of the Spanish colonial regime, the Philippines were the only group in the East Indies that improved in civilization in the three centuries following their discovery. The chief defect in the Spanish Philippine policy was that while it made converts it did not make citizens. Self-reliance, free-thought and mental growth were not encour- aged. Progress in scientific knowledge was effectively blocked by the friars. Their presses confined their activities to the production of catechisms, martyrologies and handbooks in the native languages after the fashion of the presses of Mexico. Five hundred such works were printed and distributed in Manila alone before 1800. To reach the masses, unfamiliar with Spanish, manuals of devotion and outlines of Christian doctrine were translated into the various native languages. Of the Bible itself, no part was translated or published. A knowledge of

reading and writing was generally diffused throughout the group. The era of discontent may be said to have begun in 1825 when the loss of her colonies on the mainlandof America caused Spain to take a more immediate interest in the Philippines, Discontent. an d increased emigration to the islands. Between 1840 and 1872 thirty newspapers were founded. The introduction of secular books and papers, more or less surrepti- tiously, helped to spread the seeds of sedition. In 1852 the Spanish Filipino Bank was established. In 1856 foreign trade, hitherto confined to Manila, was permitted to enter the port of Iloilo, and foreign traders were allowed to open branch houses outside of the capital. The change in Spain's economic policy, including an attempt to exploit the coalfields and to encourage both agriculture and commerce, helped to awaken hitherto dormant elements. In 1601 the Jesuits had opened a college in Manila for the education of Spanish youth. In 1768 they had been expelled. In 1859 they were permitted to return on the understanding that they were to devote themselves to education.

The Spanish Revolution of 1868 caused a further influx of Spaniards and also the introduction of the pernicious " spoils system." With every change of ministry in Madrid came a new lot of hungry politicians anxious to fill even the more humble colonial offices. The opening of the Suez Canal in 1869, followed by the establishment of direct steam communication between Spain and the Philippines, sounded the death knell of the peaceful

Rlzal.

missionary era and brought about the definite entry of the islands into the world of commerce and progress.

The friars, by perpetuating medieval conditions in a country that was now being opened to contact with the civilized world, increased the feeling of discontent. The natural result was a violent conflict. The more advanced Filipinos desired the fulfil- ment of the decrees of the Council of Trent whereby the incum- bencies in Christianized towns and villages should be held by regular clergy and not by friars. Filipinos had, for generations been ordained into priesthood although not received into monastic orders. This measure was really aimed at the political and economic supremacy of the Spanish-born friars, who had by this time acquired 400,000 acres of agricultural land, more than half of it in the vicinity of Manila. The agrarian question added to the growing discontent. All the revolutions began in the province of Cavite, where the friars owned 125,000 acres. In 1872 the secret agents of the friars induced the native garrison at Cavite to mutiny

and thus give the friars an excuse to press for vigorous action. The mutiny was not successful, but Father Burgos, the leader of the reform party, was publicly garrotted with three other native priests; and the native clergy were declared to be incompetent to have the cure of souls. Several of the richest and best educated Filipinos were convicted of treason and banished.

With the increased facilities for European travel Filipinos began to visit Europe and return with new and broader notions of life. The most distinguished of the travellers was Jose Rizal (1 861-1896). Born in Calainha, in the province of Luzon, of pure Tagalog parentage, he attended the newly reopened Jesuit university in Manila. He was then sent to Europe to complete his studies, first in Madrid, where he became a doctor of medicine, and later in Germany, where he received the degree of Ph.D. He came into touch with advanced methods of scientific research, acquired great ability as a writer, keen perception of truth and an unflinching realization of the defects of his own people, and the unpleasant but essential fact that to have better government they must first deserve it. His propaganda, aimed at the small body of Filipinos who had suffi- cient education to appreciate political satire, was very effective. His most famous novel, Noli me tangere, was published in 1886. In this he drew a masterly picture, not only of the life and immorality of the friars but also of the insolent Filipino chiefs or caciques, subservient to the powers above, tyrannical to those below, superstitious, unprogressive and grasping. Caciquism or ” bossism,” government by local aristocrats, was the prime feature of village life in the islands during the entire period of Spanish rule and existed long before their arrival.

The campaign of Rizal, Marcelo del Pilar, Graciano Lopez Jaena and Apolinario Mabini, the leaders in the “Young Filipino Party,” was a protest against both the domination of the friars and economic and administrative _. caciquism. To escape the vengeance of the friars, Fuipiaa Rizal was obliged to flee to Europe. In 1892 he • returned to the islands on the assurance of the governor, Eulogio Despujols y Dusay, that he might live there in peace. His enemies, however, succeeded in having him arrested on a charge of treason. Meanwhile he had organized a reform party under the title of Liga Filipina. Its object had been to procure, by pacific means, several reforms in the government of the islands, the chief of which were the expulsion of the friars, and the with- drawal of the governor-general’s arbitrary power to deport Filipinos. The friars importuned Despujols for Rizal’s life but he persistently refused their demand, and met the case half-way by banishing Rizal to Mindanao. Incensed by the failure of their plot, the friars obtained the recall of Despujols.

The new governor, Ramon Blanco, was like Despujols and many of his predecessors, humane at heart, but he could do little more than hold in check the tyrannical schemes of the clergy. The banishment of Rizal convinced the Katiaunan reform party that peaceful endeavour was futile. A secret organization, the Katipunan, was therefore started to secure reforms by force of arms. It was founded by An4re?

Bonifacio, a schoolmaster of Cavite. In 1895-1896 the friars acting as spies for the government, obtained the banishment of many hundreds of natives.

On the day after the Katipunan conspiracy had been brought prematurely to light by a traitor, three hundred prominent Filipinos were lodged in prison. This precipitated 1896 ‘ ° tne revolt- The insurrectos attacked the civil guard outside the city, but were unsuccessful. A week later some hundreds of insurgents attacked the powder magazine at San Juan del Monte, but were completely routed. Four of their chiefs were taken prisoners and executed in Manila. Ten days after the plot was discovered Manila and five other provinces were officially proclaimed in a state of siege. The insurrectos concentrated all their energies upon Cavite province. Several villages fell into their hands. The insurgent commander-in-chief was Emilio Aguinaldo. He was born in 1869 in Cavite, son of a native farmer of considerable ability, and of a half-caste mother whose father was a Chinaman. After attending the Tagalog school at Cavite he entered the Jesuit College in Manila but did not graduate. In 1893 he became municipal alcalde of Cavite, and later joined the Katipunan.

The government was in a difficult position. General Blanco had extremely few European troops at his disposal, and it was doubtful how far native troops could be trusted. Reinforce- ments were on the way from Spain, but the demands of Cuba had already depleted the Peninsula of the best fighting material. Blanco, blamed for not acting at once, was recalled. In December 1896 General Camilo Garcia de Polavieja (b. 1838) arrived as his successor, with General Jose Lachambre (b. 1846) as chief of staff. Before Blanco left he had released Rizal and allowed him to go to Spain, but the friars caused his arrest and he was sent back to Manila, where he was executed by Polavieja’s orders in December 1896.

Lachambre took the field in Cavite with energy and succeeded in

quelling the rebellion in that province. He was then despatched north. Numerous small battles were fought with Aguinaldo and the insurgents, who were repeatedly defeated only to re- appear in other places. Polavieja's demand for more troops having been refused, he resigned, and was succeeded in the spring of 1897 by General Fernando Primo de Rivera. Hostilities continued, but the wet season set in, making operations extremely difficult. Before Primo de Rivera could make much headway against the insurgents affairs in Cuba became so serious that the Spanish government cabled him that pacification was most urgently desired. As a result he suspended operations and signed the treaty of Biacabato (Dec. 12, 1897), by which Aguinaldo and thirty-five of his chief followers were allowed to retire to Hongkong with a cash indemnity of 400,000 pesos. The Madrid government refused to confirm the terms of peace, and the peace rejoicings in Manila were followed by the persecution of all those who were known to have sympathized with the movement. On the 15th of February 1898 in Havana harbour, the U.S.S. " Maine " was blown up. On the 15th of March Primo de Spanish- Rivera, learning that theAmerican Commodore George American Dewey was mobilizing his fleet in the harbour of War – Hongkong, called a council at which the Spanish

Admiral Patricio Montojo (b. 1839) stated that, in the event of a conflict, his own fleet would be inevitably destroyed. Primo de Rivera was now recalled and General Basilio Augusti (b. 1840) took his place. With a new governor-general all plans had to be reconsidered. Before' suitable defences could be made, word came from Hongkong that Dewey had started for Manila and Montojo hurriedly sailed from Subig Bay to Cavite, barely in time to anchor before Dewey arrived. Few among his crew understood handling a gun properly, and owing to the poor care which his vessels had received they were actually inferior to the individual vessels of the American squadron. Commodore Dewey arrived in the Bay of Manila on the 1st of May, and totally destroyed or disabled the Spanish fleet. The surrender of the city was refused. The Americans occupied Cavite. The battle of Manila Bay and the defeat of the Spanish fleet destroyed the prestige of Spain throughout the islands. Insurrections began

in nearly every province. Aguinaldo and his friends were allowed to come to Cavite in an American transport. With the approval of Commodore Dewey, who allowed arms to be supplied him, Aguinaldo successfully renewed his campaign against the Spaniards until practically all Luzon, except the city of Manila and suburbs, was in his control. Reinforcements arrived, and on the 13th of August Manila was taken by the Americans, under General Wesley Merritt (b. 1836).

The refusal of General Merritt to permit Aguinaldo's troops to enter Manila created resentment on the part of the Filipinos. A so-called constitutional convention was held at Malolos, and a constitution was adopted. At the same time the Visayan Republic was organized, and it professed allegiance to Aguin- aldo's government. Neither Aguinaldo's government nor the Visayan government was able to maintain order, and the whole country v/as subject to the looting of robber bands/ The treaty of peace between the United States and Spain, by which the Philippine Islands passed into the hands of the former, was signed in Paris on the 10th of December 1898, but it was not confirmed by the Senate until the 6th of February 1899. During this period the Filipino army remained under arms. On the 4th of February hostilities broke out between the Americans and the Filipinos. The latter were defeated on the 5th, at Paco, with heavy loss. The American troops, now under General E. S. Otis (b. 1838), following up the enemy, drove Revolt them out of Malolos and then withdrew to against the Manila to await reinforcements, which brought AmerlcaBS – the total American force up to about 60,000 men. It is unnecessary to trace in detail the gradual conquest of the islands, or the hundreds of engagements, often small, between the rebels and the Americans. Owing to the nature of the country, and the hope of securing independence from a possible overthrow of the Republican party in the United States, the war was prolonged for two or three years. With the capture of Aguinaldo on the 23rd of March 1901, the resistance became little more than that of guerrillas.

Civil government was introduced as fast as possible. During 1899 the Schurman commission, headed by Dr Jacob G. Schurman of Cornell University, was sent by The Taft President McKinley to report on the state of affairs. Commis- In February 1900 a second and more powerful slon – commission was appointed, consisting of Judge W. H. Taft, Professor D. C. Worcester (b. 1866), General L. E. Wright (b. 1846), Mr H. C. Ide (b. 1844), and Professor Bernard Moses (b. 1846). Under the presidency of Mr Taft it began to exercise a legislative jurisdiction in September 1900. Its first act was to appropriate $1,000,000 for the construction and improve- ment of roads. It next provided for the improvement of Manila harbour, which involved an expenditure of $3,000,000. The fifth act extended to the islands the benefits of a civil service based on merit. In 1901 a general school law was passed under which 1000 American school teachers were intro- duced. They were scattered among 500 towns, to teach 2500 Filipino teachers English and modern methods of school teaching. Other legislation provided for the organization of a judiciary, a supreme court, the enactment of a code of civil procedure, the establishment of

a bureau of forestry, a health department, and an agricultural bureau and a bureau of con- stabulary, made up of native soldiers officered by white men. Ladronism was very widely distributed under Spanish rule, and the old guardia civil committed outrages almost equal to those of the brigands themselves. The new constabulary has been eminently successful in maintaining law and order. Great progress has been made in the scientific mapping of the islands.

On the 4th of July 1901 the office of military governor was abolished, the military forces being largely recalled, and the part remaining being made henceforth subordinate civil to the civil authorities. Mr Taft became governor- Govern- general. A general amnesty was granted to all «•* <• rebels and political prisoners who would take the oath of allegiance to the United States. On the 1st of July 1902 President

Roosevelt signed an act establishing the civil government of the Philippines and providing for a new legislative body. A census was authorized and was taken in 1903. The act of 1902 also authorized the purchase of land belonging to the friars. Although among such an ignorant and diversified body as that of the Filipinos public opinion can hardly be said to exist, there is no doubt that the hatred of the friars was practically universal. When the revolution came the members of the four orders had to flee for their lives, although the people who killed or imprisoned those they could catch were generally good Catholics. As the insular government could not safely allow the friars to return to their parishes the friars' lands were bought for $7,000,000. Mr Taft managed the delicate task of conducting negotiations with the Vatican without arousing the hostility of either Catholics or Protestants. On the 1st of February 1904 General L. E. Wright became governor. He was succeeded in 1905 by Mr H. C. Ide, who was succeeded by General James T. Smith in 1906. The elections for the first Philippine Assembly were held on the 30th of July 1907, and 31 Nationalists, 16 Progressists, 33 Independents and others were elected. The total vote cast was about 100,000. In many districts the Nationalists' candidates promised that if they were returned immediate independence would follow. When the Assembly met it became apparent that the great majority were more anxious to act as a dignified branch of the legislature than to maintain consistency with their pre-election declarations. The legislature convened for its second session on the 1st of February

1909. During this session 72 laws were passed, of which 23 had been introduced by the Commission and 49 by the Assembly. Among the acts was one providing for the continuance of Spanish as the official language of the courts until 1913; an act providing for bankruptcy; and an act fixing the age of majority at 21 years.

Governor Smith left the islands in May 1909 and was suc- ceeded by W. Cameron Forbes. On the 6th of August 1909 the Payne and Colton bills became law, greatly promoting trade between the Islands and the United States (see Communications and Commerce). On the 2nd of November 1909 delegates were elected for the second Philippine Assembly. (H. Bi.)

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PHILIPPOPOLIS (Bulgarian, Plovdiv; Turkish, Felibe), the capital of Eastern Rumelia, and of the department of Philip- popolis, Bulgaria; situated in the midst of picturesque granite eminences on the right bank of the river Maritza, 96 m. E.S.E. of Sofia and 97 m. W.N.W. of Adrianople. Pop. (1906) 45,572, of whom a large majority are Bulgarians, and the remainder chiefly Turks, Greeks, Jews, Armenians or gipsies. Philip- popolis is on the main railway from Vienna to Constantinople, via Belgrade and Sofia. The Maritza is navigable up to this point, and as the city has communication by rail both with the port of Dedeagatch on the Mediterranean and that of Burgas on the Black Sea, and is situated in a remarkably fertile country, it has become the chief commercial centre of southern Bulgaria, and is the seat of both Greek and Bulgarian archbishops. The residences of the richer Greeks and Bulgarians occupy the slopes of the largest eminence, the Jambaz-tepe, in the centre of the city; between it and the Nobtet-tepe, from the summit of which there is a magnificent view of the city, is the Armenian quarter; near the bridge over the Maritza is the poorer Turkish quarter; and south-west of the Jambaz-tepe there is a suburb of villas. On the Bunari-tepe a monument has been erected by the Russians in commemoration of the war of 1877, and near this is the new palace of the king of Bulgaria. The Sahub- tepe is crowned by a clock-tower. Not far from it are the beautiful Exhibition Park laid out in 1892 and the fine Journaia- Jami Mosque. Near the Maritza are the remains of the ancient konak (palace) of the Turkish pashas, the

public park formed by the Russians in 1877, the gymnasium, and the new Greek cathedral. The city has a large commerce in rice, attar of roses, and cocoons; other exports being wheat, wine, tobacco, alcohol and hides.

Eumolpia, a Thracian town, was captured by Philip of Macedon and made one of his frontier posts; hence its name of Phtiippopolis, or " Philip's City." Under the Romans Philoppopolis or Trimontium became the capital of Thracia; md, even after its capture by the Goths, when 100,000 persons are said to have been slain, it continued to be a flourishing city till it was again sacked by the Bulgarians in 1205. It passed under Turkish rule in 1363; in 1818 it was destroyed by an earthquake; and in 1846 it suffered from a severe con flagration. During the war of 1877-78 the city was occupied by the Russians (see also Bulgaria: History).

PHILIPPSBURG, a town of Germany, in the grand duchy of Baden, situated on a sluggish arm of the Rhine, 15 m. N. of Karlsruhe, on the railway Bruchsal-Germersheim. Pop. (1905) 2625. It has manufactures of tobacco and cigars, and some trade in cattle and hops. Philippsburg, formerly an important fortress, originally belonged to the ecclesiastical principality of Spires, and was named Udenheim. In 1338 it was surrounded with walls by bishop Gerhard. A later bishop of Spires, Philipp Christoph von Sotern, made the place his residence early in the 17th century, strengthened the fortifications, and renamed it Philippsburg after himself. At the peace of Westphalia in 1648 the French remained in possession of the town, but in 1679 it was restored to Germany, and though again captured by the French in 1688 it was once more restored in 1697. In 1734 the dilapidated fortress fell an easy prey to the French under Marshal Berwick, who, however, lost his life beneath its walls. It was restored to Germany in 1735, and was again besieged by the French in 1799. The town was assigned to Baden in 1803.

See Nopp, Geschichte der Stadt Philippsburg (Philippsburg, 1881).

PHILIPPUS, MARCUS JULIUS, Roman emperor a.d. 244 to 249, often called " Philip the Arab," was a native of Bostra in Arabia Trachonitis. Having entered the Roman army, he rose to be praetorian praefect in the Persian campaign of Gordian III., and, inspiring the soldiers to slay the young emperor, was raised by them to the purple (244). Of his

reign little is known except that he celebrated the secular games with great pomp in 248, when Rome was supposed to have reached the thousandth year of her existence. A rebellion broke out among the legions of Moesia, and Decius, who was sent to quell it, was forced by the troops to put himself at their head and march upon Italy. Philip was defeated and slain in a battle near Verona. Accord- ing to Christian writers, he was a convert to Christianity.

See Aurelius Victor, Caesares, 28; Eutropius, ix. 3; Zonaras, xii. 19.

PHILIPS, AMBROSE (c. 1675-1749), English poet, was born in Shropshire of a Leicestershire family. He was educated at Shrewsbury school and St John's College, Cambridge, of which he became a fellow in 1699. He seems to have lived chiefly at Cambridge until he resigned his fellowship in 1708, and his pastorals probably belong to this period. He worked for Jacob Tonson the bookseller, and his Pastorals opened the 6th volume of Tonson 's Miscellanies (1709), which also contained the pastorals of Pope. Philips was a stanch Whig, and a friend of Steele and Addison. In Nos. 22, 23, 30 and 32 (1713) of the Guardian he was injudiciously praised as the only worthy successor of Spenser. The writer of the papers, who is supposed to have been Thomas Tickell, pointedly ignored Pope's pastorals. In the Spectator Addison applauded him for his simplicity, and for having written English eclogues unencumbered by the machinery of classical mythology. Pope's jealousy was roused, and he sent an anonymous contribution to the Guardian (No. 40) in which he drew an ironical comparison between his own and Philip's pastorals, censuring himself and praising Philips's worst passages. Philips is said to have threatened to cane Pope with a rod he kept hung up at Button's coffee-house for the purpose. It was at Pope's request that Gay burlesqued Philips's pastorals in his Shepherd's Week, but the parody pleased by the very quality of simplicity which it was intended to ridicule. Samuel Johnson describes the relations between Pope and Philips as a " perpetual reciprocation of malevolence." Pope lost no opportunity of scoffing at Philips, who figured in the Bathos and the Dunciad, as Macer in the Characters; and in the " In- structions to a porter how to find Mr Curll's authors " he is a " Pindaric writer in red stockings." In 17 18 he started a Whig paper, The Freethinker, in conjunction with Hugh Boulter, then vicar of St Olave's, Southwark. He had been made justice of the peace for Westminster, and in i7r7 a commissioner for the lottery, and when Boulter was made archbishop of Armagh, Philips accompanied him as secretary. He sat in the Irish parliament for Co. Armagh, was secretary to the lord chan- cellor in 1726, and in 1733 became a judge of the prerogative court. His patron died in 1742, and six years later Philips returned to London, where he died on

the 18th of June 1749.

His contemporary reputation rested on his pastorals and epistles, particularly the description of winter addressed by him from Copenhagen (1709) to the earl of Dorset. In T. H. Ward's English Poets, however, he is represented by two of the simple and charming pieces addressed to the infant children of Lord Carteret and of Daniel Pulteney. These were scoffed at by Swift as " little flams on Miss Carteret," and earned for Philips from Henry Carey the nickname of " Namby-Pamby."

Philips's works are an abridgment of Bishop Hacket's Life of John Williams (1700); The Thousand and One Days; Persian Tales

(1722), from the French of F. Petis de la Croix ; three

plays: The Distrest Mother (17 12), an adaptation of Racine's Andromaque; The Briton (1722); Humfrey, duke of Gloucester (1723). Many of his poems, which included some translations from Sappho, Anacreon and Pindar, were published separately, and a collected edition appeared in 1748.

PHILIPS, JOHN (1676-1708), English poet and man of letters, son of Dr Stephen Philips, archdeacon of Shropshire, was born at his father's vicarage at Bampton, Oxfordshire, on the 30th of December 1676. He was educated at Winchester and Christ

Church, Oxford. He was a careful reader of Virgil and of Milton. In 1 701 his poem, The Splendid Shilling, was published without his consent, and a second unauthorized version in 1705 induced him to print a correct edition in that year. The Splendid Shilling, which Addison in The Taller called " the finest burlesque poem in the British language," recites in Miltonic blank verse the miseries consequent on the want of that piece of money. Its success introduced Philips to the notice of Robert Harley and Henry St John, who commissioned him to write a Tory counter- blast to Joseph Addison's Campaign. Philips was happier in burlesquing his favourite author than in genuine imitation of a heroic theme. His Marlborough is modelled on the warriors of Homer and Virgil; he rides precipitate over heaps of fallen horses, changing the fortune of the battle by his own right arm. Cyder (1708) is modelled on the Georgics of Virgil. Cerealia, an Imitation, of Milton (1706), although printed without his name, may safely be ascribed to him. In all his poems except Blenheim he found an opportunity to insert a eulogy of tobacco. Philips died at Hereford on the 15th of February 1708/9. There is an inscription to his memory in

Westminster Abbey.

See The Whole Works of . . . John Philips . . . To which is prefixed his life, by Mr [G.] Sewell (3rd ed., 1720); Johnson, Lives of the Poets ; and Biographia Britannica.

PHILIPS, KATHARINE (1631-1664), English poet, daughter of John Fowler, a merchant of Bucklersbury, London, was born on the 1st of January 1631. Her father was a Presbyterian, and Katharine is said to have read the Bible through before she was five years old. On arriving at years of discretion she broke with Presbyterian traditions in both religion and politics, became an ardent admirer of the king and his church policy, and in 1647 married James Philips, a Welsh royalist. Her home at the Priory, Cardigan, became the centre of a “society of friendship,” the members of which were known to one another by fantastic names, Mrs Philips being ” Orinda,” her husband ” Antenor,” Sir Charles Cotterel ” Poliarchus.” The ” match- less ” Orinda, as her admirers called her, posed as the apostle of female friendship. That there was much solid worth under her affectations is proved by the respect and friendship she inspired. Jeremy Taylor in 1659 dedicated to her his ” Discourse on the Nature, Offices and Measures of Friendship,” and Cowley, Henry Vaughan the Silurist, the earl of Roscommon and the earl of Cork and Orrery all celebrated her talent. In 1662 she went to Dublin to pursue her husband’s claim to certain Irish estates, and there she completed a translation of Corneille’s Pompie, produced with great success in 1663 in the Smock Alley Theatre, and printed in the same year both in Dublin and London. She went to London in March 1664 with a nearly completed transla- tion of Corneille’s Horace, but died of smallpox on the 22nd of June. The literary atmosphere of her circle is preserved in the excellent Letters of Orinda to Poliarchus, published by Bernard Lintot in 1705 and 1709. ” Poliarchus ” (Sir Charles Cotterel) was master of the ceremonies at the court of the Restoration, and afterwards translated the romances of La Calprenede. Mrs Philips had two children, one of whom, Katharine, became the wife of Lewis Wogan of Boulston, Pembrokeshire. According to Mr Gosse, this lady may have been ” Joan Philips,” the author of a volume of Female Poems . . . written by Ephelia, which are in the style of Orinda, and display genuine feeling with very little reserve.

See E. W. Gosse, Seventeenth Century Studies (1883). Poems, By the Incomparable Mrs K. P. appeared surreptitiously in 1664 and an authentic edition in 1667. Selected Poems, edited with an appreciation by Miss L. I. Guiney, appeared in 1904; but the best modern edition is in Saintsbury’s Minor Poets of the Caroline Period

(vol. i., 1905).

PHILISTINES, 1 the general name for the people of Philistia (Ass. Palastu, Pilistu; Eg. p-r-s-t), a district embracing the rich lowlands on the Mediterranean coast from the neighbourhood

1 ” Philistine,” as a term of contempt, hostility or reproach, appears first in English, in a sense equivalent to ” the enemy,” as early as the beginning of the 17th century, and later as a slang term for a bailiff or a sheriff’s officer, or merely for drunken or vicious people generally. In German universities the townsfolk

of Jaffa (Joppa) to the Egyptian desert south of Gaza (on the subsequent extension of the name in its Greek form Palaestina, see Palestine).

i. Egyptian Evidence. — The name is derived from the Purasati, one of a great confederation from north Syria, Asia Minor and the Levant, which threatened Egypt in the XXth Dynasty. They are not among the hordes enumerated by Rameses II. or Mer- neptah, but in the eighth year of Rameses III. (c. 1200-1190) the Purasati hold a prominent place in a widespread movement on land and sea. The Syrian states were overwhelmed and the advance upon Egypt seemed irresistible. Rameses, however, collected a large fleet and an army of native troops and mer- cenaries and claimed decisive victories. The Egyptian monu- ments depict the flight of the enemy, the heavy ox-carts with their women and children, and the confusion of their ships. But the sequel of the events is not certain. Even if the increas- ing weakness of the Egyptian Empire did not invite a repetition of the incursion, it could have allowed the survivors to settle down, and about a century later one of the peoples formerly closely allied with the Purasati is found strongly entrenched at Dor, and together with the more northerly port of Byblos treats with scant respect the traditional suzerainty of Egypt. 1 That some definite political changes ensued in this age have been inferred on other grounds, and the identification of the Purasati with the Philistines may permit the assumption that the latter succeeded in occupying the district with which they have always been associated.

The Egyptian monuments represent the Purasati with a very distinctive feather head-dress resembling that of the Lycians and Mycenaeans. Their general physiognomy is hardly Cilician or Hittite,

but European. Their arms comprise two short swords, a longer spear, a round shield, and they sometimes wear a coat of mail; a curious feature is their tactics of fighting in a circle of protecting shields. The chariots resemble the Hittite with two crossed receptacles for the weapons, but obviously these were not used by the Purasati alone. On archaeological grounds the Purasati have been connected with the people of Keftiu, i.e. Mycenaeans of Crete, although a wider application of this term is not to be excluded.

See further, G. Maspero,. Struggle of the Nations, pp. 461 sqq.; W. M. Miiller, Asien u. Europa, pp. 354 sqq. ; Mitteil. d. vorderasiat. Gesell. pp. 1-42 (1900), pp. 113 sqq. (1904); H. R. Hall, British School of Athens, viii. 157 sqq., x. 154 sqq.; Proc. Soc. Bibl. Arch. xxxi. (1909) passim; R. Weill, Rev. archeol., i. 52 sqq. (1904); R. Dussaud. Rev. de I'hist. des relig., ii. 52 sqq. (1905). More re- cently, A. Wiedemann, Orient, lit. Zeit. (1910), cols. 49 sqq. dis- putes the identification of Keft with Crete.

2. History. — Biblical tradition, too, has recognized the Philistines as immigrants from Caphtor (Amos ix. 7). They appear in the pre-Mosaic age (Gen. xxi. 32, 34, xxvi.), at the Exodus of the Israelites (Ex. xiii. 17, xv. 14), and the invasion of Palestine. They are represented as a confederation of five cities (Ashdod, Ascalon [Ashkelon], Ekron, Gath and Gaza) which remained unconquered (Joshua xiii. 2 seq., Judges iii. 3; contrast Joshua xv. 45-47, xix. 43). The institution of the Hebrew monarchy (c. 1000 B.C.) follows upon periods of Philistine oppression (Judges iii. 31, x. 7, n, xiii. 1-5; see Samson; Eli; Samuel; Saul; David). The subjugation of them is ascribed

were called by the students Philister; they were "outsiders," the enemy of the chosen people. It is supposed that this use arose in 1693 in Jena after a " town and gown " row in which a student had been killed and a sermon preached on the text " the Philistines be upon you, Samson " (see Quarterly Review, April 1899, 438, note, quoted in the New English Dictionary). " Philistine " thus became the name of contempt applied by the cultured to those whom they considered beneath them in intellect and taste, and was first so used in English by Cariyle, and Matthew Arnold (Essays in Criticism, " Heinrich Heine," 1865) gave the word its vogue and its final connotation, as signifying " inaccessible to and impatient of ideas." — [Ed.]

1 So the Papyrus first published by W. GoKnischeff (Rec. de travaux, xxi. 74 sqq.), on which see A. Erman, Zeit. f. aegypt. Sprache, pp. 1-14 (1900); W. M. Miiller, Mitteil. d. vorderasiat. Gesell. pp. 14 sqq. (1900); J. H. Breasted, Hist, of Eg. pp. 513 sqq.; Historical Records, iv.

274 sqq. ; H. W. Hogg, in the Theolog. Series I. of the publications of university of Manchester, p. 90 seq.

to Samuel (1 Sam. vii. 13), Saul (xiv. 47), and David (2 Sam. viii. 1; for Solomon see 1 Kings x. 20); but they evidently recovered their independence, and we find that twice within a short time the northern Israelites laid siege to the border fortress of Gibbethon (1 Kings xv. 27, xvi. 15). Although this place has not been identified, it is mentioned in a list of Danite cities with Aijalon, Ekron, Eltekeh and Timnah (Joshua xix. 44, xxi. 23), names of importance for the history. Somewhat later the evidence becomes fuller, and much valuable light is thrown upon the part which the Philistine coast played in the political history of Palestine. Gaza, the most southerly and famous of the Philistine towns, was the terminus of the great caravan-route from Edom and south Arabia, with whose Bedouin it was generally on good terms. It was ” the outpost of Africa, the door, of Asia ” (G. A. Smith), the stepping-off point for the invasion of Egypt, and the fortress which, next in importance to Lachish, barred the maritime road to Phoenicia and Syria. 2 It is necessary to realize Gaza’s position and its links with trading centres, since conditions in the comparatively small and half-desert land of Judah depended essentially upon its relations with the Edomites and Arabian tribes on the south-east and with the Philistines on the west. 3 Jehoshaphat’s supremacy over Philistines and Arabians (2 Chron. xvii, n, partly implied in 1 Kings xxii. 47) is followed by the revolt of Libnah (near Lachish) and Edom against his son Jehoram (2 Kings viii. 20, 22). The book of Chronicles mentions Philistines and Arabians, and knows of a previous warning by a prophet of Mareshah (east of Lachish; 2 Chron. xx. 37, xxi. 16). In like manner, the conquests of Uzziah over Edom and allied tribes (2 Kings xiv. 22, see 2 Chron. xxvi. 7) and over Gath, Ashdod and Jabneh (ibid. v. 6) find their sequel in the alliance of Samaria and Damas- cus against Ahaz, when Edom recovered its independence (so read for ” Syria ” in 2 Kings xvi. 6), and the Philistines attacked Beth-shemesh, Aijalon, Timnath, &c. (2 Chron. xxviii. 17 seq.). 4 These notices at least represent natural conditions, and the Assyrian inscriptions now are our authority. Tiglath-pileser IV. (734 B.C.) marched down and seized Gaza, removing its gods and goods. Its king Hanun had fled to Musri, but was pursued and captured; Ascalon, Judah and Edom appear in a list of tributaries. Musri was entrusted to the care of the Arabian Idibi’il (of the desert district), but continued to support anti- Assyrian leagues (see Hoshea), and again in 720 (two years after the fall of Samaria) was in alliance with Gaza and north Palestine. Assyria under Sargon defeated the southern confederation at Rapihi (Raphia on the border of Egypt) and captured Hanun; the significance of the victory is

evident from the submission of the queen of Aribi (Arabia), the Sabaean Itamara, and Musri. This Musrj appears to have been a district outside the limits of Egypt proper, and although tribes of the Delta may well have been concerned, its relations to Philistia agree with the inde- pendent biblical account of the part played previously by Edom and Arabian tribes (see Mizraim). But the disturbances continued, and although desert tribes were removed and settled in Samaria in 715, Musri and Philistia were soon in arms again. Ashdod (see Isa. xx.) and Gath were taken and sacked, the people removed, and fresh colonies were introduced. Judah, Edom and Moab were also involved, but submitted (711 B.c.L Scarcely ten years passed and the whole of Palestine and Syria was again torn with intrigues. Sennacherib (Sargon's suc- cessor in 705) marched to the land of the " Hittites," traversed

2 See G. A. Smith, Hist. Geog. of the Holy Land, chs. ix. seq. ; and M. A. Meyer, History of the City of Gaza (New York, 1907). For the traditions associating Gaza with Crete, see the latter, Index, s.v. Minos; the resemblance between the Minaeans of South Arabia and Cretan Minos has afforded grounds for all kinds of speculations, ancient (Pliny vi. 157) and modern.

3 Between the central Judaean plateau and the latter lay the " lowlands " (Shephelah), a district open equally to Judaeans and Philistines alike.

4 Cf. Gaza and Edom against Judah in Amos i. 6, and, for the part played by Damascus, the later vicissitudes under the Nabat- aeans (Josephus, Ant. xiii. 13. 3). It is difficult to date the alliance of Syria and Philistia against Israel in Isa. ix. 11 seq. (on the text, see the commentaries).

the coast and, descending from Sidon, took Jaffa, Beth-dagon, Beneberak, Ekron and Timnah (all in the district ascribed to the southern Dan). At Eltekeh (also in Dan) the allies were defeated. Farther south came the turn of Ascalon, Lachish and Libnah; Judah under Hezekiah suffered severely, and its western cities were transferred to the faithful vassals of Ekron, Ashdod and Gaza. The immediate subsequent events are obscure (see further Hezekiah). In the 7th century Gaza, Ascalon, Ashdod and Ekron were Assyrian vassals, together with Judah, Moab and Edom — in all, twenty-two

kings of the ” Hittites ” — and the discovery of Assyrian contract-tablets at Gezer (c. 650) may indicate the presence of Assyrian garrisons. But as the Assyrian power declined Egyptian monarchs formed plans of aggrandizement. Herodotus mentions the Scythian invasion and sack of the temple of Aphrodite Urania (Astarte) at Ascalon, also the prolonged siege of Ashdod by Psammetichus, and the occupation of Kadytis (? Gaza) by Necho (i. 105, ii. 157 sqq., iii. 5). But the Babylonian Empire followed upon traditional lines and thrust back Egypt, and Nabonidus (553 B.C.) claims his vassals as far as Gaza. The Persians took over the realm of their predecessors, and Gaza grew in importance as a seat of international commerce. Nehemiah speaks not of Philistines, but of Ashdodites (iv. 7), speaking an ” Ashdodite ” dialect (xiii. 24) ; just as Strabo regards the Jews, the Idumaeans, the Gazans and the Ashdodites as four cognate peoples having the common characteristic of combining agriculture with commerce. In southern Philistia at least, Arabian immigration became more pronounced. In the time of Cambyses Arabs were settled at Jenysos south of Gaza (Herod, iii. 5), and when Alexander marched upon Egypt, Gaza with its army of Arabs and Persians offered a strenuous resistance. Recent discoveries near Tell Sandahannah (or Mareshah) have revealed the presence of North Arabian (Edomite) names about the 2nd century B.C. 1 On the history of the district see further Jews; Maccabees; Palestine.

3. Philistine Traditions. — The interdependence of the south Palestinian peoples follows from geographical conditions which are unchangeable, and the fuller light thrown upon the last decades of the 8th century B.C. illuminates the more fragmentary evidence elsewhere. 2 Hence the two sieges of the Philistine Gibbethon by the Israelites (above) obviously have some signifi- cance for Judaean history, but the Judaean annals unfortunately afford no help (see Asa). Again, the Aramaean attack upon Israel by Hazael of Damascus leads to the capture of Gath (2 Kings xii. 17), and this, together with the statement that he took ” the Philistine ” from Jehoahaz of Israel (ibid. xiii. 22, Lucian’s recension), bears upon Judah, but the statements are isolated. Somewhat later, the Assyrian king Adad-nirari IV. claimed tribute from Edom, Philistia and Beth-Omri (the Israelite kingdom) ; the curious omission of Judah has suggested that it was then included with the second or third of these (see Jews, § 12). The Philistines naturally had a prominent place in popular tradition, and the story of Isaac and the Philistine Abimelech (Gen. xxvi., cf. xxi. 32) is of great interest for its unbiased representation of intercourse, enmity, alliance and covenant. But it is important to notice that a parallel story (xx.) is without this distinctively Philistine background, and this variation is

significant. One account of the Israelite invasion conceived a conquest of earlier giant inhabitants (Anakim) who survived in Gaza, Gath and Ashdod (Joshua xi. 21 seq., contrast xiii. 3), but were driven out from Hebron by Caleb (Joshua xv. 14, cf. Num. xiii. 22, 28). The Philistines themselves are called the remnant of the Anakim (Jer. xlvii. 5, so the Septuagint), or as Caphtorlm replace the earlier Avvim

1 Peters and Thiersch, Painted Tombs in the Necropolis of Marissa (I905)-

2 Thus, the capture of Gezer by Egypt (1 Kings ix. 16) was presumably only part of some more extensive operations, but their relation to Shishak's great Palestine campaign is uncertain; see A. Alt, Israel u. Aegypten, pp. 19-38 (Leipzig, 1909). It would be unsafe to infer much from the Eg. reference to the " messenger (wpty, meaning ambiguous)" of Canaan and Philistia (Bull. Mus. Cairo, i. 98).

(Deut. ii. 23, see Joshua xiii. 3). Samuel's great defeat of the Philistines leads to " peace between Israel and the Amorites " (1 Sam. vii. 14); and the migration of the Danites is placed after Samson's conflicts with the Philistines (Judges xviii. seq.), or is due to the pressure of Amorites (i. 34). Even in David's fights with the Philistines in Judah, Jerusalem is Jehusite, neighbour- ing non-Israelite cities are Hivite or Amorite (Joshua ix. 7, 2 Sam. xxi. 2), and his strange adversaries find a close parallel in the semi-mythical sons of Anak (2 Sam. xxi. 16, 18, 20, 22). This fluctuation, due partly to the different circles in which the biblical narratives took shape, and partly to definite reshaping of the traditions of the past, seriously complicates all attempts to combine the early history of Israel with the external evi- dence. The history of the Philistine district goes back long before the time of the Purasati (c. 1200 B.C.), and if the references to Philistines in pre-Mosaic times are treated as anachronisms, those which can be applied to the i2th-nth century do not at once acquire an historical value. 3 The refer- ences of the time of the Exodus, the Invasion and the " Judges " — whatever chronological scheme be adopted — must be taken in connexion with a careful examination of all the evidence. It is inherently not improbable that a recollection has been preserved of Philistine oppressions in the nth century, but it is extremely difficult to sketch any adequate sequence of events, and among the conflicting traditions are situations equally applicable to later periods of hostility. Biblical history has presented its own views of the Israelite and Judaean monarchies; Israel has its enemies who come pouring forth from the south (1 Sam. xiii. 17, 18), while the founder of the Judaean dynasty has intimate relations with a Philistine king Achish (or Abime- lech, Ps. xxxiv.), or, from another

point of view, clears the district of a prehistoric race of giants. In the stories of Samson and Samuel, the Philistines are located in the maritime plain, whereas, in the oldest traceable account of Saul's rise (apparently shortly before 1000 B.C.) they hold Israel (1 Sam. ix. 16, xiii. 3 seq., 7, xiv. 1, n, 21). But there is no historical continuity between the two situations, and the immediate prelude to the achievements of Saul and Jonathan is lost. The biblical evidence does not favour any continued Philistine domination since the time of Rameses III., who indeed, later in his reign, made an expedi- tion, not against the Purasati, but into North Syria, and, as appears from the Papyrus Harris, restored Egyptian supremacy over Palestine and Syria. Upon the (incomplete) external evidence and upon a careful criticism of the biblical history of this period, and not upon any promiscuous combination of the two sources, must depend the value of the plausible though broad reconstructions which have been proposed. 4

Considerable stress is often laid upon Goliath's armour of bronze and his iron weapon, but even David himself has heimet, sword and coat-of-mail at his disposal (1 Sam. xvii.), and suits of armour had already been taken from Mesopotamia by Teth- mosis III. Chariots of iron are ascribed to theCanaanites (Joshua xvii. 16, 18, Judges i. 19, iv. 3); but if early references to iron are treated as unhistorical (Gen. iv. 22, Num. xxxi. 22,xxxv. 16, Deut. iv. 20, viii. 9, xix. 5, xxvii. 5, xxviii. 48, xxxiii. 25, Joshua vi. 19, 24) Goliath's iron spear-head must be judged together with the whole narrative in the light of a consistent historical criticism. 6

3 The inhabitants of Ascalon besieged by Rameses II. are repre- sented as Hittites. For an attempt to treat the pre-Mosaic refer- ences as historical, see A. Noordtzij, De Filistijnen (Kampen, 1905).

4 See on these, W. M. Muller, Mitteil. d. vorderasiat. Gesell. p. 39 seq.; G. F. Moore, Ency. Bib., art. " Philistines," col. 3720 seq., and cf. H. W. Hogg, op. cit. p. 91. For the suggestion that the " Philistines " have in certain cases taken the place of another ethnic, see S. A. Cook, Crit. Notes on 0. T. History, pp. 43 seq., 127 seq., 131 seq., 136 seq., 144; cf., from another point of view, T. K. Cheyne, Decline and' Fall of Kingdom of Judah (1908), pp. xx. sqq.

6 The introduction of iron has been ascribed to about 1000 B.C. (Macalister, Quart. Statem. p. 321 [1905], as against p. 122 [1904]; H. Vincent, Canaan d'apres V exploration recente, p. 235 seq.). It need hardly be said that the height and might of Goliath must be regarded in the same way as Num. xiii. 32; Deut. ii. n. The men of the heroic age are giants, as were the 'Ad and Thamud to the later Arabs.

4. Conclusions. — The Philistines appear in the Old Testament as a Semitic or at least a thoroughly Semitized people. Their proper names show that before and even during the Persian age their languages differed only dialectically from Hebrew. Among the exceptions must be reckoned Achish (Sept. &kxovs), with which has been compared Ikausu, a king of Ekron (7th century) and the “Keftian” name Akashau of the XlXth Egyptian dynasty. Names in -ath (Goliath; Ahuzzath, Gen. xxvi.) are not restricted to Philistines, and Phicol (ibid.) is too obscure to serve as evidence. The religion is not novel. The male god Dagon has his partner Astarte (qg.v.), and Baal-zebub, a famous oracle of Ekron (2 Kings i.) finds a parallel in the local ” baals ” of Palestine. 1 Even when the region seems to be completely Hellenized after the Persian age, it is not so certain that Greek culture pervaded all classes (see G. F. Moore, Ency. Bib. col. 3726), although a certain amount of foreign influence probably made itself felt upon the coast-towns at all times. The use of the term aXh6vkoi in Maccabaean and later writings (cf. the contemptuous hatred of Ben Sira, Ecclesiasticus 1. 26, and the author of Jubilees xxiv. 30 sqq.) correctly expresses the con- ditions of the Greek age and the Maccabaean wars, and naturally any allusion to the situations of many centuries previously is quite unnecessary. Similarly, the biblical evidence represents the traditions in the form which they had reached in the writer’s time, the true date of which is often uncertain. Antagonism between Philistines and Israelites was not a persisting feature, and, although the former are styled ” uncircumcised ” (chiefly in the stories in the book of Samuel), the term gained new force when the expulsion of uncircumcised aliens from the sanctuary of Jerusalem was proclaimed in the writings ascribed to Ezekiel (ch. xliv.). 2

In fact the question arises whether the history of the Philistines is not that of a territorial designation, rather than that of the lineal descendants of the Purasati, who, if one of the peoples who took part in the events of the XXth Dynasty, may well have bequeathed their name. The Mediterranean coast-land was always exposed to incursions of aliens, and when Carians appear as royal and temple guards at Jerusalem (2 Kings xi. 4), it is sufficient to recall old Greek traditions of a Carian sea-power and relations between Philistia and Greek lands. 3 Even the presence of Carians and Ionians in the time of Psammetichus I. may be assumed, and when these are planted at Defneh it is noteworthy that this is also closely associated with a Jewish colony (viz. Tahpanhes, Jer. xliii. seq.). Although the Purasati

appear after the i5th-i4th centuries, now illuminated by the Amarna tablets, their own history is perhaps earlier. 4 But there is no reason at present to believe that their entrance caused any break in the archaeological history. The apparently ” Aegean ” influence which enters into the general ” Amarna ” period seems to begin before the age of the Amarna tablets (at Lachish), and it passes gradually into later phases contemporary with the

1 See further, F. Schwally, Zeit. Wissens. Theol. xxxiv. 103-108. A few Hebrew words have been regarded as Philistine loan-words, so notably pillegesh, ” concubine ” (xaXXa/ci), iraWads, Lat. pellex), and seren (rbpavvos) the title applied to the five lords of the Philistine confederation; seren otherwise means “axle,” and may have been applied metaphorically like the Arab. £o?6 (W. R. Smith). On the other hand, a common origin in Asia Minor is also possible for these words.

2 In the prophetical writings the Philistines are denounced (with Ammon, Moab and Edom) for their vengeance upon Judah (Ezek. xxv. 15-17). With Tyre and Sidon they are condemned for plundering Judah, and for kidnapping its children to sell to the Greeks (Joel iii. 4-8; cf. Amos i. 6-12; 1 Mace. iii. 41). They are threatened with a foe from the north (Jer. xxv. 20; Isa. xiv. 29-31 ; see Zephamah), as also is Phoenicia (Jer. xlvii. 2-7) upon whom they depend (cf. Zech. ix. 3-8). Judah is promised reprisals (Zeph. ii. 7; Obad. 19), and a remnant of the Philistines may become worshippers of Yahweh (Zech. ix. 7). The historical backgrounds of these passages are disputed.

3 See J. L. Myres, Journal of Hellenic Studies, xxvi. 84 sqq. (1906); especially pp. 108, 127 sqq.

4 This is suggested by the recent discovery at Phaestos in Crete of a disk with evidence for a native script; see A. J. Evans, Scripla Minoa (Oxford, 1909), pp. 22 sqq.; E. Meyer, Sizungsberichte of the Berlin Academy for the 21st of October 1909.

Israelite monarchy. There is a fairly continuous intercourse with external culture (Cypriote, early and late Greek), and, if Gath be identified with Tel es-Safi, Bliss and Macalister, who excavated it, found no trace of any interruption in its history. Only at Gezer — perhaps Philistine, 2 Sam. v. 25 — has there been found evidence for a strange race with several distinctive features. Bricked vault tombs were discovered containing bodies outstretched (not contracted); the deposits were of an unusually fine character and comprised silve , alabaster and even iron. The culture appears to find Carian and Lydian

parallels, and has been ascribed provisionally to the i3th-ioth centuries. So far, however, of the cities lying within or im- mediately exposed to Philistine influence, the discoveries at Gezer are unique. 6

According to the biblical traditions the Philistines are the remnant of Caphtor (Jer. xlvii. 4, Amos ix. 7), and the Caphtorim drove out the aboriginal Avva from Gaza and district, as the Horites and Rephaim were displaced by Edom and Ammon (Deut. ii. 23). These Caphtorim, together with Ludim (Lydians) and other petty peoples, apparently of the Delta, are once reckoned to Egypt (Gen. x. 14) . 6 By Caphtor the Septuagint has sometimes understood Cappadocia, which indeed may be valid for its age, but the name is to be identified with the Egyptian K(a)ptar, which in later Ptolemaic times seems to mean Phoenicia, although Keftiu had had another connotation. The Cherethites, associated with the Philistine district (1 Sam. xxx. 14, 16, Ezek. xxv. 16, Zeph. ii. 5 seq.), are sometimes recog- nized by the Septuagint as Cretans, and, with the Pelethites (often taken to be a rhyming form of Philistines), they form part of the royal body-guard of Judaean kings (2 Sam. viii. 18, xv. 18. xx. 7, 1 Kings i. 38, 44; in 2 Sam. xx. 23 the Hebrew text has Carites). However adequate these identifications may seem, the persistence of an independent clan or tribe of Chere- thites-Cretans to the close of the 7th century would imply an unbroken chain of nearly six hundred years, unless, as is in- herently more probable, later immigrations had occurred within the interval. But upon the ethnological relations either of the south Palestinian coast or of the Delta it would be unsafe to dogmatize. So far as can be ascertained, then, the first mention of the Philistines belongs to an age of disturbance and change in connexion with movements in Asia Minor. Archaeological evidence for their influence has indeed been adduced, 7 but it is certain that some account must be taken also of the influence by land from North Syria and Asia Minor. The influences, whether from the Levant or from the north, were not confined to the age of Rameses III. alone, and the biblical evidence, especially, while possibly preserving some recollection of the invasion of the Purasati, is in every case late and may be shaped by later historical vicissitudes. It is impossible that Palestine should have remained untouched by the external movements in connexion with the Delta, the Levant and Asia Minor, and it is possible that the course of internal history in the age immedi- ately before and after 1000 B.C. ran upon lines different from the detailed popular religious traditions which the biblical historians have employed. (See further Palestine: History.)

For older studies, see F. Hitzig, Vrgeschichte der Philister (1845), with the theory of the Pelasgic origin of the Philistines; K. Stark, Gaza u. d. philist. Kiiste (1852), and (with special reference to earlier theories)

W. Robertson Smith's art. in Ency. Brit., 9th ed.

(S. A. C.)

PHILISTUS, Greek historian of Sicily, was born at Syracuse about the beginning of the Peloponnesian War (432 B.C.). He was a faithful supporter of the elder Dionysius, and commander

6 See R. A. S. Macalister, Quarterly Stat, of the Palestine Explor. Fund, pp. 319 sqq. (1905), pp. 197 sqq. (1907), and J. L. Myres, ibid. pp. 240 sqq. (1907). On the other hand, H. Thiersch would connect the painted pottery of Tel es-§an, &c., with the Philistines (Jahrbuch d. Arch. Inst. col. 378 sqq., Berlin, 1908); cf. also H. R. Hall, Proc. Soc. Bibl. Arch. xxxi. 235.

6 v. 13 seq. may be a secondary addition " written from specially intimate acquaintance with the (later ?) Egyptian geography (J. Skinner, Genesis, p. 214).

7 See D. G. Hogarth, Ionia and the East, pp. 28 seq. (Oxford, 1909) ; Evans, Scripta Minoa, pp. 77 sqq.

of the citadel. In 386 he excited the jealousy of the tyrant by secretly marrying his niece, and was sent into banishment. He settled at Thurii, but afterwards removed to Adria, where he remained until the death of Dionysius (366). He was then recalled by the younger Dionysius, whom he persuaded to dismiss Plato and Dion. When Dion set sail from Zacynthus with the object of liberating Syracuse from the tyrannis, Philistus was entrusted with the command of the fleet, but he was defeated and put to death (356). During his stay at Adria, Philistus occupied himself with the composition of his St/ceXua, a history of Sicily in eleven books. The first part (bks. i.-vii.) comprised the history of the island from the earliest times to the capture of Agrigentum by the Carthaginians (406); the second, the history of the elder and the younger Dionysius (down to 363). From this point the work was carried on by Philistus's fellow countryman Athanas. Cicero (ad. Q. Fr. ii. 13), who had a high opinion of his work, calls him the miniature Thucydides " (pusillus Thucydides). He was admitted by the Alexandrian critics into the canon of historiographers, and his work was highly valued by Alexander the Great.

See Diod. Sic. xiii. 103, xiv. 8, xv. 7, xvi. n, 16; Plutarch, Dion, 11-36;

Cicero, Brutus, 17, De oratore, ii. 13; Quintilian, Instil. x. 1 , 74 ; fragments and life in C. W. M tiller, Fragmenta historicorum graecorum, vol. i. (1841); C. Wachsmuth, Einleitung in das Studium der alien Geschichte (1895); E. A. Freeman, History of Sicily (1891-1894); A. Holm, Geschichte Siciliens im Altert. (1870-1898).

PHILLAUR, a town of British India, in Jullundur district, Punjab, on the north bank of the river Sutlej, 8 m. N. of Ludhiana. Pop. (1001), 6986. Founded by the Mogul emperor Shah Jahan, it was long of importance as commanding the crossing of the Sutlej. At the Mutiny in 1857 the fort contained the siege train, which was sent safely to Delhi; but the sepoy regiment in the cantonment shortly afterwards mutinied and escaped. The fort is now occupied by the police training school and the central bureau of the criminal identification department.

PHILLIMORE, SIR ROBERT JOSEPH (1810-1885), English judge, third son of a well-known ecclesiastical lawyer, Dr Joseph Phillimore, was born at Whitehall on the 5th of November 1810. Educated at Westminster and Christ Church, Oxford, where a life- long friendship with W. E. Gladstone began, his first appointment was to a clerkship in the board of control, where he remained from 1832 to 1835. Admitted as an advocate at Doctors' Commons in 1839, he was called to the bar at the Middle Temple in 1841, and rose very rapidly in his profession. He was engaged as counsel in almost every case of importance that came before the admiralty, probate or divorce courts, and became success- ively master of faculties, commissary of the deans and chapters of St Paul's and Westminster, official of the archdeaconries of Middlesex and London,and chancellor of the dioceses of Chichester and Salisbury. In 1853 be entered parliament as member for Tavistock. A moderate in politics, his energies were devoted to non-party measures, and in 1854 he introduced the bill for allowing viva voce evidence in the ecclesiastical courts. He sat for Tavistock until 1857, when he offered himself as a candidate for Coventry, but was defeated. He was appointed judge of the Cinque Ports in 1855, Queen's Counsel in 1858, and advocate- general in admiralty in 1862, and succeeded Dr Stephen Lushing- ton (1782-1873) as judge of the court of arches five years later. Here his care, patience and courtesy, combined with unusual lucidity of expression, won general respect. In 1875, in accordance with the Public Worship Regulation Act, he resigned, and was succeeded by Lord Penzance. When the Judicature Act came into force the powers of the admiralty court were transferred to the High Court of Justice, and Sir Robert Phillimore was therefore the last judge of the historic court of the lord high admiral of England. He continued to sit as judge for the new admiralty, probate and divorce division until 1883, when

he resigned. He wrote Ecclesiastical Law of the Church of England, a book which still holds its ground, Commentaries on International Law, and a translation of Lessing's Laocoon. He married, in 1844, Charlotte Anne, daughter of John Denison of Ossington Hall, Newark. He was knighted in 1862, and created a baronet in 1881. He died at Shiplake, near Henley-on-Thames, on

the 4th of February 1885. His eldest son, Sir Walter G. F. Phillimore (b. 1845), also distinguished as an authority on ecclesiastical and admiralty law, became in 1897 a judge of the high court.

PHILLIP, JOHN (1817-1867), Scottish painter, was born at Aberdeen, Scotland, on the 19th of April 181 7. His father, an old soldier, was in humble circumstances, and the son became an errand-boy to a tinsmith, and was then apprenticed to a painter and glazier. Having received some technical instruction from a local artist named William Mercer, he began, at the age of about fifteen, to paint portraits. In 1834 he made a very brief visit to London, About this time he became assistant to James Forbes, an Aberdeen portrait-painter. He had already gained a valuable patron. Having been sent to repair a window in the house of Major P. L. Gordon, his interest in the works of art in the house attracted the attention of their owner. Gordon brought the young artist under the notice of Lord Panmure, who in 1836 sent him to London, promising to bear the cost of his art education. At first Phillip was placed under T. M. Joy, but he soon entered the schools of the Royal Academy. In 1839 he figured for the first time in the royal academy exhibition with a portrait and a landscape, and in the following year he was represented by a more ambitious figure-picture of " Tasso in Disguise relating his Persecutions to his Sister." For the next ten years he supported himself mainly by portraiture and by painting subjects of national incident, such as " Presbyterian Catechizing," " Baptism in Scotland," and the " Spaewife." His productions at this period, as well as his earlier subject- pictures, are reminiscent of the practice and methods of Wilkie and 'the Scottish genre-painters of his time. In 1851 his health showed signs of delicacy, and he went to Spain in search of a warmer climate. He was brought face to face for the first time with the brilliant sunshine and the splendid colour of the south, and it was in coping with these that he first manifested his artistic individuality and finally displayed his full powers. In the " Letter-writer of Seville " (1854), commissioned by Queen Victoria at the suggestion of Sir Edwin Landseer, the artist is struggling with new difficulties in the portrayal of unwonted splendours of colour and light. In 1857 Phillip was elected an associate of the Royal Academy, and in 1859 a full member. In 1855 and in i860 further visits to Spain were made, and in

each case the painter returned with fresh materials to be embodied with increasing power and subtlety in the long series of works which won for him the title of ” Spanish Phillip.” His highest point of execution is probably reached in ” La Gloria ” (1864) and a smaller single-figure painting of the same period entitled ” El Cigarillo.” These Spanish subjects were varied in i860 by a rendering of the marriage of the princess royal with the crown prince of Prussia, executed by command of the queen, and in 1863 by a picture of the House of Commons. During his last visit .to Spain Phillip occupied himself in a careful study of the art of Velazquez, and the copies which he made fetched large prices after his death, examples having been secured by the royal and the royal Scottish academies: The year before his death he visited Italy and devoted attention to the works of Titian. The results of this study of the old masters are visible in such works as ” La Loteria Nacional, ” left uncompleted at his death. During this period he resided much in the Highlands, and seemed to be returning to his first love for Scottish subjects, painting several national scenes, and planning others that were never completed. He died in London on the 27th of February 1867.

His works were collected in the International Exhibition of 1873, and many of them are engraved by T. Oldham Barlow. In addition to the paintings already specified the following are among the more important: ” Life among the Gipsies of Seville ” (1853), ” El Paseo ” (1855), ” Collection of the Offertory in a Scotch Kirk ” (1855), ” A Gipsy Water-carrier in Seville ” (1855), ” The Prayer of Faith shall save the Sick ” (1856), ” The Dying Contrabandist ” (1856), ” The Prison Window ” (1857), ” A Huff ” (1859), ” Early Career of Murillo ” (1865), ” A Chat round the Brasero ” (18&6).

PHILLIPS, ADELAIDE (1833-1882), American contralto singer, was born at Stratford-on-Avon, England, her family emigrating to America in 1840. Her mother taught dancing,

and Adelaide began a career o& the Boston stage at ten years old. But in 1850 her talent for singing became evident, and through Jenny Lind and others she was sent to London and to Italy to study. In 1855 she returned to America an accom- plished vocalist; and for many years she was the leading American contralto, equally successful in oratorio and on the concert platform. She died at Carlsbad on the 3rd of October

1882.

PHILLIPS, EDWARD (1630-1696), English author, son of Edward Phillips of the crown office in chancery, and his wife Anne, only sister of John Milton, the poet, was born in August 1630 in the Strand, London. His father died in 1631, and Anne Phillips eventually married her husband's successor in the crown office, Thomas Agar. Edward Phillips and his younger brother, John, were educated by Milton. Edward entered Magdalen Hall, Oxford, in November 1650, but left the university in 1651 to be a bookseller's clerk in London. Although he entirely differed from Milton in his religious and political views, and seems, to judge from the free character of his Mysteries of Love and Eloquence (1658), to have undergone a certain revulsion from his Puritan upbringing, he remained on affectionate terms with his uncle to the end. He was tutor to the son of John Evelyn, the diarist, from 1663 to 1672 at Sayes Court, near Deptford, and in 1677-1679 in the family of Henry Bennet, earl of Arlington. The date of his death is unknown but his last book is dated 1696.

His most important work is Theatrum poetarum (1675), a list of the chief poets of all ages and countries, but principally of the English poets, with short critical notes and a prefatory Discourse of the Poets and Poetry, which has usually been traced to Milton's hand. He also wrote A New World in Words, or a General Dictionary (1658), which went through many editions; a new edition of Baker's Chronicle, of which the section on the period from 1650 to 1658 was written by himself from the royalist standpoint; a supplement (1676) to John Speed's Theatre of Great Britain; and in 1684 Enchiridion linguae latinae, said to have been taken chiefly from notes prepared by Milton. Aubrey states that all Milton's papers came into Phillips's hands, and in 1694 he published a translation of his Letters of State with a valuable memoir

His brother, John Phillips (1631-1706), in 1652 published a Latin reply to the anonymous attack on Milton entitled Pro Rege et populo anglicano. He appears to have acted as un- official secretary to Milton, but, disappointed of regular political employment, and chafing against the discipline he was under, he published in 1655 a bitter attack on Puritanism entitled a Satyr against Hypocrites (1655). In 1656 he was summoned before the privy council for his share in a book of licentious poems, Sportive Wit, which was suppressed by the authorities but almost immediately replaced by a similar collection, Wit and Drollery. In Montelion (1660) he ridiculed the astrological almanacs of William Lilly. Two other skits of this name, in 1661 and 1662, also full of course royalist wit, were probably by another hand.

In 1678 he supported the agitation of Titus Oates, writing on his behalf, says Wood, ” many lies and villanies.” Dr Oates’s Narrative of the Popish Plot indicated was the first of these tracts. He began a monthly historical review in 1688 entitled Modem History or a Monthly Account 0} all considerable Occurrences, Civil, Ecclesiastical and M Hilary, followed in 1690 by The Present State of Europe, or a Historical and Political Mercury, which was supplemented by a preliminary volume giving a history of events from 1688. He executed many translations from the French, and a version (1687) of Don Quixote.

An extended, but by no means friendly, account of the brothers is given by Wood, Athen. oxon. (ed. Bliss, iv. 764 seq.), where a long list of their works is dealt with. This formed the basis of William Godwin’s Lives of Edward and John Phillips (1815), with which is reprinted Edward Phillips’s Life of John Milton.

PHILLIPS, JOHN (1800-1874), English geologist, was born on the 25th of December 1800 at Marden in Wiltshire. His father belonged to an old Welsh family, but settled in England as an officer of excise and married the sister of William Smith, the ” Father of English Geology.” Both parents dying when he was a child, Phillips came under the charge of his uncle; and after being educated at various schools, he accompanied Smith on his wanderings in connexion with his geological maps. In the

spring of 1824 Smith went to York to deliver a course of lectures on geology, and his nephew accompanied him. Phillips accepted engagements in the principal Yorkshire towns to arrange their museums and give courses of lectures on the collections contained therein. York became his residence, where he obtained, in 1825, the situation of keeper of the Yorkshire museum and secretary of the Yorkshire Philosophical Society. From that centre he extended his operations to towns beyond the county; and in 1 83 1 he included University College, London, in the sphere of his activity. In that year the British Association for the ‘ Advancement of Science was founded at York, and Phillips was one of the active minds who organized its machinery. He became in 1832 the first assistant secretary, a post which he held until 1859. In 1834 he accepted the professorship of geology at King’s College, London, but retained his post at York. In 1834 he was elected F.R.S.; in later years he received hon. degrees of LL.D. from Dublin and Cambridge, and D.C.L. from Oxford; while in 1845 he was awarded the Wollaston Medal by the Geological Society of London. In 1840 he resigned his charge of the York museum and was appointed on the staff of the geological survey of Great Britain

under De la Beche. He spent some time in studying the Palaeozoic fossils of Devon, Cornwall and West Somerset, of which he published a descriptive memoir (1841); and he made a detailed survey of the region of the Malvern Hills, of which he prepared the elaborate account that appears in vol. ii. of the Memoirs of the Survey (1848). In 1844 he became professor of geology in the university of Dublin. Nine years later, on the death of H. E. Strickland, who had acted as substitute for Dean Buckland in the readership of geology in the university of Oxford, Phillips succeeded to the post of deputy, and at the dean's death in 1856 became himself reader, a post which he held to the time of his death. During his residence in Oxford he took a leading part in the foundation and arrange- ment of the new museum erected in 1859 (see his Notices of Rocks and Fossils in the University Museum, 1863; and The Oxford Museum, by H. W. Acland and J. Ruskin, 1859; reprinted with additions 1893). Phillips was also keeper of the Ashmolean museum from 1854-1870. In 1859-1860 he was president of the Geological Society of London, and in 1865 president of the British Association. He dined at All Souls College on the 23rd of April 1874, but on leaving he slipped and fell down a flight of stone stairs, and died on the following day.

From the time he wrote his first paper " On the Direction of the Diluvial Currents in Yorkshire " (1827), down to the last days of his life, Phillips continued a constant contributor to the literature of science. The pages of the Philosophical Magazine, the Journal of the Geological Society, the Geological Magazine and other publica- tions contain valuable essays by him. He was also the author of numerous separate works, which were of great benefit ,in extend- ing a sound knowledge of geology. Among these may be specially mentioned : Illustrations of the Geology of Yorkshire (in two parts, 1 829 and 1836; 2nd ed. of pt. 1 in 1835, 3rd ed., edited by R. Etheridge, in 1875); A Treatise on Geology (1837-1839); Memoirs of William Smith (1844); The Rivers, Mountains and Sea-Coast of Yorkshire (1853); Manual of Geology, Practical and Theoretical (1855); Life on the Earth: its Origin and Succession (i860); Vesuvius (1869); Geology of Oxford and the Valley of the Thames (1871). To these should be added his Monograph of British Belemnitidae (1865), for the Palaeontographical Society, and his geological map of the British Isles (1847). ' See Biographical Memoir, with portrait, in Geol. Mag. (July 1870).

PHILLIPS, SAMUEL (1814-1854), English journalist, the son of a Jewish tradesman in London, was born on the 28th of December 1814. He was educated at University College, London, and then at Gottingen. Having renounced the Jewish faith, he returned to England

and entered Sidney Sussex College, Cambridge, with the design of taking orders. His father's death, however, prevented this, and in 1841 he took to literary work. He wrote a novel, Caleb Slukely (1862), and other tales, and about 1845 began a connexion with The Times as literary critic. In the following year he purchased the John Bull newspaper, and edited it for a year. Two volumes of his Essays from The Times appeared in 1852 and 1854. Phillips took an active part in the formation of the Crystal Palace Company, and wrote their descriptive guides. In 1852 the university of Gottingen

conferred upon him the honorary degree of LL.D. He died at Brighton on the 14th of October 1854.

PHILLIPS, STEPHEN (1868-), British poet and dramatist, ■a-as born on the 28th of July 1868 at Somertown near Oxford, the son of the Rev. Stephen Phillips, precentor of Peterborough Cathedral. He was educated at Stratford and Peterborough Grammar Schools, and entered Queen's College, Cambridge; but during his first term at Cambridge, when F. R. Benson's dramatic company visited the town, he joined it, and for six years played various small parts. In 1890 a slender volume of verse was published at Oxford with the title Primavera, which contained contributions by him and by his cousin Laurence Binyon and others. In 1894 he published Eremus, a long poem of loose structure in blank verse of a philosophical complexion. In 1896 appeared Christ in Hades, forming with a few other short pieces one of the slim paper-covered volumes of Elkin Mathews's " Shilling Garland." This poem arrested the at- tention of watchful critics of poetry, and when it was followed by a collection of Poems in 1897 the writer's position as a new poet of exceptional gifts was generally recognized. This volume contained a new edition of " Christ in Hades," together with " Marpessa," " The Woman with the Dead Soul," " The Wife " and shorter pieces, including the fine lines " To Milton, Blind." The volume won the prize of £100 offered by the Academy news- paper for the best new book of its year, ran through half a dozen editions in two years, and established Mr Phillips's rank as poet, which was sustained by the publication in the Nineteenth Century in 1898 of his poem " Endymion." George Alexander, the actor-manager, moved perhaps by a certain clamour among the critics for a literary drama, then commissioned Mr Phillips to write him a play, the result being Paolo and Francesca (1900), a drama founded on Dante's famous episode. Encouraged by the great success of the

drama in its literary form, Mr Alexander produced the piece at the St James's Theatre in the course of 1901. In the meantime, Mr Phillips's next play, Herod: a Tragedy, had been produced by Beerbohm Tree on the 31st of October 1900, and was published as a book in 1901 ; Ulysses, also produced by Beerbohm Tree, was published in 1902; The Sin of David, a drama on the story of David and Bathsheba, translated into the times and terms of Cromwellian England, was published in 1904; and Nero, produced by Beerbohm Tree, was published in 1906. In these plays the poet's avowed aim was, instead of attempting to revive the method of Shakespeare and the Eliza- bethans, to revitalize the method of Greek drama. Paolo and Francesca (which admitted certainly one scene on an Elizabethan model) was the most successful, the subject being best adapted to the lyrical cast of Mr Phillips's poetical temperament ; but all contained fine poetry, skilfully stage-managed by a writer who had practical experience of stage craft.

See the section on Stephen Phillips in Poets of the Younger Generation, by William Archer (1902); also the articles on "Tragedy and Mr Stephen Phillips," by William Watson, in the Fortnightly Review (March 1898); " The Poetry of Mr Stephen Phillips," in the Edinburgh Review (January 1900) ; " Mr Stephen Phillips," in the Century (January 1901), by Edmund Gosse; and " Mr Stephen Phillips," in the Quarterly Review (April 1902), by Arthur Symons.

For bibliography up to July 1903, see English Illustrated Magazine new series, vol. xxix. p. 442.

PHILLIPS, THOMAS (1770-1845), English portrait and subject painter, was born at Dudley in Warwickshire on the 18th of October 1770. Having acquired the art of glass- painting at Birmingham he visited London in 1790 with an introduction to Benjamin West, who found him employment on the windows in St George's Chapel at Windsor. In 1792 Phillips painted a view of Windsor Castle, and in the next two years he exhibited the " Death of Talbot, Earl of Shrewsbury, at the Battle of Castillon," " Ruth and Naomi," " Elijah re- storing the Widow's Son," " Cupid disarmed by Euphrosyne," and other pictures. After 1796, however, he mainly con- fined himself to portrait-painting. It was not long before he became the chosen painter of men of genius and talent, notwithstanding the rivalry of Hoppner, Owen, Jackson and Lawrence; and he left behind portraits of nearly all the illus-

trious characters of his day. In 1804 he was elected associate and in 1808 member of the Royal Academy. In 1824 Phillips succeeded Fuseli as professor of painting to the Royal Academy, an office which

he held till 1832. During this period he de livered ten Lectures on the History and Principles of Painting, which were published in 1833. He died on the 20th of April

1845-

PHILLIPS, WENDELL (1811-1884), American orator and reformer, was born in Boston on the 29th of November 181 1. His father, John Phillips (1770-1823), a man of wealth and influence, graduated at Harvard College in 1788, and became successively " town advocate and public prosecutor," and in 1822 first mayor of Boston, then recently made into a city. Wendell Phillips himself attended the public Latin school, entered Harvard College before he was sixteen, and graduated in 183 1 in the same class with the historian John Lothrop Motley. He graduated at the Harvard law school in 1834, and was admitted to the bar in Boston. He soon came under the influence of the anti-slavery movement, witnessing in 1835 the mobbing, in Boston, of William Lloyd Garrison. On the 8th of December 1837 a meeting was held at Faneuil Hall to express the sentiments of the people on the murder of Elijah P. Lovejoy, at Alton, Illinois, for defending his press from a pro- slavery mob. In the course of the meeting a speech was made in opposition to its general current by James T. Austin (1784- 1870), attorney-general of the state, who said that Lovejoy had died " as the fool dieth," and compared his murderers to the men who threw the tea into Boston harbour just before the War of Independence. The speech seemed likely to divide the audience, when Wendell Phillips took the platform. " When I heard," he said, " the gentleman lay down principles which placed the murderers of Alton side by side with Otis and Han- cock, with Quincy and Adams, I thought these pictured lips (pointing to their portraits) would have broken into voice to rebuke the recreant American, the slanderer of the dead." This appeal not merely determined the sentiment of the meeting, it gave Wendell Phillips his first fame and determined his career. Although loving his profession, and this especially for the opening it gave in the direction of public life, he prac- tically stepped outside the sphere dearest to young Americans, and lived henceforth the life of an agitator, or, like his father, that of a " public prosecutor." Accepting unhesitatingly the leadership of Garrison, and becoming like him gradually a disunionist, he lived essentially a platform life, interested in a variety of subjects, but first and chiefly an abolitionist. In 1865, however, after the Civil War, he broke with Garrison over the question of discontinuing the Anti-Slavery Society, and from that date until the society was disbanded in 1870 he, instead of Garrison, was its president. He was not, moreover, like his great leader, a non-resistant, nor was he, on the other hand, like John Brown, borne on by irresistible necessity to overt action. Nor did he find, like his fellow-worker, Theodore Parker, the leisure to keep up his scholarship and lead in part the life of a student. Early study and travel had indeed fur- nished him with abundant material

for rhetorical illustration; and he was also a great reader of newspapers, but he used to say that he knew in his whole life but one thing thoroughly, namely, the history of the English Civil War, and there were few occasions when he could not draw from it the needful illus- tration. His style of eloquence was direct and brilliant, but eminently self-controlled. He often surprised his hearers by the quietness of his beginnings, and these were very often the speeches which turned out most brilliant and most irresistible ere the close. He may be said to have introduced the direct and colloquial manner upon the American public platform, as distinct from the highly elaborated and often ornate style which had been established by Edward Everett; nor has there ever been a reversion since his day to the more artificial method. He was capable at times, nevertheless, of highly sonorous periods with superb climaxes; yet his favourite style was the conversational. His logic, while never obtruded, was rarely at fault; but he loved the flash of the rapier, and

was never happier than when he had to face down a mob and utterly foil it by sheer superiority in fencing. The two volumes of his speeches, as edited by James Redpath, were fortunately made from verbatim reports, and they wisely enclose in paren- theses those indications of favour or dissent from the audience which transformed so many of his speeches into exhibitions of gladiatorial skill. He was a tribune of the people, associated unflinchingly not merely with the unpopular but with the unpolished; always carrying about him not merely a certain Roman look, but a patrician air. After slavery had fallen Phillips associated himself freely with reformers occupied in other paths, herein separating himself from the other patrician of the movement, Edmund Quincy, who always frankly said that after slavery was abolished there was nothing else worth fighting for. Among other things, Phillips contended, during his later years, for prohibition, woman suffrage and various penal and administrative reforms. He was not always the best judge of character, and was sometimes allied in these movements with men who were little more than demagogues. But the proof he gave by his transfer of energies that the work of reform was never quite finished — this was something of peculiar value, and worth the risk of some indiscretions. The life of a reformer did not in itself make him thoroughly happy; he chafed more and more under its fatigues, and he always felt that his natural place would have been among senators or ambassadors; but he belonged essentially to the heroic type, and it may well have been of

him that Emerson was thinking when he wrote those fine words: ” What forests of laurel we bring and the tears of mankind to him who stands firm against the opinion of his contemporaries.” His domestic life was most happy, though his wife was a confirmed invalid, seldom quitting her room. She was a woman of heroic nature and very strong convictions. Her husband used to say that she first made him an abolitionist. They had no children, but adopted an orphaned daughter of Mrs Eliza Garnaut, a friend, and this young girl (afterwards the wife of George W. Smalley), brought much light and joy into the household. Their worldly circumstances were easy, though they were always ready to impoverish themselves for the sake of others. Wendell Phillips died in Boston on the 2nd of February 1884.

See Lorenzo Sears, Wendell Phillips, Orator and Agitator (New York, 1909) HT. W. H.)

PHILLIPS, WILLIAM (1775-1828), British mineralogist and geologist, son of James Phillips, printer and bookseller in London, was born on the 10th of May 1775. He early became interested in mineralogy and geology, and was one of the founders of the Geological Society of London (1807). His Outlines of Mineralogy and Geology (181 5) and Elementary Intro- duction to the Knowledge of Mineralogy (1816) became standard textbooks. His digest of English geology, A selection of Facts from the Best Authorities, arranged so as to form an Outline of the Geo- logy of England and Wales (1818), formed the foundation of the larger work undertaken by Phillips in conjunction with W. D. Conybeare, of which only the first part was published, entitled Outlines of the Geology of England and Wales (1822). This volume made an era in geology. As a model of careful original observation, of judicious compilation, of succinct description and of luminous arrangement it has been of the utmost service in the development of geology in Britain. In this work Phillips reprinted his admirable description of the chalk cliffs of Dover and other parts of East Kent, published in 1819 in Trans. Geol. Sac. vol. v. Phillips was a member of the Society of Friends. He was elected a Fellow of the Royal Society in 1827. He died on the 2nd of April 1828.

His brother, Richard Phillips (1778-1851), was distin- guished as a chemist, and became F.R.S. in 1822. He was appointed chemist and curator to the Museum of Economic (afterwards Practical) Geology, then situated in Craig’s Court (1839). He was the author of papers published in the Annals of Philosophy and Philosophical Magazine. In 1796 the two brothers, together with William Allen and Luke Howard, took part in forming the Askesian Society.

PHILLIPSBURG, a town of Warren county, New Jersey, U.S.A., on the Delaware river, opposite Easton, Pennsylvania, and about 51 m. N.N.W. of Trenton, N.J. Pop. (1900) 10,052, of whom 990 were foreign-born; (1910 U.S. census) 13,903. Served by the Central of New Jersey and other railways, the town is situated in the river bottom and on a bluff which commands beautiful views. The river is spanned here by several bridges. The town has railway shops and various manufactures. In 1905 the value of the factory products was $6,684,173 (45-8 % more than in 1900). Phillipsburg was settled about 1750. It was only a straggling village when the Morris Banking and Canal Company was chartered in 1824, but its growth was accelerated by the canal (no longer used), by the establishment in 1848 of an iron furnace, and by the completion of the Central Railroad of New Jersey to this point in 1852; the town was incorporated in 1861.

PHILLIPSITE, a mineral of the zeolite group; a hydrated potassium, calcium and aluminium silicate, approximating to (K 2 , Ca) Al2(SiOs)4-4H20. It varies somewhat in composition, and a variety (" pseudophillipsite ") containing rather less silica has the formula (K 2 , Ca) 2 Al 4 Si 5 Oi8-9H20. Crystals are monoclinic, but only complex cruciform twins are known, these being exactly like twins of harmotome (q.v.). Crystals of phillipsite are, however, usually smaller and more transparent and glassy than those of harmotome. Spherical groups with a radially fibrous structure and bristled with crystals on the surface are not uncommon. The hardness is 45, and the specific gravity 2-2. The species was established by A. Levy in 1825 and named after William Phillips. French authors use the name christianite (after Christian VIII. of Denmark), given by A. Des Cloizeaux in 1847.

Phillipsite is a mineral of secondary origin, and occurs with other zeolites in the amygdaloidal cavities of basic volcanic rocks: e.g. in the basalt of the Giant's Causeway in County Antrim, and near Melbourne in Victoria; and in lencitite near Rome. Small crystals of recent formation have been observed in the masonry of the hot baths at Plombieres and Bourbonne- les-Bains, in France. Minute spherical aggregates embedded in red clay were dredged by the " Challenger " from the bottom of the Central Pacific, where they had been formed by the decomposition of lava. (L. J. S.)

PHILLPOTTS, HENRY (1778-1869), English bishop, was born at Bridgwater on the 6th of May 1778, and was educated at Gloucester College school and at Corpus Christi College, Oxford. He became a fellow of Magdalen College, Oxford, in 1795, took orders in 1802, and was select university preacher in 1804. In 1805 he received the living of Stainton-le-Street, Durham, and in addition was appointed to

Bishop Middleham, Durham, in the succeeding year. For twenty years he was chaplain to Shute Barrington, bishop of Durham. He was appoined vicar of Gateshead in 1808, prebendary of Durham in 1809, and vicar of St Margaret, Durham, in 1810. After holding the rich living of Stanhope, Durham from 1820, and the deanery of Chester from 1828, he was consecrated bishop of Exeter in 1831, holding with the see a residentiary canonry at Durham. His published works include numerous speeches and pamphlets, including those connected with his well-known Roman Catholic controversy with Charles Butler (1750-1832). He was an energetic supporter of the Tory party, even when it acted contrary to his views in passing the Roman Catholic Emancipa- tion Act of 1829. He died on the 18th of September 1869. ” Henry of Exeter,” as he was commonly called, was one of the most striking figures in the English Church of the 18th century. His intellect was strong rather than broad, his position being that of the traditional High Churchman, with little sympathy either with the Evangelicals or with the Tractarians. On the one hand the famous Gorham judgment was the outcome of his refusal to institute to the livinp of Brampford Speke a clergyman George Cornelius Gorham (1787-1857-), who had openly dis- avowed his belief in baptismal regeneration; on the other he denounced the equally famous Tract XC. in his episcopal charge of 1843. As bishop he was a strict disciplinarian, and

did much to restore order in a diocese of which the clergy had become extraordinarily demoralized. Though accused of avarice and pluralism, Phillpotts was generous in his gifts to the church, founding the theological college at Exeter and spending large sums on the restoration of the cathedral.

PHILO, Jewish Hellenist, and author of an epic poem in Greek hexameters on the history of Jerusalem. Alexander Polyhistor (c. 105-35 B.C.) quotes several passages of the poem, and is the source of the extracts in Eusebius (Praeparalio evangelica, ix. 20, 24, 37). This is probably the Philo who is mentioned by Clemens Alexandrinus {Strom, i. 21, 141) and by Josephus {Contra Apionem, i. 23), who calls him ” the elder.”

See M. Philippson’s work on the Jewish poets Ezechiel and Philo (Berlin, 1830).

PHILO, often called Philo Judaeus, Jewish philospher, appears to have

spent his whole life at Alexandria, where he was probably born c. 20-10 B.C. His father Alexander was alabarch or arabarch (that is, probably, chief farmer of taxes on the Arabic side of the Nile), from which it may be concluded that the family was influential and wealthy (Jos. Ant. xviii. 8, 1). Jerome's statement {De vir. ill. n) that he was of priestly race is confirmed by no older authority. The only event of his life which can be actually dated belongs to a.d. 40, when Philo, then a man of advanced years, went from Alexandria to Rome, at the head of a Jewish embassy, to persuade the emperor Gaius to abstain from claiming divine honour of the Jews. Of this embassy Philo has left a full and vivid account {De legalione ad Gaium). Various fathers and theologians of the Church state that in the time of Claudius he met St Peter in Rome; 1 but this legend has no historic value, and probably arose because the book De vita contemplativa, ascribed to Philo, in which Eusebius already recognized a glorification of Christian monasticism, seemed to indicate a disposition towards Christianity.

Though we know so little of Philo's own life, his numerous extant writings give the fullest information as to his views of the universe and of life, and his religious and scientific aims, and so enable us adequately to estimate his position and impor- tance in the history of thought. He is quite the most important representative of Hellenistic Judaism, and his writings give us the clearest view of what this development of Judaism was and aimed at. The development of Judaism in the diaspora {q.v .) differed in important points from that in Palestine; where, since the successful opposition of the Maccabee age to the Hellenization which Antiochus Epiphanes had sought to carry through by force, the attitude of the nation to Greek culture had been essentially negative. In the diaspora, on the other hand, the Jews had been deeply influenced by the Greeks; they soon more or less forgot their Semitic mother- tongue, and with the language of Hellas they appropriated much of Hellenic culture. They were deeply impressed by that irresistible force which was blending all races and nations into one great cosmopolitan unity, and so the Jews too on their dispersion became in speech and nationality Greeks, or rather " Hellenists." Now the distinguishing character of Hellenism is not the absolute disappearance of the Oriental civilizations before that of Greece but the combination of the two with a preponderance of the Greek element. So it was with the Jews, but in their case the old religion had much more persistence than in other Hellenistic circles, though in other respects they too yielded to the superior force of Greek civilization. This we must hold to have been the case not only in Alexandria but throughout the diaspora from the commencement of the Hellen- istic period down to the later Roman Empire. It was only

after ancient civilization gave way before the barbarian immigrations and the rising force of Christianity that rabbinism became supreme even among the Jews of the diaspora. This Hellenistico- Judaic phase of culture is sometimes called ” Alexandrian,” and the expression is justifiable if it only means that in Alexandria it attained its highest development and flourished most. For

1 Euseb., H. E. ii. 17, 1; Jer. ut supra; Phot. Bill. Cod. 105; Sui’d., s.v. ” &i\asr.”

here the. Jews began to busy themselves with Greek literature even under their clement rulers, the first Ptolemies, and here the law and other Scriptures were first translated into Greek; here the process of fusion began earliest and proceeded with greatest rapidity; here, therefore, also the Jews first engaged in a scientific study of Greek philosophy and transplanted that philosophy to the soil of Judaism. We read of a Jewish philo- sopher Aristobulus in the time of Ptolemy VI. Philometor, in the middle of the 2nd century B.C., of whose philosophical commentary on the Pentateuch fragments have been preserved by Clement of Alexandria and Eusebius. So far as we can judge from these, his aim was to put upon the sacred text a sense which should appeal even to Greek readers, and in par- ticular to get rid of all anthropomorphic utterances about God. Eusebius regards him as a Peripatetic. We may suppose that this philosophical line of thought had its representatives in Alexandria between the times of Aristobulus and Philo, but we are not acquainted with the names of any such. Philo certainly, to judge by his historical influence, was the greatest of all these Jewish philosophers, and in his case we can follow in detail the methods by which Greek culture was harmonized with Jewish faith. On one side he is quite a Greek, on the other quite a Jew. His language is formed on the best classical models, especially Plato. He knows and often cites the great Greek poets, particularly Homer and the tragedians, but his chief studies had been in Greek philosophy, and he speaks of Heraclitus, Plato, the Stoics and the Pythagoreans in terms of the highest veneration. He had appropriated their doctrines so completely that . he must himself be reckoned among the Greek philosophers; his system was eclectic, but the borrowed elements are combined into a new unity with so much originality that at the same time he may fairly be regarded as representing a philosophy of his own, which has for its characteristic feature the constant prominence of a fundamental religious idea. Philo’s closest affinities are with Plato, the later Pythagoreans and the Stoics. 2 Yet with all this Philo remained a Jew, and a great part of his writings is expressly directed to recommend Judaism to the respect and, if possible, the acceptance of the Greeks. He was not a stranger to

the specifically Jewish culture that prevailed in Palestine; in Hebrew he was not pro- ficient, but the numerous etymologies he gives show that he had made some study of that language. 3 His method of exegesis is in point of form identical with that of the Palestinian scribes, and in point of matter coincidences are not absolutely rare. 4 But above all his whole works prove on every page that he felt himself to be thoroughly a Jew, and desired to be nothing else. Jewish "philosophy" is to him the true and highest wisdom; the knowledge of God and of things divine and human which is contained in the Mosaic Scriptures is to him the deepest and the purest.

If now we ask wherein Philo's Judaism consisted we must answer that it lies mainly in the formal claim that the Jewish people, in virtue of the divine revelation given to Moses, possesses the true knowledge in things religious. Thoroughly Jewish is his recognition that the Mosaic Scriptures of the Pentateuch are of absolute divine authority, and that everything they contain is valuable and significant because divinely revealed. The other Jewish Scriptures are also recognized as prophetic, i.e. as the writings of inspired men, but he does not place them on the same lines with the law, and he quotes them so Seldom that we cannot determine the compass of his canon. The

2 The fathers of the Church have specially noticed his Platonism and Pythagoreanism ; an old proverb even says, with some exaggeration, f) IIX&tmc ˆuXwcifet fi *iXwp ifKaruvliu (Jerome, Photius and Suidas, ut supra). Clement of Alexandria directly calls him a Pythagorean. Eusebius {H. E. ii. 4, 3) observes both tendencies. Recent writers, especially Zeller, lay weight also on his Stoic affinities, and with justice, for the elements which he borrows from Stoicism are as numerous and important as those derived from the other two schools.

3 See the list of these in Vallarsi's edition of Jerome (iii. 731-734), and compare Siegfried, " Philonische Studien," in Merx's Archiv. ii.

143-163 (1872).

4 See Siegfried, Philo, pp. 142-159.

decisive and normative authority is to him the " holy laws " of Moses, and this not only in the sense that everything they contain is true but that all truth is contained in them. Every- thing that is right and good in the doctrines of the Greek philosophers had already been quite as

well, or even better, taught by Moses. Thus, since Philo had been deeply influenced by the teachings of Greek philosophy he actually finds in the Pentateuch everything which he had learned from the Greeks. From these premises he assumes as requiring no proof that the Greek philosophers must in some way have drawn from Moses, a view indeed which is already expressed by Aristobulus. To carry out these presuppositions called for an exegetical method which seems very strange to us, that, namely, of the allegorical interpretation of Scripture. The allegorical method had been practised before Philo's date in the rabbinical schools of Palestine, and he himself expressly refers to its use by his predecessors, nor does he feel that any further justification is requisite. With its aid he discovers indications of the pro- foundest doctrines of philosophy in the simplest stories of the Pentateuch. 1

This merely formal principle of the absolute authority of Moses is really the one point in which Philo still holds to genuinely Jewish conceptions. In the whole substance of his philosophy the Jewish point of view is more or less completely modified — sometimes almost extinguished — by what he has learned from the Greeks. Comparatively speaking, he is most truly a Jew in his conception of God. The doctrine of mono- theism, the stress laid on the absolute majesty and sovereignty of God above the world, the principle that He is to be worshipped without images, are all points in which Philo justly feels his superiority as a Jew over popular heathenism. But only over popular heathenism, for the Greek philosophers had long since arrived at least at a theoretical monotheism, and their influence on Philo is nowhere more strongly seen than in the detailed de- velopment of his doctrine of God. The specifically Jewish (i.e. particularistic) conception of the election of Israel, the obligation of the Mosaic law, the future glory of the chosen nation, have almost disappeared; he is really a cosmopolitan and praises the Mosaic law just because he deems it cosmopolitan. The true sage who follows the law of Moses is the citizen not of a particular state but of the world. A certain attachment which Philo still manifests to the particularistic conceptions of his race is meant only " in majorem Judaeorum gloriam." The Jewish people has received a certain preference from God, but only because it has the most virtuous ancestry and is itself distinguished for virtue. The Mosaic law is binding, but only because it is the most righteous, humane and rational of laws, and even its out- ward ceremonies always disclose rational ideas and aims. And lastly, outward prosperity is promised to the pious, even on earth, but the promise belongs to all who turn from idols to the true God. Thus, in the whole substance of his view of the universe, Philo occupies the

standpoint of Greek philosophy rather than of national Judaism, and his philosophy of the world and of life can be completely set forth without any reference to conceptions specifically Jewish.

His doctrine of God starts from the idea that God is a Being absolutely bare of quality. All quality in finite beings has limitation, and no limitation can be predicated of God, who is eternal, unchangeable, simple substance, free, self-sufficient, better than the good and the beautiful. To predicate any quality (ttocottjs) of God would be to reduce Him to the sphere of finite existence. Of Him we can say only that He is, not what He is, and such purely negative predications as to His being appear to Philo, as to the later Pythagoreans and the Neo-platonists, the only way of securing His absolute elevation above the world. At bottom, no doubt, the meaning of these negations is that God is the most perfect being; and so, conversely, we are told that God contains all perfection, that He fills and encompasses all things with His being.

A consistent application of Philo's abstract conception of

1 For details, see Gfrorer, Philo, i. 68 seq. ; Zeller, Phil, der Gr. (3rd ed., vol. iii., pt. ii., pp. 346-352); Siegfried, Philo, pp. 160 seq.

God would exclude the possibility of any active relation of God to the world, and therefore of religion, for a Being absolutely without quality and movement cannot be conceived as actively concerned with the multiplicity of individual things. And so in fact Philo does teach that the absolute perfection, purity and loftiness of God would be violated by direct contact with imper- fect, impure and finite things. But the possibility of a connexion between God and the world is reached through a distinction which forms the most important point in his theology and cos- mology; the proper Being of God is distinguished from the infinite multiplicity of divine Ideas or Forces: God himself is without quality, but He disposes of an infinite variety of divine Forces, through whose mediation an active relation of God to the worl4 is brought about. In the details of his teaching as to these mediating entities Philo is guided partly by Plato and partly by the Stoics, but at the same time he makes use of the concrete religious conceptions of heathenism and Judaism. Following Plato, he first calls them Ideas or ideal patterns of all things; they are thoughts of God, yet possess a real existence, and were produced before the creation of the sensible world, of which they are the types. But, in distinction from Plato, Philo's ideas are at the same time efficient causes or Forces (8vvafias) , which bring unformed matter into order conformably to the patterns within themselves, and are in fact the media of all God's activity in

the world. This modification of the Platonic Ideas is due to Stoic influence, which appears also when Philo gives to the ideal, or Swaˆtis the name of \byoi, i.e. operative ideas — parts, as it were, of the operative Reason. For, when Philo calls his mediating entities X6701, the sense designed is analogous to that of the Stoics when they call God the Logos, i.e. the Reason which operates in the world. But at the same time Philo maintains that the divine Forces are identical with the ” daemons ” of the Greeks, and the ” angels ” of the Jews, i.e. servants and messengers of God by means of which He communicates with the finite world. All this shows how uncertain was Philo’s conception of the nature of these media- ting Forces. On the one hand they are nothing else than Ideas of individual things conceived in the mind of God, and as such ought to have no other reality than that of immanent existence in God, and so Philo says expressly that the totality of Ideas, the Kdcrfios vorirbs, is simply the Reason of God as Creator (deov X670S fiSrj KoafioiroiovvTos). Yet, on the other hand, they are .represented as hypostases distinct from God, individual entities existing independently and apart from Him. This vacillation, however, as Zeller and other recent writers have justly remarked, is necessarily involved in Philo’s premises, for, on the one hand, it is God who works in the world through His Ideas, and therefore they must be identical with God; but, on the other hand, God is not to come into direct contact with the world, and therefore the Forces through which He works must be distinct from Him. The same inevitable amphiboly dominates in what is taught as to the supreme Idea or Logos. Philo regards all individual Ideas as comprehended in one highest and most general Idea or Force — the unity of the individual Ideas — which he calls the Logos or Reason of God, and which is again regarded as operative Reason. The Logos, therefore, is the highest mediator between God and the world, the firstborn son of God, the archangel who is the vehicle of all revelation, and the high priest who stands before God on behalf of the world. Through him the world was created, and so he is identified with the creative Word of God in Genesis (the Greek X670S meaning both ” reason ” and ” word “). Here again, we see, the philosopher is unable to escape from the difficulty that the Logos is at once the immanent Reason of God, and yet also an hypostasis standing between God and the world. The whole doctrine of this mediatorial hypostasis is a strange intertwining of very dissimilar threads; on one side the way was prepared for it by the older Jewish distinction between the Wisdom of God and God Himself, of which we find the beginnings even in the Old Testament (Job xxviii. 12 seq.; Prov. viii., ix.), and the fuller development in the books of Ecclesiasticus and Wisdom, the latter of which comes very near to Philo’s ideas if we substitute for the term ” wisdom ”

that of (divine) ” Reason.” In Greek philosophy, again, Philo, as we have seen, chiefly follows the Platonic doctrines of Ideas and the Soul of the World, and the Stoic doctrine of God as the X670S or Reason operative in the world. In its Stoic form the latter doctrine was pantheistic, but Philo could adapt it to his purpose simply by drawing a sharper distinction between the Logos and the world.

Like his doctrine of God, Philo’s doctrine of the world and creation rests on the presupposition of an absolute metaphysical contrast between God and the world. The world can be ascribed to God only in so far as it is a cosmos or orderly world; its material substratum is not even indirectly referable to God. Matter (CX17, or, as the Stoics said, ovala) is a second principle, but in itself an empty one, its essence being a mere negation of all true being. It is a lifeless, unmoved, shapeless mass, out of which God formed the actual world by means of the Logos and divine Forces. Strictly speaking, the world is only formed, not created, since matter did not originate with God.

Philo’s doctrine of man is also strictly dualistic, and is mainly derived from Plato. Man is a twofold being, with a higher and a lower origin. Of the pure souls which fill airy space, those nearest the earth are attracted by the sensible and descend into sensible bodies; these souls are the Godward side of man. But on his other side man is a creature of sense, and so has in him a fountain of sin and all evil. The body, therefore, is a prison, a coffin, or a grave for the soul which seeks to rise again to God. From this anthropology the principles of Philo’s ethics are derived, its highest maxim necessarily being deliverance from the world of sense and the mortification of all the impulses of sense. In carrying out this thought, as in many other details of his ethical teaching, Philo closely follows the Stoics. But he is separated from Stoical ethics by his strong religious interests, which carry him to very different views of the means and aim of ethical development. The Stoics cast man upon [his own resources; Philo points him to the assistance of God,” without whom man, a captive to sense, could never raise himself to walk in the ways of true wisdom and virtue. And as moral effort can bear fruit only with God’s help, so too God Himself is the goal of that effort. Even in this life the truly wise and virtuous is lifted above his sensible existence, and enjoys in ecstasy the vision of God, his own consciousness sinking and disappearing in the divine light. Beyond this ecstasy there lies but one further step, viz. entire liberation from the body of sense and the return of the soul

to its original condition; it came from God and must rise to Him again. But natural death brings this consummation only to those who, while they lived on earth, kept themselves free from attachment to the things of sense; all others must at death pass into another body; transmigration of souls is in fact the necessary consequence of Philo's premises, though he seldom speaks of it expressly.

Philo's literary labours have a twofold object, being directed either to expound the true sense of the Mosaic law, i.e. the philosophy which we have just described, to his Jewish brethren, or to convince heathen readers of the excellence, the supreme purity and truth, of the Jewish religion, whose holy records contain the deepest and most perfect philosophy, the best and most humane legislation. Thus as a literary figure Philo, in conformity with his education and views of life, stands between the Greeks and the Jews, seeking to gain the Jews for Hellenism and the Greeks for Judaism, yet always taking it for granted that his standpoint really is Jewish, and just on that account truly philosophical and cosmopolitan.

The titles of the numerous extant writings of Philo present at first sight a most confusing multiplicity. More than three-fourths of them, however, are really mere sections of a small number of larger works. Three such great works on the Pentateuch can be distinguished.

I. The smallest of these is the Ztittj para Kal \vaeis (Quaeshones et solutwnes), a short exposition of Genesis and Exodus, in the form of question and answer. The work is cited under this title by Eusebius (H. E. ii. 18, 1, 5; Praep. Ev. vii. 13), and by later writers, but the Greek text is now almost wholly lost, and only about one-half preserved in an Armenian translation. Genesis seems to have occupied six books. 1 Eusebius tells us that Exodus filled five books. In the Armenian translation, first published by the learned Mechitarist, J. Bapt. Aucher, in 1826, are preserved four

1 See, especially Mai, Scriptt. vett. nov. coll. vol. vii.

106, 108.

pt. 1. pp. 100,

books on Genesis and two on Exodus, but with lacunae. A Latin fragment, about half of the fourth books on Genesis (Phil. Jud. CII. quaestt. . . . super Gen.), was first printed at Paris in 1520. Of the Greek we have numerous but short fragments in various Flonlegia. 2 The interpretations in this work are partly literal and partly

allegorical.

II. Philo's most important work 'is the Nopuv lepuv aW-qyoplai (Euseb. H. E. 11. 18, 1; Phot. Bibl. Cod. 103), a vast and copious allegorical commentary on Genesis, dealing with chaps, ii.-iv., verse by verse, and with select passages in the later chapters. The readers in view are mainly Jews, for the form is modelled on the rabbinic Midrash. The main idea is that the characters which appear in Genesis are properly allegories of states of the soul (T pb-woi. rfjs i/v aXX-qyopiaL xpfirai tSiv pera ti)v Qa.op.tpov (Legum alle goriarum,\b. i., M. i. 43-65), on Gen. ii. 1-17. (2) Nop. Up. dXA. Sevrepai (Leg. all. lib. 11., M. i. 66-86), on Gen. ii. 18— iii. la. (3)N6p.. Up. dXX. rpiroi (Leg. all. lib. iii., M. i. 87-137), on Gen. iii. 8b-ia. The commentaries on Gen. iii. ib-8a, 20-23 are lost. (4) Ilepi t&v xepovfilp. Kal T?js \oyivT]s popaias Kal rod KTiadevros irpwrov e£ avBpairov Kaiv (De cherubim et flammeo gladio, M. i. 138-162), on Gen. iii. 24 and iv. I. (5) Ilepi Siv lepovpyovo-iv "A0eA re Kal Kaiv (De sacriftciis Abelis et Caini, M. i. 163-190), on Gen. iv. 2-4. The commentaries on Gen. iv. 5-7 are lost. (6) Ilepi tov to xetpov 1"$ Kpelrrovi. i\eiv tmriSeoticu. (Quod deterius potiori insidiari soleat, M! i. 191-225), on Gen. iv. 8-15. (7) Ilepi tSiv tov boK-qaia6ov Kaiv eyybvav Kal as peravaar-qs yiverai (De poster itate Caini, &c, M. i. 226-261), on Gen. iv. 16-25; this book, which is wanting in editions prior to Mangey's, is incorrectly given by him, but much more correctlv by Tischendorf, Philonea, pp. 84-143. None of the preceding is 'mentioned by its special^ title by Euseb. H.E. ii. 18, while he cites all that follow by their titles. The reason must be that all up to this point, and no further, are included by him in the Nbpuv Upav aWriyoplai ; agree- ing with this we find that these, and these only, are cited under that general title in the Florilegia, especially the so-called Johannes Monachus ineiitus (see Mangey's notes before each book). We may therefore conclude with confidence that Philo published the con- tinuous commentaries on Gen. ii.-iv. under the title Allegories of the Sacred Laws, and the following commentaries on select passages under special titles, though the identity of literary character entitles us to regard the latter as part of the same great literary plan with the former. (8) Ilepi yiyavrav (De gigantibus, M. i. 262-272), on Gen. vi. 1-4. (9) "On arpewTov to deXov (Quod Deus sit immutabilis, M. i. 272-299), on Gen. vi. 4-12. (10) Ilepi yeapyias (De agricultura, M. 1. 300-328), on Gen. ix. 20a. (n) Ilepi QvTovpyias Nue t6 devTepov (De plantahone Noe, M. i. 329-356), on Gen. ix. 20b. (12) Ilepi pWris (De ebrietate, M. i. 357-391), on Gen. ix. 21; the introduction shows that this book was preceded by another which put together the views of the philosophers about drunkenness. (13) Ilepi toD tlev^eNSe (De sobrietate, M. i.

392-403), on Gen. ix. 24. (14) Ilepi avy X vo-eas diaXeKTiov (Dc confusione linguarum, M. i. 404-435), on Gen. xi. 1-9. (1 5) Ilepi aivoiKlas (De migratione Abrahami, M. i. 436-472) , on Gen. xii. 1-6. (16) Ilepi tov rls 6 twv Beiav wpaypaToiv K-qpovbpos (Quis rerum divinarum haeres sit, M. i. 473-518), on Gen. xv. 1-18. (17) Ilepi rijs els -ra irpo-jra.i5tip.aTa cvvbSov (De congressu quaerendae eruditionis causa, M. i. 519-545), on Gen. xvi. 1-6. (18) Ilepi vyabuv (De profugis, M. 1.ˆ 546-577). on Gen. xvi. 6-14. (19) Ilepi t&v lieTovop.aiop.evav Kal Siv iveKa peTovopaˆovTat (De -mutatione nominum, M. i. 578-619), on Gen. xvii. 1-22 ; in this work Philo mentions that he had written two books, now wholly lost, Ilepi SiaB-nK&v (M. i. 586).

(20) Ilepi tov BeoTrepiTTovs elvai. tovs bveipovs (De somniis, lib. i., M. i. 620-658), on the two dreams of Jacob, Gen. xxviii. and xx'xi!

(21) Book ii. of the same (M. i. 659-699), on the dreams of Joseph, the chief butler, the chief baker, and Pharaoh, Gen. xxxvii. and xl., xli. Eusebius makes Philo the author of five books on dreams; three, therefore, are lost.

III. A work of a very different kind is the group of writings which we may call " An Exposition of the Mosaic law for Gentiles," which, in spite of their very various contents, present on nearer examination indubitable marks of close connexion. In them Philo seeks to give an orderly view of the chief points of the Mosaic legislation in the Pentateuch, and to recommend it as valuable to Gentile readers. The method of exposition is somewhat more popular than in the allegorical commentaries, for, though that method of interpretation is not wholly excluded, the main object is to give such a view of the legislation as Philo accepted as his- torical. This work has three main divisions: (a) an Account of t he creation (Kocrpoiroua) wh ich Moses put first to show that his

2 See Opp., ed. Mangey, ii. 648-680; Mai, op. cit., vol. vii. pt. i. 96 seq.; Euseb. Praep. Ev. vii. 13. A fragment on the cherubim, Exod. xxv. 18, has been published by Mai, Class. Auctt. iv. 430 seq., by Grossmann (1856) and by Tischendorf (p. 144 seq.).

legislation was conformed to the will of nature, and that therefore those who followed it were true cosmopolitans; (b) the Biographies of

the Virtuous — being, so to speak, the living unwritten laws which, unlike written laws, present the general types of moral conduct; (c) Legislation Proper, in two subdivisions — (a) the ten principal chapters of the law, (0) the special laws belonging to each of these ten. An appendix adds a view of such laws as do not fall under the rubrics of the decalogue, arranged under the headings of certain cardinal virtues.

The treatises which belong to this work are the following: (i) Uepl ttjs Muweus Koopoirouas (De mundi opificio, M. i. I -42). This work does not fall within the number of the allegorical commentaries. On the other hand, the introduction to the treatise De Abrahamo makes clear its immediate connexion with the De mundi opificio. The position of the De mundi opificio at the head of the allegorical commentaries, which is at present usual in the editions, seems indeed to go back to a very early date, for even Eusebius cites a passage from it with the formula kirb rod rpirrov tu>v els rbv vbpov (Praep. Ev. viii. 12 fin., ed. Gaisford). The group of the Biot ooS>v is headed by (2) Bios ari

v els ra ovvrelvavra KetfiaXaia rwv oe/ca Xbywv (De specialibus legibus ; the unabridged title is given by Eusebius, H.E. ii. 18, 5). Here under the rubrics of the ten commandments a system- atic review of the special laws of the Mosaic economy is given; for example, under the first and second commandments (divine worship) a survey is taken of the entire legislation relating to priesthood and sacrifice; under the fourth (i.e. the Sabbath law, according to Philo's reckoning) there is a survey of all the laws about feasts; under the sixth (adultery) an account of matrimonial law; and so on. According to Eusebius the work embraced four books, which seem to have reached us entire, but in the editions have been perversely broken up into a considerable number of separate tractates, (a) The first book (on the first and second command- ments) includes the following: De circumcisione (M. ii. 210-212); De monorchia, lib. i. (ii. 213-222) ; De monorchia, lib. ii. (ii. 222-232) ; De praemiis sacerdotum (ii. 232-237) ; De victimis (ii. 237-250) ; De sacrificantibus, or De viclimas offerentibus (ii. 251-264) ; De mercede meretricis non accipienda in sacrarium (ii. 264-269). (b) The second book (on the third, fourth and fifth commandments, i.e. on perjury, Sabbath observance, and filial piety) is incomplete in Mangey (ii. 270-298), the section De seplenario (on the Sabbath and feasts in general) being imperfect, and that De colendis parentibus being entirely wanting. Mai to a large extent made good the defect {De cophini festo el de colendis parentibus, Milan, 1818), but Tischen- dorf was the first to edit the full text (Philonea, pp. 1-83). (c) The third book relates to the sixth and seventh commandments (adultery and murder; M. ii. 299-334). (d) To the fourth book (relating to the

last three commandments) belongs all that is found in Mangey, ii. 335-374, that is to say, not merely the tractates Dejudice (ii. 344- 348) and De concupiscentia (ii. 348-358), but also those De juslilia (ii. 358-361) and De creatione principum (ii. 361-374). The last- named is, properly speaking, only a portion of the De justilia, which, however, certainly belongs to the fourth book, of which the superscription expressly bears that it treats also irepl biKauxriivi\s. With this tractate begins the appendix to the work De specialibus legibus, into which, under the rubric of certain cardinal virtues, such Mosaic laws are brought together as could not be dealt with under any of the decalogue rubrics. The continuation of this appendix forms a book by itself. (6) Ilepi rpi&v aperwv fjroi irepl avbpelas /cat i \av8puirlas nai fieravolas (De fortitudine, M. ii. 375*” 383; De caritate, ii. 383-405; De poenitentia, ii. 405-407). Finally, in less intimate connexion with this entire work is another treatise still to be mentioned, (7) Uepl &6\aiv nal ivinnlwv (De praemiis et poenis, M. ii. 408-428) and Ilepi dpfie (De execrationibus, M. ii. 429-457), two parts which constitute a single whole and deal with the promises and threatenings of the law.

IV. Besides the above-named three great works on the Penta- teuch, Philo was the author of a number of isolated writings, of which the following have reached us either in their entirety or in fragments. (1) Uepl Piov Mu<-4«j (Vita Mosis, lib. i.-iii., M. ii. 80-179). It is usual to group this, as being biographical in its character, with the Bioi v, and thus to incorporate it imme- diately after the De Josepho with the large work on the Mosaic legislation. But, as has been seen, the Bioi o- ocj>

benefit of Gentile readers. (2) Uepl toO ravra airovbalov elvai eXebdepov (Quod omnis probus liber, M. ii. 445-470). In the introduction to this treatise reference is made to an earlier book which had for its theme the converse proposition. The complete work was still extant in the time of Eusebius (H. E. ii. 18, 6) : Uepl roO bovXor elvai iravraaiiXov, £> kˆfjs iorlvb irepl ToD iravra oirovbalov eXeWepov elvai. The genuineness of the writing now possessed by us is not undis- puted: but see Lucius, Der Essenismus (1881), pp. 13-23. (3) Els $\Slkkov (Adversus Flaccum, M. ii. 517-544) and (4) Uepl kperSiv Ktd Trpea fielas irpbs Taiov (De legatione ad Gaium, M. ii. 545ˆ600). These two works have a very intimate connexion. In the first Philo relates how the Roman governor Flaccus in Alexandria, towards the beginning of the reign of Caligula, allowed the Alex- andrian mob, without interference, to insult the Jews of that city in the grossest manner, and even to persecute them to the shedding of blood. In the second he tells how the Jews had been subjected to still

greater sufferings through the command of Caligula that divine honours should be everywhere accorded to him, and how the Jews of Alexandria in vain sought relief by a mission to Rome which was headed by Philo. But both together were only parts of a larger work, in five books, of which the first two and the last have perished. For it is clear from the introduction to the Adversus Flaccum that it had been preceded by another book in which the Jewish persecutions by Sejanus, under the reign of Tiberius, were spoken of, and the Chronicon of Eusebius (ed. Schoene, ii. 150, 151) informs us that these persecutions of Sejanus were related in the second book of the work now under discussion. But from the conclusion of the Legatio ad Gaium, which we still possess, we learn that it was also followed by another book which exhibited the iraXivqbla, or change of Jewish fortunes for the better. Thus we make out five books in all — the number actually given by Eusebius (H.E. ii. 5, 1). (5) Uepl irpovolas (De providentia) . This work has reached us only in an Armenian translation, which has been edited, with a Latin translation, by Aucher (see below), 1822. It is mentioned by its Greek title in Eusebius (H.E. ii. 18, 6; Praep. Ev. vii. 20 fin., viii. 13 fin., ed. Gaisford). The Armenian text gives two books, but of these the first, if genuine at all, at any rate appears only in an abridged and somewhat revised state. 1 Eusebius (Praep. Ev. viii. 14) quotes from the second book to an extent that amounts to a series of excerpts from the whole. The short passage in Praep. Ev. vii. 21, is also taken from this book; and it appears that Eusebius knew nothing at all about the first.

(6) ‘AXeijaeopos fj irepl rod Xbyov exeiv ra aXoya £G>a(De Alexandro et quod propriam rationem muta animalia habeant; so Jerome, De Vir. III. c. 11) ; the Greek title is given in Euseb. H.E. ii. 18, 6. This also now exists only in an Armenian translation, which has been edited by Aucher. Two small Greek fragments occur in the Florilegium of Leontius and Johannes (Mai, Scr. vet. nov. coll. vii. 1, pp. 99, 100a).

(7) ‘TirooeriKa, a writing now known to us only through fragments preserved in Euseb. Praep. Ev. viii. 6, 7. The title, as Bernays 2 has shown, means ” Counsels,” ” Recommendations,” the reference being to such laws of the Jews as can be recommended also to non- Jewish readers. (8) Ilepi ‘lovSaLov, a title met with in Euseb. H.E. ii. 18, 6. The writing is no doubt the same as ‘H birep’ lovbalav airoXoyla, from which a quotation is given in Euseb. Praep. Ev. viii. 11. To this place also, perhaps, belongs the De nobilitate (M. ii. 437-444), which treats of that true noblesse of wisdom in which the Jewish people also is not wanting. 3

V. The doubtful treatises: (1) Uepl (llov BeupijriKov i) lueruv aperay (De vita contemplative). This contains the sole original account of an ascetic community known as the Therapeutae (q.v.) having their home on the shores of Lake Mareotis. These were held by Eusebius and many other Christian writers to be the earliest Christian monks, which of course could not be the case if it was a genuine work of Philo. On this account, amongst others, it was held to be spurious by Graetz and P. E. Lucius; and this view gradually received the assent of most modern scholars. Latterly, however, L. Massebieau has shown with great thoroughness that in language and thought alike it is essentially Philonic, and the genuineness of the book has also been affirmed by P. Wendland, and especially by F. C. Ccnybeare. (2) Uepl tupBapolas Kbapov (De incorruptibilitate mundi), declared unauthentic by Z. Frankel and J. Bernays, has been successfully defended by F. Cumont.

(3) Xlepl Kbanov (De mundo). It is generally agreed that, in L. Cohn's words, this is " nothing but a compilation from various portions of the irepl b4$apalas nbo-fiov and other Philonic works."

(4) Two discourses, De Sampsone and De Iona, extant only in Armenian, and certain other writings of the same kind. These appear only to have been imputed to Philo by chance, and certainly cannot claim to be his work. (5) Uepl rov iravra oirovbaiov elvai iXevBepov (Quod omnis probus liber sit) has been questioned by Z. Frankel and R. Ansfeld; but their arguments would rather point to its being an early work of Philo, which P. Wendland believes to be the case. (6) Uepl irpovolas (De providentia), which we possess as a whole

ˆee Diels, Doxographi Graeci, 1879, pp. 1-4; Zeller, Phil. d. Gr. iii. 2, p. 340 (3rd ed).

2 Monatsb. d. Berl. Akad. (1876), pp. 580-609.

3 This conjecture is Dahne's, Theol. Stud. u. Krit. (1S33), pp. 990,

1037.

only in an Armenian version, consists of two books, the first of which appears to be in a Christian recension, but there is no reason for denying its Philonic origin.

Editions.— Till recent days the best edition was that of Mangey (2 vols., London, 1742) ; the handiest the Holtze duodecimo (Leipzig, 1 yy u l are ' very useful > but for scholars they will be super- d e , , ,iV

. e enlar g ed ar >d critical edition of Leopold Cohn and £aul Wendland (Berlin, 1896-1902). See also papers by Cohn in Hermes , xxxvin. (1903) and xliii. (1908). There is an English trans- lation of the old text by C. D. Yonge (4 vols., London, 1854).

Literature.— The best special studies of Philo will be found in Siegtried, Philo von Alex. (Jena, 1875); Drummond, Philo- Judaeus (London, 1888). For his place in philosophy, see Zeller, Phil, der Griechen (1881). For his relation to Palestinian speculation, B. Kitter, Philo und die Halacha (Leipzig, 1879). An excellent" general account will be found in Schurer, The Jewish People in the time of Jesus - Christ (Eng. trans., 1891), or in Dr Edersheim's article on Fnilo in the Dictionary of Christian Biography. For the question 1 genuineness and historical value of the De vita contemplativa S ?i < Maˆebieau, in Revue de I'histoire des religions, vol. xvi. (Paris a I ' >: L – Con ybeare, Philo: About the Contemplative Life (Oxford, 1095); G. Fayot, Etudes sur les therapeutes (Geneve, 1880) • P E Lucius, Die Jherapeuten (Strassburg, 1880); P. Wendland, Die 1 herapeuten (Leipzig, 1896). Also F. Cumont, Philo, de aet. mundi (1891); j. Bernays in the Abhand. der k. Akad. der Wiss. (1876)

(E. S.*; C. Bi.) PHILO OF BYZANTIUM, Greek writer on mechanics, flourished during the latter half of the 2nd century B.C. (according to some, a century earlier). He was the author of a large work Mijxami? avvrafc), of which the fourth and (in epitome) fifth books are extant, treating of missiles, the construction of fortresses, provisioning, attack and defence (ed. R. Schone, 1893, with German translation in H. Kochly's Griechische Kriegs- schriftslelkr, vol. i. 1853; E. A. Rochas d'Aiglun, Poliorcltique des Grecs, 1872). Another portion of the work, on pneumatic engines, has been preserved in the form of a Latin translation (De mgeniis spiritualibus) made from an Arabic version (ed. W. Schmidt, with German translation, in the works of Heron of Alexandria, vol. i., in " Teubner Series," 1899; with French translation by Rochas, La Science des philosophies . . . dans Vantiquite, 1882).

A little treatise On the Seven Wonders of the World, wrongly attributed to Philo, probably belongs to the 6th century a.d. It is printed in R. Hercher's Aelian (1858).

PHILO OF LARISSA, Greek philosopher of the first half of the 1st century b.c. During the Mithradatk wars he left Athens and took up his residence in Rome. He was a pupil of Clitomachus, whom he succeeded as head of the Third or New Academy. According to Sextus Empiricus, he was the founder of the Fourth Academy, but other writers refuse to admit the separate existence of more than three

academies (see Academy, Greek). In Rome he lectured on rhetoric and philosophy, and collected around him many eminent pupils, amongst whom Cicero was the most famous and the most enthusiastic. None of his works is extant; our knowledge of his views is derived from Numenius, Sextus Empiricus and Cicero. In general, his philosophy was a reaction against the sceptic or agnostic position of the Middle and New Academy in favour of the dogmatism of Plato.

See Grysar, Die A kademiker Philo undAntiochus (1849) ; Hermann. De Fhilone Lanssaeo (Gottingen, 1851 and 1855).

PHILO, HERENNIUS, of Byblus, Greek grammarian, was born, according to Suidas, in a.d. 42. He lived into the reign of Hadrian, of which he wrote a history, now lost. He was the author of various works: On the Acquisition and Choice of Books; On Cities and their Famous Men, epitomized by the grammarian Aehus Serenus, and one of the chief authorities used by Hesychius and Stephanus of Byzantium; On Synonyms, of which there

Editions of the fragments by J. C. Orelli (1826) and C. Muller Frag. hist, graec. vol. iii. In 1836 F. Wagenfeld brought out what claimed to be a complete translation by Philo (from a MS. discovered in a convent in Portugal, now considered spurious). There are English translations by I. P. Cory (1828) and Bishop R. Cumberland

PHILOCHORUS, of Athens, Greek historian during the 3rd century B.C., was a member of a priestly family. He was a seer and interpreter of signs, and a man of considerable influence. He was strongly anti-Macedonian in politics, and a bitter oppo- nent of Demetrius Poliorcetes. When Antigonus Gonatas, the son of the latter, besieged and captured Athens (261), Philochorus was put to death for having supported Ptolemy Philadelphus, who had encouraged the Athenians in their resistance to Macedonia. His investigations into the usage? and customs of his native Attica were embodied in an Atthis, in seventeen books, a history of Athens from the earliest times to 262 b.c. Considerable fragments are preserved in the lexicographers, scholiasts, Athenaeus, and elsewhere. The work was epitomized by the author himself, and later by Asinius Pollio of Tralles (perhaps a freedman of the famous Gaius Asinius Pollio). Philochorus also wrote on oracles, divination and sacrifices; the mythology and religious observances of the tetrapolis of Attica; the myths of Sophocles; the lives of Euri- pides and Pythagoras; the foundation of Salamis. He compiled chronological lists of the archons and Olympiads, and made

a collection of Attic inscriptions, the first of its kind in Greece.

Fragments and life in C. W. Muller, Fragmenta historicorum graecorum, vol. 1. (1841); A. Bockh, Gesammelte kleine Schriften, vol YaA 18 ? 1)' on the P lan of the work; J. Strenge, Quaestiones philochoreae (Gottingen, 1868); C. Wachsmuth, Einleitung in das Studium der alten Geschwhte (1895).

PHILOCTETES, in Greek legend, son of Poeas king of the Malians of Mt Oeta, one of the suitors of Helen and a celebrated hero of the Trojan War. Homer merely states that he was distinguished for his prowess with the bow; that he was bitten by a snake on the journey to Troy and left behind in the island of Lemnos; and that he subsequently returned home in safety. These brief allusions were elaborated by the " cyclic " poets, and the adventures of Philoctetes formed the subject of tragedies by Aeschylus, Sophocles and Euripides. In the later form of the story Philoctetes was the friend and armour-bearer of Heracles, who presented him with his bow and poisoned arrows as a reward for kindling the fire on Mt Oeta, on which the hero immolated himself. Philoctetes remained at Lemnos till the tenth year of the war. An oracle having declared that Troy could not be taken without the arrows of Heracles, Odysseus and Diomedes (or Neoptolemus) were sent to fetch Philoctetes. On his arrival before Troy he was healed of his wound by Machaon, and slew Paris; shortly afterwards the city was taken. On his return to his own country, finding that a revolt had broken out against him, he again took ship and sailed for Italy, where he founded Petilia and Cremissa. He fell fighting on the side of a band of Rhodian colonists against some later immigrants from Pallene in Achaea. His tomb and sanctuary were shown at Macalla, on the coast of Bruttium.

Of the Aeschylean and Euripidean tragedies only a few fragments remain; of the two by Sophocles, one is extant, the other, dealing with the fortunes of Philoctetes before Troy, is lost. Some light is thrown upon the lost plays by Dio Chrysostom, who in one of his discourses (52) describes his reading of the three tragedies, and in another (59) gives a prose version of the opening of the Philoctetes ot Lunpides. Philoctetes was also the subject of tragedies by Achaeus of Eretna, Euphorion of Chalcis and the Roman tragedian Accius. According to F. Marx (Neue Jahrbucher fur das klassische Altertum, 1904, p. 673-685), Philoctetes did not appear in the original legend of Troy. He is a form of the Lemnian Hephaestus, who alighted on the island when flung out of Olympus by Zeus. Like him he is lame and an outcast for nine years; like him, he is brought back in time of need. His connexion with the fall of Troy indicates that the fire-god himself set fire to the

city; in like manner no other than the fire-god was thought worthy to kindle the pyre of Heracles.

See Homer, Iliad 11. 718, Odyssey, iii. 190, viii. 219; Sophocles, Philoctetes, and Jebb s Introduction; Diod. Sic. iv. 38; Philostratus, Heroica, 6; Strabo vi. 254; Hyginus, Fab. 36, 102.

PHILODEMUS, Epicurean philosopher and poet, was born at Gadara in Coele-Syria early in the 1st century B.C., and

settled in Rome in the time of Cicero. He was a friend of Calpurnius Piso, and was implicated in his profligacy by Cicero (in Pisonem, 29), who, however, praises him warmly for his philosophic views and for the elegans lascivia of his poems (cf. Horace, Satires, 1. 2. 120). The Greek anthology contains thirty-four of his epigrams. From the excavations of the villa at Herculaneum (q.v.) there have been recovered thirty- six treatises attributed to Philodemus, and it has been suggested that the villa was actually owned by him; but this is generally denied. These works deal with music, rhetoric, ethics, signs, virtues and vices, and defend the Epicurean standpoint against the Stoics and the Peripatetics.

The Rhetoric has been edited by Sudhaus (1892-1895) ; the De Ira and the De Pietate by Gomperz (1864 to 1865) ; the De Musica by Kempke (1884) ; De Vitiis by Ussing (1868) ; De Morte by Mekler (1886). See Hercul. Volum. (Oxford, 1824 and 1861); Mayor on Cicero's De Natura deorum (1871).

PHILOLAUS (b. c. 480), Greek philosopher of the Pytha- gorean school, was born at Tarentum or at Crotona l (so Diog. Laert. viii. 84). He was said to have been intimate with Democritus, and was probably one of his teachers. After the death of Pythagoras great dissensions prevailed in the cities of lower Italy. According to some accounts, Philolaus, obliged to flee, took refuge first in Lucania and then at Thebes, where he had as pupils Simmias and Cebes, who subsequently, being still young men (veavlaKoi) , were present at the death of Socrates. Before this Philolaus had returned to Italy, where he was the teacher of Archytas. He entered deeply into the distinctively Pythagorean number theory, particularly dwelling on the properties inherent in the decad — the sum of the first four numbers, consequently the fourth triangular number, the tetractys (see Vit.

Pythag. ap. Phot. Bibl. p. 712) — which he called great, all-powerful, and all-producing. The great Pythagorean oath was taken by the sacred tetractys. The discovery of the regular solids is attributed to Pythagoras by Eudemus, and Empedocles is stated to have been the first who maintained that there are four elements. Philolaus, connecting these ideas, held that the elementary nature of bodies depends on their form, and assigned the tetrahedron to fire, the octahedron to air, the icosahedron to water, and the cube to earth; the dodecahedron he assigned to a fifth element, aether, or, as some think, to the universe (see Plut. de PL Ph. ii. 6, e/c di rod dcadeKOtSpov rr/v tov tvovtos aipav and Stob. Eel. Phys. i. 10, 6 ras ofyalpas oXkos). This theory, however superficial from the standpoint of observation, indicates considerable knowledge of geometry and gave a great impulse to the study of the science. Following Parmenides, Philolaus regarded the soul as a ” mixture and harmony ” of the bodily parts; he also assumed a substantial soul, whose existence in the body is an exile on account of sin.

Philolaus was the first to propound the doctrine of the motion of the earth; some attribute this doctrine to Pythagoras, but there is no evidence in support of their view. Philolaus supposed that the sphere of the fixed stars, the five planets, the sun, moon and earth, all moved round the central fire, which he called the hearth of the universe, the house of Zeus, and the mother of the gods (see Stob. Eel. Phys. i. 488) ; but as these made up only nine revolving bodies he conceived, in accordance with his number theory, a tenth, which he called counter-earth, avrixOwv. He supposed the sun to be a disk of glass which reflects the light of the universe. He made the lunar month consist of 295 days, the lunar year of 354, and the solar year of 365I days. He was the first who published a book on the Pythagorean doctrines, a treatise of which Plato made use in the composition of his Timaeus. This work of the Pythagorean, to which the mystical name BaKxcu is sometimes given, seems to have consisted of three books: (1) Hepl Koafioo, containing a general account of the origin and arrangement of the universe; (2) Ilepi cbvo-eois, an exposition of the nature of numbers; (3) Ilept foxy*! on the nature of the soul.

1 Boeckh places his life between the 70th and 95th Olympiads (496-396 B.C.). He was a contemporary of Socrates and Democritus, but senior to them, and was probably somewhat junior to Empedocles, so that his birth may be placed at about 480.

See Boeckh, Philolaus des Pythagoreers Lehren nebst den Bruchstilcken seines Werkes (Berlin, 1819); Schaarschmidt, Die angebliche Schriftstellerei des Philolaus (1864); also Fabricius, Bibliotheca

graeca; Zeller, History of Greek Philosophy; Chaignet, Pythagore et la philosophie pythagoricienne, contenant les fragments de Philolaus et d'Architas (1873); Th. Gomperz, Greek Thinkers (Eng. trans. (1901), i. 123 sqq., 543 sqq. and authorities there quoted; also art. Pythagoras. For fragments see Ritter and Preller, Hist. Philosoph. ch. ii.

PHILOLOGY, the generally accepted comprehensive narne for the study of the word (Gr. Xoyos), or languages; it designates that branch of knowledge which deals with human speech, and with all that speech discloses as to the nature and history of man. Philology has two principal divisions, corresponding to the two uses of " word " or " speech," as signifying either what is said or the language in which it is said, as either the thought expressed — which, when recorded, takes the form of literature — or the instrumentality of its expression: these divisions are the literary and the linguistic. Not all study of literature, indeed, is philological: as when, for example, the records of the ancient Chinese are ransacked for notices of astronomical or meteorological phenomena, or the principles of geometry are learned from the textbook of a Greek sage; while, on the other hand, to study Ptolemy and Euclid for the history of the sciences represented by them is philological more than scientific. Again, the study of language itself has its literary side: as when the vocabulary of a community (say of the ancient Indo-Europeans or Aryans) is taken as a document from which to infer the range and grade of knowledge of its speakers, their circumstances and their institutions. The two divisions thus do not admit of absolute distinction and separation, though for some time past tending toward greater independence. The literary is the older of the two; it even occupied until recently the whole field, since the scientific study of language itself has arisen only within the 19th century. Till then, literary philology included linguistic, as a merely subordinate and auxiliary part, the knowledge of a language being the necessary key to a know- ledge of the literature written in that language. When, there- fore, instead of studying each language by itself for the sake of its own literature men began to compare one language with another, in order to bring to light their relationships, their structures, thei r histories, the name " comparative philology " naturally enough suggested itself and came into use for the new method; and this name, awkward and trivial though it may be, has become so firmly fixed in English usage that it can be only slowly, if at all, displaced. European usage (especially German) tends more strongly than English to restrict the name philology to its older office, and to employ for the recent branch of know- ledge a specific term, like those that have gained more or less currency with us also; as glottic, glossology, linguistics, linguistic science, science of language,

and the like. It is not a question of absolute propriety or correctness, since ihe word philology is in its nature wide enough to imply all language-study of whatever kind; it is one, rather, of the convenient distinction of methods that have grown too independent and important to be any longer well included under a common name.

I. — The Science of Language in general. Philology, in all its departments, began and grew up as classical; the history of our civilization made the study of Greek and Latin long the exclusive, still longer the predominant and regulating, occupation of secular ˆs™ e „ f ce scholarship. The Hebrew and its literature were held apart, as something of a different order, as sacred. It was not imagined that any tongue to which culture and literature did not lend importance was worthy of serious attention from scholars. The first essays in comparison, likewise, were made upon the classical tongues, and were as erroneous in method and fertile in false conclusions as was to be expected, considering the narrowness of view and the controlling prejudices of those who made them; and the admission of Hebrew to the comparison only added to the confusion. The change which the past century has seen has been a part of the general scientific movement of the age, which has brought about the establishment

of so many new branches of knowledge, both historical and physical, by the abandonment of shackling prejudices, the freedom of inquiry, the recognition of the dignity of all know- ledge, the wide-reaching assemblage of facts and their objective comparison, and the resulting constant improvement of method. Literary philology has had its full share of advantage from this movement; but linguistic philology has been actually created by it out of the crude observations and wild deductions of earlier times, as truly as chemistry out of alchemy, or geology out of diluvianism. It is unnecessary here to follow out the details of the development; but we may well refer to the decisive influence of one discovery, the decisive action of one scholar. It was the discovery of the special relationship of the Aryan or Indo-European languages, depending in great measure upon the introduction of the Sanskrit as a term in their comparison, and demonstrated and worked out by the German scholar Bopp, that founded the science of linguistic philology. While there is abundant room for further improvement, it yet appears that the grand features of philologic study, in all its departments, are now so distinctly drawn that no revolution of its methods, but only their modification in minor

respects, is henceforth probable. How and for what purposes to investigate the literature of any people (philology in the more proper sense), combining the knowledge thus obtained with that derived from other sources; how to study and set forth the material and structure and combinations of a language (grammar), or of a body of related languages (comparative grammar) ; how to co-ordinate and interpret the general phenomena of language, as variously illustrated in the infinitely varying facts of different tongues, so as to exhibit its nature as a factor in human history and its methods of life and growth (linguistic science) — these are what philology teaches.

The study of language is a division of the general science of anthropology (q.v.), and is akin to all the rest in respect to its Relation to objects and its methods. Man as we now see him Aothropo- is a twofold being: in part the child of nature, as logy. £ jjjg capacities and desires, his endowments of

mind and body; in part the creature of education, by train- ing in the knowledge, the arts, the social conduct, of which his predecessors have gained possession. And the problem of anthropology is this: how natural man has become cultivated man; how a being thus endowed by nature should have begun and carried on the processes of acquisition which have brought him to his present state. The results of his predecessors' labours are not transmuted for his benefit into natural instincts, in language or in anything else. The, child of the most civilized race, if isolated and left wholly to his own resources, aided by neither the example nor the instruction of his fellows, would no more speak the speech of his ancestors than he would buDd their houses, fashion their clothes, practise any of their arts, inherit their knowledge or wealth. In fact, he would possess no language, no arts, no wealth, but would have to go to work to acquire them, by the same processes which began to win them for the first human beings. One advantage he would doubtless enjoy: the descendant of a cultivated race has an enhanced aptitude for the reception of cultivation; he is more cultivable; and this is an element that has to be allowed for in comparing present conditions with past, as influencing the rate of progress, but nothing more. In all other respects it is man with the endowments which we now find him possessed of, but destitute of the gradually accumulated results of the exercise of his faculties, whose progress we have to explain. And it is, as a matter of necessity, by studying recent observable modes of acquisition, and transferring them, with due allowance for different circumstances, to the more primitive periods, that the question of first acquisition or origin is to be solved, for language as for tools, for arts, for family and social organization, and the rest. There is just as much and just as little

reason for assuming miraculous interference and aid in one of these departments as in another. If men have been left to themselves to make and improve instruments, to form and perfect modes of social organization, by implanted

powers directed by natural desires, and under the pressure of circumstances, then also to make and change the signs that constitute their speech. All expressions, as all instruments, are at present, and have been j through the known past, made and changed by the men who use them; the same will have been the case in the unknown or prehistoric past. And we command now enough of the history of language, with the processes of its life and growth, to determine with confidence its mode of origin — within certain limits, as will appear below.

It is beyond all question, in the first place, that the desire of communication was the only force directly impelling men to the production of language. Man's sociality, cause of his disposition to band together with his fellows, Language- for lower and for higher purposes, for mutual help makia S- and for sympathy, is one of his most fundamental character- istics. To understand those about one and to be understood by them is now, and must have been from the very beginning, a prime necessity of human existence; we cannot conceive of man, even in his most undeveloped state, as without the recogni- tion of it. Communication is still the universally recognized office of speech, and to the immense majority of speakers the only one; the common man knows no other, and can only with difficulty and imperfectly be brought to see that there is any other; of the added distinctness and reach of mental action which the possession of such an instrumentality gives him he is wholly unconscious: and it is obvious that what the compara- tively cultivated being of to-day can hardly be made to realize can never have acted upon the first men as a motive to action. It may perhaps be made a question which of the two uses of speech, communication or the facilitation of thought is the higher; there can be no question, at any rate, that the former is the broader and the more fundamental. That the kind and degree of thinking which we do nowadays would be impossible without language-signs is true enough; but so also it would be impossible without written signs. That there was a time when men had to do what mental work they could without the help of writing, as an art not yet devised, we have no diffi- culty in realizing, because the art is of comparatively recent device, and there are still communities enough that are working without it; it is much harder to realize that there was a time when speaking also was an art not yet attained, and that men had to carry on their rude and rudimentary thinking without

it. Writing too was devised for conscious purposes of com- munication only; its esoteric uses, like those of speech, were at first unsuspected, and incapable of acting as an inducement; they were not noticed until made experience of, and then only by those who look beneath the surface of things. There is no analogy closer and more instructive than this between speech and writing. But analogies are abundant elsewhere in the history of human development. Everywhere it is the lower and more obvious inducements that are first effective, and that lead gradually to the possession of what serves and stimulates higher wants. All the arts and industries have grown out of men's effort to get enough to eat and protection against cold and heat— just as language, with all its uses, out of men's effort to communicate with their fellows. As a solitary man now would never form even the beginnings of speech, as one separated from society unlearns his speech by disuse and becomes virtually dumb, so early man, with all his powers, would never have acquired speech, save as to those powers was added sociality with the needs it brought. We might conceive of a solitary man as housing and dressing himself, devising rude tools, and thus lifting himself a step from wildness toward cultivation; but we cannot conceive of him as ever learning to talk. Recogni- tion of the impulse to communication as the efficient cause of language-making is an element of primary importance in the theory of the origin of language. No one who either leaves it out of account or denies it will, however ingenious and enter- taining his speculations, cast any real light on the earliest history of speech. To inquire under what peculiar circumstances, in connexion with what mode of individual or combined action, a first outburst of oral expression may have taken place, is, on

the other hand, quite futile. The needed circumstances were always present when human beings were in one another's society; there was an incessant drawing-on to attempts at mutual understanding which met with occasional, and then ever more frequent and complete success. There inheres in most reasoning upon this subject the rooted assumption, governing opinion even when not openly upheld or consciously made, that conceptions have real natural names, and that in a state of nature these will somehow break forth and reveal themselves under favouring circumstances. The falsity of such a view is shown by our whole further discussion.

The character of the motive force to speech determined the character

of the beginnings of speech. That was first signified Beginnings which was most capable of intelligible signification, of Speech not that which was first in order of importance, ana Writing. as j u< jg e d by any standard which we can apply to it, or first in order of conceptional development. All attempts to determine the first spoken signs by asking what should have most impressed the mind of primitive man are and must be failures. It was the exigencies and possibilities of practical life, in conditions quite out of reach of our distinct conception, that prescribed the earliest signs of communication. So, by a true and instructive analogy, the beginnings of writing are rude depictions of visible objects; it is now thoroughly recognized that no alphabet, of whatever present character, can have originated in any other way; everything else is gradu- ally arrived at from that — as, indeed, in the ingeniously shaping hands of man, from any central body of signs, though but of small extent, all else is attainable by processes of analogy and adaptation and transfer. Now what is it that is directly signifiable in the world about us? Evidently the separate acts and qualities of sensible objects, and nothing else. In writing, or signification to the eye, the first element is the rude depiction of the outline of an object, or of that one of the sum of its characteristic qualities which the eye takes note of and the hand is capable of intelligibly reproducing; from that the mind understands the whole complex object itself, and then whatever further may in the circumstances of its use be suggested by it. So, for example, the picture of a tree signifies primarily a tree, then perhaps wood, something made of wood, and so on; that of a pair of outstretched wings signifies secondarily flight, then soaring, height, and whatever else these may lead to. No concrete thing is signifiable in its totality or otherwise than by a facile analysis of its constituent qualities and a selection of the one which is both sufficiently characteristic in itself and capable of being called up by a sign before the mind addressed.

And what quality shall be selected depends in great measure upon the instrumentality used for its signification. Of such Instrumen- instrumentalities men possess a considerable variety. (aiiiiesof We must leave out of account that of depiction, as Expression. j ust i nstance d) because its employment belongs to a much more advanced state of cultivation, and leads the way to the invention not of speech but of the analogous and auxiliary art of writing. There remain gesture, or changes of position of the various parts of the body, especially of the most mobile parts, the arms and hands; grimace, or the changes of expression of the features of the countenance (in strictness, a variety of the preceding); and utterance, or the production of audible sound. It cannot be doubted that, in the first stages of

communicative expression, all these three were used together, each for the particular purposes which it was best calculated to serve. The nearest approach to such action that is now possible is when two persons, wholly ignorant of one another's speech, meet and need to communicate — an imperfect corre- spondence, because each is trained to habits of expression and works consciously, and with the advantage of long experience, towards making himself understood; yet it is good for its main purpose. What they do, to reach mutual comprehension, is like what the first speechless men, unconsciously and infinitely more slowly, learned to do: face, hands, body, voice, are all put to use. It is altogether probable that gesture at first performed the principal part, even to such extent that the

earliest human language may be said to have been a language of gesture signs; indeed, there exist at the present day such gesture-languages as those in use between roving tribes of different speech that from time to time meet one another (the most noted example is that of the gesture-language, of a very considerable degree of development, of the prairie tribes of American Indians); or such signs as are the natural resort of those who by deafness are cut off from ordinary spoken inter- course with their fellows. Yet there never can have been a stage or period in which all the three instrumentalities were not put to use together. In fact, they are still all used together; that is even now an ineffective speaking to which grimace and gesture (" action," as Demosthenes called them) are not added as enforcers; and the lower the grade 6f development and culture of a language, the more important, even for intelligibility, is their addition. But voice has won to itself the Tbe Vo/ chief and almost exclusive part in communication, insomuch that we call all communication " language " (i.e. " tonguiness ") just as a race of mutes might call it "handiness" and talk (by gesture) of a handiness of grimace. This is not in- the least because of any closer connexion of the thinking apparatus with the muscles that act to produce audible sounds than with those that act to produce visible motions; not because there are natural uttered names for conceptions any more than natural gestured names. It is simply a case of " survival of the fittest," or analogous to the process by which iron has become the exclusive material of swords, and gold and silver of money: because, namely, experience has shown this to be the material best adapted to this special use. The advantages of voice are numerous and obvious. There is first its economy, as employing a mechanism that is available for little else, and leaving free for other purposes those indispensable instruments the hands. Then there is its superior perceptibleness: its nice differences impress themselves upon the sense at a distance at which visible motions become indistinct;

they are not hidden by intervening objects; they allow the eyes of the listener as well as the hands of the speaker to be employed in other useful work; they are as plain in the dark as in the light; and they are able to catch and command the attention of one who is not to be reached in any other way. We might add as the third advantage a superior capability of variation and combination on the part of spoken sounds; but this is not to be insisted on, inasmuch as we hardly know what a gesture-language might have become if men's ingenuity in expression had been expended through all time upon its elaboration; and the superiority, however real, can hardly have been obvious enough to serve as a motive : certainly, there are spoken languages now existing whose abundance of resources falls short of what is attainable by gesture. Oral utterance is the form which expression has inevitably taken, the sum of man's endowments being what it is; but it would be a mistake to suppose that a necessity of any other kind is involved in their relation. The fundamental conditions of speech are man's grade of intellectual power and his social instinct; these being given, his expression follows, availing itself of what means it finds best suited to its purpose; if voice had been wanting it would have taken the next best. So, in certain well-known cases, a marked artistic gift on the part of individuals deprived of the use of hands has found means of exercise in the feet instead. But men in general have hands, instruments of exquisite tact and power, to serve the needs of their intellect; and so voice also, to provide and use the tools of thought; there is no error in maintaining that the voice is given us for speech, if only we do not proceed to draw from such a dictum false conclusions as to the relation between thought and utterance. Man is created with bodily instruments suited to do the work prescribed by his mental capacities; therein lies the harmony of his endowment.

It is through imitation that all signification becomes directly suggestive. The first written signs are (as already noticed) the depictions of visible objects, and could be j m i ta tj on< nothing else; and, by the same necessity, the first uttered signs were the imitations of audible sounds. To reproduce

any sound of which the originating cause or the circumstances of production are known, brings up of course before the con- ception that sound, along with the originator, or circumstances of origination, or whatever else may be naturally associated with it. There are two special directions in which this mode of sign- making is fruitful:

imitation of the sounds of external nature (as the cries of animals and the noises of inanimate objects when in motion or acted on by other objects) and imitation of human sounds. The two are essentially one in principle, although by some held apart, or even opposed to each other, as respectively the imitative or onomatopoetic and the exclamatory or inter jectional beginnings of speech; they differ only in their spheres of significance, the one being especially suggestive of external objects, the other of inward feelings. There are natural human tones, indicative of feeling, as there are natural gestures, poses, modes of facial expression, which either are immediately intelligible to us (as is the warning cry of the hen to the day- old chicken), or have their value taught us by our earliest experiences. If we hear a cry of joy or a shriek of pain, a laugh or a groan, we need no explanation in words to tell us what it signifies any more than when we see a sad face or a drooping attitude. So also the characteristic cry or act of anything outside ourselves, if even rudely imitated, is to us an effective reminder and awakener of conception. We have no reason to question that such were the suggestions of the beginnings of uttered expression. The same means have made their con- tributions to language even down to our own day; we call words so produced "onomatopoetic" (i.e. "name-making"), after the example of the Greeks, who could not conceive that actually new additions to language should be made in any other way. What and how wide the range of the imitative principle, and what amount of language-signs it was capable of yielding, is a subject for special investigation — or rather, of speculation, since anything like exact knowledge in regard to it will never be attained; and the matter is one of altogether secondary con- sequence; it is sufficient for our purpose that enough could certainly be won in this way to serve as the effective germs of speech.

All the natural means of expression are still at our command, and are put to more or less use by us, and their products are as Language, intelligible to us as they have been to any generation of our ancestors, back to the very first. They are analogous also to the means of communication of the lower animals; this, so far as we know, consists in observing and interpreting one another's movements and natural sounds (where there are such). But language is a step beyond this, and different from it. To make language, the intent to signify must be present. A cry wrung out by pain, or a laugh of amusement, though intelligible, is not language; either of them, if consciously reproduced in order to signify to another pain or pleasure, is language. So a cough within hearing of any one attracts his attention; but to cough, or to produce any other sound, articulate or inarticulate, for the purpose of

attracting another's attention, is to commit an act of language-making, such as in human history preceded in abundance the establish- ment of definite traditional signs for conceptions. Here begins to appear the division between human language and all brute expression ; since we do not know that any animal but man ever definitely took this step. It would be highly interesting to find out just how near any come to it ; and to this point ought to be especially directed the attention of those who are investigating the communication of the lower animals in its relation to human communication. Among the animals of highest intelligence that associate with man and learn something of his ways, a certain amount of sign-making expressly for communication is not to be denied; the dog that barks at a door because he knows that somebody will come and let him in is an instance of it; perhaps, in wild life, the throwing out of sentinel birds from a flock, whose warning cry shall advertise their fellows of the threat of danger, is as near an approach to it as is anywhere made.

But the actual permanent beginnings of speech are only xxi. 14

reached when the natural basis is still further abandoned, and signs begin to be used, not because their natural suggestive- ness is seen in them, but by imitation, from the Language example of others who have been observed to use Conven- the same sign for the same purpose. Then for the t,oaal – first time the means of communication becomes something to be handed down, rather than made anew by each indi- vidual; it takes on that traditional character which is the essential character of all human institutions, which appears not less in the forms of social organization, the details of religious ceremonial, the methods of art and the arts, than in language. That all existing speech, and all known recorded speech, is purely traditional, cannot at all be questioned. It is proved even by the single fact that for any given conception there are as many different spoken signs as there are languages — say a thousand (this number is rather far within than beyond the truth), each of them intelligible to him who has learned to use it and to associate it with the conception to which it belongs, but unintelligible to the users of the nine hundred and ninety- nine other signs, as these are all unintelligible to him; unless, indeed, he learn a few of them also, even as at the beginning he learned the one that he calls his own. What single sign, and what set of signs ; any individual shall use, depends upon the community into the midst of which he is cast, by birth or other circumstances, during his first years. That it does not depend upon his race is demonstrated by facts the most numerous and various; the African whose purity of descent is attested by every feature is found all over the world speaking just that language, or jargon, into the midst of which the fates of present or

former slavery have brought his parents; every civilized community contains elements of various lineage, combined into one by unity of speech; and instances are frequent enough where whole nations speak a tongue of which their ancestors knew nothing; for example, the Celtic Gauls and the Germanic Normans of France speak the dialect of a geographically insignificant district in central Italy, while we ourselves can hardly utter a sentence or write a line without bringing in more or less of that same dialect. There is not an item of any tongue of which we know anything that is ” natural ” expression, or to the possession of which its speaker is brought by birth instead of by education; there is even very little that is traceably founded on such natural expression; everywhere devis or human attribution reigns supreme, and the original vcns or natural significance has disappeared and is only to be found by theoretic induction (as we have found it above). It seems to some as if a name like cuckoo (one of the most striking available cases of onomatopoeia) were a ” natural ” one; but there is just as much Btcris in it as in any other name; it implies the observation of an aggregate of qualities in a certain bird, and the selection of one among them as the convenient basis of a mutual understanding when the bird is in question; every animal conspicuous to us must have its designation, won in one way or another; and in this case to imitate the characteristic cry is the most available way. If anything but convenience and availability were involved, all our names for animals would have to be and to remain imitations of the sounds they make. That the name of cuckoo is applied also to the female and young, and at other than the singing season, and then to related species which do not make the same sound — all helps to show the essentially conventional character of even this name. An analogous process of elimination of original meaning, and reduction to the value of conventional designation merely, is to be seen in every part of language throughout its whole history. Since men ceased to derive their names from signs having a natural suggestiveness, and began to make them from other names already in use with an understood value, every new name has had its etymology and its historical occasion — as, for example, the name quarantine from the two-score (quarantaine) of days of precautionary confine- ment, or volume from its being rolled up, or book from a beech- wood staff, or copper from Cyprus, or lunacy from a fancied influence of the moon, or priest from being an older {irptcrfivTtpos) person, or butterfly from the butter-yellow colour of a certain

common species: every part of our language, as of every other, is full of such examples — but, when once the name is applied, it belongs to that to which it is applied, and no longer to its relatives by etymology; its origin is neglected, and its form may be gradually changed beyond recognition, or its meaning so far altered that comparison with the original shall seem a joke or an absurdity. This is a regular and essential part of the process of name-making in all human speech, and from the very begin- ning of the history of speech: in fact (as pointed out above), the latter can only be said to have begun when this process was successfully initiated, when uttered signs began to be, what they have ever since continued to be, conventional, or dependent only on a mutual understanding. Thus alone did language gain the capacity of unlimited growth and development. The sphere and scope of natural expression are narrowly bounded; but there is no end to the resources of conventional sign-making.

It is well to point out here that this change of the basis of men's communication from natural suggestiveness to mutual Brute understanding, and the consequent purely conven- Speech tional character of all human language, in its every and //uman part and particle, puts an absolute line of demarca- Speech. ˆ Qn between the latter and the means of communi- cation of all the lower animals. The two are not of the same kind, any more than human society in its variety of organi- zation is of the same kind with the instinctive herding of wild cattle or swarming of insects, any more than human architecture with the instinctive burrowing of the fox and nest-building of the bird, any more than human industry and accu- mulation of capital with the instinctive hoarding of bees and beavers. In all these cases alike the action of men is a result of the adaptation of means at hand to the satisfaction of felt needs, or of purposes dimly perceived at first, but growing clearer with gradually acquired experience. Man is the only being that has established institutions — gradually accumulated and perfected results of the exercise of powers analogous in kind to, but greatly differing in degree from, those of the lower animals. The difference in degree of endowment does not constitute the difference in language, it only leads to it. There was a time when all existing human beings were as destitute of language as the dog; and that time would come again for any number of human beings who should be cut off (if that were practicable) from all instruction by their fellows: only they would at once proceed to recreate language, society and arts by the same steps by which their own remote ancestors created those which we now possess; while the dog would remain what he and his ancestors have always been, a

creature of very superior intelligence, indeed, as compared with most, of infinite intelligence as compared with many, yet incapable of rising by the acquisition of culture through the formation and development of traditional institutions. There is just the same saltus existent in the difference between man's conventional speech and the natural communication of the lower races as in that between men's forms of society and the instinctive associa- tions of the lower races; but it is no greater and no other; it 's neither more absolute and characteristic nor more difficult to explain. Hence those who put forward language as the distinc- tion between man and the lower animals, and those who look upon our language as the same in kind with the means of com- munication of the lower animals, only much more complete and perfect, fail alike to comprehend the true nature of language, and are alike wrong in their arguments and conclusions. No addition to or multiplication of brute speech would make anything like human speech; the two are separated by a step which no animal below man has ever taken; and, on the other hand, language is only the most conspicuous among those institutions the development of which has constituted human progress, while their possession constitutes human culture.

With the question of the origin of man, whether or not developed out of lower animal forms, intermediate to the anthropoid apes, language has nothing to do, nor can its study ever be made to contribute anything to the solution of that question. If there once existed creatures above the apes and

below man, who were extirpated by primitive man as his especial

rivals in the struggle for existence, or became extinct in any other way, there is no difficulty in supposing them to have possessed forms of speech, more rudimentary and imperfect than ours. At any rate, all existing human speech is one in the essential characteristics which we have thus far noted or shall hereafter have to consider, even as humanity is one in its distinction from the lower animals; the differences are in non- essentials. All speech is one in the sense that every human being, of whatever race he may be, is capable of Language acquiring any existing tongue, and of using it for and the same purposes for which its present possessors Culture. use it, with such power and effect as his individual capacity allows, and without any essential change in the mental operations carried on by means of speech — even as he may acquire any other of the items of culture belonging to a race not his own. The difference between employing one language and another is like that between employing one instrument and another in mechanical arts; one instrument may be

better than another, and may enable its user to turn out better work, but the human ingenuity behind both is the same, and works in the same way. Nor has the making of language anything whatever to do with making man what he is, as an animal species having a certain physical form and intellectual endowment. Being what he is by nature, man has by the development of language and other institutions become what he is by culture. His acquired culture is the necessary result of his native endowment, not the contrary. The acquisition of the first stumbling beginnings of a superior means of communication had no more influence to raise him from a simian to a human being than the present high culture and perfected speech of certain races has to lift them up to something more than human and specifically different from the races of inferior culture. It cannot be too absolutely laid down that differences of language, down to the possession of language at all, are differences only in respect to education and culture.

How long man, after he came into such being as he now is, physically and intellectually, continued to communicate with imitative signs of direct significance, when the Deve j 00 , production of traditional signs began, how rapidly went of they were accumulated, and how long any traces of Language" their imitative origin clave to them — these and the s « fls * like questions it is at present idle to try to answer even conjec- turally: just as it is to seek to determine when the first instru- ments were used, how soon they were shaped instead of being left crude, at what epoch fire was reduced to service, and so on. The stages of development and their succession are clear enough; to fix their chronology will doubtless never be found practicable. There is much reason for holding, as some do, that the very first items of culture were hardest to win and cost most time, the rate of accumulation (as in the case of capital) increasing with the amount accumulated. Beyond all reasonable question, however, there was a positively long period of purely imitative signs, and a longer one of mixed imitative and traditional ones, the latter gradually gaining upon the former, before the present condition of things was reached, when the production of new signs by imitation is only sporadic and of the utmost rarity, and all language-signs besides are traditional, their increase in any community being solely by variation and combination, and by borrowing from other communities.

Of what nature, in various respects, this earliest language- material was is sufficiently clear. The signs, in the first place, were of the sort that we call " roots." By this is only meant that they were integral signs, significant T, e * oot ' in their entirety, not divisible into parts, of which one signified one thing and another another thing, or of

which one gave the main significance, while another was an added sign of kind or relation. In a language of developed structure like our own, we arrive at such ” roots ” mainly by an artificial stripping- off of the signs of relation which almost every word still has, or can be shown to have once had. In un-cost-li-ness, for example, cost is the centrally significant element; so far as English is

concerned it is a root, about which cluster a whole body of forms and derivatives; if we could follow its history no farther it would be to us an ultimate root, as much so as bind or sing or ■mean. But we can follow it up, to the Latin compound con-sta, a root sta with a prefixed formative element con. Then sta, which in slightly varied forms we find in a whole body of related tongues called ” Indo-European,” having in them all the same significance ” stand,” is an Indo-European root, and to us an ultimate one, because we can follow its history no farther; but there always remains the possibility that it is as far from being actually original as is the English root cost: that is to say, it is not within our power ever to get back to the really primitive elements of speech and to demonstrate their character by positive evidence. The reason for accepting a primitive root-stage of language is in great part theoretical: because nothing else is reconcilable with any acceptable view of the origin of language. The law of the simplicity of beginnings is an absolute one for everything of the nature of an institution, for every gradually developed product of the exercise of human faculties. That an original speech-sign should be of double character, one part of it meaning this and another part that, or one part radical and the other formative, is as inconceivable as that the first instru- ments should have had handles, or the first shelters a front room and a back one. But this theoretical reason finds all the historical support which it needs in the fact that, through all the observable periods of language-history we see formative elements coming from words originally independent, and not from any- thing else. Thus, in the example just taken, the li of costliness is a suffix of so recent growth that its whole history is distinctly traceable; it is simply our adjective like, worn down in both form and meaning to a subordinate value in combination with certain words to which it was appended, and then added freely as a suffix to any word from which it was desired to make a derivative adjective — or, later but more often, a derivative adverb. The ness is much older (though only Germanic), and its history obscurer; it contains, in fact, two parts, neither of them of demonstrable origin; but there are equivalent later suffixes, as ship

in hardship and dom in wisdom, whose derivation from independent words {shape, doom) is beyond question. The un- of uncostliness is still more ancient (being Indo-European), and its probably pronominal origin hardly available as an illustration; but the comparatively modern prefix be-, of become, belie, &c, comes from the independent preposition by, by the same process as -ly or li from like. And the con which has contributed its part to the making of the quasi-root cost is also in origin identical with the Latin preposition cum, ” with.” By all the known facts of later language-growth we are driven to the opinion that every formative element goes back to some previously existing independent word; and hence that in analysing our present words we are retracing the steps of an earlier synthesis, or following up the history of our formed words toward the unformed roots out of which they have grown. The doctrine of the historical growth of language-structure leads by a logical necessity to that of a root-stage in the history of all language; the only means of avoiding the latter is the assumption of a miraculous element in the former.

Of what phonetic form were the earliest traditional speech- signs is, so far as essentials are concerned, to be inferred with Earliest reasonable certainty. They were doubtless articu- Phonetic late: that is to say, composed of alternating conso- Forms. nant and vowel sounds, like our present speech; and they probably contained a part of the same sounds which we now use. All human language is of this character; there are no sounds in any tongue which are not learned and reproduced as easily by children of one race as of another; all dialects admit a like phonetic analysis, and are representable by alphabetic signs; and the leading sounds, consonant and vowel, are even practically the same in all; though every dialect has its own (for the most part, readily definable and imitable) niceties of their pronunciation, while certain sounds are rare, or even met with only in a single group of languages or in a single language. Articulate sounds are such as are capable of being combined

with others into that succession of distinct yet connectable syllables which is the characteristic of human speech-utterance. The name ” articulate ” belongs to this utterance, as dis- tinguished from inarticulate human sounds and cries and from the sounds made by the lower animals. The word itself is Latin, by translation from the Greek, and, though very widely misunderstood, and even deliberately misapplied in some languages to designate all sound, of whatever kind, uttered by any living creature, is a most happily chosen and truly descrip- tive term. It signifies ” jointed,” or broken up into successive parts, like a limb or stem; the joints are the syllables; and the syllabic structure is mainly effected by the alternation of closer or

consonant sounds with opener or vowel sounds. The simplest syllabic combination (as the facts of language show) is that of a single consonant with a following vowel; and there are languages even now existing which reject any other. Hence there is much plausibility in the view that the first speech-signs will have had this phonetic form and been monosyllabic, or dissyllabic only by repetition (reduplication) of one syllable, such as the speech of very young children shows to have a peculiar ease and naturalness. The point, however, is one of only secondary importance, and may be left to the further progress of phonetic study to settle, if it can; the root-theory, at any rate, is not bound to any definite form or extent of root, but only denies that there can have been any grammatical structure in language except by development in connexion with experience in the use of language. What particular sounds, and how many, made up the first spoken alphabet is also a matter of conjecture merely; they are likely to have been the closest consonants and the openest vowels, medial utterances being of later development.

As regards their significant value, the first language-signs must have denoted those physical acts and qualities which are directly apprehensible by the senses; both because Character these alone are directly signifiable, and because it of Early was only they that untrained human beings had Speech. the power to deal with or the occasion to use. Such signs would then be applied to more intellectual uses as fast as there was occasion for it. The whole history of ‘ language, down to our own day, is full of examples of the reduction of physical terms and phrases to the expression of non-physical conceptions and relations; we can hardly write a line without giving illustra- tions of this kind of linguistic growth. So pervading is it, that we never regard ourselves as having read the history of any intellectual or moral term till we have traced it back to a physical origin. And we are still all the time drawing figurative compari- sons between material and moral things and processes, and calling the latter by the names of the former. There has never been any difficulty in providing for new knowledge and more refined thought by putting to new uses the earlier and grosser materials of speech.

As a matter of course, whatever we now signify by our simple expressions for simple acts, wants, and the like, was intended to be signified through the first speech-signs by the users of them. But to us, with our elaborated apparatus of speech, the sentence, composed of subject and predicate, with a verb or special predicative word to signify the predication, is established as the norm of expression, and we regard everything else as an abbrevi- ated sentence, or as involving a virtual sentence. With a view to this we must have ” parts of speech

“: that is, words held apart in office from one another, each usable for such and such a purpose and no other, and answering a due variety of purposes, so that when they are combined they fit together, as parts composing a whole, and the desired meaning is made clear. Inflexions, too, lend their aid; or else auxiliary words of various kinds answering the same purpose — namely, of determining the relations of the members of the sentence. But all our success in understanding the earliest stages of language depends upon our power to conceive a state of things where none of these distinctions were established, where one speech-sign was like another, calling up a conception in its indefinite entirety, and leaving the circumstances of the case to limit its application.

Such a language is far below ours in explicitness; but it would suffice for a great deal of successful communication; indeed (as will be shown farther on) there are many languages even now in existence which are little better off. So a look of approval or disgust, a gesture of beckoning or repulsion, a grunt of assent or inquiry, is as significant as a sentence, means a sentence, is translatable into a sentence, and hence may even in a certain way be called a sentence; and in the same way, but only so, the original roots of language may be said to have been sentences. In point of fact, between the holophrastic gesture Or uttered sign and the sentence which we can now substitute for it — for example between the sign of beckoning and the equivalent sentence, ” I want you to come here ” — lies the whole history of development of inflective speech.

What has been this history of development, how the first scanty and formless signs have been changed into the immense Develop- variety and fullness of existing speech, it is of course meat of impossible to point out in detail, or by demonstration Language { f ac t S) because nearly the whole process is hidden in the darkness of an impenetrable past. The only way to cast any light upon it is by careful induction from the change and growth which are seen to have been going on in the recent periods for which we have recorded evidence, or which are going on at the present time. Of some groups of related languages we can read the life for three or four thousand years back, and by comparison can infer it much farther; and the knowledge thus won is what we have to apply to the explanation of periods and languages otherwise unknown. Nothing has a right to be admitted as a factor in language-growth of which the action is not demonstrable in recorded

language. Our own family of languages is the one of whose development most is known, by observation and well-warranted inference; and it may be well here to sketch the most important features of its history, by way of general illustration. ˆ

Apparently the earliest class-distinction traceable in Indo- European speech is that of pronominal roots, or signs of position, Iniado- from the more general mass of roots. It is not a European formal distinction, marked by a structural difference, Speech. but, s0 f ar as can £, e se en, is founded only on the assignment by usage of certain elements to certain offices. Formal distinction began with combination, the addition of. one element to another, their fusion into a single word, and the reduction of the one part to a subordinate value, as sign of a certain modification of meaning of the other. Thus, doubtless by endings of pronominal origin, were made the first verb- forms, or words used only when predication was intended (since that is all that makes a verb), conveying at first a distinction of persons only, then of persons and numbers, while the further distinctions of tense and mode were by degrees added. To the nouns, which became nouns by the setting up of the separate and special class of verbs, were added in like manner distinctions of case, of number, and of gender. With the separation of noun and verb, and the establishment of their respective in- flexion, the creative work of language-making is virtually done; the rest is a matter of differentiation of uses. For the noun (noun substantive) and the adjective (noun adjective) become two parts of speech only by a gradually deepened separation of use; there is no original or formal distinction between them; the pronouns as a rule merely add the noun-inflexion to a special set of stems ; adverbs are a part of the same formation as noun- cases; prepositions are adverbs with a specialized construction, of secondary growth; conjunctions are the products of a like specialization; articles, where found at all, are merely weakened demonstratives and numerals.

To the process of form-making, as exhibited in this history, belong two parts: the one external, consisting in the addition of one existing element of speech to another and their combina- tion into a single word; the other internal, consisting in the adap- tation of the compound to its special use and involving the subordination of one element to the other. Both parts appear also abundantly in other departments of language-change, and throughout the whole history of our languages; nothing has to be

assumed for the earliest formations which is not plainly illustrated in the latest. For example, the last important addition to the formative apparatus of English is the common adverb-making suffix -ly, coming,

as already pointed out, from the independent adjective like. There was nothing at first to distinguish a compound like godly {godlike) from one like storm-tossed, save that the former was more adaptable than the other to wider uses; resemblance is an idea easily generalized into appurtenance and the like, and the conversion of godlike to godly is a simple result of the processes of phonetic change described farther on. The extension of the same element to combination with adjectives instead of nouns, and its conversion to adverb- making value, is a much more striking case of adaptation, and is nearly limited to English among the Germanic languages that have turned like into a suffix. A similar striking case of com- bination and adaptation is seen in the Romanic adverb-making suffix mente or ment, coming from the Latin ablative mente, ” with mind.” So, to make a Romanic future like donnerai, ■” I shall give,” there was needed in the first place the pre-existing elements, donner, ” to give,” and ai, ” I have,” and their combination; but this is only a part; the other indispensable part is the gradual adaptation of a phrase meaning ” I have [something before me] for giving ” to the expression of simple futurity, donabo. So far as the adaptation is concerned the case is quite parallel to that of j’ai donnt, ” I have given,” &c. (equivalent phrases or combinations are found in many languages) , where the expression of possession of something that is acted on has been in like manner modified into the expression of past action. Parallel in both combination and adaptation is the past tense loved, according to a widely accepted theory, from love-did, while we have again the same adaptation without combination in the equivalent phrase did love.

That these are examples of the process by which the whole inflective structure of Ind. -European language was built up admits of no reasonable question. Our belief that it is so rests upon the solid foundation that we can demonstrate no other process, and that this one is sufficient. It is true that we can prove such an origin for our formative elements in only a small minority of instances; but this is just what was to be expected, considering what we know of the disguising processes of language-growth. No one would guess in the mere y of ably (for able-ly) the presence of the adjective like, any more than in the altered final of sent and the shortened vowel of led the effect of a did once added to send and lead. The true history of these forms can be shown, because there happen to be other facts left in existence to show it; where such facts are not within reach we are left to infer by analogy from the known to the unknown. The validity of our inference can only be shaken by showing that there are forms incapable of having been made in this way, or that there are and have been other ways of making forms. Of the former there is evidently but

small chance; if a noun-form meaning, ” with mind ” can become the means of conversion of all the adjectives of a language into adverbs, and a verb meaning ” have ” (and, yet earlier, ” seize “) of signifying both future and past time, there is obviously nothing that is impossible of attainment by such means. As regards the latter, no one appears to have even attempted to demonstrate the genesis of formative elements in any other way during the historical periods of language; it is simply assumed that the early methods of language-making will have been something different from and superior in spontaneity and fruitfulness to the later ones; that certain forms, or forms at certain periods, were made out-and-out, as forms; that signs of formal distinction somehow exuded from roots and stems; that original words were many-membered, and that a formative value settled in some member of them — and the like. Such doctrines are purely fanciful, and so opposed to the teach- ings both of observation and of sound theory that the epithet absurd is hardly too strong to apply to them. If the later races, of developed intelligence, and trained in the methods of a fuller expression, can only win a new form by a long and gradual pro- cess of combination and adaptation, why should the earlier and comparatively untrained generations have been able to do any

better ? The advantage ought to be, if anywhere, on our side. The progress of language in every department, accompanying AH formal an d representing the advance of the race, on the Elements whole, in the art of speaking as in other arts, is from once the grosser to the more refined, from the physical

Material. t0 f^e moral and intellectual, from the material to the formal. The conversion of compounds into forms, by the reduction of one of their elements to formative value, is simply a part of the general process which also creates auxiliaries and form-words and connectives, all the vocabulary of mind, and all the figurative phraseology that gives life and vigour to our speech. If a copula, expressive of the grammatical relation of predication, could be won only by attenuation of the meaning of verbs signifying ” grow,” ” breathe,” ” stand,” and the like; if our auxiliaries of tense and mode all go traceably back to words of physical meaning (as have to ” seize,” may to “be great or strong,” shall to ” be under penalty,” and so on) ; if of comes from the comparatively physical off, and for from ” before, for- ward “; if relative pronouns are specialized

demonstratives and interrogatives; if right means etymologically ” straight,” and wrong means ” twisted “; if spirit is ” blowing,” and intellect a ” picking out among,” and understanding a ” getting beneath,” and development an “unfolding”; if an event takes place or comes to pass, and then drops out of mind and is forgotten (opposite of gotten) — then it is of no avail to object to the grossness of any of the processes by which, in earlier language or in later, the expression of formal relations is won. The mental sense of the relation expressed is entirely superior to and independent of the means of its expression. He who, to express the plural of man, says what is equivalent to man-man or heap-man (devices which are met with in not a few languages) has just as good a sense of plurality as he who says men or homines; that sense is no more degraded in him by the coarseness of the phrase he uses to signify it than is our own sense of eventuality and of pastness by the undisguised coarseness of take place and have been. In short, it is to be laid down with the utmost distinctness and confidence, as a law of language-growth, that there is nothing formal anywhere in language which was not once material; that the formal is made out of the material, by processes which began in the earliest history of language and are still in action.

We have dropped here the restriction to our own or Indo- European language with which we began, because it is evident Laws of ‘ tnat what is true of this family of speech, one of the Change and most highly organized that exist, may also be true of Growth. tne rest — must be true of them, unless some valid evidence be found to the contrary. The unity of human nature makes human speech alike in the character of its beginnings and in the general features of its after-history. Everywhere among men a certain store of expression, body of traditional signs of thought, being given, as used by a certain community, it is capable of increase on certain accordant lines, and only on them. In some languages, and under peculiar circumstances, borrowing is a great means of increase; but it is the most external and least organically important of all. Out-and-out invention (which, so far as we can see, must be of the kind called by us onomato- poetic) is found to play only a very insignificant part in the historical periods of language — clearly because there are other and easier modes of gaining new expression for what needs to be expressed. In the course of phonetic change a word sometimes varies into two (or more) forms, and makes so many words, which are differently turned to account. Everything beyond this must be the product of combination; there is no other way, so far as concerns the externals of speech. Then, partly as accom- panying and aiding this external growth, partly as separate from and supplementing it, there is in all language an internal growth,

making no appearance in the audible part of speech, consisting in multiplication of meanings, their modification in the way of precision or comprehension or correctness, the restriction of words to certain uses, and so on. Along with these, too, a con- stant change of phonetic form constitutes an inseparable part of the life of language. Speech is no more stable with respect to the sounds of which it is composed than with respect to its

grammatical forms, its vocabulary, or the body of conceptions signified by it. Even nearly related languages differ as much in their spoken alphabets and the combinations of sounds they admit, and in their uttered forms of words historically the same, as in any other part; and the same is true of local dialects and of class dialects within the same community. Phonetic change has nothing whatever to do with change of meaning; the two are the product of wholly independent tendencies. Sometimes, indeed, they chance to coincide, as in the distinction of minute ” small,” and minute ” moment “; but it is only by chance, as the spoken accordance of second in its two meanings (” next ” and ” sixtieth of a minute “) shows; words that maintain their identity of value most obstinately, like the numerals, are liable to vary indefinitely in form (so four, fidvor, qualuor, recrcrap-es, &c, from an original kwetwor-;five, quinque, whre, coic, &c, from penkwe — while, on the other hand, two and three show as striking an accordance of form as of meaning through all the same languages); what is far the most common is that the word becomes very unlike its former self in both respects, like priest from the Greek irpecrfi vrepos (presbyter), literally ” older man.” Human convenience is, to be sure, the governing motive in both changes; but it is convenience of two different kinds: the one mental, depending on the fact (pointed out above) that a name when once applied belongs to the thing to which it is applied, to the disregard of its etymological connexions, does not need to be changed when the thing changes, and is ready for new application to anything that can be brought into one class with the latter; and the other physical, depending on the organs of speech and their successive movements, by which the sounds that make up the word are produced. Phonetic convenience is economy of effort on the part of those organs ; and to no other law than that of economy of utterance have any of the phenomena of phonetic change been found traceable (though it is also to be noted that some phenomena have not hitherto been successfully brought under it, and that the way of effecting this is still unclear). ” Euphony,” which used to be appealed to as explana- tion, is a false principle, except so far as the term may be made an idealized synonym of economy. The ear finds that agreeable which the organs of utterance find facile.

Economy in utterance is no isolated tendency; it is the same that plays its part in all other kinds of human action, and in language appears equally in the abbreviation of the sentence by leaving out parts that can be spared without loss of intelligibility. It is an insidious tendency, always lying in wait, like gravitation, to pull down what is not sufficiently held up — the holding-up force in lan- guage being the faithfulness of tradition, or accurate repro- duction by the learner and user of the signs which he has acquired. No generation of men has any intention to speak otherwise than as its predecessor has spoken, or any consciousness that it is doing so; and yet, from generation to generation, words are shortened, sounds are assimilated to one another, and one element passes out of use while a new one is introduced. Abbre- viation and assimilation are the most conspicuous depart- ments of phonetic change, and those in which the nature of the governing tendency is most plainly seen. Taken by itself, one sound is as easy as another to the person who has accustomed himself to it from childhood; and those which the young child most easily acquires are not those which in the history of speech are least liable to alteration; it is especially in the combinations and transitions of rapid speaking that the tongue, as it were, finds out for itself easier ways of performing its task, by dropping and slurring and adapting. To trace out the infinitely varied items of this change, to co-ordinate and compare them and discover their reasons, constitutes a special department of language-study, which is treated under the head of Phonetics. It only needs to be pointed out here that phonetic change plays a necessary part in the structural development of language, by integrating compound words through fusion and loss of identity of their component parts, and, what is of yet more importance, by converting them into forms, through disguise of identity of one of the parts and its phonetic subordination to the other part. It is this that turns, for example, the compound god-like into

the derivative godly, the compound love-did into the verbal form loved. And yet one further result sometimes follows: an internal change is wrought by phonetic influence in the body of a word, which change then may in the further history of the word be left as the sole means of distinction between one form and another. It is thus that, in the most recent period, the distinction of led from lead and met from meet and so on has been made; the added auxiliary which originally made these preterites induced a shortening of the root-vowel, and this was left behind when the auxiliary disappeared by the usual process of

abbrevia- tion. It is in the same way that the distinctions of men from man, of were from was, of set from sit, with all their analogues, were brought about: by a modification of vowel-sound (Ger. Umlaut) occasioned by the presence in the following syllable of an i-vowel, which in the older stages of the language is still to be seen there. And the distinctions of sing, sang, sung and song, of bind, bound, band and bond, are certainly of the same kind, though they go back so far in the history of our family of languages that their beginnings are not yet clearly demonstrable; they were in their origin phonetic accidents, inorganic, mere accompaniments and results of external combinations which bore the office of distinction of meaning and were sufficient to it; in some of our languages they have been disregarded and effaced, in others they have risen to prominent importance. To regard these internal changes as primary and organic is parallel with assuming the primariness of the formative apparatus of language in general; like this, it ignores the positive evidence we have of the secondary production of such differences; they are, like everything else in linguistic structure, the outcome of combination and adaptation. Borrowing, or the taking-in of material out of another language, has been more than once referred to above as sometimes an important element in language-history, though less orMixin Z deep-reaching and organic than the rest. There is *' nothing anomalous about borrowing; it is rather in essential accordance with the whole process of language-acquisition. All our names were adopted by us because they were already in use by others; and a community is in the same way capable of taking a new name from a community with which it comes in contact as an individual from individuals. Not that it seeks or admits in this way new names for old things; but it accepts new things along with the names that seem to belong to them. Hence any degree of intercourse between one community and another, leading to exchange of products or of knowledge, is sure to lead also to some borrowing of names; and there is hardly a language in the world, except of races occupying peculiarly isolated positions, that does not contain a certain amount of foreign material thus won, even as our English has elements in its vocabulary from half the other tongues in the world. The scale of borrowing is greatly increased when one people becomes the pupil of another in respect of its civilization: hence the abundant classical elements in all the European tongues, even the non-Romanic; hence the Arabic material in Persian and Turkish and Malay; hence the Chinese in Japanese and Corean; and, as a further result, even dead languages, like the Greek and Latin and the Sanskrit, become stores to be drawn upon in that learned and conscious quest of new expression which in the school-stage of culture supplements or even in a measure replaces the unconscious growth of natural speech. So, in

mixture of communities, which is a highly-intensified form of contact and intercourse, there follows such mixture of speech as the conditions of the case determine; yet not a mixture on equal terms, through all the departments of vocabulary and grammar; the resulting speech (just as when two individuals learn to speak alike) is essentially that of the one constituent of the new community, with more or less material borrowed from that of the other. What is most easily taken in out of another language is the names of concrete things; every degree of removal from this involves additional difficulty — names of abstract things, epithets, verbs, connectives, forms. Indeed, the borrow- ing of forms in the highest sense, or forms of inflexion, is well- nigh or quite impossible; no example of it has been demonstrated in any of the historical periods of language, though it is some-

times adventurously assumed as a part of prehistoric growth. How nearly it may be approached is instanced by the presence in English of such learned plurals as phenomena and strata. This extreme resistance to mixture in the department of inflexion is the ground on which some deny the possibility of mixture in language, and hence the existence of such a thing as a mixed language. The difference is mainly a verbal one; but it would seem about as reasonable to deny that a region is inundated so long as the tops of its highest mountains are above water. According to the simple and natural meaning of the term, nearly all languages are mixed, in varying degree and within varying limits, which the circumstances of each case must explain.

These are the leading processes of change seen at work in all present speech and in all known past speech, and hence to be regarded as having worked through the whole history of speech. By their operation every existing tongue has been developed out of its rudimentary radical condition to that in which we now see it. The variety of existing languages is well-nigh infinite, not only in their material but in their degree of development and the kind of resulting structure. Just as the earlier stages in the history of the use of tools are exemplified even at the present day by races which have never advanced beyond them, so is it in regard to language also — and, of course, in the latter case as in the former, this state of things strengthens and establishes the theory of a gradual development. There is not an element of linguistic structure possessed by some languages which is not wanting in

others; and there are even tongues which have no Languages% formal structure, and which cannot be shown ever to have advanced out of the radical stage. The most noted example of such a rudimentary

tongue is the Chinese, which in its present condition lacks all formal distinction of the parts of speech, all inflexion, all derivation; each of its words (all of them monosyllables) is an integral sign, not divisible into parts of separate significance; and each in general is usable wherever the radical idea is wanted, with the value of one part of speech or another, as determined by the connexion in which it stands; a condition parallel with that in which Indo-European speech may be regarded as existing prior to the beginnings of its career of formal development briefly sketched above. And there are other tongues, related and unrelated to Chinese, of which the same description, or one nearly like it, might be given. To call such languages radical is by no means to maintain that they exhibit the primal roots of human speech, unchanged or only phonetically changed, or that they have known nothing of the combination of element with element. Of some of them the roots are in greater or less part dissyllabic; and we do not yet know that all dis- syllabism, and even that all complexity of syllable beyond a single consonant with following vowel, is not the result of combination or reduplication. But all combination is not form-making; it needs a whole class of combinations, with a recognized common element in them producing a recognized common modification of meaning, to make a form. The same elements which (in Latin, and even to some extent in English also) are of formal value in constant and pre-dict lack that character in cost and preach; the same like which makes adverbs in tru-ly and right-ly is present without any such value in such and which (from so-like and who-like) ; cost and preach, and such and which, are as purely radical in English as other words of which we do not happen to be able to demonstrate the composite character. And so a Chinese monosyllable or an Egyptian or Polynesian dissyllable is radical, unless there can be demonstrated in some part of it a formative, value; and a language wholly composed of such words is a root-language. Recent investigation goes to show that Chinese had at some period of its history a formal development, since extinguished by the same processes of phonetic decay which in English have wiped out so many signs of a formal character and brought back so considerable a part of the vocabulary to monosyllabism. In languages thus constituted the only possible external alteration is that phonetic change to which all human speech, from the

Inflective.

very beginning of its traditional life, is liable; the only growth is internal, by that multiplication and adaptation and improve- ment of meanings which is equally an inseparable part of all language-history. This may include the reduction of certain elements to the value of auxiliaries, particles, form-words, such as play an important part in analytical tongues like English, and are perhaps also instanced in prehistoric Indo-European speech by the class of pronominal roots. Phrases take the place of compounds and of inflexions, and the same element may have an auxiliary value in certain connexions while retaining its full force in others, like, for instance, our own have. It is not easy to define the distinction between such phrase-collocations and the beginnings of agglutination; yet the distinction itself is in general clearly enough to be drawn (like that in French between donnerai and ai donnf) .when the whole habit of the language is well understood.

Such languages, constituting the small minority of human tongues, are wont to be called ” isolating,” i.e. using each Aggiutl- element by itself, in its integral form. All besides native Lan- are ” agglutinative,” or more or less compounded guages. j nt0 wor(j s containing a formal part, an indicator

of class-value. Here the differences, in kind and degree, are very great; the variety ranges from a scantiness hardly superior to Chinese isolation up to an intricacy compared with which Indo-European structure is hardly fuller than Chinese. Some brief characterization of the various families of language in this respect will be given farther on, in con- nexion with their classification. The attempt is also made to classify the great mass of agglutinating tongues under different heads: those are ranked as simply “agglutinative” in which there is a general conservation of the separate identity of root or stem on the one hand, and of formative element, suffix or prefix, on the other; while the name “inflective,” used in a higher and pregnant sense, is given to those that admit a superior fusion and integration of the two parts, to the disguise and loss of separate identity, and, yet more, with the develop- ment of an internal change as auxiliary to or as substitute for the original agglutination. But there is no term in linguistic science so uncertain of meaning, so arbitrary of application, so dependent on the idiosyncrasy of its user, as the term ” inflec- tive.” Any language ought to have the right to be called in- flective that has inflexion: that is, that not merely distinguishes parts of speech and roots and stems formally from one another, but also conjugates its verbs and declines its nouns; and the name is sometimes so used. If, again, it be strictly limited to signify the possession of inner flexion of roots and stems (as if simply agglutinated forms could be called ” exflective “), it marks

only a difference of degree of agglutination, and should be carefully used as so doing. As describing the fundamental and predominant character of language-structure, it belongs to only one family of languages, the Semitic, where most of the work of grammatical distinction is done by internal changes of vowel, the origin of which thus far eludes all attempts at explana- tion. By perhaps the majority of students of language it is, as a generally descriptive title, restricted to that family and one other, the Indo-European or Indo-Germanic; but such a classi- fication is not to be approved, for, in respect to this character- istic, Indo-European speech ranks not with Semitic but with the great body of agglutinative tongues. To few of these can the name be altogether denied, since there is hardly a body of related dialects in existence that does not exhibit some items of ” inflective ” structure; the Aryan is only the one among them that has most to show. Outside the Semitic, at any rate, one should not speak of inflective and non-inflective languages, but only of languages more inflective and less inflective.

To account for the great and striking differences of structure among human languages is beyond the power of the linguistic student, and will doubtless always continue so. We structure. are not likely to be able even to demonstrate a corre- lation of capacities, saying that a race which has done this and that in other departments of human activity might have been expected to form such and such a language.

Every tongue represents the general outcome of the capacity of a race as exerted in this particular direction, under the influence of historical circumstances which we can have no hope of tracing. There are striking apparent anomalies to be noted. The Chinese and the Egyptians have shown them- selves to be among the most gifted races the earth has known; but the Chinese tongue is of unsurpassed jejune-ness, and the Egyptian, in point of structure, little better, while among the wild tribes of Africa and America we find tongues of every grade, up to a high one, or to the highest. This shows clearly enough that mental power is not measured by language-structure. But any other linguistic test would prove equally insufficient. On the whole, the value and rank of a language are determined by what its users have made it do. The reflex action of its speech on the mind and culture of a people is a theme of high interest, but of extreme difficulty, and apt to lead its investigators away into empty declamation; taking everything together, its amount, as is shown by the instances already referred to, is but small. The question is simply one of the facilitation of work by the use of one set of tools rather than another; and a poor tool in skilful hands can do vastly better work than the best tool in unskilful hands — even as the ancient Egyptians, without steel or

steam, turned out products which, both for colossal grandeur and for exquisite finish, are the despair of modern engineers and artists. In such a history of development as that of human speech a fortunate turn may lead to results of unforeseen value; the earlier steps determine the later in a degree quite beyond their own intrinsic importance. Everything in language depends upon habit and analogy; and the formation of habit is a slow process, while the habit once formed exercises a constraining as well as a guiding influence. Hence the persistency of language-struc- ture: when a certain sum and kind of expression is produced, and made to answer the purposes of expression, it remains the same by inertia; a shift of direction becomes of extreme difficulty. No other reason can at present be given why in historical time there has been no marked development out of one grade of structure into another; but the fact no more shakes the linguistic scholar's belief in the growth of structure than the absence of new animal species worked out under his eyes shakes the confidence of the believer in animal development. The modifying causes and their modes of action are clearly seen, and there is no limit to the results of their action except what is imposed by circumstances.

It is in vain to attempt to use dates in language-history, to say when this or that step in development was taken, and how long a period it cost, especially now that the changed views as to the antiquity of man are making it probable that only a small part of the whole history is brought within the reach even of our deductions from the most ancient unity of recorded dialects. At any rate, for aught that we Origin of know or have reason to believe, all existing dialects Speech. are equally old; every one alike has the whole immeasurable past of language-life behind it, has reached its present condition by advance along its own line of growth and change from the first beginnings of human expression. Many of these separate lines we clearly see to converge and unite, as we follow them back into the past ; but whether they all ultimately converge to one point is a question quite beyond our power to answer. If in this immensity of time many languages have won so little, if everywhere language- growth has been so slow, then we can only differ as to whether it is reasonably certain, or probable, or only possible, that there should have been a considerable first period of human existence without traditional speech, and a yet more considerable one before the fixation of so much as should leave abiding traces in its descendants, and that meanwhile the race should have multiplied and scattered into independent communities. And the mere possibility is enough to exclude all dogmatic assertion of the unity of origin of human speech, even assuming unity of origin of the human race. For to prove that

identity by the still existing facts of language is utterly out of the question;

the metamorphosing effect of constant change has been too great to allow it. In point of fact, taking languages as they now exist, only those have been shown related which possess a common structure, or have together grown out of the more primitive radical stage, since structure proves itself a more constant and reliable evidence than material. And this is likely ever to be the case; at any rate, to trace all the world's languages so far back toward their beginnings as to find in them evidences of identity is beyond the wildest hope. We must be content with demonstrating for those beginnings a unity of kind as alike a body of formless roots. But, on the other hand, since this unity is really demonstrated, since all structure is the result of growth, and no degree of difference of structure, any more than of difference of material, refuses explanation as the result of discordant growth from identical beginnings, it is equally inadmissible to claim that the diversities of language prove it to have had different beginnings. That is to say, the question of the unity of speech, and yet more that of the unity of the race, is beyond the reach of the student of language; the best view he can attain is the hypothetical one, that, if the race is one, the beginnings of speech were perhaps one — but probably not, even then. This negative conclusion is so clearly established as to leave no excuse for the still oft- repeated attempts to press language into service on either side of the controversy respecting human unity of race.

That all making and changing of language is by the act of its speakers is too obvious to call for discussion. No other Unconscious fo rce capable of acting and of producing effects is Growth either demonstrable or conceivable as concerned through in the work. The doctrine that language is an s " organism, growing by its own inherent powers, exempt from the interference of those who use it, is simply an indefensible paradox. Every word that is uttered is so by an act of human will, at first in imitation of others, then more and more by a formed and controlling habit ; it is acces- sible to no change except by influences working in the speaker's mind and leading him to make it otherwise. Not that he is aware of this, or directs his action knowingly to that end. The whole process is unconscious. If any implication of reflective or intended action can be shown to inhere in any doctrine of linguistic science, it vitiates that doctrine. The attitude of the ordinary

speaker towards his language is that of unreasoning acceptance; it seems to him that his names for things are their real names, and all others unintelligent nicknames; he thinks himself to possess his speech by the same tenure as his sight or hearing; it is ” natural ” to him (or, if he reasons about it, he attributes it to a divine origin, as races beginning to philosophize are wont to ascribe their various social institutions to their gods); he knows nothing of its structure and relations; it never occurs to him to find fault with it, or to deem it insuffi- cient and add to or change it; he is wholly unaware that it does change. He simply satisfies his social needs of communi- cation by means of it ; and if he has anything to express that is different from what has been expressed before, he takes the shortest way to a provision for the need; while any relaxation of the energy of utterance tends to a variation in the uttered combinations; and thus changes come by his act, though with- out his knowledge. His sole object is, on the basis of what language he has, to make known his thought in the most con- venient way to his fellow; everything else follows with and from that. Human nature and circumstances being what they are, what follows actually is, as already shown, incessant growth and change. For it we have not to seek special disturb- ing causes in the history of the speakers, although such may come in to heighten and quicken the change; we know that even in a small community, on a narrow islet, cut off from all intercourse with other communities, the speech would grow different — as certainly, if not as rapidly, as anywhere in the world — and only by the action of its speakers: not that the speakers of a language act in unison and simultaneously to produce a, given change. This must begin in an individual, or more or less accordantly in a limited number of individuals

and spread from such example through the community. Initia- tion by one or a few, acceptance and adoption by the rest — such is the necessary method of all linguistic change, and to be read as plainly in the facts of change now going on among our- selves as in those of former language. The doctrine of the inaccessibility of language to other action than that of its speakers does not imply a power in the individual speaker to create or alter anything in the common speech, any more than it implies his desire to do so. What he suggests by his example must be approved by the imitation of his fellows, in order to become language. The common speech is the common pro- perty, and no one person has any more power over it than another. If there are, for example, a thousand speakers of a certain dialect, each one wields in general a thousandth part of the force required to change it— with just so much more as may belong to his excess of influence over his fellows, due to recog- nized superiority of any kind on his part. His

action is limited only by their assent; but this is in effect a very narrow limita- tion, ensuring the adoption of nothing that is not in near accor- dance with the already existing; though it is also to be noted that he is as little apt to strike off into startling change as they to allow it; since the governing power of already formed habits of speech is as strong in him as in them. That change to which the existing habits naturally lead is easy to bring about; any other is practically impossible. It is this tendency on the part of the collective speakers of a language to approve or reject a proposed change according to its conformity with their already subsisting usages that we are accustomed to call by the fanciful name " the genius of a language."

On the relation of the part played in language-change by the individual to that by the community, in combination with the inevitableness of change, rests the explanation of the dialectic variation of language. If language were variti stable there would of course be no divarication; but since it is always varying, and by items of difference that proceed from individuals and become general by diffusion, there can be uniformity of change only so far as diffusion goes or as the influences of communication extend. Within the limits of a single community, small or large, whatever change arises spreads gradually to all, and so becomes part of the general speech; but let that community become divided into two (or more) parts, and then the changes arising in either part do not spread to the other, and there begins to appear a difference in linguistic usage between them. It is at first slight, even to insignificance; not greater than exists between the dialects of different localities or ranks or occupations in the same community, without detri- ment to the general unity of speech. This unity, namely, rests solely on mutual intelligibility, and is compatible with no small amount of individual and class difference, in vocabulary, in grammar and in pronunciation; indeed, in the strictest sense, each individual has a dialect of his own, different from that of every other, even as he has a handwriting, a countenance, a character of his own. And every item of change, as it takes place, must have its season of existence as a local or class or trade peculiarity, before it gains universal currency; some of them linger long in that condition, or never emerge from it. All these differences in the speech of different sub-communities within the same community are essentially dialectic; they differ not in kind, but only in degree, from those which separate the best-marked dialects; they are kept down by general communi- cation within the limit of general mutual intelligibility. Where that restraining influence ceases the limit is gradually but surely overpassed, and real dialects are the result. From what we

know of the life of language we can say positively that continued uniformity of speech without continued com- munity is not practicable. If it were possible to divide arti- ficially, by an impassable chasm or wall, a people one foi ages, and continuing to occupy the same seats, the language of the divided parts would at once begin to be dialectically different; and after sufficient time had elapsed each would have become unintelligible to the other. That is to say, whenever A community of uniform speech breaks up, its speech breaks

up also; nor do we know of any other cause of dialectic diversity.

In applying this explanation of dialectic growth we have to allow for modifying circumstances of various nature, which alter not indeed the fact but the rate and kind of divarication. Some languages grow and change much more rapidly than others, with a corresponding effect upon divarication, since this is but a result of discordant growth. Usually, when there is division of a community, the parts get into different external circumstances, come in contact or mingle with different neigh- bouring communities, and the like; and this quickens and increases their divergence of speech. But the modifying factor of by far the highest importance here, as elsewhere in the history of language, is civilization. Civilization in its higher forms so multiplies the forces of communication as to render it possible that the widely-divided parts of one people, living in circum- stances and under institutions of very different character, should yet maintain a substantial oneness of speech; of this there is no more striking example than the two great divisions of the English-speaking people on opposite sides of the Atlantic. On the other hand, a savage people cannot spread even a little without dialectic disunity; there are abundant examples to be met with now of mutually unintelligible speech between the smallest subdivisions of a race of obviously kindred tongue — as the different clusters of huts on the same coral islet. It is with linguistic unity precisely as it is with political unity, and for the same reasons. Before the attainment of civilization the human race, whether proceeding from one centre of dis- persion or from several, was spread over the earth in a state of utter disintegration; but every centre of civilization becomes also a centre of integration; its influences make for unity of speech as of all other social institutions. Since culture has become incontestably the dominant power in human history, the unifying forces in language

have also been stronger than the diversifying; and with culture at its full height, and spread equally to every land and race, one universal language, like one universal community, is not an absurdity or theoretic impossibility, but only a Utopian or millennial dream.

Dialectic variation is thus simply a consequence of the movements of population. As the original human race or races, so the divisions or communities of later formation, from point to point through the whole life of man on the earth, have spread and separated, but jostled and interfered, have conquered and exterminated or mingled and absorbed; and their speech has been affected accordingly. Hence something of these movements can be read in the present condition of languages, as in a faithful though obscure record — more, doubt- less, than can be read in any other way, however little it may be when viewed absolutely. Dialectic resemblances point inevitably back to an earlier unity of speech, and hence of community; from what we know of the history of speech, they are not to be accounted for in any other way. The longer the separation that has produced the diversity, the greater its degree. With every generation the amount of accordance decreases and that of discordance increases the common origin of the dialects is at first palpable, then evident on examina- tion, then to be made out by skilled research, then perhaps no longer demonstrable at all; for there is plainly no limit to the possible divergence. So long, now, as any Speech. evidence of original unity is discoverable we call the languages ” related dialects,” and combine them into a ” family.” The term ” family ” simply signifies a group of languages which the evidence thus far at command, as estimated by us, leads us to regard as descended by the ordinary processes of dialectic divarication from one original tongue. That it does not imply a denial of the possibility of wider relationship is obvious from what has been said above. That there is abundant room for error in the classification repre- sented by it is also clear, since we may take purely accidental resemblances, or the results of borrowing, for evidence of common descent, or may overlook or wrongly estimate real evidences, which more study and improved method will bring to light.

Grouping into families is nothing more than the best classifi- cation attainable at a given stage in the progress of linguistic science; it is in no small part provisional only, and is always held liable to modification, even sweeping, by the results of further research. Of some families we can follow the history by external evidences a great way back into the past; their structure is so highly developed as to be traced with confidence everywhere; and their territory is well within our reach: such we regard with the highest degree of confidence, hardly allow- ing for more than the possibility that some other dialect,

or group, or now-accepted family even, may sometime prove its right to be added on. But these are the rare exceptions; in the great majority of cases we have only the languages as they now exist, and in more or less scanty collections, of every degree of trustworthiness; and even their first grouping is tentative and incomplete, and involves an adjournment of deeper ques- tions to the day of more light. To complete and perfect the work of classification by relationship, or the establish- ment of families and their subdivisions, is the first object of the comparative study of languages. No other classification has a value in the least comparable' with it; that by grade of structure is a mere recreation, leading to nothing; that by absolute worth is of no account whatever, at any rate in the present state of our knowledge. On genetic relationship, in the first place, is founded all investigation of the historical development of languages; since it is in the main the comparison of related dialects, even in the case of families having a long recorded history, and elsewhere only that, that gives us know- ledge of their earlier condition and enables us to trace the lines of change. In the second place, and yet more obviously, with this classification is connected all that language has to teach as to the affinities of human races; whatever aid linguistic science renders to ethnology rests upon the proved relationships of human" tongues.

That a classification of languages, to which we have now to proceed, is not equivalent to a classification of races, and why this is so, is evident enough from the principles which have been brought out by our whole discussion f^f " "' of languages, and which, in their bearing upon this particular point, may well be recapitulated here. No language is a race-characteristic, determined by the special endowments of a race; all languages are of the nature of in- stitutions, parallel products of powers common to all mankind — the powers, namely, involved in the application of the fittest available means to securing the common end of communica- tion. Hence they are indefinitely transferable, like other institutions — like religions, arts, forms of social organization, and so on — under the constraining force of circumstances. As an individual can learn any language, foreign as well as ancestral, if it be put in his way, so also a community, which in respect to such a matter is only an aggregate of individuals. Accordingly, as individuals of very various race are often found in one community, speaking together one tongue, and utterly ignorant of any other, so there are found great com- munities of various descent, speaking the dialects of one common tongue, which at some period historical circumstances have imposed upon them. The conspicuous example, which comes into every one's mind when this subject is discussed, is that of the Romanic countries of southern Europe, all

using dialects of a language which, 2500 years ago, was itself the insignificant dialect of a small district in central Italy; but this is only the most important and striking of a whole class of similar facts. Such are the results of the contact and mixture of races and languages. If language-history were limited to growth and divarication, and race-history to spread and dispersion, it would be a comparatively easy task to trace both backward toward their origin; as the case is, the confusion is inextricable and hopeless. Mixture of race and mixture of speech are coincident and connected processes; the latter never takes place without something' of the former; but the one is not at all a measure of the other, because circumstances may give to the speech of the one element of population a greatly disproportionate

preponderance. Thus, there is left in French only an insig- nificant trace of the Celtic dialects of the predominant race- constituent of the French people; French is the speech of the Latin conquerors of Gaul, mixed perceptibly with that of its later Frankish conquerors; it was adopted in its integrity by the Norse conquerors of a part of the land, then brought into Britain by the same Norsemen in the course of their further conquests, this time only as an element of mixture, and thence carried with English speech to America, to be the language of a still further mixed community. Almost every possible phase of language-mixture is traceable in the history of the abundant words of Latin origin used by American negroes. What events of this character took place in prehistoric time we shall never be able to tell. If any one chooses to assert the possibility that even the completely isolated dialect of the little Basque commun- ity may have been derived by the Iberian race from an intrusive minority as small as that which made the Celts of Gaul speakers of Latin, we should have to admit it as a. possibility — yet without detriment to the value of the dialect as indicating the isolated race-position of its speakers. In strictness, language is never a proof of race, either in an individual or in a com- munity; it is only a probable indication of race, in the absence of more authoritative opposing indications; it is one evidence, to be combined with others, in the approach towards a solution of the confessedly insoluble problems of human history. But we must notice, as a most important circumstance, that its degree of probability is greatest where its aid is most needed, in prehistoric periods and among uncultivated races; since it is mainly civilization that gives to language a propagative force disproportionate to the number of its speakers. On the whole, the contributions of language to ethnology are practically

far greater in amount and more distinct than those derived from any other source.

The genetical classification of languages, then, is to be taken for just what it attempts to be, and no more: primarily as a classification of languages only; but secondarily ttoa. as casting light, in varying manner and degree, on

movements of community, which in their turn depend more or less upon movements of races. It is what the fates of men have left to represent the tongues of men — a record imperfect even to fragmentariness. Many a family once as important as some of those here set down has perhaps been wiped out of existence, or is left only in an inconspicuous fragment; one and another has perhaps been extended far beyond the limits of the race that shaped it — which, we can never tell to our satisfaction.

i. Indo-European (Indo-Germanic) Family. — To this family belongs incontestably the first place, and for many reasons: the historical position of the peoples speaking its dialects, who have now long been the leaders in the world's history; the abundance and variety and merit of its literatures, ancient and modern, which, especially the modern, are wholly unapproached by those of any other division of mankind; the period covered by its records; and, most of all, the great variety and richness of its development. These advantages make of it an illustra- tion of the history of human speech with which no other family can bear a moment's comparison as to value, however impor- tant various other families may be in their bearing on one and another point or department of history, and however necessary the combination of the testimony of all to a solution of the problems involved in speech. These advantages have made Indo- European language the training-ground of comparative philology, and its study will always remain the leading branch of that science. Many matters of importance in its history have been brought up and used as illustrations in the preceding discussion; but as its constitution and ascertained development call for a fuller and more systematic exposition than they have found here, a special section is devoted to the subject (see Part II. below ; also Indo-European Language) .

2. Semitic Family. — This family also is beyond all question the second in importance, on account of the part which its peoples (Hebrews, Phoenicians, Assyrians, Syrians, Arabs,

Abyssinians, &c.) have played in history, and of the rank of its literatures. For a special treatment of it see Semitic Languages. Some

of the peculiarities of the language have been alluded to above; in the monotony and rigidity of its triliteral roots, and in the extended use which it makes of internal vowel-change (" inflexion " in the special sense of that term) for the purposes of grammatical distinction, it is more peculiar and unlike all the other known families of lan- guage than these are unlike one another. There are, and per- haps will always be", those to whom the peculiarities just men- tioned will seem original; but if the views of language and its history taken above are in the main true, then that opinion is untenable; Semitic language must have grown into its present forms out of beginnings accordant in kind, if not identical in substance, with those of other families; and the only question remaining to be solved is, through what processes and under what governing tendencies Semitic speech should have arrived at its present state. And with this solution is most obviously and incontestably bound up that of the other interesting and much discussed question, whether the Semitic family can be shown to be related with other families, especially with the Indo-European. To some the possession in common of gram- matical gender, or of the classification of objects in general as masculine and feminine, is of itself enough to prove such rela- tionship; but, though the fact is a striking one, and of no small importance as an indication, this degree of value can by no means be attributed to it in the present state of our know- ledge — any more than to any other single item of structure among the infinite variety of such, distributed among the multitude of human tongues. Many others compare the Semitic and Indo-European " roots " with one another, and believe themselves to find there numerous indications of identity of material and signification; but these also must pass for insuffi- cient, until it shall prove possible by their aid to work out an acceptable theory of how Semitic structure should have grown out of such radical elements as underlie Indo-European struc- ture, or out of the accordant initial products of a structural growth that afterwards diverged into two so discordant forms. To show that, both the material and the method have been hitherto wanting, and any confident decision is at least pre- mature; but present probabilities are strongly against the solubility of the question. While many general considerations favour the ultimate unity of these two great civilized and civilizing white races of neighbouring homes, and no discordance of speech (as was shown above) can ever be made to prove their diversity of origin, it seems in a high degree unlikely that the evidence of speech will ever be made to prove them one.

3. Hamitic Family. — The prominent importance of this family (see Hamitic Languages) is due to a single one of its members, the

Egyptian. It occupies the north-eastern corner of Africa, with the border-lands of that continent stretching west- ward along the whole shore of the Mediterranean, and south- ward to beyond the equator. It falls into three principal divisions: (1) the ancient Egyptian, with its descendant, the more modern Coptic (itself now for some centuries extinct; see Egypt, Copts); (2) the Libyan or Berber languages of northern Africa; (3) the Ethiopic languages of eastern Africa. Its situation thus plainly suggests the theory of its intrusion from Asia, across the isthmus of Suez, and its gradual spread from that point; and the theory is strongly favoured by the physical character of the Hamites, and the historical position, especially of the Egyptians, so strikingly different from that of the African races in general. Linguistic evidences of the relationship of Hamite with Semite have also been sought, and by many believed to be found; but the maintenance of the two families in their separateness is an indication that those evidences have not yet been accepted as satisfactory; and such is indeed the case. The Egyptian is a language of extreme simplicity of structure, almost of no structure at all.' Its radical words are partly monosyllabic, partly of more than one syllable, but not in the latter case any more than in the former showing traceable signs of extension by formative processes from simpler

elements. It has no derivative apparatus by which noun-stems are made from roots; the root is the stem likewise; there is nothing that can be properly called either declension or con- jugation; and the same pronominal particles or suffixes have now a subjective value, indicating use as a verb, and now a possessive, indicating use as a noun. There is no method known to linguistic science by which the relationship of such a tongue as this with the highly and peculiarly inflective Semitic can be shown, short of a thorough working out of the history of development of each family taken by itself, and a retracing in some measure of the steps by which each should have arrived at its present position from a common starting-point; and this has by no means been done. In short, the problem of the relation of Semitic with Hamitic, not less than with Indo- European, depends upon that of Semitic growth, and the two- must be solved together. There are striking correspondences between the pronouns of the two families, such as, if supported by evidences from other parts of their material, would be taken as signs of relationship; but, in the absence of such support, they are not to be relied upon, not till it can be shown to be possible that two languages could grow to be so different in all

other respects as are Egyptian and Hebrew, and yet retain by inheritance corresponding pronouns. And the possession of grammatical gender by Indo-European, Semitic and Hamitic speech, and by them almost alone, among all human languages, though an extremely noteworthy fact, is (as was pointed out above) in the present condition of linguistic science quite too weak a basis for a belief in the original identity of the three families.

Egyptian is limited to the delta and valley of the Nile, and is the only Hamitic language which has ancient records; of the others the existing forms alone are known.

The Libyan or Berber division of the family occupies the inhabitable part of northern Africa, so far as it has not been displaced by intrusive tongues of other connexion — in later times the Arabic, which since the Mahommedan conquest has been the cultivated tongue of the Mediterranean coast, while the earlier Vandal, Latin and Punic have disappeared, except in the traces they may have left in Berber dialectic speech. The principal dialects are the Kabyle, the Shilha and the Tuarek or Tamashek, corresponding nearly to the ancient Numidian, Mauretanian and Gaetulian respectively.

The third or Ethiopic division includes as its chief members the Beja or Bisharin, the Saho, the Dankali, the Somali, and the more inland Galla; the first two lying along the Red Sea north of Semitic Abyssinia, the others south of it, to the equator. By some authorities (Lepsius, Bleek) there is added to the Hamitic family as a fourth division a group from extreme southern Africa, the Hottentot and Bushman languages. The ground of this classification is the possession by the Hottentot of the distinction of grammatical gender, and even its designa- tion by signs closely corresponding to those used in the Ethiopic division. Others deny the sufficiency of this evidence, and rank the Hottentot as a separate group of African dialects, adding to it provisionally the Bushman, until better knowledge of the latter shall show whether it is or is not a group by itself. If the Hottentot be Hamitic, we shall have to suppose it cut off at a very remote period from the rest of the family, and forced gradually southward, while all the time suffering mixture both of speech and of blood with the negro races, until the physical constitution of its speakers has become completely metamorphosed, and of its original speech no signs are left save those referred to above; and while such exceptional phonetic peculiarities have been worked out as the use of the clicks or clucking sounds: and this must be regarded as at least extremely difficult. –

4. Monosyllabic or South-eastern Asiatic Family. — This body of

languages may well enough be the next taken up; and here again (as was the case with the preceding family) on account of the prominent importance of one of its dialects and of the people speaking it — the Chinese people and language. The territory of the family includes the whole south-eastern corner

of Asia: Chivia on the north-east, Farther India in the south, and the high plateau of Tibet, with the neighbouring Himalayan regions, to the westward. The ultimate unity of all these languages rests chiefly upon the evidence of their form, as being all alike essentially monosyllabic and isolating, or destitute of formal structure; the material correspondences among them, of accordant words, are not sufficient to prove them related. The Chinese itself can be followed up, in contemporary records, to a period probably not far from 2000 B.C., and the language, the people, and their institutions, are then already in the main what they have ever since continued to be (see China) ; the other leading tongues come into view much later, as they receive culture and religion from China on the one hand (the Annamites) , or from India on the other (the Tibetans, Burmese, Siamese) ; and the territory includes great numbers of wild tribes unknown until our own times, whose race-relations and language-relations are as yet very obscure. Current opinion tends to regard the Annamites, Peguans and Cambodians (the Mon-Khmer group) as forming a more nearly related group or division, and as having been the earlier population of Farther India, in part dispossessed and driven forward by the later intrusion from the north of Siamese and Burmese, of whom the former are more nearly related to the Chinese and the latter to the Tibetans. The Mon-Khmer group is itself more nearly related to the Kolarian and Malay-Polynesian.

The character of the languages of this family, especially as instanced by its most important member, the Chinese, has been pretty fully set forth in the general discussions above. They are languages of roots: that is to say, there is not demon- strable in any of their words a formative part, limiting the word, along with others similarly characterized, to a certain office or set of offices in the formation of the sentence. That the words are ultimate roots, come down from the first period of language-making, we have no reason whatever to believe; and they may possibly have passed through processes of growth which equipped them with some scanty supply of forms; but no evidence to that effect has yet been produced. The indications relied on to show an earlier polysyllabi-sm in the family (though already in Chinese reduced to monosyllabism before the earliest historical appearance of the language, some 4000 years ago) are the comparatively recent loss of certain final mutes in Chinese words, and

the presence on a consider- able scale in Tibetan spelling of added initial and final consonants, now silent in the literary dialect, but claimed to be still uttered in some parts of the country. If the theory connecting these phenomena be established, the Tibetan will approve itself to be by far the most primitive of the dialects of the family, furnishing the key to the history of the rest.

For further details respecting the various tongues of the monosyllabic family, the articles on the different divisions of its territory (Burma; China; Scam; Tibet, &c.) may be con- sulted. The languages all alike show . an addition to the resources of distinction possessed by languages in general, in the use of tones: that is to say, words of which the alphabetic elements are the same differ in meaning according as they are uttered in a higher or a lower tone, with the rising or the falling inflexion, and so on. By this means, for example, the mono- ■ syllabic elements of the literary Chinese, numbering but 500 as we should write them, are raised to the number of about 1500 words.

5. Ural-Altaic {Scythian, Turanian) Family. — China and Tibet are bordered on the north and west by the eastern branches of another immense family, which stretches through central arid northern Asia into Europe, overlapping the European border in Turkey, and reaching across it in Russia and Scan- dinavia to the very shore of the Atlantic. Usage has not so definitely determined as in the case of most other families by what name it shall be called; Turanian is perhaps the com- monest appellation, but also the most objectionable. Five principal branches are generally reckoned as composing the family. The two easternmost are the Tungusian, with the Manchu for its principal division, and the Mongol (see Mongols)

Of these two the language is exceedingly simple in structure, being raised but little above the formlessness of the Chinese. The Tungusian, however, some authorities would couple with Japanese as a separate branch. The three others are: the Turkish or Tatar, the dialects of which reach from the mouth of the Lena (Yakut) to Turkey in Europe; the Samoyed, from the Altai down to the arctic shore of Asia, and along this to the White Sea — an unimportant congeries of barbarous tribes; and the Finno-Hungarian, including the tongues of the two cultivated peoples from which it takes its name, and also those of a great part of the population of northern and central Russia, to beyond the Ural Mountains, and finally the Lappish, of northern Scan-

dinavia. The nearer relation of the Samoyed is with the Finno-Hungarian. The Turkish is a type of a well-developed language of purely agglutinative structure: that is, lacking that higher degree of integration which issues in internal change. Whether this degree is wholly wanting in Finnish and Hun- garian is made a question; at any rate, the languages named have no reason to envy the tongues technically called ” inflec- tive.” Of a value not inferior to that of inflective characteristics is one that belongs to all the Ural-Altaic tongues, in varying measure and form, and helps to bind them together into a single family — the harmonic sequence of vowels, namely, as between root and endings, or a modification of the vowels of the endings to agree with that of the root or its final syllable.

While the physical race-characteristics known as Mongolian are wanting in the speakers of the western dialects of this family, they are conspicuously present in the people of Japan and Korea; and hence the tendency of scholars to endeavour to connect the languages of the two latter countries, since they also are of agglutinative structure (see Japan and Korea) with the family now under treatment, as also with one another.

Other languages of north-eastern Asia, too little known to group, and too unimportant to treat as separate families, may be mentioned here by way of appendix to their neighbours of the most diversified and widespread Asiatic family. They are the Aino, of Yezo and the Kurile Islands with part of the neigh- bouring coast; the Kamchatkan; and the Yukagir and Tchukt- chi of the extreme north-east. These are sometimes combined with the Eskimo under the title of the Arctic or Hyperborean languages.

The opinion has been held by many scholars that the agglu- tinative dialects — Sumerain, Accadian, &c. — of the presumed founders of Mesopotamian culture and teachers of the Assyrian Semites (see Babylonia) belonged to the Ural-Altaic family, and specifically to its Finno-Ugrian branch ; but the data for this view are still very uncertain. The mere possession of an agglutinative structure cannot be taken as proving anything in the way of relationship.

6. Dravidian or South Indian Family. — This is an important body of nearly and clearly related tongues, spoken by about 50,000,000 people, doubtless representing the main population of all India at the time when the intrusive Indo-European tribes broke in from the north-west, and still filling most of the southern peninsula, the Deccan, together with part of Ceylon. They are languages of a high grade of structure, and of great power and euphony; and the principal ones

have enjoyed a long cultiva- tion, founded on that of the Sanskrit. As they obviously have no Indo-European affinities, the attempt has been made to connect them also with the Ural-Altaic or Turanian family, but altogether without success, although there is nothing in their style of structure that should make such connexion impossible.

7. Malay- Polynesian Family. — Not all the tribes that make up the non-Indo-European population of India speak Dravidian dialects. The Santals and certain other wild tribes appear to be of another lineage. These are now generally known as Kolarian, and are connected with the Malay-Polynesian family.

The islands, greater and smaller, lying off the south-eastern coast of Asia and those scattered over the Pacific, all the way from Madagascar to Easter Island, are filled with their own peculiar families of languages, standing in a more or less distant relationship to the languages of the Mon- Khmer group, and the

Kolarians on the mainland and the Nicobar islanders. The principal one among them is the great Malay-Polynesian family. It falls into two principal divisions, Malayan and Polynesian. The Malayan includes, besides the Malay proper (see Malays), which occupies the Malaccan peninsula (yet doubtless not as original home of the division, but by immigration from the islands), the languages also of Sumatra, Java, Borneo, &c, of the Philippine Islands, of part of Formosa, and of Madagascar, together with the coasts of Celebes and other islands occupied in the interior by Papuans. The Polynesian division includes most of the tongues of the remaining scattered groups of islands, and that of New Zealand. Probably to these are to be added, as a third division, the Melanesian dialects of the Melanesian Archi- pelago, of which both the physical and the linguistic peculiari- ties would in that case be ascribed to mixture with the black Papuan races. All these languages are extremely simple in phonetic form, and of a low grade of structure, the Polynesian branch being in both respects the lowest, and some of the Malayan dialects having reached a development considerably more advanced. The radical elements are much oftener of two syllables than of one, and reduplication plays an important part in their extension and variation. Malay literature goes back as far as to the 13th century, and there are Javan records even from the early centuries of our era, the result of religion and culture introduced into that island from Brahmanic India. In recent years more active investigation has been carried on with a view to tracing out the special laws of historical development prevailing in the family.

8. Other Oceanic Families. — At least two other families, un-

connected with the preceding and with one another, are found among the Pacific Islands, and only there. The continental island of Australia, with its dependency Tasmania (where, how- ever, the native tongue has now become extinct), has its own body of probably related dialects, as its own physical type. They have been but imperfectly investigated, their imoortanre, except to the professed student of language, being nothing; but they are not destitute of a rude agglutinative structure of their own. Still less known are the Papuan or Negrito languages, belonging to the black race with frizzled hair inhabiting most of New Guinea, and found also in the interior of some of the other islands, having been driven from the coasts by superior intruders of the Malay race.

9. Caucasian Languages. — Of the existing languages of Asia there remain to be mentioned only those of the Caucasian moun- tains and highlands, between the Black and Caspian Seas, pressed upon the north by Slavonians and Turks, upon the south by Armenians and Kurds and Turks. Its situation makes of the Caucasus a natural eddy in all movements of emigration between Asia and Europe; and its linguistic condition is as if remnants of many families otherwise extinct had been stranded and pre- served there. The dialects north of the principal range — Cir- cassian, Mitsjeghian, Lesghian, &c. — have not been proved to be related either to one another or to those of the south. Among the latter, the Georgian is much the most widespread and impor- tant (see Georgia) and, alone among them all, possesses a literature. The Caucasian dialects present many exceptional and difficult features, and are in great part of so high a grade of structure as to have been allowed the epithet inflective by those who attach special importance to the distinction thus expressed.

10. Remnants of Families in Europe. — The Basque people of the western Pyrenees, at the angle of the Bay of Biscay, are shown by their speech to be an isolated remnant of some race which was doubtless once much more widely spread, but has now everywhere else lost its separate identity; as such it is of extreme interest to the ethnologist (see Basques). The Basque language appears to be unrelated to any other on earth. It is of a very highly agglutinative structure, being equalled in intricacy of combination only by a part of the American dialects. Limited as it is in territory, it falls into a number of well-marked dialects, so that it also may not be refused the name of a ” family.”

The only other case of the kind worth noting is that of the

Etruscan language of northern central Italy, which long ago became extinct, in consequence of the conquest and absorption of Etruria by Rome, but which still exists in numerous brief in- scriptions (see Etruria). Many attempts have been made to connect the language with other families, and it has even quite recently been pronounced Aryan or Indo-European, of the Italican branch, by scholars of high rank. But its supposed Indo-European relationship was at once shown to be erroneous when, in 1892, a small book which had been used to pack a mummy was discovered in the museum at Agram, and published. The probability of relationship with the ancient Lydian, as was the opinion held in ancient times, has been increased by recent research, and is likely soon to be verified or disproved by the discovery of Lydian records.

In order to complete this review of the languages of the Old World it only remains to notice those of Africa which have not been already mentioned. They are grouped under two heads : the languages of the south and those of the centre of the continent.

11. South African or Bantu Family. — This is a very extensive and distinctly marked family (see Bantu Languages), occupy- ing (except the Hottentot and Bushman territory) the whole southern peninsula of the continent from some degrees north of the equator. It is held apart from all other known families of language by a single prominent characteristic — the extent to which it makes use of prefixes instead of suffixes as the appar- atus of grammatical distinction; its inflexion, both declensional and conjugational, is by appended elements which precede the stem or root. The most conspicuous part of this is the variety of prefixes, different in singular and plural, by which the various classes or genders (not founded on sex; the ground of classifica- tion is generally obscure) of nouns are distinguished; these then reappear in the other members of the sentence, as adjectives and verbs and pronouns, which are determined by the noun, thus producing an alliterative concord that runs through the sentence. The pronominal determinants of the verb, both subject and object, also come before it; but the determinants of mode of action, as causative, &c, are mostly suffixed. The language in general is rich in the means of formal distinction. Those dialects which border on the Hottentots have, apparently by derivation from the latter, the clicks or clucking-sounds which form a conspicuous part of the Hottentot spoken alphabet.

12. Central African Languages.- — The remaining languages of Africa

form a broad band across the centre of the continent, between the Bantu on the south and the Hamitic on the east and north. The Bantu group, extending from north of the equator to the Cape of Good Hope, with a vast variety of dialects, is the most important of all African languages. To it belongs Swahili, the language of Zanzibar, only less valuable as a means of communication and trade than the Haussa of the Sudan, the most important of the dialects under the influence of the Hamitic languages. The African languages are by no means to be called a family, but rather a great mass of dialects, numbering by hundreds, of varying structure, as to the relations of which there is great discordance of opinion even among the most recent and competent authorities. It is no place here to enter into the vexed questions of African linguistics, or even to report the varying views upon the subject; that would require a space wholly disproportioned to the importance of African speech in the general sum of human language. There is no small variety of physical type as well as of speech in the central belt; and, partly upon the evidence of lighter tint and apparently higher endowment, certain races are set off and made a separate division of; such is the Nuba-Fulah division of F. M tiller, rejected by Lepsius. The latter regarded all the varieties of physical and linguistic character in the central belt as due to mixture between pure Africans of the south and Hamites of the north and east; but this is at present an hypothesis only, and a very improbable one, since it implies modes and results of mix- ture to which no analogies are quotable from languages whose history is known; nor does it appear at all probable that the collision of two races and types of speech should produce such an immense and diverse body of transitional types. It is far

from impossible that the present prominence of the South African or Bantu family may be secondary, due to the great expansion under favouring circumstances of a race once having no more importance than belongs now to many of the Central African races, and speaking a tongue which differed from theirs only as theirs differed from one another. None of the Central African languages is a prefix-language in the same degree as the Bantu, and in many of them prefixes play no greater part than in the world's languages in general; others show special forms or traces of the prefix structure; and some have features of an extraordinary character, hardly to be paralleled elsewhere. One group in the east (Oigob, &c.) has a gender distinction, involving that of sex, but really founded on relative power and dignity: things disparaged, including women, are put in one class; things extolled, including men, are put in the other. This is perhaps the most significant hint anywhere to be found of how a gender-distinction like

that in our own Indo-European languages, which we usually regard as being essentially a dis- tinction of sex, while in fact it only includes such, may have arisen. Common among the African languages, as among many other families, especially the American, is a generic distinction between animate beings and inanimate things.

13. American Languages. — With these the case is closely the same as with the Central African languages: there is an immense number of dialects, of greatly varied structure (see Indians, North American). Even among neighbouring families like the Algonquin, Iroquois and Dakota, whose agree- ment in style of structure (polysynthetic), taken in connexion with the accordant race-type of their speakers, forbids us to regard them as ultimately different, no material correspondence, agree- ment in words and meanings, is to be traced; and there are in America all the degrees of polysynthetism, down to the lowest, and even to its entire absence. Such being the case, it ought to be evident to every one accustomed to deal with this class of subjects that all attempts to connect American languages as a body with languages of the Old World are and must be fruitless.

Literature. — Many of the theoretic points discussed above are treated by the writer with more fulness in his Language and the Study of Language (1867) and Life and Growth of Language (1875). Other English works to consult are M. Miiller's Lectures on the Science of Language; Farrar's Chapters on Language; Wedgwood's Origin of Language (all more or less anti- quated); Sayce's Principles of Philology and Introduction to the Science of Language, &c; Sweet, The History of Language (1900). In German, see Paul's Principien der Sprachgeschichte (Halle, 1880); Delbriick's Einleitung in das Sprachstudium (Leipzig, 1880; 4th ed., 1909; 5th ed., 1910; there is also an English version); Brugmann and Delbriick's Grundriss der vergleichenden Grammatik der indogermanischen Sprachen (1886-1900; a second edition of the first volume was pub- lished in 1897, two parts of vol. ii., including the stem- formation and declension of the noun and pronoun appeared in 1906 and 1909) ; also the works of W. von Humboldt and of H. Steinthal, the most important of whose linguistic works, Charak- terislik der hauplsachlichsten Typen des Sprachbaues (1861), was recast and brought up to date under the same title by F. Misteli (1893). See also handy summaries covering the same ground, but without bibliography, in F. N. Finck's Die Sprach- stdmme des Erdkreises (1909) and Die Haupllypen des Sprach- baus (1910). Many of the languages of India and Farther India have been treated in the Linguistic Survey of India, edited by Dr G. E. Grierson (a government publication still in progress). A short popular account of the subject is

given in Porzczinski's Einleitung in die Sprachwissenschaft (1910), a German translation of a Russian original. The Bantu languages have been treated by Black, Torrand, and most recently by Meinhof, whose Lautlehre der Bantu Sprachen (1910) is the most complete handling of the subject. As to the classifica- tion and relationships of languages, see Hovelacque's La Linguis- tique (Paris, 1876) and F. Miiller's Grundriss der Sprachwissen- schaft (Vienna, 3 vols. ; a fourth was left incomplete at the author's

death). Both works are already somewhat antiquated. As to the history of the study, see Lersch's Sprochphilosophie der Alten (1840); Steinthal's Geschichte der Sprachwissenschaft bei den Griechen und Romern (1863); Benfey's Geschichte der Sprach- wissenschaft mid Orientalischen Philologie in Deutschland (1869); Sandys's History of Classical Scholarship (3 vols., 1906-1908); Vilh. Thomsen's Sprogardenskatens Historien Kortpattitfranckling (1902). (W.D.W.)

II. — Comparative Philology of the Indo-European Languages. The study of Indo-European comparative philology has from its outset necessarily been in close connexion with the study of Sanskrit, a language unparalleled amongst its cognates in antiquity and distinctness of structure, and consequently the natural basis of comparison in this field. It is therefore not to be wondered at that we find no clear views of the mutual relationship of the individual members of the Indo-European family or their position with regard to other languages until Sanskrit began to attract the attention of European philologists, or that the introduction of Sanskrit as an object of study was closely followed by the discovery of the original community of a vast range of languages and dialects hitherto not brought into connexion at all, or only made the objects of baseless speculations. We meet with the first clear concep- tion of this idea of an Indo-European community of languages in the distinguished English scholar Sir William Jones, who, as early as 1786, expressed himself as follows: " The Sanskrit language, whatever may be its antiquity, is of wonderful structure; more perfect than the Greek, more copious than the Latin, and more exquisitely refined than either, yet bearing to both of them a stronger affinity, both in the roots of verbs and in the forms of grammar, than could have been produced by accident; so strong that no philologer could examine all the three

without believing them to have sprung from some common source which, perhaps, no longer exists. There is a similar reason, though not quite so forcible, for suppos- ing that both the Gothic and the Celtic, though blended with a different idiom, had the same origin with the Sanskrit.” 1 But neither Sir William Jones nor any of his older contemporaries who had arrived at similar conclusions ever raised this important discovery from a brilliant apercu into a valid scientific theory through a detailed and systematic comparison of the languages in question. To have achieved this is the undoubted merit of the German, Franz Bopp (q.v.), the founder of scientific philology of the Indo-European languages, and subsequently jari” through this example also the founder of comparative philology in general. Next to him Jacob Grimm {q.v.) must be mentioned here as the father of historical grammar. The first part of his famous Deutsche Grammatik appeared in 1819, three years after Bopp had published his first epoch- making book, Ueber das Conjugationssystem der Sanskritsprache. Bopp’s results were here at once utilized, yet Grimm’s whole system was entirely independent of that of Bopp, and had no doubt been worked out before Grimm knew of his illustrious predecessor. In fact, their scientific aims and methods were totally different. Bopp’s interest was not concentrated in comparison as such, but chiefly inclined towards the explanation of the origin of grammatical forms, and comparison to him was only a means of approaching that end.

In this more or less speculative turn of his interest Bopp showed himself the true son of a philosophical period when general linguistics received its characteristic stamp from the labours and endeavours of men like the two Schlegels and Wilhelm von lTumboldt. Jacob Grimm’s aims were of a less lofty character than those of Bopp, whose work, to his own mind, was crowned by his theory of the origin of inflexion through agglutination. In confining his task to a more limited range than the vast field of Indo-European languages embraced in

1 For this quotation and the following historical sketch in general see Th. Benfey, Geschichte der Sprachwissenschaft, p. 438 (Munich, 1869). and especially B. Delbruck, Introduction to the Study of Language, p. I (Leipzig, 1882; a fifth German edition appeared in

1909).

Bopp’s researches, and thus fixing his attention on a group of idioms exhibiting a striking regularity in their mutual relation- ship, both

where they coincide and where tihey differ, he made it his foremost object to investigate and illustrate the continuous progress, subject to definite laws, by which these languages had, been developed from their common source. He thus raised the hitherto neglected study of the development of sounds to an equal level with the study of grammatical forms, which had so far almost exclusively absorbed all the interest of linguistic research. Grimm's discovery of the so-called " Lautverschie- bung," or Law of the Permutation of Consonants in the Teutonic languages (which, however, had been partly found and pro-claimed before Grimm by the Danish scholar Rask), became especially important as a stimulus for further investigation in this line. Grimm's influence on comparative philology (which is secondary only to that of Bopp, although he was never a comparative philologist in the sense that Bopp was, and did not always derive the benefit from Bopp's works which they might have afforded him) is clearly traceable in the work of Bopp's successors, amongst whom Friedrich August Pott (1802-1887) is universally judged to hold the foremost rank. In his great work, Etymologise he Forschungen auf dem Gebiete der indo-germanischen Sprachen, mit besonderem Bezug auf die Lautum-wandlung im Sanskrit, Griechischen, Lateinischen, Liltauischen , und Gothischen (Lemgo, 1833-1836), we find Indo-European etymology for the first time based on a scientific investigation of general Indo-European phonology. Amongst Pott's contem- poraries Theodor Benfey deserves mention on account of his Griechisches Wurzellexicon (Berlin, 1839), a work equally remarkable for copiousness of contents and power of combination, yet showing no advance on Bopp's standpoint in its conception of phonetic changes.

A third period in the history of Indo-European philology is marked by the name of August Schleicher, whose Com- pendium der vergleichenden Grammatik der indo- „ Wefc i er germanischen Sprachen first appeared in 186 1. In the period subsequent to the appearance of Pott's Elymologische Forschungen, a number of distinguished scholars, too large to be recorded here individually, 2 had devoted their labours to the different branches of Indo-European philology, especially assisted and promoted in their work by the rapidly progressing Vedic (and Avestic) studies that had been inaugurated by Rosen, Roth, Benfey, Westergaard, Miiller, Kuhn, Aufrecht and others. Moreover, new foundations had been laid for the study of the Slavonic languages by Miklosich and Schleicher, of Lithuanian by Kurschat and Schleicher, of Celtic by Zeuss. Of the classical languages Greek had found a most distinguished representative in Curtius, while Corssen, Mommsen, Aufrecht, Kirchhoff, &c, had collected most valuable materials towards

2 The extensive progress made in this period is best illustrated by the foundation of two periodicals especially devoted to Indo- European comparative philology, Kuhn's Zeitschrift fur verglei- chende Sprachforschung (now 27 vols., Berlin, from 1851), and Kuhn's Beitrage zur vergleichenden Sprachforschung (8 vols., Berlin, from 1858). Benfey's school is more especially represented by the contributors to Benfey's Orient und Occident (3 vols., Gottingen, from 1862), and subsequently through Bezzenberger's Beitrage zur . Kunde der indogermanischen Sprachen (30 vols., Gottingen, from 1877); this journal has now been amalgamated with Kuhn's Zeit- schrift. The views of the " New Grammarians " — Leskien, Brug- mann, Osthoff and their schools — are represented in Indogermanische Forschungen (27 vols., since 1890). The Gottingen school has a further representative in Glotta, now (1910) in its third volume. The history of the meaning of words has a special periodical for itself, Wbrter und Sachen, now in its second volume. Besides those mentioned there are many journals, publications of academies, &c, in Belgium, Sweden, Denmark, Italy, &c, which no serious student of comparative philology can ignore. France possesses two periodi- cals of the same kind, the Revue de Linguistique (Paris, from 1868) and the Memoires de la Societe de Linguistique de. Paris (also from 1868), while England is represented by the Proceedings and Trans- actions of the Philological Societies of London and Cambridge, the Classical Review (23 vols., since 1887), and the Classical Quarterly (4 vols., since 1907), and America by the Transactions of the American Philological Association (from 1868), the American Journal of Philology (30 vols., from 1880), Classical Philology (5 vols., from 1 906),' and other more specialist organs.

the elucidation of Latin and the cognate Italic idioms. In his Compendium Schleicher undertook and solved the difficult task of sifting down the countless details amassed since the days of Bopp and Grimm, and thus making the individual languages stand out clearly on their common background, while Bopp's attention had been especially occupied with what was common to all Indo-European tongues. There are two prominent features which characterize this part of Schleicher's work — his assumption and partial reconstruction of a pre- historic parent speech, from which the separate Indo-European languages were supposed to have sprung, and the estab- lishment of a long series of phonetic laws, regulating the changes by which that development of the individual idioms had taken place. On Schleicher's views of and

contributions towards general comparative philology (which he erroneously proposed to consider as a branch of natural science) we need not enter here. (See Evolution and the Science of Language in Darwin and Modem Science, 1909, pp. 526 sqq.)

For some time after Schleicher's premature death (in 1868) Indo-European philology continued in paths indicated by him and Curtius, with the exception, perhaps, of the school founded by Benfey, who had always stood on independent ground. The difference between the two schools, however, was less strikingly marked in their writings, because it chiefly concerns general views of language and the Indo-European languages in particular, although the characteristic task of the period alluded to was that of working out the more minute details of com- parison; but behind all this the general interest still clung to Bopp's old glottogonic problems. In 1876, however, a new Hew Lin- movement, inspired in the first instance by the guistk works of W. D. Whitney, began, and a younger School. school of linguists has sprung up who are united in their opposition to many theories of the older generation, yet often differ materially both with regard to method and the solution of individual problems. In its present state this younger school (often branded with the name of Neo-Gram- marians, " Junggrammatiker," by its opponents real and imaginary) is marked by certain distinct tendencies. In the first place, they are inclined more or less, and the older members of the school perhaps more than the younger, to abandon glottogonic problems as insoluble, if not for ever, yet for the present and with the scanty means that Indo-European philo- logy alone can furnish for this purpose. In this they are in opposition to the whole of the older school. In the second place, they object to the use of all misleading metaphorical com- parisons of processes in the history of language with processes of organic development — comparisons used at all times, but especially cherished by Schleicher. In the third place — and this has been of the greatest practical importance — they hold that our general views of language and our methods of com- parison should be formed after a careful study of the living languages, because these alone are fully controllable in every minute detail, and can therefore alone give us a clear insight into the working of the different motive forces which shape and modify language, and that the history of earlier periods of language, consequently, can only be duly illustrated by trac- ing out the share which each of these forces has had in every individual case of change. Of these forces two are found to be especially prominent — phonetic variation and formation by analogy. They generally work in turns and often in opposi- tion to one another, the former frequently tending to differentia- tion of earlier unities, the latter to abolition of

earlier differences, especially to restoration of conformity disturbed by phonetic change. There are, however, other important differences in the action of the two forces. Phonetic change affects exclusively the pronunciation of a language by substituting one sound or sound-group for another. From this simple fact it is self-evident that phonetic changes as such admit of no exceptions. Pro- nunciation — that is, the use of certain sounds in certain combinations — is perfectly unconscious in natural unstudied speech, and every speaker or generation of speakers has

only one way of utterance for individual sounds or their combinations. If, therefore, a given sound was once changed into another under given circumstances, the new sound must necessarily and unconsciously replace its predecessor in every word that falls under the same rules, because the older sound ceases to be practised and therefore disappears from the language. Thus, for instance, the sound of the short so-called Italian a in English has become exchanged for the peculiarly English sound in man, hat, &c, which is so exclusively used and practised now by English speakers that they feel great difficulty in pro- nouncing the Italian sound, which at an earlier period was almost as frequent in English as in any other language that has preserved the Italian sound up to the present day. Again, the sound of the so-called long English a in make, paper, &c, although once a monophthong, is now pronounced as a diph- thong, combining the sounds of the English short e and i, and no trace of the old monophthong is left, except where it was followed by r, as in hare, mare (also air, their, where, &c), where the a has a broader sound somewhat approaching that of the short a in hat. This last instance may at the same time serve to illustrate the restrictions made above as to sounds changing their pronunciation in certain groups or combinations, or under given circumstances only. We may learn from it that phonetic change need not always affect the same original sound in the same way in all its combinations, but that neighbouring sounds often influence the special direction in which the sound is modified. The different sounds of the English a in make and hare are both equivalents of the same Old English sound & (= the Italian short a) in macian, hara. The latter sound has been split in two, but this process again has taken place with perfect regularity, the one sound appearing before r, the other before all other consonants. It is easy to see that the common practice of comprising the history of the Old English a in the one rule — that it was changed into the sound of the & in make except when followed by an r — can only be defended on the practical ground that this rule is convenient to remember, because

the words exhibiting the former change are more numerous than the instances of the latter; apart from this there is nothing to justify the assumption that one of these changes is the rule and the other the exception. The fact is, that we have two independent cases of change, which ought to be stated in two distinct and independent rules according to the different positions in which the original & stood before the splitting began. It is also easy to observe that the variety of modify- ing influences may be much more manifold than in the present instance of make and hare, and that the number of special phonetic rules in such cases must be increased in proportion to the progress made in the investigation of the said modifying powers.

In truth, however, the study of phonetic laws falls into several different stages, and the meaning attached to the phrase phonetic law has varied at each of these stages. Moreover, the sweeping nature of the original generalizations has become so hedged in and contracted by limitations that a recent writer has been compelled once more to formulate the question whether phonetic laws actually exist. It must be admitted in the first place that the word law has been ill chosen for use in this connexion. In phonetic laws there is no element which can be identified as coming under the definition of a law as propounded by a jurist like John Austin. There is no authority which enunciates the law, there is no penalty for the breach of it. But the philologists who first used the term were not thinking of law in its strict signification, but of its use in such metaphorical expressions as scientific laws, for, as already mentioned, Schleicher and his followers in the middle of the 19th century had taken a keen interest in the development of the natural sciences, and had to some extent assimilated their terminology to that employed in those sciences. It was, however, soon recognized that the laws of language and those of natural science were not really alike or akin. A scientific ” law ” is only a brief method of expressing the fact that universal experience shows that certain causes universally produce certain effects. In chemistry two atoms of

hydrogen and one of oxygen will make water, and they will make nothing else at any time or at any place the world over. Phonetic laws, however, do not hold true universally. They are often curiously limited in the area to which they apply. In ancient Greek, for example, the sound s between two vowels, which had been handed down from the original language whence Greek and the sister languages are

derived, regularly disappears; in Latin, on the other hand, it changes into r; thus an original genitive of a neuter substantive we find represented in Greek by ytve-os, a form which comparison with other languages shows to be traceable to an earlier *genes-os, preceding the separation of the languages, while the same original stem with a different vowel in the ending appears in Latin as gener-is. Similarly an early *euso appears in Greek as ewo, in Latin as uro. This disappearance of original intervocalic s pervades all Greek dialects — the apparent exceptions come under the heading of analogical change; with a very few exceptions similarly explic- able Latin intervocalic .y has become r. But Latin was originally limited to a very small part even of Italy, and the next neigh- bours of the Latins on the east and south— the Sabines, Cam- panians and Samnites — retained this intervocalic 5 without changing it into r. On the other hand, the neighbours to the north-east — the Umbrians in and beyond the Apennines — shared in this rhotacism. Yet the Celts, who bordered on the Umbrians along the Po, and who spoke a language in many respects very closely akin to the dialects of Italy, in this regard agree rather with Greek than the Italic languages. In Latin, again, the period of action of the law which changed intervocalic s into r did not in all probability exceed the century from 450 B.C. to 350 B.C. So unlike, indeed, are phonetic laws to the laws of natural science in universality that an opponent of the dogma which declares that phonetic laws have no exceptions has compared them with the laws of fashion. The comparison is not so outrageous as it may seem at first sight. For in language there are two kinds of sound change, that which is unconscious, universal at a given time and within a given area, and, on the other hand, that which belongs only to a particular class or clique, deviates consciously from the pronunciation of the majority, is therefore not universal, and exercises no permanent influence on the language. The second kind of sound change corresponds exactly to the laws of fashion; it is in fact one of them. Such sound changes are the pronunciation of the English ending -ing as in', which was fashionable in the middle of the 19th century. This had, though probably without the know ledge of those who used it, an historical justification in the earlier forms from which most of the English words now ending in -ing are descended, and which survive in numerous local dialects. A similar conventional mispronunciation was the lisp affected by some would-be artistic persons at a somewhat later period. Belonging to an entirely different social stratum, and now equally obsolete, was the London pronunciation of the first half of the 19th century typified in Tony and Sam Weller's treatment of v and w in the Pickwick Papers. This, however, made a much nearer approach to being a genuine dialect peculiarity. It undoubtedly pervaded the pronunciation of the

lower classes in London at one time; had it survived it might conceivably have spread over a wider and wider area until it embraced the whole population of England. A later change, that of the diphthong ai into ei (so that day, daily are pronounced dy, dyly), has spread from Essex and the East End of London over a large part of London and of the adjacent counties, and is still widening its range both geographically and socially. The history of these sound changes has not yet been investigated in detail with the thoroughness which it deserves.

There is, then, a part of sound change which is a matter of fashion and which is conscious. This sound change app°ars frequently in the pronunciation of individuals who have migrated from one part of a country to another. In many parts of Scotland, for example, the prepositions with and of appear in dialect only in the forms wi' and 0', which were originally the unaccented forms. In the conscious attempts tc pronounce them as they appear in literary English, the educated Scotsman,

if he remains in his native place, as a rule pronounces them as with (with the final sound unvoiced as it appears in the Scottish legal preposition outwith) and as off, the final sound here also being unvoiced. If he migrates to England or to Australia he will probably in course of time adopt the pronunciation with a voiced final sound. In the course of years habit will become second nature, and in this respect the speaker's pronunciation will become identical with that of his neighbours. It is clear, however, that changes of this nature cannot take place on a large scale. If a large number of persons migrate in a body and continue to live in close intercourse with one another and but little in contact with the outside world, changes such as take place in the pronunciation of the individual emigrant do not occur. There can be no imitation of alien sounds, for there are none; no greater effort to be intelligible is required, for the audi- ence has not changed. Hence it has been often remarked that a population which history shows to have remained undisturbed for very long periods in the same geographical situation manifests but little change in its language. Thus in Arabia and Lithuania the population has remained practically unmixed in the same habitat for thousands of years, with the result that the languages spoken there remain at the present day the most archaic members of the linguistic families to which they respectively belong.

From what has been said it will be obvious that a phonetic law is only an observed uniformity in the treatment of a sound or a combination of sounds within a linguistic area at a given time. In the definition the

term linguistic area is a very variable quantity. Thus it is a phonetic law that a sound of the original Indo-European language, the precise pronunciation of which cannot be determined, but which was at any rate a palatal sound (k), appears in the Indo-European group (Sanskrit, Zend, Old Persian, with their descendants), in Armenian, in Balto-Slavonic and Albanian, in the form of a sibilant, while in Greek, the Italic dialects, Germanic and Celtic, it appears as a &-sound (see Indo-European Languages). Here the linguistic area is extremely wide, and it is clear that the difference between the two groups of languages must be dated back to a very early period. Again, it is a phonetic law of Greek that the original combination st- at the beginning of words is retained in Greek. How then are we to explain the existence side by side of areyos and rkyos ? The former apparently complies with the law, the latter does not. The former has by its side the verb OTkyui, while rkyos is supported only by the rare Tkyrj. Yet the forms of the verb and substantive found in the Germanic languages leave no doubt that the forms without 5- represent an extremely old form, for the English thatch could not have changed its original t- into th- if it had been preceded by s-, the law being as strict for English as for Greek that initial st- remains unchanged. On the other hand, a phonetic law may be limited to a very small area. Thus in the dialect of Eretria, and nowhere else within the area of the Ionic dialect of ancient Greek, do we find the change of the sound which appears elsewhere in Greek as a between vowels into p: airrjpiv for alm/aw (ace. sing.), ira.pa@aLvwpiv for irapaˆalvooaiv (3rd pi. subjunctive). Why this change should take place here and nowhere else we do not know, although it may be conjectured that the cause was a mixture with immigrants speaking a different dialect, a mixture which ancient tradition supported. Undoubtedly such mixtures are the chief conditions of phonetic change, the effect of which is universal. The manner in which the change takes place is that the basis of articulation, the method in which the sound is produced, becomes changed. Thus along the ” Highland line ” in Scotland, where the English and Gaelic-speaking populations had their linguistic frontier for centuries, the wh- of English, the, Anglo-Saxon hw-, becomes universally /-, wha ? becoming fa ? white, fite, &c.,/ being the sound which it was most easy to substi- tute for the difficult hw-. The history of Spanish in the different communities of South America excellently illustrates this point. After the discovery of America there was a large influx of Spaniards into Chile, who ultimately, and chiefly by intermar- riage, incorporated amongst them a considerable element from amongst the native Araucanian Indians. The result has been

that the language of Chile is Spanish, pronounced not with the genuine sounds of Spanish, but with the sounds of the Araucanian language substituted for them. Elsewhere in Spanish America the language of the conquerors remained comparatively pure, because the Spaniards were much fewer in number, and had therefore to maintain themselves as a caste apart. For the same reason Latin has split up into the numerous branches which we know as the Romance languages. The particular line of development which, e.g. French followed as compared with Spanish or with the language of the Rhaetian Alps was condi- tioned by the nature of the sounds in the language which pre- ceded it in the same area, and which was spoken by the ancient Gauls who adopted Latin. The difficulty found in all of these cases is precisely of the same kind as that which an adult at the present day speaking one language finds in attempting to learn the pronunciation of another language. On the one hand, it is only with the greatest difficulty that muscles for many years accustomed to perform one set of movements can be forced into performing another set which are very similar but yet not identical; on the other hand, to an untrained ear the difference between the two sounds may remain unappreciated. The result is that the new language is pronounced with the sounds of the speaker's original language. If the new language is adopted by a whole people to whom it was originally foreign, the children naturally learn it from their parents with the sounds of the old language which has now become obsolete. Thus the basis of articulation is changed,, and if, as was the case with Latin, this process be frequently repeated among peoples speaking languages with articulation widely differing one from another, it is clear that a series of different dialects of the adopted language has been created. This kind of change is immediate and universal throughout the whole area where linguistic change has taken place.

Analogical change, on the other hand, does not affect the pronunciation of a language as a whole in the way that phonetic change does, but is confined to the formation, inflexion, syntax and meaning of single words or groups of words, and therefore is very apt to bear an entirely arbitrary and irregular character. A few instances will be sufficient to illustrate this and also to show how the apparently irregular phenomena of analogy may be classified, (a) In Old English a certain number of substantives formed their plurals by mutation of the root vowels, as fot, fit, or boc, bee. In Modern English this system of inflexion has been preserved in some cases, as in foot, feet, and altered in others, as book, books. Now, while foot, feet and book are the regular modern phonetic equivalents of the old fot, fit, boc, the

plural books can in no way be phonetically traced back to the old bee, the phonetical equivalent of which in Modern English would be *beech. The only possible explanation of a form like books is that the older bee was at some date given up and replaced by an entirely new formation, shaped after the analogy of the numerous words with a plural in -5 without modification of the root-vowel. Such changes, which are very numerous, exemplify the first kind of analogy, which is generally termed formal analogy. Other examples are the almost entire disappearance from the language of the forms in er and en, which were earlier used as plurals in English. That they were originally stem and not case suffixes does not affect the point. In Middle English, as in Modern English, oxen was spelt as a plural; oxen survives, but eyen, except in such dialect forms as the Scotch e'en, has been replaced by the form in -s: eyes. Similarly in Middle English the suffix -er existed in many words which had been originally of the neuter gender. Thus the plural of child was childer, of calf was calver, traces of which, besides the survival in dialect of childer and of calver (become by the 16th century in northern Scotch -car — pronounced as cahr — which is still in common use), are to be found in the place, and hence personal, names Childer-ley and Calver-ley. The old plural of brother was brether, where the suffix, however, contained an original -r, not -s changed into -r, as did childer and calver. In Old English, alongside the form for child making a plural childer, there had been a masculine form making its plural in s. It would not have been surprising there

fore if in Modern English the plural of child had been childs. But in spite of the common tendency to make the plural of all noun- stems in -s, child has gone in the opposite direction and has not only maintained its -r, but has added to it the -en of stems like oxen and eyen. In Wiclif we find a similar plural to calf, calveren, but here calves has long replaced in the literary language both the earlier forms.

(b) Let us now take another instance from the English verb. In Old English the different persons of the preterite indicative in the so-called strong (irregular) verbs were generally distin- guished by different root-vowels; ridan, " to ride," and bindan, " to bind," for instance, form their preterities thus; ic rod, 5m ride, he rod, we, ge, hie ridon, and ic band, 5u bunde, he band, we, ge, hie bundon. In modern English this difference in the root- vowels has been abandoned, and rode, bound now stand for all persons, rode being the modern phonetic equivalent of the 1st and 3rd sing, rod, while bound represents the u- form of bindan. When one form or set of forms ousts other varying forms from the same paradigm, the change is described

variously as material or logical analogy. Inasmuch as a similar process of levelling to that seen in rode has been carried through in all preterites of Modern English, regularity prevails even here, though a few traces of the old conflict are still visible in such poetic forms as sung for the preterite side by side with sang. But when we look to its results in the individual verbs we soon find that the choice amongst the different forms which might have served as starting-points has been entirely arbitrary. It is indeed impossible to say why the old singular form should have been chosen as a model in one case, as in rode, and the old plural form in another, as in bound. From these and numerous similar instances we must draw the conclusion that it is beyond our power to ascertain whence analogical changes start, and to what extent they may be carried through when once begun. All we can do is to classify carefully the single cases that come under our observation, and in this way to investigate where such changes are especially apt to take place and what is their general direction. As to the latter points, it has been observed before that levelling of existing differences is one of the chief features in analogical change (as in the case of rode and bound). As to the former, it must be borne in mind that, before any ana- logical change can take place, some mental connexion must exist between the words or forms serving as models and those which are remodelled after the types suggested to the minds of the speakers through the former. Of such natural mental combina- tions two classes deserve special notice: the mutual relationship in which the different, say inflexional, forms of the same word stand to each other, and the more abstract analogies between the inflexional system of word-groups bearing a similar character, as, for instance, the different declensions of nouns and pronouns, or the different conjugations of verbs. The instance of rode, bound may serve to illustrate the former category, that of books the latter. In the first case a levelling has taken place between the different forms of the root-vowels once exhibited in the different preterite forms of ridan or bindan, which clearly constitute a natural group or mental unity in consequence of their meaning. The form of rode as a plural has simply been taken from the old singular rod, the long a of which has become in Modem English 6, that of bound as a singular from the old plural bundon, the u- sound of which has in Modern English come to be pronounced as a diphthong. In the case of book, books for boc, bee, this explanation would fall short. Although we might say that the vowel of the singular here was carried into the plural, yet this would not explain the plural -5. So it becomes evident that the old declension of boc, bee was remodelled after the declension of words like arm, arms, which had always formed their plurals in s. The changes indicated may generally be shown by a proportion, the new analogical

formation being the unknown quantity to be ascertained. Thus in the case cited above, arm: arms = book: *; and clearly the form to be ascertained is books. Isolated words or forms which are no part of natural groups or systems, inflexional, formative or syn tactical must be regarded as commonly safe from alterations

through analogy, and are therefore of especial value with regard to establishing rules of purely phonetic development.

(c) In syntactical analogy the mental ˆconnexion between the two series of constructions between which the change takes place is generally still more conspicuous. The connexion may be one of similar or of contrasted meaning. In Latin, adjectives of fullness, like other adjectives, no doubt originally were followed by the genitive case; participles, on the other hand, were followed by the instrumental ablative. Thus Plautus in the Aulularia 813 and elsewhere could say aulam auri plenum, ” a pot full of gold,” or 802 aulam onustam auro, ” a pot laden with gold.” From these the transition was easy to the construction aulam onustam auri, as if in English one should say (as was possible in Earlier English), ” a pot laden of gold.” In English, con- trasted words often tend to assimilate their syntactical construc- tions. Thus, the adjectives like and similar are followed by the preposition to (though in Modern English like need have no preposition), and upon the analogy of such words, different and averse, with which correct speakers and writers couple from, are by no means rarely followed by to. Nor is it uncommon to hear or to see differ with instead of differ from, upon the analogy of agree with. Curiously enough, Latin, from which differ is descended, is found to follow the same analogy even in good writers. Thus Cicero (Academica Pr. ii. 143) combines dissidere with cum, as later does Seneca (Epistulae, 1 8. 1) .

(d) In the development of analogy in meaning, similarity of sound is often the effective cause. Thus impertinent is properly irrelevant, not to the point, and is still so used in legal language; its more common signification of ” saucy ” arises from its accidental resemblance in sound to pert, a word which curiously enough has reversed its meaning, being now used in the sense of mal-apert, while the Old French apert, aspert (a confusion of Lat. apertus, ” open,” with experlus, ” skilled “), meant both ” open ” and ” skilful.” Thus from very early times the verbs fly and flee have been confused, though they are of entirely different origins. When Middle English began to lose its verb endings in en, it was very easy for the verb leren, ” teach,” and lernen, ” learn,” to be confused. Hence frequently in Eliza bethan English learn stands side by side with teache in the same signification. Cf . Tottell’s Miscellany, p. 1 2 9 (Arber) :

” I would not have it thought hereby

The dolphin swirame I meane to teache : Nor yet to learn the Fawcon

fiie : I rowe not so farre past my reache.”

It is true that the distinction between phonetic and analogical change has always been acknowledged in comparative philology. At the same time it cannot be denied that analogical changes were for a long time treated with a certain disdain and contempt, as deviations from the only course of development then allowed to be truly ” organic ” and natural, namely, that of gradual phonetic change (hence the epithet ” false ” so constantly attached to analogy in former times). Amongst those who have recently contributed most towards a more correct evaluation of analogy as a motive power in language, Professor Whitney must be mentioned in the first place. In Germany Professor Scherer (Zur Geschichte der deutschen Sprache, 1868) was the first to apply analogy as a principle of explanation on a larger scale, but in a wilful and unsystematic way. Hence he failed to produce an immediate and lasting impression, and the merit of having introduced into the practice of modern comparative philology a strictly systematic consideration of both phonetic and analogic changes as co-ordinate factors in the develop- ment of language rests with Professor Leskien of Leipzig, and a number of younger scholars who had more or less School. experienced his personal influence. Amongst these Brugmann, Osthoff and Paul rank foremost as the most vigorous and successful defenders of the new method, the correctness of which has since been practically acknowledged by most of the leading philologists of all shades of opinion.

While the syntax of individual languages was one of the first features which attracted the grammarians’ attention, at any rate in so far as particular authors differed from a given

standard, it is only in very recent times that syntax has received methodical treatment from the comparative point of view. It may indeed be said that almost the whole fabric of the comparative syntax of the syntax. Indo-European languages as it exists to-day has been reared by one man— Professor Berthold Delbrtick of Jena. In a series of brilliant studies beginning with a pamphlet on the Locative, Ablative, and Instrumental, published in 1867, and continued in his Syntactical Researches (Syntaktische Forsch- ungen) in five volumes, comprising a treatment of the ■conjunctive and optative moods in Sanskrit and Greek (1871), the theory of the Sanskrit tenses (1877), the order of words in early Sanskrit prose (Catapatha Brahmana; 1878), the founda- tions of Greek syntax (1879), and the syntax of the oldest San- skrit (Altindische Syntax), dealing exclusively with the literature of the Vedas and Brahmanas (1888), Professor Delbrtick laid the foundations for his treatment of comparative syntax in three

volumes (1893, 1897, 1900), which has formed the completion of Brugmann's Grundriss der vergleichenden Grammatik der indogermanischen Sprachen. The only work by another hand (on a large department of the subject) which deserves to be mentioned by the side of Delbriick's studies is the small treatise by Htibschmann on the theory of the cases {Zur Casuslehre, 1875). For the comparative neglect of this field of investigation there are several reasons. The earlier philologists had so much to do in determining the languages which should be included within the Indo-European group, and in organizing the field of research as a whole, that it is not to be wondered at if they were unable to devote much attention to syntax. In the 'seventies, when attention began to be more directed towards comparative syntax, the remarkable discoveries made by Verner with regard to accentuation, and by Brugmann, Collitz and others with regard to the phonology of the Indo-European languages, again distracted attention from the subject. Moreover, the research in itself is infinitely more difficult than that into sounds and forms; for the latter may be carried on by the help of grammars and dictionaries with a comparatively small knowledge of the literature of any individual language, while on the other hand the study of syntax is impossible without a thorough and intimate knowledge of the literature and modes of expression in each separate language. It is not, therefore, matter for wonder that Delbrtick has confined himself in the investigation of syntax to a part only of the lan- guages whose sounds and forms are discussed by Brugmann in the earlier volumes of the Grundriss. To cover the whole ground is beyond the powers of a single man, and there is a great lack of preliminary studies on the syntax of many of the languages.

One of the most difficult problems connected with syntax, but primarily, as it appears, a question of morphology, is the origin of grammatical gender. It cannot be said to be an advan- tage to the languages which possess it, while languages which, like English, have dropped it except for an occasional metaphor, suffer no loss. Nor is the problem confined to the history of gender in the substantive. Even more perplexing is the intro- duction of gender into the adjective. The pronouns of the first and second persons, which are certainly very old, show no trace of gender; the pronouns of the third person, which are more of the nature of deictic adjectives, generally possess it. To the question how grammatical gender arose in the substantive, the answer was till comparatively recently supposed to be that primitive man was given greatly to personification, endowing inanimate things with life and attributing to them influences benign or the reverse upon his own existence. The answer is not quite sufficient, for though this tendency

to personification, which philologists have perhaps unduly decried or altogether denied, might account for life being attributed to inanimate objects, it hardly explains why some should be treated as mascu- line and others as feminine. Nor is it true, as has also been suggested, that in the case of the lower animals the generic name for the larger and stronger animals is masculine and that for the smaller or weaker feminine. In both Greek and Latin the wolf

is masculine and the fox feminine, but the lamb or the chicken which the fox robs from the fold or the henroost is rarely feminine, generally masculine. Nor does this explanation account for the mouse in those languages being of the masculine gender, while the ferret or cat which caught them is feminine (ya\rj, feles). An explanation which completes the theory of personifi- cation, if it does not altogether drive it from the field, has been put forward by Brugmann. 1 In its briefest form this explana- tion is that gender was attached to certain suffixes because they chanced to occur frequently in words which markedly implied sex. In the Indo-European languages the commonest suffix indicating feminine gender is a. According to this. theory it had originally nothing to do with gender, but as some early words for woman or wife ended with this sound it came to be identified with feminine gender. Similarly the ending os in o-stems occurred often in names connected with males and so became identified with the masculine gender. But many stems indicate either gender indifferently, and even the very old sex words father and mother have the same ending. But when masculine and feminine endings have been attached to certain suffixes in this way, how comes it that in one series of stems the neuter should be marked not by an absence of all suffix but by a separate suffix in -m ? These are the o-stems, other forms of which have been markedly identified with the masculine gender. As this characteristic, like the others mentioned, goes back apparently to a time before the separation of the Indo-European languages, explanation can hardly pass beyond speculation. It is, however, to be noted that the neuter form of the nominative is phonetic- ally identical with the accusative form of the masculine, and it has been ingeniously argued 2 that such forms were used originally in the accusative, such neuters not forming the subject to a verb. To the same writer the most plausible explanation of the presence of gender in the adjective is due, viz. that gender began with the deictic pronoun *so ” that man,” *sa ” that woman,” and that hence it passed to the adjective with which the pronoun was so frequently

accompanied. If this explanation be right, analogy has brought into the Indo-European languages the useless multiplication of gender marks in such sentences as the Latin hae pulcrae feminae caesae sunt, where the feminine gender is indicated no less than four times without any obvious gain over the English These fair women were slain, where grammatical gender is no longer obviously indicated at all.

Closely related to this question is that of the history of the neuter plural, which was first fully worked out by Professor Johannes Schmidt of Berlin. 3 The curious construction, most common in ancient Greek, whereby a neuter plural is combined with a singular verb, is now demonstrated to be an archaic survival from the time when the neuter plural was a collective singular. Thus a word like the Latin iugum was a single yoke, the plural iuga, however, which was earlier iuga, was a collection of yokes, with the same final a as is found generally in feminine substantives. The declension ought therefore to have been originally: nominative iuga, genitive iugas, &c, like mensa, &c, of the first declension. But as iuguum was used in the neuter singular for both nominative and accusative, iuga when it was felt as the corresponding plural was used for the accusative as well as the nominative, while the other cases of the plural were taken over from the masculine o-stems, with which the singular neuter in -o-m was so closely connected. That collective words should be used for the plural is not surprising; the English youth, first an abstract, next a collective, and finally an individual, is a case in point.

For the early history of the syntax of the verb Greek and Sanskrit are important above all other languages, because in them the original forms and the original usages are better pre- served than they are elsewhere. And it is in the verb that the great difficulty of comparative syntax present themselves. The ■ noun system is so well preserved in several languages that, when

1 Techmer's Internationale Zeitschrift fur Sprachwissenschaft, iv. ioo.

2 B. I. Wheeler, Journal of Germanic Philology, ii. 528 sqq. * Pluralbildungen der indogermanischen Neutra (1889).

the number of the original cases had once been determined, the sifting of the pro-ethnic usages attaching to each case was tolerably easy, for besides Sanskrit and (to a less extent) Latin, Lithuanian and Slavonic have kept the pro-ethnic case system almost complete. The ideas also which had to be expressed by the cases were on the whole of a very concrete character, so that here the problem was much simplified. On the other hand, the ideas-expressed by the forms of the verb are of a

much more subtle nature, while the verb system in all languages except Greek and Sanskrit has broken down earlier and more completely than the noun. It is clear that the verb of the original Indo-European language possessed two voices, and forms correspond- ing to what we call the Indicative, Subjunctive, and Optative moods, and to the Present, Imperfect, Future, Aorist, and Perfect tenses. The imperative mood seems primitively to have been confined to the second person singular, just as the vocative, which, like the imperative is a stem form without suffix, was confined to the singular. The infinitive, as is well known, is in all languages of this system not originally a verbal but a substantival form. The pluperfect, where it has developed, seems to be a mixed form arising from the application of aorist endings to a perfect stem. Thus far the history of the verb system is tolerably clear. But when we attempt to define the original meaning of the moods and of the tenses we pass into a region where, in spite of assiduous investigation in many quarters during recent years, the scanty amount of light thrown on the problem has only served to make the darkness visible. As regards the tenses, at least, it has been shown that without doubt there is no difference in formation between present, future and aorist stems, while the earliest meaning cf the perfect was that of a special kind of present expressing either repeated or intensive action or a state. It has also been proved that the original meaning of the aorist is not past in time, and that in fact the only element whereby these languages could express remoteness in time was the augment. The augment seems to have been originally a pronominal deictic particle. Thus, as there was no original pluperfect, as neither perfect nor aorist originally referred to past time, and as the future, except in Lithuanian (with slight traces in Slavonic) and the Indo-Iranian group, cannot be clearly distinguished from the aorist, the system as a method of expressing time absolutely breaks down. The tenses in fact did not originally express the times when the action took place, but the type of action which took place. Thus the present system in the main expressed continued or durative action, the aorist only the fact that the action had taken place. The action indicated by the aorist might have been of consider- able duration, or it might have been begun and ended in a moment; its characteristics in this respect are not in any way indicated by the aorist form, which intimates only that the action is viewed as a completed whole and not as a continuous process. The present system, however, is built up in a great variety of ways (thirty-two according to Brugmann's enumeration). It is a priori unlikely that such a multiplicity of formations had not originally some reason for its existence, and Delbriick thinks that he has discovered a difference in syntactical value between various forms. The reduplicated present forms of the type seen in Sanskrit

jigali, Greek f>i5co,ui, &c, he regards as expressing originally an action which consisted of repeated acts of the same nature (iterative), though this iterative meaning frequently passed into an intensive meaning. Presents of the type seen in Sanskrit tr' syali, " is thirsty," and Greek x a 'P &, > " a m g' a d " (for *xap#d), where the 1 (y) of the suffix has modified the first syllable and disappeared, he regards as cursive — i.e. they express continuous action without reference to its beginning or end. Verbs which have regard to the beginning or end of the action he calls terminative, and finds them represented (a) in verbs with » suffixes, Sanskrit rnoli, 6pvwn, " sets in motion," Hyvv/ XL, " break to pieces "; (b) in verbs with the suffix -sko~, Sanskrit gdchati, " goes " (to a definite destination), Greek fia.o:ia>), &c. The roots he classifies as momentary (punktuell) or non-momentary, according as they do or do not express an I action which is begun and ended at once.

This method of classification was no doubt suggested in the first instance by the characteristics of the Slavonic verb system. In this system a clear distinction is drawn in nearly all verbs between those which express a process (durative verbs) and those which express a completed action (perfective verbs). When perfective and durative verbs are formed from the same root, the perfective are distinguished from the durative forms (a) by having a preposition prefixed, or (b) by having a different stem forma- tion. Thus in the Old Bulgarian (Old Ecclesiastical Slavonic) to- strike (hit) and- to strike dead are expressed by the same verb, but in the latter meaning a preposition is found which does not appear in the former, biti (infinitive), "to strike"; u-biti, "to strike dead." To strike is durative; to strike dead is perfective. As an example of difference of stem formation expressing this difference of meaning, we may quote sesti, " to sit down " (perfective), sedlei, " to sit " (durative). Verbs with a suffix in n have often a perfective meaning: cf. the Sanskrit and Greek verbs quoted above. The perfective verbs correspond in meaning to the Greek aorist, and are to be carefully distinguished from perfect forms. The same distinction of meaning is often achieved in other languages also by means of prepositions, e.g. in Latin (Seneca, Epp. xciii. 10), Quid autem ad rem perlinet, quamdiu vites, quod evitare non possis? " What does it matter how long you go on avoiding [durative] what you cannot escape [perfec- tive]." From this example, however, it is clear that, though the means employed to make the distinction are different, there is no difference in meaning between such perfective

verbs and those classified by Delbriick as terminative. Here, as in many other parts of this study, the ideas are new, and grammatical terminology has not yet sufficiently crystallized, and still leaves something to be desired both in clearness and in precision.

As regards the moods, the difficulty has been to find any criterion whereby the functions of one mood should be differen- tiated from those of the others. It has long been recognized that the difference between indicative and subjunctive is one of meaning and not one of formation; that, e.g., in Sanskrit bharati (3rd sing. pres. indie), “bears,” is morphologically identical with hanati, “may slay” (3rd sing. pres. subj.), and that the latter is described as a subjunctive only because of the meaning, and because there exists a dissyllabic form, hanti, which makes the indicative ” slays.” Similarly in Greek it is impossible to distinguish morphologically between irabaoi, ” I shall check” (fut. indie.) and xavaca, ” let me check” (1st aor. subj.). Moreover, in the earliest forms of the languages which preserve the moods best (Greek and Sanskrit), the connexion syntactically between the indicative and the subjunctive forms is closest. Not only does the future express futurity, but also the determination of the subject to carry out the action expressed, which, in Delbriick’s discussion of the moods, is precisely the point chosen as characteristic of the subjunctive. On the other hand, the present optative differs from the present (and future) indicative and present subjunctive in having a special mood suffix, and in having secondary while they have primary personal endings. Nevertheless its meaning overlaps that of the other forms, and some excellent authorities, like Professor W. W. Goodwin, see in future indicative, subjunctive and optative only different degrees of remoteness inthe future, the remoteness being least in the future and greatest in the optative. Delbriick, however, abides, with slight modifications, by the distinction which he propounded in 187 1 that the subjunctive expresses Will and the optative Wish. Here again the problem has not been solved, and it is doubtful how far any definite solution is likely to be arrived at, since there are so many gaps in our know- ledge of mood forms. These gaps, owing to the break-up of the system at so early a period, it is hardly probable we shall ever be able to fill. It is possible, however, to do a great deal more than has yet been done even in the most familiar languages. In Latin, for instance, even now, the facts for the uses of the moods within the two centuries of the classical period are very imperfectly known, and it is no exaggeration to say that more has been done in the last hundred years for Sanskrit than has been done in two thousand years of continuous study for Latin or Greek.

A still later addition to the domain of Philology — the study of

meaning — presents fewer difficulties, but until recent years has been equally neglected. The study is so recent that the literature of the subject is still extremely small. The only attempts to deal with it on a large scale are M. Breal's JEssai de Simantique (1897), now translated into English under the title of Semantics (1900), with a valuable introduction and appendix by Dr Postgate, and M. de la Grasserie's Essai d'une Simantique integrate (1908), a work which deserves mention for its attempt to make a thorough classification and a corresponding termino- logy for semantic phenomena, but the value of which is much diminished by hasty compilation and imperfect knowledge of many of the languages quoted. From the practical point of view many of the phenomena have been classified in works on rhetoric under the headings of Metaphor, Synecdoche and Metonymy. The psychological principle behind this superficial classification is that of association of ideas. Here, as elsewhere, changes proceed not by accident, but according to definite principles. Here, as elsewhere in language, in history, and the other moral sciences, the particular principle in operation can be ascertained only by beginning with the result and working back to the cause. In the development of meaning much more than in phonetics is this necessarily the case. In phonetics all speakers of the same dialect start with approximately the same sound. But the same combination of sounds which we call a word does not recall the same idea to all persons who use that word. The idea that the phrase railway station calls up in the mind of a Londoner is very different from that which occurs to the mind of a child acquainted only with a wayside station serving the wants of a country village of a few hundred inhabitants. The word herring suggests one idea or train of ideas to the fisherman who catches the fish, another to the merchant who purchases it from the fisherman, a third to the domestic who cooks it, and so on. To members of the same family the same word may often have widely different associations, and, if so, the metaphors for which the word will be employed will differ in each case.

For the history of meaning it is necessary to have regard to all the forms of association of ideas which psychology recognizes. These are contiguity in place or in time, resemblance and contrast. Contrast, however, as J. S. Mill and Bain have shown, is not a simple form of association, but is evolved partly from contiguity, partly from resemblance. An artificial hollow generally implies also an artificial height made of the materials excavated from the hollow. Hence in most languages some words occur with the two contrasted meanings. Thus in English we find dyke in use both for a ditch and for a mound fronted by a ditch, the word ditch being, in fact, but a dialectal form

of dyke. In Scotland, on the other hand, where earthen mounds and stone walls form more frequent boundaries between fields than in England, the word dyke is now practically limited to elevated boundaries, while ditch is limited to excavated boundaries. Thus the proverb, ” February fill dyke,” which in England implies that the February rains will fill the ditches, is often under- stood in Scotland to mean that in February the snow will be level with the tops of the stone or turf walls. Similarly in Latin Tacitus can say fossas proruere, which can only apply to levelling raised mounds; while in Greek Xenophon also talks of the ditch (trench) thrown up (Taxfrpos a.va.fitfikqij.k.vri). It is only natural, therefore, that other words with several mean- ings should be used similarly: moat, originally a mound of earth or peat, has come to mean a big ditch; while, conversely, soldiers in trenches are not so much in ditches, as the word ought to signify, as behind breastworks. Sometimes, when two actions opposed to one another are contiguous, a word seems to change to the exact opposite of its original meaning. Thus the English verb wean, which meant originally to accustom (to cooked food), has been transferred to the necessary preliminary, to dis- accustom to the breast.

Resemblances may be (i.) genuine, and (a) of external appear- ance, or (b) of other characteristics; or (ii.) fanciful or analogical. From resemblance in the external appearance of the object, the word gem, which in Latin (gemma) usually means a bud, has

come to mean first a pearl and then by extension of the meaning any precious stone. From the concentric coats which appear in both, the Latin word for a pearl (unio, ace. unionem) appears in English as onien. Examples where the characteristics are not of external appearance are such as the German kaiser and the Russian tsar, which are descended from Julius Caesar, while the Lithuanian word for king — karalius — is Carolus, i.e. Charle- magne. So in modern Persian, Xusrev, ” Lord,” comes from the Zend proper name Husravah (Chosroes). As already pointed out, the resemblances which have established a connexion between pert and impertinent (properly irrelevant) are in sound only. The same is true of the supposed relation of the verb cut to cutlass, cutler and cutlet. While train oil really means oil in drops like tears (cf. German Thrdne), most people connect it with railway trains. The resemblance in some cases is merely in function. Thus, though the fir and the oak have no resem- blance one to the other, the word fir is now generally identified with

the Latin quercus in etymology (cf. four and quattuor), in the same way as the Latin fagus, ” beech,” is with the Greek 4 > r]y6s, ” oak,” the users of the word having, in the course of their migrations, passed from a land with oaks to a land with firs in the one case, and from a land of beeches to a land of oaks in the other. Resemblance as the basis of metaphor has a very widely extended influence on language.

The most numerous and most varied forms of change in mean- ing depend, however, upon the law of contiguity. Perhaps the commonest of all forms of contiguity is that where the word indicating some accompanying feature or condition replaces the word for the object referred to. In the countries that border the Mediterranean the heat of midday is accompanied and intensified by the dying away of the wind, a characteristic remarked upon by Aeschylus (Agam. 565): ” What time upon his noonday couch, windless and waveless sank the sea to rest.” From the Greek word KaOjua, ” burning heat,” arises through Late Latin the English calm, where the absence of wind is the only idea present, that of heat having altogether disappeared. Again, in bugle, which is abbreviated for buglehorn, the word which survives properly means wild ox, and the originally more important element is lost. In a combination like silver bugle the word has gone a stage further; the original meaning of horn has also disappeared. There is no longer any thought of an animal’s horn; the only idea that survives is that of a musical instrument. From the cope or cloak (capella) of St Martin, which was preserved as a sacred relic by the Frankish kings, comes the word chapel. The word was first transferred from the cloak to the holy place .wherein it was kept, and thence to similar shrines, and ultimately to any place, not being a church, where prayers were said. A jig was originally not the dance, but the fiddle which supplied the music for the dance. The names of liquors are often replaced by some accompaniment as of the place, port, sherry, champagne, or by a qualifying adjec- tive as in brandy, properly ” burnt,” from the Dutch brande- wijn; or, again, only the less important element of the word is retained as in whisky, literally ” water,” for the older usque- baugh, a corruption of Gaelic words meaning the ” water of life ” {aqua vitae). Replacement of substantives by their accompany- ing adjectives is common in most languages. One of the most commen methods of coining a name for a new article is to give it the name of the place or people whence it comes. Thus we have arras, lawn (from Laon), cravat (Croat), coach from Kocs in Hungary, bilboes (both fetters and swords) from the iron mines of Bilboa in Spain. Equally common are the names of inventors — pinchbeck, tontine, silhouette, guillotine, derrick. In the word cash, which comes indirectly from Latin capsa, ” a box,” the thing contained has taken its name from the container.

Similarly mortar, ” cement,” derives its name from the mortar in which it was mixed, while in box the material (boxwood, Lat. buxus, Greek, iru|oj) has usurped the place of the article made. In leper the disease (Lat. lepra, the rough disease, from Greek, X«7rpd voaos) has been made into the name of the sufferer, who was earlier called a leprous man. As a consequence, a new substantive leprosy has to be taken from the adjective to

indicate the disease. The various changes in meaning, which are classed together as synecdoche, have their origin in contiguity. Thus we have the species for the genus; the butcher, who pro- perly kills goats only (Old French boc), has ousted the flesher. But we have also the genus for the species; corn, as a rule, means in England wheat; in Scotland oats; in America, maize. The individual becomes collective as in corps, navy, body (of men); the collective becomes individual when Latin racemus, ” bunch of grapes,” passes into English ” raisin.” Here would come the so-called meliorative and pejorative developments in word-meaning, whereby, e.g. steward, ” the sty-ward,” becomes the title of a great officer of the realm and the name of a line of kings; or, on the other side, sou (Latin solidus) passes from the name of a gold coin to that of one of proverbially insignificant value. Here, too, would come many euphemistic uses which are, for the most part, applications of more general terms to avoid the mention of some specific act or object which is unpleasant, as death, murder, bankruptcy, debt, &c, while metaphorical terms for the same things come under resemblance. These examples do not exhaust the forms of contiguity which appear in language, but they are enough to show how far-reaching the effect of this type of association of ideas is upon language, and how extensive the field is which still calls for investigation before the study of meaning attains the same development as the investigation of the other branches of the history of language.

Authorities (since 1885). — For methods of Linguistic Study: Paul, Principien der Sprachgeschichte (3rd ed., 1898); Von der Gabelentz, Die Sprachwissenschaft (2nd ed., 1901) ; Strong, Logeman & Wheeler, The History of Language (1 89 1) , an adaptation of the ideas of Paul’s Principien, with many excellent examples ; van Ginneken, Principes de Linguistique psychologique (1907). For the Con- troversy regarding Phonetic Laws : Curtius, Zur Kritik der neuesten Sprachforschung; Brugmann, Zum heutigen Stand der Sprachwissen- schaft; Schuchardt, tlber die Lautgesetze: gegen die Junggrammatiher (all in 1885) ; Tarbell, ” Phonetic Law,” in Transactions of American Philological Association for 1886, pp. I sqq.; Wechssler, ” Giebt es Lautgesetze?” (1900), Sonderabzug aus Forschungen zur romanis-

chen Philologie: Festgabe fiir Hermann Suchier; Wundt, Die Volkerpsychologie (1900), vol. i. ; Oertel, Lectures on the Study of Language (1901), lecture iv. For Analogy: Wheeler, “Analogy and the Scope of its Application in Language ” (1887), Cornell University Studies in Classical Philology. For the Classification of Languages: Misteli, Characteristik der hauptsdchlichsten Typen des Sprachbaues (1893). For the Phonology, Morphology and Syntax of the Indo-European Languages: Brugmann and Delbriick, Grundriss der vergleichenden Grammatik der indogermanischen Sprachen (1886-1900) ; a new edition of the Phonology by Brugmann in 1897, °f the stem-formations and inflexion of Nouns, Adjectives, Pronouns and Numerals in two parts (1906, 1909) ; the first edition of the Phonology and Morphology, translated into English in four volumes by Wright, Conway and Rouse. For Discussion of Con- tested Points: Bechtel, Die Hauptprobleme der indo-germanischen Lautlehre (1892). For Syntax: Delbriick, in the works mentioned, in the text. For Semantics : besides Breal and Postgate, see Wundt, Die Volkerpsychologie, vol. i. pt. 2, and articles by John Grote in the Journal of Philology, vols. iv. and v. A bibliography of the works which have appeared since 1890 will be found in the Anzeiger fiir indogermanische Sprach- und Altertumskunde : Beiblatt zu den indo-germanischen,F orschungen redigiert, by W. Streitberg. (P. Gl. ; E. Si.)

Summary or Philological Articles

In addition to the genetic classification of languages given above (on pp. 426-429), some further guidance as to the actual headings under which the philological section is arranged may be of service to the student.

The pivot of the whole section is the article Alphabet, which traces the history of language and writing to the earliest stages, embodying the results of archaeological studies in all countries, together with the general conclusions based thereon. In this article (with further details under Crete) will be found an account of the controversy regarding the Cretan discoveries of Dr A. J. Evans. Supplementary to this comparative survey are the articles Palaeography, Inscriptions, Writing and Phonetics. The first two deal with ancient documents of all kinds: Palaeography with those specimens of ancient writing, literary, economic or legal, which were committed to codices, tablets or rolls by the use of the stilus, the reed or the pen; Inscriptions with documents engraved on stone or metal.

Writing deals, chiefly from the anthropological standpoint, with primitive attempts to record ideas in an intelligible form, e.g. with ” knot-signs,” ” message-sticks,” picture-writing and the like. Phonetics covers the whole subject of speech sounds and pronunciation, the organs of speech and national sound systems.

Supplementary, from another point of view, to the article Alphabet is a complete series of articles on the letters of the English alphabet. In these articles the history of the individual letters is traced from the Phoenician through Aramaic, Greek and Roman to modern times. All these articles may be read in connexion with a comparative table in the article Alphabet (ad fin.), which shows in parallel columns the earliest equivalents of the modern English letters, i.e. Brahmi, Kharosthi, oldest ˆthiopic, Sabaean, Nashki, Tema,Sindjirli, the Moabite stone, Phoenician, Greek, Latin, Cyrillic and Glagolitic. Another important comparative table of written signs is contained in the article Slavs, showing the various Cyrillic, Glagolitic and Latin letters used by the Slav peoples.

Passing from articles dealing with the method and general subject-matter of philology, the student will find articles on the great families of languages, each with its subordinate articles on special languages and dialects.

i. Indo-European Languages. — Of articles on language-families, the most important is that under the heading Indo-European Languages. This great division, which is dealt with from the comparative standpoint in the second part of the article Philology, is under its own heading treated in detail. The article begins with a sub-classification into two main groups — the so-called (A) centum and (B) satem groups — each of which is further divided into four sections. In accordance with this classification there are separate articles on the individual ancient and modern languages and dialects.

A. (i) Greek Language (supplemented by sections under Homer, Dorians, &c); (2) Latin Language (with Osca Lingua, Iguvium, &c, and articles on the Italic tribes and places, e.g. Veneti, Caere); (3) Celtic, s.v. Celt (with subsidiary articles); and (4) Teutonic, s.v. Teutonic Languages, Scandi- navian Languages, and the like.

The modern descendants of these languages are all further treated separately. Thus following Latin Language is the article Romance Languages, which traces the development of the Latin tongue during

its gradual differentiation into Italian, French, Spanish, Rumanian, &c. ; while a more detailed account of these will be found under Italian Language; French Language; Spain: Language; Rumania: Language. There is also a special article Provencal Language, dealing with the Romanic speech of southern France. The Teutonic languages are similarly dealt with in detail under English Language (in- cluding Anglo-Saxon); Dutch Language; German Language. Scandinavian Language itself includes Icelandic, Norwegian, Swedish, Danish. *

B. In the satem group of the Indo-European family the four divisions are as follows: —

(1) Indo-Iranian or Aryan. This division may be sub- divided into (a) Indo-Iranian, treated mainly in the article Persia: Language and Literature (including Zend, Old, Middle and New Persian, and the modern dialects), and (b) Indian. The Indian languages ,are discussed primarily under Indo- Aryan Languages, which describes the relations of Pisaca, Sanskrit, Prakrit, and gives a paradigm of the various languages of ; the three great divisions of India. This central article refers to the separate articles Pisaca, Sanskrit and Prakrit, which in turn are supplemented by a number of articles on particular languages. Of these reference may be made to Bengali; Bihari; Gujarati and Rajasthani; Hindostani; Kash- miri; Marathi; Pali. The gipsy languages, which may probably be assigned to the Indo-Iranian division, are described ■under Gipsies.

(2) The account of Armenian will be found under Armenian Language and Literature.

(3) The Balto-Slavonic Languages. Of these the three comprised in the Baltic group, viz. Lithuanian, Lettic and Old

Prussian, are described under the heading Lithuanians and Letts. For the Slavonic group, the chief article is Slavs: Language, which deals with the elements common to all the Slavonic tongues, with their early history and differentiation. It contains a comparative table of alphabets. It is supple- mented by an article Old Slavonic, and by further information under the headings Russia, Bulgaria, Servia, Poland, Bohemia, Croatia-Slavonia, Slovaks, Slovenes, Sorbs, Kashubes, Polabs. (4) The Albanian dialects are treated under Albania.

2. Semitic Languages. — At the heading of this section stands the article Semitic Languages, supplemented by Hebrew Language, Aramaic Languages, and linguistic sections under Phoenicia, Ethiopia, and the like.

3. Hamitic Languages. — The central article in this family is Hamitic Languages, which is supplemented, so far as the Cushitic or Ethiopian group is concerned, by further information in the articles Egypt; Ethiopia; Abyssinia; Somaliland; and, so far as the Libyan group is concerned, by the articles Berbers and Kabyles.

4. The chief feature of the Monosyllabic family is the section Language under China, supplemented again by similar sections in articles on other countries of south-eastern Asia, and by the article Tibeto-Burman Languages. There is also a language section under Japan which discusses the affinities between Chinese, Korean and Japanese.

5. The Ural-Altaic family is described in outline in the article Ural-Altaic, which gives the general relationships of Turkish, Finno-Ugrian, Mongol and Manchu, and of minor sub- divisions such as Syryenian, Mordvinian and Votyak. Turkish is discussed in the article Turks: Language, which deals with Osmanli proper and the Tatar-Turkish languages generally. The article Finno-Ugrian is a comparative survey dealing with the language of the Finns, Lapps, Samoyedes, &c. ; while Magyar is treated separately in Hungary : Language. Under Mongols there is a special section Language, discussing the three groups of East Mongol, West Mongol (including Kalmuck) and Buriat.

6. The principal languages of southern India, e.g. Tamil, Malayalam, Kanarese, Telugu, &c, are dealt with generally under the heading Dravidian; while there is a separate article Tamils, containing a section on their language; and brief notes under the headings Brahui, Telugu, Malayalam, &c.

7 and 8. The scattered languages of the Malay-Polynesian family and other Oceanic peoples are treated principally in the article Malays, which further information is given under the headings Polynesia; Samoa; Java; Negritos, Battas, &c.

9. The Caucasian family is described chiefly in the article Georgia: Ethnology. Further information will be found in Caucasia: Ethnology.

10. Of the remaining European languages only two need special. mention: Basque, which is treated in a special section under the heading Basques; and the lost Etruscan, which is treated under Etruria and Latin Language.

11. The principal languages of southern and central Africa are treated fully under Bantu Languages. There is a brief account of the Bushman language under Bushmen, and of the Hottentot languages under

Hottentots.

12. Intermediate African Languages. — Among the numerous languages spoken by the people of the great central belt of the African continent, the most important is the Hausa, described under that heading.

13. America. — The whole question of the languages of the North American Indians is dealt with in the article Indians, North American, which contains an elaborate linguistic paradigm.

Bibliographical information will be found in practically all the above headings. In addition to the most modern authorities there quoted, there will be found in the article Dictionary a very full list of older lexicographical works.

The above summary does not purport to present dogmatically a rigid philological classification. It disregards many problems, and is intended solely to enable the student readily to find the material of which he may be in search.

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PHILOSOPHY

The more certain writings of Philoponus consist of commentaries on Aristotle. These include works on the Physica, the Prior and the Posterior Analytics, the Meteorologica, the De anima, the De generations animalium, the De generatione et interitu and the Metaphysica. These have been frequently edited and are interesting in connexion with the adoption of Anstotelianism by the Christian Church. They seem to have embodied the lectures of Ammonius with addi- tions by Philoponus, and are remarkable rather for elaborate care than for originality and insight. He wrote also an attack on Proclus (De aeternitate mundi). Two treatises on mathematics are ascribed to him: A Commentary on the Mathematics of Nicomachus, edited by Hoche (1864 and 1867), and a Treatise on the Use of the Astrolabe, published by Hase. The latter is the most ancient work on this instrument, and its authenticity is rendered almost certain by its reference to Ammonius as the master of the author.

PHILOSOPHY (Gr. l\os, fond of, and iKoffoia to Pythagoras has hardly any claim to be regarded as authentic; and the somewhat self-conscious modesty to which Diogenes Laertius attributes the choice of the designation is, in all probability, a piece of etymology crystallized into narrative. It is true that, as a matter of fact, the earliest uses of

the word (the verb ikoo-oetv occurs in Herodotus and Thucydides) imply the idea of the pursuit of knowledge; but the distinction between the ik6aroos, or lover of wisdom, appears first in the Platonic writings, and lends itself naturally to the so-called Socratic irony. The same thought is to be found in Xenophon, and is doubtless to be attributed to the historical Socrates. But the word soon lost this special implication. What is of real interest to us is to trace the progress from the idea of the philosopher as occupied with any and every department of knowledge to that which assigns him a special kind of knowledge as his province.

A specific sense of the word first meets us in Plato, who defines the philosopher as one who apprehends the essence or reality of things in opposition to the man who dwells in appearances and the shows of sense. The philosophers, he says, ” are those who are able to grasp the eternal and immutable”; they are “those who set their affections on that which in each case really exists ” (Rtp. 480). In Plato, however, this distinction is applied chiefly in an ethical and religious direction; and, while it defines philosophy, so far correctly, as the endeavour to express what things are in their ultimate constitution, it is not yet accompanied by a sufficient differentiation of the subsidiary inquiries by which this ultimate question may be approached. Logic, ethics and physics, psychology, theory of knowledge and metaphysics are all fused together by Plato in a semi-religious synthesis. It is not till we come to Aristotle — the encyclopaedist of the ancient world— that we find a demarcation of the different philosophic disciplines corresponding, in the main, to that still current. The earliest philosophers, or ” physiologers,” had occupied themselves chiefly with what we may call cosmology; the one question which covers everything for them is that of the under- lying substance of the world around them, and they essay to answer this question, so to speak, by simple inspection. In Socrates and Plato, on the other hand, the start is made from a consideration of man’s moral and intellectual activity; but knowledge and action are confused with one another, as in the Socratic doctrine that virtue is knowledge. To this correspond the Platonic confusion of logic and ethics and the attempt to substitute a theory of concepts for a metaphysic of reality. Aristotle’s methodic intellect led him to separate the different aspects of reality here confounded. He became the founder of logic, psychology, ethics and aesthetics as separate sciences; while he prefixed to all such (comparatively) special inquiries the investigation of the ultimate nature of existence as such, or of those first principles which are common to, and presupposed in, every narrower field of knowledge. For this investigation

Aristotle's most usual name is " first philosophy " or, as a modern might say, " first principles "; but there has since been appro- priated to it, apparently by accident, the title " metaphysics." " Philosophy," as a term of general application, was not, indeed restricted by Aristotle or his successors to the disciplines just enumerated. Aristotle himself includes under the title, besides mathematics, all his physical inquiries. It was only in the Alexandrian period, as Zeller points out, that the special sciences attained to independent cultivation Nevertheless, as the mass of knowledge accumulated, it naturally came about that the name ".philosophy " ceased to be applied to inquiries concerned with the particulars as such. The details of physics, for example, were abandoned to the scientific specialist, and philosophy restricted itself in this department to the question of the relation of the physical universe to the ultimate ground or author of things. This inquiry which was long called " rational cosmo- logy," may be said to form part of the general subject of meta- physics, or at all events a pendant to it. By the gradual sifting out of the special sciences philosophy thus came to embrace primarily the inquiries grouped as " metaphysics " or " first philosophy." These would embrace, according to the Wolffian scheme long current in philosophical textbooks, ontology proper, or the science of being as such, with its three-branch sciences of (rational) psychology, cosmology and (rational or natural) theology, dealing with the three chief forms of being — the soul, the world and God. Subsidiary to metaphysics, as the central inquiry, stand the sciences of logic and ethics, to which may be added aesthetics, constituting three normative sciences — sciences, that is, which do not, primarily, describe facts, but rather prescribe ends or set forth ideals. It is evident, however, that if logic deals with conceptions which may be considered constitutive of knowledge as such, and if ethics deals with the harmonious realization of human life, which is the highest known form of existence, both sciences must have a great deal of weight in the settling of the general question of metaphysics.

In sum, then, we may say that " philosophy " has come to be' understood at least in modern times as a general term covering the various discipb'nes just enumerated. It has frequently tended, however, and still tends, to be used as specially con- vertible with the narrower term " metaphysics." This is not unnatural, seeing that it is only so far as they bear on the one central question of the nature of existence that philosophy spreads its mantle over psychology, logic or ethics. The particular organic conditions of perception and the associative laws to which the mind, as a part of nature, is subjected, are facts in themselves indifferent to the philosopher; and therefore

the development of psychology into an independent science, which took place during the latter half of the 19th century and may now be said to be complete, represents an entirely natural evolution. Similarly, logic, so far as it is an art of thought or a doctrine of fallacies, and ethics, so far as it is occupied with a natural history of impulses and moral sentiments, do neither of them belong, except by courtesy, to the philosophic province. But, although this is so, it is perhaps hardly desirable to deprive ourselves of the use of two terms instead of one. It will not be easy to infuse into so abstract and bloodless a term as ” meta- physics ” the fuller life (and especially the inclusion of ethical considerations) suggested by the more concrete term “philosophy.”

We shall first of all, then, attempt to differentiate philosophy from the special sciences, and afterwards proceed to take up one by one what have been called the philosophical sciences, with the view of showing how far the usual subject-matter of each is really philosophical in its bearing, and how far it belongs rather to the domain of ” science ” strictly so called. The order in which, for clearness of exposition, it will be most convenient to consider these disciplines will be psychology, epistemology or theory of knowledge, and metaphysics, then logic, aesthetics and ethics. Finally, the connexion of the last-mentioned with politics (or, to speak more modernly, with jurisprudence and sociology), with the philosophy of history and the philosophy of religion, will call for a few words on the relation of these sciences to general philosophy.

PHILOMEL (Fr. Philomele; Ger. Philomele or Stahlgeige), a musical instrument similar to the violin, but having four steel, wire strings. The philomel has a body with incurvations similar to those of the guitar; therefore, without corner blocks, the out- line of the upper lobe forms a wavy shoulder reminiscent of the viols but more ornate and fanciful. The peg-box sometimes terminates in a fancy head instead of a scroll. The philomel, never used in the orchestra, is the instrument of the dilettanti, frequently played in Germany with the bowed zither. The accordance of the philomel is the same as for the violin; the timbre is shrill and crystal-like. There is also an alto philomel corresponding to the viola. The bowed melodion is similar to the philomel, and has four steel strings of the same accordance as the violin, but arranged in inverse order; instead of being held like the violin and philomel, under the chin, it is placed on the knees of the

performer, so that a hook under the finger- board rests against the table. (K. S.)

PHILON, Athenian architect of the 4th century B.C., is known as the planner of two important works — the portico of the great Hall of the Mysteries at Eleusis and an arsenal at Athens. Of the last we have exact knowledge from an inscription. E. A. Gardner {Ancient Athens, p. 557) observes that it ” is perhaps known to us more in detail than any other lost monument of antiquity.” It was to hold the rigging of the galleys; and was so contrived that all its contents were visible from a central hall, and so liable to the inspection of the Athenian democracy. (See Athens.)

PHILOPATRIS, the title of a dialogue formerly attributed to Lucian, but now generally admitted to be spurious. Its date and purport have long formed the subject of discussion. The scene is laid at Constantinople. A certain Triephon, who has been converted to Christianity by a bald, long-nosed Galilaean, who was carried up through the air into the third heaven (an evident allusion to St Paul), meets a friend, Critias, who is in a state of great excitement. Triephon inquires the reason, and the invocation of Zeus by Critias leads to a discussion on pagan- ism and Christianity, in which all the gods proposed by Critias are rejected by Triephon, who finally suggests that Critias should swear by the Trinity. (The sub-title, fj SidacTKOfievos, refers to this ” instruction ” of Critias in matters relating to Christianity.) Critias goes on to relate how he had been introduced to a gather- ing of pessimists, who predicted all kinds of disturbances in the empire and defeat at the hands of its enemies. In the mean- time a third person appears on the scene, with the news that the imperial armies have obtained a glorious victory. The hope is expressed that Babel (Bagdad, the chief city of the caliphs) may soon be destroyed, Egypt subdued (that is, reconquered from the Arabs), and the attacks of the Scythians (Russians or Bulgarians) repulsed. The whole concludes with thanks to the unknown god of Athens that they have been permitted to be the subjects of such an emperor and the inhabitants of such an empire. The Philopatris was for a long time regarded as an attack upon Christianity, and assigned to the time of Julian the Apostate (emperor 361-363). Chronological indica- tions (e.g. the allusion to a massacre of women in Crete) led Niebuhr to ascribe it to the reign of Nicephorus Phocas (963- 969), and this view is now generally supported. There being at that time no pagans in Constantinople, the ” pessimists ” referred to must be Christians — either monks, especially the intimate friends of the patriarch of Constantinople, who, ag- grieved at the measures taken by Phocas in regard to the property of the Church, were ready to welcome the

defeat of the imperial arms and the ruin of the empire; or harmless vision- aries, who claimed to predict the future by fasting, prayer and vigil. In any case, the author, whether he was a sophist com- missioned by Phocas to attack the monks, or some professor who hoped to profit by singing the imperial praises, represents the views of the ” patriotic ” (as the title shows) as opposed to the ” unpatriotic ” party. According to another view, which assigns the dialogue to the time of Heraclius (610-641), the author was a Christian fanatic, whose object was to make known the existence of a conventicle of belated pagans, the enemies

alike of the Christian faith and the empire; it is doubtful, however, whether such a pagan community, sufficiently numer- ous to be of importance, actually existed at that date. The object of the first and longer portion of the dialogue was to combat the humanism of the period, which threatened a revival of polytheism as a rival of Christianity.

Bibliography. — Editions by J. M. Gesner (1715) and C. B. Hase in the Bonn Corpus scriptorum hist. byz. (1828), vol. xi. ; also included in Jacobitz’s edition of Lucian (1839). See R. Crampe, Philo- patris. Ein heidnisches Konventikel des siebenten Jahrhunderts zu Constantinopel (1894) ; R. Garnett, ” Alms for Oblivion ” in CornhiU Magazine (May, 1901); C. Stach, De Philopatride (Cracow, 1894), who shows its late origin by linguistic tests; S. Reinach in Revue arcMologique (1902), vol. i. ; B. G. Niebuhr, ” Ueber das Alter des Dialogs Philopatris ” in his Kleine historische Schriften (1843), v °l- “• and, for further authorities, article by Von Dobschutz in Herzog- Hauck’s Realencyklopadie fiir protestantische Theologie (1904).

PHILOPOEMEN (253-184 B.C.), Greek general, was born at Megalopolis, and educated by the academic philosophers Ecdemus and Demophanes or Megalophanes, who had dis- tinguished themselves as champions of freedom. Avoiding the fashionable and luxurious gymnasia, he devoted himself to military studies, hunting and border forays. In 233-2 Philopoemen skilfully evacuated Megalopolis before the attack of Cleomenes III., and distinguished himself at Sellasia (222). The next eleven years he spent as a condottiere in Crete. Elected commander of the League’s cavalry on his return, he reorganized that force and defeated the Aetolians on the Elean frontier (210). Appointed to the chief command two years later, he introduced heavy armour and close formation for the infantry, and with a well-trained army beat Machanidas of Sparta, near Mantinea. The new ” liberator ” was now so famous that Philip V. of Macedon attempted to poison him. In 202-1 Philopoemen drove Nabis, the Spartan tyrant,

from Messene and routed him off Tegea. After another long sojourn in Crete he again received the command against Nabis. Though unsuccessful at sea, he almost annihilated Nabis's land force near Gythium, but was prevented by the Roman Flamininus from taking Sparta. In 190 Philopoemen protected Sparta, which meanwhile had joined the League and thereupon seceded, but punished a renewed defection so cruelly as to draw the censure of Rome upon his country. At Messene he likewise checked a revolt (189), but when that city again rebelled, in 184, he was captured in a skirmish and promptly executed. His body was recovered by the Achaeans and buried with great solemnity.

Philopoemen's great merit lies in his having restored to his compatriots that military efficiency without which the Achaean League for all its skilful diplomacy could never stand. Towards Rome he advocated a courteous but independent attitude. In politics he was a democrat, and introduced reforms of a popular character (see Achaean League).

Polybius' Histories (x.-xxiii.) are our chief authority. These and a special treatise on Philopoemen (now lost) were used by Plutarch (Philopoemen), Pausanias (viii. 49-51), Livy (xxxi.-xxxviii.), and indirectly by Justin (xxx.-xxxiv.).

PHILOPONUS, JOANNES (John the Grammarian), Greek philosopher of Alexandria, lived in the later part of the 5th and the beginning of the 6th century of our era. The surname Gram- maticus he assumed in virtue of his lectures on language and literature; that of Philoponus owing to the large number of treatises he composed. He was a pupil of Ammonius Hermiae, and is supposed to have written the life of Aristotle sometimes attributed to his master. To Philoponus are attributed a large number of works on theology and philosophy. It is said that, though he was a pupil of Ammonius, he was at first a Christian, and he has been credited with the authorship of a commentary on the Mosaic Cosmogony in eight books, dedicated to Sergius, patriarch of Constantinople, and edited by Balthasar Corderius in 1630. Other authorities maintain that this, as well as the Disputatio de paschale, was the work of another author, John the Tritheist. It was perhaps this Philoponus who tried to save the Alexandrian library from the caliph Omar after Amu's victory in 639.

PHILOSOPHY

Philosophy and Natural Science. — In distinguishing philosophy from the sciences, it may not be amiss at the outset to guard against the possible misunderstanding that philosophy is con- cerned with a subject-matter different from, and in some obscure way transcending, the subject-matter of the sciences. Now that psychology, or the observational and experimental study of mind, may be said to have been definitively included among the positive sciences, there is not even the apparent ground which once existed for such an idea. Philosophy, even under its most discredited name of metaphysics, has no other subject- matter than the nature of the real world, as that world lies around us in everyday life, and lies open to observers on every side. But if this is so, it may be asked what function can remain for philosophy when every portion of the field is already lotted out and enclosed by specialists? Philosophy claims to be the science of the whole; but, if we get the knowledge of the parts from the different sciences, what is there left for philosophy to tell us ? To this it is sufficient to answer generally that the synthesis of the parts is something more than that detailed knowledge of the parts in separation which is gained by the man of science. It is with the ultimate synthesis that philosophy concerns itself; it has to show that the subject-matter which we are all dealing with in detail really is a whole, consisting of articulated members. Evidently, therefore, the relation existing between philosophy and the sciences will be, to some extent, one of reciprocal influence. The sciences may be said to furnish philosophy with its matter, but philosophical criticism reacts upon the matter thus furnished, and transforms it. Such trans- formation is inevitable, for the parts only exist and can only be fully, i.e. truly, known in their relation to the whole. A pure specialist, if such a being were possible, would be merely an instrument whose results had to be co-ordinated and used by others. Now, though a pure specialist may be an abstraction of the mind, the tendency of specialists in any department naturally is to lose sight of the whole in attention to the particular categories or modes of nature's working which happen to be exemplified, and fruitfully applied, in their own sphere of investi- gation ; and in proportion as this is the case it becomes necessary for their theories to be co-ordinated with the results of other inquirers, and set, as it were, in the light of the whole. This task of co- ordination, in the broadest sense, is undertaken by philo- sophy; for the philosopher is essentially what Plato, in a happy moment, styled him,

For it is evident from what has been said that the way in which we commonly speak of " facts " is calculated to convey a false impression. The world is not a collection of individual facts existing side by side

and capable of being known separately. A fact is nothing except in its relations to other facts; and as these relations are multiplied in the progress of knowledge the nature of the so-called fact is indefinitely modified. Moreover, every statement of fact involves certain general notions and theories, so that the ” facts ” of the separate sciences cannot be stated except in terms of the conceptions or hypotheses which are assumed by the particular science. Thus mathematics assumes space as an existent infinite, without investigating in what sense the existence or the infinity of this Unding, as Kant called it, can be asserted. In the same way, physics may be said to assume the notion of material atoms and forces. These and similar assumptions are ultimate presuppositions or working ‘ hypotheses for the sciences themselves. But it is the office of philosophy, as a theory of knowledge, to submit such conceptions

to a critical analysis, with a view to discover how far they cen be thought out, or how far, when this is done, they refute them- selves, and call for a different form of statement, if they are to be taken as a statement of the ultimate nature of the real. 1 The first statement may frequently turn out to have been merely provisionally or relatively true; it is then superseded by, or rather inevitably merges itself in, a less abstract account. In this the same ” facts ” appear differently, because no longer separated from other aspects that belong to the full reality of the known world. There is no such thing, we have said, as an individual fact; and the nature of any fact is not fully known unless we know it in all its relations to the system of the universe, or, in Spinoza’s phrase, sub specie aeternitatis. In strictness, there is but one res completa or concrete fact, and it is the business of philosophy, as science of the whole, to expound the chief relations that constitute its complex nature.

The last abstraction which it becomes the duty of philosophy to remove is the abstraction from the knowing subject which is made by all the sciences, including, as we shall see, the science of psychology. The sciences, one and all, deal with a world of objects, but the ultimate fact as we know it is the existence of an object for a subject. Subject-object, knowledge, or, more widely, self-consciousness with its implicates — this unity in duality is the ultimate aspect which reality presents. It has generally been considered, therefore, as constituting in a special sense the problem of philosophy. Philosophy may be said to be the explication of what is involved in this relation, or, in Kantian phraseology, a theory of its possibility. Any would-be theory of the universe which makes its central fact impossible stands self-condemned. On the other hand, a sufficient analysis here may be expected to yield us a statement of the reality of things in its last

terms, and thus to shed a light backwards upon the true nature of our subordinate conceptions.

Psychology, Epistemology and Metaphysics. — This leads to the consideration of the main divisions of philosophy — Psychology (q.v.), epistemology (theory of knowledge, Erkenntnisstheorie) , and metaphysics (ontology; see Metaphysic). A special relation has always existed between psychology and systematic philo- sophy, but the closeness of the connexion has been characteristic of modern and more particularly of English thought. The connexion is not difficult to explain, seeing that in psychology, or the science of mind, we study the fact of intelligence (and moral action), and have, so far, in our hands the fact to which all other facts are relative. From this point of view we may even see a truth in Jacobi's dictum as quoted by Sir W. Hamilton : " Nature conceals God; man reveals God." Nature by itself, that is to say, is insufficient. The ultimate explanation of things cannot be given by any theory which excludes from its survey the intelligence in which nature, as it were, gathers herself up. But knowledge, or the mind as knowing, willing, &c, may be looked at in two different ways. It may be regarded simply as a fact; in which case the evolutions of mind may be traced and reduced to laws in the same way as the phenomena treated by the other sciences. This study gives us the science of empirical psychology, or, as it is now termed, psychology sans phrase. In order to give an adequate account of its subject-matter, psych- ology may require higher or more complex categories than are employed in the other sciences, just as biology, for example, cannot work with mechanical categories alone, but introduces the conception of development or growth. But the affinities of such a study are manifestly with the sciences as such rather than with philosophy; and the definitive establishment of psychology as an independent science has already been alluded to. Since it has been taken up by specialists, psychology is being estab- lished on a broader basis of induction, and with the advantage, in some departments, of the employment of experimental methods of measurement. But it is not of mind in this aspect

1 The revisional office which philosophy here assumes constitutes her the critic of the sciences. It is in this connexion that the mean- ing of the definition of philosophy as " the science of principles " can best be seen. This is perhaps the most usual definition, and. though vague, one of the least misleading.

that such assertions can be made as those quoted above. Mind, as studied by the psychologist — mind as a mere fact or pheno- menon — grounds no inference to anything beyond itself. The distinction between mind viewed as a succession of “states of consciousness ” and the further aspect of mind which philosophy considers was very clearly put by Croom Robertson, who also made a happy suggestion of two terms to designate the* double point of view:

” We may view knowledge as mere subjective function, but it has its full meaning only as it is taken to represent what we may call objective fact, or is such as is named (in different circumstances) real, valid, true. As mere subjective function, which it is to the psychologist, it is best spoken of by an unambiguous name, and for this there seems none better than Intellection. We may then say that psychology is occupied with the natural function of Intellection, seeking to discover its laws and distinguishing its various modes (perception, representative imagination, conception, &c.) according to the various circumstances in which the laws are found at work. Philosophy, on the other hand, is theory of Knowledge (as that which is known).” — ” Psychology and Philosophy,” Mind (1883), pp. 15, 16.

The confusion of these two points of view has led, and still leads, to serious philosophical misconception. It is hardly an exaggeration to say that, in the English school since Hume, psychology superseded properly philosophical inquiry. And we find even a thinker with a wider horizon like Sir W. Hamilton encouraging the confusion by speaking of ” psychology or meta- physics,” ‘ while his lectures on metaphysics are mainly taken up with what belongs in the strictest sense to psychology proper, with an occasional excursus (as in the theory of perception) into epistemology. The distinction between psychology and theory of knowledge was first clearly made by Kant, who repeatedly insisted that the Critique of Pure Reason was not to be taken as a psychological inquiry. He defined his problem as the quid juris or the question of the validity of knowledge, not its quid facti or the laws of the empirical genesis and evolution of intellection (to use Croom Robertson’s phraseology). Since Kant philosophy has chiefly taken the form of theory of knowledge or of a criticism of experience. Not, indeed, a preliminary criticism of our faculties or conceptions such as Kant himself proposed to institute, in order to determine the limits of their application; such a criticism ab extra of the nature of our experience is essenti- ally a thing impossible. The only criticism which can be applied in such a case is the immanent- criticism which the conceptions or categories exercise upon one another. The organized criticism of these conceptions is realty nothing more than

the full expli- cation of what they mean and of what experience in its full nature or notion is. This constitutes the theory of knowledge in the only tenable sense of the term, and it lays down, in Kantian language, the conditions of the possibility of experience. These conditions are the conditions of knowledge as such, or, as it may be put, of objective consciousness — of a self-consciousness of a world of objects and through them conscious of itself. The inquiry is, therefore, logical or transcendental in its nature, and does not entangle us in any decision as to the conditions of the genesis of such consciousness in the individual. When we inquire into subjective conditions we are thinking of facts causing other facts. But the logical or transcendental conditions are not causes or even factors of knowledge; they are the statement of its idea. Hence the dispute between evolutionist and transcen- dentalist rest;s, in general, on an ignoratio elenchi; for the history of the genesis of an idea (the historical or genetic method) does not contain an answer to — though it may throw light on — the philosophical question of its truth or validity. Speaking of this transcendental consciousness, Kant goes so far as to say that it is not of the slightest consequence ” whether the idea of it be clear or obscure (in empirical consciousness), no, not even whether it really exists or not. But the possibility of the logical form of all knowledge rests on its relation to this apperception as a faculty or potentiality ” (Werke, ed. Hartenstein, iii. 578 note). Or, if

1 It is true that he afterwards modifies this misleading identifica- tion by introducing the distinction between empirical psychology or the phenomenology of mind and inferential psychology or on- tology, i.e. metaphysics proper. But he continues to use the terms “philosophy,” metaphysics,” and “mental science” as synony- mous.

we return to the distinction between epistemology and psychol- ogy! by way of illustrating the nature of the former, we may take the following summing up by Professor James Ward in a valuable article on ” Psychological Principles ” in Mind (April 1883, pp. 166, 167): ” Comparing psychology and epistemology, then, we may say that the former is essentially genetic in its method, and might, if we had the power to revise our existing terminology, be called biology; the latter, on the other hand, is essentially devoid of everything historical, and treats, sub specie aeternitatis, as Spinoza might have said, of human knowledge, conceived as the possession of mind in general.”

Kant’s problem is not, in its wording, very different from that which Locke set before him when he resolved to ” inquire into the original, certainty and extent of human knowledge together with the grounds and degrees of belief, opinion and assent.” Locke’s Essay is

undoubtedly, in its intention, a contribution to the theory of knowledge. But, because time had not yet made the matter clear, Locke suffered himself to digress in his second book into the psychological question of the origin cf our ideas; and his theory of knowledge is ruined by the failure to distinguish between the epistemological sense of ” idea ” as significant content and the psychological sense in which it ir applied to a fact or process in the individual mind. The same confusion runs through Berkeley’s arguments and vitiates his conclusions as well as those of Hume. But appearing with these thinkers as the problem of perception, epistemology widens its scope and becomes, in Kant’s hands, the question of the possi- bility of experience in general. With Hegel it passes into a completely articulated ” logic,” which apparently claims to be at the same time a metaphysic, or an ultimate expression of the nature of the real.

This introduces us to the second part of the question we are seeking to determine, namely the relation of epistemology to metaphysics. It is evident that philosophy as theory of know- ledge must have for its complement philosophy as metaphysics (ontology) or theory of being. The question of the truth of our knowledge, and the question of the ultimate nature of what we know, are in reality two sides of the same inquiry; and therefore our epistemological results have to be ontologically expressed. But it is not every thinker that can see his way with Hegel to assert in set terms the identity of thought and being. Hence the theory of knowledge becomes with some a theory of human ignorance. This is the case with Herbert Spencer’s doctrine of the Unknowable, which he advances as the result of epistemo- logical considerations in the philosophical prolegomena to his system. Very similar positions were maintained by Kant and Comte; and, under the name of ” agnosticism ” (q.v.), the theory has popularized itself in the outer courts of philosophy, and on the shifting borderland of philosophy and literature. The truth is that the habit of thinking exclusively from the standpoint of the theory of knowledge tends to beget an undue subjectivity of temper. And the fact that it has become usual for men to think from this standpoint is very plainly seen in the almost universal description of philosophy as an analysis of ” experi- ence,” instead of its more old-fashioned designation as an inquiry into ” the nature of things.” As it is matter of universal agree- ment that the problem of being must be attacked indirectly through the problem of knowledge, this substitution may be regarded as an advance, more especially as it implies that the fact of experience, or of self-conscious existence, is the chief fact to be dealt with. But if so, then self-consciousness must be treated as itself real, and as organically related

to the rest of existence. If self-consciousness be treated in this objective fashion, then we pass naturally from epistemology to metaphysics or ontology. (For, although the term ” ontology ” has been as good as disused, it still remains true that the aim of philosophy must be to furnish us with an ontology or a coherent and adequate theory of the nature of reality.) But if, on the other hand, knowledge and reality be ab initio opposed to one another — if consciousness be set on one side as over against reality, and merely holding up a mirror to it — then it follows with equal naturalness that the truly real must be something which lurks unrevealed

behind the subject’s representation of it. Hence come the differ- ent varieties of a so-called phenomenalism. The upholders of such a theory would, in general, deride the term ” metaphysics ” or ” ontology “; but it is evident, none the less, that their position itself implies a certain theory of the universe and of our own place in it, and the establishment of this theory constitutes their metaphysics.

Without prejudice, then, to the claim of epistemology to constitute the central philosophic discipline, we may simply note its liability to be pressed too far. The exclusive pre- occupation of men’s minds with the question of knowledge during the neo-Kantian revival in the ‘seventies of the last century drew from Lotze the caustic criticism that ” the continual sharpening of the knife becomes tiresome, if, after all, we have nothing to cut with it.” Stillingfleet’s complaint against Locke was that he was ” one of the gentlemen of this new way of reasoning that have almost discarded substance out of the reason- able part of the world.” The same may be said with greater truth of the devotees of the theory of knowledge; they seem to have no need of so old-fashioned a commodity as reality. Yet, after all, Fichte’s dictum holds good that knowledge as know- ledge — i.e. so long as it is looked at as knowledge — is, ipso facto, not reality. The result of the foregoing, however, is to show that, as soon as epistemology draws its conclusion, it becomes meta- physics; the theory of knowledge passes into a theory of being. The ontological conclusion, moreover, is not to be regarded as something added by an external process; it is an immediate implication. The metaphysic is the epistemology from another point of view — regarded as completing itself, and explaining in the course of its exposition that relative or practical separation of the individual knower from the knowable world, which it is a sheer assumption to take as absolute. This, not the so-called assumption of

the implicit unity of being and thought, is the really unwarrantable postulate; for it is an assumption which we are obliged to retract bit by bit, while the other offers the whole doctrine of knowledge as its voucher.

Logic, Aesthetics and Ethics. — If the theory of knowledge thus passes insensibly into metaphysics it becomes somewhat difficult to assign a distinct sphere to logic (q.v.). Ueberweg's definition of it as " the science of the regulative laws of thought " (or " the normative science of thought ") comes near enough to the traditional sense to enable us to compare profitably the usual subject-matter of the science with the definition and end of philosophy. The introduction of the term " regulative " or " normative " is intended to differentiate the science from psychology as the science of mental processes or events. In this reference logic does not tell us how our intellections connect themselves as mental phenomena, but how we ought to connect our thoughts if they are to realize truth (either as consistency with what we thought before or as agreement with observed facts). Logic, therefore, agrees with epistemology (and differs from psychology) in treating thought not as mental fact but as knowledge, as idea, as having meaning in relation to an objective world. To this extent it must inevitably form a part of the theory of knowledge. But, if we desire to keep by older landmarks and maintain a distinction between the two disciplines, a ground for doing so may be found in the fact that all the main definitions of logic point to the investigation of the laws of thought in a subjective reference — with a view, that is, by an analysis of the operation, to ensure its more correct performance. According to the old phrase, logic is the art of correct thinking. Moreover we commonly find the logician assuming that the process of thought has advanced a certain length before his examination of it begins; he takes his material full-formed from perception, without, as a rule, inquiring into the nature of the conceptions which are involved in our perceptive experience. Occupying a position, therefore, within the wider sphere of the general theory of knowledge, ordinary logic consists in an analysis of the nature of general statement, and of the conditions under which we pass validly from one general statement to another. But the logic of the schools is eked out by contributions from a variety of sources (e.g. from grammar on one side and from psychology

on another), and cannot claim the unity of an independent science.

Aesthetics (q.v.) may be treated as a department of psychology or physiology, and in England this is the mode of treatment that has been most general. To what peculiar excitation of our bodily or mental

organism, it is asked, are the emotions due which make us declare an object beautiful or sublime? And, the question being put in this form, the attempt has been made in some cases to explain away any peculiarity in the emotions by analysing them into simpler elements, such as primitive organic pleasures and prolonged associations of usefulness or fitness. But, just as psychology in general cannot do duty for a theory of knowledge, so it holds true of this particular application of psychology that a mere reference of these emotions to the mechanism and interactive play of our faculties cannot be regarded as an account of the nature of the beautiful. Perhaps by talking of " emotions " we tend to give an unduly subjective colour to the investigation; it would be better to speak of the perception of the beautiful. Pleasure in itself is unqualified, and affords no differentia. In the case of a beautiful object the resultant pleasure borrows its specific quality from the presence of determinations essentially objective in their nature, though not reducible to the categories of science. Unless, indeed, we conceive our faculties to be constructed on some arbitrary plan which puts them out of relation to the facts with which they have to deal, we have a prima facie right to treat beauty as an objective determination of things. The question of aesthetics would then be formulated — What is it in things that makes them beautiful, and what is the relation of this aspect of the universe to its ultimate nature, as that is expounded in metaphysics? The answer constitutes the substance of aesthetics, considered as a branch of philosophy. But it is not given simply in abstract terms: the philosophical treatment of aesthetics includes also an exposition of the concrete phases of art, as these have appeared in the history of the world, relating themselves to different phases of human culture.

Of ethics (q.v.) it may also be said that many of the topics commonly embraced under that title are not strictly philosophical in their nature. They are subjects for a scientific psychology employing the historical method with the conceptions of heredity and development, and calling to its aid, as such a psychology will do, the investigations of all the sociological sciences. To such a psychology must be relegated all questions as to the origin and development of moral ideas. Similarly, the question debated at such length by English moralists as to the nature of the moral faculty (moral sense, conscience, &c.) and the contro- versy concerning the freedom of the will belong entirely to psychology. If we exclude such questions in the interest of systematic correctness, and seek to determine for ethics a definite subject-matter, the science may be said to fall into two depart- ments. The first of these deals with the notion of duty, and endeavours to define the good or the ultimate end of action; the second lays out the scheme of

concrete duties which are deducible from, or which, at least, are covered by, this abstractly stated principle. The second of these departments is really the proper subject-matter of ethics considered as a separate science; but it is often conspicuous by its absence from ethical treatises. How- ever moralists may differ on first principles, there seems to be remarkably little practical divergence when they come to lay down the particular laws of morality. It may be added that, where a systematic account of duties is actually given, the connexion of the particular duties with the universal formula is in general more formal than real. It is only under the head of casuistry (q.v.) that ethics has been much cultivated as a separate science. The first department of ethics, on the other hand, is the branch of the subject in virtue of which ethics forms part of philosophy. As described above, it ought rather to be called, in Kant's phrase, the metaphysic of ethics. A theory of obligation is ultimately found to be inseparable from a metaphysic of personality. The connexion of ethics with metaphysics will be patent as a matter of fact, if it be remembered how Plato's

philosophy is summed up in the idea of the good, and how

Aristotle also employs the essentially ethical notion of end as the ultimate category by which the universe may be explained or reduced to unity. But the necessity of the connexion is also apparent, unless we are to suppose that, as regards the course of universal nature, man is altogether an imperium in imperio, or rather (to adopt the forcible phrase of Marcus Aurelius) an abscess or excrescence on the nature of things. If, on the contrary, we must hold that man is essentially related to what the same writer calls " a common nature," then it is a legitimate corollary that in man as intelligence we ought to find the key of the whole fabric. At all events, this method of approach must be truer than any which, by restricting itself to the external aspect of phenomena as presented in space, leaves no scope for inwardness and life and all that, in Lotze's language, gives " value " to the world. The argument ex analogic, hominis has often been carried too far; but if a " chief end of man " be discoverable — 6.vQptinnvov ayadov, as Aristotle wisely insisted that the ethical end must be determined— then it may be assumed that this end cannot be irrelevant to that ultimate " meaning " of the universe which, according to Lotze, is the quest of philo- sophy. If " the idea of humanity," as Kant called it, has ethical perfection at its core, then a universe which is really an

organic whole must be ultimately representable as a moral order or a spiritual kingdom such as Leibnitz named, in words borrowed from St Augustine, a city of God.

Philosophy of the State (Political Philosophy), Philosophy of History, Philosophy of Religion.— In Plato and Aristotle ethics and politics are indissolubly connected. In other words, seeing that the highest human good is realizable only in a community, the theory of the state as the organ of morality, and itself in its structure and institutions the expression of ethical ideas or qualities, becomes an integral part of philosophy. The difficulty already hinted at, which individualistic systems of ethics experi- ence in connecting particular duties with the abstract principle of duty is a proof of the failure of their method. For the content of morality we are necessarily referred, in great part, to the experience crystallized in laws and institutions and to the un-written law of custom, honour and good breeding, which has become organic in the society of which we are members. Plato's Republic and Hegel's Philosophie des Rechts are the most typical examples of a fully developed philosophy of the state, but in the earlier modern period the prolonged discussion of natural rights and the social contract must be regarded as a contribution to such a theory. Moreover, if philosophy is to complete its constructive work, it must bring the course of human history within its survey, and exhibit the sequence of events as an evolu- tion in which the purposive action of reason is traceable. This is the task of the philosophy of history, a peculiarly modern study, due to the growth of a humanistic and historical point of view. Lessing's conception of history as an " education of the human race " is a typical example of this interpretation of the facts, and was indeed the precursor which stimulated many more elaborate German theories. The philosophy of history differs, it will be observed, from the purely scientific or descriptive studies covered by the general title of sociology. Sociology conceives itself as a natural science elucidating a factual sequence. The philosophy of history is essentially teleological; that is to say, it seeks to interpret the process as the realization of an immanent end. It may be said, therefore, to involve a complete metaphysical theory. Social institutions and customs and the different forms of state-organization are judged according to the degree in which they promote the realization of the human ideal. History is thus represented by Hegel, for example, as the realization of the idea of freedom, or rather as the reconciliation of individual freedom and the play of cultured interests with the stable objectivity of law and an abiding consciousness of the greater whole in which we move. So far as the course of universal history can be truly represented as an approxi- mation to this reconciliation by a widening

and deepening of both the elements, we may claim to possess a philosophy of history. But although the possibility of such a philosophy seems implied in the postulated nationality of the universe,

many would hold that it remains as yet an unachieved ideal.

There only remains to be briefly noticed the relation of philo- sophy to theology and the nature of what is called Philosophy of Religion. By theology is commonly understood the syste- matic presentation of the teaching of some positive or historical religion as to the existence and attributes of a Supreme Being, including his relation to the world and especially to man. But these topics have also been treated by philosophers and religious thinkers, without dependence on any historical data or special divine revelation, under the title of Natural Theology. Natural Theology is specially associated with the Stoic theories of provi- dence in ancient times and with elaborations of the argument from design in the 18th century. But there is no warrant for restricting the term to any special mode of approaching the problems indicated; and as these form the central subject of metaphysical inquiry, no valid distinction can be drawn between natural theology and general metaphysics. The philosophy of religion, on the other hand, investigates the nature of the religious consciousness and the value of its pronouncements on human life and man's relation to the ground of things. Unity, reconciliation, peace, joy, " the victory that overcometh the world " — such, in slightly varying phrases, is the content of religious faith. Does this consciousness represent an authentic insight into ultimate fact, or is it a pitiful illusion of the nerves, born of man's hopes and fears and of his fundamental ignorance? The philosophy of religion assumes the first alternative. The function of philosophy in general is the reflective analysis of experience, and the religious experience of mankind is prima facie entitled to the same consideration as any other form of conscious activity. The certainties of religious faith are matter of feeling or immediate assurance, and are expressed in the pictorial language of imagination. It becomes the function of philosophy, dealing with these utterances, to relate them to the results of other spheres of experience, and to determine their real meaning in the more exact terms of thought. The philosophy of religion also traces in the different historical forms of religious belief and practice the gradual evolution of what it takes to be the truth of the matter. Such an account may be distinguished from what is usually called the science of religion by the teleological or metaphysical presuppositions it involves. The science of religion gives a purely historical and comparative account of the various manifestations of the religious instinct without pronouncing

on their relative truth or value and without, therefore, professing to apply the idea of evolution in the philosophical sense. That idea is fundamental in the philosophy of religion, which therefore can be written only from the standpoint of a constructive meta- physical theory.

It is, indeed, only from the standpoint of such a theory that the definitions and divisions of the different philosophical disciplines adopted in this article can be said to hold good. But those who, like the positivists, agnostics and sceptics, deny the possibility of metaphysics as a theory of the ultimate nature of things, are still obliged to retain philosophy as a theory of knowledge, in order to justify the asserted limitation or impo- tence of human reason.

Bibliography — The best general histories of philosophy are by I. E. Erdmann, Friedrich Ueberweg and W. Windelband, Windef- band's being probably the freshest in its treatment and point of view. Ed. Zeller's History of Greek Philosophy still holds the field as the best continuous exposition of the subject,, but more recent work in the early period is represented by H. Diels and J. Burnet, while Zeller's view of Plato may be said to have been superseded by the later researches of Lewis Campbell, H. Jackson and others. T. Gomperz's Greek Thinkers is an able, if somewhat diffuse, survey of the philosophical development in connexion with the general movement of Greek life and culture. It does not go beyond Plato. B. Haurfeu, A. Stockl and Karl Werner give the fullest and most trustworthy histories of the medieval period, but the subject is very carefully treated by Erdmann and Ueberweg, and a useful compendium, written from a Roman Catholic standpoint, is Da Wulf's History of Medieval Philosophy (1900; Eng. trans., 1907). For modern times, in addition to the general histories already named, the works of Kuno Fischer, R. Falckenberg and H. Hoffding, and R. Adamson's Lectures on the Development of Modern Philosophy,

may be specially mentioned. Writers on the history of philosophy generally prefix to their work a discussion of the scope of philosophy, its divisions and its relations to other departments of knowledge, and the account given by Windelband and Ueberweg will be found specially good. The Introductions to Philosophy published by F. Paulsen, O. Kiilpe, W. Wundt and G. T. Ladd, deal largely with this subject, which is also treated by Henry Sidgwick in his Philo- sophy,

its Scope and Relations (1902), by Ernest Naville, La Definition de la philosophic (1894) and by Wundt in the introduction to his System der Philosophic (1889). A useful work of general reference is J. M. Baldwin's Dictionary of Philosophy and Psychology (3 vols., 1902-1905). (A. S. P.-P.)

PHILOSTRATUS, the name of several, three (or four), Greek sophists of the Roman imperial period — (1) Philostratus " the Athenian" (c. 170-245), (2) his nephew (?) Philostratus "of Lemnos " (born c. 190); (3) a grandson (?) of (2). Of these the most famous is Philostratus " the Athenian," author of the Life of Apollonius Tyana, which he dedicated to Julia Domna, wife of Alexander Severus and mother of Caracalla (see Apollonius of Tyana). 1 He wrote also Btot 'Socjuaroiv (Lives of the Sophists), Gymnasticus and Epistolae (mainly of an erotic character). Very little is known of his career. Even his name is doubtful. The Lives of the Sophists gives the praenomen Flavius, which, however, is found elsewhere only in Tzetzes. Eunapius and Synesius call him a Lemnian; Photius a Tyrian; his letters refer to him as an Athenian. It is probable that he was born in Lemnos, studied and taught at Athens, and then settled in Rome (where he would naturally be called atheniensis) as a member of the learned circle with which Julia Domna surrounded herself. He was born probably in 172, and is said by Suidas to have been living in the reign of Philip (244-249). The fact that the author of Apollonius is also the author of the Lives of the Sophists is confirmed by internal evidence. The latter is dedicated to a consul Antonius Gordianus, perhaps one of the two Gordians who were killed in 238. The work is divided into two parts: the first dealing with the ancient Sophists, e.g. Gorgias, the second with the later school, e.g. Herodes Atticus.

The Lives are not in the true sense biographical, but rather picturesque impressions of leading representatives of an attitude of mind full of curiosity, alert and versatile, but lacking scientific method, preferring the external excellence of style and manner to the solid achievements of serious writing. The philosopher, as he says, investigates truth ; the sophist embellishes it, and takes it for granted. The Gymnasticus contains interesting matter concerning the Olympic games and athletic contests generally. The Letters breathe the spirit of the New Comedy and the Alexandrine poets; portions of Letter 33 are almost literally translated in Ben Jonson's Song to Celia, " Drink to me only with thine eyes." The 'Hpojucos, formerly attributed to Philostratus the Athenian, is probably the work of Philostratus the Lemnian. It is a popular disquisition on the heroes of the Trojan War in the form of a conversation between a Thracian vine-dresser on the shore of the Hellespont and a Phoenician merchant who derives his

knowledge from the hero Protesilaus, Palamedes is exalted at the expense of Odysseus, and Homer's unfairness to him is attacked. It has been suggested that Philostratus is here de- scribing a series of heroic paintings in the palace of Julia Domna. His other work is the Eikoj-m (Imagines), ostensibly a description of 64 pictures in a Neapolitan gallery. Goethe, Welcker, Brunn, E. Bertrand and Helbig, among others, have held that the descrip- tions are of actually existing works of art, while Heyne and Frieder- ichs deny this. In any case they are interesting as showing the way in which ancient artists treated mythological and other subjects, and are written with artistic knowledge and in attractive language. This work is imitated by the third Philostratus (or by some later sophist) of whose descriptions of pictures 17 remain.

There is great difficulty, due to a confused statement- of Suidas, in disentangling the works and even the personalities of these Philostrati. Reference is there made to Philostratus as the son of Verus, a rhetorician in Nero's time, who wrote tragedies, comedies and treatises. Suidas thus appears to give to Philostratus the Athenian a life of 200 years! We must be content to assume two Lemnian Philostrati, both sophists, living in Rome. See further a full discussion by K.Miinscher, in Philologus (1907), suppl. x., pp. 469-557. Of works bearing the name Philostratus there is a collected edition by C. F. Kayser (Zurich, 1844; Leipzig, 1870-1871), and another by Westermann (Paris, 1849), with Latin translation; these supersede those by F. Morel (Paris, 1608) and Olearius (Leipzig, 1709). There are separate editions of the Eikones by Schenkl and Reisch (Leipzig, 1902); of the Gymnasticus by Mynas (1858), who discovered the MS., _ Daremberg (Paris, 1858), Volckmar (Aurich, 1862), and especially Julius Jtithner (1909), with introd., comments and Ger.

1 As Lemnos was an Athenian island, anv Lemnian eonld be railed an Athenian.

trans.; of 73 epistles by Boissonade (Paris, 1842). The Life of Apollonius was first published by Aldus (1502) ; a French translation by Blaise de Vigenere appeared in 1596; an English translation of the first two books was published in London (1680) by Charles Blount, with some notes by Lord Herbert of Cherbury (prohibited in England in 1693, it was reprinted on the Continent) ; a full transla- tion appeared in 1903. Critical works on the Eikones are numerous: K. Fnederichs, Die Philostratischen Bilder (i860); Goethe, " Philo- strats Gemalde " in Complete Works (ed. Stuttgart, 1879); Brunn, Die Philostratischen Bilder (i860); A. Bougot, Une Galerie antique (1881); E. Bertrand, XJn Critique d'art dans I'antiquiti: Philostrate et son ecole

(1882); Bergk, ” Die Philostrate ” in Fiinf Abhandlungen zur Geschichte der griechischen Philosophic und Astronomie (1883); Schmid, Atticismus iv. 7, on the attribution of the works.

PHILOXENUS, of Cythera (435-380 B.C.), Greek dithyrambic poet. On the conquest of the island by the Athenians he was taken as a prisoner of war to Athens, where he came into the possession of the dithyrambic poet Melanippides, who educated him and set him free. Philoxenus afterwards resided in Sicily, at the court of Dionysius, tyrant of Syracuse, whose bad verses he declined to praise, and was in consequence sent to work in the quarries. After leaving Sicily he travelled in Greece, Italy and Asia, reciting his poems, and died at Ephesus. According to Suidas, Philoxenus composed twenty-four dithyrambs and a lyric poem on the genealogy of the Aeacidae. In his hands the dithyramb seems to have been a sort of comic opera, and the music, composed by himself, of a debased character. His masterpiece was the Cyclops, a pastoral burlesque on the love of the Cyclops for the fair Galatea, written to avenge himself upon Dionysius, who was wholly or partially blind of- one eye. It was parodied by Aristophanes in the Plutus (290). Another work of Philoxenus (sometimes attributed to Philoxenus of Leucas, a notorious parasite and glutton) is the Aelirvov (Dinner), of which considerable fragments have been preserved by Athenaeus. This is an elaborate bill of fare in verse, probably intended as a satire on the luxury of the Sicilian court. The great popularity of Philoxenus is attested by a complimentary resolution passed by the Athenian senate in 393. The comic poet Antiphanes spoke of him as a god among men; Alexander the Great had his poems sent to him in Asia; the Alexandrian grammarians received him into the canon; and down to the time of Polybius his works were regularly learned and annually acted by the Arcadian youth.

Fragments, with life, by G. Bippart (1843); T. Bergk, Poetae lyrici graeci.

PHILOXENUS (Syriac, Aksenaya), of Mabbog, one of the best of Syriac prose writers, and a vehement champion of Mono- physite doctrine in the end of the 5th and beginning of the 6th centuries. He was born, probably in the third quarter of the 5th century, at Tahal, a village in the district of Beth Garmai east of the Tigris. He was thus by birth a subject of Persia, but all his active life of which we have any record was passed in the territory of the Greek Empire. The statements that he had been a slave and was never baptized appear to be malicious inventions of his theological opponents. He was educated at Edessa, perhaps in the famous ” school of the Persians,” which was after-

wards (in 489) expelled from Edessa 2 on account of its connexion with the Nestorian heresy. The years which followed the Council of Chalcedon (451) were a stormy period in the Syrian Church. Philoxenus soon attracted notice by his strenuous advocacy of Monophysite doctrine, and on the expulsion of Calandio (the orthodox patriarch of Antioch) in 485 was ordained bishop of Mabbog 3 by his Monophysite successor Peter the Fuller (Bar- hebraeus, Chron. eccl. i. 183). It was probably during the earlier years of his episcopate that Philoxenus composed his thirteen homilies on the Christian life. Later he devoted himself to the revision of the Syriac version of the Bible, and with the help of his chorepiscopus Polycarp produced in 508 the so-called Philo- xenian version, which was in some sense the received Bible of the Monophysites during the 6th century. Meantime he continued his ecclesiastical activity, working as a bitter opponent of

2 According to Barhebraeus (Chron. eccl. ii. 55) through the efforts of Philoxenus himself.

3 Hierapolis of the Greeks, Manbij of the Arabs, a few miles west i of the Euphrates about latitude 36J .

Flavian II., who had accepted the decrees of the Council of Chalcedon and was patriarch of Antioch from 498 to 512. The Monophysites had” the sympathy of the emperor Anastasius, and were finally successful in ousting Flavian in 512 and replacing him by their partisan Severus. Of Philoxenus’s part in the struggle we possess not too trustworthy accounts by hostile writers, such as Theophanes and Theodorus Lector. We know that in 498 he was staying at Edessa 1 ; in or about 507, according to Theophanes, he was summoned by the emperor to Constanti- nople; and he finally presided at a synod at Sidon which was the means of procuring the replacement of Flavian by Severus. But the triumph was short-lived. Justin I., who succeeded Anasta- sius in 518, was less favourable to the party of Severus and Philoxenus, and in 519 they were both sentenced to banishment. Philoxenus was sent to Philippopolis in Thrace, and afterwards to Gangra in Paphlagonia, where he met his death by foul play in 523. Apart from his redoubtable powers as a controversialist, Phil- oxenus deserves commemoration as a scholar, an elegant writer, and an exponent of practical Christianity. Of the chief monument of his scholarship — the Philoxenian version of the Bible — only the Gospels and certain portions of Isaiah are known to survive (see Wright, Syr.

Lit. 14). It was an attempt to provide a more accurate rendering of the Greek Bible than had hitherto existed in Syriac, and obtained recognition among the Monophysites until superseded by the still more literal renderings of the Old Testament by Paul of Telia and of the New Testament by Thomas of Harkel (both in 616-617), of which the latter at least was based on the work of Philoxenus. There are also extant portions of commentaries on the Gospels from his pen. Of the excellence of his style and of his practical religious zeal we are able to judge from the thirteen homilies on the Christian life and character which have been edited and translated by Budge (London, 1894). In these he holds aloof for the most part from theological controversy, and treats in an admir- able tone and spirit the themes of faith, simplicity, the fear of God, poverty, greed, abstinence and unchastity. His affinity with his earlier countryman Aphraates is manifest both in his choice of subjects and his manner of treatment. As his quotations from Scripture appear to be made from the Peshiˆta, he probably wrote the homilies before he embarked upon the Philoxenian version. 2 Philoxenus wrote also many Controversial works and some liturgical pieces. Many of his letters survive, and at least two have been edited. 3 Several of his writings were translated into Arabic and Ethiopic. (N. M.)

PHILTRE (Lat. phillrum, from Gr. 1\tpov, i\eiv, to love), a drug or other medicinal drink supposed to have the magical property of exciting love.

PHINEUS, in Greek legend, son of Agenor, the blind king of Salmydessus on the coast of Thrace. He was skilled in the art of navigation, and Apollo had bestowed upon him the gift of prophecy. His blindness was a punishment from the gods for his having revealed the counsels of Zeus to mortals, or for his treatment of his sons by his first wife Cleopatra. His second wife having accused her stepsons of dishonourable proposals, Phineus put out their eyes, or exposed them to the wild beasts, or buried them in the ground up to their waists and ordered them to be scourged. Zeus offered him the choice of death or blindness. Phineus chose the latter, whereupon Helios (the sun-god), offended at the slight thus put upon him, sent the Harpies to torment him. In another story, the Argonauts (amongst whom were Calais and Zetes, the brothers of Cleo- patra), on their arrival in Thrace found the sons of Phineus half buried in the earth and demanded their liberation. Phineus refused, and a fight took place in which he was slain by Heracles, who freed Cleopatra (who had been thrown into prison) and her sons, and reinstated them as rulers of the kingdom. Tragedies on the subject of Phineus were written by Aeschylus and Sophocles. These would directly appeal to an Athenian audience,

Phineus's first wife having been the daughter of Orithyia (daughter of Erechtheus, king of Athens), who had been carried off by Boreas to his home in Thrace. The punish ment of Phineus would naturally be regarded as a just retribu-

1 Chronicle of Joshua Stylites, ch. 30.

2 On these and other points see Budge's introduction to his second volume, which contains also a list of the other works of Philoxenus and a number of illustrative extracts.

8 One by Martin (in Grammatica chrestomathia et glossarium linguae syriacae) and one by Guidi {La Lettera di FUosseno ai monaci di TeU 'Adda).

tion for the insult put upon a princess of the royal house of Athens.

Apollodorus i. 9, 21, iii. 15, 3; Sophocles, Antigone, 966, with Jebb's notes; Diod. Sic. iv. 43, 44; Servius on Aeneid iii. 209; Schol. on Apollonius Rhodius ii. 178.

PHIPS (or Phipps), SIR WILLIAM (1651-1695), colonial governor of Massachusetts, was born on the 2nd of February 1651, at Woolwich, Maine, near the mouth of the Kennebec river. He was a shepherd until he was eighteen, and then a ship carpenter's apprentice for four years; worked at his trade in Boston for a year, at this time learning to read and write; and with his wife's property established a ship-yard on the Sheepscot river in Maine, but soon abandoned it because of Indian disorders. In 1684-1686, with a commission from the British Crown, he searched vainly for a wrecked Spanish treasure ship of which he had heard while on a voyage to the Bahamas; he found this vessel in 1687, and from it recovered £300,000. Of this amount much went to the duke of Albe- marle, who had fitted out the second expedition. Phips re- ceived £16,000 as his share, was knighted by James II., and was appointed sheriff of New England under Sir Edmund Andros. Poorly educated and ignorant of law, Phips could accomplish little, and returned to England. In 1689 he returned to Massa- chusetts, found a revolutionary government in control, and at once entered into the life of the colony. He joined the North Church (Cotton Mather's) at Boston, and was soon appointed by the General Court commander of an expedition against the French in Canada, which sailed in April j.690 and easily captured Port Royal. A much larger expedition led by Phips in July against Quebec and Montreal ended disastrously. Phips generously bought at their par value, in order to give them credit in the colony, many of the colony's bills issued to pay for the expedition.

In the winter of 1690 he returned to Eng- land, vainly sought aid for another expedition against Canada, and urged, with Increase Mather, the colonial agent, a restora- tion of the colony's charter, annulled during the reign of Charles II. The Crown, at the suggestion of .Mather, appointed him the first royal governor under the new charter. On reaching Boston in May 1692, Phips found the colony in a very dis- ordered condition, and though honest, persevering and indis- posed to exalt his prerogative at the expense of the people, he was unfitted for the difficult position. He appointed a special commission to try the witchcraft cases, but did nothing to stop the witchcraft mania, and suspended the sittings of the court only after great atrocities had been committed. In defending the frontier he displayed great energy, but his policy of building forts was expensive and therefore unpopular. Having the manners of a 17th-century sea captain, he became involved in many quarrels, and engaged in a bitter controversy with Governor Benjamin Fletcher of New York. Numerous complaints to the home government resulted in his being summoned to England to answer charges. While in London awaiting trial, he died on the 18th of February 1695.

See Cotton Mather's Life of His Excellency Sir William Phips (London, 1697; republished in his Magnolia in 1702); Francis Bowen's " Life of Sir William Phips," in Jared Sparks's American Biography, 1st series, vol. vii. (New York, 1856); William Goold's " Sir William Phips," in Collections of the Maine Historical Society, series I, vol. ix. (Portland, 1887) ; Ernest Myrand's Sir William Phipps devant Quebec (Quebec, 1893); Thomas Hutchinson's History of Massachusetts (2 vols., Boston; 3rd ed., 1795) ; and J. G. Palfrey's History of New England (5 vols., Boston, 1858-1890).

PHLEBITIS (from Gr. (j>\i\p, a vein), inflammation of a vein. When a vein is inflamed the blood in it is apt to form a clot, or thrombus, which, if loosened and displaced from its original position, may be carried as an embolus towards the heart and there be arrested; or it may pass through the cavities of the heart into the lungs, there to lodge and to give rise to alarming symptoms. If the thrombus is formed in the inflamed vein of a pile it may pass as an embolus (see Haemorrhoids) into the liver. If an embolus is carried through the left side of the heart it may enter the large vessels at the root of the heck and reach the brain, giving rise to serious cerebral disturbance or

to a fatal paralysis. The thrombus may be formed in gout and rheumatism, or in consequence of stagnation of the blood- current due to slowing of the circulation in various wasting diseases. When a thrombus forms, absolute rest in the re- cumbent posture is to be strictly enjoined; the great danger is the displacement of the clot. An inflamed and clotted vein, if near the surface, causes an elongated, dusky elevation beneath the skin, where the vein may be felt as a hard cord, the size, perhaps, of a cedar pencil, or a pen-holder. Its course is marked by great tenderness, and the tissue which was drained by the branches of that vein are livid from congestion, and perhaps boggy and pitting with oedema. If, as often happens, the inflamed vein is one of those running conspicuously upwards from the foot — a saphenous vein (cracks, distinct) — the patient should be placed in bed with the limb secured on a splint in order to protect it from any rough movement. Should the clot become detached, it might give rise to sudden and alarming faintness possibly even to a fatal syncope. Thus, there is always grave risk with an inflamed and clotted vein, and modern surgery shows that the safest course is, when practicable, to place a ligature on the vein upon the heart-side of the clotted piece and to remove the latter by dissection. When, as some- times happens, the clot is invaded by septic organisms it is particularly liable to become disintegrated, and if parts of it are carried to various regions of the body they may there give rise to the formation of secondary abscesses. In the ordinary treatment of phlebitis, in addition to the insistence on perfect rest and quiet, fomentations may be applied locally, the limb being kept raised. Massage must not be employed so long as there is any risk of a clot being detached. (E. O.*)

PHLEGON, of Tralles in Asia Minor, Greek writer and freed- man of the emperor Hadrian, flourished in the 2nd century a.d. His chief work was the Olympiads, an historical compendium in sixteen books, from the 1st down to the 229th Olympiad (776 B.C. to a.d. 137), of which several chapters are preserved in Photius and Syncellus. Two small works by him are extant: On Marvels, containing some ridiculous stories about ghosts, prophecies and monstrous births, but instructive as regards ancient superstitions ;-On Long-lived Persons, a list of Italians who had passed the age of ioo, taken from the Roman censuses. Other works ascribed to Phlegon by Suidas are a description of Sicily, a work on the Roman festivals in three books, and a topography of Rome.

Fragments in C. Mullor, Frag. hist, graec. iii. ; ofVthe Marvels and Long-lived in O. Keller, Rerum naturalium scriptores, i. (1877); see also H. Diels, ” Phlegons Androgynenorakel ” in Sibyllinische Blatter (1890).

PHLOGOPITE, a mineral belonging to the group of micas (\oycoir6s (fiery- looking), the mineral being sometimes brownish-red and coppery in appearance. The hardness is 2ˆ—3, and the specific gravity 2-78-2-85. The optic axial plane is parallel to the plane of symmetry and the axial angle o°-io°. Phlogopite occurs chiefly as scales and plates embedded in crystalline limestones of the Archean formation. The mica mined in Canada and Ceylon is mainly phlogopite, and is largely used as an insulator for electrical purposes. In Canada it occurs with apatite in pyroxene rocks which are intrusive in Laurentian gneisses and crystalline limestones, the principal mining district being in Ottawa county in Quebec and near Burgess in Lanark county, Ontario. In Ceylon, the mineral forms irregular veins, rarely exceeding one or two feet in width, traversing granu- lite, especially near the coptact of this rock with crystalline limestone. (L. J. S.)

PHLOX (Nat. Ord. Polemoniaceae), a genus of about 30 species, mostly perennial hardy plants of great beauty, natives of North America (one occurs in Siberia), with entire, usually opposite, leaves and showy flowers generally in termina clusters. Each flower has a tubular calyx with five lobes, and a salver shaped corolla with a long slender tube and a flat limb. The five stamens are given off from the tube of the corolla at different heights and do not protrude beyond it. The ovary is three- celled with one to two ovules in each cell; it ripens into a three- valved capsule. Many of the species and varieties are tall herbs yielding a wealth of bloom throughout the summer and early autumn. These require a deep, rich, and rather heavy loam, and a cool, moist position to flourish.

The dwarf perennial species and varieties, the ” moss pinks ” of gardens, are charming plants for the rockery and as edging to beds and borders. They are trailing and tufted in habit, the branches rooting at the nodes. They succeed in poorer soil, and drier situations than the tall kinds. Seed is seldom produced. Propagation is effected by cuttings in July and early August, placed in a cold frame, and by division of the plants, which should be lifted carefully, and cut into rooted portions as required. The tufted kinds decay in patches in winter if the situation is moist and the weather mild and wet.

Phlox Drummondii and its numerous varieties are half-hardy annuals in Britain. It is a small-growing hairy plant, flowering profusely during the summer months. For early flowering it should be sown in heat in March and April and transferred out of doors in June. It succeeds if sown out of doors in April, but the flowering season is later and shorter.

The tall-growing border phloxes are divided into early and late flowering kinds respectively, the former derived mainly from P. glaberrima and P. suffrulicosa, and the latter from P. maculata and P. paniculata. The salver-shaped flowers with cylindrical tubes range from pure white to almost bright scarlet in colour, passing through shades of pink, purple, magenta lilac, mauve and salmon. New varieties are obtained by the selection of seedlings. Owing to the frequent introduction of new kinds, the reader is referred to the current lists published by growers and nurserymen. The ” moss pinks,” P. subulqfa and its varieties, are all worthy of a place in the alpine garden.

The varieties are relatively few. The following list includes nearly all the best kinds: —

P. subulata, pink with dark centre ; Aldboroughensis, rose ; annulata, bluish white, ringed with purple ; atrolilacina, deep lilac ; atropurpurea purple-rose and crimson; Brightness, bright rose with scarlet eye; compacta, clear rose; Fairy, lilac; G. F. Wilson, mauve; grandiflora, pink, crimson blotch; Little Dot, white, blue centre; Nelsoni, pure white; Vivid, rose, carmine centre; all these are about 4 in. high. P. divaricata, lavender, height I ft. ; P. ovata, rose, 1 ft. ; P. reptans, rose, 6 in.; and P. amoena, rose, 9 in., are also charming aipines.

P. Drummondii varieties come true from seed, but are usually sown in mixture. $p

PHOCAEA (mod. Fokia or Fokha) an ancient city on the western coast of Asia Minor, famous as the mother city of Marseilles. It was the most northern of the Ionian cities, and was situated on the coast of the peninsula which separates the gulf of Cyme, occupied by Aeolian settlers, from the Hermaean Gulf, on which stood Smyrna and Clazomenae. 1 Its position between two good harbours, Naustathmus and Lampter (Livy xxxvii. 31), led the inhabitants to devote themselves to maritime pursuits. According to Herodotus the Phocaeans were the first of all the Greeks to undertake distant voyages, and made known the coasts of the Adriatic, Tyrrhenia and Spain. Arganthonius, king of Tartessus in Spain, invited them to emigrate in a body to his dominions, and, on their declining, presented them with a large sum of money. This they employed in constructing a strong wall around their city, a defence which stood them in good stead when Ionia was attacked by Cyrus in 546. Eventually they determined to seek a new home in the west, where they already had flourishing colonies, e.g.

1 It was said to have been founded by a band of emigrants from Phocis, under the guidance of two Athenian leaders, named Philogenes and Damon, but it joined the Ionian confederacy by accepting the government of Athenian rulers of the house of Codrus.

Alalia in Corsica and Massilia (mod. Marseilles). A large part of the emigrants proceeded only as far as Chios, returned to Phocaea, and submitted to the Persian yoke.

Phocaea continued to exist under the Persian government, but greatly reduced in population and commerce. Though it joined in the Ionian revolt against Persia in 500 it was able to send only three ships to the combined fleet which fought at Lade. But a Phocaean took the supreme command. It never again played a prominent part in Ionian history, and is rarely mentioned. In the time of Timur Fujah was a fortress of Sarukhan, but had been previously in Genoese hands. The ruins still visible on the site bear the name of Palaea Fokia, but they are of little interest. The modern town in the immediate neighbourhood, still known as Fokia, was founded by the Genoese in 142 1 on account of the rich alum mines in the neighbourhood. It has a fair natural harbour, which is the nearest outlet of the rich district of Menemen. About 1880, while the Gediz Chai was throwing its silt unchecked into the Gulf of Smyrna and gradually filling the navigable channel, there was talk of reviving Fokia as a new port for Smyrna, and connecting it with the Cassaba railway. But, in deference to Smyrniote protests, a new estuary was cut for the Gediz. Fokia has acquired local impor- tance however as a port of call for coasting steamers, and it is used to some degree as a summer residence by Smyrniotes.

(D. G. H.)

PHOCAS, East Roman emperor (602-610), was a Cappadocian of humble origin. He was still but a centurion when chosen by the army of the Danube to lead it against Constantinople. A revolt within the city soon afterwards resulted in the abdication of the reigning emperor Maurice, and in the elevation of Phocas to the throne, which seems to have been accomplished by one of the circus factions against the wish of the troops. Phocas proved entirely incapable of governing the empire. He con- sented to pay an increased tribute to the Avars and allowed the Persians, who had declared war in 604 under

Chosroes II., to overrun the Asiatic provinces and to penetrate to the Bosporus. When the African governor Heraclius declared against him, Phocas was deserted by the starving populace of Constantinople, and deposed with scarcely a struggle (610). He died in the same year on the scaffold.

See J. B. Bury, The Later Roman Empire (London, 1889), ii. 197-206.
PHOCION, Athenian statesman and general, was born about 402 B.C., 1 the son of a small manufacturer. He became a pupil of Plato and in later life was a close friend of Xenocrates. This academic training left its mark upon him, but it was as a soldier rather than as a philosopher that he first came into notice. Under Chabrias he distinguished himself in the great sea-fight of Naxos (376), and in the subsequent campaigns loyally supported his chief. He won the confidence of the allies by his justice and integrity. In 3 5 1-349 2 he entered the Persian service and helped to subdue a rebellion in Cyprus. Hence- forward he always held a prominent position in Athens, and although he never canvassed he was elected general forty-five times in all. In politics he is known chiefly as the consistent opponent of the anti-Macedonian firebrands, headed by Demos- thenes, Lycurgus and Hypereides, whose fervent eloquence he endeavoured to damp by recounting the plain facts of Athens's military and financial weakness and her need of peace, even when the arms of Athens seemed to prosper most. But although he won the respect of his audience, his advice was frequently discarded. Yet his influence was felt at the trial of Aeschines in 343, whom he helped to defend, and after the disaster of Chaeroneia (338), when he secured very lenient terms from Philip. He also rendered good service in the field: in 348 he saved the force operating against the philo-Macedonian tyrants in Euboea by the brilliant victory of Tamynae. Under the Macedonian predominance his reputation steadily increased.

1 Diodorus' statement that Phocion was 75 at his death (i.e. that he became general at 30 and was elected 45 years in succession) would give 394-393 as the date of birth; but he must have been quite 25 as second-in-command at Naxos (376).

2 The chronology is uncertain : the dates given for this period are Beloch's L&riechische Geschichte.

Though by no means inclined to truckle to the Macedonians, as is shown by his protection of the refugee Harpalus and his spirited campaign in defence of Attica in 322, he won the confi- dence of the conquerors, and in the restricted democracy which Antipater enforced he became the virtual ruler of Athens. Old age, however, was telling

on him; when Polyperchon by his proclamation of ” freedom ” raised a new crisis in 318, Phocion’s dilatoriness was interpreted as active treason on Cassander’s behalf, and the people, incited by the restored democrats, deposed him from office. Phocion fled to Polyperchon, but was sent back by the latter to be tried at Athens. The assembly, containing numerous slaves and all the city mob, shouted Phocion down and condemned him to death unheard. Not long after, the Athenians decreed a public burial and a statue in his honour.

Phocion’s character and policy were throughout inspired’ by his philosophic training, which best explains his remarkable purity of character and his prudent councils. To the same influence we may ascribe his reserve and his reluctance to co-operate heartily either with the people or with the Macedonian conquerors who put their trust in him : a greater spirit of energy and enterprise might have made him the saviour of his country. Phocion remained famous in antiquity for the pithy sayings with which he used to parry the eloquence of his opponents. Demosthenes called him ” the chopper of my periods.”

Plutarch {Life of Phocion) draws much good information from Philochorus and Duris (who reproduces Hieronymus of Cardia); his numerous anecdotes are repeated in other works of his and in Aelian (Var. hist.). Diodorus (xvi.-xviii.) is likewise based on Duris. See Holm. Gk. Hist. vol. iii. (Eng. trans., London, 1896).

(M. O. B. C.)

PHOCIS, an ancient district of central Greece (now a depart- ment, pop. 62,246), about 625 sq. m. in area, bounded on the W. by Ozolian Locris and Doris, on the N. by Opuntian Locris, on the E. by Boeotia, and on the S. by the Corinthian Gulf. The massive ridge of Parnassus (8068 ft.), which traverses the heart of the country, divides it into two distinct portions. Between this central barrier and the northern frontier range of Cnemis (3000 ft.) is the narrow but fertile valley of the Cephissus, along which most of the Phocian townships were scattered. Under the southern slope of Parnassus were situated the two small plains of Crisa and Anticyra, separated by Mt Cirphis, an offshoot from the main range. Being neither rich in material resources nor well placed for “commercial enterprise, Phocis was mainly pastoral. No large cities grew- up within its territory, and its chief places were mainly of strategic importance.

The early history of Phocis remains quite obscure. From the scanty notices of Greek legend it may be gathered that an influx of tribes

from the north contributed largely to its popula- tion, which was reckoned as Aeolic. It is probable that the country was originally of greater extent, for there was a tradition that the Phocians once owned a strip of land round Daphnus on the sea opposite Euboea, and carried their frontier to Ther- mopylae; in addition, in early days they controlled the great sanctuary of Delphi. The restriction of their territory was due to the hostility of their neighbours of Boeotia and Thessaly, the latter of whom in the 6th century even carried their raids into the Cephissus valley. Moreover the Dorian population of Delphi constantly strove to establish its independence and about 590 B.C. induced a coalition of Greek states to proclaim a ” Sacred War ” and free the oracle from Phocian supervision. Thus their influence at Delphi was restricted to the possession of two votes in the Amphictyonic Council.

During the Persian invasion of 480 the Phocians at first joined in the national defence, but by their irresolute conduct at Thermopylae lost that position for the Greeks; in the cam- paign of Plataea they were enrolled on the Persian side. In 4S7 an attempt to extend their influence to the head waters of the Cephissus in the territory of Doris brought a Spartan army into Phocis in defence of the ” metropolis of the Dorians.” A similar enterprise against Delphi in 448 was again frustrated by Sparta, but not long afterwards the Phocians recaptured the sanctuary with the help of the Athenians, with whom they

had entered into alliance in 454. The subsequent decline of Athenian land-power had the effect of weakening this new connexion; at the time of the Peloponnesian War Phocis was nominally an ally and dependent of Sparta, and had lost control of Delphi.

In the 4th century Phocis was constantly endangered by its Boeotian neighbours. After helping the Spartans to invade Boeotia during the Corinthian War (395-94), the Phocians were placed on the defensive. They received assistance from Sparta in 380, but were afterwards compelled to submit to the growing power of Thebes. The Phocian levy took part in Epaminondas’ inroads into Peloponnesus, except in the final campaign of Mantinea (370-62), from which their contingent was withheld. In return for this negligence the Thebans fastened a religious quarrel upon their neighbours, and secured a penal decree against them from the Amphictyonic synod (356). The Phocians, led by two capable generals, Philomelus and Onomarchus, replied by

seizing Delphi and using its riches to hire a mercenary army. With the help of these troops the Phocian League at first carried the war into Boeotia and Thessaly, and though driven out of the latter country by Philip of Macedon, maintained itself for ten years, until the exhaustion of the temple treasures and the treachery of its leaders placed it at Philip's mercy. The conditions which he imposed — the obliga- tion to restore the temple funds, and the dispersion of the population into open villages — were soon disregarded. In 339 the Phocians began to rebuild their cities; in the following year they fought against Philip at Chaeronea. Again in 323 they took part in the Lamian War against Antipater, and in 279 helped to defend Thermopylae against the Gauls.

Henceforth little more is heard of Phocis. During the 3rd century it passed into the power of Macedonia and of the Aetolian League, to which in 196 it was definitely annexed. Under the dominion of the Roman republic its national league was dissolved, but was revived by Augustus, who also restored to Phocis the votes in the Delphic Amphictyony which it had lost in 346 and enrolled it in the new Achaean synod. The Phocian League is last heard of under Trajan.

See Strabo, pp. 401, 418, 424-425; Pausanias x. 1-4; E. Freeman, History of Federal Government (ed. 1893, London), pp. 113-114; G. Kazarow, De foederis Phocensium institulis (Leipzig, 1899); B. Head, Historia numorum (Oxford, 1887), pp. 287-288.

(M. O. B. C.)

PHOCYLIDES, Greek gnomic poet of Miletus, contemporary of Theognis, was born about 560 B.C. A few fragments of his " maxims " have been preserved (chiefly in the Florilegium of Stobaeus), in which he expresses his contempt for the pomps and vanities of rank and wealth, and sets forth in simple language his ideas of honour, justice and wisdom. A complete didactic poem (230 hexameters) called Holr \na vovderiKov or yvSifiai, bearing the name of Phocylides, is now considered to be the work of an Alexandrian Christian of Jewish origin who lived between 170 B.C. and a.d. 50. The Jewish element is shown in verbal agreement with passages of the Old Testament (especially the book of Sirach) ; the Christian by the doctrine of the immor- tality of the soul and the resurrection of the body. Some Jewish authorities, however, maintain that there are in reality no traces of Christan doctrine to be found in the poem, and that the author was a Jew. The poem was first printed at Venice in 1495, and was a favourite school textbook during the Reformation period.

See fragments and the spurious poem in T. Bergk, Poetae lyrici graeci, ii. (4th ed., 1882); J. Bernays Vber das Phdkylideische Gedicht (1858) ; Phocylides, Poem of Admonition, with introduction and commentaries by J. B. Fenling, and translation by H. D. Good- win (Andover, Mass., 1879); F. Susemihl, Geschichte der griechischen Lilteratur in der Alexandrinerzeit, (1892), ii. 642; S. Krauss' (s.v. " Pseudo- Phocylides ") in The Jewish Encyclopedia and E. Schurer, Hist, of the Jewish People, div. ii., vol. iii., 313-316 (Eng. trans., 1886), where full bibliographies are given. There is an English verse translation by W. Hewett (Watford, 1840), The Perceptive Poem of Phocylides.

PHOEBE, in astronomy, the ninth satellite of Saturn in order of discovery, or the tenth and outermost now known in xxi. i S

the order of distance. It was discovered by W. H. Pickering in 1899 by photographs of the stars surrounding Saturn. It is remarkable in that its motion around the planet is retrograde. (See Saturn.)

PHOEBUS (Gr. for " bright," " pure,"), a common epithet of Apollo (q.v.). Artemis in like manner is called Phoebe, and in the Latin poets and their modern followers Phoebus and Phoebe are often used simply for the sun and moon respectively.

PHOENICIA, in ancient geography, the name given to that part of the seaboard of Syria which extends from the Eleutherus (Nahr el-Kebir) in the north to Mt Carmel in the south, a distance of rather more than two degrees of latitude. These limits, however, were exceeded at various times; thus, north of the Eleutherus lay Aradus and Marathus, and south of Carmel the border sometimes included Dor and even Joppa. Formed partly by alluvium carried down by perennial streams from the mountains of Lebanon and Galilee, and fringed by great sand-dunes which the sea throws up, Phoenicia is covered with a rich and fertile soil. It is only at the mouth of the Eleutherus and at Acre (' Akk&) that the strip of coast-land widens out into plains of any size; there is a certain amount of open country behind Beirut; but for the most part the mountains, pierced by deep river-valleys, approach to within a few miles of the coast, or even right down to the sea, as at Ras en-Nakura (Scala Tyriorum, Jos. Bell. jud. ii. 10, 2) and Ras el-Abiad (Pliny's Promunturium Album), where a passage had to be cut in the rock for the caravan road which from time immemorial traversed this narrow belt of, lowland. From the flanks of Lebanon, especially from the heights which lie to the north of the Qasimiyeh or Kasimiya (Litany) River, the traveller looks down upon some of the finest landscape in the world; in general features the scenery is not

unlike that of the Italian Riviera, but surpasses it in grandeur and a peculiar depth of colouring. With regard to natural products the country has few worth mentioning; minerals are found in the Lebanon, but not in any quantity; traces of amber-digging have been discovered on the coast; and the purple shell (murex trunculus and brandaris) is still plentiful. The harbours which played so important a part in antiquity are nearly all silted up, and, with the exception of Beirut, afford no safe anchorage for the large vessels of modern times. A few bays, facing towards the north, break the coast-line, and small rocky islands are dotted here and there just off the shore. Sidon, Tyre and Aradus, though now connected with the mainland, were built originally upon islands; the Phoenicians preferred such sites, because they were con- venient for shipping and easily defended against attack.

The chief towns of ancient Phoenicia, as we know of them from the Amarna tablets (15th century B.C.) and from Egyptian, Assyrian and the Old Testament documents, were the following: Acco (now Acre or ‘Akka., Judg. i. 31), Achzib (now ez-Zib, ibid.), Ahlab (in Assyrian Mahalhba, ibid.) — three towns on the coast south of Tyre, Kanah (Josh. xix. 28), Tyre (Phoen. §6r, now Stir), Zarephath or Sarepta (1 Kings xvii. 9 now Sarafand), Sidon (now Saida), Berytus (Biruta in Egyptian, Biruna in the Amarna tablets, now Beirut), Byblus (in Phoen. and Hebr. Gebal, now Jebeil), Arka, 80 m. north of Sidon (Gen. x. 17, now ‘Arka), Sin (Assyr. Siannu, ibid.) Si my ra (Gen. x. 18, now Sumra), Marathus (now Amrit) not impor- tant till the Macedonian period, Arvad or Aradus (in Phoen. Arwad, now Ruad, Gen. x. 18; Ezek. xxvii. 8, n), the most northerly of the great Phoenician towns, and always famous as a maritime state.

Race and Language. — The Phoenicians were an early offshoot from the Semitic stock, and belonged to the Canaanite branch of it. Curiously enough in Gen. x. Sidon, the ” first-born ” of Canaan, is classed among the descendants of Ham; but the table of nations in Gen. x. is not arranged upon strict ethno- graphic principles; perhaps religious antagonism induced the Hebrews to assign to the Canaanites an ancestry different from their own; at any rate the close connexion which existed from an early date between the Phoenicians and the Egyptians may have suggested the idea that both peoples belonged to the same race. The Phoenicians themselves retained some memory of having migrated from older seats on an eastern sea; Herodotus (i. 1; vii. 89) calls it the “red sea,” meaning probably the

Persian Gulf; the tradition, therefore, seems to show that the Phoenicians believed that their ancestors came originally from Babylonia. By settling along the Syrian coast they developed a strangely un-Semitic love for the sea, and advanced on different lines from the other Canaanites who occupied the interior. They called themselves Canaanites and their land Canaan; such is their name in the Amarna tablets, Kinahhi and Kinahni; and with this agrees the statement assigned to Hecataeus (Fr. hist. gr. i. 17) that Phoenicia was formerly called Xva, a name which Philo of Byblus adopts into his mythology by making ” Chna who was afterwards called Phoinix ” the eponym of the Phoenicians (Fr. hist. gr. iii. 569). In the reign of Antiochus IV. and his successors the coins of Laodicea of Libanus bear the legend “Of Laodicea which is in Canaan”; 1 the Old Testament also sometimes denotes Phoenicia and Phoenicians by “Canaan” and “Canaanites” (Isa. xxiii. 11; Obad. 20; Zeph. i. 11), though the latter names generally have a more ex- tended sense. But ” Sidonians ” is the usual designation both in the Old Testament and in the Assyrian monuments (Sidunnu) ; and even at the time of Tyre’s greatest ascendancy we read of Sidonians and not Tyrians in the Old Testament and in Homer; thus Ethbaal king of Tyre (Jos, Ant. viii. 13, 2) is called king of the Sidonians in 1′ Kings xvi. 31. In the Homeric poems we meet with 2i56i’ioi, ‘Si&ovbi (Od. iv. 618; //. vi. 290; Od. xiii. 285; //. vi. 291) and $oivuces, #otctKrj (Od. xiii. 272, xiv. 288 seq., &c), and both terms together (Od. iv. 83 seq., II. xxiii. 743 seq.) 2 And the Phoenicians themselves used Sidonians as a general name; thus in the oldest Phoenician inscription known (CIS. i. 5 — NSI., No. 11), Hiram II. king of Tyre in the 8th century is styled ” king of the Sidonians.” But among the Greeks ” Phoenicians ” was the name most in use, $oivui(s (plur. of $oivt.£) for the people and ˆotvUrj for the land (cf. Phoenix). The former was probably the older word, and may be traced to oivos = ” blood-red “; the Canaanite sailors were spoken of as the ” red men ” on account of their sunburnt skin; then the land from which they came was called after them; and then probably the original connexion between *oTw£ and 4x>ivbs was forgotten, and new forms and meanings were invented. Thus divil- came to mean a ” date-palm “; but the date-palm is not in the least characteristic of Phoenicia, and can hardly grow there; 0oin£ in this sense has no connexion with the original meaning of Phoenician. A derivation has been sought elsewhere, and the Egyptian Fenh proposed as the origin of the name; but the word Fenh was apparently used of Asiatic barbarians in general, without any special reference to the Phoenicians (W. M. Muller, Asien u. Europa, p.*

208 seq.). The Lat. Poenus is of course merely an adaptation of the Greek form. 3 Language. — Inscriptions, coins, topographical names preserved by Greek and Latin writers, names of persons and the Punic passages in the Poenulus of Plautus, all show conclusively that the Phoenician language belonged to the North-Semitic group, and to that sub- division of it which is called the Canaanite and includes Hebrew and the dialect of Moab. A comparison between Phoenician and Hebrew reveals close resemblances both in grammatical forms and in vocabu- lary ; in some respects older features have been preserved in Phoeni- cian, others are later, others again are peculiar to the dialect ; many words poetic or rare or late in Hebrew are common in Phoenician. Hence we may conclude that the two languages developed indepen- dently from a common ancestor, which can be no other, than the ancient Canaanite, of which a few words have survived in the Canaanite glosses to the Amarna tablets (written in Babylonian). 4 But in forming an estimate of the Phoenician language it must be remembered that our material is scanty and limited in range; the Phoenicians were in no sense a literary people; moreover, with one exception (.CIS. i. 5), almost all the inscriptions are subsequent

1 Cooke, North-Semitic Inscriptions (elsewhere abbreviated NSL), No. 149 B. 8.

2 In this passage " Phoenicians " is a general name for carriers of commerce, not the inhabitants of a particular country. Similarly " Sidonian " in //. vi. 209, is taken to mean Semites in general. Elsewhere " Phoenicians " are merchants, kidnappers, &c, Sidon- ians " are artists; to indicate nationality both names seem to be used indifferently, e.g. Od. xiii. 272, xiv. 288, xv. 414.

- *See especially Pietschmann, Gesch. d. Phonizier, 13 sqq., and Winckler, Keilinschr. u. d. A. T., 3rd ed., 127.*

4 A vocabulary is given in KAT.», 652 seq.; see further Bohl, Die Sprache d. Amarnairiefe (1909).

to the 6th century B.C.; the majority belong to the 4th century and later, by which time the language must have undergone a certain amount of decay. 6 Indirectly, however, the Phoenicians rendered one great service to literature; they took a large share in the development and diffusion of the alphabet which forms the foundation of Greek (Herod, v. 58) and of all European writing. The Phoenician letters in their earlier types are practically identical with those used by the Hebrews (e.g. the Siloam inscr. NSI. No. 2), the Moabites (e.g the Mesha stone, ibid. No. 1), and the Aramaeans of north Syria (e.g. the Zenjirli inscrr. ibid. Nos. 61-63). They passed through various modifications in the course of time; after leaving

the mother country the script acquires a more cursive, flowing style on the stones from Cyprus and Attica; the tendency becomes more strongly marked at the Punic stage; until in the neo-Punic, from the destruction of Carthage (146 B.C.) to the 1st century A.D., both the writing and the language reached their most degenerate form. As a rustic dialect the language lasted on in North Africa till the 5th century A.D. In his sermons St Augustine frequently quotes Punic words.

History.— The Phoenicians, in imitation of the Egyptians, claimed that their oldest cities had been founded by the gods themselves, and that their race could boast an antiquity of 30,000 years (Africanus in Syncellus, Period. p. 31). Herodotus quotes (ii. 44) a more moderate tradition which placed the foundation of Tyre 2300 years before his time, i.e., c. 2756 B.C. According to Justin (xviii. 3) the Phoenicians, who had long been settled on the coast and occupied Sidon, founded Tyre in the year before the fall of Troy; possibly the date 1198 B.C., given byMenanderof Ephesus (in Jos. Ant. viii. 3, 1 and c. Ap. i. 18) as that from which the era of Tyre begins, may refer to the epoch which Justin mentions. Little certainty, however, can be allowed to these traditional chrono- logies. It is probable that in remote ages Babylonia exercised a considerable influence upon Syria and its coast towns; but Mr L.W.King has shown that the tradition, which was supposed to connect Sargon I. (c. 3800 B.C.) with the western land and sea, has been misunderstood; it was the sea in the east, i.e. the Persian Gulf, which Sargon crossed (Chronicles concerning Early Bab. Kings, vol. i. ch. 2, 1907).

The extension of the Egyptian empire in the direction of Asia began about 1600 B.C. under Ahmosi (Aahmes, Amasis) I., the founder of the XVIIIth Dynasty, who carried Egyptian his arms into Syria, and conquered at least Palestine Rule and Phoenicia, the latter being the country called c. 1600- Pa-hi on the Egyptian monuments (Muller, As. u. ti0 ° B ‘ c ‘ Eur. p. 181). Whether the campaign of Thothmes, (Tethmosis) I. to the Euphrates produced any lasting results is doubtful; it was Thothmes III. (1 503-1449) who repeated and consolidated the earlier conquest, and established Egyptian suzerainty over all the petty states of Syria and Phoenicia (see Egypt: History, I.). For the geography and civilization of Canaan about 1400 B.C. we have valuable evidence in the Egyptian papyrus Anastasi I., which mentions Kepuna (Gubna, Gebal-Byblus) the holy city, and continues: ” Come then to Berytus, to Sidon, to Sarepta. Where is the ford of Nat-‘ana (? Nahr el-Kasimiyeh, or a town)? Where is ‘Eutu (? Usu, Palaetyrus) ? Another city on the sea is called a haven, D’ar (Tyre) is its name, water is carried to it in boats; it is richer in fish than in sands.” 6 But the fullest information about the state of Phoenicia in the 15th and 14th centuries B.C. comes from the Amarna tablets, among which are many letters from the subject princes and the Egyptian governors of

Phoenicia to the Pharaoh. 7 It was a time of much political disturbance. The Hittites (q.v.) were invading Syria; nomads from the desert supported the invasion; and many of the local chiefs were ready to seize the opportunity to throw off the yoke of Egypt. The towns of Phoenicia were

B For the Phoen. inscrr. see Corpus inscriptionum semiticarum, pt. i., brought up to date provisionally by Repertoire d'epigr. sent. A selection is published by Lidzbarski, Handbuch d. nordsem. Epigraphik (1898); Cooke, Textbook of North-Semitic Inscriptions (1903), with translations and notes; Landau, Beitrdge z. Altertumsk. d. Orients (1899-1906); Lidzbarski, Altsem. Texte (1907), pt. i.

6 See W. M. Muller, he. cit. pp. 57, 172 sqq., 184 sqq.; Jeremias, Das A. T.im Lichie d. alt. Orients, p. 302 seq.; Records of the Past, ii. 109 seq.

'Winckler, Tett-el-Am. Letters Nos. 37 sqq.; Petrie, Syria and Egypt in the Tell el Am. Letters.

divided; Aradus, Simyra, Sidon supported the rebellion; Rib- habad, the vassal of Byblus, and Abi-melech, king of Tyre, held out for Egypt; but while all the towns made professions of fidelity, they were scheming for their own interests, and in the end Egypt lost them all except Byblus. The tablets which reveal this state of affairs are written in the language and script of Babylonia, and thus show indirectly the extent to which Babylonian culture had penetrated Palestine and Phoenicia; at the same time they illustrate the closeness of the relations between the Canaanite towns and the dominant power of Egypt. After the reign of Amenophis IV. (1376-1366) that power collapsed altogether; but his successors attempted to recover it, and Ramses (Rameses) II. reconquered Phoenicia as far as Beirut, and carved three tablets on the rock beside the Nahr el-Kelb to commemorate his victories; under the XlXth and XXth Dynasties this seems to have remained the northern limit of the Egyptian Empire. But in the reign of Ramses III. (c. 1200) great changes began to occur owing to the invasion of Syria by peoples from Asia Minor and Europe, which ended in the establishment of the Philistines on the coast near Ashkelon. The successors of Ramses III. lost their hold over Canaan; the XXIst Dynasty no longer intervened in the affairs of Syria; but Sheshonk (Shishak), the founder of the XXIInd Dynasty, about 928 B.C. endeavoured to assert the ancient supremacy of Egypt (cf. 1 Kings xiv. 25 sqq.), but his successes were not lasting, and, as we learn from the Old Testament, the power of Egypt became henceforward practically ineffective. Not until 608 did a

Pharaoh (Necho) lead an Egyptian army so far north, and he was defeated by Nebuchadrezzar. During the period which elapsed before the rise of the Assyrian power in Syria the Phoenicians were left to themselves. This was the period of their development, and Tyre became the leading city of Phoenicia.

Between the withdrawal of the Egyptian rule in Syria and the western advance of Assyria there comes an interval during ladepen- which the city-states of Phoenicia owned no suzerain. deaceof The history of this period is mainly a history of Phoenicia. Tyre, which not only rose to a sort of hegemony among the Phoenician states, but founded colonies beyond the seas (below). From 970 to 772 B.C. the bare outline of events is supplied by extracts from two Hellenistic historians, Menander of Ephesus and Dius (largely dependent upon Menan- der), which have been preserved by Josephus, Ant. viii. '$, 3 and c. Ap. i. 17, 18. From the data given in these passages we learn that Hiram I., son of Abi-baal, reigned in Tyre from 970 to 936 B.C. He enlarged the island-town to the east, restored and enriched the temples, built new ones to Heracles (i.e. Melkarth or Melqarth) and Astarte, founded the feast of the awakening of Heracles in the month Peritius, and reduced the inhabitants of Utica to their allegiance. The Tyrian annals, moreover, alluded to the connexion between Hiram and Solomon. Before this time, indeed, the Phoenicians had no doubt lived on friendly terms with the Israelites l (cf. Judges v. 17 ; Gen. xlix. 13); but the two nations seem to have drawn closer in the time of Solomon. 2 Sam. v. n, which brings David and Hiram together, probably antedates what happened in the following reign. For Solomon's palace and temple Hiram contributed cedar and fir trees as well as workmen, receiving in exchange large annual payments of oil and wine, supplies which Phoenicia must have drawn regularly from Israelite districts (1 Kings v. 9, 11; cf. Ezek. xxvii. 17; Ezr. iii. 7; Acts xii. 20; Jos. Ant. xiv. 10, 6) ; finally, in return for the gold which he furnished for the temple, Hiram received the grant of a territory in Galilee (Cabul, 1 Kings ix. 10-14). 2 This alliance between the two monarchs led to a

1 In Judges x. 12 (cf. i>. 6, iii. 3) the Sidonians are mentioned among the oppressors of Israel ; but there is no record of any invasion of Israel by the Phoenicians, and the statement is due to the post- exilic editor who introduced generalizations of ancient history into the book of Judges.

2 Jos. Ant. viii. 3, 1, dates the building of Solomon's temple in the nth year of Hiram, and 420 years after the foundation of Tyre. This gives a Tyrian era which began in 1198-1197 B.C., i.e. at the time when the Philistines settled on the coast of Canaan, an event

joint expedition from Eziongeber on the Gulf of Akaba (strictly Aqaba) to

Ophir (? on the east coast of Arabia, see Ophir) for purposes of trade. The list of Hiram's successors given by Josephus indicates frequent changes of dynasty until the time of Ithobal I. priest of Astarte, whose reign (887-855) marks a return to more settled rule. In contrast to Hiram I., king of Tyre, Ithobal or Ethbaal is styled in 1 Kings xvi. 31 " king of the Sidonians," i.e. of the Phoenicians, showing that in the interval the kings of Tyre had extended their rule over the other Phoenician cities. Under Ethbaal further expansion is recorded; Botrys north of Byblus and Aoza in North Africa are said to have been founded by him ; the more famous Carthage owed its origin to the civil discords which followed the death of Metten I. (820), his next successor but one. According to tradition, Metten's son Pygmalion (820-773) slew the husband of his sister Elissa or Dido ; whereupon she fled and founded Carthage (q.v.) in Libya (813; Justin xviii. 4-6). At this point Josephus's extracts from Menander come to an end.

From the time of Ethbaal onwards the independence of Phoenicia was threatened by the advance of Assyria. So far back as 1100 B.C. Tiglath-pileser I. had invaded North Assyrian Phoenicia, and in order to secure a harbour on the Rule, 876- coast he occupied Arvad (Aradus); but no permanent 60s B.c. occupation followed. In the 9th century, however, the system- atic conquest of the west began. In 876 b.c. Assur-nazir-pal III. " washed his weapons in the great sea," and exacted tribute from the kings of Tyre, Sidon, Byblus and other cities, including Arvad (Keilinschr. Bibliothek, i. 109). The inscriptions of his son Shalmaneser II. mention the taking of tribute from the Tyrians and Sidonians in 846 and again in 849; the Byblians are included at the latter date, and among the kings defeated at Karkar in 854 or 853 was Metten-baal, king of the Arvadites (ibid. pp. 141, 143, 173). Thus Shalmaneser completed the conquests of his predecessor on the Phoenician coast, and established a supremacy which lasted for over a hundred years and was acknowledged by occasional payments of tribute. In 741 Tiglath-pileser III. mentions on his tribute-lists " Hirtim of Tyre "; and here for the first time a piece of native evidence becomes available. The earliest Phoenician inscription at present known (CIS. i. s=NSI. No. 11) is engraved upon the fragments of a bronze bowl dedicated by a certain governor of Qarth-hadasht (or Karti-Hadasti, " New City," i.e. Citium), " servant of Hiram king of the Sidonians to Baal of Lebanon." It is to be noted that this Hiram II. was not only king of Tyre, as the Assyrian inscription calls him, but of Sidon too; and further, that by this time Tyre had established a colony in Cyprus (q.v.). In Tiglath-pileser's Philistine campaign of 734 Byblus and Aradus paid tribute, and an Assyrian chief officer (the Rab-shakeh) was sent to Tyre and extorted from the king, now Metten or Mattun, the large sum of 150 talents of gold (KB. ii. 23). For the period which follows a certain amount of information is furnished by Menander (in Jos. Ant. ix. 14, 2). Elulaeus IX., in Assyrian

Lull, who ruled under the name of Pylas, was king of Tyre, Sidon, and other cities at this time (c. 725-690), and at the beginning of his reign suffered from an invasion by Shal- maneser IV. or Salampsas (Jos.) ; this was probably the expedi- tion against Hoshea of Samaria in 725; " the king of Assyria . . . overran all Phoenicia, but soon made peace with them all and returned back." In the reign of Sargon Phoenicia itself seems to have been left alone; but the inhabitants of Citium revolted, showing that the authority of Tyre in Cyprus had grown weak; and Sargon received the submission of seven Cyprian princes, and set up in Larnaca (probably in 709) the triumphal stele now in the Berlin Museum (Schrader, Cuneif. Inscr. and 0. T., 2nd ed., vol. ii. p. 87). But Elulaeus, according to Menander, suppressed the revolt of Citium, and early in the reign of Sennacherib joined the league of Philistia and Judah,

which had considerable effect upon the' cities of Phoenicia (above, Justin xviii. 3). In the Tyrian annals (Jos. c. Ap. i. 18) the reference was probably to the felling of timber in Lebanon for Hiram's temples ; Josephus then .misinterpreted this by I Kings v. 6.

in alliance with Egypt and Ethiopia, which aimed at throwing off the oppressive tyranny of Assyria; as usual, however, the city-states of Phoenicia could not combine even against a common foe, and several broke away from Tyre, so Menander tells us, and sided with Assyria. In the great campaign of 701 Sennacherib came down upon the revolting provinces; he forced Lull, king of Sidon, to fly for refuge to Cyprus, took his chief cities, and set up Tuba'lu (Ethbaal) as king, imposing a yearly tribute {KB. ii. 91). The blockade of Tyre by sea, signifi- cantly passed over in Sennacherib's inscription, is described by Menander. The island-city proved to be impregnable, but it was the only possession left of what had been the extensive kingdom of Elulaeus. Sennacherib, however, so far accomplished his object as to break up the combination of Tyre and Sidon, which had grown into a powerful state. 1 At Sidon the successor of Ethbaal was Abd-milkath; in alliance with a Cilician chief he rebelled against Esarhaddon about the year 678, with disastrous consequences. Sidon was annihilated; Abd-milkath fell into the hands of Esarhaddon, who founded a new Sidon on the mainland, peopled it with foreigners, and called it after his own name. The old name, however, survived in popular usage; but the character of the city was changed, and till the time of Cyrus the kingdom of Sidon ceased to exist {KB. ii. 125 seq., 145; KAT? 88). Tyre also came in for its share of hardship. Elulaeus was followed by Baal, who in 672 consented to join Tirhaka, the Ethiopian king of Egypt, in a rebellion against Assyria.

Esarhaddon, on his way to Egypt for the second time, determined to deal out punishment; he blockaded Tyre, and raised earthworks on the shore and cut off the water-supply; but he did not capture the city itself. His monument found at Zenjirli represents the great king holding Baal of Tyre and Tirhaka of Egypt by cords fastened in their lips; 2 there is no evidence, however, that he actually took either of them prisoner. Early in the reign of Assur-bani-pal Tyre was besieged again (668), but Assur-bani-pal succeeded no better than his prede- cessors. Nevertheless Baal submitted in the end, along with the princes of Gebal and Arvad, Manasseh of Judah, and the other Canaanite chiefs; in the island of Cyprus the Assyrians carried all before them {KB. ii. 149 seq., 169, 173). On his return from the Arabian campaign Assur-bani-pal severely punished the rebellious inhabitants of Ushu (Palaetyrus) and Akko, and transported the survivors to Assyria (ibid. 229). In Phoenicia, as elsewhere, Assyrian rule created nothing and left nothing behind it but a record of barbarous conquest and extortion. An interesting sidelight is thrown upon this period by the list of the Thalassocracies in the Chronicon of Eusebius (p. 226, ed. Schoene), which places the 45 years of the sea-power of Phoenicia at a date which, with much probability, may be conjectured to lie between 709, when Cyprus submitted to Sargon, and 664, when Egypt threw off the rule of Assyria. If this dating is correct, and the Phoenician sea-power was at its height during these years, we can understand why Tyre gave so much trouble to the Assyrian kings. 3

In the last crisis of the dying power of Assyria the Egyptians for a short time laid hands on Phoenicia; but after their defeat rite Neo- at the battle of Carchemish (605), the Chaldaeans Babylonian became the masters of western Asia. Jeremiah's Period, 60S- allusion (xxv. 22) in 604 to the approaching downfall B-C " of the kings of Tyre and Sidon and the coast-land beyond the sea, i.e. the Phoenician settlements on the Mediter- ranean, seems to imply that the Phoenician states recovered some measure of independence; if they did it cannot have lasted long. In 588 Apries (Pharaoh Hophra) made an attempt

1 The above interpretation of Menander and the Assyrian evidence is based upon Ed. Meyer, Ency. Bib. col. 3755. For a different explanation see Landau, Beilr. z. Altertumsk. d. Or. vol. i., followed by Winckler, Altor. Forsch. ii. 65 sqq.; these scholars take Menander to refer to the later war of Esarhaddon and Assur-bani-pal against Baal of Tyre.

2 See the facsimile in Ausgrabungen in Sendschirli (Berlin, 1893), and p. 17 for the above interpretation of it.

3 John L. Myres, Journ. Hell. Studies (1906), xxvi. 84 seq., criticiz- ing Winckler, Der Alte Orient (1905), vol. vii. pt. 2.

to displace the Chaldaean supremacy; he defeated Tyre and Sidon, and terrorized the other cities into submission (Herod, ii. 161; Diod. Sic. i. 68). Some of the Phoenician chiefs, among them Ithobal II., the new king of Tyre, while forced to yield to a change of masters, were bold enough to declare their hostility to the Babylonians. This state of affairs did not escape the vigilance of Nebuchadrezzar. After the fall of Jerusalem he marched upon Phoenicia; Apries withdrew his army, and the siege of Tyre began. For thirteen years the great merchant city held out (585-573; Jos. c. Ap. i. 21; cf. Ezek. xxvi: 1 seq.). Ezekiel says that Nebuchadrezzar and his host had no reward for their heavy service against Tyre, and the presumption is that the city capitulated on favourable terms; for Ithobal's reign ends with the close of the siege, and the royal family is subsequently found in Babylon. The king appointed by Nebuchadrezzar was Baal II. (574-564), after whose death a republic was formed under a single suffete or " judge " {shojet). Josephus {loc.cit.) is again our authority for the changes of govern- ment which followed until the monarchy was revived. At length under Hiram III. Phoenicia passed from the Chaldaeans to the Persians (538), and at the same time Amasis (Ahmosi) II. of Egypt occupied Cyprus (Herod, ii. 182). There seems to have been no struggle; the great siege and the subsequent civil disorders had exhausted Tyre, and Sidon took its place as the leading state. About this time, too, Carthage made an effort for independence under Hanno the Great (538-521), the real founder of its fortunes; the old dependence upon Tyre was changed for a mere relation of piety observed by the annual sending of delegates {dewpol) to the festival of Melkarth (Arrian ii. 24; Polyb. xxxi. 20, 12). The disasters and humiliations which befell Tyre during this and the foregoing period might suggest that its prosperity had been seriously damaged. But Tyre always counted for more in commerce than in politics; and in the year 586, just before the great siege, Ezekiel draws a vivid picture (ch. xxvii.) of the extent and splendour of its commercial relations. Even when cut off from its possessions on the mainland the city itself was not captured; its seafaring trade went on; and though by degrees the colonies were lost, yet the ties of race and sentiment remained strong enough to bind the Phoenicians of the mother-country to their kindred beyond the seas.

Constitution.— At this point it is convenient to mention what little is known about the constitution of the Phoenician states. All Canaanite analogy speaks for kingship as the oldest form of Phoe- nician government. In the native inscriptions the chief of the city in Phoenicia itself and in Cyprus is always called king. The royal houses claimed divine descent, 4 and the king could not be chosen outside their members. His power, however, was limited by the wealthy merchant families, who possessed great influence in public affairs; thus it was possible for war or peace to be decided at Tyre in

the king's absence, or at Sidon against his will (Arrian ii. 15 and 16; Curtius iv. 1, 15). The priest of Melkarth at Tyre was the second man in the kingdom. Associated with the prince was a council of elders; such was the case at Gebal (Byblus) from the earliest times to the latest (Ezek. xxvii. 9) ; at Sidon this council consisted of 100 members (Diod. xvi. 45), perhaps also at Tyre. 6 Inscriptions of the 3rd and 2rtd centuries B.C. mention a Rab (chief) in Sidon, Cyprus and Gaulus (Gozo); what his position was it is difficult to say; in the colonies he may hava been a district governor. During Nebu- chadrezzar's time, as we have seen, a republic took the place of the monarchy at Tyre, and the government was administered by a succession of suffetes (judges) ; they held office for short terms, and in one instance two ruled together for six years. Much later, in the 3rd century B.C., an inscription from Tyre mentions a suffete (NSI. No. 8) without adding more to our knowledge. Carthage, of course, was governed by two suffetes, and these officers are frequently named in connexion with the Carthaginian colonies {NSI. p. 115 seq.); but we must be careful not to draw the inference that Phoenicia itself had any such magistrates. Under the Persians a federal bond was formed comprising Sidon, Tyre and Aradus, whose duty it was to contribute 300 triremes to the Persian fleet (Herod, vii. 89),

4 So the Babylonians, Canaanites (e.g. in the case of theNephilim, Gen. vi. 2), Arabs, Greeks, traced the descent of heroic families to the gods. W. R. Smith, Kinship and Marriage, p. 206; S. I. Curtis's Primitive Sent. Rel. To-day (London, 1902), p. 112 seq.

6 An inscr. from Tyre may be read, " 'Abd ba'al chief of the Hundred," NSI. p. 129; Clermont-Ganneau, Recueil d'arch. or. ii. 294 seq.

the lesser towns being underˆthe command of the great cities. Aradus presided over three subordinate townships (Arrian ii. 13) ; Berytus, which had no king of its own, probably formed with Byblus a single kingdom; while Tripolis consisted of a federation of three cities separated by a stadium from each other, and provided a meet- ing-place for the federal council, which was chiefly occupied in dealings with the Persian government (Diod. xvi. 41). But federation on a larger scale was never possible in Phoenicia, for the reason that no sense of political unity existed to bind the different states together. Commercial interests dominated everything else, and while these stimulated a municipal life not without vigour, civil discipline and loyalty were but feebly felt. On occasion the towns could defend their independence with strenuous courage; the higher

qualities which make for a progressive national life the Phoenicians did not possess.

Phoenicia now became part of the fifth satrapy of the Persian Empire, and entered upon a spell of comparative peace and The Persian growing prosperity. Favoured for the sake of Period, 538- their fleet, and having common interests against 333 B.C. Greece, 1 the Phoenicians were among the most loyal subjects of the empire. At this period Sidon occu- pied the position of leading state; in the fleet her king ranked next to Xerxes and before the king of Tyre (Herod. viii. 67); her situation afforded advantages for expansion which Tyre on its small and densely populated island could not rival. The city was distinguished by its cosmopolitan character; the satrap resided there when he came to Phoenicia, and the Persian monarch had his paradise outside the walls. In the first half of the 4th century Straton I. (in Phoen. x Abd-ashtart or Bod-'ashlart) was king, c. 374-362. He cultivated friendly relations with Athens, indicated in a decree of proxenia (Michel, Rec. d'inscr. gr. No. 93 = CiG. No. 87); his court was famed for its luxury; and the extent to which phil-Hellenic tendencies prevailed at this time in Sidon is shown by the royal sarcophagi, noble specimens of Greek art, which have been excavated in the necropolis of the city. It was in the reign of Straton that Tyre fell into the hands of Evagoras, king of Salamis, who had already supplanted Phoenician with Greek civilization in Cyprus (Isocr. Evag. 62, Paneg. 161 ; Diod. xv. 2). Straton made friends with Nicocles, son of Evagoras, and with him came to an untimely end through their implication in the great revolt of the satraps, 362 B.C. (see the story of Straton's death in Jerome, adv. Jovin. i. 45). A new revolt of Sidon against the Persians took place under King Tennes owing to the insults offered to the Sidonians at the federal diet in Tripolis. With the aid of Nectanebus of Egypt, who had grievances of his own to avenge, the Sidonians carried the rest of Phoenicia with them and drove the satraps of Syria and Cilicia out of the country. Tennes, however, betrayed his people and opened the city to Artaxerxes III.; the inhabitants to the number of 40,000 are said to have set fire to their houses and perished; Tennes himself was executed after he had served the ends of the great king (346 B.C.; Diod. xvi. 41-45). The last king of Sidon was Straton II. ("Abd-'ashtart, 346-332) before the Persian Empire came to an end. 2 Towards the close of the 5th century the Phoenician coins begin to supplement our historical sources (see Numismatics). From the time of Darius the Persian monarchs issued a gold coinage, and reserved to themselves the right of doing so; but they allowed their satraps and vassal states to coin silver and copper money at discretion. Hence Aradus, Byblus, Sidon and Tyre issued a coinage of their own, of which many specimens exist : the coins are stamped as a rule with emblem or name of the city, sometimes with the name of the ruler. 3 Thus from the coins of Byblus we learn the names of

four kings, "El-pa'al, 'Az-ba'al (between 360 and 340 B.C.), Adar-melek, 'Ain-el; from the coins of the other cities it is difficult

1 The naval expeditions against Greece in 480-449 and Sparta in 396-387 were mainly fitted out by Phoenicia. See Persia: Ancient History, for the whole of this section.

2 Justin xviii. 3 tells a story about Tyre during this period: the city, after being worn out though not defeated in long wars with the Persians, was so enfeebled that it was seized by the slaves, who rose and massacred their masters; one Straton alone escaped and was afterwards made king. The reference to the Persians is obviously incorrect; the story, if it can be taken seriously at all, must refer to one of the sieges by the Assyrians or Chaldaeans, and, as Meyer suggests (Ency. Bib. col. 3760), may be derived from the story of Abdalonymus of Sidon mentioned below.

3 See especially E. Babelon, Les Perses Ach&minides, and cf. NSI. No. 149.

to obtain much information. The native inscriptions, however, now become available, though most of them belong to the period which follows, and only a few have been discovered in Phoenicia itself. One of the earliest of these is the inscription of Byblus {CIS. i. i — NSI. No. 3), dating from the Persian period; it records a dedication made by Yehaw-milk, king of Gebal, and mentions the name of the king's grandfather, Uri-milk, but the exact dates of their reign are not given.

When Alexander the Great entered Phoenicia after the battle of Issus (333 B.C.), the kings were absent with the Persian fleet in the Aegean; but the cities of Aradus, Byblus and Toe Sidon welcomed him readily, the last-named showing Macedonian special zeal against Persia. The Tyrians also offered Period, submission, but refused to allow the conqueror 333 " 69 B – c – to enter the city and sacrifice to the Tyrian Heracles. Alexander was determined to make an example of the first who should offer opposition, and at once began the siege. It lasted seven months. With enormous toil the king drove out a mole from the mainland to the island and thus brought up his engines; ships from the other Phoenician towns and from Cyprus lent him their aid, and the town at length was forced in July 332; 8000 Tyrians were slain, 30,000 sold as slaves, and only a few notables, the king Azemilkos, and the festal envoys from Carthage who had taken refuge in the sanctuary of Melkarth, were spared (Diod. xvii. 40-46). It is not unlikely that Zech. ix. 2-4 refers to this famous siege. For the time Tyre lost its political existence, while the foundation of Alexandria presently changed the lines of trade, and dealt a blow even more fatal to the Phoenician cities.

During the wars of Alexander's successors Phoenicia changed hands several times between the Egyptian and the Syrian kings. Thus in 312 Tyre was captured from Antigonus by Ptolemy I., the ally of Seleucus; in 287 it passed into the domin- ion of Seleucus; in 275 again it was captured by Ptolemy II. Philadelphus, and began to recover itself as an autonomous municipality. From the year 275 " the people of Tyre " reckoned their era (CIS. i. 7 = NSI. No. 9, cf. 10). The Tyrian coins of the period, stamped with native, Greek and Egyptian symbols, illustrate the traditional relations of the city and the range of her ambitions. A special interest attaches to these silver tetradrachms and didrachms (staters and half- staters), because they were used by the Jews for the payment of the temple tax as "shekels of the sanctuary " (NSI. pp.

35i. 44).

Among the Phoenician states we know most about Sidon during this period. The kingship was continued for a long time. The story goes that Alexander raised to the throne a member of the royal family, Abdalonymus, who was living in obscure poverty and working as a gardener (Justin xi. 10; Curt, iv. 1; Diod. xvii. 47 wrongly connecting the story with Tyre). In 312 Ptolemy, then master of Phoenicia, appointed his general Philocles king of the Sidonians, and a decree in honour of this king has been found at Athens (Michel, No. 387, cf. 1261); but he cannot have reigned long. For at the end of the 4th and the beginning of the 3rd century we have evidence of a native dynasty in the important inscriptions of Tabnith, Esh- mun-'azar and Bod-'ashtart, and in the series of inscriptions (repeating the same text) discovered at Bostan esh-Shekh near Sidon (NSI. Nos. 4, 5, 6 and App. i.). 4 The last-named texts imply that the first king of this dynasty was Eshmun-'azar; his son Tabnith succeeded him; then came Eshmun-'azar II., who died young, then Bod-'ashtart, both of them grandsons of Eshmun-'azar I. With Bod-'ashtart, so far as we know, the dynasty came to an end, say about 250 B.C.; and it is not unlikely that the Sidonians reckoned an era of independence from this event (NSI. p. 95 «.).

Of the other Phoenician cities something is known of the history of Aradus. Its era began in 259 B.C., when it probably became a republic or free city. While the rest of Phoenicia passed under the

4 The date of this dynasty has been much disputed ; but the reference to " the lord of kings " in the great inscr. of Eshmun- 'azar (line 18) points to the Ptolemaic period, for the Persian monarch is always styled " king of kings." The interpretation of many details of the inscr. from Bostan esh-Shekh is still uncertain.

rule of Ptolemy II. and his successors between 281 and 197, Aradus remained in the kingdom of the Seleucids, who greatly favoured the city and increased its privileges (Strabo xvi. 2, 14; Polyb. v. 68). But its subject-towns availed themselves of the political changes of the period to throw off their allegiance; Marathus from 278 begins to issue a coinage bearing the heads of the Ptolemies, and later on Karne asserted its independence in the same way ; but in the end the Aradians recovered their supremacy. Diodorus records a barbarous attempt made by the Aradians, about 148 B.C. to destroy Marathus, which was frustrated by the pity and courage of an Aradian fisher- man (xxxiii. 5)._ At last in the time of Tigranes, the Armenian holder of the kingdom of the Seleucids, or soon afterwards, the coins of Marathus cease; the city was levelled to the ground, and its land, with that of Simyra, was parcelled out among tha Aradians (Strabo xvi. 2, 12). Akko issued coins of its own down to 267 B.C., if the reckoning was from the Seleucid era (312 B.C.); in 267 it was converted into a Greek city by Ptolemy, and called Ptolemais (Polyb. iv. 37; Strabo xvi. 2, 25; cf. Acts xxi. 7). Laodicea of Libanus was founded by Seleucus Nicator on the plain south-east of Hemesa (rjoms) in the region of the upper Orontes, and became an important city; its coins of the 2nd century B.C. bear the interest- ing legend in Phoenician, " Of Laodicea which is in Canaan " (NSI. p. 349 seq.). Another Laodicea " by the sea " (ad mare), also of Seleucid foundation, is probably to be identified with the ruined site called Um'm el-'Awamid. near the coast between Tyre and Akko; several Phoenician inscriptions have been found there (e.g. CIS., i. J = NSI. No. 9; Clermont Ganneau, Recueil, t. v.).

After the death of Antiochus IV. Epiphanes in 164 B.C., revolts and adventurers made their appearance in many parts of Syria, heralding the collapse of the kingdom of the Seleucids. Berytus was destroyed by the usurper Trypho in 140 B.C. Tyre in 120 and Sidon in 11 1 received complete independence, and inaugurated new eras from these dates. Byblus and Tripolis fell into the hands of " tyrants " (Strabo xvi. 2, 18; Jos. Ant. xiv. 3, 2), and Arab robbers plundered their territories from strongholds in the Lebanon. From 83-69 B.C. the entire kingdom was held by the Armenian Tigranes.

At last in 64 B.C. Pompey arrived upon the scene and established order out of chaos. Phoenicia was incorporated into the Roman province of Syria; Aradus, Sidon, Tyre and Tripolis rule. were confirmed in their rights of self-government

and in the possession of their territories. In 14 B.C. Augustus rebuilt Berytus as a Roman colony and stationed two legions there; later on

Ptolemais, Tyre and Sidon received colonial status. Under the beneficent government of Rome the chief towns prospered and extended their trade; but the whole character of the country underwent a change. During the Macedonian period Greek influences had been steadily gaining ground in Phoenicia; relations with the Greek world grew closer; the native language fell into disuse, and from the beginning of the Roman occupation Greek appears regularly in inscriptions and on coins, though on the latter Phoenician legends do not entirely vanish till the 2nd century a.d.; while the extent to which Hellenic ideas penetrated the native traditions and mythologies is seen in the writings of Philo of Byblus. For the purposes of everyday life, however, the people spoke not Greek, but Aramaic. As elsewhere, the Roman rule tended to obliterate characteristic features of national life, and under it the native language and institutions of Phoenicia became extinct.

Navigation, Trade, Colonies. — The Phoenicians were essentially a seafaring nation. Fearless and patient navigators, they ventured into regions where no one else dared to go, and, always with an eye to their monopoly, they carefully guarded the secrets of their trade routes and discoveries, and their knowledge of winds and currents. At the beginning of the 7th century B.C. a Phoenician fleet is said to have circumnavigated Africa (Herod, iv. 42). To the great powers Phoenician ships and sailors were indispensable; Sennacherib, Psammetichus and Necho, Xerxes, Alexander, all in turn employed them for their transports and sea-fights. Even when Athens had developed a rival navy Greek observers Doted with admiration the discipline kept on board the Phoenician ships and the skill with which they were handled (Xen. Oec. viii.';; all the Phoenician vessels from the round merchant-boat (yavhos — after which the island of Gaulus, now Gozo, near Malta was called) to the great Tarshish-ships, the " East-Indiamen " of the ancient world, excelled those of the Greeks in speed and equipment. As E. Meyer points out,

the war between the Greeks and the Persians was mainly a contest between the sea-powers of Greece and Phoenicia. At what period did Phoenicia first rise to be a power in the Mediter- ranean? We are gradually approaching a solution of this obscure problem. Recent discoveries in Crete (q.v.) have brought to light the existence of a Cretan or " Minoan " sea-power of remote antiquity, and it is clear that a great deal of what used to be described as Phoenician must receive quite a different designation. The Minoan sea-power was at last broken up by invaders from the north, and a Carian rule became dominant in the Aegean (Herod, i. 171; Thucyd. i. 4, 8). It was a time of disorder and conflict due to the immigration of new races into the ancient seats of civilization, and it synchronized with the weakening of the power of Egypt in the countries which bordered on the eastern Mediterranean. This was in the 12th century B.C. The Tyrian

trader saw that his opportunity was come, and the Aegean lay open to his merchant vessels. Where much is still obscure, all that seems certain is that the antiquity of Phoenicia as a sea and trading power has been greatly exaggerated both in ancient and in modern times; the Minoan power of Cnossus preceded it by many centuries; the influence of Phoenicia in the Aegean cannot be carried back much earlier than the 12th century b.c, and, comparatively speaking, it was " foreign, late, sporadic." 1

A vivid description of the Phoenicians' trade at the time of Tyre's prosperity is given by Ezekiel (xxvii. 12-25), and it shows how extensive were their commercial relations not only by sea, but by land as well. It was they who distributed to the rest of the world the wares of Egypt and Babylonia (Herod, i. 1). From the lands of the Euphrates and Tigris regular trade-routes led to the Mediterranean with trading-stations on the way, several of which are mentioned by Ezekiel (xxvii. 23). In Egypt the Phoenician merchants soon gained a foothold; they alone were able to maintain a profitable trade in the anarchic times of the XXIInd and XXIIIrd Dynasties (825-650 B.C.), when all other foreign merchants were frightened away. Though there were never any regular colonies of Phoenicians in Egypt, the Tyrians had a quarter of their own in Memphis (Herod, ii. 112). The Arabian caravan-trade in perfume, spices and incense passed through Phoenician hands on its way to Greece and the West (Herod, iii. 107); these articles of commerce were mainly pro- duced not in Arabia, but in East Africa and India, and the trade had its centre in the wealthy state of Sheba in Yemen. Between Israel and Phoenicia the relations naturally were close; the former provided certain necessaries of life, and received in exchange articles of luxury and splendour (Ezek. xxvii. 16-18). 2 Israelite housewives sold their homespun to Phoenician pedlars (Prov. xxxi. 24 R.V.M.); in Jerusalem Phoenician merchants and money-lenders had their quarter (Zeph. i. n), and after the Return we hear of Tyrians selling fish and all manner of ware in the city (Neh. xiii. 16), and introducing other less desirable imports, such as foreign cults (Isa. lxv. n). The Phoenician words which made their way into Greek at an early period indi- cate the kind of goods in which the Phoenicians traded with the West, or made familiar through their commerce; the following are some of them — xP V0 ~°s, X^v, fivtraos, bdbvr), fiiippa, vafiXa, KVTrpos, 4>vkos, fiva, TraWads, PciitvXos. Another valuable article of commerce which the Phoenicians brought into the market was amber. They can hardly have fetched it themselves from the Baltic or the North Sea; it came to them by two well- marked routes, one from the Baltic to the Adriatic, the other up the Rhine and down the Rhone. A deposit of amber has also been found in the Lebanon, and perhaps the Phoenicians worked this and concealed its origin.

1 Burrows, Discoveries in Crete (1907), 140 sqq. It may be noted that the

traditional or conjectural dates based upon the list of the Thalassocracies preserved by Eusebius carry us back to the 12th century B.C. See Professor John L. Myres's essay referred to above, § iii- (4)-

2 See Eupolemus (140-100 B.C.) quoted by Alexander Polyhistor, who, in a supposed letter from Solomon to the king of Tyre, mentions the food-supplies required by the Tyrians and promised from Palestine (Fr. Hist. Gr. iii. 226).

The Phoenician colonies were all supposed to have been founded from Tyre: with regard to the colonies in Cyprus and north Africa this was undoubtedly true. Cyprus possessed resources of timber and copper which could not fail to tempt the keen-eyed traders across the water, who made Citium (from Kittim, the name of the original non-Semitic inhabitants) their chief settle- ment, and thence established themselves in Idalium, Tamassus, Lapethus, Larnaka, Qarth-hadasht (Karti-hadasti) and other towns. In the inscriptions of the 4th to 3rd centuries, the Phoenician potentates in the island call themselves " kings of Kition and Idalion " (NSI. pp. 55-89). But the Phoenician rule was not so ancient as used to be supposed. At an early period Greeks from the south coast of Asia Minor had settled in Cyprus before the Phoenicians founded any colonies there; and it is noticeable that in the Assyrian tribute-lists of the latter half of the 7th century (KB. ii. pp. 149, 241) not one of the ten Cyprian kings mentioned appears to be Phoenician by name. Menander states (Jos. Ant. ix. 14, 2) that the kings of Tyre ruled over Cyprus at the close of the 8th century; but a clear proof that the Phoenician rule was neither ancient nor uninter- rupted is given by the fact that the Cyprian Greeks took the trouble to invent a Greek cuneiform character (Cypriote) modelled on the Assyrian.

Homer represents the Phoenicians as present in Greek waters for purposes of traffic, but not as settlers (II. xxiii. 744). They occupied tradjng-stations on some of the Aegean islands and on the Isthmus of Corinth. One of their objects was the collec- tion of murex, of which an enormous supply was needed for the dyeing industry; specially famous was the purple of the Laconian waters, the isles of Elishah of Ezek. xxvii. 7. But a great deal of what was formerly assigned to Phoenician influence in the Aegean at an early period — pottery, ornaments and local myths — must be accounted for by the vigorous civilization of ancient Crete. In the Greek world the Phoenicians made themselves heartily detested; their characteristic passion for gain (rd t,\oxpyfJ-a-Tov, Plato, Rep. iv. 435 E.) was not likely to in-

gratiate them with those who were compelled to make use of their services while they suffered from their greed.

Farther west in the Mediterranean Phoenician settlements were planted first in Sicily, on the south coast, at Heraclea or Ras Melqarth; the islands between Sicily and Africa, Melita (Malta) on account of its valuable harbour, Gaulus and Cossura were also occupied (Diod. v. 12); and a beginning was made with the colonization of Sardinia and Corsica; but farther west still, and on the Atlantic coasts to the right and left of the straits, more permanent colonies were established. It was the trade with Tarshish, i.e. the region of Tartessus in south-west Spain, which contributed most to the Phoenicians' wealth; for in this region they owned not only profitable fisheries, but rich mines of silver and other metals. The profits of the trade were enormous; it was said that even the anchors of ships returning from Spain were made of silver (Diod. v. 35).- From Gadeira (Punic Gader, Lat. Gades, now Cadiz), the town which they built on an island near the mouth of the Guadalquiver, the Sidonian ships ventured farther on the ocean and drew tin from the mines of north-west Spain or from the richer deposits in the Cassiterides, i.e. the Tin Islands. These were discovered to be, not a part of Britain as was imagined at first, but a separate group by them- selves, now known as the Scillies; hence it is improbable that the Phoenicians ever worked the tin-mines in Cornwall.

The rich trade with Spain led to the colonization of the West. Strabo dates the settlements beyond the Pillars of Hercules soon after the Trojan War (i. 3, 2), in the period of Tyre's first expan- sion. Lixus in Mauretania, Gades and Utica, are said to have been founded, one after the other, as far back as the 12th century B.C. Most of the African colonies were no doubt younger; we have traditional dates for Aoza (887-855) and Carthage (813). A large part of North-west Africa was colonized from Phoenicia; owing to these first settlers, and after them to the Carthaginians, the Phoenician language became the prevailing one, just as Latin and Arabic did in later times, and the country assumed quite a Phoenician character.

In the days of Tyre's greatness her power rested directly on the colonies, which, unlike those of Greece, remained subject to the mother-city, and paid tithes of their revenues to its chief god, Melqarth, and sent envoys annually to his feast. Then at the beginning of the 8th century B.C. the colonial power of Tyre began to decline ; on the mainland and in Cyprus the Assyrians gained the upper hand; in the Greek islands the Phoenicians had already been displaced to a great extent by the advancing tide of Dorian colonization. But as Tyre decayed in power the colonies turned more and more to Carthage as their natural parent and protector. For effective control over a colonial empire Carthage had the advantage of situation over far-away Tyre; the traditional bonds grew lax and the ancient dues ceased to be paid, though as late as the middle of the 6th century Carthage rendered tithes to the Tyrian Melqarth. And the mother-country cherished its claims long after they had lost reality; in the 2nd century B.C., for example, Sidon stamped her coins with the legend, " Mother of Kambe (i.e. Carthage), Hippo, Kition, Tyre " (NSI. p. 352).

Manufactures, Inventions, Art. — From an early date the towns of the Phoenician coast were occupied, not only with distributing the merchandise of other countries but with working at industries of their own; especially purple-dyeing and textile fabrics (II. vi. 289 sqq.), metal work in silver, gold and electrum (II. xxiii. 741 sqq.; Od. iv. 615 sqq., xv. 458 sqq.), and glass-work, which had its seat at Sidon. The iron and copper mines of Cyprus (not Sidon, as Homer implies, Od. xv. 424) furnished the ore which was manufactured into articles of commerce. 1 Egyptian monuments frequently mention the vessels of gold and silver, iron and copper, made by the Dahi, i.e. the Phoenicians (W. M. Miiller, As. u. Eur. 306) ; and in Cyprus and at Nimrud bronze and silver paterae have been found, engraved with Egyptian designs, the work of Phoenician artists (see table-cases C and D in the Nimrud gallery of the Brit. Mus.). The inven- tion of these various arts and industries was popularly ascribed, to the Phoenicians, no doubt merely because Phoenician traders brought the products into the market. But dyeing and embroidery probably came from Babylon in the first instance; glass-making seems to have been borrowed from Egypt ; the invention of arithmetic and of weights and measures must be laid to the credit of the Baby- lonians. The ancients believed that the Phoenicians invented the use of the alphabet (e.g. Pliny, N.H. v. 13, cf. vii. 57; Lucan, Bell. Civ. iii. 220 sen.) ; but it is unlikely that any genuine tradition on the subject existed, and though the Phoenician theory has found favour in modern times it is open to much question. The Phoeni- cians cannot be said to have invented any of the arts or industries, as the ancient world imagined; but what they did was something hardly less meritorious: they developed them with singular skill, and disseminated the knowledge and use of them.

The art of Phoenicia is characterized generally by its dependence upon the art of the neighbouring races. It struck out no original line of its own, and borrowed freely from foreign, especially Egyptian, models. Remains of sculpture, engraved bronzes and gems, show clearly the source to which the Phoenician artists went for inspira- tion; for example, the uraeus-frieze and the winged disk, the ankh or symbol of life, are Egyptian designs frequently imitated. It was in the times of the Persian monarchy that Phoenician art raached its highest development, and to this period belong the oldest sculp- tures and coins that have come down to us. A characteristic specimen of the former is the stele of Yehaw-milk, king of Gebal (CIS. i. 1), in which the king is represented in Persian dress, and the goddess to whom he is offering a bowl looks exactly like an Egyptian Isis-Hathor; the inscription mentions the various objects of bronze and gold, engraved work and temple furniture, which the king dedicated. The whole artistic movement in Phoenicia may be divided into two great periods: in the first, from the earliest times to the 4th century B.C., Egyptian influence and then Babylonian or Asiatic influence is predominant, but the national element is strongly marked ; while in the second, Greek influence has obtained the mastery, and the native element, though making itself felt, is much less obtrusive. Throughout these periods works of art, such as statues of the gods and sarcophagi, were imported direct at first from Egypt and afterwards mainly from Rhodes. The oldest example of native sarcophagi are copied from Egyptian mummy-cases, painted with colours and ornamented with carvings in low relief; towards and during the Greek period the contours of the body begin to be marked more clearly on the cover. The finest sarcophagi that have been found in the necropolis of Sidon (now in the Imperial Museum, Constantinople) are not Phoenician at all, but exquisite specimens of Greek art. The Phoenicians spent much care on their burial-places, which have furnished the most important

1 Traces of ancient mining for iron have been found in the Lebanon; cf. LXX. 1 Kings ii. 46c (ed. Swete), which has been taken to refer to this quarrying in search of iron; Jer. xv. 12. , See Benzinger on 1 Kings ix. 19.

monuments left to us. The tombs are subterranean chambers of varied and often irregular form, sometimes arranged in two storeys, sometimes in several rows one behind the other. While in early times a mere perpendicular shaft led to these excavations, at a later date stairs were constructed down to the chambers. The dead were buried either in the floor (often in a sarcophagus), or, according to later custom, in niches. The mouths of the tombs were walled up and covered with slabs, and

occasionally cippi (Phoen. masseboth) were set up to mark the spot. The great sepulchral monuments, popularly called magh&zti, t.e. " spindles," above the tombs near Amrit, have peculiarities of their own; some of them are adorned with lions at the base and with roofs of pyramidal shape. Besides busts and figurines, which belong as a rule to the Greek period, the smaller objects usually found are earthen pitchers and lamps, glass-wares, tesserae and gems. Of buildings which can be called architectural few specimens now exist on Phoenician soil, for the reason that for ages the inhabitants have used the ruins as con- venient quarries. Not a vestige remains of the great sanctuary of Melqarth at Tyre ; a few traces of the temple of Adonis near Byblus were discovered by Renan, and a peculiar mausoleum, Burj al- Bezzaq , is still to be seen near Amrit ; recent excavations at Bostan esh-Shekh near Sidon have unearthed parts of the enclosure or foundations of the temple of Eshmun (NSI. p. 401); the conduits of Ras el-'Ain, south of Tyre, are considered to be of ancient date. With regard to the plan and design of a Phoenician temple, it is probable that they were in many respects similar to those of the temple at Jerusalem, and the probability is confirmed by the re- mains of a sanctuary near Amrit, in which there is a cella standing in the midst of a large court hewn out of the rock, together with other buildings in an Egyptian style. The two pillars before the porch of Solomon's temple (1 Kings vii. 21) remind us of the two pillars which Herodotus saw in the temple of Melqarth at Tyre (Herod, ii. 44), and of those which stood before the temples of Paphos and Hierapolis (see W. R. Smith, Rel. of Sent. p. 468 seq.).

Religion. — Like the Canaanites of whom they formed a branch, the Phoenicians connected their religion with the great powers and processes of nature. 1 The gods whom they worshipped 17 . . belonged essentially to the earth ; the fertile field, trees a "ds"" an< ^ mountains, headlands and rivers and springs, were ' believed to be inhabited by different divinities, who were*

therefore primarily local, many in number, with no one in particular supreme over the rest. It seems, however, that as time went on some of them acquired a more extended character; thus Ba'al and Astarte assumed celestial attributes in addition to their earthly ones, and the Tyrian Melqarth combined a celestial with a marine aspect. 2 The gods in general were called 'eloriim, 'elim; Plautus uses alonium valonuth for "gods and goddesses" (Poen. v. I, 1). These plurals go back to the singular form 'El, the common Semitic name for God ; but neither the singular nor the plural is at all common in the inscriptions (NSI. pp. 24, 41, 51); El by itself has been found only once; 3 the fem. 'Elath is also rare (ibid. pp. 135, 158). The god or goddess was generally called the Ba'al or Ba'alath of such and such a place, a title which was used not only by the Canaanites, but by the Aramaeans (Be'el) and Babylo- nians (Bel) as well. There was no one

*particular god called Baal; the word is not a proper name but an appellative, a description of the deity as owner or mistress; and the same is the case with Milk or Melek, 'Adon, 'Amma, which mean king, lord, mother. The god himself was unnamed or had no name. Occasionally we know what the name was; the Baal of Tyre was Melqarth (Melkarth), which again means merely " king of the city "; similarly among the Aramaeans the Ba'al of Harran was the moon-god Sin. As each city or district had its own Ba'al, the author of its fertility, the " husband " (a common meaning of ba'al) of the land which he ferti- lized, so there were many Ba'als, and the Old Testament writers could allude to the Ba'alim of the neighbouring Canaanites. Some- times the god received a distinguishing attribute which indicates an association not with any particular place, but with some special characteristic ; the most common forms are Ba'al-hamman, the chief deity of Punic north Africa, perhaps " the glowing Ba'al," the god of fertilizing warmth, and Ba'al-shamem, " Ba'al of the heavens." * The latter deity was widely venerated throughout the North-Semitic world ; his name, which does not appear in the Phoenician inscriptions before the 3rd century B.C., implies perhaps a more universal conception of deity than existed in the earlier days. 6*

1 Cf. Hannibal's oath to Philip of Macedon; beside the named deities he invokes the gods of " sun and moon and earth, of rivers and meadows and waters " (Polyb. vii. 9).

2 This is well brought out by G. F. Hill, Church Quarterly Rev. (April 1908), pp. 118-141, who specially emphasizes the evidence of the Phoenician coins.

3 " To the lord 'El, which Ba'al-shillem . . . vowed," &c. ; Clermont-Ganneau, Recueil, v. 376.

- *Probably " the detested thing that causes horror " (oov ■ppv) of Dan. xii. n , xi. 31 , &c, is an intentional disfigurement of ddb > 'rya,*

6 The name has been found on an important Aramaic inscr. from North Syria, dating c. 800 B.C., in which Zakir, king of Hamath and La 'ash frequently speaks of his god Be'el-shamin (Pognon, Inscr. sent, de la Syrie, 1908).

The worship of the female along with the male principk waft a strongly marked feature of Phoenician religion. To judge from the earliest evidence on the subject, the Ba'alath of Gebal or Byblus, referred to again and again in the Amarna letters (Bilit ia Gubla, Nos. 55-110), must have been the most popular of the Phoenician deities, as her sanctuary was the oldest and

most renowned. The mistress of Gebal was no doubt 'Ashtart (Astarte in Greek, 'Ashtoreth in the Old Testament, pronounced with the vowels of bosheth, " shame "), a name which is obviously connected with the Babylon- ian Ishtar, and, as used in Phoenician, is practically the equivalent of " goddess." She represented the principle of fertility and genera- tion; references to her cult at Gebal, Sidon, Ashkelon, in Cyprus at Kition and Paphos, in Sicily at Eryx, in Gaulus, at Carthage, are frequent in the inscriptions and elsewhere. The common epithetsK&irpis and Ki>0epeia(of Kuthera in Cyprus) ,Cypria and Paphia, show that she was identified with Aphrodite and Venus. Though not primarily a moon-goddess, she sometimes appears in this character (Lucian, Dea syr. § 4; Herodian v. 6, 10), and Herodotus describes her temple at Ashkelon as that of the heavenly Aphrodite (i. 105). We find her associated with Ba'al and called " the name of Ba'al," i.e. his manifestation, though this rendering is disputed, and some scholars prefer " 'Ashtart of the heaven of Ba'al " (NSI. p. 37). Another goddess, specially honoured at Carthage, is Tanith (pronunciation uncertain) ; nothing is known of her characteristics ; she is regularly connected with Ba'al on the Carthaginian votive tablets, and called " the face of Ba'al," i.e. his representative or revelation, though again some question this rendering as too meta- physical, and take " face of Ba'al " to be the name of a place, like Peni'el (" face of 'El "). Two or three other deities may be men- tioned here: Eshmun, the god of vital force and healing, worshipped at Sidon especially, but also at Carthage and in the colonies, identi- fied by the Greeks with Asclepius; Melqarth, the patron deity of Tyre, identified with Heracles; Reshef or Reshuf, the " flame " or " lightning " god, especially popular in Cyprus and derived originally from Syria, whom trie Greeks called Apollo. A tendency to form a distinct deity by combining the attributes of two produced such curious fusions as Milk-'ashtart, Milk-ba'al, Milk-'osir, Eshmun- melqarth, Melqarth-resef, &c. As in the case of art and industries, so in religion the Phoenicians readily assimilated foreign ideas. The influence of Egypt was specially strong (NSI. pp. 62, 69, 148, 154); thus the Astarte represented on the stele of Yehaw-milk, mentioned above, has all the appearance of Isis, who, according to the legend preserved by Plutarch (de Is. et Os. 15), journeyed to Byblus, where she was called Astarte. The Phoenician settlers at the Peiraeus worshipped the Assyrian Nergal, and their proper names are com- pounded with the names of Babylonian and Arabian deities (NSI. p. 101). Closer intimacy with the Greek world naturally brought about modifications in the character of the native gods, which became apparent when Ba'al of Sidon or Ba'al-shamem was identified with Zeus, Tanith with Demeter or Artemis, 'Anath with Athena, &c. ; the notion of a supreme Ba'al, which finds expression in the Greek /9i)Xos and /3aaXr£s or /S^XSijs (the goddess of Byblus), was no doubt encouraged by foreign influences. On the other hand, the Phoenicians produced a considerable effect upon Greek and

Roman religion, especially from the religious centres in Cyprus and Sicily. A great number of divinities are known only as elements in proper names, e.g. Sakun-yathon (Sanchuniathon), 'Abd-sasom, Sed-yathon, and fresh ones are continually being discovered. It was the custom among the Phoenicians, as among other Semitic nations, to use the names of the gods in forming proper names and thus to express devo- tion or invoke favour; thus Hanni-ba'al, "Abd-melqarth, Hanni- 'ashtart, Eshmun- 'azar. The proper names further illustrate the way in which the relation of man to God was regarded ; the common- est forms are servant ('abd, e.g. 'Abd-'ashtart), member or limb bod, e.g. Bod-melqarth), client or guest (ger, e.g. Ger-eshmun) ; the religious idea of the guest of a deity had its origin in the social custom of extending hospitality to a stranger and in the old Semitic right of sanctuary. The interpretation of such names as 'Abi-ba'al (father of Ba'al), Himilkath (brother of Milkath), Hiram (brother of the exalted one) is not altogether certain, and can hardly be discussed here. 6

Probably like other Canaanites the Phoenicians offered worship " on every high hill and under every green tree " ; but to judge from the allusions to sanctuaries in the inscriptions and else- where, the Ba'al or 'Ashtart of a place was usually o??? worshipped at a temple, which consisted of a court or vyjˆht" enclosure and a roofed shrine with a portico or pillared p '*

hall at the entrance. In the court sometimes stood a conical stone, probably the symbol of Astarte, as on the Roman coins of Byblus (illustrated in Rawlinson, Phoenicia, 146, Perrot et Chipiez, Hist, de I' art, iii. 60; see also Ohnefalsch-Richter, Cyprus, pi. lvi., the temenos at Idalion). Stone or bronze images of the gods were set up in the sanctuaries (NSI. Nos. 13 seq., 23-27, 30, &c.) ; and besides these the baetylia (meteoric stones) which were regarded as symbols of the gods. Pillars, again, had a prominent place in the court or be- fore the shrine (nasab, ibid. pp. 102 seq.) ; but it is not known whether the sacred pole ('asherah), an invariable feature of a Canaanite sanc- tuary, was usual in a Phoenician temple (ibid. pp. 50 seq.). The

6 See Frazer, Adonis, Attis, Osiris, 44 seq.

inscriptions mention altars of stone and bronze, and from the sacrificial tariffs which have survived we learn that the chief types of sacrifice among the Phoenicians were analogous to those which we find in the Old Testament (ibid. p. 117). The ghastly practice of sacrificing human victims

was resorted to in times of great distress {e.g. at Carthage, Diod. xx. 14), or to avert national disaster (Porphyry, de Abstin, ii. 56); Philo gives the legend that Cronus or El sacrificed his only son when his country was threatened with war (Fr. hist. gr. iii. 570) ; it was regarded as a patriotic act when Hamilcar threw himself upon the pyre after the disastrous battle of Himera (Herod, vii. 167). The god who demanded these victims, and especially the burning of children, seems to have been Milk, the Molech or Moloch of the Old Testament. In this connexion may be mentioned the custom of burning the chief god of the city in effigy, or in the person of a human representative, at Tyre and in the Tyrian colonies, such as Carthage and Gades; the custom lasted down to a late time (see Frazer, loc. cit. ch. v.). Another horrible sacrifice was regularly demanded by Phoenician religion: women sacrificed their virginity at the shrines of Astarte in the belief that they thus pro- pitiated the goddess and won her favour (Frazer, ibid. ch. iii.) ; licen- tious rites were the natural accompaniment of the worship of the reproductive powers of nature. These temple prostitutes are called qedeshim qedeshoth, i.e. sacred men, women, in the Old Testament (Deut. xxiii. 18; I Kings xiv. 24, &c). Other persons attached to a temple were priests, augurs, sacrificers, barbers, officials in charge of the curtains, masons, &c. (NSI. No. 20) ; we hear also of religious gilds and corporations, perhaps administrative councils, associated with the sanctuaries (ibid. pp. 94, 121, 130, 144 seq.). No doubt the Phoenicians had their legends and myths to account for the origin of man and the universe; to some extent these would 1 have resembled the ideas embodied in the book of rf» im Genesis. Two cosmogonies have come down to us "" m which, though they differ in details, are fundamentally ous eas. j n a g reemen): The one; f Sidonian origin, is pre' served by Damascius (de prim, principiis, 125) and received at his hands a Neoplatonic interpretation; this cosmogony was probably the writing which Strabo ascribes to a Sidonian philosopher, Mochus, who lived before the Trojan times (xvi. 2, 24). The other and more elaborate work was composed by Philo of Byblus (temp. Hadrian) ; he professed that he had used as his authority the writings of Sanchuniathon (q.v.), an ancient Phoenician sage, who again derived his information from the mysterious inscribed stones (innoweis = d – :ot, i.e. images or pillars of Ba'al-bamman) in the Phoenician temples. Philo's cosmogony has been preserved, at least in fragments, by Eusebius in Praep. evang. vol. i. (Fr. hist, gr. iii. 563 sqq.). It cannot, however, betaken seriously as an account of genuine Phoenician beliefs. For Sanchuniathon is a mere literary fiction ; and Philo's treatment is vitiated by an obvious attempt to explain the whole system of religion on the principles of Euhemerus, an agnostic who taught the traditional mythology as primitive history, and turned all the gods and goddesses into men and women ; and further by a patriotic desire to prove that Phoenicia could outdo Greece in the venerable character of its traditions, that in fact Greek mvthology was

simply a feeble and distorted version of the Phoeni- cian. 1 At the same time Philo did not invent all the nonsense which he has handed down; he drew upon various sources, Greek and Egyptian, some of them ultimately of Babylonian origin, and in- cidentally he mentions matters of interest which, when tested by other evidence, are fairly well supported. He shows at any rate that some sort of a theology existed in his day ; particularly interest- ing is his description of the symbolic figure of Cronus with eyes before and behind and six wings open and folded (Fr. hist. gr. iii. 569), a figure which is represented on the coins of Gebal-Byblus (2nd cen- tury B.C.) as the mythical founder of the city. It is evident that the gods were regarded as being intimately concerned with the lives and fortunes of their worshippers. The vast number of small votive tablets found at Carthage prove this: they were all inscribed by grateful devotees " to the lady Tanith, Face of Ba'al, and the lord Ba'al-hamman, because he heard their voice." The care which the Phoenicians bestowed upon the burial of the dead has been alluded to above; pillars (masseboth) were set up to commemorate the dead among the living (e.g. NSI. Nos. 18, 19, 21, 32); if there were no children to fulfil the pious duty, a monument would be set up by a man during his lifetime (ibid. No. 16; cf. 2 Sam. xviii. 18). Any violation of the tomb was regarded with the greatest horror (ibid. Nos. 4, 5). The grave was called a resting-place (ibid. Nos. 4, 5, 16, 21), and the departed lay at rest in the underworld with the Refaim, the weak ones (the same word and idea in the Old Testa- ment, Isa. xiv. 9, xxvi. 14, 19; Job xxvi. 5; Ps. lxxxviii. 11, &c). The curious notion prevailed, as it did also among the Greeks and Romans, that it was possible to communicate with the gods of the underworld by dropping into a grave a small roll of lead (tabella devotionis, NSI. No. 50), inscribed with the message, generally a curse, which it was desired to convey to them.

Bibliography. — The principal works bearing on the subject have been mentioned in the text and notes of this article. The

following may be added: Movers, Die Phonizier (1842-1856), to be used with caution; Renan, Mission de Phenicie (1864); Schroder, Die phonizische Sprache (1869); Stade in Morgenlandische Forsch- ungen (1875); W. Baudissin, Studien zur semitischen Religions- geschichte (1876, 1878) ; Baethgen, Beitrdge zur semitischen Religions- geschichte (1888) ; Levy, Siegel und Gemmen (1869) ; J. L. Myres and Richter, Catalogue of the Cyprus Museum (1899) ; G. F. Hill, Catalogue of the Greek Coins of Cyprus (1904) ; V. Berard, Les PUniciens et I'Odyssee (1902-1903); Lidzbarski, Ephemeris filr semitische Epi- graphik (1902-1906); H. Winckler, Altorientalische Forschungen (1893-1906); Freiherr von Landau, " Die Bedeutung der Phonizier im Volkerleben " in Ex oriente lux (Leipzig, 1905), vol. i. ; Bruston, Etudes Phin. (1903) ; the articles by Thatcher in Hastings's Diet. Bible (1900) and by E. Meyer in the Ency.

*Bib. (1902). The articles by A. von Gutschmid and Albrecht Socin in the Ency. Brit. (9th ed.) have been to some extent incorporated in the present article. (G. A. C. *)*

PHOENIX (Gr. cj)divi£), a fabulous sacred bird of the Egyptians. The Greek word is also used for a date-palm, a musical in- strument like a guitar, and the colour purple-red or crimson. According to the story told to Herodotus (ii. 73), the bird came from Arabia every 500 years, bearing his father embalmed in a ball of myrrh, and buried him in the temple of the sun. Herodotus, who had never seen the phoenix himself, did not believe this story, but he tells us that the pictures of it represented a bird with golden and red plumage, closely resembling an eagle in size and shape. According to Pliny (Nat. hist. x. 2), there is only one phoenix at a time, and he, at the close of his long life, builds himself a nest with twigs of cassia and frankincense, on which he dies; from his corpse is generated a worm which grows into the young phoenix. Tacitus (Ann. vi. 28) says that the young bird lays his father on the altar in the city of the sun, or burns him there; but the most familiar form of the legend is that in the Physiologus (q.v.), where the phoenix is described as an Indian bird which subsists on air for 506 years, after which, lading his wings with spices, he flies to Heliopolis, enters the temple there, and is burned to ashes on the altar. Next day the young phoenix is already feathered; on the third day his pinions are full grown, he salutes the priest and flies away. The period at which the phoenix reappears is very variously stated, some authors giving as much as 1461 or even 7006 years, but 500 years is the period usually named; and Tacitus tells us that the bird was said to have appeared first under Sesostris (Senwosri), then under Amasis (Ahmosi) II., under Ptolemy III., and once again in a.d. 34, after an interval so short that the genuineness of the last phoenix was suspected. The phoenix that was shown at Rome in the year of the secular games (a.d. 47) was universally admitted to be an imposture. 2

The form and variations of these stories characterize them as popular tales rather than official theology; but they evidently must have had points of attachment in the mystic religion of Egypt, and indeed both Horapollon and Tacitus speak of the phoenix as a symbol of the sun. Now we know from the Book of Ike Dead, and other Egyptian texts, that a stork, heron or egret

called the benu

was one of the sacred symbols of the worship

1 An excellent and critical account of Philo's work is given by Lagrange, itudes sur les rel. sim (2nd ed., 1905), ch. xi.

of Heliopolis, and A. Wiedemann (" Die Phonix-Sage im alten Aegypten " in Zeitschrift fur agyptische Sprache, xvi. 89) has made it tolerably clear that the benu was a symbol of the rising sun, whence it is represented as " self-generating " and called " the soul of Ra (the sun)," " the heart of the renewed Sun." All the mystic symbolism of the morning sun, especially in connexion with the doctrine of the future life, could thus be transferred to the benu, and the language of the hymns in which the Egyptians praised the luminary of dawn as he drew near 2 Some other ancient accounts may be here referred to. That ascribed to Hecataeus is, in the judgment of C. G. Gobet (Mnemosyne, 1883), stolen from Herodotus by a late forger. The poem of the Jew Ezechiel quoted by Eusebius (Praep. ev. ix. 29, 30) appears to refer to the phoenix. Here the sweet song is first mentioned— a song which, according to the poem on the phoenix ascribed to Lactantius, accompanies the rising sun. The bird is often spoken of in Latin poetry, and is the subject of an idyll by Claudian. See also Solinus, Collectanea, ch. xxxiii. II, with Salmasius's Exercita- tiones; Tertullian, De resur. carnis, c. 13; Clemens Rom. Epp. ad Corinthios, i. 25 and the (? Clementine) Apostolical Conshtutwns, v. 7

from Arabia, delighting the gods with his fragrance and rising from the sinking flames of the morning glow, was enough to suggest most of the traits materialized in the classical pictures of the phoenix. That the benu is the prototype of the phoenix is further confirmed by the fact that the former word in Egyptian means also " palm-tree," just as the latter does in Greek. The very various periods named make it probable that the periodical return of the phoenix belongs only to vulgar legend, materia- lizing what the priests knew to be symbolic. Of the birds of the heron family the gorgeous colours and plumed head spoken of by Pliny and others would be least inappropriate to the purple heron (Ardea purpurea), with which, or with the allied Ardea cinerea, it has been identified by Lepsius and Peters (Alteste Texte des Todtenbuchs, 1867, p. 51). But the golden and purple hues described by Herodotus may be the colours of sunrise rather than the actual hues of the purple heron. How Herodotus came to think that the bird was like an eagle is quite unexplained ; perhaps this is merely a slip of memory.

Many commentators still understand the word "?i't, chol, in Job xxix. 18 (A.V. " sand ") of the phoenix. This interpretation is perhaps as old as the (original) Septuagint, and is current with the later Jews. Among the Arabs the story of the phoenix was confused with that of the salamander; and the samand or samandal (Damiri, ii. 36 seq.) is represented sometimes as a

quadruped, sometimes as a bird. It was firmly believed in, for the incombustible cloths woven of flexible asbestos were popularly thought to be made of its hair or plumage, and were themselves called by the same name (cf. Yaqut i. 529, and Dozy, s.v.). The 'anka (Pers. simurgh), a stupendous bird like the roc (rukh) of Marco Polo and the Arabian Nights, also borrows some features of the phoenix. According to Kazwini (i. 420) it lives 1700 years, and when a young bird is hatched the parent of opposite sex burns itself alive. In the book of Kalila and Dimna the simiir or 'anka is the king of birds, the Indian garuda, on whom Vishnu rides!

PHOENIX, the capital of Arizona, U.S.A., and the county- seat of Maricopa county, situated on the Salt river, in the south central part of the state. Pop. (1890), 3152; (1900), 5544 (935 being foreign-born and 148 negroes); (1910) 11,134. It is served by the Arizona Eastern and the Santa Fe, Prescott & Phoenix railways, the former connecting at Mari- copa (35 m. distant) with the Southern Pacific and the latter connecting at Ash Fork, near Prescott (194 m. distant), with the Atchison, Topeka & Santa Fe. The city is a popular winter and health resort, with a fine dry climate. The city is the see of a Protestant Episcopal bishopric. About 3 m. north of the city is the Phoenix (non-reservation) boarding-school for Indians, supported by the United States government, with an average attendance of about 700 pupils. The city lies in a great plain, in the centre of a region of pastures, gardens and orchards, the largest and most beautiful farming district of Arizona, irrigated with water stored by the great Roosevelt dam (about 70 m. north-east of Phoenix). Local interests are almost entirely in agriculture, stock-raising and fruit-growing. In the surrounding region are several large ostrich farms and a small exhibition ranch. Phoenix was settled in 1870, became the county-seat on the organization of Maricopa county in 187 1, was incorporated in 1 88 1, and became the capital of Arizona in 1889.

PHOENIX ISLANDS, a group of eight small islands in the Pacific Ocean, about 3 S., and 172 W., belonging to Great Britain. They have a land area about 16 sq. m. and a popula- tion of 60. Their names are Phoenix, Gardner (Kemin), Hull, Sydney, Birnie, Enderbury, Canton (Mary) and McKean. To the north-west of the group (between the equator and i° N.) lie two more islets — Baker and Howland. The islands were annexed by Great Britain in 1889-1892.

PHOENIXVILLE, a borough of Chester county, Pennsylvania, U.S.A., on the Schuylkill river at the mouth of French Creek, about 28 m. north-west of Philadelphia. Pop. (1890), 8514; (1900), 9196, of whom 2221 were foreign-born and 278 were negroes; (1910 census), 10,743. If ls served by the Pennsylvania (Schuylkill division) and the Philadelphia & Reading railways, and by electric railway to Spring City (pop. in 1910, 2880), 5 m. north-west of Phoenixville on the Schuylkill. Phoenixville is chiefly a

manufacturing borough. Its blast-furnaces and iron mills were long among the largest in the country, and the manu-

facture of steel is still the borough's predominant industry. Phoenixville was settled in 1732, and was incorporated in 1849.

PHONETICS (Gr. ivq, voice), the science of speech-sounds and the art of pronunciation. In its widest sense it is the " science of voice," dealing .not only with articulate, but also with the inarticulate sounds of animals as well as men. The originally synonymous term, " phonology," is now restricted to the history and theory of sound-changes. The most obvious of the practical applications of phonetics is to the acquisition of a correct pronunciation of foreign languages. But its applica- tions to the study of the native language are not less important : it is only by the help of phonetics that it is possible to deal effectively with vulgarisms and provincialisms of pronunciation and secure uniformity of speech; and it is only on a phonetic basis that the deaf and dumb can be taught articulate speech. From a more theoretical point of view phonetics is, in the first place, the science of linguistic observation. Without phonetic training the dialectologist, and the missionary who is confronted with a hitherto unwritten language, can neither observe fully nor record accurately the phenomena with which they have to deal. These investigations have greatly widened the scope of the science of language. The modern philologist no longer despises colloquial and illiterate forms of speech. On the contrary, he considers that in them the life and growth of language is seen more clearly than in dead literary languages, on whose study the science of comparative philology was at first exclusively built up. It was not till philologists began to ask what were the real facts underlying the comparisons of the written words in Sanskrit, Greek, Latin, and the other Indo-European languages, embodied in such generalizations as Grimm's Law, that "letter-science" developed into "sound-science" (phono- logy). The rise and decay of inflexions, and the development of grammatical forms generally, are, from the formal point of view, mainly phonetic problems; and phonetics enters more or less into every department of historical and comparative grammar.

Methods of Study and Investigation. — Phonetics is the science of speech-sounds. But sounds may be 'considered from two opposite points of view — the organic and the acoustic. From the organic point of view a sound is the result of certain actions and positions of the organs of speech, as when we define / as a lip- teeth (dento-labial) consonant. This is the point of view of the speaker of a language. To the hearer, on the other hand, / is not a lip-teeth, but a hiss consonant similar to that denoted by th. This is the acoustic point of view. Theoretically, the organic study of phonetics is a branch of anatomy and physiology: that part of these sciences which deals with the organs of speech (see Mouth) and their functions (see Voice) ;

;while, from the opposite point of view, the study of phonetics is based on that branch of physical science known as acoustics (see Sound), together with the anatomy and physiology of the organs of Hearing (q.v.).

Unfortunately, this basis is still imperfect. The principles of acoustics are well established, and we know much about the anatomy of the ear. But how the ear transmits to the brain the impression of sound is still a mystery. Again, although the mechanism of the vowel is clear enough, there is still no generally received acoustic theory of its formation. In fact, from the physical science point of view there is as yet no science of phonetics.

The real function of phonetics is philological and literary. The only sound basis of a theoretical knowledge of phonetics is the practical mastery of a limited number of sounds — that is to say, of the sounds which are already familiar to the learner in his own language. It is evident that the more familiar a sound is, the easier it is to gain insight into its mechanism and to recognize it when heard. It is indispensable to cultivate both the organic and the acoustic sense. These processes we are continually carrying out in ordinary conversation. All, therefore, that we have to do in dealing with native sounds is to develop this unconscious organic and acoustic sense into a conscious and analytic one. The first step is to learn to isolate each sound: to

pronounce it, as far as possible, apart from its context; and to preserve it unchanged through every variation of length and force, and in every combination of sounds. The next step is to analyse its formation. Let the student, for instance, compare the two consonants in such a word as five by isolating and lengthening them till he can both hear and feel the voice-vibra- tion in the second one. In the same way let him learn to feel the changes in the position of the tongue and lips in passing from one vowel to another. When the native sounds have been thoroughly studied in this way, the learner will proceed to foreign sounds, deducing each new sound from those which are already familiar to him.

The natural method of learning sounds is mainly a subjective one. We listen patiently till our ears are steeped, as it were, in the sound ; and then, after repeated trials, we hit on the exact position of the organs of speech by which we can reproduce the sound to the speaker's satisfaction. But the natural method admits also of objective control and criticism of the movements of the lips and jaws by direct observation. The movements and positions of the tongue and soft palate, and other modifications of the

mouth and throat passages are also more or less accessible to observation — ■ in the case of self-observation with the help of a small mirror held in the hand. If the mirror is small enough to go into the mouth, and is fixed obliquely to a handle, so that it can be held against the back of the mouth at such an angle as to reflect a ray of light down the throat, we have the laryngoscope. Laryngoscopy has confirmed earlier results, and has also added to our knowledge of the throat sounds. But, on the other hand, it has been a fruitful source of error. There has been great discrepancy between the results obtained by different observers; and many results which were at first received with implicit confidence for their supposed rigorously scientific and objective character have been found to be worthless. It seemed at first as if Rontgen's discovery of the so-called X-rays would meet the want of a means of direct observa- tion of the positions' of the tongue, not lengthways, but from the side, as also of the interior of the throat. But although the cheeks are to a certain extent transparent to these rays, the shadow of the tongue projected on the screen is too indistinct to be of any use.

But there are other methods besides those of direct observation by which the positions of the tongue may be objectively determined and measured with more or less accuracy. The interior of the mouth may be explored by the fingers. If the little finger is held against the gums -during the articulation of the vowels in it, ate, at, the difference in the height of the tongue will at once become apparent : in the formation of the first vowel the tongue is pressed strongly against the artificial palate, while in that of the second it only just touches it, and in that of the third it does not touch at all.

Several forms of apparatus have been devised for a more accurate determination of the positions of the tongue and the other movable organs of speech. The best results hitherto as regards the vowel- positions have been obtained by Grandgent, who uses disks of card- board of various sizes fixed to silver wires. A full description of this and other methods will be found in Scripture's Elements of Experimental Phonetics.

There are other methods whose results are obtained only indirectly. The simplest of these are the palatographs, by which are obtained " palatograms " recording the contact of the tongue with the palate. The apparatus most generally used consists of a thin, shell-like artificial palate, which is covered with chalk and placed in the mou\h; when the sound is made, the articulation of the tongue is inferred from the contact-marks on the plate. This method is evidently limited in its application. It, too, has the drawback of not being applicable to the sounds formed in the back of the mouth. The outlines of palatograms are much vaguer than they appear in the published drawings of them; and it is a question whether the thickness

even of the thinnest plate does not modify the record.

The methods hitherto considered are all comparatively simple. They require no special knowledge or training, and are accessible to all. But there are more ela'borate methods — with which the name " experimental phonetics " is more specially connected — involving special training in practical and theoretical physics and mathematics, and requiring the help of often complicated and costly, and not easily accessible, apparatus. The investigation of the speech curves of phonograph and gramophone records is a typical example. Good examples of these methods are afforded by E. A. Meyer's investigations of vowel-quantity in English (Englische Lautdauer, Uppsala, 1903). Their characteristic feature is their delicacy, and the minuteness of their distinctions, which often go beyond the range of the human ear. Although their results are often of value, they must always be received with caution: the sources of error are so numerous

The claims of instrumental phonetics have been so prominently brought forward of late years that they can no longer be ignored, even by the most conservative of the older generation of phoneticians.

But it is possible to go too. far the other way. Some of the younger generation seem to think that the instrumental methods have superseded the natural ones in the same way as the Arabic superseded the Roman numerals. This assumption has had disas- trous results. It cannot be too often repeated that instrumental phonetics is, strictly speaking, not phonetics at all. It is only a help : it only supplies materials which are useless till they have been tested and accepted from the linguistic phonetician's point of view. The final arbiter in all phonetic questions is the trained ear of a practical phonetician: differences which cannot be perceived must — or at least may be — ignored; what contradicts the trained ear cannot be accepted.

Sound-Notation; Spelling Reform. — Next to the analysis of the sounds themselves, the most important problem of phonetics is their representation by means of written and printed symbols. The traditional or " nomic " orthographies of most languages are only imperfectly phonetic. And, unfortunately, of the languages in most general use, two are exceptionally unphonetic in their, orthographies, French showing the greatest divergence between sound and symbol, while English shows the maximum of irregularity and arbitrariness. The German orthography is comparatively phonetic: it has hardly any silent letters, and it generally has one symbol for each sound, each symbol having only one value, the exceptions falling under a few simple rules, which are easily remembered. There are other languages which have still more phonetic orthographies, such as Spanish, Welsh and Finnish. But even the best of them are not perfect: even when

they are not actually misleading, they are always inade- quate. On the other hand, no system of writing is wholly unphonetic. Even in French and English there are many words whose spelling not even the most radical reformer would think of altering. In fact, all writing which has once emerged from the hieroglyphic stage is at first purely phonetic, as far as its defective means will allow. The divergence between sound and symbol which makes spelling unphonetic is the result of the retention of phonetic spellings after they have become un- phonetic through changes in the pronunciation of the words themselves. Thus, such English spelling as knight and wright were still phonetic in the time of Chaucer; for at that time the initial consonants of these words were still pronounced, and the gh still had the sound of ch in German ich. So also see and sea are written differently, not by way of arbitrary distinction, but because they were pronounced differently till within the last few centuries — as they still are in Irish-English.

Where there is no traditional orthography, as when Old English (Anglo-Saxon) was first written down in Latin letters, spelling was necessarily phonetic; but where there is a large literature and a class of professional scribes, the influence of the traditional orthography becomes stronger, till at last the invention of printing and the diffusion of one standard dialect over a large area occupied originally by a variety of other dialects make changes of spelling as inconvenient as they were once easy and natural. The ideal orthography for printers is one which is absolutely uniform over the whole territory of the language, and absolutely unchangeable. In such orthographies as those of the present English and French there is no longer any living correspondence between sound and symbol: they are, in in- tention at least, wholly unphonetic; they are preserved by graphic, not by oral, tradition.

But unphoneticness has it^jractical limits. A purely un- phonetic degradation of an originally phonetic system of writing — one in which there is absolutely no correspondence between sounds and letters — could not be mastered even by the most retentive memory: it would be even more difficult than the Chinese writing. Hence a phonetic reaction is inevitable. In the middle ages the spelling was periodically readjusted in accordance with the changes of pronunciation — as far, of course, as the imperfections of the existing orthography would allow. This adjustment went on even after the introduction of printing. In fact, it is only within the last hundred years or so that the orthographies of English and French have become fixed.

One result of this fixity is that any attempt to continue the process of adjustment assumes a revolutionary character. When, in 1849, the pioneers of the modern soelline-reform

movement — A. J. Ellis and I. Pitman — brought out the Fonetic Nuz, few of those who joined in the chorus of ridicule excited by the new alphabet stopped to consider that this uncouthness was purely the result of habit, and that the Authorized Version of the Bible in the spelling of its first edition would seem to us not less strange and uncouth than in the new-fangled phonotypy of Messrs Ellis and Pitman. Nor did they stop to consider that phonetics and phonetic spelling, so far from being innovations, are as old as civilization itself. The Alexandrian grammarians were not only phoneticians — they were spelling-reformers; they invented the Greek accents for the purpose of making the pro- nunciation of Greek easier to foreigners. The Romans, too, were phoneticians: they learnt Greek by phonetic methods, and paid great attention to niceties of pronunciation. The Sanskrit grammarians were still better phoneticians.

As a matter of fact, English spelling was still phonetic as late as the time of Shakespeare — in intention, at least. But although people still tried to write as they spoke, the inherited imperfec- tions of their orthography made it more and more difficult for them to do so. Hence already in the 16th century a number of spelling-reformers made their appearance, including classical scholars such as Sir John Cheke, and A. Gill, who was head-master of St Paul's School in London. Gill has left us extracts from Spenser's Faerie Queene in phonetic spelling; but, strange to say, nothing of Shakespeare's, although he and Shakespeare were exact contemporaries. But Gill's and the other alphabets proposed were too intricate and cumbrous for popular use.

Nevertheless, some important phonetic reforms were success- fully carried through, such as getting rid of most of the super- fluous final e's, utilizing the originally superfluous distinctions in form between i and .;', u and v, by using i, u only as vowels, ;', v only as consonants, instead of at random — a reform which seems to have begun in Italy. Another important reform was the introduction of ea and oa, as in sea and boat, which had hitherto been written with ee and 00, being thus confused with see and boot.

All these were as much phonetic reforms as it would be to utilize long s and tailed z (\ , 5) to denote the final consonants in fish and rouge respectively; a reform first suggested by A. J. Ellis, who was himself the first to call attention to the works of these early phoneticians and to utilize them in the investiga- tions enshrined in his great work on Early English Pronunciation. With all its defects, the present English spelling is still mainly phonetic; we can still approximately guess the pronunciation of the

vast majority of words from their spelling. So when we say that English spelling is unphonetic we merely mean that it is a bad phonetic spelling; and all that spelling-reformers aim at is to make this bad into a good phonetic spelling, that is, an efficient and easy one. But the difficulties are great; and the more we know of phonetics, and the more we experiment with different systems of spelling, the more formidable do they appear. One of the difficulties, however, that is commonly supposed to stand in the way of spelling-reform is quite imaginary: namely, that it would destroy the historical and etymological value of the present system. Thus E. A. Freeman used to protest against it as " a reckless wiping out of the whole history of the language." Such critics fail to see that historical spelling, if carried out consistently, would destroy the materials on which alone history can be based; that these materials are nothing else but a series of phonetic spellings of different periods of the language, and that if a consistent historical and etymological spelling could have been kept up from the beginning, there would have been no Grimm's Law, no etymology; in short, no com- parative or historical philology possible.

The advantages of beginning a foreign language in a phonetic notation are many and obvious. In the first place, the learner who has once mastered the notation and learnt to pronounce the sounds the letters stand for, is able to read off at once any text that is presented to him without doubt or hesitation, and without having to burden his memory with rules of pronunciation and spelling. Another advantage of phonetic spelling is that when the learner sees the words written in a representation of their

actual spoken form he is able to recognize them at once when he hears them. And if the learner begins with the phonetic notation, and uses it exclusively till he has thoroughly mastered the spoken language, he will then be able to learn the ordinary spelling without fear of confusion, and quicker than he would otherwise have done.

Spelling-reform may be carried out with various degrees of thoroughness. After the failure of many schemes of radical reform, an attempt was made to begin with those numerous spellings which are both unphonetic and unhistorical, or are against the analogy of other traditional spellings. Accordingly, in 1 88 1 the Philological Society of London " aproovd (sic) of certain partial corections (sic) of English spellings," which were also approved of by the American Spelling-reform Association ; and a list of them was issued jointly by the two bodies, and recommended tor general adoption. A similar movement has been started in France. But the general feeling appears to be that it is better to keep the ordinary spelling unchanged, and wait till it is possible to supersede it by one on a more or less independent basis.

If the existing Roman alphabet is made the basis of the new phonetic notation of any one language, the most obvious course is to select one of the various traditional representations of each sound, and use that one symbol exclusively, omitting, of course, at the same time all silent letters. A. J. Ellis's English Glossic is an example of such a phonetic spelling on a national basis. The following is a specimen: —

Ingglish Glosik iz veri eezi too reed. Widh proper training a cheild foar yeerz oald kan bee redili taut too reed Glosik buoks.

But a system which, like this, writes short and long vowels with totally different symbols (i, ee) is only half phonetic: it is phonetic on an unphonetic basis.

. A fully phonetic system, in which, for instance, long vowels and diphthongs are expressed by consistent modifications or combinations of the symbols of the short vowels, and in which simple sounds are, as far as is reasonable and convenient, ex- pressed by single letters instead of digraphs such as sh, must necessarily discard any national basis. k The best basis on the whole is obtained by giving the letters their original common European sounds, i.e. by returning to the Late Latin pronuncia- tion, with such modifications and additions as may be advisable. As regards the vowels at least, this Latin basis is very well preserved in German and Italian. In French, on the other hand, the Latin tradition was greatly corrupted already in the earliest period through the rapid changes which the language underwent. Thus when the Latin u in luna assumed the sound it now has in French lune, the symbol u was still kept ; and when the sound u afterwards developed again out of the diphthong ou, this digraph was used to denote the sound. So when the French system of spelling came into use in England after the Norman Conquest these unphonetic symbols were introduced into English spelling, so that such a word as Old English and Early Middle English hus, " house," was written hous in the Late Middle English of Chaucer, although the sound was still that of Scotch hoos, ou (ow) being also used to denote a true diphthong (ou) in such words as knou, know, from Old English cnawan.

By returning, then, to the original values of the letters we get the " Romic " or international (Continental) basis as opposed to the Glossic or national basis. Thus the passage quoted above appears as follows in Sweet's " Broad Romic " notation: —

i r) gli/ glosik iz veri iizi tu riid. wis prope treinirj 3 t/aild f oa jiaz ould kan bii redili tat to riid glosik buks.

Another important general distinction is that between " broad " and "

narrow " systems of notation. A broad notation is one which makes only the practically necessary distinctions in each language, and makes them in the simplest manner possible, omitting all that is superfluous. From a practical point of view the necessary distinctions are those on which differences of meaning depend. A distinction of sound which is significant in one language may be unsignificant in another. Thus the distinction between close i and open t, £ is significant in French, as in picker, picker; so if in French phonetic writing the former

is denoted by (e), it is necessary to find a new symbol (e) for the open sound. But in languages such as English and German, where the short e is always open, there is no practical objection to using the unmodified (e) to denote the open sound, even if we regard (e) as the proper symbol of the close sound. And in those languages in which the short e is always open and the long e always close it" is enough to mark the distinction of quantity, and leave the distinction of quality to be inferred from it (e, ee). In such a case as this it is, of course, possible to apply the prin- ciple of ignoring superfluous distinctions in the opposite way: by writing the long and short vowels in such a language (e, e), leaving the quantity to be inferred from the quality. But the former method is the more convenient, as it does not require any new letter. The " broad " principle is especially convenient in writing diphthongs. Thus in English Broad Romic we write the diphthongs in high and how with the same vowel as ask (hai, hau, aask), although all these (a)'s represent different sounds in ordinary southern English pronunciation. But the pronuncia- tion of these diphthongs varies so much in different parts of the English-speaking territory, and the distinctions are so minute that it would be inconvenient to express them in writing; and as these distinctions are non-significant, it would be useless to do so. (ai) and (au) are symbols, not of special diphthongs, but of two classes of diphthongs: they can stand for any diphthongs which begin with a vowel resembling the Italian a, and end with approximations to i and u respectively. Theoretically it would be just as correct in English and German to write these diphthongs (ae, ao). But these notations are misleading, because they suggest simple sounds.

In comparing the sounds of a variety of languages, or of dialects of a language, and still more in dealing with sounds in general, we require a " narrow," that is a minutely accurate, notation covering the whole field of possible sounds. It is evident from what has been said above that such a universal scientific alphabet is not suited for practical work in any one language. But the symbols of such a notation as Sweet's " Narrow Romic "

are of the greatest use as keys to the exact pronunciation of the vaguer symbols of the Broad Romic notations of each language.

To prevent confusion between these two systems of notations Broad Romic symbols are enclosed in ( ), Narrow Romic in [ ], which at the same time serve to distinguish between phonetic and nomic spellings. This in English i (i) = [*] means that the English vowel in finny is the " wide " sound, not the " narrow " one in French fini, although in the Broad Romic notations of both languages (fini) is written for finny and fini alike.

Narrow Romic was originally based on A. J. Ellis's " Palaeo- type," in which, as the name implies, no new letters are employed. The symbols of Palaeotype are made up, as far as possible, of the letters generally accessible in printing-offices, the ordinary Roman lowercase letters being supplemented by italics and small capitals (i, i, 1) and turned letters (a,o), many digraphs (th, sh) being also used. This notation was a reaction from Ellis's earlier phonotopy, in which a large number of new letters were used. Some of these, however, such as / = (sh), 5 = (zh), were afterwards adopted into Broad and Narrow Romic. In his Palaeotype Ellis also discarded diacritical letters, which, as he rightly says, are from a typographical point of view equivalent to new letters. In Narrow Romic a certain number of diacritical letters are used, such as (fi, &), most of which are already accessible. Palaeotype is a Roman- value notation, the main difference as regards the values of the symbols between it and the later systems ,being that it is more complex and arbitrary. Ellis afterwards had the unhappy idea of constructing a " Universal Glossic " on an English-values basis, which is even more cumbrous and difficult to remember than Palaeotype.

Sweet's Romic systems were made the basis of the " Inter- national " alphabet used in Le Maltre Phonitique, which is the organ of the International phonetic Association, directed by P. Passy. Although this system is at the present time more widely known and used than any other, and although it is

constructed on the international Romic principle, it is not really an international system. It is rather an attempt to make a special adaptation of the Romic basis to the needs of the French language into a general notation for all languages. But the phonetic structure of French is so abnormal, so different from that of other languages, that the attempt to force a Broad Romic French notation on such a language as English is even more hopeless than it would be to reverse the process. Although well suited for French, this alphabet must from a wider point of view be regarded as a failure: it is too minute and rigid for practical, and yet not precise enough for scientific purposes. In short, although it has done excellent service, and

has helped to clear the way for a notation which shall command general acceptance, it cannot be regarded as a final solution of the problem.

Of the numerous other notations now in use, some still adhere to the diacritic principle of Lepsius's Standard Alphabet (1855), intended for missionary use, but found quite unfit for that purpose because of the enormous number of new types required. Most of them prefer to use new letters formed by more or less consistent modifications of the existing italic letters. A, J. Lundell's Swsdish dialect alphabet and O. Jespersen's Danish dialect alphabet are good specimens of this tendency. In the latter Roman letters are used for special distinctions, just as italic letters are used in the Romic systems.

But in spite of all diversity, there is much agreement. As regards the vowels, the following approximate values are now pretty generally accepted: —

a as in father. i as in it.

ai ,, time. o „ beau (Fr.).

au ,, house. oe ,, peur (Fr.).

£E „ man. o „ fall.

e ,, ete (Fr.). oi ,, oil.

ei „ veil. ou ,, soul.

e ,, there. u „ full.

3 ,, further. y ,, une (Fr.).

Vowel-length is in some systems denoted by doubling (aa) f

in others by special marks (a: &c), the diacritic in a being used

only in the nomic orthographies of dead and oriental languages.

The only consonant-symbols that require special notice are

the following: —

c as in tyuk (Hung.). n as in sing.

c „ ich (German). J „ fish.

S „ then. {> „ thin.

j „ you. w ,, we.

J „ nagy (Hung.). x „ loch.

n ,, ogni (Ital.). 3 ,, rouge.

All the systems of phonetic notation hitherto considered are based on the Roman alphabet. But although the Roman alphabet has many advantages from a practical point of view, it is evidently impossible to build up a consistent and systematic notation on such an inadequate foundation of arbitrary signs. What is wanted, for scientific purposes especially, is a notation independent of the Roman alphabet, built up systematically — an alphabet in which there is a definite relation between sound and symbol.

This relation may be regarded either from the organic or the acoustic point of view. The tendency of the earlier attempts at an a priori universal alphabet was to symbolize the consonants organically, the vowels acoustically, as in E. Briicke's Phonetische Transscription (1863). It is now generally acknowledged that the vowels as well as the consonants must be represented on a strictly organic basis. This was first done in A. M. Bell's Visible Speech (1867), which appeared again (1882) in a shorter form and with some modifications under the title of Sounds and their Relations. Bell's pupil, H. Sweet, gave a detailed criticism of Visible Speech in a paper on Sound-notation (Trans, of Philo- logical Society, 1880-1881), in which he described a revised form of it called the Organic Alphabet, which he afterwards employed in his Primer of Phonetics and other works. Sweet's Narrow Romic notation already mentioned is practically a transcription of the Organic Alphabet into Roman letters.

Such notations are alphabetic: they go on the general principle of providing separate symbols for each simple sound. But as

the number of possible shades of sounds is almost infinite, even the most minutely accurate of them can do so only within certain limits. The Organic Alphabet especially makes a large use of " modifiers " — characters which are added to the other symbols to indicate nasal, palatal, &c, modifications of the sounds repre- sented by the latter, these modifiers being generally represented by italic letters in the Narrow Romic transcription; thus (1«) = nazalized (1).

In the Roman alphabet such symbols as /, v are arbitrary, showing no connection in form either with one another or with the organic actions by

which they are formed; but in the Organic symbol of v, for instance, we can see the graphic repre- sentation of its components " lips, teeth, voice-murmur." By omitting superfluous marks and utilizing various typographical devices the notation is so simplified that the symbols, in spite of their minute accuracy, are often simpler than in the correspond- ing Roman notation. The simplicity of the system is shown by the fact that it requires only about no types, as compared with the 280 of Lepsius's very imperfect Standard Alphabet.

All the systems hitherto considered are also alphabetic in a wider sense: they are intended for continuous writing, the more cumbrous " narrow " notations being, however, generally employed only in writing single words or short groups. An " analphabetic " basis was first definitely advocated by Jespersen, who represents each sound by a group of symbols resembling a chemical formula, each symbol representing not a sound, but an element of a sound: the part of the palate, tongue, &c, where the sound is formed, the degree of separation (openness) of the organs of speech, and so on. The two great advantages of such a system are that it allows perfect freedom in selecting and combining the elements and that it can be built up on the foundation of a small number of generally accessible signs.

As regards Jespersen's scheme, it is to be regretted that he has not worked it out in a more practical manner: that in his choice of the thirty odd symbols that he requires he should have gone out of his way to mix up Greek with Roman letters, together with other characters which would be avoided by any one con- structing even a scientific alphabetic notation. And his use of these symbols is open to much criticism. In fact, it cannot be said that the analphabetic principle has yet had a fair trial.

The Organs of Speech. — Most speech-sounds are formed with air expelled from the lungs (voice-bellows) , which passes through the two contractible bronchi or bronchial tubes into the also contractible wind-pipe or trachea, on the top of which is fixed the larynx (voice-box). Across the interior of the larynx are stretched two elastic ledges or cushions called " the vocal chords." They are inserted in front of the larynx at one end, and at the other they are fixed to two movable cartilaginous bodies " the aretynoids," so that the passage between them — • the glottis — can be narrowed or closed at pleasure. The glottis is, as we see, twofold, consisting of the chord glottis and the cartilage glottis. The two can be narrowed or closed independ- ently. The chords can also be tightened or relaxed, lengthened and shortened in various degrees.

When the whole glottis is wide open, no sound is produced by the outgoing breath except that caused by the friction of the air. Sounds in whose formation the glottis is in this passive state are called " breath " sounds.

Thus (f) is the breath consonant corresponding to the " voice " or " voiced " consonant (v). In the production of voice, the chords are brought close enough together to be set in vibration by the air passing between them. In the " thick " register of the voice (chest voice) the chords vibrate in their whole length, in the " thin " register or falsetto only in part of their length. If the glottis is narrowed without vibration, "whisper" is the result. In the "weak whisper" there is narrowing the whole glottis; in the " strong whisper," which is the ordinary form, the chord glottis is entirely closed, So that the breath passes only through the cartilage glottis. In what is popularly called " whisper " — that is, speaking without voice— the breath sounds remain unchanged, wfeile voiced sounds substitute whisper (in the phonetic sense) for voice. Thus in whispering such a word as feel

the (f) remains unchanged, while the following vowel and con- sonant are formed with the glottis only half closed. Whispered sounds— both vowels and consonants — occur in ordinary loud speech in many languages. Thus the final consonants in such English words as leaves, oblige are whispered, except when followed without a pause by a voiced sound, as in obliging, where the (3) is fully voiced.

Above the glottis — still within the larynx — comes the " upper " or " false " glottis, by which the passage can be narrowed. On the top of the larynx is fixed a leaf-like body, the " epiglottis," which in swallowing, and sometimes in speech, is pressed down over the opening of the larynx. The contractible cavity between the larynx and the mouth is called the " pharynx." The roof of the mouth consists of two parts, the " soft " and the " hard palate." The lower pendulous extremity of the soft palate, the " uvula," in its passive state leaves the passage into the nose open. In the formation of non-nasal sounds, such as (b), the uvula is pressed up so as to close the passage from the pharynx into the nose. If (b) is formed with the passage open, it becomes the corresponding nasal consonant (m). The other extremity of the (hard) palate is bounded by the teeth, behind which are the gums, extending from the teeth-rim to the arch-rim — the projection of the teeth-roots or alveolars.

There is great diversity among phoneticians as regards the mapping out — the divisions — of the palate and tongue, and their names. Foreign phoneticians generally adopt very minute distinctions, to which they give Latin names. Bell in his Visible Speech makes a few broad fundamental divisions. In the arrangement adopted here (mainly based on his) sounds formed on the soft palate are called " back," and are subdivided into " inner " = nearer the throat, and " outer " = nearer the teeth, further subdivisions being made by the terms " innermost," " outermost," the position exactly half way between these two last being defined as " intermediate back." Sounds formed on the hard palate or teeth may be

included under the common term ” forward,” more accurately distinguished as ” teeth ” (dental), ” gum,” ” front ” (palatal, afterwards called ” top ” by Bell), which last is really equivalent to “mid-palatal,” including the whole of the hard palate behind the gums. All of these divisions are further subdivided into ” inner,” &c, as with the back positions.

Of the tongue we distinguish the “back” (root), “front” or middle, ” point ” (tip), and ” blade,” which includes the point and the surface of the tongue immediately behind it. The tongue can also articulate against the lips, which, again, can articulate against the teeth. The lip passage can be closed, or narrowed in various degrees. Sounds modified by lip-narrow- ing are called ” lip-modified ” (labialized) or ” round ” (rounded), the last being specially used in speaking of vowels.

Speech-sounds. — The most general test of a simple as opposed to a compound sound (sound-group) is that it can be lengthened without change. As regards place of articulation, no sound is really simple: every sound is the result of the shape of the whole configurative passage from the lungs to the lips; and the ultimate sound-elements, such as voice, are never heard isolated. The most indistinct voice-murmur is as much the result of the shape of the superglottal passages as the clearest and most distinct of the other vowels; and its organic formation is as definite as theirs is, the only difference being that while in what we regard as unmodified voice all the organs except the vocal chords are in their passive, neutral positions, the other vowels are formed by actively modifying the shape of the super-glottal passages — by raising the tongue towards the palate, narrowing the lips, &e.

The most important elements of speech-sounds are those which are dependent on the shape of the glottis and of the mouth passage respectively. It is on the relation between these two factors that one of the oldest distinctions between sounds is based: that of vowel and consonant. In vowels the element of voice is the predominant one: a vowel is voice modified by the different shapes of the superglottal passages. In consonants, on the other hand, the state of the glottis is only secondary.

Consonants are generally the result of audible friction, as in (f), or of complete stoppage, as in (p). If the glottis is at the same time left open, as in (f, p), the consonant is ” breath ” or ” voiceless ” — if it is narrowed enough to make the chords vibrate, as in (v, b), the consonant is ” voice ”

or ” voiced “; intermediate positions producing the corresponding ” whispered ” consonants. Vowels are characterized negatively by the absence of audible friction or stoppage: if an (i) is formed with the tongue so close to the palate as to cause buzzing, it becomes a variety of the front consonant (j). There is, of course, no difficulty in forming a vowel with the glottis in the position for breath and whisper. Thus breath (i) may often be heard in French in such words as ainsi at the end of a sentence, the result being practically a weak form of the front-breath consonant ©. The division between vowel and consonant is not an absolutely definite one. As we see, the closer a vowel is— that is, the narrower its con- figurative passage is — the more like it is to a consonant, and the more natural it is to devocalize it. Some voice consonants, on the other hand, have so little buzz that acoustically they constitute a class between consonants and vowels — a class of ” vowel-like ” or ” liquid ” consonants, such as n, m, 1).

The changes in sounds which result from active narrowing of the passages admit of an important distinction as ” sound- modifying ” and ” sound-colouring,” although the distinction is not always definite. Nasality and rounding are examples of sound-modifying processes. Thus we hear a certain resem- blance between (b) and (m), (i) and (y) , but we regard all these four as distinct and practically independent sounds. Con- traction of the pharynx, on the other hand, as also of the false glottis and windpipe, have only a sound-colouring effect: if a vowel is formed with such contractions its quality (timbre) is altered, but it still remains the same vowel. It follows from the definition of speech-sounds that they admit of a twofold classification: (i) organic and (2) acoustic. As already remarked, the older phoneticians used to classify the consonants organi- cally, the vowels mainly from the acoustic point of view. The first to give an adequate organic classification of the vowels was the author of Visible Speech. Bell gave at the same time an independent acoustic classification of the consonants as well as the vowels. His acoustic classification consists simply in arrang- ing the sounds in the order of their ” pitches ” (tone-heights). The pitches of the breath consonants are absolutely fixed in each individual pronunciation, while those of spoken vowels can be varied indefinitely within the compass of each voice by tightening the vocal chords in various ways and shortening their vibrating portions: the tighter and shorter the vibrating body, the quicker its vibrations, and the higher the tone. But when a vowel is whispered or breathed nothing is heard but the resonance of the configurative passages, especially in the mouth, and the pitches of these resonant cavities are as fixed as those of the breath consonants; in other words, a whispered (or breathed) vowel cannot be sung. Although the absolute pitches of voiceless sounds may vary from individual to individual the relations of the pitches are constant: thus in all

pronunciations © and whispered (i) are the highest, breath (w) in what and whispered (u) nearly the lowest in pitch among consonants and vowels respectively.

If phonetics were an ideally perfect science there would be no occasion to discuss whether the acoustic or the organic study of the vowels and the other speech-sounds is the more important : a full description of each sound would necessarily imply ® an exact determination of its organic formation, (2) an acoustic analysis of the sound itself, both from the objective physical point of view and from the subjective one of the impression received by the ear, and (3) an explanation of how (2) is the necessary result of (1). Even this last question has already been solved to some extent. In fact, the connection between the organic formation and the acoustic effect is often self-evident. It is evident, for instance, that (i) and (g) owe their clear sound and high pitch to their being formed by short, narrow passages in the front of the mouth, while (u) owes its low pitch to being formed in exactly the opposite way, the sound being farther

muffled and the pitch consequently still more lowered by the rounding.

One reason why it is impossible to classify the vowels exclu- sively on acoustic principles is that two vowels formed in quite different ways may have the same pitch. Thus the " high- front-round" (y) and the "high-mixed" (i) have the same pitch, the tongue-retraction of the mixed position of the latter having the same effect as the rounding of the former. It is evident, therefore, that the fundamental classification of the vowels must, like that of the consonants, be purely organic. And although for practical purposes it is often convenient to classify sounds partly from the acoustic point of view, a full scientific treatment must keep the two points of view strictly apart, and make a special chapter of the relations between them.

Vowels. — The most obvious distinction between vowels is that which depends on the share of the lips in their articulation. In such non-round vowels as (i) and (a) the lips are passive, or even separated and spread out at their corners, by which the vowels assume a clearer resonance. If, on the other hand, the lips are actively approximated, they become the round vowels (y) and " open " (o) respectively.

Vowels are formed with different degrees of rounding. As a general rule, the narrowness of the lip-passage corresponds to the narrowness of the mouth-passage. Thus, in passing from the vowel of too to those of no and saw the back of the tongue is pro- gressively lowered, and the rounding is diminished in the same proportion.

But there is also abnormal rounding. Thus, if we pronounce

(0) with the lips in the position they have in forming (u), the resulting " over-rounded " vowel sounds half-way between (o) and (u) ; the second element of the diphthong (ou) in go is' formed in this way. Conversely, the (u) in put is " under-rounded " in the North of England: the tongue position is kept, but the lips are only brought together a little at the corners, as in (a).

The mouth positions of the vowels are the result of two factors:

(1) the height of the tongue — its nearness to the palate — and

(2) the degree of its retraction. Bell distinguishes three degrees of height: in his system (u) is " high," the (o) of boy is " mid," and the (?) of saw is " low." He also has three degrees of retrac- tion: in "back" vowels, such as (u), the root of the tongue is drawn to the back of the mouth, and the whole tongue slopes down from back to front. In " front " vowels, such as (i), the front of the tongue is raised towards the hard palate, so that the tongue slopes down from front to back.

Most of these slope-positions yield vowels of a distinct and clear resonance. There is also a class of " flat " vowels, such as (a), in which the tongue is in a more or less neutral position. If the tongue is raised from the low-flat position of (93) in bird to the high position, we get the (!) of North Welsh dyn " man," which, as already observed, is acoustically similar to (y).

The flat vowels were called " mixed " by Bell, in accordance with his view that they are the result of combining back and front articu- lation. And although this view is now generally abandoned, the term " mixed " is still retained by the English school of phoneticians.

In this way Bell mapped out the whole mouth by the following cardinal points: —

high-front mid-front low-front

Tiigh-back mid-back low-back

high-mixed mid-mixed low-mixed

In this arrangement " high-back," &c, are fixed points like those of latitude and longitude. Thus normal " high " means that the tongue is raised as close to the palate as is possible without causing con- sonantal friction, and " back " implies retraction of the same kind. Intermediate positions are defined as " raised," " lowered," " inner," " outer."

The most original and at the same time the most disputed part of Bell's

vowel-scheme is his distinction of ” primary ” and ” wide.” All vowels fall under one of these categories. Thus, the primary French (i) and the corresponding English wide (»’) are both high- front-vowels, and yet they are distinct in sound : the English vowel is a semitone lower in pitch. Bell explained the greater openness of the wide vowels as the result of greater expansion of the pharynx; and he considered the other class to be most nearly allied to the consonants — whence their name “primary” — the voice-passages in the formation of primary vowels being expanded only so far as to remove all fricative quality. But alterations in the shape of the pharynx have only a sound-colouring, not a sound-modifying, effect; and Sweet showed that the distinction depends on the shape of the tongue, and accordingly substituted ” narrow ” for Bell’s ” primary.” He also showed that the distinc- tion applies to consonants as well as vowels: thus the narrow French (w) in out is a consonantization of the narrow French (u) in sou, while the English (w) preserves the wide quality of the («) in put.

In forming narrow sounds there is a feeling of tension in that

part of the tongue where the sound is formed, the tongue being clenched or bunched up lengthwise, so as to be more convex than in its relaxed or ” wide ” condition.

The distinction between narrow and wide can often be ignored in practical phonetic writing, for it generally depends on quantity; length and narrowness, shortness and wideness going together. When the distinction is marked, wide vowels may be expressed by italics, as in German (biina, bin).

Bell’s category of ” mixed-round ” vowels had from the beginning been a source of difficulty to students of Visible Speech. But it was not till 1901 that Sweet showed that they are only mixed as regards position: they are really the corresponding back-round vowels moved forward into the middle of the mouth while pre- serving the slope of back vowels, instead of having the tongue flat as in the (unround) mixed vowels. They are ” out-back ” vowels: there is an exaggeration of the outer back position of such a back-round vowel as the English (m) compared with the full back (u) in German muttre.

In the same way by moving the tongue backwards while forming a front vowel another series of ” in-front ” vowels is obtained.

The “in-mixed” vowels are obtained by shifting the neutral mixed positions

into the full back position, keeping the tongue flat, so that these vowels might also be called " back-flat."

The out-back, in-front and in-mixed vowels are included under the common designation of " shifted," as opposed to " normal " vowels.

There is a large number of other vowel-schemes, of which a survey will be found in W. Vietor's Elemente der Phonetik. Many of the older ones are in the form of triangles, with the three chief vowels a, i, u at the three corners, the other vowels being inserted between these extremes according to their acoustic relations. Since the appearance of Visible Speech many attempts have been made to fit his new vowels into these older schemes.

Of all the vowel-schemes the one now most generally known is perhaps that of the International Phonetic Association already mentioned. In this scheme the distinction of narrow and wide, though admitted and occasionally marked, is not an integral part of the system, the vowels being classified first as " velar ' (back) and " palatal " (front), and then according to openness as "close," " half-close," " medium," " half-open " and " open."

Consonants. — These are the result of audible friction or stoppage, which may be accompanied either with breath, voice or whisper.

Consonants admit of a two-fold division (1) by form, and (2) by place. Thus (p, b) are by place lip-consonants, while by form they are stopped consonants or " stops."

If the mouth-stoppage is kept, and the nose-passage is opened, the stop becomes the corresponding "nasal"; thus (b) with the soft palate lowered becomes the nasal (m).

In " open " consonants the sound is formed by simply narrowing the passage, as in the back-open-breath (x) in Scotch and German loch. In some open consonants, such as the lip-teeth (f), there is slight contact of the organs, but without impeding the flow of breath.

In " divided " consonants there is central stoppage with open- ings at the sides, as in the familiar point-divided (1). These con- sonants are sometimes " unilateral " — with the opening on the side only — the character of the sound not being sensibly modified thereby.

When open and divided consonants are formed with the nose- passage open they are said to be " nazalized." Thus (m) with incomplete lip-closure becomes the nasalized lip-open- voice con- sonant.

" Trills " (or rolled) consonants are a special variety of un-stopped

consonants resulting from the vibration of flexible parts against one another, as when the lips are trilled, or against some firm surface, as when the point of the tongue trills against the gums in the Scotch ®, or the uvula against the back of the tongue, as in the Northumbrian burred ®, and the French and German ®, where— especially in German — the trill is often reduced to a mini- mum or suppressed altogether.

As regards the place of consonants, there is, as already remarked, great diversity among phoneticians, both in mapping out the palate and tongue and in the names given to these divisions. The classi- fication and nomenclature given here is, in the main, that of Bell.

By place, then, we distinguish seven main classes of consonants: back, front, point, blade, fan, lip, and lip-teeth.

" Back " (guttural) consonants are formed between the root of the tongue and the soft palate. In most languages the positions of these consonants vary according to those of the accompanying vowels : thus the back-stop and back-nasal in king are more forward than in conquer.

"Front" (palatal) consonants are formed between the middle of the tongue and the hard palate, the point of the tongue lying passively behind the lower teeth. It is easy to make the front- open- voice (j) in you into the corresponding stop (1) by narrowing the passage till there is complete closure, as in Hungarian nagy (naj) " world." In the same way the open breath © in German ich may be made into the stop © = Hungarian ty. (}) nasalized becomes (n) — Italian gn, Spanish fi, French en in vigne. The front- divided- voice consonant is the Italian gl and Spanish 11. These are

all simple sounds, distinct from the (lj), (nj) in French and English million and English onion.

" Point " consonants when formed against the teeth are called " point-teeth " (dental). English (V>) in thin is the point-teeth- open-breath consonant, (S) in then the corresponding voice con- sonant. If (S) is modified by turning the tip of the tongue back into the inner position — about on the arch-rim — it becomes the untrilled ® in English rearing, in which position the tongue is easily trilled, the trilling becoming more and more difficult the more the tongue is approximated to the point-teeth position. In French and many other languages all the point consonants (t, d, n, 1), &c, are formed on the teeth, except ®, which is always more retracted than the other point consonants. If the tip of the tongue is turned so far back as to articulate with its lower edge against the arch of the palate — that is, farther back than for the "inner" position — it is said to be "inverted." Inverted ® is frequent in the dialects of the south-west of England. The opposite of

inversion is " protrusion," in which the tip of the tongue articulates against the upper lip.

" Blade " consonants are formed by the blade or flattened tip of the tongue against the gums, as in English (s, z), or against the teeth, as in the corresponding French sounds. If these consonants are modified by turning the tongue a little back, so as to bring the point more into play, they become the " blade-point " consonants (/■ o), as in fish, measure. (J) is acoustically a dull (s). In some languages, such as German, sounds similar to (/) and (z) are formed partly by rounding, which lowers the pitch of the hiss in the same way as retraction does, so that the tongue-articulation is only imperfectly carried out. When the rounding is very marked there is only a slight raising of the front of the tongue, as in some Swedish dialects; and if the tongue-articulation is progressively shifted back, and the rounding diminished in the same proportion, (/) can at last develop into the pure back-open consonant (x), as in the present pronunciation of Spanish x and j.

The English point consonants (t, d, n, 1) are formed on the gums just behind the teeth, the point of the tongue being flattened, so that they are almost blade consonants.

" Fan " (spread) consonants — the " emphatic " consonants of Arabic — are modifications of point and blade consonants, in which the sides of the tongue are spread out, so that the hiss of such a consonant as (s) is formed partly between the sides of the tongue and the back teeth, which gives a peculiar deep, dull quality to these sounds.

" Lip " consonants, such as (p, m), and " lip-teeth " consonants, such as (f, v), offer no difficulty. The simple lip-open-breath consonant does not occur in English; it is the sound produced in blowing out a candle. The corresponding voice sound is frequent in German— especially in Middle Germany — in such words as quelle.

If the lip-open consonants are modified by raising the back of the tongue, they become the " lip-back " consonants (wh, w) in English what, we, which may also be regarded as consonantized («). In them the lip articulation predominates. In the " back-lip " consonants, as in German auch, the reverse is the case.

This last is one of a large number of " lip-modified " consonants, of which the already-mentioned German sch is a further example.

In a similar way consonants may be " front-modified." (1) is peculiarly susceptible to such modifications. In French and other languages it is

formed with the tongue more convex than in English, and consequently with a tendency to front-modification. Front- modified (s) and point ® may be heard in Russian in such words as gusl " goose," tsari " emperor," where the final vowels are silent. Some consonants are formed below the mouth. When the glottis is sharply opened or closed on a passage of breath or voice an effect is produced similar to that of a stop in the mouth, such as (k). This " glottal stop " is the sound produced in hic- cuping; and is an independent sound in some languages, such as Arabic, where it is called " hamza." In German all words beginning with a stressed (accented) vowel have a more or less distinct glottal stop before the vowel.

Of the passages below the glottis, the bronchials and the wind- pipe are both susceptible of contraction.

Spasmodic contraction of the bronchial passages is the main factor in producing what is known as " the asthmatic wheeze." If this contraction is regulated and made voluntary it results in the deep hiss of the Arabic ha. If this sound is voiced, it causes a peculiar intermittent vibration of voice, which is habitual with some speakers, especially in Germany. If this effect is softened by slightly expanding the bronchial passages, an ®-like sound is produced, which is that of the Arabic 'ain.

Contraction of the windpipe produces a sound similar to the Arabic ha, but weaker, which when followed by a vowel has the effect of a strong aspirate. When voiced it becomes a mere colourer of the accompanying voice-murmur, or vowel, to which it imparts a deep timbre.

Non-expiratory Sounds.— -All the sounds hitherto described imply out-breathing or expiration. Many of them can also be formed with in-breathing or inspiration. In English it is a not uncommon trick of speech to pronounce no in this manner, to express emphatic denial.

Some consonants are formed without either in- or out-breathing, but solely with the air in the throat or mouth. In forming " suction- stops " or " clicks " the tongue or lips are put in, the position for a stop, and the air is sucked out from between the organs in contact, so that when the stop is loosened, a smacking sound is produced by the air rushing in to fill the vacuum. Thus the point-click is the interjection of impatience commonly written tut! In many savage languages clicks are a part of ordinary speech.

Synthesis. — Besides analysing each sound separately, phonetics has, to deal with the phenomena which accompany synthesis or the combination of

sounds. Although a sentence may consist of a single word, and that word'of a single vowel, sounds mostly occur only in combination with one another. The ordinary division into sentences and words is logical, not phonetic: we cannot mark off sentences and cut them up into words until we know what they mean and are able to analyse them gram- matically. But the logical division into sentences corresponds to some extent with the phonetic division into " breath-groups," marked off by our inability to utter more than a certain number of syllables in succession without pausing to take breath. With- in each of these breath-groups there is no necessary pause between the words, except when we pause for emphasis. The only necessary phonetic divisions within the breath-group are those into syllables, sounds and intervening " glides." But before considering these last it will be necessary to say something about the general factors of synthesis: quantity, stress and intonation.

As regards quantity, it is enough for ordinary purposes to dis- tinguish three degrees: long, half-long or medium and short. In English what are called long vowels keep their full length when stressed and before final voice consonants, as in see, broad; and become half-long before voiceless consonants, as in cease, brought. In most other languages full length is preserved alike before all classes of consonants. The Romance languages have short final stressed vowels, as in French si. Unstressed vowels tend to become short in most languages. The distinctions of quantity apply to consonants as well as vowels. Thus English tends to lengthen final consonants after short stressed vowels, as in man compared with German mann, where the final consonant is quite short. Consonants, like vowels, tend to become short when unstressed. But in some languages, such as Finnish and Hungarian, stress has no effect on quantity, so that in these languages long vowels and double con- sonants occur as frequently in unstressed as in stressed syllables. Even in English we often lengthen final unstressed vowels in exclamations, as in what a pity! Some languages, such as the Romance languages and Russian, tend to level the distinctions of vowel-quantity : most of their vowels are half-long.

Stress is, organically the result of the force with which the breath is expelled from the lungs; while acoustically it produces the effect of loudness, which is dependent on the size of the sound- vibrations: the bigger the waves, the louder the sound, and the greater the stress, of which we may distinguish infinite degrees. If we distinguish only three, they are called weak, medium and strong. The use of stress in different languages shows the same variety as quantity. Some languages, such as French, make com- paratively little use of its distinctions, uttering all the syllables of words and sentences with a more or less jeven degree of force. English, on the other hand, makes great use of minute distinctions of stress both to distinguish the meanings of words and to mark their relations in sentences.

With stress is closely connected the question of syllable-division. A syllable is a group of sounds containing a " syllabic " or syllable- former, which is, of course, able to constitute a syllable by itself. The distinction between syllables and non-syllabics depends on sonority, the more sonorous sounds being the voiced ones, while of these again, the most open are the most sonorous, the most sonorous of all being the vowels, among which, again, the openest are the most sonorous. But these differences are only relative. When a vowel and a consonant come together the sonorousness of the vowel always overpowers that of the consonant, so that the two together only constitute one syllable. But in such a word as little the second (1) is so much more sonorous than the accompany- ing voiceless stop that it assumes syllabic function, and the whole group becomes dissyllabic to the ear. The beginning of a syllable corresponds with the beginning of the stress-impulse with which it is uttered. Thus in atone the strong stress and the second syllable begin on the (t), and in bookcase on the second (k), the first (k) belonging to the first syllable, so that the (kk) is here double, not merely long, as in book (bukk) by itself.

Intonation or variation of tone (pitch) depends on the rapidity of the sound-vibrations: the more rapid the vibrations, the higher the pitch. Intonation is heard only in voiced sounds, as being the only ones capable of variations of pitch.

In singing the voice generally dwells on each note without change of pitch, and then leaps up or down to the next note as quickly

as possible, so that the intervening " glide " is not noticed — except in what is called portamento. In speaking, on the other hand, the voice hardly ever dwells on any one note, but is constantly glid- ing upwards or downwards, so that an absolutely level tone hardly ever occurs in speech. But in the rising and falling inflections of speech we can distinguish between " voice-glides " (portamentos or slurs) and " voice-leaps," although the distinction is not so definite as in singing.

■ *Of the three primary forms of intonation the level tone ( ) can be approximately heard in well as an expression of musing — although it really ends with a slight rise; the rising (') in the question well?; the falling (') in the answer yes. There are besides compound tones formed by uniting the two last in one syllable. The compound rising tone (v) may be heard in lake caret the compound falling tone («) in the sarcastic oh! All these tones may be varied according to the intervals through which they pass. 1 he greater the interval, the more emphatic the tone.' Thus a high rise, which begins high, and consequently can only rise a little higher, expresses simple question, while the same word, if uttered with a low rise extending over an interval of between a fifth and an octave — or even more — expresses*

various degrees of. surprise or indignation, as in the emphatic what! compared with the simply interrogative what?

In English and most European languages, intonation serves to modify the general meaning and character of sentences. This is sentence-intonation. But some languages, such as Swedish and Norwegian, and Chinese, have word-intonation, by which words which would otherwise be identical in sound are distinguished. The distinction between Gr. oikoi and oikoi was no doubt one of intonation.

Glides. — Such a word as cat consists not only of the vowel and the two consonants of which it is made up, but also of " glides " or transitions between these sounds. The glide from the initial consonant to the vowel consists of all the intermediate positions through which the tongue passes on its way from the (k)-position to the (ae)-position. The number of these positions is infinite, but they are all implied by the mere juxta- position of the symbols, for it is assumed that in all transi- tions from one position to another the shortest way is taken. Although the direction of a glide is dependent on the positions of the two fixed points between which it lies, ; ts character may be varied both by the shape of the configurative passages — especially the glottis — and by stress and quantity.

In the word given above the " off-glides " from the consonants are both breath-glides, the glottis being kept open during the transition from the voiceless consonant to the following vowel, or, as in the case of the final consonant, to silence. The " on- glide " from the vowel to the (t) is, on the other hand, a voice- glide, the closure of the glottis being maintained till the stop is made.

In French and most of the languages of the south of Europe voiceless consonants are followed by voice-glides. Thus in French qui there is no escape of breath after the (k), as there is in English Key. Other languages again have breath on-glides before voiceless stops.

If an independent strong stress is put on the breath-glide of English key, it is heard almost as a full independent consonant, and becomes an " aspirate." Aspirated steps may be heard in the Irish-English pronunciation of such words as tell, and also in Danish, and in Sanskrit as pronounced in India. If the voice-glide after a voice stop is emphasized in a similar way the " sonant aspirates " of Sanskrit and its modern descendants are produced, as in Sanskrit dhanu.

Glides are especially important from an acoustic point of view. Acoustically speaking, indeed, voiceless stops are pure glide- sounds, the stop itself being inaudible. In voice-stops, on the other hand, the stop itself can be made

audible as well as the intervening glides. In English these latter are fully voiced when they come between voice sounds, as in ago; but when preceded by voiceless sounds or by a pause, as in go! they are formed with imperfect vocality, full voice being heard only just before the stop is loosened. So also initial English (z) as in zeal is formed with imperfect vocality under the same conditions, so that it sounds like (sz). In French and other languages which have voice-glides after voiceless consonants initial (g, z) &c. are fully voiced.

Consonant-glides may be further modified in various ways. In the formation of " implosive " stops, such as occur in Saxon German, Armenian and other languages, voiceless stops followed

by voice-glides are modified by simultaneous closure of the glottis, the larynx being raised by means of its muscles, so that it acts like a plug, compressing the air between the closed glottis and the mouth-stop, so that when the latter is released a peculiar choky effect is given to the off-glide.

Rounded glides may be heard in Russian in such words as komnata, where the rounding of the (o) is anticipated in the preceding consonant, being heard, of course, only in the off- glideˆof the consonant. The acoustic effect is between that of (kwo) and ordinary (ko).

Glideless consonant-combinations remain to be considered. The general articulative principle of taking the shortest way between sounds in juxtaposition necessarily results in certain transitions being effected without any glide at all. This is regularly the case when the consonants have the same place, and differ only in form, as in (nd, dlt), where the point of the tongue remains unmoved through the whole sound-group. In such combinations as (mf) the very slight glide is often got rid of entirely by assimilating the place of the first consonant to that of the second, so that the (m) becomes a lip teeth consonant, as in English nymph.

Even when consonants are formed in different parts of the mouth it is often possible to join them without any glide. In English such combinations as (kt, pt) are glideless, the point of the tongue being brought into position before the preceding stop is loosened. In French and most other languages such consonants are separated by a breath-glide.

Combinations of stops and vowel-like consonants (tr, gl, kw) are glideless in English and most other languages. In English the breath-glide after a voiceless stop unvoices the beginning of the following vowel-like consonant;

thus try is almost (trh-

rai).

Vowel-glides. — Vowels are begun and ended in various ways. In the " gradual beginning," which is the usual one in English and French, the glottis is gradually narrowed while breath is being emitted. In the " clear " beginning the breath is kept back till the glottis is closed for voice, which begins without any " breathiness." German favours the clear beginning, generally exaggerating it into a glottal stop.

In the gradual as well as the clear beginning the stress begins on the vowel. If in the former it is thrown back on the breath- glide, the latter is felt as an independent element and becomes the " aspirate " or (h), which in English and most other languages is a glide not only in the throat but in the mouth as well, the tongue and lips gradually moving up into the position for the following vowel while the glottis is being closed.

There is also a " strong " aspirate, which occurs in Finnish and other languages, in the formation of which the full vowel position is assumed from the beginning of the aspiration, which is therefore a voiceless vowel.

In most languages, when an aspirate comes between voiced sounds it is formed with imperfect vocality, the contrast of which with the full vocality of the other sounds is enough to produce the effect of breath. Thus in English behold the voice runs on without any actual break, the glottal closure being simply relaxed, not fully opened for breath, as in the emphatic aha I In some languages, such as Bohemian, this " voice-aspirate " is used everywhere, initially as well as medially.

Vowels are finished analogously, either by a gradual opening of the glottis, or by a cessation of aspiration while the glottis is still closed for voice. If stress is put on the gradual ending it becomes a distinct aspirate, as in the Sanskrit " visarga " in such a word as manah-

Organic Basis. — Every language has certain general tendencies which control the formation of its sounds, constituting its " organic basis " or basis of articulation. The tendency of the present English is to flatten and lower the tongue and draw it back from the teeth, while the lips are kept as much as possible in a neutral position. The flattening of the tongue makes our vowels wide and favours the development of mixed vowels, and gives the dull quality which is especially noticeable in our (1) ; and its retraction is unfavourable to the development of teeth sounds; while the neutrality of the lips eliminates front- round vowels. In such a language as French everything is reversed. The tongue is arched, and raised, and advanced,

and the lips articulate with energy. Hence French sounds tend to narrowness, dentality and distinct rounding. National Sound-systems. — Each language uses only a part of

the general phonetic material. Each one has only a limited number of sounds; and each one makes only a limited use of the synthetic distinctions of quantity, stress and intonation. As we have seen, many of these differences between individual languages are the result of, or may be referred to, differences in their organic basis.

Just as cognate languages differ from each other in phonetic structure, so also dialects of the same languages differ from each other more or less. Thus the sound-system of Lowland Scotch — which is, historically, a dialect of Northern English — differs considerably from that of standard English. Standard English itself was originally that mixture of the Midland and the Southern dialect which was spoken in London in the middle ages, just as standard French is, historically, the dialect of that district of which Paris is the centre. Standard English, like standard French, is now more a class-dialect than a local dialect: it is the language of the educated all over Great Britain. But it is not yet perfectly uniform. It is still liable to be influenced by the local dialects in grammar and vocabulary, and still more in pronunciation.

Again, English, like all other living languages, changes from generation to generation. Pronunciations which are vulgar in one century may become fashionable in the next. Sounds which are distinct in one generation may be confounded in another, and new distinctions may be made, new sounds may arise. A spoken language is, therefore, necessarily a vague and floating entity, and English is no exception to the rule. The very fixity of its written form gives all the freer play to the influences which cause change.

A standard spoken language is, strictly speaking, an abstrac- tion. No two speakers of standard English pronounce exactly alike. And yet they all have something in common in every sound they utter. There are some divergencies, some peculiari- ties of pronunciation, which pass unnoticed, while others, less considerable perhaps in themselves, are at once felt as archaisms, vulgarisms or provincialisms, as the case may be, by the majority of educated speakers.

Sounds of English. — The following is a convenient classification of the vowels of standard English : —

a a i e ae u o

aa aa ii ei uu ou, 3 ai, au oi

- *ia ea ua Here the vowels are in four rows: (i) normally short, or, more correctly, monophthongic, (2) long, or half-diphthongic, (3) full diphthongs, (4) murmur-diphthongs.*

Those under (1) are often lengthened in monosyllables such as ten, good, but they always remain absolutely monophthongic. The only one in the next row that is always strictly monophthongic is (so) : all the others, as we shall see, tend to become more or less diphthongic, especially in the south of England, being often exagger- ated into full diphthongs of the (ai) and (au)-type in vulgar speech.

(a), as in come up, is the short vowel corresponding to the (aa) in calm, (aa) is the mid-back-wide vowel, and (a) differs from it only in being narrow. Acoustically, (a) is a muffled or obscure (aa) : and the same effect may be produced by advancing the tongue from the mid-back to the corresponding out-back position, pre- serving the wide articulation : this pronunciation of u is common in the south of England. Historically, these sounds are the result of unrounding and older (u).

(a), as in sofa, is a mixed vowel, tending to wideness and mid position, which occurs only unstressed, (so) in turn, earth, is low- mixed-narrow. It is the result of absorption of an older ®, weakened into (a).

(ae), as in man, is low-front- wide, from older mid-back-wide. (i) in it is high-front-wide. The long (ii) in eat is narrow in the north of England, while in the south it is wide (i) followed by (j).

(e) in men is generally mid-front-wide, (ei) in mane is the same vowel either narrow or wide, raised in its latter half towards (i).

(u) in good is high-back-wide-round. Narrow (uu) in too becomes (aw) in southern English.

(o) in not is low-back-wide-round. In (ou), as in no, the mid- back-round vowel, either narrow or wide, is over-rounded in its latter half, (a), as in all, is low-back- narrow-round.

The full diphthongs (ai, au,oi),as in eye, now, oil, all end in lowered high vowels. Their first elements are only roughly indicated by the transcription, and vary in the mouths of different speakers. That of (ai) is generally the out-mid-back-wide, that of (au) the broader low-mixed-wide, that of (oi) the mid-back-wide-round. The murmur-diphthongs (ia) as in here, (ea) as in air, (ua) as in

poor, all tend to broaden their first elements. That of (ea) is the low-front-narrow vowel. The other two begin with lowered forms of the wide (i) and (u) respectively. In (ua) the lowering is often carried so far as to make poor almost, or completely, into pore (poa). The following arrangement of the English consonants will show their organic relations to one another;

j r; f>, 3 s, z; J , 5 wh, w;f, v 1 •

k,g t, d p, b

7j n m

The " aspirate " (h) may be regarded either as a throat-consonant or as a breath-glide.

Characteristic features of the English consonant-system are the large number of hisses and buzzes, the sharp distinction of breath and voice, and, negatively, the absence of the open-back consonant's, and of the voiceless forms of the vowel-like consonants (1, r) and the nasals, most of which still existed in Old English.

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PHONOGRAPH (Gr. 4>oivri, sound, ypafoiv, to write), an instrument for imprinting the vibrations of sound on a moving surface of tinfoil or wax in such a form that the original sounds can be faithfully reproduced by suitable mechanism. Many attempts had been made by earlier

experimenters to obtain tracings of the vibrations of bodies emitting sound, such as tuning-forks, membranes, and glass or metallic disks. In 1807 Thomas Young (Lectures, i. 191) described a method of recording the vibrations of a tuning-fork on the surface of a drum; his method was fully carried out by Wilhelm Wertheim in 1842 (Recherches sur I'elasticite, i' T – mem). Recording the vibrations of a membrane was first accomplished by Leon Scott in 1857 by the invention of the " phonautograph," which may be regarded as the precursor of the phonograph (Comptes rendus, 53, p. 108). This instrument consisted of a thin membrane to which a delicate lever was attached. The membrane was stretched over the narrow end of an irregularly-shaped funnel or drum, while the end of the lever or marker was brought against the surface of a cylinder covered with paper on which soot had been deposited from a flame of turpentine or camphor. The cylinder was fixed on a fine screw moving horizontally when the cylinder was rotated. The marker thus described a spiral line on the blackened surface. When sounds were transmitted to the membrane and the cylinder was rotated the oscillations of the marker were recorded. Thus tracings of vibrations were obtained. This instrument was much improved by Karl Rudolph Konig, of Paris, who also made with it many valuable observations. (See Nature, Dec. 26, 1001, p. 184). The mechanism of the recording lever or marker was improved by William Henry Barlow, in 1874, in an instrument called by him the " logograph " (Trans. Roy. Soc, 1874). The next step was Konig's invention of manometric flames by which the oscillations of a thin membrane under sound-pressures acted on a small reservoir of gas connected with a flame, and the oscillations were viewed in a rotating rectangular mirror, accord- ing to a method devised by Charles Wheatstone. Thus fame- pictures of the vibrations of sound were obtained (Pogg. Ann., 1864, cxxii. 242, 660; see also Quelques experiences d'acou- stique, Paris, 1882). Clarence Blake in 1876 employed the drum- head of the human ear as a logograph, and thus obtained tracings similar to those made by artificial membranes and disks (Archiv.

für Ophthalmol., 1876, v. 1.). In the same year Sigmund Theodor Stein photographed the vibrations of tuning-forks, violin strings, &c. (Pogg. Ann., 1876, p. 142). Thus from Thomas Young downwards successful efforts had been made to record graphically on moving surfaces the vibrations of sounds, but the sounds so recorded could not be reproduced. This was accomplished by T. A. Edison in 1876, the first patent being dated January 1877.

In the first phonograph a spiral groove was cut gn a brass drum fixed on a horizontal screw, so that when the drum was rotated it moved from right to left, as in the phonautograph. The recorder consisted of a membrane of parchment or gold-beater's skin stretched over the end of a short brass cylinder about 2 in. in diameter. In the centre of the membrane there was a

stout steel needle having a chisel-shaped edge, and a stiff bit of steel spring was soldered to the needle near its point, while the other end of the spring was clamped to the edge of the brass cylinder over which the membrane was stretched. The recorder was then so placed beside the large cylinder that the sharp edge of the needle ran in the middle of the spiral groove when the cylinder was rotated. The cylinder was covered with a sheet of soft tinfoil. During rotation of the cylinder, and while the membrane was not vibrating, the sharp edge of the marker indented the tinfoil into the spiral groove ; and when the membrane was caused to vibrate by sounds being thrown into the short cylinder by a funnel-shaped opening, the variations of pressure corresponding to each vibration caused the marker to make indentations on the tinfoil in the bottom of the groove. These indentations corresponded to the sound-waves. To reproduce the sounds the recorder was drawn away from the cylinder, and the cylinder was rotated backwards until the recorder was brought to the point at which it started. The cylinder was then rotated forwards so that the point of the recorder ran over the elevations and depressions in the bottom of the groove. These elevations and depressions, corresponding to the variations of pressure of each sound-wave, acted backwards on the membrane through the medium of the marker. The membrane was thus caused to move in the same way as it did when it was made to vibrate by the sound-waves falling upon it, and consequently move- ments of the same general character but of smaller amplitude were produced, and these reproduced sound-waves. Consequently the sound first given to the phonograph was reproduced with con- siderable accuracy. In 1878 Fleeming Jenkin and J. A. Ewing amplified the tracings made on this instrument by the sounds of vowels, and submitted the curves so obtained to harmonic analysis. (Trans. Roy. Soc. Edin. xxviii. 745). The marks on the tinfoil were also examined by P. F. F. Grützner, Mayer, Graham Bell, A. M. Preece, and Lahr (see The Telephone, the Microphone, and the Phonograph, by count du Moncel, London, 1884; also The Speaking Telephone and Talking Phonograph, by G. B. Prescott, New York,

1878).

The tinfoil phonograph, however, was an imperfect instrument, both as regards the medium on which the imprints were taken (tinfoil) and the general mechanism of the instrument. Many improvements were attempted. From 1877 to 1888 Edison was engaged in working out the details of the wax-cylinder phonograph. In 1885 A. G. Bell and S. Tainter patented the " graphophone," and in 1887, Emile Berliner, a German domiciled in America, patented the " gramophone," wherein the cylinder was coated with lampblack, and the friction between it and the stylus was made uniform for all vibrations. Incidentally it may be mentioned that Charles Cross deposited in 1877 a sealed packet with the Academie des Sciences,

Paris, containing a suggestion for reproducing sound from a Scott phonautograph record. The improvements made by Edison consisted chiefly (1) in substituting for tinfoil cylinders or disks made of a waxy substance on which permanent records are taken; (2) in substi- tuting a thin glass plate for the parchment membrane; (3) in improving the mechanical action of the marker; and (4) in driving the drum carrying the wax cylinder at a uniform and rapid speed by an electric motor placed below the instrument.

In the first place, permanent records can be taken on the wax, which is composed of stearin and paraffin. This material is brittle, but it readily takes the imprints made by the marker, which is now a tiny bit of sapphire. The marker, when used for recording, is shod with a chisel-shaped edge of sapphire ; but the sapphire is rounded when the marker is used for reproducing the sound. The marker also, instead of being a stiff needle coming from the centre of the membrane or glass plate, is now a lever, weighted so as to keep it in contact with the surface of the wax. A single vibration of a pure tone consists of an increase of pressure followed by a diminution of pressure. When the disk of glass is submitted to an increase of pressure the action of the lever is such that, while

the wax cylinder is rotating, the point of the marker is angled downwards, and this cuts deeply into the wax; and when there is diminution of pressure the point is angled upwards, so as to act less deeply. In reproducing the sound, the blunt end of the marker runs over all the elevations and depressions in the bottom of the groove cut on the wax cylinder. There is thus increased pressure transmitted upwards to the glass disk when the point runs over an elevation, and less pressure when the point runs over a depression on the wax cylinder. The glass disk is thus, as it were, pulled inwards and thrust outwards with each vibration, but these pulls

Fig. la. — Exterior of Edison Phonograph.

and thrusts follow each other so rapidly that the ear takes no cognizance of the difference of phase of the vibrations of the glass plate in imprinting and in reproducing. The variations of pressure are communicated to the glass plate, and these, by the medium of the air, are trans- mitted to the drum-head of the ear, and the sound is reproduced with remarkable fidelity. It is necessary for accurate reproduction that the point of the marker be in the centre of the groove. In the older phono- graphs this required accurate adjustment by a fine screw, but in newer forms a certain amount of lateral oscillation is allowed to the marker, by which it slips automatically into the

groove. Two other improvements have been effected in the construction of the instrument. A powerful triple-spring motor has been substituted for the electric motor, and the circumference of the wax cylinder has been increased from 6} in. to 15 in., whilst the disk is 12 in. in diameter. The cylinders make about two revolutions per second, so that with the smaller cylinder the point of the marker runs over nearly 14 in. in one second, while with the larger it runs over about 30 in. The marks corresponding to the individual vibrations of tones of high pitch are there- fore less likely to be crowded together with the larger cylinder, and these higher tones in particular are more accurately reproduced. In a form of instrument called the 200-thread machine motion of the drum bearing the cylinder was taken off a screw the thread of which was 50 to the inch, and by a system of gearing the grooves on the cylinder were 200 to the inch, or ˆ of an inch apart. It was somewhat difficult to keep the marker in the grooves when they were so close together; and the movement is now taken directly off a screw the thread of which is 100 to the inch, so that the grooves on the cylinder are T fo of an

inch apart. Thus with the large cylinder a spiral groove of over 300 yds. may be described by the recorder, and with a speed of about two revolutions per second this distance is covered by the marker in about six minutes. By diminishing the speed of revolu- tion, which can be easily done, the time may be considerably lengthened.

In the plate machine the disk is fixed to a table which is rotated at a fixed speed of about 76 revolutions a minute. The speed of the lateral movement of tHfe table is also uniform, and by a regular progression brings the wax blank under the sound-box to the sapphire cutting point, which detaches a fine unbroken thread of wax as it cuts into the surface of the blank to a depth of 33- to 4- thousandths of an inch, beginning at about half an inch from the circumference and continuing the spiral groove to within a couple of inches of the centre, according to the length of the music to be recorded. The essential difference between the disk and. cylinder machine is that in the former the waves are recorded by horizontal motion over the disk, while in the latter the waves are recorded as indentations.

The following is the modus operandi of making a record. The person making the record sings or plays in front of a horn or funnel used for the purpose of focusing the sound-waves upcn the diaphragm. The artist and the funnel are on one side of a screen and the recording apparatus in charge of an operator on the other. The arrangement of the various instruments in the recording room at proper relative distances from the horn is of the utmost importance in order to preserve the balance of tone. At about 4 ft. from the horn are grouped the violins and the wood wind (flutes, oboes and clarinets) ; behind the brass wind (horns, trumpets,

trombones and tubers), and right at the back the violoncellos and double basses and the kettle-drums and other instruments of percussion which may be required. On the other side of the screen is the sound-box and the recording cylinder or disk.

Cylinder records are duplicated by taking a plaster cast, electro- plating, and then using it as a matrix. The disk record admits of similar treatment. After dusting with graphite it is electro- plated to about ‘g mm. thick. This forms the permanent or master record, from which the working negatives are made by taking wax impresses of it and obtaining copper electros in turn from them. The matrix is then nickel-plated and polished and is ready for use in pressing out the commercial records by means of an hydraulic press, the material used being a tough and elastic substance contain- ing shellac and other compounds such as wood charcoal, barium sulphate, earthy colouring matters and cotton flock.

There is still a defect to be overcome in the gramophone, and that is the hissing of the needle produced by friction both during recording and intensified in reproduction. In one device for remedying this the stylus acts like a stylographic pen, depositing on a polished surface a fine stream of some liquid which solidifies and hardens very rapidly, forming a sinuous ridge instead of a groove in a wax blank. A negative is taken of the record and the matrix is made from it in the usual way.

Mechanism of Edison Phonograph.

The auxeto-gramophone or auxetophone, patented by Short in 1898 and improved by the Hon. C. A. Parsons, is similar in scope to the gramophone but attains its results in a different manner. In the Parsons-Short sound-box there is no diaphragm, but a

column of compressed air is controlled by a delicately adjusted grid-valve consisting of a metal comb rigidly connected to the stylus bar, so that as the needle moves the metal comb moves with it, following the lines of vibration fixed on the record and opening or closing the slots in the valve seat. The column of compressed air to which the valve gives access thus receives series of minute pulsations identical with those which originally produced the sounds recorded. In connexion with the sound-box is the apparatus for supplying compressed air, consisting of a sixth-horse power electric motor driving the compressor, an oil filter, a reservoir and a dust collector to keep the air absolutely free from foreign substances likely to interfere with the action of the valve.

The practical possibilities of the gramophone are being realized in many countries. Matrices of the records of well- known artists have been deposited at the British Museum and at the Grand Opera in Paris. Austria established a public phonogram record office in 1903, in which are collected folk- songs and records of all kinds for enriching the department of ethnography. The same idea is being carried out in Germany

A O

2 e 165 V.D.

*c' * 264 YD.*

Fig. 2.

by private societies and by royal museums. In Hungary records of the various dialects have been secured. The possibilities of the gramophone as a teacher are far-reaching, not only in the domain of music but in learning languages, &c.

To understand how the phonograph records and reproduces musical tones, it is necessary to remember (1) that pilch or frequency depends on the number of vibrations executed by the vibrating body in a given period of time, or on the duration of each vibration; (2) that intensity or loudness depends on the amplitude of the movement of the vibrating body; and (3) that quality, timbre or clang, first, depends on the form of the individual vibrations, or rather on the power the ear possesses of appreci- ating a simple pendular vibration producing a pure tone, or of decomposing more or less completely a compound vibration into the simple pendular vibrations

of which it is composed. If we apply this to the record of the phonograph, we find that, given a constant and sufficiently rapid velocity of the record, a note or tone of a certain pitch will be heard when the marker runs over a number of elevations and depressions corresponding to the frequency of that note. Thus if the note was produced by 200 vibrations per second, and suppose that it lasted in the music for -fo of a second, 20 marks, each made in $$$ of a second, would be imprinted on the wax. Consequently, in reproduction, the marker would run over the 20 marks in -fa>oi a second, and a tone of that frequency would be reproduced.

The loudness would correspond to the depth of each individual mark on the cylinder or the width on the disk. The greater the depth of a series of successive marks produced by a loud tone, the greater, in reproduction, would be the amplitude of the excursions of the glass disk and the louder would be the tone reproduced. Lastly, the form of the marks corresponding to individual vibrations would determine the quality of the tone or note reproduced, by which we can distinguish the tone of one instrument from another, or the sensation produced by a tone of pure and simple quality, like that from a well-bowed tuning-fork or an open organ pipe, and that given by a trumpet or an orchestra, in which the sounds of many instruments are blended together. When the phonograph records the sound of an orchestra it does not record the tones of each instrument, but it imprints the form of impression corresponding to the very complex sound-wave formed by all the instruments combined. This particular form, infinitely varied, will reproduce backwards, .as has been explained, A

9 10 11 12

152? w mm 2012 m ?%6w.

by acting on the glass plate, the particular form of sound-wave corresponding to the sound of the orchestra. Numerous instruments blend their tones to make one wave-form, and when one instru- ment predominates, or if a human voice is singing to the accom- paniment of the orches- tra, another form of sound-wave, or rather a complex series of sound waves, is imprinted. When reproduced, the wave-forms again exist in the air as very com- plex variations of pres- sure; these act on the drum-head of the human ear, there is transmission to the brain, and there an analysis of the com- plex sensation takes place, and we distin- guish the trombone from the oboe, or the human voice from the violin obbligato.

Many efforts have been made to obtain graphic tracings of wave-forms imprinted on the wax phonograph records. Thus J. G. M'Kendrick took (1) celloidin casts of the p

surface, and (2) micro- ‘ 3′

photographs of a small portion of the cylinder (Journ. of Anat. and Phys., July 1895). He also devised a phonograph recorder by which the curves were much amplified (Trans. Roy. Soc. Edin., vol. xxxviii.; Proc. Roy. Soc. Edin., 1896-1897, Opening Address; Sound and Speech Waves as revealed by the Phonograph, London, 1897; and Schafer’s Physiol., vol. ii., ” Vocal Sounds,” p. 1229). As already mentioned, so long ago as 1878 Fleeming Jenkin and Ewing had examined the marks on the tinfoil phonograph. Professor Ludimar Hermann, of Konigsberg, took up the subject about 1890, using the wax-cylinder phonograph. He obtained photographs of the curves on the wax cylinder, a beam of light reflected from a small mirror attached to the vibrating disk of the phonograph being allowed to fall on a sensitive plate while the phonograph was slowly travelling. (For references to Hermann’s important papers, see Schafer’s Physiology, ii. 1222.) Boeke, of Alkmaar, has devised an ingenious and accurate method of obtaining curves from the wax cylinder. He measured by means of a microscope the transverse diameter of the impressions on the surface of the cylinder, on different (generally equidistant) parts of the period, and he infers

from these measurements the depth of the impressions on the same spot, or, in other words, he derives from these measurements the curve of the vibrations of the tone which produced the impression

e 21 152 YD.

e 22 165 VD.

ff 25 198 VD.

c’ 24 264 VD

Fig. 4.

(Archiv. f. d. ges. Physiol. Bonn, Bd. 1, S. 297; also Proc. Roy. Soc. Edin., 1898).

From a communication to the Dutch Otorhinolaryngological Society Dr Boeke has permitted the author to select the accom- panying illustrations, which will give the reader a fair conception of the nature of the marks on the wax cylinder produced by various tones. Fig. 2 shows portions of the curves obtained by Hermann, and enlarged by Boeke one and a half times.

The numbers 1 to 4 refer to periods of the vowel A (as in " hard "), sung by Hermann on the notes c e g c'. Numbers 5 to 8 show the curves of the vowel (as in " go ") sung to the same notes. The number of vibrations is also noted. Boeke measured the marks for the same vowels by his method, from the same cylinder, and constructing the curves, found the relative lengths to be the same. In fig. 3 we see the indentations produced by the same vowels, sung by Hermann on the notes c e g c', on the same phonograph cylinder, but delineated by Boeke after his method. The curves are also shown in linear fashion beside each group of indentations. From these measure-

ments the curves were calculated and reproduced, as in fig. 4. Thus the curves of the same vowel sounds on the same Cylinder are shown by two methods, that of Hermann and that of Boeke.

d e f g a, b C c'

A 1 c f a' a; b' e"

Fig. 5. In fig. 5 we see the indentations on the vowel a, sung by Dr Boeke, aged 55, on the notes cdefgabc', and near the frequencies of 128, 144, 160, 170-6, 192, 213-3, 2 4° ar >d 256. The numbers 33 to 40 show the marks produced by the same vowel, sung by his son, aged 13. It will be seen that the boy sang the notes exactly an octave higher. Fig. 6 shows the marks produced by some musical

427 ty.

Fig. 6.

sounds. Each shows on the right-hand side the curve deduced from the marks, and under it a graphical representation of the results of its harmonic analysis after the theorem of Fourier, in which the ordinates represent the amplitude of the subsequent harmonic constituents. No. 41 is the period of the sound of a pitch-pipe giving a' (425 double vibrations per second), No. 42 the period of a Dutch pitch-pipe, also sounding a' (424-64 double vibrations per second). No. 43 is a record of the period of a sound produced by blowing between two strips of indiarubber to imitate the vocal cords, with a frequency of 453 double vibrations per second. No. 44 is that of a telephone pipe used by Hermann (503 double vibra- tions per second). Nos. 45 and 46 show the marks of a cornet sounding the notes a of = t 400 double vibrations per second, and e of 300 double vibrations per second. In fig. 7 are shown' a number of vowel curves for the vowels o, OE, A, E and 1. Each curve has on the right-hand side a graphical representation of its harmonic analysis. The curves are in five vertical

columns, having on the

left-hand side of each drawings, by Boeke's method, of two periods of the marks of the vowel. The marks are shown for the Dutch, German, English and French languages. The sounds of the vowels are 0, like in " go "; oe, like 00 in " too "; u, like the German u in " Fiihrer " ; o, like o in " hard " ; e, like a in " take " ; ij, not in English words, but somewhat like e in " bell "; and i, like ee in " beer." The first section contains only Dutch vowel sounds, either sung or spoken by Boeke or members of his family. The second section contains curves from the voice of Professor Hermann, the third from the voice of the author from a cylinder sent by him to Dr Boeke, and the fourth from the voice of Mons. H. Marichelle, professeur de l'lnstitut des Sourds-Muets, also forwarded by him to Dr Boeke. Thus curves and marks of the same vowel are shown from the voices of men of four nationalities.

On the construction of the gramophone, see L. N. Reddie, Journ. Soc. Arts (1908).

PHONOLITE (Gr. fyuvi), sound, and Xi#os, stone), in petrology, a group of volcanic lavas containing much nepheline and sanidine felspar. The term " clinkstone " was formerly given by geolo- gists to many fine grained compact lavas, which split into thin tough plates, and gave out a ringing sound when struck with the hammer. Some of these clinkstones were phonolites in the modern sense, but as the name clinkstone was used for a large variety of rocks, many of which have no close affinities with one another, it has been discarded and " phonolite " is substituted for it. The group includes rocks which are rich in alkalis with only a moderate percentage of silica; hence they contain no free quartz but much alkali felspar (sanidine and anorthoclase) and nepheline. Large plates of sanidine are often visible in the rocks; the nepheline is usually not obvious to the unaided eye. Most phonolites show fluxion structure, both in the orientation of their phenocrysts and in the smaller crystals which make up the ground-mass; and this determines to a large extent the platy jointing. Although vitreous and pumiceous forms are known they are rare, and in the great majority of cases these rocks are finely crystalline with a dull or shimmering lustre in the ground- mass. Marked characteristics are the readiness with which they decompose, and the frequency of veins and cavities occupied by natrolite, analcite, scolecite and other zeolites. Small black grains of augite or hornblende and sometimes blue specks of haiiyne may be seen in the rocks when they are fresh.

The dominant minerals are sanidine, nepheline, pyroxene, amphibole, various felspathoids and iron oxides. The sanidine is usually in two generations, the first consisting of large crystals of flattened and tabular shape, while the second generation is represented by small rectangular prisms arranged in parallel streams in the ground-mass; these felspars are nearly always simply twinned on the Carlsbad plan. They contain often as much soda as potash. The nepheline takes the form of hexagonal prisms with flat ends, and may be completely replaced by fibrous zeolites, so that it can only be recognized by the outlines of its pseudomorphs. In some phonolites it is exceedingly abundant

magnetite and zircon occur in the phonolites, and sphene is often rather common. Another mineral which is more frequent in phonolites than in many other rocks is brown melanite garnet.

The majority of the rocks of this group are of Tertiary or Recent age, but in Scotland Carboniferous phonolites occur in several localities, e.g. Traprain in Haddingtonshire, also in the Eildon Hills and in Renfrewshire. In Brazil phonolites belonging to the same epoch are also known. There are several districts in Europe where Tertiary or Recent phonolites occur in considerable numbers, as in Auvergne (Mont Dore), the Eifel, and Bohemia. The Wolf Rock which lies off the south coast of Cornwall, and is the site of a well-known lighthouse, is the only mass of phonolite in England; it is supposed to be the remains of a Tertiary lava or intrusion. The Canary Islands, Cape Verde Islands, Sardinia, Aden, British East Africa and New Zealand contain many types of phonolites; they are known also in New South Wales, while in the United States phonolites occur in Colorado (at Cripple Creek) and in the Black Hills of South Dakota.

Leucite occurs in place of nepheline in a small group of phono- lites (the leucite-phonolites) , known principally from Rocca Monfina and other places near Naples. Blue haiiyne is rather a conspicuous mineral in some of these rocks, and they also contain a good deal of sphene. When sanidine, nepheline and leucite all occur together in a volcanic rock it is classed among the leucitophyres (see Petrology, Plate III. fig. 2).

The chemical analyses of phonolites given below show that these rocks are very rich in alkalis and alumina with only a moderate amount of silica, while lime, magnesia and iron oxides are present only in small quantity. They have a close resemblance in these respects to the nepheline-syenites of which they provide the effusive types. (J. S. F.)

PHORCYS-(Phorctjs, Phorcyn), in Greek mythology, son of Pontus (Sea) and Gaea (Earth), father of the Graeae, the Gorgons, Scylla, and Ladon (the dragon that guarded the golden apples of the Hesperides). In Homer

{Odyssey, xiii. 96) he is an aged sea-deity, after whom a harbour in Ithaca was named. Accord- ing to Varro (quoted by Servius in Aeneid, v. 824) Phorcys was a king of Corsica and Sardinia, who, having been defeated by King Atlas in a naval engagement in the course of which he was drowned, was subsequently worshipped as a marine divinity.

PHORMIUM, or New Zealand Flax (also called " New Zealand hemp "), a fibre obtained from the leaves of Phormium tenax (nat. ord. Liliaceae), a native of New Zealand, the Chatham Islands and Norfolk Island. This useful plant is one of the many which were discovered by Sir Joseph Banks and Dr Solander who accompanied Captain Cook on his first voyage of discovery. The seeds brought home by Banks in 1771 did not succeed, but the plant was introduced by him to the Royal Gardens at Kew in 1789, and was thence liberally distiibuted

Si0 2

A1 2 3

Fe 2 3

FeO

MgO

CaO

Na 2

K 2

H 2

I. Phonolite, Wolf Rock, Cornwall II. Phonolite, Teplitzer Schlossberg, Bohemia III. Leucite-phonolite, Rocca Monfina, Italy .

56-46 58-16

58-48

22-29

21-57 19-56

2-70

2-77

0-97 4-99

tr

1-26 0-53

1-47

2-OI

2-60

11-13 5-97 3-14

2-8l

6-57 10-47

2-05 2-03 0-24

in the ground-mass, and these rocks form transitions to the nephelinites (nephelinitoid phonolites) (see Petrology, Plate III. fig. 1); in others it is scarce and the rocks resemble trachytes containing a little nepheline (trachytoid phonolites). The felspathoid minerals, sodalite, haiiyne and nosean, which crystallize in isometric dodecahedra, are very frequent compo- nents of the phonolites; their crystals are often corroded or partly dissolved and their outlines may then be very irregular. Small rounded enclosures of glass are often numerous in them. The pyroxenes may be pale green diopside, dark green aegirine-augite, or blackish green aegirine (soda iron pyroxene), and in many cases are complex, the outer portions being aegirine while the centre is diopside. Fine needles of aegirine are often found in the ground-mass. The commonest hornblende is dark brown barkevicite. Biotite and olivine are not really frequent in these rocks, and usually have been affected by resorption. The ordinary accessory minerals of igneous rocks, apatite,

in Great Britain and the continent of Europe. It grows luxuri- antly in the south of Ireland, where it was introduced in 1798, and also flourishes on the west coast of Scotland, and is generally cultivated as an ornamental garden plant in Europe. It has been introduced for economic purposes into the Azores and California. The name Phormium is from Gr. 4 > opfws, a basket, in allusion to one of the uses made of its leaves by the New Zealanders.

In its native country the plant is generally found near the coast. It has a fleshy rootstock, creeping beneath the surface of the soil and sending up

luxuriant tufts of narrow, sword- shaped leaves, from 4 to 8 ft. long and from 2 to 4 in. in diameter. The leaves are vertical, and arranged in two rows as in the garden flag; they are very thick, stiff and leathery, dark green above, paler below, with the margin and nerve reddish- orange. From the centre of the tuft ultimately arises a tall flower-bearing stem, 5 to 15 ft. high, bearing on its numerous

branches a very large number of lurid red or yellow, somewhat tubular flowers, recalling those of an aloe, and from i to 2 in. long. After flowering the plant dies down, but increases by new lateral growths from the rootstock. The plant will grow in almost any soil, but best on light rich soil, by the side of rivers and brooks, where sheltered from the wind.

Phormium has been treated as a cultivated plant in New Zealand, though only to a limited extent; for the supplies of the raw material dependence has been principally placed on th"e abund- ance of the wild stocks and on sets planted as hedges and boundaries by the Maoris. Among these people the fibre has always been an article of considerable importance, yielding cloaks, mats, cordage, fishing-lines, &c, its valuable properties having attracted the atten- tion of traders even before colonists settled in the islands. The leaves, for fibre-yielding purposes, come to maturity in about six months, and the habit of the Maoris is to cut them down twice a year, rejecting the outer and leaving the central immature leaves. Phormium is prepared with great care by native methods, only the mature fibres from the under-side of the leaves being taken. These are collected in water, scraped over the edge of a shell to free them from adhering cellular tissue and epidermis, and more than once washed in a running stream, followed by renewed scraping till the desired purity of fibre is attained. This native process is exceed- ingly wasteful, not more than one-fourth of the leaf-fibre being there- by utilized. But up till i860 it was only native-prepared phormium that was known in the market, and it was on the material so care- fully, but wastefully, selected that the reputation of the fibre was built up. The troubles with the Maoris at that period led the colonists to engage in the industry, and the sudden demand for all available fibres caused soon afterwards by the Civil War in America greatly stimulated their endeavours. Machinery was invented for disintegrating the leaves and freeing the fibre, and at the same time experiments were made with the view of obtaining it by water-retting, and by means of alkaline solutions and other chemical agencies. But the fibre produced by these rapid and economical means was very inferior in quality to the product of Maori handiwork, mainly because weak and undeveloped strands are, by machine

preparation, unavoidably intermixed, with the per- fect fibres, which alone the Maoris select, and so the uniform quality and strength of the material are destroyed. The New Zealand government in 1893 offered a premium of £1750 for a machine which would treat the fibre satisfactorily, and a further £250 for a process of treating the tow; and with a view to creating further interest in the matter a member of a commission of inquiry visited England during 1897. The premium was again issued in 1899. In 1903 it was stated that a German chemist had discovered a method of working and spinning the New Zealand fibre. An idea of the extent of the growth of the fibre may be gathered from the fact that the exports for 1905 amounted to 28,877 bales at a value of nearly £700,000.

Phormium is a cream-coloured fibre with a fine silky gloss, capable of being spun and woven into many of the heavier textures for which flax is used, either alone or in combination with flax. It is, however, principally a cordage fibre, and in tensile strength it is second only to manila hemp; but it does not bear well the alternations of wet and dry to which ship-ropes are subject. The fibre has come into use as a suitable material for binder-twine as used in self-binding reaping machines.

PHORONIDEA, a zoological order, containing a single genus Phoronis, which is known to be of practically world-wide dis- tribution, while there are many records of its larva, Actinotrocha, from localities where the adult has not been found. Phoronis is often gregarious, the tubes which it secretes being sometimes intertwined in an inextricable mass. These associations of individuals can hardly be the result of the metamorphosis of a corresponding number of larvae, but are probably due to a spontaneous fragmentation of the adult animals, each such fragment developing into a complete Phoronis (De Selys-Long- champs). The animal is from a quarter of an inch to six inches (P. australis) in length. The free end of the long vermiform body ends in a horseshoe-shaped " lophophore," or tentacle-bearing region (fig. 1, a), which strikingly resembles that of the Phylactolaematous Polyzoa (see Polyzoa).

In some species (figs. 2, 3) the two ends of the lophophore are rolled into spirals. An oral view of this region (fig. 2) shows: the mouth (m), continuous on either side with the groove between the two series of tentacles; the anus (o), in the middle line, at no great distance from the mouth; a transversely elongated epistome (ep), between the mouth and the anus; and, in the concavity of the lophophore, the apertures of the nephridia (n.o.) which, accord- ing to De Selys-Longchamps, open into the two large sensory or glandular " lophophoral organs " the orifices of which are seen at gl. The mouth leads into the oesophagus, which extends straight down the body nearlv to the aboral end or " ampulla," where it

dilates into a stomach, from which the ascending limb of the (J-shaped alimentary canal passes directly to the anus. The coelomic body-cavity is divided by a transverse septum (fig. 3, s) which lies near the bases of the tentacles. The praeseptal or lopho- phoral coelom is continued into each of the tentacles and into the

Fig. i.-

(After Allman.)

-The Tentacular End of Phoronis, with most of the tentacles removed.

a. The horseshoe-shaped lopho- phore. 6, Mouth.

c, Optical section of the epistome

(seen immediately below the end of the reference-line).

d, Oesophagus.

e, Intestine.

epistome. The postseptal coelom is partially divided by a ventral mesentery which is attached along the entire length of the convex side of the loop of the alimentary canal (a, a") and by two lateral mesenteries (a') which further connect the oesophagus with the

/, Efferent vessel.

g, One of the two efferent lopho- phoral vessels, uniting to form /.

h, Dorsal or afferent vessel.

i, Body-wall.

k. Fused bases of the tentacles.

(After Benham.) Fig. 2. — Dorsal View of Phoronis australis, showing the spirally

coiled ends of the lophophore.

a,

D,

ep,

?/,

i.t.,

Anus.

m.

Posterior surface.

n.o.

Epistome.

n.o.

Lophophoral organ.

o.t.,

Bases of inner tentacles.

V,

Position of the mouth. Nephridial surface. Nephridial opening. Bases of outer tentacles. Anterior surface.

body-wall. Each nephridium is provided with either one or two funnels which open into the postseptal division of the coelom (ne.f). The nervous system lies in the epidermis, externally to the basement- membrane. A general nerve-plexus probably exists over con- siderable parts of the skin, and there are special nervous concen- trations in the region of the epistome and along a double crescent (N) which follows the parietal attachment of the coelomic septum. The part which lies at the base of the epistome is morphologically dorsal in position. It is said by Schultz (11) to develop, in specimens which are regenerating the lophophoral end, from an invagination of the ectoderm; and in this condition is compared by hun with

the hollow central nervous system of some Enteropneusta and of Vertebrates. This comparison is not admitted by De Selys- Longchamps. The vascular system contains numerous red blood- corpuscles. The principal blood-channels are two longitudinal vessels which run down the

entire length of the body, and are known as the " afferent " vessel (a/) and the " efferent " vessel (ef) respectively, from their relation to the tentacles. According to researches in 1907 by De Selys-Longchamps, the blood is driven by the afferent vessel (af) to a crescentic lophophoral vessel (d.v.) which supplies the tentacles. Each of these contains a single blindly

a,

a', a",

«/.

an,

D,

d.v.

ef,

ep,

gl, it,

TO,

a- ' ~~~ a,

(From Fowler, after Benham.)

Fig. 3. — Diagram of oral end of Phoronis australis,

seen from the left side.

Oesophageal (ventral) mesen- N, Post-oral nerve-tract

tery. base of lophophore.

at

Right lateral mesentery.

Intestinal mesentery.

Afferent vessel.

Anus.

Posterior surface.

Afferent lophophoral vessel.

Efferent vessel.

Epistome.

Lophophoral organ.

Bases of inner tentacles.

Mouth.

ne.d., Duct of nephridium. ne.f., Larger nephridial funnel. ne.o., External opening of ne-

phridium. m, Oesophagus. ot., Bases of outer tentacles. ‘ R, Intestine. r.v., Right efferent lophophoral

vessel. s, Coelomic septum. V, Anterior side.

ending vessel which bifurcates at its base (see fig. 3). One of these branches communicates with the afferent lophophoral vessel, while the other one opens into the crescentic efferent lophophoral vessel (r.v.). From this the blood passes into two lateral vessels which pierce the coelomic septum (5.), the right vessel proceeding on the anterior side of the oesophagus, as shown in fig. 3, to effect a union with the left one, and thus to constitute the main efferent vessel, which gives off numerous caecal branches as it passes down the body. Hence the blood returns once more to the afferent vessel through a splanchnic sinus which surrounds the stomach. The circulation is maintained by the rhythmical contraction of the afferent vessel and by less regular contractions of some of the other vessels. The reproductive organs lie on the left side, near the aboral end, both ovary and testis being present in the same individual in some of the species. They are said to be developed from the coelomic epithelium which covers the efferent vessel or its caeca. The reproductive cells pass to the exterior by means of the nephridia. Reproduction by budding does not occur, although spontaneous fragmentation of the body, followed by complete regeneration of each of the pieces, is known to take place. Regeneration of the tentacular end of the animal is of frequent occurrence.

Development and Affinities. — The eggs of Phoronis are small and usually undergo their early development attached to the tentacles of the adult. The attachment is probably effected (Masterman) by the secretion of the lophophoral organs (fig. 2, gl.). After the formation of an invaginate

gastrula the larval form is rapidly acquired. On quitting the shelter of the parent tentacles the embryo becomes a pelagic larva, known as Actinotrocha (fig. 4) characterized by the possession of a line of tentacles running obliquely round the body. Locomotion is effected principally by means of a posterior ring of cilia surrounding the anus. The mouth (0) is in front of the tentacles, on the ventral side, and is overhung by a mobile praeoral hood, in which is the principal part of the nervous system.

An oblique septum which follows the bases of the tentacles and corresponds with that of the adult animal divides the body-cavity into two portions. The postseptal division is a coelomic space, partially subdivided by a ventral mesentery. The praeseptal cavity is a vascular space, since it is in free communication with the dorsal vessel of the larva, and it persists in part as the two lophophoral vascular crescents of the adult. It contains two tufts of peculiar excretory cells, described by Goodrich (5) as " soleno- cytes," which surround the blind ends of a pair of nephridia. These pass backwards through the septum and open to the exterior ventrally. After the Actinotrocha has led a pelagic life for some time it develops a large ventral invagination of its body-wall (fig. 4, 2, iv.). At the metamorphosis, this sac is everted and the alimentary canal is drawn into it in the form of a loop (fig. 4, 3, 4). Most of the praetentacular region and the larval tentacles separate off, being then taken into the alimentary canal, where they are digested. The relations of the surfaces after the metamorphosis are clearly very different from those which obtained in the larva. The dorsal surface of the adult is the one between the mouth and the anus, while the median ventral line is the one which corresponds with the convexity of the alimentary canal. This view of the sur- faces is, however, disputed by De Selys-Longchamps, who regards the aboral extremity of the adult as the posterior end.

The development of Phoronis was supposed by Caldwell (2) to furnish the explanation of the relations of the surfaces in Brachio- poda, Polyzoa and perhaps the Sipunculoid Gephyrea, in which the ontogenetic evidence is less clear. Caldwell's views were accepted by Lankester (8) in the 9th edition of this work, the Phylum Podaxonia being there instituted to include the groups just mentioned, together with the Pterobranchia. The peduncle of the Brachiopoda was supposed to correspond with the everted ventral sac of Actinotrocha, but the question is complicated by the want of any complete investigation of the development of the Brachiopoda, and by the absence of the anus in the majority of the genera. There is, however, a considerable amount of re- semblance between the lophophore of Phoronis australis, with its spirally twisted ends, and that of a. typical Brachiopod ; nor do the structural details of the adult Brachiopods forbid the view that they may be related to Phoronis. The comparative study of the development does not support the hypothesis that the Polyzoa (q.v.) are comparable with

Phoronis. In Pedicellina, the only Polyzoon in which the alimentary canal of the larva is known to become that of the first adult individual, the line between the mouth and anus is ventral in the larva ; and since there is no reversal of the curvature of the digestive loop during the metamorphosis it must be regarded as ventral in the adult. There are, indeed remarkable similarities between the external characters of the Phylactolaematous Polyzoa and the Phoronidea, and notably be- tween their lophophores. The supposed occurrence of a pair of nephridia in certain Phylactolaemata, in a position corresponding with that of the nephridia of Phoronis, must also be mentioned,

Fig. 4. — Diagrams illustrating the Metamorphosis of Actinotrocha.

AB, Anteroposterior axis. 3, Commencement of the meta-

DV, Dorsoventral axis. morphosis.

1, 2, Actinotrocha. 4, Later stage in the metamor-

phosis: a, anus; iv, ventral invagination; 0, mouth.

although it has been maintained that the " nephridia " of Phylac- tolaemata are merely ciliated portions of the body-cavity and not indeed nephridia at all. But a serious objection to the comparison is that the development of Phylactolaemata can be explained by supposing it to be a modification of what occurs in other Polyzoa, while it appears to have no relation whatever to that of Phoronis. Most observers consider that Actinotrocha is a highly modified Trochosphere, and this would give it some claim to be regarded as distantly related to the Entoproct Polyzoa and to other groups which have a Trochosphere larva.

Phoronis has long been regarded as a possible ally of Rhabdopleura (see Pterobranchia) ; and Masterman (10) has attempted to demonstrate the existence in Actinolrocha of most of the structures which occur in the Pterobranchia. According to his view the praeoral hood of Actinolrocha (cf. fig. 4) corresponds with the "proboscis" of Pterobranchia; the succeeding region, as far as the bases of the tentacles, with the collar; and the post-tentacular region with the metasome. Masterman's more detailed comparisons have for the most part been rejected by other morphologists. One of the most formidable difficulties in the way of the attempt to reduce Actinolrocha to the Pterobranchiate type of structure is the condition of the coelom in the former. There is indeed a perfectly definite transverse septum

which divides the body-cavity in the region of the tentacle-bases. Even if it be admitted that the post- septal space may be the metasomatic cavity, the praeseptal space can hardly be regarded as coelomic in nature, since it is in continuity with the vascular system; while Masterman's conclusion that the cavity of the praeoral hood (the supposed proboscis-cavity) is separated from that of the supposed collar has received no con- firmation. In spite of these difficulties it must be conceded that the dorsal flexure of the alimentary canal of the Pterobranchia is very Phoronis-like. It has, moreover, been shown (see especially Goodrich, 5) that shortly before its metamorphosis, Actinolrocha develops a coelomic space which lies immediately in front of the oblique septum, and gives rise later to the cavity of the lophophore and tentacles. Regarding this as a collar-cavity, it becomes

Eossible to agree with Masterman that the region shown in fig. 4, I. etween the tentacles and the praeoral hood, is really a collar the coelom of which develops relatively late. It will be noticed that the lophophore of Phoronis is, on this assumption, a derivative of the collar just as it is in the Pterobranchia. The epistome of the adult Phoronis cannot well be the proboscis since its cavity is continuous with the lophophoral coelom, and because the praeoral hood of Actinolrocha is entirely lost at the metamorphosis. It is possible that this consideration will account for the want of an anterior body-cavity in Phoronis. Since the proboscis is a purely larval organ in this genus, it may be supposed that the coelomic space which properly belongs to it fails to develop, but that the praeoral hood itself is none the less the morphological representative of the proboscis. In spite of the criticisms which have been made on the conclusion that Phoronis is allied to the Pterobranchia, it is thus possible that the view is a sound one, and that the Phoronidea should take their place, with the Enteropneusta and the Ptero- branchia, as an order of the Hemichordata.

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(S. F. H.)

PHORORHACOS, the best-known genus of the extinct Patagonian Stereornithes (see Bird: Fossil). Among the bones found in the strata of the Santa Cruz formation (now considered as mainly of mid-Miocene date) was the piece of a mandible which F. Ameghino described in 1887 as that of an edentate mammal, under the name of Phorysrhacos longissimus {Bolet. Mus. de la Plata,i. 24). In 1891 (Rev. Argent. Hist. Nat. i. 225)

(From life-size model in Brit. Mus. Nat. Hist.)

Skull of Phororhacos, longissimus.

he amended the name and recognized the bone as that of a bird, Phororhacos, which with Brontornis and others con- stituted the family Phororhacidae. About six species of the type genus are now known, the most complete being Ph. inflatus, with skull, mandible, pelvis, limbs and some of the vertebrae.

These birds were at first considered as either belonging to the Ratitae, or at least related to them, until C. W. Andrews, after much of the interesting material had been acquired by the British Museum, showed the gruiform affinities of Phororhacos (Ibis, 1896, pp. 1-12), a conclusion which he was able to further cor- roborate after the clearing of the adherent stony matrix from the skulls (Tr. Z. S. 1001, xv. pp. 55-86, pis. 14-17). The skull of Ph. longissimus is about 2 ft. long and 10 in. high; that of Ph. inflatus is 13 in. long, and this creature is supposed to have stood only 3 ft. high at the middle of the back. The under jaw is slightly curved upwards and it contains a large foramen as for instance in Psophia and in Mycteria. The strongly hooked upper beak is very high, and very much com- pressed laterally. The palate is imperfectly desmognathous, as in Dicholophus, with an inconspicuous vomer. The quadrate has a double knob for its articulation with the skull, and basip- terygoid processes are absent. What little is known of the shoulder-girdle (breastbone still unknown) points to a flightless bird, and so do the short wing bones, although these are stout. The pelvis has an ischiadic foramen. The hind limbs are dis- tinctly slender, the tibia of Ph. inflatus being between 15 and 16 in. in length.

For further detail see F. Ameghino, " Sur les oiseaux fossiles de la Patagonie," Bolet. inst. geogr. argentino, xv., chs. II and 12 (1895); F. P. Moreno and A. Mercerat, Catdlogo de los pdjaros fosiles de la Republica Argentina, An. Mus. La Plata (1891; with 21 plates). (H. F. G.)

PHOSGENITE, a rare mineral consisting of lead chlorocar- bonate, (PbCl) 2 C0 3 . The tetragonal (holosymmetric) crystals are prismatic or tabular in habit, and are bounded by smooth, bright faces: they are usually colourless and transparent, and have a brilliant adamantine lustre. Sometimes the crystals have a curious helical twist about the tetrad or principal axis. The hardness is 3 and the specific gravity 6-3. The mineral is rather sectile, and consequently- was early known as " corneous lead " (Ger. Hornblei). The fanciful name phosgenite was given by A. Breithaupt in 1820, from phosgene, the old name of carbon oxychloride, because the mineral contains the elements carbon, oxygen and chlorine. At Cromford, near Matlock, it was long ago found in an old lead mine, being associated with anglesite and matlockite (Pb 2 OCl2) in cavities in decomposed galena : hence its common name cronf ortite. Fine crystals are also found in galena at Monteponi near Iglesias in Sardinia, but the largest are those recently found near Dundas in Tasmania. Crystals of phosgenite, and also of the corresponding bromine compound [PbBr] 2 C03, have been prepared artificially.

(L. J. S.)

PHOSPHATES, in chemistry, the name given to salts of phosphoric acid. As stated under Phosphorus, phosphoric oxide, P2O5, combines with water in three proportions to form H 2 0-P 2 5 or HPO3, metaphosphoric acid; 2H 2 OP 2 5 or H4P2O7, pyrophosphoric acid; and 3H 2 0-P 2 6 or H 3 P0 4 , orthophosphoric or ordinary phosphoric acid. These acids each give origin to several series of salts, those of ordinary phosphoric acid being the most important, and, in addition, are widely distributed in the mineral kingdom (see below under Mineral Phosphates).

Orthophosphoric acid, H3PO4, a tribasic acid, is obtained by boiling a solution of the pentoxide in water; by oxidizing red phosphorus with nitric acid, or yellow phosphorus under the surface of water by bromine or iodine; and also by decompos- ing a mineral phosphate with sulphuric acid. It usually forms a thin syrup which on concentration in a vacuum over sulphuric acid deposits hard, transparent, rhombic prisms which melt at 41-7°. On long heating the syrup is partially converted into pyro-phosphoric and metaphosphoric acids, but on adding water and boiling the ortho-acid is re-formed. It gives origin to three classes of salts: M'H 2 P0 4 or M"H 4 P 2 8 ; M' 2 HP0 4 or M"HP0 4 , M' 3 P0 4 , M" 3 P 2 8 or M"'P0 4 , wherein M',M",M'" denote a mono-, di-, and tri-valent metal. The first set may be called monometallic, the second dimetallic, and the third trimetallic salts. Per-acid salts of the alkalis, e.g. (K,Na,NH 4)H 5 (P0 4) 2 , are also known; these may be regarded as composed of a monometallic phosphate

with phosphoric acid, thus M'H 2 P0 4 H3PO4. The three principal groups differ remarkably in their behaviour towards indicators. The monometallic salts are strongly acid, the dimetallic are neutral or faintly alkaline, whilst the soluble trimetallic salts are strongly alkaline. The monometallic salts of the alkalis and alkaline earths may be obtained in crystal form, but those of the heavy metals are only stable when in solution. The soluble trimetallic salts are decomposed by carbonic acid into a dimetallic salt and an acid carbonate. All soluble orthophos- phates give with silver nitrate a characteristic yellow precipitate of silver phosphate, Ag 3 P0 4 , soluble in ammonia and in nitric acid. Since the reaction with the acid salts is attended by liberation of nitric acid: NaH 2 P0 4 +3AgN0 3 = Ag 3 P0 4 +NaN0 3 + 2HN0 3 , NaoHP0 4 +3AgN0 3 = Ag 3 P04+2NaN0 3 +HN0 3 , it is necessary to neutralize the nitric acid if the complete pre- cipitation of the phosphoric acid be desired. The three series also differ when heated: the trimetallic salts, containing fixed bases are unaltered, whilst the mono- and dimetallic salts yield meta- and pyrophosphates respectively. If the heating be with charcoal, the trimetallic salts of the alkalis and alkaline earths are unaltered, whilst the mono- and di-salts give free phosphorus and a trimetallic salt. Other precipitants of phosphoric acid or its salts in solution are: ammonium molybdate in nitric acid, which gives on heating a canary-yellow precipitate of ammonium phosphomolybdate, i2[Mo0 3] (NH 4) 3 P0 4 , insoluble in acids but readily soluble in ammonia; magnesium chloride, ammonium chloride and ammonia, which give on standing in a warm place a white crystalline precipitate of magnesium ammonium phosphate, Mg(NH 4)P0 4 -6H 2 0, which is soluble in acids but highly insoluble in ammonia solutions, and on heating to redness gives magnesium pyrophosphate, Mg 2 P 2 0?; uranic nitrate and ferric chloride, which give a yellowish-white pre- cipitate, soluble in hydrochloric acid and ammonia, but insoluble in acetic acid; mercurous nitrate which gives a white precipitate, soluble in nitric acid, and bismuth nitrate which gives a white precipitate, insoluble in nitric acid.

Pyrophosphoric acid, H 4 P 2 07, is a tetrabasic acid which may be regarded as derived by eliminating a molecule of water between two molecules of ordinary phosphoric acid; its constitution may therefore be written (HO) 2 OP-0-PO(OH) 2 . It may be obtained as a glassy mass, indistinguishable from metaphosphoric acid, by heating phosphoric acid to 213°. When boiled with water it forms the ortho-acid, and when heated to redness the meta- acid. After neutralization, it gives a white precipitate with silver nitrate. Being a tetrabasic acid it can form four classes of salts; for example, the four solium salts Na 4 P 2 C>7, Na 3 HP 2 7 , Na 2 H 2

P 2 07, NaH 3 P 2 7 are known. The most important is the normal salt, Na 4 P 2 7 , which is readily obtained by heating disodium orthophosphate, Na 2 HP0 4 . It forms monoclinic prisms (with 10H0O) which are permanent in air. All soluble pyrophosphates when boiled with water for a long time are converted into orthophosphates.

Metaphosphoric acid, HP0 3 , is a monobasic acid which may be regarded as derived from orthophosphoric acid by the abstraction of one molecule of water, thus H 3 P0 4 — H 2 = HP0 3 ; its constitu- tion is therefore (HO)P0 2 . The acid is formed by dissolving phosphorus pentoxide in cold water, or by strongly heating orthophosphoric acid. It forms a colourless vitreous mass, hence its name " glacial phosphoric acid." It is readily soluble in water, the solution being gradually transformed into the ortho- acid, a reaction which proceeds much more rapidly on boiling. Although the acid is monobasic, salts of polymeric forms exist of the types (MP0 3) „, where n may be 1, 2, 3, 4, 6. They may be ob- tained by heating a monometallic orthophosphate of a fixed base, or a dimetallic orthophosphate of one fixed and one volatile base, e.g. microcosmic salt: MH 2 P0 4 = MP0 3 +H 2 0, (NH 4) NaHP0 4 = NaP0 3 +NH 3 -f-H 2 0; they may also be obtained by acting with phosphorus pentoxide on trimetallic orthophosphates: Na 3 P0 4 +P205 = 3NaP0 3 . The salts are usually non-crystalline and fusible. On boiling their solutions they yield orthophos- phates, whilst those of the heavy metals on boiling with water give a trimetallic orthophosphate and orthophosphoric acid:

3AgP0 3 +3H 2 = Ag 3 P0 4 +2H 3 P0 4 . On heating with an oxide or carbonate they yield a trimetallic orthophosphate, carbon dioxide being evolved in the latter case. Metaphosphoric acid can be distinguished from the other two acids by its power of coagulating albumen, and by not being precipitated by mag- nesium and ammonium chlorides in the presence of ammonia.

(C.E.) Mineral Phosphates. — Those varieties of native calcium phosphate which are not distinctly crystallized, like apatite (q.v.), but occur in fibrous, compact or earthy masses, often nodular, and more or less impure, are included under the general term phosphorite. The name seems to have been given originally to the Spanish phosphorite, probably because it phosphoresced when heated. This mineral, known as Estremadura phosphate, occurs at Logrossan and Caceres, where it forms an important deposit in clay-slate. It may contain from 55 to 62 % of calcium phosphate, with about 7% of magnesium phosphate. A some- what similar mineral, forming a fibrous incrustation, with a mammillary surface, and containing about 9% of calcium carbo- nate, is known as staff elite, a name given by A. Stein in 1866 from the locality Staffel, in the valley of the Lower Lahn, where (as also in the valley of its tributary the Dill) large*

deposits of phosphorite occur. Dahllite is a Norwegian phosphorite, containing calcium carbonate, named in 1888 by W. C. Brogger and H. Backstrom after the Norwegian geologists T. and J. Dahll. Osteolite is a white earthy phosphorite occurring in the clefts of basaltic rocks, named in 1851 by J. C. Bromeis from the Greek barkov, bone.

Phosphorite, when occurring in large deposits, is a mineral of much economic value for conversion into the superphosphate largely used as a fertilizing agent. Many of the impure sub- stances thus utilized are not strictly phosphorite, but pass under such names as " rock-phosphate," or, when nodular, as " coprolite " (q.v.), even if not of true coprolitic origin. The ultimate source of these mineral phosphates may be referred in most cases to the apatite widely distributed in crystalline rocks. Being soluble in water containing carbonic acid or organic acids it may be readily removed in solution, and may thus furnish plants and animals with the phosphates required in their structures. On the decay of these structures the phos- phates are returned to the inorganic world, thus completing the cycle.

There are three sources of phosphates which are of importance geologically. They occur (a) in crystalline igneous and meta- morphic rocks as an original constituent, (b) in veins associated with igneous rocks, and © in sedimentary rocks either as organic fragments or in secondary concretionary forms.

The first mode of occurrence is of little significance practically, for the crystalline rocks generally contain too little phosphate to be valuable, though occasionally an igneous rock may contain enough apatite to form an inferior fertilizing agent, e.g. the trachyte of Cabo de Gata in south-east Spain, which contains 12-15% of phosphoric acid. In many deposits of iron ores found in connexion with igneous or metamorphic rocks small quantities of phosphate occur. The Swedish, Norwegian, Ontario and Michigan mines yield ores of this kind ; and though none of them can be profitably worked as a source of phosphate, yet on reducing the ore it may be retained in the slags, and thus rendered available for agriculture. Another group of phosphatic deposits connected with igneous rocks comprises the apatite veins of south Norway, Ottawa and other districts in Canada. These are of pneumatolytic origin (see Pneumatolysis), and have been formed by the action of vapours emanating from cooling bodies of basic eruptive rock. Veins of this type occur at Oedegarden in Norway and Dundret in Lapland. From 1500 to 3500 tons of apatite are obtained yearly in Norway from these veins. In Ontario apatite has been worked for a long time in deposits of similar nature. The total output of Canada in 1907 was only 680 tons.

The phosphatic rocks which occur among the sedimentary strata are the

principal sources of phosphates for commerce and agri- culture. They are found in formations of all ages from the Cambrian to those which are accumulating at the present day. Of the latter the best known is guano (see Manures and Manuring).

Where guano-beds are exposed to rain their soluble constituents

are removed and the insoluble matters left behind. The soluble

phosphates washed out of the guano may become fixed by entering

into combination with the elements of the rock beneath. Many

I of the oceanic islets are composed of coral limestone, which in this

way becomes phosphatized ; others are igneous, consisting of trachyte or basalt, and these rocks are also phosphatized on their surfaces but are not so valuable, inasmuch as the presence of iron or alumina in any quantity renders them unsuited for the prepara- tion of artificial manures.

The leached guanos and phosphatized rocks, which are grouped with them for commercial purposes, have been obtained in great quantities in many islands of the Pacific Ocean (such as Baker, Howland, Jarvis and McKean Islands) between long. 150 to 180 VV. and lat. io° N. to 10 S. In the West Indies from Vene- zuela to the Bahamas and in the Caribbean Sea many islands yield supplies of leached guanos; the following are important in this respect: Sombrero, Navassa, Aves, Aruba, Curacoa. Christmas Island has been a great source of phosphates of this type; also Jaluit Island in the Maldive Archipelago, Banaba or Ocean Island, and Nauru or Pleasant Island. On Christmas Island the phosphate has been quarried to depths of 100 ft. To these leached guanos and phosphatized limestones the name sombrerite has been given. It has been estimated that 500,000 tons of phosphate were obtained in Aruba, 1,000,000 tons from Curacoa since the deposits were discovered in 1870, and Christmas Island in 1907 yielded 290,000 tons.

In the older formations the phosphates tend to become more and more mineralized by chemical processes. In whatever form they were originally deposited they often suffer complete or partial solution and are redeposited as concretionary lumps and nodules, often called coprolites. The " Challenger " and other oceanographic expeditions have shown that on the bottom of the deep sea concretions of phosphate are now gathering around

the dead bodies of fishes lying in the oozes; consequently the formation of the concretions may have been carried on simultaneously with the deposition of the strata in which they occur.

Important deposits of mineral phosphates are now worked on a large scale in the United States, the annual yield far sur- passing that of any other part of the world. The most active operations are carried on in Florida, where the phosphate was first worked in 1887 in the form of pebbles in the gravels of Peace river. Then followed the discovery of " hard rock-phosphate," a massive mineral, often having cavities lined with nearly pure phosphorite. Other kinds not distinctly hard and consisting of less rich phosphatic limestone, are known as " soft phosphate ": those found as smooth pebbles of variable colour are called " land pebble-phosphate," whilst the pebbles of the river-beds and old river-valleys, usually of dark colour, are distinguished as " river pebble-phosphate." The land pebble is worked in central South Florida; the hard rock chiefly between Albion and Bay City. In South Carolina, where there are important deposits of phosphate, formerly more productive than at present, the " land rock " is worked near Charleston, and the " river rock " in the Coosaw river and other streams near Beaufort. The phosphate beds contain Eocene fossils derived from the underlying strata and many fragments of Pleistocene vertebrata such as mastodon, elephant, stag, horse, pig, &c. The phosphate occurs as lumps varying greatly in size, scattered through a sand or clay; they often contain phosphatized Eocene fossils (Mollusca, &c). Sometimes the phosphate is found at the surface, but generally it is covered by alluvial sands and clays. Phosphate mining began in South Carolina in 1868, and for twenty years that state was the prin- cipal producer. Then the Florida deposits began to be worked. In 1892 the phosphates of Tennessee, derived from Ordovician limestones, came into the market. From North Carolina, Alabama and Pennsylvania, also, -phosphates have been obtained but only in comparatively small quantities. In 1900 mining for phosphates was commenced in Arkansas. In 1908 Florida produced 1,673,651 tons of phosphate valued at 11 million dollars. All the other states together produce less phosphate than Florida, and among them Tennessee takes the first place with an output of 403,180 tons.

Algeria contains important deposits of phosphorite, especially near Tebessa and at Tocqueville in the province of Constantine. Near Jebel Kouif, on the frontier between Algeria and Tunis, there are phosphate workings, as also in Tunis, at Gafsa. The deposits belong to the Lower Eocene, where it rests unconform- ably upon the Cretaceous. The joint production of Tunis and

Algeria in 1907 was not less than a million tons. Phosphates occur also in Egypt, in the desert east of Keneh and in the Dakla oasis in the Libyan desert.

France is rich in mineral phosphates, the chief deposits being the departments of the Pas-de-Calais, Somme, Aisne, Oise in and Meuse, in the north-east, and another group in the depart- ments of Lot, Tarn-et-Garonne and Aveyron, in the south-west: phosphates occur also in the Pyrenees. The deposits near Caylus and in Quercy occupy fissures and pockets in Jurassic limestone, and have yielded a remarkable assemblage of the relics of Tertiary mammals and other fossils. Phosphates occur in Belgium, especially near Mons, and these, like those of north-east France, are principally in the Upper Chalk. Two varieties of phosphate rock are recognized in these districts, viz. the phosphatic chalk and the phosphate sand, the latter resulting from the decomposition of the former. Large and valuable deposits of the sand have been obtained in sinks and depressions on the surface of the chalk. The production is on the whole diminishing in Belgium (180,000 tons in 1907), but in France it is still large (375,000 tons in 1907).

In the Lahn district of Nassau (Germany) there are phosphate beds in Devonian rocks. The deposits were rich but irregular and local, and were much worked from 1866 to 1884, but are no longer of economic importance. In northern Estremadura in Spain and Alemtezo in Portugal there are vein deposits of phosphate of lime. As much as 200,000 tons of phosphate have been raised in these provinces, but in 1906 the total production of Spain was only 1300 tons. Large deposits of phosphate occur in Russia, and those in the neighbourhood of Kertch have attracted some attention; it is said that the Cretaceous rocks between the rivers Dniester and Volga contain very large supplies of phosphate, though probably of low grade.

Phosphatic nodules and concretions, with phosphatized fossils and their casts, occur at various geological horizons in Great Britain. Bands of black nodules, highly phosphatic, are found at the top of the Bala limestone in North Wales; beds of concretions occur in the Jurassic series; and important deposits are known in the Cretaceous strata, especially in the Lower Greensand and at the base of the Gault. The Lower Greensand phosphates have been worked, under the name of " coprolites," at Potton in Bedfordshire and at Upware and Wicken in Cambridgeshire. The Cambridge Greensand, rich in phosphatic nodules, occurs at the base of the Chalk Marl. The chalk occasionally becomes phosphatized, as at Taplow (Bucks) and Lewes (Sussex). At the base of the Red Crag in East Anglia, and occasionally at the base of the other Pliocene Crags, there is a " nodule bed, ' consisting of phosphatic nodules, with rolled teeth and bones, which were formerly worked as " copro- lites " for the preparation of artificial manure. Professor R. J. Strutt has found that phosphatized nodules and bones are rich in radioactive constituents, and has brought this into relation with their geological age.

Bibliography. — For American phosphates see The Phosphates of America, by Francis Wyatt (5th ed., New York and London, 1894); the Annual Reports on Mineral Resources of the U.S. (U.S. Geol. Survey), including some valuable reports by C. W. Hayes, also those in Rothwell's Mineral Industry; " Nature and Origin of Deposits of Phosphate of Lime," by R. A. F. Penrose, Jun., Bull. U.S. Geol. Survey, No. 46 (1888); Florida, South Carolina and Canadian Phosphates, by C. C. Hoyer Miller (London, 1892); and The Non- metallic Minerah, by G. P. Merrill (1904). Many of the above include descriptions of mineral phosphates in other parts of the world. For a general discussion of the origin of the phosphates, see " The Natural History of Phosphate Deposits," by J. J. H. Teall, Proc. Geol. Assoc, xvi. 369 (1900). Consult also Etude complete sur les phosphates, by A. Deckers (Liege, 1894).

(J. S. F.;F. W.R.)*

PHOSPHORESCENCE, a name given to a variety of physical phenomena due to different causes, but all consisting in the emission of a pale, more or less ill-defined light, not obviously due to combustion. The word was first used by physicists to describe the property possessed by many substances of them- selves becoming luminous after exposure to light. This property has been noticed from early times. Pliny speaks of various gems which shine with a light of their own, and Albertus Magnus knew that the diamond becomes phosphorescent when moder- ately heated. But the first discovery of this property which apparently attracted scientific attention seems to have been that of the Bologna stone (barium sulphide) , which was discovered

by Vincenzo Cascariolo, a cobbler of Bologna, in about 1602. This was followed by the discovery of a number of other sub- stances which become luminous either after exposure to light or on heating, or by attrition, and to which the general name of " phosphori " (from 6pos, bringing light) was given. Among these may be mentioned Homberg's phosphorus (calcium chloride), John Canton's phosphorus (calcium sulphide) and Balduin's phosphorus (calcium nitrate). Of late years it has been found convenient to limit the strict meaning of the word " phosphorescence " to the case of bodies which, after exposure to light, become self-luminous (even if only for a fraction of a second). The general term "luminescence" has been proposed by E. Wiedemann to include all cases in which bodies give off light not due to ignition. This general term embraces several subdivisions. Thus, fluorescence (g.v.) and phosphorescence are included under the same

heading, " photoluminescence," being distinguished from each other only by the fact that fluorescent bodies emit their characteristic light only while under the influence of the exciting illumination, while phos- phorescent bodies are luminous for an appreciable time after the exciting light is cut off.

Phosphorescence, in its restricted meaning as above explained, is most strikingly exhibited by the artificial sulphides of calcium, strontium and barium. If any of these substances is exposed for some time to daylight, or, better, to direct sunlight, or to the light of the electric arc, it will shine for hours in the dark with a soft coloured light. The colour depends not only on the nature of the substance, but also on its physical condition, and on its temperature during insolation, that is, exposure to the sun's rays. Thus the phosphorescent light emitted by calcium sulphide may be orange- yellow, yellow, green or violet, according to the method of pre- paration and the materials used. Balmain's luminous paint, a preparation of calcium sulphide, shines with a white light. The colour also depends on the temperature during exposure to light. Thus A. E. Becquerel found that the light given by a specimen of strontium sulphide changed from violet to blue, green, yellow and orange, as the temperature during the corresponding previous insolation was 20 , 40°, 70°, ioo° or 200° C. The duration of phosphorescence varies greatly with different substances. It may last for days or for only a fraction of a second.

As in the case of fluorescent bodies, the light produced by phos- phorescent substances consists commonly of rays less refrangible than those of the exciting light. Thus the ultra-violet portion of the spectrum is usually the most efficient in exciting rays belonging to the visible part of the spectrum. V. Klatt and Ph. Lenard (Wied. Ann., 1889, xxxviii. 90), have shown that, the phosphorescence of calcium sulphide and other phosphori depends on the presence of minute quantities of other substances, such as copper, bismuth and manganese. The maximum intensity of phosphorescent light is obtained when a certain definite proportion of the impurity is present, and the intensity is diminished if this proportion is increased.

It appears likely that when a phosphorescent body is exposed to light, the energy of the light is stored up in some kind of strain energy, and that the phosphorescent light is given out during a more or less slow recovery from this state of strain. Klatt and Lenard have shown that the sulphides of the alkaline earths lose the property of phosphorescing when subjected to heavy pressure. Many fluorescent solutions become briefly phosphorescent when rendered solid by gelatin.

When the duration of phosphorescence is brief, some mechanical device becomes necessary to detect it. The earliest and best- known instrument for

this purpose is Becquerel's phosphoroscope. It consists essentially of a shallow drum, in whose ends two eccentric holes, exactly opposite one another, are cut. Inside it are fixed two equal metal disks, attached perpendicularly to an axis, and divided into the same number of sectors, the alternate sectors of each being cut out. One of these disks is close to one end of the drum, the other to the opposite end, and the sectors are so arranged that, when the disks are made to rotate, the hole in one end is open while that in the other is closed, and vice versa. If the eye be placed near one hole, and a ray of sunlight be admitted by the other, it is obvious that while the sun shines on an object inside the drum the aperture next the eye is closed, and vice versa. If the disks be made to revolve with great velocity by means of a train of toothed wheels the object will be presented to the eye almost instantly after it has been exposed to sunlight, and these presentations succeed one another so rapidly as to produce a sense of continuous vision. By means of this apparatus we can test with considerable accuracy the duration of the phenomenon after the light has been cut off. For this purpose we require to know merely the number of sectors in the disks and the rate at which they are turned.

Thermoluminescence. — Some bodies which do not emit light at ordinary temperatures in a dark room begin to do so if they are heated to a temperature below a visible red heat. In the case of

chlorophane, a variety of fluor-spar, the heat of the hand is sufficient Many yellow diamondˆ exhibit this form of luminescence. It has been shown, however, that a previous exposure to light is always necessary. Sir James Dewar found that if ammonium platino- cyanide, Balmain's paint and some other substances are cooled to the temperature of liquid air and exposed to light, they do not phosphoresce, but as soon as they are allowed to warm up to the ordinary temperature they emit a brilliant light. On the other hand, some bodies, such as gelatin, celluloid, paraffin and ivory, are phosphorescent at very low temperatures, but lose the property at ordinary temperatures.

Triboluminescence (from rpipav, to rub) is luminescence excited by friction, percussion, cleavage or such mechanical means. Calcium chloride, prepared at a red heat, exhibits this property. If sugar is broken in the dark, or two crystals of quartz rubbed together, or a piece of mica cleft, a flash of light is seen, but this is probably of electrical origin. Closely allied to this form of luminescence is crystalloluminescence, a phosphorescent light seen when some substances crystallize from solution or after fusion. This property is exhibited by arsenious acid when crystallizing from solution in hydrochloric acid.

Chemiluminescence is the name given to those cases in which chemical

action produces light without any great rise of temperature. Phosphorus exposed to moist air in a dark room shines with a soft light due to slow oxidation. Decaying wood and other vegetable substances often exhibit the same property.

Electroluminescence is» luminescence due to electrical causes. Many gases are phosphorescent for a short time after an electric discharge has been passed through them, and some solid sub- stances, especially diamonds and rubies, are strongly phosphorescent when exposed to kathode rays in a vacuum tube.

See generally, Winkelmann, Handbuch der Physik, Bd. vi. (1906); E. Becquerel, La Lumiere (1867). (J. R. C.)

Phosphorescence in Zoology. The emission of light by living substance is a widespread occurrence, and is part of the general metabolism by which the potential energy introduced as food is transformed into kinetic energy and appears in the form of movement, heat, electricity and light. In many cases it is probably an accidental by- product, and like the heat radiated by living tissues, is not necessarily of use to the organism. But in other cases the capacity to produce light is awakened on stimulation, as when the wind ripples the surface of the sea, or when the water is disturbed by the blade of an oar. It has been suggested that the response to the stimulus may be protective, and that enemies are frightened by the flash of light. In luminous insects and deep-sea fish the power of emitting light appears to have a special significance, and very elaborate mechanisms have been developed. The pale glow of phosphorescence has a certain resemblance to the light emitted by phosphorus, and it was an early suggestion that the phenomenon in living organisms was due to that substance. Phosphorus, however, and its luminous compounds are deadly poisons to all living tissues, and never occur in them in the course of natural metabolism, and the phosphorescence of life cannot therefore be assigned to the oxi- dation of phosphorus. On the other hand, it is certainly the result of a process of oxidation, as the emission of light continues only in the presence of oxygen. J. H. Fabre showed in 1855 that the luminous fungus, Agaricus, discharges more carbonic acid when it is emitting light, and Max Schultze in 1865 showed that in insects the luminous cells are closely associated with the tracheae, and that during phosphorescence they withdraw oxygen from them. In 1880 B. Radziszewski showed that many fats, ethereal oils and alcohols emit light when slowly combined with oxygen in alkaline fluids at appropriate tempera- tures. Probably the phosphorescence of organisms is due to a similar process acting on the many fats, oils and similar sub- stances found in living cells. The colour varies much in different organisms; green has been observed in the glow-sworm, fire-flies, brittle-stars, centipedes and annelids; blue in the Italian fire-fly (Luciola italica); blue

and light green are the predominant colours in the phosphorescence of marine organisms, but red and lilac have also been observed. The Lantern-Fly (Fulgora pyrorhynchus) is said to have a purple light, and E. H. Giglioli has recorded that an individual Appendicularia appeared first red, and then blue, and then green. P. Panceri, chiefly in the case of Salps, and S. P. Langley and F. W. Very in the case of Pyrophorus, have investigated the light spectroscopically, and

found that it consisted of a continuous band without separate bright lines. The solar spectrum extends farther both towards the violet and the red ends, but is less intense in the green when equal luminosities are compared.

Many of the bacteria of putrefaction are phosphorescent, and the light emitted by dead fish or molluscs or flesh is probably due in every case to the presence of these. Under the miscroscope, the individual bacteria appear as shining points of light. The phosphor- escence of decaying wood is due to the presence of the mycelium of Agaricus melleus, and various other species of Agaricus have been found to be luminous. The great displays of phosphorescence in sea-water are usually due to the presence of very large numbers of small luminous organisms, either protozoa or protophyta. Of these Noctiluca miliaris and species of Peridinium and Pyrocystis are the most frequent, the two former near land and the latter in mid-ocean.

In higher animals the phosphorescence tends to be limited to special parts of the body which may form elaborate and highly specialized luminous organs. Many coelenterates show the begin- ning of such localization ; in medusae the whole surface may be lumin- ous, but the light is brighter along the radial canals, in the ovaries, or in the marginal sense-organs. In Pennatulids each polyp has eight luminous bands on the outer surface of the digestive cavity. Some Chaetopods (Chaetopterus and Tomopteris) have luminous organs at the bases of the lateral processes of the body. Pyrosoma, a colonial pelagic ascidian, is responsible for some of the most strik- ing displays of phosphorescence in tropical seas ; it has two small patches of cells at the base of each inhalent tube which on stimula- tion discharge light, and the luminosity has been observed to spread through the colony from the point of irritation.

Amongst the Crustacea, many pelagic Copepods are phosphor- escent. W. Giesbrecht has shown that the light is produced by a fluid secreted by certain dermal glands. A similar fluid in other Copepods hardens to form a

protective case, and it may be that the display of light is in such cases an accidental by-product. Glands in the labrum of the Ostracod Pyrocypris and on the maxillae of the Mysid Gnathophausia similarly produce a luminous secretion. In the Euphausiacea, on the other hand, phosphorescence is pro- duced by elaborate luminous organs which are situated on the thoracic appendages and the abdomen, and which were at first believed to be ocular organs. The deep-sea Decapod Crustaceans belonging to many families are luminous. A. Alcock observed that in some of the deep-sea prawns a luminous secretion was dis- charged at the bases of the antennae, but in most cases the luminous organs are numerous eye-like structures on the limbs and body.

The rock-boring mollusc, Pholas, which Pliny knew to be phos- phorescent, has luminous organs along the anterior border of the mantle, two small triangular patches at the entrance of the anterior siphon, and two long parallel cords within the siphon. The cells of these organs have peculiar, granulated contents. W. E. Hoyle, in his presidential address to the Zoological Section of the British Association in 1907, brought together observations on the occur- rence of luminous organs in no less than thirty-three species of Cephalopods. In Heteroteuthis, Sepiola and Rossia the light is produced by the secretion of a glandular organ on the ventral side of the body behind the funnel. The secretion glows through the transparent wall with a greenish colour, but, at least in the case of Heteroteuthis, continues to glow after being ejected into the water. In most cases the luminous organs are nonglandular and may be simple, or possess not only a generator but a reflector, lens and diaphragm. The different organs shine with different coloured lights, and as the Cephalopods are for the most part inhabitants of the depths of the sea, it has been suggested that they serve as recognition marks.

Some centipedes (e.g. Geophilus electricus and G. phosphoreus) are luminous, and, if allowed to crawl over the hand, are stated to leave a luminous trail. Amongst insects, elaborate luminous organs are developed in several cases. The abdomen of a Ceylonese May-fly (Teleganodes) is luminous. The so-called New Zealand " glow-worm " is the larva of the fly Boletophila luminosa, and some gnats have been observed to be luminous, although the suggestion is that in their case disease is present and the light emanates from phosphorescent bacteria. An ant (Orya) and a poduran (Anuro- phorus) are occasionally luminous. The so-called lantern flies are Homoptera allied to the Cicadas, and the supposed luminous organ is a huge projection of the front of the head, regarding the luminosity of which there is some doubt. The glow-worms and true fire-flies are beetles. Eggs, larvae and adults are in some cases luminous. The organs consist of a pale transparent superficial layer which gives the light, and a deeper layer which may act as a reflector. They are in close connexion with the tracheae and

the light is pro- duced by the oxidation of a substance formed under the influence of the nervous system, and probably some kind of organic fat. In the females the phosphorescence is probably a sexual lure; in the males its function is unknown.

Phosphorescent organs known as photophores are characteristic structures in many of the deep-sea Teleostome fishes, and have been developed in widely different families (Stomiatidae, Scopelidae.

Halosauridae and Anomalopidae) , whilst numerous simple luminous organs have been detected in many species of Selachii. The number, distribution and complexity of the organs vary much in different fish. They are most frequent on the sides and ventral surface of the anterior part of the body and the head, and may extend to the tail. The simpler forms are generally arranged in rows, sometimes metamerically distributed; the more complex organs are larger and less numerous. In Opostomias micrionus there is a large organ on a median barbel hanging down from the chin, others below the eyes, and one on the elongated first ray of the pectoral fin. In Sternoptyx diaphana there is one on the lower jaw, and in many species one or two below the eyes. The luminous organs appear to be specialized skin glands which secrete a fluid that becomes luminous on slow oxidation. The essential part of the organ remains a collection of gland cells, but in the more complex types there are blood vessels and nerves, a protecting membrane, an iris-like diaphragm, a reflector and lens. As the distribution and probably the colour of the light varies with the species, these organs may serve as recognition marks. They may also attract prey, and from their association with the eyes in such a position as to send light downwards and forwards it is probable that in the higher types they are used by the fish actually as lanterns in the dark abysses of the sea. (P. C. M.)

PHOSPHORITE, in mineralogy, the name given to impure massive apatite (q.v.; see also Phosphates).

PHOSPHORUS (Gr. &s, light,

The element appears to have been first obtained in 1669 by Brand of Hamburg; Krafft bought his secret and in 1677 exhibited specimens in England, where it created an immense sensation. Its preparation was assiduously sought for, and Kunckel in 1678 and Boyle in 1680 succeeded in obtaining it by the same process as was discovered by Brand, i.e. by evapora- ting urine to dryness and distilling the residue with sand. This method was generally adopted until 1775, when Scheele prepared it from bones, which had been shown by Gahn in 1 769 to contain calcium phosphate. Scheele treated bone ash with nitric acid, precipitated the

calcium as sulphate, filtered, evaporated and distilled the residue with charcoal. Nicolas and Pelletier improved the process by decomposing the bone-ash directly with sulphuric acid; whilst Fourcroy and Vauquelin introduced further economies. In modern practice degreased bones (see Gelatin), or bone-ash which has lost its virtue as a filtering medium, &c, or a mineral phosphate is treated with sufficient sulphuric acid to precipitate all the calcium, the calcium sulphate filtered off, and the filtrate concentrated, mixed with charcoal, coke or sawdust and dried in a muffle furnace. The product is then distilled from Stourbridge clay retorts, arranged in a galley furnace, previously heated to a red heat. The temperature is now raised to a white heat, and the product led by malleable iron pipes into condensing troughs containing water, when it condenses. The chemical reactions are as follows : the treatment of the calcium phosphate with the acid gives phosphoric acid, H3PO4, which at a red heat loses water to give metaphosphoric acid, HP0 3 ; this at a white heat reacts with carbon to give hydrogen, carbon monoxide and phosphorus, thus: 2HPO3 + 6C = H 2 -r-6CO-l-P2.

Electrothermal processes are also employed. Calcium phos- phate, mixed with sand and carbon, is fed into an electric furnace, provided with a closely fitting cover with an outlet leading to a condenser. At the temperature of the furnace the silica (sand) attacks the calcium phosphate, forming silicate, and setting free phosphorus pentoxide, which is attacked by the carbon, forming phosphorus and carbon monoxide. As phosphorus boils at 290° C. (554° F.), it is produced in the form of vapour, which, mingled with carbon monoxide, passes to the

condenser, where it is condensed. It is then cast under water. The calcium silicate remains in the furnace in the form of a liquid slag, which may be run off, so that the action is practically continuous. Kaolin may with advantage be used in addition to or in part substitution for sand, because the double silicate thus formed is more fusible than the single silicate of lime. The alternating current is generally used, the action not being electrolytic. One of the special advantages of the electrical over the older process is that the distilling vessels have a longer life, owing to the fact that they are not externally heated, and so subjected to a relatively high temperature when in contact with the corrosive slag formed in the process. The Readman-Parker process (see Jour. Soc. Chem. Ind., 1891, x. 445) appears to be very generally adopted. Readman, experimenting with a Cowles furnace in Staffordshire in 1888, patented his process, and in the same year Parker and Robinson, working indepen- dently, patented a

similar one. The two inventors then co- operated, an experimental plant was run successfully, and the patents were taken over by the leading manufacturers. With the object of obtaining a valuable by-product in place of the slag produced in this furnace, several patentees (e.g. Hilbert and Frank, Billaudot, Bradley and Jacobs, and others) have sought to combine the manufacture of calcium carbide and phosphorus by using only calcium phosphate and carbon, effecting direct reduction by carbon at a high temperature.

*The crude phosphorus is purified by melting under water and then filtering through animal black and afterwards through chamois leather, or by treating it, when molten, with chromic acid or a mixture of potassium bichromate and sulphuric acid; this causes the impurities to rise to the surface as a scum which can be skimmed off. It is usually sent on the market in the form of sticks, which were at one time prepared by sucking *>he molten material up glass tubes; but the dangers to the workmen and other disadvantages of this method have led to its replacement by a continuous process, in which the phosphorus leaves the melting-pot for a pipe surrounded by water, in which it solidifies and can be removed as a continuous rod.*

Properties. — When perfectly pure phosphorus is a white, trans- parent, waxy solid, but as usually prepared it is yellowish owing to the presence of the allotropic " red phosphorus," J. Boeseken (Abs. Jour. Chem. Soc., 1907, ii. 343, 760) prepares perfectly pure phosphorus by heating the crude product with chromic acid solution, washing and drying in a vacuum, first at 40 , then at 8o°. It remains colourless in vacuum tubes in the dark, but on exposure it rapidly turns yellow. At 25 to 30 C. it is soft and flexible, but it hardens when strongly cooled, and can then only be cut with. difficulty. The fracture is distinctly crys- talline; large Crystals, either regular dodecahedra or octahedra, may be obtained by crystallization from carbon bisulphide, sulphur chloride, &c, or by sublimation. It is a non-con- ductor of electricity. Its density at 0° is 1-836; this regularly diminishes up to the melting-point, 44-3°, when a sudden drop occurs. Molten phosphorus is a viscid, oily, highly refractive liquid, which may be supercooled to 32° before solidification. It boils at 200 , forming a colourless vapour which just about the boiling-point corresponds in density to tetratomic molecules, P 4 ; at 1500° to 1700 , however, Biltz and Meyer detected dissociation into P 2 molecules. Beckmann obtained P4 mole- cules from the boiling-point of carbon bisulphide solutions, and Hertz arrived at the same conclusion from the lowering of the freezing-point in benzene solution; E. Paterno and Nasini, however, detected dissociation. Phosphorus is nearly insoluble in water, but dissolves in carbon bisulphide, sulphur chloride, benzene and oil of turpentine.

The element is highly inflammable, taking fire in air at 34 and burning with a bright white flame and forming dense white clouds of the pentoxide; in perfectly dry air or oxygen, however, Jt may be distilled unchanged, H. B. Baker showing that a trace of water vapour was necessary for combination to occur. When exposed to the air a stick of phosphorus undergoes slow combus- tion, which is revealed by a greenish- white phosphorescence when the stick is viewed in the dark. This phenomenon was

minutely studied by Boyle, who found that solutions in some essential oils . (oil of cloves) showed the same character, whilst in others (oils of mace and aniseed) there was no phosphorescence. He also noticed a strong garlic-like odour, which we now know to be due to ozone. Frederick Slare noticed that the luminosity increased when the air was rarefied, an observation confirmed by Hawksbee and Homberg, and which was possibly the basis of Berzelius's theory that the luminosity depended on the volatility of the element and not on the presence of oxygen. Lampadius, however, showed that there was no phosphorescence in a Torricellian vacuum; and other experimenters proved that oxygen was essential to the process. It depends on the partial pressure of the oxygen and also on temperature. In compressed air at ordinary temperature there is no glowing, but it may be brought about by heating. Again, in oxygen under ordinary conditions there is no phosphorescence, but if the gas be heated to 25° glowing occurs, as is also the case if the pressure be diminished or the gas diluted. It is also remarkable that many gases and vapours, e.g. CI, Br, I,NH 3 , N 2 0, NO2, H2S, SO2, CS2, CH4, C2H4, inhibit the phosphorescence.

The theory of this action is not settled. It is certain that the formation of hydrogen peroxide and ozone accompany the glowing, and in 1848 Schonbein tried to demonstrate that it depended on the ozone. E. Jungfleisch (Comptes renins, 1905, 140, p. 444) suggested that it is due to the combustion of an oxide more volatile than phosphorus, a view which appears to be supported by the observations of Scharff (Zeit. physik. Chem., 1908, 62, p. 178) and of L. and E. Bloch {Comptes rendus, 1908, 147, p. 842).

The element combines directly with the halogens, sulphur and selenium, and most of the metals burn in its vapour forming phosphides. When finely divided it decomposes water giving hydrogen phosphide; it also reduces sulphurous and sulphuric acids, and when boiled with water gives phosphine and hypo- phosphorous acid; when slowly oxidized under water it yields hypophosphoric acid.

Allotropic Phosphorus. — Several allotropic forms of phos- phorus have been described, and in recent years much work has been done towards

settling their identities. When the ordinary form immersed in water is exposed to light, it gradually loses its transparency and becomes coated with a thin film. This substance was regarded as an allotrope, but since it is not produced in non-aerated water it is probably an oxide. More important is the so-called " red phosphorus," which is produced by heating yellow phosphorus to about 230 for 24 hours in an inert atmosphere, or in closed vessels to 300 , when the change is effected in a few minutes. E. Kopp in 1844 and B. C. Brodie in 1853 showed that a trace of iodine also expedited the change. The same form is also produced by submitting ordinary phos- phorus to the silent electric discharge, to sunlight or the ultra- violet light. Since this form does not inflame until heated to above 350 , it is manufactured in large quantities for consump- tion in the match industry. The process consists in heating yellow phosphorus in iron pots provided with air-tight lids, which, however, bear a long pipe open to the air. A small quantity of the phosphorus combines with the oxygen in the vessel, and after this the operation is practically conducted in an atmosphere of nitrogen with the additional safety from any risk of explosion. The product is ground under water, and any unchanged yellow form is eliminated by boiling with caustic soda, the product being then washed and dried and finally packed in tin boxes. The red variety is remarkably different from the yellow. It is a dark red microcrystalline powder, insoluble in carbon bisul- phide, oil of turpentine, &c, and having a density of 2-2. It is stable to air and light, and does not combine with oxygen until heated to above 350° in air or 260 in oxygen, forming the pentoxide. It is also non-poisonous. When heated in a vacuum to 530° it sublimes, and on condensation forms microscopic needles.

Hittorf's phosphorus is another crystalline allotrope formed by heating phosphorus with lead in a sealed tube to redness, and removing the lead by boiling the product with nitric and

hydrochloric acid. It is also obtained by heating red phosphorus under pressure to 580 . It forms a lustrous, nearly black crystalline mass, composed of minute rhombohedra. G. E. Linck and P. Moller (Ber., 1908, 41, p. 1404) have affirmed that the product of the first process always contains lead. E. Cohen and J. Olie, Jun. (Abs. Jour. Chem. Soc, 1909, ii. 998) regard red phosphorus as a solid solution of the white in Hittorf's, but this is contradicted by A. Stock (Ber., 1909, 42, p. 4510), who points out that ordinary red phosphorus melts at 6o5°-6io°, whilst Hittorf's melts at 620°; moreover, the latter is less reactive than the former at high temperatures.

Another form was obtained by R. Schenck (Zeit. Elektrochem, 1905, ii. 117) as a scarlet amorphous powder by deposition of solutions of phosphorus in the tri-iodide, tribromide or sulphide (P4S3). It phosphoresces in ozone, but not in air, and is non- poisonous; from its solution in alcoholic potash acids precipitate the hydride Pi2H 6 , and when heated it is transformed into the red modification. It has been used in combination with potassium chlorate as a composition for matches to strike on any surface. Finally a black phosphorus was described by Thenard as formed by rapidly-cooling melted phosphorus.

Phosphine (phosphoretted hydrogen), PH3, a gas formed in the putrefaction of organic matter containing phosphorus, was obtained by Gengembre (CreU's Ann., 1789, i. 450) by the action of potash upon phosphorus, the gas so prepared being spontaneously inflam- mable. Some time later Davy, by heating phosphorous acid, obtained a phosphoretted hydrogen which was not spontaneously inflammable. These gases were considered to be distinct until Le Verrier (Ann, chim. phys., 1835 [2], 60, p. 174) showed that the inflammability of Gengembre's phosphine was due to small quantities of liquid phosphoretted hydrogen, P 2 H 4 . Phosphine may be prepared by the decomposition of calcium phosphide with water (P2H4 being formed simultaneously) ; by the decomposition of phosphorous and hypo- phosphorous acids when strongly heated; and by the action of solu- tions of the caustic alkalis on phosphorus: P4-r-3NaOH-r-3H 2 = PH 3 +3NaH 2 P02; hydrogen and P2H4 are produced at the same time, and the gas may be freed from the latter substance by passing into a hydrochloric acid solution of cuprous chloride, and heating the solution, when pure phosphine is liberated (Riban, Comptes renins, 58, p. 581). The pure gas may also be obtained by heating phosphonium iodide with caustic potash (A. W. Hofmann, Ber., 1 87 1, 4, p. 200); by the decomposition of crystalline calcium phos- phide or of aluminium phosphide with water (H. Moissan, Bull, soc. chim., 1899 (3), 21, p. 926; Mctignon. Comptes rendus. 1900, 130, p. 1391); and by the reduction of phosphorous acid with nascent hydrogen.

It is a colourless, extremely poisonous gas, possessing a character- istic offensive smell, resembling that of rotting fish. It becomes liquid at -oo° C, and solid at 133° C. (K. Olszewski, Monats., 1866, 7. P 37 T)- It is only slightly soluble in water, but is readily soluble in solutions of copper sulphate, hypochlorous acid, and acid solutions of cuprous chloride. It burns with a brightly luminous flame, and is spontaneously inflammable at about 100° C. When mixed with oxygen it combines explosively if the mixture be under diminished pressure, and is violently decomposed by the halogens. It is also decomposed when heated with sulphur or with most metals, in the latter case with the liberation of hydrogen and formation of phosphide of the metal. It combines with the halide derivatives of boron

and silicon to form, e.g. PH 3 -2BF 3 , 2PH»-SiCU (Besson, Comptes rendus, 1890, no, 80, pp. 240, 516; 1 891, 1 13, p. 78), with the halogen acids to form phosphonium salts, PH4X (X = Cl,Br,I), and with sodammonium and potassammonium to form PH 2 Na, PH 2 K (Joannis, Comptes rendus, 1894, 119, p. 557). It oxidizes slowly in air, and is a reducing agent. It decomposes when heated, hydrogen and red phosphorus being formed.

Liquid Phosphoretted Hydrogen, P2H4, first obtained by P. Thenard (Comptes rendus, 1844, 18, p. 652) by decomposing calcium phos- phide with warm water, the products of reaction being then passed through a U tube surrounded by a freezing mixture (see also L. Gattermann, Ber., 1890, 23, p. 1174). It is a colourless liquid which boils at 57°-58 C. It is insoluble in water, but soluble in alcohol and ether. It is very unstable, being readily decomposed by heat or light. By passing the products of the decomposition of calcium phosphide with water over granular calcium chloride, the P2H4 gives a new hydride, Pi 2 H 6 and phosphine, the former being an odourless, canary-yellow, amorphous powder. When heated in a vacuum it evolves phosphine, and leaves an orange-red residue of a second new hydride, P 9 H 2 (A. Stock, W. Bottcher, and W. Lenger, Ber., 1909, 42, pp. 2839, 2847, 2853).

Solid Phosphoretted Hydrogen, P4H2, first obtained by Le Verrier (loc. cit.) , is formed by the action of phosphorus trichloride on gaseous phosphine (Besson, Comptes rendus, in, p. 972) ; by the action of water on phosphorus di-iodide and by the decomposition of calcium phosphide with hot concentrated hydrochloric acid. It is a yellow

solid, which is insoluble in water. It burns when heated to about 200° C. Oxidizing agents decompose it with great violence. When warmed with alcoholic potash it yields gaseous phosphine, hydrogen and a hypophosphite. It reduces silver salts.

Phosphonium Salts. — The chloride, PH 4 C1, was obtained as a crys- talline solid by Ogier (Comptes rendus, 1879, 89, p. 705) by com- bining phosphine and hydrochloric acid gas under a pressure of from 14-20 atmospheres; it can also be obtained at —30° to 35° C. under ordinary atmospheric pressure. It crystallizes in large trans parent cubes, but rapidly dissociates into its constituents on exposure. The bromide, PmBr, was first obtained by H. Rose (Pogg. Ann., 1832, 24, p. 151) from phosphine and hydrobromic acid; it also results when phosphorus is heated with hydrobromic acid to 100- 120° C. in sealed tubes (Damoiseau, Bull. soc. chim., 1881, 35, p. 49). It crystallizes in colourless cubes, is deliquescent, and often inflames spontaneously on exposure to air. It is readily decomposed by water and also by carbonyl chloride (Besson, Comptes

rendus, 1896, 122, p. 140) : 6PH 4 Br + 5COCI2 = 10HCI + 5CO + 6HBr + 2PH 3 + P4H2. The iodide, PH 4 I, first prepared by J. Gay-Lussac (Ann. chim. phys., 18 14, 91, p. 14), is usually obtained by the action of water on a mixture of phosphorus and iodine (A. W. Hofmann, Ber., 1873, 6, p. 286). It is also prepared by the action of iodine on gaseous phosphine, or by heating amorphous phosphorus with concentrated hydriodic acid solution to 160° C. It crystallizes in large cubes and sublimes readily. It is a strong reducing agent. Water and the caustic alkalis readily decompose it with liberation of phosphine and the formation of iodides or hydriodic acid. It is also decomposed by carbonyl chloride (Besson, loc. cit.). 4PHJ+8COCl 2 = i6HCl+8CO+P 2 l4+2P.

Just as the amines are derived from ammonia, so from phosphine are derived the primary, secondary and tertiary organic phosphines by the exchange of hydrogen for alkyl groups, and corresponding to the phosphonium salts there exists a series of organic phospho- nium bases. The primary and secondary phosphines are produced when the alkyl iodides are heated with phosphonium iodide and zinc oxide to 1 50° C. (A. W. Hofmann, Ber., 1 871, 4, pp. 430, 605), thus: 2 RI + 2 PH4I + ZnO = 2 R-PHrHI + Znl 2 + H 2 0, 2RI + PH4I + ZnO = R 2 -PH-HI + Znl 2 + H ; 0. The reaction mixture on treatment with water yields the primary phosphine, the secondary phosphine being then liberated from its hydriodide by caustic soda. The tertiary phosphines, discovered by L. Thenard (Comptes rendus, 1845, 21, p. 144; 1847, 25, p. 892), are formed (together with the quaternary phosphonium salts) by heating alkyl iodides with phosphonium iodide to 150-180° C. : PH4I+3CH3I = P(CH 3) 3 HI + 3HI ; P(CH 3) 3 HI + CH 3 I = P(CH 3) 4 I + HI (see also Fireman, Ber., 1897, 30, p. 1088). They are also formed by the interaction of phosphorus trichloride and zinc alkyls (Cahours and Hofmann, Ann., 1857, 104, p. 1): 2PCl 3 +3 Zn (C2H 6)2=3ZnCl 2 + 2P(C 2 H 6) 8 .

The primary and secondary phosphines are colourless compounds, and with the exception of methyl phosphine are liquid at ordinary temperature. They possess an unpleasant odour, fume on exposure to air, show a neutral reaction, but combine with acids to form salts. They oxidize very rapidly on exposure, in many cases being spon- taneously inflammable. On oxidation with nitric acid the primary compounds give monoalkyl phosphinic acids, R-PO(OH) 2 , the secondary yielding dialkyl phosphinic acids, R 2 PO(0H). The primary phosphines are very weak bases, their salts with acids being readily decomposed by water. The tertiary phosphines are characterized by their readiness to pass into derivatives containing pentavalent phosphorus, and consequently they form addition compounds with sulphur, carbon bisulphide, chlorine, bromine, the halogen acids and the alkyl halides with great readiness. On oxidation they yield phosphine

oxides, R 3 P-0. The quaternary phosphonium salts resemble the corresponding nitrogen compounds. They are stable towards aqueous alkalis, but on digestion with moist silver oxide yield the phosphonium hydroxides, which are stronger bases than the caustic alkalis. They differ from the organic ammonium hydroxides in their behaviour when heated, yielding phosphine oxides and paraffin hydrocarbons : R 4 P-OH = R 3 PO + RH. The boiling-points of some members of the series are shown in the table : —

Primary.

Secondary.

Tertiary.

Methyl . . . Ethyl . . . Isopropyl . Isobutyl . Isoamyl

— 14° C. + 25°C.

4 i°C.

62° C. 107° c.

25° G.

85° c.

n8°C.

153° C.

210-215° C.

40-42° C. 128° C.

215° c. 300° C.(?)

The alkyl phosphinic acids are colourless crystalline compounds which are easily soluble in water and alcohol. They yield two series of salts, viz. RHM-P0 3 and RM2PO3 (M = metal). The dialkyl phosphinic acids are also colourless compounds, the majority of which are insoluble in water. They yield only one series of salts.

Oxides. — Phosphorus forms three well-defined oxides, P4O6, P 2 4 and P2O5; two others, P4O and P 2 0, have been described.

Phosphorus suboxide, P4O, is said to be formed, mixed with the

other oxides, when the element is burnt in a limited supply of air or in pure oxygen under reduced pressure (E. Jungfleisch, Abs. Jour. Chent. Soc, 1907, ii. 761), and also when a solution of phos- phorus in the trichloride or tribromide is exposed to light. It is a yellow or red powder which becomes dark red on heating; it is stable in air ; and can be heated to 300 without decomposition. Its ex- istence, however, has been denied by A. St.ock (Abs. Jour. Chent. Soc, 1910, ii. 121). The oxide P2O was obtained by Besson (Comptes rendus, 1897, 124, p. 763; 1901, pp. 132, 1556) by heating a mixture of phosphonium bromide and phosphorus oxychloride in sealed tubes to 50°.

Phosphorus oxide, P t e , discovered by Sage in 1777, is a product of the limited combustion of phosphorus in air. It may be con- veniently prepared by passing a rapid current of air over burning phosphorus contained in a combustion tube, and condensing the product in a metal condenser, from which it may be removed by heating the condenser to 50° — 60° (Thorpe and Tutton, Jour. Chent. Soc, 1890, pp. 545, 632; 1891, p. 1019). Jungfleisch has obtained it by carrying out the combustion with oxygen under reduced pressure, or diluted with an inert gas. It forms crystals, apparently monoclinic, which melt at 22-5 to a clear, colourless, mobile liquid of boiling-point 173-1°. Its specific gravity is 2 -135 at 21°. Vapour density and cryoscopic determinations point to the double formula, PjO e . It is comparatively stable up to 200°, but when heated in a sealed tube to 440° it gives phosphorus and the tetroxide P2O4. It is unaffected by light when pure, but if phosphorus be present, even in minute quantity, it turns yellow and ultimately dark red. It oxidizes on exposure to air to the pentoxide, and with a brilliant inflammation when thrown into oxygen at 5o°-6o°. It slowly reacts with cold water to form phosphorous acid ; but with hot water it is energetically decomposed, giving much red phosphorus or the suboxide being formed with an explosive evolution of spontaneously inflammable phosphoretted hydrogen; phosphoric acid is also formed. With dilute alkalis phosphites are slowly formed, but with concen- trated solutions the decomposition follows the same course as with hot water. With chlorine it gives phosphoryl and ” metaphos- phoryl ” chlorides, the action being accompanied with a greenish flame; bromine gives phosphorus pentabromide and pentoxide which interact to give phosphoryl and ” metaphosphoryl ” bromides; iodine gives phosphorus di-iodide, P2I4, and pentoxide, P2O5; whilst hydrochloric acid gives phosphorus trichloride and phosphorous acid, which interact to form free phosphorus, phosphoric acid and hydrochloric acid. It combines violently with sulphur at 160° to form phosphorus fulphoxide, P 4 6 S4, which forms highly lustrous tetragonal

plates (after sublimation), melting at 102 and boiling at 295°; it is decomposed by water into sulphuretted hydrogen and metaphosphoric acid, the latter changing on standing into ortho- phosphoric acid. Sulphur trioxide and sulphuric acid oxidize phosphorus oxide, giving the pentoxide and sulphur dioxide, whilst sulphur chloride, S2CI2, gives phosphoryl and thiophosphoryl chlorides, free sulphur and sulphur dioxide. Ammonia also reacts immediately, giving phosphorus diamide, P(OH)(NH2)2, and the corresponding ammonium salt. Phosphorous oxide is very poisonous, and is responsible for the caries set up in the jaws of those employed in the phosphorus industries (see below). It is probable, however, that pure phosphorous oxide vapour is odourless, and the odour of phosphorus as ordinarily perceived is that of a mixture of the oxide with ozone.

Phosphorus tetroxide, P2O4, was obtained by Thorpe and Tutton by heating the product of the limited combustion of phosphorus in vacuo as a sublimate of transparent, highly lustrous, orthorhombic crystals. They are highly deliquescent, and form with water a mix- ture of phosphorous and phosphoric acids: P20< +3H20 = H 3 POs-r- H 3 P0 4 . The vapour density at about 1400° is 230, i.e. slightly less than that required by P a Oi« (West, Jour. Chent. Soc, 1902, p. 923).

Phosphoric oxide, or phosphorus pentoxide, P4O10, formed when phosphorus is burned in an excess of air or oxygen, or from dry phosphorus and oxygen at atmospheric pressure (Jungfleisch, loc. cit.), was examined by Boyle and named " flowers of phosphorus " by Marggraf in 1740. It is a sqft, flocculent powder, which on sublimation forms transparent, monoclinic crystals. It is extremely deliquescent, hissing when thrown into water, with which it combines to form phosphoric acid. It is reduced when heated with carbon to phosphorus, carbon monoxide being formed simultaneously. Its vapour density at 1400° points to the double formula (West, Jour. Chent. Soc, 1896, p. 154).

Oxyacids. — Phosphorus forms several oxyacids: hypophosphorous acid, H3PO2, and hypophosphoric acid, H4P2O6 or H2PO3, of which the anhydrides are unknown ; phosphorous acid, H3PO3, derived from P«0 6 ; monoperphosphoric acid, H 3 P0 5 ; perphosphoric acid, rˆPˆO?; and meta-, pyro-, and ortho-phosphoric acids, derived from P4O10, for which see Phosphates.

Hypophosphorous acid, HP(OH) 2 , discovered by Dulong in 1816, and obtained crystalline by Thomson in 1874 (Ber., 7, p. 994), is prepared in the form of its barium salt by warming phosphorus with baryta water, removing the excess of baryta by carbon dioxide, and crystallizing the filtrate. The acid may be prepared by evaporat- ing in a vacuum the solution obtained by decomposing the barium 6alt with the equivalent

amount of sulphuric acid. The acid forms a white crystalline mass, melting at 17-4° and having a strong acid

reaction. Exposure to air gives phosphorous and phosphoric acids, and on heating it gives phosphine and phosphoric acid. A characteristic reaction is the formation of a red precipitate of cuprous hydride, CU2H2, when heated with copper sulphate solution to 60°. It is a monobasic acid forming salts which are permanent in air, but which are gradually oxidized in aqueous solution. On heating they yield phosphine and leave a residue of pyrophosphate, or a mixture of meta- and pyrophosphates, with a little phosphorus. They react as reducing agents. On boiling with caustic potash they evolve hydrogen, yielding a phosphate.

Phosphorous acid, P(OH) 3 , discovered by Davy in 1812, may be obtained by dissolving its anhydride, P40 e , in cold water; by immersing sticks of phosphorus in a solution of copper sulphate contained in a well-closed flask, filtering from the copper sulphide and precipitating the sulphuric acid simultaneously formed by baryta water, and concentrating the solution in vacuo; or by passing chlorine into melted phosphorus covered with water, the first formed phosphorus trichloride being decomposed by the water into phosphorous and hydrochloric acids. It may also be prepared by leading a current of dry air into phosphorus trichloride at 60 ” and passing the vapours into water at o°, the crystals thus formed being drained, washed with ice-cold water and dried in a vacuum. The crystals melt at 70°. The acid is very deliquescent, and oxidizes on exposure to air to phosphoric acid. It decomposes on heating into phosphine and phosphoric acid. It is an energetic reducing agent; for example, when boiled with copper sulphate metallic copper is precipitated and hydrogen evolved. Although nominally tribasic the commonest metallic salts are dibasic. Organic ethers, however, are known in which one, two and three of the hydrogen atoms are substituted (Michaelis and Becker, Ber., 1897, 30, p. 1003). The metallic phosphites are stable both dry and in solution; when strongly heated they evolve hydrogen and yield a pyrophosphate, or, especially with the heavy metals, they give hydrogen and a mixture of phosphide and pyrophosphate.

Hypophosphoric acid, H4P2O6 or H 2 P0 3 , discovered by Salzer in 1877 among the oxidation products of phosphorus by moist air, may be prepared by oxidizing phosphorus in an aqueous solution of copper nitrate, or by oxidizing sticks of phosphorus under water, neutralizing with sodium carbonate, forming the lead salt and decom- posing this with sulphuretted hydrogen (J. Cavalier and E. Cornee, Abs. Jour. Chent. Soc, 1910, ii. 31). The aqueous solution may be boiled without decomposition, but on

concentration it yields phosphorous and phosphoric acids. Deliquescent, rectangular tablets of H4P2O62H2O separate out on concentrating a solution in a vacuum, which on drying further give the acid, which melts a t 55°i an d decomposes suddenly when heated to 70° into phosphor- ous and metaphosphoric acids with a certain amount of hydrogen phosphide. The solution is stable to oxidizing agents such as dilute hydrogen peroxide and chlorine, but is oxidized by potassium

Cermanganate to phosphoric acid; it does not reduce salts of the eavy metals. With silver nitrate it gives a white precipitate, Ag4P20s. The sodium salt, Na4P20e-loH20, forms monoclinic prisms and in solution is strongly alkaline; the acid salt, Na 3 HP20 6 -9H 2 0, forms monoclinic tablets. The formula of the acid is not quite definite. Cryoscopic measurements on the sodium salt points to the double formula, but the organic esters appear to be derived from H 2 P0 3 (see A. Rosenheim and M. Pritze, Ber., 1908, 41, 2708; E. Cornee, A bs. Jour. Chent. Soc, 1910, ii. 121).

Monoperphosphoric and perphosphoric acids, H 3 P0 6 and H4P2OS, were obtained by J. Schmidlin and P. Massini {Ber., 1910, 43, 1 162). The first is formed when 30 % hydrogen peroxide reacts with phos- phorus pentoxide or meta- or pyrophosphoric acids at low tempera- tures and the mixture diluted with ice-cold water. The solution is strongly oxidizing, even converting manganous salts to perman- ganates in the cold, a property not possessed by monopersulphuric acid. Perphosphoric acid is formed when pyrophosphoric acid is treated with a large excess of hydrogen peroxide.

Halogen Compounds. — Phosphorus trifluoride, PF 3 , discovered by Davy, may be obtained mixed with the pentafluoride ; by direct combination of its elements; from the tribromide and arsenic trifluor- ide (Maclvor) ; from the tribromide and zinc fluoride, and from dried copper phosphide and lead fluoride (H. Moissan). It is a colourless, non-fuming gas, which gives a colourless, mobile liquid at -io° and 20 atmospheres; the liquid boils at -95° and solidifies at 160 (Moissan, Comptes rendus, 1904, 138, p. 789). It does not burn in air, but explodes, under the action of a flame or the electric spark, when mixed with half its volume of oxygen, giving the oxyfluoride, POF3. It is slowly decomposed by water giving hydrofluoric and phosphorous acids, or, in addition, fluorphosphorous acid, HPF4. It has no action on glass in the cold, but when heated it gives phos phorus and silicon tetrafluoride. Phosphorus pentafluoride, PF5, discovered by Thorpe (Proc. Roy. Soc, 1877, 25, p. 122), may be obtained by burning the trifluoride in fluorine, from the penta- chloride and arsenic trifluoride and from the trifluoride and bromine, the first formed fluorobromide, PF 3 Br2, decomposing into the penta- bromide and pentafluoride: 5PF 3 Br 2 = 3PF5 + 2PBr 6 . It is a colourless gas 45 times heavier than air, and

liquefies at 15° under 40 atmospheres, solidifying when the pressure is diminished. It is incombustible and extinguishes flame. It fumes in moist air and is quickly decomposed by water giving hydrofluoric and phosphoric

acids. It does not dissociate on heating as do the pentachloride and pentabromide, thus indicating the existence of pentavalent phosphorus in a gaseous compound; dissociation, however, into the trifluoride and free fluorine may be brought about by induction sparks of 150 to 200 mm. in length. It combines directly with ammonia in the proportion 2PFs:5NH3, and with nitrogen peroxide at 10° in the proportion PF 5 :N0 2 . Phosphorus trifluorodichloride, PF3CI2, prepared from chlorine and the trifluoride, is a pungent smelling gas, which at 250 gives the pentachloride and fluoride. The trifluorodibromide (see above) is an amber-coloured mobile liquid. Phosphoryl trifluoride, POF3, may be obtained by exploding 2 volumes of phosphorus trifluoride with I volume of oxygen (Moissan, 1886); by heating 2 parts of finely-divided cryolite and 3- parts of phosphorus pentoxide (Thorpe and Hambly, Jour. Chem. Soc, 1889, p. 759); or from phosphoryl chloride and zinc fluoride at 40 to 50 . It is a colourless fuming gas, which liquefies under ordinary pressure at -50 , and under a pressure of 15 atmospheres at 16°; it may be solidified to a snow-like mass. Water gives hydrofluoric and phos- phoric acids. The corresponding sulphur compound, thiophosphoryl fluoride, PSF3, obtained by heating lead fluoride and phosphorus pentasulphide to 200 , is a colourless gas, which may be condensed to a clear transparent liquid. It spontaneously inflames in air or oxygen ; and when the gas is issuing from a jet into air the flame is greyish green, with a faintly luminous and yellow tip; the flame is probably one of the coldest known. The combustion probably follows the equation PSF 3 +0 2 = PF3 + S0 2 , the trifluoride at a higher temperature decomposing according to the equations: loPFj +502 = 6PF 5 -r-2P 2 5 , 2PF 3 +0 2 = 2POF 3 , the complete re- action tending to the equation: ioPSF 3 -f-i50 2 = 6PF 5 +2P 2 05-|- loS0 2 . The gas dissolves in water on shaking; PSF 3 -r-4H 2 = H 2 S+H 3 P04-r-3HF, but is more readily taken up by alkaline solutions with the formation of fluoride and thiophosphate: PSF 3 f 6NaOH = Na 3 PS03+3NaF. Heated in a glass tube it gives silicon fluoride, phosphorus and sulphur, PSF3 = PF 3 +S; 4PF 3 -f-3Si0 2 = 3SiF4+P4+ 30 2 . Electric sparks give at first free sulphur and the trifluoride, the latter at a higher temperature splitting into the pentafluoride and phosphorus. With dry ammonia it gives am- monium fluoride and a compound P(NH 2) 2

SF.

Phosphorus trichloride or phosphorous chloride, PC1 3 , discovered by Gay-Lussac and Thenard in 1808, is obtained by passing a slow current of chlorine over heated red phosphorus or through a solution of ordinary phosphorus in carbon disulphide (purifying in the latter case by fractional distillation). It is a colourless, mobile liquid of specific gravity 1-6128 at 0° and boiling-point 76°. With chlorine it gives the pentachloride, PC1 5 , and with oxygen when heated phos- phoryl chloride, POCI3. Water gives hydrochloric and phosphorous acids, with separation of red phosphorus if the water be hot. When led with hydrogen into liquid ammonia it gives NH:PNH 2 , which on elevation of temperature gives PˆNH)] (Joannis, Comptes rendus, 1904, 139, p. 364). By submitting a mixture of phosphorous chloride and hydrogen to an electric discharge A. Besson and A. Fournier (Comptes rendus, 1901, 150, p. 102) obtained phosphorus dichloride, P 2 CU, as a colourless, oiiy, strongly fuming liquid, freezing at -28 and boiling at 180° with decomposition. With water it gave phosphorous acid and a yellow indefinite solid. It decomposes slowly at ordinary temperatures. Phosphorus pentachloride, PCI5, discovered by Davy in 1810 and analysed by Dulong in 1816, is formed from chlorine and the trichloride. It is a straw-coloured solid, which by fusion under pressure gives prismatic crystals. It sublimes when heated, but under pressure it melts at 148 , giving a normal vapour density, but on further heating it dissociates into the trichloride and chlorine; this dissociation may be retarded by vapourizing in an atmosphere of chlorine. It fumes strongly in moist air, giving hydrochloric acid and phosphoryl chloride, P0C1 3 ; with water it gives phosphoric and hydrochloric acids.

Phosphoryl trichloride or phosphorus oxychloride, P0C1 3 , correspond- ing to phosphoric acid, (HO) 3 PO, discovered in 1847 by Wurtz, may be produced by the action of many substances containing hydroxy groups on the pentachloride; from the trichloride and potassium chlorate; by leaving phosphorus pentoxide in contact with hydrochloric acid: 2P 2 6 -r-3HCl = POCl3 + 3HP0 3 ; or by heating the pentachloride and pentoxide under pressure: 3PCI5 + PsOj = 5POClj. It is a colourless liquid, boiling at 107-2 °, and when solidified it melts at 0-8°. Water gives hydrochloric and phosphoric acids; dilute alcohol gives monoethyl phosphoric acid, C 2 H 5 H 2 P04, whilst absolute alcohol gives triethyl phosphate, (C 2 H 5) 3 PC > 4. Pyrophosphoryl chloride, P 2 3 Cl4, corresponding to pyrophosphoric acid, was obtained by Geuther and Michaelis (Ber., 1 87 1, 4, p. 766) in the oxidation of phosphorus trichloride with nitrogen peroxide at low temperature; it is a colourless fuming liquid which boils at about 212 with some decomposition. With water it gives phosphoric and hydrochloric acids. Thiophosphoryl chloride, PSCU, may be obtained by the direct combination of sulphur with the trichloride; from sulphuretted

hydrogen and the penta chloride; from antimony trisulphide and the pentachloride; by heat- ing the pentasulphide with the pentachloride; and by dissolving phos- phorus in sulphur chloride and distilling the solution: 2P +3S 2 C1 2 = 4S+2PSCI3. It is a colourless mobile liquid, boiling at I25-I and having a pungent, slightly aromatic odour. It is slowly decom- posed by water giving phosphoric and hydrochloric acids, with

sulphuretted hydrogen; alkalis form a thiophosphate, e.g. PS(OK)», and a chloride.

Phosphorus tribromide, PBr 3 , prepared by mixing solutions of its elements in carbon disulphide and distilling, is a transparent, mobile liquid, boiling at 173° and resembling the trichloride chemically. The pentabromide, PBrs, which results from phosphorus and an excess of bromine, is a yellow solid, and closely resembles the penta- chloride. The bromochloride, PCl 3 Br 2 , is an orange-coloured solid formed from bromine and the trichloride, into which components it decomposes at 35 . Phosphoryl tribromide, POBr 3 , is a solid, melting at 45 and boiling at 195 . Thiophosphoryl bromide, PSBr 3 , obtained after the manner of the corresponding chloride, forms yellow octahedra which melt at 38 °, and have a penetrating, aro- matic odour. With water it gives sulphur, sulphuretted hydrogen, hydrobromic, phosphorous and phosphoric acids, the sulphur and phosphorous acid being produced by the interaction of the previously formed sulphuretted hydrogen and phosphoric acid. Pyrophosphoryl thiobromide, (PBr 2 S) 2 S, and metaphosphoryl thiobromide, PS 2 Br, are also known.

Phosphorus forms three iodides. The subiodide, P4I, was ob- tained by R. Bculough (Comptes rendus , 1905, 141, p. 256), who acted with dry iodine on phosphorus dissolved in carbon disulphide; with alkalis it gives P4(0H). The di-iodide and tri-iodide are formed similarly ; the first is deposited as orange-coloured prisms which melt at 1 10° -to a red liquid (see Doughty, Jour. Amer. Chem. Soc, 1905, 27, p. 1444), whilst the second forms dark-red hexagonal plates which melt at 55 °.

Sulphides and Thio-acids. — Phosphorus and sulphur combine energetically with considerable rise of temperature to form sulphides. The researches of A. Stock (Ber., 1908, 41, pp. 558, 657; 1909, 42, p. 2062; 1910, 43, pp. 150, 414) show that three exist, P4S1, P4S7, P 2 S 5 . The first is prepared by heating red phosphorus with finely powdered sulphur in a tube sealed at one end and filled with carbon dioxide. The product is extracted with carbon disulphide and the residue distilled in carbon dioxide. It forms light yellow crystals from benzene, which melt at 1725 “and boil at 407 “408 ° with slight decom position. Alkalis give hydrogen and phosphine. The second, P4S7, is obtained by heating a mixture of red phosphorus and sulphur in the proportions given by P4S7+5 % P4S 3 ,

and crystallizing from carbon disulphide in which P4S 3 is readily soluble. It forms small, slightly yellow prisms, which melt at 310 and boil at 523 . The third, or pentasulphide, P2S5, was obtained as a substance resembling flowers of sulphur by A. Stock and K. Thiel (Ber., 1905, 38, p. 2719; 1910, 43, p. 1223), who heated sulphur with phosphorus in carbon disulphide solution with a trace of iodine to I20°-I30°. It exists in two forms, one having the formula P4S10, and the other a lower molecular weight. With liquid ammonia it gives P 2 S 3 7NH 3 , which is a mixture of ammonium iminotrithiophosphate, P(SNH4) 3 :NH, and ammonium nitrilodithiophosphate, P(SNH 4) 2 iN. Water con verts the former into ammonium thiophosphate, PO(SNH4) 3 .H 2 0, whilst the latter heated to 300 in a vacuum gives thiophosphoric nitrite, N!P:S (Stock, ibid., 1906, 39, p. 1967).

Thiophosphates result on dissolving the pentasulphide in alkalis. Sodium monothiophosphate, Na 3 PS0 3 -l2H 2 0, is obtained by adding one P 2 S 6 to six NaOH, adding alcohol, dissolving the precipitate in water and heating to 90 °. On cooling the salt separates as white six-sided tablets. Sodium dithiophosphate, Na 3 PS 2 2 -uH 2 0, is obtained by heating the above solution only to 50°-55°, cooling and adding alcohol, which precipitates the dithio salt. On heating it gives the monothio salt. Sodium trithiophosphate appears to be formed when the pentasulphide acts with sodium hydrosulphide at 20 . All thiophosphates are decomposed by acids giving sulphur- etted hydrogen and sometimes free sulphur. They also act in many cases as reducing agents.

Nitrogen Compounds. — Phosphorus pentachloride combines directly with ammonia, and the compound when heated to redness loses ammonium chloride and hydrochloric acid and gives phospham, PN 2 H 4 , a substance first described by Davy in 181 1. It is a white, infusible, very stable solid, which decomposes water on heating, giving ammonia and metaphosphoric acid, whilst alkalis give an analogous reaction. With methyl and ethyl alcohols it forms secondary amines (Vidal, Comptes rendus, 189 1, 112, p. 950; 1892, 115, p. 123). The diamide, PN 2 H4, was obtained by Hugot (ibid., 1905, 141, p. 1235) by acting with ammonia gas on phosphorus tribromide; or tri-iodide at -70°; it is very unstable, and decomposes at 25 . Phosphorus combines with nitrogen and chlorine to form several polymeric substances of the general formula (PNC1 2) x, where x may be 1,3, 4, 5, 6, 7, or 11 ; they may be obtained by heating the penta chloride with ammonium chloride in a sealed tube and separating the mixture by fractional distillation (H. N. Stokes, Amer. Chem. Jour., 1898, 20, p. 740 ; also see Besson and Rosset, Comptes rendus, 1906, 37, p. 143). The commonest form is P3N3CI6, a crystalline solid, insoluble in water, but soluble in alcohol and ether. Several phosphoamides have been described. The diamide, PO (NH 2)(NH),

results when the : pentachloride is saturated with ammonia gas and the first formed chlorophosphamide, PC1 3 (NH 2) 2 , is decomposed by water. The triamide, PO(NH 2)3, results from ammonia and phosphorus oxy- chloride. Both these compounds on heating give phosphomonamide, PON, of which a polymer (PON) 2 had been described by Oddo (Gazz. chim. Ital., 1899, 29 (ii.), p. 330). Stokes (Amer. Chem. Jour.,

1893, 15, p- 198; 1894, 16, pp. 123, 154) has described PO(OH) 2 NH 2 and PO(OH)(NHj)», whilst the compound PO(OH)NH was obtained by Schiff [Ann., 1857, 103, p. 168) by acting with ammonia on the pentoxide. .Numerous other nitrogen compounds have been obtained.

The atomic weight of phosphorus was determined by Berzelius, Pelouze, Jacquelin, Dumas, Schrotter, Brodie and van der Plaats. More recent are the investigations of G. Ter Gazarian {Compt. rend.,

1909, 148, p. 1397) on hydrogen phosphide, which gave the value 30906, and of G. P. Baxter and G. Jones (Journ. Amer. Chem Soc,

1910, 32, p. 298) on silver phosphate, which gave the value 31-04. Therapeutics. — The phosphorus used in the British pharma- copoeia is obtained from calcium phosphate, and is a waxlike non-metallic substance soluble in oils and luminous in the dark. There are various medicinal preparations. In young animals phosphorus has a remarkable influence on the growth of bone, causing a proliferation of the jelly-like masses and finally a deposit in them of true bony material. Owing to this influence it has been used in rickets and osteomalacia. , Its most effective use, however, is as a nerve tonic in paralysis agitans, locomotor ataxia, impotence and nervous exhaustion. In some skin diseases such as psoriasis, chronic eczema and acne indurata, phosphorus is very useful, and cases of diabetes mellitus and lymphadenoma have improved under some of its compounds. The hypophosphites have been recommended in pulmonary affections, being said to act as free phosphorus without being irritant, and the glycero-phosphates are certainly useful to stimulate metabolism. Dilute phosphoric acid is used as a gastric stimulant. It does not resemble phosphorus in its physiological action and cannot be used to replace it.

Toxicology. — Poisonous amounts of phosphorus are frequently taken or administered, criminally or accidentally, it being easily accessible to the public in the form of matches or of vermin pastes. They may have been swallowed several hours before symptoms of acute poisoning show

themselves, with nausea and vomiting, and a burning in the oesophagus, stomach and abdomen. The important thing is to prevent the absorption of the poison, so emetics and purgatives should be given at once. Sulphate of copper, in doses of 3 to 5 gr., freely diluted and repeated every few minutes forms the harmless, black phosphide of copper, which is rapidly eliminated by the kidneys. The stomach may be washed out with warm water and then with a 2 % solution of permanganate of potash, an enema of the same solution being given. The old French oil of turpentine is the best antidote to use in phosphorus poisoning, delaying the toxic effects; but ordinary oils are not only useless but harmful. When some time has elapsed before treatment and the phos- phorus has become absorbed, the organic degenerative changes cannot be easily controlled. For the chronic form of industrial poisoning in the manufacture of lucifer matches — a form of necrosis, known in England as " phossy jaw " and in France as " mat chimique," a localized inflammatory infection of the periosteum, ending with the death and exfoliation of part of the bone — see Match.

PHOTIUS (c. 820-891), patriarch of Constantinople (858-867 and 878-886). From his early years he displayed an extra- ordinary talent and appetite for knowledge, and as soon as be had completed his own education he began to teach with distinguished success grammar, rhetoric, divinity and philosophy. The way to public life was probably opened for him by the marriage of his brother Sergius to the princess Irene, sister of Theodora, who, upon the death of her husband Theophilus in 842, had assumed the regency of the empire. Photius became captain of the guard and subsequently first imperial secretary. The dissensions between the patriarch Ignatius and Bardas, the uncle of the youthful Emperor Michael III., brought promotion to Photius. Ignatius was arrested and imprisoned (Nov. 858), and upon refusing to resign his office was illegally deposed, while Photius, although a layman, received all the necessary sacerdotal orders within six days, and was installed as patriarch in his place. Ignatius, continuing to refuse the abdication which could alone have given Photius's elevation a semblance of legality, was treated with extreme severity. His cause was subsequently espoused by Pope Nicholas in a manner highly offensive to the

independent feeling of the Eastern Church. Photius felt himself the champion of Eastern Christianity against Latin pretensions; and when in 863 Nicholas finally anathematized and deposed him, he replied by a counter-excommunication. Meanwhile, the situation was suddenly changed by the murder of Photius's patron, Bardas, by order of the emperor Michael, who was himself assassinated by his colleague Basil in the following year (,867). The fall of Photius immediately ensued; he was removed from his office and banished about the end of September 867, a few days after the accession of Basil, and Ignatius was reinstated on the

23rd of November. About 876 Photius was suddenly recalled to Constantinople and entrusted with the education of Basil's children. On the death of Ignatius, probably in October 878, Photius, after a decent show of reluc- tance, again filled the patriarchal throne. He then proceeded to obtain the formal recognition of the Christian world. In November 879 a synod was convened at Constantinople. The legates of Pope John VIII. attended, prepared to acknowledge Photius as legitimate patriarch, a concession for which John was much censured by Latin opinion. He stood firm, however, on the other two points which had long been contested between the Eastern and Western Churches, the ecclesiastical jurisdiction over Bulgaria and the introduction of the " filioque " clause into the creed. He disowned his legates, who had shown a tendency to yield, again excommunicated Photius, and thus aroused the open hostility which has never been appeased to this day. Strong in the support of the council, Photius simply ignored him. At the height of glory and success he was suddenly precipitated from his dignity by another palace revolution. After the death of Basil (886), his son and successor Leo, who had formerly been devoted to Photius, but in recent years displayed great hatred towards him, deprived him of his office and banished him to the monastery of Bordi in Armenia. From this time Photius disappears from history. No letters of this period of his life are extant, which leads to the inference that his imprisonment was severe. The precise date of his death is not known, but it is said to have occurred on the 6th of February

891.

For long after Photius's death his memory was held in no special honour by his countrymen. But when, in the crusading age, the Greek Church and state were alike in danger from Latin encroach- ments, Photius became a national hero, and is at present regarded as little short of a saint. To this character he has not the least pretension. Few men, it is probable, have been more atrociously calumniated; but, when every specific statement to his prejudice has been rejected, he still appears on a general review of his actions worldly, crafty and unscrupulous. Yet he shows to no little advan- tage as an ecclesiastical statesman. His firmness was heroic,' his sagacity profound and far-seeing; he supported good and evil fortune with equal dignity ; and his fall was on both occasions due to revolutions beyond his control. In erudition, literary power, and force and versatility of intellect he far surpassed every contem- porary.

The most important of the works of Photius is his renowned Bibliotheca or Myriobiblon (ed. I. Bekker, 1824-1825), a collection of extracts from and abridgments of 280 volumes of classical authors (usually cited as Codices), the originals of which are now to a great extent lost. The work is specially rich in extracts from historical writers. To Photius we are indebted for

almost all we possess of Ctesias, Memnon, Conon, the lost books of Diodorus Siculus, and the lost writings of Arrian. Theology and ecclesiastical history are also very futty represented, but poetry and ancient philosophy are almost entirely ignored. It seems that he did not think it necessary to deal with those authors with whom every well-educated man would naturally be familiar. The literary criticisms, generally distinguished by keen and independent judgment, and the excerpts, vary considerably in length. The numerous biographical notices are probably taken from the work of Hesychius of Miletus. Thet Lexicon (AQtoir Xvpaywyii), published later than the Bibliotheca, was probably in the main the work of some of his pupils. It was intended as a book of reference to facilitate the reading of old classical and sacred authors, whose language and vocabulary were out of date. The only MS. of the Lexicon is the Codex Galeanus, formerly in the possession of Thomas Gale (q.v.), and now in the library of Trinity College, Cambridge (ed. S. A. Naber, 1864, with introduction on the authorities, critical commentary, and valuable indexes). His most important theological work is the Amphilochia, a collection o(some 300 questions and answers on difficult points in Scripture, addressed to Amphilochius, archbishop of Cyzicus (ed. Sophocles Oeconomus, Athens, 1858). Other similar works are his treatise in four boohs

against the Manichaeans and Paulicians, and his controversy with the Latins on the Procession of the Holy Spirit. His Epistles, political and private, addressed to high church and state dignitaries, are valuable for the light they throw upon the character and ver- satility of the writer (ed. J. Valettas, London, 1864). A large number of his speeches and homilies have been edited by S. Aristarches (1900). The only complete edition is Bishop Malou's in Migne's Patrologia graeca, ci.-cv. R. Reifzenstein (Der Anfang des Lexikons des Photius, 1907) has published a hitherto unedited MS. containing numerous fragments from various verse and prose authors.

After the allusions in his own writings the chief contemporary authority for the life of Photius is his bitter enemy, Nicetas the Paphlagonian, the biographer of his rival Ignatius. The standard modern work is that of Cardinal Hergenrother, Photius, Patriarch von Constantinopel (1867-1869). As a dignitary of the Roman Catholic Church, Cardinal Hergenrother is inevitably biased against Photius as an ecclesiastic, but his natural candour and sympathy with intellectual eminence have made him just to the man. ■ See also article by F. Kattenbusch in Herzog-Hauck's Real- encyklopddie fur protestantische Theologie (1904), containing full

bibliographical details; J. A. Fabricius, Bibliotheca graeca, x. 670- 776, xi. 1-37 ; C. Krumbacher, Geschichte der byzantinischen Litteratur, PP- 73~79. 5 I 5~5 2 4 (2n d ed., 1897) ; J. E. Sandys, History of Classical Scholarship (2nd ed., 1906).

*PHOTOCHEMISTRY (Gr. <£&, light, and " chemistry "), in the widest sense, the branch of chemical science which deals with the optical properties of substances and their relations to chemical constitution and reactions; in the narrower sense it is concerned with the action of light on chemical change. The first definition includes such subjects as refractive and dispersive power, colour, fluorescence, phosphorescence, optical isomerism, spectroscopy, &c— subjects which are treated under other headings ; here we oL*y discuss the subject matter of the narrower definition.*

Probably the earliest photochemical investigations were associated with the darkening of certain silver salts under the action of light, processes which were subsequently utilized in photography (q.v.). At the same time, however, it had been observed that other chemical changes were regulated by the access of light; and the first complete study of such a problem was made by J. W. Draper in 1843, who investigated the combi- nation of hydrogen and chlorine to form hydrochloric acid, a reaction which had been previously studied by Gay-Lussac and Thenard. Draper concluded that the first action of sunlight consisted in producing an allotrope of chlorine, which sub- sequently combined with the hydrogen. This was denied by Bunsen and Roscoe in 1857; and in 1887 Pringsheim suggested that the reaction proceeded in two stages : H 2 + Cl 2 = C1 2 + H 2 , 2H 2 -r-Cl 2 = H 2 0-r-2HCl. This view demands the presence of water vapour (H. B. Baker showed that the perfectly dry gases would not combine), and also explains the period which elapses before the reaction commenced (the " photochemical induction " of Bunsen and Roscoe) as taken up by the formation of the chlorine monoxide necessary to the second part of the reaction. The decomposition of hydriodic acid into hydrogen and iodine was studied by Lemoine in 1877, who found that 80% decom- posed after a month's exposure; he also observed that the reac- tion proceeded quicker in blue vessels than in red. A broader investigation was published by P. L. Chastaing in 1878, who found that the red rays generally oxidized inorganic compounds, whilst the violet reduces them, and that with organic conjpounds the action was entirely oxidizing. These and other reactions suggested the making of actinometers, or instruments for measuring the actinic effect of light waves. The most important employ silver salts; Eder developed a form based on the reaction between mercuric chloride and ammonium oxalate: 2HgCl 2 + (NH4) 2 C 2 04=2HgCl+2NH 4 Cl-r-2C0 2 , the extent of the decomposition being determined by the amount; of mercurous chloride or carbon dioxide

liberated.

The article Photography (q.v.) deals with early investigations on the chemical action of light, and we may proceed here to modern work on organic compounds. That sunlight accelerates the action of the halogens, chlorine and bromine, on such com- pounds, is well known. John Davy obtained phosgene, COCl 2 , by the direct combination of chlorine and carbon monoxide in sunlight (see Weigert, Ann. d. Phys., 1907 (iv.), 24, p. 55);

chlorine combines with half its volume of methane explosively in sunlight, whilst in diffused light it substitutes; with toluene it gives benzyl chloride, C 6 H 6 CH 2 C1, in sunlight, and chlortoluene, C6H4 3 C1, in the dark; with benzene it gives an addition product, C6H 6 C1 6 , in sunlight, and substitutes in the dark. Bromine deports itself similarly, substituting and forming addition products with unsaturated compounds more readily in sunlight. Sometimes isomerization may occur; for instance, Wislicenus found that angelic acid gave dibromangelic acid in the dark, and dibromtiglic acid in sunlight. Many substances decompose when exposed to sunlight; for example, alkyl iodides darken, owing to the liberation of iodine; aliphatic acids (especi- ally dibasic) in the presence of uranic oxide lose carbon dioxide; polyhydric alcohols give products identical with those produced by fermentation; whilst aliphatic ketones give a hydrocarbon and an acid.

Among aromatic compounds, benzaldehyde gives a trimeric and tetrameric benzaldehyde, benzoic acid and hydrobenzoin (G. L. Ciamician and P. Silber, Atti. R. Accad, Lincei, 1909); in alcoholic solution it gives hydrobenzoin; whilst with nitro- benzene it is oxidized to benzoic acid, the nitrobenzene suffering reduction to nitrosobenzene and phenyl-/3-hydroxylamine ; the latter isomerizes to ortho- and para-aminophenol, which, in turn, combine with the previously formed benzoic acid. Simi- larly acetophenone and benzophenone in alcoholic solution give dimethylhydrobenzoin and benzopinacone. With nitro com- pounds Sach and Hilbert concluded that those containing a •CH- side group in the ortho position to the -N0 2 group were decomposed by light. For example, ortho-nitrobenzaldehyde in alcoholic solution gives nitrosobenzoic ester and 22′ azoxybenzoic acid, with the intermediate formation of nitrobenzaldehyde-diethylacetal, N0 2 -C 6 H 4 -CH(OC 2 H 6) 2 (E. Bamberger and F. Elgar, Ann. 1910, 371, p. 319). Bamberger also investigated nitrosobenzene, obtaining azoxybenzene as chief product, together with various azo compounds, nitrobenzene, aniline, hydroquinone and a resin.

For the photochemistry of diazo derivatives see Ruff and Stein, Ber., 1961, 34, p. 1668, and of the terpenes see G. L. Ciamician and P. Silber, Ber.,

1907 and 1908.

Light is also powerful in producing isomerization and poly- merization. Isomerization chiefly appears in the formation of stable stereo-isomers from the labile forms, and more rarely in inducing real isomerization or phototropy (Marckwald, 1899). As examples we may notice the observation of Chattaway (Journ. Chem. Soc. 1906, 89, p. 462) that many phenylhydrazones (yellow) change into azo compounds (red), of M. Padoa and F. Graziani (Atti. R. Accad. Lincei, 1909) on the /3-naphthylhydra- zones (the a-compounds are not phototropic), and of A. Senier and F. G. Shepheard (Journ. Chem. Soc, 1909, 95, p. 1943) on the arylidene- and naphthylidene-amines, which change from yellow to orange on exposure to sunlight. Light need not act in the same direction as heat (changes due to heat may be termed thcrmotropic). For example, heat changes the a form of benzyl-/3-aminocrotonic ester into the /3 form, whereas light reverses this; similarly heat and light have reverse actions with a5-diphenyl ethylene, CH 2 :C(C6H 5) 2 (R. Stoermer, Ber., 1909, 42, p. 4865); the change, however, is in the same direction with Senier and Shepheard's compounds. With regard to polymeri- zation we may notice the production of benzene derivatives from acetylene and its homologues, and of tetramethylenes from the defines.

Theory of Photochemical Action. — Although much work has been done in the qualitative and quantitative study of photo- chemical reactions relatively little attention has been given to the theoretical explanation of these phenomena. That the solution was to be found in an analogy to electrolysis was suggested by Grotthuss in 1818, who laid down: (1) only those rays which are absorbed can produce chemical change, (2) the action of the light is analogous to that of a voltaic cell; and he regarded light as made up of positive and negative electricity. The first principle received early acceptance; but the develop- ment of the second is due to W. D. Bancroft who, in a series of

papers in the Journal of Physical Chemistry for 1908 and 1909, has applied it generally to the reactions under consideration. Any electrolytic action demands a certain minimum electro- motive force; this, however, can be diminished by suitable depolarizers, which generally act by combining with a product of the decomposition. Similarly, in some photochemical reactions the low electromotive force of the light is sufficient to induce decomposition, but in other cases a depolarizer must be present. For example, ferric chloride in aqueous solution is unchanged by light, but

in alcoholic solution reduction to ferrous chloride occurs, the liberated chlorine combining with the alcohol. In the same way Bancroft showed that the solvent media employed in photographic plates act as depolarizers. The same theory explains the action of sensitizers, which may act optically or chemically. In the first case they are substances having selective absorption, and hence alter the sensitivity of the system to certain rays. In the second case there are no strong absorption bands, and the substances act by combining with the decomposition products. Bancroft applied his theory to the explanation of photochemical oxidation, and also to the chlorination and bromination of hydrocarbons. In the latter case it is supposed that the halogen produces ions; if the positive ions are in excess side chains are substituted, if the negative the nucleus.

Standard treatises are: J. M. Eder, Handbuch der Photographie, vol. i. pt. 2 (1006) ; H. VV. Vogel, Photochemie (1906). An account of the action of light on organic compounds is given in A. W. Stewart, Recent Advances in Organic Chemistry (1908).

PHOTOGRAPHY (Gr. <£&, light, and ypafaiv, to write), the science and art of producing pictures by the action of light on chemically prepared (sensitized) plates or films.

History. It would be somewhat difficult to fix a date when what we now know as " photographic action " was first recorded. No doubt the tanning of the skin by the sun's rays was what was first noticed, and this is as truly the effect of solar radiation as is the darkening of the sensitive paper which is now in use in photographic printing operations. We may take it that K. W. Scheele was the first to investigate the darkening action of sunlight on silver chloride. He found that when silver chloride was exposed to the action of light beneath water there was dissolved in the fluid a substance which, on the addition of lunar caustic (silver nitrate), caused the precipitation of new silver chloride, and that on applying a solution of ammonia to the blackened chloride an insoluble residue of metallic silver was left behind. He also noticed that of the rays of the spectrum the violet most readily blackened the silver chloride. In Scheele, then, we have the first who applied combined chemical and spectrum analysis to the science of photography. In 1782 J. Senebier repeated Scheele's experiments, and found that in fifteen seconds the violet rays blackened silver chloride as much as the red rays did in twenty minutes. 1 In 1798 Count Rumford contributed a paper to the Philosophical Transactions entitled " An inquiry concerning the chemical properties that have been attributed to light," in which he tried to demonstrate that all effects produced on metallic solution could be brought about by a temperature somewhat less than that of boiling water. Robert Harrup in 1802, however, conclusively showed in Nicholson's Journal that, at all events, salts of mercury were reduced by

visible radiation and not by change of temperature. In 1 801 we come to the next decided step in the study of photographic action, when Johann Wilhelm Ritter (1 776-1810) proved the existence of rays lying beyond the violet, and found that they had the power of blackening silver chloride. Such a discovery naturally gave a direction to the investigations of others, and Thomas Johann Seebeck (1770-1831) (between i8o2andi8o8) and, in 181 2, Jacques Etienne Berard (1789-1869) turned their attention to this particular subject, eliciting valuable information. We need only mention two or three other cases

1 It may here be remarked that had he used a pure spectrum he would have found that the red rays did not blacken the material in the slightest degree.

where the influence of light was noticed at the beginning of the 19th century. William Hyde Wollaston observed the conversion of yellow gum guaiacum into a green tint by the violet rays, and the restoration of the colour by the red rays — both of which are the effect of absorption of light, the original yellow colour of the gum absorbing the violet rays, whilst the green colour to which it is changed absorbs the red rays. Sir Humphry Davy found that puce-coloured lead oxide, when damp, became red in the red rays, whilst it blackened in the violet rays, and that the green mercury oxide became red in the red rays — again an example of the necessity of absorption to effect a molecular or chemical change in a substance. U. R. T. Le Bouvier Desmorties in 1801 observed the change effected in Prussian blue, and Carl Wilhelm Bockman noted the action of the two ends of the spectrum on phosphorus, a research which John William Draper extended farther in America at a later date. 1.

To England belongs the honour of first producing a photo- graph by utilizing Scheele's observations on silver chloride. In June 1802 Thomas Wedgwood (1771-1805) published in the Journal of the Royal Institution the paper — " An account of a method of copying paintings upon glass and of making profiles by the agency of light upon nitrate of silver, with observations by H. Davy." He remarks that white paper or white leather moistened with a solution of silver nitrate undergoes no change when kept in a dark place, but on being exposed to the daylight it speedily changes colour, and, after passing through various shades of grey and brown, becomes at length nearly black. The alteration of colour takes place more speedily in proportion as the light is more intense.

" In the direct beam of the sun two or three minutes are sufficient to produce the full effect, in the shade several hours are required, and light transmitted through different-coloured glasses acts upon it with different degrees of intensity. Thus it is found that red rays, or the common

sunbeams passed through red glass, have very little action upon it ; yellow and green are more efficacious, but blue and violet light produce the most decided and powerful effects."

Wedgwood goes on to describe the method of using this prepared paper by throwing shadows on it, and inferentially by what we now call " contact printing." He states that he has been unable to fix his prints, no washing being sufficient to eliminate the traces of the silver salt which occupied the unex- posed or shaded portions. Davy in a note states that he has found that, though the images formed by an ordinary camera obscura were too faint to print out in the solar microscope, the images of small objects could easily be copied on such paper.

" In comparing the effects produced by light upon muriate of silver (silver chloride) with those upon the nitrate it seemed evident that the muriate was the more susceptible, and both were more readily acted upon when moist than when dry — a fact long ago known. Even in the twilight the colour of the moist muriate of silver, spread upon paper, slowly changed from white to faint violet ; though under similar circumstances no intermediate alteration was produced upon the nitrate. . . . Nothing but a method of preventing the unshaded parts of the delineations from being coloured by exposure to the day is wanting to render this process as useful as it is elegant."

In this method of preparing the paper lies the germ of the silver-printing processes of modern times, and it was only by the spread of chemical knowledge that the hiatus which was to render the " process as useful as it is elegant " was filled up — when sodium thiosulphate (hyposulphite of soda), discovered by Francois Chaussier in 1799, or three years before Wedgwood published his paper, was used for making the print permanent. Here we must call attention to an important observation by Seebeck of Jena in 1810. In the Farbenlehre of Goethe he says: —

" When a spectrum produced by a properly constructed prism is thrown upon moist chloride of silver paper, if the printing be con- tinued for from fifteen to twenty minutes, whilst a constant position for the spectrum is maintained by any means, I observe the following. In the violet the chloride is a reddish brown (sometimes more violet, sometimes more blue), and this coloration extends well beyond the limit of the violet; in the blue the chloride takes a clear blue tint, which fades away, becoming lighter in the green. In the yellow I usually found the chloride unaltered ; sometimes, however, it had a light yellow tint ; in the red and beyond the red it took a rose or lilac tint. This image of the spectrum shows beyond the red and the violet a region more or less light and uncoloured. This is how the decomposition of the silver chloride is seen in this region. Beyond

the brown band, . . . which was produced in the violet, the silver chloride was coloured a grey-violet for a distanceof several inches. In proportion as the distance from the violet increased, the tint became lighter. Beyond the red, on the contrary, the chloride took a feeble red tint for a considerable distance. When moist chloride of silver, having received the action of light for a time, is exposed to the spectrum, the blue and violet behave as above. In the yellow and red regions, on the other hand, it is found that the silver chloride becomes paler; . . . the parts acted upon by the red rays and by those beyond take a light coloration."

This has been brought forward by J. M. Eder as being the first record we have of photographic action lending itself to production of natural colours. This observation of Seebeck was allowed to lie fallow for many years, until it was again taken up and published as a novelty.

The first to found a process of photography which gave pictures that were subsequently unaffected by light was Nice- phore de Niepce. His process, which he called provisionally " heliographie, dessins, et gravures," consists in coating the surface of a metallic plate with a solution of asphaltum in oil of lavender and exposing it to a camera image. He recommends that the asphaltum be powdered and the oil of lavender dropped upon it in a wine-glass, and that it be then gently heated. A polished plate is covered with this varnish, and, when dried, is ready for employment in the camera. After requisite exposure, which is very long indeed, a very faint image, requiring develop- ment, is seen. Development is effected by diluting oil of lavender with ten parts by volume of white petroleum. After this mixture has been allowed to stand two or three days it becomes clear and is ready to be used. The plate is placed in a dish and covered with the solvent. By degrees the parts unaffected by light dissolve away, and the picture, formed of modified asphaltum, is developed. The plate is then lifted from the dish, allowed to drain, and finally freed from the remaining solvents by washing in water. Subsequently, instead of using oil of lavender as the asphaltum solvent, Niepce employed an animal oil, which gave a deeper colour and more tenacity to the surface-film.

Later, Louis Jacques Mande Daguerre (1780-1851) and Niepce used as a solvent the brittle residue obtained from evaporating the oil of lavender dissolved in ether or alcohol — a transparent solution of a lemon-yellow colour being formed. This solution was used for covering glass or silver

plates, which, when dried, could be used in the camera. The time of exposure varied somewhat in length. Daguerre remarked that "the time required to procure a photographic copy of a landscape is from seven to eight hours, but single monuments, when strongly lighted by the sun, or which are themselves very bright, can be taken in about three hours." Perhaps there is no sentence that illustrates more forcibly the advance made in photography from the days when this process was described. The ratio of three hours to T^T tn of a second is a fair estimate of the progress made since Niepce. The development was conducted by means of petroleum-vapour, which dissolved the parts not acted upon by light. As a rule silver plates seem to have been used, and occasionally glass; but it does not appear whether the latter material was chosen because an image would be projected through it or whether simply for the sake of effect. Viewed in the light of present knowledge, a more perfectly developable image in half-tone would be obtained by exposing the film through the back of the glass. The action of light on most organic matter is apparently one of oxidation. In the case of asphaltum or bitumen of Judaea the oxidation causes a hardening of the material and an insolubility in the usual solvents. Hence that surface of the film is generally hardened first which first feels the influence of light. Where half-tones exist, as in a landscape picture, the film remote from the surface first receiving the image is not acted upon at all, and remains soluble in the solvent. It is thus readily seen that, in the case of half-tone pictures, or even in copying engravings, if the action were not continued sufficiently long when the surface of the film farthest from the glass was first acted upon, the layer next the glass would in some places remain soluble, and on development would be dissolved away, carrying the top layer of hardened resinous

matter with it, and thus give rise to imperfect pictures. In carbon-printing development from the back of the exposed film is absolutely essential, since it depends on the same principles as does heliography, and in this the same mode of procedure is advisable.

It would appear that Niepce began his researches as early as 1814, but it was not till 1827 that he had any success worth recount- ing. At that date he communicated a paper to Dr Bauer of Kew, the secretary of the Royal Society of London, with a view to its presentation to that society. Its publication, however, was pre- vented because the process, of which examples were shown, was a secret one. In an authentic MS. copy of Niepce's " Memoire," dated " Kew, le 8 Decembre 1827," he says that "in his framed drawings made on tin the tone is too feeble, but that by the use of chemical agents the tone may be darkened." This shows that Niepce was familiar with the idea of using some darkening medium even with his photographs taken on tin plates.

Daguerreotype. — We have noticed in the joint process of Daguerre and Niepce that polished silver plates were used, and we know from the latter that amongst the chemical agents tried iodine suggested itself. Iodine vapour or solution applied to a silvered plate would cause the formation of silver iodide on those parts not acted upon by light. The removal of the resinous picture would leave an image formed of metallic silver, whilst the black parts of the original would be represented by the darker silver iodide. This was probably the origin of the daguerreotype process. Such observers as Niepce and Daguerre, who had formed a partnership for prosecuting their researches, would not have thus formed silver iodide without noticing that it changed in colour when exposed to the light. What parts respectively Daguerre and Niepce played in the development of the daguerreotype will probably never be known with absolute accuracy, but in a letter from Dr Bauer to Dr J. J. Bennett, F.R.S., dated the 7th of May 1830, the former says: —

"I received a very interesting letter from Mons. Isidore Niepce, dated 12th March [about a month after the publication of the daguerreotype process], and that letter fully confirms what I sus- pected of Daguerre's manoeuvres with poor Nicephore, but Mr Isidore observes that for the present that letter might be considered confidential."

Dr Bauer evidently knew more of " poor Nicephore's " work than most people, and at that early period he clearly thought that an injustice had been done to Niepce at the hands of Daguerre. It should be remarked that Nicephore de Niepce died in 1833, and a new agreement was entered into between his son Isidore de Niepce and Daguerre to continue the prosecu- tion of their researches. It appears further that Niepce com- municated his process to Daguerre on the 5th of December 1820. At his death some letters from Daguerre and others were left by him in which iodine, sulphur, phosphorus, &c, are mentioned as having been used on the metal plates, and their sensitiveness to light, when thus treated, commented upon. We are thus led to believe that a great part of the success in producing the daguerreotype is due to the elder Niepce; and indeed.it must have been thought so at the time, since, on the publication of the process, life-pensions of 6000 francs and 4000 francs were given to Daguerre and to Isidore Niepce respectively. In point of chronology the publication of the discovery of the daguerreotype process was made subsequently to the Talbot- type process. It will, however, be convenient to continue the history of the daguerreotype, premising that it was published on the 6th of February 1839, whilst Talbot's process was given to the world on the 25th of January of the same year.

Daguerreotype pictures were originally taken on silver-plated copper, and even now the silvered surface thus prepared serves better than electro-

deposited silver of any thickness. An outline of the operations is as follows. A brightly-polished silver plate is cleaned by finely-powdered pumice and olive oil, and then by dilute nitric acid, and a soft buff is employed to give it a brilliant polish, the slightest trace of foreign matter or stain being fatal to the production of a perfect picture. The plate, thus prepared, is ready for the iodizing operation. Small fragments of iodine are scattered over a saucer, covered with gauze. Over this the plate is placed, face downwards, resting on supports, and the vapour from the iodine is allowed to form upon it a surface of silver iodide. It is essential to note the colour of the surface-formed iodide at its several stages, the varying colours being due to interference colours

caused by the different thicknesses of the minutely thin film of iodide. The stage of maximum sensitiveness is obtained when it is of a golden orange colour. In this state the plate is withdrawn and removed to the dark slide of the camera, ready for exposure. A plan frequently adopted to give an even film of iodide was to saturate a card with iodine and hold the plate a short distance above the card. Long exposures were required, varying in Paris from three to thirty minutes. The length of the exposure was evidently a matter of judgment, more particularly as over-exposure introduced an evil which was called " solarization," but which was in reality due to the oxidation of the iodide by prolonged exposure to light. As a matter of history it may be remarked that the development of the image by mercury vapour is said to be due to a chance dis- covery of Daguerre. It appears that for some time previous to the publication of the daguerreotype method he had been experimenting with iodized silver plates, producing images by what would now be called the "printing out " process. This operation involved so long an exposure that he sought some means of reducing it by the application of different reagents. Having on one occasion exposed such a plate to a camera-image, he accidentally placed it in the dark in a cupboard containing various chemicals, and found after the lapse of a night that he had a perfect image developed. By the process of exhaustion he arrived at the fact that it was the mercury vapour, which even at ordinary temperatures volatilizes, that had caused this intensification of the almost invisible camera-image. It was this discovery that enabled the exposures to be very consider- ably shortened from those which it was found necessary to give in mere camera-printing.

The development of the image was effected by placing the exposed plate

over a slightly heated (about 75 C.) cup of mercury. The vapour of mercury condensed on those places where the light had acted in an almost exact ratio to the intensity of its action. This produced a picture in an amalgam, the vapour of which attached itself to the altered silver iodide. Proof that such was the case was subsequently afforded by the fact that the mercurial image could be removed by heat. The developing box was so constructed that it was possible to examine the picture through a yellow glass window whilst the image was being brought out. The next opera- tion was to fix the picture by dipping it in a solution of hyposulphite of soda. The image produced by this method is so delicate that it will not bear the slightest handling, and has to be protected from accidental touching.

The first great improvement in the daguerreotype process was the resensitizing of the iodized film by bromine vapour. John Frederick Goddard published his account of the use of bromine in conjunction with iodine in 1840, and A. F. J. Claudet (1797-1867) employed a combination of iodine and chlorine vapottr in 1841. In 1844 Daguerre published his improved method of preparing the plates, which is in reality based on the use of bromine with iodine. That this addition points to additional sensitiveness will be readily understood when we remark that so-called instantaneous pictures of yachts in full sail, and of large size, have been taken on plates so prepared — a feat which is utterly impossible with the original process as described by Daguerre. The next improvement in the process was toning or gilding the image by a solution of gold, a practice introduced by H. L. Fizeau. Gold chloride is mixed with hyposulphite of soda, and the levelled plate, bearing a sufficient quantity of the fluid, is warmed by a spirit-lamp until the re- quired vigour is given to the image, as a consequence of which it is better seen in most lights. Nearly all the daguerreotypes extant have been treated in this manner, and no doubt their permanence is in a great measure due to this operation. Images of this class can be copied by taking electrotypes from them, as shown by Sir W. R. Grove and others. These reproductions are admirable in every way, and furnish a proof that the daguerrean image is a relief.

Fox-Talbot Process. — In January 1839 Fox Talbot described the first of his processes, photogenic drawing, in a paper to the Royal Society. He states that he began experimenting in 1834, and that in the solar microscope he obtained an outline of the object to be depicted in full sunshine in half a second. He published in the Philosophical Magazine full details of his method, which consisted essentially in soaking paper in common salt, brushing one side only of it with about a 12% solution of silver nitrate in water, and drying at the fire. Fox Talbot stated that by repeating the alternate washes of the silver and salt— always ending, however, with the former — greater sensi- tiveness was attained. This is the same in every respect as the method practised by Wedgwood in 1802; but,

when we come

to the next process, which he called " calotype " or " beautiful picture," we have a distinct advance. This process Talbot protected by a patent in 1841.

It may be briefly described as the application of silver iodide to a paper support. Carefully selected paper was brushed over with a solution of silver nitrate (100 grains to the ounce of distilled water), and dried by the fire. It was then dipped into a solution of potas- sium iodide (500 grains being dissolved in a pint of water), where it was allowed to stay two or three minutes until silver iodide was formed. In this state the iodide is scarcely sensitive to light, but is sensitized by brushing " gallo-nitrate of silver " over the surface to which the silver nitrate had been first applied. This "gallo-nitrate " is merely a mixture, consisting of 100 grains of silver nitrate dissolved in 2 oz. of water, to which is added one-sixth of its volume of acetic acid, and immediately before applying to the paper an equal bulk of a saturated solution of gallic acid in water. The prepared surface is then ready for exposure in the camera, and, after a short insolation, develops itself in the dark, or the development may be hastened by a fresh application of the " gallo-nitrate of silver." The picture is then fixed by washing it in clean water and drying slightly in blotting paper, after which it is treated with a solution of potas- sium bromide, and again washed and dried. Here there is no mention made of hyposulphite of soda as a fixing agent, that having been first used by Sir J. Herschel in February 1840.

In a strictly historical notice it ought to be mentioned that development by means of gallic acid and silver nitrate was first known to Rev. J. B. Reade. When impressing images in the solar microscope he employed gallic acid and silver in order to render more sensitive the silver chloride paper that he was using, and he accidentally found that the image could be developed without the aid of light. The priority of the discovery was claimed by Fox Talbot; and his claim was sustained after a lawsuit, apparently on the ground that Reade's method had never been legally published. Talbot afterwards made many slight improvements in the process. In one of his patents he recognizes the value of the proper fixing of his photogenic drawings by hyposulphite of soda, and also the production of positive prints from the calotype negatives. We pass over his application of albumen to porcelain and its subsequent treatment with iodine vapour, as also his application of albumen in which silver iodide was held in suspension to a glass plate, since in this he was preceded by Niepce de St Victor in 1848.

Albumen Process on Glass. — It was a decided advance when Niepce de St Victor, a nephew of Nicephore de Niepce, employed a glass plate and coated it with iodized albumen. The originator of this method did not meet with much success. In the hands of Blanquart fivrard it became more

practicable; but it was carried out in its greatest perfection by G. Le Gray.

The outline of the operations is as follows: The whites of five fresh eggs are mixed with about one hundred grains of potassium iodide, about twenty grains of potassium bromide and ten grains of common salt. The mixture is beaten up into a froth and allowed to settle for twenty-four hours, when the clear liquid is decanted off. A circular pool of albumen is poured on a glass plate, and a straight ruler (its ends being wrapped with waxed paper to prevent its edge from touching the plate anywhere except at the margins) is drawn over the plate, sweeping off the excess of albumen, and so leaving an even film. The plate is first allowed to dry spontaneously, a final heating being given to it in an oven or before the fire. The heat hardens the albumen, and it becomes insoluble and ready for the silver nitrate bath. One of the difficulties, is to prevent crystalliza- tion of the salts held in solution, and this can only be effected by keeping them in defect rather than in excess. The plate is sensitized for five minutes in a bath of silver nitrate, acidified with acetic acid, and exposed whilst still wet, or it may be slightly washed and again dried and exposed whilst in its desiccated state. The image is developed by gallic acid in the usual way.

After the application of albumen many ‘ modifications were introduced in the shape of starch, serum of milk, gelatin, all of which were intended to hold iodide in situ on the plate; and the development in every case seems to have been by gallic acid. At one time the waxed-paper process subsequently introduced by Le Gray was a great favourite. Paper that had been made translucent by white wax was immersed in a solution of potas- sium iodide until impregnated with it, after which it was sensi- tized in the usual way, development being by gallic acid. In images obtained by this process the high lights are represented by metallic silver, whilst the shadows are translucent. Such a print is called a ” negative.” When silver chloride paper is darkened by the passage of light through a negative, we get the highest lights represented by white paper and the shadows by darkened chloride. A print of this kind is called a ” positive.”

Collodion Process. .— – A great impetus was given to photography

in 1850, on the introduction of collodion (q.v.), a very convenient vehicle on account of the facility with which the plates are prepared, and also because it is a substance as a rule totally unaffected by silver nitrate, which

is not the case with other organic substances. Thus albumen forms a definite silver compound, as do gelatin, starch and gum. The employment of collodion was first suggested by Le Gray, but it remained for Frederick Scott Archer of London, closely followed by P. W. Fry, to make a really practical use of the discovery. When collodion is poured on a glass plate it leaves on drying a hard transparent film which under the microscope is slightly reticulated. Before drying, the film is gelatinous and perfectly adapted for holding in situ salts soluble in ether and alcohol. Where such salU are present they crystallize out when the film is dried, hence such a film is only suitable where the plates are ready to be immersed in the silver bath. As a rule, about five grains of the soluble gun-cotton are dissolved in an ounce of a mixture of equal parts of ether and alcohol, both of which must be of low specific gravity, -723 and -805 respectively. If the alcohol or ether be much diluted with water the gun-cotton (pyroxylin) precipitates, but, even if less diluted, it forms a film which is " crapey " and uneven. Such was the material which Le Gray proposed and which Archer brought into practical use. The opaque silver plate with its one impression was abandoned; and the paper support of Talbot,. with its inequalities of grain and thickness, followed suit, though not immediately. When once a negative had been obtained with collodion on a glass plate — the image showing high lights by almost complete opacity and the shadows by transparency (as was the case, too, in the calotype process) — any number of impressions could be obtained by means of the silver-printing process introduced by Fox Talbot, and they were found to possess a delicacy and refinement of detail that certainly eclipsed the finest print obtained from a calotype negative. To any one who had practised the somewhat tedious calotype process, or the waxed-paper process of Le Gray with its still longer preparation and development, the advent of the collodion method must have been extremely welcome, since it effected a saving in time, money and uncertainty. The rapidity of photographic action was much increased, and the production of a different character of pictures thus became possible.

We give an outline of the procedure. A glass plate is carefully cleaned by a detergent such as a cream of tripoli powder and spirits of wine (to which a little ammonia is often added), then wiped with a soft rag, and finally polished with a silk handkerchief or chamois leather. A collodion containing soluble iodides and bromides is made to flow over the plate, all excess being drained off when it is covered. A good standard formula for the collodion is — 55 grains of pyroxylin, 5 oz. of alcohol, 5 oz. of ether; and in this liquid are dissolved 2 J grains of ammonium iodide, 2 grains of cadmium iodide and 2 grains of cadmium bromide. When the collodion is set the plate is immersed in a bath of silver nitrate — a vertical form being that mostly used in England, whilst a horizontal dish is used on the continent of Europe — a good formula for which is 350 grains of silver nitrate

with 10 oz. of water. The plate is steadily lowered into this solution, and moved in it until all the repellent action between the aqueous solution of the silver and the solvents of the collodion is removed, when it is allowed to rest for a couple of minutes, after which period it is taken out and placed in the dark slide ready for exposure in the camera. After undergoing proper exposure the plate is withdrawn, and in a room lighted with yellow light the developing solution is applied, which originally was a solution of pyrogallic acid in water restrained in its action by the addition of acetic acid. One of the old formulae employed by P. H. Delamotte was 9 grains of pyrogallic acid, 2 drachms of glacial acetic acid and 3 oz. of water. The image gradually appears after the application of this solution, building itself up from the silver nitrate clinging to the film, which is reduced to the metallic state by degrees. Should the density be insufficient a few drops of silver nitrate are added to the pryogallic acid solution and the developing action continued.

In 1844 Robert Hunt introduced another reducing agent, which is still the favourite, viz. ferrous sulphate. By its use the time of necessary exposure of the plate is reduced and the image develops with great rapidity. A sample of this developing solution is 20 grains of ferrous sulphate, 20 minims of acetic acid, with 1 oz. of water. This often leaves the image thinner than is requisite for the formation of a good print, and it is intensified with pyrogallic acid and silver. Other intensifiers are used to increase the deposit on a plate by means of mercury or uranium, followed by other solutions to still further darken the double salts formed on the film.

Such intensifying agents have to be applied to the image after the plate is fixed, which is done by a concentrated solution of hypo- sulphite of soda or by potassium cyanide, the latter salt having been first introduced by Martin and Marc Antoine Augustin Gaudin in 1853 (La Lumiere, April 23, 1853). Twenty-five grains of potassium cyanide to one ounce of water is the strength of the solution usually employed. The reaction of both these fixing agents is to form with the sensitive salts of silver double hyposulphites or cyanides, which are soluble in water and salt. The utility of bromides in the collodion process seems to have been recognized in its earliest days, Scott Archer (1852) and R. J. Bingham (1850) both mentioning it. We notice this, since as late as 1866 a patent-right in its use was sought to be enforced in America, the patent being taken, out by James Cutting in July 1854.

Positive Pictures by the Collodion Process. — In the infancy of the collodion process it was shown by Home that a negative image could be made to assume the appearance of a positive by whitening the metallic silver deposit. This he effected by using with the pyrogallic acid developer a small quantity of nitric acid. A better result was obtained by P. W. Fry with

ferrous sulphate and ferrous nitrate, whilst Hugh Diamond gave effect to the matter in a practical way. F. Scott Archer used mercuric chloride to whiten the image. To Robert Hunt, however, must be rewarded the credit of noticing the action of this salt on the image (Phil. Trans., 1843). The whitened picture may be made to stand'out against black velvet, or black varnish may be poured over the film to give the necessary black back-ground, or, more recently, the positive pictures may be produced on japanned iron plates (ferrotype plates) or on japanned leather. This process is still occasionally practised by itinerant photo- graphers.

Moist Collodion Process. — It is seen that for the successful working of the collodion process it was necessary that the plate should be exposed very shortly after its preparation; this was a drawback, inasmuch as it necessitated taking a heavy equip- ment into the field. In 1856, Sir William Crookes and J. Spiller published in the Philosophical Magazine a process whereby they were enabled to keep a film moist (so as to prevent crystallization of the silver nitrate) several days, enabling plates to be prepared at home, exposed in the field, and then developed in the dark room. The plate was prepared in the usual way and a solution of zinc nitrate and silver nitrate in water was made to flow over it. The hygroscopic nature of the zinc salt kept sufficient moisture on the plate to attain the desired end. Various modifications in procedure have been made.

Dry Plates. — It would appear that the first experiments with collodion dry plates were due to Marc Antoine Augustin Gaudin. In La Lumiere of the 22nd of April and the 27th of May 1854 he describes his researches on the question; whilst in England G. R. Muirhead, on the 4th of August 1854, stated that light acts almost as energetically on a dry surface as on a wet after all the silver has been washed away from the former previous to desiccation. J. M. Taupenot, however, seems to have been the first to use a dry-plate process that was really workable. His original plan was to coat a plate with collodion, sensitize it in the ordinary manner, wash it, cause a solution of albumen to flow over the surface, dry it, dip it in a bath of silver nitrate acidified with acetic acid, and wash and dry it again. The plate was then in a condition to be exposed, and was to be developed with pyrogallic acid and silver. In this method we have a double manipulation, which is long in execution, though perfectly effective.

A great advance was made in all dry-plate processes by the introduction of what is known as the " alkaline developer," which is, however, inapplicable to all plates on which silver nitrate is present in the free state. The developers previously described, either for collodion or paper processes, were dependent on the reduction of metallic silver by some such agent as ferrous sulphate, the reduction taking place gradually and the reduced particles aggregating on those portions of the film which had been acted

upon by light. The action of light being to reduce the silver iodide, bromide or chloride, these reduced particles really acted as nuclei for the crystallized metal. It will be evident that in such a method of development the molecular attraction

acts at distances relatively great compared with the diameters of the molecules themselves. If it were possible to reduce the altered particles of silver salt it was plain that development would be more rapid, and also that the number of molecules reduced by light would be smaller if the metallic silver could be derived from silver compounds within shorter distances of the centres of molecular attraction. Alkaline development accomplished this to a very remarkable extent; but the method is only really practicable when applied to films containing silver bromide and chloride, as silver iodide is only slightly amenable to the alkaline development. The introduction of this developer is believed to be of American origin; and it is known that in the year 1862 Major C. Russell used it with the dry plates he introduced.

An alkaline developer consists of an alkali, a reducing agent and a restraining agent. These bodies, when combined and applied to the solid silver bromide or chloride, after being acted upon by light, were able to reduce the sub-bromide or sub-chloride, and to build up an image upon it, leaving the unaltered bromide intact, except so far as it was used in the building up. In 1877 Sir W. Abney investigated this action. A dry plate was prepared by the bath process in the usual manner (to be described below), and exposed in the camera. The exposed film was covered with another film of collodiobromide emulsion, which of course had not seen the light. An image was obtained from the double film by means of the alkaline developer, which penetrated through the upper unexposed film. The development was prolonged until an image appeared through the unexposed film, when the plate was fixed, washed and dried. A piece of gelatinous paper was cemented on the upper film, and a similar piece on the lower after both had been stripped off the glass. When quite dry the two papers were forcibly separated, a film adhering to each. The upper film, although never exposed to light, showed an image in some cases more intense than the under film. The action of the alkaline developer was here manifest : the silver bromide in close contiguity to the exposed particles was reduced to the metallic state. Hence, from this and similar experiments, Abney concluded that silver bromide could not exist in the presence of a freshly precipitated or reduced metallic silver, and that a sub-bromide was

immediately formed. From this it will be seen that the deposited silver is well within the sphere of molecular attraction, and that consequently a less exposure (i.e. the reduction of fewer molecules of the sensitive salt) would give a developable image.

The alkalis used embraced the alkalis themselves and the mono-carbonates. The sole reducing agent up till recent times was pyrogallic acid. In the year 1880 Abney found that hydroquinone was even more effective than pyrogallic acid, its reducing power being stronger. Various other experimentalists tried other kindred substances, but without adding to the list of really useful agents until recently.

The following are some of the most effective : —

Eikonogen Developer.

Eikonogen 25 parts.

Sodium sulphite …. 50 ,,

Sodium carbonate …. 50 ,,

Potassium bromide …. i ..

Water 1000 ,,

This is a one-solution developer, and acts energetically.

Metol Developer.

Solution A.

Metol 2 parts.

Sodium sulphite 18 ,,

Water 100 „

Solution B. Sodium carbonate …. 6 parts.

Potassium bromide … 1 ,,

Water 100

For use, take one part of A to from I to 3 parts of B.

Amidol Developer.

Amidol 3 parts.

Sodium sulphite 100 ,,

Potassium bromide . . . 1 to 3 ,,

Water 1000 ,,

This developer requires no addition of alkali.

Ortol Developer.

Solution A.

Ortol 15 parts.

Sodium metabisulphite . . 7 „

Water 1000 „

Solution B. Sodium carbonate …. 100 parts. Sodium sulphite …. 125 ,,

Potassium bromide … 3 ,,

Water 1000 „

A and B solutions are mixed together in equal proportions. Besides these, there are several more, such as adurol, glycin, pyrocatechin, which have been used with more or less success. They all give a black in lieu of that dark olive-green deposit of silver which is so often found with pyrogallol developers. All are alkaline developers, and the image is built up from the sensitive salt within the film. They are applicable to gelatin or collodion plates, but for the latter rather more bromide of an alkali is added, to retard fogging.

Another set of developers for dry plates dependent on the reduction of the silver bromide and the metallic state is founded on the fact that certain organic salts of iron can be utilized. In 1877 M. Carey Lea of Philadelphia and William Willis announced almost simultaneously that a solution of ferrous oxalate in neutral potassium oxalate was effective as a developer, and from that time its use has been acknowledged. In 1882 J. M. Eder demonstrated that gelatino-silver chloride plates could be developed with ferrous citrate, which could not be so readily accomplished with ferrous oxalate. The exposure for chloride plates when developed by the latter was extremely prolonged. In the same year Abney showed that if ferrous oxalate were dissolved in potassium citrate a much more powerful agent was formed, which allowed not only gelatino-chloride plates to be readily

developed but also collodio-chloride plates. These plates were undevelopable except by the precipitation method until the advent of the agents last-mentioned owing to the fact that the chloride was as readily reduced as the sub-chloride.

Amongst the components of an alkaline developer we men- tioned a restrainer. This factor, generally a bromide or chloride of an alkali, serves probably to form a compound with the silver salt which has not been acted upon by light, and which is less easily reduced than is the silver salt alone — the altered particles being left intact. The action of the restrainer is regarded by some as due to its combination with the alkali. But whichever theory is correct the fact remains that the restrainer does make the primitive salt less amenable to reduction. Such restrainers as the bromides of the alkalis act through chemical means; but there are others which act through physical means, an example of which we have in the preparation of a gelatin plate. In this case the gelatin wraps up the particles of the silver compound in a colloidal sheath, as it were, and the developing solution only gets at them in a very gradual manner, for the natural tendency of all such reducing agents is to attack the particles on which least work has to be expended. In the case of silver sub-bromide the developer has only to remove one atom of bromine, whereas it has to remove two in the case of silver bromide. The sub-bromide formed by light and that sub- sequently produced in the act of development are therefore reduced. A large proportion of gelatin compared with the silver salt in a film enables an alkaline developer to be used without any chemical restrainer; but when the gelatin bears a small proportion to the silver such a restrainer has to be used. With collodion films the particles of bromide are more or less unenveloped, and hence in this case some kind of chemical restrainer is absolutely necessary. We may say that the organic iron developers require less restraining in their action than do the alkaline developers.

In Major Russell's process the plate was prepared by immersion in a strong solution of silver nitrate and then washed and a preservative applied. The last-named agent executes two functions, one being to absorb the halogen liberated by the action of light and the other to preserve the film from atmospheric action. Tannin, which Major Russell employed, if we mistake not, is a good absorbent of the halogens, and acts as a varnish to the fiim. Other collodion dry-plate processes carried out by means of the silver-nitrate bath were very numerous at one time, many different organic bodies being also employed. In most cases ordinary iodized collodion was made use of, a small percentage of soluble bromide being as a rule added to it. When plates were developed by the alkaline method this extra bromide induced density, since it was the silver bromide alone which was amenable to it, the icdide being almost entirely unaffected by the weak developer which was at that time in general use.

Dry-Plate Bath Process. — One of the most successful bath dry-plate processes was introduced by R. Manners Gordon. The plate was given an edging of albumen and then coated with ordinary iodized collodion to which one grain per ounce of cadmium bromide had been added. It was kept in the silver- nitrate bath for ten minutes, after which it was washed thoroughly. The following preservative was then applied : —

(Gum arabic 20 grs.

1 •< Sugar candy 5 „

(Water 6 dr.

2. S Gallic acid 3 grs.

I Water 2 dr.

These ingredients were mixed just before use and, after filtering, applied for one minute to the plate, which was allowed to drain and set up to dry naturally. Great latitude is admissible in the exposure; it should rarely be less than four times or more than twenty times that which would be required for a wet plate under ordinary circumstances. The image may be developed with ferrous sulphate restrained by a solution of gelatin and glacial acetic acid, to which a solution of silver nitrate is added just before application, or by an alkaline developer.

In photographic processes not only has the chemical condition of the film to be taken into account but also the optical. When light falls on a semi-opaque or translucent film it is scattered by the particles in it and passes through the glass plate to the back. Here the rays are partly transmitted and partly reflected, a very small quantity of them being absorbed by the material of the glass. Theory points out that the strongest reflection from the back of the glass should take place at the ” critical ” angle. In 1875 Abney investi- gated the subject and proved that practice agreed with theory in every respect, and that the image of a point of light in development on a plate was surrounded by a ring of reduced silver caused by the reflection of the scattered light from the back surface of the glass, and that this ring was shaded inwards and outwards in such a manner that the shading varied with the intensity of the light reflected at different angles. To avoid ” halation,” as this phenomenon is called, it was usual to

cover the back of dry plates with some material which should be in optical contact with it, and as nearly as possible of the same density as glass, and which at the same time should absorb all the photographically active rays. This was called " backing a plate."

Collodion Emulsion Processes. — In 1864 W. B. Bolton and B. J. Sayce published the germ of a process which revolutionized photographic manipulations. In the ordinary collodion process a sensitive film is procured by coating a glass plate with collodion containing the iodide and bromide of some soluble salt, and then, when set, immersing it in a solution of silver nitrate in order to form silver iodide and bromide in the film. The question that presented itself to Bolton and Sayce was whether it might not be possible to get the sensitive salts of silver formed in the collo- dion whilst liquid, and a sensitive film given to a plate by merely letting this collodion, containing the salts in suspension, flow over the glass plate. Gaudin had attempted to do this with silver chloride, and later G. W. Simpson had succeeded in perfect- ing a printing process with collodion containing silver chloride, citric acid and silver nitrate; but the chloride until recently has been considered a slow working salt, and nearly incapable of development. Up to the time of W. B. Bolton and B. J. Sayce's experiments silver iodide had been considered the staple of a sensitive film on which to take negatives; and though bromide had been used by Major Russell and others, it had not met with so much favour as to lead to the omission of the iodide. At the date mentioned the suspension of silver iodide in collodion was not thought practicable, and the inventors of the process turned their attention to silver bromide, which they found could be secured in such a fine state of division that it remained suspended for a considerable time in collodion, and even when precipitated could be resuspended by simple agitation. The outline of the method was to dissolve a soluble bromide in plain collodion, and add to it drop by drop an alcoholic solution of silver nitrate, the latter being in excess or defect according to the will of the operator. To prepare a sensitive surface the collodion contain- ing the emulsified sensitive salt was poured over a glass plate, allowed to set> and washed till all the soluble salts resulting from the double decomposition of the soluble bromide and the silver nitrate, together with the unaltered soluble bromide or silver

nitrate, were removed, when the film was exposed wet, or allowed to dry and then exposed. The rapidity of these plates was not in any way remarkable, but the process had the great advantage of doing away with the sensitizing nitrate of silver bath, and thus avoiding a tiresome operation. The plates were developed by the alkaline method, and gave images which, if not primarily dense enough, could be intensified by the applica- tion of pyrogallic acid and silver nitrate as in the wet collodion process. Such was the crude germ of a method which was destined to effect a complete change in the aspect of photo- graphic negative taking 1 ; but

for some time it lay dormant. In fact there was at first much to discourage trial of it, since the plates often became veiled on development.

M. Carey Lea of Philadelphia, and W. Cooper, jun., of Reading, may be said to have given the real impetus to the method. Carey Lea, by introducing an acid into' the emulsion, established a practic- able collodion emulsion process, which was rapid and at the same time gave negative pictures free from veil. To secure the rapidity Carey Lea employed a fair excess of silver nitrate, and Colonel H. Stuart Wortley gained further rapidity by a still greater increase of it; the free use of acid was the only means by which this could be effected without hopelessly spoiling the emulsion. The addition of the mineral acids such as Carey Lea employed is to prevent the formation of (or to destroy when formed) any silver sub-bromide or oxide, either of which acts as a nucleus on which development can take place. Abney first showed the theoretical effect of acids on the sub-bromide, as also the effect of oxidizing agents on both the above compounds (see below). A more valuable modification was introduced in 1874 by W. B. Bolton, one of the originators of the process, who allowed the ether and the alcohol of the collodion to evaporate, and then washed away all the soluble salts from the gelatinous mass formed of pyroxylin and sensitive salt. After washing for a considerable time, the pellicle was dried naturally or washed with alcohol, and then the pyroxylin redissolved in ether and alcohol, leaving an emulsion of silver bromide, silver chloride or silver iodide, or mixtures of all suspended in collodion. In this state the plate could be coated and dried at once for exposure. Sometimes, in fact generally, preservatives were used, as in the case of dry plates with the bath, in order to prevent the atmosphere from rendering the surface of the film spotty or insensitive on develop- ment. This modification had the great advantage of allowing a large quantity of sensitive salt to be prepared of precisely the same value as to rapidity of action and quality of film.

A great advance in the use of the collodion bromide process was made by Colonel Stuart Wortley, who in June 1873 made known the powerful nature of a strongly alkaline developer as opposed to the weak one which up to that time had usually been employed for a collodion emulsion plate, or indeed for any dry plate.

An example of the preparation of a collodion emulsion and the developer is the following: 2§ oz. of alcohol, 5 oz. of ether, 75 grains of pyroxylin. In 1 oz. of alcohol are dissolved 200 grains of zinc bromide 2 ; it is then acidulated with 4 or 5 drops of nitric acid, and added to half the above collodion. In 2 drachms of water are dissolved 330 grains of silver nitrate, 1 oz. of alcohol being added. The silvered alcohol is next poured into the other half of the collodion and the brominized collodion dropped in, care being taken to shake between the operations. An emulsion of silver bromide

is formed in suspension; and it is in every case left for 10 to 20 hours to what is technically called " ripen," or, in other words, to become creamy when poured out upon a glass plate. When the emulsion has ripened it may be used at once or be poured out into a flat dish and the solvents allowed to evaporate till the pyroxylin becomes gelatin- ous. In this state it is washed in water till all the soluble salts are carried away. After this it may be either spread out on a cloth and dried or treated with two or three doses of alcohol, and then re- dissolved in equal parts of alcohol (specific gravity, -805) and ether (specific gravity, -720). In this condition it is a washed emulsion, and a glass plate can be coated with it and the film dried, or it may be washed and some of the many preservatives, such as albumen, beer, coffee, gum, &c, applied.

The type of a useful alkaline developer for collodion plates is as follows : —

1. S Pyrogallic acid . . . . . 96 grs. (Alcohol 1 oz.

2 . { Potassium bromide …. 12 grs. ' I Water distilled I oz.

•j, { Ammonium carbonate …. 80 grs.

" (Water 1 oz.

To develop the plate 6 minims of No. 1, § drachm of No. 2, and 3 drachms of No. 3 are mixed together and made to flow over the plate after washing the preservative off under the tap. Sometimes the

1 An account of Sayce's process is to be found in the Photographic News of October 1865, or the Photographic Journal of the same date.

2 The advantages of this salt were pointed out by Leon Warnerke in 1875.

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Plate II.

development is conducted in a flat dish, sometimes the solution is poured on the plate. 1 The unreduced salts are eliminated by either cyanide of potassium or sodium hyposulphite. Intensity may be given to the image, if requisite, either before or after the " fixing" operation. Where resort is had to ferrous oxalate development, the developer is made in one of two ways — (i) by saturating a saturated solution of neutral potassium oxalate with ferrous oxalate, and adding an equal volume of a solution (10 grains to I oz. of water) of potassium bromide to restrain the action, or (2) by mixing, accord- ing to Eder's plan, 3 volumes by measure of a saturated solution of the potassium oxalate with I volume by measure of a saturated solution of ferrous sulphate, and adding to the ferrous oxalate solution thus obtained an equal bulk of the above solution of potas- sium bromide. The development is conducted in precisely the same manner as indicated above, and the image is fixed by one of the same agents.

Gelatin Emulsion Process. — The facility with which silver bromide emulsion could be prepared in collodion had turned investigation into substitutes for it. As early as September 1871 Dr R. L. Maddox had tried emulsifying the silver salt in gelatin, and had produced negatives of rare excellence. In November 1873 J. King described a similar process, getting rid of the soluble salts by washing. Efforts had also been made in this direction by J. Burgess in July 1873. R. Kennett in 1874 may be said to have been the first to put forward the gelatin emulsion process in a practical and workable form, as he then published a formula which gave good and quick results. It was not till 1878, however, that the great capabilities of silver bromide when held in suspension by gelatin were fairly known; in March of that year C. Bennett showed that by keeping the gelatin solution liquid at a low temperature for as long as seven days extraordinary rapidity was conferred on the sensitive salt. The molecular condition of the silver bromide seemed to be altered, and to be amenable to a far more powerful developer than had hitherto been dreamt of. In 1874 J. S. Stas had shown that various modifications of silver bromide and chloride were possible, and it seemed that the green molecular condition (one of those noted by Stas) of the bromide was attained by prolonged warm- ing. It may be said that the' advent of rapid plates was 1878, and that the full credit of this discovery should be allotted to C. Bennett. Both Kennett and Bennett got rid of the soluble salts from the emulsion by

washing; and in order to attain success it was requisite that the bromide should be in excess of that neces- sary to combine with the silver nitrate used to form the emulsion. In June 1879 Abney showed that a good emulsion might be formed by precipitating a silver bromide by dropping a solution of a soluble bromide into a dilute solution of silver nitrate. The supernatant liquid was decanted, and after two or three washings with water the precipitate was mixed with the proper amount of gelatin. D. B. van Monckhoven of Ghent, in experimenting with this process, hit upon the plan of obtaining the emulsion by acting on silver carbonate with hydrobromic acid, which left no soluble salts to be extracted. He further, in August 1879, announced that he had obtained great rapidity by adding to the bromide emulsion a certain quantity of ammonia. This addition rapidly altered the silver bromide from its ordinary state to the green molecular condition referred to above. At this point we have the branching off of the gelatin emulsion process into two great divisions, viz. that in which rapidity was gained by long-continued heating, and the other in which it was gained by the use of ammonia — a subdivision which is maintained to the present day. Opinions as to the merits of the two methods are much divided, some maintaining that the quality of the heated emulsion is better than that produced by alkalinity, and vice versa. We may mention that in 1881 Dr A. Herschel introduced a plan for making an alcoholic gelatin emulsion with the idea of inducing rapid drying of the plates, and in the same year H. W. Vogel of Berlin introduced a method of combining gelatin and pyroxylin together by means of a solvent which acted on the gelatin and allowed the addition of alcohol in order to dissolve the pyroxylin. This " collodio-gelatm emulsion" was only a shortlived process, which is not surprising, since its preparation involved the inhalation of the fumes of acetic acid.

1 For further details the reader is referred to Instruction in Photo- graphy, nth ed., p. 362.

The warming process introduced by Bennett was soon super- seded. Colonel Stuart Wortley in 1879 announced that, by raising the temperature of the vessel in which the emulsion was stewed to 150 F., instead of days being required to give the desired sensibility only a few hours were necessary. A further advance was made by boiling the emulsion, first practised, we believe, by G. Mansfield in 1879. Another improvement was effected by W. B. Bolton by emulsifying the silver salt in a small quantity of gelatin and then raising the emulsion to boiling point, boiling it for from half an hour to an hour, when extreme rapidity was attained. Many minor improvements in this process have been made from time to time. It may be useful to give an idea of the relative rapidities of the various processes we have described.

Daguerreotype, originally …. half an hour's exposure.

Calotype 2 or 3 minutes' „

Collodion 10 seconds' „

Collodion emulsion 15 seconds' „

Rapid gelatin emulsion …. jVth second „

Technique of Photography Gelatin Emulsions. The following is an outline of two representative processes. All operations should be conducted in light which can act but very slightly on the sensitive salts employed, and this is more necessary with this process than with others on account of the extreme ease with which the equilibrium of the molecules is upset in giving rise to the molecule which is developable. The light to work with is gaslight or candlelight passing through a sheet of Chance's stained red glass backed by orange paper. Stained red glass allows but few chemically effective rays to pass through it, whilst the orange paper diffuses the light. If daylight be employed, it is as well to have a double thickness of orange paper. The following should be weighed out : —

1. Potassium iodide 5 grs.

2. Potassium bromide 135 „

3. Nelson's No. t photographic gelatin . . 30 „

4. Silver nitrate 175 „

(Autotype or other hard gelatin . . . 100 „

5 \ Nelson's No. 1 gelatin . . . . . 100 „*

Nos. 3 and 5 are rapidly covered with water or washed for a few seconds under the tap to get rid of any dust. No. 2 is dissolved in 1 1 oz. of water, and a little tincture of iodine added till it assumes a light sherry colour. No. I is dissolved in 60 minims of water. No. 4 is dissolved in J oz. of water, and No. 3 is allowed to swell up in 1 oz. of water, and is then dissolved by heat. All the flasks containing these solutions are placed in water at 150° F. and carried into the " dark room," as the orange-lighted chamber is ordinarily called; Nos. 3 and 4 are then mixed together in a jar or flask, and No. 2 added drop by drop till half its bulk is gone, when No. I is added to the remainder, and the double solution is dropped in as before. When all is added there ought to be formed an emulsion which is very ruddy when examined by gaslight, or orange by daylight. The flask containing the

emulsion is next placed in boiling water, which is kept in a state of ebullition for about three- quarters of an hour. It is then ready, when the contents of the flask have cooled down to about 100° F., for the addition of No. 5, which should in the interval be placed in 2 oz. of water to swell and finally be dissolved. The gelatin emulsion thus formed is placed in a cool place to set, after which it is turned into a piece of coarse canvas or mosquito netting made into a bag. By squeezing, threads of gelatin containing the sensitive salt can be made to fall into cold water; by this means the soluble salts are extracted. This is readily done in two or three hours by frequently changing the water, or by allowing running water to flow over the emulsion-threads. The gelatin is next drained by straining canvas over a jar and turning out the threads on to it, after which it is placed in a flask, and warmed till it dissolves, half an ounce of alcohol being added. Finally it is filtered through chamois leather or swansdown calico. In this state it is ready for the plates.

The other method of forming the emulsion is with ammonia. The same quantities as before are weighed out, but the solutions of Nos. 2 and 3 are first mixed together and No. 4 is dissolved in 1 oz. of water, and strong ammonia of specific gravity 88o added to it till the oxide first precipitated is just redissolved. This solution is then dropped into Nos. 2 and 3 as previously described, and finally No. 1 is added. In this case no boiling is required; but to secure rapidity it is as well that the emulsion should be kept an hour at a temperature of about 90° F., after which half the total quantity of No. 5 is added. When set the emulsion is washed, drained, and redissolved as before; but in order to give tenacity

*SftattS &ˆSSfcL N& 5 IS add6d *~ the ˆition Coating the Plates.— Glass pfates are best cleaned with nitric Hrii nn ‘fK d ‘ and th en treated with P° tash lution, rinsed again and dned with a clean cloth. They are then ready for receiving the I k 10 “\ whlch – after being warmed to about 120° F., is pfured on them to cover well the surface. This being done the plates are placed on a level shelf and allowed to stay there tU the ge latfn » thoroughly set; they are then put in a dryfng cupboard, though that theTarm ˆˆ air ” made t0 Pˆ-‘lt should be remarked th a m • , ? th IS L only neces sary to enable the air to take up the moisture from the plates. They ought to dry in about twelve hours, and they are ready for use. ‘ twelve*

Exposure.— With a good emulsion and on a bright day the ex- posure of a plate to a landscape, with a lens whfose alrture U

nZ~ S £u C t nth th } he focal distance – should not be rˆore than one-half to one-fifth of a second. This time depends, of course on

i xM\ I? l° f tHe V1 T = if u there be folia S e in the immediate foreground LJl gen In – th u e P or trait-studio, under the same circum-

*toTo C u7or n fi :rec U ondr H * "^ ^ ""* be fr0m half a Seco " d Development of the Plate.— To develop the image either a ferrous oxalate solution or alkaline pyrogallic acid may be used No chemical restrains such as potassium bromide is necessary since the gelatin itself acts as a physical restrainer. If the alkaUne developer be used, the following may be taken as a good standard –*

(Pyrogallol –

1.] Citric acid … fo

(Water '• ' ' ' ° oz

2 – \ W^tef " m br ° mide •••••• logrs.

*3 iwate'r nia, ' M0 – \ \ " " ' '■ " * ^ One dram of each of these is taken and the mixture" made up £,?„£■ Wlt \ wate T The P lat * ^ Placed in a dish and the above poured over it without stoppage, whereupon the image gradually*

rienf H ^ 'f the ? XP -° SUre has been P ro P er 'y timed gains suffi* cient density for printing purposes. It is fixed in a Solution of hyposulphite of soda, as in the other processes already described, fhp t h f n thoroughly washed for two or three hours to eliminate all*

then«ure e of1he g eTa h t , fn 10ng WaSHmg " "^^ ° n aCCOUnt of Intensifying the Negative.— Sometimes it is necessary to intensify

2^<. neg A ' W u 1Cl i Can be – done J ln a variet y of ways with mercury salts An excellent plan, introduced by Chapman Jones, is to use a saturated solution of mercuric chloride in water. After thoroueh washing the negative is treated with ferrous oxalate. This process can be repeated till sufficient density is attained. Wt£ most

*E f/nl" * v!?!i? ,th mercu 7 the image is apt to become yellow and to fade ; with this apparently it is not.*

rJ P ZZ k i"K the N egative.-The ^Sative is often protected by receiving first a film of plain collodion and then a coat of shellac or other photographic varnish. This protects the gelatin from moisture and also from becoming stained with the silver nitrate

owing to contact, with the sensitive paper used in silver printing! Another

varnish is a solution of celloidin in amyl acetate. This is an excellent protection against damp. mis is

Printing Processes. The first printing process may be said to be that of Fox Talbot (see above), which has continued to be generally em- ployed (with the addition of albumen to give a surface to the print— an addition first made, we believe, by Fox Talbot).

,fe r for Printing is prepared by mixing 150 parts of ammonium chloride with 240 parts of spirits of wine and 2000 parts of water though the proportions may vary. These ingredients are dissolved!

beaten,,ˆ / ? f° f ˆT fairl y- siz t d e gS? « added and the whole beaten up to a froth. In hot weather it is advisable to add a drop of carbolic acid to prevent decomposition. The albumen is allowed two or three days to settle, when it is filtered through a sponge placed in a funnel, or through two or three thicknesses of fine muslin, and trans erred to a flat dish. The paper is cut of convenient size and allowed to float on the solution for about a minute, when Zhtu 1 ° and dned ln , a warm room. For dead prints, on which colouring is to take place, plain salted paper is useful. It ˆL;l m f™ of the following proportions-90 parts of ammonium chloride 100 parts of sodium citrate, 10 parts ofgelatin, Sooo parts of distilled water. The gelatin is first dissolved in 'got water and the remaining components are added. It is next filtered, and and dried ° °" ' f ° r thrCe minutes ' then withdrawn*

Sensitizing Bath— To sensitize the paper it is floated on a 10% »'S" °Ln 1Ve J nltrate f °r.three minutes. It is then hung up and allowed to dry, after which it is ready for use. To print the image the paper is placed in a printing frame over a negative and

SET t0 l iSht A I 4 U ? llowed to Print till such time asThe fmage appears rather darker than it should finally appear.*

Toning and Fixing the Print.- The next operation is to tone and S * = Lfli ,J he earl ˆ r days this was accomplished by means rhlorJH. ™- 6 ‘ • 1 7r a u ral J XtU , re of hyposulphite of soda and gold chloride. This gilded the darkened parts of the print which light had reduced to the semi-metallic state: and on the removal of the chloride by means of hyposulphite an image composed of metallic silver, an organic salt of silver and gold was left behind There

rZuˆ SpK1 T howeVer : $*£ part of the coloration was due to a

™ ba 7 of s “lP h ” r with the silver, not that pure silver sulphide

Z£. ? d ,egree fugitive but the sulphuretted organic salt of silver

Sf„. t0 , be – Uable t0 u Change – J hls Save placl to a method of ancahne toning, or rather, we should say, of neutral toning, by employing gold chloride with a salt, such as the carbonate or acetate of soda, chloride of lime, borax, &c. By this means there wa “° dan g e , r of sulphunzation during the toning, to which the

h 1 v , SSrin«ti iu Wa u F r ° ne ow l? s , to the decomposition of the hyposulphite. The substances which can be employed in tonine seem to be those in which an alkaline base is combined with a weak acid, the latter being readily displaced by a stronger acid, such as nitric acid, which must exist in the paper after printing. This branch of photography owes much to the Rev. T. F Hardwich, he hav”ng carried on extensive researches in connexion with it during 18S4. and subsequent years. A. Davanne and A. Girard, a little later, also investigated the matter with fruitful results.

The following may be taken as two typical toning-baths :—

‘ (jold chloride x part

Sodium carbonate … Tn nartL

Wa %- • • : : 5000T

gprax I0O „

Water 4000

Gold chloride T n art

water 4000 parts

In the latter («) and (0) are mixed in equal parts immediately before use. Each of these is better used only once. A third bath

Gold chloride …….. 2 parts

Chloride of lime ….. ‘ 2

Cha l k ••■....’.’.’” 40 ” Water gˆ ”

These are mixed together, the water being warmed, “when cool the solution is ready for use. In toning prints there is a distinct difference in , the modus operandi according to the toning-bath employed. Thus in the first two baths the print must be thoroughly washed in water to remove all free silver nitrate, that salt forming no part m the chemical reactions. On the other hand, where free chlorine is used, the presence of free silver nitrate or some active chlorine absorbent is a necessity. In 1872 Abney showed that rˆVlr 1 a – tomng-bath free silver nitrate might be eliminated, and it the print were immersed in a solution of a salt such as lead nitrate the toning action proceeded rapidly and without causing any fading of the image whilst toning, which was not the case when the free silver nitrate was totally removed and no other chlorine absorbent substituted. This was an important factor, and one which had been overlooked. In the third bath the free silver nitrate should only be partially removed by washing. The print, having been partially washed or thoroughly washed; as the case may be, is immersed in the toning-bath till the image attains a purple or bluish tone, after which It is ready for fixing. The

*nf H° a n t USeC l- fo l .”- tblS u purpose J i ? a 20 % so’ 1 *! 011 of hyposulphite of soda to which it is best to add a dew drops of ammonia in order to render it alkaline. About ten minutes suffice to effect the c,K e i rS1 °V the . < hloride ‘“to hyposulphite of silver, which is soluble in hyposulphite of soda and can be removed by washing Vfˆˆanic sa ts of silver seem, however, to form a different salt, which is partially insoluble, but which the ammonia helps to remove It it is not removed there is a sulphur compound left behind according to J. Spiller, which by time and exposure becomes yellow’ 1 he use of potassium cyanide for fixing prints is to be avoided, as this reagent attacks the organic coloured oxide which, if removed would render the print a ghost. The washing of silver prints should*

1 1TT- C °i mp j’ Sln , ce ? ls ˆ that the least trace of hyposulphite lett behind renders the fading of the image a mere matter of time Ihe stability of a print has been supposed to be increased by mmersing it, after washing, in a solution of alum. The alum, like any acid body, decomposes the hyposulphite into sulphur and sulphurous acid. If this be the case, it seems probable that the destruction of the hyposulphite by time is not the occasion

of fading but that its hygroscopic character is. This, however, is a moot

wt w w 'I USU V to , wa sh , th , e , P rints some hours in running water. We have found that half a dozen changes of water, and between successive changes the application of a sponge to the back of each print separately, are equally or more efficacious, the fiˆ' 11 h h Pnnt assumes a darker tone than it has after leaving Different tones can thus be given to a print by different toning- baths; and the gold itself may be deposited in a ruddy form or in a Diue lorm. Ihe former molecular condition gives the red and sepia tones, and the latter the blue and black tones. The degree ot minute subdivision of the gold may be conceived when ft is

stated that, on a couple of sheets of albuminized paper fully printed, the gold necessary to give a decided tone does not exceed half a grain.

Collodio-chloride Silver Printing Process. — In the history of the emulsion processes we stated that Gaudin attempted to use silver chloride suspended in collodion, but it was not till the year 1864 that any practical use was made of the suggestion so far as silver printing is concerned. In the autumn of that year George Wharton Simpson worked out a method which has been more or less suc- cessfully employed. The formula appended is Simpson's: —

Silver nitrate 60 parts.

Distilled water 60 ,,

Strontium chloride 64 ,,

1 Alcohol 1000 ,,

Citric acid 64 „

Alcohol 1000 „

To every 1000 parts of plain collodion 30 parts of No. I, previ- ously mixed with 60 parts of alcohol, are added ; 60 parts of No. 2 are next mixed with the collodion, and finally 30 parts of No. 3. This forms an emulsion of silver chloride and also contains citric acid and silver nitrate. The defect of this emulsion is that it con- tains a large proportion of soluble

salts, which are apt to crystallize out on drying, more particularly if it be applied to glass plates. The addition of the citric acid and the excess of silver nitrate is the key to the whole process; for, unless some body were present which on exposure to light was capable of forming a highly-coloured organic oxide of silver, no vigour would be obtained in printing. If pure chloride be used, though an apparently strong image would be obtained, yet on fixing only a feeble trace of it would be left, and the print would be worthless. The collodio-chloride emulsion may be applied to glass, or to paper, and the printing carried on in the usual manner. The toning takes place by means of the chloride of lime or by ammonium sulphocyanide and gold, which is practi- cally a return to the sel d'or bath. The organic salt formed in this procedure does not seem so prone to be decomposed by keeping as does that formed by albumen, and the washing can be more completely carried out. There are in the market several papers which are collodio-chloride.

Gelatino-citro-chloride Emulsion. — A modified emulsion printing process was introduced by Abney in 1881, which consisted in sus- pending silver chloride and silver citrate in gelatin, there being no excess of silver present. The formula of producing it is as follows: —

(Sodium chloride 40 parts.

i.-j Potassium citrate 40 ,,

(Water 500 ,,

\ Silver nitrate 150 „

") Water 500 ,,

\ Gelatin 300 „

■ *i ' I Water 1700 ,,*

Nos. 2 and 3 are mixed together whilst warm, and No. 1 is then gently added, the gelatin solution being kept in brisk agitation. This produces the emulsion of citrate and chloride of silver. The gelatin containing the suspended salts is heated for five minutes at boiling point, when it is allowed to cool and subsequently slightly washed, as in the gelatino-bromide emulsion. It is then ready for application to paper or glass. The prints are of a beautiful colour, and seem to be fairly permanent. They may be readily toned by the borax or by the chloride of lime toning-bath, and are fixed with the hyposulphite solution of the strength before given. Most, if not all, of the gelatin papers now extant are made somewhat after this manner.

Printing with Salts of Uranium. — The sensitiveness of the salts of uranium to light seems to have been discovered by Niepce, and was subsequently applied to photography by J. E. Burnett in England. One of the original formulae consisted of 20 parts of uranic nitrate with 600 parts of water. Paper, which is better if slightly sized previously with gelatin, is floated on this solution. When dry it is exposed beneath a negative, and a very faint image is produced; but it can be developed into a strong one by 6 to 10% solution of silver nitrate to which a trace of acetic acid has been added, or by a 2 % solution of gold chloride. In both these cases the silver and goid are deposited in the metallic state. Another developer is a 2 % solution of potassium ferrocyanide to which a trace of nitric acid has been added, sufficient to give a red coloration. The development takes place most readily by letting the paper float on these solutions.

Self-toning Papers. — There are several self-toning papers based on the chloride emulsion process. These contain the necessary amount of gold to tone the print. The print is produced in the ordinary way and then immersed in salt and water or in some cases potassium sulphocyanide. The print is finished by immersing in weak hyposulphite of soda.

Printing with Chromates: Carbon Prints.— -The first mention of the use of potassium bichromate for printing purposes seems to have been made by Mungo Ponton in May 1839, when he stated that paper, if saturated with this salt and dried, and then exposed to the sun's rays through a drawing, would produce a yellow picture Jn an orange ground, nothing more being required to fix it than

washing it in water, when a white picture on an orange ground was obtained. In 1840 Edmond Becquerel announced that paper sized with iodide of starch and soaked in potassium bichromate was, on drying, more sensitive than unsized paper. Joseph Dixon of Massachusetts, in the following year, produced copies of bank-notes by using gum arabic with potassium bichromate spread upon a lithographic stone, and, after exposure of the sensitive surface through a bank-note, by washing away the unaltered gum and inking the stone as in ordinary lithography. The same process, with slight modifications, has been used by Simonau and Toovey of Brussels, and produces excellent results. Dixon's method, however, was published in the Scientific American for 1854, and consequently, as regards priority, it ranks after Fox Talbot's photo- engraving process (see below), published in 1852. On the 13th of December 1855 Alphonse Poitevin took out a patent in England, in which he vaguely described a method of taking a direct carbon- print by rendering gelatin insoluble through the action of light on potassium bichromate. This idea was taken up by John Pouncey of Dorchester, who perhaps was the first to produce veritable carbon-prints, notwithstanding that Testud de Beauregard took

out a somewhat similar patent to Poitevin's at the end of 1857.

Pouncey published his process on the 1st of January 1859; but, as described by him, it was by no means in a perfect state, half- tones being wanting. The cause of this was first pointed out by Abb6 Laborde in 1858, whilst describing a kindred process in a note to the French Photographic Society. He says, " In the sensi- tive film, however thin it may be, two distinct surfaces must be recognized — an outer, and an inner which is in contact with the paper. The action of light commences on the outer surf ace ; in the washing, therefore, the half-tones lose their hold on the paper and are washed away." J. C. Burnett in 1858 was the first to endeavour to get rid of this defect in carbon printing. In a paper to the Photographic Society of London he says, " There are two essential requisites … (2) that in printing the paper should have its wreprepared side (and not its prepared side, as in ordinary printing) placed in contact with the negative in the pressure-frame, as it is only by printing in this way that we can expect to be able after- wards to remove by washing the unacted-upon portions of the mixture. In a positive of this sort printed from the front or pre- pared side the attainment of half-tones by washing away more or less depth of the mixture, according to the depth to which it has been hardened, is prevented by the insoluble parts being on the surface and in consequence protecting the soluble part from the action of the water used in washing; so that either nothing is removed, or by steeping very long till the inner soluble part is sufficiently softened the whole depth comes bodily away, leaving the paper white." This method of exposing through the back of the paper was crude and unsatisfactory, and in i860 Fargier patented a process in which, after exposure to light of the gelatin film which contained pigment, the surface was coated with collodion, and the print placed in warm water, where it separated from the paper support and could be transferred to glass. Poitevin success- fully opposed this patent, for he had used this means of detaching the films in his powder-carbon process, in which ferric chloride and tartaric acid were used. Fargier at any rate gave an impetus to carbon-printing, and J. W. Swan took up the matter, and in 1864 secured a patent. One of the great features in Swan's innovations was the production of what, is now known as " carbon-tissue," made by coating paper with a mixture of gelatin, sugar and colouring matter, and rendered sensitive to light by means of potassium or ammonium bichromate. After exposure to light Swan placed the printed carbon-tissue on an india-rubber surface, to which it was made to adhere by pressure. The print was immersed in hot water, the paper backing stripped off, and the soluble gelatin containing colouring matter washed away. The picture could then be retransferred to its final support of paper. In 1869 J. R. Johnson of London took out a patent in which he claimed that carbon-tissue which had been soaked in water for a short period, by its tendency to swell further, would adhere to

any waterproof surface such as glass, metal, waxed paper, &c, without any adhesive material being applied. This was a most important improvement. Johnson also applied soap to the gelatin to prevent its excessive brittleness on drying, and made its final support of gelatinized paper, rendered insoluble by chrome alum. In 1874 J. R. Sawyer patented a flexible support for developing on ; this was a sized paper coated with gelatin and treated with an ammoniacal solution of shellac in borax, on which wax or resin was rubbed. The advantage of this flexible support is that the dark parts of the picture have no tendency to contract from the lighter parts, which they were apt to do when a metal plate was used, as was the case in Johnson's original process. With this patent, and minor improvements made since, carbon-printing has arrived at its present state of perfection.

According to P. E. Liesegang, the carbon-tissue when prepared on a large scale consists of from 120 to 150 grains of gelatin (a soft kind), 15 grains of soap, 21 grains of sugar and from 4 to 8 grains of dry colouring matter. The last-named may be of various kinds, from lamp-black pigment to soluble colours such as alizarin. The I gelatin, sugar and soap are put in water and allowed to stand for an hour, and then melted, the liquid afterwards receiving the

colours, which have been ground on a slab. The mixture is filtered through fine muslin. In making the tissue in large quantities the two ends of a piece of roll-paper are pasted together and the paper hung on two rollers; one of wood about 5 in. in diameter is fixed near the top of the room and the other over a trough containing the gelatin solution, the paper being brought into contact with the surface of the gelatin by being made to revolve on the rollers. The thickness of the coating is proportional to the rate at which the paper is drawn over the gelatin: the slower the movement, the thicker the coating. The paper is taken off the rollers, cut through, and hung up to dry on wooden laths. If it be required to make the tissue sensitive at once, 120 grains of potassium bichromate should be mixed with the ingredients in the above formula. The carbon-tissue when prepared should be floated on a sensitizing bath consisting of one part of potassium bichromate in 40 parts of water. This is effected by turning up about 1 in. from the end of the sheet of tissue (cut to the proper size), making a roll of it, and letting it unroll along the surface of the sensitizing solu- tion, where it is allowed to remain till the gelatin film feeis soft. It is then taken off and hung up to dry in a dark room through which a current of dry warm air is passing. Tissue

dried quickly, though not so sensitive, is more manageable to work than if more slowly dried. As the tissue is coloured, it is not possible to ascertain by inspection whether the printing operation is sufficiently carried out, and in order to ascertain this it is usual to place a piece of ordinary silvered paper in an actinometer, or photometer, alongside the carbon-tissue to ascertain the amount of light that has acted on it. There are several devices for ascertaining this amount, the simplest being an arrangement of a varying number of thicknesses of gold-beater's skin. The value of 1, 2, 3, &c, thicknesses of the skin as a screen to the light is ascertained by experiment. Sup- posing it is judged that a sheet of tissue under some one negative ought to be exposed to light corresponding to a given number of thicknesses, chloride of silver paper is placed alongside the negative beneath the actinometer and allowed to remain there until it takes a visible tint beneath a number of thicknesses equivalent to the strength of the negative. After the tissue is removed from the printing-frame — supposing a double transfer is to be made — it is placed in a dish of cold water, face downwards, along with a piece of Sawyer's flexible support. When the edges of the tissue begin to curl up, its surface and that of the flexible support are brought together and placed flat. The water is pressed out with an india- rubber squeezer or " squeegee " and the two surfaces adhere. About a couple of minutes later they are placed in warm water of about 90° to 100° F., and the paper of the tissue, loosened by the gelatin solution next it becoming soluble, can be stripped off, leaving the image (reversed as regards right and left) on the flexible support. An application of warm water removes the rest of the soluble gelatin and pigment. When dried the image is transferred to its permanent support. This usually consists of white paper coated with gelatin and made insoluble with chrome alum, though it may be mixed with barium sulphate or other similar pigments. This transfer-paper is made to receive the image by being soaked in hot water till it becomes slimy to the touch; and the surface of the damped print is brought into contact with the surface of the re- transfer-paper, in the same manner as was done with the flexible support and the carbon-tissue. When dry the retransfer-paper bearing the gelatin image can be stripped off the flexible support, which may be used again as a temporary support for other pictures. If a reversed negative be used the image may be transferred at once to its final support instead of to the temporary flexible support, which is a point of practical value, since single-transfer are better than double-transfer prints.

Printing with Salts of Iron. — Sir John Herschel and Robert Hunt entered into various methods of printing with salts of iron. At the present time two or three are practised, being used in draughts- men's offices for copying tracings (see Sun-copying),

Photo-mechanical Printing Processes. — Poitevin claimed to have

discovered that a film of gelatin impregnated with potassium bichromate, after being acted upon by light and damping, would receive greasy ink on those parts which had been affected by light. But Paul Oreloth seems to have made the discovery previous to 1854, for in his patent of that year he states that his designs were inked with printing ink before being transferred to stone or zinc. CM. Tessie de Motay (in 1 865) and C. R. Marechal of Metz, however, seem to have been the first to produce half-tones from gelatin films by means of greasy ink. Their general procedure consisted in coating metallic plates with gelatin impregnated with potassium ok ammonium bichromate or tri-chromate and mercuric chloride, then treating with silver oleate, exposing to light through a negative, washing, inking with a lithographic roller, and printing from the plates as for an ordinary lithograph. The half-tints by this process were very good, and illustrations executed by it are to be found in several existing works. The method of producing the plates, however, was most laborious, and it was simplified by A. Albert of Munich. He had been experimenting for many years, endeavour- ing to make the gelatin films more durable than those of Tessie de Motay. He added gum-resins, alum, tannin and other such matters, which had the property of hardening gelatin; but the difficulty of adding sufficient to the mass in its liquid state before

the whole became coagulated rendered these unmanageable. It at last occurred to him that if the hardening action of light were utilized by exposing the surface next the plate to light after or before exposing the front surface to the film and the image, the necessary hardness might be given to the gelatin without adding any chemical hardeners to it. In Tessie de Motay 's process the hardening was almost absent, and the plates were consequently not durable. It is evident that to effect this one of two things had to be done: either the metallic plate used by Tessie de Motay must be abandoned, or else the film must be stripped off the plate and exposed in that manner, Albert adopted the transparent plate, and his success was assured, since instead of less than a hundred impressions being pulled from one plate he was able to take over a thousand. This occurred about 1867, but the formula was not published for two or three years afterwards, when it was divulged by Ohm and Grossman, one of whom had been employed by Albert of Munich, and had endeavoured to introduce a process which resembled Albert's earlier efforts. The name of " Lichtdruck " was given about this time to these surface-printing processes, and Albert may be considered, if not the inventor, at all events the perfecter of the method. Another modification of " Lichtdruck " was patented in England by Ernest Edwards under the name of " heliotype."

Woodbury Type. — This process was invented by W. Woodbury about the year 1864, though we believe thaf J. W. Swan had been working independently in the same direction about the same time. In October 1864

a description of the invention was given in the Photographic News. Marc Antoine A. Gaudin claimed the principle of the process, insisting that it was old, and basing his pretensions on the fact that he had printed with translucent ink from intaglio blocks engraved by hand; but at the same time he remarked that the application of the principle might lead to important results. It was just these results which Woodbury obtained, and for which he was entitled to the fullest credit. Woodbury subsequently introduced certain modifications, the outcome being what is known as the " stannotype process," of which in 1880 he read a description before the French Photographic Society (see Process).

Photo-lithography. — Reference has been made to the effect of light on gelatin impregnated with potassium bichromate, whereby the gelatin becomes insoluble, and also incapable of absorbing water where the action of the light has had full play. It is this last phenomenon which occupies such an important place in photo- lithography. In the spring of 1859 E. J. Asser of Amsterdam produced photographs on a paper basis in printer's ink. Being anxious to produce copies of such prints mechanically, he conceived the idea of transferring the greasy ink impression to stone, and multiplying the impressions by mechanical lithography. Following very closely upon Asser, J. W. Osborne of Melbourne made a similar application; his process is described by himself in the Photographic Journal for April i860 as follows: "A negative is produced in the usual way, bearing to the original the desired ratio. ... A positive is printed from this negative upon a sheet of (gelatinized) paper, so prepared that the image can be transferred to stone, it having been previously covered with greasy printer's ink. The impression is developed by washing away the soluble matter with hot water, which leaves the ink on the lines of print of the map or engraving." The process of transferring is accomplished in the ordinary way. Early in i860 Colonel Sir H. James, R.E., F.R.S., brought forward the Southampton method ■ of photo-litho- graphy, which had been carefully worked out by Captain de Courcy Scott, R.E. The " papyrotype process " was published by Abney in 1870 (see Lithography and Process)..

Photographs in Natural Colours. The first notice on record of coloured light impressing its own colours on a sensitive surface is in the passage already quoted from the Farbenlehre of Goethe, where T. J. Seebeck of Jena (18 10) describes the impression he obtained on paper impregnated with moist silver chloride. In 1839 Sir J. Herschel {Athenaeum, No. 621) gave a somewhat similar description. In 1848 Edmond Becquerel succeeded in reproducing upon a daguerreotype plate not only the colours of the spectrum but also, up to a certain point, the colours of drawings and objects. His method of proceeding was to give the silver plate a thin coating of silver chloride by immersing it in ferric or cupric chlorides. It may also be immersed in chlorine water till it takes a feeble rose tint. Becquerel

preferred to chlorinize the plate by immersion in a solution of hydrochloric acid in water, attaching it to the positive pole of a voltaic couple, whilst the other pole he attached to a platinum plate also immersed in the acid solution. After a minute's subjection to the current the plate took successively a grey, a yellow, a violet and a blue tint, which order was again repeated. When the violet tint appeared for the second time the plate was withdrawn and washed and dried over a spirit-lamp. In this state it

produced the spectrum colours, but it was found better to heat the plate till it assumed a rose tint. At a later date Niepce de St Victor chlorinized by chloride of lime, and made the surface more sensitive by applying a solution of lead chloride in dextrin. G. W. Simpson also obtained coloured images on silver chloride emulsion in collodion, but they were less vivid and satisfactory than those obtained on daguerreotype plates. Poitevin obtained coloured images on ordinary silver chloride paper by preparing it in the usual manner and washing it and exposing it to light. It was afterwards treated with a solution of potassium bichromate and cupric sulphate, and dried in darkness. Sheets so prepared gave coloured images from coloured pictures, which he stated could be fixed by sulphuric acid (Comptes rendus, 1868, 61, p. 11). In the Bulletin de la Societe FranQaise (1874) Colonel St Florent described experiments which he made with the same object. He immersed ordinary or albuminized paper in silver nitrate and afterwards plunged it into a solution of uranium nitrate and zinc chloride acidulated with hydrochloric acid; it was then exposed to light till it took a violet, blue or lavender tint. Before exposure the paper was floated on a solution of mercuric nitrate, its surface dried, and exposed to a coloured image.

It is supposed — though it is very doubtful if it be so— that the nature of the chloride used to obtain the silver chloride has a great effect on the colours impressed; and Niepce in 1857 made some observations on the relationship which seemed to exist between the coloured flames produced by the metal and the colour impressed on a plate prepared with a chloride of such a metal. In 1880 Abney showed that the production of colour really resulted from the oxidation of the chloride that was coloured by light. Plates immersed in a solution of hydrogen peroxide took the colours of the spectrum much more rapidly than when not immersed, and the size of the molecules seemed to regulate the colour. He further stated that the whole of the spectrum colours might be derived from a mixture of two or at most three sizes of molecules.

In 1841, Robert Hunt published some results of colour-photography by means of silver fluoride. A paper was washed with silver nitrate and with sodium fluoride, and afterwards exposed to the spectrum. The action of the spectrum commenced at the centre of the yellow ray and rapidly proceeded upwards, arriving at its maximum in the blue ray. As far as the indigo the action was uniform, whilst in the violet the paper took a brown tint. When it was previously exposed, however, a yellow space was occupied where the yellow rays had acted, a green band where the green had acted, whilst in the blue and indigo it took an intense blue, and over the violet there was a ruddy brown. In reference to these coloured images on paper it must not be forgotten that pure salts of silver are not being dealt with as a rule. An organic salt of silver is usually mixed with silver chloride paper, the organic salt being due to the sizing of the paper, which towards the red end of the spectrum is usually more sensitive than the chloride. If a piece of ordinary silver chloride paper is exposed to the spectrum till an impression is made, it \flll usually be found that the blue aolour of the darkened chloride is mixed with that due to the coloration of the darkened organic compound of silver in the violet region, whereas in the blue and green this organic compound is alone affected, and is of a differ- ent colour from that of the darkened mixed chloride and organic compound. This naturally gives an impression that the different rays yield different tints, whereas this result is simply owing to the different range of sensitiveness of the bodies. In the case of the silver chlorinized plate and of true collodio-chloride, in which no organic salt has been dissolved, we have a true coloration by the spectrum. At present there is no means of permanently fixing the coloured images which have been obtained, the effect of light being to destroy them. If protected from oxygen they last longer than if they have free access to it, as is the case when the surface is exposed to the air.

A method devised by Gabrielle Lippmann, of Paris, by which the natural colours of objects are reproduced by means of interference, may be briefly described as follows: A sensitive plate is placed in contact with a film of mercury, and the exposure to the spectrum, or to the image of coloured objects to be photographed, is made through the back of the plate. On development, the image appears coloured when viewed at one particular angle, the colours being approximately those of the object. The necessary exposure to produce this result was very prolonged in the first experiments in which the spectrum was photographed, and a longer exposure had to be given to the red than was required for the blue. Lippmann at first employed collodion dry plates, prepared, it is believed, with albumen, and it required considerable manipulation to bring out the colours correctly. A. Lumiere used gelatin plates dyed with

appropriate dyes (orthochromatic plates); the exposure was much diminished, and very excellent representations were produced of all natural

colours. The main point to aim at in the preparation of the plate seems to be to obtain a very sensitive film without any, or, at all events, with the least possible, " grain " in the sensitive salt. A formula published by Lumiere seems to attain this object. Viewed directly, the developed images appear like ordinary nega- tives, but when held at an angle to the light the colours are vivid. They are not pure monochromatic colours, but have very much the quality of colours obtained by polarized light. It appears that they are produced by what may be termed " nodes " of different- coloured lights acting within the film. Thus in photographing the spectrum, rays penetrate to the reflecting mercury and are reflected back from it, and these, with the incident waves of light, form nodes where no motion exists, in a somewhat similar way to those obtained in a cord stretched between two points when plucked. In the negative these nodal points are found in the thickness of the silver deposit. When white light is sent through the film after the image has been developed, theoretically only rays of the wave- lengths which formed these nodes are reflected to the eye, and thus we get an impression of colour.

Action of Light on Chemical Compounds. Reference has been made above to early investigations on the chemical action of light. In 1777 Karl Wilhelm Scheele (Hunt's Researches in Light) made the following experiment? on silver salts: —

" I precipitated a solution of silver by sal-ammoniac; then I edulcorated it and dried the precipitate and exposed it to the beams of the sun for two weeks; after which I stirred the powder, and repeated the same several times. Hereupon I poured some caustic spirit of sal-ammoniac (strong ammonia) on this, in all appearance, black powder, and set it by for digestion. This men- struum dissolved a quantity of luna cornua (horn silver), though some black powder remained undissolved. The powder having been washed was, for the greater part, dissolved by a pure acid of nitre (nitric acid), which, by the operation, acquired volatility. This solution I precipitated again by means of sal-ammoniac into horn silver. Hence it follows that the blackness which the luna cornua acquires from the sun's light, and likewise the solution of silver poured on chalk, is silver by reduction. ... I mixed so much of distilled water with well-edulcorated horn silver as would just cover this powder. The half of this mixture I poured into a white crystal phial, exposed it to the beams of the sun, and shook it several times each day; the other half I set in a dark place. After having exposed the one mixture during the space of two weeks, I filtrated the water standing over the horn silver, grown already black; I let some of this water fall by drops in a solution of silver, which was immediately precipitated into horn silver."

This, as far as we know, is the first intimation of the reducing action of

light. From this it is evident that Scheele had found that the silver chloride was decomposed by the action of light liberating some form of chlorine. Others have repeated these experiments and found that chlorine is really liberated from the chloride; but it is necessary that some body should be present which would absorb the chlorine, or, at all events, that the chlorine should be free to escape. A tube of dried silver chloride, sealed up in vacuo, will not discolour in the light, but keeps its ordinary white colour. A pretty experiment is to seal up in vacuo, at one end of a bent tube, perfectly dry chloride, and at the other a drop of mercury. The mercury vapour volatilizes to a certain extent and fills the tube. When exposed to light chlorine is liberated from the chloride, and calomel forms on the sides of the tube. In this case the chloride darkens. Again, dried chloride sealed up in dry hydrogen discolours, owing to the combination of the chlorine with the hydrogen. Poitevin and H. W. Vogel first enunciated the law that for the reduction by light of the haloid salts of silver halogen absorbents were necessary, and it was by following out this law that the present rapidity in obtaining camera images, has been rendered possible. To put it briefly, then, the visible action of light is a reducing action, which is aided by or entirely due to the fact that other bodies are present which will absorb the halogens.

In the above we have alluded to the visible results on silver salts. It by no means follows that the exposure of a silver salt to light for such a brief period as to leave no visible effect must be due to the same effect, that is, that any of the molecules are absolutely reduced or split up by the light. That this or some other action takes place is shown by the fact that the silver salt is capable of alkaline development, that is, the particles

which have suffered a change in their molecules can be reduced to metallic silver, whilst those which have not been acted upon remain unaltered by the same chemical agency. Two theories have been offered to explain the invisible change which takes place in the salts of silver. One is based on the supposition that the molecules of the salt can rearrange their atoms under the vibrations caused by the ether waves placing them in more unstable positions than they were in before the impact of light took place. This, it is presumed, would allow the developer to separate the atoms of such shaken molecules when it came in contact with them. The other theory is that, as in the case of the visible effects of light, some of the molecules are at once reduced and that the developer finishes the disintegration which the light

has begun. In the case of the alkaline development the unaltered molecules next those primarily reduced combine with the reduced silver atom and again form an unstable compound and are in their turn reduced.

The first theory would require some such action as that just mentioned to take place and cause the invisible image formed by the shaking apart of the light-stricken molecules to become visible. It is hard to see why other unacted upon molecules close to those which were made unstable and which have been shaken apart by the developer should themselves be placed in unstable equilibrium and amenable to reduction. In the second theory, called the " chemical theory," the reduction is perfectly easy to understand. Abney adopts the chemical theory as the balance of unsubstantiated evidence is in its favour. There is another action which seems to occur almost simultaneously when exposure takes place in the absence of an active halogen absorbent, as is the case when the ex- posure is given in the air, that is, an oxidizing action occurs. The molecules of the altered haloid salts take up oxygen and form oxides. If a sensitive salt be briefly exposed to light and then treated with an oxidizing substance, such as potassium bichromate, potassium permanganate, hydrogen peroxide, ozone, an image is not developed, but remains unaltered, showing that a change has been effected in the compound which under ordinary circumstances is developable. If such an oxidized salt be treated very cautiously with nascent hydrogen, the oxygen is withdrawn and the image is again capable of development. 1

Spectrum Effects on Silver Compounds. — The next inquiry is as to the effect of the spectrum on the different silver compounds. We have already described Seebeck's (1810) experiments on silver chloride with the spectrum whereby he obtained coloured photographs, but Scheele in 1777 allowed a spectrum to fall on the same material, and found that it blackened much more readily in the violet rays than in any other. Senebiers experi- ments have been already quoted. We merely mention these

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have become the foundation of nearly all subsequent researches of the same kind. The effects of the spectrum have been studied by various experimenters since that time, amongst whom we may mention Edmond Becquerel, John William Draper, Alphonse Louis Poitevin, H. W. Vogel, Victor Schumann and W. de W. Abney. Fig. 1 is compiled from a cut which appeared in the Proc. Roy. Soc. for 1882, and shows the researches made by Abney as regards the action of the spectrum on the three principal haloid salts of silver. No. 7 shows the effect of the spectrum on a peculiar modification of silver bromide made by Abney, which is seen to be sensitive to the infra-red rays.

Effect of Dyes on Sensitive Films. — In 1874 Dr H. W. Vogel of Berlin found that when films were stained with certain dyes and exposed to the spectrum an increased action on develop- ment was shown in those parts of the spectrum which the dye absorbed. The dyes which produced this action he called " optical sensitizers," whilst preservatives which absorbed the halogen liberated by light he called " chemical sensitizers." A dye might, according to him, be an optical and a chemical sensi- tizer. He further claimed that, if a film were prepared in which the haloid soluble salt was in excess and then dyed, no action took place unless some " chemical sensitizer " were present. The term " optical sensitizer " seems a misnomer, since it is meant to imply that it renders the salts of silver sensitive to those regions of the spectrum to which they were previously insensitive, merely by the addition of the dye. The idea of the action of dyes was at first combated, but it was soon recognized that such an action did really exist. Abney showed in 1875 that certain dyes combined with silver and formed true coloured organic salts of silver which were sensitive to light; and Dr Robert Amory went so far as to take a spectrum on a combination of silver with eosin, which was one of the dyes experimented upon by J. Waterhouse, who had closely followed Dr Vogel, and proved that the spectrum acted simply on those parts which were absorbed by the compound. Abney further demonstrated that, in many cases at all events, the dyes were themselves reduced by light, thus acting as nuclei on which the silver could be deposited. He further showed that even when the haloid soluble salt was in excess the same character of spectrum was produced as when the silver nitrate was in excess, though the exposure had to be prolonged. This action he concluded was due to the dye.

Correct Rendering of Colours in Monochrome. — In Plate IV., fig. 14 the sensitiveness of a plate stained with homocol is shown, and it is evident that as it is sensitive throughout the visible spectrum there must be some

Agi + AgNCh on paper P. means of cutting off by a transparent screen so

much of the spectrum luminosity at different parts

AgCl + AgNCh on paper P. that evejy colour having the same luminosity to the

eye shall be shown on a negative of equal density.

P- When this is done the relative luminosities of all

colours will be shown by the same relative densities

D or in a print by different depths of greys. Abney

devised a sensitometer which should be used to

ascertain the colour of the screen that should be

employed. By proper means the luminosity of

the light of day coming through a red, a green, a

blue and an orange glass can be very accurately

r>. measured; if |-in. squares of these coloured glasses,

(‘ e, > together with a white glass of the same area, be

d. placed in a row and cemented on white glass, we

(le ‘) have a colour screen which we can make available

P. for finding the kind of light-filter to be employed.

This is readily done by reducing the luminosity of

the light coming through all the glasses to that of

the luminosity of the light coming through the blue

glass. If the luminosity of the blue be 5 and that of

Agl-f AgNCh in albumen …

Agl prepared in bath, treated with KI, washed, redipped in silver bath, developed with pyrogallic acid.

Grey AgBr in gelatin, developed alka- line or ferrous oxalate ….

Orange AgBr in collodion or gelatin, alkaline ferrous oxalate or acid developer.

Green AgBr in collodion, developed ferrous oxalate . . .

AgCl in-collodion, excess of AgN03 or NaCl present, ferrous citrate or acid development.

Agl-fAgBr, washed from AgN03

(I.e.)

D.

(I.e.)

D.

(I.e.)

D. (I.e.)

3 Agl + AgBr + AgNCb collodion, wet plate, acid or alkaline developer

Fig. I. — Spectrum Effects on Salts of Silver. [P. = print ; D. = developed ; I.e. = long exposure]. two for their historical interest, and pass on to the study of the the white light 100, then the luminosity of the former must be re

action of the spectrum on different compounds by Sir J. Herschel {Phil. Trans., 1840). He describes many experiments, which 'See Abney, "Destruction of the Photographic Image," Phil. Mag. (1878), vol. v.; also Proc. Roy. Soc. (1878), vol. xxvii.

duced to-ˆjof its original value, and so with the other glasses. The luminosity of the light coming through each small glass square can be made equal by rotating in front of them a disk in which apertures are cut corresponding to the reduction required. The

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Plate IlL

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XXL 4ˆ6

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10 15 20 ' 25 ' ' ' ' ' 86 ' ' ' ' 36

CONTINUOUS SPECTRUM TAKEN WITH THE ELECTRIC ARC.

FLUORESCENT SPECTRUM OF EOSIN.

10 15 20 25 30 ' ' ' 35

SPECTRUM OF VOLATILIZED LITHIUM AND SODIUM.

10 15

ABSORPTION SPECTRUM OF EOSIN.

30 35

GRADUATION SCALE ON HOMOCOL STAINED "SEED" PLATE.

GRADUATION SCALE ON UNSTAINED PLATE.

! i . •ifflW

IMPRESSED CONTINUOUS SPECTRUM.

unrri

15 20 25 80 ' 35 '40

SPECTRUM OF BRIGHT LINES OF METALS.

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blue glass, for instance, would not be covered by the disk at all, while opposite the white square the disk would have an aperture of an angle of i8°. When a plate is exposed behind the row of glass squares, with the light passing through the rotating disk, having the appropriate apertures for each glass, the negative obtained would under ordinary conditions, show square patches of very different opacity. A light-filter of some transparent colour, if placed in the path of the light, will alter the opacities, and eventually one can be found which will only allow such coloured light to be transmitted as will cause all the opacities in the negative to be the same. As the luminosities of the white light passing through the glasses are made equal, and as the photographic deposits are also rendered equal, this light-filter, if used in front of the camera lens, will render all coloured objects in correct monochrome luminosity. Another plan, based on the same principles, is to place segments of annuluses of Vermilion, chrome yellow, emerald green, French blue and white on a disk, and to complete the annuluses with black segments, the amount of black depending on the luminosity of the pigments, which can be readily measured. When the disk is rotated, rings of colour, modified in brightness by black, are seen, and each ring will be of the same luminosity. As before, a screen (light-filter) to be used in front of the lens must be found which will cause the developed images of all the rings to appear of equal opacity. It must be remembered that the light in which the object is to be photographed must be the same as that in which the

luminosity of the glasses or pigments is measured.

Action of the Spectrum on Chromic Salts. — The salts most usually employed in photography are the bichromates of the alkalis. The result of spectrum action is confined to its own most refrangible end, commencing in the ultra-violet and reaching as far as in the solar spectrum. Fig. 2 shows the relative action of

D CB A

No. I

No. 2

Fig. 2. — -The top letters have reference to the Fraunhofer lines; the bottom letters are the initials of the colours. The relative sensitiveness is shown by the height of the curve above the base-line.

the various parts of the spectrum on potassium bichromate. If other bichromates are employed, the action will be found to be tolerably well represented by the figures. No. 1 is the effect of a long exposure, No. 2 of a shorter one. It should be noticed that the solution of potassium bichromate absorbs those rays alone which are effective in altering the bichromate. This change is only possible in the presence of organic matter of some kind, such as gelatin or albumen.

Action of the Spectrum on Asphaltum. — This seems to be continued into and below the red, the blue rays, however, are the most effective. The action of light on this body is to render it less soluble in its usual solvents.

Action of the Spectrum on Salts of Iron. — The commonest ferric salt in use is the oxalate, by which the beautiful platinotype prints are produced. We give this as a representation (fig. 3) of

Ho. 3

N0.4

Fig. 3.— Same description as for fig. 2.

the spectra obtained on ferric salts in general. Here, again, we have an example of the law that exists as to the correlation between absorption and chemical action. One of the most remarkable compounds of iron is that experimented upon by Sir j. Herschel and later by Lord Rayleigh, viz. ferrocyanide of

potassium and ferric chloride. If these two be brushed over paper, and the paper be then exposed to a bright solar spectrum, action is exhibited into the infra-red region. This is one of the few instances in which these light-waves of low refrangibility are capable of producing any effect. The colour of this solution is a muddy green, and analysis shows that it cuts off these rays as well as generally absorbs those of higher refrangibility.

Action of Light on Uranium. — The salts of uranium are affected by light in the presence of organic matter, and they too are only acted upon by those rays which they absorb. Thus nitrate of uranium, which shows, too, absorption-bands in the green blue, is affected more where these- occur than in any other portion Of the spectrum.

Some salts of mercury, gold, copper, lead, manganese, molyb- denum, platinum, vanadium, are affected by light, but in a less degree than those which we have discussed. In the organic world there are very few substances which do not change by the continuous action of light, and it will be found that as a rule they are affected by the blue end of the spectrum rather than by the red end (see Photochemistry).

The following table gives the names of the observers of the action of light on different substances, with the date of publica- tion of the several observations. It is nearly identical with one given by Dr Eder in his Geschichte der Photo-Chemie.

Substance.

Observer.

Silver. Nitrate solution mixed with

chalk, gives in sunshine copies

of writing Nitrate solution on paper Nitrate photographically used

*Nitrate on silk *

Nitrate with white of egg. Nitrate with lead salts

Chloride

Chloride in the spectrum . Chloride photographically used . Chloride blackened ….

Iodide

Iodide by action of iodine (on

metallic silver). Iodide photographically used Iodide with gallic acid Iodide with ferrous sulphate . Chloride and iodide by chlorine

and iodine (on metallic silver).

Bromide

Bromide by action of bromine (on

metallic silver). Sulpho-cyanide ….

Nitrite …….

Oxide with ammonia .

Sulphate

Chromate . . . . .

Carbonate

Oxalate

Benzoate

Citrate

Kinate

Borate

Pyrophosphate …. Lactate

Date.

J. H. Schulze .

Hellot . . . Wedgwood and

Davy. Fulhame . Rumford . B. Fischer Herschel . J. B. Beccarius Scheele . Wedgwood Lassaigne . Davy . Daguerre .

Formiates

Fulminates

Sulphide by vapour of sulphur (on metallic silver).

Phosphide by vapour of phos- phorus (on metallic silver). Gold.

Oxide

Chloride on paper

Chloride on silk

Chloride in ethereal solution .

Chloride with ferrocyanide and ferricyanide of potassium.

Chloride and oxalic acid .

Chromate

Plate of gold and iodine vapour

Herschel . Talbot . . Hunt . Claudet

Balard Goddard .

Grotthus . Hess

Mitscherlich Bergmann . Vauquelin . Buchholz . Bergmann . Trommsdorf Vauquelin Henry and Plisson Rose

Stromeyer Pelouze and Gay

Lussac. Hunt . . . Hunt . . . Niepce.

Niepce .

Scheele . Hellot . Fulhame Rumford Hunt .

Dobereiner Hunt . . Goddard .

1727

1737 1802

1797 1798 1812 1839 1757 1777 1802

1839 1814

1839

1840 1841 1844 1840

1826 1840

1818 1828 1827 1779 1798 1800 1779

1793

1798

1829

1830 .

1830

1833

1844 1844 1820

1820

1777 1737 1794 1793 1844

1831

1844 1842

49 8

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[TECHNIQUE

Substance.

Platinum. Chloride in ether …. Chloride with lime

Iodide

Bromide

Cyanide

Double chloride of platinum and potassium.

Mercury. Oxide (mercurous)

Oxide

Oxide (mercuric) .... Oxide (more accurate observa- tions)

Chloride (mercurous)

Chloride (mercuric) . Chloride with oxalic acid . Sulphate . . ...

Oxalate (mercuric) Oxalate (mercurous) . Sulphate and ammonia (mercurous). Acetate (mercurous) . Bromide (mercuric) .

Iodide (mercurous)

Iodide (mercuric) . Citrate (mercuric) Tartrate and potassium (mercurous). Carbonate (mercuric) .

Nitrate

Sulphide (mercuric) .

Iron. Sulphate (ferrous) Chloride (ferric) and alcohol Chloride and ether Oxalate (ferric) . Ferrocyanide of potassium . Sulphocyanide .... Prussian blue . . . . _ . Ferric citrate with ammonium Ferric tartrate .... Chromate

Observer.

Copper. Chloride (cupric dissolved in

ether). Oxalate with sodium .

Chromate

Chromate with ammonium .

Carbonate

Iodide

Sulphate

Chloride (cuprous)

Copper plates (iodized)

Manganese.

Sulphate

Oxalate

Potassium permanganate Peroxide and cyanide of potas- sium

Chloride

Lead.

Oxide

Iodide

Sulphite

Peroxide

Red lead and cyanide of potas- sium

Acetate

Nickel.

Nitrate

Nitrate with ferro-prussiates . Iodide

Tin. Purple of cassius ….

Various Substances.

Cobalt salts

Arsenic sulphide (realgar) Antimony sulphide

Gehlen Herschel . Herschel .

Hunt . .

Dobereiner

Gay-Lussac and Thenard.

Davy .

Davy .

Abildgaard

Harup not till .

K. Neumann pre- viously to

Boullay

Bergmann .

Meyer .

Bergmann .

Harff . .

Fourcroy .

Garot . Lowig . Torosewicz Artus . Field . . Harff . . Carbonell and

Bravo Davy . Herschel Vitruvius .

Chastaing . Bestuscheff Klaproth . Dobereiner Heinrich . Grotthus . Scopoli Herschel . Herschel . Hunt . .

Gehlen

A. Vogel .

Date.

Hunt

A. Vogel . Kratoch Talbot . .

Brandenburg Suckow Frommberg Hunt .

Hunt .

Davy .

Schonbein

Gay-Lussac Hunt .

Hunt .

Hunt

Uncertain

Hunt . Sage . Suckow

1804 1840 1840

1844 1828

I8II

1812 1797 1797 1801

1739

1803 1776 1764 1776 1836 1791

1826 1828 1836 1836 1836 1836 1831

1812 1840

I B.C.

1877

1725

I782

1831

I808 I8l8

1783

I84O 184O

1844

1804

I8I3

1844

1859

I84I I84I

I8I5

1832

I824 I844

I844

1802 1850

■*1811*

1844

1844

1844

1844 1803 1832

Substance.

Observer.

Bismuth salts

Cadmfum salts . . 1 .

Rhodium salts

Vanadic salts

Iridium ammonium chloride . Potassium bichromate Potassium with iodide of starch Metallic chromates Chlorine and hydrogen .

Chlorine (tithonized) . Chlorine and ether Chlorine in water …. Chlorine and ethylene

Chlorine and carbon-monoxide Chlorine and marsh gas . Chlorine and hydrocyanic acid Bromide and hydrogen Iodine and ethylene . Cyanogen, solution of

Various other methyl compounds

Hydrocyanic acid …

Hypochlorites (calcium and po- tassium)

Uranium chloride and ether .

Molybdenate of potassium and tin salts.

Crystallization of salts under influence of light.

Phosphorus (in hydrogen, nitro- gen, &c.)

Phosphuretted hydrogen

Nitric acid

Hog's fat

Palm oil

Asphalt

Resins (mastic, sandarac, gam- boge, ammoniacum, &c).

Guaiacum

Bitumens all decomposed, all residues of essential oils.

Coloured extracts from flowers .

Similar colouring matters spread upon paper.

Yellow wax bleached

Eudoxia macrembolitissa (purple dye).

Other purple dyes

Oils generally …. Nitric ether …. Nicotine

Hunt . . .

Roscoe Dobereiner Mungo Ponton Becquerel . Hunt . . . Gay-Lussac and

Thenard. Draper Cahours Berthollet . . Gay-Lussac and

Thenard Davy . Henry . Serullas Balard . Faraday Pelouze and

Richardson, Cahours Torosewicz Dobereiner

Gehlen Jager .

Petit . Chaptal Dize Bockmann

A. Vogel Scheele . Vogel . Fier Niepce Senebier

Hagemann Daguerre .

Senebier Herschel .

Santonine

Pliny

Cole

Reaumur .

Senebier

Senebier

Henry & Boutron

Charlard. Merk . . .

Date.

1844

1874 1831 1838 1840

1843 1809

1842 1810

1785 1809

1812 1821 1827 1832 1821 1837

1846 1836 1813

1804 1800

1722 1788 1789 1800

1812 1777 1806 1832 1814 1782

1782 1839

1782

ˆ1842

1st cent. A. d 10th cent.

1684 1711 1782 1782 1836

1883

Effect of Hydrogen Peroxide on Sensitive Plates. — Dr W. J. Russell made a series of experiments on the effect of exposure of sensitive plates to the action of vapours and gases for long periods. It has long been known that contact of plates with such substances as wood caused a sensitive surface to show " fog " on development. By a somewhat exhaustive series of experiments, Russell showed that the probable cause of this fog is hydrogen peroxide, since substances which favoured its for- mation produced the same effect. This is somewhat remarkable, as this same substance will completely destroy the effect that light has had on a sensitive plate; indeed, it affords one way of destroying a light image on a sensitive collodion plate. The experiments of Russell give a warning to store exposed plates for brief periods. It appears that negatives wrapped in paraffin paper are secure from this danger.

The Application of Photography to Quantitative Measures. — In order to employ photography for the measurement of light it was necessary that some means should be devised by which the opacity of the deposit produced on the development of a plate could be determined. It is believed that in 1874 the first attempt was made by Sir W. Abney to do this. In the Phil. Mag. he showed how density could be measured by means of an instrument, the diaphanometer, he had devised, in which transparent

A

B

black wedges were used to make matches between the naked light and the sarr»e light after passing through the photographic opacity that had to be measured. In 1887, owing to the perfecting of the rotating sectors, which could be made to increase or diminish the apertures at pleasure during its rotation, the measurement of opacities became easy. The Rumford method of comparing the light through the deposit with the naked beam, using the sectors to equalize the illumination, was adopted, the deposit being placed between the light and the screen, the comparison light being a beam

reflected from the same light on to the screen.

Owing to the fact that photographic deposit scatters light more or less, the opacities measured by this plan were slightly greater than was shown when such opacities were to be used for contact printing. The final plan adopted by Abney was to place the part of the plate carrying the deposit to be measured behind a screen constructed as above. C D (fig. 4) is a dull black card with an aperture cut in it which may be of any desired shape. This aperture was covered with trans- parent paper, as was also a portion B, the same size as A, but pasted on the black card itself. Light thrown from u behind A would be matched with light FlG. 4. thrown on to B from the front when a

rod in the path of this last beam was made to prevent this light falling on A. When a portion of a plate bearing a deposit was placed behind and close to A, the light thrown on B had to be diminished by the sector till the two squares appeared equally bright and the aperture of the sector was noted and compared with that required when the deposit was removed.

With this screen accurate measures of printing densities can be made, and it can also be used in the determination of the com- parative photographic brightness of the light issuing from different objects. For instance, the relative brightness of the different parts of the corona as seen in a total eclipse can be readily determined if a " time scale " of gradation is impressed on the plate on which it is taken. Both scale and streamer can then be enlarged optically and thrown on the part of the screen A. The measures of the streamer densities can then be directly compared with the densities of the scale and the relative " photographic " brightness of the different parts of the streamer be ascertained by comparison with this scale also.

The same method of measurement was adopted in ascertaining quantitatively the sensitiveness of the spectrum of ordinary plates and of plates in which dyes are present. The figures on PI. IV show reproductions of plates which were exposed to the spectrum. No. I is a continuous spectrum taken with the electric light ; no. 7 is an impressed continuous spectrum; no. 8 shows the bright lines of metals; no. 3 the line spectrum of volatilized lithium and sodium to indicate the position of the spectrum colours. Nos. 4 and 2 are the absorption and fluorescent spectra of eosin. No. 5 is the graduation scale formed by a bromogelatin "Seed" plate stained with homocol, a cyanine derivative sensitive to the red; no. 6 is a similar scale formed by an unstained plate. The small numbers placed below the different bands show an empiric scale which is made to apply to each of them. The first step is to measure

o to so 30 40

Empiric Scale of the spectrum

Fig. 5.

the opacity of the gradation scale, next the opacity of the continuous spectrum at the various numbers of the empiric scale, and also the opacity of the other bands at the same scale numbers. The con- tinuous spectrum will give the sensitiveness of the plate to the different parts of the spectrum when the measures of its different opacities are compared with those of the scale of gradation, and a curve of sensitiveness can be plotted from these comparisons. It is evident that the measures of the other two bands will give us information as to the fluorescence and the absorption of the eosin. Fig. 5 shows the curve of opacity of the image of the spectrum at

its different parts, and also the curve of sensitiveness of the plate to the different parts of the spectrum. This last is derived from a comparison of the measured densities with those of the gradation scale.

Measurement of the Rapidity of a Plate.— The first attempt that was made to ascertain the rapidity of a plate was by Abney {Phil. Mag. 1874), who demonstrated that within limits the transparency of deposit varied as the logarithm of the exposure.

The last formula has been accepted for general use, though it is believed that it is not absolutely correct, though very approxi- mately true and sufficiently near to be of practical value. This belief is based on the further researches described below. 1

In 1888 Sir W. Abney pointed out that the speed of a plate could be determined by the formula T =E-M(logE+C) 2 , where T is the transparency, E is the exposure (or time of exposure X intensity of light acting), and C a constant. If the abscissae (exposures) are plotted as logarithms, the curve takes the same form as that of the law of error, which has a singular point, a tangent through which lies closely along the curve and cuts the axis of Y at a point which has a value of 2/VE. If the total transparency be unity, this ordinate has a value of 1-212, the singular point having a value of 0-606. The ordinate of the zero point of the curve will be where the tangent to the singular point cuts the line drawn at I -212. The difference between the measurements of this zero point for two kinds of plates {i.e. C in the formula) from the points in the abscissae marking the same exposure, will give the relative sensitiveness of the two plates in terms of log x. In 1890 Hurter and Driffield {Journ. Soc. Chem. Ind. Jan. 19, 1891) worked out a less empirical formula connecting the*

exposure E with the density of deposit, which in an approximate shape had the form D = ylog(E/»), where D is the density of deposit (or log l/T), i the " inertia " of the plate, T the transparency of the deposit. In the customary way a small portion of a plate was exposed to a constant light at a fixed distance and for a fixed time, and another small portion to the same light for double the time, and so on. By measuring the densities of the various deposits and constructing a curve, a large part of which was approximately a straight line, it was found possible, by the production of the straight portion to meet the axis of X, to give the relative sensitiveness of different plates by the distance of the intersection from the zero point L. (See also Exposure Meters, below, under § 1, Apparatus.)

Effect of Temperature on Sensitiveness. — In 1876 Abney showed that heat apparently increased, while cold diminished, the sensitiveness of a plate, but the experiments were rather of the qualitative than the quantitative order. In 1893, from fresh experiments, 2 he found that the effect of a difference in tempera- ture of some 40 C. invariably caused a diminution in sensitive- ness of the sensitive salt at the lower temperature, a plate often requiring more than double the exposure at a temperature of about — 1 8° C. than it did when the temperature was increased to +33 C. The general deduction from the experiments was that increase in temperature involved increase in sensitiveness so long as the constituents of the plate (gelatin, &c.) were unaltered. Sir James Dewar stated at the Royal Institution in 1896 that at a temperature of — 180° C. certain sensitive films were reduced in sensitiveness to less than a quarter of that which they possess at ordinary temperatures. It appears also, from his subsequent inquiry, that when the same films were subjected to the tempera- ture of liquid hydrogen (—252° C.) the loss in sensitiveness becomes asymptotic as the absolute zero is approached. Pre- sumably, therefore, some degree of sensitiveness would still be preserved even at the absolute zero.

Effect of Small Intensities of Light on a Sensitive Salt? — When a plate is exposed for a certain time to a light of given intensity, it is commonly said to have received so much exposure (E). If the time be altered, and the intensity of the light also, so that the exposure (time X intensity) is the same, it was usually accepted that the energy expended in doing chemical work in the film was the same. A series of experiments conducted under differing conditions has shown that such is not the case, and that the more intense the light (within certain limits) the greater is the chemical action, as shown on the development of a plate. Fig. 6 illustrates the results obtained in three cases. The exposure E is the same in all cases. The curves are so drawn that the scale of abscissae

1 Those applicable to the correction of star magnitudes as deter- mined by

photography have been verified and confirmed by Schwarzchild, Michalke and others.

3 Abney, Proc. Roy. Soc. 1893.

- *Abney, Proc. Roy. Soc. 1893, and Journ. Camera Club, 1893.*

is the intensity of the light in powers of —2, and the ordinates show the percentages of chemical action produced. If the chemical action remained the same when the intensity of light was reduced, E remaining the same, each of the curves would be shown as a straight line at the height of 100, which is the trans- parency of deposit with the unit of light. As it is, they show diminishing percentages as the light intensity is diminished.

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*o Scatter**

lit Ik 1 Intensities

of Light

Fig. 6. Thus, when the intensity of the light is reduced toˆV of the original, and the time of exposure is prolonged 64 times, the useful energy expended on a lantern plate is only 50 % of that expended when the light and time of exposure are each unity. In the cases to which the diagram refers, the light used was a standard amyl acetate lamp, and the unit of intensity taken was this light at a distance of 2 ft. from the plate, and the unit of time was 10 seconds. The lamp being moved to 16 ft. from the plate, gave an intensity of ˆrthe unit, and the time of exposure had to be increased to 640 seconds, so that E was the same in both cases. Further, it was found that when the times of exposure on different parts of the plate were successively doubled, light at a fixed distance being used for one series, and altered for a second series, the slopes of the curves of transparency (i.e. the gradation) were parallel to one another. This investigation is of use when camera images are in question, as the picture is formed by different intensities of light, not very different from those of the amyl acetate lamp, the time of exposure being the same for all intensities. The deductions made from the investigation are that with a slow plate the energy expended in chemical action is smaller as the intensity is diminished, while with a quick plate the variation is much less. As a practical deduction, we may say that to obtain proper contrast in a badly lighted picture it is advisable to use a slow plate.

Effect of very Intense Light on a Sensitive Salt. — Another investigation was made as to the effect of very intense light on sensitive surfaces. In this case a screen of step-by-step graduated opacities was made use of, and plates exposed through it to the action of lights markedly differ- ing in intensity, one being that of the amyl acetate lamp, another that of the arc light, and a third the light emitted from the spark of a Wimshurst machine. The exposures were so made that one of the

1 2 3 4- 5 G 7 °P ac i t i es produced on

t, , – . M … . the plate from exposure

Scale of Intensities in to each source of light

Powers Of 2 was approximately the

Fig. 7. same. The unit of

intensity of light is, of course, in each case widely different. The slope of the curve due to the spark light is less steep than that due to the arc light, and the latter, again, is much less steep than that due to the amyl acetate lamp. A further investigation was made of the effect of increasing the time of exposure when the intense light was diminished, and it was found that with all plates the useful chemical energy acting on a plate was least with the most intense light, but increased as the intensity diminished, though the time was correspondingly increased. This is the reverse of what we have recorded as taking place when a comparatively feeble light was employed. Further, it was proved that the variation was greatest in those plates which are ordinarily considered to be the most rapid. It follows, therefore, that there is some intensity of light when the useful chemical energy is at a maximum, and that this intensity varies for each kind of plate.

Intermittent Exposure of a Sensitive Salt. — The same investi- gator has shown that, if a total exposure is made up of inter- mittent exposures, the chemical action on a sensitive salt is less than it is when the same exposure is not intermittent. It was also proved that the longer the time of rest between the inter- mittent exposures (within limits) the less was the chemical action. We may quote one case. Exposures were first made to a naked light, and afterwards to the same light for six times longer, as a rotating disk intervened which had 1 2 apertures of 5 cut in it at equal intervals apart, and 720 intermittent exposures per second were given. The plate was moved to different distances from the light, so that the intensity was altered. The apparent loss of exposure by the intervention of the disk increases as the intensity diminishes, the ratios of the chemical energy usefully employed of the naked light exposure to that of the intermitting exposures being: —

For intensity 1 1 to -815

i 1 „ -500

tV 1 » -423

..1. .. ik 1 .1 ‘37°

These results appear to be explicable by the theoretical con- siderations regarding molecular motion.

Effect of Monochromatic Light of Varying Wave-lengths on a Sensitive Salt. — It has been a subject of investigation as to whether the gradation on a plate is altered when exposures are made to lights of different c'olours; that is to say, whether the shades of tone in a negative of a white object illuminated by, say, a red light, would be the same as those in the negative if illuminated by a blue light. Abney x announced that the gradation was different; and, quite independently, Chapman Jones made a general deduction for isochromatic plates that, except with a certain developer, the gradation, was steeper (that is, the curve shown graphically would be steeper) the greater the wave-lengths of the light to which the sensitive salt was subjected. For plates made with the ordinary haloid salts of silver Chapman Jones's deduction requires modification. When monochromatic light from the spectrum is employed, it is found that the gradation increases with wave-lengths of light which are less, and also with those which are greater, than the light whose wave-lengths has a maximum effect on the sensitive salt experimented with. Thus with bromo-iodide of silver the maximum effect produced by the spectrum is close to the blue lithium line, and the gradation of the plate illuminated with that light is less steep than when the light is spectrum violet, green, yellow or red. From the red to the yellow the gradation is much' the steepest. Whether these results have any practical bearing on ordinary photographic exposures is not settled, but that they must have some decided effect on the accuracy of three-colour work for the production of pictures in approximately natural colours is undoubted, and they may have a direct influence on the determination of star magnitudes by means of photography. Reproduction of Coloured Objects by means of Three Photo~ graphic Positives. — Ives's Process. — A practical plan of produc- ing images in approximately the true colours of nature has been devised by preparing three positives of the same object, one 1 Proc. Roy. Soc, 1900.

illuminated by a red, the other by a green, and the third by a blue light ; the images from these three transparencies, when visually combined, will show the colours of the object. This plan was scientifically and practically worked out by F. E. Ives of Phila- delphia, though in France and elsewhere it had been formulated, especially by Hauron Du Cros.

The following description may be taken as that of Ives's pro- cess: by the trichromatic theory of colour- vision every colour in nature can be accounted for by the mixture of two or three of the three-colour sensations,

red, green and blue, to which the eye is supposed to respond. Thus a mixture of a red and green sensation produces the sensation of yellow; of a green and blue, that of a blue-green; of red and blue, that of purple; and of all three, that of white. For the sensations we may substitute those colours which most nearly respond to the theoretical sensations without any material loss of purity in the resulting sensation. We must take the spectrum of white light as the only perfect scale of pure colours. It has been proved that the red sensation in the eye is excited by a large part of the visible spectrum, but with varying intensities. If, then, we can on a photographic plate produce a developed image of the spectrum which exactly corresponds in opacity and position to the amount of red stimulation excited in those regions, we shall, on illuminating a transparent positive taken from such a negative with a pure red light, have a representation of the spectrum such as would be seen by an eye which was only endowed with the sensation of red. Similarly, if negatives could be taken to fulfil the like conditions for the green and for the blue sensations, we should obtain positives from them which, when illuminated by pure green and blue light respectively, would show the spectrum as seen by an eye which was only endowed with a green or a blue sensation. Evidently if by some artifice we can throw the coloured images of these three positives on a screen, superposing them one over the other in their proper relative positions, the spectrum will be reproduced, for the over- lapping colours, by their variation in intensity, will form the colours intermediate between those used for the illumination of the positives. For the purpose of producing the three suitable negatives of the spectrum, three light-filters, through which the image has to pass before reaching the photographic plate, have to be found. With all present plates these are compromises. Roughly speaking, the screens used for taking the three negatives are an orange, a bluish-green and a blue. These transmit those parts of the spectrum which answer to the three sensations. When these are obtained an image of a coloured object can be reproduced in its true colours.

Abney devised sensitometcrs for determining the colours of the screens to be placed before the lens in order to secure the three- colour negatives which should answer these requirements. Their production depends upon the same principles indicated as neces- sary for the correct rendering in monochrome of a coloured object. When the sensitometer takes the form of glasses through which light is transmitted to the plate, the luminosities of the coloured lights transmitted are determined, and also their percentage composition in terms of the red, green, and blue lights, and thence are deduced the luminosities in terms of red, green and blue. For ascertaining what screen should be used to produce the red negative the luminosity transmitted through each glass is so adjusted that the luminosity of the red components in each is made equal by rotating a disk with correct apertures

cut out close to the row of glasses. This gives a sensitometer of equal red values. A coloured screen has to be found which, when placed in front of the lens, will cause the opacities of the deposit on the plate, corresponding to each square of glass, to be the same throughout. This is done by trial, the colour being altered till the proper result is obtained. In a similar way the " green " and " blue " screens are determined. Coloured pigments rotating on a disk can also be employed, as indicated in the paragraph on the correct rendering of colour in monochrome.

As to the camera for the amateur, whose plates are not as a rule large, all of the three negatives should be obtained on one plate, since only in this way can they be developed and the densities increased together. (For commercial work the negatives often cannot be taken on the same plate, as it would make the plate too large to manipulate.) The camera may be of an ordinary type, with a repeating back, bringing successively three different portions of the plate opposite the lens. It is convenient to have a slide, in front of which a holder containing the three screens can be fixed, which will then be close to the plate; such a one has been devised by E. Sanger-Shepherd. The light passes through them one by

one as the plate is moved into the three positions. The three exposures are given separately, after which the plate is ready for development. The three separate exposures are, however, a source of trouble at times, particularly in the case of landscapes, for the lighting may vary and the sky may have moving clouds, in which case the pictures would show variations which should not exist. Sanger-Shepherd has a " one-exposure " camera by which the three images are thrown side by side on the plate. Thus any movement in the picture affects all three negatives alike. Abney has also introduced a " one-exposure " camera which takes in a larger angle than that of Sanger-Shepherd. The next point is the exposures which should be given through each screen. This can be done by placing in front of the plate and extending its whole length a scale of gradation through which the light coming from a sun-illuminated white card passes, as well as through the screens. In the case of the three-exposure camera the times of exposure are varied till the densities of the image of the gradation appear the same in each of the three images. In the case of the one-exposure camera, the light reaching the plate through the screens is altered by cutting off with a shutter more or less of the lens used. As the plates employed for the purpose of the three-colour negatives must be sensitive to every colour, the ordinary dark-room light should be most cautiously used. If used at all, it should be very feeble and development must be carried out in a dish with a cover to it. The plate is manipulated in the usual way.

Joly's Process. — Professor J. Joly, of Dublin, in 1897 introduced a colour process by which an image in approximately natural colours could be

thrown upon a screen by an optical lantern, only one transparency being employed, instead of three, as in the Ives process. A " taking " screen was ruled with alternating orange, blue-green and blue lines -g-J-o" to 'rfrtr in. apart, touching one another and following one another in the above order. When such a screen was placed in front of a sensitive plate in the camera, and exposure made to the image of a coloured object, there were practically three negatives on the same plate, each being confined to the area occupied by lines of the same colour. The shades of colour and the depth of the colours used in ruling depended on the brand of plate. When a perfect triune negative was obtained, a transparency was made from it, and in contact with this was placed a screen ruled with lines the same distance apart, but of the colours corresponding to the three colour sensa- tions, namely red, green and blue. The red lines were made to fall on the image taken through the orange lines, the green on that of the blue-green, and the blue or violet on that of the blue. On the screen there are practically three differently coloured images shown by one transparency. The eye blends the different colours together and a picture is seen in approximately the correct colours of the original.

Autochrome. — A very remarkable process, founded on J. Joly's process, was introduced in 1907 by A. Lumiere et ses Fils of Lyons. Starch grains of very minute size, some of which were dyed with a red stain, a second portion with a green, and a third portion with a blue, are mixed together in such proportions that a fine layer of them appears grey when viewed by transmitted light. Under a magnifying glass the grains are coloured, but owing to the want of focus in the eye the colours blend one with the other. Such a layer is embedded on the surface of a glass plate in a waterproof vehicle, and a film of sensitive emulsion held in situ in some material, the composition of which has not been published, covers this layer. When such a plate is placed in the camera, with the back of the plate next the lens, the light passes through the coloured granules, and again we have three negatives on one plate, but instead of each negative being repre- sented by lines as in the Joly process they are represented by dots of silver deposit. Owing to the way in which the three- coloured film is prepared, it is evident that a positive taken from such a negative could not be backed with granules of the right colour; as the granules are placed at random in the layer. Lumiere, to overcome this difficulty, converted the negative into a positive in a very ingenious way. The plate was developed with pyrogallic and ammonia in the usual way, but instead of fixing it it was plunged into a solution of potassium permanganate and sulphuric acid. This dissolved all the silver that had been deposited during development and left a film of unaltered silver salt. On looking through the plate the colours of the coloured layer coming through the different dots where the silver was at

first deposited appeared in view, and the image was the image in colour of the object photographed. The plate after being washed was taken into the light and redeveloped with an alka- line developer, which converted the sensitive salt of silver to the metallic state. The image now consisted of black particles of silver and the coloured image. The plate was next fixed in hyposulphite of soda to remove any unreduced silver salt that might be left, and the picture after washing was complete. The coloured image so obtained is a very close representation of the true colours, but as the " taking " screen is the same as the " viewing " screen some little variation must result.

Positives in Three Colours. — Ives was the first to show that a transparency displaying approximately all the colours in nature could be produced on the same principles that underlie the three- colour printing. This he effected by printing each of the three negatives, produced for his triple projection process as already described, on gelatine films sensitized by bichromate of potash. Each of the three transparent films was dyed with a colour com- plementary to the colour of the light which he transmitted through the positives when used for projection. Thus the " red " positive he dyed with a blue-green dye, the " green " positive with a purple dye, and the " blue " positive with a yellow dye. These three films, when superposed, gave the colours of the original object. Sanger-Shepherd has made the process a commercial success (see Process) and produces lantern slides of great beauty, in which all colours are correctly rendered. Instead of using a dye for the " red " transparency, he converts the silver image of a positive image into an iron salt resembling Prussian blue in colour. (W. de W. A.)

II. — Photographic Apparatus

Photographic apparatus consists essentially of the camera with lens and stand, lens shutters, exposure meters, prepared plates for the production of negatives or transparencies, sensi- tive papers and apparatus for producing positive prints, direct or by enlargement. Besides these there are many subsidiary accessories.

Since the introduction of highly sensitive dry plates and their extended use in hand cameras, the art and practice of photo- graphy have been revolutionized. Numerous special forms of apparatus have been created suitable for the requirements of the new photography, and their manufacture and sale have become important industries. The value of the exports of photographic materials from the United Kingdom in 1906 was

£22,716. The most important improvement has been in the construction of anastigmatic lenses, which, having great covering power, flatness of field, and freedom from astigmatism, can be worked with very much larger apertures than was possible with the earlier forms of rectilinear or aplanatic lenses. The increased rapidity of work- ing thus gained has rendered it easy to photograph objects in very rapid motion with great perfection. This has encouraged the construction of the very light and compact hand cameras now so universally in use, while, again, their use has been greatly simplified by improvements in the manufacture of sensitive plates and films and the introduction of light, flexible, sensitive films which can be changed freely in daylight. The introduction in 1907 of Messrs Lumiere's " Autochrome " process of colour photography has also been a great advance, tending to popularize photographic work by the facility it offers for reproducing objects in the colours of nature.

The Camera. Historical. — The camera obscura (q.v.) was first applied to photographic use by Thomas Wedgwood between 1792 and 1802. No description of his camera is available, but it was probably one of the sketching cameras then in use. In 181 2 W. H. Wollaston found that by using a meniscus lens with a concave surface towards the object and the convex towards the screen, a diaphragm being placed in front, the projected image of the camera obscura was greatly improved in sharpness over a larger field. The first photographic lenses made by V. and Ch. L. Chevalier in Paris (1830-1840) were on this principle. The photographic camera in its simplest form is a rectangular box,

one end of which is fitted to carry a lens and the opposite one with a recess for holding the focusing screen and plate holders, these ends being connected by a rigid or expanding base-board and body, constructed to keep out all light from the sensitive plate except that passing through the lens. In 18 16 Joseph Nicephore Niepce, of Chalon-sur-Saone, for his photographic experiments made a little camera, or artificial eye, with a box six inches square fitted with an elongated tube carrying a len- ticular glass. There are now in the Chalon Museum cameras of his with an iris diaphragm for admitting more or less light to the lens; some with an accordion bellows, others with a double expanding rigid body for adjusting the focus. The iris dia- phragm was adopted later by Chevalier for his photographic lenses. In 1835 W. H. Fox Talbot constructed simple box cameras for taking views of his house on sensitive paper, and claimed them as the first photographs of a building {Phil. Mag. 1839, 14, p. 206). Fr. von Kobell and C. A. Steinheil, early in 1839, made a camera with an opera glass lens for taking land- scapes on paper. Later in 1839 J. W. Draper successfully used a camera for his daguerreotype experiments made of a spectacle lens, 14 in. focus, fitted into a cigar box. He also used a camera fitted with a concave mirror instead of a lens. Similar cameras

were constructed by A. T. Wolcott (1840) and R. Beard (1841) for reversing the image in daguerreotype portraits. They have also been recommended by V. Zenger (1875) and D. Mach (1890) for scientific work.

L. J. M. Daguerre's camera, as made by Chevalier in 1839 for daguerreotype, was of Niepce's rigid double body type, fitted with an achromatic meniscus lens with diaphragm in front on Wollaston's principle, the back part with the plate moving away from the lens for focusing, and fixed in its place with a thumb- screw. This expanding arrangement enabled lenses of different focal lengths to be used. With modifications cameras of this type were in use for many years afterwards for portrait and studio purposes. For work in the field they were found incon- venient, and many more portable forms were brought out, among them G. Knight's and T. Ottewill's single and double folding cameras (1853), made collapsible with hinges, so as to fold on to the base-board. Cameras with light bodies made of waterproof cloth, &c, also came into use, but these were superseded by cameras with collapsible bellows-body of leather, which, invented by Niepce, were used in France, in 1839, by Baron A. P. de Seguier and others for daguerreotype. The first record of them in England is, apparently, J. Atkinson's portable stereoscopic camera of parallel-side bellows form (Ph. Journ. 1857, 3, p. 261), which was soon followed by C. T. H. Kinnear's lighter conical form, made by Bell of Edinburgh (Ph. Journ. 1858, 4, p. 166). They have since been made in various patterns, conical, oblong and square, by P. Meagher, G. Hare and others, and are still, in modified forms, in general use as studio, field or hand cameras. When wet collodion plates were used many cameras were fitted with arrangements for developing in the field.

Information on these and other early cameras will be found in the photographic journals, in C. Fabre's Traiti encyclopidique de photographie, vol. i., and in J. M. Eder's Ausfiihrliches Handbuch der Photographie, 2nd ed., vol. i., pt. ii.

The distinctive feature of present day photography is the world-wide use of the hand camera. Its convenience, the ease with which it can be carried and worked, and the remarkably low prices at which good, useful cameras of the kind can be supplied, concurrently with improvements in rapid sensitive plates and lenses, have conduced to this result. It has also had a valuable educational influence in quickening artistic perception and scientific inquiry, besides its use in depicting scenes and pass- ing events for historical record. Small portable cameras had been made by B. G. Edwards (1855), T. Scaife (Pistolgraph, 1858), A. Bertsch (i860), T. Ottewill (1861), and others, but it was not until rapid gelatin dry plates were available in 1881 that T. Bolas brought out his " detective " camera (Ph.

Journ. 1881, p. 59). It consisted of a double camera (one as finder, the other for taking the picture) enclosed in another box, suitably covered, which also contained the double-plate carriers and had apertures

in front of the viewing and taking lenses. In another form the finder was omitted. A month later A. Loisseau and J. B. Germeuil-Bonnaud patented an opera glass camera. Various forms of portable magazine cameras followed, among them A. Pumphrey's " Repeating Camera " (1881), W. Rouch's " Eureka " (1887), R. Krugener's camera (book form, 1888), and others in collapsible or box forms disguised as books, watches, &c, but they did not come into general use before 1888, when the East- man Company of Rochester, U.S.A., brought out their very portable roll-film cameras, now known under the trade name of " Kodak." The manufacture of these and other light hand cameras has since become a very important and flourishing industry in Great Britain, Germany, France and the United States. It is noteworthy that the most modern form of hand camera, the reflex, goes back to an early type of portable camera obscura, figured by Johann Zahn in 1686, in which a mirror was used for reflecting the image on to a horizontal focusing screen, At the same time reversing it. The first photographic camera on this principle was T. Sutton's (i860), which has served as a basis /or many subsequent developments. A. D. Loman's (1889) and R. Krugener's (1891) were early examples of the hand camera type, but great improvements have since been made.

Modern cameras differ so much in details of improved construction that only a few of the more important requirements can be noticed. A camera should be well and strongly made of seasoned wood or of metal, perfectly rigid when set up, to avoid any shifting of the axis of the lens in respect to the sensitive plate. The front and back of the camera should normally be vertical and parallel, and the axis of the lens perpendicular to the centre of the plate, but arrangements are usually made by vertical and lateral adjustments on the camera front for raising the lens to take in less foreground or vice versa, or for moving it right or left, the latter becoming a vertical movement when the camera has to be turned on its side. In the Adams " Idento'" camera the lens and finder can be rotated together on the rising front according as the camera is used horizon- tally or vertically, the finder showing in either case the identical view projected on the plate. The best modern field cameras are fitted with a swing-back or swing-front and sometimes with both. A swing-back is necessary for bringing back the plate to the vertical position, so as to prevent convergence of vertical lines, when the camera has to be tilted. A rising swing-front, in which the lens is tilted, answers the same purpose, provided the camera is kept level. If further

tilting is necessary, when taking high buildings &c, the swing-back and front may both be required, but must be kept vertical and parallel and the effect is that of an abnormal rising front. Many modern cameras are fitted with a double rising front. The vertical and side swings are also useful for equalizing the definition of objects at different distances from the camera, but they alter the perspective. These swing-movements should

Creferably be round the central horizontal or vertical axis of the ack or front, but are frequently effected by simple inclination of the back or lens front on a hinge. When the rising front is used a lens of extended covering power is desirable, and it may be neces- sary to stop it down to obtain good definition over the extended area of the picture. A slight inclination of the lens may also be useful in readjusting the focus. The camera and plate carriers must be perfectly light-tight and all inner bright surfaces made dead black to prevent reflections from bright spots being thrown on the plate. The black varnish used, preferably of shellac and lampblack in spirit, must have no deleterious effect on the plates. Although the weight and bulk are increased it is convenient to have the camera square and fitted with a reversible back, so that the greatest length of the plate may be horizontal or vertical, as desired. Many cameras are fitted with revolving backs to be used in either position. In some French cameras the back part of the camera with the bellows is reversible, to be used upright or horizontal.

Focusing. — The earlier cameras were focused by drawing out the back and clamping it with a thumb-screw working in a slot in the base-board. When bellows cameras were introduced they were focused by an endless screw, and these are still used for large copy- ing cameras. Most modern cameras are fitted with rack and pinion movements working either in front or at the back of the camera or both. Many hand cameras, requiring to be brought to focus at once, are fitted with studs (infinity catches) which fix the front in focus for distant objects, nearer distances being noted on an engraved scale attached to the base-board. Such scales should be verified by measurement. In hand cameras with fixed infinity focus, the necessary adjustments for distance of near objects are made on the lens mount. The focusing screen may be ruled with parallel cross lines for purposes of measurement, and as a check on the vertically of the camera when photographing buildings or other objects with vertical lines. The distance of the lens from the focus- ing screen and from the sensitive plate in the dark slide must coincide exactly. This can be tested by measurement or by focusing a

bright, well-defined object on the screen and then on a ground- glass plate placed in each of the slides to be examined. A level or other means of showing that the camera is level and the plate vertical should be attached to the camera, also a view meter or finder, showing the exact extent of the

*picture on the focusing glass. In the view meter the picture is viewed directly through a pin-hole mounted at the back of the camera as it appears in a frame with cross wires on the rising front, adjusted to the size of the plate and the **>cus of the lens. Finders are practically small reflex cameras, and a reduced image is seen reflected from a mirror or prism. A rectangular concave glass mounted on the camera is also a con- venient form, it can be combined with a mirror for vertical observa- tion, and in Watson's new form is also arranged as a level and telemeter (B. J. A. p. 724, 1908). The image seen in the finders should correspond exactly with that on the plate. When the rising front is used special arrangements have to be made to ensure the correspondence of the images in the finder and on the ground- glass. This is done in the " Adams Identoscope " (1908), which is fitted to the swing front and adjusted by a lever to follow the movement of the lens.*

Plate-holders or Dark-slides. — The dark-slides or backs, holding sensitive plates, are made either single or double, the former usually for wet plates, the latter for dry plates. The ordinary book-form double dark-slide has been in use since the early days of calotype paper negatives, and contains two plates separated by a blackened metal plate; three of them usually form a set, the shutters being numbered I to 6, the odd numbers on the opening side. Inner frames can be used for smaller plates if desired. The slides should fit easily into the camera and the shutters run smoothly out and in. They must be perfectly light-tight, the corner joints, the hinges in the shutters, and the openings in the sides and top of the book- form slides are all weak points requiring occasional careful examina- tion or protection by metal plates. The shutters of dark-slides are either jointed or solid and removable; the former is perhaps the more convenient, but both forms may become liable to let in light. Various forms of solid slides, single and double, are now made in wood or metal, or of wood for the frame and metal for the shutters; they are lighter, more compact and less liable to admit light to the plates. In some cases one slide can suffice for the exposure of several plates or stiff films, enclosed in separate envelopes, as in the " Wishart-Mackenzie " slide, the " Victrix " and other similar ones, or contained in a single packet, as in the " Premo Filmpack," and similar arrangements which enable twelve thin celluloid films to be placed in the camera, exposed one after the other, and removed again safely in daylight, the pack being replaced, if necessary, by another. The packets of films are made of light cardboard, and effect a great saving of bulk and weight (fig. 1). Roll- holders are also a convenient way of carrying sensitive celluloid films in lengths of six or twelve exposures, rolled on spools, which can be changed in daylight. Changing boxes for holding a. reserve of plates or cellu- loid films in sheaths, are

used with some magazine and other cameras. They are arranged to fit on

the camera in place of the dark-slide and the plates are changed automatically so that exposed plates are placed in order successively at the back, a fresh plate going forward for exposure and the number of the exposure being recorded at the same time.

Studio cameras, for portraiture, are usually of the square bellows type, of solid construction, to take large and heavy lenses; adjustable from front and back with rack and pinion movements, to enable long or short focus lenses to be used, with extra extension for copy- ing or enlarging. They are generally fitted with repeating backs, allowing two or more exposures to be made on one plate. The backs are square or reversible, so that the plates can be used up- right or lengthways, and are fitted with double swing movements at the back. When single dark slides are used they are best fitted with a flexible shutter to avoid jerking and movement of the camera. For portraiture they are mounted on solid pillar stands, being raised or lowered with an endless screw or rack-work, and the table-top usually has vertical and horizontal angular move- ments. Large cameras with long extension for copying purposes are made in many forms with special arrangements for the various photo-mechanical processes, and are mounted on substantial table-stands with screw adjustments for obtaining the various motions above noted, and also a rectilinear traversing motion right or left. All these stands should be absolutely rigid and free from tremor. Process cameras are, however, sometimes mounted,

Fig. I. — Premo Film-pack.

Sinclair Folding Camera.

together with the copying board, on swinging stands, to avoid the effects of vibration.

Portable and field cameras include cameras of the Hare and Meagher types for outdoor work and general purposes on plates 15 in. X 12 in. to 85 in. X 6§ in., and m lighter forms from 6J in. X 4! in. to 4J in. X 3i in. For general purposes they are usually made with square bellows and fokling tail-board, rather more sub- stantially than those with conical bellows intended for outdoor work. There are many patterns, the principal modern improve- ments in field cameras being swinging fronts, tripod head and turn- table in the base-board, double and sometimes triple extension movements from the back and front for long or short focus lenses, and the use of aluminium for some of the metal-work. They are fitted with a

focusing screen and are intended for use on a tripod stand, though some of the smaller sizes of the modern light hand or stand cameras can be used as hand cameras with finders. The plates are carried in the usual dark-slides, but the smaller sizes, from half-plate downwards, can be fitted with roll-holders for flexible films, or with film packs or other daylight changing arrangements. Folding and Hand Cameras. — Folding cameras form a class of modern portable cameras which have many conveniences for hand

or stand work from quarter-plate to 7 in. X 5 in. They may have all the fittings of a stand camera and be made to take glass plates, flat or roll films, but have the advantage of forming when closed a convenient package enclosing cam- era, lens and shutter, all in position for immediate use when opened out (fig. 2). Most of them are fitted with focusing glass and finders, and may focus by scale in the same way as hand cameras. With an ap- paratus of this kind on a light stand any class of ordinary indoor or outdoor. work can be undertaken within the size of the plate, and the extension of the bellows, which should be quite double the focus of the lens.

The multiplicity of forms and arrangements of hand cameras makes it difficult to classify them into distinct types; but they may be mainly divided into box and folding cameras, and further into (a) cameras with enclosed changing magazines for plates or flat films; (b) with enclosed roll film on spools; (c) with separate changing magazines, changing boxes or roll-holders; (d) 'with single, double or multiple plate carriers or film-packs. Most cameras that will take glass plates in the ordinary plate-holders will take cut films in suitable sheaths or can be fitted with envelope slides, film-packs or roll-holders. The normal size for hand cameras is the quarter-plate (4} in. X 3l in.) , or the continental size 9X12 cm. ; 5 in. X 4 in. is also a popular size, and cameras for the post-card size, 5! in. X 35 in. or 15 X 10 cm. have been largely adopted. Smaller sizes are also made for lantern plates and for the lighter pocket cameras, some in the form of stereoscopes, field-glasses or watches, as in the " Ticka," but the pictures are small and require enlarging. Hand cameras are constructed on the same principles as stand cameras, but, being specially intended for instantaneous work, they are simplified and adapted for rapid focusing and exposing. The focusing screen is superseded or supplemented by finders arranged to show the limits of the subject on the plate, the focus being ad- justed by the infinity catches and focusing scales above noticed. Swing-backs and fronts are often dispensed with, but are desirable adjuncts, and a rising and falling front particularly so. Lenses of fairly large aperture, jr/6 to //8, and good covering power, preferably of the anastigmatic type, or a rapid aplanat, should be used, but for very rapid work anastigmats working from //4 to //6 will be more useful. Hand cameras can also be fitted with telephoto objectives of large aperture. Some cheap hand cameras are fitted with single landscape lenses or aplanats working about fill or lower, but the

want of intensity limits their use to well-illuminated subjects. Shutters of the between-lens type are now generally used in hand cameras, and for ordinary purposes should give fairly accurate exposures from ˆ to j'j of a second or less and also time exposures. Some central shutters are speeded for shorter exposures to shi of a second, but for these focal plane shutters are preferable, and for the more rapid exposures to jjVti of a second and less are necessary. The shutter should be efficient, regular in action, and readily released by gentle pressure, pneumatic or otherwise. Mechanism for automatically changing plates or films in hand cameras of the box magazine type must be certain in action, simple and not readily put out of order, special care being taken to avoid rubbing or abrasion of the plates in changing or transport. In changing plates or films the number of plates exposed should be recorded automatically, and duplicate exposures prevented as

[APPARATUS

A circular level placed near the finder is

far as practicable. useful.

The choice of a hand camera depends upon the circumstances in which it is to be used, and the purpose for which it is principally required. For general work and with the modern facilities for carrying and changing plates and films in daylight, the numerous folding hand or stand cameras for plates, flat or roll films, with full adjustments, will be found most useful. Box or magazine cameras in which a supply of cut films or plates can be carried, changed mechanically, and exposed rapidly in succession, are convenient, but their use is limited and they are liable to get out of order. A third class are the reflex and other hand cameras with focal plane shutters for specially rapid instantan- eous work as noticed below. There are two types of light folding hand or stand cam- eras, specially adapted for hand camera work-ˆ-those made for taking glass plates and cut films, and the fold- ing pocket Kodak or other roll – film cameras. The former are now made of very light construction with mahogany or metal bodies, wooden or aluminium base- boards, thin metal dark- slides (fig. 3). The cameras of the pocket Kodak type are of similar construction, but made to take roll films on spools, or with an attach- ment for focusing glass and dark-slides for taking plates and cut films. Attached to a sling-strap the quarter-plate size can be quite conveniently carried in a side-pocket. Watson's " Deft " folding camera is fitted with a focal plane shutter (fig. 4). The " Selfix carbine " camera has a self-erecting front bring- ing the lens at once into position for use on opening out. Those fitted with lenses of fairly large aperture, double extension, and rising and fall- ing fronts are to be preferred. Of box or magazine cameras there is an immense variety. In

some the lens is fixed in focus for all objects within a certain distance, in others it is adjusted by a focusing scale on the lens or by an extending front. Some have a single magazine, others two or more. Some take only glass plates, others plates or cut films. All of them are, however, self-contained and ready for immediate exposure. One of the earliest forms of single magazine cameras, still in use, as in the " Eureka " and " Yale," is the " bag," in

Fig. 3. — Ernemann's Pocket Camera.

Fig. 4.— The " Deft " Folding Focal-plane Camera.

Fig. 5.-

-Double-magazine Box Camera.

Fig. 6. — The Verascope, Richard.

which a supply of plates or films in sheaths, is kept in a magazine behind the camera, ready for exposure, the plates as exposed being lifted with the fingers into a bag or expanding chamber above the magazine and placed behind the rest of the plates at the back, a fresh plate taking its place in front. In some forms the magazines are removable and replaceable by others. The arrange- ment is simple and effective, but the bag, usually made of soft leather or cloth, is liable to wear and puncture, and may make dust. The cameras with double magazines in which unexposed plates are kept in one recess and transferred successively after exposure to a second recess are more complicated, and many

ingenious devices have been invented for effecting the change (fig- 5)- Some forms are effective and popular on account of their compactness and readiness for immediate exposure, but there is always a risk of the mechanism failing, and care has to be taken in charging them to lay the plates truly in their places. The very handy binocular cameras, or photo-jumettes, of which the " Vera- scope " (fig. 6) is a type, are of this class, and have additional

Fig. 7. — Beck's Dai-Cornex Daylight-loading Camera, magazines. So also are hand cameras of R. and J. Beck's " Frena " type, specially constructed for using stiff celluloid films. The films are notched on two sides and

packed in bundles alternately with cards similarly notched. The pack of films and cards is placed in a magazine at the back of the camera, and by the movement of

a lever, after exposure, the exposed film and its following card are released, and by turn- ing the camera down are dropped into a second re- ceptacle. A " folding Frena " is now made as a folding camera with attached maga- zine for films, without which it can be used separately for plates. R. and J. Beck's new " Dai-Cornex" is a great im- provement in this form of camera, being a daylight- loading box magazine camera for plates, the plates being packed in a bundle of ridged , „,,.,,,- sheaths, so that they are

Fig. 8.— Watsons Vnl Camera. qu i te protected from light and can be put into or taken out of the camera in full daylight. In other respects it resembles other magazine cameras (fig. 7). Another useful magazine camera is the " Zambex," carrying either plates or films, held in skeleton frames in envelopes which can be loaded or unloaded in daylight, and are kept ready for use in the back of the camera and exposed consecutively. For work in which speed is of primary importance hand cameras fitted with very rapid lenses and focal plane shutters are necessary, and several forms of portable collapsible cameras of this kind are now available, such as the Goerz-Anschiitz, Zeiss's " Palmos," Watson's " Vril " (fig. 8), Adams, " Idento," &c, and are lighter and more portable than the reflex cameras. Hand cameras are generally fitted with screw-bushes for mount- ing on a tripod stand when time ex- posures are wanted. The light folding wooden or aluminium stands noted below are specially suitable.

Twin-lens and Reflex Cameras. — For photographing animals, objects in motion,

p IG q Camera fitted public functions, &c, it is important to

with Twin Lenses, section have the means of watching the movement

to show working.' t'" tne critical moment of exposure

u j f c j arrives. For this it is convenient to

a, Hood ot hnder. have camera fitted with twm i enses

b, Ground glass screen. working in two separate compartments (fig. 9) or more simply with a mirror throwing a full-sized unreversed image of the object from the lens on to the focusing screen (fig. 10). With the former, which has the advantage that the image is seen before, during, and after exposure, the lenses must be of

exactly equal focus and focused together by the same motion of the rack-work, the object being viewed on the focusing screen of the upper compartment, and the plate kept ready in the lower

to be exposed when desired. Binocular hand cameras are also made on this principle, one compartment serving for focusing, the other holding lens and plates. Stereoscopic cameras are another form of twin-lens cameras, and are usually made for also taking single panoramic pictures.

In reflex cameras only one lens is necessary, though two are con- venient, and can be used somewhat as in fig. 9. They generally consist of a cubical box camera containing a movable mirror facing the lens at an angle of 45 and throwing up the image projected from it on to a horizontal focusing screen, on which it is viewed through a flexible hood which folds down in the upper part of the camera when not in use (fig. 10). In order to get the greatest rapidity of exposure a focal-plane shutter is generally fitted, and by a single movement of the release the mirror is smoothly lifted and the plate exposed simultaneously. They should be fitted with anastigmatic lenses working at large apertures for very rapid work. In some forms the lens is fixed, but usually there is a front bellows extension for long-focus lenses, with rising and falling front, to which swing motion may be given, a swing-back not being gener- ally used with the focal plane shutter. In the " Ernex " camera E. Human has made an arrangement by which the camera back, horizontal viewing screen and reflector are made to swing simul-taneously, by a rack and pinion movement. They may also have reversing or revolving backs for quickly changing the position of the plate. 5 in. X 4 in. and 3i in. X 4j in. are the usual sizes of the plates, but larger and smaller sizes are also available. These cameras require the best workmanship and perfect mechanism for successful working and freedom from any jarring movement in releasing the shutter or mirror. The focusing screen must also be in accurate register with the focus of the lens on the plate. Those forms in which the image can also be viewed at the height of the eye, as in the Graflex (fig. io), are preferable. Al- though reflex cameras are rather heavy and bulky as hand cameras, they have many advantages over the ordinary hand camera with finder and focusing scales for the purpose of the press photographer, the naturalist and others, in ob- serving and recording very rapid movements, and have come into very general use for such purposes. They permit the accurate focusing of a full- sized image on the ground- glass up to the moment of exposure, especially useful when lenses of long or short focus are required and when the rising or swing front is in use. The aspect of this image on the ground-glass is also a great aid in the selection and*

Fig. 10. — Reflex Camera,

a, Lens.

B, Mirror.

c, Ground-glass.

D, Plate.

E, Supplementary mirror.

placing of the subject and in judging the exposure required for it. They practically have all the advantages of a stand camera and can be used as such on a stand for subjects requiring prolonged exposure. They are also coming into increasing use in studio work for portraits of children, &c. Their use and adjustments are discussed by G. E. Brown in the British Journal Almanac for 1909. Panoramic Cameras. — Many so-called " panoramic " cameras have been introduced from time to time, among them T. Sutton's (1861), and J. R. Johnson's " Pantascopic " (1864), but did not

c, Mirror.

D, Viewing lens.

E, Working lens.

F, Shutter.

G, Focusing pinion. h, Plate carrier.

1, Plate.

Fig. 11. — Section of " Al- Vista " Panoramic Camera.

come into general use till the use of curved surfaces of celluloid film enabled such cameras of convenient size and weight to be put on the market. They are on the same principle as one made by F. von Martens in 1845 for curved daguerreotype plates, and cover- ing an angle of 150°. P. Moessard's " Cylindrographe " of 1889 was the first of the modern type. It consists of a semi-circular

Fig. 12. — " Al-Vista " Panoramic Camera, closed.

camera, the front of it formed of light-proof cloth and the back by the curved flexible carriers. The lens is fitted on a vertical axis, so that the nodal point of emergence remains motionless, and is revolved round "it by means of a handle worked by hand and carry- ing a view meter. The illumination of the image is regulated by an adjustable vertical slit in a tube attached to the lens inside the box, and by altering the rate at which the lens is revolved. The pictures taken embrace less than 180°. The apparatus folds together and is quite portable; it is fully described in Moessard's Le Cylindrographe (Paris, 1889). The " Al-Vista " (1901) and the " Panoram Kodak " (1900) are on the same principle, but arranged as roll-holder hand cameras, in two sizes, carrying film for several exposures, 7 in. X 2j in. or 4 in. X 12 in. They work instanta- neously, and by means of a clock-spring the lens rotates rapidly over a half-circle when released. The angle of view is about 120

(figs. II and 12). The views taken with this kind of camera are some- times disappointing, on account of the develop- ment of cylindrical per- spective on a plane sur- face causing apparent dis- tortion. This distortion is avoided in Carl Zeiss's " Palmos Panoram " camera for plates 6J in. X 3i in., fitted with " Tes- sar " lens and focal plane shutter, and other similar cameras which can be used for stereoscopic or single pictures. Other more elaborate instru- ments driven by clockwork have been made for making a complete tour of the horizon. Among them C. Damoizeau's " Cyclographe," which can be used with lenses of different foci and takes the pictures on a roll-film, which is unrolled as the instrument revolves on its axis, the lens also rotating on its nodal point of emergence; and thus the image always remains sharp (Bull. Soc. Franc, d. Phot.,

1 891, p. 183). Commandant A. Daubresse has improved on Moessard's apparatus, by placing the lens vertically between two right-angled prisms, the upper of which receives the image and projects it through the lens on to the lower prism, from which, by rotation of the system on the vertical axis, it is projected on to a cylindrical film through an angle of 360 (Ibid. 1906, p. 430; E. Jb.,

1907, p. 91). The " Periphote " and Ernemann's " Rundblick " camera are improved forms (£. Jb., 1908, p. 322).

Many early forms of panoramic cameras are described in B. J. A.

1892, p. 517. Colonel R. W. Stewart's " Panoram " (1893), A. Chevalier's " Photographic Plane Table," J. Bridges Lee's " Photo-Theodolite " (1894), and similar cameras fitted with telescopes, levels and divided circles, are

instruments of precision suitable for photographic surveying. Improved instruments for topographical surveying with stereo-photographic apparatus, on the principle worked out by Dr C. Pulfrich, of Messrs Zeiss & Co., in his stereo-comparator (1903), are being practically developed, and much information regarding them will be found in papers by E. Dolezal and others in J. M. Eder's Jahrbiicher, 1903 to 1908; also a paper by Lieut. F. V. Thompson in Geographical Journal,

1908, xxxi. 534.

Cameras for Three-Colour Photography. — Many forms of camera have been constructed for making the three negatives required

fortrichromatic photography. They fall into two types: (1) those with a repeating back fitted w'Ji three colour-screens or filters — red, green and violet — through which the colour impressions are made suc- cessively with one lens upon a single colour-sensitive plate, as in the Sanger-Shepherd system. The colour-screens are placed immedi- ately in front of the sensitive plate in the repeating back, which is moved on for each exposure. In a more recent form, by the same Fig. 13. — Diagram of Camera maker, the three images are taken for Three-colour Photography, on the sensitive plate with one

exposure. The camera is divided into three compartments, and fitted with a special diaphragm which 'can be regulated for the varying sensitiveness of different batches of plates. The central image is impressed directly on the plate; the other two by reflection from prisms arranged so as to equalize the sizes of the three images on the sensitive plates, the light rays passing in each case through a suitable colour-filter — red, green and blue- violet — somewhat on the principle of F. E. Ives's camera of 1900 (fig. 13). It is convenient and successful in working. (2) Cameras made on the reflecting principle of L. Ducos du Hauron (1876), elaborated by F. E. Ives (1894) in his photo chfomoscope, in which three images are taken through three colour-screens on separate plates with one lens, the respective

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exposures being regulated by reflection of the light coming from the lens by plane mirrors on to the sensitive plates, and its filtration through the colour-screens in front of them. Many variations of this method have been proposed, in which reflecting prisms replace the mirrors. The different systems have been dis- cussed by W. Gamble [Ph. Jour. 1905, xlv. 150), the latter also by E. T. Butler (Ibid. p. 199). Sir W. de W. Abney has described three-colour cameras for landscape work in Ph. Jour. 1904, xliv. 81, and 1908, xlviii. 331.

Enlarging Cameras. — -These cameras vary in form, according to the nature of the illumination, but ordinarily consist of a double or triple extension bellows camera, with a holder for the negative or transparency at one end, and for the sensitive plate or paper at the other, the lens being placed on a fixed partition between the two. Some recent forms of " daylight enlargers " can be used as an ordinary camera. Other cheaper ones are on the fixed focus principle. Enlargers for use with artificial light are made like a magic lantern, with a condenser, projecting an enlarged image on to a sensitive plate or paper fixed on an easel or screen. A simple arrangement for daylight enlarging is to fix a suitable camera on to a larger one by a sliding front, and mount the two on a studio stand tilted so that the image may be illuminated by the open sky.

Cinematographs. — Many special cameras and lenses have been introduced for taking on a long flexible sensitive film an extended series of small photographs of the successive phases of movements, and again projecting them on a screen so as to reproduce the scene, with an illusion of motion, in what are known as " living pictures," biographs, &c. As each photograph requires a certain minimum time for exposure and must be kept in true position in sequence with the rest, some means of regulating the intermittent exposures and keeping the film in position have to be adopted ; and there are many different ways of doing it, either by a continuous or inter- mittent motion and exposure of the film while it is being unwound from one roller on to another. The films used are similar to the ordinary celluloid films, but in narrow bands from if in. to 2f in. in width, the length varying with the number of exposures re- quired, at the rate of 16 to 20 per second. They are perforated on both sides, so that they may run true and have the necessary intermittent motion, the perforations fitting on to studs on a sprocket wheel in connexion with the driving wheel and crank handle. Special lenses of short focus, from 1 in. to 3 in., with good covering power and large apertures j/4 to f/2, are required both for photo- graphing and projecting; several such are noted below. Absolute rigidity in the camera is essential. Special stands are made for the purpose, but if a tripod stand is used it should be well braced. Special apparatus is required for developing and fixing the exposed films. They are wound on large rollers supported over troughs containing the necessary solutions (see

Cinematograph). The mechanical arrangements are treated in H. V. Hopwood, Living Pictures (1899); F. P. Liesegang, Handbuch der praktischen Kine- matographie (1907) ; K. W. Wolf-Czapek, Die Kinematographie (1908); G. Lindsay Johnson, Photographic Optics (1909); Eder's Jahrbiicher.

A method of cinematography in colour was introduced by G. A. Smith and C. Urban in 1908, the main features of it being the use of a film sensitive to all colour waves to the furthest red; super- imposing the colour records by persistence of vision; the use of two-colour records instead of three, in order to reduce the interval between the successive presentations; adaptation to existing cinematograph machinery and films. These conditions are fulfilled by the use, in place of the ordinary revolving sector shutter in front of the lens passing intermittent white light, of a special, more rapidly revolving shutter divided into four sectors, one fitted with orange-red glass, another with bluish-green glass and two inter- mediate opaque sectors, so that at every revolution of the shutter an exposure is made through the red and green glasses alternately. The former passes white and yellow, and then orange, scarlet to deepest red; whilst the latter also passes white and yellow, green, blue-green, blue, all in proportion according to the red and green sensitiveness of the specially sensitized panchromatic emulsion on the film. The same shutter and colour screens are used for pro- jection, some supplementary blue rays being added. The results are satisfactory and the method promises to be of great practical value (see Jour. Roy. Soc. Arts, 1908, 57, No. 2926).

Special cameras are made for various branches of scientific research in photo-micrography, photo-spectroscopy, astronomical photography, &c.

Tripod Stands. — Field cameras are usually supported on wooden tripod stands, folding in two or more sections, the head being separate or fixed in the base-board of the camera. The legs should be capable of extension to about 5 ft. and adjustable in length for use on uneven ground. A tripod stand may be light, but must be firm and rigid when set up. To prevent slipping, shoes of india- rubber or cork may be fitted to the points of the legs, and in some cases it may be desirable to strengthen the tripod by a folding adjustable brace. W. Butler's " Swincam " camera stand is made to enable the camera to be securely fixed in awkward positions, and has many valuable special features, great extension, swivel points to the feet, &c. For hand cameras the very light, portable metal folding and walking-stick stands are convenient.

APPARATUS]

PHOTOGRAPHY

Photographic Objectives or Lenses. The objective is the most important item of photographic apparatus, because upon it depends the perfection with which a correct and well-defined picture is projected upon the plane surface of the sensitive plate of objects in the different planes form- ing the field of view, which naturally would come to a focus on a series of curved surfaces. This flattened picture must be equally illuminated and sharply defined, within a limit of confusion from rii to i&b °f an inch, over a sufficiently wide angle. A good objective must also pass sufficient light to produce the required effect on the photographic plate with short exposures ; the chemical and visual foci must coincide exactly, and it must not distort straight or parallel lines. The fulfilment of these conditions is complicated by the presence of sundry focal displacements or aberra- tions. (1) Spherical aberration, or non-coincidence of the foci of the central and marginal pencils of rays passing through the lens. It is corrected by varying the curves of the component lenses and by the use of a diaphragm. (2) Coma, or blur, due to lateral spherical aberration of oblique rays, and mostly found in unsymmetrical combinations and single view lenses. It is partly eliminated by the diaphragm. (3) Astigmatism, which accompanies coma in single lenses, and is usually present in symmetrical aplanats, mani- fests itself by forming two sets of images of points off the axis, lying in two separate curved surfaces, one set focusing tangentially as more or less horizontal lines, the other radially as more or less vertical lines.. It increases with the obliquity of the rays and causes want of definition and difference of focus between horizontal and vertical lines away from the centre. (4) Curvature of field, also increasing with the obliquity of the rays. (5) Distortion, outward or inward, according to the nature and construction of the objective. With the single meniscus view lens, used with its concave surface towards the object and a diaphragm in front, a square will appear barrel shaped from inward contraction of the lines towards the centre; but with the convex surface towards the object and the diaphragm behind, it will appear with concave sides from outward expansion from the centre. It can be corrected by using two such lenses with the convex sides outwards and a central diaphragm, as in periscopic or rectilinear lenses. Lenses of the orthoscopic and telephoto types generally show the latter form of distortion. (6) Chromatic aberration, produced by the dispersion of the white light passing through the lens, and the different coloured rays composing it' coming to a focus at different distances from the visual focus in the order of their wave-lengths. It thus affects both the positions and sizes of the image for the dif- ferent colours. For ordinary photographic work it suffices for the blue-violet and yellow rays to be coincident, but for the new pro- cesses of photography in three colours, apochromatic lenses, in which perfect coincidence of the coloured rays is secured, are re- quired

to obtain the accurate register of the three images. The corrections are effected by compensating lenses of different refractive powers (see Aberration).

In constructing photographic objectives these aberrations and distortions have to be neutralized, by regulating the curves of the different positive and negative component lenses, the refractive and dispersive indices of the glasses from which they are made, and the distances of the refracting surfaces, so as to make the objective as far as possible stigmatic or focusing to a point, giving an image well defined and undistorted. This perfect correction could never be effected in objectives made before 1887, and very few could be effectively used at their full apertures, because although linear distortion could be overcome there were always residual aberrations affecting the oblique rays and necessitating the use of a diaphragm, which by lengthening out the rays caused them to define clearly over a larger surface, at the expense of luminous intensity and rapidity of working. The introduction of rapid gelatin dry plates enabled photographs to be taken with much greater rapidity than before, and led to a demand for greater intensity of illumination and better definition in lenses to meet the requirements of the necessarily very rapid exposures in hand cameras. For studio and copying work quick-acting lenses are also valuable in dull weather or in winter.

The rapidity of a lens with a light of given intensity depends upon the diameter of its aperture, or that of the diaphragm used, relatively to the focal length. In order, therefore, to obtain in- creased rapidity combined with perfect definition, some means had to be found of constructing photographic objectives with larger effective apertures. This necessity had long been recognized and met by many of the best makers for objectives of the single meniscus and aplanatic types, but with only partial success, because such objectives are dependent upon the diaphragm for the further correction necessary to obtain good definition over an extended field. The difficulty was in the removal of astigmatism and curva- ture of the field, which, as J. Petzval had shown, was impossible with the old optical flint and crown glasses. In 1886 Messrs E. Abbe and O. Schott, of Jena, introduced several new varieties of optical glasses, among them new crown glasses which, with a lower dispersion than flint glass, have a higher instead of a lower refractive power. It was thus rendered possible to overcome the old difficulties and to revolutionize photographic optics by

>0\A types.

enabling objectives to be made free from astigmatism, working at their full apertures with great flatness of field independently of the diaphragm, which is now chiefly used to extend the area of definition or angle of view, and

the so-called " depth of focus " for objects in different planes.

Photographic objectives may be classed as follows: —

1 . Single achromatic combinations. ~|

2. Unsymmetrical doublets.

3. Symmetrical doublets.

4. Triple combinations. J

5. Anastigmatic combinations — symmetrical "1

and unsymmetrical. I N

6. Telephotographic objectives. f iNew yv s –

7. Anachromatic combinations. J

They are also sometimes classified according to their rapidity, as expressed by their effective apertures, into " extra rapid," with apertures larger than //6; " rapid," with apertures from //6 to //8; " slow," with apertures less than //n. Another classification is according to the angle of view, " narrow angle " up to 35° ; " medium angle " up to 60°; " wide angle " up to 90°, 100°, or more. Many lenses are made in series, differing in rapidity and angle of view as well as in length of focus.

1. Single Achromatic Combination or Landscape Lens. — This is the earliest form of photographic objective, evolved from W. H. Wollaston's improved single periscopic meniscus camera obscura lens (1812). It was made achromatic by Ch. Chevalier, and so used by L. J. M. Daguerre, though it required correction for chemical focus, as did the object glasses of telescopes or opera glasses first used for photography. The single landscape lens usually consists of an achromatic compound meniscus, formed of a biconvex positive crown cemented to a biconcave negative flint to secure achromatism and partially correct the spherical aberration, and may be taken as the type of the " old photographic achromat " (fig. 14). 1 It is used with its concave side towards the object and a diaphragm in front, thus pro- ducing inward or barrel-shaped distortion, inherent in this type of objective, and rendering it unsuit- able for copying or architecture, though not very noticeable in landscape work. The full aperture has to be largely reduced by a diaphragm to im- prove definition; so it is slow, though many im- proved forms have been brought out. It has always been popular for pure landscape work on account of the equality of illumination over the plate, depth of focus, and the softness and brilliancy of the image owing to

its thinness and freedom from reflecting surfaces. In some of its improved and " long focus " forms it is preferred by portraitists for large heads, on account of the general softness it gives when used with large apertures.

The following are some of the best-known improved objectives of this type: T. Grubb's "Aplanatic" (1857), //15 to //30

Fig. 14-Single Lands cape Lens.

a

Fig. 15. — Grubb's " Aplanatic " Lens.

(fig. 15); J. H. Dallmeyer's " Wide Angle Landscape Lens " (1865), //15, angle 75°. In it distortion was reduced and marginal defi- nition improved. The " Rapid (long focus) Landscape Lens " (1884), //12, angle 40 4 (fig. 16), was a modification of it, and at //8 is useful for heads in portraiture. W. Wray's

' Landscape Lens " (1886), fill, is also useful for por- traiture in the larger sizes at //8. Fr. Voigtlander's " Wide- Angle Landscape Lens " (18

Fig. 16. — Rapid Landscape Lens. Long Focus.

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Fig. 17. — Rectilinear Landscape Lens.

1 In the diagrams of lenses which follow, a uniform system of indicating the nature of the glass employed by means of the shading has been adopted.

Flint glass is indicated thus : —

Crown glass of low refractive power thus : —

Crown glass of high refractive power thus : —

(These two are used indiscriminately in lenses made before the introduction of the new Jena glass.) Extra light flint glass thus: — In most cases the front of the lens is on the right.

//15, angle 90 °, with great covering power and depth of focus. T. R. Dallmeyer's " Rectilinear Landscape Lens " (1888), //14, angle 6o° (fig. 17), was of novel construction, free from distortion, brilliant in working and useful for copying. Messrs Ross's " Wide- Angle Landscape Lens " (1890), //16, angle 70 , triple cemented and made of Jena glass. Many other excellent objectives of this type have been made by British and foreign makers and are still used, though somewhat superseded by the fully corrected anastigmats spec'ally made to work singly, or as single elements of anastigmatic doublets, as noticed in § 5.

2. Unsymmetrical Doublets: Old Types. — This class includes objectives with comparatively large apertures formed of two dissimilar combinations, in most cases correcting each other, with a diaphragm between them. In some the single elements may be used independently. All the older " portrait " lenses, some of the aplanatic doublets and Fr. von Voigtlander's " Orthoscope " Lens (1857), now disused, are of this type. Eyen with the present improved conditions, the portraitist working in a studio requires a quick-acting objective of large effective aperture and compara- tively short focus, giving a brilliant well-defined image of near objects in different planes over a restricted field of view. The early single lenses were found to be too slow for portraiture by _ the daguerreotype and talbotype processes, and the efforts of opticians were directed to the problem of obtaining the maximum amount of light, together with good definition and flatness of field, and about 1840 compound lenses were brought out by Andrew Ross and C. Chevalier, consisting of two achromatic compounds, one at each end of a tube. Ross's lens, made for H. Collen, is interesting as the first lens corrected photographically, so that the visual and chemical foci were coincident (fig. 18). Ch. Chevalier also com- bined lenses of different foci, as is now done for " convertible " objectives, used singly or combined. He also fitted them with iris diaphragms. These forms were soon superseded by the com- pound portrait lens, calculated by J. Petzval and brought out by*

It had six reflecting surfaces and nearly approached a triplet (fig. 21). Steinheil's "Group Aplanats " (1879), //6 4, angle 70 , were an improvement on the ordinary " Aplanats," but were superseded in 1881 by the " Group Antiplanets," //5, angle 70°, lenses of a distinct type (fig. 22). They were a further advance on the " Aplanats," working at larger apertures and giving better definition. This lens is interesting as the first in which astigmatism was eliminated by combining a "crown-shaped" Jens of high refractivity, with a " flint-shaped " of lower refractivity, though made of the old glasses. In his " Rapid Antiplanet " (1893), //6'5, angle 30°, Dr R. Steinheil improved the "Group Antiplanet" as regards astigmatism and_ covering power by replacing the thick back combination by a triple long- focus negative element consisting of a crown between two flints, with a heavy barium crown in the front element instead of a flint (fig. 23).

Voigtlander, who originally constructed the Petzval portrait lens, improved it in 1878 and 1885, and now makes two lenses on the same principle, series I. //3 2, angle 28°, for ordinary portraiture and projection, and series la., //2-3, angle 22° (1900) for astrophotography, cinematography, &c, when intense illumina- tion is required over a small field. Both are quite free from coma-.

Fig. 18. — First English

Portrait Lens. Fig. 19. — Portrait Lens.

Fr. von Voigtlander in 1841. It consists of two dissimilar achro- matic combinations widely separated. At first the diaphragms were in front, but now they are central. The front element is a plano-convex composed of a biconvex crown cemented to a plano- concave flint, while the back element is a double convex, com- posed of a biccnvex crown separated by an air-space from a concavo- convex flint (fig. 19). This form of objective quickly supplanted all other for portraitures, and is still largely used, though it has defects which prevent its use for general purposes and is being superseded for portraiture by some of the rapid anastigmats. In his " Quick Acting Portrait Lens " (i860), jj\, angle 45°, J. H. Dallmeyer improved the correction for spherical aberration, and in his " Extra Quick Acting Portrait Lens " (i860), f/2 2, used for cinematograph work, attained greater rapidity. In the " Patent Portrait Lens "

(1866), //3, //4 and //6, angles 50° to 55° (fig. 20), he made great changes in the form and relative positions of the back elements, giving a flatter field and freedom from flare spot. By separating the two components of the back element more or less spherical aberration could be in- troduced to give softer definition and greater depth of focus. In 1875 Dr. A. Steinheil made an unsymmetrical aplanatic por- trait combination of peculiar construction, working at//3-2. It was an improvement on his similar symmetrical " Portrait-Aplanat,"

Fig. 20. — Dallmeyer's Patent Portrait Lens.

Fig. 23. — R. Steinheil's Im- Fig. 24. — Ordinary Angle

proved Group Antiplanet. Actinic Doublet.

Most of the above are portrait objectives of large aperture, but unsymmetrical doublets have also been made for landscape work. J. T. Goddard's " Combination Landscape Lens ". (1859) was one of the first, and was free from distortion, gave a flat field, and could -be used as a convertible lens. In 1864 T. Ross issued his " Actinic Doublets," modified from the Collen lens, in three series — "small angle," //8, angle 40 to 50°;

“ordinary angle,” //i4 > angle 60° to 75 (fig. 24); ” large angle,” //16, angle 80° to 95 . These lenses were similar to the ” Globe,” but unsymmetrical and more rapid. The separate elements could be used alone. Some of them were fitted with a shutter near the diaphragm. They were superseded by the ” Symmetrical ” lenses.

3. Symmetrical Doublets. — This class includes objectives formed of two similar combinations of lenses, usually of the convergent meniscus form, with their concave surfaces inwards and a diaphragm between them ; consequently they are rectilinear and practically free from marginal distortion. Until the introduction of anastig- matic doublets they were in general use for all purposes under the names ” Aplanat,” ” Rectilinear,” ” Symmetrical,” ” Euryscope,” &c. They are still largely used and have been improved by the use of Jena glasses in their construction.

The first recorded lens of this type was Dr J. W. Draper’s com- bination used in 1839 for daguerreotype portraits, consisting of two double-convex lenses 4 in. diameter, with a united focus of 8 in., mounted in a tube with a diaphragm 3! in. in front. In 1841 T. Davidson made a combination of two single landscape lenses very similar to the later rectilinear doublets. Being slower than the Petzval portrait lens its value as a non-distorting lens for general purposes was not recognized. G. S. Cundell (1844) combined two uncorrected meniscus lenses with a diaphragm between them. In i860 T. Sutton brought out his ” Panoramic Lens,” which worked on curved plates covering about ioo°. It was followed

Fig. 21. — Portrait Antiplanet. Fig. 22. — Group Antiplanet. Form I. of 1874, but was superseded in 1881 by the ” Portrait Antiplanet,” 7/4 and free from astigmatism over an angle of 14 .

Fig. 25.— C. A. Steinheil’s

” Periskop.” Fig. 26. — A. Steinheil’s “Aplanat.”

by C. C. Harrison’s ” Globe Lens ” (1862), angle 75 , composed of a symmetrical pair of deep compound menisci, the exterior surfaces forming part of a sphere. Though defective and slow it was popular for a time. C. A. Steinheil’s ” Periskop ” (1865, //I3-5, angle go”, was a symmetrical doublet formed of two plain crown menisci with central diaphragm (fig. 25). It gave a larger field than the ” Globe,” the lenses being closer together. Being nonachromatic it had to be adjusted for chemical focus. It was quite free from distortion, with a very flat field, and both nodal points together. It is considered the best possible combination of two plain lenses, and is still used in some of the cheaper hand cameras with fixed focus, the difference of the chemical and visual foci being allowed for in the_ camera

or by adjustable lens mounts. G. Rodenstock's " Bistigmats " are of this class. J. Zentmayer made a similar un- symmetrical lens. In A. Steinheil's " Aplanat " (1866) the sanle principle was carried out with achromatized leases, and a great

improvement was effected in the construction of non-distorting objectives of fairly large aperture. It consisted of two positive cemented flint menisci, each composed of a dense flint with negative focus outside and a light flint with positive focus inside, its concave surfaces facing the centre (fig. 26). This use of flint glasses alone was peculiar, former achromatic lenses having been made of flint and crown. These lenses were made in three rapidities : " Ordinary," f/6 or//7, angle 60°; " Landscape," f/12 to//i5, angle 90 , also used in convertible sets; " Wide Angle Landscape," //20 to f/25, angle 104°; " Wide Angle Reproduction," similar to the last, but with sharper definition. The " Aplanat " had many advantages over previous doublets and the triplet, being more rapid, perfectly symmetrical, so that there was no necessity for turning them when enlarging, and free from distortion or flare. There was no chemical focus. Each component could be used alone for landscape work with double focus, subject to the ordinary defects of single lenses. By the use of Jena glasses in the "Universal Aplanat" (1886) the components of this lens were brought closer together, its intensity increased, and it was made more portable. J. H. Dallmeyer had been_ working in the same direction simultaneously with Steinheil, and in 1866 brought out his " Wide Angle Rectilinear," //15, angle 100°, made of flint and crown, the front element being larger than the back (fig. 27). It was slow for ordinary purposes and was succeeded in 1867 by the well-known " Rapid Rectilinear," //8, on the same

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Fig. 27. — Wide-Angle Rectilinear Lens.

Fig. 28. — Rapid Rectilinear Lens.

Fig. 29. — Triple Achromatic Lens. Triplets" (1861), //16, they were flat.

principle as Steinheil's " Aplanat, but made of flint and crown (fig. 28). Ross's " Rapid " and " Portable Symmetrical " lenses, Voigtlander's " Euryscopes," and other similar lenses of British and foreign manufacture are of the same type, and still in use. They arc excellent for general

purposes and copying, but astigmatism is always present, and although they can be used with larger apertures than the triplets they displaced, they require stopping down to secure good marginal definition over the size of plate they are said to cover. By the use of Jena glasses they have been improved to work at larger apertures, and some are made with triple cemented elements.

4. Triple Combinations: Old Types. — This class comprises objectives composed of three separate combinations of glasses widely separated from each other. An early form of this type was made by Andrew Ross (1841) for W. H. Fox Talbot, others by F. S. Archer, J. T. Goddard (1859), T. Sutton (i860), but they never came into general

use. J. H. Dallmeyer's " Triple Achromatic Lens " (i86i),//io, angle 6o°, now out of date, was an excellent non-distorting lens, very useful for general work and copying (fig. 29). As made by Dallmeyer, the inner surfaces of the front and back components were slightly con- cave, but in T. Ross's " Actinic The centre lens was an achromatic negative serving to flatten the field.

5. Anastigmatic Combinations, Symmetrical and Unsymmetrical. — • As already stated, it was found practically impossible to obtain flatness of field, together with freedom from astigmatism, in objectives constructed with the old optical glasses. A. Steinheil attempted it in the " Antiplanets," but with only partial success. The Abbe and Schott Jena glasses, issued in 1886, put a new power into the hands of opticians by largely increasing their choice of glasses with different refractive and dispersive powers. Whereas the old glasses had high refractivity with higher dispersion, in the new ones high refrac- tivity with lower dispersion could be set against lower refractivity with higher dispersion.

Between 1887 and 1889 the first attempts to make anastigmatic objectives with the new glasses were made by M. Mittenzwei of Zwickau, R. D. Gray of New Jersey, E. Hartnach and A. Miethe of Berlin (" Pantoscope "), K. Fritsch of Vienna (" Apo- chromat ") and Fr. von Voigtlander of Brunswick, with more or less success, but progress was hindered by the instability of some of the early glasses, which was afterwards overcome by sandwiching the soft glasses between two hard ones. In 1888 Dr H. L. H. Schroeder worked out for Messrs Ross the " Concentric Lens " (fig. 30) issued in 1892 (Ph. Jour., 16, p. 276). It was a symmetrical doublet of novel construction, each element con- sisting of a plano-convex crown of high refrac- tivity cemented to a plano-concave flint of lower refractivity, but about equal or higher dispersion. Both the

Fig. 30. — Con- centric Lens.

uncemented surfaces were spherical and concentric. At//i6 it gave sharp definition and flatness of field with freedom from astigma- tism, distortion or flare over an angle of 75 °. It was an excellent lens, though slow, and has been superseded by the " Homocentric " and other more rapid anastigmats. Dr Paul Rudolph, of Messrs Carl Zeiss & Co., Jena, worked out in 1889 a new and successful method of constructing a photographic objective by which astigmatism of the oblique rays and the want of marginal definition due to it could be

Fig. 31. — Anastigmat. Fig. 32. — Anastigmat.

Series II. //6-3. Series Ilia. jf/9.

eliminated without loss of rapidity, so that a comparatively extended field could be covered with a large aperture. This he did on the prin- ciple of the opposite or opposed gradation of the refractive indices in the front and back lenses, by a combination of two dissimilar systems of single lenses cemented together, the positive element of each having in one case a higher and in the other a lower refractive index than that of the negative element with which it was associated. The front system, relied upon for the correction of spherical aberration, was made of the old glasses, a crown positive of low and a flint negative of high refractivity, whilst the back system, relied upon for the anastigmatic flattening of the field, was made of the new glasses, a crown positive of high and a flint negative of low refractivity. Both systems being spherically and chromatically corrected for a large aperture, the field was flattened, the astigmatism of the one being corrected by the opposite astigmatism of the other, without destroying the flatness of the field over a large angle (see E. Jb., 1891 and 1893; M. von Rohr's Geschichte, and O. Lummer, Photo- graphic Optics, for further details). They were issued by Messrs Zeiss and their licencees (in England, Messrs Ross), in 1890, in two different types. The more rapid had five lenses (fig. 31), two of ordinary glasses in the front normal achromat, and three in the back abnormal achromat, two crowns of very high refractive power, with a negative flint of very low refractive power between them.

Fig. 33— Anastigmat. Series VI.

Fig. 34. — Satz Anastigmat. Series Via.

The fifth lens assisted in removing spherical aberrations of higher orders with large apertures. The second type, series Ilia., f/g, 1899 (fig. 32), had only two lenses, the functions of which were as above. These combinations could not be used separately as single lenses. They are now issued as " Protars," series Ha., //8; Ilia., //9; V., //18. In 1891 Dr Rudolph devoted himself to perfecting the single landscape lens, and constructed on the same

principle a single combination of three lenses, the central one having a refractive index between the indices of the two others, and one of its cemented surfaces diverging, while the other was converging. At //l4-5 this lens gave an anastigmatically flat image with freedom from spherical aberration on or off the axis. It was, however, not brought out till 1893, as a convertible lens or " Satz-Anastigmat, " series VI., //l4'5, and VIa.,//7-7 (figs. 33 and 34). In the meantime Dr E. von Hoegh (C. B. Goerz) and Dr A. Steinheil had also been working at the pro- blem and had independently calculated lenses similar to Rudolph's, but, whereas he had devoted himself to perfecting the single lens, they sought more perfect correction by combining two single anas- tigmatic lenses to form a doublet. Dr Rudolph had had the same idea, but Messrs Goerz secured the priority of patent in 1892, and in 1893 brought out their " Double Anastigmat," now known as

Fig. 35. Ross-Goerz " Dagor." Series III. Ross-Goerz. Series IV. " Dagor." It was the first symmetrical anastigmat which combined freedom from astigmatism with flatness of field and great covering power at the large aperture of //7-7 (fig. 35). Both these types of Zeiss's " Protars " and Goerz's " Dagor " anastigmats have since

been made by Messrs Ross in England. Messrs Steinheil brought out their first " Orthostigmats " in 1893, but, owing to patent diffi- culties, were unable to manufacture them in Germany, and they were issued later in France and England. They were followed by a second type, which has since been issued in several series by Messrs Steinheil and by Messrs Beck in England (fig. 36). According to Dr R. Steinheil (E. Jb., 1897, p. 172) this lens was an application of two principles recognized by Dr A. Steinheil as necessary for the spherical and anastigmatic correction of a lens. He attempted to carry them out in the " Antiplanet," but was prevented by the want of suit- able glass. He found that for anastigmatic correction an objective should have the separating surface between two media concave towards the medium of higher refraction (new achromat), and for

Fig. 36. — Steinheil's Fig. 37. — " Collinear."

" Orthostigmat." Series II.

spherical correction the separating surface should be convex towards the higher refracting medium. A fully corrected cemented lens cannot, therefore, be made with less than three glasses, but with uncemented lenses

an air-space may form one of the media. In 1895 Dr D. Kaempfer worked out the " Collinear " for Messrs Voigtlander, constructed on the same principles as the " Ortho- stigmat," type II., and similar to it (fig. 37). It is made in three series:' II., //5'4 and//6'3; III., //68 and//77 (convertible); IV., //125, and the apochromatic collinear //8, calculated by Dr H. Harting for three-colour reproduction, &c. (Ph. Jour., 1901, 25, P- 323-)

In 1894 Dr Rudolph extended the application of his principle by combining the old achromat and the new achromat into a single quadruple cemented iens (fig. 38), which, according to T. R. Dall- meyer, was the most perfectly corrected single lens that had been

these lenses are designed to be free from diaphragm corrections, while the focal power of the negative lens is made as closely equal to the combined focal powers of the two positive lenses as may be

Fig. 38.

Series VII. //I2-5. Series Vila. //6-3.

evolved up to 1900, Dr Rudolph having succeeded in obtaining freedom from spherical aberration and astigmatism, and also in eliminating coma (Ph. Jour. 1901, 25, p. 68). These lenses were issued in 1895 as series VII. singly and Vila., in combinations now known as " Convertible Protars," and the earlier series VI. and Via. were withdrawn. The single lenses of series VII., //I2'5, angle 85°, have great anastigmatic flatness of field and only very slight marginal distortion, a condition not realized before in a single lens. The rela- tive rapidities of the double combinations of series Vila, vary from //6'3 to //8, according to the lenses used. They are excellent lenses for all general purposes.

In their " Convertible Protars," series IV. (1908), //I2'5, angle 6o°, Messrs Zeiss have simplified and cheapened the construction of these lenses by the use of new Jena glasses, so that they consist of three instead of four lens elements cemented together, while possessing the same high efficiency as series VII. They are issued as " single " or " double " Protars, //I2'5 and //6'3 or fly, also in sets of three or four objectives of different foci, which are combined to give pictures of different angles of view from the same standpoint. With both series when using the " Protar " lens singly, it should be screwed behind the iris diaphragm of the mount, to avoid curva- ture of the field, and when two such lenses are combined the one with the greater focal length should be placed in front.

In 1895 Messrs Goerz patented a double anastigmat, //5'6, with quintuple single lens components as a convertible lens, for which greater sharpness of

definition and intensity, with perfect freedom from astigmatism and distortion in the single lens, were claimed. It was issued in 1898, but, like an earlier analogous quintuplet of Messrs Turner & Reich (1895), it has not come into use on account of the cost and difficulty of construction. The latter firm, however, brought out in 1906 a new symmetrical quintuplet at//6”8.

A triple anastigmatic combination containing remarkable new features, constructed and patented by H. D. Taylor, was issued in 1895 by Messrs Taylor, Taylor & Hobson under the name of the ” Cooke Lens,” and later by Messrs Voigtlander as the “Triple Anastigmat.” It consists of three single lenses, two of them positive crossed lenses of crown glass with high refraction and low dispersion, with their most convex sides outwards, and between them, in front of the diaphragm, a single biconcave of light flint (fig. 39). All

Fig. 40. — “Cooke” Series III.

Lens.

39. — ” Cooke ” Portrait Lens. Aperture //4- 5.

necessary for the flattening of the field and correcting marginal astigmatism. They are not convertible, but arrangements are made for replacing the back lens by a low-power extension lens (Ph. Jour. 1895, 19, p. 64). Series III., //6‘5 (fig. 40), and series IV., //5‘6, are portrait lenses. In the larger objectives of series II. the back lenses are adjustable for uniform sharp definition or a soft diffusion of focus. In a later series VI. (1907), //5”6, this adjustment for diffusion is given to the front lens and is so arranged for portrai- ture that the diffusing adjustment and iris diaphragm can be operated from the back of the camera while viewing the focusing screen. A special fully corrected “Process” lens on the same general principle has recently been brought out for three-colour work and fine-line reproduction. Another distinctly new type of anastigmatic objective involving several new principles of construction was patented by H. L. Aldis in 1895, and brought out by Messrs Dall- meyer in three series, under the name of ” Stigmatic” (Ph. Jour., 1896, 20, p. 117). It also approaches the triplet construction and depends on the introduction of air-spaces between the component lenses. According to Aldis, three conditions must be observed to obtain a flat field free from marginal astigmatism : (1) The converging lenses must be of high, the diverging of low, refractive index; (2) the converging and diverging components must be separated by a considerable interval ; (3) thick meniscus glasses should be used. The first ” Stigmatic ” was a portrait lens, series I., 1896, f/4. It has been made in two forms, first with a triple front lens, and a back negative system formed

of a single thick crown lens of high refrac- tivity with a negative ce- mented meniscus. In the second form (fig. 41) the front component consists of a cemented positive and negative, and both parts of the back component are cemented lenses. All the converging lenses are of dense baryta crown, while both the diverging lenses in the back component are a light silicate crown. It is fully corrected for spherical and chromatic aberration, free from distortion and nearly so for astigmatism, giving equal illumination over a flat field of 6o°. Diffusion of focus is obtained by unscrewing the back cell. Series II. (1897) is on the same principle but differs in construction, working at //6 over an angle of 85° as a universal and convertible lens (fig. 42). The front or back component can be used alone, giving the choice of two focal lengths, 1 1 and twice the focal length of the complete lens. The principles of its construction were described by T. R. Dallmeyer in Ph. Jour. 1897, 21, p. 167. Series III., //7'5. will at //16 give sharp definition over a plate two sizes larger. The single components are not convertible.

In 1897 Messrs Zeiss issued the " Planar," an objective of large aperture based on the principle of the Gauss telescope objective. It is a symmetrical doublet, each element consisting of three lenses, the two inner ones being a double convex and a double concave, of equal refractive but different dispersive power, cemented together and separated by an air-space from the outer convex meniscus (fig. 43). Its special points are its good colour correction, large relative aperture and intensity, varying from f/3'6 to //6, with perfectly sharp definition and anastigmatic flatness of field over an angle of view from 62° to 72°. It is a very rapid wide-angle lens useful for instantaneous work with the cinematograph and hand cameras, also for portraits and groups, photo-micrography and enlargements or reductions (see E. Jb., 1898, p. 79, Von Rohr, p. 390, and Lummer, p. 81). Apochromatic planars with reduced secondary spectrum were brought out in 1903 for three-colour photography, and are also useful for astrophotography, the circle of diffusion being very small. The " Unar " (1900), //4'5 in the smaller and//6 – 5 in the larger sizes, angle 65° and 68°, was a further improvement by Dr Rudolph. It

Fig. 41. — Stigmatic Portrait Lens. Series I.

Fig. 42. — Stigmatic Lens. Series II.

consists of two unsymmetrical combinations, each formed of two single lenses of very transparent glass, dense baryta crown and light flint, separated by positive and negative air-spaces (fig. 44). The separate halves cannot be used as single lenses, neither being fully corrected for colour. It is well adapted for portraiture, groups or landscapes, especially for rapid hand camera work, on account of its covering power, with freedom from astigmatism and sharp definition with large relative aperture.

Fig. 43. — Planar. Series la. flu. Fig. 44. — Zeiss's " Unar." In 1898 Messrs Goerz patented their " Double Anastigmat Celor," series lb., //4-5 to //5-5. It is a symmetrical doublet, each element consisting of two thin single lenses : a positive of high and a negative of low refractive index, separated by an air-space (fig. 45). It is derived from the triple anastigmats by decreasing the refractive power of the central convex meniscus to the refractive power of air, so that it becomes a convex air-space between a double convex and a double concave lens. Less deeply curved surfaces can be given to the lenses, and the doublet gives anastig- matic flatness of field over an angle of 62 to 66°, equal to the best anastigmats with a still larger aperture. Series \c, //6-3, is similar and recommended for hand cameras, the aperture being smaller. Goerz's " Hypergon," (1900) //22, angle 135°, is a

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Fig. 45. — Goerz's " Celor." Fig. 46. — Goerz's " Alethar."

symmetrical doublet of remarkable construction, consisting of only two single semi-globular, very thin lenses, with diaphragm at the centre of curvature between them. Astigmatism and curvature have been eliminated, and definition is good over the above wide angle with no distortion. Chromatic aberration is uncorrected, but compensated for by using a small stop. A star mask is fitted in front of the lens to allow for falling off of illumination towards the margin (E. Jb., 1901, p. 103). The " Syntor " (1903), Series Id., //6-8, angle 64 to 70 , is on the same principle as the " Celor," but cheaper, for use in hand cameras or telephoto combinations. The " Alethar," series V. (i903),//u, isa lens with diminished secondary spectrum, for three-colour reproductions, half-tone process work, and general purposes. It is a symmetrical doublet, each element consisting of a negative and positive separated by an air-space (fig. 46). The negative is composed of three cemented lenses, which correct the spherical and chromatic aberrations more fully than hitherto possible, so that all the colours of the spectrum are focused in the same invariable plane. It gives great crispness of definition at full aperture (W. Zschokke, E. Jb., 1904, p. 165). Goerz's " Pantar," //6-3 (1904), is a convertible 4-lens anastigmat, and an improvement on the " Dagor," in that the single elements are

completely corrected for coma, and thus form efficient long-focus lenses for landscape, &c, at an aperture of //i2-5, while the doublets formed by various combinations of the single elements are universal objectives working from f/6-s to 7/7-7. The single elements are similar to those of the " Dagor," but have an additional negative

Fig. 47. — Aldis Lens. Series II.

Fig. 48.— Aldis Lens. Series III.

convex back lens. It is a long-focus objective with short back focus, and is made in two forms, series IL, //6 (fig. 47), and series III. (1903), 7/7-7 (fig. 48). In the latter the back element is very thin, and the front combination of infinite focal length. By discarding the symmetrical form simplicity is secured, while open or reflecting surfaces are avoided. Special attention has been paid to perfect correction of spherical aberration in the centre of the field. It is lighter, smaller and cheaper than series II. The " Duo " lens of the same maker (1907) is intended to replace the front lens and double the focus, but with less rapidity and without any loss of quality. The " Trio " (1908) is similar, but only increases the focus one and a half times and is thus more suitable for cameras of short extension. The Aldis " Oxys " anastigmat, series II. (1908), 7/5-°5, angle 85°, is an improved form. Being an unsymmetrical cemented doublet it is free from the defects incidental to air-spaces and is constructed to give more perfect correction for flatness of field with large aperture and wide angle.

It is generally stated that it is impossible to make a spherically, chromatically and anastigmatically corrected photographic objective with the old optical glasses. K. Martin, of Messrs Busch of Rathenow, has, however, shown (E. Jb., 1902, p. 68) that it is quite possible to do so with a system of separated lenses, and that it is immaterial whether the index of the flint or the crown is the higher. An anastigmat on this principle was issued by Messrs Busch in 1902, as the " Omnar," series III., 7/7 – 7 (fig. 49). Series IL, 7/5 – 5» angle 75°, and I., 7/4"5> have since been issued. It is a symmetrical

lens at the back, so that the outer two of the three cemented surfaces have a collective and the inner one a dispersive action, by which coma is eliminated (E. Jb., 1905, p. 55).

In 1902 H. L. Aldis issued the " Aldis Lens," 7/6, a doublet composed of a cemented meniscus in front and a single double-

Fig.

49. — " Omnar,' Series III.

Fig. 50. — Ross's " Homocentric."

doublet, each element consisting of a negative flint meniscus of higher refraction, and a positive crown of lower refraction with an air-space between them in the form of a negative lens. The back element can be used alone. The " Lumar " series, by G. Roden- stock, is similar. In 1902 Messrs Ross brought out the " Homo- centric," a symmetrical doublet, each element consisting of a nega- tive and positive meniscus separated by an air-space (fig. 50). It is constructed so that all rays of light emanating from any one point of the object are converged again into one point in the image. It is also quite free from spherical zones, is not altered in focus with different diaphragms, and thus has exquisite defining power. The colour correction is so perfect that the different coloured images are identical in size and position, thus rendering it specially suitable for three-colour and process work. The back lens can be used alone, with diaphragms, as a single lens of about double the focus of the doublet. It is made in several series: II. , //5-6, and III., 7/6-3, for rapid and instantaneous work; V., //8, for ordinary purposes; VI., //8, for process work and three-colour reproduction. A later series, IV. (1907), " Compound Homocentric," 7/6-8, differs from the others in being a symmetrical doublet composed of two triple cemented elements, very close together and separated by a diaphragm. It is

Fig. 51.— Zeiss's Fig. 52. — Voigtlander's

" Tessar." '< Heliar."

*specially suitable for outdoor work, also for copying and enlarging, having good covering power. Zeiss's " Tessar " (1902) is a rapid unsymmetrical doublet, formed of two separated uncemented posi- tive and negative lenses in the front element and a cemented meniscus at the back (fig. 51). The two halves cannot be used separately. The glasses used are very transparent, permanent and lessen the secondary spectrum. Three series are made by Messrs Ross, Ic, //3-5 for cinematographic work and portraiture, and 7/4-5 for hand- camera work and portraiture; 116., 7/6-3 for general purposes, and VIII., the " Apochromatic Tessar," specially corrected for three- colour work and reproduction. They all give fine definition over a large flat field, free from any zonal aberration. The 7/3*5 portrait lenses, with double the field and covering power of the Petzval lens, are anastigmatic and free from distortion. Messrs Voigtlander's " Heliar" (1902), 7/4-5, angle 50°, calculated by Dr H. Harting, is an objective of large aperture, suitable for portraits and very rapid instantaneous work, being well corrected for astigmatism, coma and curvature of field, with freedom from flare. It is a triplet consisting*

of a central negative lens, with cemented double front and back lenses (fig. 52). The negative lenses are of light silicate flint, the two positive of the heaviest baryta crown. Besides being a rapid universal lens, it is specially suitable for half-tone process work, with a large diaphragm {E. Jb., 1903, p. 117). The ” Dynar ” (i^^i //6, angle 60 , is of somewhat similar construction, but differs from the ” Heliar ” in the positive lenses of the cemented pairs being outside instead of towards the central lens. It can only be used as a whole. It is made of hard colourless Jena glasses, giving great brilliancy and uniformity of illumination over a large angle, and is specially adapted for very rapid hand-camera work.

Dr R. Steinheil’s ” Unofocal ” (1903), //4-5 is a symmetrical doublet, each element consisting of two single separated lenses of equal refractive power and of equal focus of opposite signs, hence its name. Each half can be used as a single lens with small stops. In its construction a quite new principle was followed, the separation of the lenses fulfilling an important part in the colour correction, as explained by Conrad Beck in Ph. Journ. (1904), 44, p. 177. This plan satisfies the Petzval condition and removes its restrictions, so that a lens of //4‘5 can be produced with telescopic central definition, perfect freedom from distortion and flare over a flat field of 6o°, with great equality of illumination (fig. 53). They are made by Messrs Beck in two series: II., //4-5, for portraiture, rapid hand- camera work, telephotography and projection; and I..//6, in which the lenses are closer together, for hand-camera work and general purposes. E. Arbeit’s ” Euryplan ” anastigmats (1903), made by Schulze Bros., Potsdam, are apochromatic objectives of quite new construction, giving perfect definition with large apertures over a

Fig.

53. — Beck-Steinheil ” Unofocal.”

Fig. 54. — Euryplan, Z/4-5-

wide angle, made in lour series: I., //4-5, angle 80°; II., //5-6, angle 90 ; III., //6-8 to 7-5, angle 82 ; IV., //6-5. They are symmetrical doublets, each element consisting of three lenses, a new achromat formed of a biconvex of heavy baryta crown of high refractivity and low dispersion, separated by an air-space from a positive meniscus of the same baryta crown, with its concave side towards the dia- phragm. In series I., //4”5,

the two positives are placed outside (fig. 54), in series II. and III. they are inside. The single elements are fully corrected astigmatically and chromatically, and can be used singly at double the focus (E. Jb. 1904, p. 35).

Beck's Isostigmar " (1907) is a new anastigmat showing a dis- tinct departure from the ordinary principles of construction, in that it does not fulfil the Petzval condition that the sum of the focal powers of its individual lenses multiplied by the reciprocals of their respective refractive indices should be equal to zero, or 2(i//xf) =0. It is a 5-lens combination, two separated thin single lenses in the front element and three in the back (fig- 55)- I n departing from the Petzval condition very low power lenses can be used, thus reducing the initial errors to be corrected; no indi- vidual component having a shorter focal length than one-half that of a complete objective. A special feature is the excellent correction of the oblique

_. Rect's " Ten. spherical aberrations and central aber-

stitfmar " " rations, giving a practically flat field

° ' without astigmatism over angles from

60° to 90 . The half combinations can also be used alone with diaphragms as long focus lenses of different foci {Ph. Journ. 1907, 47, p. 191). It is issued in six series: I. (1908), fl-$, large aperture, series, for reflex press work and portraiture; Io.,//6-S, angle 6o°-65°,

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latter is very useful when an extended use of the rising front is required, either at a wide or ordinary angle. V. (1908), //n, " Process " lenses specially corrected to give a flat field for copying. They can be fitted with suitable reversing prisms. VI. (1908), //5-6, variable portrait lenses, adjustable for sharp or soft definition from the back of the camera while focusing.

The above represent the principal types of anastigmats, but many more objectives of the kind, triple or quadruple, cemented or uncemented, with air-spaces, in many modifications, have been issued by English and foreign makers.

6. Telephotographic Objectives. — For some years past special objectives, or attachments, have been constructed for photographing near or distant objects on an enlarged scale with an ordinary camera, the extension required being very much less than would be needed to obtain an image of the same size with an ordinary long-focUs lens without enlargement. They

consist of a combination of a positive converging with a negative dispersing lens, by which the image is picked up and enlarged to varying degrees, according to the system of lenses used and the extension given to the camera, thus producing the same effect as a positive lens of very much longer focus. Enlarged images of this kind can also be made by a combination of two con- verging lenses, one of them forming an image of the object, which is received on the other of shorter focus and projected on the sensitive plate, being enlarged more or less according to the optical conditions and relative positions of the lenses and sensitive plate. The photo- heliographs at Greenwich and other solar observatories, designed by Warren de la Rue, are on this principle. Portable apparatus of the kind was made in 1869 by MM. Borie and de Tournemire, and later by Jarret, but this system requires much greater extension of the camera, entailing more loss of intensity of the image, and has never come into use.

The modern telephotographic combination is generally looked upon as an application of the principle of the " Barlow " lens, but it really goes back to the Galilean telescope (c. 1610). J. B. Porta mentions the combination of concave and convex lenses for giving enlarged and clearer images of near and distant objects {Magia Naturalis, lib. 17, cap. 10, 1589). J. Kepler showed that by a com- bination of a convex with a concave lens images of objects could be depicted on paper of a larger size than by the convex lens alone, but reversed (Dioptrice, Prob. cv. 1611). Christopher Scheiner made use of the same principle in his " Helioscope " for solar observa- tions {Rosa Ursina, cap. vii. 1630). F. M. Deschales and P. Z. Traber also dealt with the question, and in J. Zahn's Oculus artifi- cialis Teledioptricus (1686) we find figured a reflecting camera fitted with a compound enlarging lens on this principle. In his Nova Dioptrica (1692), W. Molyneux has given some interesting problems for calculating the position of the compound focus of a convex with a concave lens, also the angles subtended by an object on the focal plane. If for the simple uncorrected glasses then used we substitute a system of photographically corrected positive and negative lenses, suitably mounted, and put a sensitive plate in place of the paper, we have the modern telephotographic arrangement. I. Porro seems to have been the first to use a combination of this kind for photographing an eclipse in 1857, and later for terrestrial objects. It consisted of a small achromatic single lens combined with a concave lens. Many attempts were afterwards made in France, and also in England, to utilize the principle, but special lenses for the purpose were not available. Ad. Steinheil constructed one in 1889 for the Brussels Observatory, and another in 1890 for the Marine Department in Berlin. In 1891, curiously enough, three such combinations were worked out quite independently and patented, by T. R Dallmeyer in London, A. Miethe in Berlin and A. Duboscq in Paris. Since that time these combinations have been greatly

improved by increase in the working apertures and reduction in size and weight, so that they can be used in hand cameras. They are exceedingly valuable for obtaining details of inaccessible objects at a distance, whether architectural or topo- graphical, and for photographing animals without approaching them too closely. Large portraits can also be taken with much better perspective effects and more conveniently than by using long-focus lenses much nearer to t

the sitter. With the very perfect telephoto-

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Fig. 56.

long focus, for portraiture, &c. ; II..//5-8, angle 70 , for general use, III.//7-7, angle 65 , similar to II. but less rapid; IV.//6-3, angle 90°; wide angle, giving satisfactory definition at full aperture over an angle from 8o° to 85 . Having such a large reserve of covering power the

graphic objectives now available the loss of intensity of illumination, which no doubt was the bar to early progress in this direction, has been overcome, and definition has also been improved, so that snap- shots can readily be made with combinations of high intensity, while

with those of ordinary intensity the exposures are not unduly prolonged, and good definition can be obtained over an extended field. ;

The optical principle on which these combinations are based is very simple, and will be understood from fig. 56. It depends mainly on the fact that in order that a real image may be thrown on the screen of an object AB, the rays proceeding from it, which pass through the positive system Lj, must come to a focus at a point / within the secondary focus /" of the negative system L 2 . Falling within this limit, they will be intercepted by L2 and made less convergent, so that instead of coming to a focus at /, they will continue to converge till they reach the screen at/', and will there form a proportionally larger image a'b' of AB than the image ab given by the positive lens alone at /; just as stated in Kepler's problem. Moreover, this image a'b' will be of the same size as if it had been produced directly by a

positive lens L s with a focal length equal to If", and this distance is the equivalent focal length of the entire system. It can be found from the formula ¥=fftld, where /1 and / 2 are the focal lengths of Li and L 2 respectively, and d=f l +fi — s, s being the distance between the lenses. In many instruments of the kind a scale showing the value of d is engraved on the mount. If the rays from AB come to a focus in front of Lj, on it, or beyond/", no real image can be projected on the screen. There is therefore a certain limit, which is greater in proportion to the length of focus of the negative system, within which the focus of the positive system Li may fall and produce a series of well-defined images on the screen, which can be varied in size by altering the amount of separation of the two systems of lenses within the above limit, and the distance of the screen from L 2 . Every change in the position of the screen will involve a corresponding adjustment of the lenses. The greater the extension of the camera and the closer the lenses, the greater the size of the image, and vice versa. The camera extension for a given magnification can be found by multiply- ing the focal length of the negative system by the number of magnifi- cations, less one. The magnification produced by a given camera extension is found by dividing the latter by the focal length of the negative system, and adding one.

In its usual form (fig. 57) the telephotographic combination con- sists of a quick-acting portrait lens, or an anastigmatic doublet of

Fig. 58.—" Bis-Telar."

Fig. 57.— T. R. Dallmeyer's Compound Telephotographic Lens.

large aperture and relative intensity of suitable focal length, fitted at one end of a tube, in which slides a smaller tube carrying a properly corrected negative system, which may vary in focus, but must be of shorter focus than the positive (usually about half) ; the shorter the focus the greater the magnifying power for a given extension of camera. The amount of separation of the lenses is limited on the one hand by the position of the focus of the positive system, and on the other by the focus of the negative system, as explained above, and can be adjusted within these limits by a rack and pinion. The tubes are adjusted so that when closed up the two foci may coincide, or nearly so, and d = o, or its minimum value; and when opened to their fullest extent the focus of the positive may fall upon the negative system, or so that d may not exceed the focal length of the negative system. Within these limits the focal length of the com- bination will be positive; and a real image formed on the screen. Several forms of them have been brought out by various makes, some, as Zeiss's, with a special positive lens, others for use with ana- stigmats and other lenses of large apertures. The negative lenses are also made of various powers.

Messrs Dallmeyer's " Adon " (1902) is a telephotographic lens, for use with hand cameras, composed of two achromatic combina- tions adjusted for parallel rays, a front positive lens 4§ in. focal length, and a back negative lens of 2\ in. focus. These are mounted to permit of great variation in the separation, so that when the " Adon " is fixed on the front of a suitable lens, near or distant objects may be taken on an enlarged s

//7, is similar to an old form of " Dialytic " lens worked out by J. Petzval, having a positive front and negative back meniscus, with their concave surfaces facing p

inwards (fig. 58). As in the old " Orthoscopic and lenses of that type there is some outward dis- tortion, but it is very slight. These lenses are made in five sizes with foci from 8 to 22 in., requiring camera extensions from 4! in. to Il£ in. They magnify about twice. According to K. Martin, a telephoto- combination of the Bis-Telar type can be used in a reversed position as a projecting lens for the lantern, with the advantage of increasing the illumination from a given source of light (E. Jb. 1908, p. 46).

Captain Owen Wheeler proposed in 1907 a high-power telephoto arrangement, made by Messrs Staley, in which the negative attach- ment consists of three negative lenses, any single one of which can be used separately, giving magnifications of about 6, 9, and 13 dia- meters with a camera extension of 14 in. By combining the three a magnification of 30 diameters is attainable with the same short extension, which is a great advantage in many ways. In 1908 Messrs Zeiss issued their " Special Tele- objectives " in two sizes working at //io, the larger with an aperture of 3-14 in. and 32 in. focal length fitted in a special " tele-camera " for plates 9 X, 12 cm. with a monocular field glass magnifying four times as finder. The smaller one, with 18 in. focus, is adapted for hand cameras with 6 in. bellows extension. They consist of specially corrected positive and negative combination with a definite focal length and requiring a definite camera extension, and are specially suitable for balloon photography, instantaneous portraiture, &c. The theory, construc- tion and use of telephoto lenses has been fully described by T. R. Dallmeyer in his Telephotography.

7. Anachromatic Lenses. — For large portraiture a certain amount of softness and diffusion of the image has long been recognized by artists as desirable, and in 1895 the " Dallmeyer-Bergheim Lens was constructed with this special object. It is composed of a single uncorrected positive meniscus front lens, with a diaphragm in front of it, and an uncorrected

negative meniscus back lens, and in the larger sizes it has great range of focal length on the telephotogmphic principle. The spherical and chromatic aberration produced by the uncorrected single lenses gives the diffusion of focus which produces the peculiarly soft and delicate effect aimed at. It is most useful for large heads and life-size studies, the great depth of focus conduc- ing to uniformity of definition. There is no distortion, and by stop- ping down to about one-third perfect definition can be obtained. It works with great brilliancy, both elements being single glasses. It was the first of the anachromatic portrait lenses. Since 1903 Messrs C. Puyo and L. de Pulligny have been experimenting with various combinations of uncorrected lenses for producing the same effect in portrait and landscape photography by the diffusion of focus produced by chromatic aberration, and suitable lenses of this kind have recently been brought out in Paris as Les Objectifs d' artiste. In their construction the principal points to be considered arc spherical aberration, to be minimized in the form and arrangement of the lenses selected ; distortion, corrected by using a symmetrical system ; astigmatism, avoided by using combinations of low power. The lenses used by Puyo have been: (1) a plano-convex crown with

ipli convex side in front at//8 or f/g, or even f 15 for heads; (2) a simple thin concavo-convex meniscus, with concave side in front, is better and suitable for full lengthsat f/10 ; (3) a symmetrical system formed of two similar crown menisci, concave sides inwards, is generally useful when worked at//lo, or even//5. Arrangements are made in mounting these lenses for automatically making the necessary correction for colour. Another form is the " Adjustable Landscape Lens," formed of an anterior plano-convex crown, 3 cm. diameter, and a posterior plano-concave crown, each of 10 cm. focus, and the same radii of curvature. In contact they have an infinite focus, but when slightly separated any focus can be obtained up to about 10 cm. In such a telephotographic system, properly stopped down; anastigmatism, flatness of field, and rectilinearity are secured over a fairly large field. These lenses are fully described in Les Objectifs a" artiste, by L. de Pulligny and C. Puyo (Paris, 1906), and various forms, portrait and landscape, have been made by Messrs Hermagis, Turillon & Morin (see Fabre, T. E. P. Suppl. D. 101).

Diaphragm Apertures. — In order to regulate the intensity of the illumination by the lens, to enlarge its field, and, in the case of the older forms of objectives, to extend the area of good marginal definition, diaphragms are used, usually with circular apertures. They are made in different ways: (1) as single metal plates, fitting into a slot in the lens tube (Waterhouse diaphragms) ; (2) Rotatory, a single plate revolving on a central axis and pierced with apertures cut to fit centrically in the opening of the lens; (3) Iris: a form of diaphragm now very generally used, and very convenient, because it can be easily adjusted as required for

intermediate apertures. As a rule they are placed at the optical centre between the elements of a compound lens or in front of a single one.

In order to provide a uniform system of diaphragm apertures,

the Royal Photographic Society in 1881 drew up some rules, which were revised in 1891 and again in 1901. The former standard unit //4, and the numerical notation used with it, have been abolished in favour of the unit //i established at the International Congress in Paris 1900. Intensity ratio is defined as dependent upon the effective aperture of a lens, and not upon the diameter of the dia- phragm in relation to the focal length of a lens. The effective aperture of the lens is determined as follows: The lens must be focused for parallel rays. An opaque screen is then placed in the principal focal plane, and a pinhole is made in the centre of the plate (in the axis of the lens) ; an illuminant is placed immediately behind the pinhole itself, when the diameter of the beam emerging from the front surface of the lens may be measured. (It will be found that except in the case of the diaphragm being placed in front of the lens, the diameter of the diaphragm itself is seldom that of the effective aperture.) Every diaphragm is to be marked with its true intensity ratio as above denned, but the present intensity ratios are retained in their order of sequence : //i , //i -4, fJ2, //2-8, j/4, //516, //8, //i 1 .3, //16, //22-6, //32,//45-2,//64, &c, each diaphragm requiring double the exposure required by the preceding one. In other cases apertures are to be made in uniformity with the scale, with the exception of the highest intensity, e.g. a lens of //6-3 would be marked for //6-3, //8, &c. The corresponding numbers are known as / numbers, but are only applicable for a lens focused for distance. Other systems of notation are in use, but the above is generally adopted (see Fabre, T.E.P. Suppl. C. 38). Special diaphragms are in use for process work with ruled screens (see N.S. Amstutz, Handbook of Photo- engraving, 1907). Standards for the screws of photographic lens- flange fittings, and for the screws fitted to cameras for attachment to the stand or for fixing movable parts, have also been laid down {Ph. Journ. 1901, 25, p. 322).

Instantaneous Shutters. The general use of rapid dry plates and hand cameras has ren- dered it necessary to have some mechanical means of regulating exposures in small fractions of a second, especially for objects in rapid motion, and this instantaneous shutter has become an essential part of modern photographic equipment in many forms and patterns, but practically three types are preferred — the between-lens shutter, the roller-blind shutters, used before or behind the lens, and the focal plane shutter,

in front of and close to the plate and forming part of the back of the camera. The usual limit of rapidity of the two former is nominally about jiu of a second, and for ordinary pur- poses higher speeds are seldom required, while with the latter speeds of ic'ots to jxiVti of a second may be attained.

Two important factors in the use of lens shutters are therapidity or speed, measured by the total duration of exposure from opening to closing, and the efficiency, measured by the ratio of the time during which the shutter is fully open and the time occupied in opening and closing. Both factors are more or less variable, either with differences of construction, of diaphragm opening or of position of the shutter with regard to the plate and lens. In any case the efficient exposure is always less than the actual, and may be considerably so.

The rapidity required of a shutter in photographing moving objects is regulated by the minimum time necessary to produce a well-exposed image upon the plate, with a loss of definition, or blurring, by displacement not exceeding ˆJo, or preferably ˆJjr to lij of an inch, if enlargement is extended. This will depend on the state of the light and the illumination of the object, the rela- tive intensity of the lens as measured by its effective aperture and focal length, the sensitiveness of the plate, and the amount of effective light passing through the shutter during the exposure. The amount of displacement to be guarded against depends upon the rate of movement of the object, the direction in which it is mov- ing with reference to the axis of the lens, its distance from the camera, and the focal length of the lens. It will be proportionately less as the distance of the object increases, and as the rate of its motion and the focal length of the lens for a given distance decrease, and vice versa. It will be greatest when the object is moving at right angles to the axis of the lens, and least when the motion is directly towards it ; but in that case there will be some increase in the apparent size of the object as it approaches the camera. For example; An object moving 1 m. an hour advances 17-6 in. per second. With a lens of 5-in. focus this would represent a displacement on the ground glass, for an object 50 ft. away, amounting to -146 in. per second, and it would require exposures between ˆ and gV of a second to give maximum or minimum displacements of the image between T J B and s h of an inch. An object at the same distance moving ten times as fast would require I 10 of the above exposures. If, however, the distance be increased, the possible exposure may also be increased in the same proportion, so that the object moving 10 m. an hour at 500 ft. distance would only require the original exposures of ˆ to 3 V of a second. On the other hand, the limits of exposure for an object moving 1 m. an hour within 10 ft. of the lens would be between f z and T | s of a second. This is entirely independent of the sensitiveness of the plate, and only represents the maximum duration of exposure permissible in order to reduce the blurring of the image between certain

limits. The sensitiveness of the plate, and the intensity and amount of light

acting upon it through the lens and shutter, must be adjusted so as to produce the desired photographic effect within that time. With a lens of 8 in. focal length the displacement would have in- creased in the first instance to -23 in. per second, and the maximum exposure permissible would be from 2 V to A of a second. This shows that there is an advantage in using short-focus lenses for very rapid exposures. In practice, most work of this kind is done upon quarter-plates (44X31 in.) with lenses of 4 J to 5 in. focus. As the displacement will be greatest for an object moving at a right angle across the axis of the lens, an exposure sufficient for this case will be sufficient for any other. Sir William Abney has discussed this question practically in his Instantaneous Photography, and it is treated mathematically by W. B. Coventry in his Technics of the Hand Camera, in which will be found formulae and tables for ascer- taining the distances and limiting exposures for moving objects, allowing for a blur of t&tt of an inch. In foreign treatises the limit is usually calculated for a displacement of A of a millimetre, or about 15 5 b of an inch.

An efficient shutter should fulfil the following conditions: It should be light and compact, simple in construction and action, strongly made, and not liable to get out of order; capable of being set without admitting light into the camera; easily released with a slight pressure of the finger, if a pneumatic release is not fitted, and free from any tendency to shake the camera on release. It should open and close quickly, allowing the largest possible proportion of the exposure to be made with the full aperture, and it must not cut off any of the effective light passing through the lens, but should distribute it evenly all over the plate: though in landscape work it is an advantage to give the foreground more exposure than the sky. It should be adjustable for variable instantaneous and for prolonged or " time " exposures. With a good shutter there is less risk of shaking the camera in short " time " exposures, from J to I second, than there is in taking off a cap. Shutters working between the lenses must permit of the use of diaphragms in the lenses, and of alterations of speed while set. Above all, a shutter must be con- stant in its action, giving short and variable exposures always cor- rectly or relatively so, an important condition which cannot always be fulfilled, and the exposures marked on the indicator should lie capable of being repeated with tolerable certainty. Shutters should also be adaptable for use with different lenses. Three methods of varying the speed of a shutter are in use: (1) by altering the length of the slot; (2) by the retarding action of a pneumatic brake; (3) by varying the tension of a spring. The latter is considered by W. B. Coventry as far the best. They are usually released by the pressure of the finger on the end of a lever holding the moving part in a state of tension; or better, by J. Cadett's system of pneumatic pressure, applied by means of a compressible rubber bulb and

tube, which may drive a piston acting on the lever holding the shutter, or inflate a collapsible bulb at the other end of the tube and thus exert the necessary pressure on the lever. With W. Watson's " Antinous " release a flexible wire acts directly on the piston or trigger release of a cylinder shutter. It is also adapted for roller-blind, focal plane, flap, and various forms of between-lens shutters. It is durable, effective and convenient (see fig. 3). In many cases both methods can be used as desired, the mechanical release being preferable on account of its convenience and freedom from liability to shake the camera.

The following are the principal types of instantaneous shutter: (1) Flap, (2) drop, (3) combined drop and flap, (4) rotary, (5) roller blind, (6) focal plane, (7) moving blade central, (8) iris. They can be applied in four different positions: (a) in front of the lens; (b) centrally, near the diaphragm; (c) behind the lens (d) immediately in front of the sensitive plate. They all, however, come under two main classes: Lateral, including those in which the exposure commences and ends at the circumference of the lens aperture; and Central, those in which the exposure begins and ends at the centre of the aperture. Some of them are " lateral " in their single form and " central " when double. The form and position of the effective aperture of a shutter, relatively to the lens and plate, have a strong influence, either favourable or unfavourable, on the amount of effective light passing through the lens, and its even distribution over the plate. This is especially the case during the incomplete phases of opening and closing the aperture. It seems to be agreed that the best position for lens shutters of the lateral type is behind the objective, and for those of the central type, between the com- ponent lenses. In this latter position the whole of the plate is illuminated during the full period of exposure, with a gradually increasing intensity, until the full opening is reached, and then the illumination gradually falls off until the shutter is closed. The most effective shutter is one in which the first and third phases of incomplete illumination, during the opening and closing, are the shortest compared with the second phase of full opening.

With the focal plane shutters, however, different portions of the plate are exposed in succession, the lens working at its full aperture and efficiency throughout the exposure.

To secure successful results in using instantaneous shutters, the operator should make himself acquainted with the working of his shutter and its efficiency in various circumstances of exposure with the lenses, plates and developer he proposes to use ; ascertaining the actual value of the various exposures marked on the indicator, and f

what is more important, how far they can be depended on for regularity. There are many simple ways in which the actual time of exposure from opening to closing can be ascertained sufficiently closely for practical purposes. They depend upon the measurement of the trace left on a sensitive plate by the passage of a brightly illuminated object revolving at a known speed or falling vertically through a known distance, when photographed with different speeds of the shutter against a dark background. These, and the more elaborate methods for obtaining more accurate determinations of the shutter-exposure periods and of the corresponding effective exposures — i.e. showing the actual effect of the shutter through its different phases from opening to closing — have been described by Sir William Abney in the work already mentioned, by A. Londe in La Photo- graphic moderne and La Photographic instantanbe. An apparatus for testing shutters at the National Physical Laboratory was described by J. de Graaf Hunter in the Optician, 1906.

I. Flap Shutters. — The simple flap shutters consisting of a hinged flap opening upwards in front of the lens, though favourites in early days for landscape work, and still useful for intermittent exposures or as sky-shades for securing cloud effects or increasing foreground exposures, have been almost superseded by quicker and more com- pact forms. They are used with single and double flaps for portrai- ture and studio work, for which purpose they are made to act noiselessly and not attract the attention of the sitters. Guerry's (figs. 59 and 60) is a good example of the type. W. Watson's " Silent "

Fig. 59. — Guerry's Single-flap Shutter.

Fig. 60.— Guerry's Double-flap Shutter.

shutter is hemispherical in form and collapsible, the two wings opening out and folding together, when actuated by a special " Antinous " release, and R. & J. Beck's is another form, a single lifting flap with pneumatic release.

2. Drop Shutters. — The old simple drop shutter, in which a plate having an opening in it falls in front of the lens aperture, has been superseded by the more compact and quicker-working roller-blind shutters, which act on much the same principle. It had a theoretical interest in connexion with the effect of different forms of aperture — circular, square, or elongated — used with shutters of the lateral type, but it is now generally recognized that a more or less extended rectangular opening, of at least the full width

of the lens aperture, is best for securing the even admission of light from all parts of the image with shutters of the rectilinear lateral type, to which this and similar shutters, in which a single opening passes across the lens aperture, belong. In Busch's " sky shade " shutter (1907), fitting on the front of the lens a single leaf moves vertically upwards and descends again, giving less exposure to the sky.

3. Combined Drop and Flap Shutters. — In early dry-plate days several forms of this kind of shutter were brought out, under the names of Phoenix, Phantom, &c, but are now little used. In these shutters, in addition to the drop slide, there was also a lifting flap, which on release opened from below, and, having fully uncovered the aperture, released the drop slide, which fell and closed the shutter. They were useful and effective in the smaller sizes, but heavy and cumbrous in the larger. Speed could only be estimated very roughly by the use of india-rubber bands for giving tension.

4. Rotary Shutters. — These are of the lateral type, and consist of a circular metal disk revolving on an axis eccentric to the axis of the lens, and furnished with a radial sector-shaped opening, which passes laterally in front of the lens aperture when the tension of a

spring is released (fig. 61). They are used in various patterns in cheap hand cameras, usually in front of the objective, though they may be placed behind it or between the component lenses. So long as the opening is at least equal to the size of the lens aperture, the illumination is sufficiently even, but the openings are usually elongated so as to give a longer period of full opening. Working by a spring they are more portable and con- venient than drop shutters. Beck's " Celverex " between-lens shutter (1906) is of this type, the disk being revolved by a spring and the variations of exposure obtained by altering the size of the opening passing over the ler.s aperture, and not the tension of the spring. It is speeded for exposures of -fa, ■£/>, <"j, gV sec; also "bulb" and "time." It is fairly accurate and consistent in action, but loses efficiency at the highest speeds by the diminution of the opening.

Fll.6l.-P.otaryShutter. .

5. Roller-Blind Shutters. — For general use the well-known roller- blind shutter of the single lateral type, as made by Thornton-Pickard and others, is undoubtedly one of the most popular and efficient. It possesses most of the qualities laid down as essential to a good shutter, gives good illumination, appears to be fairly regular in its action and can be used for time or instantaneous exposures. It consists of a light mahogany or aluminium box, arranged so that it can be fitted in front of or behind the objective. It is made in different sizes, and each size can be adjusted to

smaller objectives (fig. 62). It is also made with a disappearing cord, and in an improved pattern, the " Royal," all the fittings are inside the box. By pulling the cord

Fig. 63. — Mechanism of the Thornton- Pickard Roller- Blind Shutter.

A, Upper roller.

B, Lower roller.

c, Cord.

d, Black curtain. h, Aperture in curtain.

Fig. 62. — Thornton-Pickard Roller-Blind r, Rubber ring Shutter with automatic exposure appliance. adapter.

an opaque black curtain with an elongated rectangular aperture is unrolled from the lower roller on to the upper one, and held by a coiled spring on the lower roller (fig. 63). Pressure on a pneumatic bulb inflates a second smaller bulb, raising a lever which ˆreleases the spring, and thus brings the blind down with a rapidity which can be adjusted by turning a handle actuating the spring, the corresponding speed being shown on an indicator. For time exposures, pressure on the bulb opens the shutter, and another pressure closes it, but an arrangement is now made by which time exposures of |. i, I. I, 2, 3 seconds can be given automatically, the pressure of the bulb opening the shutter, which closes of itself at the expiration of the exposure required. The theory of shutters of this type has been very fully discussed by Coventry (op. cit. p. 50), who shows that for any given tension of the spring the actual exposure decreases as the size of the lens aperture diminishes, while the effective exposure remains constant for all apertures. This is peculiar to the lateral shutter. He also shows that with plates of very different rapidities, though the exposure may be the same; the actual exposure effective is less with the rapid plate and a small stop than with the slow plate and a large stop; consequently the blur due to the movement of the object would be proportionately less on the rapid plate than on the slow one. Also that for any given lens the smaller the shutter the more rapid the exposure can be made, though with the same lens a larger shutter is capable of giving a more efficient though less rapid exposure. It is better, therefore, for moderate exposures, to have a larger shutter than the size of the lens requires. Sir William Abney had given diagrams of the action of a shutter of this kind in his book referred to; they show clearly that the centre of the plate gets more exposure than the margins; but practically this is not very noticeable, and the action is very regular.

6. Focal Plane Shutters. — These are also roller-blind shutters with mechanism similar to the foregoing, but arranged so that the slit in the curtain may move rapidly close in front of the sensitive plate, exposing different portions of it in turn, the intensity of the exposure being regulated by the width of the slit, whether adjustable or not, and the rapidity with which it is moved by the unwinding of a spring. The advantages of these shutters are now being fully appreciated, the principal being that they are quite independent of the lens, so that one shutter will serve for different lenses, and any suitable lens may be used at its full intensity, without the loss of efficiency in- herent in the ordinary forms of lens-shutters. They thus add effectively, if not actually, to the speed of a slow lens, or if a lens be stopped down there is less loss of efficiency, with a gain in increased depth and definition. They are particularly well adapted for the very short exposures required in photographing near and quickly moving objects, racing horses, divers, &c, and many reflex and other hand cameras are fitted with them. They are constructed in different forms, either for short exposures with high speeds alone, or for short and prolonged exposures ; with a single slit of fixed or variable width moved at regulated speeds, or with a series of slits or openings varying in width, their speeds being adjusted by the

tensions of the springs. Thus the new Goerz-Anschiitz shutter has ten tensions and nine curtain apertures, providing for ninety differ- ent speeds or exposures, rang- ing from J 1 ,) to jj'sjj of a second, besides autobulb exposures from ˆ to 5 seconds and time exposures (fig. 64). Most of these shutters are now pro- vided with a self-capping device for protecting the sensitive plate during the setting of the shutter. As the slit moves progressively over the plate, if it is too narrow or moving too slowly, it may cause distortion of the images of quickly-moving objects, especially if near the camera, but with due care in regulating the width of the slit and the duration of exposure this is practically not often percep- tible, especially if the slit is arranged to move in the same direction as the object. The theory of these shutters is discussed by Coventry {op. cit. p. 69), more fully by Fabre {T. E. P. Suppl., C. p. 128), and their practical use in Focal Plane Photography (" Photo-Miniature Series, No. 77,

1907).

7. Moving Blade Central Shutters. — These shutters, in which two thin

metal or ebonite plates or opaque curtains with round or rectangular apertures, or in other cases two curved blades, pass very quickly over each other in opposite directions, are largely used in many patterns fitted between the lenses of a combination or attached to them in front or behind. Formed of two single lateral shutters opening and closing in the centre of the lens aperture, they become central, the exposure taking place during the short period in which the openings are passing each other or the curved blades opening out and closing again. To obtain the greatest efficiency the size of the openings should correspond with the full aperture of the lens. If each plate moves as fast as a drop shutter the combination gives double the speed, corresponding to half the exposure. The sensitive plate will be most evenly and strongly illuminated when the leaves of the shutter work inside the lens near the diaphragm, as in Bausch and Lomb's " Unicum " and other similar between-lens shutters, in general use (fig. 65). This necessitates the fitting of the lens to the shutter, but with adapters

Fig. 64. — Goerz-Anschiitz Focal Plane Shutter.

Fig. 65. — Bausch and Lomb's " Unicum " Shutter.

Fig. 66. — Lancaster's " See-Saw " Shutter.

it is possible to fit other lenses. Some forms are, however, suitable for use in front of the lens, such as the " Constant " and Lancaster's " See-Saw " (fig. 66), while those of the double roller-blind type can be used either in front of or behind the lens, though this position is not a favourable one. In these the rectangular form of aperture is the best, circular apertures cutting off a good deal of light, as in the case of drop shutters. W. B. Coventry {op. cit. p. 60) has discussed the action of the double roller-blind shutter as typical of the central class of shutters, and shows that while, under similar conditions, with the lateral shutter the effective exposure is con- stant and the actual exposure variable at all apertures, it is the reverse with the central shutters, and it will not be so easy to calculate exposures with different sized stops. A central shutter, acting as a diaphragm of variable aperture, gives a more efficient exposure than a lateral shutter of the same dimensions, as long as the opening is greater than the lens aperture, the coefficient of illumination of the lens varying as long as the shutter opening is smaller than that of the diaphragm used. It is desirable, there- fore, to increase the speed and use as large an aperture as possible, so that the diaphragm used may be entirely uncovered during the greater part of the exposure.

Fig. 67. — Goerz's "Sector" Shutter.

8. Iris Shutters. — These are a further development of the double curved

blade central shutters, and constructed on the principle of the " Iris " diaphragm, with several leaves opening out from the centre of the lens and closing again. They are usually fitted between the lenses of double objectives, and can be made very light and compact. Theoretically this central position of the shutter is the best, and the " Iris " is the best form for ensuring the most equal distribution of light over the plate, provided, as before, that the opening is equal to the full aperture of the lens. They are made so that the periods of opening and closing may be as short as possible compared with that of full opening. They require great care in construction and fitting to the lens, and so are expensive. They can, however, be used with convertible sets of lenses of different foci fitting the same mount. Several forms are. made by British and foreign makers, with three, four or more leaves. Goerz's " Sector " shutter (fig. 67) may be taken as a type. Georgen's " Central " shutter is very light and smooth in working, and can be used in front of a lens for telephoto work. Further details regarding the different forms of shutters, theoretical and practical, will be found in the works by Abney, Coventry, Eder, Fabre and Londe.

Exposure Meters.

When gelatin dry plates came into general use, and were made of many different degrees of sensitiveness, the want of a guide to the proper exposure for the various makes of plates under different conditions of lighting began to be felt, and several methods were devised for meeting it. Some of them depend solely upon data derived from observations of the action of the principal factors affecting the result, namely: (1) the speed of the plate; (2) the actinic power of the sun's light for the time of year in a given latitude and its position at the particular time of day; (3) the effective diaphragm aperture of the lens; (4) the nature of the sub- ject and its illumination as affected by local and atmospheric conditions. With others these data are supplemented by, and practically based upon, actinometric observations of the action of the light upon sensitive paper exposed near the camera or the subject at the time. Both methods are in many cases of undoubted use, but the information given by instruments of this kind can only be considered as approximate, and much is left to the judgment of the operator, whose surest guide will be an intelligent study of the principles on which these instruments are based, together with carefully-recorded observations of the combined working of his lenses, shutters, plates and methods of development under the varying conditions of practical work. Before using any of these instruments it is necessary to know approximately the relative sensitiveness or " speed " of the plate in use. In the early days of gelatin dry plates their rapidities were stated as so many times those of wet plates, or (as they are still) " ordinary," " instantaneous," " rapid ' or " extra-rapid," terms which, though suitable for one make of plate, may not be so for others. This was improved upon

by the adoption, in 1878, of Leon Warnerke's " Sensitometer," which was in use as a standard for some years. It consisted of a transparent scale of 25 squares of different intensities, marked with opaque numbers and arranged so that each third number indicated a doubled rapidity. This was placed in a frame in front of the sensitive plate, and exposed for thirty seconds to the constant light emitted by a phosphorescent tablet, supplied with the instrument, which was previously excited by burning one inch of magnesium ribbon in front of it. The exposed plate was then developed and fixed, and the highest number visible indicated the rapidity of the plate. In 1890 F. Hurter and V. C. Driffield introduced an entirely new system of calculating the sensitiveness of plates of different rapidi- ties. They make a series of exposures in seconds on different parts of the plate in geometrical progression with a standard candle at one metre distance. After development for a certain fixed period with a standard developer, fixing, washing and drying, the

densities " or logarithms of the opacities of the different parts are measured by a special photometer and plotted on a skeleton diagram, producing a curve, one portion of which will practically be a straight line. The position of this line with reference to a scale of exposures given on the diagram decides the rapidity of the plate, while its length indicates the " capacity " of the plate for the truthful rendering of tone. The elaborate investigations by which these results were obtained are of great interest, and were published in the Journal of the Society for Chemical Industry (1890, 1891), and later ones in the Photographic Journal (1898). A complete account of the system by V. C. Driffield was published in 1903, as No. 56 of the " Photo Miniature Series." The sensitiveness shown on the H. & D. scale is directly proportional to the speed number given. The method has been adopted by several dry-plate makers in

denoting the sensitiveness of their different brands, and is more or less the basis on which the plate-speeds for the modern English dry-plate actinometers and exposure meters are calculated. Several systems of photometry and measurement of the speeds of dry plates have been discussed at the meetings of the Congres Inter- national de Photographie, in 1889, 1891, 1900 and 1905, but no definite standard has been finally adopted. In Germany the use of J. Scheiner's sensitometer has been adopted, and appears to be extending. It is based on a system of photographing the gradu- ated tints given by rotating sectors. A full account

of the instru- ment, and of a system of sensitometry based on its use, is given by J. M. Eder in the Photographische Correspondenz (1898) p. 469, and (1900) p. 244. In 1901 Chapman Jones brought out a convenient plate-tester on the same principle as the Warnerke sensitometer, but extended by the addition of a colour sensitometer, which is useful for the comparison of orthochromatic dry plates, colour screens, light filters, &c. It consists of a screen plate, 4}X3i in., containing a series of twenty-five tints of graduated densities; a series of coloured squares, blue, green, yellow and red, and a strip of neutral grey, all five being of approximately equal luminosity; a series of four squares of special pure colours, each representing a definite portion of the spectrum ; also a space of line design, over which is superposed a half-tone negative. To use the instrument, a quarter-plate of the brand to be tested is exposed behind the screen for a few seconds to the light of a standard candle placed at the distance of a foot, developed, fixed and washed. An examination of the plate will show the sensitiveness, range of gradation, possible range of exposure, sensitiveness to colour, size of grain, amount of halation, and the most suitable light for development. It can be used for many other tests, and enables any brand of plates to be readily tested by the user and compared with any standard he may find convenient. In making these and similar tests, a standard developer should be allowed to act for a fixed period and at a uniform temperature (Ph. Journ., 1901, 25, p. 246).

The next important factor is the actinic power of the light. It depends normally on the height of the sun for the latitude of the place at the time when the photograph is taken, and exposures in bright sunlight are found to vary approximately as the cosecant of the sun's altitude above the horizon. The light of the sun itself is practically the same at any given time and place year after year, but is liable to more or less local and temporary diminution by the amount of cloud, haze, dust, &c, present in the atmosphere at the time. It is also affected by the time of day, increasing from sunrise to noon, and then decreasing to sunset. The remaining factor is the effective diaphragm aperture of the lens in relation to its focal length. In most cases of ordinary outdoor exposures this can be taken at its normal value, but becomes smaller and increases exposure if the focal length is much increased for photographing near objects. Besides these principal factors, the nature and colour of the objects, their distance, and the amount of light received and reflected by them under various atmospheric conditions, have a great influence on the exposure required. W. B. Coventry has shown (op. cit. p. 75) how the " light coefficient L," for full sun- light, can be found, and has given a table of values of L for the latitude of London for every hour of the day in periods of ten days throughout the year, also the relative coefficients for " diffused light," " cloudy," " dull'" and " very dull." Tables of exposures for different subjects

under varying conditions of light have been published by W. K. Burton, A. S. Platts, F. W. Mills, Sir D. Salomons and others, and in preparing them Dr J. A. Scott's tables, showing monthly and daily variations of light for countries about N. lat. 53 , are generally used. The more modern tables, such as are published in the printed " exposure notebooks," also take into account the plate speeds, but unfortunately there is no uniform standard of plate speeds, owing to the difficulty of fixing a definite standard of light. The subject is fully treated in the British Journal Almanac (1901), p. 675, the Watkins Manual, H. Bour- sault's Calcul du temps de pose en photographie, and similar works by A. de la Baume Pluvinel, G. de C. d'Espinassoux and others.

Based on the same principle as these exposure tables, various portable exposure meters have been brought out, in which scales representing the coefficients for plate-speed, light and diaphragm are arranged as in a slide rule, so that, when properly set, the normal exposure required can be found by inspection, and in- creased or diminished according to circumstances. In Hurter and Driffield's " Actinograph " the light coefficient is given by a printed card showing the curves for every day in the year and for every hour of the day, the unit being the 1 fo f part of the brightest possible diffused daylight when the altitude of the sun is 90 . The " lens " scale shows the ratios of aperture to focal length in general use, and is calculated for single, double and triple systems of lenses. The " speed " scale is based on the exposure in seconds which with one actinograph degree of light will produce a perfect negative of an ordinary landscape. An additional scale is given for five different degrees of illumination—" very bright," " bright," " mean," " dull," " very dull." A table of factors for " views," " portraiture," " interiors," " copying," is also given, and these regulate the figure to be taken for the exposure. The scales are engraved on boxwood, and there are two sliding pieces (fig. 68).

It is specially adapted for use with plates of speed numbers agree- ing with the H. & D. scale, but can be used with any plate of which the relative speed number is known. Convenient exposure meters have been made since 1890 by A. Watkins, of Hereford, in different

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- HURTER & DRIFFIELD'S ACTINOGRAPH PATENT NO 5545 1888

Fig. 69. — Watkins's " Stan- dard " Meter.

Fig. 68. — Hurter & Driffield's Actinograph. forms based upon an actinometrical test of the light at the time of exposure. In the complete " Standard Meter " (1890) scales corre- sponding to "speed of plate," "diaphragm/ numbers," "light," " subject " and " enlarging," marked P. D. A. S. and E., are arranged on rings adjustable round a cylinder. The plate-speeds are taken from a table and the " light coefficient," or " actinometer number," is ascertained at the time by ex- posing a piece of sensitive paper in the actinometer at the end of the instrument for the number of seconds required to match a fixed tint as shown by an attached pendulum. Many improvements have been made in it and the latest pattern (1908) is made in magnalium (fig. 69). The " Dial " meter (1901) is a simpler form in a circular metal case with four apertures marked " plate," " stop," " act " and " exp." above the corresponding scales, and an actinometer for testing the light. The numbers showing the speed of the plate in use, the / value of the diaphragm, and the actinometer exposure in seconds are brought into the respective apertures and the exposure required is read off in the "exposure" aperture. An " indoor meter " is also made, and a " hand camera calculator " for use with the " Standard " or " Bee " meters. The " Queen Bee " and " Bee " meters (1903) are later, smaller and more convenient patterns which have superseded the " Dial " meter and have the plate num- bers and exposures marked round the case, and the scales of "/ numbers " and " light " on a revolving glass plate. This is revolved till the / number on the right is opposite the speed number of the plate ; opposite the " actinometer number " on the left, found as above, will be found

the exposure in seconds (fig. 70). The _ , . ,

"Queen Bee" meter is similar to the Fl G- 7°.— The Watkins s " Bee," but of better construction and " ee Meter,

fitted with a pendulum.

G. F. Wynne's " Infallible " exposure meter (1893) is also in dial form, but the sensitive paper is exposed directly, no pendulum

is used, and the scales are open on the dial. In use, the glass carrying the movable scale is turned until the actinometer time in seconds upon the exposure scale is opposite the diaphragm number of the plate, as given in

*the list of plate speeds; the correct exposure will then be found against each stop given on the scale. There are practically only two scales: the scale of dia- phragms representing the dia- phragm apertures or / numbers, the speed of plate and the vari- ation of exposure due to subject; and the time scale, represent- or,-. *t w„„„„’<. " T„f„i m g the actinometer time and the*

*\bll ““iSosure Mete? ex P osure < fi * ?A The actino- iiDie exposure meter. meter ig protectec i by a yellow glass*

screen when not in use. In a smaller form the scales are on the

circumference of a locket, and the actinometer at the back. An ” Infallible ” Printmeter is also made for showing exposures in contact printing on sensitive papers, but can also be used for testing speeds of plates and papers. Beck’s ” Zambex ” Exposure Meter gives the exposure and stop to be used, also the depth of focus to be obtained with different diaphragm apertures. The required exposure is set to the ” speed ” number on the next scale of the meter. The third scale corresponds to the times of darkening the sensitive paper in the actinometer attached to the meter, and shows the diaphragm aperture suitable for the given exposure. Other scales show the distances that will be in focus with the different stops used, arranged so that the focal depth of four different lenses can be found. Several other exposure meters are made on the principle of the slide rule, with scale corresponding to the factors of ” plate speed,” ” diaphragm number,” ” light,” ” subject,” ” exposure,” and the exposure is found by simple inspection without an actinometer. They are designed for use with particular brands of plates, but can be used for others of similar speeds.

Another class of exposure meters comprises those in which the intensity of the light is estimated visually by extinction through a semi-transparent medium of increasing intensity, such as J. Decoudun’s (1888), in which the exposure is judged by the disappearance of a series of small clear openings on a graduated scale of densities when laid on the most important part of the image as seen on the ground-glass. Its indications are not very definite, and the paper scale changes in density after a time. A better form is ” E. Degen’s Normal Photometer ” (1903), consisting of two sliding violet glass prisms, one adjusted for the diaphragm apertures, the other for the actinic illumination of the object. They are mounted with their outer faces parallel. In use the upper slide with prism is drawn out so that the pointer coincides

with the division indicating the diaphragm aperture to be used; the object to be photographed is then viewed directly through openings at one end of the instrument, and the lower slide is drawn out and pushed back slowly till the object viewed is almost obscured. The attached pointer will then indicate the exposure required, or, reversing the order, the diaphragm aperture for a given exposure can be found. Auxiliary scales are attached for very short or very long exposures. The principle of construction is that the logarithms of the times of exposure are proportional to the thickness of the coloured prisms. " G. Heyde's Actino-Photometer " (1906) is on a somewhat similar principle, and consists of a circular metal box with dark violet glass viewing screens in the centre of both sides, with an obscuring iris inside the case worked by revolving the back of the box. On the front of the instrument exposure tables are given for plates of every rapidity, and for diaphragm apertures from //3 to //45. Exposure meters of this type are specially applicable for open-air work where there is sufficient light for ready measurement. Other simple actinometers are in use for carbon and process printing, consisting generally of trans- lucent graduated scales in different densities of paper, coloured gelatin, &c, or of a photographed scale graduated by increasing exposures. The " Burton actinometer," for pigment printing, made on this principle, contains several small negatives of different densities, one of which is selected of equal depth to the one to be printed, and the progress of the printing is estimated by exposing a piece of sensitive paper under it and examining it from time to time.

Sensitive Plates, Films and Papers Sensitive Dry Plates. — A special feature of modern photography is the use of trustworthy ready-prepared sensitive dry plates and films in different grades of sensitiveness, so that there is nc necessity for the photographer to prepare his own plates, nor, indeed, could he do so with any advantage. The practice of outdoor and studio photography has thus been very greatly simplified; and although with wet collodion there was the advantage of seeing the results at once and retaking a picture if necessary, the uncertainties con- nected with the use of the silver bath and collodion, and the amount of cumbrous apparatus necessary for preparing and developing the plates, far outweighed it. There is also an enormous saving of time, in using dry plates as compared with wet, by deferring development. In tropical climates, also, dry plates can be used when work with wet plates would be impossible. On the other hand, the uncertainty of more or less random exposures on ready- prepared olates must not be overlooked. Besides their use in taking negatives, gelatin dry plates are also largely used for print- ing transparencies, lantern slides, enlargements, &c. For negative work they are prepared with an emulsion in gelatin of silver bromide, alone or with the addition of silver iodide or chloride, and are to be obtained in five or six degrees of rapidity: " slow," for photo- mechanical or "process" work; "ordinary," for general purposes

when quick exposures are not required; "rapid," for landscape and portraits; "extra rapid," for instantaneous exposures; and " double extra rapid," for very quick snapshot work in dull weather or for special subjects. These latter kinds are exceedingly sensitive, and require great care in use to avoid fog. In order to prevent halation, or irregular action by reflection from the back surface of the glass, dry plates are coated with a non-actinic " backing," which can easily be removed before development.

Self-developing dry plates were introduced in 1906, in which the developing agent is mixed in the film itself, as in the Ilford " Amauto " plate, which only requires immersion in a solution of washing soda for development, or, as in the Wellington " Watalu " plates, applied on the back of the plate, plain water only being re- quired for development, this application also preventing halation. The slow plates used for printing lantern slides and transparencies are usually prepared with an emulsion of silver chloride with or without free silver nitrate and other haloids.

The rendering of photographic plates isochromatic or sensitive to all colours by dyeing them with eosin, or other suitable dyes, has been greatly improved by the use of new dyes, especially those of the isocyanin group, prepared by Dr E. Konig of the Hoechst factory, and known as " orthochrom T," " dicyanin," " pinaverdol," " pinachrom " and " pinacyanol," the latter of which can confer on a silver bromide plate as high a degree of sensitiveness for red as erythrosin does for yellow; also F. Bayer's " Homocol," Dr A. Miethe's " ethyl red," and other similar dyes (see E. Jb., 1905, pp. 183, 336). Panchromatic plates are now largely manufactured and used for all photographic work in which a true rendering of the relative colour luminosities is essential, and more particularly for the various methods of colour reproduction in which plates are required to be sensitive to red, green and blue- violet. They are made in different degrees of general and colour sensitiveness, according to the purpose for which they are required, the ordinary " isochromatic " being most sensitive for yellow and green, and the " panchromatic " for red, orange and yellow, as well as for green, blue and violet. To obtain the best results from all these plates it is necessary to screen off the blue and violet rays with yellow or orange transparent screens, or colour filters, made of coloured glass, or glass coated with coloured gelatin, collodion, &c, or with glass cells containing solutions of suitable dyes or salts. For the various processes of three-colour reproduc- tion panchromatic plates and special red, green and blue-violet filters have to be used for taking the three negatives, their intensities and absorptions being carefully adjusted to the particular plates in use; the same applies, but less strictly, to the yellow screens used with ordinary isochromatic plates. Dyes specially suitable for these colour-filters have been prepared by Dr E. Konig. Various kinds of colour screens for ordinary, microscopic and trichromatic work are made

commercially, and Messrs Schott of Jena make a special yellow glass in three tints for the purpose.

Plates for Colour Photography. — In 1868 Louis Ducos du Hauron, among various trichromatic methods patented for photographically reproducing coloured objects in the colours of nature, described one in which the trichromatic principle, instead of being carried out on three separate plates, was to be combined in one plate by means of a transparent medium covered by a trichromatic screen divided into narrow juxtaposed lines or minute spaces, corresponding to the three primary colours, red, green and blue-violet, the trans- parent colour of each of these lines or spaces acting as a colour filter. A sensitive panchromatic plate was to be exposed in contact with this screen to produce a negative with lines or spots corresponding to the relative strength of the three coloured lights passing through it, so that a diapositive print on glass properly registered with the tricolour screen would show the object in its proper colours. This method could not be carried out successfully for want of efficient panchromatic plates and other difficulties.

Between 1892 and 1898 several patents were taken out by J. W. McDonough and J. Joly for various methods of preparing trichro- matic ruled screens (Ph. Journ., 1900, p. 191). The Joly method was fairly successful in action, but had several disadvantages owing to the coarseness of the lines, the necessity for having two screens, one for taking and another for viewing, and the cost of making them (B. J. A., 1899, p. 671). The " Florence " chromatic plate (1905), worked out in America by J. H. Powrie and Florence M. Warner, was an improvement on the Joly method, the colour screen being photographically printed on a glass plate, coated with pan- chromatic emulsion and exposed to the coloured object through the screen (Penrose Pictorial Annual, 1905-1906, p. m). Some good results were produced, but it has not come into use.

After several years of laborious research, Messrs Lumiere, of Lyons, adopting Ducos du Hauron's coloured grain method, suc- ceeded where he had failed, and in 1907 brought out their " Auto- chrome " plates, in a very complete and practical form, making it Eossible to produce photographs in the colour of natural objects y one exposure instead of three, as in the ordinary three-colour processes. Glass plates are coated with an adhesive medium over which is spread a mixture of potato starch grains, of microscopic fineness, stained violet, green and orange, the interstices being filled in with fine carbon powder to form a tricolour screen, dark by reflected and of a pinkish, pearly appearance by transmitted light. This is varnished and coated with a thin sensitive panchromatic emulsion of gelatino-silver bromide. The plates are exposed in the camera from the back, through the tricolour films, using also a

special compensating orange-yellow screen, before or behind the lens, then developed as usual, producing a negative coloured image in the complementary colours, which is then treated and re- versed so as to produce a positive coloured image by transmission, showing the picture in its proper colours. The results thus obtained

are remarkably good and practically solve the problem of direct colour photography in a simple and fairly inexpensive manner (see Agenda Lumiere, 1909).

In C. L. Finlay's " Thames " colour plate (1908) the tricolour screen is formed by rows of circular dots coloured alternately orange-red and green and the intermediate spaces blue. It is used alone, the coated surface being placed in contact with a panchro- matic plate, the uncoated side towards the lens. It carries register marks for adjusting it to the finished picture after development and reversal of the image. These screens, being more transparent than the " Autochrome," require less exposure, but the colour rendering is not so perfect. In the Jougla " Omnicolore " plate (1909) the tricolour screen and sensitive surface are combined on one plate as in the " Autochrome," but the screen is made up of a series of blue-violet parallel lines, with intermediate alternate broken lines of orange-red and yellowish-green at right angles to them, the red narrower than the green. The relative sizes of the coloured dots in the three plates are approximately : —

" Autochrome " starch grains . sgVs to i^^ in. " Thames " plate, dots, diameter . . 8 lir ,, " Omnicolore " plates, blue line . . jj^ ,,

„ „ red square . . ifo „

E. Fenske's " Aurora " plate (1909) is a tricolour screen formed by coating a glass plate with a mixture of finely divided particles of gelatin, dyed orange-red, green and blue-violet, without any intervening spaces. The grain generally is coarser and more irregular than in the " Autochrome " plates, but optically corre- sponds more closely to them than the " Thames " or " Omnicolore " screens do. These plates are issued uncoated for use with any suitable panchromatic plate. A later process is due to Dufay. With the exception of the " Autochrome," these processes are still more or less in the experimental stage.

Celluloid Films. — In order to avoid the weight of glass plates, which may

become burdensome on a tour, and also the risk of breakage of valuable records, thin films or sheets of celluloid coated with sensitive emulsions can be used, with great saving of bulk and weight and no loss of efficiency, though such films are some- times liable to deterioration by long keeping before or after ex- posure. They are made in two thicknesses, stiff or flexible, the stiff being used exactly as plates, but held in a carrier or simply backed with a card or glass plate, while the flexible are made up in separate sheaths with cardboard backing, as in the " Kodoid films, or in convenient packages of twelve or more in " film packs " of various patterns. Flexible films of this kind on celluloid have for many years past also been prepared in long strips of different widths suitable for use in hand cameras of the Kodak types and in roll-holders. In the early forms of roll-holders the films were used alone, and being unprotected had to be changed in the dark room, but, as already stated, they are now supplied on spools in cartridges which can be changed in daylight. C. Silvy seems to have been the first to employ this method in 1870. In these cartridges the film is attached to a much longer strip of black paper, and rolled up with it, so that several turns of the paper have to be unrolled before the film is ready for exposure, this point being marked on the outside paper for the successive exposures, with numbers visible through a red screen at the back of the holder. When all have been exposed, the black paper is rolled on for several turns, and when taken out of the holder the loose end is fastened up till the film is developed. As these films are principally used for landscape work, it is now usual to make them isochromatic, and they may be used with or without a yellow screen. They are also made " non-curling " by being coated with gelatin on both sides. Negatives taken on these thin films have the advantage that they can be printed from either side without perceptible loss of definition, which is useful in printing by the single transfer carbon process, and in some of the photo-mechanical printing methods. Flexible transparent films in sheets and rolls have also been prepared upon hardened gelatin, but it is difficult to retain the original dimensions of the film owing to expansion of the gelatin. Paper coated with sensitive emulsions has been successfully used for making negatives in the same way as the celluloid films, and is cheaper, but much more liable to deterioration from atmospheric action before and after exposure, and unless developed soon after exposure the im- pressed images may fade and become undevelopable. Such papers are, however, still used in meteorological and other self-recording instruments. Stripping films of thin celluloid upon a paper support were introduced by Messrs Wellington and Ward, and had advan- tages for printing from either side, but are not now made.

Photographic Printing Papers. — Pari passu with the supply of ready-prepared plates, all kinds of photographic printing papers can now be

obtained ready for use, so that the photographer has nothing to do with the preparation of his sensitive plates or papers. The old albuminized papers have been generally superseded by ready-prepared sensitive papers coated by machinery with emulsions of silver haloids in gelatin, with or without citrate or other organic silver salts, the chloride being used for most of the " P.O.P." or " printing out papers," which contain more or less free silver nitrate, and in the " self-toning " papers some salt of gold. Some of these printing out papers are also made with emulsions of silver

chloride in collodion, and known as " C.C." or " collodiochloride." The basis of most of the developable bromide papers used for en- largements and direct copying, containing no free silver nitrate, and with which an invisible image is brought out by development, much in the same way as with dry plates, is silver bromide. These papers are made in great variety of tints and surfaces, " smooth " and " rough," " glossy " and " matt," for producing different effects. They are largely used for direct printing by artificial light or daylight, for enlargements, and for printing photographic post-cards, &c, in large numbers by machinery, the prints being made on a long band with an almost instantaneous exposure, and developed and fixed by being passed through the proper solutions on large rollers or otherwise. Papers for the platinotype processes, sensitized with salts of platinum and iron, are also manufactured for printing out entirely or for development with potassic oxalate. Prints on these papers have the advantage of being permanent.

Messrs York Schwartz and J. Mallabar's process of developing and toning prints made on a special sensitive paper prepared with an emulsion of silver phosphate was introduced by Messrs Houghton in 1908 under the name of " Ensyna." Very short exposures to day or artificial light are required, and with a special developer (" Ensynoid ") permanent prints are obtained with a varied scale of tones similar to those given by toning with gold, the colour of the print being determined by the exposure, short exposures giving purple and long exposures brown or reddish tones. The process is a rapid one, the operations of printing, developing, fixing and washing being completed within about ten minutes or even less.

For the various methods of printing in permanent pigments (" Autotype," &c.) tissues are prepared coated with pigmented gelatin in various colours, and very successful results in colour photography have been obtained by printing from suitable negatives in three colours with specially prepared yellow, blue and pink tissues. Similar papers, prepared with pigmented gum instead of gelatin, are used in the " gum bichromate " process, and " single transfer " papers, coated with plain gelatin, are used in the pigment printing processes to receive the developed print, and are also useful for photo-lithography, the new " oil-printing " methods, and in trichromatic

printing on paper by the Sanger-Shepherd method and Dr Konig's " Pinatype." For Manly's " Ozotype " and " Ozobrome " processes special gelatinized and pigmented papers are made. " Cyanotype " and " Ferrogallic " papers are prepared for the use of architects, engineers, &c, in rolls of consider- able width, for the direct reproduction of tracings and drawings as blue or black prints by these and similar methods.

Apparatus for Development. — The recognition of the fact that the two principal factors in the development of modern photo- graphic dry plates with a suitable developer are time and tempera- ture, and also that a prolonged immersion in dilute solutions is in many cases a more convenient and equally efficient method of development, has led to the construction of apparatus for enabling the operation to be carried out almost automatically and for timing its duration.

In 1894 A. Watkins brought out his factorial system of develop- ment based on the principle " that with a correct exposure on a given plate with a given developing agent, the time of development required for a given printing opacity has a fixed arithmetical ratio to the time of appearance of the high lights of the image, provided the developing power of the solution remains constant during development; and this rule holds good for all variations of strength, amount of alkali or bromide, and temperature within those limits which have been found safe in practice " (Photo. News, 1894, 38, pp. 115, 729; and further, Ph. Journ., 1900, 24ˆ, p. 221). By a series of observations he ascertained the multiplying factors of most of the developers in ordinary use, and in 1905 brought out his " factorial calculator " and a " dark-room clock " for facilitating the working of the method. The former is made of aluminium, and consists of two circular disks, the upper smaller one rotating and carrying a pointer. The outer disk is marked with a scale of Watkins' factors for the different developers, as given in the " in- structions " accompanying the instrument, and is used to denote the " time of development " in minutes. The scale on the inner

Fig. 72. — Watkins's Factorial Calculator,

Fig. 73. — Watkins's Dark-room Clock,

disk shows the " time of appearance " in seconds or minutes. In use the pointer is set to the factor for the developer in use, and against the " time of appearance " on the inner scale will be found the total number of minutes required for complete development (fig. 72).

[APPARATUS

The " calculator " can be used with any ordinary clock or watch, but the " dark-room clock " (fig. 73) has been specially constructed for the factorial system. It is an improvement on the earlier forms of Watkins' " Eikronometer," and has a 4 in. dial with 10 minute and 100 seconds divisions, very plain for dark rooms, centre seconds hand, stop action and outside indicator to mark the completed time. The seconds hand completes the revolution in 100 seconds, while the minute hand does so in 10 minutes, or sufficient for the longest ordinary development, though it runs on, if necessary, very much longer, both hands starting together always at O.

In 1908 Watkins brought out another system of " thermo- development " by time dependent on the use of a standard " time developer," the duration of the development, at a given tempera- ture, being modified according to the make and speed of the partic- ular plate in use. The temperature variations are indicated by a movable scale, or " thermo-calculator," on the bottle of de- veloper, the variations for development speed of various plates being given approximately on the " Watkins' Plate Speed List," which thus shows the " speed of plate " and " speed of develop- ment " with the standard developer at 6o°. This method is well adapted for plates, films and stand development in tanks or machines, no observation of the plate being required, and the times are most conveniently observed with the " dark-room clock." Full details of these two distinct methods of development will be found in the 4th edition of the Watkins' Manual of Exposure and Development.

C. W. Piper's "photographer's stop clock " (1906) is a more elaborate clock, intended for use not only in " time development " but for all photographic operations in which accurate control in regard to time is of importance. It is fitted with a gong and arranged to work by " time " or " bulb." Once started, by pressure on a lever or on the bulb, it will continue to go until stopped, striking the gong at the completion of every minute, when the seconds hand reaches the zero point. A second pressure on the bulb stops the clock, so long as the pressure is continued, while pressure on a lever stops it permanently. It is thus useful for timing any intermittent operations, whilst the clock adds up the separate times and prevents the occurrence of errors difficult to avoid when timing with an ordinary watch. By an additional attachment a prolonged time exposure with the camera may be terminated, or an " instantaneous " or short " time " exposure given at any prearranged time. Messrs Houghton's " Ensign " clock for time development has a dial with 60 divisions, a single hand, and is fitted with a gong. It can be set to ring an alarm bell at the expiration of any period from one minute to one hour, can be started or stopped immediately and is

easily read in the dark-room. It requires no winding up, the action of setting providing the tension for the recording movements. It can be stopped and started at will and the bell arranged to give a short or prolonged ring. S. Stanley's is another convenient form, with a 4J in. dial, divided into 60 seconds and 60 minutes, the thick hand recording the seconds and the thin hand the minutes.

Several forms of developing tanks and machines have been constructed for developing a number of exposed plates, together with ordinary or dilute developers, with the aid of the factorial system or independently of it. The Kodak " Automatic Develop- ing Tank " (1905) is a useful arrangement by which bands of ex- posed roll films can be developed in daylight, without any need of a dark-room (fig. 74). The exposed film is wound from the spool

Other forms are made, and in some the fixing and washing can also be effected. These tanks undoubtedly save much time and trouble in developing a large number of exposed plates or films, and have been found to work with efficiency and regularity. Eastman Kodak Co. brought out in 1907 a machine for developing paper prints on bromide or gaslight papers.

Fig. 74. — Kodak Developing Tank.

into a red celluloid apron contained in a box A, then placed in the tank B, where it is left in a dilute developer for about twenty minutes, and requires no attention. It gives very good results. For the " Brownie " films a special daylight developing box is made. With the Kodak " Eastman Plate-developing Tank " (1908) the exposed plates are removed, in the dark-room, from the plate holders and placed, in pairs back to back, in a special framework holding six pairs, which is lowered into a metal tank containing the developer, and is fitted with a watertight lid so that it can be inverted during development. A clock face, with pointer, by which the period of development may be noted is fitted outside the tank. Another apparatus of the kind is made for developing celluloid films exposed in the " Premo Film Packs " (fig. 75).

Fig. 75.— Premo Film Pack Tank (1908). Photographic Printing Apparatus For ordinary printing purposes pressure frames, with or without glass fronts, are used for holding the negative and sensitive paper in close contact during exposure to light. They are fitted with hinged backs enabling^ the progress of the printing to be seen. The pressure is usually given with springs or with screws or wedges acting on the back. They are made in different kinds shown in the dealers' catalogues. For copying large tracings and engineers' drawings by the cyanotype and similar processes large glazed frames are used, mounted on a stand with axle, so that they

may be easily turned over for refilling or fixed at a suitable angle to the light. The pressure is given by an elastic cushion or vacuum arrangement, by which air is pumped out from under an india- rubber sh< >et covering the back of the frame, thus securing a per- fectly uniiorm pressure of about 14 tt> to the square inch without strain on the front glass. Such frames are also useful for various photo-mechanical printing processes with large negatives or metal plates.

For rapid printing of post-card and other negatives up to 8|X 6| in. a handy and simple apparatus the " Rapide " has been brought out, consisting of a lantern fitted for oil, gas or electric light, with a sloping front, in which a special printing frame is fixed and arranged so that the prints can be rapidly exposed one after another (B. /. A. 1909), p. 691. In another form arrangements are made for exposing a large number of printing frames on a suit- able stand, in one or two tiers round a central arc lamp, which may be provided, as in the " Westminster " revolving printing frame, with a shade to protect the eyes of the operator when examining the prints or changing the frames.

For printing tracings, &c, in long rolls, cylinder and rotatory machines of various types are used, so that the tracing and sensitive paper may be drawn together at a regulated speed in close contact round a glass cylindrical surface within which electric arc or mercury vapour lamps supply the source of light. Several machines of this kind are described in Eder's Jahrbuch for 1908, also in the patent records and photographic journals.

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III. — Pictorial Photography

Pictorial photography differs from other branches of photo- graphic practice in the motive by which it is prompted. Employ- ing the same methods and tools, it seeks to use photographic processes as a means of personal artistic expression. Thus in the early days of Fox Talbot's calotype, about 1846, David Octavius Hill, a successful Scottish painter, took up this method of portrayal, and, guided by an artist's knowledge and taste, and unfettered by photographic convention, which indeed had then scarcely begun to grow, produced portraits which for genuine pictorial quality have perhaps never been surpassed, especially if some allowance be made for the necessary im- perfections of the " Talbotype " (see Plate II). Whether they were in their day typical examples of Talbotype with all the latest improvements, Hill probably never cared. When, again, a few years later, Sir William J. Newton, the eminent miniature painter, read a paper before the newly formed Photographic Society of Great Britain (now the Royal Photo- graphic Society), his recommendation to depart from the custom of defining everything with excessive sharpness caused his address to be almost epoch-making. " I do not conceive it to be necessary or desirable," he said, " for an artist to repre- sent, or aim at, the attainment of every minute detail, but to endeavour at producing a broad and general effect. ... I do not consider that the whole of the subject should be what is called 'in focus'; on the contrary, I have found in many in- stances that the object is better obtained by the whole subject being a little out of focus." The doctrine has been persistently repeated ever since, but only within the last decade of the 19th century was the suppression or diffusion of focus received by photographers generally with anything better than ridicule or contempt, because it was unorthodox. O. G. Rejlander, Mrs Julia Margaret Cameron, H. P. Robinson, and others, by precept or practice, strove against such photographic conventions as had arisen out of those technical exigencies to which pictorial qualities were so often sacrificed. As late as 1868, in the Manual of Photographic Manipulation, by Lake Price, the old advice to arrange a group of persons in crescent form, so as to adapt the subject to the curve of the field of the lens, was repeated with the additional recommendation of plotting out on the ground beforehand the " curve of the focus " as a guide. As a defiance of this dictum, Rejlander, in 1869, produced a group of the members of the Solar Club in which some of

the chief figures were set widely out of the " curve of the focus." The mere technical difficulties of this performance with wet collodion plates, and in an ordinary upper room, need not be touched upon

here, but it is to be noted as one of those triumphant departures from convention which have marked the progressive stages of pictorial photography. At about the same period, Mrs Cameron, carrying the recommendation of " a little out of focus " rather further, regardless of how her lens was intended to be used by its maker, secured the rendering dictated by her own taste and judgment, with the result that many of her portraits, such as those of Tennyson, Carlyle, &c, are still in their way unsur- passed. Contemporaneously, Adam Salomon, a talented sculp- tor, " sunned " down the too garish lights of his photographic prints, and strengthened the high lights by working on the back of the negative.

But, during the concluding quarter of the 19th century, probably the most powerful influence in pictorial photography was that of H. P. Robinson, who died in February 1901, and, but for a brief period about the year 1875, was one of the most prolific " picture makers." Inspired by Rejlander, of whom he was a contemporary, Robinson will perhaps be best remembered by his earlier advocacy of combination printing. As early as 1855 Berwick and Annan exhibited a photograph which was the result of printing from more than one negative, a figure from one plate being cunningly introduced into a landscape print from another. Then came from Rejlander " The Two Ways of Life," in which, with wonderful ingenuity, thirty different negatives were combined. Robinson followed, and between 1858 and 1887 exhibited numerous examples of combination-printing, one of the most popular and fairly typical examples being " Carolling " (see Plate II), which received a medal in the exhibition of the Royal Photographic Society in 1887.

Though in this combination-printing one may perhaps perceive the germ of incentive towards the production of special effects not seen in the original, yet the practice was not destined to become very popular, for even in the most capable hands there remains the difficulty, if not impossibility, of fitting a portion of one negative into a print from another and still preserving true relative tonality, and even true proportion. Skilfully produced, eminently popular in character though " Carolling " may be, such errors are not absent. Of this combination-printing Dr P. H. Emerson has said: " Cloud printing is the simplest form of combination-printing and the only one admissible when we are considering artistic work. Rejlander, however, in the early days of photography, tried to make pictures by combination- printing. This process is really what many of us practised in the nursery, that is, cutting out figures and pasting them into white spaces left for that purpose in the picture-book. With all the care in the world the*

very best artist living could not do this satisfactorily. Nature is so subtle that it is impossible to do this sort of patchwork and represent her. Even if the greater truths be registered, the lesser truths, still important, cannot be obtained, and the softness of outline is easily lost. The rela- tion of the figure to the landscape can never be truly represented in this manner, for all subtle modelling of the contour of the figure is lost."

Pictorial photography received a large accession of votaries in consequence of the greater facilities offered by the introduction of the gelatino-bromide, or dry-plate, process, which, although dating from 1880, did not notably affect photographic communi- ties until some years afterwards; and although improvement in appliances and instruments had little to do with the advance of the pictorial side of photography, yet, indirectly at least, the dry-plate and the platinotype printing process have had an undoubted effect. The former gave enormously increased facility, and dispensed with tedious manipulations and chemical knowledge, while its increased light-sensitiveness decreased the limitations as to subjects and effects. The platinotype process was discovered in 18 74-1 880 by W. Willis, who employed his chemical skill and knowledge to give the world a printing process more likely than the hitherto prevalent silver papers to satisfy artistic requirements.

Up to 1882 but few outdoor photographers had ventured to run counter to the general dictum that photographs should only be taken during sunshine or good bright light, and unquestioning

consent would have been given everywhere to the proposition that it would be absurd to work when anything like fog or atmo- spheric haze was present. Isochromatic plates, introduced for the purpose of equalizing the actinic power of various colour luminosities, and so rendering colours in correct relative value, were recommended by one writer, who applauded their supposed advantage of enabling the photographer to photograph distance without any suggestion of atmosphere. That evening or morn- ing haze might enhance the beauty of a landscape, or that the mystery of half-concealment might itself be beautiful, does not seem to have occurred to the photographer, who had become infatuated by the exquisite clearness and sharpness which, with a minimum of labour, he was able to achieve. It is therefore interesting to note one of the first photographic successes which broke away from this convention, just as Rejlander's Solar Club group

defied the formula of arranging human figures like the tiers of an amphitheatre. William M'Leish, of Darlington, a Scottish gardener who had taken to photography, and who seems to have been less under the influence, or it may have been that he was ignorant, of the old dicta, sent to the Royal Photographic Society's Exhibition in 1882 a photograph entitled " Misty Morn- ing on the Wear," a very beautiful view of Durham Cathedral as seen through the mist from across the river. The judges, although they that year awarded eleven medals, passed this by; but appreciation came from outside, for newspaper critics, and practically all those who were not blinded by prejudice and conventionality, declared it to be the photograph of the year. The exhibitions immediately succeeding revealed numerous imitators of M'Leish, and both figure and landscape work began to be shown in which there was evidence of greater freedom and originality.

Meanwhile the Photographic Society of Great Britain had drifted away from its artistic starting-point, and had become chiefly absorbed in purely scientific and technical subjects. But the general apathy which existed in respect of the artistic aspira- tions of some workers was the forerunner of a period of renaissance which was to end in lifting the pictorial side of photography into a greatly improved position. In 1886 Dr P. H. Emerson read before the Camera Club a paper on " Naturalistic Photography," which served as an introduction to the publication (1887) of his book under that title. Unquestionably this book struck a powerful blow at the many conventionalities which had grown up in the practice of photography; the chief doctrines set forth being the differentiation of focus in different planes, a more complete recognition and truer rendering of " tone," a kind of truthful impressionism derived from a close study and general acquaintance of nature, and a generally higher and more intel- lectual standard. After the publication of a second edition in 1889 Dr Emerson publicly renounced the views he had published, by issuing in January of 1891 a bitterly worded, black-bordered pamphlet, entitled The Death of Naturalistic Photography. But the thoughts which the book had stirred were not to be stilled by its withdrawal. Towards the end of the same year the conflict which within the Photographic Society had become apparent as between the pictorial enthusiasts and the older school, culminated in connexion with some matters respecting the hanging of certain photographs at the exhibition of that year; and a number of prominent members resigned their membership as a protest against the lack of sympathy and the insufficient manaer in which pictorial work was represented and encouraged. This secession was to prove the most important event in the history of that branch of photography. The secessionists being among the most popular contributors to the annual exhibition gathered round them numerous sympathizers. In the following

Aroused into greater activity by these events, the Royal Photographic Society began to pay more attention to what had now become the more popular phase. At subsequent exhibitions the technical and scientific work was hung separately from the " Art Section," and a separate set of judges was elected for each section. It became the custom to allot by far the greater amount of space to the " artistic "; and later, artists were elected as judges, by way of encouraging those who were devoted to the pictorial side to send in for exhibition. In the autumn of 1900 the New Gallery was secured, and a comprehensive exhibition of all phases of photography was held.

It is interesting to note that as a distinct movement pictorial photography is essentially of British origin, and this is shown by the manner in which organized photographic bodies in Vienna, Brussels, Paris, St Petersburg, Florence and other European cities, as well as in Philadelphia, Chicago, &c, following the example of London, held exhibitions on exactly similar lines to those of the London Photographic Salon, and invited known British exhibitors to contribute. The international character of the " Linked Ring " encouraged an interchange of works between British and foreign exhibitors, with the result that the productions of certain French, Austrian and American photo- graphers are perfectly familiar in Great Britain. This, in the year 1900, led to a very remarkable cult calling itself " The New American School," which had a powerful influence on contem- poraries in Great Britain.

It may be well to glance at such improvements of process or apparatus as have not been direct and essential means to pictorial advance, but rather modifications and improvements made in response to the requirements of the artistic aspirant. Such im- provements are of two orders — those which are devised with the aim of securing greater accuracy of delineation, the correction of distortion and of apparent exaggeration of perspective, and the more truthful rendering of relative values and tones; and those which seek to give the operator greater personal control over the finished result. While great advances have been made in photo- graphic optics, it cannot be said that pictorial work has been thereby materially assisted, some of the most successful exponents preferring to use the simplest form of uncorrected objective, or even to dispense with the lens altogether, choosing rather to employ a minute aperture, technically called a " pinhole." This is but one example of many which might be quoted to bear out the state- ment that in photography the advance of anything in the nature of artistic qualities has not been correlative with mechanical im- provements. The hand camera can only be said to have had an indirect influence: it has increased the photographer's facilities, and by removing the encumbrance of heavy tools has widened his sphere of operations; but it is perhaps in connexion with the plates and printing processes that more direct advantages have been

gained. The fact that the actinic power of colours is not pro- portional to their luminosity was long regretted as an obstacle to correct representation; but by the introduction of orthochromatic or isochromatic plates in 1886 (when B. J. Edwards bought the Tailfer and Clayton patent, under which he shortly brought out his orthochromatic plates) this original disability was removed; while with increased rapidity in the isochromatic plate colour values may still further be corrected by the use of coloured screens or light filters, without interfering with the practicability of making sufficiently rapid exposures for most subjects. Again, by a better knowledge of what is required in artistic representation, certain modifications in the formulated treatment of ordinary and un- corrected plates are found to do much towards removing the evil; hence, with an ordinary plate " backed " so as to counteract over- exposure of the higher lights, an exposure may, except in extreme cases, be given of length sufficient to secure the feeble rays of the less actinic colours, and by subsequent suitable development a result hardly distinguishable from that of a colour corrected plate may be secured. Chemical experiment has placed in the photo- grapher's hands improved and easier means of entire, unequal and local intensification and reduction, but utility of these is restricted. By the artistic worker it is claimed that the lens and camera are but the tools, and the negative the preliminary sketch or study, the final print standing to him in the same relation as the finished

*year they formed themselves into a brotherhood called " Thˆ> painting does to the artist. In the production of the print various Linked Ring," and in 1893 held their first "Photographic Salon, ~ *""""" " f — "- ——11.— «>- *—.♦.•„„ ~f +u- ,-„.™ I,™ at the Dudley Gallery, Piccadilly. The most noteworthy of the early adherents attracted to the new body was James Craig Annan, whose work was practically unknown until he exhibited it at the first Salon; and almost at once he, by general consent, took a position amongst pictorial photographers second to none (see Plate II).*

means of personally controlling the formation of the image have been resorted to. Thus the local development of platinotype by means of glycerine has its champions, but it seems to have .been little used, its resuscitation being chiefly due to two or three promi- nent workers in New York. Here should also be mentioned the revival in 1898 of rough-surface printing papers, chiefly those sensitized with silver, the roughest texture drawing papers being employed to break up the excessive sharpness of the photographic image, and by the superficial inequalities introducing the effect

of luminousness to over-dark shadows and variety to blank whites. The almost forgotten process of Pouncy, and of Poitevin, now known as the gum bichromate process, was rehabilitated in 1894 by M. Rouille Ladeveze expressly to meet the needs of the pictorial worker. Perhaps the best results that have been achieved by it are those of M. Robert Demachy of Paris, though many English workers have used it with remarkable success. In it paper of any kind may be selected as the support. The power of the operator to modify the printed image to almost any extent, even to introducing and eliminating lights and shadows, and in other ways to depart widely from the image given by the negative, depends upon the fact that the coating of gum and pigment (which, being bichro- matized, becomes insoluble in proportion as it is acted upon by light) holds the pigment but imperfectly, and yields it up upon a vigorous application of water. According, therefore, to its application or retention, the operator can lighten or deepen in tone any portion. Numberless variations of other methods, such as brush develop- ment and local toning or stopping, have been suggested with the same object. Other workers have shown that by dexterously shutting off and admitting the light to various parts of the negative whilst printing, the disposition of the lights and shades in the print can be modified to so great an extent as to alter the general contour of the scene. Examples of an original unaltered print, and one which has been thus modified, are shown in the accompanying plate. Portions are shaded in by allowing the light to have access to the print, either through the negative — in which case the image with all its details, prints more deeply — or by removing the negative, when the action of the light is to flatten and suppress both detail and contrast. Latterly some few have resorted to extensive working on the negative, both on the back and on the film ; drawing by hand is practised on the film to render too prominent features less obtrusive, and objects in the background are merged by an intricacy of lines and cross-hatching. Many of the results are very pleasing, although one hesitates to justify the means, however good the end. On the other hand, to exclaim for purity of method and the exclusion of extraneous aids is very like setting up an arbitrary standard no less unreasonable than those conventions against which pictorial photography has so long striven.

Authorities. — P. H. Emerson, Naturalistic Photography; H. P. Robinson, Picture-making by Photography; Art Photography; Pictorial Effect in Photography; Elements of a Pictorial Photograph; A. H. Wall, Artistic Landscape Photography (1896); A. Horsley Hinton, Practical Pictorial Photography (1898), and subsequent editions; C. Puyo, Notes sur la photographic artistique (Paris).

(A. H. H.)

PHOTOGRAPHY, CELESTIAL. The requisites for celestial photography are best explained by a comparison with ordinary photography in several essential points.

a. Illumination. — In taking a portrait artificial light is used, being thrown on to the face of the sitter either directly or by reflection. If the day is dull a longer exposure is required, and artificial light may be used when the daylight fails. In photo- graphing the stars there is no question of illuminating them by artificial light; for the strongest searchlight which we could throw in the direction of the heavenly bodies would have no sensible effect. The light used is their own, and its feebleness renders it necessary to make long exposures, the length increasing as we attempt to get images of fainter objects. The invention of the dry plate, by making it possible to give very long exposures, caused a revolution in celestial photography. With the wet plate, exposures were limited to the few minutes during which the film would remain wet; but the dry plate can remain in the telescope for days, weeks or even years if necessary. On the approach of daylight, the cap is put on the camera, or the plate removed into the dark room; but when night returns the plate is put back in the telescope, which is accurately pointed to the same stars, the cap is removed, and the exposure is resumed without any loss from the interruption.

b. Magnification. — In taking a portrait we can obtain a large or small size by placing the camera near the sitter or far away. But this method is not available for the heavenly bodies, since we cannot sensibly approach them. To magnify an image we must lengthen the focus of the camera, either directly or in- directly. The direct method is to construct a lens or mirror of long focus; the camera becomes similar in length to a telescope; and indeed resembles a telescope in other respects, except that we take away the eye-piece and put in a photographic plate instead. If, however, we already have a lens of short focus which we wish to use, we may lengthen the focus indirectly by using a secondary magnifier, that is by putting in another lens near the focus of the first. In either case the profitable magnification

is limited, not only by the imperfections of the optical apparatus but by disturbances in the atmosphere. Air currents, either outside or inside the telescope, act as irregular lenses of varying shape, and produce such defects in the image that we gain nothing by enlarging it beyond a certain point. Such air dis- turbances do not trouble the ordinary photographer at all, or scarcely at all: he is only concerned with a few feet of air, whereas the celestial photographer cannot escape from the necessity of looking through many miles of it.

c. Steadiness. — In taking a portrait the photographer is only concerned to fix his camera firmly and to induce his sitter to remain still. The heavenly

bodies are in constant motion, though their real and apparent movements are fortunately smooth, except for air disturbances above mentioned. If, there- fore, it were possible to devise perfectly smooth clockwork, we could keep the camera or telescope continually pointed to the required star or stars. But human workmanship has not yet made clockwork of sufficient strength and accuracy to keep a large telescope satisfactorily pointed. The clockwork which had been found good enough for use with visual telescopes was soon found to be quite inadequate for photography. The first method adopted was to bind two telescopes, one visual and the other photographic, firmly together; and by looking through the visual one to keep some object steadily on the crosswires by using the slow motion screws; meanwhile the other telescope was kept properly pointed for taking a photograph. As it was sometimes found that extremely fine movements were required, electrical arrangements were devised, whereby the observer, on simply pressing a button, could accelerate or retard the rate of the clockwork by a minute amount, instead of actually turning the screws by hand. And about the same time the idea arose of making these corrections automatically. This automatic correction is based on the principle that a freely swinging pendulum, which has no work to do, will naturally keep much better time than the clockwork which has to drive a heavy telescope; and if such a pendulum is therefore arranged to send a current every second through certain electro-magnets, apparatus can be devised to detect whether the clockwork is going properly; and to correct it in the right direction, if it is not. One or more of these three methods, which may be called hand-guiding, electrical control, and automatic electric control, are used in taking all celestial photographs.

The Photographic Image. — The image of a star en the plate should be, theoretically, merely a point; but in practice it is a small patch on the plate which grows in size as the exposure is lengthened, while at the same time it becomes darker in the middle. One reason for this is that light is many-coloured, and when we attempt to focus it by a lens, we can only get a very few colours into even approximate focus; the other colours are not brought to focus at all, and form concentric patches of fainter light on the plate, which increase in size with the error of focus. Thus at best our focusing is only a compromise. When the exposure is short, those colours which have most nearly been brought to focus have an effect, while the faint light of the others may produce no sensible impression. It is natural to select for the colours to be brought most sharply to focus those which are most important photographically, viz. those at the violet end of the spectrum. As the exposure proceeds the faint light of the other colours affects the plate by accumulation, and hence the image spreads, while at the same time the central part naturally becomes blacker.

A reflecting telescope brings all colours to the same focus; and it might

appear, therefore, that images formed with it will not spread in this way. There is, however, another cause of spread- ing besides that due to colour; neither the reflecting telescope nor the lens can focus all the light received by them for more than one particular star. It is just theoretically possible to construct a mirror which would focus all the light from a star seen in the direction of its axis; but the light from another star seen in a slightly different direction would not be truly focused, since directly we leave the axis, some parts of the mirror have a focus slightly different from other parts; and if the image

produced is magnified, it is seen to have a shape like that of a kite. As the exposure is prolonged the small kite-shaped figure gradually increases in size from the point towards the head, and this defect is the more pronounced the farther we depart from the centre of the plate. The result is, speaking generally, that the images near the centre of a plate may be fairly small and circular, but at a certain distance from the centre they become distorted and large. It is a practical problem of great importance to have this distance as great as possible, so that the field of good definition may be large. Estimating in terms of angular distance from the centre of the field, the reflecting telescope has a good field of not more than 40'; a telescope with one compound lens (the ordinary refractor) a field of about 1°, while if two compound lenses are used (as is the case in portrait photography) the field may be very greatly extended, io c or 1 5 having been successfully covered. This is naturally a very great advantage of the " doublet " over other forms of telescope, an advantage which has only recently been fully realized. But there is a compen- sating drawback; to get a large field we must eitHer use a large plate, which is liable to bend or to have a permanent curvature; or if we use a small plate the picture will be on a small scale, so that we lose accuracy in another way.

Star Charts may thus be made by photography with any desired combination of these advantages. The Cape Photo- graphic Durchmusterung is a photographic survey of the southern hemisphere by means of 2 50 plates each covering 5° X 5° taken at the Royal Observatory, Cape of Good Hope; the plates being afterwards measured at Groningen in Holland by Professor J. C. Kapteyn who recorded the places to 0"i and O'i. A much higher degree of accuracy is aimed at in the international scheme for a map of the whole sky undertaken jointly by eighteen observatories in 1887. The plates are only 2° X 2 , and each of the eighteen observatories must take about 600 to cover its zone of the sky once, 1200 to cover it twice. Exposures of 6 min., 3 min., and 20 sec. are

given, the telescope being pointed in a slightly different direction for each exposure; so that each star to about the 9th magnitude shows 3 images, and stars to the nth or 12th magnitude show 2; which has the incidental advantage of distinguishing stars from dust-specks. A rlseau of lines accurately ruled at distances of 5 mm. apart in two directions at right angles is impressed on the plate by artificial light and de- veloped along with the star images; and by use of these reference lines the places of all stars shown with 3 min. exposure are measured with a probable error which, by a resolution of the executive committee, is not to exceed ±o-2o". An additional scheme for a series of charts enlarged from similar plates with much longer exposure has proved too costly, and only a few observatories have attempted it. Meanwhile Professor E. C. Pickering of Harvard, by using doublet lenses which cover a much larger field at once, has photographed the whole sky many times over. The plates have not been measured, and would not in any case yield results of quite the same accuracy as those of the international scheme; but being systematically stored at the Harvard Observatory they form an invaluable reference library, from which the history of remarkable objects can be read back- wards when once attention is drawn to them. Thus the history of the asteroid Eros, discovered in 1898, was traced back to 1894 from these plates; new stars have been found on plates taken previous to the time of discovery, and the epoch of their blazing up recovered within narrow limits; and the history of many variable stars greatly extended. The value of this collection of photographs will steadily increase with time and growth.

Spectroscopic Star Charts.— By placing a glass prism in front of the object glass of a telescope the light from each star can be extended into a spectrum: and a chart can thus be obtained showing not only the relative positions, but the character of the light of the stars. This method has been used with great effect at Harvard: and from inspection of the plates many discoveries have been made, notably those of several novae.

The Geometry of the Star Chart.— Let OS in the figure be the object glass with which the photograph is taken, and let its optical centre be C. Let PL be the plate, and draw CN perpendicular to the sur-

face of the plate. The point N is of fundamental importance in the- geometry of the star chart and it is natural to call it the plate centre; but it must be carefully distin- guished from two other points which should theoretically, but may not in practice, coincide with it. The first is the centre of the material plate, as placed in position in the telescope. In the figure NL is purposely drawn larger than PN, and this material centre would be to the right of N. The second point is that where the optical axis of the object glass (CG in the figure) cuts the plate. The object glass is drawn with an exaggerated tilt so that CG falls to the right of CN. To

secure adjustment, the object glass should be " squared on " to the tube by a familiar operation, so that the tube is parallel to CG : and then the plate should be set normal to the tube and therefore to CG. This is done by observing reflected images, com- bined with rotation of the plate in its plane.

The field of the object glass will in general be curved: so that the points of best focus for different stars lie on a surface such as AGB (purposely exaggerated). The best practical results for focus will thus be obtained by compromise, placing the plate so that some stars, as A, are focused beyond the plate, and others, as B, nearer the object glass: exact focus only being possible for a particular ring on the plate. The star A will thus be represented by a small patch of light, pq on the plate, which will grow in size as above explained. When we measure the position of its image we select the centre as best we can: and in practice it is important that the point selected should be that where the line Ca drawn from the star to the optical centre cuts the plate. If this can be done, then the chart represents the geometrical projection of the heavens from the point C on to the plane PL. The stars are usually conceived as lying on the celestial sphere, with an arbitrary radius and centre at the observer, which is in this case the object glass: describing such a sphere with C as centre and CN as radius, the lines &CB and aCA project the spherical surface on to a tangent plane at the point N, which we call the plate centre. If we point the telescope to a different part of the sky, we select a different tangent plane on which to project. It is a fundamental property of projections that a straight line projects into a straight line ; and in the present instance we may add that every straight line corresponds to a great circle on the celestial sphere. Hence if we measure any rectilinear co- ordinates (x, y) of a series of stars on one plate, and co-ordinates (X, Y) of the same stars on another plate, and (, y) are connected by a linear relation, so must (X, Y) be. This property leads at once to the equations,*

X=(ax+by+c)/(l-kx-ly), Y = (dx+ey+f)/(l-kx-ly), (1) the numerators being any linear functions of (x, y) but the denominators being the same linear function. When x = o, y = o, then X = c and Y=/, which are thus the co-ordinates of the origin of (xy) on plate (XY). The co-ordinate of the origin of (XY) on plate (xy) can be shown to be (k, I) if proper units of length be chosen.

As a particular case the co-ordinates

1. = cot5cosa, y = tanSsina (2)

represent the rectangular co-ordinates of a star of RA and declina- tion a and 5, projected on the tangent plane at the north pole. If the same star be

projected on the tangent plane at the point (A, D), then its rectangular co-ordinates (£, 17) will be

f = tan (a — A) sin q sec (q — D), ˆ = tan (q — D),) where tan g = tan S sec (a— A), J (3)

the axis of tj being directed towards the pole. It can readily be verified that (£, ij) can be expressed in terms of (x, y) by relations of the form (I) . The co-ordinates (£, v) have been named ‘ ‘ standard co-ordinates ‘ ‘ and represent star positions on an ideal plate free from the effects of refraction and aberration. For plates of not too large a field, differential refraction and aberration are so small that their product by squares of the co-ordinates may be neglected, and the actual star positions (x, y) are connected with (£, ij) by linear relations. The linearity of these relations is obviously not disturbed by the choice of origin of axes and of orientation; in which the effects of procession and mutation for any epoch may be included. Hence to obtain the standard co-ordinates (|, i;) of any object on a plate it is only necessary to know the position of the plate centre (the point N in fig. 1) and the six constants in the relations

Z = Ax + By+C, ,, = D+Ey+F, (4)*

where (x, y) are rectilinear co-ordinates referred to any axes. The constants can theoretically be determined when there are three stars on the plate for which £, 1; are known: but in practice it is better to use as many ” known ” stars as possible. These equations

are well adapted to solution by least squares or any equivalent device.

Photography of Nebulae and Clusters. — Some of the earliest and most striking successes in celestial photography were the pictures of nebulae. Dr A. A. Common (1841-1903), F.R.S., of Ealing, led the way in 1883 with a successful picture of the great nebula in Orion, taken with a 3 ft. concave mirror by Calver. Dr Isaac Roberts (1829-1904) was the first to show the real structure of the great nebula in Andromeda, by a photo- graph also taken with a reflector. In the clear atmosphere of the Lick Observatory in California, small nebulae were photo- graphed in great numbers by Professor J. E. Keeler (1857-1900) : and it was shown what a large percentage were spiral in form. Prof. G. W. Ritchey, at the Yerkes Observatory, has followed up these successes with a 2-ft. reflector, and is constructing a 5 -ft., to be erected on Mt Wilson (Cal.); but he has also shown that pictures of clusters are best taken with a telescope of long focus,

such as the great Yerkes refractor; and incidentally that this telescope, although intended for visual work, can be adapted to photography by using a " colour screen " just in front of the plate, which sifts out the rays not brought to focus.

Photography of the Moon. — G. W. Ritchey has used the same device of a colour screen for the moon, and obtained even better pictures than those obtained at Paris, which were pre- viously the best. The positions of a large number of craters and other points have been measured by Dr J. H. G. Franz and S. A. Saunder on photographs, and a new epoch in lunar topography has thereby been created.

Photography of the Planets. — Some striking successes have been obtained at the Lowell Observatory, Flagstaff, Arizona: by cutting down the aperture of the object-glass some of the delicate markings, called canals, on the planet Mars have been photographed; but even these do not approach what can be seen by the eye.

Photography of Comets. — Some wonderful pictures have been obtained of comets by Professor E. E. Barnard and others. Here, as in the case of nebulae, the photograph is superior to the eye in detecting faint luminosity, and delicate details of the tail structure have been photographed which could never be seen. In several pictures the tails have an appearance of violent shattering, and if successive pictures can be obtained at such times we may learn something of the nature of such disturbances.

Solar Photography. — The light of the sun is so intense that the chief difficulty is to obtain a short enough exposure. When successfully taken, photographs of the surface show the well- known spots and the mottling of the surface. The image sensibly falls off in intensity towards the limb, owing to the absorption of light by the solar atmosphere; and the bright faculae (which are thus inferred to lie above the main absorbing layer) are seen near the limb. But an immense advance in solar photography was made about a dozen years ago by the invention of the spectroheliograph, which is an instrument for photographing in the light of one very definite colour — say a single hydrogen line. The faculous appearances can be photo- graphed with this instrument all over the sun's disk, instead of merely near the limb. The appearance presented varies enormously with the line selected, or (in the case of the wide " lines " in the spectrum, such as the H and K lines) with the particular part of the same line selected. But for a full account of such matters reference must be made to the articles Sun and Spectroheliograph.

Authorities. — Various papers in the Monthly Notices of the Royal Astronomical Society and in the Astrophysical Journal. Also the bulletins

and circulars of the Harvard, Lick and Yerkes Observa- tories ; and of the Executive Committee for the A strographic Catalogue (published by Gauthier Villars for the Paris Academie des Sciences). See also more especially a paper by G. W. Ritchey in the Decennial Papers of the University of Chicago, reprinted in vol. ii. (1903) of the Yerkes Observatory Publications. (H. H. T.)

PHOTOMETRY (from Gr. (p&s,

measurements, its methods are attempts to give quantitative accuracy to the crude comparisons made by the eye itself. The necessity for this accuracy in practical affairs of life has arisen because of the great development of artificial lighting in recent times. The eye soon learns to associate with any particular source of light a quality of brightness or power of illumination which diminishes with increase of distance of the source from the eye or from the surface illuminated. This quality depends upon an intrinsic property of the source of light itself, generally known as its " candle power." The aim of photometry is to measure this candle power; and whatever be the experimental means adopted the eye must in all cases be the final judge.

In the photometric comparison of artificial lights, which frequently vary both in size and colour, direct observation of the sources themselves does not yield satisfactory results. It is found to be much better to compare the illuminations pro- duced on dead white surfaces from which no regular reflection takes place, or through colourless translucent material uniformly illuminated by the light placed on the further side. By such processes there is always loss of light, and we must be certain that the various coloured constituents of the light are reduced in the same proportion. This necessary condition is practically satisfied by the use of white diffusing screens.

Two principles of radiation underlie many photometric applications, namely, the inverse square distance law, and J. H. Lambert's " cosine law." Both can be established i nverse on theoretical grounds, certain conditions being square fulfilled. But as these conditions are never abso- Distance lutely satisfied, the applicability of the two laws Law. must in the end be tested by experiment. Since we find that within the errors of observation four candles, placed together at a distance of 2 ft. from a diffusing screen, produce the same illu- mination as one candle at a distance of 1 ft., we may regard the inverse square distance law as satisfied. Thus if two lights of intensities A and B produce equal illuminations on a screen when their distances from the screen are respectively a and b, we at once write down the relation between the two intensities in the form $A : B = a\,2 : b\,2$ *. The theoretical basis of the law follows at once from the universally accepted view that light is energy radiating outwards in all directions from the*

source. If we assume that there is no loss of energy in the transmitting medium, then the whole amount of radiant energy passing in one second across any closed surface completely surrounding the source of light must be the same whatever the size or form of the surface. Imagine for simplicity a point source of light, or its equivalent, a uniformly radiating spherical surface with the point at its centre, and draw round this point a spherical surface of unit radius. Across this surface there will pass a definite amount of radiant energy, in other words a definite total luminous flux, E, which will be the same for all concentric spherical surfaces. Since the area of a spherical surface of radius r is 47rr 2 , the flux which crosses unit area is E/47rr 2 . This quantity is the " illumination." It is measured in terms of the unit called the lux, which is defined as the illumination produced by a light of unit intensity on a perfectly white surface at a distance of 1 ft. In the great majority of photometers the illumina- tions are compared, and the intensities are deduced by applying the law of the squared distances.

Lambert's cosine law has to do with the way in which a luminous surface sends off its radiations in various directions. It is a matter of common observation that the disk of the sun appears equally bright all over the Lambert's surface. Careful measurements show that this is Law not strictly true; but it is sufficiently near the truth to suggest that under certain definable conditions the law would hold accurately. Again, when a glowing surface is viewed through a small hole in an opaque plate, the brightness is very approximately independent of the angular position of the incandescent surface. This is the same phenomenon as the first mentioned, and shows that the more oblique, and therefore larger, element of surface sends the same amount of radiation through the hole. Hence the amount per unit surface sent off

Talbot's Law.

at a given angle with the normal must be less than that sent off in the direction of the normal in the inverse ratio of the areas of the corresponding normal and oblique elements; that is, as the cosine of the given angle to unity. For most practical purposes, and so long as the obliquity is not great, Lambert's law may be assumed to hold.

In almost all accurate methods of photometry the aim is to bring the illuminating powers of the two sources to equality. This may be effected by altering the distance of either light from the illuminated surface. Or we may use polarized light and diminish the intensity of the stronger beam by

suitable rotation of a Nicol prism, a method particularly useful in spectro-photometers. The same result may also be effected by inter- posing absorbent disks, the precise absorbing powers of which must, however, be known with great accuracy. Another useful method is that first described by H. Fox Talbot in 1834, and used with effect by Professor William Swan (1849), and more recently by Sir W. de W. Abney. Talbot's law is thus enunciated by H. von Helmholtz: " When any part of the retina is excited by regularly periodic intermittent light, and when the period is sufficiently short, the resulting impression will be continuous, and will be the same as that which would be produced if the whole light were distributed uniformly throughout the whole period." Talbot deduced the principle from the well-known experiment in which a continuous luminous line is produced by rapid rotation of a luminous point. If the principle be granted, it is obvious that any mechanism by which a ray of light is obstructed in a regularly rhythmic manner during definite intervals t', separated by intervals t, during which the light is allowed to pass, will have the effect of reducing the apparent brightness of the ray in the ratio //(t + /')• This is frequently accomplished by placing in the ray a rotating disk perforated by radial sectors, the so-called Talbot disk.

If photometric results are to be of general value it is essential to have a unit in which to express all other intensities. For example, electric lights are classified according to of'ught S th e ' r " candle-power." The candle, in terms of whose brightness the brightness of other sources of light is to be expressed, must, of course, fulfil the conditions demanded of all standards. It must give under definite and easily realizable conditions a definite and constant luminous' effect, and it must be easily reproducible. The earlier attempts to get a candle of constant brightness were not very satisfactory. The British standard is a sperm candle which weighs | lb, and loses in burning 120 grains per hour. It is found that these conditions are not sufficient to determine the luminous power of the candle, since the length and shape of the wick, the height of the flame, and the composition, temperature and humidity of the atmosphere all have an effect upon its brightness. The same is true of other similar sources of light — for example, the German standard candle, which is made of paraffin, has a diameter of 2 cm., and has its wick cut until the flame is 5 cm. high, but which with all precautions suffers continual altera- tions in brightness. For ordinary practical purposes, however, these candles are steady enough. Other kinds of flame have also been used as a standard source of light. The oldest of these is the French Carcel lamp, which is provided with a cylindrical Argand burner, and gives the standard brightness Vernon- when 42 grammes of colza oil are consumed per hour. Harcourt The supply and draught are regulated by clockwork. Pentane a q Vernon-Harcourt's pentane standard, in which aa ' a mixture of gaseous pentane and air is

burnt so as to maintain a flame 2-5 in. high at ordinary barometric pressure, gives good results, and is readily adjustable to suit varied conditions. Several forms of this standard have been constructed, one of the most important being the 10 candle-power pentane lamp, in which air saturated with pentane vapour is burnt in a specially-designed burner resembling an Argand burner. For photometric purposes a definite length of the lower part of the flame is used, the upper part being hidden within an opaque tube. The amyl-acetate lamp designed by H. von Hefner-Alteneck has

been elaborately studied by the German authorities, and at present is probably more used than any other flame for photometry. It is of simple construction, and gives the standard brightness when it burns with a flame 4 cms. in

Hefner Lamp.

height in still air of humidity o-88% and free of carbon dioxide. The presence of carbon dioxide and increase in the humidity have a marked effect in diminishing the brilliancy of the flame. If the vapour pressure is e and the barometric pressure p, the strength of the flame, when all other conditions are fulfilled, is given by the formula

i-049-5-5c/(£-e) One disadvantage for photometric purposes is the reddish colour of the flame as compared with the whiter artificial lights in general use. sv -j

For an interesting account of the various experimental investi- gations into the properties of the Hefner flame see E. L. Nichols, " Standards of Light," Transactions of the International Electrical Congress, vol. ii. (St Louis, 1904). Angstrom's determination of the radiation of the flame in absolute energy units is also of special interest.

Attempts have been made, but hitherto with limited success, to construct a convenient standard with acetylene flame. Could a satisfactory burner be devised, so that a steady brilliancy could be easily maintained, acetylene would, because of its intense white light, soon displace all other flames as standards.

J. Violle has proposed to use as standard the light emitted by a square centimetre of surface of platinum at its melting- point, but there are obvious practical difficulties in the way of realizing this suggested standard. J. E. Violle' s Petavel, who carefully examined the necessary condi- Platinum tions for producing it (Proc. Roy. Soc. 1899), finds Standard. that the platinum must be chemically pure, that the crucible must be made of pure

lime, that the fusion must be by means of the oxy-hydrogen blow-pipe, that the gases must be thoroughly mixed in the proportion of 4 volumes of hydrogen to 3 of oxygen, and that the hydrogen must contain no hydro-carbons. Under these conditions the variation in the light emitted by the molten platinum would probably not exceed 1 %. O. Lummer and F. Kurlbaum have proposed as a standard a strip of platinum foil 25 mm. wide and -015 mm. thick brought to incandescence by an electric current of about 80 amperes. The temperature is gradually increased until ˆ-th of the total radiation is trans- mitted through a water trough 2 cm. in width. This ratio is determined by means of a bolometer, and so long as it is adjusted to i-ˆth the light is practically constant.

For comparative photometric work the incandescent electric light is very convenient, having the one great advantage over candles and flames that it is not affected by atmospheric changes. But it does not satisfy the requirements of a primary standard. It ages with use, and when run at constant voltage gradually loses in brilliancy, partly because of changes in the filament itself, partly because of the deposit of carbon on the interior of the bulb. Professor J. A. Fleming has shown that very good results can be obtained if carbon filaments carefully selected Fleming's and run in ordinary bulbs for a definite time at a incandes- little above their normal voltage are remounted centLamp in large clear glass bulbs 6 or 8 in. in diameter. stat " ,ard – If used sparingly, and never above their marked voltage, these large incandescent bulbs have been found to remain constant for years, and therefore to be eminently suitable as secondary standards. In his Handbook for the Electrical Laboratory and Testing Room (vol. ii.) Fleming concludes that the best primary standards are the Violle incandescent platinum and the Vernon- Harcourt pentane one-candle flame; and that the most con- venient practical standards are the Hefner lamp, the ten-candle pentane lamp, and the Fleming large bulb incandescent electric lamp. Comparisons of the intensities of these various standards do not give quite concordant results. Thus three different authorities have estimated the 10-candle pentane lamp as being equal to 10-75, n – °, n – 4 Hefner lamps.

A specially constructed instrument or piece of apparatus for comparing light intensities or illuminations is called a

Photo- meter?

photometer. The earlier forms of photometers were very simple and not

*capable of giving very precise results. The principles of construction are, however, the same in all the recog- nized forms down to the most elaborate of recent inventions. Two of the earliest forms were described by P. Bouguer and W. Ritchie. The Ritchie wedge constitutes the basis of many varieties of type. The two lights to be , compared illuminate the sides of the wedge, which Wedge * * s pl ace d between them, so that the eye set in front of the wedge sees the two sides illuminated each by one of the lights. The edge should be as sharp as possible so that the two illuminated surfaces are in close contact. The illuminations are made equal either by shifting the wedge along the line joining the lights or by moving one of the lights nearer to or farther from the wedge as may be required. The lights given out by the sources are then as the squares of the distances from Rum ford's the matched parts of the surfaces. Count Rumford Photo- suggested the comparison of the intensity of the meter. shadows of the same object thrown side by side on a screen by the two lights to be compared. In this case the shadow due to one source is lit up by the other alone; and here again the amounts of light given out by the sources are as the squares of their distances from the screen when the shadows are equally intense. The shadow-casting object should be near the screen, so as to avoid penumbra as much as possible; yet not too near, so that the shadows may not overlap.*

R. Bunsen suggested the very simple expedient of making a grease-spot on white paper for photometric purposes. When Buasea's the paper is equally illuminated from both sides Photo- the grease-spot cannot be seen except by very meter. c i ose inspection. In using this photometer, the sources are placed in one line with the grease-spot, which lies between them and can be moved towards one or other. To make the most accurate determinations with this arrangement the adjustment should first be made from the side on which one source lies, then the screen turned round and the adjust- ment made from the side of the other source — in both cases, therefore, from the same side of the paper screen. Take the mean of these positions (which are usually very close together), and the amounts of light are as the squares of the distances of the sources from this point. The efficiency of the Bunsen photometer has been improved by using two inclined mirrors so that the eye views both sides of the paper simultaneously.

Sir Charles Wheatstone suggested a hollow glass bead, silvered internally, and made to describe very rapidly a closed path, for use as a photometer. When it is placed between two sources we see two parallel curves of reflected light, one due to each source. Make these, by trial, equally bright; and the amounts of light from the sources are, again, as the squares of the distances.

William Swan's prism photometer, invented in 1859, is a beautiful application of the principle embodied in Bunsen's grease-spot photo- , meter

(see Trans. Roy. Soc. Ed. vol. xxi.). The essential

n'Hi' P art °f tne instrument is fundamentally the same as Prh that described °y °- Lummer and E. Brodhun in 1889.

It consists of two equal right-angled isosceles glass prisms placed with their diagonal faces together so as to form a cube

(fig. 1), and cemented together by a small patch of Canada balsam, which spreads out into a circle when the prisms are pressed to- gether. In the figure, which represents a central section of the bi-prism, the Canada balsam is represented by the letter N. The light from two illuminated sur- faces, PQ, RS, is allowed to fall perpendicularly on the faces AB, AD. In each case that part of the light falling internally on the por- tion of the diagonal face which is not backed with the Canada balsam is totally reflected. On the other hand, the light which falls on the portion backed by the Canada balsam is almost wholly transmitted. Thus an eye placed

Wheat- stone's PhO' tometer.

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Fig. 1.

in the position qtp receives light from both sources, the surface RS supplying nearly all the light that seems to come from the patch N, and the surface PQ supplying all the light which seems to come from the region immediately surrounding N. The patch N will in general be visible; but it will quite disappear when the luminosity of the ray Tt, which traverses the Canada balsam, is exactly equal to the luminosity of the rays Pp, Qq, which have come after total reflection from the surface PQ. This condition of in- visibility of N is arrived at by adjusting the positions of the sources of light which illuminate the surfaces PQ, RS. The brightnesses of the two sources will then be as the squares of their distances from their respective screens.

The essential part of Lummer and Brodhun's photometer is a combination of prisms very similar to Swan's. In its most im- proved form the bi-prism or " optical cube " has one of its component prisms cut in a peculiar manner. J^""^ er f The diagonal face is partly cut away, so that the central p£ / ome < er . part only of this face can be brought into contact with the diagonal face of the other prism. The Canada balsam is dispensed with, the surfaces being pressed closely together so that no layer of air is left between them. In order to make the instrument convenient for use with an optical bench, Lummer and Brodhun make the illuminated surfaces which are to be compared the opposite sides of an opaque screen set in the continuation of the diagonal (CA) of the bi-prism, the rays being brought by reflec- tion from symmetrically situated mirrors so as to enter the sides AB and AD perpendicularly. An important modification, due also to Lummer and Brodhun, is the following : By means of a sand-blast a portion, which may be called r, is removed from one half of the diagonal face of the one prism, and from the other half of the same prism there is removed in like manner all but a part / corresponding to the part r. The portions which have not been removed are pressed close to the diagonal face of the other prism, and become the parts through which light is freely transmitted. On the other hand, the light which enters the second prism and falls on the portions of surface backed by the layers of air filling the cut-out parts is totally reflected. The general result is the pro- duction of two similar luminous patches I and r, each of which is surrounded by a field of the same intensity as the other patch. When the photometric match is made the whole region will be uniformly bright. But, by insertion of strips of glass so as to weaken equally the intensity in the surrounding fields, the match will be obtained when these fields are made of equal intensity and when at the

same time the two patches differ equally in intensity from them. Under these conditions the eye is able to judge more certainly as to the equality of intensity of the two patches, and an untrained observer is able to effect a comparison with an accuracy which is impossible with most forms of photometer.

J. Joly's diffusion photometer consists of two equal rectangular parallelepipeds of a translucent substance like paraffin separated by a thin opaque disk. It is set between the sources , of light to be compared in such a way that each paraffin pwL, te . block is illuminated by one only of the sources, and is adjusted until the two blocks appear to be of the same brightness. The method is made more sensitive by mounting the photometer on an elastic vibrator so as to render it capable of a slight to- and-fro oscillation about a mean position.

A form of photometer which is well adapted for measuring the illumination in a region is that due to L. Weber. It consists of a horizontal tube across one end of which is fitted another Weber , s tube at right angles. This second tube can be rotated p notometet . t into any position perpendicular to the horizontal tube. Where the axes of the two tubes meet is placed in the later forms of the instrument one of Lummer and Brodhun's modified Swan cubes. At the other end of the horizontal tube a standard flame is set illuminating a piece of ground glass which may be moved to any convenient position in the tube. The eye looks along the cross tube, at the farther end of which is placed another piece of ground glass illuminated from the outside. The illuminations of the two pieces of ground glass as viewed through the photometer double prism are brought to equality, either by shift of the ground glass to or from the standard light, or by means of two Nicol prisms placed in the cross tube. One advantage of the instrument is its portability.

The photometry of incandescent electric lamps has led to several special modifications and devices. The candle power varies distinctly in different horizontal directions, incan- and one measurement in any particular direction descent is not sufficient. Sometimes the lamp is rotated about three times a second about a vertical axis and an average value thus obtained. But there is always a risk of the filament breaking; and in all cases the effect of centrifugal force must alter the form of the filament and therefore the distances of the different parts from the screen. Accuracy demands either the measurement of the radiation intensity in a number of directions all round the lamp, or one combined

Electric Lamp.

measurement of as many rays as can be conveniently com- bined. One of the best methods of effecting this is by means of Matthews'* C. P. Matthews's integrating photometer. By the integrating use of twelve mirrors arranged in a semicircle whose PAotometer. (jj amet;er coincides with the axis of the lamp, twelve rays are caught and reflected outward to a second set of twelve mirrors which throw the rays on to the surface of a photometric screen. This combined effect is balanced by the illumination produced by a standard lamp on the other side of the screen (see Trans. Amer. Inst. Elect. Eng., 1902, vol. xix.).

So long as the lights to be compared are of the same or nearly the same tint, the photometric match obtained by different Hetero- observers is practically the same. If, however, they chromatic are f distinctly different colours, not only do dif- ”’”’”’”^■ferent observers obtain different results but those obtained by the same observer at different times are not always in agreement. Helmholtz was of opinion that photo- metric comparison of the intensities of different coloured lights possessed no real intrinsic value. There can be little doubt that in a rigorous sense this is true. Nevertheless it is possible under certain conditions to effect a comparison which has some practical value. For example, when the intensities of two differently coloured lights differ considerably there is no difficulty in judging which is the stronger. By making the one light pass through a fairly large range of brightness we may easily assign limits outside which the intensities are undoubtedly different. After some experience these limits get close; and many experimenters find it possible, by taking proper precau- tions, not only to effect a match, but to effect practically the Abney's same match time after time. According to Abney, ExpeH- whose memoirs on colour photometry {Phil. Trans., meats.];886, 1892) form a most important contribution to the subject, the observer in making his judgment as to the equality of luminosity of two patches of colour placed side by side must not begin to think about it, but must let the eye act as unconsciously as possible. His method was to compare the coloured patch with white light given by a particular standard and cut down to the proper intensity by use of a Talbot's rotating sector, which could be adjusted by means of a suitable mechanism while it was rotating.

At the same time, although the eye may be able to effect a definite matching of two patches of colour of a particular luminosity, it has been long known that a change in the lumi- nosity will destroy the apparent equality. This depends upon a physiological property of the retina discovered by J. E. Purkinje in 1825 (see below, Celestial Photometry). In virtue of this property the blue and violet end of the spectrum is more stimu- lating to the eye than the red end when the general luminosity is

low, whereas at high luminosities the red gains relatively in brightness until it becomes more stimulating than the blue. Unless therefore account is taken in some definite measurable manner of the absolute brightness, there must always be some uncertainty in the photometric comparison of the intensities of differently coloured sources of light.

Instead, however, of trying to effect a photometric match in any of the ways which have been found sufficient when the sources are of the same or nearly the same tint, we may effect important practical comparisons in what is called hetero- chromatic photometry by an appeal to other physiological properties of the eye. For example, the power of clearly dis- criminating patterns in differently coloured lights of various intensities is obviously of great practical importance; and this power of detailed discrimination may be made the basis of a method of photometry. According to this method two lights Dlscrimlna- are arranged so as to illuminate two exactly similar tion Photo- patterns of lines drawn, for example, on the sides meter. f a Ritchie wedge, and their distances are adjusted

until the patterns are seen equally distinct on the two sides. Application of the usual distance law will then give the relation between the two lights. A discrimination photometer con- structed on this principle has been designed by J. A. Fleming. Its results do not agree with the indications of an ordinary

luminosity photometer; for it is found that the eye can dis- criminate detail better with yellow than with blue light of the same apparent luminous intensity.

Another and very promising method of photometry depends upon the duration of luminous impressions on the retina. J. A. F. Plateau observed in 1829 that the blending into Flicker a homogeneous impression of a pattern of alternate Photometry. sectors of black and some other colour marked on a disk when that disk was rotated occurred for rates of rotation which depended on the colour used. A form of experiment suggested in Professor O. N. Rood's Modern Chromatics seems to have been first carried out by E. L. Nichols (Amer. Journ. of Science, 1881). A black disk with four narrow open sectors was rotated in front of the slit of a spectroscope. When the rotation was not too quick the yellow part of the spectrum appeared as a succession of flashes of light separated by intervals of darkness of appreciable length, whereas towards both the red and violet ends no apparent interruption in the steady luminosity could be observed. As the rate of rotation increased the part of the spectrum in which flickering appeared contracted to a smaller length extending on each side of the yellow, and finally with sufficiently rapid alternation the yellow itself

became steady. This seems to show that the retinal image persists for a shorter time with yellow light than with light of any other colour; for with it the intervals of darkness must be shorter before a con- tinuous impression can be obtained. Now yellow is the most luminous part of the spectrum as it affects the normal human eye; and E. S. Ferry (Amer. Journ. of Science, 1892) has shown that the duration of luminous impression is mostly, if not entirely, determined by the luminosity of the ray. Hence the determina- tion of the minimum rate of intermittence at which a particular colour of light becomes continuous may be regarded as a measure of the luminosity, the slower rate corresponding to the lower luminosity. Although in the experiment just described the red part of the ordinary solar spectrum becomes continuous for a slower rate of intermittence than the yellow part, yet we have simply to make a red ray as luminous as the yellow ray to find that they become continuous for the same rate of inter- mittence. It is, however, highly improbable that the duration of impression depends only on the luminosity of the light and not to some extent upon the wave-length. There are indeed phenomena which require for their explanation the assumption that the duration of luminous impression does depend on the colour as well as on the brightness.

Nevertheless the luminosity is by far the more important factor, as shown by Ogden N. Rood's experiments. He found (Amer. Journ. of Science, 1893) that, when a disk whose halves (differ in tint but not in luminosity is rotated rather pˆa',,ˆ,1 slowly, the eye of the observer sees no flickering such as is at once apparent when the halves differ slightly in luminosity. Rood himself suggested various forms of photo- meter based on this principle. In his latest form (Amer. Journ. of Science, Sept. 1899) the differently coloured beams of light which are to be compared photometrically are made to illuminate the two surfaces of a Ritchie wedge set facing the eye. Between the wedge and the eye is placed a cylindrical concave lens, which can be set in oscillation by means of a motor in such a way that first the one illuminated surface of the wedge and then the other is presented to the eye in sufficiently rapid alternation. The one source of light is kept fixed, while the other is moved about until the sensation of flicker disappears. From work with this form of instrument Rood concluded that " the accuracy attainable with the flicker photometer, as at present con- structed, and using light of different colours almost spectral in hue, is about the same as with ordinary photometers using plain white light, or light of exactly the same colour." ""

Various modifications of Rood's forms have been constructed from time to time by different experimenters. The,,, Simmance and Abady nicker photometer is an i n genious an

in a peculiar manner. The sharp edge, which passes slightly obliquely across the rim from one side of the wheel to the other and back again, is the meeting of two exactly similar conical surfaces facing different ways and having their axes parallel to, but on opposite sides of, the axis of rotation of the wheel. As the wheel rotates with its rim facing the eye, the intersection of the two surfaces crosses and recrosses the line of vision during each revolution. Hence first the one illuminated side and then the other are pre- sented to the eye in rapid alternation. The inventors of this instru- ment claim that their instrument can gauge accurately and easily the relative intensities of two lights, whether of the same or of different colour {Phil. Mag., 1904). There is no doubt that results obtained by different observers with a flicker photometer are in better agreement than with any other form of photometer. The comparative ease with which the balance is obtained even when the tints are markedly different shows that its action depends upon a visual distinction which the eye can readily appreciate, and this distinction is mainly one of brightness.

The spectrophotometer is an instrument which enables us to make photometric comparisons between the similarly coloured Spectro- portions of the spectra of two different sources of photometry, light, or of two parts of the same original source after they have passed through different absorbing media. When it is desired to compare the intensities of the spectra from two different sources a convenient form is the one described by E. L. Nichols. A direct vision spectroscope mounted upon a carriage, travels along a track between the two sources. In front of the slit two right-angled triangular prisms are set so that the light from each source enters the one side of one prism perpendicularly and is totally reflected into the spectroscope. The two spectra are then seen side by side. Attention being fixed on some chosen narrow portion, say, in the green, the instrument is moved along the track between the sources until the two portions appear of the same intensity. The process is then repeated until the whole spectrum has been explored.

In Lummer and Brodhun's form of spectrophotometer the rays

to be compared pass in perpendicular lines through the modified

f Swan double prism, and then together side by side

s «cf S through a spectroscope. By means of a simple modifi-

? ro ‘ . cation in the form of the two prisms, Professor D. B. paotomeier. Brace ^^ Ma ^ lgg ^ made the combined prism

serve to produce the spectra as well as to effect the desired comparison. In this arrangement the compound prism ABC

(fig. 2) is made up of two equal right-angled prisms ADB and ADC placed with their longer sides in contact, so that the whole forms an equilateral prism with three polished faces. Part of the interface AD is silvered, the silvering forming a narrow central strip running parallel to AD. Along the rest of the interface the two prisms are cemented together with Canada balsam or other material having as nearly as possible the same refractive index as the glass. When two

Fig. 2.

R$’*

rays R S enter symmetrically from opposite sides of the base of the compound prism as shown in the diagram, the ray R will pass through the prism except where the silver strip intercepts it, and will form a part of a spectrum visible to the eye placed at R’, while to the same eye there will be visible the similarly dispersed ray SS’ reflected from the silvered surface. Thus two systems of incident parallel rays of white light will form on emergence two spectra with corresponding rays exactly parallel. With these and other forms of instrument the aim of the experimenter is to make the two spectra of equal intensity by a method which enables him to compare the original intensities of the sources. In most cases the relative intensities of the portions of the spectra being compared cannot conveniently be altered by varying the distances of the sources. Recourse is therefore generally had to one of the other methods already mentioned, such as the use of polarizing prisms or of rotating sectors. Under certain conditions K. Vierordt’s method of allowing the two rays to pass through slits of different width leads to good results, but too great confidence cannot be placed upon it.

In other types of spectrophotometer, such as those associated with the names of H. Trannin, A. Crova, H. Wild, G. Hiifner, J. Konigsberger, A. Konig, F. F. Martens and others, the equaliza- tion in brightness of two rays is effected by using polarized light, which can be cut down at pleasure by rotation of a Nicol prism. For example, in the Konig-Martens instrument the two rays which are to be compared enter the upper and lower halves pf a

divided slit. After passing through a lens they pass in succession through (1) a dispersing prism, (2) a Wollaston prism, (3) a bi- prism, and are finally focused where the eight spectra so produced can be viewed by the eye. Of these only two K° a 'B" (are made use of, the others being cut out. These two ˆ a fˆ BS s are polarized in perpendicular planes, so that if be- £ ˆ r °" / tween the spectrum images and the eye a Nicol prism p ° ometeT% is introduced the intensities of any two narrow corresponding portions of the two spectra can be readily equalized. In terms of the angle of rotation of the Nicol the relative intensities of the original rays can be calculated. An important application of the spectrophotometer is to measure the absorptive powers and extinction coefficients of transparent substances for the differently coloured rays of light. By appropriate means the in- tensities of chosen corresponding parts of the two contiguous spectra are made equal — in other words, a match is established. Into the path of the rays of one of the spectra the absorbent substance is then introduced, and a match is again established. A measure of the loss of luminosity due to the interposition of the absorbent substance is thus obtained.

To facilitate experiments of this nature Dr J. R. Milne has devised a spectrophotometer which presents some novelties of construction (see Proceedings of the Optical Convention, >

1905, vol. i.). The light from a bright flame is suitably ™ ™? s projected by a lens so as to illuminate a small hole in the ? < T ro " / end of the collimator. The rays from this point-source Photometer. are made parallel by the collimator, and then pass, partly through the absorbing medium, partly through the space above it. These two parts of the original beam are transmitted through a dispersing prism and then fall upon a screen with two similar rectangular openings, the upper one allowing the unabsorbed part of the beam to pass, the lower that part which has been transmitted through the absorbing medium. The objective of the observing telescope converges the rays suitably upon a Wollaston prism, so that two spectra are seen side by side, having their light polarized in per- pendicular planes. A Nicol prism is placed between the Wollaston prism and the eye-piece of the telescope, and by its rotation in the manner already described the intensities of any two corresponding portions of the two spectra can be brought to equality. By careful attention to all necessary details Milne shows that his instrument satisfies the requirements of a good spectrophotometer; for (1) the rays through the absorbing medium can be made strictly parallel; (2) the two spectra can be brought with ease accurately edge to edge without any diffraction effects ; (3) the plane of the delimiting screen can be made conjugate to the retina of the observer's eye; (4) not only do the two spectra touch accurately along their common edge, but the two fans of rays which proceed from every point of the common edge lie in one and the same plane; (5) the eye is called upon to

judge the relative intensities not of two narrow slits but of two broad uniformly illuminated areas. Milne also points out that this instrument can be used as a spectropolarimeter.

£. L. Nichols considers that spectrophotometers which depend for their action upon the properties of polarized light are necessarily open to serious objections, such as: selective absorp- tion in the calcspar, altering the relative intensities of the con- stituents in the original rays; selective losses by reflection of polarized rays at the various optical surfaces; and the neces- sarily imperfect performance of all forms of polarizing media. To eliminate these defects as far as possible great care in con- struction and arrangement is needed, otherwise corrections must be applied. •

It is evident that if the successive parts of two spectra are compared photometrically we may by a process of summation obtain a comparison of the total luminosities of the lights which form the spectra. This process is far too tedious to be of any practical value, but sufficiently accurate results may in certain cases be obtained by comparison of two or more particular parts of the spectra, for example, strips in the red, green and blue. Similar in principle is the method suggested by J. Mace de Lepinay, who matches his lights by looking first through a red glass of a particular tint and then through a chosen green. If R and G represent the corresponding ratios of the intensities, the required comparison is calculated from the formula

"D

I = ; — : ˆrrr- A. Crova, one of the earliest workers

1 + 0-208 (1 — GR)

in this subject, effects the photometric comparison of differently coloured lights by matching those monochromatic rays from the two sources which have the same ratio of intensities as the whole collected rays that make up the lights. Careful experi- ment alone can determine this particular ray, but were it once ascertained for the various sources of light in use the method would have the merits of rapidity and accuracy sufficient for

practical needs. Spectrophotometric observations are necessary to determine the position in the spectrum of the particular mono- chromatic ray, but when it has been determined a coloured glass may be made which allows light in the neighbourhood of this ray to pass, and the photometric comparison may then be effected by looking through this glass.

This article has been confined strictly to the methods of visual photometry, with very little reference to the results. Comparison of intensities of radiation by photographic means or by methods depending on the effects of heat introduces considerations quite distinct from those which lie at the basis of photometry in its usual signification. (C. G. K.)

Celestial, or Stellar, Photometry

The earliest records that have come down to us regard- ing the relative positions of the stars in the heavens have always been accompanied with estimations of their relative brightness. With this brightness was naturally associated the thought of the relative magnitudes of the luminous bodies from whence the light was assumed to proceed. Hence in the grand catalogue of stars published by Ptolemy (c. 150 a.d.), but which had probably been formed three hundred years before his day by Hipparchus, the 1200 stars readily visible to the naked eye at Alexandria were divided into six classes according to their lustre, though instead of that term he uses the word neyedos or " magnitude "; the brightest he designates as being of the first magnitude, and so downwards till he comes to the minimum visible, to which he assigns the sixth. These magnitudes he still further divides each into three. To those stars which, though not ranged in any particular order of brightness, nevertheless exceed the average of that order in lustre he attaches the letter /z, the initial letter in jueifcov (greater), and to those in the same order which exhibit a lustre inferior to that of the average he affixes the letter e, the initial letter of tkaaauv. With this sort of subdivision he passes through all the six orders of magnitude. He does not, indeed, tell us the precise process by which these divisions were estimated, but the principle involved is obvious. It is one of the many remarkable instances of the acuteness and precision of the Greek mind that for upwards of 1500 years no real improvement was made in these estimations of lustre. J. Flamsteed extended the estima- tion of magnitude of stars visible only by the telescope, and he improved Ptolemy's notation by writing 4-3 instead of 5, fx — indicating thereby an order of magnitude brighter than the average of a fourth, but inferior to that of a third — and 3-4 for 5, e, and so on; but it was not till the year 1796 that any real advance was made in stellar photometry. Sir W. Herschel, instead of assigning a particular magnitude to stars, arranged them in small groups of three or four or five, indicating the order in which they differed from each other in lustre at the time of observation. This method was admirably adapted to the discovery of any variations in brightness which might occur in the lapse of time among the members of the group. Sir William observed in this way some 1400 stars, published in four cata- logues in the Philosophical Transactions from 1796 to 1799; and two additional catalogues were discovered among his papers in 1883 by Professor E. C. Pickering of Harvard (see Harvard Annals, xiv. 345), and have recently been published

by Colonel J. Herschel (Phil. Trans., 1906). These researches of the elder Herschel were in due time followed by those of his son, Sir John, about the year 1836 at the Cape of Good Hope. He both extended and improved the methods adopted by his father at Slough, and by a method of estimated sequences of magnitude he hoped to arrange all the stars visible to the naked eye at the Cape or in England in the order of their relative lustre, and then to reduce his results into the equivalent magnitudes adopted by the universal consent of astronomers. Sir John, however, like his father, left this important labour incomplete. Not only is the work one of great and continuous effort, but the effects of ever-varying meteorological conditions greatly impede it. Moreover, there is an unsatisfactory indefiniteness attending all estimations made by the Unaided eye ; numerical or quantitative comparisons are out of the question, and hence we find

Sir John, in the very midst of establishing bis " sequences," adopting also an instrumental method which might lead him to more definite results.

In the year when Sir John Herschel concluded his photo- metric work at the Cape (1838) Dr F. W. A. Argelander com- menced, and in 1843 completed, his Uranometria nova, in which the magnitudes of all stars visible to the unaided eye in central Europe are catalogued with a precision and completeness previously unknown. It contains 3256 stars, and although it will probably be superseded by instrumental photometry it must ever remain a monument of intelligent patience. Arge- lander's labours were not confined to stars visible to the naked eye; by the aid of his assistants, Dr E. Schonfeld and Dr A. Kriiger, three catalogues of magnitudes and celestial co-ordinates were ultimately published (1859-1862) as the Bonn Durch- musterung, including the enormous number of 324,188 stars, and an additional volume containing 133,659 stars south of the equator was published in 1886.

Dr B. A. Gould (1824-1896), in his Uranometria argentina (1879), has done similar work for 7756 stars visible only in the southern hemisphere, and his successor at Cordoba, J. M. Thome, has published (1904) three volumes of the Argentine (Cordoba) Durchmusterung containing 489,662 stars between declination — 22 to —5 2 . There have been other worthy labourers in the same field, each of whom has rendered efficient service, such as Dr E. Heis and M. J. C. Houzeau.

It is to Sir John Herschel that we are indebted for the first successful attempt at stellar photometry by what may be termed " artificial " means. He deflected the light of the moon (by means of the internal reflection of a rectangular prism) through a small lens 0-12 in. in diameter and of very short focus (0-23 in.) so as to form a sort of artificial star in its focus. With strings and a wooden pole he could move this artificial star of

comparison so as to be in the same line of sight with any actual star whose light he proposed to measure. Other strings enabled him to remove it to such a distance from the eye that its fight was adjudged to be sensibly the same as that of the star compared; and the distance was measured by a gradu- ated tape. While he was thus busy at the Cape of Good Hope, K. A. Steinheil at Munich had completed for Dr P. L. Seidel an instrument nearly the same in principle but more manageable in form. He divided the small object-glass of a telescope into two halves, one of which was movable in the direction of its axis. The images of two stars whose light he desired to compare were formed by prismatic reflection, nearly in the same line of sight, and one of the lenses was then moved until the light of the two images seemed equal. The distance through which it was necessary to bring the movable lens furnished the data for comparing the relative lustre of the two stars in question. More recently other photometers have been devised, and de- scriptions of three of them, with which considerable researches have been conducted will now be given. With the first mentioned below Professor Pickering of Harvard has made more than a million measures with his own eyes. The results of his observa- tions, and of those of his assistants, will be found in the Harvard Annals especially in vol. xlv. published in 1901, which con- tains a general catalogue of about 24,000 stars brighter than magnitude 7-5, north of declination — 40 . With the Zollner photometer Drs Gustav Miüller and P. Kempf of Potsdam have recently completed a similar piece of work, their catalogue of stars north of the equator brighter than 7-5 containing 14,199 stars (Potsdam Publications, 1907, vol. xvii.). The catalogue of Professor C. Pritchard was smaller, containing 2784 stars brighter than magnitude about 6-5 and north of declination — io°; but it was published in 1886, when very little had yet been done towards the systematic measurement of the brightness of the stars (Uranometria nova oxoniensis, vol. ii. of the Oxford University Observatory publications).

Pickering's meridian photometer (Ann. Astron. Obs. Harv. vols, xiv. and xxiii.) consists of two telescopes placed side by side pointing due east, the light from the stars on the meridian being reflected into them by two mirrors inclined at an angle of 45 to this direction. If there were a star exactly at the Pole, one of these mirrors

would be absolutely fixed and would constantly reflect the light of this star down the axis of its telescope ; in practice a slight motion can be given to the mirror so as to keep in view Pickering's the polar star selected, whether Polaris, with which Meridian the brighter stars were compared, or X Ursae

Photometer. Minoris, which was used for fainter stars. The second mirror (which projects a little beyond the first so as to get an unobstructed view of the meridian) can be rotated round the axis, of the telescope by means of a toothed-wheel gearing, and can thus be made to reflect any star on the meridian down the second telescope; it is also provided with a small motion in the perpendicular direction, so as to command a degree or two on each side of the meridian. Near the common eyepiece of the telescopes there is a double image prism which separates the light received from each into two pencils; the pencil of ordinary rays from one object- glass is made to coincide with that of extraordinary rays from the other, and the two remaining pencils are excluded by a stop. The two coincident pencils then pass through a Nicol prism to the eye of the observer, who by rotating the prism round its axis can equalize them at a definite reading depending on their relative intensities. This reading gives in fact the difference of magnitude between the two stars selected for comparison. It may be re-marked that the position of the double image prism is important. It should be just within, not at, the common focus: this position prevents any noticeable colour in the images, and gives the ordinary and extraordinary pencils a sufficient separation at the eye-stop to permit the entire exclusion of one without the loss of any part of the other. If the prism were exactly at the focus, and any part of the superfluous images were admitted, the resulting secondary images would coincide with the others and thus lead to errors in observing. But in the actual construction of the instru- ment the secondary images would appear, if at all, only as additional stars near those under observation, and too faint to produce any inconvenience. It is worthy of note that Professor Pickering has extended his survey into the southern hemisphere, so that the Harvard photometry is the most complete of all. Each observation consists of four comparisons; after the first two the observer reverses the position of the star images in the field, and also reverses the double-image prism. The former precaution is necessary in order to eliminate a curious error depending on the relative position of the images, which may amount to several tenths of a magnitude. Errors of this kind affect all estimations of the relative brightness of two stars in the same field, as has been repeatedly shown; a striking instance is given by A. W. Roberts, of Lovedale, South Africa (Mon. Not. R.A.S. April 1897), who found that his eye-estimations of the brightness of variable stars required a correction depending on the position-angle of the comparison star ranging over nearly two magnitudes.

In Zollner's instrument an artificial star is taken as the standard of comparison. There is only one telescope, and inside the tube near the eye end is a plate of glass placed at an angle Zollner's of 45 with the axis, so that the rays from a lamp which Photometer, enter the tube from the side are reflected down the tube to the eyepiece, while the light from the star

passes through the plate unobstructed. The lamplight passes through a Nicol prism and a plate of rock crystal, which give control over the colour; through two Nicols which can be rotated round the axis of the beam to definite positions read off on a graduated circle ; and then through a convex lens which forms an image reflected by the glass plate to focus alongside the star. The whole of this apparatus is carried in a compact form on the eye end of the telescope, it being arranged that the lamp shall always stand upright. The measures are made by rotating the Nicols until the brightness of the artificial star is equal to that of the star viewed through the object glass, and reading the graduated circle.

Professor Pritchard's (1 808-1 893) wedge photometer is con- structed on the principle that the absorption of light in passing The Wedee through a uniform medium depends, caeteris paribus, Photometer, upon the thickness. On this principle a thin wedge " is constructed of homogeneous and nearly neutral- tinted glass, through which the images of stars formed in the focus of a telescope are viewed. Simple means are contrived for measuring with great exactness the several thicknesses at which the light of these telescopic star-images is extinguished. In this way the light of any star can be readily compared with that of Polaris (or any other selected star) at the moment of observa- tion, and thus a catalogue of star-magnitudes can be formed. Two material improvements suggested by Dr E. J. Spitta are worthy of notice. The first (Proc. Roy. Soc, 1889, 47, 15) corrects a slight defect in the form of the instrument. If a pencil of rays passes through a thin wedge of tinted glass, the rays do not all pass through the same thickness of glass. Dr Spitta proposes to substi- tute a pair of wedges with their thicknesses increasing in opposite directions. By sliding one over the other we obtain a parallel plate of glass of varying thickness, and a uniform beam of light of sensible dimensions can then be extinguished satisfactorily. He has also pointed out a source of error in the method of " evaluating " the wedge and shown how to correct it. The scale value was determined by Professor Pritchard by the use of a doubly refracting prism of quartz and a Nicol prism. Using this method subsequently,

Pheno- menon.

Dr Spitta found that internal' reflections within the Nicol prism interfered with the accuracy of the result, but that this error could be eliminated by using a suitable diaphragm (Mon. Not. R.A.S. March 1890; Abney, ibid., June 1890).

Since 1885 systematic catalogues of stellar brightness have been constructed with all these instruments, and it has been of great interest to compare the results. The com- The parison has in general shown a satisfactory agreement, Purkinje but there are small differences which are

almost certainly systematic, due to the difference of method and instrument. One cause of such differences, the reality of which is undoubted, but the effects of which have as yet not been perhaps fully worked out, is the " Purkinje phenom- enon " {Pfltigers Archiv. lxx. 297). If a blue source of light and a red source appear equally bright to the eye, and if the intensity of each be diminished in the same ratio, they will no longer appear equally bright, the blue now appearing the brighter ; in more general terms, the equalizing of two differently coloured lights by the eye depends upon their intensity. It is clear that this phenomenon must affect all photometric work unless the stars are all exactly of the same colour, which we know they are not. For let us suppose that both the comparison star of the meridian photometer and the artificial star of the Zollner photometer were equalized with a bright star A, and that they could be also compared inter se and found equally bright. Then when a faint star B comes under observation and the inten- sities of the comparison stars are both reduced to equality with B, they will no longer appear equal to one another unless they are exactly the same in colour. In other words, the observed ratio of intensities of A and B will vary with the colour of the comparison star, and similarly it will also vary with the aperture of the telescope employed. Now it is one of the merits of the Potsdam catalogue above mentioned that it gives estimates of the colours of the stars as well as of their magnitudes — so that we now for the first time have this systematic information. In a most interesting section of their introduction it is shown that two of the Harvard photometric catalogues show systematic differences, due to colour, and amounting to nearly half a magnitude: and that the Purkinje phenomenon is a satisfactory explanation of these differences. This is the first instance in which the effect of this phenomenon has been measured in the case of the stars, though it was known to be sensible. But there is a set of numerical results obtained in the laboratory which is of impor- tance for all such works, viz. those obtained by Sir W. Abney (Proc. Roy. Soc. May 1891; and Mon. Not. R.A.S. April 1892), giving the limiting intensity at which each pure colour vanishes. If we start with lights C D E F G of the colours usually denoted by these letters in the spectrum, and each so bright that it appears to the eye as bright as an amyl-acetate lamp at 1 ft., and if then the intensity of each be gradually diminished, the C light will disappear when the original intensity has been reduced to 22,000 ten-millionths of the original value. Theother colours will disappear at the following intensities, all expressed in ten-millionths of the original: D at 350, E at 35, F at 17, and G at 15. If then we had a mixture of two lights, one of C colour as bright as before, and the other of G colour 1000 times fainter (a combination in which the eye would be unable to distinguish the G light at all), and if we continually reduced the combined intensity, the luminosity of the C light would diminish so much more rapidly than that of the G that the latter would begin to assert itself,

and when the combined intensities were reduced to 22,000 ten-millionths of the original value, the C light would have all disappeared, while the G light would not. Hence the colour of the light would appear pure violet, though it was originally deepred. This extreme case shows that the " last ray to disappear " when a light is gradually extinguished may be very different in colour from that of the original light, and when more usual light-mixtures are considered, such as those of sunlight and starlight, which appear nearly white to the eye, the " last ray to disappear " is found to be in the green, very near E in the spectrum. This result has two important bearings on the use of the wedge photometer. In the first place,

either the wedge itself should be of a greenish hue, or green light should be used in finding the scale-value (the constant B in the formula $m = A + Bw$*). In the second, star magnitudes obtained by extinction with the wedge will agree better with those obtained by photography than those obtained with other visual photo- meters, since photographic action is chiefly produced by rays from E to G in the spectrum, and the E light of ultimate impor- tance with the wedge photometer is nearer this light in character than the D light with which other photometers are chiefly concerned. It would also appear that results obtained with the wedge photometer are independent of the aperture of telescope employed, which is not the case with other photometers.*

Passing now to the consideration of photographic methods, it is found that when a plate is exposed to the stars, the images Photo- 0I the brighter stars are larger and blacker than graphic those of the fainter ones, and as the exposure is Photo- prolonged the increase in size and blackness contin- metry. ues _ Much of the light is brought to an accurate focus, but, owing to the impossibility of perfect achromatism in the case of refractors, and to uncorrected aberration, diffraction, and possibly a slight diffusion in both refractors and reflectors, there are rays which do not come to accurate focus, grouped in rings of intensity gradually diminishing outwards from the focus. As the brightness of the star increases, or as the time of exposure is prolonged, outer and fainter rings make their impression on the plate, while the impression on the inner rings becomes deeper. Hence the increase in both diameter and blackness of the star disks. As these increase concurrently, we can estimate the magnitude of the star by noting either the increase in diameter or in blackness, or in both. There is consequently a variety in the methods proposed for determining star magnitudes by photography. But before considering these different methods, there is one point affecting them all which is of fundamental importance. In

photography a new variable comes in which does not affect eye-observations, viz., the time of exposure, and it is necessary to consider Low to make due allowance for it. There is a simple law which is true in the case of bright lights and rapid plates, that by doubling the exposure the same photographic effect is produced as by increasing the intensity of a source of light twofold, and so far as this law holds it gives us a simple method of comparing magnitudes. Unfortunately this law breaks down for faint lights. Sir W. Abney, who had been a vigorous advo- cate for the complete accuracy of this law up till 1893, in that year read a paper to the Royal Society on the failure of the law, finding that it fails when exposures to an amyl-acetate lamp at 1 ft. are reduced to o'ooi, and " signally fails " for feeble intensities of light; indeed, it seems possible that there is a limiting intensity beyond which no length of exposure would produce any sensible effect. This was bad news for astronomers who have to deal with faint lights, for a simple law of this kind would have been of great value in the complex department of photometry. But it seems possible that a certain modification or equivalent of the law may be used in practice. Professor H. H. Turner found that for plates taken at Greenwich, when the time of exposure is prolonged in the ratio of five star magni tudes the photographic gain is four magnitudes (Mon. Not. R.A.S. lxv. 775), and a closely similar result has been obtained by Dr Schwarzschild using the method presently to be mentioned.

Stars of different magnitudes impress on the plate images differing both in size and blackness. To determine the magni- Diameter as tude from the character of the image, the easiest Testof quantity to measure is the diameter of the image, Magnitude. an(j w hen measurements of position are being made with a micrometer, it is a simple matter to record the diameter as well, in spite of the indefiniteness of the border. Accordingly we find that various laws have been proposed for representing the magnitude of a star by the diameter of its image, though these have usually been expressed, as a pre- liminary, as relations between the diameter and time of exposure. Thus G. P. Bond found the diameter to increase as the square of

the exposure, Turner as the cube, Pritchard as the fourth power, while W. H. M. Christie has found the law that the diameter varies as the square of the logarithm of the exposure within certain limits. There is clearly no universal law — it varies with the instrument and the plate — but for a given instrument and plate an empirical law may be deduced. Or, without deducing any law at all, a series of images may be produced of stars of known brightness and known exposures, and, using this as a scale of reference, the magnitudes of other images may be inferred by interpolation. A most important piece of systematic work has been carried out by the measurement of diameters in the Cape Photographic Durchmusterung

{Ann. Cape Obser. vols, iii., iv. and v.) of stars to the tenth magnitude in the south- ern hemisphere. The measurements were made by Professor J. C. Kapteyn of Groningen, on photographs taken at the Cape of Good Hope Observatory; he adopts as his purely empirical formula

magnitude = B/(diameter+ C),

where B and C are obtained independently for every plate, from comparison with visual magnitudes. C varies from 10 to 28, and B from 90 to 260. The part of the sky photographed was found to have an important bearing on the value of these con- stants, and it was in the course of this work that Kapteyn found a systematic difference between stars near the Milky Way and those far from it, which may be briefly expressed in the law, the stars of the Milky Way are in general bluer than the stars in other regions of the sky. It is intended, however, in the present article to discuss methods rather than results, and we cannot here further notice this most interesting discovery.

Of methods which choose the blackness of the image rather than the diameter for measurement, the most interesting is that initiated independently by Pickering at Harvard and C. Schwarzschild at Vienna, which consists /pf^ HS- in taking star images considerably out of focus. The result is that these images no longer vary appreciably in size, but only in blackness or density; and that this gradation of density is recognizable through a wide range of magnitudes. On a plate taken in good focus in the ordinary way there is a gradation of the same kind for the faintest stars; the smallest images are all of approximately the same size, but vary in tone from grey to black. But once the image becomes black it increases in size, and the change in density is not easy to follow. The images-out-of-focus method seems very promising, to judge by the published results of Dr Schwarzschild, who used a pre- pared comparison scale of densities, and interpolated for any given star from it. The most satisfactory photographic method would certainly be to take account of both size and blackness, i.e. to measure the total deposit in the film; as, for instance, by interposing the whole image in a given beam of light, and measuring the diminution of the beam caused by the obstruction. But no considerable piece of work has as yet been attempted on these lines.

Even in a rapid sketch of so extensive a subject some notice must be taken of the application of photometry to the determina- tion of the relative amount of light received on the Light of the earth from the sun, the moon and the planets. Sun, Moon The methods by which these ratios have been a ”” ,p/al,ete • obtained are as simple as they are ingenious; and for them we are mainly indebted to the labours of P. Bouguer and W. C. Bond (1789-1859). The former compared the light received from the sun with

that from the moon in the following fashion in 1725. A hole one-twelfth of a Paris inch was made in the shutter of a darkened room; close to it was placed a con- cave lens, and in this way an image of the sun 9 in. in diameter was received on a screen. Bouguer found that this light was equal to that of a candle viewed at 16 in. from his eye. A similar experiment was repeated with the light of the full moon. The image now formed was only two-thirds of an inch in diameter, and he found that the light of this image was comparable with that of the same candle viewed at a distance of 50 ft. From these data and a very simple calculation it followed that the light of the sun was about 256,289 times that

of the moon. Other experiments followed, and the average of all the results was that the light of the sun was about 300,000 times the average light of a full moon, both being viewed in the heavens at the same altitudes. The details will be found in Bouguer's Traite d'optique. W. H. Wollaston in 1829 tried a series of experiments in which the ratio 801,072 was obtained; but the omission of certain necessary precautions vitiates the result (Phil. Trans. 1829). Bond (Mem. Amer. Acad. 1861, p. 295) adopted a different process. He formed the image of the sun on a silvered globe of some 10 in. diameter; the light of this image was reflected on to a small mercurial thermometer bulb; and then this second image was compared with a Bengal light so moved that the lights appeared to be equal. The same process was adopted with the full moon instead of with the sun. The result was that the sun's light was 470,980 times that of the moon. Seidel long before this date had compared the light of the mean full moon with that of Jupiter in mean opposition; his result is 6430. So also this light of Jupiter was found to be •4864 times that of Venus at her brightest; and Jupiter was found to give 8-2 times the light of a Lyrae. If, then, these numbers could be accepted with confidence, we should have the means of comparing the light received from the sun with that received from any of the stars. Adopting these precarious numbers on the authorities of Bond and Seidel we have the following results: —

Sun's light = 470,980 that of the full moon.

,, = 622,600,000 „ Venus at her brightest.

,, = 302,835,000 „ Jupiter at mean opposition.

» = SST 3 ˆ 00 ! 000 7. Sirius.

Lastly, Bouguer, by comparing the light of the full moon viewed at different

altitudes with an artificial light, found that the atmosphere absorbs 1877 of the light incident on it at the zenith of any place. Professor Pritchard, from photo metric measures taken at Cairo, found this number to be -157. At Oxford it was -209. Thus Bouguer's determination indicates an absorptive capacity in the atmosphere of Brittany just midway between those of Oxford and Cairo. Seidel at Munich expresses " surprise " at finding his own results so nearly accordant with Bouguer's. Although rather outside the domain of photometry in the strict sense, a word or two may be said here about recent attempts to measure the heat received from the stars, the first being made with the " radio-micrometer " of C. V. Boys. (Proc. Roy. Soc. 1890). This is an extremely delicate instrument for Very little measuring radiant heat, and consists of a very light Heat from thermo-electric circuit (two tiny bars of antimony the stars. anc j bismuth soldered together at one edge, the outer edges being connected by a hoop of copper wire) suspended by a quartz fibre (a torsion fibre of the very greatest sensitiveness) in a strong magnetic field. A minute quantity of radiant heat falling on one of the junctions of the circuit sets up a current in the circuit, which thus rotates in the magnetic field until brought to rest by the torsion of the fibre. For use on the heavenly bodies the radiant heat is collected to focus by a reflecting telescope (an object-glass would absorb it), and when the telescope is pointed to the moon the varying radiation from different parts of the disk is beautifully shown. No heat comes from the unlit portion, and of the illuminated portion the maximum is obtained from near the limb. But when pointed to the brightest stars no indications were obtained, although the instrument is sensitive enough to detect the heat from a candle more than a mile off. It seems certain that indications of heat from the stars obtained by previous observers must be spurious. It is also manifest that to obtain satisfactory results even more sensitive apparatus must be devised, and by using a radiometer and the powerful resources of the Yerkes Observatory E. F. Nichols succeeded in 1898 and 1900 in obtain- ing indications of heat from Arcturus and Vega, as well as from Jupiter and Saturn (Astrophysical Journ. xiii., 101), the heat received being comparable with that from a candle 6 m. away. We may place alongside this result that obtained by W. J. Dibdin (Proc. Roy. Soc. April 1892), who compared candle- light with twenty-one stars ranging to the sixth magnitude,

and found the light of a second magnitude star equal to that of a candle at 1260 ft. (H.H.T.)

PHRAATES (Phrahates; Pers. Frahat, modern Ferhat), the name of five Parthian kings.

1. Phraates I., son of Priapatius, reigned c. 175-170 B.C. He subdued the Mardi, a mountainous tribe in the Elburz (Justin xli. 5; Isid. Charac. 7).

He died young, and appointed as his successor not one of his sons, but his brother Mithradates I. (Justin xli. 5).

2. Phraates II., son of Mithradates I., the conqueror of Babylonia, reigned 138-127. He was attacked in 130 by Antiochus VII. Sidetes, who, however, in 129 was defeated and killed in a great battle in Media, which ended the Seleucid rule east of the Euphrates (see Seleucid Dynasty). Meanwhile the kingdom was invaded by the Scythians (the Tochari of Bactria), who had helped Antiochus. Phraates marched against them, but was defeated and killed (Justin xlii. 1; Johannes Antioch,/r. 66).

3. Phraates III., " the God " (Phlegon, jr. 12 ap. Photius corf. 97 and on some of his coins) , succeeded his father, Sanatruces, in 70 B.C., at the time when Lucullus was preparing to attack Tigranes of Armenia, who was supreme in western Asia and had wrested Mesopotamia and several vassal states from the Parthian kingdom. Naturally, Phraates declined to assist Mithradates of Pontus and Tigranes against the Romans (see Tigranes). He supported his son-in-law, the younger Tigranes, when he rebelled against his father, and invaded Armenia (65 B.C.) in alliance with Pompey, who abandoned Mesopotamia to the Parthians (Dio. Cass, xxxvi. 45, 51; Appian, Mithr. 104; Liv. Epit. 100). But Pompey soon overrode the treaty; he acknow- ledged the elder Tigranes, took his son prisoner, occupied the vassal states Gordyene and Osroene for the Romans, and denied the title of " king of kings," which Phraates had adopted again, to the Parthian king (Plut. Pomp. 33, 38; Dio. Cass, xxxvii. 5 seq.). About 57 Phraates was murdered by his two sons, Orodes I. and Mithradates III.

4. Phraates IV., son of Orodes I., by whom he was appointed successor in 37 B.C., after the death of Pacorus. He soon murdered his father and all his thirty brothers (Justin xlii. 5; Plut. Crass. 33; Dio Cass. xlix. 23). He was attacked in 36 by Antonius (Mark Antony), who marched through Armenia into Media Atropatene, and was defeated and lost the greater part of his army. Believing himself betrayed by Artavasdes, king of Armenia, he invaded his kingdom in 34, took him prisoner, and concluded a treaty with another Artavasdes, king of Atro- patene. But when the war with Octavianus Augustus broke out, he could not maintain his conquests; Phraates recovered Atropatene and drove Artaxes, the son of Artavasdes, back into Armenia (Dio. Cass. xlix. 24 sqq., 39 seq., 44; cf. li. 16; Plut. Antonius, 37 seq.). But by his many cruelties Phraates had roused the indignation of his subjects, who raised Tiridates II. to the throne in 32. Phraates was restored by the Scythians, and Tiridates fled into Syria. The Romans hoped that Augustus would avenge the defeat of Crassus on the Parthians, but he contented himself with a treaty, by which Phraates gave back the prisoners and the conquered eagles (20 B.C., Mon. Anc. 5, 40 sqq.; Justin xlii. 5); the kingdom of Armenia also was recog- nized as a

Roman dependency. Soon afterwards Phraates, whose greatest enemies were his own family, sent five of his sons as hostages to Augustus, thus acknowledging his dependence on Rome. This plan he adopted on the advice of an Italian concubine whom he made his legitimate wife under the name of "the goddess Musa"; her son Phraates, commonly called Phraataces (a diminutive form), he appointed successor. About 4 B.C. he was murdered by Musa and her son (Joseph. Ant. xviii. 2, 4).

5. Phraates V., or Phraataces, the younger son of Phraates IV. and the " goddess Musa," with whom he is associated on his coins. Under him a war threatened to break out with Rome about the supremacy in Armenia and Media. But when Augustus sent his adopted son Gaius Caesar into the east in order to invade Parthia, the Parthians preferred to conclude a

treaty (a.d. i), by which once again Armenia was recognized as in the Roman sphere (Dio. Cass. lv. 10; Velleius ii. 101). Soon after Phraataces and his mother were slain by the Parthians, about a.d. 5 (Joseph. Ant. xviii. 2, 4). (Ed. M.)

PHRANTZA, GEORGE [Georgios Phrantzes] (1401-c. 1477), the last Byzantine historian, was born in Constantinople. At an early age he became secretary to Manuel II. Palaeologus, in 1432 protovestiarius (great chamberlain), in 1446 praefect of Sparta, and subsequently great logothete (chancellor). At the capture of Constantinople by the Turks (1453) he fell into their hands, but managed to escape to Peloponnesus, where he obtained protection at the court of Thomas Palaeologus, despot of Achaea. After the downfall of the Peloponnesian princes (1460) Phrantza retired to the monastery of Tarchaniotes in Corfu. Here he wrote his Chronicle, containing the history of the house of the Palaeologi from 1258-1476. It is a most valuable authority for the events of his own times.

Editions by I. Bekker (1838) in the Corpus scriptorum hist, byz., and in J. P. Migne, Patrologia graeca, clvi; see also C. Krumbacher, Geschichte der byzantinischen Litteratur (1897).

PHRAORTES, the Greek form of Fravartish, king of Media. According to Herodotus (i. 102) he was the son of Deioces, and began the Median conquests. He first subjugated the Persians, and then a great many other peoples of Asia, till at last he attacked the Assyrians, but was defeated and killed in a battle, after a reign of twenty-two years (about 646-625 B.C.; but perhaps, as G. Rawlinson supposes, the fifty-three years of Deioces

ought in reality to be transferred to him). From other sources we obtain no information whatever about Phraortes; but the data of the Assyrian inscriptions prove that Assur-bani- pal (see Babylonia and Assyria), at least during the greater part of his reign, maintained the Assyrian supremacy in Western Asia, and that in 645 he conquered Susa. The Medians too were subject to him as far as the Elburz and the central Iranian desert.

When after the assassination of Smerdis all the Iranian tribes, the Babylonians and the Armenians rebelled against Darius and the Persian rule, " a man of the name of Fravartish {i.e. Phraortes), a Mede, rebelled in Media and spoke to the people thus: I am Khshathrita, of the family of Uvakhshatra (Cyaxares)." He reigned for a short time, but was defeated by Hydarnes, and afterwards by Darius himself, taken prisoner in Rhagae (Rai), and executed in Ecbatana (520 B.C.; see inscription of Darius at Behistun). (Ed. M.)

PHRENOLOGY, (from Gr.

History. — That the phenomena of mind are in some measure connected with the action of the brain has been recognized from a very early age of philosophy. It is true that Aristotle 1 describes the brain as the coldest and most bloodless of bodily organs, of the nature of water and earth, whose chief purpose is to temper the excessive heat of the heart, as the cooler regions of the firmament condense the vapours rising from the earth. 1 De partibus animalium, ii. c. 7 (Paris, 1629, p. 986).

In his view, as in that of most of the earlier writers of other nations of antiquity, the heart is the seat of life; to it, not to the brain, the Hebrew writers refer thoughts and affections, while they considered judgment as seated sometimes in the head, sometimes in the kidneys. 2 This was likewise the teaching of the ancient Egyptian philosophy; and hence, while many rites were practised and prayers offered for the preservation of the heart of the deceased, there were none for the conservation of the brain. 3 We learn from Diogenes Laertius 4 that Pythagoras held more accurate physiological views, as he taught that the mind and the intellect have their seat in the brain. The theory of Hippocrates was Pythagorean rather than Aristotelian, for, although in one passage in his work De corde he expresses himself doubtfully, yet elsewhere he clearly states that he considers the brain to be the index and messenger of the intellect. 5 The cerebral seat of sense-perception is also taught by Plato, 6 who puts into the mouth of Socrates the theory that the brain is the organ affected by the senses, whereby memory and opinion arise, and from whence knowledge springs. The classic poets also notice this dependence of mind on brain; for example, in the Clouds (v. 1276) Strepsiades accuses Amynias of not being

in his right mind, and, on being asked why, responds, ” You seem to me as if you had had a concussion of the brain.”

The two founders of anatomical science, Erasistratus and Herophilus, who lived in the days of Ptolemy Soter, taught not only that the brain was the seat of sensation and of intellect, but also that there was therein a certain degree of localization of function. Erasistratus believed that the sensory nerves arose from the brain-membranes, the motor from the cerebral substance. Herophilus was apparently the first who held that the vital forces resided in and circulated from the ventricles of the brain, at least so we gather from Celsus and the other authors who have preserved his views. By the influence of the writings of Galen, 7 which directly teach that the brain is the seat of soul and intellect the Pythagorean doctrine prevailed among the later philosophers. According to the Galenical theory the animal spirits have their origin in the ventricles of the brain, and pass into the heart from which they are conveyed by the arteries through the body. Galen in one place (viii. 159) refers their origin to the brain-substance, but the ventricular theory was that adopted by his followers, some of whom suggested that there was some relation between the shape of the head and the character and disposition of the mind. 8 The Arabian physicians Averroes 9 and Rhazes 10 adopted the Galenical doctrine and developed the hypothesis of a fourfold ventricular localization of faculties, which the Greeks had originated. Avicenna 11 added to these a fifth region. Such of the early Christian authors as referred in

2 In the Chaldee portion of Daniel (ii. 28, iv. 5, vii. 1) visions and thoughts are referred to the head. For other particulars as to early views see Nasse on the psychical relations of the heart in Zeitschr. f. psychische Aerzte (1818), vol. i. A few of the later medical writers express similar views ; see Santa Cruz,Opuscula medica, Madrid (1624).

3 Book of the Dead, ch. xxvi.-xxx.

4 viii. 30; ed. Cobet, Paris (1850), p. 211, — &pivas Si ko.1 vovv, tA Iv

6 De morbo sacro, on Opp. ed. Kiihn, i. 612 seq.; also Epist. iii. 824. Among later writers Licetus of Genoa taught the co-extension of soul and body, upon which subject he wrote two books (Padua, 1616). In this connexion may be noted a curious work by Schegkius, Dialogus de animae principatu,Aristotelis et Galeni rationes praeferens quibus ille cordi, hie cerebro, principatum attribuit (Tubingen, 1542).

6 Phaedo, Valpy’s ed. 1833, ch. xlv., p. 128. See also Haller’s Bibl. anat., i. 30.

7 De usu partium, ed. Kiihn, iii. 700. — ta\cp , /cat irvevfxa ipvxwbv kv cinq irepiixeaBcu irkfiiroKv. See also v. 288, viii. 159, xv. 360. In his Definitiones medicae (467, xix. 459) he says that the brain has a ifrvxutri Swap: is, but does not specify in what part the power inheres.

8 See Paulus Aegineta, Stephen's ed. 1567, cap. 62, col. 363, also Actuarius, De actionibus et affectibus spiritus animalis (Paris, 1556), p. 22, c. 7.

9 Comment, in Arist., Latin tr. (Venice, 1550), vi. 73.

. 10 " Imaginatio quidem in doubus ventricuhs anterioribus perficitur. Cogitatio vero in medio expletur. Memoria autem posteriorem possidet ventriculam." De re medica, Gerard's trans. (Basel, 1554), i.9. 11 Lib. canonis (1507), p. 19, and De naturalibus, c. 6.

their writings to the relation of soul to body naturally adopted the teaching of Galen which they accommodated to their theology, thereby conferring on it an importance which rendered correction difficult. Tertullian 1 in a sense expresses his belief in a theory of localization as also at a later period does Thomas Aquinas. 2

Early in the 13th century Albertus Magnus 3 gave a detailed description of the distribution of mental and psychical faculties in the head. The anterior region he assigned to judgment, the middle to imagination, and the posterior to memory. A some- what similar allocation was made by Gordon, professor of medicine in Montpellier (1296), 4 who assigned common sensation and the reception of impressions to the anterior cornua of the lateral ventricles, phantasia to the posterior, this power being two-fold {imaginative!, and cogitativa) , judgment or aestimativa to the third ventricle, and memory to the fourth. 5 Figures of a similar division were given by Petrus Montagnana 6 and Lodo- vico Dolce 7 still later by Ghiradelli of Bologna 8 and by Theodore Gall of Antwerp. 9 That the " vital spirits " resided in the ventricles was doubted by many, and denied by a few of the anatomists of the 17th century. G. Bauhin in 1621 10 attacked the old view, and Hoffmann of Altorf showed that, as the ventricles were closed cavities, they could not transmit any material fluid. That these spirits existed at all was doubted by Alexander Benedictus, 11 Plater, 12 and a few others; but they were believed in by the great majority of 17th and even of 18th century medical writers, many of whom conceived that the ventricles were semper pleni spiritibus animalibus

flammulis similibus, quorum beneficiis inlelligimus , senlimus, el movemus, n and the opponents of this view were strongly assailed by J. Riolan and others as revolutionary. Columbus 14 ridiculed the idea that the convoluted surface can have anything to do with intellect, as the ass, a proverbially stupid animal, has a convoluted cere- brum. According to his view, the convolutions are for the purpose of lightening the brain and facilitating its movements. The grey matter of the surface of the cerebrum was recognized as the true dynamic element by M. Malpighi 15 and T. Willis. 16

1 De anima, cxiv. (ed. Franeker, 1597), p. 268.

2 Summa theologiae, ed. Migne, i. 1094, 1 106-7. Prochaska and his translator, Laycock (Mind and Brain, ii. 163), charge Duns Scotus with holding this view; probably he did, but he does not express it, as he simply specifies the cerebrum and its root, the spinal cord, as the source of the nerves along which sensory impulses travel. Comment, de anima, i. 515 (Leiden, 1637).

3 Opera, iii. 124, vi. 20 (Leiden, 1651).

- *Lilium medicinae, 101 (Venice, 1494).*

5 Avicenna's fifth region is interposed between imaginativa and aestimativa (De naturalibus, c. vi.). Thomas Aquinas combines the last two, which he says are possessed by the same eminence. On the other hand, he says of ratio particulars, " medici assignant determinatum organum, scilicet mediam partem capitis " (i. 1 106).

6 Physiognomia (Padua, 1491).

7 Dialogo net quale si ragione del modo di accrescere e conservar la memoria, 27 (Venice, 1562).

8 Physiognomia, 1670.

- *Tabulae element, scientiae (Rome, 1632).*

10 Theatr. anat. (Basel, 1621, iii. 314); Caspar Hoffmann, De usu cerebri (Leipzig, 1619). See also Spigelius, De corp. humani fabrica, 296 (Amsterdam, 1645); Varolius (1591), p. 6; Wepfer, Historiarum apoplecticarum potissimum anatomiae subjectorum auctarium (Amster- dam, 1681). See also many of the anatomical works of this age, such as those of Fernel, Cabrol, Argenterius, Rolfinck, &c.

11 Alexander Benedictus, Anatomica, vol. iii. (Basel, 1527). Quer- cetanus is said by Laycock (following Prochaska)to have assailed this doctrine of

spirits; on what ground is not apparent, as he certainly expresses himself as a believer in the old view; see Tetras graviss. totius capitis affect, x. 89 (Marburg, 1606). Possibly Prochaska may allude to an obscure passage in the work of the other Quercetanus (Eustachius), Acroamaton in librum Hippocratis, p. 14 (Basel, 1549), not to the better-known Josephus Armeniacus; but he gives no reference.

12 Opera, col. 22, 89 (Basel, 1625).

13 Joelis opera medica, 22 (Amsterdam, 1663).

14 De re anatomica, p. 350 (Frankfort, 1593).

15 " Epist. de cerebro et cort. cereb. ad Fracassatum," in Opp., Vol. ii. (Geneva, 1685).

16 De anima brutorum, p. 71 (Oxford, 1677), " hae particulae sub- tilissimae, spiritus animales dictae, partium istarum substantias corticales prirao subeuntes, exinde in utriusque meditullia," &c. ; also p. 76 seq.

The latter regarded the convoluted surface of the Cerebrum as the seat of the memory and the will, the convolutions being intended to retain the animal spirits for the various acts of imagination and memory. Imagination he described as seated in the corpus callosum, sense-perception in the corpus striatum, and impetus et perturbatio in the basal parts of the cerebrum above the crura. The thalami he regarded as the centres of sight and the cerebellum of involuntary acts. Succeeding anatomists simply varied these localizations according to their respective fancies. G. M. Lancisi placed sense-perception in the corpus callosum, R. Vieussens in the centrum ovale majus. R. Descartes supposed the soul to be seated in the pineal gland, others in the brain-commissures especially the pons Varolii. 17 Meyer con- sidered abstract ideas to arise in the cerebellum, and memory to have its seat at the roots of the nerves. 18

Of later writers three deserve special notice, as having largely prepared the way for the more modern school of phrenology. J. A. Unzer, of Halle, in his work on physiology extended the pre-existing theories of localization. Metzger, 19 twenty years before the publication of Prochaska's work, had proposed to make a series of observations on the anatomical characters of the brains of persons of marked intellectual peculiarity; but apparently he did not carry this into effect. In a more special manner Prochaska of Vienna may be looked upon as the father of phrenology, as in his work on the nervous system, published in Vienna in 1784, are to be found the germs of the later views which were propounded in that city twelve years later. 20

The system formulated by Gall (q.v.) is thus a modern expan- sion of an

old empirical philosophy, and its immediate parentage is easily traced, although, according to Gall's account, it was with him the result of independent observations. These, he tells us, he began to make at an early age, by learning to correlate the outward appearances and mental qualities of his school- fellows. Gall's first published paper was a letter in the Deulscher Merkur of December 1798, but his principal expositions were oral, and attracted much popular attention, which increased when, in 1802, he was commanded by the Austrian government, at the instance of the ecclesiastical authorities, to discontinue his public lectures. In 1804 he obtained the co-operation of Spurzheim (1776-1832), a native of Longwich, near Treves, who became his pupil in 1800, and proved a powerful ally in pro- mulgating the system. Master and pupil at first taught in harmony, but they found it advisable to separate in 1813; and we find Spurzheim, several years after their parting, declaring that Gall had not introduced any improvements into his system since their separation (notes to Chenevix, p. 99). " My philoso- phical views," he also says, " widely differ from those of Gall." In Paris, where he settled in 1807, Gall made many influential converts to his system. F. J. V. Broussais, H. M. D. de Blain- ville, H. Cloquet, G. Andral, E. Geoffroy St-Hilaire, Vimont and others adopted it and countenanced its progress. Gall visited Great Britain, but the diffusion of phrenology here was chiefly due to Spurzheim, who lectured through the country and through America, and with the aid of his pupil, George Combe, attracted a large popular following. His most influential disciples were J. Elliotson, Andrew Combe, Sir G. S. Mackenzie, R. Macnish, T. Laycock and Archbishop R. Whately, and in America Caldwell and J. Godman. On the opposite side many influential men took up a strongly antagonistic position, prominent among whom were J. Barclay the anatomist, P. M. Roget, Sir Charles Bell, Sir'W. Hamilton, F. Jeffrey, H. P. Brougham, T. Brown and Sir B. Brodie. The nature of the system rendered it eminently fitted to catch public attention, and it rapidly attained to so great a

17 Fechner, Elemente der Psychophysik, ii. 396.

18 Some of the medieval views were very fanciful, thus Shabbethai b. Abraham, the earliest Jewish writer on medicine (d. A.D. 959), thought that the spirit of life has its seat in the brain-membrane, expanded over the brain and subarachnoid fluid, as the Shekinah in the heavens arched over the earth and waters. See Der Mensch als Gottes Ebenbild, ed. Jellinek (Leipzig, 1854), an d Castelli, Commento (Florence, 1880).

19 Vermischte medicinische Schriften (1764), i. 58.

20 See Laycock's trans., in Sydenh. Society's Pub. (1851).

degree of popularity that in 1832 there were twenty-nine phreno- logical societies in Great Britain, and several journals devoted to phrenology in Britain and America; of these the Phrenological Journal, a quarterly, edited chiefly by George Combe with aid from others of the Edinburgh confraternity, notably Sir George Mackenzie and Macnish, " the modern Pythagorean," lived from 1823 to 1847, through twenty volumes. The controversy in many places was heated and often personal, and this largely increased the popular interest. In the Edinburgh Review the theory was severely criticized by Thomas Brown, and afterwards in a still more trenchant manner by Jeffrey. In Blackwood it was ridiculed by Professor John Wilson. Being a subject which lent itself easily to burlesque, it was parodied cleverly in a long rhyme by two authors, " The Craniad," 87 pages long, published in 1817, while, on the other hand, verse was pressed into its service in the rhyme " Phrenology in Edinburgh " in 1824. 1 The'best defence of the system was that by Chenevix in the third number of the Foreign Quarterly, afterwards reprinted with notes by Spurzheim.

The Faculties and their Localities.— The system of Gall was constructed by a method of pure empiricism, and his so-called organs were for the most part identified on slender grounds. Having selected the place of a faculty, he examined the heads of his friends and casts of persons with that peculiarity in common, and in them he sought for the distinctive feature of their charac- teristic trait. Some of his earlier studies were made among low associates, in gaols and in lunatic asylums, and some of the qualities located by him were such as tend to become perverted to crime. These he named after their excessive manifestations, mapping out organs of murder, theft, &c. ; but as this cast some discredit on the system the names were changed by Spurzheim, who claimed as his the moral and religious considerations associated with it. Gall marked out on his model of the head the places of twenty-six organs as round enclosures with vacant interspaces. Spurzheim and Combe divided the whole scalp into oblong and conterminous patches (see the accompanying figures). Other methods of division and other names have been suggested by succeeding authors, especially by Cox, Sidney Smith (not Sydney) , Toulmin Smith, K. G. Carus of Dresden, Don Mariano Cubi i Solar, W. B. Powell of Kentucky, J. R. Buchanan of Cincinnati, Hittel of New York. Some, like the brothers Fowler, raise the number of organs to forty-three; but the system of Spurzheim and Combe is that which has always been most popular in Britain.

Spurzheim separated the component faculties of the human mind into two

great groups and subdivided these as follows: — I. Feelings, divided into —

1. Propensities, internal impulses inviting only to certain

actions.

2. Sentiments, impulses which prompt to emotion as well

as to action.

A. Lower — those common to man and the lower animals.

B. Higher — those proper to man. II. Intellectual faculties.

1. Perceptive faculties.

2. Reflective faculties.

In the following list the locality and the circumstances of the first recognition of the organ are appended to the names, which are mostly the inventions of Spurzheim. Gall's names are placed in brackets. 2

Propensities.

1. Amativeness (Instinct de la generation), median, below the inion ; first determined by Gall from its heat in an hysterical widow, supposed to be confirmed by many observations, and referred to the cerebellum. 3

1 Other burlesque and satirical writings were published at this time, notably The Phrenologists, a farce by Wade (1830) ; The Head- piece, or Phrenology opposed to Divine Revelation, by James the Less; and A Helmet for the Headpiece, or Phrenology incompatible with Reason, by Daniel the Seer.

! For topographical purposes Broca's names are adopted as the most convenient for localities on the head.

3 Apollonius Rhodius speaking of the love of Medea for Jason (Argonautica, iii. 760-765) says, Sd/cpu S' &' (tytfaXijou- favivSoBi &' aiel Ttip bhuv-q aftixovaa 8«1 xpodSt <&M' ipaias tvos nal n«j>a\rp, ird vttarov ivlov 4xpis, ...*

2. Philoprogenitiveness {Amour de la progeniture), median, on the squama occipitis, and selected as the organ for the love of children because this part of the skull is usually more prominent in apes and in women, iti whom the love of children is supposed to be stronger than in men.

3. Concentrativeness, below the obelion and over the lambda. This is a region of uncertain function, unnoticed by Gall, but de- scribed as Inhabitiveness by Spurzheim, because he found it large in cats and in a clergyman fond of his home. It has since been con- sidered by Combe to be the seat of the power of concentration, whereof he believed Inhabitiveness to be a special case.

4. Adhesiveness (Amide), over the lateral area of the lambdoidal suture. This region was prominent in a lady introduced to Gall as a model of friendship, and is said by him to be the region where persons who are closely attached put their heads together.

5. Combativeness (Instinct de la defense), above the asterion; it was found by Gall by examining the heads of the most quarrelsome of his low companions whom he had beforehand stimulated by alcohol. It was verified by comparing this region with the same part of the head of a quarrelsome young lady.

6. Destructiveness (Instinct carnassier), above the ear meatus. This is the widest part of the skulls of carnivorous animals, and was found large in the head of a student so fond of torturing animals that he became a surgeon, also large in the head of an apothecary who became an executioner.

6a. Alimentiveness, over the temporal muscle and above the ear. Hoppe describes it as being large in a gourmand acquaintance, and he therefore supposes it to be the origin of selecting food.

7. Secretiveness (Ruse, Finesse), the posterior part of the squam- ous suture.

8. Acquisitiveness (Sentiment de la propriete), on the upper edge of the front half of the squamous suture. This part of the head Gall noticed to be prominent in the pickpockets of his acquaintance.

9. Constructiveness (Sens de mechanique) , on the stephanion; detected by its prominence on the heads of persons of mechanical genius. It was found large on the head of a milliner of uncommon taste and on a skull reputed to be that of Raphael.

The organ of Vitativeness, or love of life, is supposed by Combe to be seated at the base of the skull. To this locality Herophilus referred most of the intellectual powers.

Lower Sentiments.

10. Self-esteem (Orgueil, fierte), at and immediately over the obelion;

found by Gall in a beggar who excused his poverty on account of his pride. This was confirmed by the observation that proud persons held their heads backwards in the line of the organ.

11. Love of Approbation (V anile), outside the obelion; the region in which Gall saw a protuberance on the head of a lunatic who fancied herself queen of France.

12. Cautiousness (Circonspection) , on the parietal eminence; placed here because an ecclesiastic of hesitating disposition and a vacillating councillor of state had both large parietal eminences.

Superior Sentiments.

13. Benevolence (BontS), on the middle of the frontal bone in front of the coronal suture; here Gall noticed a rising on the head of the highly commended servant of a friend, as well as on a bene- volent schoolmate who nursed his brothers and sisters when they were ill. To this spot Xenocrates referred the intellectual powers.

14. Veneration (Sentiment religieux), median at the bregma. Gall noted when visiting churches that those who prayed with the greatest fervour were prominent in this region, and it was also prominent in a pious brother.

15. Conscientiousness, Believingness (Forster) unknown to Gall; recognized by Spurzheim usually from its deficiency, and placed between the last and the parietal eminence.

16. Firmness (FermelS), median, on the sagittal suture from behind the bregma to the front of the obelion. Lavater first pointed out that persons of determination had lofty heads.

17. Hope, not regarded as primary by Gall, who believed hope to be akin to desire and a function of every faculty which desires and left this territory unallocated.

18. Wonder, said to be large in vision-seers and many psychic researchers. A second similar organ placed between this and the next is called Mysterizingness by Forster, and is said to be the seat of belief in ghosts and in the supernatural.

19. Ideality (Poesie), noted by Gall from its prominence in the busts of

poets; said to be the part touched by the hand when com- posing poetry.

20. Wit (Esprit caustique), the frontal eminence, the organ of the sense of the ludicrous, prominent in F. Rabelais and J. Swift.

21. Imitation (Faculte d'imiter), disposition to mimicry, placed between Benevolence and Wonder.

Perceptive Faculties.

22. Individuality, over the frontal sinus in the middle line; the capacity of recognizing external objects and forming ideas therefrom; said to have been large in Michelangelo, and small in the Scots.

23. Form (Memoire des personnes), capacity of recognizing faces; gives a wide interval between the eyes ; found by Gall in a squinting girl with a good memory for faces.

24. Size, over the trochlea at the orbital edge; described by Spurzheim and Vimont as the capacity of estimating space and distance.

25. Weight, outside the last on the orbital edge and, like it, over the frontal sinus. The prominence of ridge here is due to large sinus or a projecting bone. Certain old writers, such as Strato Physicus, located the whole intellect in this ridge.

26. Colour, also on the orbital edge external to the last.

27. Locality (Sens de localite), placed above Individuality on each side, and corresponding to the upper part of the frontal sinus and to the region immediately above it.

28. Number, on the external angular process of the frontal bone, large in a calculating boy in Vienna.

29. Order, internal to the last, first noted by Spurzheim in an orderly idiot.

30. Eventuality (Memoire des choses), the median projection above the glabella, supposed to be the seat of the memory of events.

31. Time, below the frontal eminence and a little in front of the temporal crest.

32. Tune (Sens des rapports des tons), on the foremost part of the temporal muscle, where Gall noticed a bulge on the head of a musical prodigy of five.

33. Language (Sens des mots), behind the eye. This was the first organ noticed by Gall, as a clever schoolfellow, quick at lan- guages, had prominent eyes. Old authors had noted the con- nexion between prominent eyeballs and mental development; thus Gazzali and Syenensis Medicus Cyprius place the intellect and soul behind the eyeballs.

Reflective Faculties.

34. Comparison (Sagacite comparative), median, at the top of the bare region of the forehead, where a savant friend of Gall's, fond of analogies, had a prominent boss.

35. Causality (Esprit metaphysique) , the eminence on each side of Comparison, noticed on the head of Fichte and on a bust of Kant; the seat oi the faculty of correlating causes and effects.

The first identification of each organ was made by an induction from very limited data, but the founders and exponents of the system have collected all available instances wherein enlargements of each of these regions coexisted with increased powers of the faculty supposed to reside therein, and in some cases they have discovered coincidences of a surprising nature. When, however, such do not exist, a convenient excuse is found by reference to the indefinite article of temperament, or by a supposed explanation of the faculty in question as not simple but produced by the co-operation of other influences. Thus, as Sheridan's bump of wit was small, he is said not to have been truly witty; but to have had comparison and memory strongly developed. The girl Labrosse (described in Ferussac's Bulletin for October 1831), who exhibited strong amative- ness but had a rudimentary cerebellum, is said to have obliterated

it by over-use. Thurtell, a cold-blooded murderer, whose organ of benevolence was large, is said to have been generous, as he once gave half-a-guinea to a friend, &c.

The method whereby the sizes of organs are estimated is arbitrary and the boundaries of the regions indefinite. The attempts of Nicol, Straton and Wight to devise mechanical and accurate modes of measurement have not been very successful and have not found favour with the professional phrenologist.

Anatomical Aspect of Phrenology. — The phrenological con- troversy served the useful purpose of stimulating research into the anatomy of the brain; but we owe very little of solid progress to the advocates of the system. Gall is the only writer of his creed in whose works original observations of value are to be found, and Dr B. Hollander has cited many

interesting and care- fully recorded anatomical and clinical facts in his writings. Although the study of the surface of the cerebrum is of the essence of phrenology, yet nowhere in the circle of phrenological literature are the convolutions of the brain accurately described; our knowledge of their order and disposition comes from the morphologist, not from the phrenologist. The first real step towards their systematic description was made by L. Rolando, 1 who in 1830 described the fissure to which his name is attached, and very little advance was made until the publication in 1856 of L. P. Gratiolet's 2 and Huschke's 3 memoirs. These works for the first time placed the description of the surface of the brain, imperfectly attempted by L. A. Desmoulins in 1825, 4 on a satis- factory basis.

A description of the anatomy of the brain is given under the heading Brain, so it is necessary here only to refer to points not included in that account.

1. Any psychological theory which correlates brain-action and mental phenomena requires a correspondence between brain-size and mental power; and, speaking- generally, the brains of those whose capacities are above the average are larger than those of the general run of their fellow-men.

2. Direct measurements of the relative developments of different portions of brains are difficult and troublesome to make; but their importance to phrenologists is so great that it is remarkable that no attempts to obtain any such were made by them. The series given by R. Wagner of the relative sizes of the cerebral lobes of four brains is almost the only record of importance in this direction, and is appended.

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From this it appears that the woman exceeded Gauss in percep- tive and reflective organs, exceeded Fuchs in sentiment, and fell below the workman in propensities. It must be said, however, that the phrenological divisions do not accurately coincide with the anatomical. It would furnish important physiological data if the brains of men distinguished for special qualities were examined in this or some comparable way.

3. It is important in relation to phrenology to ascertain the constancy of the convolutions. Many varieties in the detail of the surface-patterns have been recorded by Tenchini, Poggi, Gia- comini, N. Riidinger, Cunningham and Sernow, 5 but the general plan is fairly uniform. A still more important question has been recently raised by J. N. Langley, viz. how far identical spots on

1 Delia Struttura degli emisferi cerebrali (Turin, 1830).

2 Memoire sur les plis cerebraux de I’homme et des primates (Paris,

1856).

3 Schadel, Him, und Seele (Jena, 1856).

4 Magendie and Desmoulins, Anat. du syst. nerveux (Paris, 1825). 6 Rivista sperimentale di freniatria (1883), ii. 193; ibid. iv. 403;

Archiv fur Anthropologic (1879), xi. 289.

identical convolutions in different brains consist of nerve-cells with precisely the same connexions. The convoluted arrangement results From growth of brain-surface under constraint, hence as the different tracts of surface undergo proportional overgrowth they may fold along different lines. The occurrence of small differences in the rate of overgrowth, testified to by the varieties of the resulting pattern, can hardly fail to cause considerable alteration in the place of definite territories of grey cells. Some method for the deter- mination of the limits of these shiftings of place is required before comparisons can be of value as phrenological data.

4. The comparison of the rate of growth of brain with the develop- ment of mental faculties is important not only to the phrenologist but to the psychologist. No observations on this point were made by phrenological writers, who only refer to the first and rather crude observations of the earlier anatomists. We have, however, recently learned from the researches of T. L. W. von Bischoff, Tuczec, Cunningham, and S. Exner 1 many particulars as to the rate and progress of brain-growth. At birth the brain weighs one-tenth of the weight of the body, and averages about 11 oz. For the first year brain-growth and consequently expansion of the skull proceed with great rapidity, the growth during a large part of this period averaging one cubic centimetre daily. This enormous increase is chiefly due to the rapid development of medullated nerve- fibres, which are deficient in the foetal brain. During the second and third years growth takes place more slowly, the occipital and parietal lobes increasing more than the frontal or temporo-sphenoidal. During these and the four succeeding years the base elongates commensurately with the increasing depth of the face. In the sixth and seventh years the frontal lobes grow faster than the parietals, and at seven the average brain has attained the weight of 1340 grammes, being the weight of the body as 1:20. In the period between seven years and puberty growth is slight, but at puberty the whole brain grows actively, especially the frontal lobes. This activity lasts until about eighteen years of age, then diminishes; but the average brain does not reach its maximum

size until about thirty, from a little after which period the brain tends to diminish towards senility. 2

5. The estimation of the relative development of grey and white matter in the several lobes is important to any theory of cerebral dynamics which allocates functions specifically diverse to each separate part of the brain-surface; but no attempt has been made by the phrenologist to obtain precise results in this direction, nor even to determine the physical constants of the two forms of brain-matter. The recently introduced method of Bourgoin and B. Danilewski, based upon the differing specific gravities of grey and white matter, promises to give definite information as to the relative amounts of these forms of brain-matter; but further experiments are needed to perfect the method. 3

6. The relations, if any, between the alterations which take place in the shape and position of the head and alterations in brain-surface have been speculated on by the phrenologist. Broussais is reported to have said that his organ of causality had enlarged with increasing use, and a list of cases of similar alterations of head-shape is given by Deville (Phren. Journ. xiv. 32), most of which are simply age- changes, of the kind described by Professor J. Cleland (Phil. Trans., 1870). There are no exact measurements recorded which indicate the occurrence of topical increases of a normal brain in special directions coincident with the cultivation of definite faculties. All the so-called cases are given vaguely, with no measurements, and the careful measurements of George Combe in such cases as were available to him showed no appreciable alterations in adult heads even at long intervals of time (see also Andrew Combe, Phren. Journ. x. 414).

7. The phrenological want of knowledge of the topography of the brain-surface was necessarily correlated with ignorance of the exact relations of the convolutions to the interior of the cranial bones; these have been carefully worked out by E. Huschke, Heffler, W. A. Turner, Cunningham and Reid. Some latitude, however, must be allowed in topography, as the exact relation of convolution of skull varies with the shape of the skull. Giacomini showed that the fissure of Rolando is perceptibly farther back from thecoronal suture in dolichocephalic than in brachycephalic skulls, and it is still farther back in the extreme boat-shaped form of long-headedness. Passet shows that there is a slight topographical difference in the two sexes (Arch.f. Anthrop., 1882, xiv. 89), and in the heads of those with a symmetrically-shaped skull there is often a want of lateral symmetry of convolution. Artificial deformations likewise alter the topographical relations of convolutions, and have served not a little to puzzle the phrenologist. Thus, the artificial dolichocephaly of the Caribs having bulged the squama occipitis, they decided that these people must be amiable lovers

of children, 4 &c.

1 Neurologisches Centralblatl (1883), p. 457.

2 Weisbach, Med. Jahrbuch. der k. Gesellsch, der Aerzte, xvii. 133 (Vienna, 1869) ; Merkel, Beitrdgez. post-embryonalen Entwickelung des menschl. Schddel (Bonn, 1882); Calori, Mem. de I'accad. di Bologna (1871), x. 35. Cunningham, Cunningham Memoir, Royal Irish Academy.

- *Centralblatl (1880), No. 14; Beitrage zur Biologie (Stuttgart 1882). ' Martius tells us that the Caribs castrate their own children,*

8. The existence of structural differences between different areas of cerebral surface is important to any theory of cerebral localiza- tion, but no phrenologist has given us any original information on this point. Since the investigation of J. G. F. Baillarger 6 and Bevan- Lewis it has been shown that some local differentiations of structure do really exist. Thus in the convolutions around the fissure of Rolando the ganglion-cells of the fourth layer are of large size (giant- cells of Betz), and in the convolutions of the temporo-sphenoidal lobe a layer of small angular cells (granule-cells) is interposed between the larger pyramidal and the ganglion-cells, so that, while in the parts of the brain above the fissure of Sylvius the gray cortex is for the most part five-layered, below and behind that fissure it is six-layered. There is no abrupt passage from the one to the other, the only sudden transition of structure of the grey cortex being at the hippocampal sulcus; and giant-cells, although of smaller size, and less like those of the anterior cornu of the spinal cord, are scattered over other parts of the cerebral grey matter. 6

Other local variations in structure have been described by Elliot Smith and other histologists.

The teaching of anatomy with regard to phrenology may be summarized thus: (1) the rate of growth of brain is concurrent with the rate of development of mental faculty; (2) there is some degree of structural differentiation as there are varying rates of development of different parts of the cerebral surface; (3) there is no accordance between the regions of Gall and Spurzheim and definite areas of cerebral surface.

Physiological Aspect. — The theory of some of the older meta- physicians, that the mind, in feeling and reflection, makes use of no material instrument is not now accepted by psychologists. It was advanced by Brougham and Jeffrey as against the theory of phrenology; but the doctrine that the brain is the organ of the mind is now universally received. While it is probable that certain molecular changes in the grey matter are

antecedents or concomitants of mental phenomena, the precise nature of these processes, to what extent they take place, or how they vary among themselves have not as yet been determined experi- mentally; the occurrence of the change can only be demonstrated by some such coarse method as the altered pulsation of the carotid arteries, 7 the increase of the temperature of the head, 8 the abstraction, during brain-action, of blood from other organs as shown by the plethysmograph, or the formation of lecithin and other products of metabolism in brain-substance. As yet no light has been shed on the connexion between the molecular changes in the nerve-cell and the phenomena of thought and feeling. While our knowledge of the anatomy of the brain, especially of the grey nuclei and of the white bands uniting them, has in recent years become much more accurate (see articles Brain and Muscle and Nerve), our knowledge of the physiology of the nerve centres is still indefinite and fragmentary, even when the utmost allowance is made for the experimental work of C. S. Sherrington, A.S.F. Grilnbaum, F. Goltz and others; and the hypotheses relating to the division of labour in the nerve- centres is chiefly based on anatomical structure. Certain masses of grey nerve-matter situated in the spinal cord and medulla oblongata are so linked by nerve-cords to organs outside the nervous system which are set apart for the discharge of separate functions that they obviously form parts of the mechanism for the fulfilment of such functions. In cases where these can be subjected to experiment we learn that they are nervous centres presiding over the discharge of such functions; and it has been determined by experiment, or else deduced from anatomical structure, that in those lower parts of the nervous centres which are more directly connected with the segmental elements of the body there is a certain localization of function; hence the centres of pelvic actions, of respiration, cardiac action, and inhibition of vaso-motor influence, degluti- tion, secretions, &c, can be mapped out in ascending series. As certain of these centres are united by bands of fibres to the larger

fatten and eat them, an abuse of the organ of philoprogenitiveness ; see also Garcilaso de la Vega, Hist, des Incas, i. 12. 6 Mem. de Vacad. de mkdecine (1840), viii. 149.

6 For further particulars of structure, in addition to the authors quoted at i. 878, see Bevan-Lewis and Clark, P.R.S., (1878), and Phil. Trans. (1880 and 1882).

7 See Eugene Gley, " Sur les conditions physiologiques de la pensee," in Archives de physiologie (1881), p. 742.

8 J. S. Lombard, N. Y. Med. Journal (June 1867), and Experimental Researches on the Regional Temperature of the Head (London, 1872).

and higher-lying grey portions of the nervous centres there is an a priori presumption in favour of the extension of this principle of localization. This has been premised on metaphysical as well as on anatomical grounds. A. B. Bonnet long ago believed each portion of the brain to have a specifically separate function, and Herbert Spencer has said that " no physiologist can long resist the conviction that different parts of the cerebrum subserve different kinds of mental action. Localization of function is the law of all organization; separateness of duty is universally accompanied with separateness of structure, and it would be marvellous were an exception to exist in the cerebral hemispheres. Let it be granted that the cerebral hemispheres are the seats of the higher psychical activities; let it be granted that among these higher psychical activities there are distinctions of kind which, though not definite, are yet practically recognizable, and it cannot be denied, without going in direct opposition to established physiological principles, that these more or less distinct kinds of psychical activity must be carried on in more or less distinct parts of the cerebral hemisphere."

For a masterly review of the old and the new association and localization theories, see W. Wundt's Grundziige der physiologischen Psychologie, i. 289 sqq. ; also the same author's Essays, Leipzig (1888), pp. 109 sqq.

There is a large weight of evidence in favour of the existence of some form of localization of function. So little is known of the physical changes which underlie psychical phenomena, or indeed of the succession of the psychical processes themselves, that we cannot as yet judge as to the nature of the mechanism of these centres. So much of the psychic work of the individual life consists in the interpretation of sensations and the translation of these into motions that there are strong a priori grounds for expecting to find that much of the material of the nerve- centres is occupied with this kind of work, but in the present conflict of experimental evidence it is safer to suspend judgment. That these local areas are not centres in the sense of being indispensable parts of their respective motor apparatuses is clear, as the function abolished by ablation of a part returns, though tardily, so that whatever superintendence the removed region exercised apparently becomes assumed by another part of the brain. 1 Experimental physiology and pathology, by suggesting other functions for parts of the brain-surface, are thus directly subversive of many details of the phrenology of Gall and Spurzheim.

Psychological Aspect. — The fundamental hypothesis which underlies phrenology as a system of mental science is that mental phenomena are

resolvable into the manifestations of a group of separate faculties. A faculty is defined as " a convenient expression for the particular states into which the mind enters when influenced by particular organs; it is applied to the feelings as well as to the intellect, thus the faculty of benevolence means every mode of benevolence induced by the organ of benevolence " (Combe). In another work the same author says it is " used to denote a particular power of feeling, thinking, perceiving, connected with a particular part of the brain." The assumption is contained in the definition that the exercise of a faculty is the physical outcome of the activity of the organ, and in several of the standard works this is illustrated by misleading analogies between these and other organs; thus the organs of benevolence and of firmness are said to be as distinct as the liver and pancreas. The mind, according to another author, consists of the sum of all the faculties. In this view the unity of consciousness is some- what difficult to explain, and consequently there is assumed by others a single unifying substratum, and on this the organs are supposed to act; thus thoughts are defined as " relations of the simple substance, mind, to certain portions of the en- cephalon " (Welsh, Phren. J own. i. 206). Gall himself believed that there was but a single principle which saw, felt, tasted, heard, touched, thought and willed (Fonctions du cerveau, i. 243); and the American exponent of phrenology, Caldwell, says " the mind is as single in its power as it is in its substance;

1 For cases, see Rochefontaine, Archives de Physiologie (1883), 28; Bianchi, La Psichiatria, i. 97.

it is a quickening and operating principle, essential to all the mental faculties, but does not, by any means, possess them itself " {Elements, p. 16). It is not easy to understand the sup- posed relation of this hypothetical substratum to the separate faculties acting on it. It must be both immaterial and uncon- nected with the brain, as the whole two thousand million cells supposed to exist in the cerebral hemispheres are all parcelled out among the faculties, and none are left for the unifying nous. Each organ is considered as engaged, either independently in bringing forth its own product, or collectively with others in elaborating compound mental states, and according to their several degrees of development and activity they are considered capable of perceiving, conceiving, recollecting, judging or imagining each its own subject. This mechanical conception of the division of labour in the production of the phenomena of mind has the charm of simplicity, but is attended with the difficulty that arises in discriminating the operations of the different organs one from the other. Phrenologists are apt to be vague respecting the limits of the several faculties, as about the boundaries of the separate organs. It was pointed out by Jeffrey that the lines of demarcation between benevolence, adhesiveness and philoprogenitiveness were indeterminate, although the organs are not very

close, and the same applies to other organs.

It is unfortunate for the clearness of the definition that, although historically the faculties were the first phenomena noted, independent of and previous to their localization, yet in the definition the faculties are defined in terms of their localities.

The following arguments are adduced in favour of the funda- mental separateness of the faculties: (1) analogy — elsewhere in the animal economy division of labour is the rule; (2) the variety of mental endowment observed among children before they are influenced by education, and the inequalities in the mental endowments of individuals; (3) the phenomena of insanity, especially of monomania; (4) the varying periods at which individual faculties attain their maximum development; (5) the phenomena of dreams, and the awakening of a limited number of faculties during them; (6) pain being felt in an organ when it is overtaxed. 2

Such faculties are supposed to be primary — (1) as exist in some animals and not in others, (2) as vary in their development in the sexes, (3) as are developed in varying proportions with regard to other faculties, (4) as may act separately from other faculties, (5) as are not necessarily simultaneous with other faculties in action, (6) as are hereditary, and (7) as may be singly diseased.

According to the development of their powers mankind may be divided into six classes: (1) those in whom the highest qualities are largely developed and the animal qualities feeble; (2) those with the reversed conditions developed, with large animal and feeble intellectual and moral faculties; (3) those in whom good and evil are in constant war, with active animal and strong intellectual faculties and sentiments; (4) those partial geniuses in whom a few qualities are unusually developed, while the rest are at or below the mediocre standard; (5) those men of moderate endowment in whom some faculties are nearly or quite deficient; (6) those with an unvarying standard of undistinguished mediocrity in all their faculties.

It is perhaps unfortunate that the word " faculty " has been used in this sense of original power by phrenologists. It would have been better to employ, as Mr Lewes suggests, the term 2 It is interesting in this connexion to note that in a case published by Professor Hamilton in Brain (April 1884), where a tumour existed on the occipital lobe, the pain was persistently referred to the fore- head. Many similar cases are to be noticed among the records of localized brain-lesions. Bearing on this point also it is worth noting, once for all, that in nothing is the purely hypothetical nature of phrenological description better realized than in the accounts of what

these authors call the " natural language of the faculties," — that poets are supposed to touch ideality when composing, musicians to press on tone and time, and painters on foim and colour, when in the exercise of their arts ! Yet we are gravely taught this in the standard works on the subject.

" function " for the native activity of an organ, and to leave " faculty " for the expression of an acquired activity. " Faculty is properly limited to active power, and therefore is abusively applied to the mere passive affections of the mind " (Hamilton, Lectures, i. 177).

An attempt has been recently made by Dr Bernard Hollander to correlate the doctrines of phrenology with the modern physio- logical and pathological observations which bear upon the localization of function. In his works The Mental Functions of the Brain, under the sub-title " The Revival of Phrenology " (1001), and in Scientific Phrenology (1902), the author endeavours to bring Gall's clinical and pathological instances into line with more modern observations. He deprecates the craniology of Gall, as far as it deals with mere " bumps," and honours him, with justice, as the recorder of many facts worth saving out of the wreck of his system; and he endeavours, though with doubtful success, to establish an unbroken connexion between phrenology, in the Greek sense, and our present knowledge of cerebral localization.

The substance of Hollander's first work is of two kinds. The one kind is a tabulated statement of many hundred cases of different forms of mania, with injury or disease limited to one portion of the brain; the other kind is a tabulated statement of cases of injury or disease of the brain, followed by perversion, or exaltation, or loss of some definite instinct or faculty of consciousness.

He divides the tabulated cases of mania into three groups: (1) Melancholia; (ii) Irascible Insanity, " Mania furiosa "; (iii) Mania with suspicion and delusions of persecution. For these three groups of cases he lays down the following rules : (i) Melancholia is especially associated with injury or disease of the parietal lobe of the brain, more particularly with injury or disease of the convolutions under- lying the parietal eminences of the skull, i.e. the supramarginal and angular convolutions, (ii) Mania furiosa is especially associated with injury or disease of the central portion of the temporal lobe, (iii) Mania with suspicion and delusions of persecution is especially associated with injury or disease of the posterior portion of the temporal lobe.

The second kind of cases, where injury or disease of the brain, strictly localized to one part or another of its grey matter, was followed by perversion, exaltation or loss of some one instinct, habit or faculty, includes cases of kleptomania, cases of voracious hunger and thirst, cases of sexual desire exalted or lost, and cases of loss of certain special memories, as of words, tunes, numbers and the like.

These two collections of recorded cases, taken from a vast mass of clinical and pathological literature "accumulated during the past century, have been arranged by Dr Hollander with great industry ; so as to extend the limits of the study of cerebral localization, and to advance it from the observation of the motor areas and the special sense centres to the observation of the higher acts and states of con- sciousness. Modern physiology, from its objective point of view, is engaged over finer and finer issues of microscopic and experimental work; and, from its subjective point of view, is becoming more and more psychological, seeking a higher level of interpretation, and a statement of the departmental life of the brain in terms of ever-, increasing complexity. The motor centres, governing the voluntary purposeful movements of the body, are considered to be not simply motor, but "psycho-motor"; the speech-centres are not homo- geneous, but are on experimental grounds differentiated into sub- centres for the utterance of words, the recognition of words and the understanding of words; the visual centres are in like manner sub- divided according to the consciousness involved in the complete act of vision. There is room, therefore, for a " higher phrenology," if it can show clear evidence in favour of the localization, in deter- minate regions of the brain, of the physical changes accompanying certain states of consciousness.

Of the two kinds of cases that Dr Hollander has tabulated, it cannot be said that the cases of mania are convincing. Some of them are altogether beside the mark; e.g. he quotes two cases of melancholia, after an injury over the left parietal bone, which were cured by an operation limited to the scalp (excision of a painful scar, removal of a small nerve-tumour of the scalp); in neither case was anything done to the skull or to the brain, but both patients were cured of their melancholy. Again, the acceptance of these rules as to the localization of these insane thoughts involves the localization of sane thoughts in the same areas of the brain, and this in turn involves assumptions that are wholly unwarranted by our present knowledge. Moreover, cases of mania are so common that it might be possible to find an equal number of cases to con- trovert his rules: we want consecutive, not picked cases. If 5000 consecutive fatal cases of these different kinds of mania, with the post mortem record of each case, were tabulated, we should then begin to stand on surer ground. Again, though Dr Hollander seems to argue well, where he says that the facial and other movements, induced by direct electrical stimulation of certain convolutions

are such as express the mental states which he attributes to those

convolutions, yet this argument is insecure, partly because Sherring- ton s recent work, on the motor area of the anthropoid apes, has rendered it necessary to reconsider the present localization of the motor area in man, and partly because the interpretation of facial and muscular movements as representing this or that state of the emotions is always precarious.

The second kind of cases, where injury or disease limited to one portion of the brain is followed by perversion, exaltation or loss of some special instinct or habit, is more valuable and more convincing; especially the cases of voracious hunger and thirst, those of true kleptomania, and those of the loss of certain special memories. It is not so easy to believe that the cerebellum is in any primary way associated with sexual desire : its position, its structure and its proved association with the co-ordination of muscular movements seem clearly to indicate that its work is wholly subordinate and complementary to the work of the cerebral hemispheres ; and the evidence adduced in favour of its being the " seat " of the sexual impulses hardly amounts to more than a probability that it may transmit or co-ordinate the performance of the sexual act.

Practical Application. — " Die Schadellehre ist allerdings nicht so sehr Irrthum in der Idee als Charlatanerie in der Ausfuhrung," says one of its most acute critics. Even though no fault could be found with the physiology and psychology of phrenology, it would not necessarily follow that the theory could be utilized as a practical method of reading character; for, although the inner surface of the skull is moulded on the brain, and the outer surface approximates to parallelism thereto, yet the correspon- dence is sufficiently variable to render conclusions therefrom uncertain. The spongy layer or diploe which separates the two compact tables may vary conspicuously in amount in different parts of the same skull, as in the cases described by Professor Humphry (Journ. of Anat. viii. 137). The frontal sinus, that opprobrium phrenologicum, is a reality, not unfrequently of large size, and may wholly occupy the regions of five organs. The centres of ossification of the frontal and parietal bones, the muscular crests of these and of the occipital bones also, differ in their prominence in different skulls. Premature synostoses of sutures mould the brain without doing much injury to its parts. ˆ In such cases there are compensatory dilatations in other directions modifying sometimes to an extreme degree the relation of brain-surface to skull-surface. The writer has found such displacements in extremely scaphocephaly skulls; the same is true of accidental deformations due to pressure on the infantile skull before it consolidates. Artificial malformations alter the apparent skull shape considerably while they affect the relative development of the parts of the brain cortex but little. All these and other cogent reasons of a like kind, whose force can be

estimated by those accustomed to deal with the component soft parts of the head, should lead phrenologists to be careful in predicating relative brain-development from skull-shape. Psychology, physiology and experience alike contribute to discredit the practical working of the system and to show how worthless the so-called diagnoses of character really are. Its application by those who are its votaries is seldom worse than amusing, but it is capable of doing positive social harm, as in its proposed application to the discrimination or selection of servants and other subordinate officials. It has even been proposed to use it for the purposes of the guarantee society and for the selection of parliamentary representatives. The sarcastic suggestion which originated with Christopher North of moulding children's heads so as to suppress the evil and foster the good was actually repeated in good faith by a writer on phrenology, but experience of the effects of malformation leads one to be sceptical as to the feasibility of this mode of producing a social Utopia.

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PHRYGIA, the name of a large country in Asia Minor, in- habited by a race which the Greeks called <&pvyes, freemen. l Roughly speaking, Phrygia comprised the western part of the great central plateau of Anatolia, extending as far east as the river Halys; but its boundaries were vague, 2 and varied so much at different periods that a sketch of its history must precede any account of the geography. According to unvarying Greek tradition the Phrygians were most closely akin to certain tribes of Macedonia and Thrace; and their near relationship to the Hellenic stock is proved by all that is known of their language and art, and is accepted by almost every modern authority. The country named Phrygia in the better known period of history lies inland, separated from the sea by Paphiagonia, Bithynia, Mysia and Lydia. Yet we hear of a Phrygian " thalassocracy " at the beginning of the 9th century B.C. The Troad and the

district round Mt Sipylus are frequently called Phrygian, as also is the seaport Sinope; and a district on the coast between Sestus and the river Cius was regularly named Little Phrygia; names like Mygdones, Doliones and Phryges or Briges, &c, were widely current both in Asia Minor and in Europe. The inference has been generally drawn that the Phrygians belonged to a stock widespread in the countries which lie round the Aegean Sea. There is, however, no con- clusive evidence whether this stock came from the east over Armenia, or was European in origin and crossed the Hellespont into Asia Minor; but modern opinion inclines decidedly to the latter view.

According to Greek tradition there existed in early time a Phrygian kingdom in the Sangarius valley, ruled by kings among whom the names Gordius and Midas were common. It was known to the ancient Greeks of Ionia and the Troad as something great and half-divine. When the goddess appeared to her favourite Anchises she represented herself as daughter of the king of Phrygia; the Phrygians were said to be the oldest people,

1 The meaning is given in Hesych, s.v. " Bpl-yts."

2 The difficulty of specifying the limits gave rise to a proverb — X&pls tcl Qpvy&v.

and their language the original speech of mankind ; the Phrygian kings were familiar associates of the gods, and the heroes of the land tried their skill against the gods themselves; we hear of the well-walled cities of Phrygia and of the riches of its kings. Tradition is completely corroborated by archaeological evidence. In the mountainous region on the upper waters of the Sangarius, between Kutaiah Eski Shehr and Afium (Afiom) Kara Hissar, there exist numerous monuments of great antiquity, showing a style of marked individuality, and implying a high degree of artistic skill among the people who produced them. On two of these monuments are engraved the names of " Midas the King " and of the goddess " Kybile the Mother." Even the title " king " (aval;) 3 appears to have been borrowed by Greek from Phrygian.

It is impossible to fix a date for the beginning of the Phrygian kingdom. It appears to have arisen on the ruins of an older civilization, whose existence is revealed to us only by the few monuments which it has left. These monuments, which are found in Lydia, Phrygia, Cappadocia and Lycaonia, as well as in north and central Syria, point to the existence of a homo- geneous civilization over those countries; they show a singularly marked style of art, and are frequently inscribed with a peculiar kind of hieroglyphics, engraved boustrophedon; and they origi- nated probably from a great Hittite kingdom, whose kings ruled the countries from Lydia to

the borders of Egypt. There can be traced in Asia Minor an ancient road-system, to which belongs the " royal road " from Sardis to the Persian capital, Susa (Herod, v. 55). The royal road followed a route so difficult and circuitous that it is quite unintelligible as the direct path from any centre [in Persia, Assyria or Syria to the west of Asia Minor. It can be understood only by reference to an imperial centre far in the north. The old trade-route from Cappadocia to Sinope, which had passed out of use centuries before the time of Strabo (pp. 540, 546), fixes this centre with precision. It must be far enough west to explain why trade tended to the distant Sinope, 4 hardly accessible behind lofty and rugged mountains, and not to Amisus by the short and easy route which was used in the Graeco-Roman period. This road- system, then, points distinctly to a centre in northern Cappadocia near the Halys. Here must have stood the capital of some great empire connected with its extremities, Sardis or Ephesus on the west, Sinope on the north, the Euphrates on the east, the Cilician Gates on the south, by roads so well made as to continue in use for a long time after the centre of power had changed to Assyria, and the old road-system had become circuitous and unsuitable. 5 The precise spot on which the city stood is marked by the great ruins of Boghaz Keui, probably the ancient Pteria, of which the wide circuit, powerful walls and wonderful rock-sculptures make the site indisputably the most remarkable in Asia Minor. On this site Winckler found in 1907 the records of the Hittite kings who fought against Egypt and Assyria.

The ancient road from Pteria to Sardis crossed the upper Sangarius valley, and its course may be traced by the monuments of this early period. Close to its track, on a lofty plateau which overhangs the Phrygian monument inscribed with the name of " Midas the King," is a great city, inferior indeed to Pteria in extent, but surrounded by rock-sculptures quite as remarkable as those of the Cappadocian city. The plateau is 2 m. in circumference, and presents on all sides a perpendicular face of rock 50 to 200 ft. in height. This natural defence was crowned by a wall partly Cyclopean, partly built of large squared stones. 6 This city was evidently the centre of the old Phrygian kingdom

3 fa.va.KTu. on the Midas tomb. It is expressly recorded that rvpavvos is a Lydian word. BatriXefa resists all attempts to explain it as a purely Greek formation, and the termination assimilates it to certain Phrygian words.

4 Sinope was made a Greek colony in 751 B.C., but it is said to have existed long before that time.

6 When the Persians conquered Lydia they retained, at least for a time, this route, which they found in existence.

6 The stones have all fallen, but the line where they were fitted on the rocks can be traced by any careful explorer. The small fortress Pishmish Kalessi is a miniature of the great city beside it (See Perrot, Explor. Archeol. p. 169 and pi. viii.)

of the Sangarius valley, but at least one of the monuments in it seems to belong to the older period of Cappadocian supremacy, and to prove that the city already existed in that earlier time. The Phrygian kingdom and art therefore took the place of an older civilization. It is probable that the tradition of battles between the Phrygians and the Amazons on the banks of the Sangarius preserves the memory of a struggle between the two races and the victory of the Phryges.

Of the monuments that exist around this city two classes may be confidently referred to the period of Phrygian greatness. That which is inscribed with the name of " Midas the King " is the most remarkable example of one class, in which a large perpendicular surface of rock is covered with a geometrical pattern of squares, crosses and maeanders, surmounted by a pediment supported in the centre by a pilaster in low relief. In some cases a floral pattern occupies part of the surface, and in one case the two sides of the pediment are filled by two sphinxes of archaic type. 1 In some of these monuments a door- way is carved in the lower part; the door is usually closed, but in one case, viz. the sphinx monument just alluded to, the valves of the door are thrown wide open and give access to a little chamber, on the back of which is sculptured in relief a rude image of the Mother-goddess Cybele, having on each side of her a lion which rests its forepaws on her shoulder and places its head against hers. Sometimes a grave has been found hidden behind the carved front; in other cases no grave can be detected, but it is probable that they are all sepulchral. 2 The imitation of woodwork is obvious on several monuments of this kind. The second class is marked by the heraldic type of two animals, usually lions rampant, facing one another, but divided by a pillar or some other device. This type is occasionally found conjoined with the preceding; and various details common to both classes show that there was no great difference in time between them. The heraldic type is used on the monuments which appear to be the older, and the geometrical pattern is often employed on the inscribed monuments, which are obviously later than the earliest uninscribed. Monuments of this class are carved on the front of a sepulchral chamber, the entrance to which is a small doorway placed high and inaccessible in the rocks. There are also many rock monuments of the Roman time.

Early Phrygian art stands in close relationship with the art of Cappadocia. The monuments of the type of the Midas tomb are obviously imitated from patterns which were employed in cloth and carpets and probably also in the tilework on the inside of chambers varying slightly according to the material. Such patterns were used in Cappadocia, and the priest in the rock- sculpture at Ibriz wears an embroidered robe strikingly similar in style to the pattern on the Midas tomb ; but the idea of using the pattern as the Phrygians did seems peculiar to themselves. The heraldic type of the second class is found also in the art of Assyria, and was undoubtedly adopted by the Phrygians from earlier art; but it is used so frequently in Phrygia as to be specially characteristic of that country. 3 While Phrygian art is distinctly non-Oriental in spirit, its resemblance to archaic Greek art is a fact of the greatest importance. It is not merely that certain types are employed both in Phrygia and in Greece, but several favourite types in early Greek art can be traced in Phrygia, employed in similar spirit and for similar purposes. The heraldic type of the two lions is the device over the principal gateway of Mycenae, and stamps this, the oldest great monument on Greek soil, with a distinctly Phrygian character. Mycenae was the city of the Pelopidae, whom Greek tradition unhesita- tingly declares to be Phrygian immigrants. A study of the topo- graphy of the Argive plain suggests the conclusion that Mycenae,

1 Published in Journ. Hell. Stud. (1884).

2 The monuments of Phrygia fall into two groups, which probably mark the sites of two cities about 16 m. distant from each other, Metropolis and Conni. One group lies round the villages of Yazili- Kaya, Kumbet, Yapuldak and Bakshish; the other beside Liyen, Bei Keui, Demirli and Ayazin.

3 The heraldic type continues on gravestones down to the latest period of paganism. Carpets with geometrical patterns of the Midas-tomb style are occasionally found at the present time in the houses of the peasantry of the district.

Midea and Tiryns form a group of cities founded by an immigrant people in opposition to Argos, the natural capital of the plain and the stronghold of the native race. Midea appears to be the city of Midas, and the name is one more link in the chain that binds Mycenae to Phrygia. This connexion, whatever may have been its character, belongs to the remote period when the Phrygians inhabited the Aegean coasts. In the 8th and probably in the 9th century B.C. communication with Phrygia seems to have been maintained especially by the Greeks of Cyme, Phocaea and Smyrna. About the end of the 8th century Midas, king of Phrygia, married Damodice, daughter of Agamemnon, the last king of Cyme. Gyges, the first Mermnad

king of Lydia (687-653), had a Phrygian mother. The worship of Cybele spread over Phocaea to the west as far as Massilia: rock monuments in the Phrygian style and votive reliefs of an Anatolian type are found near Phocaea. Smyrna was devoted to the Phrygian Meter Sipylene. It is then natural that the Homeric poems refer to Phrygia in the terms above described, and make Priam's wife a Phrygian woman. After the foundation of the Greek colony at Sinope in 751 there can be no doubt that it formed the link of connexion between Greece and Phrygia. Phrygian and Cappadocian traders brought their goods, no doubt on camels, to Sinope, and the Greek sailors, the aeivavrai. of Miletus, carried home the works of Oriental and Phrygian artisans. The Greek alphabet was carried to Phrygia and Pteria, either from Sinope or more probably direct east from Cyme, in the latter part of the 8th century. The immense importance of Sinope in early times is abundantly attested, and we need not doubt that very intimate relations existed at this port between the Ionic colonists and the natives. The effects of this commerce on the development of Greece were very great. It affected Ionia in the first place, and the mainland of Greece indirectly; the art of Ionia at this period is almost unknown, but it was probably closely allied to that of Phrygia. 4 A striking fact in this connexion is the use of a very simple kind of Ionic capital in one early Phrygian monument, suggesting that the " proto- Ionic " column came to Greece over Phrygia. It is obvious that the revolution which took place in the relations between Phrygians and Greeks must be due to some great movement of races which disturbed the old paths of communication. Abel is probably correct in placing the inroads of the barbarous European tribes, Bithynians, Thyni, Mariandyni, &c, into Asia Minor about the beginning of the 9th century B.C. The Phrygian element on the coast was weakened and in many places annihilated; that in the interior was strengthened; and we may suppose that the kingdom of the Sangarius valley now sprang into greatness. The kingdom of Lydia appears to have become important about the end of the 8th century, and to have completely barred the path between Phrygia and Cyme or Smyrna. Ionian maritime enterprise opened a new way over Sinope. 6

The downfall of the Phrygian monarchy can be dated with comparative accuracy. Between 680 and 670 the Cimmerians in their destructive progress over Asia Minor overran Phrygia; the king Midas in despair put an end to his own life; and from henceforth the history of Phrygia is a story of slavery, degrada- tion and decay, which contrasts strangely with the earlier legends. The catastrophe seems to have deeply impressed the Greek mind, and the memory of it was preserved. The date of the Cimmerian invasion is fixed by the concurrent testimony of the contemporary poets Archilochus and Callinus, of the late chronologists Eusebius, &c, and of the inscriptions of the Assyrian king Esar-haddon. The Cimmerians were finally expelled

from Asia Minor by Alyattes before his war with the Medes under Cyaxares (590-585 B.C.). The Cimmerians, therefore, were ravaging Asia Minor, and presumably held possession of Phrygia, the only country where they achieved 4 See Furtwangler, Goldfund von Vettersfelde, Winckelm. Progr. (1884) ; Hogarth, &c, The Archaic Artemisia (British Museum, 1908). The closest analogies of old Phrygian art are to be found in the earliest Greek bronze work in Olympia, Italy and the northern lands.

' Hipponax, jr. 36 [49], proves that a trade-route from Phrygia down the Maeander to Miletus was used in the 6th century.

complete success, till some time between 610 and 590 Phrygia then fell under the Lydian power, and by the treaty of 585 the Halys was definitely fixed as the boundary between Lydia and Media (see Lydia and Persia). The period from 675 to 585 must therefore be considered as one of great disturbance and probably of complete paralysis in Phrygia. After 585 the country was ruled again by its own princes under subjection to Lydian supremacy. To judge from the monuments, it appears to have recovered some of its old prosperity; but the art of this later period has to a great extent lost the strongly marked individuality of its earlier bloom. The later sepulchral monu- ments belong to a class which is widely spread over Asia Minor from Lycia to Pontus. The graves are made inside a chamber excavated in the rock, and the front of the chamber imitates a house or temple. No attempt is made to conceal the entrance or to render it inaccessible. The architectural details are in some cases unmistakably copied, without intentional modification, from the architecture of Greek temples; others point perhaps to Persian influence, while several — which are perhaps among the early works of this period — show the old freedom and power of employing in new and original ways details partly learned from abroad. This style continued in use under the Persians, under whose rule the Phrygians passed when Cyrus defeated Croesus in 546, and lasted till the Roman period. One monu- ment appears to presuppose a development of Greek plastic art later than the time of Alexander 1 and is almost certainly of the Roman time. It would, however, be wrong to suppose that the influence of truly Hellenic art on Phrygia began with the conquest of Alexander. Under the later Mermnad kings the Lydian empire was penetrated with Greek influence, and Xanthus, the early Lydian historian, wrote his history in Greek. Under the Persian rule perhaps it was more difficult for Greek manners to spread far east; but we need not think that European influence was absolutely unfelt even in Phrygia. The probability is that Alexander found in all the large cities a party favourable

to Greek manners and trade. Very little is to be learned from the ancient writers with regard to the state of Phrygia from 585 to 300. The slave-trade flourished: Phrygian slaves were common in the Greek market, and the Phrygian names Midas and Manes were stock-names for slaves. Herodotus (i. 14) records that a king Midas of Phrygia dedicated his own chair at Delphi; the chair stood in the treasury of Cypselus, and cannot have been deposited there before 680 to 660 B.C. It is not improbable that the event belongs to the time of Alyattes or Croesus, when Greek influence was favoured throughout the Lydian empire; and it is easy to understand how the offering of a king Midas should be considered, in the time of Herodotus, as the earliest made by a foreign prince to a Greek god. The Phrygian troops in the army of Xerxes were armed like the Armenians and led by the same commander.

It is to be presumed that the cities of the Sangarius valley gradually lost importance in the Persian period. The final castastrophe was the invasion of the Gauls about 270 to 250; and, though the circumstances of this invasion are almost unknown, yet we may safely reckon among them the complete devastation of northern Phrygia. At last Attalus I. settled the Gauls permanently in eastern Phrygia, and a large part of the country was henceforth known as Galatia. Strabo mentions that the great cities of ancient Phrygia were in his time either deserted or marked by mere villages. The great city over the tomb of Midas has remained uninhabited down to the present day. About 5 m. west of it, near the modern Kumbet, stood Metropolis, a bishopric in the Byzantine time, but never men- tioned under the Roman empire.

Alexander the Great placed Phrygia under the command of Antigonus, who retained it when the empire was broken up. When Antigonus was defeated and slain, at the decisive battle of Ipsus, Phrygia came under the sway of Seleucus. As the Pergamenian kings grew powerful, and at last confined the Gauls in eastern Phrygia, the western half of the country was

1 A gorgoneum of Roman period, on a tomb engraved in Journ. Hell. Stud. (PI. xxvi.).

incorporated in the kingdom of Pergamum. Under the Roman empire Phrygia had no political existence under a separate government, but formed part of the vast province of Asia. In autumn 85 B.C. the pacification of the province was completed by Sulla, and throughout the imperial time it was common for the Phrygians to date from this era. The imperial rule was highly favourable to the spread of Hellenistic civilization, which under the Greek kings had affected only a few of the great cities, leaving the mass of the country purely Phrygian. A good deal of local self-government was permitted; the cities struck their own bronze coins,

inscribed on them the names of their own magistrates, 2 and probably administered their own laws in matters purely local. The western part of the country was pervaded by Graeco-Roman civilization very much sooner than the central, and in the country districts the Phrygian language 3 continued in common use at least as late as the third century after Christ.

When the Roman empire was reorganized by Diocletian at the end of the 3rd century Phrygia was divided into two pro- vinces, distinguished at first as Prima and Secunda, or Great and Little, for which the names Pacatiana and Salutaris soon came into general use. Pacatiana comprised the western half, which had long been completely pervaded by Graeco-Roman manners, and Salutaris the eastern, in which the native man- ners and language were still not extinct. Each province was governed by a praeses or rfyt\Miv about a.d. 412, but shortly after this date an officer of consular rank was sent to each province (Hierocles, Synecd.). About 535 Justinian made some changes in the provincial administration: the governor of Pacatiana was henceforth a comes, while Salutaris was still ruled by a consularis. When the provinces of the Eastern empire were reorganized and divided into themata the two Phrygias were broken up between the Anatolic, Opsician and Thracesian themes, and the name Phrygia finally disappeared. Almost the whole of Byzantine Phrygia is now included in the vilayet of Brusa, with the exception of a small part of Parorius and the district about Themisonium (Karayuk Bazar) and Ceretapa (Kayadibi), which belong to the vilayet of Konia, and the district of Laodicea and Hierapolis, which belongs to Aidin. The principal modern cities are Kutaiah (Cotyaeum), Eski Shehir (Dorylaeum), Afiom Kara Hissar (near Prymnessus), and Ushak (Trajanopolis).

It is impossible to say anything definite about the boundaries of Phrygia before the 5th century. Under the Persians Great Phrygia extended on the east to the Halys and the Salt Desert; Xenophon (Anab. i. 2, 19) includes Iconium on the south- east within the province, whereas Strabo makes Tyriaeum the boundary in this direction. The southern frontier is unknown: the language of Livy (xxxviii. 15) implies that the southern Metropolis (in the Tchul Ova) belonged to Pisidia; but Strabo (p. 629) includes it in Phrygia. Celaenae, beside the later city of Apamea (Dineir), and the entire valley of the Lycus, were Phrygian. The Maeander above its junction with the Lycus formed for a little way the boundary between Phrygia and Lydia. The great plateau now called the Banaz Ova was entirely or in great part Phrygian. Mt Dindymus (Murad Dagh) marked the frontier of Mysia, and the entire valley of the Tembrogius or Tembris (Porsuk Su) was certainly included in Phrygia. The boundaries of the two Byzantine Phrygias were not always the same.

Taking Hierocles as authority, the extent of the two provinces at the

beginning of the 6th century will be readily gathered from the accompanying list, in which those towns which coined money under the Roman empire are italicized and the name of the nearest modern village is appended.

I. Pacatina. — (1) Laodicea (Eski Hissar) ; (2) Hierapolis (Pambuk Kalessi); (3) Mosyna (Geveze) ; [(4) Motellopolis, only in Notitiaf

2 This liberty was not granted to the cities of any other province in Anatolia.

3 A number of inscriptions in a language presumably Phrygian have been discovered in the centre and east of the country; they belong generally to the end of the 2nd and to the 3rd century.

*Episcop. (Medele)]; (5) Attudda (Assar); (6) Trapezopdis (Bolo S. tram Serai Keui) ; (7) Colossae (near Chonas) ; (8) Ceretapa Diocaesarea (Kayadibi) ; (9) Themtsontum (Karayuk Bazar) ; (10) Tacina (Yar-ishli); (11) Sanaus (Sari Kavak, in Daz Kiri); (12) Dionysopolis * a L Keui) ; (13) Anastasiopolis, originally a village of the Hyrgaleis (Utch Kuyular); (14) Attanassus (Eski Aidan) ; (15) Lunda (Eski ˆt, ;; „V 6 ‘) f e * toe v (Karayashlar) ; (17) Eumenea (Ishekli) ; (18) Sibha (Horna) ; (19) Pepuza (DumanorSuretli) ; (20) Bria (Bourgas) ; (21) Sebaste (Sivasli) ; (22) Eluza or Aludda (Hadjimlar) ; (23) Acmoma (Ahat Keui) ; (24) Alia (Kirka) ; (25) Siocharax (Otourak) , Y°\ Dioclea (Dola) ; (27) Aristtum (Karaj Euren, in Sitchanli Ova); 28) Ctdyessus (Geukche : Eyuk); (29) Apia (Abia) ; (3 o) Cotyaeum Kutaiah); (31) \Aezani (Tchavdir Hissar) ; (32) Tiberiopolis (Amed); (33) Cadot (Gediz) ; (34) Ancyra (Kilisse Keui) ; (35) Synaus (Sirnav) ; (36) tlamopohs Temenothyrae (Ushak) ; (37) Trajanopolis Grimeno- tkyrae (Giaour Euren, near Orta Keui); (38) Blaundus (Suleimanli) .11. Salutaris.— (1) Eucarpia (Emir Assar); (2) Hieropolis (Kotch Hissar) ; (3) Otrous (Tchor Hissar) ; (4) Stectorium (Mentesh) ; (5)Bruzus (Kara Sandykly)’; (6) Beudus (Aghzi Kara) ; (7) Augusto- polis, formerly Anabura (Sufmeneh) ; (8) Sibidunda (Baljik Hissar) • (9) Lysias (Oman) ; (10) Synnada (Tchifut Cassaba) ; (1 1) Prymnessus (beulun); (12) Ipsus, afterwards Julia (near Sakly) ; (13) Polybotus (Bolawadun); (14) Docimium (Istcha Kara Hissar); (15) Metropolis (Kumbet), including Conni (B. Tchorgia) and Ambasus (Ambanaz); (16) Merus (Doghan Arslan); (17) Nacolea (Seidi Ghazi); (18) Dory- ‘,T- S V Sheher); (19) Midaeum (Kara Euuk) ; (20) Lycaones (Kalejik) ; (21) Aulocra (in Dombai Ova) ; (22)*

Amadassus (unknown perhaps corrupt: it should include Kinnaborion near Geneli) ■ (23) Praepenissus (Altyntash). In later times the important fortress (and bishopric) of Acroenus was founded on the site of the present Anom Kara Hissar.

Besides these, certain cities beyond the bounds of the Byzantine l-'hrygias belonged under the Roman empire to the province of Asia and are usually considered Phrygian: (1) in Byzantine Pisidia, Philomehum (Ak Shehr), Hadrianopolis; (2) in Byzantine Galatia, Amonum (Assar near Hamza Hadji), Orcistus (Alikel or Alekian) Incomia or Trocmada or Trocnada (Kaimaz); (3) in Byzantine Lycia, Libyra (Horzum).

Phrygia contains several well-marked geographical districts. (I) Farorius, the long, level, elevated valley stretching north-west to south-east between the Sultan Dagh and the Emir Dagh from Holmi (about Tchai) to Tynaeum (Ilghin); its waters collect within the valley, in three lakes, which probably supply the great fountains in the Axylon and through them the Sangarius. (2) Axylon the vast treeless plains on the upper Sangarius; there burst forth at various points great perennial springs, the Sakaria fountains (Strabo p. 543), Ilije Bashi, Bunar Bashi, Geuk Bunar, Uzuk Bashi, &c, which feed the Sangarius. Great part of the Axylon was assigned to Galatia (3) The rest of Phrygia is mountainous (except the great plateau, Banaz Ova), consisting of hill-country intersected by rivers, each of which flows through a fertile valley of varying breadth. The northern half is drained by rivers which run to the Black Sea; of these the eastern ones, Porsuk Su (Tembris or Tem- brogius), Seidi Su (Parthenius), Bardakchi Tchai (Xerabates), and Bayat Tchai (Alandrus), join the Sangarius, while the western, 2 laushanly Tchai (Rhyndacus) and Simav Tchai (Macestus), meet and How into the Propontis. The Hermus drains a small district included in the Byzantine Phrygia, but in earlier times assigned to Lydia and Mysia. Great part of southern and western Phrygia is drained by the Maeander with its tributaries, Sandykly Tchai (Glaucus), Banaz Tchai, Kopli Su (Hippurius), and Tchuruk Su (Lycus) ; moreover, some upland plains on the south, especially the Dombai Ova (Aulocra), communicate by underground channels with the Maeander. Finally, the Karayuk Ova in the extreme south- west drains through the Kazanes, a tributary of the Indus, to the Lycian Sea. Phrygia Parorius and all the river-valleys are exceed- ingly fertile, and agriculture was the chief occupation of the ancient inhabitants; according to the myth, Gordius was called from the plough to the throne. The high-lying plains and parts of the vast Axylon furnish good pasturage, which formerly nourished countless Hocks of sheep. The Romans also obtained fine horses from Phrygia Grapes, which still grow abundantly in various parts, were much cultivated in ancient times. Other fruits are rare, except in a few small districts. Figs cannot be grown in the country, and the ancient references to Phrygian figs are either erroneous or due to a loose

use of the term Phrygia. 3 Trees are exceedingly scarce, in the country; and the pine-woods on the western tributaries of the San- garius and the valonia oaks in parts of the Banaz Ova and a few other districts form exceptions. The underground wealth is not known to be great. Iron was worked in the district of Cibyra, and the marble of Synnada, or more correctly of Docimium, was largely used by the Romans. Copper and quicksilver were mined in the Zizima district, north of Iconium. The scenery is generally mono- tonous; even the mountainous districts rarely show striking features

1 Nos. 1-5 were called the Phrygian " Pentapolis."

2 This district was according to the Greek view part of Mysia.

3 In Strabo, p. 577, iXaityvrov must be wrong; &ijiire\iVTov is true to fact, and is probably the right reading. Olives cannot now grow on these uplands, which are over 3000 ft. above sea-level.

or boldness of character; where the landscape has beauty it is of a subdued melancholy character. The water-supply is rarely abun- dant and^agriculture is more or less dependent on an uncertain rainfall. The circumstances of the country are well calculated to impress the inhabitants with a sense of the overwhelming power of nature and of their complete dependence on it. Their mytholoev so far as we know it, has a melancholy and mystic tone, and their religion partakes of the same character. The two chief deities were Cybele the Mother, the reproductive and nourishing power of Earth, and Sabazius, the Son, the life of nature, dying and revivine every year (see Great Mother of the Gods). The annual vicissi- tudes of the life of Sabazius, the Greek Dionysus, were accompanied by the mimic rites of his worshippers, who mourned with his suffer- ings and rejoiced with his joy. They enacted the story of his birth and life and death ; the Earth, the Mother, is fertilized only by an act ot violence by her own child ; the representative of the god was prob- ably slain each year by a cruel death, just as the god himself died. 1 he rites were characterized by a frenzy of devotion, unrestrained enthusiasm, wild orgiastic dances and wanderings in the forests and were accompanied by the music of the flute, cymbal, and tam- bourine. 1 At an early time this worship was affected by Oriental lnHuence coming over Syria from Babylonia. Sabazius was iden- tified with Adonis or Attis (Atys), Cybele with the Syrian goddess- and many of the coarsest rites of the Phrygian worship, the mutila- tion of the^ priests, the prostitution at the shrine, 6 came from the countries of the south-east. But one point of Semitic religion never penetrated west of the Halys: the pig was always unclean and abhorred among the Semites, whereas it was the animal regularly used in purification by the Phrygians, Lydians, Lycians and Greeks, the Phrygian religion exercised a very strong

influence on Greece In the archaic period the Dionysiac rites and orgies spread from Inrace into Greece, in spite of opposition which has left many traces in tradition, and the worship of Demeter at Eleusis was modified by Cretan influence ultimately traceable to Asia Minor. Pindar erected a shrine of the Mother of the gods beside his house, and the Athenians were directed by the Delphic oracle to atone for the execution of a priest of Cybele during the Peloponnesian War bv building the Metroon. In these and other cases the Phrygian character was more or less Hellenized; but wave after wave of religious influence from Asia Minor introduced into Greece the unmodified barbarian " ritual of Phrygia. The rites spread first among the common people arid those engaged in foreign trade 1 he comic poets satirized them, and Plato and Demosthenes in- veighed against them; but. they continued to spread, with all their fervid enthusiasm, their superstition and their obscene practices wide among the people, whose religious cravings were not satisfied with the purely external religions of Hellenism. The orgies or mysteries were open to all, freemen or slaves, who had duly performed the preliminary purifications, and secured to the participants salvation and remission of sins. Under Mysteries (qv) a dis tinction of character has been pointed out between the true Hellenic mysteries, such as the Eleusinian and the Phrygian; but there certainly existed much similarity between the two rituals In the first centuries after Christ onfy the Phrygian and the Egyptian rites retained much real hold on the Graeco-Roman world. Phrygia itself, however, was very early converted to Christianity. Christian inscriptions m the country begin in the 2nd and are abundant in the 3rd century. There is every appearance that the great mass of the people were Christians before 300, and Eusebius (H.E.v 16) is probably correct in his statement that in the time of Diocletian there was a Phrygian city in which every living soul was Christian. 1 he great Phrygian saint of the 2nd century was named Avircius Marcellus (Abercius) ; the mass of legends and miracles in the late biography ot him long brought his very existence into dispute, but a fragment of his gravestone, discovered in 1883, and now preserved in the Lateran Museum in Rome, has proved that he was a real per- son, and makes it probable that the wide-reaching conversion of the people attributed to him did actually take place. The stranee enthusiastic character of the old Phrygian religion was not wholly lost when the country became Christian, but is clearly traced in the various heresies that arose in central Anatolia. Especially the wild ecstatic character and the prophecies of the Montanists recall the old -type of religion. Montanus (see Montanism) was born on the borders of Phrygia and Mysia (probably south-east from Philadel- phia), and was vehemently opposed by Abercius.

Of the old Phrygian language very little is known; a few words are preserved in Hesychius and other writers. Plato mentions that the Phrygian

words for dog, " "fire," &c, were the same as the Oreek; and to these we may add from inscriptions the words for mother, king, &c. A few inscriptions of the ancient period are known, and a larger number of the Roman period have been published in the Oesterreichische Jakreshefte (1905).

Owing to the scantiness of published material about Phryeia frequent reference has been made in this article to unpublished

The influence which was exerted on Greek music and lyric poetry stu rhr .yg ian music wa s great ; see Marsyas ; Olympus Ihere is no direct evidence that this was practised inthe wor- ship ot Lybele, but analogy and indirect arguments make it pretty certain. H '

PHRYNE— PHTHALIC: ACIDS

monuments. Besides the works already quoted of Abel and Perrot see Hitter s Klemasien," in his Erdkunde von Asien; Leake Asia Minor (1824);. Kiepert appendix to Franz, Fiinf Inschr. u. fiinf StadteKleinasiens (1840) ; Haase, in Ersch and Gruber's Encyklop. art. Fhrygien ; Hamilton, Travels in Asia Minor (1842); Hirschfeld " Reisebencht," in the Bed. Monatsber (1879) ; Texier, Asie mmeure (1862); bteuart, Ancient Monuments of Lydia and Phrygia, besides the special chapters in the geographical treatises of Cramer, Vivien St Martin, Forbiger, &c. ; numerous articles by recent travellers ■ J. G. C. Anderson in Journal of Hellenic Studies (1898, &c)• D g' Hogarth, ibid.; Korte in Mittlieil. Inst. A then. &c, and his book Gordium (1904); Humann and Judeich, Hierapolis (1898); Radet in his work En Phrygie ; Ramsay [in addition to articles in Mitlheil Instil. Athen. (1882 sqq.), Bulletin de corresp. hellen (1883 sqq.), Journal of Hellenic Studies (1882, sqq.), American Journal of Archaeo- logy, Revue des etudes anciennes], /Cities and Bishoprics of Phrygia, vols. 1. it. (1895 sqq.); Studies in the History and Art of the Eastern provinces (1906); Pauline and other Studies (1906); Historical Com- mentary on Galatians, &c. (1899); Cities of St Paul (1907); see also T. Eisele, " Die Phrygischen Kulte " in Neue Jahrb. f. das klass. Altertutn (Sept. 1909). (W. M. Ra.)

PHRYNE, Greek courtesan, lived in the 4th century B.C. Her eal name was Mnesarete, but owing to her complexion she was called Phryne (toad), a name given to other courtesans. She was born at Thespiae in Boeotia, but seems to have lived at Athens. She acquired so much wealth by her extraordinary beauty that she offered to rebuild the walls of Thebes, which had been destroyed by Alexander the Great (336), on condition that the words " Destroyed by Alexander, restored by Phryne the courtesan," were inscribed upon them. On the occasion of a festival of Poseidon at Eleusis she laid aside her garments, let down her hair, and stepped into the sea in

the sight of the people, thus suggesting to the painter Apelles his great picture of Aphrodite Anadyomene, for which Phryne sat as model. She was also (according to some) the model for the statue of the Cnidian Aphrodite by Praxiteles. When accused of profaning the Eleusinian mysteries, she was defended by the orator Hypereides, one of her lovers. When it seemed, as if the verdict would be unfavourable, he rent her robe and displayed her lovely bosom, which so moved her judges that they acquitted her. According to others, she herself thus displayed her charms. She is said to have made an attempt on the virtue of the philo- sopher Xenocrates. A statue of Phryne, the work of Praxiteles, was placed in a temple at Thespiae by the side of a statue of Aphrodite by the same artist.

See Athenaeus, pp. 558, 567, 583, 585, 590, 591; Aelian, Var. Hist. ix. 32; Pliny, Nat. Hist, xxxiv. 71.

PHRYNICHUS — 1. Son of Polyphradmon and pupil of Thespis, one of the earliest of the Greek tragedians. Some of the ancients, indeed, regarded him as the real founder of tragedy. He gained his first poetical victory in 511 B.C. His famous play, the Capture of Miletus, was probably composed shortly after the conquest of that city by the Persians. The audience was moved to tears, the poet was fined for reminding the Athenians of their misfortunes, and it was decreed that no play on the subject should be produced again. In 476 Phrynichus was successful with the Phoenissae, so called from the Phoenician women who formed the chorus, which celebrated the defeat of Xerxes at Salamis (480). Themistocles acted as choragus, and one of the objects of the play was to remind the Athenians of his great deeds. The Persians of Aeschylus (472) was an imitation of the Phoenissae. Phrynichus is said to have died in Sicily. Some of the titles of his plays, Danaides, Actaeon, Alcestis, Tantalus, show that he treated mythological as well as con- temporary subjects. He introduced a separate actor as distinct from the leader of the chorus, and thus laid the foundation of dialogue. But in his plays, as in the early tragedies generally, the dramatic element was subordinate to the lyric element as represented by the chorus and the dance. According to Suidas, Phrynichus first introduced female characters on the stage (played by men in masks), and made special use of the trochaic tetrameter.

Fragments in A. Nauck, Tragicorum graecorum fragmenta (1887).

2- A poet of the Old Attic comedy and a contemporary of Aristophanes. His first comedy was exhibited in 429 B.C. He xxi. 18

composed ten plays, of which the Solitary (Movorporos) was exhibited in

414 along with the Birds of Aristophanes and gained the third prize. The Muses carried off the second prize in 405, Aristophanes being first with the Frogs, in which he accuses Phrynichus of employing vulgar tricks to raise a laugh, of plagiarism and bad versification.

Fragments in T. Kock, Comicorum atticorum fragmenta (1880).

3. Phrynichus Arabius, a grammarian of Bithynia, lived in the 2nd century a.d. According to Suidas he was the author of (1) an Atticist, or On Attic Words, in two books; (2) HiBepkyuiv o-vvayayyri, a collection of subjects for discussion; (3) Soˆkttiki) Trapao-Kevfj, or Sophistical Equipment, in forty-seven (or seventy-four) books. As models of Attic, style Phrynichus assigned the highest place to Plato, Demosthenes and Aeschines the Socratic. The work was learned, but prolix and garrulous. A fragment contained in a Paris MS. was published by B. de Montfaucon, and by I. Bekker in his Anecdota graeca (1814). Another work of Phrynichus, not mentioned by Photius, but perhaps identical with the Atticist mentioned by Suidas, the Selection (‘EicXoyri) of Attic Words and Phrases, is extant, ‘it is dedicated to Cornelianus, a man of literary tastes, and one of the imperial secretaries, who had invited the author to undertake the work. It is a collection of current words and forms which deviated from the Old Attic standard, the true Attic equivalents being given side by side. The work is thus a lexicon anti- barbarum, and is interesting as illustrating the changes through which the Greek language had passed between the 4th century B.C. and the 2nd century a.d.

Editions of the ‘EkXottJ, with valuable notes, have been published by C. A. Lobeck (1820) and W. G- Rutherford (1881) ; Lobeck devotes his attention chiefly to the later, Rutherford to the earlier usages noticed by Phrynichus. See also J. Brenous, De Phrynicho Atticista (i895).

4. An Athenian general in the Peloponnesian War. He took a leading part in establishing the oligarchy of the Four Hundred at Athens in 411 B.C., and was assassinated in the same year (Thucydides viii.).

PHTHALAZINES (benzo-orthodiazines or benzopyridazines), in organic chemistry a group of heterocyclic compounds contain- ing the ring complex shown in formula I. They are isomeric with the cinnolines (q.v.). The parent substance of the group, phthalazine, $C_8H_6N_2$, is best obtained from the condensation of co-tetrabromorthoxylene with hydrazine (D. Gabriel, Ber. 1893, 26, p. 2210), or by the reduction of chlorphthalazine with phosphorus and hydriodic acid {Ber., 1897, p. 3024). It possesses basic properties and forms addition products with alkyl iodides. On oxidation with alkaline potassium permanganate it yields pyridazine dicarboxylic acid. Zinc and hydrochloric acid decompose it with formation

of orthoxylylene diamine.

The keto-hydro derivative phthalazone, C 8 H 6 ON 2 , (formula II.) is obtained by condensing hydrazine with orthophthalaldehydo- acid. On treatment with phosphorus oxychloride it yields a chlor- phthalazine which with zinc and hydrochloric acid gives isoindole C 8 H 7 N, and with tin and hydrochloric acid phthalimidine, C 8 H,On' the second nitrogen atom being eliminated as ammonia. '

i / Y co > H

I. Phthalazine. II. Phthalazone.

PHTHALIC ACIDS, or Benzene Dicarboxylic Acids C6H4 2 . There are three isomers: (1) ortho, or phthalie acid; (2) meta, or isophthalic acid; (3) para, or terephthalic acid.

*Phthalie acid was obtained by Laurent in 1836 by oxidizing naphthalene tetrachloride, and, believing it to be a naphthalene derivative, he named it naphthalenic acid; Marignac determined its formula and showed Laurent's supposition to be incorrect, upon which Laurent gave it its present name. It is manufactured by oxidizing naphthalene tetrachloride (prepared from naph- thalene, potassium, chlorate and hydrochloric acid) with nitric acid, or, better, by oxidizing the hydrocarbon with fuming sulphuric acid, using mercury or mercuric sulphate as a catalyst (German pat. 91, 202). It also results on the oxidation of ortho**

diderivatives of benzene. It torms white crystals, melting at 213 with decomposition into water and phthalic anhydride; the latter forms long white needles, melting at 128 and boiling at 284 . Heated with an excess of lime it gives benzene; calcium benzoate results when calcium phthalate is heated with one molecule of lime to 330°~35o°. The acid (and anhydride) are largely used in the colour industry (see Fluorescein; Phenol- phthalein)
.

Phthalyl chloride, C 6 H 4 (C0C1) 2 or C 6 H 4 (CCl 2)(CO)0, formed by heating the anhydride with phosphorus chloride, is an oil which solidifies at 0° and boils at 275 . In some reactions it behaves as having the first formula, in others as having the second. Phthalyl chloride with phosphorus pentachloride gives two phthalylene tetrachlorides, one melting at 88° and the other at 47°. They cannot be changed into one another, and have been given the formulae C,H 4 (CC1,)(C0C1) and C 6 H 4 (CC1 2)

2 0. Phthalimide, QH 4 (CO) 2 NH, is formed by heating phthalic anhydride or chloride in ammonia gas or by molecular rearrangement of ortho-cyanbenzoic acid. It forms N-metallic and alkyl salts. Bromine and potash give anthranilic acid, C«H 4 (NH 2)(C0 2 H). (See Indigo.)

Isophthalic acid is obtained by oxidizing meta-xylene with chromic acid, or by fusing potassium meta-sulphobenzoate, or meta-brombenzoate with potassium formate (terephthalic acid is also formed in the last case) . It melts above 300 , and dissolves in 7800 parts of cold water and in 460 of boiling. The barium salt (+6H 2 0) is very soluble (a distinction between phthalic and terephthalic acids). Uvitic acid, 5-methyl isophthalic acid, is obtained by oxidizing mesitylene or by condensing pyroracemic acid with baryta water.

Terephthalic acid, formed by oxidizing para-diderivatives of benzene, or best by oxidizing caraway oil, a mixture of cymene and cuminol, with chromic acid, as almost insoluble in water, alcohol and ether; it sublimes without melting when heated.

For the reduced phthalic acids see Polymethylenes.

PHTHISIS (Gr. 8'uns " wasting "), a term formerly applied (like " Consumption ") to the disease of the lung now known as Tuberculosis (q.v.).

PHYLACTERY (ˆuXaKrˆptov), a Greek word meaning " guard " (sc. against misfortune), i.e. an amulet. It is applied in the New Testament to the tefillin or " prayer-thongs " worn by orthodox Jews daily at morning-prayer (whether at home or in the synagogue). The title employed in Hebrew, tefillin, seems really to be derived from an Aramaic term meaning " attach- ments," " ornaments "; it corresponds to the Biblical Hebrew word rendered " frontlets " (totafdth). The tefillin or phylac- teries are worn, one on the left arm (the " hand-tefilla "), and the other on the head (the " head-tefilla "). In each case the leather thongs support a small satchel which is fastened to the arm and the forehead respectively, and contains certain passages of the Law written (in Hebrew) on parchment, viz. Exod. xiii. i-ioamdu-16; Deut. vi. 4-9 and xi. 13-21. The custom of wear- ing phylacteries seems to have been derived in the first instance from the Pharisees. By the Sadducees and the generality of the people in the time of Christ it seems not to have been practised. Later it became— not without protest — one of the badges of orthodox Judaism. It is significant that the custom is entirely unknown to the Samaritan community.

The phylacteries, together with the " fringe " (tsitstth) and door-post symbol (mezuza) — which latter consists of a piece of parchment,

containing the Hebrew text of Deut. vi. 4-0 and xi. 13-21 enclosed in a glass or metal tube, and fixed upon the right hand post of the door of each dwelling-room in a house — form the three sets of visible signs by which the Israelite is constantly reminded of his duty to God (cf. Num. xv. 39-40; Deut. vi. 9; xi. 20). The " fringe " (or " tassels ") was originally attached to the common outer garment— a large square wrap — the loose end of which hung over the left shoulder. This garment with tassels is mentioned in the New Testament (cf. Matt. ix. 20; xiv. 36; xxiii. 5 and parallels). Among modern Jews it has sur- vived in two forms: (1) the fringed praying shawl called talith worn by every male orthodox Jew at the synagogue morning ser- vice; and (2) an under-garment, shaped like a chest-protector,

one part covering the chest, the other the back, which is worn continuously by male orthodox Jews. It is called Arba Kanfoth {i.e. "Four Corners," Deut. xxii. 12) or " little Talith," and is, of course, " fringed." Both phylactery and mezuza were supposed to keep off hurtful demons (Targ. on Cant, viii. 3).

See Surenhusius, Mischna, i. 9 seq. ; and Bodenschatz, Kirch. Verf. d. heutigen Juden, iv. 9 seq. (W. R. S. ; G. H. Bo.)

PHYLARCHUS, a Greek historian, who flourished during the time of Aratus, the strategus of the Achaean League, in the 3rd century B.C. His birthplace is variously given as Athens, Naucratis, or Sicyon. He was probably a native of Naucratis, and subsequently migrated to Athens. He was the author of a history in 28 books, covering the period from the expedition of Pyrrhus king of Epirus to Peloponnesus (272) to the death of the Spartan king Cleomenes (220) after his defeat by Antigonus Doson. Polybius (ii. 56-63) charges him with undue partiality for Cleomenes and unfairness towards Aratus; Plutarch (Aratus, 38), who is of the same opinion, did not hesitate to use him freely in his own biographies of Agis and Cleomenes.

Fragments and life in C. W. Muller, Fragmenta historicorum graecorum, vol. i. (1841); monographs by J. F. Lucht (1836) and C. A. F. Bruckner (1839) ; C. Wachsmuth, Einleitung in das Studium der alien Geschichte (1895).

PHYLE, a mountain fortress, on a pass leading from Athens to Boeotia and Thebes, and commanding a fine view of the Attic plain. It is situated on the south-west end of Mt Parnes. It is chiefly famous for its occupation by Thrasybulus at the head of the Athenian exiles during the rule of the Thirty Tyrants in 404 B.C. After defending himself from attack, with the help of a snowstorm, he succeeded by a venturesome night march in seizing Munychia. Close to Phyle is the cliff called Harma, over which the Pythian

lightnings were watched for from Athens.

PHYLLITE (Gr. {i\ov, a leaf, probably because they yield leaf-like plates, owing to their fissility), in petrology, a group of rocks which are in practically all cases metamorphosed argillaceous sediments, consisting essentially of quartz, chlorite and muscovite, and possessing a well-marked parallel arrange- ment or schistosity. They form an intermediate term in the series of altered clays or shaly deposits between clay-slates and mica-schists. The clay-slates have a very similar mineral constitution to the phyllites, but are finer grained and are distinguished also by a very much better cleavage. In the phyllites also white mica (muscovite or sericite) is more abundant as a rule than in slate, and its crystalline plates are larger; the abundance of mica gives these rocks a glossy sheen on the smooth planes of fissility. Many of the best Welsh slates are rich in small scales of white mica, which polarize brightly between crossed nicols. The Cornish slates are still more micaceous and rather coarser grained, so that they might be called mica-slates or even phyllites.

A microscopical section of a typical phyllite shows green chlorite and colourless mica both in irregular plates disposed in parallel order, with a greater or smaller amount of quartz which forms small lenticular grains elongated parallel to the foliation. Grains of iron oxide (magnetite and haematite) and black graphitic dust are very commonly present. Feldspar is absent or scarce, but some phyllites are characterized by the development of small rounded grains of albite, often in considerable numbers. The minute needles of rutile, so often seen in clay-slates, are not of ten met with in phyllites, but this mineral forms small prisms which may be intergro\vn with black magnetite; at other times it occurs as networks of sagenite. Other phyllites contain carbonates (usually calcite but sometimes dolomite) in flat or spindle-shaped crystals, which often give evidence of crushing. Very tiny blue needles of tourmaline are by no means rare in phyllites, though readily overlooked. Garnet occurs some- times, a good example of garnetiferous phyllite being furnished by the whetstones of the Ardennes, in which there are many small isotropic crystals of magnesian garnet. Hornblende, often in branching feathery crystals, is a less frequent accessory. In some phyllites a mineral of the chloritoid group makes its appearance; this may be ottrelite, sismondine or other varieties of chloritoid, and occurs in large sub-hexagonal plates showing complex twinning, and lying across the foliation planes of the rock, so that they seem to have developed after the movements and pressures which gave rise to the foliation had ceased.

PHYLLOXERA

The structural variations presented by the phyllites are compara- tively few. The most finely crystalline specimens have generally the most perfect parallel arrangement of their constituents. The foliation is generally flat or linear, but in some rocks is undulose or crumpled. From the imperfection of their cleavage phyllites are rarely suitable for roofing materials ; their softness renders them valueless as road stones, but they are not uncommonly employed as inferior building materials. They are exceedingly common in all parts of the world where metamorphic rocks occur; as in the Scottish Highlands, Cornwall, Anglesey, north-west Ireland, the Ardennes, the Harz Mountains, ˆSaxony, the Alps, Norway, the Appalachians, the Great Lakes district in America, &c. (J. S. F.)

PHYLLOXERA (Gr. vXkov, leaf, and frpos, dry), a genus of insects belonging to the family of Aphidae, or Plant-lice, in the Homopterous section of the order Hemiptera. It is chiefly known from the causal relation of one of its species to the most serious of vine-diseases. The name was first given in 1834 to a plant-louse which was observed to "dry up the leaves" of oaks in Provence. About twenty-seven species are now known, all characterized by length not exceeding -06 of an inch, flat wings, three articulations in the antennae, one or two articulations in the tarses, with digitules, but without cornicles on the abdomen. The following full description of the only species which attacks the vine, the Phylloxera vastatrix, or grape-louse, is reprinted from the article Vine in the 9th edition of this encyclopaedia.

" The symptoms of the disease, by means of which an infected spot may be readily recognized, are as follows: The vines are stunted and bear few leaves, and those small ones. When the disease reaches an advanced stage the leaves are discoloured, yellow or reddish, with their edges turned back, and withered. The grapes are arrested in their growth and their skin is wrinkled. If the roots are examined numerous fusiform swellings are found upon the smaller rootlets. These are at first yellowish in colour and fleshy; but as they grow older they become . rotten and assume a brown or black colour. If the roots on which these swellings occur be examined with a lens, a number of minute insects of a yellowish-brown colour are observed ;

these are the root-forms (radi-

J – cola) of Phylloxera (fig. 1); they

are about -8 mm. long, of an

oval outline and with a swollen

body. No distinction between

head, thorax and abdomen can

be observed. The head bears

small red eyes and -a pair of

three-jointed antennae, the first

two joints being short and thick,

the third more elongated, with

the end cut off obliquely and

Fig. 1. — Root-inhabiting Form slightly hollowed out. Under-

(Radicola.) ol Phylloxera, with pro- neath, between the legs, lies the

boscis inserted into tissue of root rostrum, which reaches back to

of vine. the abdomen. The insect is fixed

by this rostrum, which is inserted into the root of the vine for the purpose of sucking the sap. The abdomen consists of seven segments, and these as well as the anterior segments bear four rows of small tubercles on their dorsal surface. These root-dwelling insects are females, which lay parthenogenetic eggs. The insect is fixed by its proboscis, but moves its abdomen about and lays thirty to forty yellow eggs in small clusters. After the lapse of six, eight or twelve days, according to the temperature, the larvae hatch out of the eggs. These are light yellow in colour and in appearance resemble their mother, but with relatively larger appendages. They move actively about for a few days and then, having selected a convenient place on the young roots, insert their proboscis and become stationary. They moult five times, becoming with each change of skin darker in colour; in about three weeks they become adult and capable of laying parthenogenetic eggs. In this way the insect increases with appalling rapidity: it has been calculated that a single mother which dies after laying her eggs in March would have over 25,000,000 descendants by October. If, however, the insect were content with this method of reproduction the disease could be isolated by surrounding the infected patches with a deep ditch full of some such substance as coal-tar, which would prevent the insects spreading on to the roots of healthy vines. The fertility of the parthenogenetically produced insects would also diminish after a certain number of generations had been produced.

As the summer wears on a second form of insect appears amongst the root-

dwellers, though hatched from the same eggs as the form described above. These are the nymphs, destined to acquire wings; their body is more slender in outline, and at first they bear well-marked tubercles. After several moults the rudiments of two pairs of wings appear, and then the insect creeps up to the surface of the earth, and on to the vine. Here it undergoes its fifth and last moult, and appears as a winged female, capable of reproducing parthenogenetically. The winged form has a slender body with distinct head (fig. 2). The eyes are well developed,

with numerous facets; the antennae have three joints, the ter- minal one shaped like that of the root-dwellers. The wings are transparent, with few nervures, and are well adapted for flight. The anterior pair reach far beyond the end of the abdomen; the posterior are narrower and not so long. These winged forms are about 1 mm. long. They fly about from July till October, living upon the sap of the vine, which is sucked up by the rostrum from the leaves or buds. They lay their parthenogenetically produced eggs in the angles of the veins of the leaves, in the buds, or, if the season is already far advanced, in the bark. In very damp or cold weather the insect remains in the ground near the surface, and deposits its eggs there. The eggs are very few in number and of two sizes, small and large (fig. 3, b and c). From the larger a female (fig. 4) is hatched in eight or ten days, and simultaneously, for the first time in the life-history of the Phylloxera, a male (fig. 3) appears from the smaller egg. Neither male nor female has wings; the rostrum is replaced by a functionless tubercle ; and there is no alimentary canal. The female is larger than the male and differs from it and the other forms in the last joint of the antennae.

The life of these sexual forms lasts ,- ■ , , , .

but a few days, and is entirely taken ° n leaves and buds of vine, up with reproduction. The female is and lays parthenogenetically fertilized by the male and three or e Sf ? f two kinds, one de- four days later lays a single egg-the yeloping into a wingless winter egg— and then dies This egg is fen] ale > the other lnto a laidinthecrevicesofthebarkofthevine, male –

and as it is protectively coloured it is almost impossible to find it. Here the winter eggs remain undeveloped during the cold months; but in the following spring, as a rule in the month of April, they give

Fig. 2. — P hylloxer a. Winged Female which lives

Fig. 3. — o, Male produced from small egg c, laid by winged female (fig. 2); b, large egg; c, small egg.

Fig. 4. — Wingless Female pro- duced from large egg (fig. 3, b), laid by

winged female (fig. 2).

birth to a female insect without wings, which resembles the root- dwelling forms, but has pointed antennae. These forms are termed the stock-mothers; they creep into the buds of the vine, and, as these develop into the young leaves, insert their proboscis into the upper side. By this means a gall is produced on the under side of the leaf.

Scheme of the Various Forms of Phylloxera vastatrix.

A. Root-infesting forms, ?

Root -infesting forms, 2nd generation, $

Root -infesting forms, 3rd generation, ?

I

&c.

Winged forms, S ■

Wingless female.

I

Male.

Gall-producing ? ditto

I Winter egg.

Stock-mother.

I

Root-infesting $

1

The gall is cup-shaped, and its outer surface is crumpled and covered with small warts and hairs. The opening upon the upper surface

of the leaf is protected by similar structures. Within this gall the stock-

mother lives and surrounds herself with numerous partheno- genetically produced eggs — sometimes as many as two hundred in a single gall ; these eggs give birth after six or eight days to a numerous progeny (gallicola), some of which form new galls and multiply in the leaves, whilst others descend to the roots and become the root-dwelling forms already described. The galls and the gall- producing form are much commoner in America than in the Old World.

The particular species of phylloxera which attacks the vine is a native of the United States, probably originating among the wild vines of the Colorado district. It was first observed in 1856 by Asa Fitch (1809-1878), who did not suspect its mischief, and called it Pemphigus vitifoliae. In 1863 'it was independently discovered by Westwood in an English vinery at Hammersmith; he was ignorant of Fitch's observation, and called it Peritymbia vitisana. From 1858 to 1863 there were many importations of American vines for grafting purposes to Bordeaux, Roque- maure and other parts of France, England, Ireland, Germany, Portugal, &c. It is practically certain that the deadly, phyl- loxera was imported on these plants. A year or two later certain vine-growers in the South of France began to complain of the new vine-disease. M. Delorme, of Aries, in 1865, appears to have been the first who recognized its novelty and had a presentiment of disaster. The disease steadily spread outwards in concentric circles from its first place of lodgment near Roquemaure. Within two or three years whole departments were infested. In 1866 a second centre of infection made its appearance near Bordeaux. The vine-growers were at their wits' end to account for this new plague, which threatened to be even more costly than the oidium. The completeness of the ruin which threatened them may be illustrated by the statistics for a single commune, that of Graveson, whose average annual production of wine in the years 1865-1867 was about 220,000 gallons. In 1868 this fell to 121,000 gallons, in 1869 to 48,400 gallons, in 1870 to 8800 gallons, and by 1873 to 1100 gallons.

In 1868 Planchon proved that the disease was due to a new species of phylloxera, which was invariably found on the roots of the affected vines, and to which he accordingly gave the prophetic name of Phylloxera vastatrix. During the next ten years a series of students, of whom only Riley and "Balbiani need be mentioned here, worked out the natural history of Phylloxera vastatrix, and proved its identity with the American grape-louse. Its devastations rapidly assumed gigantic proportions. In France, where the disease was by far the most prevalent — owing in great part to the obstinacy with which the vine-growers at first refused to take any reasonable precautions against its spread — -M. Lalande, president of the chamber of commerce at Bordeaux, in 188S calculated the direct loss to the country by the phylloxera at 10 milliards (£400,000,000), or double the indemnity which had been paid to Germany in 1871 !

The phylloxera has made its appearance in almost every vine- growing country in the world. Thus it appeared in Austria-Hungary in 1868; in Italy, in spite of the frantic efforts made — as in other countries — to keep it out by strict legislation against the import of vines, in 1879; in Russia in 1880; in Germany, on the Rhine and Moselle, and in Switzerland in 1872 ; in Madeira, Spain and Portugal, about 1876. The pest even crossed the oceans, and appeared in Australia, at Geelong, about 1880; it has since twice broken out in Victoria, and has ravaged the vineyards of South Australia and New South Wales. At the Cape, in spite of a long endeavour to prohibit the import of the phylloxera, it appeared about 1884. In 1885 it crossed the Mediterranean to Algeria. There was only one country where its ravages were long unimportant; that was its home in the United States, where the native vines had become, by the operation of natural selection, immune to its attacks. Yet no imported vine has ever lived there more than five years, and in 1890 the phylloxera crossed the Rocky Mountains, and seriously damaged the vineyards of California, where it had previously been unknown.

Three different methods of fighting the pest have been success- fully adopted. One is to kill the phylloxera itself; another, to destroy it along with the infected vines, and plant fresh and healthy plants; the third, to adapt the secular therapeutics of nature, and to introduce American vines which a long acquain- tance with the phylloxera has made immune to its ravages. Insecticides, of which the bisulphide of carbon (CS 2) and the

sulpho-carbonate of potassium (KSCS 2) remain in use, were injected into the earth to kill the phylloxera on the roots of the vine. These methods were chiefly advocated in vineyards of the first class, where it was worth while to spend a good deal of money and labour to preserve the old and famous vines: the Chateau Leoville Poyferre and Clos Vougeot are instances. Some good judges attribute the peculiar and not unpleasing flavour of certain clarets of 1888 to means thus adopted to kill the phylloxera. The second plan was largely adopted in Switzerland and on the Rhine, where measures resembling those taken with cattle suspected of anthrax were applied to all diseased vineyards. The third plan, which consists in replanting the affected vineyard with American vines — such as the Vitis labrusca, V. riparia, V. rupestris or V. monticola — has proved the most generally successful.

A very good bibliography will be found in Les Insectes de la vigne, by Professor Majet of Montpellier (1890), which is the best book on the subject. Reference may also be made to the classic memoirs of Planchon, culminating, in Les Masurs de la phylloxera de la vigne (1877); Dreyfus, Vber Phylloxerinen (1889); Lichtenstein, Histoire du phylloxera; the Rapports annuels a la commission supirieure du phylloxera; and the excellent Report on Phylloxera drawn up by the Hon. J. W. Taverner

(Victoria, 1899, No. 68).

(W. E. G. F.)

PHYSHARMONICA, a keyboard instrument fitted with free- reeds, a kind of harmonium much used in Germany. The phys- harmonica resembles a small harmonium, but is differentiated from it by having no stops; being without percussion action, it does not speak readily or clearly. As in the harmonium, the bellows are worked by the feet by an alternate movement, which also affords a means of varying the dynamic force of the tone according as more or less energetic pedalling increases or decreases the pressure of the wind supply. The physharmonica was invented in 1818 by Anton Hackel, of Vienna; in the original instrument the bellows were placed right and left immediately under the shallow wind-chest, and were worked by means of pedals connected by stout wire. A specimen, having a compass of four octaves and a very sweet tone, is preserved in the collection of Paul de Wit, formerly in Leipzig, now transferred to Cologne. (K. S.)

PHYSICAL PHENOMENA, in the terminology of spiritualism and psychical research, molar or molecular phenomena in the physical world not traceable to ordinary causes and referred to the action of spirits or of mediums in abnormal psychical states. Among the phenomena or alleged phenomena are: materializa- tion, levitation or elongation of the medium; passage of matter through matter, alteration of weight in a balance, tying of knots in an endless cord, apports (objects brought from a distance) and movements of objects (telekinesis); the production of writing, imprints of plaster or other objects; raps, voices and other sounds, including music; spirit photographs; lights and perfumes. To these may be added immunity against the effects of fire and the untying of ropes.

Analogous phenomena are found in many parts of the world (see Poltergeist; Firewalking) ; spectral lights are associated with the tombs of Mahommedan saints, with Buddhist shrines, with religious revivals, with Red Indian and other magicians, &c, and as sporadic phenomena in the Highlands and Norway, Levitation is asserted of Australian wizards, the rope-trick of Eskimo angekoks; glyphs and direct writing are found in Mexican and Tibetan cults.

See F. Podmore, Modem Spiritualism; F. W. H. Myers, Human Personality, ii. 506; Journal S. P. R., vi. 309 sq. (N. W. T.)

PHYSIOCRATIC SCHOOL, the name given to a group of French economists and philosophers. The heads of the school were Francois Quesnay (q.v.) and Jean Claude Marie Vincent, sieur de Gournay (1712-1759). The

principles of the school had been put forward in 1755 by R. Cantillon, a French merchant of Irish extraction (Essai sur la nature du commerce en general) , whose biography W, S. Jevons has elucidated, and whom he regards as the true founder of political economy; but it was in the hands of Quesnay and Gournay that they acquired a system- atic form, and became the creed of a united group of thinkers

and practical men, bent on carrying them into action. The members of the group called themselves les Sconomisles, but it is more convenient, because unambiguous, to designate them by the name physiocrates (Gr. vck, nature, and Kpareiv, to rule), invented by P. S. Dupont de Nemours (1730-1817), who was one of their number. In this name, intended to express the fundamental idea of the school, much more is implied than the subjection of the phenomena of the social, and in particular the economic, world to fixed relations of coexistence and succession. This is the positive doctrine which lies at the bottom of all true science. But the law of nature referred to in the title of the sect was something quite different. The theological dogma which represented all the movements of the universe as directed by divine wisdom and benevolence to the production of the greatest possible sum of happiness had been transformed in the hands of the metaphysicians into the conception of a jus naturae, a harmonious and beneficial code established by the favourite entity of these thinkers, nature, antecedent to human institu- tions, and furnishing the model to which they should be made to conform.

The general political doctrine is as follows: Society is com- posed of a number of individuals, all having the same natural rights. If all do not possess (as some members of the negative school maintained) equal capacities, each can at least best understand his own interest, and is led by nature to follow it. The social union is really a contract between these individuals, the object of which is the limitation of the natural freedom of each just so far as it is inconsistent with the rights of the others. Government, though necessary, is a necessary evil; and the governing power appointed by consent should be limited to the amount of interference absolutely required to secure the fulfil- ment of the contract. In the economic sphere this implies the right of the individual to such natural enjoyments as he can acquire by his labour. That labour, therefore, should be undis- turbed and unfettered, and its fruits should be guaranteed to the possessor; in other words, property should be sacred. Each citizen must be allowed to make the most of his labour; and there- fore freedom of exchange should be ensured, and competition in the market should be unrestricted, no monopolies or privileges being permitted to exist.

The physiocrats then proceed with the economic analysis as follows: Only those labours are truly " productive " which add to the quantity of raw materials available for the purposes of man; and the real annual addition to the wealth of the com- munity consists of the excess of the mass of

agricultural products (including, of course, metals) over their cost of production. On the amount of this produit net depends the well-being of the community and the possibility of its advance in civilization. The manufacturer merely gives a new form to the materials extracted from the earth; the higher value of the object, after it has passed through his hands, only represents the quantity of provisions and other materials used and consumed in its elabora- tion. Commerce does nothing more than transfer the wealth already existing from one hand to another; what the trading classes gain thereby is acquired at the cost of the nation, and it is desirable that its amount should be as small as possible. The occupations of the manufacturer and merchant, as well as the liberal professions, and every kind of personal service, are " useful " indeed, but they are " sterile," drawing their income, not from any fund which they themselves create, but from the superfluous earnings of the agriculturist. The revenue of the state, which must be derived altogether from this net product, ought to be raised in the most direct and simplest way — namely, by a single impost of the nature of a land tax.

The special doctrine relating to the exclusive productiveness of agriculture arose out of a confusion between " value " on the one hand and "matter and energy" on the other. A. Smith and others have shown that the attempt to fix the character of " sterility " on manufactures and commerce Was founded in error. And the proposal of a single impot territorial falls to the ground with the doctrine on which it was based. But such influence as the school exerted depended little, if at all, on these

peculiar tenets, which indeed some of its members did not hold. The effective result of its teaching was mainly destructive. It continued in a more systematic form the efforts in favour of the freedom of industry already begun in England and France, It was to be expected that the reformers should, in the spirit of the negative philosophy, exaggerate the vices of established systems; and there can be no doubt that they condemned too absolutely the economic action of the state, both in principle and in its historic manifestations, and pushed the laissez- faire doctrine beyond its just. limits.' But this was a necessary incident of their connexion with the revolutionary movement, of which they really formed one wing. In the course of that movement, the primitive social contract, the sovereignty of the people and other dogmas now seen to be untenable, were habitually invoked in the region of politics proper, and had a transitory utility as ready and effective instruments of warfare. And so also in the economic sphere the doctrines of natural rights of buying and selling, of the sufficiency of enlightened selfishness as a guide in mutual dealings, of the certainty that each member of the society will understand and follow his true interests, and of the coincidence of those interests with the public welfare, though they will not bear a dispassionate examination, were

temporarily useful as convenient and serviceable weapons for the overthrow of the" established order.

These conclusions as to the revolutionary tendencies of the school are not at all affected by the fact that the form of govern- ment preferred by Quesnay and some of his chief followers was what they called a legal despotism, which should embrace within itself both the legislative and the executive function. The reason for this preference was that an enlightened central power could more promptly and efficaciously introduce the policy they advocated than an assembly representing divergent opinions and fettered by constitutional checks and limitations. Turgot used the absolute power of the Crown to carry into effect some of his measures for the liberation of industry, though he ultimately failed because unsustained by the requisite force of character in Louis XVI. But what the physiocratic idea with respect to the normal method of government was appears from Quesnay's advice to the dauphin, that when he became king he should " do nothing, but let the laws rule," the laws having been, of course, first brought into conformity with the jus naturae. The partiality of the school for agriculture was in harmony with the sentiment in favour of " nature " and primi- tive simplicity which then showed itself in so many forms in France, especially in combination with the revolutionary spirit, and of which Rousseau was the most eloquent exponent. The members of the physiocratic group were undoubtedly men of thorough uprightness, and inspired with a sincere desire for the public good, especially for the material and moral elevation of the working classes. Quesnay was physician to Louis XV., and resided in the palace at Versailles; but in the midst of that corrupt court he maintained his integrity, and spoke with manly frankness what he believed to be the truth. And never did any statesman devote himself with greater singleness of purpose or more earnest endeavour to the service of his country than Turgot, who was the principal practical representative of the school. ',..■■

The physiocratic school never obtained much direct popular influence, even in its native country, though it strongly attracted many of the more gifted and earnest minds. Its members, writing on dry subjects in an austere and often heavy style, did not find acceptance with a public which demanded before all things charm of manner in those who addressed it. The physio- cratic tenets, which were in fact partly erroneous, were regarded by many as chimerical, and were ridiculed in the contemporary literature; as, for example, the impdt unique by Voltaire in his L'Homme aux quarante icus, which was directed in particular against P. P. Mercier-Lariviere (1720-1704). It was justly objected to the group that they were too absolute in their view of things; they supposed, as Smith remarks in speaking of Quesnay, that the body politic could thrive only under one precise regime — that, namely, which they recommended— ˆand

thought their doctrines universally and immediately applicable in practice. They did not, as theorists, sufficiently take into account national diversities or different stages in social develop- ment; nor did they, as politicians, adequately estimate the impediments which ignorance, prejudice and interested opposi- tion present to enlightened statesmanship.

The physiocratic system, after guiding in some degree the policy of the Constituent Assembly, and awakening a few echoes here and there in foreign countries, soon ceased to exist as a living power; but the good elements it comprised were not lost to mankind, being incorporated into the more complete construc- tion of Adam Smith.

See the article on Quesnay, with bibliography appended thereto, also the articles on Mirabeau and Turgot. Most French histories contain an account of the school; see especially Tocqueville, L'Ancien rigime et la revolution, ch. iii. ; Taine, Les Origines de la France contemporaine, vol. i. ; R. Stourm, Les Finances de I'ancien rigime ei de la revolution (1885); Droz, Histoire du rigne de Louis XVI.; also L. de Lavergne, Hconomistes francais du XV III' siecle; H. Higgs, The Physiocrats (London, 1897, with authorities).

PHYSIOGNOMY, the English form of the middle Greek vcioyv(i>iiia, a contraction of the classical tpvcnoyvcanovia. (from 0(ns, nature, and yvoi/ MV, an interpreter), (1) a term which denotes a supposed science for the " discovery of the disposition of the mind by the lineaments of the body " (Bacon) ; (2) is also used colloquially as a synonym for the face or outward appearance, being variously spelled by the old writers: fysenamy by Lydgate, phisnomi in Udall's translation of Erasmus on Mark iv., physnomie in Bale's English Votaries (i. 2. p. 44), and fisnomie in All's well that ends well, iv. 5 (first folio).

Physiognomy was regarded by those who cultivated it as a twofold science: (1) a mode of discriminating character by the outward appearance, and (2) a method of divination from form and feature. On account of the abuses of the latter .aspect of the subject its practice was forbidden by the English law. By the act of parliament 17 George II. c. 5 (1743) all persons pre- tending to have skill in physiognomy were deemed rogues and vagabonds, and were liable to be publicly whipped, or sent to the house of correction until next sessions. 1 The pursuit thus stigmatized as unlawful is one of great antiquity, and one which in ancient and medieval times had an extensive though now almost forgotten literature. It was very early

noticed that the good and evil passions by their continual exercise stamp their impress on the face, and that each particular passion has its own expression. Thus far physiognomy is a branch of physiology. But in its second aspect it touched divination and astrology, of which Galen J says that the physiognomical part is the greater, and this aspect of the subject bulked largely in the fanciful literature of the middle ages. There is evidence in the earliest classical literature that physiognomy formed part of the most ancient practical philosophy. Homer was a close observer of expression and of appearance as correlated with character, as is shown by his description of Thersites and elsewhere. Hippo- crates, writing about 450 B.C., expresses his belief in the influence of environment in determining disposition, and in the reaction of these upon feature, 4 a view in which he is supported later by Trogus. Galen, in his work Ilept t&v ttjs \fa>xys ifl&v r having discussed the nature and immortality of the soul, proceeds in ch. vii. to a brief study of physiognomy (ed. Kuhn iv. 795). In this passage he deprecates current physiognomical specula- tions, saying that he might criticize them but feared to waste time and become tedious over them. In chapter viii. he quotes with approbation the Hippocratic doctrine referred to above; and ■The Act 39 Elizabeth c. 4 (1 597-1598) declared "all persons fayning to have knowledge of Phisiognomie or like Fantasticall Ymaginacious " liable to " be stripped naked from the middle up- wards and openly whipped until his body be bloudye." This was modified by 13 Anne c. 26 (1713), still further by 17 George II. c. 5, which was re-enacted by the Vagrancy Act 1824. This last act only specifies palmistry.*

2 Galen. Htpl KaraicXlacois rpoyvaimKi (ed. Kuhn xix. 530).

3 Iliad, ii. 214. See also Blackwell's Inquiry, (2nd ed. 1736), p. 330. A physiognomical study of the Homeric heroes is given by Malalas, Chronogr. ed. Dindorf, v. 105.

4 Qffil it par, 6SA,to>v, t6t&»> (ed. Kuhn, i. 547).

in a later work, Ilept KaraxKiaeus TpoyvoicrTiKa. , he speaks of the advantage of a knowledge of physiognomy to the physician. 6 We learn both from Iamblichus 6 and Porphyry 7 that Pytha- goras practised the diagnosis of the characters of candidates for pupilage before admitting them, although he seems to have discredited the current physiognomy of the schools, as he rejected Cylo, the Crotonian, on account of his professing these doctrines, and thereby was brought into some trouble. 8 Plato also tells us that Socrates predicted the promotion of Alcibiades from his appearance; and Apuleius 9 speaks of Socrates recog- nizing the abilities of Plato at first view. On the other hand, it has been recorded by Cicero 10 that a certain physiognomist, Zopyrus, who professed to know the habits

and manners of men from their bodies, eyes, face and forehead, characterized Socrates as stupid, sensual and dull (bardus), " in quo Alcibiades cachin- num dicitur sustulisse." Alexander Aphrodisiensis adds that, when his disciples laughed at the judgment, Socrates said it was true, for such had been his nature before the study of philosophy had modified it. Zopyrus is also referred to by MaximusTyrius 11 as making his recognitions " intuitu solo."

That one's occupation stamps its impress on the outward appearance was also noticed at an early period. In the curious poem in the Sallier papyrus (II.), written about 1800 B.C., Duan, son of Khertu, expatiates on the effects of divers handicrafts on the workmen as compared with the elevating influences of a literary life. 12 Josephus tells us that Caesar detected the pretence of the spurious Alexander by his rough hands and surface. 13

The first systematic treatise which has come down to us is that attributed to Aristotle, 14 in which he devotes six chapters to the consideration of the method of study, the general signs of character, the particular appearances characteristic of the dispositions, of strength and weakness, of genius and stupidity, of timidity, impudence, anger, and their opposites, '&c. Then he studies the physiognomy of the sexes, and the chanacters derived from the different features, and from colour, hair, body, limbs, gait and voice. He compares the varieties of mankind to animals, the male to the lion, the female to the leopard. The general character of the work may be gathered from the following specimen. While discussing noses, he says that those with thick bulbous ends belong to persons who are insensitive, swinish; sharp-tipped belong to the irascible, those easily provoked, like dogs; rounded, large, obtuse noses to the mag- nanimous, the lion-like; slender hooked noses to the eagle-like, the noble but grasping; round- tipped retrousse noses to the luxurious, like barndoor fowl; noses with a very slight notch at the root belong to the impudent, the crow-like; while snub noses belong to persons of luxurious habits, whom he compares to deer; open nostrils are signs of passion, &c.

The practice of physiognomy is alluded to in many of the Greek classics. 15 Apion speaks of the metoposcopists, who judge by the appearance of the face, and Cleanthes the Stoic says it is

6 Op. cit., xix. 530.

6 Ilepi fliov UvBayopiKov Xo-yos, i. 17, 59 (Amsterdam, 1707).

7 De vita Pythagorae, p. 16 (Amsterdam, 1707). This author tells us that he applied the same rule to his friends. See also Aulus Gellius, i. ix.

8 Iamblichus, p. 49.

9 De dogmate Platonis, i. 567, p. 34 (Leiden, 1714).

10 Tuscul. quaestionum, iv. 37. De fato, v.

11 Diss., xv. 157 (Cambridge, 1703).

12 Select Papyri, PI. xv., xix., and (Anastasi) ibid., cxxviii., cxxxiii.

13 Ant., xvii. 12, 2-.

14 Authors differ in their views as to its authenticity, but Diogenes Laertius (v. 22) and Stobaeus {Serm. clxxxix.) both believe it to be genuine. The chief difficulty is the reference to a certain sophist, Dionysius, but this is probably an interpolation. There are phy- siognomic references in other writings of Aristotle (ci.Anal. pr., ii. c. 30; Hist, anim., i. 8, &c.) sufficient to justify the attribution of the treatise to him. On this, see Franz, Preface, p. vi. seq., of his Scrip- tores physiognomiae veteres (Leipzig, 1780).

16 See an interesting paper on " Stretching and Yawning as Signs of Madness," by Professor Ridgeway (Trans. Camb. Phil. Soc, i. 201), which refers to Aristoph. Wasps, 642, with which he compares Plautus, Menaechmi, 279. Other references exist to physiognomy in Cassiodorus, Isidorus, Meletius and ˆNemesius, but none of any great importance.

possible to tell habits from the aspect (cf. Ecclus. xix. 29, 30). Polemon (c. a.d. 150) compiled a treatise (published 1534, in Latin) on the subject, similar in character to that of Aristotle; but he excels in graphic descriptions of different dispositions, and differs only from Aristotle in some of his animal comparisons. A more important work was written by a converted Jew, Adamantius, about a.d. 415. This is in two books, the first on the expression of the eye, the second on physiognomy in general, mostly Aristotelian in character.

Among the Latin classical authors Juvenal, Suetonius and Pliny in well-known passages refer to the practice of physiog- nomy, and numerous allusions occur in the works of the Christian Fathers, especially Clement of Alexandria and Origen (for example, the familiar passage in his work against Celsus, i. 33). 1 While the earlier classical physiognomy was chiefly descriptive, the later medieval authors particularly developed the predictive and astrological side, their treatises often digressing into chiro-

mancy, onychomancy, clidomancy, podoscopy, spasmatomancy, and other branches of prophetic folk-lore and magic.

Along with the medical science of the period the Arabians contributed to the literature of physiognomy; 'AH b. Ragel wrote a book on naevi; Rhazes (1040) devoted several chapters to it; and Averroes (1165) made many references to it in his De sanitate, p. 82 (Leiden, 1537). Avicenna also makes some acute physiog- nomical remarks in his De animalibus, which was translated by Michael Scot about 1270. Among medieval writers Albertus Magnus (born 1205) devotes much of the second section of his De animalibus to physiognomy; but this chiefly consists of extracts from Aristotle, Polemon and Loxus. He does not enter into the animal comparison's of his predecessors, but occupies himself chiefly with simple descriptive physiognomy as indicative of character; and the same is true of the scattered references in the writings of Duns Scotus and Thomas Aquinas. The famous sage of Balwearie, Michael Scot, while court astrologer to the emperor Frederick II., wrote his treatise De hominis phisiognomia, much of which is physiological and of curious interest. It was probably composed about 1272, but not printed until 1477. This was the first printed work on the subject. Physiognomy also forms the third part of his work De secretis naturae. In 1335 Pietro d'Abano of Padua delivered in Paris a course of lectures on this subject (afterwards edited by Blondus, 1544), a few years before he was burned for heresy.

The 16th century was rich in publications on physiognomy. The works of the classical authors before mentioned were printed, and other treatises were published by John de Indagine, Codes, Andreas Corvus, Michael Blondus, Janus Cornaro, Anselm Douxciel, Pompeius Ronnseus, Gratarolus, Lucas Gauricus, Tricassus, Cardanus, Taisnierus, Magnus Hund, Rothman, Johannes Padovanus, and, greatest of all, Giambattista della Porta. The earliest English works were anonymous: On the Art oj Foretelling Future Events by Inspection of the Hand (1504), and A Pleasant Introduction to the Art of Chiromancie and Physiognomie (1588). Dr Thomas Hill's work, The Contempla- tion of Mankynde, contayning a singular Discourse after the Art of Physiognomie, published in 1 571, is a quaintly written adapta- tion from the Italian authors of the day. The undated book on moles and naevi by " Merlin Britannicus, " after the model of 'AH ibn Ragel, is of about the same date.

The development of a more accurate anatomy in the 17th century seems to have diminished the interest in physiognomy, by substituting fact for fiction; and consequently the literature, though as great in quantity, became less valuable in quality. The principal writers of this age were T. Campanella, R. Coclen- ius, Clement, Timpler, J. E. Gallimard, Moldenarius, Septalius, Saunders, C. Lebrun (a precursor of Charles Bell),

Elsholz, de la Belliere, J. Evelyn (in the appendix to Numismata), Baldus, Bulwer (in his Pathomyotomia), Fuchs, Spontoni, Ghiradelli,

1 For Scriptural allusions to physiognomy see Vecchius, Observa- tiones in div. script. (Naples, 1641). Other classical references are contained in the Prooemium to the 1593 edition of the works of Baptista Portae.

Chiaramonti, A. Ingegneri, Finella, De la Chambre, Zanardus, R. Fludd, and others of less importance.

The 1 8th century shows a still greater decline of interest in physiognomy. Historians of philosophy, like J. Meursius and Franz, re-edited some of the classical works, and G. G. Ftilleborn reviewed the relation of physiognomy to philosophy. Indeed, the only name worthy of note is that of J. K. Lavater (q.v.). The other authors of this century are Peuschel, Spon, Schutz, Wegelin, J. Pernetti, Girtanner, Grohmann, and several anony- mous writers, and from the anatomical side G. M. Lancisi, J. Parsons and Peter Camper. The popular style, good Ulustra- tions and pious spirit pervading the writings of Lavater have given to them a popularity they Httle deserved, as there is no system in his work, which chiefly consists of rhapsodical com- ments upon the several portraits. Having a happy knack of estimating character, especiaUy when acquainted with the histories of the persons in question, the good pastor contrived to write a graphic and readable book, but one much inferior to Porta's or Aristotle's as a systematic treatise. The treatises of Nicolai and of Lichtenberg were written to refute his theory. With Lavater the descriptive school of physiognomists may be said to have ended, as the astrological physiognomy expired with de la Belliere. The few works which have since appeared, before the rise of the physiological school of Sir Charles Bell and Charles Darwin, are undeserving of notice, the development of phrenology having given to pure physiognomy the coup de grdce by taking into itself whatever was likely to Hve of the older science. The writers of the 19th century are Horstig, Maas, Rainer, Thone, A. Stohr, Sehler, Dr Rubels, Polli, Cardona, Mastriani, Diez, Cams, Piderit, Burgess and P. Gratiolet.

The physiological school of physiognomy was foreshadowed by Parsons and founded by Sir Charles Bell, whose Essay on the Anatomy of the Expression, published in 1806, was the first scientific study of the physical manifestation of emotions in the terms of the muscles which produce these manifestations. In the later editions of this essay the thesis is elaborated with greater detail. Moreau's edition of Lavater, in 1807, was some- what along the same Hnes. In 181 7 Dr Cross of Glasgow wrote his defence of a scientific physiognomy based on general physio- logical principles. The experiments of G. B. A. Duchenne (Mlcanisme de la physiognomie humaine, Paris, 1862) showed that by the use of electricity the action of

the separate muscles could be studied and by the aid of photography accurately represented. These observations confirmed by experimental demonstration the hypothetical conclusions of Bell. The machinery of expression having thus been indicated, the con- nexion of the physical action^ and the psychical state was made the subject of speculation by Herbert Spencer (Psychology, 1855). These speculations were reduced to a system by Darwin (Expres- sion of Emotions, 1872), who formulated and illustrated the following as fundamental physiognomical principles: —

(1) Certain complex acts are of direct or indirect service, under certain conditions of the mind, in order to relieve or gratify certain sensations or desires; and whenever the same states of mind are. induced the same sets of actions tend to be performed, even when they have ceased to be of use. (2) When a directly opposite state of mind is induced to one with which a definite action is correlated, there is a strong and involuntary tendency to perform a reverse action. (3) When the sensorium is strongly excited nerve-force is generated in excess, and is transmitted in definite directions, depending on the connexions of nerve-cells and on habit.

The last of these propositions is adversely criticized by P. Mantegazza as a truism, but it may be allowed to stand with the qualification that we are ignorant concerning the nature of the influence caUed " nerve-force." It follows from these proposi- tions that the expression of emotion is, for the most part, not under control of the will, and that those striped muscles are the most expressive which are the least voluntary. To the fore- going may be added the following three additional propositions, so as to form a more complete expression of a physiognomical philosophy: —

(4) Certain muscles concerned in producing these skin-folds be- come strengthened by habitual action, and when the skin diminishes

in elasticity and fulness with advancing age, the wrinkles at right angles to the course of the muscular fibres become permanent. {5) To some extent habitual muscular action of this kind may, by affecting local nutrition, alter the contour of such bones and cartilages as are related to the muscles of expression. (6) If the mental dis- position and proneness to action are inherited by children from their parents, it may be that the facility in, and disposition towards, certain forms of expression are in like manner matters of heredity.

Illustrations of these theoretic propositions are to be found in the works of

Bell, Duchenne and Darwin, and in the later publi- cations of Theoddr Piderit, Mimike und Physiognomik (1886) and Mantegazza, Physiognomy and Expression (1890), to which the student may be referred for further information.

For information on artistic anatomy as applied to physiognomy see the catalogue of sixty-two authors by Ludwig Choulant, Ge- schichte und Bibliographic der anatomischen A bbildung, &c. (Leipzig, 1852), and the works of the authors enumerated above, especially those of Aristotle, Franz, Porta, Cardan, Corvus and Bulwer. For physiognomy of disease, besides the usual medical handbooks, see Cabuchet, Essai sur V expression de la face dans les maladies (Paris, 1801); Mantegazza, Physiology of Pain (1893), and Polli, Saggio di fisiognomonia e potognomonia (1837). For ethnological physi- ognomy, see amongst older authors Gra tardus, and amongst moderns the writers cited in the various textbooks on anthropology, especially Schadow, Physionomies nationales (1835) and Park Harrison, Journ. Anthrop. Inst. (1883). The study of the physical characteristics of criminals is discussed at great length by Lombroso, L'Uomo delin- quenle (1897); Ferri, L'Omicidio (1895); von Baer, Der Verbrecher (1 893) ; Laurent, Les Habitues des prisons (1890) ; and Havelock Ellis, The Criminal (1901). (A. Ma.)

*PHYSIOLOGUS, the title usually given to a collection of some fifty Christian allegories much read in the middle ages, and still existing in several forms and in about a dozen Eastern and Western languages. As nearly all its imagery is taken from the animal world, it is also known as the Bestiary. There can, be hardly a doubt about the time and general circumstances of its origin. Christian teachers, especially those who had a leaning towards Gnostic speculations, took an interest in natural history, partly because of certain passages of Scripture that they wanted to explain, and partly on account of the divine revelation in the book of nature, of which also it was man's sacred duty to take proper advantage. Both line's of study were readily combined by applying to the interpretation of descriptions of natural objects the allegorical method adopted for the interpretation of Biblical texts. Now the early Christian centuries were any thing but a period of scientific research. Rhetorical accomplishments were considered to be the chief object of a liberal education, and to this end every kind of learning was made subservient. Instead of reading Aristotle and other naturalists, people went' for information to commonplace books like those of Aelian, in which scraps of folk-lore, travellers' tales and fragments of misappre- hended science were set forth in an elegant style. Theological writers were not in the least prepared to question the worth of the marvellous descriptions of creatures that were current in the schools on the faith of authorities vaguely known as " the history of animals," " the naturalists," and " the naturalist " in the singular number (#1*710X6705)*

. So they took their notions. of strange beasts and other marvels of the visible world on trust and did their best to make them available for religious instruction. In some measure we find this practice adopted by more than one of the Fathers, but it was the Alexandrian school, with its pronounced taste for symbolism, that made the most of it. Clement himself had declared that natural lore, as taught in the course of higher Christian education according to the canon of truth, ought to proceed from " cosmogony " to " the theological idea," 2 and even in the little that is left of the works of Origen we have two instances of the proceeding in question. And yet the fact that these reappear in the Physiologus would not suffice to stamp the work as a series of extracts from Alex- andrian writings, as parallels of the same kind can be adduced*

1 Qrigen, Sel. in Jerem. xvii. 11, 'a> t§ irepl £<#o>v iirrop'p; Epiphan. A.dv. haer. i. 3, p. 274 (ed. D. Petav.), acnp ol 4>v(ru>\6yoi; Origen, Horn, xvii., in Gen. xliv. 9, " nam physiologus de catulo ieonis scribit."

2 Strom., iv. p-. 564 (ed. Potter), ij yovv /card t&v ttjs &\rjdelas navdva yvuMTTticrjs iropa56(Tews v

from Epiphanius (loc, cit.) and Ephraem Syrus (Opp. Syr. ii. 17, 130). Father Cahier would even trace the book to Tatian, and it is true that that heresiarch mentions a writing of his own upon animals. Still, the context in which the quotation occurs makes it evident that the subject-matter was not the nature of particular species nor the spiritual lessons to be drawn therefrom, but rather the place occupied by animal beings in the system of creation. On the other hand, the opinion of Cardinal Pitra, who referred the Physiologus to the more orthodox though somewhat peculiar teaching of the Alexandrians, is fully borne out by a close examination of the irregularities of doctrine pointed out in the Physiologus by Cahier, all of which are to be met with in Origen. The technical words by which the process of allegorizing is designated in the Physiologus, like ipurjvela, dtvpia, avaywyii, &X\ifyopla, are familiar to the students of Alexandrian exegesis. It has, moreover, been remarked that almost all the animals mentioned were at home in the Egypt of those days, or at least, like the elephant, were to be seen there occasionally, whereas the structure of the hedgehog, for instance, is explained by a reference to the sea-porcupine, better known to fish-buyers on the Mediterranean. The fables Of the phoenix and of the conduct of the wild ass and the ape at the time of the equinox owe their origin to astronomical symbols belonging to the Nile country. 3 In both chapters an Egyptian month is named, and elsewhere the antelope bears its Coptic name of " antholops."

That the substance of the Physiologus was borrowed from commentaries on Scripture 4 is confirmed by many of the sec- tions opening with a text,

followed up by some such formula as " but the Physiologus says." When zoological records failed, Egypto-Hellenic ingenuity was never at a loss for a fanciful invention distilled from the text itself, but which to succeeding copyists appeared as part of the teaching of, the original Physio- logus. As a typical instance we may take the chapter on the ant-lion — not the insect, but an imaginary creature suggested by Job. iv. 11. The exceptional Hebrew for a lion (layish) appeared to the Septuagint translators to call for a special rendering, and as there was said to exist on the Arabian coast a lion-like animal called " myrmex " (see Strabo xvi. 774', Aelian, N.A., vii. 47) they ventured to give the compound noun " myrmekoleon." After so many years the commentators had lost the key to this unusual term, and only knew that in common Greek " myrmex " meant an ant. So the text " the myrme- koleon hath perished for that he had no nourishment " set them pondering, and others reproduced their meditations, with the following result: " The Physiologus relates about the ant-lion: his father hath the shape of a lion, his mother that of an ant; the father liveth upon flesh, and the mother upon herbs. And these bring forth the ant-lion, a compound of both, and in part like to either, for his fore part is that of a lion, and his hind part like that of an ant. Being thus composed, he is neither able to eat flesh like his father, nor herbs like his mother; therefore he perisheth from inanition "; the moral follows.

At a later period, when the Church had learnt to look with suspicion upon devotional books likely to provoke the scoffing of some and lead others into heresy, a work of this kind could hardly meet with her approval. A synod of Pope Gelasius, held in 496, passed censure, among others, on the " Liber Physiologus, qui ab haereticis conscriptus est et B. Ambrosii nomine signatus, apocryphus," and evidence has even been offered that a similar sentence was pronounced a century before. Still, in spite of such measures, the Physiologus, like the Church History of Eusebius or the Pastor of Hermas, continued to be read with general interest, and even Gregory the Great did not disdain to allude to it on occasion. Yet the Oriental versions, which had certainly nothing to do with the Church of Rome, show that there was no systematic revision made according to the catholic

3 Cp. Leemans on Horapollo i. 16, 34.

4 Including the Apocrypha. See the Icelandic account of the elephant, also a decidedly Alexandrian fragment upon the ulipyoi, founded upon 4 Mace. i. 3, which has got into the scholia upon the Odyssey xviii. 2 (ii. 533, ed. Dindorf, Oxford, 1855).

standard of doctrine. The book remained essentially the same, albeit great liberties were taken with its details and outward form. There must have been many imperfect copies in circula- tion, from which people transcribed such sections as they found or chose, and afterwards completed their MS. as occasion served. Some even rearranged the contents according to the alphabet or to zoological affinity. So little was the collection considered as a literary work with a definite text that every one assumed a right to abridge or enlarge, to insert ideas of his own, or fresh scriptural quotations; nor were the scribes and translators by any means scrupulous about the names of natural objects, and even the passages from Holy Writ. Physiologus had been abandoned by scholars, and left to take its chance among the tales and traditions of the uneducated mass. Nevertheless, or rather for this very reason, its symbols found their way into the rising literature of the vulgar tongues, and helped to quicken the fancy of the artists employed upon church buildings and furniture.

The history of the Physiologus has become entwined from the beginning with that of the commentaries on the account of creation in Genesis. The principal production of this kind in our possession is the Hexaemeron of Basil, which contains several passages very like those of the Physiologus. For instance, in the seventh homily the fable of the nuptials of the viper and the conger-eel, known already to Aelian and Oppian, and proceeding from a curious misreading of Aristotle {Hist. An. v. 4, 540 b, Bekk.), serves to point more than one moral. Notwithstanding the difference in theology, passages of this kind could not but be welcome to the admirers of the Alexandrian allegories. In fact a medley from both Basil and the Physiologus exists under the title of the Hexaemeron of Eustathius; some copies of the first bear as a title Ilepi vcno\oylas, and in a Milan MS. the " morals " of the Physiologus are ascribed to Basil. The Leyden Syriac is supplemented with literal extracts from the latter, and the whole is presented as his work. Other copies give the names of Gregory Theologus, Epiphanius, Chrysostom and Isidore.

As far as can be judged, the emblems of the original Physio- logus were the following: (i)the lion (footprints rubbed out with tail; sleeps with eyes open; cubs receive life only three days after birth by their father's breath); (2) the sun-lizard (restores its sight by looking at the sun) ; (3) the charadrius (Deut. xiv. 16; presages recovery or death of patients); (4) the pelican (recalls its young to life by its own blood); (5) the owl (or nykti- korax; loves darkness and solitude); (6) the eagle (renews its youth by sunlight and bathing in a fountain); (7) the phoenix (revives from fire) ; (8) the hoopoe (redeems its parents from the ills of old age); (9) the wild ass (suffers no male besides itself}; (10) the viper (born at the cost of both its parents' death); (n) the serpent (sheds its skin; puts aside its venom before drinking; is afraid of man in a state of nudity; hides its head and abandons

the rest of its body); (12) the ant (orderly and laborious; prevents stored grain from germinating; distinguishes wheat from barley on the stalk); (13) the sirens and onocentaurs (Isa. xiii. 21, 22; compound creatures); (14) the hedgehog (pricks grapes upon its quills); (13) the fox (catches birds by simulating death); (16) the panther (spotted skin; enmity to the dragon; sleeps for three days after meals; allures its prey by sweet odour) ; (17) the sea-tortoise (or aspidochelone; mistaken by sailors for an island) ; (18) the partridge (hatches eggs of other birds); (19) the vulture (assisted in birth by a stone with loose kernel); (20) the ant-lion (able neither to take the one food nor to digest the other); (21) the weasel (conceives by the mouth and brings forth by the ear); (22) the unicorn (caught only by a virgin); (23) the beaver (gives up its testes when pursued); (24) the hyaena (a hermaphrodite) ; (25) the otter (enhydris; enters the crocodile's mouth to kill it); (26) the ichneumon (covers itself with mud to kill the dragon; another version of No. 25) ; (27) the crow (takes but one consort in its life); (28) the turtle-dove(same nature as No. 27); (29) the frog (either living on land and killed by rain, or in the water without ever seeing the sun) ; (30) the stag (destroys its enemy the serpent); (31) the salamander (quenches fire);

(32) the diamond (powerful against all danger); (33) the swallow (brings forth but once; misreading of Aristotle, Hist. An. v. 13); (34) the tree called peridexion (protects pigeons from the serpent by its shadow); (35) the pigeons (of several colours: led by one of them, which is of apurple or golden colour); (36) theantelope (or hydrippus; caught by its horns in the thicket); (37) the fire- flints (of two sexes; combine to produce fire); (38) the magnet (adheres to iron) ; (39) the saw-fish (sails in company with ships) ; (40) the ibis (fishes only along the shore); (41) the ibex (descries a hunter from afar) ; (42) the diamond again (read " carbuncle ", found only by night) ; (43) the elephant (conceives after partaking of mandrake; brings forth in the water; the young protected from the serpent by the father; when fallen is lifted up only by a certain small individual of its own kind); (44) the agate (em ployed in pearl-fishing); (45) the wild ass and ape (mark the equinox) ; (46) the Indian stone (relieves patients of the dropsy) ; (47) the heron (touches no dead body, and keeps to one dwelling- place); (4S) the sycamore (or wild fig; grubs living inside the fruit and coming out) ; (49) the ostrich (devours all sorts of things; forgetful of its own eggs). Besides these, or part of them, certain copies contain sections of unknown origin about the bee, the stork, the tiger, the woodpecker, the spider and the wild boar.

The Greek text of the Physiologus exists only in late MSS., and has to be corrected from the translations. In Syriac we have a full copy in a 12th-century Leyden MS., published in J. P. N. Land's Anecdota syriaca; thirty-two chapters with the " morals " left out in a very late Vatican copy,

published by Tychsen ; and about the same number in a late MS. of the British Museum (Add. 25878). In Armenian Pitra gave some thirty-two chapters from a Paris MS. (13th century). The Aethiopic exists both in London and Paris, and was printed at Leipzig by Dr Hommel in 1877. In Arabic we have fragments at Paris, of which Renan translated a specimen for the Spicilegium solesmense, and another version of thirty-seven chapters at Leiden, probably the work of a monk at Jerusalem, which Land translated and printed with the Syriac. . The Latin MSS. of Bern are, after the Vatican glossary of Ansilcubus, the oldest of which we know; there are others in several libraries, and printed editions by Mai, Heider and Cahier. Besides these, a few fragments of an old 'abridgment occur in Vallarsi's edition of Jerome's works (vol. xi. col. 218). A metrical Physiologus of but twelve chapters is the work of Theobaldus, probably abbot of Monte Cassino (a.d. 1022-1035). From this was imitated the Old-English fragment printed by Th. Wright, and afterwards by Maetzner; also the Old-French Sensuyl le bestiaire d'amours. The prose Physiologus was done into Old High German before 1000, and afterwards into rhyme in the same idiom; since Von der Hagen (1824) its various forms have found careful editors among the leading Germanists. The Icelandic, in a Copenhagen MS. of the 13th century, was printed by Professor Th. Mobius in his Analecta ncrroena (2nd ed., 1877); at the same time he gave it in German in Dr Hommel's Aethiopic publication. Some Anglo-Saxon metrical fragments are to be found in Grein's Bibliothek, vol. i. The Provencal (c. 1250), published in Bartsch's Chrestomathie provengale, omits the "morals," but is remarkable for its peculiarities of form. Before this there had been translations into French dialects, as by Philippe, de Thaun (1121), by Guillaume, " clerc de Normandie," also, about the same period, by Pierre, a clergyman of Picardy. All the Old-French materials have not yet been thoroughly examined, and it is far from improbable that some versions of the book either remain to be detected or are now lost past recovery. A full account of the history of the Physiologus should also embrace the subjects takgn from it in the productions of Christian art, the parodies suggested by the original work, e.g. the Bestiaire a" amour by Richard de Fournival, and finally, the traces left by it upon the encyclopaedical and literary work of the later middle ages.

Nearly all the information now obtainable is to be found in the following works and such as are there quoted : S. Epiphanius ad physiologum, ed. Ponce de Leon (with woodcuts) (Rome, 1587); another edition, with copper-plates (Antwerp, 1588); S.Eustathii in hexahemeron commentarius, ed. Leo Allatius (Lyons, 1629; cf. H> van Herwerden, Exercitt. Critt., pp. 180-182, Hague, 18S2); Physio- logus syrus, ed. O. G. Tychsen (Rostock, 1795); Classici auctores, ed. Mai, vii. 585-596 (Rome, 1835); G. Heider, in Archiv fur Kunde osterreich. Geschichtsquellen ii. 545 seq. (Vienna,

1850); Cahier and Martin, Melanges d'archeologie, &c. ii. 85 seq. (Paris, 1851), iii. 203 seq. (1853), iv. 55 se Q- (l8 5 6) < Cahier, Nouveaux melanges (1874), p. 106 seq.; J. B. Pitra, Spicilegium solesmense in. xlvii. seq., 338 seq., 416, 535 (Paris, 1855) ; Maetzner, Altengl: Sprach- proben (Berlin, 1867), vol. i. pt. i. p. 55 seq.; J. Victor Carus, Gesch. der Zoologie (Munich, 1872), p. 109 seq.; J. P. N. Land, Anecdota. syriaca (Leiden, 1874), iv. 31 seq., 115 seq., and in Verslageri en Mededeelingen der kon. Akad. van Wetenschappen, 2nd series, vol. iv. (Amsterdam, 1874); Mobius and Hommel in their

publications quoted above. See also Lauchert, Geschichte des Physiologus (Strassburg, 1889) and E. Peters, Der griechische Physiologus und seine orienialischen Vbersetzungen (Berlin, 1898).

PHYSIOLOGY (from Gr. v

Ever since men began to take a scientific interest in the problems of life two distinct rival explanatory principles of vital phenomena have claimed attention: a natural and Theory!' a m ystical principle. The first outcome of the scientific attempt to explain vital phenomena after the natural method and by a unitary principle was the doctrine of the Pneuma, held by the followers of Hippocrates, which found its clearest expression in Galen's system. According to this doctrine, the origin of all vital phenomena was a very fine substance, the Pneuma, which was supposed to exist in atmo- spheric air, to be inhaled into the lungs of man, and thus through the blood to reach all the parts of the body, where it produced vital phenomena. This doctrine — an attempt to explain the phenomena of life which was not altogether natural, but even materialistic — was accepted by the middle ages together with Galen's system. With its translation into the Latin spiritus, however, the conception of the Pneuma lost its original force. The spiritus animates of the middle ages developed ere long into mystical powers, the result ' being the explanation of vital phenomena by a supernatural theory. Not until the scientific renaissance of the 16th and 17th centuries did views again undergo a change. After the establishment of a scientific method in physiology by William Harvey, and the development of Descartes' mechanical system of regarding living bodies, the natural explanation of vital phenomena once more universally found favour. Two schools arose, which endeavoured by dissimilar methods to find a mechanical explanation of vital phenomena: the iatrophysical, originating with the gifted and versatile Borelli, and the iatrochemical, founded by the Dutch- man, F. de la Boe (Sylvius). But when both chemical and physical

methods of explanation failed at such problems as, for instance, irritability and evolution, another change in opinion took place. By degrees there emerged once more the tendency to explain vital phenomena by mystical means, finding expression in the Animism of Stahl, to quote an example; and in the second half of the 18th century Vitalism, originating in France, began its victorious march throughout the whole scientific world. Again the opinion came to be entertained that the cause of vital phenomena was a mystical power (force hypermicanique) — that " vital force " which, neither physical nor chemical in its nature, was held to be active in living organisms only. Vitalism continued to be the ruling idea in physiology until about the middle of the 19th century, and its supremacy was only gradually overthrown by the great discoveries in natural science of that century. The chemical discoveries resulting from Wohler's synthesis of urea first showed that typical products of the animal body, the production of which had hitherto been supposed to be solely the result of the operation of vital force, could be obtained artificially by purely chemical methods. Then above all came the discovery of the law of the Conservation of Energy by Robert Mayer (1814-1878) and Hermann von Helmholtz (1821-1894), and its application to the living organism by Mayer, Helmholtz, Pierre Louis Dulong (1785-1838), Edward Frankland, Max Rubner and others, to prove that the manifestations of energy by the organism are simply the result of the quantity of potential energy received into the body by means of food. Finally, the stupendous results arrived at by Darwin and the establishment of the fundamental law of " biogenesis " by Ernst Haeckel, prepared the way for a natural explanation of the enigma of evolution and structure of organisms. Thus by the second half of the 19th century the doctrine of vital force was definitely

and finally overthrown to make way for the triumph of the natural method of explaining vital phenomena, which down to the present time has continued to spread and flourish with an unparalleled fertility. It would, it is true, appear as if in our day, after the lapse of half a century, mystical tendencies were again disposed to crop up in the investigation of life. Here and there is heard once more the watchword of Vitalism. But all the so-called neo-vitalistic efforts — such as those of Alexander von Bunge (1803-1890), Georg Evon Rindfleisch (b. 1835), Johannes Reinke (b. 1849) and others — have nothing to do with the old vitalism. They originate solely in a widespread confusion with regard to the boundaries of natural science, their principal tendency being to amalgamate psychological and speculative questions with problems of purely natural science. In the face of all these efforts, which by their unfortunate designations of Vitalism and Neo-vitalism give rise to entirely false concep- tions, and which by their intermingling of psychological ques- tions and questions of natural science have led to mere confusion in research, it is essential that natural

philosophy should be called upon to realize its own limits, and above all clearly to understand that the sole concern of physical science is the investigation of the phenomena of the material world. Physiology, as the doctrine of life, must therefore confine itself to the material vital phenomena of organisms. It is self-evident, however, that only such laws as govern the material world will be found governing material vital phenomena — the laws, that is, which have hitherto been brought to their most exact and most logical development by physics and chemistry, or, more generally speaking, by mechanics. The explanatory principles of vital phenomena must therefore be identical with those of inorganic nature — that is, with the principles of mechanics.

The investigation of vital phenomena in this sense requires, in the first place, an exact knowledge of the substratum in which these phenomena are manifested, just as in chemistry ultimate and physics a thorough knowledge of the composition Elements of of the material world is a necessary premise to the L,fe – investigation of the phenomena of inorganic nature. The knowledge of the composition and structure of organisms has in the course of the scientific development of anatomy attained to an ever-increasing minuteness of detail, without having as yet reached a definite limit. The last important step in this direction was the discovery by Matthias Jakob Schleiden (1804-1881) and Theodor Schwann (1810-1882) that all organ- isms are built up of elementary living structural components, namely of cells (see Cytology). The details of the anatomical construction of organisms are described under various appro- priate headings, and a general guide to these will be found under Anatomy and Zoology. We would here merely point out that a cell is the simplest particle of living substance which appears to be permanently capable of life. Different elements are essential, however, to the existence of the cell — two, at least, so far as has hitherto been discovered — the protoplasm and the nucleus. It must at present be regarded as at least very doubtful whether the centrosome, which in recent times it has been possible to demonstrate as existing in very many cells, and which appears sometimes in the protoplasm, sometimes in the nucleus, is a general and third independent cell-constituent. On the other hand, the number of special constituent parts which appear in various cell-forms is very large. A question which has long been discussed, and which has received special and animated attention, is that with regard to the finer structure of the cells — with regard, that is, to the protoplasm and the nucleus lying in it. Views on this subject have diverged very widely, and several totally diverse theories have been opposed to one another. One theory maintains that the living cell-substance has a reticular structure; another, that it is fibrillous. According to a third theory, the essence of the construction of the cell-substance lies in the granules which it contains; and according to a fourth, it lies in the

ground-substance in which these granules are embedded. One view holds this ground substance to be homogeneous, another regards it as possessing a fine foam-structure. It may at present be regarded as

Incontrovertible that living substance is more or less fluid, and that there does not exist any general structure for all cell-forms. But in some special cases all the theories which have been quoted are to a certain extent correct. In different cells there are reticular, fibrillous and granular differentiations respectively, and differentiations in foam-structure; in many cells, however, the protoplasm appears to be beyond doubt homogeneous and without a distinct structure, and only under certain conditions to assume changing structures. But the fact which is of most importance for the right understanding of vital phenomena is that the cell-substance is always more or less fluid, for only in a fluid substratum can such intense chemical processes be enacted as are to be found in every living cell.

Where the analytical powers of the microscope in anatomy can go no farther, chemical analysis of the composition of the cell steps in. By its means the discovery is made that there is no elementary difference between organic and inorganic nature, for only such chemical elements as are known to exist in the inorganic world are found in the organic. On the other hand, however, the living cell-substance possesses chemical compounds which find analogues nowhere in inorganic nature. The characteristic organic substances which are present in every cell are proteids and proteid-compounds. Besides these there occur, widely disseminated, carbohydrates, fats and other organic substances, which partly originate in the decomposition of proteids and their compounds, and are partly used for their construction. Lastly, there are in addition great quantities of water and some inorganic salts.

Such are the structure and composition of the substratum in which vital phenomena play their part. When we consider General vital phenomena themselves in the various living Phenomena organisms — in protista, plants, animals, man — there of Lite. appears an incalculable diversity of phenomena. Here, however, as in the case of the structure of organisms, we have to analyse and to penetrate ever farther and deeper till we reach the fundamental phenomena. We then find that the great variety of vital manifestations may be traced back to a few fundamental general groups, which are precisely the same groups of phenomena as those to be observed in in- organic nature. All the processes that take place in the organic world

may be regarded from the three different standpoints of their changes in substance, in energy and in form; for substance, energy and form are all necessary to our conception of matter. Accordingly, the general elementary vital phenomena likewise fall into three groups — metabolism, the mechanism of energy, and the assumption of form. Every cell, so long as it is living, takes in certain substances from its environment, submits them to chemical transformation in its interior, and gives out other substances. This metabolism is manifested in several special functions — in nutrition and digestion, respiration and circu- lation, secretion and excretion. The essence of the whole process is the fact that while out of these ingested stuffs living substance is always again being formed by the living substance which already exists, it is itself continually under- going decomposition, and the products of this decomposition are what the cell gives off again to the outside. With metabolism, however, there is inseparably associated a transformation of energy. These substances taken in by the cell contain a large quantity of potential energy, which is transformed into kinetic energy. This has for its result the manifold activities of the organism, more especially motion, heat, electricity and light. Finally, the chemical transformations in living substance may also manifest themselves outwardly in changes of form, as is the case generally in the matter of growth, reproduction and development. The three general elementary groups of vital phenomena are therefore in reality merely the expression of the various aspects of one and the same process — of the actual vital process itself. The ultimate object of all physiology is to discover what this vital process is — that is to say, what is the exact cause of these manifold vital phenomena — a goal from which it is at the present day still very remote.

As every physical and chemical phenomenon of inorganic nature occurs only under distinct conditions, so vital phenomena are also dependent upon certain conditions of life. Every living body, every living cell, requires food, *water, oxygen, and, further, a certain temperature and a certain pressure in its environment. These are the general conditions of life. But the special conditions on which depends the continued existence of the individual forms of organism are as numerous as the forms of organisms themselves. Now, just as the physicist or chemist varies those conditions under which a phenomenon occurs in order to get at its causes, so does the physiologist try to experiment with vital phenomena, altering the vital conditions: and testing the changes which are thereby produced. The great importance of this method consists in the power it gives the experimenter of analysing vital phenomena systematically from definite points of view. Every change in its normal vital conditions which produces any effect whatsoever upon an organism is termed a stimulus. This is the only general definition we have for a conception which is of such vast impor- tance to*

physiology. According to it, experimental physiology is entirely a physiology of stimuli. It further follows from this conception of stimulation that there must be an enormous multiplicity of stimuli, since each particular vital condition may be subjected to some change capable of acting upon it as a stimulus. But, besides this, other factors may be brought to bear upon organisms which have absolutely no place among their vital conditions: for instance, many chemical reagents and electric currents. These influences come under the general definition of stimulus, because they likewise imply a change in the conditions under which the organism lives. From their qualitative nature stimuli are distinguished as chemical, thermal, photic, mechanical and electrical. Each of these several varieties may, however, be applied quantitatively in various degrees of intensity, and may in consequence produce quite different results. This opens up to experimental physiology a vast field of research. But the physiology of stimulation is not only of the greatest value as a means of research: its importance is much increased by the fact that in nature itself stimuli are everywhere and constantly acting upon the organism and its parts. Hence the investigation of their action comes to be not merely a means, but a direct end of research.

Although it is not at present possible to define all the laws that govern stimulation, on the one hand because the number of stimulating effects known to us in the whole organic world is as yet too limited, and on the other because stimuli. ° those already known have not yet been thoroughly analysed, yet it is within our power to classify stimula- ting effects according to their various characteristics, and to ascertain a few facts concerning their general and funda- mental conformity to law. The first fact, apparent from a glance at a great many of the various forms of stimulation, is that all their effects are manifested in either a quanti- tative or a qualitative alteration of the characteristic vital phenomena of each living object. The quantitative is the usual mode of action of stimuli. It is generally found that a stimulus either increases or diminishes the intensity of vital phenomena. In the first case the effect is one of excitation; in the second of depression. It is the more important to bear in mind this twofold operation of stimuli, owing to the fact that in former times physiologists were very apt to conceive of excitation and stimulation as identical. It is now, however, an undisputed fact that depression may also occur as a typical effect of stimulation. This is most apparent in cases where the same stimulus that produces excitation may on being applied for a longer period and with greater intensity, produce depression. Thus narcotics (alcohol, ether, chloroform, morphia, &c.) on certain forms of living substance produce the phenomena of excitation when their action is weak, whereas when it is stronger they produce complete depression. Thus, likewise, temperature stimuli act differently upon vital phenomena according to the

degree of temperature: very low temperatures depressing

medium temperatures exciting with increasing intensity, and higher temperatures from a certain height upwards again de- pressing. The effects of stimulation are not, however, always manifested in merely quantitative changes of the normal vital phenomena. Sometimes, especially in the case of long uninter- rupted and chronic stimuli, stimulation is found gradually to produce phenomena which are apparently quite foreign to the normal vital phenomena of the cell in question. Such qualitative alterations of normal vital phenomena are perceptible chiefly in chronic maladies in the cells of different organs (the heart, liver, kidneys, spleen, &c), in which the vital conditions become gradually more and more modified by the cause of the malady. To this category pertain all the so-called chronic processes of degeneration which in pathology are known as fatty degeneration, mucous degeneration, amyloid degeneration, and so forth. The characteristic element in all these processes is that the normal metabolism is diverted into a wrong channel by the altered vital conditions of the cells of the organ affected, so that substances are formed and accumulated in the cell which are entirely foreign to its normal life. But this class of stimulation is still very obscure as regards causes and inner processes, and it is within the range of possibility that the ultimate cause of the qualitative changes in the normal metabolism is to be found simply in the processes of excitation and depression which chronic stimulation produces in separate parts of the metabolism. Thus, at least with regard to fat-metamorphosis (fatty degeneration), it is highly probable that fat is deposited in the protoplasm simply because, owing to an inadequate supply of oxygen, it cannot, when it originates, be oxidized in the same proportion as it is formed, whereas in the normal cell all fat which originates in metabolism is consumed as soon as it is produced. According to this conception, therefore, fatty degeneration is attributable primarily to a depression of the processes of oxidation in the cell. If we may accept this view as correct with regard to the other metamorphic processes also, the qualitative changes in vital phenomena under the influence of stimuli would after all depend simply upon the excitation or depression of the constituent parts of the vital process, and, according to such a view, all stimuli would act primarily only as exciting or as depressing agents upon the normal process of life.

In accordance with the three groups into which general vital phenomena are divided, it follows as a matter of course that the excitation or depression produced by a stimulus can manifest itself in the cell's metabolism, assumption of form, and mani- festation of energy. The effects

of excitation upon the produc- tion of energy are the most striking, and were therefore in former times frequently thought to have a claim par excellence to rank as stimulating effects. These reactions attract most attention in cases where the production of energy is proportionately very great— as with muscle, for instance, which is made to twitch and perform work by a feeble stimulus. Processes of discharge (Auslosungsvorgange), however, lie at the bottom of cases like these. Potential chemical energy, which is stored up in a con- siderable quantity in living substance, is converted by the impulse of the stimulus into kinetic energy. Therefore the amount of the effect of stimulation— Hhat is to say, the quantity of work performed — bears no proportion whatever to the amount of energy acting as a stimulus upon the muscle. The amount of energy thus acting may be very small as contrasted with an enormous production of energy on the part of the living sub- stance. It will not do to make generalizations, however, with regard to this proportion, as was frequently done in former times. All processes of stimulation are not processes of discharge. The influence of many stimuli, as has been observed, consists far more in depression than in excitation, so that in certain circumstances a stimulus actually diminishes the normal liberation of energy. There is therefore no general law as to the proportion which the amount of energy acting as a stimulus upon living substance bears to the amount of energy liberated.

Among special varieties of stimulation there is one class of stimuli which has attracted particular attention — namely, those which act unilaterally upon free-moving organisms. It is

principally with the lowest forms of life that we have here to do — unicellular protista and free-living cells in the bodies of higher organisms (sperm-cells, leucocytes, &c). When from Directive one direction a stimulus — be it chemical, thermal, stimuia- photic, electrical, or of any other kind — acts upon tioa – these organisms in their medium, they are impelled to move in a course bearing a definite relation to the source of the stimulus — either directly towards that source or directly away from it, more rarely in a course transverse to it. This directive action of stimulation is under such a fixed conformity to law, that it vividly recalls such purely physical processes as, for instance, the attraction and repulsion of iron particles by the poles of a magnet. For example, if light falls from one side upon a vessel full of water containing unicellular green algae, according to the intensity of the light these organisms swim either towards the illuminated side, where they form a compact mass on the edge of the vessel, or away from it, to cluster on the opposite edge. In the same way infusoria in water are observed to hasten towards or to flee from certain chemical substances, and leucocytes in our bodies act in the same manner towards the metabolic products of pus- forming bacteria which have penetrated into an open wound. The suppuration of wounds is always accompanied by an amazing

conglomeration of leucocytes at the seat of the lesion. Perhaps the most striking effects are those of the constant electric current upon unicellular organisms, since in this case the motion follows the cause with absolutely automatic regularity, certainty and rapidity. Thus, for example, after the establishment of the current many Infusoria (Paramaecium) accumulate at the negative pole with great celerity and without deviation, and turn round again" with equal celerity as soon as the direction of the current is altered. As such cases of directive stimulation may occur among all varieties of stimuli whenever stimuli act unilater- ally, they have been designated, according to the direction in which they occur in relation to the source of the stimulus, as positive or negative chemotaxis, phototaxis, thermotaxis, galvanotaxis, and so forth. The strange and perplexing element in these phenomena becomes clear to us as soon as we know the characteristic method of locomotion for each form of organism, and whether the stimulus in question in the given intensity exercises an effect of excitation or of depression upon the special form. The direction of motion is the essential mechanical result of unilateral stimulation of the organs of locomotion. Seeing that these reactions are exceedingly widely distributed throughout the whole organic world, and possess a deep biological significance for the existence and continuance of life, the interest they have awakened is thoroughly justified.

One of the most important physiological discoveries of the 19th century was that of the " Specific Energy of Sense-sub- stances." Johannes Muller was the first to establish the fact that very different varieties of stimuli applied Bneny •• to one and the same organ of sense always produce one and the same variety of sensation, and that, conversely, the same stimulus applied to the different organs of sense produces a 1 different sensation in each organ — the one, in fact, which is its specific attribute. Thus, for example, mechanical, electrical and photic stimuli applied to the optic nerve produce no other sensation than that of light; and, conversely, any one variety of stimulus — take the electrical, for example — produces sensations of light, hearing, taste or smell, according as it affects the optic, auditory, gustatory or olfactory nerves. This law of the " Specific Energy of Sense-substances," as Johannes Muller (1809-1875) called it, has come to have a highly important bearing upon scientific criticism, since it proves experimentally that the things of the outer world are in themselves in no way discernible by us, but that from one and the same outward object — - the electric current, or a mechanical pressure, for instance — we receive altogether different sensations and form altogether different conceptions according to the sense-organ affected. But this law does not possess significance for psychology alone; as regards physiology also it has a much more general and more comprehensive force than Muller ever anticipated. It holds good, as demonstrated by Ewald Hering (b. 1834) and others,

not of sense-substances only, but of living substance generally, Each cell has its specific energy in Johannes Müller's sense, and in its extended form there is no more general law for all the operations of stimuli than this law of specific energy. To take examples, whether a muscle be stimulated by a chemical, ' mechanical, thermal or electrical stimulus the result is in each case the same — namely, a twitching of the muscle. Let a salivary gland be stimulated chemically, mechanically, electrically or in any other way, there always follows the same specific action — a secretion of saliva; no matter what be the kind of stimulus acting upon it, the liver-cell always reacts by producing bile, and so on. On the other hand, one and the same stimulus — the electric current, for example — gives in each form of living substance a specific result: twitching in the muscle, secretion of saliva in the salivary gland, production of bile in the liver-cell, &c. That is, of course, with the proviso that the effect of the stimulus be exciting and not depressing. The following general formulation, however, of the law of specific energy brings the depressing stimuli also within its scope: " Different stimuli produce in each form of living substance an increase or a dimi- nution of its specific activity." As already observed, it will probably be found that those weak chronic forms of stimulation which produce qualitative changes may also be comprised MKter this general law.

The knowledge thus far acquired from analysis of vital phenomena and their changes under the influence of stimuli affords but a very indefinite temporary basis for of Lite. trie theory of the actual vital process itself, of which vital phenomena are the outward manifes- tation. The conceptions to which physiological research has hitherto attained in this matter are of a more or less doubt- ful nature. The facts contained in them still require to be linked together by hypotheses if we are ' to obtain even a vague outline of what lies hidden behind the great riddle of life. Such hypotheses, serving as they do to link facts consistently together, are absolutely essential, however, to the further progress of research, and without their aid any systematic investigation would be impracticable. But at the same time it must never be forgotten that these hypotheses are merely provisional, and that whenever they are found to be no longer in harmony with the widening range of new experiences and ideas they must either be proved to be facts or be subjected to modification. This is the point of view from which we must deal with modern ideas concerning the nature of the actual vital process — the mechanism of life.

The fundamental fact of life is ' the metabolism of living substance which is continually and spontaneously undergoing Metabolism decomposition, and

building itself up anew with the help of the food-substances it takes in. These processes of decomposition and of reconstruction may be briefly designated as dissimilation (catabolism) and assimilation (anabolism) respectively. Now the question arises: How are we to understand this process of dissimilation and assimilation from a mechanical standpoint? It is quite evident that we have to do with some chemical occurrence; but how are the chemical transformations brought about? There are obviously two possibilities. It is conceivable that the decomposition of food -stuffs and the formation of excretion-products in the cell- body are caused by the repeated casual encounter of a great series of chemical combinations and by their repeatedly reacting upon one another in the same manner, bringing about transformations and forming waste products which are excreted, while at the same time certain chemical affinities are always taking in from without new chemical combinations (food-stuffs) and uniting them. This theory was in fact occasionally advanced in former times, particularly in its chemical aspect, and the belief was especially entertained that the enzymes in living substance might play an important part in these transformations. This assumption, however, leads to no clear and lucid image of what takes place, and, moreover, draws too largely upon auxiliary hypotheses. It has therefore met with but little acceptance. The other possible explanation of metabolism is that its. whole process is confined

to one single class of chemical combinations whose tendency it is to be constantly undergoing spontaneous decomposition and regeneration. This latter theory was founded by Ludimar Hermann (b, 1838), Eduard Friedrich Pfliiger (b. 1829) and others, and has met with universal recognition because of its naturalness, simplicity and clearness.

Starting with this hypothesis, the path of further research lies clear and well defined before us. In the first place, we are obviously met by the question: What conception are Proteias. we to form of these combinations on which hinges the whole vital process? Among the organic matters which compose living substance, proteids perform the most important part. Proteids and proteid-compounds form the only organic matter which is never absent from any cell. They form also the greater part of all the organic compounds of the cell, unless reserve-stuffs are accumulated to a considerable extent, and they are by far the most complicated of the compounds of living substance. While animal life is impossible without profeid food, there are, on the other hand, animals which can continue to subsist oh proteid alone. This series of facts proves very conclusively that proteids and their compounds play by far the most impor- tant part of all organic matter in the processes of life. The idea thus naturally presents itself that the required hypothetical compound forming the central point of metabolism will be found to bear a very close relation to proteids. But another point must be

here considered. The proteids and their com- pounds known to us are, comparatively speaking, stable com- pounds, which never undergo spontaneous decomposition Be- long as they are protected from outward injury, whereas: the hypothetical combination whioh lies at the centre of organic metabolism is extraordinarily liable and continually undergoing spontaneous decomposition. Therefore we have to think n<3t df ordinary proteids in this case, but of. still more complicated combinations, the atoms in the molecule of which have a strong tendency to group themselves in new arrangements.- Owing to their fundamental importance, these combinations have been termed " biogens." When we come to inquire how such labile biogen molecules are built up out of the proteids of food, we find our knowledge very much restricted. Doubtless the intra- molecular addition of inspired oxygen has much to do with it; for living substance when deprived of oxygen loses its irritability — that is to say, its tendency to decomposition. The fact that the decomposition of living substance is always associated with the formation of carbonic acid — a circumstance obviously necessi tating the aid of oxygen — also points to the absolute indis- pensableness of oxygen in the matter. Pfliiger has further suggested that the molecule of living substance owes its lability and its tendency to form carbonic acid when joined by oxygen atoms principally to cyanogen groups which are contained in it. According to this view, the following is supposed to be the process of the formation of biogen molecules: It is assumed that the biogen molecules already present in living substance take out of the proteids of food certain groups of atoms, and dispose them so as to produce cyanogen-like compounds. The addition of oxygen atoms then brings the biogen molecule to the maximum of its power of decomposition, so that- — partly spontaneously, but more especially when impelled by a stimulus — it breaks down somewhat explosively, causing the formation of carbonic acid. In this proceeding, according to the hypothesis which is the most widely accepted and the most fruitful in results, would lie the very germ of the vital process.

If we accept these views as far as their general principle is concerned, assimilation is the re-formation of biogen molecules by those already existing, aided by food-stuffs; dissimilation, the decomposition of biogen molecules. of ceii-nte. To this primary process, however, is attached a whole series of secondary chemical processes, which serve partly to work upon the food so as to fit it for the building up of biogen mole- cules, and partly to form out of the direct decomposition-products of the biogen molecules the characteristic secretion-products of living substance (excretions and secretions). The various workings of matter in the cell are rendered very much more

complex by the circumstance that the living cell exhibits various morphological differentiations — above all, the differentiation in protoplasm and nucleus. Again, a transformation of energy is inseparably connected with metabolism. Along with food and oxygen potential chemical energy is continually being introduced into the cell, to be accumulated in the biogen molecules, and at their decomposition transformed into kinetic energy, which finds an outlet in the various manifestations of energy in the cell — motion, heat, and so forth. In the light of this hypothesis the operations of stimuli also become comprehensible. Seeing that there is an initial tendency to the occurrence of certain definite chemical processes, which are associated with the reconstruction and decomposition of biogen molecules, various stimuli will either further or hinder the course of this metabolic series. A cell which is exposed to no outward disturbance, and which continues always in the unvarying medium provided by an exact sufficiency of food, will be in " metabolic equilibrium "—that is to say, its assimilation and its dissimilation will be equal (A = D). When, however, the influence of external stimuli is brought to bear upon them — that is to say, any change in their environing vital conditions — A and D will either be altered in similar proportion, or their mutual equilibrium will be disturbed. In the former case the vital processes will merely be intensified in their course; in the latter and usual case the result will be deter- mined according to the part of metabolism excited or depressed. When the effect of a stimulus is to excite D continuously in a high degree without correspondingly increasing A, the result is a dying off — an atrophy. In the contrary case, when A remains continuously greater than D, the result is growth, increase and Metabolic reproduction of the cell. Experience proves, how- Bquiu- ever, that A and D stand in a certain relation of brium. mutual dependence to each other, with the result that when D has been increased by a stimulus, for example, A correspondingly increases during the stimulation, and continues to do so after its cessation, till the loss in living substance produced by the stimulation of D is eventually made good, and metabolic equilibrium is restored. The muscle may be taken as an example of this self-regulation of metabolism common to all living substance (Hering's Selbststeuerung des Stoffwechsels). When a muscle has been fatigued by some stimulation causing an enormous increase of D, there is a corresponding spontaneous increase in A. After some time the muscle is observed to have recovered. It has once more become capable of performing work ; its metabolism is again in equilibrium.

The vital phenomena of the cell may be derived mechanically from metabolism and the changes it undergoes under the influence of stimuli. Our ability to do this will increase more rapidly as we become better acquainted with the details of the metabolism of the cell itself. The

foregoing outline must be regarded, of course, as embodying only a fragmentary hypo- thesis, which can serve as a guide for further research only so long as it does not clash with facts, and which must be amplified, specialized and developed with the widening of specific knowledge regarding the cell's metabolism. The relations already known are so exceedingly complex that only by slow degrees can we pursue the investigation of separate fragments of the entire metabolic series. The differentiation of nucleus and protoplasm in the living substance of the cell alone gives rise to an extra- ordinary complication in the metabolic process, for these two parts of the cell stand in the most complicated correlation with Qe U . one another as well as with the environing medium — a

Processes fact of which the experiments made by vivisection the Secret j n various free-living cell-forms have furnished ° abundant evidence. The farther such knowledge

advances, the more rounded, clear and free from hypotheses will become our conception of the cell's metabolism. But the cell is the elementary component part of all organisms, and from the life of individual cells is constructed the life of the separate tissues and various organs, and thus of the entire organism. Hence the cell is the only vital element which the organism possesses, and therefore the investi- gation of the vital processes in its separate cells leads

ultimately to a knowledge regarding the mechanism of life in the whole.

Vegetable physiology is dealt with in the article Plants : Physio- logy. For details of different parts of the animal body, see Animal Heat ; Respiratory System ; Vascular System ; Touch ; Smell ; Taste; Vision; Hearing; Voice; Muscle and Nerve; Sleep; Hypnotism; Brain; Spinal Cord; Sympathetic System; Blood; Lymph; Phagocytosis; Digestive Organs; Nutrition, &c.

The principal modern English textbooks of animal physiology are those of Sir Michael Foster (1885), A. E. Schafer (1898), Noel Paton (1908), Halliburton (1909), and Starling (1909). See, how- ever, the bibliographical notes to the separate articles. (M. V.)

PIACENZA (Lat. Placentia), a town and episcopal see of Emilia, Italy, the capital of the province of Piacenza, 42 1 m. S.E. of Milan and 91 m. N.W. of Bologna by rail. Pop. (1906), 39,786. It lies on the Lombard plain, 217 ft. above sea-level, near the right bank of the Po, which here is crossed by road and railway bridges, just below the confluence of the Trebia. It is still surrounded by walls with bastions and fosse in a circuit of 4 m. The cathedral was erected between 1122 and 1233, in the Lombard Romanesque style, under the direction of Santo da Sambuceto, on the site

of a church of the 9th century which had been destroyed by earthquake. The west front has three doors with curious pillared porches. The campanile is a massive square brick tower 223 ft. high; the iron cage attached to one of its windows was put up in 1495 by Ludovico il Moro for the confine- ment of persons guilty of treason or sacrilege. The crypt is a large church supported by one hundred columns. The entire edifice has been restored since 1898, and the frescoes by Guercino and Caracci, which decorate parts of its roof, though good in themselves, are inappropriate to its severe style. Sant' Antonino, which was the cathedral church till 877, is supposed to have been founded by St Victor, the first bishop of Piacenza, in the 4th century, and restored in 903; it was rebuilt in 1104, and altered in 1857. It was within its walls that the deputies of the Lombard League swore to the conditions of peace ratified in 1183 at Con- stance. The Gothic brick vestibule (II Paradiso) on the north side is one of the older parts of the building. San Francesco, a spacious Gothic edifice begun by the Franciscans in 1278, was erected on the site of the palace of Ubertino Landi, a leader of the Ghibelline party. S. Savino, a fine Romanesque building of a.d. 903 (well restored in 1903), contains a mosaic pavement of this period with curious representations, including one of a game of chess. S. Sisto, which dates from 1499, and takes the place of the church founded in 874 by Angilberga (consort of the emperor Louis II.), lost its chief attraction when Raphael's Sistine Madonna (now in Dresden) was sold by the monks in 1734 to Frederick Augustus III. Its place, however, is occupied by a copy by Avanzini, and there are also several good intarsias by Bartolomeo da Busseto. S. Sepolcro and S. Maria della Campagna are both good early Renaissance churches; the latter is rich in frescoes by Pordenone. S. Anna, dating from 1334, was the church of the barefooted Carmelites. Of the secular buildings the most interesting is the Palazzo Communale, begun in 1281, one of the finest buildings of its kind in Italy. The square in front is known as the Piazza dei Cavalli, from the two bronze equestrian statues of Ranuccio (1620) and his father Alexander, prince of Parma, governor of the Netherlands (1625). Both were designed by Francesco Mocchi. The Palazzo dei Tribunali and the Palazzo degli Scoti are fine early Renaissance brick buildings with terra-cotta decorations. The huge Farnese palace was begun after Vignola's designs by Margaret of Austria in 1558, but it was never completed, and since 1800 it has been used as barracks. Other buildings or institutions of note are the old and the new bishop's palace, the fine theatre designed by Lotario Tomba in 1803, the great hospital dating from 147 1, the library presented to the commune in 1846 by the marquis Ferdinando Landi, and the Passerini library founded in 1685. The Museo Civico, formed in 1903, contains collections of antiquities (though many of the Roman antiquities of Piacenza have passed to the museum of Parma), some good Flemish tapestries and a few pictures. The castle erected by Antonio da Sangallo the

younger has been demolished. Piacenza is the junction of the Milan and Bologna line with that from Voghera and Turin. From Codogno, 7 m.

to the north, a branch line runs to Cremona. By road Piacenza is 88 m. north-east of Genoa. The town has an arsenal, a technical and arts school, and various industries — iron and brass works, foundries, silk-throwing, printing works and flour- mills.

Piacenza was made a Roman colony in 218 B.C. While its walls were yet unfinished it had to repulse an attack by the Gauls, and in the latter part of 218 it afforded protection to the remains of the Roman army under Scipio which had been de- feated in the great battle on the Trebia. In 205 it withstood a protracted siege by Hasdrubal. Five years later the Gauls burned the city; and in 190 it had to be recruited with three thousand families. In 187 it was connected with Ariminum and the south by the construction of the Via Aemilia. Later on it became a very important road centre; the continuation north- wards of the Via Aemilia towards Milan, with a branch to Ticinum, crossed the Po there, and the Via Postumia from Cremona to Dertona and Genoa passed through it. Later still Augustus reconstructed the road from Dertona to Vade, and into Gallia Narbonensis, and gave it the name of Julia Augusta from Placentia onwards. The rectangular arrangement of the streets in the centre of the town, through which passes the Via Aemilia, is no doubt a survival from Roman times. Placentia is mentioned in connexion with its capture by Cinna and a defeat of the forces of Carbo in the neighbourhood (82 B.C.), a mutiny of Julius Caesar's garrison (50 B.C.), another mutiny under Augustus (40 B.C.), the defence of the city by Spurinna, Otho's general, against Caecina, Vitellius's general (a.d. 69), and the defeat of Aurelian by the Marcomanni outside the walls (a.d. 271). In 546 Totila reduced Piacenza by famine. Between 997 and 1035 the city was governed by its bishops, who had received the title of count from Otho III. At Roncaglia, 5 m. to the east, the emperor Conrad II. held the diet which passed the Salic law. In the latter part of the 12th century it was one of the leading members of the Lombard League. For the most part it remained Guelph, though at times, as when it called in Galeazzo Visconti, it was glad to appeal to a powerful Ghibelline for aid against its domestic tyrants. In 1447 the city was captured and sacked by Francesco Sforza. Having been occupied by the papal forces in 1512, it was in 1545 united with Parma (q.v.) to form an here- ditary duchy for Pierluigi Farnese, son of Paul III. In 1746 a battle between the Franco-Spanish forces and the Austrians was fought under the city walls, and in 1796 it was occupied by the French. In 1848 Piacenza was the first of the

towns of Lombardy to join Piedmont; but it was reoccupied by the Austrians till 1859.

PIANOFORTE (Ital. piano, soft, and forte, loud). The group of keyed stringed musical instruments, among which the piano- forte is latest in order of time, has been invented and step by step developed with the modern art of music, which is based upon the simultaneous employment of different musical sounds. In the 10th century the " organum " arose, an elementary system of accompaniment to the voice, consisting of fourths and octaves below the melody and moving with it; and the organ (q.v.), the earliest keyed instrument, was, in the first instance, the rude embodiment of this idea and convenient means for its expression. There was as yet no keyboard of balanced key levers; sliders were drawn out like modern draw-stops, to admit the compressed air necessary to make the pipes Evolution. soun(i. About the same time arose a large stringed instrument, the organistrum, 1 the parent of the now obsolete hurdy-gurdy; as the organ needed a blower as well as an organist, so the player of the organistrum required a handle-turner, by whose aid the three strings of the instru- ment were made to sound simultaneously upon a wheel, and, according to the well-known sculptured relief of St George de Boscherville, one string was manipulated by means of a

1 An organistrum is shown in the lower right hand corner of the full page miniature of a fine 12th century psalter of English work- manship, forming part of the Hunterian collection in University Court Library, Glasgow. No. 31 in Catalogue of the Exhibition of Illuminated MSS. at the Burlington Fine Arts Club (1908).

row of stoppers or tangents pressed inwards to produce the notes. The other strings were drones, analogous to the drones of the bagpipes, but originally the three strings followed the changing organum.

In the nth century, the epoch of Guido d'Arezzo, to whom the beginning of musical notation is attributed, the Pythagorean monochord, with its shifting bridge, was used in the singing schools to teach the intervals of the plain-song of the church. The practical necessity, not merely of demonstrating the pro- portionate relations of the intervals, but also of initiating pupils into the different gradations of the church tones, had soon after Guido's time brought into use quadruplex-fashioned monochords, which were constructed with scales, analogous to the modern practice with thermometers which are made to show both Reaumur and Centigrade, so that four lines indicated as many authentic and as many plagal clavichord.' tones. This arrangement found great acceptance, for Aribo, 2 writing about fifty years after Guido, says that few monochords were to be found without it. Had the clavi- chord then been known, this make- shift

contrivance would not have been used. Aribo strenuously en- deavoured to improve it, and " by the grace of God " invented a mono- chord measure which, on account of the rapidity of the leaps he could make with it, he named a wild-goat (caprea). Jean de Muris (Musica speculativa, 1323) teaches how true relations may be found by a single- string monochord, but recommends a four-stringed one, properly a tetrachord, to gain a knowledge of unfamiliar intervals. He describes the musical instruments known in his time, but does not mention the clavichord or monochord with keys, which could not have been then invented. Perhaps one of the earliest forms of such an instrument, in which stoppers or tangents had been adopted from the organistrum, is

shown in fig. 1, from a wood carving representation of a Keyed of a vicar choral or organist, pre- Stringed Instrument, from

S cT ed K in %, M r' S , ChUrCh ' (primSlkvicS!'^ Shrewsbury. The latest date to f ore I4 6o.

which this interesting figure may be

attributed is 1460, but the conventional representation shows that the instrument was then already of a past fashion, although perhaps still retained in use and familiar to the carver.

In the Weimar Wunderbuch, 3 a MS. dated 1440, with pen and ink miniatures, is given a " clavichordium " having 8 short and apparently 16 \or\g keys, the artist has drawn 12 strings in a rectangular case, but no tangents are visible. A keyboard of balanced keys existed in the little portable organ known as the regal, so often represented in old carvings, paintings and stained windows. Vitruvius, De architectura, lib. x. cap. xi., translated by Newton, describes a balanced keyboard; but the key appar- atus is more particularly shown in The Pneumatics of Hero of Alexandria, translated by Bennet Woodcroft (London, 1851). In confirmation of this has been the remarkable recovery at Carthage ' of a terra-cotta model of a Hydraulikon or water organ, dating from the 2nd century a.d., in which a balanced keyboard of 18 or 19 keys is shown. It seems likely the balanced keyboard was lost, and afterwards reinvented. The name of

- *See " Musica aribonls scholastici," printed by Martin Gerbert in Scriptores ecclesiastici de musica sacra (1784), ii. 197; and in J. P. Migne, Patrologiae cursus computus, vol. 150, col. 1307.*

s Grossherzogliche Bibliothek. See also Dr Alwin Schulz, Deutsches Leben im xiy. and xv. Jahrhund. (Vienna, 1892), p. 58, fig. 522.

- *For an illustration of this important piece of evidence, see under*

Organ: Ancient History; and for description and illustration of balanced keys, see Keyboard.

Fig. i.-ˆ-Earliest existing

regal was derived from the rule (regula) or graduated scale of keys, and its use was to give the singers in religious processions the note or pitch. The only instrument of this kind known to exist in the United Kingdom is at Blair Atholl, and it bears the very late date of 1630. The Brussels regal 1 may be as modern. These are instances of how long a some-time admired musical instrument may remain in use after its first intention is forgotten. We attribute the adaptation of the narrow regal keyboard to what was still called the monochord, but was now a complex of monochords over one resonance board, to the latter half of the 14th century; it was accomplished by the substitution of tangents fixed in the future ends of the balanced keys for the movable bridges of the monochord or such stoppers as are shown in the Shrewsbury carving. Thus the monochordium or " payre of monochordis " became the clavichordium or " payre of clavi- chordis " — pair being applied, in the old sense of a " pair of steps," to a series of degrees. This use of the word to imply gradation was common in England to all keyed instruments; thus we read, in the Tudor period and later, of a pair of regals, organs, or virginals. Ed. van der Straeten 2 reproduces a so-called clavichord of the 15th century from a MS. in the public library at Ghent. The treatise is anonymous, but other treatises in the same MS. bear dates 1503 and 1504. Van der Straeten is of opinion that the drawing may be assigned to the middle of the 15th century. The scribe calls the instrument a clavicim- balum, and this is undoubtedly correct; the 8 strings in the drawing are stretched from back to front over a long sound- board, the longest strings to the left; 8 keys, 4 long and 4 short with levers to which are attached the jacks, are seen in a horizontal line behind the keyboard, and behind them again are given the names of the notes a, b, c, d, e, f, g, h. In the Weimar Wunderbuch is a pen-and-ink sketch of the " clavicim- balum " 3 placed upon a table, in which we recognize the familiar outline of the harpsichord, but on a smaller scale. The keyboard shows white and black notes — the latter short keys, one between each group of two white keys, precisely as in the instrument reproduced by Van der Straeten" — but no mechanism is visible under the strings.

The earliest known record of the clavichord occurs in some rules of the minnesingers, 4 dated 1404, preserved at Vienna. The monochord is named with it, showing a differentiation of these instruments, and of them

from the clavicymbalum, the keyed cymbal, cembalo (Italian), or psaltery. From this we learn that a keyboard had been thus early adapted to that favourite medieval stringed instrument, the " cembalo " of Boccaccio, the " sautrie " of Chaucer. There were two forms of the psaltery: (1) the trapeze, one of the oldest representations of which is to be found in Orcagna's famous Trionfo della Morf e in the Campo Santo at Pisa, 'and another by the same painter in the National Gallery, London; and (2) the contemporary "testa di porco," the pig's head, which was of triangular shape as the name suggests. The trapeze psaltery was strung horizontally; the " istromento di porco " either horizontally or vertically— the notes, as in the common dulcimer, being in groups of three or four unisons. In these differences of form and stringing we see the cause of the ultimate differentiation of the spinet and harpsi chord. The compass of the psalteries was nearly that of Guido's scale; but according to Mersenne, 5 the lowest interval was a fourth, G to C, which is worthy of notice as anticipating the later " short measure " 6 of the spinet and organ.

The simplicity of the clavichord inclines us to place it, in order of time, before the clavicymbalum or clavicembalo ; but we do not know how the sounds of the latter were at first excited.' There is an indication as to its early form to be seen in the church of the Certosa near Pavia, which compares in probable date with

1 See Victor C. Mahillon, Catalogue descriptif (1880), I. p. 320ˆ No. 454: regal with two bellows, end of XVI. C. Compass E to a 2 .

2 La Musique aux Pays Bas, i. 278.

8 See Dr Alwin Schulz, op. cit., fig. 524.

'V. 410 and 414. See Ambros, Geschichte der Musik (1892), ii. 226.

• L'Harmonie universelle (Paris, 1636), livre III. p. 107.

- *A. J. Hipkins, History of Pianoforte (London, 1896), p. 51.*

the Shrewsbury example. We quote the reference to it from Dr Ambros. 1 He says a carving represents King David as holding an " istromento di porco " which has eight strings and as many keys lying parallel to them; inside the body of the instrument, which is open at the side nearest the right hand of King David, he touches the keys with the right hand and damps the strings with the left. The attribution of archaism applies with equal force to this carving as to the Shrewsbury one, for when the monastery of Certosa near Pavia was built by Ambrogio Fossana in 1472, chromatic keyboards, which imply a considerable ad- vance, were already in use. There is an authentic representation of a chromatic keyboard, painted not later than

1426, in the St Cecilia panel (now at Berlin) of the famous Adoration of the Lamb by the Van Eycks. The instrument depicted is a positive

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Fig. 2. — Diatonic Clavichord Keyboard (Guido's Scale) from Virdung. Before 1 511.

organ, and it is interesting to notice in this realistic painting that the keys are evidently boxwood, as in the Italian spinets of later date, and that the angel plays a common chord — A with the right hand, F and C with the left. But diatonic organs with eight steps or keys in the octave, which included the B flat and the B natural, as in Guido's scale, were long preserved, for Praetorius speaks of them as still existing nearly two hundred years later. This diatonic keyboard, we learn from Sebastian Virdung {Musica getutscht und auszgezogen, Basel, 1511), was the keyboard of the early clavichord. We reproduce his diagram as the 1 ttft'ly authority we have for the disposition of the one short key. :

The extent of this scale is exactly Guido's. Virdung's diagram of the chromatic is the same as our own familiar keyboard, and comprises three octaves and a note, from F below the bass stave to G above the treble. But Virdung tells us that even then clavichords were made longer than four octaves by repetition of the same order of keys. The introduction of the chromatic order he attributes to the study of Boetius, and the consequent endeavour to restore the three musical genera of the Greeks — the diatonic, chromatic and' enharmonic. But the last-named had not been attained. Virdung gives woodcuts of the clavichordium, the virginal, the clavicymbalum and the clavicytherium. We reproduce three of them (figs. 3, 6 and 12), omitting the virginal

Fig. 3.— Virdung's Clavichordium, 151 1 ; reversed facsimile.

as obviously incorrect. Writers on musical instruments have continually repeated these drawings without! discerning that in the printing they are reversed, which puts the keyboards entirely wrong, and that in Luscinius's Latin translation of Virdung (Musurgia, sive praxis musicae, Strasburg, 1536), which has been hitherto chiefly followed, two of the engravings, the clavicim- balum and the clavicytherium, are transposed, another cause of error. Martin Agricola {Musica instrumentalis, Wittenberg, 1529) has copied Virdung's illustrations with some differences of perspective, and the addition, here and there, of errors- of his own.

r Geschichte der Musik, ii. 544-555.

Still vulgarly known as monochord, Virdung's clavichord was really a box of monochords, all the strings being of the same length. He derives the clavichord from Guido's monochord as he does the virginal from the psaltery, but, at the same time, confesses he does not know when, or by whom, either instrument was invented. We observe in this drawing the short sound-board, which always remained a peculiarity of the clavichord, and the straight sound- board bridge — necessarily so when all the strings were of one length. To gain an angle of incidence for the tangents against the strings the keys were made crooked, an expedient further rendered necessary by the " fretting " — three tangents, according to Virdung, being directed to stop as many notes from each single group of three strings tuned in unison; each tangent thus made a different vibrating length of string. In the drawing the strings are merely indicated. The German for fret is Bund, and such a clavichord, in that language, is known as a "gebun- denes Clavichord" both fret (to rub) and Bund (from binden, to bind) having been taken over from the lute or viol. The French and Italians employ " touche " and " tasto," touch. Praetorius who wrote a hundred years later than Virdung, says two, three and four tangents were thus employed in stopping. There are extant small clavichords having three keys and tangents to one pair of strings and others have no more than two tangents to a note formed by a pair of strings, instead of three. Thus seven pairs of strings suffice for an octave of twelve keys, the open notes being F, G, A, B flat, C, D, E flat, and by an unexplained peculiarity, perhaps derived from some special estimation of the notes which was connected with the church modes, A and D are left throughout free from a second tangent. A corresponding value of these notes is shown by their independence of chromatic alteration in tuning the double Irish harp, as explained by Vincentio Galilei in his treatise on music (Dialogo della musica, Florence, 1581). Adlung, who died in 1762, speaks of another fretting, but it must have been an adaptation to the modern major scale, the " free " notes being E and B. Clavichords were made with double fretting up to about the year 1700 — that is to say, to the epoch of J. S. Bach, who, taking advantage of its abolition and the consequent use of independent pairs of strings for each note, was enabled to tune in all keys equally, which had been impossible so long as the fretting was maintained. The modern scales having become established, Bach was now able to produce, in 1722, Das wohltemperirte Clavier, the first collection of preludes and fugues in all the twenty-four major and minor scales for a clavichord which was tuned, as to con- cordance and dissonance, fairly equal.

The oldest clavichord, here called manicordo (as French manlcorde, from monochord), known to exist is that shown in fig. 4. It will be observed that the lowest octave is here already

Fit;. 4. — Manicordo (Clavichord) d'Eleonora di Montalvo, 1659; Kraus Museum, Florence.

" bundfrei " or fret-free. The strings are no longer of equal length, and there are three bridges, divisions of the one bridge, in different positions on the sound-board. Mersenne's " mani- corde " (Harmonie universelle, Paris 1636, p. 115), shown in an engraving in that work, has the strings still nearly of equal length, but the sound-board bridge is divided into five. The fretted clavichords made in Germany in the last years of the 17th century have the curved sound-board bridge, like a spinet. In the clavichord the tangents always form the second

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Fig. 5. — Clavichord Tangent.

bridge, indispensable for the vibration, besides acting as the sound exciters (fig. 5). The common damper to all the strings is a list of cloth, interwoven behind the tangents. As the tangents quitted the strings the cloth immediately stopped all vibration. Too much cloth would diminish the tone of this already feeble instrument, which gained the name of " dumb spinet " from its use. In the clavichord in Rubens's St Cecilia (Dresden Gallery) — interesting as perhaps representing that painter's own instrument — the damping cloth is accurately

painted. The number of keys

there shown is three octaves and a third, F to A — the same extent

as in Handel's clavichord now in the museum at Maidstone (an

Italian instrument dated 1726, and not fretted), but with the

peculiarity of a combined chromatic and short octave in the

lowest notes, to which we shall have to refer when we arrive

at the spinet; we pass it by as the only instance we have

come across in the clavichord.

The clavichord must have gone out of favour in Great Britain and the Netherlands early in the 16th century, before its ex- pressive power, which is of the most tender and intimate quality, could have been, from the nature of the music played, observed, — the more brilliant and elegant spinet being preferred to it. Like the other keyboard instruments it had no German name, and can hardly have been of German origin. Holbein, in his drawing of the family of Sir Thomas More, 1528, now at Basel, indicates the place for " Klavikordi und ander Seytinspill." But it remained longest in use in Germany — until even the begin- ning of the 19th century. It was the favourite " Klavier " of the Bachs. Besides that of Handel already noticed there are in existence clavichords the former possession of which is attri- buted to Mozart and Beethoven. The clavichord was obedient to a peculiarity of touch possible on no other keyboard instru- ment. This is described by C. P. Emmanuel Bach in his famous essay on playing and accompaniment, entitled Versuch iiber die wahre Art das Klavier zu spielen (" An Essay on the True Way to play Keyboard Instruments.") It is the Bebung (trembling), a vibration in a melody note of the same nature as the tremolo frequently employed by violin players to heighten the expressive effect; it was gained by a repeated movement of the fleshy end of the finger while the key was still held down. The Bebung was indicated in the notation by dots over the note to be affected by it, perhaps showing how many times the note should be repeated. According to the practice of the Bachs, as handed down to us in the above mentioned essay, great smoothness of touch was required to play the clavichord in tune. As with the monochord, the means taken to produce the sound disturbed the accuracy of the string measurement by increasing tension, so that a key touched too firmly in the clavichord, by unduly raising the string, sharpened the pitch, an error in playing deprecated by C. P. Emmanuel Bach. This answers the assertion which has been made that J. S. Bach could not have been nice about tuning when he played from preference on*

an instrument of uncertain intonation.

The next instrument described by Virdung is the virginal (virgin' alis, proper for a girl), a parallelogram in shape, having the same projecting keyboard and compass of keys the same as the clavichordium. Here we can trace derivation from the psaltery in the sound-board covering the entire inner surface of the instrument and in the triangular disposition of the strings. The virginal in Virdung's drawing has an impossible position with reference to the keyboard, which renders its reproduction as an illustration useless. But in the next drawing, the clavi- cimbalum , this is rectified, and the drawing, reversed on cˆnbalum account of the keyboard, can be accepted as roughly representing the instrument so called (fig. 6). There would be

no difference between it and the virginal were it not for a peculi- arity of keyboard compass, which emphatically refers itself to the Italian " spinetta," a name unnoticed by Virdung or by his countryman Arnold Schlick, who, in the same year 1511, pub- lished his Spiegel der Orgelmacher (Organ-builders' Mirror), and named the clavichordium and clavicimbalum as familiar instruments. In the first place, the keyboard, beginning appar- ently with B natural, instead of F, makes the clavicimbalum smaller than the virginal, the strings in this arrangement being shorter; in the next place it is almost certain that the Italian spinet compass, beginning apparently upon a semitone, is identical with a " short measure " or " short octave " organ compass, a very old keyboard arrangement, by which the lowest note, representing B, really sounded G and C sharp in like manner A. The origin of this may be deduced from the psaltery and many representations of the regal, and its object appears to have been to obtain dominant basses for cadences, harmonious closes having early been sought for as giving pleasure to the ear. Authority for this practice is to be found in Mersenne, who, in 1636, expressly describes it as occurring in his own spinet (espinette). He says the keyboards of the spinet and organ are the same. Now, in his Latin edition of the same work he renders

Fig. 6. — Virdung's Clavicimbalum (Spinet), 1511 ; reversed facsimile.

espinette by clavicimbalum. We read {Harmonie Universelle, Paris, 1636, liv. 3, p. 107 — "Its longest string [his spinet's] is little more than a foot in

length between the two bridges. It has only thirty-one keys [marches] in its keyboard, and as many strings over its sound-board [he now refers to the illustra- tion], so that there are five keys hidden on account of the per- spective^ — that is to say, three diatonic and two chromatic [feintes, same as the Latin ficti] , of which the first is cut into two [a divided sharp forming two keys] ; but these sharps serve to go down to the third and fourth below the first step, C sol [tenor clef C] , in order to go as far as the third octave, for the eighteen principal steps make but an eighteenth, that is to say, a fourth more than two octaves." The note we call F, he, on his engrav- ing, letters as C, indicating the pitch of a spinet of the second size, which the one described is not. The third and fourth, reached by his divided sharp, are consequently the lower A and G; or, to complete, as he says, the third octave, the lowest note might be F, but for that he would want the diatonic semitone B, which his spinet, according to his description, did not possess. 1 Mersenne's statement sufficiently proves,' first, the use in spinets as well as in organs of what we now call " short measure," and, secondly, the object of divided sharps at the lower end of the keyboard to gain lower notes. He speaks of one string only to each note; unlike the double and triple strung clavichord, those instruments, clavicimbalum, spinet, or virginal, derived from the psaltery, could only present one string to the mechanical plectrum which twanged it. As regards the kind of plectra

1 A. J. Ellis {History of Musical Pitch, p. 318) sees the B in Mersenne's outline diagram.

earliest used we have no evidence. The little crow-auill points project from centred tongues in uprights of wood known as "jacks" (fig. 7), which also carry the dampers, and rising by the depression of the keys in front, the quills set the strings vibrating as they pluck them in passing, springs at first of steel, later of bristle, giving energy to the twang and governing their return J. C. Scaliger in Poetices libri septem (1561, p. 51. c. 1.) states that the Clavicimbalum and Harpichordum of his boyhood are now called Spinets on account of those quill points (a b Mis mucronibus), and attributes the introduction of the name " spinetta " to them (from spina, a thorn). We will leave harpichordum for the present, but the early identity of clavicimbalum and spinetta is certainly proved. Scaliger's etymology remained unquestioned until Signor Ponsicchi of Florence discovered another derivation. He found in a rare book entitled Conclusione nel suono dell' organo, di D. Adriano Banchieri (Bologna, 1608), the following passage, which translated reads: " Spinetta was thus named from the inventor of that oblong form, who was one Maestro Giovanni Spinetti, a Venetian; and I have seen one of those instruments, in the possession of Francesco Stivori, organist of the magnificent community of Montagnana, within which was this inscription — Joannes Spinetvs Venetvs fecit, a.d. 1503." Scaliger's and Banchieri's statements may be combined, as there is

no discrepancy of dates, or we may rely upon whichever seems to us to have the greater authority, always bearing in mind that neither invalidates the other. The introduction of crow-quill points, and adaptation to an oblong case of an instrument previously in a trapeze form, are synchronous ; but we must accept 1 503 as a late date for one of Spinetti's instruments, seeing that the altered form had already become common, as shown by Virdung, in another country as early as 1 51 1. After this date there are frequent references to spinets in public records and other documents, and we have fortunately the instruments themselves to put in evidence, preserved in public museums and in private collections. A spinet dated 1490 was shown at Bologna in 1888; another old spinet in the Conserva- toire, Paris, is a pentagonal instrument made by Francesco di Portalupis at Verona, 1523. The Milanese Rossi were famous spinet-makers, and have been accredited {La Nobilitd di Mttano, 1595) with an improvement in the form which we believe was the recessing of the keyboard, -a feature which had previously entirely projected; by the recessing a greater width was obtained for the sound-board. The spinets by Annibale Rosso at South Kensington, dated respectively 1555 (fig. 8) and 1577, show this

FlG. 7. — Spinet " Jack."

FlG. 8.— Milanese Spinetta, by Annibale Rosso, 1555; South Kensington Museum.

alteration, and may be compared with the older and purer form of one, dated 1568, by Marco Jadra (also known as Marco " dalle spinette," or " dai cembali"). Besides the pentagonal spinet, there was an heptagonal variety; they had neither covers nor stands, and were often withdrawn from decorated cases when required for performance. In other instances, as in the 1577 Rosso spinet, the case of the instrument itself was richly adorned. The apparent compass of the keyboard in Italy generally exceeded four octaves by a semitone, E to F; but we may regard the lowest natural key as usually C, and the lowest sharp key as usually D, in these instruments, according to" short measure." The rectangular spinet, Virdung's " virginal," early assumed in Italy the fashion of the large " cassoni " or wedding chests. The oldest we know of in this style, and dated, is the fine specimen belonging to M. Terme which figures in L' Art decoratif (fig. 9). Virginal is not an Italianname;

the rectangular instrument in Italy is " spinetta tavola." In England, from

Henry VII. to Charles II., all quilled instruments (stromentidipenna), without distinction as to form, were known as virginals. It was a common name, equivalent to the con- temporary Italian clavkordo and Flemish clavisingel. From the latter, by apocope, we arrive at the French clavecin — the French clavier {clavis, a key), a keyboard, being in its turn adopted by the Germans to denote any keyboard stringed instrument.

SESTifJi"

Fig. 9. — Spinetta Tavola (Virginal), 1568; Vict, and Albert Museum.

Mersenne {op. oil., liv. iii., p. 158) gives three sizes for spinets — one 2j ft. wide, tuned to the octave of the " ton de chapelle " (in his day a half tone above the present English medium pitch) , one of 35 ft. tuned to the fourth below, and one of 5 ft. tuned to the octave below the first, the last being therefore tuned in unison to the chapel pitch. He says his own spinet was one of the smallest it was customary to make, but from the lettering of the keys in his drawing it would have been of the second size, or the spinet tuned to the fourth. The octave spinet, of trapeze form, was known in Italy as " ottavina " or " spinetta di serenata." It had a less compass of keys than the larger instru- ment, being apparently three and two-third octaves, E to C — which by the " short measure " would be four octaves, C to C. We learn from Praetorius that these little spinets were placed upon the larger ones in performance; their use was to heighten the brilliant effect. In the double rectangular clavisingel of the Netherlands, in which there was a movable octave instrument, we recognize a similar intention. There is a fine spinet of this

1 11 ,, r Harpsichord;

we should therefore clavicymbal.

·.-,_. JAHSc

Fig. 10.— English Spinet (Spinetta Traversa), by Carolus Haward. About 1668.

kind at Nuremberg. Praetorius illustrates the Italian spinet by a form known as the " spinetta traversa," an approach towards the long clavicembalo or harpsichord, the tuning pins being immediately over the keyboard. This transposed spinet, more powerful than the old trapeze one, became fashionable in England after the Restoration, Haward, Keene, Slade, Player, Baudin, the Hitchcocks, Mahoon, Haxby, the Harrir family, and others

having made such " spinets " during a period for which we have dates from

1664 to 1784. Pepys bought his "Espinette" from Charles Haward for £5, July 13, 1664.

The spinets of Keene and Player, made about 1700, have frequently two divided sharps at the bass end of the keyboard, as in the description by Mersenne, quoted above, of a spinet with short measure. Such divided sharps have been assumed to be quarter tones, but enharmonic intervals in the extreme bass can have no justification. From the tuning of Handel's Italian clavi- chord already mentioned, which has this peculiarity, and from Praetorius we find the further halves of the two divided sharps were the chromatic semitones, and the nearer halves the major thirds below i.e. the dominant fourths to the next natural keys. Thomas Hitchcock (for whom there are dates 1664 and 1703 written on keys and jacks of spinets bearing Edward Blunt's name and having divided bass sharps) made a great advance in constructing spinets, giving them the wide compass of five octaves, from G to G, with very fine keyboards in which the sharps were inlaid with a slip of the ivory or ebony, as the case might be, of the naturals. Their instruments, always numbered, and not dated as has been sometimes supposed, became models for contemporary and subsequent English makers.

We have now to ask what was the difference beween Scaliger's harpichordum and his clavicymbal. Galilei, the father of the astronomer of that name {Dialogo della musica antica e moderna, Florence, 1581), says that the harpichord was so named from having resembled an " arpa giacente," a prostrate or " couched" harp, proving that the clavicymbal was at first the trapeze-shaped spinet; and

differentiate harpichord and clavicymbal as, in form, suggested by or derived from the harp and psaltery, or from a " testa di porco " and an ordinary trapeze psaltery. We are inclined to prefer the latter. The Latin name " clavicymbalum," having early been replaced by spinet and virginal, was in Italy and France bestowed upon the long harpichord, and was continued as clavicembalo (gravecembalo, or familiarly cembalo only) and clavecin. Much later, after the restoration of the Stuarts, the first name was accepted and naturalized in England as harpsichord, which we will define as the long instrument with quills, shaped like a modern grand piano, and resembling a wing, from which it has gained the German appellation " Fliigel." We can point out no long instrument of this kind so old as the Roman cembalo at South Kensington (fig. n). It was made by Geronimo of Bologna in 1521, two years before the Paris Porta- lupis spinet. The outer case is of finely tooled leather. It has a spinet keyboard with a compass of nearly four octaves, E to D. The natural keys are of boxwood, gracefully arcaded in front. The keyboard of the Italian cembalo was afterwards carried out to the normal four octaves. There is an existing example, dated

1626,. with the bass keys carried out without sharps in long measure (unfortunately altered by a restorer). It is sur- prising to see with what steady persistence the Italians adhered to their original model in making the instrument. As late as the epoch of Cristofori, 1 and in his 1722 cembalo at Florence, 2 we still find the independent outer case, the single keyboard, the two unisons, without power to reduce to one by using stops. The Italians have been as conservative with their forms of spinet, and are to this day with their organs. The startling " piano e forte " of 1598, brought to light from the records of the house of D'Este by Count Valdrighi of Modena, 3 after much consideration and a desire to find in it an anticipation of Cristo- fori's subsequent invention of the pianoforte, we are disposed to regard as an ordinary cembalo with power to shift, by a stop,

1 In the harpsichord Cristofori made for Prince Ferdinand dei Medici in 1702, recently acquired by Mr Stearns, of Detroit, and presented by him to the University of Michigan, U.S.A., there are three keyboards, thus arranged: 1st, highest keyboard, octave string only; 2nd, middle, octave and first unison; 3rd, lowest, both unisons. A harpsichord similarly designed with three keyboards, inscribed " Vincentius Sodi Florentinus Fecit, Anno Domini 1779," was presented by Mrs J. Crosby Brown to the Metropolitan Museum, New York.

2 In the Kraus Museum Catalogue (1901), No. 559.

3 See Van der Straeten, vi. 122.

from two unisons (forte) to one string (piano), at that time a Flemish practice, and most likely brought to Italy by one of the Flemish musicians who founded the Italian school of composition. About the year 1600, when accompaniment was invented for monody, large cembalos were made for the orchestras to bring out the bass part, the performer standing to play. Such an

Fig. 11. — Roman Clavicembalo by Geronimo of Bologna, 1 521;

Albert Museum.

instrument was called " archicembalo," 1 a name also applied to a large cembalo, made by Vito Trasuntino, a Venetian, in 1606, intended by thirty-one keys in each of its four octaves — one hundred and twenty-five in all — to restore the three genera of the ancient Greeks. How many attempts have been made before and since Trasuntino to purify intonation

in keyboard instruments by multiplying keys in the octave ? Simultaneously with Father Smith's well-known experiment in the Temple organ, London, there were divided keys in an Italian harpsichord to gain a separate G sharp and A flat, and a separate D sharp and E flat.

Double keyboards and stops in the long cembalo or harpsichord came into use in the Netherlands early in the 16th century. We find them imported into England. The following citations, quoted by Rimbault in his History of the Pianoforte, but imper- fectly understood by him, are from the privy purse expenses of King Henry VIII., as extracted by Sir Harris Nicolas in

1827.

" I 53° (April). Item the vj daye paied to William Lewes for ii payer of virginalls in one coffer with iiii stoppes brought to Grenewiche iii li. And for ii payer of virginalls in one coffer brought to the More other iii li."

Now the second instrument may be explained, virginals meaning any quilled instru- ment, as a double spinet, like that at Nuremberg by Martin van der Beest, the octave divi- sion being movable. But the first cannot be so explained; the four' stops can only belong to a harpsichord, and the two pair instrument to a double- keyed one, one keyboard be- ing over, and not by the side of the other. Again from the inventory after the king's death (see Brit. Mus. Harl. MS. 1419) fol. 247 —

1 Invented by Nicola Vicentino; see L'Antica musica ridotto alia moderna prattica (Rome, 1555).

Fig. 12. — Virdung's Clavicy- therium (upright Harpsichord), 1 511; (reversed facsimile).

" Two fair pair of new long Virginalls made harp-fashion of Cipres, with keys of ivory, having the King's Arms crowned and supported by his Grace's beastes within a garter gilt, standing over the keys."

We are disposed to believe that we have here another double keyboard harpsichord. Rimbault saw in this an upright instrument, such as Virdung's clavicytherium (fig. 12). Having since seen the one in the Kraus Museum, Florence, it seems that Virdung's drawing should not have been reversed; but he has mistaken the wires acting upon the jacks for strings, and omitted the latter stretched hori- zontally across the soundboard (see Clavi- cytherium). We read in an inventory of the furniture of Warwick Castle, 1584, " a faire paire of double virginalls," and in the Hengrave inventory, 1603, " one great payre of double virginalls." Hans Ruckers, the great clavisingel maker of Antwerp, lived too late to have invented the double keyboard and stops, evident adaptions from the organ, and the octave

string Up" (the invention of which was so long attributed

p to him), which incorporated the octave spinet

with the large instrument, to be henceforth playable without the co-operation of another per- former, was already in use when he began his work. Vict and Until the last harpsichord was made by Joseph Kirkman, in 1798, scarcely an instrument of the kind was constructed, except in Italy, without the octaves. The harpsichord as known throughout the 18th century, with piano upper and forte lower keyboard, was the invention of Hans Ruckers's grandson, Jean Ruckers's nephew, Jan Couchet, about 1640. Before that time the double keyboards in Flemish harpsichords were merely a transposing expedient, to change the pitch a fourth, from plagal to authentic and vice versa, while using the same groups of keys. Fortunately there is a harpsichord existing with double keyboards unaltered, date 1638, belonging to Sir Bernard Samuelson, formerly in the possession of Mr Spence, of Florence, made by Jean Ruckers, the keyboards being in their original position. It was not so much invention as beauty of tone which made the Ruckers' harpsi- chords famous. The Ruckers harpsichords in the 18th century were fetching such prices as Bologna lutes did in the 17th or Cremona violins do now. There are still many specimens existing in Belgium, France and England. Handel had a Ruckers harpsichord, now in Buckingham Palace; it completes the number of sixty-three existing Ruckers instruments catalogued in Grove's Dictionary of Music and Musicians.

After the Antwerp make declined, London became pre- eminent for harpsichords — the representative makers being Jacob Kirckmann and Burckhard Tschudi, pupils of a Flemish master, one Tabel, who had settled in London, and whose business Kirckmann continued through marriage with Tabel's widow. Tschudi was of a noble Swiss family belonging to the canton of Glarus. According to the custom with foreign names obtaining at that time, by which Haendel became Handel, and Schmidt Smith, Kirckmann dropped his final n and Tschudi became Shudi, but he resumed the full spelling in the fades of the splendid harpsichords he made in 1766 for Frederick the Great, which are still preserved in the New Palace, Potsdam. By these great makers the harpsichord became a larger, heavier-strung and more powerful instrument, and fancy stops were added to vary the tone effects. To the three shifting registers of jacks of the octave and first and second unisons were added the " lute," the charm of which was due to the favouring of high harmonics by plucking the strings close to the bridge, and the " harp," a surding or muting effect produced by impeding the vibration of the strings by contact of small pieces of buff leather. Two pedals were also used, the left-hand one a combina- tion of a unison and lute. This pedal, with the " machine " stop, reduced the upper keyboard to the lute register, the plectra of which acted upon the strings near the wrest-

plank bridge

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of the Pianoforte,

only; the lower keyboard to the second unison. Releasing the machine stop and quitting the pedal restores the first unison on both keyboards and the octave on the lower. The right-hand pedal was to raise a hinged portion of the top or cover and thus gain some power of " swell " or crescendo, an invention of Roger Plenius, 1 to whom also the harp stop may be rightly attributed. This ingenious harpsichord maker had been stimulated to gain these effects by the nascent pianoforte which, as we shall find, he was the first to make in England. The first idea of pedals for the harpsichord to act as stops appears to have been John Hayward's (PHaward) as early as 1676, as we learn from Mace's Mustek's Monument, p. 235. The French makers preferred a kind of knee-pedal arrangement, known as the " genouillere," and sometimes a more complete muting by one long strip of buff leather, the " sourdine." As an improvement upon Plenius's clumsy swell, Shudi in 1769 patented the Venetian swell, a framing of louvres, like a Venetian blind, which opened by the movement of the pedal, and becoming in England a favourite addition to harpsichords, was early transferred to the organ, in which it replaced the rude " nag's-head " swell. A French harpsichord maker, Marius, whose name is remembered from a futile attempt to design a pianoforte action, invented a folding harpsichord, the " clavecin brise," by which the instru- ment could be disposed of in a smaller space. One, which is preserved at Berlin, probably formed part of the camp baggage of Frederick the Great.

It was formerly a custom with kings, princes and nobles to keep large collections of musical instruments for actual playing purposes, in the domestic and festive music of their Cristofori's courts. There are records of their inventories, invention and it was to keep such a collection in playing order that Prince Ferdinand dei Medici engaged a Paduan harpsichord maker, Bartolommeo Cristofori, the man of genius who invented and produced the pianoforte. 2 We fortunately possess the record of this invention in a literary form from a well-known writer, the Marchese Scipione Maffei; his description appeared in the Giornale dei letterati d'ltalia, a publication conducted by Apostolo Zeno. The date of Maffei's paper was 171 1. Rimbault reproduced it, with a technically imperfect translation, in his History of the Pianoforte. We learn from it that in 1709 Cristofori had completed four " gravecembali col piano e forte " — keyed-psalteries with soft and loud — three of them being of the long or usual

harpsichord form. A synonym in Italian for the original cembalo (or psaltery) is " salterio," and if it were struck with hammers it became a " salterio tedesco " (the German hackbrelt, or chopping board), the latter being the common dulcimer. Now the first notion of a pianoforte is a dulcimer with keys, and we may perhaps not be wrong in supposing that there had been many attempts and failures to put a keyboard to a dulcimer or hammers to a harpsichord before Cristofori successfully solved the problem. The sketch of his action in Maffei's essay shows an incomplete stage in the invention, although the kernel of it — the principle of escapement or the controlled rebound of the hammer — is already there. He obtains it by a centred lever (linguetta mobile) or hopper, working, when the key is depressed by the touch, in a small projection from the centred hammer-butt. The return, governed by a spring, must have been uncertain and incapable of further regulating than could be obtained by modifying the strength of the spring.

1 Mace describes a primitive swell contrivance for an organ 65 years before Plenius took out his patent (1741).

2 The invention of the piano by Cristofori, and him alone, is now past discussion. What is still required to satisfy curiosity would be the discovery of a Fort Bien or Frederici square piano, said to ante- date by a year or two Zumpe's invention of the instrument in London. The name Fort Bien was derived, consciously or unconsciously, from the Saxon German peculiarity of interchanging B and P. Among Mozart's effects at the time of his death was a Forle-Biano mit Pedal (see Vierzehnter jdhrlicher Bericht des Mozarteum, " Salzburg," Dec. 19, 1791). Also wanted is the " old movement " for the long or grand pianos, sometimes quoted in the Broadwood day-books of the last quarter of the 18th century with reference to the displacement by the Backers English action.

Moreover, the hammer had each time to be raised the entire distance of its fall. There are, however, two pianofortes by Cristofori, dated repectively 1720 and 1726, which show a much improved, we may even say a perfected, construction, for the whole of an essential piano movement is there. The earlier instrument (now in the Metropolitan Museum, New York) has undergone considerable restoration, the original hollow hammer-head having been replaced by a modern one, and the hammer-butt, instead of being centred by means of the holes provided by Cristofori himself for the purpose, having been lengthened by a leather hinge screwed to the block; 3 but the 1726 one, which is in the Kraus Museum at Florence, retains the original leather hammer-heads. Both instruments possess alike a contrivance for determining the radius of the hopper, and both have been unexpectedly found to have the " check " (Ital. paramartello) , which regulates the fall of the hammer according to the strength of the blow

which has impelled it to the strings. After this discovery of the actual instruments of Cristofori there can be no longer doubt as to the attribution of the invention to him in its initiation and its practical comple- tion with escapement and check. To Cristofori we are indebted, not only for the power of playing piano and forte, but for the infinite variations of tone, or nuances, which render the instrument so delightful.

But his problem was not solved by the devising of a working action ; there was much more to be done to instal the pianoforte as a new musical instrument. The resonance, that most subtle

*Fig. 13. — Cristofori's Escapement Action, 1720. Restored in *875 by Cesare Ponsicchi.*

and yet all-embracing factor, had been experimentally developed to a certain perfection by many generations of spinet and harpsi- chord makers, but the resistance structure had to be thought out again. Thicker stringing, rendered indispensable to withstand even Cristofori's light hammers, demanded in its turn a stronger framing than the harpsi- chord had needed. To make his structure firm he considerably increased the strength of the block which holds the tuning- pins, and as he could not do so without materially adding to its thickness, he adopted the bold expedient of inverting it ; driving his wrest-pins, harp-fashion, through it, so that tuning was effected at their upper, while the wires were attached to their lower, ends. Then, to guarantee the security of the case, he ran an independent string – block round it of stouter wood than had been used in

Fig. 14. — Cristofori's Piano e Forte, 1726; Kraus Museum, Florence.

harpsichords, in which block the hitch-pins were driven to hold the farther ends of the strings, which were spaced at 3 Communicated by Baron Alexander Kraus (May 1908).

Silbermann.

equal distances (unlike the harpsichord), the dampers lying between the pairs of unisons.

Cristofori died in 1731. He had pupils, 1 but did not found a school of Italian pianoforte-making, perhaps from the peculiar Italian conservatism in musical instruments we have already remarked upon. The essay of Scipione Maffei was translated into German, in 1725, by Konig, the court

poet at Dres- den, and friend of Gottfried Silbermann, the renowned organ builder and harpsichord and clavichord maker. 2 Incited by this publication, and perhaps by having seen in Dresden one of Cristofori's pianofortes, Silbermann appears to have taken up the new instrument, and in 1726 to have manufactured two, which J. S. Bach, according to his pupil Agricola, pronounced failures. The trebles were too weak; the touch was too heavy. There has long been another version to this story, viz. that Silbermann borrowed the idea of his action from a very simple model contrived by a young musician named Schroeter, who had left it at the electoral court in 1721, and, quitting Saxony to travel, had not afterwards claimed it. It may be so; but Schroeter's letter, printed in Mitzler's Bibliothek, dated 1738, is not supported by any other evidence than the recent discovery of an altered German harpsichord, the hammer action of which, in its simplicity, may have been taken from Schroeter's diagram, and would sufficiently account for the condemnation of Silbermann's earliest pianofortes if he had made use of it. In either case it is easy to distinguish between the lines of Schroeter's interesting communications (to Mitzler, and later to Marpurg) the bitter disappointment he felt in being left out of the practical development of so important an instrument.

But, whatever Silbermann's first experiments were based upon, it was ascertained, by the investigations of A. J. Hipkins, that he, when successful, adopted Cristofori's pianoforte without further alteration than the compass and colour of the keys and the style of joinery of the case. In the Silbermann grand pianofortes, in the three palaces at Potsdam, known to have been Frederick the Great's, and to have been acquired by that monarch prior to J. S. Bach's visit to him in 1747, we find the Cristofori framing, stringing, inverted wrest-plank and action complete. Fig. 15 represents the instrument on which J. S. Bach played in the Town Palace, Potsdam.

Mahillon of Brussels, however, acquired a Frederici " upright grand " piano, dated 1745 (fig. 16). In Frederici's upright grand action we have not to do with the ideas of either Cristofori or Schroeter; the movement is practically identical with the hammer action of a Ger- man clock, and has its counterpart in a piano at Nuremberg; a fact which needs further elucidation. We note here the earliest example of the leather hinge, afterwards so common in piano actions and only now going out of use. Where are we to look for Schroeter's copyist if not found in Silbermann, Frederici, or, as we shall presently see, perhaps J. G. Wagner? It might be in the harpsichord we have mentioned, which, made in 171 2 by one Brock for the elector of Hanover (afterwards George I. of England), was by him presented to the Pro- ||M

testant pastor of Schulen- JL

berg, near Hanover, and 1™

has since been rudely Fig. 16— Frederici's Upright Grand

altered into a ninnnfnrte Plano Actlon > J 745- In the museum altered into a pianotorte of the Brussels Conservatoire.

(fig. 17), There ts an

altered harpsichord in the museum at Basel which appears to have been no more successful. But an attempted com- bination of harpsichord and pianoforte appears as a very early intention. The English poet Mason, the friend of Gray, bought such an instrument at Ham- burg in 1755, with " the cleverest mechanism imaginable."

It was only under date of 1763 that Schroeter 3 published for the first time a diagram of his pro-

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Fig. 15.

-Silbermann Forte Piano; Stadtschloss, Potsdam, 1746.

Frederici.

It has been repeatedly stated in Germany that Frederici, of Gera in Saxony, an organ builder and musical instrument maker, invented the square or table-shaped piano, the " fort bien," as he is said to have called it, about 1 7 58-1 760. No square piano by this maker is forthcoming, though an " upright grand " piano, made by Domenico del Mela in 1739, with an action adapted from Cristofori's has been discovered by Signor Ponsicchi of Florence. Victor

1 See Cesare Ponsicchi, // Pianoforte, sua origine e sviluppo (Florence, 1876), p. 37.

2 This translation, published at Hamburg and reproduced in extenso, may be read in Dr Oscar Paul's Geschichte des Claviers (Leipzig, 1868).

Fig. 17. — Hammer and Lifter of altered Harpsichord by Brock. Instrument in the collection of Mr Kendrick Pyne, Manchester.

posed invention, designed more than forty years before. It appeared in Marpurg's Kritische Briefe (Berlin, 1764). Now, immediately after, Johann Zumpe, a German in London, who zumpe. ' had been one of Shudi's workmen, invented or introduced (for there is some tradition that Mason had to do with the invention of it) 4 a square piano, • which was to become the most popular domestic instrument. It would seem that Zumpe was in fact not the inventor of the square piano, which appears to have been well known in Germany before his date, a discovery made by Mr George Rose. In Paul de Wit's Musical Instrument Museum — formerly "" in Leipzig, now transferred to Cologne — there is a

small square piano, 27 in. long, 10 in. wide and 4j in. high, having a contracted keyboard of 3 octaves and 2 notes. The action of this small instrument is practically identical in every detail with that of the square

pianofortes made much later by Zumpe (Paul de Wit, Katalog des musikhistorischen Museums, Leipzig, 1903. No. 55, illustration, p. 38). Inside is inscribed: " Friedrich Hildebrandt, Instrumentenmacher in Leipzig, Quergasse," with four figures

3 For arguments in favour of Schroeter's claim to the invention of the pianoforte see Dr Oscar Paul, op. cit. pp. 85-104, who was answered by A. J. Hipkins in Grove's Diet, of Music and Musicians.

4 Mason really invented the " celestina " (known as Adam Walker's patent No. 1020), as we know from the correspondence of Mary Granville. Under date of the nth of January 1775 she des cribes this invention as a short harpsichord 2 ft. long, but played with the right hand only. The left hand controlled a kind of violin bow, which produced a charming sostinente, in character of tone between the violin tone and that of musical glasses.

almost illegible. Paul de Wit refers the instrument to the middle of the 18th century. It has all the appearance of being a reduced copy of a well-established type, differing very little from the later models, except that it has no dampers. It seems probable that this small instrument is a converted clavichord, and that the action may have been suggested by Schroeter's model, left in 1721 at the Electoral Court of Saxony. Burney tells us all about Zumpe; and his instruments still existing would fix the date of the first at about 1765. Fetis narrates, however, that he began the study of the piano on a square piano made by Zumpe in 1762. In his simple "old man's head" action we have the nearest approach to a realiza- tion of Schroeter's simple idea. It will be observed that Schroeter's damper would stop all vibration at once. This defect is overcome by Zumpe's " mopstick " damper.

Another piano action had, however, come into use about that time or even earlier in Germany. The discovery of it in the simplest form is to be attributed to V. C. Mahillon, who found it in a square piano belonging to Henri Gosselin, painter, of Brussels. The principle of this action is that which was later perfected by the addition of a good escape- ment by Stein of Augsburg, and was again later experimented

Stela.

Fig. 18. — Schroeter's Model for an Action, 1721.

upon by Sebastian Erard. Its origin is perhaps due to the contrivance of a piano action that should suit the shallow clavi- chord and permit of its

transformation into a square piano; a transformation, Schroeter tells us, had been going on when he

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Fig. 19. — Zumpe's Square Piano Action, 1766.

wrote his complaint. It will be observed that the hammer is, as compared with other actions, reversed, and the axis rises with the key, necessitating a fixed means for raising the hammer, in this action effected by a rail against which the hammer

is known to remain. It is from Augsburg, dated 1780, and has Stein's escapement action, two unisons, and the knee pedal, then and later common in Germany.

Mozart's own grand piano, preserved at Salzburg, and the two grand pianos (the latest dated 1790) by Huhn of Berlin, preserved at Berlin and Charlottenburg, because they had

Fig. 21. — Stein's Action (the earliest so-called Viennese), 1780. *belonged to Queen Luise of Prussia, follow Stein in all particulars. These instruments have three unisons upwards, and the muting movement known as celeste, which no doubt Stein had also. The wrest-plank is not inverted; nor is there any imitation of Cristofori. We may regard Stein, coming after the Seven Years' War which had devastated Saxony, as the German reinventor of the grand piano. Stein's instrument was accepted as a model, as we have seen, in Berlin as well as Vienna, to which city his business was transferred in 1794 by his daughter Nanette, known as an accomplished pianist and friend of Beethoven, who at that time used Stein's pianos. She had her brother in the business with her, and had already, in 1793, married J. A. Streicher, a pianist from Stuttgart, and distin- guished as a personal friend of Schiller. In 1802, the brother and sister dissolving partnership, Streicher began himself to take his full share of the work, and on Stein's lines improved the Viennese instrument, so popular for many years and famous for its lightness of touch, which contributed to the special character of the*

Viennese school of pianoforte playing. Since 1862, when Steinway's example caused a complete revolution in German and Austrian piano-making, the old wooden cheap grand piano has died out. We will quit the early German piano with an illustration (fig. 22) of an early square piano

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Fig. 20. — Old Piano Action on the German principle of Escape- ment. Square Piano belonging to M. Gosselin, Brussels.

is jerked up. It was Stein's merit to graft the hopper principle upon this simple action; and Mozart's approbation of the inven- tion, when he met with it at Augsburg in 1777, is expressed in a well-known letter addressed to his mother. No more " blocking " of the hammer, destroying all vibration, was henceforth to vex his mind. He had found the instrument that for the rest of his short life replaced the harpsichord. V. C. Mahillon secured for his museum the only Johann Andreas Stein piano which

Fig. 22. — German Square Action, 1783. Piano by Wagner, Dresden.

action in an instrument made by Johann Gottlob Wagner of Dresden in 1783. This interesting discovery of Mahillon's introduces us to a rude imitation (in the principle) of Gristofori, and it appears to have no relation whatever to the clock-hammer motion seen in Frederici's.

Burney, who lived through the period of the displacement of the harpsichord by the pianoforte, is the only authority to whom we can refer as to the introduction of the latter instrument into England. He tells us, 1 in his gossiping way, The Piano- that the first hammer harpsichord that came to forte in England was made by an English monk at Rome, Bngland. a Father Wood, for an English gentleman, Samuel Crisp of Chesington; the tone of this instrument was superior to that produced by quills, with the added power of the shades of piano and forte, so that, although the touch and mechanism were so imperfect that nothing quick could be executed upon it, yet in a slow movement like the " Dead March " in Saul it excited wonder and delight. Fulke Greville afterwards bought this instrument for 100 guineas, and it remained unique in England for several years, until Plenius, the inventor of the lyrichord, made a pianoforte in imitation of it. In this instrument the touch was better, but the tone was inferior. We have no date for Father Wood. Plenius produced his lyrichord, a soslenente

1 Rees's New Cyclopaedia, art. " Harpsichord."

harpsichord, in 1745. When Mason imported a pianoforte in 1755, Fulke Greville's could have been no longer unique. The Italian origin of Father Wood's piano points to a copy of Cristofori, but the description of its capabilities in no way confirms this supposition, unless we adopt the very possible theory that the instrument had arrived out of order and there was on one in London who could put it right, or would perhaps divine that it was wrong. Burney further tells us that the arrival in London of J. C. Bach in 1759 was the motive for several of the second- rate harpsichord makers trying to make pianofortes, but with no particular success. Of these Americus Backers (d. 1776), . said to be a Dutchman, appears to have gained the

first place. He was afterwards the inventor of the so-called English action, and as this action is based upon Cristofori's we may suppose he at first followed Silbermann in

were the assistants of Backers in the installation of his invention. On his deathbed he commended it to Broadwood's care, but Stodart appears to have been the first to advance it — Broadwood being probably held back by his partnership with his brother- in-law, the son of Shudi, in the harpsichord business. (The elder Shudi had died in 1773.) Stodart soon made a considerable repu- tation with his " grand " pianofortes, a designation he was the first to give them. In Stodart's grand piano we first find an adapta- tion from the lyrichord of Plenius, of steel arches between the

Fig. 23. — Grand Piano Action, 1776. The Americus Backers.

English " action of

copying the original inventor. There is an old play-bill of Covent Garden in Messrs Broadwood's possession dated the 16th of May 1767, which has the following announcement: —

"End of Act 1. Miss Brickler will sing a favourite song from Judith, accompanied by Mr Dibdin on a new instrument call'd Piano Forte."

The mind at once reverts to Backers as the probable maker of this novelty. Backers's "Original Forte Piano" was played at the Thatched House in St James's Street, London, in 1773. Ponsicchi has found a Backers grand piano at Pistoria, dated that year. It was Backers who produced the action continued in the direct principle by the firm of Broadwood, or with the reversed lever and hammer-butt introduced by the firm of Collard in 1835.

The escapement lever is suggested by Cristofori's first action,

to which Backers has added a contrivance for regulating it by

means of a button and screw. The check is from

sT'dart"""" Cristofori's second action. No more durable action

has been constructed, and it has always been found

equal, whether made in England or abroad, to the demands of the

Fig. 24. — Broadwood's Grand Piano Action, 1884. English direct mechanism.

most advanced virtuosi. John Broadwood and Robert Stodart were friends, Stodart having been Broadwood's pupil; and they

Fig. 25. — Collard's Grand Piano Action, 1884. English action, with reversed hopper and contrivance for repetition added.

wrest -plank and belly-rail, bridging the gap up which the ham- mers rise, in itself an important cause of weakness. These are not found in any contemporary German instruments, but may have been part of Backers's.

Imitation of the harpsichord by "octaving" was at this time an object with piano makers. Zumpe's small square piano had met with great succcess; he was soon enabled to retire, and his imitators, who were legion, continued his model with its hand stops for the dampers and sourdine, with little change but that which straightened the keys from the divergences inherited from the clavichord. John Broadwood took this domestic instrument first in hand to improve it, and in the year 1780 succeeded in entirely reconstructing it. He transferred the wrest-plank and pins from the right-hand side, as in the clavichord, to the back of the case, an improvement universally adopted after his patent, No. 1379 of 1783, expired. In this patent we first find the damper and piano pedals, since universally accepted, but at first in the grand pianofortes only. Zumpe's action remaining with an altered damper, another inventor, John Geib, patented (No. 1 57 1 of 1786) the hopper with two separate escapements, one of which soon became adopted in the grasshopper of the square piano, it is believed by Geib himself; and Petzold, a Paris maker, appears to have taken later to the escapement effected upon the key. We may mention here that the square piano was developed and continued in England until about the year i860, when it went out of fashion.

To return to John Broadwood — having launched his recon- structed square piano, he next turned his attention to the grand piano to continue the improvement of it from the point where Backers had left it. The grand

piano was in framing and resonance entirely on the harpsichord principle, the sound-board bridge being still continued in one undivided length. The strings, which were of brass wire in the bass, descended in notes of three unisons to the lowest note of the scale. Tension was left to chance, and a reasonable striking line or place for the hammers was not thought of. Theory requires that the notes of octaves should be multiples in the ratio of 1 to 2, by which, taking the treble clef C at one foot, the lowest F of the five- octave scale would require a vibrating length between the bridges of 12 ft. As only half this length could be conveniently afforded, we see at once a reason for the above-mentioned deficiencies. Only the three octaves of the treble, which had lengths practically ideal, could be tolerably adjusted. Then the striking-line, which should be at an eighth or not less than a ninth or tenth of the vibrating length, and had never been cared for in the harpsichord, was in the lowest two octaves out of all proportion, with corresponding disadvantage to the ' tone. John Broadwood did not venture alone upon the path

towards rectifying these faults. He called in the aid of professed men of science — Tiberius Cavallo, who in 1788 published his calculations of the tension, and Dr Gray, of the British Museum. The problem was solved by dividing the sound-board bridge, the lower half of which was advanced to carry the bass strings, which were still of brass. The first attempts to equalize the tension and improve the striking-place were here set forth, to the great advantage of the instrument, which in its wooden construction might now be considered complete. The greatest pianists of that epoch, except Mozart and Beethoven, were assembled in London — Clementi, who first gave the pianoforte its own character, raising it from being a mere variety of the harpsichord, his pupils Cramer and for a time Hummel, later on John Field, and also the brilliant virtuosi Dussek and Steibelt. To please Dussek, Broadwood in 1791 carried his five-octave, F to F, keyboard, by adding keys upwards, to five and a half octaves, F to C. In 1794 the additional bass half octave to C, which Shudi had first introduced in his double harpsichords, was given to the piano. Steibelt, while in England, instituted the familiar signs for the employment of the pedals, which owes its charm to excitement of the imagination instigated by power over an acoustical phenomenon, the sympathetic vibra- tion of the strings. In 1799 Clementi founded a pianoforte manufactory, to be subsequently developed and carried on by Messrs Collard.

The first square piano made in France is said to have been constructed in 1776 by Sebastian Erard, a young Alsatian. In 1786 he came to England

and founded the London manufactory of harps and pianofortes bearing his name. That eminent mechanician and inventor is said to have at first adopted for his pianos the English models.

Erard.

was introduced by William Stodart in 1822. A pressure-bar bearing of later introduction is claimed for the French maker, Bord. The first to see the importance of iron sharing with wood (ultimately almost supplanting it) in pianoforte framing was a native of England and a civil engineer by H aw klns. profession, John Isaac Hawkins, known as the inventor of the ever-pointed pencil. He was living at Phila- delphia, U.S. A., 'when he invented and first produced the familiar

Fig. 26. — Erard's Double Escapement Action, 1884. The double escapement or repetition is effected by a spring in the balance press- ing the hinged lever upwards, to allow the hopper which delivers the blow to return to its position under the nose of the hammer, before the key has risen again.

However, in 1794 and 1801, as is shown by his patents, he was certainly engaged upon the elementary action described as appertaining to Gosselin's piano, of probably German origin. In his long-continued labour of inventing and constructing a double escapement action, Erard appears to have sought to combine the English power of gradation of tone with the German lightness of touch. He took out his first patent for a " repeti- tion" action in 1808, claiming for it " the power of giving repeated strokes without missing or failure, by very small angular motions of the key itself." He did not, however, succeed in producing his famous repetition or double escapement action until 1821; it was then patented by his nephew Pierre Erard. who, when the patent expired in England in 1835, proved a loss from the difficulties of carrying out the invention, which induced the House of Lords to grant an extension of the patent.

Erard invented in 1808 an upward bearing to the wrest-plank bridge, by means of agraffes or studs of metal through holes in which the strings are made to pass, bearing against the upper side. The wooden bridge with down-bearing strings is clearly not in relation with upward-striking hammers, the tendency of which must be to raise the strings from the bridge, to the detriment of the tone. A long brass bridge on this principle

Fig. 27. — Steinway's Grand Piano Action, 1884. The double escapement as in Erard's, but with shortened balance and usual check.

cottage pianoforte — " portable grand " as he then called it. He patented it

in America, his father, Isaac Hawkins, taking out the patent for him in England in the same year, 1800. It will be observed that the illustration here given (fig. 28) represents a wreck; but a draughtsman's restoration might be open to question.

There had been upright grand pianos as well as upright harpsichords, the horizontal instrument being turned up upon its wider end and a keyboard and action adapted to it. William Southwell, an Irish piano-maker, had in 1798 tried a similar experiment with a square piano, to be repeated in later years by W. F. Collard of London ; but Hawkins was the first to make a piano, or pianino, with the strings descending to the floor, the keyboard being raised, and this, although at the moment the chief, was not his only merit. He anticipated nearly every

"JAW'

FlG. 28. — Hawkins's Portable Grand Piano, 1800. An upright instrument, the original of the modern cottage, piano or pianino. In Messrs Broadwood's museum and unrestored.

discovery that has since been introduced as novel. His instrument (fig. 28) is in a complete iron frame, independent of the case; and in this frame, strengthened by a system of iron resistance rods combined with an iron upper bridge, his sound- board is entirely suspended. An apparatus for tuning by mechanical screws regulates the tension of the strings, which are of equal length throughout. The action, in metal supports, anticipates Wornum's in the checking, and still later ideas in a contrivance for repetition. This remarkable bundle of inven- tions was brought to London and exhibited by Hawkins himself;

but the instrument being poor in the tone failed to bring him pecuniary reward or the credit he deserved. Southwell appears to have been one of the first to profit by Hawkins's ideas by bringing out the high cabinet pianoforte, with hinged sticker action, in 1807. All that he could, however, patent in it was the simple damper action, turning on a pivot to relieve the dampers from the strings, which is still frequently used with such actions. The next steps for producing the lower or cottage upright piano were taken by Robert Wornum, who in 181 1 produced a diagonally, and in 1813 a vertically, strung one. Wornum's perfected crank action (fig. 29) was not complete until 1826, when it was patented for a cabinet piano; but it was not really introduced until three years later, when Wornum applied it to his

little " piccolo." The principle of this centred lever check action was introduced into Paris by Pleyel 1 and Pape, and thence into Germany and America.

It was not, however, from Hawkins's inven- tion that iron became introduced as essential to the structure of a pianoforte. This was due to William Allen, a young Scotsman in the employ of the Stodarts. He devised a metal system of framing intended primarily for compensation, but soon to become, in other hands, a framing for resistance. His idea was to meet the divergence in tuning caused in brass and iron strings by atmospheric changes by compensating tubes and plates of the same metals, guaranteeing their stability by a cross batoning of stout wooden bars and a metal bar across the wrest-plank. Allen, being simply a tuner, had not the full practical knowledge for carrying out the idea. He had to ally himself with Stodart's foreman, Thorn; and Allen and Thorn patented the invention in January 1820. The firm of Stodart at once acquired the patent.

We have now arrived at an important epoch in pianoforte construc- tion — the abolition, at least in England and France, of the wooden

Fig. 29. — Wornum's Upright Action, 1826. The original of the now universal crank action in upright pianos.

construction in favour of a combined construc- tion of iron and wood, the former material gradually as- serting pre-eminence. Allen's design is shown in fig. 30. The long bars shown in the diagram are really tubes fixed at one end only; those of iron lie over the iron or steel wire, while those of brass lie over the brass wire, the metal plates to which they are attached being in the same corre- spondence. At once a great advance was made in the pos- sibility of using heavier strings than could be stretched before, without danger to the dur- ability of the case and frame. The next step was in 1821, to a fixed iron string-plate, the invention of one of Broad- wood's workmen, Samuel

Fig. 30. — Allen's Compensating Grand Piano, 1820. The first complete metal framing system applied over the strings.

Herve, which was in the first instance applied to one of the square pianos of that firm. Tbe great advantage in the fixed plate was a more even solid counterpoise to the drawing or tension of the strings and the abolition of their undue length

1 Pleyel exhibited a small upright piano in Paris in 1827. Pierre Erard did not turn his attention to upright pianos until 1831.

behind the bridge, a reduction which Isaac Carter 2 had tried some years

before, but unsuccessfully, to accomplish with a plate of wood. So generally was attention now given to improved methods of resistance that it has not been found possible to de- termine who first practically introduced those long iron or steel resistance bars which are so familiar a feature in modern grand pianos. They were experimented on as substitutes for the wooden bracing by Joseph Smith in 1798; but to James Broad wood belongs the credit of trying them first above the sound-board in the treble part of the scale as long ago as 1808, and again in 1818; he did not succeed, however, in fixing them properly. The introduction of fixed resistance bars is really due to observation of Allen's compensating tubes, which were, at the same time, resisting. Sebastian and Pierre Erard seem to have been first in the field in 1823 with a complete system of nine resistance bars from treble to bass, with a simple mode of fastening them through the sound-board to the wooden beams beneath, but, although these bars appear in their patent of 1824, which chiefly concerned their repetition action, the Erards did not either in France or England claim them as of original invention, nor is there any string-plate combined with them in their patent. James Broadwood, by his patent of 1827, claimed the combination of string-plate and resistance bars, which was clearly the completion of the wood and metal instru- ment, differing from Allen's in the nature of the resistance being fixed. Broadwood, however, left the brass bars out, but added a fourth bar in the middle to the three in the treble he had previously used. It must be borne in mind that it was the trebles that gave way in the old wooden construction before the tenor and bass of the instrument. But the weight of the stringing was always increasing, and a heavy close overspinning of the bass strings had become general. The resistance bars were increased to five, six, seven, eight and, as we have seen, even nine, according to the ideas of the different English and French makers who used them in their pursuit of stability.

The next important addition to the grand piano in order of time was the harmonic bar of Pierre Erard, introduced in 1838. This was a gun-metal bar of alternate pressing and drawing power by means of screws which were tapped into the wrest- plank immediately above the treble bearings, mak- ing that part of the instru- ment nearly immovable; this favoured the produc- tion of higher harmonics to the treble notes, recog- nized in what we com- monly call " ring." A similar bar, subsequently extended by Broadwood across the entire wrest- plank, was to prevent any tendency in the wrest-plank to rise, from the combined upward drawing of the strings. A method of fastening the strings on the string-plate depending upon friction, and thus dispensing with " eyes," was a contri- bution of the Collards, who had retained James Stewart, a man of con

siderable inventive power, Fig. 31.— Broadwood's Iron Grand who had been in America Piano, 1884. Complete iron frame with with Chickering.

This diagonal resistance bar. invention was introduced in 1827. Between 1847 and 1849 2 Sometime foreman to the pianoforte maker Mott, who attracted much attention by a piano with sostenente effect, produced by a roller and silk attachments in 1817. But a sostenente piano, how- ever perfect, is no longer a true piano such as Beethoven and Chopin wrote for.

Mr Henry Fowler Broadwood, son of James, and grandson of John Broadwood, and also great-grandson of Shudi (Tschudi), invented a grand pianoforte to depend practically upon iron, in which, to avoid the conspicuous inequalities caused by the break- ing of the scale with resistance bars, there should be no bar parallel to the strings except a bass bar, while another flanged resistance bar, as an entirely novel feature, crossed over the strings from the bass corner of the wrest-plank to a point upon the string-plate where the greatest accumulation of tension strain was found. Broadwood did not continue, without some compromise, this extreme renunciation of ordinary resistance means. After the Great Exhibition of 1851 he employed an ordinary straight bar in the middle of his concert grand scale, his smaller grands having frequently two such as well as the long bass bar. After 1862 he covered his wrest-plank with a thick plate of iron into which the tuning pins screw as well as into the wood beneath, thus avoiding the crushing of the wood by the constant pressure of the pin across the pull of the string, an ultimate source of danger to durability.

The introduction of iron into pianoforte structure was differ- ently and independently effected in America, the fundamental idea there being to use a single casting for the metal plate and bars, instead of forging or casting them in separate pieces. Alphaeus Babcock was the pioneer to this kind of metal construction. He also was bitten with the compensation notion, and had cast an iron ring for a square piano in 1825, which, although not a success, gave' the clue to a single casting resis- tance framing, successfully accomplished by Conrad Meyer, in Philadelphia, in 1833, in a square piano which still exists, and was shown in the Paris Exhibition of 1878. Meyer's idea was improved upon by Jonas Chickering (1797-1853) of Boston, who applied it to the grand piano as well as to the square, and brought the principle up to a high degree of perfection — establishing by it the independent con- struction of the American pianoforte.

We have now to do with over- or cross-stringing, by which the bass division of the strings is made to cross over the tenor part of the scale in a single, double or treble disposition at diverging angles — the object being in the

first instance to get longer bass strings than are attainable in a parallel scale, and in the next to open out the scale and extend the area of bridge pressure on the sound-board. In the 1 8th century clavichords were sometimes overstrung in the lowest octave to get a clearer tone in that very indistinct part of the instrument (strings tuned an octave higher being employed). The first suggestion for the overstringing in the piano was made by the celebrated flute-player and inventor Theobald Boehm, who carried it beyond theory in London, in 1 83 1, by employing a small firm located in Cheapside, Gerock & Wolf, to make some overstrung pianos for him. Boehm expected to gain in tone; Pape, an ingenious mechanician in Paris, tried a like experiment to gain economy in dimensions, his notion being to supply the best piano possible with the least outlay of means. Tomkinson in London continued Pape's model, but neither Boehm's nor Pape's took permanent root. The Great Exhibition of 185 1 contained a grand piano, made by Lichtenthal of St Petersburg, overstrung in order to gain symmetry by two angle sides to the case. It was regarded as a curiosity only. Later, in 1855, Henry Engelhard Steinway (originally Steinweg; 1707-1871), who had emigrated from Brunswick to New York in 1849, an d had established the firm of Steinway & Sons in 1853 in that city, effected the combination

Over- stringing,

Fig. 32. — Meyer's Metal Frame for a Square Piano, 1833. In a single casting.

of an overstrung scale with the American iron frame, which exhibited in grand and square instruments shown in London in the International Exhibition of 1862, excited the attention of European pianoforte makers, leading ultimately to important results. The Chickering firm claim to have anticipated the Steinways in this invention. They assert that Jonas Chickering had begun a square piano on this combined system in 1853, but, he died before it was completed, and it was brought out later. It is often difficult to adjudicate upon the claims of inventors, so rarely is an invention the product of one man's mind alone. However, the principle was taken up and generally adopted in America and Germany, and found followers elsewhere, not only in grand but in upright pianos, to the manufacture of which it gave, and particularly in Germany, a powerful impetus.

Steinway.

, Fig. 33. — Steinway's Grand Piano, 1884. Metal framing in a single casting and overstrung.

Since 1885 the American system of a metal plate in one casting, and cross-

or over-stringing by which the spun bass strings cross the longer steel diagonally, has become general Recent in Europe with the exception of France, where structural musical taste has remained constant to the older Changes. wooden structure and parallel stringing throughout. The greater tenacity of the modern cast-steel wire favours a very much higher tension, and consequent easier production of the higher partials of the notes, permitting a sostenuto unknown to Beethoven, Schumann or Chopin. While in 1862 the' highest tension of a concert grand piano worked out at sixteen tons, since 1885 thirty tons has been recorded. Generally speaking, the rise in tension may be expressed musically by the interval of a minor third, to the great advantage of the standing in tune. First shown by Henry Steinway in the London Exhibition of 1862, this altered construction attracted extraordinary attention at Paris in 1867, and determined the German direction of manufacture and a few years later the English. What is now particularly noticeable wherever pianos are made is the higher average of excellence attained in making, as well as in piano- playing. Naturally the artistic quality, the personal note, characterizes all first-class instruments, and permits that liberty of choice which appertains to a true conception of art.

Much attention has been given of late years to the touch of pianos, to make it less tiring for the modern performer, especially since, in 1885-1886, Anton Rubinstein went through the hercu- lean feat of seven consecutive historical recitals, repeated in the capital cities and principal musical centres of Europe. For even this stupendous player a light touch was indispensable. In

the competition for power piano makers had been gradually increasing the weight of touch to be overcome by the finger, until, to obtain the faintest pianissimo from middle C, at the front edge of the key, from three to four ounces was a not uncom- mon weight. The Broadwood grand piano which Chopin used for his recitals in London and Manchester in 1848, an instrument that has never been repaired or altered, shows the resistance he required: the middle C sounds at two ounces and a half, and to that weight piano-makers have returned, regarding two ounces and three-quarters as a possible maximum. Owing to the greater substance of the hammers in the bass, the touch will

Fig. 34. — Broadwood Barless Grand.

always be heavier in that department, and lighter in the treble from the

lesser weight. In balancing the keys, allowance has to be made for the shorter leverage of the black keys. When the player touches the keys farther back the leverage is propor- tionately shortened and the weight increased, and there is also an ascending scale in the weight of the player's blow or pressure from pianissimo to fortissimo. The sum of the aggregate force expended by a pianist in a recital of an hour and a half's duration, if calculated, would be astonishing.

The most important structural change in pianos in recent years has been the rejection of support given by metal bars or struts between the metal plate to which the strings are hitched and the wrest-plank wherein the tuning-pins are inserted. These bars formed part of Willis m Allen's invention, brought forward by Stodart in 1820, and were first employed for rigidity in place of compensation by the Paris Erards two years later, Broadwood in London introducing about that time the fixed metal plate. The patent No. 1231, for the barless or open-scale piano, taken out in London in 1888 by H. J. Tschudi Broadwood, is remarkable for simplification of design as well as other qualities. Ten years elapsed after the taking out of the patent before the first barless grand was heard in public (January 1898 at St James's Hall). The metal frame, bolted in the usual manner to the bottom framing, is of fine cast steel entirely free from any transverse bars or struts, being instead turned up round the edges

to form a continuous flange, which enables the frame to bear the increased modern tension while providing additional elas- ticity and equality of vibration power throughout the scaling. The absence of barring and bracing tends to subdue the metallic quality of tone so often observable in pianofortes constructed with heavy iron frames, and the barless steel frame being so much more elastic than the latter, no loss in resonance is per- ceptible. The tone of the barless grand is of singular beauty and sonority and is even throughout the compass.

The problem of resonance — with stringed keyboard instru- ments, the reinforcement or amplification of sound — has, from the days of the lute- and spinet-makers, been empirical. With lute, guitar, and viol or violin T ˆ. the sound-box comes in, combining in the instrument R es(lne ace. the distinct properties of string and enclosed air or wind. With the spinet, harpsichord and piano we have to do chiefly with the plate of elastic wood, to amplify the initial sound of the strings; and the old plan of a thin plate of spruce, put in slightly convex and with an under-barring of wood for tension, has absorbed the attention of piano-makers. The violin belly, with its bass bar and sound post, has relation to it; but the recent invention of the Stroh violin has shown that the initial string vibrations may be passed through a bridge, be concentrated, and adequately transferred to an aluminium disk not much larger than half a crown. The piano, with its

numerous strings, cannot be so reduced, but the reinforce- ment problem is open to another solution, tentative it is true, but a possible rival. The " Gladi- ator " soundboard is the invention of Albert Schulz, late director of the piano manufactory of Ritmiiller and Sonne of Gottin- gen. Dr Moser's name has been associated with the inventor's in the English patent. In the " Gladiator " two slabs of wood, with grain of opposed direction to give the necessary tension, are glued together, and the whole system of belly bars is done away with. There is a thinning round the edge, to facilitate promptness of speech. As we are still feeling our way towards an accurate and comprehensive statement of resonance, this invention is one claiming scientific interest, as well as being of possible practical im- portance.

To return to the touch. The desirability of what is called

repetition — that the _

*. *\, ... Repetition.*

jack or sticker, which

from the depression of the key delivers the blow that raises the hammer to the strings, should never be far away from the notch or nose which receives the impulse — is as much an object of consideration with piano- makers now as it has been since Sebastian Erard began those experiments in 1808 which ended

Fig. 35. — Cary's Repeating Action. I, the butt in which the hammer is glued. E, a spring attached to the butt by a link of silk cord passed through a wire guide. The object is that though the key may be still pressed down, the hammer returns but a short distance to ensure a quick response to the blow if repeated.

in his famous " double escapement " action. The principle of this grand action, like that of Wornum patented for upright pianos in 1826, has become general. But Joseph Henry Cary in 1853 (patent No. 2283) invented a simple contrivance for repetition in all pianos, neglected at the time, and subsequently repatented and disputed over by others, which has only been preserved in the records of the patent office, while the inventor has left no other mark. But the utility of the invention has come to light. It is increasingly used in the actions of upright pianos, and, in combination with the old English grand action, is successfully competing with the Erard action proper and the simplified Herz-Erard, of late years so very generally

employed.

There has been a great change in the freer technique of piano- playing, partly favoured by the development of piano-making, but reacting and obliging the piano-makers to keep ec a que. ^^ r attention incessantly alive to the aim and re- quirements of the players. It is true that the genius of Beet- hoven dominates a technique that has become obsolete, and so completely that the adequate performance of his piano works still gives to the sense as well as the intellect the highest pleasure, but his annotations to Cramer's Studies, as preserved by Schindler, betray the close touch of the clavichord-player and the student of C. P. E, Bach's Essay on Clavichord-Playing, as well as the

Mechanics! Playing.

Fig. 36. — Modern Pianola.

A, Blowing pedals operated by feet of player connected by metal crank to feeder B, which exhausts air from bellows C, which in turn exhausts air from all working valves and bellows in Pianola.

D, is perforated roll passing over tracker bar E winding on to spool F operated by a pneumatic motor and controlled by lever G, which is connected to' metrostyle pointer H. This is used in conjunction with a specially marked roll, giving correct interpretation of tempo.

I, is channel leading to primary pneumatic J operating secondary pneumatic K, which exhausts striking motor L, connected to key lever M to depress piano key.

The themodist device consists of two small holes, one at each end of tracker bar E, connecting with pneumatic valve, which increases power of suction instantaneously when melody notes are being played, by means of an extra perforation at each outside edge of music roll D; one hole for bass melody at left, and one at right edge for treble melody.

N, is metai arm or bracket connected to lever in front for purpose of depressing sustaining pedal of piano.

O, is the governing bellows of motor for operating music-roll and prevents pace of roll being accelerated or retarded by hard or soft pedalling, thus allowing great change of expression to be made without interfering with speed of roll.

weakness as a musical instrument of the early piano. The in- ventor of a technique so original, and at the time (c. 1830) so extraordinary, as

Chopin's, sat at the piano with his elbows immovable, using, for flexibility, neither wrist nor arm. With Chopin, to play loudly was anathema. The modern free style of playing comes from Czerny — whom Beethoven despised as having no legato (Bindung) — through Liszt to the Rubinsteins and to the splendidly equipped performers of our time, to whom the pedal has become indispensable for cantabile ind effect.

The most expert performers are now rivalled technically by the recent extraordinary invasion of the American automatic piano-players — the Angelus, Pianola, Apollo, Ceci- lian, and other varieties of the same idea. The use of the perforated roll acts by means of the ingenious and indeed faultless application of pneumatic leverage to the ordinary piano, doing duty for the pianist's fingers; and it is made possible to play louder or softer, faster or slower, by mechanical arrangement. Such an instrument lacks the player's touch, which is as personal and indispensable for sympathy as the singer's voice or violinist's bow. Still, to a violinist, it is a benefit to have a correct coadjutor in a Beethoven or Brahms sonata with one of these handy companions, just as it is to a singer to have always at command the accompaniments to his or her repertory. The Apollo has the addition of a useful transposing apparatus — an aid, however, that, though often tried, has never yet been adopted; it is possibly too disturbing to the musician's ear. The mechanical tuning-pin is an analo- gous experiment which comes regularly under notice as the years go by, to be as persistently rejected. The most practical of these tuning inventions was the Alibert, shown in the Inventions Exhibition, 1885. Here, pressure upon the strings above the wrest plank bridge modified their tension after a first rough adjustment to pitch had been effected.

The perforated music-sheet, a mechanism common to piano- playing attachments as well as self-playing pianos, first appears in a French patent, 1842. A United States patent for a keyboard piano-player was issued to E. D. Bootman (Dec. 18, i860), and the first pneumatic keyboard piano-player was patented in France in 1863 by M. Fourneaux. Between 1879 and 1902 a total of 55 patents had been issued in the States. The first complete automatic piano-player ready for performance was the Angeius (No. 24799, J 897). The specification is from a communication to the British patent office by Edward Hollingworth White, of Meriden, New Haven county, Conn., U.S.A. There is a pneumatic chest, fulcrum bar, finger levers, bellows and pedals. The whole apparatus is contained in a portable cabinet mounted upon castors, so as to be conveniently moved about a room. The finger levers or key strikers correspond with a considerable portion of the manual keys or clavier of a piano. Thus the automatic piano-player comprises a portable cabinet provided with bellows and operating pedals, a pneumatic actuating mechanism, a tracker adjusted for the use of a perforated music-sheet, a pneumatic motor and

winding-roll mechanism to propel the music-sheet, and a series of finger levers operated by the pneumatic mechanism, so projecting as to overhang the piano keyboard and play upon it, with rockers or levers for depressing the piano pedals. Subsequently the apparatus was made capable of accelerating or retarding the tempo at the will of the operator. A roll of music, 12 in. wide and varying in length accord- ing to the composition, can be placed in position promptly, and when exhausted can be returned upon its original roll by a simple stop, altogether a triumph of mechanical adjustment. The Pianola followed in 1898, the Apollo 1900. The difference of all these clever contrivances is not conspicuous to the amateur.

While these allied inventions have had to do with a substitute for touch and the necessity for the persevering acquirement of a difficult technique, another, the Virgil Practice Clavier, so called after the inventor, Mr Almon Kincaid Virgil, an American music teacher, is intended to shorten the period of study by doing away with tone, so that the finger technique is acquired mechanically and unmusically, while value of tone, reading, expression, what- ever we understand by musical production exciting our re- ceptivity through the ear, is delayed until the player's hand is formed and considerably developed. The opinion of some of the very greatest pianists is brought forward as approving of the system; in the work, for instance, of Vladimir de Pachmann, whose technique was formed long before the Virgil Clavier came to Europe. Bearing in mind that the minimum weight of the touch of a concert piano is not likely to exceed three and a half ounces it is hardly likely that these skilled performers use this dumb keyboard with the graduated weight advised for advancing

pupils, namely, from five to eight ounces. It is allowed that the lightest possible touch may be used at first. One high recommen- The Dumb Nation certainly remains after all that rriay be said regard- Keyboard. m 6 Mr Virgil's invention: that it is practically silent, almost noiseless, the up and down clicks that mark the duration of finger attachment being alone audible, a boon to the unwilling hearers of ordinary piano practice, scales and five-finger exercises. Mr Virgil's invention was produced in its elementary form in 1872, the more satisfactory Practice Clavier dates from the completion of the invention, about 1890. It was brought to England in 1895 by Mr Virgil.

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PIANOSA (anc. Planasia), an island of Italy, belonging to the province of Leghorn, and forming part of the commune

of Marciana (Elba), from which it is 75 m. S.W. Pop. (1881), 774. As its name indicates, it is quite flat, and the highest point is only 95 ft. above sea-level. Its area is 6 sq. m. Augus- tus banished to it his grandson, Agrippa Postumus, and some ruins of baths near the harbour still bear his name. It changed hands more than once in the wars between Pisa and Genoa in the 1 2th and 13th centuries; from 1390 it belonged to the prince of Piombino, but was depopulated in 1553 by the Turkish fleet, and only resettled at the beginning of the 19th century. In 1857 a penal colony was established here.

PIARISTS, the popular name of a Catholic educational order, the " clerici regulares scholarum piarum," the Pauline Congrega- tion of the Mother of God, founded by Joseph Calasanza (Jose- phus a Matre Dei) at Rome in the beginning of the 17th century. Calasanza, a native of Calasanz in the province of Huesca in Aragon, was born on September 11, 1556, studied at Lerida and Alcaic, and after his ordination to the priesthood removed to Rome (1592). Here he organized, in 1607, a brotherhood which ultimately, in 1617, became an independent Congregation, numbering at

that time fifteen priests, under Calasanza as their head. To the three usual vows they added a fourth, that of devotion to the gratuitous instruction of youth. In 1622 the Congregation received a new constitution from Gregory XV., and had all the privileges of the mendicant orders conferred upon it, Calasanza being recognized as general. In 1643 the jealousy of the Jesuits led to his removal from office; owing to the same cause the Congregation was deprived of its privileges by Innocent X. in 1646. Calasanza, who died on August 22, 1648, was beatified in 1748, and canonized in 1767. The privileges of the Congregation were successively restored in 1660, 1669 and 1698. The Piarists, who are not numerous, are found chiefly in Italy, Spain, the West Indies, Germany, and especially in Austria-Hungary. Before the course of study was regulated by the state, a Piarist establishment contained nine classes: reading, writing, elementary mathematics, schola parva or Rudimentorum, schola Principiorum, Grammatica, Syntaxis, Humanitas or Poesis, Rhetorica. The general provost of the order is chosen by the general chapter, and with a general procurator and four assistants resides at Rome. The members are divided into professors, novices, and lay brethren. Their dress is very similar to that of the Jesuits; their motto " Ad majus pietatis incrementum! "

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PIATRA (Peatra), the capital of the department of Neamtzu, Rumania, situated on the left bank of the river Bistritza, where it cuts a way through the Carpathian foothills. Pop. (1900), 17,391. A branch railway passes through the town, and at Bacau meets the main line from Czernowitz in Bukowina to Galatz. The church of St John's (or the Prince's) monastery was founded in 1497 by Stephen the Great. There are saw-mills and textile factories in Piatra, which has a considerable trade in wine and timber. Neamtzu is one of the most densely forested regions in Moldavia. Lumber rafts are floated down the Bis- tritza to the Sereth, and so on to Galatz. There are several monasteries in the neighbourhood.

PIATTI, CARLO ALFREDO (1822-1901), Italian violoncellist, was born at Bergamo on the 8th of January 1822. He was the son of a violinist, and became a pupil at the conservatorio of Milan. From 1838 onwards he journeyed over Europe, playing with extraordinary success in all the important cities of the continent. In 1844 he appeared before the London

public at a Philharmonic Concert; and in 1859, on the foundation of the Popular Concerts, he took up the work with which he was most intimately connected for thirty-nine seasons, retaining until 1897 the post of first violoncello at these famous chamber concerts, during the latter

half of each series. His purely classical style, his wide musical sympathies, and his general culture and charm, would have ensured him a high position even without his marvellously finished technical skill. In 1894 the fiftieth anniversary of his first appearance in London was celebrated by a reception given in honour of him and his lifelong friend Joachim. He retired from public life, owing to a severe illness, in 1897, and until his death at Bergamo on the 19th of July 1901 divided his time between his native town and Cadenabbia. As a composer he attained a wide popularity with some graceful and popular songs; he did excellent work as an editor; and he was an enthusiastic collector and musical antiquary.

PIAUHY, or Piauhi, a north-eastern state of Brazil, bounded N. and W. by Maranhao, E. by Ceara, Pemambuco and Bahia, and S. by Bahia. It has a few miles of Atlantic coast-line on the N., and the Rio Parnahyba forms the boundary line with Maranhao throughout its entire length. Area, 116,523 sq. m.; pop. (1900), 334,328. Part of the state on the Atlantic coast and along the lower Parnahyba is low, swampy and malarial. South of this the country rises gradually to a high plateau with open campos. This plateau region is watered by numerous tributaries of the Parnahyba, chief of which are the Urussuhy, the Caninde and its tributary the Piauhy, the Gurgueia and its tributary the Parahim, which drains the large inland lake of Parnagua, the Longa, and the Poty, which has its source in the state of Ceara. The Parnahyba is navigable for boats of 3 ft. draught up to Nova York, a few miles above the mouth of the Gurgueia, and could be made navigable up to the mouth of the Balsas. The climate is hot and humid in the lowlands and along the lower Parnahyba, but in the uplands it is dry with high sun tempera- tures and cool nights. The principal industry is stock-raising, which dates from the first settlement in 1674 by Domingos Affonso Mafrense, who established here a large number of cattle ranges. A secondary industry is the raising of goats, which are able to stand neglect and a scanty food supply. Sheep have likewise been raised in Piauhy, but there is no market for mutton and their wool is not utilized. The agricultural products are cotton, sugar and tobacco. Of food-stuffs the people do not produce enough for their own consumption. Forest products include rubber, carnauba wax and dyewoods. The exports in- clude hides, skins, rubber, wax, tobacco and cotton. The capital is Therezina, on the

right bank of the Parnahyba, 250 m. above Parnahyba (town), with which it is connected by a line of light-draught river boats. The town dates from 1852, is attrac- tively situated, and is regularly laid out with broad, straight streets crossing each other at right angles. The population of the municipio in 1890 was 31,523, which includes a large rural district. Other towns, with their populations in 1890, are Oeiras (19,858), founded in 1718 under the name of Moxa; Amarante (15,525); Valenca (17,693); and CampoMaior (12,425), the figures given of population being those of the large districts (municipios) in which the towns are situated.

PIAZZA, properly an open square or place in an Italian town (Ital. piazza, from Lat. platea, broad space, Gr. irXdrus, broad). These squares were usually surrounded with a colonnade or arcade, and thus the word has been loosely applied to a covered walk or arcade along the front of a building, and in America, to the veranda of a house.

PIAZZA ARMERINA, a city of Sicily, in the province of Caltanisetta, 39 m. by road E.S.E. from that town, and the same distance S. of the railway station of Assoro-Valguarnera, 43 m. W. of Catania, situated 2360 ft. above sea-level. Pop. (1901), 24,119. It has a 15th-century cathedral, with a fine campanile, and some of the houses show Norman or Gothic architecture. The foundation of the town dates from the nth century, and the dialect is Lombard.

See Mauceri in L' 'Arte (1906), 14.

PIAZZI, GIUSEPPE (1 746-1 826), Italian astronomer, was born at Ponte, in the Valtellina, on the 16th of July 1746. He entered the Theatine Order in 1764, accepted the chair of mathematics in the academy of Palermo in 1780, and persuaded the viceroy, Prince Caramanico, to build an observatory there.

During a visit to England in 1788 he procured from Jesse Ramsden a five-foot altazimuth, with which he collected at Palermo, 1792-1813, the materials for two admirable star- catalogues, published in 1803 and 1814 respectively. While engaged on this work he discovered, on the 1st of January 1801, the first asteroid or minor planet, to which he gave the name of Ceres, the tutelary deity of Sicily. He died at Naples on the 22nd of July 1826.

See B. E. Maineri, L'Astronomo Giuseppe Piazzi (Milan, 1871); R. Wolf, Biographien, Bd. iv. p. 275 ; Monatliche Correspondenz (1810; portrait), xxi. 46; Astr. Jahrbuch, liv. 218; Bulletin des sciences (1826), vi. 339; Edin. Journal of Science (1827), vi. 193; Memoirs Roy. Astr. Soc. iii. 119; R. Grant, Hist. Phys. Astronomy, pp. 238, 510, 549.

PIBRAC, GUY DU FAUR, Seigneur de (1529-1584), French jurist and poet, was born at Toulouse, of an old family of the magistracy. He studied law there with Jacques Cujas, and afterwards at Padua. In 1548 he was admitted to the bar at Toulouse, at once took high rank, and rose to be juge-mage, an office in Languedocian cities about equal to that of prSvdt. He was selected in 1562 as one of the three representatives of the king of France at the council of Trent. In 1565 he became general advocate to the parlement of Paris, and extended the renaissance in jurisprudence which was transforming French justice. In 1573 he was sent by Charles IX. to accompany as chancellor his brother Henry (afterwards Henry III.) to Poland, of which country Henry had been elected king. Pibrac's fluent Latin won much applause from the Poles, but his second visit to Poland in 1575, when sent back by Henry III. to try to save the Crown he had deserted, was not so successful. Then he was employed in negotiations with the so-called politiques, and he managed to keep them quiet for a while. In 1578 he became the chancellor of Marguerite of France, queen of Navarre. Although he was fifty, her beauty and intellectual gifts led him to aspire to win her affection; but he was rejected with disdain. He died in 1584. His oratorical style was too pedantic, but quotations from the classics had a fresher meaning in his day. He was the friend of Ronsard, de Thou and L'Hopital, and left, among other literary remains, elegant and sententious quatraines.

PIBROCH, a form of music as played by the bagpipe. The word is derived from the Gaelic piobaireachd, the art of the bagpiper. This special form of bagpipe music, consisting of a series of variations founded on a theme, was called the urlar. These variations are generally of a martial or warlike character and include dirges and marches (see Bagpipe).

PICA, the name of the European representative of a group of diminutive rodent mammals, also known as tailless hares, mouse-hares, or piping hares, constituting the family Ochotonidae with the single genus Ochotona. From the more typical hares and rabbits they differ by the short and rounded ears, the absence of a tail, and the relatively shorter hind-limbs, as well as by complete collar-bones. The soles of the feet are hairy, and the fur is usually soft and thick; while in some cases the last upper molar is absent. Picas are inhabitants of cold and desert regions. They dwell either in the chinks between rocks, or in burrows, although one Himalayan species frequents pine-forests. They are very active, and most of the species utter a piping or whistling cry. They store up a supply of grass for winter use; in Siberia it is stacked in small heaps. The Himalayan Ochotona roylei may be seen in the daytime, but most kinds are nocturnal. The Siberian species, O. alpina, ranges into eastern Europe, but Central Asia is the headquarters, although a few species range into Arctic America and the Rocky Mountains. In size picas may be compared to guinea-pigs. Till of late

years the group has been generally known by the name of Lagomys. There are several extinct genera.

See Rodentia; also J. L. Bouhote, "The Mouse-hares of the genus Ochotona," Proc. Zool. Soc. (London, 1905). (R. L.)*

PICA, the Latin name of a genus of oscine passerine birds, the magpies. The Latin word, by interchange of initial p and k, is possibly the Gr. do-aa (see Magpie), and probably the same word as picus, the woodpecker (q.v.). Another derivation would connect both pica and picus with the root pic- of pingere, to

paint, from the parti-coloured appearance of the bird. It is this " pied " or black and white look of the page that probably gave the name of pica, " pie " or " pye," to the ordinal printed in black-letter (see Pie), and thence to a size of type in printing coming next to " English " (see Typography). The Gr. tdaaa. and Lat. pica were used of a perverted craving for unnatural foods; and the word has been adopted in this sense in modern medical terminology.

PICARD, LOUIS JOSEPH ERNEST (1821-1877), French politician, was born in Paris on the 24th of December 1821. After taking his doctorate in law in 1846 he joined the Parisian bar. Elected to the corps legislatif in 1 858, he joined the group of Emile Ollivier. But as Ollivier approximated to the government standpoint, Picard, one of the members of the group known as Les Cinq, veered more to the left. He founded in 1868 a weekly iemocratic journal, L'Electeur libre, and in 1869 was elected both for Herault and Paris, electing to sit for the former. From the 4th of September 1870 he held the portfolio of finance in the government of National Defence. In January 1871 he accompanied Jules Favre to Versailles to arrange the capitula- tion of Paris, and in the next month he became minister of the interior in Thiers's cabinet. Attacked both by the Monarchist and the Republican press, he resigned in May. Later in the year he was sent as ambassador to Brussels, where he remained for two years. On his return to Paris he resumed his seat in the Left centre, and in 1875 became life senator. He died in Paris on the 13th of May 1877.

PICARDY {La Picardie), one of the old provinces of France, bounded on the N. by Hainaut and Artois, on the E. by Cham- pagne, on the S. by the lie de France, and on the W. by Nor- mandy and the English Channel. Its maritime frontier ran from the mouth of the Aa to the cliffs of Caux, and it

included tha whole of the basin of the Somme and part of that of the Oise. The chief towns of Picardy were Amiens, Boulogne, Abbeville, Laon, Soissons, Montreuil, Peronne, Beauvais, Montdidier, St Quentin and Noyon. Its principal rivers were the Somme and the Oise. Picardy formed part of the arch- diocese of Reims, and its bishoprics were Amiens, Beauvais, Senlis, Soissons, Noyon and Laon. In 1789 the province of Picardy was covered by the three bishoprics of Amiens, Noyon and Boulogne. It was one of the provinces of the five great fermes, districts subject to the tariff of 1664, and in judicial matters was under the authority of the parlement of Paris. Its area now forms the department of the Somme and parts of the departments of Pas de Calais, Aisne and Oise.

The name of Picardy does not appear until the 13th century, but was employed by Matthew Paris and was in general use in the 14th century. In the 13th century the province was divided into the two bailliages of Amiens and Vermandois, but its regular organization as part of the kingdom of France only dates from the beginning of the 16th century. At this time it was divided into north and south Picardy. North Picardy, or Picardy proper, formed one of the great military governorships of the kingdom, while south Picardy was included in the lie de France. North Picardy was divided into upper and lower Picardy, the former being the interior part of the province and the latter the district along the coast. Upper Picardy comprised the districts of Amienois, Santerre, Vermandois and Thierache, and lower Picardy those of Ponthieu, Vimeu, Boulonnais and Calaisis, or the Pays reconquis; south Picardy included the districts of Beauvaisis, Laonnais and Soissonais.

Under the Romans Picardy was part of Belgica secunda; it was inhabited by the Morini, the Ambiani, the Veromandui, the Bellovaci and the Suessiones, whose names still appear in Amiens, Vermandois, Beauvais and Soissons. The Romans intersected the district with roads and built several castra to defend the valley of the Somme. In the 3rd century Christianity was preached here, and St Quentin and others were martyred. A little later abbeys were founded, among them Corbie, St Valery and St Riquier. Early in the 5th century Picardy became the centre of Merovingian France, for, as the historian Michelet says, "l'histoire de l'antique France semble entassee

en Picardie." Clovis had his first capital at Soissons Charle- magne had his at Noyon, and Laon was the capital and the refuge of the later and feebler Carolingian sovereigns.

During the later feudal period Picardy was the home of the counts of Vermandois, of Clermont and of Ponthieu, the sire of Coucy and others. The neighbouring dukes of Burgundy cast covetous eyes upon the province;

in 1435, by the famous treaty of Arras, the royal towns and lands in the valley of the Somme were ceded by King Charles VII. to Burgundy. However, after the death of Charles the Bold in 1477 Picardy was finally'united with the crown of France. The province was early an industrial district. Flemish immigrants brought with them the lucrative trade of weaving cloth, and the Somme towns were soon compet- ing with those of Flanders. The Picard towns were noted for their love of independence, which often brought them into collision with the kings of France during the 13th century. At a later time the province received a number of Spanish immi- grants. In the middle ages the Picards formed one of the four " nations " at the university of Paris. Picardy has a high place as a home of Gothic art, this being testified to by the superb cathedrals at Amiens and Noyon, while within its borders is the famous chateau of Coucy.

Picardy has a literature of its own, which was rich and popular in the 12th century. It suffered greatly from the ravages of the Normans, and later during the Hundred Years' War and the wars between France and Spain. Within it are the famous fields of Crecy, Agincourt and St Quentin, while it also includes places of conference like Guines, Amiens and Picquigny. The Picard had a high reputation as a soldier, being sometimes called the " Gascon of the North," and in 1558 Henry II. created the rigiment de Picardie. Many anthropological remains have been found in the Somme valley.

See Labourt, Essai sur Vorigine des villes de Picardie (Amiens, 1840); Grenier, Introduction a l'histoire generate de la province de Picardie (Amiens, 1856); and H. Carnoy, Litterature orale de la Picardie (1883).

PICARESQUE NOVEL, THE. This special form of the roman d'aventures may be defined as the prose autobiography of a real or fictitious personage who describes his experiences as a social parasite, and who satirizes the society which he has exploited. The picaroon, or rogue type, is represented by Encolpos, Ascyltos and Giton in the Satyricon which tradition ascribes to Petronius; it persists in Lucian, in the Roman de Renart, in the fableaux, and in other works popular during the middle ages; and it is incarnated in real life by such men of genius as the Archpriest of Hita and Francois Villon. But in its final form the picaresque novel may be regarded as a Spanish invention. The word picaro is first used, apparently, in a letter written by Eugenio de Salazar at Toledo on the 15th of April 1560; the etymology which derives picaro from picar (to pick up) is unsatisfactory to philologists, but it suggests the picaroon's chief business in life. In the Tesoro de la lengua castellana (Madrid, 161 1) Sebastian Covarrubias y Orozco, the best of Spanish lexicographers, describes a picaro as a man of loose character engaged in menial work and — by extension — a rascal who attains his ends by skilful dissimulation; and the earliest application of

the expression picaro to a character in fiction occurs in Mateo Aleman's Guzman de Alfarache, the first part of which was published in 1599. But a genuine novela picaresca existed in Spain before the word picaro became generally current.

The earliest specimen of the kind is La Vida de Lazarillo de Tormes y de sus fortunas y adversidades, an anonymous tale long attributed, on insufficient grounds, to Diego Hurtado de Mendoza (q.v.) . The authorship of this brilliant book and the circumstances of its publication are obscure; however, it was certainly issued not later than 1554, and was thrice reprinted before 1559, when it was placed on the Index. Imitations of so successful a story were inevitable, and so early as 1555 there appeared at Antwerp La Segunda parte de Lazarillo de Tormes, an anonymous sequel which completely misinterpreted the irreverent wit of the original. The first part had been prohibited because of its attacks on the

clergy ; in the second part the hero is presented as a devout youth transformed into a tunny at the intercession of the Virgin Mary, who thus saved him from death; after many extravagant experi- ences in this form he is restored to human shape, and proposes to teach the submarine language at the university of Salamanca. This dull performance naturally failed to please and, meanwhile, many surreptitious copies of the first part were introduced into Spain; the Inquisition finally gave up the attempt to suppress it, and in 1573 an expurgated edition was authorized. With this mutilated version the Spanish public was forced to be content during the remaining fifteen years of Philip II. 's reign. Upon the death of this sombre monarch society relaxed its hypocritical pose of austerity, and in 1599 Mateo Aleman (q.v.) published the Primera parte de Guzmdn de Alfarache. It is modelled upon Lazarillo de Tormes, being the autobiography of the son of a ruined Genoese money-lender; but the writer indulges in a tedious series of moralizings. This contrasts sharply with the laconic cynicism of Lazarillo de Tormes; but Guzmdn de Alfarache is richer in invention, in variety of episode and in the presentation of character. Its extraordinary popularity tempted a Valencian lawyer named Juan Jose Marti to publish a Segunda parte de la vida del picaro Guzmdn de Alfarache (1602) under the pseudonym of Mateo Lujan de Sayavedra. Though partly plagiarized from the manuscript of the genuine second part to which Marti had somehow obtained access, the continuation was coldly received; in 1604 Aleman brought out the true continuation, and revenged himself by introducing into the narrative a brother of Marti — a crazy picaroon of the lowest morality who ultimately commits suicide in disgust

at his own turpitude. In Lazarillo de Tormes, and still more in Guzmdn de Alfarache, it is difficult to distinguish between the invented episodes and the personal reminiscences of the authors. The Viage entretenido (1603) of Agustin de Rojas is a realistic account of the writer's experiences as a strolling actor and playwright, and, apart from its considerable literary merits, it is an invaluable contribution to the history of the Spanish stage as well as a graphic record of contemporary low life; the chief character in the book is called the caballero del milagro, an expression which recurs in Spanish literature as the equivalent of a chevalier d'induslrie.

The next in chronological order of the Spanish picaresque tales is La Picara Justina (1605), the history of a woman picaroon, which it has long been customary to ascribe to Andres Perez, a Dominican monk: there is, however, no good reason to suppose that the name of Francisco Lopez de Ubeda on the title-page is a pseudonym. The Picara Justina has wrongly acquired a reputation for indecency; its real defects are an affected diction and a want of originality. The writer frankly admits that he has taken material from the Celestina, from Lazarillo de Tormes, from Guevara, Timoneda and Aleman, and he boastfully asserts that " there is nothing good in ballad, play or Spanish poet, but that its quintessence is given here." Unluckily he has not the talent to utilize these stolen goods. The Picara Justina was thrice reprinted during the seventeenth century; this is the only basis for the untenable theory that it is the source of the cultera-nismo which reaches its climax in Gracian's treatises. The Picara Justina is now read solely by philologists in quest of verbal eccentricities. Gines de Pasamonte, one of the secondary figures in Don Quixote (1605-1615), is a singularly vivid sketch of the

Spanish rogue, and in the comedy entitled Pedro de Urdemalas Cervantes again presents a brilliant panorama of picaresque existence. He returns to the subject in Rinconete y Cortadillo and in the Coloquio de los perros, two of the best stories in the Novelas ejemplares (1613). The attraction of picaresque life was felt by pious and learned critics, and expounded in print. In the Viage del mundo (1614) the zealous missionary Pedro de Cevallos interpolates amusing tales of what befell him in the slums of Andalusia before he fled from justice to America, where he lived as a sinful soldier till his spiritual conversion was accomplished. Cristobal Suarez de Figueroa, a caustic critic of his contemporaries and an arbiter of taste, did not think it beneath his dignity to show a disconcerting acquaintance with the ways of professional rogues, and in El Pasagero (161 7) he

fills in the sketch of the knavish inn-keeper already outlined by Cervantes in Don Quixote. Evidence of the widely diffused taste for picaresque literature is found in Enriquez de Castro (1617), an interminable story written in Spanish by a Frenchman named Francois Loubayssin de Lamarca, who brought out his book at Paris; two years previously Loubayssin had introduced some clever but risky picaresque episodes in his Enganos deste siglo y historia sucedida en nuestros tiempos. But his attempt to fill a larger canvas is a complete failure.

The roving instinct of Vicente Martinez Espinel (q.v.) had led him into strange and dangerous company before and after his ordination as a priest, and a great part of his Relaciones de la vida del escudero Marcos de Obregdn (1618) is manifestly the confession of one who has regretfully outlived his pleasant vices. The baffling compound of fact with fiction and the lucid style of which Espinel was a master would suffice to win for Marcos de Obregdn a permanent place in the history of Spanish literature; the fact that it was largely utilized by Le Sage in Gil Bias has won for it a

place in the history of comparative literature. Within five months of its publication at Madrid a fragmentary French version by the Sieur d'Audiguier was issued at Paris, and at Paris also there appeared a Spanish picaresque story entitled La Desordenada codicia de los bienes ajenos (16 19), ascribed con- jecturally to a certain Dr Carlos Garcia, who reports his conver- sation with a garrulous gaol-bird, and appends a glossary of slang terms used by the confraternity of thieves; he was not, however, the first worker in this field, for a key to their gross jargon had been given ten years previously by Juan Hidalgo in his Romances de germania (1609), a series of gipsy ballads. Every kind of picaroon is portrayed with intelligent sympathy by Alonso Jeronimo de Salas Barbadillo, who is always described as a picar- esque novelist; yet he so constantly neglects the recognized conventions of the Spanish school that his right to the title is disputable. Thus in La Hija de Celestina (1612) he abandons the autobiographical form, in El Subtil cordobes Pedro de Urdemalas (1620) he alternates between dialogue and verse, and in El Necio Hen afortunado (1621) the chief character is rather a cunning dolt than a successful scoundrel. The pretence of warning new- comers against the innumerable occasions of sin in the capital is solemnly kept up by Antonio Linan y Verdugo in his Guia y avisos de for aster os que vienen d la corle (1620), but in most of his tales there is more entertainment than decorum.

The profession of a serious moral purpose on the part of many picaresque writers is often a transparent excuse for the intro- duction of unsavoury incident. There is, however, no ground for doubting the sincerity of the physician Jeronimo de Alcala Yanez y Ribera, who at one time thought of taking holy orders, and studied theology under St John of the Cross. An unusual gravity of intention is visible in Alonso, mozo de muchos amos (1624-1626), in which the repentant picaro Alonso, now a lay- brother, tells the story of his past life to the superior of the monastery in which he has taken refuge. It abounds with pointed anecdotes and with curious information concerning the Spanish gipsies, and this last characteristic explains George Borrow's hyperbolical praise of the work as competing with Don Quixote in grave humour, and as unequalled " for knowledge of the human mind and acute observation."

At about this time there lived in Spain an ex-nun named Catalina de Erauso, who fled from her convent, dressed herself in men's clothes, enlisted, was promoted ensign, and saw more of life than any other nun in history. Broadsides relating the story of this picaresque amazon were circulated during her lifetime, and the details of her adventures arrested the attention of De Quincey, who would seem to have read them in a Spanish original which has been admirably translated since then by the French poet Jose Maria de Heredia. The Spanish original, in its existing form, was issued no earlier than 1829 by Joaqufn Maria de Ferrer, whose character

is not a satisfactory guarantee of the work's authenticity; but its interest is unquestionable. No such suspicion attaches to the Vida of Alonso de Contreras, first published in 1899; this out-at-elbows soldier faithfully records how he became a knight of the Order of Santiago, how he

broke all the Commandments, how he found himself stranded in Madrid, how his fine air captivated Lope de Vega, who housed him for eight months and dedicated to him a play entitled Rey sin reino, and how the ex-captain ended by " resolving to retire to a lonely spot and there serve God as a hermit." Every convention of the picaresque novel is faithfully observed, and the incidents are no doubt substantially true, though Contreras, like most converts, judges his own past with unnecessary harshness. This subtle form of vanity also pervades the Comentarios de el desen- gahado de si mismo of Diego duque de Estrada, a rakish soldier and inferior dramatist whose autobiography (begun in 1614 and continued at intervals during many years) was not printed till i860. A far higher order of talent distinguishes the Capilulaci- ones de la vida de la corte y oficios entretenidos in ella, a bitterly unsparing review of picaresque life written by the great satirist Francisco Gomez de Quevedo y Villegas (q.v.). These thumbnail sketches were the preparatory studies worked up into the more elaborate Vida del buscdn Don Pablos (1626), the cleverest and most revolting book of its class. There is no attempt to scare the wicked by means of awful examples; the moral lesson is con- temptuously thrown aside; the veil of romance is rent in twain, and the picaro — the nephew of the public executioner — is revealed as he is, gloating in cruelty and revelling in the conscious enjoy- ment of crime. But though Quevedo detests mankind, his morose vision of existence rarely degenerates into caricature. In his repugnant, misanthropic masterpiece the sordid genius of the Spanish picaroon finds absolute expression. Nothing further remained to be done in the matter of realism; henceforth the taste for picaresque novels grew less keen, and later writers unconsciously began to humanize their personages.

The Varia fortuna del soldado Pindaro (1626) added nothing to the established reputation of Gonzalo Cispedes y Meneses. A clever anonymous story, Don Raimundo el entretenido (1627), missed fire, even though it was attributed to Quevedo; yet the author, Diego Tovar y Valderrama, compiled a sprightly diary of the events which make up a picaroon's crowded day, and failed solely because the interest in rogues was waning. Other writers of undoubted gifts were slow to see that the fashion had changed. AJonso de Castillo Solorzano (q.v.) tempted the public with three picaresque stories published in quick succession: La Nina de los embusles,

Teresa de Manzanares (1634), the Aventuras del Bachiller Trapaza (1637) and a sequel to the latter entitled La Garduna de Sevilla (1642). Clever as Castillo Solorzano's stories are, their tricky heroes and heroines were no longer welcomed with the old enthusiasm in Spain; the Bachiller Trapaza was destined to be continued by Mateo da Silva Cabral in Portugal and to be ex- ploited by Le Sage in France, and to these two accidents it owes its survival. Le Sage likewise utilized in Gil Bias episodes taken from El Siglo pitagorico (1644), the work of Antonio Enriquez Gomez (q.v.) ; but most of El Siglo pitagorico is in verse, and as it was published at Paris by an exiled Portuguese Jew, its circu- lation in Spain must have been limited. The normal primitive rogue returns to the scene in La Vida y hechos de Estebanillo Gonzalez (1646) , which is no doubt the genuine autobiography that it purports to be. If he is still occasionally read by students he owes it to the fact that Le Sage drew upon him in the Histoire d' Estevamlle Gonzdles. By the general public he is completely forgotten, and the same may be said of many subsequent Spanish writers who adopted the picaresque formula. The Buscdn is the last great book of its kind.

*Meanwhile, the rogue had forced his way into other European literatures. The Antwerp continuation (1555) of Lazarillo de Tortnes brought the original to the notice of northern readers, and this first part was translated into French by Jean Saugrain in 1561. A Dutch version was issued anonymously in 1579, a*nd it seems extremely likely that the book had been translated into English before this date. This follows from a manuscript note written by Gabriel Harvey in a copy of the Howleglass given him by Edmund Spenser; Harvey here mentions that he had received the Howleglass, Skoggin, Skelton and Lazarillo from Spenser on the 20th of December 1578. The earliest known edition of David Rowland's version of Lazarillo de Tormes is dated 1586,*

but as a licence to print a translation of this tale was granted on the 22nd of July 1568/1569, it is probable that a 1576 edition which appears in the Harleian Catalogue really existed. Numerous reprints (1599, 1639, 1669-1670, 1672, 1677) go to prove that Lazarillo de Tormes was very popular, and that Shakespeare had read it seems to follow from an allusion in Mucfi Ado about Nothing (Act. 11., sc. i.) : " Now you strike like the blind man; 't was the boy that stole your meat, and you will beat the post." To Thomas Nash belongs the credit, such as it is, of being the first to write a picaresque novel in English: The Unfortunate Traveller; or the Life of Jack Wilton (1594). Nash carefully points out that his work is a new experiment, " being a cleane different veine from other my former courses of writing " ; the only possible Spanish model that he can have had was Lazarillo de Tormes, but he has nothing of his predecessor's sardonic brevity, and he anticipates later Spanish writers by his emphatic insistence

on the pleasures of eating and drinking to repletion. Nash led the way, and a reference to " Spanish pickaroes " in Middleton's Spanish Gipsie indicates that the picaroon type had speedily become familiar enough for London playgoers to understand the reference. Interest in picaresque literature was kept alive in England by a translation (1622) of a sequel to Lazarillo de Tormes published at Paris two years earlier by Juan de Luna, who came to London to supervise the English rendering; by James Mabbe's admirable version (1622) of Guzmdn de Alfarache; by The Son of the Rogue or the Politic Thief (1638), an anonymous translation, done through the French, of La desordenada codicia; and by another anonymous translation (1657), likewise done through the French, of Quevedo's Buscdn. The result of this campaign was The English Rogue described in the Life of Meriton Latroon, a witty Extravagant (1665), by Richard Head and Francis Kirkman. The authors of this farrago insist on the English nationality of their chief character, and repudiate the idea that they are in any way indebted to Aleman and Quevedo. It is no exaggeration, however, to say that almost all the material in the text is taken from Spanish sources, and even the thieves' vocabulary is stolen from John Awdeley's Fraternitye of Vacabondes or Thomas Harman's Caveat, or Warning for Common Cursetors. It is not till Defoe's time that the English picaresque novel acquires any real importance, and the picaresque intention informs much of his work that contravenes the accepted rules of composition. There is a female picaroon in Moll Flanders, and, as Defoe read Spanish, it is conceivable that Moll Flanders was suggested by the Picara Justina; but this resemblance does not make a picaresque novel of Moll Flanders. The satirical spirit which is lacking in Moll Flanders is abundantly present in Colonel Jack, which bravely aims at exhibiting " vice and all kinds of wickedness attended with misery." Henceforward the picaroon is naturalized in English literature, and is gloriously reincarnated in Fielding's Jonathan Wild and in Smollett's Ferdinand, Count Fathom. The classification of Sterne's Tristram Shandy and Morier's Hajji Baba as picaresque novels is not strictly accurate; like Pickwick and Oliver Twist and Barry Lyndon, they are rather varieties of the peripatetic novel, but many incidents in all five recall the pleasing wiles of the Spanish picaroons.

The Dutch translation of Lazarillo de Tormes (1579) did not enable the picaresque novel to strike root in Holland, yet from it is derived one of the best Dutch comedies, De Spaensche Brabander Jorolimo (1616) of Gerbrand Bredero. A German translation of Guzmdn de Alfarache was published by Aegidius Alberitnus in 161 5; both Lazarillo and Rinconete y Cortadillo were translated by Niclas Ulenhart in 1716, and in 1627 there appeared an anonymous version of the Picara Justina. The Spanish tradition was followed by Martin Frewden in a con- tinuation (1626) of Guzmdn de Alfarache, but the only original picaresque novel of real value

in German is Grimmelhausen's Simplicissimus. The attempt to acclimatize the picaresque novel in Italy failed completely. Barezzo Barezzi translated Guzmdn de Alfarache, Lazarillo de Tormes and the Picara Justina in 1606, 1622 and 1624 respectively, and Giovanni Pietro Franco did the Buscdn into Italian in 1634; but there was no important native

development. The same may be said of Portugal; for though Silva Cabral's continuation of the Bachiller Trapaza is called the most remarkable of Portuguese picaresque romances, it is significant that O peralvilho de Cordrva remains in manuscript.

The case was very different in France, where pictures of low life had always found admirers. The first translation of Laza- rillo de Tormes appeared, as already noted, at Paris in 1561; the first translation of the first part of Guzmdn de Aljarache was issued there by Gabriel Chappuis in 1600, and the dictator Chapelain deigned to translate both parts in 1619-1620; the first translation of the Novelas ejemplares was published at Paris in 1618 by Rosset and d'Audiguier; and French translations of Marcos de Obregon, of La Desordenada codicia, of the Buscon and of the Picara Justina were printed in 1618, 1621, 1633 and 1635 respectively. Before this series of translations was completed Charles Sorel recounted in Francion (1622) " the comic mishaps which befall evil-doers," invoking the common excuse that it is " lawful to find pleasure at their expense." Many of the episodes in Francion are picaresque in tone, but unfortunately Sorel wanders from his subject, and devotes no small part of his book to satirizing literary men who, though fribbles or paupers, are in no sense picaroons. The legitimate Spanish tradition is followed more closely and with much more ability by Paul Scarron in the Roman comique (165 1), in which horseplay is predominant. The framework may have been suggested by Agustin de Rojas or Quevedo, both of whom introduce a strolling company, and such characters as Liandre, Angelique de FEtoile and Ragotin might be found in any average novela picaresca. Scarron frankly mentions Castillo Solorzano's Garduiia de Sevilla in his text, and his Precaution inutile and Les Hypocrites are convincing proofs of close study of Spanish picaresque stories: the Precaution inutile is taken from Guzmdn de Aljarache, and Les Hypocrites is merely a translation of Salas Barbadillo's Hija de Celestina. The Roman bourgeois (1666) of Antoine Furetiere is generally described as a picaresque novel, but this involves a new definition of the adjective; the Roman bourgeois includes some portraits and more satire which seem suggested by picaresque reading, but it is concerned with the foibles of the middle class rather than with the sly devices of common vagabonds.

The Spanish picaroon lives again in Gil Bias, where, with a dexterity almost rarer than original genius, a master of literary manipulation fuses materials unearthed from forgotten and seemingly worthless Spanish quarries. Gil Bias is a creation of the gentler, sunnier French spirit; like Beaumarchais' Figaro he is a Spaniard born, reared and humanized in Paris, and these two are the only picaroons whose relative refinement has not been gained at the cost of verisimilitude. But the old original scoundrel was not yet extinct: in the interval between the appear- ance of the Barbier de Seville and the Mariage de Figaro Restif de la Bretonne produced a sequel (1776) to the Buscon — a sequel so dull as to be wellnigh unreadable. The untamed Spanish rogue had become impossible towards the end of the 18th cen- tury: in the 19th he was deliberately rejected when Theophile Gautier wrote his Capitaine Fracasse. Yet Gautier conscien- tiously provides a Spanish atmosphere; the personages have Spanish names; the knife has a Spanish inscription; the host speaks French with a Spanish accent; Vallombreuse parts from the marquis with a Spanish formula: " beso a vuestra merced la mano, caballero." Capitaine Fracasse is the last important book which continues the picaresque tradition. The possibilities of picaresque fiction can never be exhausted while human nature is unchanged. Pereda (q.v.) in Pedro Sdnchez (1884) touches the old theme with the accent of modernity. It may be that instead of one continuous tale, interrupted by episodical digressions, the picaresque fiction of the future will take the form of short stories independent of one another; but this would be nothing more than a convenient mechanical device, a readjust- ment of means to ends.

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(j. F .. K .)

PICAYUNE, the name in Florida and Louisiana of the Spanish half -real, = ˆ of a dollar, b\ cents, and hence used of the United States 5 cent piece. The French picaillon, from which the word was adapted in America, was an old copper coin of Piedmont. Its origin is doubtful, but is possibly related to the Italian piccolo, little, small. In America the word is used of anything trifling, petty, mean or contemptible.

PICCANINNY, or Pickaninny, a word applied originally by the negroes of the West Indies to their babies. It is adapted either from Span, pequeno, small, or Port, pequenino, very small. The w.ord spread with the slave trade to America, and has since been adopted in Australia and in South Africa.

PICCININO, NICCOLd (1386-1444), Italian condoltiere, born at Perugia, was the son of a butcher. He began his military career in the service of Braccio da Montone, who at that time was waging war against Perugia on his own account, and at the death of his chief, shortly followed by that of the latter's son Oddo, Piccinino became leader of Braccio's condotta. After serving for a short period under the Florentine Republic, he went over to Filippo Maria Visconti, duke of Milan (1425), in whose service together with Niccold Fortebraccio he fought in the wars against the league of Pope Eugenius IV., Venice and Florence. He defeated the papal forces at Castel Bolognese (1434), but another papal army under Francesco Sforza having defeated and killed Fortebraccio at Fiordimonte, Piccinino was left in sole command, and in a series of campaigns against Sforza he seized a number of cities in Romagna by treachery. In 1439 he again fought in Lombardy with varying success against Sforza, who had now entered the Venetian service. Piccinino then induced the duke of Milan to send him to Umbria, where he hoped, like so many other condottieri, to carve out a dominion for himself. He was defeated by Sforza at Anghiari (1440), but although a number of his men were taken prisoners they were at once liberated, as was usually done in wars waged by soldiers of fortune. Again the war shifted to Lombardy, and Piccinino, having defeated and surrounded Sforza at Martinengo, demanded of the visconti the lordship of Piacenza as the price of Sforza's capture. The duke by way of reply concluded a truce with Sforza; but the latter, who, while professing to defend the Papal States, had established his own power in the Marche, aroused the fears of the pope and the king of Naples, as well as of the visconti, who gave the command of their joint forces to Piccinino. Sforza was driven from the Marche, but defeated Piccinino at Monte- lauro, and while the latter was preparing for a desperate effort against Sforza he was suddenly recalled to Milan, his army was beaten in his absence, and he died of grief and of his wounds in 1444. Short of stature, lame and in weak health, he was brave to the point of foolhardiness, wonderfully resourceful, and never overwhelmed by defeat. He was cruel and treacherous, and had no aim beyond his own

aggrandizement. Piccinino left twe sons, Jacopo and Francesco, both distinguished condottieri.

A good account of Piccinino is contained in vol. iii. of E. Ricotti's Storia delta compagnie di ventura (Turin, 1845); G. B. Poggio, Vita dt N. Piccinino (Venice, 1572); see also the general histories of the period.

PICCINNI, NICCOLA (1728-1800), Italian musical composer, was born at Bari on the 16th of January 1728. He was educated under Leo and Durante, at the Conservatory di Sant' Onofrio in Naples. For this Piccinni had to thank the intervention of the bishop of Bari, his father, although himself a musician, being opposed to his son's following a musical career. His first opera, Le Donne dispettose, was produced in 1755, and in 1760 he composed, at Rome, the chef d'auvre of his early life, La Cecchina, ossia la buona

Figliuola, an opera biiffa which attained a European success. Six years after this Piccinni was invited by Queen Marie Antoinette to Paris. He had married in 1756 his pupil Vincenza Sibilla, a singer, whom he never allowed after her marriage to appear on the stage. All his next works were successful; but, unhappily, the directors of the Grand Opera conceived the mad idea of deliber- ately opposing him to Gluck, by persuading the two composers to treat the same subject — Iphigenie en Tauride — simultaneously. The Parisian public now divided itself into two rival parties, which, under the names of Gluckists and Piccinnists, carried on an unworthy and disgraceful war. Gluck's masterly Iphi- ginie was first produced on the 18th of May 1779. Piccinni's Iphigenie followed on the 23rd of January 1781, and, though performed seventeen times, was afterwards consigned to oblivion. The fury of the rival parties continued unabated, even after Gluck's departure from Paris in 1780; and an attempt was after- wards made to inaugurate a new rivalry with Sacchini. Still, Piccinni held a good position, and on the death of Gluck, in 1787, proposed that a public monument should be erected to his memory — a suggestion which the Gluckists themselves declined to support. In 1 784 Piccinni was professor at the Royal School of Music, one of the institutions from which the Conservatoire was formed in 1794. On the breaking out of the Revolution in 1789 Piccinni returned to Naples, where he was at first well received by King Ferdinand IV.; but the marriage of his daughter to a French democrat brought him into irretrievable disgrace. For nine years after this he maintained a precarious existence in Venice, Naples and Rome; but he returned in 1798 to Paris, where the fickle public received

him with enthusiasm, but left him to starve. He died at Passy, near Paris, on the 7th of May 1800. After his death a memorial tablet was set up in the house in which he was born at Bari.

The most complete list of his works is that given in the Rivista musicale italiana, viii. 75. He produced over eighty operas, but although his later work shows the influence of the French and German stage, he belongs to the conventional Italian school of the 18th century.

See also P. L. Ginguene, Notice sur la vie et les ouvrages de Niccolo Piccinni (Paris, 1801); E. Demoiresterres, La Musique francaise au 18′ Steele Cluck et Piccinni 1774-1800 (Paris, 1872).

reign of Conradin, and again returned to Siena with the help of Charles of Anjou. But through their riotous political activity the Piccolomini lost their commercial influence, which passed into the hands of the Florentines, although they retained their palaces, castles and about twenty fiefs, some of which were in the territory of Amalfi and of great extent. Many members of the house were distinguished ecclesiastics, generals and statesmen in Siena and elsewhere; two of them were popes, viz. Aeneas Silvius Piccolomini (Pius II., q.v.) and Francesco Piccolomini (Pius III., q.v.).

See Riehter, Die Piccolomini (Berlin, 1874); A. Lisini and A. Libcrati, Albero della famiglia Piccolomini (Siena, 1899); and articles by A. Lisini in the Miscellanea storica senese, 3rd series 12, and 4th series, 17 and 189.

PICCOLOMINI, OCTAVIO, Prince (1599-1656), duke of Amalfi, Austrian general, was born on the nth of November 1599 in Florence, and carried a pike in the Spanish service at the age of sixteen. Two years later, on the outbreak of the Thirty Years' War in Bohemia, he was appointed a captain in a cavalry regiment sent by the grand duke of Tuscany to the emperor's army, and he fought with some distinction under Bucquoy at the Weisser Berg and in Hungary. In 1624 he served for a short time in the Spanish army and then as lieutenant-colonel of Pappenheim's cuirassier regiment in the war in the Milanese. In 1627 he re-entered the Imperial service as colonel and captain of the lifeguard of Wallenstein, duke of Friedland. In this capacity he soon fell into disgrace for practising extortion at Stargard in Pomerania, but his adroitness secured him, after no long interval, the rank of " colonel of horse and foot." About this time the appointment of his younger brother to the arch- bishopric of Siena secured him a position of influence in the diplomatic world. Diplomatic talent was indeed almost the birthright of a member of an Italian family, that had seen two of its members occupying the papal chair, and Wallenstein freely made use of his

subordinate's capacity for negotiation and intrigue. In the events of the Mantuan War Piccolomini took a prominent part in the dual role of the subtle diplomatist and the plundering soldier of fortune. At this moment came the invasion of Germany by Gustavus Adolphus. Piccolomini was interned at Ferrara as a hostage for the ratification of a treaty, but he

PICCOLO (Fr. petite flute octave; Ger. Pickelflote; Ital. flauto added his voice to the general call for Wallenstein's reappoint piccolo or oltavi no), a small flute of less than half the dimensions of the large concert flute and pitched an octave higher. The principles of construction and the acoustic properties are the same for the piccolo as for the flute, with the exception that the piccolo does not contain the additional tail-piece with the extra low keys, which give the flute its extended compass. As the pitch of the piccolo is so high, the highest of all orchestral instru- ments with the exception of a few harmonics on the violin, the music for it is written an octave lower than the real sounds in order to avoid the ledger lines. The piccolo has been used with good effect in imitating the whistling of the wind in storms, as in Beethoven's Pastoral Symphony, Wagner's Flying Dutchman, and in conjunction with the violins in tremolo to depict the rust- ling of the leaves in the breeze, as in the " Waldweben " in Siegfried. Verdi employed it to advantage in Falstaf as a comic agent in humorous situations. The piccolo is generally in D, sometimes in E'p or F. (K- S.)

PICCOLOMINI, the name of an Italian noble family, which was prominent in Siena (q.v.) from the beginning of the 13th century onwards. In 1220 Enghelberto d'Ugo Piccolomini received the fief of Montertari in Val d'Orcia from the emperor Frederick II. as a reward for services rendered. The family acquired houses and towers in Siena and castles in the republic's territory, including Montone and Castiglione; the latter they sold to the commune in 132 1. They obtained great wealth through trade, and established counting-houses in Genoa, Venice, Aquileia, Trieste, and in various cities of France and Germany. Supporters of the Guelph cause in the civil broils by which Siena was torn, they were driven from the city :r? the time of Manfred and their houses demolished; fcy returned in triumph after the Angevin victories, were expelled once more during the brief

ment as commander-in-chief. He was not, however, included in the list of promotions that followed the duke's reappearance, and he served under General Hoik, an officer brought in from the Danish service, in the preliminary operations and in the battle of Lutzen. His ambition was gratified when, on reading the official report of the battle, the emperor made him a generel- feldwachtmeister. At the same time, however, Hoik was created a field marshal at Wallenstein's instance, much to his rival's chagrin. In the campaign of 1633 Piccolomini held the command of an important detachment posted at Koniggratz to bar the enemy's advance

from Silesia into Bohemia. History repeated itself on the same ground in 1756, 1778 and 1866; in the first of these cases it was a Piccolomini, grand-nephew of Octavio, who commanded the Austrians; in the last the victorious Prussians passed over the estate of Nachod, which after 1635 was a heredi- tary possession of the family. In May Wallenstein entered Silesia with the main army with the unavowed object of compel- ling or persuading the electors of Brandenburg and Saxony to make common cause with the emperor against the Swedes. Piccolomini was with him, and, disapproving of the duke's policy, joined in a military conspiracy, out of which grew the drama that ended with the murder of Wallenstein on the 25th of February 1634. Piccolomini's own part in the tragedy has been set forth for all time in the pages of Schiller's Wallenstein. His reward was his marshal's baton, 100,000 gulden and the beautiful estate of Nachod in the Riesengebirge.

He was Wallenstein's pupil as well as his slayer, and had learned the art of war from that master. On the 5th-6th of September in the same year he distinguished himself amongst the foremost in the great victory of Nordlingen. Fie soon saw the necessity for following out the lines of military policy laid

down by the duke, but neither he nor Gallas, the new lieutenant- general of the emperor, possessed the capacity for carrying it out, and the war dragged on year after year. Piccolomini was in 1635 allied with a Spanish army, and bitterly complained that their sloth and caution marred every scheme that he formed. In 1638 he was made a count of the empire, and in 1639, having been fortunate enough to win a great victory over the French (relief of Thionville, July 7, 1639), he was rewarded with the office of privy councillor from the emperor and with the dukedom of Amain from the king of Spain. But instead of being appointed, as he hoped, Gallas's successor, he was called in to act as ad latus to the Archduke Leopold Wilhelm, with whom he was defeated in the second battle of Breitenfeld in 1642. After this he spent some years in the Spanish service and received as his reward the title of grandee and the order of the Golden Fleece. Some years later, having re-entered the Imperial army, he was again dis- appointed of the chief command by the selection of the brave veteran Peter Melander, Count Holzapfel. But when in 1648 Melander fell in battle at Zusmarshausen, Piccolomini was at last appointed lieutenant-general of the emperor, and thus con- ducted as generalissimo the final campaign of the weary and desultory Thirty Years' War. Three days after the commission for executing the peace had finished its labours, the emperor addressed a

letter of thanks " to the Prince Piccolomini," and awarded him a gift of 114,566 gulden. Piccolomini died on the nth of August 1656. He left no children (his only son Josef Silvio, the " Max " of Schiller's Wallenstein, was murdered by the Swedes after the battle of Jankau in 1645), and his titles and estates passed to his brother's son. With the death of the latter's nephew Octavio Aeneas Josef in 1757, the line became extinct.

PICENE, C22H14, a hydrocarbon found in the pitchy residue obtained in the distillation of peat-tar and of petroleum. This is distilled to dryness and the distillate repeatedly recrystallized from cymene. It may be synthetically prepared by the action of anhydrous aluminium chloride on a mixture of naphthalene and ethylene dibromide (R. Lespieau, bull. soc. chim., 1891, (3), 6, p. 238), or by distilling a-dinaphthostilbene (T. Hirn, Ber., 1899, 32, p. 3341). It crystallizes in large colourless plates which possess a blue fluorescence. It is soluble in concentrated sulphuric acid with a green colour. Chromic acid in glacial acetic acid solution oxidizes it to picene-quinone, picene-quinone carboxylic acid, and finally to phthalic acid. When heated with hydriodic acid and phosphorus it forms hydrides of composition C-vjHm and C22H36 (see E. Bamberger and F.D. Chattaway, Ann., 1895, 284, p. 61).

PICENUM, a district of ancient Italy, situated between the Apennines and the Adriatic, bounded N. by the Senones and S. by the Vestini. The inhabitants were, according to tradition, an offshoot of the Sabines. Strabo (v. 4, 1) gives the story of their migration, led by a woodpecker (picus), a bird sacred to Mars, from which they derived their name Picentini (cf. Dion. Hal. i. 14, 5), just as the Hirpini derived theirs from hirpus, a wolf. The district was conquered by the Romans early in the 3rd century B.C. and the whole territory was divided up among Latin-speaking settlers by the Lex Flaminia in 232 B.C. Hence we have very scanty records of any non-Latin Language that may have been spoken in the district before the 3rd century. Besides the problematic inscriptions from Belmonte, Nereto and Cupra Maritima (see Sabellic), we have one or two Latin inscriptions (probably of the 2nd or even the 1st century B.C.) which contain certain forms showing a distinct affinity with the dialect of Iguvium (cf. the name Pasdi = Latin Pacidii). Hence there seems some ground for believing that the population which the Romans dispossessed, or held in subjection, really spoke a dialect very much like that of their neighbours in Umbria.

For inscriptions, see R. S. Conway, The Italic Dialects, p. 449, where the place-names and personal names of the district will also be found; see further, Livy, Epit. xv. ; B. V. Head, Historia numorum, p. 19. (R. S. C.)

It was in Picenum, at Asculum, that the Social War broke out in 90 b.c. At the end of the war the district became connected with Pompeius Strabo, and his son Pompey the Great threw into

the scale on the side of Sulla, in 83 B.C., all the influence he possessed there, and hoped to make it a base against Caesar's legions in 49 B.C. Under Augustus it formed the fifth region of Italy, and included twenty-three independent communities, of which five, Ancona, Firmum, Asculum, Hadria and Interamnia, were coloniae. It was reached from Rome by the Via Salaria, and its branch the Via Caecilia. It was also on a branch leading from the Via Flaminia at Nuceria Camellaria to Septempeda. There were also communications from north to south; a road led from Asculum to Urbs Salvia and Ancona, another from Asculum and Firmum and the coast, another from Urbs Salvia to Potentia, while finally along the whole line of the coast there ran a prolongation of the Via Flaminia, the name of which is not known to us.

At the end of the 2nd century a.d. the north-eastern portion of Umbria was divided from the rest and acquired the name Flaminia, from the high road. For the time it remained united with Umbria for administrative purposes, but passed to Picenum at latest in the time of Constantine, and acquired the name of Flaminia et Picenum Annonarium, the main portion of Picenum being distinguished as Suburbicarium. In an inscription of A.D. 399 Ravenna is actually spoken of as the chief town of Picenum. When the exarchate of Ravenna was founded the part of Pice- num Annonarium near the sea became the Pentapolis Maritima, which included the five cities of Ariminum, Pisaurum, Fanum Fortunae, Sena Gallica and Ancona. The exarchate was seized by Luitprand in 727, and Ravenna itself was taken by Aistulf in 752. In the next year, however, the Emperor Pippin took it from him and handed it over to the pope, a grant confirmed by his son Charlemagne. (T. As.)

PICHEGRU, CHARLES (1761-1804), French general, was born at Arbois, or, according to Charles Nodier, at Les Planches, near Lons-le-Saulnier, on the 16th of February 1761. His father was a labourer, but the friars of Arbois gave the boy a good education, and one of his masters, the Pere Partault, took him to the military school of Brienne. In 1783 he entered the first regiment of artillery, where he rapidly rose to the rank of adjutant-sub- lieutenant. When the Revolution began he became leader of the Jacobin party in Besancon, and when a regiment of volun- teers of the

department of the Gard marched through the city he was elected lieutenant-colonel. The fine condition of his regiment was soon remarked in the army of the Rhine, and his organizing ability was made use of by an appointment on the staff, and finally by his promotion to the rank of general of brigade. In 1793 Carnot and Saint Just were sent to find roturier generals who could be successful; Carnot discovered Jourdan, and Saint Just discovered Hoche and Pichegru. In co-operation with Hoche and the army of the Moselle, Pichegru, now general of division and in command of the army of the Rhine, had to reconquer Alsace and to reorganize the disheartened troops of the republic. They succeeded; Pichegru made use of the elan of his soldiers to win innumerable small engagements, and with Hoche forced the lines of Haguenau and relieved Landau. In December 1793 Hoche was arrested, it is said owing in part to his colleague's machinations, and Pichegru became commander-in-chief of the army of the Rhine-and-Moselle, whence he was summoned to succeed Jourdan in the army of the North in February 1794. It was now that he fought his three great campaigns of one year. The English and Austrians held a strong position along the Sambre to the sea. After vainly attempting to break the Austrian centre, Pichegru suddenly turned their left, and defeated Clerfayt at Cassel, Menin and Courtrai, while Moreau, his second in command, defeated Coburg at Tourcoing in May 1794; then after a pause, during which Pichegru feigned to besiege Ypres, he again dashed at Clerfayt and defeated him at Rousselaer and Hooglede, while Jourdan came up with the new army of the Sambre-and-Meuse, and utterly routed the Austrians at Fleurus on the 27th of June 1794. Pichegru began his second campaign by crossing the Meuse on the 18th of October, and after taking Nijmwegen drove the Austrians beyond the Rhine. Then, instead of going into winter-quarters, he prepared his army for a winter

campaign. On the 28th of December he crossed the Meuse on the ice, and stormed the island of Bommel, then crossed the Waal in the same manner, and, driving the English before him, entered Utrecht on the 19th of January, and Amsterdam on the 20th of January, and soon occupied the whole of Holland. This grand feat of arms was marked by many points of interest, such as the capture of the Dutch ships, which were frozen in the Helder, by the French hussars, and the splendid discipline of the ragged battalions in Amsterdam, who, with the richest city of the continent to sack, yet behaved with a self-restraint which few revolutionary and Napoleonic armies attained. The former friend of Saint Just now offered his services to the Thermidorians, and after receiving from the Convention the title of " Sauveur de la Patrie," subdued the sans-culottes of Paris,

when they rose in insurrection against the Convention on 12 Germinal (April 1). Pichegru then took command of the armies of the North, the Sambre-and-Meuse, and the Rhine, and crossing the Rhine in force took Mannheim in May 1795. When his fame was at its height he allowed his colleague Jourdan to be beaten, betrayed all his plans to the enemy, and took part in organizing a conspiracy for the return of Louis XVIII., in which he was to play, for his own aggrandizement, the part that Monk played from higher motives in the English revolution. His intrigues were suspected, and when he offered his resignation to the Directory in October 1795 it was to his surprise promptly accepted. He retired in disgrace, but hoped to serve the royalist cause by securing his election to the Council of Five Hundred in May 1797. He was there the royalist leader, and planned a coup d'etat, but on the 18th Fructidor he was arrested, and with fourteen others deported to Cayenne in 1797. Escaping, he reached London in 1798, and served on General Korsakov's staff in the campaign of 1799. He went to Paris in August 1803 with Georges Cadoudal to head a royalist rising against Napoleon; but, betrayed by a friend, he was arrested on the 28th of February 1804, and on the 15th of April was found strangled in prison. It has often been asserted that he was murdered by the orders of Napoleon, but there is no foundation for the story. Pichegru 's campaigns of 1794 are marked by traits of an audacious genius which would not have disgraced Napoleon. His tremendous physical strength, the personal ascendancy he gained by this and by his powers of command made him a peculiarly formidable opponent, and thus enabled him to main- tain a discipline which guaranteed the punctual execution of his orders. He had also, strangely enough, the power of captivating honest men like Moreau. He flattered in turn Saint Just and the Terrorists, the Thermidorians and the Directors, and played always for his own hand — a strange egoist who rose to fame as the leader of an idealist and sentimental crusade.

There is no really good life of Pichegru; perhaps the best is J. M. Gassier's Vie du general Pichegru (Paris, 1815). For his treason, trial and death, consult Montgaillard's Memoires concernant la Irahison de Pichegru (1804); Fauche-Borel's Memoires; Savary, Memoires sur la mori de Pichegru (Paris, 1825); and G. Pierret, Pichegru, son proces et sa mort (1826).

PICHLER, KAROLINE (1769-1843), Austrian novelist, was born at Vienna on the 7 th of September 1769, the daughter of Hofrat Franz von Greiner, and married, in 1796, Andreas Pichler, a government official. For many years her salon was the centre of the literary life in the Austrian capital, where she died on the 9th of July 1843. Her early works, Olivier, first published anonymously (1802), Idyllen (1803) and Ruth (1805), though displaying considerable talent, were immature. She made her mark in historical romance, and the first of her novels of this class, Agathocles

(1808), an answer to Gibbon's attack on that hero in the Decline and Fall of the Roman Empire, attained great popularity. Among her other novels may be mentioned Die Belagerung Wiens (1824); Die Schweden in Prag (1827); Die W iedereroberung Ofens (1829) and Henriette von England (1832). Her last work was Zeitbilder (1840).

The edition of Karoline Pichler's Samtliche Werke (1 820-1 845) comprises no less than 60 volumes. Her Denkwurdigkeiten aus tneinem Leben (4 vols.) was published posthumously in 1844. A

selection of her narratives, Ausgewa'hUi, Erziihlungen, appeared in 4 vols, in 1894.

PICKENS, ANDREW (1739- 1817), American soldier in the War of Independence, was born in Paxton, Bucks county, Pennsylvania, on the 19th of September 1739. His family settled at the Waxhaws (in what is now Lancaster county), South Carolina, in 1752. He fought against the Cherokees in 1 76 1 as a lieutenant. In the War of Independence he rose to brigadier-general (after Cowpens) in the South Carolina militia. He was a captain among the American troops which surrendered at Ninety Six in November 1775. On the 14th of February 1779, with 300-400 men, he surprised and defeated about 700 Loyalists under Colonel Boyd on Kettle Creek, Wilkes county, Georgia; on the 20th of June he fought at Stono Ferry; and later in the same year at Tomassee defeated the Cherokees, who were allied with the British. Upon the surrender of Charleston (May 1780) he became a prisoner on parole, which he observed rigidly until, contrary to the promises made to him, Major James Dunlap plundered his plantation; he then returned to active service. His command (about 150 men) joined General Daniel Morgan immediately before the battle of Cowpens, in which Pickens commanded an advance guard (270-350 men from Georgia and North Carolina) and twice rallied the broken American militia; for his services Congress gave him a sword. With Colonel Henry Lee he harassed Lieut. -Colonel Banastre Tarleton, who was attempting to gather a Loyalist force just before the battle of Guilford Court House; and with Lee and others, he captured Augusta (June 5, 1781) after a siege. At Eutaw Springs (Sept. 8, 1781) he commanded the left wing and was wounded. In 1782 he defeated the Cherokees again and forced them to surrender all lands south of the Savannah and east of the Chattahoochee. After the war he was a member % of the South Carolina House of Representatives for a number of years, of the state Constitutional Convention in 1790, and of the National House of Representatives in 1 793-1 795. He died in Pendleton district, South Carolina, on the 17th of August 1 81 7. He had married in 1765 Rebecca Calhoun, an aunt of John C. Calhoun. Their son, Andrew Pickens (1779-1838), served as a lieutenant-colonel in the War of 181 2, and was governor of South

Carolina in 1816-1818.

PICKENS, FRANCIS WILKINSON (1805-1869), American politician, was born in Togadoo, St Paul's parish, South Carolina, on the 7th of April 1805, son of Andrew Pickens (1 779-1838) and grandson of General Andrew Pickens (1739-1817). He was educated at Franklin College, Athens, Georgia, and at South Carolina College, Columbia, and was admitted to the bar in 1829. In 1832 he was elected to the state House of Representatives, where, as chairman of a sub-committee, he submitted a report denying the right of Congress to exercise any control over the states. He was a Democratic member of the National House of Representatives in 1834-1843, served in the South Carolina Senate in 1 844-1 845, was a delegate to the Nashville Southern Convention (see Nashville, Tennessee) in 1850, was United States minister to Russia in 1858-1860, and in 1860-1862 was governor of South Carolina. He strongly advocated the secession of the Southern states; signed the South Carolina ordinance of secession; protested against Major Robert Ander- son's removal from Fort Moultrie to Fort Sumter; sanctioned the firing upon the " Star of the West " (Jan. 9, 1861), which was bringing supplies to Anderson, and the bombardment of Fort Sumter; and was a zealous supporter of the Confederate cause. At the close of his term he retired to his home at Edgefield, South Carolina, where he died on the 25th of January 1869.

PICKERING, EDWARD CHARLES (1846-), American physicist and astronomer, was born in Boston on the 19th of July 1846. He graduated in 1865 at the Lawrence Scientific School of Harvard, where for the next two years he was a teacher of mathematics. Subsequently he became professor of physics at the Massachusetts Institute of Technology, and in 1876 he was appointed professor of astronomy and director of the Harvard College observatory. In 1877 he decided to

devote one of the telescopes of the observatory to stellar photo- metry, and after an exhaustive trial of various forms of photo- meters, he devised the meridian photometer (see Photometry, Stellar), which seemed to be free from most of the sources of error. With the first instrument of this kind, having objectives of 1 -5 inch aperture, he measured the brightness of 4260 stars, including all stars down to the 6th magnitude between the North Pole and 30 declination. With the object of reaching fainter stars, Professor Pickering constructed another instrument of larger dimensions, and with this more than a million observations have been made. The first important work undertaken with it was a revision of the magnitudes given in the Bonn

Durch musterung. On the completion of this, Professor Pickering decided to undertake the survey of the southern hemisphere. An expedition, under the direction of Prof. S. I. Bailey, was accordingly despatched (1889), and the meridian photometer erected successively in three different positions on the slopes of the Andes. The third of these was Arequipa, at which a permanent branch of the Harvard Observatory is now located. The .nagnitudes of nearly 8000 southern stars were determined, including 1428 stars of the 6th magnitude and brighter. The instrument was then returned to Cambridge (U.S.A.), where the survey extended so as to include all stars of magnitude 7-5 down to -40° declination, after which it was once more sent back to Arequipa. In 1886 the widow of Henry Draper, one of the pioneers of stellar spectroscopy, made a liberal provision for carrying on spectroscopic investigations at Harvard College in memory of her husband. With Professor Pickering's usual comprehensiveness, the inquiry was so arranged as to cover the whole sky; and with four telescopes — two at Cambridge for the northern hemisphere, and two at Arequipa in Peru for the southern — to which a fine 24-in. photographic telescope was afterwards added, no fewer than 75,000 photographs had been obtained up to the beginning of 1901. These investigations have yielded many important discoveries, not only of new stars, and of large numbers of variable stars, but also of a wholly new class of double stars whose binary character is only revealed by peculiarities in their spectra. The important conclusion has been already derived that the majority of the stars in the Milky Way belong to one special type.

PICKERING, TIMOTHY (1 745-1829), American politician, was born at Salem, Massachusetts, on the 17th of July 1745. He graduated from Harvard College in 1763 and was admitted to the bar in 1768. In the pre-revolutionary controversies he identified himself with the American Whigs; in 1773 he prepared for Salem a paper entitled State of the Rights of the Colonists; in 1775 he drafted a memorial protesting against the Boston Port Bill; and in 1776 he was a representative from Salem in the General Court of Massachusetts. In 1766 he had been commis- sioned lieutenant and in 1769 captain in the Essex county militia; early in 1775 he published An Easy Plan of Discipline for a Militia, adopted in May 1776 by the General Court for use by the militia of Massachusetts, and he was elected colonel of his regiment. In the same year he became judge of the court of common pleas for Essex county, and sole judge of the maritime court for the counties of Suffolk, Essex and Middlesex. In the winter of 1776-1777 he led an Essex regiment of volunteers to New York, and he subsequently served as adjutant-general (June 1777-Jan. 1778) and later as quartermaster-general (1780- 1785); he was also a member of the board of war from the 7th of November 1777 until its abolition. With the aid of some officers he drew up, in April 1783, a plan for the settlement of the

North- West territory, which provided for the exclusion of slavery. In 1785 he became a commission merchant in Philadelphia; but in October 1786, soon after the legislature of Pennsylvania had passed a bill for erecting Wyoming district into the county of Luzerne, he was appointed prothonotary and a judge of the court of common pleas and clerk of the court of sessions and orphans' court for the new county, and was commissioned to organize the county. He offered to purchase for himself the Connecticut title to a farm, and in the following year he was appointed a member of a commission to settle claims

according to the terms of an act, of which he was the author, confirming the Connecticut titles (see Wyoming Valley and Wilkes-Barre). Pickering was a member of the Pennsylvania convention of 1787 which ratified the Federal constitution, and of the Pennsylvania constitutional convention of 1789-1790. In November 1790 he negotiated a peace with the Seneca Indians, and he concluded treaties with the Six Nations in July 1 791, in March 1792 and in November 1794. Under Washington he was postmaster-general (1791-1795), secretary of war (1795), and after December 1795 secretary of state, to which position he was reappointed (1797) by Adams. In 1783, while he was quartermaster-general, he had presented a plan for a military academy at West Point, and now, as secretary of war, he super- vised the West Point military post with a view to its conversion into a military academy. As head of the state department he soon came into conflict with Adams. His hatred of France made it impossible for him to sympathize with the president's efforts to settle the differences with that country on a peaceable basis. He used all his influence to hamper the president and to advance the political interests of Alexander Hamilton, until he was dismissed, after refusing to resign, in May 1800. Returning to Massachusetts, he served as chief justice of the court of common pleas of Essex county in 1802-1803. He was a United States senator in 1803-1811 and a member of the Federal House of Representatives in 1813-1817. As an ultra Federalist — he was a prominent member of the group known as the Essex Junto — he strongly opposed the purchase of Louisiana and the War of 18 12. He died at Salem, Massachu- setts, on the 29th of January 1829.

The standard biography is that by his son, Octavius Pickering (1791-1868), and C. W. Upham, The Life of Timothy Pickering (4 vols., Boston, 1867-1873). In the library of the Massachusetts Historical Society at Boston, there are sixty-two manuscript volumes of the Pickering papers, an index to which was published in the Collections of the society, 6th series, vol. viii. (Boston, 1896).

His son, John Pickering (1777-1846), graduated at Harvard in 1796, studied law and was private secretary to William Smith, United States

minister to Portugal, in 1 797-1 799, and to Rufus King, minister to Great Britain, in 1799-1801. He practised law in Salem and (after 1827) in Boston, where he was city solicitor in 1827-1846, and wrote much on law and especially on the languages of the North-American Indians. He was a founder of the American Oriental Society and published an excellent Comprehensive Dictionary of the Greek Language

(1826).

See Mary 0. Pickering (his daughter), Life of John Pickering (Boston, 1887).

Timothy Pickering's grandson, Charles Pickering (1805- 1878), graduated at Harvard College in 1823 and at the Harvard Medical School in 1826, practised medicine in Philadelphia, was naturalist to the Wilkes exploring expedition of 1838-1842, and in 1843-1845 travelled in East Africa and India. He wrote The Races of Man and their Geographical Distribution (1848), Geographical Distribution of Animals and Man (1854), Geographical Distribution of Plants (1861) and Chronological History of Plants (1879).

PICKERING, a market town in the Whitby parliamentary division of the North Riding of Yorkshire, England, 32 m. N.E. by N. from York by the North Eastern railway, the junction of several branch lines. Pop. of urban district (1901), 3491. The church of St Peter is Norman and transitional Norman, with later additions including a Decorated spire. It contains a remarkable series of mural paintings of the 15th century. The castle, on a hill to the north, is a picturesque ruin, the fragmentary keep and several towers remaining. The work is in part Norman, but the principal portions are of the 14th century. One of the towers is connected in name and story with Fair Rosamond. The castle was held by Earl Morcar shortly before the Conquest; it then came into the hands of the Crown, and subsequently passed to the duchy of Lancaster. It was the prison of Richard II. before his confinement at Ponte- fract. During the civil wars of the 17th century the castle was held by the Royalists, and suffered greatly in siege. The district

surrounding Pickering is agricultural, and the town is a centre of the trade. Agricultural implements are manufactured, and limestone and freestone are quarried in the vicinity.

PICKET, Piquet or Picquet (Fr. piquet, a pointed stake or peg, from piquer, to point or pierce), a military term, signifying an outpost or guard,

supposed to have originated in the French army about 1690, from the circumstance that an infantry company on outpost duty dispersed its musketeers to watch, the small group of pikemen called piquet remaining in reserve. Thus at the present day the word " picquet " is, in Great Britain at any rate, restricted to an infantry post on the outpost line, from which the sentries or " groups " of watchers are sent out. In the United States a " picket " is synonymous with a sentry, and the " picket-line " is the extreme advanced line of observa- tion of an army. In the French army picquets are called " grand' gardes," and the phrase " grand guard " is often met with in English military works of the 17th and 18th centuries. A body of soldiers held in readiness for military or police duties within the limits of a camp or barracks is also called a picquet or " inlying picquet." These special uses of the word in English are apparently quite modern (after about 1750). " Picket " in its ordinary meaning of a peg or stake, has always been in common military use, being applied variously to the picketing pegs in horse-lines, to long pointed stakes employed in palisades or stockades, to straight thin rods used for marking out the line of fire for guns, &c. Of the various spellings " picquet " is officially adopted in Great Britain and " picket " in the United States, but the latter is now invariably used when a peg or stake is meant.

Two obsolete meanings of the word should also be mentioned. The " picket " was a form of military punishment in vogue in the 16th and 17th centuries, which consisted in the offender being forced to stand on the narrow flat top of a peg for a period of time. The punishment died out in the 18th century and was so far unfamiliar by 1800 that Sir Thomas Picton, who ordered a mulatto woman to be so punished, was accused by public opinion in England of inflicting a torture akin to impalement. It was thought, in fact, that the prisoner was forced to stand on the head of a pointed stake, and this error is repeated in the New English Dictionary. In the middle of the 19th century, when elongated rifle bullets were a novelty, they were often, and especially in America, called pickets. The ordinary military use of the word gives rise to compound forms such as " picket boat " or " picket launch," large steam launch or pinnace fitted with guns-and torpedoes, and employed for watching the waters of harbours, &c. For picketing in strikes, &c, see below.

PICKETING, a term used to describe a practice resorted to by workmen engaged in trade disputes, of placing one or more men near the works of the employer with whom the dispute is pending, with the object of drawing off his hands or acquiring information useful for the purposes of the dispute. In England, under the Conspiracy and Protection of Property Act 1875, it is an offence wrongfully and without legal authority to watch or beset the house or place where another resides or works, or carries on business or happens co be, or the approach to such house or place, if the

object of the watching, &c, is to compel the person watched, &c, to abstain from doing or to do an act which he is legally entitled to do or to abstain from doing (§ 7). The definition of the offence was qualified by a proviso excluding from punishment those who attend at or near a house or place merely to obtain or communicate information, in other words what is termed peaceful picketing, without intimidation, molesta- tion or direct efforts to influence the course of a trade dispute. This enactment led to a great deal of litigation between trade unions and employers; and trade unions were in some instances restrained by injunction from picketing the works of employers, The decisions of the courts upon this subject met with severe criticism from the leaders of trade unions, and by the Trades Disputes Act 1906 the proviso above quoted was repealed, and it was declared lawful for one or more persons acting for them- selves or for a trade union or for an individual employer to attend at or near a house. &c, " if the attendance is merely for the

purpose of peacefully obtaining or communicating information or of peacefully persuading any person to work or abstain frovi working." The exact effect of this change in the law has not yet been determined by the courts, but during the Belfast carters' strike of 1907 serious riots ensued upon the efforts of the authori- ties to counteract the interference with lawful business caused by free use of picketing. The change in the law is supplemented by provisions forbidding actions against trade unions in respect of any tortious acts alleged to have been committed by or on behalf of the union.

PICKLE. In the wider sense the term " pickle " is applied to any saline or acid preservative solution; in the narrower to vegetables preserved in vinegar. The word appears to be an adaptation of Dutch pekel, brine, pickle; cf. Ger. Pokel. The ultimate origin is unknown; connexions with a supposed in- ventor's name, such as Beukeler or Bockel are mere inventions. A solution of copper or zinc sulphate is used as a " pickle " for railway-sleepers or other wood, a brine containing salt and saltpetre as a preservative for meat, lime-water as " pickle " for eggs. Domestic pickles are made from small cucumbers, onions, cauliflowers, cabbages, mangoes and unripe walnuts, by either steeping or boiling them in salt-brine and vinegar. On account of the large proportion of water natural to these vegetables, only the strongest vinegar, containing from 5 to 6 % of acetic acid, can be used. For the better kinds vinegar made from malted or unmalted barley is as a rule employed, for cheaper varieties simply dilute acetic acid obtained from acetate of lime. Sauces such as Worcestershire sauce, or Yorkshire relish, consist of fluid pickles, that is of salted and variously spiced vinegar solutions or emulsions containing tissue of vegetables (tomatoes, mushrooms, &c), or of fish (sardines or anchovies).

PICKNELL, WILLIAM LAMB (1854-1897), American land- scape-painter, was born at Hinesburg, Vermont, on the 23rd of October 1854. He was a pupil of George Inness in Rome for two years, and of J. L. Gerome in the Ecole des Beaux Arts, Paris. With Robert Wylie he worked for several years in Brittany, at Pont Aven and Concarneau, where he painted his " Route de Concarneau " (Corcoran Art Gallery, Washington, D.C.). His " Morning on the Loing " received a gold medal at the Paris Salon of 1895. In 1880 he became a member of the Society of American Artists, and in 1891 an associate of the National Academy of Design. He died at Marblehead, Massa- chusetts, on the 8th of August 1897.

PICNIC, a fcrm of entertainment in which the guests are invited to join an excursion to some place where a meal can be taken in the open air. During the first half of the 19th century the essential of a picnic was that the guests should each bring with them a contribution of provisions. At the beginning of the 19th century a society was formed in London called the " Picnic Society," the members of which supped at the Pantheon in Oxford Street, and drew lots as to what part of the meal each should supply (see L. Melville, The Beaux of the Regency, 1908, i. 222). The French form pique-nique is said to be of recent introduction in 1692 (Menage, Diet. etym.). It is doubtful whether picnic is merely a rhyming word, or can be referred to pique, pick, and nique, small coin.

PICO, an island in the Atlantic Ocean, belonging to Portugal, and forming part of the Azores archipelago. Pop. (1900), 24,028; area 175 sq. m. Pico is a conical mountain, rising to the height of 7612 ft. The soil consists entirely of pulverized lava. The so-called Fayal wine, though named after an adjacent island, was formerly produced here, and largely exported to Europe. But in 1852 the vines were attacked by the Oidium fungus and completely destroyed, while the orange-trees suffered almost as much from the Coccus hesperidum. The people were consequently forced to emigrate in great numbers, till the planting of fig-trees and apricots alleviated the evil. Pico also produces a species of wood resembling mahogany, and equal in quality to it. Its chief town is Lagens do Pico. Pop. (2975).

PICO DELLA MIRANDOLA, GIOVANNI, Count (1463-1404), Italian philosopher and writer, the youngest son of Giovanni

Francesco Pico, prince of Mirandola, a small territory about jo Italian miles west of Ferrara, afterwards absorbed in the duchy of Modena, was born on the 24th of February 1463. The family was illustrious and

wealthy, and claimed descent from Constantine. In his fourteenth year Pico went to Bologna, where he studied for two years, and was much occupied with the Decretals. The traditional studies of the place, however, disgusted him; and he spent seven years wandering through all the schools of Italy and France and collecting a precious library. Besides Greek and Latin he knew Hebrew, Chaldee and Arabic; and his Hebrew teachers (Eliah del Medigo, Leo Abarbanel and Jochanan Aleman — see L. Geiger Johann Reuchlin (i8yi),p. 167) introduced him to the Kabbalah, which had great fascinations for one who loved all mystic and theosophic speculation. His learned wanderings ended (i486) at Rome, where he set forth for public disputation a list of nine hundred questions and conclusions in all branches of philosophy and theology. He remained a year in Rome, but the disputation he proposed was never held. The pope prohibited the little book in which they were contained, and Pico had to defend the impugned theses (De otnni re scibili) in an elaborate Apologia. His personal orthodoxy was, however, subsequently vindicated by a brief of Alexander VI., dated 18th June 1493. The suspected theses included such points as the following : that Christ descended ad inferos not in His real presence but quoad ejfectum; that no image or cross should receive latreia even in the sense allowed by Thomas ; that it is more reasonable to regard Origen as saved than as damned; that it is not in a man's free will to believe or disbelieve an article of faith as he pleases. But perhaps the most startling thesis was that no science gives surer conviction of the divinity of Christ than " magia " {i.e. the knowledge of the secrets of the heavenly bodies) and Kabbalah. Pico was the first to seek in the Kabbalah a proof of the Christian mysteries and it was by him that Reuchlin was led into the same delusive path.

Pico had been up to this time a gay Italian nobleman; he was tall, handsome, fair-complexioned, with keen grey eyes and yellow hair, and a great favourite with women. But his troubles led him to more serious thoughts; and he published, in his 28th year, the Heptaplus, a mystical exposition of the creation. Next he planned a great seven-fold work against the enemies of the Church, of which only the section directed against astrology was completed. After leaving Rome he again lived a wandering life, often visiting Florence, to which he was drawn by his friends Politian and Marsilius Ficinus, and where also he came under the influence of Savonarola. It was at Florence that he died on the 17th of November 1494. Three years before his death he parted with his share of the ancestral principality, and designed, when certain literary plans were completed, to give away all he had and wander barefoot through the world preach- ing Christ. But these plans were cut short by a fever which carried him off just at the time when Charles VIII. was at Florence.

Pico's works cannot now be read with much interest, but the man himself is still interesting, partly from his influence on Reuchlin and partly from the

spectacle of a truly devout mind in the brilliant circle of half-pagan scholars of the Florentine renaissance.

His works were published at Bologna in 1496 by his nephew, Giov. Fran. Pico, with a biography, which was translated by Sir Thomas More as Life of John Picus, Earl of Mirandola, in 1510. See the essay in Walter Pater's Renaissance (1878); and the study by J. Rigg, prefixed to the reprint of More's Life in the " Tudor Library " (London, 1890).

PICRIC ACID, or Trinitrophenol, C 6 H 2 OH-(N0 2) 3 [i-2-4-6], an explosive and dyestuff formed by the action of con- centrated nitric acid on indigo, aniline, resins, silk, wool, leather, &c. It is the final product of the direct nitration of phenol, and is usually prepared by the nitration of the mixture of phenol sulphonic acids obtained by heating phenol with concentrated sulphuric acid (E. Eisenmann and A. Arche, V-ng. pat., 4539 (1889). It may also be obtained by oxidizing the symmetrical trinitrobenzene with potassium

ferricyanide in alkaline solution (P. Hepp, Ann. 1882, 215, p. 352). It crystallizes from water in yellow plates melting at 122-5° C., which sublime on careful heating, but explode when rapidly heated. It is poisonous and possesses a bitter taste, hence its name from the Greek m/cpos, bitter. It has a strongly acid reaction, being almost comparable with the carboxylic acids. By the action of bleaching powder it is converted into chlorpicrin, CCL/NCˆ. Phosphorus pentachloride converts it into picryl chloride, C6H 2 C1(N0 2)3, which is a true acid chloride, being decomposed by water with the regeneration of picric acid and the formation of hydrochloric acid ; with ammonia it yields picramide, C6H 2 NH 2 (N02)3. Silver picrate and methyl iodide yield the methyl ester, which gives with ammonia picramide. Picric acid forms many well-defined salts, of a yellow or red-brown colour. It also yields crystalline compounds with many aromatic hydrocarbons and bases. It imparts a yellow colour to wool and silk. The chief application of picric acid and its salts is in the manufacture of explosives. When ignited, picric acid burns quietly with a smoky flame, and it is very difficult to detonate by percussion; its salts, however, are more readily detonated. The more important picric powders are melinite, believed to be a mixture of fused picric acid and gun-cotton; lyddite, the British service explosive, and shimose, the Japanese powder, both supposed to be identical with the original melinite; Brugere's powder, a mixture of 54 parts of ammonium picrate and 45 parts of saltpetre; Designolle' s powder, composed of potassium picrate, saltpetre and charcoal; and emmensile, invented by Stephen Emmens, of the United States It may be detected by the addition of an aqueous solution of potassium cyanide, with which it gives a violet-red coloration, due to the formation of isopurpuric acid. R. Anschutz [Ber., 1884, 17, p. 439) estimates picric acid by precipitation with acridine.

PICRITE (from. Gr. wiKpos, bitter, because these rocks are rich in magnesia, a base which forms bitter salts), a rock belong- ing to the ultrabasic group, and consisting mainly of olivine and augite often with hornblende and biotite and a greater or less amount of plagioclase felspar. The picrites are of " hypabyssal " origin and in their natural occurrence are connected with dolerites (diabases and teschenites). The distinction between them and the peridotites, which have an essentially similar composition, is not easy to define, but the peridotites accompany the true plutonic rocks, such as gabbro, norite and pyroxenite, are often very coarsely crystalline, and form large bosses and laccolites, while the picrites usually are found in sills or intrusive sheets.

In hand specimens the picrites are dark green to black; the absence or scarcity of lath-shaped plagioclase felspars distin- guishes them from diabases and they rarely have the lustre- mottling which is a characteristic of the peridotites. Since they contain much olivine they readily decompose, passing into deep green and brown incoherent masses in which are embedded rounded lumps of harder consistency. They have a high specific gravity (about 3-0) and may be distinctly magnetic, because they are rich in iron ores. Porphyritic structure is rare though occurring sometimes in the rocks known as picrite-porphyrites; the phenocrysts are olivine and augite. There is seldom any fine-grained or glassy groundmass, and the typical micro- structure is holocrystalline, moderately fine grained and some- what poikilitic. Olivine is abundant in rounded pale green crystals. It may form one half of the rock but rarely more than this. The augite is generally brown or reddish-brown, sometimes violet, and tends to enclose the olivine, yielding poecilitic aggre- gates. Brown hornblende often occurs as marginal growths around the pyroxene, and may be so abundant as to replace augite to a large extent; rocks of this class are known as hornblende-picrites. Bright green or pale-green hornblende are less frequently present, and in many cases are really of secondary origin. Deep brown biotite is a frequent accessory mineral and both biotite and hornblende sometimes enclose olivine. A small amount of basic plagioclase occurs in many picrites; apatite, iron oxides, chromite and spinels are minor ingredients seldom altogether absent.

The minerals of picrites are very frequently decomposed. Serpentine partly or wholly replaces olivine, forming radiate fibrous masses which are green, yellow or red in microscopic sections. Sometimes hornblende (pilite), talc, chlorite and mica appear as secondary products after olivine. The augite passes into chlorite or into green fibrous or platy amphibole. Horn- blende

and biotite are often fresh when the other components are much altered. The felspar is rarely in good preservation but yields epidote, prehnite, sericite, kaolin; calcite and analcite are abundant in some weathered picrites.

Rocks of this type are well represented in Great Britain. In the central valley of Scotland several masses of picrite have been discovered, always in close association with olivine-diabase and teschenite. One of these forms the island of Inchcolm in the Firth of Forth, another lies near Bathgate (in Linlithgowshire), and there are others at Aberdour (Fife), Ardrossan and Barnton (Midlothian). They belong to the great series of Carboniferous eruptive rocks ot the Scottish midland valley. These picrites are not known to be represented in England, but, on the other hand, there are Devonian picrites in Devon and Cornwall as basic members of the diabase and proterobase series of these counties. Some of them contain much augite like the picrite (often called palaeopicrite as being of palaeozoic age) at Menheniot Station in Cornwall and the picrite of Highweek near Newton Abbot in Devonshire. Others are horn- blende-picrites like that of Cartuther near St Germans, Cornwall. Hornblende-picrite occurs also in the island of Sark and several beautiful examples have been described from Anglesey and from Penarfynnydd in North Wales and from Wicklow in Ireland. Picrites occur in several parts of Germany, notably in the Devonian rocks of the Fichtelgebirge and Nassau, where they accompany diabases and proterobases like those of Cornwall and Devonshire. In Silesia and Moravia picrites are found with teschenites like those of Central Scotland. In some of the continental picrites ensta- tite is present but is rare. In North America picrites occur among the igneous rocks on the Hudson river and in Alabama and Montana. (J. S. F.)

PICROTOXIN, a neutral principle obtained from the Cocculus indicus, which is the fruit of the Anamirta paniculate. It is used in medicine externally as an antiparasitic. Internally it has been successfully used to check the night-sweats of phthisis. In large doses it is a powerful poison, causing unconsciousness, delirium, convulsions, gastro-enteritis and stimulation of the respiratory centre followed by paralysis, from which death sometimes results. Formerly low class publicans sometimes added Cocculus indicus berries to beer to increase the intoxicat- ing effects. Its chemical formula is GsHieOe" H 2 0.

PICTET DE LA RIVE, FRANQOIS JULES (1809-1872), Swiss zoologist and palaeontologist, was born in Geneva on the 27th of September 1809. He graduated B. es Sc. at Geneva in 1829, and pursued his studies for a short time at Paris, where under the influence of Cuvier, de Blainville and others, he worked at natural history and comparative anatomy. On his return to Geneva in 1830 he assisted A. P. de Candolle by giving demon-

strations in comparative anatomy. Five years later, when de Candolle retired, Pictet was appointed professor of zoology and comparative anatomy. In 1846 his duties were restricted to certain branches of zoology, including geology and palaeontology, and these he continued to teach until 1859, when he retired to devote his energies to the museum of natural history and to special palaeontological work. He was rector of the academy from 1847 to 1850, and again from 1866 to 1868. He was for many years a member of the Representative Council of Geneva, and in 1862 President of the Constituent Assembly. His earlier published work related chiefly to entomology, and included Recherches pour servir a I'histoire et d I'anatomie des Phryganides (1834) and two parts of Histoirs naturelle, generate et particuliere des insectes Neuropteres (1842-1845). Feeling the want of a hand-book, he prepared his Traite elementaire de paleontologie (4 vols. 1 844-1 846). In the first edition Pictet, while adopting the hypothesis of successive creations of species, admitted that some may have originated through the modification of pre- existing forms. In his second edition (1853-1857) he enters further into the probable transformation of some species, and discusses the independence of certain faunas, which did not appear to have originated from the types which locally preceded them. He now directed his attention to the fossils of his native country, more especially to those of the Cretaceous and Jurassic

strata, and in 1854 he commenced the publication of his great work, MaUriaux pour la paleontologie suisse, a series of quarto memoirs, of which six were published (1854-1873). In this work Pictet was aided by E Renevier, G. Campiche, P. de Loriol and others, Pictet also brought out Melanges paleonto- logiques (1863-1868). He died at Geneva on the 15th of March

1872.

Obituary by W. S. Dallas, Quart. J own. Ceol. Soc. (1873), vol. xxix.
PICTON, SIR. THOMAS (1758-1815), British general, was the younger son of Thomas Picton, of Poyston, Pembrokeshire, where he was born in August 1758. In 177 1 he obtained an ensign's commission in the 12th regiment of foot, but he did not join until two years afterwards. The regiment was then stationed at Gibraltar, where he remained until he was made captain in the 75th in January 1778, when he returned to England. The regiment was disbanded five years later. On the occasion of its disbandment Picton quelled a mutiny amongst the men by his prompt personal action and courage, and was promised a majority in reward for his conduct. This, however, he did not receive, and after living in retirement on his father's estate for nearly twelve years, he went out to the West Indies in 1794 on the strength of a slight acquaintance with Sir John Vaughan, the commander-in-chief, who made him his aide-de- camp and

gave him a captaincy in the 17th foot. Shortly afterwards he was promoted major. Under Sir Ralph Aber- cromby, who succeeded Vaughan in 1795, he took part in the capture of St Lucia (for which he was promoted lieutenant- colonel) and in that of St Vincent. After the reduction of Trinidad Abercromby made him governor of the island. He administered the island with such success that the inhabitants petitioned against the retrocession of the island to Spain, and their protest, with Picton's and Abercromby's representations, ensured the retention of Trinidad as a British possession. In October 1801 he was gazetted brigadier-general. But by this time the rigour of his government, as reported by his enemies, had led to a demand by humanitarians at home for his removal. Colonel William Fullarton (1754-1808) procured the appointment of a commission to govern the island, of which he himself was the senior member, Captain (afterwards Admiral Sir Samuel) Hood the second, and Picton himself the junior. Picton there- upon tendered his resignation, and Hood, as soon as the nature of Fullarton's proceedings became obvious, followed his example (1803). On his way home Picton took part with great credit in military operations in St Lucia and Tobago. Realizing, however, that the attacks upon him were increasing in virulence, he quickly returned to England, and in December 1803 he was arrested by order of the privy council. He was tried in the court of king's bench before Lord Ellenborough in 1806 on a charge of unlawfully applying torture to extort a confession from Luise Calderon, a mulatto woman of loose character who was charged, along with a man, with robbery. The torture consisted in compelling the woman to stand on one leg on a flat- headed peg for one hour. The punishment was ordered under Spanish law (which in default of a fresh code Picton had been appointed to administer in 1801) by the local alcalde, and approved by Picton. On these grounds the court returned a merely technical verdict of guilty, which was superseded in 1808 by a special verdict on retrial. It should be mentioned that the inhabitants of the island, who had already given him a sword of honour, and had petitioned the king not to accept his resignation, subscribed £4000 towards his legal expenses, which sum Picton contributed in return to the relief of the suffering caused by a widespread fire in Port of Spain. He had meanwhile been promoted major-general, and in 1809 he had been governor of Flushing during the Walcheren expedition. In 1810, at Wellington's request, he was appointed to command a division in Spain. For the remaining years of the Peninsular War, Picton was one. of Wellington's principal subordinates. The commander-in-chief, it is true, never reposed in him the confidence that he gave to Beresford Hill and Craufurd. But in the resolute, thorough and punctual execution of a well- defined task Picton had no superior in the army. His debut,

iswing partly to his naturally stern and now embittered temper, and partly to the difficult position in which he was placed, was unfortunate. On the Coa in July 1810 Craufurd's division became involved in an action, and Picton, his nearest neighbour, refused to support him, as Wellington's direct orders were to avoid an engagement. Details of the incident will be found in Oman, Peninsular War, vol. iii. Shortly after this, however, at Busaco, Picton found and used his first great opportunity for distinction. Here he had a plain duty, that of repulsing the French attack, and he performed that duty with a skill and resolution which indicated his great powers as a troop-leader. After the winter in the lines of Torres Vedras, he added to his reputation and to that of his division, the 3rd, at Fuentes d'Onor. In September he was given the local rank of lieutenant-general, and in the same month the division won great glory by its rapid and orderly retirement under severe pressure from the French cavalry at El Bodon. In October Picton was appointed to the colonelcy of the 77th regiment. In the first operations of 1812 Picton and Craufurd, side by side for the last time, stormed the two breaches of Ciudad Rodrigo, Craufurd and Picton's second in command, Major-GeneralMackinnon, being mortallywounded. At Badajoz, a month later, the successful storming of the fortress was due to his daring self-reliance and penetration in converting the secondary attack on the castle, delivered by the 3rd division, into a real one. He was himself wounded in this terrible engage- ment, but would not leave the ramparts, and the day after, having recently inherited a fortune, he gave every survivor of his command a guinea. His wound, and an attack of fever, compelled him to return .to England to recruit his health, but he reappeared at the front in April 1813. While in England he was invested with the collar and badge of a K.B. by the prince regent, and in June he was made a lieutenant-general in the army. The conduct of the 3rd division under his leadership at the battle of Vittoria and in the engagements in the Pyrenees raised his reputation as a resolute and skilful fighting general to a still higher point. Early in 1814 he was offered, but after consulting Wellington declined, the command of the British forces operating on the side of Catalonia. He thus bore his share in the Orthez campaign and in the final victory before Toulouse.

On the break-up of the division the officers presented Picton with a valuable service of plate, and on the 24th of June 1814 he received for the seventh time the thanks of the House of Commons for his great services. Somewhat to his disappoint- ment he was not included amongst the generals who were raised to the peerage, but early in 1815 he was made a G.C.B. When Napoleon returned from Elba, Picton, at Wellington's request, accepted a high command in the Anglo-Dutch army. He was severely wounded at Quatre Bras on the 16th of June, but concealed his wound and

retained command of his troops, and at Waterloo on the 18th, while repulsing with impetuous valour " one of the most serious attacks made by the enemy on our position," he was shot through the head by a musket ball. His body was brought home to London, and buried in the family vault at St George's, Hanover Square. A public monument was erected to his memory in St Paul's Cathedral, by order of parliament, and in 1823 another was erected at Carmarthen by subscription, the king contributing a hundred guineas thereto.

See Rob.inson's Life of Sir Thomas Picton (London, 1836), with which, however, compare Napier's and Oman's histories of the Peninsular War as to controversial points.

PICTOU, a seaport, port of entry, and capital of Pictou county, Nova Scotia, 90 m. N.E. by N. of Halifax, on a branch of the Intercolonial railway. Pop. (1001), 3235. It has several valuable industries, and is the shipping port for the adjacent coal-mines. The Academy, founded in 1818, played an important part in the early educational history of the province, and still enjoys a high reputation.

PICUS, in Roman mythology, originally the woodpecker, the favourite bird and symbol of Mars as the god of both nature and war. He appears later as a spirit of the forests, endowed with the gift of prophecy, haunting springs and streams, with

a special sanctuary in a grove on the Aventine. As a god oi agriculture, especially connected with manuring the soil, he is called the son of Stercutus (from slercus, dung, a name of Saturn). Again, Picus is the first king of Latium, son of Saturn and father of Faunus. Virgil (Aen. vii. 170) describes the reception of the ambassadors of Aeneas by Latinus in an ancient temple or palace, containing figures of his divine ancestors, amongst them Picus, famous as an. augur and soothsayer. Ac- cording to Ovid (Metam. xiv., 320), Circe, while gathering herbs in the forest, saw the youthful hero out hunting, and immediately fell in love with him. Picus rejected her advances, and the goddess in her anger changed him into a woodpecker, which pecks impotently at the branches of trees, but still retains prophetic powers. The purple cloak which Picus wore fastened by a golden clasp is preserved in the plumage of the bird. In the simplest form of art, he was represented by a wooden pillar surmounted by a woodpecker; later, as a young man with the bird upon his head.

Picumnus is merely another form of Picus, and with him is associated his brother and double Pilumnus. Picumnus, a rustic deity (like Picus) and husband of Pomona, is specially concerned with the manuring of the soil and hence called Sterquilinus, while Pilumnus is the inventor of the

pounding of grain, so named from the pestle (pilum) used by bakers. Under a different aspect, the pair were regarded as the guardians of women in childbed and of new-born children. Before the child was taken up and formally recognized by the father, a couch was set out for them in the atrium, where their presence guarded it from all evil. Augustine (De civitate dei, vi. 9) mentions a curious custom: to protect a woman in childbed from possible violence on the part of Silvanus, the assistance of three deities was invoked — Intercidona (the hewer), Pilumnus (the pounder) and Deverra (the sweeper). These deities were symbolically represented by three men who went round the house by night. One smote the threshold with an axe, another with a pestle, the third swept it with a broom — three symbols of culture (for trees were hewn down with the axe, grain pounded with the pestle, and the fruits of the field swept up with the broom) which Silvanus could not endure.

PIDGIN [or Pjgeon] ENGLISH, the lingua franca of the sea- ports of China, the Straits Settlements in the Far East, con- sisting in a jargon of corrupted English words with some inter- mixture of Portuguese and Malay, following Chinese idiomatic usage. It is employed as a means of communication between foreigners and the native Chinese. The word " pidgin " is the Chinese corruption of " business."

PIE. (1) The name of the bird more generally known as the magpie (q.v.). The word comes through the French from Lat. pica (q.v.). It is probably from the black and white or spotted appearance of the bird that the name "pie" or "pye" (Lat. pica) was given to the ordinal, a table or calendar which supplemented that which gave the services for the fixed festivals, &c, and pointed out the effect on them of the festivals rendered movable by the changing date of Easter. An English act of 1549 (3 & 4 Edw. VI. c. 10) abolished " pie" with manuals, legends, primers and other service books. The parti-coloured appearance of the magpie also gives rise to the term " piebald," applied to an animal, more particularly a horse, which is marked with large irregular patches of white and black; where the colour is white and some colour other than black, the more appropriate word is " skew-bald," i.e. marked with " skew " or irregular patches. (2) A dish made of meat, fish or other ingredients, also of vegetables or fruit, baked in a covering of pastry; in English usage, where " fruit " is the ingredient, the dish is generally called a " tart," except in the case of " apple-pie." The word appears early in the 14th century of meat or fish pies.*

The expression " to eat humble-pie," i.e. to make an apology, to retract or recant, is a facetious adaptation of " umbles " (O. Fr. nombles, connected with Lat. lumbus, loin or umbilicus, navel), the inner parts of a deer, to " humble " (Lat. humilis, lowly). An " umble-pie," made of the inner parts of a deer or other animal, was once a favourite dish. " Printers' pie," i.e. a

mass of confused type, is a transferred sense of " pie," the dish, or of " pie," the ordinal, from the difficulty of decipherment.

PIEDMONT (Ital. Piemonte; Low Lat. Pedemons and Pede- montium), a territorial division (compartimento) of northern

Italy, bounded N. by Switzerland, W. by France, S. by Liguria and E. by Lombardy. Physically it may be briefly described as the upper gathering-ground and valley of the river Po, enclosed on all sides except towards the Lombard plain by the vast semicircle of the Pennine, Graian, Cottian, Maritime and Ligurian Alps. In 1859 it was divided into the four provinces of Alessandria, Cuneo, Novara and Torino (Turin). It has an area of 11,340 sq. m. The people are chiefly engaged in agri- culture — growing wheat, maize and rice, chestnuts, wine and hemp; in the reeling and throwing of silk and in the manu- facture of cotton, woollens and clothing; there are also considerable manufactures at Turin, Savigliano, &c. The Piedmontese dialect has been rather strongly influenced by French. The chief towns in the several provinces are as follows, with their communal populations in 1901: Alessandria (72,109), Asti (39,251), Casale Monferrato (31,370), Novi Ligure (17,868)', Tortona (17,419), Acqui (13,940), Valenza (10,956), Ovada (10,284); total of province 825,745, number of communes 343; Cuneo (26,879), Mondovi (18,982), Fossano (18,175), Savigliano (17,340), Saluzzo (16,028), Bra. (15,821), Alba (13,637), Boves (10,137); total of province 670,504, number of com- munes 263; Novara (44,249), Vercelli (30,470), Biella (19,267) Trino (12,138), Borgomanero (16,131); total of province 763,830; number of communes, 437; Turin (329,691), Pinerolo (18,039), Carmagnola (11,721), Ivrea (11,696), Moncalieri (11,467); total of province 1,147,414; number of communes, 442. The total population of Piedmont was 2,738,814 in 1859, and in 1901 3,407,493. The large number of communes is noticeable, as in Lombardy, and points to a village life which, owing to greater insecurity and the character of the country, is not to be found in central and southern Italy as a whole. There are numerous summer resorts in the Alpine valleys. The chief railway centres are Turin, communicating with the Mont Cenis line, and with the Riviera by the railway over the Col di Tenda (in process of construction), Novara, Vercelli, Asti, Alessandria, Novi. The communications with Liguria are difficult owing to the approach of the mountains to the coast, and the existing lines from Genoa to Turin and Milan are hardly sufficient to cope with the traffic. Piedmont in Roman times until 49 B.C. formed a part of Gallia Transpadana, and in Augustus' division of Italy formed with what

was later known as Lombardy the nth region. It formed part of the Lombard kingdom, and it was not till about A.D. 1000 that the house of Savoy (q.v.) arose. The subsequent history of Piedmont is that of its dynasty.

PIENZA, a town of Tuscany, Italy, in the province of Siena, 9 m. west of the town of Montepulciano by road, 1611 ft. above sea-level. Pop. (1901), 2730 (town); 3836 (commune). The place was originally called Corsignano and owes its present name to Aeneas Silvius Piccolomini, Pope Pius II. (q.v.) who was born here in 1405. The buildings which he caused to be erected by Bernardo Rossellmo in 1460-1463 form a noble group of early Renaissance architecture round the Piazza del Duomo. The latter retains Gothic details in the interior, but the facade is simple Renaissance work. The ether three sides are occupied by the episcopal and municipal palaces, and the Palazzo Picco- lomini; the last, resembling the Palazzo Rucellai at Florence, is the finest, and in front of it is a beautiful fountain. The episcopal palace contains a museum with some fine ecclesiastical vestments, enamels and other works of art.

PIER (older forms per or pere, from Med. Lat. pera; the word is of obscure origin, and the connexion with Fr. pierre, Lat. pctra, stone, is doubtful; equivalents are Fr. piedroit, pilier, trumcau; Ital. pila; Ger. Pfeiler), the term given in architecture to a vertical support in masonry or brickwork, usually rect- angular on plan, which carries an arch or superstructure. The term is also sometimes given to the great circular columns which in some English cathedrals and churches carry the nave arches. In early Christian churches, when antique columns, such as abounded in Rome, were not procurable, square piers took the place of columns and sometimes alternated with them. The introduction of vaulting, however, in the nth century, neces- sitated a support of much greater dimensions than those which

had been deemed sufficient when the roof was of timber only, and led to the development of the compound or clustered pier. To give extra support to the subordinate arches of the nave arcade, semicircular shafts or pilasters were added, carried up to the transverse and diagonal ribs of the main vault. In Romanesque work the pier was generally square on plan with semicircular shafts attached, the angles of the pier being worked with smaller shafts. As the rings or orders of the nave arches increased in number, additional shafts were added to carry tnem, and the pilaster facing the nave had central and side shafts rising to carry the transverse and diagonal ribs of the vault ; this development of the compound pier obtains throughout Europe in all vaulted structures. In the Early English period the piers become loftier and lighter, and in most important buildings a series of clustered columns, frequently of marble, are placed side by side, sometimes

set at intervals round a circular centre, and sometimes almost touching each other. These shafts are often wholly detached from the central pier, though grouped round it, in which case they are almost always of Purbeck or Bethersden marbles. In Decorated work the shafts on plan are very often placed round a square set angle-wise, or a lozenge, the long way down the nave; the centre or core itself is often worked into hollows or other mouldings, to show between the shafts, and to form part of the composition. In this and the latter part of the previous style there is generally a fillet on the outer part of the shaft, forming what has been called a " keel moulding " (q.v.). They are also often tied together by bands, formed of rings of stone and sometimes of metal. About this period, too, these intermediate mouldings run up into and form part of the arch moulds, there being no impost. This arrange- ment became much more frequent in the Perpendicular period; in fact it was almost universal, the commonest section being a lozenge set with the long side from the nave to the aisle, and not towards the other arches, as in the Decorated period, with four shafts at the angles, between which were shallow mouldings, one of which was in general a wide hollow, sometimes with wave moulds. The small columns at the jambs of doors and windows, and in arcades, and also those attached to piers or standing detached, are generally called " shafts " (q.v.).

The term pier is sometimes applied to the solid parts of a wall between windows or voids, and also to the isolated masses of brickwork or masonry to which gates are hung. (R. P. S.)

Piers of Bridges. — The piers of bridges and viaducts on land are constructed of masonry or brickwork and occasionally, in the. case of high piers, of open braced ironwork, as exemplified by the old Crumlin viaduct in Wales and the Pecos viaduct in Texas. These piers, besides being proportioned in cross-section to the weight they have to support, are widened out at their base, so as to distribute the load over a sufficient area for it to be borne by the stratum on which it rests without risk of settlement. Special provisions have to be made for the foundations of piers where the ground is soft for some depth, or loose water-bearing strata are encountered, and especially where the piers of large bridges crossing rivers have to be constructed under water. In soft ground, bearing piles driven down to a firm stratum, and surmounted by a planked floor or a layer of concrete, provide a convenient foundation for a pier; and in places where timber is abundant, wooden cribs filled with rubble stone or concrete have been used in the United States for raising the foundations for piers out of water. For river piers, where a firm, watertight stratum is found at a moderate depth below the river-bed, the site is often enclosed within a coffer-dam or a plate iron caisson carried down into the stratum and raised out of water; and then, after the water has been pumped out and the

surface layers removed, the pier is readily built within the enclosure in the open air. When, however, a river-bed consists of silt, sand or other soft materials extending down to a considerable depth, brickwork wells are gradually sunk to a firm stratum by removing the material within them with grabs, and on them the piers are built out of water; or bottomless caissons are carried down by excavating their interiors under compressed air, and the piers are built on top of them within a plate-iron enclosure, a system

adopted for the piers of the Brooklyn, St Louis, Forth and other large bridges, and essential for forming foundations on sloping rock, such as was encountered in places under the Firth of Forth.

The methods indicated above as employed for the foundations of the piers of bridges under favourable conditions belong equally to the foundations of other structures (see Founda- tion's) ; but there are some methods which, by combining bridge piers and their foundations in a single structure, appertain entirely to piers. Thus iron screw piles, sunk by turning into

Scale

20 Feet

Fig. 1. — Pier with Disk Piles.

the soft bed of a river till they reach a firm stratum or one sufficiently consolidated by the superincumbent layers to enable it to support the wide blades of the screws with the weight imposed on them, were formerly often arranged in converging clusters joined together at the top, so as to serve as the piers of bridges having several comparatively small spans, and intended for carrying lightly constructed railways across rivers in India and elsewhere. Hollow, cast-iron, cylindrical piles also, with a broad circular disk at the bottom to increase their bearing surface, have been used for piers founded in sandy or silty strata

bolted together with a specially strong bottom ring, sometimes made of wrought iron and having a cutting edge, have been often employed for the construction of the river piers of bridges, being gradually carried down to a watertight stratum by excavating inside, and subsequently filled up solid with concrete and brick- work; the piers of the Charing Cross and Cannon Street bridges across the Thames are notable instances of the adoption of this method, which is well illustrated by the piers of the bridges across the

River Chittravati in India (fig. 2). Sometimes, instead of two or more independent cylinders being sunk, the whole site of a pier is enclosed within a wrought-iron caisson, usually divided into sections by vertical partitions, which is sunk and filled up solid in the same way as cylinders, a system adopted, for instance, for the piers of the bridge across the Hawkesbury River in New South Wales.

Promenade Piers. — The term pier is often applied to works sheltering harbours, such as the Tynemouth piers, which are strictly breakwaters. Landing stages also, whether solid or open, have for a long time been called piers, as the Admiralty Pier and the Prince of Wales's Pier at Dover; but the open promenade piers which form a common feature at seaside resorts are the type of pier best known to the general public. These piers are supported upon open pilework of timber or iron, and consequently expose little surface to waves in storms and do not interfere with the drift of shingle or sand along the coast (fig. 3). 1 Timber piles are best suited for withstanding the shocks of vessels at landing stages, at which places they are generally used; but since they are subject to the attacks of the teredo, and expose a considerable surface to the waves, iron piles are generally adopted for the main portion of these piers.

The pioneer of these piers was the old chain pier at Brighton, which was erected in 1822-1823. It was founded upon oak piles, was 1 136 ft. long, and had a timber landing-stage at the end. It consisted of four spans suspended from chains on the model of the Menai Suspension Bridge, then in course of construction, and was destroyed by a gale in December 1896. A wider and more modern type of pier was erected at the west end of Brighton in 1865-1866,

Rock.

Fig. 2. — Cylindrical Piers for River Bridges.

Fig. 3. — Promenade Pier.

of considerable thickness; they are sunk to the requisite depth by lowering a pipe down the inside of the pile to the bottom and emitting a powerful jet of water which, stirring up the soft material and scouring it away from under the disk, causes the pile to descend. This system was first adopted for the piers of a railway viaduct crossing the wide, sandy Kent and Leven estuaries opening into Morecambe Bay (fig. 1). Cast-iron cylinders, consisting of a series of rings formed of segments all

and subsequently extended; whilst a new pier was completed in 1900 near the site of the old chain pier, 1700 ft. long. The Southport pier, erected in

1859-1860 and afterwards prolonged, furnishes an example of an iron pier supported on disk piles sunk in sand as described above (fig. 1); whilst the much more commonly used iron screw piles, adopted as early as 1847 for an open landing-pier on the Irish coast at Courtown, which was exposed to a great littoral drift of sand, are shown as the mode of support for the pier

1 The Engineer (1888), i. 380, 381 and 384.

at St Leonards (fig. 3). The length given to these promenade {tiers depends mainly on the slope of the foreshore, which deter- mines the distance from the shore at which a sufficient depth is reached for steamers of moderate draught to come alongside the end of the pier. Thus, whereas a length of 900 ft. has sufficed for the St Leonards pier on a somewhat steep, shingly beach, the pier at Ryde, constituting the principal landing-place for the Isle of Wight passengers, has had to be carried out about half a mile across a flat alluvial foreshore to reach water deep enough for the access of the steamboats crossing the Solent. The vast sands, moreover., at the outlet of the Ribble estuary, stretching two or three miles in front of Southport at low water of spring tides, have necessitated the construction of a pier 4395 ft. long merely to get out to an old flood-tide channel, which is now completely severed by the sands at low water from all connexion with the river.

(L. F. V.-H.)

PIERCE, FRANKLIN (1804-1869), fourteenth president of the United States, was born at Hillsborough, New Hampshire, on the 23rd of November 1804. His father, Benjamin Pierce (1757-1839), served in the American army throughout the War of Independence, was a Democratic member of the New Hamp- shire House of Representatives from 1789 to 1803, and was governor of the state in 1827-1829. The son graduated in 1824 at Bowdoin College, at Brunswick, Maine, where he formed a friendship with Nathaniel Hawthorne. Pierce then studied law, and in 1827 was admitted to the bar and began] to practise at Hillsborough. He at once took a lively interest in politics, and from 1829 to 1833 served in the state House of Representa- tives, for the last two years as Speaker. In 1833 he entered the national House of Representatives, and although he achieved no distinction in debate he was a hard worker, and a loyal sup- porter of the policies of President Jackson. After four years in the House he entered the Senate, being its youngest member. In 1842, before the expiration of his term, he resigned his seat, and at Concord, New Hampshire, began his

career at the bar in earnest, though still retaining an interest in politics. In 1845 he declined the Democratic nomination for governor, and also an appointment to the seat in the United States Senate made vacant by the resignation of Judge Levi Woodbury. He accepted, however, an appointment as Federal District Attorney for New Hampshire, as the duties of this office, which he held in 1845-1847, were closely related to those of his profession. In 1846 he again declined public honours, when President Polk invited him to enter the cabinet as attorney-general. Soon after the outbreak of the war with Mexico, in 1846, Pierce enlisted as a private at Concord, but soon (in February 1847) became colonel of the Ninth Regiment (which joined General Winfield Scott at Pueblo on the 6th of August 1847), an< i later (March, 1847) became a brigadier-general of volunteers. At the battle of Contreras, on the 19th of August 1847, he was thrown from his horse and received severe injuries. At the end of the war he resigned his commission and returned to Concord. In 1850 Pierce became president of a convention assembled at Concord to revise the constitution of his state, and used his influence to secure the removal of those provisions of the con- stitution of 1792 which declared that only Protestants should be eligible for higher state offices. This amendment passed the convention in April 1852, but was rejected by the electorate of the state; a similar amendment was adopted by popular vote in 1877. In January 1852 the legislature of New Hampshire proposed him as a candidate for the presidency, and when the Democratic national convention met at Baltimore in the follow- ing June the Virginia delegation brought forward his name on the thirty-fifth ballot. Although both parties had declared the Compromise of 1850 a finality, the Democrats alone were thoroughly united in support of this declaration, and therefore seemed to offer the greater prospect of peace. This fact, com- bined with the colourless record of their candidate, enabled them to sweep the country at the November election. Pierce received 254 electoral votes, and General Winfield Scott, his Whig opponent, only 42. The Democrats carried every state except Massachusetts, Vermont, Kentucky and Tennessee. No president since James Monroe had received such a vote.

Pierce was the youngest man who had as yet been elevated to the presidency. For his cabinet he chose William L. Marcy

of New York, secretary of state; Jefferson Davis of Mississippi, secretary of war; James Guthrie (1792-1869) of Kentucky, secretary of the treasury; James C. Dobbin (1814-1857) of North Carolina, secretary of the navy; Robert McClelland (1807-1880) of Michigan, secretary of the interior; James Campbell (1813-1893) of Pennsylvania, postmaster-general; and Caleb Cushing of Massachusetts, attorney-general. Thib was an able body of men, and is the only cabinet in American history that has continued unbroken throughout an entire administration. Although Pierce during his

term in the Senate had severely criticized the Whigs for their removals of Demo- crats from office, he himself now adopted the policy of replacing Whigs by Democrats, and the country acquiesced. Pierce had no scruples against slavery, and opposed anti-slavery agitation as tending to disrupt the Union. The conduct of foreign relations was on the whole the most creditable part of his adminis- tration. The Koszta Affair (1853) gave the government an opportunity vigorously to assert the protection it would afford those in the process of becoming its naturalized citizens. When the British government refused to prevent recruiting for the Crimean War by their representatives in America, their minister, John F. Crampton, received his passports, and the exequaturs of the British consuls at New York, Philadelphia and Cincinnati were revoked. A commercial treaty was negotiated with Japan in 1854 after Perry's expedition in the previous year. As an avowed expansionist, Pierce sympathized with the filibuster government set up in Nicaragua by William Walker, and finally accorded it recognition. It was during this term also that the Gadsden Purchase was consummated, by which 45,535 sq. m. of territory were acquired from Mexico, and that three routes were surveyed for railways from the Mississippi river to the Pacific coast.

When the Democratic national convention met at Cincinnati in June 1856, Pierce was an avowed candidate for renomination, but as his attitude on the slavery question, and especially his subserviency to the South in supporting the pro-slavery party in the Territory of Kansas, had lost him the support of the Northern wing of his party, the nomination went to James Buchanan. After retiring from the presidency Pierce returned to Concord, and soon afterwards went abroad for a three years' tour in Europe. Many Southern leaders desired his renomina- tion by the Democratic party in i860, but he received such suggestions with disfavour. After his return to America he remained in retirement at Concord until the day of his death, the 8th of October 1869.

Pierce was not a great statesman, and his fame has been overshadowed by that of Benton, Calhoun, Clay and Webster. But he was an able lawyer, an orator of no mean reputation, and a brave soldier. He was a man of fine appearance and courtly manners, and he possessed personal magnetism and the ability to make friends, two qualities that contributed in great measure to his success.

A portion of Pierce's correspondence has been published in the American Historical Review, x. 1 10-127, SS ˆ? – D. W. Bartlett's Franklin Pierce (Auburn, New York, 1852), and Nathaniel Haw- thorne's Franklin Pierce (Boston, 1852), are two " campaign " biographies, and are very eulogistic. J. R. Irelan's History of the Life, Administration and Times of Franklin Pierce (Chicago, 1888), being vol. xiv. of his Republic, is a more critical

work, but inaccu- rate as to details. J. E. Cooley's Review of the Administration of General Pierce (New York, 1854) and Anna E. Carroll's Review of Pierce's Administration (Boston, 1856) are hostile anti-administra- tion tracts. The best accounts of Perce's administration are to be found in James Schouler's History of the United States, vol. v. (new ed., New York, 1894); J. F. Rhodes's History of the United States, vols. i. and ii. (New York, 1893-1894); and J. W. Burgess's Middle Period (New York, 1900).

PIERO DI COSIMO (1462-1521), the name by which the Florentine painter Pietro di Lorenzo is generally known. He was born in Florence about 1462, and worked in the bottega of Cosimo Rosselli (from whom he derived his popular name). Other influences that can be traced in his work are those of Filippino Lippi, Luca Signorelli, and Leonardo da Vinci, and, as has been recently suggested by Professor R. Muther, that of Hugo van der Goes, whose Portinari altar-piece (now at the

Spedale of S. Maria Novella in Florence) helped to lead the whole of Florentine painting into new channels. From him, most probably, he acquired the love of landscape and the intimate knowledge of the growth of flowers and of animal life. The influence of Hugo van der Goes is especially apparent in the " Adoration of the Shepherds," at the Berlin Museum. He had the gift of a fertile fantastic imagination, which, as a result of a journey to Rome in 1482 with his master, Rosselli, became directed towards the myths of classic antiquity. He proves himself a true child of the Renaissance in such pictures as the " Death of Procris," at the National Gallery, the " Mars and Venus," at the Berlin Gallery, the " Perseus and Andromeda " series, at the Uffizi in Florence, and the " Hylas and the Nymphs " belonging to Mr Benson. If, as we are told by Vasari, he spent the last years of his life in gloomy retire- ment, the change was probably due to Savonarola, under whose influence he turned his attention once more to religious art. The " Immaculate Conception," at the Uffizi, and the " Holy Family," at Dresden, best illustrate the religious fervour to which he was stimulated by the stern preacher.

With the exception of the landscape background in Rosselli's fresco of the " Sermon on the Mount," in the Sistine Chapel, we have no record of any fresco work from his brush. On the other hand, he enjoyed a great reputation as a portrait painter, though the only known examples that can be definitely ascribed to him are the portrait of a warrior, at the National Gallery, (No. 895), the so-called "Bella Simonetta," at Chantilly, the

portraits of Giuliano di San Gallo and his father, at the Hague, and a head of a youth, at Dulwich. Vasari relates that Piero excelled in designing pageants and triumphal processions for the pleasure-loving youths of Florence, and gives a vivid descrip- tion of one such procession at the end of the carnival of 1507, which illustrated the triumph of death. Piero di Cosimo exercised considerable influence upon his fellow pupils Alberti- nelli and Bartolommeo della Porta and was the master of Andrea del Sarto. Examples of his work are also to be found at the Louvre in Paris, the Harrach and Liechtenstein collections in Vienna, the Borghese Gallery in Rome, the Spedale degli Innocenti in Florence, and in the collections of Mr John Burke and Colonel Cornwallis West in London. A " Magdalen " from his brush was added to the National Gallery of Rome in 1907?

See Piero di Cosimo, by F. Knapp (Halle, 1899); Piero di Cosimo, by H. Haberfeld (Breslau, 1901).

PIERRE, the capital of South Dakota, U.S.A., and the county-seat of Hughes county, situated on the east bank of the Missouri river, opposite the mouth of the Bad river, about 185 m. N.W. of Yankton. Pop. (1905) 2794; (1910) 3656. Pierre is served by the Chicago & North- Western railway; the Missouri is navigable here, but river traffic has been practically abandoned. Among the principal buildings are the state capitol (1909) and the post office building. Pierre has a public library, and is the seat of the Pierre Industrial School (co-educa- tional, opened in 1890), a government boarding school (non- reservation) for Indian children. The city has a large trade in livestock, and is a centre for the mining districts of the Black Hills and for a grain-growing country. Natural gas is used for lighting, heating and power. A fur-trading post, Fort La Framboise, was built in 1817 by a French fur-trader (from whom it took its name) at the mouth of the Teton or Little Missouri river (now called the Bad River) , on or near the site of the present village of Fort Pierre (pop. in 1910, 792). In 1822 Fort Tecumseh was built about 2 m. up-stream by the Columbia Fur Company, which turned it over in 1827 to the American Fur Company. The washing away of the river bank caused the abandonment of this post and the erection about a mile farther up-stream, and a short distance west of the river, of Fort Pierre Chouteau (later called Fort Pierre), occupied in 1832, and named in honour of Pierre Chouteau, jun. (1789-1865). 1 For twenty 1 Pierre Chouteau in 1804 succeeded his father, one of the founders of St Louis, in the Missouri Fur Company; and about 1834 Pratt, Chouteau & Company, of which he was the leading member, bought the entire western department of the American Fur Company, and in 1838 reorganized under the name of Pierre Chouteau, jun., &

years thereafter Fort Pierre was the chief fur-trading depot of the Upper Missouri country. In 1855 the United States government bought the post

building and other property for $45,000, and laid out around them a military reservation of about 270 sq. m. The fort was the headquarters of General William S. Harney (1800- 1889) in his expedition against the Sioux in 1856, and in March of that year an important council between General Harney and the chiefs of all the Sioux bands, except the Blackfeet, was held here. The fort was abandoned in 1857. Pierre was laid out in 1880, was incorporated as a village in 1883, and was chartered as a city in 1000.

See Major Frederick T. Wilson, " Fort Pierre and Its Neighbors," in South Dakota Historical Collections, vol. i. (Aberdeen, S.D., 1902); and Hiram M. Chittenden, The American Fur Trade of the Far West (3 vols., New York, 1902).

PIERRE DE CASTELNAU (d. 1208), French ecclesiastic, was born in the diocese of Montpellier. In 1199 he was archdeacon of Maguelonne, and was appointed by Pope Innocent III. as one of the legates for the suppression of heresy in Languedoc. In 1202, when a monk in the Cistercian abbey of Fontfroide, Narbonne, he was designated to similar work, first in Toulouse, and afterwards at Viviers and Montpellier. In 1207 he was in the Rhone valley and in Provence, where he became involved in the strife between the count of Baux and Raymond, count of Toulouse, by one of whose agents he was assassinated on the 15th of January 1208. He was beatified in the year of his death by Pope Innocent III.

See De la Bouillerie, Le Bienheureux Pierre de Castelnau et les Albigeois au XIII. siecle (Paris, 1866).

PIERREFONDS, a town of northern France, in the depart- ment of Oise, 9 m. S.E. of Compiegne by road. Pop. (1906), 1482. It is celebrated for its feudal stronghold, a masterpiece of modern restoration. The building is rectangular in shape, with a tower at each corner and at the centre of each of the walls, which are strengthened by crenelation and machicolation. A lofty keep defends the principal entrances on the south-west. The interior buildings are chiefly modern, but the exterior reproduces faithfully that of the medieval fortress. Pierrefonds has a church dating from various periods from the nth to the 1 6th century, and its mineral springs are in some repute. The chateau was begun in the last decade of the 14th century by Louis d'Orleans, to whom the domain was given by Charles VI., and finished early in the 15th century. It was subsequently held by the Burgundians, the English and the adherents of the League, from whom it passed to Henry IV. It was dismantled in 1622. The ruins, bought by Napoleon I., were restored, by order of Napoleon III., from 1858 to 1895, under the direction, first of Viollet-le-Duc and afterwards of E. Boeswillwald.

PIERREPONT, WILLIAM (c. 1607-1678), English politician, was the second son of Robert Pierrepont, 1st earl of Kingston. Returned to the Long Parliament in 1640 as member for Great Wenlock, he threw his influence on the side of peace and took part for the parliament in the negotiations with Charles I. at Oxford in 1643. Pierrepont was a member of the committee of both kingdoms, and represented the parliamentary party during the deliberations at Uxbridge in 1645; but from that time, according to Clarendon, he forsook his moderate attitude, and " contracted more bitterness and sourness than formerly." This statement, however, is perhaps somewhat exaggerated, as Pierrepont favoured the resumption of negotiations with the king in 1647, and in the following year his efforts on behalf of peace at Newport, where again he represented the parliament- arians, brought upon him some slight censure from Cromwell. For his services at Newport he was thanked by parliament; but he retired from active political life soon afterwards, as he disliked the " purging " of the House of Commons by Colonel Pride and the proceedings against the king. In spite of his

Company. Chouteau built (in 1830-1831) the " Yellowstone," which went up the river to the present site of Pierre in 1 83 1, and was the first steamboat to navigate the upper waters of the Mis- souri. Chouteau lived for some years in New York City, and while living in St Louis was a member of the convention (1820) which drafted the first constitution of Missouri.

moderate views Pierrepont enjoyed the personal friendship of Cromwell; but, although elected, he would not sit in the parlia- ment of 1656, nor would he take the place offered to him in the Protector's House of Lords. When Richard Cromwell suc- ceeded his father, Pierrepont was an unobtrusive but powerful influence in directing the policy of the government, and after a short period of retirement on Richard's fall he was chosen, early in 1660, a member of the council of state. He represented Nottinghamshire in the Convention Parliament of 1660, and probably was instrumental in saving the lives of some of the parliamentary leaders. At the general election of 1661 he was defeated, and, spending the remainder of his life in retirement, he died in 1678. Pierrepont married Elizabeth, daughter of Sir Thomas Harris, Bart., of Tong Castle, Shropshire, by whom he had five sons and five daughters. His eldest son, Robert (d. 1666), was the father of Robert, 3rd earl, William, 4th earl, and Evelyn, 1st duke of Kingston; and his third son, Gervase (1649-17 1 5), was created in 17 14 baron Pierrepont of Hanslope, a title which became extinct on his death.

PIERROT (Ital. Pedrolino), the name given to the leading character in the French pantomime plays since the 18th century; transferred from the Italian stage, and revived especially in recent times. He is always in white, both face and costume, with a loose and daintily clownish garb, and is represented as of a freakish disposition. Modern pierrot plays have converted the pierrot into a romantic and even pathetic figure.

PIERSON, HENRY HUGO [properly Henry Hugh Pearson], (1S15-1873), English composer, was the son of the Rev. Dr Pearson of St John's College, Oxford, where he was born in 181 5; his father afterwards became dean of Salisbury. Pierson was educated at Harrow and Trinity College, Cambridge, and was at first intended for the career of medicine. His musical powers were too strong to be repressed, and after receiving instruction from Attwood and A. T. Corfe he went in 1839 to Germany to study under C. H. Rink, Tomaschek and Reissiger. He was elected Reid Professor of Music in Edinburgh in 1844, but, owing to a disagreement with the authorities, he resigned in the following year, and definitely adopted Germany as his country about the same time, making the change in his names noted above. His two operas, Leila (Hamburg, 1848) and Contarini (Hamburg, 1872), have not retained their hold upon the German public as his music to Faust has done, a work which until quite recently was frequently associated with Goethe's drama. He was never recognized in England as he was in Germany, for most of his career fell in the period of the Mendels- sohn fashion. His ' most important work was the oratorio Jerusalem, produced at the Norwich Festival of 1852, and subsequently given in London (Sacred Harmonic Society, 1853) and Wurzburg (1862). For the Norwich Festival (at one of the meetings a selection from his Faust music was given with success) he began an oratorio, Hezekiah, in 1869; it was not finished, but was given in a fragmentary condition at the festival of that year. These two large works and a number of Pierson's songs, as well as the three overtures played at the Crystal Palace, reveal undeniable originality and a wealth of melodic ideas. He was weak in contrapuntal skill, and his music was wanting in outline and coherence; but in more fortunate con- ditions his great gifts might have been turned to better account. He died at Leipzig on the 28th of January 1873, and was buried at Sonning, Berks., of which parish his brother, Canon Pearson, was rector.

PIETAS, in Roman mythology, the personification of the sense of duty towards God and man and the fatherland. According to a well-known story, a young woman in humble circumstances, whose father (or mother) was lying in prison under sentence of death, without food, managed to gain admittance, and fed her parent with milk from her breast. To commemorate her filial affection a temple was dedicated (181 B.C.) by Manius Acilius Glabrio to Pietas in the Forum Holitorium at Rome, on the spot where the young woman had formerly lived. The temple was probably

originally vowed by the elder Glabrio out of gratitude for the pietas shown during

the engagement by his son, who may have saved his life, as the elder Africanus that of his father at the battle of Ticinus (Livy xxi. 46) ; the legend of the young woman (borrowed from the Greek story of Mycon and Pero, Val. Max. v. 4, ext. 1) was then connected with the temple by the identification of its site with that of the prison. There was another temple of Pietas near the Circus Flaminius, which is connected by Amatucci (Rivista di sloria antica, 1903) with the story of the pietas of C. Flaminius (Val. Max. v. 4, 5), and regarded by him as the real seat of the cult of the goddess, the Pietas of the sanctuary dedicated by Glabrio being a Greek goddess. Pietas is represented on coins as a matron throwing incense on an altar, her attribute being a stork. Typical examples of " piety " are Aeneas and Antoninus Pius, who founded games called Eusebeia at Puteoli in honour of Hadrian.

See Val. Max. v. 4, 7; Pliny, Nat. hist. vii. 121; Livy xl. 34; Festus, s.v. ; G. Wissowa, Religion und Kultus der Rbmer (1902J; F. Kuntze, " Die Legende von der guten Tochter," in Jahrbiicher fur das klassische Altertum (1904), xiii. 280.

PIETERMARITZBURG, the capital of Natal, situated in 29° 46′ S., 30 13′ E., 45 m. in a direct line (71 by rail) W.N.W. of Durban. It lies, 2200 ft. above the sea, north of the river Umsunduzi, and is surrounded by wooded hills. Of these the Town Hill, flat-topped, rises 1600 ft. above the town. Pop. (1904), 31,119, of whom 15,087 were whites, 10,752 Kaffirs, and 5280 Indians. The town is laid out on the usual Dutch South African plan — in rectangular blocks with a central market square. The public buildings include the legislative council chambers and the legislative assembly buildings, government house, the government offices, college, post office and market buildings. The town-hall, a fine building in a modified Renaissance style (characteristic of the majority of the other public buildings), has a lofty tower. It was completed in 1901, and replaces a building destroyed by fire in 1898. St Saviour's is the cathedral church of the Anglican community. The headquarters of the Dutch Reformed Church are also in the town. There are monuments of Queen Victoria and Sir Theophilus Shepstone, and various war memorials — one commemorating those who fell in Zululand in 1879, and another those who lost their lives in the Boer War 1899-1902. A large park and botanical gardens add to the attractions of the town. A favourite mode of con- veyance is by rickshaw. The climate is healthy and agreeable, the mean annual temperature being 65 F. (55 in June, 7i°in February). The rainfall is about 38 in. a year, chiefly in the summer months (Oct.-Mar.), when the heat is tempered by violent thunderstorms.

Pietermaritzburg was founded early in 1839 by the newly- arrived Dutch settlers in Natal, and its name commemorates two of their leaders — Piet Retief and Gerrit Maritz. From the time of its establishment it was the seat of the Volksraad of the Natal Boers, and on the submission of the Boers to the British in 1842 Maritzburg (as it is usually called) became the capital of the country. It was given a municipal board in 1848, and in 1854 was incorporated as a borough. Railway connexion with Durban was made in 1880, and in 1895 the line was extended to Johannesburg. The borough covers 44 sq. m. and includes numerous attractive suburbs. The rateable value is about £4,000,000. Various industries are carried on, including brick- making, tanning, brewing, and cart and wagon building.

See J. F. Ingram, The Story of an African City (Maritzburg,

1898).

PIETERSBURG, a town of the Transvaal, capital of the Zoutpansberg district, and 177 m. N.N.E. of Pretoria by rail. Pop. (1904), 3276, of whom 1620 were whites. The town is pleasantly situated, at an elevation of 4200 ft., on a small tribu- tary of the Zand river affluent of the Limpopo, and is the place of most importance in the province north of Pretoria. From it roads run to Klein Lelaba and other gold-mining centres in the neighbourhood, and through it passes the old route to Mashona- land, which crosses the Limpopo at Rhodes Drift. The Zout- pansberg district contains a comparatively dense Kaffir popula- tion, and a native newspaper is published at Pietersburg.

PIETISM, a movement in the Lutheran Church, which arose towards the end of the 17th and continued during the first half of the following century. The name of Pietists was given to the adherents of the movement by its enemies as a term of ridicule, like that of " Methodists " somewhat later in England. The Lutheran Church had, in continuing Melanchthon's attempt to construct the evangelical faith as a doctrinal system, by the 17th century become a creed-bound theological and sacra- mentarian institution, which orthodox theologians like Johann Gerhard of Jena (d. 1637) ruled with almost the absolutism of the papacy. Christian faith had been dismissed from its seat in the heart, where Luther had placed it, to the cold regions of the intellect. The dogmatic formularies of the Lutheran Church had usurped the position which Luther himself had assigned to the Bible alone, and as a consequence only they were studied and preached, while the Bible was neglected in the family, the study, the pulpit and the university. Instead of

advocating the priesthood of all believers, the Lutheran pastors had made themselves a despotic hierarchy, while they neglected their practical pastoral work. In the Reformed Church, on the other hand, the influence of Calvin had made less for doctrine than the practical formation of Christian life. The presbyterian constitu- tion gave the people a share in church life which the Lutherans lacked, but it involved a dogmatic legalism which imperilled Christian freedom and fostered self-righteousness.

As forerunners of the Pietists in the strict sense, not a few earnest and powerful voices had been heard bewailing the shortcomings of the Church and advocating a revival of practical and devout Christianity. Amongst them were Jakob Boehme (Behmen), the theosophic mystic; Johann Arndt, whose work on True Christianity became widely known and appreciated; Heinrich Miiller, who described the font, the pulpit, the con- fessional and the altar as the four dumb idols of the Lutheran Church; the theologian, Johann Valentin Andrea, the court chaplain of the landgrave of Hesse; Schuppius, who sought to restore to the Bible its place in the pulpit; and Theophilus Grossgebauer (d. 1661) of Rostock, who from his pulpit and by his writings raised " the alarm cry of a watchman in Sion." The direct originator of the movement was Philip Jacob Spener, who combined the Lutheran emphasis on Biblical doctrine with the Reformed tendency to vigorous Christian life. Born at Rappoltsweiler, in Alsace on the 13th of, January 1635, trained by a devout godmother, who used books of devotion like Arndt's True Christianity, accustomed to hear the sermons of a pastor who preached the Bible more than the Lutheran creeds, Spener was early convinced of the necessity of a moral and religious reformation of the German Church. He studied theology, with a view to the Christian ministry, at Strassburg, where the professors at the time (and especially Sebastian Schmidt) were more inclined to practical Christianity than to theological disputation. He afterwards spent a year in Geneva, and was powerfully influenced by the strict moral life and rigid ecclesias- tical discipline prevalent there, and also by the preaching and the piety of the VValdensian professor, Antoine Leger, and the converted Jesuit preacher, Jean de Labadie. 1 During a stay in Tubingen he read Grossgebauer's Alarm Cry, and in 1666 he entered upon his first pastoral charge at Frankfort-on-the-Main, profoundly impressed with a sense of the danger of the Christian life being sacrificed to zeal for rigid orthodoxy. Pietism, as a distinct movement in the German Church, was then originated by Spener by religious meetings at his house {collegia pietatis), at which he repeated his sermons, expounded passages of the New Testament, and induced those present to join in conversa- tion on religious questions that arose. They gave rise to the name " Pietists." In 1675 Spener published his Pia desideria, cr Earnest Desires for a Reform of the True Evangelical Church. In this publication he made six proposals as the best means of restoring the life of the Church:

(1) the earnest and thorough study of the Bible in private meetings, ecclesiolae in ecclesia;

1 Labadie had formed the ascetic and mystic sect of " The Regenerati " in the Church of Holland (c. 1660), and then in other parts of the Reformed Church.

(2) the Christian priesthood being universal, the laity should share in the spiritual government of the Church; (3) a knowledge of Christianity must be attended by the practice of it as its indispensable sign and supplement; (4) instead of merely didactic, and often bitter, attacks on the heterodox and unbelievers, a sympathetic and kindly treatment of them; (5) a reorganization of the theological training of the universities, giving more prominence to the devotional life; and (6) a different style of preaching, namely, in the place of pleasing rhetoric, the implant- ing of Christianity in the inner or new man, the soul of which is faith, and its effects the fruits of life. This work produced a great impression throughout Germany, and although large numbers of the orthodox Lutheran theologians and pastors were deeply offended by Spener's book, its complaints and its demands were both too well justified to admit of their being point-blank denied. A large number of pastors at once practi- cally adopted Spener's proposals. In Paul Gerhardt the move- ment found a singer whose hymns are genuine folk poetry. In 1686 Spener accepted an appointment to the court-chaplaincy at Dresden, which opened to him a wider though more difficult sphere of labour. In Leipzig a society of young theologians was formed under his influence for the learned study and devout application of the Bible. Three magislri belonging to that society, one of whom was August Hermann Francke, subse- quently the founder of the famous orphanage at Halle (1695), commenced courses of expository lectures on the Scriptures of a practical and devotional character, and in the German language, which were zealously frequented by both students and townsmen. The lectures aroused, however, the ill-will of the other theo- logians and pastors of Leipzig, and Francke and his friends left the city, and with the aid of Christian Thomasius and Spener founded the new university of Halle. The theological chairs in the new university were filled in complete conformity with Spener's proposals. The main difference between the new Pietistic school and the orthodox Lutherans arose from the conception of Christianity as chiefly consisting in a change of heart and consequent holiness of life, while the orthodox Lutherans of the time made it to consist mainly in correctness of doctrine.

Spener died in 1705; but. the movement, guided by Francke, fertilized from Halle the whole of Middle and North Germany. Among its greatest achievements, apart from the philanthropic institutions founded at Halle, were the organization of the Moravian Church in 1727 by Count von

Zinzendorf, Spener's godson and a pupil in the Halle Orphanage, and the estab- lishment of the great Protestant missions, Ziegenbalg and others being the pioneers of an enterprise which until this time Protestantism had strangely neglected.

Pietism, of course, had its weaknesses. The very earnestness with which Spener had insisted on the necessity of a new birth, and on a separation of Christians from the world, led to exaggera- tion and fanaticism among followers less distinguished than himself for wisdom and moderation. Many Pietists soon main- tained that the new birth must always be preceded by agonies of repentance, and that only a regenerated theologian could teach theology, while the whole school shunned all common worldly amusements, such as dancing, the theatre, and public games. There thus arose a new form of justification by works. Its ecclesiolae in ecclesia also weakened the power and meaning of church organization. Through these extravagances a reac- tionary movement arose at the beginning of the 18th century, one of the most distinguished leaders of which was Loescher, superintendent at Dresden.

As a distinct movement Pietism had run its course before the middle of the 18th century; by its very individualism it had helped to prepare the way for another great movement, the Illumination (Aufkldrung) , which was now to lead the world into new paths. Yet Pietism could claim to have contributed largely to the revival of Biblical studies in Germany, and to have made religion once more an affair of the heart and the life, and not merely of the intellect. It likewise vindicated afresh the rights of the Christian laity in regard to their own beliefs and

the work of the Church, against the assumptions and despotism of an arrogant clergy. " It was," says Rudolf Sohm, " the last great surge of the waves of the ecclesiastical movement begun by the Reformation; it was the completion and the final form of the Protestantism created by the Reformation. Then came a time when another intellectual power took possession of the minds of men."

Some writers on the history of Pietism — e.g. Heppe and Ritschl — have included under it nearly all religious tendencies amongst Protestants of the last three centuries in the direction of a more serious cultivation of personal piety than that preva- lent in the various established churches. Ritschl, too, treats Pietism as a retrograde movement of Christian life towards Catholicism. Some historians also speak of a later or modern Pietism,

characterizing thereby a party in the German Church which was probably at first influenced by some remains of Spener's Pietism in Westphalia, on the Rhine, in Wurttemberg, and at Halle and Berlin. The party was chiefly distinguished by its opposition to an independent scientific study of theology, its principal theological leader being Hengstenberg, and its chief literary organ the Evangelische Kirchenzeitung. The party originated at the close of the wars with Napoleon I.

Amongst older works on Pietism are J. G. Walch, Historische und theologische Einleitung in die Religionsstreitigkeiten der evangelisch-Lutherischen Kirche (1730); A. Tholuck, Geschichte des Pietismus und des ersten Stadiums der Aufkldrung (1865); H. Schmid, Die Geschichte des Pietismus (1863) ; M. Goebel, Geschichte des christlichen Lebens in der Rheinisch-Westfalischen Kirche (3 vols., 1849-1860); and the subject is dealt with at length in J. A. Dorner's and W. Gass's Histories of Protestant theology. More recent are Heppe's Geschichte des Pietismus und der Mystik in der reformirten Kirche (1879), which is sympathetic; A. Ritschl's Geschichte des Pietismus (3 vols., 1880-1886), which is hostile; and C. Sachsse, Vrsprung und Wesen des Pietismus (1884). See also Fr. Nippold's article in Theol. Stud, und Kritiken (1882), pp. 347-392; H. von Schubert, Outlines of Church History, ch. xv. (Eng. trans., 1907) ; and Carl Mirbt's article, "Pietismus," in Herzog-Hauck's Realen- cyklopadie fur prot. Theologie u. Kirche, end of vol. xv.

PIETRO DELLA VIGNA, or Pier delle Vigne [Petrtjs de Vineas or df. Vineis] (c. 1190-1249), chancellor and secretary to the emperor Frederick II., was born at Capua in humble circumstances. He studied law at Padua, and through his classical education, his ability to speak Latin and his poetic gifts, he gained the favour of Frederick II., who made him his secretary, and afterwards judex magnae curiae, councillor, governor of Apulia, prothonotary and chancellor. The emperor, " of whose heart he held the keys," as Dante says, sent him to Rome in 1232 and 1237 to negotiate with the pope, to Padua in 1239 to induce the citizens to accept imperial protection, to England in 1 234-1 235 to arrange a marriage between Frederick and Isabella, sister of King Henry III. He proved a skilful and trustworthy diplomat, and he persistently defended the emperor against his traducers and against the pope's menaces. But at the Council of Lyons, which had been summoned by Pope Innocent IV., Pietro della Vigna entrusted the defence of his master to the celebrated jurist Taddeo of Suessa, who failed to prevent his condemnation. Frederick, whose suspicions had been awakened by the slanders of the envious, had him im-prisoned and blinded without giving him a chance to rebut his accusers. Unable to bear his disgrace, he committed suicide in his prison at Pisa in 1 249. The exact date, place and manner of his death are, however, subject to controversy, and Flaminio del Borgo states that it occurred in the church

of S. Andrea, at Pisa, in 1256. The tragic fate of this man gave rise to many legends. The Guelphic tradition accuses Pietro della Vigna, as well as the emperor and the court, of heresy; it was even stated, probably without any foundation, that they were the authors of the famous work, De tribus impostoribus, wherein Moses, Christ and Mahomet are blasphemed.

Pietro della Vigna was a man of great culture; he encouraged science and the fine arts, and contributed much to the welfare of Italy by wise legislative reforms. He was the author of some delicate verse in the vernacular tongue, of which two canzoni and a sonnet are still extant. His letters, mostly written in the name of the emperor and published by Iselin (Epistolarum

libri in., 2 vols., Basel, 1740), contain much valuable information on the history and culture of the 13th century. A collection of the laws of Sicily, a Tractatus de potestate imperiali, and another treatise, " On Consolation," in the style of Boethius, are also attributed to him.

See Huillard-Bre'holles, Vie et correspondence de Pierre de la Vigne (Paris, 1864); Presta, Pier delle Vigne (Milan, 1880); Capasso and Ianelli, Pier delle Vigne (Caserta, 1882) ; also Frederick II.

PIG (a word of obscure origin, connected with the Low Ger. and Dut. word of the same meaning, bigge), a common name given to the domesticated swine of agricultural use. (For the zoology, see Swine.)

British breeds of pigs are classified as black, white and red. In some places, notably Wales and Gloucester, a remnant of a spotted breed lingers; and a large proportion of common pigs, often parti-coloured, are mongrels. The white breeds are liable to sun-scald, and black pigs (like black men) are much better adapted than white to exposure in strong sunlight, conforming to the rule that animals in the tropics have black skins.

The Large Whites may have in the skin a few blue spots which grow white hair. The head is long, light in the jowl, and wide between the eyes, with long thin ears inclined slightly forward and fringed with long fine hair. The neck is long, but not coarse, the ribs are deep, the loin wide and level, the tail set high, and the legs straight and set well outside the carcase. The whole body, including the back of the neck, is covered with straight silky hair, which denotes quality and lean meat. Pigs of this breed are very prolific, and they may be grown to enormous weights— over n cwt. alive.

The Middle Whites are built on a smaller scale than the Large Whites. They are shorter in the heads and legs, and fuller at the jowl, thicker and more compact in the body. The sows are quite as prolific as those of the Large

White breed, and, as their produce matures earlier, they are much in demand for breeding porkers.

The Small White pigs are beautifully proportioned. The head and legs are very short, and the body short, thick and wide; the jowl is heavy, the ears pricked, and the thin skin laden with long silky, wavy, but not curly, hair, whilst the tail is very fine. A deficiency of lean meat is a common characteristic of the breed, which is almost extinct.

The above three breeds were designated Yorkshire Whites, and are still so named at times. The Middle White, formed by crossing the large and the small breeds, is not so symmetrical as the parent stocks, and the type is not uniform.

The Lincolnshire Curly Coated or Boston pig is a local breed of great size and capacity for producing pork. It is very hardy and prolific, but somewhat coarse in the bone. It has an abundance of long curly hair, a short face and a straight nose, and the ears, not too long and heavy, fall over the face. It crosses well with the Large White, the Large Black and the Berkshire.

The Large Black breed, which vies with the Large White breed for size, and is probably its superior as a bacon pig, has only since 1900 received national show-yard recognition; but there is ample evidence that, with its characteristic whole black colour with a mealy hue, length, fine hair and lop ear, the Large Black existed in the south of England for generations. It has been continuously and carefully bred in Cornwall, Devon, Essex and Suffolk, and from these centres it has rapidly spread all over the country. Large Blacks are exceedingly docile, and the ears, hanging well forward over the eyes, contribute materially to a quietness of habit which • renders them peculiarly adapted to field grazing. On account of their hardiness and disposition to early maturity they have proved valuable for crossing purposes. The Large Black Pig Society was incorporated in 1899.

The Berkshire is a black pig with a pinkish skin, and a little white on the nose, forehead, pasterns, and tip to the tail. It has a moderately short head with heavy jowl, a deep, compact carcase, and wide, low and well-developed hind-quarters, with heavy hams. The skin carries an abundance of fine hair. The Berkshire is an early-maturity breed which has been somewhat

PIG

Plate.

LARGE BLACK SOW. TAM WORTH BOAR.

ENGLISH BREEDS OF PIG, from photographs of F. Babbage. The comparative sizes of the animals are indicated by

the scale of reproduction of the photographs.

inbred, and is not so hardy and prolific as most breeds. The boars cross well with common stock. It merits the most credit in raising the quality of Irish pigs. In America it is in the front rank for numbers and quality as a lard-hog. There it often grows to be a larger and finer animal than it is in England.

The Small Black or Black Suffolk was produced from the old Essex pig by crossing with the Neapolitan. It resembles the Small White, except that the skin is coal-black in colour, and the coat of hair is not usually profuse. The Small Black, more- over, is rather longer, and stands somewhat higher, whilst it yields more lean meat than the Small White. It matures early and is quick to fatten.

The Tamworth is one of the oldest breeds of pigs. It is hardy, active and prolific, and nearly related to the wild boar. The colour is red or chestnut, with at times darkish spots on the skin. The head, body and legs are long, and the ribs deep and flat. Originally a local breed in the districts around the Stafford- shire town from which it takes its name, it is now extensively bred, and highly valued as a bacon pig. (W. FR. ; R. W.)

In America nearly all the breeds may be classified as lard- hogs. Bacon-pigs fed on Indian corn degenerate into lard- hogs, run down in size and become too small in the bone and less prolific by inbreeding.

The Poland-China, the most popular breed in the United States, is thus degenerating. It is a black pig like the Berk- shire, but has short lop-ears, a more pointed, straight nose, a more compact body, and more white markings. It is a breed of mixed blood, and is believed to have originated from the " Big China " pig — a large white hog with sandy spots, taken to Ohio in 1816, and blended with Irish graziers in 1839, and with a breed known as Bayfields, as well as with Berkshires. In Iowa ' the Berkshire is a combined lard and bacon pig in high favour. The Duroc Jersey or Duroc, of a red or cherry-red colour — not sandy or dark — is the most popular pig in Nebraska and equal to any other in Iowa. It is a large prolific lard-hog, easily making 300 lb in eight months. It has gained rapidly in popularity since the beginning of this century, and is spreading to other centres.

The Chester White, named from Chester county, Pennsyl- vania, is one of the four leading breeds of lard-hogs in America. It is of mixed origin and bears a strong family resemblance to the Lincolnshire curly-coated pig. The early English ancestors, the breed of which is not on record in America, were most probably of Lincoln origin. The sow is a prolific breeder and good mother, weighing, when mature but not fat, 450 lb — the boar averaging 600 lb, and barrows at six to eight months 350 lb. At Vermont Station, in a 127 days' test, Chester Whites made an average gain of 1-36 lb and dressed 84-5% carcase, and they can gain fully 1 lb of live weight for 3 lb of grain consumed.

Management. — The brood sow should be lengthy and of a prolific strain, known to milk well. She is moderately fed and put to a boar of her own age when large enough, i.e. seven to eight months old. She remains in a state of oestrum for about three days, and if not pregnant comes in heat again in three weeks. Breeding swine, male and female, run most of their time at pasture and receive a liberal allowance of green food or raw roots. The period of gestation is sixteen weeks. Six to eight pigs are reared of the first litter, and ten to twelve afterwards. Many brood sows are fattened to greatest profit after the second or third litter. Two litters are produced in one year, as pigs are usually weaned at two months old, and the sow will take the boar at from three days to a week after the pigs are removed, according to condition. A convenient sty to hold five or six pigs has a southern aspect, and consists of a covered compartment and outer court, each 10 ft. square. When the animals are fed outside the inner court is kept clean and dry, and there the pigs lie. The labouring man's pig is his bank, and is fed on scraps, small potatoes and waste products. In connexion with cheese dairies pigs are largely fed on sour whey thickened with mixed meal produced from any or all of the grains or pulses, the choice depending upon the market price. Food may with advantage be cooked for very young pigs; but, with the exception of potatoes, which should never be given raw, roots and meals are best given uncooked. Meal mixed with pulped roots for a few hours improves in digestibility, and a sprinkling of salt is an improvement. Meal derived from leguminous seeds makes the flesh firm and improves the quality. Fattening pigs are fed

three times a day and supplied with coal-ashes or a few handfuls of earth. Of the fatted live weight of a pig 83 % is butcher's carcase, and 91 % of the increase from 100 to 200 lb is carcase. From 3 to 5 lb of meal consumed results in an increase of I lb of live weight in a pig, which is the most economical meat producer on a farm. Concentrated and digestible foods give best results, a pig has a small stomach. Fjord's Danish experiments show that for fattening pigs 1 ft) of rye- or barley-meal is equivalent to 6 lb of skim-milk or 12 lb of whey, and I tt> of meal equivalent to 8 lb of mangolds or 4 lb of potatoes.

Literature. — J. Coleman, Pigs of Great Britain (1877); Sanders Spencer, Pigs: Breeds and Management (1905); G. M. Rommel, The Hog Industry (1904; Bull.. No. 47, U.S.A. Bureau of Animal Industry) ; J. Long, The Book of the Pig (1906) ; F. D. Coburn, Swine Husbandry (1904) ; R. Wallace, Farm Live Stock of Great Britain (4th ed., 1907) ; Douglas Encyclopaedia (1906) ; C. S. Plumb, Types and Breeds of Farm Animals (1906) the Herd Books of the Breed Societies, and Reports of the Agricultural Departments of Great Britain, Canada and the United States. (R. W.)

PIGALLE, JEAN BAPTISTE (1714-1785), French sculptor, was born in Paris on the 26th of January 17 14. He was the seventh child of a carpenter. Although he failed to obtain the grand prix, after a severe struggle he entered the Academy and became one of the most popular sculptors of his day. His earlier work, such as " Child with Cage " (model at Sevres) and " Mercury Fastening his Sandals " (Berlin, and lead cast in Louvre), is less commonplace than that of his maturer years, but his nude statue of Voltaire, dated 1776 (Institut), and his tombs of Comte d'Harcourt (c. 1764) (Notre Dame) and of Marshal Saxe, completed in 1777 (Lutheran church, Strassburg), are good specimens of French sculpture in the 18th century. He died on the 28th of August 1785.

See P. Tarb6, Vie el ceuv. de Pigalle (1859) ; Suard, Eloge de Pigalle; Melanges de Uttirature.

PIGAULT-LEBRUN (Pigault de l'Epinoy), CHARLES ANTOINE GUILLAUME (1753-1835), French novelist, was born at Calais (he is said to have traced his pedigree on the mother's side to Eustache de St Pierre) on the 8th of April 1753. His youth was stormy. He twice carried off young ladies of some position, and was in consequence twice imprisoned by lettre de cachet. The first, a Miss Crawford, the daughter of an English merchant whose office Pigault had entered, died almost immediately after her elopement; the second, Mile de Salens, he married. He became a soldier in the Queen's Guards, then a very unsuccessful actor, and a teacher of French. At the breaking out of the great war he re-enlisted and fought at Valmy. He wrote more than twenty plays, and a large number of novels, the first of which appeared in 1787. In his old age he took to graver work, and executed an abridgement of French history in eight volumes, besides some other work. His (Euvres computes were published in twenty volumes between 1822 and 1824, but much of his work is subsequent to this collection. He died on the 24th of. July 1835. The style of Pigault's novels is insignificant, and their morality very far from severe. As almost the father of a kind of literature which later developed enormously, Pigault-Lebrun deserves a certain place in literary history. Among the most celebrated of his novels may be mentioned L' Enfant du Carnaval (1792)

and Angelique et Jeanne- ton de la place Maubert (1799). His Cilateur (2 vols., 1803), a collection of quotations against Christianity, was forbidden and yet several times reprinted.

PIGEON (Fr. pigeon,- Ital. piccione and pipione, Lat. pipio, literally a nestling-bird that pipes or cries out, a " piper " — the very name now in use among some pigeon-fanciers, though "squeaker" in the more usual term). The name pigeon, doubtless of Norman introduction as a polite term, seems to bear much the same relation to dove, the word of Anglo-Saxon origin, that mutton has to sheep, beef to ox, veal to calf, and pork to bacon; no sharp zoological distinction can be drawn (see Dove) between dove and pigeon, and the collective members of the group Columbae are by ornithologists ordinarily called pigeons. Perhaps the best-known species to which the latter name is exclusively given in common speech 1 is the wild pigeon 1 ft may be observed that the " rock-pigeons " of Anglo-Indians are Sand-grouse (q.v.), and the " Cape pigeon " of sailors is a petrel (q.v.).

or passenger pigeon of North America, Eclopisles migrarius, which is still found in many parts of Canada and the United States, though now almost extinct and never appearing in the countless numbers that it did of old, when a flock seen by A. Wilson was estimated to consist of more than 2230 millions. The often-quoted descriptions given by him and J. J. Audubon of pigeon-haunts in the then " backwoods " of Kentucky, Ohio and Indiana need not here be reproduced. That of the latter was declared by C. Waterton to be a gross exaggeration; but the critic would certainly have changed his tone had he known that, some hundred and fifty years earlier, passenger-pigeons so swarmed and ravaged the colonists' crops near Montreal that a bishop of his own church was constrained to exorcise them with holy water, as if they had been demons. 1 The passenger- pigeon is about the size of a common turtle-dove, but with a long, wedge-shaped tail. The male is of a dark slate-colour above, and purplish-bay beneath, the sides of the neck being enlivened by violet, green and gold. The female is drab- coloured above and dull white beneath, with only a slight trace of the brilliant neck-markings. 2 (See plate illustration under Dove.)

Among the multitudinous forms of pigeons very few can here be noticed. A species which might possibly repay the trouble of domestication is the wonga-wonga or white-fleshed pigeon of Australia, Leucosarcia picata, a bird larger than the ring-dove, of a slaty-blue colour above and white beneath, streaked on the flanks with black. It is known to breed, though not very freely, in captivity, and is said to be excellent for the table. As regards

flavour, the fruit-pigeons of the genus Treron (or Vinago of some authors) and its allies surpass all birds. These inhabit tropical Africa, India, and especially the Malay Archi- pelago; but the probability of domesticating any of them is very remote. Hardly less esteemed are the pigeons of the genus Ptilopus and its kindred forms, which have their headquarters in the Pacific Islands, though some occur far to the westward and also in Australia. There may be mentioned the strange Nicobar pigeon, Caloenas (see plate illustration under Dove), an inhabi- tant of the Indian Archipelago, not less remarkable for the long lustrous hackles with which its neck is clothed than for the structure of its gizzard, which has been described by Sir W. H. Flower (Proc. Zool. Soc, i860, p. 330), though this peculiarity is matched or even surpassed by that of the same organ in the Phaenorrhina golialh of New Caledonia (Rev. de zoologie, 1862, p. 138) and in the Carpophaga latrans of Fiji. In this last the surface of the epithelial lining is beset by horny conical processes, adapted, it is believed, for crushing the very hard fruits of Onocarpus vitiensis on which the bird feeds (Proc. Zool. Soc, 1878, p. 102). The modern giants of the group, consisting of about half a dozen species of the genus Goura and known as crowned pigeons (see plate illustration under Dove), belong to New Guinea and the neighbouring islands, and are conspicuous by their large size, beautiful filmy fan-shaped crest, and the reticulated instead of scutellated covering of their " tarsi."

A very distinct type of pigeon is that represented by Didun- culus strigirostris, the " Manu-mea " of Samoa, still believed by some to be the next of kin to the Dodo (q.v.), but really presenting only a superficial resemblance in the shape of its bill to that extinct form, from which it differs osteologically quite as much as do other pigeons (Phil. Trans., 1869, p. 349). It remains to be seen whether the Papuan genus Otidiphaps, of which several species are now known, may not belong rather to the Didunculidae than to the true Columbidae.

Pigeons are now regarded as belonging to the Charadriiform or plover-like birds (see Birds) and are placed in the sub-order

1 Voyages du Baron de la Hontan dans VAmerique septentrionale , i. 93, 94 (2nd ed., Amsterdam, 1705). In the first edition, published at the Hague in 1703, the passage, less explicit in details but to the same effect, is at p. 80. The author's letter, describing the cir- cumstance, is dated May 1687.

2 There are several records of the occurrence in Britain of this pigeon, but in most cases the birds noticed cannot be supposed to have found their own way hither. One, which was shot in Fife in 1825, may, however, have crossed the Atlantic unassisted by man.

Columbae, near the sand-grouse (q.v.). They are divided into three families, Dididae, which includes the Dodo (q.v.) and Solitaire, the Columbidae, which includes the doves and pigeons, and the Didunculidae, of which the curious tooth-billed pigeon, of Samoa is the only example. The body is always compact, and the bill has a soft skin or cere covering the nostrils. The pigeons are chiefly vegetable feeders and have a hard gizzard, and all drink much w r ater; they perch, and have a note of the nature of a " coo." The nest is a rough platform or is in holes on the ground or in rocks. The eggs are two or three and white, and the young, which are helpless when hatched, are fed by a secretion from the crop of the parents. (A. N.)

PIGEON-FLYING, the sport of racing homing-pigeons bred and trained for the purpose. It is of very recent date, although the use of birds as a means of carrying messages (see Pigeon Post) is of great antiquity. Belgium may be considered as par excellence the home of the sport, the first birds flown there probably coming from Holland. Long-distance flying began in 1818, with a match of 100 m., while in 1820 there was a race from Paris to Liege, and three years later the first race from London to Belgium. The sport is now a favourite one in Great Britain, the United States, France, and, to a less degree, in some other countries, although nowhere attaining the general popularity which it enjoys in Belgium, where nearly every village has its Societe colombophile, millions of pigeons being sent over the French border to be raced back. The annual Belgian concours national, a race of about 500 m. from Toulouse to Brussels, was inaugurated in 1881, in which year the first regular races in Great Britain, from Exeter, Plymouth and Penzance to London, took place. The velocity attained at that time was about 1250 yds. per minute, but this was soon surpassed in the races of the London Columbarian Society, one of the winners in which attained a speed of 1836 yds. per minute.

The sport was introduced into the United States about the year 1875, although regular racing did not begin until 1878. Since then it has gained widespread popularity, the American record for old birds at 300 m. being 1848 yds. per minute and for young birds (yearlings) 1665 yds., while the distance record is 1004 m. The American " blue ribbon " champion- ships are held at 100, 200, 300, 400, 500 and 600 m. The speed of homing-pigeons depends very greatly upon the state of the atmosphere. In the race from Montargis to Brussels in 1876 in bright and clear weather, all the prize-winners made the distance of 270 m. within three and one-quarter hours, while in the same race in 1877, on a thick and stormy day, thirty hours passed before the first bird arrived.

Training. — The loft should be on a commanding site. It is best made in the shape of a large room, suitably subdivided, protected from vermin, and

provided with drinking troughs, rock salt and crushed mortar for the birds' use. It should be fitted with a sufficient number of nests about 2 ft. long, 20 in. in breadth and height. Arrangements should be made for allowing the pigeons to fly out daily for exercise; and they should be trained to re-enter the loft through bolting wires, which open inwards only, into a small chamber, to which an electric arrangement may be fitted. so as to sound a bell and warn the owner of the arrival of a bird. The food of birds in training consists of vetch, beans, maize, peas, broken rice and millet, in various proportions, according to the country, climate and season of the year, the daily allowance for each bird being about 40 grammes weight. Young birds may be fed on rice in the husk and bread. They are called " squealers " for a week or two after birth, and then " squeakers " until about three months old. Each brood consists of two eggs, on which, both parents sit in turn, the cock only for a few hours in the middle of the day. When the young are being brought up, only one of the parent, birds is taken out at a time. One meal per day, given before the birds are let out in the morning, is sufficient. Training should commence in warm weather, when the bird is about four months old, and it consists in taking it out in a closed wicker basket and liberating or " tossing " it at gradually increasing distances from its loft, with several days interval of rest between the flights. The usual pre- liminary distances are I, 2, 5, ro and 15 or 20 m. These tosses should all be made on the same line between the loft and, say, some neighbouring city, in order that a bird may always have to fly in the same general direction during the season. About 100 m. may be expected of birds the first season; they reach their full distances only about the fifth year. It is considered better to

train the young homers alone, so that they may become independent of the older birds. When thoroughly trained they may be flown over long distances about once a week. The Belgian fanciers generally divide their birds into two classes, one for breeding and the other for racing, though the latter are allowed to breed within certain limits. Some fanciers always choose birds with chicks in the nest for long journeys, claiming that they return faster with this incentive. A seamless metal ring marked with the owner's name is slipped over the foot of the pigeon when only a few days old, and during its racing career the longer wing-feathers are stamped with the bird's records. At the start of a race the competing birds are tossed together by a starter who takes the time. Upon being released the homer ascends rapidly in spirals until, apparently des- crying some familiar landmark on the horizon, it will fly straight and swiftly towards it. As the birds enter their home-lofts the time is taken by the owner. A bird is not

considered to have got " home " until it has actually passed through the door of its loft.

PIGEON POST. The use cf homing pigeons to carry messages is as old as Solomon, and the ancient Greeks, to whom the art of training the birds came probably from the Persians, conveyed the names of Olympic victors to their various cities by this means. Before the electric telegraph this method of communi- cation had a considerable vogue amongst stockbrokers and financiers. The Dutch government established a civil and military pigeon system in Java and Sumatra early in the igth century, the birds being obtained from Bagdad. Details of the employment of pigeons during the siege of Paiis in 1870-71 will be found in the article Post and Postal Service: France. This led to a revival in the training of pigeons for military purposes. Numerous private societies were established for keeping pigeons of this class in all important European countries; and, in time, various governments established systems of com- munication for military purposes by pigeon post. When the possibility of using the birds between military fortresses had been thoroughly tested attention was turned to their use for naval purposes, to send messages between coast stations and ships at sea. They are also found of great use by news agencies and private individuals. Governments have in several countries established lofts of their own. Laws have been passed making the destruction of such pigeons a serious offence; premiums to stimulate efficiency have been offered to private societies, and rewards given for destruction of birds of prey. Pigeons have been used by newspapers to report yacht races, and some yachts have actually been fitted with lofts. It has also been found of great importance to establish registration of all birds. In order to hinder the efficiency of the systems of foreign countries, difficulties have been placed in the way of the importation of their birds for training, and in a few cases falcons have been specially trained to interrupt the service in war-time, the Germans having set the example by employing hawks against the Paris pigeons in 1870-71. No satisfactory method of protecting the weaker birds seems to have been evolved, though the Chinese formerly provided their pigeons with whistles and bells to scare away birds of prey.

In view of the development of wireless telegraphy the modern tendency is to consider fortress warfare as the only sphere in which homing pigeons can be expected to render really valuable services. Consequently, the British Admiralty has discontinued its pigeon service, which had attained a high standard of effici- ency, and other powers will no doubt follow the example. Nevertheless, large numbers of birds; are, and will presumably continue to be, kept at the great inland fortresses of France, Germany and Russia.

See L. du Puy de Podio, Die Brieftaube in der Kriegskunst (Leipzig, 1872);

Brinckmeier, Anzucht, Pflege, und Dressur der Brieftauben (Ilmenau, 1891).

PIGEON-SHOOTING, a form of sport consisting of shooting at live pigeons released from traps. The number of traps, which are six-sided boxes, falling flat open at the release of a spring, is usually five; these are arranged 5 yds. apart on the arc of a circle of which the shooter forms the centre. The distance (maximum) is 31 yds., handicapping being deter- mined by shortening the distance. The five traps are each connected by wires with a case (" the puller "); a single string pulled by a man stationed at the side of the shooter works an

arrangement of springs and cog-wheels in the " puller," and lets fall one of the traps; it is impossible to know beforehand which trap will be released. At a fixed distance from the centre of the traps is a boundary within which the birds hit must fall if they are to count to the shooter. This line varies in distance in the various clubs; the National Gun Club boundary being 65 yds., that of the Monaco Club being only 20 yds. The charge of shot allowed must not exceed ij oz. The best type of pigeon is the blue rock. From the start of the Hurlingham Club at Fulham in 1867 pigeon-shooting was a favourite sport there; it was, however, stopped in 1906. The principal pigeon- shooting centre in England is now at the National Gun Club grounds at Hendon. The great international competitions and sweepstakes take place at Monaco. An artificial bird of clay, now more usually of a composition of pitch, is often substituted for the live pigeon. These clay birds are also sprung from traps. This sport originated in the United States, where, under the name of " trap-shooting," or inanimate bird shooting, it is extremely popular. At first the traps invented threw the birds with too great regularity of curve; now the traps throw the birds at different and unknown angles, and the skill required is great. In clay-bird shooting the traps usually number fifteen, and are out of sight of the shooter. The Inanimate Bird Shooting Association in England was started in 1893.

PIGMENTS (Lat. pigmentum, from pingere, to paint). It is convenient to distinguish between pigments and paints, the latter being prepared from the former by the addition of a vehicle or medium. Nor are pigments and dyes identical, although there are cases in which the same colouring matter which yields a dye or stain may give rise to a pigment. A pigment is, in fact, a substance which is insoluble in the vehicle with which it is mixed to make a paint,- while a dye is soluble. Pigments exhibit various degrees of transparency and opacity, and ought to possess such qualities as these: ease in working, chemical indifference to each other and, generally, to the vehicles employed, also stability under exposure to light and air. As a rule, it is desirable that pigments should not be seriously affected in hue by the

vehicle; at all events, whatever change does occur ought to admit of calculation. In the case of oil colours it should be remembered that a thorough drying of the paint is preferable to the formation of a surface-skin, and that a few pigments, notably white lead, possess properties conducing to this desirable result. It is scarcely necessary to add to these general observations concerning pigments that their artistic value depends primarily upon the nature and amount of the optical sensation which they are competent to produce.

Although the number of available pigments is great, the number of chemical elements which enter into their composition is not large. Very many richly-coloured compounds _ cannot be employed because they lack the properties of insolubility, inertness and stability. Pigments are drawn from various sources. Some are natural, some artificial; some are inorganic, some organic, some are elements, some mixtures, some compounds. It is not unusual to arrange them into two groups, substantive and adjective. Amongst the members of the former group such a pigment as vermilion, where each particle is homogeneous, may be cited as an example. Amongst the adjective pigments rose-madder may be named, for each particle consists of a colourless base on which a colouring matter (alizarin) has been thrown. Most of the inorganic pigments, whether natural or artificial, belong to the substantive group; while there are many organic pigments, notably those of artificial origin, which are of adjective character. The following table presents a summary classification of pigments according to their source or origin: —

Mineral pigments Organic pigments

Natural ; as terre verte.

Artificial ; as aureolin. (Animal ; as carmine. \ Vegetable; as madder-lake. (Artificial ; as alizarin-orange.

A variety of processes are in use in order to fit natural coloured substances for employment as pigments. The first step is,

in many cases, to select, or " pick over," the raw material, rejecting whatever impurities may weaken or injure the char- acteristic hue of the product. It is occasionally tion™' necessary to treat the finely-ground substance with water by the method of elutriation or washing-over; the wash-waters will then deposit, on standing, various grades of the coloured body required. With rare exceptions native pigments need careful grinding,*

either by means of a muller on a slab or by edge rollers, or horizontal mill-stones, or special machines. The substance is usually ground in spirits of turpen- tine, or alcohol, or water; oil-paints are of course finally ground in a drying-oil, such as linseed oil or poppy oil; water-colours require gum-water, or gum-water and glycerin if they are to be " moist " paints. In the case of all pigments, whether mineral or organic, whether natural or artificial, it is of the highest importance to make sure that they are free from saline matters soluble in water. Such salts are removed by thorough washing with distilled water. A treatment of this kind is essential in the case of a large number of pigments formed by chemical reactions in the " wet way." Characteristic examples are furnished by Prussian blue, viridian and lakes. Sometimes it is necessary to remove dangerous impurities by solvents other than water, such as carbon bisulphide, which is used to extract free sulphur from cadmium yellow. Mention may here be made of another kind of preparative treatment which is adopted with some pigments: they are subjected to the action of heat — moderate in some cases, strong in others. Thus, a few substances, such as ivory black and yellow ochre, which in ordinary circumstances contain much non-essential moisture, before they are ground in oil may with advantage be gently dried at a temperature not above that of boiling water. Again, there are pigments, such as Prussian brown, light red and burnt sienna, which owe their hues to a process of actual calcination, the first of these being thus made from Prussian blue, the second from yellow ochre, and the third from raw sienna. The pigments known as burnt carmine and burnt madder are prepared at a much lower temperature, and ought to be described as roasted rather than as burnt.

The substitution of one pigment for another is rarely practised, but it is not so unusual to find that a costly substance has received an admixture of something cheaper, and that an inferior grade of a genuine pigment has had its hue exalted or enhanced by some unlawful or dangerous addition. In fact, these two kinds of sophistication are often associated. Thus vermilion is adulterated with red lead, with red antimony sulphide, or with baryta white and lead sulphate, and then the hue of the mixture is restored to the proper pitch by the introduction of the powerful but fugitive colouring matter eosin. Amongst other adulterations which may be named here are the addition of chrome-yellow (lead chromate) to yellow ochre, of green ultramarine to terre verte, and of indigo to ivory black; this last mixture being a substitute for vine-black, the natural blue-black. The detection of the above-named sophistications is by no means difficult even in the hands of persons unacquainted with chemical manipulation, but it needs a trained analyst when quantitative results are required. If we are dealing with an oil-colour, the first step is to remove the oil by means of a solvent, such, for example, as ether. The residual pigment is then allowed

to dry, and the dry powder submitted to the appropriate physical and chemical tests. Thus a suspected vermilion, having been freed from oil, is heated in a small hard glass bulb-tube: it should prove practically volatile, leaving a mere trace of residue. In this particular case the presence of a red hue in the ether-extract affords evidence of adulteration with an organic colouring matter, such as eosin. Then, again, we may detect the presence in yellow ochre of lead chromate by pouring a little sulphuretted hydrogen water and dilute hydrochloric acid upon one portion of the dry pigment, and boiling another portion with dilute sulphuric acid and some alcohol: in the former experiment blackening will occur, in the latter the liquid part of the mixture will acquire a greenish tint. So also green ultramarine may be

Adultera- tion.

recognized in adulterated terre verte by the addition of dilute hydrochloric acid, which destroys the colour of the adulterant and causes an abundant evolution of the evil-smelling sulphur- etted hydrogen. Moreover, nothing is easier than the recogni- tion of indigo in vine or charcoal-black, for the dry powder, heated in a glass tube, gives off purple vapours of indigo, which condense in the cooler part of the tube into a blackish sublimate.

A word must be said here as to the adulteration of white lead, and the examination of this most important pigment. The best variety of white lead or flake white contains two molecules of lead carbonate to one of lead hydrate, and is wholly soluble in dilute nitric acid, while barium sulphate, its most frequent adulterant, is wholly insoluble. China-clay and lead sulphate will also remain undissolved; but whitening or chalk cannot be detected in this way — indeed, the thorough examina- tion of white lead, not only for sophistications but also for correspondence with the best type in composition, cannot be carried out save by a skilled chemist.

Pigments may be classified on two systems: (i) based on the chemical composition; (2) based on the colour. On the first system pigments fall into nine groups, seven of which are fairly well defined, but the eighth and Won< ninth have a somewhat miscellaneous character. The groups of elements, oxides, sulphides, hydrates, carbon- ates and silicates present this characteristic, namely, that each member of any one group is without action upon the other members of the group; any two or more may therefore be mixed together without fear of mutual injury. The same statement may be made with reference to the various inorganic salts of Group VIII. and to the organic compounds of Group IX., although in this large final group there are two pigments con- taining copper (verdigris and emerald green) which must be regarded with suspicion. The inertness of the members of the same group towards each other may be explained in the majority of cases by the following consideration. An oxide does not act

upon an oxide, nor does a sulphide affect a sulphide, because all the pigment oxides have taken up their full comple- ment of oxygen, and can neither give nor lose this element to similar oxides; so also with sulphur in the sulphides, A few details regarding the several members of the nine groups are now offered : —

Group I. Elements. — All the black pigments in ordinary use — ivory black, lamp black, charcoal black, Indian ink, and graphite, less correctly termed black-lead and plumbago — consist of or contain carbon, an element not liable to change. The metallic pigments, gold, silver, aluminium and platinum, belong here ; of these, silver alone is easily susceptible of change, tarnishing by combination with sulphur.

Group II. Oxides. — The oxides have generally been" formed at a high temperature an3 are not easily amenable to physical or chemical change; they are, moreover, not liable to affect other pigments, being practically inert, red lead only being an exception. The oxides include zinc white, green chromium oxide, burnt umber (a mixture of iron and manganese oxide), cobalt green (CoO.raZnO), cobalt blue (CoO,»Al 2 3), coeruleum (CoO.wSnOs), Venetian red, light red, Indian red and burnt sienna (all chiefly composed of ferric oxide), and red lead (PbsO^.

Group III. Sulphides. — Some of the members of this group are liable to contain free sulphur, and some may give up this element to the metallic bases of other pigments. Thus cadmium yellow blackens emerald green, producing copper sulphide. Another pigment of this group, vermilion, is prone to a molecular change whereby the red form passes into the black variety. This change, frequent in water-colour drawings, is scarcely observable in works painted in oil. The sulphides comprise cadmium yellow (CdS), king's yellow (As 2 S 2), realgar (As^), antimony red (Sb 2 S 3) and vermilion (HgS). It is convenient to give places in the same group to the various kinds of ultramarine, blue, green, red, violet and native, for in all of them a part of the sulphur present occurs in the form of a sulphide. It may be stated that the sulphides of _ arsenic and antimony just named are dangerous and changeable pigments not suited for artistic painting.

Group IV. Hydrates or Hydroxides. — Several native earths belong here, notably yellow ochre, raw umber, raw sienna and Cappagh brown. These substances owe their colours mainly to hydrates and oxides of iron and of manganese, but the presence of a colourless body such as white clay or barium sulphate is usual with the paler pigments. A false yellow ochre from Cyprus is really a basic ferric sulphate, and does not properly belong to this

group. Besides the yellow and brown pigments, there is a magnifi- cent deep green pigment in this group, known as emerald oxide of chromium or viridian. The blue copper preparation which goes under the name of bleu lumiere and mountain blue, a very unstable pigment, is also essentially a hydrate, though by no means pure. It should be stated that all the earthy or native hydrates belonging to this group contain water in two states, namely, hygroscopic or loosely-attached and constitutional. Before grinding them in oil, the reduction in the amount of the hygroscopic moisture by means of a current of dry air or a gentle warmth often improves the hue and working quality of these pigments.

Group V. Carbonates. — There is but one really important member of this group, namely, the old and typical variety of white lead (2PbC0 3 , PbH 2 2). Like green verditer (2CuCO a . CuH 2 2), and blue verditer (CuCC>3. CUH2O2), it is a basic carbonate. Purified chalk or whitening (CaC0 3) belongs here also.

Group VI. Silicates. — Terre verte, which is a natural green ochre containing a silicate of iron, potassium and magnesium, and one other silicate, smalt, an artificial glass containing a silicate of cobalt and potassium, constitute this small group. However, some of the ochreous earths contain silicates of iron, manganese and aluminium, as well as hydrates of the two former 'metals, and so have some claim to be ranked with the silicates.

Group VII. Chromates. — These salts are rich in oxygen. When in contact with some of the more alterable organic pigments belong- ing to Group IX. the chromates may lose oxygen, acquiring a somewhat greenish or greyish hue, owing to the formation of the lower or green oxide of chromium. The chromates cannot be trusted as pigments. The yellow chromates, those of barium, strontium, zinc and lead, are represented by the general formula M"Cr04; chrome red is basic, and is PbjCrGv

Group VIII. Various Inorganic Salts. — This group is intended to receive a number of pigments which are solitary, or almost solitary, examples of various classes of salts. There is one cobalti- nitrite, aureolin (K3Co(N0 2)6, associated with one or more molecules of water), called sometimes cobalt yellow; one antimonate, that of lead, the true Naples yellow; one tungstate, that of chromium, known as tungsten green; a metaphosphate of manganese, which goes under the name of Niirnberg or manganese violet; and several mixed cobalt compounds containing arsenates and phosphates of that metal, and represented by cobalt violet and Thenard's blue. Two sulphates also belong here, namely, baryta white (BaSCi) and lead

sulphate (PbSO,i) ; also Schweinfurt green, a basic copper arsenite. It is obvious that of the members of so miscellaneous a group of pigments no general characteristics can be predicated. But it may be stated that the two sulphates, the tungstate and the cobalt compounds are practically inert and unalterable, while the copper arsenite and the lead antimonate are sensitive to the action of sulphur and of sulphides. The cobaltinitrite, aureolin, cannot be safely mixed with some of the organic pigments belonging to the next and last group.

Group IX. Organic Compounds. — Most of the members of this large and unwieldy group of pigments possess this character in common, proneness to oxidation and consequent deterioration in the presence of light, moisture and air. Such oxidation is acceler- ated by the action of some highly oxidized pigments belonging to other groups, such as the chromates of Group VII. and aureolin of Group VIII., this action being particularly marked in the case of the yellow lakes, the cochineal lakes and indigo. There are two pigments consisting of copper salts in this group. They are verdigris — both the blue-green and the green varieties being basic copper acetates — and the pigment known in England as emerald-green, which is a basic cupric aceto-arsenite. These copper pigments present the usual sensitiveness to the attack of sulphur which dis- tinguishes compounds of this metal, and cannot therefore be safely mixed with the members of Group III., and more particularly with the cadmium colours. About nine members of Group IX. may be regarded as substantive pigments. These include Indian yellow (mainly magnesium and calcium euxanthates), gamboge, sap green, indigo. Prussian blue, bitumen or asphalt, bistre, sepia, and the bituminous variety of Vandyck brown. The adjective pigments include a great variety of lakes where different kinds of colouring matters of more or less acid character have been thrown upon a base, generally of colourless aluminium hydrate, aluminium phos- phate, stannous hydrate, stannic oxide, bartya or lime; sometimes coloured bases containing such metals as copper, chromium, manganese or iron are introduced in small quantities. The colour- ing matters used are both natural and artificial. Amongst the former may be named Indian lake, from the resinous exudation produced in certain trees by the attacks of Coccus lacca; carmine, crimson and purple lake, from the colouring matter obtained from the cochineal insect, Coccus cacti; rose-madder and the madder- lakes, from the alizarin and allied bodies derived from the root of the ordinary madder plant Rubia tinctorum; and yellow lakes, from quercitron bark (Quercus tinctoria), and from Persian and Avignon berries (species of Rhamnus or Buckthorn). The lakes derived from alkanet root, archil, Brazil wood, and red sanders wood are of very small interest and value. The same judgment may be pronounced upon the large number of artificial lakes which owe their colours to coal-tar derivatives, with the single

exception of

the important class of pigments obtained from artificial alizarin, and from its congeners and derivatives. Of these, alizarin (q.v.) itself, in its purest state and associated with alumina and a little lime, yields those pigments which possess a pink or rosy hue. When purpurin and its isomers, anthrapurpurin and flavopurpurin, are present, the red hue is more pronounced, and may even tend towards a golden colour, or, when some copper or iron or manganese is introduced, may become decidedly brown. Many of the alizarin crimsons sold as paints are not made from alizarin itself, but from the sulphonic acids of alizarin.. These lakes present a wide range of hues. Another derivative of alizarin, known as /3-nitro-alizarin, yields a rich orange lake, to which such names as pure orange, orange madder and marigold have been applied.

Stability. — Some notion of the relative stability of pigments will have been derived from the remarks already made under " Classification." But as permanence is of no less importance than chromatic quality in the case of pigments used in the fine art of painting, to which the present article is mainly devoted, further particulars concerning certain selected pigments may profitably be given here. Beginning with white pigments, these three may be named as useful: white lead, Freeman's white, zinc white. As an oil-colour, white lead of the old type is generally the best to use, but among water-colours its place must be taken by zinc white in the condensed form known as Chinese white. Zinc white, in spite of the qualities which recommend its use in oil, namely, the fact of its being not only unaffected by sulphur, but odourless and non-poisonous, lacks toughness as an oil-paint, and has a tendency to scale. Freeman's white, which consists essentially of lead sulphite, is the best substitute for white lead yet devised. The small percentages of zinc white and baryta white which it contains are not to be regarded as adulterations, for they greatly increase its body, and though of less specific gravity than lead sulphate, actually raise the weight per cubic foot of the dry pigment. Out of a dozen or more familiar yellow paints, a selection may be made of these six: yellow ochre, raw sienna, mars orange, cadmium yellow, aureolin and baryta yellow. Concerning two of these, cadmium yellow and aureolin, the following observations may be set down. Cadmium sulphide, CdS, exists in two forms, which in some measure correspond to the two modifications of mercuric and antimonious sulphides. One of these forms is yellow and the other reddish orange. When sulphuretted hydrogen is sent into a weak, cold, and neutral solution of cadmium salt, the sulphide which separates is pale and yellow — the orange variety is obtained from a strong, hot, and acid solution. The pale variety is more prone to change than the darker one; but as oil colours both forms are sufficiently stable for use, provided they are pure. The value of aureolin as a pigment depends much upon its mode of preparation. A new

variety of bright yellow hue was described by Adie and Wood in 1900, and is represented by the formula K 2 NaCo(N02)6, H 2 0. Of red pigments, six claim special mention. These are vermilion, light red, Venetian red, Indian red, red ochre, and the red lakes derived from madder or alizarin. Vermilion is stable in oils, but as water-colour paint is prone to change, under exposure to strong light, into the black modification of mercuric sulphide. The iron-reds named above, whether natural or artificial, are quite permanent, but so much cannot be said of the various madder-paints. They are of far greater stability under exposure to light than any other red organic pigments, and are absolutely necessary to the artist, It must be noted that those madder and alizarin lakes which contain an element of yellow and brown are less stable than those of a crimson hue. Five green pigments may be recom- mended, namely, viridian, or the emerald Oxide of chromium, the ordinary green oxide, cobalt green, green ultramarine, and terre verte. Except for minor decorative work, where perma- nence is of secondary moment, one is obliged to exclude from the palette emerald green, green verditer, verdigris, sap-green, and the numerous preparations which owe their colour to mixtures of Prussian blue and chrome yellow, and are sold under the names of green vermilion, chrome green, Brunswick green, and so on. All these pigments usually contain much barium sulphate. Similarly, amongst blue pigments, ultramarine, cobalt blue and coeruleum may be retained, while smalt, indigo and all

copper blues should be rejected. Prussian blue, or the mixture of this pigment with a white base which is usually called Antwerp blue, can scarcely be spared, but care should be taken to choose a sample containing no potassium compounds. Coeruleum, which may be described as cobalt stannate presents the peculiar- ity of appearing a greenish blue in artificial light, not a purplish blue like that of ordinary cobalt blue. Cobalt violet is a sound pigment, while manganese metaphosphate or Nurnberg violet is said not to be safe in oil. Mars violet, an artificially prepared ferric oxide, is dull in hue but permanent. Passing on to brown pigments, it is matter for regret that there are no permanent colours possessing the artistic capacities of asphalt, madder brown, and the old bituminous Vandyke brown. Cappagh brown, burnt sienna, and raw and burnt umber may be employed safely. Little need be said as to the selection of black pigments, for all are permanent. The soot from burning acetylene, which has recently been introduced, forms a black pigment of remarkable intensity.

Uses. — Hitherto pigments have been considered chiefly in relation to the requirements of the painter of pictures. In many merely decorative arts,

such as the manufacture of wall- papers and the painting of woodwork and of iron, the pigments available are in one direction, that of cost, more restricted, but, on the other hand, many alterable or weak pigments are com- monly employed. In paints intended for the protection of iron-work, the nature of the pigment introduced is a matter of great moment, for red lead, zinc white and white lead are found to exert a strong protective influence, which is not observed in the case of the vast majority of pigments. There are a number of other uses besides those just named for which special pigments, or, more precisely, special paints, are employed. Amongst such preparations may be named luminous paints, anti-fouling paints, metallic paints, damp-proof paints, and asbestos and other fire-proof paints.

Authorities. — -J. Bersch, Manufacture of Pigments, translated from the 2nd German edition by A. C. Wright (London, 1900) ; Cennino Cennini, The Booh of the Art, translated by Mrs Herringham (London, 1899); Sir A. H. Church, Chemistry of Paints and Painting (London, 1901); G. H. Hurst, Painters' Colours, Oils and Varnishes (London, 1901); S. Mierzinski, Handbuch der Farben-Fabrikation (Vienna, 1898); Riffault (and others), Fabricant de couleurs (Paris, 1884). (A. H. C.)

PIGOT, GEORGE, Baron (1719-1777), English governor of Madras, was born on the 4th of March 17 19 and entered the service of the East India Company in 1736; after nineteen years he became governor and commander-in-chief of Madras in 1755. Having defended this place against the French in 1758-59 and occupied Pondicherry on behalf of the company, he resigned his office in November 1763 and returned to England, being made a baronet in 1764. In the following year he obtained a seat in parliament, and this'he retained until his death; in 1766 he was created an Irish peer as Baron Pigot. Returning to India in 1775 to occupy his former position at Madras, Pigot was at once involved in a fierce quarrel with the majority of his council, which arose out of the proposed restoration of the rajah of Tanjore. The governor was arrested by order of his opponents, and was still a prisoner when he died on the nth of May 1777. Meanwhile the conduct of Pigot was censured by the court of directors in England and the order for his restoration was followed immediately by another for his recall. This happened about a month after his death, but before the news had reached England. In 1779 the matter was discussed in parliament, and four of those who were responsible for his arrest were tried and were fined £1000 each. Pigot, who left several illegitimate children, was never married, and his barony became extinct.

Two of the governor's brothers were men of repute. Sir Robert Pigot (1 720-1 796), who succeeded to the baronetcy, commanded his regiment (the 38th) at the battles of Lexington and Bunker Hill during the War of

American Independence. He became a lieutenant- general in 1782. The other brother, Hugh Pigot (c. 1721-1792), was a sailor. After some years of service he became an admiral and commander-in-chief in the West Indies in 1782. One of his sons was General Sir Henry Pigot (1750-1840), and another was Hugh Pigot (1769-1797), a captain in the navy, who was murdered

during a mutiny in September 1797 while in command of the " Hermione."

PIG-STICKING, or Hog-Hunting, the chase of the wild boar, as a sport, on horseback with the spear. The chase on foot was common among ancient peoples, and in central Europe has lasted to the present day, although, on account of the introduction of fire-arms, the spear has gradually become an auxiliary weapon, used to give the coup de grace to a wounded animal. The modern sport is the direct descendant of bear- spearing which was popular in Bengal until the beginning of the 19th century, when the bears had become so scarce that wild pigs were substituted as the quarry. The weapon used by the Bengalese was a short, heavy, broad-bladed javelin. British officers introduced the spear or lance and this has become the recognized method of hunting wild pigs in India. The season for hunting in northern India, the present headquarters of the sport, is from February to July. The best horses should be quick and hot too big. Two kinds of weapon are used. The long, or underhand, spear, weighing from two to three pounds, has a light, tough bamboo shaft, from seven to eight feet long, armed with a small steel head of varying shape. This spear is held in the hand about two-thirds the distance from the point, with the knuckles turned down and the thumb along the shaft. The short, or jobbing, spear is from six to six and a half feet long, and somewhat heavier than the longer weapon. It is grasped near the butt, with the thumb up. Although easier to handle in the jungle, it permits the nearer approach of the boar and is therefore more dangerous to man and mount.

Having arrived at the bush-grown or marshland haunt of the pigs, the quarry is " reared," i.e. chased out of its cover, by a long line of beaters, usually under the command of a mounted shikari. Sometimes dogs and guns loaded with small shot are used to induce an animal to break cover. The mounted sportsmen, placed on the edge of the cover, attack the pig as soon as it appears, the honour of " first spear," or " spear of honour," i.e. the thrust that first draws blood, being much coveted. As a startled or angry wild boar is a fast runner and a desperate fighter the pig-sticker must possess a good eye, a steady hand, a firm seat, a cool head and a courageous heart. For these reasons the military authorities encourage the sport, which is for the most part carried on by the tent clubs of the larger Indian stations.

The following technical terms are used. " Frank," a boar enclosure. " Jhow," the tamarisk, a common cover for boars. " Jink " (of the boar), to turn sharply to one side. " Nullah," a dry water-course. " To pig," to hunt, the boar. " Pug," the boar's footprint. " Pugging," tracking the boar. " Ride to hog," to hunt the boar. " Rootings," marks of the pig's snout in the ground. " Sanglier " (or " singular "), a boar that has separated from the " sounder." " Sounder," a family of wild swine. " Squeaker," a pig under three years. " Tusker," a full-grown boar.

See Pig-Sticking or Hog-Hunting, by R. S. S. Baden-Powell (London, 1889).

PIKE, ZEBULON MONTGOMERY (1779-1813), American explorer and soldier, was born in Lamberton (now a part of Trenton), New Jersey, on the 5th of January 1779, son of Zebulon Pike (1751-1834), an officer in the American army. He entered his father's company as a cadet about 1794, and became an ensign (or second lieutenant) in 1799 and first lieutenant in the same year. On the 9th cf August 1805 he started with twenty men from St Louis to explore the head-waters of the Mississippi. At Prairie du Chien he met some Chippewa chiefs and induced them to expel the whisky-traders among them and to make peace with the Sioux; at the Falls of St Anthony (Sept. 23) he bought a tract 9 m. square at the mouth of the St Croix for a fort; and at Little Falls (in the middle of October) he built a stockade, where he left seven men. He reached Leech Lake ("Lake La Sang Sue"), which he called " the main source of the Mississippi," on the 1st of February 1806; went 30 m. farther to Cass Lake (" Red Cedar "); and, after working against British influences among the Indians, turned back, and went down the Mississippi from Dean Creek to St Louis, arriving on the 30th of April. In 1806 he was

ordered to restore to their homes 50 Osages, redeemed by the United States government from Potawatami, and to explore the country. He started on the 15th of July; and went north along the Missouri and the Osage into the present state of Kansas and probably to the Republican river in the south of the present Nebraska, where on the 29th of September he held a grand council of the Pawnees. Then (early in October), turning nearly south, he marched to the Arkansas river, which he reached on the 14th of October, and up which (after the 28th with only 16 men) he went to the Royal Gorge (Dec. 7), having first seen the mountain called in his honour Pike's Peak on the 23rd of November; and then went north-west, probably up Oil Creek from Canon City. In searching for the Red river he came to the South

Platte, marched through South Park, left it by Trout Creek pass, struck over to the Arkansas, which he thought was the Red River for which he was searching, and, going south and south-we,st, came to the Rio Grande del Norte (about where Alamosa, Conejos county, Colorado, is now) on the 30th of January 1807. There on the 26th of February he and a small number of his men were taken prisoners by Spanish authorities, who sent him first to Santa Fe, then to Chihuahua to General Salcedo, and by a roundabout way to the American frontier, where he was released on the 1st of July 1807. He was promoted captain (August 1806), major (May 1808), lieutenant-colonel (Dec. 1809) and colonel (July 1812). In 1808 he tried in vain to get an appropriation from Congress for himself and his men. He was military agent in New Orleans in 1809-1810, was deputy quartermaster-general in April-July 181 2, and was in active service in the War of 181 2 as adjutant and inspector-general in the campaign against York (now Toronto), Canada, and in the attack on York on the 27th of April 1813 was in immediate command of the troops in action and was killed by a piece of rock which fell on him when the British garrison in its retreat set fire to the magazine.

His Account of an Expedition to the Sources of the Mississippi and through the Western Parts of Louisiana . . . and a Tour through the Interior Parts of New Spain was published at Philadelphia in 1810; was reprinted and rearranged in London in 181 1 ; and was published in a French version in Paris in 1812, and a Dutch version at Amsterdam in 1812-1813. The standard edition with memoir and notes by Elliott Coues was published in three volumes in New York in 1895. Some of Pike's papers taken from him in Mexico are now in the Mexican archives (Seccion de Asuntos Inter- nacionales caxa 181 7-1 824), and the more important were pub- lished by H. E. Bolton in the American Historical Review, (1907-1908), xiii. 798-827. See the sketch by Henry Whiting in vol. v., series 2, of Jared Sparks's Library of American Biography.

PIKE, fresh-water fishes generally distributed over the rivers and lakes of Europe, northern Asia, and North America, and forming a small family (Esocidae) of soft-rayed fishes. They are readily recognized by their elongate compressed body covered

European Pike (Esox lucius). with small scales, a long head, long and spatulate snout, and very large mouth armed with strong and long teeth in the jaws and broad bands of smaller teeth on the palate and tongue. The teeth point backwards or can be depressed so as to offer no obstruction to any object entering the gape, but prevent its withdrawal in the opposite direction. The dorsal and anal fins are placed far back on the tail, thus greatly increasing the propelling power of the fish, and, although pike are bad swim- mers and lead rather a sedentary than a roving life, they are

excelled by no other fresh-water fish in rapidity of motion when,

by a single stroke of the tail, they dash upon their prey or dart out of reach of danger. In the Old World one species only is known (Esox lucius), which prefers lakes and sluggish reaches of rivers to strong currents or agitated waters. Its eastward range in northern Asia is not known; it extends into Lapland in the north and into central Italy and the vicinity of Constantinople in the south, but is absent in the Iberian Peninsula. The European species occurs also in North America, and is common in the eastern United States southwards to northern Ohio. But North America is tenanted by other species of pike besides, of which the largest is the muskelunge or maskinonge of the Great Lakes (Esox nobilior); it commonly attains to the large size which is exceptionally recorded of Esox lucius. The other American pike are of smaller size, and generally named " pickerel "; but opinions as to the distinction of the species differ widely among American ichthyologists. The European pike, like its brethren, is the most voracious of fresh-water fishes; it probably exceeds the shark, to which it has been compared by many writers, in the relative quantity of food it consumes. Large specimens will seize rats or water-voles, and are said to attack even foxes and small dogs. Individuals of from 40 lb to 50 lb are not scarce, but captures of much larger ones are on record. Pike are wholesome food, and much esteemed in inland countries — the smaller (of 20 to 24 in. in length) being preferred to the larger individuals. They are prolific, and not easily exter- minated in a water in which they have been once allowed to spawn. According to season and climate they spawn in April or May, and sometimes as early as February.

PIKE, a word which, with its collateral forms " pick " and " peak," has as its basic meaning that of anything pointed or tapering to a point. The ultimate etymology is much disputed, and the interrelation of the collaterals is very confused. In Old English there are two forms (pic), one with a long and the other with a short vowel, which give " pike " and " pick " respectively. The first form gave in the 15th century the variant " peak," first with reference to the peaked shoes then fashionable, pekyd schone. In Romanic languages are found Fr. pic, Span, pico, Ital. piccare, to pierce, &c. There are also similar words in Welsh, Cornish and Breton. The Scandinavian forms, e.g. Swed. and Nor. plk, are probably taken from English. While some authorities take the Celtic as the original, others look to Latin for the source. Here the woodpecker, picus, is referred to, or more probably the root seen in spica, ear of corn, and spina, prickle (English spike, spine). The current differen- tiation in meanings attached to pike, pick and peak are more or less clearly marked, though in dialects they may vary. (1) Pike: Apart from the use as the name of the fish (see above), probably a shortened form of pike-fish, from its sharp, pointed beak, the common uses of the word are for a long hafted weapon with sharply

pointed head of iron or steel, the common weapon of the foot-soldier till the introduction of the bayonet (see Spear and Bayonet), and for a hill with a pointed summit, appearing chiefly in the names of such hills in Cumberland, Westmorland and North West Lancashire. It may be noticed that the proverbial expression " plain as a pike-staff " appears originally as " plain as a pack-staff," the flat plain sided staff on which a pedlar carried and rested his pack. The use of " pike " for a highway, a toll-gate, &c, is merely short for " turnpike." (2) Pick : As a substantive this form is chiefly used of the common tool of the navvy and the miner, consisting of a curved double- ended head set at right angles to the handle, one end being squared with a chisel edge, the other pointed, and used for loosening and breaking hard masses of earth, coal, &c. (see Tools). The other name for this tool, " pickaxe," is a corrup- tion of the earlier pikoys, Fr. picois, M. Lat. picosium, formed from Fr. pic, the termination being adapted to the familiar English " axe." The sense-development of the verb " to pick " is not very clear, but the following meanings give the probable line: to dig into anything like a bird with its beak, in order to extract or remove something, to gather, pluck, hence to select, choose. (3) Peak: The chief uses are for the front of a cap or hat projecting sharply over the eyes, for the part of a ship's

hold where it narrows towards the bows, the fore-peak, or towards the stern, the after-peak, for the top corner of a sail extended by a gaff, or for the projecting end of the gaff itself, and for a pointed or conical top of a hill or mountain. The name of the high table-land district in Derbyshire is not to be connected with this word, but probably retains the name of an old English demon, Peac (see Peak, The).

PIKE-PERCH (Lucioperca), fresh- water fishes closely allied to the perch, but with strong canine teeth standing between the smaller teeth of the jaws and palate. They resemble the pike in their elongate body and head, and they are also most danger- ous enemies to other fresh-water fishes, though they compensate for their destructiveness by the excellent flavour of their flesh. In Europe two species occur, the more celebrated being the " Zander " of North Germany or " Schiel " of the Danube (Lucioperca sandra); strange to say, it is absent in the system of the Rhine. It prefers the quiet waters of large rivers and clear deep lakes, in which it reaches a weight of 25 lb or 30 lb. The second (Lucioperca wolgensis) is limited to rivers in southern Russia and Hungary. In North America several pike-perches have been described, but in the most recent works only two are distinguished, viz. Lucioperca americana, which grows to a weight of 20 lb, and the much smaller Lucioperca canadensis; both are abundant in the Canadian lakes and upper Mississippi, and the latter also in the Ohio.

PIKE'S PEAK, a famous peak of the Rampart range of the Rocky Mountains in El Paso county, Colorado, U.S.A., about 6 m. W. of Colorado Springs. Though surpassed in altitude (14,108 ft.) by many summits in the state, no other is so well known. The commanding appearance of the peak is very fine. To the south are Cameron Cone (10,685 ft.), Mt Sachett, Mt Bald (13,974), Mt Rosa (11,427), and Mt Cheyenne (9407). From the summit the magnificent Sangre de Cristo range is in the foreground, while on a clear day not only its southernmost summit, Blanca Peak (14,390 ft.) is visible, but also the Spanish Peaks (12,708 and 13,623 ft.) 100 m. to the south, and Long's Peak 100 m. to the north, and between them Mt Lincoln, Gray's Peak and other giants. At the base of the mountain are Manitou and Colorado Springs, whence tourists can make the ascent of the peak (in summer safe and relatively simple) on horseback or by a cog-railway, 8-75 m. long (opened in 1891), which makes a total ascent of 8100 ft. (maximum gradient 1 in 4) to the summit. In 1905 a powerful searchlight was erected on the summit.

Pike's Peak was discovered in November 1806 by Lieut. Zebulc M. Pike. He attempted to scale it, but took the wrong path and found himself at the

summit of Cheyenne Mountain. He pronounced the mountain unclimbable. In 1819 it was successfully climbed by the exploring party of Major S. H. Long.

PILASTER (Fr. pilastre, med. Lat. pilaslrum, from pila, a pillar), in architecture, an engaged pier projecting slightly from the wall, and employed to divide up and decorate a wall surface or to serve as respond to a column. One of the earliest examples (c. 100 B.C.) exists in the propylaea at Priene in Asia Minor, where it tapers towards the top. Pilasters have bases and capitals and are frequently fluted like columns. The Romans would seem to have preferred semi-detached columns, but for their amphitheatres sometimes pilasters are employed, as in the upper story of the Colosseum. In the revival of Classic architecture, and especially in Italy, architects seem to have considered that no building was complete without a network of pilasters on every storey, and France and England followed their example; and not only externally but inside the great cathedrals and churches the pilaster is adopted as the simplest and best way of dividing the bays.

PILATE, PONTIUS, the Roman governor of Judaea under whom Jesus Christ suffered crucifixion. Of equestrian rank, his name Pontius suggests a Samnite origin, and his cognomen in the gospels, pileatus (if derived from the pileus or cap of liberty), descent from a freedman. In any case he came in a.d. 26 from the household of Tiberius, through the influence

of Sejanus, to be procurator over part of the imperial province of Syria, viz. Judaea, Samaria and Idumea. He ruled ten years, quarrelled almost continuously with the Jews — whom Sejanus, diverging from the Caesar tradition, is said to have disliked — and in a.d. 36 was recalled. Before he arrived Tiberius died, and Pilate disappears from history. Eusebius relates (Hist. eccl. ii. 7) — but three centuries later and on the authority of earlier writers unnamed — that he was exiled to Gaul and committed suicide at Vienne.

Pilate kept the Roman peace in Palestine but with little understanding of the people. Sometimes he had to yield; as when he had sent the standards, by night, into the Holy City, and was besieged for five days by suppliants who had rushed to Caesarea (Jos. Ant. 31; B. J. ii. ix. 2, 3); and again when he hung up inscribed shields in Jerusalem, and was ordered by Tiberius to remove them to the other city (Philo ad Gaium 38). Sometimes he struck more promptly; as when the mob protested against his using the temple treasure to build an aqueduct for Jerusalem, and he disguised his soldiers to disperse them with clubs (Jos. Ant. xviii. 3, 2); or when he "mingled the blood " of some unknown Galileans " with their sacrifices " (Luke xiii. 1); or slew the Samaritans who came to Mt Gerizim to dig up

sacred vessels hidden by Moses there (Jos. Ant. xviii. 4, 1) — an incident which led to his recall. Philo, who tells how any suggestion of appeal by the Jews to Tiberius enraged him, sums up their view of Pilate in Agrippa's words, as a man " inflexible, merciless, obstinate."

A more discriminating light is thrown upon him by the New Testament narratives of the trial of Jesus. They illustrate the right of review or recognitio which the Romans retained, at least in capital causes; the charge brought in this case of acting adversus majestatem populi romani; the claim made by Jesus to be a king; and the result that his judge became convinced that the claimant was opposed neither to the public peace nor to the civil supremacy of Rome. The result is explained only by the dialogue, recorded exclusively in John, which shows the accused and the Roman meeting on the highest levels of the thought and conscience of the time. " I am come to bear witness unto the truth . . . Pilate answered, What is truth?" Estimates of Pilate's attitude at this point have varied infinitely, from Tertullian's, that he was " already in conviction a Christian " — jam pro sua conscientia Christianus — to Bacon's " jesting Pilate," who would not stay for a reply. We know only that to his persistent attempts thereafter to get his proposed verdict accepted by the people, came their fatal answer, " Thou art not Caesar's friend," and that at last he unwillingly ascended the bema (in this case a portable judgment seat, brought for the day outside the Praetorium), and in such words as Ibis ad crucem " delivered Him to be crucified."

Pilate's place in the Christian tragedy, and perhaps also in the Creed, stimulated legend about him in two directions, equally unhistorical. The Gospel of Nicodemus, written by a Christian (possibly as early, Tischendorf thought, as the middle of the 2nd century), repeats the trial in a dull and diluted way; but adds not only alleged evidence of the Resurrection, but the splendid vision of the descensus ad inferos — the whole professing to be recorded in the Acta Pilati or official records of the governor. The Epistola Pilati gives Pilate's supposed account to Tiberius of the Resurrection; and the Paradosis Pilati relates how Tiberius condemned him and his wife Procla or Procula, both Christian converts. All this culminates in Pilate being canon- ized in the Abyssinian Church (June 25), and his wife in the Greek (Oct. 27). On the other hand the Mors Pilati tells how when condemned by the emperor he committed suicide; and his body, thrown first into the Tiber and then the Rhone, disturbed both waters, and was driven north into " Losania," where it was plunged in the gulf near Lucerne and below Mt Pilatus (originally no" doubt Pileatus or cloud-capped), from whence it is raised every Good Friday to sit and wash unavailing hands.

Bibliography. — For legends see Tischendorf's Evangelia apoc- rypha (1863) and Apocryphal Gospels, Ante-Nicene Lib. (1880).

The earlier Pilate literature, to the extent of no treatises, chiefly of the 17th and 1 8th centuries, is enumerated in G. A. Muller s Pontius Pilatus der funfte Prokurator von Judaa (Stuttgart, 1888). See in loco in the following English or translated histories of the life or time of Jesus, Theodor Keim, E. Schiirer, A. Edersheim, J. P. Lange, Bernhard Weiss and F. W. Farrar ; Expositor (1884) p. 107 and (1900) p. 59; also H. Peter," Pontius Piiatus, der romische Landpfleger in Judaa," in Neue Jahrb. f. d. kl Altertum (1907). Sir James Fitzjames Stephen, in his Liberty, Equality and Fraternity (!873), p. 87, starts the question, " Was Pilate right in crucifying Christ:" his somewhat paradoxical answer is criticised in The Trial of Jesus Christ, a legal monograph, by A. Taylor Innes (1899).

(A. T. I.)

PILATUS, LEO, or Leontius [Leonzio Pilato] (d. 1366), one of the earliest promoters of Greek studies in -western Europe, was a native of Thessalonica. According to Petrarch, he was a Calabrian, who posed as a Greek in Italy and as an Italian abroad. In 1360 he went to Florence at the invitation of Boccaccio, by whose influence he was appointed to a lectureship in Greek at the Studio, the first appointment of the kind in the west. After three years he accompanied Boccaccio to Venice on a visit to Petrarch, whom he had already met at Padua. Petrarch, disgusted with his manners and habits, despatched him to Constantinople to purchase MSS. of classical authors. Pilatus soon tired of his mission and, although Petrarch refused to receive him again, set sail for Venice. Just outside the Adriatic Gulf he was struck dead by ' lightning. His chief importance lies in his connexion with Petrarch and Boccaccio. He made a bald and almost word for word translation of Homer into Latin prose for Boccaccio, subsequently sent to Petrarch, who owed his introduction to the poet to Pilatus and was anxious to obtain a complete translation. Pilatus also furnished Boccaccio with the material for his genealogy of the gods, in which he made an ostentatious display of Greek learning.

See Gibbon, Decline and Fall, ch. 66 ; G. Voigt, Die Wiederbelebung des classischen Alterthums (1893); H. Hody, De Graecis illustribus (1742); G. Tiraboschi, Storia delta letteratura italiana, v. 691.

PILAU, a favourite Eastern dish, consisting essentially of rice, boiled with mutton or other meat, fowl or fish, and flavoured with spices, raisins, &c. The word appears in Persian, Turkish and Urdu, and has been adopted in European languages. The form pilaff, showing the Turkish pronunciation, is

also common.

PILCHARD (in earlier 16th century forms pylcher, pilchar; of unknown origin; the Fr. piiseir is adapted from Eng.), Clupea pilchardus, a fish of the herring family (Clupeidae), abundant in the Mediterranean and on the Atlantic coasts of Europe, north to the English Channel. Sardine is another name for the same fish, which on the coast of Britanny and Normandy is also called cclan or celeren. It is readily distinguished from the other European species of Clupea. The operculum is sculptured with ridges radiating and descending towards the suboperculum; the scales are large, about thirty along the lateral line, deciduous; the ventral fins are inserted below, or nearly below, the middle of the base of the dorsal fin; the dorsal fin has seventeen or eighteen, the anal from nineteen to twenty-one rays. A small blackish spot in the scapulary region is very constant, and sometimes succeeded by other similar marks. There are no teeth on the palate; pyloric appendages exist in great numbers; the vertebrae number fifty-three. The pilchard is one of the most important fishes of the English Channel. It spawns at a distance from the shore, and its eggs are buoyant, like those of many other marine fishes and unlike those of the herring, which are adhesive and demersal, i.e. develop under water. The egg of the pilchard is very easily distinguished from other pelagic eggs by the unusually large space separating the vitelline

membrane from the contained ovum. Spawning takes place in summer, the season extending from June to October. When commencing their migrations towards the land the shoals consist of countless numbers, but they break up into smaller companies near the shore. Pilchards feed on minute crustaceans and other pelagic animals and require two or three years before they attain their full size, which is about 10 in. in length. The sardines of the west coast of France, which are tinned in oil for export, are immature fish of the same stock as those taken on the coasts of Cornwall; they are 5 to i\ in. in length, and though such fish occur also on the Cornish coast it is only in small numbers and for brief periods. In the Mediterranean the sardine does not exceed 7J in. in length when mature. On the Pacific coast of America, in New Zealand and in Japan a pilchard occurs {Clupea sagax) which in its characters and habits is so similar to the European pilchard that its general utilization is deserving of attention. Immense shoals are reported to visit the east coast of Otago every year in February and March, Clupea scombrina is the " oil sardine " of the east coast of India.

(J. T. C.) PILE, an homonymous word, of which the main branches are (1) a heap, through Fr. from pila, pillar; (2) a heavy beam used in making foundations, literally a pointed stake, an adapta- tion of Lat. pllum, javelin; (3) the nap on cloth, Lat. pilus, hair. In the first branch the Lat. pila (for pigla, from root of pangere, to fasten) meant also a pier or mole of stone, hence any mass of masonry, as in Fr. pile. In English usage the word chiefly means a " heap " or " mass " of objects laid one on the top of the other, such as the heap of faggots or other combustible material on which a dead body is cremated, " funeral pile," or on which a living person is burnt as a punishment. It also is applied to a large and lofty building, and specifically, to a stand of arms, " piled " in military fashion, and to the series of plates, "galvanic" or " voltaic piles," in an electric battery. The modern " head and tail " of a coin was formerly " cross and pile," Fr. croix et pile, in modern Fr. face et pile. In the older apparatus for minting the die for the reverse was placed on a small upright pillar, pile, the other on a puncheon known as a " trussell " (Fr. trousseau). The common name of the disease of haemor- rhoids (

PILGRIM, a wanderer, traveller, particularly to a holy place (see Pilgrimage). The earliest English forms are pileg/im or pelegrim, through Fr. pelerin (the original O. Fr. pelegrin is not found), from Lat. peregrinus, a stranger, foreigner, particu- larly a resident alien in Rome (see Praetor, and Roman Law). The Lat. pereger, from which peregrinus is formed, meant " from abroad," " travelled through many lands " {per, through, and ager, country).

It was customary for pilgrims to bring back as proof of their pilgrimage to a particular shrine or holy place a badge, usually made of lead or pewter, bearing some figure or device identifying it with the name or place. These " pilgrim signs " are frequently alluded to in literature — notably in the Canterbury Tales and in Piers Plowman. The British Museum and the Musee Cluny in Paris have fine collections of them, mainly dredged from the Thames and the Seine. The badges were generally worn fastened to the pilgrim's hat or cape. Among the best known are those of the cockle or scallop shell of St. James of Compostella in Spain; the " vernicle," a representation of the miraculous head of Christ; the vera icon, true image, on St Veronica's handkerchief, at Rome, or of the Abgar portrait at Genoa, of " a vernicle hadde he sowed on his cappe " {Cant. Tales, " Prol." 685); the Amiens badge of the head of John the Baptist on the charger, the cathedral claiming the custody of the relic from 1206 (fig. 1); and the palm branches or cross of palm leaf, the

badge of the " Palmers " pilgrimage to the Holy Land. The most common of the English pilgrims' signs are those of the shrine of Thomas Becket at Canterbury, the greatest centre of pilgrimage in England. These take a variety of forms,

(From Andrews' Church Treasury.) (From Andrews' Church Treasury.)

Fig. I — Pilgrim's Sign, from Fig. 2. — Pilgrim's Sign, from

the cathedral at Amiens. Canterbury.

sometimes a simple T, sometimes a bell marked campana Thome, the Canterbury bell, most often a figure of the saint, sometimes seated, sometimes riding on a horse, and carrying his episcopal cross, and with hand uplifted in benediction (fig. 2). Some- times the badges took the shape of small ampullae, or vases, as in the case of the badges of the shrine of Our Lady of Walsingham, which were marked with a W and crown.

See W. Andrews, Church Treasury (1898), article " Pilgrims' Signs," by Rev. G. S. Tyack; and Guide to Medieval Room, British Museum, p. 69.

The English " Pilgrims' Way." — From Winchester, in Hamp- shire, to Canterbury, in Kent, runs a road or way which can still be traced, now on the present made roads, now as a lane, bridle path, or cart track, now only by a line of ancient yews, hollies or oaks which once bordered it. To this old track the name of " pilgrims' way " has been given, for along it passed the stream of pilgrims coming through Winchester from the south and west of England and from the continent of Europe by way of Southampton to Canterbury Cathedral to view the place of the martyrdom of Thomas Becket, in the north transept, to the relics in the crypt where he was first buried after his murder, in 1170, and the shrine in the Trinity Chapel which rose above his tomb after the translation of the body in 1220. There were two festivals for the pilgrimage, on the 29th of December, the day of the martyrdom, and on the 7th of July, the day of the transla- tion. The summer pilgrimage naturally became the most popular. In 1538 the shrine was destroyed and the relics of the saint scattered, but the great days of the pilgrimage had then passed. Erasmus gives a vivid picture of the glories of the shrine and of all that was shown to the pilgrims on his visit with Colet to Canterbury in 1514.

The principal villages, towns and places near or through which the way passed are as follow: Winchester, Alresvord, Ropley, Alton, Farnham (here the way follows the present main road), Seale, Puttenham, by the ruined chapel of St Catherine, outside Guildford, near where the road crosses the Wey above Shalford, 1 and by the chapel of St Martha, properly of " the martyr," now restored and used as a church, Albury, Shere, Gomshall, Dorking (near here the Mole is crossed), along the southern slope of Boxhill to Reigate, then through Gatton Park, Merstham, Otford, Wrotham, after which the Medway was crossed, Burham, past the megalithic monument Kit's Coty House, and the site of Boxley Abbey, the oldest after Waverley Abbey of Cistercian houses in England, and famous for its miraculous image of the infant saint Rumbold, and the still more famous winking rood or crucifix. The road passes next by Hollingbourne, Lenham and Charing. At Otford, Wrotham and Charing were manor-houses or rather palaces of the archbishops of Canterbury; at Hollingbourne was a manor of the priors of Christchurch. After

1 Shalford Fair, the chapels on the two hills and the Surrey hills are probably the scene of Bunyan's Pilgrim's Progress, see E. Renouard James, Notes on the Pilgrim's Way in West Surrey (1871).

Hollingbourne come Westwell, Eastwell, Boughton Aluph, Godmersham, Chilham Castle, and then at Harbledown, where are the remains of the

Hospice of St Nicholas, the road joins Watling Street, by which came the main stream of pilgrims from London, the North and the Midlands.

This road, although its name of the Pilgrims' Way has for long confined it to the road by which the pilgrims came to Canterbury from Winchester, follows a far older track. Right back into British and even older times the main direction which commerce and travellers followed across southern and western England to the Straits of Dover and the Continent lay from Canterbury along the southern chalk slope of the North Downs to near Guildford, then by the Hog's Back to Farnham. At this point the oldest track went across Salisbury Plain towards Stonehenge and so on to Cornwall. From Farnham westward the only portion of this the oldest track that can now be traced is a small portion that still bears the name of the Harrow {i.e. hoary, old) road. It was in early times abandoned for the road from Winchester to which the stream of travel and com- merce from the Continent and the south and south-west of England was diverted.

The " pilgrims' way " has been traced fully in Mrs Ady's book The Pilgrims' Way (1893), and the older track in the fullest detail in Hilaire Belloc's The Old Road (1904).

The American " Pilgrim Fathers." — In American history the name " Pilgrims " is applied to the earliest settlers of the colony of Plymouth, Massachusetts, and more specifically to the first company of emigrants, who sailed in the " Mayflower " in 1620. They were from the beginning Separatists from the Church of England; they had established Independent (Congregational) churches at Scrooby and Gainsborough early in the 17th century, and some of them had fled to Amsterdam in 1608 to avoid persecution, and had removed to Leiden in the following year. They sailed from Delftshaven late in July 1620, from Southamp- ton on the 5th of August, from Plymouth on the 6th of September, and late in December 1620 founded the colony of Plymouth, Massachusetts. See Massachusetts; Plymouth, and Mayflower.

PILGRIMAGE (Fr. pelerinage, Lat. peregrinatio) , a journey undertaken, from religious motives, to some place reputed as sacred. These journeys play an important role in most pre- Christian and extra-Christian religions: in the Catholic Church their acceptance dates from the 3rd and 4th centuries.

I. The Pilgrimage in pre-Christian and non-Christian Religions. — To the Germanic religions the pilgrimage is unknown. On the other hand, it is an indigenous element, not only in the creeds of Asia, but in those of the ancient seats of civilization on the Mediterranean. The fundamental conception is always that the Deity resides — or exercises a peculiarly

powerful influence — in some definite locality; and to this locality the devout repair, either in reverence of their god, or in quest of his assistance and bounty. Thus, as the cult of a particular divinity spreads farther and farther, so the circle expands from which are drawn those who visit his sanctuary.

One of the oldest homes of the pilgrimage is India. There the army of devotees tends more especially to the Ganges — the hallowed river of Hindu belief. On the Ganges lies Benares, the holy city of Brahminism: and to look on Benares, to visit its temples, and to be washed clean in the purifying river, is the yearning of every pious Indian. Even Buddhism — originally destitute of ceremonial — has adopted the pilgrimage; and the secondary tradition makes Buddha himself determine its goals: the place where he was born, where he first preached, where the highest insight dawned on him, and where he sank into Nirvana. The four ancient sacred resorts are Kapilavastu, Gaya, Benares and Kusinagara.

In Syria, the temple of Atargatis in Hierapolis was an im- memorial resort of pilgrims. In Phoenicia, a similar significance was enjoyed by the shrine of Astarte, on the richly-watered source of the river Adonis, till, as late as the 4th century after Christ, it was destroyed by Constantine the Great. In Egypt, the great annual and monthly festivals of the indigenous gods

gave rise to all manner of religious expeditions. Even among the Israelites, the visitation of certain cult-centres prevailed from remote antiquity; but, when the restriction of Yahweh- worship to Jerusalem had doomed the old shrines, the Jewish pilgrimages were directed solely to the sanctuary on Mt Moria. Among the Greeks the habit was no less deeply rooted. Just as the inhabitants of each town honoured their tutelar deity by solemn processions to his temple, so, at the period of the Olympic games, the temple of Zeus at Olympia formed the goal of multitudes from every Hellenic country. No less power- ful was the attraction exercised by the shrines of the oracular divinities, though the influx of pilgrims was not limited to certain days, but, year in and year out, a stream of private persons, or embassies from the city-states, came flowing to the temple of Zeus in Dodona or the shrine of Apollo at Delphi.

The unification of the peoples of antiquity in the Roman Empire, and the resultant amalgam of religions, gave a powerful impetus to the custom. For,

as East and West still met at the old sanctuaries of Greece, so — and yet more — Greece and Rome repaired to the temples of the southern and eastern deities. In the shrine of Isis at Philae, Europeans set up votive inscriptions on behalf of their kindred far away at home, and it may be surmised that even among the festival- crowds at Jerusalem a few Greeks found place (John xii. 20).

The pilgrimage, however, attained its zenith under Islam. For Mahomet proclaimed it the duty of every Mussulman, once at least in his life, to visit Mecca; the result being that the birth- place of the Prophet is now the religious centre of the whole Mahommedan world (see Mahommedan Religion; Caravan; Mecca).

II. The Pilgrimage under Christianity. — The pilgrimages of Christianity presuppose the existence of those of paganism; but it would be an error to maintain that the former were a direct development of the latter. For primitive Christianity was devoid of any point by which these journeys of devotion might naturally have been suggested. It was a religion without temples, without sanctuaries, and without ceremonial. The saying of the Johannine Gospel — that God is to be adored neither in Jerusalem nor on Gerizim" but that His true worshipper must worship Him in spirit and in truth — is in complete harmony with the old Christian piety. And, accordingly, in the ancient Christian literature, we find no trace of a conception that the believer should visit a definite place in order to pay homage to his Master. The evolution of the Christian pilgrimage moved on other lines.

Cicero finely observes that, in Athens, the glorious architecture caused him less pleasure than did the thought of the great men whose work was done in its midst — " how here one had lived, and there fallen asleep; how here another had disputed, and there lay buried " {De Legg. ii. 2). This feeling was not weakened by the advent of Christianity, in fact, we may say that it was appreciably strengthened. Cicero had already compared the sites consecrated by the memory of some illustrious name with those hallowed by recollections of a loved one. But with the Christian, when his Redeemer was in question, both motives coincided : for there the greatest was also the dearest.

In this devotion to the memory of Jesus, we find the key to the origin of the Christian pilgrimage: the faithful repaired to those places which were invested with memories of their Lord's earthly life. And these journeys must certainly date from the 2nd century. For Origen (d. 254) mentions that in Bethlehem the cave was shown where Christ was born, and in it the manger in which Mary made the bed of her child. The site must have been much visited long before this, since Origen remarks that it was common

knowledge, even among the infidels, that there was the birthplace of that Jesus whom the Christians worshipped (Contr. Cels. i. 51). But those who visited Bethlehem must certainly have visited Jerusalem and the places there, so rich in memorials of their Master. And the sympathy of Christendom soon led them beyond this immediate circle. The anonymous author of the Cohortatio ad Graecos, a work of the 2nd century, visited the remnants of those cells, in which — so legend related —

the seventy interpreters laboured on their version of the Old Testament: nor, when he came to Cumae in Campania, did he fail to have shown him the old shrine of the Sibyl (Coh. ad Gr. 13 and 37). Soon we begin to hear the names of the pilgrims. In the course of the 3rd century, as Jerome relates, Firmilian, bishop of Caesarea in Cappadocia, travelled to Palestine to view the sacred places (De Vir. ill. 54); while, according to Eusebius, a second bishop from Cappadocia, Alexander by name, visited Jerusalem in order to pray and acquaint himself with the holy sites, and was there invited by the community to remain with them and assume the episcopate of the aged Narcissus [Hist. eccl. vi. n). With regard to his own times — the early years of the 4th century — the same authority recounts that believers kept streaming to Palestine from all regions, there to offer their prayers at a cavern shown on the Mount of Olives (Demonstr. evang. vi. 18).

This statement, that the Christians of the 3rd and 4th centuries were in the habit of visiting Jerusalem for prayer, proves that the non-Christian conception of the religious pilgrimage had already entered the sphere of Christian thought. That men travelled for purposes of prayer implies acceptance of the heathen theory of sanctuaries which it is an act of piety to visit. We may regret the fact, for it sullied the purity of primitive Christian thought. Nevertheless, it is clear that the develop- ment was inevitable. As soon as the non- Christian ideas of priests, sacrifices, houses of the god, and so forth, were naturalized in the Christianity of the 3rd century, it was but a short step to the belief in holy places.

III. The Pilgrimage in the Ancient Church. — In the passages cited above, Bethlehem and the Mount of Olives figure as the main goal of the pilgrim: and on the Mount of The East. Olives the mind must naturally turn to the Garden of Gethsemane and the scene of the Ascension. It may seem surprising that there is no mention of Golgotha and the Sepulchre. But the visitation of these sites was rendered impossible to the Christians by the destruction of Jerusalem and the erection of the town of Aelia Capitolina. They had not forgotten them; but the grave was concealed under a mound of earth and stones — a profanation probably dating from the siege of the city and Titus's attack on the second wall. On the summit of this mound there stood, in the days of Eusebius, a sanctuary of Venus (Eus. Vit. Const,

iii. 26, 30). The Sepulchre and the Hill of the Crucifixion were lost to the Christian pilgrim; and, consequently, before the era of Constantine, the one holy site in the town of Jerusalem was the so-called Coenaculum, which received its name in later years. It lay south of the city, near the outer wall, and, if Epiphanius is to be believed, was already in existence when Hadrian (130-131) visited Jerusalem (De mens. 14). It was regarded as the house, in which — according to the Acts of the Apostles (xii. 12 sqq.) — Mary, the mother of John Mark, lived; and the belief was that there the Lord held the Last Supper, and that there the eleven assembled after the Ascension. It was there, also, that the scene of the Pentecostal effusion of the Spirit was laid (cf. Cyrill. Hierus. Cat. xvi. 4).

The pilgrimage to Palestine received a powerful impetus from the erection of the memorial churches on the holy sites, under Constantine the Great, as described by Eusebius in his biography of the emperor (iii. 25 sqq.). At the order of Con- stantine, the shrine of Venus above mentioned was destroyed, and the accumulated rubbish removed, till the ancient rock- foundation was reached. There the cave was discovered in which Joseph of Arimathea had laid the body of Jesus; and above this cave and the Hill of the Crucifixion the imposing church of the Holy Sepulchre was built (a.d. 326-336). The churches in Bethlehem and on the Mount of Olives were erected by Helena, the mother of Constantine, who herself undertook the pilgrimage to the Holy Land. These churches were then endowed with new sanctuaries of miraculous powers; and relics of Christ were found in the shape of the Cross and the nails. Eusebius, the contemporary of Constantine, is silent on this point. To his continuators, on the other hand, it is an established fact that Helena brought all three crosses to light, and ascertained

the genuine Cross by the instrumentality of a miracle, in addition to discovering the nails of the Crucifixion (Rufin. i. 7; Socr. i.17; Sozomen. ii. 1; Theod. i. 17). It is impossible to fix the date at which the supposititious relics were introduced into the church of the Sepulchre: it is certain, however, that in the 5th century the Cross was there preserved with scru- pulous reverence, and accounted the highest treasure of the sanctuary.

After the 4th century, monks and nuns begin to form no inconsiderable part of the pilgrimages — a fact which is especially manifest from the numerous notices to be found in Jerome, and the narratives of Theodoret in the Historia religiosa. In fact, many were inclined to regard a journey to Jerusalem as the bounden duty of every monk — an exaggerated view

which led to energetic protests, especially from Gregory of Nyssa, who composed a monograph on the pilgrimages (De Us qui adeunt Hierosol.). Jerome, like Gregory, insists on the point that residence in Jerusalem has in itself no religious value: it is not locality, but character, that avails, and the gates of Heaven are as open in Britain as in Jerusalem (Ep. 58, 3). These utterances, however, must not be misinterpreted. They are not directed against the pilgrimage in itself, nor even against the belief that prayer possesses special efficacy on sacred ground, but solely against the exaggerated developments of the system.

The theologians of the 4th and 5th centuries were at one with the masses in recognizing the religious uses of the pilgrim- ages. Jerome in particular considered it an act of faith for a man to offer his prayers where the feet of the Lord had stood, and the traces of the Birth, of the Cross, and of the Passion were still to be seen (Ep. 47, 2).

We may gain some impression of the mood in which the pilgrims completed their journey, when we read how Paula, the friend of Jerome, expresses herself on her visit to the church of the Sepulchre: " As oft as we enter its precincts we see the Saviour laid in the shroud, and the angel seated at the feet of the dead!" (Hieron. Ep. 46, 2). She assured Jerome that, in the church of the Nativity at Bethlehem, she beheld, with the eye of faith, the Christ-child wrapped in swaddling clothes (Ep. 108, 10). But with these thoughts, others of an entirely different stamp were frequently blended. Pilgrimages were conceived as means to ensure an answer to particular prayers. So, for example, Eudocia, the wife of Theodosius II., vowed to undertake a pilgrimage to Jerusalem, if she should see her daughter married. (Socr. Hist. eccl. vii. 47). And, closely as this approaches to pagan ideas, the distinction between paganism and Christianity is completely obliterated when we find the hermit Julian and his companions travelling to Sinai in order to worship the Deity there resident (Theod. Hist. rel. 2).

With the number of the pilgrims the number of pilgrim-resorts also increased. Of Jerusalem alone Jerome relates that the places of prayer were so numerous that it was impossible to visit them all in one day (Ep. 46, 9). In the Holy Land the list was still longer: the natives were ready to show everything for which the foreigners inquired, and the pilgrim was eager to credit everything. In her expedition to the East, the Paula

mentioned above visited, among other places, Sarepta and Caesarea. In the first-named place she was shown the tower of Elijah; in the second, the house of Cornelius, that of Philip, and finally the grave of the four virgins. At Bethlehem she saw, in addition to the church of the Nativity, the grave of Rachel; at Hebron the hut of Sarah, in which the swaddling clothes of Isaac and the remains of Abraham's oak were on view (Hieron. Ep. 108). A similar picture is given in the Travels of the so-called Silvia Aquitana, who seems, in reality, to have been a Spanish nun, named Etheria or Eucheria. She went as a pilgrim to Jerusalem (c. 380), and from there traversed the whole of Palestine, in order to visit every site which was consecrated by memories of the Lord's earthly life. Nor did she neglect the scenes of patriarchal history. Of greater antiquity is the concise account of his travels by an anonymous pilgrim, who, in a.d. 333, undertook the journey from Bordeaux to Palestine. The Itinerary of the African Theodosius who visited the East between a.d. 520 and a.d. 530 is of later date (P. Geyer, Ilin. hierosol. saec. iv-viii.).

While pilgrim-resorts were thus filling the East, their counter- parts began to emerge in the West. And here the starting- point is to be found in the veneration of martyrs. ln tbeWest Care for the tombs of martyrs was sanctioned by immemorial custom of the Church; but, in this case also, a later age failed to preserve the primitive conception in its purity; and Augustine himself was obliged to defend the usage of the Church from the imputation that it implied a transference of heathen ceremonial to the sphere of Christianity (Contr. Faust, xx. 21). The martyrs were the local heroes of particular communities; but there were men whose life and death were of significance for the whole of Christendom — the apostles. Of these Peter and Paul had suffered martyrdom in Rome, and it was inevitable, from the nature of the case, that their graves should soon become a resort,

not only of Romans born, but of strangers also. True, the presbyter Caius (c. 200) who first mentions the situation of the apostolic tombs on the Vatican and the road to Ostia, and refers to the memorials there erected, has nothing to say of foreign Christians journeying to Rome in order to visit them. And though Origen travelled to Rome, it was not to view the graves of dead men, but to establish relations with the living flock (Euseb. Hist. eccl. ii. 25, 7; vi. 14, 10); still, it is certain that the Roman cemeteries were visited by numerous pilgrims even in the 3rd century: for the earliest graffiti in the papal crypt of the Coemeterium Callisti must date from this period (De Rossi, Roma softer, i. 253 sqq.; Kraus, Rom. Sott. 148 sqq.). And if the tombs of the popes were thus visited, so much more must this hold of the tombs of the apostles. After these, the most frequented resort at Rome in the 4th century was the grave of Hippolytus. The poet Prudentius describes how, on the day of the martyr's death, an innumerable multitude of pilgrims flocked round the site. Even on ordinary days arrivals and departures were almost incessant — foreigners being everywhere seen mingled with the native Latins. They poured balsam on the sepulchre of the saint, washed it with their tears, and covered it with their kisses, in the belief that they were thus assuring themselves of his intercession or testifying their gratitude for his assistance. Prudentius says of himself, that whenever he was sick in soul or body, and prayed there, he found help and returned in cheerfulness: for God had vouchsafed His saint the power to answer all entreaties (Perist. xi. 175 sqq.). Paulinus of Nola (d. 431) concurs — his custom being to visit Ostia each year, and Rome on the apostolic anniversaries (Ep. 20, 2; 45, 1). Next to Rome the most popular religious resort was the tomb of Felix of Nola (August. Ep. 78, 3); while in Gaul the grave of St Martin at Tours drew pilgrims from all quarters (Paul. Nol. Ep. 17, 4). Africa possessed no sanctuary to compete with these; but we learn from Sulpicius Severus (c. 400) that the tomb of Cyprian seems to have been visited even by a Gaul (Dial. i. 3).

The motive that drew the pilgrims to the graves of the saints is to be found in the conviction, expressed by Prudentius, that there divine succour was certain; and hence came the belief in a never-ending series of miracles there performed (cf., e.g. Ennod. Ticin. Lib. pro syn. p. 315). Doubt was unknown. St Augustine observes that, though Africa was full of martyrs' tombs, no miracle had been wrought at them so far as his knowledge extended. This, however, did not lead him to doubt the truth of those reported by others — a fact that is somewhat surprising when we reflect that the phenomenon caused him much disquiet and perplexity. Who, he asks, can fathom the design of God in ordaining that this should happen at one place and not at another? And eventually he acquiesces in the conclusion that God, who gives every man his individual gift at pleasure, has not willed that the same powers should have efficacy at every sepulchre

of the saints (Ep. 78, 3).

IV. The Pilgrimage in the Middle Ages. — The medieval Church

New Motives.

adopted the custom of the pilgrimage from the ancient Church. The young Germanic and Romance nations did precisely as the Greek and Romans had done before them, and the motives of these devotional journeys — now much more difficult of execution in the general decay of the great world-system of commerce — remained much the same. They were undertaken to the honour of God {Pip p. Cap. 754-755, c. 4), for purposes of prayer {Ann. Hild. 992), or in quest of assistance, especially health {Vita Galli, ii. 37; Vita Liudg. iii. 10). But the old causes were reinforced by others of at least equal potency. The medieval Church was even more profoundly convinced than its predecessor that the miraculous power of Deity attached to the bodies of saints and their relics. But the younger nations — French, English and German — were scantily endowed with saints; while, on the other hand, the belief obtained that the home-countries of Christianity, especially Rome and Jerusalem, possessed an inexhaustible supply of these sanctified bodies. Pilgrimages were consequently undertaken with the intention of securing relics. At first it was enough to acquire some object which had enjoyed at least a mediate connexion with the hallowed corpse. Gregory of Tours (d. 594) mentions one of his deacons who made a pilgrim- age into the East, in order to collect relics of the Oriental saints; and, on his return, visited the grave of the bishop Nicetius (St Nizier, d. 573) in Lyons, where he still further increased his store. His testimony showed how relics came to be distri- buted among the populace: one enthusiast took a little wax dropped from the taper; another, a portion of the dust which lay on the grave; a third, a thread from the cloth covering the sar- cophagus; and he himself plucked the flowers which visitors had planted above the tomb. Such were the memorials with which he returned; but the universal belief was that something of the miraculous virtue of the saint had passed into these objects {Vit. patr. 8, 6). Before long, however, these humble trophies failed to content the pilgrims, and they began to devote their efforts to acquiring the actual bodies, or portions of them • — frequently by honest means, still oftener by trickery. One of the most attractive works of early medievalism — Einhard's little book, Translalio Marcellini et Petri — gives a vivid description of the methods by which the bodies of the two saints were acquired and transported from Rome to Seligenstadt on the Main.

Far more important consequences, however, resulted from the fact that the medieval mind associated the pilgrimage with the forgiveness of sins. This conception of the pilgrimage, as a means of expiation or a source of pardon for wrong, was foreign to the ancient Church. It is quite in accordance with the keener consciousness of sin, which prevailed in the middle ages, that the expiatory pilgrimage took its place side by side with the pilgrimage to the glory of God. The pilgrimage became an act of obedience; and, in the books of penance {Poenitentialia) which date from the early middle ages, it is enjoined— whether for a definite period {e.g. Poen. Valicell. i. c. 19; Theod. Cant. i. 2, 16) or for life {Poen. Cummeani, vii. 12, Casin. 24) — as an expiation for many of the more serious sins, especially murder or the less venial forms of unchastity. The place to be visited was not specified; but the pilgrim, who was bound by an open letter of his bishop to disclose himself as a pentitent, lay under the obligation, wherever he went, to repair to the churches and — more especially — the tombs of the saints, and there offer his prayers. On occasion, a chain or ring was fastened about his body, that his condition might be obvious to all; and soon all manner of fables gained currency: how, here or there, the iron had sprung apart by a miracle, in token that the sinner was thereby absolved by God. For instance, the Vita Liudgeri recounts the history of a fratricide who was condemned to this form of pilgrimage by Jonas, bishop of Orleans (d. 843); he wore three iron rings round his body and arms, and travelled bare-footed, fasting, and devoid of linen, from church to church till he found pardon, the first ring breaking by the tomb of St Gertrude at Nivelles, the second in the crypt of St Peter, and the third by the grave of Liudger. The pilgrim-

age with a predetermined goal was not recognized by the books of penance; but, in 1059, Peter Damiani imposed a pilgrimage to Rome or Tours on the clerics of Milan, whom he had absolved {Acta mediol. patrol, lat. 145, p. 98).

As the system of indulgences developed, a new motive came to the fore which rapidly overshadowed all others: pilgrimages were now undertaken to some sacred spot, simply in order to obtain the indulgence which was vested in the respective church or chapel. In the nth century the indulgence consisted in a remission of part of the penance imposed in the confessional, in return for the discharge of some obligation voluntarily assumed by the penitent. Among these obligations, a visit to a particular church, and the bestowal of pious gifts upon it, held a prominent place. The earliest instance of the indulgential privilege conferred on a church is that granted in ici6 by Pontius, archbishop of Aries, to the Benedictine abbey of Montmajour (Mons Major) in Provence (d'Achery, Spicil. iii. 383 seq.),, But these dispensations, which at first lay chiefly in the gift of the bishops, then almost exclusively in that of the popes, soon increased in an incessant

stream, till at the close of the middle ages there were thousands of churches in every western country, by visiting which it was possible to obtain an almost indefinite number of indulgences. But, at the same time, the character of the indulgence was modified. From a remission of penance it was extended, in the 13th century, to a release from the temporal punishment exacted by God, whether in this life or in purgatory, from the repentant sinner. And, from an absolu- tion from the consequences of guilt, it became, in the 14th and 15th centuries, a negation or the guilt itself; while simultaneously the opportunity was offered of acquiring an indulgence for the souls of those already in purgatory. Consequently, during the whole period of medievalism, the number of pilgrims was perpetually on the increase.

So long as the number of pilgrims remained comparatively small, and the difficulties in their path proportionately great, they obtained open letters of recommendation from „.,„_, their bishops to the clergy and laity, which ensured n esor ts\ them lodging in convents and charitable foundations, in addition to the protection of public officials. An instance is preserved in Markulf's formulary (ii. 49). To receive the pilgrim and supply him with alms was always considered the duty of every Christian: Charlemagne, indeed, made it a legal obligation to withhold neither roof, hearth, nor fire from them {Admon. gent. 789, c. 75; Cap. Miss. 802, c. 27).

The most important places of resort both for voluntary and involuntary pilgrimages, were still Palestine and Rome. On the analogy of the old Itineraria, the abbot Adamnan of Iona (d. 704) now composed his monograph Dc locis Sanctis, which served as the basis of a similar book by the Venerable Bede (d. 735) — both works being edited in the Itin. hierosol. His authority was a Frankish bishop named Arculf, who resided for nine months as a pilgrim in Jerusalem, and visited the remaining holy sites of Palestine in addition to Alexandria and Constanti- nople. Of the later itineraries the Descriptio terrae sanctae, by the Dominican Burchardusde Monte Sion, enjoyed the widest vogue. This was written between the years 1285 and 1295; but books of travel in the modern tongues had already begun to make their appearance. The initiative was taken by the French in the 12th and 13th centuries, and the Germans followed in the 14th and 15th ; while the Book of Wayes to Jerusalem of John de Maundeville (c. 1336) attained extreme popularity, and was translated into almost all the vernacular languages. Most pilgrims, probably, contented themselves with the brief guide- books which seem to have originated in the catalogues of indul- gences. In later periods, that of Romberch a Kyrspe, printed at Venice (15 19), stood high in favour.

A long list might be compiled of men of distinction who per- formed the pilgrimage to Palestine. In the 8th century one of the most famous is the

Anglo-Saxon Willibald, who died in 781 as bishop of the Frankish diocese of Eichstatt. He left his home in the spring of 720, accompanied by his father and brother. The pilgrims traversed France and Italy, visiting

every religious resort; in Lucca the father died, and the brother remained behind in Rome. Early in 722 Willibald began his expedition to the Holy Land alone, except for the presence of two companions. He travelled past Naples to Syracuse, then on shipboard by Cos and Samos to Ephesus, and thence through Asia Minor to Damascus and Jerusalem. On St Martin's day, in 724, he arrived in the Holy City. After a prolonged stay in the town and its environs, Willibald proceeded (727) to Constantinople, and in 729 returned to Italy. Such is the account given by the nun of Heidenheim in her biography of Willibald; and her version is probably based on notes by the pilgrim himself (Mon. Germ. hist. scr. xv. 80 sqq.). In the Qth century the French monk Bernard visited Palestine with two companions, and afterwards wrote a simple and trust- worthy account of his journey (Patrol, lat. 121, 569 sqq.). In the 10th century Conrad, bishop of Constance (934-976), per- formed the pilgrimage to Jerusalem three times (Vila Chuonr. 7) ; and to the same period belong the first women-pilgrims to Jerusalem of whom we have any cognisance — Hidda, mother of Gero, archbishop of Cologne (Thietm. Chron. ii. 16), and the countess Hademod of Ebersberg (Chron. ebersb.). The leaders, moreover, of the monkish reform movement in the 10th and nth centuries, Richard of St Vanne in Verdun and Poppo, abbot of Stavelot (978-1048), had seen the Holy Land with their own eyes (Vila Rich. 17; Vita Popp. 3). In the year 1028 Archbishop Poppo of Trier (d. 1047) undertook a pilgrimage which led him past Jerusalem to the .banks of the Euphrates, his return taking place in 1030 (Gesla Trevir. Cont. i. 4 seq.). But the most celebrated devotional expedition before the Crusades was that of the four bishops — Sigfrid of Mainz, Gunther of Bamberg, William of Utrecht, and Otto of Regensburg. They set out in 1064, with a company whose numbers exceeded seven thousand. The major portion, however, fell in battle against the Mahommedans, or succumbed to the privations of the journey, and only some two thousand saw their homes again(.4««a/. Allah., Lamb., Disib., Marian. Scot. &c). Among the followers of the bishops were two clerics of Bamberg, Ezzo and Wille, who composed on the way the beautiful song on the miracles of Christ — one of the oldest hymns in the German language. The text was due to Ezzo, the tune to Wille (Miillen- hoff and Scherer, Denkmaler, i. p. 78, No. 31). A few years later Count Dietrich of Trier began a pilgrimage to Jerusalem with 113 companions, in atonement for the murder of Archbishop Kuno. The ship, however, which conveyed them

went down with all hands in a storm (Berth. Ann. 1073).

As a result of this steady increase in the number of pilgrims, the old arrangements for their accommodation were found deficient. Consequently hospices arose which were designed exclusively for the pilgrim. Those on the Alpine passes are common knowledge. The oldest, that on the Septimer pass, dates from the Carolingian period, though it was restored in 1 1 20 by the bishop Wido of Chur: that on the Great St Bernard was founded in the 10th century, and reorganized in the 13th. To this century may also be assigned the hospice on the Simplon; to the 14th those on the St Gothard and the Lukmanier. Similarly, the Mediterranean towns, and Jerusalem in particular, had their pilgrirn-refuges. Service in the hospices was regularly performed by the hospital-fraternities — that is to say, by lay associations working under the authorization of the Church. The most important of these was the fraternity of the Hospilale hierosolymitanutn, founded between 1065 and 1075; for hence arose the order of St John, the earliest of the orders of knighthood. In addition to the hospital of Jerusalem, numerous others were under its charge in Acre, Cyprus, Rhodes, Malta, &c. Associations were formed to assist pilgrims bound for the East; one being the Confrerie des pelerins de Terre-Sainte in Paris, founded in 1325 by Louis de Bourbon, count of Clermont (afterwards first duke of Bourbon). Its church was in the rue des Cordeliers. Similar institutions existed also in Amsterdam, Utrecht, Antwerp and elsewhere in the Netherlands.

But since, in the middle ages, the Holy Land was no longer held by a Christian Power, the protection of the pilgrims was

no less necessary than their sustenance. This fact, after the close of the nth century, led to the Crusades (q.v.), which in many respects are to be regarded as armed pilgrimages. For the old dream of the pilgrim, to view the country where God had walked as man, lived on in the Crusades — a fact which is demon- strated by the letters of Bernard of Clairvaux, with the songs of Walther von der Vogelweide and other Crusaders. And, since the strongest motive in the pilgrimage was the acquisition of indulgences, unnumbered thousands were moved to assume the Cross, when, in 1095, Urban II. promised them plenary indulgence (Cone. Claram. c. 2). The conquest of Jerusalem, and the erection of a Christian empire in Palestine, naturally welled the influx of pilgrims. And though in 1187 the Holy City again fell into the hands of the infidel, while in 1291 the loss of Acre eliminated the last Christian possession in Palestine, the pilgrimages still proceeded. True, after the fall of the city and the loss of Acre, they were forbidden by the Church; but the veto was impracticable. In the 12th century these religious expeditions were still so common that, every Sunday, prayers were offered in church for the pilgrims (Honor. Aug. Spec. eccl. p. 828). In the 13th century the annual number of those who visited

Palestine amounted to many thousands: in the 14th and 15th it had hardly shrunk. In fact, between the years 1300 and 1600, no fewer than 1400 men of distinction can be enumerated from Germany alone who travelled to the Holy Land (Rohricht and Meissner, Deutsche Pilgerreisen, pp. 465-546). It was not till the Reformation, the wars of the 16th century, and the loss of Rhodes, Candia and Cyprus to the Turks, that any appreciable alteration was effected. When Ignatius de Loyola (q.v.) set sail in 1523 from Venice to Palestine, only some thirteen souls could be mustered on the pilgrim-ship, while eight or nine others sailed with the Venetian state-vessel as far as Cyprus. A considerable number had abandoned their pilgrim- age and returned home on the news of the fall of Rhodes (Dec. 25, 1522: see Acta sand. Jul. vii. 642 seq.).

For pilgrimage overseas, as it was styled, the permission of the Church was still requisite. The pilgrims made their journey in grey cowls fastened by a broad belt. On the cowl they wore a red cross; and a broad-brimmed hat, a staff, sack and gourd completed their equipment. During their travels the beard was allowed to grow, and they prepared for departure by confession and communion. Of their hymns many are yet extant (" Jeru- salem mirabilis," "In gottes namen faren wir," &c). The embarcation took place either in France or Italy. In France, Marseilles was the main harbour for the pilgrims. From there ships belonging to the knights of St John and the knights templars conducted the commerce with Palestine, and carried annually some 6000 passengers. In the Italian ports the number of shipments was still greater — especially in Venice, whence the regular passagium started twice a year. The Venetian pilgrim ships, moreover, carried as many as 1500 souls. The pilgrims formed themselves into unions, elected a " master " and con- cluded their agreements, as to the outward voyage and return, in common. After Venice, Genoa and Pisa occupied the most prominent position. The voyage lasted from six to eight weeks, the stay in Jerusalem averaging ten days. The visitation of the holy places was conducted in processions headed by the Fran- ciscans of the Convent of Zion.

The expenses of the journey to Palestine were no light matter. In the 1 2th century they may be estimated at 100 marks of silver (£200) for the ordinary pilgrim. This was the amount raised in 1147 by one Goswin von Randerath to defray the expenses of his pilgrimage (Niederrhein. Urk. Buck. i. No. 361). Later the cost was put at 280-300 ducats (£i4o-£i5o). In the 13th century a knight with two squires, one groom, and the requi- site horses, had to disburse 8j marks of silver for his passage, while for a single pilgrim the rate was rather less than 1 mark. In the 1 6th century Ignatius de Loyola calculated the cost of the voyage from Venice to Jaffa at some 6 or 7 gold florins (£3). The expenses of the princes and lords were, of course, much heavier. Duke William of Saxony, who was in Jerusalem

in 1461, spent no less than £10,000 on his journey (see Prutz,

Kullurgeschichte tier Kreuzziige, pp. 106 sqq. ; Rohricht, Deutsche Pilgerreisen, p. 42).

Great as was the number of pilgrims oversea, it was yet far exceeded by that of the visitants to the " threshold of the apostles," i.e. Rome. As was the case with Jerusalem, guide-books to the city of the apostles were now composed. The oldest is the Notilia ecclesiarum urbis Romae, which was probably compiled under Honorius I. (625-638). The mono- graph De locis s. martyrum is of somewhat later date. Both are to be found in De Rossi, Roma sotterranea, i. 138 sqq.). The Itincrarium einsidlense (ed. G. Hanel, Archill, f. Philologie, v. 1 10ˆ belongs to the second half of the 8th century. Its composer would seem to have been a disciple of Walahfrid; for his interests are not confined to the churches, their reliquaries, and the ecclesiastical ceremonial of saint-days, but he takes a pleasure in transcribing ancient inscriptions. William of Malmesbury, again, when relating the crusade of Count Robert of Normandy (1096), transfers into his Gesta regmn anglorum (iv. § 351) an old description of Rome, originally intended for the use of pilgrims. This may have dated from the 7th century. The pilgrimages to Rome received their greatest impetus through the inauguration of the so-called Year of Jubilee (q.v.). On the 22nd of February 1300 the bull of Boniface VIII., Antiqucrum habet fidem, promised plenary indulgence to every Roman who should visit the churches of the apostles Peter and Paul on thirty days during the year, and to every foreigner who should perform the same act on fifteen days. At the close of the Jubilee this dispensation was extended to all who had expired on the way to Rome. This placed the pilgrimage to Rome on a level with the crusades — the only mode of obtaining a plenary indulgence. The success of the papal bull was indescribable. It is computed that, in the Year of Jubilee, on an average, 200,000 strangers were present in the city during the day. The greatest number of the pilgrims came from southern France, England sending comparatively few on that occasion (see Gregorovius, Gesch. d. Stadt Rom. v. 546 sqq.). The Jubilee dispensation according to the edict of Boniface VIII. was to be repeated each century; but this period was greatly abridged by succeeding popes (see Jubilee, Year of), so that in the years 1350, 1390, 1423, 1450, 1475, 1500, the troops of pilgrims again came streaming into Rome to obtain the cherished dispensation. Of the other pilgrim-resorts, we shall only emphasize the most important. Priority of mention is due to St James of Compo- stella (Santiago, in the Spanish province of Galicia). Here the attraction for the pilgrim was the

supposed possession of the body of James the son of Zebedee. The apostle was executed (a.d. 44) by command of Herod Agrippa (Acts xii. 1); and at the beginning of the medieval period it was believed that his corpse was laid in Palestine (Venant. Fortun.carm.~v. 144, viii.3). The first connexion of the apostle with Spain is to be traced in the Poema de aris b. Mar. et xii. aposl. dedic, which is ascribed to Aldhelm (d. 709) and contains a story of his preaching in that country. The earliest account of the transference of his relics to the Peninsula is found in Notker Balbulus (d. 912, Marlyrol. in Jul. xxv.). But in Spain belief in this cherished possession was universal; and, step by step, the theory won credence through- out the West. In 1059, Archbishop Wido of Milan journeyed to St James (Damiani, Acta mediol. p. 98); and a little later we hear of bands of pilgrims from Germany and France. In England, indeed, the shrine of St James of Compostella became practically the most favoured devotional resort; and in the 12th century its visitation had attained such popularity that a pil- grimage thither was ranked on a level with one to Rome or Jerusalem (Honor. August. Spec. eccl. p. 828). In Paris, after 1419, there existed a special hospice for the "fraternity of St James," in which from 60 to 80 pilgrims were received each day, fed. and presented with a quarter of a denarius (Dulaure, Hist, de Paris (1842), i. 531). Even in the period of the Reformation the " Song of St James " was sung in Germany (Wackernagel, Kirchcnlied, ii. No. 1246); and in 1478 pilgrimages to that, shrine were placed by Sixtus IV. on official equality with those to Rome and Jerusalem (Extrav. comm. c. 5; De poenit. v. 9).

In France St Martin remained the chief goal of the pilgrim; while Notre Dame de Sous-Terre in Chartres (with a portrait of the " black Virgin "), Le Puy-en-Velay (dep. Haute Loire), and others, also enjoyed considerable celebrity. In England pilgrimages were made to the tomb of the murdered archbishop, Thomas Becket, in Canterbury Cathedral. The setting of Chaucer's Canterbury Tales gives a vivid idea of the motley company of pilgrims; but it seems probable that Germany also sent a contingent (Gervas. Cantuar. chr. ann. 1184; Ralph de Diceto, Ymag. hist. ann. 1184). In addition, Walsingham, Peterborough, St Davids, Holywell, and St Andrews in Scotland were much frequented. In lower Germany, Cologne and Aix-la- Chapelle, in Switzerland Einsiedeln, were the principal resorts.

In Italy the church of the Archangel on Mt Gargano was one of the most ancient centres of the pilgrimage, being visited even by the monk Bernard (vide supra). Later the Portiuncula church at Assisi displaced all other religious resorts, with the exception of Rome; but in the 15th century it was overshadowed in turn by the " Holy House " at Loretto on the Adriatic. According to an extravagant legend, the house of Joseph and Mary in Nazareth was transported by angels, on the night of the 9th-ioth of May 1 29 1 to Dalmatia, then brought to the Italian coast opposite (Dec. 10,

1294), till, on the 7th of September 1295 it found rest on its present site. The pilgrimage thither must have attained great importance as early as the 15th century; for the popes of the Renaissance found themselves constrained to erect an imposing pilgrim church above the " Holy House."

The significance of the pilgrimage for the religious life of later medievalism cannot be adequately estimated. The possession of an extraordinary relic, a bloody Host, or the like, was every- where considered a sufficient claim for the privileges of indul- gences; and wherever this privilege existed, there the pilgrims were gathered together. All these pilgrimages, great and small, were approved and encouraged by the Church. And yet, during the whole of the middle ages, the voice of suspicion in their regard was never entirely stilled. Earnest men could not disguise from themselves the moral dangers almost inevitably consequent upon them; they recognized, moreover, that many pilgrims were actuated by extremely dubious motives; and they distrusted the exaggerated value set on outward works. The Roman papacy had no more zealous adherent than Boniface; yet he absolutely rejected the idea that Englishwomen should make the journey to Rome, and would willingly have seen the princes and bishops veto these pilgrimages altogether (Ep. 78). The theologians who surrounded Charlemagne held similar views. When the abbess Ethelburga of Fladbury (Worcester- shire) found her projected pilgrimage impracticable, Alcuin wrote to her, saying that it was no great loss, and that God had better designs for her: " Expend the sum thou hast gathered for the journey on the support of the poor; and if thou givest as thou canst, thou shalt reap as thou wilt "(Ep. 300). Bishop Theodulf of Orleans (d. 821) made an energetic protest against the delu- sion that to go to Rome availed more than to live an upright life (Carm. 67). To the same effect, the synod of Chalon-sur-Saone (813) reprobated the superstition which was wedded to the pilgrimage (c. 13); and it would be easy to collect similar judg- ments, delivered in every centre of medievalism. But, funda- mentally, pilgrimages in themselves were rejected by a mere handful: the protest was not against the thing, but against its excrescences. Thus Fridank, for instance, in spite of his emphatic declaration that most pilgrims returned worse than they went, himself participated in the crusade of Frederick II.

V. The Modem Pilgrimage. — The Reformation eradicated the belief in the religious value of visits to a particular locality. It is only pious memory that draws the Protestant to the site consecrated by ecclesiastical history. On the other hand, while in the Eastern Church things have undergone little change, — the pilgrims, in addition to the Holy Land, visiting Mt Athos and Kiev — the developments in the Roman Church show important divergences. The Year of Jubilee, in 1525, was unprecedented in its scant attendance, but the jubilees of 1575 and 1600 again saw great armies of pilgrims marching to Rome.*

Fresh pilgrim resorts now began to spring up, and medieval shrines, which had fallen on evil days, to emerge from their obscurity. In the 16th century we must mention the pilgrimages to the " Holy Mount " at Gorz on the Austrian coast, and to Mont- serrat in the Spanish province of Barcelona: in the 17th century, those to Luxemburg, Kevelaer (Gelderland), Notre Dame de Fourviere in Lyons, Hciligenberg in Bohemia, Roermond in the Netherlands, &c. The 18th century, which witnessed the religious Aufklarung, was not favourable, to the pilgrimage. Enlightened bishops and princes prohibited it altogether: so, for instance, Joseph II. of Austria. Archbishop Clement Wenceslaus of Trier forbade, in 1777, the much-frequented, medieval " leaping-procession " of Echternach (duchy of Luxem- burg). The progressive theologians and clergy, moreover, assumed a hostile attitude, and, in 1800, even the Curia omitted the Year of Jubilee. The 19th century, on the other hand, led to an extraordinary revival of the pilgrimage. Not only did new resorts spring into existence — e.g. La Salette in Dauphine (1846), and more particularly Lourdes (1858) in the department of Hautes Pyrenees — but the numbers once more attained a height which enables them to compete with the medieval figures. It is computed that 60,000 pilgrims were present in La Salette on the 29th of September 1847, the first anniversary of the appear- ance of Mary which gave rise to the shrine. The dedication of the church of Lourdes, in 1876, took place in the presence of 30 bishops, 3000 priests and 100,000 pilgrims. In 1877 the number rose to 250,000; and similar statistics are given of the German and Austrian devotional resorts. The sanctuaries of Aix-la-Chapelle are said to have been visited by 65,000 pilgrims on the 15th of July i860; and on the following Sunday by 52,000. From 25,000 to 30,000 persons take part each year in the resuscitated " leaping-procession " at Echternach; and the annual visitants to the " Holy Mount " at Gorz are estimated at 50,000. No new motives for the pilgrimage emerged in the 19th century, unless the ever-increasing cultus of the Virgin Mary may be classed as such, all of the new devotional sites being dedicated to the Virgin. For the rest, the desire of acquiring indulgences maintains its influence: but doubting voices are no more heard within the pale of the Roman Catholic Church.

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• *(A. H.*)*

PILIBHIT, a town and district of British India, in the Bareilly division of the United Provinces. The town— pop. (1901), 33,490 — contains the mosque of Hafiz Rahmat Khan, the' Rohilla chieftain, built in the second half of the 18th century. Trade is mainly in agricultural produce, and in the products of the neighbouring Himalayan territory and Nepal.

The District of Pilibhit has an area of 1350 sq. m.; pop. (1901), 470,339, showing a decrease of 3% in the decade. Though so near the Himalayas it is entirely a plain. In its midst is the Mala swamp. The east is forest-clad, poor and unhealthy; on the other side of the Mala the land becomes more fertile. The chief river is the Sarda, and the Gumti rises in the east. The principal crops are rice, pulses, wheat and sugar-cane. Sugar-refining is carried on, and sugar, wheat, rice and hemp are exported. The Lucknow-Bareilly section of the Oudh & Rohilkhand railway runs through the district, a portion of which is watered by the Rohilkhand canals.

PILLAR (O. Fr. piler, Mod. pilier, Late Lat. pilare, from pila, column), an isolated upright structure, of narrow width in relation to its height, which is either employed as a support for a superincumbent load of some sort or is set up for commemorative or ornamental purposes. In the first sense the word has many common applications, as to columns supporting the girders of a

warehouse floor or the deckbeams of a ship, to the single central support or pedestal of a table, machine-t6ol, &c, and to the masses of coal which the miner leaves in certain methods of working as supports to the roof (see Coal) ; it is also used figuratively of persons in such phrases as a " pillar of the state." In archi- tecture it has strictly the second sense. The column erected in honour of Diocletian at Alexandria is known as Pompey's pillar, and the so-called columns of Trajan and Antoninus are in reality pillars, performing no structural function beyond that of carrying a statue. In India the only example is the iron pillar at Delhi, which is an extraordinary specimen of the iron- worker's art considering the remote date at which it was made. Up to the middle of the 19th century the term " pillar " was employed to designate the masses of masonry in a church, which carry the arcades, but now the term " pier " is invariably adopted in preference.

PILLAU, a seaport and watering-place of Germany, in the Prussian

province of East Prussia, on the spit of sand (Nehrung) which separates the Frische Haff from the Baltic, on the north of the entrance channel, and 29 m. by rail from Konigsberg. Pop. (1905), 7374. It is fortified and has a harbour, which serves as the outer port of Konigsberg, and to some extent also of Elbing and Braunsberg. A new navigable channel was in 1900-1901 constructed across the Frische Haff from Pillau to Konigsberg. Pillau has a school of navigation, and is a well-known pilot station. Ship-building, sail-making, fishing and the working of amber are carried on.

Pillau is memorable as the place where Gustavus Adolphus of Sweden landed in 1626. It did not obtain civic privileges until 1725, but was fortified shortly after that date. In 1807 it offered a stout resistance to the French. By a treaty of the 24th of February 1812 it was ceded to Napoleon, but on the 6th of February in the following year it was restored to Prussia.

PILLION, a light saddle without pommel or bow, especially a pad fastened to the back of an ordinary saddle, as a seat for another person, generally a woman. Pillions were also used to support baggage. They were in common use from the 16th to the 18th centuries. The word appears to have been adapted into English from the Irish pillin, cushion, formed from Lat. pellis, skin. In the sense of a hat worn by a priest or doctor of divinity, " pillon " or " pylion " occurs in the 1 5th and 16th centuries. This is probably from Lat. pileus, a conical felt hat or cap, Gr. ttTXos.

PILLNITZ, a village in the kingdom of Saxony, situated on the right bank of the Elbe, 5 m. above Dresden. Pop. (1905), 770. The new palace of the king of Saxony was built in 1818 on the site of a building which was destroyed by fire. The place became a residence of the electors of Saxony about 1700, and the different parts of the palace were erected at various times during the 18th century. By the convention of Pillnitz in August 1791 the emperor Leopold II. and Frederick William II., king of Prussia, agreed to take common action against any attack on the part of France; this compact may be regarded as the basis of the first coalition against that country.

See A. von Minchwitz, Geschichte van Pillnitz (Dresden, 1893).

PILLORY (O. Fr. pilori, Prov. espitlori, from Lat. specuio- torium, a place of observation or " peep-hole "), an instrument of punishment which consisted of a wooden post and frame fixed on a platform raised several feet from the ground, behind which the culprit stood, his head and his hands being thrust through holes in the frame (as are the feet in the stocks) so as to be held fast, exposed in front of it. This frame in the more complicated forms of the instrument consisted of a perforated iron circle,

which secured the heads and hands of several persons at the same time, but it was commonly capable of holding only one.

In the statutes of Edward I. it is enacted that every pillory or " stretch-neck " should be made of convenient strength so that execution might be done on offenders without peril of their bodies. It was customary to shave the heads wholly or partially, and the beards of men, and to cut off the hair and even in extreme cases to shave the heads of female culprits. Some of the offences punished in England by the pillory will be found enumerated in

a statute of Henry III. (1266). By this "Statute of the Pillory" it was ordered as the penalty for " forestalled and regrators, users of deceitful weights, perjurers and forgers." Stow, describ- ing Cornhill pillory, says: " On the top of the cage (a strong prison of timber) was placed a pillory for the punishment of bakers offending in the assize of bread, for millers stealing corn at the mill, for bawds, scoids and other offenders." Until 1637 the pillory was reserved for such offenders. In that year an attack was made on the Press, and the pillory became the recog- nized punishment of those who published books without a licence or libelled the government. Alexander Leighton, John Lilburn, Prynne and Daniel Defoe were among those who suffered. These were popular favourites, and their exposures in the pillory were converted into public triumphs. Titus Oates, however, was put in the pillory in 1685 and nearly killed. In 1816 the pillory was abolished except for perjury and suborna- tion, and the perjurer Peter James Bossy was the last to stand in the pillory at the Old Bailey for one hour on the 22nd of June 1830. It was finally abolished in 1837 at the end of William IV. 's reign. In France the pillory, called carcan, was employed till 1832. In Germany it was known as pranger. The pillory was used in the American colonies, and provisions as to its infliction existed in the United States statute books until 1839; it survived in the state of Delaware until 1905.

Finger-pillories were at one time in common use as instru- ments of domestic punishment. Two stout pieces of oak, the top being hinged to the bottom or fixed piece, formed when closed a number of holes sufficiently deep to admit the finger to the second joint, holding the hand imprisoned. A finger- pillory is preserved in the parish church of Ashby-de-la-Zouch, Leicestershire, and there is one, still in its original situation against the wall, at Littlecote Hall, Wilts.

PILLOW (O. Eng. pylu; Lat. pulvinus, a cushion), a support for the head

during sleep or rest. The pillow of Western nations is a cushion of linen or other material, stuffed with feathers, down, hair or wool. In the East it is a framework made of bamboo or rattan with a depression in the top to receive the neck; similarly blocks of wood with a concave-shaped top are used by the natives of other countries. The word is found in various technical uses for a block or support, as for a brass bearing for the journal of a shaft, and the like. In architecture the term " pillowed," or " pulvinated," is given to the frieze of an order which bulges out in the centre and is convex in section. It is found in friezes of some of the later works of the Roman school and is common in Italian practice.

PILOCARPINE, CiiH 16 N 2 02, an alkaloid found, together with isopilocarpine and other related compounds, in the leaves of jaborandi {Pilocarpus pennatif alius) . It was first isolated by E. Hardy in 1875 (Ber., 8, p. 1594), and is a crystalline, very hygro- scopic solid. It is a strong poison. It has the properties of a monacid base and contains the methylamino group, -NCH3. When heated with hydrochloric acid it gives isopilocarpine. Isopilocarpine was isolated in 1900 by H. A. D. Jowett (Journ. C/iem. Soc. 77, p. 473), and is a colourless oil which boils at 261° C. (10 mm.). It is a monacid base which is readily soluble in solutions of the causric alkalis. Jowett is of the opinion that pilocarpine and isopilocarpine are stereo-isomers of the structure:— ˆCH-N-CH s C 2 H 5 - CH-CO

\CH: C— CH 2 — CH-CH 2 /

PILOfiA, a town of northern Spain, in the province of Oviedo; between the right bank of the river Pilona, a left-hand tributary of the Sella, and the Sierra de Abes (3268 ft.). Pop. (1900), 18,228. Though officially classed as a town, Pilona is rather a densely populated mining and agricultural district. It is served by the railway from Infiesto, on the river Pilona, to Oviedo and Gijon.

PILOT, the name applied either to a particular officer serving on board a ship during the course of a voyage and having the charge of the helm and the ship's route, or to a person taken on -»oard at a particular place for the purpose of conducting a ship through a river, road or channel, or from or into a port. The

latter kind is the only one to which the term is now applied either in British or foreign countries. The word " pilot " is not the early name for the man who guides or steers a ship.. In Old English the name is Iddman, i.e. the man who leads the way. " Pilot " does not appear in English till the 16th century. The origin of the word has been much debated. Many etymolo- gists find it in the Dutch pijloot (Hexham's Dictionary, 1658). This has

been identified with peillood, peil-loth, sounding lead, cf. German peilen, to sound; the last part of these words is the same as English "lead," the metal; the first part, peilen, is for pegclen, to mark with pegs or points for measuring, cf . pegel, gauge. The New English Dictionary, on the other hand, finds that the Dutch piloot, the earlier form, is taken from the French. The source is, therefore, to be looked for in Romance languages. Du Cange (Gloss. Med. et Inf. Lat.) gives Pedottae, defined as quorum est scire intrare et exire portus, a gloss on pedotte e timonieri in F. Ubaldini's edition, 1640, of I documenti d'amore by Francesco da Barberino (1 264-1348). It is therefore conjectured that the Italian pilota is a popular conception of pedotta, and a possible source may be found in the Greek vrjSov, oar.

In England, formerly, pilots were subject to the jurisdiction of the lord high admiral; and in the 16th century there are many instances of the admiralty court dealing with pilots disciplinarily as well as civilly, holding them liable in damages to owners of ships lost or damaged by their negligence. For some consider- able time throughout the United Kingdom the appointment and control of pilots have been in the hands of numerous societies or corporations established at the various ports by charter or act of Parliament, such as the Trinity Houses of Deptford Strond (London), Kingston-upon-Hull, Newcastle-on-Tyne, and Leith, and the Society of Cinque Ports Pilots and Court of Lodemanage (now extinct). These societies had jurisdiction over the pilots exercising their employment within Autborit!eSt the limits of such ports, and in many cases made it compulsory for ships resorting thither to employ them. By degrees the London Trinity House acquired a leading position, which was confirmed and extended by the general Pilotage Acts passed in the 18th and 19th centuries, with the object of intro- ducing a uniform system throughout the realm. At the present day the United Kingdom is divided into districts for the purpose of .pilotage jurisdiction. The (London) Trinity House has jurisdiction over the London district, which extends from Orfordness to Dungeness, and comprises the Thames and Med- way up to London and Rochester bridges; the English Channel district, comprising the sea between Dungeness and the Isle of Wight;, and the Trinity outport districts, which include any pilotage districts for the appointment of pilots within which no particular provision is made by act of Parliament or charter, and the number of which is 40, all English and Welsh'. There are 66 other districts, within which other pilotage authorities have jurisdiction.

The present general pilotage law is contained in the Merchant Shipping Acts 1894 to 1906. Pilotage authorities are defined as bodies or persons authorized to appoint or license pilots, or to fix and alter rates of pilotage or to exercise any jurisdiction in respect of pilotage. They are subject to the control of the Board of Trade as the supreme mercantile marine authority.

Those bodies, however, which existed at the time of the passing of the act retain their powers and jurisdiction, so far as is consistent with it. The board has power to appoint a new pilotage authority in any area where there is none, and to include a new area where there is none within an already existing one (but in either case pilotage cannot be made compulsory), or to transfer pilotage jurisdiction over a port other than that where the pilotage authority for that port resides, from that pilotage authority to the harbour or other local authority for that port, or to the Trinity House, or to a new authority; and the board has all powers necessary to effectuate such transfer and constitute the new authority. The board may also, by provisional order (which requires parliamentary confirmation), provide for the representation of pilots or shipowners on the pilotage authority

of any district, and the exemption of ships from compulsory pilotage in any district. Where pilotage is not compulsory, and the power of obtaining pilotage licences unrestricted, the board can in the same way give the pilotage authority powers with respect to licences, amount of pilotage rates, and the like. Pilotage authorities may, by by-laws under the act (which require confirmation by order in council), exempt wholly or partly any ships or classes of ships from compulsory pilotage, and regulate the means of obtaining licences, and the amount of pilotage rates, subject to a maximum limit. They must make yearly returns to the Board of Trade of their by-laws, the names, ages and services of their licensed pilots, the rates of pilotage, the amounts received for pilotage and their receipts and expenditure; and if they fail to do so, the board may suspend their authority, which is then exercised by the Trinity House.

The statu tes also provide generally for the qualifications of pilots. A " qualified " pilot is one duly licensed by a pilotage authority to conduct ships to which he does not belong. Qualities- Q n j,j s a pp om t men t he receives a licence, which is re- gistered with the chief officer of customs at the nearest place to the pilot's residence, and must be delivered up by the pilot whenever required by the licensing pilotage authority. On his death this licence must be returned to that authority. By an act of 1906 no pilotage certificate shall be granted to the master or mate of a British ship unless he is a British subject; this does not, however, refer to the renewal of a certificate granted before 1906 to one not a British subject. Pilotage dues are recoverable summarily from the owner, master, or consignees of the

ship, after a written demand for them has been made. A pilot may not be taken beyond the limits of his district without his consent, and if so taken he is entitled to a fixed daily sum in addition to the dues; if he cannot board the ship, and leads her from his boat, he is entitled to the same dues as if he were on board; and he must be truly informed of the ship's draught of water. An unqualified pilot may in any pilotage district take charge of a ship without subjecting himself or his employer to any penalty, where no qualified pilot has offered himself, or where a ship is in distress, or in circumstances where the master must take the best assistance he can, or for the purpose of changing the moorings of any ship in port on docking or undocking her; but after a qualified pilot has offered himself any unqualified pilot continuing in charge, or any master continuing him in charge of the ship, is liable to a penalty. A qualified pilot may not be directly or indirectly interested in licensed premises or in the selling of dutiable goods, or in the unnecessary supply. of gear or stores to a ship for his personal gain or for the gain of any other person. He can be punished for quitting a ship before the com- pletion of his duty without the consent of the master, refusing or delaying to perform his duty without reasonable cause when required by lawful authority, lending his licence, acting as pilot when suspended or when intoxicated, and any pilot who through wilful breach of or neglect of duty, or by reason of his drunken- ness, endangers ship, life or limb, is guilty of a misdemeanour and liable to suspension or dismissal; but the pilot has an appeal in cases of fines over £2, of suspension or dismissal, suspension or revocation of his licence, or the application of a pilotage fund to which he has contributed. This appeal lies in England to a county court judge having jurisdiction over the port where he is licensed, or a metropolitan police magistrate or stipendiary magis- trate with the like power; in Scotland, to a sheriff; in Ireland, to a county court judge, chairman of quarter sessions, recorder, or magistrate. Pilotage certificates may also be granted by pilotage authorities, available within their districts, to masters and mates of ships; and the holder of such a certificate may pilot any ship in respect of which it is available without incurring any penalty for not employing a qualified pilot.

The statute further makes special regulation for Trinity House pilots. Every such pilot, on his appointment, must execute a bond for £roo conditioned for due observance of the Trinity House regulations and by-laws, and thereupon he is not liable for neglect or want of skill to anybody beyond the penalty of the

bond and the amount payable to him for pilotage on the voyage on which he was engaged at the time of his so becoming liable. The licence may be revoked or suspended by the Trinity .House when it thinks fit; it only continues in force for a year, and the Trinity House has absolute discretion whether it shall be renewed or not.

A pilot boat is approved and licensed by the district pilotage authority who appoints or removes the master thereof. In order to be easily recognized, she has printed on her stern in legible white letters the name of her owner and sil, her port, and on her bows the number -of her licence; the remainder of the boat is usually black. The pilot flag is a red and white horizontal flag of a comparatively large size, and is flown from a conspicuous position. When the flag is flown from a merchant vessel, it indicates that a licensed pilot is on board or that the master or mate holds a certificate entitling him to pilot the ship. By order in council of 1900, on and after the 1st day of January 1901 the signals for a pilot displayed together or separately are: In daytime, there is (1) hoisted at the fore the pilot jack (Union Jack having round it a white border, one-fifth of the breadth of the flag); (2) the international code pilotage signal indicated by P.T.; (3) the international code flag S. (white with small blue square centre), with or without the code pennant; (4) the distant signal consisting of a cone point upwards, having above it two balls or shapes resembling balls. By night, (1) the pyrotechnic light commonly known as a blue light, every fifteen seconds; (2) a bright white light, flashed or shown at short or frequent intervals just above the bulwarks, for about a minute at a time.

Pilotage in British waters may be either compulsory or free for all or certain classes of ships. From parliamentary pilotage returns, it appears that it is compulsory in about 64 districts of the United Kingdom (of which two- %™Jtagl°' 7 thirds are the Trinity House districts), free in 32, free and compulsory in 8, while in 3 cases (Berwick, Dingwall and Coleraine) no particulars are given. British war-ships in British waters are not compelled to employ a pilot, the navigating officer becoming the pilot under the direction of the captain. If a pilot be employed, the captain and navigating officer are not relieved from responsibility. They supervise the pilot, and should, if necessary, remove him from the ship. In the majority of foreign ports British war-ships are exempted from employing pilots, but the Suez Canal and the ports of France are exceptions. The Merchant Shipping Act 1894 continues the compulsory employment of pilots in all districts where it was already compulsory, and also the already existing exemptions; and there is no power in any pilotage authority or the Board of Trade to increase the area of compulsory pilotage, though there is to diminish it. Compulsion is enforced by a provision in the act, that within a district where compulsory pilotage exists, the master of an unexempted ship who pilots her himself without holding the necessary certificate, after a qualified pilot has offered or signalled to take charge of the ship, shall be liable for each offence to a fine of double the amount of the pilotage dues demandable for the conduct of the ship. The exemptions from compulsory pilotage still existing in British territorial waters are as follows: Ships or vessels with British registers trading to Norway or the Cattegat or the Baltic

(except vessels on voyages between any port in Sweden or Norway and the port of London), or round the North Cape, or into the White Sea on their inward or outward voyages, whether coming up by North or South Channels; any constant British traders inwards from ports between Boulogne inclusive and the Baltic coming up by North Channel, and any British ships or vessels trading to ports between the same limits on their outward passages and when coming up by the South Channels; Irish traders using the navi- gation of the Thames and Med way; ships engaged in the regular coasting trade of the kingdom; ships or vessels wholly laden with stone produced in the Channel Islands and Isle of Man and brought thence; ships or vessels not exceeding 60 tons, whether British or belonging to a foreign country specified by order in council; ships within the limits of the port or place to which they belong, if

this is not a place particularly provided for by act of Parliament or charter as regards the appointment of pilots; ships passing through the limits of any pilotage district in their voyages from one port to another port, and not being bound to any port or place within such limits or anchoring therein, but not including ships loading or discharging at any place situate within the district, or at any place situate above the district on the same river or its tributaries. Ships whose masters or mates are owners or part-owners of them, and living at Dover, Deal, or the Isle of Thanet, may be piloted by them from any of these places up and down the Thames or Medway, or into or out of any place or port within the jurisdiction of the Cinque Ports. The following ships in the London district and Trinity outport districts are also exempt when not carrying passengers, namely: Ships employed in the coasting trade of the United Kingdom; ships of not more than 60 tons burden; ships trading to or from any port in Great Britain within the above districts to or from the port of Brest in France, and any port in Europe (which does not include the United Kingdom) north and east of Brest, or to the Channel Islands or Isle of Man; and ships navigating within the limits of the port to which they belong. The port to or from which the ship must be " trading " in this provision has been interpreted by the decisions to mean the port where the cargo is substantially discharged or loaded respectively; and the word " coaster " similarly has been held to apply only to a vessel carrying to one port of the United Kingdom a cargo which has been taken in at another. Every ship carrying passengers between any place in the British Islands and any other place so situate must carry a compulsory pilot, unless her master or mate have a pilotage certificate. The effect in law of the ship (British or foreign) being in charge of a compulsory pilot under the act is that her owner and master are not answerable to any

person whatever for any loss or damage occasioned by the fault or incapacity of any qualified pilot acting in charge of such ship within any district where the employment of such pilot is com- pulsory by law. In order to take advantage of this privilege, the shipowner must show ® that a properly qualified pilot was acting in charge of the ship; there are, however, various kinds of qualified pilots — the qualified pilot who is always capable of acting, and the qualified pilot who is liable to be superseded if a better can be obtained; (2) that that charge was compulsory; the pilot, however, need not be compulsorily employed at the place where the accident happened, so long as he is compulsorily employed within the district where it happens; (3) that it was solely the pilot's fault or incapacity which caused the damage. Similarly, under the Harbours, Piers and Docks Clauses Act, the owner of a vessel is not liable for damage done thereby to docks or piers when she is in charge of a duly licensed pilot.

This statutory exemption of a ship in charge of a compulsory pilot from any liability for her negligent navigation by that pilot, is only declaratory of the common law of England, and is based on the principle that the pilot is a state official put in charge of a ship, and is not the servant of the shipowner so as to make him liable for his negligence; and a British court gives the same effect to any foreign or colonial law which makes it com- pulsory on shipowners to put a pilot in charge of their ship when within their jurisdiction. Most foreign codes, however, while agreeing with English law in making the presence of a pilot on board compulsory, differ from it in not putting him in charge of the ship; and in this case the defence of compulsory pilotage cannot be pleaded successfully in British courts. Judicial decisions have established that French, Suez Canal, Danube and Dutch pilots are not compulsory pilots in the British sense of the word, being only advisers of the master, or " living charts." But if the pilot is put in charge by the foreign or colonial law, although that law expressly provides that in spite of the owner surrendering the charge of the ship to him the owner shall still remain liable, a British court will hold the owner free from liability, on the ground that to make any person liable for a tort committed abroad, the act complained of must be wrongful not only according to the foreign law, but also by English law. This consequence which English law attaches to the employment

of a compulsory pilot has been much criticized in recent times, and it would seem that the foreign view is much more satisfactory in regarding the pilot merely as the adviser and not the superior of the master. Moreover, the adoption of the foreign law on this point would restore the old general maritime law. The policy of the law was at one time inclined to extend this principle of compulsory pilotage, on the ground that it was for the benefit of commerce and the safety of seamen's lives, t but it now restricts it within as narrow limits as possible, e.g. the presence of a compulsory pilot on

board a tow who is directing the navigation of a tug does not protect the tug-owner from liability for negligent navigation. As already pointed out, pilotage authorities have • no power to extend its scope.

A pilot who is compulsorily in charge of a ship under English law has supreme control over her navigation, superseding the master for the time being; and if she is a tow he has also control of the navigation of her tug. The judicial decisions establish that it is within his province to decide whether the ship shall get under way, the proper time and place for her to anchor, the way of carrying her anchor, the proper orders for the helm, her rate of speed, and whether the statutory rules of navigation shall be complied with; and the master and crew must not interfere with his control, and only remain liable for the proper execution of the pilot's orders and the trim and general efficiency as to look-out, &c, of the ship. The master, however, is bound to supersede the pilot in case of his intoxication or manifest incapacity, and to interfere if there is a clear and plain prospect of danger to the ship in following the pilot's directions, e.g. getting under way in a thick fog. The pilot is entitled to receive from the master assistance in having his attention called to anything which a competent mariner would see that he ought to know. A pilot taken voluntarily, and not by compulsion of law, is considered as the servant of the shipowner, and as such renders him liable for his acts of negligence towards third parties. He does not, it seems, supersede the master in the control of the ship, but only advises him. The Admiralty and the Board of Trade and the Trinity House all take the view that the captain or master is bound to keep a vigilant eye on the navigation of the vessel by the pilot, and insist on all proper precautions being taken. For the purposes of a policy of marine insurance a ship is not seaworthy without a pilot in compulsory pilotage waters; and where there is no legal compulsion to have one, but the locality requires navigation by a person having local knowledge, it has been said that a ship must take a pilot, certainly when leaving a port, and probably on entering a port if a pilot is available.

A pilot can sue for his pilotage fee at common law or in Admiralty (q.v.), in the latter case provided that the contract was made and the work done not within the body of a county; but he has a 'summary remedy by statute which is of easier application. He cannot be sued in Admiralty for damage done by a collision caused by his negligence' (e.g. on the Admiralty side of a county court having Admiralty jurisdiction) ; but he can be made liable at common law or in the Admiralty Division of the High Court, although in the case of a Trinity House pilot his liability is limited to the amount of his bond and pilotage fee then being earned (see above) ; but the court has refused to join him as a defendant to an action in rem brought against the ship of which he had the charge. A pilotage authority cannot be made liable for the negligent navigation of a ship by a pilot which it has licensed,

for he is not its servant, though it has been held liable for the negligence of a person not licensed by it as a pilot, but employed by it for wages to pilot ships into a harbour under its jurisdiction, itself taking the pilotage dues and applying them for harbour purposes. A pilot is not in common employment with the master and crew of a ship, and can recover for any injury done him by their negligence. He may be entitled to claim salvage from a ship of which he has charge, if the services he renders are beyond the scope of his pilotage contract, either from the outset or owing to supervening circumstances, but not otherwise, whether he is on board her or leading her from his boat. (See Salvage.)

In the United States pilotage laws are regulated by the respective

states. If the waters are the boundary between two states a duly licensed pilot of either state may be employed, but no dis- crimination can be made in the rates of pilotage between vessels of different states. In the German Empire the pilotage laws are very complicated. In the majority of the maritime states each one has its own regulations and laws. In Prussia there are government pilots who enter the service as apprentices, and are placed under a department of state. In France the general organi- zation of pilots is regulated by the Statute on Pilots of the 12th of December 1806, a»d the pilotage regulations for each port are made by the minister of marine at the request of his local repre- sentative and the Chamber of Commerce. French pilots are exempt from military service.

See Abbott, Shipping (London, 1901); Maude and Pollock, Shipping (London. 1 881) ; Marsden, Collisions at Sea (London, 1910) ; Select Pleas of the Admiralty (Selden Society, London, 1892 and 1897); Temperley, Merchant Shipping Acts (1907); Twiss, Black Book of Admiralty (London, 1871). (G. G. P.; J. W. D.)*

PILOT-FISH (Naucrates doctor), a pelagic fish of the family of horse-mackerels or Carangidae, well known to sailors from its peculiar habit of keeping company with ships and large fishes, especially sharks. It occurs in all tropical and sub-tropical seas, and is common in the Mediterranean, but becomes scarcer in higher latitudes. In summer pilots will accompany ships as far north as the south coast of England into port. This habit was known to the ancients, who describe the Pompilus as

Pilot-fish.

a fish which points out the way to dubious or embarrassed sailors, and by

its sudden disappearance indicates to them the vicinity of land; the ancient seamen of the Mediterranean re- garded it, therefore, as a sacred fish. That the pilot accompanies sharks is an observation which first appears in works of travel of the 17th century, the writers asserting that it is of great use to its big companion in conducting it and showing it the way to its food. It is, however, extremely doubtful whether the pilot's connexion with a shark serves a more special purpose than its temporary attachment to a ship. It accompanies both on account of the supply of food which it derives from them. The pilot, therefore, stands to both in the relation of a so-called " com- mensal," like the Echeneis or sucking-fish. All observers, however, agree that neither the pilot nor the sucker is ever attacked by the shark. The pilot attains to a length of about 12 in. In the shape of its body it resembles a mackerel, but is rather shorter, especially in the head, and covered with small scales. A sharp keel runs along the middle of each side of the tail. The first dorsal fin consists of a few short spines not connected by a membrane; the second dorsal and the anal are composed of numerous rays. The teeth, which occupy the jaws, vomer and palatine bones, are all small, in villiform bands. The coloration of the pilot renders it conspicuous at a distance; on a bluish ground-colour from five to seven dark-blue or violet cross-bands traverse the body from the back to the belly. The pilot-fish spawns in the open sea, and its fry is constantly caught in the tow-net. But young pilot-fish differ considerably from the adult, having the spines of the first dorsal connected by a membrane, and some bones of the head armed with projecting spines. These little fishes were therefore long considered to be a distinct genus, Nauclcrus.

PILOTY, KARL VON (1826-1886), German painter, was born at Munich, on the 1st of October 1826. His father, Ferdinand Piloty (d. 1844), enjoyed a great reputation as a lithographer. In 1840 he was admitted as a student of the Munich Academy, under the artists Schorn and Schnorr. After a journey to Belgium, France and England, he commenced work as a painter of genre pictures, and in 1853 produced a work, Die Amme (" The Wet Nurse "), which, on account of its originality of style,

caused a considerable sensation in Germany at the time. But he soon forsook this branch of painting in favour of historical subjects, and produced in 1854 for King Maximilian II. " The Adhesion of Maximilian I. to the Catholic League in 1609." It was succeeded by " Seni at the Dead Body of Wallenstein " (1855), which gained for the young painter the membership of the Munich Academy, where he succeeded Schorn (his brother-in- law) as professor. Among other well-known works by Piloty are the " Battle of the White Mountain near Prague," " Nero Dancing upon the Ruins of Rome " (1861), " Godfrey of Bouillon on a Pilgrimage to the Holy Land " (1861), " Galileo in Prison " (1864), and " The Death of Alexander the Great " (unfinished), his last great work. He also executed a

number of mural paint- ings for the royal palace in Munich. For Baron von Schach he painted the justly celebrated " Discovery of America." In 1874 he was appointed keeper of the Munich Academy, being after- wards ennobled by the king of Bavaria. Piloty was the fore- most representative of the realistic school in Germany. He was a most successful teacher, and among his more famous pupils may be mentioned Makart, Lenbach, Defregger, Max and Griitzner. He died at Munich on the 21st of July 1886.

PILSEN (Czech, Plzen), a town of Bohemia, Austria, 68 m. W.S.W. of Prague by rail. Pop. (1900), 68,292, of which 94% are Czech. It is the second town of Bohemia, and lies at the confluence of the Radbusa and the Mies. It consists of the town proper, which is regularly built and surrounded with promenades on the site of the old ramparts, and of three suburbs. The most prominent buildings are the Gothic church of St Bartholomew, said to date from 1292, whose tower (325 ft.) is the highest in Bohemia, and the fine Renaissance town hall dating from the 16th century. The staple article of manufacture and commerce is beer, which is exported to all parts of the world. Other industrial products are machinery, enamelled tinware, leather, alum, paper, earthenware, stoves and spirits, while a tolerably brisk trade is carried on in wool, feathers, cattle and horses. In the neighbourhood are several coal-pits, iron-works and glass-works, as well as large deposits of kaolin.

Pilsen first appears in history in 976, as the scene of a battle in the war between Prince Boleslaus and the emperor Otto II., and it became a town in 1272. During the Hussite wars it was the centre of Catholic resistance to the Hussites; it was three times unsuccessfully besieged by Prokop the Great, and it took part in the league of the Romanist lords against King George of Podebrad. During the Thirty Years' War the town was taken by Mansfield in 1618 and not recaptured by the Imperialists till 1 62 1. Wallenstein made it his winter-quarters in 1633, an< l it was in the great hall of the Rathaus that his generals took the oath of fidelity to him (January 1634). The town was unsuccess- fully besieged by the Swedes in 1637 and 1648. The first Bohemian printing press was established here in 1468.

PIMA, a tribe and stock of North American Indians. Their range was southern Arizona and northern Mexico. The ruined Pima village, known to the Spanish as Casa Grande on the south bank of the Gila, is an example of their early civilization and skill in building. Driven out of their homes by neighbouring tribes, they lived a more or less nomadic life. They were always good farmers, showing much skill in irrigation. At first submitting to the Spaniards, they revolted in 1751, destroying all the missions. The war lasted two years, but since then the Pima Indians have been friendly with

the settlers. As a race they are brave, honest and hard working. They number some 5000 on two reservations in Arizona. The Piman stock includes such tribes as the Papago, Huichol, Opata, Tarumari, and numbers upwards of a hundred thousand.

PIMENTO, also called Allspice (from a supposed combination of various flavours) and Jamaica Pepper, the dried immature fruit of Eugenia pimenta or Pimento, officinalis, an evergreen tree about 30 ft. high, belonging to the natural order Myrlaceae. It is indigenous in the West India Islands, growing on limestone hills near the sea, and is especially grown in Jamaica. The spice derives its name from the Portuguese pimenta, Spanish pimienla, pepper, which was given to it from its resemblance to

pepper-corns. The berries are gathered in July and August, when of full size, but still unripe— the small branches bearing fruit being broken off and dried in the sun and air for some days, when the stalks are removed and the berries are ready for packing. These owe their aromatic properties to an essential oil present to the extent of 3 to 4!% and consisting largely of eugenol or allyl guaiacol, HO(CH 3 0)C6HrC3H 5 . The chief use of pimento is as a spice. The oil, the action of which resembles that of cloves, is occasionally used in medicine, and is also employed in perfum- ing soaps. The " bay rum " used as a toilet article is a tincture scented with the oil of the leaves of an allied species, Pimento, acris, commonly known as the bayberry tree.

PIN (a doublet with " pen " from Lat. pinna, feather, pinnacle, which is said to contain the same root as irirvs, pine tree, and properly to mean a sharp point or end), a small peg or bolt of metal or wood, not necessarily pointed, employed as a fasten- ing to connect together different parts of an article, as a stop to limit the motion of some moving piece in a machine, as a support on which a small wheel may turn, &c, but most commonly a small metal spike, used for fastening portions of fabrics together, having one end pointed and at the other a bulbed head, or some other arrangement for preventing the spike from passing entirely through the cloth or other material with which it is employed. In one form or another pins of this last kind are of the highest antiquity, the earliest form doubtless being a natural thorn. Pins of bronze, and bronze brooches in which the pin is the essen- tial feature, are of common occurrence among the remains of the bronze age. The ordinary domestic pin had become in the 15th

century an article of sufficient importance in England to warrant legislative notice, as in 1483 the importation of pins was prohibited by statute. In 1540 Queen Catherine received pins from France, and again in 1543 an act was passed providing that " no person shall put to sale any pinnes but only such as shall be double headed, and have the heads soldered fast to the shank of the pinnes, well smoothed, the shank well shapen, the points well and round filed, canted and sharpened." At that time pins of good quality were made of brass; but a large proportion of those against which the legislative enactment was directed were made of iron wire blanched and passed as brass pins. To a large extent the supply of pins in England was received from France till about 1626, in which year the manufacture was introduced into Gloucestershire by John Tilsby. His business flourished so well that he soon gave employment to 1500 persons, and Stroud pins attained a high reputation. In 1636 the pinmakers of London formed a corporation, and the manufacture was subse- quently established at Bristol and Birmingham, the latter town ultimately becoming the principal centre of the industry. So early as 1775 the attention of the enterprising colonists in Caro- lina was drawn to the manufacture by the offer of prizes for the first native-made pins and needles. At a later date several pin-making machines were invented in the United States. During the war of 1812, when the price of pins rose enormously, the manufacture was actually started, but the industry was not fairly successful till about the year 1836 when the Howe Manu- facturing Company was formed at Birmingham, Connecticut. Previous to this an American, Lemuel W. Wright, had in 1824 secured in England a patent for a machine to make solid-headed pins, which established the industry on its present basis.

The old form of pin consisted of a shank with a separate head of fine wire twisted round and secured to it. Fine wire for heads was first wound on a lathe round a spit the exact circumference of the pin shanks to be headed. In this way a long elastic spiral was produced which had next to be cut into heads, each consisting of two complete turns of the spiral. These heads were softened by annealing and made into a heap for the heading boy, whose duty was to thrust a number of shanks into the heap and let as many as might be fit themselves with heads. Such shanks as came out thus headed were passed to the header, who with a falling block and die arrangement compressed together shank and head of such a number as his die-block was fitted for. All the other operations of straightening the wire, cutting, pointing, &c, were separately performed, and these numerous details connected with the pro- duction of a common pin were seized on by Adam Smith as one of the most remarkable illustrations of the advantages of the division of labour.

The beautiful automatic machinery by which pins are now made of single pieces of wire is an invention of the 19th century. In 1817 a

communication was made at the Patent Office by Seth Hunt, describing a machine for making pins with " head, shaft and point in one entire piece." By this machine a suitable length of wire was cut off and held in a die till a globular head was formed on one end by compression, and the other end was pointed by the revolu- tion around it of a roughened steel wheel. This machine does not appear to have come into use; but in 1824 Wright patented the pin-making apparatus above referred to as the parent form pf the machinery now employed. A factory equipped with his machines was established in London, but the company which owned it was not successful. The plant passed into the hands of Daniel Foote- Tayler of Birmingham, who obtained an extension of Wright's patent for five years from 1838, and his firm was the first to carry on the production of machine-made solid-headed pins on a com- mercial basis. In a modern pin-making machine wire of suitable gauge running off a reel is drawn in and straightened by passing between straightening pins or studs set in a table. When a pin length has entered it is caught by lateral jaws, beyond which enough of the end projects to form a pin-head. Against this end a steel punch advances and compresses the metal by a die arrangement into the form of a head. The pin length is immediately cut off and the headed piece drops into a slit sufficiently wide to pass the wire through but retain the head. The pins are consequently suspended by the head while their projecting extremities are held against a revolving cutter, by which they are pointed. They are next cleaned by being boiled in weak beer, and then arranged in a copper pan in layers alternating with layers of grained tin. The contents of the pan are covered with water over which a quantity of argol (bitartrate of potash) is sprinkled, and after boiling for several hours the brass pins are coated with a thin deposit of tin, which gives them their silvery appearance. They are then washed in clean water, and dried and polished by being revolved in a barrel, mixed with dry bran or fine sawdust, from which they are winnowed finished pins. A large proportion of the pins sold are stuck into paper by an automatic machine not less ingenious than the pin- making machine itself. Mourning pins are made of iron wire, finished by immersing in black japan and drying in a stove. A considerable variety of pins, including the ingeniously coiled, bent and twisted nursery safety pin, ladies' hairpins, &c, are also made by automatic machinery. The sizes of ordinary pins range from the 31-in. stout blanket pin down to the finest slender gilt pin used by entomologists, 4500 of which weigh about an ounce.

PINA, RUY DE (1440-1521), Portuguese chronicler, was a native of Guarda. He acted as secretary of the embassy sent by King John II. to Castile in the spring of 1482, and in the following September returned there as sole envoy. He was present at the execution of the duke of Braganza at Evora in 1483, and in 1484 went to Rome as secretary of an embassy to

Pope Innocent VII. On his return, the king charged him to write a history of his reign and gave him a pension for his support. Following the arrival of Columbus from his first voyage in 1493, Pina was one of the commissaries despatched to Barcelona by John II. to negotiate with the Catholic sovereigns respecting the Hmits of their) respective jurisdictions. In September 1495 he attested the will of John II. in his capacity as a notary public, and on the 25th of October of the same year he was present at his master's death at Alvor and opened and read his testament. King Manoel confirmed his pension and appointed him in 1497 chronicler of the kingdom, keeper of the archives and royal librarian, with a suitable salary. By 1304 Pina had completed his chronicles of Alphonso V. and John II. King John III. charged him with a history of his father, Manoel, and at his death Pina had carried it down to the capture of Azamor, as we know from Damiao de Goes, who used it in preparing his own chronicle of that monarch.

It is probable that the chronicles of the early kings of Portugal from Sancho I. to Alphonso IV. which were published under Pina's name in the 18th century were written by Fernao Lopes and edited by Pina, while that of King Duarte seems to have been the joint production of Lopes and Azurara, with Pina again as the editor only. Pina was a favourite of fortune during his life, for, apart from royal benefactions, he received presents from public men who wished to figure well in his books, and after his death he obtained the credit for work that was not his. His authority as an historian is considerable, and his frankness is said to have provoked remark from contemporaries.

Pina's chronicle of King Alphonso IV. was first published in Lisbon in 1853; those of King Duarte and King Alphonso V. in vol. i. of the Collecao de livros ineditos da historia portugueza

(Lisbon, 1790), and his chronicle of John II. in vol. ii. of the same collection (Lisbon, 1792). The introduction to the chronicle of King Duarte contains the fullest account of Pina's life. (E. Pr.)

PINACOTHECA, a picture-gallery (Gr. Tnvaxo6i)Krt, from 7rii>a£, a tablet or picture) . The name is especially given to the building containing pictures which formed the left wing of the Propylaea on the Acropolis at Athens. Though Pausanias (Bk. II., xxii. 6) speaks of the pictures " which time had not effaced," which seems to point to fresco painting, the fact that there is no trace of any preparation for stucco on the walls rather shows

that the paintings were easel pictures (J. G. Frazer, Pausanias' s Description of Greece, 1898, ii. 252). The Romans adopted the term for the room in a private house containing pictures, statues, and other works of art. It is used for a public gallery on the continent of Europe, as at Bologna and Turin. At Munich there are two galleries known as the Old and New Pinakothek.

PINAR DEL RIO, capital of Pinar del Rio Province, Cuba, about 107 m. S.W. by railway from Havana. Pop. (1907), 10,634. The city is in the fertile valley of the Guama. It is the centre of the tobacco industry of the Vuelta Abajo region. Its port is La Coloma, on the southern coast. The pueblo was created after 1773; but the history of the settlement goes back to 1 571, and the parochial church dates from 17 10.

PINCKNEY, CHARLES (1757-1824), American statesman, was born on the 26th of October 1757 at Charleston, South Carolina; he was the son of Charles Pinckney (1 731-1784), first president of the first South Carolina Provincial Congress (Jan. to June 1775), and a cousin of Charles Cotesworth Pinckney and Thomas Pinckney. He was studying law at the outbreak of the War of Independence, served in the early campaigns in the South, and in 1779 was elected to the South Carolina House of Representatives. He was captured by the British at the fall of Charleston (1780), and remained a prisoner until the close of hostilities. He was elected a delegate to the Congress of the Confederation in 1784, 1785 and 1786, and in 1786 he moved the appointment of a committee " to take into consideration the affairs of the nation," advocating in this connexion an en- largement of the powers of Congress. The committee having been appointed, Pinckney was made chairman of a sub-commit- tee which prepared a plan for amending the articles of confedera- tion. In 1787 he was a delegate to the Federal constitutional convention, and on the same day (May 29) on which Edmund Randolph iq.v.) presented what is known as the Virginia plan, Pinckney presented a draft of a constitution which is known as the Pinckney plan. Although the Randolph resolutions were made the basis on which the new constitution was framed, Pinckney's plan seems to have been much drawn upon. Furthermore, Pinckney appears to have made.valuable sugges- tions regarding phrasing and matters of detail. On the 18th of August he introduced a series of resolutions, and to him should probably be accredited the authorship of the substance of some thirty-one or thirty-two provisions of the constitution. 1 Pinck-

1 The " Pinckney Plan " has been the subject of considerable discussion. When, in 1818, John Qiiincy Adams was preparing the journal of the convention for publication and discovered that the Pinckney plan was missing, he wrote to Pinckney for a copy, and Pinckney sent him what he asserted was either a copy of his original draft or a copy of a draft which

differed from the original in no essentials. But as this was found to bear a close resemblance to the draft reported by the committee of detail, Madison and others, who had been members of the convention, as well as historians, treated it as spurious, and for years Pinckney received little credit for his work in the convention. Later historians, however, notably J. Franklin Jameson and Andrew C. McLaughlin, have accredited to him the suggestion of a number of provisions of the constitution as a result of their efforts to reconstruct his original plan chiefly from his speeches, or alleged speeches, and from certain papers of James Wilson, a member of the committee of detail, one of which papers is believed to be an outline of the Pinckney plan. See J. F. Jameson, " Studies in the History of the Federal Con- vention of 1787," in the Annual Report of the American Historical Association for 1902, vol. i.; A. C. McLaughlin, " Outline of Pinck- ney's Plan for a Constitution," in The Nation, April 28, 1904; an article entitled " Sketch of Pinckney's Plan for a Constitution," in the American Historical Review for July 1904; and C. C. Nott, The Mystery of the Pinckney Draught (New York, 1908), an attempt by a former chief-justice of the U.S. Court of Claims to prove that

ney was president of the State Convention of 1790 that framed a new constitution for South Carolina, was governor of the state from 1 789 to 1792, a member of the state House of Represen- tatives in 1 792-1 796, and again governor from 1796 to 1798. From 1799 to 1801 he was a member of the United States Senate. He entered public life as a Federalist, but later became the leader in organizing the Democratic-Republican party in his state, and contributed largely to the success of Thomas Jefferson in the presidential election of 1800. By Jeiferson's appointment he was American minister to Spain from 1801 to 1805. In general his mission was a distinct failure, his arrogance and indiscretions finally causing the Spanish government to request his recall. He was elected to the state House of Repre- sentatives in 1805, was again governor of South Carolina from 1806 to 1808, in 1810-1814 was once more a member of the state House of Representatives, in which he defended President Madison's war policy, and from 1819 to 1821 was a member of the National House of Representatives, in which he opposed the Missouri Compromise in a brilliant speech. He died at Charleston, South Carolina, on the 29th of October 1824.

His son, Henry Laurens Pinckney (1794-1863), was a mem- ber of the state House of Representatives in 1816-1832, founded in 1819 and edited for fifteen years the Charleston Mercury, the great exponent of state's rights principles, and was a member of the National House of Representatives in 1833-1837.

PINCKNEY, CHARLES COTESWORTH (1746-1825), Ameri- can

statesman, was born in Charleston, South Carolina, on the 25th of February 1746, the son of Charles Pinckney (d. 1758), 2 by his second wife, the celebrated girl planter, Eliza Lucas. When a child he was sent to England, like his brother Thomas after him, to be educated. Both of them were at Westminster and Oxford and were called to the bar, and for a time they studied in France at the Royal Military College at Caen. Return- ing to America in 1769, C. C. Pinckney began the practice of law at Charleston, and soon became deputy attorney-general of the province. He was a member of the first South Carolina provincial congress in 1775, served as colonel in the South Carolina militia in 1 776-1 777, was chosen president of the South Carolina Senate in 1779, took part in the Georgia expedi- tion and the attack on Savannah in the same year, was captured at the fall of Charleston in 1780 and was kept in close confine- ment until 1782, when he was exchanged. In 1783 he was commissioned a brevet brigadier-general in the continental army. He was an influential member of the constitutional convention of 1787, advocating the counting of all slaves as a basis of representation and opposing the abolition of the slave- trade. He opposed as " impracticable " the election of represen- tatives by popular vote, and also opposed the payment of senators, who, he thought, should be men of wealth. Subse- quently Pinckney bore a prominent part in securing the ratifica- tion of the Federal constitution in the South Carolina convention called for that purpose in 1788 and in framing the South Carolina State Constitution in the convention of 1790. After the organization of the Federal government, President Washington offered him at different times appointments as associate justice of the Supreme Court (1791), secretary of war (1795) and secretary the document sent by Pinckney to Adams in 1818 is a genuine copy of his original plan.

2 Charles Pinckney, the father, was long prominent in colonial affairs; he was attorney-general of the province in 1733, speaker of the assembly in 1 736-1 738 and in 1740, chief justice of the province in 1 752-1 753, and agent for South Carolina in England in 1753- 1758. He was the uncle of Charles Pinckney (1731-1784), and the great-uncle of Charles Pinckney (1757-1824). Eliza Lucas Pinckney (c. 1722-1793) was the daughter of Lieut. Colonel George Lucas of the British army, who about 1738 removed from Antigua to South Carolina, where he acquired several plantations. He was almost immediately recalled to Antigua, and his daughter under took the management of the plantations with conspicuous success. She is said to have been the first to introduce into South Carolina (and into continental North America) the cultivation and manu- facture of indigo, and she also imported silkworms — in 1753 she presented to the princess of Wales a dress made of silk from her plantations. She was married to Charles Pinckney in 1744. See Harriott H. Ravenel, Eliza Pinckney (New York, 1896), in the " Women of Colonial and Revolutionary Times " series.

of state (1795), each of which he declined; but in 1796 he suc- ceeded James Monroe as minister to France. The Directory refused to receive him, and he retired to Holland, but in the next year, Elbridge Gerry and John Marshall having been appointed to act with him, he again repaired to Paris, where he is said to have made the famous reply to a veiled demand for a " loan " (in reality for a gift), " Millions for defence, but not one cent for tribute," — another version is, " No, not a sixpence." The mission accomplished nothing, and Pinckney and Marshall left France in disgust, Gerry {q.v.) remaining. When the correspon- dence of the commissioners was sent to the United States Congress the letters " X," " Y " and " Z," were inserted in place of the names of the French agents with whom the com- mission treated — hence the " X Y Z Correspondence," famous in American history. In 1800 he was the Federalist candidate for vice-president, and in 1804 and again in 1808 for president, receiving 14 electoral votes in the former and 47 in the latter year. From 1805 until his death, on the 16th of August 1825, he was president-general of the Society of the Cincinnati.

PINCKNEY, THOMAS (1750-1828), American statesman and diplomat, was born in Charleston, South Carolina, on the 23rd of October 1750, a younger brother of Charles Cotesworth Pinckney (q.v.). Educated in England, he returned to Charles- ton in 1773, and was admitted to the bar in 1774. During the War of Independence his early training at the French military college at Caen enabled him to render effective service to General Benjamin Lincoln in 1778-1779, to Count d'Estaing (1779), to General Lincoln in the defence of Charleston and afterwards to General Horatio Gates. In the battle of Camden he was badly wounded and captured, remaining a prisoner for more than a year. Subsequently he was governor of South Carolina in 1787^-1789; presided over the state convention which ratified the Federal constitution in 1788; was a member of the state legislature in 1791; and was United States minister to Great Britain in 1792-1796. During part of this time (1794-1795) he was also envoy extraordinary to Spain, and in this capacity nego- tiated (1795) the important Treaty of San Lorenzo el Real; by that treaty the boundary between the United States and East and West Florida and between the United States and " Louisiana " was settled (Spain relinquishing all claims east of the Mississippi above 31 N. lat.), and the United States secured the freedom of navigation of the Mississippi to its mouth with the right of deposit at New Orleans for three years, after which the United States was to have the same right either at New Orleans or at some other place on the Mississippi to be designated by Spain. In 1796 Pinckney was the Federalist

candidate for vice-president, and in 1 797-1801 he was a Federalist representative in Congress. During the War of 1812 he was a major-general. In 1825 he succeeded his brother as president-general of the Society of the Cincinnati. He died in Charleston on the 2nd of November 1828. Pinckney, like many other South Carolina revolutionary leaders, was of aristocratic birth and politics, closely connected with England by ties of blood, education and business relations. This renders the more remarkable their attitude in the War of Independence, for which they made great sacrifices. Men of Pinckney's type were not in sympathy with the progressive democratic spirit of America, and they began to withdraw from politics after about 1800.

See C. C. Pinckney, Life of General Thomas Pinckney (Boston,

1895).

PINDAR (Gr. Uivdapos, c. 522-443 b.c), the great lyric poet of ancient Greece, was born at Cynoscephalae, in Boeotia, at the time of the Pythian games (Jr. 175, Bergk 4 , 193)/ which is taken by Bockh to be 522 B.C. He would thus be some thirty-four years younger than Simonides of Ceos. He was the son of Daiphantus and Cleodice (or Cleidice). The traditions of his family have left their impress on his poetry, and are not without importance for a correct estimate of his relation to his contemporaries. The clan of the Aegidae — tracing their line from the hero Aegeus— belonged to the " Cadmean " element

1 The references are to the edition of Pindar by C. A. M. Fennell (1803-1899), and the fourth edition of Bergk's Poetae lyrici graeci.

of Thebes, i.e. to the elder nobility whose supposed date went back to the days of the founder Cadmus. A branch of the Theban Aegidae had been settled in Achaean times at Amyclae in the valley of the Eurotas (Pind. Isthm. vi. 14), and after the Dorian conquest of the Peloponnesus had apparently been adopted by the Spartans into one of the three Dorian tribes. The Spartan Aegidae helped to colonize the island of Thera (Pyth. v. 68-70). Another branch of the race was settled at Cyrene in Africa; and Pindar tells how his Aegid clansmen at Thebes " showed honour " to Cyrene as often as they kept the festival of the Carnea (Pyth. v. 75). Pindar is to be conceived, then, as standing within the circle of those families for whom the heroic myths were domestic records. He had a personal link with the memories which everywhere were most cherished by Dorians, no less than with those which appealed to men of " Cadmean " or of Achaean stock. And the wide ramifications of the Aegidae throughout Hellas rendered it peculiarly fitting that a member of that illustrious clan should celebrate the glories of many cities in verse which was truly

Panhellenic.

Pindar is said to have received lessons in flute-playing from one Scopelinus at Thebes, and afterwards to have studied at Athens under the musicians Apollodorus (or Agathocles) and Lasus of Hermione. In his youth, as the story went, he was defeated in a poetical contest by the Theban Corinna — who, in reference to his profuse employment of Theban mythology, is said to have advised him " to sow with the hand, not with the sack." There is an extant fragment in which Corinna reproves another Theban poetess, Myrtis, " for that she, a woman, contended with Pindar " (on fiava 4>ova' e/3a Ili.v8a.pou) tot' tpw) — a sentiment which hardly fits the story of Corinna's own victory. The facts that stand out from these meagre traditions are that Pindar was precocious and laborious. Preparatory labour of a somewhat severe and complex kind was, indeed, indispensable for the Greek lyric poet of that age. Lyric com- position demanded studies not only in metre but in music, and in the adaptation of both to the intricate movements of the choral dance (opxt^tikti) . Several passages in Pindar's extant odes glance at the long technical development of Greek lyric poetry before his time, and at the various elements of art which the lyrist was required to temper into a harmonious whole (see, e.g. 01. iii. 8, vi. 91, xiii. 18, xiv. 15; Pyth. xii. 23, &c). The earliest ode which can be dated (Pyth. x.) belongs to the twentieth year of Pindar's age (502 B.C.) ; the latest (Olymp. v.) to the seventieth (452 B.C.). 2 He visited the court of Hiero at Syracuse; Theron, the despot of Acragas, also entertained him; and his travels perhaps included Cyrene. Tradition notices the special closeness of his relations with Delphi: " He was greatly honoured by all the Greeks, because he was so beloved of Apollo that he even received a share of the offerings; and at the sacrifices the priest would cry aloud that Pindar come in to the feast of the god." 3 His wife's name was Megacleia (another account says Timoxena, but this may have been a second wife), and he had a son named Daiphantus and two daughters, Eumetis and Protomache. He is said to have died at Argos, at the age of seventy-nine, in 443 B.C.

Among the Greeks of his own and later times Pindar was pre-eminently distinguished for his piety towards the gods. He tells us that, " near to the vestibule " of his house (Pyth. iii. 78), choruses of maidens used to dance and sing by night in praise of the Mother of the Gods (Cybele) and Pan— deities peculiarly associated with the Phrygian music of the flute, in which other members of Pindar's family besides the poet himself are said to have excelled. A statue and shrine of Cybele, which he dedicated at Thebes, were the work of the Theban artists, Aristomedes and Socrates. He also dedicated at Thebes a statue to Hermes Agoraios, and another, by Calamis, to Zeus Ammon. The latter god claimed his especial veneration because Cyrene, one of the homes of his Aegid ancestry, stood " where Zeus Ammon hath his seat," i.e. near the oasis and temple

2 According to others, his latest poem is the eighth Pythian ode, 450 or 446.

5 T3.ivbb.pov yivos, in ed. Aid.

(Pyth. iv. 16). The author of one of the Greek lives of Pindar says that, " when Pausanias the king of the Lacedaemonians was burning Thebes, some one wrote on Pindar's house, ' Burn not the house of Pindar the poet ' ; and thus it aloro escaped destruction." This incident, of which the occasion is not further denned, has been regarded as a later invention. 1 Better attested, at least, is the similar clemency of Alexander the Great, when he sacked Thebes one hundred and eight years after the traditional date of Pindar's death (335 B.C.). He spared only

(1) the Cadmeia, or citadel, of Thebes (thenceforth to be occupied by a Macedonian garrison); (2) the temples and holy places; and (3) Pindar's house. While the inhabitants were sold into slavery, exception was made only of (1) priests and priestesses;

(2) persons who had been connected by private i;evia with Philip or Alexander, or by public £e«a with the Macedonians;

(3) Pindar's descendants. It is probable enough, as Dio Chry- sostom suggests (ii. 33), that Alexander was partly moved by personal gratitude to a poet who had celebrated his ancestor Alexander I. of Macedon. But he must have been also, or chiefly, influenced by the sacredness which in the eyes of all Hellenes surrounded Pindar's memory, not only as that of a 1,'reat national poet, but also as that of a man who had stood in a specially close relation to the gods, and, above all, to the Delphian Apollo. 2 Upwards of six hundred years after Pindar's death the traveller Pausanias saw an iron chair which was preserved among the most precious treasures of the temple in the sanctuary at Delphi. It was the chair, he was told, " in which Pindar used to sit, whenever he came to Delphi, and to chant those of his songs which pertain to Apollo " (x. 24, 5).

During the second half of Pindar's life, Athens was rising to that supremacy in literature and art which was to prove more lasting than her political primacy. Pindar did not live to see the Parthenon, or to witness the mature triumphs of Sophocles; but he knew the sculpture of Calamis, and he may have known the masterpieces of Aeschylus. It is interesting to note the feeling of this great Theban poet, who stands midway between Homeric epos and Athenian drama, towards the Athens of which Thebes was so

often the bitterest foe, but with which he himself had so large a measure of spiritual kinship. A few words remain from a dithyramb in which he paid a glowing tribute to those " sons of Athens " who " laid the shining foundations of free- dom " (7rat56s 'hBavaiiov epakovro (paevvav KptjirlS' eXevdepias, fr. 55, Bergk 4 , ˆ 77),ˆ while Athens itself is thus invoked: w ral Xnrapai mi locTtˆavoi. koX aolSiiioi, "EXXdSos iptiapja., KXeirat 'Aflarai, 8aLij.6vi.ov TroXkdpov (fr. 54, Bergk 4 , 76). Isocrates, writing in 353 b.c, states that the phrase 'EXXdSos tpeio-p.0., " stay of Hellas," so greatly gratified the Athenians that they conferred on Pindar the high distinction of wpo&via (i.e. appointed him honorary consul, as it were — for Athens at Thebes), besides presenting him with a large sum of money (Antidosis, 166). One of the letters of the pseudo-Aeschines (Ep. iv.) gives an improbable turn to the story by saying that the Thebans had fined Pindar for his praise of Athene, and that the Athenians repaid him twice the sum. 3 The notice preserved by Isocrates —less than one hundred years after Pindar's death — is good warrant for the belief that Pindar had received some exceptional honours from Athens. Pausanias saw a statue of Pindar at Athens, near the temple of Ares (i. 8, 4). Besides the fragment just mentioned, several passages in Pindar's extant odes bespeak his love for Athens. Its name is almost always joined by him with some epithet of praise or reverence. In alluding to the great battles of the Persian wars, while he gives the glory of Plataea to the Spartans, he assigns that of Salamis to the Athenians (Pyth. i. 76). In celebrating (Pyth. vii.) the Pythian

1 A. Schafer, Demosthenes und seine Zeit. iii. 119.

2 It – wi il. 1 ? e remarked that history requires us to modify the statement in Milton's famous lines :—

" The great Emathian conqueror bade spare The house of Pindarus, when temple and tower Went to the ground." Indeed, the point of the incident depends much on the fact that the temples and Pindar's house were classed together for exemption

3 Compare Jebb, Attic Orators, ii. 143.

victory of the Athenian Megacles, he begins thus: ” Fairest of preludes is the renown of Athens for the mighty race of the Alcmaeonidae. What home, or what house, could I call mine by a name that should sound more glorious for Hellas to hear ?” Referring to the fact that an Aeginetan victor in the games had been trained by an Athenian, he says (Nem. v. 49) ” meet it is that a shaper of athletes should come from Athens” — and recollecting how often Pindar compares the poet’s efforts to the athlete’s, we may well believe that he was thinking of his own early training at Athens.

Pindar’s versatility as a lyric poet is one of the characteristics remarked by Horace (Odes, iv. 2), and is proved by the fragments, though the poems which have come down entire represent only one class of compositions — the Epinicia, or odes of victory, commemorating successes in the great games. The lyric types to which the fragments belong, though it cannot be assumed that the list is complete, are at least numerous and varied.

(1) “Tpvot., Hymns to deities — as to Zeus Ammon, to Persephone, to Fortune. The fragmentary iinvos entitled 07j/3auHs seems to have celebrated the deities of Thebes. (2) Haiaves, _. paeans, expressing prayer or praise for the help of Fra Z ments – a protecting god, especially Apollo, Artemis or Zeus. (3) AiBbpanfioi, Dithyrambs, odes of a lofty and impassioned strain, sung by choruses in honour of Dionysus (cf. Pind. 01. xiii. 18, Tat Aiavbo-ov iroBev iˆicpavfu aiv 0o7/\ora Xaptres SiSvpafifkp — where Pindar alludes to the choral form given to the dithyramb, c. 600 B.C., by Arion — /SoijXa-n;?, ” ox-driving,” perhaps meaning “winning an ox as prize “). (4) UpoaSdia, Processional Songs, choral chants for worshippers approaching a shrine. One was written by Pindar for the Delians, another for the Aeginetans. (.5) TLapeivia, Choral Songs for Maidens. The reference in Pyth. iii. 78 to maidens worshipping Cybele and Pan near the poet’s house is illustrated by the fact that one of these Uapdivia invoked ” Pan, lord of Arcadia, attendant of the Great Mother, watcher of her awful shrine” (fr. 72, Bergk 4 , 95). (6) ‘TTopxˆara, Choral Dance-Songs, adapted to a lively movement, used from an early date in the cult of Apollo, and afterwards in that of other gods, especially Dionysus. To this class belongs one of the finest frag- ments (84, Bergk 4 , 107), written for the Thebans in connexion with propitiatory rites after an eclipse of the sun, probably that of the 30th of April 463 B.C. (7) ‘E7<«W«a, Songs of Praise (for men, while vjivoi were for gods), to be sung by a k&ixos or festal company. In strictness ctkw/x'oj' was the genus of which imvUiov was a species; but the latter is more conveniently treated

as a distinct kind. Pindar wrote encomia for Theron, despot of Acragas, and for Alexander I. (son of Amyntas), king of Macedon. (8) Xko\m, Festal Songs. The usual sense of hkoKiov is a drinking-song, taken up by one guest after another at a banquet. But Pindar's cubkia, were choral and antistrophic. One was to be sung at Corinth by a chorus of the UpdSovXoi attached to the temple of Aphrodite Ourania, when a certain Xenophon offered sacrifice before going to compete at Olympia. Another brilliant fragment, for Theoxenus of Tenedos, has an erotic character. (9) Opfjvoi, Dirges, to be sung with choral dance and the music of the flute, either at the burial of the dead or in commemorative rituals. Some of the most beautiful fragments belong to this class (106-110, Bergk 4 , 129-133). One of the smaller fragments (114, Bergk 4 , 137)— in memory of an Athenian who had been initiated into the Eleusinian mysteries (ISwv K&va) — has been conjecturally referred to the Bpijvos which Pindar is said to have written (schol. Pyth. vii. 18) for Hippocrates, the grandfather of Pericles. A number of small fragments, which cannot be certainly classified, are usually given as e£ aZ-qKuv tihuiv, " of uncertain class." On comparing the above list with Horace, Odes, iv. 2, it will be seen that he alludes to No. 3 (dithyrambos) ; to Nos. 1, 2, and 7 (seu deos regesve canit); and to No. 9 (flebili sponsae juvenemve raptum Plorat) — as well as to the extant Epinicia (sive quos Elea domum reducit Palma caelestes).

j The Epinicia.— The kirivlua (sc. jueXi?), or brivUioi, (sc. vfivoi), " Odes of Victory," form a collection of forty-four odes, traditionally divided into four books, answering to the four great festivals: (1) 'OXvp.wtov'iKai (sc. v/xvol): fourteen odes for winners of the wild olive-wreath in the Olympian games, held at Olympia in honour of Zeus once in four years; (2) ILvOioviKai: twelve odes for winners of the laurel-wreath in the Pythian games held at Delphi in honour of Apollo, once in four years, the third of each Olympiad; (3) NejueoviKai: eleven odes for winners of the pine-wreath in the Nemean games, held at Nemea, in honour of _ Zeus, once in two years, the second and fourth oi each Olympiad; and (4) To-dp.iovlKai: seven odes for winners of the parsley wreath in the Isthmian games, held at the Isthmus

of Corinth, in honour of Poseidon, once in two years, the first and third of each Olympiad. The Greek way of citing an ode is by the nomin. plur. followed by the numeral, e.g. " the ninth Olympian " is ' OXu/uiticti'Tkcu 6'. The chronological range of the collection (so far as ascertainable) is from 502 B.C. (Pyth.x.) to 452 B.C. (01. v.). With respect to the native places of the victors, the geographical distribution is as follows: for the

mainland of Greece proper, 13 odes; for Aegina, n, for Sicily, 15; for the Epizephyrian Locrians (southern Italy), 2; for Cyrene (Africa), 3.

The general characteristics of the odes may be briefly con- sidered under the following heads: (1) language; (2) treatment of theme; (3) sentiment — religious, moral and political; (4) relation to contemporary art.

1. The diction of Pindar is distinct in character from that of every other Greek poet, being almost everywhere marked by the greatest imaginative boldness. Thus (a) metaphor is used even for the expression of common ideas, or the translation of familiar phrases, as when a cloak is called (01. ix. 07) " a warm remedy for winds." (b) Images for the highest excellence are drawn from the farthest limits of travel or navigation, or from the fairest of natural objects; as when the superlative hospitality of a man who kept open house all the year round is described by saying, " far as to Phasis was his voyage in summer days, and in winter to the shores of Nile " (Isthm. ii. 41); or when Olympia, the " crown " or " flower " of festivals, is said to be excellent as water, bright as gold, brilliant as the noonday sun (01. i. ad init.). This trait might be called the Pindaric imagery of the superlative, (c) Poetical inversion of ordinary phrase is frequent; as, instead of, " he struck fear into the beasts," " he gave the beasts to fear " (Pyth. v. 56). (d) The efforts of the poet's genius are represented under an extraordinary number of similitudes, borrowed from javelin-throwing, chariot-driving, leaping, rowing, sailing, ploughing, building, shooting with the bow, sharpening a knife on a whetstone, mixing wine in a bowl, and many more, (e) Homely images, from common life, are not rare; as from account-keeping, usury, sending merchandise over sea, the anvraXri or secret dispatch, &c. And we have such homely proverbs as, " he hath his foot in this shoe," i.e. stands in this case (01. vi. 8). (/) The natural order of words in a sentence is often boldly deranged, while, on the other hand, the syntax is seldom difficult, (g) Words not found except in Pindar are numerous, many of these being compounds which (like kvapinflporos, KarcHpvWopoeCv, &c.) suited the dactylic metres in their Pindaric combinations. Horace was right in speaking of Pindar's " nova verba," though they were not confined to the " audaces dithyrambi."

2. The actual victory which gave occasion for the ode is seldom treated at length or in detail — which, indeed, only exceptional incidents could justify. Pindar's method is to take some heroic myth, or group of myths, connected with the victor's city or family, and, after a brief prelude, to enter on this, returning at the close, as a rule, to the subject of the victor's merit or good fortune, and interspersing the whole with moral comment. Thus the fourth Pythian is for Arcesilaus, king of Cyrene, which was said to have been founded by men of Thera, descendants of one of Jason's comrades. Using this link, Pindar introduces his splendid narrative of the

Argonauts. Many odes, again, contain shorter mythical episodes — as the birth of Iamus (01. vi.), or the vision of Bellerophon (01. xiii.) — which form small pictures of masterly finish and beauty. Particular notice is due to the skill with which Pindar often manages the return from a mythical digression to his immediate theme. It is bold and swift, yet is not felt as harshly abrupt- justifying his own phrase at one such turn — kox riva olpov taapx fipaxiiv (Pyth. iv. 247). It has been thought that, in the parenthesis about the Amazons' shields (quibus Mos wide deductus . . . quaerere distuli, Odes, iv. 4, 18), Horace was imitating a Pindaric transition; if so, he has illustrated his own observation as to the peril of imitating the Theban poet.

3. a. The religious feeling of Pindar is strongly marked in the odes. " From the gods are all means of human excellence."

He will not believe that the gods, when they dined with Tantalus ate his son Pelops; rather Poseidon carried off the. youth to Olympus. That is, his reason for rejecting a scandalous story about the gods is purely religious, as distinct from moral; it shocks his conception of the divine dignity. With regard to oracles, he inculcates precisely such a view as would have been most acceptable to the Delphic priesthood, viz. that the gods do illumine their prophets, but that human wit can foresee nothing which' the gods do not choose to reveal. A mystical doctrine of the soul's destiny after death appears in some passages (as 01. ii. 66 sq.). Pindar was familiar with the idea of metempsychosis (cf. ibid. 68), but the attempt to trace Pytha-goreanism in some phrases (Pyth. ii. 34, iii. 74) appears unsafe. The belief in a fully conscious existence for the soul in a future state, determined by the character of the earthly life, entered into the teaching of the Eleusinian and other mysteries. Com- paring the fragment of the Qprjvos (114, Bergk 4 , 137), we may probably regard the mystic or esoteric element in Pindar's theology as due to such a source.*

b. The moral sentiment pervading Pindar's odes rests on a constant recognition of the limits imposed by the divine will on human effort, combined with strenuous exhortation that each man should strive to reach the limit allowed in his own case. Native temperament (4>vrj) is the grand source of all human excellence (apery), while such excellences as can be acquired by study (SidaKrai aperai, 01. ix. 100) are of relatively small scope — the sentiment, we may remark, of one whose thoughts were habitually conversant with the native qualities of a poet on the one hand and of an athlete on the other. The elements of vylas oX(3os — "' sane happiness," such as has least reason to dread the jealousy of the gods — are substance sufficing for daily wants and good repute (evkoyla). He who has these should not " seek to be a god." " Wealth set with virtues " (ir \ovros aptTcus St8at.da.\ij.evos) , as gold with precious gems, is the most

fortunate lot, because it affords the amplest opportunities for honourable activity. Pindar does not rise above the ethical standard of an age which said, " love thy friend and hate thy foe " (cf. Pyth. ii. 83; Isthm. iii. 65). But in one sense he has a moral elevation which is distinctively his own; he is the glowing prophet of generous emulation and of reverent self- control.

c. The political sentiments of the Theban poet are suggested by Pyth. xi. 52; " In polities I find the middle state crowned with more enduring good; therefore praise I not the despot's portion; those virtues move my zeal which serve the folk." If in Pyth. ii. 87, a democracy is described as 6 Xd/3pos (TTparos, " the raging crowd, " it is to be noted that the ode is for Hiero of Syracuse, and that the phrase clearly refers to the violence of those democratic revolutions which, in the early part of the 5th century B.C., more than once convulsed Sicilian cities. At Thebes, after the Persian wars, a " constitutional oligarchy " (oKiyapxia. l

4. Pindar's genius was boldly original; at the same time he was an exquisite artist. " Mine be it to invent new strains, mine the skill to hold my course in the chariot of the Muses; and may courage go with me, and power of ample grasp " (01.

ix. 80). Here we see the exulting sense of inborn strength; in many other places we perceive the feeling of conscious art — as in the phrase daidaWnv , so apt for his method of inlaying an ode with mythical subjects, or when he compares the opening of a song to the front of a stately building (01. vi. 3). Pindar's sympathy with external nature was deeper and keener than is often discernible in the poetry of his age. It appears, for example, in his welcome of the season when " the chamber of the hours is opened, and delicate plants perceive the fragrant spring" (Jr. 53, Bergk 4 , 75); in the passage where Jason invokes " the rushing strength of waves and winds, and the nights, and the paths of the deep" {Pyth. iv. 195); in the lines on the eclipse of the sun (Jr. 84, Bergk, 4 107); and in the picture of the eruption, when Etna, " pillar of the sky, nurse of keen snow all the year," sends forth " pure springs of fire unapproachable " (Pyth. i. 20). The poet's feeling for colour is often noticeable — as in the Deautiful story of the birth of Iamus — when Evadne lays aside her silver pitcher and her girdle of scarlet web; the babe is found, " its delicate body steeped in the golden and deep purple rays of pansies " (01. vi. 55).

The spirit of art, in every form, is represented for Pindar by xˆpw — " the

source of all delights to mortals " (01. i. 30) — or by the personified Charites (Graces). The Charites were often represented as young maidens, decking themselves with early flowers — the rose, in particular, being sacred to them as well as to Aphrodite. In Pindar's mind, as in the old Greek conception from which the worship of the Charites sprang, the instinct of beautiful art was inseparable from the sense of natural Sculpture. beauty. Tne period from 500 to 460 B.C., to which most of Pindar's extant odes belong, marked a stage in the development of Greek sculpture. The schools of Argos, Sicyon and Aegina were effecting a transition from archaic types to the art which was afterwards matured in the age of Pheidias. Olympia forms the central link between Pindar's poetry and Greek sculpture. From about 560 B.C. onwards sculpture had been applied to the commemoration of athletes, chiefly at Olympia. In a striking passage (Nem. v. ad. init.) Pindar recognizes sculpture and poetry as sister arts employed in the commemoration of the athlete, and contrasts the merely local effect of the statue with the wide diffusion of the poem. " No sculptor I, to fashion images that shall stand idly on one pedestal for aye; no, go thou forth from Aegina, sweet song of mine, on every freighted ship, on each light bark." Many particular subjects were common to Pindar and contem- porary sculpture. Thus (1) the sculptures on the east pediment of the temple at Aegina represented 'Heracles coming to seek the aid of Telamon against Troy — a theme brilliantly treated by Pindar in the fifth Isthmian; (2) Hiero's victory in the chariot-race was commemorated at Olympia by the joint work of the sculptors Onatas and Calamis; (3) the Gigantomachia, (4) the wedding of Heracles and Hebe, (5) the war of the Centaurs with the Lapithae, and (6) a contest between Heracles and Apollo, are instances of mythical material treated alike by the poet and by sculptors of his day. The contemporary improve- ments in town architecture, introducing spacious and well- paved streets, such as the cKVfxcrri 656s at Cyrene (Pyth. v. 87), suggests his frequent comparison of the paths of song to broad and stately causeways (7rXia), and that on this side it has had an historical development like that of other arts, is forcibly illustrated by his reference to the inventions (ia-jucu-a) for which Corinth had early been famous. He instances (1) the development of the dithyramb, (2) certain improvements in the harnessing and driving of horses, and (3) the addition of the pediment to temples (01. xiii. 21).

In the development of Greek lyric poetry two periods are broadly distinguished. During the first, from about 600 to 500 B.C., lyric poetry is local or tribal — as Alcaeus and Sappho write for Lesbians, Alcman and Stesichorus for Dorians. During

the second period, which takes its rise in the sense of Hellenic unity created by the Persian wars, the lyric poet addresses all Greece. Pindar and Simonides are the great representatives of this second period, to which

Bacchylides, the nephew of Simonides, also belongs. These, with a few minor poets, are classed by German writers as die universalen Mcliker. The Greeks usually spoke, not of " lyric," but of " melic " poetry (i.e. meant to be sung, and not, like the epic, recited); and " universal melic " is lyric poetry addressed to all Greece. But Pindar is more than the chief extant lyrist. Epic, lyric and dramatic poetry succeeded each other in Greek literature by a natural development. Each of them was the spontaneous utterance of the age which brought it forth. In Pindar we can see that phase of the Greek mind which produced Homeric epos passing over into the phase which produced Athenian drama. His spirit is often thoroughly dramatic — witness such scenes as the interview between Jason and Pelias (Pyth. iv.), the meeting of Apollo and Chiron (Pyth. ix.), the episode of Castor and Polydeuces (Nem. x.), the entertainment of Heracles by Telamon (Isthm. v.). Epic narrative alone was no longer enough for the men who had known that great trilogy of national life, the Persian invasions; they longed to see the heroes moving and to hear them speaking. The poet of Olympia, accustomed to see beautiful forms in vivid action or vivid art, was well fitted to be the lyric interpreter of the new dramatic impulse. Pindar has more of the Homeric spirit than any Greek lyric poet known to us. On the other side, he has a genuine, if less evident, kinship with Aeschylus and Sophocles. Pindar's work, like Olympia itself, illustrates the spiritual unity of Greek art.

The fact that certain glosses and lacunae are common to all cur MSS. of Pindar make it probable that these MSS. are derived from a common archetype. Now the older scholia on Pindar, which appear to have been compiled mainly from the commentaries of Didymus (c. 15 B.C.), sometimes presuppose a purer text than ours. But the compiler of these older scholia lived after Herodian (a.d. 160). The archetype of our MSS., then, cannot have been older than the end of the 2nd century. Our MSS. fall into two general classes: (1) the older, representing a text which, though often corrupt, is comparatively free from interpolations; (2) the later, which exhibit the traces of a Byzantine recension, in ether words, of lawless conjecture, down to the 14th or 15th century. To the first class belong Parisinus 7, breaking off in Pyth. v. ; Ambrosianus I, which has only 01. i.-xii.; Mediceus 2; and Vaticanus 2 — the two last-named being of the highest value. The editio princeps is the Aldine (Venice, 1513). A modern study of Pindar may be almost said to have begun with C. G. Heyne'a edition (1773). Hermann did much to advance Pindaric criticism. But August Bockh (1811-1821), who was assisted in his commentary by L. Dissen, is justly regarded as the founder of a scientific treat- ment of the poet. The edition of Theodor Bergk (Poetae lyrici graeci, new ed. by O. Schroder, 1900) is marked by considerable boldness of conjecture, as that of Tycho Mommsen (1864) by a sometimes excessive adherence to MSS. A

recension by W. Christ has been published in Teubner's series (2nd ed., 1896), also with Prolegomena and commentary (1896); and by O. Schroder (1908). The complete edition of J. W. Donaldson (1841) has many merits; but that of C. A. M. Fennell (1879-1883; new ed., 1893-1899) is better adapted to the needs of English students. The Olympia and Pythia have been edited by B. L. Gildersleeve (1885), the Nemea and Isthmia by J. B. Bury (1890-1892); the Scholia by E. Abel (1890, unfinished) and A. B. Brachmann (1903). There is a special lexicon by J. Rumpel (1883). The translation into English prose by Ernest Myers (2nd ed., 1883) is excellent; verse translation by T. C. Baring (1875), and of the Olympian Odes by Cyril Mayne (1906). Pindar's metres have been analysed by J. H. H. Schmidt, in Die Kunstformen der grieckischen Poesie (Leipzig, 1868-1872). On Pindar generally, see monographs by A. F. Villemain (1859), L. Schmidt (1862), G. Lubbert (1882), A. Croiset (1880), W. Christ, Geschichte der griechiscken Litteratur (1898) ; and the little volume by F. D. Morice in Blackwood's Ancient Classics for English Readers. Exhaustive bibliographical information on the earlier literature will be found in Engelmann, Scriptores graeci (1881); see also L. Bornemann, in Bursian's Jahresbericht, (cxvi. 1904), with special reference to chronological questions and Pythia, i., ii., iii. Some considerable fragments of the paeans were discovered in 1906 by B. P. Grenfell and A. S. Hunt (see Oxyrhynchus papyri, pt. v. pp. 24-81); some critical notes will be found in Classical Review, Feb. 1908 (A. E. Housman).

(R.C. J.;X.)

PINDARICS, the name by which was known a class of loose and irregular odes greatly in fashion in England during the close

of the 17th and the beginning of the 18th century. The inven- tion is due to Abraham Cowley, who, probably in Paris — " a place where he had no other books to direct him " — and perhaps in 1650, found a text of Pindar and determined to imitate the Greek poetry in English, without having comprehended the system upon which Pindar's prosody was built up. Cowley published, however, in 1656, fifteen Pindarique Odes, which became the model on which countless imitators founded their pindarics. The erroneous form of these poems, which were absolutely without discipline of structure, was first exposed by Congreve, exactly half a century later, he very justly describing them as " bundles of rambling incoherent thoughts, expressed in a like parcel of irregular stanzas, which

also consist of such another complication of disproportioned, uncertain and per- plexed verses and rhymes." This is harsh, but it describes a pindaric with absolute justice. Cowley had not been aware that " there is nothing more regular than the Odes of Pindar," and that his poems were constructed in harmony with rigid prosodical laws in strophe, antistrophe and epode; " the liberty which Pindar took in his numbers, which has been so much misunderstood and misapplied by his pretended imitators, was only in varying the stanzas in different odes; but in each par- ticular ode they are ever correspondent one to another in their turns, and according to the order of the ode." These excellent critical remarks were made by Congreve in his Discourse on the Pindarique Ode of 1706, and from that date forward the use of pindarics ceased to be so lax and frantic as it had been during the previous fifty years. The time had now passed in which such a critic as Sprat could praise " this loose and unconfined measure " as having " all the grace and harmony of the most confined." It began to be felt that the English pindaric was a blunder founded upon a misconception. If we examine Cowley's " Resurrection," which was considered in the 17th century to be a model of the style, and " truly pindarical," we find it to be a shapeless poem of 64 lines, arbitrarily divided, not into strophes, but into four stanzas of unequal volume and structure: the lines which form these stanzas are of lengths varying from three feet to seven feet, with rhymes repeated in wilful disorder, the whole forming a mere vague caricature of Pindar's brilliant odes. The very laxity of these pindarics attracted the poets of the unlyrical close of the 17th century, and they served the purpose not only of Dryden and Pope, but of a score of lesser poets, among whom Oldham, Mrs Behn, Otway, Sprat, Flatman and many others were prominent. The pindaric became the almost necessary form in which to indite a poem of compliment on a birth, a wedding or a funeral. Although the vogue of these forms hardly survived the age of Anne, something of the vicious tradition of them still remained, and even in the odes of Wordsworth, Shelley and Coleridge the broken versification of Cowley's pindarics occasionally survives. Tennyson's Ode on the Death of the Duke of Wellington (1852) is the latest important specimen of a pindaric in English literature. (E. G.)

PINDARIS, a word of uncertain origin, applied to the irregular horsemen who accompanied the Mahratta armies in India during the 18th century when the Mughal Empire was breaking up; loosely organized under self chosen leaders, each band was usually attached to one or other of the great Mahratta chieftains. Their special characteristic was that they received no pay, but rather purchased the privilege of plundering on their, own account. The majority of them seem to have been Mahom medans: when the regular forces of the Mahrattas had been broken up in the campaigns conducted by Sir Arthur Wellesley and Lord Lake in 1802-04, the Pindaris

made their headquarters in Malwa, under the tacit protection of Sindhia and Holkar. They were accustomed to assemble every year at the beginning of November, and sally forth into British territory in search of plunder. In one such raid upon the Masulipatam coast they plundered 339 villages, killing or wounding 682 persons, torturing 3600 and carrying off property worth a quarter of a million. In 1808-09 they plundered Gujarat, and in 181 2 Mirzapur. In 1814 they were reckoned at 25,000 to 30,000 horsemen, half of them well armed. At last the evil became intolerable, and in

181 7 the marquess of Hastings obtained the consent of the East India Company to the organized campaign, known as the Pindari War. The Pindaris were surrounded on all sides by a great army, consisting of 120,000 men and 300 guns, which converged upon them from Bengal, the Deccan and Gujarat under the supreme command of Lord Hastings in person. Sindhia was overawed and forced to sign the treaty of Gwalior, consenting to aid in the extirpation of the Pindaris, whom he had hitherto protected. The Peshwa at Poona, the Bhonsla raja at Nagpur and the army of the infant Holkar each took up arms, but were separately defeated. The Pindaris themselves offered little opposition. Amir Khan, by far their most powerful leader, accepted the conditions offered to him; and his descendant is now Nawab of the state of Tonk in Rajputana. The rest surrendered or were hunted down, the fate of Chitu, one of the most notorious, being to perish in a tiger's den. These military operations were followed by the pacification of Central India under the administration of Sir John Malcolm.

See J. Grant Duff, History of the Mahrattas (1826) ; and Major Ross of Bladensburg, Marquess of Hastings (Rulers of India Series) (1893).

PIND DADAN KHAN, a town of British India, in the Jhelum district of the Punjab, situated near the right bank of the river Jhelum, on the Sind-Sagar branch of the North- Western railway. Pop. (1901), 13,770. It is an important centre of trade,, and its manufactures include boats, brass- ware, pottery, embroidered scarves and riding-whips.

PINDUS, the ancient name of the rugged group of mountains which separates Thessaly from Epirus, and branches south in various directions. The geographical name is sometimes extended over ail these branches, and so reaches from Aetolia to the Gulf of Lamia. The northern part of the ridge was known as Lacmon. There is no modern name covering the whole range, but its different parts have separate names. Several of them attain a height of 7000 ft. or more.

PINE (Lat. Pinus, Gr. irlrvs), a name given by the ancients to some of the resinous cone-bearing trees to which it is now applied, and, as limited by

modern botanists, the designation of a large genus of true conifers, differing from the firs in their hard woody cone-scales being thickened at the apex, and in their slender needle-shaped leaves growing from a membranous sheath, either in pairs or from three to five together — each tuft representing an abortive branch, springing from the axil of a partially deciduous scale-leaf, the base of which remains closely adherent to the stem. The numerous male catkins are generally arranged in dense whorls around the bases of the young shoots; the anther-scales, surmounted by a crest-like appendage, shed their abundant pollen by longitudinal slits; the two ovules at the base of the inner side of each fertile cone-scale develop into a pair of winged seeds, which drop from the opening scales when mature — as in the allied genera.

The pines are widely distributed over the north temperate zone, in the southern portions chiefly confined to the mountains, along which, in Central America, a few are found within the tropic; in more northern regions they frequently form extensive forests, sometimes hardly mingled with other trees. Their soft, straight-grained, resinous and often durable wood gives to many kinds a high economic value, and some are among, the most esteemed of timber trees.

Of the two-leaved species, P. sylveslris, the pine of northern Europe, may be taken as a type. When growing in perfection it is one of the finest of the group, and perhaps the most pictur- esque of forest trees; attaining a height of from 70 to 120 ft., it is of conical growth when young, but in maturity acquires a spreading cedar or mushroom-like top, with a straight trunk of from 2 to 4 ft. in diameter at the base, and gnarled twisted boughs, densely clothed at the extremities with glaucous green foliage, which contrasts strongly with the fiery red-brown bark. The leaves are rather short, curved, and often twisted; the male catkins, in dense cylindrical whorls, fill the air of the forest with their sulphur-like pollen in May or June, and fecundate the purple female flowers, which, at first sessile and erect, then

become recurved on a lengthening stalk; the ovate cones, about the length of the leaves, do not reach maturity until the autumn of the following year, and the seeds are seldom scattered until the third spring; the cone-scales terminate in a pyramidal

Fig. i. — Scotch Fir (Pinus sylvestris). a, Male flower and young cones; b, male catkin; c, d, outer and inner side of anther-scale.

recurved point, well marked in the green state and in some varieties in the mature cone, but in others scarcely projecting. P. sylvestris is found, in greater or less abundance, from the hills of Finmark and the plains of Bothnia to the mountains of Spain and even the higher forest-slopes of Etna, while in longitude its range extends from the shores of the North Sea to Kamchatka. Nowhere more abundant than in the Scandinavian peninsula, this tree is the true fir (fur, fura) of the old Norsemen, and still retains the name among their descendants in Britain, though botanically now classed as a pine. It grows vigorously in Lap- land on the lower ground, and is found even at an elevation of 700 ft., while in south Norway it occurs up to 3000 ft., though the great forests from which " Norway pine " timber is chiefly derived are on the comparatively lower slopes of the south- eastern dales: in the highest situations it dwindles to a mere bush. It furnishes the yellow deal of the Baltic and Norway. In Germany, both on the mountains and the sandy plains, woods of " kiefer " are frequent and widely spread, while vast forests in Russia and Poland are chiefly composed of this species; in many northern habitats it is associated with the spruce and birch. In Asia it abounds in Siberia and on the mountains of the Amur region; on the European Alps it occurs at a height of 5600 ft., and on the Pyrenees it is found at still higher elevations; on the northern side of Etna it is said to grow at above 7000 ft. In Britain natural forests of Scotch fir of any extent are only now found in the Highlands, chiefly on the declivities of the Gram- pians. In former ages the tree covered, a large portion of the more northern part of the island, as well as of Ireland; the numerous trunks found everywhere in the mosses and peat-bogs

of the northern counties of England attest its abundance there in prehistoric times; and in the remoter post-Glacial epoch its range was probably vastly more extended. The tree is not at present indigenous in southern Britain, but when planted in suitable ground multiplies rapidly by the wind-sown seeds; on many of the sandy moors and commons natural pine woods of large extent have been thus formed during the last fifty years. The Scotch fir is a very variable tree, and certain varieties have acquired a higher reputation for the qualities of their timber than others; among those most prized by foresters is the one called the Braemar pine, the remaining fragments of the great wood in the Braemar district being chiefly composed of this kind ; it is mainly distinguished by its shorter and more glaucous leaves and ovoid cones with blunt recurved spines, and especially by the early horizontal growth of its ultimately drooping boughs; of all varieties this is the most picturesque. On the European continent the Hagenau pine of Westphalia is esteemed for the straightness and good quality of its timber. The heart- wood of the finer kinds of Scotch fir is of a deep brownish-red colour, abounding in the resin to which its durability is

probably due. For all indoor and most outdoor purposes it is as lasting as oak, and for ship planking is perhaps little inferior; from its lightness and elasticity it is well adapted for the construction of yachts and other small fast-sailing craft, and is said to be the best of all wood for masts and large spars; its weight varies from 30 to 40 lb the cubic foot. The sap-wood is more perishable, but it is useful for fences, casks and a variety of other purposes; soaking in lime-water renders it more lasting; great numbers of young pines are annually cut for railway sleepers, mining timber and numerous agricultural applications; large quantities are consumed for wood-pavement. The quality of the timber

Fig. 2. — Scotch Fir (Pinus sylvestris). a, Fertile flower of mature cone; 6, winged seed; c, fertile catkin (or cone) ; d, scale and bract; e, inner side of scale.

depends greatly on the soil and position in which the trees are grown: the dry slopes of granitic or gneissic mountains, or the deep well-drained sandy gravels of the lower country seem to answer equally well; but on clay or wet peat the tree rarely

PINE

Plate I.

SCOTCH FIR (Finns sylvestris) A, Cone, seed and needles.

CORSICAN PINE (Pinus Laricio). B, Cone, seed and needles.

STONE PINE (Pinus Pinea). D, Cone and seed.

CLUSTER PINE (Pinus Pinaster). C, Cone, needle and seed.

Photo ; by Henry Irving,

Plate II.

PINE

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CEDAR OF LEBANON (Cednts Libani). Cy Cone, foliage and seed.

DEODAR (Cedrus Deodar a) .

Photos by Henry Irving

PINE

flourishes, and the timber is always indifferent; it is usually said that the wood is best in the cold climate of its more northern habitats, but a trunk (4 ft. in diameter) grown on the sands of Surrey had heart-wcod quite equal to any produced in Glenmore or Rothiemurchus. The rapidity of growth is still more vari- able: in Britain full maturity is attained in from seventy to one hundred and twenty years, but in Norway the trunk increases much more slowly; Schiibeler states that a tree felled in the Alten "district (about 70 lat.), measuring 2 ft. 10 in. in diameter without the bark, showed four hundred circles of annual growth. In Norway the tree, growing in dense forests, is generally of but moderate girth, and probably this pine nowhere reaches a greater size than in the Scottish woods; a plank from Glenmore forest measured nearly si ft. across, and from 3 to \ ft. is not an unusual diameter for a British pine tree.

Vast numbers of Scotch firs are raised in nurseries for artificial planting; the seed is sown in the spring, being just covered with earth, and the seedlings transplanted in the second year into rows for further culture, or taken direct from the seed-bed for final planting; sometimes the seed is sown where the trees are intended to grow. A plantation of Scotch fir requires frequent and careful thinning as the young trees increase in size; but pruning should be avoided as much as possible, excepting for the removal of dead wood. Plantations in England are generally ready for final cutting in from sixty to seventy years, and many are cleared at a much earlier stage of growth. P. sylvestris in Britain is liable to many insect depredations: the pine-chafer, Hylurgus piniperda, is destructive in some places, the larva of this beetle feeding on the young succulent shoots, especially in young plantations; HyJobius abietis, the fir-weevil, eats away the bark, and numerous lepidopterous larvae devour the leaves; the pine-sawfly is also injurious in some seasons; the removal of all dead branches from the trees and from the ground beneath them is recommended, as most of these insects lay their eggs among the decaying bark and dead leaves. In common with other pines, P. sylvestris is subject to the attacks of various fungi. Trametes radiciperda attacks the roots and penetrates to the stem, causing rotting of the wood; the disease is difficult to eradicate, as the mycelium of the fungus travels from root to root in the soil. Rotting of the wood at the base of the trunk is also caused by Agaricus mclleus, which spreads from root to root in the soil by means of its long purple-black, cord-like mycelial strands known as Rhizomorpha. Much damage is often caused by species of Peridermium, which often invade the cortex and cambium to such an extent as to " ring " the stem or branch, or to cause an abnormal formation of turpentine which soaks into the wood and stops the upward passage of water; this causes the parts above the diseased area to perish. In England the pine is largely employed as a " nurse " for oak trees,

its conical growth when young admirably adapting it for this purpose; its dense foliage renders it valuable as a shelter tree for protecting land from the wind; it stands the sea gales better than most conifers, but will not flourish on the shore like some other species.

The pine is an important tree in the economy of the northern nations of Europe. In Scandinavia and Russia houses are chiefly constructed of its timber; and log-huts are made of the smaller trunks and lined and roofed with the bark. The inner bark is twisted into ropes, and, like that of the spruce, is kiln dried, ground up, and mixed with meal in times of scarcity; in Kamchatka it is macerated in water, then pounded, and made into a kind of substitute for bread without any admixture of flour. In recent days the fibre of the leaves has been extracted in some quantity and applied to textile purposes under the name of waldwolle, both in Germany and Sweden. It is prepared by boiling the needles in a solution of soda to remove the resin, which process loosens the fibre and renders its separation easy; it has some resemblance to coarse wool, and is spun and woven into blankets and garments that are said to be warm and durable; it is also used for stuffing cushions; an essential oil, obtained by a previous distillation of the leaves, has medicinal virtues attributed to it by some German practitioners.

Large quantities of turpentine are extracted from this pine in Sweden and Russia by removing a strip of bark, terminating below in a deep notch cut in the wood, into which the turpentine runs, and from which it is scooped as it accumulates; but the product is not equal to that of the silver fir and other species. Tar is prepared largely from P. sylvestris; it is chiefly obtained from the roots, which, mingled with a few logs, are arranged in a conical or funnel-shaped hollow made on the steep side of a hill or bank; after filling up, the whole is covered with turf and fired at the top, when the tar exudes slowly and runs into an iron vessel placed below, from the spout of which it is conveyed into barrels. Most of the so-called Stockholm tar is thus prepared, chiefly in the province of Bothnia.

Closely allied to the Scotch pine, and perhaps to be regarded as a mere alpine form of that species, is the dwarf P. montana (or P. Pumilio), the " krummholz " or " knieholz " of the Germans — a recumbent bush, generally only a few feet high, but with long zigzag stems, that root occasionally at the knee-like bends where they rest upon the ground. The foliage much resembles that of the Scotch fir, but is shorter, denser and more rigid; the cones are smaller but similar in form. Abounding on the higher slopes of the Bavarian and Tirolese Alps, it is a favourite shelter for the chamois; the hunters call it the " latschen," from its recumbent straggling habit. Krummholz oil, valued in Germany as an outward applica- tion in rheumatism and for bruises and sprains, is distilled from

the young branches, and a fragrant white resin that exudes in some quantity from the buds is used for similar purposes and as a perfume, under the name of Hungarian balsam it is sold in the towns of Germany, being probably obtained from the Carpathians. The red pine of Canada and New England (so called from the colour of its bark), P. resinosa, is a tree of considerable size, some- times attaining the dimensions of P. sylvestris. The somewhat glaucous leaves form dense tufts at the ends of the branches, and' are 4 or 5 in. long; the ovate blunt cones are about half that length. The tree is of quick growth and the wood strong and resinous, but it is less durable than Scotch fir, though much em- ployed in ship-building; according to Emerson, trunks exist in Maine 4 ft. in diameter. A sandy soil seems to suit it best, and the quality of the wood probably much depends on its place of. growth. Red pines abound in Nova Scotia and Newfoundland, and the tree is rather widely distributed over the northern parts of the continent; it rarely forms extensive woods, but grows chiefly in clumps among other trees, at least in its more southern habitats. Nearly allied is P. Banksiana, the grey or Labrador pine, some- times called the scrub pine from its dwarfish habit; it is the most northerly representative of the genus in America, and is chiefly remarkable for its much recurved and twisted cones, about 2 in. long. The trunks are too small to be of great economic value, but the light wood is used by the natives for their canoes.

P. Laricio, the Corsican pine, is one of the noblest trees of this group, growing to a height of 100 or even 150 ft., with a straight trunk and branches in regular, whorls, forming in large trees a pyramidal head ; the slender leaves, of a dark green tint, are from 4 to 7 in. long; the cones, either in pairs or several together, project horizontally, and are of a light brown colour. This pine abounds in Corsica, and is found in more or less abundance in Spain, southern France, Greece, and many Mediterranean countries; it occurs on the higher mountains of Cyprus. The tree is of very rapid growth, but produces good timber, much used in southern dockyards, and very durable, though less strong than that of P. sylvestris; the heart-wood is of a brownish-tint. In southern France it has been planted with success on the drift-sands of the Bay of Biscay, though it does not bear the full force of the sea- blast as well as the pinaster. In England it grows well in sheltered situations and well-drained soils.

The black pine, P. austriaca, generally now regarded as a variety of P. Laricio, derives its name from the extreme depth of its foliage tints — the sharp, rigid, rather long leaves of a dark green hue giving a sombre aspect to the tree. The light-coloured, glossy, horizontal cones are generally in pairs, but sometimes three or four together. The tree is conical when young, but when old forms a spreading head; it often attains a large size. Southern Austria and the adjacent countries are the natural habitats of this pine; it seems to flourish best on rocky mountain sides, but in England grows well

on sandy soils. The timber is valued in its native country, and is said to be durable and to stand exposure to the weather well; various resinous products are extracted from it. P. pyrenaica is a handsome species of pyramidal form, attaining a large size on the mountains of northern Spain, whence it extends through the Mediterranean region to Asia Minor, northern Persia and Afghanistan. The leaves are long and of a light bright green; the cones are solitary, oblong, conical and of a yellow tint. The timber is used in Spanish dockyards, but opinions vary as to its quality. In plantations its bright foliage, with the orange cones and young shoots, render it an ornamental tree, hardy in southern Britain. P. brutia, the Calabrian pine, is regarded as the same

species. P. halepensis, another Mediterranean form, is valued for its timber, which is white with a fine grain, and resinous products. P. pinaster, the cluster pine or pinaster, is an important species from its vigorous growth in the sand-drifts of the coast, for the purpose of binding which it has been grown more extensively and successfully than any other tree, especially on the dunes of the Bay of Biscay. Giowing to a height of from 40 to 80 ft., the deeply- furrowed trunk occasionally reaches a diameter of 3 ft. or more at the base, where, like most sand trees, it usually curves upward gradually, a form that enables the long tap-roots to withstand better the strain of the sea gale; when once established, the tree is rarely overthrown even on the loosest sand. The branches curve upwards like the stem, with their thick covering of long dark green leaves, giving a massive rounded outline to the tree; the ovate cones are from 4 to 6 in. long, of a light shining brown hue, with thick scales terminating in a pyramidal apex; they are arranged around the branches in the radiating clusters that give name to the tree. The pinaster grows naturally on sandy soils around the Mediterranean from Spain to the Levant. On the drift-sands of France, especially in the Gironde, forests have been formed mainly of this pine; the seeds, sown at first under proper shelter and protected by a thick growth of broom sown simultaneously, vegetate rapidly in the sea-sand, and the trees thus raised have, by their wind-drifted seed, covered much of the former desert of the Landes with an evergreen wood. These forests of pinaster, apart from the production of timber in a once treeless district, have a great economic value as a source of turpentine, which is largely obtained from the trees by a process analogous to that employed in its collection from P. sylvestris; the resin is yielded from May to the end of September, the cuts being renewed as the supply fails, until the tree is exhausted; the trunks are then felled and used in the manufacture of charcoal and lamp black; much tar and pitch is also obtained from these pinaster forests. In England the

cluster-pine has been largely planted on sandy districts near the sea, and has become naturalized in Purbeck and other wild tracts in the southern counties, but the summer heat is too small to permit of its resinous products acquiring any value; the soft coarse wood, though perishable in the natural state, has been used for railway sleepers after saturation with creosote or pre- servative solutions.

P. Pinea is the stone pine of Italy; its spreading rounded canopy of light green foliage, supported on a tall and often branchless trunk, forms a striking feature of the landscape in that country, as well as in some other Mediterranean lands. The beautiful reddish-brown shining cones, roundly ovate in shape, with pyrami- dal scale apices, have been prized from the ancient days of Rome for their edible nut-like seeds, which are stiil used as an article of food or dessert. They do not ripen until the fourth year, and are kept in the cone until required, as their abundant oil soon turns rancid. The tree has been naturalized in many warm countries, even in China; in England it seldom attains any large size, as the deficient summer heat prevents the wood from maturing; but trees occur occasionally in plantations 20 or 30 ft. in height; the wood, though soft and deficient in the resin that gives durability to the timber of some species, is valued by the southern carpenter and cabinetmaker for its lightness, its fineness of grain, and the ease with which it is worked.

P. mitis, the yellow pine of the northern and middle states of America, is rather allied to the three-leaved section, but the leaves are mostly in pairs. It is a tree of large size, often attaining a height of 70 ft. and upwards, though rarely more than 2 ft. in diameter at the root; the lower branches spread horizontally, the upper, converging towards the trunk, give the tree somewhat the aspect of a spruce, hence it is called in some districts the " spruce- pine." The leaves are long, slender, and of a bluish-green hue; the pendant cones are about \ in. long, with a slender point to each scale. The yellow pine is one of the most important timber trees of the genus; the heart-wood being very durable is largely employed in ship-building and for house timber, being nearly equal to that of P. sylvestris; large quantities are exported to Britain under the name of " New York yellow pine "; the sapwood is perishable.

The three-leaved group includes several of the most valuable trees of America ; among them is P. rigida, the pitch pine of the northern states, a tree of from 40 to 50 ft. in height with rugged trunk, occasionally 3 ft. in diameter; the short dark-green leaves are in thick tufts, contrasting with the pale yellowish, usually clustered cones, the scales of which are furnished with small curved spines. The wood is very hard and abounds with resin, but on swampy land is of inferior quality and of little value except for fuel, for which the pitch-pine is highly prized; on drier ground the grain is fine

from the numerous knots. Large quantities of tar and pitch are obtained from this species. The tree is one of the few that will flourish in salt-marshes.

P. palustris (or P. australis) is the " Georgia pitch pine," or yellow pine of the southern states; it abounds on the sandy soils that cover so much of Georgia, the Carolinas, and Florida, and on those dry lands attains its highest perfection, though occasionally abundant on moist ground, whence its name. The most marked feature of the tree is its long tufted foliage — the leaves, of a bright

green tint, springing from long white sheaths, being often a foot in length. The tall columnar trunk furnishes the most valued pine timber of the states; close-grained and resinous, it is very durable and polishes well ; it is largely employed in American shipyards, and immense quantities are exported, especially to Britain and the West Indies. This tree yields an abundant supply of tar and turpentine of good quality, which products are collected and manufactured in the " pine-barrens " on a large scale.

P. Taeda, the " loblolly pine " of the backwoodsman, a tall tree with straight trunk and spreading top, covers great tracts of the " pine-barrens " of the southern states, but also frequently spreads over deserted arable lands that have been impoverished by long and bad farming; hence the woodsmen call it the " old-field " pine, while, from the fragrance of its abundant resin, it is also known as the frankincense pine. It is a fine species 80 or 90 ft. high, having sometimes a girth of 6 or 8 ft., with a broad spreading head; the leaves are rather long and of a light green tint, the cones generally in pairs, the scales terminating in a sharp incurved prickle. The timber of this pine is indifferent, but the forests of it are of importance from the quantity of turpentine they yield; the trees also furnish much firewood of good quality.

P. ponderosa, the yellow pine of the Pacific coast of America, belongs to this section; it is a fine timber tree deserving of notice from the extreme density of its wood, which barely floats in water; it abounds in some parts of the western range of the Rocky Mountains, and is the most widely distributed pine tree of the mountain forests of western North America. The leaves are very long and twisted, the small oval cones armed with recurved prickles; the tree is said to be of rapid growth. In Oregon and California several large pines of this group are found. P. Coulteri or macro- carpa, is remarkable for its enormous cones (sometimes a foot long, 6 in. in diameter, and weighing more than 4 lb) ; the scales end in long hooked points curving upwards; the leaves are long, rigid, and glaucous in hue. Nearly related to this is P. Sabiniana, the nut-pine of California, the cones of which are 7 to 9 in. long and 5 to 6 in. in diameter, also with hooked

scales; the large nut-like seeds are eaten by the Indians; the tree is one of the largest of the section, sometimes attaining a height of 120 ft., and upwards, while trunks have been found, it is said, 10 or 12 ft. in diameter. P. longifolia, a Himalayan species, is remarkable for the great length of its lax slender leaves, of a grass-green tint; the cones have the points of the scales recurved. It is known in India as the " cheer pine "; the wood is good, resinous, and moderately durable; the tree is common on the foot-hills of the Himalayas. P. Gerardiana, a north-west Himalayan species, is a medium-sized tree with a conical head, growing on the more elevated parts of the mountain range; it furnishes edible seeds. The leaves, short and glaucous, like those of the Scotch fir, have deciduous sheaths ; the cones have recurved scale-points like those of the cheer pine. P. canariensis, which forms forests on the mountains of Grand Canary and Teneriffe, growing at an elevation of 6000 ft., also belongs to this group. The leaves are long, lax, and of a bright green tint ; the cone-scales are without spines; the trunk attains a large size, and yields good and durable timber. The beautiful Monterey pine, P. insignis, dis- tinguished by the brilliant colour of its foliage, has the leaves in tufts of three or four; the lower cone-scales have recurved points. This fine pine has been planted in the south-west of England, but is scarcely hardy.

The pines with five leaves in each tuft have generally deciduous sheaths. The most important economic species is the well-known white pine, P. Strobus, from its large growth and abundance, as well as the soft even grain of its white wood, one of the most valuable of North American timber trees. The tree abounds from Canada to Georgia, but in the eastern states has been so long sought for by the lumberer that most of the old trees have long disappeared, and large white pine timber is now only found in quantity in the Canadian Dominion. Formerly Maine and Vermont were celebrated for the size of their pines, but few of these great trees now exist in New England. On a deep rich soil P. Strobus attains a height of 150 ft., and trunks without a branch are sometimes found 80 or 90 ft. long; in the earlier stages of growth it has a pyramidal form, in open glades the lower boughs often touching the ground, but in old age it acquires a wide almost cedar-like top. The light bluish-green foliage is somewhat lax, very dense in young trees; the cones are long and rather curved, with thin smooth scales a little thickened at the apex, and generally more or less covered with exuding white resin; they are about 5 or 6 in. in length and 1 J to 2 in. broad; the male catkins are of a bluish tint; the cones ripen in the autumn of the second year. The wood of the white pine is durable for indoor use, especially when protected by paint, but when exposed to moist air it rapidly decays, and it is very liable to dry rot ; it is said to be best when grown on sandy soils. Immense quantities are still exported, especially from Canada, its smooth easily-worked grain rendering it a favourite wood for the house-

carpenter and joiner; it weighs about 28 lb per cubic foot. In England where it is generally known as the " Weymouth pine," it succeeds well on deep light soils when well-drained; trees have attained occasionally a height of 100 ft. and upwards in British plantations; but it is apt to be infested with American blight (Eriosoma). In northern Germany it also grows well. The climate of Scotland

appears less suitable for it, probably from the want of summer heat, and it can hardly be recommended for British planting other- wise than for ornamental purposes.

Nearly approaching this is P. excelsa, the Bhotan pine, which differs chiefly in its longer cones and drooping glaucous foliage. It is found in Kumaon and Bhotan and on some of the Nepal ranges, but does not grow in the moist climate of the Sikkim Himalayas; it is found at a height of 7000 to 12,000 ft., and attains large dimen- sions ; the wood is highly resinous, and is said to be durable ; great quantities of a white clear turpentine exude from the branches when injured. The Bhotan pine is quite hardy in southern England, and has been largely planted of late as an ornamental tree.

P. Lambertiana, the giant pine or sugar pine of California, is the largest of the genus, rising to the height of 200 ft., with a trunk 20 to 30 ft. in girth, and, it is said, occasionally attaining much larger dimensions. The head is of a pyramidal form, the lower branches drooping like those of a Norway spruce; its foliage is of a light bright green colour. The pendent cones are very large, sometimes 18 in. long and 4 in. in diameter, with large nut-like seeds, which, pounded and baked, are eaten by the Indians. The tree abounds in some sandy districts, but more generally occurs singly or in small groups dispersed through the woods, attaining its greatest dimensions in light soils. The wood is soft and nearly white, but contains much resin, which when fire has run through the forest exudes, and, having in this half-burnt condition a sweetish taste, has given the common name to the tree; the wood seems to be formed slowly; from its smooth grain it is valued for indoor carpentry; the saccharine burnt resin is used as a laxative in California.

P. Cembra is the stone pine of Siberia and central Europe. It abounds on the Alps, the Carpathians and the Siberian ranges, in Switzerland being found at an altitude of 4000 to 6000 ft. It is a straight-growing tree, with grey bark and -whorls of horizontal branches giving a cylindro-conical

outline; the leaves are short, rigid and glaucous; the cones, oblong and rather pointing upwards, grow only near the top of the tree, and ripen in the second autumn; the seeds are oily like those of P. Pinea, and are eaten both on the Alps and by the inhabitants of Siberia; a fine oil is expressed from them which is used both for food and in lamps, but, like that of the Italian pine, it soon turns rancid. The growth of P. Cembra is slow, but the wood is of remarkably even grain, and is employed by the Swiss wood-carvers in preference to any other. The Cembra is the " zirbel " or " zirbel-kiefcr " of the Germans, and is known locally in Switzerland as the " aroile," " aloics," and " arve."

P. occidentalis, a five-leaved pine with pale-green foliage and small ovate cones, is found on the high mountains of Santo Domingo and Cuba. Many members of the group occur on the Mexican isthmus, one of which, P. cetnbroides, produces edible seeds; another, P. Montezumae, is a valuable timber tree. P. Ayacahuite, the common white pine of Mexico, spreads southwards on to the mountains of Guatemala, it is a large tree with glaucous foliage like P. Strobus, and yields a valuable resin. P. filifolia and P. macrophylla, likewise natives of Central America, are remarkable for the extreme length of their leaves; the former is said to attain a large size. (C. P. J.)

PINE-APPLE. The pine-apple so called consists in reality of the inflorescence of the plant, the originally separate flowers of which, together with the bracts supporting them, become fleshy and consolidated into one mass. The swelling and fusion of the tissues take place after the process of fertilization, and it may be that the richly perfumed succulent mass is an aid in the distribution of seed by affording food to certain animals. In the highly developed cultivated pines, however, it frequently happens that the seeds do not ripen properly. The pine, Ananas salivas, is a member of the natural order Bromeliaceae, of tropical American origin, where it is widely spread; and it is now naturalized in the tropical regions of the Old World.

Evelyn in his Diary mentions tasting a pine-apple from Barbados at the table of Charles II., and this is we believe the first mention of the fruit in English literature. A picture, of which a copy may be seen at the rooms of the Royal Horticul- tural Society of London, represents the royal gardener, Mr Rose, presenting on bended knee the first pine-apple grown in Britain, and it is surmised that this may have been grown from the "suckers" of the fruit above alluded to by Evelyn, though it is generally considered that the pine was not cultivated in England till 1712. For many years pine-apples were cultivated in large private gardens, but owing to the great developments in culture in the West Indies, the Azores, Canary Islands, &c, they are no longer cultivated in Britain or Europe.

PINE BLUFF, a city and the county-scat of Jefferson county, Arkansas, U.S.A., situated at an altitude of about 200 ft. in the alluvial bottoms of the Arkansas river, about 107 m. from its

mouth, and about 42 m. S. by E. of Little Rock. Pop. (1910), 15,102. It has an active river trade with St Louis, Memphis and New Orleans, and five railway outlets — the Missouri Pacific and its branch, the Pine Bluff & Western, and the St Louis South- Western and its two branches, the Pine Bluff & Arkan- sas River and the Altheimer. The city has many schools, and a business college, the state normal school for negroes, and Merrill institute, endowed by Joseph Merrill of Pine Bluff with $100,000. Large quantities of cotton and lumber are shipped from the city. Among the manufactures are cotton-seed oil, lumber and staves, and furniture. Pine Bluff has shops of the St Louis South-Western railway. The city's factory products were valued at- $2,989,242 in 1905, an increase of 94% over their value in 1900. Pine Bluff was laid out in 1832 and chartered as a city in i?

Pine-apple (Ananas sativus) much reduced. PINEL, PHILIPPE (1 745-1826), French physician, was born at the chateau of Rascas, Saint-Andre, in the department of Tarn, France, on the 20th of April 1745. He studied at Lavaur and afterwards at the university of Toulouse, where he took his doctor's degree in 1773. From Montpellier he removed in 1778 to Paris, engaging there chiefly in literary work connected with his profession. His first publication was a French translation of William Cullen's Nosology (1785); it was followed by an edition of the works of G. Baglivi (1788), and in 1791 he published a Traite medico-philosophique de V alienation mentale. In 1792 he became head physician of the Bicetre, and two years after- wards he received the corresponding appointment at the Salpe- triere, where he began to deliver a course of clinical lectures; these formed the basis of his Nosographie pkilosophique (1798; 6th ed., 1818), which was further developed in La Medecine chnique (1802). Pinel was made a member of the Institute in 1803, and soon afterwards was appointed professor of pathology in the Ecole de Medecine. His fame rests entirely upon the fact that he was among the first to introduce the humane treat- ment of the insane. He died at Paris on the 26th of October

1826.

PINERO, SIR ARTHUR WING (1855-), English dramatist, was born in London on the 24th of May 1855, the son of John Daniel Pinero, a Jewish solicitor, whose family was of Portuguese origin, long established in London. A. W. Pinero was engaged in 1874 as an actor at the Theatre Royal, Edinburgh, and came to London in 1876, to play at the Globe Theatre. Later in the year he joined the Lyceum company, of which he

remained a member for five years. The first piece of his to see the footlights

was £200 a year, played in October 1877 at the Globe Theatre for the benefit of Mr F. H. Macklin. The first play to make a hit was The Money Spinner (Theatre Royal, Manchester, Nov. 1880); but in The Squire (St James's Theatre, Dec. 1881) he attempted serious drama, and gave promise of the qualities of his later work. In 1883 and 1884 Pinero produced seven pieces, but the most important of his works at this period were the successful farces produced at the Court Theatre: The Magis- trate (March 1885), which ran for more than a year; The School- mistress (March 1886); Dandy Dick (Jan. 1887), revived in Febru- ary 1900; The Cabinet Minister (April 1890), and The Amazons (March 1893). Two comedies of sentiment, Sweet Lavender (Terry's, March 1888) and The Weaker Sex (Theatre Royal, Man- chester, Sept. 1888), met with success, and Sweet Lavender has enjoyed numerous revivals. With The Profligate (Garrick, April 1889) he returned to the serious drama which he had already touched on in The Squire. Out of deference to the wishes of John Hare the play was fitted with the conventional " happy ending," but the original denouement was restored, with great advantage to the unity of the play, in the printed version. The Second Mrs Tanqueray (St James's, May 27, 1893) dealt with the converse of the question propounded in The Profligate, but with more art and more courage. The piece aroused great discussion, and placed Pinero in the front rank of living dramatists (see Drama: Recent English). It was translated into French, German and Italian, and the part of Paula Tanqueray, created in the first place by Mrs Patrick Campbell, attracted many actresses, among others Eleonora Duse. His later plays were The Notorious Mrs Ebbsmith (Garrick, March 13, 1895), The Benefit of the Doubt (Comedy, Oct. 1895), The Princess and the Butterfly (St James's, April 7, 1897), Trelawney of the Wells (Court, Jan. 30, 1898), The Gay Lord Quex (Globe, April 8, 1899), Iris (Garrick, Sept. 21, 1901), Lctty (Duke of York's, Oct. 8, 1903), A Wife Without a Smile (Wyndham's, Oct. 9, 1904), His House in Order (St James's, Feb. 1, 1906), The Thunderbolt (St James's, May 9, 1908) and Mid-Channel (St James's, Sept. 2, 1909). Pinero was knighted in 1909.

His Plays (11 vols. 1891-1895) have prefaces by M. C. Salaman. See also H. Hamilton Fyfe, A. W. Pinero (1902).

PINEROLO [Pionerol], a city and episcopal see of Piedmont, Italy, in the province of Turin. Pop. (1901), 12,608 (town); 18,039 (commune). It is built on a hill-side just above the valleys of the Chisone and the Lemina, at

a height of 1234 ft. above the sea, 24 m. by rail S.W. of Turin. The railway goes on to Torre Pellice; and steam tramways run from Pinerolo to Perosa, and to Cavour and Saluzzo. Till 1696 it was strongly fortified with a citadel on Santa Brigida, a castle on S. Maurizio, and city walls constructed by Thomas I. of Savoy. It has a cathedral (St Donatus), the palace of the princes of Acaia and other buildings of some interest. Cotton, silk, wool and hemp are among the local manufactures.

Pinerolo was bestowed on the bishops of Turin by Otto III. in 996; but in 1078 the countess Adelaide made it over to the Benedictine abbey of Santa Maria, in whose possession it remained till n 59. Thomas I. of Savoy captured the castle in 1 188, and in 1246 the commune formally recognized the supremacy of Savoy. Passing in 1295 into the hands of Philip, son of Thomas III., Pinerolo became his residence and capital, a distinction which it retained under Amadeus VIII. of Savoy. Francis I. of France obtained possession of the town in his descent into Italy, but Emmanuel Philibert received it back from Henry III. in 1574. A second occupation by the French occurred under Cardinal Richelieu; the French language was imposed on the people, great fortifications were constructed, and the fortress (Pignerol) was used as a state prison for such men as Fouquet, De Caumont and the Man with the Iron Mask (see Iron Mask). Victor Amadeus bombarded the place in 1693, and ultimately compelled Louis XIV. to relinquish his hold on it; but before the withdrawal of the French troops the defences were demolished. In 1748 the town was made a bishop's see.

PIN-EYED, a botanical term for flowers which occur in two forms, one of which shows the stigma at the mouth of the corolla, as in the primrose; the term is contrasted with thrum-eyed.

PING-PONG, or Table-Tennis, a miniature variety of lawn- tennis played on a table, which may be of any size not less than 5I ft. long by 3 ft. broad. Various attempts were made to adapt lawn-tennis to the house, but the real popularity of the game began when, near the close of the 19th century, celluloid balls were introduced, and the game was called ping-pong from the sound of the balls as they were struck by the racket or rebounded from the table. In 1900 the ball was improved and made heavier, and for the next two years ping-pong enjoyed a popular- ity never before attained by a game in so short a time, not only in Great Britain but in France, the British Colonies and America. Two leagues were formed, the " Table-Tennis Association " and the " Ping-Pong Association," whose laws were practically identical. The regular tournament table is 9 ft. long by 5 ft. broad, and the net is a little less than 7 in. high. The balls, which are of hollow celluloid, are about f in. in diameter. The racket has a blade, shaped like a lawn-tennis racket, about 6 in long and a handle long enough

to grasp comfortably, all in one piece. Rackets are made either wholly of wood covered with vellum, cork, sand-paper or rubber, or of light frames covered with vellum or some other material. The table was at first marked out in courts, but is now plain. It should be unpolished and stained. In serving, a player must stand directly behind his end of the table and use an underhand motion only. The ball must clear the net and strike the table anywhere on the other side. The game is then continued until the ball misses the table or fails to pass over the net. Only one service is allowed, except in case of a let. The scoring is the same as in lawn-tennis.

See Ping-Pong, by Arnold Parker (London, 1902) ; Table Tennis, by A. Sinclair (London, 1902).

*PINK, in botany, the common name corresponding to a genus of Caryophyllacae, the Dianthus of botanists. It is characterized by the presence of simple leaves borne in pairs at the thickened nodes, flowers terminating the axis and having a tubular calyx surrounded by a number of overlapping bracts, a showy corolla of five free long-stalked petals, ten stamens proceeding, together with the petals, from a short stalk supporting the ovary, which latter has two styles and ripens into a cylindric or oblong pod- like one-chambered many-seeded capsule which opens at the apex by four cults or valves. The species are herbaceous perennials of low stature, often with very showy flowers. They are natives chiefly of southern Europe and the Mediterranean region, a few being found in temperate Asia and South Africa. Four species are wild in Britain. Of these, D. armeria, Deptford pink and D. deltoides, maiden pink, are generally distributed, D. caesius, Cheddar pink, occurs only on the limestone rocks at Cheddar. Two others, D. plumarius and D. caryophyllus, are more or less naturalized, and are interesting as being the originals of the pinks and of the carnations and picotees of English gardens. Garden pinks are derivatives from Dianthus plumarius, a native of central Europe, with leaves rough at the edges, and with rose-coloured or purplish flowers. The use of " pink " for a colour is taken from the name of the plant.**

The pink is a favourite garden flower of hardy constitution. It has been in cultivation in England since 1629, and is a great favourite with florists, those varieties being preferred which

1 The etymology of "pink" is disputed; it may be connected with " to pink " (apparently a naturalized form of " pick "), properly to prick or punch holes in material for the purpose of ornament, hence, later, to scallop or cut a pattern in the edge of the material. The flower has jagged edges to the petals, but the name occurs in the 16th century, and the later meaning, " to scallop," not till the 19th. Others connect with " pink," half- shut blinking of the eyes, as in " plumpie Bacehus, with pinke eyne " (Shakspeare Ant.

and CI. II. vii. 121); this word is seen in Dutch pinken, to blink, shut the eyes, and may be connected wfrr; " pinch." The French name for the flower, oeillet, little eye, may point to this derivation. The disease of horses, known as " pink- eye," a contagious influenza, is so-called from the colour of the i inflamed conjunctiva, a symptom of the affection

aave the margin of the petals entire, and which are well marked in the centre with bright crimson or dark purple. Its grassy but glaucous foliage is much like that of the carnation, but the whole plant is smaller and more tufted. Pinks require a free loamy soil deeply trenched, and well enriched with cow-dung. They are readily increased by cuttings (pipings), by layers and by seed. Cuttings and layers should be taken as early in July as practicable. The former should be rooted in a cold frame or in a shady spot out of doors. When rooted, which will be about August, they should be planted 4 in. apart in a nursery bed, where they may remain till the latter part of September or the early part of October. The chief attention required during winter is to press them down firmly should they become lifted by frosts, and in spring the ground should be frequently stirred and kept free from weeds. The pink is raised from seeds, not only to obtain new varieties, but to keep up a race of vigorous- growing sorts. The seeds may be sown in March or April in pots in a warm frame, and the young plants may be pricked off into boxes and sheltered in a cold frame. They should be planted out in the early part of the summer in nursery beds, in which, if they have space, they may remain to flower, or the alternate ones may be transplanted to a blooming bed in September or the early part of October; in either case they will bloom the following summer. These will grow in any good garden soil, but the richer it is the better.

The border varieties are useful for forcing during the early spring months. These are propagated from early pipings and grown in nursery beds, being taken up in October, potted in a rich loamy compost, and wintered in a cold pit till required for the forcing house.

The following varieties are among the best. For borders and forcing: Ascot, Carnea, Delicata, Derby Day, Her Majesty, Hercules, Anne Boleyn, Lady Blanche, Mrs Sinkins, Mrs James Welsh, Pilrig Park, Rubens, Snowdon, Tom Welsh. Florists' show and laced varieties: Attraction, Beauty of Bath, Clara, Criterion,. Ensign, Galopin, Harry Hooper, John Ball, Malcolm Dunn, Mrs D. Gray, Reliance, William Paul.

The Carnation (q.v.) and Picotee are modifications of Dianthus

Caryophyllus, the Clove Pink. This is a native of Europe, growing on rocks in the south, but in the north usually found on old walls. Its occurrence in England on some of the old Norman castles, as at Rochester, is supposed by Canon Ellacombe to indicate its introduction by the Normans; in any case the plant grows in similar situations in Normandy. The carnation includes those flowers which are streaked or striped lengthwise — the picotees are those in which the petals have a narrow band of colour along the edge, the remainder of the petal being free from stripes or blotches. These by the old writers were called " gillyflowers." The Sweet William of gardens is a product from Dianthus barbatus.

The Sea-Pink, or Thrift, Statice Armeria (Armeria vulgaris), is a member of the natural order Plumbagineae ; it is a widely distributed plant found on rocky and stony sea-shores and on lofty moun- tains. There are many improved varieties of it now in cultivation, one with almost pure white flowers.

PINKERTON, ALLAN (1819-1884), American detective, was born in Glasgow, Scotland, on the 25th of August 1819. His father, a sergeant of the Glasgow municipal police, died in 1828 of injuries received from a prisoner in his custody. In 1842 • \llan emigrated to Chicago, Illinois. In 1843 he removed to Dundee, Kane county, Illinois, where he established a cooper- age business. Here he ran down a gang of counterfeiters, md he was appointed a deputy-sheriff of Kane county in 1846 and immediately afterwards of Cook county, with headquarters in Chicago. There he organized a force of detectives to capture thieves who were stealing railway property, and this organization developed in 1852 into Pinkerton's National Detective Agency, of which he took sole charge in 1853. He was especially success- ful in capturing thieves who stole large amounts from express companies. In 1866 his agency captured the principals in the theft of $700,000 from Adams Express Company safes on a train of the New York, New Haven & Hartford railway, and recovered all but about $12,000 of the stolen money. In February 1861 Pinkerton found evidence of a plot to assassinate President-elect Lincoln upon his arrival in Baltimore on his way to Washington; as a result, Lincoln passed through Baltimore at an early hour in the morning without stopping. In April 1861 Pinkerton, on

the suggestion of General George B. McClellan, organized a system of obtaining military information in the Southern states. From this system he developed the Federal secret service, of which he was in charge throughout the war, under the assumed name of Major E. J. Allen. One of his detectives, James McParlan, in 1873-1876 lived among the Molly Maguires (q.v.) in Pennsylvania and secured evidence which led to the breaking up of the organization. In 1869 Pinkerton suffered a partial stroke of paralysis, and thereafter the management of the detective agency

devolved chiefly upon his sons, William Allan (b. 1846) and Robert (1848-1907). He died in Chicago on the 1st of July 1884. He published The Molly Maguires and the Detectives (1877), The Spy of the Rebellion (1883), in which he gave his version of President-elect Lincoln's journey to Washing- ton; and Thirty Years a Detective (1884).

PINKERTON, JOHN (1758-1826), Scottish archaeologist, numismatist and author, was born at Edinburgh on the 17th of February 1758. He was articled as a law clerk in Edinburgh, and his Elegy on Craigmillar Castle (1776) was printed during his clerkship. In 1781 he removed to London to devote himself to literary work, publishing in the same year a volume of Rimes of no great merit, and Scottish Tragic Ballads. These were followed in 1782 by Two Dithyrambic Odes on Enthusiasm and Laughter, and by a series of Tales in Verse. Under the title of Select Scottish Ballads he reprinted in 1783 his tragic ballads, with a supplement comprising Ballads of the Comic Kind. Ritson pointed out in 1784 that the so-called ancient ballads were some of them of modern date, and Pinkerton confessed that he was the author of the second part of Hardy Kanute and part- author of some others. He published an Essay on Medals in 1784, and in 1785, under the pseudonym of " Robert Heron," his bold but eccentric Letters of Literature depreciating the classical authors of Greece and Rome. In 1786 he edited Ancient Scottish Poems from the MS. collections of Sir Richard Maitland of Leth- ington — a genuine reproduction. It was succeeded in 1787 by a compilation, under the new pseudonym of " H. Bennet," entitled The Treasury of Wit, and by his first important historical work, the Dissertation on the Origin and Progress of the Scythians or Goths, to which Gibbon acknowledged himself indebted. Pinkerton next collected and printed in 1789 certain Vitae sanctorum scotiae, and, a little later, published his Enquiry into the History of Scotland preceding the Reign of Malcolm III. His assertion that the Celtic race was incapable of assimilating the highest forms of civilization excited " violent disgust," but the Enquiry was twice reprinted, in 1794 and 1814, and is still of value for the documents embodied in it. His edition of Barbour's Bruce and a Medallic History of England to the Revolution appeared in 1790; a collection of Scottish Poems reprinted from scarce Editions in 1792; and a series of biographical sketches, the Iconographia scotica, in the years 1795-1797. In 1797 he published a History of Scotland from the Accession of the House of Stuart to that of Mary, containing much valuable material. A new biographical collection, the Gallery of Eminent Persons of Scotland (1799), was succeeded after a short interval by a Modern Geography digested on a New Plan (1802; enlarged, 1807). About this time he left London for Paris, where he made his headquarters until his death on the 10th of March 1826. His remaining publications were the Recollections of Paris in the years 1802-3-4.- 5 (1806); a very useful General Collection of

Voyages and Travels (1808-1814); a New Modem Atlas (1808- 1819); and his Petrology (1811).

PINKNEY, WILLIAM (1764-1822), American lawyer- and statesman, was born in Annapolis, Maryland, on the 17th of March 1764. He was admitted to the bar in 1786, and in 1788- 1792 practised in Harford county. In 1788 he was a member of the state convention which ratified the Federal constitution for Maryland, in 1 788-1 792 and in 1795 of the House of Delegates (where in 1788 and 1789 he defended the right of slave-owners to manumit their slaves), and in 1792-1795 of the state executive council. In 1 796-1 804 he was a commissioner under article 7 of Jay's Treaty of 1794 to determine the claims of American merchants for damage through " irregular or illegal captures

or condemnations," and during this time adjusted on behalf of Maryland a claim of the state to stock in the Bank of England. In May 1806, with James Monroe, then minister at London, he was commissioned to treat with the British government con- cerning the capture of neutral ships in time of war; in 1807-1811, after Monroe's return to America, he was resident minister in London. He was elected to the Maryland senate in September 1811, and from December 1811 to January 1814 was attorney- general of the United States. In August 1814 he was wounded at Bladensburg. He served in the National House of Repre- sentatives in January-April 1816, and in 1816-1818 was minister plenipotentiary to Russia and special minister to Naples, where he attempted to secure indemnity for the losses to American merchants by seizure and confiscation during the rule of Murat in 1809. From 1820 until his death, at Washington, on the 25th of February 1822, he was a member of the United States Senate. He was a member of the conference committee on the bill for the admission of Maine and Missouri, which in its final form embodied what is known as the Missouri Compromise. Pinkney was a remarkably able lawyer and an orator of the old school.

See The Life of William Pinkney (New York, 1853) by his nephew, William Pinkney (1810-1883), who was Protestant Episcopal bishop of Virginia in 1879-1883; and Henry Wheaton, Some Account of the Life, Writings, and Speeches of William Pinkney (New York,

1828).

PINNACE, the name of two types of vessel or boat, one a light sailing vessel

with two schooner-rigged masts, the other a heavy eight-oared man-of-war's boat. The word is usually referred to Lat. pimis, pine, but this derivation is at variance with the earlier form " spinace."

PINNACLE (from Lat. pinnaculum, a little feather, pinna; the Gr. irrepvyiov, diminutive of wrepvˆ, wing, is also used in this sense), an architectural ornament originally forming the cap or crown of a buttress or small turret, but afterwards used on parapets at the corners of towers and in many other situations. Some writers have stated that there were no pinnacles in the Romanesque styles, but conical caps to circular buttresses, with finial terminations, are not uncommon in France at very early periods. Viollet-le-Duc gives examples from St Germer and St Remi, and there is one of similar form at the west front of Rochester Cathedral. In the 12th-century Romanesque two ex- amples have been cited, one from Bredon in Worcestershire, and the other from Cleeve in Gloucestershire. In these the buttresses run up, forming a sort of square turret, and crowned with a pyramidal cap, very much like those of the next period, the Early English. In this and the following styles the pinnacle seems generally to have had its appropriate uses. It was a weight to counteract the thrust of the vaults, particularly where there were flying buttresses; it stopped the tendency to slip of the stone copings of the gables, and counterpoised the thrust of spires; it formed a pier to steady the elegant perforated parapets of later periods; and in France especially served to counterbalance the weight of overhanging corbel tables, huge gargoyles, &c. In the Early English period the small buttresses frequently finished with gablets, and the more important with pinnacles supported with clustered shafts. At this period the pinnacles were often supported on these shafts alone, and were open below; and in larger work in this and the subsequent periods they frequently form niches and contain statues. About the Transition and during the Decorated period, the different faces above the angle shafts often finish with gablets. Those of the last-named period are much richer, and are generally decorated with crockets and finials, and sometimes with ball- flowers. Very fine groups are found at Beverley Minster and at the rise of the spire of St Mary's, Oxford. Perpendicular pinnacles differ but little from Decorated, except that the crockets and finials are of later character. They are also often set angle-ways, particularly on parapets, and the shafts are panelled. In France pinnacles, like spires, seem to have been in use earlier than in England. There are small pin- nacles at the angles of the tower in the abbey of Saintes. At Roullet there are pinnacles in a similar position, each com-posed of four small shafts, with caps and bases surmounted with

small pyramidal spires. In all these examples the towers have semicircular-headed windows.

PINNOCK, WILLIAM (1782-1843), English publisher and educational

writer, was born at Alton, Hampshire, on the 3rd of February 1782, and was at first a schoolmaster, then a book- seller. In 181 7 he went to London and, in partnership with Samuel Mander, began to publish cheap educational works. The firm's first productions were a series of Catechisms, planned by Pinnock, consisting of short popular manuals, arranged in the form of question and answer, of the different departments of knowledge. They were followed by abridged editions of Goldsmith's histories of England, Greece and Rome, and a series of county histories which were no less profitable. Pinnock lost nearly all his money in outside speculation, and died in London on the 21st of October 1843. His son > William Henry Pinnock (1813-1885), a clergyman, was the editor and author of several elementary textbooks and scriptural manuals, and of various works on ecclesiastical law and usage.

PINOCHLE, or Penuchle (Ger. Pinochet or Binochel, of uncertain etymology), a game of cards probably invented by Germans in the United States about the middle of the 19th century. It bears a general resemblance to Bezique (q.v.), and has almost entirely usurped the place of the older game in America. Pinochle may be played by two, three or four persons. Two packs, from which all cards below the nines have been deleted, are shuffled together, forming one pack of 48 cards. The object of the game is to make 1000 points. The cards rank as follows: ace n, ten 10, king 4, queen 3, knave 2. The nine counts nothing unless it be turned for trumps, when it scores 10. The last trick scores 10. The term "to meld" (Ger. melden, to announce), as used in pinochle, means " to declare." " Melds " are combinations which are declared during the play of the hands. They are of three classes: (1) " marriages " and " sequences," (2) " pinochles," and (3) "fours." The "melds" of the first class score as follows: "marriage" (king and queen of any plain suit), 20; "royal marriage" (king and queen of trumps), 40; "sequence" (the five highest trumps), 150. In the second class the " melds " are " pinochle " (queen of spades and knave of diamonds), 40; " double pinochle " (both queens of spades and knaves of • diamonds), 300; " grand pinochle " (king and queen of spades and knave of diamonds), 80; this " meld " is not often played in America. Of the third class the " melds " are: four aces of different suits, 100; four kings of different suits, 80; four queens of different suits, 60; four knaves of different suits, 40; eight aces, 1000; eight kings, 800; eight queens, 600; eight knaves,

400.

In single pinochle (two players) each player receives twelve cards, four at a time, the twenty-fifth being turned up beside the stock for trumps. The non-dealer leads a card, to which the dealer plays. There is no obligation either to take, follow suit or trump. The winner of the trick leads again, before

which, however, he may ” meld ” any one combination he holds. After he has ” melded,” or refused to do so, he draws a card from the top of the stock and adds it to his hand without showing it, his adversary doing the same, so that each player continues to hold twelve cards. Playing, announcing, and drawing then go on until the stock is exhausted. All combinations ” melded ” must be laid face upward on the table but still belong to the player’s hand, though they may not be taken up until the stock has given out. When this happens all announce- ments cease, and all cards exposed are replaced in the hands. The last twelve tricks are then played, but now both players must follow suit and must win the trick if possible, either with a superior card or a trump. A failure to do this is a ” revoke ” and is penalized by the loss of all points made by ” cards,” i.e. for the five highest cards in each suit, which after all the tricks have been played, are counted for the player holding them. Ace counts n points, ten 10, king 4, queen 3, and knave 2, whatever the suit, so that 240 points for ” cards ” are divided between the two players. Though points are not counted during the play, a mental count is kept, and whenever a player sees that, by adding the value of his ” melds ” to what he thinks his cards will count, he has enough to win the game, namely 1000 points, he ” calls out ” or knocks on the table, and proceeds to expose his cards. If he fails to show enough to win, he loses the game. If neither player knocks, the game continues until one of them scores 1250; if still a tie, 1500. If a player fails to make good a ” meld ” he is set back that number of points. The game is scored by counters or on a cribbage-board

PINSK— PINTO

„!?: th T ” ha , “ded pinochle the “melds” are exposed before a

tnthP «£/?•’ > /° P a – yer may – ” meld ” after he has Pˆyed to the first trick. A rule is sometimes made that an overlooked combination may be scored by the other players. Four handed pinochle is played either with partners or each player for himself.*

PINSK, a town of Russia, in the government of Minsk

*at the confluence of the Strumen and Pina rivers, 196 m S W**

by rail of Minsk. Pop., 27,938, two-thirds being Jews The

town carries on considerable trade, due to the navigable river

Fina, which connects it with the fertile regions in the basin of the

Dnieper, and, by means of the Dnieper-and-Bug canal, with

I oland and Prussia, while the Oginsky canal connects it with the basin of the Niemen. Pottery, leather, oil, soap and beer are the chief products of the local industries. The draining of the marshes around Pinsk was begun by the government in 1872, and by 1897 8,000,000 acres had been drained at an average cost of 3 s. per acre. Pinsk (Pinesk) is first mentioned in 1097 as a town belonging to Sviatopolk, prince of Kiev. In 1132 it formed part of the Minsk principality. After the Mongol invasion of 1239-42 it became the chief town of a separate principality, and continued to be so until the end of the 13th century. In 1320 it was annexed to Lithuania; and in 1569 after the union of Lithuania with Poland, it was chief town of the province of Brest. During the rebellion of the Cossack chief, Bogdan Chmielnicki (1640), the Poles took it by assault killing 14,000 persons and burning 5000 houses. Eight years later the town was burned by the Russians. Charles XII took it in 1706, and burned the town with its suburbs. Pinsk was annexed to Russia in 1795.

PINSUTI, CIRO (1829-1888), Anglo-Italian composer, was born at Siena, and was educated in music, for a career as a pianist partly in London and partly at Bologna, where he was a pupil of Rossini. From 1848 he made his home in England where he became a teacher of singing, and in 1856 he was made a professor at the Academy of Music in London. He became well known as a composer of numerous favourite songs and part-songs, as well as of three operas brought out in Italy, and it is by the former that he is still remembered.

PINT (derived probably through Spanish, from Lat. pincta, puta, a painted or marked vessel), a liquid measure of capacity equivalent to J of a gallon.

The imperial British pint = – S7 of a litre, 34-66 cub. in. The United States standard pint = -47 of a litre, 2 8f cub. in. The word appears in French as pinte tor a liquid measure as early as the 13th century

PINTO, ANIBAL (1825-1884), Chilean president, was born at Santiago, Chile. After a diplomatic training in the legation at Rome he learned the practice of administration as intendente of Concepcion, and from 1871 to 1876 was minister of war and marine under Errazuriz. During his term of office as president (1876 to 1881) Pinto had to deal first with a severe financial crisis and then to conduct the struggle with Peru and Bolivia, in which he displayed great coolness of judgment and devotion to duty.

PINTO, FERNAO MENDES (1509-1583), Portuguese adven- turer, was born at Montemor-o-Velho, of poor and humble parents, and entered the service of a noble lady in Lisbon, being afterwards for two years page to the duke of Aveiro in Setubal Desiring to try his fortune in the East, he embarked for India in 1537 in a fleet commanded by the son of Vasco da Gama, and for twenty-one years travelled, fought and traded in China, f artary, Pegu and the neighbouring countries, sailing in every sea, while m 1 542-1 543 he was one of the 'first Europeans to visit Japan, where he introduced the musket. Though he was thirteen times a captive and seventeen times sold into slavery his gay and dauntless spirit brought him through every mis- fortune. He was soldier and sailor, merchant and doctor, missionary and ambassador; moreover, as the friend and travel- ling companion of St Francis Xavier, he lent the apostle of the Indies the money with which to build the first Jesuit establish- ment in Japan. In January 1554 Mendes Pinto was in Goa waiting for a ship to take him to Portugal, when he took a sudden resolution to enter the company of Jesus and devote a large part of the capital he had accumulated to the evangelization of Japan.

The viceroy appointed him ambassador to the king of Bungo in order to give the mission an official standing, and on the 18th of April he set sail with the provincial, Father Belchior Nunes Owing to bad weather and contrary winds, however, the mis- sioned did not reach Japan until July 1556, but the success of the mission represented a notable service to the cause of Chris- tianity and civilization. On the 14th of November 1556 Father Belchior and Mendes Pinto began their return voyage and reached Goa on the 17th of February 1557. During his stay of a twelve- month there, the latter left the company, being dispensed from his vows for want of vocation at his own request, though a modern authority states that he was expelled because he was found to be a marrano, i.e. to possess Jewish blood. He finally returned to Portugal on the 22nd of September 1558, and

settled at Pragal near Almada, where he married and wrote his famous book, the Peregrination; the MS., in fulfilment of his wishes was presented by his daughter to the Casa Pia for penitent women m Lisbon, and it was published by the administrators in 1614. When Philip II. of Spain came to Portugal as its kmg, he listened with pleasure to the account of Mendes Pinto s travels, and by letter of the 15th of January 1583 gave him a pension for his services in the Indies But the reward came too late, for the great traveller died on the 8th of July.*

_ In the light of our present-day knowledge of the East, Pinto is regarded as having been on the whole a careful observer and truthful narrator, but this was not always the case. Some witty countryman of his own parodied his name into Fernao, mentes? Mmtol { Ferdinand, do you lie? I do!"); and the English dramatist Congreve only expressed the general opinion of the unlearned when he wrote in Love for Love " Mendez Pinto was but a type of thee, thou liar of the first magnitude." It must be remembered that Pinto wrote the Peregrination long sub- sequent to the events he records, and this fact and a certain fertility of imagination sufficiently account for inexactitudes furthermore as the book was only published posthumously, he never had the opportunity of correcting the proofs. Some of his most marvellous stories are expressly given on the authority of writers belonging to the countries he describes; others he tells from hearsay, and Oriental informants are prone to ex- aggeration. But if he somewhat adorned the truth, he did not wilfully misrepresent it. The book itself gives the impression of sincerity, and the editors of the first edition bear witness to the probity, good faith and truthfulness of Mendes Pinto as a man Herrera Maldonado prefaced his Spanish translation of the Peregrination (1620) by a lengthy and erudite apology to demonstrate its authenticity, and Castilho has reinforced his arguments by modern testimonies. In the narrative portions of his work Pinto's style is simple, clear and natural, his diction rich, particularly m sea terms, and appropriate to his varying subjects. There is an entire absence of artifice about the book which must always rank as a classic, and it might fairly be argued that Mendes Pinto did for the prose of Portugal what Camoens did for its poetry; this is the more remarkable, because it does not appear that he ever received any education in the ordinary sense. He wrote the book for his children to learn to read by and modestly excused its literary defects by alleging his rudeness and lack of talent. Tradition has it that the MS. was entrusted to the chronicler Francisco de Andrade for the purpose of being polished m style and made ready for press, but that all he did was to divide it into chapters.

tJtllt F Z e£ ^ a J i0n i 1 ^ 8 go L e t ^ rou S h man y editions subsequent Livraria rl^'/^ m l86 5 Castilho published excerpts in his p 7 classica portugueza with an interesting notice of Mendes FWh ', w W " U ^. . Versions exist in German (3 editions), rnc^n I 3 e 3 It,0n , s) « Spamsh (4

editi °ns), and in English by Henry Logan, London (1663 1692 and— abridged and illustrated, with introduction by Arminius Vambery— 1891). Cogan omits the chapters relating to Mendes Pinto's intercourse with, and the last uays 01, stfrancis Xavier, presumably as a concession to anti-Catholic prejudice.

F„™I Sr ris j° va n- Ayres ' Vern&0 denies Pinto (Lisbon, 1904), Fernao Mendes Ptnto e Japao (Lisbon, 1906); also Subsidies… para a bwgraphm de Fernao Mendes Pinto by Jordao de FreitaE (Coimbra, 1905). J ■ ˆp R ˆ

PINTO. The remarkable brown, black and blue spots of discoloration of the whole body met with endemically in Mexico, Panama, Colombia and Venezuela, and known under the name of " pinto" or " mal de los pintos," were first claimed by Gastambide (Presse med. Beige, 1881, Nos. 33-41) as due to the presence of a vegetable parasite, whose spores and even mycelial filaments may be detected among the deeper rows of cells of the rete mucosum. The disease appears to be one of the many forms of morbus miseriae; but it is contagious, and is sometimes seen in the well-to-do. In some villages of the western districts of Tabasco (Mexico) it has been estimated that 9% of the inhabitants suffer from the pinto; M'Clellas says that in 1826 in the City of Mexico he saw a whole regiment •f " pintados."

PINTURICCHIO (1454-1513), Italian painter, whose full name was Bernardino di Betti, the son of a citizen of Perugia, Benedetto or Betto di Biagio, was one of a very important group who inherited the artistic traditions and developed the style of the older Perugian painters, such as Bonfigli and Fiorenzo di Lorenzo. According to Vasari he was a pupil of Perugino; and so in one sense no doubt he was, but rather as a paid assistant than as an apprentice. The strong similarity both in design and methods of execution which runs through the works of this later Perugian school is very striking; paintings by Perugino, Pinturicchio, Lo Spagna and Raphael (in his first manner) may often be mistaken one for the other. In most cases, especially in the execution of large frescoes, pupils and assistants had a large share in the work, either in enlarging the master's sketch to the full-sized cartoon, in transferring the cartoon to the wall, or in painting backgrounds, drapery and other accessories. After assisting Perugino in the execution of his frescoes in the Sistine Chapel, Pinturicchio was employed by various members of the Delia Rovere family and others to decorate a whole series of chapels in the church of S. Maria del Popolo in Rome, where he appears to have worked from 1484, or earlier, to 1402

with little interruption. The earliest of these is an altarpiece of the " Adoration of the Shepherds," in the first chapel (from the west) on the south, built by Cardinal Domenico della Rovere; a portrait of the cardinal is introduced as the foremost of the kneeling shepherds. In the lunettes under the vault Pinturicchio painted small scenes from the life of St Jerome. The frescoes which he painted in the next chapel, that built by Cardinal Innocenzo Cibo, were destroyed in 1700, when the chapel was rebuilt by Cardinal Alderano Cibo. The third chapel on the south is that of Giov. della Rovere, duke of Sora, nephew of Sixtus IV., and brother of Giuliano, who was afterwards Pope Julius II. This contains a fine altarpiece of the " Madonna enthroned between Four Saints," and on the east side a very nobly composed fresco of the " Assumption of the Virgin." The vault and its lunettes are richly decorated with small pictures of the life of the Virgin, surrounded by graceful arabesques; and the dado is covered with monochrome paintings of scenes from the lives of saints, medallions with prophets, and very graceful and powerfully drawn female figures in full length in which the influence of Signorelli may be traced. In the fourth chapel Pintu- ricchio painted the Four Latin Doctors in the lunettes of the vault. Most of these frescoes are considerably injured by damp, but happily have suffered little from restoration; the heads are painted with much minuteness of finish, and the whole of the pictures depend very largely for their effect on the final touchings a seeco. The last paintings completed by Pinturicchio in this church were the frescoes on the vault over the retro-choir, a very rich and well-designed piece of decorative work, with main lines arranged to suit their surroundings in a very skilful way. In the centre is an octagonal panel of the coronation of the Virgin, and round it medallions of the Four Evangelists — the spaces between them being filled up by reclining figures of the Four Sibyis. On each pendentive is a figure of one of the Four Doctors enthroned under a niched canopy. The bands which separate these pictures have elaborate arabesques on a gold ground, and the whole is painted with broad and effective touches, very telling when seen (as is necessarily the case) from

a considerable distance below. No finer specimen of the decora- tion of a simple quadripartite vault can anywhere be seen.

In 1492 Pinturicchio was summoned to Orvieto, where he painted two Prophets and two of the Doctors in the duomo. In the following year he returned to Rome, and was employed by Pope Alexander VI. (Borgia) to decorate a suite of six rooms in the Vatican, which Alexander had just built. These rooms, called after their founder the Appartamenti Borgia, now form part of the Vatican library, and five of them still retain the fine series of frescoes with which they were so skilfully decorated by Pinturicchio. The upper part of the walls and vaults, not only covered with painting, but further enriched with delicate stucco work in relief, are a masterpiece of

decorative design applied according to the truest principles of mural ornament — a much better model for imitation in that respect than the more celebrated Stanze of Raphael immediately over the Borgia rooms. The main subjects are: (1) the Annunciation, the Nativity, the Magi, and the Resurrection; (2) Scenes from the lives of St Catherine, St Antony and other saints; (3) allegorical figures of music, arithmetic and the like; (4) four figures in half length, with rich arabesques; (5) figures of the planets, the occupations of the various months, and other subjects. The sixth room was repainted by Perino del Vaga. 1

Though not without interruption, Pinturicchio, assisted by his pupils, worked in these rooms from 1492 till 1498, when they were completed. His other chief frescoes in Rome, still existing in a very genuine state, are those in the Cappella Bufalini at the south-west of S Maria in Ara Coeli, probably executed from 1497 to 1500. These are well-designed compositions, noble in conception, and finished with much care and refinement. On the altar wall is a grand painting of St Bernardino of Siena between two other saints, crowned by angels; in the upper part is a figure of Christ in a vesica-glory, surrounded by angel musicians; on the left wall is a large fresco of the miracles done by the corpse of St Bernardino, very rich in colour, and full of very carefully painted heads, some being portraits of members of the Bufalini family, for whom these frescoes were executed. One group of three females, the central figure with a child at her breast, is of especial beauty, recalling the grace of Raphael's second manner. The composition of the main group round the saint's corpse appears to have been suggested by Giotto's paint- ing of St Francis on his bier in S. Croce at Florence. On the vault are four noble figures of the Evangelists, usually attributed to Luca Signorelli, but certainly, like the rest of the frescoes in this chapel, by the hand of Pinturicchio. On the vault of the sacristy of S. Cecilia in Trastevere, Pinturicchio painted the Almighty surrounded by the Evangelists. During a visit to Orvieto in 1496 Pinturicchio painted two more figures of the Latin Doctors in the choir of the duomo — now, like the rest of his work at Orvieto, almost destroyed. For these he received fifty gold ducats.

Among his panel pictures the following are the most important. An altarpiece for S Maria de' Fossi at Perugia, painted in 1496-1498, now moved to the picture gallery, is a Madonna enthroned among Saints, graceful and sweet in expression, and very minutely painted; the wings of the retable have standing figures of St Augustine and St Jerome; and the predella has paintings in miniature of the Annunciation and the Evangelists. Another fine altarpiece, similar in delicacy of detail, and probably painted about the same time, is that in the cathedral of San Severino — the Madonna enthroned looks down towards the kneeling donor. The angels at the sides in beauty of face and expression recall the

manner of Lorenzo di Credi or Da Vinci. The Vatican picture gallery has the largest of Pinturicchio's panels — the Coronation of the Virgin, with the apostles and other saints below. Several well-executed portraits occur among the kneeling saints. The Virgin, who kneels at Christ's feet to receive her crown, is a figure of great tenderness and beauty, and the lower group is composed with great skill and grace in arrange- ment. Other important panel paintings by Pinturicchio exist

'See Guattani, Quadri nell' appart. Borgia (Rome, 1820).

in the cathedral of Spello, in the Siena gallery, at Florence, at Perugia, and in other collections.

In 1 501 Pinturicchio painted several fine frescoes in S. Maria Maggiore at Spello — all very decorative and full of elaborate architectural accessories. One of them, the Annunciation, is signed " Bernardinvs Pintvrichivs Pervsinvs." The most striking of all Pinturicchio's frescoes, both for brilliance of colour and their wonderful state of preservation, are those in the cathedral library at Siena, a large room built in 1495 by Cardinal Francesco Piccolomini, afterwards Pius III. In 1502 the cardinal contracted with Pinturicchio to decorate the whole room with arabesques on the vault, and on the walls ten scenes from the life of Aeneas Sylvius Piccolomini, Pius II., the uncle of Cardinal Francesco.

The contract specially provided that the cartoons, their trans- ference on to the walls, and all the heads, were to be by Pinturic- chio's own hand, thus contradicting Vasari's assertion that the cartoons were the work of Raphael. The document provides for the price of these frescoes, namely one thousand gold ducats, to be paid in various instalments. The work was begun early in 1503, but was interrupted for a while by the death of Pius III. His will, however, provided for the completion of the work by his executors, and the whole series were finished in 1507. The subjects are (1) the journey of the young Sylvius Piccolomini to the Council of Basel, in the suite of Cardinal Capranica; (2) his reception by James I. of Scotland as envoy from the Council of Basel ; (3) his being crowned with the poet's laurel by Frederick III.; (4) his reception by Pope Eugenius IV. as ambassador from Frederick III. ; (5) outside the wall of Siena he presents to Frederick III. his bride Leonora, infanta of Portugal ; (6) he receives the cardinal's hat from Pope Calixtus III. ; (7) he is borne in procession after his election as Pope Pius II.; (8) he presides at a council at Mantua; (9) he canonizes St Catherine of Siena; (10) he arrives in Ancona to promote the

crusade against the Turks. In addition to these there is, outside the library, over the door, the coronation of Pius III. In the lower part of the scene of St Catherine's canonization he has intro- duced his own portrait, and standing by him is a youth who bears some resemblance to Raphael.

In 1508 Pinturicchio painted another panel of the Madonna enthroned among saints for the church of the Minori Conventuali at Spello. It is now over the altar in the sacristy. On his return to Siena he painted a whole series of frescoes on the walls of the Palazzo Petrucci, now all destroyed except one scene of the return of Ulysses to Penelope (or possibly Collatinus and Lucretia), which is now in the National Gallery of London, transferred to canvas. One of his last works, painted in 1513, the year of his death, is a very beautiful and highly finished panel with Christ bearing His Cross, now in the Palazzo Bor- romeo in Milan. Pinturicchio married Grania di Niccolo, and had by her two sons and four daughters; there is probably no truth in the story of his being starved by his wife during his last illness.

Pinturicchio's worth as a painter has been for the most part undervalued, partly owing to the very strong prejudice and dislike which tinges Vasari's biography of him. Even Crowe and Caval- caselle hardly did him justice. A fairer estimate of his position in the history of art is given by Vermiglioli, Memorie di Pinturic- chio (Perugia, 1837); and in the valuable notes and appendix of Milanesi's edition of Vasari, iii. 493-531 (Florence, 1878). See also Schmarsow , Raphael und Pinturicchio in Siena (Stuttgart, 1880), and Pinturicchio in Rom (Stuttgart, 1882), both well illustrated by photo-lithography. (J. H. M.)

PINWELL, GEORGE JOHN (1842-1875), British water-colour painter, was born at Wycombe, and educated at Heatherley's Academy. He is one of the most interesting personalities in the little group of water-colour painters which included Frederick Walker and A. B. Houghton, a group whose style was directly derived from the practice of drawing upon wood for book illustration. He was one of the most delightful book illustrators of his day, poetic in imagination, with considerable inventive power and an admirable sense of colour. As he died young his works are few, but their promise was so great that had he lived he would probably have attained a very high position. His early life was one of considerable privation. In 1862 he entered at Heatherley's studio and there obtained his art education. His earliest drawings appeared in Lilliput Levie. He did a little work for Fun and executed several designs for the silversmiths, Elkingtons. In 1863 his first drawing appeared in Once a Week,

and from that time his work was in constant demand. There are many of his compositions in Good Words, The Sunday Magazine, The Quiver and

London Society, but his most important productions made for the Dalziel brothers were illustrations ol Goldsmith, of Jean Ingelow's poems, Robert Buchanan's Ballads of the Affections, and the Arabian Nights.

Of Pinwell's pictures in colour, which are distinguished by a remarkable, jewel-like quality and marked by his strong love of pure, bright colour and opalescent effect, the chief are the two scenes from the Pied Piper of Hamelin, Gilbert & Becket's Troth, Out of Tune or The Old Cross, A Seat in St James's Park, and The Elixir of Life.

In 1874 Pinwell fell seriously ill and went to Africa for the winter. He painted several remarkable pictures at Tangier, but his strength gradually broke down and he returned to die in his wife's arms on the 8th of September 1875. Pinwell was an exhibitor at the Dudley gallery, and in 1869 was elected associate of the Royal Water-Col our Society and full member in 1870; to this gallery he contributed fifty-nine works. A posthumous exhibition of his works was held in 1876 in Bond Street.

See Life of George J. Pinwell, by George C. Williamson, quarto, 1900. (G. C. W.)

PINZON, a family of wealthy Spanish navigators, of Palos in Andalusia, three members of which — Martin Alonzo, Francisco and Vicente Yanez, brothers — were associated with Columbus in the discovery of America.

Martin Alonzo Pinzon, born about the middle of the 1 5th century, gave material assistance to Columbus in carrying out his project. " If Colon was the head, Pinzon was the right arm " (Asensio). In the expedition of 1492 he commanded the " Pinta," on which his brother Francisco was pilot; another brother, Vicente Yanez, commanded the " Nina." On the 6th of October Martin Alonzo suggested to Columbus (when already in the longitude of the Bermudas) to change the course of the expedition from due west to south-west; on the 7th of October this suggestion — strengthened by the observation of a flight of birds to the south-west — was adopted, bringing the fleet, four days later, to the landfall at Guanahani (San Salvador, Watling Island) in the Bahamas (Oct. 12, 1492). On the 21st of Novem- ber 1492, near the east end of the north coast of Cuba, Martin Alonzo left Columbus, making eastward in search of the gold-land of which they had heard the natives speak. On the 6th of January 1493 he rejoined the admiral, who accepted his excuses. But on the return journey he again left his leader, and when Columbus arrived at Palos on the 15th of March 14Q3 he learned that Alonzo had already landed at Bayona in Galicia. If his object was to forestall Columbus and pose as discoverer of the New World, he was foiled; audience was refused him by Ferdi- nand and Isabella; and soon after he died, perhaps of chagrin. ■ Vicente Yanez

Pinzon, who commanded the " Nina" in 1492-1493, also gave Columbus material help, and remained loyal to his leader throughout. In after years he made important discoveries on his own account. Late in December 1499 he sailed with four caravels across the Atlantic to the south-west, and on the 7 th of February 1500 he struck the South American continent at Cape S. Agostinho, near its most easterly projection (called by him Cape Santa Maria de la Consolacion) almost three months before the Portuguese navigator Cabral reached Brazil, the discovery of which is generally attributed to him. Proceed- ing southwards a short distance, he then turned north, followed the coast to the north-west, discovered the Amazon estuary, and went at least as far as what is now Costa Rica. After touch- ing at Haiti, and losing two of his vessels among the Bahamas, Vicente returned to Palos in the end of September 1500. Although concessions were made to him, and he was created governor of the newly discovered lands by Ferdinand and Isabella, he does not seem to have ever taken possession. In 1507 we find Vicente sailing with Juan Diaz de Solis along the east coast of Central America. In 1509, again with De Solis, he coasted the Atlantic side of South America as far as the La Plata estuary, hoping to find an opening westwards leading to I the Spice Islands. According to Herrera, he even reached 40° S.,

passing the La Plata without recognizing it, and turning back about the mouth of the Rio Negro, but this is probably an exaggeration. After 1523 all traces of Vicente are lost.

See Navarrete, Coleccion de viajes; Washington Irving's Columbus, Bk. XIV'., ch. ii. ; bibliography in Joaquim Caetano da Silva's L'Oyapoc et V Amazone (Paris, 1861) ; Herrera, Indias Occid., Dec. I., lib. vi. cap. 17; lib. vii., caps. 1 and 9 (Madrid, 1730); Oviedo, Hist, general de las Indias, lib. xxiii. cap. 1 (Madrid, 1852); O. Peschel, Geschichte der Erdkunde, pp. 230, 233, 249 (Munich, 1865); Zeitalter der Entdeckungen, pp. 305, &c, 426; Jose Maria Asensio, Cristoval Colon, su vida, sus viajes, sus descobrimientos (Barcelona, 1891) ; Cesareo Fernandez Duro, Colon e Pinzon.

PIO DI SAVOIA, an ancient noble Italian family, first men- tioned by good authorities in the 14th century. From the house of Este (q.v.) they received the lordship of Carpi, and later they acquired the fiefs of Meldola, Sassuolo, &c. Many members of the family were distinguished as condotlicri, diplomats and ecclesiastics. Alberto Pio obtained from the house of Savoy in 1450 the privilege of adding " di Savoia" to his name as

a reward for his military services. Another Alberto Pio (1475- 1531), who was French ambassador in Rome, won fame as a man of learning, and Cardinal Rodolfo Pio (1516-1564) was a trusted adviser to Pius III. and helped to establish the Inquisition at Milan. Ascanio Pio (d. 1649) was a dramatic poet of some merit. Spain conferred the title of prince on the family, and one branch of it is to this day established in Spain.

See P. Litta, Le Famiglie celcbri italiane (Milan) ; G. Campori Memorie storiche di Marco Pio di Savoia (Modena, 1876); A. Ceriani and G. Porro, " II Rotolo epistografo dei principi Pio di Savoia," in the Archivio storico lombardo, ser. II. an. XI. fasc. I, ser. III. an. VIII. 96, and ser. III. an. XIX. 453.

PIOMBINO, a seaport of Tuscany, Italy, in the province of Pisa, 8 m. by rail W.S.W. of Campiglia Marittima (which is 53 m. S.S.E. of Pisa), 62 ft. above sea-level, at the southern extremity of the peninsula of the Monte Massoncello. Pop. (1901), 5979 (town); 7703 (commune). It is surrounded by old walls, and contains some interesting Renaissance works by a master of about 1458 under the influence of Alberti. It is the port of embarcation for Elba, the nearest point of which is about 6 m. to the south-west, and originally belonged to Pisa. It gives the title of prince to the Buoncompagni Ludovisi family, who, however, no longer own it.

PIONEER, properly a foot-soldier (Med. Lat. pedo, pedonis, through O. Fr. peonnier, pionnier, cf. " pawn ") who with spade, axe and other implements, precedes an army or smaller military body, and clears or makes a road, digs intrenchments, prepares a camping ground, &c. The word is thus applied to all who, actually or figuratively, are first in exploring or working an undiscovered or undeveloped country or field of inquiry.

PIOTRKOW (Ger. Petrikau), a government of Russian Poland, hounded by the government of Warsaw on the N., Radom and Kielce on the E., Kalisz on the W. and Prussian Silesia on the S. Area, 4729 sq. m.; pop. (1906, estimate), 1,675,200. Geologically it represents a continuation of Upper Silesia, and is built up of Upper Carboniferous deposits, containing near Bendzin a bed of coal 265 sq. m. in extent. Permian and Jurassic deposits, containing zinc ores, as also lignite and limonite iron ores, overlie the Carboniferous. The surface consists of a series of heights, 1000 to 1600 ft. above sea-level, intersected by ravines, and stretching from south-west to north-east. The government is drained by the Warta and the Pilica, and was formerly covered with thick forests. It was colonized by Mazurs and Poles (Veliko-Polyans and Malo-Polyans). The government, which is the most densely peopled in the Russian Empire, is divided into eight districts, of which the chief towns are Piotrkow, Bendzin, Brzeziny, Czenstochowa,

Lask, Lodz, Nowo-Radom and Rawa. Agriculture and cattle-breeding are extensively carried on; and coal and iron are mined. Textile industries developed with extraordinary rapidity during the closing years of the 19th and the opening years of the 20th centuries, the towns of Lodz, Pabianice, Zgerz and Bendzin all being important centres. Other branches of productive industry are distilleries, breweries, flour-mills, brickyards, sugar, cement, glass and candle factories. Granica and Sosnowice, in this government, are two of the most

important custom-houses in Russia, and the annual trade is estimated at £12,000,000.

PIOTRKOW, a town of Russian Poland, capital of the govern- ment of the same name, and formerly the seat of the high court of Poland, on the railway from Warsaw to Vienna, 90 m. south- west of the former and 5 m. west of the river Pilica. Pop. (1900), 32,173. It is a well-kept town, with numerous gardens, and has flour-mills, saw-mills, tanneries, agricultural machinery works, and breweries. One of the oldest towns in Poland, Piotrkow was in the 15th and 16th centuries the place of meeting of the diets, and here the kings were elected. In the 14th century Casimir the Great built here a castle (now a military church) and surrounded the town with walls. Here in 1769 the Russians defeated the (Polish) forces of the Bar Confederation.

PIOZZI, HESTER LYNCH (1741-1821), English writer, well known as the friend (Mrs Thrale) of Samuel Johnson {q.v.), was born on the 16th of January 1741, her father being John Salus- bury of Bobbel, Carnarvonshire. Her maternal uncle, Sir Robert Salusbury Cotton, contemplated providing for his niece, but he died without having carried out his intention. She and her mother lived in London, and amongst her childish recollec- tions were meetings with James Quin and David Garrick. She received a solid education, for she was acquainted with Latin as well as with French, Italian and Spanish. In 1763 she was married to Henry Thrale, a rich Southwark brewer, whose house was at Streatham on the south-east corner of Tooting Bee Common. There was very little sympathy between the lively girl and Thrale, who was thirteen years her senior, but gradually she drew round her a distinguished circle of friends. She was introduced to Samuel Johnson in 1765 by Arthur Murphy, who was an old friend of her husband's. In 1766 Johnson paid a long visit to Streatham, and from that time was more or less domesti- cated with the Thrales. In time it became his custom to spend the middle of the week at Streatham, devoting the remaining days to his own heterogeneous " family." He was genuinely attached to his hostess, and thoroughly appreciated the luxury in which the Thrales lived. They were able to soften some of his eccentricities, and they certainly made him happy. He travelled with them in Wales in

1774, and in France in 1775. Dr Burney gave lessons to one of the Miss Thrales, and in 1778 he brought his daughter Fanny to Streatham. She became a warm friend of Mrs Thrale, and has left an account of the Streatham household in her diary. This friendship was by no means always unclouded. Fanny Burney was very sensitive, and sometimes thought that Mrs Thrale gave herself airs of patronage. Meanwhile, in 1772, Thrale's business was seriously injured, and he was threatened with bankruptcy. The situation was saved by his wife's efforts, and in the next year Thrale travelled, leaving her in charge of his affairs. He was twice returned for the borough of Southwark, chiefly through her efforts. In 1781 Mr Thrale died, and Dr Johnson helped the widow with her business arrangements, advising her to keep on the brewery, until she " cured his honest heart of its incipient passion for trade, by letting him into some, and only some, of its mysteries." The brewery was finally sold for £135,000. Mrs Thrale had met Gabriele Piozzi, an Italian musician, in 1780. Johnson was now in failing health, and soon began to feel himself slighted. His suspicions were definitely aroused when she laid aside her mourning for Thrale in 1782, and the Streatham house was sold. In 1783 her engagement to Piozzi was announced. The objections of her daughters and her friends induced her to break it off for a time, but it was soon resumed, and in 1784 they were married. Johnson told Miss Burney that he drove the memory of Mrs Thrale from his mind, burning every letter of hers on which he could lay his hand. The Piozzis presently left England to travel in Italy. At Florence they fell in with Robert Merry and the other " Delia Cruscan" writers ridiculed by William Gifford in his Maeviad and Baviad, and she contributed some verses to their Florence Miscellany in 1785. In 1786 she published Anecdotes of Ihe late Samuel Johnson, during the last twenty years of his life, which was severely criticized by Boswell. She was ridiculed by " Peter Pindar " in Bozzy and

Piozzi; or the British Biographers, A Town Eclogue (1786). But though Miss Burney and some others held aloof, the Piozzis found plenty of friends when they returned to London in 1787. Piozzi died at Brynbella, a villa he had built on his wife's Carnarvonshire estate in 1809, and Mrs Piozzi gave up her Welsh property to her husband's son, and spent most of the rest of her life at Bath and Clifton. When long past seventy she took a fancy to William Augustus Conway, the actor. She retained her vivacity to the last, celebrating her 80th birthday by a ball to six or seven hundred people at Bath. She died at Clifton on the 2nd of May 1821.

From 1776 to 1809 she kept a note-book which she called " Thraliana."

Her well-known poem of the " Three Warnings " is to be found in many popular collections. Letters to and from the late Samuel Johnson appeared in 1788; Observations and Reflections made in the course of a Journey, through France, Italy and Germany, in 1789; and in 1801 she published Retrospection; or a review of the most striking and important events, characters, and situations . . . which the last eighteen hundred years have presented to the view of mankind (1801).

See Letters and Literary Remains of Mrs Piozzi (Thrale), edited with notes and an Introductory Account of her Life and Writings by A. Hayward (1861); Piozziana; or Recollections of the late Mrs Piozzi by a Friend (1833), the anonymous friend being Edward Mangin (1772-1852); L. B. Seeley, Mrs Thrale, afterwards Mrs Piozzi . . . (1891), and G. Birkbeck Hill, Johnsonian Miscellanies (1897). Also works noted in bibliography to Johnson, Samuel

PIPE, a term used of a musical wind-instrument of tubular form, and hence of any cylindrical hollow tube. The original application of the term is to the musical instrument (see Pipe and Tabor below), and the source is to be found in Lat. pipare, to chirp, of a bird. The general meaning of " pipe," in the sense of a tube for such purposes as carrying water, gas, sewage, &c, is treated under Tube. Among specific uses of the word are those for the hollow stem of clay, wood or other material with a bowl at one end in which tobacco is smoked (see below) ; for the metal or wooden sound tubes in an organ (q.v.) ; and for various forms of cylindrical veins, hollows, channels, &c, in mining and geology. The Great Roll of the Exchequer was known as the "Pipe Roll "; this contained the various "pipes" or enrolled accounts of the sheriffs, &c, which were so called either from being sent in a cylindrical case or as resembling a pipe in shape when rolled (see Records).

Tobacco Pipe. — The smoking of tobacco in pipes is a custom which prevailed in America for a period of unknown duration previous to the discovery of that continent by Columbus. The most ancient pipes of which remains exist have been found in mounds or tumuli called pipe mounds, principally in Ohio, Indiana, Illinois and Iowa. These mound pipes, which are carved in porphyry and other hard stones, are very uniform in type. The pipe, cut out of a single piece of stone, consists of a slightly convex platform or base, generally from 3 to 4 in. in length, and about an inch broad, with the bowl on the centre. A

fine hole is pierced from one end of the platform to the bottom of the bowl, the opposite end being obviously for holding in the hand while the pipe is being smoked. In the commonest forms the bowl is a simple cylinder or urn (fig. 1), but in many cases remarkable artistic skill has been displayed in

carving the bowls into miniature figures of birds,mammals,reptiles and human heads, often gro- tesque and fantastic, but always vigorously expressed (fig. 2). These mound or platform pipes with carved human andanimal formsare objects of the highest ethno- graphic interest and im- portance, being among the

Monitor " Pipe.

Fig. 2.-

Heron Pipe.

most characteristic remains of the ancient inhabitants of the Mississippi valley. The wide area over which they, as well as

remains of baked clay pipes, are found throughout the American continent testifies to the universal prevalence of smoking in the pre-Columbian era. Many of the ancient clay pipes found in Mexico, &c, are elaborately moulded and ornamented, while others show considerable similarity to the early clay pipes of Europe. Among the North-American Indian tribes the tobacco pipe occupies a position of peculiar symbolic significance in connexion with the superstitious rites and usages of the race. The calumet, peace pipe or medicine pipe, is an object of the most profound veneration, entrusted to the care of a highly honoured official, and produced and smoked with much ceremony only on occasions of great importance and solemnity. It is remarkable that, whilst the most ancient American pipes had no separate stem, it is the stem only of the medicine pipe which . is the object of veneration among the Indians, the bowl used being a matter of indifference. The favourite material for Indian pipe bowls is the famous red pipe stone (catlinite), a fine-grained easily-worked stone of a rich red colour of the Coteau des Prairies, west of the Big Stone Lake in S. Dakota. The quarries were formerly neutral ground among the warring Indian tribes, many sacred traditions being associated with the locality and its product.

It is disputed whether pipes for smoking were at all known in Europe previous to the discovery of America. That tobacco- smoking was unknown is certain; but pipes of iron, bronze and clay have been so frequently found associated with Roman remains and other antiquities as to lead many authorities to maintain that such pipes must have been anciently used for burning incense or for smoking aromatic herbs or hemp. Through- out Great Britain and Ireland small clay pipes are frequently dug up, in some instances associated with Roman relics. These are known amongst the people as elfin, fairy or Celtic pipes, and in some districts supernatural agencies have been called in to account for their existence. The elfin pipes

have commonly flat broad heels in place of the sharp spur now found on clay pipes, and on that flat space the mark or initials of the maker is occasionally found. There is no reason to believe that these pipes are older than the 17 th century. The introduction of the tobacco pipe into Europe is generally ascribed to Ralph Lane, first governor of Virginia, who in 1586 brought an Indian pipe to Sir Walter Raleigh, and taught that courtier how to use the implement. The pipe-makers of London became an incorporated body in 1619, and from England the other nations of Europe learned the art of making clay pipes.

The habit of smoking with pipes spread with incredible rapidity; and among the various peoples the pipe assumed special characteristics, and its modifications became the medium of conveying social, political and personal allusions, in many cases with no little artistic skill and humour. The pipe also became the object of much inventive ingenuity, and it varied as greatly in material as in form — wood, hern, bone, ivory, stone, precious and other metals, amber, glass, porcelain and, above aE, clay being the materials employed in various forms. By degrees pipes of special form and material came to be associated with particular people, e.g. the elongated painted porcelain bowls and pendulous stem of the German peasantry, the red clay bowl and long cherry wood stem of the Turk, and the very small metallic bowl and cane stem of the Japanese, &c. Among other kinds of pipe which have been popular at various times are the " corn-cob," where the bowl is made of the cob of maize or Indian corn, and the " calabash " with the bowl of a small gourd. The " churchwarden " is a clay pipe with a slender stem, some 16 or 20 in. long. The most luxurious and elaborate form of pipe is the Persian kaiyun, hookah or water tobacco pipe. This consists of three pieces, the head or bowl, the water bottle or base, and the snake or long flexible tube ending in the mouthpiece. The tobacco, which must be previously prepared by steeping in water, is placed in the head and lighted with live charcoal, a wooden stem passes from its bottom down into the water which fills the base, and the tube is fitted to a stem which ends in the bottle above the water. Thus the smoke is cooled and washed before it reaches the smoker by passing through the water in

the bottle, and by being drawn through the coil of tube fre- quently some yards in length. The bottles are in many cases made of carved and otherwise ornamented coco-nut shells, whence the apparatus is called narglla, from n&rgil, a coco- nut. Silver, gold, damascened steel and precious stones are freely used in the making and decoration of these pipes for wealthy smokers.

Pipe Manufacture. — The regular pipe-making industries divide into many branches, of which the more important are the clay pipe, meerschaum (real and artificial), and wooden bowl trades. Clay pipes are made In prodigious numbers by hand labour with an iron mould and a steel wire for forming the tube of the stem. Pipe- moulding is a very simple operation in pottery, and the work is Cerformed with astonishing celerity. A number of machines have een devised for automatic pipe-moulding; but the manual opera- tions are so rapid and inexpensive that there is little margin for saving by the substitution of machinery. The pipes are very [slightly fired so as to keep them soft and porous; and so cheaply made are they that the commoner kinds can be retailed at a profit for a farthing each. The principal early centres of the clay-pipe industry were at Broseley in Staffordshire, where the trade has been established since the early part of the 17th century, and at Amesbury in Wiltshire. The manufacture is still carried on at Broseley. Meerschaum pipes (see Meerschaum) are the luxury of the European smoker. The favourite wooden pipe generally known as a briar- wood or briar-root pipe is really made from the roots of the tree heath, Erica arborea (Fr. bruyire), principally obtained on the hills of the Maremma and taken thence to Leghorn. There the roots are shaped into blocks each suitable for a pipe, the cutting of the wood so as to avoid waste requiring considerable skill. These blocks are simmered in a vat for twelve hours, which gives them the much-appreciated yellowish-brown hue of a good " briar- root." So prepared the blocks are exported for boring and finishing. Many devices have been invented for the purpose of preventing the nicotine liquor from reaching the smoker's mouth or collecting in and fouling the pipe.

PIPE and TABOR (Fr. galoubet; Ger. Schwegel or Stamm- tienpfeiff), a popular medieval combination of a small pipe or flageolet, and a small drum. The pipe consists of a cylindrical tube of narrow bore, pierced with three holes, two in front and one at the back, all very near the end of the pipe; and of a mouthpiece of the kind known as whistle, fipple or beak common to the flutes & tec or recorder family. The compass of this instrument, with no more than three holes, exceeds two octaves in the hands of a good player, and is chromatic throughout. The fundamental notes of the open pipe and of the three holes cannot be produced; the scale consists, therefore, entirely of harmonics, the and, 3rd and 4th of the series being easily obtained, and, by half stopping the holes, also the semitones which are required to complete the chromatic scale. The tabor being fastened to the performer's left elbow, the hands remained free, the right beating the little drum with a stick to mark the rhythm, while the left held and fingered the pipe with thumb and first two fingers.

Mersenne mentions a wonderful virtuoso, John Price, who could rise to the twenty-second on the galoubet. Praetorius mentions and figures three sizes

of the Stamentienpfeiff, the treble 20 in. long, the tenor 26 in. and the bass 30, the last being played by means of a crook about 23 in. long. A specimen of the bass in the museum of the Brussels Conservatoire has for its lowest note middle C. The pipe and tabor are said to be of Provengal origin ; it is certain that they were most popular in France, England and the Netherlands, and they figure largely among the musical and social scenes in the illuminated MSS. of those countries. (K. S.)

PIPE-FISHES (Syngnalhim) , small fishes, which with the Sea- horses form a distinct family, Syngnathidae, of Lophobranchiate

Fig. i.—Syngnathus acus, Male, with sub-caudal pouch. Thoracostei. The name is derived from the peculiar form of their snout, which is produced into a more or less long tube, ending in a

narrow and small mouth which opens upwards and is toothless. The body and tail are long and thin, snake-like, encased in hard integuments which are divided into regularly arranged segments. This dermal skeleton shows several longitudinal ridges, so that

a vertical section through the body represents an angular figure,

not round or oval as in the majority of other fishes. A dorsal

fin is always present, and is the principal

(in some species, the only) organ of

locomotion. The ventral fins are as

constantly absent, and the other fins

may or may not be developed. The

gill-openings are extremely small and

placed near the upper posterior angle

of the gill-cover. Most of the pipe- fishes are marine, only a few being

fluviatile. Pipe-fishes are abundant on

such coasts of the tropical and temperate

zones as offer by their vegetation shelter

to these defenceless creatures. They

are very bad swimmers, slowly moving

through the water by means of the rapid

undulatory movement of the dorsal fin.

Their tail, even when provided with a

caudal fin, is of no use in swimming,

and not prehensile as in sea-horses. Speci- mens, therefore, are not rarely found at

a great distance from land, having been

resistlessly carried by currents into the

open ocean; one species, Syngnathus

pelagicus, has an extraordinarily wide

range over the tropical seas, and is one

of the common fishes inhabiting the

vegetation of the Sargasso Sea. The colour of these fishes often changes with the sea-weeds among which they may be found, passing from brown to green or even brick-red. In pipe-fishes the male is provided with a pouch — in some species on the abdomen, in others on the lower side of the tail — in which the ova are lodged during their development. This marsupial pouch is formed by a fold of the skin developed from each side of the trunk or tail, the free margins of the fold being firmly united in the median line throughout the period during which the eggs are being hatched. When the young are hatched the folds separate, leaving a wide slit, by which the young gradually escape when quite able to take care of themselves. Nearly a hundred different species of pipe-fishes are known, of which Siphono stoma typhle, Syngnathus acus (the Great Pipe-fish up to 18 in. in length), Nerophis aequoreus (Ocean Pipe-fish), Nerophis ophidion (Straightnosed Pipe-fish), and Nerophis lumbriciformis (Little Pipe-fish) are British species. The last three are destitute of a caudal fin.

A review of the extensive literature on the breeding habits of the Syngnathidae is given by E. W. Gudger, " The Breeding habits and the Segmentation of the Egg of the Pipefish," Proc. U.S. Nat. Mus. (1905), xxix. 447.

PIPER, CARL, Count (1647-1716), Swedish statesman, was born at Stockholm on the 29th of July 1647. He entered the foreign office after completing his academical course at Upsala, accompanied Benedict

Oxenstjerna on his embassage to Russia in 1673, and attracted the attention of Charles XL during the Scanian War by his extraordinary energy and ability. In 1679 he was appointed secretary to the board of trade and ennobled. In 1689 he was made one of the secretaries of state, and Charles XL recommended him on his deathbed to his son and successor, Charles XII. Piper became the most confidential of the new sovereign's ministers. In 1697 he was made a senator and set over domestic affairs while still retaining his state-secretaryship. In 1698 he was created a count, in 1702 appointed chancellor of Upsala University, and during the first half of the Great Northern War, as the chief of Charles's perambulating chancel- lery, he was practically prime minister. It was his misfortune, however, to be obliged to support a system which was not his

Fig. 2. — Sub-caudal pouch of Syngnathus acus,] with the young ready to leave the pouch. One side of the membrane of the pouch is pushed aside to admit of a view of its interior. (Nat. size.)

own. He belonged to the school of Benedict Oxenstjerna and was therefore an avowed advocate of a pacific policy. He protested in vain against nearly all the military ventures of Charles XII., e.g. the War of Deposition against Augustus of Saxony and Poland, the invasion of Saxony, the raid into the Ukraine. Again and again he insisted that the pacific overtures of Peter the Great should at least be fairly considered, but his master was always immovable. Piper's career came to an end at Poltava (1709), where he was among the prisoners. The last years of his life were spent in exile in Russia. He died at Schliisselburg on the 29th of May 17 16.

See W. L. Svedelius, Count Carl Piper (Stockholm, 1869).

(R. N. B.)

PIPERAZIN, a substance formed by the action of sodium glycol on ethylene-diamine hydrochloride, consisting of small alkaline deliquescent crystals with a saline taste and soluble in water. It was originally introduced into medicine as a solvent for uric acid. When taken into the body the drug is partly oxidized and partly eliminated unchanged. Outside the body piperazin has a remarkable power of dissolving uric acid and producing a soluble urate, but in clinical experience it has not proved equally successful. Lycetol, lysidine and sidonal are bodies having similar action.

PIPERINE, C17H19NO3, an alkaloid found in the fruits of Piper nigrum

*and P. longum. It forms white prisms, which melt at i28°-2i9°. It is almost insoluble in water, but readily soluble in alcohol and ether. It is a very weak base, salts being only formed with mineral acids, and these are dissociated by water. Alcoholic potash decomposes it into piperidine, C 5 H U N, and piperic acid, C 12 H 10 O4. The constitution of piperic acid was elucidated by R. Fittig and his pupils {Ann., vols. 152, 159, 168, 216, 227) and shown to be (1). Piperine consequently is (2). ~ **

CH

CH:CH-CH:CH-COOH ,(1)

— CH:CH-CH:CH-CO-N(CH 2) 6 (2)

Oxidation with potassium permanganate converts piperic acid into piperonal, C 8 H 6 3 , and piperonylic acid, CsHjO The latter when heated with hydrochloric acid to 170°, or water to 200°, separates carbon with the formation of protocatechuic acid, i-2-dioxy-3-benzoic acid, C 6 H 3 (OH) 2 COOH. Conversely, by heating protocatechuic acid with potash and methylene iodide, piperonylic acid was regained. These results show that pipero- nylic acid is the methylene ether of protocatechuic acid. Piperonal (q.v.)_ is the corresponding aldehyde. Piperic acid differs from piperonylic acid by the group C 4 H 4 , and it was apparent that these carbon atoms must be attached to the carbon atom which appears in the carboxyl group of piperonylic acid, for if they were directly attached to the benzene ring polycarboxylic acids would result in oxidation. The above formula for piperic acid was con- firmed by its synthesis by A. Ladenburg and M. Scholtz {Ber., 1894, 27, p. 2958) from piperonyl acrolein (the condensation product of piperonal and acetaldehyde) and acetic acid. The synthesis of piperine fojlows_ from the interaction of piperyl chloride (formed from piperic acid and phosphorus pentachloride) and piperidine (L. Rtigheimer, Ber., 1882, 15, p. 1390.)*

PIPERNO (anc. Privernum) , a town of the province of Rome, Italy, 61 m. S.E. of Rome by rail. Pop. (1901), 6736. The medieval town was founded in the 10th century (?) on a hill 490 ft. above sea-level, by refugees from the Roman town of Privernum, lower down (118 ft. above sea-level) on the highroad, 1 \ m. to the north, at the mouth of a low pass leading through the Volscian mountains to the valley of the Sacco. Here are remains of an arch crossing the road and other ruins (mostly buried) of the Roman period; but the remains above ground are largely medieval. It is improbable, however, that the ancient Volscian town should have occupied so easily accessible a site; it is not unlikely that it stood on the site occupied by the medieval and modern town, but there is no proof of this, rrivernum was a Volscian town, and took up arms against Rome after the foundation

of a Latin colony at Setia in 382 B.C. It was finally captured in 329 B.C., and eleven years later the

tribus Oufentina was founded, taking its natne from the river Oufens (mod. Uffente) in the territory of Privernum. Little is known of it subsequently. The medieval town has a pic- turesque piazza, with a Gothic cathedral (1283), which pre- serves a fine porch, though the interior was modernized in 1782; a Gothic palazzo pubblico; and other Gothic churches exist in the town. Polygonal terrace walls of the Roman or pre-Roman period exist at various places in the vicinity (G. B. Giovenale and L. Mariani in Notizie degli Scavi, 1899,88). (T.As.)

PIPERONAL (heliotropine, protocatechuic aldehyde methylene ether), C 8 H 6 03, an aromatic aldehyde. It is prepared by oxidizing piperic acid with potassium permanganate (R. Fittig, Ann., 1869, 152, p. 35); by condensing methylene iodide with protocatechuic aldehyde (R. Wegscheider, Monats., 1893, 14, p. 388) ; or by oxidizing isosafrol with chromic acid. It forms long colourless crystals which melt at 37° C. and boil at 263 C. It has an agreeable smell, resembling that of heliotrope, and is much used in perfumery. It is only slightly soluble in cold water, but is readily soluble in alcohol and in ether. When heated with dilute hydrochloric acid to 200 C. it yields proto- catechuic aldehyde, C 7 H 6 3 , and carbon. It readily combines with sodium bisulphite and with various bases (ammonia, aniline, methylamine, &c).

PIPIT (cognate with the Lat. Pipio; see Pigeon), the name applied by ornithologists to a group of birds having a great resemblance both in habits and appearance to the larks {q.v.). They differ however from larks in several important characters, and, having been first separated to form the genus Anthus, which has since been much broken up, are now generally asso- ciated with the wagtails {q.v.) in the Passerine family Motacillidae. Pipits, of which over fifty species have been described, occur in almost all parts of the world, but in North America are repre- sented by only two species — Neocorys spraguii, the prairie-lark of the north-western plains, and Anthus ludovicianus , the American titlark, which last is very nearly allied to the so-called water-pipit of Europe, A. spipoletta. To most English readers the best known species of pipit is the titlark or meadow-pipit, A. pratensis, a bird too common to need description, and abundant on pastures, moors, and uncultivated districts generally; but in some localities the tree-pipit, A. trivialis, or A. arbor eus of some authors, takes its place, and where it does so it usually attracts attention by its loud song, which is not unlike that of a canary, but delivered (as appears to be the habit of all the pipits) on the wing and during a short circuitous flight. Another species, the rock-lark, A. obscurus, scarcely ever leaves the sea- coast and is found almost all round the British Islands. The South-African genus Macronyx,

remarkable for the extreme length of its hind claw, is generally placed among the pipits, but differs from all the rest in its brighter coloration, which has a curious resemblance to the American genus Sturnella (see Icterus), though the bird is certainly not allied thereto.

(A. N.)

PIPPIN, or Pepin, the name of three members of the Caro- lingian family.

Pippin I. (d. 640), incorrectly called Pippin of Landen, was mayor of the palace to the youthful Dagobert I., whom Clotaire II. had placed over the kingdom of Austrasia. He was disgraced when Dagobert became sole king in 629, and had to seek' refuge in Aquitaine. Returning at Dagobert's death (639), he governed Austrasia in Sigebert's name, but died in the following year.

Pippin II. (d. 714), incorrectly called Pippin of Herstal, was son of Adalgiselus (son of Arnulf, bishop of Metz) by a daughter of Pippin I., called in later documents Begga. Towards 678 he placed himself at the head of the great nobles in Austrasia to combat Ebrom, the mayor of the palace, and Neustria. After some reverses he gained a great victory after Ebroin's death at the battle of Tertry, not far from St Quentin. This victory made Pippin almost entire master of Gaul. He appointed one of his sons mayor of the palace of Neustria, reserving for another of his sons the mayoralty of Austrasia. He made war

on the Frisians and defeated their duke Radbod; and part of this people became converts to Christianity. He also defeated Willari, the duke of the Alamanni, and subdued his country. The Bavarians, too, recognized the Frankish suzerainty. The plans he had formed for reforming the church and convoking councils were interrupted by his death, which took place on the 16th of December 714.

Pippin III. (d. 768), the Short, 1 was son of Charles Martel. Before his death in 741 Charles Martel had divided the Frankish kingdom between his two sons, Carloman and Pippin, giving Carloman the eastern part and Pippin the western. Since 737 there had been no king in the Frankish realm; in the diplomas the two brothers bear the title of majores palatii, while the chroniclers call them simply principes. In 743, however, the mayors decided to appoint a king in the person of Childeric III., who was apparently connected with the Merovingian family. But Childeric was a mere figure-head, and had no power. The two brothers presided over the

tribunals, convoked the councils at which the Frankish Church was reformed, assembled the host and made war, jointly defeating and subduing Duke Hunald of Aquitaine. In 747 Carloman unexpectedly abdicated, became a monk, and retired to a monastery near Rome, subsequently founding on Mt Soracte the monastery of St Silvester. From the time of the abdication Pippin was sole master; and in 751, after consulting Pope Zacharias, he took the title of king and removed the feeble Childeric to a monastery. He then got himself crowned by St Boniface, a ceremony which was new to France and which gave the sovereign immense prestige; henceforth the king of the Franks called himself Gratia Dei rex Francnrum.. Pippin's reign is marked by many important events. He received in France a personal visit from Pope Stephen II., who conferred on him the title of Patrician of the Romans and recrowned him. In return for these honours Pippin, at the appeal of the pope, made two expeditions into Italy, in 754 and 756; and he became the veritable creator of the papal state by conferring on the pope the exarchate of Ravenna, which he had wrested from Aistulf, the king of the Lombards. Pippin took Septimania from the Arabs, and after a stubborn war of nearly eight years' duration (760-68) succeeded in taking Aquitaine from its duke, Waiter. He also intervened in Germany, where he forced the duke of Bavaria, Tassilo, to become his vassal. In 763, however, Tassilo abandoned Pippin during an expedition against Aqui- taine. Pippin made several expeditions against the Saxons, but failed to subdue them. He entered into relations with the Eastern Empire, exchanging ambassadors with the emperor Constantine Copronymus. During Pippin's reign Frankish institutions underwent some modification. The Frankish assemblies, previously held in the month of March [champs de mars), but under Pippin deferred to May {champs de mai), came to be more numerous, and served the king of the Franks as a means of receiving the gifts of his subjects and of promul- gating his capitularies. At the head of the administration was placed the archchaplain, and an ecclesiastical chancellor was substituted for the ancient referendarius. Ecclesiastical reform was continued under Pippin, Bishop Chrodegans of Metz uniting the clergy of Metz in a common life and creating canons (see Canon). Pippin died on the 24th of September 768 at St Denis, leaving two sons, Charles (Charlemagne) and Carloman.

See H. Bonnell, Die Anfange des karolingischen Hauses (Berlin, 1866); K. Hahn, Jahrbiicher des frankischen Retches 741-752 (Berlin, 1863); L. Oelsner, Jahrbiicher des frankischen Reiches unter Kbnig Pippin (Leipzig, 1871); J. F. Bohmer and E. Miihlbacher, Regesten des Kaiserreichs unter den Karolingern (2nd ed., 1899); and E. Miihlbacher, Deutsche Geschichte unter den Karolingern (Stuttgart, 1896). (C. Pf.)

PIPRAWA, a village on the Birdpur estate in the Basti district, United Provinces, India. It lies on the Uska-Nepal road at mile 19-75; and about

half a mile south of the boundary pillar numbered 44 on the frontier line between British and Nepalese

1 A surname given to Pippin III. on the strength of a legendary anecdote related by the monk of St Gall.

territory. The village is celebrated as the site of the following discovery: —

In 1896 interest having been aroused by the discovery, only twelve miles away, of the Buddha's birthplace (see Lumbini), William Peppe, then resident manager of the Birdpur estate, opened a ruined tope or burial mound situate at Piprawa, but nothing of importance was found. In January 1897 he carried the work of excavation farther. A well, 10 ft. sq., was dug down the centre of the mound. After digging through 18 ft. of solid brickwork set in clay a massive stone coffer was found lying due magnetic north and south. Its dimensions were, 4 ft. 4 in. by 2 ft. 8J in. and 2 ft. 2j [in. high. The stone lid of the coffer was split into four pieces; but the coffer remained perfectly closed, so accurately was the lid fitted into flanges on the sides of the box. The pieces were thus firmly held in their place, and the contents of the coffer were found intact. These consisted of five vessels, two vases, a bowl and a casket being made of steatite, and the fifth, also a bowl, of crystal. All these vessels are beautifully worked, the crystal bowl especially, with its fish-shaped cover handle, being as a work of art of high merit. 2 The coffer is of fine hard sandstone of superior quality, and has been hollowed out, at the cost of vast labour and expense, fjrom a solid block of rock. Peppe cal- culates its weight, lid included, at 1537 lb. It is only the great solidity of this coffer which has preserved the contents. A cover of one of the vases was found dislodged and lying on the bottom of the stone coffer. As this cover fits very well it must have required a quite violent shock to remove' it. This was almost certainly the shock of an earthquake, and the same shock probably caused the split in the stone lid of the coffer itself.

The vessels contained a dark dust, apparently disintegrated ashes, small pieces of bone, and a number of small pieces of jewelry in gold, silver, white and red cornelian, amethyst, topaz, garnet, coral and crystal. Most of these are perforated for mounting on threads or wires, and had been, no doubt, originally connected together to form one or more of the elaborate girdles, necklaces and breast ornaments then worn by the women. 3 On the bottom of the stone box there was similar dust, pieces of bone and jewelry, and also remains of what had been vessels of wood. The knob forming the handle of one of these wooden receptacles was still distinguishable. The total quantity of scraps of bone may have amounted to a wineglassful.

An inscription ran round one of the steatite vases just below the lid. 4 The

words mean : This shrine for ashes of the Buddha, the Exalted One, is the pious work of the Sakiyas, his brethren, associated with their sisters, and their children, and their wives. The thirteen words, in a local dialect of Pali, are written in very ancient characters, and are the oldest inscription as yet dis- covered in India. Twelve out of the thirteen are well-known words, the interpretation of which is not open to doubt. One word, rendered above by " pious work," has not been found else- where, and its derivation is open to discussion-. The explanation here adopted as most probable was put forward by Professor Pischel of Berlin. 6 The phrase " pious work " probably had a precise technical connotation like the English " benefaction."

The monument must have been of imposing appearance. The diameter (on the ground level) of the dome is 116 ft. For 8 ft. from the summit of the ruin it was not possible to trace the outline. At that point the outer wall, if one may so call it, of the solid dome could be traced, and had a diameter of 68 ft. The dome, therefore, sloped inwards 1 ft. for every 3 ft. in height, in other words, it was, like all the most ancient of these artificial burial domes in India, a shallow dome, and cannot have been more than about 35 ft. high exclusive of the ornament or "tee" on the summit. We have in bas-reliefs of the 3rd century representations of what these ornaments were like — small

2 An illustration from a photograph is given in Rhys Davids' Buddhist India, p. 131.

3 For figures of the jewelry found see the plate in Mr Peppers article, reproduced in Rhys Davids' Buddhist India, p. 89. For the jewelry of the time, ibid., pp. 90, 91.

4 See illustration ibid., p. 129.

6 Zvitschrift der deutschen morgenlundischen Gesellschaft, Ivi. 1 57-

square erections, like a shrine or small temple, surmounted by a canopy called from its shape a T. They were then more than a third of the height of the dome itself. The total height of this Sakiya tope will therefore have been approximately a little under 50 ft. It was probably surrounded by a carved wooden railing, but this has long since disappeared.

All such monuments hitherto discovered in India were put up in honour of some religious teacher, not in memory of royal persons, generous

benefactors, politicans, or soldiers or private persons, however distinguished. And we need have no hesita- tion in accepting this as a monument put up over a portion of the ashes from the funeral pyre of Gotama the Buddha. The account of the death and cremation of the Buddha, preserved in the Buddhist canon, states that one-eighth portion of the ashes was presented to the Sakiya clan, and that they built a thfipa. or memorial mound, over it. 1

Mr Peppe presented the coffer and vases with specimens of the jewelry to the museum at Calcutta where they still are. He also gave specimens of the trinkets to the Asiatic Society in London.

Peppe" s original article is in the JowmC of the Royal Asiatic Society for 1898, pp. 573 sqq. CommeU? upon it, one or two of them sceptical, are in the same joun'.ai 1898, pp. 579, 588, 387, 868; 1899, P- 425; 1901, p. 398; 190= p. 679; 1906, pp. 149 sqq. See also A. Barth, Comptes rendues de Vacademie des inscriptions (1898), xxvi., 147, 233; Sylvain Levy. Journal des savants (1905) pp. 540 sqq.; and R. Pischel and Rhys Davids as quoted above.

(T. W. R. D.)

PIQUA, a city of Miami county, Ohio, U.S.A., on the Miami River and the Miami & Erie Cana), 73 m. W. by N. of Columbus. Pop. (1890), 9000; (1900), 12,172, of whom 901 were foreign-born and 4S7 were negroes; (1910 census), 13,388. It is served by the Pittsburg, Cincinnati, Chicago & St Louis, and the Cincinnati, Hamilton & Dayton railways, and by inter-urban electric lines to Lima, Dayton and Covington. It has a park, a public library and a public hospital. There are quarries of blue limestone in the vicinity. The city has various manu- factures, the factory products being valued in 1905 at $4,035,706. The municipality owns and operates its waterworks. On or near the site of Piqua was one of the principal villages of the Chillicothc division of the Shawnee tribe; the village also w T as called Chillicothc. It was destroyed by George Rogers Clark in 17S2. A town was laid out here in 1809 under the name of Washington, and the present name, that of another division of the Shawnee tribe, was substituted in 1823. Piqua was chartered as a city in 1846. During the French and Indian War, in 1763, a battle was fought in this vicinity chiefly between the Miamis, Wyandots, Ottawas and other Indian allies of the French, and the Dclawares, Shawnees, Cherokees, Catawbas and other Indian allies of the English, the English allies making an unsuccessful attempt to drive the French allies from their fortified position, Fort Piqua.

See Henry Howe, Historical Collections of Ohio (Columbus, 1891).

PIQUET, a game at cards, probably a development of ronfa, a game mentioned by Berni in 1526; la ronjlc (included in Rabelais's list, c. 1530) may be regarded as the same game. The point at piquet was anciently called ronjlc. The Spanish name of the game was cienlos (centum, a hundred). Piquet was played in England under the name of cent, or sant, probably as early as 1550 (contemporaneously with the marriage of Mary to Philip of Spain). About the middle of the 17th century (shortly after the marriage of Charles I. to Henrietta Maria of France) the name cent was dropped in England, and the French equivalent, piquet, adopted. It is played by two persons, with a pack of thirty-two cards — the sixes, fives, fours, threes and twos being thrown out from a complete pack. At one time the partic was the best of five games of a hundred up (a player not obtaining fifty losing a double game) . But now the partie is generally determined in six hands, the player making the largest aggregate score being the winner. The number of points won is the difference between the two scores, with a hundred

'Translated in Rhys Davids' Buddhist Suttas (Oxford, 1881).

added for the game. If, however, the loser fails to make a hundred in six hands, the number of points won is the sum of the two scores, with a hundred for the game. Piquet played in this way is called Rubicon Piquet.

The dealer deals twelve cards to his adversary and twelve to himself, two at a time, or three at a time. He then places the eight undealt cards, called the " stock," face downwards on the table, the top five being for the elder hand (non-dealer) to take from first in exchange for his own. The players now look at their hands, and carte blanche (see later) having been declared, if there is one, put out (without showing them) such cards as they deem advisable in order to improve their hands, and take in an equiva- lent number from the stock. Each player must discard at least one card. If the elder hand discards less than the five he is entitled to, he must state how many he leaves. He is entitled to look at the cards he leaves, replacing them face downwards on the top of the stock. The younger hand then makes the exchange from the remainder of the stock. If the elder hand leaves any of the top five, the younger may exchange as many as remain in the stock, discarding an equal number. If the younger hand leaves any cards, he announces the number left. He may look at the cards he leaves. If he looks at them he must show them to the elder hand, after the elder has named the suit he will lead first, or has led a card.

If the younger hand elects not to look at the cards left the elder cannot see them. The younger hand must make his election before he plays to the card first led, or, if so required, after the dealer has named the suit he will first lead. Each player may examine his own discard at any time during the

hand; but he must keep it separate from his other cards.

The elder hand next makes a declaration of what he has in his hand.

The " point " must be called first or the right to call it is lost. It is scored by the player who announces the suit of greatest strength, valued thus: ace 11 ; court cards, 10 each; other cards, the number of pips on each. Thus if the elder hand's best suit is ace, king, knave, nine, eight, he calls " five cards." If the younger hand has no suit of five cards, he says " good." The elder hand then says " in spades," or whatever the suit may be, or shows his point face upwards. If the younger hand has a suit of more than five cards, he says " not good." If the younger hand has also five cards, he says "equal" or "what do they make ? " when the elder calls " forty-eight " (or " making eight," short for forty-eight). The younger must not inquire what the point makes unless he has an equal number of cards. If the younger hand's five cards make less than forty-eight he says "good"; if exactly forty-eight,, he says " equal "; if more than forty-eight he says " not good." The player whose point is good reckons one for each card of it; if the points are equal neither player scores for point.

" Sequences " are usually called next, the elder hand stating what his best sequence is, and the younger saying, " good," " equal," or " not good," as in the case of the point. Any three or more consecutive cards of the same suit held in hand constitute a sequence. The order of the cards is as follows: ace (highest), king, queen, knave, ten, nine, eight, seven (lowest). A sequence of three cards is called a " tierce "; of four, a " quart "; of five, a " quint "; of six, a " sixieme "; of seven, a " septieme "; of eight, a " huitieme." A tierce of ace, king, queen is called a " tierce major "; a tierce of king, queen, knave is called a " tierce to a king " (and sc on for other intermediate sequences according to the card which heads them); a tierce of nine, eight, seven is called a "tierce minor." Sequences of four or more cards follow the same nomenclature; e.g. ace, king, queen, knave is a quart major; knave, ten, nine, eight, is a quart to a knave; and so on A sequence of a greater number of cards is good against a sequence of a smaller number; thus, a quart minor is good against a tierce major. As between sequences containing the same number of cards, the one headed by the highest card is good ; thus, a quart to a queen is good against a quart to a knave. Only identical sequences can be equal. The player whose sequence is good reckons one for each card of it, and ten in addition for quints or higher sequences. Thus a tierce counts three; a quart, four; a quint, fifteen; a sixieme, sixteen; and so on. If the elder hand's sequence is good, he names the suit, or shows it face upwards. If the highest sequence (or the sequence first called) is good, all lower sequences can be reckoned, notwithstanding that the adversary has a sequence of intermediate value. For example, A has a quart to a queen (good,) and a tierce minor. He calls

and reckons seven, notwithstanding that B has a quart to a knave. B's quart counts nothing. If the highest sequence is equal, neither player scores anything for sequence, even though one player may hold a second sequence of equal or inferior value.

" Quatorzes " and " trios " are the next calls. " Quatorzes " are composed of four aces, four kings, four queens, four knaves, or four tens, in order of value; " trios " of three of any of these A quatorze, if good, reckons fourteen ; a trio, if good, reckons three ; . one that is good establishes any smaller quatorzes or trios in his hand.

When the elder hand has done calling he leads a card. Before

playing to this card, the younger hand reckons all that he has good, stating of what cards his claims are composed, or showing the cards claimed for. The elder hand leads any card he pleases; the younger plays to it. The younger hand must follow suit if able; otherwise he may play any card he thinks fit. It is not compulsory to win the trick. The leader counts one for each card led, whether it wins the trick or not. If the second player wins the trick he also counts one. The winner of the last trick counts an additional one for the last card. The tricks are left face upwards in front of the player who wins them. They may be examined by either player.

If each player wins six tricks the cards are " divided," and there is no further score. If one player wins more than six tricks he wins " the cards," and adds ten to his score. If one player wins every trick, he wins a capot, and scores forty for the cards, instead of ten.

During the play of the hand, a player is entitled to be informed as to any cards his adversary holds which he has reckoned as good, or has declared to be equal. A player may require his adversary to exhibit any such cards. But if a player, having played three cards of a sixieme, declared as a quint, is asked how many he has left, he need only reply " Two."

During the progress of the hand each player repeats aloud the amount of his score for the time being. At the end of the hand the points scored are recorded by each player. If there is any difference in the written scores, a player's score of his own hand is deemed to be the correct one.

Example. — A (elder hand) has dealt him ace, king, knave of spades; ace, queen, knave, eight of hearts; knave, eight, seven of clubs; and nine, eight of diamonds. He discards king of spades; eight, seven of clubs; and nine,

eight of diamonds. He takes in nine, eight of spades; king of hearts; nine of clubs; and king of diamonds.

B (younger hand) has ten, seven of spades; ten, nine, seven of hearts; king, queen, ten of clubs; and ace, queen, knave, ten of diamonds. He discards seven of spades; and nine, seven of hearts. He takes in queen of spades; ace of clubs; and seven of diamonds. The hand then proceeds thus. A (calling his point) " five cards." B says " equal," or " what do they make?"

A " forty-nine," or " making nine." B " good." A (counting his point) " five " and, counting his sequence, which is good) " a quart major, nine. Three knaves?" B " not good."

A (leads ace of hearts and says) " ten." B " four tens, fourteen, and three queens, seventeen " (plays the ten of hearts).

A (leads the remaining hearts and says) " eleven, twelve, thirteen, fourteen." B (plays seven, ten, knave, queen of diamonds, and repeating his score says) " seventeen."

A has now five tricks, and in order to win the cards should lead any card but a high spade. He leads king of diamonds, and says " fifteen." B (wins with ace and says) " eighteen" (and then leads the winning clubs, saying) " nineteen, twenty, twenty-one, twenty- two. ' '

A (keeps ace, knave of clubs, and repeating his score says) " fifteen." B (leads queen of spades and says) " twenty-three. "

A (wins with ace and says) ." sixteen " (and leads knave, saying) " eighteen " (and adding ten for the cards) " twenty-eight. "

A then writes on his scoring card 28; 23. B writes on his 23; 28. The pack is collected, and the next hand commences. Three scores (omitted in order to simplify the description of the game) have yet to be mentioned.

Carte Blanche. — If either player has no king, queen or knave in the hand dealt him, he holds carte blanche, for which he scores ten. As soon as a player discovers he has a carte blanche, he must tell his adversary; this he usually does by saying "discard for carte blanche." The adverse discard is then made (as explained under discarding), after which the carte blanche is shown by dealing the cards, face upwards on the table; they are then taken back into the hand.

Pique. — If the elder hand scores, in hand and play, thirty or more, before the younger hand counts anything in that deal, he gains a pique, for which he scores thirty.

Rcpique. — If a player scores in hand alone thirty or more before his adversary reckons anything, he gains a repique, for which he adds sixty to his score. Equalities do not prevent piques or repiques. A player who has an equal point or sequence scores nothing for it. Therefore if, notwithstanding the equality, a player makes thirty, in hand and play, or in hand, by scores which reckon in order before anything his adversary can count, he gains a pique or a repique.

The order in which the scores accrue is of importance. For the sake of convenience, the elder hand finishes his reckoning before the younger begins. The scores, however, whether made by the elder or younger hand are recordable in the following order: (1) carle blanche; (2) point; (3) sequences; (4) quatorzes and trios; (5) points made in play; (6) the cards. This will often affect a pique or repique. Thus, a pique can only be made by the elder hand, as the one he reckons in play when he leads his first card counts before points subsequently made in play by the younger hand. The younger, therefore, cannot make thirty in hand and play before the elder scores one. But the one reckoned by the

elder hand when he leads his first card does not prevent his being repiqued, because scores made in hand have precedence of points made in play. The elder leads his first card and counts for it before the younger reckons, simply as a convenient way of stating that he has nothing in hand which is good. Again, say A has a quint (good), a tierce, and a quatorze (good). He scores thirty-two in hand alone; but, if his point is not good, he does not gain a repique, because the younger hand's point is recordable in order before the sequences and quatorze. Carte blanche, taking pre- cedence of all other scores, saves piques and repiques. It also counts towards piques and repiques. A capot does not count towards a pique, as the capot is not made in play. It is added after the play of the hand is over. A player who reckons nothing that hand as a penalty is not piqued or repiqued if he holds any cards which, but for the penalty, would have reckoned before his adversary reached thirty.

See " Cavendish," The Laws of Piquet and of Rubicon Piquet, adopted by the Portland Club, with a Treatise on the Game (1882); " Cavendish," Guide to Piquet (1898).

PIRAM, or Perim, an island in the Gulf of Cambay, forming part of Ahmadabad district, Bombay. Formerly notorious as the stronghold of a pirate chieftain, it has attained fame among palaeontologists for the large quantity of fossil remains discovered here in 1836, similar to the better-known Siwalik fauna.

PIRANESI, GIOVANNI BATTISTA, Italian engraver of ancient

architectural subjects, was born in the earlier half of the 18th century, and studied his art at Rome. The great remains of that city kindled his enthusiasm and demanded portrayal. His hand faithfully imitated the actual remains of a fabric; his invention, catching the design of the original architect, supplied the parts that were wanting; his skill introduced groups of vases, altars, tombs; and his broad and scientific distribution of light and shade completed the picture, and threw a striking effect over the whole. One engraving after another was executed with much brilliancy; and, as the work went on, the zeal of the artist only waxed stronger. In course of time it was found necessary to call in the aid of all his children and of several pupils. He did not, in fact, slacken in his exertions till his death in 1778.

The plates of Piranesi, in which the severity of burin work is largely supplemented by the freer lines of the etching-needle, were collected and preserved by his son and coadjutor Francesco. They were published, to the number of about 2000, in 29 vols. fol. (Paris, I835-I837)-

PIRANO, a seaport of Austria, in Istria, 22 m. S.W. of Trieste by rail. Pop. (1900), 13,339, mostly Italians. In addition to viticulture and the cultivation of the olive, its principal resources are ship-building and fishing. In the neighbourhood are the most extensive works in Istria for the extraction of salt from the sea-water, which produce about 50,000 tons of salt annually. Pirano is celebrated for the victory of the Venetians over the fleet of the emperor Frederick Barbarossa in 1177. It passed under the domination of Venice in 1283 and became definitely incorporated with Austria, together with the other possessions of Venice in the Istrian Peninsula, in 181 3.

PIRATE and PIRACY. Sir Edward Coke (Instil, iii. 113) describes a pirate (Lat. pirata, from Gr. ireiparijs, ■Ktipo.v, to attempt or attack), as hostis humani generis, and as a robber upon the sea. Sir J. Fitzjames Stephen in his Digest of Criminal Law defined piracy as follows: " Taking a ship on the High Seas or within the jurisdiction of the Lord High Admiral from the possession or control of those who are lawfully entitled to it and carrying away the ship itself or any of its goods, tackle, apparel or furniture under circumstances which would have amounted to robbery if the act had been done within the body of an English county " (cf . A . G. for Hong-Kong v. Kwok-a-Sing, 1873, L.R. 5 P.C. 179). Piracy, being a crime not against any particular state but against all mankind, may be punished in the competent court of any country where the offender may be found or into which he may be carried. But, whilst the practice of nations gives to every one the right to pursue and exterminate pirates without any previous declaration of war (pirates holding no commission or delegated authority from any sovereign or state), it is not allowed to kill them without trial

except in battle. Those who surrender or are taken prisoners.

must be brought before the proper tribunal and dealt with according to law.

Piracy has been dealt with in a large number of English statutes, from 1536 down to the Territorial Waters Jurisdiction Act 1878 (41 & 42 Vict. c. 73), which provided for the mainten- ance of the existing jurisdiction for the trial of " any act of piracy as defined by the law of nations."

During the Spanish-American War the Spanish government issued(i898)a decree declaring that "captains, masters and officers of vessels, which, as well as two-thirds of their crew, are not American, captured while committing acts of war against Spain, even if they are provided with letters of marque issued by the United States" would be regarded and judged as pirates. This was not in accordance with the international practice on the subject. A public ship or one which is entitled to fly the flag of a belligerent /nd navigates under the cover of state papers, by the very sense of the term, is not a pirate. Again, during the Russo-Japanese War, the word " piracy " was freely applied in British news- papers to the seizure of the " Malacca " and other vessels held up by the " Peterburg " and " Smolensk," two cruisers belonging to the Russian Black Sea volunteer fleet, which in July 1904 passed as merchantmen through the Bosporus and Dardanelles and were transformed to their real character on the open sea. The application of the term in this case was equally inaccurate.

The conversion of merchant into war ships was one of the subjects dealt with by the second Hague Conference (1907), but it was agreed that "the question of the place where such conversion is effected remains outside the scope " of the agreement."

Piracy is essentially a crime under international law, and although any state may apply its penalties to its own subjects by analogy, as was done by Great Britain and the United States in connexion with the repression of the slave trade, they cannot be lawfully applied to subjects of other states. (T. Ba.)

Historical Sketch. — It has at all times been more difficult to enforce good order on the sea than on the land; or perhaps we ought to say that the establishment of law and order on the sea has in all ages of the world's history followed, but has not accompanied, and has still less preceded, the creation of a good police on the land. The sea robber, or pirate, cannot make a profit from any part of his booty except the food which he

consumes, or the vessels which he may use, unless he can find a market. But so long as he is sure that he will somewhere meet a purchaser for the goods he has taken by violence, he has every encouragement to pursue his trade. Therefore from the times described in the Odyssey, down to the days when Sir Henry Keppel sailed in H.M.S. " Dido " to suppress the pirates of Borneo, and when Rajah Brooke of Sarawak co-operated with him on land, we find that the prevalence of piracy and the suppression of it have been closely dependent on the efforts made to rout it out from its lurking-places on the coast, and the degree of success achieved.

Very different types of men have been named pirates. They have in fact been so unlike that to class them all together would be in the last degree unjust. The Greek in the youth of the world, and the Malay of Borneo in the 19th century, knew of no rule of morals which should restrain them from treating all who lay outs > de the limits of their city or their tribe as enemies, to be traded with when strong and plundered when weak. They might be patriotic, and law-abiding men towards the only authority they recognized. Their piracy was a form of war, not without close moral analogies to the seizure of Silesia by Frederick the Great, the attempted seizure of Spain by Napoleon. Indeed the story of this latter venture, with its deceitful preliminary success and its final disaster, may fairly be compared with the fall of Ulysses and his companions on the Cicones, as told in the ninth book of the Odyssey. Yet it would be highly uncritical to class Ulysses or Napoleon with Captain Avery, or Captain Kidd, or Bartholomew Roberts. We are not here concerned with the legal aspects of piracy, but with the true character of the persons to whom the name pirate has been applied at various times. The term was applied by the Romans

to the adventurers against whom Pompey was commissioned to act by the Gabinian Law, by the English of the 9th and 10th centuries to the Vikings, and by the Spaniards to the English, French and Dutch who were found sailing beyond the line. Sufferers by naval commerce-destroyers call it " a piratical form of warfare." But the pirates of the Roman Republic were no mere " gang of robbers." They were the victims of a time of conquest and " general overture " — " the ruined men of all nations, the hunted refugees of all vanquished parties, everyone that was wretched and daring — and where was there not misery and violence in this unhappy age? If was no longer a gang of robbers who had flocked together, but a compact soldier state, in which the freemasonry of exile and of crime took the place of nationality, and within which crime redeemed itself, as it so often docs in its own eyes, by displaying the most generous public spirit." Such men are akin to the fuorusciti bf Italian history or the Dutch Beggars of the Sea, the victims of party strife in the cities, who took to the sword because they had no other resource. Mutatis mutandis we may say as much for the intruders beyond the line, whom history calls the "Buc- caneers " (g.v.). The "

Vikings ” (q.v.) were a portion of the Barbarian invasions. The ” Barbary Pirates ” {q.v.) stand apart. As for the piratical character of the commerce-destroyer, or privateer — why are we to brand Captain Fortunatus Wright, the Englishman who captures a French merchant ship, or Captain Robert Surcouf, the Frenchman who captures a British East Indiaman, as piratical, and not make the same reproach, against Admiral Lord Howe, or Admiral Don Luis de Cordoba, who with a fleet captures whole convoys?

The pirate pure and simple is that member of an orierfy community who elects to live on the sea, by violence and robbery, making no distinction between his own city or tribe and any other. The old adage that ” war makes thieves and peace hangs them ” has ever been peculiarly true of the sea. War has always been conducted there by the capture of an enemy’s property, and by division of the spoil. A portion of the naval forces of all nations has been composed of privateers, letters of marque or corsairs, who plundered with a licence. They have ever found a difficulty in drawing the line between enemy and neutral; when peace returned some of them found it hard to be content with honest wages earned by dull industry. Nelson declared that all privateers were no better than pirates. He was borne out by the experience of Great Britain, which at the beginning of the Seven Years’ War had to take strong measures to repress the excesses of its privateers, and to hang a good few of them as mere pirates. The pirates suppressed by Pompey did not all submit to remain in the settlements he made. Some continued to rob at sea. If we can trust the Pastoral of Longus, and the other Greek romances, the pirate was a known type even under the Reman peace, but it is highly probable that he was more of a stock literary figure than a reality. Before the Roman peace, and during long centuries after it had been shattered, piracy was common. It grew out of a state of war. In modern times — even down to 181 5 — a recrudescence of piracy has followed regular hostilities. But there are other conditions which have a material influence, such as the need for a lurking- place and for a receiver of the plundered goods. An archipelago provides the best lurking-places, and next to it a coast of many inlets. Therefore the Greek Islands, the British Isles, the Antilles, the Indian Ocean, the coast of Cilicia in Asia Minor, of Dalmatia, of Malabar and of Norway, have all at one time or other, and some of them for centuries, been haunts of pirates. The convenience of the place had to be completed by the con- venience of the market. In the ancient world, and the middle ages, the market never failed. One city or tribe had little care for the sufferings of another. The men of the Cinque Ports who plundered the men of Yarmouth knew that their own townsmen would never call them to account, and therefore they had a safe refuge. Even when the medieval anarchy had come to an end on land, the sea was lawless. When peace was made with Spain after the death of Queen Elizabeth there were many who could not settle down to a life of

industry. Some took the

plain course of betaking themselves to Algiers or Salee. But there were many who prowled nearer home. Sir William Monson, in his Naval Tracts, tells how he was sent in 1605 to hunt pirates out of the Shetlands and the Hebrides. He found none at sea near Scotland, but some unemployed, whom he shipped and used as guides and informers, on the coast of Ireland. At Broad Haven he discovered an Irish gentleman of the name of Cormat (presumably Cormac) living in some dignity. His house was " the well-head of all pirates," and their captains were the lovers of his daughters. Monson found agents of merchants of London and of Galway, who came to buy the goods which the pirates had to sell at a bargain. He put that inter- esting family under the gallows, and frightened them into turning king's evidence. It was his boast that he had cleared the Irish coast of pirates, but we know that they were common late in the reign of Charles I., and that under the name of " sea Tories " they abounded during the Civil War both in Ireland and in the Scilly Isles. Their existence was prolonged by the weakness of the government, which when piracy became very rampant took the disastrous course of offering pardon to all who would come in by a certain date. As a matter of course many did, and when their booty was spent returned to their piratical trade. Monson says that the pirates he caused to be executed had already tasted of the king's mercy. While there were friendly harbours to anchor in, purchasers to be met and a very fair prospect of a free pardon, piracy was not likely to cease.

As the 17th century drew on the law and the police became too strong for such persons as Mr Cormat at Broad Haven, and his pirate friends. But the pirate class did not ■ cease. It was only driven to a wider field of operations — to a field which in fact stretched from the Red Sea to New England. On this wide portion of the earth's surface everything combined to favour the pirate. In the West Indies there was a " well- head " of immense capacity. Spain was forced late and reluc- tantly to recognize the legitimacy of any foreign settlement. She would rather put up with the lawless adventurers known as the " Brothers of the Coast " and the " Buccaneers " than co-operate with foreign governments to suppress them. Even when she renounced her full pretensions, several of the islands remained unoccupied except by the lingering remnants of the native races. Swine and cattle had been let loose on many of them, and had multiplied. The turtle was abundant and succulent. There was no want of food. A population with predatory instincts had been formed in the early days of

hostile settlement and buccaneering. Jamaica was full of the so-called " private men-of-war " whose doings are prominent in the correspondence of the early governors, who were not uncom- monly their associates. Add to this that the commercial policy of Spain denied to her colonists the right of trading with foreigners, and yet that she could not supply their needs herself. Hence arose a smuggling trade which had affinities with piracy. The lawless trader was not liable to be asked awkward questions, as to the origin of his cargo, by the Spanish American who purchased it on the sly for money or by barter. Nor were any questions asked him when he brought his cargo to Jamaica, San Domingo, the Carolinas, New England or even Europe. In the decay of Spain her navy was not to be feared. But it was not the commercial policy of Spain alone which helped the pirate. Great Britain, and France also, insisted that their colonists should trade exclusively with or through them. The colonists were always ready to buy " good cheap " from the smuggler, and never ask him whether the East Indian produce — tea, silk, spices and so forth — he offered for sale were pur- chased or plundered in the Red Sea or on the coast of Malabar or of Coromandel. Add to all this that the police and patrol work of regular navies was but superficially done even in peace, and hardly at all in war, and that in the British colonies there was no judicial machinery for trying pirates till the nth and 12th years of William III. (1700, 1701), and it will be seen that all the conditions favoured the pirate. In the East the decadence of the Mogul Empire was plunging India into anarchy,

and it had no navy. Yet a large native trade existed, conducted by "Moors," as they were called, and Madagascar, a great " no-man's-land," afforded ample anchorage and food. To get possession of a ship, to sail to the East, to plunder the " Moors," to sell the booty in New England or the Carolinas, to spend the produce in riotous living, and go to sea on the same errand again, was the round of life of the large class of known pirates, who formed a recognized element of the population of Massachusetts and New York at the end of the 17th century. These are the men we know best, for they were encouraged by the tolerance shown them to come into the light. Others are buried in, or only dimly visible in, obscurity. Some trace of these latter may be found in the Letter Books of the Old Providence Company, a puritan society formed in the reign of Charles I., of which Pym and the earl of Warwick, afterwards the Parliamentary admiral of the Civil War, were governors. It was founded to colonize Old Providence on the coast of Honduras, a place not to be confused with another pirate haunt, New Providence in the Bahamas. It took to plain piracy and was suppressed by the Spaniards in 1638. Warwick made a regular business and large profits by fitting out " privateers," which were in fact pirates on the " Spanish main," not the seas of America, as some have thought, but the coast of the mainland.

The lives of the later and better known pirates may be illus- trated by the career of Captain Avery, or Every (alias Bridg- man), whose renown was great at the end of the 17th century, and who has the credit of having inspired Defoe's Life, Adven- tures and Piracies of Captain Singleton. Avery was mate of a Bristol ship hired by the Spaniards in 1694 to serve as a coastguard vessel in South America. She was called the " Charles II.," commanded by one Captain Gibson, and mounted 40 guns. While the " Charles II. " was lying at Corunna, in company with another vessel also hired by the Spaniards, waiting for the payment of wages which was delayed, Avery persuaded part of the two crews to seize her and sail with her on a piratical voyage to the East. The enterprise was carried out without bloodshed or, apparently, coercion of those who were unwilling to go. Avery and his crew sailed to Madagascar, a regular haunt of the pirates. Many of them ended by remain- ing for life among the natives. The adventurers in the " Charles II.," who had already made some small prizes, English and Danish, were joined at the island by others of the same character who had come from the West Indies. From Madagascar they went to the Straits of Bab-el-Mandeb, to lie in wait for the trade from India. Several prizes were taken, and finally a large and valuable ship, belonging " to the Great Mogul and his subjects." was captured about ten miles from Surat. Avery and his crew now hastened to New England to sell their booty. The " Charles II." was disposed of as a privateer at Providence, and the pirates bought a sloop in which they sailed along the coast of the English colonies, selling their spoil, with the consent of the colonists and the connivance of the officials, who were bribed. In an evil hour for themselves they decided to come to England. The Indian governments, exasperated by the piracy practised at the expense of their subjects, were threatening reprisals on the East India Company. The Company made complaints to the government at home, and energetic measures of repression were taken. Avery himself escaped capture, but several of his men were brought to trial, condemned and executed. It is to be noted that when first tried, on the 19th of October 1696, they were acquitted. They were, however, re-tried on other counts, on the 31st of October. The charge of Lord Chief Justice Holt to the jury, and the address of Sir Charles Hedges, the admiralty judge, shows that they felt both the importance and the uncertainty of securing a verdict.

The cruise of Avery is not only a typical example of a piratical venture, but it is an important date in the history of the policing of the sea. The English government was roused to a sense of the necessity for strong measures to repiess piracy. All the steps taken were not according to knowledge. The extra- ordinary private venture of Lord Bellamont and his associates who sent out Captain Kidd (q.v.), a man of piratical antecedents,

to suppress pirates in the Eastern seas, brought deserved discredit upon them. The decision taken on the advice of Burchett, the secretary of the admiralty, to offer a pardon to all who would surrender by a given date — for all piracies committed before the 30th of April to the east of the Cape of Good Hope, and the 30th of June 1699 to the west — was an error. It induced many to come in, but it also gave all pirates the hope that they would in the future be provided with similar means of escape. The establishment of admiralty courts in the East Indies and America and the despatch of warships were more effectual methods. Yet it was long before piracy was thoroughly checked; indeed the signing of the Peace of Utrecht was followed by a recrudescence of this form of crime. The privateers who swarmed in the West Indies and, as long as the war lasted, used, in the phrase of the time, to join the squadrons of war-ships " on the plundering account," could not settle down to dull industry. They leagued themselves into a species of pirate republic, with its capital at Providence in the Bahamas. In 1718 a special force had to be sent against them under Woodes Rogers, who is best remem- bered now for having taken Alexander Selkirk from the island of Juan Fernandez, in the course of a privateering voyage into the Pacific with the " duke " and " duchess " of Bristol. Rogers broke up the Providence settlement, and did a similar piece of service on the coast of Madagascar. Piracy did not, however, die. The Asiento (q.v.) Treaty having given Great Britain a monopoly of the slave trade with Spanish America, the monopol- ists, i.e. the South Sea Company and Royal African Company, were of course subject to the competition of interlopers. The interlopers were the natural friends of the pirates, who divided their activity between the Antilles and the west coast of Africa, plundering in the second, selling and re-fitting, not without further plunder, in the first. The most notorious of these free- booters was Bartholomew Roberts, who was introduced to piracy by Howel Davis. Roberts was the nearest known approach to the pirate of romance, ostentatious, brave, not without touches of generosity. He was killed in action with Captain Chaloner Ogle, of H.M.S. " Swallov/," on the coast of Africa, in 1722.

As the American colonies grew more settled piracy became intolerable to them. Yet it lingered on the coast of North Carolina, where the pirates could either terrorize the scattered inhabitants, or were encouraged by dishonest officials. Here flourished the grotesque brute known as Blackbeard, Edward Teach, till he was run down and slain by Lieut. Milvain in 1 7 18. It was noted that several of those who helped to suppress him afterwards " went a-pirating " themselves. So strong was the piratical tradition of the New World that even men of some standing fell into it. " Major " or Captain Stede Bonnet, who was condemned and executed at Charleston, South Carolina, as a pirate, in 17 18, was a

gentleman of some property in Barbadoes, who first ventured to sea in a ship of his own. Stede Bonnet had taken advantage of an act of grace, had come in on a proclamation, and had returned to a pirate's life. The last great explosion of piracy in the West Indies followed the peace of 1815. Here again we find the old conditions — privateers and other unsettled men, the safe lurking-place and the receiver. The refuge and the market were supplied by the Spanish colonies, which were plunged into anarchy by their revolt against Spain. The pirates were able to masquerade as " patriot " navies. The sloth and corruption of Spanish captains-general of Cuba were no less favourable to the pirates. The south coast of the island became a haunt of these villains till the British and American governments were driven to combine for their sup- pression. When they had been followed into their hiding-places and their vessels sunk, they took to brigandage on land, and were garrotted by the Spanish authorities in self-defence. The piracy of the Greek islands went on to later years, and the Malays were not tamed till nearly 1850. On the coast and the rivers of China piracy was and is endemic, but the sailing junk has no chance with the modern steamer. When cases of piracy have occurred in the Straits of Malacca or in the China seas, Xxi. 21

by which Europeans have been the sufferers, the crime has generally been perpetrated by men who shipped as passengers or as crew, and who surprised the vessel. The pirate has been as useful to the author of modern tales and poems as to the writers of the Greek romances. When he is seen in authentic evidence he is found to have been for the most part a pitiful rogue. His gains were but small. A share of £200 was wealth to a mere sailor, and one of £1000 wealth beyond the dreams of avarice. He rarely fought a warship if he could help it, and indeed nothing is more surprising than his readiness to surrender when the fate before him was the gallows.

Authorities. — The pirates of the ancient world are admirably dealt with in Mommsen's History of Rome. For the modern pirate, see Monson's " Naval Tracts " in Churchill's Voyages, v. 5 (London, 1744-1746), and in the edition of the Navy Record Society (1902). But the best accounts are to be found in the State Trials, vols, xiii., xiv., xv. (London, 1812). Captain Charles Johnson's General History of the Pyrates (London, 1724) must be used with caution. He no doubt learnt much from pirates who, having come in on a proclamation, were free to talk, but he cannot always be reconciled with authentic records. The Documents relative to the Colonial History of the State of New York (Albany, 1 856-1 858) contain many curious details. For the eastern seas, the Compendious History of the Indian Wars; with an account of the Rise, Progress, Strength and Forces of Angria, the Pyrate, &c, by Clement Downing (London, 1737) is useful. (D. H.)

PIRKE ABOTH. The penultimate tract of the fourth part of the Mishnah is

the booklet of proverbs in five chapters called Massecheth Aboth (tractalus patrum), better known with a sixth chapter as Pirke Aboth (capitula patrum). For Pirke Aboth in English see The Authorized Daily Prayer Book of the_ united Hebrew congregations of the British Empire, with a new translation by the Rev. S. Singer. The six chapters are there appointed to be read one on each Sabbath afternoon between Passover and New Year. Formerly they were read, in places at least, on the six Sabbaths between Passover and Pentecost only. The subsections of the chapters are hereinafter numbered as in the Authorized Prayer Book.

Chapters i., ii. — The Mosaic succession has first to be established. Moses (i., 1-3) having received the Torah from Sinai, it was handed down to Joshua, the Elders (Josh. xxiv. 31), the Prophets and the men of the Great Synagogue, from one of the last of whom, Simon Justus, it was received by Antigonus of Socho. Next are named (i. 4-15), without any title, as links in the chain of tradition, five pairs of teachers, the last Hillel and Shammai, elsewhere in the Mishnah called mundi patres (Surenh. iv. 324). Rabban Jochanan ben Zacchai (ii. 9) " received from Hillel and Shammai." Sayings of Jochanan and his five disciples follow, and chap. ii. ends with words of their somewhat younger contemporary, Rabbi Tarphon (Tp60oif), to the effect Ars longa vita brevis. These sections (i. 1-15, ii. 9-21) contain the " Kern der Sammlung " (Strack). After the sayings of Shammai (i. 15) come interpolated sayings (i. 16— ii. 8) . of Rabban Gamaliel I., Rabban Simeon, " Rabbi," i.e. R. Jehudah ha-Nasi (cent. a.d. 1-2), the traditional redactor of the Mishnah, Rabban Gamaliel II. and Hillel, which break the sequence.

Chapters Hi., iv. — Maxims of numerous authorities, mostly Mishnah teachers and called Rabbis (Matt. xxii. 7 seq. ; J. F. p. 27), not in exact chronological order.

Chapters v., vi. — Chap. v. which is sui generis, is presumably of later date than what precedes. Naming no teacher until the end, it combines historical, legendary and didactic elements. It touches upon the miraculous and its place in nature (v. 9). In form it is a series of numbered groups of things, from the ten creative Sayings to the triads of qualities which differentiate the disciples of Balaam and Abraham. R. Jacob ben Shimshon's commentary makes Aboth end with the saying of Jehudah ben Tema (v. 23), " Be bold as a leopard, and swift as an eagle, and fleet as a hart, and strong as a lion, to do the will of thy Father who is in heaven." Chapter vi., on acquisitio legis, is thought to have been added for use on the last of the six sabbaths above-mentioned (Strack, J. F. Ap. p. 61). In some manuscripts there are seven chapters.

Pirke Aboth serves as a primer to the student of rabbinic Judaism. For the

most part in simple Hebrew, it has a few sayings in Aramaic (i. 13— ii., 7, v. 25, 26) and some adopted Greek words, as paraclete (iv. 13; Philo). He who would be pious should fulfil the dicta of Aboth (Baba Kam. 30a). It gives favourite aphorisms of leading Jewish teachers who flourished in or before the earliest Christian centuries, and supplies material for some interesting illustrations of the New Testament. Too heterogeneous to be represented by a few extracts, the collection

must be read through to be appreciated. Among the sayings of Hillel we miss the best known one, What is hateful to thee do not, &c. (/. F. p. 142), with which we may now compare Ecclus. xxxi. 15 Heb., " Know (?) thy neighbour is as thyself, and consider what thou hatest." Of the precept, " Make a fence to the Torah " (i.i; cf. iii. 17) it may be said that " every-thing is therein." As a doctrine of development and as an ethical principle it is reflected in Clement of Alexandria's view of philosophy as a paynbs of the vineyard (Strom, i. 20), and Polycarp's saying. " He that has love is far from all sin." The use of Aboth in the synagogue stamps it as authoritative, and, with its intrinsic excellence, has led to its being " the most popular of all rabbinical writings." For midrashic comments upon it see the Aboth of Rabbi Nathan (ed. S. Schechter, Vienna, 1887), or the rendering of it (new ed., New York, 1900) in M. L. Rodkinson's translation of the Babylonian Talmud into English. (See also Apocryphal Literature, § Old

Testament, II. d.)

Bibliography. — Aboth is included in editions of the Mishnah and the Talmud Babli, and in many prayer-books. For separate editions from about 1484-1485, see Montz Steinschneider's Bodleian Catalogus, col. 228-239, 2 7ˆ5, and other works cited in Herm. L. Strack's very useful rips 'pis, Die Spruche der Vater (ed. 3, 1901). See also C. Taylor's Sayings of the Jewish Fathers (ed. 2, 1897, referred to above as /. F.) a separate Appendix (1900) describes or enumerates manuscripts of Aboth — and Jewish Encyclopedia, art. " Abot." (C. T.*)*

PIRMASENS, a town of Germany, in the Bavarian Palatinate, 40 m. W. by S. of Spires, on the railway from Biebermuhle. Pop. (1905), 34,002. The only noteworthy buildings are the town-hall and the principal Evangelical church, which contains a fine monument to Louis IX. (d. 1790), landgrave

of Hesse- Darmstadt, who made the town his residence. The staple industry is the production of boots and shoes; but musical instruments, leather and machines are also manufactured. Pirmasens owes its name to a St Pirmin, who is said to have preached Christianity here in the 8th century. It originally belonged to the count of Hanau-Lichtenberg, but passed to Hesse-Darmstadt in 1736. In September 1793 the Prussians gained a victory here over a body of French troops.

See T. Weiss, Pirmasens in der Franzosenzeit (Pirmasens, 1905).

PIRMEZ, OCTAVE (1832-1883), Belgian author, was born at Chatelineau in 1832. He belonged to a well-known Belgian family, and his cousin, Edouard Pirmez, was distinguished for his works on literary and political subjects. He lived an un- eventful life at his chateau of Acoz, in Hainaut, where he died in May 1883. Pirmez was an ardent admirer of the French romanticists. His works include Les Feuillees: pensees et maximes (1862); Victor Hugo (1863); Jours de solitude (1869); Remo; Souvenirs d'unfrere (1880); Heures de philosophie (1881); and the posthumous Lettres d Josi (1884). ' These books form a history of his emotional life, and reveal an extreme melancholy.

See Vie et correspondance d'Octave Pirmez (1888), by Adolphe Siret and Jose de Coppin.

PIRNA, a town in the kingdom of Saxony, on the left bank of the Elbe, 1 1 m. above Dresden, and on the railway to Bodenbach and Prague. Pop. (1905), 19,220. The town is regularly built, with promenades covering the site of the old fortifications; the most notable edifices are the fine Gothic parish church, built in the 16th century and restored in 1890, and the old town-hall. Excellent sandstone is found on both banks of the Elbe. There are manufactures of glass, machinery, cigars, pottery and enam- elled goods; and there is a trade in grain, fruit and timber, mainly carried on by river, and a little shipbuilding. Pima, originally a Slavonic settlement, was for many years in the alternate possession of Bohemia and Meissen, but it became permanently united with the latter, and thus with Saxony, in 1405. The Sonnenstein, a fortress on a commanding eminence above the town, was erected in the 16th century on the site of an older castle by the elector of Saxony, Augustus I. It was once con- sidered the most important fortress on the Elbe, and successfully withstood the Swedes in 1639, but it was captured and dis- mantled by the Prussians in 1758, and in 1813 was occupied by the French.

See R. Hofmann, Zur Geschichte der Stadt Pima (Pirna, 1891); E. Kiingel, Fuhrer durch Pirna (Pirna, 1889); the Urkundenbuch der Stddte Dresden und Pirna, edited by C. F. von Posern-Klett (Leipzig, 1875) ; and the

publications of the Verein fur Geschichte der Stadt Pirna (Pirna, 1897 seq.).

PIROGUE, or Piragua (the French and Spanish forms respec- tively of a Caribbean word for this type of vessel; it has at various times taken many corrupt forms, e.g. periagua, peltiaugua, pelty- oagar), originally the native name of a vessel made by hollowing out the trunk of a tree, a " dug-out "; hence applied to many different developments of this type of vessel used in the West Indies and along the American coast. An early improvement was to split the " dug-out " into two sections and insert a flat bottom of planking to widen it; another form had a leeboard, was decked in at either end, and had two masts.

PIRON, ALEXIS (1689-1773), French epigrammatist and dramatist, was born at Dijon on the 9th of July 1689. His father, Aime Piron, was an apothecary, who wrote verse in the Burgundian patois. Alexis began life as clerk and secretary to a banker, and then studied law. In 17 19, when nearly thirty years old, he went to seek his fortune at Paris. An accident brought him money and notoriety. The jealousy of the regular actors produced an edict restricting the Theatre de la Foire, or licensed booths at fair times, to a single character on the stage. None of the ordinary writers for this theatre would attempt a monologue-drama for the purpose, and Piron made a great success with a piece called Arlequin Deucalion, representing Deucalion immediately after the Deluge, amusing himself with recreating in succession the different types of man. In 1728 he produced Les Fits ingrats (known later as L'Ecole des peres) at the Comedie Frangaise. He attempted tragedy in Callisthene (1730), Gustavo Vasa (1733) and Fernand Cortes (1744), but none of these succeeded, and Piron returned to comedy with La Mltro- manie (1738), in which the hero, Damis, suffers from the verse mania. His most intimate associates at this time were Mile Quinault, the actress, and her friend Marie Therese Quen- audon, known as Mile de Bar. This lady was slightly older than Piron and not beautiful, but after twenty years' acquaintance he married her in 1741. He died on the 21st of January 1773, in his eighty-fourth year. He was elected in 1753 to the Academy, but his enemies raked up a certain Ode d Priape, dating from his early days, and induced Louis XV. to interpose his veto. Piron however was pensioned, and during the last half-century of his life was never in any want. His best title to remembrance lies in his epigrams. The burlesque epitaph on himself, in which he ridicules the Academy —

" Ci-git Piron, qui ne fut rien, Pas mSme academicien " —

is well-known, while many others are as brilliant. Grimm called him a "machine a saillies."

Piron published his own theatrical works in 1758, and after his death his friend and literary executor, Rigoley de Juvigny, pub- lished his CEuvres completes. M. Bonhomme produced a critical edition in 1859, completed by Poesies choisies el pieces inedites in

1879.

PIROT (Turkish Shehr-Kcey) , a Servian town, i2fm. from the Bulgarian frontier at Tsaribrod, on the railway line between Nish and Sofia. Pop. (1900), 10,428. Pirot is the seat of the prefecture for the department of the same name, with a tribunal, several schools and a custom-house. It is the only proper industrial town in Servia, having numerous small factories for the manufacture of thin cloth (shayak), woollen braiJ (gaytan), and especially carpets. Its carpets have a, great reputation in the Balkan Peninsula for their quaint designs, durability and freshness of colour. Pirot has a medieval fortress, believed to have been built on the site of the Roman fortress Quimedava, on the military road leading from Old Naissus to Philippopolis. The town is of great strategical importance, for which reason the Russian plenipotentiaries at the Berlin congress (1878) stubbornly tried to include it within the Bulgarian frontier, while Austria and some other Powers insisted that it should be given to Servia. In the war between Servia and Bulgaria in 1885 the Bulgarians occupied and held it until the conclusion of >• 9«ace,

PISA

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PISA, a town, archiepiscopal see and capital of a province of the same name, Tuscany, Italy, on the Arno, 7 m. from the sea 1 and 49 m. west of Florence by rail. Pop. (1881), 42,779; (1900,, 61,279. It still retains its ancient walls, 6jm. in circuit, and is defended by a citadel on the south-west. The principal streets run alongside the river, and are lined with fine buildings. Besides the cathedral, the baptistery and the famous leaning tower, the city possesses several notable churches, as the Renaissance church of the Tuscan order of St Stephen, built in 1562 from plans by Vasari; San Niccolo, with a four-storeyed tower (1230), built by Niccola Pisano, and the tomb of John of Swabia, the parricide; Santa Caterina (1262); Santa Maria della Spina, in the Italo-Gothic style, built in 1230 and restored in 1872; San Sepolchro, erected in n 50 by Diotisalvi; San Francesco, with frescoes byTaddeo Gaddi; and the basilica of San Michele (1018). Amongst the secular buildings may be mentioned the royal palace; the archiepiscopal palace; the palace of the order of St Stephen, built by Niccola Pisano and reconstructed by Vasari; the Upezzinghi (formerly Lanfreducci) palace, built of Carrara marble in 1590; the Lanfranchi,

Agostini and other palaces; the university (1472); a large hospital (1258); and fine market halls. There are statues to Cosimo I. (by Francavilla), Arch- duke Leopold, and Ferdinand I. The city possesses also an academy of the fine arts, with a gallery of paintings; and the university a library of 120,000 volumes, a natural history museum, botanical garden and agricultural schools. The univer- sity, founded in 1338, has faculties of law, medicine, mathematics and philosophy and literature, and is to this day one of the most famous in Italy.

The architects of the cathedral were Boschetto and Rinaldo, both Italians, probably Pisans. It is in plan a Latin cross, with an internal length of 31 if ft. and a breadth of 252 ft. The nave, 109 ft. high, has double vaulted aisles and the transepts single aisles ; and at the intersection of nave and transepts there is a cupola. The basilica is still the predominent type, but the influence of the domed churches of Constantinople and the mosques of Palermo is also apparent. The pillars which support the nave are of marble from Elba and Giglio ; those of the side aisles are the spoils of ancient Greek and Roman buildings brought by the Pisan galleys. Extern- ally the finest part of the building is the west front, in which the note struck by the range of arches running round the base is repeated by four open arcades. Of the four doors three are by John of Bologna, who waS greatly helped by Francavilla, Tacca and others; that of the south side, of much older date, is generally supposed to be the work of Bonanno. Of the interior decorations it is enough to mention the altars of the nave, said to be after designs by Michel- angelo, and the mosaics in the dome and the apse, which were among the latest designs of Cimabue. The baptistery was completed only in 1278, and marred in the 14th century by the introduction of Gothic details. The building is a circle 100 ft. in diameter, and is covered with a cone-surmounted dome 190 ft. high on which stands a statue of St Raniero. The lowest range of semicircular arches consists of twenty columns and the second of sixty; and above this is a row of eighteen windows in the same style separated by as many pilasters. In the interior, which is supported by four pilasters and eight columns, the most striking features are the octagonal font and the hexagonal pulpic, erected in 1260 by Niccola Pisano. The campanile or " leaning tower of Pisa " is a round tower, the noblest, according to Freeman, of the southern Roman- esque. Though the walls at the base are 13 ft. thick, and at the top about half as much, they are constructed throughout of marble. The basement is surrounded by a range of semicircular arches sup- ported by fifteen columns, and above this rise six arcades with thirty columns each. The eighth storey, which contains the bells, is of much smaller diameter than the rest of the tower, and has only twelve columns. The height of the tower is 179 ft., but the ascent is easy by a stair in the wall, and the visitor hardly perceives the inclination till he reaches the top and from the lower edge of the gallery looks " down

” along the shaft receding to its base. The tower leans or deviates from the perpendicular, to a striking extent, which has gradually increased: it was 15J ft. out of the perpendicular when measured in 1829, and 16J ft. in 1910. There is no reason to suppose that the architects, Bonanno and William of Innsbruck, intended that the campanile should be built in an oblique position ; it would appear to have assumed it while the work was still in progress. The foundations are not more than 10 ft. deep, and their circumference only that of the tower. The Campo Santo, lying to the north of the cathedral, owes its origin to Archbishop Ubaldo

1 In Strabo’s time it was only 2 m. away, but the increase of the delta at the mouth of the river has since then pushed forward the coast-line.

(1 188-1200), who made the spot peculiarly sacred by bringing fifty-three shiploads of earth from Mount Calvary. The building, erected in the Italian Gothic style between 1278 and 1283, by Gio- vanni Pisano, is of special interest chiefly for its famous frescoes.

There are numerous industries, the most important being the manufacture of cottons. In the vicinity are the royal stud-farm (horses and dromedaries) of Cascine di San Rossore, and the minera I baths of San Giuliano, alkaline-ferruginous, with tempera- ture 91-4° to 105-8° Fahr. At the mouth of the Arno, joined to the city by a steam tramway, is the seaside resort of Marina di Pisa, also known as Bocca d’Arno. a well-known centre for land- scape painters.

The old town occupied the site of the ancient Pisae on the right bank of the Arno. The foundation of Pisae is by tradition ascribed to a very remote period, and it was often (possibly only owing to the similarity of name) believed to have been founded from Pisae in Elis. It is first mentioned in history as the place at which a Roman army from Sardinia landed in 225 B.C., its harbour being at the mouth of the south branch of the Arno, north of Livorno. Being situated on the coast road (Via Aemilia) it was important as a frontier fortress against Liguria, to which, and not to Etruria, it really belonged, perhaps, up to the time of Sulla, the actual boundary lying between it and Vada Volaterrana (mod. Vada). It became a colony in 180 B.C., and was important for the fertility of its territory, for its quarries, and for the timber it yielded for ship-building. Augustus gave it the name of Colonia Julia Pisana; his grandsons Gaius and Lucius were patrons of the colony, and after their death monu- ments were erected in their honour, as is recorded in two long inscriptions still extant. Greek vases have been found within the city itself, seeming to point to the presence of Etruscan tombs (G. Ghirardini in Notizie degli Scavi, 1892, 147); but no remains now exist except of the Roman period — some scanty ruins of baths and of a temple, while the Piazza dei Cavalieri follows the outline of the ancient

theatre. See E. Bormann, Corp. inscr. lat. xi. 272 (1888). Little is known of the history of Pisa during the barbarian invasions, but it is an ascertained fact that it was one of the first towns to regain its independence. Under the Byzantine dominion Pisa, like many other of the maritime cities of Italy, profited by the weakness of the government at Constantinople to reassert its strength. And even during the first years of the harsh Lombard rule the need recognized by these oppressors of defending the Italian coast from the attacks of the Byzantines was favourable to the development of the Pisan navy. Few particulars are extant concerning the real condition of the town; but we occasionally find Pisa mentioned, almost as though it were an independent city, at moments when Italy was over- whelmed by the greatest calamities. According to Amari's happy expression, " it was already independent by sea, while still enslaved on land." Its prosperity notably declined after the establishment of the Lombard rule and under the Franks. It again began to flourish under the marquises of Tuscany, who governed it in the name of the emperor.

In 1003 we find records of a war between Pisa and Lucca, which, according to Muratori, was the first waged between Italian cities in the middle ages. But the military development and real importance of Pisa in the nth century must be attri- buted to the continuous and desperate struggle it maintained against the tide of Saracenic invasion from Sicily. And, although the numerous legends and fables of the old chroniclers disguise the true history of this struggle, they serve to attest the im- portance of Pisa in those days. In 1004 the Saracens forced the gates and sacked a quarter of the town; and in ion they re- newed the attack. But the Pisans repulsed them and assumed the offensive in Calabria, Sicily, and even in Africa. Still more memorable was the expedition afterwards undertaken by the united forces of Pisa and Genoa against Mogahid, better known in the Italian chronicles as Mugeto. This Moslem chief had made himself master of Sardinia, and was driven thence by the allied fleets in 1015. Again invading the island, he was again attacked and defeated by the same adversaries, leaving a

brother and son, or, as some authorities aver, a wife and son, prisoners in their hands. Sardinia continued to be governed by native " judges " who were like petty sovereigns, but were now subject to the sway of Pisa. This was the primary cause of the jealousy of the Genoese, and of the wars afterwards made by them upon Pisa and carried on until its power was crushed. Meanwhile the Pisans flourished more and more, and continued hostilities against the Saracens. In 1062 their ships returned from Palermo

laden with spoil. Thus it is not surprising that Pisa should already have had its own code of laws (Consuetudini di mare), which in 1075 were approved by Gregory VII., and in 1081 confirmed by a patent from the emperor Henry IV., a document which mentions for the first time the existence of a magistrate analogous to the consuls of the republic, although the latter, according to some writers, already existed in Pisa as early as the year 1080; the point, however, is doubtful, and other writers place the first authentic mention of the consuls in the year 1094. l The oldest of Pisan statutes still extant is the Breve dei consoli di mare of

1162.

In 1090 the Pisans joined in the second crusade, proved their valour at the capture of Jerusalem, and derived many commercial advantages from it; for within a short time they had banks, consuls, warehouses and privileges of all kinds in every Eastern port. Thus, while the commune of Pisa was still under the rule of the marquises of Tuscany, all negotiations with it were carried on as with an independent state officially represented by the archbishop and consuls. The aristocrats were the dominant party, and filled the highest offices of the republic, which, in the 12th century, rose to great power, both on sea and land, by its wars with the Lucchese, Genoese and Moslems. In mo Pisa made peace with Lucca after six years of continuous hostilities. And in the years n 13 and n 15 it achieved a still greater enterprise. The Pisan fleet of three hundred sail, com- manded by the archbishop Pietro Moriconi, attacked the Balearic Isles, where as many as 20,000 Christians were said to be held captive by the Moslems, and returned loaded with spoil and with a multitude of Christian and Moslem prisoners. The former were set at liberty or ransomed, and among the latter was the last descendant of the reigning dynasty. The chief eunuch who had governed Majorca perished in the siege. Im- mediately afterwards the fourteen years' war with Genoa broke out. The two republics contested the dominion of the sea, and both claimed supreme power over the islands of Corsica and Sardinia. A papal edict awarding the supremacy of Corsica to the Pisan church proved sufficient cause for the war, which went on from 1118 to 1132. Then Innocent II. transferred the supremacy over part of Corsica to the Genoese church, and compensated Pisa by grants in Sardinia and elsewhere. Accord- ingly, to gratify the pope and the emperor Lothair II., the Pisans entered the Neapolitan territory to combat the Normans. They aided in the vigorous defence of the city of Naples, and twice attacked and pillaged Amalfi,in ir35 and 1137, with such effect that the town never regained its prosperity. It has been said that the copy of the Pandects then taken by the Pisans from Amalfi was the first known to them, but in fact they were already acquainted with those laws. The war with Genoa never came to a real end. Even after the retaking of Jerusalem by the Moslems (1187) the Pisans and Genoese again met in conflict in the

East, and performed many deeds of valour. They were always ready to come to blows, and gave still more signal proofs of their enmity during the Sicilian War in behalf of the emperor Henry VI. From that moment it was plain that there could be no lasting peace between these rival powers until the one or the other should be crushed. The greatness and wealth of the Pisans at this period of their history is proved by the erection of the noble buildings by which their city is adorned. The founda- 1 It must be remembered that the Pisans and Florentines dated the beginning of the year ab incamatione, i.e. from the 25th of March. But the Florentines dated it from the 25th following and the Pisans from the 25th of March preceding the commencement of the common year. The new or common style was adopted throughout Tuscany in the year 1750.

tions of the cathedral were laid in 1063, and its consecration took place in n 18; the baptistery was begun in 1152, and the campanile (the famous leaning tower) in n 74. And all three magnificent structures were mainly the work of Pisan artists, who gave new life to Italian architecture, as they afterwards renewed the art of sculpture.

It is asserted by some writers, especially by Tronci, that in the 1 2th century Pisa adopted a more democratic form of govern- ment. But in fact the chief authority was still vested in the nobles, who, both in Pisa and in Sardinia, exercised almost sovereign power. They formed the real strength of the republic, and kept it faithful to the empire and the Ghibelline party. The Guelph and popular element which constituted the force and prosperity of Florence was hostile to Pisa, and led to its downfall. The independence of the former city was of much later origin, only dating from the death of Countess Matilda (11 1 5), but it rapidly rose to an ever-increasing power, and to inevitable rivalry with Pisa. Owing to the political and com- mercial interests binding Florence to the Roman court, the Guelph element naturally prevailed there, while the growth of its trade and commerce necessarily compelled that state to encroach oa waters subject to Pisan rule. And, although Pisa had hitherto been able to oppose a glorious resistance to Genoa and Lucca, it was not so easy to continue the struggle when its enemies were backed by the arms and political wisdom of the Florentines, who were skilled in obtaining powerful allies. The chroniclers ascribe the first war with Florence, which broke out in 1222, to a most ridiculous motive. The ambassadors of the rival states in Rome are said to have quarrelled about a lapdog. This merely shows that there were already so many general and permanent reasons for war that no special cause was needed to provoke it. In 1228 the Pisans met and defeated the united forces of Florence and Lucca near Barga in the Garfagnana, and at the same time they despatched fifty-two galleys to assist Frederick II. in his expedition to the East. Shortly after this they renewed hostilities with the Genoese on account of Sardinia. The judges who governed the island were always at

strife, and, as some of them applied to Pisa and some to Genoa for assistance against one another, the Italian seas were once more stained with blood, and the war burst out again and again, down to 1259, when it terminated in the decisive victory of the Pisans and the consolidation of their supremacy in Sardinia. But meanwhile Florence had made alliance with Genoa, Lucca and all the Guelph cities of Tuscany against its Ghibelline rival. The pope had excommunicated Frederick II. and all his adherents. And, as a crowning disaster, the death of Frederick in 1250 proved a mortal blow to the Italian Ghibelline cause. Nevertheless, the Pisans were undaunted. Summoning Siena, Pistoia and the Florentine exiles to their aid, they boldly faced their foe, but were defeated in 1254. Soon after this date we find the old aristocratic government of Pisa replaced by a more popular form. Instead of the consuls there were now twelve elders (anziani); besides thepodesta., there was a captain of the people; and there was a general council as well as a senate of forty members. The rout of the Tuscan Guelphs on the field of Monta- perto (1260) restored the fortunes of Pisa. But the battle o£ Benevento (1266), where Manfred fell, and the rout of Taglia- cozzo (1268), sealing the ruin of the house of Hohenstaufen in Italy and the triumph of that of Anjou, were fatal to Pisa. For the republic had always sided with the empire and favoured Conradin, whose cruel end struck terror into the Ghibelline faction. The pope hurled an edict against the Pisans and tried to deprive them of Sardinia, while their merchants were driven from Sicily by the Angevins. The internal condition of the city was affected by these events. Owing to the increasing influence of the Guelph and popular side, to which the more ambitious nobles began to adhere for the furtherance of personal aims, the aristocratic Ghibelline party was rapidly losing ground. The first man to step to the front at this moment was Count Ugolino della Gherardesca of the powerful house of that name. He had become the virtual head of the republic, and, in order to preserve its independence and his own sway, inclined to the

Guelphs and the popular party, in spite of the Ghibelline tradi- tions of his race. He was supported by his kinsman Giovanni Visconti, judge of Gallura; but almost all the other great families vowed eternal hatred against him, and proclaimed him a traitor to his party, his country and his kin. So in 1274 he and Visconti were driven into exile. Both then joined the Florentines, took part in the war against their native city, and laid waste its surrounding territories. In 1276 the Pisans were compelled to agree to very grievous terms — to exempt Florentine merchandise from all harbour dues, to yield certain strongholds to Lucca, and to permit the return of Count Ugolino, whose houses they had burnt, and whose lands they had

confiscated. Thus the count again became a powerful leader in Pisa. Visconti, however, was dead.

This was the moment chosen by Genoa for a desperate and decisive struggle with her perpetual rival. For some years the hostile fleets continued to harass each other and engage in petty skirmishes, as if to measure their strength and prepare for a final effort. On the 6th of August 1284 the great battle of Meloria took place. Here seventy-two Pisan galleys engaged eighty- eight Genoese, and half the Pisan fleet was destroyed. The chroniclers speak of 5000 killed and 11,000 prisoners; and, although these figures must be exaggerated, so great was the number of captives taken by the Genoese as to give rise to the saying — " To see Pisa, you must now go to Genoa." This defeat crushed the power of Pisa. She had lost her dominion over the sea, and the Tuscan Guelphs again joined in attacking her by land. Count Ugolino had taken part in the battle of Meloria and was accused of treachery. At the height of his country's disasters he sought to confirm his own power by making terms with the Florentines, by yielding certain castles to Lucca, and by neglecting to conclude negotiations with the Genoese for the release of the prisoners, lest these should all prove more or less hostile to himself. This excited a storm of opposition against him. The archbishop Ruggieri, having put himself at the head of the nobles, was elected podesta by the Lanfranchi, Sismondi and Gualandi, and a section of the popular party. The city was plunged into civil war. The great bell of the commune called together the adherents of the archbishop; the bell of the people summoned the partisans of the count. After a day's fighting (July 1, 1288) the count, his two sons and his two grandsons were captured in the palazzo del popolo (or town hall), and cast into a tower belonging to the Gualandi and known as the " Tower of the Seven Streets." Here they were all left to die of hunger. Their tragic end was afterwards immortalized in the Divina commedia. The sympathies of Dante Alighieri, the Florentine patriot and foe of Rome, were naturally in favour of the victims of an aristocratic prelate, opposed to all reconciliation with Florence.

The Florentines were now allied with Lucca and Genoa, and a few of their vessels succeeded in forcing an entry into the Pisan port, blocked it with sunken boats, and seized its towers. Their own internal dissensions of 1293 put a stop to the campaign, but not before they had concluded an advantageous peace. They and all the members of the Guelph league were freed from all imposts in Pisa and its port. In addition to these privileges the Genoese also held Corsica and part of Sardinia; and through- out the island of Elba they were exempted from every tax. They likewise received a ransom of 160,000 lire for their Pisan prisoners. These were no longer numerous, many having suc- cumbed to the hardships and sufferings of all kinds to which they had been exposed.

In 13 1 2 the arrival of the emperor Henry VII. gladdened the hearts of the Pisans, but his sudden death in 1313 again over- threw their hopes. He was interred at Pisa, and Uguccione della Faggiuola remained as imperial lieutenant, was elected podesta and captain of the people, and thus became virtual lord of the city. As a Ghibelline chief of valour and renown he was able to restore the military prestige of the Pisans, who under his com- mand captured Lucca and defeated the Florentines at Montecatini on the 29th of August 13T5. So tyrannical, however, was his rule that in 1316 he was expelled by the popular fury. But

Pisa's freedom was for ever lost. He was succeeded by other lords or tyrants, of whom the most renowned was Castruccio Castracane, a political and military adventurer of much the same stamp as Uguccione himself. With the help of Louis the Bavar- ian, Castruccio became lord of Lucca and Pisa, and was victorious over the Florentines; but his premature death in 1328 again left the city a prey to the conflicts of opposing factions. New lords, or petty tyrants, rose to power in turn during this period of civil discord, but the military valour of the Pisans was not yet extinguished. By sea they were almost impotent — Corsica and Sardinia were lost to them for ever; but they were still formidable by land. In 1341 they besieged Lucca in order to prevent the entry of the Florentines, to whom the city had been sold for 250,000 florins by the powerful Mastino della Scala. Aided by their Milanese, Mantuan and Paduan allies, they gave battle to their rivals, put them to rout at Altopascio (Oct. 2), and then again excluded them from their port. Thereupon the Florentines obtained Porto Talamone from Siena and established a navy of their own. By this means they were enabled to capture the island of Giglio, and, attacking the Pisan harbour, carried off its chains, bore them in triumph to Florence, and suspended them in front of the baptistery, where they remained until 1848. Then, in pledge of the brotherhood of all Italian cities, they were given back to Pisa, and placed in the Campo Santo.

The war was now carried on by the free companies with varying fortune, but always more or less to the hurt of the Pisans. In 1369 Lucca was taken from them by the emperor Charles IV.; and afterwards Giovan Galeazzo Visconti, known as the count of Virtu, determined to forward his ambitious designs upon the whole of Italy by wresting Pisa from the Gambacorti. For at this time the conflicts of the Raspanti faction, headed by the Gherardesca, with the Bergolini led by the Gambacorti, had left the latter family masters of the city. At Visconti's instigation Piero Gambacorti, the ruler of the moment, was treacherously assassinated by Jacopo d'Appiano, who succeeded him as tyrant of Pisa, and bequeathed the state to his son Gherardo. The latter, a man of inferior ability and daring, sold Pisa to the count of Virtu, receiving in exchange 200,000 florins, Piombino, and the islands of Elba, Pianosa and Monte Cristo. Thus in 1399 Visconti took

possession of Pisa, and left it to his natural son Gabriele Maria Visconti, who was afterwards expelled from its gates. But even during this century of disaster the Pisans continued to cherish not only commerce, but also the fine arts. In the year 1278 they had entrusted the erection of their fine Campo Santo to Niccola and Giovanni Pisano, by whom the architectural part of it was completed towards the end of the century. In the following year the first artists of Italy were engaged in its decoration, and the celebrated frescoes attributed to Orcagna (q.v.) were painted on its walls. Others were after- wards supplied by Benozzo Gozzoli and men of lesser note, and the labour of ornamentation was only discontinued in 1464.

Meanwhile, in 1406, the Florentines made another attack upon Pisa, besieging it simultaneously by sea and land. Owing to the starving condition of its defenders, and aided by the treachery of Giovanni Gambacorti, they entered the city in triumph on the 9th of October, and sought to " crush every germ of rebellion and drive out its citizens by measures of the utmost harshness and cruelty." Such were the orders sent by the Ten of War to the representatives of the Florentine government in Pisa, and such was then the established policy of every Italian state. Consequently for a long time there was a continual stream of emigration from Pisa. The Medici pursued a humaner course. In 1472 Lorenzo the Magnificent tried to restore the ancient renown of the Pisan university. To that end he filled it with celebrated scholars, and, leaving only a few chairs of letters and philosophy in Florence, compelled the Florentines to resort to Pisa for the prosecution of their studies. But nothing could now allay the inextinguishable hatred of the conquered people. When Charles VIII. made his descent into Italy in r494, and came to Sarzana on his way to Tuscany, he was welcomed by the Pisans with the greatest demonstrations of joy. And, although that monarch was ostensibly the friend of Florence, they did" not

hesitate, even in his presence, to assert their own independence, and, casting the Florentine ensign, the Marzocco, into the Arno, made instant preparations for war. Between 1499 and 1505 they heroically withstood three sieges and repulsed three attacking armies. But their adversaries always returned to the assault, and, what was worse, yearly laid waste their territories and destroyed all their crops. Soderini, who was perpetual gonfalonier of Florence, and Machiavelli, the secretary of the Ten, urged on the war. In 1509 Florence encamped her forces on three sides of the distressed city, which at last, reduced to extremity by famine, was compelled to surrender on the 8th of June 1509. Thenceforth the

Florentines remained lords of Pisa. But now, mainly owing to the efforts of Soderini and Machiavelli, the conquerors showed great magnanimity. They brought with them large stores of provisions, which were freely distributed to all; they tried to succour the suffering populace in every way, and gave other assistance to the wealthier classes. Nevertheless, emigration continued even on a larger scale than in 1406, and the real history of Pisa may be said to have ended. In Naples, in Palermo, in all parts of Italy, Switzerland and the south of France, we still find the names of Pisan families who quitted their beloved home at that time. The Florentines immediately built a new citadel, and this was a great bitterness to the Pisans. The Medici, however, remained well disposed towards the city. Leo X. was an active patron of the university, but it again declined after his death. The grand duke Cosmo I., a genuine statesman, not only restored the university, but instituted the " uffizio dei fossi," or drainage office for the reclamation of marsh lands, and founded the knighthood of St Stephen. This order played a noble part in the protection of Tuscan commerce, by fighting the Barbary pirates and establish- ing the prestige of the grand-ducal navy (see Medici). Under the succeeding Medici, Pisa's fortunes steadily declined. Ferdinand I. initiated a few public works there, and above all restored the cathedral, which had been partly destroyed by fire in 1595. These dreary times, however, are brightened by one glorious name — that of Galileo Galilei.

The population of Pisa within the wails had been reduced in 1551 to 8574 souls, and by 1745 it had only risen to the number of 1 2,406. Under the house of Lorraine, or more correctly during the reign of that enlightened reformer the grand duke Peter Leopold (1765-1790), Pisa shared in the general prosperity of Tuscany, and its population constantly increased. By 1840 it contained 21,670 souls, exclusive of the suburbs and outlying districts.

Authorities. — Paolo Tronci, Annali di Pisa, edited by E. V. Montazio (2 vols., Lucca, 1842-1843), which comes down to 1840; Ranieri Grassi, Pisa e le sue adiacenze (Pisa, 1851), which is a useful historical guide; Roncioni, " Istorie Pisane," in the Archivio storico italiano, vol. vi., pt. 1; " Cronache Pisane," in the same Archivio, vol. vi., pt. 2; for the early constitution of the city, see G. Volpe's Studii sulk istituzioni, comunali di Pisa (Pisa, 1902), and for the laws, F. Bonaini's Statuti inediti della cittd, di Pisa (3 vols., Florence, 1851, &c). The maritime and commercial history of the republic is dealt with in A. Schaube's Das Konsulat des Meeres in Pisa (Leipzig, 1888) and in Pawinski's Zur Entstehungs- geschichte des Konsulats in den Ccmmunen Nord- und Mittel-Italiens (Berlin, 1867); for the monuments and inscriptions see A. Da Morrona, Pisa illustrata (Leghorn, 1812) and G. R. de Fleury's Les Monuments de Pise au moyen dge (Paris, 1866); also Repetti's Dizionario geografico della Toscana, s.v. " Pisa." For Dante's connexion with Pisa, see Dante e i Pisani, by Giovanni

Sforza (Pisa, 1873). Among the more recent historical guides to Pisa of a popular character is The Story of Pisa and Lucca, by Janet Ross' and Nellie Erichsen-, in Dent's " Medieval Towns " (London, 1007), and T. B. Supino's Pisa, in the" Italia artistica Series."

(P. V.)

PISA, COUNCIL OF (1409). The great schism of the west had already lasted thirty years, and the efforts which had been made to restore unity within the Church by the simultaneous resignation of the two rival pontiffs had been in vain, when in the spring of 1408, the state of affairs being desperate, the idea arose of assembling a council to effect a union without the co-operation of the popes. The initiative came from those cardinals who had one after the other seceded either from Gregory XII. or Benedict XIII. They were forestalled by the popes, who each

summoned a council, the former to Cividale (in Friuli), the latter to Perpignan, so the dissident cardinals sent out antedated letters inviting Christendom to assemble at Pisa on the 25th of March 1409. Their appeal met with a response in a great part of Italy, France, Navarre, Portugal and England, and in Germany in the states subject to Wenceslas king of the Romans, the electors of Cologne and Mainz, the margrave of Brandenburg, &c. For a time the number of the fathers exceeded five hundred.

The day after the opening of the council, proceedings were started against the two popes, who, it was agreed, were to be eliminated. An act of accusation, containing in 37 articles the chief complaints against them, was read out to the people; not only their policy, but their orthodoxy was attacked, and there was even an insinuation of sorcery. The reason is, that in order to depose them with some show of legality, it was necessary, as a preliminary, to convict them of heresy, and it began to be seen that their tenacity of power, and the ruses by which they evaded the necessity of abdicating, however harmful might be their consequences, did not in themselves constitute a clearly-defined heresy. On the 5th of June 1409 was read the definitive sentence: that as heretics, and therefore separated from the Church, Pedro de Luna (Benedict XIII.) and Angelo Corrario (Gregory XII.) were ipso facto deposed from any office; they must not be obeyed, nor assisted, nor harboured. In the course of the rejoicings which followed this sentence among the populace of Pisa, occurred the somewhat scandalous event of the burning of two images crowned with parchment mitres, representing Gregory XII. and Benedict XIII. It was in vain that the ambassadors of Benedict XIII. presented themselves at Pisa. The crowd greeted their arrival with mockery and derision, and being treated as the envoys of heretics they escaped without having obtained a hearing.

In order to complete their .task the cardinals present at Pisa, authorized by delegation of the council, shut themselves up in conclave, and elected one of their number, Peter Philarges, cardinal of Milan, as the new pope, who assumed the name of Alexander V. They had hoped to save the Church, but unfortun- ately the result of their efforts, generous as they were, was that the schism increased in bitterness, and that instead of the unity for which the Church craved, three popes continued to flourish. Both the deposed pontiffs protested against the legality of the council of Pisa; each had numerous partisans, and the thesis, constructed rather to meet the exigencies of the case, which attributed to a synod assembled by the cardinals the right of constituting itself judge of a sovereign pontiff, was far from being established.

Originally the council of Pisa was to have occupied itself not only with effecting the union, but also with the reform of the Church. As a matter of fact, it confined itself to expressing certain desiderata in a " libellus supplicatorius " which it sub- mitted to the new pope. Alexander V. only partially acceded to these demands, many of which constituted serious encroach- ments on the prerogative of the Holy See; he then declared the work of reform suspended, and dissolved the council (August 7,

1409).

See Jacques Lenfant, Histoire du concile de Pise (Utrecht, 1731); Mansi, Concil., xxvii.; F. Stuhr, Die Organisation und Geschdfts- ordnung des Pisaner und Konstanzer Konzils (Schwerin, 1891); N. Valois, La France et le grand schisme d'occident, iv. 3-107, 175 seq. (Paris, 1902). (N. V.)

PISACA LANGUAGES, the name which has been given to a family of languages spoken immediately to the south of the Hindu Kush, and north of the frontier of British India. The family includes the group of Kafir languages spoken in Kafiristan, Khowar, spoken in the Chitral country, and the group of Shina languages, which includes the Shina of Gilgit, KohistanI, spoken in the Kohistans of the Indus and Swat rivers, and Kashmiri. Of all these Kashmiri is the only one which has received any literary cultivation, and of which the number of speakers is known. The Pisaca languages are Aryan by origin, but are neither Iranian nor Indo-Aryan. (See Indo-Aeyan Languages and Kashmiri.) (G. A. Gr.)

PISACANE, CARLO, duke of San Giovanni (1818-1857), Italian revolutionary, was born at Naples, and entered the Neapolitan army in

1839; but having become imbued with Mazzinian ideas he emigrated in 1847, and after a short stay in England and France served in the French army in Algeria. The revolution of 1848 recalled him to Italy; he played a part in the brief but glorious history of the Roman Republic, and was the life and soul of the war commission in the defence of the city. After its capture by the French he again went into exile, first to London and then to Genoa, maintaining himself by teaching. He regarded the rule of the house of Savoy as no better than that of Austria. When Mazzini, undeterred by the failure of the abortive Milan rising on the 6th of February 1853, determined to organize an expedition to provoke a rising in the Neapolitan kingdom, Pisacane offered himself for the task, and sailed from Genoa with a few followers (including Giovanni Nicotera) on board the " Cagliari " on the 25th of June 1857. They landed on the island of Ponza, where the guards were overpowered and some hundreds of prisoners liberated, and on the 28th arrived at Sapri in Calabria and attempted to reach the Cilento. But hardly any assistance from the inhabitants was forthcoming, and the invaders were quickly overpowered, Pisacane himself being killed.

See P. M. Bilotti, La Spedizione di Sapri (Salerno, 1907).

PISAN, CHRISTINE DE (1364-c. 1430), French poet, of Italian birth, was born at Venice in 1364. When she was four years old she was brought to her father, a councillor of the Venetian Republic, in Paris, where he held office as astrologer to Charles V. At fifteen Christine married Etienne du Castel, who became Charles's notary and secretary. After the king's death in 1380 her father lost his appointment, and died soon after ; and when Christine's husband died in 1389 she found herself without a protector, and with three children depending on her. This determined her to have recourse to letters as a means of livelihood. Her first ballads were written to the memory of her husband, and as love poems were the fashion she continued to write others — lais, virelais, rondeaux and jeux a vendre — though she took the precaution to assure her readers (Cent balades, No. 50) that they were merely exercises. In 1399 she began to study the Latin poets, and between that time and 1405, as she herself declares, she composed some fifteen important works, chiefly in prose, besides minor pieces. The earl of Salisbury, who was in Paris on the occasion of the marriage of Richard II. with Isabella of France (1396), took her elder son, Jean du Castel (b. 1384), and reared him as his own; the boy, after Salisbury's death (1400). being received by Philip of Burgundy, at whose desire Christine wrote Le Livre des faitz et bonnes mceurs du sayge roy Charles 1 (1405), valuable as a first-hand picture of Charles V. and his court. Her Mutation de fortune, in which she finds room for a great deal of history and philosophy, was presented to the same patron on New Year's Day, 1404. It possesses an introduction of great autobiographical interest. In La Vision (1405) she tells her own history, by way of defence against

those who objected to her pretensions as a moralist. Henry IV. of England desired her to make his court her home, and she received a like invitation from Galeazzo Visconti, tyrant of Milan. She preferred, however, to remain in France, where she enjoyed the favour of Charles VI., the dukes of Berry and Burgundy, the duchess of Bourbon and others.

Christine was a champion of her own sex. In her DU de la rose (1402) she describes an order of the rose, the members of which bind themselves by vow to defend the honour of women. Her Epitre au dieu d 'amour (1399) is a defence of women against the satire of Jean de Meun, and initiated a prolonged dispute with two great scholars of her time, Jean de Montreuil (d. 141 5) and Gonthier Col, who undertook the defence of the Roman de la rose. Christine wrote about 1407 two books for women, La Cite des dames and Le Livre des trois vertus, or Le Trisor de la cite des dames. She was devoted to her adopted country. During the civil wars she wrote a Lamentation (141s) and a Livre

1 See C. B. Petitot, Collection complete des mSmoires relatifs d. I'histoire de France (1st series, vols. v. and vi.. 1819, &c.).

de la paix (1412-1413), but after the disasters of the campaign of Agincourt she retired to a convent. We have no more of her work until 1429, when she broke her silence to write a song in honour of Joan of Arc. Of the circumstances of her death nothing is known but it probably took place about this time. Her Cite des dames contains many interesting contemporary portraits, and her Livre des trois vertus contains details of domestic life in the France of the early 15th century not supplied by more formal historians.

Her poems were edited by Maurice Roy for the Societe des anciens Textes frangais (1886, &c), and her Livre du chemin du long estude, by Puschel (Berlin, 1887). There are monographs by Raimond Thomassy (Paris, 1838); E. M. D. Robineau (Saint-Omer, 1882); and Friedrich Koch (Goslar, 1885). It is possible that Jean Castel, who was chronicler of France under Louis XL, was Christine's grandson. Hoccleve imitated her Epitre au dieu d'amour, in his " Letter of Cupid " (Chaucerian and other Pieces, ed. W. W- Skeat, 1897). A translation of her Hpitre d'Olhea was made (c. 1440) by Stephen Scrope for his stepfather, Sir John Fastolf, and is pre- served in a MS. at Longleat. This was edited (1904) for the Rox-burghe Club by W. G. F. Warner as The Epistle of Othea to Hector, or the Boke of Knyghthode. The Moral Proverbs of Christyne de Pise, translated by Earl Rivers, was printed in 1 478 by Caxton, who himself translated, by order of Henry VII., her Livre des faitz d'armes, et de chevalerie, a treatise on the art of war, based chiefly on Vegetius. Her Cite des dames was translated by Brian Anslay (London, 1521).

PISANI, VETTOR (d. 1380), Venetian admiral, was in command of the Venetian fleet in 1378 during the war against the Genoese, whom he defeated off Capo d'Anzio; subsequently he recaptured Cattaro, Sebenico and Arbe, which had been seized by the Hungarians, the allies of the Genoese. But the Genoese fleet completely defeated Pisani at Pola in May 1379, and on his return to Venice he was thrown into prison. The enemy now pressed home their victory, and besieged and captured Chioggia, whereby Venice itself was in danger. The people thereupon demanded the liberation of Pisani, in whose skill they had the fullest con- fidence. The government gave way and appointed the aged commander admiral of the fleet once more. Through his able strategy and daring he recaptured Chioggia, defeated the Genoese and threatened Genoa itself until that republic agreed to peace terms. Pisani died in 1380 while on his way to Manfredonia with a squadron to ship provisions.

See Vittorio Lazzarini, " La morte e il mohumento di Vettor Pisani," in the Nuovo archivio veneto, vol.xi., pt. ii. (1896).

PISANO, ANDREA, also known as Andrea da Pontadera (c. 1270-1348), Italian sculptor, was born about 1270, and first learned the trade of a goldsmith. He became a pupil of Giovanni

Part of the first Bronze Door of the Baptistery at Florence, by Andrea Pisano.

Pisano about 1300, and worked with him on the sculpture for S. Maria deila Spina at Pisa and elsewhere. But it is at Florence

that his chief works were executed, and the formation of his mature style was due rather to Giotto than to his earlier master. Of the three world-famed bronze doors of the Florentine baptistery, the earliest one — that on the south side — was the work of Andrea; he spent many years on it; and it was finally set up in 1336. 1 It consists of a number of small quatrefoil panels — the lower eight containing single figures of the Virtues, and the rest scenes from the life of the Baptist. Andrea Pisano, while living in Florence, also produced many important works of marble sculpture, all of which show strongly Giotto's influence. In some cases probably they were actually designed by that artist, as, for in- stance, the double band of beautiful panel-reliefs which Andrea executed for the great campanile. The subjects of these are the Four Great Prophets, the Seven Virtues, the Seven Sacraments, the Seven Works of Mercy and the Seven Planets. The duomo

contains the chief of Andrea's other Florentine works in marble. In 1347 he was appointed architect to the duomo of Orvieto, which had already been designed and begun by Lorenzo Maitani. The exact date of his death is not known, but it must have been shortly before the year 1349.

Andrea Pisano had two sons, Nino and Tommaso — both, especi- ally the former, sculptors of considerable ability. Nino was very successful in his statues of the Madonna and Child, which are full of human feeling and soft loveliness — a perfect embodiment of the Catholic ideal of the Divine Mother. Andrea's chief pupil was Andrea di Cione, better known as Orcagna (q.v.). Balduccio di Pisa, another, and in one branch (that of sculpture) equally gifted pupil, executed the wonderful shrine of S. Eustorgio at Milan — ■ a most magnificent mass of sculptured figures and reliefs.

PISANO, GIOVANNI (c. 1250-1330), Italian architect and sculptor, was the son of Niccola Pisano. Together with Arnolfo del Cambio and other pupils, he developed and extended into other parts of Italy the renaissance of sculpture which in the main was due to his father's talent. After he had spent the first part of his life at home as a pupil and fellow worker of

Part of the Tomb of Benedict XI., by Giovanni Pisano.

Niccola, the younger Pisano was summoned between 1270 and 1274 to Naples, where he worked for Charles of Anjou on the Castel Nuovo. One of his earliest independent performances was the Campo Santo at Pisa, finished about 1283; along with this he executed various pieces of sculpture over the main door and inside the cloister. The richest in design of all his works (finished about 1 286) is in the cathedral of Arezzo — a magnificent marble high altar and reredos, adorned both in front and at the back with countless figures and reliefs — mostly illustrative of the lives of St Gregory and St Donato, whose bones are enshrined there. The actual execution of this was probably wholly the work of his pupils. In 1290 Giovanni was appointed architect or " capo maestro " of the new cathedral at Siena, in which office he suc- ceeded Lorenzo Maitani, who went to Orvieto to build the less ambitious but equally magnificent duomo which had just been founded there. The design of the gorgeous facade of that duomo has been attributed to him, but it is more probable that he only carried out Maitani's design. At Perugia, Giovanni built the

1 The date on. the door, 1330, refers to the original wax model.

church of S. Domenico in 1304, but little of the original structure remains. The north transept, however, still contains his beauti- ful tomb of Benedict XL, with a sleeping figure of the pope, guarded by angels who draw aside

the curtain. One of Giovanni's most beautiful architectural works was the little chapel of S. Maria della Spina (now rebuilt, " restored "), on the banks of the Arno in Pisa; the actual execution of this chapel, and the sculpture with which it is adorned, was mostly the work of his pupils. 2 The influence of his father Niccola is seen strongly in all Giovanni's works, but especially in the pulpit of S. Andrea at Pistoia, executed about 1300. Another pulpit, designed on the same lines, was made by him for the nave of Pisa Cathedral between 1310 and 131 1. The last part of Giovanni's life was spent at Prato, near Florence, where with many pupils he worked at the cathedral till his death about 1330.

See M. Sauerlandt, fiber die Bildwerke des Giovanni Pisano, &c. (1904); A. Brach, Nicola und Giovanni Pisano und die Plastik des XIV. Jahrhunderts in Siena (1904).

PISANO, NICCOLA (c. 1206-1278), Italian sculptor and archi- tect. Though he called himself Pisanus, from Pisa, where most of his life was spent, he was not a Pisan by birth. There are two distinct accounts of his parentage, both derived mainly from existing documents. According to one of these he is said to have been the son of " Petrus, a notary of Siena;" but this statement is very doubtful, especially as the word " Siena " or " de Senis " appears to be a conjectural addition. Another document among the archives of the Sienese Cathedral calls him son of " Petrus de Apulia." Most modern writers accept the latter statement, and believe that he not only was a native of the province of Apulia in southern Italy, but also that he gained there his early instruction in the arts of sculpture and architecture. Those, on the other hand, who, with most of the older writers, prefer to accept the theory of Niccola's origin being Tuscan, suppose that he was a native of a small town called Apulia near Lucca.

Except through his works, but little is known of the history of Niccola's life. As early as 1221 he is said to have been sum- moned to Naples by Frederick II., to do work in the new Castel del l'Uovo. This fact supports the theory of his southern origin, though not perhaps very strongly, as, some years before, the Pisan Bonannus had been chosen by the Norman king as the sculptor to cast one of the bronze doors for Monreale Cathedral, where it still exists. The earliest existing piece of sculpture which can be attributed to Niccola is a beautiful relief of the Deposition from the Cross in the tympanum of the arch of a side door at San Martino at Lucca; it is remarkable for its graceful composition and delicate finish of execution. The date is about 1237. In 1260, as an incised inscription records, he finished the marble pulpit for the Pisan baptistery; this is on the whole the finest of his works.

It is a high octagon, on semicircular arches, with trefoil cusps, supported by

nine marble columns, three of which rest on white marble lions. In design it presents that curious combination of Gothic forms with classical details which is one of the character- istics of the medieval architecture of northern Italy; though much enriched with sculpture both in relief and in the round, the general lines of the design are not sacrificed to this, but the sculpture is kept subordinate to the whole. In this respect it is superior to the more magnificent pulpit at Siena, one of Niccola's later works, which suffers greatly from want of repose and purity of outline, owing to its being overloaded with reliefs and statuettes. Five of the sides of the main octagon have panels with subjects — the Nativity, the Adoration of the Magi, the Presentation in the Temple, the Crucifixion and the Doom. These are all, especially the first three, works of the highest beauty, and a wonderful advance on anything of the sort that had been produced by Niccola's prede- cessors. The drapery is gracefully arranged in broad simple folds; the heads are full of the most noble dignity; and the sweet yet stately beauty of the Madonna could hardly be surpassed. The panel with the Adoration of the Magi is perhaps the one in which Niccola's study of the antique is most apparent (see figure). The veiled and diademed figure of the Virgin Mother, seated on a throne, recalls the Roman Juno;' the head of Joseph behind her might be that of Vulcan; while the youthful beauty of an Apollo and the mature dignity of a Jupiter are suggested by the standing

2 See Schultz, Denkmdler der Kunst in Unter-Italien. vii. 5.

and kneeling figures of the Magi. Certain figures in others of the panels are no less deeply imbued with classical feeling.

The next important work of Niccola in date is the Area di San Domenico, in the church at Bologna consecrated to that saint, who died in 1221. Only the main part, the actual sarcophagus covered with sculptured reliefs of St Dominic's life, is the work of Niccola and his pupils. The sculptured base and curved roof with its fanciful ornaments are later additions. This " Area "

The Adoration of the Magi, one of the panels in the pulpit of the Pisan Baptistery, by Niccola Pisano.

was made when St Dominic was canonized, and his bones trans- lated; it was finished in 1267, not by Niccola himself, but by his pupils. The most magnificent, though not the most beautiful, of Niccola's works is the great pulpit in Siena cathedral (1268). It is much larger than that at Pisa,

though somewhat similar in general design, being an octagon on cusped arches and columns. Its stairs, and a large landing at the top, with carved balusters and panels, rich with semi-classical foliage, are an addition of about 1 500. The pulpit itself is much overloaded with sculpture, and each relief is far too crowded with figures. An attempt to gain magnificence of effect has destroyed the dignified simplicity for which the earlier pulpit is so remarkable.

Niccola's last great work of sculpture was the fountain in the piazza opposite the west end of the cathedral at Perugia. This is a series of basins rising one above another, each with sculptured bas-reliefs; it was begun in 1274, and completed, except the topmost basin, which is of bronze, by Niccola's son and pupil Giovanni.

Niccola Pisano was not only pre-eminent as a sculptor, but was also the greatest Italian architect of his century; he designed a number of very important buildings, though not all which are attributed to him by Vasari. Among those now existing the chief are the main part of the cathedral at Pistoia, the church and convent of Sta Margherita at Cortona, and Sta Trinita at Florence. The church of Sant' Antonio at Padua has also been attributed to him, but without reason. Unfortunately his archi- tectural works have in most cases been much altered and modern- ized. Niccola was also a skilled engineer, and was compelled by the Florentines to destroy the great tower, called the Guarda- morto, which overshadowed the baptistery at Florence, and had for long been the scene of violent conflicts between the Guelphs and Ghibellines. He managed skilfully so that it should fall without injuring the baptistery. Niccola Pisano died at Pisa in the year 1278, leaving his son Giovanni a worthy successor to his great talents both as an architect and sculptor.

Though his importance as a reviver of the old traditions of beauty in art has been to some extent exaggerated by Vasari, yet it is probable that Niccola, more than any other one man, was the means of starting that " new birth " of the plastic arts which, in the years following his death, was so fertile in countless works of the most unrivalled beauty. Both Niccola and his son had many pupils of great artistic power, and these carried the influence of the Pisani throughout Tuscany and northern Italy, so that the whole art of the succeeding generations may be said to have owed the greater part of its rapid development to this one family.

See Sculpture, and general histories of Italian art; Symonds,

Renaissance in Italy; A. Brach, Nicola unA Giovanni Pisano und die Plastik des XIV. Jahrhunderts in Siena (Strassburg, 1904).

PISANO, VITTORE (c. 1380-1456), commonly called Pisa- nello, Italian medallist, was a native of San Vigilio sul Lago in the territory of Verona. Specimens of his work as a painter are still extant in Rome, Venice, Verona and Pistoia, and entitle him to a place of some distinction in the history of that art. The National Gallery in London possesses a very fine specimen of Pisanello's work— a panel painted with miniature-like delicacy. During the latter portion of his life he lived in Rome, where he enjoyed great repute.

PISAURUM (mod. Pesaro, q.v.), an ancient town of Umbria on the Via Flaminia, 26 m. from Ariminum and 8 from Fanum Fortunae. A Roman colony was founded here in the territory of the Galli Senones in 184 B.C., at the mouth of the river Pisaurus (mod. Foglia; the sea has since then receded about half a mile). Whether it took the place of an earlier town or not, is not known: an important Gaulish cemetery has been discovered near the village of Novilara between Pisaurum and Fanum, but to which of these centres (if either) it belonged is uncertain (E. Brizio in Monumenti dei Lincei [1895], v. 85 sqq.). In 174 B.C. we hear that the censors built a temple of Jupiter here and paved a road. T. Accius, the counsel who opposed Cicero in the case when he defended Cluentius in a still extant speech, was a native of Pisau- rum. Catullus refers to the town as decadent or unhealthy, but this may be merely malicious, and does not seem to be borne out by facts : for it is not infrequently mentioned by classical authors. It was occupied by Caesar in 49 B.C., and was made a colony under the second triumvirate. Hence it bears the name Colonia Julia Felix. We hear little of it under the empire. It was destroyed by the Goths in 539, and restored by Belisarius in 545. From the inscriptions, nearly 200 in number, an idea of the im- portance of the town may be gained. Among them are a group of cippi found on the site of a sacred grove of the matrons of Pisaurum, bearing dedications to various deities, and belonging probably to the date of the foundation of the colony. There are some remains of the town walls, and an ancient bridge over the Foglia. It was, like Ariminum, 'a considerable place for the manufacture of bricks and pottery, though the factories cannot always be precisely localized.

PISCES (the fishes), in astronomy, the twelfth sign of the zodiac (q.v.), represented by two fishes tied together by their tails and denoted by the symbol }{. It is also a constellation, mentioned by Eudoxus (4th century B.c.)and Aratus (3rd century B.C.); and catalogued by Ptolemy (38 stars), Tycho Brahe (36) and Hevelius (39). In Greek legend Aphrodite and Eros, while on the banks of the Euphrates, were surprised by Typhon, and sought safety by jumping into the water, where they were changed into two fishes. This fable, however, as in many other similar cases, is probably nothing more than an adaptation of an older Egyptian tale, a Piscium, is a fine double star of magnitude 3 and 4; 35 Piscium, is another double star, the components being a white star of the 6th magnitude and a purplish star of

the 8th magnitude.

Piscis australis, the southern fish, is a constellation of the southern hemisphere, mentioned by Eudoxus and Aratus, and cata- logued by Ptolemy, who described 18 stars. The most important star is a Piscis australis or Fomalhaut, a star of the first magnitude.

Piscis volans, the flying fish, is a new constellation introduced by John Bayer in 1603.

PISCICULTURE (from Lat. piscis, fish). The species of fish which can be kept successfully in captivity throughout their lives from egg to adult is exceedingly limited in number. The various breeds of goldfish are familiar examples, but the carp is almost the only food-fish capable of similar domestication. Various other food-fishes, both marine and fresh-water, can be kept in ponds for longer or shorter periods, but refuse to breed, while in other cases the fry obtained from captive breeders will not develop. Consequently there are two main types of pisci- culture to be distinguished: (1) the rearing in confinement of young fishes to an edible stage, and (2) the stocking of natural waters with eggs or fry from captured breeders.

Fish-rearing. — Of the first type of pisciculture there are few examples of commercial importance. The pond-culture of carp is an important industry in China and Germany, and has been introduced with some success in the United States, but in England it has long fallen out of use, and is not likely to be revived so long as fresh fish can be obtained and distributed so readily as is now the case. Other examples are to be found in the cultivation of the lagoons of the Adriatic, and of the salt- marshes of various parts of France. Here, as in ancient Greece and Rome, it is the practice to admit young fish from the sea by sluices, into artificial enclosures or " viviers," and to keep them there until they are large enough to be used. An in- teresting modification of this method of cultivation has been introduced into Denmark. The entrances to the inner lagoons of the Limf jord are naturally blocked against the immigration of flatfish by dense growths of sea-grass (Zostera), although the outer lagoons are annually invaded by large numbers of small plaice from the North Sea. The fishermen of the dis- trict consequently combined to defray the expenses of trans- planting large numbers of small plaice from the outer waters to the inner lagoons, where they were found to thrive far better than in their natural habitat. The explanation has been shown by Dr Petersen to be due to the abundance of food, coupled with the lack of overcrowding of the

small fish. This trans- plantation of plaice in Denmark has been annually repeated for several years with the most successful results, and a suitable subvention to the cost is now an annual charge upon the govern- ment funds.

As a result of the international North Sea fishery investigations, it has been proposed to extend the same principle for the develop- ment of the deep sea fishery in the neighbourhood of the Dogger Bank. Experiments with labelled plaice, carried out in 1904 by the Marine Biological Association, showed that small plaice trans- planted to the Dogger Bank in spring grew three times as rapidly as those on the inshore grounds, and the same result, with in- significant variations, has been obtained by similar experiments in each succeeding year. In this case the deep water round the Dogger Bank acts as a barrier to the emigration of the small plaice from the shores. It has consequently been proposed that the small plaice should be transplanted in. millions to the Bank by well vessels every spring. It is claimed, as a further result of the experiments, that from May to October the young fish would be practically free on the shallow part of the Bank from the risk of premature capture by trawlers, and that the increased value of the fish, consequent upon their phenomenal growth-rate, would greatly exceed the cost of transplantation.

The methods of oyster- and mussel-culture are similar in principle to those just described. A breeding stock is maintained to supply the ground, or the " collectors," with spat, and the latter, when sufficiently grown, is then transplanted to the most favourable feeding-grounds, care being taken to avoid the local over-crowding which is so commonly observed among shell-fish under natural conditions.

Fish-hatching. — The second, and more familiar, type of pisciculture is that known as fish-hatching, with which must be associated the various methods of artificial propagation.

The fertilization of the spawn is very easily effected. The eggs are collected either by " stripping " them from the mature adult immediately after capture, or by keeping the adults alive until they are ready to spawn, and then stripping them or by keeping them in reservoirs of sea-water and allowing them to spawn of their own accord. In the two former cases a little milt is allowed to fall from a male fish into a vessel con- taining a small quantity of water — fresh or salt as required — and the eggs are pressed from the female fish into the same vessel. In fresh-water culture the eggs thus fertilized may be at once distributed to the waters to be stocked, or they may be kept in special receptacles provided with a suitable stream of water until the fry are hatched, and then distributed, or again they may be reared in the hatchery for several months until the fry are active and

hardy.

The hatching of eggs, whether of fresh-water or salt-water fishes, presents no serious difficulties, if suitable apparatus is employed; but the rearing of fry to an advanced stage, without serious losses, is less easy, and in the case of sea-fishes with pelagic eggs, the larvae of which are exceedingly small and

tender, is still an unsolved problem, although recent work, carried out at the Plymouth laboratory of the Marine Bio- logical Association, is at least promising. It has been found possible to grow pure cultures of various diatoms, and by feeding these to delicate larvae kept in sterilized sea-water, great suc- cesses have been attained. In fresh-water culture little advan- tage, if any, has been found to result from artificial hatching, unless this is followed by a successful period of rearing. Thus the Howietown Fishery Company recommend their customers to stock their streams either with unhatched ova or with three- month-old fry. Their experience is " that there is no half-way house between ova sown in redds and three-month-old fry. Younger fry may do, but only where ova would do as well, and at half the cost." In marine hatcheries, on the other hand, it is the invariable practice to hatch the eggs, although the fry have to be put into the sea at the most critical period of their lives. If it is a risky matter to plant out the robust young fry of trout under an age of three months, it would seem to be an infinitely more speculative proceeding to plant out the delicate week-old larvae of sea-fishes in an environment which teems with predaceous enemies.

Objects and Utility of Fish-hatcheries. — The earlier advocates of artificial propagation and fish-hatching seem to have been under the impression that the thousands of fry resulting from a single act of artificial propagation meant a corresponding increase in the numbers of edible fish when once they had been deposited in suitable waters; and also that artificial fertilization ensured a greater proportion of fertilized eggs than the natural process. For the second of these propositions there is no evi- dence, while the first proposition is now everywhere discredited. It is recognized that the great fertility of fishes is nature's provision to meet a high mortality — greater in sea-fishes with minute pelagic eggs than in fresh-water fishes with larger-yolked eggs, partly because of the greater risks of marine pelagic life, and partly because of the greater delicacy of marine larvae at the time of hatching. Artificially propagated eggs and fry after planting must submit to the same mortality as the other eggs and fry around them. Consequently it is useless to plant out eggs or fry unless in numbers sufficiently great to appre- ciably increase the stock of eggs and fry already existing.

It is this, combined always with the suitability of the ex- ternal conditions,

which accounts for the success of the best known experiments of American pisciculturists. The artifi- cially propagated eggs of the shad from the eastern rivers of the United States were planted in those of California and the Mississippi, where the species did not naturally occur. The conditions were suitable, and the species became at once accli- matized. Similarly reservoirs and streams can be stocked with various kinds of fish not previously present. But in the case of indigenous species the breeding stock must be very seriously reduced before the addition of the eggs or fry of a few score or hundreds of fish can appreciably increase the local stock.

In the case of sea-fishes it is becoming increasingly recog- nized that the millions of cod fry which are annually turned out of the American, Newfoundland and Norwegian hatcheries are but an insignificant fraction of the billions of fry which are naturally produced. A single female cod liberates, according to its size, from one to five million eggs in a single season. Yet the annual output of fry from each of these hatcheries rarely exceeds 200 millions, i.e. the natural product of a few hundred cod at most. In Britain marine hatcheries have been estab- lished by the Fishery Board for Scotland in the bay of Nigg, near Aberdeen, by the Lancashire Sea Fisheries Committee at Peel, and by the government of the Isle of Man at Port Erin. These establishments have been principally devoted to the hatching of the eggs of plaice. But again the maximum out- put of fry from any one of these establishments has not exceeded 40 millions in any single year. As a single female plaice produces about 200,000 eggs per annum, this output does not exceed the natural produce of a few hundred fish. Under these circumstances the probable utility of the operations muld be

admitted only if the fry were sedentary and could be planted in suitable localities where young fish were naturally scarce. But the fry drift with the currents as helplessly as the eggs, and the a priori objections to the utility of the operations have in no case been met by evidence of tangible results. The plaice fry hatched in the Scottish establishment have been dis- tributed for many years in the waters of Loch Fyne. Yet in this area, according to the investigations of Mr Williamson {Report of the Scottish Fishery Board for 1898), nearly 500 millions of plaice eggs are naturally produced in one spawning season. Evidence is still lacking as to whether the 20 to 30 million fry annually added from the hatchery have appre- ciably increased the quantities of young plaice on the surround- ing shores. Supposing this could be established, the question would still remain whether the same result could not be obtained at far less expense by dispensing with the hatching operations and distributing the eggs directly after fertilization.

In the United States the utility of the cod-hatching opera- tions has been constantly asserted by representatives of the Bureau of Fisheries, but practically the only evidence adduced is the occasional appearance of unusual numbers of cod in the neighbourhood. It has not been established that the fluctua- tions in the local cod fisheries bear any fixed relation to the ex- tent of the hatching operations, while the earlier reports of the Commissioners of Fisheries contain evidence that similar fluctu- ations occurred before the hatching of " fish commission cod " had begun.

The situation may be summed up in the words of Mr Fryer, H.M. Superintending Inspector of Fisheries, who critically examined the evidence bearing upon the operations of the Newfoundland Hatchery at Dildo (Reports x.xii. of the Inspectors of Sea Fisheries, E. & W.): "Where the estab lishment of a hatchery, even on the smallest scale, is followed by an increased take of fish, there is a tendency to connect the two as cause and effect on insufficient evidence, and without any regard to the many conditions which have always led to fluctuations in the case of any particular kind of fish."

The most exact investigations bearing upon this problem are those which have been recently undertaken in Norway in con- nexion with the cod-hatching operations at Arendal under Captain Dannevig. Four fjords were selected in the south coast of Norway in proximity to the hatchery, and the usual number of fry (10-30 millions) were planted in the spring in alternate fjords, leaving the intermediate fjords unsupplied. The relative number of young cod in the various fjords was then carefully investigated throughout the succeeding summer and autumn months. It was found that there was no relation between the abundance of young fish and the presence or ab- sence of " artificial " fry. In 1904, 2>5 million fry were

planted in Sondelefjord and young fish were exceptionally abundant in the following autumn (three times as abundant as in 1903 when no fry were planted). But their abundance was equally striking in other fjords in which no fry had been planted, while in 1905 all the fjords were deficient in young cod whether they had been planted with fry from the hatchery or not.

For a summary of these investigations see papers on " Artificial Fish-hatching in Norway," by Captain Dannevig and Mr Dahl, in the Report of the Lancashire Sea Fisheries Laboratory for 1906 (Liverpool, 1907).

It would thus seem clear that the attempts hitherto made to increase the supply of sea-fish by artificial hatching have been unsuccessful. The experience gained has doubtless not been wasted, but the direction to be taken by future work is plain. The energy and money devoted to hatching operations should be diverted to the serious attempt to discover a means of rearing on a large scale the just-hatched fry of the more sedentary species to a sturdy adolescence. When that has been done (it has been achieved by the present writer in the case of the sea fish Coitus with demersal eggs,) it would be possible to deposit the young fish in suitable localities on a large scale, with a reasonable prospect of influencing the local abundance of the species of fish in question.

For further details, see J. T. Cunningham, Natural History of the Marketable Marine Fishes of the British Islands (London, 1896); A Manual of Fish-Culture (Washington, 1897); Rochd, La Culture des mers (Paris, 1898); W. Garstang, Experiments on the Trans- plantation of Marked Plaice (First Report of the North Sea Fisheries Investigation Committee, 1905). (W. Ga.)

PISCINA, a Latin word first applied to a fish-pond, and later used for any pool of water for bathing, &c, either natural or artificial, and also for a tank or reservoir. In ecclesiastical usage the term was given to a shallow stone basin (the French cuvette) placed near the altar in a church, with drains to take away the water used in the ablutions at the mass. " Piscinae " seem at first to have been mere cups or small basins, supported on perforated stems, placed close to the wall, and afterwards to have been recessed therein and covered with niche heads, which often contained shelves to serve as aumbries. They are rare in England till the 13th century, after which there is scarcely an altar without one. They frequently take the form of a double niche, with a shaft between the arched heads, which are often filled with elaborate tracing.

PISEK, a town of Bohemia, 55 m. S. of Prague by rail. Pop. (1900), 13,608, mostly Czech. It lies on the right bank of the Wottawa, which is

*here crossed by an interesting stone bridge of great antiquity. The most prominent buildings are the church of the Nativity, the town-hall, and a castle dating from the 1 5th*century. The industries are iron and brass founding, brewing, and the manufacture of shoes, paper, cement and Turkish fezes. Feldspar, quartz and granite are quarried in the environs. The name of Pisek, which is the Czech for sand, is said to be derived from the gold-washing formerly carried on in the bed of the Wottawa (1571-1621).*

In 1 619 it was captured by the imperialist general, Karl Bonaventura de Longueval, Graf von Buquoy, and suffered so severely that the citizens opened their gates to his opponent, Ernst von Mansfeld. This was punished in October of the following year, when Duke Maximilian of Bavaria sacked the town and put nearly all the inhabitants to the sword. Pisek was one of the chief centres of the Hussites. It was occupied by the French in 174 1.

PISIDIA, in ancient geography, the name given to a country in the south of Asia Minor, immediately north of Pamphylia by which it was separated from the Mediterranean, while it was bounded on the N. by Phrygia, on the E. by Lycaonia, Isauria and Cilicia, and on the W. and S.W. by Lycia and a part of Phrygia. It was a rugged and mountainous dis- trict, comprising some of the loftiest portions of the great range of Mt Taurus, together with the offshoots of the same chain towards the central table-land of Phrygia. Such a region was naturally occupied from a very early period by wild and lawless races of mountaineers, who were very imperfectly reduced to subjection by the powers that successively established their dominion in Asia Minor. The Pisidians are not mentioned by Herodotus, either among the nations that were subdued by Croesus, or among those that furnished contingents to the army of Xerxes, and the first mention of them in history occurs in the Anabasis of Xenophon, when they furnished a pretext to the younger Cyrus for levying the army with which he designed to subvert his brother's throne, while he pretended only to put down the Pisidians who were continually harassing the neigh- bouring nations by their lawless forays (Anab. i. 1, n; ii. 1, 4, &c). They are afterwards mentioned frequently by later writers among the inland nations of Asia Minor, and assume a more prominent part in the history of Alexander the Great, to whose march through their country they opposed a deter- mined resistance. In Strabo's time they had passed under the Roman dominion, though still governed by their own petty chiefs and retaining to a considerable extent their predatory habits (giving rise to such wars as that carried on by Quirinius, about 8-6 B.C.).

The boundaries of Pisidia, like those of most of the inland provinces or regions of Asia Minor, were not clearly defined, and appear to have fluctuated at different times. This was especially the case on the side of

Lycia, where the upland

district of Milyas was sometimes included in Pisidia, at other times assigned to Lycia. Some writers, indeed, considered the Pisidians as the same people with the Milyans, while others regarded them as descendants of the Solymi, but Strabo speaks of the language of the Pisidians as distinct from that of the Solymi, as well as from that of the Lydians. The whole of Pisidia is an elevated region of table-lands or upland valleys in the midst of the ranges of Mt Taurus which descends abruptly on the side of Pamphylia. It contains several small lakes, and two of large size, Bey-Sheher Lake, the ancient Karalis, and the double lake now called the Egerdir Geul, of which the ancient came was Limnai. The latter is a fresh-water lake of about 30 m. in length, situated in the north of Pisidia on the frontier of Phrygia, at an elevation of 3007 ft. Karalis is a larger body, also of fresh water, and at a distinctly higher level above the sea. The only rivers of importance are the Cestrus and the Eurymedon, both of which take their rise in the highest ranges of Mt Taurus, and flow down through deep and narrow valleys to the plain of Pamphylia, which they traverse on their way to the sea.

Notwithstanding its rugged and mountainous character, Pisidia contained in ancient times several considerable towns, the ruins of which have been brought to light by the re- searches of recent travellers (Arundell, Hamilton, Daniell, G. Hirschfeld, Radet, Sterrett, Lanckoronski, Ramsay, &c), and show them to have attained under the Roman Empire to a degree of opulence and prosperity far beyond what we should have looked for in a country of predatory mountaineers. The most important of them are Termessus, near the frontier of Lycia, a strong fortress in a position of great natural strength and commanding one of the principal passes into Pamphylia; Cremna, another mountain fortress, north of the preceding, impending over the valley of the Cestrus; Sagalassus, a little farther north, a large town in a strong position, the ruins of which are among the most remarkable in Asia Minor; Selge, on the right bank of the Eurymedon, surrounded by rugged moun- tains, notwithstanding which it was in Strabo's time a large and opulent city; and Antioch, known for distinction's sake as Antioch of Pisidia, and celebrated for the visit of St Paul. This was situated in the extreme north-east of the district imme- diately on the frontier of Phrygia, between Lake Egerdir and the range of the Sultan Dagh and was reckoned in the Greek and earlier Roman period, e.g. by Strabo, as a city of Phrygia.

Besides these there were situated in the rugged mountain tract west of the

Cestrus Cretopolis, Olbasa, Pogla, Isinda, Etenna and Comama. Pednelissus was in the upper valley of the Eurymedon above Selge. The only place in the district at the present day deserving to be called a town is Isbarta, the residence of a pasha; it stands 'at the northern foot of the main mass of Mt Taurus, looking over a wide and fertile plain which extends up to the northern chain of Taurus. North of this and immediately on the borders of Phrygia stood Apollonia, called also Mordiaeum. Large estates in Pisidia and the adjoining parts of Phrygia belonged to the Roman emperors; and their administration has been investigated by Ramsay and others.

We have no clue to the ethnic character and relations of the Pisidians, except that we learn from Strabo that they were distinct from the neighbouring Solymi, who were probably a Semitic race, but we find mention at an early period in these mountain districts of various other tribes, as the Cabali, Milyans, &c, of all which, as well as the neighbouring Isaurians and Lycaonians, the origin is wholly unknown, and the absence of monuments of their languages must remain so. A few short Pisidian inscriptions have been published by Ramsay in Revue des etudes anciennes (1895, PP- 353~362). No inscriptions in these other languages are known. (W. M. Ra.)

PISO, the name of a distinguished Roman plebeian family of the Calpurnian gens which continued in existence till the end of the 2nd century a.d. Nearly fifty of its members were prominent in Roman history, but the following deserve particular mention.

1. Lucius Calpurnius Piso Caesoninus, Roman statesman, was the father-in-law of Julius Caesar. In 58 B.C., when consul, he and his colleague Aulus Gabinius entered into a compact with P. Clodius, with the object of getting Cicero out of the way. Psio's reward was the province of Macedonia, which he adminis- tered from 57 to the beginning of 55, when he was recalled, perhaps in consequence of the violent attack made upon him by Cicero in the senate in his speech De provinciis consularibus. On his return Piso addressed the senate in his defence, and Cicero replied with the coarse and exaggerated invective known as In Pisonem. Piso issued a pamphlet by way of rejoinder, and there the matter dropped, Cicero being afraid to bring the father-in-law of Caesar to trial. At the outbreak of the civil war Piso offered his services as mediator, but when Caesar marched upon Rome he left the city by way of protest. He did not, however, definitely declare for Pompey, but remained neutral, without forfeiting the respect of Caesar. After the murder of the dictator he insisted on the provisions of his will being strictly carried out, and for a time opposed Antony. Subsequently, however, he became one of his supporters, and is mentioned as taking part in an embassy to Antony's camp at Mutina with the object of bringing about a reconciliation.

2. Lucius Calpurnius Piso, surnamed Frugi (the worthy), Roman statesman and historian, was tribune in 149 B.C. He is known chiefly for his lex Calpurnia repetundarum, which brought about the system of quaestiones perpetuae and a new phase of criminal procedure. As praetor (136) and consul (133) Piso fought against the slaves in Sicily. He energetically opposed GaiusGracchus,especiallyinconnexion'withhis corn law.

See Annalists; C. Cichorius in Pauly-Wissowa's Real encyclo- pddie (1897), vol. iii., pt. 1; H. Peter, Historicorum romanorum reliquiae (1870), vol. i.; Teuffel-Schwabe, Hist, of Roman Lit. (Eng. trans.), § 132, 4. On the lex Calpurnia, Corpus inscr. latinarum, i., No. 198, with Mommsen's commentary; A. H. J. Greenidge, Hist, of Rome, 133-104 b.c. (1904).

3. Gnaeus Calpurnius Piso, Roman statesman, was consul in 7 B.C., and subsequently governor of Spain and proconsul of Africa. In a.d. 17 Tiberius appointed him governor of Syria, with secret instructions to thwart Germanicus, to whom the eastern provinces had been assigned. The indignation of the people at the death of Germanicus, and the suspicion that Piso had poisoned him, forced Tiberius to order an investigation. Piso committed suicide, though it was rumoured that Tiberius, fearing incriminating disclosures, had put him to death.

See H. Schiller, Geschichte der rbmischen Kaiserzeit (1883), vol. i.

4. Gaius Calpurnius Piso, Roman statesman, orator and patron of literature in the 1st century a.d., is known chiefly for his share in the conspiracy of a.d. 65 against Nero (q.v.). He was one of the most popular men in Rome, partly for his skill in poetry and music, partly for his love of luxury and generosity.

It is probably the last-named who is referred to by Cajpurnius Siculus under the name of Meliboeus, and he is the subject of the panegyric De laude Pisonis.

PISSARRO, CAMILLE (1831-1903), French painter, was born at St Thomas in the Danish Antilles, of Jewish parents of Spanish extraction. He went to Paris at the age of twenty, and, as a pupil of Corot, came into close touch with the Barbizon masters. Though at first he devoted himself to subjects of the kind which will ever be associated with the name of Millet, his interest was entirely absorbed by the landscape, and not by the figures. He subsequently fell under the spell of the rising impressionist movement and threw in his lot with Monet and his friends, who were at that time the butt of public ridicule. Like Monet, he made sunlight, and the effect of sunlight on the objects of nature, the chief subjects of his paintings, whether

in the country or on the Paris boulevards. About 1885 he took up the laboriously scientific method of the pointiHists, but after a few years of these experiments he returned to a broader and more attractive manner. Indeed, in the closing years of his life he produced some of his finest paintings, in which he set down with admirable truth the peculiar atmosphere and colour and teeming life of the boulevards, streets and bridges of Paris and Rouen. He died in Paris in 1903.

Pissarro is represented in the Caillebotte room at the Luxem- bourg, and in almost every collection of impressionist paintings. A number of his finest works are in the collection of M. Durand- Ruel in Paris.

PISTACHIO NUT, the fruit of Pistacia vera (natural order Anacardiaccae), a small tree which is a native of Syria and generally cultivated in the Mediterranean region. Although a delicious nut and much prized by the Greeks and other Eastern nations, it is not well known in Britain. It is not so large as a hazel nut, but is rather longer and much thinner, and the shell is covered with a somewhat wrinkled skin. The pistachio nut is the species named in Gen. xliii. n (Heb. 1 9 a, At. botm) as forming part of the present which Joseph's brethren took with them from Canaan, and in Egypt it is still often placed along with sweetmeats and the like in presents of courtesy. The small nut of Pistacia Lentiscus, not larger than a cherry stone, also comes from Smyrna, Constantinople and Greece. P. Lentiscus is the mastic tree, a native of the Mediterranean region, forming a shrub or small tree with evergreen pinnately- compound leaves with a winged stalk. " Mastic " (from maslicare, to chew) is an aromatic resinous exudation obtained by making incisions in the bark. It is chiefly produced in Asia Minor and is used by the Turks as a chewing gum. It is also used as a varnish for pictures. P. Terebinthus, the Cyprus turpentine tree, a native of southern Europe, Asia Minor and North Africa, yields turpentine from incisions in the trunk. A gall is produced on this tree, which is used in dyeing and tanning. PISTIL, a term in botany for the female or seed-bearing organ of a flower (q.v.). The Lat. pistillum (diminutive from pinsere, pistum, to pound), a pestle, a club-headed instrument used for crushing or braying substances in a mortar (q.v.), was taken as the name for this organ from its similarity in shape, and thence adapted in Fr. pistil about the middle of the 18th century. In its complete form a pistil consists of three parts — ovary, at the base, containing the bodies which become seeds, style (Gr. orDXos, pillar), and stigma (Gr. ariy/xa, mark, otiˆuv, to brand), the part which in impregnation receives the pollen.

PISTOIA, or Pistoja (anc. Pistoriae), a town and episcopal see of Tuscany, Italy, in the province of Florence, from which it is 21 m. N.W. by rail. Pop. (1906), 27,127 (town); 68,131 (commune). It is situated on a slight eminence (210 ft.) near the Ombrone, one of the tributaries of the Arno. It is on the site of the Roman Pistoriae, which is hardly mentioned in ancient times, except for the destruction of Catiline's forces and the slaughter of their leader near it in 62 B.C., and as a station on the road between Florentia and Luca; and earlier still by Plautus, but only with jesting allusion to the similarity of the name to the word pistor (baker). Hardly any inscriptions of the ancient town have been found; but excavations in 1902 (see G. Pellegrini in Notizie degli Scavi, 1904, p. 241) in the Piazzo del Duomo led to the discovery of a large private house, which belonged to the end of the 1st century B.C. Some mosaic pavements were found, belonging perhaps to the 3rd century a.d., while the hous.e appears to have fallen into ruin at the beginning of the 5th. Remains of four subsequent periods were discovered above it. It was found that the tradition that the cathedral occupied the site of a temple of Mars was ground- less; for the house appears to have extended under it. Ammi- anus Marcellinus (5th century) mentions Pistoriae as a city of Tuscia Annonaria. During the middle ages Pistoia was at times a dangerous enemy to Florence, and the scene of constant conflicts between the Guelphs and Ghibellines; it was there that the great party struggle took place which resulted in the creation of the Bianchi and Neri factions (see Dante, Inferno, xxiv. 121 to end). In 1302-06 it was besieged and eventually taken by the armies of Florence and Lucca, and in 1325 it became subject to Castruccio of Lucca. In 13 51 it was obliged to surrender to Florence, and thenceforth shared its fate.

The city is still surrounded by walls, dating from shortly after the siege of 1302-06; while two inner lines of streets represent two earlier and inner lines of wall. In the early development of architecture and sculpture Pistoia played a very important

part; these arts, as they existed in Tuscany before the time of Niccolaˆ Pisano, can perhaps be better studied in Pistoia than anywhere else; nor is the city less rich in the later works produced by the school of sculptors founded by Niccola. In the 14th century Pistoia possessed a number of the most skilful artists in silver-work, a wonderful specimen of whose powers exists now in the cathedral — the great silver altar and frontal of St James, originally made for the high altar, but now placed in a chapel on the south side. The cathedral is partly of the 1 2th century, with a porch and facade with small arcades— in black and white marble, as is the case with several other churches of Pistoia — but was remodelled in the 13th century, and modernized inside in the worst taste. Besides the silver altar it contains many fine works of sculpture; the chief are the monument of Cino da Pistoia, lawyer and poet, Dante's contemporary (1337), by

Cellino di Nese, surrounded by his scholars, and Verrocchio's finest work in marble, the monument to Cardinal Forteguerra (1474), with a large figure of Christ, surrounded by angels, in high relief. The clay model for it is in the South Kensington Museum. The monument has unfortunately been altered. The octagonal baptistery is by Cellino di Nese (1339). Among the earlier churches the principal is Sant' Andrea, enriched with sculpture, and probably designed by Gruamons and his brother Adeodatus in 1136; in the nave is Giovanni Pisano's magnificent pulpit, imitated from his father's pulpit at Pisa. Other churches of almost equal interest are S. Giovanni Fuorcivitus (so called because it was outside the line of the earliest, pentagonal, enceinte of the middle ages), with one of the long sides elaborately adorned with small arcades in the Pisan style, in black and white marble, also with sculpture by Gruamons (1162) on the facade. Within is a beautiful group of the Visitation by Luca della Robbia. There is also a fine pulpit by Fra Guglielmo dell' Agnello of Pisa (1270). S. Bartolomeo in Pantano is an interesting basilica of 1167. San Francesco al Prato is a fine church of the end of the 13th century with interesting frescoes of the school of Giotto. San Domenico, a noble church, begun in 1294, contains the beautiful tomb of Filippo Lazari by Bernardo and Antonio Rossellino (1462-1468). In addition to its fine churches, Pistoia contains many noble palaces and public buildings. The Palazzo del Commune and the Palazzo Pretorio, once the residence of the podesta, are both fine specimens of 14th-century domestic architecture, in good preservation. The quadrangle of the latter contains many well-painted armorial bearings of the podestas. The Ospedale del Ceppo, built originally in the 13th century, but remodelled in the 15th, is remarkable for the reliefs in enamelled and coloured terra-cotta with which its exterior is richly decorated. Besides various medallions, there is a frieze of figures in high relief extending along the whole front, over its open arcade. The reliefs consist of a series of groups representing the Seven Works of Mercy and other figures; these were executed by Giovanni Delia Robbia between 1514 and 1525, and, though not equal to the best work of Luca and Andrea, are yet very fine in conception and model- ling, and extremely rich in their general decorative effect. The last on the right was added in 1 585 by Paladini.

The industries of Pistoia include iron and steel works, especi- ally manufactures of glass, silk, macaroni, woollens, olive oil, ropes, paper, vehicles and fire-arms. The word "pistol" is derived (apparently through pistolese, a dagger — dagger and pistol being both small arms) from Pistoia, where that weapon was largely manufactured in the middle ages.

PISTOIA, SYNOD OF, a diocesan synod held in 1786 under the presidency of Scipione de' Ricci (1741-1810), bishop of Pistoia, and the patronage of Leopold, grand-duke of Tuscany, with a view to preparing the ground for a national council and a reform of the Tuscan Church. On the 26th of

January the grand-duke issued a circular letter to the Tuscan bishops suggesting certain reforms, especially in the matter of the restoration of the 1 authority of diocesan synods, the purging of the missals and breviaries of legends, the assertion of episcopal as against papal authority, the curtailing of the privileges of the monastic orders, and the better education of the clergy.

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PISTOL

In spite of the hostile attitude of the great majority of the bishops, Bishop de' Ricci issued on the 31st of July a summons to a diocesan synod, which was solemnly opened on the 18th of September. It was attended by 233 beneficed secular and 13 regular priests, and decided with practical unanimity on a series of decrees which, had it been possible to carry them into effect, would have involved a drastic reform of the Church on the lines advocated by " Febronius " (see Febronianism) .

The first decree (Decretum de fide et ecclesia) declared that the Catholic Church has no right to introduce new dogmas, but only to preserve in its original purity the faith once delivered by Christ to His apostles, and is infallible only so tar as it conforms to Holy Scripture and true tradition; the Church, moreover is a purely spiritual body and has no authority in things secular. Other decrees denounced the abuse of indulgences, of festivals of saints, and of processions and suggested reforms; others again enjoined the closing of shops on Sunday during divine service, the issue of service-books with parallel translations in the vernacular, and recommended the abolition of all monastic orders except that of St Benedict, the rules of which were to be brought into harmony with modern ideas; nuns were to be forbidden to take the vows before the age of 40. The last decree proposed the convocation of a national council.

These decrees were issued together with a pastoral letter of Bishop de' Ricci, and were warmly approved by the grand-duke, at whose instance a national synod of the Tuscan bishops met at Florence on the 23rd of April 1787. The temper of this assembly was, however, wholly different. The bishops refused to allow a voice to any not of their own order, and in the end the decrees of Pistoia were supported by a minority of only three. They were finally condemned at Rome by the bull Auctorem fidei of the 28th of August 1794. De' Ricci, deprived of the personal support of the grand-duke (now the emperor Leopold I.), exposed to pressure from Rome, and threatened with mob violence as a suspected destroyer of holy relics, resigned his see in 1 791, and lived in Florence as a private gentleman until his death in 1810. In May 1805, on the return of Pope Pius VII. from

Paris, he had signed an act of submission to the papal decision of 1794.

De' Ricci's own memoirs, Memorie di Scipione de' Ricci, vescovo di Prato e Pistoia, edited by Antonio Galli, were published at Florence in 2 vols, in 1865. Besides this his letters to Antonio Marini were published by Cesare Guasti at Prato in 1857; these were promptly put on the Index. See also De Potter, Vie de Scipion de' Ricci (3 vols., Brussels, 1825), based on a MS. life and a MS. account of the synod placed on the Index in 1823. There are many documents in Zobi, Storia civile delta Toscana, vols. ii. and iii. (Florence, 1856). The acts of the synod of Pistoia were published in Italian and Latin at Pavia in 1788.

PISTOL, a small fire-arm designed for quick work and personal protection at close quarters, and for use in one hand. It was originally made as a single and also double-barrelled smooth bore muzzle-loader, involving no departure in principle from the

History. — Pistols are understood to have been made for the first time at Pistoia in Italy, whence they receive their name. Caminelleo Vitelli, who flourished in 1540, is the accredited inventor. The first pistols, in the 16th century," had short single barrels and heavy butts, nearly at right angles to the barrel. Shortly afterwards the pattern changed, the butts being lengthened out almost in a line with the barrels. These early pistols 1 were usually fitted with the wheel-lock (see Gun). Short, heavy pistols, called " daggs," were in common use about the middle of the 17th century, with butts of ivory, bone, hard wood or metal. A chiselled Italian dagg of 1650, for example, had a slightly bell-nosed barrel of about 8 in. in length and 14 bore. The German wheel-lock military pistols used by the Reiters, and those made for nobles and gentlemen, were profusely and beautifully ornamented. Pistols with metal hafts were common in the 16th and 17th centuries, many beautiful specimens of which, silver-mounted, were made in Edinburgh and used by Highlanders. Duelling, when in vogue, caused the production of specially accurate and well-made single-barrelled pistols, reliable at twenty paces. The pattern of this pistol seldom varied, its accuracy at short range equalling that of more modern ones, the principle of a heavy bullet and light charge of powder being employed. The first double- barrelled pistols were very bulky weapons made with the barrels laid alongside one another, necessitating two locks and two hammers. There was also the "over and under" pistol, one barrel being laid over the other. This was a more portable weapon, only requiring one lock and hammer, the second barrel being turned round by hand, after the first had been fired, or, as an alternative, the flash-hole being adjusted to the second barrel by a key. These pistols were first made with flint and steel locks and subsequently for percussion caps. Double " over and under " pistols were also made with a trigger mechanism that served to discharge both barrels in

turn.

Revolvers. — A revolver is a single-barrelled pistol with a revolving breech containing several chambers for the cartridges, thus enabling successive shots to be rapidly fired from the same weapon without reloading. The ordinary pistol is now, and has been for many years past, superseded by the revolver. The first revolver, fired with the percussion cap, was made with the whole of the barrels, six, seven or eight, revolving in one piece, and was known as the " pepper-box." It was " single action," i.e. the hammer was raised and the barrels revolved by the pull of the trigger. This weapon was cumbrous and no accurate aim could be taken with it owing chiefly to the strength and resistance of the main-spring and the consequent strong pull required on the trigger. The principle of a revolving breech to one barrel, which superseded the " pepper-box," is an old one

in the history of fire-arms, dating from the 16th century. At

■*P INS.*

Fig. 1. — Dagg (Royal United Service Institution).

ordinary fire-arms of the day. With the introduction of revol- vers and breech-loading pistols and the application of " rifling " to musket barrels, came also, in the early half of the 19th century, the rifling of pistol-barrels.

first the breech cylinder was revolved by hand, as in the revolving arquebus or matchlock, a specimen of which is now in the

1 For the use of long heavy pistols by cavalry in the 16th and 17th centuries, see Army: History; and Cavalry.

Tower of London, but this was subsequently improved by introducing geared mechanism, by which the pull of the trigger or the cocking of the hammer, or both, do the work. There exists a pistol of the time of Charles I. which is rotated auto- matically as the hammer is raised.

rapidly fired, if necessary, by the trigger action alone. Many revolvers on the Colt principle were in use during the Crimean War and the Indian Mutiny, and proved of valuable service to British officers.

As rim-fire, pin-fire and central-fire cartridges were succes-

Fig. 2. — Wheel-lock pistol (Royal United Service Institution).

In 1814 a self-acting revolver mechanism of a crude pattern was produced in England. Four years later Collier used a separate spring to rotate the chamber. In 1835, an American, Samuel Colt, produced and patented the first practical revolving pistol, the idea of which was obtained by him, it is stated, from an ancient " revolving " weapon in the Tower of London. The chambers of the first Colt revolver were loaded with powder and bullets from the muzzle end, and each thamber had a nipple that required to be capped. It was the invention of the copper cap that made the Colt revolver possible. Under the old

sively introduced, breech-loading revolvers were constructed to use them. Messrs Smith & Wesson, of Springfield, U.S.A., produced the first metal cartridges for revolvers. Pin-fire cartridges, paper and metallic, were used on the continent of Europe for Lefaucheux and other revolvers, and these and rim- ! fire cartridges are still used for revolvers of small calibre. But since the central-fire cartridge has proved its superiority for guns, its principle has been generally applied to pistol cartridges, at first to the larger bores.

The alteration of the muzzle-loading to the breech-loading

10 INCHES

Fig. 3. — Wheel-lock pistol (Royal United Service Institution).

priming system with exposed powder in a pan the difficulty of separate and effective ignition with the revolving cylinder was almost insuperable.

The first American revolver makers caused the cocking of the hammer to revolve the cylinder, while the English makers effected this by the pull of the trigger. In 1855, Adams of London, and also Tranter of Birmingham, brought out the double-action revolver, in which the revolution of the cylinder could be effected by both these methods. When the revolver is cocked and fired by pressing the trigger, greater rapidity of

chamber in the revolver involved no decided change of type. The original Colt, as a breech-loader, remained practically the same weapon as before, with a changed chamber. A hinged flap uncovered the breech-chamber on the right, and as each chamber reached that point the empty cartridge case was ejected by means of an ejecting-rod carried in a tube attached to the under side of the barrel and kept in place by a spiral spring, and the chamber reloaded. The next improvement was greater ease and rapidity of extraction, obtained first by Thomas's invention of making the barrel and chamber slide

FlG. 4. — Flint-lock pistol (Royal United Service Institution).

fire is obtained than when the hammer is cocked with the thumb, but accuracy is impaired, as the trigger requires a long pull and considerable force in order to compress the mainspring and revolve the cylinder. The double action revolver was, there- fore, a great advance on the single action, enabling the first and also following shots, if desired, to be accurately fired by a moderate pressure of the trigger after the hammer had been cocked by the thumb; or, alternatively, the revolver could be

forward on the frame of the pistol. The extractor, being fast to the pivot, retained the cartridges until the chamber was pushed clear of them. Then the chamber was made to swing on one side, as in the Colt pistol illustrated, enabling all the cartridges to be simultaneously extracted. Finally, self-extracting revol- vers with jointed frames were introduced, in which the dropping of the barrel forces out the extractor as in an ordinary double gun, the extractor acting simultaneously in all the chambers of

the pistol. A spring returns the extractor to its place when the empty cartridge cases have been ejected, and brings the barrel to an angle of about 45°, for convenience in loading. The soundness and rigidity of the weapon depend upon the efficiency of the connexion between the barrels and the standing breech, and a top snap bolt has proved the strongest and handiest with the pistol, as with the shot-gun.

This type of revolver originated with Messrs Smith & Wesson, but they and other gunmakers have greatly improved upon the original model. Between the American pattern and the English, as made by Messrs F. Webley & Son, the chief difference is that in the Smith & Wesson the holding-down bolt or catch is upon the barrel, and it engages with the top of

hammer and trigger when the latch is pushed to the rear for open- ing the cylinder, and does not unlock them until the cylinder is positively closed and is locked by the latch. The cylinder revolves and is supported on a central arbour of the crane (E). The crane fits in a recess in the frame below the barrel and turns on its pivot arm (A). The ejector rod with its spring passes through the centre of the cylinder arbour and is terminated in rear by the ejector with a ratchet (y). Pushing against the front end of the ejector rod will empty the chambers, the cylinder being swung out for loading. The thumb-piece of the latch (j) slides to the rear in the left side of the frame, unlocking the cylinder for opening, but upon closing the

cylinder, the body of the latch firmly enters a recess in the ejector, locking the cylinder in position for firing.

One great disadvantage of revolvers is the escape of gas at the opening between the breech of the barrel and the cylinder.

Fig. 5. — Percussion-lock pistol (Royal United Institution).

the standing breech; whereas in the Webley the bolt is upon the standing breech and grips the extremity of the hinged barrel. Neither mechanism is as strong as could be wished if heavy charges of smokeless nitro-compounds are to be used. This hinged type of revolver is most convenient for use on horseback, as the pistol can be opened, the cartridges extracted and the weapon reloaded with one hand.

The Colt's Double-action Revolver, calibre 38, model 1896, used in the United States army, consists (figs. 7 and 8) of the barrel (B), the cylinder © with six chambers, the frame (F), and the firing mechan ism, all of steel. The muzzle velocity, with a charge of 16 grains of black powder and a bullet of 150 grains of lead, is about 708 ft. per second, giving at 25 yards a penetration of about 5 in. in pine.

The lock mechanism consists of the hammer (h), with its stirrup (r), stirrup pin (p), strut (s), strut pin (i), strut spring (g) ; the trigger {t) ; the rebound lever {I); the hand (a), with the spring (2); the cylinder bolt (b), with its spring (x) ; the locking lever (11); the main spring (m), and rebound lever spring (re). The hammer (h), trigger (t), and rebound lever (/) are pivoted on their respective pins, which are fastened in the left side of the frame. The lower end of the rebound lever spring (n) is secured to the frame and the free end bears under the rear end of the rebound lever so that the latter, when the trigger is released, cams the hammer back to its safety position, and forces the trigger forward. Pressure upon the trigger causes its upper edge to engage the strut, and thereby raises the hammer until nearly in the full-cock position, when the strut will escape from the trigger, and the hammer, under the action of the main-spring, will fall and strike the cartridge. A projection on the upper part of the trigger, working in a slot in the frame, prevents the cylinder from making more than one-sixth of a revolu- tion at a time by entering one of the grooves nearest the rear end of the surface of the cylinder. When the cylinder is swung out of the frame, the parts are arranged to prevent the cocking of the hammer. The cylinder bolt is pivoted on the trigger pin, and its spring, bearing on the rebound lever arm, causes the nose of the bolt to project through a slot in the frame ready to enter one of the rectangular cuts in the cylinder surface. During the first movement of the trigger in cocking the revolver, the nose of the bolt is withdrawn, allowing free rotation of the cylinder. The object of the bolt

is to prevent rotation of the cylinder in trans- portation. The hand is attached by its pivot to the trigger, and, as the latter swings on its pin when the hammer is being cocked, the hand is raised and revolves the cylinder, and also serves to lock the cylinder in position at the time of firing. An abutment on the side plate supports the hand spring in rear. The spring ensures the engagement of the hand with the ratchet (y). The revolver is cocked by hand by withdrawing the hammer by the pressure of the thumb until its full-cock notch engages in the rear sharp corner of the trigger. Pulling the trigger then releases the hammer, allowing its firing pin (/) to move forward and strike the cartridge.

The locking lever is pivoted by its screw in a recess in the left side of the frame, and so connected with the latch that it locks the

Service

Fig. 6. — Pepper-box revolver. '

This efcape corrodes the surrounding parts and also materially diminishes the pressure in the barrel and the consequent velocity of the bullet. In the Nagant revolver, adopted by Russia, this disadvantage has been overcome by em- ploying a long cartridge case which extends beyond the nose of the bullet and bridges the gap between barrel and cylinder as the cylinder is moved forward. A " mitrailleuse " pistol has also been constructed by the Braendlin Armoury Co., Ltd., on the " pepper-box " principle, with fixed barrels, either four or six, arranged in pairs, and a special striking mechanism, in which there is no revolving chamber and no escape of gas at the breech. It gives stronger shooting than a revolver, but is more cum- brous, and has the serious defect that the shock of the dis- charge of one barrel sometimes prematurely fires a second barrel. In 1865, Sharp, an American, patented an invention to remedy the escape of gas, in which the four barrels of the pistol

Figs. 7 and 8. — Colt double-action revolver.

were drilled the full length out of one block of metal. The barrels were slid forward by an under lever to load, and the firing was effected by a revolving head to the hammer, set by the action of cocking the pistol.

About 1878 Messrs Lancaster introduced both two- and four- barrelled hammerless pistols, in which an internal hammer was worked by the pull of the trigger. In all the three weapons

above mentioned, extraction and reloading were slow processes, which made them unsuited for use on horseback.

Hammerless Revolver. — The Smith & Wesson pocket pistol is one of the safest weapons of the size made. There is no

and fires a charge of if drams of powder without unpleasant recoil. The duelling pistol, as made by Gartinne Renette of Paris, is capable of wonderfully accurate shooting, firing a 9 millimetre spherical bullet and about 12 grs. of powder. This

Maker's Name.

Colt

Smith S; Wesson

Webley

Description of Revolver.

New Service

New Army

New Police

New Pocket or Pocket Positive

Police Positive

Double Action

Safety Hammerless Single Action Target . Single Action Bisley model Military and Police

Hand Ejector

British Govt. Mark IV . . " W.G." Army model . "W.G." Target . . . .

Mark III

" W.P." Pocket model . . . R.I.C. No. 1

No. of Shots.

6 6 6 6 6 5 5 6 6 6

7 6 6 6 6 6 6

Calibre.

hammer or equivalent protuberance to catch as the pistol is drawn from the pocket; or to entangle if the weapon falls. An automatic safety bolt, whose length lies half across the palm of the hand, and ensures certainty of freedom at the time of shooting, blocks the action until the pistol is firmly gripped for use.

Breech-loading Pistols. — Although the revolver has for many years practically superseded the pistol, some breech-loading

Fig. 9. — Mauser pistol {Text-book of Small Arms, by permission of the Controller of H. M. Stationery Office).

•45 •38 •32 •32

•38 •32

•32 •3S/-44 •45 •38 •22 •455 •455 •455 •380 •320 •45°/-455

Length

of Barrel.

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In. iof 9l

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i3i

12

61

9i

9i

Weight.

lb

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2 2 2

I I I

OZ.

8

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2

o

5i 12J

%

3i

9

i5i

9f

3 8 10

4

I

14

Cartridge.

Powder Weight.

gr-

40 21

13 12

14

IO

10 20

2ii

5

18 18 18

3 Cor

6

18

Bullet

Weight.

gr.

250

158 98 82

150

146 226 158 40 265 265 265

145

80

265

varieties of pistols are still made — the small pocket pistol, for example, and occasionally the heavy double-barrelled horse pistol. At one time these latter were much used, of -577 bore, as well as the well-known short, large-bore pistol known as the Derringer, usually of -41 calibre. The double horse pistol is now usually made for a 20-bore cartridge and spherical bullet, and weighs about 35 lb. It is a clumsy, but effective weapon,

weapon is far superior in accuracy to a revolver. Single-barrelled pistols, chambered for the -22 or 297/230 calibre cartridges, with a barrel of from 6 to 10 in. in length, are also made, and when fitted with a detachable metal stock form excellent little weapons for target practice.

Automatic Revolver. — The Webley-Fosbery automatic revolver is a weapon of a distinctly new design, in which for the first time the principle of utilizing the recoil of each shot to operate the mechanism is applied to the revolver. In appearance the weapon is very similar to the Webley service model. The simple pressure of the forefinger on the trigger, the pressure being released between each shot, is all that is required to fire the six successive shots of the revolver. It is supplied with a safety bolt worked by a thumb-piece, and Messrs Webley have introduced a clip loader which enables the six chambers to be reloaded at the same time. This weapon has met with considerable success, and is made in two calibres, the -455, 6 shot, 2 lb Sj oz. in weight; and the -38 model, 8 shot, 2 R> 3 oz. in weight.

Automatic Pistols. — These weapons are the latest and most advanced type of pistol, and it is anticipated by experts that they will ultimately supersede the revolver. They are made with one barrel and a magazine, on the principle of the repeating rifle, thus doing away with the escape of gas that takes place in revolvers between the chamber and the barrel.

Automatic pistols are so constructed that the force of the recoil is utilized to open the breech, extract the empty case, cock the pistol, reload the chamber with the top cartridge from the magazine, and close the breech, leaving the pistol ready to fire on again pressing the trigger.

The Mauser " self-loading " pistol (fig. 9) is one of the earliest of the successful automatic weapons. It is usually -300 calibre, 10 shot, with a metal clip loader from which the cartridges are " stripped " into the magazine, weight 2| lb, length of barrel 5 1 in.; bullet 85 grains, initial velocity about 1394 f.s.

The barrel (1) and body (2) are in one piece; the latter contains the bolt (3). The barrel and body slide on the frame (4) ; the 10-shot magazine (5) and the stock are in one piece with, the frame, and the lock frame (6) and lock-work are contained in the rear part of it. The bolt (3), which is square, slides in the body, and is kept pressed up to the chamber by the bolt spring (8) ; the rear end of this bolt spring bears against the block (9). The striker and extractor are contained in the bolt. The bolt is locked by the bolt-lock (10). This is slotted through the centre and fits on to the projection (11) under the body; it is supported at the moment of firing by a projection on the lock frame (12) ; the top of the bolt-lock has two teeth (13), which in the loaded and cocked position fit into two recesses in the bolt, and the bottom of its front end_ [in front of the body attachment (11)] has another tooth (14) which bears on the rocker (15). This rocker is pivoted at its bottom corner. The main-spring (16) bears in front against the rocker, and in rear against the hammer mechanism. The action of the mechanism U

as follows: on pressing the trigger, the trigger nose lifts the lever (18) which is attached to the sear (19), the lifting of the sear allows the main-spring to act backwards on the hammer, which impinges on the striker and fires the cartridge. At this moment the bolt is locked by the two upper teeth (13) of the bolt-lock, which is itself held up by the lock frame projection (13). But, the barrel body and bolt recoiling together fa of an in., the rear end of the bolt-lock (10) is no longer supported, the rocker (15) acting on the

forward tooth (14) pulls down the bolt-lock and its upper teeth, the nose of the bolt-lock falling into the recess just behind the projection (12). Thus the barrel and body come to a standstill and the remaining recoil energy is used in driving back the bolt (now free) and extracting the cartridge case. When this energy is used up the bolt spring (8) reasserts itself, drives the bolt forward and pushes another cartridge into the chamber as in the magazine rifle, and the main-spring, acting on the rocker, pulls up the bolt-lock again and engages the teeth (13) in the bolt, locking it for

10. — Colt automatic

pistol.

the next shot. The releasing of the trigger brings the sear" (19) to its former position, cocking the pistol.

This pistol is usually supplied with a wooden holster which can also be attached to the grip of the pistol and so form a shoulder-stock for long-range shooting. It is sighted from 50 to IOOO yards.

The Colt Automatic Pistol, calibre 38 (fig. 10) consists of four main parts, namely the frame (F), the barrel (B), the slide (S), and the magazine (M). The frame forms, at its rear and lower part, the handle (A), which is hollow, and contains the seat for the maga zine. After being charged with seven cartridges, the magazine is seated from below and held in place by the magazine catch («) which slightly projects from the bottom of the handle. This pro- jection serves to release the magazine from the catch, when it can be readily drawn from the handle for re-charging. In front of the handle is the trigger guard (g), in which the trigger _(<) is found, and in the rear and above the grip the firing mechanism is placed in the part of the frame called the receiver ®. The firing mechanism consists of the hammer (h), the sear (w), the trigger (/), a safety device (a), the main-spring (2) and sear spring (e), the lower part of the latter serving to operate the magazine catch. The top of the receiver extends forward from the handle, and to it the barrel is attached by two short links, one (/) near the front end of the barrel, and the other (0) at its rear end; these links are pivoted to the receiver and also to the barrel, and allow the barrel to swing rear- wards thereon. As both links are of the same length, the rearward movement of the barrel in swinging on these links _ carries the barrel slightly downwards, but keeps its longitudinal axis in parallel positions during all its movements. Below the barrel the receiver forms a tubular seat for the retractor spring ®, which in front is closed by a plug (ii) fastened in the receiver by the lower pivot-pin (j) of the front barrel-link. The upper surface of the receiver and two longitudinal grooves on its sides form the seat for the slide, which is guided thereon in its rearward and forward

movements. The rear part of the slide forms the bolt or breech block (K), and the front part forms a partly tubular cover (s) which encloses the barrel. In the forward part of the receiver is a transverse mortice extending through the retractor spring seat, and transverse re- cesses in the forward part of the slide serve to admit a key (m) which, passing through the sides of the slide and through the mortice, serves to lock the slide to the frame. The retractor spring ®, in its seat in the frame, consists of a spiral spring, the rear end of which rests against the receiver, and the front end of which carries a piston (p). The rear face of the key (m) has a slight recess, and when the key is in its place the front end of the retractor spring rests in this recess, thereby confining the key laterally. The tension of the retractor spring is exerted to force the key and the slide to their forward position. Upon the barrel are provided three transverse ribs (6), and in the interior of the slide are three corresponding recesses. These serve to lock the barrel and the slide firmly together when in their forward position. Between the locking recesses and the bolt, the slide has an opening on its right side for the ejection of the cartridge cases (J), and the bolt is pro- vided with an extractor, a firing pin (/), a firing pin retraction

spring (g), and a firing pin lock (y). This latter is pivoted at the rear end in the top of the slide, and when depressed, locks the firing pin in its retracted position, thus preventing its point from coming in contact with the cartridge primer. When raised, the firing pin lock releases the firing pin, and in this position also serves as the rear sight, being provided on the top with a sighting notch.

The operation of the pistol is as follows: When a charged maga- zine (M) is inserted, the slide (S) is drawn once to -the rear by hand, thereby cocking the hammer (k). In this position of the slide, the carrier © and carrier spring in the magazine raise the topmost cartridge so as to bring it into the path of the bolt (K). On releasing the slide, it, with the bolt, is carried forward by the retractor spring ®, and during this movement the bolt forces the topmost cartridge into the barrel (B). As the slide approaches its forward position the front of the bolt encounters the rear end of the barrel and forces the latter to its forward position. During this forward movement the barrel swings forward and upward on the links (/, 0), and thus the locking ribs (b) on the barrel are carried into the corresponding locking recesses in the slide. The barrel and slide are thereby interlocked, and the pistol ready for firing.

A slight pull on the trigger (/) now serves to move the sear (w) so as to release the hammer (h) and fire a shot. The force of the powder gases driving the bullet from the barrel is exerted rear- wardly against the bolt, and, overcoming the inertia of the slide and the tension of the retractor spring, causes the slide and the barrel to recoil together. After moving

rearwards together, for a distance, enough to ensure the bullet having passed from the barrel, the downward swinging movement of the barrel releases the latter from the slide and stops the barrel in its rearmost position. The momentum of the slide causes the latter to continue its rearward movement, thereby again cocking the hammer and compressing the retractor spring, until, as the slide arrives at its rearmost posi- tion, the empty shell is ejected from the side of the pistol and another cartridge raised in front of the bolt. During the return or forward movement of the slide, caused by the retractor spring, the cartridge is driven into the barrel, and the slide and barrel are interlocked, thus making the pistol ready for another shot. These operations may be continued so long as there are cartridges in the magazine, each discharge requiring only the slight pull on the trigger. The pistol is provided with a safety device (a) which makes it impossible to release the hammer unless the slide and barrel are in their first forward position and interlocked.

In the Borchardt-Leuger pistol (fig. 11) the bolt is solidly supported

at the moment of firing by a toggle joint. The barrel (1 A) and body (1 B) slide in the frame (1 C), the bolt (2) slides in the body and is held up to the breech by the toggle joint 3 and 4 and the pins 5 and 7, which secure the links of the toggle to the body. The centre of pin (6) is below those of the other pins so that the joint cannot bend at the moment of firing. On the rear link (4) there is a swivel (9) which is connected to the recoil spring (10) in the grip. This pistol is fired by a spring striker, like a rifle, instead of by a hammer. The striker is within the bolt ; it is cocked in the recoil position by a claw on the end of the front link (3 A) and held thus when ready to fire by the nose of the trigger sear, these engaging with a pro- jection (8 A) on the side of the striker. The magazine (8 shot) is in the grip. The action is as follows: the first cartridge is loaded from the magazine by pulling back the toggle joint. As soon as the toggle joint is released the recoil spring acts and forces the bolt home, with the cartridge in front of it. On pressing the trigger the barrel and body recoil a little. Then the toggle joint comes

against curved ramps on the sides of the non-recoiling frame and is forced up, so that thereafter the bolt alone recoils (the ejector is similar in principle to that of a rifle). The recoil spring then acts as before on reloading.

Other varieties of the automatic pistol are the ” Mannlicher,” the ” Mars,”

the " Bergmann " and the " Webley." The last, being simple in construction, small and light, weight 18 oz. and length over all only 6J in., may be classed as a pocket pistol.

Qualities of Automatic Pistols.— In reference to the general qualities of automatic pistols, while these weapons have the advantage over revolvers of longer range and greater rapidity of fire and recharging, on the other hand they are necessarily more complicated in their mechanism, which has to do the work of extraction, reloading and cocking that in the revolver is done by hand. A stoppage may occur through a cartridge missing fire, or continuous uncontrolled fire may take place through the trigger spring breaking until the magazine is exhausted. Their action is also to some extent uncertain, as it depends on the recoil of the discharge, which may be affected by variables in the cartridge; also the effective automatic working of the moving parts depends upon their cleanliness and lubrication. As automatic pistols, like revolvers, are intended for personal defence at short range and for sudden use in emergencies, simplicity of mechanism and certainty of action are in their case of paramount importance. There is usually no time to rectify a stoppage or jam, however slight. From a military point of view, therefore, before the revolver is altogether superseded by the automatic pistol, it is most desirable that the latter should be as certain in its action under service conditions as the former. Some automatic pistols, as already stated, are sighted up to 1000 yards, and provided with attachable butts. The practical value of these improvements is open to question, as the sighting of a pistol differs materially when used with and without a butt, and under no circumstances can the accuracy of shooting of a pistol, even with a butt, equal that of a carbine.

The tendency in automatic pistols has been to reduce the bore to •3 in., and increase the muzzle velocity, on the lines of modern small-bore rifles. These, again, would appear to be advantages of minor importance in a weapon intended for use at short range in the field, where a heavy bullet of fairly large diameter, with a moderate muzzle velocity, has a more immediate and paralysing effect, and is therefore, from this point of view, and particularly in savage warfare, preferable to a small projectile of high muzzle velocity. (H. S.-K.)

PISTOLE, the French name given to a Spanish gold coin in use from 1537; it was a double escudo, the gold unit, and was worth 16s. iijd. sterling. The name was also given to the louis d'or of Louis XIII. of France, and to other European gold coins of about the value of the Spanish coin.

PISTON (through Fr. from Ital. pistone or pestone, a great pestle, from Late Lat. pistare, to pound, a frequentative form of classical Lat. pinsere), in the

steam engine, a disk or partition placed inside the cylinder, from end to end of which it moves alternately under the pressure of the steam. By means of the " piston-rod " attached to it this forward and backward motion is communicated to the machinery which the engine is employed to drive, and is in most cases converted into rotary motion by a " connecting-rod," one end of which is jointed to the " cross-head " carried at the end of the piston-rod, while the other turns the crank on the crank-shaft. The piston in gas, oil and air engines has a. similar function, but in a pump, instead of imparting motion, it has motion imparted to it by some prime-mover. In every case the piston must fit the cylinder so accurately that as little as possible of the working fluid, whether it be steam, gas or water, can escape past it, packing of various forms being commonly placed round its periphery in order to secure this fit. In music, the valves which in certain wind instruments, such as the cornet, enable the player to increase the length of the air-column and thus lower the note produced, are known as pistons. (See Valves.)

PIT (0. E. pytt, cognate with Du. put, Ger. Pfutze, &c, all ultimately adaptations of Lat. puteus, well, formed from root pu-, to cleanse, whence purus, clean, pure), a term of wide application for a hole, cavity or excavation in the earth or other

surface ; thus it is applied to the excavations made in the ground for the purpose of extracting minerals, e.g. chalk, gravel or sand, or for carrying on some industry, e.g. tan-pit, saw-pit, or to the group of shafts which form a coal-mine. Roots and other vegetables can be stored in the winter in a pit, and the term is thus transformed to a heap of such vegetables covered with earth or straw. The word is also used of any hollow or depression in a surface, as in the body, the arm-pit, the pit of the stomach, or on the skin, as the scars left by small-pox or chicken-pox. As applied to a portion of a building or construction, the word first appears for an enclosure, often sunk in the ground, in which cock-fighting was carried on, a " cock-pit." It would seem a transference of this usage that gave the common name to that part of the auditorium of a theatre which is on the floor, the French parterre. In the United States a special usage is that of its application to that part of the floor space in an exchange where a particular branch of business is transacted; thus in the Chicago Board of Trade, transactions in the grain trade are carried on in what is known as the " Wheat Pit."

In Scottish legal history there was a baronial privilege which in Latin is termed furca et fossa, "fork (i.e. gallows) and pit"; here the term has usually been taken to refer to the drowning-pit, in which women criminals were put to death ; others take it to refer to an ordeal pit. There is a parallel phrase in M. Dutch, putte ends galghen ; here putte is the pit in which women were buried alive as a penalty.

PITCAIRN, an island in the mid-eastern Pacific Ocean, in 2 S° 3′ S., 130° 6′ W., belonging to Great Britain. It lies south of the Paumotu archipelago, 100 m. from the nearest member of this group. Unlike the majority of the islands in this region, it is without coral reefs, but rises abruptly with steep and rugged cliffs of dark basaltic lava. The extreme elevation is over 2000 ft., and the area 2 sq. m. The soil in the valleys is volcanic and fertile, but the gradual utilization of natural timber increases the liability to drought, as there are no streams. The climate is variable and rainy. Stone axes, remains of carved stone pillars similar to those of Easter Island, and skeletons with a pearl-mussel beneath the head have been found in the island, though it was uninhabited when discovered by Philip Carteret in 1767. Pitcairn was the name of the midshipman who first observed it.

The island was destined to become the scene of a curious social experiment. On the 28th of April 1789 a mutiny broke out on board the " Bounty," then employed by the British government in conveying young bread-fruit trees from Tahiti to the West Indies. The commander, Lieutenant William Bligh, was set adrift in the launch with part of the crew, but managed to make his way to Timor in the Malay Archipelago. The twenty-five mutineers at first all returned to Tahiti. Some remained, and six of these were ultimately court-martialled in England, three being executed in 1792. Meanwhile in 1790 a party consisting of Fletcher Christian, the leader of the mutiny, eight Englishmen, six Polynesian men and twelve Polynesian women had taken possession of Pitcairn Island and burned the " Bounty." Treachery and debauchery filled the first years of the annals of the beautiful island. By 1800 all the men were dead except Alexander Smith, afterwards known as John Adams, who rose to a sense of his responsibility and successfully trained up the youthful generation left in his charge. An American vessel, the " Topaze," discovered the strange colony in 1808; again, by accident, it was visited by the " Briton," Captain Sir F. Staines, and the " Tagus," Captain Pipon, in 181 7; and by the exploring ship " Blossom " in 1825. On the death of John Adams on the 29th of March 1829 George Hunn Nobbs, who had settled at Pitcairn in 1828, was appointed pastor and chief magistrate. Through fear of drought the islanders removed to Tahiti in 1830, but disapproved of both the climate and the morals of this island, and returned to Pitcairn in 1 83 1. Shortly after this an adventurer named Joshua Hill appeared, and, claiming government authority, tyrannized over the islanders till his removal by a British man-of-war in 1838. In 1856 the whole of the islanders — 60 married persons and 134 young men, women and children — were landed on

Norfolk Island, but in 1858 two families chose to return, and their example was afterwards followed by a few others. Visited in 1873 and 1878 the colony was found in excellent order, but by the end of the century it was stated that intermarriage was bringing a deterioration of intellect, morals and energy, and that the islanders would probably drift into imbecility. Later accounts made it appear that this was an exaggeration, although the standard of morality was unquestionably low on the whole.

In religion the islanders are Seventh Day Adventists. " They have adopted an extraordinary patois, derived from the language of the Tahitian women who accompanied the mutineers of the " Bounty " to Pitcairn Island, although most of the adults can speak the English language fairly well " (R. T. Simons, Report, 1905). The island is a British colony by settlement, and is within the jurisdiction of the High Commissioner for the Western Pacific (since 1898). There is a governing body chosen from among the islanders, the constitution of which has been altered more than once owing to internal jealousies, &c. The island produces sweet potatoes, yams, melons, bananas and other fruits, arrowroot and coffee. Goats and chickens run wild. Some trade is carried on with Mangareva in a vessel owned by the islanders. The population is about 1 70.

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PITCAIRNE, ARCHIBALD (1652-1713), Scottish physician, was born at Edinburgh on the 25th of December 1652. After obtaining some classical education at the school of Dalkeith, Pitcairne entered Edinburgh University in 1668, and took his degree of M.A. in 167 1. Having been sent to France for the benefit of his health, he was induced at Paris to begin the study of medicine, and after courses at Edinburgh and Paris he obtained in 1680 the degree of M.D. at Rheims. He began practice at Edinburgh, and in a short time acquired so great a reputation that in 1692 he was appointed professor of medicine at Leiden. Among his pupils were Richard Mead and H. Boerhaave, and both of them attributed much of their skill to what they had learned from Pitcairne. In 1693 Pitcairne returned to Scotland to marry a daughter of Sir Archibald Stevenson, an eminent physician in

Edinburgh. The family objected to her going abroad, so he did not return to Leiden, but settled once more in Edinburgh. He rose to be the first physician in Scotland, and was frequently called into consulta- tion both in England and Holland. Soon after his return to Edin- burgh, feeling the great want of the means of anatomical study, he importuned the town council to permit himself and certain of his medical friends to treat without fee the sick paupers in " Paul's Work," on condition of being allowed to dissect such of the bodies as were unclaimed by their relatives, and therefore had to be buried at the town's expense. Strangely enough this proposal was strongly opposed by the chief surgeons of the place, but ultimately the town council had the good sense to comply with Pitcairne's request, and in this way he may be said to have the credit of laying the foundation of the great Edinburgh school of medicine.

Pitcairne's medical opinions are chiefly contained in a volume of Dissertationes medicae which he published in 1701 (2nd ed. 1 7 13). In these he discusses the application of geometry to physic, the circulation of the blood in the smaller vessels, the difference in the quantity of the blood contained in the lungs of animals in the womb and of the same animals after birth, the motions by which food becomes fit to supply the blood, the question as to inventors in medicine (in which he repels the idea of certain medical discoveries of modern times having been

known to the ancients, especially vindicating for Harvey the discovery of the circulation of the blood, and refuting the view that it was known to Hippocrates), the cure of fevers by evacua- ting medicines, and the effects of acids and alkalis in medicine. Pitcairne was a good classical scholar, and wrote Latin verses, occasionally with something more than mere imitative cleverness and skill. He was supposed to be the author of a comedy, The Assembly, or Scotch Reformation, and of a satirical poem Babel, containing witty sketches of prominent Presbyterian divines of the time, whom, as a loudly avowed Jacobite, he strongly disliked. He was prone to irreverent and ribald jests, and thus gained the reputation of being an unbeliever and an atheist, though he was a professed deist. The stories about his over-indulgence in drink are probably exaggerated. He was repeatedly involved in violent quarrels with his medical brethren and others, and once or twice got into scrapes with the govern- ment on account of his indiscreet political utterances. Among his friends, however, he was evidently well liked, and he is known to have acted with great kindness and generosity to deserving men who needed his help. Thomas Ruddiman, the Scottish scholar, for example, was rescued from a life of obscurity by his encouragement and assistance, and by no one was his memory more gratefully cherished. Mead, too, appears never to have forgotten what he owed to his old teacher at Leiden. A son of Pitcairne's had gone out in the rebellion of 1715, and, having been condemned to death, was saved by the

earnest interposition of Mead with Sir Robert Walpole. He pleaded, very artfully, that if Walpole's health had been bettered by his skill, or if members of the royal family were preserved by his care, it was owing to the instruction he had received from Dr Pitcairne. Pitcairne died in Edinburgh on the 20th of October 1713. He had been a great collector of books, and his library, which is said to have been of considerable value, was, through the influence of Ruddiman, disposed of to Peter the Great of Russia.

PITCH. (1) (O. Eng. pic, an adaptation of Lat. pix, picis, Gr. Trio-era, ixlrro., allied with Gr. ttLtvs, pine-tree, Lat. pinus), the name of various substances of dark colour and of extremely viscid and tenacious consistency when subjected to heat. Strictly the term is applied to the resinous substance obtained as a solid residuum by the distillation of wood-tar (see Tab), or the non-resinous substance similarly produced from Coal-tar (q.v.). The name is also applied to the natural mineral sub- stances, i.e. asphalt or bitumen (qq.v.). (2) A noun of various meanings which are somewhat difficult to connect with the verb from which they apparently must be derived. " To pitch " means primarily to thrust in or fix a stake or other pointed object into the ground, hence to place in a fixed position, set in order, cast or throw, hence to incline or slope. The etymology is obscure, but it appears in Northern dialects as " pick," of which it may be a variant ; there is some difficulty in connecting this form with " pick," variant of " pike " (q.v.). PITCH, MUSICAL. The pitch of a musical sound is aurally defined by its absolute position in the scale and by its relative position with regard to other musical sounds. It is precisely defined by a vibration number recording the frequency of the pulsations of a tense string, a column of air, or other vibrator, in a second of time. In Great Britain and America the complete vibration to and fro (swing both ways of a pendulum) is taken as the unit; elsewhere the vibration in one direction only (swing one way of the pendulum). The only official standard is the French, dating from 1859, preserved by a tuning-fork vibrating 870-9 (double vib. 43S – 4S) at a temperature of 15 Centigrade (59° Fahr.) in a second. The vibration number stated in the edict establishing the Diapason Normal is 870 (435), which for comparison will be here adhered to. The natural basis for a standard musical pitch is the voice, particularly the male voice, which has been of greater importance historically. There is no reason to suppose the human voice has varied, during the period of which we have evidence, more than other physical attributes. The only difference to be reckoned with may be in recent tendencies of solo vocalists to sing for effect, and so to

extend the compass of the voice upwards. Otherwise we may assume no disturbing alteration has taken place for more than 2000 years in its position and extent. Vibrations increase in rapidity as a note rises and decrease as jt falls. Any note may be a pitch note; for orchestras custom has settled upon a 1 in the treble clef, for organs and pianos in Great Britain c 2 , and for modern brass instruments b flat 1 .

We are not without a. clue to the pitch usual in the classic Greek and Alexandrian ages: the vocal octave to which the lyre was adapted was noted as from e to e l . As in choruses baritone and low tenor singers always prevail, d-d 1 , at French or at medium pitch, would really be the Greek singing octave; we may therefore regard it as a tone lower than that to which we are accustomed. But to sing the lower Greek modes in or near the vocal octave it was necessary to transpose (neraftoXri) a fourth upwards, which is effected in modern notation by a flat placed upon the b line of the staff; thus modulating from our major key of C to that of F. This transposition has had, as we shall see. much to do with the history of our subject, ultimately influencing the ecclesiastical chant and lasting until the 17th century of our era. It does not appear from any evidence that the keyboards — when there were more than one — of the early organs were arranged for transposition, but it is certain that the Flemish harpsichords to 1650 were made with double keyboards to accommodate it (see Hipkins' History of the Pianoforte, 1897). But a positive identity of pitch cannot be claimed for any period of time, and certainly not for the early organs; the foot-rule of the organ-builder, which had to do with the lengths of the pipes, and which varied in every country and province, could easily cause a difference of a semitone. Scale and wind-pressure are also important factors. But with all these often opposed conditions, we find less variation than might be expected, the main and really important divergence being due to the necessity of transposition, which added a very high pitch to the primarily convenient low one.

The first to attempt to define pitch would seem to have been Arnold Schlick {Musica ausgetcutscht und ausgezogen, Heidelberg, 1 511), who gives a measure, a fine of 4! Rhenish inches, which, he says, multiplied sixteen times, should be the lowest F of a small organ. He gives no diameter or wind-pressure. Dr A. J. Ellis used this indication to have an organ pipe made which with one-sixteenth diameter and a wind-pressure of 31 in., at one-fourth Schlick's length, gave/ 1 301-6, from which he derived a just major third of a 1 377, which would compare very well with an old Greek a 1 . Schlick goes on to say the organ is to be suited to the choir and properly tuned for singing, that the singer may not be forced to sing too high or too low and the organist have to play chromatics, which is not handy for every one. Further, he says pitch cannot be exactly defined, because voices vary; he nevertheless gives the measure above men- tioned

for the low F, but if a larger organ is built to include the still lower C, then this C must be of the same measurement, the reason being that a greater part of church music ends in " gram- bus," a word understood by Schlick's editor to mean the trans- position of a fourth. The larger high-pitch organ will therefore be at a 1 502-6. The Halberstadt organ, about which so much has been written, was, according to Praetorius {Syntagma musician, Wolffenbuttel, 1618), built in 1361, and repaired or rebuilt 1495. He gives the longest pipe of this organ, B natural, as 31 Brunswick feet, and the circumference 35 ft. He further tells us this pitch was a tone, nearly a tone and a half, higher than a suitable church pitch (Chorton), for which he gives a diagram. Dr Ellis had pipes (now preserved in the Royal Institution, London) made to reproduce both these pitches at 3j in. wind-pressure. The Halberstadt pitch was found to be a 1 505-8; the Chorton, 424-2. Ellis used mean-tone tempera- ment in calculating this lower pitch; but as he used just intona- tion for the Halberstadt, it seems preferable to substitute it for the Chorton, thus reducing it to a 1 422-8. Praetoaus's Cammer- ton, or chamber pitch, formulated in his diagrams for voices and instruments, is, he says, a whole tone higher; equivalent, therefore, to a 1 475-65. ˆNearly all the German organs in his

time were tuned to this higher pitch. Ellis offered the suggestion of a much higher pitch for this Cammerton in his lecture " On the History of Musical Pitch," read before the Society of Arts, London {J own. Soc. Arts, March 5, 1880), but the present writer is unable to accept it. The lower vibration number is justified by due consideration of the three divisions of the male voice, bass, tenor and alto, as given by Praetorius, whose Cammerton very closely corresponds with Bernhardt Schmidt's Durham organ, 1663-1668, the original pitch of which has been proved by Professor Armes to have been a 1 474-1. The Halberstadt pitch is nearly a semitone higher, which again agrees with the state- ment of Praetorius, and also Schlick's high C organ. Yet it would seem there had been a still higher pitch used in the old ecclesiastical music. Upon this interesting question Praetorius is confused and difficult to understand, but he never wavers about the transposition of a fourth. In one passage he distinctly says the old organ high pitch had been a whole tone above his Cammerton, with which we shall find his tertia minore combines to make the required interval. The term tertia minore, or inferiore, is used by Praetorius to describe a low pitch, often preferred in England and the Netherlands, in Italy and in some parts of Germany. An organist, instead of transposing a whole tono down from the Cammerton, would for the tertia minore have to transpose a minor third. A corroboration of this pitch is found in A. Silbermann's great organ in Strasburg minster (1713-1716), the pitch of which, taken in 1880 and reduced to 59 Fahr. (as are all pitches in this article), is a 1 393-2. An old organ at Versailles (1789) was very near this example, a 1 395-8. Sir

Frederick Gore Ouseley (vide Ellis's lecture) regarded the French ton de chapelle as being about a minor third below the Diapason Normal, a 1 435, and said that most of the untouched organs in the French cathedrals were at this low pitch. Stras- burg was French territory in 17 13, but Silbermann's organ is not quite a whole tone below. Ellis quotes an organ at Lille, a 1 374-2, but no other instance of the very low Schlick pitch is recorded, although trial of the French cathedral organs might perhaps result in the finding of examples. Ellis gives Dom Bedos (L'Art du facture d'orgues, Paris, 1766) as authority for a mean tone a 1 376-6. To return to the tertia minore. Dr R. Smith, of Cambridge, in 1759, had the organ of Trinity College, built by Bernhardt Schmidt, lowered a whole tone, to reduce it to certain Roman pitch pipes made about 1720. His deter- minations of pitch by a weighted wire are not trustworthy; Ellis thinks they are not safe within four or five vibrations per second, but gives a mean pitch for this organ, when altered, of a 1 395-2. St Michael's church at Hamburg, built as late as 1762 and unaltered in 1880, had a 17th-century pitch, a 1 407-9. This is about a semitone below the Diapason Normal, and a just minor third lower than the St Jacobi organ in the same city (1688), measured by Herr Schmahl, a 1 489-2. What was remarkable in this organ was that it had one stop which was an equal minor third lower, a 1 41 1 4 1 . The difference of a minor third, or, as we shall see later, a whole tone, had replaced the earlier fourth. Sir Frederick Gore Ouseley's comparison of the church and chamber pitches of Orlando Gibbons (vide Ellis's lecture) clearly shows the minor third in Great Britain in the first half of the 17th century. But the narrowing continued. Bern hardt Schmidt, better known in England as Father Smith, was invited about 1660 to build the organ for the Chapel Royal, Whitehall; two years later he built the organ in Durham Cathedral a 1 474-1, difference a whole tone, and practically agree- ing with the Cammerton of Praetorius. The Hampton Court organ of 1690 shows that Schmidt had further lowered his pitch a semitone, to a 1 441-7. What happened at Durham was that at some subsequent date the pipes were shifted up a semitone to bring the organ into conformity with this lower pitch, with which it is probable Schmidt's organs in St Paul's and the Temple, and also Trinity College, Cambridge, agreed. This lowering tendency towards the low church pitch, and the final adoption of the latter as a general mean pitch throughout the 1 8th century, was no doubt influenced by the introduction of the violin, which would not bear the high tension to which the

lutes and viols had been strained. Harpsichords had long been preferred at the tertia minore. The Chorton of Praetorius, a 1 422-8, is practically the

same pitch as that of the fork the possession of which has been attributed to Handel, a 1 422-5. It is a very fair mean between G. Silbermann's 18th-century Dresden pitch, a 1 415, and the organs of Renatus Harris, a 1 428-7. Stein tuned Mozart's piano to a fork a 1 421-6, and the Broad wood pianos used at the London Philharmonic Society in its first concerts (1813) were tuned to a fork

According to Schindler (Niederrheinische Musik-Zeitung, 1855, Nos. 8 and 9) and the report of the French Commission, 1859, the rise in pitch began at the Congress of Vienna in 1816, the military bands being the cause. With the improvements in wind instruments this continued, as a more brilliant effect was gained. In 1823 Weber's Euryanthe is recorded as having been played in Vienna at a 1 437-5, and in 1834 Kreutzer's Nachllager at a 1 440. The measurements are doubtful, but the upward tendency is clear. Scheibler, by his simple and accurate tonometer, has recorded pitches in Vienna about 1834 from a 1 433-9 to 440-2. About that time, or it may be a few years earlier, Sir George Smart established a fork for the Philharmonic Society, a 1 433-2. Forks intended for this vibration number, stamped "Philharmonic," were sold as late as 1846. But about that year the performing pitch of the Society had reached 452-5. Sir Michael Costa was the conductor 1846-1854, and from his acceptance of that high pitch the fork became known as Costa's, and its inception was attributed to him, though on insufficient grounds. In 1874 a further rise in the fork to a 1 454 was instigated by Sir Charles Halle. The British army is bound by His Majesty's Rules and Regulations to play at the Philharmonic pitch, and a fork tuned to a 1 452-5 in 1890 is preserved as the standard for the Military Training School at Kneller Hall. But the Philharmonic Society adopted the Diapason Normal in 1896, and the military bands have not gone with it. In point of fact, they are gradually going higher, and the brass bands, which are so important in the North of England and in Wales, are not behind them.

It was the irrepressible upward tendency that caused the French government in 1859, acting with the advice of Halevy, Meyerbeer, Auber, Ambroise Thomas and Rossini, to establish by law the Diapason Normal. Other countries have gradually followed, and, with few exceptions, the low pitch derived from the Diapason Normal may be said to prevail throughout the musical world. Great Britain has been the last to fall in, but the predominance of the low pitch, introduced at Covent Garden Opera since 1880, is assured. The proprietors of Queen's Hall, London, did much for it when they undertook the alteration, at great expense, of their large concert organ, which had only just been erected. In 1896 the Philharmonic Society decided upon a performing pitch, ostensibly at 68° Fahr., of a 1 439; and in 1899 Messrs Broadwood made a successful effort to get this vibration number accepted by their competitors in Great Britain. The high pitch

remains only where there are large concert organs not yet lowered, and with the military and brass bands.

The consideration of temperature as affecting the use of a standard pitch was not attended to when the French government issued its ordonnance. The 15 Centigrade attached to the description of the standard fork in Paris was intended for the definition and verification of the fork only. The alteration of the fork due to heat is scarcely perceptible, but wind instruments, and particularly the organ, rise almost proportionately to the increase in temperature of the surrounding air, because sound travels at an enhanced rate as the temperature rises. The coefficient of this rise is equivalent to half a vibration (0-5) per degree Fahr. per second. D. J. Blaikley (Essay on Musical Pilch, Catalogue of the Royal Military Exhibition, Chelsea, 1 890) , and Victor Mahillon (Catalogue descriptif et analytique du Musse, Bruxelles, troisieme volume, appendice, 1900) have recorded their experience of wind instruments under changes of temperature. The French Commission, in establishing the Diapason Normal, should have chosen a temperature of 20 C.

There would then have been less disturbance owing to the breath of the players and heat of the theatres or concert-rooms. It would be a great advantage to get this higher grade generally adopted. It was proposed in the Stimm-Conferenz at Vienna in 1885, but not carried. Table III., showing orchestral pitches obtained in 1899, for the measurements of which the writer is responsible, prove how chimerical it is to hope for greater accuracy than is found between 435 and 440 vibrations a second for a 1 , inasmuch as temperature must always be reckoned with.

Table I.

149S to 1690. Pitch descending.

Halberstadt organ Arnold Schlick, Heidelberg St Jacobi, Hamburg . 1688 St Catharinen, Hamburg Praetorius. Cammerlon . Durham organ Great Franciscan organ,

Vienna c

Hampton Court organ .

1495 15″ -1693

1543 1618 1683

1640 1690

Authority.

V.at59°F.

Ellis …. Ellis …. Schmahl Degenhardt . . Hipkins . . Armes and Ellis

Ullmann . . Ellis ….

a> 505-8

502-6 489-2 480-8

475-65 474-1

457-6 441-7

Table II.

151 1 to 1900. Pitch ascending.

Arnold Schlick, Heidelberg . Strasburg Minster. A. Sil-

bermann . . . 1713-1716 Trinity College, Cambridge. 1759 Versailles organ . Praetorius ” Tertia minore ‘ St Michael’s, Hamburg . Pascal Taskin’s tuning-fork

Paris

St Jacobi, Hamburg, ” Tertia

minore ” stop . . 1688 Hofcapelle, Dresden St Sophie, Dresden, G

Silbermann Freiberg. G. Silbermann

Seville Cathedral.

1511

1789 1618 1762

1783

-1693

1754

1722 1714

1785-1790 1715

Old English tuning-fork c

Imperial Russian Court

Church Band …. i860

Stein's tuning-fork, Vienna 1780

Handel's tuning-fork . . .1751

Praetorius. Chorton . . .1618

Peppercorn's tuning-fork

(Broadwood) …. 1813

Renatus Harris, St Andrew's, Undershaft ….. 1696

Renatus Harris, Newcastle- on-Tyne 1670

C.Meerens, proposed standard derived from c 2 512, and favoured by Boi'to and other Italian musicians . 1876

Sir George Smart, Philhar- monic …. 1826-1834

Scheibler No. I., Vienna orchestra 1834

Montal's tuning-fork, Paris opera 1829

Scheibler No. II., Paris opera. 1834

Reissiger's tuning-fork, Dres- den 1826

Paris Diapason Normal.

Ordonnance 1859

Scheibler No. III., Paris Conservatoire …. 1834

Paris Diapason Normal.

Standard fork …. 1859

Paris opera 1836

Scheibler, Stuttgart, proposed standard (440 at 69 F.) . 1834

Scheibler No. IV., Vienna opera 1834

Hullah's tuning-fork . . . 1842

Naples opera. San Carlo . 1857

Society of Arts intended for 444. (Since 1886 the Society of Arts has advocated the Diapason Normal) 1 860

Authority. V. at59°F.

Ellis ….

Stockhausen Smith and Ellis M'Leod and Ellis Hipkins . . Schmahl . .

Lissajous

Schmahl

Nake . .

Nake … Nake …. Ellis …. Ellis ….

Nake and Ellis . Nake and Ellis. Ellis …. Ellis andHipkins

Ellis ….

Ellis ….

Ions and Ellis .

Meerens . .

Ellis . . .

Scheibler

CagnarddelaTour

Scheibler

Nake

Fr. Comm. . .

Scheibler

Koenig . CagnarddelaTour

Scheibler .

Scheibler

Ellis ….

Lissajous

Ellis ….

o 1 377-0

393-2 395-2 395-8 396-4 407-9

409-0

411-4 415-0

415-5 419-5 419-6 419-9

421-2 421-6

422-5 422-8

423-5

427-7 428-7

432-0 I

433-2

433-9

434-o

434-0

435-o

435-0

435-2

435-45 437-0

440-2

440-3 441-3 444-9

445-7

PITCHBLENDE— PITCHER PLANTS

663

151 1 to 1900. Pitch ascending.

Broadwood's medium . . 1850

Paris grand opera . . . 1858

Lazaru.s's clarinet 1843

Gewandhaus, Leipzig . . . 1869

Berlin opera 1857

Milan opera, La Scala . . 1856 Philharmonic, London 1846-1854

Kneller Hall 1890

Philharmonic, London . 1874 Streicher's tuning – fork,

Vienna 1859

Strauss's Band, Imperial

Institute, London, open

air 1897

Authority.

V.at59°F.

Ellis. . . .

Lissajous

Ellis and Hipkins

Ellis. . . .

Lissajous

Lissajous

Ellis and Hipkins

Hipkins .

Hipkins .

Ellis ….

Hipkins

445-9 448-0 448-0 448-2 448-4 450-3 452-5 452-5 454-0

456-1

457-5

Table III.

Orchestral Pitch. 1899.

Leipzig

Berlin

New York

Boston

London

St Petersburg

Meiningen (and Bayreuth)

Stuttgart

Vienna

London. Covent Garden opera Paris

Authority.

V.at68°F.

Blilthner Bechstein Stein way Chickenng Broadwood Becker . Miihlfeld'sclarinet A. Schiedmayer Bosendorf er . Hipkins . Erard

a‘435-o

438-0 438-6 438-8

439-o

439-4 439-5 440-0 440-0 440-0 442-4

Verified by A. J. Hipkins. But for Leipzig a comparison with the Gewandhaus Band may be sought. (A. J. H.)

PITCHBLENDE, or Uraninite, a mineral species consisting essentially of uranium oxide, of importance as a source of uranium and radium. It is a very heavy (specific gravity 9-0- 97), compact mineral with a conchoidal to uneven fracture, and a brownish to velvet-black colour and pitchy lustre. Crystals are rare; they have the form of regular octahedra or less often of cubes. The hardness is 55, and the streak is brown with a greenish tinge. The mineral has been known to occur at Joachimsthal in Bohemia since 1727, and it was early called pitchblende, because of its appearance; but its true nature was not recognized until 1789, when M. H. Klaproth’s analysis of it resulted in the discovery of the element uranium. Analyses of material from different localities exhibit wide variations in chemical composition. In addition to uranium oxides, there are thorium, cerium (and lanthanum), yttrium and lead oxides, each varying in amount from a trace up to 10%. Calcium, iron, magnesium, manganese, silica, water, &c, are also present in small amounts. The amounts of uranous and uranic oxides (U0 2 , 21-72; U0 3 , 13-59%) also vary considerably. The mineral is often described as a uranate of uranyl, lead, thorium and cerium; but in the least altered material from Branch ville in Connecticut the uranous oxide predominates, whilst in altered specimens uranic oxide is in excess. In the closely allied mineral, thorianite, thorium predominates (Th0 2 , 76; U0 2 , 1 2 %) . Since the dioxides of uranium, thorium and cerium may be obtained artificially as cubic crystals, it seems probable that pitchblende consists of isomorphous mixtures of these dioxides, the uranic oxide being due to oxidation.

The radio-active properties of pitchblende are of special interest. The fact that this mineral is more strongly radio-active than metallic uranium led to the discovery in it of the elements radium, polonium and actinium. When pitchblende is ignited or dissolved in dilute sulphuric acid, a gas is evolved which consists largely of helium and argon: terrestrial helium was first recognized in this mineral.

The mineral occurs either as a primary constituent of granitic rocks or as one of secondary origin in metalliferous veins. Octa- hedral crystals (”

cleveite "and" broggerite ") occur in the pegmatite veins of southern Norway, being occasionally found in the felspar quarries at Moss, Arendal and other places. Crystals are found under similar conditions at Middletown and Branchville in Connecti- cut, Llano county in Texas (" nivenite "), Mitchell county in North Carolina, Villenveuve in Quebec, and other American localities. Thorianitej found as water-worn cubes in the gem-gravels near

Balangoda in Sabaragamuwa province, Ceylon, has also no doubt been derived from crystalline rocks. On the other hand, the mineral found in metalliferous veins, and to which the name pitchblende is more properly restricted, never occurs as crystals, but as compact masses rendered more or less impure by admixture of other minerals, the specific gravity being sometimes as low as 6-5; thorium, cerium, &c, are absent, and radium and helium are present in smaller amounts. This variety occurs with ores of silver, lead, copper, nickel, cobalt, bismuth, &c, at Johanngeorgenstadt, Marienbergand Schneeberg in Saxony, Joachimsthal and Przibram in Bohemia, Rezbanya in Bihar Mountains in Hungary, Gilpin county in Colorado, St Just, in Penwith, Redruth, Grampound Road and elsewhere in Cornwall.

Often associated with pitchblende, and resulting from its altera- tion, is an orange-yellow, amorphous, gum-like mineral called gummite, which is a hydrous uranic oxide with small amounts of lead, calcium, iron, &c. (L. J. S.)

PITCHER. (1) A large vessel for holding liquids, derived through Fr. from Med. Lat. picarium; the Lat. variant bicarium, Gr. /3Tkos, has given the Ger Becker, Eng. beaker {q.v.). (2) One who " pitches," i.e. throws, casts, fixes; the name of the player in the game of base-ball who pitches or delivers the ball to the striker.

PITCHER PLANTS, in botany, the name given to plants in which the leaves bear pitcher-like structures or are pitcher-like in form. The plant generally understood by this name is Nepenthes, a genus containing nearly sixty species, natives of tropical Asia, north Australia and (one only) of Madagascar. North Borneo is especially rich in species. They are shrubby plants climbing over surrounding vegetation by means of tendril- like prolongations of the midrib of the leaf beyond the leaf-tip.

Fig. 1. — Pitcher of Nepenthes distillatoria.

A, Honey-gland from attractive C, Transverse section of the surface of lid. same.

B, Digestive gland from interior of pitcher, in pocket-like de- pression of epidermis, opening downwards.

The pitcher is a development at the end of the tendril. It is generally tubular in form, but in some species two forms are produced on the same plant, lower or terrestrial goblet-shaped pitchers and upper suspended pitchers retaining the more primitive more or less tubular form; in a few species a third form — funnel- or cornucopia-shaped pitchers — occurs in the upper part. In the terrestrial type a pair of well-developed wings traverse the length of the pitcher; in the tubular or funnel- shaped form the wings are narrow or ridge-like. The mouth of the pitcher has a corrugated rim (peristome) formed by in- curving of the margin, the convex surface of which is firm and shining. It is traversed by more or less prominent parallel

ridges, which are usually prolonged as teeth beyond the in- folded margin. Above the mouth is the lid (operculum), which varies in size from a small narrow process to a large heart- shaped expansion. A study of the development of the pitcher, especially in the young pitchers of seedling plants, shows that the inflated portion is a development of the midrib of the leaf, while the wings, which are especially well represented in the terrestrial type of pitcher, represent the upper portion of the leaf-blade which has become separated from the lower portion by the tendril; the lid is regarded as representing two leaflets which have become fused. The short straight or curved process from the back of the pitcher behind the lid represents the organic apex of the leaf (A in fig. i).

The size of the pitcher varies widely in the different species, from an inch to a foot or more in depth. The colour also varies considerably, even in different pitchers of the same individual,

Fig. 2. — Leaves of Sarracenia purpurea.

A, Attractive surface of lid; B, conducting; C, glandular; and D,

detentive surface ; magnified. A and D are taken from 5. flpva.

according to age, light exposure or soil conditions. It is uni- formly green or more or less spotted, blotched or suffused with red or crimson, or sometimes, as in N. sanguinea or N. Edwards- iana, largely or wholly of a rich scarlet or crimson colour. In- sects are attracted to the mouth of the pitcher by a series of glands, yielding a sweet excretion, which occurs on the stem and also on the leaf from the base of the leaf-stalk to the lid and

peristome. Embedded in the incurved margin of the rim which affords a very insecure foothold to insects, are a number of large glands excreting a sweet juice. The cavity of the pitcher is in some species lined throughout with a smooth glistening surface over which glands are uniformly distributed; these glands secrete a liquid which is found in the pitcher even in the young state while it is still hermetically closed by the lid. In other species the glands are confined to the lower portion of the cavity surface, while the upper part bear a smooth waxy secretion on which it is impossible, or at any rate extremely difficult, for insects to secure a foothold. This area is termed the " conducting " area, as distinguished from the lower or " detentive " gland-bearing area. It has been proved that the secretion contains a digestive ferment capable of rendering proteid matter soluble. Insects, especially running insects, which have followed the track of honey glands upwards from the stem along the leaf, reach the mouth of the pitcher, and in their efforts to sip the attractive marginal glands fall over into

the liquid. The smooth walls above the liquid afford no foot- hold, and they are drowned; their bodies are digested and the products of digestion are ultimately absorbed by the glands in the pitcher-wall. . Thus Nepenthes secures a supply of nitro- genous food from the animal world in a manner somewhat similar to that adopted by the British sundew, butterwort, and other insectivorous plants.

The side-saddle plant, Sarracenia, native of the eastern United States, is also known as a pitcher-plant. There are about seven species, herbs with clusters of radical leaves some or all of which are more or less trumpet- or pitcher-shaped. The leaf has a broadly sheathing base succeeded by a short stalk bearing the pitcher, which represents a much enlarged midrib with a wing- like lamina. Above the rim of the pitcher is a broad flattened lid, which is also a laminar development. The surface of the leaf, especially the laminar wing, bears glands which in spring exude large glistening drops of nectar. The lid and mouth of the pitcher are brighter coloured than the rest of the leaf, which

•Slfe-

Fig. 3. — Cephalotus follicularis , showing ordinary leaves and pitchers, the right hand one cut open to show internal structure.

varies from yellow-green to deep crimson in different species and in individuals according to exposure to sunlight and other conditions. This forms the attractive area, and the inner sur- face of the lid also bears numerous glands, as well as downward- pointing hairs, each with a delicately striated surface (fig. 2, A). Below it is the conducting surface (B)

of glassy epidermal cells, with short downward-directed points, which facilitate the descent, but impede the ascent of an insect. Then come the glandular surface ©, which is formed of smooth polished epidermis with numerous glands that secrete the fluid contents of the pitcher, and finally the detentive surface (D), of which the cells are produced into long and strong bristles which point

A

Fig. 4. — Morphology of Pitchers.

A, Ordinary leaf of Cephalotus.

B, Monstrous leaf with spoon-shaped depression.

C and D, Other abnormal forms more deeply pouched,

showing formation of pitcher. E, Ordinary pitcher of Cephalotus. a, Apex of leaf.

downwards and meet in the centre of the diminishing cavity so as to render escape impossible. The secretion wets an insect very rapidly, but, so far as is known, seems to be completely destitute of digestive power — indeed, rather to accelerate decomposition. The pitchers accumulate vast quantities of insects in the course of a season, and must thus abundantly manure the surrounding soil when they die. Moreover, the

feast is largely shared by unbidden guests. Not to speak of insects which feed upon the pitcher itself, some drop their eggs into the putrescent mass, where their larvae find abundant nourishment, while birds often slit open the pitchers with their beaks and devour the maggots in their turn.

Cephalotus follicularis, a native of south-west Australia, a small herbaceous plant, bears ordinary leaves close to the ground as well as pitchers. The latter somewhat resem- ble in general form those of Nepenthes. The lid is especially attractive to insects from its bright colour and honey secretion; three wings lead up to the mouth of the pitcher, on the inside of which a row of sharp spines points downwards, and below this a circular ridge (r, fig. 3) armed with papillae serves as a conducting area. A number of glands on the in- terior of the pitcher secrete a plentiful fluid which has digestive properties. Comparison with monstrous forms shows that the pitcher of Cephalotus arises by a calceolate pouching from the

upper surface of the ordinary spathulate leaves, the lid here arising from the proximal side of the pitcher-orifice.

PITCHSTONE (German Pechstein, from its resemblance to pitch), in petrology, a glassy igneous rock having a resinous lustre and breaking with a hollow or conchoidal fracture. It differs from obsidian principally in its rather dull lustre, for obsidian is bright and vitreous in appearance; all pitchstones also contain a considerable quantity of water in combination amounting ' to from 5 to 10% of their weight or 10 to 20 % of their volume. The majority of the rocks of this class occur as intrusive dikes or veins; they are glassy forms of quartz porphyry and other dike rocks. Their dull lustre may be connected with the great abundance of minute crystal- lites and microlites they nearly always contain. These are visible only in microscopic sections, and their varied shapes make pitchstones very interesting to the microscopist. Although pitchstones are known which are of Devonian age (e.g. the glassy dacite of the Tay Bridge in Fife, Scotland, and the andesite-pitchstones of the Cheviot Hills), most of them are Tertiary or recent, as like all natural glasses they tend to crys- tallize or become devitrified in course of time. In some of the older pitchstones the greater part of the mass is changed to a dull felsitic substance, while only nodules or kernels of unaltered glass remain.

Some pitchstones are very acid rocks, containing 70 to 75 % of silica, and have close chemical affinities to granites and rhyolites. Others contain more alkalis and less silica, being apparently vitreous types of trachyte or keratophyre; others have the composition of dacite and andesite, but the black basaltic glasses are not usually classified among the pitchstones. Very weli known rocks of this group occur at Chemnitz and Meissen in Saxony. They are brown or dark green, very often perlitic (see Petrology, Plate I., fig. 5), and show progressive devitrification starting from cracks and joints and spread- ing inwards through the mass. For a long time the pitchstone dikes of Arran in Scotland have been famous among geologists for the great beauty and variety of skeleton crystals they contain. These pitchstones are dull green in hand specimens. Some of them con- tain phenocrysts of felspar, augite, &c. ; others do not, but in all there is great abundance of branching feathery crystalline growths in the ground mass: they resemble the branches of fir trees or the fronds or ferns, minute crystalline rods being built together in aggregates which often recall the frost patterns on a window-pane. It is sup- posed that the mineral they consist of is hornblende. In addition to these larger growths there are many small microlites scattered through the glass, also hair-like trichites, and fine rounded globulites. When phenocrysts are present the small crystals are planted on their surfaces like grass growing from a turf-covered wall. These pitch- stones are believed to proceed from the great eruptive centres which were active in western Scotland in early Tertiary times. Another pitchstone

of the same period forms a great craggy ridge or scuir in the island of Eigg (Scotland). At one time regarded as a lava flow occupying an old stream channel it has recently been described as an intrusive sheet. It is from 200 to 300 ft. thick. The rock is a dark, nearly black, pitchstone-porphyry, with glancing idiomor- phic crystals of felspar in a vitreous base. It contains no quartz; the felspars are anorthoclase, and with them there are numerous crystals of green augite. The ground mass contains small crystallites of felspar, and is of a rich brown colour in thin section with well developed perlitic structure (see Petrology, Plate II., fig. 1). In

chemical composition this rock resembles the trachytes rather than the rhyolites. In Eigg and Skye there arc many dikes of pitchstone, mostly of intermediate rather than of acid character, all connected with the great eruptive activity which characterized that region in early Tertiary times.

The following analyses give the chemical composition of a few- well-known pitchstones: —

Si0 2

Al 2 O a

Fe 2 3

MgO

CaO

Na 2

K 2

H 2

I. Meissen, Saxony . II. Corricgills, Arran III. Scuir of Eigg, Scotland .

72-42 72-07 65-81

11-26 11-26 14-01

o-75

3-24 4-43

0-28

tr.

0-89

1-35

i-53

2-01

2-86

o-6i

4-15

3-80 5-61

6-08

7-64

5”45 2-70

The first two of these contain much water for rocks the ingredients of which are but little decomposed. They are of acid or rhyolitic character, while the third is richer in alkalis and contains less silica ; it belongs more naturally to the intermediate rocks (or trachytes.)

(J- S. F.) PITESCI (Pitesti), also written Pitesti and Pitest, the capital of the department of Argesh, Rumania; situated among the outlying hills of the Carpathians, on the river Argesh, which is here joined by several smaller streams. Pop. (1900), 15,570. The surrounding uplands produce good wine, fruit and grain, besides being rich in petroleum and salt; and, as the main Walachian railway is met at Pitesci by lines from Campulung and Hermannstadt in Transylvania, the town has a consider- able trade. It has manufactures of lacquer and varnish.

PITH (O.E. pitha, cognate with Du. pit, kernel of a nut), properly the medulla, the central column of spongy cellular tissue, in the stems of dicotyledonous plants (see Plants : Anatomy). The word is thence applied to the spinal cord or marrow in animals, to the medullary end of a hair, and to that which forms the central part or core of any object or substance; hence, figuratively, vigour, energy, concentrated force. Very light hats or helmets are made of the dried pith of the Indian spongewood or hat plant (Asschynomene aspera, the native name being Solah). These pith hats are worn by Europeans in India and the East. The Chinese Ricepaper-tree (Aralia or Fatsia papyrifera) , from the pith of which the deli- cate white

film known as " rice-paper " is made, is also known as the pith-plant.

PITHECANTHROPUS ERECTUS (Erect Ape-Man), the name given by Dr Eugene Dubois, of the Dutch army medical service, to the imaginary creature which he constructed from fossilized remains found by him in Java. These fragments consisted of a thigh-bone, two teeth, and the upper part of a skull, and were unearthed in 1891-1892 on the left bank of the Bengawan River near Trinil. The skull appears to have been low and depressed with strong supraciliary ridges; the teeth are very large, and the femur is quite human. The teeth and skull were found together, the femur a few yards away a year afterwards. The discoverer, however, stated it as his belief that the fragments were portions of the same skeleton and belonged to a creature half-way between man and the higher apes and of the Pleistocene age. Much discussion followed the " find," and many authorities have given an opinion adverse to Dr Dubois's theory. The prevailing opinion is that the bones are human. They are not held to represent what has been called " the missing link," bridging over the gulf between man and the apes; but almost all authorities are agreed that they constitute a further link in the chain, bringing man nearer his Simian prototype. L. Manouvrier concludes that Homo javanensis walked erect, was of about medium height, and was a true precursor, possibly a direct ancestor, of man. He calls attention to the fact that the cranial capacity decreases in proportion to the antiquity of the human skulls found, and that the pithecanthropus skull has a capacity of from 900 to 1000 cc. — that is, " stands at the level of the smallest which have been occasionally found amongst the reputedly lowest savage peoples."

See Dubois, Pithecanthropus erectus (Batavia, 1894) ; a later paper read by Dr Dubois before the Berlin Anthropological Society was translated in the Smithsonian Report for 1898. Also a paper read by Dr D. J. Cunningham before the Royal Dublin Society, January 23. 1895 (reported in Nature, February 28, 1895); O. C. Marsh,

American Journ. of Science (June 1896); " Le Pithecanthropus et l'origine de l'homme," in Bull, de la soc. d'anthrop. de Paris (1896), pp. 460-67; L. Manouvrier, " Discussion du pithecanthropus erectus comme precurseur de l'homme," in Bull. soc. d'anthrop. de Paris (1895), pp. 13-47 an d 216-220: L. Manouvrier, Bull. soc. d'anthrop. (1896), p. 419 sqq. ; " The Trinil Femur contrasted with the Femora of various savage and civilized races," in Journal of Anat. and Physiol. (1896), xxxi. 1 seq. ; Virchow, " Tiber den Pithecanthropus erectus Dubois " in Zeitschri.fi f. Ethnologic

(1895), pp. 336, 435, 648.

PITHIVIERS, a town of north central France, capital of an arrondissement in the department of Loiret, 28 m. N.N.E. of Orleans, on the railway to Malesherbes. Pop. (1906), 5676. The church of St Solomon, chiefly in the Renaissance style, and remains of the ancient ramparts are of interest. Statues have been erected of the mathematician Denis Poisson (d. 1840), and of the physician and agriculturist Duhamel de Mon- ceau (d. 1782), natives of Pithiviers. The town is an agri- cultural market, and an important centre for the saffron of the region of Gatinaris the cultivation of which, originally intro- duced by the Jews of Avignon in the 12th century was fostered by Louis XIV. The shrine of St Solomon in the 9th century and that of St Gregory, an Armenian bishop, in the 10th, formed the nuclei of the town; and the donjon built at the end of the 10th century for Heloise, lady of Pithiviers, was one of the finest of the period.

PITHOM, one of the " treasure cities " stated to have been built for Pharaoh by the Hebrews in Goshen during the Oppres- sion (Exod. i. 11). We have here the Hebraized form of the Egyptian Petom " House of (the sun-god) Etom," in Greek, Patumos, capital of the 8th nome of Lower Egypt and situated in the Wadi Tumilat on the canal from the Nile to the Red Sea. Succoth (Egyptian Thuket) was identical with it or was in its immediate neighbourhood. The site, now Tell el Maskhuta, has yielded several important monuments, including the best preserved of the trilingual stelae of Darius which commemorated his work on the canal. The earliest name yet found is that of Rameses II. of the XIX th Dynasty, but in one case he has usurped earlier work, apparently of the XHth Dynasty (a sphinx), and the city was evidently very ancient. Several of the monuments from Pithom have been removed to Ismailia on the Suez Canal.

See Ed. Naville, The Store City of Pithom and the route of the Exodus (London, 1885); W. M. F. Petrie, Tanis, pt. i. (London, 1885); W. Golenischeff, "Stele de Darius" in Recueil de travaux relatifs a la philologie et I'archeologie egyptiennes et assyriennes, xiii. 99, and the article Rameses. (F. Ll. G.)

PITHOU, PIERRE (1539-1596), French lawyer and scholar, was born at Troyes on the 1st of November 1539. His taste for literature was early seen, and his father Pierre (1496-1556) cultivated it to the utmost. He was called to the Paris bar in 1560. On the outbreak of the second war of religion in 1567, Pithou, who was a Calvinist, withdrew to Sedan and afterwards to Basel, whence be returned to France on the publication of the edict of pacification. Soon after- wards he accompanied the due de Montmorency on his embassy to England, returning shortly before the massacre of St Bartholomew, in which he narrowly escaped with his life.

Next year he followed the example of Henry of Navarre by abjuring the Protestant faith. Henry, shortly after his own accession to the throne of France, recognized Pithou's talents and services by bestowing upen him various legal appointments. The most important work of his life was his co-operation in the production of the Satire Menippie (1593), which did so much to damage the cause of the League; the harangue of the Sieur d'Aubray is usually attributed to his pen. He died at Nogent- sur-Seine on the 1st of November 1596. His valuable library, specially rich in MSS., was for the most part transferred to what is now the Bibliotheque Nationale in Paris.

Pithou wrote a great number of legal and historical books, besides preparing editions of several ancient authors. His earliest publica- tion was Adversariorum subsecivorum lib. II. (1565). Perhaps his edition of the Leges Visigothorum (1579) was his most valuable con- tribution to historical science ; in the same line he edited the Capitula of Charlemagne, Louis the Pious, and Charles the Bald in 1588, and he also assisted his brother Francois in preparing an edition of the

Corpus juris canonici (1687). His Liberies de I'eglise gallicane (1594) is reprinted in his Opera sacra juridica his orica miscellanea collecta (1609). In classical literature he was the first who made the world acquainted with the Fables of Phaedrus (1596) ; he also edited the Pervigilium Veneris (1587), and Juvenal and Persius (1585).

Three of Pithou's brothers acquired distinction as jurists: Jean (1524-1602), author of Traite de police et du gouvernement des repub- liques, and, in collaboration with his twin brother Nicolas (1524- !598), of Institution du mariage chretien; and Francois (1543-1621), author of Glossarium ad libros capitularium (1588), Traite de I'ex- communication et de I'interdit, &c. (1587).

PITIGLIANO, a town in Italy, province of Grosseto. Pop. (1901), 4416. It is the cathedral city of the bishopric named after the neighbouring town of Sovana, and possesses a 16th- century cathedral and a church of tbe nth- i5th centuries, Pitiglia.no was originally a fief of the countship of Sovana, which in 1293 came by marriage into the possession of the Orsini. In 1410 Sovana was taken by the Siennese, but by the terms of a peace concluded in 141 7 the Orsini retained Pitigliano, Gentile Orsini (assassinated 1434) assuming the title of count of Pitigliano. The most famous of the line of counts was Niccolo III. (1442-1510), a celebrated condottiere. Under his successors Pitigliano became the scene of ceaseless family feuds culmin- ating in assassinations. In 1562 the Medici of Florence seized part of their territories, and acquired the rest by exchange in 1 580. The Orsini stronghold still stands in the town.

PITLOCHRY, a village of Perthshire, Scotland, 28ˆ m. N.W. of Perth by the Highland railway. Pop. (1901), 1541. It lies on the left bank of the Tummel, a little below the confluence of that river and the Garry, 350 ft. above the sea. It is a favourite health resort and tourist centre. Among the im- mediate attractions are the pass of Killiecrankie, the falls of Tummel, the exquisite prospect called " Queen's View " (named after Queen Victoria) and Loch Tummel, 8 m. to the west. One m. S.E. of the village is the Black Spout, a waterfall of 80 ft. formed by the Edradour.

PITMAN, SIR ISAAC (1813-1897), English phonographer, was born at Trowbridge, Wiltshire, on the 4th of January 1813, and was educated at the local grammar school. He started in life as a clerk in a cloth factory, but in 1831 he was sent to the Normal College of the British and Foreign School Society in London. Between 1832 and 1839 he held masterships at Barton-on-Humber and Wotton-under-Edge, but he was dis- missed by the authorities when he became a Swedenborgian, and from 1839 to 1843 he conducted a private school of his own at Bath. In 1829 he took up Samuel Taylor's system of short- hand, and from that time he became an enthusiast in developing the art of phonography. In 1837 he drew up a manual of Taylor's system and offered it to Samuel Bagster (1771-1852). The publisher did not accept the work, but suggested that Pitman should invent a new system (see Shorthand) of his own. The result was his Stenographic Soundhand (1837). Bagster's friendship and active help had been secured by Pit- man's undertaking to verify the half-million references in the Comprehensive Bible, and he published the inventor's books at a cheap rate, thus helping to bring the system within the reach of all. Pitman devoted himself to perfecting phono- graphy and propagating its use, and established at Bath a Phonetic Institute and a Phonetic Journal for this purpose; he printed in shorthand a number of standard works, and his book with the title Phonography (1840) went through many editions. He was an enthusiastic spelling reformer, and adopted a phonetic system which he tried to bring into general use. Pitman was twice married, his first wife dying in 1857, and his second, whom he married in 1861, surviving him. In 1894 he was knighted, and on the 22nd of January 1897 he died at Bath. Sir Isaac Pitman popularized shorthand at a time when the advance of the newspaper press and modern business methods were making it a matter of great commercial importance. His system adapted itself readily to the needs of journalism, and its use revolutionized the work of reporting. He was a non- smoker, a vegetarian, and advocated temperance principles.

His Life was written by Alfred Baker (19.-.8) and (1902) by his brother, Benn Pitman (1822-791 1).

PITONI-

P1T0NI, GIUSEPPE OTTAVIO (1657-1743), Italian musical composer, was born at Rieti on the 18th of March 1657. He came to Rome as a boy and sang in the choir of SS Apostoli. Foggia gave him instructions in counterpoint, and he became maestro di Cappella, first at Terra di Rotondo and later (1673) at Assisi. In 1676 he went to Rieti, and in 1677 to Rome, where he held various appointments, dying on the 1st of Feb- ruary 1743 as maestro di Cappella at St Marco, where he was buried. Pitoni appears to have devoted himself exclusively to church music, and although he did not disdain the modern style with instrumental accompaniment, he is best known by his Masses and other works in the manner of Palestrina.

Several volumes of his autograph composition are in the Santini Library at Miinster.

PITT, THOMAS (1653-1726), British East India merchant and politician, usually called " Diamond Pitt," was born at Bland- ford, Dorset, on the 5th of July 1653. In early life he went to India, and from his headquarters at Balasore he made trading journeys into Persia and soon became prominent among those who were carrying on business in opposition to the East India Company. Twice he was arrested by order of the company, the second time being when he reached London in 1683, but after litigation had detained him for some years in England he returned to India and to his former career. Unable to check him the East India Company took him into its service in 1695, and in 1697 he became president of Fort St George, or Madras. Pitt was now very zealous in defending the interests of his em- ployers against the new East India Company, and in protecting their settlements from the attacks of the natives; in directing the commercial undertakings of the company he also appears to have been very successful. Soon, however, he had a serious quarrel with William Fraser, a member of his council, and con- sequently he was relieved of his office in 1709, although he was afterwards consulted by the company on matters of impor- tance. During his residence in India Pitt bought for about £20,000 the fine diamond which was named after him; in 171 7 he sold this to the regent of France, Philip duke of Orleans, for £80,000 or, according to another account, for £135,000. It is now the property of the French government. During his former stay in England Pitt had bought a good deal of property, including the manor of Old Sarum, and for a short time he had represented this borough in parliament. After his final return from India in 17 10 he added to his properties and again became member of parliament for Old Sarum. He died at Swallowfield near Reading on the 28th of April 1726. His eldest son, Robert, was the father of William Pitt, earl of Chatham

{q.v.) ; and of Thomas Pitt (d.1761), whose son became the first Lord Camelford; his second son, Thomas Pitt (c. 1688- 1729), having married Frances (d. 1772), daughter of Robert Ridgeway, 4th earl of Londonderry (d. 17 14), was himself created earl of Londonderry in 1726.

PITT, WILLIAM (1750-1806), English statesman, the second son of William Pitt, earl of Chatham, and of Lady Hester Grenville, daughter of Hester, Countess Temple, was born at Hayes, near Bromley, Kent, on the 28th of May 1759. The child inherited a name which, at the time of his birth, was the most illustrious in the civilized world, and was pronounced by every Englishman with pride, and by every enemy of England with mingled admiration and terror. During the first year of his life every month had its illuminations and bonfires, and every wind brought some messenger charged with joyful, tidings and hostile standards. In Westphalia the English infantry won a great battle which arrested the armies of Louis XV. in the midst of a career of conquest; Boscawen defeated one French fleet on the coast of Portugal; Hawke put to flight another in the Bay of Biscay; Johnson took Niagara; Amherst took Ticonderoga; Wolfe died by the most enviable of deaths under the walls of Quebec; Clive destroyed a Dutch armament in the Hugli, and established the English supremacy in Bengal; Coote routed Lally at Wande- wash, and established the English supremacy in the Carnatic. The nation, while loudly applauding the successful warriors,

considered them all, on sea and on land, in Europe, in America, and in Asia, merely as instruments which received their direc- tion from one superior mind. It was the great William Pitt who had vanquished the French marshals in Germany and French admirals on the Atlantic — who had conquered for his country one great empire on the frozen shores of Ontario and another under the tropical sun near the mouths of the Ganges. It was not in the nature of things that popularity such as he at this time enjoyed should be permanent. That popularity had lost its gloss before his children were old enough to understand that the earl of Chatham was a great man. The energy and decision which had eminently fitted him for the direction of war were not needed in time of peace. The lofty and spirit-stirring eloquence which had made him supreme in the House of Commons often fell dead on the House of Lords. Chatham was only the ruin of Pitt, but an awful and majestic ruin, not to be contemplated by any man of sense and feeling without emotions resembling those which are excited by the remains of the Parthenon and of the Colosseum. In one re- spect the old statesman was eminently happy. Whatever might be the vicissitudes of his public life, he never failed to find peace and love by his own hearth. He loved all his children, and was loved by them; and of all his children the one of whom he was fondest and proudest was his second son.

The child's genius and ambition displayed themselves with a rare and almost unnatural precocity. At seven the interest which he took in grave subjects, the ardour with _. ,., which he pursued his studies, and the sense and vivacity of his remarks on books and on events amazed his parents and instructors. One of his sayings of this date was reported to his mother by his tutor. In August 1766, when the world was agitated by the news that Mr Pitt had become earl of Chatham, little William ex- claimed, " I am glad that I am not the eldest son. I want to speak in the House of Commons like papa." At fourteen the lad was in intellect a man. Hayley, who met him at Lyme in the summer of 1773, was astonished, delighted, and somewhat overawed, by hearing wit and wisdom from so young a mouth. The boy himself had already written a tragedy, bad, of course, but not worse than the tragedies of his friend. This piece (still preserved) is in some respects highly curious. There is no love. The whole plot is political ; and it is remark- able that the interest, such as it is, turns on a contest about a regency. On one side is a faithful servant of the Crown, on the other an ambitious and unprincipled conspirator. At length the king, who had been missing, reappears, resumes his power, and rewards the fathful defender of his rights. A reader who should judge only by internal evidence would have no hesitation in pronouncing that the play was written by some Pittite poetaster at the time of the rejoicings for the recovery of George III, in 1789.

The pleasure with which William's parents observed the rapid development of his intellectual powers was alloyed by apprehensions about his health. He shot up alarmingly fast; he was often ill, and always weak; and it was feared that it would be impossible to rear a stripling so tall, so slender, and so feeble. Port wine was prescribed by his medical advisers; and it is said that he was, at fourteen, accustomed to take this agreeable physic in quantities which would, in our more abstemious age, be thought much more than sufficient for any full-grown man. It was probably on account of the delicacy of his frame that he was not educated like other boys of the same rank. Almost all the eminent English statesmen and orators to whom he was afterwards opposed or allied — North, Fox, Shelburne, Windham, Grey, Wellesley, Grenville, Sheridan, Canning — went through the training of great public schools. Lord Chatham had himself been a distinguished Etonian; and it is seldom that a distinguished Etonian forgets his obligations to Eton. But William's infirmities required a vigilance and tenderness such as could be found only at hon?" He was therefore bred under the paternal roof. His studies were superintended by a clergyman named Wilson; and those

studies, though often interrupted by illness, were prosecuted with extraordinary success. He was sent, towards the close of the year 1773, to Pembroke Hall, in the university of Cam- bridge. The governor to whom the direction of William's academical life was confided was a bachelor of arts named Pretyman, 1 who had been senior wrangler in the preceding year, and, who though not a man of prepossessing appearance or brilliant parts, was eminently acute and laborious, a sound scholar, and an excellent geometrician. A close and lasting friendship sprang up between the pair. The disciple was able, before he completed his twenty-eighth year, to make his pre- ceptor bishop of Lincoln and dean of St Paul's; and the preceptor showed his gratitude by writing a life of the disciple, which enjoys the distinction of being the worst biographical work of its size in the world. Pitt, till he graduated, had scarcely one acquaintance, attended chapel regularly morning and evening, dined every day in hall, and never went to a single evening party. At seventeen he was admitted, after the fashion of those times, by right of birth, without any examination, to the degree of master of arts. But he continued during some years to reside at college, and to apply himself vigorously, under Pretyman's direction, to the studies of the place, while mixing freely in the best academic society.

The stock of learning which Pitt laid in during this part of his life was certainly very extraordinary. The work in which he took the greatest delight was Newton's Principia. His liking for mathematics, indeed, amounted to a passion, which, in the opinion of his instructors, themselves distinguished mathe- maticians, required to be checked rather than encouraged. Nor was the youth's proficiency in classical learning less remark- able. In one respect, indeed, he appeared to disadvantage when compared with eveu second-rate and third-rate men from public schools. He had never, while under Wilson's care, been in the habit of composing in the ancient languages; and he therefore never acquired the knack of versification. It would have been utterly out of his power to produce such charming elegiac lines as those in which Wellesley bade farewell to Eton, cr such Yirgilian hexameters as those in which Canning described the pilgrimage to Mecca. But it may be doubted whether any scholar has ever, at twenty, had a more solid and profound knowledge of the two great tongues of the old civilized world. He had set his heart on being intimately acquainted with all the extant poetry of Greece, and was not satisfied till he had mastered Lycophron's Cassandra.

To modern literature Pitt paid comparatively little attention. He knew no living language except French; and French he knew very imperfectly. With a few of the best English writers he was intimate, particularly with Shakespeare and Milton. The debate in Pandemonium was, as it well deserved to be, one of his favourite passages; and his early friends used to

talk, long after his death, of the just emphasis and the melodious cadence with which they had heard him recite the incomparable speech of Belial. He had indeed been carefully trained from infancy in the art of managing his voice, a voice naturally clear and deep- toned. At a later period the wits of Brookes's, irritated by observing, night after night, how powerfully Pitt's sonorous elocution fascinated the rows of country gentlemen, reproached him with having been " taught by his dad on a stool ".

His education, indeed, was well adapted to form a great parliamentary speaker. The classical studies of Pitt had the effect of enriching his English vocabulary, and of making him wonderfully expert in the art of constructing correct English sentences. His practice was to look over a page or two of a Greek or Latin author, to make himself master of the meaning, and then to read the passage straight forward into his own language. This practice, begun under his first teacher Wilson,

t 1 George Pretyman (1750-1827) was senior wrangler in 1772. In 1803, on falling heir to a large estate, he assumed the name of Tom- line. From Lincoln, to which see he had been elevated in 1787, he was translated to Winchester in 1820. Tomline, to whom Pitt when dying had bequeathed his papers, published his Memoirs of the Life of William Pitt (down to the close of 1792) in 1821 (3 vols. 8vo).]

was continued under Pretyman. Of all the remains of antiquity, the orations were those on which he bestowed the most minute examination. His favourite employment was to compare harangues on opposite sides of the same question, to analyse them, and to observe which of the arguments of the first speaker were refuted by the second, which were evaded, and which were left untouched. Nor was it only in books that he at this time studied the art of parliamentary fencing. When he was at home he had frequent opportunities of hearing important debates at Westminster; and he heard them, not only with interest and enjoyment, but with close scientific attention. On one of these occasions Pitt, a youth whose abilities were as yet known only to his own family and to a small knot of college friends, was introduced on the steps of the throne in the House of Lords to Fox, his senior by eleven years, who was already the greatest debater, and one of the greatest orators, that had appeared in England. Fox used afterwards to relate that, as the discussion proceeded, Pitt repeatedly turned to him, and said, " But surely, Mr Fox, that might be met thus," or " Yes; but he lays himself open to this retort." What the particular criticisms were Fox had forgotten; but he said that he was much struck at the time by the precocity of a lad who, through the whole sitting, seemed to be thinking only how all the speeches on both sides could be answered.

He had not quite completed his nineteenth year when, on the 7th of April

1778, he attended his father to Westminster. A great debate was expected. It was known that France had recognized the independence of the United States. The duke of Richmond was about to declare his opinion that all thought of subjugating those states ought to be relinquished. Chatham had always maintained that the resistance of the colonies to the mother country was justifiable. But he conceived, very errone- ously, that on the day on which their independence should be acknowledged the greatness of England would be at an end. Though sinking under the weight of years and infirmities, he determined, in spite of thb entreaties of his family, to be in his place. His son supported him to a seat. The excitement and exertion were too much for the old man. In the very act of addressing the peers, he fell back in convulsions. A few weeks later his corpse was borne, with gloomy pomp, from the Painted Chamber to the Abbey. The favourite child and name- sake of the deceased statesman followed the coffin as chief mourner, and saw it deposited in the transept where his own was destined to lie. His elder brother, now earl of Chatham, had means sufficient, and barely sufficient, to support the dignity of the peerage. The other members of the family were poorly provided for. William had little more than £300 a year. It was necessary for him to follow a profession. He had already begun to " eat his terms." In the spring of 1780 he came of age. He then quitted Cambridge, was called to the bar, took chambers in Lincoln's Inn, and joined the western circuit. In the autumn of that year a general election took place; and he offered himself as a candidate for the university; but he was at the bottom of the poll. He was, however, at the request of an hereditary friend, the duke of Rutland, brought into parliament by Sir James Lowther for the borough of Appleby.

The dangers of the country were at that time such as might well have disturbed even a constant mind. Army after army had been sent in vain against the rebellious colonists of North America. Meanwhile the house of Bourbon, i"g 3me " ' humbled to the dust a few years before by the genius and vigour of Chatham, had seized the opportunity of revenge. France and Spain had united against England, and had recently been joined by Holland. The command of the Mediterranean had been for a time lost. The British flag had been scarcely able to maintain itself in the British Channel. The northern powers professed neutrality; but their neutrality had a menacing aspect. In the East, Hyder Ali had descended on the Carnatic, had destroyed the little army of Baillie, and had spread terror even to the ramparts of Fort St George. The discontents of Ireland threatened nothing less than civil war. In England the authority of Lord North's government had sunk to the

lowest point. The king and the House of Commons were alike unpopular. The cry for parliamentary reform was scarcely less loud and vehement than afterwards in 1830.

The Opposition consisted of two parties which had once been hostile to each other, but at this conjuncture seemed to act together with cordiality. The larger of these parties consisted of the great body of the Whig aristocracy, headed by Charles, marquess of Rockingham. In the House of Commons the adhe- rents of Rockingham were led by Fox, whose dissipated habits and ruined fortunes were the talk of the whole town, but whose commanding genius, and whose sweet, generous and affectionate disposition, extorted the admiration and love of those who most lamented the errors of his private life. Burke, superior to Fox in largeness of comprehension, in extent of knowledge, and in splendour of imagination, but less skilled in that kind of logic and in that kind of rhetoric which convince and persuade great assemblies, was willing to be the lieutenant of a young chief who might have been his son. A smaller section of the Opposi- tion was composed of the old followers of Chatham. At their head was William, earl of Shelburne, distinguished both as a statesman and as a lover of science and letters. With him were leagued Lord Camden, who had formerly held the Great Seal, and whose integrity, ability and constitutional knowledge com- manded the public respect; Barre, an eloquent and acrimonious declaimer; and Dunning, who had long held, the first place at the English bar. It was to this party that Pitt was naturally attracted.

On the 26th of February 1781 he made his first speech in favour of Burke's plan of economical reform. Fox stood up at the same moment, but instantly gave way. The lofty yet animated deportment of the young member, his perfect self- possession, the readiness with which he replied to the orators who had preceded him, the silver tones of his voice, the perfect structure of his unpremeditated sentences, astonished and delighted his hearers. Burke, moved even to tears, exclaimed, " It is not a chip of the old block; it is the old block itself." " Pitt will be one of the first men in parliament," said a member of the Opposition to Fox. " He is so already," answered Fox, in whose nature envy had no place. Soon after this debate Pitt's name was put up by Fox at Brookes's Club. On two subsequent occasions during that session Pitt addressed the house, and on both fully sustained the reputation which he had acquired on his first appearance. In the summer, after the prorogation, he again went the western circuit, held several briefs, and acquitted himself in such a manner that he was highly complimented by Buller from the bench, and by Dunning at the bar.

On the 27th of November the parliament reassembled. Only forty-eight hours before had arrived tidings of the surrender of Cornwallis and his army. In the debate on the report of the address Pitt spoke with even more

energy and brilliancy than on any former occasion. He was warmly applauded by his allies; but it was remarked that no person on his own side of the house was so loud in eulogy as Henry Dundas, the lord advocate of Scotland, who spoke from the ministerial ranks. From that night dates his connexion with Pitt, a connexion which soon became a close intimacy, and which lasted till it was dissolved by death. About a fortnight later Pitt spoke in the committee of supply on the army estimates. Symptoms of dissension had begun to appear on the treasury bench. Lord George Germaine, the secretary of state who was especially charged with the direc- tion of the war in America, had held language not easily to be reconciled with declarations made by the first lord of the treasury. Pitt noticed the discrepancy with much force and keenness. Lord George and Lord North began to whisper together; and Welbore Ellis, an ancient placeman who had been drawing salary almost every quarter since the days of Henry Pelham, bent down between them to put in a word. Such interruptions sometimes discompose veteran speakers. Pitt stopped, and, looking at the group, said with admirable readiness, " I shall wait till Nestor has composed the dispute between Agamemnon and Achilles." After several defeats, or victories hardly to be

distinguished from defeats, the ministry resigned. The king, reluctantly and ungraciously, consented to accept Rockingham as first minister. Fox and Shelburne became secretaries of state. Lord John Cavendish, cne of the most upright and honourable of men, was made chancellor of the exchequer. Thurlow, 'whose abilities and force of character had made him the dictator of the House of Lords, continued to hold the Great Seal. To Pitt was offered, through Shelburne, the vice-treasurer- ship of Ireland, one of the easiest and most highly paid places in the gift of the Crown; but the offer was without hesitation declined. The young statesman had resolved to accept no post which did not entitle him to a seat in the cabinet; and a few days later (March 1782) he announced that resolution in the House of Commons.

Pitt gave a general support to the administration of Rocking- ham, but omitted, in the meantime, no opportunity of courting that ultra-Whig party which the persecution of Wilkes and the Middlesex election had called into existence, and which the disastrous events of the war, and the triumph of republican principles in America, had made formidable both in numbers and in temper. He supported a motion for shortening the duration of parliaments. He made a motion for a committee to examine into the state of the representation, and, in the speech (May 7, 1782) by which that motion was introduced, avowed himself the enemy of the close boroughs, the strongholds of that corruption to which he attributed all the calamities of the nation, and which, as he phrased it in one of those exact and sonorous sentences of which he had a boundless command, had grown with

the growth of England and strengthened with her strength, but had not diminished with her diminution or decayed with her decay. On this occasion he was supported by Fox. The motion was lost by only twenty votes in a house of more than three hundred members. The Reformers never again had so good a divison till the year 1831.

*The new administration was strong in abilities, and was more popular than any administration which had held office since the first year of George III., but was hated by the king, hesitatingly supported by the parliament, l782 *

and torn by internal dissensions. It was all that Rockingham could do to keep the peace in his cabinet; and before the cabinet had existed three months Rockingham died. In an instant all was confusion. The adherents of the deceased statesman looked on the duke of Portland as their chief. The king placed Shelburne at the head of the treasury. Fox,' Lord John Cavendish, and Burke immediately resigned their offices; and the new prime minister was left to constitute a government out of very defective materials. It was necessary to find some member of the House of Commons who could confront the great orators of the Opposition; and Pitt alone had the eloquence and the courage which were required. He was offered the great place of chancellor of the exchequer and he accepted it (July 1782). He had scarcely completed his twenty-third year.

The parliament was speedily prorogued. During the recess a negotiation for peace which had been commenced under Rockingham was brought to a successful termination. England acknowledged the independence of her revolted colonies; and she ceded to her European enemies some places in the Mediter- ranean and in the Gulf of Mexico. But the terms which she obtained were quite as advantageous and honourable as the events of the war entitled her to expect, or as she was likely to obtain by persevering in a contest against immense odds. There is not the slightest reason to believe that Fox, if he had remained in office, would have hesitated one moment about concluding a treaty on such conditions. Unhappily Fox was, at this crisis, hurried by his passions into an error which made his genius and his virtues, during a long course of years, almost useless to his country. He saw that the great body of the House of Commons was divided into three parties — his own, that of North, and that of Shelburne; that none of those three parties was large enough to stand alone; that, therefore, unless two of them united there must be a miserably feeble administration,

or, more probably, a rapid succession of miserably feeble administrations,

and this at a time when a strong government was essential to the prosperity and respectability of the nation. It was then necessary and right that there should be a coalition. To every possible coalition there were objections. But of all possible coalitions that to which there were the fewest objections was undoubtedly a coalition between Shelburne and Fox. It would have been generally applauded by the followers of both. It might have been made without any sacrifice of public principle on the part of either. Unhappily, recent bickerings had left in the mind of Fox a profound dislike and distrust of Shelburne. Pitt attempted to mediate, and was authorized to invite Fox to return to the service of the Crown. " Is Lord Shelburne," said Fox, " to remain prime minister ? " Pitt answered in the affirmative. " It is impossible that I can act under him," said Fox. " Then negotiation is at an end," said Pitt; " for I cannot betray him." Thus the two statesmen parted. They were never again in a private room together. As Fox and his friends would not treat with Shelburne, nothing remained to them but to treat with North. That fatal coalition which is emphatically called " The Coalition" was formed. Not three- quarters of a year had elapsed since Fox and Burke had threat- ened North with impeachment, and had described him night after night as the most arbitrary, the most corrupt, and the most incapable of ministers. They now allied themselves with him for the purpose of driving from office a statesman with whom they cannot be said to have differed as to any important question. Nor had they even the prudence and the patience to wait for some occasion on which they might, without inconsistency, have combined with their old enemies in opposition to the government. That nothing might be wanting to the scandal, the great orators who had, during seven years, thundered against the war determined to join with the authors of that war in passing a vote of censure on the peace.

The parliament met before Christmas 1782. But it was not till January 1783 that the preliminary treaties were signed. On the 17 th of February they were taken into consideration by the House of Commons. There had been, during some days, floating rumours that Fox and North had coalesced; and the debate indicated but too clearly that those rumours were not unfounded. Pitt was suffering from indisposition — he did not rise till his own strength and that of his hearers were exhausted; and he was consequently less successful than on any former occasion. His admirers owned that his speech was feeble and petulant. He so far forgot himself as to advise Sheridan to confine himself to amusing theatrical audiences. This ignoble sarcasm gave Sheridan an opportunity of retorting with great felicity. " After what I have seen and heard to-night," he said, " I really feel strongly tempted to venture on a competition with so great an artist as Ben Jonson, and to bring on the stage a second Angry Boy. " On a division, the address proposed by the supporters of the government was rejected by a

majority of sixteen. But Pitt was not a man to be disheartened by a single failure, or to be put down by the most lively repartee. When, a few days later, the Opposition proposed a resolution directly censuring the treaties, he spoke with an eloquence, energy and dignity which raised his fame and popularity higher than ever. To the coalition of Fox and North he alluded in language which drew forth tumultuous applause from his followers. " If," he said, " this ill-omened and unnatural marriage be not yet consummated, I know of a just and lawful impediment; -and, in the name of the public weal, I forbid the banns." The ministers were again left in a minority, and Shelburne consequently tendered his resignation (March 31, 1783). It was accepted; but the king struggled long and hard before he submitted to the terms dictated by Fox, whose faults he detested, and whose high spirit and powerful intellect he detested still more. The first place at the board of treasury was repeatedly offered to Pitt; but the offer, though tempting, was steadfastly declined. The king, bitterly complaining of Pitt's faintheartedness, tried to break the coalition. Every art of seduction was Dractised on North, but in vain. During

several weeks the country remained without a government. It was not till all devices had failed, and till the aspect of the House of Commons became threatening, that the king gave way. Tl 3 duke of Portland was declared first lord of the treasury. Thurlow was dismissed. Fox and North became secretaries of state, with power ostensibly equal. But Fox was the real prime minister. The year was far advanced before the new arrangements were completed; and nothing very important was done during the remainder of the session. Pitt, now seated on the Opposition Bench, brought the question of parliamentary reform a second time (May 7, 1783) under the consideration of the Commons. He proposed to add to the house at once a hundred county members and several members for metropolitan districts, and to enact that every borough of which an election committee should report that the majority of voters appeared to be corrupt should lose the franchise. The motion was rejected by 293 votes to 149.

After the prorogation Pitt visited the Continent for the first and last time. His travelling companion was one of his most intimate, friends, William Wilberforce. That was the time of Anglomania in France; and at Paris the son of the great Chatham was absolutely hunted by men of letters and women of fashion, and forced, much against his will, into political disputation. One remarkable saying which dropped from him during this tour has been preserved. A French gentleman expressed some surprise at the immense influence which Fox, a man of pleasure, ruined by the dice-box and the turf, exercised over the English nation. " You have not," said Pitt, " been under the wand of the magician."

In November 1783 the parliament met again. The govern- ment had

irresistible strength in the House of Commons, and seemed to be scarcely less strong in the House of Lords, but was, in truth, surrounded on every side by dangers. The king was impatiently waiting for the moment at which he could emancipate himself from a yoke which galled him so severely that he had more than once seriously thought of retiring to Hanover; and the king was scarcely more eager for a change than the nation. Fox and North had committed a fatal error. They ought to have known that coalitions between parties which have long been hostile can succeed only when the wish for coalition pervades the lower ranks of both. At the beginning of 1783 North had been the recognized head of the old Tory party, which, though for a moment prostrated by the disastrous issue of the American war, was still a great power in the state. Fox had, on the other hand, been the idol of the Whigs, and of the whole body of Protestant dissenters. The coalition at once alienated the most zealous Tories from North and the most zealous Whigs from Fox. Two great multitudes were at once left without any head, and both at once turned their eyes on Pitt. One party saw in him the only man who could rescue the king; the other saw in him the only man who could purify the parlia- ment. He was supported on one side by Archbishop Markham, the preacher of divine right, and by Jenkinson, the captain of the praetorian band of the king's friends; on the other side by Jebb and Priestley, Sawbridge and Cartwright, Jack Wilkes and Home Tooke. On the benches of the House of Commons, however, the ranks of the ministerial majority were unbroken; and that any statesman would venture to brave such a majority was thought impossible. No prince of the Hanoverian line had ever, under any provocation, ventured to appeal from the representative body to the constituent body. The ministers, therefore, notwithstanding the sullen looks and muttered words of displeasure with which their suggestions were received in the closet, notwithstanding the roar of obloquy which was rising louder and louder every day from every corner of the island, thought themselves secure. Such was their confidence in their strength that, as soon as the parliament had met, they brought forward a singularly bold and original plan for the government of the British territories in India. What was proposed in Fox's India bill was that the whole authority which till that time had been exercised oyer those territories by the East India Company should be transferred to seven commissioners, who were to be

named by parliament, and were not to be removable at the pleasure of the Crown. Earl Fitzwilliam, the most intimate personal friend of Fox, was to be chairman of this board, and the eldest son of North was to be one of the members.

As soon as the outlines of the scheme were known all the hatred which the coalition had excited burst forth with an astounding explosion. Burke, who, whether right Bill. or wron g m the conclusions to which he came, had

at least the merit of looking at the subject in the right point of view, vainly reminded his hearers of that mighty population whose daily rice might depend on a vote of the British parliament. He spoke with even more than his wonted power of thought and language, about the desolation of Rohilcund, about the spoliation of Benares, about the evil policy which had suffered the tanks of the Carnatic to go to ruin ; but he could scarcely obtain a hearing. The contending parties, to their shame it must be said, would listen to none but English topics. Out of doors the cry against the ministry was almost universal. Town and country were united. Corporations exclaimed against the violation of the charter of the greatest corporation in the realm. Tories and democrats joined in pronouncing the proposed board an unconstitutional body. It was to consist of Fox's nominees. The effect of his bill was to give, not to the Crown, but to him personally, whether in office or in opposition, an enormous power, a patronage sufficient to counterbalance the patronage of the treasury and of the admiralty, and to decide the elections for fifty boroughs. He knew, it was said, that he was hateful alike to king and people; and he had devised a plan which would make him independent of both. Some nicknamed him Cromwell, and some Carlo Khan. Wilberforce, with his usual felicity of expression, and with very unusual bitterness of feeling, described the scheme as the genuine offspring of the coalition, as marked with the features of both its parents, the corruption of one and the violence of the other. In spite of all opposition, however, the bill was supported in every stage by great majorities, was rapidly passed, and was sent up to the Lords. To the general astonishment, when the second reading was moved in the upper house, the Opposition proposed an adjournment, and carried it by eighty-seven votes to seventy-nine. The cause of this strange turn of fortune was soon known. Pitt's cousin Earl Temple, had been in the royal closet, and had there been authorized to let it be known that his majesty would consider all who voted for the bill as his enemies. The ignominious commission was performed, and instantly a troop of lords of the bedchamber, of bishops who wished to be translated, and Prime of Scotch peers who wished to be re-elected, made Minister haste to change sides. On a later day the Lords rejected the bill. Fox and North were immediately directed to send their seals to the palace by their under-secre- taries; and Pitt was appointed first lord of the treasury and chancellor of the exchequer (December 1783).

The general opinion was that there would be an immediate dissolution. But Pitt wisely determined to give the public feeling time to gather strength. On this point he differed from bis kinsman Temple. The consequence was that

Temple, who had been appointed one of the secretaries of state, resigned his office forty-eight hours after he had accepted it, and thus relieved 'he new government from a great load of unpopularity; for all men of sense and honour, however strong might be their dislike of the India Bill, disapproved of the manner in which that bill had been thrown out. The fame of the young prime minister preserved its whiteness. He could declare with perfect truth that, if unconstitutional machinations had been employed, he had been no party to them.

He was, however, surrounded by difficulties and dangers. In the House of Lords, indeed, he had a majority; nor could any orator of the Opposition in that assembly be considered as a match for Thurlow,who was now again chancellor, or for Camden, who cordially supported the son of his old friend Chatham. But in the other house there was not a single eminent speaker among the official men who sat round Pitt. His most useful

assistant was Dundas, who, though he had not eloquence, had sense, knowledge, readiness and boldness. On the opposite benches was a powerful majority, led by Fox, who was supported by Burke, North and Sheridan. The heart of the young minis- ter, stout as it was, almost died within him. But, whatever his internal emotions might be, his language and deportment indicated nothing but unconquerable firmness and haughty confidence in his own powers. His contest against the House of Commons lasted from the 17th of December 1783 to the 8th of March 1784. In sixteen divisions the Opposition triumphed. Again and again the king was requested to dismiss his ministers ; but he was determined to go to Germany rather than yield. Pitt's resolution never wavered. The cry of the nation in his favour became vehement and almost furious. Addresses assuring him of public support came up daily from every part of the kingdom. The freedom of the city of London was presented to him in a gold box. He was sumptuously feasted in Grocers' Hall; and the shopkeepers of the Strand and Fleet Street illuminated their houses in his honour. These things could not but produce an effect within the walls of parliament. The ranks of the majority began to waver; a few passed over to the enemy; some skulked away; many were for • capitulating while it was still possible to capitulate with the honours of war. Negotiations were opened with the view of forming an adminis- tration on a wide basis, but they had scarcely been opened when they were closed. The Opposition demanded, as a preliminary article of the treaty, that Pitt should resign the treasury; and with this demand Pitt steadfastly refused to comply. While the contest was raging, the clerkship of the Pells, a sinecure place for life, worth three thousand a year, and tenable with a seat in the House of Commons, became vacant. The appointment was with the chancellor of the exchequer; nobody doubted that he would appoint himself, and nobody could have blamed him if he had done so; for such sinecure offices had always been defended on

the ground that they enabled a few men of eminent abilities and small incomes to live without any profession, and to devote themselves to the service of the state. Pitt, in spite of the remonstrances of his friends, gave the Pells to his father's old adherent, Colonel Barre, a man distinguished by talent and eloquence, but poor and afflicted with blindness. By this arrangement a pension which the Rockingham administration had granted to Barre was saved to the public. Pitt had his reward. No minister was ever more rancorously libelled; but even when he was known to be overwhelmed with debt, when millions were passing through his hands, when the wealthiest magnates of the realm were soliciting him for marquisates and garters, his bitterest enemies did not dare to accuse him of touching unlawful gain.

At length the hard-fought fight ended. A final remon- strance, drawn up by Burke with admirable skill, was carried on the 8th of March by a single vote in a full house. The supplies had been voted; the Mutiny Bill had been passed; and the parliament was dissolved. The popular constituent bodies all over the country were in general enthusiastic on the side of the new government. A hundred and sixty of the supporters of the coalition lost their seats. The first lord of the treasury himself came in at the head of the poll for the university of Cambridge. Wilberforce was elected knight of the great shire of York, in opposition to the whole influence of the Fitz-williams, Cavendishes, Dundases and Saviles. In the midst of such triumphs Pitt completed his twenty-fifth year. He was now the greatest subject that England had seen during many generations. He domineered absolutely over the cabinet, and was the favourite at once of the sovereign, of the parliament and of the nation. His father had never been so powerful, nor Walpole, nor Marlborough.

Pitt's first administration (1784-1801) lasted seventeen years. That long period is divided by a strongly marked line into two almost exactly equal parts. The first part put's First ended and the second began in the autumn of 1792. Adminis- Throughout both parts Pitt displayed in the highest trat ' on – degree the talents of a parliamentary leader. During the first

part he was fortunate and in many respects a skilful adminis- trator. With the difficulties which he had to encounter during the second part he was altogether incapable of contending; but his eloquence and his perfect mastery of the tactics of the House of Commons concealed his incapacity from the multitude. The eight years which followed the general election of 1784 were as tranquil and prosperous as any eight years in the whole

history of England. Her trade increased. Her manufactures flourished. Her exchequer was full to overflowing. Very idle apprehensions were generally entertained that the public debt, though much less than a third of the debt which we now bear with ease, would be found too heavy for the strength of the nation. But Pitt succeeded in persuading first himself and then the whole nation, his opponents included, that a new sinking fund, which, so far as it differed from former sinking funds, differed for the worse, would, by virtue of some mysterious power of propagation belonging to money, put into the pocket of the public creditor great sums not taken out of the pocket of the tax-payer. The minister was almost universally extolled as the greatest of financiers. Meanwhile both the branches of the house of Bourbon found that England was as formidable an antagonist as she had ever been. France had formed a plan for reducing Holland to vassalage. But England interposed, and France receded. Spain interrupted by violence the trade of the English merchants with the regions near the Oregon. But England armed, and Spain receded. Within the island there was profound tranquillity. The king was, for the first time, popular. From the day on which Pitt was placed at the head of affairs there was an end of secret influence. Any attempt to undermine him at court, any mutinous movement among his followers in the House of Commons, was certain to be at once put down. He had only to tender his resignation and he could dictate his own terms. For he, and he alone, stood between the king and the coalition. The nation loudly applauded the king for having the wisdom to repose entire confidence in so excellent a minister. His people heartily prayed that he might long reign over them; and they prayed the more heartily because his virtues were set off to the best advantage by the vices and follies of the prince of Wales, who lived in close intimacy with the chiefs of the Opposition.

How strong this feeling was in the public mind appeared signally on one great occasion. In the autumn of 1788 the king The became insane. The Opposition, eager for office,

Regency, committed the great indiscretion of asserting that 1788. the heir apparent had, by the fundamental laws of

England, a right to be regent with the full powers of royalty. Pitt, on the other hand, maintained it to be the constitutional doctrine that when a sovereign is, by reason of infancy, disease or absence, incapable of exercising the regal funcions, it belongs to the estates of the realm to determine who shall be the vice- gerent, and with what portion of the executive authority such vicegerent shall be entrusted. A long and violent contest followed, in which Pitt was supported by the great body of the people with as much enthusiasm as during the first months of his administration. Tories with one voice applauded him for defending the sick-

bed of a virtuous and unhappy sovereign against a disloyal faction and an undutiful son. Not a few Whigs applauded him for asserting the authority of parliaments and the principles of the Revolution, in opposition to a doctrine which seemed to have too much affinity with the servile theory of indefeasible hereditary right. The middle class, always zealous on the side of decency and the domestic virtues, looked forward with dismay to a reign resembling that of Charles II. That the prince of Wales must be regent nobody ventured to deny. But he and his friends were so unpopular that Pitt could, with general approbation, propose to limit the powers of the regent by restrictions to which it would have been impossible to subject a prince beloved and trusted by the country. Some interested men, fully expecting a change of administration, went over to the Opposition. But the majority, purified by these desertions, closed its ranks, and presented a more firm array than ever to the enemy. In every division Pitt was

victorious. When at length, after a stormy interregnum of three months, it was announced, on the very eve of the inaugura- tion of the regent, that the king was himself again, the nation was wild with delight. Pitt with difficulty escaped from the tumultuous kindness of an innumerable multitude which insisted on drawing his coach from St Paul's Churchyard to Downing Street. This was the moment at which his fame and fortune may be said to have reached the zenith. His influence in the closet was as great as that of Carr or Villiers had been. His dominion over the parliament was more absolute than that of Walpole or Pelham had been. He was at the same time as high in the favour of the populace as ever Wilkes or Sacheverell had been. But now the tide was on the turn. Only ten days after the triumphant procession to St Paul's, the states- general of France, after an interval of a hundred and seventy- four years, met at Versailles.

The nature of the great Revolution which followed was long very imperfectly understood in England. Burke saw much further than any of his contemporaries; but what- ever his sagacity descried was refracted and dis- «„„„/„«„„ coloured by his passions and his imagination. More than three years elapsed before the principles of the English administration underwent any material change. Nothing could as yet be milder or more strictly constitutional than the minister's domestic policy. Not a single act indicating an arbitrary temper or a jealousy of the people could be imputed to him. In office, Pitt had redeemed the pledges which he had, at his entrance into public life, given to the supporters of parlia- mentary reform. He had, in 1785, brought forward a judicious plan for the representative system, and had prevailed on the king, not only to refrain from talking against that plan, but to recommend it to the houses in a speech from the throne. 1 This attempt failed; but there can be little doubt that, if the French Revolution had not produced a violent reaction of public feeling, Pitt would have performed, with little difficulty and no danger, that great

work which, at a later period, Lord Grey could accom- plish only by means which for a time loosened the very founda- tions of the commonwealth. When the atrocities of the slave trade were first brought under the consideration of parliament no abolitionist was more zealous than Pitt. A humane bill, which mitigated the horrors of the middle passage, was, in 1788, carried by the eloquence and determined spirit of Pitt, in spite of the opposition of some of his own colleagues. In 1791 he cordially concurred with Fox in maintaining the sound constitu- tional doctrine that an impeachment is not terminated by a dissolution. In the course of the same year the two great rivals contended side by side in a far more important cause. They are fairly entitled to divide the high honour of having added to the statute-book the inestimable law which places the liberty of the press under the protection of juries. On one occasion, and one alone, Pitt, during the first half of his long administration, acted in a manner unworthy of an enlightened Whig. In the debate on the Test Act he stooped to gratify the master whom he served, the university which he represented, and the great body of clergymen and country gentlemen on whose support he rested, by talking, with little heartiness indeed, and with no asperity, the language of a Tory. With this single exception, his conduct from the end of 1783 to the middle of 1792 was that of an honest friend of civil and religious liberty.

Nor did anything, during that period, indicate that he loved war, or harboured any malevolent feeling against any neighbour- ing nation. Those French writers who have represented him as a Hannibal sworn in childhood by his father to bear eternal hatred to France, as having, by mysterious intrigues and lavish bribes, instigated the leading Jacobins to commit those excesses which dishonoured the Revolution, as having been the real

1 The speech with which the king opened the session of 1785 concluded with an assurance that his majesty would heartily con- cur in every measure which could tend to secure the true principles of the constitution. These words were at the time understood to refer to Pitt's Reform Bill.

author of the first coalition, know nothing of his character or of his history. So far was he from being a deadly enemy to France that his laudable attempts to bring about a closer connexion with that country by means of a wise and liberal treaty of commerce brought on him the severe censure of the Opposition. He was told in the House of Commons that he was a degenerate son, and that his partiality for the hereditary foes of our island was enough to make his great father's bones stir under the pavement of the Abbey.

And this man, whose name, if he had been so fortunate as to die in 1792, would have been associated with peace, with free- dom, with philanthropy, with temperate reform, with mild and constitutional administration, lived to associate his name with arbitrary government, with harsh laws harshly executed, with alien bills, with gagging bills, with suspensions of the Habeas Corpus Act, with cruel punishments inflicted on some political agitators, with unjustifiable prosecutions instigated against others and with the most costly and most sanguinary wars of modern times. He lived to be held up to obloquy as the stern oppressor of England and the indefatigable disturber of Europe. Poets, contrasting his earlier with his later years, likened him sometimes to the apostle who kissed in order to betray, and sometimes to the evil angels who kept not their first estate. By the French press and the French tribune every crime that disgraced and every calamity that afflicted France was ascribed to the monster Pitt and his guineas. While the Jacobins were dominant it was he who had corrupted the Gironde, who had raised Lyons and Bordeaux against the Convention, who had suborned Paris to assassinate Lepelletier, and Cecilia Regnault to assassinate Robespierre. When the Thermidorian reaction came, all the atrocities of the Reign of Terror were imputed to him. Collot D'Herbois and Fouquier Tinville had been his pensioners. It was he who had hired the murderers of September, who had dictated the pamphlets of Marat and the carmagnoles of Barere, who had paid Lebon to deluge Arras with blood and Carrier to choke the Loire with corpses. The truth is that he liked neither war nor arbitrary government. He was a lover of peace and freedom, driven, by a stress against which it was hardly possible for any will or any intellect to struggle, out of the course to which his inclinations pointed, and for which his abilities and acquirements fitted him, and forced into a policy repugnant to his feelings and unsuited to his talents.

Between the spring of 1789 and the close of 1792'the public mind of England underwent a great change. If the change of Pitt's sentiments attracted peculiar notice, it was not because he changed more than his neighbours, for in fact he changed less than most of them, but because his position was far more conspicuous than theirs, because he was, till Bonaparte appeared, the individual who filled the greatest space in the eyes of the inhabitants of the civilized world. During a short time the nation, and Pitt as one of the nation, looked with interest and approbation on the French Revolution. But soon vast confisca- tions, the violent sweeping away of ancient institutions, the domination of clubs, the barbarities of mobs maddened by famine and hatred, produced a reaction. The court, the nobility, the gentry, the clergy, the manufacturers, the merchants, in short nineteen-twentieths of those who had good roofs over their heads and good coats on their backs, became eager intolerant Antijacobins. This feeling was at least as strong among the minister's adversaries as among his supporters.

Fox in vain attempted to restrain his followers. All his genius, all his vast personal influence, could not prevent them from rising up against him in general mutiny. Burke set the example of revolt; and Burke was in no long time joined by Portland, Spencer, Fitzwilliam, Loughborough, Carlisle, Malmesbury, Windham, Elliot. In the House of Commons the followers of the great Whig statesman and orator diminished from about a hundred and sixty to fifty. In the House of Lords he had but ten or twelve adherents left. There can be no doubt that there would have been a similar mutiny on the ministerial benches if Pitt had obstinately resisted the general wish. Pressed at once by his master and by his colleagues, by old friends and by old xxi. 22

opponents, he abandoned, slowly and reluctantly, the policy which was dear to his heart. He laboured hard to avert the European war. When the European war broke out he still flattered himself that it would not be necessary for this country to take either side. In the spring of 1792 he congratulated the parliament on the prospect of long and profound peace, and proved his sincerity by proposing large remissions of taxation. Down to the end of that year he continued to cherish the hope that England might be able to preserve neutrality. But the passions which raged on both sides of the Channel were not to be restrained. The republicans who ruled France were inflamed by a fanaticism resembling that of the Mussulmans, who, with the Koran in one hand and the sword in the other, went forth conquering and converting, eastward to the Bay of Bengal, and westward to the Pillars of Hercules. The higher and middle classes of England were animated by zeal not less fiery than that of the crusaders who raised the cry of Deus vult at Clermont. The impulse which drove the two nations to a collision was not to be arrested by the abilities or by the authority of any single man. As Pitt was in front of his fellows, and towered high above them, he seemed to lead them. But in fact he was violently pushed on by them, and, had he held back but a little more than he did, would have been thrust out of their way or trampled under their feet.

He yielded to the current; and from that day his misfortunes began. The truth is that there were only two consistent courses before him. Since he did not choose to oppose

himself, side by side with Fox, to the public feeling, p u cy , he should have taken the advice of Burke, and should have availed himself of that feeling to the full extent. If it was impossible to preserve peace, he should have adopted the only policy which should lead to victory. He should have proclaimed a holy war for religion, morality, property, order, public law, and should have thus opposed to the Jacobins an energy equal to their

own. Unhappily he tried to find a middle path; and he found one which united all that was worst in both extremes. He went to war; but he could not understand the peculiar character of that war. He was obstinately blind to the plain fact that he was contending against a state which was also a sect, and that a new quarrel between England and France was of quite a different kind from the old quarrels about colonies in America and fortresses in the Netherlands. It was pitiable to hear him, year after year, proving to an admiring audience that the wicked republic was exhausted, that she could not hold out, that her credit was gone, that her assignats were not worth more than the paper of which they were made — as if credit was necessary to a government of which the principle was rapine, as if Alboin could not turn Italy into a desert till he had negotiated a loan at 5%, as if the exchequer bills of Attila had, been at par. It was impossible that a man who so com- pletely mistook the nature of a contest could carry on that contest successfully. Great as Pitt's abilities were, his military administration was that of a driveller. In such an emergency, and with such means, such a statesman as Richelieu, as Louvois, as Chatham, as Wellesley, would have created in a few months one of the finest armies in the world, and would soon have discovered and brought forward generals worthy to command such an army. Germany might have been saved by another Blenheim; Flanders recovered by another Ramillies; another Poitiers might have delivered the Royalist and Catholic pro- vinces of France from a yoke which they abhorred, and might have spread terror even to the barriers of Paris. But the fact is that, after eight years of war, after a vast destruction of life, after an expenditure of wealth far exceeding the expenditure of the American War, of the Seven Years' War, of the War of the Austrian Succession and of the War of the Spanish Succes- sion united, the English army under Pitt was the laughing-stock of all Europe. It could not boast of one single brilliant exploit. It had never shown itself on the Continent but to be beaten, chased, forced to re-embark or forced to capitulate. To take some sugar island in the West Indies, to scatter some irob of half-naked Irish peasants — such were the most splendid victories

won by the British troops under Pitt's auspices. The English navy no mismanagement could ruin. But during a long period whatever mismanagement could do was done. The earl of Chatham, without a single qualification for high public trust, was made, by fraternal partiality, first lord of the admiralty, and was kept in that great post during two years of a war in which the very existence of the state depended on the efficiency of

the fleet. Fortunately he was succeeded by George, Earl Spencer, one of those chiefs of the Whig party who, in the great schism caused by the French Revolution, had followed Burke. Lord Spencer, though inferior to many of his colleagues as an orator, was decidedly the best administrator among them. To him it was owing that a long and gloomy succession of days of fasting, and most emphatically of humiliation, was inter- rupted, twice in the short space of eleven months, by days of thanksgiving for great victories.

It may seem paradoxical to say that the incapacity which Pitt showed in all that related to the conduct of the war is, in some sense, the most decisive proof that he was a man of very extra- ordinary abilities. Yet this is the simple truth. While his schemes were confounded, while his predictions were falsified, while the coalitions which he had laboured to form were falling to pieces, while the expeditions which he had sent forth at enormous cost were ending in rout and disgrace, while the enemy against whom he was feebly contending was subjugating Flanders and Brabant, the electorate of Mainz and the electorate of Treves, Holland, Piedmont, Liguria, Lombardy, his authority over the House of Commons was constantly becoming more and more absolute. There was his empire. There were his victories — his Lodi and his Areola, his Rivoli and his Marengo. Of the great party which had contended against him during the first eight years of his administration more than one-half now marched under his standard, with his old competitor the duke of Portland at their head; and the rest had, after many vain struggles, quitted the field in despair. Session followed session with scarcely a single division. In the eventful year 1 799 the largest minority that could be mustered against the government was twenty-five.

In Pitt's domestic policy there was at this time assuredly no want of vigour. While he offered to French Jacobinism a resistance so feeble that it only encouraged the Policy. ev " wn ' c h he wished to suppress, he put down English Jacobinism with a strong hand. The Habeas Corpus Act was repeatedly suspended. Public meetings were placed under severe restraints. The government obtained from parliament power to send out of the country aliens who were suspected of evil designs; and that power was not suffered to be idle. Writers who propounded doctrines adverse to monarchy and aristocracy were proscribed and punished with- out mercy. The old laws of Scotland against sedition, laws which were considered by Englishmen as barbarous, and which a succession of governments had suffered to rust, were now furbished up and sharpened anew. Men of cultivated minds and polished manners were, for offences which at Westminster would have been treated as mere misdemeanours, sent to herd with felons at Botany Bay. Some reformers, whose opinions were extravagant, and whose language was intemperate, but who had never dreamed of subverting the government

by physical force, were indicted for high treason, and were saved from the gallows only by the righteous verdicts of juries.

One part only of Pitt's conduct during the last eight years of the 1 8th century deserves high praise. He was the first English minister who formed great designs for the benefit of Ireland. Had he been able to do all that he wished, it is probable that a wise and liberal policy would have averted the rebellion of 1798. But the difficulties which he encountered were great, perhaps insurmountable; and the Roman Catholics were, rather by his misfortune than by his fault, thrown into the hands of Jacobins. There was a third great rising of the Irishry against the Englishry, a rising not less formidable than the risings of 1641 and 1689. The Englishry remained victorious; and it was necessary for Pitt, as it had been

necessary for Oliver Cromwell and William of Orange before him, to consider how the victory should be used. He determined to make Ireland one kingdom with England, and, at the same time, to relieve the Roman Catholic laity from civil disabilities, and to grant a public maintenance to the Roman Catholic clergy. Had he been able to carry these noble designs into effect the union would have been a union indeed. But Pitt could execute only one-half of what he had projected. He succeeded in obtaining the consent of the parliaments of both kingdoms to the union; but that reconciliation of races and sects without which the union could exist only in name was not accomplished. The king imagined that his coronation oath bound him to refuse his assent to any bill for relieving Roman Catholics from civil disabilities. Dundas tried to explain the matter, but was told to keep his Scotch metaphysics to himself. Pitt and Pitt's ablest colleagues resigned their offices (March 14, 1801).

It was necessary that the king should make a new arrangement. But by this time his anger and distress had brought back the malady which had, many years before, incapacitated him for the discharge of his functions. He actually assembled his family, read the coronation oath to them, and told them that, if he broke it, the crown would immediately pass to the house of Savoy. It was not until after an interregnum of several weeks that he regained the full use of his small faculties, and that a ministry after his own heart was at length formed. In an age pre-eminently fruitful of parliamentary talents, a cabinet was formed containing hardly a single man who in parliamentary talents could be considered as even of the second rate. Henry Addington was at the head of the treasury. He had been an early, indeed an hereditary friend of Pitt, and had Addingtoa by Pitt's influence been placed, while still a young Ministry, man, in the chair of the House of Commons. He l80, – ,80 ' i – was universally admitted to have

been the best Speaker that had sat in that chair since the retirement of Onslow. But nature had not bestowed on him very vigorous faculties; and the highly respectable situation which he long occupied with honour had rather unfitted than fitted him for the dis- charge of his new duties. Nevertheless, during many months, his power seemed to stand firm. The nation was put into high good humour by a peace with France. The enthusiasm with which the upper and middle classes had rushed into the war had spent itself. Jacobinism was no longer formidable. Everywhere there was a strong reaction against what was called the atheistical and anarchical philosophy of the 18th century. Bonaparte, now first consul, was busied in construct- ing out of the ruins of old institutions a new ecclesiastical establishment and a new order of knighthood. The treaty of Amiens was therefore hailed by the great body of the English people with extravagant joy. The popularity of the minister was for the moment immense. His want of parliamentary ability was, as yet, of little consequence; for he had scarcely any adversary to encounter. The old Opposition, delighted by the peace, regarded him with favour. A new Opposition had indeed been formed by some of the late ministers, and was led by Grenville in the House of Lords and by Windham in the House of Commons. But the new Opposition could scarcely muster ten votes, and was regarded with no favour by the country.

On Pitt the ministers relied as on their firmest support. He had not, like some of his colleagues, retired in anger. He had expressed the greatest respect for the conscientious scruple which had taken possession of the royal mind; and he had promised his successors all the help in his power. But it was hardly possible that this union should be durable. Pitt, conscious of superior powers, imagined that the place which he had quitted was now occupied by a mere puppet which he had set up, which he was to govern while he suffered it to remain, and which he was to fling aside as soon as he wished to resume his old position. Nor was it long before he began to pine for the power which he had relinquished. Addington, on the other hand, was by no means inclined to descend from his high position. He took his elevation quite seriously, attributed it

to his own merit, and considered himself as one of the great triumvirate of English statesmen, as worthy to make a third with Pitt and Fox. Meanwhile Pitt's most intimate friends exerted themselves to effect a change of ministry. His favourite disciple, George Canning, was indefatigable. He spoke; he wrote; be intrigued; he tried to induce a large number of the supporters of the government to sign a round robin desiring a change; he

made game of Addington and of Addington's rela- tions in a succession of lively pasquinades. The minister's partisans retorted with equal acrimony, if not with equal vivacity. Pitt could keep out of the affray only by keeping out of politics altogether; and this it soon became impossible for him to do. The treaty of Amiens had scarcely been sigred when the restless ambition and the insupportable insolence of the First Consul convinced the great body of the English people that the peace so eagerly welcomed was only a precarious armistice. As it became clearer and clearer that a war for the dignity, the inde- pendence, the very existence of the nation was at hand, men looked with increasing uneasiness on the weak and languid cabinet which would have to contend against an enemy who united more than the power of Louis the Great to more than the genius of Frederick the Great. They imagined that Pitt was the only statesman who could cope with Bonaparte. This feeling was nowhere stronger than among Addington's own colleagues. The pressure put on him was so strong that he could not help yielding to it. His first proposition was that some insignificant nobleman should be first lord of the treasury and nominal head of the administration, and that the real power should be divided between Pitt and himself, who were to be secretaries of state. Pitt, as might have been expected, refused even to discuss such a scheme, and talked of it with bitter mirth. " Which secretaryship was offered to you?" his friend Wilber- force asked. " Really," said Pitt, " I had not the curiosity to inquire." Addington was frightened into bidding higher. He offered to resign the treasury to Pitt on condition that there should be no extensive change in the government. But Pitt would listen to no such terms. Then came a dispute such as often arises after negotiations orally conducted, even when the negotiators are men of strict honour. Pitt gave one account of what had passed; Addington gave another; and, though the discrepancies were not such as necessarily implied any intentional violation of truth on either side, both were greatly exasperated.

Meanwhile the quarrel with the First Consul had to come to a crisis. On the 16th of May 1803 the king sent a message calling on the House of Commons to support him in withstanding the ambitious and encroaching policy of France; and on the 22nd the house took the message into consideration.

Pitt had now been living many months in retirement. There had been a general election since he had spoken in parliament, and there were two hundred members who had never heard him. It was known that on this occasion he would be in his place, and curiosity was wound up to the highest point. Unfortunately, the shorthand writers were, in consequence of some mistake, shut out on that day from the gallery, so that the newspapers contained only a very meagre report of the proceedings. But several accounts of what passed are extant; and of those accounts the most

interesting is contained in an unpublished letter written by a very young member, John William Ward, after- wards earl of Dudley. When Pitt rose he was received with loud cheering. At every pause in his speech there was a burst of applause. The peroration is said to have been one of the most animated and magnificent ever heard in parliament. '• Pitt's speech," Fox wrote a few days later, " was admired very much, and very justly. I think it was the best he ever made in that style." The debate was adjourned; and on the second night Fox replied to it in an oration which, as the most zealous Pittites were forced to acknowledge, left the palm of eloquence doubtful. Addington made a pitiable appearance between the two great rivals; and it was observed that Pitt, while exhorting the Commons to stand resolutely by the executive government against France, said

not a word indicating esteem or friendship for the prime minister.

War was speedily declared. The First Consul threatened to invade England at the head of the conquerors of Belgium and Italy, and formed a great camp near the Straits of Dover. On the other side of those straits the whole British population was ready to rise up as one man in defence of the soil. In the spring of 1804 it became evident that the weakest of ministries would have to defend itself against the strongest of Oppositions, an Opposition made up of three Oppositions, each of which would, separately, have been formidable from ability, and which, when united, were also formidable from number. It was necessary to give way; the ministry was dissolved, and the task of performing a government was entrusted (May 1804) to Pitt. Pitt was of opinion that there was now an opportunity, such as had never before offered itself, and such as might never offer itself again, of uniting in the public service, on honourable terms, all the eminent talents of the kingdom. pltt . The treasury he reserved for himself; and to Fox Second he proposed to assign a share of power little inferior Administra- te his own. The plan was excellent; but the king tlon ' would not hear of it. Dull, obstinate, unforgiving, and at that time half mad, he positively refused to admit Fox into his service. In an evil hour Pitt yielded. All that was left was to construct a government out of the wreck of Addington's feeble administration. The small circle of Pitt's personal retainers furnished him with a very few useful assistants, particularly Dundas (who had been created Viscount Melville), Lord Harrowby and Canning.

Such was the inauspicious manner in which Pitt entered on his second administration (May 12, 1804). The whole history of that administration was of a piece with the commencement. Almost every month brought some new disaster or disgrace. To the war with France was soon added a war with Spain. The opponents of the ministry were numerous, able and active. His most useful coadjutors he soon lost. Sickness deprived him of the help of Lord Harrowby. It was discovered that Lord Melville had been guilty of

highly culpable laxity in trans- actions relating to public money. He was censured by the House of Commons, driven from office, ejected from the privy council and impeached of high crimes and misdemeanours. The blow fell heavy on Pitt. His difficulties compelled him to resort to various expedients. At one time Addington was persuaded to accept office with a peerage; but he brought no additional strength to the government. While he remained in place he was jealous and punctilious; and he soon retired again. At another time Pitt renewed his efforts to overcome his master's aversion to Fox; and it was rumoured that the king's obstinacy was gradually giving way. But, meanwhile, it was impossible for the minister to conceal from the public eye the decay of his health and the constant anxiety which gnawed at his heart. All who passed him in the park, all who had interviews with him in Downing Street, saw misery written in his face. The peculiar look which he wore during the last months of his life was often pathetically described by Wilberforce, who used to call it the Austerlitz look.

Still the vigour of Pitt's intellectual faculties and the intrepid haughtiness of his spirit remained unaltered. He had staked everything on a great venture. He had succeeded in forming another mighty coalition against the French ascendancy. The united forces of Austria, Russia and England might, he hoped, oppose an insurmountable barrier to the ambition of the common enemy. But the genius and energy of Napoleon prevailed. While the English troops were preparing to embark for Germany, while the Russian troops were slowly coming up from Poland, he, with rapidity unprecedented in modern war, moved a hundred thousand men from the shores of the ocean to the Black Forest (and compelled a great Austrian army to surrender at Ulm. To the first faint rumours of this calamity Pitt would give no credit. He was irritated by the alarms of those around him. "Do not believe a word of it" he said; "it is all a fiction." The next day he received a Dutch newspaper containing the

capitulation. He knew no Dutch. It was Sunday, and the public offices were shut. He carried the paper to Lord Malmes- bury, who had been minister in Holland; and Lord Malmesbury translated it. Pitt tried to bear up, but the shock was too great; and he went away with death in his face.

The news of the battle of Trafalgar arrived four days later, and seemed for a moment to revive him. Forty-eight hours after that most glorious and most mournful of victories had been announced to the country came the Lord Mayor's Day; and Pitt dined at Guildhall. His popularity had

declined. But on this occasion the multitude, greatly excited by the recent tidings, welcomed him enthusiastically, took off his horses in Cheapside, and drew his carriage up King Street. When his health was drunk, he returned thanks in two or three of those stately sentences of which he had a boundless command. Several of those who heard him laid up his words in their hearts; for they were the last words that he ever uttered in public: " Let us hope that England, having saved herself by her energy, may save Europe by her example."

This was but a momentary rally. Austerlitz soon completed what Ulm had begun. Early in December Pitt had retired to Bath, in the hope that he might there gather strength for the approaching session. While he was languishing there on his sofa arrived the news that a decisive battle had been fought and lost in Moravia, that the coalition was dissolved, that the Continent was at the feet of Prance. He sank down under the blow. Ten days later he was so emaciated that his most intimate friends hardly knew him. He came up from Bath by slow journeys, and on the nth of January 1806 reached his villa at Putney. Parliament was to meet on the 21st. On the 20th was to be the parliamentary dinner at the house of the first lord of the- treasury in Downing Street; and the cards were already issued. But the days of the great minister were num- bered. On the day on which he was carried into his bedroom at Putney, the Marquess Wellesley, whom he had long loved, whom he had sent to govern India, and whose administration had been eminently able, energetic and successful, arrived in London after an absence of eight years. The friends saw each other once more. There was an affectionate meeting and a last parting. That it was a last parting Pitt did not seem to be aware. He fancied himself to be recovering, talked on various subjects cheerfully and with an unclouded mind, and pronounced a warm and discerning eulogium on the marquis's brother Arthur. " I never," he said, " met with any military man with whom it was so satisfactory to converse." The excitement and exertion of this interview were too much for the sick man. He fainted away; and Lord Wellesley left the house convinced that the close was fast approaching.

And now members of parliament were fast coming up to London. The chiefs of the Opposition met for the purpose of considering the course to be taken on the first day of the session. It was easy to guess what would be the language of the king's speech, and of the address which would be moved in answer to that speech. An amendment condemning the policy of the government had been prepared, and was to have been proposed in the House of Commons by Lord Henry Petty (afterwards 3rd marquess of Lansdowne). He was unwilling, however, to come forward as the accuser of one who was incapable of defending himself. Lord Grenville, who had been informed of Pitt's state by Lord Wellesley, and had been deeply affected by it, earnestly recommended forbearance; and Fox, with characteristic

generosity and good nature, gave his voice against attacking his now helpless rival. " Sunt lacrymae rerum," he said, " et mentem mortalia tang- gunt." On the first day, therefore, there was no debate. It was rumoured that evening that Pitt was better. But on the follow- ing morning his physicians pronounced that there were no hopes. It was asserted in many after-dinner speeches, Grub Street elegies and academic prize poems and prize declamations that the great minister died exclaiming, " Oh my country! " This is a fable, but it is true that the last words which he uttered, while he knew what he said, were broken exclamations about

Death.

Character.

the alarming state of public affairs. He ceased to breathe on the morning of the 23 rd of January 1806, the twenty-fifth anniversary of the. day on which he first took his seat in parliament.

It was moved in the House of Commons that Pitt should be honoured with a public funeral and a monument. The motion was opposed by Fox in a speech which deserves to be studied as a model of good taste and good feeling. The task was the most invidious that ever an orator undertook; but it was performed with a humanity and delicacy which were warmly acknowledged by the mourning friends of him who was gone. The motion was carried by 288 votes to 89. The 22nd of Feb- ruary was fixed for the funeral. The corpse, having lain in state during two days in the Painted Chamber, was borne with great pomp to the northern transept of the Abbey. A splendid train of princes, nobles, bishops and privy councillors followed. The grave of Pitt had been made near to the spot where his great father lay, near also to the spot where his great rival was soon to lie. Wilberforce, who carried the banner before the hearse, described the awful ceremony with deep feeling. As the coffin descended into the earth, he said, the eagle face of Chatham from above seemed to look down with consternation into the dark house which was receiving all that remained of so much power and glory.

Pitt was emphatically the man of parliamentary government, the type of his class, the minion, the child, the spoiled child, of the House of Commons. He was a distinguished member of the House of Commons at twenty-one. The ability which he had displayed in the House of Commons made him the most powerful subject in Europe before he was twenty-five. It was when the House of Commons was to be convinced and persuaded that he put forth all his powers. Of those powers we must form our estimate chiefly from tradition; for, of all the eminent speakers of that age, Pitt has suffered most from the reporters. Even while he was still living, critics remarked that his

eloquence could not be preserved, that he must be heard to be appreciated. They more than once applied to him the sentence in which Tacitus describes the fate of a senator whose rhetoric was admired in the Augustan age: " Haterii canorum illud et profluens cum ipso simul exstinctum est." There is, however, abundant evidence that nature had bestowed on Pitt the talents of a great orator; and those talents had been developed in a very peculiar manner, first by his educa- tion, and secondly by the high official position to which he rose early, and in which he passed the greater part of his public life.

At his first appearance in parliament he showed himself superior to all his contemporaries in command of language. He could pour forth a long succession of round and stately periods, without premeditation, without ever pausing for a word, without ever repeating a word, in a voice of silver clearness, and with a pronunciation so articulate that not a letter was slurred over. He had less amplitude of mind and less richness of imagination than Burke, less ingenuity than Windham, less wit than Sheridan, less perfect mastery of dialectical fence and less of that highest sort of eloquence which consists of reason and passion fused together than Fox. Yet the almost unanimous judgment of those who were in the habit of listening to that remarkable race of men placed Pitt, as a speaker, above Burke, above Windham, above Sheridan and not below Fox. His declamation was copious, polished and splendid. In power of sarcasm he was probably not surpassed by any speaker, ancient or modern; and of this formidable weapon he made merciless use. In two parts of the oratorical art which are of the highest value to a minister of state he was singularly expert. No man knew better how to be luminous or how to be obscure. When he wished to be understood, he never failed to make himself understood. Nothing was out of place; nothing was forgotten; minute details, dates, sums of money, were all faith- fully preserved in his memory. On the other hand, when he did not wish to be explicit — and no man who is at the head of affairs always wishes to be explicit — he had a marvellous power

of saying nothing in language which left on his audience the impression that he had said a great deal.

The effect of oratory will always to a great extent depend on the character of the orator. There perhaps never were two speakers whose eloquence had more of what may be called the race, more of the flavour imparted by moral qualities, than Fox and Pitt. The speeches of Fox owe a great part of

their charm to that warmth and softness of heart, that sympathy with human suffering, that admiration for everything great and beautiful, and that hatred of cruelty and injustice, which interest and delight us even in the most defective reports. No person, on the other hand, could hear Pitt without perceiving him to be a man of high, intrepid and commanding spirit, proudly con- scious of his own rectitude and of his own intellectual superiority, incapable of the low vices of fear and envy, but too prone to feel and to show disdain. Pride, indeed, pervaded the whole man, was written in the harsh, rigid lines of his face, was marked by the way in which he walked, in which he sat, in which he stood, and above all, in which he bowed. Such pride, of course, inflicted many wounds. But his pride, though it made him bitterly disliked by individuals, inspired the great body of his followers in parliament and throughout the country with respect and confidence. It was that of the magnanimous man so finely described by Aristotle in the Ethics, of the man who thinks himself worthy of great things, being in truth worthy. It was closely connected, too, with an ambition which had no mixture ef low cupidity. There was something noble in the cynical disdain with which the mighty minister scattered riches and titles to right and left among those who valued them, while he spurned them out of his way. Poor himself, he was surrounded by friends on whom he had bestowed three thousand, six thousand, ten thousand a year. Plain Mister himself, he had made more lords than any three ministers that had preceded him. The garter, for which the first dukes in the kingdom were contending, was repeatedly offered to him, and offered in vain.

The correctness of his private life added much to the dignity of his public character. In the relations of son, brother, uncle, master, friend, his conduct was exemplary. In the small circle of his intimate associates he was amiable, affectionate, even playful. He indulged, indeed, somewhat too freely in wine, which he had early been directed to take as a medicine, and which use had made a necessary of life to him. But it was very seldom that any indication of undue excess could be detected in his tones or gestures; and, in truth, two bottles of port were little more to him than two dishes of tea. He had, when he was first introduced into the clubs of St James's Street, shown a strong sense for play; but he had the prudence and the resolution to stop before this taste had acquired the strength of habit. From the passion which generally exercises the most tyrannical dominion over the young he possessed an immunity, which is probably to be ascribed partly to his temperament and partly to his situation. His constitution was feeble; he was very shy; and he was very busy. The strictness of his morals furnished such buffoons as Peter Pindar and Captain Morris with an inexhaustible theme for merriment of no very delicate kind. But the great body of the middle class of Englishmen could not see the joke. They warmly praised the young statesman for commanding his passions, and for

covering his frailties, if he had frailties, with decorous obscurity.

The memory of Pitt has been assailed, times innumerable, often justly, often unjustly; but it has suffered much less from his assailants than from his eulogists. For, during many years, his name was the rallying cry of a class of men with whom, at one of those terrible con- junctures which confound all ordinary distinctions, he was accidentally and temporally connected, but to whom, on almost all great questions of principle, he was diametrically opposed. The haters of parliamentary reform called themselves Pittites, not choosing to remember that Pitt made three motions for parliamentary reform, and that, though he thought that such a reform could not safely be made while the passions excited by the French Revolution were raging, he never uttered a word

indicating that he should not be prepared at a more convenient season to bring the question forward a fourth time. The toast of Protestant ascendancy was drunk on Pitt's birthday by a set of Pittites who could not but be aware that Pitt had resigned his office because he could not carry Catholic emancipation. The defenders of the Test Act called themselves Pittites, though they could not be ignorant that Pitt had laid before George III. unanswerable reasons for abolishing the Test Act. The enemies of free trade called themselves Pittites, though Pitt was far more deeply imbued with the doctrines of Adam Smith than either Fox or Grey. The very negro-drivers invoked the name of Pitt, whose eloquence was never more conspicuously dis- played than when he spoke of the wrongs of the negro. This mythical Pitt, who resembles the genuine Pitt as little as the Charlemagne of Ariosto resembles the Charlemagne of Eginhard, has had his day. History will vindicate the real man from calumny disguised under the semblance of adulation, and will exhibit him as what he was — a minister of great talents, honest intentions and liberal opinions, pre-eminently qualified, intellectually and morally, for the part of a parliamentary leader, and capable of administering with prudence and modera- tion the government of a prosperous and tranquil country, but unequal to surprising and terrible emergencies, and liable in such emergencies to err grievously, both on the side of weakness and on the side of violence. (M.)

Authorities. — Lord Macaulay's article, a classic on its subject, written in 1859 for this Encyclopaedia and included in the 9th edition unaltered, is preserved above in its essentials, but has been shortened and readjusted. Among standard biographies are the 5th Earl Stanhope's important Life (4 vols., 2nd ed., 1862), and Lord Rose- bery's masterly study in the " Twelve English Statesmen Series " (1891). See also the bibliographical note to the Rev. William Hunt's article on Pitt in the Diet. Nat. Biog., and also the same historian's app. i., pp. 461-462, to his vol. x. (for the years

1760-1801) of The Political History of England (1905), dealing with the authorities for the period.

PITTA, in ornithology, from the Telugu pitta, meaning a small bird, latinized by Vieillot in 1816 {Analyse, p. 42) as the name of a genus, and since adopted by English ornithologists as the general name for a group of birds, called by the French Breves, and remarkable for their great beauty. 1 For a long while the

Estimates of Pitt.

Pitta elegans, male and female.

pittas were commonly supposed to be allied to the Turdidae, and some English writers applied to them the name of " water- thrushes " and " ant-thrushes," though there was no evidence of their having aquatic habits or predilections, or of their preying especially upon ants; but the fact that they formed a separate 1 In ornithology the word is first found as part of the native name, " Ponnunky pitta," of a bird, given in 1713 by Petiver, in the " mantissa " to Ray's Synopsis (p. 195), on the authority of Buckley (see Ornithology). This bird is the Pitta bengalensis of modern ornithologists, and is said by Jerdon {Birds of India, i. 503) now to bear the Telugu name of Pona-inki.

family was gradually admitted. Their position was partly determined by A. H. Garrod, who, having obtained examples for dissection, in a communication to the Zoological Society of London, printed in its Proceedings for 1876, proved (pp. 512, 513) that the Pittidae belonged to that section of Passerine birds which he named Mesomyodi, since their syrinx, like that of the Tyrannidae (see King-Bird), has its muscles attached to the middle of its half-rings, instead of to their extremities as in the higher Passerines or Acromyodi. They are now placed as a separate family Pittidae of the Clamatores division of the Anisomyodine Passeres. There are about fifty species, divided into a number of genera, confined to the Old World, and ranging from India and North China to Australia, New Guinea and New Britain, with one species in West Africa, the greatest number being found in Borneo and Sumatra. Few birds can vie with the pittas in brightly-contrasted coloration. Deep velvety black, pure white and intensely vivid scarlet, turquoise-blue and beryl-green — mostly occupying a considerable extent of surface — are found in a great many of the species — to say nothing of ether composite or intermediate hues; and, though in

some a modification of these tints is observable, there is scarcely a trace of any blending of shade, each patch of colour standing out distinctly. This is perhaps the more remarkable as the feathers have hardly any lustre to heighten the effect produced, and in some species the brightest colours are exhibited by the plumage of the lower parts of the body. Pittas vary in size from that of a jay to that of a lark, and generally have a strong bill, a thick-set form, which is mounted on rather high legs with scutellated " tarsi," and a very short tail. In many of the forms there is little or no external difference between the sexes.

Placed originally among the Pittidae, but now created to form an allied family Philepittidae, is the genus Philepitta, consisting of two species peculiar to Madagascar. The two species which compose it have little outward resemblance to the pittas, not having the same style of coloration and being apparently of more arboreal habits. The sexes differ greatly in plumage, and the males have the skin round the eyes bare of feathers and carunculated. (A. N.)

PITTACUS, of Mytilene in Lesbos (c. 650-570 B.C.), one of the Seven Sages of Greece. About 611, with the assistance of the brothers of the poet Alcaeus, he overthrew Melanchrus, tyrant of Lesbos. In a war (606) between the Mytilenaeans and Athenians for the possession of Sigeum on the Hellespont he slew the Athenian commander Phrynon in single combat. In 589 his fellow citizens entrusted Pittacus with despotic power (with the title of Aesymnetes) for the purpose of protecting them against the exiled nobles, at the head of whom were Alcaeus and his brother Antimenides. He resigned the government after holding it for ten years, and died ten years later. According to Diogenes Laertius, who credits him with an undoubtedly spurious letter to Croesus (with whom his connexion was probably legendary), Pittacus was a writer of elegiac poems, from which he quotes five lines. His favourite sayings were: " It is hard to be good," and " Know when to act."

See Herodotus v. 27, 94; Diog. Laert. i. 4; Lucian, Macrdbii, 18; Strabo xiii. 600, 617-618; Aristotle, Politics, ii. 12, iii. 14; T. Bergk, Poetae lyrici graeci.

PITTANCE (through O. Fr. pitance, from Lat. pietas, loving- Kindness), properly a gift to the members of a religious house for masses, consisting usually of an extra allowance of food or wine on occasions such as the anniversary of the donor's death, festivals and the like. The word was early transferred to a charitable donation and to any small gift of food or money.

PITT-RIVERS, AUGUSTUS HENRY LANE-FOX (1827-1900), English

soldier and archaeologist, son of W. A. Lane-Fox, was born on the 14th of April 1827. It was not till 1880 that he assumed the name of Pitt-Rivers, on inheriting the Dorsetshire and Wiltshire estates of his great-uncle, the second Lord Rivers. Educated at Sandhurst, he received a commission in the Grenadier Guards in 1845, being captain 1850, lieutenant- colonel 1857, colonel 1867, major-general 1877 and lieutenant- general 1882. He served in the Crimean War, and was at the Alma and the siege of Sebastopol. His talent for experimental research was utilized in investigation into

improvements of the army rifle, and he was largely responsible for starting the Hythe School of Musketry. It is not, how- ever, for his military career, but for his work as an anthro- pologist and archaeologist, that General Pitt-Rivers will be remembered. His interest in the evolution of the rifle early extended itself to other weapons and instruments in the history of man, and he became a collector of articles illustrating the development of human invention. His collection became famous, and, after being exhibited in 1874-1875 at the Bethnal Green Museum, was presented in 1883 to the university of Oxford. When, in 1880, General Pitt-Rivers obtained possession of his great-uncle's estates — practically untouched by the excavator since they had been the battleground of the West Saxons, the Romans and the Britons — he devoted himself to exploring them. His excavations round Rushmore resulted in valuable "finds"; he founded a local museum and published several illustrated volumes. As a scientific archaeologist he attained high rank. Oxford gave him the D.C.L. in 1886; he was president of the Anthropological Institute, and F.R.S. He married, in 1853, Alice Margaret, daughter of the second Lord Stanley of Alderley, and had a numerous family; his second daughter became in 1884 the wife of Sir John Lubbock (Lord Avebury). General Pitt-Rivers died at Rushmore on the 4th of May 1900.

PITTSBURG, a city of Crawford county, Kansas, U.S.A., about 130 m. S. of Kansas City. Pop. (1880), 624; (1890), .6697; (1900) 10,112, of whom 860 were foreign-born; (1910 census), 14,755. It is situated at the intersection of four great railway systems — the Atchison Topeka & Santa F6, the St Louis & San Francisco, the Kansas City Southern (which main- tains shops here), and the Missouri Pacific, and is served by inter-urban electric railways. The city is the seat of the State Manual Training Normal School (1903) and of the Pittsburg Business College. Pittsburg is situated near the lead and zinc region of south-east Kansas and south-west Missouri, is in the midst of a large and rich bituminous coalfield, and lies near natural gas and oil fields. Among the manufactures are zinc spelter — there are large smelters here — clay products (chiefly vitrified brick, sewer pipe and tile; the clay being obtained from a great underlying bed of shale), blasting powder, packing- house products and planing-mill products. The

total value of the city's factory products in 1905 was $1,824,929. Pittsburg was settled about 1879, was chartered as a city in 1880, and became a city of the first class in 1908.

PITTSBURG, or Pittsburgh, 1 the second largest city of Pennsylvania, U.S.A., and the county-seat of Allegheny county, on the Allegheny, Monongahela and Ohio rivers, 440 m. by rail W. by S. of New York City, 360 m. W. by N. of Philadelphia, 368 m. N.W. of Washington and 468 m. E. by S. of Chicago. Pop. (1890), 238, 617; 2 (190c), 321,616, of whom 84,878 were foreign-born, 17,040 were negroes and 154 were Chinese; (1910 census, after the annexation of Allegheny), 533,905. Of the 84,878 foreign-born in 1900, 21,222 were natives of Germany, 18,620 of Ireland, 8902 of England, 6243 of Russian Poland, 5709 of Italy, 4107 of Russia, 3553 of Austria, 3515 of German Poland, 2539 of Wales, 2264 of Scotland, 2124 of Hungary, 1072 of Sweden and 1023 of Austrian Poland. Area (including Allegheny, annexed in 1906), 40-67 sq. m. Pittsburg is served by the Pennsylvania (several divisions), the Baltimore & Ohio,, the Pittsburg & Lake Erie (controlled by the New York Central System) , the Pittsburg, Cincinnati, Chicago & St Louis (controlled by the Pennsylvania Company), the Pittsburg, Chartiers & Youghiogheny (controlled jointly by the two preceding railways; 21 m. of track), the Buffalo, Rochester & Pittsburg, and the Wabash-Pittsburg Terminal (60 m. to Pittsburg Junction, Ohio; controlled by the Wabash railway), and the Pittsburg Terminal (also controlled by the Wabash and operating the

1,1 Pittsburgh " is the official spelling of the charter and seal; but " Pittsburg " is the spelling adopted by the U.S. Geographic Board and is in more general use.

2 In previous census years the population was as follows: (1800), 1565 ; (1820), 7248; (1840), 21,115 ; (i860), 49,221 ; (1880), 156, 389-

West Side Belt, from Pittsburg to Clairton, 21 m.) railways, and by river boats on the Ohio, Monongahela and Allegheny.

Picturesque rolling plateaus, the three rivers and narrow valleys, from which rise high hills or precipitous bluffs, are the principal natural features of the district over which the city extends. Retail houses, wholesale houses, banks, tall office buildings, hotels, theatres and railway terminals are crowded into the angle, or "The Point," formed at the confluence of the Alleghenj/ and Monongahela rivers, with Fifth Avenue as the principal

thoroughfare, especially for the retail houses, and Fourth Avenue as the great banking thoroughfare. Factories extend for miles along the banks of all three rivers into the tributary valleys, and are the cause of Pittsburg's nickname, " The Smoky City." The more attractive residential districts are on the plateau in the eastern portion of the district between the Allegheny and Monongahela rivers and on the hills over- looking the Allegheny river from the north. Overlooking the Monongahela river is Schenley Park (about 422 acres), the first city park, of which about 400 acres were given to the city in 1890 by Mrs. Mary E. Schenley. About 2 m. to the north, overlooking the Allegheny river, is Highland Park (about 366 acres), which contains the city reservoirs and a picturesque lake. Adjacent to Schenley Park are Homewood and Calvary cemeteries; and adjacent to Highland Park is Allegheny cemetery. Across the Allegheny river, in the Allegheny district, are the beautiful Riverview Park (240 acres), in which is the Allegheny Observa- tory, and West Park (about 100 acres). A number of bridges span the rivers.

The city has some fine public buildings, office buildings and churches. The Allegheny county court-house (1884-1888) is one of H. H. Richardson's masterpieces. The Nixon theatre is also notable architecturally. The high Frick Office building has exterior walls of white granite; in its main hall is a stained- glass window by John La Farge representing Fortune and her wheel. A large government building of polished granite con- tains the post office and the customs offices. St Paul's Cathedral (Roman Catholic, 1903-1906) is largely of Indiana limestone. The city is the see of a Roman Catholic and a Protestant Episco- pal bishop. In Schenley Park is the Carnegie Institute (estab- lished by a gift of $10,000,000 from Andrew Carnegie, who made further contributions of $9,000,000 for its maintenance), with a main building containing a library, a department of fine arts, a museum (see Museums of Science) and a music hall, and several separate buildings for the technical schools, which had 2102 students in 1909. The main building, dedicated in April 1907, is 660 ft. long and 400 ft. wide; in its great entrance ball is a series of mural decorations by John White Alexander, a native of the city. The library, in which the institution had its beginning in 1895, contains about 306,000 volumes. The Phipps Conservatory was presented to the city in 1893 by Henry Phipps (b. 1839), a steel manufacturer associated with Andrew Carnegie. It is the largest in America, and, with its Hall of Botany, which is utilized in instructing school children in botany, is situated in Schenley Park. The conservatory is maintained by municipal appropriations. There is a zoological garden in Highland Park. In December 1907 it was decided that the several departments of the Western University of Pennsylvania, then in different parts of the city, should be brought together on a new campus of 43 acres near the Carnegie Institute. In July 1908 the name was

changed to " The University of Pitts- burgh." The university embraces a college and engineering school, the Western Pennsylvania School of Mines and Mining Engineering, a graduate department, an evening school of economics, accounts and finances, a summer school, evening classes, Saturday clasess, and departments of astronomy (the Allegheny Observatory, in the Allegheny district), law (the Pitts- burg Law School), medicine (the Western Pennsylvania Medical College), pharmacy (the Pittsburgh College of Pharmacy) and dentistry (the Pittsburgh Dental College). The institution had its beginning in the Pittsburgh Academy, which was opened about 1770 and was incorporated in 1787. It was incorporated as the Western University of Pennsylvania in 1819,

but was only a college from that date until 1892, when the Western Pennsylvania Medical College became its depart- ment of medicine. In 1895 the department of law was added, the Pittsburgh College of Pharmacy was united to the university, and women were for the first time admitted. In 1896 the department of dentistry was established. In 1909 the university had 151 instructors and 1243 students. In the east end is the Pennsylvania College for Women (Presbyterian; chartered in 1869), with preparatory, collegiate and musical depart- ments. In the Allegheny district are the Allegheny Theological Seminary (United Presbyterian, 1825), the Western Theological Seminary (Presbyterian, opened 1827), and the Reformed Presbyterian Theological Seminary (1856). Although Alle- gheny is now a part of Pittsburg, the two public school systems remain independent. The Pittsburg High School (five buildings in 1910) has a normal course; and there are various private schools and academies.

The Pittsburg Gazette-Times is probably the oldest news- paper west of the Alleghany Mountains ; the Gazette was founded in 1786 and in 1906 was consolidated with the Times (1879). Other prominent newspapers of the city are the Dispatch (1846), the Chronicle Telegraph (1841), the Post (1792; daily, 1842), which is one of the few influential Democratic newspapers in Pennsylvania, the Leader (Sunday, 1864; daily, 1870) and the Press (1883). Two German dailies, one Slavonic daily, one Slavonic weekly, two Italian weeklies, and iron, building, coal and glass trade journals are published in the city. In Pittsburg is the publishing house of the United Presbyterian Church, and The Christian Advocate (weekly, Methodist Episcopal, 1834) is published here under the auspices of the general conference.

The oldest hospital is the Reineman (private; 1803) for maternity cases; the municipal hospital (1878) is for contagious diseases; the Sisters of Charity, the Sisters of Mercy, the Institu- tion of Protestant Deaconesses, the Presbyterian Church and the United Presbyterian Woman's Association each have charge of a hospital; and there is also an eye, ear and throat

hospital (1895). The Western Pennsylvania Institution for the instruc- tion of the deaf and dumb (1876), in Edgewood Park, is in part maintained by the state. And the state assists the Home for Aged and Infirm Colored Women (1882), and the Home for Colored Children (1881). Among other charitable institutions are the Curtis Home (1894) for destitute women and girls, the Bethesda Home (1890) for homeless girls and their children, the Florence Crittenton Home (1893) for homeless and unfor- tunate women, the Roselia Foundling Asylum and Maternity Hospital (1891), the Protestant Home for Incurables (1883), the Pittsburg Newsboys' Home (1894), the Children's Aid Society of Western Pennsylvania, the Pittsburg Association for the Improvement of the Poor and the Western Pennsylvania Humane Society.

Pittsburg is in the midst of the most productive coalfields in the country; the region is also rich in petrc^um and natural gas. The city is on one of the main lines cf communication between the east and the west, is the centre of a vast railway system, and has freight yards with a total capacity for more than 60,000 cars. Its harbour has a total length on the three rivers of 27-2 m., and an average width of about 1000 ft., and has been deepened by the construction (in 1877-1885) of the Davis Island dam, by dredging, under a federal project of 1899. Slack water navigation has been secured on the Alle- gheny by locks and dams (1890 and 1896 sqq.) at an expense up to July 1909 of $1,658,804; and up to that time $263,625 had been spent for open-channel work. The Monongahela from Pittsburg to the West Virginia state line (91-5 m.) was improved in 1836 sqq. by a private company which built seven locks and dams; this property was condemned and bought for $3,761,615 by the United States government in 1897, and, under the project of 1899 for rebuilding three of the locks and enlarging another, and that of 1907 for a new lock and dam and for other improvements, $2,675,692 was spent up to July 1909. Coal is brought to the city from the coalfields by boats on the Allegheny and Monongahela rivers as well as by rail, and

great fleets of barges carry coal and other heavy freight, such as steel rails, cotton ties, sheet iron, wire and nails, down the Ohio in the winter and spring. A ship canal to provide water communication between Pittsburg and Lake Erie has been projected. The railways have a heavy tonnage of coal, coke and iron and steel products, and a large portion of the iron ore that is produced in the Lake Superior region is brought to Pittsburg. In 1908 the river traffic amounted to 9,090,146 tons, most of which was carried on barges down the Ohio. Pittsburg is also a port of entry; in 1907 the value

of its imports amounted to $2,416,367, and in 1909 to $2,062,162.

The value of the factory products in 1905 was $165,428,881, and to this may be added $45,830,272 for those of the city of Allegheny, making a total of $211,259,153. In the manufacture of iron and steel products Pittsburg ranks first among the cities of the United States, the value of these products amounting in 1905 to $88,250,805 or 53-3% of the total for all manufactures; if the manufactures of Allegheny be added they amounted to $92,939,860 or 43-7%. Several neighbouring cities and towns are also extensively engaged in the same industry, and in 1902 Allegheny county produced about 24% of the pig-iron, nearly 34% of the Bessemer steel, more than 44% of the open-hearth steel, more than 53 % of the crucible steel, more then 24% of the steel rails, and more than 59% of the structural shapes that were made in that year in the United States. In 1905 the value of Pittsburg's foundry and machine shop-products was $9,631,514; of the product of steam railway repair shops, $3,726,990 (being 424-8% more than in 1900); of malt liquors, $3,166,829; of slaughtering and meat-packing products, $2,732,027; of cigars and cigarettes, $2,297,228; 'of glass, $2,130,540; and of tin and terne plate, $1,645,570. Electrical machinery, apparatus and supplies were manufactured largely in the city (value in 1905, $1,796,557), and there was another large plant for their manufacture immediately outside of the city limits. Coke, cut cork, rolled brass and copper were other important products in 1905. In 1900, and for a long period preceding, Pittsburg ranked first among American cities in the manufacture of glass, but in 1905 it was outranked in this industry by Muncie, Indiana, Millville, New Jersey, and Washington, Pennsylvania; but in the district outside of the city limits of Pittsburg much glass is manufactured, so that the Pittsburg glass district is the greatest in the country, and there are large glass factories at Washington (18 m. south-west), Charleroi (20 m. south) and Tarentum (15 m. north-east). In Pittsburg or the immediate vicinity are the more important plants of the United States Steel Corporation, including that of the Carnegie Company. Here, too. are the plants of the Westinghouse Company for the manufacture of electrical apparatus, of air brakes invented by George Westinghouse (born 1846), and of devices for railway signals which he also invented. In the Allegheny district the H. J. Heinz Company has its main pickle plant, the largest establishment of -he kind in the country.

The Pittsburg charter of 1816 vested the more important powers of the city government in a common council of 15 members and a select council of 9 members, and until 1834 the mayor was appointed annually by these city councils from their own number. By the Wallace Act of the state legislature in 1874 a form of government was provided for cities of three classes, and Pittsburg became a city of the second class (popula- tion between 100,000

and 300,000) ; under the act of 1895 a new classification was made, under which Pittsburg remains in the second class. An act of 1887 had amended the provisions of the Wallace Act in regard to second class cities by changing the terms of select councilmen from two to four years and of common councilmen from one to two years. In 1901 a new act was passed for the government of cities of the second class. It provided that the executive be a " city recorder "; this provision was repealed in 1903, when the title of mayor again came into use. The mayor holds office for three years, has the powers and jurisdiction of a justice of the peace, appoints the heads of departments (public safety, public works, collector of delinquent taxes, assessors, city treasurer, law, charities and correction.

and sinking fund commission), and may remove any of the officers he has appointed, by a written order, showing cause, to the select council. The city controller is elected by popular vote. The legislative bodies are the select and common council, elected under the law of 1887; by a three-fifths vote it may pass resolutions or ordinances over the mayor's veto. The department of public safet}' controls the bureaus of police, detectives, fire, health, electricity and building inspection; the department of public works controls bureaus of surveys, construction, highways and sewers, city property, water, assessment of water rents, parks, deed registry, bridges and light. In 1909 the taxable valuation was $100,771,321, and the tax rate was 138 mills for city property, 9-2 mills on rural property and 6-9 mills on agricultural property. The tax rate for separate indebtedness varied from 6 mills in Allegheny to 16-2 mills in the 43rd ward. The water-supply of Pittsburg is taken from the Allegheny river and pumped into reservoirs, the highest of which, in Highland Park, is 367 ft. above the river; and there is a slow sand filtration plant for the filtration of the entire supply.

Pittsburg owed its origin to the strategic value of its site in the struggle between the English and the French for the posses- sion of the North American continent. A few Frenchmen attempted to establish a settlement here in 1731, but were soon driven away by the Indians. In 1753, after the French had laid formal claim to this region and the Ohio Land Company had been formed with a view to establishing a settlement within it, Robert Dinwiddie, governor of Virginia and a shareholder in the Ohio Company, sent George Washington with a letter to " the commandant of the French forces on the Ohio " (then stationed at Fort LeBceuf, near the present Waterford, about 115 m. north of the head- waters of that river) asking him to account for his invasion of territory claimed by the English. This was Washington's first important public service. He reached the present site of Pittsburg on the 24th of November 1753, and subsequently reported 1 that what is now called " The Point," i.e. the tongue of land formed by the confluence of the Monongahela and Allegheny rivers, was a much more favourable situation for a fort and trading post than the one about two

miles up the Monongahela (near the present site of McKees Rocks) which had been tentatively selected by the Ohio Company. Accordingly, on the 17th of February 1754, a detachment of about 40 soldiers, under the command of Captain William Trent, 2 reached " The Point," and began to build a fortification (under the auspices of the Ohio Company) , which it seems to have been the intention to call Fort Trent, and which was the beginning of the permanent settlement here by whites. On the 17th of the following April, however, Ensign Edward Ward, commanding the soldiers, in the absence of Captain Trent, was forced to evacuate the unfinished fortification by a party of about 1000 French and Indians, under Captain Contrecceur, who immediately occupied the works, which he enlarged and completed, and named Fort Duquesne, in honour of Duquesne de Menneville, governor of New France in 1752- 1755. In the following summer Washington attempted to recover this fort, in a campaign which included the skirmish

1 His Journal, published in 1754, gives a concise and lucid account of this expedition.

2 William Trent (c. 1715-1778) was a native of Lancaster county, Pennsylvania, became a captain in the state militia in 1746 and served against the French and Indians, was for many years, after 1749, a justice of the court of common pleas and general sessions of the peace for Cumberland county, Pennsylvania, and in 1 750-1 756 was the partner of George Crogan in an extensive trade with the Indians. According to one account, he visited the site of Pittsburg, and examined its availability for fortification, in August 1753 — before the arrival of Washington. In 1755 he became a member of the council of Lieut.-Governor Robert H. Morris, and in 1758 he accompanied General Forbes's expedition against Fort Duquesne. He acted many times as Indian agent; his lucrative trade with the Indians, conducted from a trading house near Fort Pitt, was ruined during Pontiac's conspiracy. At the beginning of the War of Independence he was given a major's commission to raise troops in Western Pennsylvania. See Journal of Captain William Trent (Cincinnati, Ohio, 1871), edited by Alfred T. Goodman.

(commonly considered the beginning of the French and Indian — Seven Years' — War) on the 28th of May 1754, at Great Meadows (in what is now Wharton township, Fayette county, Pennsyl- vania, about 50 m. south-east of Pittsburg), between a detach- ment under his command and a scouting party under N. Coulon de Jumonville, in which Jumonville and

several of his men were killed ; the building, at Great Meadows, by Washington, of Fort Necessity, and its capitulation (July 3); and the retreat of Washington to Virginia. Another expedition, led by Major-General Edward Braddock, resulted in the engagement known as- " Braddock's Defeat " (July 9, 1755), fought within the present borough of Braddock (about 8 m. east of Fort Duquesne), in which Braddock's force was practically annihilated, and Braddock was mortally wounded, dying four days later. The fort was finally recaptured by the English in 1758, as the result of an elaborate expedition (involving about 7000 troops) planned by Brigadier-General John Forbes (1710-1759), and prosecuted, with the assistance of Colonel George Washington and Colonel Henry Bouquet, in the face of great difficulties. General Forbes himself was so ill that he had to be carried in a litter throughout the campaign. The troops having rendez-voused during the summer (of 1758) at Ray's Town (now Bedford, Pennsylvania), and at Loyalhanna creek (now in Westmoreland county), about 50 m. to the north-west (where Fort Ligonier was built), Colonel Bouquet, commanding the division at the latter place, despatched Major James Grant (1720-1806) at the head of about 850 men to reconnoitre the fort. Grant advanced to a hill (still known by his name, and upon the crest of which the court-house now stands) within about a quarter of a mile of the fort. Here he rashly divided his force, and in a sortie of French and Indians, on the morning of the 14th of September, one of his divisions was surrounded, and a general rout ensued in which about 270 of Grant's men were killed, about 40 were wounded, and others (including Grant) were taken prisoners. Forbes's army advanced to within about 15 m. of the fort on the 24th of November, whereupon the French blew up part of the works, set fire to the buildings and retreated down the Ohio in boats. The English occupied the place on the next day and General Forbes ordered the immediate erection of a stockade fort near the site of the old one. In reporting to Lieut. -Governor William Denny (Nov. 26) the success of the expedition he dated his letter from Fort Duquesne "or now Pitts-Bourgh," and this name, with its subsequent modification " Pittsburgh," was thereafter more commonly used than that of Fort Pitt, which, as designating the fortification proper appears to have been first applied by General John Stanwix to the enlarged fort built (at a cost, it was estimated, of £60,000) chiefly under his direction during 1 759-1 760.

The first considerable settlement around the fort sprang up in 1760; it was composed of two groups of houses and cabins, fhe " lower town," near the fort's ramparts; and the " upper town," built chiefly along the banks of the Monongahela, and extending as far as the present Market Street. In April 1761, according to a census of the settlement, outside of the fort, taken for Colonel Bouquet, there were 332 inhabitants and 104 houses. Fort Pitt was one of the important objective points of Pontiac's conspiracy (1763), and

as soon as the intentions of the Indians became evident, Captain Simeon Ecuyer, the Swiss officer in command of the garrison (which then numbered about 330), had the houses outside the ramparts levelled and prepared for a siege. The Indians attacked the fort on the 22nd of June (1763), and kept up a continuous, though ineffective, fire upon it from the 27 th of July until the 1st of August, when they drew off and advanced to meet the relieving party under Colonel Bouquet. They were defeated at Bushy Run, and Colonel Bouquet relieved the fort on the 10th of August (see Ponttac). In 1764 Colonel Bouquet added to the fort a redoubt, the " Block House," which still stands, the sole remaining trace of Fort Pitt, and is owned and cared for by the Daughters of the American Revolution.

A second town, laid out in 1 764, by Colonel John Campbell (with the permission of the commandant at Fort Pitt), is bounded in

the present city by Water Street, Market Street, Second Avenue and Ferry Street, and comprises four blocks. In November 1768, at a general council of the Six Nations with Sir Williarp Johnson and representatives of Pennsylvania and Virginia, held at Fort Stanwix, on the site of the present Rome, New York (q.v.), at which was signed a treaty establishing the boundary line between the English possessions and the territory claimed by the Six Nations, the Indians sold for $10,000 to Thomas Penn (1702-1775) and Richard Penn (1706-1771), respectively, the second and third sons of William Penn — the founder of Pennsylvania — by his second wife, the remaining land in the province of Pennsylvania to which they claimed title, namely the tract lying south of the west branch of the Susquehanna river and of a straight line from the north-west corner of what is now Cambria county to the present Kittanning (in Armstrong county), and all of the territory east of the Allegheny river below Kittanning and south of the Ohio river. To this transaction the commissioner from Virginia seems to have made no objection, though the tract included the Fort Pitt region and other territory then claimed by Virginia. In January-March 1769 the Penns caused to be surveyed the " Manor of Pittsburgh," a tract of about 5700 acres, including much of the original city, intending to reserve it for their private use; but in the following April they offered at public sale the lands in the remainder of their purchase of the preceding year. 1 At this time the settlement about Fort Pitt consisted of about twenty houses, occupied chiefly by Indian traders. By order of General Thomas Gage the fort was abandoned as a military post in October 1772, and was partly dismantled. In January 1774 it was occupied by an armed force under Dr John Connolly, a partisan of Lord Dunmore, governor of Virginia, and by him was named Fort Dunmore (which name, however, was never formally recognized), this being one of Dunmore's overt acts ostensibly in support of his contention that the Fort Pitt region was included in Augusta county, Virginia. In the

following April Connolly took forcible posses- sion of the court-house at Hanna's Town (near the present Greensburg), the county-seat of Westmoreland county (which then included the Fort Pitt region) , a few days afterwards arrested the three justices who lived in Pittsburg, and for the remainder of the year terrorized the settlement. Lord Dunmore himself issued a proclamation dated " Fort Dunmore," 17th September (1774), in which he called upon the inhabitants to ignore the authority of Pennsylvania, and to recognize only that of Virginia. A year afterwards Fort Pitt was occupied by a company of Virginia soldiers by order of the Virginia Provincial Convention (assembled at Williamsburg in August 1775), but this move apparently was more for the defence of the frontier in the coming war than an expression on the Pennsylvania- Virginia boundary dispute; and, in November, Connolly was arrested at Fredericks- burg, Maryland, on the charge of furthering Dunmore's plans for invading the western frontier. The boundary itself was in controversy until 1780, and the marking of the boundary lines was not completed until 1785. During the War of Independence the fort was maintained as a frontier Indian post, and as a pro- tection against the British at Detroit. Soon after the close of the war it was neglected, and by 1791 it was in bad repair; there- fore at the time of the Indian hostilities of 1792 another stockade fort was built near the bank of the Allegheny river and about a quarter of a mile above the site of Fort Pitt, this new fort being named Fort Lafayette, or, as it was more commonly called, Fort Fayette. After General Anthony Wayne's defeat of the Indians, at Fallen Timbers, Ohio (Aug. 20, 1794), Pittsburg lost its importance as a frontier post.

In January 1784 the sale of the land included in the " Manor of Pittsburgh " was begun by the grandsons of William Penn, John Penn (1729-1795), the second son of Richard Penn and lieutenant-governor of Pennsylvania in 1763-1771 and in 1773- 1776; and John Penn (1760-1834), the fourth son of Thomas Penn; and in the following June a new series of town lots was laid out in which was incorporated Colonel Campbell's survey. Thereafter, settlers, chiefly Scotch and Irish, came rapidly. 1 This tract was confiscated by Pennsylvania in 1779.

Pittsburg and its vicinity witnessed much of the disorder, and some of the violence against person and property, incident to the Whiskjˆ Insurrection of 1791-94. Delegates from Alle- gheny, Westmoreland, Washington and Fayette counties met here on the 7th of September 1791, and passed resolutions severely denouncing the excise tax; and a similarly constituted gathering, on the 24th of August 1792, voted to proscribe all persons who

assisted in the enforcement of laws taxing the manufacture of liquor. Thereafter various persons who had paid the excise tax, or had assisted in collecting it, were tarred and feathered or had their houses or barns burned. General John Neville (1731-1803), having accepted the office of chief excise inspector for Western Pennsylvania, his fine country residence, about 7 m. south-west of Pittsburg, was attacked by a mob of about 500 men on the 16th and 17th of July 1794. The defenders of the property (who included a squad of soldiers from the garrison at Pittsburg) killed two and wounded several of the attacking party, but they were finally forced to surrender, and General Neville's mansion and other buildings were burned to the ground. A mass meeting of about 5000 citizens of the above-mentioned counties (many of them armed militiamen), at Braddock's Field, on the 1st and 2nd of August 1794, threat- ened to take possession of Fort Lafayette and to burn Pittsburg, but cooler counsel prevailed, and after voting to proscribe several persons, and marching in a body through the streets of the town, the crowd dispersed without doing any damage. Upon the arrival in the following November of the troops sent by President Washington, a military court of inquiry, held at Pittsburg, caused the arrest of several persons, who were sent to Phila- delphia for trial, where some of them were found guilty and sentenced to terms of imprisonment, but the sentences were not enforced.

The town was made the county-seat in 1 791 , it was incorporated as a borough in 1794, the charter was revived in 1804, and the borough was chartered as a city in 1816. As early 'as the year of its incorporation as a borough Philadelphia and Baltimore merchants had established an important trade with it. Their goods were carried in Conestoga wagons to Shippensburg and Chambersburg, Pennsylvania, and Hagerstown, Maryland, taken from there to Pittsburg on pack horses, and exchanged for Pittsburg products; these products were carried by boat to New Orleans, where they were exchanged for sugar, molasses, &c, and these were carried through the gulf and along the coast to Baltimore and Philadelphia. Boat-building was begun in Pittsburg in 1797 or earlier; the galley " President Adams," built by the government, was launched here in 1798, and the " Senator Ross," completed in the same year, was launched in 1799. In 1797 glassworks which were the first to use coal as a fuel in making glass were built here; later Pittsburg profited greatly by the use of its great store of natural gas in the manu- facture of glass. In 1806 the manufacture of iron was well begun, and by 1825 this had become the leading industry. On the 10th of April 1845 a considerable portion of the city was swept by fire, and in July 1877, during the great railway strike of that year, a large amount of property was destroyed by a mob. The commercial importance of the city was increased by the canal from Pittsburg to Philadelphia, built by the state in 1834 at a cost of $10,000,000. The first petroleum pipe line

reached Pittsburg in 1875. A movement to consolidate the cities of Pittsburg and Allegheny, together with some adjacent boroughs, was begun in 1853-1854. It failed entirely in that year but in 1867 Lawrenceville, Peebles, Collins, Liberty, Pitt and Oak- land, all lying between the two rivers, were annexed to Pittsburg; in 1872 there was a further annexation of a district embracing 27 sq. m. south of the Monongahela river; in 1906 Allegheny (q.v.), although, a large majority of those voting on the question in that city were opposed to it, was annexed, and in November 1907 the Supreme Court of the United States declared valid the act of the state legislature under which the vote was taken.

See N. B. Craig, The History of Pittsburgh (Pittsburg, 1851); Early History of Western Pennsylvania and the West, by a gentleman of the bar— J. D. Rupp (Pittsburg, 1848); William H. Egle,

Illustrated History of the Commonwealth of Pennsylvania (Harrisburg, Pa., 1876) ; Sarah H. Killikelly, The History of Pittsburgh, Its Rise and Progress (Pittsburg, 1906) ; S. H. Church, " Pittsburgh the Industrial City," in L. P. Powell's Historic Towns of the Middle States (New York, 1899) ; G. H. Thurston, Pittsburgh and Allegheny^ in the Cen- tennial Year (Pittsburg, 1876) ; for a history of the various forts as such, Report of the Commission to Locate the Frontier Forts of Penn- sylvania, vol. li. (Harrisburg, Pa., 1896); and for a thorough study of economic and social conditions in Pittsburg, P. U. Kellogg (ed.), The Pittsburg Survey (6 vols., New York, 1910 sqq.), prepared under the direction of the Sage Foundation.

PITTSFIELD, a city and the county-seat of Berkshire county, Massachusetts, U.S.A., in the western part of the state among the Berkshire Hills, and about 150 m. W. of Boston. Pop. (1890), 17,281; (1900), 21,766, of whom 4344 were foreign-born; (1910 census), ,',2,121. Area, about 41 sc m. It is served by the New York, New Haven & Hartford and the Boston & Albany (New York Central & Hudson River) railways, and by two inter-urban electric lines. Pittsfield is a popular summer resort; it lies in a plain about 1000 ft. above sea-level, is sur- rounded by the picturesque Berkshire Hills, and is situated in a region of numerous lakes, one of the largest — Lake Pontoosuc — being a summer pleasure resort. On either side of the city flow the east and west branches of the Housatonic river. Stand- ing in the public green, in the centre of the city, is the original statue (by Launt Thompson) of the " Massachusetts Color Bearer," which has been reproduced on the battlefield of Gettysburg, Pennsylvania. The principal institutions are the House of Mercy Hospital, with which is connected the Henry W. Bishop Memorial Training School for nurses, the Berkshire Home for aged women, the Berkshire Athenaeum, containing the public library, the Crane Art Museum and a Young Men's Christian Association. Prominent buildings are St Joseph's Cathedral and the

buildings of the Berkshire Life Insurance Company, the Agricultural National Bank and the Berkshire County Savings Bank. In the south-western part of Pittsfield, on the boundary between it and Hancock, is Shaker Village, settled about 1790 by Shakers. Pittsfield has water-power and important manufacturing industries. In 1905 its factory products were valued at $8,577,358, or 49-1% more than in 1900. Fully half of the manufactures consist of textile goods. The first settlement in what is now Pittsfield was made in 1743, but was soon abandoned on account of Indian troubles. In 1749 the settlement was revived, but the settlers did not bring their families to the frontier until 1752. The settlement was first called " Boston Plantation," or " Poontoosuck," but in 1 761, when it was incorporated as a township, the name was changed to Pittsfield, in honour of the elder William Pitt. In 1891 Pittsfield was chartered as a city. It was here, in the Appleton (or Plunkett) House, known as " Elm Knoll," and built by Thomas Gold, father-in-law of Nathan Appleton, that in 1845 Henry W. Longfellow (who married Nathan Appleton's daughter) wrote his poem " The Old Clock on the Stairs." For thirty years (1842-1872) Pittsfield was the home of the Rev. John Todd (1800-1873), the author of numerous books, of which Lectures to Children (1834; 2nd series, 1858) and The Student's Manual (1835) were once widely read. From 1807 to 1816 Elkanah Watson (1758-1842), a prominent farmer and merchant, lived at what is now the Country Club, and while there intro- duced the merino sheep into Berkshire county and organized the Berkshire Agricultural Society; he is remembered for his advocacy of the building of a canal connecting the Great Lakes with the Atlantic Ocean, and as the author of Memoirs : Men and Times of the Revolution (1855), edited by his son, W. C. Watson.

PITTSTON, a city of Luzerne county, Pennsylvania, U.S.A., on the Susquehanna river just below the mouth of the Lacka- wanna, about n m. S.W. of Scranton and about 9 m. N.E. of Wilkes-Barre. Pop. (1890), 10,302; (1900), 12,556, of whom 3394 were foreign-born; (1910 census), 16,267. It is served by the Erie, the Lehigh Valley, the Delaware, Lackawanna & Western, the Central of New Jersey, the Delaware & Hudson, and the Lackawanna & Wyoming Valley railways; there is an electric railway from Pittston to Scranton, and a

belt-Une electric railway connects Pittston with Avoca, Nanti- coke, Plymouth and Wilkes-Barre. Two bridges connect the city with the borough of West Pittston (pop., 1910, 6848). Pittston is in the midst of the richest anthracite coal region of the state, and fire-clay also abounds in the

vicinity. In 1905 the value of the factory products was $1,474,928 (47-8% more than in 1900). Pittston, named in honour of William Pitt, earl of Chatham, was one of the five original towns founded in the Wyoming Valley by the Susquehanna Company of Con- necticut; it was first settled about 1770 and was incorporated as a borough in 1803. It was chartered as a city in 1894.

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PIURA, the northernmost maritime department of Peru, bounded north by the Gulf of Guayaquil, N.E. by Ecuador, S. by the departments of Cajamarca and Lambayeque, and W. by the Pacific. Area, 14,849 sq. m.; pop. (1906, estimate), 154,080— both totals exclusive of the province of Tumbes, or Tumbez (area, about 1980 sq. m.; pop., in 1906, about 8000), which has been administratively separated from the department for military reasons. The department belongs partly to the arid coastal plain that extends from the Gulf of Guayaquil southward nearly to Valparaiso, and partly to a broken mountainous region belonging to the Western Cordilleras. The coastal zone is traversed by the Tumbes, Chira and Piura rivers, which have their sources in the melting snows of the higher Andes and flow westward across the desert to the coast. The valleys of the Chira and Piura are irrigated and maintain large populations. Rough cotton, called " vegetable wool," and tobacco are the principal products, and are also produced in the valley of the Tumbes and in some of the elevated mountain districts. On the upland pastures cattle have long been raised, and goat- breeding has been added in modern times. Mules also are reared. Petroleum is an important product, and there are wells at a number of places along the coast, from Tumbes to Sechura, the most productive being those of Talara and Zorritos. There are sulphur deposits in the Sechura desert, and salt is manufactured at some places on the southern coast. The making of Panama hats from the fibre of the " toquilla " palm is a household industry. The capital is Piura (est. pop. 9100 in 1906), on the Piura river, about 35 m. (direct) E.S.E. of Paita, and 164 ft. above sea-level. It was founded by Pizarro in 1531 under the name of San Miguel, at a place called Tangarara, nearer Paita, but the present site was afterwards adopted. A railway (60 m. long) by way of Sullana connects with the port of Paita, and an extension of 6 m. runs S.S.E. to Catacaos. Other towns of the department, with their estimated populations in 1906, are: Tumbes, or Tumbez (2300), the most northern port of Peru, on the Gulf of Guayaquil, celebrated as the place where Pizarro landed in 1531; Paita; Sechura (6450), on Sechura Bay in the southern part of the department, with exports of salt and sulphur; Sullana (5300), an inland town with railway connexions in the fertile Chira valley; Moiropon (3800) on the upper Piura; Huan- cabamba, the centre of a tobacco district in the mountains; and Tambo Grande (6100) and Chulucanas (4600), both in the fertile

Piura valley above the capital. PIUS, the name of ten popes.

Pius I., pope from about 141 to 154. He was the brother of Hermas, author of the Shepherd.

Pius II. (Enea Silvio de' Piccolomini, known in literature as Aeneas Silvius), pope from 1458 to 1464, was born on the 18th

of October 1405, at Corsignano (afterward called Pienza after him), near Siena. His family, though poor, was noble, -and claimed to trace descent from Romulus. The eldest of eighteen children, he had to work on the farm with his father, until a priest taught him the rudiments of letters, which enabled him, at the age of eighteen, to go as a poor student to Siena, dividing his time between severe humanistic studies and a life of sensual pleasure. He was attracted to Florence by the teaching of Filelfo. His father urged him to become a lawyer, but he accepted the position of secretary to Domenico Capranica, bishop of Fermo, and went with him to the council of Basel, where he stayed several years (1431-1435), changing masters whenever he could improve his position. As secretary of the bishop of Novara he became engaged in a conspiracy against Pope Eugenius IV.; his master was caught and imprisoned, and Aeneas only saved himself by a hasty flight. He was next (1435) employed as secretary of Cardinal Nicholas Albergati (d. 1443) at the congress of Arras, where peace was made between France and Burgundy. From here he took a long journey to Scotland and England, on a secret diplomatic mission; he had numerous adventures, in one of which he nearly lost his life. In 1436 he was back at Basel, and, although a layman, obtained a seat in the council and exercised considerable influence. In order to control it better Eugenius tried to get the council to move to Florence; a minority agreed and seceded; the majority, however, stayed where they were and took vigorous measures against the pope, culminating in his deposition on the 25th of June 1438. Aeneas took an active part in the council; and though he still declined to take orders, he was given a position on the conciliar conclave which elected Amadeus of Savoy as pope under the title of Felix V. In return for his services Felix made Aeneas papal secretary.

A new period of his career opened in 1442, when he was sent by the council to take part in the diet of Frankfort-on-Main. Here he met Frederick III. of Germany, who made him poet laureate and his private secretary. He ingratiated himself with the chancellor, Kaspar Schlick, at Vienna, one of whose adventures he celebrated in Lucretia and Eurialus, a novel in the style of Boccaccio. At this period he also wrote his witty but immoral play, Chrisis. In 1446 he took orders as subdeacon, and wrote that he meant to reform, " forsaking Venus for Bacchus," chiefly on the ground of satiety, and also, as he frankly wrote, because the clerical

profession offered him more advantages than he could secure outside it.

Aeneas was useful to Frederick as a diplomatist, and managed to give all parties the impression that he was the devoted advocate of each. During the struggle between pope and council he induced Frederick to be neutral for a while. He tcok an important part in the diet of Nuremberg (1444), and being sent on an embassy to Eugenius in the following year he made his peace with the pope. At the diet of Frankfort (Sept. 1446) Aeneas was instrumental in changing the majority of the electors from their hostile position towards pope and emperor into a friendly one. He brought the good news to Eugenius shortly before his death (Feb. 7, 1447), and made friends with the new pope, Nicholas V., by whom he was made bishop of Siena. He was an agent of Frederick in making the celebrated concordat of Vienna (also called concordat of Aschaffenburg) in February 1448. His services to pope and emperor brought him the titles of prince of the empire and cardinal, positions which he used rather unscrupulously to get as many lucrative benefices into his hands as possible. Those in Germany brought him two thousand ducats a year.

The death of Calixtus III. (who succeeded Nicholas V.) occurred on the 5th of August 1458. After a hot fight in the conclave, in which it seemed that the wealthy French cardinal, Guillaume d'Estouteville, archbishop of Rouen and bishop of Ostia, would be elected, the intrigues of Aeneas and of his friend Rodrigo Borgia (later the notorious Alexander VI.) gave the victory to the cardinal of Siena, who took the title Pius II., with a reminiscence of Virgil's " pius Aeneas." The humanists hailed his election with joy, and flocked around to secure a share

of the good things, but they were bitterly disappointed, as Pius did not prove himself the liberal and undiscriminating patron they hoped. The fall of Constantinople in 1453 had made a deep impression upon Pius, and he never ceased to preach the crusade against the Turk. In September 1459 he opened a congress at Mantua for the purpose of considering what could be done in this direction. His proposals for the raising of troops and money met with general opposition. The French were angry because Pius had crowned the Spanish claimant, Ferdinand, king of Naples, and thus disposed of the pretensions of Rene of Anjou. The Germans also objected to Pius's plans, but finally agreed to furnish some troops and money, promises which they did not carry out. Pius felt how much the position of the papacy had fallen in importance since the days of Urban and Innocent III., and, believing that the change was due to the general councils which had

asserted power over the popes, he changed his position, which before his election to the papal throne had been that of a warm advocate of the conciliar claims, and issued (Jan. 1460) the bull Execrabilis et in pristinis temporibus in- audilns, in which he condemned as heretical the [doctrine that the councils were superior to the popes, and proclaimed the anathema against any one who should dare to appeal to one. He issued another bull at the same time, promising forgiveness of sins to those who would take part in the crusade, and then dissolved the congress.

While Pius was at Mantua war broke out between the French and Spanish in southern Italy, and a rising of the barons devas- tated the Campagna. Hurrying back to Rome Pius succeeded in quelling the disorders, and sent his nephew Antonio Todes- chini to the aid of Ferdinand, who made him duke of Amalfi and gave him his natural daughter Maria in marriage. This measure still further alienated the pope from the French, with whom he was at that time negotiating for the abrogation of the Pragmatic Sanction. When Louis XL came to the throne (Nov. 1461), he sent to Pius saying that he had abolished the Pragmatic Sanction, hoping in return to get the kingdom of Naples for his countryman Rene of Anjou. When Pius refused to do anything to the prejudice of Ferdinand, Louis changed his attitude, and allowed the protests of the university of Paris and the parlements to persuade him to restore the ancient liberties of the Gallican Church. At the same time a serious quarrel with the Germans prevented anything being done towards a crusade. George Podiebrad, king of Bohemia, was plotting to depose the emperor Frederick III., who was sup- ported by Pius. Diether, archbishop of Mainz, took the side of Podiebrad, and replied to Pius's measures by appealing to a general council. He was declared deposed by the pope, but kept his seat, and in 1464 compelled the pope to recognize him again. The quarrel with Podiebrad, who was accused of supporting the Utraquist heresy, continued with increasing bitterness, but without any decisive result, until the death of Pius. In the meantime the pope did what he could to further the cause of the crusade. The discovery of alum mines at Tolfa gave him an unexpected pecuniary resource, and to stimulate the zeal of Christendom, Pius took the cross on the 18th of June 1464. He set out for Venice, where he intended to sail for the East, but he was attacked with a fever, and on the 14th of August 1464 he died.

Pius II. was a voluminous author. Besides poems, a novel and a play, he wrote a number of orations, which were con- sidered models of eloquence in their day. His most valuable work, however, is his Commentaries, a history of his own life and times, told in an interesting and rational manner. He is very frank about himself, and most of the adverse judgments which have been pronounced on his character have been based on his own confessions. He was an opportunist, sailing along with any favourable breeze, and not quite enough in earnest about anything to pursue the same

tack steadily for long. We must give him the credit, however, of advocating a statesman- like policy in the interests of the whole of Europe in trying to get the powers to unite against the Turks, who threatened to overwhelm them all.

See Herzog-Hauck, Realencyklopiidie (1904), vol. xv., where a full bibliography will be found; M. Creighton, History of the Papacy during the Reformation, vol. ii. (London, 1882) ;L. Pastor, History of the Popes from the close of the Middle Ages (Eng. trans., 1896, vol. ii.) ; Voigt, Pius II. (1856-1863). The Commentaries of Pius were pub- lished in 1584, under the name of Gobelinus Persona. His other works are found in Aeneae Silvii opera omnia (Basel, 1551). See also W. Boulting, Aeneas Silvius (1909). (p, Sm.)

Pitjs III. (Francesco Nanni-Todeschini-Piccolomini), pope from the 22nd of September to the 18th of October 1503, was born at Siena on the 9th of May 1439. After studying law at Perugia, he was made archbishop of Siena and cardinal-deacon of St Eustachio, when only twenty-two years of age, by his uncle Pius II., who permitted him to assume the name and arms of the Piccolomini. He was employed by subsequent popes in several important legations, as by Paul II. at the diet of Regensburg, and by Sixtus IV. to secure the restoration of ecclesiastical authority in Umbria. He bravely opposed the policy of Alexander VI., and was elected pope, amid the dis- turbances consequent upon the death of the latter, through the interested influence of Cardinal della Rovere, afterwards Julius II., and was crowned on the 8th of October 1503. He permitted Cesare Borgia to return to Rome, but promptly took in hand the reform of the curia. Pius was a man of blameless life, and would doubtless have accomplished much had he lived. His successor was Julius II.

See L. Pastor, History of the Popes, vol. vi., trans, by F. I. Antrobus (London, 1898); M. Creighton, History of the Papacy, vol. v. (Lon- don, 1901); F. Gregorovius, Rome in the Middle Ages, vol. viii., trans, by Mrs G. W. Hamilton (London, 1900-1902) ; Piccolomini, "II Pontificato di Pio III.," inlArchivio stor. ital., vol.;v.(Firenze, 1903).

Pius IV. (Giovanni Angelo Medici, or " Medighino "), pope from 1559 to 1565, was born at Milan on the 31st of March 1499, of an obscure family, not related to the Medici of Florence (a claim to such relationship was advanced after Giovanni Angelo had attained to prominence). The fortune of the family was established by an elder brother, Gian Giacomo, who fought his way to the marquisate of Marignano and distinguished him- self in the service of the emperor. Giovanni Angelo studied in Bologna and Pavia, and for some time followed the law. Entering the service of the Church, he found favour with Paul III., who entrusted him with the

governorship of several important towns, and in 1549 made him a cardinal. Julius III. sent him upon missions to Germany and Hungary. With Paul IV. he was out of favour, because not in sympathy with his policy, and accordingly retired to Milan. In the protracted and momentous conclave that followed the death of Paul the election of Pius (Dec. 25, 1559) was due to a compromise between the Spanish and French factions.

In temperament and habit Pius was the antithesis of his predecessor: affable, vivacious, convivial. He was, moreover, astute, diplomatic and experienced in affairs. He allowed the reform movement free course, but tried to repair certain in- justices of Paul IV. (for example, releasing and reinstating Morone, who had been imprisoned on a charge of heresy), and mitigated some of his extreme decrees. But to the nephews of Paul he showed no mercy: they were charged with various crimes, condemned, upon testimony of suspicious validity, and executed on the 5th of March 1561. The Colonnesi, who had been active fti the prosecution, recovered Paliano. But under Pius V. judgment was reversed, the memory of the Caraffa rehabilitated, and restitution made to the family. Pius IV. himself was not guiltless of nepotism; but the bestowment of .the cardinalate and the archbishopric of Milan upon his nephew, the pure and upright Carlo Borromeo, redounded to the honour of his pontifi- cate and the welfare of the church.

With England lost to the papacy, Germany overwhelmingly Protestant, and France on the verge of civil war, Pius realized how fatuous was the anti-Spanish policy of his predecessor. He therefore recognized Ferdinand as emperor, and conciliated Philip II. with extensive ecclesiastical privileges. But sub- sequently, antagonized by Philip's arrogance, he inclined to-wards France, and gave troops and money for the war against the Huguenots.

After a suspension of ten years the council of Trent reconvened on the 18th of January 1562. Among the demands presented by the various nations were, the recognition of the equality of the episcopate, communion in both kinds, clerical marriage, and the use of the vernacular in Church services. It required all the pope's diplomacy to avoid compliance on the one hand, and a breach with the powers on the other. Thanks to Morone and Borromeo, however, he achieved his end. The council was dissolved on the 4th of December 1563, and its decrees and definitions confirmed by the pope (Jan. 26, 1564), who reserved to himself the sole right of interpretation. The decrees were immediately accepted by most of the

Catholic states; only tardily, however, and with reservation by France and Spain. Various measures were taken for carrying the decrees into effect: residence was strictly enjoined; plurality of benefices prohibited; the Inquisition resumed, under the presidency of Ghislieri (afterwards Pius V.) ; a new edition of the Index published (1564); and the " Tridentine creed" promulgated (Nov. 13,

1564).

After the termination of the council Pius indulged his desire for ease and pleasure, to the great offence of the rigorists. A certain fanatic, Benedetto Accolti, brooding over the pope's unworthiness, felt inspired to remove him, but his plot was discovered and punished (1565). Pius fortified Rome, and con- tributed much to the embellishment of the city — among other works, the church of Sta Maria degli Angeli in the Baths of Diocletian; the Porta Pia; the Villa Pia in the Vatican Gardens; and the Palace of the Conservatori. He died on the oth of December, and was succeeded by Pius V.

See Panvinio, continuator of Platina, De vitis pontiff, rom. (a contemporary of Pius) ; Ciaconius, Vitae et res gestae sutnmorum pontiff, rom. (Rome 1 601-1602; also contemporary); T. Muller, Das Konklave Pius IV. (Gotha, 1889; more comprehensive than the title suggests) ; Ranke, Popes (Eng. trans., Austin), i. 323 seq., 358 seq. ; and v. Reumont, Gesch. der Stadt Rom. iii. 2, 534 seq., 730 seq.

(T. F. C.)

Pius V. (Michele Ghislieri), pope from 1566 to 1572, was born on the 17th of January 1504, in the Milanese. At the age of fourteen he became a Dominican monk. His austere life, his vehemence in attacking heresy and his rigorous discipline as prior of several monasteries proved his fitness for the work of reform, and he was appointed inquisitor in Como, where his zeal provoked such opposition as to compel his recall (1550). The chief inquisitor, Caraffa, convinced of his value, straightway sent him upon a mission to Lombardy, and in 1551 appointed him commissary-general of the Holy Office. When Caraffa became pope, Ghislieri was made bishop of Nepi and Sutri, cardinal (1557), and finally grand inquisitor, which office he discharged in a manner to make the name of " Fra Michele dell' Inquisizione " a terror. In this office he was continued by Pius IV., whom, however, he repelled by his excessive severity, and antagonized by his censoriousness and obstinacy. But the movement with which he was so fully identified was irresistible; and, after the death of Pius IV., the rigorists, led by Borromeo, had no difficulty in making him pope (Jan. 7, 1566).

Though pope, Pius did not cease to be a monk: his ascetic mode of life and his devotions suffered no interruption. With- out delay he applied himself to the work of reform. Decrees and ordinances were issued with astonishing rapidity: the papal court was rid of everything unseemly, and became a model of sobriety; prostitutes were driven from the city, or confined to a certain quarter; severe penalties were attached to Sunday dese- cration, profanity and animal baiting; clerical residence was enforced; conventuals were compelled to live in strict seclusion according to their vows; catechetical instruction was enjoined. A new catechism appeared in 1566, followed by an improved breviary (1568), and an improved missal (1570). The use of indulgences and dispensations was restricted, and the penitential system reformed.

Pius was the avowed enemy of nepotism. One nephew, it is true, he made cardinal, but allowed him no influence: the rest of his relatives he kept at a distance. By the constitution Admonet nos (March 29, 1567), he forbade the reinvestiture

of fiefs that should revert to the Holy See, and bound the cardinals by oath to observe it. In March 1569 Pius ordered the expulsion of the Jews from the states of the Church. For commercial reasons they were allowed to remain in Rome and Ancona, but only upon humiliating conditions. In February 1 571, the Umiliati, a degenerate monastic order of Milan, was suppressed on account of its complicity in an attempt upon the life of the archbishop, Carlo Borromeo.

The election of Pius to the papacy was the enthronement of the Inquisition: the utter extinction of heresy was his darling ambition, and the possession of power only intensified his passion. The rules governing the Holy Office were sharpened; old charges, long suspended, were revived; rank offered no protection, but rather exposed its possessor to fiercer attack; none were pursued more relentlessly than the cultured, among whom many of the Protestant doctrines had found acceptance; princes and states withdrew their protection, and courted the favour of the Holy See by surrendering distinguished offenders. Cosmo de' Medici handed over Pietro Carnesecchi (and two years later received in reward the title of grand duke, Sept. 1569); Venice delivered Guido Zanetti; Philip II., Bartolome de Carranza, the arch- bishop of Toledo. In March 1571 the Congregation of the Index was established and greater thoroughness introduced into the pursuit of heretical literature. The result was the flight of hundreds of printers to Switzerland and Germany. Thus heresy was hunted out of Italy: the only regret of Pius was that he had sometimes been too lenient. In 1567 Pius condemned the doctrines of Michael Baius, a professor of Louvain, who taught justification by faith, asserted the sufficiency of the Scriptures, and disparaged outward forms. Baius submitted; but his doctrines were

afterwards taken up by the Jansenists.

The political activities of Pius were controlled by one principle, war upon the heretic and infidel. He spurred Philip II. on in the Netherlands, and approved the bloody work of Alva. He denounced all temporizing with the Huguenots, and commanded their utter extermination {ad internecionem usque). While it cannot be proven that he was privy to the massacre of St Bartholomew, still his violent counsels could not fail to stir up the most savage passions. He exclaimed loudly against the emperor's toleration of Protestantism, and all but wished his defeat at the hands of the Turks. He urged a general coalition of the Catholic states against the Protestants; and yet published, in sharper form, the bull In coena domini (1568), which was regarded by these very states as an attack upon their sovereignty. One of his cherished schemes was the invasion of England and the dethronement of Elizabeth, whom he excommunicated and declared a usurper (Feb. 25, 1570); but he was obliged to content himself with abetting plots and fomenting rebellions. He did, however, effect an alliance with Spain and Venice against the Turks, and contributed to the victory of Lepanto (Oct. 6,

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Thus lived and wrought Pius, presenting " a strange union of singleness of purpose, magnanimity, austerity and profound religious feeling with sour bigotry, relentless hatred and bloody persecution " (Ranke). He died on the 1st of May 1572; and was canonized by Clement XI. in 1712.

See Ciaconius, Vitae et res gestae summorum pontiff, rom. (Rome, 1601-1602; a contemporary of Pius); Acta sanctorum, maij, torn. i. pp. 616 seq., containing the life by Gabuzio (1605), based upon an earlier one by Catena (1586); Falloux, Hist, de St Pie V. (3rd ed. (Paris, 1858), eulogistic; Mendham, Life and Pontificate of St Pius V. (London, 1832), a bitter polemic. The life of Pius has also been written by Fuenmayor (Madrid, 1595), Paolo Alessandro Maffei (Rome, 1712), and by T. M. Granello (Bologna, 1877). His letters, have been edited by Catena (vide supra), Goubau (Antwerp, 1640), and a select number in a French translation, by de Potter (Paris, 1826). See also Hilliger, Die Wahl Pius V. zum Papste (Leipzig, 1891); Ranke, Popes (Eng. trans., Austin), i. 361 seq., 384 seq.; and von Reumont, Gesch. der Stadt Rom. iii. 2, 557 seq. (T. F. C.)

Pius VI. (Giovanni Angelo Braschi), pope from 1775 to 1799, was born at Cesena, on the 27th of December 1717. After taking the degree of doctor of laws he went to Ferrara and became the private secretary of Cardinal Ruffo, in whose bishopric of Ostia and Velletri he held the post of uditore until 1753. His

skill in the conduct of a mission to the court of Naples won him the esteem of Benedict XIV., who appointed him one of his secretaries and canon of St Peter's. In 1758 he was raised to the prelature, and in 1766 to the treasurership of the apostolic chamber by Clement XIII. Those who chafed under his conscientious economies cunningly induced Clement XIV. to create him cardinal-priest of San Onofrio on the 26th of April 1773, a promotion which rendered him for the time innocuous. In the four months' conclave which followed the death of Clement XIV., Spain, France and Portugal at length dropped their objection to Braschi, who was after all one of the more moderate opponents of the anti-Jesuit policy of the previous pope, and he was elected to the vacant see on the 15th of February 1775.

His earlier acts gave fair promise of liberal rule and reform in the defective administration of the papal states. He showed discrimination in his benevolences, reprimanded Potenziani, the governor of Rome, for unsuppressed disorders, appointed a council of cardinals to remedy the state of the finances and relieve the pressure of imposts, called to account Nicolo Bischi for the expenditure of moneys intended for the purchase of grain, reduced the annual disbursements by the suppression of several pensions, and adopted a system of bounties for the encourage- ment of agriculture. The circumstances of his election, however, involved him in difficulties from the outset of his pontificate. He had received the support of the ministers of the Crowns and the anti- Jesuit party upon a tacit understanding that he would continue the action of Clement, by whose brief Dominus ac redemptor (1773) the dissolution of the Society of Jesus had been pronounced. On the other hand the zelanti, who believed him secretly inclined towards Jesuitism, expected from him some reparation for the alleged wrongs of the previous reign. As a result of these complications Pius was led into a series of half measures which gave little satisfaction to either party: although it is perhaps largely due to him that the order was able to escape shipwreck in White Russia and Silesia; at but one juncture did he even seriously consider its universal re-establishment, namely in 1792, as a bulwark against revolutionary ideas. Besides facing dissatisfaction with this temporizing policy, Pius met with practical protests tending to the limitation of papal authority. To be sure " Febronius," the chief German literary exponent of the old Gallican ideas, was himself led (not without scandal) to retract; but his positions were adopted in Austria. Here the social and ecclesiastical reforms undertaken by Joseph II. and his minister Kaunitz touched the supremacy of Rome so nearly that in the hope of staying them Pius adopted the excep- tional course of visiting Vienna in person. He left Rome on the 27th of February 1782, and, though

magnificently received by the emperor, his mission proved a fiasco; he was, however, able a few years later to curb those German archbishops who, in 1786 at the Congress at Ems, had shown a tendency towards independence. In Naples difficulties necessitating certain concessions in respect of feudal homage were raised by the minister Tannucci, and more serious disagreements arose with Leopold I. and Scipione de' Ricci, bishop of Pistoia and Prato, upon the questions of reform in Tuscany; but Pius did not think fit to condemn the offensive decrees of the synod of Pistoia (1786) till nearly eight years had elapsed. At the out- break of the French Revolution Pius was compelled to see the old Gallican Church suppressed, the pontifical and ecclesiastical possessions in France confiscated and an effigy of himself burnt by the populace at the Palais Royal. The murder of the republican agent, Hugo Basseville, in the streets of Rome (January 1793) gave new ground of offence; the papal court was charged with complicity by the French Convention; and Pius threw in his lot with the league against France. In 1796 Napoleon invaded Italy, defeated the papal troops and occupied Ancona and Loreto. Pius sued for peace, which was granted at Tolentino on the 19th of February 1797; but on the 28th of December of that year, in a riot created by some Italian and French revolu- tionists, General Duphot of the French embassy was killed and a new pretext furnished for invasion. General Berthier marched to Rome, entered it unopposed on the 13th of February 1798,

and, proclaiming a republic, demanded of the pope the renuncia- tion of his temporal authority. Upon his refusal he was taken prisoner, and on the 20th of February was escorted from the Vatican to Siena, and thence to the Certosa near Florence. The French declaration of war against Tuscany led to his removal by way of Parma, Piacenza, Turin and Grenoble to the citadel of Valence, where he died six weeks later, on the 29th of August 1 799. Pius VII. succeeded him.

The name of Pius VI. is associated with many and often unpopular attempts to revive the splendour of Leo X. in the promotion of art and public works — the words " Munificentia Pii VI- P- M." graven in all parts of the city, giving rise amongst his impoverished subjects to such satire as the insertion of a minute loaf in the hands of Pasquin with that inscription beneath it. He is best remembered in connexion with the estab- lishment of the museum of the Vatican, begun at his suggestion by his predecessor, and with an unpractical and expensive attempt to drain the Pontine marshes.

Authorities.— Zopffel and Benrath, " Pius VI." in Herzog- Hauck, Realencyklopadie, 3rd ed., vol. xv. pp. 441-451 (Leipzig, 1904, with elaborate bibliography); F. Nielsen, History of the Papacy in the 19th Century, vol. i. chap. vii. (London, 1906); J. Gendry, Pie VI. sa vie, son pontifical, d'apres les archives vaticanes et de nombreux documents inedits

(2 vols., Paris, 1907). (W. W. R.)*

Pius VII. (Luigi Barnaba Chiaramcnti), pope from 1800 to 1823, the son of Count Scipione Chiaramonti and the deeply religious Countess Ghini, was born at Cesena on the 14th of August 1740 (not 1742). After studying at Ravenna, at the age of sixteen he entered the Benedictine monastery of St Mary in his native town: here he was known as Gregorio. Almost immediately he was sent by his superiors to Padua and to Rome for a further course of studies in theology. He then held various teaching appointments in the colleges of his order at Parma and at Rome. He was created an abbot of his order by his relative Pius VI., who also appointed him bishop of Tivoli on the 16th of December 1782, and on the 14th of February 1785, because of excellent conduct of office, raised him to the cardinalate and the see of Imcla. At the death of Pius VI. the conclave met at Venice on the 30th of November 1799, with the result that Chiaramonti, the candidate of the French cardinal-archbishop Maury, who was most skilfully supported by the secretary of the conclave Ercole Consalvi, was elected pope on the 14th of March 1800. He was crowned on the 21st of that month; in the following July he entered Rome, on the nth of August appointed Consalvi cardinal-deacon and secretary of state, and busied himself with administrative reforms.

His attention was at once directed to the ecclesiastical anarchy of France, where, apart from the broad schism on the question of submission to the civil constitution of the clergy, discipline had been so far neglected that a large proportion of the churches were closed, dioceses existed without bishops or with more than one, Jansenism and clerical marriage were on the increase, and indifference or hostility widely prevailed amongst the people. Encouraged by Napoleon's desire for the re-establishment of the Roman Catholic religion in France, Pius negotiated the celebrated concordat, which was signed at Paris on the 15th of July and ratified by Pius on the 14th of August 1801 (see Concordat). The importance of this agreement was, however, considerably lessened by the 'articles organiques " appended to it by the French government on the 8th of April T802. In 1804 Napoleon opened negotiations to secure at the pope's hands his formal consecration as emperor. After some hesitation Pius was induced to perform the ceremony at Notre Dame and to extend his visit to Paris for four months; but in return for these favours he was able to obtain from Napoleon merely one or two minor conces- sions. Pius, who arrived in Rome on the 16th of May 1805, gave to the college of cardinals a rose-coloured report of his experiences; but disillusionment was rapid. Napoleon soon began to disregard the Italian concordat of 1803, and himself decreed the dissolution of the marriage of his brother Jerome with Miss Patterson of Baltimore. The irritation between France and the Vatican increased so rapidly that on the 2nd of February 1808 Rome was

occupied by General Miollis; a month later the provinces of Ancona, Macerata, Fermo and Urbino were united to the kingdom of Italy, and diplomatic relations between Napoleon and Rome were broken off; finally, by a decree issued from Schonbrunn on the 17 th of May 1809, the emperor united the papal states to France. Pius retaliated by a bull excommunicating the invaders; and, to prevent, insurrection, Miollis — either on his own responsi- bility, as Napoleon afterwards asserted, or by order of the latter — employed General Radet to take possession of the pope's person. The palace on the Quirinal was broken open during the night of July 5th, and, on the persistent refusal of Pius to rescind the bull of excommunication and to renounce his temporal authority, he was carried off, first to Grenoble, thence after an interval to Savona on the Gulf of Genoa. Here he steadfastly refused canonical institution to the bishops nominated by Napoleon; and, when it was discovered that he was maintaining a secret correspondence, he was deprived of all books, even of pen and ink. At length, his nerves shattered by insomnia and fever, he was willing to give satisfactory oral assurances as to the institution of the French bishops.

In May 1812 Napoleon, on the pretext that the English might liberate the pope if he were left at Savona, caused the aged and sick pontiff to be transported to Fontainebleau; the journey was so hard that on Mount Cenis Pius received the viaticum. Arriv- ing safely, however, at Fontainebleau, he was lodged in a suite of regal magnificence to await the return of the emperor from Moscow. When Napoleon arrived, he entered into personal negotiations with the pope, who on the 25th of January 1813 assented to a concordat so degrading that his conscience found no relief till the 24th of March, when, on the advice of the cardinal Pacca and Consalvi, he abrogated it; and on the 9th of May he proceeded to defy the emperor by declaring invalid all the official acts of the new French bishops. In consequence of the battle of Leipzig and the entry of the allied forces into France, Napoleon ordered in January 1814 that the pope be returned to Savona for safe keeping; but soon the course of events forced him to liberate the pope and give back the States of the Church. On the 19th of March Pius left Savona, and was received with rejoicing at Rome on the 24th of May. While Consalvi at the Congress of Vienna was securing the restitution of nearly all the papal territory, reaction had full swing at Rome; the Jesuits were restored; the French legislation, much of which was of great social value, was repealed; the Index and the Inquisition were revived. On his return Consalvi conducted a more enlightened and highly centralized administration, based largely on the famous Motn propria of

1816; nevertheless the finances were in a desperate condition. Discontent centred perhaps in the Carbonari, a Liberal secret society condemned by the pope in 182 1. The chief triumphs of Consalvi were the negotiation of a series of valuable concordats with all the Roman Catholic powers save Austria. In the latter years of Pius's life royalty often came to Rome; the pope was very gracious to exiled kings and showed notable magnanimity toward the family of Napohon. He also attracted many artists to the city, including the greatest sculptors of the time, one of whom, the Protestant Thorwaldsen, prepared the tomb in which repose the remains of the gentle and courageous pontiff, who passed into rest on the 20th of August 1823. His successor was Leo XII.

Authorities.— Zopffel and Benrath, " Pius VII.," in Herzog- Hauck, Realencyklopadie, xv. 4ˆ51-458 (Leipzig, 1904), (long list of older literature) ; Ilario Rinien, La Diplomazia pontijicia net secolo XIX. (Rome, 1902), two volumes treating the years 1800-1805, based largely on Vatican sources; I. Rinieri, Napoleone Pio VII. (1804—1817), relaziovi storiche su documenti inediti dell' archivio valicano (Turin, 1906) ; H. Chotard, Le Pape Pie VII. & Savone (Paris, 1887): Mary H. Allies, Pius the Seventh (London, 1897), a popular Roman Catholic biography; Leo Konig, S.J. Pius VII. Die Sakularisation und das Reichskonkordat (Innsbruck, 1904), based chiefly on Vienna material; H. Welschinger, Le Pape et I'empereur, 1804-1815 (Paris, 1905); Louis Madelin, La Rome de Napoleon: la domination ft anqaise a Rome de 180Q a 1814 (Paris, 1906), an elaborate study; L. G. Wickham-Legg, " The Concordats "(Cambridge Modern History, vol. ix. ch. 7, 1906); Lady Blennerhassett, "The Papacy and the Catholic Church " (Cambridge Modern History, vol. x. ch. 5, 1907). Both these last have good bibliographies. 'W. W. R.)*

Pius VIII. (Francesco Xaviero Castiglioni) , pope from 1829 to 1830, who came of a notable family at Cingoli near Ancona, was born on the 20th of November 1761. He studied canon law at Rome, became vicar-general at Anagni and later at Fano, and in 1800 was appointed bishop of Montalto. Because he refused the oath of allegiance to the Napoleonic king of Italy he was carried captive to France; but in 1816 his steadfastness was rewarded by his being created cardinal-priest of Sta Maria in Trastevere; and this same year he was translated from the see of Montalto to that of Cesena. In 182 1 he was made cardinal- bishop of Frascati, also grand penitentiary; and later he became prefect of the Congregation of the Index. In the conclave which followed the death of Leo XII., Castiglioni, the candidate of France, was elected pope on the 31st of March 1829. He avoided nepotism, abandoned the system cf espionage employed by his predecessor, and published an encyclical condemning Bible societies and secret associations. He rejoiced over Catholic emancipation in England, recognized Louis Philippe as king of the French, and exhibited a pacific spirit in dealing with

the problem' of mixed marriages in Germany. Worn out with work, he died on the morning of the 1st of December 1830. His successor was Gregory XVI.

Authorities. — Zopffel and Benrath, " Pius VIII.," in Herzog- Hauck, Realencyklopadie, xv. 458 seq. (Leipzig, 1904, with biblio- graphy); F. Nielsen, A History of the Papacy in the jpth Century, ii- 3 I_ 5° (London, 1906); P. B. Gams, Series episcoporum ecclesiae catholicae (Regensburg, 1873). (W. W. R.)*

Pius IX. (Giovanni Maria Mastai-Ferretti), pope from 1846 to 1878, was born on the 13th of May 1792 at Sinigaglia, the fourth son of Count Jerome and Countess Catherine Vollazi; the family of Mastai was of ancient descent, and the title of count came to it in the 17th century, while later the elder branch, allied by marriage with the Ferretti family, took that name in addition. He spent some time at the College of Piarists in Volaterra, and then proceeded to Rome with the intention of entering the pontifical guard as an officer. In spite of his good connexions, he was disappointed in this aim as it became known that he suffered from epilepsy. The malady, however, was surmounted; and in 1819 he was ordained priest. After ministering for some time in his native town, he accompanied Cardinal Muzzi to Chile (1823). On his return he was entrusted by Leo XII. with the direction of the Roman hospital of San Michele: in 1830 he received the archbishopric of Spoleto, in 1832 the bishopric cf lmola, and in 1840 Gregory XVI. created him a cardinal, with the title Santi Pietro e Marecellino.

On the death of Gregory XVI. (June 1, 1846) the College of Cardinals met in conclave on the 14th of June. But their deliberations were destined to last but a short while; for, on the 1 6th of June, Cardinal Mastai Ferretti had already obtained the requisite two-thirds majority, and ascended the papal chair under the title of Pius IX. In his various capacities he had gained much popularity: he had shown himself to be of a kindly disposition and a zealous churchman, and his reputation for piety and tact stood high; he possessed, too, a winning personality and a handsome presence.

The reign of Pius IX. began at an extremely critical time. The problem of the government of the Papal States, transmitted to him by his predecessor, stood in urgent need of solution, for the actual conditions were altogether intolerable. The irritation of the populace had risen to such a pitch that it found vent in revolts which could only be quelled by the intervention of foreign powers; and the ferment in the dominions of the Church was accentuated by the fact that the revolutionary spirit was in the ascendant in all the states of Europe. The proclamation of a general amnesty for all political offenders made an excellent impression on the people; and Pius at

once instituted preparations for a reform of the administration, the judicature and the financial system. The regulations affecting the censorship were mitigated, and a breath of political liberalism vitalized the whole govern- ment. Pius at once acquired the reputation of a reforming pope. But the prestige so gained was not sufficient to calm the people permanently, and two demands were urged with ever increasing energy — a share in the government and a national

Italian policy. The problem of giving the people a due share in the government was one of peculiar difficulty in the papal states. It was not simply a question of adjusting the claims of monarch and subject: it was necessary, at the same time, to oust the clergy — who, till then, had held all the more important offices in their own hands — from their dominant position, or at least to limit their privileges. That the clerical character of the administration could not be indefinitely retained was plain enough, it would seem, to any clear-thinking statesman: for, since the restoration of the papal state in 1814, the pernicious effects of this confusion of the spiritual and the secular power could no longer be denied. But Pius IX. lacked the courage and perspicacity to draw the inevitable conclusions from these premises; and the higher clergy at Rome were naturally opposed to a policy which, by laicizing the administration, would have de- prived them of the power and privileges they had so long enjoyed. In these circumstances it is not surprising that the pope, while making concessions to his people, did so with reservations which, so far from restoring peace, served only to aggravate the turmoil. By a motu proprio of the 2nd of October 1847 the government of the city of Rome was reorganized and vested in a council of 100 members, not more than four of whom were to be clerics. But the pope reserved to himself the right of nominating the first members, and the new senate was only later to have the right of filling up vacancies by co-optation. The institution of a state council {consulta) was announced on the 19th of April 1847; and on the 14th of October it was called into existence by a motu proprio. It consisted of 24 councillors, who were to be selected by the pope from a list of candidates to be submitted by the provincial assemblies. A cardinal and one other prelate were to be at its head. The consulta was to be divided into four sections, dealing with (1) legislation, (2) finance, (3) internal administration, (4) the army and public works. Matters of importance were, however, to be submitted to the College of Cardinals, after being debated in the consulta. A motu proprio of the 29th of December altered the constitution of the ministerial council. Nine mutually independent ministries were formed, and the principle of the responsibility of the ministers was established: but all the positions were

filled by clerics.

The agitation for constitutional government was urgent in the demand for further concessions; but they came too late. On the 1 2th of February a proclamation of the pope transferred three portfolios to the laity; but the impression produced by the news of the revolution in Paris nullified the effect. At the formation of the Antonelli ministry (March 11), only the three departments of foreign affairs, finance and education, were reserved by the clergy; while the remaining six were entrusted to laymen. On the 14th of March 1848 Pius took the last step, and published a constitution {Fundamental Statute for the Secular Government of the Slates of the Church). Two chambers were to be formed. The first {alto consiglio) consisted of members nominated for life by the pope; the second, of a hundred elected deputies. The laws adopted by these two chambers had first to undergo the scrutiny of the College of Cardinals, before being submitted to the pope for his assent or rejection. Ecclesiastical, or ecclesiastico-political, affairs were exempted from the jurisdiction of the parliament; which was further required to abstain from the enactment of laws conflicting with the discipline of the Church, and from criticism of the diplomatic and religious relations of the Holy See with foreign powers.

The utility of this constitution was never tested; for the demand for an extension of popular rights was now eclipsed by a still more passionate aspiration towards the national unity of Italy. This nationalist movement at once took head against Austria. On the 1 8th of March the revolution broke out in Milan, and King Albert of Sardinia undertook the conduct of the war against the emperor. When news of the events at Milan reached Rome the populace was swept away in a whirlwind of enthusiasm: the Austrian embassy was mobbed; the imperial arms, surmount- ing the main gate of the palace, were torn down; and great troops of volunteers clamoured to be led against Austria. Pius was carried away at first on the flood-tide of excitement, and seemed,

after his proclamation of the 30th of March, on the point of conferring his blessing upon the war against Austria. But the course of political events during the next few weeks damped his ardour. When, on the 29th of April, in his allocation to the cardinals, he proclaimed the papal neutrality, the Romans received his vacillation as a sign of treachery; and the storm, precluded from discharging its fury on Austria, broke over his head. When the ministry in power resigned office on the istof May, the Mamiani administration was formed, only one cleric being included. Mamiani himself, whose writings were on the Index, had little sympathy with the pope, and did all that was possible to complete the secularization of government in the States of the Church. He received his dismissal on the 1st of August, and was followed by Count Fabbri, then by Count de Rossi, who

made the last attempt to restore order by a moderate liberal policy. On the 15th of November, as he was about to open the Chambers, he was assassinated on the staircase leading to the hall of session. A state of anarchy ensued. Armed bands gathered before the Quirinal, and attempted to storm it. To avoid further bloodshed the pope was compelled to assent to the formation of a radically democratic ministry under Galetti. The Swiss, who composed the papal guard, were disbanded; and the protection of the pontiff was transferred to the civil militia; in other words, Pius IX. was a prisoner. On the evening of the 24th of November he contrived by the aid of the French and Bavarian ambassadors — the due d'Harcourt and Count Spaur — ■ to leave the palace unobserved, in the dress of a common priest, and to reach Gaeta in the kingdom of Naples. From this refuge he issued a breve on the 27 th of November, protesting against the sacrilege practised on himself, declaring all actions forced upon him null and void, and appointing a commission to carry on the government in his absence. Since the Chamber declined to recognize this step, and the pope was equally resolute in refusing to hold any intercourse with the deputation which it despatched to him, a supreme Giunta was provisionally created by the Chamber on the nth of December to discharge all the functions assigned to the executive power by the constitution. On the 17th of the same month Pius made a public protest; and, as soon as the elections for a national assembly were an- nounced, he forbade any participation in them, menacing the disobedient with the penalties of the Church (Jan. 1, 1849). The elections, however, were held; and on the 9th of February the constituent assembly decreed, by 142 votes to 23, the erection of a Roman republic. Pius answered by a protest dated the 14th of February. All the ecclesiastical property of the Roman state was now declared to be vested in the republic; convents and religious edifices were requisitioned for secular purposes; bene- volent institutions were withdrawn from clerical influence; and church establishments were deprived of the right to realize their possessions. In the beginning of December Pius had already ap- pealed to the European powers for assistance; and on the 7th of February 1849 it was resolved in the Consistory to approach officially France, Austria, Spain and Naples, with a view to their armed intervention. The French republic, under the presidency of Louis Napoleon, was the first state to throw troops into Italy. On the 24th of April General Oudinot appeared before Civita Vecchia; only to be defeated at first by Garibaldi. But, after receiving reinforcements, he prosecuted the war successfully, and made his entry into Rome on the 3rd of July; while, in the early part of May an Austrian army advanced into the north of the papal states. On the 14th of July Oudinot proclaimed the restoration of the pontifical dominion; and, three days later, Pius IX. issued a manifesto entrusting the government to a commission appointed by himself.

On the 1 2th of April 1850 Pius returned to Rome, supported by foreign arms, embittered, and hostile henceforward to every form of political liberalism or national sentiment. In Gaeta he had mentally cut himself loose from all ideas of progress, and had thrown himself into the arms of the Jesuits. His subsequent policy was stamped by reaction. Whether it might have been possible to avoid the catastrophe of 1870 is a difficult question. But there can be no question whatever that the policy which

Pius now inaugurated, of restoring the old pre-revolutionary conditions, sealed the fate of the temporal dominion of the papacy. He made no attempt to regain the estranged affections of the populace, and took no measures to liberate himself and his subjects from the incubus of the last few years. He even sought to exact vengeance for the events of that period: the state officials, who had compromised themselves, lost their offices; and all grants in aid were forfeited if the recipients were dis- covered by the secret commissions (consigli di censura) to have taken part in the revolutionary movement. The tribunals extorted declarations on the part of witnesses by flogging, deprivation of food, and like methods of torture. In many cases the death sentence was executed at their instance, though the guilt of the accused was never established. The system of precautionary arrest, as it was termed, rendered it possible for any man to be thrown into prison, without trial and without verdict, simply on the ground that he lay under suspicion of plotting against the government. The priests, who usurped the judicial function, displayed such cruelty on several occasions that officers of the Austrian army were compelled to record a protest. The consequence of these methods was that every victim — innocent or guilty — ranked as a martyr in the estimation of his fellow-citizens. A subsidiary result was the revival of brigandage, which found a suspicious degree of support among the people. Corruption was rampant among the officials; the police were accused of illicit bargaining with criminals; and nothing but contempt was entertained for the papal army, which was recruited from the dregs of humanity. To this was added a disastrous financial administration, under which the efficiency and credit of the country sank to appalling depths. The system of taxation was calculated with a view to relieving the Church and the clergy, and imposing the main burden upon the laity. In this department the family of Cardinal Antonelli seems to have played a fatal part. The secretary of state was born in humble circumstances: when he died he left a fortune of more than 100,000,000 lire, to which a daughter succeeded in establishing her claim. His brother Felippo was president of the Roman Bank, and his brother Luigi the head of the Annona — an office created to regulate the import of grain. The pope himself had

neither the will nor the power to institute searching financial reforms; possibly, also, he was ignorant of the facts.

The mismanagement which obtained in the papal dominions could not escape the observation of the other powers. As early as the Congress of Paris in 1856 the English ambassador, Lord Clarendon, had directed an annihilating criticism against the government of the pontiff; and a convincing proof of the justice of his verdict was given by Pius himself, in his treatment of the famous Mortara case. A Jewish boy of this name had been torn from his parents in Rome and the rite of baptism performed on him without their knowledge or consent. The pope flatly refused to restore the " Christian " to his Jewish parents, and turned a deaf ear both to the protest of public opinion and the diplomatic representations of France and England. The sequel to this mode of government was that the growing embitterment of the subjects of the Church came to be sympathized with outside the bounds of Italy, and the question whether the secular authority of the papacy could be allowed to continue became a much-debated problem. Even the expression of the doubt was symptomatic. In 1859 appeared an anonymous brochure, Le Pape et le congres, composed by Laguerronniere, the friend of Napoleon III., in which it was proposed to ensure the pope " un revenu considerable " and the city of Rome, but to relieve him of a political task to which he was not competent. In 1861 another anonymous pamphlet, Pro causa italica ad episcopos catholicos, was published in Florence, advocating the ecclesiastico- political programme of Cavour; and the pope was horrified when he discovered that it came from the pen of Passaglia, the professor of dogmatic theology. In spite of all, the national idea gained strength in Italy, and the movement towards unity found power- ful champions in King Victor Emmanuel of Sardinia and his great statesman Cavour. Free scope was given when the under- standing between the two powers protecting the papal state —

France and Austria — broke down. So soon as Napoleon anc Cavour had come to an agreement war ensued, France anc Sardinia being ranged against Austria (1859). The result wai that Austria lost the greater part of her Italian possessions, whili the pope also forfeited two-thirds of his dominions. By the war o: 1866, in which Italy fought on the Prussian side, Victor Emmanue gained Venice in addition; so that the States of the Church noy formed the last remaining obstacle to complete national unity In September 1864, France — who had been the protectress o: these states since 1849 — had concluded a treaty with Victoi Emmanuel, undertaking to withdraw her garrison from Rome ir two years time; while, on his part, the king agreed to abstair from any attack on the papal dominions, and to guarantee th< safety of the pope and the patrimonium Petri. The emperoi Napoleon had, in point of fact, recalled his troops in 1866; bul in 1867, when Garibaldi crossed the frontiers of the papal state at the head of his

volunteers, he declared the treaty violated and again threw his regiments into Rome. Three years later the time came when he could employ his arms more advantageous!} elsewhere, and after the outbreak of the war with Germany Rome was evacuated. The news that the French Empire had fallen produced an electrical effect in Italy: the Italian parliament called on the king to occupy Rome; on the 8th of September Victor Emmanuel crossed the borders; and on the 20th of September the green- white-and-red of the tricolour floated over the Capitol. The protests of Pius IX. remained unheeded, and his attempts to secure another foreign intervention met with no success. On the 2nd of October Victor Emmanuel instituted a plebiscite in Rome and the possessions of the Church to decide the question of annexation. The result of the suffrage was that 153,681 votes were given in favour of union with Italy, and 1507 against the proposed incorporation: that is to say only the direct dependants of the Vatican were opposed to the change. The papal state was now merged in the kingdom of Italy, which proceeded to define its diplomatic relations with the Holy See by the law of the 13th of May 1871 (see Italy: History) .

In his capacity as head of the Church, Pius IX. adhered to the principles of the Ultramontanist party, and contributed materially to the victory of that cause. The political reaction which followed the revolutionary era in most quarters of Europe offered a favourite soil for his efforts; and in several countries he found it possible to regulate the relations between Church and state from the standpoint of the curia. In 1851 he con- cluded a concordat with Queen Isabella II. of Spain, proclaiming Roman Catholicism the sole religion of the Spanish people, to the exclusion of every other creed (art. 1) ; and we find the same provision in another concordat with the South American republic of Ecuador (1862). A third concordat, negotiated with the emperor Francis Joseph I. of Austria (1855), entrusted the supervision of schools and the censorship of literature to the clergy, recognized the canon law, and repealed all secular legislation conflicting with it. France came into line with the wishes of the pope in every respect, as Napoleon needed clerical support in his political designs. Even in Germany he found no resistance; on the contrary, lie was able to secure advantageous compacts from individual states (Hesse, 1854; Wurttemberg, 1857). In fact, the growing tendency to romanize Catholicism — to bring it, that is to say, into close connexion with Rome, and to a state of dependency on the guidance and instructions of the curia — made special progress in Germany.

Among the most important acts of Pius IX. must be counted his proclamation of the dogma of the Immaculate Conception of the Virgin Mary, by the bull Ineffabilis Deus, on the 8th of December 1854. In this bull the preservation of Mary from every stain of hereditary sin, in the first moment of her conception, was declared to be a divinely revealed truth,

which consequently demanded universal acceptance (see Immaculate Conception). By this means a view, which till then had been no more than a pious belief, was elevated into a dogma to be held de fide; though grave doubts on the subject had always been entertained, even in the midst of the Church itself. For the inner life of that

Church this solution of the controversy was of great significance, and created a desire for further dogmatic decisions on the Virgin Mary — her resurrection and ascension. But the procedure of Pius IX. proved of far-reaching importance from another point of view. True, he had taken the opinion of the bishops on the subject, and had received the assent of a large majority; none the less, the verdict was pronounced by himself alone, not by an ecumenical council. Thus, by arrogating the function formerly exercised by the ecumenical council, he virtually laid claim to the infallibility which had always been regarded as inherent only in the doctrinal pronouncements of such a council: in other words, he availed himself of a privilege not accorded to him till the 18th of July 1870.

Though the Marian dogma of 1854 received, with very few exceptions, an enthusiastic welcome in Roman Catholic circles, another measure of the pope, ten years later, excited a painful sensation even among the orthodox members of the Church. As reigning sovereign of the papal states Pius IX. had passed through a " liberal period ": as head of the Church, he had never been liable to attacks of liberalism. Nevertheless, his return from exile left its mark on his spiritual administration. For from this period onwards he deliberately and stubbornly set his face against the influence of modernism on ecclesiastical life; showed his displeasure at and distrust of the scientific theology and philo- sophy which marked a moderate advance (Giinther, Frohs- chammer and Dollinger); and, entrenched in the stronghold of medieval ideals, combated the transformations of the new order of society, and the changes in the relationship between Church and state, which obtained in most countries of Europe since the French Revolution. After long and careful consultation, the adverse criticisms which he had expressed on various occasions were published on the 8th of December 1864, together with the encyclical Quanta cura, under the title Syllabus complectens praecipuos nostrae aetatis err ores (see Syllabus). In this Pius claimed for the Church the control of all culture and all science, and of the whole educational system. He rejected the liberty of faith, conscience and worship enjoyed by other creeds; and bade an easy farewell to the idea of tolerance. He claimed the complete independence of the Church from state control; upheld the necessity of a continuance of the

temporal power of the Roman See; and finally, in the last clause, declared that " the pontiff neither can be nor ought to be reconciled with progress, liberalism and modern civilization." The publication of this syllabus created a profound impression: for it declared war on modern society, and committed the papacy to the principles of Ultramontanism (q.v.). But, as any attempt to translate its precepts into practice would entail a disastrous conflict with the existing regime as established by law, Roman Catholic circles have frequently shown a tendency to belittle the significance of the manifesto and to deny that its rules are absolutely binding. But these well-meant explanations, however comprehensible, are refuted by the unequivocal pronouncements of Pius IX., Leo XIII., and many recognized ecclesiastical authorities — e.g. Cardinal Manning, archbishop of Westminster, who described the syllabus as an emanation from the highest doctrinal authority in the Church.

The zenith of Pius's pontificate was attained on the 18th of July 1870 when the Vatican council proclaimed the infallibility of the pope and the universality of his episcopate, thus elevating him to a pinnacle which none of his predecessors had reached and at the same time fulfilling his dearest wish. That, personally, he laid great stress on the acceptance of the dogma, was a fact which he did not attempt to conceal during the long preliminary deliber- ations of the council; and his attitude was a not inconsiderable factor in determining its final resolutions. But the loss of the papal states, immediately afterwards, was a blow from which he never recovered. Whenever he brought himself to speak of the subject — and it was not rarely — he repeated his protest in the bitterest terms, and, to the end of his days, refused to be recon- ciled with the " sacrilegious " king of Italy. When, in Germany, the situation created by the Vatican council led to the outbreak of the Kulturkampf, Pius IX. failed to display the tact peculiar

to his successor. For, in the encyclical Quod numquam (Fˆf 5, 1875), he took the rash step of declaring invalid the Prussian laws regulating the relationship between Church and state— the only result being that the feud was still further embittered.

In these later years the dark days of his " captivity " were amply compensated bythe proofs of reverence displayed by Roman Catholic Christianity, which accorded him magnificent ovations as his period of jubilee began to fall due. The twenty-fifth anniversary of his pontificate was celebrated with great splendour on the 16th of June 1871 ; for he was the first pope who had thus reached the traditional " years of Peter." In 1872 his 80th birthday gave occasion for new demonstrations; and 1875 was a so-called " year of jubilee." Finally, in 1877, the fifty years of his priesthood were completed: an event which brought him innumerable expressions of loyalty and led to a great manifesta- tion of devotion to the

Holy See from all the Roman Catholic world. On the 7th of February 1878 Pius IX. died. His successor was Leo XIII.

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Sources. — Acta Pit IX. (4 vols., Rome, 1854 sqq.); Acta sanctae sedis (Rome, 1865 sqq.). A selection of the documents for the his- tory of Pius IX. will be found in C. Mirbt, Quellen zur Geschichte des Papsttums und des romischen Katholicismus (2nd ed., Tubingen, 1901). §§ 422-442, pp. 361-390. (C. M.)

Pius X. (Giuseppe Sarto), elected pope in 1903, was born on the 2nd of June 1835, of humble parents, at the little town of Riete in the province of Treviso, Italy. He studied theology at the episcopal seminaries of Treviso and Padua, and was ordained priest in 1858. For seventeen years he acted as parish priest at various small places in Venetia, until in 1875 he was appointed canon of the cathedral and superior of the seminary at Treviso. In 1880 he refused the bishopric of Treviso, but in 1884, on the express command of Leo XIII. , he accepted that of Mantua. On the 12th of June 1893 he was created a cardinal, and three days later was nominated patriarch of Venice. In Venice he made himself very popular owing to his piety, his simplicity and geni- ality, and by his readiness to act in harmony with the Italian government. He succeeded Leo XIII. in his election to the papal chair on the 4th of August 1903. (See Papacy, ad fin.)

PIVOT (Fr. pivot; probably connected with Ital. pivolo, peg, pin, diminutive of piva, pipa, pipe), that on which something turns, specifically a metal pointed pin or short shaft in machinery, such as the end of an axle or spindle. The term occurs frequently ir» combination with other words,

chiefly in technical usage, e.g. " pivot-gearing," for a system of gearing in machinery which admits of the shifting of the axis of a driving wheel, so that the power may be communicated in various directions.

PIZARRO, FRANCISCO (c. 1471 or 1475-1541), discoverer and conqueror of Peru, was born at Trujillo in Estremadura, Spain, about 1471 (or. 1475). He was an illegitimate son of Gonzalo Pizarro, who as colonel of infantry afterwards served in Italy under Gonsalvo de Cordova, and in Navarre, with some distinction. Of Pizarro's early years hardly anything is known; but he appears to have been poorly cared for, and his education was neglected. Shortly after the news of the discovery of the New World had reached Spain he was in Seville, and thence found his way across the Atlantic. There he is heard of in 1510 as having taken part in an expedition from Hispaniola to UrabS.

under Alonzo de Ojeda, by whom he was entrusted with the charge of the unfortunate settlement at San Sebastian. He accompanied Balboa (whom he afterwards helped to bring to the block) in the discovery of the Pacific; and under Pedrarias d'Avila he received a repartimento, and became a cattle-farmer at Panama. Here in 1522 he entered into a partnership with a priest named Hernando de Luque, and a soldier named Diego de Almagro, for purposes of exploration and conquest towards the south. Pizarro, Almagro and Luque afterwards renewed their compact in a more solemn and explicit manner, agreeing to conquer and divide equally among themselves the opulent empire they hoped to reach. Explorations were then undertaken down the west coast of South America, in which Pizarro, though left for months with but thirteen followers on a small island without ship or stores, persisted till he had coasted as far as about 9° S. and obtained distinct accounts of the Peruvian Empire. The governor of Panama showing little disposition to encourage the adventurers, Pizarro resolved to apply to the sove- reign in person for help, and with this object sailed from Panama for Spain in the spring of 15 28, reaching Seville in early summer. Charles V. was won over, and on the 26th of July 1529 was executed at Toledo the famous capitulation, by which Pizarro was upon certain conditions made governor and captain-general of the province of New Castile for the distance of 200 leagues along the newly discovered coast, and invested with all the authority and prerogatives of a viceroy, his associates being left in wholly secondary positions. One of the conditions of the grant was that within six months Pizarro should raise a sufficiently equipped force of two hundred and fifty men, of whom one hundred might be drawn from the colonies; as he could not make up his due complement

he sailed clandestinely from San Lucar in January Gland./ 1 5.30. He was afterwards joined by his brother I

Hernando with the remaining vessels, and when the expedition left Panama in January of the following year it numbered three ships, one •hundred and eighty men, and twenty-seven horses. The subsequent movements of Pizarro belong to the history of Peru (q.v.). After the final effort of the Incas to recover Cuzco in 1536-37 bad been defeated by Diego de Almagro, a dispute occurred between him and Pizarro respecting the limits of their jurisdic- tion. This led to battle; Almagro was defeated (1538) and executed; but his supporters conspired, and assassinated Pizarro on the 26th of June 1541.

PIZZICATO (from Itai. pizzicare, to pluck or twitch), a term in music for a direction to the players of stringed instruments, that the passage

accounts for the occurrence of parts of a town being known as Place, e.g. Ely Place in London, formerly the site of the town residence of the bishops of Ely. A " place of arms " (Fr. place d'armes), in fortification, means the wide spaces (suitable for the assembly of troops for a sortie) made by the salients and re-entrants of the covered way. The phrase is also used in a strategic sense to express an entrenched camp or fortress in which a large army can be collected under cover previous to taking the field.

PLACENTA (Lat. for a cake), in anatomy, the organ by which the embryo is nourished within the womb of its mother. When the young one is born the placenta and membranes come away as the " afterbirth." In human anatomy the organ is a circular disk about seven or eight inches in diameter and one and a quarter inches in thickness at its centre, while at its margin it is very thin and is continuous with the foetal membranes. It weighs about a pound.

In order to explain the formation of the placenta it is necessary to encroach to some extent on the domain of physiology. Before each menstrual period, during the child-bearing age of a woman, the mucous membrane of the uterus hypertrophies, and, at the period, is cast off and renewed, but if a fertilized ovum reaches the uterus the casting off is postponed until the birth of the child. From the fact that the thickened mucous membrane lining the interior of the uterus is cast off sooner or later, it is spoken of as the " decidua." The fertilized ovum, on reaching the uterus, sinks into and embeds itself in the already prepared decidua, and, as it enlarges, there is one part of the decidua lying between it and the uterine wall (" decidua serrotina " or " basalis "), one part stretched over the surface of the enlarging ovum (" decidua renexa " or " capsularis ") and one part lining the rest of the uterus (" decidua vera ") (see fig 1.).

Decidua basalis.

Dilated part. “Unchanged part.

Cavity which becomes coelom.

Unchanged layer.

Stratum spongiosum. \rjterine

Stratum compactum. J mucosa.

Ectodermal villus enclosing space containing maternal blood.

x mass (Entoderm)- Decidua vera.

From A. H. Young and A. Robinson, in Cunningham’s Texl-Boak of Anatomy.

- – , 1 . . u 1 ju,,„i,„„iˆ «■!,„ „f r ;„r, < - Fig. 1. — Diagram representing a very young human ovum almost immediately

*so marked is to be played by plucking the strings after {u entran * e ; nto t £ e decidl ? a) and ˆ hi j st th 6 e place ofits entrance is still covered*

with the fingers instead of using the bow. w ; tn a p i ug f fibrin. The ectoderm has already proliferated and embraced spaces

PIZZO, a seaport of Calabria, Italy in the which contain maternal blood and are continuous with the maternal blood-vessels.

province of Catanzaro, 72 m. by rail N.E. of

Reggio, situated on a steep cliff overlooking the Gulf of Santa Eufemia, 351 ft. above sea-level. Pop. (1901), 9172. It has an old castle, in which Joachim Murat, ex-king of Naples, was shot on the 13th of October 1815. The people engage in tunny- and coral- fishing. In 1783 the town was almost destroyed by an earth- quake, and it suffered some damage from the same cause in 1905.

PLACARD (15th cent. Fr. plackart, from plaquier; mod. plaquer, to plaster), a bill or poster pasted or affixed to a wall or in any prominent - position for the purpose of giving notice to the public of a proclamation, police or other regulations, or of forthcoming events or the like.

PLACE (through Fr. from Lat. platea, street; Gr. TrXarfc, wide), a definite position in space, whether of limited or unlimited extent, situation or locality; also position in a series or rank; or an office, or employment, particularly one in the service of a government. Special applications are to an open space in a town, a group of buildings, row of houses, or as the name of a

It is the decidua basalis which is specially interesting in considering the formation of the placenta. That part which is nearest the ovum is called the " stratum compactum," but farther away the uterine glands dilate and give a spongy appearance to the mucous membrane which earns this particular layer the name of " stratum spongiosum." Processes grow out from the surface of the ovum which penetrate the stratum compactum of the decidua basalis and capsularis and push their way into the enlarged maternal blood sinuses; these are the " chorionic villi." Later, the " allantoic " or " abdominal_ stalk " grows from the mesoderm of the hind end of the embryo into the chorionic villi which enter the decidua basalis, and in this blood-vessels pass which push their way into the maternal blood sinuses. Eventually the original walls of these sinuses, together with the false amnion, disappear, and nothing now separates the maternal from the foetal blood except the delicate walls of the foetal vessels covered by some nucleated noncellular tissue, known as syncytium, derived from the chorionic epithelium, so that the embryo is able to take its supply of oxygen and materials for growth from the blood of its mother and to give up

carbonic acid and excretory matters. It is the gradual enlargement of the chorionic villi in the decidua basalis together with the intervillous maternal blood sinuses that forms the

residence or manor-house. In certain cases this latter use | placenta ; the decidua capsularis and vera eventually become pressed

together as the embryo enlarges, and then, as pressure continues, atrophy. The allantoic stalk elongates enormously, and in its later Stages contains two arteries (umbilical) and only one vein (owing to the obliteration of the right one) embedded in some loose connec- tive tissue known as " Wharton's jelly." At first the stalk of the yolk-sac is quite distinct from this, but later the two structures become bound up together (see fig. 2), after which they are known as the " umbilical cord." A distinction must be made between the allantoic stalk and the allantois; the latter is an entodermal out- growth from the hind end of the mesodaeum or primitive alimentary canal, which in the human subject only reaches a little way toward the placenta. The allantoic stalk is the mass of mesoderm contain- ing blood-vessels which is pushed in front of the allantois and, as has been shown, reaches and blends with the decidua basalis to form the placenta.

For further details see Quain's Anatomy, vol. i. (London, 1908); and, for literature, O. Hertwig's Handbuch der Entwickelungslehre (Jena).

Comparative Anatomy. — If the placenta is to be regarded as a close union between the vascular system of the parent and embryo, the condition may be found casually scattered throughout the phylum of the Chordata. In such a very lowly member of the

Placenta.

Unchanged layer.

'lacental villus.

'£ oik -sac

Peri- cardium.

Heart.

Fused decidua cap- sularis and decidua vera. Fused mesodermal amnion

and chorion.

From A. H. Young and A. Robinson, in Cunningham's Text-Book of Anatomy.

Fig 2. — Diagram. Later stage in the development of the placenta,

showing the relations of the foetal villi to the placental sinuses, the fusion of the amnion with the inner surface of the chorion, and the thinning of the fused deciduae (capsularis and vera), phylum as Salpa, a placenta is formed, and the embryo is nourished within the body of its parent. In seme of the viviparous sharks, e.g. the blue shark (Carcharias), the yolk-sac has ridges which fit into grooves in the wall of the oviduct and allow an interchange of materials between the maternal and foetal blood. This is an example of an " umbilical placenta." In the viviparous blennies (Zoarces viviparus), among the teleostean fishes, two or three hundred young are nourished in the hollow ovary, which develops villi secreting nutritive material. Among the Amphibia the alpine salamander (Salamandra atra) nourishes its young in its oviducts until the gilled stage of development is past, while in the Reptilia the young of a viviparous lizard {Seps chalcides) establish a communication between the yolk-sac anteriorly and the allantois posteriorly, on the one hand, and the walls of the oviduct on the other. In this way both an umbilical and an allantoic placenta are formed.

The mammals are divided into Placentalia and Aplacentalia ; in the latter group, to which the monotremes and most marsupials

belong, the ova have a great deal of yolk, and the young, born in a very immature condition, finish their development in their mother's pouch; but although these mammals have no allantoic placenta there is an intimate connexion between the walls of the yolk-sac and the uterine mucous membrane, and so an umbilical or omphalic placenta exists. The name Aplacentalia therefore only means that they have no allantoic placenta. Among the Placentalia the umbilical and allantoic placentae sometimes coexist for some time, as in the case of the hedgehog, the bandicoot and the mouse. In most of the lower placental mammals the allantois is much more developed than in man, and the most primitive type of placenta is that in which villi are formed over the whole surface of the chorion projecting into the decidua of the tubular cornu of the uterus. This is known as a " diffuse placenta," and is met with in the pangolin, pig, hippopotamus, camel, chevrotain, horse, rhinoceros, tapir and whale. When the villi are collected into a number of round tufts or cotyledons, as in most ruminants, the type is spoken of as a " cotyle- donous placenta," and an intermediate stage between this and the last is found in the giraffe.

In the Carnivora, elephant, procavia (Hyrax) and aard vark (Orycteropus), there is a " zonary-placenta " which forms a girdle round the embryo. In sloths and lemurs the placenta is dome- shaped, while in rodents, insectivores and bats, it is a ventral disk or closely applied pair of disks, thus differing from the dorsal disk of the ant-eater, armadillo and higher Primates, which is known as a " metadiscoidal placenta." It will thus be seen that the form of the placenta is not an altogether trustworthy indication of the systemic position of its owner. In the diffuse and cotyledonous placentae the villi do not penetrate very deeply into the decidua, and at birth are simply withdrawn, the decidua being left behind in the uterus, so that these placentae are spoken of as non-deciduate while other kinds are deciduate.

For further details see S. W. W. Turner, Lectures on the Com- parative Anatomy of the Placenta (Edinburgh, 1876); A.Robinson, " Mammalian Ova and the Formation of the Placenta," Journ. Anat. and Phys. (1904) xxxviii., 186, 325. For literature up to 1906, R. Wiedersheim's Comparative Anatomy of Vertebrates, translated and adapted by W. N. Parker (London, 1907).

(F. G. P.)

PLAGIARISM, an appropriation or copying from the work of another, in literature or art, and the passing off of the same as original or without acknowledgment of the real authorship or source. The Lat. plagiaries meant a kidnapper, stealer or abductor of a slave or child, though it is also used in the modern sense of a literary pilferer or purloiner by Martial (I. 53, 9). The word plagium is used in the Digest of the offence of kidnapping or abduction, and the ultimate source is probably to be found in plaga, net, snare, trap, cognate with Gr. irkenuv, to weave, plait. The idea of plagiarism as a wrong is comparatively modern, and has grown up with the increasing sense of property in works of the intellect. (See Copyright.)

PLAGIOCLASE, an important group of rock-forming minerals, constituting an isomorphous series between albite, or soda-felspar and anorthite, or lime-felspar. Inter- mediate members are thus soda-lime-felspars, which in their crystallographical, optical and other physical characters vary progressively with the chemical composition between the two extremes albite (NaAlSi 3 Os) and anorthite (CaAl 2 Si20 8). This variation is continuous in the series, but specific names are applied to members falling between certain arbitrary limits, viz.: Albite, Ab (= NaAlSisOV) ; Oligoclase, AbeAm to AbjAnr, Andesine, Ab 3 Ani to AbiAni; Labradorite, AbiAni to AbiAn 3 ; Bytownite, AbiAn 3 to AbiAn 6 ; Anorthite, An (= CaAl2Si 2 8). All the members of the series crystallize in the anorthic (triclinic) system. They possess a perfect cleavage parallel to the basal

pinacoid P (001) and a somewhat less pronounced cleavage parallel to the pinacoid M (010). The angle between these two cleavages varies from 86° 24′ in albite to 85° 50′ in anorthite. It was on account of the oblique angle between the cleavages that A. Breithaupt in 1847 gave the name plagio-clase (Gr.irX&Yios, oblique, and kXSv, to cleave) to these felspars, to distinguish them from the orthoclase felspar in which the corresponding cleavage angle is a right angle. It should be noted that the potash — and potash-soda-felspars, microcline (q.v.) an anorthoclase, though also anorthic, are not included in the plagioclase series of soda-lime-felspars. Crystals are

usually tabular in habit, parallel to the plane M, as shown in the accompanying figure; sometimes, however, they are flattened parallel to P, this being a characteristic habit of the pericline variety of albite; microlitic crystals forming the ground-mass of volcanic rocks are usually elongated in the direction of the edge between P and M.

Twinning is an important character, which is almost invariably present and affords a ready means of distinguishing the plagioclases from other felspars. Most frequent is the twinning according to the ” albite law ” with M as twin-plane. One half of the twin is turned through 180° about the normal to this plane and the two portions are united along the same plane (for figures of twinned crystals see Albite). The basal planes of the two portions are inclined to each other at a salient or re-entrant angle of 7° 12′ in albite and 8° 20′ in anorthite. This twinning is usually polysynthetic, being many times repeated, and giving rise to numerous thin lamellae, which are the cause of the fine striations on the cleavage planes P and parallel to the edge PM, so characteristic of the plagioclases as seen in hand specimens. Viewed in polarized light, thin sections of twinned crystals show a very characteristic banded structure parallel to M. A second twin-law is known as the “pericline- law” because of its frequent occur- rence in pericline. Here the axis of rotation is the edge x P (the crystallographic axis b) and the plane of composition is the ” rhombic section ” : the latter is a plane which intersects the prism faces T and / in a rhomb; it is not a possible face of the crystal, and its position varies in the different species. In addition to being twinned according to these two laws, plagioclase may also be twinned on the Carlsbad-, Baveno- and Manebach-laws, as in orthoclase (?.».).

a specific infectious fever, one variety being characterized by buboes (glandular swellings) and carbuncles. This definition excludes many of the

celebrated pestilences recorded in history — such as the plague of Athens, described by Thucydides ; that not less celebrated one which occurred in the reign of Marcus Aurelius and spread over nearly the whole of the Roman world (a.d. 164-180), 1 which is referred to, though not fully described, by the contemporary pen of Galen; and that of the 3rd century (about 253), the symptoms of which are known from the allusions of St Cyprian (Sermo de mortalitate) . There is a certain resem- blance between all these, but they were very different from Oriental plague. " Plague " was formerly divided into two chief varieties: (1) mild plague, pestis minor, larval plague (Radcliffe), peste fruste, in which the special symptoms are accompanied by little fever or general disturbance; and (2) ordinary epidemic or severe plague, pestis major, in which the general disturbance is very severe. Cases which are rapidly fatal from the general disturbance without marked local symp- toms have been distinguished as fulminant plague (pestis siderans, peste foudroyante) .

History up to 1880.— The. first historical notice of the plague is contained in a fragment of the physician Rufus of Ephesus, who lived in the time of Trajan, preserved in the Collections of Oribasius? Rufus speaks of the buboes called pestilential as being specially fatal, and as being found chiefly in Libya, Egypt and Syria. He refers to the testimony of a physician Dionysius, who lived probably in the 3rd century B.C. or earlier}

Constants of Plagioclase Felspars.

Composi- tion.

Si0 2 .

A1 2 3 .

Na 2 0.

CaO.

Sp. gr.

Melting- point (Centigrade).

Cleavage Angle PM.

*Angle of Rhombic Section. **

Mean

Refractive

Index

P-

Optical Extinction.

*On P.**

*OnM**

In sections

j-M.

Ab

Ab 3 Ani

AbiAn,

Ab,Ab 3

An

68-7 62 55-6 49-3 43-2

19-5 24-0 28-3 32-6 36-7

n-8

8-7 5-7

2-8

5-3 10-4

15-3

20-I

2-624 2-659 2-694

2-728 2-758

1340° 1419°

1477° 1532°

86° 24′ 86° 8′ 86° 14′ 86° 4′ 85° 50′

+ 27°

+ 3°

- i°

- 9°

- 16°

1-534 1-542 1-558 1-570 1-582

+ 4° 3°’ + i°4′ – 5° 10′ -17° 40′

-37°

+ 19° + 4° 36′ -16° -29° 28′ -36°

-16°

+ 7° +27° +48° +53°

‘ Angles measured to the edge PM.

The optical characters of the plagioclases have been the subject of much study, since they are of great value in determining the constituents of rocks in thin sections under the microscope. The mean indices of refraction and the angles of extinction on the cleavages P and M are given in the accompanying table. (The meaning of the + and — directions will be seen from the figure, where the face P slopes from left to right, i.e. the angle between the normals to the faces lettered P and M is less than 90°). The extinc- tion angles on other faces, or in sections of known orientation in the crystal, also give constants of determinative value: for example., in sections perpendicular to the plane M the extinctions, which in crystals twinned according to the albite-law are symmetrical with respect to this place, reach the maximum values given in the table. Not only do the directions of extinction (axes of light-elasticity) vary in the different species, but also the optic axial angle, so that while albite is optically positive, anorthite is negative, and a member near andesine has an axial angle of 90°. The figures seen in conver- gent polarized light through the P and M cleavages are characteristic of the different species. A detailed summary of the optical charac- ters and their employment in discriminating the several members of the plagioclase series is given by H. Rosenbuch, Mikroskopische Physiographic der Mineralien und Gesleine (4th ed. Stuttgart, 1905).

The plagioclases occur as primary constituents of igneous rocks of almost every kind, and are also frequent as secondary minerals in metamorphic rocks. Albite and oligoclase are more characteristic of acidic rocks, whilst the basic members at the anorthite end of the series are characteristic of rocks containing less silica. The composition may, however, vary even in the same crystal, zoned crystals with a basic nucleus and with shells successively more and more acid towards the exterior being common.

For further particulars respecting individual species and their modes of occurrence see Albite ; Andesine ; Anorthite ; Bytownite Labradorite; Oligoclase. (L. J. S.)

PLAGUE (in Gr. Xoijuos; in Lat. pestis, peslilentia) , in medicine, a term given to any epidemic disease causing a great mortality, and used in this sense by Galen and the ancient medical writers, but now confined to a special disease, otherwise called Oriental, Levantine, or Bubonic Plague, which may be shortly defined as

and to Dioscorides and Posidonius, who fully described these buboes in a work on the plague which prevailed in Libya in their time. Whatever the precise date of these physicians may have been, this passage shows the antiquity of the plague in northern Africa, which for centuries was considered as its home. The great plague referred to by Livy (Ix. Epitome) and more fully by Orosius (Histor. iv. n) was probably the same, though the symptoms are not recorded. It is reported to have destroyed a million of persons in Africa, but is not stated to have passed into Europe.

It is not till the 6th century of our era, in the reign of Justinian, that we find bubonic plague in Europe, as a part of the great cycle of pestilence, accompanied by extraordinary natural phenomena, which lasted fifty years, and is described with a singular misunderstanding of medical terms by Gibbon in kis forty-third chapter. The descriptions of the contemporary writers Procopius, Evagrius arid Gregory of Tours are quite unmistakable. 3 The plague of Justinian began at Pelusium in Egypt in a.d. 542 ; it spread over Egypt, and in the same or the next year passed to Constantinople, where it carried off 10,000 persons in one day, with all the symptoms of bubonic plague. It appeared in Gaul in 546, where it is described by Gregory of Tours with the same symptoms as lues inguinaria (from the frequent seat of buboes in the groin). In Italy there was a great mortality in 543, but the most notable epidemic was in 565, which so depopulated the country as to leave it an easy prey to the Lombards. In 571 it is again recorded in Liguria,

1 Amm. Marcell. xxiii. 7; see Hecker, De peste Antoniana (Berlin,

1835).-

2 Lib. xliv. cap. 17 — CEuvres de Oribase, ed. Bussemaker and Daremberg (Paris, 1851), iii. 607.

3 Evagrius, Hist, eccles. iv. 29; Procopius, De hello persico, ii. 22, 23.

and in 590 a great epidemic at Rome is connected with the pontificate oi Gregory the Great. But it spread in fact over the whole Roman world, beginning in maritime towns and radiating inland. In another direction it extended from Egypt along the north coast of Africa. Whether the numerous pestilences recorded in the 7th century were the plague cannot now be said; but it is possible the pestilences in England chronicled by Bede in the years 664, 672, 679 and 683 may have been of this disease, especially as in 690 pestis inguinaria is again recorded in Rome. For the epidemics of the succeeding centuries we must refer to more detailed works. 1

It is impossible, however, to pass over the great cycle of epidemics in the 14th century known as the Black Death.

Whether in all the pestilences known by this name Death." ˆhe disease was really the same may admit of doubt,*

but it is clear that in some at least it was the bubonic plague. Contemporary observers agree that the disease was introduced from the East; and one eyewitness, Gabriel de Mussis, an Italian lawyer, traced, or indeed accompanied, the march of the plague from the Crimea (whither it was said to have been introduced from Tartary) to Genoa, where with a handful of survivors of a Genoese expedition he landed probably at the end of the year 1347. He narrates how the few that had them- selves escaped the pest transmitted the contagion to all they met. 2 Other accounts, especially old Russian chronicles, place the origin of the disease still farther east, in Cathay (or China), where, as is confirmed to some extent by Chinese records, pestilence and destructive inundations are said to have destroyed the enormous number of thirteen millions. It appears to have passed by way of Armenia into Asia Minor and thence to Egypt and northern Africa. Nearly the whole of Europe was gradually overrun by the pestilence. It reached Sicily in 1346, Constanti- nople, Greece and parts of Italy early in 1347, and towards the end of that year Marseilles. In 1348 it attacked Spain, northern Italy and Rome, eastern Germany, many parts of France including Paris, and England; from England it is said to have been

conveyed to the Scandinavian countries. In England the western counties were first invaded early in the year, and London in November. In 1349 we hear of it in the midlands; and in subsequent years, at least till 1357, it prevailed in parts of the country, or generally, especially in the towns. In 1352 Oxford lost two-thirds of her academical population. The outbreaks of 1361 and 1368, known as the second and third plagues of the reign of Edward III., were doubtless of the same disease, though by some historians not called the black death. Scotland and Ireland, though later affected, did not escape.

The nature of this pestilence has been a matter of much controversy, and some have doubted its being truly the plague. But when the symptoms are fully described they seem to justify this conclusion, one character only being thought to make a distinction between this and Oriental plague, viz. the special implication of the lungs as shown by spitting of blood and other symptoms. Guy de Chauliac notes this feature in the earlier epidemic at Avignon, not in the later. Moreover, as this com- plication was a marked feature in certain epidemics of plague in India, the hypothesis has been framed by Hirsch that a special variety of plague, pestis indica, still found in India, is that which overran the world in the 14th century. But the same symptoms (haemoptysis) have been seen, though less notably, in many

1 See Noah Webster's History of Epidemic Diseases, 8vo (2 vols., London, 1800) (a work which makes no pretension to medical learning, but exhibits the history of epidemics in connexion with physical disasters — as earthquakes, famines, &c.) ; Lersch, Kleine Pest-Chronik (Svo, 1880) (a convenient short compendium , but not always accurate) ; " Athanasii Kircheri Chronologia Pestium " (to a.d. 1656), in Scrutinium pestis (Rome, 1658; Leipzig, 1671, 4to); Bascome, History of Epidemic Pestilences (London, 1851, 8vo). The most complete medical history of epidemics is Haser's Geschichte der epidemischen Krankheiten (3rd ed., Jena, 1882), forming the third volume of his History of Medicine.

2 See the original account reprinted with other documents in Haser, op. cit. ; also Hecker, Epidemics of the Middle Ages, trans, by Babington, Sydenham Soc. (London, 1844) ; Volkskrankheiten des Mittelalters, ed. Hirsch (Berlin, 1865) ; R. Hoeniger, Der schwarze Tod in Deutschland (Berlin, 1882).

plague epidemics, even in the latest, that in Russia in 1878-1879, and, moreover, according to the latest accounts, are not a special feature of Indian plague. According to a Surgeon- General Francis (Trans. Epidem. Soc. v. 398) " haemorrhage is not an ordinary accompaniment " of Indian plague, though when seen it is in the form of haemoptysis. It seems, therefore, impossible to make a special variety of Indian plague, or to refer

the black death to any such special form. Gabriel de Mussis describes it even in the East, before its arrival in Europe, as a bubonic disease.

The mortality of the black death was, as is well known, enormous. It is estimated in various parts of Europe at two- thirds or three-fourths of the population in the first pestilence, in England even higher; but some countries were much less severely affected. Hecker calculates that one-fourth of the population of Europe, or 25 millions of persons, died in the whole of the epidemics.

In the 15th century the plague recurred frequently in nearly all parts of Europe. In the first quarter it was very destructive in Italy, in Spain (especially Barcelona and Seville), in Germany and in England, where London was severely visited in 1400 and 1406, and again in 1428. In 1427, 80,000 persons died in Dantzic and the neighbourhood. In 1438-1439 the plague was in Germany, and its occurrence at Basel was described by Aeneas Sylvius, after- wards Pope Pius II. In 1448-1450 Italy (Kircher), Germany (Lersch, from old chronicles), France and Spain, were ravaged by a plague supposed to have arisen in Asia, scarcely less destructive than the black death. England was probably seldom quite free from plague, but the next great outbreak is recorded in 1472 and following years. In 1466, 40,000 persons died of plague in Paris; in 1477-1485 the cities of northern Italy were devastated, and in 1485 Brussels. In the fifteenth year of Henry VII. (1499-1500) a severe plague in London caused the king to retire to Calais.

The 1 6th century was not more free from plague than the 15th. Simultaneously with a terrible pestilence which is reported to have nearly depopulated China, plague prevailed over Germany, Holland, Italy and Spain, in the first decade of the century, and revived at various times in the first half. In 1529 there was plague in Edinburgh; in London in 1 537-1 539, and again 1547-1548; and also in the north of England, though probably not absent before. Some of the epidemics of this period in Italy and Germany are known by the accounts of eminent physicians, as Vochs, Fracastor, Mercurialis, Borgarucci, Ingrassia, Massaria, Amici, &c., 3 whose writings are important because the question of contagion first began to be raised, and also plague had to be distinguished from typhus fever, which began in this century to appear in Europe.

The epidemic of 1 563-1 564 in London and England was very severe, a thousand dying weekly in London. In Paris about this time plague was an everyday occurrence, of which some were less afraid than of a headache (Borgarucci). In 1570, 200,000 persons died in Moscow and the neighbourhood, in 1572, 50,000 at Lyons; in 1568 and 1574 plague was at Edinburgh, and in 1570 at New- castle. When, however, in 1575 a new

wave of plague passed over Europe, its origin was referred to Constantinople, whence it was said to have spread by sea to Malta, Sicily and Italy, and by land through the Austrian territories to Germany. Others contended that the disease originated locally; and, indeed, considering previous history, no importation of plague would seem necessary to explain its presence in Europe. Italy suffered severely (Venice, in 1576, lost 70,000); North Europe not less, though later; London in 1580-1582. In 1585 Breslau witnessed the most destructive plague known in its history. The great plague of 1592 in London seems to have been a part of the same epidemic, which was hardly extinguished by the end of the century, and is noted in London again in I599- On the whole, this century shows a decrease of plague in Europe.

In the first half of the 17th century plague was still prevalent in Europe, though considerably less so than in the middle ages. In the second half a still greater decline is observable, and by the third quarter the disease had disappeared or was disappearing from a great part of western Europe. The epidemics in England will be most conveniently considered in one series. From this time

3 Vochs, Opusculum de pestilentia (1537); Fracastorius, " De Contagione, &c," Opera (Venice, 1555); Hieron. Mercurialis, De peste, praesertim de Veneta et Patavina (Basel, 1577); Prosper Borgarutius, De peste (Venice, 1565), 8vo; Filippo Ingrassia, In- formatione del pestifero morbo . . . Palermo e . . . regno di Sicilia (i575~i576, 4to, Palermo, 1576-1577); A. Massaria, De peste (Venice, 1597); Diomedes Amicus, Tres tractatus (Venice, 1599), 4to; Victor de Bonagentibus, Decern problemata de- peste (Venice, 1556), 8vo; Georgius Agricola, De peste libri tres (Basel, 1554) 8vo. The works of English physicians of this period are of little medical value; but Lodge's Treatise of the Plague (London, 1603) deserves mention.

onwards we have the guidance of the " Bills of Mortality " issued in London, which, though drawn up on the evidence of ignorant persons, are doubtless roughly true. The accession of James I. in 1603 was marked by a very destructive plague which killed 38,000 in London. In this and subsequent years the disease was widely diffused in England — for instance, Oxford, Derbyshire, Newcastle. It prevailed at the same time in Holland, and had done so some years previously in northern Germany. In the same year (1603) one million persons are said to have died of plague in Egypt. This plague is said to have lasted eight years in London. At all events in 1609 we have the second great plague year, with a mortality of 11,785. After this there is a remission till about 1620, when plague again began to spread in northern Europe, especially Germany and Holland,

which was at that time ravaged by war. In 1625 (the year of the siege of Breda in Holland) is the third great London plague with 35,417 deaths — though the year 1624 was remarkably exempt, and 1626 nearly so. In 1630 was the great plague of Milan, described by Ripamonti. 1 In 1632 a severe epidemic, apparently plague, was in Derbyshire. 1636 is the fourth great plague year in London with a mortality of 10,400, and even in the next year 3082 persons died of the same disease. The same year 7000 out of 20,000 inhabitants of Newcastle died of plague; in 1635 it was at Hull. About the same time, 1635-1637, plague was pre- valent in Holland, and the epidemic of Nijmwegen is celebrated as having been described by Diemerbroeck, whose work {Tractatus de peste, 4to, 1641-1665) is one of the most important on the subject. The English epidemic, was widely spread and lasted till 1647, in which year, the mortality amounting to 3597, we have the fifth epidemic in London. The army diseases of the Civil Wars were chiefly typhus and malarial fevers, but plague was not unknown among them, as at Wallingford Castle (Willis, " Of Feavers," Works, ed. 1681, p. 131) and Dunstar Castle. From this time till 1664 little was heard of plague in England, though it did not cease on the Continent. In Ireland it is said to have been seen for the last time in 1650. 2

In 1656 one of the most destructive of all recorded epidemics in Europe raged in Naples; it is said to have carried off 300,000 persons in the space of five months. It passed to Rome, but there was much less fatal, making 14,000 victims only — a result attri- buted by some to the precautions and sanitary measures introduced by Cardinal Gastaldi, whose work, a splendid folio, written on this occasion (Tractatus de avertenda et profliganda peste politico- legalis, Bologna, 1684) is historically one of the most important on the subject of quarantine, &c. Genoa lost 60,000 inhabitants from the same disease, but Tuscany remained untouched. The comparatively limited spread of this frightful epidemic in Italy at this time is a most noteworthy fact. Minorca is said to have been depopulated. Nevertheless the epidemic spread in the next few years over Spain and Germany, and a little later to Holland, where Amsterdam in 1663-1664 was again ravaged with a mortality given as 50,000, also Rotterdam and Haarlem. Hamburg suffered in

1664.

The Great Plague of London. — The preceding enumeration will have prepared the reader to view the great plague of 1664-1665 Great in its true relation to others, and not as an isolated

Plague of phenomenon. The preceding years had been unusu- Londoa. a rjy f ree f r0 m plague, and it was not mentioned in the bills of mortality till in the autumn of 1664 (Nov. 2) a few isolated cases were observed in the

parishes of St Giles and St Martin's, Westminster, and a few occurred in the following winter, which was very severe. About May 1665 the disease again became noticeable, and spread, but somewhat slowly. Boghurst, a contemporary doctor, notices that it crept down Holborn and took six months to travel from the western suburbs (St Giles) to the eastern (Stepney) through the city. The mortality rapidly rose from 43 in May to 500 in June, 6137 in July, 17,036 in August, 31,159 in September, after which it began to decline. The total number of deaths from plague in that year, according to the bills of mortality, was 68,596, in a population estimated at 460,000,' out of whom two-thirds are supposed to have fled to escape the contagion. This number is likely to be rather too low than too high, since of the 6432 deaths from spotted fever many were probably really from plague, though not declared so to avoid painful restrictions. In December there was a sudden fall in the mortality which continued through the winter; but in 1666 nearly 2000 deaths from plague are recorded.

1 Josephus Ripamontius, De peste anni 1630 (Milan, 1641), 4to.

2 For this period see Index to Remembrancia in Archives of City of London 1579-1664 (London, 1878); Richardson, Plague and Pesti- lence in North of England (Newcastle, 1852).

3 Graunt, Observations on the Bills of Mortality (3rd ed., London,

1665).

According to some authorities, especially Hodges, the plague was imported into London by bales of merchandise from Holland, which came originally from the Levant; according to others it was introduced by Dutch prisoners of war; but Boghurst regarded it as of local origin. It is in favour of the theory that it spread by some means from Holland that plague had been all but extinct in London for some seventeen years, and prevailed in Holland in 1663-1664. But from its past history and local conditions, London might well be deemed capable of producing such an epidemic. In the bills of mortality since 1603 there are only three years when no deaths from plague are recorded. The uncleanliness cf the city was comparable to that of oriental cities at the present day, and, according to contemporary testimony (Garencieres, Angliae flagellum, London, 1647, p. 85), little improved since Erasmus wrote his well-known description. The spread of the disease only partially supported the doctrine of contagion, as Boghurst says: " The disease spread not altogether by contagion at first, nor began only at one place and spread further and further as an eating sore doth all over the body, but fell upon several places of city and suburbs like rain." In fact dissemination seems to have taken place, as usual, by the conversion of one house after another into a focus of disease, a process favoured by

the fatal custom of shutting up infected houses with all their inmates, which was not only almost- equivalent to a sentence of death on all therein, but caused a dangerous concentration of the poison. The well- known custom of marking such houses with a red cross and the legend " God have mercy upon us!" was no new thing: it is found in a proclamation in the possession of the present writer dated 1641; and it was probably older still. Hodges testifies to the futility and injurious effects of these regulations. The lord mayor and magistrates not only carried out the appointed administrative measures, but looked to the cleanliness of the city and the relief of the poor, so that there was little or no actual want; and the burial arrangements appear to have been well attended to. The college of physicians, by royal command, put forth such advice and prescriptions as were thought best for the emergency. But it is clear that neither these measures nor medical treatment had any effect in checking the disease. Early in November with colder weather it began to decline; and in December there was so little fear of contagion that those who had left the city " crowded back as thick as they fled." As has often been observed in other plague epidemics, sound people could enter infected houses and even sleep in the beds of those who had died of the plague " before they were even cold or cleansed from the stench of the diseased " (Hodges). The symptoms of the disease being such as have been generally observed need not be here considered. The disease was, as always, most destructive in squalid, dirty neighbourhoods and among the poor, so as to be called the " poor's plague." Those who lived in the town in barges or ships did not take the disease; and the houses on London Bridge were but little affected. Of those doctors who remained in the city some eight or nine died, not a large proportion. Some had the rare courage to investigate the mysterious disease by dissecting the bodies of the dead. Hodges implies that he did so, though he left no full account of his observations. Dr George Thomson, a chemist and a disciple of Van Helmont, followed the example, and nearly lost his life by an attack which immediately followed. 4

The plague of 1665 was widely spread over England, and was

4 On the plague of 1665 see Nath. Hodges, Lpimologia sive pestis nuperae api'd populum londinensem narratio (London, 1672) 8vo — in English by Quincy (London, 1720), (thechief authority) ; AoiftoypaQta or an Experimental Relation of the last Plague in the City of London, by William Boghurst, apothecary in St Giles's-in-the-Fields (London, 1666), — a MS. in British Museum (Sloane 349), containing im- portant details; George Thomson, AOIMOTOMIA, or the Pest Anatomized, 8vo (London, 1 666); Sydenham, " Febris pestilentialis et pestis annorum 1665-1666," Opera, ed. Greehhill, p. 96 (London, 1844); Collection of Scarce Pieces on the Plague in 1665 (London, 1721), 8vo; Defoe's fascinating Journal of a Citizen, which should be read and admired as a fiction, but accepted with

caution as history; T. Vincent (minister of the gospel), God's Terrible Voice in the City, 8vo (London, 1667) ; Calendar of State Papers (1665- 1666; " Domestic " series), by M. E. Green.

generally regarded as having ba;n transmitted from London, as it appeared mostly later than in the metropolis, and in many cases the importation by a particular person could be traced. Places near London were earliest affected, as Brentford, Greenwich, Deptford; but in July or August 1665 it was already in Southampton, Sunder- land, Newcastle, &c. A wider distribution occurred in the next year. Oxford entirely escaped, though the residence of the court and in constant communication with London. The exemption was attributed to cleanliness and good drainage.

After 1666 there was no epidemic of plague in London or any part of England, though sporadic cases appear in bills of mortality up to 1679; and a column filled up with " o " was left till 1703, when it finally disappeared. The disappearance of plague in London was attributed to the Great Fire, but no such cause existed in other cities. It has also been ascribed to quarantine, but no effective quarantine was established till 1720, so that the cessation of plague in England must be regarded as spontaneous.

But this was no isolated fact. A similar cessation of plague was noted soon after in the greater part of western Europe. In 1666 a severe plague raged in Cologne and on the Rhine, which was pro- longed till 1670 in the district. In the Netherlands there was plague in 1667-1669, but there are no definite notices of it after 1672. France saw the last plague epidemic in 1668, till it reappeared in 1720. In the years 1675-1684 a new plague epidemic appeared in North Africa, Turkey, Poland, Hungary, Austria and Germany, progressing generally northward. Malta lost 11,000 persons in 1675. The plague of Vienna in 1679 was very severe, causing 76,000 or probably more deaths. Prague in 1681 lost 83,000 by plague. Dresden was affected in 1680, Magdeburg and Halle in 1682 — in the latter town with a mortality of 4397 out of a popula- tion of about 10,000. Many North German cities suffered about the same time; but in 1683 the plague disappeared from Germany till the epidemic of 1707. In Spain it ceased about 1681; in Italy certain cities were attacked till the end of the century, but not later (Hirsch).

Plague in the iSth Century. — At the beginning of this period plague was very prevalent in Constantinople and along the Danube. In 1703 it caused great destruction in the Ukraine. In 1704 it began to spread through

Poland, and later to Silesia, Lithuania, Prussia and a great part of Germany and Scandinavia. In Prussia and Lithuania 283,000 persons perished; Dantzig, Hamburg and other northern cities suffered severely. Copenhagen was attacked in 1 710. In Stockholm there was a mortality of 40,000. Certain places near Brunswick (io c E.) marked the western limit of the epidemic; and cholera was arrested at the same spot in later years (Haser).

At the same time the plague spread westward from the Danube to Transylvania and Styria, and (1713) appeared in Austria and Bohemia, causing great mortality in Vienna. Thence it passed to Prague and Ratisbon — to the former, possibly to the latter, almost certainly conveyed by human intercourse. This city (12 E.) was the western limit reached in this year. Haser states that the plague disappeared everywhere in Europe after the great hurricane of the 27th of February 17 14.

In 171 7 plague raged severely in Constantinople; and in 1 719 it made a fresh progress westward into Transylvania, Hungary, Galicia and Poland, but not farther (about 20° E.). It thus appears that each successive invasion had a more easterly western- limit, and that the gradual narrowing of the range of plague, which began in the 17th century, was still going on.

This process suffered a temporary interruption by the outbreak of plague of southern France in 1720-1722. In 1720 Marseilles became affected with an epidemic plague, the origin of which was attributed by some to contagion through the ship of a Captain Chataud which arrived on the 20th of May 1720, from Syria, where plague at that time prevailed, though not epidemically when he sailed. Six of the crew had died on the voyage to Leghorn, but the disease was declared not to be plague. Cases of plague occurred, however, on the ship, and on the 22nd of June among porters unloading the cargo. Hence, according to believers in contagion, the disease passed to families in the " old town," the poorest and unhealthiest quarter. In the meantime other ships had arrived from Syria, which were put in quarantine. According to others the plague arose in Marseilles from local causes; and re- cently discovered data show that suspicious cases of contagious disease occurred in the town before the arrival of Chataud's ship. 1 Opinions were divided, and the evidence appears even now nearly balanced, though the believers in contagion and importation gained the victory in public opinion. The pestilence was fearfully severe. Thousands of unburied corpses filled the streets, and in all 40,000 to 60,000 persons were carried off. In December 1721 the plague passed away, though isolated cases occurred in 1722. It passed to, or at least broke out in, Aries and Aix in 1720, causing great mortality, but in Toulon not till 1721, when it destroyed

1 Relation historique de la peste de Marseille (Cologne, 1721, Paris, 1722, &c); Chicoyneau, Verny, &c, Observations et reflexions . . . de la peste (Marseilles, 1721); Chicoyneau, TraitS de la peste, Paris, 1744); LittrtS, article "Peste," in Dictionnaire de midicine, xxiv. (Paris, 1841).

two-thirds of the population. The epidemic spread generally over Provence, but not to other parts of France, notwithstanding that, as confessed by DAntrechaus, consul of Toulon, a believer in the exclusive power of contagion, there were abundant oppor- tunities. The disease was in fact, as in other cases, self-limited. In all 87,659 persons are said to have died out of a population of nearly 250,00c 2

This great epidemic caused a panic in England which led to the introduction (under Mead's advice) of quarantine regulations, never previously enforced, and also led to the publication of many pamphlets, &c, beside Mead's well-known Discourse on Pestilential Contagion (London, 1720).

Plague in Sicily in 1743. — An outbreak of plague at Messina in

1743 is important, not only for its fatality, but as one of thestrong- est cases in favour of the theory of imported contagion. Messina had been free from plague since 1624, and the Sicilians prided them- selves on the rigour of the quarantine laws which were thought to have preserved them. In May 1743 a vessel arrived ftom Corfu, on board of which had occurred some suspicious deaths. The ship and cargo were burnt, but soon after cases of a suspicious form of disease were observed in the hospital and in the poorest parts of the town; and in the summer a fearful epidemic of plague developed itself which destroyed 40,000 or 50,000 persons, and then became extinct without spreading to other parts of Sicily.

Spread of Plague from the East. — Independent of the episodes of Marseilles and Messina, the spread of plague from the East con- tinued to exhibit the above-mentioned law of limitation. In 1738-

1744 the disease was in the Ukraine, Hungary, the borders of Carn- iola, Moravia and Austria, extending along the Carpathians as far as Poland (20° E.), and also in Bukowina (25 E.). It lasted till 1745, and then disappeared from those parts for fifteen years. In 1 755-1 757 plague prevailed in parts of European Turkey, whence it on one occasion extended into Transylvania, in the neighbour- hood of Cronstadt, where it was checked (25-5° E.). 3

In 1770 a destructive plague arose in Moldavia during the Russo- Turkish War, and shortly afterwards in Wallachia, apparently endemic in the

former country at least. It affected also Transyl- vania and part of Hungary, and still more severely Poland, but was confined to Podolia, Volhynia, the Ukraine and east Galicia (5° E.), not even penetrating as far as Warsaw. After destroying, it is said, 300,000 persons, and without being checked by any quarantine regulations, the plague died out finally in March 1771, being remarkable for its short duration and spontaneous limitation (Haser).

In another direction the plague spread over Little Russia in 1770, and desolated Kieff, while in the next year it broke out in Moscow and produced one of the most destructive epidemics of modern times. More than 50,000 persons, nearly one-fourth of the popula- tion, were carried off. 4

The remaining European plague-epidemics of the 18th century were inconsiderable, but on that very account noteworthy. Tran- sylvania was again affected in 1785, Slavonia and Livonia (a district of eastern Galicia) in 1795-1796 (25° E.), Volhynia in 1798. The disease, while reappearing in the seats of the terrible earlier epidemics, was more limited in its range and of shorter duration. 6 An epidemic in Dalmatia in 1 783-1 784 is noteworthy in connexion with later outbreaks in the same region. In the last years of the century (179971800) there was a new epidemic in Syria and Egypt, where it affected the French and afterwards the English army.

Plague in the igth Century. — Plague appeared at Constanti- nople in 1802-1803, about the same time in Armenia (Kars), and in 1801 in Bagdad. It had prevailed since 1798 in Georgia and the Caucasus, and in 1803-1806 began to spread from the north of the Caucasus into Russia, till in 1806 it was established at or near Astrakhan, and in 1807 reached Zareff, 200 m. higher up the Volga. These localities are interesting as being near those where plague appeared in 1877-1878. It is also said to have entered the government of Saratov, but probably no great distance. 6 The plague remained in the Caucasus and Georgia till 1819 at least. In 1828-1831 it was in Armenia, and again in 1840-1843, since which time it has not been heard of in that country.

2 D'Antrechaus, Relation de la peste de Toulon en 1721 (Paris, 1756); G. Lambert, Histoire de la peste de Toulon en 1721 (Toulon, 1861), quoted by Haser, Gesch. der epidem. Krankh.

3 Adam Chen'ot, Abhandlung von der Pest (Dresden, 1776); De Peste (Vienna, 1766).

1 Samoilowitz, Memoire sur la peste en Russie, 177 1 (Paris, 1783); Mertens, De la peste en 1 771 (Paris, 1784).

6 Lorinser, Pest des orients (Berlin, 1837) p. 103; Schraud, Pest in Syrmien, 1795 (2 vols., Pesth, 1801).

6 From the annals of the Moravian community of Sarepta on the Volga, Geschichte der Brilder-Gemeinde Sarepta, by A. Glitsch (Sarepta and Berlin, 1865) ; also Tholozan, Epidemies de peste du Caucase (Paris, 1879).

In 1808 plague was at Constantinople, in 1809 at Smyrna. In 181 2 was a more general epidemic affecting these places and also Egypt. An outbreak at Odessa is supposed to have been brought from Constantinople, and thence to have passed to Transylvania. In 1813 a severe plague at Bucharest is sup- posed to have been brought from Constantinople. About the same time plague prevailed in Bosnia, and is supposed to have passed thence to Dalmatia in 1815. In 1814-1815 it again appeared in Egypt, and once more invaded the continent of Europe in Albania and Bosnia. Two insular outbreaks, Malta in 1813 and Corfu in 1815, attracted much attention as being both thought to be cases of importation by sea-traffic, 1 and there seems good reason for this opinion.

A panic spread through Europe in 181 5 in consequence of an outbreak in Noja on the eastern coast cf Italy. According to one view it was imported from the opposite coast of Dalmatia, though no definite history of contagion was established; accord- ing to others, it originated endemically in that place. It remained, however, strictly confined to a small district, perhaps in consequence of the extraordinarily rigorous measures of isolation adopted by the Italian government. In 1828 an isolated epidemic appeared in Greece in the Morea, supposed to have been brought by troops from Egypt. 2 In 1824-1825 an outbreak took place at Tutchkoff in Bessarabia; the town was strictly isolated by a military cordon and the disease did not spread. 3 Cronstadt in Transylvania was the scene of a small outbreak in 1828, which was said to be isolated by similar measures (Lorinser). A far more serious epidemic was connected with the campaign of the Russian army against Turkey in 1828-1829. Moldavia, Wallachia and Bessarabia were widely affected; the disease broke out also in Odessa and the Crimea, and isolated cases occurred in Transylvania. The most northerly points reached by the plague were near Czernowitz on the frontier of Bessarabia and Bukowina, and its limitation was as before attributed to the Russian and Austrian military cordons.

In 1 83 1 another epidemic occurred in Constantinople and Roumelia; in

1837 again in Roumelia and in Odessa — its last appearance in these regions, and the last on the European continent except an isolated outbreak in Dalmatia in 1840, and one in Constantinople in 1841. 4

The plague-epidemics in Egypt between 1833 and 1845 are very important in the history of plague, since the disease was almost for the first time scientifically studied in its home by skilled European physicians, chiefly French. The disease was found to be less contagious than reported to be by popular tradition, and most of the French school went so far as to deny the contagiousness of the disease altogether. The epidemic of 1834- 1835 was not less destructive than many of those notorious- in history; but in 1844-1845 the disease disappeared.

In 1853 plague appeared in a district of western Arabia, the Asir country in North Yemen, and it is known to have occurred in the same district in 1815, as it did afterwards in 1.874 and 1879. In 1874 the disease extended within four days' march of Mecca. From the scantiness of population the mortality was not great, but it became clear that this is one of the endemic seats of plague. 5

In June 1858 intelligence was received in Constantinople of an outbreak of disease at the small town Benghazi, in the district of Barca, province of Tripoli, North Africa, which though at first misunderstood was clearly bubonic plague. From later researches there is reason to believe that it began in 1856 or in 1855. The disease did not spread, and ceased in the autumn, to

1 Faulkner, On the Plague in Malta (London, 1820), 8vo; J. D. Tully, History of the Plague in Malta, Gozo, Corfu and Cephalonia (London, 1821), 8vo;White, Treatise on the Plague (at Corfu) (London 1847); Calvert, "On the Plague in Malta, 1813," Med.Chi. Trans actions, vi. 1.

2 L. A. Gosse, Relation de la peste en Grece, 1827-1828 (Paris,

1838).

3 Lorinser, Pest des orients, p. 319.

4 For the authorities, see Haser, Op. cit.

6 J. N. Radcliffe, Report of Local Government Board 1870-1880, suppl., p. 42.

return with less violence in 1859, when it died out. In the autumn of 1873 it returned, but came again to a spontaneous termination. 6

After the epidemic of Benghazi in 1856-1859, plague was next heard of in the district of Maku, in the extreme north-west of Persia in November 1863. It occurred in a scattered population, and the mortality was not absolutely large. 7

In 1867 an outbreak of plague was reported in Mesopotamia (Irak), among the marshes of Hindieh bordering on the lower Euphrates. The epidemic began in December 1866 (or probably earlier) and ceased in June 1867. But numerous cases of non- fatal mild bubonic disease (mild plague or pestis minor) occurred both before and after the epidemic, and according to Tholozan similar cases had been observed nearly every year from 1856 to

1865. 8

The next severe epidemic of plague in Irak began in December 1873. But facts collected by Tholozan show that pestis minor, or sporadic cases of true plague, had appeared in 1868 and subsequent years. The outbreak of 1873-1874 began about 60 m. from the origin of that of 1867. It caused a much greater mortality and extended over a much wider area than that of 1867, including the towns of Kerbela and Hilleh. After a short interval it reappeared at Divanieh in December 1874, and spread over a much wider area than in the previous epidemics. This epidemic was carefully studied by Surgeon-Major Colvill. 9 He estimated the mortality at 4000. The epidemic ceased in July, but broke out again early in 1876, and in this year extended northwards to Bagdad and beyond. The whole area now affected extended 250 m. from north-west to south-east, and the total number of deaths was believed to be 20,000. In 1877 plague also occurred at Shuster in south-west Persia, probably conveyed by pilgrims returning from Irak, and caused great mortality.

After its customary cessation in the autumn the epidemic began again in October 1876, though sporadic cases occurred all the summer. The disease appeared in 1877 in other parts of Mesopotamia also with less severity than in 1876, but over a wider area, being now announced at Samara, a town 70 m. above Bagdad on the Tigris. The existence of plague in Bagdad or Mesopotamia was not again announced till the year 1884, when accounts again appeared in the newspapers, and in that July the usual official statement was made that the plague had been stamped out.

In 1870-1871 it appeared in a district of Mukri in Persian Kurdistan to the south of Lake Urumiah (far removed from the outbreak of 1863). The epidemic appears, however, to have died out in 1871, and no further accounts of plague there were received. The district had suffered in the great epidemic of plague in Persia in 1829-1835. In the winter 1876-1877

a disease which appears to have been plague appeared in two villages in the extreme north of the province of Khorasan, about 25 leagues from the south-east angle of the Caspian Sea. In March 1877 plague broke out in Resbt, a town of 20,000 inhabitants, in the province of Ghilan, near the Caspian Sea at its south-west angle, from which there is a certain amount of trade with Astrakhan. In 1832 a very destructive plague had carried off half the inhabitants. In 1877 the plague was very fatal. From March to September 4000 persons were calculated to have died. The disease continued till the spring of 1878. In 1877 there was a doubtful report of the same disease at Astrabad, and also in some parts near the Perso-Afghan frontier. In 1878 plague again occurred in Kurdistan in the district of So-uj-Bulak, said by Dr Tholozan to be the same as in the district of Mukri where it occurred in 1870-1871. These scattered outbreaks of plague in Persian territory are the more remarkable because that country

6 Tholozan, La Peste en Turquie dans les temps modernes (Paris,

1880).

7 J. Netten Radcliffe, Report of the Medical Officer of the Privy Council, &c. {1875); also in Papers on Levantine Plague, presented to parliament (1879), p. 7.

8 Tholozan, La Peste en Turquie, p. 86.

9 See his report cited by Radcliffe, Papers on Levantine Plague

(1879).

had been generally noted for its freedom from plague (as com- pared with Asiatic Turkey and the Levant).

A few cases of plague occurred in January 1877 at Baku on the west shore of the Caspian, in Russian territory. 1

An outbreak of plague on European soil in 1878-1879 on the banks of the Volga caused a panic throughout Europe. 2 In the summer of 1877 a disease prevailed in several villages in the neighbourhood of Astrakhan and in the city itself, which was clearly a mild form of plague (pestis minor). It caused no deaths (or only one due to a complication) and died out apparently spontaneously. An official physician, Dr Kastorsky, who investigated the matter for the government, declared the disease to be identical with that

prevailing in the same year at Resht in Persia; another physician, Dr Janizky, even gave it the name of pestis nostras. In October 1878 some cases appeared in the slanitza or Cossack military settlement of Vetlanka, 130 m. from Astrakhan on the right bank of the Volga, which seem to have puzzled the physicians who first observed them, but on the 30th of November were recognized as being but the same mild plague as had been observed the year before near Astrakhan by Dr Doppner, chief medical officer of the Cossacks of Astra- khan. His report on the epidemic is the only original one we have. At the end of November 3 the disease became suddenly more severe, and most of those attacked died; and from the 21st of December it became still more malignant, death occurring in some cases in a few hours, and without any buboes being formed. No case of recovery was known in this period. At the end of the year it rapidly declined, and in the first weeks of January still more so. The last death was on the 24th of January. In the second half of December, when the disease had already lasted two months, cases of plague occurred in several neighbouring villages, all of an extremely malignant type, so that in some places all who were attacked died. In most of these cases the disease began with persons who had been at Vetlanka, though this was not universally established. The inhabitants of these villages, terrified at the accounts from Vetlanka, strictly isolated the sick, and thus probably checked the spread of the disease. But it evidently suffered a spontaneous decline. By the end of January there were no cases left in the district except at one village (Selitrennoye), where the last occurred on the 9th of February. The total number of cases in Vetlanka, out of a population of about 1700, was 417, of whom 362 died. In the other villages there were about 62 deaths from plague, and not more than two or three cases of recovery. In consequence of the alarm excited by this appearance of plague upon European soil, most European governments sent special commissions to the spot. The British commissioners were Surgeon-Major Colvill and Dr J. F. Payne, who, like all the foreign commis- sioners, reached the spot when the epidemic was over. With respect to the origin of this epidemic, the possibility of its having originated on the spot, as in Resht and on the Euphrates in very similar situations, is not to be denied. An attempt was made to show that the contagion was brought home by Cossacks returning from the Turkish War, but on absolutely no evidence. In the opinion of Dr Payne the real beginning of the disease was in the year 1877, in the vicinity of Astrakhan, and the sudden development of the malignant out of a mild form of the disease was no more than had been observed in other places. The Astra- khan disease may have been imported from Resht or Baku, or may have been caused concurrently with the epidemics of these places by some cause affecting the basin of the Caspian generally. Plague in India. — It used to be held as a maxim that plague never appeared east of the Indus; nevertheless it was observed during the 19th century in more than one

distinct centre in India. So long ago as 181 5 the disease appeared in Guzerat, Kattywar and Cutch, " after three years of severe famine."

1 J. Netten Radcliffe, Reports; Tholozan, Histoire de la peste bubonique en Perse (Paris, 1874).

5 See Radcliffe, Reports (1 879-1 880); Hirsch and Sommerbrodt, Pest-Epidetnie 1878-1879 in Aslrachan (Berlin, 1880); Zuber, La Peste d' Astrakhan en 1878-1879 (Paris, 1880) ; Colvill and Payne, Report to the Lord President of the Council (1879).

' The dates are all reduced to new style.

It reappeared early next year, in the same locality, when it extended to Sind as far as Hyderabad, and in another direction south-east as far as Ahmedabad and Dhollerah. But it disap- peared from these parts in 1820 or early in 1821, and was not heard of again till July 1836, when a disease broke out into violence at the town of Pali in Marwar in Rajputana. It spread from Pali to the province of Meywar, but died out spon- taneously in the hot season of 1837. The origin of these two epidemics was obscure. No importation from other countries could be traced.

In 1823 (though not officially known till later) an epidemic broke out at Kedarnath in Gurwhal, a sub-district of Kumaon on the south-west of the Himalayas, on a high situation. In 1834 and 1836 other epidemics occurred, which at last attracted the attention of government. In 1849-1850, and again in 1852, the disease raged very severely and spread southward. In 1853 Dr Francis and Dr Pearson were appointed a commission to in- quire into the malady. In 1876-1877 another outbreak occurred. The symptoms of this disease, called maha murree or mahamari by the natives, were precisely those of oriental plague. The feature of blood-spitting, to which much importance had been attached, appeared to be not a common one. A very remarkable circumstance was the death of animals (rats, and more rarely snakes) at the outbreak of an epidemic. The rats brought up blood, and the body of one examined after death by Dr Francis showed an affection of the lungs. 4

Oriental plague was observed in the Chinese province of Yunnan from 1871, and also at Pakhoi, a port in the Tongking Gulf, in 1882 — being said to have prevailed there at least fifteen years. In both places the symptoms were the same, of undoubted bubonic plague. At Pakhoi it recurs nearly every year. 6

In 1880 therefore plague existed or had existed within ten years, in the following parts of the world: (1) Benghazi, Africa; (2) Persian Kurdistan;

(3). Irak, on the Tigris and Euphrates; (4) the Asir country, western Arabia; (5) on the lower Volga, Russia; (6) northern Persia and the shores of the Caspian; (7) Kumaon and Gurhwal, India; (8) Yunnan and Pakhoi, China.

*Literature. — See the following works, besides those already quoted: Kamintus, Regimen contra epidimiam sive pestem, 4to, c. 1494 (many editions) ; Jacobus Soldus, Opus insigne de peste, 4to (Bologna, 1478) ; Alex. Benedictus, De observatione in pestilentia, 4to (Venice, 1493) ; Nicolaus Massa, De febre pestilentia, 4to (Venice, 1556, &c.) ; Fioravanti, Regimento delta peste, 8vo, Venice, 1556; John Woodall, The Surgeon's Mate, folio (London, 1639) ! Van Helmont, Tumulus pestis, 8vo (Cologne, 1644, &c.) ; Muratori, Trattato del governo delta peste, Modena, 1714; John Howard, An Account of Lazarettoes in Europe, &c., *4to (London, 1789); Patrick Russell, A Treatise of the Plague, 4to (London, I 791); Thomas Hancock, Researches into the Laws of Pestilence, 8vo (London, 1821); Foderfi, Lecons sur les epidemies, &c, 4 vols. 8vo (Paris, 1822-1824) ; S6gur Dupeyron, Recherches historiques, &c, sur la peste (1837); Bulard, La Peste orientate, 8vo (Paris, 1839); Griesinger, Die tnfectionskrankheiten (2nd ed., 8vo, Erlangen, 1864). (J. F. P.)*

History since 1880. — The most striking feature of the early history of plague summarized above is the gradual retrocession of plague from the west, after a series of exceedingly destructive outbreaks extending over several centuries, and its eventual disappearance from Europe. It appears to have come to a sudden end in one country after another, and to have been seen there no more. Those lying most to the west were the first

4 On Indian plague, see Francis, Trans. Epidem. Soc. Lond. iv. 407-408; John Murray, ibid., vol. iv. part 2; J. N. Radcliffe, Reports of Local Government Board (1875, 1876, 1877 and for 1879- 1880); Parliamentary Papers (1879); Frederick Forbes, On Plague in North-West Provinces of India (Edinburgh, 1840) (Disserta- tion) ; Hirsch, Handbuch der historischen-geogr. Pathologie, i. 209 (i860), (Eng. trans, by Creighton, London, 1883); Hecker's Volks- krankheiten des Mittelalters (Berlin, 1865), p. 101 ; Webb, Pathologia indica (2nd ed., Calcutta, 1848).

5 See J. N. Radcliffe's Report for 1879-1880, p. 45; Manson in Reports of Imperial Chinese Customs, special series No. 2, for half- year ended the 31st of March 1878, 15th issue (Shanghai); Lowry, " Notes on Epidemic Disease at Pakhoi " (1882), ibid., 24th issue, P- 3i-

to be freed from its presence, namely, England, Portugal and Spain. From all these it finally disappeared about 1680, at the close of a period of pandemic prevalence. Northern and central Europe became free about 17 14, and the south of France in 1722. The last outbreak in northern Russia occurred in 1770. After this plague only appeared in the south-east of Europe, where in turn it gradually died away during the first half of the 19th century. In 1841 its long reign on this continent came to an end with an isolated outbreak in Turkey. From that time until quite recently it remained extinct, except in the East. The province of Astrakhan, where a very small and limited out- break occurred in 1878, is politically in Europe, but geographi- cally it belongs rather to Asia. And even in the East plague was confined to more or less clearly localized epidemics; it showed no power of pandemic diffusion. In short, if we regard the his- tory of this disease as a whole, it appears to have lost such power from the time of the Great Plague of London in 1665, which was part of a pandemic wave, until the present day. There was not merely a gradual withdrawal eastwards lasting nearly two hundred years, but the outbreaks which occurred during that period, violent as some of them were, showed a constantly diminishing power of diffusion and an increasing tendency to localization. The sudden reversal of that long process is therefore a very remarkable occurrence. Emerging from the remote endemic centres to which it had retreated, plague has once more taken its place among the zymotic diseases with which Western communities have to reckon, and that which has for more than a century been little more than a name and a tradition has become the familiar object of investigation, carried on with all the ardour and all the resources of modern science. In what follows an attempt will be made to summarize the facts and indicate the conclusions to be drawn from recent experience.

Diffusion. — At the outset it is characteristic of this subtle disorder that the present pandemic diffusion cannot be traced with certainty to a definite time or place of origin. Herein it differs notably from other exotic diseases liable to similar diffusion. For instance, the last visitation of cholera could be traced clearly and definitely to a point of origin in northern India in the spring of 1892, and could be followed thence step by step in its march westward (see Cholera). Similarly, though not with equal precision, the last wave of influenza was shown to have started from central Asia in the spring of 1889, to have travelled through Europe from east to west, to have been carried thence across the sea to America and the Antipodes, until it eventually invaded every inhabited part of the globe (see Influenza). In both cases no doubt remains that the all-important means of dissemination is human intercourse. The movements of plague cannot be followed.in the same way. With regard to origin, several endemic centres are now recog- nized in Asia and Africa, namely, (1) the district of Assyr in Arabia, on

the eastern shore of the Red Sea; (2) parts of Meso- potamia and Persia; (3) the district of Garwhal and Kumaon in the North- West Provinces of India; (4) Yunnan in China; (5) East and Central Africa. The last was recently discovered by Dr Koch. It includes the district of Kisiba in German East Africa, and extends into Uganda. In applying the term " endemic centres " to these localities, no very precise meaning can be attached to the word. They are for the most part so remote, and the information about them so scanty, that our knowledge is largely guesswork. What we mean is that there is evidence to show that under various names a disease identical with plague has been more or less continuously prevalent for a number of years, but how long and how continuously is not known. Whether any of them are permanent homes of plague the evidence does not enable us to say. They seem, at any rate, to have harboured it since its disappearance from Europe, and probably further investigation would disclose a still wider prevalence. For instance, there are good reasons for believing that the island of Reunion has been subject, since 1840 or there- abouts, to outbreaks under the name of " lymphangite infec- tieuse," an elegant euphemism characteristically French. In

all the countries named plague appears to behave very much as it used to do in Europe from the time of the Black Death on- wards. That is to say, there are periods of quiescence, with epidemic outbreaks which attract notice at irregular intervals.

Taking up the story at the point where the earlier historical summary leaves off, we get the following list of countries in which plague is known to have been present in each year (see Local Government Board's Reports): 1880, Mesopotamia; 1 88 1, Mesopotamia, Persia and China; 1882, Persia and China; 1883, China; 1884, China and India (as mahamari); 1885, Persia; 1886, 1887, 1888, India (as mahamari) ; 1889, Arabia, Persia and China; 1890, Arabia, Persia and China; 1891, Arabia, China and India (as mahamari); 1892, Mesopotamia, Persia, China, Russia (in central Asia); 1893, Arabia, China, Russia and India (as mahamari) ; 1894, Arabia, China and India (as mahamari); 1895, Arabia and China; 1896, Arabia, Asia Minor, China, Japan, Russia and India (Bombay) ; 1897, Arabia, China, Japan, India, Russia and East Africa; 1898, Arabia, Persia, China, Japan, Russia, East Africa, Madagascar and Vienna; 1899, Arabia, Persia, China, Japan, Mesopotamia, East Africa, West Africa, Philippine Islands, Straits Settlements, Madagascar, Mauritius, Reunion, Egypt, European Russia, Portugal, Sandwich Islands, New Caledonia, Paraguay, Argen- tine, Brazil: 1900, to the foregoing should be added Turkey, Australia, California, Mexico and Glasgow; in 1901, South Africa and in 1902 Russia chiefly at Odessa.

This list is probably by no means exhaustive, but it sufficiently indicates in

a summary fashion the extent of that wave of diffu- sion which set in during the closing years of the 19th century. It did not fully gather way till 1896, when plague appeared in Bombay, but our modern knowledge of the disease dates from 1894, when it attacked Hong Kong and first presented itself to accurate observation. From this point a more detailed account- may be given. Plague was recognized at Hong Kong in May 1894, and there can be little doubt that it was imported from Canton, where a violent outbreak-ˆ-said to have caused 100,000 deaths — was in progress a few months earlier, being part of ail extensive wave of infection which is believed to have come originally out of the province of Yunnan, one of the recognized endemic centres, and to have invaded a large number of places in that part of China, including Pakhoi and other seaports. Hong Kong was severely affected, and has never since been entirely free from plague. In two intermediate years — 1895 and 1897 — very few cases were recorded, but more recently the epidemic has gathered force again. The following table gives the cases and deaths in each of the six years 1894-1899: —

Year.

1894 . . .

1895 • • •

1896 . . .

1897 . . .

1898 . . .

1899 . . .

Total

Cases.

2833 45

1204 21

1320

i486

6909

Deaths.

2550 36

1078 18

“75

1415

6272

Case Mortality.

% 90 80 89

85 89

95

90-7

The excessively high rate of mortality is probably due in part to under-statement of the number of cases. Concealment is practised by the Chinese, who are chiefly attacked, and it is easier to conceal sickness than death. Plague appears to have been equally persistent and destructive on the mainland in southern China during the period indicated, but no accurate details are available. In 1897 the Portuguese settlements of Lappa and Macao were invaded. In addition to the provinces of Yunnan, Kwang-si and Kwang-tung in southern China, plague is reported to have been present for several years in a district in Mongolia to the north of Peking, and distant about ” twelve days’ ride.” More recently several localities in Mongolia and Manchuria have been affected. Formosa was attacked in 1896, and suffered considerably in subsequent years; in 1899 I the Japanese government officially reported 2633 cases, with

1974 deaths. Japan itself has had a certain amount of imported plague, but not on a large scale. Speaking generally, the disease has persisted and spread in the Far East since 1894, but precise information is lacking, except with regard to Hong Kong. W. J. Simpson in his Report on the Causes of the P ague in Hong Kong (1903) reports the endemicity of the plague in that colony to be maintained by (a) infection among rats often connected with infectious material in rat runs or in houses, the virus of which has not been destroyed, (b) retention of infection in houses which

are rat-ridden, and © infected clothing of people who have been ill or died of plague. He considers the outbreaks are favoured by the seasonal heat and moisture of the spring and early summer, and the movement from place to place of infected rats or persons. He also believes that human beings may infect rats. In 310 cases of plague examined by Simpson 56% were bubonic, 40% septic and 4% pneumonic.

In r89& plague appeared in the city of Bombay. It was certainly present in August, but was not recognized until the 23rd of September, and the diagnosis was not bacteriolcgically confirmed until the 13th of October. This feet should be remembered when failure to recognize the disease on its first appearance occurs elsewhere. The origin of the Bombay inva- sion is shrouded in obscurity. It is not even known when or in what part of the city it began (Condon, The Bombay Plague). Several theories have been put forward, and importation by sea from China is the theory which has met with most acceptance. The native form of plague, known as mahamari, is confined to the southern slopes of the Himalaya. It is described above, but that account may be supplemented by seme earlier references unearthed by the Bombay Gazetteer (vol. iv.). Ibn Batesta notices two destructive pestilences in the 14th century, and Ferishta one in 1443, which he calls ta'un, and dsscribes as very unusual in India. At the end of the 16th century there was a pestilence following a prolonged famine, and in the 17th century two violent epidemics are recorded under the names ta'un and waba. In the second of these, which occurred in the Ahmedabad district of the Bombay Presidency in 1683-89, buboes ate distinctly described. In the 18th century several pestilences are recorded without description. It is at least probable from these notes that even before the undoubted outbreak, which began in Cutch in 181 2, India was no stranger to epidemic plague. To return to Bombay and 1896: the infection spread gradually and slowly at first, but during the first three months of 1897 not only was the town of Bombay severely affected, but district after district in the presidency was attacked, notably Poona, Karachi, Cutch Mandvi, Bhiwandi and Daman. The number of cases and deaths reported in the presidency, exclusive of the city, in each year down to the end of 1899, was as follows: —

Year.

Cases.

Deaths.

Case Mortality.

1896

1897

1898

1899

Total . .

367 49.125 90,506

I3L794

273

36,797

68,061

101,485

% 74-3 74-7 75-2 77-0

271,792

206,616

75‘8

The corresponding figures for Bombay city are: —

Year.

Cases.

Deaths.

Case Mortality.

1896

1897

1898

1899

Total . .

2,530 11,963 19.863 19,484

1,801 10,232 18,160 15.830

% 71- 1

85-7 91-2

8i-3

53.840

46,023

85-4

incidence according to population. Moreover, concealment was extensively practised. The most striking fact brought out by the tables just given is the large and steady increase year by year in the presidency, in spite of all efforts to arrest the spread of infection. It has gone on since 1899, and it has not been confined to Bombay, but has extended over the whole of India. In 1897 it had already penetrated to Rajputana, the Punjab, the North West Provinces and the Central Provinces. In the following year Bengal, Madras, Haidarabad and Mysore were invaded. Not all these provinces suffered alike, but on the whole plague steadily strengthened its hold on India generally, and hardly relaxed it in any part. The most

noteworthy details available are as follows, taken from the plague mortality returns published June 1908. In the Punjab from 179 deaths in 1897 the mortality reached a maximum of 334,897 in 1905, in Agra and Oudh they rose from 72 in 1897 to 383,802 in 1905, and in Madras Presidency from 1658 in 1899 to 20,125 in 1904. The most striking figures, however, are those for Bombay and Bengal which are given below, as well as the total mortality in India.

The total for the presidency, including the city, in four years was 325,632 cases with 252,549 deaths in a population of 26,960,421 (census of 1891). The population of the city is 821,764, but during the earlier plague period large numbers fled, so that the foregoing figures do not give the true plague

Year.

Bengal Presidency

Bombay Presidency

All India.

(including Calcutta).

(including Bombay City).

1896

—

2,219

2,219

1897

—

47,7lo

47,974

1898

219

86,191

89,265

1899

3.264

96,592

102,369

1900

38,412

33,196

73,576

1901

78,629

128,259

236,433

1902

32,967

184,752

452,655

1903

65,680

281,269

684.445

1904

75,438

223,957

938,010

1905

126,084

71,363

940,821

1906

59,6i9

51,525

3oo,355

Outside China and India plague has caused no great mortality in any of the countries in which it has appeared, with the exception perhaps of Arabia, about which very little is known. But some of the outbreaks are interesting for other reasons, and require notice. The first case is the singular occurrence of three deaths at Vienna in October 1898. The earliest victim was an attendant named Barisch, employed in the pathological laboratory of the Vienna General Hospital, and told off to look after the animals and bacteriological apparatus devoted to the investigation of plague, cultures of which had been brought from India by the medical commissioners sent by the Royal Academy of Science in 1897. Barisch was drunk and out all night on the 8th of October; on the 14th of October he fell ill. Plague was suspected, but Dr Miiller, who attended the man and had studied the disease in India, would not admit the diagnosis on clinical grounds, nor was it bacteriologically established until the 19th of October. Barisch died on the 18th of October. On the 20th one of the nurses, and on the 21st Dr Miiller, fell ill. Both died of pneumonic plague, from which also Barisch had undoubtedly suffered. A second nurse and a sister of mercy had feverish attacks, but no further case occurred. Barisch was shown to have been careless in the performance of his duties, and to have disregarded instructions; and the inference is that he conveyed the infection to his mouth, and so to the lungs, from the bacteriological specimens or inoculated animals. The melancholy incident illustrates several points of interest: (1) the correctness of the bacterial theory of causation, and the identity of the bacillus pesiis as the cause; (2) the infectious character of the pneumonic type of disease; (3) its high fatality; (4) the difficulty of diagnosis.

The next occurrence of special interest is the appearance of plague in

Portugal in 1899, after an absence of more than 200 years. Its origin is shrouded in obscurity. Oporto, the seat of the outbreak, had no connexion by sea with any place known to be infected, and all attempts to trace introduction ended in speculation or assumption. The most probable theory was that soldiers returning home from infected Portuguese possessions in the East brought it with them, but this does not explain the selection of Oporto and the escape of other places. The earliest

cases, according to retrospective inquiry, occurred in June 1890; suspicions were aroused in July, but the diagnosis was not established until August. The conclusion reached, after careful investigation by Dr Jorge, the medical officer of health, that the commencement really dated from June, is confirmed by the fact that about that time the riverside labourers, who were first affected, began to notice an illness among themselves sufficiently novel to attract their attention and that of an English ship- owner, who from their description suspected plague. Through him the suspicion was conveyed to the Medical Times and Gazette, in which the suggestion of plague at Oporto was made before any public mention of it in the town itself. The outbreak never assumed large proportions. It gained ground by degrees until October, after which it declined, and eventually ceased in February 1900. No recrudescence has been officially announced. The number of cases recorded in a population of 150,000 was 310, with 114 deaths, representing a case mortality of 36-7%. They were widely scattered about the town and outlying suburbs; but no further extension occurred, except some isolated cases at Braga, a town 35 m. distant, and one at Lisbon, in the person of the distinguished bacteriologist, Professor Camara Pestana, who contracted the disease in making a post-mortem at Oporto, and died in Lisbon.

The only other appearance of plague in Europe in 1899 was on the Volga. Three places were affected, namely, Kolobovka, and Krasnoyarsk, in the province of Astrakhan, and Samara, higher up the river. All three outbreaks were small and limited, and no further extension took place. A commission appointed by the Russian government pronounced the disease to be undoubtedly plague, and it appears to have been very fatal. The origin was not ascertained.

The most interesting extensions of plague in 1900 were those in Australia and Glasgow. The following towns were affected in Australia: Sydney, in New South Wales; Adelaide, in South Australia; Melbourne, in Victoria; Brisbane, Rockhampton, Townsville, Cairns and Ipswich, in Queensland;

Freemantle, Perth and Coolgardie, in West Australia. In none of these, with the exception of Sydney, did plague obtain a serious hold. The total number of cases reported in Queensland was only 123, with 53 deaths. In Sydney there was 303 cases, with 103 deaths, a case mortality of 34%. The infection is supposed to have been brought from Noumea, in New Caledonia, where it was present at the end of 1899; and the medical authorities believe that the first case, which occurred on the 19th of January, was recognized. The outbreak, which hardly reached epidemic proportions, lasted about six months. That in Glasgow was on a still smaller scale. It began, so far as could be ascertained, in August 1900, and during the two months it lasted there were 34 cases and 1 5 deaths. Once more the disease was not at first recognized, and its origin could not be traced. In 1901 plague invaded South Africa, and obtained a distinct footing both at Cape Town and Port Elizabeth. The total number of cases down to July was 760, with 362 deaths; the number of Europeans attacked was 196, with 68 deaths, the rest being natives, Malays, Indians, Chinese and negroes. With regard to Great Britain, a few ship-bome cases have been dealt with at different ports from time to time since 1896, but except at Glasgow the disease has nowhere obtained a footing on land.

Causation. — Plague is a specific infectious fever, caused by the bacillus pestis, which was identified in 1894 by Kitasato, and subsequently, but independently, by Yersin (see Parasitic Diseases). It is found in the buboes in ordinary cases, in the blood in the so-called " septicaemic " cases, and in the sputum of pneumonic cases. It may also be present in the urine. Post mortem it is found in great abundance in the spleen and liver. Nothing is known of its natural history outside the body, but on cultivation it is apt to undergo numerous involution forms. Its presence in a patient is regarded as positive diagnostic proof of plague; but failure to find or to identify it does not possess an equal negative value, and should not be too readily accepted, for many instances are recorded in which expert observers have only succeeded in demonstrating its presence after repeated

attempts. It is clear, from the extreme variations in the severity of the illness, that the resisting power of individuals varies greatly. According to the Plague Research Committee of Bombay, the predisposing causes are " those leading to a lower state of vitality," of which insufficient food is probably the most important. There is no evidence that age, sex or race exercises a distinct predisposing influence. The largest incidence in Bombay was on young adults; but then they are more numerous and more exposed to infection, because they go about more than the younger and the older. Similarly, the comparative immunity of Europeans in the East may be explained by their different conditions of life. It is doubtful whether the distinc- tion drawn between pestis minor and pestis major has a real aetiological basis. Very mild cases occurring in the course of an outbreak of

typical plague may be explained by greater power of resistance in individuals, but the epidemic prevalence of a mild illness preceding the appearance of undoubted plague suggests some difference or modification of the exciting cause. " It is impossible," writes Sir Richard Thorne (Local Government Board Report, 1898-1899), " to read the medical history of this disease in almost every part of the world without being impressed with the frequency with which recognized plague has been pre- ceded by ailments of such slight severity, involving some bubonic enlargement of glands and some rise in body-temperature, as to mask the real nature of the malady." Considering the great importance of arresting the spread of infection at the outset, and the implicit reliance placed upon bacteriological criteria, the aetiology of such antecedent ailments deserves more atten- tion than has hitherto been paid to it. Of course plague does not stand alone in this respect. Epidemic outbreaks of other diseases — for instance, cholera, diphtheria and typhoid fever — are often preceded and followed by the prevalence of mild illness of an allied type; and the true significance of this fact is one of the most important problems in epidemiology. In plague, however, it is of special importance, on account of the peculiarly insidious manner in which this disease fastens itself upon a locality.

The path by which the bacillus enters the body varies. In pneumonic cases it is presumed to enter by the air-passages, and in bubonic cases by the skin. The Bombay Plague Research Committee, whose experience is unequalled, say: " In a number of instances points of inoculation were found on the extremities of patients, from which plague cultures were obtained, and in these cases buboes were found above the point of inoculation. In the majority of instances, however, no local indication could be found marking the point at which the microbe was implan- ted." From the fact that bacilli are hardly ever found in the blood of bubonic cases it may be inferred that they are arrested by the lymphatic glands next above the seat of inoculation, and that the fight — which is the illness — takes place largely in the bubo; in non-bubonic cases they are not so arrested, and the fight takes place in the general circulatory system, or in the lungs. As might be expected from these considerations, the bubonic type is very little infectious, while pneumonic cases are highly so, the patients no doubt charging the surrounding atmosphere by coughing. Whether infection can be introduced through the digestive tract by infected food is doubtful. The bacillus is non-resistant and easily killed by heat and germicide substances, particularly acids. Little is known of its toxic action; only a weak toxin has been obtained from cultures. Of the lower animals, mice, rats, guinea-pigs, rabbits, squirrels and monkeys are susceptible to the bacillus; horses, cattle, sheep, goats, pigs, dogs and cats are more or less resistant, but cats and dogs have been known to die of plague (Oporto, Daman, Cutch and Poona). Jn the Great Plague of London they were

believed to carry the infection, and were killed in vast numbers. The bacillus has been demonstrated in the bodies of fleas, flies, bugs and ants.

Clinical Characters. — One of the results of recent observation is the. classification of plague cases under three heads, which have already been mentioned several times: (1) bubonic, (2) pneumonic, (3) septicaemic. (The word " pesti-caemic " is

also used instead of " septi-caemic," and though etymologically objectionable, it is otherwise better, as " septicaemic " already has a specific and quite different meaning.) It should be under- stood that this classification is a clinical one, and that the second and third varieties are just as much plague as the first. It is necessary to say this, because a misleading use of the word " bubonic " has given rise to the erroneous idea that true plague is necessarily bubonic, and that non-bubonic types are a different disease altogether. The word " plague " — or " pest," which is the name used in other languages — had originally a general meaning, and may have required qualifications when applied to this particular fever; but it has now become a specific label, and the prefix "bubonic" should be dropped.

The illness varies within the widest limits, and exhibits all gradations of severity, from a mere indisposition, which may pass almost unnoticed, to an extreme violence, only equalled by the most violent forms of cholera. The mild cases are always bubonic; the other varieties are invariably severe, and almost always fatal. Incubation is generally from four to six days, but it has been observed as short as thirty-six hours and as long as ten days (Bombay Research Committee). Incubation, however, is so difficult a thing to determine that it is unwise to lay down any positive limit. As a rule the onset is sudden and well marked. The symptoms may be described under the headings given above, (i) Bubonic cases usually constitute three-fourths of the whole, and the symptoms may therefore be called typical. In a well-marked case there is usually an initial rigor — in children convulsions — followed by a rise of temperature, with vomiting, headache, giddiness, intolerance to light; pain in epigastrium, back and limbs; sleeplessness, apathy or delirium. The headache is described as splitting; delirium is of the busy type, like delirium tremens. The temperature varies greatly; it is not usually high on the first day — from 101° to 103°— and may even be normal, but sometimes it rises rapidly to 104° or 105 or even 107 F.; a fall of two or three degrees on the second or third day has frequently been observed. The eyes are red and injected; the

tongue is somewhat swollen, and at first covered with a thin white fur, except at the tip and edges, but later it is dry, and the fur yellow or brownish. Pros- tration is marked. Constipation is the rule at first, but diarrhoea may be present, and is a bad sign. A characteristic symptom in severe cases is that the patient appears dazed and stupid, is thick in speech, and staggers. The condition has often been mistaken for intoxication. There is nothing, however, in all these symptoms positively distinctive of plague, unless it is already prevalent. The really pathognomonic sign is the appearance of buboes or inflamed glands, which happens early in the illness, usually on the second day; sometimes they are present from the outset, sometimes they cannot be detected before the third day, or even later. The commonest seat is the groin, and next to that the axilla; the cervical, submaxillary and femoral glands are less frequently affected. Sometimes the buboes are multiple and on both sides, but more commonly they are unilateral. The pain is described as lancinating. If left, they usually suppurate and open outwards by sloughing of the skin, but they may subside spontaneously, or remain hard and indurated. Petechiae occur over buboes or on the abdomen, but they are not very common, except in fatal cases, when they appear shortly before death. Boils and carbuncles are rare. (2) Pneumonic plague was observed and described in many of the old epidemics, and particularly by two medical men, Dr Gilder and Dr Whyte, in the outbreak in Kathiawar in 1816; but its precise significance was first recognized by Childe in Bombay. He demonstrated the presence of the bacilli in the sputa, and showed that the inflammation in the lungs was set up by primary plague infection. The pneumonia is usually lobular, the onset marked by rigors, with difficult and hurried breathing, cough and expectoration. The prostration is great and the course of the illness rapid. The breathing becomes very hurried — forty to sixty respirations in the minute — and the face dusky. The expectoration soon becomes watery and profuse, with little whitish specks, which contain great quantities of

bacilli. The temperature is high and irregular. The physical signs are those of broncho-pneumonia; oedema of the lungs soon supervenes, and death occurs in three or four days. (3) In septicaemic cases the symptoms are those of the bubonic type, but more severe and without buboes. Prostration and cerebral symptoms are particularly marked; the temperature rises rapidly and very high. The patient may die comatose within twenty-four hours, but more commonly death occurs on the second or third day. Recovery is very rare.

There is no reason for doubting that the disease described above is identical with the European plagues of the 14th and subsequent centuries. It does not differ from them in its clinical features more than epidemics of other diseases are apt to vary at different times, or more than can be accounted for by difference of handling. The swellings and discolorations of the skin

which play so large a part in old descriptions would probably be equally striking now but for the surgical treatment of buboes. Similarly, the comparatively small destructiveness of modern plague, even in India, may be explained by the improved sanitary conditions and energetic measures dictated by modern knowledge. The case mortality still remains exceedingly high. The lowest recorded is 34% in Sydney, and the highest 95% at Hong Kong in 1899. During the first few weeks in Bombay it was calculated by Dr Viegas to be as high as 99%. It is very much higher among Orientals than among Europeans. In the Bombay hospitals it was about 70% among the former, and between 3d and 40% among the latter, which was much the same as in Oporto, Sydney and Cape Town. It appears, therefore, that plague is less fatal to Europeans than cholera. The average duration of fatal cases is five or six days; in the House' of Correc- tion at Byculla, where the exact period could be well observed, it was five and a half days. Patients who survive the tenth or twelfth day have a good chance of recovery. Convalescence is usually prolonged. Second attacks are rare, but have been known to occur.

Diagnosis. — When plague is prevalent in a locality, the diagnosis is easy in fairly well-marked cases of the bubonic type, but less so in the other varieties. When it is not prevalent the diagnosis is never easy, and in pneumonic and septicaemic cases it is impossible without bacteriological assistance. The earliest cases have hardly ever been even suspected at the time in any outbreak in a fresh locality. It may be taken at first for almost any fever, particularly typhoid, or for venereal disease or lymphangitis. In plague countries the diseases with which it is most liable to be confounded are malaria, relapsing fever and typhus, or broncho-pneumonia in pneumonic cases.

Treatment. — The treatment of plague is still symptomatic. The points requiring most attention are the cerebral symptoms — headache, sleeplessness, delirium, &c. — and the state of the heart. Alcohol and cardiac stimulants may be required to prevent heart failure. Speaking generally, it is important to preserve strength and guard against collapse. Extracts of supra-renal gland have been found useful. Buboes should be treated on ordinary surgical principles. An antitoxic serum has been prepared from horses by the Institut Pasteur in France, but has not met with success. The results in India obtained by British and various foreign observers were uniformly unfa- vourable, and the verdict of the Research Committee (1900) was that the serum had " failed to influence favourably the mortality among those attacked." Success was somewhat noisily claimed for an improved method tried in Oporto, but the evidence is of little or no value. Of 142 cases treated, 21 died; while of 72 cases not treated, 46 died; but the former were all hospital patients, and included several convalescents and many cases of extreme mildness, whereas the non-serum

cases were treated at home or not at all, some being only discovered when death had made further concealment impossible. Later obser- vations have, however, established that the Yersin-Roux serum is of undoubted benefit when used early in the case, in fact during the first twenty-four hours. Very large doses, so much as rso cc. may be injected subcutaneously or preferably intravenously, and it is stated to modify the whole course of

the disease. Another serum has been prepared by Lustig and Galeotti.

Morbid Anatomy. — (1) Bubonic cases. A bubo is found to consist of a chain of enlarged glands, surrounded by a mass of engorged connective tissue, coagulated blood and serum. Nearly all the lymphatic glands in the body are a little swollen, but the lymphatic vessels show little or no change. The spleen and liver are always enlarged, the former to sometimes twice or thrice its natural size. The lungs are engorged and oedematous, and often show haemorrhages. The kidneys are enlarged and congested. The serous membranes show petechiae and hae- morrhages. The right side of the heart is frequently dilated, with clots in the cavities. The heart muscle is normal, or soft and friable. The substance of the brain, spinal cord and nerve-trunks is normal, but the membranes are engorged. (2) Pneu- monic cases. The lymphatic glands are hardly affected. There is general engorgement and oedema of the lungs, with pneumonic patches varying in size and irregularly distributed. (3) Septi- caemic cases. Nearly all the lymphatic glands in the body are involved, and have a characteristic appearance. They are enlarged to the size of an almond, rounded, firm and pink; there is some engorgement and oedema on section; the substance is rather soft, and can be scraped off with a knife. The surrounding tissue is not engorged or oedematous. The description of the other organs given under (1) applies also to (2) and (3).

Dissemination. — Given the bacillus, the questions arise, How is it disseminated? and What are the conditions that favour its propagation? That it is conveyed from person to person is an undoubted fact, proved by innumerable cases, and tacitly implied by the word " infectious," which is universally allowed. The sick are a source of danger and one means of dissemination, and, since the illness may be so slight as to pass unrecognized, an obviously insidious one. The ambulatory plague patient goes far to explain the spread of the disease without leaving any track. But there is evidence that persons may carry the infec- tion and give it to others without being ill at all themselves. One such case occurred at Glasgow, and another at Oporto. In the Glasgow case the wife of a laundryman employed

in handling plague linen contracted the disease. She was brought into connexion with it in no other way, and there can be no doubt that she took it from her husband, though he was not ill at all himself. The Oporto instance is still more conclusive. Two little girls had plague at Argoncilhe, a suburb some miles from Oporto, and were the only cases which occurred in that place. Their father was a riverside labourer, who lodged during the week in Oporto, but went home for Sunday. He was not ill, but several cases of plague occurred in the house in which he lodged. How the poison passes from one person to another is less clear. In pneumonic cases patients no doubt spread it around them by coughing, and others may take it up through the air-passages or the skin; but even then the range of infection is small, and such cases are comparatively rare. In the vast majority of cases the bacilli are in the lym- phatic or the circulatory system, and aerial convection, even for a short distance, seems highly improbable. This view is borne out by the experience in hospitals and with " contacts," which goes to show that with reasonable care and under fair conditions the risk of infection from ordinary plague patients is very small. When persons live crowded together in close contact, and when they are careless with regard to discharges of all kinds from patients, the risk is obviously much increased. Discharges — vomited matters, sputa, urine and faeces — are possible media by which plague is spread from person to person. They also contaminate clothing, which thus becomes another means of dissemination capable of acting at a distance. This is the most probable explanation of the two cases of indirect infection related above. Failure to catch or induce plague from clothing that has been worn by plague patients proves nothing. Such clothing is not necessarily infectious; indeed, the probability is that it is not, unless contaminated by discharges. There is no evidence that merchandise and food- stuffs are means of dissemination, but a great deal of evidence

against such a theory. Then we come to the lower animals. Attention has been concentrated on rats, and some observers seem disposed to lay upon them the whole blame for the propa- gation and spread of plague, which is held to be essentially a rat-borne disease. The susceptibility of rats has been noted from remote times and in many countries, particularly in China, but it has never attracted so much attention as during the recent prevalence of plague. From one place after another a great mortality among rats was reported, and the broad fact that they do die of plague is incontestable. It is therefore easily intelligible that they may play an important part in multiplying and fixing the poison on a locality. As to how they convey it from man to man the greatest probability is in favour of the flea as an intermediary. Mortality among rats is said to precede the appearance of human plague, but the evidence of this is always retrospective and of a very loose character. At Sydney a careful investigation was made; and the

conclusion reached by Dr Tidswell was that " there was no ground for even a suspicion that our epidemic was being maintained by any process of direct contagion between man and man," but that rats were the carriers. In Glasgow the experience was just the contrary. Personal connexion was traced in every case, and rats excluded; there was no mortality among them, and of 300 caught and examined none had plague (Chalmers). Similarly, at Oporto, personal connexion was traced in all the earlier cases; there was no mortality among rats, and no evidence to connect them with the outbreak (Jorge). Again, a comparison between rat- infested and rat-free districts in Bombay showed a much higher incidence of plague in the latter. A campaign against rats in Bombay, by which 50,000 or 60,000 were killed in a short time, had no effect in checking the disease. Plague-rats have rarely been found in ships sailing from infected ports; and though millions of these animals must have been carried backwards and forwards from quay to quay bet ween Hong-Kong, Bombay and the great European ports, they have not brought the disease ashore. By far the most important communication on the role of rats in the spread of plague is formed by the " Report on the Plague Investigations in India " {Journal of Hygiene, vol. vi. No. 4; vol. vii. No. 3, 1907). The chief conclusions arrived at in the report as the result of experiments are the following: —

1. Healthy rats contracted plague from infected rats when the only apparent means of communication between the two was the rat flea (pulex cheopis).

2. In 21 experiments out of 38, 55% of healthy rats living in flea-proof cages have contracted plague after receiving fleas collected from rats either dead or dying of septicaemic plague ; consequently it is proved the rat flea can transmit plague from rat to rat.

3. Close and continuous contact of plague-infected animals with healthy ones does not infect the latter if fleas are excluded.

4. Should fleas be present an epizootic at once starts and spreads in porportion to the number of fleas present.

5. Guinea-pigs set free in plague-infected houses become infected with the rat flea and develop plague in a certain percentage.

6. Fleas caught on plague-infected rats are able to infect rats placed in flea-proof cages.

7. Guinea-pigs placed in plague-infected houses do not contract plague if they are protected from fleas; those placed in cages pro- tected by a border of sticky paper at least six inches in radius, which the fleas cannot jump

over, do not contract plague; the others not similarly protected, do.

8. Chronic plague may prevail in rats.

On this report it may, therefore, be taken that aerial infection, except, perhaps, in pneumonic cases, may be excluded, and that the chief source of infection is the flea. It was also shown that animals may become infected through the faeces of a flea which has been fed on plague-infected rats. This may serve to explain the manner in which plague-infected linen and clothing may convey the disease. The report also considers it proved that the bacillus pestis multiplies in the stomach of a flea and may remain a considerable time within its host.

Browning Smith says the following facts are admitted as known. (1) Plague can be carried by fleas from an unhealthy rat. (2) A flea can retain the plague bacilli alive for seven or eight days. (3) Man is, in the majority of cases, infected through the skin, though the puncture may not be seen. (4) The rat flea, when finding no rats, will attack man and it will also attack other animals.

Very little light has been thrown on the conditions which favour the prevalence of plague. We do not know why it has developed a diffusive activity of late years, nor why it has attacked some places and consistently passed by others, such as Singapore. The words " dirt " and " insanitary conditions " are much used, but such general terms explain nothing. Singapore, where plague has several times been introduced, but never taken hold, is probably quite as dirty and insanitary as Hong-Kong, and it is pertinently remarked by the Bombay Research Committee that filth per se has but little influence, inasmuch as " there occurred in the House of Correction at Byculla, where cleanliness is brought as near to perfection as is attainable, an outbreak which exceeded in severity that in any of the filthy chaivls and tenements around." Again, in Oporto there is an area which combines every possible sanitary defect — dense overcrowding, great poverty, no light, no air, no drainage, no scavenging, water brought in buckets. Plague got into this quarter, but did not spread there; on the other hand, it appeared in other and vastly superior parts of the town. Yet in at least one case neither the patient nor the " con- tacts " were removed, but were all shut up in one room with a sentry at the door and another in the street. The seasonal variations have been well marked and extremely regular in Bombay. The disease begins to be active in late autumn or the beginning of winter, and reaches its height in February or March, dying

down in the summer. Baldwin Latham made an elaborate examination of the meteorological conditions, and more particularly of the vapour tension, from which he draws the conclusion that the seasonal variations are due to exhalation from the ground. His observations are original and worth attention. A simpler explanation is that the people live more indoors, and are so more exposed to infection during the plague season. The curve shows two rises, one at the begin- ning of winter, and the other at the commencement of the monsoon, and at both these times the people are driven indoors. A broad survey of the epidemiological facts suggests some general conclusions. The outbreaks fall into two well-defined groups: (i) those in which the disease is destructive and per- sistent, (2) those in which its effects are slight and transient. In the former the poison clearly fastens on the locality, and gradually increases its hold. The place is infected, not merely the people in it; for if they evacuate it, the disease soon ceases among them, and if they return in a short time, they are again attacked. Now the poison is contained, as we have already seen, in the discharges from patients, and in such infected localities the standing conditions and the habits of the people combine to retain the discharges on the premises. The floors, mostly of mud covered with dung, are fouled with spittle, vomit, and urine, and, being seldom or never cleaned out, foster a gradual accumulation of poison, to which infected rats and the concealment of illness contribute. These are just the con- ditions which prevailed in Europe in the old plague days. They do not prevail now in those " white countries " which have been invaded but have repelled the attack with comparative ease and little loss. It may be concluded, with some confidence, from experience and theory alike, that localities where they do not prevail may fail to keep plague out, but have very little to fear from it, except the disturbance of trade caused by the traditional terrors that still cling to the name.

Prevention. — The principles are the same as those which govern the prevention of other infectious diseases. " Sanitary cordons " and the like are obsolete. International procedure is supposed to be regulated by the Venice convention of 1897 (see Quarantine), but that instrument contains an optional clause, which allows countries to do as they please with their own frontiers. Except Great Britain and Germany, they all retain quarantine in a more or less stringent form at seaports. It is generally used as a system of local extortion imposed upon travellers and shipping. According to the Venice convention, ships are divided into (1) healthy, (2) suspected, (3) infected.

(1) Healthy are those free from plague throughout the voyage;

(2) suspected, those in which plague has occurred, but no fresh

case within twelve days; (3) infected, those in which plague has occurred within twelve days. Great Britain relies on medical inspection, removal of sick or suspected cases, and supervision of the healthy arriving on an infected ship; infected clothing is burnt and infected ships are disinfected. The procedure is the same as for cholera, but it has been equally successful. Ships passing through the Suez Canal are subject to similar inspection; sick persons are landed at Moses Wells, and suspected ones detained. The risk of importing plague from India has been materially lessened by medical inspection of outward-bound ships at the principal ports. This has been very thoroughly carried out at Bombay with good results. In 1897 pilgrimages from India to the Hedjaz were prohibited. By the Venice convention a number of articles of merchandise are classed as susceptible and liable to be refused admission, but the only ones which there is any reason to consider dangerous are used clothing and rags. A watch should be kept on rats at ports of arrival and on board ships from infected countries.

When plague is present in a place, the measures to be taken are the usual ones for dealing with infectious disease, with some additions. The sick and suspected should be removed in special ambulances to an isolation hospital, their soiled linen, &c, should be burnt, and the premises disinfected. Corrosive sublimate in an acid solution is the best disinfectant, but sulphuric acid, 1 in 250, is efficient and cheaper. Suspected cases should be bestowed in a special isolated building until the diagnosis is fully determined. " Contacts " should be kept under observation. Rats should be exterminated as far as possible, especially by means of the Danysz virus, which spreads a disease amongst rats which cannot be communicated to man. The greatest care should be taken in dealing with the hospital linen and discharges from patients. Hospital staffs should be kept apart. Inoculation with Haffkine's prophylactic fluid should be offered to all persons willing to avail themselves of it. It is especially desirable for hospital and ambulance staffs to be inoculated with a vaccine prepared from sterilized cultures of plague bacillus. Inoculation is harmless, and the results obtained in India justify a favourable' opinion of its protective efficacy. 1 At Hubli, where nearly the whole population was inoculated between the nth of May and the 27th of September

1 The system of inoculation against plague with a fluid prepared from sterilized virus of the disease was introduced in India by Pro- fessor Haffkine early in 1897. The composition of this fluid was subjected to a searching inquiry by the Indian Plague Commission, who pronounced its employment to be free from danger, and it was used on a large scale in various parts of India without producing injurious effects. In September 1902 the standard method of manufacturing this fluid was changed by the director of the Plague Institute on his own authority, with the object of expediting the process, and thus meeting the heavy demand then being

made by the Punjab government in connexion with a large scheme of inoculation. The change involved the omission of a small pro- portion of carbolic acid which had up till then been added to the original fluid as a further precaution against contamination. The new fluid, or water agar process, contained no carbolic acid, other methods being relied upon to ensure its purity. On the 6th of November 1902, nineteen persons who had been inoculated on the 30th of October in the village of Malkowal from a single bottle (labelled 53-n) of the new fluid were found to be suffering from tetanus, and all of them subsequently died. A commission, con- sisting of Sir Lawrence Jenkins, Lieut.Colonel Bomford, M.D., principal of the Medical College, Calcutta, and Major Semple, R.A.M.C., director of the Pasteur Institute, Kasauli, was appointed by the government of India to inquire into the disaster. They found that the germ of tetanus had been introduced into the fluid before the bottle was opened at Malkowal, and they thought it pro bable that this might have occurred owing either to insufficient sterilization or to the process of filling the bottle from a larger flask having been performed with defective precautions. They also expressed the opinion that carbolic acid was a valuable agent in restraining tetanus growth when added to plague prophylactic, and they, therefore, thought that its omission was a grave mistake. Experiments undertaken in India by two independent inquiries appeared to confirm the view, and their conclusions, together with the data on which they were based, were submitted with the report of the commission for examination and further experiment to the Lister Institute in London. With reference to the findings of the Malkowal commission the Institute were asked to report: (1) On the comparative efficacy of the standard and new fluids as a

*1898, the mean mortality among the inoculated was 1*3%; among the uninoculated 13 • 2 . At Daman the mortality was — inoculated i-6, uninoculated 24-6%; at Dharwar, inoculated 1-2%, uninoculated 5-2%. In all these cases the numbers dealt with were large and the test fair.*

Simpson, in The Practitioner (Dec. 1906), gives an analysis of the results of Haffkine's serum inoculations as follows: —

Year.

Case Mortality.

Uninoculated.

Inoculated.

1897-1900 average . 1900-1901 „ ...

1901-1902 ,, ... 1902-1903 ,, . . .

60-99 60-59 65-12

6o-i

36-55 36-50 35-07 239

In Poona, out of 5595 uninoculated cases the incidence was 6-8%, while in 1300 inoculated cases it was only 0-33 %. Klein also prepares a new prophylactic from the dried organs of a guinea-pig, and one of the most interesting experiments is that of Strong (Archiv fiirSchiffs- und tropische Hygiene, April, 1906), who uses for producing immunity in man a living virulent culture of the bacillus pestis. He immunized 40 persons with- out mishap and with no more unpleasant results than those occurring after vaccination. Inoculation protects against attack, and greatly modifies the illness when it fails to protect. How long the protection lasts has not been determined, but it appears to be several months at least.

The main authorities for the researches into plague are- in the official reports of recent years from India and elsewhere. See generally W. J. Simpson, A Treatise on Plague (1905).

(A. Sl.;H. L. H.)

protection against plague; (2) on the comparative liability of each fluid to contamination; and (3) on the probable origin of tetanus virus in the Malkowal cases. Their report on these points (Dec. 1904) contained the following conclusions: (1) "The Institute sees no reason to differ from the conclusions of the commission that the new prophylactic is not less efficacious than the old. (2) The Institute is of opinion that in the hands of more or less unskilled workers it is easier to ensure freedom from contamination by Haffkine's ' standard method ' of manufacturing plague vaccine than with the ' water agar process ' as employed by him. (3) The Institute is in entire agreement with the commission as to the value of 5 % carbolic acid in restraining tetanus growth when added to plague prophylactic, and its experiments emphasize still further the importance of this addition in preventing growth and toxin formation in a vaccine which might be liable to the possibility of contamination with spores of tetanus. (4) The conclusions of the Institute coincide with those of the commission that in all probability tetanus was at the time of inoculation in the fluid contained in the bottle, but that it is impossible to determine at what stage in its history or in what way the bottle (53-n) became contaminated." The government decided, on the advice of the director, that only the standard

fluid should be manufactured at the plague institute. This fluid was sterilized by methods approved by the Indian Plague Commission and contained the requisite proportion of carbolic acid. It was bottled by a new method patented by Dr E. Maynard. The result of the inquiries by the commission and the Lister Institute led to a protracted controversy with regard to the re- sponsibility of Mr Haffkine's laboratory, and to his subsequent treatment by the government of India; and the leading bacteriologists in England warmly took up his cause. A parliamentary " Return of Papers" was issued in June 1907, and in The Times of the 29th of July there appeared a letter signed by the distinguished pathologists, Ronald Ross, R. T. Hewlett, A. S. Grunbaum, W. J. Simpson, R. F. C. Leith, W. R. Smith, G. Sims Woodhead, E. Klein, S. Flexner and C. Hunter Stewart, pointing out that the evidence, so far from showing that Mr Haffkine's laboratory was to blame, made it clear to those acquainted with bacteriological work that it could have had nothing to do with the occurrence. They agreed that there was strong evidence to show that " the contamination took place when the bottle was opened at Malkowal, owing to the abolition by the plague authorities of the technique prescribed by the Bombay laboratory, and to the consequent failure to sterilize the forceps which were used in opening the bottle, and which during the process were dropped on the ground "; and they complained of the inadequacy of the inquiries made by the Indian government, and called for Mr Haffkine's exoneration. The evidence showed that it had been much too readily believed that the tetanus germs had entered the fluid before the bottle was opened, and that a grave injustice had been done to Mr Haffkine. Acting on this view, in November 1907, the Indian government invited Mr Haffkine again to take up work in India. XXI. 23

PLAICE (Pleuronectes platessa), a species of flat-fish, common on the coasts of northern Europe from Iceland to the Bay of Biscay. It is readily recognized by the yellow or orange-coloured spots which are placed in a row along the dorsal and anal fins, and scattered over the body. The eyes are on the right side, and the teeth in the jaws compressed and truncate. The scales are minute and smooth. Plaice, like other flat-fishes, prefer a sandy flat bottom to a rocky ground, and occur in suitable localities in great abundance; they spawn early in spring, and are in finest condition in the month of May. Individuals of seven or eight pounds weight are considered fish of large size, but specimens of double that weight have been caught.

See the monograph by F. J. Cole and J. Johnstone (Liverpool, 1901); and W. Garstang's " Reports on the Natural History of the Plaice " {Rapports et proces-verbaux du conseil international pour I' exploration de la mer, 1905 seq.).

PLAID (Gael, plaide, Ir. ploid, usually taken to be derived from Gael, peall, sheepskin, Lat. pellis, skin), an outer garment, consisting of an oblong piece of woollen cloth, which has formed the principal outer part of the costume of the Highlanders of Scotland. The wearer wrapped himself in the plaid, the lower portion, reaching to the knees and belted, forming the kilt. Later the lower portion was separated, being called the phili- beg, the plaid being used as a covering for the shoulders and upper part of the body. The plaids were usually of a checked or tartan pattern. The word is thus used of any cloth made with such a pattern. " Shepherd's plaid " is a cloth with a chequer of black on a white ground.

PLAIN (O. Fr. plain, from Lat. planum), a level surface; hence in physical geography a tract of country generally quite flat or comparatively so (see Geography). The adjective " plain " signifies " level," and thence smooth, clear, simple, ordinary, &c. PLAINFIELD, a city of Union county, New Jersey, U.S.A., about 24 m. W. by S. of New York City. Pop. (1910 U.S. census), 20,550. It is served by the Central Railroad of New Jersey and by electric lines connecting with neighbouring towns. It is situated for the most part on a plain; north-east are heights occupied by the suburb of Netherwood, and north in Somerset county, on the slope of the first Watchung Mountain, is the borough of North Plainfield (pop. 1910 U.S. census, 6117), which forms with Plainfield virtually a single residential and business community. Plainfield is one of the most attractive residential suburbs of New York. The city has an excellent public school system, a good public library, with an art gallery and museum. The Muhlenberg hospital, club houses and a driving track are features of the city. The value of the factory products increased from $2,437,434 in 1900 to $3,572,134 in 1905, or 46-6%. Plainfield was settled in 1684, but it was not until 1735 that the first frame house was erected. In 1760 a grist mill was erected, and for several years the place was called Milltown. The township of Plainfield was created out of Westfield township in 1847, and in 1867 Plainfield was chartered as a city.

PLAIN SONG, or Plain Chant {Gregorian Music; Lat. cantus planus; Ital. canto gregoriano; Fr. plain chant), a style of unisonous music, easily recognizable by certain strongly marked characteristics, some very ancient fragments of which are believed to have been in use under the Jewish dispensation from a remote period, and to have been thence transferred to the ritual of the Christian Church.

The theories advanced as to the origin of this solemn form of ecclesiastical music are innumerable. The most widely spread opinion is that the older portion of it originated with the Psalms themselves, or at least sprang from the later synagogue music. Another theory traces the origin of plain song to the early Greeks; and the supporters of this view lay much stress on the fact

that the scales in which its melodies are composed are named after the old Greek " modes." But, beyond the name, no connexion whatever exists between the two tonalities. Less reasonable hypotheses attribute the origin of the plain song to the Phoenicians, to the Egyptians, to the early Christian converts, and to the musicians of the middle ages.

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PLAINTIFF

Towards the close of the 4th century Ambrose of Milan, fearing the loss or corruption of the venerable melodies which had been preserved by means of oral tradition only, endeavoured to restore them to their primitive purity, and to teach the clergy to sing them with greater precision. A still more extensive work of the same nature was undertaken, two centuries later, by Pope Gregory the Great. And thus arose two schools of ecclesiastical music, still known as the " Ambrosian " and the " Gregorian chant " — the first of which is practised only in the diocese of Milan, while the latter is universally accepted as the authorized " Roman use." In order to explain the essential differences between these two schools, we must describe in detail some of the peculiar characteristics of plain song.

The melodies which form the repertoire of plain chant are not written in modern major and minor scales, but in certain tonalities bearing names analogous to those of the early Greek "modes," though constructed on very different principles. Of these " modes," fourteen exist in theory, though twelve only are in practical use. The intervals of each " mode " are derived from a fundamental sound, called its " final." 1 The compass of each mode comprises eight sounds — that of the first, third, fifth, seventh, ninth, eleventh and thirteenth " modes " extending to the octave above the " final," and that of the second, fourth, sixth, eighth, tenth, twelfth and fourteenth extending from the fourth note below the final to the fifth note above it. Con- sequently, the " finals " of the first series, called the " authentic modes," occupy the lowest place in each system of sounds, and those of the second series, called the " plagal modes," the middle place — the same " final " being common to one " authentic " and one " plagal mode." The following table exhibits the entire system, expressed in the alphabetical notation peculiar to modern English music — the " final " being indicated in each case by an asterisk, and the position of the semitones, from which each mode derives its distinctive character, by brackets.

*Plagal Modes. 2. Hypodorian, A, B, C, *D, E, F, G, A. 4.*

*Hypophrygian,B,C,D, *E,F,G,A,B.*

Authentic Modes.

*1. Dorian, *D, E, F, G, A, B, C, D.*

*3. Phrygian, *E~F, G, A, B'Tc, D, E.*

*5 . Lydian, * F, G, A, bTc, D, £~F.*

*7. Mixolydian, *G, A, B, C, D, eTf, G.*

*9. Aeolian, *A, B, C, D, E, F, G, A. 11. locrian, * b7£, D, E^F, G, A, B. 13. Ionian, *C, D, E, F, G, A, B, C.*

*6. Hypolydian, C, D, E, *F, G, A, B, C.*

*8. Hyporai!«>lydian,D,E,F,*G,A,B,C,D. 10. Hypoaeolian, E, F, G, *A, B, C, D, E. 12. HyPolocrUn, F, G, A, *B, C, D, E, F. 14. Hypoionian, G, A, B'7*C, D, E, F, G.*

Nos. 11 and 12 in this series are rejected, for technical reasons into which we have not space to enter ; they are practically useless. 2 Of these modes Ambrose used four only — the first four " authentic modes," now numbered 1, 3, 5 and 7. Gregory acknowledged, and is said by some historians of credit to have invented, the first four " plagal modes " — Nos. 2, 4, 6 and 8. The use of the remaining " modes," except perhaps the ninth, was not formally authorized until the reign of Charlemagne, who published an official decision upon the subject. In one or other of the twelve " modes " recognized by this decision every plain-chant melody is composed. The number of such melodies preserved to us, the genuineness of which is undoubted, is very large; and the collection is divided into several distinct classes, the most important of which are the melodies proper to the Psalm- Tones and Antiphons; the Ordinarium Missae, the Inlroits, Graduals and Offertoria; the Praefationes, Versiculi and Responsoria; the Hymns and Sequences; and the Lamenla- tiones, Exultet and other music used in Holy Week.

Of these classes the most interesting by far is that which includes the psalm-tones, or psalm-tunes, called by modern English historians, the " Gregorian tones." The oldest of these are tones 1,3,5 ar >d 7, as sung by Ambrose. The antiquity of tones 2, 4, 6 and 8 is less firmly established, though there is no doubt that Gregory the Great sanctioned their use on strong traditional evidence. In addition to these, a peculiarly beautiful melody in mode 0, known as the Tonus peregrimis, has been sung from time immemorial only to the psalm In exitu Israel. 1 Analogous to the tonic or

key-note of the modern scale. •For fuller information on the subject see the article " Modes," in Grove's Dictionary of Music.

The oldest version of this melody now extant is undoubtedly to a certain extent impure; but tradition imputes to it a very high antiquity, and even our doubts as to the authenticity of the now generally accepted reading extend only to one single note. A widely accepted tradition points out this melody as the tune sung to In exitu Israel, as part of the Great Hallel (see Psalms), which is generally (but hardly rightly) identified with the hymn sung by Christ and His apostles immediately after the Last Supper.

One very powerful argument in favour of the Jewish origin of the psalm-tones lies in the peculiarity of their construction. It is impossible to ignore the perfect adaptation of these venerable melodies to the laws of Hebrew poetry, as opposed to those which governed Greek and Latin verse. The division of the tune into two distinct strains, exactly balancing each other, points assuredly to the intention of singing it to the two contrasted phrases which, inseparable from the constitution of a Hebrew verse, find no place in any later form of poetry. And it is very remarkable that this constructional peculiarity was never imitated, either in the earliest hymns or antiphons we possess or in those of the middle ages — evidently because it was found impossible to adapt it to any medieval form of verse — even to the Te Deum, which, though a manifest reproduction of the Hebrew psalm, was adapted by Ambrose to a melody of very different formation, and naturally so since so many of its phrases consist of a single clause only, balanced in the following verse. This peculiarity now passes for the most part unnoticed; and the Te Deum is constantly sung to a psalm-tone, very much to the detriment of both. But in the middle ages this abuse was unknown; and so it came to pass that, until the " School of the Restoration " gave birth, in England, to the single chant, avowedly built upon the lines of its Gregorian predecessor, and a somewhat later period to the double one, so constructed as to weld two verses of the psalm into one, often with utter disregard to the sense of the words, the venerable psalm-tones stood quite alone — the only melodies in existence to which the psalms could be chanted. And so intimate is the adaptation of these plain- chant melodies to the rhythm as well as to the sense of the sacred text, even after its translation into more modern languages, so strongly do they swing with the one and emphasize the other, that it is difficult to believe that the composition of the music was not coeval with that of the poetry.

Next in antiquity to the psalm-tones are the melodies adapted to the antiphons, the offertoria, the graduals and the introits, sung at High Mass. Those proper to the Ordinarium missae are probably of later date. Those belonging to hymns and sequences are of all ages. Among the latest we possess — perhaps the very latest of any great importance — is that of

Lauda Sion, a very fine one, in modes 7 and 8, adapted to the celebrated sequence written by Thomas Aquinas about 1261.

To the melodies adapted to the Lamenlationes and the Exultet, as sung in the Church of Rome during Holy Week, it is abso- lutely impossible to assign any date at all. All we know is that they are of extreme antiquity, and beautiful beyond all descrip- tion. The melody of Exultet is, indeed, very frequently cited as the finest example of plain song in existence.

To assert that melodies so old as these have been handed down to us in their original purity would be absurd. But the presence of corruption rarely passes undetected by the initiated; and vigorous efforts have been made from time to time to purify the received text by reference to the oldest and most trustworthy MSS. attainable. Such an effort was begun on a very extensive scale by the " Congregation of Rites," at the instigation of Pope Pius IX., in the year 1868; and the labours of that learned body, together with those of the monks of Solesmes and else- where, have done much towards the restoration of plain chant to the highest state of purity possible. In England the Plain- Song and Medieval Music Society, founded in 1888, has also done valuable work by its publications. (W. S. R.)

PLAINTIFF, one who brings a " plaint " (Low Lat. plancta plangere, beat the breast, lament), the name, in law, of the party who brings an action against another, who is called the

" defendant." In suits for divorce the party bringing the suit is styled the " petitioner," the party against whom it is brought the " respondent."

PLAIT (through O. Fr. ple.it, from Lat. plicitum, folded, plicare, to fold), properly a fold, especially a fold of cloth, now usually in the collateral form " pleat." " Plait " is now princi- pally applied to entwined strands of ribbon, hair, straw or fibre. PLAN (from Lat. planus, flat), a diagram on a flat surface; hence by analogy any deliberate scheme or design. In archi- tecture, a " plan " is a horizontal geometrical section of the walls of a building, or indications, on a horizontal plane, of the relative positions of the walls and partitions, with the various openings, such as windows and doors, recesses and projections, chimneys and chimney-breasts, columns, pilasters, &c. This term is sometimes incorrectly used in the sense of design (q.v.). PLANARIANS, a well-defined group of animals, characterized externally by their ovoid or vermiform shape, their gliding movement and their soft, unsegmented, ciliated bodies: inter- nally by that combination of

low somatic type of structure and complex gonidial organization which is characteristic of the Platyelmia (q.v.). Their low type of bodily structure may be exemplified by the facts that the mouth is the only means of ingress to and egress from the blind alimentary sac, and that no vascular system is differentiated. Most Planarians are aquatic and the cilia that cover the body produce by their beating a stirring of the water. Hence the class is generally known by the name Turbellaria.

Planarians form one of the basal groups of the animal kingdom. They are the simplest of multicellular creeping things. In them the gliding movement has become habitual. The lowest Planarians are still largely free-swimming animalcules and we can trace within the limits of the group the development of the creeping habit and the consequences that flow from it. It has led to the differentiation of anterior and posterior extremities; to the formation of bilateral symmetry; and to the development of a mucilage protecting the body against friction. It entails the concentration of the scattered nervous system on the ventral surface and at the anterior end, and it has induced the segregation of the diffused sense-organs in the head. The Planarians occupy a position midway between the simple planula larva of Coelen- terates and the segmented Annelids. They have probably sprung either from an early Coelornate stock, or represent an independent class descended from a two-layered parentage distinct from that of the Coelenterates; a view which is adopted in the present article.

Occurrence. — Most Turbellaria are aquatic. They abound on the seashore and in fresh water, amongst weeds or under cover of stones, shells and sand. Few of them are pelagic or deep- water forms, and only some half-dozen Planarians are known to be parasitic. A large number of land Planarians are known, chiefly from tropical and south temperate countries.

The majority of marine Planarians are nocturnal or cryptozoic, hiding away during the period of low tide to avoid desiccation of their soft sticky bodies and coming out at night or during high tide to feed. They are mostly carnivorous, and their movements are correlated largely with the nature of their food. The smaller, more active species occur in companies amongst the finer sea- weeds over which they creep or swim in pursuit of their food. The larger marine species occur singly or in pairs on Ascidians, Nullipores or Polyzoa, from whence as the tide rises they issue to feed. By the time the next low tide exposes them, these Planarians have so completely digested their meal that we know very little of its nature. The common fresh-water Planarians form either little companies of a dozen or more, usually of a single species, huddled together under a stone or in some cranny (see Pearl [8] 1), or societies of several species that inhabit Sphagnum and other fresh-water vegetation. This fresh-water planarian fauna is of two kinds, the fauna of permanent and that of temporary sheets of water and both

show a certain adaptation to their environment. The latter, being subject to greater extremes of temperature than the lacustrine Planarians, produce 1 These references are to the literature at the end of this article.

thick-shelled eggs only. The development of these eggs is rapid in warm water, slow in cold: so that a pool after a few days of early spring sunshine is soon populated and provision is made for the continuance of the race should a cold snap follow. The lacustrine Planarians exhibit a different form of adaptation. The eggs laid by many of these animals are either thin-shelled and rapidly hatched or thick-shelled and slowly hatched. The lake-water, however, is in spring, even after sunshine, of a much lower temperature than that of pool-water, but the masses of Sphagnum and other weeds that border lakes and marshes are often warmer than the open water and may be as much as 13 or 1 s° C. higher in temperature. Here the Planarians assemble to benefit by the warmth, and under such favourable conditions lay thin-shelled eggs which rapidly develop; whilst in colder surroundings or at the onset of winter thick-shelled resting eggs are laid. In this manner we can understand the abun- dance of Planarian life in cold meres and transitory pools in Great Britain, Scandinavia, Finland, Denmark and North America.

In contrast to the general habit among Turbellaria of haunting dim or dark places, the station chosen by a few species is exposed and strongly illuminated. The marine Convoluta and Poly- chaerus and the fresh-water Vortex viridis may be taken as examples. Convoluta paradosa occurs among brown weeds which receive much light during neap tides and strong direct sun or light every fortnight. Polychaerus creeps about the New England shore without resorting habitually to cover, and is also strongly insolated. Vortex resembles the green Hydra of our ponds in choosing the lightest side of its surroundings; and finally, Convoluta roscojfensis paints the beach green in Brittany, part of Normandy and Natal. In every such case the Planarian is coloured brown or green by the presence of photosynthetically active cells and the singular heliotropic habit of these Turbellaria is associated with the illumination necessary for the activity of their coloured cells.

Only one branch of the Planarians has become terrestrial, but this has spread over almost all the whole globe. One species (Rhynchodemus terrestris, fig. 1, e) is fairly common in Great Britain under stones, logs and occasionally on fungi, but the Holarctic countries (North America, Europe and North Africa, North Asia) are extremely poor in terrestrial species. In coun- tries lying in the centre and in the south of the great continents and in the south temperate continental islands and archipelagoes these land Planarians become more abundant and varied; and being frequently transported with earth or plants they are often found in hothouses and

botanical gardens far from their native country. Their distribution offers some points of special interest showing a close relationship between the South American fauna and that of Australia and New Zealand: between the land Planarians of Madagascar, of Ceylon and of Indo-Malaya: and a marked contrast between Japan and the rest of the Palaearctic region (see Von Graff [1], 1899).

External Characters. — Planarians range from the minute forms no larger than Infusoria to ovate, marine species, 6 in. in diameter and to ribbon-like land forms 8 in. in length. The majority are small, somewhat cylindrical organisms with a flat creeping surface. Others, comprising the common fresh- water and marine forms, are flattened and leaf-like, often provided with a pair of tentacles near the front end of the body, and in some cases the whole dorsal surface is beset with papillae. The land forms are elongate and smooth, and their anterior extremity is often modified into the arcuate shape of a cheese-cutter. Their movements are usually of a gliding character. The minuter forms perform short excursions into the water round their station, and in so doing recall Infusoria. The larger forms, in addition to gliding like pellicles, fold the expanded anterior part of their body into a couple of fins, with which they swim after the fashion of a skate. The folded margins of other forms clasp the weeds on which they live. Adhesion is effected by the mucous investment of the body and frequently by some specially developed local secretion of slime, or by a sucker. By these means, aided by their

algal-frequenting and cryptic habits, the Turbellaria, though soft-bodied, are able to withstand the violence of the waves. The anterior end in all Turbellaria is the site of the chief

sense-organs, and in some forms (Proboscida) becomes transformed into an imagin- able proboscis of highly tactile nature. Such forms lead naturally to the Nemertina (q.v.).

Coloration. — The coloration of Planarians is of interest. The flattened marine forms are often brilliantly coloured on the dorsal surface, either uniformly or with some strik- ing marginal band; or they may exhibit longitudinal bands of contrasting tints or a mottled appearance. The significance of these colours is not fully understood, but in some cases of sympathetic coloration the derivative function of the pigments is probably to aid cryptic re- semblance. The terrestrial Planarians exhibit the most striking patterns in longitu- dinal striping and cross-bars which appear to

have no relation to the environment of these essentially nocturnal animals. The fresh-water forms are colourless or dusky, often dark-brown, possibly in relation to the retention of heat ; but in a number of both fresh-water and marine Plana- rians a green colour is present, constantly in some species,

Fig. i. Convolula paradoxa, Oe. Vortex viridis, M. Sch. Monotus fuscus, Gff. Thysanozoon brochii, Gr., with elevated anterior extremity (after Joh. Schmidt). Rhynchodemus terrestris, O. F.

Miiller (after Kennel). Bipalium ceres, Mos. (after

Moseley). Polycelis cornuta, O. Sch., at- tached by the pharynx (ph) to a dead worm (after Johnson). All the figures of natural size, and viewed from the dorsal surface. a, c and d are marine, b and g are fresh-water, e and / are ter- restrial. All found in Great Britain except d.

e,

f,

g

sporadically in others.

This green effect is due to the infection of the Planarian by a minute alga which multiplies in the tissues and may profoundly affect the habits and even the structure of its " host." The planarian so affected acquires a heliotropic habit; it becomes gregarious and in extreme cases ceases to ingest solid food. In Convolula roscoffensis the green cells have become indispensable. They function both as the nutritive and excretory organs of the Planarian, and the young animal cannot develop until it is infected and has acquired a supply of these green cells which become incorporated into its tissues (Gamble and Keeble [7]). Brown algal cells (Zooxanthellae) are known in other species of Convoluta.

Food. — The food of Turbellarians consists, in the smaller species, of diatoms, unicellular algae, microscopic animals and other Turbellarians; in the larger ones, of worms, mollusca and insects. The fine feeders capture their food chiefly at night by gulping down the minute organisms that settle or swim in their neighbourhood. The coarse feeders enclose their prey with a coating of slime and then proceed either to engulf it in their expansible mouth or to perforate it by their trumpet-like pharynx. The mouth is remarkably variable in position (fig. 2). In many flattened Planarians it is placed centrally on the ventral surface somewhat as in a jelly-fish. In the majority it is nearer the anterior end, but in a few remarkably elongate

forms it occupies a position near the hinder end of the animal. In the cylindrical forms (Rhabdocoels) a similar variability in the position of the mouth is met with.

Anatomy. — The structure of the Turbellaria though greatly varied in detail, conforms to a single type of somatic organization which is transitory in the higher invertebrates. The sexual organs,

on the other hand, are founded on two or more types, and the astounding complications of these structures suggest that their evolution has been governed by quite other factors or combina- tions of factors than those that have guided the somatic evolution of the group.

MG

(From Cambridge Natural History, vol. ii. "Worms, &c," by permission of Macmillan & Co., Ltd. After Lang.)

Fig. 2.— A group of Polyclad Turbellaria, illustrating the various positions in which the mouth of Planarians may occur, and the concomitant changes in other organs.

A, Anonymus virilis: mouth central, male genital aperture (tf) multiple and biradial.

B, Prosthiostomun siphunculus: mouth anterior, the pharynx protruded through it.

C, Cestoplana: mouth posterior (m) ; ' & , male ; S, female genital aperture; Br. brain; CG, eyes especially related to the brain; Ey, marginal eyes; m, mouth; MG, stomach; Ph, Pharynx; s, sucker.

The general structural characters are as follows. The body consists of a muscular envelope covered externally by a ciliated glandular epidermis and of an alimentary sac, cylindrical or branched,

PC EP

SC PC M

(After Bohmig.)

Fig. 3.— To show the structure of the simplest Turbellaria.

The figure represents the left half of a transverse section across the body of the Acoelous planarian Haplodiscus. The mouth (M) is plugged up with a digestive polynuclear mass of cytoplasm and the transitions from this to the

stellate scattered central paren- chyma (SC) and again from the latter to a firmer peripteral zone (PC) are shown. The outermost layer (EP) is a ciliated epidermis resting on (BM), a basement membrane (dark line), the row of dots beneath this represents the longitudinal muscles (L).

for which the mouth serves both as ingress and egress. Between this aproctous gut and the integument the body consists of a jelly-like, vacuolated mesenchyme made up of branched gland- cells, excretory cells, pigment- and muscle-cells. A space may be secondarily hollowed out around part of the gut; but no coelomic or true perivisceral cavity exists in the sense in which these terms are used in higher animals. A nervous system is present and consists of an anterior "brain" and of ramifying ganglionic trunks that are developed in relation to the muscular integument and to the sense-organs for the perception of light and pressure. No

respiratory organs are developed, probably in correlation with the absence of a blood vascular system. On the other hand, the process of reproduction is elaborately organized. The Planarians are hermaphrodite and, as in so many other small animals, the body, after attaining maturity, becomes in many Planarians practically a genital sac and is soon exhausted by the repeated calls upon its reserves that are involved in the rapid production of eggs and sper matozoa. The intervals between successive clutches has been found in Convoluta roscoffensis to be a month, thus suggesting the influence of the lunar tides upon maturation.

Integument. — The epidermis is ciliated and highly glandular. It consists of a single layer of cubical or oblong cells with the structure seen in fig. 3. The glandular secretion takes various forms, such as mucus, mucinoid granular blocks, or fusiform re- fringent homogeneous rods. These rods or " rhabdites " are

DM—

(Partly after Luther: Zeilschrift fur wissenschafl. Zoologie, by permission of Wilhelm Engelmann.)

Fig. 4. — Portion of a transverse section of Mesostomaehrenbergii.

The epidermis (E) consists of cells divided into an outer and inner

zone, the latter containing rhabdites (Rb) ; the cilia (Ci) axe

thickened about the middle of their length. Below the epidermis

is the basement-membrane (BM) , a layer of circular muscles © and

of longitudinal ones (L). Below this again is the mesenchyma (M),

made up of branched cells and dorso-ventral muscle-fibres {DM).

The mesenchymatous glands (Rmc) are producing rhammites (Rm)

which pass outwards.

frequently coloured red or yellow, and are highly characteristic of

the Turbellaria. Their real use is unknown. In only two genera

does the epidermis produce cuticular spines (Acantkozoon, Enantia)

on the surface, but chitinoid hooks, spines and spirals occur

frequently on the lining membrane of the male and female

copulatory ducts.

Below the epidermis is a firm basement membrane into which the subjacent muscles are inserted. They are divided into cuter circular and inner longitudinal groups and subdivided in the larger forms by diagonal fibres, and in the most highly differentiated Planarians there are six muscular layers, two of each kind. In a number of Turbellaria the musculature is modified to form a sucker either single or double and anterior or posterior, and it undergoes further modification in connexion with the pharynx and reproductive organs.

classification of the Planarian is based on them. Thus we have the Rhabdocoelida with straight gut and the Tricladida and the Polycladida with triple and multiple branches to the gut. The Rhabdocoelida are further divided into three groups: the Acoela

Fig. 5. — Integument of Mesostoma lingua, O. Sch. On the right hand is the epidermis (z) with perforations (/) through which the rhabdites (st) project. Beneath this the basement mem- brane (bm), and beneath this again the muscular layers consisting of circular (rm), diagonal (sm), and longitudinal (Im) fibres.

Alimentary Sac. — The alimentary sac consists of a muscular pharynx opening outwards through the mouth and inwards into a median digestive organ which may be solid or hollow, and in the latter case straight, lobate

or branched. These characters are correlated with such a number of distinctive features that the

Fig. 6. — Main trunks of the Excretory System of Mesostoma ehrenbergii, O. Sch., opening to the exterior through the mouth; ph. Pharynx.

(From Lankester's Treatise on Zoology. Part IV.)

Fig. 7. — Flame-cell from the Excretory System. a, nucleus; b, excretory granules; c, " flame " ; d, branches of cell; e, beginning of excretory tube.

with a simple syncytial gut not sharply separated from the surround- ing mesenchyma; the Rhabdocoela, with a hollow gut and a peri- visceral schizocoelic span; and the Alloeocoela with a lobate gut and reduced schizocoele. The last group leads one naturally to the Tricladida; the Polyclads being an independent group.

The pharynx varies widely in structure. In the Acoela it is a mere thickening and pitting of the integument. In the Rhabdo- coela a great number of elaborate modifications are found. These are based on the type of a buccal invagination, which forms the pharyngeal sheath, and from the bottom of this there springs a mus- cular outwardly directed tube or fold. In the Alloeocoela and Tricladida the pharynx is an elongate protrusible cylinder, and in the Polyclads it may be an immensely distensible frilled organ, the folds of which have indepen- dent movement, or an elongate tube. At the base of the pharynx lie the openings of salivary glands. In the Polycladida the section of the alimen- tary sac into which the pharynx opens is a median stomach from which the intestinal branches radiate. The stomach in few forms is provided with digestive glands. The branches . _. ,

possess an independent musculature System of a S ? m P le Plan f and exhibit active peristalsis. The in- ana 1 (Haplodiscus, one of testine of Planarians is not ciliated, and digestion appears to be largely intra- cellular and not cavitary.

Mesenchyma. ■ — The mesenchyma (Bohmig: parenchyma auctt.) consists of a mass of branched vacuolated cells, imbedded in which lie gland-cells, pig- ment-cells and the excretory system. It envelops the genital organs, which though in the mesenchyma are not of it, and it forms an investment to the gut and to the space (schizocoel) which often occurs between the gut and the mass of the mesenchyma. The mesenchymatous gland-cells are of different kinds. (1) Single cells in which rods (rhammites) are developed (fig. 4, Rmc). Such cells in embryonic life give rise to a process which perforates the soft basement-membrane and penetrates between the epidermal cells. The process becomes hollow, and

the rhammites pass outwards along it on to the surface of the animal, forming in many Turbellarians thickly set rows of rods on the head. (2) Similar cells contain nematocysts in a few Planarians (Microstoma, Stenostoma, Anonymus virilis and Stylochoplana tarda). Whether these

the Acoela).

B, the brain which gives off a dorsal (DN) and a ventral (VN) plexus and also lateral nerves (LN). The mouth (M) and the otocyst (OT) are shown. The former is ventral, the latter dorsal in position.

nematocysts develop in the Turbellarian is doubtful, and it is not impossible that they are derived from the tissues of some coelenter- ate animals eaten by the Planariah, as has been shown to be the case in the nematocysts of Eolids. (3) Cells producing aciculate spicules, sometimes associated with a spiral thread. These structures are often associated together in batteries, notably so in the remarkable genus Anonymus.

Excretory System. — The excretory system consists of proto- nephridia, that is, of tubes opening to the exterior by one or more

(From Cambridge Natural History, vol. ii. " Worms, &c," by permission of Macmillan & Co., Ltd. After Lang.)

Fig. 9. — Double Eye found on the brain of Polyclads. Each consists of a pigment-cup and of four nerve-end cells (rod-cells) in which the nerves terminate.

N, nerve fibres and cells. Pc, pigment-cell. Re, rod cell.

apertures, and after branching extensively in the mesenchyma, end blindly in peculiar hollow cells (flame-cells) provided with a bunch of synchronously vibrating cilia. The excretory tubules have a markedly sinuous course and are provided with cilia. The motion of these cilia and of the flame-cells is to induce an outward current of the fluid from the canals, but the process of excre- tion seems to be performed chiefly by the branched mesenchymatous flame-cells. The position of the external opening varies greatly. It may be single or paired, mid- ventral or terminal, or again multiple and arranged in pairs along the dorsal surface (Tricladida and probably in Polycladida). The flame-cells are arranged in pairs in

Tricladida, but lie less regularly in the mesenchyma of most forms. Finally, it is noteworthy that in the Acoela no excretory system is known.

Nervous System.— -The nervous system is present in all divisions of the order. It consists of a paired, anterior ganglion lying ventral to the gut, and from this are given off, right and left, dorsal, lateral and ventral fibres interconnected by a plexus. The nerve-cells are scattered throughout the plexus. The chief development of the system occurs in relation to the muscular body- wall, sense-organs and the pharynx. In these characters the nervous system of Planarians shows an interesting transition from the scattered plexus of Coelenterates to the segmental ganglia and sympathetic nervous system of Annelids.

Sense-organs. — These occur in the form of tactile organs, otocysts and eyes. The whole skin of many Planarians is sensitive, and amongst the ordinary locomotor cilia long Fig \o. -Microstoma st ‘ n? ones are found which it is natural to lineare Oe. under think are tactile organs. The head-end is going division, There often provided with specialized cells that are 16 individuals 8 a PPear to subserve the sense of touch and with mouth apertures, Possibly of taste also. The abundance showing the buds of °’ rhammites, of long stiff cilia, and the the first (m) second g rea t mobility and sensitiveness of this (/»’). third (m”) and re gi° n , bear out this conclusion. A further fourth (m’”) genera- development of cephalic, sensory structures tion. The fifth genera- °£ curs , ‘ m , , the f form ? f , a cre f centic groove tion has not yet (Polyclads) of paired, lateral pits {Mtcro- acquired a mouth sioma < n g. 10) of mobile papillae on the aperture, c ciliated extreme front margin (Land Triclads) grooves ;' e eye spots • an d of extensible tentacles, marginal or i intestine'. ' nuchal in most Pclyclads.

The otocyst occurs constantly in the Acoela and sporadically in every other division of the group. It is with one exception a single median organ placed over the brain, and consists oi a uni- or bi-cellular sac containing a calcareous

concretion lying in a fluid. From what is known of these organs in higher invertebrates we may infer that they serve to increase the perception of slow wave-movement and enhance the control of the muscular sense.

Eyes are generally present in Planarians. Two types are dis- tinguishable — eyes with a cup-shaped retina facing outwards, and those with an inverted retina facing inwards. The former occur in Triclads and Polyclads around the margin of the body often a hundred or more may be present. The latter occur in all groups except the Acoela, but are limited to the neighbourhood of the brain or bases of the nuchal tentacles. Recent investigation has

shown that the essential part of the eyes has in all cases a compli- cated structure and is not a mere epidermal cell-group enclosed by pigment and provided with an optic nerve. On the contrary (Hesse [10]), adequately known eyes are composed of rod-cells that contain each an axial filament or bundle of fibrillae (the termination of the nerve), and the distal end of the rod-cell is converted into a striated usually broad border where the action of light commences. A group of such specialized rod-cells is enclosed in a pigmented cup opening either outwards or inwards and pierced by an optic nerve. The whole is usually depressed beneath the epidermis, but in some Acoela and Alloeocoela the eyes retain a surface- position. In the Polyclads eyes may increase by division and in Triclads may decrease in number by fusion (Carriere [n]). The marginal and often radial disposition of the scattered eyes, and the prostomial position of the paired eyes, afford interesting evidence of the intermediate position that Planarians occupy between the radiate Coelentera and the bilateral Annelids.

Reproduction. — All Turbellaria are hermaphrodite, and reproduce sexually, but a few forms (Microstomidae and some Triclads)

Fig. 12. — Plan of a Rhabdo- coelous Turbellarian. be, Bursa copulatrix. en, \ Brain.

e, '- Eye.

g, Germarium.

i, Intestine.

In, Longitudinal nerve trunk.

m, Mouth.

ph, Pharynx.

rs, Receptaculum seminie.

s, Salivary gland.

I, Testis.

«, Uterus (containing an egg).

v, Yelk gland.

vs, Vesicula seminalis.

j, Chitinous copulatory organ.

be, Bursa copulatrix.

increase during the summer by fission and during the winter by eggs. The body of the Microstomidae becomes constricted and partially subdivided into two, the posterior half regenerates a brain and pharynx. Subsequently each becomes again converted into two zooids, and the process is repeated until a chain is formed as in fig. 10. This breaks up into its constituent members, each of Which repeats the process until the onset of reproduction. The

Fig. 11. — Plan of an Acoelous Turbellarian.

e, Eye.

m, Mucous gland, formerly mis- taken for the mouth, which lies in the centre of the body.

ot, Otolith.

ov, Ovary.

p, Digesting parenchyma.

t, Testicular follicles.

vs, Vesicula seminalis.

$, Male-organ of copulation.

Triclads, on the other hand, fragment, without undergoing prepara- tory changes.

The male and female genital ducts (gono-ducts) open to the exterior, either through a common chamber on the ventral surface (most Rhabdocoelida and all Tricladida, figs. 12, 14) or by separate apertures that are also usually ventral. In the latter case, the male gonopore is usually in front of the female one (all Polycladida and some Rhabdocoelida). A separate opening is sometimes acquired by one or other of the accessory reproductive organs (as by the spermotheca in some Rhabdocoelida in which it is dorsal).

The generative organs of the Planarians are complex. Male and female germ-cells develop in one and the same individual and reach the exterior by independent ducts. These ducts are provided with accessory glands along their course and terminate in penial

Fig. 13. — Plan of an Alloeo- coelous Turbellarian. Letter- ing as in fig. 12.

Fig. 14. — Plan of a Tricladid.

ii, Anterior, and i 2 , is, paired pos- terior branches of intestine. od, Oviduct. te, Tentacle. vd, Vas deferens.

(J 1 , Male, and ? , female copulatory organ. Other lettersasinfig.12.

or vaginal structures, often of great complexity, which are sur- rounded by an " atrium " or invagination of the ventral body- wall. From this invagination a special vesicle " uterus " is often developed for the reception of the fertilized egg previous to oviposition.

The Acoela present the simplest arrangement. In this group (fig. 1 1) the male germ-cells arise in follicles each of which is the product of a single sperm-mother-cell. From these follicles, the motile spermatozoa enter the paired sperm-duct, which opens by a single aperture near the hinder end of the animal, and is provided with a simple unarmed glandular penis. The female germ-cells or ova arise from a paired ovary, some of the cells of which appear to act as nurse-cells, supplying the young eggs with nourishment. When mature the eggs are transferred to the oviduct. At the point where the two oviducts join in order to open to the exterior they receive a conical sac (spermotheca) which contains spermatozoa. At this point the eggs are fertilized, and deposited in a mucilaginous mass which is attached to algae or buried in the sand. It is characteristic of the Acoela that the testes and ovaries should not be continuous with either the sperm-duct or the oviduct respectively.

In one genus of the Acoelous Turbellaria— Polychaerus — this primitive arrangement undergoes a development which foreshadows the complicated ovaria and vitellaria of higher forms. In Poly- chaerus the eggs mature in a special roomy chamber and are here provided with yolk which is elaborated by a sterile part of the ovary. Thus we have a differentiation of germ-cells into two portions allocated to two chambers: fertile ova which open eventu-

ally into the oviduct, and sterile ova that become yolk-cells and open into the brood-pouch.

The remaining Rhabdocoelida possess separate ovaries and yolk- glands. The union between the two sets of ducts takes place in the genital atrium which is provided with a spermotheca for the fertilization of the ova, but in at least one sub-family (Cylindro- stominae) the spermotheca opens by a special dorsal pore. These ova, together with the yolk and spermatozoa, are then transferred to another atrial diverticulum— the uterus, in which a shell is formed and from which they are deposited in the form of a cocoon. In addition, a muscular pouch, the so-called " bursa copulatrix," is usually present. The male organs of Rhabdocoelida are no less complex. The testes are either follicular (Alloeocoela) or compact

Fig. 15. — Plan of a. Polycladid.

en,

Brain.

st,

Stomach.

i,

Intestinal branches.

t,

Testicular follicle.

iu

Anterior unpaired intestinal

u,

Uterus.

branch.

vd

Vas deferens.

In,

Longitudinal nerve cord.

Male copulatory organ, with

m,

Mouth.

the male aperture behind.

od,

Oviduct.

?-

Female copulatory organ,

ov,

Ovarian follicle.

with the female aperture

ph,

Pharynx.

before it. The eyes are

ph

Pharyngeal pouch.

omitted.

(Rhabdocoela), and communicate indirectly or directly with the paired seminal ducts. The ducts unite at the base of an evagin- able penis. This muscular organ is provided with glandular and chitinoid appendages of considerable complexity,' and, in addition to these, a poison gland and duct are sometimes present. In certain genera {Macrorhynchus, Prorhynchus) the penis is used for catching prey, perhaps exclusively so in the former genus. The opening of the atrium into the oral cavity in Cylindrostominae and of the male organ into the mouth of Prorhynchus is possibly explained by this tact.

From the Alloeocoela we pass readily to the Triclads. In both of these groups the reproductive organs are based on the same plan ; but in Triclads the separation of ovarian and vitellarian portions of the gonad is less

perfectly effected. The oviduct transmits the eggs from the anteriorly placed ovary, and receives in its course the openings of numerous vitellaria (fig. 14). No distinct spermo- theca is developed, but a cocoon is formed in a special chamber —

the uterus — which "may either be a dilatation of the common oviduct (vagina) or of the atrium, and may open to the exterior independently (single in Uteriporus, paired in Syncoelidium) . In Bdelloura the uterus is said to act as a spermotheca. In addition to these structures, accessory muscular organs are found in Dendro- coelum and developed to a high degree in land Planarians, where they form the so-called adenocheiri and adenodactyli (see von Graff, 1899).

Lastly, the Polyclads offer certain distinctive sexual characters. The ovaries are follicular, very numerous, and the ova elaborate their own yolk (fig. 15). The oviducts open into a chamber which, after receiving a voluminous shell-gland, opens by a muscular bursa to the exterior. No special uterus is developed, but from the point of union of the two egg-chambers a vesicle is given off which may open separately to the exterior (Trigonoporus) . The testes are equally diffused and the seminal vesicles usually form a median muscular eversible sac which opens in front of the female genital pore. In Stylostomum, however, this penial organ opens through the mouth, as in certain Rhabdocoelida. Moreover, it may be paired {Thysanozoon) or multiple. Thus in Anonymus twelve or more pairs occur. In Cryptocehdes two, four or six may be present, but in this genus they all lie in a common sac. In Polypostia twenty pores occur ranged about the female pore, but the most posteriorly placed of these structures are devoid of a seminal duct. This condition supports the view that in Polyclads the penis was at first a glandular organ probably used for attacking prey and that it has become secondarily connected with repro- duction. In confirmation of this conclusion we have the observa- tions of Lang (5) that Yungia stabs the body of other Polyclads with its penis when brought into contact with them. (See Whit- man [9].) The genus Laidlavia differs from all other Polyclads in possessing a dorsal genital opening.

Development. — The development of the Planarians is fairly well known. Except for one or two species of Polyclads, develop- ment is direct and without meta- morphosis; but in Thysanozoon and Yungia the embryo develops eight strongly ciliated lobes which form a circumoral band of larval processes. These have been compared with the girdle of Trochosphere larvae and also with the eight rows of swimming plates in Ctenophores.

From the name of their discoverer these girdled larvae are called Miiller's larvae (fig. 16).

In the Rhabdocoelida the eggs are usually laid in a shell which has characteristic shapes. Each capsule contains a single ovum and several yolk-cells. Segmentation results in the formation of dislocated megacytes and microcytes. The latter give rise to the epidermis which is laid down in bilateral sheets, the former to the various internal organs. There is no distinction of germ-layers, and the gut is gradually organized from the mesenchyme, the rest of which gives rise to the parenchyma. The pharynx and the rudiment of the gonads are . the first organs to appear (Breslau Fig. 16.— Larva of Yungia [131,1905). The development of the auranttca, L. (Polycladida), Acoela differs in certain particulars with provisional ciliated f rom t h a t of other Rhabdocoelida. processes. f ne ova contain yolk-granules, and

yolk-cells are absent. Groups of such eggs, each with its own shell, are laid in a gelatinous envelope. Each ovum segments into a two-layered embryo composed of a ciliated outer layer and a central syncytium. No trace of a distinct enteron or gut is visible, but as the embryo grows the syncytium becomes differentiated into a more fluid central portion and a firmer peripteral zone. The former, together with the wandering phagocytes, corresponds functionally to the separate gut of other Rhabdocoelida. Pelagic larvae with a coat of long cilia have been identified by Uljanin as belonging to the Acoela.

The development of the Tricladida offers other peculiarities. From four to twenty or more ova are surrounded by several hundred amoeboid yolk-cells in each cocoon. Each egg-cell divides; but, as happens in the capsular ova of certain Mollusca and Oligochaeta, they do not all survive, some being used up as food by the remainder. The segmented ovum becomes dislocated as in some Rhabdocoels, the blastomeres moving apart from one another. The details of organ-formation are still imperfectly understood.

The eggs of the Polyclads are laid somewhat like those of the Acoela in a gelatinous envelope, each ovum being provided with yolk and an egg-shell which may be operculate. The majority of species go through a direct development. Tbe segmentation of the egg in Discocelis and Leptoplana has been worked out by Lang and his results re-interpreted by Wilson and others (Hubrecht

(After A. Lang.)

[12]). In Polyclads a distinction of germ-layers similar to that occurring in the development of Mollusca, Chaetopod-Annelids and certain other

Invertebrates, is early apparent. The ovum by unequal segmentation gives rise to megameres and micromeres, and between the two, intermediate cells form one origin for the mesenchyma. The micromeres surround the intermediate and centrally placed macromeres. The latter undergo division into hypoblast cells and yolk-masses. The similarity of cell-lineage in Polyclads and Coelomate Invertebrates, together with the trochosphere-like Polyclad larval form (Müller's larva), have been the two chief arguments in support of the view that this group is a link between the Planarian and Coelomata. It is at present, however, doubtful whether such highly organized animals as Poly- clads can be regarded as in any sense ancestral forms. Their re- lations to other Turbellaria are quite uncertain, and on present evidence it seems legitimate to hold that they are the most highly differentiated division both in embryonic and adult structure.

Systematic Arrangement.

Order Turbellaria. — Free-living Platyelmia with a ciliated epidermis. A well-developed nervous system and sense-organs concentrated at the anterior end of the body, diffused elsewhere.

Sub-order A. Rhabdocoelida. — Gut syncytial or tubular. Female gonads always compact.

Tribe I. Acoela (fig. 11). — Mesenchyma not differentiated into separate gut and parenchyma. No excretory organs of protone- phridial type. A simple pharynx., A median otocyst (statocyst) over the brain. Small, often flattened forms. All marine and many infected by brown or green algal cells. One species parasitic in Echinoderms.

Tribe II. Rhabdocoela (fig. 12). — Gut and parenchyma separate, the former a simple straight sac. Vitellaria usually present. Testes compact. Penis and pharynx often complex, occasionally protruded through a common opening. Marine and fresh-water. Many fresh-water forms infected by algal cells. Typhloplana, Grajjilla, Anoplodium, are respectively parasitic in Nephthys, in Gastropods and Holothurians.

Tribe III. Alloeocoela. — Gut and parenchyma distinct. In- testine straight or lobate. Testes follicular. Penis and pharynx simple. One family with otolith. All marine except Plagiostoma lemani (deep-water, Geneva) and the Bothrioplanidae.

Sub-order B. Dendrocoelida. — Large forms with flattened body, branched intestine, follicular testes and follicular ovaries or compact ovaries and yolk-glands.

Tribe I. Tricladida. — Intestine with three main branches. A pair of

compact ovaria and numerous yolk-glands connected by a common duct. A single genital aperture. Fresh-water forms: Planaria, Dendrocoelum, Polycelis, common. Peculiar forms in Lake Baikal. Marine forms: Gunda segmentata, Bdelloura (ex- ternal parasite of Limulus). Terrestrial forms: Rhynchodemus, Geoplana, Bipalium.

Tribe II. Polycladida. — Body leaf-like. Intestine composed of a median stomach with many branched or reticulate coeca; testes and ovaries follicular; genital openings usually separate, the male gonopore preceding the female one. Multiple male gonopores in some forms. All marine and widely distributed; some genera cosmopolitan.

Literature. — (1) L. von Graff (Rhabdocoela, Acoela, Tricladida), Monographic d. Turbellarien (1882), vol. i., (1899) vol. ii. ; Die Acoela (1891) ; (2) Arbeiten aus der zool. Institut zu Graz (1904, 1905, 1906) ; (3) " Turbellaria," in Bronn's Klassen v. Ordnungen d. Thierreichs, vol. ii. ; (4) Turbellaria als Parasitcn v. Wirthe (Graz, 1904); (5) A. Lang, " Die Polycladen," Fauna and Flora of the Gulf of Naples, vol. ii. (1884); (6) F. F. Laidlaw (Polyclads) in Zoological Results of Expeditions conducted by Dr Willey, Stanley Gardiner and C. Crossland, Cambridge Univ. Press, and Proc. Zool. Soc. (1902- 1906); (7) Gamble and Keeble (Green cells of Convoluta), Quart. Jour. Micro. Sci. (1903, 1907) ; (8) E. R. Pearl (Bionomics of Planarians), ibid. (1903); (9) Whitman (Hypodermic Impregna- tion), Jour. Morphology (1890), iv. 361; (10) Hesse (Eyes of Planarians), Zeitschr. f. wiss. Zool., vol. lxi. (1897); (11) Carriere (ditto), "Die Sehorgane der Thiere " (1885); (12) A. A. W. Hubrecht (affinities), Zeitschr. f. Nalurwiss (Jena, 1905); (13) Breslau (Development of Rhabdocoels), Zeitschr. f. wiss. Zool. (1905). Besides these special works, useful general accounts of the Turbellaria will be found in Cambridge Natural History, ii. 1-50; A Treatise on Zoology (Black), iv. 1-42, and the references given by these works.

Appendix to the Turbellaria.

Class Temnocephaloidea. — This small class of Platyelmia possesses a special interest. It connects the Turbellaria (and in particular the Vorticid rhsbdocoela) with the Trematoda. At the same time the Temnocephaloidea present certain peculiar structural features which entitle the class to an independent position.

The name of the class is derived from the digitate tentacles which occur on the anterior or lateral margins of the body. The body measures about 5 mm. in length, and the flattened ventral surface is armed with a sucker. It presents in most genera the appearance of a minute cephalopod, but in Craspedella the posteriof

part of the dorsal surface is raised up into three transverse fringed lamellae. These animals are epizoic, i.e. they live attached to the outer surface of other organisms, but are not ectoparasitic for they ingest Infusoria, Rotifera and Diatoms. Most of the species occur on fresh-water crayfish and crabs in Chile, Madagascar, the Malay Archipelago and Australasia. Two Brazilian forms are known, one from the pulmonary chamber of the Mollusc Ampullaria and the other from water tortoises. The genus Temnocephala is found in all the countries mentioned. The two others, Craspedella and Actinodactylella are only known from Australia.

The epidermis offers an interesting transitional structure. It is still, as in Turbellaria, cellular, or rather syncytial without cell- boundaries, but in most species has lost its cilia and developed a

(From Cambridge Natural History, vol. ii. " Worms," &c. t by permission of MacmUlao & Co., Ltd.)

Fig. 17. — The anatomy of Temnocephala (after Haswell). 9 S, Common genital aperture. rh, Rhabdites.

d, Gut. rh.c, Rhabdite-forming cells. ex.s, Excretory sac. sc, Sucker.

m, Mouth. sh, Shell-gland.

ov, Ovary. te, Testis.

ovd, Oviduct. ut, Uterus.

ph, Pharynx. vg. Vagina.

rv, Receptaculum vitelli. vs, Vesicula seminalis.

thick cuticle as in Trematodes, pierced by the necks of subdermal gland-cells. These cells, however, still retain the Turbellarian character of secreting rhabdites and form thickly-grouped tracts. The mouth, which is placed near the anterior end, leads into a bulbous pharynx from which a short, broad digestive sac is given off. The excretory system is peculiar. Besides the ordinary flame cells, single large canaliculated cells may form the com- mencement of the tubules, composed of comparatively few cells with large nuclei. They open to the exterior by a pair of con- tractile sacs situated dorsally at the level of the mouth as in certain Trematoda. Each sac is the product of a single cell, and is said to contain several branches of

" flames " or synchronously con- tractile cilia. The reproductive system recalls that of certain Rhabdocoels, whilst the nervous system has retained a more primi- tive condition. The brain, which is placed over the mouth, gives rise to six main longitudinal tracts interconnected by a subdermal network. A pair of eyes is placed above the brain.

Class and order Temnocepholoidea. — Platyelmia in which the flattened body is produced into anterior or anterior and lateral tentacular processes and carries a ventral sucker. The epidermis is a syncytium covered by a thick cuticle. Cilia and rhabdites are present. Family I. : Temnocephalidae : 4-12 anterior ten- tacles. Family II. : Actinodactylellidae. Lateral tentacular pro- cesses.

See Haswell, – Macleay Memorial Volume (1893); Plate, Sitz- berich. Akad. Wiss. Berlin (1894), p. 527. (F. W. Ga.)

PLANCEER, or Planchier (0. Fr. plancier, or planchier, planking), in architecture, a term sometimes used in the same sense as a soffit, but more correctly applied to the soffit of the corona in a cornice.

PLANCHE, JEAN BAPTISTE GUSTAVE (1808-1857), French critic, was born in Paris on the 16th of February 1808. Intro-

duced by Alfred de Vigny to Francois Buloz, he began to write for the Revue des deux mondes, and continued to do so until 1840. He resumed his connexion with the journal in 1846 and contributed to it until his death in Paris on the 18th of September 1857. Gustave Planche was an altogether honest critic and refused to accept a place from Napoleon III. for fear of compro- mising his freedom. He was in early life a fervent admirer of George Sand, and he lavished praise on De Vigny. But he had nothing but scorn for Victor Hugo, whose earlier dramas he characterized as odes, those following Le Roi s 'amuse as anti- theses, and the later ones as nothing but spectacle. His critical papers were collected under the titles: Portraits litteraires (1836- 1849); Nouveaux portraits litteraires (1854); and art criticisms, Etudes sur I'ecole francaise (1855).

See Ernest Montegut, in the Revue des deux mondes (June 1858) ; Hatzfeld and Meunier, Les Critiques litteraires du XIX' siecle

(1891).

PLANCHfi, JAMES ROBINSON (1 796-1880), English dra- matist and antiquary, was born in London on the 27 th of February 1796, the son of a watchmaker of Huguenot descent. In 1810 he was articled to a bookseller. In 1818 his first dra- matic piece, a burlesque entitled Amoroso, King of Little Britain, was produced at Drury Lane theatre. From this time onwards

he made play-writing his principal work. In 1820-1821 he wrote ten pieces for the Adelphi theatre. In 1823 he designed the dresses for Charles Kemble's revival of King John at Covent Garden, and superintended its production. This was the first time that an historical drama had been " dressed " in the costume of the period. In 1828 he began writing regularly for Covent Garden theatre, and in 1830 was manager of the Adelphi. On Mme Vestris taking the Olympic theatre in 1831, Planch6 entered into an agreement with her to write a series of plays. The first of these, Olympic Revels, a burlesque, was given on the opening night of the theatre, the performance being given in correct classical costume. In 1843 his Fair One with the Golden Locks was produced by Webster at the Haymarket. In 1847 Mme Vestris became manageress of the Lyceum theatre, and Planche was engaged as her leading author and designer, his principal success being the Island of Jewels (1849). Subse- quently he wrote for a number of other managements, his last dramatic piece being King Christmas (1871), but he also wrote the songs for Babil and Bijou at Covent Garden (1872). In addition to his dramatic work Planche enjoyed a considerable reputation as an antiquary and heraldic student. He was a Fellow of the Society of Antiquaries, and aided in the foundation of the British Archaeological Association in 1843. In 1834 he published The History of British Costumes. In 1854 he was appointed Rouge Croix pursuivant of arms at the Heralds' College, and in 1866 Somerset herald. In 1869, at the request of the War Office, he arranged the collection of armour at the Tower of London in chronological order. He died at Chelsea on the 30th of May 1880.

Planch6's Recollections and Reflections were published in 1872.

PLANCK, GOTTLIEB JAKOB (1751-1833), German Protestant divine and historian, was born at Niirtingen in Wiirttemberg, where his father was a notary, on the 15th of November 1751. Educated for the Protestant ministry at Blaubeuren, Beben- hausen and Tubingen, he became repentent at Tubingen in 1774, preacher at Stuttgart in 1780, and professor of theology at Gottingen in 1784. At Tubingen he wrote Das Tagebuch eines neuen Ehemannes. In 1781 he published anonymously the first volume of his Geschichte des protestantischen Lehrbegriffs; the second, also anonymous, appearing in 1783, and it was completed in six volumes in 1800. It was followed by an extensive Geschichte der christlich-kirchlichen Gesellschaftsverfassung in five volumes (1803-1809). Both are works of considerable impor- tance, and are characterized by abundant learning. He died on the 31st of August 1833. His son Heinrich Ludwig Planck (1785-1831), also professor of theology at Gottingen, published Bemerkungen iiber den ersten Brief an den Timotheus (1808) and Abriss d. philos. Religionslehre (182 1).

PLANCK, KARL CHRISTIAN (1810-1880), German philo- sopher, was born at Stuttgart on the 17th of January 1819. He studied at Tubingen, where he became doctor of philosophy in 1840 and Privaldozenl in 1848. During this period the influence of Reiff led him to oppose the dominant Hegelianism of the time. In 1850-1851 he published his great book, Die Wellalter, in which he developed a complete original system of philosophy, based on the realistic view that thought should proceed from nature to the highest forms of existence in the spiritual life. Not only did Planck oppose the idealism of his confreres; his views were, in another aspect, directly antagonistic to the Darwinian theory of descent, which he specifically attacked in Wahrheit und Flachheit des Darwinismus (Nordlingen, 1872). The natural consequence of this individuality of opinion was that his books were practically disregarded, and Planck was deeply incensed. The ill success of Die Weltalter nerved him to new efforts, and he repeated his views in Katechismus des Rechts (1852), Grundlinen einer Wissenschaft der Natur (1864), Seele und Geist (1871), and numerous other books, which, however, met with no better fate. In the meantime he left Tubingen for Ulm, whence he came finally to the seminary of Maulbronn. He died on the 7th of June 1880 in an asylum after a short period of nervous prostration. After his death a summary of his work came into the hands of K. Kostlin (author of Aesthetics, 1869), who published it in 1881 under the titleTestamenteinesDeutschen, Philosophie der Natur und der Menschheit. Planck's views were elaborately developed, but his method of exposition told heavily against their acceptance. He regarded himself as the Messiah of the German people.

Beside the works above quoted, he wrote System des reinen Idealismus (1851); Anthropologie und Psychologie auf naturwissen- schaftlicher Grundlage (1874); a political treatise, Bismarck : Sud- deutschland und der deutsche Nationalstaat (1872); and Logisches Causalgesetz und natiirliche Zweckmassigkeit (1874). _ •

See Umfrid, Karl Planck, dessen Werke und Wirken (Tubingen, 1881); and Schmidt, " Das Lebensideal Karl Christian Plancks," in the Vortrdge der philosophischen Gesellschaft (Berlin, 1896).

PLANE. 1. In botany, the common name of a handsome tree known botanically as Platanus orientalis, a native of Greece and western Asia, a favourite shade-tree of the ancient Greeks and Romans, and introduced by the latter to south-west Europe. It

Plane (Platanus orientalis). 1, Leaf, i nat. size. 2 and 3, Base of leaf-stalk showing bud-protecting cap,

about i nat. size. 4, Male, 5, Female inflorescence.

6, Head of fruits, about i nat. size.

7, A fruit with enclosed seed, cut lengthwise.

is one of the most successful trees in London and other large towns; the smooth face of the leaf is easily washed by rain; and the periodical peeling of the bark also serves to get rid of im- purities. It is a large tree with widely spreading branches and alternate, palmately five-lobed leaves, resembling those of the sycamore in shape, but quite hairless and of a brighter green. The bud in the leaf axil is protected during its development by the hollow base of the leaf-stalk, which lifts off like an extin- guisher when the leaf falls in autumn. The minute, unisexual

flowers are borne in dense pendulous heads, which contain either male or female flowers; the small one-seeded fruits are densely crowded in a ball, from which they gradually separate in drying, and are readily carried by the wind. The wood, which is hard and heavy, though not strong, is used in Persia and other coun- tries of western Asia for house construction and furniture. A variety of forms are known in cultivation, the commonest being the maple-leaved (acerifolia) , the London plane, which has usually three-lobed leaves; var. laciniata has very deeply much divided leaves, and var. variegata, variegated foliage. Platanus occi- dentalis, an allied species, is a native of the United States, being most abundant and growing to its largest size in the bottom lands of the basins of the lower Ohio and the Mississippi rivers. It was introduced into England early in the 17th century, and is occa- sionally met with in western and central Europe. Professor C. S. Sargent (Silva of North America) refers to it as the most massive if not the tallest, deciduous-leaved tree of the North American forest; it is known in America as sycamore and buttonwood. It differs from P. orientalis in its less deeply lobed, more leathery pubescent leaves and in the usually solitary balls of fruit.

2. The name of a carpenter's hand-tool, used for levelling and smoothing (Lat. planus, level) the surface of wood. The machine tool used for a similar purpose for metals is generally known as a planing-machine or planer.

PLANET (Gr. ifKavrj-rris, a wanderer), in the ancient astro- nomy, one of seven heavenly bodies characterized by being in motion relative to the fixed stars, which last appeared immovable upon the celestial sphere. As thus

defined the planets were the sun, the moon, Mercury, Venus, Mars, Jupiter and Saturn. In modern astronomy since Copernicus, the term is applied to any opaque body moving around the sun. Taken in its widest sense it applies to the satellites which are sometimes termed secondary planets. Each of these moves around a planet larger than itself, which it accompanies in its revolution round the sun. A planet not revolving round another is termed a primary planet.

The primary planets are classified as major and minor. The former are eight in number and, with the sun, form the principal members of the solar system, under which head their arrange- ment is described. The earth on which we live is the third in the order of the major planets from the sun. With respect to the positions of their orbits relative to the earth, the other planets are distinguished as inferior and superior. The former, only two in number, comprise Mercury and Venus, which revolve between the earth and the sun. The superior planets are those whose orbits are outside that of the earth. The synodic revolution of an inferior planet is the time in which it performs a revolution relative to the line joining the earth and the sun. This is greater than its actual time of revolution. The phases or appearances presented by such a planet depend upon its configuration with respect to the earth and sun, and therefore go through their complete periods in a synodic revolution. At superior conjunc- tion the illuminated hemisphere of the planet is presented to the earth so that it presents the form of a full moon. As it moves towards inferior conjunction, the lines from the planet to the sun and to the earth, or the angle sun-earth as seen from the planet, on which the phase depends, continually make a greater angle. At the time of greatest elongation this angle is 90 , and the planet appears one half illuminated, like the moon at first or last quarter. Then, as it approaches inferior conjunction, the visible portion of the disk assumes the crescent form, and while the circle bounding the disk continually increases owing to the approach of the planet to the earth, the crescent becomes thinner and thinner until, near inferior conjunction, the planet is no longer visible. After conjunction the phases occur in the reverse order. The brilliancy of the planet, as measured by the total amount of light we receive from it, goes through a similar cycle of change. The point of greatest brilliancy is between inferior conjunction and greatest elongation. In the case of Venus this phase occurs about three or four weeks before and after inferior I conjunction.

Tht dots round the orbits show the

position of the planets at Intervals

of ten days _ ”

PLANET

The symbol 1 \ indicate the greatest*

distance of an orbit north and south of the plant; of the Elliptic

*7*5*

The dots round the orbit show the position of iho planets at intervals of a thousand days*

‘ n

*The arma-htfo’d on *aeh orbit shows*

J the direction of revolution, also the place of each planet On Jan. Ist.WJO at noon

Venus

Saleet

bundrcdsoLmiJIjcins of tnftcs

y i a ˆ 6 .8 io

The Sun,

Scalt ten thousand -times that of Orbits (The Earth,Kars,and the Sun, are shown at seen from the dirtotiam of Uu Dolt of the ecliptic in their true axial poeitiom)

Fig. 3.

VtfSiMr Soale about one hundred times that of Orbit**

utonatj

O

Venus

Mare

Jupiter

Saturn

Scale of Planets 20,000 times that of Orbits

Fig. 4 .

I Jupiter and Saturn are shown In their true axial position, Uranus and Neptune in the axial positions inferred from the motions of their Satellites /
•

Soale about 4000 times that of the Orbits

Saturn's

System of

Satellites

EEXDCG

Vranus'e Satellites

Jupiter's

ˆSystem

ˆ of Satellites

Neptune's Satellite

Fig. 5.

In the figures given above are shown the relative orbits of the planets, the orbits of Mars, the Earth, Venus and Mercury (fig. 1) being drawn to a scale twenty times that of the outer ones — Neptune, Uranus, Saturn, Jupiter (fig. 2). The positions of the planets at ten-day intervals; their actual position on the 1st of January 1910 at noon, of their nodes and nearer apses, and the points when they are farthest distant north and south of the ecliptic, are also given.

The relative sizes of the planets are also given, orientated in their true axial position with regard to the ecliptic. The nearer planets (and also the Moon) are separately compared (fig. 3) ; and then shown (on a smaller scale) in comparison with the more distant ones (fig. 4). Finally scale diagrams of the distances of the orbits of the satellite-systems of Saturn, Uranus, Jupiter and Neptune are given (fig. 5).

The phases of a superior planet are less strongly marked, because the lines from the planet to the earth and sun never increase to a right angle. The result is that although the appar- ent disk of Mars is sometimes gibbous in a very marked degree, it is always more than half illuminated. In the case of the other superior planets, from Jupiter outward, no variation in phase is perceptible even to telescopic vision. The entire disk always seems fully illuminated.

The most favourable time for viewing an inferior planet is near that of greatest brilliancy. As it recedes further from the earth, although a continually increasing proportion of its disk is illu- minated by the sun, this advantage is neutralized by the diminu- tion in its size produced by the increasing distance. When a superior planet is in opposition to the sun it rises at sunset and is visible all night. This is also the time when nearest the earth, and therefore when the circumstances are most favourable for observation.

The greater the distance of a planet from the sun the less is the speed with which it moves in its orbit. The orbit being larger, the time of its revolution is greater in a yet larger degree. An approximation to the general laws of speed in different planets is that the linear speed is inversely proportional to the square root of the mean distance. From this follows Kepler's third law, that the squares of the times of revolution are pro- portional to the cubes of the mean distances.

Notes on the Plate showing Planetary Spectra.

Only those lines and bands are mentioned which are peculiar to the planets ; the Fraunhofer lines are therefore omitted.

Wave length.

Remarks.

4600

Neptune.

4800

F hydrogen, H/3 strong.

Neptune, Uranus, Saturn (?)

5090

Neptune, Uranus.

*5190**

Broad.

Neptune, Uranus.

5370

Neptune, Uranus.

5430

Broad, unsymmetrical,

Neptune, Uranus, Saturn,

strong.

Jupiter.

5570 =•=

Neptune, Uranus (?).

5700 ±

Broad, unsymmetrical,

Neptune, Uranus, Saturn (?)

strong.

Jupiter (?).

5980

Strong.

Neptune, Uranus.

6090

Neptune, Uranus.

6190

Very strong.

Neptune, Uranus, Saturn, Jupiter.

6400

Broad (?).

Neptune, Uranus.

6500 ±

Neptune, Uranus, Jupiter, Saturn (?).

6560

C hydrogen, Ho.

Neptune, Uranus.

6670 ±

Broad band.

Neptune, Uranus, Saturn,

Jupiter. Neptune, Uranus.

[6780

Bright region due to ab-

sence of selective ab-

sorption which is strong

both above and below.

6820

Strong, narrow, near

Neptune, Uranus, Saturn,

above B.

Jupiter.

7020

Strong, broad.

Neptune, Uranus, Saturn, Jupiter.

[7140

Bright, unabsorbed region similar to that at 6780.

Neptune, Uranus.

7260

Strongest band present.

Saturn, Jupiter.

7500

Band (?).

1 Saturn.

It was once supposed that the planets were surrounded by comparatively dense atmospheres. The question whether such Spectraand ls the case, and, if so, what is the physical constitu- Atmo- tion of the atmospheres, is a difficult one, on which spheres ot little light is thrown except by the spectroscope.

e aae . jj an ˆ o ˆ these bodies is surrounded by a transparent atmosphere like that of the earth, the light which reaches us from it will have passed twice through this atmosphere. If the latter were materially different in its constitution from that of the earth, that fact would be made known by the spectrum showing absorption lines or bands different from those found in the solar spectrum as we observe it. If, how- ever, the planetary atmosphere had the same composition as ours we should see only an intensification of the atmospheric lines, which might be imperceptible were the atmosphere rare.

Actual observation has thus far shown no well marked devia- tion in the spectra of any of the inner group of planets, Mercury, Venus and Mars, from the solar spectrum as we see it. It follows that any atmospheres these planets may have must, if transparent, be rare. The evidence in the cases of Venus and Mars is given in the articles on these planets. Taking the outer group of planets, it is found that the spectrum of Jupiter shows one or more very fainf shaded bands not found in that of the sun. In Saturn these bands become more marked, and in Uranus and Neptune many more are seen. The spectra in question have been observed both optically and

photographically by several observers, among whom Huggins, Vogel and Lowell have been most successful. It may be said, in a general way, that seven or eight well marked dark bands, as well as some fainter ones are observable in the spectra of the two outer planets. The general conclusion from this is that these planets are surrounded by deep and dense atmospheres, semi-trans- parent, of a constitution which is probably very different from that of the earth's atmosphere. But it has not, up to the present time, been found practicable to determine the chemical constitution of these appendages, except that hydrogen seems to be an important constituent. (See Plate.)

Intimately associated with this subject is the question of the conditions necessary to the permanence of an atmosphere round a planet. Dr Johnstone Stoney investigated these stability of conditions, taking as the basis of his work the Planetary kinetic theory of gases (Trans. Roy. Dull. Soc. vi. Atm °- 305). On this theory every molecule of a gaseous sp eres ' mass is completely disconnected from every other and is in rapid motion, its velocity, which may amount to one or more thousand feet per second, depending on the temperature and on the atomic weight of the gas. At any temperature the velocities of individual molecules may now and then increase without any well-defined limit. If at the boundary of an atmosphere the velocity should exceed a certain limit fixed by the mass and force of gravity of the planet, molecules might fly away through space as independent bodies. The absence of hydrogen from the atmosphere of the earth, and of an atmosphere from the moon, may be thus explained. If the fundamental hypo- theses of Dr Stoney's investigations are correct and complete, it would follow that neither the satellites and minor planets of the solar system nor Mercury can have any atmosphere. If the separate molecules thus flying away moved according to the laws which would govern an ordinary body, they would, after leaving their respective planets, move round the sun in independent orbits. The possibility is thus suggested that the matter producing the zodiacal light may be ah agglomeration of gaseous molecules moving round the sun; but several questions respecting the intimate constitution of matter will have to be settled before any definite conclusions on this point can be reached. It is not to be assumed that a molecule would move through the ether without resistance as the minutest known body does, and there is probably a radical difference between the minutest particle of meteoric matter and the molecule of a gas. The relations of identity or difference between such finely-divided matter as smoke and atmospheric haze and a true gas have yet to be fully established, and until this is done a definite and satisfactory theory of the subject does not seem possible.

Since the radiation of heat by a planet is, with our present instruments, scarcely capable of detection and measurement, the temperature of these

bodies can be estimated Temperature only from general physical laws. The laws govern- of the ing the radiation of heat have been so developed p,anets – during recent years that it is now possible to state at least the general principle on which a conclusion as to the tem- perature of a planet may be reached. At the same time our knowledge of the conditions which prevail on other planets is so limited, especially as regards their atmospheres, that only more or less probable estimates of the temperature of their surfaces can even now be made. Summarily stated, some of the physical principles are these: —

1. A neutrally coloured body— understanding by that term

PLANET

Plate I.

PLANETARY SPECTRA, PHOTOGRAPHED AT LOWELL OBSERVATORY, FLAGSTAFF, ARIZONA,

BY V. M. SLIPHER.

Jupiter.

Saturn.

Uranus.

Neptune.

Comparison spectrograms of the Moon and Mars, showing absorption bands in that of the latter, which denote the presence

of water vapour in the Martian atmosphere (see Mars). XXI. 716.

PLANET

REPRESENTATIVE STELLAR SPECTRA, PHOTOGRAPHED AT LOWELL OBSERVATORY, FLAGSTAFF, ARIZONA, BY V. M. SLIPHER.

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a o

s

5.

one which absorbs the same fraction of the thermal radiation falling upon it whatever the wave length of this radiation — exposed to the sun's radiation in void space tends to assume a definite temperature, called the normal temperature, the degree of which depends upon the distance of the body from the sun. This is a result of Kirchhoff 's laws of radiation.

2. An atmosphere surrounding such a body, if at rest, will tend to assume a state of thermal equilibrium, in which the temperature will be the same at all heights.

3. If the atmosphere is kept in constant motion by an inter- change between its higher and lower portions, the tendency is towards adiabatic equilibrium, in which the temperature diminishes at a constant rate with the height, until it may approach the absolute zero. The rate of diminution depends upon the intensity of gravity and the physical constants of the gases composing the atmosphere.

4. In the actual case of a planet surrounded by an atmosphere and exposed to the sun's radiation, the actual rate of diminution of temperature with height above the surface of the planet lies between the extreme limits just defined, the rate varying widely with the conditions. The general tendency will be towards a condition in which the temperature at the base of the atmosphere is higher than the normal, while in the upper regions it is lower. The temperature of the surface of the planet on which the atmosphere rests is determined partly by the sun's radiation and partly by the temperature of the air. What we should generally expect in the absence of any selective absorption by the air is that the temperature of the lower air would be higher than that of the material surface on which it rests. But this condition might be reversed by the effect of such absorption in either the air or the material of the planet.

ment. Something of this sort has been suspected in the case of Jupiter,

which has several points of resemblance to the sun. The planets Uranus and Neptune which, but for their atmo- spheres, would approximate to the absolute zero in temperature, may be prevented from doing so by the dense atmosphere which the spectroscope shows around them.

A very elaborate investigation of the probable mean tempera- tures of the surfaces of the several planets has been made by J. H. Poynting, Phil. Trans, (vol. 202 a, 1904).

Tables of Planetary Elements and Constants.

Table I. gives the elements determining the motions of each major planet, and Table II. certain numbers pertaining to its physical condition. For explanation of terms used see Orbit. The elements are given for the epoch 1900, Jan. o, Greenwich mean time, except the mean longitudes, which are for 1910, Jan. o.

In interpreting or using the numbers it must be remembered that only the mean distances and mean daily motions can be regarded as well determined and invariable quantities. The other elements are subject to a secular variation, and all vary more or less from the action of the planets. In Table II. the reciprocal of the mass is given, the mass of the sun being unity. Some of these and other quantities are extremely uncertain. This is especially the case with the mass of Mercury, which the astronomical tables put at 1/6,000,000 that of the sun, while G. W. Hill has computed from an estimate of the probable density of the planet that it is probably less than 1/11,000,000. In the table we assume the round number 1/10,000,000. The volumes are derived from micro- metric measures of the diameters, which are more or less uncertain. From these and the mass follows the density of each planet. From this again is derived the intensity of gravity at the surface; this is also frequently uncertain. Finally the normal temperature is that which a black or neutrally coloured body would assume when every part of it is equally exposed to the sun's rays by a rapid revolution. As has already been intimated, the actual temperature may also depend upon the interior heat of the planet, which is an unknown quantity. (S. N.)

Table I.

— Elements of the Orbits of the E

lght Major

Planets.

Mean Distance from Sun.

Eccentricity of Orbit.

Longitude

Longitude of Node.

Inclina- tion.

Period of Revolution.

Mean Daily Motion.

Mean Long-

Planet.

Astronomical

Thousands

of Peri-

itude 1910,

Units.

of Miles.

helion.

Jan. 0.

Mercury .

0-3870987

36,000

0-205614

75° 54′

47° 9′

7°o’

Days.

87-969256

4°-0927

3° 32′

Venus

0-72333I5

67,269

0-006821

130 10′

75° 47′

3° 24′

224-700798

I°-602I

73° 53′

Earth

1 • 0000000

92,998

0-016751

101° 13′

—

—

365-256360

o°-9856

99° 17′

Mars .

1-523688

141,701

0-093309

334° 13′

48° 47′

i°5i’

686-979702

o°-524°3

47° 39′

Jupiter

5-202804

483.853

0-048254

12° 36′

99° 37′

i° 19′

4332-5879

o°-o8309i

l8i° 4 3′

Saturn

9-S38844

887,098

0-056061

90° 49′

ii3°3′

2 30′

I0759-2OIO

o°-03346o

28 56′

Uranus

19-19096

1.784.732

0-047044

169° 3′

73° 29′

o°46′

30586-29

o°-on77o

286 42′

Neptune

30-07067

2,796,528

0-008533

43° 45′

130° 41′

i°47′

60187-65

0°-O06020

107 1′

Table II. — Physical Constants pertaining

‘ to the Major Planets.

Angular Semidiameter.

At

Diameter

Reciprocal of

Density.

Gravity at

Orbital

Normal

Planet.

Mass.

Surface.

Velocity.

Temperature.

Equatorial.

Polar.

Dist.

in Miles.

(O’s mass = i)

(Water = 1)

(® = i)

(© = 1)

Miles persec.

Centigrade.

‘ Mercurv

3-30″

3-30″

1

2,976

10,000,000

3-5

•633

0-24

29-76

195°

Venus .

8-46″

8-46″

1

7,629

408,000

5-o5

•913

o-88o

21-77

7″

Earth .

8-79″

8-76″

1

7,917

333.430

5-53

I -000

i-oo

18-52

19°

Mars

4-80″

4-76″

1

4.316

3.093.500

3-68

•666

0-363

15-00

_ 36°

Jupiter

18-75′

17-65″

5-203

86,259

1.047-35

1-363

•247

2-68

8-12

-144

| Saturn

8-75′

7-88″

9 539

72,772

3.5oo

0-678

•123

i-i3

6-00

-177ˆ

Uranus

1-90′

1-90″

19-19

32,879

22,869

I-I3

•204

0-85

4-24

-205

'Neptune

i-io"

i- 10"

30-07

29,827

19.314

1-79

•322

1-22

3-40

-218°

It would follow from these laws that the temperature of the superior planets diminishes rapidly with distance from the sun, and must therefore be far below that of the earth, unless they are surrounded by atmospheres of such height and density as to be practically opaque to the rays of heat, or unless they have no solid crust.

The resemblance of the spectra of Mars, Jupiter and Saturn to that of the sun leads to the conclusion that the atmospheres of these planets are transparent down to the reflecting surface of the body. The temperature of these surfaces must therefore be determined by Kirchhoff's law, unless they resemble the sun in being entirely liquid or gaseous, or in having only solid

nuclei surrounded by liquid matter in a condition of continual move-

PLANETS, MINOR. The minor planets, commonly known as asteroids or planetoids, form a remarkable group of small planetary bodies, of which all the known members but three move between the orbits of Mars and Jupiter. Until recently they were all supposed to be contained within the region just mentioned; but the discovery of one, which at perihelion comes far within the orbit of Mars, and of two others, which at aphelion pass outside the orbit of Jupiter, shows that no well-defined limit can be set to the zone containing them. Before the exist- ence of this group was known, the apparent vacancy in the region occupied by it, as indicated by the arrangement of the planets according to Bode's law, had excited remark and led to the belief that a planet would eventually be found there. Towards the

end of the 18th century the conviction that such a planet existed was so strong that an association of astronomers was formed to search for it. The first discovery of the looked-for planet was not, however, made by any member of this association, but by Giuseppe Piazzi of Palermo. On the ist of January 1801 he noted a small star in Taurus, which, two days later, had changed its place, thus showing it to be a planet. Shortly after Piazzi's discovery the body was lost in the rays of the sun, and was not again seen until near the following opposition in 1801- 1802. The orbit was then computed by C. F. Gauss, who found its mean distance from the sun to correspond with Bode's law, thus giving rise to the impression that the gap in the system was filled up. The planet received the name Ceres.

On the 28th of March 1802 H. W. M. Olbers (1758-1840) discovered a second planet, which was found to move in an orbit a little larger than that of Ceres, but with a very large eccen- tricity and inclination. This received the name of Pallas. The existence of two planets where only one was expected led Olbers to his celebrated hypothesis that these bodies were fragments of a larger planet which had been shattered by an internal convulsion; and he proposed that search should be made near the common node of the two orbits to see whether other frag- ments could be found. Within the next few years two other planets of the group were discovered, making four. No others were found for more than a generation; then on the 8th of December 1845 a fifth, Astrea, was discovered by K. L. Hencke of Driesen. The same observer added a sixth in 1847. Two more were found by J. R. Hind of London during the same year, and from that time discovery has gone on at an increasing rate, until the number now known is

more than six hundred and is growing at the rate of thirty or more annually.

Up to 1890 discoveries of these bodies were made by skilful search with the telescope and the eye. Among the most success- ful discoverers were Joharin Palisa of Vienna, C. H. F. Peters (1813-1800) of Clinton, New York, and James Craig Watson (1838-1880) of Ann Arbor, Michigan. In recent times the dis- coveries are made almost entirely by photography. When a picture of the stars is taken with a telescope moved by clock- work, so as to follow the stellar sphere in its apparent diurnal rotation, the stars appear on the plates as minute dots. But if the image of a planet is imprinted on the plate it will generally appear as a short line, owing to its motion relative to the stars. Any such body can therefore be detected on the plate by careful examination much more expeditiously than by the old method of visual search. The number now known is so great that it is a question whether they can be much longer individually followed up so as to keep the run of their movements.

Among the distinctive features of the planets of this group one is their small size. None exists which approaches either Mercury or the moon in dimensions. The two largest, Ceres and Juno, present at opposition a visible disk about 1 in dia- meter, corresponding to about 400 miles. The successively discovered ones naturally have, in the general average, been smaller and smaller. Appearing only as points of light, even in the most powerful telescopes, nothing like a measure of their size is possible. It can only be inferred from their apparent magnitude that the diameters of those now known may range from fifteen or twenty miles upwards to three or four hundred, the great majority being near the lower limit. There is yet no sign of a limit to their number or minuteness. From the in- creasing rate at which new ones approaching the limit of visibility are being discovered, it seems probable that below this limit the number of unknown ones is simply countless; and it may well be that, could samples of the entire group be observed, they would include bodies as small as those which form the meteors which so frequently strike our atmosphere. Such being the case, the question may arise whether the total mass of the group may be so great that its action on the major planets admits of detection. The computations of the probable mass of those known, based upon their probable diameter as concluded from the light which they reflect, have led to the result that their*

combined action must be very minute. But it may well be a question whether the total mass of the countless unknown planets may not exceed that of the known. The best answer that can be made to this question is that, unless the smaller members of the group are almost perfectly black, a number great enough to produce any observable effect by their attraction

would be visible as a faintly illuminated band in the sky. Such a band is occasionally visible to very keen eyes; but the observa- tions on it are, up to the present time, so few and uncertain that nothing can positively be said on the subject. On the other hand, the faint " Gegenschein" opposite the sun is sometimes regarded as an intensification of this supposed band of light, due to the increased reflection of the sun's light when thrown back perpendicularly (see Zodiacal Light). But this sup- position, though it may be well founded, does not seem to fit with all the facts. All that can be said is that, while it is possible that the light reflected from the entire group may reach the extreme limit of visibility, it seems scarcely possible that the mass can be such as to produce any measurable effect by its attraction. Another feature of the group is the generally large inclinations and eccentricities of the orbits. Comparatively few of these are either nearly circular or near any common plane. Con- sidering the relations statistically, the best conception of the distribution of the planes of the orbits may be gained by con- sidering the position of their poles on the celestial sphere. The pole of each orbit is defined as the point in which an axis per- pendicular to the plane intersects the celestial sphere. When the poles are marked as points on this sphere it is found that they tend to group themselves around a certain position, not far from the pole of the invariable plane of the planetary system, which again is very near that of the orbit of Jupiter. This statistical result of observation is also inferred from theory, which shows that the pole of each orbit revolves around a point near the pole of the invariable plane with an angular motion varying with the mean distance of the body. This would result in a tendency toward an equal scattering of the poles around that of Jupiter, the latter being the centre of position of the whole group. From this it would follow that, if we referred the planes of the orbit to that of Jupiter, the nodes upon the orbit of that planet should also be uniformly scattered. Ex- amination, however, shows a seeming tendency of the nodes to crowd into two nearly opposite regions, in longitudes of about 180° and 330 . But it is difficult to regard this as anything but the result of accident, because as the nodes move along at unequal rates they must eventually scatter, and must have been scattered in past ages. In other words it does not seem that any other than a uniform distribution can be a permanent feature of the system.

A similar law holds true of the eccentricities and the perihelia. These may both be defined by the position of the centre of the orbit relative to the sun. If a be the mean distance and e the eccentricity of an orbit, the geometry of the ellipse shows that the centre of the orbit is situated at the distance ae from the sun, in the direction of the aphelion of the body. When the centres of the orbits are laid down on a diagram it is found that they are not scattered equally around the sun but around a point lying in the direction of the centre of the orbit of Jupiter. The statistical law governing these may

be seen from fig. I. Here S represents the position of the sun, and J that of the centre of the orbit of Jupiter. The direction JS produced is that of the perihelion of Jupiter, which is now near longitude 12°. moves by its secular variation, the line SJ revolves around S. Theory then shows that for every asteroid there will be a certain point A near the line SJ and moving with it. Let C be the actual position of the centre of the planetoid. Theory shows that C is in motion around A as a centre in the direction shown by the arrow, the linear eccentricity ae being represented by the line SC. It follows that e will be at a minimum when AC passes through S, and at a maximum when in the opposite direction. The position of A is different in the case of different planetoids, but is generally about two- thirds of the way from S to J. The lines AC for different bodies are at any time scattered miscellaneously around the region A as a centre. AC may be called the constant of eccentricity of the planetoid, while SC represents its actual but varying eccentricity,

Fig. 1.

As the perihelion

Grouping of the Planetoids. — A curious feature of these bodies is that when they are classified according to their distances from the sun a tendency is seen to cluster into groups. Since the mean distance and mean motion of each planet are connected by Kepler's third law, it follows that this grouping may also be described as a tendency toward certain times of revolution or certain values of the mean motion around the sun. This feature was first noticed by D. Kirkwood in 1870, but at that time the number of planetoids known was not sufficient to bring out its true nature. The seeming fact pointed out by Kirkwood was that, when these bodies are arranged in the order of their mean motions, there are found to be gaps in the series at those points where the mean motion is commensurable with that of Jupiter; that is to say, there seem to be no mean daily motions near the values 598", 748" and 898", which are respec- tively 2, 25 and 3 times that of Jupiter. Such mean motions are nearly commensurable with that of Jupiter, and it is shown in celestial mechanics that when they exist the perturbations of the planet by Jupiter will be very large. It was therefore supposed that if the commensurability should be exact the orbit of the planet would be unstable. But it is now known that such is not the case, and that the only effect of even an exact com- mensurability would be a libration of long period in the mean motion of the planetoid. The gaps cannot therefore be ac- counted for on what seemed to be the plausible

supposition that the bodies required to fill these gaps originally existed but were thrown out of their orbits by the action of Jupiter. The fact can now be more precisely stated by saying that we have not so much a broken series as a tendency to an accumulation of orbits between the points of commensurability. The law in question can be most readily shown in a graphical form. In fig. 2 the horizontal line represents distances from the sun,

limits of the groups shown in the figure. Eros is so near the sun, and its orbit is so eccentric, that at perihelion it is only about 0'i6 outside the orbit of the earth. On those rare occasions when the earth is passing the perihelion point of the orbit at nearly the same time with Eros itself, the parallax of the latter will be nearly six times that of the sun. Measurements of parallax made at these times will therefore afford a more precise value of the solar parallax than can be obtained by any other purely geometrical measurement. An approach almost as close as the nearest geometrically possible one occurred during the winter of 1893-1894. Unfortunately the existence of the planet was then unknown, but after the actual discovery it was found that during this opposition its image imprinted itself a number of times upon the photographs of the heavens made by the Harvard Observatory. The positions thus discovered have been ex- tremely useful in determining the elements of the orbit. The next near approach occurred in the winter of 1900-1901, when the planet approached within 0-32 of the earth. A combined effort was made by a number of observatories at this time to determine the parallax, both by micrometric measures and by photography. Owing to the great number of stars with which the planet had to be compared, and the labour of determining their positions and reducing the observations, only some frag- mentary results of this work are now available. These are mentioned in the article Parallax. So far as can yet be seen, no other approach so near as this will take place untffl January

i93i-

A few of the minor planets are of such special interest that some pains will doubtless be taken to determine their orbits and continue observations upon them at every available opposi- tion. To this class belong those of which the orbits are so eccentric that they either pass near that of Jupiter or approach

■*7T*

2-8

Fig. 2.

increasing toward the left, of which certain equidistant numerical values

are given below the line. Points on the line corresponding to each o-oi of the distances are then taken, and at each point a perpendicular line of dots is drawn, of which the number is equal to that of the planetoids having this mean distance, no account being taken of fractions less than o-oi. The accumula- tions between the points of close commensurability with the mean motion of Jupiter may be seen by inspection. For example, at the point 2-59 the mean motion is three times that of Jupiter; at the point 2-81 twice the mean motion is equal to five times that of Jupiter; at 3-24 the mean motion is twice that of Jupiter. It will be seen that there is a strong tendency toward grouping near the values 2-73, and a lesser tendency toward 3-1 and 24. It is probable that the grouping had its origin in the original formation of these bodies and may be plausibly attributed to the formation of three or more separate rings which were broken up to form the group.

Continuing the question beyond these large collections, it will be seen that between the values 3-22 and 3-33 there are no orbits at all. Then between 3-3 and 3-5 there are nine orbits. The space between 3-5 and 3-9 is thus far a complete blank; then there are three orbits between 3-90 and 3-95, not shown in the diagram.

A group of great interest, of which only three members are yet known, was discovered during the years 1906-1907. The mean distance of each member of this group, and therefore its time of revolution, is so near that of Jupiter that the relations of the respective orbits are yet unknown. The case thus offered for study is quite unique in the solar system, but its exact nature cannot be determined until several more years of observation are available.

Several planetoids of much interest are situated without the

near that of the earth. With most of the others little more can be done than to compute their elements with a view of subse- quently identifying the object when desired. Unless followed up at several oppositions after discovery, the planet is liable to be quite lost. Of those discovered before 1890 about fifteen have not again been found, so that if discovered, as they doubt- less will be, identification will be difficult.

The system of nomenclature of these bodies is not free from difficulty. When discoveries began to go on at a rapid rate, the system was introduced of assigning to each a number, in the order of its discovery, and using as its symbol its number enclosed in a circle. Thus Ceres was designated by the symbol®; Pallas by @, &c, in regular order. This system has been con- tinued to the present time. When photography was applied to the search it was frequently doubtful whether the planet of which the image was

detected on the plates was or was not previously known. This led to the use of capital letters in alphabetical order as a temporary designation. When the alphabet was exhausted a second letter was added. Thus there are planetoids temporarily designated as A, B, &c, and AB, AC, &c. The practice of applying a name to be selected by the discoverer has also been continued to the present time. Originally the names were selected from those of the gods or goddesses of classical mythology, but these have been so far exhausted that the name is now left to the discretion of the person selecting it. At present it is customary to use both the number and the name, the former being necessary to the ready finding of the planetoid in a list, while the name serves for more certain identification. (S. N.)

PLANK, a flat piece of timber, sawn and planed; it is techni- cally distinguished from a " board " by its greater thickness, and should measure from 2 to 4 in. in thickness and from 10 to n in.

in width. The word comes through the Fr. planche (from post- Augustan, Lat. planca, a nasalized adaptation probably of Gr. 7rX

PLANKTON, a name invented by Professor Victor Hensen for the drifting population of the sea. This is a convenient heading under which to discuss not only plankton proper, but the benthos, or crawling population of the sea-bottom. Scientific investigation of these subjects dates from the reports of the " Challenger " expedition, which, despite its many successors, still stands out as the most important of the oceanographic expeditions, alike by the work achieved, the distance traversed, the time occupied, and the money devoted to the publication of the results. It laid the foundation of our knowledge of the physics and chemistry of ocean water, of oceanic and atmospheric currents, of the contour of the sea-bottom, and of the main features of distribution of deep-sea life. Later work has con- firmed and expanded, but not revoked, the conclusions thus attained. But, in spite of this and of several subsequent expeditions, it cannot be pretended that we are in a position to formulate general canons of marine distribution other than of the most tentative character. Two fallacies underlie many attempts to define distributional oceanic areas for special groups: the one, that such areas can be made to bear some relation to existing geographical or even national divisions; the other, that what is true for one group of the animal kingdom must hold good equally for another. It is necessary at the outset to divest oneself of these errors; oceanic conditions depend only very indirectly upon the distribution of the land, and strongly swim- ming or freely floating animals are not to be confined by the same factors as

determine the distribution of sessile forms, whose range is governed by a variety of circumstances.

As Wyville Thomson pointed out long ago, there is but one ocean. This surrounds the southern half of the globe, and has two large gulfs, generally called the Atlantic and Pacific Oceans, which meet through narrow channels in the small Arctic Ocean, and a half gulf, the Indian Ocean. The Atlantic and Pacific exhibit a striking homology of atmospheric pressure and of prevalent wind and current; the Indian, to a great extent, resembles the southern half of a larger one, but this resemblance is modified by the neighbourhood of vast land masses. The prevalent winds, dependent on the fairly constant distribution of atmospheric pressure over the great oceans, are the most important determinant of currents. As at most points in the ocean the temperature, salinity and chemical composition of the water are mainly determined by the currents — that is, by the condition at the place whence the water came — it is obvious that a study of currents must precede any general view of the distribution of marine forms.

Regard must be had not merely to the superficial currents indicated in fig. i , but also to the movements of the deeper layer. Ice melting at the poles, together with polar precipitation of hail, snow and rain, yields large quantities of water of low salinity and very low temperature; this water sinks under the warmer Salter surface water drifted from lower latitudes, and, creeping slowly north and south from the poles, covers the bottom of all the great open oceans at very uniformly low temperatures (in some cases as low as 30 F.). Between surface and bottom the temperature gradually decreases (except where affected by local circumstances), and in the middle layers the existence of slow currents is suspected. The cold bottom water wells up to the surface in certain areas, replacing the surface water drained away by currents, notably to the westward of the great land masses. Ocean water is remarkably uniform as regards its contained salts and gases, and it does not seem likely that we can look to these to explain the facts of distribution. In its temperature, on the contrary, there is enormous variation. While the bottom water of the ocean is very cold, and the mid- water of a more or less intermediate temperature, the surface water, according as it has drifted from the equator polewards

or in the reverse direction, has a mean annual temperature somewhere between 84° and 30 F., losing or gaining heat on its way. In the case of narrow or " closed " seas, and near land masses, sea- water does not exhibit that uniformity of composition which characterizes the open ocean; but even in such cases the temperature is largely influenced by adjacent currents, and, though less obviously than in the open ocean, seems to be a very important agent in distribution.

The fauna of the sea is divisible into the plankton, the swim- ming or drifting fauna which never rests on the bottom (generally taken now to include E. Haeckel's nekton, the strong swimmers, such as fish and cephalopods), and the benthos, which is fixed to or crawls upon the bottom. These groups require a further subdivision according to depth — the more necessarily since, to some zoologists, any water over 100 fathoms is " deep " or even " abyssal." It is simplest to begin with the benthos. From

Fig. I. — Diagram of the Atlantic Ocean, showing the Main Surface Currents (some are seasonal only) : the corresponding Indian and Pacific currents are cited in parentheses; they are rarely so strongly marked as in the Atlantic. 1. Counterequatorial (also 1′ Pacific and Indian).

North Equatorial (also Pacific).

The Equatorial (also 2″ Pacific and Indian).

Gulf Stream proper (Japan Stream).

Brazil Current (Australian Current).

Mozambique Current (recurved off Cape Agulhas).

Labrador Current (Kamchatka Current).

Falkland Current.

North Atlantic Drift, generally called Gulf Stream (North Pacific Drift).

South Atlantic Drift, ill defined (South Pacific Drift).

North African Current (Mexico Current).

Benguela Current.

Peru Current.

Antarctic Circumpolar Drift. 7', its northerly branches on the west sides of Africa and South America.

the shore seawards we may distinguish several zones. Even the tidal zone, between high and low water-mark, is subdivisible by its fauna and flora. There generally follows on this a very gentle slope to the depth of about 100 fathoms, locally sub- divisible into many lesser zones. It has been termed the con- tinental shelf or littoral zone, not very appropriately, since it occurs round many oceanic islands, and even away from any land. In this zone, if near land, fall to the bottom the heavy materials produced by

land waste and river drainage. The fauna of this zone, generally very well characterized, may be

distinguished as the epibenthos. As with the shallowest or tidal zone, its nature varies much more according to latitude and the character of the coast than the deeper zones. Everywhere, however, the epibenthic fauna is exposed to certain definite environmental conditions, as compared with a deeper fauna: namely, a high or fairly high temperature (except near the poles) ; a fairly good light, with its important consequence, a vegetable basis of food supply; tide and current to distribute the larvae to a suitable habitat, which the varied nature of the bottom near land is likely to furnish. Passing farther seawards, we find a steeper slope to about the 500-fathom line, the so-called continental slope. In this zone the environment is absolutely

Fig. 2. — Mean Annual Surface Isotherms of the Atlantic. (After Buchan, "Challenger" Report on "Oceanic Circulation.") On the north-east and south-west sides they are deflected polewards by the warm North Atlantic Drift and Brazil Current ; on the south- east and north-west sides equatorwards by the cold Labrador and Benguela Currents. Note the markedly different latitudes of the same isotherms east and west of South America and Africa; also the effect of tne Falkland Current against the Brazil Current.

different. The water, no longer subject to seasonal variations of temperature, or to direct sunlight, is cold, and of a nearly uniform annual temperature (300 fathoms, =•= 44-7° F.). Light has disappeared from all but the shallower part, and with it plant life; tide and current are no longer felt. To the latter fact is due, however, a great part of the food supply, which maintains in this zone an abundant fauna: a great quantity of organic matter, brought down by river action, produced by disintegrated sea-weed, and due to the death of surface organisms, together with the finer clayey materials of land waste, settles to the bottom in quiet water, near the 100-fathom contour, thus making the mud-line the richest feeding-ground in the ocean (Murray). The mud-line is the real upper limit of this zone; it typically begins at about 100 fathoms, but may begin at 5 to 20 fathoms in deep sheltered firths, or be pushed down to 300 fathoms where currents are strong. The fauna of this zone may be termed the mesobenthos; it is not so abundant, nor so sharply characterized, as the epibenthos, and yet is sufficiently distinct to deserve at any rate a provisional name. Another

difference of condition between epibenthos and mesobenthos is the pressure of the water; at a depth of 5°° fathoms this is, roughly speaking, half a ton to the square inch. It is very doubtful whether this enormous pressure makes the slightest difference to marine invertebrates, the tissues of which are uniformly permeated by fluids, so that the pressure is uniform in every direction; but animals with free gases naturally require time to adjust the gas-pressure when altering their levels. As regards the penetration of light, assimilative rays useful to plant life probably do not reach beyond 150 fathoms. Photographic rays have been detected as low as 220 fathoms, and if any light penetrate beyond this depth, it will consist only of blue, violet arid ultra-violet rays: it has been suggested that the red colour prevalent in many deep-sea animals may be a screen from these hurtful rays. Below the 500-fathom line the ocean bottom exhibits almost uniform conditions everywhere, varied only by the character of the bottom deposit and the amount of food supply. In this zone, which extends from about 500 fathoms to the greatest depths (which may in some cases exceed 5000 fathoms, or more than 5 J m -) > the temperature at any given point is uniform throughout the year, and is always very low: the mean at 2200 fathoms is 35-2° F.; at greater depths and in special circumstances less than 30° F. has been recorded. The darkness is probably absolute; for food the animals are dependent upon each other and upon the incessant rain of dead plankton from higher levels; the pressure may be anything between half a ton and five tons per square inch. To the fauna which lives in these remarkable circumstances the name hypobenthos may be applied.

That each of the three benthic groups is well characterized by a special fauna is shown by the following table, out of the total numbers of species captured by the " Challenger " at seventy stations in these three zones : —

Species confined to this Zone.

Species occurring in other Zones.

Epibenthos. Mesobenthos . Hypobenthos .

91%

74 , > 61 „

8% 25 ,.

38 „

Out of the 25% of its species which the mesobenthos shares with other zones, 59% occur also in the epibenthos, about 40% in the hypobenthos; the mesobenthos, therefore, on these figures, may be taken to consist of

74% of peculiar species, 15% shared with the epibenthos, 10% with the hypobenthos. Speaking of the benthos as a whole, it may be said that the following statement holds good: The number of individuals, the proportion of species to genera, and the number of individuals of a given species, all decrease with increasing depth. Animal life also tends to diminish with increasing distance from land; this may be partly due to the greater food supply near land, partly to the fact that population is obviously thinnest on the advancing fringe of a migration.

The plankton can be subdivided into at least two groups. The fauna to which light and warmth are more or less necessary, which feeds either upon plants or upon organisms nearly dependent upon plant life, may be termed the epiplankton. This fauna is capable of a good deal of vertical movement upwards and down- wards, the causes of which are still obscure, but most of its members seem rarely to descend lower than about 100 fathoms. Below this depth the fauna may be called the mesoplankton. In every area this appears to have its peculiar species, but the careful study by opening and closing tow-nets of the distribution of the meso- plankton is of so recent a growth that no statistics, such as we have of the benthos, are available. It is now generally admitted that the mesoplankton extends to the lowest depths yet searched (2730 to 2402 fathoms, Valdivia) ; but the number of specimens decreases rapidly after 200 fathoms, and below 1000 fathoms very little is captured. The conditions of light, temperature, pressure, &c, are practically those of the corresponding depths of the benthos; as regards the food, however, the mesoplankton can only depend on intercepting dead organisms which are falling from higher horizons, or on capturing the scanty prey of its own zone. It is possible that the plankton immediately over the bottom may prove to be sufficiently distinct to be separately classed as hypoplanklon.

The main subdivisions of the marine fauna having thus been briefly sketched, it is advisable to consider them in somewhat more detail. The epibenthos is obviously that fauna to which, except in polar regions, light and warmth are necessary; and the absence of these at greater depths is

probably the chief barrier to its vertical extension; the food supply is sufficiently plentiful in, at any rate, the upper parts of the mesobenthic zone to present no obvious barrier. The chemical constitution of the water (except to animals in brackish water near river mouths) and the pressure appear to exert little or no influence; and only those species which attach themselves to clean hard substances would be repelled by the mud-line.

restrain. In relation to temperature the wide-ranging species are termed eurythermal, the limited, stenothermal (Moebius); the terms are useful to record a fact, but are not explanatory. It seems to be the case that to every organism is assigned a minimum temperature below which it dies, a maximum tempera- ture above which it dies, and an optimum temperature at which it thrives best; but these have to be studied separately

Fig. 3. — Diagram showing the Coastwise {not seaward) Extension of the Provinces of Epibenthic Gastropods and Lamellibranchs. Provinces : —

Orders part of the circumpolar Antarctic region.

16. Argentinian.

17. Caribbean.

18. Transatlantic.

I.

Arctic.

6. South African.

12. Californian.

2.

Boreal of East Atlantic.

7. Indo-Pacific.

13. Panama.

2′

. Boreal of West Atlantic.

8. Japanese.

14. Peruvian.

3-

Celtic.

9. Australian.

15. Generally termed Patagonian

4-

Lusitanian.

10. New Zealand.

or Magellanic for purely epi-

5-

West African.

II. Aleutian.

benthic forms, but in many

The chief barrier to a horizontal extension of the epibenthos is undoubtedly temperature. As an example of its distribution may be taken the Gastropod and Lamellibranch Molluscs, as groups of which the distribution has been studied for many years by specialists. The shallow-water species fall into provinces (compare Cooke, Camb. Nat. Hist. vol. " Molluscs," ch. xii.), and a comparison of figs. 1 and 3 shows at once the profound influence upon them of the great currents. Taking the Atlantic Ocean, we find the Arctic species, tempted southwards by the cold Labrador Current, repelled northwards by the warm North Atlantic Drift. The Boreal or sub-Arctic species, many of which are identical on both sides of the ocean (2 and 2', fig. 3), lie much farther southwards on the west than on the east side, from the same causes. The warm-water molluscs of West Africa (5) are cut off from those of the east side (7) by the cold water from the great easterly Antarctic Drift, which impinges on the Cape, giving it a special fauna (6) . On the South American coasts the tropical and temperate fauna reach respectively to 28 S. and 45° S. on the east coast, owing to the warm Brazil Current; but the corresponding groups on the west coast only to 5° S. and 37 S., being kept back by cold upwelling and Hum- boldt's Current. This influence is visible in individual species as well as in the facies of a fauna: Purpura lapillus, a temperate form, reaches on the east side of the Pacific to 24° N. and on the East Atlantic to 32 N.; but on the West Pacific only to 41° N. and the West Atlantic to 42 N., being repelled by the Japan stream (and other warm currents of the south-west monsoon) and Gulf Stream respectively.

But while some species may be confined to a bay, others to a province, others to an ocean, there are cosmopolitan species which either vertical or horizontal barriers, or both, fail to

for every species. Similarly, in regard to depth, species have been classed as eurybathic and stenobathic, but, since in- creased depth practically means diminished temperature, these are probably merely expressions of the same fact in another form. That an Arctic shallow-water species should stretch to considerable depths is not surprising, but it is remarkable to find such forms as, for example, Venus mesodesma on a New Zealand beach at 55° F. and in 1000 fathoms at 37 F. off Tristan d'Acunha. The provinces of zoological distribution, like the geographical divisions of mankind, must be taken merely to indicate the facies of a well-characterized fauna, not to imply the restriction of all its habitants to that area.

In considering the effect of temperature (and this applies to plankton as well as to benthos down to 100 fathoms), attention must be directed not only to the question of general warmth or cold as expressed by the mean annual temperature, but also to the range between the annual extremes: these ranges of variation have been carefully mapped by Sir J. Murray (Geog. Journ. xii. 113; compare ibid. xiv. 34). Still more important to the death-rate than these is the suddenness with which such variations occur: many animals are known to endure great extremes of heat and cold if exposed to them gradually, but to succumb to rapid alterations of temperature. Hence the frontier districts (Mischgebiete) between opposing currents are character- ized by a heavy death-rate, and constitute marked barriers. A conspicuous instance of such a barrier in distribution is afforded at the Cape. The warm Mozambique Current, with a south-westerly direction off Natal, meets a north-east branch of the cold Antarctic Drift, and is beaten back eastwards: a result of the constant warring of these hot and cold currents is a high range of sudden temperature variation. Hence the Cape fauna

consists mainly of only such species from neighbouring provinces as can endure high sudden variations; and the district is practi- cally impassable. For example, nineteen species of Echinoids are known from the Cape district. Of these twelve are peculiar to the Indo-Pacific province, which stretches from East Africa to the Sandwich Islands and from Japan to Australia; two species are Southern Ocean forms, all but confined to south of 40 S.; four species are peculiar to the Atlantic Ocean: of these eighteen not one gets past the Cape into the next province; the nine- teenth is practically a cosmopolitan (A. Agassiz, " Challenger " Reports: " Echinoidea"; compare also C. Chun, Aus den Tiefen des Weltmeeres, pp. 157, 158).

Among the barriers to the horizontal extension of epibenthos must be mentioned a wide deep ocean. The Indo-Pacific fauna ranges from East Africa to about 108 W., stepping from island to island over the Pacific; but this continuity is then broken by 37 degrees of longitude and more than 2000 fathoms of water, and such sessile species as are most Mollusca (cf. fig. 3) are unable to reach the American coast. This is presumably due to the fact that the planktonic larvae of epibenthic adults must settle on a suitable bottom within a certain period or die. In spite of the direct set of the currents from Florida to the British Isles, the epibenthos of the two is absolutely dissimilar; the similarity of the two Boreal provinces (2 and 2', fig. 3) is to be assigned to a former continuity by way of Greenland, Iceland and Faeroe; a similar continuity, still unbroken, is exhibited by the Aleutian province on both sides of the Pacific. Though larvae cannot cross wide oceans, adults may no doubt traverse great stretches occasionally on floating timber, &c.

This barrier by distance may be instanced in another way. In the Arctic regions land masses are continuous or contiguous, and there are many circumpolar species, as, for example, Rhynchonella psittacea; towards the South Pole the southern continent is almost ice-bound, and the available land consists only of the tips of the continents and of the few oceanic islands. Hence few if any littoral species are circumpolar. For example, not a single littoral Ophiurid surrounds the South Pole, but five or six species are circumpolar in the northern hemisphere.

Taking next the mesobenthos and hypobenthos, living at depths where temperature is constant and current practically negligible, Meso- there appears theoretically to be no reason why an benthos; organism which can thrive at 500 fathoms should Hypo- not have a world-wide range over the bottom of all benthos, oceans. Yet this is not often, although occasionally, known to be the case; and although perhaps, speaking generally, hypobenthic species have wider ranges than epibenthic, still they also seem to be limited. It must, however, be remembered that the ocean is large, deep hauls of trawl or dredge few, and individuals at great depths scattered, so that too much stress must not be laid on this point. The " Challenger" results seem to allow of at least one generalization — the deeper the fauna, the wider its range. This is shown by the following table of the "Challenger"' benthos: the first column gives the number of benthos species captured at depths indicated in fathoms by the second column; the percentage of these species which is known to have been captured between the tropics, as well as south and north of the tropics, is shown in the third column: —

Number of

Specimens.

Horizon.

S. T. N.

4248

0-100

o-6

1887

100-500

2

616

500-1000

4

493

1000-1500

7

394

1500-2000

7

247

2000-2500

9

153

over 2500

9

We can only guess at the causes of the apparently limited range of many deep-sea types, (a) One of these is probably the limited food supply: presumably, as with a land fauna, there are as many mouths in a given area as it will support, and an equi- librium of species is maintained which will at least hinder the extension of any one. For food the bulk of the deep-water fauna

is dependent upon the rain of dead organisms falling from higher levels, these, slowly disintegrating (probably under chemical, not bacterial, action), seem to form with the bottom deposit a kind of nitrogenous ooze, through which many deep-sea organ- isms slowly swallow their way, as an earthworm goes through earth extracting nutriment, (b) Another hindrance to the extension of many deep-sea species is that they are holobenthic, that is, do not pass through a free-swimming larval stage; the means of dispersal is therefore regulated by the animal's own power of locomotion. Generally speaking, as might be expected, the freely-moving hypobenthos, fish and Crustacea, have the widest ranges, and even these are not helped by currents, as are epibenthic or planktonic forms. The larval history of deep-water forms is, however, unfortunately obscure, (c) Lastly, extension of area of a species being at best difficult in deep water for non-swimmers, the place and date of their first migration must be taken into account; forms which have comparatively recently adopted deep-water life cannot be expected to have spread far from their original centre. As regards this point, in the first place, it is with migration, not with local evolution, that we have to deal: no classes and orders, only a few families and genera, rarely sub-orders, are peculiar to the hypobenthos; the deep members of each group consist for the most part of widely separated genera, the species do not grade into each other, as is so often the case in the epibenthos; and evolution could hardly have produced these species and genera under the uniformity of their present environment. This migration down- Wards from the mud-line has no doubt occurred all over the world, notably in the Southern Ocean, if we may judge by the richness of the deep-water fauna there to-day; probably also largely in Arctic and sub-Arctic regions, less so in tropical and temperate zones- As to the date of migration, the following fact seems to show that it is of comparatively recent origin, and is indeed still in progress: taking the " Challenger " species from the epibenthos, from the mesobenthos, and then from zones of 500 fathoms down to 2500, each zone shares a larger per- centage of species with the zone above it than with that below it (except in one case where they are nearly equal). But it is not to be supposed that all our present-day deep-water forms began their migration simultaneously, and we can say with fair certainty that migration to deep water did not begin before the close of the Mesozoic epoch. Had it begun earlier, we should find typical Mesozoic and even older forms, or their congeners, at great depths: so far is this from being the

case that the most venerable animals of to-day — Lingula, Amphioxus, Limulus, 75% of Crinoids, 90% of Brachiopoda, &c. — are epibenthic or mesobenthic. On the other hand, it is extremely likely that the Cretaceous epoch marked the commencement of migration. The hexactinellidan sponges are known to have lived in quite shallow water at the date of deposition of the Inferior Oolite; to-day none occur at a less depth than 95 fathoms; and as only two genera are known from the shallow Tertiary deposits, it would seem that the migration began about Creta- ceous times (" Challenger " Reports: " Hexactinellida," F. E. Schulze). In 1881 (A. Agassiz, " Challenger " Reports: " Echin- oidea ") 105 living genera of Echinoidea were admitted; of these 23 % were known from Cretaceous but not from Tertiary deposits, 35% from Tertiary but not Cretaceous, and 40% as Recent only. The species of Cretaceous genera constituted only 29% of the epibenthic Echinoids, 44% of the mesobenthic, and no less than 55% of the hypobenthic. These species of Cretaceous genera were distributed fairly evenly over all three zones, but 72% of the species of Tertiary genera and 55% of the Recent forms were confined to the epibenthos. As out of the twenty-five living genera known from the Cretaceous only seven are known also from Jurassic deposits, it is obvious that the close relation- ship is between Cretaceous and hypobenthos, rather than between any other geological and bathymetric horizons. Other instances, such as that of the Eryonidae, seem to point to similar conclusions.

Excepting the essential air-breathers, practically every phylum and class and most orders are represented in the benthos. The

epibenthos of warm seas appears to be especially wealthy in such forms as secrete heavy calcareous skeletons; but in colder water, among the epibenthos of polar or sub-polar regions, and the hypobenthos everywhere in open oceans, the predominant forms are those which exhibit little or no calcareous secretion: even the apparent exceptions, Madreporaria and Echinoderma from great depths, tend to develop slighter skeletons than their warm-water congeners. The following table will serve to illustrate this point, and to give an idea of the composition of the epibenthos of cold and warm seas and of the hypobenthos: the figures are the percentages of total species captured in each locality by H.M.S. " Challenger," the balance being made up by few specimens in scattered groups: —

Kerguelen

Area — over

1260 fm.

Kerguelen

Area — to

150 fm.

Cape York — to 12 fm.

Madreporaria .

o-8

o-o

3-3 1

3 c! V,

Alcyonaria .

I -2

I-O

3-3

O O £ oj Jj — 1 Q.

Shelled Mollusca

8-0

197

57-3

lcar kelel wel velo

Decapoda

3-6

o-8

8-1

Echinodermata .

33-6

n-7

7-9 J

C3 rjj

Actiniaria . .) Hydrozoa . . i

6-8

4-6

i-7 ”

*S * c 00 F*

Annelida

6-8

8-0

0-9

Crustacea . . |

7-6

■ *g-s.s?-^*

except Decapoda i

16-5

25-0

Tunicata

4.4

6-8

i-i

U °

81-7

77-6

91-2

While the Madreporaria represent only 3”3 % of the species at the tropical station, it must be remembered that they probably made up 80 % or more of the weight.

The epiplankton is dependent either directly or proximately upon light, warmth and the presence of plant life. The wealth Epi- of minute organisms near the surface is inconceivable

plankton, to those who have not seen the working of a two-net: it may be gauged by the fact that a single species is sometimes present in such quantities as to colour the sea over an appreciable area, and by the estimate that the skeletons of epiplankton from a square mile of tropical ocean a hundred fathoms deep would yield 16 tons of lime. In the tropics the wealth of species, and towards the poles the number of individuals of comparatively few species, are characteristic of the latitudes. In temperate and tropical regions there is a great difference between the epiplankton near land and that far out at sea: the former is termed neritic; it extends, roughly speaking, at least as far out as the mud-line, and is characterized by the predominance of what may be termed hemibenthic forms, that is, benthic forms with a planktonic larval stage (Decapoda, Polychaeta, &c), or with a planktonic phase (metagenetic Medusae). The horizontal barriers to the neritic plankton are practically those mentioned as governing the epibenthos; indeed, it would seem that the distribution of hemibenthic adults is determined by that of their more delicate larvae. Special conditions of wind and current may of course carry into the neritic zone forms which are characteristic of the open sea, and vice versa. In the neritic epiplankton of polar waters the larvae of hemibenthic forms are almost absent; indeed, the development of cold-water benthos, whether shallow or abyssal, appears to be in most cases direct, this is, without a larval metamorphosis. The epiplankton of the open sea is described as oceanic; it consists almost entirely of holoplanklonic forms and their larvae. The chief barrier to horizontal distribution, here as elsewhere, is doubtless tempera- ture. For example, through the reports of the ” National ” cruise (German Plankton Expedition) runs the same story; one fauna characterized their course from Shetland to Greenland and Newfoundland,

another the traverse of the Gulf Stream, Sargasso Sea and the Equatorial Currents. The influence of temperature may be gauged in another way: where hot and cold currents meet, occur " frontier " districts, in which the respective organisms are intermingled, and can only exist till their maxima or minima are reached. Well-marked examples of such districts occur off New Jersey (Gulf Stream and Labrador Current), in

the China Sea (warm currents of the south-west monsoon and Kamchatka Current), in the Faeroe Channel, south of the Cape (recurving of the Agulhas Current) : in some of these the range of variation amounts to as much as 50° F. in the year, with the result of a colossal death-rate of the plankton, and its corollary, a rich bottom fauna, for which food is thus amply supplied. The majority of the oceanic epiplankton appears to be steno- thermal; for example, few components of the well-characterized fauna of the Gulf Stream and Sargasso Sea ever reach the British shores alive, although, if current and salinity were the determin- ing factors and not temperature, this fauna should reach to Shetland, and even to Lofoten. It will only be possible to make satisfactory distributional areas for these oceanic forms by such systematic traverses as that of the " National "; at present it would seem that adjacent species have such different maxima and minima that every species must be mapped separately (compare the distribution-maps of the " National " Plankton Expedition). Some members of the epiplankton are, however, extraordinarily eurythermal and eurybathic; for example, Calanus finmarchicus ranges from 76 N. to 52 S. (excepting perhaps for 10° each side of the equator), and is apparently indifferent to depth.

In the first hundred fathoms at sea the fall of temperature is gradual and slight, and forms practically no hindrance to the diurnal oscillation of the oceanic epiplankton — the alleged rise and fall of almost the entire fauna. Roughly speaking, the greatest number of animals is nearest the surface at midnight; but different species sink and rise at different times, and to or from different depths. Apart from this diurnal oscillation, unfavourable conditions at the surface send or keep the fauna down in a remarkable way: for example, in the Bay of Biscay few organisms are to be found in the first fathom in bright sun- light, but on a still, hot day the next few fathoms teem with life; yet after a few minutes' wind or rain these upper layers will be found almost deserted. This leads to the consideration of the hydrostatics of the plankton: apart from strong swimmers, the majority contests the tendency to sink either by some means of diminishing specific gravity (increasing floating power) or by increased frictional resistance. The former is generally attained

(a) by increase of bulk through development of a fluid secretion of low specific gravity (vacuoles of Foraminifera, Radiolaria, &c.) ;

(b) or of a gelatinous secretion of low specific gravity (Medusae, Chaetopod and Echinoderm larvae, Chaetognatha, Thaliacea: the characteristic transparence of so many oceanic forms is probably attributable to this) ; (c) by secretion or retention of air or other gas (Physalia, Minyas, Evadne) ; (d) by development of oil globules (Ccpepoda, Cladocera, fish ova). Increased frictional resistance is obtained by flattening out of the body (Phyllosoma, Sapphirina), or by its expansion into lateral pro- cesses (Tomopteris, Glaucus), or by the development of long delicate spines or hairs (pelagic Foraminifera, many Radiolaria, many Chaetopod and Decapod larvae). In many cases two or more of these are combined in the same organism. Notwith- standing the above adaptations, some of which are adjustable, it is difficult to understand the mechanics of the comparatively rapid oscillations of the epiplankton, of which both causes and methods are still obscure.

It will be seen from the distribution of the Thecosomatous Pteropoda — a purely oceanic group — how difficult it will prove to draw distributional areas for classes of epiplankton. P. Pelseneer recognizes in all ten such provinces (" Challenger " Reports: " Zool.," xix., xxiii.) and 42 good species: of the latter 1 is confined to the Arctic, 4 to the Antarctic province, but of the remaining 37 species and eight provinces 30% occur in all eight, 16% in seven, and only 35 % have as yet been captured in a single province only.

The mesoplankton has only received serious attention during the last few years. In the " Challenger," open nets towed at various depths seemed to show the existence of a deep-water plankton, but this method gives no certain information as to the horizon of capture, the nets being open in their passage down and up. C. Chun

Meso- plankton.

constructed the first efficient net which could be opened and shut at known depths, using a propeller mechanism (Bibl. Zool. vol. i.); and he improved his original pattern for the " National " and " Valdivia " expeditions. The present writer has devised a net, of which the opening and closing are effected from the deck by heavy weights; this has been used successfully on the " Siboga " expedition and in cruises of the " Research " (Proc. Zool. Soc, 1898). W. Garstang has con- structed an ingenious net which is useful in comparatively shallow water, but is open to criticism as being too light for depths beyond 100 fathoms; and several other types are in use. The

existence of a mesoplankton, that is, of a plankton living between 100 fathoms from the surface and the bottom, has been generally considered as definitely proved by these nets. On the other hand, A. Agassiz, using the Tanner tow-nets, contends that while a mixture of surface and bottom species may occur in a closed sea near land, there is no intermediate fauna in the open ocean between about 200 fathoms from the surface and the bottom; his conclusions, based on negative evidence, have not met with general acceptance. Animals captured below the first hundred fathoms in the open sea (the Mediterranean, for special physical reasons, is on a special footing) are divisible into at least three categories: (1) those which are eurythermal and eurybathic, e.g. Calanus finmarchicus; (2) those which, so far as we know, are purely mesoplanktonic and never come to the surface, for example, the Radiolarian family Tuscaroridae; (3) those which, like some Schizopoda, spend a larval period in the epiplankton, and seek deeper water when adult, rising to the surface, if at all, only at night. But until the publication of the results of expeditions provided with efficient mesoplankton nets, generali- zations about this fauna had better be stated with all reserve. There is, however, a certain amount of evidence to show that the mesoplankton includes different organisms in different latitudes; that surface animals of the north and south, unable to spread into the warmer surface water of lower latitudes, there sink into the cooler waters of the mesoplankton; the . distribu- tional area of such an organism will be in three dimensions bounded by isotherms (isobathytherms) and isothermobaths. As with the hypobenthos, there seems to be no theoretical reason against the universal distribution of the mesoplankton.

When a more systematic investigation of the various horizons has been carried out, many of the present cases of supposed discontinuous distribution will doubtless disappear. There are, however, undoubted cases of discontinuity where physical barriers have cut across a distributional area, an example of which may be cited here. The Isthmus of Panama was appar- ently only upraised about Miocene time, having been previously an archipelago through which a great circumequatorial current could pass; consequently the benthos of the Panama region shows marked alliance with the Caribbean, with which it was formerly continuous, but practically none with the Indo-Pacific. To the same cause is doubtless attributable the distribution of the five Decapoda which are characteristic of the Sargasso Sea, which are circumequatorial oceanic types, only occasionally littoral: three of these are known only from the Atlantic, one occurs in the Atlantic and Pacific, one in the Atlantic, Pacific and Indian Oceans. The damming of a great circumequatorial current by the Isthmus of Panama is probably also responsible for that dislocation of currents which resulted in the present relations of the Gulf Stream and North Atlantic Drift to the Labrador Current, and cut the Atlantic Boreal fauna into two

discontinuous districts (2 and 2', fig. 3).

Under the head of discontinuous distribution, the alleged phenomenon known as bipolarity must be mentioned. In summarizing the work of the " Challenger," Sir John Murray maintained on the basis of the reports that numerous species occurred in both polar and sub-polar areas which were absent from the tropic. He regarde'd them as the hardy survivors of a universal fauna which had withstood that polar cooling which set in towards the close of the Mesozoic period (Murray, Trans. Roy. Soc. Edin. vol. xxxviii., 1896; G. Puffer, Verh. deutsch. Zool. Gesellsch. ix. 1899). This view and the facts on which it was

based have been acutely contested, and the question is still far from settlement (for lists of the literature see A. E. Ortmann, Am. Nat. xxxiii. 583; and Miss E. M. Pratt, Mem. Manchester Soc. vol. xlv., 1901). As regards the purely epibenthic and sessile fauna, there are a few undoubted instances of actual specific identity; in some classes, however, such as the Echinoderms, this does not appear to hold {Hamburger Magalhaensche Sammelreise; and F. Romer and F. Schaudinn's Fauna arctica); but even in these the general composition of the fauna and the presence of certain identical and peculiar genera seem to point to some- thing more than a mere " convergence " due to similar environ- ment. As regards the plankton of the two polar regions and such epibenthic forms as extend also into deep water, the suggestion has been made that the Arctic and Antarctic benthos and plankton are really continuous by way of deep water in the main oceans, where the organisms can find a suitably low tem- perature. As an instance of this, C. Chun (Bezieh. zwischen dem arkt. und antarkt. Plankton, 1897) cites Krohnia hamata, a characteristic Arctic and sub-Arctic constituent of the epi- plankton and mesoplankton, known only from the mesoplankton in the tropics, but rising to 38 fathoms at 40 S. 26 E. More exact information, such as may be expected from the various Antarctic expeditions, is required to settle this interesting question with its far-reaching corollaries. (G. H. Fo.)

See also Zoological Distribution: § Marine.

PLANQUETTE, ROBERT (1850-), French musical com- poser, was born in Paris on the 31st of July 1850, and educated at the Conservatoire. As a boy he wrote songs and operettas for cafe concerts, and sprang into fame as the composer of Les Cloches de Corneville (Paris, 1877; London, 1878). In this work he showed a fertile vein of melody, which won instant recognition. There is in his music a touch of pathos and romantic feeling, which, had he cared to cultivate it, would have placed him far above contemporary writers of Optra bouffe. Unfortunately, he did little but repeat the formula which originally brought him reputation. Le Chevalier

Gaston was produced in 1879 with little success. In 1880 came Les Voltigeurs du $2 me ‘ which had a long run in London in 1887 as The, Old Guard, and La Cantinicre, which was translated into English as Nectarine, though never produced. In 1882 Rip van Winkle was produced in London, being subsequently given in Paris as Rip, in both cases with remarkable success. The libretto, an adaptation by H. B. Farnie of Washington Irving’s famous tale, brought out what was best in Planquette’s talent. In 1884 the phenomenon of an opera by a French composer being produced in London previously to being heard in Paris was repeated in Nell Gwynne, which was tolerably successful, but failed com- pletely when produced in Paris as La Princesse Colombine. It was followed by La Cr&maillere (Paris, 1885), Surcouf (Paris, 1887; London, as Paul Jones, 1889), Captain Thirese (London, 1887), La Cocarde tricolore (Paris, 1892), Le Talisman (Paris, 1892), Panurge (Paris, 1895) and Mam’zelle Quat’sous (Paris,

1897).

PLANTAGENET, a surname conveniently, but unhistori- cally, applied to the royal line descended from the union of Geoffrey, count of Anjou, with the empress Maud, who are now styled by historians the Angevin house. It was, historically, only a personal nickname of Geoffrey, as was ” Beauclerc ” of his father-in-law (Henry I.) and ” Curtmantel ” of his son (Henry II.), and was derived from his wearing in his cap a sprig of the broom (genet) plant, “which in early, summer makes the open country of Anjou and Maine a blaze of living gold.” When the fashion of personal nicknames passed away, the members of the royal house were usually named from their birthplace, as Thomas ” of Brotherton,” Thomas “of Woodstock,” Edmund ” of Woodstock,” Edmund ” of Langley,” Lionel ” of Antwerp,” and so forth. But Edward I. and his younger brother, the founder of the house of Lancaster, had still nicknames respec- tively, as ” Longshanks ” and ” Crouchback.” In the later days of the dynasty the surname of Beaufort was adopted by the legitimated issue of John of Gaunt by Katherine Swynford, but that of Plantagenet was bestowed on Arthur, natural son

of Edward IV., who was created Viscount L’Isle. It appears, however, to have been adopted as a surname by Richard duke of York (father of Edward IV.) some twelve years before his death. At the death of Geoffrey’s grandson, Richard I., the succession was in doubt, John’s elder brother Geoffrey having left, by the heiress of Brittany, a son and a daughter. But at that epoch the law of inheritance was in such a case unsettled, and their

right was not clear. Arthur's fate is well known, and Eleanor, the daughter, was kept captive till her death in 1241. John's younger son Richard, king of the Romans, left a son Edmund, earl of Cornwall, with whom his line ended; his elder son Henry III. left two sons, of whom the younger was created earl of Lancaster and was grandfather of Henry, earl of Lancaster, whose heiress married John of Gaunt (i.e. Ghent). Edward I., the elder son, was grandfather of Edward III., the marriages of whose numerous children greatly affected English history. Edward his heir, the " Black Prince," left an only son, who succeeded his grandfather as Richard II., on whose death (1399) this line became extinct. Lionel, the next surviving brother of the Black Prince, left an only child Philippa, who married the earl of March, in whose heirs was the right to the succes- sion. But John of Gaunt, the next brother, who had married the heiress of Lancaster and had been created duke of Lancaster in consequence, refounded the Lancastrian line, which obtained the throne in the person of his only son by her, Henry IV., on the deposition of Richard II., to the exclusion of the infant earl of March. His next brother, Edmund of Langley,who was created duke of York (1385), founded the Yorkist line, and was father, by a daughter and co-heiress of Pedro the Cruel, king of Castile, of two sons, Edward, second duke, who was slain at Agincourt, and Richard, earl of Cambridge, who by marrying the granddaughter and eventual heiress of Lionel's daughter Philippa, brought the right to the succession into the house of York.

Between their son and Henry VI. (grandson of Henry IV.) and Edward and Henry, sons and heirs of these rivals, was fought out the dynastic struggle known as " the Wars of the Roses," which proved fatal to several members of both houses. Richard, the son of Richard and Anne Mortimer, became third duke of York (1425), and was made protector of the realm 1454-145.5, being finally declared heir to the throne on the triumph of his side in 1460; but he was slain at the battle of Wakefield (Dec. 31, 1460). Of his four sons, Edward, the eldest became king as Edward IV. within three months of his death Edmund, the second, was slain with his father at Wakefield George, the third, duke of Clarence, was put to death in 1478 and Richard, the fourth, duke of Gloucester, became king as Richard III. in 1483 and was slain on Bosworth Field in 1485. King Edward IV.'s two surviving sons, Edward and Richard (the princes in the Tower), had been mysteriously put to death in 1483, so that the only male descendant of the house of York, and indeed of the whole Plantagenet race, was the duke of Clarence's son Edward, earl of Warwick (grandson of " the Kingmaker",), who was imprisoned by Richard III. (his father's younger brother) in 1483, and finally executed on Tower Hill, under Henry VII., in 1499.

Of the house of Lancaster, the only son of Henry VI. was slain after the battle of Tewkesbury (1471), while Edmund (Beaufort) duke of Somerset, a grandson of John of Gaunt, was slain at the first battle of St Albans

(1455), and all his three sons were slain or beheaded. On the death of Henry VI. and his son in 147 1, so complete was the extinction of their line that its representation vested in the heirs of the two daughters of John of Gaunt by the heiress of Lancaster, viz. Philippa queen of Portugal and Elizabeth countess of Huntingdon. But by his second wife, the heiress of Castile, John had left an only daughter, wife of Henry III., king of Castile and Leon, who also left descendants, and from his third but ambiguous union sprang the house of Beaufort, whose doubtful claims to – his heirship passed with his great-granddaughter Margaret, by her husband Edmund Tudor, to their son Henry VII. Although Henry was careful to claim the crown in his own right (1485),

he soon fortified that claim by marrying Elizabeth, eldest daughter of Edward IV. and rightful heiress to the throne. The marriage of tbeir eldest daughter Margaret to James IV. of Scotland in 1503 resulted in the accession of James VI. of Scotland, a century later, as next heir to the throne (see Stewart).

Although no other dynasty has reigned so long over England since the Norman Conquest, the whole legitimate male issue of Count Geoffrey Plantagenet is clearly proved to have become extinct in 1499. Of its illegitimate descendants the house of Cornwall was founded by Richard, a natural son of Richard, king of the Romans and earl of Cornwall, who was ancestor of Lord Cornewall of Fanhope, temp. Henry VI., of the Cornewalls, " barons of Burford," and other families; but the principal house is that which was founded, at a later date, by Sir Charles Somerset, natural son of Henry (Beaufort) duke of Somerset (beheaded 1464), who was created earl of Worcester in 15 13, and whose descendant Henry, marquess and earl of Worcester, obtained the dukedom of Beaufort in 1682. From him descend the ducal house, who bear the ancient arms of France and England, quarterly, within a bordure. (J. H. R.)

PLANTAIN (Lat. plantago), a name given to certain plants with broad leaves. This is the case with certain species of Plantago, Alisma and Musa, to all of which the term is popularly applied. The species of Plantago are mostly weeds with a dense tuft of radical leaves and scapes bearing terminal spikes of small flowers; the long spikes of P. major, when in seed, are used for feeding cage-birds; P. lanceolata, so called from its narrow lanceolate 3-6-ribbed leaves, is popularly known as ribwort; Alisma P. is the water-plantain, so called from the resemblance of its broad ribbed aerial leaves to those of P. major. The tropical fruit known as plantain belongs to the genus Musa (see Banana).

PLANTATION (Lat. plantar e, to plant), literally the placing of plants in the ground, hence a place planted or a collection of growing things, &c,

particularly used of ground planted with young trees. The term was early applied, in a figurative sense, to the settlement of people, and particularly to the colonization of North America in the early part of the 17th century and to the settlement of Scotch and English in the forfeited lands in Ireland (see below). The practice of sending convicted criminals to serve on the plantations in the colonies became common in the 17th century (see Deportation). These plantations were chiefly in the cotton, sugar and tobacco growing colonies, and the term " plantation " is thus particularly applied to estates in tropical or semi-tropical countries; the proprietors of such estates are specifically styled " planters."

The negroes on the plantations of the Southern States of North America sang their songs and hymns and danced to tunes which were traditional, and are frequently known as " Plantation Songs." It has been claimed s'ongs!'''" for some of them that they represent the folk songs brought by the first slaves from Africa; but the more generally accepted view is that they were those European hymn and song tunes which the negroes picked up from the revivalist preachers or from the Europeans around them, and adapted to their own strongly marked rhythms, which are certainly of African origin. The earliest song which became familiar to those outside the Southern States was " Jim Crow," sung by Dan Rice, and introduced to England about 1836. The " Jubilee Singers," a troupe from Fisk University, Nashville, Tennessee, toured the United States and Europe in 187 1; but the great popularity of the negro songs and dances, and the traditional instruments, the bones and tambourine (the banjo was not originally used by the genuine negro), was due to the so-called "negro minstrel" troupes, of which the best known in England were Christy's, whence the generic name of Christy Minstrels, and later of the Moore and Burgess troupe at St James's Hall, London, started in 1862 and finally dis- solved in 1904.

The best collection of genuine " plantation songs " and their words is Slave Songs of the United States (New York, 1871); see also

PLANTIN

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C. L. Edwards, Bahama Songs and Stories (Boston, 1895); J. B. T.

Marsh, The Story of the Jubilee Singers (Boston, 1895) ; and articles by G. W. Cable on " The Creole Slave Dance " and " Creole Slave Songs," in the Century, February and April 1886.

Plantation of Ulster.— The Irish rebellion, which had dis- turbed Ulster during the closing years of Elizabeth's reign, was followed under James I.

by further trouble, due partly to the inability of the English government to understand the system of land ownership prevalent in Ireland. At this time the chief offenders against the authority of England were the earls of Tyrconnell and Tyrone, but in September 1607 these once powerful nobles fled from the country. The English lawyers declared that the extensive estates which they held, not in their personal capacity, but as the heads respectively of the tribes of O'Neill and O'Donnell, had become the property of the English crown; and the problem which now confronted James I. and his advisers was what to do with the land, which was much too large to be cultivated properly by the scanty population living thereon. The idea of a plantation or coloniza- tion of Ulster, which was put forward as an answer to this question, is due mainly to Sir Arthur Chichester, the Irish lord deputy; its object was to secure the better cultivation of the land and to strengthen the English influence in Ulster by granting estates to English and Scottish settlers. Chichester proposed that the native inhabitants should be allowed to occupy as much land as they could cultivate, for he said, " that many of the natives in each county claim freehold in the lands they possess, and albeit these demands are not justifiable by law, yet it is hard and almost impossible to displant them." Even if this advice were carried out on a generous scale, the deputy con- sidered that there would be abundance of land to offer to colonists, and also to reward the class of men known as servitors, those who had served the English king in Ireland. He submitted his ideas to Sir James Ley and Sir John Davies, two of the minis- ters of James I.; they reported to the English privy council, which signified its approval, and after the question had been illuminated by Bacon's great intellect, a committee was ap- pointed to make the necessary arrangements. But those responsible for the plantation made one cardinal mistake, a mistake which was to cost the country much in the future. They rejected Chichester's idea of allotting land to the natives on a liberal scale, preferring to turn them out and to parcel out the whole of the forfeited district anew.

The forfeited lands lay in six counties, Tyrone, Donegal, Armagh, Fermanagh, Cavan and Coleraine (Londonderry), and the scheme for the plantation having been drawn up, the necessary survey began in May 1609. This was very inaccurate, but it served its purpose. The land was divided into three sections. One block was set apart for English and Scottish settlers, who were not to be allowed to have any Irish tenants; another was allotted to the servitors, who might have either English or Irish tenants; and a third was reserved for the Irish. Applications were then entertained from those willing to take up the land, and under Chichester's direction the settlement was proceeded with. The land was divided into portions of 1000, 1500 and 2000 acres, each colonist undertaking in return for his grant to build a castle or a walled enclosure, and to keep, train and arm sufficient men for its defence. Moreover he must take the oath of supremacy to James, and must not alienate his estate to an Irishman. He was given two years in which to do the necessary building; during this period he was freed from paying rent, but afterwards he must pay a quit-rent to the Crown. A scale of rents was drawn up, the native Irish paying at a higher rate than the English and Scottish settlers. Out of the forfeited lands provision was made for the maintenance of churches and schools, which were to be erected in conformity with the scheme.

The work progressed very slowly and much of the building was not even begun within the required time. Then in 161 1 Tames I., who had from the first taken a lively interest in the plantation, sent Lord Carew to report on it. Carew's inspection did not reveal a very favourable condition of affairs, and in

1615 Sir Josiah Bodley was sent to make a further report about the progress of the work. A third report and survey was made three years later by Nicholas Pynnar, who found in the six counties 1974 British families, with 6215 men capable of bearing arms. He said that even on the lands occupied by the colonists the cultivation of the soil was still very much neglected The words spoken by Bacon in 16ˆ7 with reference to the plantation had come true. " Take it from me," he said, " that the bane of a plantation is when the undertakers or planters make such haste to a little mechanical present profit, as disturbeth the whole frame and nobleness of the work for times to come." Another survey took place in 1622, when various changes were suggested, but no serious alterations were made. On the whole the plantation had been a failure. Very few of the settlers had carried out their undertaking. In many cases the Irish had remained on the land allotted to the colonists, living under exactly the same conditions as they had done before the planta- tion, and holding on " whether the legal landlords liked it or not." As actually carried out the plantation dealt with 511,465 acres. Two-fifths of this was assigned to British colonists, being

divided about equally between Englishmen and Scotchmen. Rather more than one-fifth went to the Church and about the same amount to the servitors and the natives. The best settlers were the Scots, although their tendency to marry with the Irish was noted and condemned during the early years of the settlement.

An important part of the plantation was the settlement of the county of Coleraine by the corporation of the city of London. Receiving a grant of practically the whole of the county the corporation undertook to spend £20,000, and within two years to build 200 houses in Derry and 100 in Coleraine. This was the most successful part of the settlement, and to it Londonderry owes its present name.

The expulsion of the Irish from the land in which by law and custom they had a certain proprietary and hereditary right, although not carried out on the scale originally contemplated, naturally aroused great indignation among them. Attacks on the settlers were followed by reprisals, and the plantation may fairly be regarded as one of the causes which led to the terrible massacre in Ulster in 1641. During Elizabeth's reign a scheme for the plantation of Munster was considered, and under Charles I. there was a suggestion for the plantation of Connaught, but eventually both were abandoned.

The " Orders and Conditions of Plantation " are printed in Walter Harris's Hibernica (Dublin, 1770); and in George Hill's Historical Account of the Plantation in Ulster, i6o8-l620(Be\iast,l 877) . See also S. R. Gardiner, History of England (1899), vol. i.; and R. Bagwell, Ireland under the Stuarts (1909), vol. i.

PLANTIN, CHRISTOPHE (1 514-1589), French printer, was born in a village near Tours (probably Saint- Avertin) . He learned bookbinding and bookselling at Caen, and, having married in that town, settled in 1549 as bookbinder in Antwerp, where he was soon known as the first in his profession. A bad wound in the arm seems to have been the cause that first led him (about 1555) to apply himself to typography. The first known book printed in his office was La Institutione di una fanciulla nata nobilmente, by J. M. Bruto, with a French transla- tion, and this was soon followed by many other works in French and Latin, which in point of execution rivalled the best printing of his time, while the masters in the art of engraving then flourish- ing in the Netherlands illustrated many of his editions. In 1562, Plantin himself being absent in Paris, his workmen printed an heretical pamphlet, which caused his movables to be seized and sold. It seems, however, that he recovered a great deal of the money, and in 1563 he associated himself with some, friends to carry on his business on a larger scale. Among them were two grand-nephews of Dan. Bomberg, who

furnished him with the fine Hebrew types of that renowned Venetian printer. His editions of the Bible in Hebrew, Latin and Dutch, his Corpus juris, Latin and Greek classics, and many other works produced at this period are renowned for their beautiful execution and accuracy. A much greater enterprise

was planned by him in those years — the publication of a Biblia polyglotta, which should fix the original text of Old and New Testaments on a scientific basis. In spite of clerical opposition he was supported by Philip II. king of Spain, who sent him the learned Benedictus Arias Montanus to take the leading part in the work of editorship. With his zealous help the work was finished in five years (1569-1573, 8 vols, folio). Plantin earned little profit, but received the privilege of printing all liturgical books for the states of King Philip, and the office of " prototypo- graphus regius." Though outwardly a faithful son of the church, he was till his death the partisan of a mystical sect of heretics; and it is now proved that many of their books published without the name of a printer came from his presses together with the missals, breviaries, &c, for the Roman Catholic Church.

Besides the polyglot Bible, Plantin published in those years many other works of note, such as editions of St Augustine and St Jerome, the botanical works of Dodonaeus, Clusius and Lobelius, the description of the Netherlands by Guicciardini, &c. In 1575 his printing-office reckoned more than twenty presses and seventy-three workmen, besides a similar number that worked for the office at home. But in November 1576 the town was plundered and in part burnt by the Spaniards, and Plantin had to pay an exorbitant ransom. He established a branch of his office in Paris; and when in 1583 the states of Holland sought a typographer for the newly erected university at Leiden, he left his much reduced business in Antwerp to his sons-in-law John Moerentorf (Moretus) and Francis van Ravel- inghen (Raphelengius), and settled there. When in 1585 Antwerp was taken by the prince of Parma and affairs became there more settled, he left the office in Leiden to Raphelengius and returned to Antwerp, where he laboured till his death on the 1st of July 1589. His son-in-law, John Moretus, and his descendants continued to print many works of note " in ofncina Plantiniana," but from the second half of the 17th century the house began to decline. It continued, however, in the possession of the Moretus family, which religiously left every- thing in the office untouched, and when in 1876 the town of Antwerp acquired the old buildings with all their

contents, for 1,200,000 francs, the authorities were able with little trouble to create one of the most remarkable museums in existence (the Musee Plantin, opened August 19, 1877).

See Max Rooses, Christophe Plantin imprimeur anversois (Ant- werp, 1882); Aug. de Backer and Ch. Ruelens, Annates de Vim- primerie Plantinienne (Brussels, 1865); Degeorge, La Maison Plantin (2nd ed., Brussels, 1878). (P. A. T.)

PLANTS. In the most generally used sense, a plant is a member of the lower or vegetable order of living organized things; the term is also popularly applied to the smaller herbaceous plants, thus excluding trees and shrubs. The early use of the word is for a twig, shoot, cutting or sapling, which was the meaning of Lat. planta (for plancta, the root being that seen in planus, flat, cf . Gr.TrXariis, broad; planta thus meant a spreading shoot or sucker). Other meanings of " plant " are derived from the verb " to plant " (Lat. plantare, to fix in position or place). It is thus used of the fixtures, machinery, apparatus necessary for the carrying on of an industry or business, and in colloquial or slang use, of a swindle, a carefully arranged plot or trap laid or fixed to deceive; cf. also Plantation. In the following sections the botanical sense of the word is followed, the term being used generally as opposed to " animals."

Classification or Plants

Some account of the history of plant classification and the development of a natural system in which an attempt is made to show the actual relationships of plants, is given in the article Botany. The plant world falls into two great divisions, the higher or flowering plants {Phanerogams) , characterized by the formation of a seed, and the lower or flowerless plants {Crypto- gams) , in which no seed is formed but the plants are disseminated by means of unicellular bodies termed spores. The term

Cryptogam is archaic, implying a hidden method of reproduction as compared with the obvious method represented by the flower of the Phanerogam; with the aid of a good microscope it is, however, easier to follow the process of fertilization in many Cryptogams than in the flowering plants. These two great divisions are moreover of unequal value, for the Cryptogams comprise several groups differing from each other by characters as marked as those which separate some of them from the Phanerogams. The following groups or sub-kingdoms are those which are now generally recognized: —

f I. Thallophyta. Cryptogams -j II. Bryophyta.

L 1 1 1. Pteridophyta. Phanerogams or IV. Spermatophyta.

Thallophyta are the most lowly organized plants and include a great variety of forms, the vegetative portion of which consists of a single cell or a number of cells forming a more or less branched thallus. They are characterized by the absence of that differentia- tion of the body into root, stem and leaf which is so marked a feature in the higher plants, and by the simplicity of their internal structure. Both sexual and asexual reproduction occur, but there is usually no definite succession of the two modes marking that alternation of sexual generation (gametophyte) and asexual generation (sporo- phyte) which characterizes the higher groups. The group Has until recent years been regarded as comprising three classes dis- tinguished by well-marked physiological features — the Algae (includ- ing the Seaweeds) which contain chlorophyll, the Fungi which have no chlorophyll and therefore lead a saprophytic or parasitic mode of life, and the Lichens which are composite organisms consisting of an alga and a fungus living together in a mutual parasitism (symbiosis) ; Bacteria were regarded as a section of Fungi. Such a system of classification, although convenient, is not the most natural one, and a sketch of the system which better expresses the relationships between the various subdivisions is given here. It has however been deemed advisable to retain the older groups for purpose of treatment in this work, and articles will be found under the headings Algae, Fungi, Bacteria, and Lichens. The study of phylogeny has suggested fourteen classes arranged in the following sequence: (1) Bacteria; (2) Cyanophyceae (Blue-green algae); (3) Flagellatae; (4) Myxomycetes (Slime-fungi); (5) Peri- dineae; (6) Conjugatae; (7) Diatomaceae (Diatoms); (8) Hetero- conteae; (9) Chlorophyceae (Green Algae); (10) Characeae (Stone- worts); (11) Rhodophyceae (Red Algae); (12) Eumycetes (Fungi); (13) Phycomycetes (Algal fungi); (14) Phaeophyceae (Brown Algae). Bacteria (see Bacteriology) and Cyanophyceae (see Algae), which are often grouped together as Schizophyta, are from points of view of both structure and reproduction extremely simple organisms, and stand apart from the remaining groups, which are presumed to have originated directly or indirectly from the Flagellatae, a group of unicellular aquatic organisms combining animal and plant characteristics which may be regarded as the starting-point of unicellular Thallophytes on the one hand and of the Protozoa on the other. Thus simple forms included in the Heteroconteae, Chlorophyceae and Phaeophyceae show an obvious connexion with the Flagellatae; the Peridineae may be regarded as a further developed branch; the Conjugatae and Diatomaceae cannot be directly connected ; the origin of the Rhodophyceae is also obscure; while the Characeae are an advanced and isolated group (see Algae). The Mycetozoa (q.v.) or Myxomycetes are a saprophytic group without chlorophyll, of simple structure and isolated position. The algal fungi,

Phycomycetes, are obviously derived from the Green Algae, while the remaining Fungi, the Eumycetes, appear to have sprung from the same stock as the Rhodophyceae (see Fungi). Owing to the similarity of structure and mode of life it is convenient to treat the Lichens {q.v.) as a distinct class, while recognizing that the component fungus and alga are representatives of their own classes.

The Bryophyta and Pteridophyta have sprung from the higher Thallophyta, and together form the larger group Archegoniatae, so-called from the form of the organ {archegonium) in which the egg-cell is developed. The Archegoniatae are characterized by a well-marked alternation of gametophyte and sporophyte generations; the former bears the sexual organs which are of characteristic structure and known as antheridia (male) and archegonia (female) respectively; the fertilized egg-cell on germination gives rise to the spore-bearing generation, and the spores on germination give rise directly or indirectly to a second gametophyte.

The Mosses and Liverworts (see Bryophyta) include forms with a more or less leaf-like thallus, such as many of the liverworts, and forms in which the plant shows a differentiation into a stem bearing remarkably simple leaves, as in the true mosses. They have no true roots, and their structure is purely cellular or conducting bundles of a very simple structure are present. The independent plant which is generally attached to the soil by hair-like structures is the sexual generation, the sporophyte is a stalked or sessile capsule

which remains always attached to the gametophy'te from which it derives the whole or part of its nourishment.

The Ferns and fern-like plants (see Pteridophyta) have on the other hand a well developed independent sporophyte which is differentiated into stem, leaf and root with highly organized internal structure including true vascular bundles. In general structure they approach the Phanerogams with which they form collectively the Vascular Plants as contrasted with the Cellular Plants — Thallophyta and Bryophyta. The gametophyte is a small thalloid structure which shows varying degrees of independence affording an interesting transition to the next group.

Spermatophyta are characterized by an extreme reduction of the gametophyte generation. The sporophyte is the plant which is differentiated

into stem, leaf and root, which show a wonderful variety of form; the internal structure also shows increased com- plexity and variety as compared with the other group of vascular plants, the Pteridophyta. The spores, as in the heterosporous Pteridophyta, are of two kinds — microspores (pollen grains) borne in microsporangia (pollen sacs) on special leaves (sporophylls) known as stamens, and macrospores (embryo-sac) borne in macrosporangia (ovules) on sporophylls known as carpels. The fertile leaves or sporophylls are generally aggregated on special shoots to form rlowers which may contain one or both kinds. The microspores are set free from the sporangium and carried generally by wind or insect agency to the vicinity of the macrospore, which never leaves the ovule. The male gametophyte is represented by one or few cells and, except in a few primitive forms where the male cell still retains the motile character as in the Pterido- phyta, is carried passively to the macrospore in a development of the pollen grain, the pollen tube. The Spermatophyta are thus land plants par excellence and have, with the few exceptions cited, lost all trace of an aquatic ancestry. Aquatic plants occur among seed plants but these are readaptations of land plants to an aquatic environment. After fertilization the female cell, now called the oospore, divides and part of it develops into the embryo (new sporophyte), which remains dormant for a time still protected by the ovule which has developed to become the seed. The seed is a new structure characteristic of this group, which is therefore often referred to as the Seed-plants. The seed is set free from the parent plant and serves as the means of dissemination (see Flower; Pollination; Fruit, and Seed). The Spermatophyta fall into two classes, Gymncsperms (q.v.) and Angiosperms (g.u.); the former are the more primitive group, appearing earlier in geological time and showing more resemblance in the course of their life-history to the Pteridophyta. A recently discovered fossil group, the Pteridospermae (see Palaeobotany) have characters inter-mediate between the Pteridophyta and the more primitive seed- plants.

In Gymnos perms — so-called because the ovules (and seeds) are borne on an open sporophyll or carpel — the microsporophylls and macrosporophylls are not as a rule associated in the same shoot and are generally arranged in cone-like structures; one or two small prothallial cells are formed in the germination of the micro- spore ; the male cells are in some older members of the group motile though usually passive. The ovule is not enclosed in an ovary, and the usually solitary macrospore becomes filled with a pro- thallus, in the upper part of which are formed several rudimentary archegonia. The fertilized egg-cell (oospore) forms a filamentous structure, the proembryo, from a restricted basal portion of which one or more embryos develop, one only as a rule reaching maturity. The embryo consists of an axis bearing two or more cotyledons and ending below in a radicle; it lies in a generally copious food-storing tissue

(endosperm) which is the remains of the female prothallus. The plant has a well-developed main root (tap-root) and a single or branched leafy stem which is provided with a means of secondary increase in thickness. The leaves are generally tough-skinned and last for more than one season.

The Angiosperms, which are much the larger class, derive their name from the fact that the carpel or carpels form a closed chamber, the ovary, in which the ovules are developed — associated with this is the development of a receptive or stigmatic surface on which the pollen grain is deposited. The sporophylls (stamens and carpels) are generally associated with other leaves, known as the perianth, to form a flower ; these subsidiary leaves are protective and attrac- tive in function and their development is correlated with the transport of pollen by insect agency (see Angiosperms; Pollina- tion, and Flower). The male gametophyte is sometimes repre- sented by a transitory prothallial cell ; the two male cells are carried passively down into the ovary and into the mouth of the ovule by means of the pollen-tube. The female gametophyte is extremely reduced ; there is a sexual apparatus of naked cells, one of which is the egg-cell which, after fusion with a male cell, divides to form a large " suspensorial " cell and a terminal embryo. Endosperm is formed as the result of the fusion of the second male cell with the so-called " definitive nucleus " of the embryo-sac (see Angio- sperms). The embryo consists of an axis bearing one (Mono- cotyledons) or two (Dicotyledons) cotyledons, which protect_ the stem bud (plumule) of the future plant, and ending below in a radicle. The seed is enclosed when ripe in the fruit, a development of the ovary as a result of fertilization of the egg-cell. (A. B. R.)

Anatomy of Plants

The term " Anatomy," originally employed in biological science to denote a description of the facts of structure revealed on cutting up an organism, whether with or without the aid of lenses for the purposes of magnification, is restricted in the present article, in accordance with a common modern use, to those facts of internal structure not concerned with the constitu- tion of the individual cell, the structural unit of which the plant is composed.

An account of the structure of plants naturally begins with the cell which is the proximate unit of organic structure. The cell is essentially an individualized mass of protoplasm containing a differentiated protoplasmic body, called a nucleus. But all cells which are permanent tissue-elements of the plant- body possess, in addition, a more or less rigid limiting membrane or cell-wall, consisting primarily of cellulose or some allied substance. It is the cell-walls which connect the different cells of a tissue (see below) , and it is upon their characters (thickness, sculpture and constitution) that the qualities of the tissue largely depend. In many cases, indeed, after the

completion

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Fig. 1. — Examples of the differentiation of the cells of plants.

A, Cell (individual) of the unicellular Green Alga Pleurococcus, as an example of an undifferentiated autonomous assimilating cell, pr.y Cell protoplasm; n., nucleus; chl., chloroplast; c.w., cell-wall.

B, Plant of the primitive Siphoneous Green Alga Protosiphon botryoides. The primitive cell sends colourless tubelets (rhizoids, rh.) into the mud on which it grows. The subaerial part is tubular or ovoid, and contains the chloroplast (chl.). There are several nuclei.

C, Base of the multicellular filamentous Green Alga CJiaetomorpha aerea. The basal cell has less chlorophyll than the others, and is expanded and fixed firmly to the rock on which the plant grows by the basal surface, rh, thus forming a rudimentary rhizoid.

D, Part of branched filamentous thallus of the multicellular Green Alga Oedocladium. cr. ax., Green axis creeping on the surface of damp soil; rh., colourless rhizoids penetrating the soil; asc. ax., ascending axes of green cells.

E, Vertical section of frond of the complicated Siphoneous Green Alga Halimeda. The substance of the frond is made up by a single much-branched tube, with interwoven branches, cond. med., Longitudinally running comparatively colourless central (medullary) branches, which conduct food substances and support the (ass. cor.) green assimilating cortical branches, which are the ends of branches from the medulla and fit tightly together, forming the continuous surface of the plant.

F, Section through the surface tissue of the Brown Alga Cutleria multifida, showing the surface layer of assimilating cells densely packed with phaeoplasts. The layers below have progressively fewer of these, the central cells being quite colourless.

G, Section showing thick-walled cells of the cortex in a Brown Alga (seaweed). Simple pits (p.) enable conduction to take place readily from one to another.

H, Two adjacent cells (leptoids) of a food-conducting strand in Fucus (a Brown seaweed). The wall between them is perforated, giving passage to coarse strands of protoplasm.

I, End of hydroid of the thalloid Liverwort Blyttia, showing the thick lignified wall penetrated by simple pits.

of the cell-wall (which is secreted by the living cell-body) the protoplasm dies, and a tissue in which this has occurred consists solely of the dead framework of cell-walls, enclosing in the cavities, originally occupied by the protoplasm, simply water or air. In such cases the characters of the adult tissue clearly depend solely upon the characters of the cell-walls, and it is usual in plant-anatomy to speak of the wall with its enclosed

cavity as " the cell," and the contained protoplasm or other substances, if present, as cell-contents. This is in accordance with the original use of the term " cell," which was applied in the 1 7th century to the cavities of plant-tissues on the analogy of the cells of honeycomb. The use of the term to mean the individualized nucleated mass of living protoplasm, which, whether with or without a limiting membrane, primitively forms the proximate histological element of the body of every organism, dates from the second quarter of the 19th century. For a more detailed description of the cell see Cytology and the section on Cytology of Plants below) . In all but the very simplest forms the plant-body is built up of a number of these cells, associated in more or less definite ways. In the higher (more complicated) plants the cells differ very much among themselves, and the body is composed of definite systems of these units, each system with its own characteristic structure, depending partly on the characters of the component cells and partly

Fig. \a. — Examples of the differentiation of the tissue of plants.

J, End of hydroid of the Moss Mnium, showing particularly thin oblique end-wall. No pits.

K, Optical section of two adjacent leptoids of the Moss Polytrichum juniperinum. The leptoids are living and nucleated. They bulge in the neighbourhood of the very thin cross-wall. Note resemblance to H and R.
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L, Optical section of cell of parenchyma in the same moss. Embedded in the protoplasm are a number of starch grains.

M, Part of elongated stereid of a Moss. Note thick walls and oblique slit-

like pits with opposite inclination on the two sides of the cell seen in surface view.

N, One side of the end of hydroid (tracheid) of a Pteridophyte (fern), with scalariform pits.

O, Optical section of two adjacent leptoids (sieve-tube segments) of Pteridophyte, with sieve plates (s. pi.) on oblique end-wall and side-walls.

P, Part of spiral hydroid (tracheid) of Phanerogam (Flowering Plant).

Q, Three segments of a " pitted " vessel of Phanerogam.

R, Optical section of leptoid (sieve-tube segment) of Phanerogam, with two proteid (companion) cells, j. pi., sieve-plate.

S, Optical section of part of thick- walled stereid of Phanerogam, with almost obliterated cavity and narrow slit-like oblique pits.

T, Part of vertical section through blade of typical leaf of Phanero- gam, u.e., Upper epidermal cells, with © cuticle, (p) Assimilating (palisade) cells, sp., Assimilating (spongy) cells with large lacunae. I.e., Lower epidermis, with St., stoma.

U, Absorbing cell, with process (root-hair) from piliferous layer of root of Phanerogam.

V, Endodermal cell of Phanerogam, with suberized central band on radial and transverse walls.

on the method of association. Such a system is called a tissue- system, the word tissue being employed for any collection of cells with common structural, developmental, or functional characters to which it may be conveniently applied. The word is derived from the general resemblance of the texture of plant substance to that of a textile fabric, and dates from a period when the fundamental constitution of plant substance from in- dividual cells was not yet discovered. It is convenient here to define the two chief types of cell-form which characterize tissues

of the higher plants. The term parenchyma is applied to tissues whose cells are isodiametric or cylindrical in shape, prosenchyma tissues consisting of long narrow cells, with pointed ends.

We may now proceed to a systematic account of the anatomy of the different groups of plants, beginning with the simplest, and passing to the more complicated forms.

Thallophyta. — The simplest members of both the Algae and the Fungi (q.v.) (the two divisions of the Thallophyta, which is the lowest of the four great groups into which the plant-kingdom is divided) have their bodies each composed of a single cell. In the Algae such a cell consists essentially of: (1) a mass of protoplasm provided with (2) a nucleus and (3) an assimilating apparatus consisting of a coloured protoplasmic body, called a chromatophore, the pigment of which in the pure green forms is chlorophyll, and which may then be called a chloroplast. The whole of these living structures are covered externally by the dead cell-membrane (fig. 1 A). It is from such a living and assimilating cell, performing as it does all the vital functions of a green plant, that, according to current theory, all the different cell-forms of a higher plant have been differentiated in the course of descent.

_ Among the Green Algae the differentiation of cells is compara- tively slight. Many forms, even when multicellular, have all their cells identical in structure and function, and are often spoken of as " physiologically unicellular." The cells Ce H aa

the cell or cells which attach the plant to the substratum often have a peculiar form, containing chlorophyll and constituting a rudimentary fixing organ or rhizoid (fig. I C). In certain types living on damp soil, the rhizoids penetrate the substratum, and in addition to fixing the plant absorb food substances (dissolved salts) from the substratum (fig. 1 B and D).

The second type of differentiation is that between supporting axis and assimilating appendages. The cells of the axis are com- monly stouter and have much less chlorophyll than those of the appendages (Draparnaldio). This differentiation is parallel with that between stem and leaf of the higher plants. In the group of the Siphoneae both these types of differentiation may exist in the single, long, branched, tube-like and multinucleate " cell " (coenocyte) which here forms the plant-body. Protosiphon (fig. 1 B) is an example parallel with Oedocladium; Bryopsis, with Draparnaldia. In Caulerpa the imitation of a higher plant by the differentiation of fixing, supporting and assimilating organs (root, stem and leaf) from different branches of the single cell is strikingly complete. In the Siphoneous family of Codiaceae the branches of the primitive cell become considerably interwoven one with another, so that a dense tissue-like structure is often produced. In this we get a further differentiation between the central tubes (branches of the primitive cell), which run in a longitudinal direction through the body, possess little or no chlorophyll, and no doubt serve to conduct food substances from one region to another, and the peripheral ones, which are directed perpendicularly to the surface of the body, ending blindly there, contain abundant chlorophyll, and are the assimilating organs (fig. 1 E).

None of the existing Red Seaweeds (Rhodophyceae) has a unicellu- lar body. The thallus in all cases consists of a branched filament of cells placed end to end, as in many of the Green Algae. Each branch grows simply by the transverse division of its apical cell. The branches may be quite free or they may be united laterally to form a solid body of more or less firm and compact consistency. This may have a radial stem-like organization, a central cell-thread giving off from every side a number of short sometimes unicellular branches, which together form a cortex round the centra! thread, the whole structure having a cylindrical form which only branches when one of the short cell-branches from the central thread grows out beyond the general surface and forms in its turn a new central thread, from whose cells arise new short branches. Or the thallus may have a leaf-like form, the branches from the central threads which form the midrib growing out mainly in one plane and forming a lamina, extended right and left of the midrib. Numerous varia- tions and modifications of these forms exist. In all cases, while the internal threads which bear the cortical branches consist of elongated cells with few chromatophores, and no doubt serve mainly for conduction of food substances, the superficial cells of the branches themselves are packed with chromatophores and form the chief assimilating tissue of the plant. In the bulky forms colourless branches frequently grow out from some of the cortical cells, and, pushing among the already-formed threads in a longi- tudinal direction, serve to strengthen the thallus by weaving its original threads together. The cells belonging to any given thread may be recognized at an early stage of growth, because each cell

is connected with its neighbours belonging to the same thread by two depressions or pits, one at each end. The common wall separat- ing the pits of the two adjoining cells is pierced by strands of protoplasm. The whole structure, consisting of the two pits and the wall between is known as a genetic pit. Other pits, connecting cells not belonging to the same branch, are, however, formed at a later stage.

Many of the lower forms of Brown Seaweeds (Phoeophyceae) have a thallus consisting of simple or branched cell threads, as in the green and red forms. The lateral union of the branches to form a solid thallus is not, however, so common, nor is it carried to so high a pitch of elaboration as in the Rhodophyceae. In a few of the lower forms (Sphacelariaceae), and in the higher forms which possess a solid thallus, often of very large size,

the plant-body is no longer formed entirely of branched cell-threads, but consists of what is called a true parenchymatous tissue, i.e. a solid mass of cells, formed by cell division in all directions of space. In the Laminariaceae this tissue is formed by cell division at what is called an intercalary growing point, i.e. a meristematic (cell-dividing) region occupying the whole of a certain transverse zone of the thallus, and cutting off new cells to add to the permanent tissue on both sides. In the Fucaceae, on the other hand, there is a single prismatic apical cell situated at the bottom of a groove at the growing apex of the thallus, which cuts off cells from its sides to add to the peripheral, and from its base to add to the central permanent cells. The whole of the tissue of the plant is formed by the division of this apical cell. In whatever way the tissues are originally formed, however, the main features of their differentiation are the same. According to a law which, as we have seen, applies also to the green and red forms, the superficial cells ?.re packed with chromatophores and form the assimilating tissue (fig. I , F). In these brown types with bodies of considerable thickness (Laminariaceae and Fucaceae), there is, however, a further differentiation of the internal tissues. The cells immediately subjacent to the superficial assimilating layer form a colourless, or nearly colourless, parenchymatous cortex, which acts as a food storage tissue (fig. I , G) , and surrounds a central medulla of elongated conducting cells. The latter are often swollen at the ends, so that the cross-wall separating two successive cells has a larger surface than if the cells were of uniform width along their entire length. Cells of this type are often called trumpet-hyphae (though they have no connexion with the hyphae of Fungi), and in some genera of Laminariaceae those at the periphery of the medulla simulate the sieve-tubes of the higher plants in a striking degree, even (like these latter) developing the peculiar substance callose on or in the perforated cross-walls or sieve-plates. A specialized con- ducting tissue of this kind, used mainly for transmitting organic substances, is always developed in plants where the region of assimilative activity is local in the plant-body, as it is in practically all the higher plants. This is the case in the Fucaceae, and in a very marked degree in the Laminariaceae in question, where the assimilative frond is borne at the end of an extremely long supporting and conducting stipe. A similar state of things exists in some of the more highly differentiated Red, Seaweeds. The tissue developed to meet the demands for conduction in such cases always shows some of the characters described. It is known as leptom, each constituent cell being a leptoid (fig. I , H). In addition to the cell types described, it is a very common occurrence in these bulky forms for rhizoid-like branches of the cells to grow out, mostly from the cells at the periphery of the medulla, and grow down between the cells, strengthening the whole tissue, as in the Rhodophyceae. This process may result in a considerable thickening of the thallus. In many Laminariaceae the thallus also grows regularly in thickness by division of its surface layer,

adding to the subjacent permanent tissue and thus forming a secondary meristem.

The simpler Fungi, like the simpler Green Algae, consist of single cells or simple or branched cell-threads, but among the higher kinds a massive body is often formed, particu- fereatiatton^y in connexion with the formation of spores, and la Fungi this ma Y exhibit considerable tissue-differentiation. A characteristic feature of the fungal vegetative plant- body {mycelium) is its formation from independent coenocytic tubes or cell-threads. These branch, and may be packed or inter- woven to form a very solid structure; but each grows in length independently of the others and retains its own individu- ality, though its growth in those types with a definite external form is of course correlated with that of its neighbours and is subject to the laws governing the general form of the body. Such an independent coenocytic branch or cell-thread is called a hypha. Similar modes of growth occur among the Siphoneous Green Algae and also among the Red Seaweeds. A solid fungal body may usually be seen to consist of separate hyphae, but in some cases these are so bent and closely interwoven that an appearance like that of ordinary parenchymatous tissue is obtained in section, the structure being called pseudoparenchyma. By the formation of numerous cross-walls the resemblance to parenchyma is increased. The surface-layer of the body in the massive Fungi differs in character according to its function, which is not constant throughout the class, as in the Algae, because of the very various conditions of life to which different Fungi are exposed. In many forms its hyphae are particularly thick-walled, and may strikingly resemble

the epidermis of a vascular plant. This is especially the case in the lichens (symbiotic organisms composed of a fungal mycelium in association with algal cells), which are usually exposed to very severe fluctuations in external conditions. The formation of a massive body naturally involves the localization of the absorptive region, and the function of absorption (which in the simpler forms is carried out by the whole of the vegetative part of the mycelium penetrating a solid or immersed in a liquid substratum) is subserved by the outgrowth of the hyphae of the surface-layer of that region into rhizoids, which, like those of the Algae living on soil, resemble the root-hairs of the higher plants. The internal tissue of the body of the solid higher Fungi, particularly the elongated stalks {stipes) of the fructifications of the Agarics, consists of hyphae running in a longitudinal direction, which no doubt serve for the conduction of organic food substances, just as do the " trumpet-hyphae," similar in appearance, though not in origin, of the higher Brown Seaweeds. (In one genus {Lactarius) " milk-tubes," recalling the laticiferous tubes of many vascular plants, are found.) These elongated hyphae are frequently thick-walled, and in some cases form a central strand, which may serve to resist longitudinal pulling

strains. This is particularly marked in certain lichens of shrubby habit. The internal tissues, either consisting of obvious hyphae or of pseudoparenchyma, may also serve as a storehouse of plastic food substances.

Looking back over the progress of form and tissue-differenti- ation in the Thallophyta, we find that, starting from the simplest unicellular forms with no external differentiation of the body, we can trace an increase in complexity of organization every- where determined by the principles of the division of physio- logical labour and of the adaptation of the organism to the needs of its environment. In the first place there is a differentiation of fixing organs, which in forms living on a soft nutrient sub- stratum penetrate it and become absorbing organs. Secondly, in the Algae, which build up their own food from inorganic materials, we have a differentiation of supporting axes from assimilating appendages, and as the body increases in size and becomes a solid mass of cells or interwoven threads, a corresponding differentiation of a superficial assimilative system from the deep-lying parts. In both Algae and Fungi the latter are primarily supporting and food-conducting, and in some bulky Brown Seaweeds, where assimilation is strongly localized, some of the deep cells are highly specialized for the latter func- tion. In the higher forms a storage and a mechanically-strength- ening system may also be developed, and in some aerial Fungi an external protective tissue. The " hyphal " mode of growth, i.e. the formation of the thallus, whatever its external form, by branched, continuous or septate, coenocytic tubes (Siphoneae and Fungi), or by simple or branched cell-threads (Red and many Green Algae), in both cases growing mainly or entirely at the apex of each branch, is almost universal in the group, the exceptions being met with almost entirely among the higher Brown Seaweeds, in which is found parenchyma produced by the segmentation of an apical cell of the whole shoot, or by cell division in some other type of meristem.

Bryophyta. — The Bryophyta [including the Liverworts (Hepaticae) and Mosses (Musci)], the first group of mainly terrestrial plants, exhibit considerably more advanced tissue differentiation, in response to the greater complexity in the conditions of life on land. In a general way this greater complex- ity may be said to consist (i) in the restriction of regular absorp- tion of water to those parts of the plant-body embedded in the soil, (2) in the evaporation of water from the parts exposed to the air (transpiration). But these two principles do not find their full expression till we come, in the ascending series, to the Vascular Plants. In the Bryophytes water is still absorbed, not only from the soil but also largely from rain, dew, &c, through the general surface of the subaerial body (thallus), or in the more differentiated forms through the leaves. The lowest Hepaticae have an extremely simple vegetative structure, little more advanced than

that found in some of the higher Green Algae and very much simpler than in the large Red and Brown Seaweeds. The plant-body (thallus) is always small and normally lives in very damp air, so that the demands of terrestrial life are at a minimum. It always consists of true paren- chyma, and is entirely formed by the cutting off of segments from an apical cell.

Liver- worts.

A sufficient description of the thallus of the liverworts will be found in the article Bryophyta. We may note the universal occurrence on the lower surface of the thallus of fixing and absorbing rhizoids in accordance with the terrestrial life on soil (cf. Oedocladium among the Green Algae). The Marchantiaceae (see article Bryophyta) show considerable tissue-differentiation, possessing a distinct assimilative system of cells, consisting of branched cell threads packed with chloroplasts and arising from the basal cells of large cavities in the upper part of the thallus. These cavities are completely roofed by a layer of cells; in the centre of the roof is a pore surrounded by a ring of special cells. The whole arrangement has a strong resemblance to the lacunae, mesophyll and stomata, which form the assimilative and transpiring (water-evaporating) apparatus in the leaves of flowering plants. The frondose (thalloid) Jungermanniales show no such differentiation of an assimilating tissue, though the upper cells of the thallus usually have more chlorophyll than the rest. In three genera — Blyttia, Symphyogyna and Hymenophytum — there are one or more strands or bundles consisting of long thick- walled fibre-like (prosenchymatous) cells, pointed at the ends and running longitudinally through the thick midrib. The walls of these cells are strongly lignified {i.e. consist of woody substance) and are irregularly but thickly studded with simple pits (see Cytology), which are usually arranged in spirals running round the cells, and are often elongated in the direction of the spiral (fig. I, I). These cells are not living in the adult state, though they sometimes contain the disorganized remains of protoplasm. They serve to conduct water through the thallus, the assimilating parts of which are in these forms often raised above the soil and are comparatively remote from the rhizoid-bearing (water-absorbing) region. Such differentiated water-conducting cells we call hydroids, the tissue they form hydrom. The sporogonium of the liverworts is in the simpler forms simply a spore-capsule with arrangements for the development, protection and distribution of the spores. As such its consideration falls outside the scheme of this article, but in one small and

peculiar group of these plants, the Anthoceroteae, a distinct assimilating and transpiring system is found in the wall of the very long cylindrical capsule, clearly rendering the sporo- gonium largely independent of the supply of elaborated organic food from the thallus of the mother plant (the gametophyte). A richly chlorophyllous tissue with numerous intercellular spaces communicates with the exterior by stomata, strikingly similar to those of the vascular plants (see below). If the axis of such a sporogonium were prolonged downwards into the soil to form a fixing and absorptive root, the whole structure would become a physiologically independent plant, exhibiting in many though by no means all respects the leading features of the sporophyte or ordinary vegetative and spore-bearing individual in Pteridophytes and Phanerogams. These facts, among others, have led to the theory, plausible in some respects, of the origin of this sporophyte by descent from an Anthoceros-like sporogonium (see Pteridophyta). But in the Bryophytes the sporogonium never becomes a sporophyte producing leaves and roots, and always remains dependent upon the gametophyte for its water and mineral food, and the facts give us no warrant for asserting homology (i.e. morphological identity) between the differentiated tissues of an Anthocerotean sporogonium and those of the sporophyte in the higher plants. Opposed to the thalloid forms are the group of leafy Liverworts (Acrogynae), whose plant-body consists of a thin supporting stem bearing leaves. The latter are plates of green tissue one cell thick, while the stem consists of uniform more or less elongated cylindrical cells. The base of the stem bears numerous cell-filaments (rhizoids) which fix the plant to the substratum upon which it is growing.

In the Mosses the plant-body (gametophyte) is always separable into a radially organized, supporting and conducting axis (stem) Mosses a thin, flat, assimilating, and transpiring appendages (leaves). To the base of the stem are attached a number of branched cell-threads (rhizoids) which ramify in the soil, fixing the plant and absorbing water from soil. [For the histology of the comparatively simple but in many respects aberrant Bog-mosses (Sphagnaceae) , see Bryophyta.] The stems of the other mosses resemble one another in their main histological features. In a few cases there is a special surface or epidermal layer, but usually all the outer layers of the stem are composed of brown, thick-walled, lignified, prosenchymatous, fibre-like cells forming a peripheral stereom (mechanical or supporting tissue) which forms the outer cortex. This passes gradually into the thinner-walled parenchyma of the inner cortex. The whole of the cortex, stereom and parenchyma alike, is commonly living, and its cells often contain starch. The centre of the stem in the forms living on soil is occupied by a strand of narrow elongated hydroids, which differ from those of the liverworts in being thin-walled, unlignified, and very seldom pitted (fig. I, J). The hydrom strand has in most cases no connexion with the

leaves, but runs straight up the stem and spreads out below the sexual organs or the foot of the sporogonium. It has been shown that it conducts water with considerable rapidity. In the stalk of the sporogonium there is a similar strand, which is of course not in direct connexion with, but continues the conduction of water from, the strand of the gametophytic axis. In the aquatic, semi-aquatic, and xerophilous

types, where the whole surface of the plant absorbs water, per- petually in the first two cases and during rain in the last, the hydrom strand is either much reduced or altogether absent. In accord- ance with the general principle already indicated, it is only where absorption is localized [i.e. where the plant lives on soil from which it absorbs its main supply of water by means of its basal rhizoids) that a water-conducting (hydrom) strand is developed. The leaves of most mosses are flat plates, each consisting of a single layer of square or oblong assimilating (chlorophyllous) cells. In many cases the cells bordering the leaf are produced into teeth, and very frequently they are thick-walled so as to form a supporting rim. The centre of the leaf is often occupied by a midrib consisting of several layers of cells. These are elongated in the direction of the length of the leaf, are always poor in chlorophyll and form a channel for conducting the products of assimilation away from the leaf into the stem. This is the first indication of a conducting foliar strand or leaf bundle and forms an approach to leptom, though it is not so specialized as the leptom of the higher Phaeophyceae. Associated with the conducting parenchyma are frequently found hydroids identical in character with those of the central strand of the stem, and no doubt serving to conduct water to or from the leaf according as the latter is acting as a transpiring or a water- absorbing organ. In a few cases the hydrom strand is continued into the cortex of the stem as a leaf-trace bundle (the anatomically demonstrable trace of the leaf in the stem). This in several cases runs vertically downwards for some distance in the outer cortex, and ends blindly — the lower end or the whole of the trace being band-shaped or star-shaped so as to present a large surface for the absorption of water from the adjacent cortical cells. In other cases the trace passes inwards and joins the central hydrom strand, so that a connected water-conducting system between stem and leaf is established.

In the highest family of mosses, Polytrichaceae, the differentia- tion of conducting tissue reaches a decidedly higher level. In addition to the water-conducting tissue or hydrom there is a well- developed tissue (leptom) inferred to be a conducting channel for organic substances. This leptom is not so highly differentiated as in the most advanced Laminariaceae, but shows some of the characters of sieve-tubes with great distinctness. Each leptoid is an elongated living cell with nucleus and a thin layer of protoplasm lining the wall (fig. I, K). The whole cavity of the cell is sometimes stuffed with proteid contents. The end of the cell is slightly

swollen, fitting on to the similar swollen end of the next leptoid of the row exactly after the fashion of a trumpet-hypha. The end wall is usually very thin, and the protoplasm on artificial contraction commonly sticks to it just as in a sieve-tube, though no perforation of the wall has been found. Associated with the leptoids are similar cells without swollen ends and with thicker cross-walls. Besides the hydrom and leptom, and situated between them, there is a tissue which perhaps serves to conduct soluble carbohydrates, and whose cells are ordinarily full of starch. This may be called amylom. The stem in this family falls into two divisions, an underground portion bearing rhizoids and scales, the rhizome, and a leafy aerial stem forming its direct upward continuation. The leaf consists of a central midrib, several cells thick, and two wings, one cell thick. The midrib bears above a series of closely set, verti- cal, longitudinally-running plates of green assimilative cells over which the wings close in dry air so as to protect the assimilative and transpiring plates from excessive evaporation of water. The midrib has a strong band of stereom above and below. In its centre is a band-shaped bundle consisting of rows of leptom, hydrom and amylon cells. This bundle is continued down into the cortex of the stem as a leaf-trace, and passing very slowly through the scleren- chymatous external cortex and the parenchymatous, starefcy internal cortex to join the central cylinder. The latter has a central strand consisting of files of large hydroids, separated from one another by very thin walls, each file being separated from its neighbour by stout, dark-brown walls. This is probably homo- logous with the hydrom cylinder in the stems of other mosses. It is surrounded by (i) a thin-walled, smaller-celled hydrom mantle; (2) an amylom sheath; (3) a leptom mantle, interrupted here and there by starch cells. These three concentric tissue mantles are evidently formed by the conjoined bases of the leaf traces, each of which is composed of the same three tissues. As the aerial stem is traced down into the underground rhizome portion, these three mantles die out almost entirely — the central hydrom strand forming the bulk of the cylinder and its elements becoming mixed with thick- walled stereids; at the same time this central hydrom- stereom strand becomes three-lobed, with deep furrows between the lobes in which the few remaining leptoids run, separated from the central mass by a few starchy cells, the remains of the amylom sheath. At the periphery of the lobes are some comparatively thin-walled living cells mixed with a few thin-walled hydroids, the remains of the thin-walled hydrom mantle of the aerial stem. Outside this are three arcs of large cells showing characters typical of the endodermis in a vascular plant; these are interrupted by strands of narrow, elongated, thick-walled cells, which send branches into the little brown scales borne by the rhizome. The surface layer of the rhizome bears rhizoids, and its whole structure strikingly resembles that of the typical root of a vascular plant. In Catharinea

undulata the central h' 'drom cylinder of the aerial stem is a loose tissue, its interstices being filled up with thin-walled, starchy parenchyma. In Dawsonia superba, a large New Zealand moss, the hydroids of the central cylinder of the aerial stem are mixed with thick-walled stereids forming a hydrom-stereom strand some- what like that of the rhizome in other Polytrichaceae.

The central hydrom strand in the seta of the sporogonium of most mosses has already been alluded to. Besides this there is usually a living conducting tissue, sometimes differentiated as leptom, forming a mantle round the hydrom, and bounded ex- ternally by a more or less well-differentiated endodermis, abutting on an irregularly cylindrical lacuna ; the latter separates the central conducting cylinder from the cortex of the seta, which, like the cortex of the gametophyte stem, is usually differentiated into an outer thick-walled stereom and an inner starchy parenchyma. Frequently, also, a considerable differentiation of vegetative.tissue occurs in the wall of the spore-capsule itself, and in some of the higher forms a special assimilating and transpiring organ situated just below the capsule at the top of the seta, with a richly lacunar chlorophyllous parenchyma and stomata like those of the wall of the capsule in the Anthocerotean liverworts. Thus the histo- logical differentiation of the sporogonium of the higher mosses is one of considerable complexity; but there is here even less reason to suppose that these tissues have any homology (phylogenetic community of origin) with the similar ones met with in the higher plants.

The features of histological structure seen in the Bryophytic series are such as we should expect to be developed in response to the exigencies of increasing adaptation to terrestrial life on soil, and of increasing size of the plant-body. In the liverworts we find fixation of the thallus by water-absorbing rhizoids; in certain forms with a localized region of water-absorption the development of a primitive hydrom or water-conducting system; and in others with rather a massive type of thallus the differentia- tion of a special assimilative and transpiring system. In the more highly developed series, the mosses, this last division of labour takes the form of the differentiation of special assimila- tive organs, the leaves, commonly with a midrib containing elongated cells for the ready removal of the products of assimila- tion; and in the typical forms with a localized absorptive region, a well-developed hydrom in the axis of the plant, as well

as similar hydrom strands in the leaf-midribs, are constantly met with. In higher forms the conducting strands of the leaves are continued downwards into the stem, and eventually come into connexion with the central hydrom cylinder, forming a complete cylindrical investment apparently distinct from the latter, and exhibiting a differentiation into hydrom, leptom and amylom which almost completely parallels that found among the true vascular plants. Similar differentiation, differing in some details, takes place independently in the other generation, the sporogonium. The stereom of the moss is found mainly in the outer cortex of the stem and in the midrib of the leaf.

Vascular Plants. — In the Vascular Plants (Pteridophytes, i.e. ferns, horse-tails, club mosses, &c, and Phanerogams or Flowering Plants) the main plant-body, that which we speak of in ordinary language as "the plant," is called the sporophyte because it bears the asexual reproductive cells or spores. The gametophyte, which bears the sexual organs, is either a free-living thallus corresponding in degree of differentiation with the lower liverworts, or it is a mass of cells which always remains enclosed in a spore and is parasitic upon the sporophyte.

The body of the sporophyte in the great majority of the vascular plants shows a considerable increase in complexity over that found in the gametophyte of Bryophytes. The principal new feature in the external conformation of the body is the acquirement of " true " roots, the nearest approach to which in the lower forms we saw in the " rhizome " of Poly-trichaceae. The primary root is a downward prolongation of the primary axis of the plant. From this, as well as from various parts of the shoot system, other roots may originate. The root differs from the shoot in the characters of its surface tissues, in the absence of the green assimilative pigment chloro- phyll, in the arrangement of its vascular system and in the mode of growth at the apex, all features which are in direct relation to its normally subterranean life and its fixative and absorptive

functions. Within the limits of the sporophyte generation the Pteridophytes and Phanerogams also differ from the Bryophytes in possessing special assimilative and transpiring organs, the leaves, though these organs are developed, as we have seen, in the gametophyte of many liverworts and of all the mosses. The leaves, again, have special histological features adapted to the performance of their special functions.

Alike in root, stem and leaf, we can trace a three-fold division of tissue systems, a division of which there are indications among the lower plants, and which is the expression of the fundamental conditions of the evolution of a bulky differ- Tlssue entiated plant-body. From the primitive uniform Systems. mass of undifferentiated assimilating cells, which we may

conceive of as the starting-point of differentiation, though such an undifferentiated body is only actually realized in the thallus of the lower Algae, there is, (i) on the one hand, a specialization of a surface layer regulating the immediate relations of the plant with its surroundings. In the typically submerged Alga and in submerged plants of every group this is the absorptive and the main assimilative layer, and may also by the production of mucilage be of use in the protection of the body in various ways. In the terrestrial plants it differs in the subterranean and subaerial parts, being in the former pre- eminently absorptive, and in the latter protective — provision at the same time being made for the gaseous interchange of oxygen and carbon dioxide necessary for respiration and feeding. This surface layer in the typically subaerial " shoot " of the sporophyte in Pteridophytes and Phanerogams is known as the epidermis, though the name is restricted by some writers, on account of developmental differences, to the surface layer of the shoot of Angiosperms, and by others extended to the surface layer of the whole plant in both these groups. On the other hand, we have (2) an internal differentiation of conducting tissue, the main features of which as seen in the gametophyte of Bryo-phytes have already been fully described. In the Vascular Plants this tissue is collectively known as the vascular system. The remaining tissue of the plant-body, a tissue that we must regard phylogenetically as the remnant of the undifferentiated tissue, of the primitive thallus, but which often undergoes further differentiation of its own, the better to fulfil its characteristically vital functions for the whole plant, is known, from its peripheral position in relation to the primitively central conducting tissue, as (3) the cortex. Besides absorption, assimilation, conduction and protection there is another very important function for which provision has to be made in any plant-body of considerable size, especially when raised into the air, that of support. Special tissues (stereom) may be developed for this purpose in the cortex, or in immediate connexion with the conducting system, according to the varying needs of the particular type of plant-body. The important function of aeration, by which the inner living tissues of the bulky plant-body obtain the oxygen necessary for their respiration, is secured by the development of an extensive system of intercellular spaces communicating with the external

In relation to its characteristic function of protection, the epi- dermis, which, as above defined, consists of a single layer of cells has typically thickened and cuticularized outer walls. „ These serve not only to protect the plant against slight B P'" ermls – mechanical injury from without, and against the entry of smaller parasites, such as fungi and bacteria, but also and especially to prevent the evaporation of water from within.

At intervals it is interrupted by pores [stomata) leading froni the air outside to the system of intercellular spaces below. Each stoma is surrounded by a

pair of peculiarly modified stomata epidermal cells called guard-cells (fig. I , T) , which open and close the pore according to the need for transpiration. The structure of the stomata of the sporophyte of vascular plants is fundamentally the same as that of the stomata on the sporogonium of the true mosses and of the liverwort Anthoceros. Stomata are often situated at the bottom of pits in the surface of the leaf. This arrangement is a method of checking transpiration by creating a still atmosphere above the pore of the stoma, so that water vapour collects in it and diminishes the further outflow of vapour. This type of struc- ture, which is extremely various in its details, is found especially, as we should expect, in plants which have to economize their water

supply. The stomata serve for all gaseous interchange between the plant and the surrounding air. The guard-cells contain chloro- phyll, which is absent from typical epidermal cells, the latter acting as a tissue for water storage. Sometimes the epidermis is consider- ably more developed by tangential division of its cells, forming a many-layered water-tissue. This is found especially in plants which during certain hours of the day are unable to cover the water lost through transpiration by the supply coming from the roots. The water stored in such a time supplies the immediate need of the transpiring cells and prevents the injury which would result from their excessive depletion.

The epidermis of a very large number of species bears hairs of various kinds. The simplest type consists simply of a single elongated cell projecting above the general level of the Hairs. epidermis. Other hairs consist of a chain of cells;

others, again, are branched in various ways; while yet others have the form of a flat plate of cells placed parallel to the leaf surface and inserted on a stalk. The cells of hairs may have living con- tents or they may simply contain air. A very common function of hairs is to diminish transpiration, by creating a still atmosphere between them, as in the case of the sunk stomata already mentioned. But hairs have a variety of other functions. They may, for instance, be glandular or stinging, as in the common stinging nettle, where the top of the hair is very brittle, easily breaking off when touched. The sharp, broken end penetrates the skin, and into the slight wound thus formed the formic acid contained by the hair is injected.

Mention may be made here of a class of epidermal organ, the hydathodes, the wide distribution and variety of which have been revealed by recent research. These are special organs, Hydathodes. usua liy situated on foliage leaves, for the excretion of water in liquid form when transpiration is diminished so that the pressure in the water-channels of the plant has come to exceed a certain limit. They are widely distributed, but are particularly abundant in certain tropical climates where active root absorption goes on while the air is nearly saturated with water vapour. In one type they may take the form of specially-modified single epidermal cells or multicellular hairs without any direct connexion with the vascular system. The cells concerned, like all secreting organs, have abundant protoplasm with large nuclei, and sometimes, in addition, part of the cell-wall is modified as a filter. In a second type they are situated at the ends of tracheal strands and consist of groups of richly protoplasmic cells belonging to the epidermis (as in the leaves of many ferns), or to the subjacent tissue (the commonest type in flowering plants); in this last case the cells in question are known as epithem. The epithem is penetrated by a network of fine intercellular spaces, which are normally filled with water and debouch on one or more intercellular cavities below the "epidermis. Above each cavity is situated a so-called water-stoma, no doubt derived phylogenetically from an ordinary stoma, and enclosed by guard-cells which have nearly or entirely lost the

power of movement. The pores of the water-stomata are the outlets of the hydathode. The epithem is frequently surrounded by a sheath of cuticularized cells. In other cases the epithem may be absent altogether, the tracheal strand debouching directly on the lacunae of the mesophyll. This last type of hydathode is usually situated on the edge of the leaf. Some hydathodes are active glands, secreting the water they expel from the leaf. [Many other types of glands also exist, either in connexion with the epidermis or not, such as nectaries, digestive glands, oil, resin and mucilage glands, &c. They serve the most various purposes in the life of the plant, but they are not of significance in relation to the primary vital activities, and cannot be dealt with in the limits of the present article.] The typical epidermis of the shoot of a land plant does not absorb water, but some plants living in situations where they cannot depend on a regular supply from the roots (e.g. epiphytic plants and desert plants) have absorptive hairs or scales on the leaf epidermis through which rain and dew can be absorbed. Some hydathodes also are capable of absorbing as well as excreting water.

The surface layer of the root, sometimes included under the term epidermis, is fundamentally different from the epidermis of the stem. In correspondence with its water-absorbing Epidermis f unc tj on it j s no t cuticularized, but remains usually thin- of Root. wa]l e d ; the absorbing surface is increased by its cells being produced into delicate tubes which curl round and adhere firmly to particles of soil, thus at once fixing the root firmly in the soil, and enabling the hair to absorb readily the thin films of water ordinarily surrounding the particles (fig. I, U). The root-hair ends blindly and is simply an outgrowth from a surface cell, having no cross-

walls. It corresponds in function with the rhizoid of a Bryophyte. At the apex of a root, covering and protecting the delicate tissue of the growing point, is a special root-cap consisting of a number of layers of tissue whose cells break down into mucilage towards the outer surface, thus facilitating the passage of the apex as it is pushed between the particles of soil.

The cortex, as has been said, is in its origin the remains of the

primitive assimilating tissue of the plant, after differentiation

of the surface layer and the conducting system. It

Cortex. consists primitively of typical living parenchyma; but

its differentiation may be extremely varied, since in the complex

bodies of the higher plants its functions are numerous. In all green plants which have a special protective epidermis, the cortex of the shoot has to perform the primitive fundamental function of carbon assimilation. In the leafy shoot this function is mainly localized in the cortical tissue of the leaves, known as mesophyll, mesophyll. which is essentially a parenchymatous tissue containing chloroplasts, and is penetrated by a system of intercellular spaces so that the surfaces of the assimilating cells are brought into contact with air to as large an extent as possible, in order to facilitate gaseous interchange between the assimilating cells and the atmosphere. At the same time the cells of the mesophyll are transpiring cells — i.e. the evaporation of water from the leaf goes on from them into the intercellular spaces. The only pathways for the gases which thus pass between the cells of the mesophyll and the outside air are the stomata. A land plant has nearly always to protect itself against over-transpiration, and for this reason the stomata of the typical dorsiventral leaf (fig. 2, A), which has distinct upper and lower faces, are placed mainly or exclusively on the lower side of the leaf, where the water vapour that escapes from them, being lighter than air, cannot pass away from the surface of the leaf, but remains in contact with it and thus tends to check further transpiration. The stomata are in direct communication with the ample system of intercellular spaces which is found in the loosely arranged mesophyll (spongy tissue) on that side. This is the main transpiring tissue, and is protected from direct illumination and consequent too great evaporation. The main assimilating tissue, on the other hand, is under the upper epidermis, where it is well illuminated, and consists of oblong cells densely packed with chloroplasts and with their long axes perpen- dicular to the surface (palisade tissue). The intercellular spaces are here very narrow channels between the palisade cells. Leaves whose blades are normally held in a vertical position possess palisade tissue and stomata on both sides

(isobilateral leaves) (fig. 2, B), since there is no difference in the illumination and other external conditions,

Fig. 2. — Transverse Sections of Leaves.

A , Dorsiventral leaf. B, Isobilateral leaf.

ep, epidermis; si, stoma; mes, mesophyll; pal, palisade; spo, spongy tissue;

i.sp, intercellular space; w.t. , water tissue; x, xylem; ph, phloem;

phlt, phloeoterma; scl, sclerenchyma.

while those which are cylindrical or of similar shape (centric leaves) have it all round. The leaves of shade plants have little or no differentiation of palisade tissue. In fleshy leaves which contain a great bulk of tissue in relation to their chlorophyll content, the central mesophyll contains little or no chlorophyll and acts as water- storage tissue. The cortex of a young stem is usually green, and plays a more or less important part in the assimilative function. It also always possesses a well-developed lacunar system communicating with the external air through stomata (in the young stem) or lenticels (see below). This lacunar system not only enables the cells of the cortex itself to respire, but also forms channels through which air can pass to the deeper lying tissues. The cortex of the older stem of the root frequently acts as a reserve store-house for food, which generally takes the form of starch, and it also assists largely in providing the stereom of the plant. In the leaf-blade this sometimes appears as a layer of thickened subepidermal cells, the hypoderm, often also as subepidermal bundles of sclerenchymatous fibres, or as similar bundles extending right across the leaf from one epidermis to the other and thus acting as struts. Isolated cells (idioblasts) , thickened in various ways, are not uncommonly found supporting the tissues of the leaf. In the larger veins of the leaf, especially in the midrib, in the petiole, and in the young stem, an extremely frequent type of mechanical tissue is collenchyma. This consists of elongated cells with cellulose walls, which are locally thickened along the original corners of the cells, reducing the lumen to a cylinder, so that a number of vertical pillars of cellulose con- nected by comparatively thin walls form the framework of the tissue. This tissue remains living and is usually formed quite early, just below the epidermis, where it provides the first peripheral support for a still growing stem or petiole. Sclerenchyma may be formed later in various positions in the cortex, according to local needs, Scattered single stereids or bundles of fibres are not uncommon in the cortex of the root.

Phloeo- terma.

The innermost layer of the cortex, abutting on the central cylinder of the stem or on the bundles of the leaves, is called the phloeoterma, and is often differentiated. In the leaf- blade it takes the form of special parenchymatous sheaths to the bundles. The cells of these sheaths are often distinguished from the rest of the mesophyll by containing little or no chlorophyll. Occasionally, however, they are par- ticularly rich in chloroplasts. These bundle sheaths are important in the conduction of carbohydrates away from the assimilating cells to other parts of the plant. Rarely in the leaf, frequently in the stem (particularly in Pteridophytes), and universally in the root, the phloeoterma is developed as an endodermis (see below). In other cases it does not differ histologically from the parenchyma of the rest of the cortex, though it is often dis- tinguished by containing particularly abundant starch, in which case it is known as a starch sheath.

One of the most striking characters common to the two highest groups of plants, the Pteridophytes and Phanerogams, is the v / – possession of a double (hydrom-leptom) conducting S tern system, such as we saw among the highest mosses, ■ˆ s ‘ but with sharply characterized and peculiar features, probably indicating common descent throughout both these groups. It is confined to the sporophyte, which forms the leafy plant in these groups, and is known as the vascular system. Associated with it are other tissues, consisting of parenchyma, mainly starchy, and in the Phanerogams particularly, of special stereom. The whole tissue system is known as the stelar system (from the way in which in primitive forms it runs through the whole axis of the plant in the form of a column). The stelar system of Vascular Plants has no direct phylogenetic connexion with that of the mosses. The origin of the Pteridophyta (q.v.) is very obscure, but it may be regarded as certain that it is not to be sought among the mosses, which are an extremely specialized and peculiarly differentiated group. Furthermore, both the hydrom and leptom of Pteridophytes have marked peculiarities to which no parallel is to be found among the Bryophytes. Hence we must conclude that the conduct- ing system of the Pteridophytes has had an entirely separate evolution. All the surviving forms, however, have a completely established double system with the specific characters alluded to, and since there is every reason to believe that the condi- tions of evolution of the primitive Pteridophyte must have been essentially similar to those of the Bryophytes, the various stages in the evolution of the conducting system of the latter (p. 732) are very useful to

compare with the arrangements met with in the former.

The hydroid of a Pteridophyte or of a Phanerogam is character- istically a dead, usually elongated, cell containing air and water, and _. either thin-walled with lignified (woody) spiral (fig. 1, P.)

Elements or annu ‘ ar thickenings, or with thick lignified walls, in-completely perforated by pits (fig. 1, Q.) (usually bordered pits) of various shapes, e.g. the pits may be separated by a network of thickenings w-hen the tracheid is reticulate or they may be trans- versely elongated and separated by bars of thickening like the rungs of a ladder (scalariform thickening). When, in place of a number of such cells called tracheids, we have a continuous tube with the same kind of wall thickening, but composed of a number of cells whose cross walls have disappeared, the resulting structure is called a vessel. Vessels are common in the Angiospermous group of Flower- ing Plants. The scalariform hydroids of Ferns (fig. 1, N.) have been quite recently shown to possess a peculiar structure. The whole of the middle lamella or originally formed cell-wall separating one from another disappears before the adult state is reached, so that the walls of the hydroids consist of a framework of lignified bars with open communication between the cell cavities. The tracheids or vessels, indifferently called tracheal elements, together with the immediately associated cells (usually amylom in Pteridophytes) constitute the xylem of the plant. This is a morphological term given to the particular, type of hydrom found in both Pteridophytes and Phanerogams, together with the parenchyma or stereom, or both, included within the boundaries of the hydrom tissue strand. The leptoid of a Pteridophyte (fig. 1, O.) is also an elongated cell, with a thin lining of protoplasm, but destitute of a nucleus, and always in communication with the next cell of the leptom strand by perforations (in Pteridophytes often not easily demonstrable), through which originally pass strings of protoplasm which are bored out by a ferment and converted into relatively coarse ” slime strings,” along which pass, we must suppose, the organic substances which it is the special function of the leptoids to conduct from one part of the plant to another. The peculiar substance called callose, chemically allied to cellulose, is frequently formed over the surface of the perforated end-walls. The structure formed by a number of such cells placed end to end is called a sieve-tube (obviously comparable with a xylem-vessel), and the end-wall or area of end- wall occupied by a group of perforations, a sieve-plate. When the sieve- tube has ceased to function and the protoplasm, slime strings, and callose have disappeared, the perforations through which the slime strings passed are left as relatively large holes, easily visible in some cases with low powers of the microscope, piercing the sieve-plate. The sieve-tubes, with their accompanying paren- chyma or stereom, constitute the tissue called phloem. This is

the term for a morphologically defined tissue system, i.e. the leptom found in Pteridophytes and Phanerogams with its associated cells, and is entirely parallel with the xylem. The sieve-tubes differ, however, from the tracheids in being immediately associated, apparently constantly, not with starchy parenchyma, but with parenchymatous cells, containing particularly abundant proteid contents, which seem to have a function intimately connected with the conducting function of the sieve-tubes, and which we may call proteid-cells. In the Angiosperms there are always sister- cells of sieve-tube segments and are called companion-cells (fig- 1, R-).

*The xylem and phloem are nearly always found in close asso- ciation in strands of various shapes in all the three main organs of the sporophyte — root, stem and leaf — and form a connected tissue-system running through the whole body. In the primary axis of the plant among Pteridophytes and many Phanerogams, at any rate in its first formed part, the xylem and phloem are associated in the form of a cylinder (stele), with xylem occupying the centre, and the phloem (in the upward-growing part or primary stem) forming a mantle at the periphery (fig. 4). In the downward growing part of the axis (primary root), Arrange- however, the peripheral mantle of phloem is interrupted, ™. ~f. the xylem coming to the surface of the cylinder t J a ˆ t along (usually) two or (sometimes) more vertical lines. „ e ,,*j ‘ r * Such an arrangement of vascular tissue is called radial, ■ and is characteristic of all roots (figs. 3 and 10). The cylinder is sur- rounded by a mantle of one or more layers of parenchymatous cells, the pericycle, and the xylem is generally separated from the phloem in the stem by a similar layer, the mesocycle (corresponding with the amylom sheath in mosses). The pericycle and mesocycle together form the conjunctive tissue of the stele in these simplest types. When the diameter of the stele is greater, parenchymatous conjunc- tive tissue often occupies its centre and is frequently called the pith. In the root the mesocycle, like the phloem, is interrupted, and runs into the pericycle where the xylem touches the latter (fig. 3). The whole cylinder is enclosed by the peculiarly differentiated innermost cell-layer of the cortex, known as the endodermis. This layer has its cells closely united and sealed to one another, so to speak, by the conversion of the radial and transverse walls (which separate each cell from the other cells of the layer), or of a band running in the centre of these, into corky substance (fig. 1, v.), so that the endodermal cells cannot be split apart to admit of the formation of intercellular spaces, and an air-tight sheath is formed round the cylinder. Such a vascular cylinder is called a haplostele, and the axis containing it is said to be haplostelic. In the stele of the root the strands of tracheids along the lines where the xylem touches the pericycle are spiral or annular, and are the xylem elements first formed when the cylinder is developing. Each strand of spiral or annular first-formed tracheids is called a protoxylem strand, as distinct from the*

metaxylem or rest of the xylem, which consists of thick-walled tracheids, the pits of which are often scalari- form. The thin-walled spiral or annular tracheae of the protoxylem allow of longitudinal stretching brought about by the active growth in length of the neighbouring living parenchymatous cells of a grow- ing organ. During the process the thin walls are stretched and the turns of the spiral become pulled apart without rupturing the wall of the tracheid or vessel. If the pitted type of tracheal element were similarly stretched its continuously thickened walls would resist the stretching and eventually break. Hence such tracheae are only laid down in organs whose growth in length has ceased. The stele is called monarch, diarch, . . . polyarch according as it contains one, two, ... or many protoxylems. When the proto- xylem strands are situated at the periphery of the stele, abutting on the pericycle, as in all roots, and many of the more primitive Pteridophyte stems, the stele is said to be exarch. When there is a single protoxylem strand in the centre of the stele, or when, as is more commonly the case, there are several protoxylem strands situated at the internal limit of the xylem, the centre of the stem being occupied by parenchyma, the stele is endarch. This is the case in the stems of most Phanerogams and of some Pteridophytes. When the protoxylems have an intermediate position the stele is mesarch (many Pteridophytes and some of the more primitive Phanerogams). In many cases externa! protophloem, usually con- sisting of narrow sieve-tubes often with swollen walls, can be distinguished from metaphloem.

*As the primitive stele of a Pteridophyte is traced upwards from the primary root into the stem, the phloem becomes con- tinuous round the xylem. At the same time the p . stele becomes more bulky, all its elements increas- ,? h ” ” ing in number (fig. 4). Soon a bundle goes off to ° * e . the first leaf. This consists of a few xylem elements, ~f ‘,° a segment of phloem, pericycle, and usually an arc of D <. v*

that of the amphiphloic haplostele, is maintained throughout the adult stem (Lindsaya). In the majority of ferns, at a higher level, after the stele has increased greatly in diameter, a large-celled true pith or medulla, resembling the cortex in its characters, and quite distinct from conjunctive, from which it is separated by an internal endodermis, appears in the centre. These successive new tissues, appearing in the centre of the stele, as the stem of a higher fern is traced upwards from its first formed parts, are all in con- tinuity with the respective corresponding external tissues at the

point of origin of each leaf trace (see below). Where internal phloem is present this is separated from the internal endodermis by an endocycle or " internal pericycle," as it is sometimes called, and from the xylem by an internal mesocycle — these two layers, together with the outer mesocycle and pericycle, constituting the conjunctive tissue of the now hollow cylindrical stele. (The conjunctive frequently forms a connected whole with bands of

axis. The type of siphonostele characteristic of many ferns, in which are found internal phloem, and an internal endodermis separating the vascular conjunctive from the pith, is known as a solenostele. The solenostele of the ferns is broken by the departure of each leaf-bundle, the outer and inner endodermis joining so that the stele becomes horseshoe-shaped and the cortex continuous with the pith (fig. 6). Such a break is known as a leaf-gap. A little above the departure of the leaf-bundle the stele again closes up, only to be again broken by the departure of the next leaf-bundle. Where the leaves are crowded, a given leaf-gap is not closed before the next ones appear, and the solenostele thus becomes split up into a number of segments, sometimes band-shaped or semilunar, sometimes isodiametric in cross-section (fig. 7). In the latter case each flfc(„„ (■ segment of the solenostele frequently resembles a '

haplostele, the segments of inner endodermis, pericycle, phloem and

Figs. 3-15. — Types of Stele in Vascular Plants. FlO. 3. — Diarch stele of root of a Fem. Fig. 4. — Haplostele of stem of young Fern. Fig. 5. — Amphiphloic haplostele of stem of young Fern. Fig. 6. — Solenostele of stem of Fern showing detachment of leaf-trace and leaf-gap. Fig. 7. — Dictyostele of Fern. Fig. 8. — Tricyclic solenostele of Matonia. Fig. 9. — Tricyclic dictyostele of Datuea. Fig. 10. — Diarch haplostele of Selaginella. Fig. 11. — Tristelic stem of Selaginella. Fig. 12. — Modified haplostele of Lycopodium. Fig. 13. — Typical siphonostele of dicotyledon. Fig. 14. — Stele of monocotyledon. Fig. 15. — Polyarch root of Veralrum (a monocotyledon).

Explanation of Lettering: st. stele; msi. meristele; Lt. leaf-trace; l.g. leaf-gap; cor. cortex; p.t. peristelar tissue; pj. peristelar lacuna; end. endodermis; p.c. passage cell; per. pericycle; ph. phloem; mes. mesocycle; x. xylem; px. protoxylem; mx. metaxylem; p. pith; set. p. sclerised pith; c. cambium; p.m.r. primary, medullary, ray.

starchy xylem-parenchyma, which, when the xylem is bulky, usually appear among the tracheids, the phloem also often being pene- trated by similar bands of phloem-parenchyma.)

In the other groups of Pteridophytes internal phloem is not found and an internal endodermis but rarely. The centre of the StohoDo- ste ‘ e i s . however often occupied by a large-celled pith July. ” resem bling the cortex in structure, the cortex and pith together being classed as ground tissue. To this type of stele having a ” ground-tissue pith,” whether with or without internal phloem, is given the name siphonostele to distinguish it from the solid haplostele characteristic of the root, the first-formed portion of the stem, and in the more primitive Pteridophytes, of tile Wtioie of the

mesocycle joining with the corresponding outer segments to form a nearly concentric structure. For this reason a stem in which the vascular system has this type of structure used to be spoken of as polystelic, the term ” stele ” being transferred from the primary central cylinder of the axis and applied to the vascular strands just described. In this use the term loses, of course, its morpho- logical value, and it is better to call such a segment of a broken-up stele a meristele, the whole solenostele with overlapping leaf-gaps being called a dictyostele. The splitting up of the vascular tube into separate strands does not depend wholly upon the occurrence of leaf -gaps. In some forms other gaps (perforations) appear in the vascular tube placing the pith and cortex in communication.

In other cases the leaf-gaps are very broad and long, the meristeles separating them being reduced to comparatively slender strands, while there is present in each gap a network of fine vascular threads, some of which run out to the leaf, while others form cross-connexions between these ” leaf-trace ” strands and also with the main cauline meristeles. Finally the cauline meristeles themselves may be resolved into a number of fine threads. Such a structure may be spoken of as a dissected dictyostele.

In some solenostelic ferns, and in many dictyostelic ones additional vascular strands are present which do not form part of the primary vascular tube. They usually run freely in the pith and Polycycly. —ˆ t j ie p r ; mar y tu b e in the neighbourhood of the leaf-gaps. Sometimes a complete internal vascular cylinder, having the same structure as the primary one, and concentric with it, occurs in the pith, and others may appear, internal to the first (Matonia, Saccoloma) . Junctions of the first internal cylinder are made with the primary (external) cylinder at the leaf-gaps, and of the second internal cylinder with the first in the same neighbourhood (fig. 8). In dictyostelic ferns similar internal (dicty- ostelic)

cylinders are found in some forms, and occasionally a large series of such concentric cylinders is developed (Marattiaceae) (fig. 9). In such cases the vascular system is said to be polycyclic in contrast with the ordinary monocyclic condition. These internal strands or cylinders are to be regarded as peculiar types of elaboration of the stele, and probably act as reservoirs for water-storage which can be drawn upon when the water supply from the root is deficient.

The vascular supply of the leaf (leaf-trace) consists of a single strand only in the haplostelic and some of the more primitive siphonostelic forms. In the " microphyllous " groups rfo« C ^ °^ Pteridophytes (Lycopodiales and Equisetales) in anapetioiar w j,ich the leaves are small relatively to the stem, the ran single bundle destined for each leaf is a small strand

whose departure causes no disturbance in the cauline stele. In the " megaphyllous " forms, on the other hand, (Ferns) whose leaves are large relatively to the stem, the departure of the correspondingly large trace causes a gap (leaf-gap) in the vascular cylinder, as already described. In the haplostelic ferns the leaf-trace appears as a single strand with a tendency to assume the shape of a horse- shoe on cross-section, and this type is also found in the more primi- tive solenostelic types. In the more highly developed forms, as already indicated, the leaf-trace is split up into a number of strands which leave the base and sides of the leaf gap independently. In the petiole these strands may increase in number by branching, and though usually reducible to the outline of the primitive " horse shoe," more or less elaborated, they may in some of the complex polycylic dictyostelic types (Marattiaceae) be arranged in several concentric circles, thus imitating the arrangement of strands formed in the stem. The evolution of the vascular structure of the petiole in the higher ferns is strikingly parallel with that of the stem, except in some few special cases.

There is good reason to believe that the haplostele is primitive in the evolution of the vascular system. It is found in most of _ a 1 f those Pteridophytes which we have other reasons for " r e considering as primitive types, and_ essentially the same

" H ? gen}r type is found, as we have seen, in the independently p developed primitive conducting system of the moss-

Phylogeny. stem _ This type of stem is therefore often spoken of as protostelic. In the Ferns there is clear evidence that the amphiphloic haplostele or protostele succeeded the simple (ecto- phloic) protostele in evolution, and that this in its turn gave rise to the solenostele, which was again succeeded by the dictyostele. Polycycly was derived independently

from monocycly in soleno- stelic and in dictyostelic forms. In the formation of the stem of any fern characterized in the adult condition by one of the more advanced types of vascular structure all stages of increase in complexity from the haplostele of the first-formed stem to the par- ticular condition characteristic of the adult stem are gradually passed through by a series of changes exactly parallel with those which we are led to suppose, from the evidence obtained by a comparison of the adult forms, must have taken place in the evolution of the race. There is no more striking case in the plant- kingdom of the parallel between ontogeny (development of the individual) and phylogeny (development of the race) so well known in many groups of animals.

The stele of most Lycopods is a"more or less modified protostele, but in the genus Lycopodium a peculiar arrangement of the xylem and phloem is found, in which the latter, instead of being confined to a peripheral mantle of tissue, forms bands running across the stele and alternating with similar m rw" S bands of xylem (fig. 12). In Selaginella the stelar system ." °~ shows profounder modifications. In some forms we find p ytes. a s ; m p[e protostele, exarch-polyarch in one species

(S. spinosa), exarch-diarch in several (fig. 10). In other species, how- ever, a peculiar type of polystely is met with, in which the original diarch stele gives rise to so-called dorsal and ventral stelar " cords " which at first lie on the surface of the primary stele, but eventually, at a higher level separate from it and form distinct " secondary " steles resembling the primary one. Similar cords may be formed on, and may separate from, these secondary steles, thus giving rise

to a series of steles arranged in a single file (fig. 11). In the creeping stem of one species (S. Lyallii) a polycyclic solenostele is found exactly parallel with that of the rhizome of ferns. The gaps in the outer tubular stele, however, are formed by the departure of aerial branch-traces, instead of leaf-traces as in the ferns. The first formed portion of the stem in all species of Selaginella which have been investigated possesses an exarch haplostele. The stele of Equisetum is of a very peculiar type whose relations are not completely clear. It consists of a ring of endarch collateral bundles, surrounding a hollow pith. The protoxylem of each is a leaf- trace, while the metaxylem consisting of a right and a left portion forms a quite distinct cauline system. All the metaxylems join at the nodes into a complete ring of xylem. The whole stele may be surrounded by a common external endodermis; sometimes there is an internal endodermis in addition,

separating the bundles from the pith ; while in other cases each bundle possesses a separate endodermis surrounding it. At the nodes the relation of the endodermis to the bundles undergoes rather complex but definite changes. It is probable that this type of stele is a modification of a primitive protostele, in which the main mass of stelar xylem has become much reduced and incidentally separated from the leaf- traces.

*During recent years a number of fossil (Carboniferous and Permian) plants have been very thoroughly investigated in the light of modern anatomical knowledge, and as a result it has become „ . . _ clear that in those times a large series of plants existed e ar . £ s ‘ _ intermediate in structure between the modern ferns f”J„? yc *’ and the modern Gymnosperms (especially Cycads), s ”*

and to these the general name ” Cycadofilices ” has been applied. We now know that many at least of the Cycadofilices bore seeds, of a type much more complex than that of most modern seed plants, and in some cases approximating to the seeds of existing Cycads. Among the Cycadofilices a series of stages is found leading from the primitive fern-protostele to the type of siphono- stele characteristic of the Cycads which agrees in essentials in all the Spermophytes. The main events in this transition appear to have been (1) disappearance of the central xylem of the proto- stele and replacement by pith, leading to the survival of a number of (mesarch) collateral bundles (see below) at the periphery of the stele; (2) passage from mesarchy to endarchy of these bundles cor- related with a great increase in secondary thickening of the stele. The leaves of the more primitive members of this series were entirely fern-like and possessed a fern-like vascular strand ; while in the later members, including the modern Cycads, the leaf bundles, remaining unaffected by secondary thickening, are mesarch, while those of the stem-stele have become endarch. Besides the types forming this series, there are a number of others (Medulloseae and allied forms) which show numerous, often very complex, types of stelar structure, in some cases polystelic, whose origin and relationship with the simpler and better known types is frequently obscure. Among the existing Cycads, though the type of vascular system conforms on the whole with that of the other existing seed-plants, peculiar structures are often found (e.g. indications of polystely, frequent occurrence of extra-stelar concentric bundles, ” anomalous ” secondary thicken- ing) which recall these complex types of stelar structure in the fossil Cycadofilices.

The typical structure of the vascular cylinder of the adult primary stem in the Gymnosperms and Dicotyledons is, like that of the higher ferns, a hollow cylinder of vas- structure ot cular tissue enclosing a central parenchymatous pith. ... » e i e ._ But, unlike the ferns, there is in the seed-plants no in- _ . . . ternal phloem (except as a special development in e – P

” »• certain families) and no internal endodermis. The xylem and phloem also, rarely form perfectly continuous layers as they do in a soleno- stelic fern. The vascular tissue is typically separable into distinct collateral bundles (figs. 13, 23), the xylem of which is usually wedge- shaped in cross-section with the protoxylem elements at the inner extremity, while the phloem forms a band on the outer side of the xylem, and separated from it by a band of conjunctive’ tissue (mesodesm). These collateral bundles are separated from one another by bands of conjunctive tissues called primary medullary rays, which may be quite narrow or of considerable width. When the pith is large celled, the xylems of the bundles are separated from it by a distinct layer of conjunctive tissue called the endocycle, and a similar layer, the pericycle, separates the phloem from the cortex. The inner layer of the cortex {phloeoterma) may form a well-marked endodermis, or differ in other ways from the rest of the cortex. The pericycle, medullary rays, endocycle and mesoderm all form parts of one tissue system, the external conjunctive, and are only topographically separable. The external conjunctive is usually a living comparatively small-celled tissue, whose cells are consider- ably elongated in the direction of the stem-axis and frequently contain abundant starch. Certain regions of it, particularly the whole or part of the pericycle, but sometimes also the endocycle, are typically converted into thick-walled hard (sclerenchymatous) tissue usually of the prosenchymatous (fibrous) type, which is important in strengthening the stem, particularly in enablingit to resist bending strains. The relatively peripheral position in the stem of the pericycle is important in this connexion. Various secondary meristems (see p. 741) also arise in the external conjunctive.

Most of the collateral bundles of this spermophytic type of siphonostele are leaf-trace bundles, i.e. they can be traced upwards from any given point till they are found to pass out of the cylinder, travel through the cortex of the stem and enter a leaf. The remaining bundles (compensation bundles) which go to make up the cylinder are such as have branched off from the leaf-traces, and will, after joining with others similarly given off, themselves form the traces of leaves situated at a higher level on the stem. Purely cauline vascular strands (i.e. confined to the stem) such as are found in the dictyosteles of ferns are rare in the flowering plants. The leaf trace of any given leaf rarely consists of a single bundle only (unifascicular) ; the number of bundles of any given trace is always odd; they may either be situated all together before they leave the stele or they may be distributed

at intervals round the stele. The median bundles of the trace are typically the largest, and at any given level of the stem the bundles destined for the next leaf above are as a whole larger than the others which are destined to supply higher leaves. Leaf-gaps are formed in essentially the same way as in the ferns, but when in the case of a plurifascicular trace the bundles are distributed at intervals round the cylinder it is obvious that several gaps must be formed as the different bundles leave the stele. The gaps, are, however, often filled as they are formed by the development of external conjunctive tissue immediately above the points at which the bundles begin to bend out of the stele, so that sharply defined open gaps such as occur in fern-steles are bift rarely met with in flowering plants. The con- stitution of the stele of a flowering plant entirely from endarch collateral bundles, which are either themselves leaf-traces or will form leaf-traces after junction with other similar bundles, is the great characteristic of the stem-stele of flowering plants. These collateral bundles are obviously highly individualized. The external conjunctive tissue is often arranged in relation to each bundle sepa- rately, the pericyclic fibres for instance, already referred to, being often confined to the bands of pericyclic tissue abutting on the phloem of each bundle, while the cortex and pith frequently form rays in the intervals between the adjacent bundles.

In some cases this individualization is carried further, the cortex and pith becoming continuous between the bundles which appear

, as isolated strands em- Aberraat Types ot Stele in Angfo sperms.*

external

tissue with

as

bedded in a general ground-tissue. Each bundle has its own investment of corresponding conjunctive, and now called peridesm. The bundles some- times keep their arrangement in a ring corresponding with the stele, though the continuous cylin- der no longer exists (species of Ranunculus). This condition is known as astely. In some astelic stems (Nymphaeaceae) the number of bundles is greatly increased and they are scattered throughout the ground tissue. A " polystelic " con- dition arises in some members of this order by the association of collateral bundles round common centres. A similar phenomenon is seen in two widely separated genera of flower- ing plants: Primula § Auricula and Gunnera (Halorageae).

The monocotyledons, one of the primary divisions of angiosperms, „ typically possess large

Monocoty. leaves with broad

sheathing bases contain- ing a very great number of bundles. This results in the number of bundles present at any

t. . ,~ . given level of the stem being enor-

Transverse section of^the mougly lncreased . These g und l es

are scattered in a definite though not superficially obvious order through the conjunctive tissue of the stele, which occupies nearly the whole i.v. Sieve-tubes with accompanying com- diameter of the stem, the cortex panion-cells being reduced to a very narrow

scl.p. Sclenxed peridesm. , ° _,. . ■>.. .

*Surrounding parenchyma. Outer layer, or disappearing altogether cells a of the bundle are parenchy- (fig. 3). The mass of Conjunctive matous > marks the inner side of t ; ssue ; s developed as a large-celled the bundle. * , , . . s , , & , ,*

ground-tissue, and round each

bundle there is a " peridesm " which is often fibrous (fig. 16). It is possible to suppose that this con- dition is derived from the astelic condition already referred to, but the evidence on the whole leads to the conclusion that it has arisen by an increase in the number of the bundles within the stele, the individuality of the bundle asserting itself after its escape from the original bundle-ring of the primitive cylinder.

ledoaous Type.

(Sachs.)

Fig. 16. closed vascular bundle of cotyledon.

f . Annular vessel. s. Spiral vessel. i. Inter-cellular canal.

g. Pitted vessel

*In the stems of many water-plants various stages of reduction of the vascular system, especially of the xylem, are met with, and very often this reduction leads to the formation of a compact stele in which the individuality of the separate * ^.. bundles may be suppressed, so that a closed cylinder j-y%° s e of xylem surrounds a pith. The phloem is generally unreduced, and there is normally a well marked endodennis (fig. 17).*

Fig. 1 7. — Transverse section of the stele of the stem of a water-plant (Naias) ; I. intercellular channel representing xylem; ph. phloem; e. endodennis.

In other cases the reduction goes much further, till the endodermis eventually comes to surround nothing but an intercellular channel formed in place of the stelar tissue.

In the blade of a typical leaf of a vascular plant — essentially a thin plate of assimilating tissue — the vascular system takes the form of a number of separate, usually branching and anastomosing strands. These, with their associated stereom, form a kind of framework which is of great importance in supporting the mesophyll; but also, and chiefly, they provide a number of channels, pene- trating every part of the leaf, along which water and dissolved salts are conveyed to, and elaborated food-substances from, > the mesophyll cells. The bundle-system is of course continuous with that of the petiole and stem. The leaf-bundles are always J° collateral (the phloem being turned down- wards and the xylem upwards), even in Ferns, where the petiolar strands are con- centric, and they have the ordinary meso- desm and peridesm of the collateral bundle. The latter is often sclerized, especially opposite the phloem, and to a less extent opposite the xylem, as in the stem. As a bundle is traced towards its blind termination in the mesophyll the peridesmic stereom first disappears, the sieve-tubes of the phloem are replaced by narrow elongated parenchyma cells, which soon die out, and the bundle ends with a strand of tracheids covered by the phloeo- termic sheath.

The structure of the stele of the primary root as it is found in most Pteridophytes and many Phanerogams has been already described. The radial structure is char- acteristic of all root-steles, which have in essential points a remarkably uniform structure throughout the vascular plants, a fact no doubt largely dependent on the very uniform con- ditions under which they live. While the stele of the primary root in both Gymnosperms and Angiosperms is usually diarch or tetrarch, the large primary root-steles of many adventitious roots are frequently polyarch, sometimes with a very large number of protoxylems. Such a stele seldom has the centre filled up with xylem, this being replaced by a large-celled pith, so that a siphonostelic structure is acquired (fig. 15). Sometimes, however, the centre of a bulky root stele has strands of metaxylem (to which may be added strands of meta- phioem) scattered through it, the interstices being filled with conjunctive. The conjunctive of a root-stele possessing a pith is often sclerized between the pith and the pericycle. Sometimes all the parenchyma within the stele undergoes this change. In the roots of some

palms and orchids a " polystelic " structure obtains.

In certain families of Angiosperms a peculiar tissue, called latici- ferous tissue is met with. This takes the form of long usually

Fig. 18. — Vertical section of a Palm-stem, showing the vascular bundles, fv, curving inwards and then outwards.

*richly branched tubes which penetrate the other tissues of the plant mainly in a longitudinal direction. They possess a delicate Laticiferous Y 1 OI protoplasm, with numerous small nuclei lining Tissue * ;ne wa -l' s > while the interior of the tube (corresponding*

with the cell-vacuole) contains a fluid called latex, consisting of an emulsion of fine granules and drops of very various substances suspended in a watery medium in which various other substances (salts, sugars, rubber-producers, tannins, alkaloids and various enzymes) are dissolved. Of the suspended substances, grains of caoutchouc, drops of resin and oil, proteid crystals and starch grains may be mentioned. Of this varied mixture of sub- stances some are undoubtedly plastic (i.e. of use in constructing new plant-tissue), others are apparently end-products of meta- bolism, in other words excr-eta, though they are not actually cast out from the plant-body. The relation of the laticiferous tissue to the assimi- lating cells under which they often end, and the fact that where this tissue is richly developed the conducting paren- chyma of the bundles, and sometimes also the sieve-tubes, are poorly developed, as well as various other facts, point to the conclusion that the laticiferous system has an important function in conduct- ing plastic substances, in addition to acting as an excretory reservoir. As a secondary function we may recognize, in certain cases, the power of closing wounds, which results from the rapid coagulation of exuded latex in contact with the air. The use of certain plants as rubber-producers (notably Hevea brasiliensis, the Para rubber-tree) de- pends on this property. The trees are regularly tapped and the coagulated latex which exudes is collected and worked up into rubber. Opium is ob- tained from the latex of the opium poppy (Papaver somniferum) , which contains the alkaloid morphine.

Laticiferous tissue is of two kinds: (i) laticiferous cells (coenocytes) (fig. 19) which branch but do not anastomose, and the apices of which keep pace in their growth with that of the other tissues of the plant

(Apocynaceae, most Euphorbi- aceae, &c.) ; (2) laticiferous vessels (fig. 20) which are formed from rows of meri- Fic. 19— A portion of a lactici- stematic cells, the walls separating the tcrous coenocyte dissected out of cells breaking down, so that a network the leaf of a Euphorb.a (Xl.o). of l atici f erous tubes arises (Papaver-

aceae, Hevea, &c). In some cases (Allium, Convolvulaceae, &c.) rows of cells with latex-like contents occur, but the walls separating the individual cells do not break down.

The body of a vascular plant is developed in the first place by repeated division of the fertilized egg and the growth of Develop- tne products of division. The body thus formed meat of is called the embryo, and this develops into the adult plant, not by continued growth of all its parts as in an animal, but by localization of the regions of cell-division and growth, such a localized region being called a growing-point. This localization takes place first at the two free ends of the primary axis, the descending part of which is the primary root, and the ascending the primary shoot. Later, the axis branches by the formation of new growing-points, and in this way the complex system of axes forming the body of the ordinary vascular plant is built up. In the flowering plants the embryo, after developing up to a certain point, stops growing and rests, enclosed within the seed. It is only on " germination " of the latter that the development of the embryo into the free plant is begun. In the Pteridophytes, on the other hand, development from the egg is continuous.

The triple division of tissues is laid down in most cases at a very early period of development — in the flowering plants usually before the resting stage is reached. In many Pteridophytes the first leaf is formed very early, and the first vascular strand is developed at its base, usually becoming continuous with the cylinder of the root ; the strand of the second leaf is formed in a similar way and runs down to join that of the first, so that the stem stele is formed by the joined bases of the leaf-traces. In other cases, however, a continuous primitive stele is developed, extending from the primary stem to the primary root, the leaf-traces arising later. This is

(After Haberlandt. From Vines' Text-Book of Botany, by per- mission.)

Primary Tissue.

correlated with the comparatively late formation and small develop- ment of the first leaves. The evidence scarcely admits of a decision as to which of these methods is to be regarded as primitive in descent. In the seed-forming plants (Phanerogams) one or more primary leaves (cotyledons) are already formed in the resting embryo. In cases where the development of the

embryo is advanced at the resting period, traces run from the cotyledons and determine the symmetry of the stele of the primitive axis, the upper part of w-hich often shows stem-structure, in some respects at least, and is called the hypocoty- " ledonary stem or hypocotyl, while the lower part is the primary root'

(After Sachs. Fig.

From Vines' Text-Book of Botany, by permission.)

). — Laticiferous Vessels from the cortex of the root Scorzonera hispanica, tangential section. .4, Slightly magnified. B, A small portion highly magnified.

(radicle). In other cases the root structure of the stele continues up to the cotyledonary node, though the hypocotyl is still to be dis- tinguished from the primary root by the character of its epidermis. On germination of the seed the radicle first grows out, increasing in size as a whole, and soon adding to its tissues by. cell division at its apical growing-point. The hypocotyl usually elongates, by its cells increasing very greatly in the longitudinal direction both in number and size, so that the cotyledons are raised into the air as the first foliage-leaves. Further ' growth in length of the stem is thenceforward confined to the apical growing point situated between the cotyledons. In other cases this growing- point becomes active at once, there being little or no elongation of the hypocotyl and the cotyledon or cotyledons remaining in the seed.

The structure of the growing-points or apical meristems varies much in different cases. In most Pteridophytes there is a single large apical cell at the end of each stem and root axis. nrowlnir- This usually has the form of a tetrahedron, with its points. base occupying the surface of the body of the axis and its apex pointing towards the interior. In the stem, segments are successively cut off from the sides of the tetrahedron, and. by their subsequent division the body of the stem is produced. In the root exactly the same thing occurs, but segments are cut off also from the base of the tetrahedron, and by the division of these the root-cap is formed (fig. 21). In both stem and root early walls separate the cortex from the stele. The epidermis in the stem and the surface layer of the root soon becomes differentiated from the underlying tissue. In some Pteridophyte stems the apical cell is wedge-shaped, in others prismatic; in the latter case segments are cut off from the end of the prism turned towards the body of the stem. In other cases, again, a group of two or four prismatic cells takes the place of the apical cell. Segments are then cut iff

from the outer sides of these initial cells. In most of the Phanero- gams the apical (or primary) meristem, instead of consisting of a single apical cell or a group of initials, is stratified — i.e. there is

P Pb

tAftei Strasburger. From Vines' Text-Book of Botany, by permission.)

Fig.

-Median Longitudinal Section through the Apex of the Root of Pteris cretica.

I, A,

Apical cell.

Initial segment of root -cap.

Outermost layer of root-cap.

p, Wall marking limit between the plerome

P and the pleriblem Pb. c. Wall marking the inner limit of the outer

cortex.

more than one layer of initials (fig. 22). Throughout the Angio- sperms the epidermis of the shoot originates from separate initials, which never divide tangentially, so that the young shoot is covered by a single layer of dividing cells, the dermatogen. Below this are

(After De Bary. From Vines' Text-Book of Botany, by permission.)

Fig. 22. — Median Longitudinal Section of the Growing Point of the Stem of Hippuris vulgaris, showing a many-layered meristem.

I, Rudiment of leaf; d, dermatogen.

the initials of the cortex and central cylinder Whether these are always in layers which remain separate is not known, but it is certain that in many cases such layers cannot be distinguished. This, however, may be due to irregularity of division and displacement of the cells by irregular tensions destroying the obvious layered arrangement. In some cases there is a perfectly definite line of separation between the young cylinder (plerome) and young cortex (periblem), the latter having one or more layers of initials at the actual apex. This clear separation between periblem and plerome is mostly found in plants whose stem-apex forms a naked cone, the leaves being produced relatively late, so that the stele of the young stem is obvious above the youngest leaf-traces (fig. 22). Where the leaves are developed early, they often quite overshadow the actual apex of the stem,

and the rapid formation of leaf-tissue disturbs the obviousness of, and perhaps actually destroys, the stratified arrangement of the shoot initiaJs. In this case also,

the differentiation of leaf-bundles, which typically begins at the base of the leaf and extends upwards into the leaf and downwards into the stem, is the first phenomenon in the development of vascular tissue, and is seen at a higher level than the formation of a stele. The latter is produced (except in cases of complete astely where a cylinder is never formed) after a number of leaf-traces have appeared on different sides of the stem so as to form a circle as seen in trans- verse section, the spaces intervening between adjacent bundles becoming bridged by small-celled tissue closing the cylinder. In this tissue fresh bundles may become differentiated, and what remains of it becomes the rays of the fully-formed stele. Many cases exist which are intermediate between the two extreme types described. In these the stele becomes obvious in transverse section at about the same level as that at which the first leaf-traces are developed. Where a large-celled pith is developed this often becomes obvious very early, and in some cases it appears to have separate initials situated below those of the hollow vascular cylinder. In some cases where there is apparently a well-marked plerome at the apex, this is really the young pith, the distinction between the stelar and cortical initials, if it exists, being, as is so often the case, impossible to make out. The young tissue of the stelar cylinder, in the case of the modified siphonostele characteristic of the dicotyle- donous stem, differs from the adjoining pith and cortex in its narrow elongated cells, a difference produced by the stopping of transverse and the increased frequency of longitudinal divisions. This is especially the case in the young vascular bundles themselves (des- mogen strands). The protoxylem and protophloem are developed a few cells from the inner and outer margins respectively of the desmogen strand, the desmogenic tissue left over giving rise to the segments of endocycle and pericycle capping the bundle. Differ- entiation of the xylem progresses outwards, of the phloem inwards, but the two tissues never meet in the centre. Sometimes develop- ment stops altogether, and a layer of undifferentiated parenchyma (the mesodesm) is left between them ; or it may continue indefinitely, the central cells keeping pace by their tangential division with the differentiation of tissue on each side. In this case the formation of the primary bundle passes straight over into the formation of secondary tissue by a cumbium, and no line can be drawn between the two processes. The differentiation of the stelar stereom, which usually takes the form of a sclerized pericycle, and may extend to the endocycle and parts of the rays, takes place in most cases later than the formation of the primary vascular strand. In the very frequent cases where the bundles have considerable individual- ity, the fibrous " pericyclic " cap very clearly has a common origin from the same strand of tissue as the

vascular elements themselves. In such cases it is part of the peridesm or sheath of elongated narrow- celled tissue surrounding the individual bundle.

The separation of layers in the apical meristem of the root is usually very much more obvious than in that of the stem. The outermost is the calyptrogen, which gives rise to the root-cap, and in Dicotyledons to the piliferous layer as well. The periblem, one cell thick at the apex, produces the cortex, to which the piliferous layer belongs in Monocotyledons; and the plerome, which is nearly always sharply separated from the periblem, gives rise to the vascular cylinder. In a few cases the boundaries of the different layers are not traceable. The protoxylems and the phloem strands are developed alternately, just within the outer limit of the young cylinder. The differentiation of metaxylem follows according to the type of root-stele, and, finally, any stereom there may be is developed. Differentiation is very much more rapid — i.e. the tissues are completely formed much nearer to the apex, than is the case in the stem. This is owing to the elongating region (in which proto- xylem and protophloem alone are differentiated) being very much shorter than in the stem. The root hairs grow out from the cells of the piliferous layer immediately behind the elongating region.

The branches of the stem arise by multiplication of the cells of the epidermis and cortex at a given spot, giving rise to a protuber- ance, at the end of which an apical meristem is established. The vascular system is connected in various ways with that of the parent axis by the differentiation of bundle-connexions across the cortex of the latter. This is known as exogenous branch-formation. In the root, on the other hand, the origin of branches is endogenous. The cells of the pericycle, usually opposite a protoxylem strand, divide tangentially and give rise to a new growing-point. The new root thus laid down burrows through the cortex of the mother-root and finally emerges into the soil. The connexions of its stele with that of the parent axis are made across the pericycle of the latter. Its cortex is never in connexion with the cortex of the parent, but with its pericycle. Adventitious roots, arising from stems, usually take origin in the pericycle, but sometimes from other parts of the conjunctive.

In most of the existing Pteridophytes, in the Monocotyledons, and in annual plants among the Dicotyledons, there is no further growth of much structural importance in the tissues after differentiation from the primary meri- rissues. stems. But in nearly all perennial Dicotyledons, in all dicotyledonous and gymnospermous trees and shrubs,

and in fossil Pteridophytes belonging to all the great groups, certain layers of cells remain meristematic among the permanent tissues, or after passing through a resting stage reacquire meri- stematic properties, and give rise to secondary tissues. Such meristematic layers are called secondary meristems. There are two chief secondary meristems, the cambium and the phellogen. The formation of secondary tissues is characteristic of most woody plants, to whatever class they belong. Every great group or phylum of vascular plants, when it has become domi- nant in the vegetation of the world, has produced members with the tree habit arising by the formation of a thick woody trunk, in most cases by the activity of a cambium.

The cambium in the typical case, which is by far the most frequent, continues the primary differentiation of xylem and phloem in the desmogen strand (see above), or arises in the resting mesodesm or mesocycle and adds new (secondary) xylem and phloem to the primary tissues. New tangential walls arise in the cells which are the seat of cambial activity, and an initial layer of cells is established which cuts off tissue mother-cells on the inside and out- side, alternately contributing to the xylem and to the phloem. A tissue mother-cell of the xylem may, in the most advanced types of Dicotyledons, give rise to — (1) atracheid; (2) a segment of a vessel; (3) a xylem-fibre; or (4) a vertical file of xyiem-parenchyma cells. In the last case the mother-cell divides by a number of horizontal walls. A tissue mother-cell of the phloem may give rise to (1) a segment of a sieve-tube with its companion cell or cells; (2) a phloem fibre; (3) a single phloem-parenchyma (cambiform) cell, or a vertical file of short parenchyma cells. At certain points the cambium does not give rise to xylem and phloem elements, but cuts off cells on both sides which elongate radially and divide by horizontal walls. When a given initial cell of the cambium has once begun to produce cells of this sort it continues the process, so that a radial plate of parenchyma cells is formed stretching in one plane through the xylem and phloem. Such a cell-plate is called a medullary ray. It is essentially a living tissue, and serves to place all the living cells of the secondary vascular tissues in communication. It con- ducts plastic substances inwards from the cortex, and its cells are frequently full of starch, which they store in winter. They are accompanied by intercellular channels serving for the conduction of oxygen to, and carbon dioxide from, the living cells in the interior of the wood, which would otherwise be cut off from the means of respiration. The xylem and phloem parenchyma consist of living cells, fundamentally similar in most respects to the medullary ray cells, which sometimes replace them altogether. The parenchyma is often arranged in tangential bands between the layers of sieve- tubes and tracheal elements. The xylem parenchyma is often found in strands associated with the tracheal elements. These strands are not isolated, but

form a connected network through the wood. The xylem parenchyma cells are connected, as are the medullary ray cells, with the tracheal elements by one-sided bordered pits — i.e. pits with a border on the tracheal element side, and simple on the parenchyma cell side. The fibres are frequently found in tangential bands between similar bands of tracheae or sieve-tubes. The fibrous bands are generally formed towards the end of the year's growth in thickness. The fibres belong to the same morphological category as the parenchyma, various transitions being found be- tween them; thus there may be thin-walled cells of the shape of fibres, or ordinary fibres may be divided into a number of super- posed cells. These intermediate cells, like the ordinary parenchyma, frequently store starch, and the fibres themselves, though usually dead, sometimes retain their protoplasm, and in that case may also be used for starch accumulations. The vessels and tracheids are very various in size, shape and structure in different plants. They are nearly always aggregated in strands, which, like those of the parenchyma, are not isolated, but are connected with one another. In a few cases some of the tracheids have very thick walls and reduced cavities, functioning as mechanical rather than as water- conducting elements. All transitions are found between such forms and typical tracheids. These fibre-tracheids are easily confused on superficial view with the true wood-fibres belonging to the paren- chymatous system ; but their pits are always bordered, though in the extreme type they are reduced to mere slits in the wall. The sieve-tubes of the secondary phloem usually have very oblique end-walls bearing a row of sieve-plates; plates also occur on the radial side-walls.

The tissue-elements just described are found only in the more complicated secondary vascular tissues of certain Dicotyledons. A considerable evolution in complexity can be traced in passing from the simplest forms of xylem and phloem found in the primary vascular tissues both among Pteridophytes and Phanerogams to these highly differentiated types. In the simplest condition we have merely tracheae and sieve-tubes, respectively associated with parenchyma, which in the former case is usually amylom, i.e. consists of starch-containing cells, and in the latter of proteid cells. This type is found in nearly all Pteridophytes and, so far as is known, in Cycadofilices, both in primary and secondary tissue. The stereom

is furnished either by cortical cells or by the tracheal elements, in a few cases by fibres which arc probably homologous with sieve- tubes. Among Gymnosperms the secondary xylem is similarly simple, consisting of tracheids which act as stereom as well as hydrom, and a little amylom ; while the phloem-parenchyma sometimes under- goes a differentiation, part being developed as amylom, part as proteid cells immediately associated with the sieve-tube. In other cases the proteid cells of the secondary phloem do not form part of the phloem-parenchyma, but occupy the top and

bottom cell- rows of the medullary rays, the middle rows consisting of ordinary starchy cells. The top and bottom rows of the xylem rays are often developed as irregularly-thickened radially-elongated tracheids which serve for the radial conduction of water, and communicate with the ordinary tracheids of the secondary xylem by large bordered pits. The. primary vascular tissues of Angiosperms are likewise nearly always simple, consisting merely of tracheae and sieve-tubes often associated with amylom. A characteristic peculiarity, both

(From Green's Vegetable Physiology, by permission.)

Fig. 23. — Section of part of hypocotyledonary stem of Ricinus communis.

a, Starch sheath; at the extremities of the figure its cells are represented as empty; b, cambium layer.

in the primary and secondary tissue, is that the proteid cells of the phloem are here always sister-cells of the leptoids and are known as companion-cells. In the secondary tissues of Dicotyledons we may have, as already described, considerably more differentiation of the cells, all the varieties being referable, however, on the one hand to the tracheal or sieve-tube type, on the other to the paren- chyma type. The main feature is the development of special vas- cular stereom and storage tissue. In some cases special secreting tissues, resin ducts, oil glands, laticiferous tissue, crystal sacs, &c, may be developed among the ordinary secondary vascular elements.

The limit of each year's increment of secondary wood, in those plants whose yearly activity is interrupted by a regular winter or dry season, is marked by a more or less distinct Annual line, which is produced by the sharp contrast between Dings the wood formed in the late summer of one year (characterized by the sparseness or small diameter of the tra- cheal elements, or by the preponderance of fibres, or by a com- bination of these characters, giving a denseness to the wood) and the loose spring wood of the next year, with its absence of fibres, or its numerous large tracheae. The abundance of water- conducting channels is in relation to the need for a large and rapid supply of water to the unfolding leaves in the spring and early summer. In Gymnosperms, where vessels and fibres are absent, the late summer wood is composed of radially narrow thick-walled tracheids, the wood of the succeeding spring being wide-celled and thin-walled, so that the limit of the year's growth is very well marked. The older wood of a large tree forming a cylinder in the centre of the trunk frequently undergoes marked changes in charac- ter. The living elements die, and the walls of all the cells often become hardened, owing to the deposit in them of special substances. Wood thus altered is known as heart-wood, or duramen, as dis-

tinguished from the young sap-wood, or alburnum, which, forming a cylinder next the cambium, remains alive and carries on the active functions of the xylem, particularly the conduction of water. The heart-wood ceases to be of any use to the tree except as a support, but owing to its dryness and hardness it alone is of much use for industrial purposes. The great hardness of teak is due to the silica deposited in the heart-wood, and the special colouring matters of various woods, such as satinwood, ebony, &c, are confined to the heart-wood. In some cases the heart- wood, instead of becoming speci- ally hard, remains soft and easily rots, so that the trunk of the tree frequently becomes hollow, as is commonly the case in the willow. Heart-wood is first formed at very different epochs in the life of a tree, according to the species — e.g. after fifteen to twenty years in the oak, forty years in the ash, &c.

In many annual plants no cambium is formed at all, and the same is true of most perennial Pteridophytes and Monocotyledons. Cambi m When tne vascular tissue of such plants is arranged in st “« ‘ n se P arate bundles these are said to be closed,. The bundles of plants which form cambium are, on the contrary, called open. In stems with open bundles the formation of cambium and secondary tissue may be confined to these, when it is said to be entirely fascicular. In that case either very little secondary tissue is formed, as in the gourds, some Ranunculaceae, &c, or a considerable amount may be produced (clematis, barberry, ivy). In the latter event the cells of the primary rays are either merely stretched radially, or they divide to keep pace with the growth of the bundles. If this division occurs by means of a localized secondary meristem connecting the cambial layers of adjacent bundles, an interfascicular is formed in addition to the fascicular cambium. The interfascicular cambium may form nothing but parenchymatous tissue, producing merely continuations of the primary rays. Such rays are usually broader and more conspicuous than the secondary rays formed within the wedges of wood opposite the primary bundles, and are distinguished as principal rays from these narrower subordinate or fascicular rays (fig. 24). This is the typical case in most trees where the primary bundles are close together. Where the primary bundles are farther apart, so that the primary rays are wider, the interfascicular cambium may form several fairly broad (principal) secondary rays in continuation of certain radial bands of the primary ray, and between these, wedges of secondary xylem and phloem: or, finally, secondary xylem and phloem may be formed by the whole circumference of

the cambium, fascicular and interfascicular alike, interrupted only by narrow secondary rays, which have no relation to the primary ones.

(After Kuy, from Green's Vegetable Physiology, by permission.)

Fig. 24. — Section of three-year-old stem of Lime. f€ t periderm; c, cortex; ph, phloem with alternating strands of fibres, sieve-tubes and parenchyma; pr.r., principal ray; s.r., subordinate rays; ca, cambium.

In a good many cases, sometimes in isolated genera or species, sometimes characteristic of whole families, so-called anomalous cambial layers are formed in the stem, either as an extension of, or in addition to, the original cambial cylinder. They are fre- quently associated with irregularities in the activity of the original cambium. Irregularity of cambium occurs in various families of woody dicotyledonous plants, mostly among the woody climbers, known as lianes, characteristic of tropical and sub-tropical forests. In the simplest cases the cambium produces xylem more freely along certain tracts of the circumference than along others, so that the stem loses its original cylindrical form and becomes elliptical or lobed in section. In others the secondary phloem is produced more abundantly in those places where the secondary xylem is deficient, so that the stem remains cylindrical in section, the phloem occupying the bays left in the xylem mass. Sometimes in such cases the cam- bium ceases to be active round these bays and joins across the out- side of the bay, where it resumes its normal activity, thus isolating a phloem strand, or, as it is sometimes called, a phloem island, in the midst of the xylem. The significance of these phenomena, which pre- sent many minor modifications in different cases, is not fully under- stood, but one purpose of the formation of phloem promontories and islands seems to be the protection of the sieve-tubes from crushing by the often considerable peripheral pressure that is exercised on the

stems of these lianes. Sometimes the original cambial ring is broken into several arcs, each of which is completed into an indepen- dent circle, so that several independent secondary vascular cylinders are formed. The formation of additional cambial cylinders or bands occurs in the most various families of Dicotyledons and in some Gymnosperms. They may arise in the pericycle or endocycle of the stele, in the cortex of the stem, or in the parenchyma of the secondary xylem or phloem. The activity of the new cambium is often associated with the stoppage of the original one. Some- times the activity of the successive cambiums simply results in the formation of concentric rings or arcs of secondary xylem and phloem. In other cases a most intricate arrangement of secondary tissue masses is produced, quite impossible to interpret unless all stages of their development have been followed. Sometimes in lianes the whole stem

breaks up into separate woody strands, often twisted like the strands of a rope, and running into one another at intervals. An ordinary cambium is scarcely ever found in the Monocotyledons, but in certain woody forms a secondary meristem is formed outside the primary bundles, and gives rise externally to a little secondary cortex, and internally to a secondary parenchyma in which are developed numerous zones of additional bundles, usually of concen- tric structure, with phloem surrounded by xylem.

The cambium in the root, which is found generally in those plants which possess a cambium in the stem, always begins in the con- junctive tissue internal to the primary phloems, and cambium forms new (secondary) phloem in contact with the , Roots primary, and secondary xylem internally. In roots which thicken but slightly, whose cambium usually appears late, it is confined to these regions. If the development of secondary tissues is to proceed further, arcs of cambium are formed in the pericycle external to the primary xylems, and the two sets of cambial arcs join, forming a continuous, wavy line on transverse section, with bays opposite the primary phloems and promontories opposite the primary xylems. Owing to the resistance offered by the hard first-formed secondary xylem, the bays are pushed outwards as growth proceeds, and the wavy line becomes a circle. Opposite the primary xylems, the cambium either (a) forms parenchyma on both sides, making a broad, secondary (principal) ray, which inter- rupts the vascular ring and is divided at its inner extremity by the islet of primary xylem ; or (6) forms secondary xylem and phloem in the ordinary way, completing the vascular ring. In either case, narrow, secondary rays are formed at intervals, just as in the stem. Thus the structure of an old thickened root approximates to that of an old thickened stem, and so far as the vascular tissue is concerned can often only be distinguished from the latter by the position and orientation of the primary xylems. The cambium of the primary root, together with the tissues which it forms, is always directly continuous with that of the primary stem, just in the same way as the tissues of the primary stele. The so-called anomalous cambiums in roots follow the same lines as those of the stem.

In nearly all plants which produce secondary vascular tissues by means of a cambium there is another layer of secondary meristem arising externally to, but in quite the same fashion as, pu e n oven the cambium, and producing like the latter an external and ™ and an internal secondary tissue. This is the phellogen, p er id erm , and the whole of the tissue it gives rise to is known as periderm. The phellogen derives its name from the fact that its external product is the characteristic tissue known as cork. This consists typically of close-fitting layers of cells with completely suberized walls, intended to replace the epidermis as the external protective layer of the plant when the latter, incapable as it is of further growth after its original formation, is broken and cast off by the increase in thickness of the

stem through the activity of the cambium. Cork is also formed similarly in the root after the latter has passed through its primary stage as an absorptive organ, and its structure is becoming assimilated to that of the stem. The inter- nal tissue formed by the phellogen is known as phelloderm, and con- sists usually of ordinary parenchyma. The phellogen may arise, in the first place, in any tissue of the axis external to the actual vascular tissues — i.e. in the epidermis itself (rarely), in any layer of the cortex, or in the pericycle. Its most usual seat of origin in the stem is the external layer of the cortex immediately below the epidermis; in the root, the pericycle. All the tissues external to the cork are cast off by the plant. The extent of development of the phelloderm is dependent upon whether the phellogen has a superficial or a deep-seated origin. In the former case the formation of phelloderm is trivial in amount; in the latter, considerable, since this tissue has to replace the cast-off cortex, as a metabolic and particularly a storage tissue.

Provision is made for gaseous interchange between the internal tissues and the external air after the formation of cork, by the de- velopment of lenticels. These are special organs which ˆ . . interrupt the continuity of the impermeable layer of ordinary cork-cells. A lenticel is formed by the phellogen at a given spot dividing very actively and giving rise to a loose tissue of rounded cells which soon lose their contents, and between which air can pass to the tissues below (fig. 25). A lenticel appears to the naked eye as a rounded or elongated scar, often forming a distinct promin- ence on the surface of the organ. The lenticels of the stem are usually 1 formed beneath stomata, whose function they take up after the

stomata have been ruptured and cast off with the rest of the epider- mis. Both cork and phelloderm may be differentiated in various ways. The former often has its cells lignified, and may consist of alternate layers of hard and soft cells. The latter may develop stereom, and may also be the seat of origin of new formations of various kinds — e.g. supplementary vascular bundles, anomalous cambial zones, &c. It is often enormously developed and forms a very important tissue in roots. In the stem of a tree the original

(From Vines' Text-Book of Botany, by permission.)

Fig. 25. — Lenticel in the transverse section of a twig of Elder.

E, epidermis; q, phellogen; /, cells, and pi, the phellogen of the lenticel; Ic, cortical parenchyma, containing chlorophyll.

phellogen is replaced by successive new phellogenic layers of deeper and deeper origin, each forming its own layer of cork. Eventually the new phellogens reach the level of the secondary phloem, and are formed in the parenchyma of the latter, keeping pace in their inward march with the formation of fresh secondary phloem by the cam- bium. The complex system of dead and dying tissues cut off by these successive periderms, together with the latter themselves — in fact, everything outside the innermost phellogen, constitutes what is often known botanically as the bark of the tree. Rhytidome is, however, a preferable term, as the word bark has long been estab- lished in popular usage to mean all the tissue that can easily be peeled off — i.e. everything down to the wood of the tree. The rough surface of the bark of many trees is due to the successive phellogens not arising in regular concentric zones, but forming in arcs which join with the earlier-formed arcs, and thus causing the bark to come off in flakes or thick chunks. A layer of cork is regularly formed in most Phanerogams across the base of the petiole before leaf fall, so as to cover the wound caused by the separation of the leaf from the stem. Special " wound-cork " is also often formed round accidental injuries so as to prevent the rotting of the tissues by the soaking in of rain and the entrance of fungal spores and bacteria. A peculiar modification of periderm is formed by the phellogen in the submerged organs (roots or stems) of many aquatic or marsh-loving plants. This may take various forms and may cover the whole of the organ or be localized in special regions; but its cells are always living and are separated by very large intercellular spaces containing air. This tissue is called aerenchym, and no doubt its function is to facilitate the respiration of the organs on which it is formed and to which the access of oxygen is difficult. In other cases, a similar formation of spongy but dead periderm tissue may occur for the same purpose in special patches, called pneumatodes, on the roots of certain trees living in marshy places, which rise above the soil in order to obtain air.

History and Bibliography. — The study of plant anatomy was begun in the middle of the seventeenth century as a direct result of the construction of microscopes, with which a clear view of the structure of plant tissues could be obtained. The Englishman Grew and the Italian Malpighi almost simul- taneously published illustrated works on the subject, in which they described, for the most part very accurately, what they saw with the new instruments. The subject was practically dormant for nearly a century and a half, largely owing to the dominance of classificatory botany under the influence of Linnaeus. It was revived by several German workers, prominent among whom were Treviranus and Link, and later Moldenhawer, as well as by the Frenchmen Mirbel, at the beginning of the

19th century. The new work largely centred round a discussion of the nature and origin of vessels, conspicuous features in young plant tissues which thus acquired an importance in the contemporary literature out of proportion to their real signifi- cance in the construction of the vascular plant. The whole of the writings of this time are dominated by a preoccupation with the functions of the different tissues, in itself an excellent standpoint for investigation, but frequently leading in the case of these early investigators to one-sided and distorted views of the facts of structure. The pioneer of modern plant anatomy was Hugo von Mohl (fl. 1840), who carefully investigated and

described the facts of anatomical structure without attempting to fit them into preconceived views of their meaning. He produced a solid body of accurately described facts which has formed the secure groundwork of subsequent advance. From Mohl down to the eighth decade of the century the study of anatomy was entirely in the hands of a group of German investi- gators, prominent among whom were several of the most eminent founders of modern scientific botany — such, for instance, as Nageli, Sanio and De Bary. To the first we owe the secure foundation of our knowledge of the structure and course of the vascular strands of the higher plants (" Ueber den Bau und die Anordnung der Gefassbiindel bei den Stamm und Wurzel der Phanerogamen," Beitrage zur wissenschaftlichen Botanik, Heft i., Leipzig, 1859); to the second the establishment of the sound morphological doctrine of the central cylinder of the axis as the starting-point for the consideration of the general arrange- ment of the tissues, and the first clear distinction between primary and secondary tissues {Botanische Zeitung, 1861 and 1863); to the last the putting together of the facts of plant anatomy known up to the middle of the eighth decade of the century in that great encyclopaedia of plant anatomy, the Vergleichende Anatomie der Vegetationsorgane bei den Phanero- gamen und Farnen (Stuttgart, 1876; Eng. trans., Comparative Anatomy of the Vegetative Organs of the Phanerogams and Ferns, Oxford, 1882). In 1870-1871 Van Tieghem published his great work, " Sur la Racine," Ann. sci. nat. bot. (Paris). This was not only in itself an important contribution to plant anatomy, but served as the starting-point of a series of researches by Van Tieghem and his pupils, which has considerably advanced our knowledge of the details of histology, and also culminated in the foundation of the doctrine of the stele (Van Tieghem and Douliot, "Sur la polystelie," Ann. sci. nat. bot., 1887; Van Tieghem, Traits de botanique (2nd ed. Paris, 1889-1891). This has had a most important effect on the development in recent years of morphological anatomy.

In the progress of the last three decades, since the publication of De Bary's great work, five or six main lines of advance can be distinguished. First, the knowledge of the details modern of histology has of course advanced

greatly in the Progress oi direction through the ceaseless activity of very the Subject. numerous, mainly German, workers, though no fundamen- tally new types of tissue have been discovered. Secondly, the histology of fossil plants, particularly woody plants of the carboniferous period, has been placed on a sound basis, assimilated with general histological doctrine, and has consider- ably enlarged our conceptions of plant anatomy as a whole, though again without revealing any entirely new types of structure. This branch of the subject, founded by Corda, Goppert, Stenzel and others in Germany, was enormously advanced by Williamson's work on the Coal Measures plants, recorded in the magnificent series of memoirs, "Researches on the Organization of Fossil Plants of the Coal Measures " (Phil. Trans. Roy. Soc, vols, i.-xix., 1871-1893). The work of Solrns Laubach in Germany, Renault and Bertrand in France, and in recent years, of Zeiller in France, and Scott, Seward and others in England, has advanced our knowledge of the anatomy of ,fossil plants in an important degree. While con- vincing us that the plants of past ages in the earth's history were exposed to very similar conditions of life, and made very much the same adaptive responses as their modern representa- tives, one of the main results of this line of work has been to reveal important data enabling us to fill various gaps in our morphological knowledge and to obtain a more complete picture of the evolution of tissues in the vascular plants. One of the most striking incidents in the progress has been the recognition within the last few years of the existence of an extinct group of plants lying on the borderland between Filicales and Gymno- sperms, and known as the Cycadofilices, a group in which, curiously enough, the reproductive organs remained undis- covered for some time after the anatomy of the vegetative organs was sufficiently well known to afford clear evidence of their true affinities. Thirdly, we have to record very considerable

progress in our knowledge of distinctively morphological anatomy, i.e. the study of tissues from the standpoint of evolution. The Russian plant-anatomist, Russow, may be said to have founded the consideration of plant tissues from the point of view of descent (Vergleichende Untersuchungen iiber die Leitbicndelkryptogamen, St Petersburg, 1872; and Betrachtungen iiber Leitbiindel und Grundgewebe, Dorpat, 1875). He was ably followed by Strasburger (Ueber den Ban und die Verrichtungen der Leitungsbahnen in den Pflanzen, Jena, 1891), Haberlandt and others. The explicit adoption of this point of view has had the effect of clearing up and

rendering definite the older morphological doctrines, which for the most part had no fixed criterion by which they could be tested.

Since about 1895 this branch has been most actively pursued in England, where the work of Boodle and of Gwynne-Vaughan especially on Ferns) has been the most important, leading to a coherent theory of the evolution of the vascular system in these plants (Tansley, Evolution of the Filicinean Vascular System, Cambridge, 1908) ; and in America, where Jeffrey has published important papers on the morphology of the vascular tissues of the various groups of Pteridophytes and Phanerogams and has sought to express his conclusions in a general morpho- logical theory with appropriate terminology. As a result of this activity Van Tieghem's so-called " Stelar theory " has been revised and modified in the light of more extended and detailed anatomical and developmental knowledge. Schoute's Die Steldr-Theorie (Groningen, 1902), gives an important critical account of this subject.

Fourthly, attention must be called to the great development of what is called " Systematic Anatomy," i.e. the study of the anatomical features characteristic of the smaller groups of flowering plants, i.e. the orders, families, genera and species. Radlkofer (1883) was the first to call attention to the great importance of this method in systematic botany, as providing fresh characters on which to base a natural classifi- cation. Solereder's great work, Systematische Anatomie der Dicotyledonen (Stuttgart, 1898-1908; Eng. trans., Systematic Anatomy of Dicotyledons, Oxford, 1908), brings together so many of the facts as are at present known in an orderly arrangement. Theoretically this branch of the subject should connect with and form the completion of " morphological anatomy," but the field, has not yet been sufficiently explored to allow of the necessary synthesis. The true relation of " systematic " to " ecological " anatomy (see below) also awaits proper elucidation. Fifthly, we have to record the foundation of the modern study of " physiological anatomy " {i.e. the study of the specific functions of the various tissues) by Schwendener (Das mechan- ische Princip im Bau der Monocolylen, 1874, and other works), followed by numerous pupils and others, among whom Haber- landt (Physiologische Pflanzen- Anatomie, Leipzig, 1st ed., 1884, 4th ed., 1909, and other works) is pre-eminent. The pursuit of this study has not only thrown valuable light on the economy of the plant as a whole, but forms an indispensable condition of the advance of morphological anatomy. A great deal of work still remains to be done in this department, which at the present time affords one of the most promising fields of anatomical investigation.

Finally we may mention " ecological anatomy," i.e. the study of anatomical features directly related to the habitat. A very considerable

body of knowledge relating to this subject already exists, but further work on experimental lines is urgently required to enable us to understand the actual economy of plants growing under different conditions of life and the true relation of the hereditary anatomical characters which form the subject matter of " systematic anatomy " to those which vary accord- ing to the conditions in which the individual plant is placed. On these lines the future of anatomical study presents almost inexhaustible possibilities. (A. G. T.)

Physiology of Plants

The so-called vegetable physiology of a generation ago was in »rrear of animal, and particularly of human, physiology, the

study of the latter being followed by many more observers, and from its relative degree of advancement being the more capable of rapid development. It was fully recognized by its followers that the dominating influence in the structure and working of the body was the protoplasm, and the division of labour which it exhibited, with the accompanying or result- ing differentiation into various tissues, was the special subject of investigation. Many who followed the study of vegetable structure did not at that time give an equal prominence to this view. The early histological researches of botanists led them to the recognition of the vegetable cell, and the leading writers in the middle of the 19th century pointed out the probable identity of Von Mohl's " protoplasm " with the " sarcode " of zoologists. They laid great stress on the nitrogenous nature of protoplasm, and noted that it preceded the formation of the cell-membrane. But by the ordinary student of thirty years later their work was to some extent overlooked, and the cell-wall assumed a prominence to which it was not entitled. The study of the differentiation of protoplasm was at that time seldom undertaken, and no particular attention was paid either to fixing it, to enable staining methods to be accurately applied to it, or to studying the action of chemical reagents upon it. It is only comparatively recently that the methods of histological investigation used by animal physiologists have been carefully and systematically applied to the study of the vegetable organ- isms. They have, however, been attended with wonderful results, and have revolutionized the whole study of vegetable structure. They have emphasized the statements of Von Mohl, Cohn, and other writers alluded to, that the protoplasm is here also the dominant factor of the body, and that all the peculiarities of the cell-wall can only be interpreted in the light of the needs of the living substance.

The Nature of the Organization of the Plant, and the Relations of the Cell-Membrane and the Protoplasm. — This view of the structure of the plant and this method of investigation lead us to a greatly modified conception of

its organization, and afford more completely an explanation of the peculiarities of form found in the vegetable kingdom.

The study of simple organisms, many of which consist of nothing but a little mass of protoplasm, exhibiting a very rudimentary degree of differentiation, so far as our methods enable us to determine any at all, shows that the duties of existence can be discharged in the absence of any cell-wall. Those organisms which possess the latter are a little higher in the scale of life than those which remain unclothed by it, but a comparison of the behaviour of the two quickly enables us to say that the membrane is of but secondary importance, and that for those which possess it, it is nothing more than a protec- tive covering for the living substance. Its physical properties, permeability by water, extensibility and elasticity, receive their interpretation in the needs of the latter. We come, accordingly, to regard it as practically an exoskeleton, and its functions as distinctly subordinate to those of the protoplasm which it clothes. If we pass a little higher up the scale ot life we meet with forms consisting of two or more cells, each of which contains a similar minute mass of living substance. A study of them shows that each is practically independent of the others; in fact, the connexion between them is so slight that they can separate and each become free without the slightest dis- advantage to another. So long as they are connected together mechanically they have apparently the power of influencing one another in various ways, and of passing liquid or gaseous materials from one to another. The conjoined organism is, in fact, a colony or association of the protoplasmic units, though each unit retains its independence. When we pass, again, from these to examine more bulky, and consequently more complex, plants, we find that the differences which can be ob- served between them and the simple lowly forms are capable of being referred to the increased number of the protoplasmic units and the consequent enlarged bulk of the mass or colony. Every plant is thus found to be composed of a number of these protoplasmic units, or, as they may preferably be termed,

protoplasts, all of which are at first exactly alike in appearance and in properties. This is evident in the case' of such plants as have a body consisting of filaments or plates of cells, and is little less conspicuous in those whose mass is but small, though the cells are evidently capable of computation in three dimen- sions. It does not at first appear to be the same with the bulkier plants, such as the ordinary green herbs, shrubs or

trees, but a study of their earlier development indicates that they do not at the outset differ in any way from the simple undifferen- tiated forms. Each commences its existence as a simple naked protoplast, in the embroyo-sac or the archegonium, as the case may be. After the curious fusion with another similar proto- plast, which constitutes what we call fertilization, the next stage in complexity already noted may be observed, the proto- plasm becoming clothed by a cell-membrane. Very soon the single cell gives rise to a chain of cells, and this in turn to a cell mass, the individual units of which are at first quite uniform. With increase of number, however, and consequently enlarge- ment of bulk in the colony, differentiation becomes compulsory. The requirements of the several protoplasts must be met by supplies from without, and, as many of them are deep seated, varieties of need arise, so that various members of the colony are set apart for special duties, masses of them being devoted to the discharge of one function, others to that of another, and so on. Such limitations of the powers and properties of the individuals have for their object the well-being of the community of which those individuals are constituents.

Physiological and Morphological Differentiation. — The first indication of this differentiation in the vegetative body of the plant can be seen not only in the terrestrial green plants which have been particularly referred to, but also in the bulkier sea- weeds. It is an extension of the first differentiation which was observable in the simple protoplasts first discussed, the formation, that is, of a protective covering. Fucus and its allies, which form conspicuous members of the larger Algae, have their external cells much smaller, more closely put together, and generally much denser than the rest of their tissue. In the lowly as well as the higher green plants we have evidence of special- ization of the external protoplasts for the same purpose, which takes various shapes and shows different degrees of complete- ness, culminating in the elaborate barks which clothe our forest trees.

The second prominent differentiation which presents itself takes the form of a provision to supply the living substance with water. This is a primal necessity of the protoplast, and every cell gives evidence of its need by adopting one of the various ways in which such need is supplied. What little differentiation can be found to exist in the protoplasm of the simple unicellular organism shows the importance of an adequate water-supply, and indeed, the dependence of life upon it. The naked cells which have been alluded to live in water, and call therefore for no differentiation in connexion with this necessity; but those which are surrounded by a cell-wall always develop within themselves a vacuole or cavity which occupies the greater part of their interior, and the hydrostatic pressure of whose contents keeps the protoplasm in contact with the membrane, setting up a condition of turgidity.

The need for a constant supply of water is partly based upon the constitution of protoplasm, so far as we know it. The apparently structureless substance is saturated with it; and if once a cell is completely dried, even at a low temperature, in the enormous majority of cases its life is 1 gone and the restoration of water fails to enable it to recover. Besides this intimate relationship, however, we can point to other features of the necessity for a constantly renewed water supply. The proto- plasm derives its food from substances in solution in the water; the various waste products which are incident to its life are excreted into it, and so removed from the sphere of its activity. The raw materials from which the food is constructed are ab- sorbed from the exterior in solution in water, and the latter is the medium through which the gaseous constituents necessary for life reach the protoplasm. Moreover, growth is essentially

dependent upon water-supply. There is little wonder, then, that in a colony of protoplasts such as constitute a large plant a considerable degree of differentiation is evident, bearing upon the question of water supply. Certain cells of the exterior are set apart for absorption of water from the soil, this being the source from which supplies are derived. Others are devoted to the work of carrying it to the protoplasts situated in the interior and at the extremities of the plant, a conducting system of considerable complexity being the result.

Other collections of cells are in many cases set apart for giving rigidity and strength to the mass of the plant. It is evident that as the latter increases in bulk, more and more attention must be paid to the dangers of uprooting by winds and storms. Various mechanisms have been adopted in different cases, some connected with the subterranean and others with the sub-aerial portions of the plant. Another kind of differentiation in such a cell-mass as we are dealing with is the setting apart of particular groups of cells for various metabolic purposes. We have the formation of numerous mechanisms which have arisen in connexion with the question of food supply, which may not only involve particular cells, but also lead to differentiation in the protoplasm of those cells, as in the development of the chloroplastids of the leaves and other green parts.

The inter-relations of the members of a large colony of proto- plasts such as constitute a tree, demand much adjustment. Relations with the exterior are continually changing, and the needs of different regions of the interior are continually varying, from time to time. Two features which are essentially proto- plasmic assume a great importance when we consider these relations. They are the power of receiving impressions or stimuli from the exterior, and of communicating with each other, v/ith the view of co-ordinating a suitable response. We have nothing structural which corresponds to the former of these. In this matter, differentiation has proceeded very

differently in animals and plants respectively, no nerves or sense organs being structurally recognizable. Communication between the various protoplasts of the colony is, however, carried on by means of fine protoplasmic threads, which are continuous through the cell-walls.

All the peculiarities of structure which we encounter conse- quently support the view with which we started, that the proto- plasm of the plant is the dominant factor in vegetable structure, and that there need be but one subject of physiology, which must embrace the behaviour of protoplasm wherever found. There can be no doubt that there is no fundamental difference between the living substance of animals and plants, for many forms exist which cannot be referred with certainty to either kingdom. Free-swimming organisms without cell-membranes exist in both, and from them series of forms can be traced in both directions. Cellulose, the material of which vegetable cell-walls are almost universally composed, at any rate in their early condition, is known to occur, though only seldom, among animal organisms. Such forms as Volvox and the group of the Myxomycetes have been continually referred to both kingdoms, and their true systematic position is still a subject of controversy. All physiology, consequently, must be based upon the identity of the protoplasm of all living beings.

This method of study has to a large extent modified our ideas of the relative importance of the parts of such an organism as a large tree. The interest with which we regard the latter no longer turns upon the details of the structure of its trunk, limbs and roots, to which the living substance of the more superficial parts was subordinated. Instead of regarding these as only ministering to the construction of the bulky portions, the living protoplasts take the first place as the essential portion of the tree, and all the other features are important mainly as minister- ing to their individual well-being and to their multiplication. The latter feature is the growth of the tree, the well-being of the protoplasts is its life and health. The interest passes from the bulky dense interior, with the elaborate features of its cell - walls, to the superficial parts, where its life is in evidence. We see herein the reason for the great subdivision of the body, with its

finely cut twigs and their ultimate expansions, the leaves, and we recognize that this subdivision is only an expression of the need to place the living substance in direct relationship with the environment. The formation and

gradually increasing thickness of its bark are explained by the continually increasing need of adequate protection to the living cortex, under the strain of the increasing framework which the enormous multiplication of its living protoplasts demands, and the development of which leads to continual rupture of the exterior. The increasing development of the wood as the tree grows older is largely due to the demands for the conduction of water and mineral matters dissolved in it, which are made by the increased number of leaves which from year to year it bears, and which must each be put into communication with the central mass by the formation of new vascular bundles. Similar considerations apply to the peculiar features of the root-system. All these points of struc- ture can only be correctly interpreted after a consideration of the needs of the individual protoplasts, and of the large colony of which they are members.

Gaseous Interchanges and their Mechanism. — Another feature of the construction of the plant has in recent years come into greater prominence than was formerly the case. The organism is largely dependent for its vital processes upon gaseous inter- changes. It must receive a large constituent of what ultimately becomes its food from the air which surrounds it, and it must also take in from the same source the oxygen of its respiratory processes. On the other hand, the aerial environment presents considerable danger to the young and tender parts, where the protoplasts are most exposed to extremes of heat, cold, wet, &c. These must in some way be harmonized. No doubt the primary object of the cell-wall of even the humblest protoplast is pro- tection, and this too is the meaning cf the coarser tegumentary structures of a bulkier plant. These vary considerably in completeness with its age; in its younger parts the outer cells wall undergoes the change known as cuticularization, the material being changed both in chemical composition and in physical properties. The corky layers which take so prominent a share in the formation of the bark are similarly modified and subserve the same purpose. But these protective layers are in the main impermeable by gases and by either liquid or vapour, and prevent the access of either to the protoplasts which need them. Investi- gations carried out by Blackman, and by Brown and Escombe, have shown clearly that the view put forward by Boussingault, that such absorption of gases takes place through the cuticular covering of the younger parts of the plant, is erroneous and can no longer be supported. The difficulty is solved by the provision of a complete system of minute intercellular spaces which form a continuous series of delicate canals between the cells, extending throughout the whole substance of the plant. Every protoplast, except in the very young regions, has part of its surface abutting on these, so that its wall is accessible to the gases necessary for its vital processes. There is no need for cuticularization here, as the external dangerous influences do not reach the interior, and the processes of absorption which Boussingault attributed

to the external cuticularized cells can take place freely through the delicate cell-walls of the interior, saturated as these are with water. This system of channels is in com- munication with the outer atmosphere through numerous small apertures, known as stomata, which are abundant upon the leaves and young twigs, and gaseous interchange between the plant and the air is by their assistance rendered constant and safe. This system of intercellular spaces, extending throughout the plant, constitutes a reservoir, charged with an atmosphere which differs somewhat in its composition from the external air, its gaseous constituents varying from time to time and from place to place, in consequence of the interchanges between itself and the protoplasts. It constitutes practically the exterior environment of the protoplasts, though it is ramify- ing through the interior of the plant.

The importance of this provision in the case of aquatic vascular plants of sturdy bulk is even greater than in that of terrestrial organisms, as their environment offers considerable obstacles

to the renewal of the air in their interior. They are without stomata on their submerged portions, and the entry of gases can only take place by diffusion from the water through their external cells, which are not cuticularized. Those which are only partially submerged bear stomata on their exposed portions, so that their environment approximates towards that of a terrestrial plant, but the communication even in their case is much less easy and complete, so that they need a much larger reservoir of air in their interior. This is secured by the development of much larger intercellular spaces, amounting to lacunae or passages of very considerable size, which are found ramifying in different ways in their interior.

Transpiration. — In the case of terrestrial plants, the continual renewal of the water contained in the vacuoles of the protoplasts demands a copious and continuous evaporation. This serves a double purpose, bringing up from the soil continually a supply of the soluble mineral matters necessary for their metabolic processes, which only enter the plant in solutions of extreme dilution, and at the same time keeping the plant cool by the process of evaporation. The latter function has been found to be of extreme importance in the case of plants exposed to the direct access of the sun's rays, the heat of which would rapidly cause the death of the protoplasts were it not employed in the evaporation of the water. Brown and Escombe have shown that the amount of solar energy taken up by a green leaf may often be fifty times as much as it can utilize in the constructive pro- cesses of which it is the seat. If the heat were allowed to accu- mulate in the leaf unchecked, they have computed that its temperature would rise during bright sunshine at the rate of more than 12 C. per minute, with of course very rapidly fatal results. What is not used in the constructive processes is employed in the evaporation of the water, the leaf being thus kept cool.

Whether the leaf is brightly or only moderately illuminated, the same relative proportions of the total energy absorbed are devoted to the purposes of composition and con- struction respectively. This large evaporation, which constitutes the so-called transpiration of plants, takes place not into the external air but into this same intercellular space system, being possible only through the delicate cell- walls upon which it abuts, as the external coating, whether bark, cork or cuticle, is impermeable by watery vapour. The latter ultimately reaches the external air by diffusion through the stomata, whose dimen- sions vary in proportion as the amount of water in the epidermal cells becomes greater or less.

Mechanism and Function of Stomata. — It is not quite exact to speak of either the gaseous interchanges or the transpiration as taking place through the stomata. The entry of gases into, and exit from, the cells, as well as the actual exhalation of watery vapour from the latter, take place in the intercellular space system of which the stomata are the outlets. The opening and closing of the stomata is the result of variation in the turgidity of their guard cells, which is immediately affected by the condition of turgidity of the cells of the epidermis contiguous to them. The amount of watery vapour in the air passing through a stoma has no effect upon it, as the surfaces of the guard cells abutting on the air chamber are strongly cuticularized, and there- fore impermeable. The only way in which their turgidity is modified is by the entry of water into them from the contiguous cells of the general epidermis and its subsequent withdrawal through the same channel. This opening and closing of the stomata must be looked upon as having a direct bearing only on the emission of watery .vapour. There is a distinct advantage in the regulation of this escape, and the mechanism is directly connected with the greater or smaller quantity of water in the plant, and especially in its epidermal cells. This power of varying the area of the apertures by which gases enter the internal reservoirs is not advantageous to the gaseous inter- changes — indeed it may be directly the reverse. It may lead to an incipient asphyxiation, as the supply of oxygen may be greatly interfered with and the escape of carbon dioxide may be almost stopped. It may at other times lead to great difficulties in the supply of the gaseous constituents which are used in the

manufacture of food. The importance of transpiration, is, however, so great, that these risks must be run.

The Ascent of Water in Trees. — The supply of water to the peripheral protoplasts of a tree is consequently of the first importance. The means by which such a supply is ensured are by no means clearly understood, but many agencies are probably at work. The natural source of the water is in all cases the soil, and few plants normally obtain any from elsewhere. The water of the soil, which in well-drained soil is met with in the form of delicate films surrounding the particles of solid matter, is absorbed into the plant by the delicate hairs borne by the young roots, the entry being effected by a process of modified osmosis. Multitudes of such hairs on the branches of the roots cause the entry of great quantities of water, which by a subsequent similar osmotic action accumulates in the cortex of the roots. The great turgidity which is thus caused exerts a considerable hydrostatic pressure on the stele of the root, the vessels of the wood of which are sometimes filled with water, but at other times contain air, and this often under a pressure less than the ordinary atmospheric pressure. This pressure of the turgid cortex on the central stele is known as root pressure, and is of very considerable amount. This pressure leads to the filling of the vessels of the wood of both root and stem in the early part of the year, before the leaves have expanded, and gives rise to the exudation of fluid known as bleeding when young stems are cut in early spring.

Root pressure is one of the forces co-operating in the forcing of the water upwards. The evaporation which is associated with transpiration is no doubt another, but by themselves they are insufficient to explain the process of lifting water to the tops of tall trees. There is at present also a want of agreement among botanists as to the path which the water takes in the structural elements of the tree, two views being held. The older is that the water travels in the woody cell-walls of the vascular bundles, mainly under the action of the forces of root pressure and trans- piration , and that the cavities of the vessels contain only air. The other is that the vessels are not empty, but that the water travels in their cavities, which contain columns of water in the course of which are large bubbles of air. On this view the water flows upwards under the influence of variations of pressure and tension in the vessels. These forces however fail to furnish a complete explanation of the ascent of the current, and others have been thought to supplement them, which have more or less weight. Westermaier and Godlewski put forward the view that the living cells of the medullary rays of the wood, by a species of osmosis, act as a kind of pumping apparatus, by the aid of which the water is lifted to the top of the tree, a series of pumping-stations being formed. Though this at first met with some acceptance, Strasburger showed that the action goes on in great lengths of stem the cells of which have been killed by poison or by the action of heat. More recently, Dixon and Joly in Dublin and Askenasy in Germany have suggested the action of another force. They have shown that columns of

water of very small diameter can so resist tensile strain that they can be lifted bodily instead of flowing along the channel. They suggest that the forces causing the movement are complex, and draw particular attention to the pull upwards in consequence of disturbances in the leaves. In these we have (i) the evaporation from the damp delicate cell-walls into the intercellular spaces; (2) the imbibition by the cell-wall of water from the vacuole; (3) osmotic action, consequent upon the subsequent increased concentration of the cell sap, drawing water from the wood cells or vessels which abut upon the leaf parenchyma. They do not, of course, deny the co-operation of the other forces which have been suggested, except so far as these are inconsistent with the motion of the water in the form of separate columns rather than a flowing stream. This view requires the existence of certain anatomical arrangements to secure the isolation of the separate columns, and cannot be said to be fully established.

Nature of the Food of Plants. — The recognition of the fundamental identity of the living substance in animals and plants has directed attention to the manner in which plants are nourished, and especially to the exact nature of their food. The idea was till recently currently accepted, that anything which plants absorbed from without, and

which went to build up their organic substance, or to 9upply them with energy, or to exert some beneficial influence upon their meta- bolism, constituted their food. Now, as the materials which plants absorb are carbon dioxide from the air, and various inorganic compounds from the soil, together with water, it is clear that if this view is correct, vegetable protoplasm must be fed in a very different way from animal, and on very different materials. A study of the whole vegetable kingdom, however, negatives the theory that the compounds absorbed are in the strict sense to be called food. Fungal and phanerogamic parasites can make no use of such substances as carbon dioxide, but draw elaborated products from the bodies of their hosts. Those Fungi which are saprophytic can only live when supplied with organic compounds of some complexity, which they derive from decomposing animal or vegetable matter. Even in the higher flowering plants, in which the processes of the absorp- tion of substances from the environment has been most fully studied, there is a stage in their life in which the nutritive processes approxi- mate very closely to those of the group last mentioned. When the young sporophyte first begins its independent life — when, that is, it exists in the form of the embryo in the seed — its living substance has no power of utilizing the simple inorganic compounds spoken of. Its nutritive pabulum is supplied to it in the shape of certain complex organic substances which have been stored in some part or other of the seed, sometimes even in its own tissues, by the parent plant from which it springs. When the tuber of a potato begins to ger- minate the shoots which it puts out derive their food from the accumulated store of

nutritive material which has been laid up in the cells of the tuber. If we examine the seat of active growth in a young root or twig, we find that the cells in which the organic substance, the protoplasm, of the plant is being formed and increased, are not supplied with carbon dioxide and mineral matter, but with such elaborated material as sugar and proteid substances, or others closely allied to them.

Identity of the Food of Animals and Plants. — It is evidently to the actual seats of consumption of food, and of consequent nutrition and increase of living substance, that we should turn when we wish to inquire what are the nutritive materials of plants. If we go back to the first instance cited, the embryo in the seed and its development during germination, we can ascertain what is necessary for its life by inquiring what are the materials which are deposited in the seed, and which become exhausted by consumption as growth and develop- ment proceed. We find them to consist of representatives of the great classes of foodstuffs on which animal protoplasm is nourished, and whose presence renders seeds such valuable material for animal consumption. They are mainly carbohydrates such as starch and sugar, proteids in the form of globulins or albumoses, and in many cases fats and oils, while certain other bodies of similar nutritive value are less widely distributed.

The differences between the nutritive processes of the animal and the plant are not therefore fundamental, as they were formerly held to be. The general vegetable protoplasm has not the capacity of being nourished by inorganic substances which are denied to the living substance of the animal world. Differences connected with the mode of supply of nutritive material do exist, but they are mainly correlated with the structure of the organisms, which makes the method of absorption different. The cell-walls of plants render the entry of solid material into the organism impossible. The food must enter in solution in order to pass the walls. Moreover, the stationary habit of plants, and the almost total absence of locomo- tion, makes it impossible for them to seek their food.

The Special Apparatus of Plants for constructing Food. — The explanation of the apparent difference of food supply is very simple. Plants are furnished with a constructive mechanism by which they are enabled to fabricate the food on which they live from the inor- ganic, gaseous and liquid matters which they absorb. The fact of such absorption does not render these substances food; they are taken in not as food, but as raw materials to be subjected to the action of this constructive mechanism, and by it to be converted into substances that can nourish protoplasm, both vegetable and animal. It is sometimes forgotten, when discussing questions of animal nutrition, that all the food materials of all living organisms are prepared originally from inorganic substances in exactly the same way, in

exactly the same place, and by the same machinery, which is the chlorophyll apparatus of the vegetable kingdom. A Consideration of these facts emphasizes still more fully the view with which we set out, that all living substance is fundamentally, the same, though differentiated both anatomically and physiologically in many direc- tions and in different degrees. All is nourished alike on materials originally prepared by a mechanism attached to the higher vegetable organism, and capable of being dissociated, in theory at least, from its own special means of nutrition, if by the latter term We understand the appropriation by the protoplasm of the materials so constructed.

The chlorophyll apparatus of plants demands a certain descrip- tionˆ It consists essentially of a number of minute corpuscles or plastids, theprotoplasmic substance of which is impregnated with a green colouring matter. These bodies, known technically as chloro- plasts, are found embedded in the protoplasm of the cells of the meso- phyll of foliage leaves, of certain of the cells of some of the leaves of ‘ the flower, and of the cortex of the young twigs and petioles. Usually

they are absent from the cells of the epidermis, though in some of the lower plants they are met with there also. The plastids are not rigidly embedded in the cytoplasm, but are capable of a certain amount of movement therein. Each is a small protoplasmic body, in the meshes of whose substance the green colouring matter chlorophyll is contained in some form of solution. Various solvents, such as benzene, alcohol and chloroform, will dissolve out the pigment, leaving the plastid colourless. Chlorophyll is not soluble in water, nor in acids or alkalies without decomposition.

These plastids are especially charged with the duty of manufactur- ing carbohydrates from the carbon dioxide which the air contains, and which is absorbed from it after it has entered the intercellular passages and has so reached the cells containing the plastids. This action is found to take place only in the presence of light, preferably moderate sunlight. The reason for the distribution of the chloro- plasts described above is consequently seen. The relation of the chlorophyll to light has been studied by many observers. If a solution of the pigment is placed in the path of a beam of light which is then allowed to fall on a prism, the resulting spectrum will be found to be modified. Instead of presenting the appearance of a continuous band in which all the colours are represented, it is interrupted by seven vertical

dark spaces. The rays which in the absence of the solution of chlorophyll would have occupied those spaces have no power to pass through it, or in other words chlorophyll absorbs those particular rays of light which are missing.

The absorption of these rays implies that the pigment absorbs radiant energy from the sun, and gives us some explanation of its power of constructing the carbohydrates which has been mentioned as the special work of the apparatus. The working of it is not at all completely understood at present, nor can we say exactly what is the part played by the pigment and what is the r61e of the proto- plasm of the plastid. It is not certain either whether the action of the chlorophyll apparatus is confined to the manufacture of carbohydrates or whether it is concerned, and if so how far, with the construction of proteids also.

As the action of the chlorophyll apparatus is directly dependent upon light, and the immediate result of its activity is the building up of complex compounds, it has become usual to speak of the processes it sets up under the name of photosynthesis.

Photosynthesis. — In the presence of light and when the plant is subjected to a suitable temperature, photosynthesis commences, provided that the plant has access to air containing its normal amount of carbon dioxide, about 3 parts, or rather less, in 10,000. The process involves the inter- action of water also, and this, as we have seen, is always present in the cell. In addition, certain in- organic salts, particularly certain compounds of potassium, are apparently necessary, but they seem to take no part in the chemical changes which take place. The original hypothesis of Baeyer sug- gested that the course of events is the following : the carbon dioxide is decomposed into carbon monoxide and oxygen, while water is simultaneously split up into hydrogen and oxygen; the hydrogen and the carbon monoxide unite to form formaldehyde and the oxygen is exhaled. This explanation is unsatisfactory from many points of view, but till quite recently no acceptable alternative has been advanced. There is no evidence that carbon monoxide is ever produced, indeed there are strong reasons for disbelieving in its occurrence. The formation of formaldehyde has till recently not been satisfactorily proved, though it has been obtained from certain leaves by distillation. Certain Algae have been found capable of forming nutritive carbohydrates in darkness, when supplied with a compound of this body with sodium-hydrogen-sulphite. But it is certain that it can only be present in a cell in very small amount at any moment, for an extremely dilute solution acts as a poison to protoplasm. If formed, as it probably is, it is immediately changed into some more complex combination, and so rendered incapable of exerting its poisonous action.

Baeyer's hypothesis was entertained by botanists partly because it explained the gaseous interchanges accompanying photosynthesis. These show that a definite intake of carbon dioxide is always accompanied by an exhalation of an equal volume of oxygen.

Recent investigations have confirmed Baeyer's view of the forma- tion of formaldehyde, but a different explanation has been recently advanced. The first chemical change suggested is an interaction between carbon dioxide and water, under the influence of light acting through chlorophyll, which leads to the simultaneous formation of formaldehyde and hydrogen peroxide. The formaldehyde at once undergoes a process of condensation or polymerization by the proto- plasm of the plastid, while the hydrogen peroxide is said to be decomposed into water and free oxygen by another agency in the cell, of the nature of one of the enzymes of which we shall speak later.

Polymerization of the aldehyde was also a feature of Baeyer's hypothesis, so that this view does not very materially differ from those he advanced- More emphasis is, however, now laid on the action of the plastid in polymerization, while the initial stages are still not definitely explaincu.

The steps which lead from the appearance of formaldehyde to that of the first well-defined carbohydrate are again matters of speculation. There are many possibilities, but no definite body of simpler composition than a sugar has so far been detected. Nor

is the nature of the first formed sugar certain; the general opinion has been that it is a simple hexose such as glucose or fructose, CeHnOe. Brown and Morris in 1892 advanced strong reasons for thinking that cane-sugar, C12H22O11, is the first carbohydrate synthesized, and that the hexosts found in the plant result from the decomposition of this. The whole story of the different sugars existing in the plant — their relations _ and their several functions — requires renewed investigation.

The first visible carbohydrate formed, one which appears so rapidly on the commencement of photosynthesis as to have been regarded as the first evidence of the setting up of the process, is starch. This is met with in the form of small granular specks in the substance of the chloroplast, specks which assume a blue colour when treated with a solution of iodine. Its very prompt appear- ance, as soon as the apparatus became active, led to the opinion formerly held, that the work of the latter was complete only when the starch was formed. We have seen that the starch is preceded by the formation of sugar, and its appearance is now interpreted as a sign of surplus manufacture. As much sugar as is produced in excess of the immediate requirements of the cell is converted into the insoluble form of

starch by the plastidsof the chlorophyll apparatus, and is so withdrawn from the sphere of action, thereby enabling the construction of further quantities of sugar to take place. The presence of too much sugar in solution in the sap of the cell inhibits the activity of the chloroplast s; hence the necessity for its removal. Starch, indeed, wherever it appears in the plant seems to be a reserve store of carbohydrate material, deposited where it is found for longer or shorter periods till it is needed for consumption. The readiness with which it is converted into sugar fits it especially to be a reserve or stored material.

Proteid Formation. — We have seen that it has been suggested that the chlorophyll apparatus may perhaps be concerned in the manu- facture of proteids as well as of carbohydrates. If not, there must exist in the green plant, side by side with it, another mechanism which is concerned with the manufacture of the complex compounds in which nitrogen is present. The independence of the two is sug- gested by the fact that fungi can live, thrive and grow in nutritive media which contain carbohydrates together with certain salts of ammonia, but which are free from proteids. It is certain that their protoplasm cannot be nourished by inorganic compounds of nitrogen, any more than that of animals. We must therefore surmise their possession of a mechanism which can construct proteids, if supplied with these compounds of nitrogen together with sugar.

The probability is that this mechanism is to be found in green plants in the leaves — at any rate there is a certain body of evidence pointing in this direction. It may be, however, that there is no special mechanism, but that this power is a particular differentiation of a physiological kind, existing in all vegetable protoplasm, or in that of certain cells. The idea of an identity of protoplasm does not involve a denial of special powers developed in it in different situations, and the possession of such a power by the vegetable cell is not more striking than the location of the powers of co-ordina- tion and thought in the protoplasm of cells of the human brain.

But if we accept either view we have still to examine the process of construction in detail, with a view to ascertaining the stages by which proteid is built up. Here unfortunately we find ourselves in the region of speculation and hypothesis rather than in that of fact. The nitrogen is absorbed by the plant in some form of combi- nation from the soil. The green plant prefers as a rule nitrates of various metals, such as calcium, magnesium or potassium. The fungus seems to do better when supplied with compounds of ammonia. The nitrogen of the atmosphere is not called into re- quisition, except by a few plants and under special conditions, as will be explained later. The fate of these inorganic compounds has not been certainly traced, but they give rise later on to the presence in the plant of various amino acid amides, such as leucin. glycin, asparagin, &c. That

these are stages on the way to proteids has been inferred from the fact that when proteids are split up by various means, and especially by the digestive secretions, these nitrogen-containing acids are among the products which result.

While we know little of the processes of proteid-construction, we are almost completely in the dark also as to what are the particular proteids which are first constructed.

Opinions are conflicting also as to the conditions under which proteids are formed. There is a certain amount of evidence that at any rate in some cases light is necessary, and that the violet rays of the spectrum are chiefly concerned. But the subject requires elucidation from both chemical and biological points of view.

The normal green plant is seen thus to be in possession of a complete machinery for the manufacture of its own food. The way in which such food when manufactured is incorporated into, and enabled to build up, the living substance is again hidden in obscurity. This is, however, also the case with the nutrition of animal proto- plasm.

The building up and nutrition of the living substance by the foods manufactured or absorbed is properly spoken of as the assimi- lation of such food. Up to very recently the original absorption and subsequent treatment of the carbon dioxide and the compounds of nitrogen has been called by the same term. We frequently find the expression used, "the 'assimilation' of carbon dioxide, or of

nitrogen." As this is not the incorporation of either into the living substance, but is only its manufacture into the complex substances which we find in the plant, it seems preferable to limit the term " assimilation " to the processes by which foods are actually taken into the protoplasm.

Symbiosis. — Though green plants thus possess a very complete mechanism for the manufacture of their different foodstuffs, it is not always exercised to the fullest extent. Many of them are known to supplement it, and some almost entirely to replace it, by absorb- ing the food they need in a fully prepared condition from their environment. It" may be that they procure it from decomposing organic matter in the soil, or they may get it by absorption from other plants to which they attach themselves, or they may

in rare cases obtain it by preying upon insect life. The power of green plants, not even specialized in any of these directions, to absorb certain carbohydrates, particularly sugars, Irom the soil was demonstrated by Acton in 1889. Similar observations have been made in the case of various compounds of nitrogen, though these have not been so complex as the proteids. It was formerly the custom to regard as parasites all those p'ants which inserted roots or root-like organs into the tissues of other plants and absorbed the contents of the latter. The most conspicuous case, perhaps, of all these is the mistletoe, which flourishes luxuriantly upon the apple, the poplar and other trees. Bonnier has drawn attention to the fact that the mistletoe in its turn, remaining green in the winter, contributes food material to its host when the latter has lost its leaves. The relationship thus existing he showed to be mutually beneficial, each at one time or another supplying the necessities of the other. Such a relationship is known as symbiosis, and the large majority of the cases of so-called parasitism among green plants can be referred to it. Bonnier showed that the same relationship could be proved in the cases of such plants as the rattle (Rhinanthus) , the eye-bright (Euphrasia), and other members of the Natural Orders, Scrophulari- aceae and Santalaceae, which effect a union between their roots and the roots of other plants growing near them. The union taking place underground, while the bulk of both partners in the symbiosis rises into the air, renders the association a little difficult to see, but there is no doubt that the plants in question do afford each other assistance, forming, as it were, a kind of partnership. The most pronounced case of parasitism, that of Cuscuta, the dodder, which infests particularly clover fields, appears to differ only in degree from those mentioned, for the plant, bare of leaves as it is, yet con- tains a little chlorophyll. The advantages it can offer to its host are, however, infinitesimal when compared with the injury it does it. Many other cases of symbiosis have been investigated with some completeness, especially those in which lower plants than the Phanerogams are concerned. The relations of the Alga and the Fungus, which have formed a close associationship in the structure known as the Lichen, were established many years ago. Since about 1880 our knowledge of the species which can enter into such relationships has been materially extended, and the_ fungal con- stituents of the Lichens are known to include Basidiomycetes as well as Ascomycetes.

Mycorhizas. — The most interesting cases, however, in which Fungi form symbiotic relationships with green plants have been discovered in connexion with forest trees. The roots of many of the latter, while growing freely in the soil are found to be surrounded with a dense feltwork of fungal mycelium, which sometimes forms a mass of considerable size. The plants showing it are not all forest trees, but include also some Pteridophytes and some of the prothallia of the Ferns, Club-mosses,

Liverworts and Horsetails. The true nature of the relationship was first recognized by Pfeffer in 1877, but few cases were known till recent years. Very complete examina- tion, however, has now been made of many instances, and the name mycorhiza has been given to the symbiotic union. Two classes are recognized. In the first, which are called ectotropic, the fungal filaments form a thick felt or sheath round the root, either completely enclosing it or leaving the apex free. They seldom penetrate the living cells, though they do so in a few cases. The root-hairs pene- trate between masses of the hyphae of the Fungus. This type of mycorhiza is found among the Poplars, Oaks ˆnd Fir trees. The other type is called endctropic. The fungal filaments either pene- trate the epidermis of the root, or enter it from the stem and ramify in the interior. Some make their way through the cells of the outer part of the cortex towards the root-tip, and form a mycelium or feltwork of hyphae, which generally occupies two or three layers of cells. From this branches pass into the middle region of the cortex and ramify through the interior half of its cells. They often cause a considerable hypertrophy of the tissue. From the outer cortical mycelium, again, branches pass through the epidermis and grow out in the soil. In such cases the roots of the plants are usually found spreading in soils which contain a large amount of humus, or decaying vegetable matter. The organic compounds of the latter are absorbed by the protruding fungal filaments, which take the place of root-hairs, the tree ceasing to develop the latter. The food so absorbed passes to the outer cortical mycelium, and from this to the inner hyphae, which appear to be the organs of the interchange of substance, for they are attracted to the neighbourhood of the nuclei of the cells, which they enter, and in which they form agglom erations of interwoven filaments. The prothalli of the Pterido-

phytes, which form similar symbioses, show a somewhat different mode of arrangement, the Fungi occupying the external or the lower layers of the thalloid body.

The discovery of the widespread occurrence of this mycorhizal symbiosis must be held to be one of the most important results oi research upon the nutritive processes of plants during the closing decade of the 19th century. Among green plants the symbionts include Conifers, Orchids, Heaths, Oaks, Poplars and Beeches, though all do not derive equal advantages from the association. Monotropas afford an extreme case of it, having lost their chlorophyll almost entirely, and come to depend upon the Fungi for their nutri- ment. The fungal constituents vary considerably. Each species of green plant may form a mycorhiza with two or three different Fungi, and a single species of Fungus may enter into symbiosis with several green plants. The Fungi that have been discovered taking part in the union include Eurotium, Pythium, Boletus, A garicus, Lactarius, Penicillium and many others of less frequent occurrence. All the known species belong to the

Oomycetes, the Pyrenomycetes, the Hymenomycetes or the Gasteromycetes. The habit of forming mycorhizas is found more frequently in warm climates than cold; indeed, the percentage of the flora exhibiting this peculiarity seems to increase with a certain regularity from the Arctic Circle to the equator.

Fixation of Nitrogen. — Another, and perhaps an even more impor- tant, instance of symbiotic association has come to the front during the same period. It is an alliance between the plants of the Natural Order Leguminosae and certain bacterium-like forms which find a home within the tissues of their roots. The importance of the symbiosis can only be understood by considering the relationship in ■which plants stand with regard to the free nitrogen of the air. Long ago the view that this gas might be the source of the combined nitrogen found in different forms within the plant, was critically examined, particularly by Boussingault, and later by Lawes and Gilbert and by Pugh, and it was ascertained to be erroneous, the plants only taking nitrogen into their substance when it is presented to their roots in the form of nitrates of various metals, or compounds of ammonia. Many writers in recent years, among whom may be named especially Hellriegel and Wilfarth, Lawes and Gilbert, and Schloesing and Laurent, have shown that the Leguminosae as a group form conspicuous exceptions to this rule. While they are quite capable of taking up nitrates from the soil where and so long as these are present, they can grow and thrive in soil which contains no combined nitrogen at all, deriving their supplies of this element in these cases from the air. The phenomena have been the subject of very careful and critical examination for many years, and may be regarded as satisfactorily established. The power of fixing atmo- spheric nitrogen by the higher plants seems to be confined to this solitary group, though it has been stated by various observers with more or less emphasis that it is shared by others. Frank has claimed to have found oats, buckbeans, spurry, turnips, mustard, potatoes and Norway maples exercising it; Nobbe and others have imputed its possession to Elaeagnus. There is little direct evidence pointing to this extension of the power, and many experimenters directly contradict the statements of Frank.

The power exercised by the Leguminosae is associated with the presence of curious tubercular swellings upon their roots, which are developed at a very early age, as they are cultivated in ordinary soil. If experimental plants are grown in sterilized soil, these swellings do not appear, and the plant can then use no atmospheric nitrogen. The swellings have been found to be due to a curious hypertrophy of the tissue of the part, the cells being filled with an immense num- ber of minute bacterium-like organisms of V, X or Y shape. The development of these structures has been studied by many observers, both in England and on the continent of Europe. They appear to be present in large numbers in the soil, and to infect the Legumin- ous plant

by attacking its root-hairs. One of these hairs can be seen to be penetrated at a particular spot, and the entering body is then found to grow along the length of the hair till it reaches the cortex of the root. It has the appearance of a delicate tube which has granular contents, and is provided withan apex that appears to be open. The wall of the tube is very thin and delicate, and does not seem to be composed of cellulose or any modification of it. Careful staining shows that the granular substance of the interior really consists of a large number of delicate rod-like bodies. As the tube grows down the hair it maintains its own independence, and does not fuse with the contents of the root-hair, whose protoplasm re- mains quite distinct and separate. After making its way into the interior, the intruder sets up a considerable hyper trophy of the tissue, causing the formation of a tubercle, which soon shows a certain differentiation, branches of the vascular bundles of the root being supplied to it. The rod-like bodies from the intenor of the tube, which has considerable resemblance to the zoogloea of many Bacteria, are liberated into the interior of the cells of the tubercle and fill it, increasing by a process of branching and fission. When this stage is reached the invading tubes and their ramifications frequently disappear, leaving the cells full of the bacterioids, as they have been called. When the root dies later such of these as remain are dis- charged into the soil, and are then ready to infect new plants. In some cases the zoogloea thread or tube has not been seen, the organ- ism consisting entirely of the bacterioids.

This peculiar relationship suggests at once a symbiosis, the Fungus gaining its nutriment mainly or entirely from the green plant, while the latter in some way or other is able to utilize the free nitrogen of :he air. The exact way in which the utilization or fixation of the nitrogen is effected remains undecided. Two views are still receiving certain support, though the second of them appears the more prob- able. These are: (i) That the green plant is so stimulated by the symbiotic association which leads to the hypertrophy, that it is able to fix the nitrogen or cause it to enter into combination. (2) That the fixation of the gas is carried out by the fungal organism either in the soil or in the plant, and the nitrogenous substance so produced is absorbed by the organism, which is in turn consumed by the green plant. Certain evidence which supports this view will be referred to later.

Whichever opinion is held on this point, there seems no room for doubt that the fixation of the nitrogen is concerned only with the root, and that the green leaves take no part in it. The nodules, in particular, appear to play

the important part in the process. Mar- shall Ward has directed attention to several points of their structure which bear out this view. They are supplied with a regular system of conducting vascular bundles communicating with those of the roots. Their cells during the period of incubation of the symbiotic organism are abundantly supplied with starch. The cells in which the fungoid organism is vigorously flourishing are exceedingly active, showing large size, brilliant nuclei, protoplasm and vacuole, all of which give signs of intense metabolic activity. The sap in these active tissues is alkaline, which has been interpreted as being in accordance with Loew's suggestion that the living protoplasm in presence of an alkali and free nitrogen can build up ammonium nitrate, or some similar body. It is, however, at present entirely unknown what substances are formed at the expense of the atmo- spheric nitrogen.

The idea that the atmospheric nitrogen is gradually being made use of by plants, although it is clearly not easily or commonly utilized, has been growing steadily. Besides the phenomena of the symbiosis just discussed, certain experiments tend to show that we have a constant fixation of this gas in the soil by various Bacteria. Researches which have been carried out since 1885 by Berthelot, Andree, Laurent and Schlcesing, and more recently by Kossowitsch, seem to establish the fact, though the details of the process remain undiscovered. Berthelot imputes it to the action of several species of soil Bacteria and Fungi, including the Bacterium of the Legu- minosae, when the latter is cultivated free from its ordinary host. Laurent and Schlcesing affirm that the free nitrogen of the air can be fixed by a number of humble green plants, principally lowly green Algae. They must be exposed freely to light and air during the process, or they fail to effect it. Frank has stated that Penicillvim cladiosporioides can flourish in a medium to which no nitrogen but that of the atmosphere has access. Kossowitsch claims to have proved that fixation of nitrogen takes place under the influence of a symbiosis of certain Algae and soil Bacteria, the process being much facilitated by the presence of sugar. The Algae include Nostoc, Cystococcus, Cylindrospermum and a few other torms. In the sym- biosis the Algae are supplied with nitrogen by the bacteria, and in turn they construct carbohydrate material, part of which goes to the microbes. This is supported by the fact that if the mixed culture is placed in the light there is a greater fixation than when it is left in darkness. If there is a plentiful supply of carbon dioxide, more nitrogen is fixed.

Nitrification and Denitrification in the Soil. — Another aspect of the nitrogen question has been the subject of much investigation and controversy since 1877. The round of changes which nitrogenous organic matter undergoes in the soil, and how it is ultimately made use of again by plants, presents some curious features. We have seen that when nitrogenous matter is present in the condition of humus, some plants can absorb it by

their roots or by the aid of mycorhizas. But the changes in it in the usual course of nature are much more profound than these. It becomes in the soil the prey of various microbes. Ammonia appears immediately as a product of the disruption of the nitrogen-containing organic molecule. Later, oxidation processes take place, and the ammonia gives rise to nitrates, which are absorbed by plants. These two processes go on successively rather than simultaneously, so that it is only towards the end of the decomposition of the organic matter that nitrification of the ammonia which is formed is set up. In this process of nitri- fication we can distinguish two phases, first the formation of nitrites, and secondly their oxidation to nitrates. The researches of Waring- ton in England and Winogradsky on the Continent have satis- factorily shown that two distinct organisms are concerned in it, and that probably more than one species of each exists. One of them comprising the genera Nitrosomonas and Nitrosococcus, has the power of oxidizing salts of ammonium to the condition of compounds of nitrous acid. When in a pure culture this stage has been reached no further oxidation takes place. The oxidation of the nitrites into nitrates is effected by another organism, much smaller than the first. The name Nitrobacter has been given to this genus, most of our knowledge of which is due to the researches of Winogradsky. , The two kinds of organism are usually both present in the same soi}^ those of the second type immediately oxidizing the nitrites which those of the first form from ammonium salts. The Nitro-

bacter forms not only cannot oxidize the latter bodies, but they are very injuriously affected by the presence of free ammonia. When cultivated upon a suitable nutritive material in the laboratory, the organism was killed by the presence of -015 % of this gas, and seriously inconvenienced by one-third as much. Except in this respect, however, the two classes show great similarity. A very interesting peculiarity attaching to them is their distaste for organic nutriment. They can be cultivated most readily on masses of gelatinous silica impregnated with the appropriate compounds of nitrogen, and their growth takes place most copiously in the absence of light. They need a little carbonate 'in the nutrient material, and the source of the carbon which is found in the increased bulk of the plant is partly that and partly the carbon dioxide of the air.

We have in these plants a power which appears special to them, in the possession of some mechanism for the construction of organic substance which differs essentially from the chlorophyll apparatus of green plants, and yet brings about substantially similar results. The steps by which this carbon dioxide is built up into a compound capable of being assimilated by the protoplasm of the cells are not known. The energy for the purpose appears to be supplied by the oxidation of the molecules containing nitrogen, so that it is dependent upon such oxidation taking place.

Winogradsky has investigated this point with great care, and he has come to the conclusion that about 35 milligrammes of nitrogen are oxidized for each milligramme of carbon absorbed and fixed.

Deposition and Digestion of Reserve Materials in Plants and Animals. — As we have seen, the tendency of recent research is to prove the identity of the mode of nutrition of vegetable and animal organisms. The material on which they feed is of the same descrip- tion and its treatment in the body is precisely similar. In both groups we find the presence of nutritive material in two forms, one specially fitted for transport, the other for storage. We have seen that in the plant the processes of construction go on in the seats of manufacture faster than those of consumption. We have the sur- plus sugar, for instance, deposited as starch in the chloroplasts themselves. The manufacture goes on very actively so long as light shines upon the leaves, and we find towards night a very great surplus stored in the cells. This excess of manufacture is one of the features of plant life, and is exhibited, though in various degrees, by all green plants. The accumulated material is made to minister to the need of the plant in various ways ; it may be by increasing the ■ bulk of the plant, as by the formation of the wood of the trunk, branches and roots; or it may be by laying up a store of nutritive materials for purposes of propagation, as in tubers, corms, seeds, &c. In any case the surplus is continuously being removed from the seats of its construction and deposited for longer or shorter periods in other parts of the structure, usually near the regions at which its ultimate consumption will take place. We have the deposition of starch, aleurone grains, amorphous proteids, fats, &c, in the neighbourhood of growing points, cambium rings and phellogens; also the more prolonged storage in tubers, seeds and other repro- ductive bodies. Turning to the animal, we meet with similar pro- visions in the storage of glycogen in the liver and other parts, of fat in various internal regions, and so on. In both we find the reserve of food, so far as it is in excess of immediate need, existing in two conditions, the one suitable for transport, the other for storage, and we see continually the transformation of the one into the other. The formation of the storage form at the expense of the travelling stream is due to the activity of some protoplasmic structure — it may be a plastid or the general protoplasm of the cell — and is a pro- cess of secretion. The converse process is one of a true digestion, which deserves the name no less because it is intracellular. We find processes of digestion strictly comparable to those of the alimentary canal of an animal in the case of the insectivorous Nepenthes, Drosera and other similar plants, and in the saprophytic Fungi. Those which now concern us recall the utilization of the glycogen of the liver, the stored fats and proteids of other parts of the animal body being like them intracellular.

Enzymes. — The agents which effect the digestive changes in plants have

been studied with much care. They have been found to be mainly enzymes, which are in many cases identical with those of animal origin. A vast number of them have been discovered and investigated, and the majority call for a brief notice. Their number, indeed, renders it necessary to classify them, and rather to look at groups of them than to examine them one by one. They are usually classified according to the materials on which they work, and we may here notice especially four principal groups, the members of which take part in the digestion of reserve materials as well as in the processes of external digestion. These decompose respectively carbohydrates, glucosides, proteids and fats or oils. The action of the enzyme in nearly every case is one of hydration, the body acted on being made to take up water and to undergo a subsequent decomposition.

Among those which act on carbohydrates the most important are ; the two varieties of diastase, which convert starch into maltose or malt sugar; inulase, which forms fructose from inulin; invertase, which converts cane sugar into glucose (grape sugar) and fructose ; glucase or maltase, which produces grape sugar from maltose; and cytase, which hydrolyses cellulose. Another enzyme which does

not appear to be concerned with digestion so directly as the others is peclase, which forms vegetable jelly from pectic substances occurring in the cell-wall.

The enzymes which act upon glucosides are many ; the best known are emulsin and myrosin, which split up respectively amygdalin, the special glucoside of certain plants of the Rosaceae; and sinigrin, which has a wide distribution among those of the Cruciferae. Others of less frequent occurrence are erythrozym, rhamnase and gaul- therase.

The proteolytic enzymes, or those which digest proteids, are usually divided into two groups, one which breaks down ordinary proteids into diffusible bodies, known as peptones, which are them- selves proteid in character. Such an enzyme is the pepsin of the stomach of the higher animals. The other group attacks these peptones and breaks them down into the amino-acids of which we have spoken before. This group is represented by the erepsin of the pancreas and other organs. A third enzyme, the trypsin of the pancreas, possesses the power of both pepsin and erepsin. The relationships existing between these enzymes are still the subjects of experiment, and we

cannot regard them as exhaustively examined. It is not quite certain whether a true pepsin exists in plants, but many trypsins have been discovered, and one form of erepsin, at least, is very widespread. Among the trypsins we have the papain of the Papaw fruit (Carica Papaya), the bromelin of the Pine-apple, and the enzymes present in many germinating seeds, in the seedlings of several plants, and in other parts. Another enzyme, rennet, which in the animal body is proteolytic, is frequently met with in plants, but its function has not been ascertained.

The digestion of fat or oil has not been adequately investigated, but its decomposition in germinating seeds has been found to be due to an enzyme, which has been called lipase. It splits it into a fatty acid and glycerine, but seems to have no further action. The details of the further transformations have not yet been completely followed. Oxidases. — Another class of enzymes has been discovered in both animals and plants, but they do not apparently take any part in digestion. They set up a process of oxidation in the substances which they attack, and have consequently been named oxidases. Very little is known about them.

In many cases the digestion of reserve food materials is effected by the direct action of the protoplasm, without the intervention of enzymes. This property of living substance can be proved in the case of the cells of the higher plants, but it is especially prominent in many of the more lowly organisms, such as the Bacteria. The processes of putrefaction may be alluded to as affording an instance of such a power in the vegetable organisms. At the same time it must be remembered that the secretion of enzymes by Bacteria is of widespread occurrence.

Supply and Distribution of Energy in Plants.— It is well known that one of the conditions of life is the maintenance of the process which is known as respiration. It is marked by the constant and continu- ous absorption of a certain quantity of oxygen and by the exhalation of a certain volume of carbon dioxide and water vapour. There is no direct connexion between the two, the oxygen is absorbed almost immediately by the protoplasm, and appears to enter into some kind of chemical union with it. The protoplasm is in a condition of instability and is continually breaking down to a certain extent, giving rise to various substances of different degrees of complexity, some of which are again built up by it into its own substances, and others, more simple in composition, are given off. Of these carbon dioxide and water are the most prominent. These respiratory pro- cesses are associated with the liberation of energy by the protoplasm, energy which it applies to various purposes. The assimilation of complex foods consequently may be regarded as supplying the proto- plasm with a potential store of energy, as well as building up its substance. Whenever complex bodies are built up from simple ones we have an absorption of energy in some form and its

conversion into potential energy; whenever decomposition of complex bodies into simpler ones takes place we have the liberation of some or all of the energy that was used in their construction.

Since about 1880 considerable attention has been directed to the question of the supply, distribution and expenditure of energy in the vegetable kingdom. This is an extremely important question, since the supply of energy to the animal world has been found to depend entirely upon the vegetable one. The supply of energy to the several protoplasts which make up the body of a plant is as necessary as is the transport to them of the food they need; indeed, the two things are inseparably connected. The source of energy which is the only one accessible to the ordinary plant as a whole Is the radiant energy of the rays of the sun, and its absorption is mainly due to the properties of chlorophyll. This colouring matter, as shown by its absorption spectrum, picks out of the ordinary beam of light a large proportion of its red and blue rays, together with some of the green and yellow. This energy is obtained especially by the chloroplastids, and part of it is at once devoted to the construction of carbohydrate material, being thus turned from the kinetic to the potential condition. The other constructive processes, which are dependent partly upon the oxidation of the carbohydrates so formed, and therefore upon an expenditure of part of such energy, also mark the storage of energy in the potential form. Indeed, the construc- tion of protoplasm itself indicates the same thing. Thus even in

these constructive processes there occurs a constant passage of energy backwards and forwards from the kinetic to the potential condition and vice versa. The outcome of the whole round of changes, how- ever, is the fixation of a certain part of the radiant energy absorbed by the chlorophyll. ‘ The rays of the visible spectrum do not supply all the energy which the plant obtains. It has been suggested by several botanists, with considerable plausibility, that the ultra-violet or chemical rays can be absorbed and utilized by the protoplasm without the intervention of any pigment such as chlorophyll. There is some evidence pointing to the existence of this power in the cells of the higher plants. Again, we have evidence of the power of plants to avail themselves of the heat rays. There is, no doubt, a direct interchange of heat between the plant and the air, which in many cases results in a gain of heat by the plant. Indeed, the tendency to absorb heat in this way, either from the air or directly from the sunlight, has already been pointed out as a danger which needs to be averted by transpiration.

There is probably but little transformation of one form of kinetic energy into another in the plant. It has been suggested that the red pigment Anthocyan, which is found very commonly in young developing shoots, petioles and midribs, effects a conversion of light rays into heating ones, so

facilitating the metabolic processes of the plant. This is, however, rather a matter of speculation. The various electrical phenomena of plants also are obscure.

Certain plants possess another source of energy which is common to them and the animal world. This is the absorption of elaborated compounds from their environment, by whose decomposition the potential energy expended in their construction can be liberated. Such a source is commonly met with among the Fungi, the insecti- vorous plants, and such of the higher plants as have a saprophytic habit. This source is not, however, anything new, for the elaborated compounds so absorbed have been primarily constructed by other plants through the mechanism which has just been described.

The question of the distribution of this stored energy to the separate protoplasts of the plant can be seen to be the same problem as the distribution of the food. The material and the energy go together, the decomposition of the one in the cell setting free the other, which is used at once in the vital processes of the cell, being in fact largely employed in constructing protoplasm or storing various products. The actual liberation in any cell is only very gradual, and generally takes the form of heat. The metabolic changes in the cells, however, concern other decompositions side by side with those which involve the building up of protoplasm from the products of which it feeds. So long as food is supplied the living substance is the seat of transformations which are continu- ally proceeding, being partially decomposed and again constructed, the new food being incorporated into it. The changes involve a continual liberation of energy, which in most cases is caused by the respiration of the protoplasm and the oxidation of the substances it contains. The need of the protoplasm for oxygen has already been spoken of : in its absence death soon supervenes, respiration being stopped. Respiration, indeed, is the expression of the libera- tion of the potential energy of the protoplasm itself. It is not certain how far substances in the protoplasm are directly oxidized without entering into the composition of the living substance, though this appears to take place. Even their oxidation, however, is effected by the protoplasm acting as an oxygen carrier.

The supply of oxygen to a plant is thus seen to be as directly connected with the utilization of the energy of a cell as is that of food concerned in its nutrition. If the access of oxygen to a protoplast is interfered with its normal respiration soon ceases, but frequently other changes supervene. The partial asphyxiation or suffocation stimulates the protoplasm to set up a new and perhaps supplementary series of decompositions, which result in the libera- tion of energy just as do those of the respiratory process. One of the constant features of respiration — the exhalation of carbon dioxide — can still be observed. This comes in almost all such cases from the

decomposition of sugar, which is split up by the protoplasm into alcohol and carbon dioxide. Such decompositions are now generally spoken of as anaerobic respiration. The decomposition of the complex molecule of the sugar liberates a certain amount of energy, as can be seen from the study of the fermentation set up by yeast, which is a process of this kind, in that it is intensified by the absence of oxygen. The liberated energy takes the form of heat, which raises the temperature of the fermenting wort. It has been ascertained that in many cases this decomposition is effected by the secretion of an enzyme, which has been termed zymase. This body has been prepared from active yeast, and from fruits and other parts which have been kept for some time in the absence of oxygen. The protoplasm appears to be able also to bring about the change without secreting any enzyme.

Expenditure of Energy by Plants. — The energy of the plant is, as we have seen, derived originally from the kinetic radiant energy of the sun. In such cells as are capable of absorbing it, by virtue of their chlorophyll apparatus, the greater part of it is converted into the potential form, and by the transport from cell to cell of the compounds constructed every part of the plant is put into possession of the energy it needs. The store of energy thus accumulated and distributed has to subserve various purposes in the economy of the plant. A certain part of it is devoted to the maintenance of

the framework of the fabric of the cell, and the construction of a continuously increasing skeleton; part is used in maintaining the normal temperature of the. plant, part in constructing various sub- stances which are met with in the interior, which serve various purposes in the working of the vital mechanism. A great part again is utilized in that increase of the body of the plant which we call growth.

Growth, as usually spoken of, includes two essentially different processes. The first of these, which may be regarded as growth proper, is the manufacture of additional quantities of living sub- stance. The second, which is usually included in the term, is the increase of such accessories of living substance as are necessary for its well-being. These include cell walls and the various stored products found in growing cells. There is clearly a difference between these two categories. The formation of living substance is a process of building up from simple or relatively simple materials; the construction of its cellulose framework and supporting substance is done by the living substance after its own formation is completed, and is attended

by a partial decomposition of such living substance. Growth is always going on in plants while they are alive. Even the oldest trees put out continually new leaves and twigs. It does not, of course, follow that increase of bulk is always conspicuous; in such trees death is present side by side with life, and the one often counterbalances the other. As, however, we can easily see that the constructive processes are much greater than those which lead to the disappearance of material from the plant-body, there is generally to be seen a conspicuous increase in the substance of the plant. This is, in nearly all cases, attended by a permanent change in form. This is not perhaps so evident in the case of axial organs as it is in that of leaves and their modifications, but even in them it can be detected to a certain extent.

In the lowliest plants growth may be co-extensive with the plant- body ; in all plants of any considerable size, however, it is localized in particular regions, and in them it is associated with the formation of new protoplasts or cells. These regions have been called growing points. In such stems and roots as increase in thickness there are other growing regions, which consist of cylindrical sheaths known as cambium layers or phellogens. By the multiplication of the proto- plasts in these merismatic areas the substance of the plant is in- creased. In other words, as these growing regions consist of cells, the growth of the entire organ or plant will depend upon the behaviour of the cells or protoplasts of which the merismatic tissues are composed.

The growth of such a cell will be found to depend mainly upon five conditions: (i) There must be a supply of nutritive or plastic materials, at the expense of which the increase of its living substance can take place, and which supply the needed potential energy. (2) There must be a supply of water to such an extent as to set up a certain hydrostatic pressure in the cell, for only turgid cells can grow. (3) The supply of water must be associated with the formation of osmotic substances in the cell, or it cannot be made to enter it. (4) The cell must have a certain temperature, for the activity of a protoplast is only possible within certain limits, which differ in the case of different plants. (5) There must be a supply of oxygen to the growing cell, for the protoplast is dependent upon this gas for the performance of its vital functions, and particularly for the libera- tion of the energy which is demanded in the constructive processes. This is evident from the consideration that the growth of the cells is attended by the growth in surface of the cell wall, and as the latter is a secretion from the protoplasm, such a decomposition cannot readily take place unless oxygen is admitted to it.

When these conditions are present, the course of the growth of a cell appears to be the following: The young cell, immediately it is cut off from its fellow, absorbs water, in consequence of the presence in it of osmotically

active substances. With the water it takes in the various nutritive substances which the former contains in solu- tion. There is set up at once a certain hydrostatic pressure, due to the turgidity which ensues upon such absorption, and the extensible cell wall stretches, at first in all directions. The growth or increase of the protoplasm at the expense of the nutritive matter for a time keeps pace with the increased size of the cell, but by and by it be- comes vacuolated as more and more water is attracted into the interior. Eventually the protoplasm usually forms only a lining to the cell wall, and a large vacuole filled with cell sap occupies the centre. The growth of the protoplasm, though considerable, is therefore not commensurate with the increase in the size of the cell. The stretching of the cell wall by the hydrostatic pressure is fixed by a secretion of new particles and their deposition upon the original wall, which as it becomes slightly thicker is capable of still greater extension, much in the same way as a thick band of india- rubber is capable of undergoing greater stretching than a thin one. The increase in surface of the cell wall is thus due — firstly to the stretching caused by turgidity, and secondly to the formation and deposition of new substance upon the old. _ When the limit of extensibility is reached the cell wall increases in thickness from the continuation of the latter of the two processes.

The rate of growth of a cell varies gradually throughout its course; it begins slowly, increases to a maximum, and then becomes slower till it stops. The time during which these regular changes in the rate can be observed is generally spoken of as the grand period of growth.

If we consider the behaviour of a growing organ such as a root, we find that, like a cell, it shows a grand period of growth. Just behind its apex the cells are found to be all in process of active division. Growth is small, and consists mainly in an increase of the quantity of protoplasm, for the cells divide again as soon as they have reached a certain size. As new cells are continually formed in the merismatic mass those which are farthest from the apex gradually cease to divide and a different process of growth takes place in them, which is associated more particularly with the formation of the vacuoles, consequent upon the establishment of considerable hydro- static pressure in them, thus causing the bulk of the cells to be greatly enlarged. Here it is that the actual extension in length of the root takes place, and the cells reach the maximum point of the grand period. They then gradually lose the power of growth, the oldest ones or those farthest from the apex parting with it first, and they pass gradually over into the condition of the permanent tissues.

The same order of events may be ascertained to take place in the stem ; but in this region it is complicated by the occurrence of nodes and internodes, growth in length being confined to the latter, many of which may be

growing simultaneously. The region of growth in the stem is, as a rule, much longer than that of the root. The growth of the leaf is at first apical, but this is not very prolonged, and the subsequent enlargement is due to an intercalary growing region near the base.

The turgidity in the cells of a growing member is not uniform, but shows a fairly rhythmical variation in its different parts. If the member is one which shows a difference of structure on two sides, such as a leaf, the two sides frequently show a difference of degree of turgidity, and consequently of rate of growth. If we consider a leaf of the common fern we find that in its young condition it is closely rolled up, the upper or ventral surface being quite concealed. As it gets older it gradually unfolds and expands into the adult form. This is due to the fact that while young the turgidity and consequent growth are greater in the dorsal side of the leaf, so that it becomes rolled up. As it develops the maximum turgidity and growth change to its upper side, and so it becomes unfolded or expanded. These two conditions are generally described under the names of hyponasty and epinasty respectively.

Cylindrical organs may exhibit similar phenomena. One side of a stem may be more turgid than the opposite one, and the maximum turgidity, with its consequent growth, may alternate between two opposite sides. The growing apex of such a stem will alternately incline, first to one side and then to the other, exhibiting a kind of nodding movement in the two directions. More frequently the re- gion of maximum turgidity passes gradually round the growing zone. The apex in this case will describe a circle, or rather a spiral, as it is elongating all the time, pointing to all points of the compass in succession. This continuous change of position has been called circumnutation, and is held to be i universal in all growing cylindrical organs. The passage of the maximum turgidity round the stem may vary in rapidity in different places, causing the circle to be replaced by an ellipse. The bending to two sides alternately, described above, often called simple nutation, may be regarded as only an extreme instance of the latter.

Nervous System of Plants. — So far we have considered the plant almost exclusively as an individual organism, carrying out its own vital processes, and unaffected by its surroundings except in so far as these supply it with the materials for its well-being. When we consider, however, the great variability in those surroundings and the consequent changes a plant must encounter, it appears obvious that interaction and adjustment between the plant and its environment must be constant and well balanced. That such adjustment shall take place postulates on the part of the plant a kind of perception or appreciation of the changing conditions which affect it.

Careful examination soon shows an observer that such perceptions exist,

and that they are followed by certain purpose- ful changes in the plant, sometimes mechanical, sometimes chemical, the object being evidently to secure some advantage for the plant, to ward off some danger, or to extricate it from some difficulty. We may speak, indeed, of the plant as possessed of a rudimentary nervous system, by the aid of which necessary adjustments are brought about. The most constantly occurring changes that beset a plant are connected with illumination, temperature, moisture, and contact with foreign bodies. Setting aside other susceptibilities, we have evidence that most plants are sensitive to all these.

If a growing stem receives stronger illumination on one side than another, its apex slowly turns from the vertical in the direc- tion of the light source, continuing its change of position until it is in a direct line with the incident rays. If a root is similarly illuminated, a similar change of direction of growth follows, but

in this case the organ grows away from the light. These move- ments are spoken of as heliotropic and apkeliotropic curvatures. The purpose of the movements bears out the contention that the plant is trying to adjust itself to its environment. The stem, by pointing directly to the light source, secures the best illumination possible for all of its leaves, the latter being distributed sym- metrically around it. The root is made to press its way into the darker cracks and crannies of the soil, so bringing its root-hairs into better contact with the particles round which the hygroscopic water hangs. Leaves respond in another way to the same influ- ence, placing themselves across the path of the beam of light.

Similar sensitivenesses can be demonstrated in other cases. When a root comes in contact at its tip with some hard body, such as might impede its progress, a curvature of the growing part is set up, which takes the young tip away from the stone, or what-not, with which it is in contact. When a sensitive tendril comes into contact with a foreign body, its growth becomes so modified that it twines round it. Many instances might be given of appreciation of and response to other changes in the environment by the growing parts of plants; among them we may mention the opening and closing of flowers during the days of their expansion. One somewhat similar phenomenon, differing in a few respects, marks the relation of the plant to the attraction of gravity. Observation of germinating seedlings makes it clear that somehow they have a perception of direction. The

young roots grow vertically downwards, the young stems vertically upwards. Any attempt to interfere with these direc- tions, by placing the seedlings in abnormal positions, is frustrated by the seedlings themselves, which change their direction of growth by bringing about curvatures of the different parts of their axes, so that the root soon grows vertically downward again and the stem in the opposite direction. Other and older plants give evidence of the same perception, though they do not respond all in the same way. Speaking generally, stems grow upwards and roots downwards. But some steins grow parallel to the surface of the soil, while the branches both of stems and roots tend to grow at a definite angle to the main axis from which they come. These movements are spoken of as different kinds of geotropic curvatures. This power of perception and response is not by any means confined to the growing organs, though in these it is especially striking, and plays a very evident part in the disposition of the growing organs in advantageous positions. It can, however, be seen in adult organs, though instances are less numerous.

When the pinnate leaf of a Mimosa pudica, the so-called sensitive plant, is pinched or struck, the leaf droops rapidly and the leaflets become approximated together, so that their upper surfaces are in contact. The extent to which the disturb- ance spreads depends on the violence of the stimulation — it may be confined to a few leaflets or it may extend to all the leaves of the plant.

The leaves and leaflets of many plants, e.g. the telegraph plant, Desmodium gyrans, behave in a similar way under the stimulus of approaching darkness.

A peculiar sensitiveness is manifested by the leaves of the so- called insectivorous plants. In the case of Dionaea muscipula we find a two-lobed lamina, the two lobes being connected by a midrib, which can play the part of a kind of hinge. Six sensitive hairs spring from the upper surface of the lobes, three from each; when one of these is touched the two lobes rapidly close, bringing their upper surfaces into contact and imprisoning any- thing which for the' moment is between them. The mechanism is applied to the capture of insects alighting on the leaf.

Drosera, another of this insectivorous group, has leaves which are furnished with long glandular tentacles. When these are excited by the settling of an insect on the leaf they slowly bend over and imprison the intruder, which is detained there mean- while by a sticky excretion poured out by the glands.

In both these cases the stimulation is followed, not only by movement, but by the secretion of an acid liquid containing a digestive juice, by virtue of

which the insect is digested after being killed.

The purposeful character of all these movements or changes of position indicates that they are of nervous origin. We have in them evidence of two factors, a perception of some features of the environment and following this, after a longer or shorter interval, a response calculated to secure some advantage to the responding organ. We find on further investigation that these two con- ditions are traceable to different parts of the organs concerned. The perception of the changes, or, in other words, the reception of the stimulus, is associated for example, with the tips of roots and the apices of stems. The first recognition of a specially receptive part was made by Charles Darwin, who identified the perception of stimulation with the tip of the young growing root. Amputation of this part involved the cessation of the response, even when the conditions normally causing the stimu- lation were maintained. Francis Darwin later demonstrated that the tips of the plumules of grasses were sensitive parts. The responding part is situated some little distance farther back, being in fact the region where growth is active. This bending part has been proved to be insensitive to the stimuli. There is consequently a transmission of the stimulus from the sensitive organ to a kind of motor mechanism situated some little way off. We find thus three factors of a nervous mechanism present, a receptive, a conducting, and a responding part. The differen- tiation of the plant's substance so indicated is, however, physiological only; there is no histological difference between the cells of these regions that can be associated with the several properties they possess. Even the root tip, which shows a certain differentiation into root cap and root apex, cannot be said to be a definite sense organ in the same way as the sense organs of an animal. The root is continually growing and so the sensitive part is continually changing its composition, cells being formed, growing and becoming permanent tissue. The cells of the tip at any given moment may be sensitive, but in a few days the power of receiving the stimulus has passed to other and younger cells which then constitute the tip. The power of appreciating the environment is therefore to be associated with the protoplasm only at a particular stage of its development and is transitory in its character.

What the nature of the stimulation is we are not able to say. The protoplasm is sensitive to particular influences, perhaps of vibration, or of contact or of chemical action. We can imagine though perhaps only vaguely, the way in which light, tempera- ture, moisture, contact, &c, can affect it. The perception of direction or the influence of gravity presents greater difficulty, as we have no clear idea of the form which the force of gravity takes. Recently some investigations by Haberlandt, Noll, Darwin and others have suggested an explanation which has much to recommend it. The sensitive cells must clearly be influenced in some way by weight —

not the weight of external organs but of some weight within them. This may possibly be the cell sap in their interior, which must exercise a slightly different hydrostatic pressure on the basal and the lateral walls of the cells. Or more probably it may be the weight of definite particulate structures in their vacuoles. Many experiments point to certain small grains of starch which are capable of dis- placement as the position of the cell is altered. Such small granules have been observed in the sensitive cells, and there is an evident correlation between these and the power of receiving the geotropic stimulus. It has been shown that if the organ con- taining them is shaken for some time, so that the contact between them and the protoplasm of the cells is emphasized, the stimulus becomes more efficient in producing movement. This reduces the stimulus to one of contact, which is in harmony with the observations made upon roots similarly stimulated from the exterior. The stimulating particles, whether starch grains in all cases, or other particles as well, have been termed statoliths.

We have spoken of the absence of structural differentiation in the sense organs. There is a similar difficulty in tracing the paths by which the impulses are transmitted to the growing and curving regions. The conduction of such stimulation to parts removed some distance from the sense organ suggests paths of transmission comparable to those which transmit nervous

impulses in animals. Again, the degree of differentiation is very slight anatomically, but delicate protoplasmic threads have been shown to extend through all cell-walls, connecting together all the protoplasts of a plant. These may well serve as con- ductors of nervous impulses. The nervous mechanism thus formed is very rudimentary, but in an organism the conditions of whose life render locomotion impossible great elaboration would seem superfluous. There is, however, very great delicacy of perception or appreciation on the part of the sense organ, stimuli being responded to which are quite incapable of impressing themselves upon the most highly differentiated animal.

The power of response is seen most easily in the case of young growing organs, and the parts which show the motor mechanism are mainly the young growing cells. We do not find their behaviour like that of the motor mechanism of an animal. The active contraction of muscular tissue has no counterpart in the plant. The peculiarity of the protoplasm in almost every

cell is that it is especially active in the regulation of its permeability by water. Under different conditions it can retain it more strongly or allow it to escape more freely. This regulation of turgor is as characteristic of vegetable protoplasm as contraction is of muscle. The response to the stimulus takes the form of increasing the permeability of particular cells of the growing structures, and so modifying the degree of the turgidity that is the precursor of growth in them. The extent of the area affected and of the variation in the turgor depends upon many circum- stances, but we have no doubt that in the process of modifying its own permeability by some molecular change we have the counterpart of muscular contractibility.

The response made by the adult parts of plants, to which reference has been made, is brought about by a mechanism similar in nature though rather differently applied. If the leaf of Mimosa or Desmodium be examined, it will be seen that at the base of each leaflet and each leaf, just at the junction with the respective axes, is a swelling known as a pulvinus. This has a relatively large development of succulent parenchyma on its upper and lower sides. In the erect position of the leaf the lower side has its cells extremely turgid, and the pulvinus thus forms a cushion, holding up the petiole. On stimulation these cells part with their water, the lower side of the organ becomes flaccid and the weight of the leaf causes it to fall. The small pulvini of the leaflets, by similar changes of the distribution of turgidity, take up their respective positions after receiving the stimulus. In some cases the two sides of the pulvini vary their turgidity in turns; in others only the lower side becomes modified.

Similar turgescence changes, taking place with similar rapidity in the midrib of the leaf of Dionaea, explain the closing of the lobes upon their hinge. More slowly, but yet in the same way, we may note the change in turgidity of certain cells of the Droscra tentacles, as they close over the imprisoned insect.

Organic PJiylhm.- — It is a remarkable fact that during the process of growth we meet with rhythmic variation of such turgidity. The existence of rhythm of this kind has been ob- served and studied with some completeness. It is the immediate cause of the phenomena of circumnutation, each cell of the circumnutating organ showing a rhythmic enlargement and decrease of its dimensions, due to the admission of more and less water into its interior. The restraint of the protoplasm changes gradually and rhythmically. The sequence of the phases of the rhythm of the various cells are co-ordinated to produce the movement. Nor is it only in growing organs that the rhythm can be observed, for many plants exhibit it during a much longer period than that of growth. It is easy to realize how such a rhythm can be modified by the reception of stimuli, and can consequently serve as the basis for the movement of the stimu- lated organ.

This rhythmic affection of vegetable protoplasm can be observed in very many of its functions. What have been described as " periodicities," such as the daily variations of root -pressure, afford familiar instances of it. It reminds us of a similar property of animal protoplasm which finds its expression in the rhythmic beat of the heart and other phenomena.

Authorities. — Sachs, Lectures on the Physiology of Plants, trans- lated by Marshall Ward ; Vines, Lectures on the Physiology of Plants ; Pfeffer, The Physiology of Plants, trans, by Ewart ; Reynolds Green, Introduction to Vegetable Physiology; The Soluble Ferments and Fer- mentation; Detmer, Practical Plant Physiology, trans, by Moor; Darwin and Acton, Practical Physiology of Plants; Davenport, C.B., Experimental Morphology, vols. i. and ii. ; Verworn, General Physiology, trans, by Lee; Biitschli, Investigation on Microscopic Forms and on Protoplasm, trans, by Minchin. (J. R. Gr.)

Pathology or Plants " Phytopathology " or plant pathology (Gr. 4>vtov, plant), comprises our knowledge of the symptoms, course, causes and remedies of the maladies which threaten the life of plants, or which result in abnormalities of structure that are regarded, whether directly injurious or not to life, as unsightly or undesir- able. In its systematized form, as a branch of botanical study, it is of recent date, and, as now understood, the subject first received special attention about 1850, when the nature of parasitism began to be intelligible; but many disjointed refer- ences to diseased conditions of plants had appeared long before this. The existence of blights and mildews of cereals had been observed and recorded in very ancient times, as witness the Bible, where half a dozen references to such scourges occur in the Old Testament alone. The epidemic nature of wheat-rust was known to Aristotle about 350 B.C., and the Greeks and Romans knew these epidemics well, their philosophers having shrewd speculations as to causes, while the people held characteristic superstitions regarding them, which found vent in the dedication of special festivals and deities to the pests. Pliny knew that flies emerge from galls. The few records during the middle ages are borne out by what is known of famines and pestilence. Shakespeare's reference in King Lear (Act in., sc. iv.) may be quoted as evincing acquaintance with mildew in the 17th century, as also the interesting Rouen law of Loverdo (1660). Malpighi in 1679 gave excellent figures and accounts of leaf-rolling and gall insects, and Grew in 1682 equally good descriptions of a leaf- mining caterpillar. During the 18th century more academic treatment of the subject began to replace the scattered notes. Hales (1727-1733) discussed the rotting of wounds, cankers, &c, but much had to be done with the microscope before any real progress was possible, and it is easily intelligible that until the theory of nutrition of the higher plants had been founded by the work of Ingenhouss, Priestley and De Saussure, the way was not even prepared for accurate knowledge of cryptogamic parasites and the diseases they induce. It was

not till De Bary (1866) made known the true nature of parasitic Fungi, based on his researches between 1853-1863, that the vast domain of epidemic diseases of plants was opened up to fruitful investigation, and such modern treatises as those of Frank (1880 and 1.805), Sorauer (1886), Kirchner (1890), were gradually made possible.

Plant pathology embraces several branches of study, and may be conveniently divided as follows: —

1. The observation and accurate description of symptoms (Diagnosis).

2. The study of causes or agencies inducing disease (Aetiology).

3. The practise of preventive and remedial measures (Thera- peutics) .

In plants, however, the symptoms of disease are apt to exhibit themselves in a very general manner. Our perceptions differen- tiate but imperfectly symptoms which are due to very different causes and reactions, probably because the organization of the plant is so much less highly specialized than that of higher animals. The yellowing and subsequent casting of leaves, for instance, is a very general symptom of disease in plants, and may be induced by drought, extremes of temperature, insufficient or excessive illumination, excess of water at the roots, the action of parasitic Fungi, insects, worms, &c, or of poisonous gases, and so forth; and extreme caution is necessary in dealing with amateur descriptions of such symptoms, especially when the untrained eye has taken no cognisance of, or has only vaguely observed, the numerous collateral circumstances of the case.

The causes of disease may be provisionally classified somewhat as follows, but it may be remarked at the outset that no one of

these proximal causes, or agents, is ever solely responsible; and it is very easy to err in attributing a diseased condition to any of them, unless the relative importance of primary and subordinate agencies is discoverable. For instance, a Fungus epidemic is impossible unless the climatic conditions are such as to favour the dispersal and germination of the spores; and when plants are killed off owing to the supersaturation of the soil with water, it is by no means obvious whether the excess of water and dissolved materials, or the exclusion of oxygen from the root-hairs, or the lowering of

the temperature, or the accumulation of foul products of decomposition should be put into the foreground. In every case there are chains of causation concerned^and the same factors will be differently grouped in different cases.

Bearing in mind these precautions, we may classify the proximal causal agents of disease as —

I. — External agencies. A. Non-living. a. Material.

1. Physical — Soil. Water. Atmosphere.

2. Chemical — Soil. Water. Atmosphere.

b. Non-material.

i. Temperature.

2. Illumination.

3. Other agencies. B. Living.

a. Animals.

1. Vertebrata.

2. Invertebrata.

b. Plants.

1. Phanerogams.

2. Cryptogams.

If. — Internal agencies. While such a classification may serve its purpose as a sort of index, it must be confessed that the limits of its usefulness are soon reached. In the first place, the so-called " internal causes " of disease is probably a mere phrase covering our ignorance of the factors at work, and although a certain convenience attaches to the distinction between those cases where tender breeds of plants apparently exhibit internal predisposition to suffer more readily than others from parasites, low temperatures, excessive growth, &c. — as is the case with some grafted plants, cultivated hybrids, &c. — the mystery involved in the phrase " internal causes " only exists until we find what action of the living or non-living environment of the essential mechanism of the plant has ups«t its equilibrium.

I. — Passing to the recognized external agencies, the physical condition of the soil is a fruitful source of disease. If too closely packed, the soil particles present mechanical obstacles to growth; if too retentive of moisture, the root-hairs suffer, as already hinted ; if too open or over-drained, the plant succumbs to drought. All those properties of soil known as texture, porosity, depth, inclina- tion to the horizon, &c, are concerned here. Many maladies of plants are traceable to the chemical composition of soils — e.g. deficiency of nutritive salts, especially nitrates and phosphates; the presence of poisonous salts of iron, copper, &c, or (in the soil about the roots of trees in towns) of coal-gas and so forth. But it is worthy of special attention that the mere chemical com- position of agricultural and garden soils is, as a rule, the least im- portant feature about them, popular opinion to the contrary notwithstanding. Ordinary soils will almost always provide the necessary chemical ingredients if of proper physical texture, depth, &c. (see Fungi and Bacteriology).

As regards water, its deficiency or excess is a relative matter, and although many of the minor maladies of pot-plants in windows and greenhouses controlled by amateurs depend on its misuse, water alone is probably never a primary cause of disease. Its over-supply is, however, a frequent cause of predisposition to the attacks of parasitic Fungi — e.g. the damping off of seedlings — and in saturated soils not only are the roots and root-hairs killed by asphyxiation, but the whole course of soil fermentation is altered, and it takes time to " sweeten " such by draining, because not only must the noxious bodies be gradually washed out and the lost salts restored, but the balance of suitable bacterial and fungal life must be restored.

The atmosphere is a cause of disease in the neighbourhood of chemical works, large towns, volcanoes, &c, in so far as it carries acid gases and poisons to the leaves and roots; but it is usual to associate with it the action of excessive humidity which brings about those tender watery and more or less etiolated conditions which favour parasitic Fungi, and diminish transpiration and there- fore nutrition. It is customary to speak of the disastrous effects of cold winds, snow, hail and frost, lightning, &c, under the heading of atmospheric influences, which only shows once more how im- possible it is to separate causes individually.

Turning to the non-material external agents, probably no factors are more responsible for ill-health in plants than temperature and

light. Every plant is constrained to carry out its functions of germination, growth, nutrition, reproduction, &c, between certain limits of temperature, and somewhere between the extremes of these limits each function finds an optimum temperature at which the working of the living machinery is at its best, and, other things being equal, any great departure from this may

induce pathological conditions; and many disasters are due to the failure to provide such suitable temperatures — e.g. in greenhouses where plants requiring very different optimum temperatures and illumination are kept together. Equally disastrous are those climatic or seasonal changes which involve temperatures in themselves not excessive but in wrong sequence; how many more useful plants could be grown in the open in the United Kingdom if the deceptively mild> springs were not so often followed by frosts in May and June ! The indirect effects of temperature are also important. Trees, of which the young buds are " nipped " by frost, would frequently not suffer material injury, were it not that the small frost-cracks serve as points of entry for Fungi; and numerous cases are known where even high temperatures can be endured on rich, deep, reten- tive soils by plants which at once succumb to drought on shallow or non-retentive soils.

All chlorophyll plants require light, but in very different degrees, as exemplified even in the United Kingdom by the shade-bearing beech and yew contrasted with the light-demanding larch and birch ; and as with temperature so with light, every plant and even every organ has its optimum of illumination. The " drawn " or etiolated condition of over-shaded plants is a case in point, though here again the soft, watery plant often really succumbs to other disease agents — e.g. parasitic Fungi — supervening on its non- resistant condition.

Animals and plants as agents of disease or injury form part of the larger subject of the struggle for existence between living organisms, as is recognized even by those who do not so readily apprehend that diseased conditions in general are always signs of defeat in the struggle for existence between the suffering organism and its environment, living and non-living.

The Vertebrata come within the scope of our subject, chiefly as destructive agents which cause wounds or devour young shoots and foliage, &c. Rabbits and other burrowing animals injure roots, squirrels and birds snip off buds, horned cattle strip off bark, and so forth. It is among the Invertebrata that epidemics of destruction are referred to, though we should bear in mind that it is only the difference in numerical proportion that prevents our speaking of an epidemic of elephants or of rabbits, though we use the term when speaking of blight insects; there is little consistency in the matter, as it is usual to speak of an invasion or scourge of locusts, caterpillars, &c. Insect injuries are very varied in degree and in kind. Locusts devour all before them ; caterpillars defoliate c-_ plant, and necessitate the premature utilization of its reserves; other insects {e.g. Grapholitha) eat the buds or the roots (e.g. wire- worms), and so maim the plant that its foliage suffers from want of water and assimilation is diminished, or actual withering follows. Many aphides, &c, puncture the leaves, suck out the sap, and induce various local deformations, arrest of

growth, pustular swellings, &c, and if numerous all the evils of defoliation may follow. Others {e.g. miners) tunnel into the leaf parenchyma, and so put the assimilating areas out of action in another way. It should be remembered that a single complete defoliation of a herbaceous annual may so incapacitate the assimilation that no stores are available for seeds, tubers, &c, for another year, or at most so little that feeble plants only come up. In the case of a tree matters run somewhat differently; most large trees in full foliage have far more assimilatory surface than is immediately necessary, and if the injury is confined to a single year it may be a small event in the life of the tree, but if repeated the cambium, bud-stores and fruiting may all suffer. Many larvae of beetles, moths, &c, bore into bark, and injure the cambium, or even the wood and pith; in addition to direct injury, the interference with the transpiration current and the access of other parasites through the wounds are also to be feared in proportion to the numbers of insects at work. Various local hypertrophies, including galls, result from the increased growth of young tissues irritated by the punctures of insects, or by the presence of eggs or larvae left behind. They may occur on all parts, buds, leaves, stems or roots, as shown by the numerous species of Cynips on oak, Phylloxera on vines, &c. The local damage is small, but the general injury to assimilation, absorption and other functions, may be important if the numbers increase. In addition to insects, various kinds of worms, molluscs, &c, are sometimes of importance as pests. The so-called eel- worms {Nematodes) may do immense damage on roots and in the grains of cereals, and every one knows how predatory slugs and snails are. (See Economic Entomology.)

Plants as agents of damage and disease may be divided into those larger forms which as weeds, epiphytes and so forth, do injury by dominating and shading more delicate species, or by gradually exhausting the soil, &c, and true parasites which actually live on and in the tissues of the plants. It must be remembered that phanerogams also include parasitic species — e.g. Cuscuta, Loranlhus, Viscum, Thesium, Rhinanthus, &c. — with various capac- ities for injury. These enemies are as a rule so conspicuous that

we do not look on their depredations as diseases, though the gradual I deterioration of hay under the exhausting effects of root-parasites like Rhinanthus, and the onslaught of Cuscuta when unduly abund- ant, should teach us how unimportant to the definition the question of size may be.

It is, however, among the Fungi that we find the most disastrous and elusive agents of disease. Parasitic Fungi may be, as regards their direct action, purely local — e.g. Schinzia, which forms gall- like swellings on the roots of rushes; Gymnosporangium, causing excrescences on juniper stems; numerous leaf Fungi such as Puc- cinia, Aecidium, Septoria, &c, causing yellow, brown or black spots on leaves; or Ustilago in the anthers of certain flowers. In such cases the immediate damage done may be slight; but the effects of prolonged action and the summation of numerous attacks at numerous points are often enormous, certain of these leaf- diseases costing millions sterling annually to some planting and agricultural communities. In other cases the Fungus is virulent and rampant, and, instead of a local effect, exerts a general de- structive action throughout the plant — e.g. Pythium, which causes the " damping off " of seedlings, reducing them to a putrid mass in a few hours, and Phytophthora, the agent of the potato disease. Many Fungi, in themselves not very aggressive, slowly bring about important and far-reaching secondary effects. Thus, many Hymeno- mycetes (Agarics, Polyporei, &c.) live on the wood of trees. This wood is in great part already dead substance, but the mycelium gradually invades the vessels occupied with the transmission of water up the trunk, cuts off the current, and so kills the tree; in other cases such Fungi attack the roots, and so induce rot and starva- tion of oxygen, resulting in " fouling." Numerous Fungi, though conspicuous as parasites, cannot be said to do much individual injury to the host. The extraordinary malformations known as " Witches' Brooms," caused by the repeated branching and tufting of twigs in which the mycelium of Exoascus (on birch) or Aecidium (on silver fir) are living, may be borne in considerable numbers for years without any very extensive apparent injury to the tree. Again, the curious distortions on the stems of nettles attacked by the Aecidium form of the heteroecious Puccina Caricis (see Fungi for Heteroecism), or on maize stems and leaves attacked by Ustilago Maydis, or on the inflorescence of crucifers infested with Cystopus, &c, are not individually very destructive; it is the cumulative effects of numerous attacks or of extensive epidemics which eventu- ally tell. Some very curious details are observable in these cases of malformation. For instance, the Aecidium elatinum first referred to causes the new shoots to differ in direction, duration and arrange- ment, and even shape of foliage leaves from the normal; and the shoots of Euphorbia infected with the aecidia of Uromyces Pisi depart so much from the normal in appearance that the attacked plants have been taken for a different species. Similarly with Anemone infested with Puccinia and Vaccinium with Calyptospora, and many other cases of deformations due to hypertrophy or atrophy. In- stances of what we may term tolerated parasitism, where the host plant seems to accommodate itself very well to the presence of the Fungus, paying the tax it extorts and nevertheless not succumbing but managing to provide itself with sufficient material to goon

with, are not rare; and these seem to lead to those cases where the mutual accommodation between host and guest has been carried so far that each derives some benefit from the association — symbiosis (see Fungi).

II. The kinds of disease due to these various agencies are very different. A plant may be diseased as a whole, because nearly all its tissues are in a morbid or pathological condition, owing to some Fungus pervading the whole — e.g. Pythium in seedlings — or to a poison diffusing from cell to cell; in the case of unicellular plants — e.g. an alga infested with a Chytridium — indeed, matters can hardly be otherwise. But the case is obviously different where a plant dies because some essential organ or tissue tract has been destroyed, and other parts have suffered because supplies are cut off — e.g. when the upper parts of a tree die off owing to destruction of the roots, or to the ringing of the stem lower down,' and consequent interference with the transpiration current. In a large number of cases, however, the disease is purely local, and does not itself extend far into the organ or tissue affected.

If a mass of living plant-tissue is cut, the first change observed is one of colour: the white " flesh " of a potato or an apple turns brown as the air enters, and closer examination shows that cell walls and contents are alike affected. The cut cells die, and oxidized products are concerned in the change of colour, the brown juices exuding and soaking into the cell-walls. The next change observ- able after some hours is that the untouched cells below the cut grow larger, push up the dead surface, and divide by walls tangential to it, with the formation of tabloid cork-cells. The layer of cork thus formed cuts out the dead debris and serves to protect the uninjured cells below. Such healing by cork formation is accom- panied by a rise of temperature: the active growth of the dividing cells is accompanied by vigorous metabolism and respiration, and a state of " wound fever " supervenes until the healing is completed. The phenomena described occur in all cases of cicatrization of wounds in nature — e.g. leaf-tissue, young stems, roots, &c, when cut or pierced by insects, thorns and so forth. They are con- cerned in the occlusion of broken twigs and of falling leaves, and

it is from the actively growing " callus" developed at the surface of the wounded tissues of cuttings, buddings, prunings, &c, that the healing and « renewal of tissues occur of which advantage is taken in the practice of what might well be termed plant surgery. A third phenomenon observable in such healing tissues is the increased flow and accumulation of plastic materials at the seat of injury. The enhanced metabolism creates a current of draught on the supplies of available food-stuffs around. The phenomenon of irritability here concerned is well shown in certain cases where a parasitic organism gains access to a cell — e.g. Pleotr achelus causes the invaded Pilobolus to swell up, and changes the whole course of

its cell metabolism, and similarly with Plasmodiophora in the roots of turnips, and many other cases.

Irritation and hypertrophy of cells are common signs of the pres- ence of parasites, as evinced by the numerous malformations, galls, witches'- brooms, &c, on diseased plants. The now well-known fact that small doses of poisonous substances may act as stimuli to living protoplasm, and that respiratory activity and growth may be accelerated by chloroform, ether and even powerful mineral poisons, such as mercuric chloride, in minimal doses, offers some explanation of these phenomena of hypertrophy, " wound fever," and other responses to the presence of irritating agents. Still further insight is afforded by our increasing knowledge of the enzymes, and it is to be remarked that both poisons and enzymes are very common in just such parasitic Fungi as induce discolora- tions, hypertrophies and the death of cells — e.g. Botrytis, Ergot, &c. Now it is clear that if an organism gains access to all parts of a plant, and stimulates all or most of its cells to hypertrophy, we may have the latter behaving abnormally — i.e. it may be diseased through- out; and such actually occurs in the case of Euphorbia pervaded with Uromyces Pisi, the presence of which alters the whole aspect of the host-plant. If such a general parasite carries its activities farther, every cell may be killed and the plant forthwith destroyed— e.g. Phytophthora in potatoes. . If, on the other hand, the irritating agent is local in its action, causing only a few cells to react, we have the various pimples, excrescences, outgrowths, &c, exhibited in such cases as Ustilago Maydis on the maize, various galls, witches'- brooms, &c.

It must not be overlooked that the living cells of the plant react upon the parasite as well as to all external agencies, and the nature of disease becomes intelligible only if we bear in mind that it con- sists in such altered metabolism — deflected physiology — as is here implied. The reaction of the cells may be in two directions, moreover. For instance, suppose the effect of a falling temperature is to so modify the metabolism of the cells that they fill up more and more with watery sap; as the freezing-point is reached this may result in destructive changes, and death from cold may result. If, on the contrary, the gradual cooling is met by a corresponding depletion of the cells of water, even intense cold may be sustained without injury.

Or, take another case. If the attack of a parasite is met by the formation of some substance in the protoplasm which is chemo- • tactically repulsive to the invader, it may be totally incapable of penetrating the cell, even though equipped with a whole armoury of cytases, diastatic and other enzymes, and poisons which would easily overcome the more passive resistances offered by mere cell-walls and cell-contents of other plants, the protoplasm of which forms bodies chemotactically attractive to the Fungus.

The various degrees of parasitism are to a certain extent explained by the

foregoing. In order that a Fungus may enter a plant, it must be able to overcome not merely the resistance of cell-walls, but that of the living protoplasm; if it cannot do this, it must remain outside as a mere epiphyte, e.g. Fumago, Herpotrichia, &c, or, at most, vegetate in the intercellular spaces and anchor itself to the cell-walls, e.g. Trichosphaeria. The inability to enter the cells may be due to the lack of chemotactic bodies, to incapacity to form cellulose-dissolving enzymes, to the existence in the host-cells of antagonistic bodies which neutralize or destroy the acids, enzymes or poisons formed by the hyphae, or even to the forma- tion and excretion of bodies which poison the Fungus. But even when inside it does not follow that the Fungus can kill the cell, and many cases are known where the Fungus can break through the cell's first lines of defence (cell-wall and protoplasmic lining) ; but the struggle goes on at close quarters, and various degrees of hypertrophy, accumulation of plastic bodies or secretions, dis- colorations, &c, indicate the suffering of the still living cell. Finally, cases occur where the invaded cell so adapts itself to the presence of the intruder that life in common — symbiosis — results. The dissemination of plant parasites is favoured by many cir- cumstances not always obvious, whence an air of mystery regarding epidemics was easily created in earlier times. The spores of Rusts, Erysipheae and other Fungi may be conveyed from plant to plant by snails; those of tree- killing polyporei, &c, by mice, rabbits, rats, &c, which rub their fur against the hymenophores. Bees carry the spores of Sclerotinia as they do the pollen of the bilberries, and flies convey the conidia of ergot from grain to grain. Insects, indeed, are largely concerned in disseminating Fungi, either on their bodies or via the alimentary canal. Worms bring spores to the surface of soil, ducks and other birds convey them on their muddy feet, and, as is well-known, wind and other physical

agencies are very efficient in dissemination. The part played by man also counts for much. Gardeners and farm labourers convey spores from one bed or field to another; carted soil, manure, &c, may abound in spores of Smuts, Fusarium, Polyporei and in sclerotia; and articles through the post and so forth often carry infective spores. Every time a carpenter saws fresh timber with a saw recently put through wood attacked with dry-rot, he risks infect- ing it with the Fungus; and similarly in pruning, in propagating by cuttings, &c.

The annual losses due to epidemic plant diseases attain pro- portions not

easily estimated. As regards money value alone the following figures may serve in illustration. In 1882 the United States was calculated to have lost £40,000,000 to £60,000,000 from insect and other pests. The wheat-rust costs Australia £2,000,000 to £3,000,000 annually, and in 1891 alone the loss which Prussia suffered from grain-rusts was estimated at £20,000,000 sterling.

The terrible losses sustained by whole communities of farmers, planters, foresters, &c, from plant diseases have naturally stimu- lated the search for remedies, but even now the search is too often conducted in the spirit of the believer in quack medicines, although the agricultural world is awakening to the fact that before any measures likely to be successful can be attempted, the whole chain of causation of the disease must be investigated. Experience with epidemics, dearly bought in the past, has shown that one fruitful cause is the laying open to the inroads of some Fungus or insect, hitherto leading a quiet endemic life in the fields and forests,_ large tracts of its special food, along which it may range rampant without check to its dispersal, nutrition and reproduction. Numerous wild hypotheses as to changes in the constitution of the host-plant, leading to supposed vulnerability previously non-existent, would probably never have seen the light had the full significance of the truth been grasped that an epidemic results when the external factors favour a parasite somewhat more than they do the host. It may be that in particular cases particular modes of cultivation disfavour the host; or that the soil, climate or seasons do so; but overwhelming evidence exists to show that the principal causes of epidemics reside in circumstances which favour the spread, nutrition and reproduction of the pest, and the lesson to be learnt is that precautions against the establishment of such favouring conditions must be sought. Nevertheless, epidemics occur, and practical measures are devised to meet the various cases and to check the ravages already begun. The procedure consists in most cases in spraying the affected plants with poisonous solutions or emulsions, or in dusting them with fungicidal or insccticidal powders, or apply- ing the fumes of lethal gases. For the composition of the numerous liquids and powders special works must be consulted, but the following principles apply generally. The poison must not be strong enough to injure the roots, leaves, &c, of the host-plant, or allowed to act long enough to bring about such injury. Care and intelligence are especially needful with certain insecticides such as poisonous gases, or the operators may suffer. It is worse than useless to apply drastic remedies if the main facts cf the life- history of the pest are not known; e.g. the application of ordinary antiseptic powders to leaves inside which a Fungus, such as a Uredo or Vstilago, is growing can only result in failure, and similarly if tobacco fumes, for instance, are applied when the insects con- cerned are hibernating in the ground beneath. Such applications at the moment when

spores are germinating on the leaves, e.g. Peronospora, or to the young mycelia of epiphytic parasites, e.g. Erysiphe, or the steeping in hot water of thoroughly ripe hard grains to which spores are attached, e.g. Ustilago, and filling a greenhouse with hydrocyanic acid gas when young insects are commencing their ravages, e.g. Red-spider — all these and similar procedures timed to .catch the pest at a vulnerable stage are intelligent and profitable prophylactic measures, as has been repeatedly shown. Numerous special methods of preventing the spread of Fungi, or the migrations of insects, or of trapping various animals; of leaving infested ground fallow, or of growing another crop useless to the pest, &c, are also to be found in the practical treatises. More indirect methods, such as the grafting of less resistant scions on more vigorous stocks, of raising special late or early varieties by crossing or selection, and so on, have also met with .success; but it must be understood that " resistant " in such cases usually means that some peculiarity of quick growth, early ripening or other life-feature in the plant is for the time being taken advantage of. Among the most interesting modern means of waging war against epidemic pests is that of introducing other epidemics among the pests themselves — e.g. the infection of rats and mice with disease bacilli, or of locusts with insect-killing Fungi, and signs of the successful carrying out of such measures are not wanting. That the encouragement of insectivorous birds has been profitable is well established, and it is equally well-known that their destruc- tion may lead to disastrous insect plagues.

Diseases and Symptoms. — The symptoms of plant diseases are, as already said, apt to be very general in their nature, and are sometimes so vaguely defined that little can be learned from them as to the causes at work. We may often distinguish between primary symptoms and secondary or subordinate

symptoms, but for the purposes of classification in an article of this scope we shall only attempt to group the various cases under the more obvious signs of disease exhibited.

I. Discolor ations are among the commonest of all signs that a plant is " sickly " or diseased. The principal symptom may show itself in general pallor, including all cases where the normal healthy green hue is replaced by a sickly yellowish hue indicating that the chlorophyll apparatus is deficient. It may be due to insufficient illumination (Etiolation), as seen in geraniums kept in too shaded a situation, and is then accompanied by soft tissues, elongation of internodes, leaves usually reduced in size, &c. The laying of wheat is a particular case. False etiolation may occur from too low a temperature, often seen in young wheat in cold springs. Cases of pallor due to too intense illumination and destruction of chlorophyll must also be distinguished. Chlorosis is a form of pallor where the chlorophyll

remains in abeyance owing to a want of iron, and can be cured by adding ferrous salts. Lack of other ingredients may also induce chlorotic conditions. Yellowing is a common sign of water-logged roots, and if accompanied by wilting may be due to drought. Over-transpiration in bright wintry weather, when the roots are not absorbing, often results in yellow- ing. In other cases the presence of insects, Fungi or poisons at the roots may be looked for. Albinism, with which variegated foliage may be considered, concerns a different set of causes, still obscure, and usually regarded as internal, though experiments go to show that some variegations are infectious.

2. Spotted Leaves, &c. — Discoloured spots or patches on leaves and other herbaceous parts are common symptoms of disease, and often furnish clues to identification of causes, though it must be remembered that no sharp line divides this class of symptoms from the preceding. By far the greater number of spot-diseases are due to Fungi, as indicated by the numerous " leaf-diseases " described, but such is by no means always the case. The spot or patch is an area of injury; on (or in) it the cell-contents are suffering destruc- tion from shading, blocking of stomata, loss of substance or direct mechanical injury, and the plant suffers in proportion to the area of leaf surface put out of action. It is somewhat artificial to classify these diseases according to the colour of the spots, and often im- possible, because the colour may differ according to the age of the part attacked and the stage of injury attained; many Fungi, for instance, induce yellow spots which become red, brown or black as they get older, and so on. White or grey spots may be due to Peronospora, Erysiphe, Cystopus, Entyloma and other Fungi, the mycelium of which will be detected in the discoloured area; or they may be scale insects, or the results of punctures by Red-spider, &c. Yellow spots, and especially bright orange spots, commonly indicate Rust Fungi or other Uredineae; but Phyllosticta, Exoascus, Clastero- sporium, Synchytrium, &c, also induce similar symptoms. Certain Aphides, Red-spider, Phylloxera and other insects also betray their presence by such spots. It is a very common event to find the early stages of injury indicated by pale yellow spots, which turn darker, brown, red, black, &c, later, e.g. Dilophia, Rhytisma, &c. Moreover, variegations deceptively like these disease spots are known, e.g. Senecio Kaempferi. Red" spots may indicate the presence of Fungi, e.g. Polystigma, or insects, e.g. Phytoptus. Brown spots are characteristic of Phytophthora, Puccinia, &c, and black ones of Fusicladium, Ustilago, Rhytisma, &c. Both are common as advanced symptoms of destruction by Fungi and insects. Brilliantly coloured spots and patches follow the action of acid fumes on the vegetation near towns and factories, and such parti- coloured leaves often present striking resemblance to autumn foliage. Symptoms of scorching owing to abnormal insolation — e.g. in greenhouses where the sun's rays are concentrated on

particular spots — and a certain class of obscure diseases, such as " silver-leaf " in plums, " foxy leaves " in various plants, may also be placed here.

3. Wounds. — The principal phenomena resulting from a simple wound, and the response of the irritated c&ls in healing by cork and in the formation of callus, have been indicated above. Any clean cut, fracture or bruise which injures the cambium over a limited area is met with the same response. The injured cells die and turn brown; the living cells beneath grow out, and form cork, and under the released pressure bulge outwards and repeatedly divide, forming a mass of succulent regenerative tissue known as callus. Living ce'ls of the pith, phloem, cortex, &c, may also co-operate in this formation of regenerative tissue, and if the wound is a mere knife-cut in the " bark," the protruding lips of callus formed at the edges of the wound soon meet, and the slit is healed over — occluded. If a piece of bark and cortex are torn off, the occlusion takes longer, because the tissues have to creep over the exposed area of wood; and the same is true of a transverse cut severing the branch, as may be seen in any properly pruned tree. Wounds may be artificially grouped under such heads as the following: Burrows and excavations in bark and wood_ due to boring insects, especially beetles. Breakages and abrasions due to wind, snow, lightning, and other climatic agents. Cuts, break- ages, &c, due to man and other vertebrate animals. Erosions of leaves and herbaceous parts by caterpillars, slugs, earwigs and so forth. Frost-cracks, scorching of bark by sun and fire, &c, and

wounds due to plants which entwine, pierce or otherwise materially injure trees, &c, on a large scale.

4. Excrescences. — Outgrowths, more or less abnormal in character, are frequent signs of diseased organs. They are due to hyper- trophy of young tissues, which may undergo profound alterations subsequently, and occur on all parts of the plants. The injury which initiates them may be very slight in the first place — a mere abrasion, puncture or Fungus infection — but the minute wound or other disturbance, instead of healing over normally, is frequently maintained as a perennial source of irritation, and the regenerative tissues grow on month after month or year after year, resulting in extraordinary outgrowths often of large size and remarkable shape. Excrescences may be divided into those occurring on herbaceous tissues, of which Galls are well-known examples, and those found on the

woody stem, branches, &c, and themselves eventually woody, of which Burrs of various kinds afford common illustrations. Among the simplest examples of the former are the hairs which follow the irritation of the cells by mites. These hairs often occur in tufts, and are so coloured and arranged that they were long taken for Fungi and placed in the " genus " Erineum.

Cecidia or galls arise by the hypertrophy of the subepidermal cells of a leaf, cortex, &c, which has been pierced by the ovipositor of an insect, and in which the egg is deposited. The irritation set up by the hatching egg and its resulting larva appears to be the stimulus to development, and net a poison or enzyme injected by the insect. The extraordinary forms, colours and textures of the true galls have always formed some of the most interesting of biological questions, for not only is there definite co-operation between a given species of insect and of plant, as shown by the facts that the same insect may induce galls of different kinds on different plants or organs, while different insects induce different galls on the same plant — e.g. the numerous galls on the oak — but the gall itself furnishes well adapted protection and abundant stores of nutriment to its particular larva, and often appears to be borne without injury to the plant. This latter fact is no doubt due to the production of an excess of plastic materials over and above what the tree requires for its immediate needs. Galls in the wide sense — technically Cecidia — are not always due to insects. The nodules on the roots of leguminous plants are induced by the presence of a minute organism now known to do no injury to the plant. Those on turnips and other Cruciferae are due to the infection of Plasmodiophora, a dangerously parasitic Myxomycete. Nodules due to " eel-worms " (Nematodes) are produced on numer- ous classes of plants, and frequently result in great losses — e.g. tomatoes, cucumbers, &c. ; and the only too well known Phylloxera, which cost France and other vine-growing countries many millions sterling, is another case in point. Fungus-galls on leaves and stems are exemplified by the " pocket-plums " caused by the Exoasceae, the black blistering swellings of Ustilago Maydis, the yellow swellings on nettles due to Aecidium, &c.

In many cases the swellings on leaves are minute, and may be termed pustules — e.g. those due to Synchytrium, Protomyces, Cystopus, many Ustilagineae, &c. These cases are not easily distinguished superficially from the pustular outgrowth of actual mycelia and spores (stromata) of such Fungi as Nectria, Puccinia, <&c. The cylindrical stem-swellings due to Calyptospora, Epichloe; &c, may also be mentioned here, and the tyro may easily confound with these the layers and cushions of eggs laid on similar organs by moths. There is a class of gall-like or pustular outgrowths for which no external cause has as yet been determined, and which are therefore often ascribed to internal causes of disease. Such are the cork-

warts on elms, maples, &c, and the class of outgrowths known as Intumescences. Recent researches point to definite external conditions of moisture, affecting the processes of respira- tion and transpiration, &c, as being responsible for some of these. The " scab " of potatoes is another case in point. Frost blisters are pustular swellings due to the up-growth of callus-tissue into cavities caused by the uprising of the superficial cortex under the action of intense cold. »

Turning now to outgrowths of a woody nature, the well-known burrs or " knaurs," so common on elms and other trees are cases in point. They are due to some injury — e.g. bruising by a cart- wheel, insects — having started a callus on which adventitious buds arise, or to the destruction of buds at an early stage. Then, stores of food-material being accumulated at the injured place, other buds arise at the base of or around the injured one. If matters are propitious to the development of these buds, then a tuft of twigs is formed and no burr; but if the incipient twigs are also de- stroyed at an early stage, new buds are again formed, and in larger numbers than before, and the continued repetition of these processes leads to a sort of conglomerate woody mass of fused bud-bases, not dead, but unable to grow out, and thus each contributing a crowded portion of woody material as it slowly grows. There are many varieties of burrs, though all woody outgrowths of old trees are not to be confounded with them, e.g. the " knees " of Taxo- dium, &c. Many typical burrs might be described as witches'- brooms, with all the twigs arrested to extremely short outgrowths. Witches'-brooms are the tufted bunches of twigs found on silver firs, birches and other trees, and often present resemblances to birds' nests or clumps of mistletoe if only seen from a distance.

They are branches in whicha perennial Fungus (Aecidium, Exoascus, &c.) has obtained a hold. This Fungus stimulates the main twig to shoot out more twigs than usual; the mycelium then enters each incipient twig and stimulates it to a repetition of the process, and so in the course of years large broom-like tufts result, often markedly different from the normal.

But undoubtedly the most importapt of the woody excrescences on trees are cankers. A canker is the result of repeated frustrated attempts on. the part of the callus to heal up a wound. If a clean cut remains clean, the cambium and cortical tissues soon form callus over it, and in this callus — regenerative tissue — new wood, &c, soon forms, and if the wound was a small one, no trace is visible after a few years. But the occluding callus is a mass of delicate succulent cells, and offers a dainty morsel to certain insects — e.g. Aphides — and may be easily penetrated by certain Fungi such as Peziza, Nectria; and when thus attacked, the repeated conflicts between the cambium and callus, on the one hand, trying to heal over the wound, and the insect or Fungus, on the other, destroying the new tissues

as they are formed, results in irregular growths; the still uninjured cambium area goes on thickening the branch, the dead parts, of course, remain unthickened, and the portion in which the Fungus is at work may for the time being grow more rapidly. Such cankers often commence in mere insect punctures, frosted buds, cracks in the cortex, &c, into which a germinating spore sends its hypha. The seriousness of the damage done is illustrated by the ravages of the larch disease, apple canker, &c.

5. Exudations and Rotting. — The outward symptoms of many diseases consist in excessive discharges of moisture, often accom- panied by bursting of over-turgid cells, and eventually by putre- factive changes. Conditions of hyper-turgescence are common in herbaceous plants in wet seasons, or when overcrowded and in situations too moist for them. This unhealthy state is frequently combined with etiolation: what is termed rankness is a particular case, and if the factors concerned are removed by drainage, weed- ing out, free transpiration, &c, no permanent harm may result. With seedlings and tender plants, however, matters are frequently complicated by the onslaughts of Fungi — e.g. Pythium, Perono- spora, Completoria, Volutella, Botrytis, &c. That such over- turgescence should lead to the bursting of fleshy fruits, such as gooseberries, tomatoes and grapes, is not surprising, nor can we wonder that fermentation and mould Fungi rapidly spread in such fruits; and the same is true for bulbs and herbaceous organs generally. The rotting of rhizomes, roots, &c, also comes into this category; but while it is extremely difficult in given cases to explain the course of events in detail, certain Fungi and bacteria have been so definitely associated with these roots — e.g. beet-rot, turnip disease, wet-rot of potatoes — that we have to consider each case separately. It is, of course, impossible to do this here, but I will briefly discuss one or two groups of cases.

Honey-dew.— The sticky condition of leaves of trees — e.g. lime — in hot weather is owing to exudations of sugar. In many cases the punctures of Aphides and Coccideae are shown to be responsible for such exudations, and at least one instance is known where a Fungus — Claviceps — causes it. But it also appears that honey- dew may be excreted by ordinary processes of over-turgescence pressing the liquid through water-pores, as in the tropical Caesal- pinia, Calliandra, &c. That these exudations on leaves should afterwards serve as pabulum for Fungi — e.g. Fumago, Antennaria — is not surprising, and the leaves of limes are often black with them.

Flux.— A common event in the exudation of turbid, frothing liquids from wounds in the bark of trees, and the odours of putre- faction and even alcoholic fermentation in these are sufficiently explained by the coexistence of albuminous and saccharine matters with fungi, yeasts and bacteria in such fluxes. It is clear that in these cases the obvious symptom — the flux

— is not the primary one. Some wound in the succulent tissues has become infected by the organisms referred to, and their continued action prevents healing. At certain seasons the wound "bleeds," and the organ- isms — some of which, by the bye, are remarkable and interesting forms — multiply in the nutritious sap and ferment it. The pheno menon is, in fact, very like that of the fermentation of palm wine and pulque, where the juices are obtained from artificial cuts.

Comparable with these cases is that of Cuckoo-spit, due to the juices sucked out by Aphrophthora on. herbaceous plants of all kinds. Outflows of resin — Resinosis — alfo come under this general heading; but although some resin-fluxes are traced to the destructive action of Agaricus melleus in Conifers, others, as well as certain forms of Gummosis, are still in need of explanation.

Bacteriosis. — Many of the plant diseases involving rot have been ascribed to the action of bacteria, and in some cases — e.g. cabbage- rot, bulb-rot of hyacinths, &c, carnation disease — there is evidence that bacteria are causally connected with the disease. It is not sufficient to find bacteria in the rotting tissues, however, nor even to be successful in infecting the plant through an artifieial wound, unless very special and critical precautions are taken, and in many of the alleged cases of bacteriosis the saprophytic bacteria in the tissues are to be regarded as merely secondary agents.

6. Necrosis. — A number of diseases the obvious symptoms of which are the local drying up and death of tissues, in many cases

with secondary results on organs or parts of organs, may be brought together under this heading. No sharp line can be drawn between these diseases and some of the preceding, inasmuch as it often depends on the external conditions whether necrosis is a dry-rot, in the sense I employ the term here, or a wet-rot, when it would come under the preceding category. The " dying back " of the twigs of trees and shrubs is a frequent case. The cortical tissues gradually shrink and dry up, turning brown and black in patches or all over, and when at length the cambium and medullary ray tissues dry up the whole twig dies off. This may be due to frost, especially in " thin-barked " trees, and often occurs in beeches, pears, &c. ; or it may result from bruising by wind, hailstones, gun-shot wounds in coverts, &c, the latter of course very local. It is the common result of fires passing

along. too rapidly to burn the trees; and " thin-barked " trees — hornbeam, beech, firs, &c. — may exhibit it as the results of sunburn, especially when exposed to the south-west after the removal of shelter. The effects of frost and of sunburn are frequently quite local. The usual necrosis of the injured cortex occurs — drying up, shrivelling, and consequent stretching and cracking of the dead cortex on the wood beneath. Such frost-cracks, sun-cracks, &c, may then be slowly healed over by callus, but if the conditions for necrosis recur the crack may be again opened, or if Fungi, &c, interfere with occlusion, the healing is prevented; in such cases the local necrosis may give rise to cankers. The dying back of twigs may be brought about by many causes. General attacks of leaf-diseases invariably lead to starva-tion and necrosis of twigs, and similarly with the ravages of cater- pillars and other insects. Drought and consequent defoliation result in the same, and these considerations help us to understand how old-established trees in parks, &c, apparently in good general health, become " stag-headed " by the necrosis of their upper twigs and smaller branches: the roots have here penetrated into subsoil or other unsuitable medium, or some drainage scheme has deprived them of water, &c, and a dry summer just turns the scale. Such phenomena are not uncommon in towns, where trees with their roots under pavement or other impervious covering do well for a time, but suddenly fail to supply the crown sufficiently with water during some hot summer.

7. Monstrosities. — A large class of cases of departure from the normal form, depending on different and often obscure causes, may be grouped together under this heading; most of them are of the kind termed Teratological, and it is difficult to decide how far they should be regarded as pathological if we insist that a disease threatens the existence of the plant, since many of these malforma- tions — e.g. double flowers, phyllody of floral parts, contortions and fascinations, dwarfing, malformed leaves, &c. — can not only be transmitted in cultivation, but occur in nature without evident injury to the variety. In many cases, however, monstrosities of flowers have been shown to be due to the irritating action of minute insects or Fungi, and others are known which, although induced by causes unknown to us, and regarded as internal, would not be likely to survive in the wild condition. This subject brings the domain of pathology, however, into touch with that of variation, and we are profoundly ignorant as to the complex of external conditions which would decide in any given case how far a variation in form would be prejudicial or otherwise to the continued existence of a species. Under the head of malformations we place cases of atrophy of parts or general dwarfing, due to starvation, the attacks of Fungi or minute insects, the presence of unsuitable food-materials and so on, as well as cases of transformation of stamens into petals, carpels into leaves, and so forth. Roots are often flattened, twisted and otherwise

distorted by mechanical obstacles; stems by excess of food in rich soils, the attacks of minute parasites, overgrowth by climbing plants, &c. Leaves are especially apt to vary, and although the formation of crests, pitchers, puckers, &c, must be put down to the results of abnormal development, it is often difficult to draw the line between teratological and merely 'varietal pheno- mena. For instance, the difference between the long-stalked and finely-cut leaves of Anemone attacked with rust and the normal leaves with broad segments, or between the urceolate leaves oc- casionally found on cabbages and the ordinary form — in these cases undoubtedly pathological and teratological respectively — is nothing like so great as between the upper and lower normal- leaves of many Umbelliferae or the submerged and floating leaves of an aquatic Ranunculus or Cabomba. When we come to pheno- mena such as proliferations, vivipary, the development of " Lammas shoots," adventitious buds, epicormic branches, and to those mal- formations of flowers' known as peloria, phyllody, virescence, &c. while assured that definite, and in many cases recognizable, physio- logical disturbances are. at work, we find ourselves on the borderland between patholpgical and physiological variation, where each case must be examined with due regard to all the circumstances, and no generalization seems possible beyond what has been sketched. This is equally true of the phenomena of apogamy and apospory in the light of recent researches into the effects of external con- ditions on reproduction.

This sketch of an enormous subject shows us that the pathology of plants is a special department of the study of variations which threaten injury to the plant, and passes imperceptibly into the

study of variations in general. Moreover, we have good reasons for inferring that different constellations of external causes may determine whether the internal physiological disturbances induced by a given agent shall lead to pathological and dangerous variations, or to changes which may be harmless or even advan- tageous to the plant concerned.

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Ecology of Plants

Introduction. — The word ecology is derived from 01/cos, a house (habitat), and X670J, a discourse. As a botanical term, ecology denotes that branch of botany which comprises the study of the relations of the individual plant, or the species, or the plant community with the habitat. Following Schroter 1 (Flahault and Schroter, 1910 : 24), the term autecology may be used for the study of the habitat conditions in relation to the single species, and the term synecology for this study in relation to plant communities.

From the phytogeographical standpoint, ecology is frequently termed ecological plant geography. Thus Warming 2 (1901 : 1 and 2)

1 Flahault and Schroter, Phytogeographical Nomenclature: reports and propositions (Zurich, 1910).

2 Warming, Oecology of Plants (Oxford, 1909).

plants which, like deciduous trees and bulbous plants, are hygro- phytes during one season of the year and xerophytes during another season of the year. Such plants, which comprise the great majority of the species of the central European flora, Schimper termed tropophytes.

Recently, Warming 1 (1909 : 136), assisted by Vahl, has modified his earlier classification, and adopted the following: —

A. The soil (in the widest sense) is very wet, and the abundant water is available to the plant (at least in hydrophytes).

1. Hydrophytes. — These include plants of the plankton, or micro- phytes that float free on water, of the pleuston, or macrophytes which float on or are suspended in water, and of the benthos, or all aquatic plants which are fixed to the substratum.

2. Helophytes. — These are marsh plants which normally have their roots

in soaking soil but whose branches and foliage are more or less aerial. Warming admits there is no sharp limit between marsh plants and land plants; and it seems equally obvious that there is no sharp limit between some of his helophytes and some of his hydrophytes. For example, the difference between aquatic plants with floating leaves, such as the yellow water-lily (Nymphaea luted) and those with erect leaves, such as Typha angustifolia, is probably more apparent than real. Among helophytes, Warming places plants of the reed swamp, and includes such trees as the alder (Alnus rotundifolia) , willows (e.g., Salix alba, S. fragilis, S. cinerea, S. pentandra), birch, and pine, when these grow in marshy places.

B. The soil is physiologically dry.

3. Oxylophytes. — These plants, sometimes spoken of as " bog xerophytes," grow in soils which contain an abundance of free humous compounds, and include plants which grow on fens and moors.

4. Psychrophytes. — These include the plants which grow on the cold soils of subniveal and polar districts.

5. Halophytes. — These are plants which grow on saline soils.

C. The soil is physicallyMry.

6. Lithophytes. — These are plants which grow on " true rock," but not " on the loose soil covering rock, even though this may entertain species that are very intimately associated with the rock. Still to this limitation an exception must be made in favour of the vegetation growing in clefts and niches " (Warming, 1909 : 240). Many Algae, lichens, and mosses are included among lithophytes, and also Saxifraga Aizoon, S. oppositifolia, Silene acauhs, and Gnaphalium luteo-album.

7. Psammophytes. — These are plants which grow on sand and gravel. Plants of sand-dunes, whether in maritime or inland localities, are psammophytes, as well as plants (such as Calluna vulgaris) of dune heaths, dune " bushland " or scrub, and dune forest.

8. Chersophytes. — Here are placed certain " xerophytic perennial herbs " which occur on " particular dry kinds of soil, such as lime- stone rocks, stiff clay, and so forth " (Warming, 1909 : 289).

D. The climate is very dry, and the properties of the soil are decided by climate.

9. Erempphytes. — Under this term, are placed plants of deserts and steppes.

10. Psilophytes. — Here are placed plants found in " savannah-vegetation," viz. (i.) "thorny savannah-vegetation, including: (a) orchard-scrub, Jb) thorn-bushland and thorn-forest; (ii.) true savannah: tropical and sub-tropical savannah ; (iii.) savannah-forest, including bush-forest in Africa and ' campos serrados ' in Brazil " (Warming, 1909 : 293 et seq.).

11. Sclerophyllous formations, e.g., garigues, maquis, and forests of evergreen oaks (Q. Ilex, Q. Ballota, Q. Suber) , arid of Eucalyptus spp.

E. The soil is physically or physiologically dry.

12. Coniferous forest formations, e.g., of Pinus sylvestris, Picea excelsa, Abies pectinata, Larix sibirica, L. decidua.

F. " Soil and climate favour the development of mesophilous formations."

13. Mesophytes. — Warming defines mesophytes as " plants that show a preference for soil and air of moderate humidity, and avoid soil with standing water or containing a great abundance of salts " (1909 : 317). Under mesophytes, Warming places plants occurring in " Arctic and Alpine mat-grassland and mat-herbage," in " mat- vegetation of the Alps," in meadows, in pasture on cultivated soil, in " mesophytic bushland," in deciduous dicotyledonous forests, and_in evergreen dicotyledonous forests.

This new system of Warming's, whilst probably too involved ever to come into general use, must be taken as superseding his older one; 2 and perhaps the best course open to botanists is to select such terms as appear to be helpful, and to use the selected terms in a general kind of way and without demanding any pre- cise definitions of them: it must also be borne in mind that the

*' 1 Warming (1909, op. «#.). * Ibid, (1894, op- cit.).*

various classes are neither mutually exclusive nor of equivalent rank. From this point of view, the following terms will perhaps be found the most serviceable: —

Hydrophytes (submerged aquatic plants). — Plants whose vege- tative organs live wholly in water; e.g., most Algae, many mosses, such as Fontinalis spp., and liverworts, such as Jungermannia spp.; a few Pteridophytes, such as Pilularia spp., Isoetes spp.; several flowering plants, such as Potamogeton pectinatus, Ceratophyllum spp., Hottonia palustris, Utricularia spp., Littorella lacustris.

Hemi-hydrophytes (swamp plants, marsh plants, &c). — Plants whose vegetative organs are partly submerged and partly aerial; Vaucheria

terrestris, Philonotis fontana, Scapania undulata, Mar- silia spp., Salvinia natans, Azolla spp., Equisetum limosum, Typha angustifolia, Phragmites communis, Scirpus lacustris, Nymphaea lutea, Oenanthe fistulosa, Bidens cernua.

Hygrophytes. — Plants which are sub-evergreen or evergreen but not sclerophyllous, and which live in moist soils; e.g., Lastraea Filix-mas, Poa pratensis, Carex ovalis, Plantago lanceolata, and Ackillaea Millefolium.

Xerophytes. — Plants which grow in very dry soils; e.g., most lichens, Ammophila (Psamma) arenaria, Elymus arenarius. Ana- basis dretioides, Zilla macroptera, Sedum acre, Bupleurum spinosum, Artemisia herba-alba, Zollikofferia arbor escens.

Halophytes.— Plants which grow in very saline soils; e.g., Triglochin maritimum, Salicornia spp., Zygophyllum cornutum, Aster Tri- polium, Artemisia maritima. It should be recognized, however, that " a halophyte, in fact, is one form of xerophyte " (Warming,

1909: 219).

Sclerophyllous Plants. — These are plants with evergreen leathery leaves, and typical of tropical, sub-tropical, and warm temperate regions; e.g., Quercus Suber, Ilex Aquifolium, Hedera Helix, Eucalyp- tus Globulus, Rosmarinus officinalis. Sclerophyllous leaves are usually characterized by entire or sub-entire margins, a thick cuticle, small but rarely sunken stomata, a weH-developed and close-set palisade tissue and a feeble system of air-spaces.

Hydro-xerophytes (" bog xerophytes "). — Plants which live in wet, peaty soils, and which possess aeration channels and xero- philous leaves; e.g., Cladium Mariscus, Enophorum angustifolium, Rubus Chamaemorus, and Vaccinium Vitis-Idaea. The term " oxylo- phyte " is open to the objection that some peaty waters are alkaline, and not acidic as the term implies. Many plants of peaty soils are sclerophyllous.

Tropophytes. — Plants which are hygrophytes during some favour- able part of the year and xerophytes during the rest of the year; e.g., deciduous trees and shrubs, deciduous herbaceous plants with underground perennating organs, and annuals and ephemerals.

Plant Communities. — The study of plant communities {Formationslehre or synecology) has made much progress in recent years. Even here, however, general agreement has not been reached; and the questions involved in relating the facts of the distribution of plant communities to the factors of the habitat are very imperfectly understood. Plant communities may be

classified as follows: —

A plant association is a community of definite floristic com- position: it may be characterized by a single dominant species; or, on the other hand, it may be characterized by a number of prominent species, one of which is abundant here, another there, whilst elsewhere two or more species may share dominance. The former are pure associations, and are well illustrated by a heather moor, where Calluna vulgaris is the dominant plant. The latter are mixed associations, such as fens, where different fades are produced by the varying abundance of characteristic plants, such as Cladium Mariscus, Phragmites communis, Molinia coerulea, Calamagrostis lanceolata, and Juncus obtusiflorus. The different facies are possibly related to slight differences in a generally uniform habitat: it is unscientific to regard them as due to chance; still, in the majority of cases, the causes of the different facies have not been demonstrated. A local aggre- gation of a species other than the dominant one in an associ- ation brings about a plant society; for example, societies of Erica Tetralix, of Scirpus caespitosus, of Molinia coerulea, of Carex curia, of Narthecium ossifragum, and others may occur within an association of Calluna vulgaris. The plant societies are also doubtless due to slight variations of the habitat.

The plant association is sometimes referred to in technical language; 3 the termination -etum is added to the stem of the generic name, and the specific name is put in the genitive. Thus

3 See Moss, " The Fundamental Units of Vegetation : historical development of the concepts of the plant association and the plant formation." Botany School (Cambridge, 1010).

an association of Quercus sessUiflora may be referred to as a Quercetum sessiliflorae.

A plant formation is a group of associations occupying habitats which are in essentials identical with each other. Thus, associ- ations of Agropyrum (Triticum) junceum, of Car ex arenaria, of Ammophila (Psamma) arenaria, and of other plants occur on sand dunes: the associations are related by the general identity of the habitat conditions, namely, the physiological dryness and the loose soil; but they are separated by differences in floristic composition, especially by different dominant species,

and by minor differences of the common habitat. The whole set of associations on the sand dunes constitutes a plant formation.

The plant formation may be designated in technical language by the termination ion added to a stem denoting the habitat. Thus, a sand dune formation may be termed an Arenarion. The associational term, in the genitive, may be added tothe forma tional term to indicate the relationship of the formation and the association; thus, a plant association of Ammophila arenaria belonging to the plant formation of the sand dunes may be designated an Arenarion Ammophilae-arenariae (cf. Moss, op. cit.

1910:43). _ _ .

The question of universal names for vegetation units is bound up with that of the universality or otherwise of particular formations. "Remote regions which are floristically distinct ... may possess areas physically almost identical and yet be covered by different formations" (Clements, 1 1905:203). For example, the sand dunes of North America and those of western Europe are widely separated in geographical position and there- fore in floristic composition, yet they are related by common physical factors. This relationship may be indicated by the addition of some prefix to the formational name. For example, an Arenarion in one climatic or geographical region might be termed an a-Arenarion and one in a different region a ˆ-Arena- rion, and so on (Moss, loc. cit.).

It is, however, frequently desirable to consider such allied formations as a single group. Such a group of formations may be designated a plant federation: and this term may be defined as a group of formations, which are characterized by common edaphic factors of the habitat, and which occur in any geographical region. Thus, different geographical or climatic regions are characterized by salt marshes. The latter all agree in their edaphic characteristics; but they differ climatically and in floristic composition. The salt marshes of a given region con- stitute a single plant formation : the salt marsh formations of the whole world constitute a plant federation.

Again, it is possible to arrange plant associations into groups related by a common plant form. Thus woodland associations may be classified as deciduous forests, coniferous forests, sclero- phyllous forests, &c. These, in a general way, are the "forma- tions " of Warming, 2 and (in part) the " climatic formations " of Schimper. 3 Thus the various reed-swamps of the whole world constitute a " formation " in Warming's sense (1909 : 187).

There is much difference of opinion among ecologists and plant geographers as to which of these points of view is the most fundamental. Among British

authorities, it is now customary to adopt the position of Clements, who states (1905:292) that " the connexion between formation and habitat is so close that any application of the term to a division greater or smaller than the habitat is both illogical and unfortunate," and that (1905:18) " habitats are inseparable from the formations which they bear " (cf. Moss, 1910).

From the standpoint of plant communities, it is convenient to divide the earth's surface into (1) tropical districts; 4 (2) sub-

X F. E. Clements, Research Methods in Ecology (1905), Lincoln, Neb., U.S.A.

s Warming (1909, op. cit.). ' Schimper (1898, op. at.).

- *The nomenclature of the terms (floristic as well as ecological) used in geographical botany is in a very confused state. In the present article, the term " district " is used in a general sense to indicate any definite portion of the earth's surface. For a dis- cussion of such phytogeographical terms, see Flahault, " Premier essai de nomenclature phytogeographique," in Bull. Soc. langue- docienne de Geogr. (1901); and also in Bull. Torr. Bot. Club (1901).*

tropical and warm temperate districts; (3) temperate districts; (4) cold temperate and frigid districts.

1. Tropical Districts. — The vegetation of tropical districts hai been subdivided by Schimper (1903:260, et seq.) as follows:— (i.) Tropical woodland: (a) rain forest, (6) monsoon forest, (c) savana forest, (d) thorn forest, (ii.) Tropical grassland: (a) savana, (b) steppe, (iii.) Tropical desert: (a) scrub, (6) succulent plants, (c) perennial herbs.

Schimper regards the minor divisions as groups of " climatic formations"; and he also distinguishes certain tropical "edaphic formations," such as mangrove swamps. He states that rain forests and high monsoon forests in the tropics occur when the average rainfall is over 70 in. (178 cm.) per annum, and that tropical thorn forest may prevail when the mean annual rainfall is below

A tropical rain forest exhibits great variety both of species of plant and of plant forms. There is great diversity in the trees and masses of tangled lianes, and a wealth of flowers in the leafy fprest crown. Humboldt 6 points out_ that whilst temperate forests frequently furnish pure associations, such uniformity of association is usually absent from the tropics. Some tropical forests exhibit dense foliage from the forest floor to the topmost leafy layer; and the traveller finds the mass of foliage almost

im- penetrable. Other tropical forests afford a free passage and a clear outlook. It is obvious that tropical forests will eventually be subdivided into plant associations; but the difficulties of deter- mining the relative abundance of the species of plants in the upper layers of tropical rain and monsoon forests are very great. One of the best known results of the great struggle for light which takes place in tropical forests is the number of epiphytic plants which grow on the high branches of the trees.

The leaves of the trees are frequently of leathery consistency, very glossy, usually evergreen, entire or nearly so, and seldom hairy ; and thus they agree closely with the leaves of sclerophyllous forest generally.

Monsoon forests are characteristic of localities with a seasonal rainfall. The trees usually lose their foliage during the dry season and renew it during the monsoon rains. With a less abundant rainfall, savana forest and thorn forest occur. Less precipitation induces tropical grassland, which, according to Schimper (1903: 346) is of the savana type; but Warming (1909:327) thinks that all grassland in the tropics is artificial. Still greater drought induces desert vegetation; but, as deserts are more characteristic of subtropical districts, they are discussed later on.

Mangrove swamps, or tropical tidal forests, occur in saline _ or brackish swamps on flat, muddy shores in the tropics; and, being almost independent of atmospheric precipitations, Schimper regards them as " edaphic formations." However, they are climatic communities in the sense that they occur only in hot districts. Cases such as this illustrate the difficulty of regarding the dis- tinction between " climatic formations " and " edaphic formations " as absolute. The plants exhibit markedly xerophilous structures; and many of the fruits and seeds of the mangrove trees and shrubs are provided with devices to enable them to float and with curious pneumatophores or " prop roots." The latter serve as supports and also as a means of supplying air to the parts buried in the mud. The seedlings of characteristic species of Rhizophoraceae germinate on the trees, and probably perform some assimilatory work by means of the hypocotyl.

Other tropical " edaphic formations " occur on sandy shores, where the. creeping Ipomoea biloba {Pes-caprae) and trees of Barringtonia form characteristic plant associations.

The succession of associations on new soils of a tropical shore has recently been described by Ernst. 6

2. Warm Temperate and Subtropical Districts. — In subtropical and warm temperate districts, characterized by mild and rainy winters and hot and dry summers, we find two types of forests. First, there are forests of

evergreen trees, with thick, leathery leaves. Such forests are known as sclerophyllous forests, and they occur in the Mediterranean region, in south-west Africa, in south and south-west Australia, in central Chile, and in western California. In the Mediterranean district, forests of this type are sometimes dominated by the Cork Oak {Quercus Suber), sometimes by the Holm Oak (Q. Ilex). When these forests become degenerate, maquis and garigues respectively are produced. Maquis and garigues are characterized by the abundance of shrubs and under- shrubs, especially by shrubby Leguminous plants, and by species Cistus and Lavandula. Secondly, there are forests of coniferous trees. In the Mediterranean region, even at comparatively low altitudes, forests occur of the maritime pine {Ptnus mantima) and of the Aleppo pine (P. halepensis) ; and these forests are also related to maquis and garigues respectively in the same way as the evergreen oaks. The occurrence of forests of this type in the Mediterranean and in Arctic regions, whose dominant species belong to the same genu s (Pinus) and to the same plant form, renders it

B Humboldt, Eng. trans, by Sabine, Aspects of Nature (London,

6 Eng. trans, by Seward, The New Flora of the Volcanic Island of Krakatau (Cambridge, 1908).

subdivided plant geography into floristic plant geography and ecological plant geography. The former is concerned with the division of the earth's surface into major districts characterized by particular plants or taxonomic groups of plants, with the subdivision of these floristic districts, and with the geographical distribution (both past and present) of the various taxonomic units, such as species, genera, and families. On the other hand, ecological plant geography seeks to ascertain the distribution of plant communities, such as associations and formations, and enquires into the nature of the factors of the habitat which are related to the distribution of plants — plant forms, species, and communities. In a general way, floristic plant geography is concerned with species, ecological plant geography with vege- tation. The study of the distribution of species dates back to the time of the early systematists, the study of vegetation to the time of the early botanical travellers. Humboldt, 1 for example, defined his view of the scope of plant geography as follows: " C'est cette science qui considere les vegetaux sous les rapports de leur association locale dans les differents climats " (1807:

14).

The Habitat. — The term habitat, in its widest sense, includes all the factors of the environment which affect a plant or a plant community, though the term is frequently used to signify only some of these factors. The factors of the habitat may be grouped as follows: geographical, physical, and biological.

Geographical Factors. — Geographical position determines the particular species of plants which grow in any particular locality. This matter is bound up with the centres of origin and with the past migrations of species; and such questions are usually treated as a part of floristic plant geography. Here, therefore, floristics and ecology meet. Flahault and Schroter, 2 in defining the term habitat, appear to exclude all geographical factors. They state that " the term habitat is understood to include everything relating to the factors operative in a geographically defined locality, so far as these factors influence plants " (1910: 24); but the exclusion of geographical and historical factors from the concept of the habitat does not appear to be either desirable or logical.

Physical Factors. — These are frequently classified as edaphic or soil factors and climatic factors; but there is no sharp line of de- marcation between them. Edaphic factors include all those relating to the soil. The water content of the soil, its mineral content, its humus content, its temperature, and its physical char- acteristics, such as its depth and the size of its component particles are all edaphic factors. Climatic factors include all those relating to atmospheric temperature, rainfall, atmospheric humidity, and light and shade. Factors connected with altitude, aspect, and exposure to winds are also climatic: such are often spoken of as physiographical _ factors. The difficulty of sharply delimiting edaphic and climatic factors is seen in the case of temperature. Soil temperature is partly dependent on the direct rays of the sun, partly on the colour and constitution of the soil, and partly on the water content of the soil. Again, the temperature of the air is affected by radiation from the soil; and radiation differs in various soils.

Biological Factors. — These include the reactions of plants and animals on the habitat. Here again, no sharp boundary-line can be drawn. In one sense, the accumulation of humus and peat is a biological factor, as it is related to the work of organisms in the soil ; but the occurrence or otherwise of these organisms in the soil is probably related to definite edaphic and climatic conditions. Again, the well-known action of earthworms may be said to be a biological work ; but the resulting aeration of the soil causes edaphic differences ; and earthworms are absent from certain soils, such as peat. The pollination of flowers and the dispersal of

seeds by various animals are biological factors; but pollination and dispersal by the wind cannot be so regarded. The influence of man on plants and vegetation is also a biological factor, which is fre- quently ignored as such, and treated as if it were a thing apart.

When the nature and effect of ecological factors have become more fully understood, it will be possible to dispense with the above artificial classification of factors, and to frame one depending on the action of the various factors; but such a classification is not possible in the present state of knowledge.

Ecology and Physiology.— Whilst our knowledge of the nature and effect of habitat is still in a very rudimentary condition, much progress has been made in recent years in the study of plant communities; but even here the questions involved in relating the facts of the distribution of plant communities to the

1 Humboldt and Bonpland, Essai sur la geographie des planles (Paris, 1807).

2 Flahault and Schroter (op. cit.).

factors of the habitat are very imperfectly understood. This is due to a lack of precise knowledge of the various habitat factors and also of the responses made by plants to these factors. Until much more advance has been made by ecologists in the investi- gation of the nature of habitat factors, and until the effect of the factors on the plants has been more closely investigated by physiologists, it will remain impossible to place ecology on a physiological basis: all that is possible at present is to give a physiological bias to certain aspects of ecological research. Obviously no more than this is possible until physiologists are able to state much more precisely than at present what is the influence of common salt on the plants of salt-marshes, of the action of calcium carbonate on plants of calcareous soils, and of the action of humous compounds on plants of fens and peat moors.

Ecological Classes. — Many attempts have been made to divide plants and plant communities into classes depending on habitat factors. One of the best known classifications on these lines is that by Warming. 3 Warming recognized and defined four ecological classes as follows: —

Hydrophytes. — These live in a watery or wet substratum, with at least 80% of water. Warming included plants of peat-bogs among his hydrophytes.

Xerophytes. — These are plants which live in very dry places, where the

substratum has less than 10% of water.

Halophytes. — These are plants living in situations where the sub- stratum contains a high proportion of sodium chloride.

Mesophytes. — These are plants which live in localities which are neither specially dry nor specially wet nor specially salty.

Such terms as hydrophytes, xerophytes, and halophytes had been used by plant geographers before Warming's time e.g., by Schouw; 4 and the terms evidently supply a want felt by botanists as they have come into general use. However, the terms are incapable of exact definition, and are only useful when used in a very general way. The above classification by Warming, although it was without doubt the best ecological classification which had, at the time, been put forward, has not escaped criti- cism. The criticisms were directed chiefly to the inclusion of sand dune plants among halophytes, to the exclusion of halo- phytes from xerophytes, to the inclusion of " bog xerophytes " among hydrophytes, to the inclusion of all conifers among xerophytes and of all deciduous trees among mesophytes, and to the group of mesophytes in general.

Schimper 5 made a distinct advance when he distinguished between physical and physiological dryness or wetness of the soil. A soil may be physically wet; but if the plants absorb the water only with difficulty, as in a salt marsh, then the soil is, as regards plants, physiologically dry. All soils which are physi- cally dry are also physiologically dry; and hence only the physiological dryness or wetness of soils need be considered in ecology.

Schimper used the term xerophytes to include plants which live in soils which are physiologically dry, and the term hygrophytes those which live in soils which are physiologically wet or damp. Schimper recognized that the two classes are connected by transi- tional forms, and that it is useless to attempt to give the matter a statistical basis. It is only in a general sense like Schimper's that such ecological terms as xerophytes have any value; and it is not possible, at least at present, to frame ecological classes, which shall have a high scientific value, on a basis of this nature. Whilst Schimper objected to the constitution of a special category, such as mesophytes, to include all plants which are neither pronounced xerophytes nor pronounced hygrophytes, he recognized the necessity of a third class in which to place those

3 Warming, Plantesamfund, Kjobenhavn, 1895ˆ, (See German trans, by Knoblauch, " Lehrbuch der okologischen Pflanzen- geographie " (Berlin, 1896); new German ed. by Graebner (Berlin,

1902).

4 Schouw, Grundtraek til en almindelig Plantegeografie (Kjoben- havn, 1822); German trans., ” Grundzuge einer allegemeinen Pflanzengeographie ” (Berlin, 1823).

5 Schimper, Pflanzengeographie auf physiologischer Grundlage (Berlin, 1898); Eng. trans, by Fisher, ” Plant Geography upon a Physiological Basis” (Oxford, 1903-1904).

difficult to regard ” coniferous forests ” as a natural ecological group. At much higher altitudes, in the south-west of the Mediter- ranean region, forests occur of the Atlantic cedar (Cedrus atlantica) . These occur from about 4000 ft. (1219 m.) to about 7000 ft. (2133 m.) on the Atlas Mountains. Some sclerophyllous forests of the eastern Atlas Mountains are, owing to a comparatively high rainfall, characterized by many deciduous trees, such as Fraxinus oxy- phylla, Ultnus campestris (auct. alg.), Alnus rotundifolia, Salix pedicellate., Prunus avium, &c. ; and thus they have some elements in common with the deciduous forests of central Europe.

The forests of these subtropical and warm temperate regions are situated near the sea or in mountainous regions, and (as already stated) are characterized by winter rains. In inland localities, where the rainfall is much lower, steppes occur. For example, in southern Algeria, a region of steppes is situated on a flat plateau, about 3000 ft. (914 metres) high, between the southern slopes of the Tell Atlas and the northern slopes of the Saharan Atlas. The rainfall, which occurs chiefly in winter, only averages about 10 in. (254 mm.) per annum. Here we find open plant associations of Haifa or Esparto Grass (Stipa tenacissima) alternating with steppes of Chih (Artemisia herba-alba); and each plant association extends for several scores of miles. In the hollows of this steppe region, salt water lakes occur, known as Chotts; and on the saline soils sur- rounding the Chotts, a salt marsh formation occurs, with species of Salicornia, some of which are undershrubs.

Where the rainfall is still lower, deserts occur. At Ghardaia, in south-eastern Algeria, the mean annual rainfall, from 1887 to 1892, was about 45 in. (114 mm.). In 1890, it fell as low as 2 in. (53 mm.) (Schimper, 1903 : 606). At Beni Ounif and Colomb Bechar, in south-western Algeria, I was informed, in March 1910, that there had been no rain for about

three years. Here the gravelly desert is characterized by " cushion plants," such as Anabasis aretioides; by " switch plants," such as Retama Retam ; and specially by spiny plants, such as Zizyphus Lotus and Zilla macropteris ; whereas succulent plants are rare. Both in the steppe and in the desert, small ephemeral species occur on the bare ground away from the large plants and especially in the wadis. Steppe and desert formations are of the open type.

3. Temperate Districts. — Temperate districts are characterized by forests of deciduous trees and of coniferous trees, the latter being of different species from those of the warm temperate districts, but frequently of the same plant form. The identity of plant form of many of the conifers of both temperate and of warm temperate districts is probably a matter of phylogenetic and not of ecological importance.

Britain is fairly typical of the west European district. In these islands, we find forests 1 or woods of oak (Quercus Robur and Q. sessiliflora), of birch (Belula tomentosa), of ash (Fraxinus excelsior), and of beech (Fagus sylvatica). In central Scotland, forests occur of Pinus sylvestris; and, in south-eastern England, extensive planta- tions and self-sown woods occur of the same species.

Just as in the Mediterranean region, the degeneration of forests has given rise to maquis and garigues, so in western Europe, the degeneration of forests has brought about different types of grass- land, heaths, and moors.

4. Cold Temperate and Frigid Districts. — In the coldest portion of the north temperate zone, forests of dwarfed trees occur, and these occasionally spread into the Arctic region itself (Schimper, 1904: 685). Schimper distinguishes moss tundra, Polytrichum tundra, and lichen tundra; and the lichen tundra is subdivided into Cladonia tundra, Platysma tundra, and Alectoria heath. Where the climate is most rigorous, rock tundra occurs (p. 685).

The types of vegetation (tropical forests, sclerophyllous forest, temperate forests, tundra, &c.) thus briefly outlined are groups of Schimper's " climatic formations." Such groups are interesting in that they are vegetation units whose physiognomy is, in a broad sense, related more to climatic than to edaphic conditions. For example, Schimper, after describing the sclerophyllous woodland of the Mediterranean district and of the Cape district, says: " The scrub of West and South Australia in its ecological aspect resembles so completely the other sclerophyllous formations that a description of it must seem a repetition." This resemblance, however, only has reference to the general aspect or physiognomy of the vegetation and to the plant forms: the floristic composition of the various sclerophyllous —

and other physiognomically allied — associations in the various geographical districts is very different; and indeed it is true that, just as the general physio- gnomy of plant associations is related to climate, so their floristic composition is related to geographical position. Hence, in any cosmopolitan treatment of vegetation, it is necessary to consider the groups of plant communities from the standpoint of the climatic or geographical district in which they occur; and this

1 See Moss, Rankin, and Tansley, " British Woodlands." Botany School (Cambridge, 1910).

indeed is consistently done by Schimper. Finally, within any district of constant or fairly constant climatic conditions, it is possible to distinguish plant communities which are related chiefly to edaphic or soil conditions; and the vegetation units of these definite edaphic areas are the plant formations of some writers, and, in part, the "edaphic formations" of Schimper.

When a district like England is divided into edaphic areas, a general classification such as the following may be obtained: —

1. Physically and physiologically ivet habitats, with the accom- panying plant communities of lakes, reed swamps, and marshes. tf"2. Physically wet but physiologically dry habitats, 2 with the accompanying plant communities of fens, moors, and salt marshes.

3. Physically and physiologically dry habitats, with the accom- panying plant communities of sand dunes and sandy heaths with little humus in the soil.

4. Habitats of medium wetness, with the accompanying plant communities of woodlands and grasslands. This class may be subdivided as follows : —

a. Habitats poor in mineral salts, especially calcium carbonate, often rich in acidic humous compounds, and characterized by oak and birch woods, siliceous pasture, and heaths with much acidic humus in the sandy soil.

b. Habitats rich in mineral salts, especially calcium carbonate, poor in acidic humous compounds, and characterized by ash woods, beech woods, and calcareous pasture.

Ecological Adaptations. — It is now possible to consider the ecological adaptations which the members of plant com- munties show in a given geographical district such as western Europe, of which England of course forms a part. In the present state of knowledge, however, this can only be done in a very meagre fashion; as the effect of habitat factors on plants is

but little understood as yet either by physiologists or ecologists.

Hydrophytes and hemi-hydrophytes (aquatic plants). — Of marine hydrophytes, there are, in this country, only the grass-wracks (Zostera marina and Z. nana) among the higher plants. Even these species are sometimes left stranded by low spring tides, though the mud in which they are rooted remains saturated with sea-water. Although many plants typical of fresh water are able to grow also in brackish water, there are only a few species which appear to be quite confined to the latter habitats in this country. Such species perhaps include Ruppia maritima, R. spiralis, Zannichellia maritima, Z. polycarpa, Potamogeton interruptus (= P. flabellatus) , and Naias marina.'

In freshwater lakes and ponds, especially if the water is stagnant, aquatic plants are abundant. Aquatic vegetation may be con- veniently classified as follows : —

Aquatic plants with submerged leaves: Chara spp., Naias spp., Potamogeton pectinatus, Ceratophyllum spp., Myriophyllum spp., Hottonia palustris, Utricularia spp.

Aquatic plants with submerged and floating leaves: Glyceria fluitans, Ranunculus peltatus, Nymphaea (Nuphar) ■ lutea, Calli- triche stagnalis, Potamogeton polygonifolius.

Aquatic plants with floating leaves: Lemna spp., Hydrocharis Morsus-ranae, Castalia (Nymphaea) alba.

Aquatic plants with submerged leaves and erect leaves o – stems: Sagittaria sagittifolia, Scirpus lacusiris, Hippuris vulgaris, Sium latifolium.*

Aquatic plants with erect leaves or stems (reed swamp plants) : Equisetum palustre, Phragmites communis, Glyceria aquatica, Carex riparia, Iris Pseudacorus, Rumex Hydrolapathum, Oenanthe fistulosa, Bidens spp.

Marsh plants: Alopecurus geniculatus, Carex disiicha, Juncus spp., Caltha palustris, Nasturtium palustre.

In many aquatic plants, the endosperm of the seed is absent or very scanty. The root-system is usually small. Root-hairs are frequently missing. The submerged stems are slender or hollow. Strengthening tissue of all kinds (and sometimes even the phloem) is more or less rudimentary. The stems are frequently characterized by aeration channels, which connect the aerial parts with the parts which are buried in practically airless mud or silt. Submerged leaves are usually filamentous or narrowly ribbon- shaped, thus exposing a large amount of surface to the water, some of the dissolved

gases of which they must absorb, and into which they must also excrete certain gases. Stomata are often absent, absorption and excretion of gases in solution being carried on through the epidermal layer. Chloroplastids are frequently present in the epidermal cells, as in some shade plants. Very few aquatic plants are pollinated under water, but this is well- known to occur in species of Zostera and of Naias. In such plants, the pollen grains are sometimes filiform and not spherical in shape. In the case of aquatic plants with aerial flowers, the latter obey

2 As very little experimental work has been done with regard to physiological dryness in physically wet habitats, any classifica- tion such as the above must be of a tentative nature;

the ordinary laws of pollination. Heterophylly is rather common among aquatic plants, and is well seen in several aquatic species of Ranunculus, many species of Potamogeton, Sagittaria sagitti- folia, Scirpus lacustris, Castalia (Nymphaea) alba, Hippuris vul- garis, Callitriche spp., Stum latifolium.

Insectivorous species occur among aquatic plants; e.g. Utricularia spp., which are locally abundant in peaty waters, are insectivorous. Xerophytes. — These plants have devices (a) for procuring water, (b) or for storing water, (c) or for limiting transpiration; and these adaptations are obviously related to the physically or physio- logically dry habitats in which the plants live. Plants of physi- cally dry habitats, such as deserts and sand dunes, have frequently long tap-roots which doubtless, in some cases, reach down to a subterranean water supply. The same plants have sometimes a superficial root system in addition, and are thus able to utilize immediately the water from rain showers and perhaps also from dew, as Volkens 1 maintains. Root-hairs give an enlarged super- ficial area to the roots of plants, and thus are related to the pro- curing of water.

The stems of some xerophytes, e.g. Cactaceous and Crassulaceous plants, may be succulent, i.e. they have tissues in which water is stored. Some deserts, like those of Central America, are specially characterized by succulents; in other deserts, such as the Sahara, succulents are not a prominent feature. Other xerophytes again are spinous. " Switch plants," such as Retama Retam and broom (Cytisus scoparius), have reduced leaves and some assimilating tissue in their stems ; and stomata occur in grooves

on the stem.

The transpiring surface of xerophytes is frequently reduced. The ordinary leaves may be small, absent, or spinous. In " cushion plants " the leaves are very small, very close together, and the low habit is protective against winds. The latter, of course, greatly increase transpiration. A " cushion plant " (Anabasis aretioides) of the north-western Sahara, frequently shows dead leaves on the exposed side whilst the plant is in full vigour on the sheltered side. The buds and leaves on the exposed side are probably killed by sand blasts. Many xerophytes are hairy or have sunken stomata which may be further protected by partial plugs of wax: the stomata are frequently in grooves: the leaves are frequently rolled — sometimes permanently so, whilst sometimes the leaves roll up only during unfavourable weather. These adaptations tend to lessen the amount of transpiration by protecting the stomata from the movements of the air. In species of Eucalyptus, the leaves are placed edge-wise to the incident rays of light and heat. The coriaceous leaves of " sclerophyllous plants " also, to some extent, are similarly protective. In such leaves, there are a well-marked cuticle, a thick epidermis, a thick hypodermis at least on the upper side of the leaf, well-developed palisade tissue, and a poorly developed system of air-spaces. Such adaptations are well seen in the leaf of the holly {Ilex aquifolium). Warming, however, states that " Ilex aquifolium is undubitably a meso- phyte " (1909: 135).

Halophytes, or plants which live in saline soils, have xerophytic adaptations. A considerable proportion of halophytes are succu- lents, i.e. their leaves and, to some extent, their stems have much water-storing tissue and few intercellular spaces. Some halo- phytes tend ■ to lose their succulence when cultivated in a non- saline soil; and some non-halophytes tend to become succulent when cultivated in a salty soil; there is, it need scarcely be stated, little or no evidence that such characters are transmitted. British salt marshes furnish few instances of spiny plants, though such occur occasionally on the inland salt marshes of continental dis- tricts. Salsola Kali is British, and a hemi-halophyte at least; and it is rather spiny. Warming states that " the stomata of true, succulent, littoral halophytic herbs, in cases so far investigated, are not sunken " (1909 : 221). It is possible, however, that the absence of sunken stomata, and the occurrence of some other halophytic features, are related merely to the succulent habit and not to halophytism, for succulent species often occur on non-saline soils. Similarly, the small amount of cuticular and of epidermal protection, and of lignification in succulent halophytes may also be related to the same circumstance. Forms of " stone cells " or " stereids " occur in some of the more suffruticose halophytes, as in Arthrocnemum glaucum. The interesting occurrence of certain halophytes and hemi-halophytes on sea-shores and also on mountains is probably to be explained by the past

distribution of the species in question. At one time, such plants were probably of more general occurrence: now they have been extirpated in the intermediate localities, chiefly owing to the cultivation of the land in these places by man. In the west of Ireland and in the Faroes, where certain inland and lowland localities are still uncultivated, Plantago maritima and other halophytes occur in quantity and side by side with some " Alpine species," such as Dryas octopetala.

The effect of common salt on the metabolism of plants is not understood. Lesage 2 has shown that the height of certain plants is decreased by cultivation in a saline soil, and that the leaves of

1 Volkens, Die Flora der dgyptisch-arabischen Wuste (Berlin,

1887).

2 Lesage. " Recherches experimentales sur les modifications des feuilles chez les plantes maritimes," in Rev. gen. de bot. (1890), voL ii.

plants under such conditions become smaller and more succulent. He showed further, that the increase of common salt in the soil is correlated with a reduction in the number and size of the chloro- plastids, and therefore in the amount of chlorophyll. On the other hand, some plants did not respond to the action of common salt, whilst others were killed. Warming (1909: 220) quotes Griffon (1898), to the effect that " the assimilatory activity is less in the halophytic form than in the ordinary form of the same species." Schimper had previously maintained that the action of common salt in the cell-sap is detrimental as regards assimilation. Many marine Algae appear to be able to regulate their osmotic capacity to the surrounding medium ; and T. G. Hill 3 has shown that the root- hairs of Salicornia possess this property. There has, however, been performed upon halophytes very little physiologically ex- perimental work which commands general acceptance.

Bog Xerophytes live in the peaty soil of fens and moors which are physically wet, but which are said to be physiologically dry. Related to the physiological drought, such plants possess some xerophytic characters; and, related to the physical wetness, the plants possess the aeration channels which characterize many hydrophytes and hemi-hydrophytes. The occurrence of xerophytic characters in plants of this type has given rise to. much difference of opinion. It is sometimes maintained, for example, by Schimper, that their xerophytic characters are related to the physiological dryness of the habitat : this, however, is denied by others who maintain (Clements, 1905: 127) that the xerophytism is due to the persis- tence of ancestral structures. It is possible, of course, that each explanation is

correct in particular cases, as the views are by no means mutually exclusive. With regard to the occurrence of plants, such as Juncus effusus, which possess xerophytic characters and yet live in situations which are not ordinarily of marked physio- logical dryness, it should be remembered that such habitats are liable to occasional physical drought; and a plant must eventually succumb if it is not adapted to the extreme conditions of its habitat. The xerophytic characters being present, it is not surprising that many marsh plants, like Juncus effusus and Iris pseudacorus, are able to survive in dry situations, such as banks and even garden rockeries.

Tropophytes. — These plants are characterized by being xerophytic during the unfavourable season. For example, deciduous trees shed their leaves in winter: geophytes go through a period of dor- mancy by means of bulbs, rhizomes, or other underground organs with buds; whilst annuals and ephemerals similarly protect them- selves by means of the seed habit. All such plants agree in reduc- ing transpiration to zero during the unfavourable season, although few or no xerophytic characters may be demonstrable during the period favourable to growth.

Hygrophytes.—\Avin%, as these plants do, under medium con- ditions as regards soil, moisture and climate, they exhibit no cha- racters which are markedly xerophytic or hydrophytic. Hence, such plants are frequently termed mesophytes. Assimilation goes on during the whole year, except during periods of frost or when .the plants are buried by snow. An interesting special case of hygro- phytes is seen with regard to plants which live in the shade of forests. Such plants have been termed sciophytes. Their stomata are frequently not limited to the underside of the leaves, but may occur scattered all over the epidermal surface. The epidermal cells may contain chlorophyll. Strengthening tissue is feebly developed. Many sciophytes are herbaceous tropophytes, and are dormant for more than half the year, usually during late summer, autumn and early winter. It may be that this is a hereditary character (cf. "bog xerophytes"), or that the physical drought of summer is unfavourable to shade-loving plants. In this con- nexion, it is interesting that in the east of England with the lowest summer rainfall of this country, many common sciophytes are absent or rare in the woods, such, for example, as Melica uniflora. Allium ursinum, Lychnis dioica, Oxalis Acetosella, and Asperula odorata. However, the cause of the absence or presence of a given species from a given locality is a department of ecology which has been studied with little or no thoroughness.

Calcicole and Calcifuge Species. — Plants which invariably inhabit calcareous soils are sometimes termed calcicoles; calcifuge species are those which are found rarely or never on such soils. The effect of lime on plants is less understood even than the effect of common salt. Doubtless, the

excess of any soluble mineral salt or salts interferes with the osmotic absorption of the roots; and although' calcium carbonate is insoluble in pure water, it is slightly solublel in water containing carbon dioxide. In England, the following species are confined or almost confined to calcareous soils : A splenium Ruta-muraria, Melica nutans, Carex digitata, Aceras anthropophora, Ophrys apifera, Thalictrum minus, Helianthemum Chamaecistus, Viola hirta, Linum perenne, Geranium lucidum, Hippocrepis comosa, Potentilla verna, Viburnum Lantana, Galium asperum (= G. sylvestre), Asperula cynanchica, Senecio campestris. The following plants, in England, are calcifuge : Lastraea Oreopteris, Holcus mollis, Carex echinata, Spergula arvensis, Polygala serpyllacea, Cytisus

3 T. G. Hill, " Observations on the Osmotic Properties of the Root-Hairs of certain Salt Marsh Plants," in The New Phytologist (1908), vol. vii.

scoparius, Potentilla procumbens, Galium hercynicum (=G. saxatile), Gnaphalium sylvaticum, Digitalis purpurea. Other plants occur indifferently both on calcareous and on non-calcareous soils.

It is sometimes said that lime acts as a poison on some plants and not on others, and sometimes that it is the physiological dry- ness of calcareous soils that is the important factor. In relation to the latter theory, it is pointed out that some markedly calcicole species occur on sand dunes; but this may be due to the lime which is frequently present in dune sand as well as to the physical dryness of the soil. Further, no theory of calciolous and calcifugous plants can be regarded as satisfactory which fails to account for the fact that both kinds of plants occur among aquatic as well as among terrestrial plants. Schimper (1903: 102) thinks that in the case of aquatic plants, the difference must depend on the amount of lime in the water, for the physical nature of the sub- stratum is the same in each case. Again, acidic humus does not form in calcareous soils; and hence one does not expect to find plants characteristic of acidic peat or humus on calcareous soils. Some such species are Blechnum boreale, Aira flexuosa, Calluna vulgaris, Vaccinium, Myrlillus, Rubus, Chamaemorus, Empetrum nigrum, Drosera spp. Some, at least, of these species possess my- corhiza in their roots, and are perhaps unable to live in soils where such organisms are absent.

In England, the number of calcicole species is greater than the number of

silicolous species. It would therefore be curious if it were proved that lime acts on plants as a poison. It is said that some plants may be calcicoles in one geographical district and not in another. However, until more is known of the exact chemical composition of natural — as contrasted with agricultural — soils, and until more is known of the physiological effects of lime, it is impossible to decide the vexed question of the relation of lime-loving and lime-shunning plants to the presence or absence of calcium carbonate in the soil. From such points of view as this, it is indeed true, as Warming has recently stated, " that ecology is only in its infancy." (C. E. M.)

Cytology of Plants

The elementary unit of plant structure, as of animal structure, is the cell. Within it or its modifications all the vital phenomena of which living organisms are capable have their origin. Upon our knowledge of its minute structure or cytology, combined with a study of its physiological activities, depends the ultimate solution of all the important problems of nutrition and growth, reception and conduction of stimuli, heredity, variation, sex and reproduction.

The Cell Theory. — For a general and historical account of the cell theory see Cytology. It is sufficient to note here that cells were first of all discovered in various vegetable tissues by Robert Hooke in 1665 (Micrographia) ; Malpighi and Grew (1674-1682) gave the first clear indications of the importance of cells in the building up of plant tissues, but it was not until the beginning of the 19th century that any insight into the real nature of the cell and its functions was obtained. Hugo von Mohl (1846) was the first to recognize that the essential vital constituent of the plant cell is the slimy mass — proto- plasm — inside it, and not the cell wall as was formerly supposed. The nucleus was definitely recognized in the plant cell by Robert Brown in 1831, but its presence had been previously indicated by various observers and it had been seen by Fontana in some animal cells as early as 1 781. The cell theory so far as it relates to plants was established by Schleiden in 1838. He showed that all the organs of plants are built up of cells, that the plant embryo originates from a single cell, and that the physiological activities of the plant are dependent upon the individual activities of these vital units. This conception of the plant as an aggregate or colony of independent vital units governing the nutrition, growth and reproduction of the whole cannot, however, be maintained. It is true that in the uni- cellular plants all the vital activities are performed by a single cell, but in the multicellular plants there is a more or less highly developed differentiation of physiological activity giving rise to different tissues or groups of cells, each with a special function. The cell in such a division of labour cannot therefore be regarded as an

independent unit. It is an integral part of an individual organization and as such the exercise of its functions must be governed by the organism as a whole.

General Structure and Differentiation of the Vegetable Cell. — The simplest cell forms are found in embryonic tissues, in repro- ductive cells and in the parenchymatous cells, found in various parts of the plant. The epidermal, conducting and strengthen- ing tissues show on the other hand considerable modifications both in form and structure.

The protoplasm of a living cell consists of a semifluid granular substance, called the cytoplasm, one or more nuclei, and some- times centrosomes and plastids. Cells from different parts of a plant differ very much in their cell-contents. Young cells are

full of cytoplasm, old cells generally contain a large vacuole or vacuoles, containing cell-sap, and with only a thin, almost invisible layer of cytoplasm on their walls. Chlorophyll grains, chromatophores, starch-grains and oil-globules, all of which can be distinguished either by their appearance or by chemical reagents, may also be present. Very little is known of the finer structure of the cytoplasm of a vegetable cell. It is sometimes differentiated into a clearer outer layer, of hyaloplasm, commonly called the ectoplasm, and an inner granular endoplasm. In some cases it shows, when submitted to a careful examination under the highest powers of the microscope, and especially when treated with reagents of various kinds, traces of a more or less definite structure in the form of a meshwork consisting of a clear homogeneous substance containing numerous minute bodies known as microsomes, the spaces being filled by a more fluid ground-substance. This structure, which is visible both in living cells and in cells treated by reagents, has been interpreted by many observers as a network of threads embedded in a hQmogeneous ground-substance. Butschli, on the other hand, interprets it as a finely vacuolated foam-structure or emul- sion, comparable to that which is observed when small drops of a mixture of finely powdered potash and oil are placed in water, the vacuoles or alveoli being spaces filled with liquid, the more solid portion representing the mesh-work in which the microsomes are placed. Evidence is not wanting, however, that the cytoplasm must be regarded as, fundamentally, a semifluid, homogeneous substance in which by its own activity, granules, vacuoles, fibrils, &c, can be formed as secondary structures. The cytoplasm is largely concerned in the formation of spindle fibres and centrosomes, and such structures as the cell membrane, cilia, or flagella, the coenocentrum, nematoplast's or vibrioids and physodes are also products of its activity.

Protoplasmic Movements. — In the cells of many plants the cytoplasm

frequently exhibits movements of circulation or rotation. The cells of the staminal hairs of Tradescantia virginica contain a large sap-cavity across which run, in all directions, numerous protoplasmic threads or bridges. In these, under favourable conditions, streaming movements of the cytoplasm in various directions can be observed. In other forms such as Elodea, Nitella, Chara, &c, where the cytoplasm is mainly restricted to the periphery of the sap vacuole and lining the cell wall, the streaming movement is exhibited in one direction only. In some cases both the nucleus and the chromatophores may be carried along in the rotating stream, but in others, such as Nitella, the chloroplasts may remain motionless in a non-motile layer of the cytoplasm in direct contact with the cell wall. 1

Desmids, Diatoms and Oscillaria show creeping movements probably due to the secretion of slime by the cells; the swarm- spores and Plasmodium of the Myxomycetes exhibit amoeboid movements; and the motile spores of Fungi and Algae, the spermatozoids of mosses, ferns, &c, move by means of delicate prolongations, cilia or flagella cf the protoplast.

Chromatophores. — The chromatophores or plastids are proto- plasmic structures, denser than the cytoplasm, and easily distinguishable from it by their colour or greater refractive power. They are spherical, oval, fusiform, or rod-like, and are always found in the cytoplasm, never in the cell-sap. They appear to be permanent organs of the cell, and are transmitted from one cell to another by division. In young cells the chromatophores are small, colourless, highly refractive bodies, principally located around the nucleus. As the cell grows they may become con- verted into leucoplasts (starch-formers), chloroplasts (chlorophyll- bodies) , or chromoplasts (colour-bodies) . And all three structures may be converted one into the other (Schimper). The chloro- plasts are generally distinguished by their green colour, which is due to the presence of chlorophyll; but in many Algae this is masked by another colouring matter — Phycoerythrin in the Florideae, Phycophaein in the Phaeophyceae, and Phycocyanin

1 Ewart, On the Physics and Physiology of Protoplasmic Stream- ing in Plants. (Oxford, 1903), gives an excellent account of the phenomena of protoplasmic streaming with a full discussion of the probable causes to which it is due.

in the Cyanophyceae. These substances can, however, be dissolved out in

water, and the green colouring matter of the chloroplast then becomes visible. The chloroplast consists of two parts, a colourless ground substance, and a green colouring matter, which is contained either in the form of fibrils, or in more or less regular spherical masses, in the colourless ground-mass. The chloroplasts increase in number by division, which takes place in higher plants when they have attained a certain size, independent of the division of the cell. In Spirogyra and allied forms the chloroplast grows as the cell grows, and only divides when this divides. The division in all cases takes place by con- striction, or by a simultaneous splitting along an equatorial plane. Chloroplasts are very sensitive to light and are capable in some plants of changing their position in the cell under the stimulus of a variation in the intensity of the light rays which fall upon them. In the chromatophores of many Algae and in the Liverwort Anthoceros there are present homogeneous, highly refractive, crystal-like bodies, called pyrenoids or starch-centres, which are composed of proteid substances and surrounded by an envelope of starch-grains. In Spirogyra the pyrenoids are distinctly connected by cytoplasmic strands to the central mass of cyto-plasm, which surrounds the nucleus, and according to some observers, they increase exclusively by division, followed by a splitting of the cytoplasmic strands. Those chromatophores which remain colourless, and serve simply as starch-formers in parts of the plant not exposed to the light, are called leucoplasts or amyloplasts. They are composed of a homogeneous proteid substance, and often contain albuminoid or proteid crystals of the same kind as those which form the pyrenoid. If exposed to light they may become converted into chloroplasts. The formation of starch may take place in any part of the leucoplast. When formed inside it, the starch-grains exhibit a concentric stratifi- cation; when formed externally in the outer layers, the stratifi- cation is excentric, and the hilum occurs on that side farthest removed from the leucoplast. As the starch-grains grow, the leucoplasts gradually disappear.

Chromoplasts are the yellow, orange or red colour-bodies found in some flowers and fruits. They arise either from the leucoplasts or chloroplasts. The fundamental substance or stroma is colourless and homogeneous. The colour is due to the presence of xantho- phyll, or carotin or both. The colouring matters are not dissolved in the stroma of the chromoplast, but exist as amorphous granules, with .or without the presence of a protein crystal, or in the form of fine crystalline needles, frequently curved and sometimes present in large numbers, which are grouped together in various ways in bundles and give the plastids their fusiform or triangular crystalline shape. Such crystalline plastMs occur in many fruits and flowers {e.g. Tamus communis, Asparagus, Lonicera, berries of Solaneae, flowers of Cacalia coccinea, Tropaeolum, bracts of Strelitzia, &c), and in the root of the carrot. In some cases the plastid disappears and the crystalline pigment

only is left. In the red variety of Cucurbita pepo these' crystals may consist of rods, thin plates, flat ribbons or spirals. Starch grains may often be seen in contact with the pigment crystals. The crystalline form appears to be due entirely to the carotin, which can be artificially crystallized from an alcohol or ether solution. In addition to the plastids, there are found in some plant-cells, e.g. in the epidermal cells of the leaf of species of Vanilla (Wakker), and in the epidermis of different parts of the flower of Funkia, Ornithogalum, &c. (Zimmermann), highly refrac- tive bodies of globular form, elaioplasts, which consist of a granular protein ground-substance containing drops of oil. They are stained deep red in dilute solution of alkanin.

Substances contained in the Protoplasm. — .Starch may be found in the chlorophyll bodies in the form of minute granules as the first visible product of the assimilation of carbon dioxide, and it occurs in large quantities as a reserve food material in the cells of various parts of plants. It is highly probable that starch is only produced as the result of the activity of chromatophores, either in connexion with chromoplasts, chloroplasts or leucoplasts. Starch exists, in the majority of cases, in the form of grains, which are composed of stratified layers arranged around a nucleus or hilum. The stratification, which may be concentric or excentric, appears to be due to a difference in density of the various layers. The outer layers are denser than the inner, the density decreasing more or less uniformly from the outside layers to the centre of hilum. The outermost, newly formed layer is composed of a more homogeneous, denser substance than the

inner one, and can be distinguished in all starch-grains that are in process of development. The separate layers of the starch-grain are deposited on it by the activity of the chromatophore, and according to Meyer the grain is always surrounded by a thin layer of the chromatophore which completely separates it from the cytoplasm. The layers appear to be made up of elements which are arranged radially. These are, according to Meyer, acicular crystals, which he calls trichites. The starch grain may thus be regarded as a crystalline structure of the nature of a sphere- crystal, as has been suggested by many observers.

Whether the formation of the starch grain is due to a secretion from the plastid (Meyer, 1895) or to a direct transformation of the proteid of the plastid (Timberlake, 1001) has not been definitely established.

Aleurone. — Aleurone is a proteid substance which occurs in seeds especially those containing oil, in the form of minute granules or large grains. It may be in the form of an albumen crystal' some- times associated with a more or less spherical body — globoid — com- posed of a combination of an organic substance with a double phos- phate of

magnesium and calcium. Albumen crystals are also to be found in the cytoplasm, in leucoplasts and rarely in the nucleus.

Glycogen, a substance related to starch and sugar, is found in the Fungi and Cyanophyceae as a food reserve. It gives a character- istic red-brown reaction with iodine solution. In the yeast cell it accumulates and disappears very rapidly according to the conditions of nutrition and is sometimes so abundant as to fill the cell almost entirely (Errera, 1882, 1895: Wager and Peniston, 19 10). _

Volutin occurs in the cytoplasm of various Fungi, Bacteria, Cyano- phyceae, diatoms, &c, in the form of minute granules which have a characteristic reaction towards methylene blue (Meyer). It appears to have some of the characteristics of nucleic acid, and accord- ing to Meyer may be a combination of nucleic acid with an unknown organic base.

Numerous other substances are also found in the cytoplasm, such as tannin, fats and oil, resins, mucilage, caoutchouc, gutta- percha, sulphur and calcium oxalate crystals. The cell sap con- tains various substances in solution such as sugars, inulin, alkaloids, glucosides, organic acids and various inorganic salts. The colours of flowers are due to colouring matters contained in the sap of which the chief is anthocyanin.

Reference must also be made here to the enzymes or unorganized ferments which occur so largely in the cytoplasm. It is probable that most, if not all, the metabolic changes which take place in a cell, such as the transformation of starch, proteids, sugar, cellulose ; and the decomposition of numerous other organic substances which would otherwise require a high temperature or powerful reagents is also due to their activity. Their mode of action is similar to that of ordinary mechanical catalytic agents, such as finely divided platinum (see Bayliss, The Nature of Enzyme Action, and J. R. Green, The Soluble Ferments).

The Nucleus. — The nucleus has been demonstrated in all plants with the exception of the Cyanophyceae and Bacteria, and even here structures have been observed which resemble nuclei in some of their characteristics. The nucleus is regarded as a controlling centre of cell-activity, upon which the growth and development of the cell in large measure depends, and as the agent by which the transmission of specific qualities from one generation to another is brought about. If it is absent, the cell loses its power of assimilation and growth, and soon dies. Haber- landt has shown that in plant cells, when any new formation of membrane is to take place in a given spot, the nucleus is found in its immediate vicinity; and Klebs found that only that portion of the protoplasm of a cell which contains the nucleus is capable of forming a cell- wall; whilst Townsend has further

shown that if the non-nucleated mass is connected by strands of protoplasm to the nucleated mass, either of the same cell or of a neighbouring cell, it retains the power of forming a cell-membrane.

The Structure of the Nucleus. — In the living condition the rest- ing nucleus appears to consist of a homogeneous ground sub- stance containing a large number of small chromatin granules and one or more large spherical granules — nucleoli — the whole being surrounded by a limiting membrane which separates it from the cytoplasm. When fixed and stained this granular mass is resolved into a more or less distinct granular network which consists of a substance called Linin, only slightly stained by the ordinary nuclear stains, and, embedded in it, a more deeply stainable substance called Chromatin. The nucleolus appears to form a part of the Linin network, but has usually also a strong affinity for nuclear stains. The staining reactions of the various

parts of the nucleus depend to some extent upon their chemical constitution. The chromatin is practically identical with nuclein. This has a strong attraction for basic aniline dyes, and can usually be distinguished from other parts of the cell which are more easily coloured by acid anilines. But the staining reactions of nuclei may vary at different stages of their development; and it is, probable that there is no method of staining which differentiates with certainty the various morphological consti- tuents of the nucleus.

Our knowledge of the chemical constitutions of the nucleus is due to the pioneer researches of Sir Lauder Brunton, Plosz, Miescher, Kossel and a host of more recent investigators. Nuclein is a com- plex albuminoid substance containing phosphorus and iron in organic combination (Macallum). It appears to be a combination of a pro- tein with nucleic acid. Recent researches have shown that the nucleic acid can be broken up by chemical means into a number of different compounds or bases. The results at first obtained were very confusing and seemed to show that nucleic acid is very variable in constitution, but thanks to the work of Schmiedeberg and Stendel (Germany), Ivar Bang (Sweden) and Walter Jones and Levene (America), the confusion has been reduced to some sort of order, and it now seems probable that all ordinary nucleic acids yield two purine bases, adenine and guanine; two pyrimidine bases, cytosine and thymine and a hexose carbohydrate, the identity of which is uncertain. 1

The Nucleolus. — In the majority of plant-nuclei, both in the higher and lower plants, there is found, in addition to the chromatin network, a deeply stained spherical or slightly irregular body (sometimes more than one) called the nucleolus (fig. 2, A to D). It is often vacuolar, sometimes granular, and in other cases it is a homogeneous body with no visible structure or differentiation. The special function of this organ has been a source of controversy during the past few years, and much uncertainty still exists as to its true nature. It forms a part of the linin or plastin network of the nucleus and may become impregnated with varying quantities of chromatin stored up for use in the formation of the chromosomes and other nuclear activities. The relation of the nucleolus to the chromosomes is clearly seen in the reconstruction of the daughter nuclei after division in the cells of the root-apex of Phaseolus (fig. i, A to F). The chromosomes (fig. i, A) unite to form an irregular mass (fig. i, B) out of which is evolved the nucleolus and nuclear net- work (figs, i, E, F) by a fusion of the chromosomes (fig. i, C, D). Centrosome. — The centrosome is a minute homogeneous granule found in the cytoplasm of some cells in the neighbour- hood of the nucleus. It is generally surrounded by a granular or radiating cytoplasmic substance. In plant cells its presence has been demonstrated in the Thallophytes and Bryophytes. In the higher plants the structures which have been often de- scribed as centrosomes are too indefinite in their constitution to allow of this interpretation being placed upon them, and many of them are probably nothing more than granules of the frag- mented nucleolus. The centrosomes in plants do not appear to be permanent organs of the cell. They are prominent during cell-division, but many disappear in the resting stage. They are more easily seen, when the nucleus is about to undergo mitosis, at the ends of the spindle, where they form the centres towards which the radiating fibres in the cytoplasm converge (see fig. 7, E G). The centrosome or centrosphere is usually regarded as the dynamic centre of the cell and a special organ of division; but its absence in many groups of plants does not lend support to this view so far as plant-cells are concerned.

Nuclear Division. — The formation of new cells is, in the case of uninucleate cells, preceded by or accompanied by the division of the nucleus. In multinucleate cells the division of the nucleus is independent of the division of the cell. Nuclear division may be indirect or direct, that is to say it may either be accompanied by a series of complicated changes in the nuclear structures called mitosis or karyokinesis (fig. 2), or it may take place by simple direct division, amitosis, or fragmentation. Direct division is a much less common phenomenon than was formerly supposed to be the case. It occurs most frequently in old cells, or in cells which are placed under abnormal conditions.

1 See Halliburton. Science Progress in the 20th Century (1909), vol. iv.

It may also take place where rapid proliferation of the cell is going on, as in the budding of the Yeast plant. It takes place in the internodal cells of Characeae; in the old internodal cells of

Fig. 1. — Reconstruction of the daughter nuclei of Phaseolus.

Tradescantia; and in various other cells which have lost their power of division. It has been shown that, in cells of Spirogyra placed under special conditions, amitotic division can be induced, and that normal mitosis is resumed when they are placed again under normal conditions. Amitosis is probably connected by a series of intermediate gradations with karyokinesis.

Mitosis. — In indirect nuclear division the nucleus undergoes a series of complicated changes, which result in an equal division of the chromatic substance between the two daughter nuclei. Four stages can be recognized. (1) Prophase. — The nucleus increases in size; the network disappears, and a much convoluted thread takes its place (fig. 2, B). The chromatin substance increases in amount; the thread stains more deeply, and in most cases presents a homogeneous appearance. This is commonly called the spirem-figure. The chromatin thread next becomes shorter and thicker, the nucleoli begin to disappear, and the thread breaks up into a number of segments — chromosomes — which vary in number in different species, but are fairly constant in the same species (fig. 2, C, D). Coincident with these changes the nuclear membrane disappears and a spindle-shaped or barrel-shaped group of threads makes its appearance in the midst of the chromosomes, the longitudinal axis of which is at right angles to the plane of the division (fig. 2, F). At each pole of this spindle figure there often occur fibres radiating in all directions into the cytoplasm, and sometimes a minute granular body, the centro- some, is also found there. (2) Metaphase. — The chromosomes pass to the equator of the spindle and become attached to the

spindle-fibres in such a way that they form a radiating star- shaped figure — Aster — when seen from the pole of the spindle. This is called the nuclear plate (fig. 2, E, F, G, H). As they pass into this position they undergo a longitudinal splitting by which the chromatin in each chromosome becomes divided into equal halves. (3) Anaphase. — The longitudinal division of the chro- mosomes is completed by the time they

have 7 taken up their position in the nuclear plate, and the halves of the chromosomes then begin to move along the spindle-fibres to opposite poles of the spindle (fig. 2, I, J). Many observers hold the view that the chromosomes are pulled apart by the contraction of the fibres to which they are attached. (4) Telophase. — When they reach the poles the chromosomes group themselves again in the form of stars — Diaster — with spindle-fibres extending between them (fig. 2, K). The chromosomes then fuse together again to form a single thread (fig. 2, L), a nucleolus appears, a nuclear membrane is formed, and daughter nuclei are thus constituted which possess the same structure and staining reactions as the mother nucleus.

The spindle figure is probably the expression of forces which are set up in the cell for the purpose of causing the separation of the daughter chromosomes. Hartog has endeavoured to show that it can only be formed by a dual force, analagous to that of magnetism, the spindle- fibi es being comparable to the lines of force in a magnetic field and possibly due to electrical differences in the cell. The spindle arises partly from the cytoplasm, partly from the nucleus, or it may be derived entirely from the nucleus — intranuclear spindle — as occurs in many of the lower plants (Fungi, &c). The formation of the spindle begins in the prophases of division. A layer of delicate filamentous cytoplasm — kinoplasm — may collect around the nucleus, or at its poles, out of which the spindle is formed. As division proceeds, the filamentous nature of this cytoplasm becomes more prominent and the threads begin either to converge towards the poles of the nucleus, to form a bipolar spindle, or may converge towards, or radiate from, several different points, to form a multi- polar spindle. The wall of the nucleus breaks down, and the cyto- plasmic spindle-fibres become mixed with those derived from the nuclear network. The formation of the spindle differs in details in different plants.

The significance of this complex series of changes is very largely hypothetical. It is clear, however, that an equal quantitative division and distribution of the chromatin to the daughter cells is brought about; and if, as has been suggested, the chromatin consists of minute particles or units which are the carriers of the hereditary characteristics, the nuclear division also probably results in the equal division and distribution of one half of each of these units to each daughter cell.

Reduction Divisions (Meiosis). — The divisions which take place leading to the formation of the sexual cells show a reduction in the number of chromosomes to one-half. This is a necessary consequence of the fusion of two nuclei in fertilization, unless the chromosomes are to be doubled at each generation. In the vascular cryptogams and phanerogams it takes place in the spore mother cells and the reduced number is found in all the

cells of the gametophyte, the full number in those of the sporophyte. We know very little of the details of reduction in the lower plants, but it probably occurs at some stage in the life history of all plants in which sexual nuclear fusion takes place. The reduc- tion is brought about simply by the segmentation of the spirem thread into half the number of segments instead of the normal number. In order to effect this the individual chromosomes must become associated in some way, for there is no diminution in the actual amount of nuclear substance, and this leads to certain modifications in the division which are not seen in the vegetative nuclei. The two divisions of the spore mother cell in which the reduction takes place, follow each other very rapidly and are known as Heterotype and Homotype (Flemming), or according to the terminology of Farmer and Moore (1905) as the meiotic phase. In the heterotype division the spirem thread is divided longi- tudinally before the segmentation occurs (fig. 2, B), and this is preceded by a peculiar contraction of the thread around the nucleolus which has been termed synapsis (fig. 1, A). A second contraction may take place later, immediately preceding the segmentation of the thread. It has been suggested that synapsis may be connected with the early longitudinal splitting of the thread or with the pairing of the chromosomes, but it is possible

that it may be connected with the transference of nucleolar substance to the nuclear thread. The segments of each chromo- some are usually twisted upon each other and may be much contorted (fig. 2, C, D), and appearances are observed which suggest a second longitudinal division, but which are more

(After Gregoire.) ~s

Fig. 2. — Various Stages in the Nuclear Division of the Pollen 1 Mother-cells of Lilium.

probably due to a folding of the segment by which the two halves come to lie more or less parallel to each other, and form variously shaped figures of greater or less regularity (fig. 2, E). The chromosomes now become attached to the spindle-fibres (fig. 2, F, G) and as thedaughter chromosomes become pulled asunder they often appear more or less V-shaped so that each pair appears as a closed ring of irregular shape, the ends of the V's being in contact thus— < > (fig. 2, H, I, J, K). This V has been variously interpreted. Some observers consider that it repre- sents a longitudinal half of the original segment of the spireme, others that it is a half of the segment produced by transverse division by means of which a true qualitative separation of the chromatin is brought about. The problem is a very difficult one and cannot be regarded as definitely settled, but it is difficult to understand why all this additional complexity in the division of

the nucleus should be necessary if the final result is only a quantitative separation of the chromatin. It seems to be fairly well established that in the meiotic phase there is a true qualitative division brought about by the pairing of the chromosomes during synapsis, and the subsequent separation of whole

chromosomes to the daughter nuclei. The method by which this is brought about is, however, the subject of much controversy. There are two main theories: (1) that the chromosomes which finally separate are at first paired side by side (Allen, Gregoire, Berghs, Strasburger and others), and (2) that they are joined together or paired end to end (Farmer and Moore, Gregory, Mottier and others). Good cytological evidence has been ad- duced in favour of both theories, but further investigation is necessary before any definite conclusion can be arrived at. The second .or homotype division which immediately follows reverts to the normal type except that the already split chromosomes at once separate to form the daughter nuclei without the interven- tion of a resting stage.

Cell Division. — With the exception of a few plants among the Thallophytes, which consist of a single multinucleate cell, Caulerpa, Vaucheria, &c, the division of the nucleus is followed by the division of the cell either at once, in uninucleate cells, or after a certain number of nuclear divisions, in multinucleate cells. This may take place in various ways. In the higher plants, after the separation of the daughter nuclei, minute granular swellingc appear, in the equatorial region, on the connecting fibres which still persist between the two nuclei, to form what is called the cell-plate. These fuse together to form a membrane (fig. 1, C, D) which splits into two layers between which the new cell-wall is laid down. In the Thallophytes the cytoplasm may be segmented by constriction, due to the in-growth of a new cell wall from the old one, as in Spirogyra and Cladophora, or by the formation of cleavage furrows in which the new cell-wall is secreted, as occurs in the formation of the spores in many Algae and Fungi. Cell budding takes place in yeast and in the formation of the conidia of Fungi.

In a few cases both among the higher and the lower plants, of which the formation of spores in the ascus is a typical example, new cells are formed by the aggregation of portions of the cytoplasm around the nuclei which become delimited from the rest of the cell contents by a membrane. This is

known as free cell formation.

In Fucus and allied forms the spindle-fibres between the daughter nuclei disappear early and the new cell-wall is formed in the cytoplasm. '

Cell Membrane. — The membrane which surrounds the proto- plasts in the majority of plants is typically composed of cellulose, together with a number of other substances which are known as pectic compounds. Some of these have a neutral reaction, others react as feeble acids. They can be distinguished by their insolubility in cuprammonia, which dissolves cellulose, and by their behaviour towards stains, some of which stain pectic substances but not cellulose. Cellulose has an affinity for acid stains, pectic substances for basic stains. The cell-membrane may become modified by the process of lignification, suberiza- tion, cuticularization or gelatinization. In the Fungi it is usually composed of a modified form of cellulose known as fungus cellulose, which, according to Mangin, consists of callose in combination either with cellulose or pectic compounds. The growth of the cell-wall takes place by the addition of new layers to those already formed. These layers arc secreted by the protoplasm by the direct apposition of substances on those already in existence; and they may go on increasing in thickness, both by apposition and by the intussusception of particles probably carried in through the protoplasmic fibres, which penetrate the cell-wall as long as the cell lives. The growth of the cell-wall is very rarely uniform. It is thickened more in some places than in others, and thus are formed the spiral, annular and other markings, as well as the pits which occur on various cells and vessels. Besides the internal or centripetal growth, some cell-walls are thickened on the outside, such as pollen grains, oospores of Fungi, cells of Peridineae, &c. This centrifugal growth must apparently take place by the activity of protoplasm external to the cell. The outer protective walls of the oospores of some Fungi are formed out of protoplasm containing numerous nuclei, which is at an early stage separ- ated from the protoplasm of the oospore. In the Peridineae, xxi. 25

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Diatoms and Desmids, according to recent researches, the thick- enings on the outer walls of the cells are due to the passage of protoplasm from the interior of the cell to the outside, through pores which are found perforating the wall on all sides.

Cell-walls may become modified by the impregnation of various substances. Woody or lignified cell-walls appear to contain sub- stances called coniferin and vanillin, in addition to various other compounds which are imperfectly known. Lignified tissues are coloured yellow by aniline sulphate or aniline chloride, violet with phloroglucin and hydrochloric acid, and characteristic reactions are also given by mixtures containing phenol, indol, skatol, thallin, sulphate, &c. (see Zimmermann's Microtechnique). Staining reagents can also be used to differentiate lignified cell-walls. Cuticularized or suberized cell-walls occur especially in those cells which per- form a protective function. They are impervious to water and gases. Both cuticularized and suberized membranes are insoluble in cuprammonia, and are coloured yellow or brown in a solution of chlor-iodide of zinc. It is probable that the corky or suberized cells do not contain any cellulose (Gilson, Wisselingh) ; whilst cuti- cularized cells are only modified in their outer layers, cellulose inner layers being still recognizable. The suberized and cuticularized cell-walls appear to contain a fatty body called suberin, and such cell-walls can be stained red by a solution of alcanin, the lignified and cellulose membranes remaining unstained.

Fertilization. — The formation of the zygote or egg-cell takes place usually by the fusion of the contents of two cells, and always includes, as an essential feature, the fusion of two germ nuclei. In many of the lower plants the fusing cells — gametes — are precisely similar so far as size and general appearance are concerned; and the whole contents of the two cells fuse together, cytoplasm with cytoplasm, nucleus with nucleus, nucleolus with nucleolus and plastid with plastid. The gametes may be motile (some Al- gae) or non-motile, as in Spirogyra, Mucor, Bas- idiobolus, &c. In many of the lower plants and in all higher plants there is a difference in size in the fusing cells, the male cell being the smaller. The reduction in size is due to the absence of cytoplasm, which is in soma cases so small in amount that the cell consists mainly of a nucleus. In all cases of complete sexual differenti- ation the egg-cell is quies- cent; the male cell may be motile or non-motile. In many of the Fungi the non-motile male cell or nucleus is carried by means of a fertilizing tube actually into the interior of the egg-cell, and is extruded through the apex in close proximity to the egg nucleus. In the Florideae, Lichens and Laboulbeniaceae the male cell is a non-motile spermatium, which is carried to the female organ by movements in the water. In Monoblepharis, one of the lower Fungi, in some Algae, in the Vascular Crypto-' grams, in Cycads {Zamia and Cycas), and in Ginkgo, an isolated genus of Gymnosperms, the male cell is a motile spermatozoid with two or more cilia. In the Algae, such as Fucus, Volvox, Oedogonium, Bulbochaete, and in the Fungus Monoblepharis, the spermatozoid is a small oval or elongate cell containing nucleus, cytoplasm and sometimes plastids. In the Characeae, the Vascular Cryptogams, in

Zamia and Cycas, and in Ginkgo, the spermatozoids are more or less highly modified cells witL- two or more cilia, and resemble in many respects, both in their

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(From Wilson. After Guignard and Mottier.) Fig. 3. — Fertilization in the Lily, a, Antipodal cell ; sp, polar nuclei;

pt, pollen tube.

A, Two vermiform nuclei in the em- bryo sac; one approaching the egg-nucleus, the other uniting with the upper polar nucleus.

B, LJnion of the vermiform nuclei with the egg-nucleus and the two polar nuclei.

C, Fusion of the germ nuclei in the egg-cell.

[After Webber.)

Fig. 4. — Spermatozoid and Fertiliza- tion in Zamia.

structure and mode of formation, the spermatozoids of animals. In Characeae and Muscineae they are of elongate spiral form, and consist of an elongate dense nucleus and a small quantity of

cytoplasm. At the an- terior end are attached two cilia or flagella. In the Vascular Cryptogams the structure is much the same, but a more or less spherical mass of cyto- plasm remains attached to the posterior spirals, and a large number of cilia are grouped along the cytoplasmic anterior portion of the spiral. In Zamia (fig. 4, A), Cycas and Ginkgo they consist of large spherical or oval cells with a coiled band of cilia at one end, and a large nucleus which nearly fills the cell. They are carried by the pollen tube to the apex of the prothallus, where they are extruded, and by means of their cilia swim through a small quantity of liquid, contained in a slight depression to the oosphere. In the other Phanerogams the male cell, which is non-motile, is carried to the oosphere by means of a pollen tube. In the spermatozoids of Chara, Vascular Cryptogams, and in those of Cycas, Zamia and Ginkgo, the cilia arise from a centrosome-like body which is

found on one side of the nucleus of the spermatozoid mother-cell. This body has been called a blepharoplast, and in the Pteridophytes, Cycads and Ginkgo it gives rise to the spiral band on which the cilia are formed. Belajeff regards it as a true centrosome; but this is doubtful, for while in some cases it appears to be connected with the division of the cell, in others it is independent of it. The egg- cell or oosphere is a large cell containing a single large nucleus, and in the green plants the rudiments of plastids. In plants with multinucleate cells, such as Albugo, Peronospora and Vaucheria, it is usually a uninucleate cell differentiated by separation of the nuclei from a multinucleate cell, but in Albugo bliti it is multinucleate, and in Sphaeroplea it may contain more than one nucleus. In some cases the region where the penetration of the male organ takes place is indicated on the oosphere by a hyaline receptive spot (Oedogonium, Vaucheria, &c), or by a receptive papilla consisting of hyaline cytoplasm (Perono- sporeae). Fertilization is effected by the union of two nuclei in all those cases which have been carefully investigated. Even in the multinucleate oosphere of Albugo bliti the nuclei fuse in pairs; and in the oospheres of Sphaeroplea, which may contain more than one nucleus, the egg nucleus is formed by the fusion of one only of these with the spermatozoid nucleus (Klebahn). In the higher Fungi nuclear fusions take place in basidia or asci which involve the union of two (fig. 7, A) nuclei, which may be regarded as physiologically equivalent to a sexual fusion. The union of the germ nuclei has now been observed in all the main groups of Angiosperms, Gymnosperms, Ferns, Mosses, Algae and Fungi, and presents a striking resemblance in all. In nearly all cases the nuclei appear to fuse in the resting stage (fig. 3, C). In many Gymnosperms the male nucleus penetrates the female nucleus before fusing with it (Blackman, Ikeno). In other cases the two nuclei place them- selves side by side, the nuclear membrane between them disappears, and the contents fuse together — nuclear thread

with nuclear thread, and nucleolus with nucleolus — so com- pletely that the separate constituents of the nuclei are not visible. It was at one time thought that the centrosomes played an important part in the fertilization of plants, but recent researches seem to indicate that this is not so. Even in those cases where the cilia band, which is the product of the centrosome-like body or blepharoplast, enters the ovum, as in Zamia (c in fig. 4, B, C, D), it appears to take no part in the fertilization phenomena, nor in the subsequent division of the nucleus. During the process of fertilization in the Angiosperms it has been shown by the researches of Nawaschin and Guignard that in Lilium and Fritillaria both generative nuclei enter the embryo sac, one fusing with the oosphere nucleus, the other with the polar nuclei (fig. 3, A, B). A double fertilization thus takes place. Both nuclei are elongated vermiform structures, and as they enter the embryo sac present a twisted appearance like a spermatozoid without cilia (fig. 3, A,

B) . It has since been shown by other observers that this double fertilization occurs in many other Angiosperms, both Dicotyledons and Monocotyledons, so that it is probably of general occurrence throughout the group (see Angiosperms).

The Nucleus in Relation to Heredity. — There is a certain amount of cytological evidence to show that the nucleus is largely concerned with the transmission of hereditary characters. Whether this is entirely confined to the nucleus is, however, not certain. The strongest direct evidence seems to be that the nuclear substances are the only parts of the cells which are always equivalent in quantity, and that in the higher plants and animals the male organ or spermatozoid is composed almost entirely of the nucleus, and that the male nucleus is carried into the female cell without a particle of cytoplasm. 1

Since, however, the nucleus of the' female cell is always accompanied by a larger or smaller quantity of cytoplasm, and that in a large majority of the power plants and animals the male cell also contains cytoplasm, it cannot yet be definitely stated that the cytoplasm does not play some part in the process. On the other hand, the complex structure of the nucleus with its separate units, the chromosomes, and possibly even smaller units represented by the chromatin granules, and the means taken through the complex phenomena of mitosis to ensure that an exact and equal division of the chromosomes shall take place, emphasizes the importance of the nucleus in heredity. Further, it is only in the nucleus and in its chromosomes that we have any visible evidence to account for the Mendelian .segregation of characters in hybrids which are known to occur. Visible differences in the chromosomes have even been observed, especially in insects, which are due apparently to an unequal division by which an additional or accessory chromosome is produced, or in some cases one or two extra chromosomes which differ in size from the others. These differences indicate a separation of different elements in the formation of the chromo- somes and have been definitely associated with the determination of sex. It is possible, however, that the segregation of characters in the gametes may depend upon something far more subtle and elusive than the chromosomes or even of possible combina- tions of units within the chromosomes, but so far as we can see at present these are the only structures in the cell with which it can be satisfactorily associated. Boveri in fact has put forward the view that the chromosomes are elementary units which maintain an organic continuity and independent existence in the cell. The cytological evidence for this appears to be made stronger for animal than for plant cells. From numerous investigations which have been made to trace the chromosomes through the various stages of the nuclear ontogeny of plant cells, it appears that the individuality and continuity of the chromo- somes can only be conceived as possible if we assume the exis-

tence of something like chromosome centres in the resting nucleus around which the chromosomes become organized for purposes of division. Rosenberg (1909) adduces evidence for

1 Strasburger (1909) states very definitely that he has observed the entrance of the male nucleus into the egg without a trace of cytoplasm.

the existence of chromosomes or " prochromosomes " in resting nuclei in a large number of plants, but most observers consider that the chromosomes during the resting stage become com- pletely resolved into a nuclear network in which no trace of the original chromosomes can be seen.

Special Cell-Modifications for the Reception of Stimuli.- — In studying the physiology of movement in plants certain modifica- tions of cell-structure have been observed which appear to have been developed for the reception of the stimuli by which the response to light, gravity and contact are brought about. Our knowledge of these structures is due mainly to Haberlandt.

Organs which respond to the mechanical stimulus of contact are found to possess special contrivances in certain of their cells — (1) sensitive spots, consisting of places here and there on the epidermal cells where the wall is thin and in close contact with protoplasmic projections. These occur on the tips of tendrils and on the tentacles of Drosera; (2) sensitive papillae found on the irritable filaments of certain stamens; and (3) sensitive hairs or bristles on the leaves of Dionaea muscipula and Mimosa pudica — all of which are so con- structed that any pressure exerted on them at once reacts on the protoplasm.

Response to the action of gravity appears to be associated with the movements of starch grains in certain cells — statolith cells — by which pressure is exerted on the cytoplasm and a stimulus set up which results in the geotropic response.

The response to the action of light in diatropic leaves is, according to Haberlandt, due to the presence of epidermal cells which are shaped like a lens, or with lens-shaped thickenings of the cuticle, through which convergence of the light rays takes place and causes a differential illumination of the lining layer of protoplasm on the basal walls of the epidermal cells, by which the stimulus resulting in the orientation of the

leaf is brought about. Fig. 5, A, shows the

of division, chromosomes, nuclear spindle and centrosomes are to be seen (fig. 7, C-G). The investigations of Dangeard, Harper, Blackman, Miss Fraser and many others have also

A Pig. 5. B

A, Epidermal cells of Saxijraga hirsutum.

B, of Tradescantia fluminensis.

convergence of the light to a bright spot on the basal walls of the epidermal cells of Saxijraga hirsutum and fig. 5, B, shows a photograph taken from life through the epidermal cells of Tradescantia fluminen- sis. Notwithstanding the fact, however, that these cells are capable of acting as very efficient lenses the explanation given by Haber- landt has not been widely accepted and evidence both morphological and physiological has been brought forward against it.

The presence of an eye-spot in many motile unicellular Algae and swarm spores is also probably concerned with the active response to light exhibited by these organisms. In Euglena viridis, which has been most carefully studied in this respect, the flagellum which brings about the movement bears near its base a minute spherical or oval refractive granule or swelling which is located just in the hollow of the red pigment-spot (fig. 6) ; and it has been suggested that the association of these two is analogous to the association of the rods and cones of the animal eye with their pigment layer, the light absorbed by the red pigment-spot setting up changes which react upon the refractive granule and being transmitted to the flagellum bring about those modifications in its vibrations by which the direction of movement of the organism is regulated.

The Nuclei of the Lower Plants. — It is only in comparatively recent times that it has been possible to determine with any degree of certainty that the minute deeply stainable bodies described more especially by Schmitz (1870) in many Algae and Fungi could be regarded as true nuclei. The researches of the last twenty years have shown that the structure of the nucleus and the phenomena of nuclear division in these lower forms conforms in all essential details to those in the higher plants. Thus in the Basidiomycetes (fig. 7) the nuclei possess all the structures found in the higher plants, nuclear membrane, chromatin network and nucleolus (fig. 7, B), and in the process

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(From the Journal of the Linnean Society, " Zoology" vol. xxvii.)

Fig. 6. — A, Eye-spots of Euglena viridis. B, Anterior end of Euglena showing the flagellum with its swelling just in the hollow of the eye-spot.

shown that in the Ascomycetes, Rust Fungi, &c, the same structure obtains so far as all essential details are concerned.

The only groups of plants in which typical nuclei have not been found are the Cyanophyceae, Bacteria and Yeast Fungi.

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(From the Annals of Botany, vols. vii. and viii.) Fig. 7. — Nuclei and Nuclear Division in the Basidiomycetes.

A to D, Amanita muscarius; E to G, Mycena galericulatus. A, Basidium with two nuclei. B, single nucleus due to the fusion of the two pre-existing nuclei. C, Nuclear thread segment- ing. D, Nuclear cavity with chromosomes. E, Chromosomes on the spindle. F, Separation of the chromosomes into two groups. G, Chromosomes grouped at opposite ends of the spindle to form the daughter nuclei.

In the Cyanophyceae the contents of the cell are differentiated into a central colourless region, and a peripheral layer containing the chlorophyll and other colouring matters together with granules of a reserve substance called cyanophycin. Chromatin is contained in the central part together with granules known as volutin, the function of which is unknown. The central body probably plays the part of a nucleus and some observers consider that it has the characters of a typical nucleus with mitotic division. But this is very doubtful. The central body seems to consist merely of a spongy mass of slightly stainable substance, more or less impregnated with chromatin, which divides by constriction. At a certain stage in the division figures are produced resembling a mitotic phase (fig. 8, i), which are not, in

(From Proc. Roy. Soc, vol. lxxii.)

Fig. 8. — Cell Structure of the Cyanophyceae. A and B, Tolypothrix lanata: (i) Young, (2) Old cells. C, Oscillaria litnosa: transverse microtome section.

the opinion of the writer, to be interpreted as a true mitosis. It is interesting to note that in many species the formation of new cell-walls is initiated before any indication of nuclear division is to be seen.

The bacteria, in most cases, have no definite nucleus or central body. The chromatin is distributed throughout the cytoplasm in the form of granules which may be regarded as a distributed nucleus corresponding to what Hertwig has designated, in protozoa, chromidia.

In the yeast cell the nucleus is represented by a homogenous granule, probably of a nucleolar nature, surrounded and perhaps to some extent impregnated by chromatin and closely connected with a vacuole which often has chromatin at its periphery, and contains one or more volutin granules which appear to consist of nucleic acid in combination with an unknown base. Some observers consider that the yeast nucleus possesses a typical nuclear structure, and exhibits division by mitosis, but the evidence for this is not very satisfactory.

Tissues. — The component parts of the tissues of which plants are composed may consist of but slightly modified cells with copious protoplasmic contents, or of cells which have been modified in various ways to perform their several functions. In some the protoplasmic contents may persist, in others they disappear. The formation of the conducting tubes or secretory sacs which occur in all parts of the higher plants is due either to the elongation of single cells or to the fusion of cells together in rows by the absorption of the cell-walls separating them. Such cell-fusions may be partial or complete. Cases of complete fusion occur in the formation of laticiferous vessels, and in the spiral, annular and reticulate vessels of the xylem. Incomplete fusion occurs in sieve tubes. Tubes formed by the elongation of single cells are found in bast fibres, tracheides, and especially in laticiferous cells.

Laticiferous Tissue. — The laticiferous tissue consists of a network of branching or anastomosing tubes which contain a coagulable fluid known as latex. These tubes penetrate to all parts of the plant and occur in all parts of the root, stem and leaves. A proto- plasmic lining is found on their walls which contains nuclei. The

walls are pitted, and protoplasmic connexions between the latici- ferous tubes and neighbouring parenchyma-cells have been seen. There are two types of laticiferous tissue — non-articulate and articulate. The non-

articulate tissue which occurs in Euphorbiaceae, Apocynaceae, Urticaceae, Asclepiadaceae, consists of long tubes, equivalent to single multinucleate cells, which ramify in all directions throughout the plant. Laticiferous vessels arise by the coalescence of originally distinct cells. The cells not only fuse together in longi- tudinal and transverse rows, but put out transverse projections, which fuse with others of a similar nature, and thus form an anasto- mosing network of tubes which extends to all parts of the plant. They are found in the Compositae (Cichoriaceae) , Campanulaceae, Papaveraceae, Lobeliaceae, Papayaceae, in some Aroideae and Musaceae, and in Euphorbiaceae (Manihot, Hevea). The nuclei of the original cells persist in the protoplasmic membrane. The rows of cells from which the laticiferous vessels are formed can be distinguished in many cases in the young embryo while still in the dry seed (Scott), but the latex vessels in process of formation are more easily seen when germination has begun. In the process of cell-fusion the cell-wall swells slightly and then begins to dissolve gradually at some one point. The opening, which is at first very small, increases in size, and before the cross- wall has entirely dis- appeared the contents of the two cells become continuous (Scott). The absorption of the cell-walls takes place very early in the germina- ting seedling.

Sieve Tubes. — The sieve tubes consist of partially fused rows of cells, the transverse or lateral walls being perforated by minute openings, through which the contents of the cells are connected with each other, and which after a certain time become closed by the formation of callus on the sieve plates. The sieve tubes contain a thin lining layer of protoplasm on their walls, but no nuclei, and the cell sap contains albuminous substances which are coagulable by heat. Starch grains are sometimes present. In close contact with the segments of the sieve tubes are companion ceils which communi- cate with the sieve tubes by delicate protoplasmic strands; they can be distinguished from ordinary parenchymatous cells by their small size and dense protoplasm. Companion cells are not found in the Pteridophyta and Gymnosperms. In the latter their place is taken by certain cells of the medullary rays and bast parenchyma. The companion cells are cut off from the same cells as those which unite to form the sieve tube. The mode of formation of the sieve plate is not certainly known; but from the fact that delicate connecting threads of protoplasm are present between the cells from their first development it is probable that it is a special case of the normal protoplasmic continuity, the sieve pores being produced by a secon- dary enlargement of the minute openings through which these delicate strands pass. According to Lecomte, the young wall consists partly of cellulose and partly of a substance which is not cellulose, the latter existing in the form of slight depressions, which mark the position of the future pores. As the sieve plate grows these non-cellulose regions swell and

gradually become converted into the same kind of mucous substance as that contained in the tube; the two cells are thus placed in open communication. If this is correct it is easy to see that the changes which take place may be initiated by the original delicate protoplasmic strands which pass through the cell- wall. (For further information regarding tissues, see the section on- Anatomy above.)

Protoplasmic Continuity. — Except in the unicellular plants the cell is not an independent unit. Apart from their depen- dence in various ways upon neighbouring cells, the protoplasts of all plants are probably connected together by fine strands of protoplasm which pass through the cell-wall (Tangl, Russow, Gardiner, Kienitz-Gerloff and others) (fig. 9). In Pinus the presence of connecting threads has recently been demonstrated throughout all the tissues of the plant. These proto- plasmic strands are, except in the case of sieve tubes, so delicate that special methods have to be employed to make them visible. The basis of these methods consists in causing a swelling of the cell-wall by means of sulphuric acid or zinc chloride, and subsequent staining with Hoffmann's blue or other aniline dyes. The results so far obtained show that the connecting threads may be either " pit-threads " which traverse the closing membrane of the pits in the Fig. 9.— Continuity of

,, ,, ,,. -r,\ « „ protoplasm of cells 01 Tamus

cell-walls (fig. 9, B), or _ wall- \ omm v unis (A) and endos .

threads " which are present in the pe rm of Lilium Martagon

wall of the cell (fig. 9, A). Both (B).

pit-threads and wall-threads may occur in the same cell, but more often the threads are limited to the pits. The pit-threads are larger and stain more readily than the wall-threads. The threads vary in size in different plants. They are very thick in Viscum album, and are well seen in Phaseolus multiflorus and Lilium Martagon. They are present from the beginning of the develop- ment of the cell-wall, and arise from the spindle fibres, all of which may be continued as connecting threads (endosperm of Tamus communis) , or part of them may be overlaid by cellulose lamellae (endosperm of Lilium Martagon), or they may be all overlaid as in pollen mother-cells and pollen grains of Helleborus foeiidus. The presence of these

threads between all the cells of the plant shows that the plant body must be regarded as a connected whole; the threads themselves probably play an important part in the growth of the cell-wall, the conduction of food and water, the process of secretion and the transmission of impulses.

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Morphology of Plants

The term morphology, which was introduced into science by Goethe (181 7), designates, in the first place, the study of the form and composition of the body and of the parts of which the body may consist; secondly, the relations of the parts of the same body; thirdly, the comparison of the bodies or parts of the bodies of plants of different kinds; fourthly, the study of the development of the body and of its parts {ontogeny) ; fifthly, the investigation of the historical origin and descent of the body and its parts (phytogeny) ; and, lastly, the consideration of the relation of the parts of the body to their various functions, a study that is known as organography.

It is this last department of morphology that was the first to be pursued. The earliest scientific result of the study of plants was the recognition of the fact that the various parts of the body are associated with the performance of different kinds of physiological work; that they are, in fact, organs discharging special functions. The origin of the organography of the present day may be traced back to Aristotle, who described the parts of plants as " organs, though very simple ones." It was not until many centuries had passed that the parts began to be regarded from the point of view of their essential nature and of their mutual relations; that is, morphologically instead of organographically. Joachim Jung, in his Isagoge phytoscopica (1678), recognized that the plant-body consists of certain definite members, root, stem and leaf, and defined them by their different form and by their mutual relations. This point of view was further developed in the following century by Caspar Friedrich Wolff (Theoria generationis, 1759), who first followed the development of the members at the growing-point of the stem. He observed that the " appendicular organs," as he called the leaves, are developed in the same way, whether they be foliage- leaves, or parts of the flower, and stated his conclusions thus: " In the entire plant, whose parts we wonder at as being, at the first glance, so extraordinarily diverse, I finally perceive and recognize nothing beyond leaves and stem (for the root may be regarded as a stem). Consequently all parts of the plant, except the stem, are modified leaves." Similar views were arrived at by Goethe, though by the deductive rather than the inductive method, and were propounded in his famous pamphlet, Versuch die Metamorphose der Pflanzen zu erkldren (1790), from which the following is a quotation: " The underlying relationship between the various external parts of the plant,

such as the leaves, the calyx, the corolla, the stamens, which develop one after the other and, as it were, out of one another, has long been generally recognized by investigators, and has in fact been specially studied; and the operation by which one and the same organ presents itself to us in various forms has been termed Metamorphosis of Plants."

Pure Morphology. — Thus it became apparent that the many

and various organs of plants are, for the most part, different forms of a small number of members of the body, which have been distinguished as follows, without any reference to function. The thallus (thallome) is a plant-body which is not differentiated into the members root, stem and leaf; it is the morphologically simplest body, such as is of common occurrence in the lower plants (e.g. Thallophyta). In a differentiated body the stem (caulome) is an axis capable of bearing leaves and (directly or indirectly) the proper reproductive organs. The leaf (phyllome) is an appendicular member only borne by a stem, but differing from it more or less obviously in form and development, though co-ordinate with it in complexity of structure. The root is an axis which never bears either leaves or the proper reproductive organs (whether sexual or asexual) of the plant. The hair (trichome) is a superficial appendage of simple structure, which may be borne by any of the other members. The emergence is also an appendicular member of more complex structure than the hair {e.g. the prickles of the rose). Further, it has been found convenient to designate the leaf-bearing stem as a whole by the term shoot, so that the body may, as Sachs suggested, be primarily analysed into shoot and root.

At the present time some objection is being taken to this purely morphological conception of the body and its parts as being too abstract. It is urged that the various parts are, as a matter of fact, organs; and that it is therefore inadmissible to ignore their functions, as is done in the foregoing definitions. To this it may be replied that pure morphology and organo- graphy are not alternatives, but are two complementary and equally necessary modes of considering the composition of the plant-body. Moreover, the abstract terms " stem," " leaf," " root," &c, are absolutely indispensable; and are continually used in this sense by the most ardent organographers. It has not yet been suggested that they should be replaced by organo- graphical terms; were this accomplished, descriptive botany would become impossible.

It is also urged against these definitions that they are not of universal applicability; that there are exceptional structures which cannot be brought within the limits of any one of them. But admitting the validity of this criticism, and even going so far as to question the possibility of ever devising absolutely inclusive and, at the same time, exclusive definitions, no sufficient reason is adduced for giving up all attempt at morphological analysis.

Homology. — All members belonging to the same morphological category are said to be homologous, however diverse their functions. Thus, in a phanerogam, the sepals, petals, stamens and foliage-leaves all come under the category leaf, though some are parts of the perianth, others are spore-bearing organs (sporophylls), and others carry on nutritive processes. The homology of members was based, in the first instance, upon similarity of development and upon similar relations to the other parts of the body, that is, upon ontogeny. But since the general adoption of the theory of evolution, similarity of descent, that is of phylogeny, has come to form an essential part of this conception; in other words, in order that their homology may be established the parts compared must be proved to be homo- genetic.

The introduction of the phylogenetic factor has very much increased the difficulty of determining homologies; for the data necessary for tracing phylogeny can only be obtained by the study of a series of allied, presumably ancestral, forms. One of the chief difficulties met with in this line of research, which is one of the more striking developments of modern morphology, is that of distinguishing between organs which are " reduced," and those which are really " primitive." The object of the phylogenetic study of any organ is to trace it back to its primitive form. But, as will be pointed out later, organs are often found to have undergone " degeneration " or " reduction," and such reduced or degenerate structures may easily be mistaken for primitive structures, and so the investigator may be misled.

The effect of the phylogenetic factor in homology may be illustrated in the following cases. The leaves of the true mosses

and those of the club-mosses (Lycopodium, Selaginella) being somewhat alike in general appearance and in ontogeny, might be, and indeed have been, regarded as homologous on that ground. However, they belong respectively to two different forms in the life-history of the plants; the leaves of the mosses are borne by the gametophyte, those of the club-mosses by the sporophyte. In accordance with the prevalent antithetic view of the alternation of generations in these plants (see Plants, Reproduction or), the forms distinguished as sporophyte and gametophyte are not homogenetic; consequently their leaves are not homologous, but are only functionally

similar (homo- plastic; see infra).

Another effect is that different degrees of homology have to be recognized, just as there are different degrees of relationship or affinity between individual plants. When two organs can be traced along the same line of descent to one primitive form, that is when they are found to be monophyletic, their homology is complete; when, however, they are traceable to two primitive forms, though these forms belong to the same morphological series, they are polyphyletic and therefore only incompletely homologous. For instance, all the leaves of the Bryophyta are generally homologous inasmuch as they are all developments of the gametophyte. But there is reason to believe that they have been differentiated quite independently in various groups, such as the Marchantiaceae, the Jungermanniaceae, and the mosses proper; consequently their phylogeny is not the same, they are polyphyletic, and therefore they are not completely homologous, but are parallel developments.

Analogy. — Considering the parts of the body in relation to their functions, that is as organs, they are found to present pecu- liarities of form and structure which are correlated with the functions that they have to discharge; in other words, the organ shows adaptation to its functions. All organs performing the same function and showing similar adaptations are said to be analogous or homoplastic, whatever their morphological nature may be; hence organs are sometimes both homologous and analo- gous, sometimes only analogous. The tendrils of a vetch and of a cucumber are analogous, and also homologous because they both belong to the category leaf; but they are only analogous to the tendrils of the vine and of the passion-flower, which belong to the category stem.

Metamorphosis. — It has already been pointed out that each kind of member of the body may present a variety of forms. For example, a stem may be a tree-trunk, or a twining stem, or a tendril, or a thorn, or a creeping rhizome, or a tuber; a leaf may be a green foliage-leaf, or a scale protecting a bud, or a tendril, or a pitcher, or a floral leaf, either sepal, petal, stamen or carpel (sporophyll) ; a root may be a fibrous root, or a swollen tap-root like that of the beet or the turnip. All these various forms are organs discharging some special function, and are examples of what Wolff called " modification," and Goethe " metamor- phosis." It may be inquired what meaning is to be attached to these expressions, and what are the conditions and the nature of the changes assumed by them. The leaf of the higher plants will be taken as the illustrative case because it is the most " plastic " of the members, the one, that is, which presents the greatest variety of adaptations, and because it has been most thoroughly studied.

In this, as in all morphological inquiries, two lines of investi- gation have to

be followed, the phylogenetic and the ontogenetic. Beginning with its phylogeny, it appears, so far as present knowledge goes, that the differentiation of the shoot of the sporophyte into stem and leaf first occurred in the Pteridophyta; and, in accordance with the views of Bower {Origin of a Land- Flora), the primitive leaf was a reproductive leaf, a sporophyll, from which the foliage-leaf was derived by progressive sterilization. From the nature of the case, this view is not, and could not be, based upon actual observation, nor is it universally accepted; however, it seems to correspond more closely than any other to the facts of comparative morphology. It was formerly assumed, and the view is still held, that the foliage-leaf was the primitive form from which all others were derived, mainly on

the ground that, in ontogeny, the foliage-leaf generally precedes the sporophyll. The phylogeny of the various floral leaves, for instance, was generally traced as follows: foliage-leaf, bract, sepal, petal, stamen and carpel (sporophylls) — in accordance with what Goethe termed " ascending metamorphosis." Recent researches, however, more especially those of Celakovsky, tend to pfove that the perianth-leaves have been derived from the stamens (i.e. from sporophylls); that is, they are the result of " descending metamorphosis." Moreover there is the fact that the flowers of nearly all the primitive phanerogams, such as the Gymnosperms, consist solely of sporophylls, having no perianth. There is thus a considerable body of evidence to support Bower's view of the primitive nature of the sporophyll.

Accepting this view of the phylogeny of the leaf, the perianth- leaves (sepals and petals) and the foliage-leaves may be regarded as " modified " or " metamorphosed " sporophylls; that is, as leaves which are adapted to functions other than the bearing of spores. The sepals are generally organs for the protection of the flower-bud; the petals, for attracting insects by their con- spicuous form and colour; the foliage-leaves, for the assimilation of carbon dioxide and other associated functions. But this phylogenetic differentiation of the organs was not what Wolff and Goethe had in mind; what they contemplated was an onto- genetic change, and there is abundant evidence that such changes actually occur. Taking first the conversion of members of one morphological category into those of another, this has been actually observed, though rarely. Goebel (Organography) gives several instances of the conversion of the root into a

shoot in ferns, and a few in phanerogams (Listera ovata, Neottia nidus-avis, Anthurium longifolium) . Much more common is the conversion of one form of a member into another form. The most varied changes of this kind have been described, and are generally familiar as "monstrosities"; the study of them constitutes, under the name of teratology, a distinct department of biology. A simple case is that of " double " flowers, in which the number of the petals is increased by the " metamorphosis " of stamens; or again the conversion of floral leaves into green leaves, a change known as " chloranthy." These changes may be brought about by external causes, such as the attacks of insects or of fungi, alterations in external conditions, &c, or by some unexplained internal disturbance of the morphological equilibrium. They can also be effected experimentally. Goebel has shown that if the developing foliage-leaves of the fern Onoclea struthiopteris be removed as they are formed, the subsequently developed sporophylls assume more or less com- pletely the habit of foliage-leaves, and may be sterile. Similarly bud-scales can be caused to develop into foliage-leaves, if the buds to which they belong are caused to grow out in the year of their formation by the removal of the existing foliage-leaves.

Useful and suggestive as they often are, teratological facts played, at one time, too large a part in the framing of morpho- logical theories; for it was thought that the " monstrous " form gave a clue to the essential nature of the organ assuming it. There is, however, no sufficient reason for regarding the mon- strous form as necessarily primitive or ancestral, nor even as a stage in the ontogeny of the organ. For when the older morpho- logists spoke of a stamen as a " metamorphosed " leaf, it was implied that it originated as a foliage-leaf and subsequently became a stamen. As a matter of fact, a stamen is a stamen and nothing else, from the very beginning. The development of the organ is already determined at its first appearance upon the growing-point; though, as already explained, the normal course of its ontogeny may be interfered with by some abnormal external or internal condition. The word " metamorphosis " cannot, in fact, be used any longer in its original sense, for the change which it implied does not normally occur in ontogeny, and in phylogeny the idea is more accurately expressed by the term " differentiation." However, it may still be useful in describing " monstrosities," and perhaps also those cases in which an organ serves first one purpose and then another, as when a leafy shoot eventually becomes a thorn, or the base of a foliage-leaf becomes a bud-scale.

Differentiation. — Any account of the general morphology of living organisms is incomplete if it does not include some attempt at an explanation of its causation; though such an attempt cannot be carried far at the present time. A survey of the vegetable kingdom indicates that evolution has proceeded, on the whole, from the simple to the complex; at the same time, as has been already mentioned, evidence of reduction or

degenera- tion in common. Thus in the series Bryophyta, Pteridophyta, Phanerogamia, whilst the sporophyte presents progressive development, the gametophyte presents continuous reduction.

Evolution means the gradual development of " highly organized " from " lowly organized " forms; that is, of forms in which the " physiological division of labour " is more com- plete, from those in which it is less complete; of forms possessing a variety of organs, from forms possessing but few. Differentia- tion means the development and the specialization as organs of various parts of the body. It presents itself in two aspects: there is morphological differentiation, which can be traced in the distinction of the members of the body, root, stem, leaf, &c; there is physiological differentiation, which can be traced in the adaptation of these members to various functions. But, in actual operation, these two processes are simultaneous; every member is developed as an organ for the performance of some special function.

Factors in Evolution. — Evolution in the race involves progres- sive differentiation in the individual; hence the causes of evolu- tion and of differentiation must be the same. The evolution of higher from lower plants, it is generally assumed, has proceeded by variation. With regard to the causation of variation Darwin says (Origin of Species, ch. v.): "In all cases there are two factors, the nature of the organism, which is much the most important of the two, and the nature of the conditions. The direct action of changed conditions leads to definite or indefinite results. In the latter case the organization seems to become plastic, and we have much fluctuating variability. In the former case the nature of the organism is such that it yields readily, when subjected to certain conditions, and all or nearly all the individuals become modified in the same way."

In spite of the statement that the " nature of the organism " is the most important factor in variation, the tendency amongst evolutionists has been to take much more account of the influence of external conditions. Exceptions to this attitude are Lamarck, who speaks with regard to animals (but not to plants!) of " la composition croissante de l'organisation " (Philosophie zoologique, t. i.), and Nageli, who attributes variation to causes inherent in the " idioplasm," and has elaborately worked out the view in his Abslammungslehre.

The position assumed in this article is in agreement with the views of Lamarck and of Nageli. All but the lowest plants visibly tend towards or actually achieve in various degrees the differentiation of the body, whether sporophyte or gametophyte, into stem, leaf, root, &c, that is, the differentiation of parts not previously present. It is inconceivable that external conditions can impart to an organism the capacity to develop

something that it does not already possess: can impart to it, that is, the capacity for variation in the direction of higher complexity. The alternative, which is here accepted, is that differentiation is essentially the expression of a developmental tendency inherent in the protoplasm of plants. Just as every crystallizable chemical substance assumes a definite and constant crystalline form which cannot be accounted for otherwise than by regarding it as one of the properties of the substance, so every living organism assumes a characteristic form which is the outcome of the properties of its protoplasm. But whereas the crystalline form of a chemical substance is stable and fixed, the organized form of a living organism is unstable and subject to change.

Influence of External Conditions. — This position does not, however, exclude the influence of external conditions; that influence is undeniable. Darwin's expression " the nature of the organism " has been interpreted in the preceding paragraph to mean an inherent tendency towards higher organization; that interpretation may now be completed by adding that the

organism is susceptible to, and can respond to, the action of external conditions. There is every reason to believe that plants are as " irritable " to varying external conditions as they are to light or to gravity. A change in its external conditions may act as a " stimulus," evoking in the organism a response of the nature of a change in its form. As Darwin has pointed out, this response may be direct or indirect. In illustration of the indirect response, the evolution of the Bryophyta and of more highly organized plants may be briefly considered. It is generally admitted that life originated in water, and that the earliest plants were Algae. The study of existing Algae, that is of plants that have continued to live in water, shows that under these conditions no high degree of organization has been reached, though some of them have attained gigantic dimensions. The primitive water-plants were succeeded by land-plants, a land- flora being gradually established. With the transition from water to land came the progressive development of the sporo- phyte which is the characteristic feature of the morphology of the Bryophyta and of all plants above them in the scale of life (see Bower, Origin of a Land-Flora). This evolution of the sporophyte is no doubt to be correlated with the great change in the external conditions of life. There is no conclusive ground for regarding the action of this change as having been direct, it is more reasonable to regard it as indirect, having acted as a general stimulus to which the ever-

increasing complexity of the sporophyte was the response.

Adaptation. — The morphological and physiological differentia- tion of the plant-body has, so far, been attributed to (i) " the nature of the organism," that is to its inherent tendency towards higher organization, and (2) to the " indefinite results " of the external conditions acting as a stimulus which excites the organism to variation, but does not direct the course of variation. The " definite results " of the action of external conditions have still to be considered.

It is a familiar observation that climatic and edaphic (nature of soil) conditions exert an influence upon the form and structure of plants (see Plants : Ecology of) . For instance, some xerophy tes are dry and hard in structure, whilst others are succulent and fleshy. This so-called direct effect of external conditions upon the form and structure of the body differs from the indirect effect in that the resulting variations bear a relation, of the nature of adaptation, to those conditions; the effect of the conditions is not only to cause variation, but to cause variation in a particular direction. Thus all existing hygrophytes (excepting the Algae) are considered to have been derived from land-plants which have adapted themselves to a watery habitat. The effect can also be demonstrated experimentally: thus it has been observed that a xerophyte grown in moist air will lose its characteristic adaptive features, and may even assume those of a hygrophyte.

Climatic and edaphic conditions are not, however, the only ones to affect the structure and composition of the body or its parts; other conditions are of importance, particularly the relations of the plant to animals and to other plants. For instance, the " animal traps " of carnivorous plants (Drosera, Nepenthes, &c.) did not, presumably, originate as such; they began as organs of quite another kind which became adapted to their present function in consequence of animals having been accidentally caught. It is also probable that the various forms of the angiospermous flower, with its many specialized mechan- isms for pollination, may be the result of insect-visits, the flowers becoming adapted to certain kinds of insects, and the insects having undergone corresponding modification. Parasites, again, were derived from normal autotrophic plants, which, as the parasitic habit became more pronounced, acquired the corresponding characteristics of form and structure; there is, in fact, the group of hemi-parasites, plants which still retain autotrophic characters though they are root-parasites.

Though adaptation to the environment seems sometimes to be considered, especially by neo-Lamarckians, as equivalent to, or at least as involving, the evolution of higher forms from lower, there does not appear to be any

evidence that this is the

case. The effect of external conditions is confined to the modi- fication in various directions of members or organs already existing, and cne very common direction is that of reduction or entire disappearance of parts: for instance, the foliage-leaves of certain xerophytes (e.g. Cactaceae, Euphorbiaceae), of parasites, and of saprophytes. Moreover, had the evolution of plants proceeded along the line of adaptation, the vegetable kingdom could not be subdivided, as it is, into the morphological groups Thallophyta, Bryophyta, Pteridophyta, Phanerogamia, but only into physiological groups, Xerophyta, Hygrophyta, Tropophyta, &c.

In endeavouring to trace the causation of adaptation, it is obvious that it must be due quite as much to properties inherent in the plant as to the action of external conditions; the plant must possess adaptive capacity. In other words, the plant must be irritable to the stimulus exerted from without, and be capable of responding to it by changes of form and structure. Thus there is no essential difference between the " direct " and the " indirect " action of external conditions, the difference is one of degree only. . In the one case the stimulus induces indefinite variation, in the other definite; but no hard-and-fast line can be drawn between them.

Adaptive characters are often hereditary, for instance, the seed of a parasite will produce a parasite, and the same is true of a carnivorous plant. On the other hand, adaptations, especially those evoked by climatic or edaphic conditions, may only be shown by the seedling if grown under the appropriate external conditions; here what is hereditary is not the actual adaptation, but the capacity for responding in a particular way to a certain set of external conditions.

Summary. — The general theory of differentiation propounded in this article is an attempt at an analysis of the factors termed by Darwin " the nature of the organism " and " the nature of the conditions." It is assumed, as an inevitable conclusion from the facts of evolution, that plant-protoplasm possesses (1) an inherent tendency towards higher organization, and (2) that it is irritable to external conditions, or to changes in them, and can respond to them by changes of form which may be either indefinite or definite (adaptive). Thus it is that the variations are produced upon which natural selection has to work.

Material Cause of Differentiation. — It may be inquired, in conclusion, if there are any facts which throw light upon the internal mechanism of differentiation, whether spontaneous or induced; if it is possible to refer it to any material cause. It may be replied that there are such facts, and though they are but few as yet, they suffice to suggest an hypothesis that

may eventually prove to be a law. Sachs was the first to formulate the theory that morphological differences are the expression of differences in material composition. He considered, for instance, that stems, leaves, roots and flowers differ as they do because the plastic substances entering into their structure are diverse. This view he subsequently modified to this — that a relatively small proportion of diverse substance in each of these parts would suffice to account for their morphological differences. This modification is important, because it transfers the formative influence from the plastic substances to the protoplasm, suggest- ing that the diverse constituents are produced (whether spon- taneously or as the result of stimulation) as secretions by the protoplasm. It is an obvious inference that if a small quantity of a substance can affect the development of an entire organ it probably acts after the manner of an enzyme. Beyerinck has, in fact, gone so far as to speak of " formative enzymes."

It is not possible to go into all the facts that might be adduced in support of this view: one case, perhaps the most pregnant, must suffice. Beyerinck was led to take up the decided position just mentioned by his researches into the conditions determining the formation of plant-galls as the result of injury by insects. He found that the development of a gall is due to a temporary modification of the part affected, not, as is generally thought, in consequence of the deposition of an egg by the insect, but of the injection of a poisonous substance which has the effect of stimulating the protoplasm to develop a gall instead of normal

structure. If this be so, it may justifiably be inferred that both normal and abnormal morphological features may be due to the presence of enzymatic substances secreted by the protoplasm that determine the course of development. At any rate this hypothesis suggests an explanation of many hitherto inexplicable facts. For instance, it has been pointed out in the article on the reproduction of plants that the effect of the fertilization of the female cell in the ovule of a phanerogam is not confined to the female cell, but extends more or less widely outside it, inducing growth and tissue-change. The ovule develops into the seed; and the gynaeceum and even more remote parts of the flower, develop into the fruit. The facts are familiar, but there is no means of explaining them. In the light of Sachs's theory the interpretation is this, that the act of fertilization causes the formation in the female cell of substances which are transmitted to adjacent structures and stimulate them to further development.

Literature. — As the scope of this article limits it to the general principles of the morphology of plants, comparatively few facts have been adduced. Full morphological and organographical details are given in the articles on the various groups of plants, such as those on the Algae, Bryophyta, Pteridophyta, Angiosperms, Gymnosperms, &c. The following works may also be consulted : Schimper, Plant-Geography (Clarendon Press, Oxford) ; Goebel, Organography (Clarendon Press, Oxford) ; Bower, The Origin of a Land-Flora (Macmillan) ; Beyerinck, " Ueber Cecidien," (Bot. Zeitung, 1888). (S. H. V.)*

Distribution of Plants

Common experience shows that temperature is the most important condition which controls the distribution of plants. Those of warmer countries cannot be cultivated in British gardens without protection from the rigours of winter; still less are they able to hold their own unaided in an unfavourable climate. Temperature, then, is the fundamental limit which nature opposes to the indefinite extension of any one species. Buffon remarked " that the same temperature might have been expected, all other circumstances being equal, to produce the same beings in different parts of the globe, both in the animal and vegetable kingdoms." Yet lawns in the United States are destitute of the common English daisy, the wild hyacinth of the woods of the United Kingdom is absent from Germany, and the foxglove from Switzerland. We owe to Buffon the recogni- tion of the limitation of groups of species to regions separated from one another by " natural barriers." When by the aid of man they surmount these, they often dominate with unexpected vigour the native vegetation amongst which they are colonists. The cardoon and milk thistle, both European plants, cover tracts of country in South America with impenetrable thickets in which both man and beast may be hopelessly lost. The watercress blocks the rivers of New Zealand into which it has been introduced from Europe. The problem, then, which plant- distribution presents is twofold: it has first to map out the earth's surface into " regions " or " areas of vegetation," and secondly to trace the causes which have brought them about and led to their restriction and to their mutual relations.

The earliest attempts to deal with the first branch of the inquiry may be called physiognomical. They endeavoured to define " aspects of vegetation " in which the " forms " exhibited an obvious adaptation to their climatic surroundings. This has been done with success and in great detail by Grisebach, whose Vegetation der Erde from this point of view is still unsur- passed. With it may be studied with advantage the unique collection at Kew of pictures of plant-life in its broadest aspects, brought together by the industry and munificence of Miss Marianne North. Grisebach declined to see anything in such " forms " but the production by nature of that which

responds to external conditions and can only exist as long as they remain unchanged. We may agree with Schimper that such a point of view is obsolete without rejecting as valueless the admirable accumulation of data of which it admittedly fails to give any rational explanation. A single example will be sufficient to illustrate this. The genus Senecio, with some 1000 species, is practically cosmopolitan. In external habit these exhibit

adaptations to every kind of climatic or physical condition: they may be mere weeds like groundsels or ragworts, or climbers masquerading like ivy, or succulent and almost leafless, or they may be shrubs and even trees. Yet thrcughout they agree in the essential structure of their floral organs. The cause of such agreement is, according to Grisebach, shrouded in the deepest obscurity, but it finds its obvious and complete explana- tion in the descent from a common ancestor which he would unhesitatingly reject.

From this point of view it is not sufficient, in attempting to map out the earth's surface into " regions of vegetation, " to have regard alone to adaptations to physical conditions. We are compelled to take into account the actual affinity of the plants inhabiting them. Anything short of this is merely descriptive and empirical, and affords no rational basis for inquiry into the mode in which the distribution of plant-life has been brought about. Our regions will not be " natural " unless they mark out real discontinuities both of origin and affinity, and these we can only seek to explain by reference to past changes in the earth's history. We arrive thus at " the essential aim of geographical botany," which, as stated by Schimper, is " an inquiry into the causes of differences existing among the various floras." To quote further: " Existing floras exhibit only one moment in the history of the earth's vegetation. A transformation which is sometimes rapid, some- times slow, but always continuous, is wrought by the reciprocal action of the innate variability of plants and of the variability of the external factors. This change is due partly to the migra- tions of plants, but chiefly to a transformation of the plants covering the earth." This transformation is due to new charac- ters arising through variation. " If the new characters be useful, they are selected and perfected in the descendants, and consti- tute the so-called ' adaptations ' in which the external factors acting on the plants are reflected." The study of the nature of these adaptations, which are often extremely subtle and by no means merely superficial, is termed Ecology (see above).

The remark may conveniently find its place here that plants which have reached a high degree of adaptive specialization have come to the end of their tether: a too complicated adjust- ment has deprived them of the elasticity which would enable them to adapt themselves to any further change in their surround- ings, and they would pass away with conditions with which they are too inextricably bound up. Vast floras have doubtless

thus found their grave in geologic change. That wrought by man in destroying forests and cultivating the land will be no less effective, and already specimens in our herbaria alone represent species no longer to be found in a living state. Extinc- tion may come about indirectly and even more surely. This is easy to happen with plants dependent on insects for their fertilization. Kronfeld has shown that aconites are dependent for this on the visits of a Bombus and cannot exist outside the area where it occurs.

The actual and past distribution of plants must obviously be controlled by the facts of physical geography. It is concerned with the land-surface, and this is more symmetrically disposed than would at first sight appear from a glance at a map of the world. Lyell points out that the eye of an observer placed above a point between Pembroke and Wexford, lat. 52° N. and long. 6° W., would behold at one view the greatest possible quantity of land, while the opposite hemisphere would contain the greatest quantity of water. The continental area is on one side of the sphere and the oceanic on the other. Love'has shown (Nature, Aug. 1, 1907, p. 328) that this is the result of physical causes and that the existence of the Pacific Ocean " shows that the centre of gravity of the earth does not coincide with the centre of figure." One half of the earth has therefore a greater density than the other. But " under the influence of the rotation the parts of greater density tend to recede further from the axis than the parts of less density . . . the effect must be to produce a sort of furrowed surface." The furrows are the great ocean basins, and these would still persist even if the land surface were enlarged to the 1400 fathoms contour. These considerations

preclude the possibility of solving difficulties in geographical distribution by the construction of hypothetical land-surfaces, an expedient which Darwin always stoutly opposed {Life and Letters, ii. 74-78). The furrowed surface of the earth gives the land-area a star-shaped figure, which may from time to time have varied in outline, but in the main has been permanent. It is excentric as regards the pole and sends tapering extensions towards the south. Sir George Darwin finds a possible explana- tion of these in the screwing motion which the earth would suffer in its plastic state. The polar regions travelled a little from west to east relatively to the equatorial, which lagged behind.

The great primary divisions of the earth's flora present them- selves at a glance. The tropics of Cancer and Capricorn cut off with surprising

precision (the latter somewhat less so) the tropical from the north and south temperate zones. The north tem- perate region is more sharply separated from the other two than the south temperate region from the tropical.

I. North Temperate Region (Holarctic). — This is the largest of all, circumpolar, and but for the break at Bering Straits, would be, as it has been in the past, continuous in both the old and new worlds. It is characterized by its needle-leaved Coniferae, its catkin-bearing (Amentaceae) and other trees, deciduous in winter, and its profusion of herbaceous species.

II. South Temperate Region. — This occupies widely separated areas in South Africa, Australia, New Zealand and South America. These are connected by the presence of peculiar types, Proteaceae, Restiaceae, Rutaceae, &c, mostly shrubby in habit and on the whole somewhat intolerant of a moist climate. Individual species are extremely numerous and often very restricted in area.

III. Tropical Region. — This is characterized by the presence of gigantic Monocotyledons, palms, Musaceae and bamboos, and of evergreen polypetalous trees and figs. Herbaceous plants are rare and mostly epiphytic.

A consideration of these regions makes it apparent that they are to a large extent adaptive. The boreal is cold, the austral warm, and the tropical affords conditions of heat and moisture to which the vegetation of the others would be intolerant. If we take with Drude the number of known families of flowering plants at 240, 92 are generally dispersed, 17 are more restricted, while the remainder are either dominant in or peculiar to separate regions. Of these 40 are boreal, 22 austral and 69 tropical. If we add to the latter figure the families which are widely dispersed, we find that the tropics possess 161 or almost exactly two-thirds of the large groups comprised in the world's vegetation. M. Casimir de Candolle has made an independent investigation, based on Hooker and Bentham's Genera plantarum. The result is unfortunately (1910) unpublished, but he informs the present writer that the result leads to the striking con- clusion: "La vegetation est un phenomene surtout intertropical, dont nous ne yoyons plus que restes affaiblis dans nos regions tem- perees." In attempting to account for the distribution of existing vegetation we must take into account palaeontological evidence. The results arrived at may be read as a sequel to the article on Palaeobotany.

The vegetation of the Palaeozoic era, till towards its close, was apparently remarkably homogeneous all over the world. It was characterized by

arborescent vascular Cryptogams and Gymno- sperms of a type (Cordaiteae) which have left no descendants beyond it. In the southern hemisphere the Palaeozoic flora appears ulti- mately to have been profoundly modified by a lowering of tempera- ture and the existence of glacial conditions over a wide area. It was replaced by the Glossopteris flora which is assumed to have originated in a vast continental area (Gondwana land), of which remnants remain in South America, South Africa and Australia.

The Glossopteris flora gradually spread to the northern hemisphere and intermingled with the later Palaeozoic flora which still persisted. Both were in turn replaced by the Lower Mesozoic flora, which again is thought to have had its birth in the hypothetical Gondwana land, and in which Gymnosperms played the leading part formerly taken by vascular Cryptogams. The abundance of Cycadean plants is one of its most striking features. They attained the highest degree of structural complexity in the Bennettiteae, which have been thought even to foreshadow a floral organization. Though now on the way to extinction, Cycadeae are still widely represented in the southern hemisphere by genera which, however, have no counterpart in the Mesozoic era. Amongst Conifers the archaic genera, Ginkgo and Araucaria still persist. Once widely distributed in the Jurassic period throughout the world, they are now dying out: the former is represented by the solitary maiden-hair tree of China and Japan; the latter by some ten species confined to the southern hemisphere, once perhaps their original home. With them may be associated the anomalous Sciadopitys of Japan.

So far the evolution of the vegetable kingdom has proceeded with- out any conspicuous break. Successive types have arisen in ascend- ing sequence, taken the lead, and in turn given way to others. But

the later period of the Mesozoic era saw the almost sudden advent of a fully developed angiospermous vegetation which rapidly occu- pied the earth's surface, and which it is not easy to link on with any that preceded it. The closed ovary implies a mode of fertiliza- tion which is profoundly different, and which was probably correlated with a simultaneous development of insect life. This was accom- panied by a vegetative organization of which there is no obvious foreshadowing. As Clement Reid remarked : ' ' World-wide floras, such as seem to characterize some of the older periods, have ceased to be, and plants are distributed more markedly according to geographical provinces and in climatic zones." The field of evolu- tion has now been transferred to the northern hemisphere. Though Angiosperms become dominant in all known plant-bearing Upper Cretaceous deposits, their origin dates even earlier. In Europe Heer's Populus primaeva from the Lower Cretaceous in Greenland was long

accepted as the oldest dicotyledonous plant. Other un- doubted Dicotyledons, though of uncertain affinity, of similar age have now been detected in North America. The Cenomanian rocks of Bohemia have yielded remains of a sub-tropical flora which has been compared with that existing at present in Australia. Upper Cretaceous formations in America have yielded a copious flora of a warm-temperate climate from which it is evident that at least the generic types of numerous not closely related existing dicotyledonous trees had already come into existence. It may be admitted that the identification of fragmentary leaf-remains is at most precarious. Even, however, with this reservation, it is difficult to resist the mass of evidence as a whole. And it is a plausible conjecture that the vegetation of the globe had already in its main features been consti- tuted at this period much as it exists at the present moment. There were oaks, beeches (scarcely distinguishable from existing species), birches, planes and willows (one closely related to the living Salix Candida), laurels, represented by Sassafras and Cinnamomum, magnolias and tulip trees (Liriodendron) , myrtles, Liquidambar, Diospyros and ivy. This is a flora which, thinned out by losses, practically exists to this day in the southern United States. And one essentially similar but adapted to slightly cooler conditions existed as far north as the latitude of Greenland.

The tertiary era opens with a climate in which during the Eocene period something like existing tropical conditions must have obtained in the northern hemisphere. The remains of palms (Sabal and Nipa) as well as of other large-leaved Monocotyledons are preserved. Sequoia (which had already appeared in the American Upper Cre- taceous) and the deciduous cypress (Taxodium distichum) are found in Europe. Starkie Gardner has argued with much plausibility that the Tertiary floras which have been found in the far north must have been of Eocene age. That of Grinnell Land in lat. 81 ° consisted of Conifers (including the living spruce), poplars and willows, such as would be found now 25 ° to the south. The flora of Disco Island in lat. 70 contained Sequoia, planes, maples and magnolias, and closely agrees with the Miocene flora of central Europe. Of this copious remains have been found in Switzerland and have been investigated with great ability by O. Heer. They point to cooler conditions in the northern hemisphere: palms and tropical types diminish; deciduous trees increase. Sequoia and the tulip-tree still remain ; figs are abundant ; laurels are represented by Sassafras and camphor; herbaceous plants (Ranunculaceae, Cruciferae, Umbelliferae) are present, though, as might be expected, only frag- mentarily preserved.

We may draw with some certainty the conclusion that a general movement southward of vegetation had been brought about. While Europe and probably North America wr-re occupied by a warm temperate flora, tropical types had been driven southward, while the adaptation of others to

arctic conditions had become accentuated. A gradual refrigeration proceeded through the Pliocene period. This was accompanied in Europe by a drastic weeding out of Miocene types, ultimately leaving the flora pretty much as it now exists. This, as will be explained, did not take place to anything like the same extent in North America, the vegetation of which still pre- serves a more Miocene facies. Torreya, now confined to North America and Japan, still lingered,- as did Ocotea, now profusely developed in the tropics, but in north temperate regions only existing in the Canaries : the evergreen oaks, so characteristic of the Miocene, were reduced to the existing Quercus ilex. At the close of the Pliocene the European flora was apparently little different from that now existing, though some warmer types such as the water- chestnut (Trapa natans) had a more northern extension. _ The glacial period effected in Europe a wholesale extermination of temperate types accompanied by a southern extension of the arctic flora. But its operation was in great measure local. The Pliocene flora found refuges in favoured localities from which at its close the lowlands were restocked while the arctic plants were left behind on the mountains. During the milder interglacial period some southern types, such as Rhododendron ponticum, still held their own, but ultimately succumbed.

The evidence which has thus been briefly summarized, points unmistakably to the conclusion that existing vegetation originated in the northern hemisphere and under climatic conditions correspond- ing to what would now be termed sub-tropical. It occupied a con- tinuous circumpolar area which allowed free communication between the old and new worlds. The gradual differentiation of their floras

has been brought about rather by extermination than specialization, and their distinctive facies by the development and multiplication of the surviving types.

The distribution of mountain barriers in the Old and New Worlds is in striking contrast. In the former they run from east to west; in the latter from north to south. In the Old World the boreal zone is almost sharply cut off and afforded no means of escape for the Miocene vegetation when the climate became more severe. Thus in the Mediterranean region the large groups of palms, figs, myrtles and laurels are each only represented by single surviving species. The great tropical family of the Gesneraceae has left behind a few outliers: Ramondia in the Pyrenees, Haberlea in the

Balkans, and Jankaea in Thessaly ; the Pyrenees also possess a minute Dioscorea, sole European survivor of the yams of the tropics.

In North America there is no such barrier: the Miocene flora has been able to escape by migration the fluctuations of climate and to return when they ameliorated. It has preserved its character- istic types, such as Magnolia, Liriodendron, Liquidambar, Torreya, Taxodium and Sequoia. While it has been customary to describe the Miocene flora of Europe as of a North American type, it would be more accurate to describe the latter as having in great measure preserved its Miocene character.

If mountains serve as barriers which arrest the migration of the vegetation at their base, their upper levels and summits afford lines of communication by which the floras of colder regions in the northern hemisphere can obtain a southern extension even across the tropics. They doubtless equally supply a path by which southern temperate types may have extended northwards. Thus the characteristic assemblage of plants to which Sir Joseph Hooker has given the name Scandinavian " is present in every latitude of the globe, and is the only one that is so " (Trans. Linn. Soc. xxiii. 253). In the mountains of Peru we find such characteristic northern genera as Draba, Alchemilla, Saxifraga, Valeriana, Gentiana and Bartsia. High elevations reproduce the physical conditions of high latitudes. The aqueous vapour in the atmosphere is transparent to luminous but opaque to obscure heat-rays. The latter are retained to warm the air at lower levels, while it remains cold at higher. It results that besides a horizontal distribution of plants, there is also an altitudinal: a fact of cardinal importance, the first observation of which has been attributed to Tournefort.

Speaking generally, all plants tend to exhaust particular consti- tuents of the soil on which they grow. Nature therefore has pro- vided various contrivances by which their seeds are disseminated beyond the actual position they occupy. In a large number of cases these only provide for migration within sufficient but narrow limits ; such plants would be content to remain local. But other physical agencies come into play which may be briefly noticed. The first of these is wind: it cannot be doubted that small seeds can be swept up like dust and transported to considerable distances. This is certainly the case with fern-spores. The vegetation of Krakatoa was completely exterminated in 1883 by a thick coat of red-hot pumice. Yet in 1886 Treub found that it was beginning to cover itself again with plants, including eleven species of ferns; but the nearest source of supply was 10 m. distant. Seeds are carried with more facility when provided with plumes or wings. Treub found on Krakatoa four species of composites and two grasses. Water is another obvious means of transport. The littoral vegetation of coral islands is derived from sea-borne fruits. The seeds of West Indian plants are thrown on the western shores of the British Isles,

and as they are capable of germination, the species are only pre- vented from establishing themselves by an uncongenial climate. Travers picked up a seed of Edwardsia in the Chatham Islands, evidently washed ashore from New Zealand [Linn. Soc. Journ. ix. 1865). Rivers bring down the plants of the upper levels of their basins to the lower: thus species characteristic of the chalk are found on the banks of the Thames near London. Birds are even more effective than wind in transporting seeds to long distances. Seeds are carried in soil adhering to their feet and plumage, and aquatic plants have in consequence for the most part an exception- ally wide range. Fruit-pigeons are an effective means of transport in the tropics by the undigested seeds which they void in their excrement. Quadrupeds also play their part by carrying seeds or fruits entangled in their coats. Xanthium spinosum has spread from the Russian steppes to every stock-raising country in the world, and in some cases has made the industry impossible. Even insects, as in the case of South African locusts, have been found to be a means of distributing seeds.

The primary regions of vegetation, already indicated, and their subordinate provinces may now be considered more in detail.

I . North Tem pe r ate Region.— Many writers on the distribution of animals prefer to separate this into two regions of " primary rank " : the Palaearctic and the Nearctic. But to justify such a division it is necessary to establish either an exclusive possession or a marked predominance of types in the one which are correspondingly deficient in the other. This cannot apparently be done for insects or for birds; Newton accordingly unites the two into the Holarctic region. It equally fails for plants. To take, for example, one of the most characteristic features of the Palaearctic region, its catkin-bearing deciduous trees : in North America we find precisely the same genera

as in the Old World — oaks, chestnuts, beeches, hazels, hornbeams, birches, alders, willows and poplars. Or to take the small but well- defined group of five-leaved pines, all the species of which may be seen growing side by side at Kew under identical conditions: we have the Weymouth pine (Pinus Strobus) in eastern North America, P. monticola and the sugar pine (P. Lambertiana) in California, P. Ayacahmte in Mexico, the Arolla pine (P. Cembra) in Switzerland and Siberia, P. Pence in Greece, the Bhotan pine (P. excelsa) in the Himalayas, and two other species in Japan. Amongst broad- leaved trees Juglans has a similar Holarctic range, descending to the West Indies; so has Aesculus, were it not lacking in Europe; it becomes tropical in South America and Malaya. If we turn to herbaceous plants, Hemsley has pointed out that of the thirteen genera of Ranunculaceae in California, eleven are British.

While the tropics preserve for us what remains of the pre- Tertiary or, at the latest, Eocene vegetation of the earth, which formerly had a much wider extension, the flora of the North Tem- perate region is often described as the survival of the Miocene. Engler therefore calls it Arcto-Tertiary. We must, however, agree with Starkie Gardner that it is only Miocene as regards its present position, which was originally farther north, and that its actual origin was much earlier. There has been in effect a successive shifting of zones of vegetation southwards from the pole. Their distinctive and adaptive characteristics doubtless began to be established as soon as the phanerogamic flora was constituted. There is no reason to suppose that the peculiarities of the arctic flora are more modern than those of any other, though there is no fossil evidence to prove that it was not so.

The North Temperate region admits of subdivision into several well-marked sub-regions. The general method by which this is effected in this and other cases is statistical. As A. de Candolle, however, points out, exclusive reliance on this may be misleading unless we also take into account the character and affinities of the plants dealt with (Geogr. Bot. i. 11 66). The numerical predominance of certain families or their absence affords criteria for marking out boundary lines and tracing relationships. The analysis of the flora of the British Isles will afford an illustration. This was first attempted in 1835 by H. C. Watson, and his conclusions were en- forced ten years later by Edward Forbes, who dealt also with the fauna. Watson showed that Scotland primarily, and to a less extent the north of England, possessed species which do not reach the south. Such are the crowberry (Empeirum nigrum), Trientalis europaea, Rubus saxatilis and the globe-flower (Trollius europaeus). He further found that there was an element which he termed " boreal ... in a more intense degree," which amounted to about " a fifteenth of the whole flora." This was not confined to the north but may occur on the mountains of England and Wales: Salix herbacea, Silene acaulis and Dryas octopetala will serve as examples. Even so small an area as that of Britain illustrates what has already been pointed out, that the species of a flora change both with latitude and altitude. Watson further brought out the striking fact that the west and east of Britain each had species peculiar to it; the former he characterized as Atlantic, the latter as Germanic. The Cornish heath (Erica vagans) and the maiden-hair fern (Adiantum Capillus- Veneris) may serve as instances of the one, the man-orchis (Aceras anthropophora) and Reseda lutea of the other. Ireland illustrates the same fact. It possesses about 1000 species, or about two-thirds the number of Britain. On its western shores there are some twenty, such as Saxifraga umbrosa, Erica mediterranea and Arbutus unedo, which are not found in Britain at all. The British Phanero- gamic flora, it may be remarked, does not contain a single endemic species, and 38% of the total

number are common to the three northern continents.

The analysis of larger areas yields results of the same kind. Within the same region we may expect to find considerable differences as we pass from one meridian to another. Assuming that in its cir- cumpolar origin the North Temperate flora was fairly homogeneous, it would meet in its centrifugal extension with a wide range of local conditions ; these would favour the preservation of numerous species in some genera, their greater or less elimination in others. Thus comparing the Nearctic and Palaearctic floras we find striking differ- ences overlying the points of agreement already indicated. The former is poor in Cruciferae, Caryophyllaceae, Umbelliferae, Primul- aceae and Labiatae; but for the occurrence of Calluna in Newfound- land it would have no heaths. On the other hand, it is rich in Com- positae, especially Solidago and Aster, Polemoniaceae, Asclepiad- aceae, Hydrophyllaceae and Cyperaceae, and it has the endemic Sarracenia, type of a family structurally allied to poppies, of which of the remaining genera Darlingtonia is Calif ornian, and Heliamphora Venezuelan. These distinctions led Sir Joseph Hooker to claim for the two divisions the rank of primary regions. Darwin doubted, however, whether they ought to be separated (Life, iii. 230). Lyell, discussing the facts of zoological distribution, admits that " the farther we go north . . . the more the discordance in genera and species diminishes " (Principles, ii. 340) ; and Hemsley finds that not less than 75 % of the genera in the flora of eastern North America " are represented in the old world," and, according to Asa Gray, 50 % in Europe.

Latitudinally the region subdivides naturally into several well- marked sub-regions which must be briefly discussed.

i. The Arctic-Alpine sub-region consists of races of plants belong- ing originally to the general flora, and recruited by subsequent additions, which have been specialized in low stature and great capacity of endurance to survive long dormant periods, sometimes even unbroken in successive years by the transitory activity of the brief summer. It is continuous round the pole and roughly is bounded by the arctic circle. Mature seeds are highly tolerant of cold and have been shown to be capable of withstanding the temperature even of liquid hydrogen. Arctic plants make their brief growth and flower at a temperature little above freezing-point, and are dependent for their heat on the direct rays of the sun. Characteristic representatives are Papaver nudicaule, Saxifraga opposilifolia, which forms a profuse carpet, and Dryas octopetala. Such plants perhaps extend to the most northern lands at present known. On May 30th, in Ward Hunt's Island, lat. 83 ° 5', Sir George Nares found that " vegetation was fairly

represented as regards quantity in the poppy, saxifrage and small tufts of grass." We may compare this with extreme alpine conditions: on a spot above the Aletsch glacier at a height of 10,700 ft. Ball found the temperature one inch below the surface to be 83 °, and he collected " over forty species in flower." Taking the whole arctic flora at 762 species, Hooker found that 616 occurred in arctic Europe, and of these 586 are Scandinavian. Beyond the arctic circle some 200, or more than a quarter, are confined to the mountains of the northern hemisphere and of " still more southern regions." This led Hooker to the striking observation already quoted. The arctic flora contains no genus that is peculiar to it, and only some fifty species that are so. Christ has objected to terming the arctic flora Scandinavian, but the name implies nothing more than that Scandinavia has been its chief centre of preservation.

A detailed examination of mountain floras shows that a large local element is present in each besides the arctic. The one is in fact the result of similar physical conditions to that which has produced the other. Thus Saxifraga cernua is regarded as an alpine form of the lowland 5. granuiata. Comparing the Alps with the Pyrenees, according to Ball, each has about half its flora common to the other: " the Alps have 172 endemic species and at least 15 genera that are not found in the Pyrenees, while the latter range counts about 100 endemic species with several (six or seven) genera not found in the Alps." Drude has accordingly suggested the substitution of the term " High-mountain floras " for Alpine, which he regards as misleading. Its meaning has, however, become synonymous and is consecrated by usage.

The repetition of the same species in the arctic regions and in the high mountains of the North Temperate region is generally attributed to the exchange which took place during the glacial period. This was first suggested by Edward Forbes in 1846, though the idea had earlier suggested itself to Darwin (Life, i. 88). It took place south- wards, for the arctic flora is remarkably uniform, and, as Chodat points out, it shows no evidence of having been recruited from the several mountain floras. That the arctic flora was driven south into Central Europe cannot be contested in the face of the evidence collected by Nathorst from deposits connected with the boulder- clay. And Reid has shown that during the glacial period the exist- ing flora was replaced by an arctic one represented by such plants as Salix polaris, S. herbacea, S. reticulata and Betula nana. At the same time the then existing alpine floras descended to lower levels, though we may agree with Ball that they did not necessarily become extinct at higher ones as long as any land-surface remained uncovered by ice. At the close of the glacial period the alpine floras retreated to the mountains accompanied by an arctic contingent, though doubtless many species of the latter, such as Salix polaris, failed to establish themselves. Christ, while admitting an

ancient endemic element, such as Campanula excisa in the arctic-alpine flora of Europe, objects that a Scandinavian colonization could not furnish such characteristic plants as the larch and edelweiss. He traces the original home of the bulk of existing alpine plants to northern Asia, the mountains of which appear to have escaped glaciation. At the close of the glacial epoch the north Asiatic flora spread west- wards into Europe and intermingled with the surviving vegetation. Some species, such as Anemone olpina, which are wanting in the Arctic flora of the Old World, he thinks must have reached Europe by way of Greenland from north-east America.

2. The Intermediate sub-region comprises the vegetation of the large area occupied by the steppes of the Old World, the prairies of the new and the forest region of both. The former support a copious herbaceous flora, the characteristics of which in the Old and New Worlds have been already briefly summarized. In the former that of Europe and of Central Asia are continuous. Of species common to the two, Maximowicz finds that Manchuria possesses 40% and scarcely 9 % that are endemic. Of a collection of about 500 species made in that country by Sir Henry James nearly a third are British. This confirms the theory of Christ that Europe was restocked mainly from Asia after the close of the glacial epoch, the south being closed to it. In the new world no southern barriers existed and it is more difficult to draw the line between contiguous sub-regions.

The dominant characteristics of the arboreous vegetation are, besides deciduous and amentiferous trees, Coniferae, especially the more recent tribe of Abietineae — pines, silver-firs, hemlocks, spruces and larches, of which, unlike the older types, no representative

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crosses the tropic. The prominent deciduous trees of Europe appear to be of eastern origin, and the progress of western migration has continued to historic times. The evidence of the peat bogs shows that the Scots fir, which is now extinct, was abundant in Denmark in the Roman period. It was succeeded by the sessile-fruited oak, which was in turn supplanted by the pedunculate form of the same tree. Quercus Robur has left no trace in the Tertiary deposits of Europe and it is most nearly allfed to east Asiatic species. The oak in turn has been almost superseded in Denmark by the beech, which, if we may trust Julius Caesar, had not reached Britain in his time, though it existed there in the pre-glacial period, but is not native in either Scotland or Ireland. Its eastern limit in Europe is a line from Konigsberg to the Caucasus; thence through China it is con- tinued by varietal forms to Japan. It has a solitary representative in North America.

Broadly speaking, the American portion of the sub-region consists of an

Atlantic and Pacific forest area and an intervening non-forest one, partly occupied by the Rocky Mountains, partly by intervening plains. Its arboreal vegetation is richer both in genera and species than that corresponding to it in the Old World. Glacial elimination has been less severe, or rather there has been, at any rate on the Atlantic side, an unimpeded return of Miocene types. The Atlantic area has five magnolias, a tulip tree, an Anonacea (Asimina), two Ternstroemiaceae (Stuarlia and Gordonia), Liquidambar, Vitis (the fox-grape, V. Labrusca, reappears in Japan), and others; an assem- blage, as long ago pointed out by Asa Gray, which can only be paralleled in the Chino-Japanese region, another centre of preserva- tion of Miocene types. All these are wanting in the Pacific area, though there are indications in its gold-bearing gravels that it once possessed them. On the other hand, the latter " is rich in coniferous types beyond any country except Japan " (A. Gray), but till we reach California these are boreal in type. The Atlantic flora has also numerous oaks and maples, signalized by their autumnal colora- tion. These were abundant in Tertiary Europe, as they are now in Japan, and represent perhaps a cooler element in the flora than that indicated above. The highlands of Central America and the West Indies have preserved a number of Chino-Japanese types — Bocconia, Deutzia, Abelia, &c. — not met with elsewhere in the New World.

3. The Mediterfaneo-Oriental sub-region contrasts no less vividly with the Intermediate than the Arctic-Alpine. It includes the Azores and Canaries, the Mediterranean basin, northern Africa as far as the Atlas and Sahara, Asia Minor, Persia and the countries eastward as far as Sind, being bounded to the north by the mountains which run from the Caucasus to the Hindu-Kush. Its extreme richness in number of species (it comprises six-sevenths of the European flora) and the extremely restricted areas of many of them point to a great antiquity. The Mediterranean basin has been a centre of preservation of Miocene vegetation: the oleander is said to have been found in local deposits of even earlier age, and the holm oak {Quercus Ilex) is the living representative of a Miocene ancestor. Extensions of the flora occur southwards of the high mountains of tropical Africa ; A denocarpus, a characteristic Mediterranean genus, has been found on Kilimanjaro and 2000 m. distant on the Cameroons. Two British plants may be added which both reach North Africa : Sanicula europaea extends from Abyssinia to the Cameroons and southwards to Cape Colony and Madagascar; Sambucus Ebulus reaches Uganda. The Mediterranean, however, has apparently been a barrier to the southward passage of the arcto-alpine flora which is totally wanting on the Atlas. The vegetation of the sub- region is rich in shrubs: myrtle, bay, Cistus, Pistacia, Arbutus, heaths in its western portion, and the ground-palm (Chamaerops). It is even richer in more herbaceous plants tolerant of a hot summer; giant Umbelliferae (such as Ferula) are especially characteristic and yield gum-

resins which have long been reckoned valuable. Of the 1000 known species of Astragalus it possesses 800. Evergreen oaks and Conifers form the forests. Asia Minor has a Liquidambar. The Argan tree (A rgania Sideroxylon) , which forms forests in Morocco, is a remarkable survivor of a tropical family (Sapotaceae). Amongst Conifers Cedrus is especially noteworthy; it is represented by geo- graphical races in the north-west Himalaya, in Syria, Cyprus and North Africa.

This well-marked sub-region has a deeper interest than the botanical. It has been the cradle of civilization, and to it is due the majority of cultivated plants. Such are the date in Mesopotamia (a second species of Phoenix occurs in the Canaries) ; most European fruits, e.g. the vine, fig, mulberry, cherry, apricot, walnut; pulses, e.g. the bean, pea and lentil; pot-herbs, e.g. lettuce, endive, beet, radish, cress; cereals; and fodder plants such as lucerne and carob. 4. The Chino-Japanese sub-region. — Of the vegetation of China till recently very little has been known. In 1873 Elwes pointed out that the Himalayan avifauna extended into north-west China and established the Himalo-Chinese sub-region. Shortly afterwards the collections of Prejewalsky confirmed it for the flora. And we now know that, excluding the southern tropical area, it has the same character throughout the whole of China proper. We may therefore regard the Himalayan flora as a westward extension of the Chinese rather than the latter as a development of the former. Of four genera which Hooker singles out as the largest in Sikkim, in China Corydalis has 76 species, Saxifraga 58, Pedicularis 129, and Primula 77. Of Rhododendron there are 134 species. Upwards of 8000

species are known out of a probable total of not less than 12,000, and of these more than half are endemic. The number of species to a genus, 3, is only half that found in other large areas. This aggregation of genera and of endemic species is characteristic of the circumferential portions of the earth's land surface: the expansion of the one and the further advance of the other is arrested. The sub-region is probably sharply cut off from the Intermediate. Maximowicz -finds that 40 % of the plants of Manchuria are common to Europe and Asia, but the proportion falls sharply to 16% in the case of Japan. Its connexion with the Mediterraneo-Oriental sub- region is still more remote. China has no Cistus or heath, only a single Ferula, while Astragalus is reduced to 35 species. There are two species of Pistacia and four of Liquidambar. The affinity to Atlantic North America is strongly

marked as it has long been known to be in Japan. China has 66 species of Quercus, 35 of Vitis, 2 of Aesculus, 42 of Acer, 33 Magnoliaceae (including two species of Liriodendron) , 12 Anonaceae, 71 Ternstroemiaceae (including the tea-plant), and 4 of Clethra, which has a solitary western represen- tative in Madeira. Trachycarpus and Rhapis are characteristic palms, and Cycadeae are represented by Cycas.

5. The Mexico- American sub-region has as its northern boundary the parallel of lat. 36° as far as New Mexico and then northwards to the Pacific coast at lat. 40 . The eastern and western halves are contrasted in climate — the former being moist and the latter dry — and have been distinguished by some zoologists as distinct sub- regions. They are in fact in some degree comparable to sub-regions 3 and 4 in the Old World. The absence of marked natural boundaries makes any precise north and south limitation difficult. But it has been a centre of preservation of the Taxodieae, a tribe of Coniferae of great antiquity. Taxodiurn (with single species in China and Mexico) is represented by the deciduous cypress (T. distichum), which extends from Florida to Texas. The two species of Sequoia, the " Wellingtonia " (S. gigantea) and the redwood (S. sempervirens), are confined to California. In the eastern forests the prevalence of Magnoliaceae and of Clethra and Rhododendron continues the alliance with eastern Asia. Florida derives a tropical element from the Antilles. Amongst palms the Corypheae are represented by Sabal and Thrinax, and there is a solitary Zamia amongst Cycads. The western dry areas have the old-world leguminous Astragalus and Prosopis (Mesquit), but are especially characterized by the north- ward extension of the new-world tropical Cactaceae, Mpmmillaria, Cereus and Opunlia, by succulent Amaryllideae such as Agave (of which the so-called " American aloe " is a type), and by arborescent Liliaceae {Yucca). Amongst palms Washingtonia, Brahea and Erythea (all Corypheae) replace the eastern genera. On the west coast Cupressus Lawsoniana replaces the northern Thuya gigantea, and a laurel (Umbellularia of isolated affinity) forms forests. California and Arizona have each a SDecies of Platanus, a dying-out genus. Elsewhere it is only represented by P. occidentalis, the largest tree of the Atlantic forests from Maine to Oregon, and by P. orientalis in the eastern Mediterranean. Otherwise the Califor- nian flora is entirely deficient in the characteristic features of that of eastern North America. Nor, with perhaps the interesting exception of Castanopsis chrysophylla, the solitary representative in the New World of an east Asiatic genus, which ranges from Oregon to California, has it any affinity with the Chino-Japanese sub-region. Its closest connexion is with the South American Andine.

\. The Tropical Region. — The permanence of continents and great oceans was first insisted upon by J. D. Dana, but, as already stated, has later

received support on purely physical grounds. It precludes the explanation of any common features in the dissevered portions of the tropical area of vegetation by lateral communi- cations, and throws back their origin to the remotest geological antiquity. In point of fact, resemblance is in the main con- fined to the higher groups, such as families and large genera; the smaller genera and species are entirely different. No genus or species of palm, for example, is common to the Old and New Worlds. The ancient broad-leaved Gymnosperm Gnetum has a few surviving species scattered through the tropics of both worlds, one reaching Polynesia.

1. African sub-region. — Western Arabia must be added to the African continent, which, with this exception and possibly a former European connexion in the far west, has had apparently from a very early period an almost insular character. Bentham remarks (Journ. Linn. Soc. xiii. 492) : " Here, more perhaps than in any other part of the globe, in Compositae as in so many other orders, we may fancy we see the scattered remains of ancient races dwindling down to their last representatives." It is remarkable that the characteristic features of the Miocene flora, which in other parts of the world have spread and developed southwards, are conspicu- ously absent from the African tropical flora. It has no Magnolia- ceae, no maples, Pomaceae, or Vacciniaceae, no Rhododendron and no Abietineae. Perhaps even more striking is the absence of Cupuliferae; Quercus, in particular, which from Tertiary times has been a conspicuous northern type and in Malayan tropical conditions has developed others which are widely divergent. Palms are strikingly deficient : there are only three out of 79 genera of Areceae, and the Corypheae are entirely absent. But including the Mas- carene Islands and Seychelles the Borasseae are exclusively African. Aroideae are poorly represented compared with either South

America or Malays. A peculiar feature in which tropical Africa stands alone is that at least one-fifth and probably more of the species are common to both sides of the continent and presumably stretch right across it. An Indian element derived from the north- east is most marked on the eastern side: the Himalayan Gloriosa will suffice as an example, and of more tropical types Phoenix and Calamus amongst palms. The forest flora of Madagascar, though including an endemic family Chlaenaceae, is essentially tropical African, and the upland flora south temperate.

2. The Indo-Malayan sub-region includes the Indian and Malayan peninsulas, Cochin-China and southern China, the Malayan archipel- ago, and Philippines, with New Guinea and Polynesia, excluding the Sandwich Islands. Probably in point of number of species the pre- ponderant family is Orchideae, though, as Hemsley remarks, they do not " give character to the scenery, or constitute the bulk of the vegetation." In Malaya and eastward the forests are rich in arbor- escent figs, laurels, myrtles, nutmegs, oaks and

bamboos. Diptero- carpeae and Nepenthaceae only extend with a few outliers into the African sub-region. Screw pines have a closer connexion. Com- positae are deficient. Amongst palms Areceae and Calameae are preponderant. Cycads are represented by Cycas itself, which in several species ranges from southern India to Polynesia. In India proper, with a dryer climate, grasses and Leguminosae take the lead in the number of species. But it has few distinctive botanical features. In the north-west it meets the Mediterraneo-Oriental and in the north-east the Chino-Japanese sub-regions, while south India and Ceylon have received a Malayan contribution. Bengal has no Cycas, oaks or nutmegs. Apart from the occurrence of Cycas, the Asiatic character of the Polynesian flora is illustrated by the distribution of Meliaceae. C. de Candolle finds that with one excep- tion the species belong to genera represented in one or other of the Indian peninsulas.

3. The South American sub-region is perhaps richer in peculiar and distinctive types than either of the preceding. As in the Indo- Malayan sub-region, epiphytic orchids are probably most numerous in point of species, but the genera and even sub-tribes are far more restricted in their range than in the Old World ; 4 sub-tribes with 74 genera of Vandeae are confined to South America, though varying in range of climate and altitude. Amongst arboreous families Leguminosae and Euphorbiaceae are prominent ; Hevea belonging to the latter is widely distributed in various species in the Amazon basin, and yields Para and other kinds of rubber. Amongst Rubia- ceae, Cinchoneae with some outliers in the Old World have their headquarters at cooler levels. In Brazil the myrtles are represented by " monkey-pots " (Lecythideae). Nearly related to myrtles are Melastomaceae which, poorly represented in the Old World, have attained here so prodigious a development in genera and .species, that Ball looks upon it as the seat of origin of the family. Amongst Ternstroemiaceae, the singular Marcgravieae are endemic. So also are the Vochysiaceae allied to the " milkworts." Cactaceae are widely spread and both northwards and southwards extend into temperate regions. Screw pines are replaced by the nearly allied Cyclanthaceae. The Amazon basin is the richest area in the world in palms, of which the Cocoineae are confined to South America, except the coco-nut, which has perhaps spread thence into Polynesia and eastward. The singular shrubby Amaryllids, Vellozieae, are common to tropical and South Africa, Madagascar and Brazil. Aroids, of which the tribes are not restricted in their distribution, have two large endemic genera, Philodendron and Anthurium. Amongst Cycads, Zamia is confined to the New World, and amongst Conifers, Araucaria, limited to the southern hemisphere, has scarcely less antiquity; Pinus reaches as far south as Cuba and Nicaragua. The flora of the Hawaiian Islands has complicated relations. Out of the 860 indigenous plants, 80 % are endemic,

but Hillebrand finds that a large number are of American affinity.

III. The South Temperate Region contrasts remarkably with the northern. Instead of large continuous areas, in which local characteristics sometimes blend, it occupies widely dissevered territories in which specialization, intensified by long separation, has mostly effaced the possibility of comparing species 'and even genera, and compels us to seek for points of contact in groups of a higher order. The resemblances consist, in fact, not so much in the exis- tence of one general facies running through the regions, as is the case with the northern flora, but in the presence of peculiar types, such as those belonging to the families Restiaceae, Proteaceae, Ericaceae, Mutisiaceae and Rutaceae.

1 . The South African sub-region has a flora richer perhaps in number of species than any other; and these are often extremely local and restricted in area. It exhibits in a marked degree the density of species which, as already pointed out, is explicable by the arrest of further southern expansion. Hemsley remarks that " the northern genus Erica, which covers thousands of square miles in Europe with very few species, is represented by hundreds of species in a comparatively small area in South Africa." There is an interesting connexion with Europe through the so-called Iberian flora. Ben- tham (Pres. addr. Linn. Soc, 1869, p. 25) points out that " the west-European species of Erica, Genisteae, Lobelia, Gladiolus, &c, are some of them more nearly allied to corresponding Cape species than they are to each other; and many of the somewhat higher races, groups of species and genera, have evidently diverged from stocks

now unrepresented anywhere but in South Africa." This flora extends from Ireland to the Canaries and reappears on the highlands of Angola. On the eastern side the southern flora finds representa- tives in Abyssinia, including Protea, and on the mountains of equa- torial Africa, Calodendron capense occurring on Kilimanjaro. This is the most northern representative of the Rutaceous Diosmeae, which are replaced in Australia by the Boronieae. The Proteaceous genus, Faurea, occurs in Angola and Madagascar. The character- istic genus Pelargonium has a few Mediterranean representatives, and one even occurs in Asia Minor. In all these cases it is a nice question whether we are tracing an ascending or descending stream. Darwin thought that the migration southwards would always be preponderant (Origin of Species, 5th ed., 458). Other

characteristic features of the flora are the abundance of Compositae, Asclepiadeae, and petaloid Monocotyledons generally, but especially Orchideae (terrestrial species predominating) and Iridaceae. There is a marked tendency towards a succulent habit. The nearly related Ficoideae replace the new-world Cactaceae, but the habit of the latter is simu- lated by fleshy Euphorbias and Asclepiads, just as that of Agave is by the liliaceous Aloe. South Africa has only two palms (Phoenix and Hyphaene). In the Gnetaceous Welwitschia it possesses a vegetable type whose extraordinary peculiarities make it seem amongst contemporary vegetation much as some strange and extinct animal form would if suddenly endowed with life. Conifers are scantily represented by Callitris and Podocarpus, which is common to all three sub-regions; and Cycads by the endemic Encephalartos and Stangeria.

2. The Australian sub-region consists of Australia, Tasmania, New Caledonia and New Zealand, and, though partly lying within the tropic is most naturally treated as a whole. They are linked together by the presence of Proteaceae and of Epacrideae, which take the place of the nearly allied heaths in South Africa. The most dominant order in Australia is Leguminosae, including the acacias with leaf-like phyllodes (absent in New Zealand). Myrtaceae comes next with Eucalyptus, which forms three-fourths of the forests, and Melaleuca; both are absent from New Caledonia and New Zealand; a few species of the former extend to New Guinea and one of the latter to Malaya. Cupuliferae are absent except Fagus in Australia and New Zealand. The so-called " oaks " of Australia are Casuar- ina, which also occurs in New Caledonia, but is wanting in New Zealand. The giant rushes Xanthorrhoea and Kingia are peculiar to Australia. Palms are poorly represented in the sub-region and are of an Indo-Malayan type. Amongst Conifers, Podocarpus is found throughout, Agathis is common to Australia, New Zealand and New Caledonia; Araucaria tv -he first and last. Of Cycads, Australia and New Caledonia have Cycas, and the former the endemic Macrozamia and Bowenia. The Australian land-surface must be of great antiquity, possibly Jurassic, and its isolation scarcely less ancient. In Lower Eocene times its flora appears to have been distinctly related to the existing one. Little confidence can, however, be placed in the identification of Proteaceous or, indeed, of any distinctively Australian plants in Tertiary deposits in the northern hemisphere. The Australian flora has extensions at high levels in the tropics; such exists on Kinabalu in Borneo under the equator. The Proteaceous genus Helicia reaches as far north as China, but whether it is starting or returning must as in other cases be left an open question.

While the flora of New Caledonia is rich in species (3000), that of New Zealand is poor (1400). While so many conspicuous Australian elements are wanting in New Zealand, one-eighth of its flora belongs to South

American genera. Especially noteworthy are the Andine Acaena, Gunner a, Fuchsia and Calceolaria. By the same path it has received a remarkable contribution from the North Temperate region; such familiar genera as Ranunculus, Epilobium and Veronica form more than 9 % of the flowering plants. And it is interesting to note that while the tropical forms of Quercus failed to reach Aus- tralia from Malaya, the temperate Fagus crept in by a back door. Three-quarters of the native species are endemic ; they seem, however, to be quite unable to resist the invasion of new-comers, and already 600 plants of foreign origin have succeeded in establishing themselves.

3. The Andine sub-region extends from Peru to the Argentine and follows roughly the watershed of the Amazon. In the New World, as already explained, the path of communication between the north- ern and southern hemispheres has always been more or less open, and the temperate flora of southern America does not exhibit the isolation characteristic of the southern region of the Old World. Taking, however, the Andean flora as typical, it contains a very marked endemic element ; Ball finds that half the genera and four-fifths of the species are limited to it ; on the other hand, that half the species of Gamopetalae belong to cosmopolitan genera such as Valeriana, Gentiana, Bartsia and Gnaphalium. The relation to the other sub-regions is slight. Ericeae are wholly absent, and it has but a single Epacrid in Fuegia. Proteaceae are more marked in Guevina and Embolhrium. Of Restiaceae, a single Leptocarpus has been found in Chile. On the other hand, it is the headquarters of Muti- siaceae, represented in South Africa by such genera as Oldenburgia and Gerbera and by Trichocline in Australia. Tropaeolum takes the place of the nearly allied South African Pelargonium. There has been an interchange between it and the Mexico- American sub-region, but as usual the northern has been preponderant. Prosopis extends

to the Argentine; other characteristic genera are Oenothera, Godetia Collomia, Heliotropium and Eritrichium. In the ascending stream may be mentioned — Larrea, a small genus of Zygophylleae with headquarters in Paraguay and Chile, of which one species, L. mexicana, is the creosote plant of the Colorado desert, where it forms dense scrub; Acaena; the Loasaceae, of which Mentzelia reaches North America, Petunia and Lippia. Compositae compose a quarter of the Andean flora, which is a greater proportion than in any in the world. Baccharis, with some 250 species, ranges over the whole continent from the Straits of Magellan and, with seven species, to California. Melastomaceae, copiously represented in tropical America, are more feebly so in Peru and wholly wanting in Chile. A few Cactaceae extend to Chile. Of Cupuliferae, Quercus in three species only reaches Colombia, but Fagus, with only a single one in North America, is represented by several from Chile southwards and thence

extends to New Zealand and Tasmania. The Magnoliaceous genus Drimys, with a single species in the new world, follows the same track. Bromeliaceae are represented by Rhodostachys and the tem- perate Puya. Palms as usual are few and not nearly related. Wettinia occurs in Peru, Trithrinax in Chile with the monotypic Jubaea, Juania, also monotypic, is confined to Juan Fernandez. Amongst Coniferae Podocarpus is common to this and preceding sub-regions ; Libocedrus extends from California to New Zealand and New Caledonia; Fitzroya is found in Chile and Tasmania; and Araucaria in its most familiar species occurs in Chile.

4. The Antarctic- Alpine region is the complement of the Arctic- Alpine, but unlike the latter, its scattered distribution over numerous isolated points of land, remote from great continental areas, from which, during migrations like those attending the glacial period in the northern hemisphere, it could have been recruited, at once accounts for its limited number of species and their contracted range in the world. On the whole, it consists of local species of some widely distributed northern genera, such as Carex, Poa, Ranun- culus, &c, with alpine types of strictly south temperate genera, characteristic of the separate localities. The monotypic Pring- lea antiscorbutica, the " Kerguelen Island cabbage," has no near ally in the southern hemisphere, but is closely related to the northern Cochlearia.

Such a summary of the salient facts in the geographical distribution of plants sufficiently indicates the tangled fabric of the earth's existing floral covering. Its complexity reflects the corresponding intricacy of geographical and geological evolution.

If the surface of the globe had been symmetrically divided into sea and land, and these had been distributed in bands bounded by parallels of latitude, the character of vegetation would depend on temperature alone; and as regards its aggre- gate mass, we should find it attaining its maximum at the equator and Sinking to its minimum at the poles. Under such circumstances the earth's vegetation would be very different from what it is, and the study of plant distribution would be a simple affair.

It is true that the earth's physical geography presents certain broad features to which plants are adapted. But within these there is the greatest local diversity of moisture, elevation and isolation. Plants can only exist, as Darwin has said, where they must, not where they can. New Zealand was poorly stocked with a weak flora; the more robust and aggressive one of the north temperate region was ready at any moment to invade it, but was held back by physical barriers which human aid has alone enabled it to surpass.

Palaeontological evidence conclusively proves that the surface of the earth has been successively occupied by vegetative forms of increasing

complexity, rising from the simplest algae to the most highly organized flowering plant. We find the ultimate explanation of this in the facts that all organisms vary, and that their variations are inherited and, if useful, perpetuated. Structural complexity is brought about by the superposition of new variations on preceding ones. Continued existence implies perpetual adaptation to new conditions, and, as the adjustment becomes more refined, the corresponding structural organization becomes more elaborate. Inheritance preserves what exists, and this can only be modified and added to. Thus Asclepiadeae and Orchideae owe their extraordinary floral complexity to adaptation to insect fertilization.

All organisms, then, are closely adapted to their surroundings. If these change, as we know they have changed, the organisms must change too, or perish. In some cases they survive by migration, but this is often prohibited by physical barriers,

These, however, have often protected them from the com- petition of more vigorous invading races. Fagus, starting from the northern hemisphere, has more than held its own in Europe and Asia, but has all but died out in North America, finding conditions favourable for a fresh start in Australasia. The older types of Gymnosperms are inelastic and dying out. Even Pinus has found the task of crossing the tropics insuperable.

The whole story points to a general distribution of flower- ing plants from the northern hemisphere southwards. It confirms the general belief on geological grounds that this was the seat of their development at the close of the Mesozoic era. It is certain that they originally existed under warmer conditions of climate than now obtain, and that progressive refrigeration has supplied a powerful impulse to migration. The tropics eventually became, what they are now, great areas of preservation. The Northern Temperate region was denuded of its floral wealth, of which it .only retains a comparatively scanty wreck. High mountain levels supplied paths of com- munication for stocking the South Temperate region, the floras of which were enriched by adapted forms of tropical types. Such profound changes must necessarily have been accompanied by enormous elimination; the migrating hosts were perpetually thinned by falling out on the way. Further development was, however, not stopped, but in many cases stimulated by migra- tion and settlement in new homes. The northern Quercus, arrested at the tropic in the new world, expanded in that of the old into new and striking races. And it cannot be doubted that the profusion of Melastomaceae in South America was not derived from elsewhere, but the

result of local evolution. There is some evidence of a returning stream from the south, but as Hooker and A. de Candolle have pointed out, it is insignificant as compared with the outgoing one. Darwin attributes this to the fact that " the northern forms were the more powerful " (Origin of Species, 5th ed., p. 458).

The result of migration is that races of widely different origin and habit have had to adapt themselves to similar conditions. This has brought about superficial resemblance in the floras of different countries. At first sight a South African Euphorbia might be mistaken for a South American Cactus, an Aloe for an Agave, a Senecio for ivy, or a New Zealand Veronica for a European Salicornia. A geographical botany based on such resemblances is only in reality a study of adaptations. The investigation of these may raise and solve interesting physio- logical problems, but throw no light on the facts and genetic relationship which a rational explanation of distribution requires. If we study a population and sort it into soldiers, sailors, ecclesiastics, lawyers and artisans, we may obtain facts of sociological value but learn nothing as to its racial origin and composition.

In the attempt that has been made to map out the land surface of the earth, probable community of origin has been relied upon more than the possession of obvious characters. That sub-regions framed on this principle should show inter- relations and some degree of overlapping is only what might have been expected, and, in fact, confirms the validity of the principle adopted. It is interesting to observe that though deduced exclusively from the study of flowering plants, they are in substantial agreement with those now generally adopted by zoologists, and may therefore be presumed to be on the whole " natural."

Authorities. — A. de Candolle, La Geographie botanique raisonnee, (Paris and Geneva, 1855); A. Grisebach, La Vegetation du globe, transl. by P. de Tchihatchef (Paris, 1875); Engler, Versuch einer Entwicklungsgeschichte der Pflanzenwelt (Leipzig, 1 879-1 882); Oscar Drude, Manuel de geographie botanique, transl. by G. Poirault (Paris, 1897) ; A. F. W. Schimper, Plant Geography, transl. by W. R. Fisher, (Oxford, 1903). (W. T. T.-D.).

PLANUDES, MAXIHUS (c. 1 260-1330), Byzantine grammarian and theologian, flourished during the reigns of Michael VIII. and Andronicus IL Palaeologi. He was born at Nicomedia in Bithynia, but the greater part of his life was spent in Con- stantinople, where as a monk he devoted himself to study

and teaching. On entering the monastery he changed his original name Manuel to Maximus. Planudes possessed a knowledge of Latin remarkable

at a time when Rome and Italy were regarded with hatred and contempt by the Byzantines. To this accomplishment he probably owed his selection as one of the ambassadors sent by Andronicus II. in 1327 to remonstrate with the Venetians for their attack upon the Genoese settlement in Pera. A more important result' was that Planudes, especially by his translations, paved the way for the introduction of the Greek language and literature into the West.

He was the author of numerous works; notably a Greek grammar in the form of question and answer ,like the 'Epwrˆjci Ta of Moschopulus, with an appendix on the so-called " political " verse; a treatise on syntax ; a biography of Aesop and a prose version of the fables ; scholia on certain Greek authors ; two hexameter poems, one a eulogy of Claudius Ptolemaeus, the other an account of the sudden change of an ox into a mouse; a treatise on the method of calculating in use amongst the Indians (ed. C. J. Gerhardt, Halle, 1865) ; and scholia to the first two books of the Arithmetic of Diophantus. His numerous translations from the Latin included Cicero's Somnium Scipionis with the commentary of Macrobius: Caesar's Gallic War; Ovid's Heroides' and Metamorphoses; Boetius, De consolatione philosophiae; Augustine, De trinitate. These translations were very popular during the middle ages as textbooks for the study of Greek. It is, however, as the editor and compiler of the collection of minor poems known by his name (see Anthology : Greek) that he is chiefly remembered.

See Fabricius, Bibliotheca graeca, ed. Harles, xi. 682 ; theological writings in Migne, Patrologia graeca, cxlvii; correspondence, ed. M. Treu (1890), with a valuable commentary; K. Krumbacher, Geschichte der byzantinischen Litteratur (1897); J. E. Sandys, Hist, of Class. Schol. (1906), vol. i.

PLAQUE, a French term for a small flat plate or tablet, applied particularly to rectangular or circular ornamental plates or tablets of bronze, silver, lead or other metal, or of porcelain or ivory. Small plaques, plaquettes, in low relief in bronze or lead, were produced in great perfection in Italy at the end of the 15th and beginning of the 16th centuries, and were usually copies of ancient engraved gems, earlier goldsmith work and the like.

PLASENCIA, a city of Spain and an episcopal see, in the north of the province of Caceres. Pop. (1900), 8208. Plasencia is situated on the river Jerte, a subtributary of the Tagus, and at the foot of the sierras of Bejar and Vera. The place has some interest on account of its fine walls, built in 1197 by Alphonso VIII. of Castile, and its cathedral, begun in 1498, a favourable specimen of the ornate Gothic of its period. The Hieronymite convent of Yuste, the scene of the last years of the emperor Charles V. (1 500-1 558), is 24 m. east.

PLASSEY (Paldsi), a village of Bengal on the river Bhagi- rathi, the scene of Clive's victory of the 23rd of June 1757, over the forces of the nawab Suraj-ud-Dowlah. The fall of Calcutta and the " Black Hole " atrocity led to instant action by the East India Company, and Clive, with as many troops as could be spared, undertook a campaign against the nawab, and soon reoccupied Calcutta. Long and intricate negotiations, or rather intrigues, followed, and at the time of the battle the loyalty of most of the nawab's generals had been effectually undermined, though assistance, active or passive, could hardly be counted on. With this doubtful advantage, Clive, with 1 100 European and 2100 native soldiers, and 10 field-pieces, took the field against the nawab, who had 50,000 men, 53 heavy guns, and some French artillery under M. de St Frais. Only the river Bhagirathi separated Clive's little force from the entrenched camp of the enemy, when the English leader, for once undecided, called a council of war. Clive and the majority were against fighting, Major Eyre Coote, of the 39th Foot, and a few others for action. Coote's soldierly advice powerfully impressed Clive, and after deep consideration he altered his mind and issued orders to cross the river. After a fatiguing march, the force bivouacked in a grove near Plassey early on the 23rd. The nawab's host came out of its lines and was drawn up in a huge semicircle almost enclosing the little force in the grove, and St Frais' gunners on the right wing opened fire. Clive replied, and was soon subjected to the converging fire of 50 heavy guns. For hours the unequal fight was maintained,

until a rainstorm stopped it. The English covered up their guns, but the enemy took no such precaution. Mir Mudin, the only loyal general of the nawab's army, thinking that Clive's guns were as useless as his own, made a disastrous cavalry charge upon them; he lost his own life, and his colleagues then had the game in their hands. Mir Jagar persuaded the nawab to retire into the entrenchments. St Frais stood fast until one of Clive's officers, Major Kilpatrick, successfully drove him in. Clive followed up this success by cannonading the camp at close range. But the rank and file of the native army, ignorant of the treachery of their leaders, made a furious sortie. For a time Clive was hard pressed, but his cool general- ship held its own against the undisciplined valour of the enemy, and, noticing Mir Jagar's division in his rear made no move against him, he led his troops straight against the works. After a short resistance, made chiefly by St Frais, the whole camp fell into his hands. At a cost of 23 killed and 49 wounded this day's work decided the fate of Bengal. The historic grove of mangoes, in which Clive encamped on the previous night, has been entirely washed away by changes in the course of the river; but other relics of the

day remain, and a monument has recently been erected.

PLASTER, a mixture of lime, hair and sand, used to cover rough walling of lathwork between timbers (see Plaster- work) ; also a fine white plaster of gypsum, generally known as " plaster of Paris." The word (also as " plaister ") is used in medicine of adhesive mixtures employed externally for the protection of injured surfaces, for support of weak muscular or other structures/or as counter-irritants, soothing applications &c. The ultimate derivation of the word is the Gr. e / u7r\aoTpoi' or t/nrKaoTov in the medical sense, from iv, on, and TKaaaav, to daub or smear.

PLASTER OF PARIS, a variety of calcined gypsum (calcium sulphate) which forms a hard cement when treated with water (see Cement). The substance obtained its name in consequence of being largely manufactured in the neighbourhood of Paris.

PLASTER-WORK, in building. Plastering is one of the most ancient of handicrafts employed in connexion with building operations, the earliest evidence showing that the dwellings of primitive man were erected in a simple fashion with sticks and plastered with mud. Soon a more lasting and sightly material was found and employed to take the place of mud or slime, and that perfection in the compounding of plastering materials was approached at a very remote period is made evident by the fact that some of the earliest plastering which has remained undisturbed excels in its scientific composition that which we use at the present day. The pyramids in Egypt contain plaster- work executed at least four thousand years ago (probably much earlier) and yet existing, hard and durable, at the present time. From recent discoveries it has been ascertained that the principal tools of the plasterer of that time were practically identical in design, shape and purpose with those used to-day. For their finest work the Egyptians used a plaster made from calcined gypsum just like the " plaster of Paris " of the present time, and their methods of plastering on reeds resemble in every way our " lath, plaster, float and set " work. Hair was introduced to strengthen the " stuff," and the whole finished somewhat under an inch thick. Very early in the history of Greek archi- tecture we find the use of plaster of a fine white lime stucco. Such has been found at Mycenae. The art had reached perfection in Greece more than five centuries before Christ, and plaster was frequently used to cover temples externally and internally, in some cases even where the building was of marble. It formed a splendid ground for decorative painting, which at this period of Grecian history had reached a very high degree of beauty. The temple of Apollo at Bassae, built of yellow sandstone about 470 B.C., is an excellent example. Pavements of thick, hard plaster, stained with various pigments, were commonly laid in Greek temples. The Roman architect Vitruvius, in his book on architecture written about 16 B.C., gives detailed information concerning the methods

of making plaster and the manner of using it. " The lime used for stucco," he writes, " should be

of the best quality and tempered a long time before it is wanted for use. The Greeks, besides making their stucco work hard with thin coats of marble-dust plaster polished with chalk or marble, caused the plaster when being mixed to be beaten with wooden staves by a great number of men. Some persons cutting slabs of such plaster from ancient walls use them for tables and mirrors." Pliny the elder tells us that " no builder should employ lime which had not been slaked at least three years," and that " the Greeks used to grind their lime very fine and beat it with pestles of wood." In England the walls of large houses and mansions were formerly plastered above the wainscoting and coloured, while the ornamented plaster ceilings of the time of Henry VIII., Elizabeth and James I., are still the admiration of lovers of the art. Still earlier specimens of the plasterer's skill are extant in the pargeted and ornamented fronts of half-timbered houses. With regard to the smaller buildings, comprising small dwelling-houses and cottages, the general application of plaster is of comparatively late date; for wainscoted walls and boarded ceilings or naked joists alone are frequently found in houses of not more than a century old both in England and on the Continent.

In the more common operations of plastering, comparatively few tools and few materials are required, but the workman efficient in all branches of the craft will possess a very large variety of implements. The materials of the workman are laths, lath nails, lime, sand, hair, plaster of paris, and a variety of cements, together with various ingredients to form colouring washes, &c.

Wood laths are narrow strips of some straight-grained wood, generally Baltic or American fir, in lengths of from two to four or five feet to suit the distances at which the timbers of a floor or partition are set. Laths are about an inch Lathing. wide, and are made in three thicknesses; " single " (J to -jˆ in. thick), " lath and a half " (\ in. thick), and " double " (| to J in. thick). The thicker laths should be used in ceilings, to stand the extra strain, and the thinner variety in vertical work such as partitions, except where the latter will be subjected to rough usage, in which case thicker laths become necessary. Laths are usually nailed with a space of about f in. betv/een them to form a key for the plaster. Laths were formerly all made by hand. A large quantity, however, are now made by machinery and are known as sawn laths, those made by hand being called rent or riven laths. Rent laths give the best results, as they split in a line with the grain of the wood, and are stronger and not so liable to twist as machine-made laths, some of the fibres of which are usually cut in the process of sawing. Laths must be nailed so as to break joint in bays three or four feet wide with ends

butted one against the other. By breaking the joints of the lathing in this way, the tendency for the plaster to crack along the line of joints is diminished and a better key is obtained. Every lath should be nailed at each end and wherever it crosses a joist or stud. All timbers over three inches wide should be counter- lathed, that is, have a fillet or double lath nailed along the centre upon which the laths are then nailed. This is done to preserve a good key for the plaster. Walls liable to damp are sometimes battened and lathed in order to form an air cavity between the damp wall and the plastering.

Lathing of metal, either of wire or in the form of perforated sheets, is now extensively used on account of its fire-proof and lasting quality. There are very many kinds of this material made in different designs under various patents, the , t f, best-known in England being the Jhilmil, the Bostwick, Lathing. and the Expanded Metal lathing. The two last-named are also widely used in America.

Lathing nails are usually of iron, cut, wrought or cast — and in the better class of work they are galvanized to prevent rusting. Zinc nails are sometimes used, but are costly.

The lime principally used for internal plastering is that calcined from chalk or other nearly pure limestone, and is known as fat, pure, chalk or rich lime. Hydraulic limes, which are . referred to in the articles Brickwork and Mortar, are Limes. also used by the plasterer, chiefly for external work. Perfect slaking of the calcined lime before being used is very important as, if used in a partially slaked condition, it will " blow " when in position and blister the work. Lime should therefore be run as soon as the building is begun, and at least three weeks should elapse between the operation of running the lime and its use.

Hair is used in plaster as a binding medium, and gives tenacity to the material. Ox-hair, which is sold in three qualities, is the kind usually specified ; but horsehair, which is shorter, „ .

is sometimes substituted in its stead or mixed with the ox-hair in the lower qualities. Good hair should be long, strong, and free from grease and dirt, and before use must be well beaten to separate the lumps. In America, goats' hair is frequently used,

External Work.

though it is not so strong as ox-hair. The quantity used in good work is one pound of hair to two or three cubic feet of coarse stuff.

Manila hemp fibre has been used as a substitute for hair. As a result of experiments to ascertain its strength as compared with that of other materials, it was found that plaster Substitutes slal3S ma(j e w j t j 1 Manila hemp fibre broke at 195 ib, for Hair. plaster mixed with Sisal hemp at 150 lb, jute at 145 lb, and goats' hair at 144I lb. Another test was made in the following manner. Two barrels of mortar were made up of equal propor- tions of lime and sand, one containing the usual quantity of goats' hair, and the other Manila fibre. After remaining in a dry cellar for nine months the barrels were opened. It was found that the hair had been almost entirely eaten away by the action of the lime, and the mortar consequently broke up and crumbled quite easily. The mortar containing the Manila hemp, on the other hand, showed great cohesion, and required some effort to pull it apart, the hemp fibre being apparently quite uninjured. Sawdust has been used as a substitute for hair and also instead of sand as an aggregate. It will enable mortar to stand the effects of frost and rough weather. It is useful sometimes for heavy cornices and similar work, as it renders the material light and strong. The sawdust should be used dry.

Some remarks are made on the ordinary sands for building in the articles on Brickwork and Mortar. For fine plasterer's work special sands, not hitherto referred to, are used, Sana. such as silver sand, which is used when a light colour

and fine texture are required. In England this fine white sand is procured chiefly from Leighton Buzzard.

For external work Portland cement is undoubtedly the best material on account of its strength, durability, and weather resisting properties. The first coat or rendering is from j to J in. thick, and is mixed in the proportions of from one part of cement to two of sand to one part to five of sand. The finishing or setting coat is about -^ in. thick, and is worked with a hand float on the surface of the rendering, which must first be well wetted.

Stucco is a term loosely applied to nearly all kinds of external plastering, whether composed of lime or of cement. At the present time it has fallen into disfavour, but in the early part Stucco. Q f j.jjg jg(-h century a great deal of this work was done.

The principal varieties of stucco are common, rough, trowelled and bastard. Cement has largely superseded lime for this work. Common stucco for external work is usually composed of one part hydraulic lime and three

parts sand. The wall should be suffi- ciently rough to form a key and well wetted to prevent the moisture being absorbed from the plaster.

Rough stucco is used to imitate stonework. It is worked with a hand float covered with rough felt, which forms a sand surface on the plaster. Lines are ruled before the stuff is set to represent the joints of stonework. Trowelled stucco, the finishing coat of this work, consists of three parts sand to two parts fine stuff. A very fine smooth surface is produced by means of the hand float. Bastard stucco is of similar composition, but less labour is expended on it. It is laid on in two coats with a skimming float, scoured off at once, and then trowelled. Coloured stucco: lime stucco may be executed in colours, the desired tints being obtained by mixing with the lime various oxides. Black and greys are obtained by using forge ashes in varying proportions, greens by green enamel, reds by using litharge or red lead, and blues by mixing oxide or carbonate of copper with the other materials.

Rough-cast or Pebble-dash plastering is a rough form of external plastering in much use for country houses. In Scotland it is termed " harling." It is one of the oldest forms of external plastering. In Tudor times it was employed to fill in between the woodwork of half-timbered framing. When well executed with good material this kind of plastering is very durable. Rough- casting is performed by first rendering the wall or laths with a coat of well-haired coarse stuff composed either of good hydraulic lime or of Portland cement. This layer is well scratched to give a key for the next coat, which is also composed of coarse stuff knocked up to a smooth and uniform consistency. While this coat is still soft, gravel, shingle or other small stones are evenly thrown on with a small scoop and then brushed over with thin lime mortar to give a uniform surface. The shingle is often dipped in hot lime paste, well stirred up, and used as required.

Sgraffito (Italian for " scratched ") is scratched ornament in plaster. Scratched ornament is the oldest form of surface decora- tion, and at the present day it is much used on the continent of Europe, especially in Germany and Italy, in both external and internal situations. Properly treated, the work is durable, effective and inexpensive. The process is carried out in this way: A first coat or rendering of Portland cement and sand, in the proportion of cne to three, is laid on about J in. thick; then follows the colour coat, sometimes put on in patches of different tints as required for the finished design. When this coat is nearly dry, it is finished with a smooth-skimming, rV t" 5 in. thick, of Parian, selenitic or other fine cement or lime, only as much as can be finished in one day being laid on. Then by pouncing through the pricked cartoon, f .he design is transferred to the plastered surface. Broad spaces

of background are now exposed by removing the finishing coat, thus revealing the coloured plaster beneath, and following this the outlines of the rest of the design are scratched with an iron knife through the outer skimming to the underlying tinted surface. Sometimes the coats are in three different colours, such as brown for the first, red for the second, and white or grey for the final coat. The pigments used for this work include Indian red, Turkey red, Antwerp blue, German blue, umber, ochre, purple brown, bone black or oxide of manganese for black. Combinations of these colours are made to produce any desired tone.

Lime plastering is composed of lime, sand, hair and water in proportions varying according to the nature of the work to be done. In all cases good materials, well mixed and skilfully applied, are essential to a perfect result. Plaster is applied in successive coats or layers on walls or lathing, and gains its name from the number of these coats. " One coat " work is the coarsest and cheapest class of plastering, and is limited to inferior buildings, such as outhouses, where merely a rough coating is required to keep out the weather and draughts. This is described as " render " on brickwork, and " lath and lay " or " lath and plaster one coat " on studding. " Two coat " work is often used for factories or warehouses and the less important rooms of residences. The first coat is of coarse stuff finished fair with the darby float and scoured. A thin coat of setting stuff is then laid on, and trowelled and brushed smooth. " Two coat " work is described as " render and set " on walls, and " lath, plaster and set," or " lath, lay and set " on laths. " Three coat " work is usually specified for all good work. It consists, as its name implies, of three layers of material, and is described as " render, float and set " on walls and " lath, plaster, float and set," or " lath, lay, float and set," on lathwork. This makes a strong, straight, sanitary coating for walls and ceilings. The process for " three coat " work is as follows: For the first coat a layer of well-haired coarse stuff, about J in. thick, is put on with the laying trowel. This is termed " pricking up " in London, and in America " scratch coating." It should be laid on diagonally, each trowelful overlapping the previous one. When on laths the stuff should be plastic enough to be worked through the spaces between the laths to form a key, yet so firm as not to drop off. The surface while still soft is scratched with a lath to give a key for the next coat, which is known as the second or " floating coat," and is J to f in. thick. In Scotland this part of the process is termed " straightening " and in America " browning," and is performed when the first coat is dry, so as to form a straight surface to receive the finishing coat. Four operations are involved in laying the second coat, namely, forming the screeds; filling in the spaces between the screeds; scouring the surface; keying the face for finishing. Wall screeds are plumbed and ceiling screeds levelled. Screeds are narrow

strips of plastering, carefully plumbed and levelled, so as to form a guide upon which the floating rule is run, thus securing a perfectly horizontal or vertical surface, or, in the case of circular work, a uniform curve.

The " filling in," or " flanking," consists of laying the spaces between the screeds with coarse stuff, which is brought flush with the level of the screeds with the floating rule.

The " scouring " of the floating coat is of great importance, for it consolidates the material, and, besides hardening it, prevents- it from cracking. It is done by the plasterer with a hand float which he applies vigorously with a rapid circular motion, at the same time sprinkling the work with water from a stock brush in the other hand. Any small holes or inequalities are filled up as he proceeds. The whole surface should be uniformly scoured two or three times, with an interval between each operation of from six to twenty-four hours. This process leaves the plaster with a close-grained and fairly smooth surface, offering little or no key to the coat which is to follow. To obtain proper cohesion, howevet, a roughened face is necessary, and this is obtained by " keying " the surface with a wire brush or nail float, that is, a hand float witb the point of a nail sticking through and projecting about f in.; sometimes a point is put at each corner of the float. After the floating is finished to the walls and ceiling, the next part of internal plastering is the running of the cornice, followed by the finishing of the ceiling and walls.

The third and final coat is the " setting coat," which should be about I in. thick. In Scotland it is termed the " finishing," and in America the " hard finish " or " putty coat." Considerable skill is required at this juncture to bring the work to a perfectly true finish, uniform in colour and texture. Setting stuff should not be applied until the floating is quite firm and nearly dry, but it must not be too dry or the moisture will be drawn from the setting stuff.

The coarse stuff applied as the first coat is composed of sand and lime, usually in proportions approximating to two to one, with hair mixed into it in quantities of about a pound to two or three cubic feet of mortar. It should be mixed with clean water to such a consistency that a quantity picked up on the point of a trowel holds well together and does not drop.

Floating stuff is of finer texture than that used for " pricking up," and is used in a softer state, enabling it to be worked well into the keying of the first coat. A smaller proportion of hair is also used.

Fine stuff mixed with sand is used for the setting coat. Fine

stuff, or lime putty, is pure lime which has been slaked and then mixed with water to a semi-fluid consistency, and allowed to stand until it has developed into a soft paste. For use in setting it is mixed with fine washed sand in the ratio of one to three.

For cornices and for setting when the second coat is not allowed time to dry properly, a special compound must be used. This is often " gauged " stuff, composed of three or four parts of lime putty and one part of plaster of Paris, mixed up in small quantities immediately before use. The plaster in the material causes it to set rapidly, but if it is present in too large a proportion the work will crack in setting.

The hard cements used for plastering, such as Parian, Keene's, and Martin's, are laid generally in two coats, the first of cement and sand i to f in. in thickness, the second or setting coat of neat cement about | in. thick. These and similar cements have gypsum as a base, to which a certain proportion of another substance, such as alum, borax or carbonate of soda, is added, and the whole baked or calcined at a low temperature. The plaster they contain causes them to set quickly with a very hard smooth surface, which may be painted or papered within a few hours of its being finished.

The by-laws made by the London County Council under § 31 of the London Council (General Powers) Act 1890 set forth the description and quality of the substances of which plastering is to be made for use in buildings erected under its jurisdiction.

Plain, or unenriched, mouldings are formed, with a running mould of zinc cut to the required profile. Enrichments may be added after the main outline moulding is set, and are Mouldings. cast ; n mou id g made of gelatine or plaster of paris. For a cornice moulding two running rules are usual, one on the wall, the other on the ceiling, upon which the mould is worked to and fro by one workman, while another man roughly lays on the plaster to the shape of the moulding. The mitres at the angles are finished off with joint rules made of sheet steel of various lengths, three or four inches wide, and about one-eighth inch thick, with one end cut to an angle of about 30 . In some cases the steel plate is let into a " stock " or handle of hardwood.

Cracks in plastering may be caused by settlement of the building, and by the use of inferior materials or by bad workmanship, but Cracks a part from these causes, and taking the materials and labour as being of the best, cracks may yet ensue by the too fast drying of the work, caused through the laying of plaster on dry walls which suck from the composition the moisture required to enable it to set, by the application of external heat or the heat of the sun, by the laying of a coat upon one which has not properly set, the cracking in this case being caused by unequal contraction, or by the use of too small a proportion of sand.

For partitions and ceilings, plaster slabs are now in very general use when work has to be finished quickly. For ceilings they require Slabs simply to be nailed to the joists, the joints being made

with plaster, and the whole finished with a thin setting coat. In some cases, with fire-proof floors, for instance, the slabs are hung up with wire hangers so as to allow a space of several inches between the soffit of the concrete floor and the ceiling. For partitions the slabs frequently have the edges tongued and grooved to form a better connexion; often, too, they are holed through vertically, so that, when grouted in with semi-fluid plaster, the whole partition is bound together, as it were, with plaster dowels. Where very great strength is required the work may be reinforced by small iron rods through the slabs. This forms a very strong and rigid partition which is at the same time fire-resisting and of light weight, and when finished measures only from two to four inches thick. The slabs may be obtained either with a keyed surface, which requires finishing with a setting coat when the partition or ceiling is in position, or a smooth finished face, which may be papered or painted immediately the joints have been carefully made. Partitions are also formed with one or other of the forms of metal lathing previously referred to, fixed to iron uprights and plastered on both sides. So strong is the result that partitions of this class only two or three inches thick were used for temporary cells for prisoners at Newgate Gaol during the rebuilding of the new sessions house in the Old Bailey, London.

Fibrous plaster is given by plasterers the suggestive name " stick and rag," and this is a rough description of the material, for it is Fibrous composed of plaster laid upon a backing of canvas Plaster stretched on wood. It is much used for mouldings, circular and enriched casings to columns and girders and ornamental work, which, being worked in the shop and then nailed or otherwise fixed in position, saves the delay often attendant upon the working of ornament in position.

Desachy, a French modeller, took out in 1856 a patent for " producing architectural mouldings, ornaments and other works of art, with surfaces

of plaster," with the aid of plaster, glue, wood, wire, and canvas or other woven fabric. The modern use of this material may be said to have started then, but the use of fibrous plaster was known and practised by the Egyptians long before the Christian era; for ancient coffins and mummies still preserved prove that linen stiffened with plaster was used for decorating coffins and making masks. Cennino Cennini, writing in 1437, says that fine linen soaked in glue and plaster and laid on wood was used for forming grounds for painting. Canvas and mortar were in general

use in Great- Britain up to the middle of the last century. This work is also much used for temporary work, such as exhibition buildings.

The principal books of reference on the subject are: W. Millar. Plastering, Plain and Decorative; G. R. Burnell, Limes, Cements, Mortars and Mastics; Rivington, Notes on Building Construction, Part III. "Building Materials"; the works on architecture of Robert and James Adam. (J. Bt.)

PLATA, RIO DE LA, or River Plate, a funnel-shaped estuary, on the east side of South America, extending W.N.W. from the sea about 170 m. The discovery of the South Sea by Balboa, then governor of Castilla del Oro, of which Darien formed a part, created a lively desire to learn something of its coast-line, and the year following (in 1514), the Spanish monarch concluded a navigation contract with Juan Diaz de Solis, then Piloto Mayor, to search for a strait connecting the Atlantic with the newly found ocean, explore the coasts of the latter and communicate with Pedrarias de Avila, the new governor of Castilla del Oro; and, if it were found to be an island, to report to the superior authorities of Cuba. De Solis set sail from the port of Lepe on the 8th of October 1515, reached the Bay of Rio de Janeiro on the 1st of January 1516, and continuing southward to lat. 35 entered the great estuary now known as the Plata, which, for a short period of time, was called the de Solis and the Mar Dulce. Ascending it to the vicinity of the island of Martin Garcia, near the mouth of the Parana river, de Solis was ambushed and killed in the early part of 1516 by Guarani Indians while attempting to capture some of them. In the first months of 1520 Magellan explored the Rio de la Plata, and afterwards, in the same year, discovered and navigated the straits which bear his name. This discovery led to the voyage of Sebastian Cabot, who fitted out an expedition in 1326 to reach the Spice Islands by the Magellan route. Owing, however, to shortness of provisions and the insubordination of his men Cabot abandoned his proposed voyage to the Moluccas, and, ascending the Mar Dulce, discovered the Parana river and reached a point on the Paraguay near the site of the present city of Asuncion. Here he met many Guarani Indians wearing silver ornaments, probably obtained in trade across the Gran Chaco, from the frontier of the Inca Empire. In exchange for beads and trinkets Cabot acquired many of these ornaments

and sent them to Spain as evidence of the richness of the country in precious metals and the great importance of his discoveries. The receipt of these silver baubles caused the name of Rio de la Plata to be applied to the third (perhaps the second) greatest river of the Western Continent.

The extreme breadth of the river at its mouth is 138 m. It narrows quickly to 57 m. at Montevideo, and at its head, where it receives the united Parana and Uruguay rivers, its width is about 25 m. Its northern or Uruguayan shore is somewhat elevated and rocky, while the southern or Buenos Airean one is very low. The whole estuary is very shallow, and in no place above Montevideo exceeds 36 ft. in depth when the river is low. The bottom generally consists of enormous banks of sand covered with from 10 to 20 ft. of water, and there is a continuous and intricate channel, of about 22 ft. depth only, to within 14 m. of the port of Buenos Aires. The remaining distance has a depth of 18 ft. in the uncertain channel. The Plata is simply the estuarine receptacle of two mighty streams, the Uruguay and Parana, which drain the Plata basin. This has an area of 1,198,000 sq. m., or over two and one-half times that of the Pacific slope of the Andes, and comprises the most fertile, healthiest and best part of Brazil, a large portion of the Argentine Republic, the whole of Paraguay and south-eastern Bolivia, and most of Uruguay.

The Uruguay river has a length of about 1000 m. Many small streams from the western slope of the Brazilian Serra do Mar unite, in about 27″ 45′ S., to form this river, which then Tbe flows W.N.W., serving as the boundary between the , (j rujmay states of Santa Catharina and Rio Grande do Sul, an j as far as 52 W., near which it receives a considerable Affluents. tributary from the north, called the Pepiri-guazti. Between 27 58′ and 33° 34′ S. three important tributaries join it from the east — the Ipui-guazu, the Ibicui and the Negro, the last being its main affluent.

The Pepiri-guazii was one of the limits between the possessions of Portugal and Spain. Its lower course is about 250 ft. wide, but higher up it narrows to about 30 ft., and runs with great violence between high wooded banks. It is navigable for canoes for about 70 m. above its mouth, as far as its first fall. The Rio Negro has a delta of several large islands at its confluence with the Uruguay Its head-waters are in the southern part of Rio Grande do Sul, but the main river belongs entirely to the state of Uruguay, which it cuts midway in its course from north-east to south-west. Its lower reaches are navigable for craft of moderate draught.

From the time the Uruguay leaves the coast range of Brazil it runs for a long distance through a beautiful, open, hilly country, _ but afterwards enters a forest belt of high lands. At

o/Jlhe t ‘ le r ‘ ver Pepiri-guazii it turns suddenly to the south-*

Vrumav wes t> and continues this course to its junction with the

Parana and Plata. Near Fray Bentos, 61 m. before reaching the Plata, it forms a great lake, about 56 m. long and from 4 to 6 m. wide. At Punta Gorda, where it debouches into the Plata, it is only 1 m. to \ m. wide, but is 90 ft. deep. From the Pepiri-guazii junction its banks are high and covered with forest as far down as 27° 30′ S., where the river is 2300 ft. wide and from 10 to 40 ft. deep. The Uruguay is much obstructed by rocky barriers. Four miles below its confluence with the Pepiri-guazu it has a cataract, about 8 m. long, with a total fall of 26 ft. at low water. The river near the Pepiri-guazii is 1550 ft. wide, but about 1 5 m. before reaching the cataract its width is reduced to 600 ft. Along the cataract it is closed in between high precipitous walls of black rock only 70 ft. apart. Above Punta Gorda, 212 m., is the Salto Grande, which has a length of 15 m. of rapids, the greatest single fall being 12 ft., and the difference of level for the entire length of the reefs 25 ft. These cross the river diagonally, and during floods all, excepting a length of if m. of them, are submerged. Nine miles beiow the Salto Grande is the Salto Chico, which bars navigation during six months of the year, but in flood-time may be passed in craft drawing 5 ft. of water. The Uruguay can be navigated at all seasons by vessels of 4! ft. draught as far up as the Salto Chico, and of 14 ft. up to Paysandu for a greater part of the year. Fray Bentos may be reached all the year round by any vessel that can ascend the Parana. Above the navigable lower river there is launch and canoe navigation for many hundreds of miles upon the main artery and its branches, between the rapids which are met with from time to time. The Uruguay has its annual floods, due to the rains in its upper basin. They begin at the end of July and continue to November, attaining their maximum during September and October. At the narrow, places the river rises as high as 30 ft., but its average rise is 16 ft. It flows almost for its entire course over a rocky bed, generally of red sandstone, at times very coarse and then again of extremely fine composition. Except in floods, it is a clear-water stream, and even at its highest level carries comparatively little silt.

The Parana (the ” Mother of the Sea ” in Guarani) drains a vast area of southern Brazil. It is formed by the union of the Rio Grande and Paranahyba, and is about 1600 m. long from its extreme source in Goyaz to its junction with the Paraguay, and thence 600 more to the Plata estuary. Its average width for the latter length is from I to 3 m. Its Rio

Grande branch descends from the slope of the Serra da Mantiqueira, in the region where the orographic system of Brazil culminates near the peak of Itatiaia-assii, almost in sight of Rio de Janeiro. It is about 680 m. long, but only navigable in the stretches between the many reefs, falls and rapids which interrupt its regular flow. Among its numerous affluents the principal one is the Rio das Mortes, rising in the Serra Mantiqueira. It is 180 m. long, with two sections, of a total of 120 m., which are navigable for launches. The main branch of the Parana, the Paranahyba, rises in about 15° 30′ S., on the southern slopes of the Pyreneos Mountains. It drains a little-known region of Goyaz and western Minas Geraes, lying upon the immediate southern water- shed of Brazil.

Besides these rivers, the Parana has many long and powerful affluents from the Brazilian states of Sao Paulo and Parana. Most of them, although obstructed by rapids, are navigable for launches and canoes. Among the eastern tributaries are the Ti6t6, the Parana-panema, formerly known as the Anemby, and the Iguazii.

The Tiete, over 700 m. long, rises in the Serra Paranapicaba and flows in a north-west direction. Its course is broken by fifty- four rapids, and the lower river by two falls, the Avanhandava, 44 ft. drop, and the Itapura, 65 ft.

The Parana-panema is about 600 m. long, and rises in a ramifica- tion of the Serra Paranapicaba which overlooks the Atlantic Ocean. Its genera! course is north-west. It is navigable for a distance of only about 30 m. above its mouth, and for its whole course it has so many obstructions that it is useless for commercial purposes.

The Iguazii, also called the Rio Grande de Curutiba, has its sources on the slopes of the Serra do Mar of Brazil, and flows nearly west, through thick forests, along the line of 26 S. Its navigation is difficult even for small craft, as it is full of reefs, rapids and cataracts. Sixteen miles above its mouth is the magnificent Salto del Iguazu, sometimes called the Victoria Fall, round which canoes have to be transported 37 m. before quiet water is reached again. The width

The Parana and its Affluents,

Course of the Parana.

The Paraguay.

of the falls, measured along their crest or edge, is 2 J m. ; part of the river takes two leaps of about 100 ft. each, but a portion of it plunges down the whole depth in unbroken mass. Its mouth is about 800 ft. wide, and the

depth in mid-river 40 ft.

The Parana, at a point 28 m. above the mouth of the Tiete, is interrupted by the falls of Urubuponga, but below these it has unobstructed navigation for about 400 m., as far down as the falls of Guaira, in 24° 3′ S., where the river forms a lake \ m. long and 2\ m. wide, preparatory to breaching the Serra de Mbaracayu, which there disputes its right of way. It has torn a deep gorge through the mountains for a length of about 2 m., where it is divided into several channels, filled with rapids and cataracts. It finally gathers its waters into a single volume, to plunge with frightful velocity through a long canon only about 200 ft. wide. From these so-called falls of Guaira. or " Sete Quedas," as far as its confluence with- the Paraguay river, the Parana has carved a narrow bed through an immense cap of red sandstone, along which it sometimes flows with great rapidity, occasionally being interrupted by dangerous narrows and rapids, where the banks in some places close in to a width of 450 to 600 ft., although the average is from 1200 to 1600 ft. At the south-east angle of Paraguay the Parana is prevented from continuing its natural southern course to the river Uruguay by the highlands which cross the Argentine province of Misiones, and connect those of Rio Grande do Sul with the Caa-guazu range of Paraguay. Here, therefore, it is turned westwards; but before escaping lrom its great sandstone bed it is obstructed by several reefs, notably at the rapids of Apipe, which are the last before it joins the placid Paraguay, 130 m. farther on. From the Apipe rapids there is a vast triangular space at the south-western corner of Paraguay but little above sea-level, consisting of low, sandy ground and morasses, at times flooded by the Paraguay river. This district, united to the equally enormous area occupied by the Ybera lagoon and its surrounding morasses, in the northern part of the Argentine province of Cor- rientes, was probably the delta of the Parana river when it emptied into the ancient Pampean Sea.

The river Paraguay, the main affluent of the Parana, rises in Matto Grosso, in the vicinity of the town of Diamahtino, about 1 4 24′ S. It flows south-westwards, as far as Villa Maria, along the foot of the high plateau which divides it from the Cuyaba River to the east, and then, turning southwards, soon reaches the morass expansion of Xarayes, which it traverses for about 100 m. A few miles below Villa Maria it receives an affluent from the north-west, the Jaura, which has its source nearly in contact with the head-waters of the Guapore branch of the river Madeira. The Cuyaba, which is known as the Sao Lourenco for 90 m. above its confluence with the Paraguay, has its sources in 13° 45′ S., almost in touch with those of the Tapajos branch of the Amazon. Above the town of Cuyaba it is from 150 to 400 ft. wide, and may be navigated up stream by canoes for 150 m. ; but there are many rapids. The town may be reached from the Paraguay River, at low water, by craft drawing 18 in. According to the observations

of Clauss, Cuyaba is only 660 ft. above sea-level. From the junction of the Sao Lourengo (or Cuyaba) with the river Paraguay, the latter, now a great stream, moves sluggishly southwards, spreading its waters, in the rainy season, for hundreds of miles to the right and left, as far south as 20 , turning vast swamps into great lakes — in fact, temporarily restoring the region, for thousands of square miles, to its ancient lacustrine condition.

On the west side of the upper Paraguay, between about 17° 30′ and 19° S., are several large, shallow lagunas or lakes which receive the drainage of the southern slopes of the Chiquitos sierras, but represent mainly the south-west overflow Lagoons of the vast morass of Xarayas. The principal of these lakes, naming them from north to south, are the Uberaba, the Gaiba, Mandiore and the " Bahia " de Caceres. The Uberaba is the largest. The northern division of the lake belongs entirely to Brazil, but the southern one, about two-thirds of its area, is bisected from north to south by the boundary line between Brazil and Bolivia, according to the treaty of 1867. It is in great part surrounded by high ground and hills, but its southern coast is swampy and flooded during the rainy season. The west shore is historic. Here, in 1543, the conquistador, Martinez de Irala, founded the " Puerto de los Reyes," with the idea that it haight become the port for Peru ; and from Lake Gaiba several expeditions, in Spanish colonial days, penetrated 500 m. across the Chaco to the frontier of the empire of the Incas. At the Puerto de los Reyes Bolivia laid out a town in December 1900, in the forlorn hope that the " Port " may serve as an outlet for that commercially suffocated country, there being no other equally good accessible point for Bolivia on the Paraguay River.

South of the Sao Lourenco, the first river of importance which enters the Paraguay from the east is the Taquary, about 19 S. It rises in the Serra Cayapo, on the southern extension of the Matto Grosso table-land. South of this stream about 50 m. a considerable river, the Mondego, with

of Upper Paraguay.

Affluents of the Paraguay.

many branches, draining a great area of extreme south- ern Matto Grosso, also flows into the Paraguay; and still farther south, near 21 , is the Apa tributary, which forms the boundary between Paraguay and Brazilian Matto Grosso.

The Pilcomayo is of more importance from its length than from its volume.

It rises among the Bolivian Ancles north of Potosi and north-west of Sucre, races down the mountains to The their base, crosses the Chaco plains, and pours into the

Pilcomayo. r { ver Paraguay near Asuncion. Nor does it receive any branch of importance until it reaches about 21° S., where it is joined from the south-west by the river Pelaya, upon which Tupiza, the most southerly city of Bolivia, is situated. The Pelaya rises upon the lofty inter-Andean plateau, and, taking an easterly course, saws its way across the inland Andean range, turns northwards and then eastwards to unite with the Pilcomayo, which it is said at least to equal in volume. Just below the junction is the fall of Guara- petendi, 23 ft. high. From this point to the mouth of the Pilcomayo the distance in a straight line is 480 m., although by the curves of the river, which is extremely tortuous, it is about double that dis- tance. According to Storm, who quotes Captain Baldrich, the river bifurcates at 21 ° 51′ S., but again becomes a single stream at 23 ° 43', the right channel being the greater in volume. It is probable that between 23° and 24° S. it throws E.S.E. three great arms to the river Paraguay, the upper portions of which have yet to be explored, but the lower parts have been examined for 100 to 200 m. up from the Paraguay. Enumerating from north to south, they are called the Esperanza, the Montelindo and the Maca. From 180 to 200 m. above its mouth the Pilcomayo filters through a vast swamp about 100 m. in diameter, through which there is no principal channel. This swamp, or perhaps shallow lagoon, is probably partly drained by the river Confuso, which reaches the Paraguay between the Pilcomayo and Maca. A northern branch of the Pilcomayo, the Fontana, the junction being at 24 56′ S., is probably also a drainage outlet of the same great swamp.

For the first 100 m. below the fall of Guarapetendi the Pilcomayo is from 600 to 1000 ft. wide, but it so distributes its waters through its many bifurcations, and loses so much from infiltration and in swamps, and by evaporation from the numerous lagoons it forms on either side of its course, that its channel is greatly contracted before it reaches the Paraguay. From Sucre to the Andean margin of the Chaco, a distance of about 350 m. by the river, the fall is at least 8000 ft. — a sufficient indication that its upper course is useless for purposes of navigation.

The missionaries in 1556 first reported the existence of the Pilco- mayo, which for a long period of time was known as the Araguay. In 1 72 1 Patifio and Rodriguez partially explored it, and since then numerous attempts have been made to test its navigability, all of which have been failures; and several of them have ended in disaster and loss of life, so that the Pilcomayo now has a sinister reputation. The Bermejo river flows parallel to the Pilcomayo, and enters the Paraguay a few miles above the

junction of this with the Parana. Its numerous sources are on the eastern frontage of the V' e inland Andes, between the Bolivian town of Tarija

Bermejo. an(j t j le Argentine city of Jujuy. Its most northerly tributary is the San Lorenzo, which, after being augmented by several small streams, takes the name of Rio de Tarija. This running east, and then taking a general south-easterly course, joins the Bermejo in 22 ° 50′ S. at a point called the Juntas de San Antonio. Thence, flying southwards, the Bermejo finally, in 23° 50′ S., receives its main affluent, the San Francisco, from the south-west. The latter has its source in about 22° 30′ S., and, under the name of Rio Grande, runs directly southwards, in a deep mountain valley, as far as Jujuy. It then turns eastwards for 50 m., and is joined by the Lavayen from the south-west. These two streams form the San Francisco, which, from their junction, runs north-eastwards to the Bermejo. The average width of the San Francisco is about 400 ft. ; it is seldom over 2 ft. deep, and has many shoals and sand- banks. From its junction with the latter stream the Bermejo flows south-eastwards to the Paraguay with an average width in its main channel of about 650 ft., although narrowing at times to 1 60 and even 100. In its course, however, it bifurcates and ramifies into many channels, forming enormous islands, and frequently leaves old beds for new ones.

Since the exploration of the Bermejo by Patifio in 1721, it has often been examined from its sources to its mouth, with a view to ascertain its navigability. Captain Page in 1854 and 1859 found it impracticable to ascend it over 135 m. in the dry season, with a little steamer drawing 23 in. of water; but in flood-time, in December 1 87 1, he succeeded, in 60 days, in reaching a point 720 m. from its mouth, in the steamer " Alpha," 53 ft. long and 30 in. draught. He afterwards penetrated another 100 m. up stream. The round voyage took a year, owing to the swift currents, shoals, quicksands, snags and fallen trees.

The Salado, about 250 m. south-west of and approximately parallel to the Bermejo, is the only great tributary which the Parana receives from the west below its confluence with the Paraguay. Tbe Its extreme head-waters are in the Argentine province

Saledo. f galta, anc J they drain a much broken Andean region

lying between 24° and 26° 30′ south. The most westerly sources are the rivers Santa Maria and Calchaqui, which unite near the town of San Carlos and form the river Guachipas. Having received the Arias, the Guachipas runs north-eastwards about 50 m., and then it changes its name to the Juramento, which is retained until the river reaches the Chaco plains at the base of the foot-hills of the Andes.

Here it becomes the Salado, a name it preserves for the remainder of its course. It joins the Parana near Santa Fe in 31° 39′ south and 60° 41′ west. Explorers of the Salado, inclusive of Captain Page in 1855, claim that its lower half is navigable, but the many efforts which have been made to utilize it as a commercial route have all resulted in failure.

As the Pilcomayo, the Bermejo and the Salado wander about the country, ever in search of new channels, they erode and tear away great quantities of the Pampean material, dissolve it into silt, and pour it into the Paraguay and Parana rivers. The engineer Pelleschi estimates that " the soil annually subtracted from the territory of the Chaco by the Bermejo alone equals 6,400,000 cubic yards."

South of its confluence with the river Paraguay, the Parana washes the western foot of a series of sandstone bluffs for 30 miles. Thence for 240 m. the bordering hills are about 80 ft. high, but at Goya the country is almost on a level ou "

with the river. Near the boundary-line between ?? s '" y . Corrientes and Entre Rios the banks are very low on p a rank both sides of the river, and continue so for nearly ' 100 m. ; but farther down, for 150 m., the left bank is margined, as far as Diamante, by a range of hills from 125 to 160 ft. high, at times boldly escarped. At Diamante they trend inland, south-eastwards, for about 50 m., and probably once bordered an ancient channel of the river. From 31° 30′ south to the head of the Plata estuary the western bank of the Parana is a precipitous bluff of reddish clay, varying from 25 to 75 ft. above mean river level. It is being gradually undermined, and tumbles into the water in great blocks, adding to the immense volume of silt which the river carries. According to Ramon Lista, " the lowest level of the Parana is in October and November, and, save an occasional freshet, it remains stationary until the beginning of summer, when its waters begin to rise, reaching their maximum about the middle of February in the lower part of their course." The difference between low and high river is generally about 12 ft., depending upon the varying quantity of rains in , Brazil and the melting of the Andean snows. Below its junction with the Paraguay the Parana has an average current of 2 J m. an hour, and the river varies in width from I to 3 m., at low water; but in floods it seems almost a continuous lake, broad- ening to 10 and 30 m. and burying many of its numerous islands and marginal swamps under a vast sheet of water, and obliterating its many parallel lateral channels and intricate systems of connecting canals.

In the middle Parana, from the mouth of the Iguazu to the mouth of the Paraguay river, there are many islands, some of them large, rocky and high above the river. From Paraguay to the city of Rosario, islands are

numerous, many of ‘ anas or them of great area ; and again below Rosario they soon Parana. increase in number and size until the Plata estuary is reached. In flood-time the upper portion of the trees being out of water, they have the appearance of floating forests. Then the river often makes wild work with its banks, and builds up or sweeps away entire islands, leaving deep channels instead. Mouchez in 1857, searching for two islands the position of which he had fixed in the previous year, found in their place 2$ and 32 ft. of water. The lower delta of the Parana does not share in these phenomena; its islands and main channels appear more fixed. This probably is due to the less elevation at- tained by the wat rs in flood-time, and the numerous branches which distribute them into the Plata estuary. This must have extended, in a very recent geological period, inland from its present head to at least 32 ° S. ; but the enormous quantity of silt which the Parana receives from its Paraguay affluent, and from the tributaries which reach it from the Andes, has filled this length of about 220 m. with these muddy islands, which rest upon a sandy bed of great depth.

The frontage of the Parana delta is 40 m. across, almost in a straight line from north to south. Through this the river finds its way to the Plata by eleven outlets, large and small, the two principal ones being the Parana-guazii and the Parana de las Palmas.

The mean flow of the Mississippi river at New Orleans is 675,000 cub. ft. per second, and its flood maximum about 1,000,000 ft. The minimum of the Plata past Buenos Aires is 534,000, the maxi- mum 2,145,000. It may therefore be fairly_ assumed that the yearly discharge of the great North American river is not superior, and may be inferior, to that of the Plata.

The Parana is navigable at all times as far up as the Sao Lourenco river by craft drawing 3 ft. of water, and to within a few miles ot Asuncion, the capital of Paraguay, by vessels drawing 9 ft. The city of Parana may always be reached with a draught of 12 and Rosario with 15 ft. of water.

The commercial development of the Plata basin may be con- veniently illustrated by statistics for the year 1822, which marks the beginning of independent rule in its republics; for 1854, when the steamboat and the railway first began Commerce. to play a part in this quarter of the world; and in 1898 and 1899, as indicating approximately the state of affairs at the end of the 19th century. In Buenos Aires, for example, the foreign trade (entered and cleared) in 1822 aggregated 107,170 tons; in 1854, 342,463 tons; and in 1899, 5,046,847 tons. The coasting and river trade of the same port increased from 150,741 tons in 1854 to 3,695,088 tons in 1899. But taking into account all the Argentine ports, except

Parank Delta.

those which lie to the south of the Plata, there was for the six years ending with 1 899 an annual average of 1 4,000,000 tons for the overseas commerce and 11,000,000 tons for the river and coasting trade. On the other, or northern, bank of the stream the chief port is Monte- video; and its foreign commerce increased from an aggregate of 50,000 tons in 1822 to 150,000 tons in 1854 and to 4,069,870 tons in 1898, the river and coasting trade having increased from 50,000 tons in 1822 to_ 150,000 tons in 1854 , ar >d to 3,915,421 tons in 1898. The total foreign trade of the Plata valley thus increased from over 157,000 tons in 1822 to nearly 18,100,000 tons in 1898-1899. Its growth since the opening of the 20th century has been phenomenal and promises to become gigantic. The Andes on the west, the in- terior of South America on the north, great rivers, and the Brazilian mountains on the east of the Plata basin are obstacles which compel the rich and varied products of at least 1,500,000 sq. m. of fertile country to seek access to the ocean by a single avenue — the Plata estuary. (G. E. C.)

PLATAEA, or Plataeae, an ancient Greek city of Boeotia, situated close under Mt Cithaeron, near the passes leading from Peloponnesus and Attica to Thebes, and separated from the latter city's territory by the river Asopus. Though one of the smallest Boeotian towns, it stubbornly resisted the centralizing policy of Thebes. In 519 B.C. it invoked Sparta's help against its powerful neighbour, but was referred by king Cleomenes to Athens (for the date, see Grote's History of Greece, ed. 1907, p. 82, note 4). The Athenians secured Plataea's inde- pendence, and thus secured its enduring friendship. In 490 the Plataeans sent their full levy to the assistance of the Athenians at Marathon, and during the invasion of Xerxes they joined eagerly in the national defence. At Artemisium they volunteered to man several Athenian ships, and subsequently abandoned their town to be burnt by Xerxes. In 479 they fought against the Persians under Mardonius in the decisive battle which bears the name of the city. In this campaign the Persian commander, retiring from Attica before the combined Peloponnesian and Athenian levy, had encamped in the Asopus plain in order to give battle on ground suited to his numerous cavalry. The Greeks under the Spartan regent Pausanias at first did not venture beyond the spurs of Cithaeron, but, encour- aged by successful skirmishing, advanced towards the river and attempted a flanking movement so as to cut Mardonius off from his base at Thebes. The operation miscarried, and in their exposed condition the Greeks were severely harassed by the enemy's horse, which also blocked the Cithaeron passes against their supply columns. Pausanias thereupon ordered a night retreat to the hilly ground

near Plataea, but the movement was badly executed ; for whereas the Peloponnesians in the centre retired beyond their proper station, the Spartans and Athenians on the wings were still in the plain at daybreak. The Persians immediately fell upon these isolated contingents, but the Spartan infantry bore the brunt of the attack with admirable steadiness, and both wings ultimately rolled back their opponents upon the camp. When this was stormed the enemy's resistance collapsed, and Mardonius's army was almost annihilated. This great victory was celebrated by annual sacrifices and a Festival of Liberation (Eleutheria) in every fourth year at Plataea, whose territory moreover was declared inviolate.

In spite of this guarantee Plataea was attacked by Thebes at the beginning of the Peloponnesian War (431) and formally besieged by the Peloponnesians (420-27). The garrison after capitulating was put to death, and the city razed by the Thebans. The remaining Plataeans received a qualified franchise in Athens, and in 42 r were settled on the territory of Scione. Expelled by Lysander in 404 they returned to Athens, until in 387 Sparta restored them in their native town as a check upon Thebes. The city was again destroyed by Thebes in 373, and the inhabi- tants once more became citizens of Athens. Plataea was rebuilt by Philip and Alexander of Macedon, and during the rest of antiquity enjoyed a safe but obscure existence. It continued to flourish in Byzantine and Frankish times. The walls of the town, which at various periods occupied different portions of the triangular ledge on which it stood, remain partly visible. Recent excavations have discovered the Heraeum; but the temple of Athena the Warlike, built from the Persian spoils and adorned by the most famous artists, has not been identified.

Authorities. — Strabo p. 411; Pausanias ix. 1-4; Herodotus vi. 108, viii. I, ix. 25-85; Plutarch, Aristides, 11-21; Thucydides ii. 1-16, 71-78, iii. 20-24, 52-68; Isocrates, Plataicus; G.B.Grundy, The Topography of the Battle of Plataea (London, 1894) and Great Persian War (London, 1901), ch. xi. ; W. Woodhouse in Journal of Hellenic Studies (1898), pp. 33-59; H. B. Wright, The Campaign of Plataea (New Haven, 1904); R. W. Macan, Herodotus, vii.-ix. (London, 1908), appendix; W. M. Leake, Travels in Northern Greece, ch. xvi., pp. 323-367 (London, 1835); Amer. Journ. of Archaeo- logy, 1890, pp. 445-475; 1891, pp. 390-405; B. V. Head, Historia numorum, p. 294 (Oxford, 1887). (M. O. B. C.)

PLATE. The word " plate " (connected with Gr. irXarbs, flat, Late Lat. plata= lamina, and Span, plata, silver), in the sense to which it is restricted in the following article, is employed to denote works in silver or gold which belong to any class other than those of personal ornaments or coins. 1 As implying a thin sheet of metal, the term has come to be used in various technical connexions, and has been transferred by analogy to other

materials {e.g. glass). A "plate," as the common name for the table utensil (of whatever material), derives its usage partly from the metal prototype and partly from an etymological connexion with French plat, dish, Latin plattus, flat. (See also Pewter; Sheffield Plate; Metal-Work.)

On account of the ease with which gold can be worked and the pure state in which it is generally found, it is probable that this was the first metal used by man; and it is certain that, in some countries at least, he attained to the most marvellous skill in its manipulation at a time when the other arts were in a very elementary condition. As an instance of this we may mention a sword of the bronze age, found in a barrow near Stonehenge, and placed in the museum at Devizes. 2 The hilt of this sword is covered with the most microscopically minute gold mosaic. A simple design is formed by fixing tesserae, or rather pins, of red and yellow gold into the wooden core of the handle. Incredible as it may appear, there are more than two thousand of these gold tesserae to the square inch. The use of silver appears to belong to a rather later period, probably because, though a widely spread metal ir. almost all parts of the world, it is usually found in s less pure state than gold, and requires some skill to smelt and refine it. Though both these precious metals were largely and skilfully used by prehistoric races, they were generally employed as personal ornaments or decorations for weapons. Except in Scandinavian countries, but little that can be called " plate " has been discovered in the early barrows of the prehistoric period in western Europe.

Ancient Egypt. — An enormous amount of the precious metals was annually brought as tribute to the Egyptian kings; accord- ing to Diodorus, who quotes the authority of Hecataeus, the yearly produce of the royal gold and silver mines amounted to 32 millions of minae — that is, about 133 millions sterling of modern money. Though this estimate is probably an exaggera- tion, the amount must have been very great. The gold chiefly came from the Nubian mines in the western desert in the Wadi 'Alaki and the neighbouring valleys. A map of these mines, dating from the time of Rameses II. (1300 B.C.), has been pre- served. Silver was not mined in Egypt itself, and came mostly from Asia Minor even at the earliest period. Then gold was comparatively common, silver a great rarity. ' Later, gold appears to have been relatively more abundant than silver, and the difference in value between them was very much less than it is now.

In the language of the hieroglyphs silver is called " white gold," and gold is the generic name for money — unlike most languages, in which silver usually has this special meaning — a fact which points strongly to the priority of the use of gold, which archaeological discoveries have rendered very probable. Among the treasures of the " royal tombs " at Abydos, dating to the 1st and Ilnd Dynasties, much gold was found, but no

1 In medieval English the term " a plate " was occasionally used in the sense of a silver vessel.. A curious survival of this use of the word still exists at Queen's College, Oxford, where the servants may yet be heard asking at the buttery for so many " plates of beer," that is, silver tankards.

2 Hoare, Ancient Wiltshire (1840).

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Fig. i.— Gold Vase, from wall-paintings at Thebes.

silver. On the walls of one of the tombs at Beni Hassan there is an interesting representation of a gold- and silver-smith's workshop, showing the various processes employed — weighing, melting, or soldering with the blow-pipe, refining the metal, and polishing the almost finished bowl or vase. Owing to the Egyptian practice of burying with their dead personal ornaments and jewelry, rather than other possessions less intimately connected with the person of the deceased, but few specimens of either gold or silver plate have survived to our times, whereas the amount of gold jewelry that has been discovered is very large, and shows the highest degree of skill in working the precious metals. We can, however, form some notion of what the larger works, such as plates and vases in gold and silver, were like from the frequent representations of them in mural sculpture and paintings. In many cases they were extremely elaborate and fanciful in shape, formed with the bodies or heads of griffins, horses, and other animals real or imaginary. Others are simple and graceful in outline, enriched with delicate surface ornament of leaves, wave and guilloche patterns, hieroglyphs, or sacred animals. Fig. i shows a gold vase of the time of Tethmosis (Thothmes) III. (Dynasty XVIII., about 1500 B.C.), taken from a wall- painting in one of the tombs at Thebes. The figure on its side is the hieroglyph for " gold." Others appear to have been very large and massive, with human figures in silver or gold supporting a great bowl or crater of the same metal. Vases of this type were, of course, manufactured in Egypt itself, but many of those represented in the Theban tombs were tribute, mostly of Phoenician workmanship. Already as early as the time of Tethmosis IJL, when, as we know, the Phoenician cities had already existed for centuries, we find the ships of Arvad, of Byblos and of Tyre well known in the har- bours of the Delta, and even bringing tribute of foreign vases to the river quays of Thebes itself. We cannot doubt that much of the precious plate of gold and silver used by the Egyp- tians at this time and specifically described as foreign tribute was made in Egyptian or egyptizing style by Phoenician artists. But plate of really foreign type as well as origin was also brought to Egypt at this time by the Phoenician "

Kefti ships " from Kefti, the island of Crete, where the " Minoan " culture of Cnossos and Phaestus was now at its apogee. Ambassadors from. Kefti also brought gold and silver vases as presents for the Egyptian king, and on the walls of the tomb of Senmut, Queen Hatshepsut's architect, at Thebes, we see a Keftian carrying a vase of gold and silver which is the duplicate of an actual vase discovered at Cnossos by Dr Arthur Evans. The art of the " Minoan " and " Mycenaean "goldsmiths exercised considerable influence upon that of the Egyptians; under the XXth Dynasty, about 1150 B.C., we find depicted on the tomb of Rameses III. golden stirrup-vases (Bugelkannen) of the well- known Mycenaean type, and in that of Imadua, an officer of Rameses IX., golden vases imitating the ancient Cretan shape of the cups of Vaphio. In fact, it is more than probable that the Egyptians and Phoenicians manufactured plate of " Minoan " and " Mycenaean " types long after the ancient culture of Crete and the Aegean had come to an end. In the time of Rameses III., about 1300 B.C., a clearly defined Asiatic influ- ence appears in the decoration of some of the gold plate. A gold basket represented in the tomb of this king at Thebes, has on its side a relief of the sacred tree between two beasts, an Asiatic idea.

The chief existing specimens of Egyptian plate are five silver phialae (bowls), found at the ancient Thmuis in the Delta, and now in the Cairo Museum (Nos. 482-486 in the catalogue). These are modelled in the form of a lotus blossom, most graceful in design, but are apparently not earlier than the 4th century B.C. Of the splendid toreutic art cf a thousand years before,

of which we gain an idea from the wall-paintings mentioned above, but few actual specimens have survived. The Louvre possesses a fine gold patera, 6f in. across, with figures of fishes within a lotus border in repousse work; an inscription on the rim shows it to have belonged to Thutii, an officer of Tethmosis III. (Mint, soc. ant. de France, xxiv. 1858). Thutii's bowl is a typical specimen of the Egyptian plate of the XVIIIth Dynasty, and its design is precisely that of the hundreds of blue glazed faience bowls which were made at the time, and of which some perfect specimens and many fragments (especially from Deir el-Bahri) are in our museums. These were imitated from metal originals, just as most of the early Cretan pottery vessels were. A splendid bronze bowl, which shows us what some of the finer gold and silver plate was like, was found in the tomb of Hetaai, a dignitary of the XVIIIth Dynasty, at Thebes a few years ago, and is now in the Cairo Museum (No. 3553 in von Bissing's catalogue). The engraved decoration, representing birds and animals in the papyrus-marshes, is very fine and evidently of native Egyptian work. The silver bowl at Berlin, said by di Cesnola to have come from Athienou in Cyprus, is certainly of XVIIIth Dynasty date, but, though purely Egyptian in style, more probably of Phoenician than Egyptian work- manship.

Assyrian and Phoenician Plate. — The art of making gold and silver plate, whether it originated in Egypt and passed thence to Crete or not, was evidently on its own ground in Egypt and in Minoan Crete. In Asia it was an exotic art, introduced from Egypt through the Phoenicians. In fact, it may be doubted whether any of the bronze imitations of plate found in Assyria are of Assyrian manufacture; they are probably Phoenician imports. The British Museum possesses a fine collection of these bowls, mostly found in the palace at Nimrud, and so dating from the oth and 8th centuries (reigns of Assur-nazir-pal to Sargon). Though they are made of bronze, and only occasionally ornamented with a few silver studs, they are evidently the production of artists who were accustomed to work in the precious metals, some of them in fact being almost identical in form and design with the silver phialae found at Curium and elsewhere in Cyprus. They are ornamented in a very delicate and minute manner, partly by incised lines, and partly by the repoussi process, finally completed by chasing. Their designs consist of a central geometrical pattern, with one or more concentric

Fig. 2. — Silver Bowl, about 7 in. in diameter, found in a tomb in Cyprus, with repousse reliefs of Egyptian and Assyrian style.

bands round it of figures of gods and men, with various animals and plants, such as antelopes amid papyri, which are derived from the Egyptian designs of the XVIIIth Dynasty. Often there is a strange admixture of Assyrian and Egyptian style.

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Bulls, for instance, are usually represented as with a single mighty horn, curving to the front (in the style of the ancient Babylonian seals), rather than with both horns 'showing, in Egyptian fashion. When figures of gods and men are shown, the principal groups are purely Assyrian imitations of Assyrian temple-reliefs, in fact — such as the sacred tree between the two attendant beasts, or the king engaged in combat and van- quishing a lion single-handed; while mingled with these are figures and groups purely Egyptian in style, such as the hawk- headed deity, or a king slaying a whole crowd of captives at one blow. Occasionally one sees traces of the ancient Mycenaean influence, or perhaps rather of the young Ionian art which had now arisen out of the ashes of that of Mycenae. These Phoenician imitative designs are still good imitations. But a century or so later we meet with them again on the silver bowls and dishes from Cyprus, in which the imitations have become bad. The same mixture of subjects was still in vogue, but confusion has been superadded to mixture, and we find kings in

Assyrian robes and Egyptian wigs slaying Syrian dragons with Egyptian wings, and so on. Fig. 2 gives a silver dish from Curium con- taining examples of the above-mentioned subjects. It is a characteristic specimen of this mixed Phoenician art, of which di Cesnola seems to have collected a remarkable number of examples. In addition to the numerous silver phialae some were found, with similar decoration, made of pure gold. To the same period as these bowls from Cyprus belong the similar specimens of Phoenician plate from Etruscan graves at Praeneste and Cervetri in Italy. Those from the Regulini-Galassi tomb can hardly be earlier than the 6th century, so that this peculiar Mischkunst of the later type may well be dated to the 7th~5th centuries.

References. — Von Bissing, " Metallgefasse " Cairo Museum Catalogue (1901); " Eine Bronzeschale mykenischer Zeit," Jahrb. Inst. (1898); L. P. di Cesnola, Cyprus; Layard, Nineveh, &c.

(H. R. H.) Prehistoric Greece: " Minoan " and " Mycenaean " Periods. — In the early history of the goldsmith's art no period is more important than that of the Greek Bronze age, the period of the prehistoric civilization which we call " Minoan " and " Mycenaean," which antedated the classical civilization of Greece by many centuries, and was in fact contemporary and probably coeval with the ancient culture of Egypt. In Greece during this, her first, period of civilization, metal-work was extensively used, perhaps more extensively than it ever was in the history of later Greek art. So generally was metal used for vases that even as early as the " Middle Minoan " period of Cretan art (some 2000 years B.C.) the pottery forms are obvious imitations of metal-work. The art of the metal-worker domi- nated and influenced that of the potter, a circumstance rarely noted in Egypt, where, in all probability, the toreutic art was never so'much patronized as in Minoan Greece, although beautiful specimens of plate were produced by Egyptian and Phoenician artists. Also but few of these have come down to us, and we are forced to rely upon pictured representations for much of our knowledge of them. It is otherwise in early Greece. We possess in our museums unrivalled treasures of ancient toreutic art in the precious metals from Greece, which date from about 2500 to 1400 B.C., and as far as mass and weight of gold are concerned are rivalled only by the Scythian finds. These are the well-known results of the excavations of Schliemann at Troy and Mycenae and of others elsewhere. They do not by any means suffer in point of additional interest from the fact that they were made and used by the most ancient Greeks, the men of the Heroic age, probably before the Greek language was spoken in Greece.

The most ancient of these " treasures " is that discovered by Schliemann in 1873 buried, apparently in the remains of a box, deep in the fortification wall of Hissarlik the ancient Troy. It consists of vases and dishes of gold

and silver, and of long tongue-shaped ingots of silver. In consonance with the early date (perhaps about 2500 B.C.) to which they are probably to be assigned (Schliemann ascribes them to the second Trojan city) these objects are all of simple type, some of the vases being

unornamented jugs with tubular suspension-handles on the sides. Here we have metal imitating stonework, as, later, pottery imitates metal. These are of silver. A unique form in gold is a boat-shaped cup with handles at the sides (Plate I., fig. 23), at Berlin, which weighs 600 grammes. One vase is of electrum (one part of silver to four of gold).

A treasure of much the same date (the second " Early Minoan " period, about 2500 B.C. or before) was discovered in May 1908 in graves on the island of Mochlos, off the coast of Crete, by R. B. Seager. This is, however, of funerary character, like part of the treasures discovered in the shaft-graves of Mycenae, and, while including diadems, golden flowers, olive branches, chains, and so forth, for the adornment of the dead, does not include much gold used by the deceased during life.

The much later Mycenaean treasures include both funerary objects of thin gold and objects of plate that had actually been used. Among the former should be especially noted the breast- plates, diadems and masks which were placed on the bodies of the chieftains whom Schliemann, great in faith as in works, honestly believed to be Agamemnon and his court (and he may not have been very far wrong). Among the latter we may mention the small flat objects of gold plate, little sphinxes and octopuses modelled in relief, small temples with doves, roundels with spiral designs, and so on, which were ornaments for clothing, and the golden plate decorations of weapon-handles. The great cast-silver bull's head with the gold rosette on its forehead may perhaps have been regarded simply as a beautiful object of price, and buried with its owner. Similar protomae of bulls (of gold or silver) were brought by Minoan ambassadors as presents to the Egyptian court in the reign of Thothmes III. Gold and silver vases were found both in the shaft-graves, in the treasure-pit close by, and in chamber tombs at Mycenae. The most usual shape in the shaft-tombs is that well known to us from the vases of Vaphio, described below; among other types may be mentioned specially the S«nxs afufrucvTeWov with doves feeding above its handles (Plate I., fig. 21 ; from a restored reproduction) — Soial 8£ ireXeia&s a/j$is tkaxrrov xpuceiai vepiOovTo; the golden jug with spiral decoration from the fourth grave; and the cup with lions of Egyptian appearance chasing each other round its bowl, found in grave 5. The fragment of a silver vase with a scene in high relief of slingers and bowmen defending their town against besiegers from grave 4 (Plate I., fig. 22), is an object unrivalled in ancient art. On this, as on the bull's head, we have gold overlaid on silver (with an intermediate plating of copper) ; on a silver cup

from the same grave we find gold inlay, and on. another silver cup, from a chamber-tomb, enamel and gold inlaid. How the Minoan goldsmith could combine silver with gold and the two with bronze we see on the marvellous inlaid dagger-blades from Mycenae, with their pictures in many-coloured metals of lion-hunts, cats chasing birds, and so forth, which show that he was perhaps the greatest master of all time in this art.

We speak of him as " Minoan," because most of the metal objects found at Mycenae are, if not of actual Minoan workman- ship and imported from Crete, at any rate designed in accord- ance with the Minoan taste of the " Great Palace Period " (Late Minoan i. and ii.) at Cnossus. They are only " Mycenaean " in the sense that they were found at Mycenae. Of the art of the gold vase maker in the Mycenaean period properly speaking (Late Minoan iii.) we obtain an idea from the pictures of golden Bilgelkannen with incised designs of zigzags, &c, represented on the walls of the tomb of Rameses III. at Egyptian Thebes. The objects from the Mycenaean shaft-graves are much older than this, as are also those from the next treasure we shall mention, that from Aegina, now in the British Museum. The gold cups and other objects of this treasure, with their fine but simple decoration, are certainly to be ascribed to the best Minoan period, although when first published Dr A. J. Evans was inclined to assign them to so late a date as c. a.d. 800. They aie surely some seven hundred years older, having no characteristic of the decadent " sub-Mycenaean " period, as

Dr Evans would doubtless now agree. These objects were probably found in a tomb.

Dr Evans's excavations at Cnossus, those of the Italians at Phaestos and Hagia Triada and those of the British school at Palaikastro have not produced any very striking examples of the Minoan goldsmith's art in his own country, though splendid bronze bowls and vases have been found, which give us a good idea of what the plate must have been like, as do also the gilt steatite imitations of plate mentioned below. One of the bronze vases from Cnossus exactly resembles one of gold and silver which was brought to Egypt by the ambassadors in Queen Hatshepsut's time (fresco in the tomb of Senmut). But we possess a fine silver cup (of the Middle Minoan period) from the American excavations at Gournia, and two examples of the finest Minoan gold plate, which were discovered outside Crete, in the famous " Vaphio cups," with their embossed representations of bull-netting, which have been illustrated so often as triumphs of ancient art (Plate I., figs. 24, 25). These are of Cretan work- manship, though found

in Laconia, and are no doubt contem- porary with the vases of black steatite with reliefs showing a harvest-home procession, gladiatorial combats, and a king receiving or bidding farewell to a warrior with his armed followers, which have been found by the Italians at Hagia Triada in Crete. These were originally overlaid with gold leaf, and are undoubtedly imitations in a cheap material of golden embossed vases of the same style as those found at Vaphio.

Next in order of time came the objects of gold and silver plate found by the expedition of the British Museum at Enkomi in Cyprus, which perhaps represent a somewhat later phase of Minoan art, but certainly cannot now any longer be regarded as belonging to the very late period to which they were at first assigned. One silver vase found at Enkomi is of the " Vaphio " shape, which first appears in Cretan pottery as early as the Middle Minoan period, contemporary with the Xllth Egyptian Dynasty (c. 2000 B.C.), and even then is clearly an imitation of a metal original. Slightly modified, this type remained late in use, as we find it represented among other golden vases on the walls of the tomb of Imisib or Imadua, an Egyptian official of the time of Rameses IX. (c. 1100 B.C.) at Thebes. But some, at least, of the Enkomi finds must be earlier than this.

The Egyptian representations of Minoan vases of gold and silver in the tomb of Senmut at Thebes (c. 1500 B.C.) and of later Mycenaean golden Biigelkannen in that of Rameses III. (c. 1 150 B.C.) have been mentioned already. During the age of Mycenaean and sub-Mycenaean decadence the art of the Greek goldsmith necessarily passed through a period of eclipse, to arise again, with the other arts, in rich and luxurious Ionia probably. The Homeric poems preserved for later days a traditional echo of the glorious works of the metal-workers of the Heroic age.

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Etruscan Plate. — The Etruscans were specially renowned for their skill in working all the metals, and above all in their gold work. Large quantities of exquisite gold jewelry have been found in Etruscan tombs, including, in addition to smaller objects, sceptres, wreaths of olive, and plates decorated with filigree- work and animal figures, which were used as personal

ornaments (breastplates, girdles, diadems, &c). In the Museo Kircheriano in Rome is a magnificent specimen of the last form of ornament; it is covered with nearly a hundred little statuettes of lions arranged in parallel rows; and the Vatican (Museo Gregoriano) possesses a very fine collection of similar objects from the " Regulini-Galassi " tomb at Caere. Little, however, that can be classed under the head of plate has yet been found.

Hellenic Plate.— The period of " geometrical " art which followed the Mycenaean age was one of decline in material pros- perity and artistic skill. We possess some specimens of the work then produced in the precious metals in the gold diadems placed on the head of corpses interred at Athens {Archdologische Zeitung, 1884, pis. viii., ix.; cf. Athenische Mittheilungen, it

Fig. 3. — Silver Cantharus from Rhodes, with gold mounts. Possibly the form of the Homeric Siiras afict>i.KvirtXKov.

367; and G. Perrot and C. Chipiez, Histoire de Part dans I'antiquite, vii. 245). , The period of Oriental influence is represented by the finds of gold ornaments made at Camirus in Rhodes (see Greek Art, fig. 11). Fig. 3 shows a silver cup, with gold mounts, also found at Camirus, apparently a work of the same early date. A remarkable find of gold objects was made in 1882 at Vettersfelde in Brandenburg; the principal piece was a gold fish (see Greek Art, fig. 10) with ornaments in relief. These objects recall by their style early Ionic art, but were probably produced in one of the Black Sea colonies, since similar objects have been found, together with later work, in Crimean graves (see below), and exchanged for the amber of the Baltic coasts. Croesus especially encouraged the art, and paid enor- mous sums for silver vases and cups to the most renowned artists of his time, such as Glaucus and Theodorus the Samian. The British Museum possesses a fine specimen of archaic Greek plate, found at Agrigentum in Sicily. This is a gold phiale or bowl, about 5 in. across, with central boss or

Fig. 4. — Archaic Gold Phiale, found at Agrigentum, now in the British Museum. It is shown in section below. It is 5 in. in diameter.

omphalos (4>i&\ri eao^aXos) which seems once to have con- tained a large jewel. Round the inside of the bowl are six figures of oxen repousse in relief, and at one side a crescent, formed by punched dots. A delicate twisted moulding surrounds the edge; the workmanship of the whole is very skilful (see fig. 4).

Pliny (N. H. xxxiii. 154 sqq.) gives a brief valuable account of the art of silver chasing (caelatura, Gr. TopevnKrj).

In the best times of Greek art the chief works in gold and silver seem to have been dedicated to religious purposes, and to have been seldom used for the ostentation of private individuals. Vessels for the use of the temples, tripods in gold or silver

PLATE

Plate I.

pJr' ll~v 0ldcn A /T W'^tAXo- from Mycenae (Late Minoan i. ; about 1600 B.C.).

*%=8^&^^^^^J»$$°~ –• ^y; *» Mycenae (Late Minoan ,,*

He. 24, 25.— Gold Cups of Valphio (Late Minoan i.).

xxi. ?M . GREEK PLATE OF THE BRONZE AGE (PREHISTORIC PERIOD).

Plate II.

PLATE

Photo, BHh & Sounders bv permission ol Corpus Christi College.

Fig. 26.— GOLD CHALICE AN'D PATEN OF BISHOP FOXE.

Photo. Soiakwo'-k Photo Eng. Co.

Fig. 27. SALT OF THK VINTNERS' COMPANY (ELIZABETHAN).

From Jackson, History oj English Plate, by permission of C. J. Jackson. F.S.A.

Fig. 29.^GOLD CUP AND COVER, CHARLES II.

From Gardner, Old Silversi'orl\ by permission of LJ. T. Balsford.

Fig. 30.- -'IT DOR CUP.

By permission of Cnckion Bros.

Fig. 28.—BRAIKENBRIDGE MAZER BOWL.

By permission of the Royal Irish Academy,

Fig. 31.— ARDAGH CHALICE.

of the richest work, and statues of the gods were the chief objects on which the precious metals were lavished. 1

The gold used by the Greeks probably came from Asia Minor or Egypt, while the mines of Laurium, in the mountains which form the promontory of Sunium in Attica, supplied an abundant amount of silver for many centuries. According to Pliny,

of Ulysses and Diomedes carrying off the Palladium. Enormous prices were given by wealthy Romans for ancient silver plate made by distinguished Greek artists; according to Pliny, the last-mentioned cup, which weighed 2 oz., was sold for 1 0,00c denarii (£330)- It is worthy of note that a large number of the artists named by Pliny were natives of Asia Minor; and

Fig. 5. — Greek Silver Vase, 4th_century B.C., from South Russia.

Pheidias was the first sculptor who produced works of great merit in. the precious metals; he mentions a number of other Greek artists who were celebrated for this class of work, but does not give their dates. The chief of these were Mentor and Mys (both of the 5th century B.C.), Acragas, Boethus, the sculptors Myron

Fig. 6.— Silver Crater, found in Ithaca. (3! in. high.)

and Stratonicus, as well as the well-known Praxiteles and Scopas. In Pliny's time many works in gold and silver by these artists still existed in Rhodes and elsewhere. Among later workers he specially mentions Zopyrus, who made two silver cups, embossed with the scene of the judgment of Orestes by the Areopagite court, 2 and Pytheas, who made a bowl with reliefs

1 The gold eagles on the sacred omphalos at Delphi were notable examples of this ; see Pindar, Pyth. iv. 4.

2 It has been thought that a silver cup in the Corsini collection

it is very probable that the Asiatic school of silversmiths had at least as much influence on Roman caelatura as that of Alexandria, whose importance has been overrated by Schreiber.

The finest extant examples of Greek plate are those found in the tumuli of south Russia, especially in the neighbourhood of Kertch, the ancient

Panticapaeum. Fig. 5 shows a silver vase found in 1862 at Nikopol in the tomb of a native Scythian prince. The native horse-tamers of the steppes are represented on the shoulder with wonderful naturalism, and the work is beyond doubt that of an Athenian artist of the 4th century B.C. Splendid examples of goldwork were found in the tumulus of Kuloba, about 6J kilometres from Kertch, which was excavated in 1830 and found to be the burial-place of a Scythian prince and his wife. The jewelry and plate found in this tomb, which were clearly of Greek origin, comprised (amongst other objects) an electrum vase 13 cm. high, representing Scythians in their native costume, one of whom is extracting a neighbour's tooth, another binding up a wound, a third stringing a bow, besides several silver vases and two gold medallions with reproductions of the head of the Athena Parthenos of Pheidias. In these Crimean tombs are often found golden crowns in the form of oak leaves, some of which belong to late Roman times. The finest extant example of a gold wreath, however, is that discovered at Armento in south Italy and preserved in the Antiquarium at Munich; it bears an inscription of the 4th century B.C., showing that it was dedicated by a certain Kreithonios. In 181 2 Dr Lee discovered at Ithaca a beautiful crater, 3ˆ in. high (see fig. 6), and a phiale or patera, 9! in. across, both of silver, re- pousse and chased, with very rich and graceful patterns of leaves and flowers picked out with gilding. 3 These are probably not later than the 5th century B.C. Many silver mirror-cases, with repousse figure-subjects in high relief, have been found at various places; as, for instance, one with a beautiful seated figure of Aphrodite found at Tarentum and now in the British Museum. 4

at Rome (Michaelis, Das corsinische Silbergefass, 1859; cf. W. Amelung, in Romische Mitteilungen, 1906, pp. 289 sqq.) may re- produce the design of Zopyrus.

3 See Arckaeologia, xxxiii. 36-54.

4 Ibid, xxxiv. 265-272.

The Victoria and Albert Museum contains an exquisite little silver vase, found in the baths of Apollo at Vicarello in

Italy (fig. 7), enriched with a band in low relief of storks devour- ing serpents executed with gem- like minuteness and finish — probably not later than the 3rd century B.C. The British Museum has a little vase of similar form and almost equal beauty, though perhaps later in date; it is

decorated with bands of vine branches in a graceful flowing pattern, and is partly gilt.

Graeco-Roman Plate. — During . jjgg, the last century of the Republic the growing luxury and osten- tation of the wealthy Romans found expression in the collection of elaborate specimens of plate.

The works of the old Greek masters were the most highly prized, but contemporary artists, such as Pasiteles, also attained distinction in this branch of art. Amongst the numerous finds of silver plate made in modern times we may distinguish (a) temple treasures made of up of votive offerings, such as the treasure of Bernay in France (dep. Eure), discovered in 1830 and preserved in the Cabinet des Medailles, which belonged to the shrine of Mercurius Canetonnensis; (6) private collections.

Fig. 7. — Greek Silver Vase, 5 in. high, c. 3rd century B.C. The ornamental band is shownbelowinplano. (Victoria and Albert Museum.)

whose decoration recalls that of (see Roman Art), and a cylix Athena in high relief, soldered bowl, which appears to be of

the Ara Pacis Augustae

with a seated figure of

on to the centre of the

Greek workmanship. Such

Fig. 8. — Silver Crater, 15J in. high, from the Hildesheim find. (Berlin Museum.)

The most famous of these are the Hildesheim treasure, in the Berlin Museum, discovered in 1869, which has been thought (without adequate reason) to have formed part of the campaigning equipment of a Roman military commander, and the Bosco Reale treasure, found in 1895 in a villa near Pompeii, whence its owner was endeavouring to remove it when buried by the eruption of Vesuvius. These collections contain pieces of various dates. The Bernay treasure, in part belonging to the 2nd century a.d., contains oenochoai (ewers) with mythological subjects in relief inspired by classical Greek models— the theft of the Palladium was the subject of a famous cup of Pytheas, mentioned by Pliny — which must belong to the early imperial period. The Hildesheim treasure, again, contains two barbaric vases, without feet or handles, together with such fine pieces as the crater figured (fig. 8),

detachable figures were termed emblemata; in the Bosco Reale treasure is a cup with such a bust, typifying the province of Africa. Great value was also set upon crustae, i.e. bands of repoussi work forming an outer covering to a smooth silver cup (cf. the Rothschild vases, Roman Art). Such works commonly have Latin inscriptions incised on the foot giving the weight of the piece, the cup and emblema being weighed separately. The artistic value of Roman plate is discussed under Roman Art.

Among later specimens of Roman plate the most remarkable is the gold patera, nearly 10 in. in diameter, found at Rennes in 1777, and now in the Paris Bibliotheque — a work of the most marvellous delicacy and high finish — almost gem-like in its minuteness of detail. Though not earlier than about 210 a.d., a slight clumsiness in the proportion of its embossed figures is the only visible sign of decadence. The outer rim is set with sixteen fine gold coins — aurei of various members of the Antonine family from Hadrian to Geta. The central emblema or medallion represents the drinking contest between Bacchus and Hercules, and round this medallion is a band of repousse figures showing the triumphal procession of Bacchus after winning the contest. He sits triumphant in his leopard-drawn car, while Hercules is led along, helplessly intoxicated, supported by bacchanals. A long line of nymphs, fauns and satyrs complete the circular band.

Late Roman plate is also represented by a series of large silver dishes, to which the name missorium is often, though perhaps wrongly, applied. These were used for presentations by emperors (whose portraits they sometimes bear) and distin- guished officials. Three are preserved in the Cabinet des Medailles of the Bibliotheque Nationale at Paris — the " shield of Scipio," found in the Rhone near Avignon, about 26 in. in diameter, with a relief representing the restoration of Briseis to Achilles; 1 the /'shield of Hannibal," 2 chiefly remarkable for

Fig. 9. — Shield of Theodosius. its size (it is 72 cms. in diameter and weighs 10 kilogrammes); and a third, decorated with a group of Hercules and the Nemean lion. 3 Other well-known examples of this form of art are the

1 Cf. S. Reinach in Gazette des beaux-arts (1896).

2 Cf. E. Babelon, in Bulletin de la societe des antiauaires de la France (1890), p. 228.

8 Cf. E. Piot, in Gazette archeologique (1886).

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" shield of Theodosius " at Madrid (fig. 9), which represents the emperor seated between Valentinian II. and Arcadius 1 ; the " shield of Valentinian " at Geneva 2 ; the " shield of Aspar " at Florence 3 ; and a fine dish found at Aquileia, now at Vienna. 4

The British Museum contains some fine specimens of late Roman silver work, found on the Esquiline in 1793 (cf. Visconti, Una Supelleltile d'argento, Rome, 1825; the objects are published and described in Mr Dalton's Catalogue of the Early Christian Antiquities in the British Museum, pp.61 sqq., pis. xiii.-xx.). The most remarkable of these are: (i.) a silver casket decorated in repousse, with the inscription SECONDE ET PROJECTA VTVATIS IN CRISTO, doubtless a wedding gift to a couple bearing the names of Secundus and Projecta, whose portraits appear in a medallion on the centre of the lid; (ii.) four statuettes representing personified cities — Rome, Constantinople, Antioch and Alexandria (cf. P. Gardiner in J. H. S., 1888, ix. 77 sqq.). This treasure appears to belong in the main to the 5th century a.d., though some minor pieces may be earlier.

Bibliography. — A general account will be found in Smith's Dictionary of Antiquities, 3rd ed., s.v. " Caelatura " (without illus- trations), and in Daremberg and Saglio's Dictionnaire des antiquites, under the same heading (with several cuts). The passages in ancient writers which refer to the art will be found in Oberbeck's Antike Schriftquellen Nos. 2167-2205; Pliny's account is most conveniently studied in K. Jex-Blake and E. Sellers, The Elder Pliny's Chapters on the History of Art, pp. 2 sqq. The finds made in southern Russia were published in the Antiquites du Bosphore cimmerien (St Petersburg, 1854) ; the Comptes rendus de la com- mission imperiale (St Petersburg, 1859 sqq.) ; and the Recueil des antiquites de la Scythie (1866-1873). The first of these works, which is very rare, has been republished on a reduced scale by M. Salomon Reinach, in his Bibliotheque des monuments figures (Paris, 1892) with notes; and all the more important objects are figured in Antiquites de la Russie meridionale, by Kondakoff, Tolstoy and Reinach (Paris, 1891-1892). For Graeco-Roman plate the most important works are Heron de Villefosse's publica- tion of the Bosco Reale treasure in the Monuments Piot, vol. v. (cf. the articles by the same author and M. Thedenat on " Les Tresors de vaisselle d'argent trouves en Gaule," Gazette archeologique, 1883- 1884), and Der hildesheimer Silberfund, by E. Pernice and F. Winter (Berlin, 1901). Reference should also be made to T. Schreiber, " Die alexandrinische Toreutik," (Abhandlungen der sacks. Gesellsch. der Wissenschaften, 1894, vol. xiv.), whose theories are somewhat exaggerated; and A. Odobescu, Le Tresor de Petrossa (1889-1900), which deals with a find of barbaric plate and jewelry made in Rumania, but gives much information on the history

of the art. For early Greek work, see R. Schneider, " Goldtypen des griechischen Ostens,' Berichte der sacks. Gesellsckaft der Wissenschaften (1891, p. 204), and A. Furtwangler, Der Goldfund von Vettersfelde (1883). For Etruscan metal-work, see J. Martha, L'Art etrusque, ch. xvii. An interesting popular account of ancient work in precious metals will be found in E. T. Cook's Popular Handbook to the Greek and Roman Antiquities in the British Museum, pp. 569 sqq.

(H. S. J.)

Oriental, African Plate, &c. — Some very curious pieces of plate, both in gold and in silver, have been found in northern India in which country the goldsmith's art is of great antiquity; 6 these appear to be of native workmanship, but the subjects with which they are embossed, and the modelling of the figures, show that they were produced under late Roman influence, or in some cases possibly even Greek influence in a highly degraded state, handed down from the time of Alexander's Indian conquests. A fine gold casket (Buddhist relic} said to date from about 50 B.C. is worthy of note. 6 In the British Museum are an Indian silver dish (3rd~4th century a.d.) 7 and an earlier one, ascribed to c. a.d. 200.

Under the Sassanian kings of Persia (from the 3rd to 6th centuries) very massive and richly decorated gold vases, bowls,

1 Cf. E. Hiibner, Die antiken Bildwerke in Madrid, pp. 213 sqq.

2 A. Odobescu, Le Tresor de Petrossa, pp. 153 sqq., fig. 68.

- *D. Bracci, Dissertazione sopra un clipeo votivo (Lucca, 1771).*

4 See R. v. Schneider, Album auserlesenster Gegenstande der Antikensammlung des allerhochsten Kaiserhauses (1895); and cf. Verhandlungen der 42 Versammlung deutscher Philologen (1893), pp. 297 sqq.

6 Sir G. Birdwood, Industrial Arts of India (1880).

6 Wilson's Arcana antiqua (1841).

7 Archaeologia- lv. 534.

Fig. 10. — Sassanian Gold Bottle, about 10 in. high. In the Vienna Museum.

and bottles were made (fig. 10). Those which still exist show a curious mingling of ancient Assyrian art with that of Rome in its decline. Reliefs re-

presenting winged lions, or the sacred treebetween its attendant beasts, alternate with subjects from Roman mythology, such as the rape of Ganymede; but all are treated alike with much originality, and in a highly decorative man- ner. A fine example of Persian work of the early 1 9th century (dated 1 8 1 7) is the circular gold dish, richly enamelled, which is in the Victoria and Albert Museum, where a large collection of Oriental plate may be studied. Here may be seen a gold rose-water sprinkler of gold, en- tirely covered with richly enamelled flowers, Mogul work, 17th century; fine Burmese gold work found in a.d. ˆ84-1485 in a Buddhist temple, Rangoon ; remarkable gold ornaments of the Burmese regalia; and a large elephant howdah, from the Punjab, made of silver, parcel gilt, the top covered with silver plates of large repousse foliage. Tibetan craftsmen work is represented by numerous vessels for sacred and domestic purposes, mostly of metal, partially mounted in silver, which display the skill of the Tibetans in the 19th century. Of the skill of the Hindus as goldsmiths, abundant evidence is afforded by the Ramayana and Mahabhdrata, though very little of their ancient gold and silver work has survived. In India the people of the Cash- mere valley have long been famous for their natural superiority as craftsmen, as was Lucknow for its utensils of gold and silver, much of it richly enamelled in the 18th and 19th centuries. Chanda in the Central Provinces was once celebrated for its skilled goldsmiths, and the plate of Cutch and Gujarat in the Bombay Presidency has enjoyed a well-deserved reputation. The uncontaminated indigenous designs of the Sind goldsmiths' work call for special notice. Indian plate, as is quite natural, has often been influenced by European designs: for instance, the beautiful gold and silver work of Cutch is Dutch in origin, while the ornate throne of wood covered with plates of gold, early 19th century, used by Ran jit Singh (at South Kensington) also displays European influence. Much of the Siamese decora- tive plate of the 18th and 19th centuries is of silver-gilt and nielloed. In the Rijks museum, Amsterdam, is a collection of silver dishes, boxes of gold and silver, jewelry, &c, all of excellent workmanship, from Lombok. African goldsmiths' work is represented in the British Museum by the gold orna- ments from Ashanti, where there are also some gold ornaments from graves in Central America and Colombia. Ancient Abys- sinian work can be studied at the Victoria and Albert Museum in the gold chalice, gold crown of the Abuna of Abyssinia, another more ornate crown of silver-gilt, a fine shield with silver-gilt filigree, and other objects. ' The gold and silver work of Russia resembles in style that of Byzantium at an early period. Shrines and other magnificent pieces of plate in the treasury of the cathedral at Moscow (see Weltmann, Le Tr&sor de Moscou, 1861), though executed at the end of the 15th and 16th century, are similar in design to Byzantine work of the nth or 12th century, and even since then but little change or development of style has taken place.

The caliphs of Bagdad, the sultans of Egypt, and. other Moslem rulers were once famed for their rich stores of plate,

which was probably of extreme beauty both in design and work- manship. Little or nothing of this Moslem plate now remains, and it is only possible to" judge of its style and magnificence from the fine works in brass and other less valuable metals which have survived to our time.

Towards the end of the ioth century the Rhine valley became the centre of a school of goldsmiths, who produced splendid examples of their work — a mixture of Byzantine art with their own original designs. The book-covers, portable altars and other objects, preserved at Trier and Aix-la-Chapelle, are notable examples produced at that centre. The magnificent book-cover from Echternach, now at Gotha, is of the school of Trier.

Early Medieval Plate. — The Gothic, Gaulish and other semi-barbarian peoples, who in the 6th century were masters of Spain, France and parts of central Europe, produced great quantities of work in the precious metals, especially gold, often of great magnificence of design and not without some skill in work- manship. The Merovingians encouraged the art of the gold-smith by spending immense sums of money on plate and jewelry, though only two examples of their great wealth in church vessels have survived — the gold chalice and paten of Gourdon, now at Paris. Fine examples of Carlovingian work, which was mainly wrought in the monasteries in the north of the Frankish dominions and on the Rhine, may be studied in the covers for the Gospels, in the Bibliotheque Nationale in Paris. In 1837 a large number of pieces of very massive gold plate were found at Petrossa in Rumania; much of this find was unfortunately broken up and melted, but a considerable portion was saved, and is now in the museum at Bucharest. These magnificent objects are all of solid gold, and consist of large dishes, vases, ewers, baskets of open work, and personal ornaments (fig. n). Some of them show a strong Roman influence in their design, others are more purely barbaric in style. To the first of these classes belongs a very fine phiale or patera, 10 in. in diameter. In the centre is a seated statuette of a goddess, holding a cup, while all round, in high relief, are standing figures of various male and female deities, purely Roman in style. Though the execution is somewhat clumsy, there is much reminiscence of classical grace in the attitudes and drapery of these figures. A large basket and other pieces, made of square bars of gold arranged so as to form an open pattern of stiff geometrical design, have nothing in common with the vessels in which Roman influence is apparent, and can hardly be the work of the

same school of goldsmiths. 1 The date of this Petrossa treasure is supposed to be the 6th century. The celebrated Gourdon gold cup and tray now preserved in Paris belong to about the same date. They are very rich and magni- ficent, quite free from any survival of classic influence, and in style resemble the Merovin- gian gold work which was found in the tomb of Childeric I. The cup is 3 in. high, shaped like a miniature two-handled chalice; its companion oblong tray or plate has a large cross in high relief in the centre. They are elaborately ornamented with inlaid work of turquoises and garnets, and delicate filigree patterns in gold, soldered on.

In the 6th century Byzantium was the chief centre for the production of large and magnificent works in the precious metals. The religious fervour and the great wealth of Justinian and his successors filled the churches of Byzantium, not only with enormous quantities of gold and silver chalices, shrines, and other smaller pieces of ecclesiastical plate, but even large altars, with tall pillared baldacchini over them, fonts, massive candelabra, statues, and high screens, all made of the precious metals.- The wealth and artistic splendour with which St Peter's 1 Soden Smith, Treasure of Petrossa (1869).

Ewer, 15 in. high, from the Petrossa treasure.

in Rome and St Sophia in Constantinople were enriched is now almost inconceivable. To read the mere inventories of these treasures dazzles the imagination — such as that given in the Liber pontificalis of Anastasius Bibliothecarius, which includes the long list of treasures given by Constantine to St Peter's before he transferred his seat of empire to Byzantium (330), and the scarcely less wonderful list of gold and silver plate presented to the same basilica by Pope Symmachus (498-5 14) ?

Some early Byzantine plate of the 6th century is in the British Museum; an inscribed paten of the ioth and nth centuries is in Halberstadt Cathedral in Germany, and numerous ecclesiastical vessels are in the Treasury of St Mark's, Venice.

Early in the medieval period France and other Western countries were but little behind Italy and Byzantium in their production of massive works, both secular and religious, in the precious metals. At this time every cathedral or abbey church in Germany, France and even England began to accumulate rich treasures of every kind in gold and silver, enriched with jewels and enamel; but few specimens, however, still exist of the work of this early period. The most notable are Charle- magne's regalia 3 and other treasures at Aix-la-Chapelle, a few preserved at St Peter's in Rome, and the remarkable set of ecclesiastical utensils which still exist in the cathedral of Monza near Milan — the gift of Queen Theodelinda in the early part of the

7th century. 4 The treasure of Nagy-Szent-Miklos, consist- ing of several vessels of gold, of Hungarian origin (8th-c)th century), is in the Imperial Museum at Vienna.

The existing examples of magnificent early work in the precious metals mostly belong to a somewhat later period. The chief are the gold and silver altar in Sant' Ambrogio at Milan, of the 9th century; the " Pala d'Oro," or gold retable, in St Mark's at Venice, begun in the ioth century; the silver altar-front in St Domenico's Church at Palermo; the shrine of silver-gilt (with later additions) in the church of St Simeon at Zara, Dalmatia, by Francesco di Antonio of Sesto near Milan, 1380; and the gold altar-frontal given by the emperor Henry II. and his wife Cunigunde, at the beginning of the nth century, to the cathedral at Basel. The last is about 4 ft. high by 6 ft. long, repousse in high relief, with figures of Christ, the three archangels, and St Benedict, standing under an arcade of round arches; it is now in the Musee Cluny in Paris. 6 A similar gold frontal, of equal splendour, was that made for the archbishop of Sens in 999. This was melted down by Louis XV. in 1760, but fortunately a drawing of it was preserved, and is published by Du Sommerard {Album, 9th series, pi. xiii.). Reliquaries of great splendour were made of the precious metals, one of the most notable being that containing the skulls of the three kings in Cologne Cathedral. This shrine, which resembles in form a building of two storeys, was wrought in the 12th century. The covers of the Textus in the Victoria and Albert Museum are highly important examples of goldsmiths' work; they are of gold and silver, decorated with enamel and set with stones, probably dating from the 12th century.

Celtic. — The skill in metal-working of the Celtic people in the British Islands, especially in Ireland, in Pagan and Christian times, is well known, and need hardly be emphasized here. While much has perished, much happily remains in proof of their extraordinary skill in working gold and silver, particularly in jewelry. The most remarkable specimen of their technical skill and artistic perception is the famous Ardagh chalice of the 9th- 10th century (in the museum at Dublin) (Plate II., fig. 31), which is composed chiefly of silver, with enrichments of gold and gilt bronze, and with exquisite enamels. The interlaced ornament is a feature of Celtic work, and may further be studied in the celebrated Tara brooch, with its seventy-six varieties of designs as well as in other exquisite examples of jewelry. Further evidence of Celtic skill is forthcoming in the shrines for the sacred bells in Ireland, not to mention other ecclesiastical

2 See D'Agincourt, Histoire de I'art (1823).

3 Bock, Die Kleinodien des heil. romischen Reiches (1864).

4 Arch. Jour, xiv. 8.

6 Archaeoloaia, xxx. 144-148.

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ornaments. These are of great beauty, and the silver shrine of the bell of St Patrick (1091-1105) displays the interlaced scroll ornament in a striking degree. With the introduction of Gothic art into Britain the special characteristics of Christian Celtic art in Ireland gradually died out.

Anglo-Saxon. — Judged by the examples of Anglo-Saxon jewelry discovered, the Anglo-Saxon craftsmen brought their art to a high state of perfection, though hardly equal in merit to the Celtic. A large quantity of their metal-work is of bronze, frequently enriched with gold and enamel. Happily, there is preserved one priceless specimen of the goldsmith's art of this period— namely, the famous Alfred jewel of gold, now in the Ashmolean Museum at Oxford, with a portrait, believed to be of Alfred the Great, in cloisonne enamel. Another notable speci- men is the Ethelwulf ring in the British Museum. Though ecclesiastical vessels, doubtless of the precious metals, appear in Anglo-Saxon illuminated manuscripts, the only piece of plate of that time at present known is the plain silver cup of the latter part of the 9th century, found with gold and silver jewelry and pennies at Trewhiddle in Cornwall, which is now in the British Museum. 1 There is, however, an important example of metal- work embellished with silver plates — namely, the portable altar of St Cuthbert at Durham.

A most valuable description of the various methods of work practised by gold- and silversmiths in the nth and 12th cen- turies is given by the monk Theophilus in his Diversarum artiunt schedula (Hendrie's ed., 1847). He minutely describes every possible process that could be employed in making and orna- menting elaborate pieces of ecclesiastical plate — such as smelting, refining, hammering, chasing and repousse work, soldering, casting (by the " cire perdue" process) , wire-drawing, gilding with mercury amalgam, and the application of niello, enamel and gems. The silversmith of those days, as in classical times, was not only a thorough artist with a complete sense of beauty and fitness in his work, but he was also a craftsman of the most varied fertility of resource, and made himself thoroughly responsible for every part of his work and every stage through which it passed — a most striking contrast to the modern subdivision of labour, and eagerness to produce a show of neatness without regard to real excellence of work, which is the curse of all 19th- century handicrafts, and one of the main reasons why our modern productions are in the main

neither works of true art nor objects of real lasting utility.

Italian Plate. — Before the latter part of the 15th century, large pieces of silver work were made more for ecclesiastical use than for the gratification of private luxury. The great silver shrine in Orvieto Cathedral, made to contain the blood- stained corporal of the famous Bolsena miracle, is one of the chief of these. It is a very large and elaborate work in solid silver, made to imitate the west front of a cathedral, and decor- ated in the most sumptuous way with figures cast and chased in relief, and a wonderful series of miniature-like pictures embossed in low relief and covered with translucent enamels of various brilliant colours. This splendid piece of silver work was executed about 1338 by Ugolino da Siena, one of whose other works, a fine reliquary, is also at Orvieto. The other most important pieces of silver work in Italy are the frontal and retable of St James in the cathedral at Pistoia 2 and the altar of San Giovanni at Florence. On these two works were employed a whole series of the chief Tuscan artists of the 14th and 15th centuries, many of whom, though of great reputation in other branches of art, such as painting, sculpture on a large scale, and architecture, did not disdain to devote their utmost skill and years of labour, to work which we now as a rule consign to craftsmen of the very smallest capacity. The following celebrated artists were employed upon the altar at Florence: Antonio Pollaiuolo, Michelozzo, Verrocchio, as well as less prominent artificers, Betto Geri, Leonardo di Ser Giovanni and Betto di Francesco Betti. Among the distinguished names of Florentines who during

1 Victoria History of Cornwall, i. 375.

2 E. Alfred Jones, " The Altar of Pistoia, " The Reliquary (January, 906), pp. 19-28.

the space of one century only, the 15th, worked in gold and silver, the following may be given to suggest the high rank which this class of work took among the arts: Brunelleschi, Ghiberti, Donatello, Luca della Robbia, the two Follaiuoli, Verrocchio, Michelozzo, Ghirlandaio, Botticelli, Lorenzo di Credi, Baccio Baldini and Francia. The cities of Italy which chiefly excelled in this religious and beautiful class of silver work during the 14th and 15th centuries were Florence, Siena, Arezzo, Pisa, Pistoia, Bologna, where there are fine 14th-century silver reliquaries executed by Jacopo Roseto da Bologna for the heads of St Dominic and St Petronio in the church of St Stefano, Perugia, where Paolo Vanni, Roscetto and others worked in the 14th and early 15th centuries, and Rome.

Owing to the demoralization and increase of luxury which grew in Italy with such startling rapidity during the early years of the 1 6th century, the wealth and artistic skill which in the previous centuries had been mainly

devoted to religious objects were diverted into a different channel, and became for the most part absorbed in the production of magnificent pieces of platen- vases, ewers, dishes, and the like — of large size, and decorated in the most lavish way with the fanciful and over-luxuriant forms of ornament introduced by the already declining taste of the Renaissance. This demand created a new school of metal- workers, among whom Benvenuto Cellini (1500-1571) was per- haps the ablest and certainly the most prominent. His graphic autobiography makes him one of the foremost and most vivid figures of the wonderful 16th century, in which often the most bestial self-indulgence was mingled with the keenest enthusiasm for art. The large salt-cellar made for Francis L, now at Vienna, is the only piece of plate which can be definitely assigned to Cellini. The splendid Farnese casket, with crystal plaques engraved by Giovanni di Bernardi, in the Naples Museum, has been wrongly attributed to Cellini. His influence on the design of plate was very great, not only in Italy and France, but also in Germany. 3 During the 17th century fine pieces of plate were produced in Italy, many of them still retaining some of the grace and refinement of the earlier Renaissance.

The papal treasure, containing priceless examples of the goldsmith's art, was almost entirely depleted by Pius VI. to pay the indemnity demanded by Napoleon. The tiara of Julius II. by Caradosso, and the splendid morse of Clement VII. by Benvenuto Cellini, coloured drawings of which are preserved in the Print Room, British Museum, are among the objects then destroyed.

A valuable source of study of Italian plate (now de- stroyed) is contained in the three volumes of drawings, executed between 1755 and 1764, by Grauenbroch, in the Museo Correr at Venice.

Germany. — From very early times Germany was specially famed for its works in the precious metals, mostly for eccle- siastical use. In the 15th century a large quantity of secular plate was pro- duced of beautiful design and skilful workmanship. Tall covered cups on Fig. 12. — Silver Beaker, decorated stems, modelled with a with open work, filled in with trans-

c 1 „ „„„„„.i,;„„ lucent enamels. German or Flemish,*

series of bosses something of the h ce (s _ K u)

like a pineapple, beakers

and tankards, enriched with Gothic cresting and foliage, are

3 See Eugene Plon, Benvenuto Cellini, sa vie, &c. (1883); also Cellini's own work, Dell' Oreficeria (1568).

among the most important pieces of plate. During the 16th century Augsburg and Nuremberg, long celebrated for their silver work, developed a school of craftsmen whose splendid productions have often been ascribed to the great Cellini himself. In the first decade of the 16th century, Paul Milliner, a Nuremberg goldsmith, furnished Frederick the Wise with several silver-gilt reliquaries for his collection at Wittenberg. Later in the same century came the Jamnitzer family of Nuremberg, chief among them being Wentzel Jamnitzer, one of whose masterpieces, an enamelled silver centre-piece, belongs to the baroness James de Rothschild of Paris. Mathaeus Wallbaum of Augsburg was another celebrated goldsmith of the 16th century. His chief works are religious ornaments of ebony mounted in silver, and the Pom- merscher Kunstschrank in the Kunstgewerbe Museum, Berlin. But the chief German goldsmith of the 16th century was Anton Eisenhoit J of Warburg, who wrought the fine crucifix (1589), the chalice and other ecclesiastical vessels which belong to the Fiirstenberg family. Other notable craftsmen of this period were Hans Petzolt and Melchior Bayr, the latter having made the silver altar (with scenes from the Life of Christ after Durer)

Fig. 13. — Silver Cup, 8J in. high, usually attributed to Jamnitzer, but more probably by Paul Flint. Made at Nuremberg about the mid- dle of the 16th century. (S. K. M.)

Fig. 14. — Ewer by Fransois Briot, about 10 in. high. Middle of 16th century.

for the king of Poland, which is in the Sigismund chapel in Cracow Cathedral. 2 Jakob Mores, the elder, of Hamburg, was employed by the royal house of Denmark. A large number of his original designs for plate are in the public art library at Berlin. Jakob Mores, the younger, executed the silver altar at Frederiksborg in the 17th century. In Germany the traditions of earlier Gothic art were less rapidly broken with, and many purely Gothic forms survived there till the end of the 16th century, and Gothic decorative features even later. In the first half of the 17th century, though the technical skill of the German silver- smiths reached a high standard of merit, there was some falling off in the execution and in the purity of outline in their designs. Germany is richer in secular plate than any other country. The remarkable royal collections of plate in the green vaults at Dresden, Gotha and Munich, as well as public museums in Germany, including the treasure of Liineburg at Berlin, afford excellent opportunities for the study of the German goldsmith's art, the remarkable

chalice, 12th century, of St Gothard's church, Hildesheim; the celebrated Kaiserbecher of Osnabriick

1 Lessing, Die Silber-Arbeiten von Anton Eisenhoit (1880).

2 Illustrated by Ordzywolski, in Renesaus w Polsce, pis. n-12.

of the 13th century; the cup given by the emperor Frederick III. and Mathias Corvinus to Vienna in 1462, and the splendid ewer of Goslar, 1477, are notable specimens of early German work. In England the only public collections of German plate worthy of notice are the " Waddesdon " in the British Museum, and the Victoria and Albert Museum. Prior to its dispersal among his five daughters, the late baron Carl von Rothschild's collection at Frankfort-on-Main was the most extensive private collection in existence. The Gutmann collection, acquired by Mr J. Pier- pont Morgan, contains many rare pieces, as does that of the baronesses Alphonse and Salomon de Rothschild in Paris.

Many of the most beautiful vessels of crystal, agate, &c, formerly attributed to Italian artists, were carved and engraved and set in beautiful enamelled gold and silver mounts, in southern Germany in the 16th and 17th centuries. At the end of the 17th and the beginning of the 18th centuries household plate and other ornaments were frequently decorated with painted enamels, mostly originating from Augsburg. Dinglinger of Dresden and his school at about this time exercised considerable influence in the production of ornaments in pearl and other materials, elaborately carved, mounted and enamelled.

Several specimens exist of the models of cups required of candidates for the rank of master-craftsmen in the second half of the 16th century. One of these, at the Victoria and Albert Museum, is believed to have been wrought by Martin Rehlein of Nuremberg in 1572-1573.'

Many of the famous 15th and 16th century artists — such as Martin Schon, Israel von Mecken, Aldegrever, Altdorfer, Brosamer, Peter Flotner, the Behams, Hopfer and Hans Holbein the younger, supplied the silversmiths with designs for plate. Several of Holbein's original designs, including one for the gold cup probably wrought by his friend, John of Antwerp, for Queen Jane Seymour, are in the Print Room, British Museum, where there is also an original design for a table fountain by the celebrated artist, Albrecht Durer. Virgil Solis of Nuremberg (1514-1562) was especially fertile in designing plate, and he executed a large series of etchings of designs for vases, cups, ewers, tazze, &c. 4 Many of the German silver ewers and basins resemble those made in pewter at the end of the 16th century by Francois Briot and Gaspar Enderlein, who migrated from

Switzerland to Germany.

Switzerland. — This country produced several silversmiths whose work in the main follows that of the German school. The three historical beakers in the national library at Zurich were made in that city from money sent out as gifts from England by the three English bishops, Jewel of Salisbury, Horn of Winchester, and Parkhurst of Norwich, in appreciation of the hospitality afforded them during their exile at Zurich, in tin reign of Queen Mary I. 6 Important plate was wrought at Berne, Rappersweil and other Swiss towns.

Russia. — In no country is the ecclesiastical and secular plate of greater interest than in Russia, where so many different influences have been at work in its designs and decoration — Byzantine, Oriental, Gothic, Renaissance, &c. The " golden age " of ecclesiastical art was undoubtedly the 17th century, when the churches and monasteries were being enriched with many priceless ornaments in the precious metals. Enamels of great richness — which had been introduced there by Hungarian artists — niello and precious stones were employed in the decora- tion. A drinking – cup or bowl exclusively Russian in form and character, known as bratina, was largely made (see the fine one of gold, enamelled and set with precious stones, in the royal collection at Vienna), as was a smaller bowl, called czarka, with a single handle. Another secular vessel, peculiarly Russian, is the kovsh, a pointed or boat-shaped bowl with a long handle. Much of the domestic plate after Peter the Great's time was influenced by that of western countries, particularly Germany. Poland. — -Though not without a character of its own, the

3 See Rosenberg in Kunst und Gewerbe (1885).

4 See twenty-one facsimiles of these etchings published by J. Rimell (London, 1862).

6 Keller, " Three Silver Cups at Zurich," Arch. Journ. xvi. 158.

ecclesiastical plate of Poland ' came under the influence both of Germany and Hungary. Many of the sacred vessels of late medieval times are decorated with enamels and niello. In the 17 th century ecclesiastical vessels encrusted with corals are met with, such as those given by Michael Wisniowiecki, king of Poland, to the church of Czeustochowa. A magnificent 17th- century chalice of gold, beautifully enamelled, given by the bishop of Plock and Breslau, son of Sigismund III., is in Plock cathedral. Many important pieces of plate still exist in churches in Poland,

though a Polish origin is not claimed for them; for instance, the 10th-century chalice at Trzemeszno, where there is also another chalice of about the same period. The cathedral of Cracow contains many priceless examples, such as the 14th- century gold cross given by Casimir the Great; the gold crucifix of Mathias Corvinus, and the gold reliquary, 16th century, of St Stanislas, bishop of Cracow.

France. — France, like England, has suffered grievous losses in its plate, though it can show a larger array of medieval church vessels than can England. The chief specimens of medieval plate are the 9th-century casket and the seated statuette of St Foy (10th century) in the treasure of Conques; the cross of Laon (c. 1200) in the Louvre; the ciborium (early 13th century) in the treasury of Sens; the cross of the same period in Amiens Cathedral; the caskets of St Taurin (c. 1250); the reliquary of St Epine, given by St Louis; the virgin of the abbey of Roncevaux (Navarre, 14th century); and the virgin given by Queen Jeanne d'Evreux to St Denis in 1339. One of the most cherished possessions of the British Museum is the celebrated gold and enamel cup of the kings of England, French work of the 14th century. No doubt the visit to Paris of Cellini exercised a great influence in the goldsmith's art there, though, unfortunately, no examples have survived. The extravagances of Louis XIV. and his court led to the destruction of all the royal plate of France, as did the Revolution of 1789 of vast quantities of domestic plate. It was not until the early part of the 18th century that any signs of revival are visible in the art of the silversmith. Chief among the Paris goldsmiths of that time are Claude Ballin the younger, Thomas Germain, and, later in the century, Francois Thomas Germain, who made the royal plate of Portugal and several pieces for the court of Russia.

The Low Countries. — Flemish silversmiths of the late medieval period were as skilful as they were in the Renaissance. So little Flemish plate remains that pictures of the Flemish school are recommended as the chief sources of study of ecclesiastical vessels. A fine covered silver beaker, decorated with open work and translucent enamel in the South Kensington Museum, and another covered with figures and foliage in niello, in the print room of the British Museum, are notable examples of Flemish work of the 15th century. A large triptych, 13th century, is in the Rothschild bequest to the Louvre. Ornate rosewater ewers and basins, which came in with the Renaissance, such as the important pair dated 1535 in the Louvre, were made at Antwerp and other places.

The Utrecht silversmith, Paul van Vianen (early 17th century) wrought many fine pieces of plate, including the silver bas-reliefs in the Rijks Museum at Amsterdam, where there are five fine bas-reliefs in silver by the Belgian silversmith, Mathias Melin. Two other members of the same family,

Adam and Christian van Vianen, were also prominent silversmiths of this time. An earlier Dutch silversmith, Christian van Vianen of Utrecht, made the vessels for the altar of St George's Chapel, Windsor, for Henry VIII.

Two important pieces of Dutch plate are the covered tazza- shaped cup of William the Silent, date about 1573, belonging to the earl of Yarborough, 2 and another large cup of the same form (1595), known as the "Breda cup," in the possession of the Hohenlohe family. Considerable quantities of plate were produced at Amsterdam (where Johann Lutma the elder— d. 1669 — was a well-known silversmith), Haarlem, the Hague and many other places. The numerous 17th-century Dutch pictures

1 Pozczdziecke and Rastawiecki, Polish Silver Work (1&53-1869). 2 Archaeologia, lix. 83.

of still-life and other subjects afford opportunities for the study of tazze, beakers and other domestic vessels in silver. Hendrik Janssens, a Dutch engraver of about 1640, executed many designs for goldsmiths and jewellers.

Spain and Portugal. — Spanish plate was largely influenced in the middle ages by that of France and Flanders and the art of the Moors. But little medieval plate exists in Spain, most of it having been destroyed at the time when a taste for more elaborate ornaments sprang up as a result of the introduction of fresh wealth from the colonies in the New World. The following examples may be singled out: a cross of wood, covered with gold filigree work, set with stones (a.d. 808), in Oviedo Cathedral, where there is also a larger cross of wood and gold, dating from later in the same century. A Moorish casket of wood covered with thin silver plates is in Gerona Cathedral. The reliquary of Alphonso III. and his queen (a.d. 866-896 covered with embossed silver plates of the symbols of the evangelists; the nth- century chalice at Silos; chalices of the 13th and early 14th centuries in the cathedrals of Santiago and Toledo; and Don Martin's great armchair, of wood covered with elaborate silver- gilt plates, in Barcelona cathedral. The Spanish monstrances of the 15th century are noticeable because of the Flemish influence displayed, while those of the early part of the 16th century, such as that by the celebrated silversmith, Enrique Arfe, in the cathedral of Cordova, is remarkable for its ornate character. The latter's grandson, Juan de Arfe y Villafane (who wrote De varia conmensuracion, 1585, on silverwork and other arts) became a chief maker of these magnificent mon- strances; for instance, the celebrated example in Seville cathedral. He was associated with Pacheco in executing statues. About the 15th century Barcelona became famed as a centre for the silversmith's art, and the Libros de pasantia, or silversmiths' examination books, still preserved in that city, contain a large number of

designs for jewel-work. Seville likewise had an important gild of silversmiths, as did the following cities: Toledo, Valladolid, Burgos, Cordova and Salamanca. The celebrated family of Becerril wrought fine plate at Cuenca in the 16th century. Many chalices and some domestic plate of the 16th and early 17th centuries are embellished with small enamelled disks, some of which show Saracenic influence in details. The Victoria and Albert Museum possesses a fine collection of Spanish goldsmith's work.

Portuguese plate displays in its Gothic features a very florid style, in imitation of that adopted by architects in the reign of Don Manuel (1495-1521). A typical example of this extrava- gance of Gothic motives may be seen in the monstrance of Belem, which was made from gold brought from the East by Vasco da Gama.

Austria and Hungary. — Austrian plate is, like that of Switzer- land, largely based on German models. The ecclesiastical plate of Hungary in the 15th and 16th centuries is celebrated for its enamelled work of a flowered design enclosed in filigree wire — introduced from Italy. This enamelled decoration was con- tinued in the 17th century, but without the filigree wire, and it is then described as " Transylvanian." Much of the secular plate of the 16th and 17th centuries in north and east Hungary is influenced by German plate, while that in Transylvania is frequently inspired by Oriental designs.

English. — There is strong evidence of the importance attached to English medieval plate by Continental peoples, as there was to the magnificent English illuminated MSS., and, later, to the embroidered vestments, opus anglicanum. But, unfortunately, the ruthless destruction of plate during the Wars of the Roses, the Reformation and the Great Rebellion has spared but few medieval pieces to which we can point. Under the name of Protestantism every ecclesiastical vessel with a device savouring of " popish superstition " was instantly destroyed. The inven- tories of the great cathedrals and religious houses plainly reveal their marvellous wealth in gold and silver vessels.

Norfolk is richer than any other county in pre-Reformatiorj chalices and patens. 3 The well-known " Gloucester " candlestick, 3 Norfolk Arch. xii. 85.

though composed of inferior metal, is an illustration of the fine plate

wrought in England in the 12th century, while the ancient anointing spoon of the sovereigns of England at the Tower of London is an historical relic of the end of the 12th century (with the bowl altered for Charles II.). The earl of Carysfort is the fortunate possessor of a silver-gilt censer of about 1375 and an incense ship, of about 1400, found in Whittle- sea Mere in 1850, and formerly belonging to Ramsey Abbey. 1 Only one pre-Reformation English gold chalice has survived, which with its paten and a silver crosier was given to Corpus Christi College, Oxford, by its founder, Bishop Foxe (Plate II., fig. 26). Both bear the London date-letter for 1 507-1 508. Another historical relic which has come down to the present day, though in a restored form, is the gold ampulla of about the end of the 14th century in the Tower of London. The universities of Oxford and Cambridge, though sadly depleted of their plate, can still show some notable pieces. The earliest example at each is a drinking horn, both of the 14th century, at Queen's College, Oxford, and Corpus Christi College, Cambridge. Other notable horns are the Pusey horn 2 ; the celebrated Bruce horn with the seals of John of Gaunt attached, and one at Christ's Hospital.

Mazer bowls, made of wood mounted in silver and even in gold, and frequently engraved with scriptural and other inscrip- tions (see Plate II., fig. 28), were popular drinking vessels in England in medieval times. Many of these have survived, the earliest specimen being one of Edward II. at Harbledown hospital. They ceased to be made after the reign of Elizabeth (Archaeologia, i. 129). Medieval coco-nut cups, mounted in silver, are of frequent occurrence in England, the best known examples being in the possession of the colleges at Oxford and Cambridge and several of the city companies. As has been men- tioned before, but few examples of early plate exist; the following is a brief list of some of the most notable pieces, other than those previously enumerated: the " Sokborn " cup (c. 1430), and the " Anathema " cup (1481-1482) at Pembroke College, Cambridge; the Leigh cup (1499) at Mercers' Hall; the ivory and silver cup (1525-1526) of the duke of Norfolk; the pastoral staff (c. 1367) at New College, Oxford; the Richmond cup (c. 1510) at Armourers' Hall; the " election cup " (c. 1520) at Winchester College; and the Foundress' plate, consisting of a fine covered cup (1435-1440), two salts (c. 1500), a beaker and cover (1 507-1 508), and a salt (1507-1508) at Christ's College, Cambridge. Of Elizabeth's reign, the finest examples are probably the salt of the Vintners' Com- pany (Plate II., fig. 27), and the rosewater dish and ewer of the duke of Rutland. Stoneware jugs, as the well-known example

(1581) from West Mailing, Kent, and Chinese porcelain vessels were elaborately mounted in Elizabethan times, a goodly pro- portion of the former having been done by goldsmiths at Exeter.

The Celtic races of both England and Ireland appear to have possessed great wealth in gold and silver, but especially the former. It seems, however, to have been mostly used in the manufacture of personal ornaments, such as torques, fibulae and the like. A magnificent suit of gold armour, repoussi with simple patterns of lines and dots, was found some years ago at Mold in Flintshire, and is now in the British Museum. 3 The amount of old jewelry found in Ireland during the past century has been enormous; but, owing to the unfortunate law of " treasure-trove," by far the greater part was immediately

1 Illustrated in Old Cambridge Plate, pp. 102-303.

2 Archaeologia, iii. 3, xii. 377. 3 Ibid. xxvi. 422.

*melted down by the finders. Little of this period that can be called plate has been discovered in the British Isles — unlike Denmark and other Scandinavian countries, where the excava- tion of tombs has in many cases yielded rich results in the way of massive cups, bowls, ladles and horns of solid gold, mostly decorated with simple designs of spirals, concentric circles, or interlaced grotesques. Others are of silver, parcel-gilt, and some have figure subjects in low relief (fig. 15). In like manner, during the Saxon period, though gold and silver jewelry was common, yet little plate appears to have been made, with the exception of shrines, altar-f rentals and vessels for ecclesiastical use, of which every important church in England must have possessed a magnificent stock. With regard to English secular plate, though but few early examples still exist, we know from various records, such as wills and inventories, that the 14th century was one in which every rich lord or burgher prided himself on his fine and massive collection of silver vessels; on festive occasions this was displayed, not only on the dinner-table, but also on sideboards, arranged with tiers of steps, one above the other, so as to show off to advantage the weighty silver vases, flagons and dishes with which it was loaded. The central object on every rich man's table was the " nef " — a large silver casket, usually (as the name suggests) in the form of a * ship, and arranged to contain the host's napkin, goblet, spoon and knife, with an assortment of spices and salt. No old English " nefs " are now known. Great sums were often spent on this large and elaborate piece of plate, e.g. one made for the duke of Anjou in the 14th century weighed 348 marks of gold. The English silversmiths of this period were highly skilled in their art, and produced objects of great beauty both in design and workmanship. One of the finest specimensof Edward III.'s plate which still exists is a silver cup belonging to the mayor and corporation of King's Lynn. It is graceful and chalics-like in*

Fig. 15. — Silver Cup, 4! in. high, with embossed gold band; found in a grave in the east of Zealand (Denmark). This cup dates from the earlier part of the Iron Age.

Fig. 16. — Silver Cup, with Fig. 17. — Silver-gilt

translucent enamels. Probably Salt-cellar, 14J in. high.

English work of the 14th Given to New College,

century. Oxford, in 1493.

form, skilfully chased, and decorated in a very rich and elaborate way with coloured translucent enamels (fig. 16) of ladies and youths, several with hawks on their wrists. Silver salt-cellars were among the most elaborate pieces of plate produced during the 15th century. Several colleges at Oxford and Cambridge still possess fine specimens of these (fig. 17); a favourite shape was a kind of hour-glass form richly ornamented, made between about 1480 and 1525.

But few existing specimens of English plate are older than the beginning of the 15th century. Among the few that remain the principal are chalices — such as the two large silver-gilt ones found in the coffin of an archbishop of York, now used for holy communion in the cathedral, and a fine silver chalice from the church of Berwick St James, Wilts, now in the British Museum. Both this and the York chalices are devoid of orna- ment, and, judging from their shape, appear to be of the first half of the 13th century, which is the date of the fine medieval chalice and paten found near Dolgelly some years ago (the latter now believed in some quarters to be of German origin). Several Tudor cups are in existence: the celebrated one of 1 521 (Plate II., fig. 30), an earlier one, 1500; two covered ones of about 1510 and 1512 at Sandwich and Wymeswold, respectively; one (1515) at Corpus Christi College, Oxford, and the Bodkin cup (1525) of the Corporation of Portsmouth. A very early beaker (1496) is in a private collection, as is also a small Tudor bowl (1525-1526). The earliest known chalices of silver include the Gourdon chalice and paten, the St Gozlin chalice at Nancy (10th century); the 12th-century specimen in the abbey of Wilten in Tirol.

It is interesting to note the various changes of form through which the ecclesiastical chalice passed from early Christian times Chalices. ˆ" tne ˆth

century. It was at first an ordinary secular cup with two handles, classical in form and of large capacity, because the laity as well as the clergy received the wine. The double handles were of practical use in passing the cup round like a modern " loving cup." The first alteration was the omission of the handles, so that it took the form of a large hemispherical bowl, with a round foot, and a knop for security in holding it. For some centuries it appears to have been the custom for the priest to hold the chalice, while the communicant sucked the wine through a silver tube or " fistula." Some of the most magnificent early examples of this form of chalice have the bowl mounted in bands, set with jewels, and enriched with minute filigree work — a design which appears to have been taken from those cups, such as the four magnificent examples in the treasury of St Mark's at Venice, which have their bowl cut out of crystal, onyx or some other precious stone. 1 The finest examples of this class are the Ardagh chalice, now in the Dublin Museum, and the chalice of St Remigius, in Reims cathedral; both are most magnificent speci- mens of the taste and skill of 10th to nth century goldsmiths. In the 12th and 13th centuries the design becomes simpler; there , is a distinct shaft, extending above and below the knop; and on the foot is marked a cross, not found in the earlier ones, to show which side the priest is to hold towards himself at celebration. The next alteration in the form of chalice, which occurred in the 14th century, was to make the foot not circular in plan but polygonal or lobed, so that the cup might not roll when laid on its side to drain, after it had been rinsed out. This Fig. 18. — Elizabethan form lasted in most countries till about 1500, Chalice. a "d in England till the Reformation. Then

the bowl, which in the previous two or three centuries had been slowly reduced in size, owing to the gradually introduced practice of refusing the wine to the laity, was suddenly made more capacious, and the form was altered to the shape shown in fig. 18, in order that the Protestant " com- munion cup " might bear no resemblance to the old Catholic " mass- ing chalice." This was ordered to be done in 1562 (see Arch. Journ. xxv. 44-53). The best account of the evolution in the form of English medieval chalices and patens is by W. H. St John Hope and T. M. Fallow, in Archaeologia, vol. xliii.

Secular plate during the 15th and 16th centuries was fre- quently similar in style to that made in Germany, though the English silversmiths of the latter century never quite equalled the skill or artistic talent of the great Nuremberg and Augsburg silver- workers. In the 1 7th century, during the reigns of James I. and Charles I., many fine pieces of plate, especially tall cups and tankards, were made of very graceful form and decoration. The greater part of this, and all earlier plate, especially the fine collections belonging to the universities, were melted down during the Civil War. In

Charles II. 's reign returning prosperity and the increase of luxury in England caused the production of many magnificent pieces of plate, often on a large scale, such as toilet services, wine-coolers, and even fire-dogs and other furniture. These are very florid in their ornament, much of it 1 See De Fleurv. La Messe (Paris, 1882), &c. xxi. 26

under Dutch influence, and mostly have lost the beautiful forms of the century before (fig. 19 and Plate II., fig. 29). In the early part of the 18th century the designs of English plate were to some extent influenced by the introduction of French ornaments by the large band of French silversmiths who sought refuge in England after the revocation of the edict of Nantes. Chief among these Frenchmen (though probably not a refugee him- self) was Paul Lamerie, who produced a large number of notable specimens, the largest of which is a fjne wine-cooler in the Winter Palace, St Petersburg. Through the greater part of the reign of George III. English plate is more remarkable for its plain solidity than for artistic merit. With the advent, however, of the talented architects, the brothers Adam, came a taste for plate with classical characteristics. The South Kensington Museum has a small, though fine, collection of plate, varying

Fig. 19. — Covered Cup of Solid Gold, 6 in. high, c. 1660-1670. Given to Exeter College, Oxford, by George Hall, Bishop of Chester.

in date from 1770 to 1788, in the Adam style. Many of Flax- man's designs were produced in plate, among the most important being the " Shield of Achilles," in silver-gilt, at Windsor Castle. Thomas Stothard, the painter, executed several designs for gold- smith's work for Rundell and Bridge.

The Assay of Gold and Silver Plate. — The primitive method of testing the purity of the metal was by marking a streak with it on the touchstone, and comparing the colour of the mark with that made by various pieces of gold or silver of known degrees of purity. Assay by cupellation is now employed for silver: a piece of the silver to be tested is melted with some lead in a cupel or bone- ash crucible; the lead is oxidized, and rapidly sinks into the bone-ash, carrying with it any other impurities which are present. The residue of pure silver is then weighed, and by its loss shows how much alloy it contained. Gold is now tested by an elaborate chemical process by which the trial bit is dissolved in acid, and then thrown down in the form of precipitate, Fig. 20. — Silver

which can be examined by a careful quan- ^^\ Ix „ ln " J: ' ,_.,■■ , . / . J N dated 1772. De-

titative analysis (see Assaying). signed by the

The standard of purity required in the brothers Adam, time of Edward I. was, for gold, that it should be of the " Paris touch," i.e. 19J carats out of 24. Before then 22 carats was the standard. Silver was to be " of the sterling alloy," viz. n oz. 2 dwt. to the pound. Except for a time during the 16th century this standard of silver has been kept up, and is still required by law.

Hall-marks on Silver. — In the 13th century the English Gild of Gold- and Silver-smiths had grown into'great importance, and had acquired monopolies and many special privileges. In order to keep the standard up to the required purity the system of requiring each article to be stamped with certain marks was introduced by royal command. The first of these was the

king's mark — a leopard's or lion's head crowned. This was introduced in 1300 by Edward I. (29 Edw. I. stat. 3, c. 30). The second, the maker's mark, was instituted in 1363 (37 Edw. III. c. 7). This might be any badge or initial chosen by the master silversmith himself. The third was the Year letter or assayer's mark; this was an alphabet, one letter being used for a year, counting from the day of the annual election of the warden of the Goldsmiths' Company. When one alphabet was exhausted another with differently shaped letters was begun. The earliest existing piece of plate which has the three marks is the chalice (with paten, 1479-1480), at Nettlecombe, Somerset. Other marks, subsequently introduced, were the lion passant, first used in 1544; the lion's head erased; and a full-length figure of Britannia, used only between 1697 and 1719-1720; and, lastly, the portrait of the reigning sovereign, which was used from 1784 to 1890, when the duty on gold and silver plate ceased. In addition to these general hall-marks, the plate made in various provincial towns had certain special assay and hall-marks.

The best work on hall-marked plate and the marks themselves, with the history of the Goldsmiths' Company, is C. J. Jackson's English Goldsmiths and their Marks (1905), where will be found illustrations of the marks found on plate wrought in Scotland and Ireland, and at English provincial gilds — York, Norwich, Exeter, Chester, Lincoln, Newcastle, Birmingham, Sheffield and other places. E. Alfred Jones's book, Old English Gold Plate (1907), illustrates and describes gold plate only.

Modern Plate in the East. — Though little plate of real artistic merit is now

made in Europe, in the East among the Moslem and Hindu races there still survive some real taste in design and skill in execution. Delhi, Benares, Lucknow, Cutch and other places in India and Kashmir still produqe a quantity of beautiful silver and gold work — chiefly ewers, basins, rose-water sprinklers, salvers, coffee-pots and the like. These are of graceful form, covered with rich repousse work, or more often with very delicate chased patterns. Their style in the main is Moslem, but some combine an Arab form with native Indian surface decoration. This class of work is not a revival, but has been practised and handed down by unbroken tradition, and with little or no change in style from the 16th century or even earlier. 1 The silversmiths of Persia, Damascus and other Eastern places are still skilful, and retain some good tradition in their designs. They are, however, more occupied in the production of personal ornaments than in making larger works of silver or gold.

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PLATEAU, JOSEPH ANTOINE FERDINAND (1801-1883), Belgian physicist, was born at Brussels on the 14th of October 1 801, and died on the 15th of September 1883 at Ghent, where he had been professor of physics from 1835. He was a pupil and friend of L. A. J. Quetelet, who had much influence on the early part of his career. The more original investigations of Plateau refer chiefly to portions of one or other of two branches of science — physiological optics and molecular forces. We owe to him the " stroboscopic " method of studying the motion of a vibrating body, by looking at it through equidistant radial slits in a revolving disk. In 1829 he imprudently gazed at the midday sun for 20 seconds, with the view of studying the after effects. The result was blindness for some days, succeeded by a temporary recovery; but for the next fourteen years his sight gradually deteriorated, and in 1843 he became permanently blind. This calamity did not interrupt his scientific activity. Aided by his wife and son, and afterwards by his son-in-law G. L. van der Mensbrugghe, he continued to the end of his life his researches on vision — directing the course of the experiments which they made for him, and interpreting the bearing of the results. He also published a valuable analytical catalogue of all the more important memoirs which had been written, from the earliest times to the end of the 18th century, on his favourite theme of subjective visual phenomena. But even more extra- ordinary were this blind man's investigations about molecular forces, embracing hundreds of novel

experiments whose results he saw only with others' eyes. These form the subject of his great work Statique experimentale et Morique des liquides soumis aux settles forces moleculaires (2 vols., 1873), a valuable contribution to our knowledge of capillary phenomena. His son, Felix Auguste Joseph Plateau (b. 1841), became professor of zoology and comparative anatomy at Ghent in 1870.

PLATEAU (a French term, older platel, for a flat piece of wood, metal, &c, from plat, flat), in physical geography, an elevated region of level or gently undulating land-surface, the term being synonymous with " table-land." The most clearly defined plateaus have steep flanks in contrast with their level summits, but the term does not necessarily connote a steep ascent from the surrounding country. Indeed, it is applied to such diverse forms as the high-lying plains encircled by the higher elevations of the Andes, and to those of the west of North America, which rise almost imperceptibly from the low central plains. A plateau may have its origin either in the upheaval of strata which preserve their original horizontal position during the process, or in the prolonged denudation of an originally broken surface. The two forms are distinguished respectively as Plateaus of Deposition and Plateaus of Erosion.

PLATED WARE, articles chiefly intended for table use consisting of an inferior metal or alloy covered by one of the precious metals, with the object of giving them the appearance of gold or silver. Before the introduction of electro-plating the method employed for silver-plating (the invention of which in 1742 is associated with the name of Thomas Bolsover, of Sheffield) was to fuse or burn together, by a flux of borax, a thin sheet of silver on each side of an ingot of base metal, gener- ally copper, or German silver, which is an alloy of copper. The silver plates were firmly wired to the ingot, which was then placed in a heated furnace and brought nearly to the fusing- point of the silver. The artisan knew the exact moment to withdraw the ingot. When cold it was rolled down to a sheet, and from such sheets " silver-plated " articles were made. Articles like dish-covers were originally only silver-plated on one side, and after being worked into shape were tinned inside with pure tin. In Birmingham bar-copper was the base metal used; when bare of silver this showed blood-red. The Sheffield manufacturers, on the other hand, used shot-copper mixed with brass (an alloy of copper and zinc) in the proportion of 4 or 6 to 1. In this way they got rid of the redness of the copper and rendered it harder, and their product is the " old Sheffield plate " (q.v.) that has become famous all over the world. This method of plating rapidly declined with the introduction of the newer process of electro-plating (q.v.), by which it has been superseded. Plating with nickel is extensively used for bedsteads and other articles of upholstery, and for various parts of bicycles, steam- ships, railway carriages, &c. Steel sheets are also plated with nickel

for cooking purposes, and iron is plated with brass.

PLATEN-HALLERMUND, AUGUST, Graf von (1796- 1835), German poet and dramatist, was born on the 24th of October 1796 at Ansbach, the son of the Oberforstmeister in the little principality of that name. The latter, together with other Franconian principalities, having shortly after his birth become incorporated with Bavaria, he entered the school of cadets (Kadeltenhaus) in Munich, where he showed early promise of poetical talent. In 1810 he passed into the royal school of pages (konigliche Pagerie), and in 1814 was appointed lieutenant in the regiment of Bavarian life-guards. With it he took part in the short campaign in France of 1815, being in bivouac for several months near Mannheim and in the department of the Yonne. He saw no fighting, however, and returned home with his regi- ment towards the close of the same year. Possessed of an intense desire for study, and finding garrison life distasteful and irksome, he obtained a long leave of absence, and after a tour in Switzerland and the Bavarian Alps, entered the university of Wiirzburg in 18 18 as a student of philosophy and philology. In the following year he migrated to that of Erlangen, where he sat at the feet of F. W. J. von Schelling, and became one of his most enthusiastic admirers. As a result of his Oriental studies he published a little volume of poems — Ghaselen (1821), each consisting of ten to twenty verses, in which he imitates the style of Ruckert; Lyriscke Blatter (1821); Spiegel der Hasis (1822); Vermischte Schriften (1822); and Neue Ghaselen (1823). These productions attracted the attention of eminent men of letters, among them Goethe, both by reason of their contents, which breathe the spirit of the East, and also of the purity and elegance

of their form and diction. Though he was at first influenced by the school of Romanticism, and particularly by Spanish models, yet the plays written during his university life at Erlangen, Der gldserne Pantojfel, Der Schatz des Rhampsinit, Berengar, Treue um Treue, Der Turm mit sieben Pjorten, show a clearness of plot ard expression foreign to the Romantic style. His antagonism to the literature of his day became more and more pronounced, and he vented his indignation at the want of art shown by the later Romanticists, the inanity of the lyricists, and the bad taste of the so-called fate tragedies (Schicksalstragodien) , in the witty " Aristophanic " comedies Die verhangnisvolle Gabel (1826) and Der romantische Oedipus

(1828).

The want of interest, amounting even to hostility, with which Platen's enthusiasm for the purity and dignity of poetry was received in many literary circles in Germany increased the poet's indignation and disgust. In 1826 he visited Italy, which he henceforth made his home, living at Florence, Rome and Naples. His means were slender, but, though frequently necessitous, he felt happy in the life he had chosen, that of a " wandering rhapsodist." Der romantische Oedipus earned for him the bitter enmity of Karl Immermann and Heinrich Heine, and in the literary feud which ensued Heine launched the most baseless calumnies at the poet, which had the effect of prejudicing public opinion against him. But he retained many stanch admirers, who delighted in the purity of the subject matter of his productions and their beauty of form and diction. In Naples, where he formed the friendship of August Kopisch, the poet and painter, were written his last drama Die Liga von Cambrai (1833) and the delightful epic fairy-tale Die Abbassiden (1830; 1834), besides numerous lyrical poems, odes and ballads. He also essayed historical work in a fragment, Geschichten des Kbnigreichs Neapel (1838), without, however, achieving any marked success. In 1832 his father died, and after an absence of eight years Platen returned to Germany for a while, and in the winter of 1832-1833 lived at Munich, where he revised the first complete edition of his poems, Gedichte (1833). In the summer of 1834 he returned to Italy, and, after living in Florence and Naples, proceeded in 1835 to Sicily. Dread of the cholera, which was at that time very prevalent, induced him to move from place to place, and in November of that year he was taken ill at Syracuse, where he died on the 5th of December 1835. Like Heine himself, Platen failed in the drama, but his odes and sonnets, to which must be added his Poleniieder (1831), in which he gives vent to his warm sympathy for the Poles in their rising against the rule of the Tsar, are in language and metre so artistically finished as to rank among the best classical poems of modern times.

Platen's Gesammelte Werke were first published in one volume in 1839, and have been frequently reprinted; a convenient edition is that edited by K. Goedeke in Cotta's Bibliothek der Wellliteratur (4 vols., 1882). His Tagebuch (1796-1825), was published in its entirety by G. von Laubmann and L. von Schemer (2 vols., 1896- 1900). See J. Minckwitz, Graf Platen als Mensch und Dichler (1838); P. Besson, Platen, Stude biographique et litteraire (1894); O. Greulich, Platens Literaturkomodien (1901); A. Fries, Platen- Forschungen (1903); and R. Unger, Platen in seinem Verhdltnis zu Goethe (1903).

PLATERSPIEL, Blaterpfeife, a medieval simplified bagpipe, consisting of an insufflation tube, a bladder and a chaunter; the double reed in its socket at the top of the chaunter being concealed within the bladder. In the platerspiel we recognise the early medieval chorus, a word which in

medieval Latin was frequently used also for the bagpipe. In the earlier forms of platerspiels of which we possess illustrations, such as the well-known example of the 13th century reproduced by Martin Gerbcrt from a MS. at St Blasius, the bladder is unusually large, and the chaunter has, instead of a bell, the grotesque head of an animal with gaping jaws. At first the chaunter was a straight conical tube terminating in a bell, as in the bagpipe. The later instruments have a pipe of larger calibre more or less curved and bent back as in the cromorne. One of these appears in the 13th-century Spanish MS., known as the

Cantigas de Santa Maria 1 in the Escurial, together with a platerspiel having two pipes, a chaunter and a drone side by side. Another is figured by Virdung (15 n).

There was practically no technical difference between the bent platerspiel and the cromorne, the only distinction being the form and size of the air-chamber in which the reed was set in vibration by the compressed air forced into it through the insufflation tube or the raised slit respectively of the two instruments. The earlier form of platerspiel is found at the end of the 15th century, in the magnificent Book of Hours, known as the Sforza Book 2 (Brit. Mus.). An interesting allusion to the platerspiel occurs in an old English ballad. 3 Eight shepherds were playing on various instruments: " the fyrst hed ane drone bagpipe, the next hed ane pipe maid of ane bleddir and of ane reid, the thrid playit on ane trump, &c," from which it is evident that the platerspiel retained its individu- ality and did not become merged in the bagpipe. (K. S.)

PLATFORM (Fr. plateforme, i.e. ground plan), a word now generally confined to a raised flat structure or stage, temporary or permanent, erected in a building or in the open air, from which speeches, addresses, lectures, &c, can be delivered at a public cr other meeting. Similar structures of wood, brick or stone, are used in railway stations at such a level above the rails as to enable passengers to have easy access to the carriages; and in fortification the word is used of the raised level surface on which guns are mounted. The earlier uses of the word, such as for a plane geometrical figure, the ground plan of a building, and figuratively, for a plan, design, scheme, &c, are now obsolete. In a figurative sense the term is applied to a common basis on which members of a political party may agree, and especially in the United States to the declaration made by a party at a national or state convention.*

PLATINUM [symbol Pt, atomic weight 195-0 (0=i6)], a metallic chemical element. The name, derived from platina, the diminutive of Span, plata (silver), was first given to a mineral, platinum ore or native platinum, originally discovered in South America, from the resemblance to silver.

Russia furnishes about 95% of the world's annual supply of platinum.

Native platinum occurs usually in small metallic scales or flat grains, sometimes in the form of irregular nuggets, and occasionally, though rarely, in small crystals belonging to the cubic system. Grains of platinum have been found embedded, with cbromite, in serpentine derived from an olivine-rock, the metal having probably separated out from an original basic magma. It is said to occur also in veins in syenitic and other rocks. Usually, however, platinum is found in detrital deposits, especially in auriferous sands, where it is associated with osmiri- dium (known also as iridosmine), chromite, magnetite, corundum, zircon, &c. The platinum has a steel grey cr silver-white colour and a metallic lustre; is often magnetic, sometimes with polarity; has a hardness of about 4-5 and a specific gravity varying with its composition from 14 to 19. Native platinum usually contains more or less iron and copper, often gold, and invariably a small proportion of some of the allied metals — iridium, osmium, ruthenium, rhodium and palladium. From the associated metals it was named by J. F. L. Hausmann polyxene (Gr. iro\vs, many, and £,kvos, a guest), whilst from its occurrence as a white metal in auriferous alluvia it is sometimes known to miners as " white gold."

Platina del Pinto was the name by which native platinum was first introduced into Europe from South America about the middle of the 18th century. Although it appears to have been known locally much earlier, the attention of scientific men in Europe was first directed to it by Antonio de Ulloa y Garcia de La Torre, a Spaniard who joined a French scientific expedition to Peru in 1735, and published in 1748 an account of his journey, in which he refers to platinum, though not under that name, as occurring with gold in New Granada (now Colombia). Sir William Watson, an English physicist, had, however, in 1 741 received some grains of the mineral, probably from the

1 Reproduced by J. F. Riano, in Studies of Early Spanish Music (London, 1887).

2 See facsimile edited by Dr George Warner, pi. xxviii. fol. 51.

3 See F. J. Furnivall, Captain Cox, his ballads and Books, or Robert Laneham's Letter a.d. 1575 (London, 1871), clx. 86.

same locality, though brought by way of Jamaica; and it was he who first described it in 1750 as a new metal.

Native platinum was discovered in 1819 in the gold washings of Verkhniy-Isetsk, in the Urals, but it was not until 1822 that its true nature was recognized. The chief Russian localities are in the districts of Nizhne Tagilsk and Goroblagodatsk, where it is found in shallow drift deposits, containing pebbles of serpentine, which represent the original matrix. The Iset district has acquired importance in recent years. Although the platinum-bearing gravels usually contain a very small propor- tion of the metal, the average in 1895 being only 15 dwt. to the ton, rich discoveries have occasionally been made in the history of the workings, and nuggets of exceptional size have been unearthed. The largest recorded specimens are one of 310 oz. from Nizhne Tagilsk, and another of 72 j oz. from the Goro- blagodatsk district.

In 1 83 1 platinum ore was recognized in the gold-bearing deposits of Borneo, where it had previously been regarded as worthless, being known to the natives as mas kodok (frog gold). Although recorded from various parts of the island, its occur- rence seems to be definitely known only in Tanah-Laut, in the south-east of Borneo. In Australia platinum ore has been found near Fifield (near Condobclin), New South Wales; whilst in New Zealand it occurs in sands and gravels in the Thames gold-field, the Takaka River and the Gorge River flowing into Awarua Bay. Many localities in North America have yielded platinum, generally in beach sands or in auriferous alluvia, and in some cases the deposits are of commercial importance. The metal is found in Alaska, British Columbia, Oregon (Douglas county) and California (Butte county, Trinity county, Del Norte ccunty). It has been recorded also from the states of New York and North Carolina. In a nickeliferous sulphide ore worked at Sudbury, in Ontario, platinum has been discovered in the form of an arsenide (Pt As 2), which has been called sperrylite by H. L. Wells, who analysed it in 1889, and named it after F. L. Sperry, of Sudbury. It belongs to the pyrites group, and is interesting as being the only known mineral in which platinum occurs in combination except as alloy.

Native platinum seems to be a mineral of rather wide distri- bution, but in very sparse quantity. The sands of the Rhine, derived from Alpine rocks, have been found to contain plati- num in the proportion of 0-0004%. It has also been found in the sands of the Ivalo River in 'Lapland; it is recorded from Roros in Norway; and it was detected by W. Mallet in some of the gold-sands of the streams in Co. Wicklow, Ireland.

The table shows the official amount (in ounces Troy) of platinum produced in Russia for certain years, the actual amounts are much larger: —

Year.

Amount.

Year.

Amount.

1890

116,640

1904

161,950

1895

I4L757

1905

167.950

1900

163,060

1906

185,492

1901

203,257

1 1907

172,758

1902

197,024

1908

157.005

1903

192,976

(Rothwell's Mineral Industry, 1908.) Platinum is largely used for the manufacture of chemical apparatus, incandescent lamps, thermo-couples; in the manu- facture of sulphuric acid by the contact process, in photography, and in jewelry. The price of the metal has risen considerably, not so much on account of the restricted supply, but chiefly because the sources of supply have passed into the hands of a few individuals. The following data show the fluctuations in 'he average price of platinum ingot per once Troy: — – £ a. d. £ s. d.

1874-1898: 1 5 2 to 2 2 o 1 899-1905: 3 13 6 „ 4 10 4

1906: 4 15 2 ,, 7 19 8 1907: 700,, 6 18 8

1908: 526 (average) price. Platinum may be extracted from its ore by both wet and dry processes. In the latter method, due to H. Sainte-Claire-Deville and H. J. Debray, the ore is smelted in a furnace constructed of two blocks of lime, and the metallic button so obtained is | corresponding to the formula PtO

re-melted in a reverberatory furnace with galena or litharge, the lead platinum alloy being then cupeled, and the platinum fused into an ingot by re-smelting in a lime furnace (see Dingler's Polytech. Journ. 1859, 153, p. 38; 1859, 154, p. 383, 1862, 165, p. 205). The platinum so obtained is not pure. In Wollaston's wet method the ore is dissolved in aqua regia, the osmiridium, ruthenium and rhodium being left unattacked, and the platinum precipitated as ammonium platinochloride by adding ammonium chloride in the presence of an excess of acid. The double chloride is then washed, dried and ignited, leaving a residue of metal. G. Matthey (Chem. News, 1879, 39. P- J 75) obtains pure platinum from the commercial metal by fusing the latter with a large excess of lead. The lead alloy is then treated with a dilute nitric acid and the insoluble portion taken up in dilute aqua regia.. From the solution so obtained lead is precipitated as sulphate, and platinum and rhodium as double ammonium chlorides. The rhodium ammonium chloride is converted by fusing with potassium and ammonium bisulphates into rhodium sulphate, which is then removed by extraction with water, when a residue of finely divided

Clatinum remains. The German firm of Heraus (in Hanover) eat the raw ore with aqua regia and water under pressure, evaporate the solution to dryness, and heat the residue to 125 ° C. A clear aqueous extract of the residue is then acidified with hydro- chloric acid and precipitated with ammonium chloride. The double chloride is ignited and the finely divided platinum so obtained is fused in the oxyhydrogen blowpipe.

Platinum is a greyish-white metal which is exceedingly malleable and ductile; the addition of a small quantity of iridium hardens it and diminishes its ductility very considerably. Its specific gravity is 20-85 t0 21 'l 1 i ar >d its mean specific heat from o to 100° C. is 0-0323 (J. Violle, Comptes renins, 1877, 85, p. 543); W. P. White (Amer. Journ. Sci., 1909, iv. 28, p. 334) gives the general formula S t = o-o3i98+3-4Xio -6 /. S t being the specific heat at l°C. Its temperature of fusion is in the neighbourhood of 1700 to i8oo°C, various intermediate values having been obtained by different investigators (see J. A. Harker, Chem. News, 1905, 91, p. 262; C. Fery and C. Cheneveau, Comptes rendus, 1909, 148, p. 401 ; also C. W. Waidner and G. H. Burgess, ibid., 1909, 148, p. 1177). Its latent heat of fusion is 27-18 calories (Violle, loc. cit). The metal has been obtained in the crystalline condition by distillation in the electric furnace, or by decomposing its fluoride at a red heat (H. Moissan). Platinum, like palladium, absorbs large quantities of hydrogen and other gases, the occluded gas then becoming more "active"; for this reason platinum is used largely as a catalytic agent. Several forms of platinum, other than the massive form, may be obtained. Spongy platinum is produced when ammonium platinochloride is ignited; platinum black on the reduction of acid solutions of platinum salts; and colloidal platinum by passing an electric arc between two platinum wires under the surface of pure water (G. Bredig, Zeit. phys. Chem., 1901, 37, pp. 1, 323). Platinum is practically unoxidizable; it combines directly with phosphorus, arsenic, antimony, silicon, boron, and fluorine, and with almost all other metals. It is practically unattacked by all acids, dissolving only in aqua regia or in mixtures which generate chlorine. When fused with alkaline hydroxides in the presence of air it forms platinates. It is readily attacked by fused nitrates, and by potassium cyanide and ferrocyanide. All the platinum compounds when heated strongly decompose, a"nd leave a residue of the metal. Of platinum salts, in the true sense of the word, none exist; there is no carbonate, nitrate, sulphate, &c; halide salts, however, are known, but are obtained in an indirect manner.

Platinum monoxide, PtO, obtained by heating the corresponding hydrate, is a dark-coloured powder which is easily reduced to the metal (L. Wohler, Ber., 1903, 36, p. 3475). The hydrated form, PtO-2HaO, is obtained impure by precipitating the dichloride with caustic soda, or by adding caustic soda to a boiling solution of potassium platinous chloride, K 2 PtCl 4 , the precipitate being rapidly washed and dried in vacuo (L. Wohler, Zeit. anorg. Chem., 1904, 40, p. 423). It is a black powder; when freshly prepared it is soluble in concentrated acids, but when dried it is insoluble. It is an acidic oxide, the dioxide being both acidic and basic. It behaves as a strong oxidizing and reducing agent. C. Engler and L. Wohler {Zeit. anorg. Chem., 1901, 29, p. 1) have shown that platinum black, containing

occluded oxygen, is soluble in dilute hydro- chloric acid and also liberates iodine from potassium iodide, and that the ratio between the amount of platinum dissolved and the amount of oxygen occluded agrees with the formation of a compound

Platinum dioxide (platinic

oxide), PtOiˆHiO, is obtained by adding an excess of caustic soda solution to a boiling solution of chlorplatinic acid, the hot solution being diluted and neutralized with acetic acid. It loses its water of hydration when heated, finally decomposing into platinum and oxygen. When freshly prepared it is soluble in dilute acids. Other hydrated forms of composition, Pt0 2 -3H 2 and Pt0 2 2H 2 0, have been described (E. Prost, Bull. soc. chim., 1886, 46, p. 156; H. Topsoe, Ber., 1870, 3, p. 462). The tetrahydrate may be considered as an acid, H 2 Pt(OHj6, for salts are known (namely the platinates) corre sponding to it, those of the alkali metals being soluble in water, and possessing an alkaline reaction (M. Blondel, Ann. chim. phys., 1905 [viii.], 6, p. 81). A similar set of chlorine-holding compounds is also known, the chlorine replacing one or more hydroxyl groups and giving rise to complexes of composition, HJPtCWOH)], H 2 [PtCU(OH) 2], H £ [PtCl 2 (OH)J and H 2 [PtCl(OH) 6]. The platinic salts (derived from Pt0 2) are yellow or brown solids, which are readily reduced to the metallic condition. They give with sulphu- retted hydrogen a dark brown precipitate, soluble in excess of ammonium sulphide. Potassium iodide gives a brown solution with gradual formation of a precipitate. They form characteristic precipitates with potassium and ammonium chlorides. The platinous salts are brown or colourless solids which, with sulphu- retted hydrogen, give a dark brown precipitate of platinum sulphide, and with potassium iodide a gradual precipitation of platinic iodide, Ptl 2 . Platinum trioxide, Pt0 3 , is obtained as K 2 0-3Pt03, by electrolysing a solution of platinic hydroxide in potash, this compound with acetic acid giving the oxide as a brown, easily decomposable powder (L. Wohbr and F. Martin, Ber., 1909, 42, P-3326).

•Platinum bichloride, PtCl 2 , is obtained by heating chlorplatinic acid to 300-350 C. (j. J. Berzelius), or, mixed with more or less platinic chloride, by passing chlorine over spongy platinum at a temperature of 250 C. (P. Schutzenberger, Comptes rendus, 1870, 70, pp. 1 134, 1287). It may also be obtained by the decomposition of the compound HCl-PtCl 2 -2H 2 (see below) at 100 C, this method giving a very pure product (L. F. Nilson, Journ. prak. Chem., 1877 (2), 15, p. 260). It is a brown or greyish green*

coloured solid, which is soluble in hydrochloric acid. It decomposes into its constituent elements when heated. It combines with many chlorides to form characteristic double salts. Platinum bichloride combines with carbon monoxide, yielding compounds of composition, PtCl 2 .CO, PtCl 2 -2CO, 2PtCl 2 3CO (P. Schutzenberger, Ann. chim. phys., 1870 (4), 21, p. 350). Hydrogen platinochloride or chlorplatinous acid, H 2 PtCU, is only known in solution, and as such is obtained when platinum bichloride is dissolved in hydrochloric acid, or by decom posing the barium salt with sulphuric acid, or the silver salt with hydrochloric acid. Its salts, the platinochlorides or chlorplatinites, are obtained by reducing the chlorplatinates or directly from the acid itself. They are mostly soluble in water giving red solutions. They are readily oxidized, and nascent hydrogen reduces them to metallic platinum. Potassium platinochloride or chlorplatinite, K 2 PtClj, is prepared by reducing hydrogen platinichloride with sulphur dioxide, or potassium platinichloride with potassium oxalate in the presence of iridium (Klason, Ber., 1904, 37, p. 1360); or by adding potassium chloride to a solution of platinum bichloride in hydrochloric acid. It crystallizes in dark red prisms, is readily soluble in water, but insoluble in alcohol. The solution of the free acid when concentrated in vacuo leaves a residue of HCl.PtCl2.2H2O. When the free acid is reduced by alcohol, or when ethylene is passed into a solution of platinum bichloride in hydrochloric acid, PtCl 2 C 2 H4 is obtained as a brown amorphous mass which decomposes when heated. When the bichloride is heated in a current of carbon monoxide, a sublimate of platino- monocarbonyl dichloride, PtCl 2 CO, dicarbonyl dichloride,PtCl2(CO) 2 , and tricarbonyl tetrachloride, Pt 2 Cl4(CO)3, is obtained. The first forms bright yellow needles and the second white acicular crystals. The bichloride also combines with phosgene to form PtCl 2 .2COCl 2 . Platinic chloride, PtCU, is obtained when chlorplatinic acid is heated in a current of dry hydrochloric acid gas to 165° C. (W. Pullinger, Journ. Chem. Soc, 1892, 61, p. 422) or in a current of dry chlorine at 275 C. (A. Rosenheim and W. Lowenstamm, Zeit. anorg. Chem., 1903, 37, p. 394). It forms a reddish brown crystalline mass which is very hygroscopic. Numerous hydrates are known. The chloride is characterized by the readiness with which it forms double salts with the metallic chlorides and with the hydrochlorides of most organic bases. Chlorplatinic acid, H2PtCl 6 6H 2 0, is obtained by dissolving platinum in aqua regia containing an excess of hydro chloric acid, or by the action of chlorine (dissolved in hydrochloric acid) on platinum sponge. It crystallizes in needles, which are very deliquescent and dissolve easily in water. It melts in its own water of crystallization at 70 C, and when heated in vacuo to 100° C. it leaves a residue of composition HCl.PtCU.2H2O. The potassium and ammonium salts and the salts it forms with organic bases are char- acterized by their exceedingly small solubility in water. The aqueous solution of the acid reddens litmus and decomposes the metallic

car- bonates. Its salts may be prepared by the direct action of the acid on the metallic hydroxides or carbonates, and are usually of an orange or yellow colour and are mostly soluble in water. Potassium chlorplatinate, K 2 PtCl 6 , is obtained, in the form of a yellow crystal- line precipitate, when a concentrated solution of a potassium salt

is added to a solution of chlorplatinic acid. It crystallizes in octahedra which are scarcely soluble in water, and practically insoluble in absolute alcohol. It decomposes at a red heat into platinum, chlorine and potassium chloride. The corresponding sodium salt, Na2PtCl6.6H 2 0, is much more soluble in water and in alcohol. The ammonium salt, (NHjˆPtCls, resembles the potas- sium salt in its solubility in water and in alcohol. Corresponding bromo- and iodo- compounds are known. Platinum bifluoride and tetrafluoride, PtF 2 and PtF, were obtained simultaneously by H. Moissan (Ann. chim. phys., 1894 (6), 24, p. 282) by the action of fluorine on platinum at 500-600 C. T+iey may be separated by taking advantage of their different solubilities in water.*

Platinum monosulphid'e, PtS, is obtained by the direct union of platinum and sulphur ; by heating ammonium chlorplatinate with sul phur; or by the action 01 sulphuretted hydrogen on the chlorplati- nites. It is a dark coloured powder which is almost insoluble in aqua regia. It decomposes when heated strongly leaving a residue of metallic platinum, the same reduction taking place at com- paratively low temperatures when it is heated in a current of hydrogen. Platinic sulphide, PtS2, is formed when the chlor- platinates are heated with sulphuretted hydrogen to 6o° C. The precipitate must be rapidly washed and dried in vacuo, since it oxidizes rapidly on exposure to air. It is a black powder, which when heated strongly in air decomposes and leaves a residue of platinum, but if heated in absence of air leaves a residue of the monosulphide. It is scarcely affected by acids and is little soluble in solutions of the alkaline sulphides. Sulphides of composition Pt 2 S 3 and PtsSe have been described (R. Schneider, Pogg. Ann., 1869, 138, p. 604; 1873, 148, P- 633; 1873, 149, p. 381). A salt of composition, Pt(OH) 4 .H 2 S0 4 .H 2 0, has been prepared by M. Blondel (Ann. chim. phys., 1905, (8), 6, p. 81) by the solution of the hydrate H 2 Pt(OH) 6 , i.e. Pt(J2-4H 2 0, in dilute sulphuric acid (1:1) at 0° C. On the addition of cold concentrated sulphuric acid to the solution so obtained, the above salt is precipitated in the form of minute needles, which readily decompose in the presence of water. A platinum sulphate, Pt(S04) 2 .2H 2 0, has been obtained by L. Stuchlik (Ber., 1904, 37, p. 2913) by the action of sulphuric acid (s.g. 1-84) on platinum under the influence of an alternating current. A crystalline precipitate is obtained, which is soluble in water and is very hygroscopic.

The platinonitrites of composition M 2 Pt(N0 2)4 are mostly obtained by double decomposition from the potassium salt, which is formed by adding a warm aqueous solution of potassium nitrite to one of potassium chlorplatinate. They are mostly colourless or pale yellow solids which are more or less soluble in water (L. F. Nilson, Ber., 1876, 9, p. 1722). The corresponding platino-oxalates M 2 Pt(C 2 04) 2 were first obtained by J. W. Dobereiner (Pogg. Ann., 1833, 104, p. 180) and their constitution was determined by H. G. Soderbaum (Ber., 1888, 21, p. 567 R; Zeit. anorg. Chem., 1894, 6, p. 45). The sodium salt, from which the others are obtained by double decomposition, is formed by adding a warm solution of oxalic acid to sodium platinate. On recrystallization from alkaline solutions the salts are obtained in yellow or orange crystals (see M. Vezes, Bull. soc. chim., 1898 (3), 19, p. 875). These salts are scarcely soluble in water and decompose explosively when suddenly heated. The free acid is obtained by decomposing the silver salt with hydrochloric acid, the indigo blue solution so obtained on concentration in vacuo yielding a red crystalline mass, which dis- solves in water with an indigo blue colour, changing to yellow on dilution.

Platinum cyanide, Pt(CN) 2 , is formed by the addition of mercuric cyanide to a solution of a chlorplatinite, or by the decomposition of mercury or ammonium platinocyanide by heat. It is an amor- phous powder which is insoluble in water, acids or alkalis, but is soluble in a solution of hydrocyanic acid. It burns when heated. The platinocyanides are derived from the acid H 2 Pt(CN)e, which is formed by the decomposition of the mercury or copper- salt with sulphuretted hydrogen, or of the barium salt with sulphuric acid. It crystallizes from water in cinnabar-red prisms which contain five molecules of water of crystallization; in the anhydrous condition it is of a yellowish green colour. It decom- poses carbonates. Its salts, which are characterized by the property of polychroism, may be prepared by the usual methods, or bv the solution of metallic platinum in the alkaline cyanides or alkaline earth cyanides under the influence of an alternating current (A. Brochet and J. Petit, Ann. chim. phys., 1904 (8), 3, p. 460; M. Berthelot, Comptes rendus, 1904, 138, p. 1 130). Those of the alkali and alkaline earth metals are soluble in water. Many combine with the halogen elements to form complex salts of the type M 2 Pt(CN) 4 .Cl 2 . x H 2 0. By the decomposition of the barium salts of this tvpe, addition products of the free acid, of composition H 2 Pt(CN) 4 .Cl2.4H 2 and H 2 Pt(CN)4.Br 2 , have been obtained (C. Blomstrand, Ber., 1869, 2, p. 202). They are deliquescent solids which are exceedingly soluble in water. Potassium platinocyanide, K 2 Pt(CN)j.3H 2 0, is obtained by dissolving platinum bichloride in potassium cyanide; by heating potassium ferrocyanide with spongy platinum; or by heating ammonium chlorplatinate with potassium

cyanide. It crystallizes in needles which effloresce readily. The dry salt is exceedingly hygroscopic and is very soluble in water. When boiled wich aqua regia it forms the chlorine addition

product, $K_2Pt(CN)_4.Cl_2.2H_2O$. It combines directly with iodine. Barium platinocyanide, $BaPt(CN)_4.4H_2O$, is prepared by the action of baryta water on the copper salt; by dissolving platinum in barium cyanide under the influence of an alternating current; by the addition of barium cyanide to platinum bichloride; or by the simultaneous action of hydrocyanic and sulphurous acids on a mixture of baryta and chlorplatinic acid (P. Bergsoe, Zeit. anorg. Chem., 1899, 19, p. 318). It crystallizes in yellow monoclinic prisms and is soluble in hot water. It is employed for the manu- facture of fluorescent screens used for the detection of X-rays.

The platinum salts combine with ammonia to form numerous derivatives which can be considered as salts of characteristic bases. The first compound of this type was isolated in 1828 by Magnus, who obtained a green salt by the action of ammonia on platinum bichloride. Two series of these salts are known, one in which the metal corresponds to bivalent platinum, the other in which it corresponds to tetravalent platinum. The general formulae of the groups in each series are shown below, the method of classi- fication being that due to Werner.

Divalent (platinous) Salts.

Tetravalent (platinic) Salts.

Tetrammine salts$[Pt(NH_3)_4]X_2$ Triammine „ $[Pt(NH_3)_3X]X$ Diammine „ $[Pt(NH_3)_2X_2]$ Monammine „ $[Pt(NH_3)X_3]R$

Hexammine salts$[Pt(NH_3)_6]X_4$ Tetrammine „ $[Pt(NH_3)_4X_2]X_2$ Triammine „ $[Pt(NH_3)_3X_3]X$ Diammine „ $[Pt(NH_3)_2X_4]$ Monammine ,, $[Pt(NH_3)X_6]R$

In the above table X represents a monovalent acid radical and R a monovalent basic radical. For methods of preparation of salts of these series see P. T. Cleve, Bull. soc. chim. 1867 et seq.; S. M. Jorgensen, Journ. prak. Chem. 1877 et seq. ; C. W. Blomstrand, Ber. 1871 et seq.; and A. Werner, Zeit. anorg. Chem. 1893 et seq. A very complete account of the method of classification and the general theory of the metal ammonia compounds is given by A. Werner, Ber. 1907, 40, p. 15.

Platinum also forms a series of complex phosphorus compounds. At 250° finely divided platinum and phosphorus pentachloride combine to form PtCl 2 .PCl 3 , as dark claret-coloured crystals. With chlorine this substance gives PtCl 3 .PCU as a yellow powder, and with water it yields phosphmplatinic acid, PtCl2.P(OH) 3 , which may be obtained as orange-red deliquescent prisms.

The atomic weight of platinum was determined by K. Seubert (Ann. 1888, 207, p. 1; Ber. 1888, 21, p. 2179) by analyses of ammonium and potassium platinochlorides; the value 194-86 being obtained.

PLATO, the great Athenian philosopher, was born in 427 B.C., and lived to the age of eighty. His literary activity may be roughly said to have extended over the first half of the 4th century b.c. His father's name was Ariston, said to have been a descendant of Codrus; and his mother's family, which claimed descent from Solon, included Critias, one of the thirty tyrants, and other well-known Athenians of the early 4th cen- tury B.C. That throughout his early manhood he was the devoted friend of Socrates, that in middle life he taught those who resorted to him in the grove named Academus, near the Cephisus, and there founded the first great philosophical school, that (with alleged interruptions) be continued to pre- side over the Academy until his death, are matters of estab- lished fact. It is said by Aristotle that he was at one time intimate with Cratylus the Heraclitean. Beyond this we have no authentic record of his outward life. That his name was at first Aristocles, and was changed to Plato because of the breadth of his shoulders or of his style or of his forehead, that he wrestled well, 1 that he wrote poetry 2 which he burnt on hearing Socrates, fought in three great battles, 3 that he had a thin voice, that (as is told of other Greek philosophers) he travelled to Cyrene and conversed with priests in Egypt, are statements of Diogenes Laertius, which rest on more or less uncertain tradi- tion. The express assertion — which this author attributes to Hermodorus — that after the death of Socrates Plato and other Socratics took refuge with Euclides in Megara, has a somewhat stronger claim to authenticity. But the fact cannot be regarded as certain, still less the elaborate inferences which have been drawn from it. The romantic legend of Plato's journeys to Sicily, and of his relations there with the younger Dionysius and the princely but unfortunate Dion, had obtained some degree

1 See Laws, vii. 814 c.

2 Some epigrams in the Anthology are attributed to him.

3 This is told on the authority of Aristoxenus. But Plato cannot have been at Delium.

of consistency before the age of Cicero, and at an unknown but probably early time was worked up into the so-called Epistles of Plato, now all but universally discredited. Nor is there sufficient ground for supposing, as some have done, that an authentic tradition is perceptible behind the myth.

The later years of the Peloponnesian War witnessed much mental disturbance and restlessness at Athens. More than at any time since the age of Cleisthenes, the city was divided, and a man's foes were often men

of his own tribe or deme. Contention in the law- courts and rivalries in the assembly had for many men a more absorbing interest than questions of peace and war. Hereditary- traditions had relaxed their hold, and political principles were not yet formulated. Yet there was not less scope on this account for personal ambition, while the progress of democracy, the necessity of conciliating the people, and the apportionment of public offices by lot had a distracting and, to reflecting persons, often a discouraging effect. For those amongst \fhom Plato was brought up this effect was aggravated by the sequel of the oligarchical revolution, while, on the other hand, for some years after the restoration of the democracy, a new stimulus had been imparted, which, though of short duration, was universally felt.

These events appear in two ways to have encouraged the diffusion of ideas. The ambitious seem to have welcomed them as a means of influence, while those who turned from public life were the more stimulated to speculative disputation. However this may have been, it is manifest that before the beginning of the 4th century B.C. the intellectual atmosphere was already charged with a new force, which although essentially one may be differently described, according to the mode of its development, as (1) rhetorical and (2) theoretical and " sophistical." This last word indicates the channel through which the current influences were mostly derived. A new want, in the shape both of inter-, ested and of disinterested curiosity, had insensibly created a new profession. Men of various fatherlands, some native Athenians, but more from other parts of Hellas, 4 had set themselves to supplement the deficiencies of ordinary education, and to train men for the requirements of civic life. More or less consciously they based their teachings on the philosophical dogmas of an earlier time, when the speculations of Xenophanes, Heraclitus or Parmenides had interested only a few " wise men." Those great thoughts were now to be expounded, so that " even cobblers might understand." 5 The self-appointed teachers found a rich field and abundant harvest among the wealthier youth, to the chagrin of the old-fashioned Athenian, who sighed with Aristophanes for the good old days when men knew less and listened to their elders and

obeyed the customs of their fathers. And such distrust was not wholly unfounded. For, amidst much that was graceful and improving, these novel questionings had an influence that, besides being unsettling, was aimless and unreal. A later criticism may discern in them the two great tendencies of naturalism and humanism. But it may be doubted if the sophist was himself aware of the direction of his own thoughts. For, although Prodicus or Hippias could debate a thesis and moralize with effect, they do not appear to have been capable of speculative reasoning. What passed for such was often either verbal quibbling or the pushing to an extreme of some isolated abstract notion. That prudens quaestio which is dimidium scientiae had not yet been put. And yet the hour for putting it concerning human life was fully come. For the sea on which men were drifting was profoundly troubled, and would not sink back into its former calm. Conservative reaction was not less hopeless than the dreams of theorists were mischievously wild. In random talk, with gay, irresponsible energy, the youth were debating problems which have exercised great minds in Europe through all after time.

Men's thoughts bad begun to be thus disturbed and eager when Socrates (q.v.) arose. To understand him is the most necessary preliminary to the study of Plato. There is no reason to doubt

4 It had been the policy of Pericles to invite distinguished foreigners to Athens.

5 Theaet. 180 D.

the general truth of the assertion, which Plato attributes to him in the Apologia, that he felt a divine vocation to examine Socrates himself by questioning other men. He was really doing for Athenians, whether they would or no, what the sophist professed to do for his adherents, and what such men as Protagoras and Prodicus had actually done in part. One obvious difference was that he would take no fee. But there was another and more deep-lying difference, which dis- tinguished him not only from the contemporary sophists but from the thinkers of the previous age. This was the Socratic attitude of inquiry. The sceptical movement had confused men's notions as to the value of ethical ideas. 1 If " right is one thing in Athens and another in Sparta, why strive to follow right rather than expediency? The laws put restraint on nature, which is. prior to them. Then why submit to law? " And the ingenuities of rhetoric had stirred much unmeaning disputation. Every case seemed capable of being argued in

opposite ways. Even on the great question of the ultimate constitution of things, the conflicting theories of absolute immutability and eternal change appeared to be equally irrefragable and equally untenable. Men's minds had been confused by contradictory voices — one crying " All is motion," another " All is rest " ; one " The absolute is unattainable," another " The relative alone is real " ; some upholding a vague sentiment of traditional right, while some declared for arbitrary convention and some for the law " of nature." Some held that virtue was spontaneous, some that it was due to training, and some paradoxically denied that either vice or falsehood had any meaning. The faith of Socrates, whether instinctive or inspired, remained untroubled by these jarring tones. He did not ask " Is virtue a reality? " or " Is goodness a delusion? " But, with perfect confidence that there was an answer, he asked himself and others " What is it?" (rt tori); or, more particularly, as Xenophon testifies, "What is a state? What is a statesman? What is just? What is unjust? What is government? What is it to be a ruler of men ? " In this form of question, however simple, the originality of Socrates is typified; and by means of it he laid the first stone, not only of the fabric of ethical philosophy, but of scientific method, at least in ethics, logic and psychology. Socrates never doubted that if men once knew what was best, they would also do it. They erred, he thought, from not seeing the good, and not because they would not follow it if seen. This is expressed in the Socratic dicta: " Vice is ignorance," " Virtue is knowledge." This lifelong work of Socrates, in which the germs of ethics, psychology and logic were contained, was idealized, developed, dramatized — first embodied and then extended beyond its original scope — in the writings of Plato, which may be described as the literary outcome of the profound impression made by Socrates upon his greatest follower. These writings (in pursuance of the importance given by Socrates to conversation) are all cast in the form of imaginary dialogue. But in those which are presumably the latest in order of compo- sition this imaginative form interferes but little with the direct expression of the philosopher's own thoughts. The many- coloured veil at first inseparable from the features is gradually worn thinner, and at last becomes almost imperceptible.

Plato's philosophy, as embodied in his dialogues, has at once an intellectual and a mystical aspect; and both are dominated Plato's by a pervading ethical motive. In obeying the Dialogues. Socratic impulse, his speculative genius absorbed and harmonized the various conceptions which were present in con- temporary thought, bringing them out of their dogmatic isolation into living correlation with one another, and with the life and experience of mankind. His poetical feeling and imagination, taking advantage of Pythagorean and Orphic suggestions, surrounded his abstract reasonings with a halo of mythology which made them more fascinating, but also more difficult for the prosaic intellect to comprehend. Convinced

through the conversations of Socrates that truth and good exist and that they are inseparable, persuaded of the unity of virtue and of its dependence upon knowledge, he set forth upon a course of inquiry, 1 See Caird, Hegel, p. 168.

in which he could not rest until the discrepancies of ordinary thinking were not only exposed but accounted for, and resolved in relation to a comprehensive theory. In this " pathway towards reality," from the consideration of particular virtues he passed to the contemplation of virtue in general, and thence to the nature of universals, and to the unity of knowledge and being. Rising still higher on the road of generalization, he dis- cussed the problem of unity and diversity, the one and the many. But in these lofty speculations the facts of human experience were not lost to view. The one, the good, the true, is otherwise regarded by him as the mora] ideal, and this is examined as realized both in the individual and in the state. Thus ethical and political speculations are combined. And as the method of inquiry is developed, the leading principles both of logic and of psychology become progressively more distinct and clear. Notwithstanding his high estimate of mathematical principles, to him the type of exactness and certitude, Plato contributed little directly to physical science. Though he speaks with sympathy and respect of Hippocrates, he had no vocation for the patient inductive observation cf natural processes, through which the Coan physicians, though they obtained few lasting results, yet founded a branch of science that was destined to be beneficently fruitful. And he turned scornfully aside from the Atomists, Leucippus and Democritus, whose first principle, the basis of so much in modern physics, appeared to him to be tainted with materialism. Yet his discursive thought, as in later years he held high intercourse with Archytas and other contemporary minds, could not fail, unlike his master's, to include a theory of the Cosmos in its purview. In this regard, however, the poet-philosopher brought imagination to the aid of reason, thus creating a new mythology, of which the Timaeus is the most conspicuous example.

Amidst great diversity, both of subject and of treatment, Plato's dialogues are pervaded by two dominant motives, a passion for human improvement and a persistent faith in the power and supremacy of mind. What is commonly known as his doctrine of Ideas is only one phase in a continuous progress towards the realization of a system of philosophy in which the supreme factor is reason guiding will. But the objectivity, which from the first was characteristic of all Greek thinking, and his own power of poetic presentation, obscured for a time, even for Plato himself, the essential spirituality of his conceptions, and at one time even threatened to arrest them at a stage in which the universal was divorced from the particular, the permanent from the transient, being from becoming, and in which the first princi- ples of reality were isolated from one another as well as from

the actual world. Gradually the veil was lifted, and the relation between the senses and the intellect, phenomena and general laws, the active and the contemplative powers, came to be more clearly conceived. The true nature of abstraction and general- ization, and of predication and inference, began to be discerned, and speculation was verified through experience. The ideas were seen as categories, or forms of thought, under which the infinite variety of natural processes might be comprised. And thus the dialogues present, as in a series of dissolving views, a sort of model or compendium of the history of philosophy. Plato's system is nowhere distinctly formulated, nor are the views put forward in his dialogues always consistent with each other, but much especially of his later thought is systematized, and as it were crystallized in the treatises of Aristotle; by whom the point of view which Plato had approached, but not finally attained, was made the starting-point for more precise metaphysical determinations and carried into concrete theories having the stamp of a more rigid logical method. The departments of ethics and politics, of dialectic and of psychology, of physics and meta- physics, thus came to be more clearly distinguished, but some- thing was lost of the unity and intensity of spiritual insight which had vitalized these various elements, and fused them in a dynamic harmony.

The student of philosophy, whatever may be the modern system to which he is most inclined, sensational, intuitional, conceptional, transcendental, will find his account in returning

to this well-spring of European thought, in which all previous movements are absorbed, and from which all subsequent lines of reflection may be said to diverge. As was observed by Jowett (St Paul, 1855), " the germs of all ideas, even of most Christian ones, are to be found in Plato."

Two great forces are persistent in Plato : the love of truth and zeal for human improvement. In the period culminating with Historical the Republic, these two motives, the speculative and influence the practical, are combined in one harmonious of Plato. W orking. In the succeeding period, without ex- cluding one another, they operate with alternate intensity. In the varied outcome of his long literary career, the metaphysical " doctrine of ideas " which has been associated with Plato's name underwent many important changes. But pervading all these there is the same constant belief in the supremacy of reason and the identity of truth and good. From that abiding root spring forth a multitude of thoughts concerning the mind and human things — turning chiefly on the principles of psycho- logy,

education and political reform — thoughts which, although unverified, and often needing correction from experience, still constitute Plato the most fruitful of philosophical writers. While general ideas are powerful for good or ill, while abstractions are necessary to science, while mankind are apt to crave after perfection, and ideals, either in art or life, have an acknowledged value, so long the renown of Plato will continue. " All philosophic truth is Plato rightly divined; all philosophic error is Plato misunderstood " — is the verdict of one of the keenest of modern metaphysicians. 1

Plato's followers, however, have seldom kept the proportions of his teaching. The diverse elements of his doctrine have survived the spirit that informed them. The pythagorizing mysticism of the Timaeus has been more prized than the subtle and clear thinking of the Theaetetus. Logical inquiries have been hardened into a barren ontology. Semi-mythical statements have been construed literally and mystic fancies perpetuated without the genuine thought which underlay them. A part (and not the essential part) of his philosophy has been treated as the whole. But the influence of Plato has extended far beyond the limits of the Platonic schools. The debt of Aristotle to his master has never yet been fully estimated. Zeno, Chrysippus, Epicurus borrowed from Plato more than they knew. The moral ideal of Plutarch and that of the Roman Stoics, which have both so deeply affected the modern world, could not have existed without him. Neopythagoreenism was really a crude Neoplatonism. And the Sceptics availed themselves of weapons either forged by Plato or borrowed by him from the Sophists. A wholly distinct line of infiltration is suggested by the mention of Philo and the Alexandrian school (cf. section in Arabian Philosophy, ii. 26bc, gth edition), and of Clement and Origen, while Gnostic heresies and even Talmudic mysticism betray perversions of the same influence. The effect of Hellenic thought on Christian theology and on the life of Christendom is a subject for a volume, and has been pointed out in part by E. Zeller and others (cf. Neo- platonism). Yet when Plotinus in the 3rd century (after hearing Ammonius), amidst the revival of religious paganism, founded a new spiritualistic philosophy upon the study of Plato and Aristotle combined, this return to the fountain head had all the effect of novelty. And for more than two centuries, from Plotinus to Proclus, the great effort to base life anew on the Platonic wisdom was continued. But it was rather the ghost than the spirit of Plato that was so " unsphered." Instead of striving to reform the world, the Neoplatonist sought after a retired and cloistered virtue. Instead of vitalizing science with fresh thought, he lost hold of all reality in the contemplation of infinite unity. He had skill in dealing with abstractions, but laid a feeble hold upon the actual world.

" Hermes Trismegistus " and " Dionysius Areopagita " are names that mark

the continuation of this influence into the middle ages. The pseudo-Dionysius was translated by Erigena in the gth century.

Two more "Platonic" revivals have to be recorded— at "•Ferrier, Institutes of Metaphysics, p. 169 (§ i. prop. vi. § 12).

Florence in the 15th and at Cambridge in the 17th century. Both were enthusiastic and both uncritical. The translation of the dialogues into Latin by Marsilio Ficino was the most lasting effect of the former movement, which was tinged with the unscientific ardour of the Renaissance. The preference still accorded to the Timaeus is a fair indication of the tendency to bring fumum ex fulgore which probably marred the discussions of the Florentine Academy concerning the " chief good." The new humanism had also a sentimental cast, which was alien from Plato. Yet the effect of this spirit on art and literature was very great, and may be clearly traced not only in Italian but in English poetry.

The " Cambridge Platonists " have been described by Principal Tulloch in his important work on Rational Theology in England in the 17th century, and again by Professor J. A. Stewart in the concluding chapter of his volume on the Myths of Plato. Their views were mainly due to a reaction from the philosophy of Hobbes, and were at first suggested as much by Plotinus as by Plato. It is curious to find that, just as Socrates and Ammonius (the teacher of Plotinus) left no writings, so Whichcote, the founder of this school, worked chiefly through conversation and preaching. His pupils exercised a considerable influence for good, especially on English theology; and in aspiration if not in thought they derived something from Plato, but they seem to have been incapable of separating his meaning from that of his interpreters, and Cudworth, their most consistent writer, was at once more systematic and less scientific than the Athenian philosopher. The translations of Sydenham and Taylor in the 1 8th century and the beginning of the 19th are proofs of the continued influence of Platonism in England.

The critical study of- Plato begins from Schleiermacher, who did good work as an interpreter, and tried to arrange the dialogues in the order of composition. His attempt, which, critical like many efforts of constructive criticism, went far History. beyond possibility, was vitiated by the ground-fallacy of sup- posing that Plato had from the first a complete system in his mind which he partially and gradually revealed in writing. At a considerably later time Karl Friedrich Hermann, to whom all students of Plato are indebted, renewed the same endeavour on the far more plausible assumption that the dialogues faithfully reflect the growth of Plato's mind. But he also was too sanguine, and exaggerated the possibility of tracing a connexion between the outward events of Plato's life and the progress of his

thoughts. This great question of the order of the dialogues, which has been debated by numberless writers, is one which only admits of an approximate solution. Much confusion, however, has been obviated by the hypothesis (first hinted at by Ueberweg, and since supported by Lewis Campbell and others) that the Sophistes and Politicus, whose genuineness had been called in quescion by Joseph Socher, are really intermediate between the Republic and the Laws. The allocation of these dialogues, not only on grounds of metaphysical criticism, but also on philological and other evidence of a more tangible kind, supplies a point of view from which it becomes possible to trace with confidence the general outlines of Plato's literary and philosophical development. Reflecting at first in various aspects the impressions received from Socrates, he is gradually touched with an inspiration which becomes his own, and which seeks utterance in half-poetical forms. Then first the ethical and by and by the metaphysical interest becomes predominant. And for a while this last is all absorbing, as he confronts the central problems which his own thoughts have raised. But, again, the hard-won acquisitions of this dialectical movement must be fused anew with imagi- nation and applied to fife. And in a final effort to use his intellectual wealth for the subvention of human need the great spirit passed away.

It may not be amiss to recapitulate the steps through which the above position respecting the order of the dialogues has become established. Lovers of Hegel had observed that the point reached in the Sophistes in defining DialogueSi " not being " was dialectically in advance of the Republic. But Kantian interpreters might obviously have said

the same of the Partnenid.es: and Grote as a consistent utilitarian looked upon the Protagoras as the most mature production of Plato's genius. It seemed desirable to find some criterion that was not bound up with philosophical points of view. Dr Thompson, the Master of Trinity College, Cambridge, had vindicated the genuineness of the Sophistes against the objections of Socher, but had not accounted for the peculiarities of language, which that acute critic had perceived. By comparing those peculiarities with the style of the Laws, Plato's latest work, and with that of the Timaeus and Criliqs, which presupposed the Republic, Lewis Campbell argued in 1867 that the Sophistes and Politicus, with the Philebus, were in chronological sequence intermediate between the Republic and the Laws. Thus a further defence of their authenticity was at the same time a long step towards the solution of the problem which Schleier- macher had proposed. Many years afterwards the more detailed stylistic investigations

of W. Dittenberger, Constantin Ritter and others arrived independently at the same conclusion. It was vehemently supported by W. Lutoslawski in his work on Plato's Logic, and has been frankly accepted with ample acknowledgments by the high authority of Dr Theodor Gomperz (see especially the Notes to his Greek Thinkers, iii. 310, 315 of English translation).

The Works or Plato

The Platonic dialogues are not merely the embodiment of the mind of Socrates and of the reflections of Plato. They are the portraiture of the highest intellectual life of Hellas in the time of Plato — a life but distantly related to military and political events, and scarcely interrupted by them. Athens appears as the centre of the excitable Hellenic mind, profoundly stirred by the arrival of great sophists, and keenly alive to the questions of Socrates, although in the pages of Plato, even more than in reality, he only " whispers with a few striplings in a corner." For, in the Platonic grouping, the agora, which was the chief scene of action for the real Socrates, retires into the background, and he is principally'seen consorting with his chosen companions, who are also friends of Plato, and with the acquaintances whom he makes through them. The scene is narrowed (for the Academy was remote from the bustle of resort, and Plato judged the Hellenic world securely from the vantage-ground of partial retirement) — but the figures are distinct and full of life. In reading the dia- logues we not only breathe the most refined intellectual atmo- sphere, but are also present witnesses of the urbanity, the freedom, the playfulness, the generous warmth of the " best society " in Athens. For Plato has a numerous repertory of dramatis personae, who stand in various relations to his chief character — the impetuous Chaerephon, Apollodorus the inseparable weak brother, old Crito the true-hearted, Phaedo the beloved disciple, Simmias and Cebes, who have been with Philolaus, the graceful and ingenuous Phaedrus, the petulant Philebus, Theaetetus of the philosophic nature, who is cut off in his prime, and the incorrigible Alcibiades; then Plato's own kinsmen — Glaucon the irrepressible in politics, in quarrel and in love; Adeimantus, solid and grave; Critias in his phase of amateur philosopher, and not as what he afterwards became; Charmides, not in fiery manhood, but in his first bloom of diffident youth; and many others who appear as mere acquaintances, but have an interest of their own — the. accomplished Agathon, the gay Aristophanes, Eryxi- machus the all- worthy physician; Meno, light of spirit; Callias, entertainer of sophists; Callicles the wilful man of the world; Cephalus the aged father of Lysias; and Nicias the honoured soldier. All these appear, not as some of them do on the page of history, in sanguinary contention or fierce rivalry, but as peaceful Athenians, in momentary contact with Socrates, whose electric touch now benumbs and now exhilarates, and sometimes goads to frenzy of love or anger. Still more distantly related to him, as it were standing in an outer

circle, are the imposing forms of Gorgias and Protagoras, surrounded with the lesser lights of Hippias, Prodicus and Polus. Thrasymachus, Euthydemus, Dionysodorus hang round like comic masks, adding piquancy to the design. The adversaries Anytus and Meletus are allowed

Laches.

to appear for a moment, but soon vanish. The older philosophers, though Socrates turned away from them, also make their entrance on the Platonic stage. Parmenides with his magnificent depth is made to converse with the imaginary Socrates, who is still quite young. A stranger from Elea plays an important part in some later dialogues, and Timaeus the Pythagorean is introduced discoursing of the creation of the world. In these dialogues Socrates is mostly silent; in the Philebus he has lost himself in Plato; and in the twelve books of the Laws, where an unnamed Athenian is the chief speaker, even the Platonic Socrates finally disappears.

Now, in evolving his philosophy from the Socratic basis, Plato works along three main lines — the ethical and political, the metaphysical or scientific, and the mystical. All three are often intimately blended, as in the close of Rep., bk. vi., and even where one element is uppermost the others are not wholly suppressed. But this distinction, like that sometimes made in modern philosophy between the good, the true and the beautiful, is one which, if not unduly pressed, may be usefully borne in mind.

Having noted this once for all, we pass to the more detailed consideration of the several dialogues.

I. Laches, Charmides, Lysis. — In this first group Socrates is dealing tentatively with single ethical notions. The result in each case is a confession of ignorance, but the subject has been so handled as to point the way to more fruitful discussions in the future. And suggestions are casually thrown out which antici- pate some of the most far-reaching of Plato's subsequent contemplations.

The Laches is a vigorous sketch, in which the characters of the soldier, the aged citizen, and the prudent general are well preserved; and Socrates is seen conversing with his elders, although with reference to the treatment of the young. The question raised is the definition of courage; and the humour of the piece consists in showing that three men, all of whom are unquestionably brave, are unable to give an account of bravery, or to decide whether courage is an animal instinct or a mental accomplishment.

Similarly, in the dialogue which bears his name, the temperate Charmides, of whom all testify that (as Aristophanes has it), 1 he " fills up the gracious

mould of modesty," is hopelessly „. . . embarrassed when challenged by the Socratic method to put in words his conception of the modesty or temperance which he possesses, and which, as Socrates assures him, is a priceless gift. The Charmides contains some hints of Platonic notions, such as that of knowledge as self-consciousness, and of virtue as " doing one's own business."

The graceful little dialogue which bears the name of Lysis ends, like the two former, with a confession of failure. Socrates, Lysis and Menexenus are all friends, and think , . highly of friendship, yet after many efforts they are unable to tell " what friendship is." Yet some] of the sug- gestions which are here laid aside are afterwards allowed to reappear. The notion that " what is neither good nor evil loves the good because of the presence of evil " is expanded and emphasized in the Symposium. And the conception of an ideal object of friendship, an avro 4>&ov (though rejected as in the criticism of Aristotle by the characteristic reductio ad infinitum), is destined to have a wider scope in the history of Platonism.

II. Protagoras, Io, Meno. — The previous dialogues have marked the distinction between unconscious and conscious morality, and have also brought out the Socratic tendency to identify virtue with the knowledge of good. Now, the more strongly it is felt that knowledge is inseparable from virtue the more strange and doubtful appears such unconscious excellence as that of Laches, Charmides or Lysis. Hence arises the further paradox of Socrates: " Virtue is not taught, and that which is commonly regarded as virtue springs up spontaneously or is received unconsciously by a kind of inspiration."

Protagoras, in the dialogue named after him, is the professor of popular, unscientific, self-complacent excellence; while

1 Nub., 995i T V aUoOs yueXAeis ray a\fi' &pair\rjaai.

Socrates appears in his life-long search after the ideal knowledge of the best. The two men are naturally at cross purposes. Protagoras. Prota g° ra s contends that virtue is taught by himself and others more or less successfully, and is not one but many. Socrates disputes the possibility of teaching virtue (since all men equally profess it, and even statesmen fail to give it to their sons), but affirms that, if it can be taught, virtue is not many, but one. The discussion, as in the former dialogues, ends inconclusively. But in the course of it Plato vividly sets forth the natural

opposition between the empiric and scientific points of view, between a conventional and an intellectual standard. He does full justice to the thesis of Protagoras, and it is not to be supposed that he was contented to remain in the attitude which he has here attributed to Socrates. In his ideal state, where the earlier training of the best citizens is a refinement on the actual Hellenic education, he has to some extent reconciled the con- ceptions which are here dramatically opposed.

The preparations for the encounter and the description of it include many life-like touches — such as the eagerness of the young Athenian gentleman to hear the sophist, though he would be ashamed to be thought a sophist himself; the confusion into which the house of Callias has been thrown by the crowd of strangers and by the self-importance of rival professors; the graceful dignity of the man who has been forty years a teacher, the graphic description of the whole scene, the characteristic speeches of Prodicus and Hippias (from which some critics have elicited a theory of their doctrines), and the continued irony with which Socrates bears them all in hand and soothes the great man after disconcerting him.

In the argument there are two points which chiefly deserve notice. (i) Protagoras, in accordance with his relative view of things (which Plato afterwards criticized in the Theaetetus), claims not to teach men principles but to improve them in those virtues which Providence has given in some measure to all civilized men. (2) Socrates in postulating a scientific principle, which he expressly reserves for future consideration, would have it tested by the power of calculating the amount of pleasure. Grote dwells with some complacency on the " utilitarianism " of Socrates in the Protagoras. And it is true that a principle of utility is here] opposed to con- ventional sentiment. But this opposition is intended to prepare the way for the wider and deeper contrast between an arbitrary and a scientific standard, or between impressions and conceptions or ideas. And when Plato (in the Gorgias and Philebus) endeavours to define the art of measurement, which is here anticipated, it is not wonderful that differences here unthought of should come into view, or that the pleasant should be again contradistinguished from the good.- In all three dialogues he is equally asserting the supremacy of reason.

On the first vision of that transcendental knowledge 1 which is to be the key at once to truth and good, philosophy is apt to lose her balance, and to look with scorn upon " the trivial round, the common task," and the respectable commonplaces of "ordinary thinking." Yet, as Socrates is reminded by Protagoras, this unconscious wisdom also has a value. And Plato, who, when most ideal, ever strives to keep touch with experience, is fully convinced of the reality of this lower truth, of this unphilosophic virtue. But he is long puzzled how to conceive of it. For, if knowledge is all

in all, what are we to make of wisdom and goodness in those who do not know? Protagoras had boldly spoken of honour and right as a direct gift from Zeus, and Socrates, in the Io and Meno, is represented as adopting an hypothesis of inspiration in order to account for these unaccredited graces of the soul.

Socrates has observed that rhapsodists and even poets have no definite knowledge of the things which they so powerfully repre- lo sent (cf. Apol. 22; Phaed., 245 A.; Rep. iii. 398 A).

He brings the rhapsode Io to admit this, and to conclude that he is the inspired medium of a magnetic influence. The Muse is the chief magnet, and the poet is the first of a series of magnetic rings. Then follow the rhapsode and the actor, who are rings of inferior power, and the last ring is the hearer or spectator.

The Meno raises again the more serious question, Can virtue be taught? Socrates here states explicitly the paradox with which Meno. the Protagoras ended. " Virtue is knowledge; therefore virtue can be taught. But virtue is not taught. Therefore (in the highest sense) there can be no virtue." And he repeats several of his former reasons — that Athenian 1 Phaed. 82 B ; Rey. x. 619 C.

statesmen failed to teach their sons, and that the education given by sophists is unsatisfying. (The sophists are here denounced by Anytus, who is angered by Socnates's ironical praise of them.) But the paradox is softened in two ways: (1) the absence of knowledge does not preclude inquiry, and (2) though virtue cannot be taught, yet there is asense in which virtue exists.

1. Meno begins in gaiety of heart to define virtue, but is soon '! benumbed " by the "torpedo" shock of Socrates, and asks " How can one inquire about that which he does not know?" Socrates meets this " eristic " difficulty with the doctrine of reminiscence (AvA/wijais). All knowledge is latent in the mind from birth and through kindred (or association of) ideas much may be re- covered, if only a beginning is made. Pindar and other poets have said that the soul is immortal and that she has passed through many previous states. 2 And Socrates now gives a practical illus- tration of the truth that knowledge is evolved from ignorance. He elicits, from a Greek slave of Meno's, the demonstration of a geometrical theorem. 3 About the middle of the process he turns to Meno and observes that the slave (who has made a false start) is now becoming conscious of ignorance. He then gradually draws from the man, by leading questions, the positive proof.

2. Though virtue is not yet defined, it may be affirmed " hypo- thetically "

that, if virtue is knowledge, virtue can be taught. And experience leads us to admit two phases of virtue — the one a mode of life based on scientific principle, which hitherto is an ideal only; the other sporadic, springing of itself, yet of divine origin, relying upon true opinion, which it is, however, unable to make fast through demonstration of the cause or reason. But if there were a virtuous man who could teach virtue he would stand amongst his fellows like Teiresias amongst the shades. 4

This mystical account of ordinary morality is in keeping with the semi-mythical defence of the process of inquiry — that all know- ledge is implicit in the mind from birth.

III. Euthyphro, Apologia, Crito, Phaedo. — There is no ground for supposing that these four dialogues were written consecu- tively, or that they .belong strictly to the same period of Plato's industry. But they are linked together for the reader by their common reference to the trial and death of Socrates; no one of them has been proved to be in the author's earliest or latest manner; and they may therefore fitly end the series of dialogues in which the personal traits of the historic Socrates are most apparent, and Plato's own peculiar doctrines are as yet but partially disclosed.

The little dialogue known by the name of Euthyphro might have been classed with the Laches, Charmides and Lysis, as dealing inconclusively with a single notion. But, although slight and tentative in form, it has an under- " ¥P "' tone of deeper significance, in keeping with the gravity of the occasion. Plato implies that Socrates had thought more deeply on the nature of piety than his accusers had, and also that his piety was of a higher mood than that of ordinary religious men.*

Euthyphro is a soothsayer, well-disposed to Socrates, but not one of his particular friends. They meet at the door of the king Archon, whither Socrates has been summoned for the " precog- nition" (drajcpuris) preliminary to his trial. Both men are inter- ested in cases of alleged impiety. For Euthyphro's business is to impeach his father, who has inadvertently caused the death of a cri- minal labourer. The prophet feels the duty of purging the stain of blood to be more imperative the nearer home. Socrates is struck by the strong opinion thus evinced respecting the nature of piety and detains Euthyphro at the entrance of the court, that he may learn from so clear an authority " what piety is," and so be for- tified against Meletus. He leads his respondent from point to point, until the doubt is raised whether God loves holiness be- cause it is holy, or it is holy because loved by God. Does God will what is righteous, or is that righteous which is willed by God? Here they find themselves wandering round and round. Socrates proves himself an involuntary Daedalus who makes

opinions move, while he seeks for one which he can " bind fast with reason."

" The holy is a portion of the just." But what portion? " Due service of the gods by prayer and sacrifice." But how does this affect the gods? " It pleases them." Again we are found to be reasoning in a circle.

" Thus far has Socrates proceeded in placing religion on a moral foundation. He is seeking to realize the harmony of religion and

2 The origin of this traditional belief is very obscure. The Greeks themselves were apt to associate it with Pythagoras and with the " Orphic " mysteries.

3 Eucl. i. 47 (the case where the triangle is isosceles).

4 Horn. Odyss. x. 495, Ofy weirvwdai., rai Si aniaX ataaovoiv.

morality, which the great poets Aeschylus, Sophocles and Pindar had unconsciously anticipated, and which is the universal want of all men. To this the soothsayer adds the ceremonial element, ' attending upon the gods.' When further interrogated by So- crates as to the nature of this ' attention to the gods,' he replies that piety is an affair of business, a science of giving and asking and the like. Socrates points out the anthropomorphism of these notions. But when we expect him to go on and show that the true service of the gods is the service of the spirit and co-operation with them in all things true and good, he stops short; this was a lesson which the soothsayer could not have been made to understand, and which everyone must learn for himself." 1

In Plato's Apology the fate of Socrates is no longer the subject of mere allusions, such as the rage of Anytus at the end of the Meno, and the scene and occasion of the Euthyphro. He is now seen face to face with his accusers, and with his countrymen who are condemning him to death.

What most aggravated his danger (after life-long impunity) is thus stated by James Riddell, in the introduction to his edition of the dialogue: "The kiuuKua" (clemency) "of the restored people did not last long, and was naturally succeeded by a sensi- tive and fanatical zeal for their revived political institutions. Inquiry into the foundations of civil society was obviously rather perilous for the inquirer at such a time. Socrates knew the

full extent of his danger. But, according to Xenophon (Mem. iv. c. 8, § 14), he prepared no defence, alleging that his whole life had been a preparation for that hour."

The tone of the Platonic Apology is in full accordance with that saying; but it is too elaborate a work of art to be taken literally as a report of what was actually said. Jowett well compares it to " those speeches of Thucydides in which he has embodied his conception of the lofty character and policy of the great Pericles." Yet " it is significant that Plato is said to have been present at the defence, as he is also said to have been absent at the last scene of the Phaedo. Some of the topics may have been actually used by Socrates, and the recollection of his very words may have rung in the ears of his disciple."

The Platonic Apology is in three parts: (1) before conviction, (2) after conviction and before sentence, (3) after the sentence.

I. Socrates cares not for acquittal. But he does care to ex- plain his life. And he selects those aspects of it which there is hope of making his audience understand. That he partly suc- ceeded in this is shown by the large number of those (220 out of 500) who voted for his acquittal.

a. His answer to Meletus, as least important, is reserved for the middle of his speech. He addresses himself first to " other accusers " — comic poets and the rest, who have prejudiced his reputation by falsely identifying him with the physical philosophers and the sophists. But what then is the strange pursuit which has given to Socrates the name of wise? It is the practice of cross-examining, to which he was first impelled by the oracle at Delphi, and which he has followed ever since as a religious mission. The god said " Socrates is wise," when he was conscious of no wisdom great or small. So he went in search of some one wiser than himself, but could find none, though he found many who had conceit of wis- dom. And he inferred that the god must mean " He is wisest who, like Socrates, is most aware of his own ignorance." This unceasing quest has left him in great poverty, and has made him enemies, who are represented by Anytus, Meletus and Lycon. And their enmity is further embittered by the pleasure which young men take in seeing pretence unmasked, and in imitating the process of refutation. Hence has arisen the false charge that Socrates is a corrupter of youth.

b. Here he turns to Meletus. " If I corrupt the youth, who does them good?" Mel. " The laws, the judges, the audience, the Athenians generally " (cf. Protagoras and Meno). " Strange, that here only should be one to corrupt and many to improve; or that any one should be so infatuated as to wish to have bad neighbours." Mel. " Socrates is an atheist. He believes the sun to

be a stone." " You are accusing Anaxagoras. I have said that I knew nothing of such theories. And you accuse me of introduc- ing novel notions about divine things. How can I believe in divine things (iai/xovia) and not in divine beings (Salmons) ? and how in divine beings, if not in gods who are their authors?"

c. That is a sufficient answer for his present accuser. He re- turns to the general long-standing defamation, which may well be his death, as slander has often been and again will be the death of many a man.

Yet if spared he will continue the same course of life, in spite of the danger. As at Potidaea and Delium he faced death where the Athenians posted him, so now he will remain at the post where he

1 jowett.

is stationed by the god. For to fear death is to assume pretended knowledge.

One thing is certain. A worse man cannot harm a better. But if the Athenians kill Socrates they will harm themselves. For they will lose the stimulus of his exhortations — and his poverty is a sufficient witness that he was sincere. Not that he would engage in politics. If he had done that he would have perished long before, 2 as he nearly did for his independent vote after the battle of Arginusae, and for disobeying the murderous command of the Thirty Tyrants.

But have not Socrates's disciples, Alcibiades, Critias, Charmides, proved bad citizens? He has no disciples. Any one, bad or good, may come and hear him, and the talk which is his life-work is not unamusing. But why are no witnesses brought to substantiate this charge ? There are elder friends of his companions, who would be angry if he had used his influence for harm. But these men's confidence in Socrates is unshaken.

He will not appeal ad misericordiam. That would be a disgrace for one who (rightly or not) has been reputed wise, and to admit such an appeal in any case is a violation of the juror's oath.

Socrates has told the Athenians the whole truth, so far as a mixed audience of them could receive it. Elaboration and subtlety could have no place in addressing the Heliastic court, nor could that universal truth towards which he was leading men be made intelli- gible to a new audience while the clepsydra was running. But his tone and attitude must have made a strong appeal to the better nature of his hearers. With Meletus he " played rather than fought," but he has shown clearly that he has no fear of death, that he chooses to obey God rather than man, and that for very love of the

Athenians he will not be swayed by their desires.

2. One convicted on a capital charge had the right of pleading before sentence in mitigation of the penalty proposed by his accuser. Socrates was convicted by fewer votes than he himself anticipated. The indictment of Meletus was ineffectual, and if it had not been for the speeches of Anytus and Lycon the defendant would have been triumphantly acquitted. Could he but have conversed with his judges more than once, he might have removed their prejudices. In no spirit of bravado, therefore, but in simple justice to himself, he meets the claim of Meletus that he shall be punished with death by the counterclaim that he shall be main- tained in the prytaneum as a public benefactor. He cannot ask that death, which may be a good, shall be commuted for imprison- ment or exile, which are certainly evils. A fine would be no evil: but he has no money — he can offer a mina. Here Plato and others interpose, and with their friendly help he offers thirty minae.

3. He is sentenced to death, and the public business of the court is ended. But while the record is being entered and the magis- trates are thus occupied, Socrates is imagined as addressing (a) the majority, and (b) the minority in- the court.

a. To those who have condemned him he speaks in a prophetic tone. " For the sake of depriving an old man of the last dregs of life they have given Athens a bad name. He would not run away, and so death has overtaken him. But his accusers are overtaken by unrighteousness, and must reap the fruits of it.

" Nor will the Athenians find the desired relief. Other reprovers, whom Socrates has hitherto restrained, will now arise, not in a friendly but in a hostile spirit. The only way for the citizens to escape reproof is to reform their lives."

b. To the minority, who would have acquitted him, he speaks with gentle solemnity. " Let them know to their comfort that the divine voice has not once checked him throughout that day. This indicates that death is not an evil. And reason shows that death is either a long untroubled sleep, or removal to a better world, where there are no unjust judges.

" No evil can happen to a good man either in life or after death. Wherefore Socrates will not be angry with his condemners, who have done him no harm, although they meant him anything but good. He will only ask of them to do to the sons of Socrates as Socrates has done to them."

Is the love of truth consistent with civic duties? Is the philosopher a good

citizen? are questions which are sure to arise where the truth involves practical improvement. In the Apology Socrates appears as an intrepid reformer; the Crito gives an impressive picture of him as a loyal and law-abiding Athenian.

Execution had been delayed during the annual mission to Delos (during which no one could be put to death). But the returning vessel had just been reported as descried from Sunium. At early dawn Crito, the oldest friend of Socrates, obtained access to his cell, and found him sleeping peacefully. Presently he awoke, and Crito told him of the approach of the fatal ship. Socrates replies by telling his dream. A fair form stood over him and said,

" The third day hence to Phthia shalt thou come " And it would seem that the day after to-morrow will really be the day for going home.

2 Cf . Gorg. 52 1 ; Rep. vi. 4.96.

Crito then reveals his plan for an escape. And Socrates argues the question in the old familiar way. " Crito's zeal is excellent, and most men would think his object right. But the few who think soundly say that it is wrong to return evil for evil. The laws of Athens (through the fault of men) are doing Socrates harm, But ought he therefore to infringe the law ? Might not the laws of his country plead with him and say : ' You owe to us your birth and breeding; and when grown up you voluntarily submitted to •us. For you might have gone elsewhere. But you preferred us to all other laws, and have been the most constant resident in Athens. Even at the last you accepted death rather than exile. If you now break your covenant you will ruin your friends and will be rejected by all well-ordered cities. You might be received in Thessaly, but could only live there by cringing to foreigners for food. Where in that case will be your talk about virtue? You would not take your sons thither, And your friends would be equally kind to them if you were dead. Think not of life and children first and of justice afterwards, but think of justice first, that you may be justified in the world below.' "

Crito admits these arguments to be unanswerable.

The Meno referred to the immortality and pre-existence of the soul as a traditional doctrine, and it was there associated with the possibility of inquiry. In the Phaedo Flato ' undertakes to substantiate this belief and

base it anew by narrating the last hours of Socrates, who is represented as calmly discussing the question with his friends when his own death was immediately at hand. The argument turns chiefly on the eternity of knowledge, and is far from satisfying. For, granting that eternity of knowledge involves eternity of mind, does the eternity of mind assure continued being to the indivi- dual? l Yet no unprejudiced reader of the Phaedo can doubt that Plato, at the time of writing it, sincerely believed in a conscious personal existence after death. The words of Socrates, when he declares his hope of going to be with other friends, are absolutely unambiguous, and his reply to Crito's question, " How shall we bury you ?" has a convincing force beyond all dialectic: " I cannot persuade Crito that I here am Socrates — I who am now reasoning and ordering discourse. He imagines Socrates to be that other, whom he will see by and by, a corpse." This and similar touches not only stamp the Phaedo as a marvel of art, but are indisputable evidence of the writer's profound belief. They may be inventions, but they have nothing " my- thical " about them, any more than the charge of Socrates to his friends, that they would best fulfil his wishes by attending to their own lives.

The narrative, to be appreciated, must be read in full. But a short abstract of the argument may be given here.

I. Death is merely the separation of soul and body. And this is the very consummation at which philosophy aims. The body hinders thought. The mind attains to truth by retiring into her- self. Through no bodily sense does she perceive justice, beauty, goodness and other ideas. The philosopher has a life-long quarrel with bodily desires, and he should welcome the release cf his soul. Thus he alone can have true courage, even as temperance and all the virtues are real in him alone.

But does the soul exist after death?

a. An old tradition tells of many successive births, the soul departing to Hades and returning again, so that the living are born from the dead. And if the dead had no existence, this could not be, since from nothing nothing can arise. Moreover, experi- ence shows that opposite states come from their opposites, and that such a process is always reciprocal. Death certainly succeeds to life. Then life must succeed to death. And that which undergoes these changes must exist through all. If the dead came from the living, and not the living from the dead, the universe would ulti- mately be consumed in death.

This presumption is confirmed by the doctrine (here attributed to Socrates, cf. Meno) that knowledge comes from recollection. What is recollected must be previously known. Now we have never since birth had intuition of

the absolute equality of which (through association) we are reminded by the sight of things approxi- mately equal. And we cannot have seen it at the moment of birth, for at what other moment can we have forgotten it? Therefore, if ideals be not vain, our souls must have existed before birth, and, according to the doctrine of opposites above stated, will have continued existence after death.

b. To charm away the fears of the " child within," Socrates adds, as further considerations : —

1 In the Timaeus immortality is made to rest on the goodwill of God, because " only an evil being would wish to dissolve that which is harmonious and happy " (Tim. 41 A).

i. The soul is uncompounded, incorporeal, invisible, and there- fore indissoluble and immutable.

ii. The soul commands, the body serves; therefore the soul is akin to the divine.

iii. Yet even the body holds together long after death, and the bones are all but indestructible.

The soul, if pure, departs to the invisible world, but, if tainted by communion with the body, she lingers hovering near the earth, and is afterwards born into the likeness of some lower form. That which true philosophy has purified alone rises ultimately to the gods. The lesson is impressively applied.

2. A pause ensues; and Simmias and Cebes are invited to express their doubts. For, as the swan dies singing, Socrates would die discoursing.

o. Simmias desires not to rest short of demonstration, though he is willing to make the highest attainable probability the guide of life.

If the soul is the harmony of the body, what becomes of her " when the lute is broken " ?

b. Cebes compares the body to a garment which the soul keeps weaving at. The garment in which the weaver dies outlasts him. So the soul may have woven and worn many bodies in one lifetime, yet may perish and leave a body behind. Or even supposing her to have many lives, does even this hypothesis exempt her from ultimate decay?

Socrates warns his friends against losing faith in inquiry. Theories, like men, are disappointing; yet we should be neither misanthropists nor misologists. Then he answers his two friends.

a — i. The soul is acknowledged to be prior to the body. But no harmony is prior to the elements which are harmonized.

ii. The soul has virtue and vice, i.e. harmony and discord. Is there harmony of harmony ? Cf. Rep. x. 609.

iii. All soul is equally soul, but all harmony is not equally har- monious.

iv. If the soul were the harmony of the body they would be agreed: but, as has been already shown, they are perpetually quarrelling.

v. The soul is not conditioned by the bodily elements, but has the power of controlling them.

b. Cebes has raised the wide question whether the soul is inde- pendent of generation and corruption. Socrates owns that he him- self (i.e. Plato ?) had once been fascinated by natural philosophy, and had sought to give a physical account of everything. Then, hearing out of Anaxagoras that mind was the disposer of all, he had hoped to learn not only how things were, but also why. But he found Anaxagoras forsaking his own first principle and jumbling causes with conditions. ("The cause why Socrates sits here is not a certain disposition of joints and sinews, but that he has thought best to undergo his sentence — else the joints and sinews would have been ere this, by Crito's advice, on the way to Thessaly.") Physical science never thinks of a power which orders everything for good, but expects to find another Atlas to sustain the world more strong and lasting than the reason of the best.

Socrates had turned from such philosophers and found for him- self a way, not to gaze directly on the universal reason, but to seek an image of it in the world of mind, wherein are reflected the ideas, as, for example, the idea of beauty, through partaking of which beautiful things are beautiful. Assuming the existence of the ideas, he felt his way from hypothesis to hypothesis.

Now the participation of objects in ideas is in some cases essential and inseparable. Snow is essentially cold, fire hot, three odd, two even. And things thus essentially opposite are inclusive of each other's attributes. (When it was said above that opposites come from opposites, not opposite things were meant, but opposite states or conditions of one thing). Snow cannot admit heat, nor fire cold; for they are inseparable vehicles of heat and cold respectively. The soul is the inseparable vehicle of life, and therefore, by parity of reasoning, the soul cannot admit of death, but is immortal and imperishable.

3. What follows is in the true sense mythological, and is admitted by Socrates to be uncertain: " Howbeit, since the soul is proved to bejimmortal, men ought to]charm their spirits with such tales."

The earth, a globe self-balanced in the midst of space, has many mansions for the soul, 2 some higher and brighter, some lower and darker than our present habitation. We who dwell about the Mediterranean Sea are like frogs at the bottom of a pool. In some higher place, under the true heaven, our souls may dwell hereafter, and see not only colours and forms in their ideal purity but truth and justice as they are.

In the Phaedo, more than elsewhere, Plato preaches with- drawal from the world. The Delian solemnity is to Socrates

2 Cf. Milton, II Penseroso, 88-92—

" To unsphere The spirit of Plato, to unfold What worlds or what vast regions hold The immortal mind that hath forsook Her mansion in this fleshly nook."

and his friends a period of " retreat," in which their eyes are turned from earthly things to dwell on the eternal. The theory of ideas here assumes its most transcendental aspect, and it is from portions of this dialogue and of the Phaedrus and Timaeus that the popular conception of Platonism has been principally derived. But to understand Plato rightly it is not enough to study isolated passages which happen to charm the imagi- nation; nor should single expressions be interpreted without regard to the • manner in which he prssents the truth else- where.

It has already been shown (1) that Socratic inquiry implied a standard of truth and good, undiscovered but endlessly dis- coverable, and to be approached inductively; and (2) that in Plato this implicit assumption

becomes explicit, in the identifi- cation of virtue with knowledge {Lack., Charm.) as an art of measurement (Protag.), and in the vision (towards the end of the Lysis) of an absolute object of desire. The Socratic " self-knowledge " has been developed (Charm.) into a science of mind or consciousness, apart from which no physical studies can be fruitful. (3) Co-ordinate with these theoretical tendencies there has appeared in Plato the determination not to break with experience. In the Phaedo, a long step is made in the direction of pure idealism. The ordinary virtue, which in the Protagoras and Meno was questioned but not condemned, is here rejected as unreal, and the task proposed to the philosopher is less to under- stand the world than to escape from it. The universal has assumed the form of the ideal, which is supposed, as elsewhere in Plato, to include mathematical as well as moral notions. The only function of perception is to awaken in us some reminiscence of this ideal. By following the clue thus given, and by searching for clearer images of truth in the world of mind, we may hope to be emancipated from sensation, and to lay hold upon the sole object of pure reason.

It is obvious that when he wrote the Phaedo Plato conceived of universals as objective entities rather than as forms of thought. The notion of " ideal colours " (though occurring in the myth) is an indication of his ontological mood. Yet even here the eidy are not consistently hypostatized. The notion of " what is best " has a distinctly practical side, and the " knowledge through reminiscence " is in one aspect a process of reflection on experience, turning on the laws of association. 1 It is also said that objects " partake " of the ideas, and some concrete natures are regarded as embodiments or vehicles of some of them. Still if regarded as a whole, notwithstanding the scientific attitude of Socrates, the Phaedo is rather a meditation than an inquiry — a study of the soul as self-existent, and of the mind and truth as coeternal.

IV. Symposium, Phaedrus, Cralylus. — Socrates is again imagined as in the fullness of life. But the real Socrates is be- coming more and more inextricably blended with Platonic thought and fancy. In the Apology there is a distinct echo of the voice of Socrates; the Phaedo gives many personal traits of him; but the dialogues which are now to follow are replete with original invention, based in part, no doubt, on personal recollections.

The Symposium admits both of comparison and of contrast with the Phaedo. Both dialogues are mystical, both are spiritual, but the spirituality in either is of a different order. That is here immanent which was there transcendent; the beautiful takes the place of the good. The world is not now to be annihilated, but rather transfigured, until particular objects are lost in universal light. Instead of flying from the region of growth and decay, the mind, through inter- course with beauty, is now the active cause

of production. Yet the life of contemplation is still the highest life, and philosophy the truest juouctuc^.

The leading conception of the Symposium has been anticipated in the Lysis, where it was said that " the indifferent loves the good, because of the presence of evil."

The. banqueters {including Socrates), who are met to celebrate the tragic victory of Agathon, happen not to be disposed for hard drinking. They send away the flute-girl and entertain each other with the praise of Love. Phaedrus tells how Love inspires to

1 Cf. Theaet. 184-186.

Symposium.

honourable deeds, and how Alcestis and Achilles died for Love. Pausanias rhetorically distinguishes the earthly from the heavenly Love. The physician Eryximachus, admitting the distinction, yet holds that Love pervades all nature, and that art consists in following the higher Love in each particular sphere. So Empedocles had spoken of Love as overcoming previous discord. For opposites cannot, as Heraclitus fancied, coexist. Aristophanes, in a comic myth, describes the origin of Love as an imperfect creature's longing for completion. The original double human beings were growing impious, and Zeus split them in twain, ever since which act the bereaved halves wander in search of one another. Agathon speaks, or rather sings, of Love and his works. He is the youngest, not the eldest of gods, living and moving delicately wherever bloom is and in the hearts of men — the author of all virtue and of all good works, obeyed by gods, fair and causing all things fair, making men to be of one mind at feasts — pilot, defender, saviour, in whose footsteps all should follow, chanting strains of love.

Socrates will not attempt to rival the poet, and begins by stipu- lating that he may tell the truth. He accepts the distinction between Love and his works, but points out that, since desire implies want, and the desire of Love is toward beauty, Love, as wanting beauty, is not beautiful. So much being established in the Socratic manner, he proceeds to unfold the mystery once revealed to him by Diotima, the Mantinean wise woman. Love is neither beautiful nor ugly, neither wise nor foolish, neither god nor mortal. Between gods and mortals is the world of mediating spirits (t6 baxubviov) . And Love is a great spirit, child of Resource (the son of Prudence) and Poverty the beggar maid, who conceived him at the birthday feast of Aphrodite. He is far from living " delicately," but is ragged and shoeless, always in difficulties, yet always brimming with invention, a mighty hunter after wisdom and all things fair; sometimes "all full with feasting " on

them, the next moment " clean starved " for lackj never absolutely knowing nor quite ignorant. That is to say, he is a " philosopher. ' For knowledge is the most beautiful thing, and love is of the beau- tiful.

But what does love desire of the beautiful? The possession is enough. But there is one kind of love — called " being in love " — which desires beauty for a peculiar end. The lover is seeking, not his " other half," but possession of the beautiful and birth in beauty. For there is a season of puberty both in body and mind, when human nature longs to create, and it cannot, save in presence of beauty. This yearning is the earnest of immortality. Even in the bird's devotion to its mate and to its young there is a craving after continued being. In individual lives there is a flux, not only of the body, but in the mind. Nay the sciences themselves also come and go (here the contrast to the Phaedo is at its height). But in mortal things the shadow of continuity is succession.

The love of fame is a somewhat brighter image of immortality than the love of offspring. Creative souls would bring into being not children of their body, but good deeds. And such a one is readiest to fall in love with a fair mind in a fair body, and then is filled with enthusiasm and begets noble thoughts. Homer, Hesiod, Lycurgus, Solon, were such genial minds. But they stopped at the threshold (cf. Prot., Meno), and saw not the higher mysteries, which are reserved for those who rise from noble actions, institu- tions, laws, to universal beauty. The true order is to advance from one to all fair forms, then to fair practices, fair thoughts, and lastly to the single thought of absolute beauty. In that com- munion only, beholding beauty with the eye of the mind, one shall bring forth realities and become the friend of God and be immortal, if mortal man may.

Alcibiades here breaks in and is vociferously welcomed. He is crowning Agathon, when, on perceiving Socrates, he declares that he will crown him too. Then he announces himself king of the feast, and insists upon hard drinking (though this will make no difference to Socrates). Eryximachus demands from the newcomer a speech in praise of love. But Alcibiades will praise no one else when Socrates is near. And with the freedom of one who is deep in wine he proceeds with his strange encomium of " this Marsyas." " In face and outward bearing he is like a Satyr or Silenus, and by his voice he charms more powerfully than they do by their pipings. The eloquence of Pericles has no effect in comparison with his. His words alone move Alcibiades to shame, and fascinate him until he stops his ears and runs from him." — " I often wish him dead. Yet that would break my heart. He brings me to my wit's end." — " And, as carved Sileni are made to encase images of gods, so this Silenus-mask entreasures things divine. He affects ignorance and susceptibility to beauty. Thus he mocks mankind. But he cares nothing for outward shows, and his temperance (pocripr)) is

wonderful." To prove this Alcibiades reveals his own heart-secret. (He is not ashamed to speak it amongst others who have felt the, pang which Socrates inflicts). And he makes it abundantly mani- fest that in their widely rumoured intercourse (cf. Protag. init.) Socrates had never cared for anything but what was best for his younger friend. Alcibiades then relates as an eyewitness the endurance shown by Socrates at Potidaea, his strange persistence in solitary meditation — standing absorbed in thought - for a day and a night together — and his intrepid conduct in the retreat from Delium (cf. Laches). " The talk of Socrates is of pack-asses and

cobblers, and he is ever saying the same things in the same words ; but one who lifts the mask and looks within will find that no other words have meaning." Alcibiades ends by warning his companions against the wiles of Socrates.

Some raillery follows, and they are invaded by another band ot revellers, who compel them to drink still more deeply. The soberly inclined (led by Eryximachus) slink off, and Anstodemus, the reporter of the scene, only remembers further that when he awoke at cock-crow Socrates was still conversing with Agathon and Aristophanes, and showing them that tragedy and comedy were essentially one. He talked them both asleep, and at daybreak went about his usual business.

The philosopher of the Symposium is in the world and yet not of it, apparently yielding but really overcoming. In the Phaedo the soul was exhorted to " live upon her servant's loss," as in Shakespeare's most religious sonnet; this dialogue tells of a " soul within sense " in the spirit of some more recent poetry. By force of imagination rather than of reason, the reconciliation of becoming (yevecns) with being (ovala), of the temporal with the eternal, is anticipated. But through the bright haze of fancy and behind the mask of irony, Socrates still appears the same strong, pure, upright and beneficent human being as in the Apology, Crito and Phaedo.

The impassioned contemplation of the beautiful is again imagined as the beginning of philosophy. But the " limitless ocean of beauty " is replaced by a world of supra- Phaedms. mundane f ormS! beheld by unembodied souls, and remembered here on earth through enthusiasm, proceeding by dialectic from multiform impressions to one rational conception, and distinguishing the " lines and veins " of truth. The Phaedrus records Plato's highest " hour of insight," when he willed the various tasks hereafter to be fulfilled. In it

he soars to a pitch of contemplation from whence he takes a comprehensive and keen-eyed survey of the country to be explored, marking off the blind alleys and paths that lead astray, laying down the main roads and chief branches, and taking note of the erroneous wanderings of others. Reversing the vulgar adage, he flies that he may walk.

The transcendent aspiration of the Phaedo and the mystic glow of the Symposium are here combined with the notion of a scientific process. No longer asking, as in the Protagoras, Is virtue one or many? Plato rises to the conception of a scientific one and many, to be contemplated through dialectic — no barren abstraction, but a method of classification according to nature. This method is to be applied especially to psychology, not merely with a speculative, but also with a practical aim. For the " birth in beauty " of the Symposium is here developed into an art of education, of which the true rhetoric is but the means, and true statesmanship an accidental outcome. .

Like all imaginative critics, Plato falls to some extent under the influence of that which he criticizes. The art of rhetoric which he so often travestied had a lasting effect upon his style. Readers of his latest works are often reminded of the mock grandiloquence of the Phaedrus. But in this dialogue the poetical side of his genius is at the height. Not only can he express or imitate anything, and produce any effect at will, but he is standing behind his creation and disposing it with the most perfect mastery, preserving unity amidst profuse variety, and giving harmony to a wildness bordering on the grotesque.

The person of Socrates is here deliberately modified. He no longer (as in the Symposium) teaches positive wisdom under the pretence of repeating what he has heard, but is himself caught by an exceptional inspiration, which is accounted for by the unusual circumstance of his finding himself in the country and alone with Phaedrus. He has been hitherto a stranger to the woods and fields, which would tempt him away from studying himself through intercourse with men. But by the promise of discourse— especially of talk with Phaedrus— he may be drawn any whither.

Phaedrus has been charmed by a discourse of Lysias, which after some coy excuses he consents to read.

It is a frigid erotic diatribe, in which one not in love pleads lor preference- over the lover. Socrates hints at criticism, and is chal- lenged to produce something better on the same theme.

I. Distinguishing desire from true opinion, he defines love as

desire prevailing against truth, and then expatiates on the harmful tendencies of love as so defined. But he becomes alarmed at his own unwonted eloquence, and is about to remove, when the " divine token " warns him that he must first recite a " palinode in praise of love. For no divine power can be the cause of evil.

2. Love is madness; but there is a noble madness, as is shown by soothsayers (called ixavrm from p,alvonai). And of the higher madness there are four kinds.

To explain this it is necessary to understand psychology. the soul is self-existent and self-moving, and therefore eternal. And her form is like a pair of winged steeds with their charioteer. In divine souls both steeds are good, but in human souls one of them is bad. Now before entering the body the soul lost her wings, which in her unembodied state were nourished by beauty, wisdom, goodness, and all that is divine. For at the festival of souls, in which they visit the heaven that is above the heavens, che unruly steed caused the charioteer to see imperfectly. So the soul cast her feathers and fell down and passed into the human form. And, according to the comparative clearness or dimness of that first vision, her earthly lot is varied from that of a philosopher or artist down through nine grades (including woman) to that of a tyrant. On her conduct in this state of probation depends her condition when again born into the world. And only in ten thousand years can she return to her pristine state, except through a life of philosophy (cf. Phaedo) or of pure and noble love (cf. Symposium).

The mind of the philosopher alone has wings. He is ever being initiated into perfect mysteries, and his soul alone becomes complete. But the vulgar deem him mad and rebuke him; they do not see that he is inspired. ,. „

This divine madness (the fourth kind of those above mentioned) is kindled through the renewed vision of beauty. For wisdom is not seen; her loveliness would have been transporting if she had a visible form. The struggle of the higher passion with the lower is then described with extraordinary vividness, under the image of the two steeds. When the higher impulse triumphs the issue is a philosophic friendship, at once passionate and absolutely pure. 3. From his " palinode " Socrates returns to Lysias, who is advised to leave speech-writing for philosophy. _ … ,

a. Phaedrus remarks that the speech-writer is despised by the politician. Socrates replies that speech-writing and politics are one concern. The real difference is between those who base their teaching on philosophy and those who are content with rules of art. For example, if the first speech of Socrates is compared with that of Lysias, the one is found to distinguish and define, the other not; the one observes order in discourse, the other "

begins where he should end," and his utterance is like a disordered chain. A speech should be an organic whole, a " creature having hands and feet." So in the " palinode " there was a classification of the kinds of madness, which led the way to " a possibly true though partly erring myth." This approximation to truth in the midst of much that was playful was due to the observance of two principles, generalization and division (ovva.yoi'rq, diaipecns) . Whoever sees the one and many in nature, him Socrates follows and walks in his footsteps, as if he were a god. In comparison of dialectic, as thus conceived, the frigid rules of Lysias, Thrasymachus, Theodoras, Evenus, Tisias, Gorgias, Polus and Protagoras are futile and absurd.

b. Another condition of teaching (or true rhetoric) is the science of mind. Whether the soul be one or many, complex or multiform, and if multiform what are its parts and kinds, are questions which the teacher must have already solved. And he must likewise have classified all arguments and know them in their various applic- ability to divers souls. An art of speaking that should fulfil this condition is non-existent. Yet how can even verisimilitude be attained without knowledge of truth?

c. The art of writing is kindred to the art of speech. But Socrates maintains that oral teaching through the living contact of mind with mind has many advantages over written composition, which is, comparatively speaking, a dead thing. Men may write for amusement or to record the intercourse that has been. But the serious occupation of the true thinker and teacher is the com- munication of truth through vital converse with others like-minded — the creation of " thoughts that breathe " in spirits conscious of their value. ,

In conclusion, a friendly hint is given to Isocrates that he may do better than Lysias if he will but turn his attention to philosophy.

The Phaedrus anticipates much that Plato afterwards slowly elaborated, and retains some things which he at last eliminated. (1) The presence of movement or impulse in the highest region is an aspect of truth which reappears in the Sophistes and other later dialogues. It has been thought strange that it should be found so early as in the Phaedrus. But does not this remark imply an unwarrantable assumption, viz. that Plato's idealism took its departure from the being of Parmenides ? Is it not rather the fact that his own theory was formulated before the Megarian ascendancy led him to examine the Eleatic doctrine, and that it was by a tendency from the first inherent in Platonism that that doctrine was modified in his final teaching? (2) The

outlines of method which are thrown out at white heat in the Phaedrus are a preparation for the more sober treatment of the ideas in the dialectical dialogues. In these, however, the conception of classification is somewhat altered through contact with Eleaticism. (3) The Phaedrus aims, not merely at realizing universals, but at grasping them in and thiough particulars. This is an ideal of knowledge which was" lost as soon as seen," but one which in some of his latest dialogues, such as the Politicus and Philebus, Plato again endeavoured to work out. (4) The Phaedrus contains the elements of that true psychology into which the ontological theory of the ideas is gradually transmuted in Plato's more advanced writings, when the difficulties of his ideal doctrine in its cruder forms have been clearly felt and under- stood. (5) Plato here appears as a professor of education preferring oral intercourse to authorship. In this paradox he at once exalts the work of Socrates and avows his own vocation as a teacher. The passage throws an interesting light upon the form of dialogue in which his works are cast. But it is not to be sup- posed that he remained long unconscious of the influence he was destined to wield by writing. In executing a great task like the Republic, he practically diverged from the untenable view asserted here; and in the Laws he recommends his longest and least dramatic work as a suitable basis for the education of the future. (6) It must always appear strange, even to those most familiar with the conditions of Hellenic life, that in portraying the idealizing power of passionate love Plato should have taken his departure from unnatural feeling.

On this subject he has sung his own " palinode " in the Laws, which he intended as his final legacy to mankind. 1 Not that he ceased to exalt genius and originality above mere talent, or to demand for philosophy the service of the heart as well as the head, nor yet that friendship was less valued by him in later years. All this remained unchanged. And in the Republic the passion of love is still distantly referred to as the symbol of ideal aspira- tion. But a time came when he had learned to frown on the aberration of feeling which in the Symposium and Phaedrus he appears to regard as the legitimate stimulus of intellectual enthusiasm. And already in the Theaetelus not love but wonder is described as the only beginning of philosophy.

While calling attention to this change of sentiment, it is right to add that Platonic love in the " erotic " dialogues of Plato is very different from what has often been so named, and that nothing even in the noble passage of the Laws above referred to casts the slightest shadow of blame on the Socrates of the Symposium. Such changes are, amongst other things, a ground for caution in comparing the two steeds of the Phaedrus with the spirit (dvfibs) and desire (emdvuia) of the Republic and Timaeus. The Phaedrus, in

common with these dialogues, asserts the existence of higher and lower impulses in human nature, but there is no sufficient ground for supposing that when Plato wrote the Phaedrus he would have defined them precisely as they are defined in the Republic.

The Cratylus is full of curious interest as marking the highest point reached by the " science of language " in antiquity; but, as this dialogue " hardly derives any light from Plato's other writings," 2 so neither does it reflect much light on them. It deals slightly with the contrast between Heracliteanism and Eleaticism, the importance of dialectic, the difficulty about the existence of falsehood, and ends with a brief allusion to the doctrine of ideas— but these topics are all more fully discussed elsewhere.

Three persons maintain different views respecting the nature and origin of language.

Hermogenes affirms that language is conventional, Cratylus (the Heraclitean) that it is natural. Socrates, mediating between these sophistical extremes, declares that language, like other institutions, is rational, and therefore (1) is based on nature, but (2) modified by convention.

In his dialectical treatment of the subject, Socrates displays a tissue of wild etymologies in reliance on the " inspiration " of Euthyphro. Presently a distinction appears between primary and

1 Laws viii. 836.

1 jowett — who has, notwithstanding, thrown much light on the Cratylus in his brilliant introduction.

secondary words. Many primary words convey the notion of movement and change. It follows that the legislator or Word-maker held Heraclitean views. Socrates thus far presses on Hermogenes the view of Cratylus. Then turning to Cratylus he asks if there are no false names. " False language," Cratylus argues, " is impossible."' Socrates shows that a true image may be inadequate, so that we have a right to criticize the work of the word-maker. And the facts indicate an element of meaningless convention. Nor was the original word-maker consistently Heraclitean. For some important words point not to motion but to rest.

But the question returns — Are we sure that the theory of nature which the word-maker held was true? This difficulty cannot be touched by verbal arguments. In seeking to resolve it we must consider, not words, but things.

If there is a true beauty and a true good, which are immutable, and if these are accessible to knowledge, that world of truth can have nothing to do with flux and change.

V. Gorgias, Republic. — In the Symposium and Phaedrus Plato largely redeems the promise implied in the Phaedo, where Socrates tells his friends to look among themselves for a charmer who may soothe away the fear of death. But he was pledged also to a sterner duty by the warning of Socrates to the Athenians, in the Apology, that after he was gone there would arise others for their reproof more harsh than he had been. To this graver task, which he had but partially fulfilled with the light satire upon Lysias or the gentle message to Isocrates, the philo- sopher now directs his powers, by holding up the mirror of what ought to be against what is, the principles of truth and right against the practice of men. For the good has more than one aspect. The beautiful or noble when realized in action becomes the just. And to the question, What is just? are closely allied those other questions of Socrates — What is a state? What is it to be a statesman?

In the Gorgias Plato asserts the absolute supremacy of justice through the dramatic portraiture of Socrates in his opposition to the world; in the Republic he strives at greater length to define the nature of justice through the imaginary creation of an ideal community.

In the Gorgias the Platonic Socrates appears in direct antagon- ism with the Athenian world. The shadow of his fate is impend- ing. Chaerephon (who is still alive) understands Q him, but to the other interlocutors, Gorgias, Polus, Callicles, he appears perversely paradoxical. kYet he effectively dominates them all. And to the reader of the dialogue this image of " Socrates contra mundum " is hardly less impressive than that other image of Socrates confronting death.

1. Gorgias asserts that rhetoric is an art concerned with justice, and that persuasion is the secret of power.

a. Socrates, after suggesting some ironical doubts, declares his opinion that rhetoric is no art, but a knack of pleasing, or in other words " the counterfeit of a subsection of statesmanship." This oracular definition rouses the interest of Gorgias, and Socrates proceeds with the following " generalization and division ": — Management of

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Soul.

1

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Body

1 1

Real. Pretended.

1 1

Real

1

Pretended.

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ffoAlTlKTf. |~ [, ,1 ,., «’ «

1

a

Gymnastic.

J

Medicine.

1, 1,

a B’

1 1 Sophistic. Rhetoric.

P II Legis- Juris- | j

Cosmetic. Confeo | tionery.

lanon. prudence. ~ ~ 1

1

Flattery.

Flattery influences men through pleasure without knowledge. And the rhetor is a kind of confectioner, who can with difficulty be distinguished

from the sophist.

b. Rhetoric, then, is not an art. And persuasion is not the secret of power. Here Socrates maintains against Polus the three paradoxes : —

The tyrant does what he chooses but not what he wishes;

It is less evil to suffer wrong than to do wrong;

It is better for the wrongdoer to be punished than to escape punishment.

The only use of rhetoric, therefore, is for self-accusation, and (if it is ever permissible to do harm) to prevent the punishment of one's enemy.

2. Callicles here loses patience and breaks in. He propounds his theory, which is based on the opposition of nature and custom.

" There is no natural right but the right of the stronger. And natural nobility is to have strong passions and power to gratify them. The lawful

is a word that cowards use, Devised at first to keep the strong in awe."

Socrates entangles him in an argument in which it is proved that pleasure is different from good, and that there are good and bad pleasures.

Now the question is whether the life of philosophy, or the life which Callicles defends, is conducive to good. And it has been shown that rhetoric is one of a class of pursuits which minister to pleasure without discriminating what is good.

Callicles again becomes impatient. Did not Themistocles, Cimon, Pericles labour for their country's good? Socrates then renews his demonstration, proving that if the just man is wronged the evil lies with the wrongdoer, not with him, and that it is worst for the wrongdoer if he escape. And for avoidance of this greatest evil not rhetoric avails anything, nor any of the arts which save life (seeing that life may be used well or ill), nor even such an art of politics as Themistocles, Cimon, or Pericles knew, but another science of politics which Socrates alone of the Athenians practises. The pursuit of it may well endanger him; but his strength lies in having done no wrong. For in the world to come he can present his soul faultless before her judge. Not the show of justice but the reality will avail him there.

This truth is enforced by an impressive myth. And Callicles is invited to leave the life which relies on rhetoric and to follow Socrates in practising the life of philosophic virtue.

The value of justice has been shown. But what is justice ? Is the life upheld by Socrates sufficiently definite for practical guidance? The views of Callicles have been over-‘ borne; but have they been thoroughly examined? Socrates claims to be the only politician. But how can that deserve the name of policy which results in doing nothing? These and cognate questions may well have haunted Plato when he planned the Republic, the greatest of his works. For that which lay deepest in him was not mere speculative interest or poetic fervour, but the practical enthusiasm of a reformer. The example of Socrates had fired him with an ideal of wisdom, courage, temperance and righteousness, which under various guises, both abstract and concrete, has appeared and reappeared in the preceding dialogues. But the more vividly he conceived of this ideal life, the more keenly he felt its isolation in the present world — that of the restored Athenian democracy. For to a Greek mind above all others life was nothing without the social environ- ment, and justice, of all virtues, could least be realized apart from a community. Hence it became necessary to imagine a form of society in which the ideal man might find himself at home, a state to which the philosopher might stand in harmonious relationship, no longer as an alien sojourner, but as a native citizen, not standing aloof in lonely contemplation, but acting with the full consent of other men and ruling in the right of wisdom. Plato did not regard his own republic as a barren dream. He believed that sooner or later in the course of time a state essen>- tially resembling his ideal commonwealth would come into being. Still more firmly was he convinced that until then mankind would not attain their highest possible development. To ignore this real aspect of his most serious work is to lose much of the author’s meaning. Yet it is hardly less erroneous to interpret a great imaginative creation au pied de la lettre, as if examining a piece of actual legislation. Even in his Laws, a far more prosaic writing, Plato himself repeatedly protests against such criticism. In his most aspiring flights he is well aware of the difference between the imaginary and actual embodiment of an ideal, 1 although as a literary artist he gives to his creations, whether in anticipation or retrospect, an air of sober reality and matter-of- fact. He is more in earnest about principles than about details, and if questioned would probably be found more confident with regard to moral than to political truth. He may have been wholly unconscious of the inconsistencies of his scheme, but it would not have greatly disconcerted him to have discovered them, or to have been told that this or that arrangement would not ” work.” He would have trusted the correction of his own rough draft to the philosopher-kings of the future.

The Republic falls naturally into five portions, (i) Bk. i. is preliminary, raising the main question about justice. (2) Bks. ii.,

1 See especially Rep. v. 472 ; Lege,, v. 746.

iii., iv. contain the outlines of the perfect state, including the education of the " guardians," and leading up to the definition of justice (a) in the state, and (6) in the individual. (3) Bks. v., vi., vii. (which to some critics present the appearance of an after- thought or excrescence on the original design) contain the cardinal provisions (1) of communism (for the guardians only), (2) that philosophers shall be kings, (3) of higher education for the rulers (viz. the philosopher-kings). This third provision occupies bks. vi. and vii. (which have again, as some think, the appearance of an outgrowth from bk. v.). (4) Bks. viii. and ix., resuming the general subject from bk. iv., present the reverse of the medal by showing the declension of the state and individual through four stages, until in the life of tyranny is found the image of ideal injustice, as that of justice was found in the life of the perfect state. (5) Bk. x. forms a concluding chapter, in which several of the foregoing enactments are reviewed, and the work ends, like the Gorgias, with a vision of judgment.

Thus the main outlines of the scheme are contained in bks. ii., iii., iv., viii., ix. And yet bks. v., vi., vii. form the central portion, a sort of inner kernel, and are of the highest significance.

In speculating about the composition of the Republic (as is the fashion of some interpreters) it is important to bear in mind the general character of Plato's writings.

" The conception of unity," says Jowett, 2 " really applies in very different degrees to different kinds of art — to a statue, for example, far more than to any kind of literary composition, and to some species of literature far more than to others. Nor does the dialogue appear to be a style of composition in which the require- ment of unity is most stringent ; nor should the idea of unity derived from one sort of art be hastily transferred to another. . . . Plato subjects himself to no rule of this sort. Like every great artist he gives unity of form to the different and apparently distracting topics which he brings together. He works freely, and is not to be supposed to have arranged every part of the dialogue before he begins to write. He fastens or weaves together the frame of his discourse loosely and imperfectly, and which is the warp and which the woof cannot always be determined."

It should be added, that as Dialectic was still a " world not realized," and he was continually conscious of using imperfect methods, he was not

solicitous to bind himself to any one method, or to watch carefully over the logical coherence of his work. " Sailing with the wind of his argument," he often tacks and veers, changing his method with his subject-matter, much as a poet might adopt a change of rhythm. Absorbed as he is in each new phase of his subject, all that precedes is cancelled for the time. And much of what is to come is deliberately kept out of view, because ideas of high importance are reserved for the place where their introduction will have most effect. Another cause of apparent inconsequence in Plato is what he himself would call the use of hypothesis. He works less deduc- tively and more from masses of generalized experience than Platonists have been ready to admit. And in the Republic he is as much engaged with the criticism of an actual as with the projection of an ideal condition of society. If we knew more of the working of Attic institutions as he observed them, wt should often understand him better.

These general considerations should be weighed against the inequalities which have led some critics to suppose that the " first sketch of the state" in bks. ii.— iv. is much earlier than the more exalted views of bks. v.vii. 3 If in these later books new conditions for choosing the future rulers are allowed to emerge, if in discussing the higher intellectual virtues the simple psycho logy of bk. iv. is lost sight of (it reappears in the Timaeus) , if the " knowledge of the expedient " at first required falls far short of the conception of knowledge afterwards attained, all this is quite in keeping with Plato's manner elsewhere, and may be sufficiently accounted for by artistic and dialectical reserve. It can hardly be an altogether fortuitous circumstance that the culminating crisis, the third and highest " wave " of [difficulty — the declaration that philosophers must be kings and kings philosophers— comes in precisely at the central point of the whole long work.

The great principle of the political supremacy of mind, though thus held back through half the dialogue, really dominates the whole. It may be read between the lines all through, even in the institution of gymnastic and the appraisement of the cardinal

! Introd. to the Phaedrus.

3 Krohn, Der platonische Staat (Halle, 1876).

virtues. It is a genuine development of Socratic thought. And it is this more than any other single feature which gives the Republic a prophetic

significance as "an attempt towards anticipating the work of future generations." l

Other aspects of the great dialogue, the Dorian framework, so inevitable in the reaction from Ionian life, the traces of Pythagorean influence, the estimate of oligarchy and democracy, the characters of the interlocutors in their bearing on the exposition, have been fully treated by recent writers, and for brevity's sake are here passed over.

There are other points, however, which must not be omitted, because they are more intimately related to the general develop- ment of Plato's thoughts.

1. The question debated by Proclus has been raised before and since, whether the proper subject of the Republic is justice or the State. The doubt would be more suggestive if put in a somewhat different form: Is Plato more interested in the state or the indi- vidual? That he is in earnest about both, and that in his view of them they are inseparable, is an obvious answer. And it is almost a truism to say that political relations were prior to ethical in the mind of a Greek. Yet if in some passages the political analogy reacts on moral notions (as in the definition of temperance) , in others the state is spoken of in language borrowed from individual life. And it remains questionable whether the ethics or the politics of the Republic are less complete. On the whole Plato himself seems to be conscious that the ideal derived from the life-work of Socrates could be more readily stamped on individual lives than on communities of men (see especially Rep. vii. 528 A, ix. 592).

2. The analogy of the individual is often used to enforce the requirement of political unity and simplicity (see especially v. 462 C). This is also to be referred, however, to Plato's general tendency to strain after abstractions. He had not yet reached a point of view from which he could look steadily on particulars in the light of universal principles. He recurs often to experience, but is soon carried off again into the abstract region which to him seemed higher and purer.' 2 " It has been said that Plato flies as well as walks, but this hardly expresses the whole truth, for he flies and walks at the same time, and is in the air and on firm ground in successive instants " (Jowett). Plato's scheme of communism had been suggested to him partly by Dorian institutions and partly by the Pythagorean rule. But it was further commended by the general consideration that the state is a higher and more abstract unity than the family. The lower obligation must give way to the higher ; the universal must overrule the particular bond.

3. Similarly it may be argued that, while the subordination of music to state discipline, and the importance attached to rhythm and harmony in

education, had likewise a connexion with Sparta and the Pythagoreans severally, Plato's deliberate attitude towards poetry and art could hardly be other than it is. Philosophy, while still engaged in generalization, could not assign to the imagina- tion its proper function. " Aesthetik " could not enter into her purview. For a moment, in the Symposium, the ancient quarrel of poetry and philosophy had seemed to be melted in a dominant tone, but this was only a fond anticipation. Plato, if man ever did so, had felt the siren charm, but he is now embarked on a more severe endeavour, and, until the supreme unity of truth and good is grasped, vagrant fancy must be subdued and silent.

4. In the early education of the guardians a place is found for the unconscious virtue acquired through habit, which the Prota- goras and Meno stumbled over and the Phaedo treated with disdain. In the ideal state, however, this lower excellence is no longer a wild plant, springing of itself through some uncovenanted grace of inspiration, but cultivated through an education which has been purified by philosophy so as to be in harmony with reason. But if Plato were cross-questioned as to the intrinsic value of habits so induced as a preservative for his pupils against temptation, he would have replied, " I do not pretend to have removed all difficulties from their path. Enough of evil still surrounds them to test their moral strength. I have but cleared the well-springs of the noxious weeds that have been fatal to so many, in order that they may have little to unlearn, and be exposed only to such dangers as are inevitable."

5. It is a singular fact, and worth the attention of those who look for system in Plato, that the definition of justice here so laboriously wrought out, viz. the right division of labour between the three classes in the state and between the three corresponding faculties in the individual soul, is nowhere else repeated or applied, although the tripartite division of the soul recurs in the Timaeus, and the notion of justice is of great importance to the arguments of the Politicus and the Laws.

6. Before leaving the Republic, it is important to mark the

stage which has now been reached by Plato's doctrine of ideas.

The statements of the Republic on this subject are by no means

everywhere consistent.

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8 See, for example, the admission of luxury and the after-purifi- cation through " music," bks. ii., iii.

a. Towards the end of bk. v. philosophers are defined as lovers of the whole, who recognize the unity of justice, goodness, beauty, each in itself, as distinguished from the many just or good or beautiful things. The former are said to be objects of knowledge, the latter of opinion, which is intermediate between knowledge and ignorance. Knowledge is .of being, ignorance of the non-existent, opinion of that which is and is not.

b. In bk. vi. there is a more elaborate statement, implying a more advanced point of view. The " contemplation of all time and all existence ' is a riper conception than " the love of each thing as a whole." Ignorance and nonentity have now disappeared, and the scale is graduated from the most evanescent impression of sense to the highest reach of absolute knowledge. And in the highest region there is again a gradation, rising to the form of good, and descending from it to the true forms of all things. In the application of this scheme to the theory of education in bk. vii. there are still further refinements. The psychological analysis becomes more subtle, and more stress is laid on the connexion of ideas.

c. The doctrine reverts to a cruder aspect in bk. x., where we are told of an ideal bed, which is one only and the pattern of all the many actual beds.

d. A yet different phase of idealism presents itself in bk. ix. {sub fin.), in the mention of a " pattern " of the perfect state laid up in heaven which the philosopher is to make his rule of life.

What is said above concerning Plato's mode of composition has some bearing on these inconsistencies of expression. And that bks. vi., vii., as being the most important, were finished last is a not untenable hypothesis. But that Plato, in preparing the way for what he had in contemplation, should content himself with provisional expressions which he had himself outgrown, or that in a casual illustration (as in bk. x.) he should go back to a crude or even childish form of his own theory, is equally conceivable and in accordance with his manner elsewhere. Socrates in the Parme- nides confessedly wavers on this very point. And there are " ideas " of the four elements in the Timaeus.

VI. Euthydemus, Parmenides, Theaetetus, Sophist, Statesman, Philebus (the dialectical dialogues). — Even in the most advanced metaphysics of the Republic there is a hyperbolical, trans- cendental tendency, from which Plato ultimately to some extent worked himself free. But it was not in conversation with " dear Glaucon," or " between the lines " of an ethico-politicai writing, that this partial emancipation could be effectually attained. We have now to consider a series of dialogues, probably intended for a narrower circle of readers, in which Plato grapples directly with the central difficulties of his own theory of knowing and being. It is not

necessary to assume that all of these are later than the Republic. The position of the Euthydemus and Par- menides in the order of composition is very uncertain. The Theaetetus has points of affinity with the Republic. The Sophist, Politicus and Philebus are in a later style. But, on account of their cognate subject-matter, these six dialogues may be con- veniently classed together in a group by themselves. And the right place for such a group is intermediate between the Republic and the Laws.

The unity of the object of definition, the identity of virtue and knowledge, the existence of an absolute good, which would be universally followed if universally known, and of a standard of truth which is implied in the confession of ignorance, were postulates underlying the Socratic process, which in so far made no claim to be a " philosophy without assumptions." These postulatesˆ, when once apprehended, drew Plato on to speculate concerning the nature, the object and the method of knowledge. Now, so far as we have hitherto followed him, his speculation has either been associated with ethical inquiry, or has been projected in a poetical and semi-mythical form. In the Phaedrus however, the vision of ideas was expressly conjoined with an outline of psychology and _ foreshadowing of scientific method. And, while the opposition of ideas to phenomena and of know- ledge to opinion has been repeatedly assumed, it has also been implied that there is a way between them, and that the truth can only be approached by man through interrogation of experi- ence. For it is nowhere supposed that the human inquirer is from the first in a position to deduce facts from ideas. Much rather, the light of the ideas is one which fitfully breaks in upon experience as men struggle towards the universal.

But it is not less true that the metaphysical aspirations from which Socrates had seemed to recall men's thoughts had been reawakened in consequence of the impulse which Socrates

himself had given. From asking, Is virtue one? Can virtue be taught? Plato passes on to ask, What is unity? What are knowledge and being? From criticizing imperfect modes of teaching virtue, he has begun to speculate about the right and wrong uses of the intellect, and from dramatic portraits of the individual Protagoras or Gorgias goes on to the ideal delineation of the sophist. He has entered upon the " longer way," and is no longer contented with mere " hypotheses." With this demand for scientific precision his conception of the ideas them- selves is modified, and he strives anew to conceive of them in relation to one another, to the mind, and to the world. As the balance of ethical truth was restored by admitting an

uncon- scious (or inspired) conformity to reason, so now a fresh attempt is made on the intellectual side to bridge the gulf between sense and knowledge.

This endeavour involves, not only an expansion of the method of Socrates, but an examination of the earlier philosophies from which Socrates had turned away. Their influence on Plato has been traceable in the preceding dialogues, though, except in the case of Pythagoreanism (Gorg., Phaed., Rep.) it has been mostly indirect and casual. But in these dialectical dialogues he mani- fests his serious conviction that the contemporary fallacies which formed the chief hindrance to inquiry were deeply rooted in forms of thought created by earlier thinkers, above all by Heraclitus and Parmenides. To the exclusiveness of their first principles as held by their followers Plato attributed the barrennesss and impracticable unreality of many discussions, which put shadow-fighting and controversy in the place of real investigation, and led men to think that truth was unattainable. He therefore enters into conversation, as it were, with the great minds of former times, and in the spirit of Socrates compels each of them to yield up his secret, and to acknowledge a supple- mental truth. To this effort he may very probably have been stimulated by the dialectical activity of his Socratic friends at Megara, whose logical tastes had drawn them towards Eleaticism. But, unlike them, while strengthening his metaphysical theory, he was also led to give to his political speculations a more practical turn.

The Euthydemus is a treatise " De Sophisticis Elenchis " in the form of a farce, and may serve to introduce the five other Bath demus dialogues, as the encounter with Thrasymachus ' introduces the serious part of the Republic. Under the mask of mockery there is more of concentrated thought, and also more of bitterness, in this dialogue than in the Protagoras or the Gorgias.

A sample of educational dialectic — in which Socrates draws out of young Cleinias the admissions (i) that a philosophy is needed, (2) that the highest philosophy is a science of kingcraft, which remains for the present undefined — is contrasted with a series of ridiculous sophisms, propounded by Dionysodorus and his brother Euthydemus, in which absolute and relative notions, whether affirmative or negative, object and subject, universal and particular, substance and attribute, action and modality, are capriciously confused. Crito, to whom Socrates narrates the scene, is moved to contempt. But Socrates warns him not on this account to despair of philosophy. In conclusion, Isocrates, or some one else, who prematurely mixes up philosophy with practical politics, is cautioned against spoiling two good things. Such puzzles as — How can I learn either what I know or what I do not know? 1 How can things become what they are not? How is falsehood or denial possible? — although treated jocularly here, will be

found returning afterwards to " trouble the mind's eye."

Plato appears in the same act to have become aware of his affinity with Parmenides, and to have been led to reconsider the P rmealdes foundations of his own doctrine. The one being ' of Parmenides was a more abstract notion than justice, beauty or the good. And the Zenonian method had more pretension to exactness than the Socratic. But it remained barren, because contented to repeat its own first essays in the destructive analysis of experience, without rising to the

1 Cf. Meno.

examination of its own first principles. For this higher criticism, of which he himself also stood in need, Plato looks up from the disciples to the master Parmenides. The appeal to him is put into the mouth of Socrates, as a very young man, who has framed for himself a theory of ideas, and would gladly see the Zenonian process applied to the notions of sameness, difference, likeness, unlikeness, unity and being.

Parmenides, whom Plato treats with tender reverence not unmixed with irony, proposes to the youth a series of questions which reveal the crudity of the doctrine of effiij. (1) Are there ideas of trivial things? 2 (2) How do things '"partake" of them? (3) Must not idealism proceed in infinitum? (4) If ideas are thoughts, do they and their participants think ? (5) If they are patterns, and things resemble them, must there not be a pattern of the resemblance, and so on in infinitum ? (6) If absolute, are they thinkable by man ?

These difficulties are real, and yet to deny ideas is to destroy philosophy. (As the paradoxical doubts in the Protagoras do not shake the faith of Socrates in the existence of good, so neither does Plato here intend for a moment to derogate from the belief in the existence of the One and the True.)

Parmenides advises Socrates to arm himself for the further pur- suit of truth (1) by the higher application and (2) by the extension or completion of the Zenonian method. (1) The method is to be applied to abstractions. (2) It is not enough to show the inferences which may be drawn from the admission of an hypothesis, but account must also be taken of the inferences which follow from its rejection.

Parmenides exemplifies his suggestion by examining his own first principle in conversation with a youth who, while a contemporary of Socrates, is a namesake of Plato's pupil Aristotle. 3 Not content with the affirmative and negative hypotheses, he pursues either along two lines , according as either

term of the proposition is emphasized, and this not only as regards the hypothesis of unity, but also as applied to the alternative hypothesis of plurality. The result, as in the Protagoras, is purely destructive, and the dialogue ends abruptly without a word of reply from Socrates.

The second part of the Parmenides may be regarded as an experiment in which Plato " assays to go " in Eleatic armour. Yet the strange web is " shot " with colours of original thought. The mode of conceiving time and becoming, and the vision of nothingness towards the end, may be noted as especially Platonic. These passages may be regarded in the same light as the wise words of Protagoras or the sober truths which occur amidst the wild fancies of the Cratylus. They should not mislead the interpreter into a search for recondite meanings.

The Zenonian method has been carried out to the utmost in application to the highest subject, and has led the mind into a maze of contradiction. It remains to call in question the method itself, and the notion of absolute identity and difference on which it hinges, and so to lay anew the foun- dation-stone of thought. Before this can be attempted, how- ever, another set of difficulties have to be met, and another set of philosophers examined. For the current scepticism had undermined the conception of knowledge as well as that of being, and the fame of Heraclitus was hardly second to that of Par- menides. Protagoras appeared in a former dialogue as the champion of ordinary morality; he is now made the exponent of ordinary thinking. His saying " Man the measure " is shown to rest on the unstable basis of the Heraclitean flux. By an elaborate criticism of both theories knowledge is at last separated from the relativity of sense; but the subsequent attempt to distinguish on abstract grounds between true and false opinion, and to define knowledge as true opinion with a reason (cf. Meno), proves ineffectual. Plato still shows traces of Megarian influence. But the disjunctive method of the Parmenides is not resumed. The indirect proofs are so arranged as to exhibit the skill of Socrates in " bringing to the birth " the germs of thought in a richly endowed and " pregnant " young mind. Theaetetus is the embodiment of the philosophic nature des- cribed in Rep. bk. vi., and has already been trained by Theodorus of Cyrene in geometry and the other preparatory sciences of

- *Cf. Rep. x. 597.*
- *Cf. the younger Socrates of the Politicus. It would be precarious to draw any inference from this minute fact.*

Rep. bk. vii. It is in conversation with Theodorus that Socrates impressively contrasts the lives of the lawyer and the philosopher. The Theaetetus marks a great advance in clearness of metaphysical and psychological expression. See for example the passage (184-186) in which the independent function of the mind is asserted, and ideas are shown to be the truth of experience. There is also a distinct approach towards a critical and historical method in philosophy, while the perfection of style continues unimpaired, and the person of Socrates is as vividly represented as in any dialogue.

Notwithstanding the persistence of an indirect and negative method, the spirit of this dialogue also is the reverse of sceptical. " Socrates must assume the reality of knowledge or deny himself " (197 A). Perhaps in no metaphysical writing is the balance more firmly held between experience, imagination and reflection. Plato would seem to have made a compact with himself to abstain rigidly from snatching at the golden fruit that has so often eluded his grasp, and to content himself with laboriously " cutting steps " towards the summit that was still unsealed.

With Plato, as with other inventive writers, a time seems to have arrived when he desired to connect successive works in a series. Thus in planning the Sophistes he linked it to op s the Theaetetus (which had been written without any such intention), and projected a whole tetralogy of dialectical dialogues, Theaetetus, Sophistes, Politicus, Philosophus, of which the last piece seems never to have been written. -»

After an interval, of which our only measure is a change of style, the philosopher returns to the great central question of knowledge and being. The obstacle in his path, on which he has often played with light satire, dramatic portraiture and indirect allusion, is now to be made the object of a seriously planned attack. He has made his approaches, and the enemy's fortress is to be forthwith sapped and overthrown. This hostile position is not merely the " Sophistik " which, as some tell us, is an invention of the Germans, and as Plato himself declares is only the reflection or embodiment of the average mind, 1 but the fallacy of fallacies, the prime falsehood {irpCrrov \ptv80s) of all contemporary thought. This is nothing else than the crude absoluteness of affirmation and negation which was ridiculed in the Euthydemus, and has been elsewhere mentioned as the first principle of the art of controversy. 2 For dramatic purposes this general error is personified. And the word " sophist," which had somehow become the bite noire of the Platonic school, thus for the first time fixedly acquires the significance which has since clung to the name. That Plato himself would not adhere pedantically to the connotation here implied is shown by the admission, at the opening of the dialogue, that amongst other disguises under which the philosopher walks the earth the sophist is one. '

In the Sophistes, as in the Parmenides, a new method is intro- duced, and again by an Eleatic teacher. This method is repeated with improvements in the Politicus, and once more referred to in the Philebus. It bears a strong resemblance to the " syna- goge " and " diaeresis " of the Phaedrus, but is applied by the " friend from Elea " with a degree of pedantry which Socrates nowhere betrays. And the two methods, although kindred, have probably come through different channels — the classifi- cations of the Phaedrus being Plato's own generalization of the Socratic process, while the dichotomies of the Stphistes and Politicus are a caricature of Socrates cast in the Megarian mould. Plato seems to have regarded this method as an implement which might be used with advantage only when the cardinal principles on which it turned had been fully criticized.

1. After various attempts to " catch the sophist," he is defined as the maker of an unreal likeness of truth. Here the difficulty begins — for the definition implies the existence of the unreal, i.e. of not-being. In our extremity it is necessary to " lay hands on our father Parmenides."

2. The contradictions attendant on the notion of " being," whether as held by Parmenides or his opponents or by the " less exact " thinkers who came after them, are then examined, and in an extremely subtle and suggestive passage (246-249) an attempt

1 Rep. vi. 493.

2 iiriXoYwoJ.

is made to mediate between idealism and materialism. The result is that while consummate being is exempt from change it cannot be devoid of life and motion. " Like children, ' Give us both,' say we."

3. This leads up to the main question: (a) are different notions incommunicable, or (b) are all ideas indiscriminately communicable, or © is there communion of some kinds and not of others? The last view is alone tenable, and is confirmed by experience. And of the true combination and separation of kinds the philosopher is judge.

4. Then it is asked (in order to " bind the soDhist ") whetheK being is predicable of not-being.

Five chief kinds (or categories) are now examined, viz. being, rest, motion, sameness, difference. Rest and motion are mutually incommunicable, but difference is no less universal than being itself. For everything is " other " than the rest, i.e. is not. Thus positive and negative not only coexist but are coextensive.

5. And, in spite of Parmenides, we have discovered the existence, and also the nature, of not-being. It follows that the mere pursuit of contradictions is childish and useless and wholly incompatible with a philosophic spirit.

Negation, falsity, contradiction, are three notions which Plato from his height of abstraction does not hold apart. His position is the converse of the Spinozistic saying, " Omnis determinatio est negatio." According to him, every negative implies an affirmative. And his main point is that true negation is cor- relative to true affirmation, much as he has said in the Phaedrus that the dialectician separates kinds according to the " lines and veins of nature." The Sophistes is a standing protest against the error of marring the finely-graduated lineaments of truth, and so destroying the vitality of thought.

The idealists whom the Eleatic stranger treats so gently have been identified with the Megarians. But may not Plato be reflecting on a Megarian influence operating within the Academy? Here, as partly already in the Parmenides and Theaetetus, the ideas assume the nature of categories, and being is the sum of positive attributes, while negation, as the shadow of affirmation, is likewise finally comprehended in the totality of being.

The remark made incidentally, but with intense emphasis, that the universe lives and moves "according to God," 1 is an indication of the religious tone which reappears increasingly in the Politicus, Philebus, Timaeus and Laws.

In passing on to consider the statesman, true and false, the Eleatic stranger does not forget the lesson which has just been learned. While continuing his method of dicho- Pomicus tomies, he is careful to look on both sides of each (States- alternative, and he no longer insists on dividing between this and not-this when another mode of classification is more natural. A rule not hitherto applied is now brought forward, the rule of proportion or right measure (rd //.erpiov), as distinguished from arbitrary limitations. Nor is formal logical treatment any longer felt to be adequate to the subject in hand, but an elaborate myth is introduced. On the ethico- political side also a change has come over Plato. As he has stripped his ideas of transcendental imagery, so in reconsidering his philosopher-king he turns away from the smiling optimism of the Republic and looks for a scientific statesmanship that shall lay a strong grasp upon the actual world. He also feels more bitterly towards the demagogues and other rulers of Hellas. The author of the Politicus must have had some great quarrel with mankind. But so far as they will receive it he is still intent on doing them good.

1. The king is first defined as a herdsman of men, who as " slow bipeds " are distinguished from the pig and the ape. But the king is not all in all to his | charges, as the herdsman is. The above definition confuses human

with divine rule.

2. Now the universe is like a top, which God first winds in one direction and then leaves to spin the other way. In the former or divine cycle all was spontaneous, and mankind who had all things in common, were under the immediate care of gods. They were happy, if they used their leisure in interrogating nature. But in this reign of Zeus it is far otherwise. Men have to order their own ways and try to imitate in some far-off manner the ail-but forgotten divine rule.

3. Therefore in our present definition the term " superintendent "

must be substituted for " herdsman ."

What special kind of superintendence is true statesmanship?

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4. By way of an example, the art of weaving is denned. The example shows that kingcraft has first to be separated from other kindred arts, both causal and co-operative. Nine categories are adduced which exhaust social functions. Eight are eliminated, and the ninth, the class of ministers, remains. Of these (a) slaves, (b) hirelings, (c) traders, (d) officials, (e) priests are again parted off, although the last are only with difficulty separated from the king, when (f) a strange medley of monstrous creatures come into view. Some are fierce like lions, some crafty like the fox, and some have mixed natures like centaurs and satyrs. These are the actual rulers of mankind, more sophistical and juggling than the sophist himself. And they too must be separated from the true king.

5. The familiar tripartite distinction of monarchy, oligarchy, democracy, is doubled by introducing into each the distinction involved in the presence or absence of wealth, and in the observance or non-observance of law. But no one of the six carries in itself a scientific principle.

The true government is the rule, not of many, but of one or of a few. " And they may govern, whether poor or rich, by free-will or compulsion, and either with or without law, so long as they govern scientifically."

6. The respondent, a youthful namesake of Socrates, is shocked at the remark that the true ruler may govern without law.

This leads to a discussion of the nature of law, which is compared to the prescription left by a physician. If present, he might dispense with his own rule. So the presence of a competent ruler is better than the sovereignty of law, which makes no allowance for nature or circumstance, but tyrannically forces its own way. Imagine medicine, navigation, &c, similarly conducted by time- honoured prescription, with penalties for innovation ;— what would become of civilization? Yet if law is disregarded by rulers who are unscientific and warped by self-interest, this leads to far worse evils. For the laws are based on some experience and wisdom. Hence, in the continued absence of the true ruler, the best course, though only second best, is the strict observance of law. And he who so rules in humble imitation of the scientific governor may be truly called a king, although if the divine lawgiver were to appear his living will would supersede the law.

7. As it is, though cities survive many evils, yet many are ship- wrecked because of the ignorance of those at the helm. The order of badness in the actual states is —

1. Constitutional monarchy.

2. Constitutional oligarchy.

I — 3. Law-abiding democracy.

‘ — 4. Law-breaking democracy.

5. Law-defying oligarchy.

5. Tyranny.

8. It remains to separate from the true ruler those who co-operate with him as subordinates, the general, the judge, the orator. His own peculiar function is an art of weaving strength (the warp) with gentleness (the woof), when education has prepared them — -and this (1) by administration, (2) by marriage.

The four preceding dialogues have shown (1) the gradual transformation of the Platonic ideas (while still objective) into forms of thought, (2) the tendency to group them into series of categories, (3) a corresponding advance in psychological classifi- cation, (4) an increasing importance given to method, (5) the inclination to inquire into processes {yevtaus) as well as into the nature of being.

Meanwhile Plato’s approach to the Eleatics, though in the way of criticism, has brought into prominence the notions of Pbttebas un i t y> being,

sameness, difference, and has left some- what in abeyance the idea of good. To this " highest of all studies " Plato now returns, equipped with his improved instruments, and ready to forge new ones in the same laboratory, or in some other, should occasion serve. His converse with Parmenides ended in his assertion of an element of difference pervading all things — in other words, of an indeterminate element underlying all determinations. This brings him again into relation with the Pythagoreans, who had similarly asserted the combination of finite and infinite in the universe. Taking advantage of their help, he gains a more advanced (but still ideal) conception of the concrete harmony of things, and approaches the definition of that which in the Republic he but shadowed forth. With this most serious inquiry there is combined (as in the Sophistes and Politicus) an ironical and controversial use of dialectic, by which the juggler and false pretender (who is in this case the goddess of pleasure), after claiming the highest place, is thrust down to the lowest.

It must be admitted that the style of the Philebus is far from brilliant, or even clear. In the effort of connecting abstractions

Plato's movement is more laboured than in his first glad realiza- tion of them.

Instead of attempting here to follow the windings of the dialogue, it must suffice to state the main result. Neither pleasure nor knowledge is the highest good, and the good eludes definition; but the shrine, or habitation, of the good is a complex life of which the elements are, in order of merit: (r) measure, the cause of all right mixture; (2) (a) beauty, the effect, and (b) reality, the inseparable condition; (3) intellect; (4) science, art and right opinion; (5) pure pleasure unaccompanied with pain. " Not all the animal kingdom shall induce us to put pleasure first."

The Philebus introduces us to the interior of the Academy in the lifetime of the master. More than any other of the dialogues it recalls Aristotle's description of Plato's teaching. But, while his followers seem early to have fallen under the dominance of the latest phase of his doctrine, Plato himself, even in the Philebus, is still detached from any servitude to the creations of his own mind. He manipulates them as the medium for expressing his fresh thoughts, but they are not yet crystallized into a system.

" I will remind you," Socrates, " of what has been omitted," says Protarchus at the conclusion of this dialogue. The last (presumably) of Plato's metaphysical writings thus fitly ends with a confession of incompleteness. But if, as Renan says, " the most fatal error is to believe that one serves one's country by calumniating those who founded it,"

neither is it for the interest of science to ignore these imperfect anticipations. By methods elaborated in the course of centuries, and far more sure than any which Plato had at his command, mankind have gained an extent of knowledge which he dreamt not of. 1 But the Greek metaphysician is none the less a pioneer of knowledge, 2 while the special sciences of ethics and psychology had been carried from infancy to adolescence in a single lifetime.

VII. Timaeus, Critias [Hermoerates]. — As the Sophistes and Politicus were written in continuation of the Theaetetus, so, at some uncertain time, Plato conceived the design of writing a great trilogy, for which the ideal state depicted in the Republic should be the point of departure. The grand outline there sketched by Socrates was now to be filled up by Critias and Hermoerates. The form set up by reasoning should be made alive, the " airy burghers " should be seen " making history." As a prelude to this magnificent celebration, Timaeus, the Pythagorean philosopher, who is present at the Panatbenaea, is invited to discourse of the origin of all things, and to bring down the glorious theme to the creation of man. What should have followed this, but is only commenced in the fragment of the Critias, would have been the story, not of a fall, but of the triumph of reason in humanity.

In the Philebus (50 A, cf. 62 D) Plato speaks with a touch of contempt of the life-long investigation of nature, as being concerned only with this visible universe, and immersed in the study of phenomena, whether past, present or to come, which admit of no stability and therefore of no certainty. " These things have no absolute first principle, and can never: be the objects of reason and true science."

Yet even this lower knowledge is there admitted as an element of that life which is the habitation of the good. And there are not wanting signs in his later dialogues that Plato's imagination had again been strongly drawn towards those physical studies which, as the Phaedo shows, had fascinated him in youth. That nature and the world proceed " according to God and not according to chance " is the belief of the Eleatic stranger, to which he perceives that Theaetetus will be irresistibly drawn as he grows older (Soph. 265 D). In the midst of dialectical abstractions, the processes of actual production (yev&

1 See, however, Polit. 272 C, D.

2 See Jowett, Introd. to the Timaeus.

his thoughts. In the same passage (272 C) there occurs the first clear anticipation of an interrogatio naturae.

The impulse in this new direction, if not originated, was manifestly reinforced, through closer intercourse with the Pythagorean school. And the choice of Timaeus the Pytha- gorean as chief speaker is an acknowledgment of this obvious tendency. If in the course of the dialogue there occur ideas apparently borrowed from the Atomists, whom Plato persist- ently ignored, this fact ought probably to be referred to some early reaction of Atomic on Pythagorean doctrine. It is import- ant to observe, however, that not only the Timaeus, but the unfinished whole of which it forms the introduction, is pro- fessedly an imaginative creation. For the legend of prehistoric Athens and of Atlantis, whereof Critias was to relate what belonged to internal policy and Hermocrates the conduct of the war, would have been no other than a prose poem, a " mytho- logical lie," conceived in the spirit of the Republic, and in the form of a fictitious narrative. And, therefore, when Timaeus professes to give only a probable account of shadowy truths, he must be taken at his word, and not criticized in too exacting a spirit. His descriptions have much the same relation to the natural philosophy of Plato's time that Milton's cosmology has to the serious investigations of Galileo or Copernicus — except that all physical speculation hitherto partook in some measure of this half-mythological 'character, and that Plato's mind, although working in an unfamiliar region, is still that of a speculative philosopher.

As Parmenides, after demonstrating the nonentity of growth and decay, was yet impelled to give some account of this non- existent and unintelligible phenomenal world, so Plato, although warned off by Socrates, must needs attempt to give a probable and comprehensive description of the visible universe and its creation. In doing so he acknow- ledges an imperfect truth in theories which his dialectic had previously set aside. In examining the earlier philosophers he has already transgressed the limits prescribed by Socrates, and the effort to connect ideas has made him more and more conscious of the gap between the ideal and the actual. He cannot rest until he has done his utmost to fill up the chasm — calling in the help of imagination where reason fails him. His dominant thought is still that of a deduction from the " reason of the best," as in the Phaedo, or " the idea of good," as in the Republic. But both his abstract idealism and his absolute optimism were by this time considerably modified, and, although not confounding " causes with conditions," as he once accused Anaxagoras of doing, he yet assigns more scope to " second causes " than

he would then have been willing to attribute to them. This partly comes of ripening experience and a deepening sense of the persistency of evil, and partly from the feeling — which seems to have grown upon him in later life — of the distance between God and man.

Timaeus begins by assuming (1) that the universe being corporeal is caused and had a beginning, and (2) that its mysterious Author made it after an everlasting pattern. Yet, being bodily and visible, it can only be made the subject, humanly speaking, of probable discourse. Thus much being premised, he proceeds to unfold — (a) the work of mind in creation, (b) the effects of necessity, including the general and specific attributes of bodies, (c) the principles of physiology, and (d) an outline of pathology and medicine. _

To give a full account of such a comprehensive treatise is beyond our scope, and the Timaeus, however great and interesting, has been well described as an out-building of the great fabric of original Platonism. A very few scattered observations are all that there is space for here.

a. J. In the mythology of the Timaeus some of the conceptions which attained logical clearness in the Sophist and Philebus resume an ontological form. Thus, in compounding the soul-stuff of the universe, the father of all takes of the continuous and discrete and fuses them into an essence (the composite being of the Philebus). Again he takes of the same and other (cf. the Sophist), over- coming their inherent repugnance by his sovereign act.

2. The notion of an economy or reservation in Plato has been often exaggerated and misapplied. But it is difficult to acquit him of intentional obscurity in speaking of the creation of the Earth. It is clear, though Plato does not say so, that she is meant to have been created together with the Heaven and together with Time, and so before the other " gods within the heaven," i.e. the sun and

moon and five planets, and it is a plausible supposition that she is the "artificer of day and night," by interposing her bulk to the sun's rays. If the word eiWopivri in p. 40 implies motion (as Aristotle thought 1), it cannot be, as Grote supposed, a motion con- sentaneous with that of the outer sphere, but either some far slower motion, perhaps assumed in order to account for the shifting of the seasons, or an equal retrograde motion which is supposed to neutral- ize in her case the " motion of the same." She clings to the centre, as her' Natural abode. And the diurnal motion of the heavens is due not to any mechanical force but to the soul of the world extending from the centre to the poles and comprehending all.

3. Immortality is in the Timaeus dependent on the will of the Eternal. And

the sublime idea of eternity is here first formulated.

4. The phenomena of vision and hearing are included among the works of reason, because the final cause of these higher senses is to give men perception of number, through contemplation of the measures of time.

b. 1. It has been commonly said that the four elements of the Timaeus are geometrical figures, without content. This is not true. For what purpose does Plato introduce, " besides the archetype and the created form, a third kind, dim and hard to conceive, a sort of limbec or matrix of creation," if not to fill up the triangles which are elements of elements, and to be the vehicle of the forms com- pounded of them ? It has been supposed that this " nurse of generation " is identical with " space," and it cannot be said that they are clearly kept apart by Plato. But he had a distinct nomen- clature for either, and, although gravity is explained away (so that his molecules, unlike Clerk Maxwell's, may be called imponderable), yet extension, or the property of filling space, is sufficiently implied.

2. The difference of size in the triangles and varying sharpness of their outlines are ingenious though inadequate expedients, adopted in order to account for qualitative difference and physical change.

3. In criticizing the illusory notion of "up and down," Plato, apparently for the first time, broaches the conception of antipodes.

4. More distinctly than in the Philebus, bodily pleasure is ex- plained by " a sudden and sensible return to nature " (cf. Ar. Rhet. i. 11, §1; N.E., vii. 10).

5. Natural philosophers are warned against experimenting on the mixture of colours, which is a divine process and forbidden to man (Tim. 68 d). (Ancient science was at a loss for a theory of colours.)

c. I. Plato tends more and more in his later writings to account for moral evil by physical conditions, thus arriving at the Socratic principle of the mvoluntariness of vice by a different road.

Hence in the Timaeus not the body only is made by the inferior gods, but they also create the lower and mortal parts of the human soul: the principle of anger which is planted in the breast, within hearing of reason, and that of appetite which is lodged below the diaphragm like an animal tied in a stall, with the stomach for a crib and the liver for a " soothsaying " looking-glass to soothe or terrify it when tempted to break loose.

2. The brain-pan was left bare of protecting flesh " because the sons of God who framed us deliberately chose for us a precarious life with capability of

reason, in preference to a long secure existence with obstruction of thought."

3. The nails are a rudimentary provision for the lower animals, into which degenerate souls were afterwards to be transformed.

4. Vegetables have sensation but not motion.

5. By way of illustrating the very curious account here given of respiration, it is asserted that what is ccmmonly thought to be the attraction of the magnet is really due to rotatory motion and displacement: a remarkable anticipation (Tim. 80c).

6. When the original particles wear out, and the bonds of soul and body in the marrow give way, the soul escapes delightedly and flies away. This is the painless death of natural decay.

d. 1. The dependence of mental disease on bodily conditions is more fully recognized in the Timaeus than elsewhere in Plato (contrast the Charmides, for example).

2. He has also changed his mind about the treatment of disease, and shows more respect for regimen and diet than in the Republic. Diseases are a kind of second nature, and should be treated accordingly.

3. It is also a remark in contrast with the Republic, that over- study leads to head complications, which physicians ascribe to chill and find intractable. . .

Lastly, it is one of the strange irregularities in the composition of the Timaeus that the creation of woman and the relation of the sexes 2 to each other are subjects reserved to the end, because this is the place given to the lower animals, and woman (cf. the Phaedrus) is the first transmigration from the form of man. This order is probably not to be attributed to Plato's own thought, but to some peculiarity of Pythagorean or Orphic tradition.

VIII. The Laws. — The two series of dialogues, the dialectical and the imaginative— Sophistes, Politicus, Philosophus — Timaeus, Critias, Hermocrates — were left Incomplete. For Plato had concentrated his declining powers, in the evening of

1 Aristotle, however uses elXov/ikvri, a different word.

2 There is an anticipation of microscopic observation in the words ibpara iiri a-fiiKporriTos nal 48i&7rXa

Laws,

his life, l upon a different task. He was resolved to leave behind him, if he could so far overcome the infirmities of age, 2 a code of laws, conceived in a spirit of concession, and such as he still hoped that some Hellenic state might sanction. The motive for this great work may be gathered from the Politicus. The physician in departing is to give a written prescription, adapted as far as possible to the condition of those from whom he goes away. This is the second-best course, in the absence of the philosopher-king. And, as the Hellenic world will not listen to Plato's heroic remedy, he accommodates his counsel to their preconceptions. He returns once more from abstract discussions to study the application of ideas to life, and though, by the conditions of the problem, his course is " nearer earth and less in light," this long writing, which is said to have been posthumous, 3 has a peculiar interest. The ripeness of accumulated experience and the mellowness of wise contem- plation make up for the loss of prophetic insight and poetic charm.

The form of dialogue is still retained, and an aged Athenian is imagined as discoursing of legislation with the Lacedaemonian Megillus and the Cretan Cleinias, who has in view the foundation of a new colony, and is on his way with his two companions from Cnossus to the temple and oracle of Zeus.

Plato now aims at moderating between Dorian and Ionian law, freely criticizing both, and refining on them from a higher point of view. " The praise of obedience, the authority assigned to elders, the prohibition of dowries, the enforcement of marriage, the common meals, the distribution and inalienability of land, the institution of the Crypteia, the freedom of bequest to a favourite son, the dislike of city walls — all reflect the custom of Sparta." ..." The use of the lot, the scrutiny of magistrates, the monthly courses of the council, the pardon of the forgiven homicide, most of the regulations about testaments and the guardianship of orphans, the degrees of consanguinity recognized by law, correspond to Athenian laws and customs " (Jowett).

The philosopher's own thoughts come out most strongly in the " preludes " to the laws, 4 and in the regulations concerning education, marriage and the punishment of impiety (i.e. ist, atheism; 2nd, denial of providence; 3rd and worst, immoral superstition). The difficulty which is met in the Politicus by the abandonment of the world for a time, and in the Timaeus

by the lieutenancy of lower gods, here leads to the hypothesis of an evil soul. The priority of mind (often before asserted) and the increased importance attached to numbers are the chief indications of Plato's latest thoughts about the intelligible world. But it must be remembered that the higher education (answering to Rep. vi., vii.) is expressly reserved. 5 Had Plato written his own Epinomis, the proportions of the whole work (not then " acephalous ") might have been vastly changed.

The severity of the penalties attached to the three forms of heresy, especially to the third and worst of them, has led to the remark that Plato, after asserting " liberty of prophesying," had become intolerant and bigoted in his old age (Grote). But the idea of toleration in the modern sense was never distinctly present to the mind of any ancient philosopher. And, if in the Laws the lines of thought have in one way hardened, there are other ways in which experience has softened them. Plato's " second-best " constitution contains a provision, which was not admissible in the " perfect state," for possible changes and readaptations in the future. The power of self-reformation is hedged round indeed with extreme precautions; and no young or middle-aged citizen is ever to hear a word said in depreciation of any jot or tittle of the existing law. But that it should be provided, however guardedly, that select commissioners, after

1 Otitis S' iv Svcr/xaU tou jSiov, Legg. vi. 770 A.

3 &v . . . 717PWS €7rtKpaTwju€P ye roaovrov, Legg. vi. 75 2 A.

3 Published by Philippus the Opuntian.

4 See especially iv. 716 seq.; v. 727 seq. ; 735 seq.; vi. 766; vii. 773 seq., 777, 794, 803 seq., 811, 817; viii. 835 seq. ; ix. 875 ; x. 887 seq. 897 seq., 904 seq.

6 Legg. xii. 968 E. (Ath.) " I am willing to share with you the danger of stating to you my views about education and nurture, which is the question coming to the surface again."

travelling far and wide, should bring back of the fruit of their observations for the consideration of the nocturnal council, and that a power of constitutionally amending the laws should thus be admitted into the state, is sufficiently remarkable, when the would-be finality of ancient legislation is considered. Plato even comes near to the reflexion that " constitutions are not made, but grow " (iv. 709 A).

Plato in the Laws desists finally from impersonating Socrates. But he is in some ways nearer to his master in spirit than when he composed the Phaedrus. The sympathy with common life, the acceptance of Greek

religion, the deepening humanity, are no less essentially Socratic than the love of truth which breathes in every page. And : some particular aspects of Socratism reappear, such as the question about courage 6 and that concerning the unity of virtue. 7

Doubtful and Spurious Works. — Of the dialogues forming part of the " Platonic canon," and not included in the preceding survey, the Lesser Hippias, First Alcibiades and Menexenus are the most Platonic, though probably not Plato's. The Greater Hippias and the Clitophon are also admitted to have some plausibility. The Second- Alcibiades (on Prayer), the Hipparchus (touching on Peisistratus and Homer), Minos (" de lege"), Epinomis, Erastae, Theages, are generally condemned, though most of them are very early forgeries or academic exercises. 8 And the Axiochus (though sometimes prized for its subject, "the contempt of death "), the Dejuslo, De virtute, Demodocus, Sisyphus, Eryxias] (a not-uninteresting treatise on the use of money), together with the so-called Definitions, were rejected in ancient times, and are marked as spurious in the MSS.

Editions. — (1) Complete: Aldine, Ven., 1513; H. Stephanus, 3 vols. (1578), with Latin version by Serranus (i.e. De Serre, the real editor); (the paging of this edition is preserved for convenience of reference on the margins of most subsequent editions) ; G. Stallbaum, (12 vols., 1821-1825); G. Stallbaum, the text in 1 vol. (1850); C. F. Hermann (6$Vols., 1851-1853); Immanuel Bekker (1816-1823); the Zurich edition by Baiter, Orelli and Winkelmann (1839-1842); Hirschig and Schneider, in Didot's series (1856-1873) ; M. von Schanz, with critical notes (1875-1887) ; J. Burnet (Oxford, 1902). (2) Partial : L. F. Heindorf , Lysis, Charmides, Hippias Major, Phaedrus, Gorgias, Theaetetus, Cratylus, Parmenides, Euthydemus, Phaedo, Sophist, Protagoras; Philebus, C. Badham, E. Poste (1861), R. G. Bury; Apologia, J. Riddell (with Digest of Platonic Idioms) (1861); Protagoras, Wayte (1854) 1871; Theaetetus, L. Campbell (1861) 1883, B. Kennedy; Sophist and Politicus, L. Campbell (1867); Phaedo, W. Geddes, Archer Hind ; Timaeus, Archer Hind (1888) ; Parmenides, Waddell (1894) ; Meno, J. Adam, Seymer Thompson; Apologia, Crito, Meno, St G. Stock; Euthydemus, Gifford; Phaedrus, Gorgias, W. H. Thompson; Symposium, Euthydemus, Laches, C. Badham; Par- menides, Stallbaum, Maguire, Waddell; Leges, F. Ast (1814), C. Ritter (Commentary) (1896) ; Republic, Jowett and Campbell (1894), J. Adam (1902).

Translations. — Latin: A Latin version of the Timaeus by Chalcidius existed in the middle ages and was known to Dante. It was printed at Paris in 1520 (Teubner, 1876). The complete rendering by Marsiglio Ficino (1496) formed the basis of other Latin translations, such as that of Serranus (supra), which accompanied the edition of Stephanus. It was

printed in the Basel edition of 1534. English: (1) Complete: Sydenham and Taylor (1804); Jowett (1871-1892). (2) Partial: Republic, Davies and Vaughan, Jowett (in a separate volume; 3rd ed., 2 vols., 1908); Philebus, E. Poste; Georgias, Cope; Timaeus, Archer Hind (in his edition); Apology, Crito, Phaedo, Church, Jowett (reprinted from the complete translation with preface by E. Caird) ; Theaetetus, Paley, Kennedy ; German: Schleiermacher (1817-1828), J. H. Muller (1850-1866); French: V. Cousin (13 vols., 1822-1840). Italian: Bonghi. j

Dissertations. — English: F. Schleiermacher's Introductions, translated by W. Dobson (1836); Ed. Zeller's Plato and the Older Academy, translated by F. Alleyne, &c. (1876) ; B. Jowett's Intro- ductions, in his complete translation, final edition (1892); G. Grote, Plato and the other Companions of Socrates (1865); F. C. Conybeare on an Armenian version (1891); W. Pater, Plato and Platonism (1893); R. L. Nettleship, Lectures on the Republic, &c. (1898) (cf. also his essay in Hellenica, 1880); Th. Gomperz, Greek Thinkers, vols. ii. and iii. in Eng. trans. (1905) ; W. Lutoslawski, Plato's Logic, &c. ; L. Campbell on Plato's Republic in Murray's " Home and School Series " (1902); L. Campbell, Religion in Greek Literature (London, 1898); J. A. Stewart, The Myths of Plato (1905); A. E. Taylor, Plato (1908); J. A. Stewart, Plato's Doctrine of Ideas (1909). German:

6 Cf. Laches. 7 Cf. Protagoras.

8 According to Schaarschmidt, only nine dialogues are genuine — Protag., Phaedr., Symp., Apol., Crito, Phaedo, Rep., Tim., Leges.

C. F. Hermann, Geschichte und System, &c. (1839) ; A. Boeckh, Unter- suchungen (1852); Ed. Zeller, Geschichte der gr. Philosophic; Fr. Uberweg, Untersuchungen (1861); S. Ribbing, Genetische Darstellung (1863) ; Fr. Susemihl, Genetische Entwicklung (1855-1898) ; E. Alberti, Geist und Ordnung (1864); C. Schaarschmidt, Die Sammlung der piatonischen Schriften (1866); M. Vermehren, Plat. Studien (1870);

D. Peipers, Untersuchungen iiber das System Platons. Teil i., " Die Erkenntnisstheorie " (Leipzig, 1874) ; O. Apelt, Beitrdge zur Geschichte der griechischen Philosophien; L. Spengel, Isocrates und Plaion (1863); A. Krohn, Die platonische Frage (1878); E. Teichmuller, Literarische Fehder (1881); H. Bonitz, Platonische Studien (especially valuable) (1886); E. Pfleiderer, Socrates und Platon (1896); H. Windenband, Plaion (1900) ;

C. Ritter, Untersuchungen ; Th. Gomperz, Platonische Aufsdlze : Griechische Denker, vol. ii. ; P. Natorp, PL Ideen lehre (1903); C. Ritter, Platon: sein Leben, seine Schriften, seine Lehre (1909), vol. i. ; and Neue Untersuchungen (1910). Other refer- ences will be found in the volumes named. French: V. Cousin; T. H. Martin, Etudes sur la Timee (1 841). Italian : Felice Tocco.*

Dictionaries and Indices. — Mitchell's Index to Plato; F. Ast, Lexicon platonicum; E. Abbott, Index to Plato (English, 1875).

On the MSS. — See especially Bekker's edition; Gaisford's Lec- tiones platonicae (1820); M. Schanz's edition with critical notes; Jowett and Campbell's Republic, vol. ii.; J. Burnett's Oxford edition. The important Codex Clarkianus in the Bodleian library has been reproduced in facsimile, with a preface by T. W. Allen (1898-1899). . (L. C.)

PLATO, Athenian comic poet of the Old Comedy, flourished between 428-389 B.C. According to Suldas, he was the author of thirty comedies. Some of these deal with political matters. Such were the Cleophon and Hyperbolus, directed against the well-known demagogues, and the Symmachia, referring to a coalition formed by Nicias, Alcibiades and Phaeax to get rid of Hyperbolus by ostracism. His later plays treat the vices and failings of mankind in the spirit of burlesque and parody. Such were the Sophistae, akin to the Clouds of Aristophanes; the Cinesias, an attack on a contemporary poet; the Festivals, satirizing the useless expenditure and extravagance common on such occasions; mythological subjects — Adonis, Europe, lo, the Ants (on the Aeginetan legend of the change of ants into men); Phaon, the story of the Lesbian ferryman, who was presented by Aphrodite with a marvellous ointment, the use of which made women madly in love with him.

See T. Kock, Comicorum atticorum fragmenta, i. (1880); A. Meineke, Poetarum comicorum graecorum fragmenta (1855).

PLATON, LEVSHIN (1737-1812), Russian divine, was born at Chashnikovo near Moscow, and educated in the academy of that city. In 1763 the empress Catherine II. invited him to instruct her son Paul in theology, and he became one of the court chaplains. Three years afterwards Platon was appointed archimandrite of the monastery of the Trinity (Troitskaya Lavra) near Moscow, in 1770 archbishop of Tver, and in 1787 archbishop of Moscow and metropolitan. He died in 181 2, one of his last acts having been to write an encouraging letter to the emperor Alexander I. in view of the French invasion. Platon was a brilliant and learned man, and the author of several works which enjoyed a high reputation in their time, including A Short History of the Russian Church,

which has been translated into English.

PLATONIC LOVE, a term commonly applied to an affectionate relation between a man and a woman into which the sexual element does not enter. The term in English goes back as far as Sir William Davenant's Platonic Lovers (1636). It is derived from the conception, in Plato's Symposium, of the love of the idea of good which lies at the root of all virtue and truth. Amor platonicus was used, e.g. by Marsilio Ficino (15th century), as a synonym for amor socraticus, referring to the affection which subsisted between Socrates and his pupils.

PLATOON (Fr. peloton, from Fr. pelote, a ball or pellet; cf. Ger. Haufe, heap), a small group of soldiers. In the early 17th century it was a definite tactical unit of infantry, corre- sponding to the modern section or half company. In the 18th century the battalion, irrespective of its organization into companies, was told off on parade into six, eight or ten platoons of equal strength. " Platoon fire " was the systematic and regulated fire of platoon volleys, the platoons firing one after the other. Hence a " platoon " sometimes means a volley.

The fire of a long line of infantry was as a rule conducted on the same principles, each battalion of the front line employing platoon fire, which is often picturesquely described as a " rolling platoon fire," or " rolling volleys." The word is obsolete in the British army, but is used in the United States, and, in various forms, in the armies of France and other Latin nations.

PLATT, THOMAS COLLIER (1833-1910), American politician, was born in Owego, Tioga county, New York, on the 1 5th of July 1833. He studied in 1840-1852 at Yale, from which he received the honorary degree of A.M. in 1876. He made money in lumber- ing out West, and returning to Owego became a banker and railway director. He helped to organize its Republican party in Tioga county, and in 1873-1877 was a representative in Congress. In 1877 he was chairman of the state Republican Convention at Rochester. On the 18th of January 1881 he was elected United States senator, but resigned, with his colleague, Roscoe Conkling, on the 1 6th of May following, chiefly because President Garfield, in spite of their protest, had appointed as collector of the port of New York, Judge William H. Robertson, a political opponent. Within ten years he became the acknowledged Republican " boss " of the state, and he again served in the United States Senate from 1897 to 1909. But his power waned steadily after about 1903: He died in New York City on the 6th of March

1910.

PLATTE (so named, from the French, because of its shallow- ness), or Nebraska, a river system of Colorado, Wyoming and Nebraska, tributary to the Missouri river, which it enters immediately north of Plattsmouth, Nebraska, 18 m. below Omaha, in about 41 3′ N. lat. Including the North Platte it is about 900 m. long from its headwaters, with a drainage basin for the entire system of 90,000 sq. m. The Platte proper is formed by the junction of the North Platte and the South Platte, sometimes called the North and South Forks of the Platte, immediately below the city of North Platte in Lincoln county, Nebraska. The North Platte and South Platte rise respectively in North Park and South Park in Colorado. The tributaries of the main stream all flow in from the north; the most important being the Loup, which empties immediately east of Columbus in Platte county, and the Elkhorn, which joins the Platte in Douglas county, due west of Omaha.

See J. C. Stevens, Surface Water Supply of Nebraska (Washington,

1909).

PLATTNER, KARL FRIEDRICH (1800-1858), German metallurgical chemist, was born at Kleinwaltersdorf, near Freiberg in Saxony, on the 2nd of January, 1800. His father, though only a poor working miner, found the means to have him educated first at the Bergschule and then at the Berg-akademie of Freiberg, and after he had completed his courses there in 1820 he obtained employment, chiefly as assayer, in connexion with the royal mines and metal works. Having taken up the idea of quantitative mouth-blowpipe assaying, which was then almost unknown — except that E. Harkort (1797-1835) itk 1827, while a student in Freiberg Academy, had worked out a blowpipe assay for silver — he succeeded in devising trustworthy methods for all the ordinary useful metals; in particular his modes of assaying for nickel and cobalt quickly found favour with metallurgists. He also devoted himself to the improvement of qualitative blowpipe analysis, and summed up his experience in a treatise Die Probierkunst mit dem Lblhrohr (1835), which became a standard authority. In 1840 he was made chief of the royal department of assaying. Two years later he was deputed to complete a course of lectures on metallurgy at the Bergakademie in place of W. A. Lampadius (1772-1842), whom he subsequently succeeded as professor. He died at Freiberg on the 22nd of Tanuary 1858.

In addition to many memoirs on metallurgical subjects he also published Die metallurgischen Rostprocesse theoretisch belrachtet (1856), and posthumously Vorlesungen iiber allgemeine Huttenkunde (i860).

PLATTSBURG, a city, port of entry and the county-seat of Clinton county, New York, U.S.A., situated on the west shore of Lake Champlain, at the

mouth of the Saranac river, 168 m.

(by rail) N.N.E. of Albany. Pop. (1890), 7010; (1900), 8434, of whom 1053 were foreign-born; (1910, census), 11,138. It is served by the Delaware & Hudson railway, and has steamer connexions with lake ports. Its situation in the region of lakes and mountains and its delightful climate have made it a summer resort. Among its institutions are the Samuel F. Vilas Home (for aged and infirm women); the Home for the Friendless of Northern New York (1874), for the care of homeless children; the Plattsburg State Normal and Training School, the D'You- ville Academy for girls (founded in i860, chartered in 1871), under the direction of the Grey Nuns; the College St Pierre (Roman Catholic, 1903), and the Champlain Valley Hospital. The barracks, about a mile away, is an important military post. Cliff Haven, 2 m. south, is the seat of the Catholic summer school. Plattsburg has a fine harbour and is the port of entry of the Champlain customs district; in 1909 its exports were valued at $15,169,502 and its imports at $8,167,527. Among the city's manufactures are lumber, wood pulp, paper, shirts, sewing-machines and automobiles. The total value of the factory products in 1905 was $1,056,702.

Plattsburg was incorporated as a village in 1795, and derived its name from Zephaniah Piatt (1740-1807), who had led a colony of settlers to this place from Long Island; it became a city in 1902. About Valcour Island (5 m. south-east of Platts- burg), on the nth of October 1776, a British fleet under Captain Thomas Pringle and an American flotilla under Benedict Arnold engaged in the first conflict between American and British fleets, the British being victorious. On the outbreak of the War of 1 81 2 the village became the headquarters of the American army on the northern frontier. On the nth of September 1814, in Plattsburg (or Cumberland) Bay, Captain George Downie, commanding a British flotilla, was defeated by an American flotilla commanded by Commodore Thomas Mac- donough, losing his life in the engagement (see Champlain, Lake).

PLATTSMOUTH, a city and the county-seat of Cass county, Nebraska, U.S.A., situated in the valley and on the bluffs of the Missouri river near the mouth of the Platte. Pop. (1900), 4964 (979 foreign-born); (1910) 4287. It is served by the Chicago, Burlington & Quincy, and the Missouri Pacific railway systems. There are railway car-shops, and a considerable trade is done in grain and cattle. A trading-post licensed by the United States government was opened here in 1853, and a town platted in 1854. Plattsmouth was first incorporated as a city in 1855, being one of the

oldest settlements and cities of the state.

PLATYELMIA, a phylum of the animal kingdom which comprises three classes, the, Planarians, Trematodes {q.v.) and Cestodes. It is the group of animals in which the act of creeping has first become habitual. In association with this movement in a definite direction the body has become vermiform and bilaterally symmetrical. One end of the body, through contact, during locomotion, with fresh tracts of medium and other forms of stimuli, has become more specialized than the rest, and here the nervous system and sense-organs are more densely aggregated than elsewhere, forming a means of controlling locomotion and of correlating the activities of the inner organs with the varying stimuli that impinge upon the body. The form and habits of the group vary widely. The Planarians are free-hVing animals, the Trematodes are parasitic upon and within animals, and the Cestodes are wholly endoparasitic.

Structure. — The chief features which Platyelmia possess in common are the following. The body is not metamerically segmented and is composed of a muscular tunic covered externally by a more or less modified cellular layer. Within this muscular tube lies a parenchy- matous tissue which may be uniform (Cestodes) or differentiated into a central or digestive, and a peripheral portion (some Turbellaria), or finally the central portion becomes tubular and forms the digestive sac (Trematodes), while the peripheral portion is separated from it by a space lined in some forms by a flattened epithelium (most Planarians). It is characteristic of the group that the mouth should be the only means of ingress to and egress from the digestive sac and that no true perivisceral space or coelom exists in the sense in which these terms are used in higher Invertebrates. The peripheral paren-

chyma gives rise to protonephridia, that is to coiled tubes commenc- ing in pyriform cells containing a flame-like bundle of cilia and provided with branched outgrowths, and communicating with the exterior by long convoluted canals which open at the surface of the body. These protonephridia are the excretory organs. The nervous system, though centralized at one end of the body, contains diffused nerve-cells in the course of its tracts, which are disposed in two or more longitudinal bundles interconnected by transverse bands. The Platyelmia are hermaphrodite and the reproductive organs are complex. The male organs consist of paired testes communicating by delicate canals with a protrusible penis. This organ is generally single but sometimes paired and occasionally multiple. It is fre- quently armed with spines, hooks or stylets, and is further compli- cated by the addition of a nutritive secretion (the prostate gland) which may Open at its base or pass separately by a special duct to the exterior. There is some reason to believe that this complicated and variable

apparatus is used for stabbing the body of another animal and that beginning as a weapon for catching prey it has become modified for hypodermic impregnation and only gradually adapted for insertion into the bursa copulatrix. The female organs are no less complex. They consist of solid or tubular ovaries which may be single, double or multiple. In the majority of Platyelmia the primitive ovary becomes divided into fertile and sterile portions, i.e. into distinct ovarian and vitellarian regions. The yolk prepared by the latter is conducted by one or more specialized ducts to the oviduct and the point of union is distinguished by the opening of a " shell-gland " which secretes a membrane around the conjoined mass of ovum and yolk. From this junction there proceeds an oviduct or " uterus " (paired or single) which before opening to the exterior expands to form a muscular protrusible pouch — the bursa copulatrix. Frequently also from this junction of the ovaria and the vitellaria a median tube is given off which either opens to the exterior or into the intestine, in the latter case it appears to serve as means of conveying superfluous yolk to the gut, where it may serve as food.

Inter-relationships. — The inter-relationships of the three members of the Platyelmia are of a more doubtful nature than is the unity of the phylum. The Turbellaria undoubtedly form the most primi- tive division, as is shown by their free-living habits, ciliation and sense-organs. The Trematodes are somewhat modified in accord- ance with their ecto- or endoparasitic life, but they exhibit such a close similarity of structure with the Turbellaria that their origin from Planarians can hardly be doubted, and indeed the Temnocepha- loidea (see Planarians) form an almost ideal annectant group link- ing the ectoparasitic Trematodes and Rhabdocoel Planarians. The Cestodes, however, are connected by no such intermediate forms with the other Platyelmia. Their adaptations to parasitic life in vertebrate animals appear to have involved such modifications of structure and development that their affinities are quite problemati- cal. The entire absence of any trace of a distinct alimentary tract, the loss of true regenerative power, the peculiar gametic segmenta- tion of the body into hundreds of "proglottides" budded off from

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(From Cambridge Natural History, vxjl. ii., "Worms, &c," by permission of Macmillan & Co., Ltd)

Fig. I. — Free-swimming Larva (Müller's Larva) of a Polyclad Planarian to illustrate the trochosphere-hypothesis of the origin of Platyelmia. The larva is seen in optical section, and its dis- tinguishing feature is the ciliated lobed band {vl, si, dl), which corresponds to the pre-oral ciliated band of a trochosphere-larva. It is here drawn out .into eight processes, of which six

are shown, their continuity being expressed by the dotted line.

br, Brain. mg, Stomach.

dr, Glands. «, Nerves.

ep, Epidermis. ph, Pharynx.

mo, Mouth. par, Parenchyma.

one extremity, and the absence of any morphologically distinct antetior extremity, are adaptations to the wholly parasitic life of this class. Their structure is similar to that of Trematodes, from which in the opinion of most zoologists they have been derived.

Affinities. — As the Turbellaria (Planarians) are the most primitive division of the Platyelmia, the problem of the affinities of this phylum resolves itself into that of the relationships of the Turbellaria. With regard to the origin of this class two divergent views are still held. On the one hand the Turbellaria are considered to be an offshoot of the early Coelomate stock, on the other they are held to be descendants of a simpler two-layered stock. The former hypothesis with its variants may be called the Trochosphere-hypothesis, the latter the Gastraea-hypothesis. The Trochosphere-hypothesis (2), (3) is based chiefly on the occurrence in certain Polyclad Turbellaria, of a larval form (Muller's larva) which is comparable to a certain stage (pro-trochula) in the development of the Trochosphere-larva. This Trochosphere is the characteristic larva of Mollusca, Annelida

(After Abbott, TSkyo Zool. Society's Anno). ZoologicaeJaponmsis, iv. 4, 2 and 3.) Fig. 2. — Dorsal view of Coeloplana to illustrate the similarity between Ctenophora and Turbellaria. The branched intestine (G) is drawn on one side of the animal only; it cpens to the exterior by means of a pharynx (not shown). The mouth is shown by the line surrounding the otolith (OT) in the centre. The mouth is ventral, the otolith dorsal. The two branched tentacles (TB) are seen partially extruded from their sheaths (TS) ; when fully extended they exceed the diameter of the animal five or six times. The short tentacles (T) are drawn on one side only. Coeloplana has been found in shallow water in the Red Sea and on the coast of Japan. Ctenophora possess two similar long branched tentacles, a ventral mouth and dorsal otolith.

and some Gephyrea ; and the Rotif era appear to remain throughout life as modified Trochospheres. It is a top-shaped, free-swimming organism provided with a preoral band of cilia, an apical sense- organ, a simple gut, protonephridia and schizocoele. The impor- tance of this resemblance between the Polyclad larva and the Trocho- sphere-larva of higher invertebrates is increased if the widely adopted

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(After F. E. Schultze, Kgl. Preuss. Akad. der Wissenschaft, Berlin, 1891.) Fig. 3. — Trichoplax adhaerens, an organism considered, on the Gastraea-hypothesis, to be closely allied to the progenitors of the Platyelmia. (The recent work by Krumbach [Zoolog. Anzeiger 1907, xxxi. 450], serves to show that Trichoplax is the planula- larva of a Hydromedusa.)

A, a small specimen drawn from life. The spherical granules (G) are probably gland-secretions ; the dark bodies (Z) are probably xantnellae, i.e. algal cells living in association with the animal.

B, a specimen undergoingfission.

C, part of a vertical section. D.Ep, The dorsal epidermis. G, Refringent corpuscles. PC, Parenchymatous cells.

V.Ep, Ventral epidermis. The hair-like processes are cilia.

view (held on other grounds) that the Polyclads are the most primi- tive of the Turbellaria, is soundly based. The grounds for this view are the radial symmetry of several Polyclads and the supposed origin of gonads and excretory flame-cells from the walls of gut, the occurrence of nematocysts in Anonymus, one of the most radially constructed Polyclads, and lastly the presence of two peculiar animals Clenoplana and Coeloplana, which suggests a transition from Ctenophora to Polyclads. At the present time, however, none of these grounds can be said to possess so much force as they did some years ago (4). The argument has come to rest on the agreement between the cell-lineage of Polyclads and that of certain Mollusca and Annelids. This resemblance is considered by Hubrecht (5) to give reason for concluding that the Polyclads are an qffshoot, and possibly a degenerate offshoot, from the early Coelomate stock.

The Gastraea-hypothesis is founded on quite other considerations. In effect (6) it traces the Turbellaria to small two-layered organisms consisting of an outer ciliated epidermis and a central syncytial tissue. Such an organism is found in the peculiar Trichoplax, Lohmanniella, &c. The early stages of most animals pass through such a stage, which is known as a " planula." From such begin- nings the evolution of the Turbellaria leads first through

the Acoelous forms in which the central syncytium is partly differentiated into digestive, muscular and skeletotrophic tissue, then to the more specialized Rhabdocoela, and so through the Alloeocoela to the Triclads and finally to the Polyclads. The careful study of the development of one Acoelous form and of certain Rhabdocoels has strengthened this hypothesis by showing that no definite enteron or gut is at first laid down, but that certain embryonic syncytial tracts become digestive tracts, others excretory, others again muscu- lar. The study of Rhabdocoels t7) has led to the important discovery that the rudiment of the gonads and that of the pharynx are the first organs to appear, and that the alimentary sac arises inde- pendently of them. t This segregation of the germ cells and their independence of the intestinal sac is an indication that the origin of these cells is not coelomic nor enteric, and until we possess further information as to the evolution of the complex genitalia of the higher Turbellaria we cannot hope to understand the presence of such highly modified structures in animals of an otherwise low grade or organization.

Literature. — Recent discussions of the affinities of the Platy- elmia will be found in (1) A. Sedgwick, Textbook of Zoology (1898),!. 212; (2) Hatschek, Lehrbuch der Zoologie (1891), pp. 316-326; (3) A. Lang, Die Trophocoel-Theorie (Jena, 1903); (4)E.RayLankester, Treatise on Zoology (1900), pt. ii. Introduction and ch. vii. pp. 15- x 9 ; (5) A. A. W. Hubrecht, Jenaische Zeitschrift fur Naturwissen- schaft (1905), pp. 151-176; (6) Von Graff, Die Acoela, p. 519 (Leipzig, 1891). For the development of Rhabdocoelida see (7) Bresslau, Zeitschrift fiir viissenschaftliche Zoologie (1904), vol. 76.

(F. W. Ga.) PLATYPUS. The duck-billed platypus {Platypus anatinus) was the name assigned to one of the most remarkable of known animals by George Shaw (1751-1813), who had the good fortune to introduce it to the notice of the scientific world in the Naturalist's Miscellany (vol. x., 1799). In the following year it was independently described by Blumenbach (Voigts Magazin, ii. 205) under the name of Ornithorhynchus paradoxus. Shaw's generic name, although having priority to that of Blumenbach, could not be retained, as it had been used at a still earlier time (1793) by Herbst for a genus of Coleoptera. Ornithorhynchus (Gr. opvis, bpvidos, bird, and pvy%os, bill) is therefore now universally adopted as the scientific designation, although duck-billed platypus (Gr. ifKarvs, flat, and xofe, foot) may be conveniently retained as a vernacular appellation. By the colonists it is called " water-mole," but its affinities with the true moles are of the slightest and most superficial description. The anatomical differences by which the platypus, and its only allies the echidnas, are separated from all other mammals, so as to form a distinct sub-class, are described in the article Monotremata, where also will be found the main distinctive characters of the two existing representatives of the group. It is

there stated that the early stages of the development of the young are not yet fully known. Sir R. Owen, and later E. B. Poulton, showed that the ovum of the platypus was large compared with that of other mammals, whilst W. H. Caldwell showed that it was filled with yolk, and finally established the fact that Platypus as well as Echidna is oviparous. Two eggs are produced at a time, each measuring about three-fourths of an inch in its long and half an inch in its short axis, and enclosed in a strong, flexible, white shell.

The platypus is pretty generally distributed in situations suitable to its aquatic habits throughout the island of Tasmania and the southern and eastern portions of Australia.

The length of the animal when full grown is from 18 to 20 in. from the extremity of the beak to the end of the tail, the male being slightly larger than the female. The fur is short, dense and rather soft to the touch, and composed of an extremely fine and close under-fur, and of longer hairs which project beyond this, each of which is very slender at the base, and expanded, flattened and glossy towards the free end. The general colour is deep brown, but paler on the under parts. The tail is short, broad and depressed, and covered with coarse hairs, which in old animals generally become worn off from the under

(From Gould's Mammals of Australia.)

Platypus.

surface. There are no true teeth in the adult, although the young possess a set which are shed after being worn down by friction with food and sand, their purposes being afterward served by horny prominences, two on each side of each, jaw — those in the front narrow, longitudinal, sharp-edged ridges, and those behind broad, flattened and molariform. The upper surface of the lateral edges of the mandible has also a number of parallel fine transverse ridges, like those on the bill of a duck. In the cheeks are tolerably capacious pouches, which appear to be used as receptacles for food.

The limbs are strong and short, each with five well-developed toes provided with strong claws. In the fore feet the web not only fills the interspaces between the toes, but extends consider- ably beyond the ends of the long, broad and somewhat flattened nails, giving great expanse to the foot when used for swimming, though capable of being folded back on the palm when

the animal is burrowing or walking on the land. On the hind foot the nails are long, curved and pointed, and the web extends only to their base. On the heel of the male is a strong, curved sharply pointed, movable horny spur, directed upwards and backwards, attached by its expanded base to the accessory bone of the tarsus. This spur, which attains the length of nearly an inch, is traversed by a minute canal, terminating in a fine longitudinal slit near the point, and connected at its base with the duct of a large gland situated at the back part of the thigh. The whole apparatus is so exactly analogous in structure to the poison-gland and tooth of a venomous snake as to suggest a similar function, and there is now evidence that it employs this organ as an offensive weapon.

The platypus is aquatic in its habits, passing most of its time in the water or close to the margin of lakes and streams, swim- ming and diving with the greatest ease, and forming for the purpose of sleeping and breeding deep burrows in the banks, which generally have two orifices, one just above the water level, concealed among long grass and leaves, and the other below the surface. The passage at first runs obliquely upwards in the bank, sometimes to a distance of as much as 50 ft., and

expands at its termination into a cavity, the floor of which is lined with dried grass and leaves, and in which, it is said, the eggs are laid 1 and the young brought up. Their food consists of aquatic insects, small crustaceans and worms, which are caught under water, the sand and small stones at the bottom being turned over with their bills to find them. They appear at first to deposit what they have thus collected in their cheek pouches, and when these are filled they rise to the surface and quietly triturate their meal with the horny teeth before swallow- ing it. Swimming is effected chiefly by the action of the broad forepaws, the hind feet and tail taking little share in locomotion in the water. When asleep they roll themselves into a ball, as ‘ shown in the figure. In their native haunts they are extremely timid and wary, and very difficult to approach, being rarely seen out of their burrows in the daytime. Mr A. B. Crowther, who supplemented the often quoted observations of Dr George Bennett upon the habits of these animals in confinement, states: ” They soon become very tame in captivity; in a few days the young ones appeared -to recognize a call, swimming rapidly to the hand paddling the water; and it is curious to see their attempts to procure a worm enclosed in the hand, which they greedily take when offered to them. I have noticed that they appear to be able to smell whether or not a worm is contained in the closed hand to which they swim, for they desisted from their efforts if an empty fist was offered.” (W. H. F. ; H. Sc.)

PLAUEN, a town of Germany, in the kingdom of Saxony, on the Weisse Elster, 60 m. south of Leipzig, on the railway to Hof and Munich and at the junction of lines to Eger and Gera. Pop. (1890), 47,007; (1900),

73,891; (1905), 105,383. It was formerly the capital of Vogtland, or Voigtland, a territory governed by the imperial vogt, or bailiff, and this name still clings in popular speech to the hilly district in which the town lies. Of its three Evangelical churches the most prominent is the fine Gothic church of St John, with twin spires, which was restored in 1886. Other buildings of note are the town hall, dating from about 1550; and the old castle of Hradschin, now used as a law court. Plauen is now the chief place in Germany for the manufacture of embroidered white goods of all kinds, for the finishing of woven cotton fabrics, known as Plauen goods, and for the making of lace.

Plauen was probably founded by the Slavs. First mentioned in 1122, it passed under the authority of Bohemia in 1327 and came to Saxony in 1466, remaining permanently united with the electorate since 1569. The manufacture of white goods was introduced by Swabian, or Swiss, immigrants, about 1570. The advance in its material prosperity has been especially rapid since the incorporation of Saxony in the German Zollverein.

See Fiedler, Die Stadt Plauen im Vogtland (Plauen, 1874); and Beitrage zur Geschichte der Stadt Plauen (Plauen, 1876); Metzner, Filhrer dutch Plauen (1903) ; and the publications of the Alter- lumsverein zu Plauen (1875 seq.).

PLAUTUS, TITUS MACCIUS (originally perhaps Maccus; cf. Asin. Viol, n), the great comic dramatist of ancient Rome, was born at Sarsina in Umbria according to the testimony of Festus, who calls him Umber Sarsinas, and Jerome. The date of his death was 184 B.C. (Cicero, Brutus, xv. 60). The date of his birth depends upon an inference based on the statement of Cicero (De senectute, xiv. 50) that he was an old man when he wrote his Tructdentus and Pseudolus. The latter play was

1 Some doubt has been expressed as to whether the eggs are extruded or hatched within the body. At a scientific meeting of the Zoological Society of London, on the 17th of December 1901, Mr Oldfield Thomas read a letter from Mr G. Metcalfe, who had lived many years in a region inhabited by these animals. He had made special inquiries of the authorities of the Sydney, Melbourne, Brisbane and Hobart museums, and published questions in the newspapers, but no evidence has reached him that the eggs of Ornithorhyncus have ever been obtained except by the dissection of the mother. Mr Thomas laid stress on what had been advanced on the other side by Mr Caldwell {Philosophical Transactions, clxxviii. 463), Professor Spencer {Nature, xxxi. 132) and Mr J. Douglas Ogilby {Catalogue of Australian Mammals, p. 1, Sydney, 1902), but expressed the hope ” that further inquiries might be madeby naturalists in Australia as to the actual

finding of such eggs in the burrows, so that this roost interesting point might be finally settled."

produced in 191 B.C.; hence we get 254-251 B.C. as the approxi- mate date of his birth. The only record that we possess as to his life is that contained in Aulus Gellius iii. 3, 14 (based on Varro), the historical character of which is doubted by Leo (Plautinische Forschungen, p. 60, sqq.). According to this statement he left his native town at an early age and settled at Rome, where he got employment in a theatre, though it is not clear in what capacity. The words of Gellius in operis artificum scaenicorum, are interpreted by F. Marx as indicating that Plautus was a member of the theatrical staff of Livius Andro- nicus. At Rome he saved a little money, and embarked on some mercantile enterprise, probably abroad. Having lost his money he returned to Rome penniless, and was driven to support himself by manual labour in a mill (cum . . . ad circumagendas molas quae Irusatiles appellantur operant pistori locasset); and in this pistrinum he wrote three of his plays (the Saturio, the Addictus and another). The main body of his works belongs, so far as can be ascertained from the scanty evidence which we have, to the latter half of his life; 206 B.C. is the approximate date of the Miles gloriosus; cf. line 211 seq., quoi bini custodes . . . occubant (present tense), which alludes to the imprisonment of Naevius, an event which cannot be proved to be earlier than 206 B.C. The defects of construction and the absence of " can- tica " in the Miles also point to this as one of his early plays. On the other hand it is hardly likely that all his comedies (which greatly exceeded in number the extant twenty) were produced during the last twenty years of his life. Radermacher assigns the Asinaria to a date as early as 212 B.C. Of the extant plays the Cistellaria and the Stichus must be associated with the Miles as comparatively early works; for the former was clearly produced before (though not long before) the conclusion of the Second Punic War, see 1. 201 seq.; and the Stichus is proved by its didascalia to have been produced in 200 B.C. The Pseudolus and the Truculentus fall within the last seven years of his life. The dates of the rest of the extant plays, here given in alpha- betical order, are quite uncertain, namely, Amphitruo, Aulularia, Bacchides, Caplivi, Casina, Curculio, Epidicus, Menaechmi, Mercator (probably later than the Rudens, as shown by F. Marx) , Mostellaria, Persa, Poenulus, Rudens, Trinummus (later than 194 B.C.; cf. novi aediles in 1. 990). Of the Vidularia we possess only the fragments contained in the Codex Ambrosianus.

The plays of Plautus are all based on Greek originals. 1 To what extent he

is dependent on these originals, and how far he departed from them, we shall perhaps never know exactly. But such evidence as we have points to a pretty close imitation on the part of the Roman poet: there are passages in which he does not hesitate to take over from his originals allusions which can hardly have been intelligible to a Roman audience, e.g. the reference to Stratonicus, a musician of the time of Alexander the Great (Rudens, 932); and in the delineation of character we have no reason to suppose that he improved on his models (cf. Aul. Gell. ii. 23). Even the prologues, which later researches have shown to be in the main by the hand of Plautus himself, though certain passages were clearly added at a later date, e.g. Cas. prol. 5-20, may in most cases have formed part of the Greek original. Plautus must therefore be regarded as primarily a translator or adapter, so far as our present knowledge goes. Where he varies his plot on lines of his own by amalga- mating the plots of two distinct Greek comedies (e.g. in the Miles and the Poenulus) the result is generally not happy; and the romanization of the plays by way of allusions to towns in Italy, to the streets, gates and markets of Rome, to Roman magistrates and their duties, to Roman laws and the business of Roman law-courts, banks, comitia and senate, &c, involves the poet in all the difficulties of attempting to blend two different civiliza- tions. The inconsistency of his attitude is shown by his use, side by side, of the. contemptuous expressions barbarus (applied to the Romans) and pergraecari (applied to the Greeks). In some passages the poet seems to take delight in casting dramatic illusion to the winds (e.g. Pseudolus, 720; Poenulus, 550).

1 See further P. E. Legrand, Daos: tableau de la comidie grecque pendant la ptriode dits nouveUe (igto).

But as a translator Plautus is nothing less than masterly. His command of the art is such that his plays read like original works, and it may be at least said that some of his characters stand out so vividly from his canvas that they have ever since served as representatives of certain types of humanity, e.g. Euclio in the A ulularia, the model of Moliere's miser. Alliteration, asso- nance, plays upon words and happy coinages of new terms, give his plays a charm of their own. " To read Plautus is to be once for all disabused of the impression that Latin is a dry and unin- teresting language " (Skutsch, in Die Cultur der Gegenwart; 1905). It is a mistake to regard the Latin of Plautus as " vulgar " Latin. It is essentially a literary idiom, based in the main upon the language of intercourse of the cultivated Roman society of the day (cf. Cic. De oratore, iii. 12, 45); though from the lips of slaves and other low persons in the plays we no doubt hear expressions which, while they are quite in keeping with the characters to whom they are allotted, would have shocked the ears of polite society in the 2nd century B.C.

The characters in his plays are the stock characters of the new comedy of Athens, and they remind us also of the standing figures of the Fabulae atellanae (Maccus, Bucco, Dossennus, &c). We may miss the finer insight into human nature and the delicate touch in drawing character which Terence presents to us in his reproductions of Menander, but there is wonderful life and vigour and considerable variety in the Plautine embodiments of these different types. And the careful reader will take note of occasional touches of serious thought, as in the enumeration of the ten deadly political sins (Persa, 555 seq.) and allusions to ethical philosophy (Pseud. 972 seq.; Stick. 124; Trin. 305 sqq., 320 sqq., 363 seq., 447; Rud. 767, 1235-1248, &c). Virtue is often held up for admiration, and vice painted in revolting colours or derided. The plots of Plautus also are more varied than those of Terence. We have from him one mythological burlesque, the Amphitruo, and several plays dealing with domestic subjects like the Captivi, Cistellaria, Rudens, Stichus and Trinummus; but most of his plays depend for their main interest on intrigue, such as the Pseudolus, Bacchides, Mostel- laria. In the Menaechmi and, as a subordinate incident, in the Amphitruo we have a " comedy of errors."

In one respect Plautus must be regarded as distinctly original, viz. in his development of the lyrical element in his plays. The new comedy of Greece was probably limited for the most part to scenes written in the metres of dialogue; it remained for Plautus, as Leo has shown, to enliven his plays with cantica modelled on the contemporary lyric verse of Greece or Magna Graecia, which was in its turn a development of the dramatic lyrics of Euripides. A new light has been thrown on the irapcucKavcrWvpov of the Curculio (147-155) by the discovery of the Alexandrian erotic fragment published by Grenfell and Hunt (Oxford, 1896). The lyrical metres of Plautus are wonder- fully varied, and the textual critic does well not to attempt to limit the possibilities of original metrical combinations and developments in the Roman comedian. Recent investigation has considerably extended the list of his numeri innumeri.

Plautus was a general favourite in the days of republican Rome. Cicero, though he found fault with the iambics of the Latin comedians generally as abiecti, " prosaic " (Orator, lv. 184), admired Plautus as elegans, urbanus, ingeniosus, facetus (De offic. i. 29, 104). To the fastidious critics of the Augustan age, such as Horace, he seemed rude (cf. Ars Poetica, 270-274), just as Addison declared Spenser to be no longer fitted to please " a cultivated age." In another passage (Epist. ii. 1, 170-176) Horace accuses him of clumsiness in the construction of his plays and the drawing of his characters, and indifference to everything excepting immediate success: gestit enim nummum in loculos demittere, post hoc securus cadat an recto stet fabula talo. That there are many inconsistencies and signs of carelessness in his work has been proved in detail by Langen. But that he

found many admirers, even in the Augustan age, Horace himself bears witness (ibid. 1. 58), where he says that Plautus was regarded as a second Epicharmus: Plautus ad exemplar Siculi proper are Epicharmi — a passage which is important as suggesting that

Plautus was under some obligation to the Sicilian representatives of the old Dorian comedy; cf. Varro's statement (in Priscian ix. 32), deinde ad Siculos se applicant. It is possible that Plautus may have been working on the lines of the old comedy in the tell-tale names which he is so fond of inventing for his characters, such as Polymachaeroplagides {Pseud. 988), Pyrgo- polinices {Mil. 56), Thensaurochrysonicochrysides {Capt. 285) — names which stand in remarkable contrast to the more commonplace Greek names employed by Terence.

In the middle ages Plautus was little regarded, and twelve of his plays {Bacchides-Truculentus} disappeared from view until tbey were discovered (in the MS. called D) by Nicholas of Treves in the year 1429. Apparently some early archetype had been divided into two volumes, of which only the first (containing eight plays, Amphitruo-Epidicus) had escaped oblivion or destruction. After the revival of learning Plautus was reinstated, and took rank as one of the great dramatists of antiquity; cf. Shakespeare, Hamlet, 1. ii. 420, where Polonius says, " The best actors in the world . . . Seneca cannot be too heavy nor Plautus too light."

Manuscripts. — The chief MSS. of Plautus belong to two families, which are proved by the errors which they have in common to be descended from a single source (Sicker, " Novae quaestiones plau- tinae," in Philologus suppl. xi. 2 ; 1908) : (i.) that represented by the fragmentary palimpsest of the Ambrosian Library at Milan {A, 4th century a.d.), discovered in 1815 by Cardinal Mai and now acces- sible in the Apograph of Studemund, edited by Seyffert (1889); (ii.) that represented by the Palatine MSS. (P, ioth-i2th century), viz. B, now in the Vatican, containing all the twenty plays preceded by the spurious Querolus; C, now at Heidelberg, containing the last twelve plays, i.e. Bacchides-Truculentus; D, now in the Vatican, containing the Amphitruo, Asinaria, Aulularia, half of the Captivi and the last twelve plays: to the same family belong the following less important MSS.: E (at Milan), V (at Leiden), / (in the British Museum), O (in the Vatican).

Editions. — The editio princeps, based mainly on a transcript of D, was printed at Venice, 1472 : the first scientific text, based on B, C and D, was

*that of Camerarius, completed 1 552, in whose steps followed Lambinus (with a commentary which is still useful), *576; Taubmann, 1605-1621; Pareus (a meritorious edition) , 1619 and 1623; Guyet, edited by Marolles, 1658; Gronovius (the " Vulgate "), 1 664-1684 ; then, after the lapse of more than a century, came the editions of Bothe, 1809-1811; Naudet, 1830; and Weise, 1 837-1 848. A new era began with the great critical edition of certain plays by Ritschl, 1 848-1 854, in which a collation of A was used; a revised and completed form of this work Was commenced by Ritschl himself and continued by his disciples Goetz, Loewe and Schoell, 1871-1894: and of this an entirely rewritten editio minor by Goetz and Schoell appeared in 1893-1896 (continued by a 2nd ed. of Fasciculus ii. in 1904), which is still the most useful of modern editions for a critical study of the text, exhibiting, as it does, the MS. tradition with only such emendations as are securely established by the results of modern investigation. The other modern editions of the text are those of Fleckeisen (containing ten plays, excellent for his time), 1859; Ussing (with a commentary), 1 875-1 887, 2nd ed. of vol. hi. 1888; Leo (a very important work), 1 895-1 896; Lindsay, 1904-1905. Among modern editions of separate plays with commen- taries the following are probably the most useful: Amphitruo by Palmer, 1890, and Havet, 1895; Asinaria by Gray, 1894; Aulularia by Wagner, 1866 and 1876; Captivi by Brix, 6th ed., revised by Niemeyer, 1910; an English edition of this work by Sonnenschein (with introduction on prosody), 1880; same play by Lindsay (with metrical introduction), 1900; Epidicus by Gray, 1893; Menaechmi by Brix, 4th ed., revised by Niemeyer, 1 891; Miles gloriosus by Lorenz, 2nd ed., 1886; by Brix, 3rd ed., revised by Niemeyer, 1901 ; by Tyrrell, 3rd ed., 1894; Mostellaria by Lorenz, 2nd ed., 1883; by Sonnenschein, 2nd ed., 1907; Pseudolus by Lorenz, 1876; Rudens by Sonnenschein, 1891, editio minor (with a metrical appendix), 1901 ; Trinummus (with a metrical introduction) by Brix, 5th ed., revised by Niemeyer, 1907; by Gray, 1897; Truculentus by Spengel and Studemund, 1898.*

Criticism. — Good characterizations of Plautus, from the literary point of view, are given by Sellar in his Roman Poets of the Republic, and Wight Duff, in his Literary History of Rome (1909). A summary of recent critical works bearing on the text and interpretation is given by Seyffert in his admirable reports (in Bursian's Jahres- berichte uber die Fortschritie der klassischen Altertumswissenschaft), 1883-1885, 1886-1889, 1890-1894, continued by Lindsay, 1895- 1906. Important contributions to textual criticism are contained in Ritschl Parerga (1845), Neue plautinische Excurse (1869), and his collected Opuscula philologica; Studemund, Studia in priscos scriptpres latinos (vol. i. 1873, vol. ii. 1891); Langen, Beitrage (1877) and Plautinische Studien (1886); Leo, Plautinische Forsch- ungen (1895); Lindsay, Codex Turnebi (1898). Bentley's Plautine

Emendations were published by Sonnenschein partly in his edition

of the Captivi (1880), partly in the Anecdota oxoniensia series

(1883).

Metre and Prosody. — The most important treatises (apart from those mentioned under " Editions ") are MttUer, Plautinische Prosodie (1869); Spengel, Reformvorschlage zur Metrik der lyrischen Versarten{ 1882); Klotz,Grundzuge altromischer Metrik{i8go) ; Skutsch , Forschungsn zur lateinischen Grammatik und Metrik (1892), Iamben- kiirzung und Synizese (Satura Viadrina) (1896), continued by the author in a work called Tipm (1903) ; Leo, Die plautinischen Cantica und die hellenistische Lyrik (1897); Maurenbrecher, Hiatus und Verschleifung im alten Latein (1899); Ahlberg, De proceleusmaticis (1900), De correptione iambica plautina (1901); Jacobsohn, Quaesti- ones plautinae (1904) ; Radford, on the " Recession of the Latin Accent " (in Amer. Journ. Phil., 1904), " Studies in Latin Accent and Metric" (in Trans. Amer. Phil. Assoc, 1904), "Plautine synizesis " (ibid., 1905, continued in Amer. Journ. Phil., 1906), (a work on cognate subjects is promised by Exon); Sudhaus, Der Aufbau der plautinischen' Cantica (1909),

Syntax. — The most recent works bearing on Old Latin syntax, are Sjogren, Zum Gebrauch des Futurums im Altlateinischen (1906); Lindsay, Syntax of Plautus (1907) ; Sonnenschein, The Unity of the Latin Subjunctive (1910). A work by H. Thomas, entitled A catalogue raisonni of the Subjunctive in Plautus, in support of the theory 0} the unity of origin of the Latin Subjunctive, is announced as in preparation.

Lexica. — The only completed lexicon (apart from the Indices of Naudet, 1832, and Weise, 1838) is that of Pareus (2nd ed., 1634). New lexica have been begun by Waltzing (1900; apparently not to be continued) and Lodge (1901 ;' in progress). The latter work, when completed, will be indispensable.

Translations and Adaptations. — A comprehensive view of the influence of Plautus on modern literatures is given by Reinhard- stoettner, Spdtere Bearbeitungen plautinischer Lustspiele (1886). Many adaptations for the Italian stage were produced between the years i486 and 1550, the earliest (the Menaechmi) under the direction of Ercole I., duke of Ferrara. From Italy the practice spread to France, Spain, England and other countries.

Of English plays, the interlude called Jack Juggler (between 1547 and 1553) was based on the Amphitruo, and the lost play called the Historie of Error (acted in 1577) was probably based on the Menae-chmi; Nicholas

Udall's Ralph Royster Doyster, the first English comedy (acted before 1551, first printed 1566), is founded on the Miles gloriosus; Shakespeare's Comedy of Errors (about 1591) is an adaptation of the Menaechmi; and his Falstaff may be regarded as an idealized reproduction or development of the braggart soldier of Plautus and Terence — a type of character which reappears in other forms not only in English literature {e.g. in Shakespeare's Parolles and Ben Jonson's Captain Bobadil) but also in most of the literatures of modern Europe. Shakespeare's Taming of the Shrew has been influenced in several respects (including the names Tranio and Grumio) by the Mostellaria. Ben Jonson produced a skilful amalgamation of the Aulularia and the Captivi in his early play The Case is Altered (written before 1599). Thomas Heywood adapted the Amphitruo in his Silver Age (r6i3), the Rudens in his Captives (licensed 1624), and the Mostellaria in his English Traveller (1633). Dryden's Amphitryon or the two Sosias (1690) is based partly on the Amphitruo, partly on Moliere's adaptation thereof; Fielding's Miser (acted 1732) on Moliere's L'Avare rather than on the Aulularia, and his Intriguing Chambermaid (acted 1733) on Regnard's Le Retour imprbiu rather than on the Mostellaria. There was no English translation, strictly so called, of any play of Plautus in the 16th or 17th century, except that of the Menaechmi by W. W. (probably William Warner), first printed in 1595, which Shakespeare may possibly have used (in MS.) for his Comedy of Errors. A translation of the whole of Plautus in " familiar blank verse " by Bonnell Thorn- ton and others appeared in 1767 (2nd ed., 1769-1774). Five plays have been translated in the metres of the original by Sugden (1893).

(E. A. So.)

PLAY, a word of which the primary meaning is that of free or active movement or exercise. The O. Eng. plegan or plegian, from which comes the substantive plega, play, is apparently cognate with Ger. pflegen, to take care or charge of, and Pflege, care, and the connexion in sense is to be found in the primary meaning, that of exercise or active movement. In its primary meaning " play " is used of the rapid changing movement of light and colour, and also figuratively of thought or fancy, and specifically of the free movement of parts of a mechanism on each other, of a joint or limb, &c. To play a musical instrument is to move the fingers upon it, and until the 18th century the verb was intransitive, and " on " or " upon " was always used with the name of the instrument. The very general use of the word for sport, game or amusement, is an early and easy develop- ment from the meaning of active movement or exercise as a recreation after work; that of a dramatic performance (see Drama) is very early; the New English Dictionary quotes from King Alfred's Orosius {c. 893).

PLAYA— PLEADING

The primitive play instinct or play impulse in man has been much discussed in recent years by psychologists in connexion with child- study (see Child), and with the expression of the emotions (see J. Sully, On Laughter, 1902, &c; also Aesthetics). See generally Carl Groos, The Play of Animals (1898) and The Play of Man (1901) ; and Baldwin's Diet, of Philosophy, s.v.

PLAYA (a Spanish word meaning " shore "), the name applied in America to a level plain formed of the deposits of a river which has no outlet to the sea or a lake. If at seasons of high water a river floods any area and temporarily converts it into a lake, which subsequently dries up in hot weather, the tract thus left dry is called a playa. The barren Black Rock Desert in north-western Nevada, about 100 m. in length by 1 5 in breadth, is typical.

PLAYFAIR, JOHN (1748-1819), Scottish mathematician and physicist, was born at Benvie, Forfarshire, where his father was parish minister, on the 10th of March 1748. He was educated at home until the age of fourteen, when he entered the university of St Andrews. In 1766, when only eighteen, he was candidate for the chair of mathematics in Marischal College, Aberdeen, and, although he was unsuccessful, his claims were admitted to be high. Six years later he made application for the chair of natural philosophy in his own university, but again without success, and in 1773 he was offered and accepted the living of the united parishes of Liff and Benvie, vacant by the death of his father. He continued, however, to carry

A collected edition of Playfair's works, with a memoir by James G. Playfair, appeared at Edinburgh in 4 vols. 8vo. His writings include a number of essays contributed to the Edinburgh Review from 1804 onwards, various papers in the Phil. Trans, (including his earliest publication, " On the Arithmetic of Impossible Quantities," 1779, and an " Account of the Lithological Survey of Schehallion," 181 1) and in the Transactions of the Royal Society of Edinburgh (" On the Causes which affect the Accuracy of Barometrical Measurements," &c), alsp the articles "Aepinus" and "Physical Astronomy," and a "Dissertation on the Progress of Mathematical and Physical Science since the Revival of Learning in Europe," in the Encyclopaedia Britannica (Supplement to fourth, fifth and sixth editions). His Elements of Geometry first appeared in 1795 and have passed through many editions; his Outlines of Natural Philosophy (2 vols., 1812-1816) consist of the propositions and formulae which were the basis of his class lectures. Playfair's con- tributions to pure mathematics were not considerable, his paper "On the Arithmetic of Impossible Quantities," that " On the Causes which affect the Accuracy of Barometrical Measurements,"

and his Elements of Geometry, all already referred to, being the most important. His lives of Matthew Stewart, Hutton, Robison, many of his reviews, and above all his " Dissertation ' are of the utmost value.

PLAYFAIR, LYON PLAYFAIR, 1st Baron (1818-1898), was born at Chunar, Bengal province, on the 21st of May 181 8. He was sent to Europe by his father at an early age, and received his first education at St Andrews. Subsequently he studied medicine at Glasgow and Edinburgh. A short visit to India (in 1837-1838) was followed by his return to Europe to study

chemistry, which had always attracted him. This he did at University College, London, and afterwards under Liebig at Giessen, where he took his doctor's degree. At Liebig's request, Playfair translated into English the former's work on the Chemistry of Agriculture, and represented Liebig at a meeting of the British Association at Glasgow. The outcome of his studies was his engagement in 1841 as chemical manager of the Primrose print-works at Clitheroe, a post which he held for rather more than a year. In 1843 ne was elected honorary professor of chemistry to the Royal Institution of Manchester, and soon afterwards was appointed a member of the Royal Commission on the Health of Towns, a body whose investigations may be said to have laid the foundations of modern sanitation. In 1846 he was appointed chemist to the geological survey, and thenceforward was constantly employed by the public depart- ments in matters of sanitary and chemical inspection. The opportunity of his life came with the 1851 Exhibition, of which he was one of the special commissioners. For his services in this connexion he was made C.B., and his work had the additional advantage of bringing him into close personal relations with the Prince Consort, who appointed him gentleman usher in his household. From 1856 to 1869 he was professor of chemistry at Edinburgh University. In 1868 he was elected to represent the universities of Edinburgh and St Andrews in parliament, and retained his seat till 1885, from which date until 1892 he sat as member for Leeds. In 1873 he was made postmaster-general, and in the following year, after the dissolution of parliament, was applied to by the incoming Tory government to preside over a commission to inquire into the working of the civil service. Its report established a completely new system, which has ever since been officially known as the " Playfair scheme." The return of Mr Gladstone to power in 1880 afforded opportunity for Playfair to resume his interrupted parliamentary career, and from that time until 1883 he acted as chairman of committees during a period when the obstructive tactics of the Irish party were at their height. On his retirement from the post he was made K.C.B. In 1892 he was created Baron Playfair of St Andrews, and a little later was appointed lord-in-waiting to the queen. In 1895 he was given the G.C.B. In spite of failing health the last years of his life were full of activity, one of his latest public

acts being his suggestion that Queen Victoria's Diamond Jubilee of 1897 should be commemorated by the completion of the South Kensington Museum. He died in London, after a short illness, on the 29th of May 1898, and was buried at St Andrews. He was three times married. He was the author of a number of papers on scientific and social topics, a selection from which he published in 1889 under the title of Subjects of Social Welfare.

A memoir by Sir Wemyss Reid was published in 1899.

PLEADING (Fr. plaider, plaidoyer), the term applied in English law to the preparation of the statement of the facts on which either party to a criminal prosecution or a civil action founds his claim to a decision in his favour on the questions involved in the proceeding; and also to the document in which these statements are embodied. The term " pleadings " is used for the collected whole of the statements of both parties; the term " pleading " for each separate part of the pleadings. The term " plea " {placitum, plaid) 1 is now applied in England oftenest to the defence made by an accused person. To " plead " is to make a pleading or plea. 2

All systems of law agree in making it necessary to bring the grounds of a claim or defence before the court in a more or less definite and technical form.

Roman System. — In Roman law the action passed through three stages (see Action), and the manner of pleading changed with the action. In the earliest historical period, that of the legis actiones, the pleadings were verbal, and made in court by the parties them- selves, the proceedings imitating as far as possible the natural

1 In Scots and ecclesiastical law the word " plea " is used as to the statements of both parties to a cause.

2 In French law plaider and plaidoyer are still applied to the oral arguments of counsel, and in English popular speech " to plead " has much the same sense.

conduct of persons who had been disputing, but who suffered their quarrel to be appeased (Maine, Ancient Law, ch. x.). The use of technical language in pleading at an early date came to be regarded as so important that, as Gaius tells us, the party who made even the most trifling mistake would lose his suit. This excessive reverence for formality is a universal

characteristic of archaic law. In the second period, that of the procedure by formulae, the issue which the judex decided was made up by the praetor in writing from the statements of the parties before him. The formula was a short summary of the facts in dispute in technical language, with instructions to the judex, and corresponded to what would now be called the submission or terms of reference to an arbitrator chosen by the parties. The part of the formula which contained the plaintiff's claim was called the intentio. Any equitable defence included in the formula was set up by means of an exceptio, which was either peremptory, denying the right of the plaintiff to recover at all, or dilatory, denying only that the action could be brought at the time or by the particular plaintiff. The plaintiff might meet the exceptio by a replicatio, the defendant on his side might set up a duplicatio, and the plaintiff might traverse the duplicatio by a triplicatio. The parties might proceed even further, but beyond this point the pleadings had no special names. Actions bonae fidei implied every exceptio that could be set up; in other actions the exceptio must be specially pleaded. From the formula the judex derived his whole authority, and he was liable to an action for exceeding it. He could not amend the formula: that could only be done by the praetor. In the third period the formula did not exist, the plaintiff's claim appeared in the summons (libellus conventionis), and the defendant might take any defence that he pleased, all actions being placed on the footing of actions bonae fidei. The issue to be tried was determined by the judge from the oral statements of the parties.

English System. — The English system of pleading seems to have drawn largely from, if it was not directly based upon, the Roman. Bracton {temp. Henry III.) uses many of the Roman technical terms. Pleading was oral as late as the reign of Henry VIII., but in the reign of Edward III. pleadings began to be drawn up in writing, perhaps at first more for the purpose of entry on the court records than for the instruction of the court (see 2 Reeves, History of English Law, p. 398). The French language was used until 1362, after which English was used for oral pleading, but Latin for enrolment, except for a short period during the Commonwealth. Latin was the language of written pleadings at common law until 1731. The period of the Roman formula has its analogue in the period of the original writ in England. 1 The writ was at first a formal commission from the Crown to a judicial officer to do justice between the parties, the claim being made by a count (conte, narrative). The issue of the writ was part of the prerogative of the Crown, unlimited until the Provisions of Oxford (1258) forbade the issue of fresh writs except " writs of course " (de cursu) without the consent of the council. Gradually the writ came to absorb the count and included the plaintiff's claim and sometimes the nature of his evidence. The defendant pleaded to the writ. The writ became the universal form of

instituting proceedings in the king's court, irrespective of the method of trial which followed, and probably grew fixed in form about the reign of Henry II. (see Bigelow, History of Procedure, ch. iv.). At a later date the writ again tended to approach its earlier form and to split into two parts— the writ of summons and the declaration or plaintiff's claim. The writ of summons was addressed to the defendant, and not, as the original writ, to a judicial officer. The pleadings became the act of the party, differing in this from Roman law, in which they were a judicial act. The writs became precedents for the forms of action, which, like the writs, were limited in number. The plaintiff's declaration was a substantial repetition of the writ. In the writ, as in the formula, the slightest failure in form was as a rule fatal. " The assigning of a writ of a par- ticular frame and scope to each particular cause of action, the appropriating process of one kind to one action and of a different kind to another, these and the like distinctions rendered pro- ceedings very nice and complex, and made the conduct of an action a matter of considerable difficulty " (1 Reeves, Hist, of English Law, p. 147). Fines were levied for mistakes in pleading, non-liability to which was sometimes granted by charter as a

1 The original writ was so called to distinguish it from the judicial writ, which was a part of the process of the court. The judicial writs still exist, e.g. writs of certiorari or fieri facias.

special privilege to favoured towns. In both Roman and English law fictions, equity and legislation came to mitigate the rigour of the law. In England this result was largely attained by the framing of the action of trespass on the case under the powers of the Statute of Westminster the Second (1285), and by the extension of the action of assumpsit to non-feasance. The difficulties and technicalities of the common law system were met by elaboration of what is known as " special pleading," 2 , which became an art of the utmost nicety, depending on numerous rules, some of them highly technical (see Coke upon Littleton, p. 303). Those who made it their business to frame pleadings were called special pleaders. They were not necessarily members of the bar, but might be licensed to practise under the bar. At one time it was usual to practise for a time as a special pleader before call to the bar. Such licences are now rarely sought, and the Law List of 1906 contained only one name of a special pleader who was not a barrister. The art became necessary because of the absolute particularity with which claims must be framed, and the narrowness of the powers of amendment possessed by the courts. The result was that substantive law was smothered in procedure, and the practical questions at issue were of less moment than the phraseology in which they were to be stated. As an extreme instance, a learned judge in the 19th century challenged a pleading for putting the year without adding a.d., on the ground that " non constat that a.c. might not be intended." '

Some of the difficulties as to amendment were removed by the statutes of Jeofails (j'aifailli) beginning in 1340. But until the 19th century the courts of common law and equity worked side by side in Westminster Hall, administering each their own system without due regard to the other; and even in so simple a matter as the right of a defendant to set off against a claim on him a debt due to him from the plaintiff required statutory provision. Many of the defects and technicalities of the common law system were removed by the Common Law Procedure Acts and the general rules of practice made thereunder. Wide powers of amendment were given, and the parties were allowed to raise and try claims which theretofore could have been dealt with only in courts of equity. In the court of chancery the pleadings used were bill (or in certain public matters an information by the attorney-general), answer and replication. 3 Demurrers were used, or " exceptions " could be taken to the bill or answer. They differed from the common law forms by being much more diffuse, by pleading matters of evidence, and in that the answer was on oath. Beyond the replication chancery proceedings did not go, the place of further pleadings being supplied by amend- ment. Exceptions might be taken to the bill or answer on various grounds. Equity pleadings were signed by counsel. On the creation of the divorce court the pleadings authorized were (and still are) as follows: petition (which must be verified by oath), answer (which is so verified if it goes beyond a mere denial) and reply; and a special pleading called "act on petition" (derived from the ecclesiastical courts) with answer thereto, generally used for the determination of some preliminary question in the suit, e.g. the domicile of the husband. In the court of admiralty the pleadings used were petition, answer, reply and conclusion. In the probate court the common law terms were used (declaration, plea and replication), but the procedure was not the same as in the common law courts.

Under the old common law system 4 as modified in the 19th century the pleadings in use were as follows: — •

1. Declaration, made up of one or more counts (contes), or modes of framing the plaintiff's claim so as to state his grievances in fact in a form suggesting the appropriate remedy at law, and concluding by demand for a plea. The counts were spoken of as common or special according as the facts of the case allowed the use of common

2 The ingenuity of the pleader showing itself chiefly in framing special as opposed to general pleas, the term " special pleading " grew to be used for the whole proceedings of which it was the most important part.

3 In Chancery the " English Bill," so called from its being in the English language, had existed, according to G. Spence, as early as the reign of Henry V. (Equitable Jurisdiction, i. 348).

- *Bullen and Leake, Precedents of Pleading (3rd ed., 1868).*

forms or required special statement. The declaration corresponds to the Roman formula and intentio.

2. Plea by the defendant to the counts of the declaration. The plea corresponds to the Roman exceptio.

3. Replication by the plaintiff to the plea. In this pleading the plaintiff usually took issue upon the statements in the defence- but he might do what was termed " new assign," e.g. complain of acts in excess of a justification alleged in the plea.

4. Rejoinder by the defendant to the replication, answering to the Roman duphcaho. °

5. Surrejoinder by the plaintiff to the rejoinder, answering to the Roman triplicatio.

6. Rebutter by the defendant to the surrejoinder.

7. Surrebutter by the plaintiff to the rebutter.

Nos. 4, 5, 6 and 7 were rarely necessary, as the parties usually came to a definite issue on the facts in the replication, and the last of them is only kept in legal memory because Lord Wensleydale (the last and best versed of the old common law pleaders) was nicknamed Chief Baron Surrebutter. At any stage of the plead- ings after (1), the party might instead of pleading to the preceding document demur, i.e. admit the facts as therein stated and contend that assuming the truth of those facts the document was insufficient in law to found a claim or a defence as the case might be De- murrers (q.v.) were general or special according as they went to the substance of the claim or plea or to a mere defect in the mode of statement. When the pleadings had reached a stage at which the parties were in flat contradiction on matters of fact, they con- cluded by ;oinder of issue, upon which the record was made uo and the action was ripe for trial.

Pleas fell into the following classes : —

1. In abatement also described as temporary or dilatory (terms ot Roman law), directed either to the jurisdiction of the court or to the abatement or defeat of the action for defects of form.

2. In bar, also described as peremptory, which answered the alleged cause

of action by denying facts stated in the declaration which were material, or by confessing their truth, but stating new matter of fact which destroyed their legal effect.

Some of these were by way of justification or excuse, e.g. by setting up the truth of matter alleged to be defamatory, or legal warrant tor an arrest complained of as illegal; others were by wav of discharge, e.g. of an alleged debt by payment.

Pleas in denial were known (a) as general traverses or general issues, when they denied in a general and appropriate form one or more of the facts alleged (e.g. " never indebted " to a claim in assumpsit or not guilty " to a claim for tort) ; (b) as specific traverses of separate and material allegations in the declaration setting out with particularity the facts relied on.

It was permissible to plead alternatively, i.e. to set up a number of different answers to the facts on which the claim was based. As a general rule a plea must be " issuable," i.e. must put the merits pt the cause in issue on the facts or the law, so that the decision of judge and jury thereon would put an end to the action upon the merits. r

All the above forms of pleading, except in matrimonial causes, were abolished by the Judicature Acts, and a new system was set up by these acts and the rules of the Supreme Court. Under this system the pleadings proper are " statement of claim " " defence," " reply," and, if need be, " rejoinder."

When pleadings are allowed they must contain, and contain only, a statement in a summary form of the material facts on which the party pleading relies for his claim or defence, as the case may be, but not the evidence by which they are to be proved ; and must, when necessary, be divided into paragraphs, numbered consecutively. Dates, sums and numbers are expressed in figures and not in words. Signature of counsel is not necessary; but where pleadings have been settled by counsel or a special pleader they are to be signed by him, and if not so settled they are to be signed by the solicitor or by the party if he sues or defends in person (0. 19, r. 4). 1 There has been a growing dis- position to dispense with formal pleadings in the simpler kinds of action. A plaintiff is allowed to proceed to trial without pleadings if the writ of summons is endorsed in a manner sufficient to indicate the nature of his claim and the relief or remedy which he seeks (O. 18a), and contains a notice of his intention. In no case is a statement of claim other than that endorsed on the writ necessary unless the defendant on appearance asks for one, and his right to insist has been cut down by the provisions presently to be stated. In commercial cases a

statement by the parties to the points of law and fact which they propose to raise is substituted for ordinary pleadings. In cases where

1 Before the Judicature Acts equity pleadings were signed by counsel, but common law pleadings were not. xxi. 27

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the demand is for a liquidated sum certain, or to recover land from a tenant on expiration of his term or its forfeiture for non- payment of rent, the statement of claim must be endorsed on the writ; and m all other cases no statement of claim beyond that on the writ may be delivered except under order of the master or judge at chambers (Ords. 18a and 30). A statement of defence may not be delivered except under order made on the summons for directions (which must be taken out immediately after the appearance of the defendant in answer to the writ) nor a reply without special leave. The result of the present practice is to substitute " particulars," i.e. specific statement of the details which the parties intend to prove, for the more general terms in which pleadings were formerly framed.

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»Z Zt T the P – amtl ? or , to raise fa y wa y of counter-claim any right or claim against the plaintiff or a third party, whether

- *nnn£ln n % ¥ dam ages or not The counter-claim is in substance a conjoined action in which the defendant is plaintiff and the plaintiff or third party affected may put in a defence to it. Except in such twwiT rep i? and s " bs equent pleadings are now seldom permitted. Both the parties and the court or a judge have large powers of amending the pleadings both before and at the trial Issues are*

*phnS!? Ca !f Setded "? y the court or a J ud S e – Demurrers are "S a f nd a Pfrty is now entitled to raise by his pleading a nJ P ?u f- W – Where decl sion of a point of law woulcfput an end to the action steps may be taken for obtaining such decision ,?„ ˆl , ob y. late the . necessity of trying the issues of fact raised n = „,? £ ? lu gS V Forms ° f pleading are given in Appendices C, JJ and fc. to the Supreme Court Rules. In all actions such ground of defence or reply as if not raised would be likely to take the opposite party by surprise, or would raise issues of fact not arising out ot the preceding pleadings, must be specially pleaded. Such are compulsory pilotage fraud, the Statute of Limitations, the Statute of Frauds and the Gaming Act. The Supreme Court ■a t£ , apP V *? P r ?ceedings in Crown suits or in the Crown side of the king s bench division. In actions for damages by col hsion between ships each party must as a general rule file a*

sealed document called a preliminary act containing details as to the time and place of collision, the speed, tide, lights, &c. The case may be tried on the preliminary act without pleadings, but it there are pleadings the act may not be unsealed until they are completed and certain consents given. The document was peculiar t <-! u PU u rt i- of adl S lr alty, but may now be used in all divisions of the High Court (O 19, r. 28). The High Court system of plead- ings has been adopted in the chancery courts of the counties palatine of Lancaster and Durham. The place of the " record " is supplied by copies of the pleadings delivered for the use of the iudge and of the officer entering the judgment (O. 36, r. 30; O. 41, r. 1). 1 11 j county courts proceedings are commenced by a plaint, followed by an ordinary or default summons. No " pleadings "are necessary, but the defendant is precluded from setting up certain special defences such as set-off or infancy County

or statutory defences, without the consent of the Courts. plaintiff, unless he has given timely notice in writing of his intention to set up the special defence. This system is made workable by insisting on the insertion of adequate details or particulars of the nature of the claim in the plaint. But in cases where a special defence is not required considerable inconvenience is caused bv uncertainty as to the line of defence.

*In some of the local civil courts of record which have survived the creation of the county courts, the pleadings are still in the form recognized by the Common Law Procedure Acts. , , _ This is the case in the Mayor's Court of London. In ' nfer ' or others (.eg. the Liverpool Court of Passage and the b. 00 "' , Salford Hundred Court) the system of the Judicature S * Acts has been adopted with or without official sanction. Kecord – the policy of the lord chancellor and the treasury has been to ret use reform of procedure to all but the most used of these local courts so as to extinguish them in favour of the county courts.*

In the ecclesiastical courts the statements of the parties are called generally pleas. The statement of the plaintiff in civil suits is called a libel; of the promoter in criminal suits articles. Every subsequent plea is called an allegation. Ecclesl- lo the responsive allegation of the defendant the pro- astical. moter may plead a counter-allegation. The cause is concluded when the parties renounce any further allegation. There exists in addition a more short and summary mode of pleading called an act on petition.

In Roman criminal procedure the indictment (inscriptio or

libellus accusationis) was usually in writing, and contained a formal statement of the offence. In some cases oral accu- sations were allowed. The pleading of the accused seems to have been informal. In English criminal cases the expression " pleadings " is limited to those tried on in- dictment or information before a jury. In matters dealt with by justices of the peace there are informations sometimes in writing, but they are never regarded as " pleadings." English criminal pleading has been less affected by legislation than civil pleading, and retains more of what is called the common law system. Cases in which the Crown was a party early became known as " pleas of the Crown " (placita coronae), as distinguished from "common pleas" {communia placita), or pleas between subject and subject — that is to say, ordinary civil actions. Pleas of the Crown originally included all matters in which the Crown was concerned, such as exchequer cases, franchises and liberties, but gradually became confined to criminal matters, strictly to the greater crimes triable only in the king's courts. In criminal pleading the Crown states the case in an indictment or information. The answer of the accused is a plea, which must be pleaded by the accused in person, except in certain cases of misdemeanour tried in the High Court {Crown Office Rules, 1906). The plea, according to Blackstone, is either to the jurisdiction, a demurrer, in abatement, special in bar, or the general issue. The last is the only plea that often occurs in practice; it consists in the answer (usually oral) of " guilty " or " not guilty " to the charge. A demurrer is strictly not a plea at all, but an objection on legal grounds. Pleas to the jurisdiction or in abatement do not go to the merits of the case, but allege that the court has no jurisdiction to try the particular offence, or that there is a misnomer or some other technical ground for stay of proceedings. The powers of amendment given in 1851 (14 & 15 Vict. c. 100) and the procedure by motion in arrest of judgment have rendered these pleas of no practical importance. The special pleas in bar are autrefois convict or autrefois acquit (alleging a previous conviction or aquittal for the same crime) and pardon (see Pardon). The plea of autrefois attaint has fallen out of use since the abolition of attainder by the Forfeitures Act 1870. There are also special pleas of justification to indictments' for defamatory libel under the Libel Act 1843; and to indictments for non-repair of highways and bridges the accused may plead that the liability to repair falls upon another person. These special pleas are usually, and in some cases must be, in writing. When there is a special plea in writing the Crown puts in a replication in writing.

Ireland— The practice as to civil and criminal pleading in Ireland is substantially the same as in England, though to some extent based on different statutes and rules of court.

Scotland. — In Scotland an action in the Court of Session begins by a summons on the part of the pursuer, to which is annexed a condescendence, containing the allegations in fact on which the action is founded. The pleas in law, or statement of the legal rule or rules relied upon (introduced by the Court of Session Act 1825), are subjoined to the condescendence. The term libel is also used (as in Roman law) as a general term to express the claim of the pursuer or the accusation of the prosecutor. The statement of the^de- fender, including his pleas in law, is called his defences. They are either dilatory or peremptory. There is no formal joinder of issue, as in England, but the same end is attained by adjustment of the pleadings and the closing of the record. Large powers of amend- ment and revisal are given by the Court of Session Act 1868. In the sheriff court pleadings are very similar to those in the Court of Session. They are commenced by a petition, which includes a condescendence and a note of the pursuer's pleas in law. The defender may upon notice lodge defences. The procedure is now governed by the Sheriff Courts Scotland Act 1876. The term ' pleas of the Crown " is confined in Scotland to four offences — murder, rape, robbery and fire-raising. The criminal procedure of Scotland was simplified and amended in 1887. The old pro- cedure by criminal letters has been abolished, and prosecutions fcr the public interest whether in the high court of justiciary or before the sheriff with a jury are by indictment in the name of His Majesty's advocate. The Scots indictment differs from the English in not being found by a grand jury, except in cases of high treason, and resembles rather the ex officio information of English law. Until 1887 it was in the form ofa syllogism, the major proposition stating the nature of the crime, the minor the actual offence com- mitted and that it constitutes the crime named in the major, the

conclusion that on conviction of the panel he ought to suffer punish- ment. Under the present practice it is in the second person addressed to the accused, and follows the forms scheduled to the act of 1887, which also makes specific provisions for simplification, and if need be for amendment (s. 70). A copy of the indictment with a list of the witnesses and the productions must be served on the accused. There are two sittings (diets) to deal with the in- dictment. At the first, held before the sheriff, the accused (termed the panel) may plead guilty or raise preliminary objections to the relevancy of the indictment, &c, or otherwise (such as want of jurisdiction or res judicata); or without taking such objections, or after they are overruled, may plead not guilty. The second diet is the diet of trial. If the trial is before the sheriff his rulings at the first diet are final, if before the court of justiciary his rulings may be reviewed. At the second diet, besides his plea of not guilty, the panel may rely on certain special defences, e.g. insanity or alibi, but only if his special and written plea was tendered and recorded at the first diet or the delay explained, and he cannot call

evidence in support of these pleas except on written notice specify- ing the names of the witnesses and the documents not included in the prosecutor's lists (s. 36). (See Macdonald, Criminal Law of Scotland.)

British Dominions Beyond Seas. — In most of the Australian states, and in Ontario and New Zealand, civil pleadings are governed by rules adopted from the English Judicature Acts. In New South Wales a system based on the Common Law Procedure Acts is retained. Civil pleadings in India are regulated by the Civil Procedure Code. Indictments, except in India, are based on the English system as modified by the criminal codes or other legisla- tion of the colony. Indictments in India are regulated by the Criminal Procedure Code of 1898.

United Slates. — In the United States two systems of pleading in civil procedure exist side by side. Up to 1848 the pleading did not materially differ from that in use in England at the same date. But in 1848 the New York legislature made a radical change in the system, and the example of New York has been followed by many states. The New York Civil Code of 1848 established a uniform procedure called the civil action, applicable indifferently to common law and equity. The pleadings are called complaint, answer (which includes counterclaim) and reply. The demurrer also is still used. In some states which follow this procedure the complaint bears the name of petition. In inferior courts, such as courts of justices of the peace, the pleadings are more simple, and in many cases oral. In states which do not adopt the amended procedure the pleading is much the same as it was in the days of Blackstone, and the old double jurisdiction of common law and equity still remains. Criminal pleading is on the lines of the common law system of England. (W. F. C.)

PLEASURE (through Fr. plaisir from Lat. placere, to please; Gr. ■qhovq), a term used loosely in ordinary language as practically synonymous with " enjoyment." As such it is applied equally to what are known as the " higher " or " intellectual " pleasures, and to purely " sensual," " animal " or " lower " pleasures. The conditions under which a man is pleased are the subject both or psychological and of ethical investigation. In general it may be said that pleasure and pain follow respectively upon the success of the failure of some effort, mental or physical (see Psychology) ; they may also attend upon purely passive sensa- tions, e.g. a warm sun, a heavy shower, or upon associations with previous states of mind {i.e. a man may enjoy a sensation which is intrinsically painful, if it has pleasant associations). Recogni- tion of the fact that mankind seeks pleasure and avoids pain has led some moralists to the conclusion that all human conduct is actuated by hedonic considerations: this is the direct antithesis to ethical theories which maintain an absolute criterion of right and wrong (see Hedonism; Ethics). Aristotle took a middle view, holding that pleasure, though not the end of

virtuous action yet necessarily follows upon it {hruyevbixtvov tl t«Xos).

PLEBISCITE (Lat. plebiscilum, a decree of the plebs), a term borrowed from the French for a vote of all the electors in a country taken on some specific question (see also Referendum). The most familiar example of the use of the plebiscite in French history was in 1852, when the coup d'Stat of 1851 was confirmed and the title of emperor was given to Napoleon III. In Roman constitutional law the plebiscitum was a decree enacted in the assembly of the plebs, the comitia tributa, presided over by a plebeian magistrate.

PLEBS (from the root seen in Lat. plenus, full; cf. Gr. Tkfjdos), the " multitude," or unprivileged class in the early Roman state. For the origin and history of this order see Patricians and Nobility. Its disqualifications were originally based on

descent; but after the political equalization of the two orders the name was applied to the lower classes of the population with- out reference to their descent. Under the empire the word is regularly used of the city proletariate, or of the commons as distinct from knights and senators.

PLEDGE, 1 or Fawn, in law " a bailment of personal property as a security for some debt or engagement " (Story on Bailments, § 286). The term is also used to denote the property which constitutes the security. Pledge is the pignus of Roman law, from which most of the modern law on the subject is derived. It differs from hypothec and from the more usual kind of mort- gage in that the pledge is in the possession of the pledgee; it also differs from mortgage in being confined to personal property. A mortgage of personal property in most cases takes the name and form of a bill of sale. The chief difference between Roman and English law is that certain things, e.g. wearing apparel, furniture and instruments of tillage, could not be pledged in Roman law, while there is no such restriction in English law. In the case of a pledge, a special property passes to the pledgee, sufficient to enable him to maintain an action against a wrong- doer, but the general property, that is the property subject to the pledge, remains in the pledgor. As the pledge is for the benefit of both parties, the pledgee is bound to exercise only ordinary care over the pledge. The pledgee has the right of selling the pledge if the pledgor make default in payment at the stipulated time. No right is acquired by the wrongful sale of a pledge except in the case of property passing by delivery, such as money or negotiable securities. In the case of a wrongful sale by a pledgee, the pledgor cannot recover the

value of the pledge without a tender of the amount due.

The law of Scotland as to pledge generally agrees with that of England, as does also that of the United States. The main differ- ence is that in Scotland and in Louisiana a pledge cannot be sold unless with judicial authority. In some of the American states the common law as it existed apart from the Factors' Acts is still followed; in others the factor has more or less restricted power to give a title by pledge.

See also Factor and Pawnbroking.

PLEHVE, VIATSCHESLAF KONSTANTINOVICH (1846-1904), Russian statesman, was born of Lithuanian stock in 1846. He was educated at Warsaw and studied law at the university in St Petersburg before he entered the bureaucracy in the depart- ment of justice, in which he rose rapidly to be assistant solicitor- general in Warsaw, then solicitor-general in St Petersburg, and in 1881 director of the state police. As assistant to the minister of the interior he attracted the attention of Alexander III. by the skill he showed in investigating the circumstances of the assassination of Alexander II. He received the title of secretary of state in 1894, became a member of the council of the empire, and in 1902 succeeded Sipiaguine as minister of the interior. Plehve carried out the " russification " of the alien provinces within the Russian Empire, and earned bitter hatred in Poland, in Lithuania and especially in Finland. He despoiled the Armenian Church, and was credited with being accessory to the Kishinev massacres. His logical mind and determined support of the autocratic principle gained the tsar's entire confidence. He opposed commercial development on ordinary European lines on the ground that it involved the existence both of a dangerous proletariat and of a prosperous middle class equally inimical to autocracy. He was thus a determined opponent of M. de Witte's policy. An attempt was made on his life early in 1904, and he was assassinated on the 28th of July of the same year by a bomb thrown under his carriage as he was on his way to Peterhof to make his report to the tsar; the assassin, Sasonov, was a member of the fighting organization of the socialist revolutionary party.

PLEIAD (Gr. IlXetds), in Greek literature, the name given (by analogy from Pleiades, below) by the Alexandrian critics to seven tragic poets who flourished during the reign of Ptolemy

1 The word " pledge " is adapted from the O. Fr. plege, mod. pleige, security, hostage, Med. Lat. plivium. This is a formation form Med. Lat. plevire or plebire, to undertake or engage for some- one, cf. " replevin "; it is now considered to be a word of Teutonic origin and connected with Ger. pflegen and " plight."

Philadelphus (285-247 B.C.). In French literature, in addition to the Pleiad of Charlemagne, there were two famous groups of the kind. The first, during the reign of Henri III. (1574-1589), the chief member of which was Pierre de Ronsard, sought to improve the French language and literature by enthusiastic imitation of the classics; the second, under Louis XIII. (1610-r643), consisted of authors who excelled in the composition of Latin verse.

PLEIADES, in Greek mythology, the seven daughters of Atlas and Pleiione, and sisters of the Hyades. Owing to their grief at the death of their sisters or at the sufferings of their father, they were changed into stars. In another account, the Pleiades and their mother met the hunter Orion in Boeotia, and the sight of them inflamed his passion. For five years he pursued them through the woods, until Zeus translated them all — Pleiione and her daughters, Orion, and his dog — to the sky. The Pleiades rose in the middle of May and set at the end of October, and their connexion with spring and autumn explains the legend. As bringers of the fertilizing rains of spring, which have their origin in the west, they are the daughters of Atlas; as the forerunners of the storms of autumn, they are represented as being driven onward by Orion .in pursuit. The word is probably connected with 7rXeiwi', either in the sense of " many in number," since the stars formed a close group, resembling a bunch of grapes (hence sometimes called floTpvs), or as " more in number " than their sisters. Others derive the name from t\cIv (to sail), because navigation began at the time of their rising. They are probably alluded to in Homer (Odyssey, xii. 62) as the doves GreXeiaSes) who brought ambrosia from the west to Zeus. One of these doves was always lost during the passage of the Planctae (wandering rocks), referring to the fact that one of the seven Pleiades was always invisible. This was Merope, who hid her light from shame at having had intercourse with a mortal, Sisyphus. All the Pleiades became the ancestresses of divine or heroic families. They were called Vergiliae (probably con- nected with ver, spring) by the Romans.

See Hesiod, Works and Days, 383; Apollodorus iii. 10; Diod. Sic. iii. 60; Theocritus xiii. 25; Hyginus, Astronom. ii. 21; Ovid, Fasti, iv. 1691 v. 599.

PLEIADES, Atlantides or Vergiliae, in astronomy, a group of stars situated in the constellation Taurus. They are supposed to be referred to in the Old Testament (Job. ix. 9, xxxviii. 31). This group is particularly rich in bright stars, and is full of nebulosity, but there are fewer faint stars than in equal areas of the surrounding sky; the central star is Alcyone (3rd magnitude) ; Pleiione and Atlas are also of the 3rd magnitude.

PLEISTOCENE, in geology, the epoch which succeeded the Pliocene; it is the last of the Tertiary periods, and hence the lower subdivision of the quaternary or modern era. The name was introduced by Sir C. Lyell in

1839 (from Gr. ttKuotov, most, and xaivds, recent), the rocks of this period containing a higher percentage of living forms than the youngest of the Tertiary formations. By many writers " Pleistocene " has been regarded as synonymous with " Glacial Period " or the " Diluvium " of some geologists. In the northern hemisphere the protracted period of glaciation, with its predominating influence upon modern topography and fauna! distribution, was undoubtedly the outstanding feature of the time. The pheno- mena of the Glacial period (q.v.), which was by no means strictly limited to the northern latitudes, are dealt with under that head, but there are certain other characteristics of the Pleistocene period which bear no direct relationship to glaciation, and these will be dealt with here.

The gradual inception of colder conditions in the northern hemisphere which lead up to the more extreme conditions of glaciation clearly began in the latter part of the Pliocene period, and the effects of this cooling are seen not only in northern Europe and America but as far south as the Mediterranean. The result of this is that there is a certain indefiniteness as to the exact base line to be adopted for the Pleistocene formations; thus the Forest Bed of Cromer and certain beds in Sicily and Italy are by some authors placed in this period and by others

in the Pliocene (q.v.). Again it is clear that in parts of northern Europe, Siberia and North America, the conditions character- istic of a glacial period are still existent; even in Scotland and Norway the last traces of glacial action are remarkably fresh, and the last remnants of great glacial centres still linger in the Alps and other lofty southern mountains. Many of the formations of this period can be Shown by their fossil contents to belong to early quaternary time, but since so many of these deposits are strictly local in character, and since the fauna and flora present in any one spot have been determined by local geo- graphical conditions which have assisted or retarded the migration of certain forms, it is a matter of extreme difficulty — ■ one may say impossibility— to reduce the Pleistocene formations to any generally applicable chronological order. For similar reasons it is impossible to define strictly the upper limit of the formations of this period, and to say where the Pleistocene ends and where the Recent or Holocene period begins.

The composition and distribution of the Pleistocene fauna and flora present many points of extreme interest. The feature of great- est importance is that man existed somewhere and in some con- dition before and in this period; but no really satisfactory proof has so far been forthcoming which will set

back his first appear- ance before the beginning of the glacial peripd (Pithecanthropus erectus found by E. Dubois in Java is regarded as of Pliocene age). The presence of the remains of man or of his works might reason- ably be taken as a criterion of the Pleistocene age of a deposit — if we omit the remains of historical time. But here again it has to be borne in mind that historical time is continually being set back by archaeological research, and further, the difficulty of employing artefacs of stone as chronological indicators is shown by the fact that even at the present day implements of stone are still in use, and that different local races of early men must have been in diverse stages of development in Pleistocene as in later ages. It is, therefore, only with the utmost caution that chronological subdivisions of the period, such as those mentioned below, based' upon the form and degree of finish of stone implements, can be used in anything but local correlations unless the evidence is supported by satisfactory fossils.

Next to the appearance of man the most striking characteristic of the land fauna was the existence of numerous large-bodied mam- mals; Elephas antiquus, for instance, attained a more excessive bulk than any other proboscidean either before or since, the woolly rhinoceros, the great hippopotamus, the cave bear, cave lion and giant deer were all larger than their living representatives. No less striking is the disappearance of these large forms together with highly specialized creatures such as Machaerodus within the same period, through the action of the same causes which had re- moved the bulky and specialized reptiles of an earlier geological period. The Pleistocene mammalia of Europe include Elephas antiquus, E. primogenius (mammoth), R. antiquitatis (tichorhinus) (the woolly rhinoceros), R. mercki (especially in Silesia), R. lepto- rhinus (south-east Europe) , Elasmotherium (Silesia and south Russia), Hippopotamus major, Bos primigenius (aurochs, extinct in historical time), Bison priscus, Bison europaeus (still living in the Caucasus and Lithuania), Bos (Bubalus) pallasi (north Europe), camels in south Russia and Rumania, Equus fossilis and varieties, Cervus (Megaceros) giganteus (= hibernicus) (the great Irish "elk" and its varieties) ; Cervus elaphus, C. aleus, Rangifer tarandus and R. groenlandicus (reindeer), Capreolus caprea, Capra ibex, Saiga tatarica, Ovibos moschalus, Felis spelaeus. Hyaena spelaea, Ursus spelaeus, badger, weasel, glutton, hare, lemming (Myodes torquatus and M. lemmus), Spermophilus, Alactaga, Arctomys, Castor fiber, Lagomys, Trogontherium. In North America there were numerous mammals common to Europe and North Asia, including the musk- ox, mammoth and horse ; the mastodon held on into this period in America but not in Europe ; there were also lamas, tapirs, camels (Camelus auchenia), Machaerodus, Mylodon, Procyon, Alces. In South America there was at first a very characteristic endemic fauna including Megatherium, Mylodon, Grypotherium, Lestodon, Toxodon, Typotherium, Glyptodon,

Macrauchenia, Capybara, Rhea, to which were added later, Mastodon, Machaerodus, Lama and other North American forms. In Australia a very distinct assemblage of iarge marsupials and monotremes lived in the Pleistocene period ; including Phascolus, Diprolodon, Thylacoleo, Nototherium and a large extinct Echidna; placental mammals were not then known in this region. In Madagascar the Aepiornis, Megaladapis, and certain extinct lemuroid creatures have left their remains.

The advance and retreat of glacial conditions in northern latitudes had a marked influence upon animal and plant life, and was the means of determining the present distribution of many of the living mammalia and plants; some were driven permanently southward, some northern forms still live isolated on the higher mountain regions, others like the reindeer and musk-ox returned northward as soon as the conditions permitted. The apparently curious admixture of what are now often regarded as tropical or sub-tropical

forms (Hon, hyena, rhinoceros and elephants) with cold-temperate or arctic genera, presents no real difficulty, since their distribution was doubtless merely a matter of food supply; and some of these, like the woolly rhinoceros and mammoth, were provided with a thick hairy pelt.

Although in the main the arrangement of land and sea was little different from that which obtains at the present time, one or two features existed in the Pleistocene period which had a considerable influence on faunal migration. For instance, the absence of the Bering Straits permitted free communication between Europe and North America, and the absence of the Straits of Dover allowed a similar interchange between Great Britain and France; while an extension of the sea in the Caspian region and of the Arctic Sea in northern Russia acted as a bar to free passage between Europe and Asia in those regions.

The formations of Pleistocene age, other than those of direct glacial origin, include deposits on the floors of caves in limestone and dolomitic rocks, calcareous sinter (travertine or tufa) formed by springs, ancient river and lake alluvial and lacustrine terraces, elevated marine beaches, submerged forests, ancient lake deposits and peat beds, laterite, loess and sand dunes.

Some of the prevalent styles of classifying the deposits of the glacial formations of this period are mentioned in the article Glacial Period. The following subdivisions are often employed by European geologists: a younger division, Reindeer time = Magda- l^nien 1 stage; a middle division, Mammoth time = Salutreen 2 stage; and an older division, Elephas antiquus time = Chellfcn 3 stage. While some authors include all the above in the " glacial period," others would place the Magdal6nien in a

post-glacial division. The terms Magdalenien, &c, are really archaeological, based upon the characters of the implements found in the deposits, and like the similar terms " eolithic " and " palaeolithic "they are of little value in geological chronology unless they are supported by palaeontological evidence.

See E. Geinitz, Das Quartar von nord Europa (Stuttgart, 1904), with very full references; T. C. Chamberlin and R. D. Salisbury, Geology, vol. iii. (New York, 1906), for references to American authorities. (J. A. H.)

PLEONASM (Gr. ir\eovao-ii6s, from irKeovaˆav, to abound or be superfluous, irKeov, comparative of xoXiis, many, great, large), redundancy or superfluity in speaking or writing, hence an unnecessary work or phrase. The word, more usually in the Latin form " pleonasmus," is used in pathology of an abnormal growth or formation.

PLESIOSAURUS, an extinct marine reptile belonging to the Order Sauropterygia, which characterized the Mesozoic period and had an almost world-wide distribution (see 'Reptiles). The animal is best known by nearly complete skeletons from the Lias of England and Germany. It was named Plesiosaurus (Gr. more-lizard) by W. D. Conybeare in 182 1, to indicate that it was much more nearly a normal reptile than the strange

(From a memoir by Professor W. Dames in the' Abhandlungm der kg. preuss. Aiad. d. Wiss.)

Plesiosaurus guilelmi-imperatoris, restored. Ichthyosaurus, which had been found in the same Liassic forma- tion a few years previously. It has a small head, a long and slender neck, a round body, a very short tail, and two pairs of large, elongated paddles. The snout is short, but the gape of the mouth is wide, and the jaws are provided with a series of conical teeth in sockets, much like those of the living gavial

1 Magdalenien from the caves of Madelaine, Perigord.

2 Saiutr6, Bourgogne.

8 Chelles, near Paris. Other subordinate stages are the Mou- sterien from Moustier, Dordogne, and Acheuleen, Saint Acheul.

of Indian rivers. The neck, though long and slender, must have been rather stiff, because the bodies of the vertebrae are nearly flat-ended, while they

bear short ribs: it could not have been bent in the swan-fashion represented in many restorations. The other vertebrae are similarly almost flat-ended and firmly united, but there is no sacrum. The ribs are single-headed, and in the middle of the trunk, between the supports of the paired limbs, they meet a dense plastron of abdominal ribs. The short tail is straight and rapidly tapering, but one specimen in Berlin suggests that it was provided with a rhomboidal flap of skin in a vertical plane. The bones in the ventral wall of the body which support the paired limbs are remarkably expanded, and those of the pectoral arch have often been compared with the corresponding bones of turtles. The limbs are elongated paddles, with five complete digits, of which the constituent bones (phalanges) are unusually numerous. The only traces of skin hitherto discovered suggest that it was smooth. The reptile must have been almost exclusively aquatic, feeding on cuttle- fishes, fishes and other animal prey. It propelled itself chiefly by the paddles, scarcely by the tail.

The typical species is Plesiosaurus dolichodeirus, from the Lower Lias of Lyme Regis, which attains a length of about three metres. Other species from the same formation seem to have measured five to six metres in length, and there are species of allied genera from the Upper Lias which are probably still larger. A fine large skeleton from the Upper Lias of Wiirttemberg, now in the Berlin Museum, is named Plesiosaurus guilelmi-imperatoris (see figure above). Cryptoclidus, known by complete skeletons from the Oxford Clay of Peterborough, differs very little from Plesiosaurus. The Cretaceous Cimoliosaurus, found in North and South America, Europe and New Zealand, is also very similar. The fossilized contents of the stomach in some of the later Plesiosaurs show that these reptiles swallowed stones for digestive purposes like the existing crocodiles.

References. — R. Owen, Fossil Replilia of the Liassic Formations, pt. iii. (Monogr. Palaeont. Soc., 1865) ; W. Dames, paper in Abhandl- k. preuss. Akad. Wiss. (1895), p. 1. (A. S. Wo.)

PLEURISY, or Pleuritis (Gr. irXeDpfc = ribs), inflammation of the pleura, caused by invasion by certain specific micro- organisms. (See Respiratory System: Pathology.) Secondary pleurisies may occur from extension of inflammation from neighbouring organs.

The morbid changes which the pleura undergoes when inflamed consist of three chief conditions or stages of progress. (1) In- flammatory congestion and infiltration of the pleura, which may spread to the tissues of the lung on the one hand, and to those of the chest wall on the other. (2) Exudation of lymph on the pleural surfaces. This lymph is of variable consistence, some- times composed of thin and easily separated pellicles, or of extensive thick masses or strata, or again showing itself in the form of a tough

membrane. It is of greyish-yellow colour, and microscopically consists mainly of coagulated fibrin along with epithelial cells and red and white blood corpuscles. Its presence causes roughening of the two pleural surfaces, which, slightly separated in health, may now be brought into contact by bands of lymph extending between them. These bands may break up or may become organized by the development of new blood vessels, and adhering permanently may obliterate throughout a greater or less space the pleural sac, and interfere to some extent with the free play of the lungs. (3) Effusion of fluid into the pleural cavity. This fluid may vary in its characters.

The chief varieties of pleurisy are classified according to the variety of the effusion, should effusion take place. (1) Some pleurisies do not reach the stage of effusion, the inflammation terminating in the exudation of lymph. This is termed dry pleurisy. (2) Fibrinous or plastic pleurisy. In this variety the pleura is covered by a thick layer of granular, fibrinous material. Fibrinous pleurisy is usually secondary to acute diseases of the lung such as pneumonia, cancer, abscess or tuberculosis. (3) Sero-fibrinous pleurisy. This is the most common variety, and produces the condition commonly known as pleurisy with effusion. The amount may vary from an

almost inappreciable quantity to a gallon or more. When large in quantity it may fill to distension the pleural sac, bulge out the thoracic wall-externally, and compress the lung, which may in such cases have all its air displaced and be reduced to a mere fraction of its natural bulk. Other organs, such as the heart and liver, may in consequence of the presence of the fluid be shifted away from their normal position. In favourable cases the fluid is absorbed more or less completely and the pleural surfaces again may unite by adhesions; or, all traces of inflamma- tory products having disappeared, the pleura may be restored to its normal condition. When the fluid is not speedily absorbed it may remain long in the cavity and compress the lung to such a degree as to render it incapable of re-expansion as the effusion passes slowly away. The consequence is that the chest wall falls in, the ribs become approximated, the shoulder is lowered, the spine becomes curved and internal organs permanently displaced, while the affected side scarcely moves in respiration. Sometimes the unabsorbed fluid becomes purulent, and an empyema is the result.

The symptoms of pleurisy vary; the onset is sometimes obscure but usually well marked. It may be ushered in by rigors, fever and a sharp pain in the side, especially on breathing. Pain is felt in the side or breast, of a severe cutting character, referred usually to the neighbourhood of the nipple, but it may be also at some distance from the affected part, such as through the middle of the body or in the abdominal or iliac regions. On auscultation the physician recognizes sooner or later " friction," a superficial rough rubbing

sound, occurring only with the respiratory acts and ceasing when the breath is held. It is due to the coming together during respiration of the two pleural surfaces which are roughened by the exuded lymph. The pain is greatest at the outset, and tends to abate as the effusion takes place. A dry cough is almost always present, which is particularly distressing owing to the increased pain the effort excites. At the outset there may be dyspnoea, due to fever and pain; later it may result from compression of the lung.

On physical examination of the chest the following are among the chief points observed: (1) On inspection there is more or less bulging of the side affected, should effusion be present, obliteration of the intercostal spaces, and sometimes elevation of the shoulder. (2) On palpation with the hand applied to the side there is diminished expansion of one-half of the thorax, and the normal vocal fremitus is abolished. Should the effusion be on the right side and copious, the liver may be felt to have been pushed downwards, and the heart somewhat displaced to the left; while if the effusion be on the left side the heart is dis- placed to the right. (3) On percussion there is absolute dullness over the seat of the effusion. If the fluid does not fill the pleural sac the floating lung may yield a hyper-resonant note. (4) On auscultation the natural breath sound • is inaudible over the effusion. Should the latter be only partial the breathing is clear and somewhat harsh, with or without friction, and the voice sound is aegophonic. Posteriorly there may be heard tubular breathing with aegophony. These various physical signs render it impossible to mistake the disease for other maladies the symptoms of which may bear a resemblance to it, such as pleurodynia.

The absorption or removal of the fluid is marked by the disappearance or diminution of the above-mentioned physical signs, except that of percussion dullness, which may last a long time, and is probably due in part to the thickened pleura. Friction may again be heard as the fluid passes away and the two pleural surfaces come together. The displaced organs are restored to their position, and the compressed lung re-expanded. Frequently this expansion is only partial.

In most instances the termination is favourable, the acute symptoms subsiding and the fluid (if not drawn off) becoming absorbed, sometimes after reaccumulation. On the other hand it may remain long without undergoing much change, and thus a condition of chronic pleurisy becomes established.

Pleurisy may exist in a latent form, the patient going, about for weeks with a large accumulation of fluid in his thorax, the

ordinary acute symptoms never having been present in any marked degree. Cases of this sort are often protracted, and 'heir results unsatisfactory as regards complete recovery.

In the treatment of early pleurisy, pain may be relieved by a hypodermic of morphia or the application of leeches. A purgative is essential. Fixation of the affected side of the thorax by strapping with adhesive plaster gives great relief. The ice- bag is useful in the early stages, as in pneumonia. The open-air treatment of cases is recommended, as the majority of the cases are of tuberculous origin. When effusion has taken place, counter irritation and the exhibition of iodide of potassium are useful. Dry diet and saline purgatives have been well spoken of. The most satisfactory method of treatment is early and if necessary repeated aspiration of the fluid. The operation (thoracentesis) was practised by ancient physicians, but was revived in modern times by Armand Trousseau (1801-1867) in France and Henry I. Bowditch (1808-1892) in America; by the latter an excellent instrument was devised for emptying the chest, which, however, has been displaced in practice by the still more convenient aspirator. The chest is punctured in the lateral or posterior regions, and in most cases the greater portion or all of the fluid may be safely drawn off. In many instances not only is the removal of distressing symptoms speedy and complete, but the lung is relieved from pressure in time to enable it to resume its normal function.

In cases of chronic pleurisy after the failure of repeated aspirations, Samuel West reports well of free incision and drain- age. He has reported cases of recovery of effusion, fifteen or eighteen months standing. Sir James Barr has advocated the treatment of these cases by the withdrawal of the fluid and the substitution of sterilized air and solution of supra-renal extract; others have introduced physiological salt solution or formalin solution into the cavity, after the removal of the fluid. Vaquez injects nitrogen into the cavity and reports a number of cases in which it prevented recurrence.

PLEURO-PNEUMONIA, or Lung-Plague, a contagious disease peculiar to cattle, generally affecting the lungs and the lining membrane of the chest, producing a particular form of lobar or lobular pleuro-pneumonia, and, in the majority of cases, transmitted by the living diseased animal, or, exceptionally, by mediate contagion. It cannot be communicated to animals other than those of the bovine race. Inoculation of healthy cattle with the fluid from the diseased lungs produces, after a certain interval, characteristic changes at the seat of inoculation, and though it does not develop the lung lesions always observed in natural infection, yet there is a local anatomical similarity or identity. Though numerous investigations

have been made, the nature of the infective agent remains doubtful. In 1888 Arloing, of Lyons, described various bacilli obtained from the lesions, but the pathogenic organism of lung-plague has not been discovered.

The earliest notices of this disease testify that it first prevailed in central Europe, and in the 18th century it was present in certain parts of southern Germany, Switzerland and France, and had also appeared in upper Italy. Though Valentine described an epizooty occurring among cattle in 1693 in Hesse, doubts have been entertained as to whether it was this malady. It was not until 1769 that it was definitely described as prevailing in Franche-Comte by the name of " murie." From that date down to 1789 it appears to have remained more or less limited to the Swiss mountains, the Jura, Dauphine and Vosges, Pied- mont and upper Silesia; it showed itself in Champagne and Bourbonnais about the time of the Revolution, when its spread was greatly accelerated by the wars that followed. In the 19th century its diffusion was accurately determined. It invaded Prussia in 1802, and soon spread over north Germany. It was first described as existing in Russia in 1824; it reached Belgium in 1827, Holland in 1833, the United Kingdom in 1841, Sweden in 1847, Denmark in 1848, Finland in 1850, South Africa in 1854, the United States — Brooklyn in 1843, New Jersey in 1847, Brooklyn again in 18 so and Boston in 1850; it was also carried to Melbourne in 1858, and to New South Wales in i860; New

Zealand and Tasmania received it in 1864, but it was eradicated in both countries by the sanitary measures adopted. It was carried to Asia Minor, and made its presence felt at Damascus. It prevails in various parts of China, India, Africa and Austialia, and until quite recently it existed in every country in Europe, except Scandinavia, Holland, Spain and Portugal. In Great Britain cases occurred in 1897.

Symptoms. — The malady lasts from two to three weeks to as many months, the chief symptoms being fever, diminished appetite, a short cough of a peculiar and pathognomonic charac- ter, with quickened breathing and pulse, and physical indications of lung and chest disease. Towards the end there is great debility and emaciation, death generally ensuing after hectic fever has set in. Complete recovery is rare.

The pathological changes are generally limited to the chest and its contents, and consist in a peculiar marbled-like appear- ance of the lungs on section, and fibrinous deposits on the pleural membrane, with oftentimes great effusion into the cavity of the thorax.

Willems of Hasselt (Belgium) in 1852 introduced and practised inoculation as a protective measure for this scourge, employing for this purpose the lymph obtained from a diseased lung. Since that time inoculation has been

extensively resorted to, not only in Europe, but also in Australia and South Africa, and its pro- tective value has been generally recognized. When properly performed, and when certain precautions are adopted, it would appear to confer temporary immunity from the disease. The usual seat of inoculation is the extremity of the tail, the virus being introduced beneath the skin by means of a syringe or a worsted thread impregnated with the lymph. Protection against infection can also be secured by subcutaneous or intravenous injection of a culture of Arloing's pneumo-bacillus on Martin's bouillon, and by intravenous injection of the lymph from a diseased lung, or from a subcutaneous lesion produced in a calf by previous inoculation.

PLEVNA (Bulgarian Pleven), the chief town of the department of Plevna, Bulgaria; 85 m. N.E. of Sofia, on the Tutchinitza, an affluent of Vid, which flows north into the Danube and on the Sofia-Varna railway (opened in 1899). Pop. (1906), 21,208. A branch line, 25 m. long, connects Plevna with Samovit on the Danube, where a port has been formed. After the events of 1877, it was almost entirely forsaken by the Turks, and most of the mosques have gone to ruin; but, peopled now mainly by Bulgarians, it has quite recovered its prosperity, and has a large commerce in cattle and wine.

Battles of 1877. — Plevna, prior to the Russo-Turkish War of 1877 (see Russo-Turkish Wars) a small and unknown town without fortifications became celebrated throughout the world as the scene of Osman Pasha's victories and his five months' defence of the entrenched camp which he constructed around the town, a defence which upset the Russians' plans and induced them to devote their whole energies to its capture. Osman Pasha left Widin on the 13th of July with a column consisting of 19 battalions, 6 squadrons and 9 batteries, a total of 12,000 men and 54 guns. Hearing that he was too late to relieve Nikopol, he pushed on to Plevna, where there was a garrison of 3 battalions and 4 guns, under Atouf Pasha.

Passing through Plevna on the afternoon of the 19th of July he at once took up a position, previously selected by Atouf Pasha, on the hills covering the town to the north and east. The column had been joined en route by 3 battalions from the banks of the Danube, so that Osman's command now consisted of 25 battalions. He was none too soon. General Schilder-Schuldner, commanding the 5th division of the The First IX. corps, which had just captured Nikopol, had Battle ot been ordered to occupy Plevna, and his guns were WevM# already in action. The Turkish batteries came into action as soon as they arrived and returned the fire. A desultory artillery duel was carried on till nightfall, but no attack was made by the Russians on the 19th. Osman distributed his troops in three sections: on the Janik Bair, facing north, were 13 battalions and 4 batteries, with advanced

posts of 2 battalions

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and 1 battery each, at Opanetz and Bukova, facing east and north-east, 5 battalions and 10 guns were posted on the eastern end of the Janik Bair; to the hills south of the Bulgareni road 4 battalions and 2 batteries were allotted, and on either side of the road, under cover, in rear of them, most of the cavalry was placed. The remaining troops formed a general reserve, which was posted on the hill just east of the town. The hills to the north and east of Plevna were perfectly bare. The Turks had covered the 115 m. from Widin in seven days, in trying heat, and were exhausted, but a few trenches were thrown up. On the 20th of July at 5 a.m., having made no preliminary reconnaissance, the Russian commander brought his guns into action, and, after a short bombardment, advanced his infantry

sent a force of 6 battalions and 1 battery under Rifaat Pasha to occupy Lovcha (Lovatz), where they entrenched themselves.

The Plevna garrison now numbered 20,000 (35 battalions, 8 squadrons, 57 guns and 400 mounted irregulars), who were organized in two wings with a general reserve. Adil Pasha commanded the left wing consisting of 12 battalions, 3 batteries and 2 squadrons, and held the ground from the Vid bridge to Grivitza, Hassan Sabri Pasha commanded the right wing, of equal strength, covering from Grivitza to the south. The remainder, as general reserve, was posted on the crest and slopes of the hill east of the town, with one battalion in Plevna itself. The west front was not fortified till October. Trenches were

PLEVNA

English Miles

Turkish fntrenchments,September r 7th.,I877, _ J

Additional Turkish Intrenchments, December, 10th.,1877…..l TurMlgh Camp shown thus*

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in four separate columns. On the north flank they pressed into Bukova, and also succeeded in driving back the Turkish right wing; but in both cases Turkish reinforcements arrived and with vigorous counter-attacks pressed back the Russians, with the result that by noon they were in full retreat, having lost 2800 men out of a total of 8000. The Turks lost 2000. Osman made no attempt to reap the fruits of his victory by pursuit. He at once drew up plans for the fortification of the position, and the troops were employed night and day constructing redoubts and entrenchments. A plentiful supply of tools and daily convoys of stores reached Plevna from Orcbanie, and on the 24th of July Osman’s strength was increased by 14 battalions and a battery from Sofia. In order to secure his line of communications, on the 25th of July he

4 ft. deep and the redoubts had a command of 10 to 16 ft., with parapets about 14 ft. thick. In addition to the trenches to the flanks, there were in some cases two lines of trench to the front, thus giving three tiers of fire.

In accordance with orders from the Russian headquarters at Tirnova, a fresh attack was made by General Kriidener on the 30th of July. He had been reinforced by three brigades of infantry and one of cavalry under General Shakovskoi, and his force numbered over 30000 with 176 guns. After a preliminary cannonade the infantry advanced at 3 before in widely spread columns. The columns attacking from the north and north-east were repulsed with heavy loss. Shakovskoi advancing from Radischevo, his left flank safeguarded by Skobelev from

p.m., as

Second Battle of Plevna.

the neighbourhood of Krishin, temporarily occupied two redoubts, but a heavy counter-stroke by the Turkish reserves forced him back with severe loss. The Russians retreated, the northern column to Tristenik and Karagakh, the southern to Poradim. Their losses amounted to 7300, while the Turkish losses exceeded 2000. Had the Turkish garrison of Lovcha been called in, the result would have been still more disastrous to the Russians.

The victory was decisive, but Osman again failed to pursue. His troops were elated by success, the moral of the enemy severely shaken, the undefended Russian bridge over the Danube was within 40 m. of him, but he lost his opportunity, and contented himself with strengthening his defensive works. It is said that he was tied down to Plevna by orders from Constantinople.

The Russians now concentrated all their available forces against Plevna and called in the aid of the Rumanians. By the end of August they had assembled a force of 74,000 infantry, 10,000 cavalry and 440 guns, including 24 siege guns, about 100,000 men in all. On the 30th of August Osman moved out of Plevna with all his cavalry, 3 batteries of artillery and 19 battalions of infantry, and on the 31st attacked the Russians about Pelishat. He returned to Plevna the same evening. The Turks lost 1300 and the Russians 1000 men. The Russians determined to occupy Lovcha, and so cut Osman's communi- cations before again attacking Plevna. After three days' fighting this was accomplished by Skobelev, acting under Imeretinski, with a force of 20,000 men, on the 3rd of September. Osman moved out to the relief of the garrison that day with a strong column, but, finding he was too late, returned to Plevna on the 6th. The survivors from

Lovcha were re-formed into 3 battalions, including which Osman had been reinforced by 13 battalions, 25 batteries of artillery and n squadrons of cavalry. His strength was now 30,000, with 72 guns, 46 battalions, 19 squadrons and 12 batteries. This force was organized in 4 approximately equal commands, the northern, south-eastern and southern, and a general reserve.

The Russians moved to their preliminary positions on the night of September 6th~7th. Their plan was for the Rumanians, Third the IX. and IV. corps and Imeretinski's column to Battle of attack the north-east, south-east and south fronts Plevna. simultaneously. An artillery bombardment began at 6 a.m. on the 7th of September, was carried on till 3 p.m. on the nth, when the infantry advanced. The Rumanians took one Grivitza redoubt; Skobelev occupied two redoubts on the south front, but the centre attack on the Radishevo front failed. On the 1 2th the Turks recaptured the southern redoubts, the Rumanians remained in possession of the Grivitza redoubt, but the Russian losses already amounted to 18,000 and they withdrew, and entrenched themselves on a line Verbitza- Radishevo, with cavalry on either flank to the Vid. The Turkish losses totalled 5000, of which only a few hundred were caused by the artillery fire of the first few days. There was no question of pursuit. The Russians were greatly superior in numbers and the Turks were completely exhausted.

Several causes contributed to the Russian defeat. The Russian bombardment, at ranges beyond the powers of their guns and lacking the co-operation of the infantry to give them a target, had been useless. No reconnaissance had been made of the position. The infantry attacks were not simultaneous, and were beaten in detail, besides which, they were spread over the whole of a strongly fortified front in equal strength, instead of being pressed home at definite points. The lack of unity of command, in that the commander-in-chief interfered with the dispositions and conduct of the operations as arranged by the commander of the Plevna forces also militated against the Russian success.

This was the last open-force attack on Osman's lines. investment General Todleben, the defender of Sevastopol, was now and Pall entrusted with the conduct of the siege, and he de- of Plevna, termined to complete the investment, which was accomplished by the 24th of October, Osman's request to retire

from Plevna having been refused by Constantinople. Supplies eventually gave out and a sortie on the night of the 9th-ioth of December failed, with the result that he and his army capitulated.

Plevna is a striking example of the futility of the purely passive defence,

which is doomed to failure however tenaciously carried out. Osman Pasha repelled three Russian attacks and practically held the whole Russian army. It remained for the other Turkish forces in the field to take the offensive and by a vigorous counterstroke to reap the fruits of his successes. Victories which are not followed up are useless. War without strategy is mere butchery. The position of Plevna, threatening the Russian bridge and communications, was strategically important, but there was no necessity for the Russians to attack the position. On the eastern flank was an army stronger than Osman's and the fortress of Rustchuk was nearer the bridge than Plevna, but they did not consider it necessary to attack them. They might have contained Osman's force as they did the army under Mehemet Ali, and either awaited his attack or attacked when he evacuated the position. They failed to realize the resisting force of improvised fortifications and the strength conferred by extensive and well-placed entrenchments, and despising their adversary made direct frontal attacks on a well- fortified position, instead of aiming at a flank or the rear. The part played by Plevna in the war was due in the first place to the imaginary importance set by the Russians on its capture, and later to their faulty procedure in attack on the one hand, and to the skill evinced by the Turks in fortifying and defending the position on the other. (J. H. V. C.)

See W. V. Herbert, The Defence of Plevna, 1877 (London, 1895); F. V. Greene, The Russian Army and its Campaign in Turkey (London, 1880); General Kuropatkin (Ger. trans, by Krahmer), Kritische Ruckblicke auf den russisch-tiirkischen Krieg; Mouzaffer Pacha and Talaat Bey, Defense de Plevna; Krahmer's German translation of the Russian Official History; General H. Langlois, Lessons of Two Recent Wars (Eng. trans., War Office, 1910) ; Th. von Trotha, Kampf um Plewna (Berlin, 1878); Vacaresco (Ger. trans.), Rumanians Antheil am Kriege, 1877-1878 (Leipzig, 1888).

PLEYEL, IGNAZ JOSEPH (1757-1831), Austrian musician, was born at Rupperstbal, near Vienna, on the 1st of June 1757, the twenty-fourth son of a poor village' schoolmaster. He studied the pianoforte under Van Hal (known in England as Vanhall), and in 1772 learned composition from Haydn, who became his dearest friend. He was appointed temporary maltre de chapelle at Strasburg in 1783, receiving a permanent appoint- ment to the office in 1789. In 1791 he paid a successful visit to London. He narrowly escaped the guillotine on returning to Strasburg, and was only saved by the existence of a cantata which he had written, and in which the inspiration could fairly be claimed to be on the side of liberty; so that he was permitted to remain until 1795, when he migrated to Paris. Here he opened a large music shop, published the first complete edition of Haydn's quartets, and founded, in 1807, the pianoforte manufactory which still bears his name. The latter years of his life were spent in agricultural pursuits. The July revolution of 1830 inflicted upon him a severe shock,

and on the 14th of November 1 83 1 he died in Paris.

Maria Pleyel, nie Moke (1811-1875), the wife of his eldest son, Camille, was one of the most accomplished pianists of her time.

PLIGHT, an homonymous word now used chiefly with two meanings, (1) pledge, and (2) condition or state. The first appears more generally in the verbal form, " to plight one's troth," &c, and the second with a direct or impj'ed sense of misfortune. The derivations of the two words show they are quite distinct in origin. The O. Eng. pliht meant danger or risk, hence risk of obligation (cf. Ger. Pflicht, Du. plicht, care, duty). The root pleh- or pleg- is probably also to be seen in the much disputed word " pledge." The M. ~E.-ag.-plU or plyt, on the other hand, is an adaptation of O. Fr. ploit, fold, and therefore a doublet of " plait," but appears in the 14th century with the neutral sense of condition or state in general.

PLIMER, A.— PLINY, THE ELDER

PLIMER, ANDREW (c. 1763-1837), English miniature painter, was the son of a clock-maker at Wellington. Disliking his father's business, he and his brother Nathaniel joined a party of gypsies and wandered about with them, eventually reaching London, where he presented himself to Mrs Cosway in 1781 and was engaged by her as studio boy. His skill in painting was quickly detected by Cosway, who sent him to a friend to learn drawing, and then received him into his own studio, where he remained until 1785, when he set up for himself in Great Maddox Street. It was of this artist that Cosway said " Andrew will be my Elisha," adding with characteristic vanity, " if I am not constrained to carry my mantle up to Paradise with me." Plimer married Joanna Louisa Knight, whose sister, Mary Ann, was his pupil and a well-known artist. He had five children, only one of whom, Louisa, married. He exhibited many times in the Royal Academy, resided for a while in Exeter, travelled a good deal through England, and died at Brighton and was buried at Hove. His miniatures are of great brilliance and in considerable demand among collectors. They are to be dis- tinguished by the peculiar wiry treatment of the hair and by the large full expressive eyes Plimer invariably gave to his female sitters, eyes resembling those of his own wife and daughters.

See Andrew and Nathaniel Plimer, by G. C. Williamson (London, 1903). (G. C. W.)

PLIMER, NATHANIEL (1757-c. 1822), English miniature painter, was the brother of Andrew Plimer (q.v.). He worked for a while with Henry Bone the enameller, eventually entering Cosway's studio. He exhibited at the Royal Academy from 1787 until r8i5, when he is lost sight of, although he

is said to have lived until 1822. He had four daughters, one of whom married the painter, Andrew Geddes, and left children. He exhibited twenty-six works, and many of his smaller portraits are of extreme beauty.

See Andrew and Nathaniel Plimer, by G. C. Williamson (London, 1903). (G. C. W.)

PLIMSOLL, SAMUEL (1824-ˆ898), British politician and social reformer, was born at Bristol on the 10th of February 1824. Leaving school at an early age, he became a clerk, and rose to be manager of a brewery in Yorkshire. In 1853 he endeavoured to set up a business of his own in London as a coal merchant. The venture proved a failure, and Plimsollwas reduced to destitution. He has himself related how for a time he lived in a common lodging-house on 7s. q\&. a week. Through this experience he learnt to sympathize with the struggles of the poor; and when the success of his enterprise placed him in possession of a competence, he resolved to devote his leisure to the amelioration of their lot. His efforts were directed more especially against what were known as ” coffin-ships ” — unseaworthy and overloaded vessels, often heavily insured, in which unscrupulous owners were allowed by the law to risk the lives of their crews. Plimsoll entered parliament as Liberal member for Derby in 1868, and endeavoured in vain to pass a bill dealing with the subject. In 1872 he published a work entitled Our Seamen, which made a great im- pression throughout the country. Accordingly, on PlimsolPs motion in r873, a royal commission was appointed, and in 1875 a government bill was introduced, which Plimsoll, though regard- ing it as inadequate, resolved to accept. On the 22nd of July, the premier, Disraeli, announced that the bill would be dropped. Plimsoll lost his self-control, applied the term ” villains ” to members of the house, and shook his fist in the Speaker’s face. Disraeli moved that he be reprimanded, but on the suggestion of Lord Hartington agreed to adjourn the matter for a week’ to allow Plimsoll time for reflection. Eventually Plimsoll made an apology. The country, however, shared his view that the bill had been stifled by the pressure of the shipowners, and the popular agitation forced the government to pass a bill, which in the following year was amended into the Merchant Shipping Act. This gave stringent powers of inspection to the Board of Trade. The mark that indicates the limit to which a ship may be loaded is generally known as Plimsoll’s mark. Plimsoll was re-elected for Derby at the general election of 1880 by a great majority, but

gave up his seat to Sir W. Harcourt, in the belief that the latter, as home secretary, could advance the sailors’ interests more effectively than any private member. Though offered a seat by some thirty constituencies, he did not re-enter the house, and subsequently became estranged from the Liberal leaders by what he regarded as their breach of faith in neglecting the

question of shipping reform. He held for some years the presidency of the Sailors' and Firemen's Union, raised a further agitation, marred by obvious exaggeration, about the horrors of the cattle-ships. Later he visited the United States with the object, in which he did good service, of securing the adoption of a less bitter tone towards England in the historical textbooks used in American schools. He died at Folkestone on the 3rd of June 1898.

PLINLIMMON (Plynlimmon, Pumplumon, Pumlumon, Penlumon: Pumlumon is the name used locally: pump means five: lumon, chimney, flag or beacon; pen, head), a mountain of Wales of the height of 2463 ft., equidistant (about 10 m.) from Machynlleth and Llanidloes. Much inferior in elevation to Snowdon or Cader Idris, Plinlim- mon is certainly the most dangerous of the Welsh hills because of its quaking bogs. The scenery is comparatively poor, consisting chiefly of sheep-downs (in Montgomeryshire) and barren turbaries (in Cardiganshire). If the name means " five- beacons," only three of these are high, with a carnedd (stone-pile, probably a military or other landmark, rather than the legendary barrow or tomb) on each of the three. Plinlimmon is notable as the source of five streams — three small: the Rheidol, the Llyfnant and the Clywedog; and two larger and famous: the Wye (Gwy) and the Severn (Hafren).

The morasses of Plinlimmon saw many a struggle, notably the war to the knife between Owen Cyfeilog (fl. c. 900), prince of Powys, and Hywel ab Cadogan. Here also Owen Glendower unfurled the banner of Welsh independence; from here, in 1401, he harassed the country, sacking Montgomery, burningWelshpool, and destroying Cwm Hir (long " combe," or valley) abbey, of which some columns are said to be now in Llanidloes old church. On the side of Plinlimmon, some 2 m. from the Steddfagurig inn, is Blaen Gwy (the point of the Wye), the course of the streamlet being traceable up to Pont-rhyd-galed (the hard ford bridge), some 4 m. distant from the inn. Near this bridge are numerous barrows and cairns, on the right from Aberystwyth. There are slate quarries, with lead and copper mines. Machynlleth (per- haps Maglona in Roman times') has Owen Glendower's " senate house " (T402), and is known as the scene of Glendower's at- tempted assassination by Dafydd Gam. Llyn pen rhaiadr (the waterfall-head pool), or Pistyll y llyn (pool spout), is some 6 m. south of Machynlleth. Llanidloes has a trade in Plinlimmon slates and minerals besides flannel and wool manufactures.

PLINTH (Gr. -Kblvdos, a square tile), the term in architecture given to the lower mouldings of a podium, pedestal or skirting, also to any rectangular block on which a statue or vase is placed, and in the Classic Orders to the square block of moderate height t under the base mouldings of the column or pedestal.

PLINY, THE ELDER. Gaius Plinius Secundus (c. A.D. 23-79), the author of the Naturalis historia, was the son of a Roman eques by the daughter of the senator Gaius- Caecilius of Novum Comum. He was born, at Comum, not (as is sometimes supposed) at Verona: it is only as a native of Gallia Transpadana that he calls Catullus of Verona his conterraneus, or fellow-countryman, not his municeps, or fellow-townsman (Praef. § 1). Before A.D. 35 (N. H. xxxvii. 81) Lis father took him to Rome, where he was educated under his father's friend, the poet and military commander, P. Pomponius Secundus, who inspired him with a lifelong love of learning. Two centuries after the death of the Gracchi Pliny saw some of their autograph writings in his preceptor's library (xiii. 83), and he afterwards wrote that preceptor's Life. He makes mention of the grammarians and rhetoricians, Remmius Palaemon and Arellius Fuscus (xiv. 49, xxxiii. 152), and he may have been instructed by them. In Rome he studied botany in the garden of the aged Antonius Castor (xxv. 9), and saw the fine old lotus-trees in the grounds that had once belonged to Crassus (xvii. 5). He also viewed the

vast structure raised by Caligula (xxxvi. in), and probably witnessed the triumph of Claudius over Britain (iii. 119; a.d. 44). Under the influence of Seneca he became a keen student of philosophy and rhetoric, and began practising as an advocate. He saw military service under Corbulo in Lower Germany (a.d. 47), taking part in the Roman conquest of the Chauci and the construction of the canal between the Maas and the Rhine (xvi. 2 and 5). As a young commander of cavalry (praef edits alae) he wrote in his winter-quarters a work on the use of missiles on horseback (de jaculatione equestri), with some account of the points of a good horse (viii. 162). In Gaul and Spain he learnt the meanings of a number of Celtic words (xxx. 40). He .took note of sites associated with the Roman invasion of Germany, and, amid the scenes of the victories of Drusus, he had a dream in which the victor enjoined him to transmit his exploits to posterity (Plin. Epp. iii. 5, 4). The dream prompted Pliny to begin forthwith a history of all the wars between the Romans and the Germans. He probably accompanied his father's friend, Pomponius, on an expedition against the Chatti (a.d. 50), and visited Germany for a third time (57) as a comrade of the future emperor, Titus {Praef. § 3). Under Nero he lived mainly in Rome. He mentions the map of Armenia and the neighbourhood of the Caspian Sea, which was sent to Rome by the staff of Corbulo in a.d. 58 (vi. 40). He also saw the building of Nero's "golden house" after the fire of 64 (xxxvi. in). Meanwhile he was completing the twenty books of his History of the German Wars, the only authority expressly quoted in the first six books of

the Annals of Tacitus (i. 69), and probably one of the principal authorities for the Germania. It was superseded by the writings of Tacitus, and, early in the 5th century, Sym- machus had little hope of finding a copy (Epp. xiv. 8). He also devoted much of his time to writing on the comparatively safe subjects of grammar and rhetoric. A detailed work on rhetoric, entitled Studiosus, was followed by eight books, Dubii sermonis (a.d. 67). Under his friend Vespasian he returned to the service of the state, serving as procurator in Gallia Narbonensis (70) and Hispania Tarraconensis (73), and also visiting the Provincia Belgica (74). During his stay in Spain he became familiar with the agriculture and the mines of the country, besides paying a visit to Africa (vii. 37). On his return to Italy he accepted office under Vespasian, whom he used to visit before daybreak for instructions before proceeding to his official duties, after the discharge of which he devoted all the rest of his time to study (Plin. Epp. iii. 5, 9). He completed a History of his Times in thirty-one books, possibly extending from the reign of Nero to that of Vespasian, and deliberately reserved it for publication after his decease (N. H., Praef. 20). It is quoted by Tacitus (Ann. xiii. 20, xv. 53; Hist. iii. 29), and is one of the authorities followed by Suetonius and Plutarch. He also virtually com- pleted his great work, the Naturalis historia. The work had been planned under the rule of Nero. The materials collected for this purpose filled rather less than 160 volumes in a.d. 23, when Larcius Licinus, the praetorian legate of Hispania Tarra- conensis, vainly offered to purchase them for a sum equivalent to more than £3200. He dedicated the work to Titus in a.d. 77. Soon afterwards he. received from Vespasian the appointment of praefect of the Roman fleet at Misenum. On the 24th of August a.d. 79 he was stationed at Misenum, at the time of the great eruption of Vesuvius, which overwhelmed Pompeii and Hercu- laneum. A desire to observe the phenomenon from a nearer point of view, and also to rescue some of his friends, from their perilous position on the shore of the Bay of Naples, led to his launching his galleys and crossing the bay to Stabiae (Castella- mare), where he perished, in the fifty-sixth year of his age. The story of his last hours is told in an interesting letter addressed twenty-seven years afterwards to Tacitus by the Elder Pliny's nephew and heir, the Younger Pliny (Epp. vi. 16), who also sends to another correspondent an account of his uncle's writings and his manner of life (iii. 5) : —

" He began to work long before daybreak. ... He read nothing without making extracts; he used even to say that there was no book so bad as not to contain something of value. In the country

it was only the time when he was actually in his bath that was exempted from study. When travelling, as though freed from every other care, he devoted himself to study alone. ... In short, he deemed all time wasted that was not employed in study."

The only fruit of all this unwearied industry that has survived to our own times is the Naturalis historia, a work which in its present form consists of thirty-seven books, the first book including a characteristic preface and tables of contents, as well as lists of authorities, which were originally prefixed to each of the books separately. The contents of the remaining books are as follows: ii., mathematical and physical description of the world; iii.— vi., geography and ethnography; vii., anthro- pology and human physiology; viii.-xi., zoology; xii.-xxvii., botany, including agriculture, horticulture and materia medica; xxviii.-xxxii., medical zoology; xxxiii.-xxxvii., mineralogy, especially in its application to life and art, including chasing in silver (xxxiii. 154-157), statuary in bronze (xxxiv.), painting (xxxv. 15-149), modelling (151-158), and sculpture in marble (xxxvi.).

He apparently published the first ten books himself in a.d. 77, and was engaged on revising and enlarging the rest during the two remaining years of his life. The work was probably pub- lished with little, if any, revision by the author's nephew, who, when telling the story of a tame dolphin, and describing the floating islands of the Vadimonian Lake, thirty years later (viii. 20, ix. a), has apparently forgotten that both are to be found in his uncle's work (ii. 209, ix. 26). He describes the Naturalis historia, as a Naturae historia, and characterizes it as a " work that is learned and full of matter, and as varied as nature herself." The absence of the author's final revision may partly account for many repetitions, and for some contradic- tions, for mistakes in passages borrowed from Greek authors, and for the insertion of marginal additions at wrong places in the text.

In the preface the author claims to have stated 20,000 facts gathered from some 2000 books and from 100 select authors. The extant lists of his authorities amount to many more than 400, including 146 of Roman and 327 of Greek and other sources of information. The lists, as a general rule, follow the order of the subject matter of each book. This has been clearly shown in Heinrich Brunn's Disputatio (Bonn, 1856).

Pliny's principal authority is Varro. In the geographical books Varro is supplemented by the topographical commentaries of Agrippa which were completed by the emperor Augustus; for his zoology he relies largely on Aristotle and on Juba, the scholarly Mauretanian king, studiorum claritate memorabilior quam regno (v. 16). Juba is also his principal guide in botany. Theophrastus is also named in his Indices. In the History of Art the original Greek authorities are Duris of Samos (born c. 340 B.C.), Xeno- crates of Sicyon (fl. 280), and Antigonous of Carystus (born c. 295 B.C.). The anecdotic element has been ascribed to Duris (xxxiv. 61, Lysippum Sicyonium Duris negat ullius fuisse discipulum. &c); the notices of the successive developments of art, and the list of workers in bronze and

painters, to Xenocrates ; and a large amount of miscellaneous information to Antigonus. The last two autho- rities are named in connexion with Parrhasius (xxxv. 68, hanc ei gloriam concessere Antigonus et Xenocrates, qui de pictura scripsere) , while Antigonus is named in the Indices of xxxiii.-xxxiv. as a writer on the " toreutic " art. Greek epigrams contribute their share in Pliny's descriptions of pictures and statues. One of the minor authorities for books xxxiv.-xxxv. is Heliodorus (fl. 1 50 B.C.), the author of a work on the monuments of Athens. In the Indices to xxxiii.xxxvi. an important place is assigned to Pasiteles of Naples (fl. 88 B.C.), the author of a work in five volumes on famous works of art xxxvi. 40), probably incorporating the substance of the earlier Greek treatises; but Pliny's indebtedness to Pasiteles is denied by Kalkmann,who holds that Pliny used the chronological work of Apollo dorus, as well as a current catalogue of artists. Pliny's knowledge of the Greek authorities was probably mainly due to Varro, whom he often quotes (e.g. xxxiv. 56, xxxv. 113, 156, xxxvi. 17, 39, 41). Varro probably dealt with the history of art in connexion with architecture, which was included in his Disciplinae. For a number of items relating to works of art near the coast of Asia Minor, and in the adjacent islands, Pliny was indebted to the general, states- man, orator and historian, Gaius Licinius Mucianus, who died before a.d. 77. Pliny mentions the works of art collected by Vespasian in the Temple of Peace and in his other galleries (xxxiv. 84), but much of his information as to the position of such works in Rome is due to books, and not to personal observation. The main merit of his account of ancient art, the only classical work of its kind, is that it is a compilation ultimately founded on the lost text- books of Xenocrates and on the biographies of Duris and Antigonus.

He shows no special aptitude for art criticism; in several passages, however, he gives proof of independent observation (xxxiv. 38, 46, 63, xxxv. 17, 20, 116 seq.). He prefers the marble Laocoon in the palace of Titus to all the pictures and bronzes in the world (xxxvi. 37) ; in the temple near the Flaminian Circus he admires the Ares and the Aphrodite of Scopas, " which would suffice to give renown to any other spot." " At Rome indeed (he adds) the works of art are legion ; besides, one effaces another from the memory and, however beautiful they may be, we are distracted by the overpowering claims of duty and business; for to admire art we need leisure and profound stillness " (ibid. 26-27).

Like many of the finest spirits under the early empire, Pliny was an adherent to the Stoics. He was acquainted with their noblest representative, Thrasea Paetus, and he also came under the influence of Seneca. The

Stoics were given to the study of nature, while their moral teaching was agreeable to one who, in his literary work, was unselfishly eager to benefit and to instruct his contemporaries (Praef. 16, xxviii. 2, xxix. 1). He was also influenced by the Epicurean and the Academic and the revived Pythagorean schools. But his view of nature and of God is essentially Stoic. It was only (he declares) the weakness of humanity that had embodied the Being of God in many human forms endued with human faults and vices (ii. 148). The Godhead was really one; it was the soul of the eternal world, displaying its beneficence on the earth, as well as in the sun and stars (ii. 1 2 seq. , 1 54 seq.) . The existence of a divine Providence was uncertain (ii. 19), but the belief in its existence and in the punish- ment of wrong-doing was salutary (ii. 26); and the reward of virtue consisted in the elevation to Godhead of those who resembled God in doing good to man (ii. 18, Deus est mortali juvare mortalem, el haec ad aeternam gloriam via). It was wrong to inquire into the future and do violence to nature by resorting to magical arts (ii. 114, xxx. 3); but the significance of prodigies and portents is not denied (ii. 92, 199, 232). Pliny's view of life is gloomy; he regards the human race as plunged in ruin and in misery (ii. 24, vii. 130). Against luxury and moral corruption he indulges in declamations, which are so frequent that (like those of Seneca) they at last pall upon the reader; and his rhetorical flourishes against practically useful inventions (such as the art of navigation) are wanting in good sense and go^d taste (xix. 6).

With the proud national spirit of a Roman he combines an admiration of the virtues by which the republic had attained its greatness (xvi. 14, xxvii. 3, xxxvii. 201). He does not suppress historical facts unfavourable to Rome (xxxiv. 139), and while he honours eminent members of distinguished Roman houses, he is free from Livy's undue partiality for the aristo- cracy. The agricultural classes and the old landlords of the equestrian order (Cincinnatus, Curius Dentatus, Serranus and the Elder Cato) are to him the pillars of the state; and he bitterly laments the decline of agriculture in Italy (xviii. 21 and 35, latifundia perdidere Italiam). Accordingly, for the early history of Rome, he prefers following the prae-Augustan writers; but he regards the imperial power as indispensable for the govern- ment of the empire, and he hails the salutaris exortus Vespasiani (xxxiii. 51). At the conclusion of his literary labours, as the only Roman who had ever taken for his theme the whole realm of nature, he prays for the blessing of the universal mother on his completed work.

In literature he assigns the highest place to Homer and to Cicero (xvii. 37 seq.); and the next to Virgil. He takes a keen interest in nature, and in the natural sciences, studying them in a way that was then new in Rome, while the small esteem in which studies of this kind were held does not deter him from endeavour- ing to be of service to his fellow countrymen (xxii. 15).

The scheme of his great work is vast and comprehensive, being nothing short of an encyclopaedia of learning and of art so far as they are connected with nature or draw their materials from it. With a view to this work he studied the original authorities on each subject and was most assiduous in making excerpts from their pages. His indices auctorum are, in some cases, the authori- ties which he has actually consulted (though in this respect they are not exhaustive) ; in other cases, they represent the principal writers on the subject, whose names are borrowed second-hand

for his immediate authorities. He frankly acknowledges his obligations to all his predecessors in a phrase that deserves to be proverbial (Praef. 21, plenum ingenui pudoris fateri per quos profeceris). He had neither the temperament for original investigation, nor the leisure necessary for the purpose. It is obvious that one who spent all his time in reading and in writing, and in making excerpts from his predecessors, had none left for mature and independent thought, or for patient experimental observation of the phenomena of nature. But it must not be forgotten that it was his scientific curiosity as to the phenomena of the eruption cf Vesuvius that brought his life of unwearied study to a premature end; and any criticism of his faults of omis- sion is disarmed by the candour of the confession in his preface: nee dubitamus multa esse quae et nos praeterierint; homines enim sumus et occupati officiis.

His style betrays the unhealthy influence of Seneca. It aims less at clearness and vividness than at epigrammatic point. It abounds not only in antitheses, but also in questions and excla- mations, tropes and metaphors, and other mannerisms of the silver age. The rhythmical and artistic form of the sentence is sacrificed to a passion for emphasis that delights in deferring the point to the close of the period. The structure of the sentence is also apt to be loose and straggling. There is an excessive use of the ablative absolute, and ablative phrases are often appended in a kind of vague " apposition " to express the author's own opinion of an immediately previous statement, e.g. xxxv. 80, dixit (Apelles) . . . uno se praestare, quod manum de tabula sciret tollere, memorabili praecepto nocere saepe nimiam diligentiam.

About the middle of the 3rd century an abstract of the geographical portions of Pliny's work was produced by Solinus; and, early in the 4th, the medical passages were collected in the Medicina Plinii. Early in the 8th we find Bede in possession of an excellent MS. of the whole work. In the 9th Alcuin sends to Charles the Great for a copy of the earlier books {Epp. 103, Jaff6) ; and Dicuil gathers extracts from the pages of Pliny for his own Mensura orbis terrae (c. 825). Pliny's work was held in high esteem in the middle ages. The number of extant MSS. is about 200; but the best of the more ancient MSS., that at Bamberg, contains only books xxxii.-xxxvii.

Robert of Cricklade, prior of St Frideswide at Oxford, dedicated to Henry II. a Defloratio consisting of nine books of selections taken from one of the MSS. of this class, which has been recently recognized as sometimes supplying us with the only evidence for the true text. Among the later MSS. the codex Vesonlinus, formerly at Besancon (1 ith century), has been divided into three portions, now in Rome, Paris and Leiden respectively, while there is also a transcript of the whole of this MS. at Leiden.

In modern times the work has been the theme of a generous appreciation in several pages of Humboldt's Cosmos (ii. 195-199, E. T., 1848). Jacob Grimm, in the first paragraph of c. 37 of his Deutsche Mythologie, writing with his own fellow-countrymen in view, has commended Pliny for condescending, in the midst of his survey of the sciences of botany and zoology, to tell of the folk- lore of plants and animals, and has even praised him for the pains that he bestowed on his style. It may be added that a special interest attaches to his account of the manufacture of the papyrus (xiii. 68-83), and of the different kinds of purple dye (ix. 130), while his description of the notes of the nightingale is an elaborate example of his occasional felicity of phrase (xxix. 81 seq.). Most of the recent research on Pliny has been concentrated on the investigation of his authorities, especially those which he followed in his chapters on the history of art — the only ancient account of that subject which has survived.

A carnelian inscribed with the letters C. Plin. has been re- produced by Cades (v. 211) from the original in the Vannutelli collection. It represents an ancient Roman with an almost com- pletely bald forehead and a double chin; and is almost certainly a portrait, not of Pliny the Elder, but of Pompey the Great. Seated statues of both the Plinies, clad in the garb of scholars of the year 1500, maybe seen in the niches on either side of the main entrance to the cathedral church of Como. The elder Pliny's anecdotes of Greek artists supplied Vasari with the subjects of the frescoes which still adorn the interior of his former home at Arezzo.

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PUNY, THE YOUNGER, Publius Caecilius Secundus, later known as Gams Plinius Caecilius Secundus (a.d. c. 61-c. 113), Latin author of the Letters and the Panegyric on Trajan, was the second son of Lucius Caecilius Cilo, by Plinia, the sister of the Elder Pliny. He was born at Novum Comum, the modern Como, the date of his birth being approximately determined by the fact that he was in his 18th year at the death of his uncle in August a.d. 79 (Epp. vi. 20, 5). Having lost his father at an early age, he owed much to his mother and to his guardian, Verginius Rufus, who had twice filled the office of consul and had twice refused the purple (ii. 1,8). He owed still more to his uncle. When the Elder Pliny was summoned to Rome by Vespasian in a.d. 72, he was probably accompanied by his nephew, who there went through the usual course of education in Roman literature and in Greek, and at the age of fourteen composed a " Greek tragedy " (vii. 4, 2). He afterwards studied philosophy and rhetoric under Nicetes Sacerdos and Quintilian (vi. 6, 3, ii. 14, 9), and modelled his own oratorical style on that of Demos- thenes, Cicero and Calvus (i. 2). The Elder Pliny inspired his nephew with something of his own indomitable industry; and in August 79, when the author of the Historia naturalis lost his life in the

famous eruption of Vesuvius, it was the sister of the Elder and the mother of the Younger Pliny who first descried the signs of the approaching visitation, and, some twenty-seven years later, it was the Younger Pliny who wrote a graphic account of the last hours of his uncle, in a letter addressed to the historian Tacitus (vi. 16). By his will the Elder Pliny had made his nephew his adopted son, and the latter now assumed the nomen and praenomen of his adoptive father.

A year later he made his first public appearance as an advocate (v. 8, 8), and soon afterwards became a member of the board of decemviri stiitibus judicandis, which was associated with the praetor in the presidency of the centumviral court. Early in the reign of Domitian he served as a military tribune in Syria (a.d. 81 or 82), devoting part of his leisure to the study of philo- sophy under the Stoic Euphrates (i. 10, 2). On returning to Rome he was nominated to the honorary office of sevir equitum romanorum, and was actively engaged as a pleader before the rentumviri, the chancery court of Rome (vi. 12, 2).

His official career began in a.d. 89, when he was nominated by Domitian as one of the twenty quaestors. He thus became a member of the senate for the rest of his life. In December 91 he was made tribune, and, during his tenure of that office, with- drew from practice at the bar (i. 23). Early in 93 he was appointed praetor (iii. n, 2), and, in his year of office, was one of the counsel for the impeachment of Baebius Massa, the pro- curator of Hispania Baetica (iii. 4, vi. 29, vii. 33). During the latest and darkest years of Domitian he deemed it prudent to withdraw from public affairs, but his financial abilities were recognized by his nomination in 94 or 95 to the praefectura serarii miliiaris (ix. 13, 11). On the death of Domitian and the accession of N/.iva he

delivered a speech (subsequently published) in prosecution of Publicius Certus, who had been foremost in the attack on Helvidius Priscus (ix. 13). Early in 98 he was promoted to the position of praefect of the public treasury in the temple of Saturn. After the accession of Trajan in the same year, Pliny was associated with Tacitus in the impeachment of Marius Priscus for his maladministration of the province of Africa (ii. 11). The trial was held under the presidency of the emperor, who had already nominated him consul suffectus for part of the year a.d. 100. The formal oration of thanks for this nomi- nation, described by Pliny himself as his gratiarum actio (iii. 13, 1 and 18, 1), is called in the MSS. the Panegyricus Trajano dictus.

The following year was marked by the death of Silius Italicus and Martial, who are gracefully commemorated in two of his Letters (iii. 7 and 21). It is probable that in 103-104 he was promoted to a place in the college of

Augurs, vacated by his friend Frontinus (iv. 8), and that in 105 he was appointed curator of the river Tiber (v. 14, 2). In the same year he employed part of his leisure in producing a volume of hendeca- syllabic verse (iv. 14, v. 10). He usually spent the winter at his seaside villa on the Latian coast near Laurentum, and the summer at one of his country houses, either among the Tuscan hills, near Tifernum, or on the lake of Como, or at Tusculum, Tibur or Praeneste.

It was probably in 104, and again in 106, that he was retained for the defence of a governor of Bithynia, thus becoming familiar with the affairs of a province which needed a thorough re- organization. Accordingly, about 111, he was selected by Trajan as governor of Bithynia, under the special title of " legate propraetor with consular power." He reached Bithynia in September, held office for fifteen months or more, and probably died in 113.

His health was far from robust. He speaks of his delicate frame {gracUitas mea) ; and he was apt to suffer from weakness of the eyes (vii. 21) and of the throat or chest (ii. 11, 15). Frugal and abstemious in his diet (i. 15; iii. 1 and 12), studious and methodical in his habits (i. 6, v. 18, ix. 36 and 40), he took a quiet delight in some of the gentler forms of outdoor recreation. We are startled to find him telling Tacitus of his interest in hunting the wild boar, but he is careful to add that, while the beaters were at work, he sat beside the nets and was busily taking notes, thus combining the cult of Minerva with that of Diana (i. 6). He also tells the historian that, when his uncle left Misenum to take a nearer view of the eruption of Vesuvius, he preferred to stay behind, making an abstract of a book of Livy (vi. 20, 5).

Among his friends were Tacitus and Suetonius, as well as Frontinus, Martial and Silius Italicus; and the Stoics, Musonius and Helvidius Priscus. He was thrice married; on the death of his second wife without issue, Trajan conferred on him the jus trium liberorum (a.d. 98), and, before 105, he found athird wife in the accomplished and amiable Calpurnia (iv. 19). He was generous in his private and his public benefactions (i. 19, 2, ii. 4, 2, vi. 32). At his Tuscan villa near Tifernum Tiberinum (iv. 1, 4), the modern Citta di Castello, he set up a temple at his own expense and adorned it with statues of Nerva and Trajan (x. 8). Tn his lifetime he founded and endowed a library at his native place (i. 8, v. 7), and, besides promoting local education (iv. 13), established an institute for the maintenance and instruction of the sons and daughters of free-born parents (vii. 18). By his will he left a large sum for the building and the perpetual repair of public baths, and the interest of a still larger sum for the benefit of one hundred freedmen of the testator and, ultimately, for an annual banquet.

On a marble slab that once adorned the public baths at Comum, his distinctions were recorded in a long inscription, which was afterwards removed to Milan. It was there broken into six square pieces, four of which were built into a tomb within the great church of Sant' Ambrogio. Of these four fragments only one survives, but with the aid of transcripts of the other three made by Cyriacus of Ancona in 1442, the whole was

restored by Mommsen [C.I.L. v. 5262]. It is to the following effect : —

Gaius Plinius Caecilius , son of Lucius, of the Ufentine tribe ; augur ; legate-propraetor of the province of Pontus and Bithynia, with consular power, by decree of the senate sent into the said province by the emperor Nerva Trajan ; praefectof the Treasury of Saturn; praefect of the Treasury of War; , tribune of the plebs; emperor's quaestor, sevir of the knight?; military tribune of the Gallic legion ; for the ad- judication of ; provided by will for the erection of baths at a cost of … , adding for the furnishing of the same 300,000 sesterces (£2400) and furthermore, for maintenance, 200,000 sesterces (£1600); likewise, for the support of one hundred of his own freedmen he devised to the townsfolk for a public entertainment; . . . dikewise, in his life- time> he gave for the support of sons and daughters of the towns- folk <5oo,ooo> sesterces (£4000) ; dikewise a library, and> , for the maintenance of the library, 100,000 sesterces (£800).

With the exception of two mediocre sets of verses, quoted by himself (vii. 4 and 9), his poems have perished. His speeches were apt to be prolix, and he defended their prolixity on principle (i. 20). He was apparently the first to make a practice of reciting his speeches before a gathering of his friends before finally publishing them (iii. 18). The only speech that has survived is the Panegyric on Trajan, first delivered by Pliny in the emperor's presence, next recited to the orator's friends for the space of three days, and ultimately published in an expanded form (Epp. iii. 18) . It is unduly florid and redundant in style, but it supplies us with the fullest account of the emperor's antecedents, and of his policy during the first two years and a half of his rule.

It describes his entering Rome on foot, amid the rejoicings of the citizens; his liberality towards his soldiers and to the citizens of Rome, a liberality that was extended even to persons under eleven years of age; his charities for the maintenance of the children of the poor; his remission of succession-duties in cases where the property was small or the heirs members of the testator's family; his establishment of free trade in corn between the various

parts of the empire; his abandonment of vexatious and petty prosecu- tions for " high treason " ; his punishment of informers; his abolition of pantomimes; his repairs of public buildings and his extension and embellishment of the Circus Maximus. The speech was dis- covered by Aurispa at Mainz in 1432, as part of a collection of Panegyrici; and was first printed by Fr. Puteolanus at Milan about fifty years later.

Besides the Panegyric, we possess the nine books of Pliny's Letters, and a separate book containing his Correspondence with Trajan.

In the first letter of the first book Pliny states that he has collected certain of his letters without regard to chronological order (non servato temporis ordine). Pliny's learned biographer, the Dutch scholar, Jean Masson (1709), wrongly assumed that this statement referred to the whole of the collection. He inferred that all the nine books were published simultaneously; and he also held that Pliny was governor of Bithynia in a.d. 103-105. It was afterwards maintained by Mommsen (1868) that the books were in strictly chronological order, that the letters in each book were in general arranged in order of date, that all of them were later than the death of Domitian (September 96), that the several books were probably published in the following order: i. (97); ii. x (ioo); iii. (101-102); iv. (105); v. and vi. (106); vii. (107); viii. (108); and ix. (not later than 109); and, lastly, that Pliny was governor of Bithynia from a.d. 111-112 to 113. The letter which is probably the earliest (ii. 20) has since been assigned to the last part of the reign of Domitian, and it has been suggested by Professor Merrill that the nine books were published in three groups: i.-ii. (97 or 98) ; iii.-vi.(lo6) ; vii.-ix. (108 or 109).

In his Letters Pliny presents us with a picture of the varied Interests of a cultivated Roman gentleman. The etiquette of the imperial circle, scenes from the law-courts and the recitation- room, the reunions of dilettanti and philosophers, the busy life of the capital or of the municipal town, the recreations of the seaside and of the country — all these he brings vividly before our eyes. He elaborately describes his Laurentine and his Tuscan villa, and frankly tells us how he spends the day at each (ii . 1 7 , v. 6 , ix. 36 and 40) j'expatiates on his verses and his speeches, his holiday-tasks in Umbria (vii. 9, ix. 10), and his happy memories of the Lake of Como (i. 6) . He gives an enthusiastic account of a statuette of Corinthian bronze he has recently purchased (iii. 6). He is interested in providing a teacher of

rhetoric for the place of his birth (iv. 13); he exults in the devo- tion of his wife, Calpurnia (vi. 19); towards his servants he is an indulgent master (viii. 16) ; he intercedes on behalf of the freed- man of a friend (ix. 21), and, when a freedman of his own is in delicate health, sends him first to Egypt and afterwards to the Riviera (v. 19). He consults Suetonius on the

interpretation of dreams (i. 18); he presents another of his correspondents with a batch of ghost-stories (vii. 27) or a marvellous tale about a tame dolphin on the north coast of Africa (ix. 33). He discourses on the beauties of the Clitumnus (viii. 8) and the floating islands of the Vadimonian lake (viii. 20). He describes an eruption of Vesuvius in connexion with the last days of the Elder Pliny (vi. 16 and 20), giving elsewhere an account of his manner of life and a list of his writings (iii. 5). He laments the death of Silius Italicus (iii. 7), of Martial (iii. 21), and of Vergihius Rufus (ii. 1), and of others less known to fame. He takes as his models Cicero and Tacitus (vii. 20), whose name is so often (to his delight) associated with his own (ix. 23). He rejoices to learn that his writings are read at Lyons (ix. n). He complains of the inanity of circus-races (ix. 6), of the decay of interest in public recitations (i. 13), of bad taste in matters of hospitality (ii. 6), and of the way in which time is frittered away in the social duties of Rome (i. 9). He lays down the principles that should guide a Roman governor in Greece (viii. 24) ; he maintains the cause of the oppressed provinces of Spain and Africa; and he exposes the iniquities of the informer Regulus, the only living • man whom he attacks in his Letters, going so far as to denounce him as omnium bipedum nequissimus (i. 5, 14)."

The Letters are models of graceful thought and refined expres- sion, each of them dealing with a single topic and generally ending with an epigrammatic point. They were imitated by Symmachus (Macrobius v. 1, 7) and by Apollinaris Sidoniug (Epp. ix. r, 1). In the middle ages they were known to Ratherius of Verona' (10th century), who quotes a passage from i. 5, 16 (Migne, cxxxvi. p. 391). Selections were included in a volume oi Flores compiled at Verona in 1329; and a MS. of bks. i.-vii. and ix. was discovered by Guarino at Venice in 141 9. These books were printed in the editio princeps (Venice, 1471). Part of bk. viii. appeared for the first time at the end of the next edition (Rome, c. 1474). The whole of bk. viii. was first published in its propel place by Aldus Manutius (Venice, 1508),

Pliny's Correspondence with Trajan supplies us with many interesting details as to the government of Bithynia, and as to the relations between the. governor and the central authority. It reflects the greatest credit on the strict and almost punctilious conscientiousness of the governor, and on the assiduity and the high principle which animated the emperor.

On reaching the province, Pliny celebrates the emperor's birth- day, and proceeds to examine the finances of Prusa. His request for a surveyor to check the outlay on the public works is refused on the ground that the emperor has hardly enough surveyors for the works he is carrying on in Rome. He asks the emperor to sanction the repair of the ancient baths at Prusa, the building of an aqueduct at Nicomedia and a theatre at Nicaea, and the covering in of a stream that has become a public nuisance at

Amastris. When he consults the emperor as to the baths at Claudiqpolis, the emperor sensibly replies: " You, who are on the spot, will be best able to decide " (40). When Pliny hesitates about a small affair relating to Dio Chrysostom (the Bithynian friend of Nerva and Trajan), the emperor betrays a not unnatural impatience in his response: potuisti non haerere, mi Secunde carissime (82). Pliny also asks for a decision on the status and maintenance of deserted children (65), and on the custom of distributing public doles on the occasion of interesting events in the life of a private citizen. The emperor agrees that the custom might lead to " political factions," and should therefore be strictly controlled (117). Owing to a destructive fire at Nicomedia, Pliny suggests the formation of a volunteer fire-brigade, limited to 150 members. The emperor is afraid that the fire-brigade might become a " political club," and cautiously contents himself with approving the provision of a fire-engine (34).

Trajan's fear of factions and clubs in these two last cases has sometimes been connected with the question of his attitude towards the Christians in Bithynia. Pliny {Epp. 96) states that he had never taken part in formal trials of Christians, and was therefore un- familiar with precedents as to the extent of the investigation, and as to the degree of punishment. He felt that a distinction might be drawn between adults and those of tender years ; and that

allowance might be made for any one who recanted. There was also the question whether any one should be punished simply for bearing the name of Christian or only if he was found guilty of " crimes associated with that name.' Hitherto, in the case of those who were brought before him, he had asked them three dis- tinct times whether they were Christians, and, if they persisted in the admission, had ordered them to be taken to execution. What- ever might be the real character of their profession, he held that such obstinate persistence ought to be punished. There were others no less " demented," who, being Roman citizens, would be sent to Rome for trial. Soon, as the natural consequence of these proceedings, a variety of cases had come under his notice. He had received an anonymous statement giving a list of accused persons. Some of them, who denied that they had ever been Christians, had consented to pray to the gods, to adore the image of the emperor, and to blaspheme Christ; these he had dismissed. Others admitted that they were Christians, but presently denied it, adding that they had ceased to be Christians for some years. All of these worshipped images of the gods and of the emperor, and blasphemed Christ. They averred that the sum and substance of their " fault " was that they had been accustomed

to meet on a fixed day before daylight to sing in turns a hymn to Christ as God, and to bind themselves by a solemn oath (sacramento) to abstain from theft or robbery, and from adultery, perjury and dishonesty; after which they were wont to separate and to meet again for a common meal. This, however, they had ceased to do as soon as Pliny had pub- lished a decree against collegia, in accordance with the emperor's edict. To ascertain the truth, he had also put to the torture two maid-servants described as deaconesses, but had discovered nothing beyond a perverse and extravagant superstition. He had accord- ingly put off the formal trial with a view to consulting the emperor. The question appeared to be worthy of such a consultation, es- pecially in view of the number of persons of all ages and ranks, and of both sexes, who were imperilled. The contagion had spread through towns and villages and the open country, but it might still be stayed. Temples that had been wellnigh deserted were already beginning to be frequented, rites long intermitted were being renewed, and the trade in fodder for sacrificial victims was reviving. It might be inferred from this how large a number might be reclaimed, if only room were granted for repentance.

Trajan in his reply (Epp. 97) expresses approval of Pliny's course of action in the case of the Christians brought before him. It was impossible (he adds) to lay down any uniform or definite rule. The persons in question were not to be hunted out, but if they were reported and were found guilty, they were to be punished. If, however, any one denied that he was a Christian, and ratified his denial by worshipping the gods of Rome, he was to receive pardon. But no attention was to be paid to anonymous charges. It would be a bad precedent and unworthy of the spirit of the age.

The view that the Christians were punished for being members of a collegium or sodalitas (once held by E. G. Hardy, and still maintained by Professor Merrill) is hard to reconcile with Pliny's own statement that the Christians had promptly obeyed the emperor's decree against collegia (§ 7). Further reasons against this view have been urged by Ramsay, who sums up his main results as follows: (1) There was no express law or formal edict against the Christians. (2) They were not prosecuted or punished for contravening any formal law of a wider character. (3) They were judged and condemned by Pliny (with Trajan's full approval) by virtue of the imperium delegated to him, and in accordance with the instructions issued to governors of provinces to search out and punish sacrilegious persons. (4) They had already been classed as outlaws, and the name of Christian in itself entailed condemnation. (5) This treatment was a settled principle of imperial policy, not established by the capricious action of a single emperor. (6) While Trajan felt bound to carry >ut the established principle his personal view was to some extent opposed to it. (7) A definite form of procedure had been established. (8) This procedure was followed

by Pliny (W. M. Ramsay, The Church in the Roman Empire, p. 223).

It has been well observed by E. G. Hardy that the " double aspect of Trajan's rescript, which, while it theoretically con- demned the Christians, practically gave them a certain security," Explains "the different views which have since been taken of it ; but by most of the church writers, and perhaps on the whole with justice, it has been regarded as favourable and as rather discouraging persecution than legalizing it " {Pliny's Corre- spondence with Trajan, 63,210-217).

Authorities. — The correspondence with Trajan was apparently preserved in a single Paris MS.; Epp. 41-121 were first printed by Avantius of Verona (1502); and Epp. 1-40 by Aldus Manutius (1508). The original MS. has vanished; but the " copy " supplied

to the printers of the Aldine text was discovered by Mr. E. G. Hardy in the Bodleian in 1888. The two letters on the Christians were known to Tertullian (Apol. c. 2). The attacks on the genuine- ness of the whole or part of the collection have been refuted by Wilde (Leiden, 1889).

For a critical edition of text, see H. Keil (Leipzig, 1870), with full index of names by Mommsen; for plain text, Keii (1853), &c, C. F. W. Miiller (1903); the best annotated editions are those of Gesner and Schaefer (1805) and G. E. Gierig (1796-1806); of the Letters alone, G. Kortte (1734), and the less trustworthy edition of M. Doring (1843); of bks. i. and ii., Cowan (1889); of iii., Mayor (1880, with Life by G. H. Rendall); of vi., Duff (1906); of the Panegyricus, C. G. Schwarz (1846); of the Correspondence with Trajan, E. G. Hardy (1889); of Selected Letters, E. T. Merrill (1903) ; best Eng. trans, by J. D. Lewis (1879).

On Pliny's life, see the works by J. Masson (Amsterdam, 1709); H. Schontag (Hof, 1876) ; and Giesen (Bonn, 1885). On the chronology of the letters, &c, Mommsen, in Hermes, iii. 31-114 (1868; trans, into French by Morel, 1873); criticized by Stobbe (Philologus, 1870); Gemoll (Halle, 1872); C. Peter (Philologus, 1873); Asbach (Rhein. Mus., 1 881); and Schultz (Berlin, 1899). For style, the works of H. Holstein (1862-1869); K. Kraut (1872); J. P. Lagergren (1872); and Morillot (Grenoble, 1888). On the villas, Burn's Rome and the Campagna (1871), 411-415; Aitchison, in the Builder (Feb. 8, 1890); Winnefeld, in Jahrb. des arch. Inst. (1891), pp. 201-217; and Magoun, in Trans. Amer. Philol. Assoc.

(1895).

See also bibliography in Hiibner and Mayor's Lai. Lit. (1875), pp. 147-149; and in Schanz, Rom. Lit. §§ 4ˆ4-449.

For recent literature on Pliny and the Christians, see C. F. Arnold, Studien (KSnigsberg, 1887); Lightfoot, Apostolic Fathers, ii. 7 (ed. 1889) ; Neumann, Der rdmische Stoat und die allgemeine Kirche (1890) vol. i. ; Mommsen, in Hist. Zeitschrift (189c) ; W. M. Ramsay, The Church in the Roman Empire (ed. 1893), en. 10, pp. 196-225; and E. G. Hardy, Christianity and the Roman Government (1894), reprinted in Studies in Roman History (1906), pp. 1-162; with the literature quoted in these works and in Schanz, Rom. Lit. § 641.

(J. E. S.)*

PLIOCENE (from the Gr. irKetov, mr>re, and kcuv6s, recent), in geology, the name given by Sir C. Lyell to the formations above the Miocene and below the Pleistocene (Newer Pliocene) strata. During this period the great land masses of the earth were rapidly approaching to the configuration which they exhibit at the present day. The marine Pliocene deposits are limited to comparatively few areas; in Europe, in the beginning of the period, the sea washed the shores of East Anglia and parts of the south coast of England; it extended well into Belgium and Holland and just touched here and there on the northern and north-western coasts of France; it sent an arm some distance up the valley of the

Pliocene Period

Hypothetical continental outlth'es

after W.Dl Matthews

By permission of UK American Museum of Natural History

EnutyWalkslsov

Guadalquivir and formed small bays on several points of the southern coast of France; and up the Rhone basin a considerable gulf reached as far as Lyons. Early in the period the sea covered much of Italy and Sicily; but the eastward extension of the ancient Mediterranean in south-east Europe, through the Danube basin, the Aral, north Caucasian and Caspian regions, continued to suffer the process of conversion to lagoons and large lakes which had begun in the Miocene.

Generally all over the world the majority of Pliocene for- mations are non-marine, and the limited and local nature of the elevations since the

inception of the period has exposed to view only the shallow marginal marine deposits. The principal exception to the last statement is to be found in the Pliocene of Italy and Sicily, where a continuous crustal depres- sion permitted the accumulation of great thicknesses of material, which later on, towards the close of the period, were elevated some thousands of feet. With these deformatory movements are associated the Italian volcanoes, Etna certainly began its career beneath the sea, for its older tuffs are found interstratified with marine beds, and possibly some of the others had a similar origin. At the same time volcanic outbursts, some apparently comparable to that of Martinique in recent times, were taking place in central France, while far away in southern Sumatra thousands of feet of submarine tuffs were being thrown out and deposited, and great lava flows were being erupted in Australasia.

Considerable differences of opinion are exhibited among geologists as to the lower limits of the Pliocene formations; this is partly to be accounted for by the absence of widely-spread marine deposits, and partly by the comparatively short time- differences between one deposit and another, and hence the similarity of the faunas of contiguous strata-groups in local vertical series of beds. Following A. de Lapparent (Traite de g&ologie, 5th ed., 1906), we shall regard the Pliocene as divisible into three stages: an upper Sicilian stage, a middle Astian stage, and a lower Plaisancian stage. Other writers, however, have selected a different nomenclature, which often involves a different grouping of the formations; thus E. Kayser in his Formationskunde (3rd ed., 1908) distinguishes three stages under the names Arnian (upper), Astian (middle) and Messinian (lower) = Zanclean. The lower stage, however, includes the Pontian, Epplesheim, Pikermi and other formations which are here placed in the Miocene. This stage has been referred to a so-called Mio-Pliocene inter-period.

The Pliocene rocks of Britain now occupy but a small area in Norfolk, Suffolk and part of Essex; but from the presence of small outlying patches in Cornwall (St Erth and St Agnes), Dorsetshire (Dewlish) and Kent (Lenham), it is evident that the Pliocene Sea covered a considerable part of southern England. Moreover, these patches show by their present altitude above the sea that the Downs of Kent must have been elevated more than 850 ft., and the west coast of Cornwall 400 ft. since Pliocene times. The Pliocene rocks rest with strong unconformity upon the older strata in Britain. In the eastern counties the shelly, sandy beds are called " Crag"; this name has come into very general use for all the members of the series, and it is frequently employed as a synonym for Pliocene.

The English Pliocene strata are classified by the Geological Survey of England and Wales as follows: —

• *Yoldia (Leda) myalls bed (provisionally placed here).*

Forest-bed group and Dewlish gravels with Elephas meridionalis.

Weybourne crag (and Chillesford clay?).

Chillesford crag.

Norwich crag and Scrobicularia crag.

Red crag of Butley. . Red crag of Walton, Newbourn and Oakley.

(St Erth and St Agnes beds. Coralline crag. Lenham beds (Diestian). Box-stones and phosphatic beds with derived early Pliocene and other fossils.

The box-stones are rounded pieces of brown earthy sandstone containing casts of fossils; the phosphatic beds contain the phos- phatized bones of whale, deer, mastodon, pig, tapir, rhinoceros, &c, and have been worked as a source of manure. These basal con- glomerate deposits underlie the red crag and sometimes the coralline crag. The last-named formation, known also as the " white " or " Suffolk crag," or as the " Bryozoan crag " (it was the presence of Bryozoa which led to the name coralline), is essentially a shell bank, which was accumulated at a depth of from 20 to 40 fathoms. It is best exposed near Aldeburgh and Gedgrave in Suffolk. The Red Crags are sandy, marine, shallow-water deposits, with an abundant fauna ; they vary rapidly from point to point, and in general the more southern localities are richer in southern (older) forms than those farther north. The Norwich crag (fluvio-marine or mammaliferous

Newer Pliocene

Older

crag) is not always very clearly marked off from the Red Crags. Marine fresh-water and land shells are found in these beds, together with many mammalian remains, including Elephas antiquus, Masto- don arvernensis, Equus stenonis, Cervus carnuiorum, and dolphins, cod and other fish. The Forest-Bed group or Cromer forest-bed is exposed beneath the boulder clay cliffs of the Norfolk coast ; it con- tains transported stumps of trees and many plants still familiar in Britain, many living fresh-water and estuarine molluscs and a large number of mammals, many of which are extinct (Ma'haerodus, Cants lupus, Ursus spelaeus, Hyaena crocuta, Hippopotamus amphi- bius, Rhinoceros etruscus, Elephas antiquus and E. meridionalis, Bison bonasus, Ovibos moschatus, numerous species of deer, Equus caballus and E. stenonis, Castor fiber, Talpa europaea and many others). The only record of Pliocene remains in the northern part of

England consists of a few teeth of Elephas meridionalis found in a fissure in the limestone at Dove Holes, Derbyshire.

The Pliocene deposits of Belgium and Holland and the northern extremity of France are closely related with those of Britain, though as a whole they are very much thicker. The older marine beds may be traced from Lenham across the Channel at Calais and through Cassel to Diest. The newer marine Pliocene runs in a parallel belt to the north of the older beds through Antwerp. Belgian geologists have divided the local Pliocene into the following groups (from above downwards) : Poederlian, Scaldisian, Casterlian, Diestian. F. W. Harmer {Quart. Journ. Geol. Soc, 1898 and 1900) proposed the following scheme for the Pliocene of Britain and the Low Countries : —

Cromerian = Forest-bed of Cromer.

(Iceno-Cromerian = Chillesford beds and Weybourne crag. Icenian = marine crag of Norwich. Amstelian = Red Crag, comprising the Newbournian and But-

leyan sub-stages. Waltonian = Walton crag and Poederlian and Scaldisian. Gedgravian = Coralline crag and Casterlian. Lenhamian = Diestian.

In addition to the deposits just mentioned in French Flanders, the early Pliocene sea has left numerous small patches of marls and sands in Brittany and Normandy. In southern France marine sands, gravels and marls of Plaisancian and Astian ages occur in the de- pression of Roussillon, followed by Sicilian marls and gravels. In Languedoc (Montpellier, Nimes, Beziers) marine marls and sands are followed by calcareous conglomerate (40 metres) or by marls and lignite; gravels and loams constitute the uppermost beds. In the Rhone basin the earliest deposits are the Congeria beds of Bollene (Vaucluse) ; this brackish formation differs from the beds of the • same name in Vienna, but resembles those of Italy and Rumania. Then followed a marine invasion (groupe de Saint-Aries) ; these beds are now found at considerable elevations increasing northward and westward. The later formations in this area. are fluviatile or lacustrine in origin, with remarkable torrential gravel deposits at several horizons. The marine Pliocene of the maritime Alps, consisting of blue and yellow clays and limestone, are now elevated 170 metres above the sea, and even up to 350 m. in the neighbourhood of Nice. In central France no marine beds are found, but many interesting and in some cases highly fossiliferous deposits occur in association with volcanic rocks, such as the lower conglomerate and upper trachytic breccia of Perrier (Issoire), the fine tuffs (cinentes) with plants of Cantal, the

lignitiferous sandstones beneath the basalt of Cezallier, the diatomite of Ceyssac, &c. In Italy, Pliocene rocks form the low ranges of hills on both sides of the Apennines, hence the term " sub-Apennine " given to these rocks by A. d'Orbigny. They are marine marls and sands; the blue marls which crop out near Rome at the base of Mt Mario and Mt Vatican with the succeed- ing sands and gravels; the conglomerate followed by deep-sea marls of Calabria, and the marls, sands, limestones and blue clay of Sicily, all belong to the Plaisancian stage. To the next stage belong the yellow sands full of massive fossils, including the conglomerate of Castrovillari in Calabria and the white marls of the Val dArno. In the final (Sicilian) stage fluvio-lacustrine sands and gravels are found in Italy, except in Calabria and in Sicily where thick marine beds were formed. In Switzerland some of the deposits of Nagelfluh and Deckenschotter, glacial plateau gravels, belong to the Sicilian stage. In south-eastern Europe a great series of sands and marls with lignites, termed the Paludina beds, rests directly upon the Pontian formation. From their great development in the Levant, they have been given the rank of a " Levantine stage " by F. von Hochstetter; they are found in Dalmatia, Croatia, Slavonia, Bosnia, Rumania, Bulgaria, southern Russia, the Cyclades, and the Caspian region. On the north coast of Africa marine and brackish sands and marls occur in Morocco, Algeria and Egypt; and the " rifts " of the Red Sea and Suez have been assigned to this period.

In North America marine Pliocene is found fringing the coasts_ of California and the Gulf of Mexico. In the latter region marine marls, clays and limestones are best developed in Florida and can be traced into the Carolinas and Virginia ; they have been classed asthe Lafayette group (with lignites), the Florida group, and the Caloo- shatchis stage. On the Pacific coast the marine beds have attained great thicknesses, notably in the Merced series of San Francisco. In the San Luis Obispo region the non-marine Paso Robles beds, said to be 1000 ft. thick, belong to this period. Other local formations of

marine origin in California are those of San Diego and Wild Cat. In the Rocky Mountains are large lacustrine formations of consider- able thickness, and certain conglomerates in Wyoming and Bishop Mountain are assigned to this age. The sands and clays with gypsum of Entre Rios in South America contain fossils of the Atlantic type.

Lignitiferous shale with petroleum and great thickness of volcanic tuffs have been found in southern Sumatra. In New South Wales Pliocene river

terraces and alluvial deposits are covered by Mid- Pliocene lavas and from these " deep leads " or buried river beds much gold has been obtained. In Victoria great basaltic and dole- ritic flows have filled up the Pliocene river valleys, and marine beds have been found at elevations of iooo ft. above present sea-level. Very similar deposits and volcanic rock, belonging to the Wanganui system of F. W. Hutton, are found in New Zealand.

See C. Reid, " The Pliocene Deposits of Britain " (Mem. Geol. Survey, 1890); E. T. Newton, "The Vertebrates of the Pliocene Deposits of Britain " (Mem. Geol. Survey, 1 891) (both contain a bibliography): C. Reid, Origin of the British Flora (1899); and '^■Geological Literature " (Geol. Soc. London Annual, since 1893).

(J. A. H.)

PLOCK, or Plotsk, a government of Russian Poland, on the right bank of the Vistula, having the Prussian provinces of West and East Prussia on the N. and the Polish governments of Lomza on the E. and Warsaw on the S. Its area is 4160 sq. m. Its flat surface, 350 to 500 ft. above the sea-level, rises gently towards the north, where it merges into the Baltic coast-ridge of the Prussian lake district. Only a few hills reach 600 ft. above

TABLE OF PLIOCENE FORMATIONS.

Stages.

England.

Belgium

and Holland.

Rhone Basin.

Languedoc

and Roussillon.

Italy.

Eastern Europe.

Other Countries. 1

Cromer Forest Bed.

Sicilian.

Fluvio-marine Norwich crag.

Red crag of Suffolk.

Clays of Campine. Amstelian.

Marls of St

Cosme. Gravels of

Chagny. Conglomerates of

Chambaran. Sands of Tre-

voux and

Mollon. Travertine of

Meximieux.

Durfort beds with Elephas meridionalis.

Sands of Val d'Arno.

Limestones of Paler- mo and clays with northern mollusca.

Upper Paludina (Vivipara) beds.

Marine beds of

Entre Rios. Volcanic tuffs of

S. Sumatra.

Astian.

Base of Red crag.

Poederlian.

Scaldisian sands with Trophon antiquum.

Conglomerates of Montpellier and Fourres.

Sands of Rous- sillon with Mastodon arvernensis.

Marls of Val d'Arno with Mastodon arvernensis.

Yellow sands of Asti, Plaisantin, Monte Maria and Tuscany.

Conglomerates of Castrovillari.

Middle Paludina beds.

Petroleum-bearing beds of Sumatra.

Marine sands of Moghara and Mokatta.

Plaisancian.

Coralline crag. Lenham beds.

Sands with Isocardia car. Diestian sandstones.

Marine marls of Bresse, Hauterives.

Congeria beds of Bollene.

Yellow sands of Montpellier.

Blue marls of Millas.

Blue marls of Pia- cenza, Bologna, and Vatican.

Lower Paludina beds.

Marine beds of

Florida. Lacustrine beds of 1 Rocky Moun- tains.

Life of the Pliocene Period. — Sir C. Lyell defined the Pliocene strata as those which contained from 36-95 % of living marine molluscs. This rule can no longer be strictly applied to the widely scattered marine deposits, and it is of course inapplicable to the very numerous formations of lacustrine and fluviatile origin. On the whole the marine organisms are very like their living representatives, and there is often practically no specific difference; Nassa, Volula, Chenopus, Dentalium, Fusus, Area, Pecten, Pectunculus, Panopoea, Cyprina and Mactra may be mentioned among the marine genera; Congeria (Dreyssensia) , Auricula, Paludina, Melanopsis and Helix are found in the lacustrine deposits. One of the most interesting facts exposed by the study of the mollusca is the gradual lowering of the temperature of Europe during the period. In Britain the early Pliocene was, if anything, warmer than at present, but the percentage of northern forms ascends steadily through the higher beds, and finally arctic forms, such as Buccinum groenlandicum, Trichopteris borealis, My a truncata, Cyprina

islandica, &c, appear on the coasts of Norfolk and Suffolk, and some of the northern species even reached the Mediterranean (Sicily) at the close of the period. The flora exhibits the same gradual change, the large palms and camphor trees disappeared from Europe, the sabal palm lin- gered in Languedoc, and Chamerops humilis lived about Marseilles until the end ; the sequoias and bamboos held on for some time, and the aspect of the vegetation in mid-Pliocene times was not unlike that of Portugal, Algeria and Japan of to-day. Not a few species that dwelt in Pliocene Europe are found in the forests of America. The flora of the Cromer forest beds is very like that of the same dis- trict at the present time. The mammals of the British Pliocene show a curious blending of northern and southern forms; they include Machaerodus (the sabre-toothed lion), hyenas, dogs, fox, wolf, glutton, marten, bears, Ursus arvernensis and the grizzly and cave bear, seals, whales, dolphins, bisons, musk ox, gazelle, the red deer and many others now extinct, the roebuck, pigs and wild boar, hippopotamus, hipparion and horse (Equus caballus and E. stenonis), several species of rhinoceros, tapir, hyrax, elephants (Elephas meridionalis and E. antiquus), several mastodons, squirrel, beaver, hare, mice, voles, &c. The mastodon disappeared from Europe before the close of the period, but lived much longer in America. No generally accepted fossil man has been found in the Pliocene; Pithecanthropus erectus, found by E. Dubois in Java, is the nearest to the human type. Monkeys, Macacus and Semnopithecus, occur in the Pliocene of Europe. At this time the Pliocene mammals of North America were able to migrate into South America, and a few ot the southern forms travelled northwards.

the sea, while the broad valley of the Vistula has an elevation of only 130 to 150 ft. In the west (district of Lipno) broad terraces, covered with forests, small lakes and ponds, and very poor in vegetation, descend from the Baltic lake-district towards the plains of PJock; and in the central district of Mlawa extensive marshes fill the upper basin of the Wkra. The Vistula borders the government on the south, almost all the way from Warsaw to Thorn, receiving the Skrwa and Wkra. The Drweca, or Drewenz, flows along the north-west boundary, while several small tributaries of the Narew drain the north-eastern district of Ciechanow. Peat-bogs, used for fuel, and marshes containing bog-iron, fill many depressions in the north, while the more elevated parts of the plains are covered with fertile clays, or a kind of " black earth." Lacustrine post-Glacial deposits fill all the depressions of the thick sheet of boulder clay, with Scandinavian erratic boulders, which extends everywhere over the Tertiary sands and marls — these last containing masses of silicated wood and lignite. Layers of gypsum are found in the hills beside the Vistula.

The estimated population in 1906 was 619,000. About one- third are Jews and 36,000 Germans. The government is divided into seven districts, of

which the chief towns are Plock, Ciechanow, Lipno, Mlawa, Prasnysz, Rypin and Sierpc. Agriculture is the chief industry. The principal crops are rye, oats, barley, wheat and potatoes; beetroot is cultivated for sugar, especially on the large estates of the west, where modern machinery is used. Gardening and bee-keeping are extensively practised. In the north the property is much divided, and the landholders, very numerous in Ciechanow, are far from prosperous. The forests have been lavishly cut, but Plock is still one of the best wooded governments (20%) in Poland. Other occupations are provided by shipping on the Vistula, mining and various domestic indus- tries, such as the fabrication of wooden cars, sledges and wheels, and textile industry. The manufactures include flour-mills, saw-mills, sugar factories, distilleries, tanneries, breweries,

agricultural implement works, match factories and ironworks. There is some export trade, especially in the Lipno district; but its development is hampered by lack of communications, the best being those offered by the Vistula. The railway from Warsaw to Danzig, via Ciechanow and Miawa, serves the eastern part of the government.

After the second dismemberment of Poland in 1793, what is now the government of Plock became part of Prussia. It fell under Russian dominion after the treaty of Vienna (1815), and, in the division of that time into five provinces, extended over the western part of the present government of Lomza, which was created in 1864 from the Ostrolenka and Pultusk districts of Plock, together with parts of the province of Augustowo.

PLOCK, or Plotsk, a town of Russia, capital of the govern- ment of the same name, on the right bank of the Vistula, 67 m. by the Vistula W.N.W. of Warsaw. Pop. 27,073. It has a cathedral, dating from the 12th century, but restored in 1903, which contains tombs of Polish dukes and of Kings Ladislaus and Boleslav (of the nth and 12th centuries). There is consider- able navigation on the Vistula, grain, flour, wool and beetroot being exported, while coal, petroleum, salt and fish are imported.

PLOEN, a town of Germany, in Schleswig-Holstein, beautifully situated between two lakes, the large and the small Ploener-See, 20 m. S. from Kiel by the railway to Eutin and Lubeck. Pop. (1905), 3735. It has a palace built about 1630 and now converted into a cadet school, a gymnasium and a biological station. Tobacco, soap, soda, beer and furniture are manufactured, and there is a considerable trade in timber and grain. The lakes afford good fishing, and are navigated in summer by steamboats.

Ploen is mentioned as early as the nth century as a Wendish settlement, and a fortified place. It passed in 1559 to Duke John the Younger, founder of the line of Holstein-Sonderburg, on the extinction of which, in 1761, it fell to Denmark, and in 1867, with Schleswig-Holstein, to Prussia. The sons of the emperor William II. received their early education here.

See H. Eggers, Schloss und Stadt Ploen (Kiel, 1877), and J. C. Kinder, Urkundenbuch zur Chronik der Stadt Ploen (Plon, 1890).

PLOENNIES, LUISE VON (1803-1872), German poet, was born at Hanau on the 7th of November 1803, the daughter of the naturalist Philipp Achilles Leisler. In 1824 she married the physician August von Ploennies in Darmstadt. After his death in 1847 she resided for some years in Belgium, then at Jugenheim on the Bergstrasse, but finally at Darmstadt, where she died on the 22nd of January 1872. Between 1844 and 1870 she published several volumes of verse, being particularly happy in eclectic love songs, patriotic poems and descriptions of scenery. She also wrote two biblical dramas, Maria Magdalena (1870) and David (1873).

As a translator froir 1 the English, Luise von Ploennies published two collections of poems, Britannia (1843) and Englische Lyriker des igten Jahrhunderts (1863, 3rd ed., 1867).

PLOfiRMEL, a town of western France, capital of an arrondisse- ment in the department of Morbihan, 36 m. N.N.E. of Vannes by rail. Pop. (1906), town, 2492; commune, 5424. The Renais- sance church of St Armel (16th century) is remarkable for the delicate carving of the north facade and for fine stained glass. It also possesses statues of John II. and John III., dukes of Brittany, which Were transferred to the church from their tomb in an ancient Carmelite monastery founded in 1273 and destroyed by the Protestants in 1592 and again at the Revolution. The lower ecclesiastical seminary has an apartment in which the Estates of Brittany held several meetings. Remains of ramparts of the 15th century and some houses of the 16th century are also of interest. Farm-implements are manufactured, slate quarries are worked in the neighbourhood, and there is trade in cattle, wool, hemp, cloth, &c. Ploermel (Plou Armel, people of Armel) owes its name to Armel, a hermit who lived in the district in the 6th century.

PLOESCI (Ploescii), the capital of the department of Prahova, Rumania; at the southern entrance of a valley among the Carpa- thian foothills, through which flows the river Prahova; and at the junction of railways to Buzeu, Bucharest and Hermannstadt in

Transylvania. Pop. (1900), 42,687. As the name Ploesci (pluviena, rainy) implies, the climate is moist. The surrounding hills are rich in petroleum,

salt and lignite. There are cardboard factories, roperies, tanneries and oil mills. Ploesci possesses schools of commerce and of arts and crafts, several banks, and many synagogues and churches, including the Orthodox church of St Mary, built in 1740 by Matthew Bassarab.

PLOMBIERES, a town of eastern France, in the department of Vosges, on a branch line of the Eastern railway, 17 m. S. of Epinal by road. Pop. (1906), 1882. The town is situated at a height of 1410 ft. in a picturesque valley watered by the Augronne. It is well known for its mineral springs, containing sodium sulphate and silicic acid, varying from 66° to 166° F. Plombieres has a handsome modern church and a statue of the painter Louis Francais, born in the town in 1814. The waters were utilized by the Romans and during the middle ages. In later times Montaigne, Richelieu, Stanislas, duke of Lorraine and Voltaire were among the distinguished people who visited the place. Napoleon III. built the most important of the bathing establishments and made other improvements.

PLOT, ROBERT (1640-1696), English naturalist and anti- quary, was born at Borden in Kent in 1640. He was educated at Wye, and at Magdalen Hall, Oxford, where he graduated B.A. yi 1661, and proceeded to M.A. (1664) and D.C.L. (1671). He was distinguished for his folio work The Natural History of Oxfordshire (1677), in which various fossils, as well as other objects of interest, were figured and described. It was regarded as a model for many subsequent works. In 1677 Plot was elected F.R.S., and he was secretary for the Royal Society from 1682 to 1684. He was appointed in 1683 the first keeper of the Ashmolean Museum at Oxford, and in the same year he became professor of chemistry. In 1686 he wrote The Natural History of Staffordshire. Two years later he became historiographer- royal. He died on the 30th of April 1696.

PLOT, a term originally meaning a space of ground used for a specific purpose, especially as a building site, formerly in frequent usage in the sense of a plan, a surveyed space of ground; hence the literary sense of a plan or design. The word is of doubtful origin; there is a collateral form " plat," which appears in the 1 6th century, according to the New English Dictionary, under the influence of " plat, " flat place, surface (Fr. plat, Late Lat. plattus, probably from Gr. irAa-rus, broad). Skeat (Etym. Diet.) refers " plot," in the sense of a space of ground, to the O. Eng. plaec, Mid. Eng. pleck, later plalch, patch. " Plot," in the sense of plan, scheme, would then be identical with " plot," a conspiracy, which may be a shortened form of " complot," a French word, also of doubtful origin, meaning in the 1 2 th century " a compact body of men "; in the 14th century " conspiracy."

PLOTINUS (a.d. 204-270), the most important representative of

Neoplatonism, was born of Roman parents at Lycopolis in Egypt. At Alexandria he attended the lectures of Ammonius Saccas (q.v.), the founder of the system, until 242, when he joined the Persian expedition of Gordian III., with the object of studying Persian and Indian philosophy on the spot. After the assassination of Gordian in 244, Plotinus was obliged to take refuge in Antioch, whence he made his way to Rome and set up as a teacher there. He soon attracted a large number of pupils, the most distinguished of whom were Amelius, Eusto- chius and Porphyry. The emperor Gallienus and his wife Salonina were also his enthusiastic admirers, and favoured his idea of founding a Platonic Commonwealth (Platonopolis) in Campania (cf. Bishop Berkeley's scheme for the Bermuda islands), but the opposition of Gallienus's counsellors and the death of Plotinus prevented the plan from being carried out. Plotinus's wide popularity was due partly to the lucidity of his teaching, but perhaps even more to his strong personality. Assent developed into veneration; he was considered to be divinely inspired, and generally credited with miraculous powers. In spite of ill-health, he continued to teach and write until his death, which took place on the estate of one of his friends near Minturnae in Campania.

Under Ammonius Plotinus became imbued with the eclectic spirit of the Alexandrian school. ' Having accepted the Platonic metaphysical doctrine, he applied to it the Neo-Pythagorean principles and the Oriental doctrine of Emanation (q.v.). The results of this introspective mysticism were collected by him in a series of fifty-four (originally forty-eight) treatises, arranged in six " Enneads," which constitute the most authoritative exposition of Neoplatonism. This arrangement is probably due to Porphyry, to whose editorial care they were consigned. There was also another ancient edition by Eustochius, but all the existing MSS. are based on Porphyry's edition.

The Enneades of Plotinus were first made known in the Latin translation of Marsilio Ficino (Florence, 1492) which was reprinted at Basel in 1580, with the Greek text of Petrus Perna. Later editions by Creuzer and Moser (" Didot Series," 1855), A. Kirchhoff (1856), H. F. Miiller (1878-1880), R. Volkmann (1883-1884). There is an English translation of selected portions by Thomas Taylor, re-edited in Bonn's Philosophical Library (1895, with introduction and biblio- graphy by G. R. S. Mead).

On Plotinus generally see article in Suidas; Eunapius vitae sophistarum ; and above all the Vita Plotini by his pupil Porphyry. Among modern works, see the treatises on the school of Alexandria by J. F. Simon, i. (1845), and

£. Vacherot (1846); A. Richter, Ueber Leben und Geistesentwicklung des Plotin (Halle, 1864-1867); T. Whittaker, The Neoplatonists (1901) ; A. Drews, Plotin und der Unter- gang der antiken Weltanschauung (1907) ; E. Caird, Evolution of Theology in the Greek Philosophers (1904), ii. 210-257; Rufus M. Jones, Studies in Mystical Religion (1909). A detailed account of Plotinus's philosophical system and an estimate of its importance will be found in the article Neoplatonism, the works above referred to, and the histories of philosophy. For his list of categories, see Categories; also Logos; Mysticism; Magic.

PLOUGH AND PLOUGHING. To enable the soil to grow good crops the upper layer must be pulverized and weathered. This operation, performed in the garden by means of the spade, is carried on in the field on a larger scale by the plough, 1 which breaks the soil and by inverting the furrow-slice, exposes fresh surfaces to the disintegrating influence of air, rain and frost.

The first recorded form of plough is found on the monuments of Egypt, where it consists simply of a wooden wedge tipped with iron and fastened to a handle projecting backwards and a beam, pulled by men or oxen, projecting forwards. Many references to the plough are found in the Old Testament, notably that in 1 Sam. xiii. 20: " All the Israelites went down to the Philistines to sharpen every man his share and his coulter." Descriptions of ploughs found in Hesiod's Works and Days and in Virgil's Georgics i. 169-175, show little development in the implement. The same may be said of the Anglo-Saxon ploughs. These are shown with coulter and share and also with wheels, which had in earlier times been fitted to ploughs by the Greeks and also by the natives of Cis-Alpine Gaul (Pliny, Hist. nat. 18, 18). A mattock with which to break the clods is often found represented in Anglo-Saxon drawings as subsidiary to the plough. All these types of plough are virtually hoes pulled through the ground, breaking but not inverting the soil. In the first half of the 18th century a plough with a short convex mould-board of wood was introduced from the Netherlands into England and, as improved at Rotherham in Yorkshire, became known as the Rotherham plough and enjoyed considerable vogue. At this period ploughs were made almost wholly of wood, the mould- board being cased with plates of iron. Small, of Berwickshire, brought out a plough in which beam and handle were of wrought

1 The O. Eng. form is pˆoh, which is usually found in the sense of " plough-land," a unit for the assessment of land (see Hide), the regular O. Eng. word for the implement being sulh, still found in some dialects in the form sull. It appears in many Teutonic languages, cf. Du. ploeg, Ger. Pflug, Swed. plog, Dan. plov. The Slavonic forms, such as Russ. or Pol. plug, are borrowed from the German. It does not appear in Gothic, where the word

used is hoha. The ultimate origin of " plough " is unknown. Max-Muller (Science of Language, i. 296) connects the word with the Indo- European root meaning " to float," seen in the Gr. jtXotow, a boat or ship; the same word would be applied to the ship " ploughing " through the waves, and to the implement " ploughing " through the earth. A Celtic origin has been suggested, connecting the word with Gael, ploe, stump of a tree, as forming the original plough. The form " plow " was common in English until the beginning of the 18th century, and is usual in America.

iron, the mould-board of cast iron. The shares, when made of the same material, required constant sharpening; this necessity was removed by the device, patented by Robert Ransome in 1803, of chilling and so hardening the under-surface of the share; the upper surface, which is soft, then wears away more quickly than the chilled part, whereby a sharp edge is always assured. Nowadays the mould-board is of steel with a chilled and polished surface to give greater wearing qualities and to reduce friction. In the latter part of the 19th century there were numerous improvements but no fundamental alterations in the construction of the ordinary plough.

The working parts of the plough are the coulter, the share, and the breast or mould-board. These are carried on the beam, to which are attached the handles or tilts at the back, and the hake or clevis and draught-chain at the front. The hake is notched so that, by moving the draught-chain higher or lower thereon, the plough is caused to go more or less deeply into the ground. It may also be adjusted to suit the height of the horses used. The hake moves laterally on a quadrant and it is thus possible to give the plough a tendency to left or right by moving the hake in the reverse direction. A frame is bolted to the beam and this carries the breast or mould-board to the fore-end of which the share is fitted. The side-cap, a plate of

Newcastle Plough.

iron fixed to the land-side of the frame, is intended to keep the edge of the unploughed soil vertical and prevent it from falling into the furrow. A piece of iron called the slade is bolted to the bottom of the frame, and this, running along the sole of the fur- row, acts as a base to the whole implement. The coulter (either knife or disk) and sometimes a skim-coulter (or jointer) are attached adjustably to the beam, so as to act in the front of the share.

The coulter is a knife or revolving disk which is fixed so that its point clears the point of the share. The skim-coulter is shaped like a miniature plough, substituted for or fixed in front of the coulter; it is used chiefly on lea land, to pare off the surface of the soil together with the vegetation thereon, and

turn it into the previous furrow, where it is immediately buried by the fuirow slice. Two wheels of unequal height are commonly fitted to the front of the beam. By means of them the depth and width of the furrow are regulated, whereas in the case of " swing " or wheelless ploughs these points depend chiefly on the skill of the ploughman. In the wheeled plough some of the weight and downward pull due to its action on the ground is taken by the wheels; the sliding friction is thus to some extent converted into a rolling friction, and the draught is correspond- ingly diminished.

In operation the coulter makes a perpendicular cut separating the furrow-slice which is divided from the " sole " of the furrow

•/////////////////////////////////A W/////////////////////////////7/////////. Crested Furrow. Rectangular Furrow,

by the share and then inverted by the curve of the breast as the plough moves forward. The process is indicated in the illustra- tion of different types of furrow. The form of a furrow is

regulated by the shape and 'width of the share, working in combination with a proper shaped breast. A " crested " furrow is obtained by the use of a share, the wing of which is set at a higher altitude than the point, but this type of furrow

Wide Broken Furrow, is less generally found than the " rectangular " form obtained by a level-edged share, which leaves a flat bottom.

During the greater part of the 19th century the ideal of plough- ing was to preserve the furrow-slice unbroken, and this object was attained by the use of long mould-boards which turned the

Digging Plough.

slices gently and gradually, laying them over against one another at an angle of 45 , thus providing drainage at the bottom of the furrow, and exposing the greatest possible surface to the influ- ences of the weather. Subsequently the digging plough came into vogue; the share being wider, a wider furrow is cut, while the slice is inverted by a short concave mould-board with a sharp turn which at the same time breaks up and pulverizes the soil after the fashion of a spade. Except on extremely heavy soils or on shallow soils with a subsoil which it is unwise to bring upon the surface, the

modern tendency is in favour of the digging plough.

A ploughed field is divided into lands or sections of equal width separated by furrows. On light easy draining land 22 yds. is the usual width; on the heaviest lands it may be as little as S yds., and in the latter case the furrows will act as drains into which the water flows from the intervening ridges. 1

Certain important variations of the ordinary plough demand consideration. The one-way plough lays the furrows alter-

counteract the tendency for the soil to work down the slope. One-way ploughs also leave the land level and dispense with the wide open furrows between the ridges which are left by the ordinary plough. They are made on different principles. One type comprises two separate ploughs, one right hand and one left, which revolve on the beam, one working, while the other stands vertically above it. In another the mould-board and

Turnwrest Plough, nately to its left and right, so that they all slope in the same direction. This is found advantageous on hill-sides where the work is easier if all the furrows are turned downhill; or from another point of view the furrows may be all laid uphill so as to 1 Methods of the " setting-out " of land to be ploughed together with a full discussion of other technical details relating to ploughing will be found in ch. vii. of W. J. Maiden's Workman's Technical Instructor (London, 1905).

Balance Plough, share are shaped so that they can be swung on a swivel under the beam when the latter is lifted. A third type is made on the " balance " principle, two plough beams with mould-boards being placed at right angles to one another, so that while the right-hand plough is at work the left-hand is elevated above the ground.

Double-furrow or multiple ploughs are a combination of two or more ploughs arranged in echelon so as to plough two or more furrows. The weight of these implements necessitates some provision for turning them at the headlands, and this is supplied either by a bowl wheel, enabling the plough to be turned on one side, or by a pair of wheels cranked so that they can be raised by a lever when the plough is working. The double-furrow

Riding Plough, plough was known as early as the 17th century, but, till the introduction of the latter device by Ransome in 1873, cannot be said to have been in successful use.

The " sulky " or riding plough is little known in the United Kingdom, but on the larger arable tracts of other countries where quick work is essential and the character of the surface permits, it is in general use. In this form of

plough the frame is mounted on three wheels, one of which runs on the land, and the other two in the furrow. The furrow wheels are placed on inclined axles, the plough beam being carried on swing links, operated by a hand lever when it is necessary to raise the plough out of the furrow. The land wheel and the forward furrow wheel are adjustable vertically with reference to the frame, for the purpose of controlling the action of the plough.

In the disk plough, which is built both as a riding and a walking plough, the essential feature is the substitution of a concavo-

convex disk, pivoted on the plough beam, for the mould-board and share of the ordinary plough. This disk is carried on an axle inclined to the line of draught, and also to a vertical plane. As the machine is drawn forward the disk revolves and cuts deeply into the ground, and by reason of its inclination crowds the earth outwards and thus turns a furrow. A scraper is

Multiple Disk Plough.

provided to keep the disk clean and prevent sticking. The controlling levers and draught arrangements are similar to those in the " sulky ' ' plough. The advantage of this plough over the ordi- nary form is in the absence of sliding friction, and in the mellow and porous condition in which it leaves the bottom of the furrow.

Disk ploughs are unsuitable for heavy sticky soils and for stony land, but may be used with effect on stubbles and on land in a dry hard state. Perhaps their most common use is in ploughing on a large scale in conjunction with steam power.

Steam is employed as motive power when it is necessary to plough large areas in a short time. In the United Kingdom steam ploughing is generally carried on on the double-engine system (introduced by Messrs John Fowler about 1865), in which case two sets of ploughs are arranged on the one-way balance principle, so that while one set is at work the other is carried clear of the ground. In this arrangement, a pair of locomotive engines, each having a plain winding drum fixed underneath the boiler, are placed opposite to each other at the ends of the field to be operated upon; the rope of each of the engines is attached to the plough, or other tillage implement, which is drawn to and fro betwixt them by each working in turn. While the engine in gear is coiling in its rope and drawing the plough towards itself, the rope of the other engine is paid out with merely so much drag on it as

to keep it from kinking or getting ravelled on the drum.

In the United States and elsewhere engines drawing behind them a number of ploughs, arranged in echelon and taking perhaps

The subsoil plough has the beam and body but not the mould-board of an ordinary plough. Following in the furrow of an ordinary plough it breaks through the sub-soil to a depth of several inches, making it porous and penetrable by plant roots.

Gripping and draining ploughs are employed in opening the grips and trenches necessary both in surface and underground drainage.

See Davidson and Chstse,Farm Motors and Farm Machinery ; articles in L. H. Bailey's Cyclopedia of American Agriculture (New York, 1907) and Standard Encyclopaedia (London, 1908), &c.

PLOVER, a bird whose name (Fr. pluvier, O. Fr. plovier) doubtless has its origin in the Latin pluvia, rain (as witness the German equivalent Regenpfeifer, rain-fifer). P. Belon (1555) says that the name Pluvier is bestowed " pour ce qu'on le prend mieux en temps pluvieux qu'en nulle autre saison," which is not in accordance with modern observation, for in rainy weather plovers are wilder and harder to approach than in fine. Others have thought it is from the spotted (as though with rain-drops) upper plumage of two of the commonest species of plovers, to which the name especially belongs — the Charadrius pluvialis of Linnaeus, or golden plover, and the Squatarola helvetica of recent ornithologists, or grey plover. Both these birds are very similar in general appearance, but the latter is the larger and has an aborted hind-toe on each foot. 1 Its axillary feathers are also black, while in the golden plover they are pure white. The grey plover is a bird of almost circumpclar range, breeding in the far north of America, Asia and eastern Europe, frequenting in spring and autumn the coasts of the more temperate parts of each continent, and generally retiring farther southward in winter — examples not unfrequently reaching Cape Colony, Ceylon, Australia and even Tasmania. Charadrius pluvialis has a much narrower distribution, though where it occurs it is much more numerous. Its breeding quarters do not extend farther than from Iceland to western Siberia, but include the more elevated tracts in the British Islands, whence in autumn it spreads itself, often in immense flocks, over the cultivated districts if the fields be sufficiently open. Here some will remain so long as the absence of frost or snow permits, but the majority make for the Mediterranean basin, or the countries beyond, in which to winter; and stragglers find their way to the southern extremity of Africa. Two other cognate forms, C. virginicus and C. fulvus, respectively represent C. pluvialis in America and eastern Asia, where they are also known by the

same English name. The discrimination of these two birds from one another requires a very acute eye, 2 but both are easily distin- guished from their European ally by their smaller size, their greyish-brown axillary feathers, and their proportionally longer

American Steam Plough.

30 ft. at a time, are frequently seen. On smaller areas petrol motors with one or more ploughs attached are sometimes used.

There is a large variety of ploughs which differ in their purpose from the ordinary plough.

The ridging plough is an implement with a mould-board on each side, terminating in front in a flat point, and used for moulding up potatoes, and for throwing up the ridge on which to plant roots.

and more slender legs. All, however — and the same is the case with the grey plover — undergo precisely the same seasonal

1 But for this really unimportant distinction both birds could doubtless have been kept by ornithologists in the same genus, for they agree in most other structural characters.

s Schlegel (Mus. Pays-Bas, Cursores, p. 53) states that in some examples it seems impossible to determine the form to which they belong; but ordinarily American specimens are rather larger and stouter, and have shorter toes than those from Asia.

change of colour, greatly altering their appearance and equally affecting both sexes. In spring or early summer nearly the whole of the lower plumage from the chin to the vent, which during winter has been nearly pure white, becomes deep black. A corresponding alteration is at the same season observable in the upper plumage.

Though the birds just spoken of are those most emphatically entitled to be called plovers, the group of ringed plovers (see Killdeer and Lapwing), with its allies, has, according to usage, hardly less claim to the name, which is also extended to some other more distant forms that can here have only the briefest notice. Among them one of the most remarkable is the " Zick- zack " (so-called from its cry) — the rpoxiˆos of Herodotus (see Humming-bird), the Pluvianus or Hyas aegyptius of ornitholo- gists, celebrated for the

services it is said to render to the croco- dile—a small bird whose plumage of delicate lavender and cream colour is relieved by markings of black and white. This belongs to the small family Glareolidae, of which the members best known are the coursers, Cursorius, with some eight or ten species inhabiting the deserts of Africa and India, while one, C. gallicus, occasionally strays to Europe and even to England. Allied to them are the curious pratincoles (q.v.) , also peculiar to the Old World, while the genera Thinocoris and Attagis form an outlying group peculiar to South America, that is by some systematists regarded as a separate family Thinocoridae, near which are often placed the singular Sheathbills (q.v.). By most authorities the Stone-curlews (see Curlew), the Oyster-catchers (q.v.) and Turnstones (q.v.) are also regarded as belonging to the family Charadriidae, and some would add the Avocets (Recurvi- rostra) and Stilts (q.v.), among which the Cavalier, or Crab-plover, Dromas ardeola — a form that has been bandied about from one family and even order to another — should possibly find its resting-place. It frequents the sandy shores of the Indian Ocean and Bay of Bengal from Natal tc Aden, and thence to Ceylon, the Malabar coast, and the Andaman and Nicobar Islands — a white and black bird, mounted on long legs, with webbed feet, and a bill so shaped as to have made some of the best ornithologists lodge it among the Terns (q.v.).

Though the various forms here spoken of as plovers are almost certainly closely allied, they must be regarded as constituting a very indefinite group, for hardly any strong line of demarcation can be drawn between them and the Sandpipers and Snipes (q.v.). United, however, with both of the latter under the name of Limicolae, after the method approved by the most recent systematists, the whole form an assemblage the compactness of which no observant ornithologist can hesitate to admit, even if he be uncertain of the exact kinship.

For " plovers' eggs " see Lapwing. (A. N.)

PLUCK, to pull or pick off something, as flowers from a plant, feathers from a bird. The word in O. Eng. is pluccian or ploccian and is represented by numerous forms in Teutonic languages, cf. Ger. pflilcken, Du. plukken, Dan. plakke, &c. In sense and form a plausible identification has been found with Ital. piluc- care, to pick grapes, hair, feathers, cf. Fr. tplucher, pick. These romanic words are to be referred to Lat. pilus, hair, which has also given " peruke " or " periwig " and " plush." Difficulties of phonology, history and chronology, however, seem to show that this close similarity is only a coincidence. " Pluck," in the sense of courage, was originally a slang word of the prize-ring, and Sir W. Scott (Journal, Sept. 4, 1827) speaks of the " want of that article blackguardly called pluck." In butcher's parlance the " pluck " of an animal is the heart, liver and lungs, probably so called

from their being " plucked " or pulled out of the carcase immediately after slaughtering. The heart being the typical seat of courage, the transference is obvious. In university colloquial or slang use, " to pluck " is to refuse to pass a candi- date on examination; the more usual colloquial word is now " to plough." At the granting of degrees at Oxford objection to a candidate could be taken for other reasons than failure at examination, and the person thus challenging drew the atten- tion of the proctor in congregation by " plucking " a piece of black silk attached to the back of his gown.

PLUCKER, JULIUS (1801-1868), German mathematician and physicist, was born at Elberfeld on the 16th of June 1801. After being educated at Diisseldorf and at the universities of Bonn, Heidelberg and Berlin he went in 1823 to Paris, where he came under the influence of the great school of French geometers, whose founder, Gaspard Monge, was only recently dead. In 1825 he was received as Privatdozent at Bonn, and after three years he was made professor extraordinary The title of his " habilitationsschrift," Generalem analyseos applicationem ad ea quae geometriae altioris et mechanicae basis et fundamenta sunt e serie Tayloria deducit Julius Plucker (Bonn, 1824), indicated the course of his future researches. The mathe- matical influence of Monge had two sides represented respec- tively by his two great works, the Geomitrie descriptive and the Application de V analyse a la glomitrie. Plucker aimed at fur- nishing modern geometry with suitable analytical methods so as to give it an independent analytical development. In this effort he was as successful as were his great contempor- aries Poncelet and J. Steiner in cultivating geometry in its purely synthetic form. From his lectures and researches at Bonn sprang his first great work, Analytisch-geometrische Entwickelungen (vol. i., 1828; vol. ii., 1831).

In the first volume of this treatise Plucker introduced for the first time the method of abridged notation which has become one of the characteristic features of modern analytical geometry (see Geometry, Analytical). In the first volume of the Entwickelungen he applied the method of abridged notation to the straight line, circle and conic sections, and he subsequently used it with great effect in many of his researches, notably in his theory of cubic curves. In the second volume of the Ent- wickelungen he clearly established on a firm and independent basis the great principle of duality.

Another subject of importance which Plucker took up in the Entwickelungen was the curious paradox noticed by L. Euler and G. Cramer, that, when a certain number of the intersections of two algebraical curves are given, the rest are thereby determined. Ger- gonne had shown that when a number of the intersections of two curves of the (/> +g)th degree lie on a curve of the £th degree the rest lie on a curve of the 5th degree. Plucker finally (Gergonne Ann., 1828-1829) showed how many

points must be taken on a curve of any degree so that curves of the same degree (infinite in number) may be drawn through them, and proved that all the points, beyond the given ones, in which these curves intersect the given one are fixed by the original choice. Later, simultaneously with C. G. J. Jacobi, he extended these results to curves and surfaces of unequal order. Allied to the matter just mentioned was Pliicker's discovery of the six equations connecting the numbers of singularities in alge- braical curves (see Curve). Plucker communicated his formulae in the first place to Crelle's Journal (1834), vol. xii., and gave a further extension and complete account of his theory in his Theorie der algebraischen Curven (1839).

In 1833 Plucker left Bonn for Berlin, where he occupied a post in the Friedrich Wilhelm's Gymnasium. He was then called in 1834 as ordinary professor of mathematics to Halle. While there he published his System der analytischen Geometric, auf neue Betrachtungsweisen gegriindet, und insbesondere eine ausfuhrliche Theorie der Curven dritter Ordnung enthaltend (Berlin, 1835). In this work he introduced the use of linear functions in place of the ordinary co-ordinates; he also made the fullest use of the principles of collineation and reciprocity. His discussion of curves of the third order turned mainly on the nature of their asymptotes, and depended on the fact that the equation to every such curve can be put into the form pqr--fis = o. He gives a complete enumeration of them, including two hundred and nineteen species. In 1836 Plucker returned to Bonn as ordinary professor of mathematics. Here he published his Theorie der algebraischen Curven, which formed a continuation of the System der analytischen Geometrie The work falls into two parts, which treat of the asymptotes and singularities of algebraical curves respectively; and extensive use is made of the method of counting constants which plays so large a part in modern geometrical researches.

From this time Pliicker's geometrical researches practically ceased, only to be resumed towards the end of his life. It is true that he published in 1846 his System der Geometrie des

Raumes in neuer analytischer Behandlungsweise, but this contains merely a more systematic and polished rendering of his earlier results. In 1847 he was made professor of physics at Bonn; and from that time his scientific activity took a new and astonishing turn.

His first physical memoir, published in Poggendorfs Annalen (1847), vol.

lxxii., contains his great discovery of magnecrystallic action. Then followed a long series of researches, mostly published in the same journal, on the properties of magnetic and diamagnetic bodies, establishing results which are now part and parcel of our magnetic knowledge. In 1858 {Fogg. Ann. vol. ciii.) he published the first of his classical researches on the action of the magnet on the electric discharge in rarefied gases.

Pliicker, first by himself and afterwards in conjunction with J. W. Hittorf, made many important discoveries in the spectro- scopy of gases. He was the first to use the vacuum tube with the capillary part now called a Geissler's tube, by means of which the luminous intensity of feeble electric discharges was raised sufficiently to allow of spectroscopic investigation. He antici- pated R. W. Y. Bunsen and G. Kirchhoff in announcing that the lines of the spectrum were characteristic of the chemical sub- stance which emitted them, and in indicating the value of this discovery in chemical analysis. According to Hittorf he was the first who saw the three lines of the hydrogen spectrum, which a few months after his death were recognized in the spec- trum of the solar protuberances, and thus solved one of the mysteries of modern astronomy.

Hittorf tells us that Pliicker never attained great manual dexterity as an experimenter. He had always, however, very clear conceptions as to what was wanted, and possessed in a high degree the power of putting others in possession of his ideas and rendering them enthusiastic in carrying them into practice. Thus he was able to secure from the Sayner Hiitte in 1846 the great electromagnet which he turned to such use in his magnetic researches; thus he attached to his service his former pupil the skilful mechanic Fessel; and thus he discovered and fully availed himself of the ability of the great glass-blower Geissler.

Induced by the encouragement of his mathematical friends in England, Pliicker in 1865 returned to the field in which he first became famous, and adorned it by one more great achievement — the invention of what is now called " line geometry." His first memoir on the subject was published in the Philosophical Transactions of the Royal Society of London. It became the source of a large literature in which the new science was de- veloped. Pliicker himself worked out the theory of complexes of the first and second order, introducing in his investigation of the latter the famous complex surfaces of which he caused those models to be constructed which are now so well known to the student of the higher mathematics. He was engaged in bringing out a large work embodying the results of his researches in line geometry when he died on the 22nd of May 1868. The work was so far advanced that his pupil and assistant Felix Klein was able to complete and publish it (see Geometry, Line). Among the very numerous honours bestowed on Pliicker by the various scientific societies of Europe was the

Copley medal, awarded to him by the Royal Society two years before his death.

See R. F. A. Clebsch's obituary notice (Abh. d. kon. Ges. d. Wiss. z. Gottingen, 1871, vol. xvi.), to which is appended an appreciation of Plucker's physical researches by Hittorf, and a list of Plucker's works by F. Klein. See also C. I. Gerhardt, Geschichte der Mathematik in Deulschland, p. 282, and Plucker's life by A. Dronke (Bonn, 1871).

PLUM, the English name both for certain kinds of tree and also generally for their fruit. The plum tree belongs to the genus Prunus, natural order Rosaceae. Cultivated plums are supposed to have originated from one or other of the species P. domestica (wild plum) or P. insititia (bullace). The young shoots of P. domestica are glabrous, and the fruit oblong; in P. insititia the young shoots are pubescent, and the fruit more or less globose. A third species, the common sloe or blackthorn, P. spinosa, has stout spines; its flowers expand before the leaves; and its fruit is very rough to the taste, in which particulars it differs from the two preceding. These

distinctions, however, are not maintained with much constancy. P. domestica is a native of Anatolia and the Caucasus, and is con- sidered to be the only species naturalized in Europe. P. insititia is wild in southern Europe, in Armenia, and along the shores of the Caspian. In the Swiss lake-dwellings stones of the P. insititia as well as of P. spinosa have been found, but not those of P. domestica. Nevertheless, the Romans cultivated large numbers of plums. The cultivated forms are extremely numer- ous, some of the groups, such as the greengages, the damsons and the egg plums being very distinct, and sometimes reproduc- ing themselves from seed. The colour of the fruit varies from green to deep purple, the size from that of a small cherry to that of a hen's egg; the form is oblong acute or obtuse at both ends, or globular; the stones or kernels vary in like manner; and the flavour, season of ripening and duration are all subject to variation. From its hardihood the plum is one of the most valuable fruit trees, as it is not particular as to soil, and the crop is less likely to be destroyed by spring frosts. Prunes and French plums are merely plums dried in the sun. Their preparation is carried on on a large scale in Bosnia and Servia, as well as in Spain, Portugal and southern France.

Plums are propagated chiefly by budding on stocks of the Mussel, Brussels, St Julien and Pear plums. The damson, wine-sour and other varieties, planted as standards, are generally increased by suckers. For planting against walls, trees which have been trained for two years in the nursery are preferred, but maiden trees can be very successfully introduced, and by liberal treatment may be speedily got to a fruiting state. Any good well-drained loamy soil is suitable for plums, that of medium quality as to

lightness being decidedly preferable. Walls with an east or west aspect are generally allowed to them. The horizontal mode of training and the fan or half-fan forms are commonly followed; where there is sufficient height probably the fan system is the best. The shoots should be laid in nearly or quite at full length. The fruit is produced on small spurs on branches at least two years old, and the same spurs continue fruitful for several years. Standard plum trees should be planted 25 ft. apart each way, and dwarfs 15 or 20 ft. The latter are now largely grown for market purposes, being more easily supported when carrying heavy crops, fruiting earlier, and the fruit being gathered more easily from the dwarf bush than from standard trees.

The following is a selection of good varieties of plums, with their times of ripening: —

Dessert Plums.

Early Green-gage . . e. July

Early Transparent Gage b. Aug.

Denniston's Superb . b. Aug. Oullin's Golden . .

Green-gage . . . M'Laughlin's . . Angelina Burdett .

m. Aug. m.e.Aug. e. Aug. b. Sept.

Transparent Gage . . b.

Jefferson b.

Kirke's m.

Coe's GoldenDrop . . e.

Reine Claude de Bavay] f'

Ickworth Impdratrice b.

Late Rivers …. j ˆ

Sept.

Sept.

Sept.

Sept.

Sept.

Oct.

Oct.

Oct.

Nov.

Culinary Plums.

Early Prolific …. e. July Victoria Sept.

Belle de Louvain . . Aug. White Magnum Bonum Sept.

Belgian Purple . . . m. Aug. Pond's Seedling . . . m. Sept.

Czar . e. Aug. Diamond m. Sept.

Pershore e. Aug. Monarch e. Sept.

Prince Englebert . . e. Aug. Grand Duke …. Oct.

Mitchelsons' …. b. Sept. Wyedale e. Oct.

Diseases. — The Plum is subject to several diseases of fungal origin. A widespread disease known as pocket-plums or bladder- plums is due to an ascomycetous fungus, Exoaccus pruni, the mycelium of which lives parasitically in the tissues of the host plant, passes into the ovary of the flower and causes the characteristic malformation of the fruit which becomes a deformed, sometimes curved or flattened, wrinkled dry structure, with a hollow occupying the place of the stone ; the bladder plums are yellow at first, subse- quently dingy red. The reproductive spores are borne in sacs (asci) which form a dense layer on the surface, appearing like a bloom in July; they are scattered by the wind and propagate the disease. The only remedy is to cut off and burn the diseased branches.

Plum-leaf blister is caused by Polystigma rubrum, a pyrenomy- cetous fungus which forms thick fleshy reddish patches on the leaves.

The reproductive spores are formed in embedded flesh-shaped recep- tacles (perithecia) and scattered after the leaves have fallen. The

spots are not often so numerous as to do much harm to the leaves, but where the disease is serious diseased leaves should be collected and burned. Sloes and bird- cherries should be removed from the neighbourhood of plum-trees, as the various disease-producing insects and fungi live also on these species. The branches are some- times attacked by weevils {Rhyn- cites) and the larvae of various moths, and saw-flies (chiefly Erio- campa) feed on the leaves, and young branches and leaves are sometimes invaded by Aphides. Leaf-feeding beetles and larvae of moths are best got rid of by shaking the branches and collecting the insects. Slug-worms or saw-fly larvae require treatment by wash- ing with, soapsuds, tobacco and lime-water or hellebore solution, and Aphides by syringing from below and removing all surplus young twigs.

(After Sadebeck. From Strasburger's Lehrbuch der Botanik, by permission of Gustav Fischer.)

Taphrina Pruni. — Transverse section through the epidermis of ah infected plum. Four ripe asci, 01, 02, with eight spores a», a t , with yeast-like conidia abstricted from the spores.

st, Stalk-cells of the asci.

m, Filaments of the mycelium cut transversely.

cut, Cuticle.

ep, Epidermis.

PLUMBAGO (from Lat. plum- bum, lead), a name frequently applied to graphite {q.v.), in allusion to its remote resem- blance to lead, whence it is popularly called " black-lead." It was formerly held in repute in medicine, but is now regarded as having no medicinal properties of any value.

PLUMBAGO DRAWINGS. What we should now speak of as pencil drawings were in the 17th and 18th centuries usually known as drawings " in plumbago," and there is a group of artists whose work is remarkable for their exquisite portraits drawn with finely pointed pieces of graphite and upon vellum. In some books of reference they are grouped as engravers, and as such Horace Walpole describes several of them. There is no doubt that many of their fine pencil drawings were prepared for the purpose cf engraving, but this is not likely to have been the case with all, and we have evidence of certain commissions executed, by Forster for example, when the portrait was not required for the preparation of a plate. One of the earliest

of this group of workers was Simon Van de Pass (1 5957-1647) , and in all probability his pencil drawings were either for repro- duction on silver tablets or counters or for engraved plates. A very few pencil portraits by Abraham Blooteling, the Dutch engraver, have been preserved, which appear to have been first sketches, from which plates were afterwards engraved. They are of exceedingly delicate workmanship, and one in the present writer's collection is signed and dated. By David Loggan (1635-1700), a pupil of Van de Pass, there also remain a few portraits, as a rule drawn on vellum and executed with the utmost dexterity and with marvellous minuteness, the lines expressing the intricacies of a lace ruffle or the curls of a wig being perfectly rendered. It is evident that these were not always prepared for engraving, because there is one representing Charles II., set in a beautiful gold snuff box, which was given by the king to the duchess of Portsmouth and now belongs to the duke of Richmond, and a similar portrait of Cromwell in the possession of Lord Verulam, while several others belong to Lord Caledon, and there are no engravings corresponding to these. On the other hand, a large drawing by Loggan in the writer's collection, representing Charles II., is the sketch for the finished engraving and bears a declaration to that effect. An artist who is better known to the general collector is William Faithorne (1616-1601). He was the pupil of Sir Robert Peake, the engraver, but derived much of his skill from the time he spent with Nanteuil, whose involved minute style he closely followed, triumphing over technical difficulties with great success. There are important drawings by him in the Bodleian, at Welbeck

Abbey and at Montagu House, and two fine portraits in the British Museum. Thomas Forster (fl. 1695-1712) was one of the greatest draughtsmen in this particular form of portraiture. His drawings are both on vellum and on paper, as a rule on vellum. Of the details of his life very little is known. He engraved a few prints, but they are of the utmost rarity. His finest portraits are executed with very great refinement and delicacy, the modelling of the face being quite wonderful. It is in fact one of the marvels of this type of portraiture how such exquisite lines could have been drawn with the roughly cut pieces of graphite which were at the disposal of the artists. In some instances in Forster's work the lines representing the modelling of the face are so fine as to be quite indistinguishable without the aid of a glass. His work can be studied at Welbeck Abbey, in the Holburne Museum at Bath, in the Victoria and Albert Museum and elsewhere. Two other Englishmen should be referred to, Robert and George White, father and son. The former (164 5-1704) was a pupil of Loggan and a prolific engraver, and most of his drawings, executed on vellum, were for the purpose of engraving. George White (c. 1684-1732) was taught by his father, and finished some of his father's plates. His own pencil drawings are of even finer execution than those of Robert White. These three men,

Forster and the two Whites, carefully signed their drawings and dated them. By Robert White there are remarkable portraits of Bunyan and Sir Matthew Hale in the British Museum, and his own portrait at Welbeck; and by him and his son there are other drawings in private collections, depicting Sir Godfrey Kneller, Archbishop Tennyson and others. The two Fabers (i66o?-i72i and 16957-1756) were from Holland, the elder having been born at the Hague, as he himself states on his portrait which was in Vertue's collection. In addition to the portraits these two men usually added beautiful drawn inscriptions, often found within circles around the portraits and occasionally extending to many lines below them. The son was the greater artist and a famous mezzotinter. The portrait painter Jonathan Richardson (1665-1745) executed many fine drawings in pencil, examples of which can be seen in the British Museum. One of the best of these plumbago draughtsmen was a Scotsman, whose work is of the utmost rarity, David Paton, who worked in 1670. The chief of his drawings belong to the earl of Dysart and are at Ham House, and two examples of his portraiture are in the possession of the Dalzell family. Of Paton's history nothing is known save that he was a Catholic who worked for more than one Dominican house, a devoted adherent of the Stuart cause, and was attached to the court of Charles II., when the king was in Scotland. At that time he drew his remarkable portrait of the king now at Ham House. There are drawings of the same character as his, the work of George Glover (d. 1618) and Thomas Cecill (/?. 1630), but they are of extraordinary rarity and were evidently first studies for engravings. Of Glover's work the only signed example known is in the writer's collection. A Swiss artist, Joseph Werner (b. 1637) or Waerner, drew well in pencil, adopting brown paper as the material upon which his best drawings were done, and in some cases heightening them with touches of white paint. The most notable of his portraits is one which is in the collection at Welbeck Abbey.

The earlier miniature painters also drew in this manner, notably Hilliard in preparing designs for jewels and seals, and Isaac and Peter Oliver in portraits. By Isaac Oliver there is a fine drawing in Lord Derby's collection; and one by Peter, a marvellous likeness cf Sir Bevil Grenville, in that of the writer. The later men, Hone, Grimaldi, Lens and Downman, also drew finely in plumbago. Other notable exponents of this delightful art were Thomas Worlidge (1 700-1 766), F. Steele (c. 1 7 14), W. Robins (c. 1730), G. A. Wolff- gang (1692-1775), George Vertue the engraver (1684-1756), Johann Zoffany (1733-1810), and the Swede, Charles Bancks (c. 1748), who resided in England for some years. (G. C. W.)

PLUMBING, properly working in lead (Lat. plumbum), now a term embracing all work not only in lead, but also in tin, zinc and other metals, connected with the installation, fitting, repairing, soldering, &c, of pipes for water, gas, drainage, on cisterns, roofs and the like in any building, i.e. the

general work of a plumber. (See Building and Sewerage.)

PLUMPTRE, EDWARD HAYES (1821-1891), English divine and scholar, was born in London on the 6th of August 1821. A scholar of University College, Oxford, he graduated with a double-first class in 1844, and in the same year he was elected fellow of Brasenose College. He was ordained in 1847, and shortly afterwards appointed chaplain, and then professor of pastoral theology, at King's College, London. In 1863 he was given a prebendal stall at St Paul's, and from 1869 to 1874 he was 1 a member of the committee appointed by Convocation to revise the authorized version of the Old Testament. He was Boyle lecturer in 1866-1867 (" Christ and Christendom "), and Grinfield lecturer on the Septuagint at Oxford 1872-1874. After successively holding the livings of Pluckley and Brickley in Kent, he was installed in 1881 as dean of Wells. He died on the 1st of February 1891.

Plumptre was a man of great versatility and attained high repu- tation as a translator of the plays of Sophocles (1865) and Aeschylus (1868), and of the Divina commedia of Dante (1886). In verse his main achievements were Lazarus (1864), and Master and Scholar (1866). Among his many theological works may be mentioned An Exposition of the Epistles to the Seven Churches of Asia (1877), The Spirits in Prison (1884), " The Book of Proverbs " (which he annotated in the Speaker's Commentary), the " Synoptic Gospels, Acts, and II. Corinthians," in Bishop Ellicott's New Testament Commentary, and Life of Bishop Ken (1888).

PLUNDER, to rob, to pillage, especially in war. The word came into English usage directly from Ger. plundern (derived from a substantive Plunder meaning " household stuff," bed- clothes, clothing, &c), particularly with reference to the pillaging of the Thirty .Years' War. Thomas May (History of the Long Parliament, 1647; quoted in the New English Dictionary) says: " Many Tounes and Villages he (Prince Rupert) plundered, which is to say robb'd, for at that time first was the word plunder used in England, being borne in Germany." The New English Dictionary's earliest quotation is from the Swedish Intelligencer*

(1632).

PLUNKET, OLIVER (1620-1681), Irish Roman Catholic divine, was born at Loughcrew, Co. Meath. He was edu- cated privately and at Rome, whither he went with Father Scarampi in 1645. From 1657 to 1669 he

was professor of theology at the College of the Propaganda, enjoyed the friend- ship of the historian, Pallavicini, and acted as representative of Irish ecclesiastical affairs at Rome. Pope Clement IX. appointed him to the archbishopric of Armagh and primacy of Ireland in July 1669, and in November he was consecrated at Ghent, reaching Ireland in March 1670. Lord Berkeley of Stratton, the viceroy, showed him much kindness and allowed him to establish a Jesuit school in Dublin. Plunket showed amazing diligence in furthering the cause of his Church. He was in very straitened circumstances, the revenue of his see being only £62 in good years. The repressive measures following on the Test Act bore hardly upon him, and in December 1678 he was imprisoned in Dublin Castle for six weeks. Accused of a share in the Irish branch of the " Popish Plot," he was brought to London, and in June 1681 arraigned in the King's Bench, charged with conspiring to bring a French army to Carlingford. He made a good defence, but on the absurdest of evidence the jury convicted him of treason, and on the 1st of July he was hanged, drawn and quartered at Tybum.

PLUNKET, WILLIAM CONYNGHAM PLUNKET, ist Baron (1764-1854), Irish lawyer, orator and statesman, was born in the county of Fermanagh in July 1764. 1 He was educated first by his father, a Presbyterian minister of considerable ability and reputation, and in 1779 he became a student of Trinity College, Dublin. He was conspicuous as the acknowledged leader of the Historical Society, the debating club of Trinity College, then full of young men of remarkable promise. Having entered Lincoln's Inn in 1784, Plunket was called to the Irish bar in 1787. He gradually obtained a considerable practice in equity; and was made a king's counsel in 1797.

1 The Irish Plunkets are distinguished by the spelling of the name from the Plunketts of the families of the barons Dunsany (cr. 1439) and the" earls of Fingall (cr. 1628), though the earlier members of these houses are often given the spelling of Plunket.

In 1798 he entered the Irish parliament as member for Charle- mont. He was an anti- Jacobin Whig of the school of Burke, not ungracefully filled with a. fervent Irish patriotism. But he was a sincere admirer of the constitutional government of England as established in 1688; he even justified the ascendancy it had given to the Established Church, although he thought that the time had arrived for extending toleration to Roman Catholics and dissenters. To transfer it to Ireland as thus modified, and under an independent legislature, was the only reform he sought for his country; he opposed the union because he thought it incompatible with this object.

When Plunket entered the Irish parliament, the Irish Whig party was almost extinct, and Pitt was feeling his way to accomplish the union. In this he

was seconded ably by Lord Castlereagh, by the panic caused by a wild insurrection, and by the secession of Grattan from politics. When, however, the measure was brought forward, among the ablest and fiercest of its adversaries was Plunket, whose powers as a great orator were now universally recognized. His speeches raised him immediately to the front rank of his party; and when Grattan re-entered the moribund senate he took his seat next to Plunket, thus significantly recognizing the place the latter had attained.

After the union Plunket returned to the practice of his profession, and became at once a leader of the equity bar. In 1803, after Emmet's rebellion, he was selected as one of the Crown lawyers to prosecute the unfortunate enthusiast, and at the trial, in summing up the evidence, delivered a speech of remarkable power, which shows his characteristic dislike of revolutionary outbursts. For this speech he was exposed to much unmerited obloquy, and more especially to the abuse of Cobbett, against whom he brought a successful action for damages. In 1803, in Pitt's second administration, he became solicitor-general, and in 1805 attorney-general for Ireland; and he continued in office when Lord Grenville came into power in 1806. Plunket held a seat in the Imperial parliament during this period, and there made several able speeches in favour of Catholic emancipation, and of continuing the war with France; but when the Grenville cabinet was dissolved he returned once more to professional life.

In 181 2, having amassed a considerable fortune, he re-entered parliament as member for Trinity College, and identified himself with the Grenville or anti-Gallican Whigs. He was soon acknow- ledged as one of the first orators, if not the first, of the House of Commons. His reverence for the English constitution in church and state, his steady advocacy of the war with Napoleon, and his antipathy to anything like democracy made him popular with the Tory party. In 1822 Plunket was once more attorney-general for Ireland, with Lord Wellesley as lord-lieutenant. One of his first official acts was to prosecute for the " bottle riot," an attempt on his part to put down the Orange faction in Ireland. He strenuously opposed the Catholic Association, which about this time, under the guidance of O'Connell, began its agitation. In 1825 he made a powerful speech against it; thus the curious spectacle was seen of the ablest champion of an oppressed church doing all in his power to check its efforts to emancipate itself.

In 1827 Plunket was made master of the rolls in England; but, owing to the professional jealousy of the bar, who regarded an Irishman as an intruder, he resigned in a few days. Soon afterwards he became chief justice of the common pleas in Ireland, and was then created a peer of the United Kingdom. In 1830 he was appointed lord chancellor of Ireland, and held

the office, with an interval of a few months only, until 1841, when he finally retired from public life. He died on the 4th of January 1854, and was succeeded by his eldest son, the bishop of Tuam (1 792-1866) as 2nd baron. The 4th baron (1828-1897) was bishop of Meath and afterwards archbishop of Dublin and primate of Ireland, and an active ecclesiastical statesman; and his younger brother David Plunket (b. 1838), solicitor-general for Ireland in 1875-1877, and first commissioner of works in the Unionist administration of 1885-1892, was in 189s created Baron

Rathmore. William Lee Plunket, 5th baron (b. 1864), was governor of New Zealand from 1904 to 1910.

PLUNKETT, SIR HORACE CURZON (1854-), Irish politician, third son of Edward, 16th baron Dunsany, was born on the 24th of October 1854, and was educated at Eton and University College, Oxford, of which college he became honorary fellow in 1909. He spent ten years (1879-1889) ranching in Montana, U.S.A., where, together with a substantial fortune, he acquired experience that proved invaluable in the work of agricultural education, improvement and development, to which he devoted himself on his return to Ireland in 1889. At first Plunkett resolved to hold himself aloof from party politics, and he set himself to bring together men of all political views for the promotion of the material prosperity of the Irish people. In 1894 he founded the Irish Agricultural Organization Society, which accomplished a work of incalculable importance by introducing co-operation among Irish farmers, and by proving to the latter the benefits obtainable through more economical and efficient management. But already in 1892 he had felt compelled to abandon his non-political attitude, and he entered parliament as Unionist member for south Dublin (county). Continuing, however, his policy of conciliation, Plunkett suggested in August 1895 that a few prominent persons of various political opinions should meet to discuss and frame a scheme of practical legislation. The outcome of this proposal was the forma- tion of the " Recess Committee " with Plunkett as chairman, which included men of such divergent views as the earl of Mayo, Mr John Redmond, The O'Conor Don and Mr Thomas Sinclair. In July 1896 the Recess Committee issued a report, of which Plunkett was the author, containing valuable accounts of the systems of state aid to agriculture and of technical instruction in foreign countries. This report, and the growing influence of Plunkett, who became a member cf the Irish Privy Council in 1897, led to the passing of an act in 1899 which established a department of agriculture and technical instruction in Ireland, of which the chief secretary was to be president ex

officio. Plun- kett was appointed vice-president, a position which gave him control of the department's operations. It was intended that the vice-president should be responsible for the department in the House of Commons, but at the general election of 1900 Plunkett lost his seat. An extensively signed memorial, sup- ported by the Agricultural Council, prayed that he might not be removed from office, and at the government's request he continued to direct the policy of the department without a seat in parliament. He was created K.C.V.O. in 1903.

On the accession of the Liberal party to power in 1906, Sir Horace Plunkett was requested by Mr Bryce, the new chief secretary, to remain at the head of the department he had created. But, having sat in the House of Commons as a Unionist, Plunkett had incurred the hostility of the Nationalist party, whose resentment had been further excited by the bold statement of certain unpalatable truths in his book, Ireland in the New Century (1904), in which he described the economic condition and needs of the country and the nature of the agricultural improvement schemes he had inaugurated. A determined effort was therefore made by the Nationalists to drive from office the man who had probably done more than any one else of his generation to benefit the Irish people; and in moving a resolution in the House of Commons with this object in 1907, a Nationalist declared that his party " took their stand on the principle that the industrial revival could only go hand in hand with the national movement." The government gave way, and in the summer of 1907 Sir Horace Plunkett retired from office. Since the year 1900 a grant of about £4000 had been made annually by the Department of Agriculture to the Irish Agricultural Organization Society; but the new vice-president, Mr T. W. Russell, who had been himself previously a member of the Unionist administration, withdrew in 1907 this modest support of an association with which Sir Horace Plunkett was so closely identified, and of which he continued to be the guiding spirit. In addition to the publication mentioned, Sir Horace Plunkett published Noblesse Oblige: An Irish

Rendering (1908), and Rural Life Problems of the United States

(1910).

See Sir Horace Plunkett, Ireland in the New Century (London, 1904); Report of the Committee of Inquiry: Department of Agriculture and Technical Instruction {Ireland), (Cd. 3572) (1907).

PLURALISM (Lat. plus, plures, many, several), a term used generally in the sense of plurality (see below), and in philosophy for any theory which postulates more than one absolutely dis- tinct being or principle of being, opposed to monism. Plural- istic systems are based on the difficulty of

reconciling with the monistic principle the principles of variety and freewill. The chief difficulty which besets any such view is that if the elements are absolutely independent, the cosmos disappears and we are left with chaos: if, on the other hand, there is interrelation (as in Lotze's system), the elements are not ultimate 'in any intelligible sense.

PLURALITY (O. Fr. pluralite, Late Lat. pluralitas, plural number), in a general sense, a word denoting more than one; applied particularly to the holding of two or more offices by the same person (called then a pluralist). In ecclesiastical law, plurality or the holding of more than one benefice or preferment was always discountenanced, and is now prohibited in England by the Pluralities Act 1838, as amended by the Pluralities Act 1850 and the Pluralities Acts Amendment Act 1885. By the latter act a provision was made that two benefices might be held together, by dispensation of the archbishop on the recom- mendation of the bishop, if the churches be within four miles of each other, and if the annual value of one does not exceed £200 (see Benefice). It was formerly a practice to evade enactments against plurality by means of commendams, i.e. by committing or commending a benefice to a holder of other benefices until an incumbent should be provided for it. Com- mendams were abolished by the Ecclesiastical Commissioners Act 1836 (6 & 7 Will. IV. c. 77, § 18). See also Colt v. Bishop of Coventry, 1613, Hob. 14c seq., where much learning on the subject will be found.

In elections, particularly where there are three or more candidates, and no one candidate receives an absolute majority of votes, the excess of votes polled by the first candidate over the second is often termed plurality, especially in the United States.

PLUSH (Fr. peluche), a textile fabric having a cut nap or pile the same as fustian or velvet. Originally the pile of plush consisted of mohair or worsted yarn, but now silk by itself or with a cotton backing is used for plush, the distinction from velvet being found in the longer and less dense pile of plush. The material is largely used for upholstery and furniture purposes, and is also much employed in dress and millinery.

PLUTARCH (Gr. nXourapxos) (c. a.d. 46-120), Greek bio- grapher and miscellaneous writer, was born at Chaeronea in Boeotia. After having been trained in philosophy at Athens he travelled and stayed some time at Rome, where he lectured on philo- sophy and undertook the education of Hadrian. 1 Trajan bestowed consular rank upon him, and Hadrian appointed him procurator of Greece. He died in his native town, where he was archon and priest of the Pythian Apollo. In the Consolation to his Wife on the loss of his young daughter, he tells us (§ 2) that they had brought up four sons besides, one of whom was called by the name of Plutarch's brother,

Lamprias. We learn incidentally from this treatise (§ 10) that the writer had been initiated in the secret mysteries of Dionysus, which held that the soul was imperishable. He seems to have been an independent thinker rather than an adherent of any particular school of philosophy. His vast acquaintance with the literature of his time is every- where apparent.

The celebrity of Plutarch, or at least his popularity, is mainly founded on his forty-six Parallel Lives. He is thought to have written this work in his later years after his return to Chaeronea. His knowledge of Latin and of Roman history he must have partly derived from some years' residence in Rome and other

1 There seems no authority for this statement earlier than the middle ages.

parts of Italy, 1 though he says he was too much engaged in lecturing (doubtless in Greek, on philosophy) to turn his attention much to Roman literature during that period.

Plutarch's design in writing the Parallel Lives — for this is the title which he gives them in dedicating Theseus and Romulus to Sosius Senecio — appears to have been the publication, in successive books, of authentic biographies in pairs, taking together a Greek and a Roman. In the introduction to the Theseus he speaks of having already issued his Lycurgus and Numa, viewing them, no doubt, as bearing a resemblance to each other in their legislative character. Theseus and Romulus are compared as the legendary founders of states. In the opening sentence of the life of Alexander he says that " in this book he has written the lives of Alexander and Caesar " (Julius), and in his Demosthenes, where he again (§ i) mentions his friend Sosius, be calls the life of this orator and Cicero the fifth book. 2 It may therefore fairly be inferred that Plutarch's original idea was simply to set a Greek warrior, statesman, orator or legislator side by side with some noted Roman celebrated for the same qualities, or working under similar conditions. Nearly all the lives are in pairs; but the series concluded with single biographies of Artaxerxes, Aratus (of Sicyon), Galba and Otho. In the life of Aratus, not Sosius Senecio, but one Polycrates, is addressed.

The Lives are works of great learning and research, long lists of authorities are given, and they must for this very reason, as well as from their considerable length, have taken many years in compilation. It is true that many of the lives, especially of Romans, do not show such an extent of

research. But Plutarch must have had access to a great store of books, and his diligence as an historian cannot be questioned, if his accuracy is in some points impeached. From the historian's point of view the weakness of the biographies is that their interest is primarily ethical. The author's sympathy with Doric characters and institutions is very evident; he delights to record the exploits, the maxims and virtues of Spartan kings and generals. This feeling is the key to his apparently unfair and virulent attack on Herodotus, who, as an Ionian, seemed to him to have exaggerated the prowess and the foresight of the Athenian leaders.

The voluminous and varied writings of Plutarch exclusive of the Lives are known under the common term Opera moralia. These consist of above sixty essays, some of them long and many of them rather difficult, some too of very doubtful genuine- ness. Their literary value is greatly enhanced by the large number of citations from lost Greek poems, especially verses of the dramatists, among whom Euripides holds by far the first place. The principal treatises in the Opera moralia are the following: —

On the Education of Children (regarded as spurious by some) recommends (i) good birth, and sobriety in the father; (2) good disposition and good training are alike necessary for virtue; (3) a mother ought to nurse her own offspring, on the analogy of all animals; (4) the paedogogus must be honest and trustworthy; (5) all the advantages of life and fortune must be held secondary to education; (6) mere mob-oratory is no part of a good education; (7) philosophy should form the principal study, but not to the exclusion of the other sciences ; (8) gymnastics are to be practised ; (9) kindness and advice are better than blows; (10) over-pressure in learning is to be avoided, and plenty of relaxation is to be allowed ;

(11) self-control, and not least over the tongue, is to be learned;

(12) the grown-up youth should be under the eye and advice of his father, and all bad company avoided, flatterers included ; (13) fathers should not be too harsh and exacting, but remember that they were themselves once young; (14) marriage is recommended, and without disparity of rank; (15) above all, a father should be an example of virtue to a son.

How a Young Man ought to Hear Poetry is largely made up of quotations from Homer and the tragic poets. The points of the essay are the moral effects of poetry as combining the true with the false, the praises of virtue and heroism with a mythology depraved and unworthy of gods, tlBtolrt Spuai. i>, o!>k eiaip Beol (§21).

1 Demosth. § 2. Plutarch's orthography of Roman words and names is important as bearing on the question of pronunciation. A curious example

(De fortun. Rem. § 5) is Virtutis et honoris, written OfoproOrts re nai 'OvSipis. The Volsci are OtioXoOorot, ibid.

! It is quite evident that the original order of the books has been altered in the series of Lives as we now have them.

*On the Right Way of Hearing (ir*pi toO &koI > *i.v) advocates the listening in silence to what is being said, and not giving a precipitate reply to statements which may yet receive some addition or modifica- tion from the speaker (§ 4). The hearer is warned not to give too much weight to the style, manner or tone of the speaker (§7), not to be either too apathetic or too prone to praise, not to be impatient if he finds his faults reproved by the lecturer (| 16). He concludes with the maxim, " to hear rightly is the beginning of living rightly," and perhaps he has in view throughout his own profession as a lecturer.*

How a Flatterer may be Distinguished from a Friend is a rather long and uninteresting treatise. The ancient writers are full of warnings against flatterers, who do not seem to exercise much influence in modern society. The really dangerous flatterer (§ 4) is not the parasite, but the pretender to a disinterested friendship — one who affects similar tastes, and so insinuates himself into your confidence. Your accomplished flatterer does not always praise, but flatters by act, as when he occupies a good seat at a public meeting for the express purpose of resigning it to his patron (§ 15). A true friend, on the contrary, speaks freely on proper occasions. A good part of the essay turns on irapprjaia, the honest expression of opinion. The citations, which are fairly numerous, are mostly from Homer.

How one may be Conscious of Progress in Goodness is addressed to Sosius Senecio, who was consul in the last years of Nerva, and more than once (99, 102, 107) under Trajan. If, says Plutarch, a man could become suddenly wise instead of foolish, he could not be ignorant of the change; but it is otherwise with moral or mental processes. Gradual advance in virtue is like steady sailing over a wide sea, and can only be measured by the time taken and the forces applied (§3). Zeno tested advance by dreams (§ 12); if no excess or immorality presented itself to the imagination of the sleeper, his mind had been purged by reason and philosophy. When we love the truly good, and adapt ourselves to their looks and manners, and this even with the loss of worldly prosperity, then we are really getting on in goodness ourselves (§ 15). Lastly, the avoidance of little sins is an evidence of a scrupulous conscience (§17).

How to get Benefit out of Enemies argues that, as primitive man had savage animals to fight against, but learnt to make use of their skins for clothing and their flesh for food, so we are bound to turn even our enemies to some

good purpose. One service they do to us is to make us live warily against plots; another is, they induce us to live honestly, so as to vex our rivals not by scolding them, but by making thein secretly jealous of us (§ 4). Again, finding fault leads us to consider if we are ourselves faultless, and to be found fault with by a foe is likely to be plain truth speaking, ixovarkav iarl vapi. t&v ixOp&v ti\v iMfiuav (§ 6). Jealousies and strifes, so natural to man, are diverted from our friends by being legitimately expended on our enemies (§ 10).

On Having Many Friends, On Chance, On Virtue and Vice, are three short essays, the first advocating the concentration of one's affections on a few who are worthy (roils anions i\ias Sii>Keu>, §4), rather than diluting them, as it were, on the many; the second pleads that intelligence, 0p6n;axs, not mere luck, is the ruling principle of all success; the third shows that virtue and vice are but other names for happiness and misery. All these are inter- spersed with citations from the poets, several of them unknown from other sources.

A_ longer treatise, well and clearly written, and not less valuable for its many quotations, is the Consolation addressed to Apollbnius (considered spurious by some) on the early death of his " generally beloved and "religious and dutiful son." Equality of mind both in prosperity and in adversity is recommended (§ 4), since there are " ups and downs " (v\j/os ko.1 Taimcorijs) in life, as there are storms and calms on the sea, and good and bad seasons on the earth. That man is born to reverses he illustrates by citing fifteen fine verses from Menander (§ 5). The uselessness of indulging in grief is pointed out, death being a debt to all and not to be regarded as an evil (§§ 10-12), Plato's doctrine is cited (§ 13) that the body is a burden and an impediment to the soul. Death may be annihilation, and therefore the dead are in the same category as the unborn (§ 15). The lament- ing a death because it is untimely or premature has something of selfishness in it (§ 19), besides that it only means that one has arrived sooner than another at the end of a common journey. If a death is more grievous because it is untimely, a new-born infant's death would be the most grievous of all (§ 23). One who has died early may have been spared many woes rather than have been deprived of many blessings; and, after all, to die is but to pay a debt due to the gods when they ask for it (§ 28). Examples are given of fortitude and resignation under such affliction (§ 33). If, says the author in conclusion, there is a heaven for the good hereafter, be sure that such a son will have a place in it. The author has borrowed from the IlepJ irkvBovs of Crantor.

Precepts about Health commences as a dialogue, and extends to some length as a lecture. It is technical and difficult throughout, and contains but little that falls in with modern ideas. Milk, he says, should be taken for

food rather than for drink, and wine should not be indulged in after hard work or mental effort, for it does but tend to increase the bodily disturbance (§ 17). Better than purges or emetics is a temperate diet, which induces the bodily

functions to act of themselves (§ 20). Another wise saying is that idleness does not conduce to health (068′ Ξ0« <

Advice to the Married is addressed to his newly wedded friends Polhanus and Eurydice. It is simply and plainly written, and consists chiefly of short maxims and anecdotes, with but few citations from the poets.

The Banquet of the Seven Wise Men (considered spurious by some) is a longer treatise, one of the several ” Symposia ” or imaginary conversations that have come down to us. It is supposed to be given by Periander in the public banqueting-room {iariarbpiov) near the harbour of Corinth (Lechaeum) on the occasion of a sacrifice to Aphrodite. The whole party consisted of ” more than twice seven, the friends of the principal guests being also present. Like Plato s Symposium this treatise takes the form of a narrative of what was said and done, the narrator being one Diccles, a friend of Perian- der, who professes to give Nicarchus a correct account as having been present. The dinner was simple, and in contrast with the usual splendour of ” tyrants ” (§ 4). The conversation turns on various topics; Solon is credited with the remarkable opinion that

a king or tyrant is most likely to become celebrated it he makes a democracy out ot a monarchy” (§ 7). There is much playful banter throughout, but neither the wit nor the wisdom seems of a very high standard. Solon delivers a speech on food being a necessity rather than a pleasure of life (§ 16), and one Gorgus, a brother of the host, comes in to relate how he has just shaken hands with Arion, brought across the sea on the back of a dolphin (§ 18), which brings on a dis- cussion about the habits of that creature. Among the speakers are Aesop, Anacharsis, Thales, Chilo, Cleobulus and one Chersias, a poet.

A short essay On Superstition contains a good many quotations from the poets. It opens with the wise remark that ignorance about the gods, which makes the obstinate man an atheist, also begets credulity in weak and pliant minds. The atheist fears nothing because he believes nothing; the superstitious man believes there are gods, but that they are unfriendly to him (j 2). A man who fears the gods 13 never free from fear, whatever he may do or what- ever may befall him. He extends his fears beyond his death, and believes in the ” gates of hell,” and its fires, in the darkness, the

ghosts, the infernal judges, and what not (§ 4). The atheist does not believe in the gods; the superstitious man wishes he did not, but tears to disbelieve (§11). On the whole, this is a most interesting treatise.

On I sis and Osiris is a rather long treatise on Egyptian symbolism, interesting chiefly to students of Egyptology. It gives an exposition ot the strange myths and superstitions of this ancient solar cult, including a full account of the great antagonist of Osiris, Typhon, or the Egyptian Satan. Plutarch thus lays down the Zoroastrian theory of good and bad agencies (§ 45) : " If nothing can happen without cause, ana good cannot furnish cause for evil, it follows that the nature of evil, as of good, must have an origin and principle of its own.

On the Cessation of Oracles is a dialogue, discussing the reasons why divine inspiration seemed to be withdrawn from the old seats of prophetic lore. The real reason of their decline in popularity is probably very simple; when the Greek cities became Roman provinces the fashion of consulting oracles fell off, as unsuited to the more practical influences of Roman thought and Roman politics. the question is discussed whether there are such intermediate beings as daemons, who according to Plato communicate the will ot the gods to men, and the prayers and vows of men to the gods.

1 he possibility of a plurality of worlds is entertained, and of the planets being mere or less composed of the essence of the five elements, fire, ether, earth, air and water (§ ^7). The whole treatise is metaphysical, but it concludes with remarks on the exhalations at Delphi having different effects on different people and at different times The ancient notion doubtless was that the vapour was the breath of some mysterious being sent up from the under-world.

On the Pythian Responses, why no longer given in Verse, is also a dialogue, the first part of which is occupied mainly with conver- sation and anecdotes about the statues and other offerings at Delphi. It is rather an amusing essay, and may be regarded as a kind of appendix to the last. The theory propounded (§ 24) is that verse was the older vehicle of philosophy, history and religion, but that plain prose has become the later fashion, and therefore that oracles are now generally delivered "in the same form as laws speak to citizens, kings reply to their subjects, and scholars hear their teachers speak. Discredit, too, was brought on the verse-oracle by the tacihty with which it was employed by impostors (§ 25). Moreover verse is better suited to ambiguity, and oracles nowadays have less need to be ambiguous (§ 88).

On the E at Delphi is an inquiry why that letter or symbol was written on or in the Delphic temple. Some thought it represented the number five,

others that it introduced the inquiry of oracle- seekers, // sp-and-so was to be done ; while one of the speakers, Am- monius, decides that it means El, " thou art," an address to Apollo containing the predication of existence (§ 17).

On the Face of the Moon's Disk is a long and curious if somewhat tntling speculation, yet not without interest from its calculations

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of the sizes and the distance from earth of the sun and moon (§10) and from the contrast between ancient lunar theories and modern mathematics. The cause of the moon's light, its peculiar colour the possibility of its being inhabited and many kindred questions are discussed in this dialogue, the beginning and end of which are alike abrupt. Some of the " guesses at truth " are very near the mark, as when :t is suggested (§§ 21-22) that the moon, like the earth, contains deep recesses into which the sun's light does not descend, and the appearance of the " face " is nothing but the shadows of streams or of deep ravines.

On the Late Vengeance of the Deity is a dialogue consequent on a supposed lecture by Epicurus. An objection is raised to the ordinary dealings of providence, that long-delayed punishment encourages the sinner and disappoints the injured, the reply to which is (§ 5) that the god sets man an example to avoid hasty and precipitate resentment, and that he is willing to give time for repentance (§ 6). Moreover, he may wish to await the birth of good progeny from erring parents (§ 7). Another fine reflection is that sin has its own punishment in causing misery to the sinner, and thus the longer the life the greater is the share of misery (S 9) 1 he essay cone hides with a long story about one Thespesius, and the treatment which he saw, during a trance, of the souls in the other world.

On Fate (probably spurious) discusses the law of chance as against the overruling of providence. This treatise ends abruptly ; the point ot the argument is that both fate and providence have their due influence in mundane affairs (§9), and that all things are constituted for the best.

On pie Genius of Socrates is a long essay, and, like so many of the rest, in the form of a dialogue. The experiences of one Timarchus and his supernatural visions in the cave of Trophonius, are related at length in the Platonic style (§ 22), and the true nature of the oaigovt, is revealed to him. They are the souls of the just, who still retain regard for human affairs and assist the good in their efforts after virtue (§ 28). The dialogue ends with an interesting narrative of the concealment of Pelopidas and some of the Theban conspirators against the Spartans in the house of Gharon.

On Exile is a fine essay, rendered the more interesting from its numerous quotations from the poets, including several from the Fhoemssae. Man is not a plant that grows only in one soil; he belongs to heaven rather than to earth, and wherever he goes there are the same sun, the same seasons, the same providence, the same laws of virtue and justice (§ 5). There is no dfecredit in being driven trom ones country; Apollo himself was banished from heaven and condemned to live for a time on earth (§ 18).

The Consolation to his Wife, on the early death of their only daughter Timoxena (§ 7), is a feeling and sensible exhortation to moderate her grief.

Nine books of Symposiaca extend to a great length, discussing inquiries (ipoˆXˆara) on a vast number of subjects. The general treatment of these, in which great literary knowledge is displayed, is not unlike the style of Athenaeus.

The Amorous Man is a dialogue of some length, describing a con- versation on the nature of love held at Helicon, pending a quin- quennial feast of the Thespians, who specially worshipped that deity along with the Muses. It is amply illustrated: by poetical quotations. In & 24 mention is made of the emperor Vespasian. It is followed by a short treatise entitled Love Stories, giving a few narratives of sensational adventures of lovers.

Short Sayings (i.Toˆ8ky M ara), dedicated to Trajan, extend to a great length, and are divided into three parts: (1) of kings and commanders (including many Roman); (2) of Spartans; %) of Spartan women (a short treatise on Spartan institutions being interposed between the last two). The names of the authors are added, and to some of them a large number of maxims are attributed

A rather long treatise On the Virtues of Women contains a series ot narratives of noble deeds done by the sex in times of danger and trouble, especially from " tyrants." Many of the stories are interesting, ana the style is easy and good.

Another long and learned work bears the rather obscure title K&t>a

Parallels (spurious) are a series of similar incidents which occurred respectively to Greeks and Romans, the Greek standing first and the Roman counterpart following. Many of the characters are mytho- logical, though Plutarch regards them as historical.

On the Fortune of the Romans discusses whether, on the whole, good luck or valour had more influence in giving the Romans the supremacy. This is followed by two discourses on the same ?jˆ St J° n ? s a PP licable to the career of Alexander the Great, and Whether the Athenians were more

renowned for War or for Wisdom? The conclusion is (§ 7) that it was not so much by the fame of their poets as by the deeds of their heroes that Athens became renowned.

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PLUTARCH— PLUTO

Gryllus is a most amusing dialogue, in which Circe, Odysseus and a talking pig take part. Odysseus wishes that all the human beings that have been changed by the sorceress into bestial forms should be restored ; but the pig argues that in moral virtues, such as true bravery, chastity, temperance and general simplicity of life and contentment, animals are very far superior to man.

Whether Land Animals or Water Animals are the Cleverer is a rather long dialogue on the intelligence of ants, bees, elephants, spiders, dogs, &c, on the one hand, and the crocodile, the dolphin,, the tunny and many kinds of fish, on the other. This is a good essay, much in the style of Aristotle's History of Animals.

On Flesh-eating, in two orations, discusses the origin of the practice, viz. necessity, and makes a touching appeal to man not to destroy life for mere gluttony (§ 4). This is a short but very sensible and interesting argument. Questions on Plato are ten in number, each heading subdivided into several speculative replies. The subjects are for the most part metaphysical; the essay is not long, but it concerns Platonists only. Whether Water or Fire is more Useful is also short ; after discussing the uses of both elements it decides in favour of the latter, since nothing can exceed in im- portance the warmth of life and the light of the sun. On Primary Cold is a physical speculation on the true nature and origin of the quality antithetical to heat. Physical Reasons (Quaestiones Naturales) are replies to inquiries as to why certain facts or pheno- mena occur, e.g. " Why is salt the only flavour not in fruits ? " " Why do fishing-nets rot in winter more than in summer ? " " Why does pouring oil on the sea produce a calm ? " On the Opinions accepted by the Philosophers (spurious), in five books, is a valuable compendium of the views of the Ionic school and the Stoics on the phenomena of the universe and of life. On the Ill-nature of Herodotus is a well-known critique of the historian for his unfairness, not only to the Boeotians and Lacedaemonians, but to the Corinthians and other Greek states. It is easy to say that this essay " neither requires nor merits refutation "; but Plutarch knew history, and he writes like one who thoroughly understands the charges which he brings against the historian. The Lives of the Ten Orators from Antiphon to Dinarchus (now considered spurious) are biographies of various lengths, compiled, doubtless, from

materials now lost.

Two rather long essays, Should a Man engage in Politics when he is no longerYoung, and Precepts for Governing(iro\iTiKa irapayyiXnaTa), are interspersed with valuable quotations. In favour of the former view the administrations of Pericles, of Agesilaus, of Augustus, are cited (§ 2), and the preference of older men for the pleasures of doing good over the pleasures of the senses (§ 5). In the latter, the true use of eloquence is discussed, and a contrast drawn between the brilliant and risky and the slow and safe policy (§ 10). The choice of friends, and the caution against enmities, the dangers of love, of gain and of ambition, with many topics of the like kind, are sensibly advanced and illustrated by examples.

(F.A. P.; J. M. M.) Bibliography. — Editio princeps, by H. Stephanus (1572); other complete editions by J. J. Reiske (1774-1782), J. G. Hutten (1791- 1804), T. Dohner and F. Diibner (1846-1855). Of the Lives, there are editions by A. Coray (1809-1814), C. Sintenis (1839-1846; ed. min., 1874-1881), and of many separate lives by Siefert-Blass, Sintenis-Fuhr, Holden, Hardy and others. There are many English translations, of which the most popular is that by John and William Langhorne; also the old French version by Jacques Amyot (1559) from which Sir Thomas North's (1579) was made, newly edited by G. Wyndham (1895) ; many of the Roman lives have been trans- lated, with notes, by George Long. The Moralia has been edited by D. Wyttenbach (1795-1830), and G. N. Bernardakes (1888-1896). The old English translation by Philemon Holland (1603) has been revised by C. W. King and A. R. Shilleto in Bohn's Classical Library (1882-1888), and a later translation by various hands (London, 1684-1694), edited by W. W. Goodwin with introduction by R. W. Emerson, has been republished at Cambridge, Massachusetts (1874- 1878). Mention may also be made of P. Holland's Romane Questions, edited with introductory dissertations by F. B. Jevons (1892) ; Roman Problems, with essay on " Roman Worship and Belief," by G. C. Allen (1904); De la Musique, ed. H. Weil and Th. Reinach (1900); J. Oakesmith, The Religion of Plutarch as expounded in his Ethics (1902); Archbishop Trench, A Popular Introduction to Plutarch (1873) ; O. Greard, De la Morale de Plutarque (1866) ; R. Volkmann, Leben, Schriften und Philosophie des Plutarch (1869). The earlier literature of Plutarch is very extensive, for which W. Engelmann, Scriptores graeci (1881), may be consulted.

PLUTARCH, of Athens (c. 35°-43°), Greek philosopher, head of the Neoplatonist school at Athens at the beginning of the 5th century, was the son of Nestorius and father of Hierius and Asclepigenia, who were his colleagues in the school. The origin of Neoplatonism in Athens is not known, but Plutarch and his followers (the " Platonic Succession ") claim

to be the disciples of Iamblichus, and through him of Porphyry and Plotinus. Plutarch's main principle was that the study of Aristotle must precede that of Plato, and that the student should be taught to realize primarily the fundamental points of agree-

ment between them. With this object he wrote a commentary on the De anima which was the most important contribution to Aristotelian literature since the time of Alexander of Aphro- disias. His example was followed by Syrianus and others of the school. This critical spirit reached its greatest height in Proclus, the ablest exponent of this latter-day syncretism. Plutarch was versed in all the theurgic traditions of the school, and believed in the possibility of attaining to communion with the Deity by the medium of the theurgic rites. Unlike the Alex- andrists and the early Renaissance writers, he maintained that the soul which is bound up in the body by the ties of imagina- tion and sensation does not perish with the corporeal media of sensation. In psychology, while believing that Reason is the basis and foundation of all consciousness, he interposed between sensation and thought the faculty of Imagination, which, as distinct from both, is the activity of the soul under the stimulus of unceasing sensation. In other words, it provides the raw material for the operation of Reason. Reason is present in children as an inoperative potentiality, in adults as working upon the data of sensation and imagination, and, in its pure activity, it is the transcendental or pure intelligence of God.

See Marinus, Vita Prodi, 6, 12; Zeller's History of Greek Philo- sophy; Bouillet, Enneades de Plotin, ii. 667-668; Windelband, History of Philosophy (trans. J. H. Tufts, p. 225).

PLUTO (JSXoinuv), in Greek mythology, the god of the lower world. His oldest name was Hades, Aides or Aiidoneus, " the Unseen." He was the son of Cronus and Rhea, and brother of Zeus and Poseidon. Having deposed Cronus, the brothers cast lots for the kingdoms of the heaven, the sea, and the infernal regions. The last, afterwards known as Hades from their ruler, fell to Pluto. Here he ruled with his wife Persephone over the other powers below and over the dead. He is stern and pitiless, deaf to prayer or flattery, and sacrifice to him is of no avail; only the music of Orpheus prevailed upon him to restore his wife Eurydice. His helmet, given him by the Cyclopes after their release from Tartarus, rendered him invisible (like the Tarn — or Nebelkappe of German mythology). He is hated and feared by gods and men, who, afraid to utter his name, both in daily life and on solemn occasions make use of euphe- mistic epithets: Polydectes (the receiver of many), Clymenus (the Illustrious), Eubulus (the giver of good counsel). Later, owing to his connexion with Persephone and under the influence of the Eleusinian mysteries, the idea of his character, underwent a radical change. Instead of the life-hating god of death, he became a

beneficent god, the bestower of grain, minerals, and other blessings produced in the depths of the earth. In this aspect he was called Pluto, the " giver of wealth " (a name that first occurs in the Attic poets of the 5th century), and at most of the centres of his cult he was so worshipped; at Elis alone he was Hades, the god of the dead. The plants sacred to him were the cypress and narcissus; black victims were sacrificed to him, not white, like those offered to the other gods. In art he was represented like Zeus and Poseidon; his features are gloomy, his hair falls over his forehead; his attributes are a sceptre and Cerberus; he carries the key of the world below (cf. the epithet irvXaprris, " keeper of the gate "), and is frequently in company with Persephone. He is sometimes represented as an agri- cultural god, carrying a cornu copiae and a two-pronged fork. Amongst the Romans Hades was usually called Dis pater (the " wealthy father ") and Orcus, although the name Pluto is often used. Orcus, however, was rather the actual slayer, the- angel of death, while Father Dis was the ruler of the dead. The Etruscan god of death was represented as a savage old man with wings and a hammer; »t the gladiatorial games of Rome a man masked after this fashion removed the corpses from the arena. In Romanesque folk-lore Orcus (possibly English " ogre," q.v.) has passed into a forest-elf, a black, hairy, man-eating monster, upon whose house children lost in the woods are apt to stumble, and who sometimes shows himself kindly and helpful.

The " house of Hades " was a dreadful abode deep down in the earth, and the god was invoked by rapping on the ground. According

to another view, the realm of Hades was beyond the ocean in the far west, which to the Greek was always the region of darkness and death, as the east of light and life. This is the view of Hades presented in the Odyssey. Besides this gloomy region, we find in another passage of the Odyssey (iv. 561 seq.) a picture of Elysium, a happy land at the ends of the earth, where rain and snow fall not, but the cool west wind blows and men live at ease. After Homer this happy land, the abode of the good after death, was known as the Isles of the Blest (g.n.). 1 But in the oldest Greek mythology the " house of Hades " was simply the home of the dead, good and bad alike, who led a dim and shadowy reflection of life on earth.

See article " Hades," in Roscher's Lexikon der Mythologie; Preller- Robert, Griechische Mythologie (1894) ; L. Farnell, Cults of the Greek States, vol. iii., who regards Hades as an evolution from Zeus and his counterpart; according to J. E. Harrison, in Classical Review (Feb. 1908), Hades is the

under-world sun.

PLUTOCRACY (Gr. 7r\ouTOKparia, from irXoDros, wealth, and uparos, power), government or power exercised by the possessors of wealth, power obtained by the mere possession of riches ; hence a body or ruling class whose influence is due only to their money.

PLUTO MONKEY, a guenon, Cercopithecus (Mono) leucampyx, nearly allied to the Mona (q.v.), which takes its name from the black fur of the under-parts, passing into blackish grey on the head and back. The violet-coloured face, which has no beard, is fringed by large bushy whiskers and surmounted by a white band above the brows. The range of the species extends from the Congo and Angola to Nyasaland. (See Primates.)

PLUTUS, in Greek mythology, son of Iasion and Demeter, the personification of wealth (xXoOros). According to Aristo- phanes, he was blinded by Zeus because he distributed his gifts without regard to merit. At Thebes there was a statue of For- tune holding the child Plutus in her arms; at Athens he was similarly represented in the arms of Peace; at Thespiae he was represented standing beside Athena the Worker. Elsewhere he was represented as a boy with a cornu copiae. He is the subject of one of the extant comedies of Aristophanes, the Plutus.

PLYMOUTH, EARLS OF, a title first borne by Charles (1657-1680), an illegitimate son of the English king Charles II. by Catharine Pegge, who was created earl in 1675. The title became extinct on his death in October 1680. In 1682 Thomas Windsor Hickman-Windsor, 7th Baron Windsor de Stanwell (c. 1627-1687), who had fought for Charles I. at Naseby, was created earl of Plymouth. His father was Dixie Hickman of Kew, Surrey, and his mother, Elizabeth, was a sister of Thomas Windsor, 6th Baron Windsor de Stanwell (1596-1641); having inherited the estates of his uncle and taken the additional name of Windsor, the abeyance of the barony of Windsor de Stanwell was terminated in his favour and he became the 7th baron. From 1661-1663 he was nominally governor of Jamaica. His grandson Other (1679-1725) was the 2nd earl, and the earldom became extinct when Henry, the 8th earl, died in December 1843. Called again out of abeyance, the barony of Windsor came in 1855 to Harriet, a daughter of Other Archer, the 6th earl (1709-1833), and the wife of Robert Henry Clive (1789-1854), a younger son of Edward Clive, 1st earl of Powis. She was succeeded in 1869 by her grandson, Robert George Windsor- Clive, who became the 14th Baron Windsor. After serving as paymaster-general in 1891-1892 and first commissioner of works from 1902-1905, Lord Windsor was created earl of Plymouth in

1 The Samoan Islanders unite the two conceptions: the entrance to their spirit-land is at the westernmost point of the westernmost island, where the ghosts descend by two holes into the under-world. Long ago the inhabitants of the French coast of the English Channel believed that the souls of the dead were ferried across to Britain, and there are still traces of this belief in the folk-lore of Brittany (Tylor, Primitive Culture, ii. 64; Grimm, Deutsche Mythologie, ii. 694). In classical mythology the underground Hades prevailed over the western. It was an Etruscan custom at the foundation of a city to dig a deep hole in the earth and close it with a stone ; on three days in the year this stone was removed and the ghosts were then supposed to ascend from the lower world. In Asia Minor caves filled with mephitic vapours or containing hot springs were known as Plutonia or Charonia. The most famous entrances to the under-world were at Taenarum in Laconia, Heraclea on the Euxine, and at the Lake Avernus in Italy.

PLYMOUTH, a municipal county (1888, extended 1896) and parliamentary borough and seaport of Devonshire, England, 231 m. W.S.W. of London. Pop. (1910), 126,266. It lies at the head of Plymouth Sound, stretching westward from the river Plym towards the mouth of the Tamar, from which it is separated by the township of East Stonehouse and the borough of Devonport, the two later constituting with it the " Three Towns." The prince of Wales is lord high steward of the borough, which is divided into 14 wards, under e mayor, 14 aldermen and 42 councillors. The parliamentary borough, returning two members, is not coextensive with the municipal borough, part of the latter being in the Tavistock (county) division of Devon. The water frontage of the Three Towns consists of Plymouth Sound, with its inlets, in order from east to west, the Catwater, Sutton Pool, Mill Bay, Stonehouse Pool and the Hamoaze. The Catwater and Hamoaze are flanked on the east and west respectively by high ground, on which are built forts that command the harbour and its approaches. On the western side of the entrance to Catwater is the Citadel, founded in the reign of Henry VIII. and rebuilt by Charles II. The adjacent Hoe extends along the northern edge of the Sound, and from it can be obtained a splendid view, embracing the rugged Staddon Heights on the east and the wooded slopes of Mount Edgcumbe on the west. To the north is seen the town of Plymouth rising up to the hills known as Mannamead. On the site of an old Trinity House obelisk landmark is Smeaton's lighthouse tower, removed from its original position on the Eddystone Reef in 1884. It is now used as a wind-recording station in connexion with the adjoining Meteorological Observatory. On the Hoe there stands the striking Drake statue by Sir Edgar Boehm, and the Armada Memorial, while at the north-east end is an obelisk monument to the memory of troops engaged in the South African War. A municipal bowling-green recalls a probable early use

of the Hoe. Adjacent to the Citadel, at its south-west angle, is the Marine Biological Station, and, further west, projects the Promenade Pier. In the Sound is Drake's (formerly St Nicholas's) Island, now strongly fortified, at one time the property of the corporation, and serving in Stuart times as a place of imprison- ment of certain Plymouth Baptist ministers. Few evidences, however, of the antiquity of the town remain. Below, and to the north-east of the Citadel, is the Barbican with its " May- flower " commemoration stone, a large fish-buying trade being done on the adjacent quay, near which is the Custom House. From the Barbican winding streets lead past the old Guildhall (1800) which contained the municipal library, pending its removal to more commodious quarters in the new museum, opposite the technical and art schools, situated in the most northern part of the town. At a short distance west stands the new Guildhall, with the enlarged post office, central police station, law courts and municipal buildings in close proximity. Opened in 1874, the Guildhall is built in a bold, rather exotic, Early Pointed French style. The tower at the south-west end is 190 ft. high, and the building is ornamented with a series of coloured windows relating to events in the history of Plymouth or commemorating men and families connected with the town. The large hall contains a fine organ. In the mayor's parlour is a contemporary portrait of Sir Francis Drake and some interesting prints of the town of Plymouth.

Near the eastern entrance to Guildhall Square is St Andrews, the mother church of Plymouth, erected on the site of a chapel dedicated to the Virgin. The church is typical of the Devon- shire Perpendicular style of 1480-1520, but, though large, pre- sents few features of artistic or archaeological interest. It underwent complete restoration in 1874. The burying-ground on the north side has been levelled, and on it erected a stone monument. The church, furnished with one of the finest organs in the west of England, contains the tombs of a son of Admiral Vernon, of Sir John Skelton (a former governor of the Citadel), and of Charles Mathews the comedian, as well as portions of the bodies of Frobisher and Drake. Here Katherine of Aragon returned thanks for a safe voyage from Spain to Plymouth. In 1640 a second parish was formed with Charles

Church (1658) at its head, the last-named being popularly known as New Church, in contradistinction to St Andrews or " Old Church." The New Church is an interesting specimen of Stuart "debased" Gothic architecture. South of Andrews church is the site of a Franciscan Friary with some early 15th- century remains. Near the church are a few old houses scattered along the crooked little streets going down to the water These houses date

from Elizabethan times, but are not of any unusual mterest. The Citadel (now used as army headquarters and

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and Environs

foundation, and intermediate day and evening school and numerous primary departments. The philanthropic institutions include the enlarged South Devon and East Cornwall hospital, eye infirm- ary homoeopathic hospital, blind institution and female orphan asylum. y

The public recreation grounds, other than the Hoe, are few and small; Hartley Reservoir Grounds at the northern extremity of the town commands extensive moorland views; the Freedom Park by its plain, unfinished monument, recalls the siege of Plymouth by the Royalists in 1646, and the Beaumont Park contains the tem- porary home of the nucleus for a museum and art gallery. The

Victoria Park, reclaimed from a part of

btonehouse Creek, is under the joint ad- ministration of Plymouth, Stonehouse and Devonport.

barracks) is a fine specimen of 17th-century military architec- ture. It is an irregular bastioned pentagon in trace. It pos- sesses a fine florid classical gateway. In the centre stands a dignified Jacobean house, once the residence of the governor of Plymouth.

_ Plymouth is the seat of a Roman Catholic bishopric founded in 185 1, the cathedral, in Wyndham Street, being completed in 1858 through the efforts of Bishop Vaughan, who was the second occupant of the see (until 1902). The building is in the Early English style, and adjoining are the bishop's house and the convent of Notre Dame. In the immediate vicinity is the only Presbyterian church in the Three Towns. Noteworthy among the many Nonconformist places of worship are the Baptist chapel (George Street), with its tablet recording the imprison- ment of ministers on Drake's Island; Sherwell (Congregational) on the Tavistock Road, the most ornate in its style of architec- ture; the Wesleyan Methodist chapel in the main thoroughfare of the residential suburb of Mutley, unique among Methodist edifices in the town in respect of its fine spire. All the principal religious bodies have places for worship or for assembly in the town, and the borough has given, in popular speech, the name of

Plymouth Brethren " to one body.

In addition to the Plymouth College (for boys), there are several educational institutions administered by the borough council

sc°h m cSr3 a – SCle ˆ e ‘ art and – techni ˆ school, a mixed secondary school replacing the corporation grammar school of Elizabethan

The township of East Stonehouse, having Plymouth on the east, is separated from Devonport on the west by the Stonehouse Pool Creek, which is crossed by a toll-bridge and thoroughfare known locally as the ” Halfpenny Gate Bridge.” A manor of the Mount Edgcumbe family, East Stonehouse, is an urban district, in the administrative county of Devon, with a council of 15 members, but is united for parliamentary purposes with Devonport, with which it returns two members. Within the boundaries of Stonehouse are the Royal Naval Hos- pital (1762), the Royal Marine Barracks (179S) in Durnford Street, and the Royal William Victualling Yard (1825), the last-named having frontage on the Hamoaze, which separates the Devon from the Cornish portion of the Stonehouse manor.

The Stanehus(e) of Domesday Book ultimately passed into the bands of the Valletorts, whose hamlet of West Stone- house stood on the Cornish side of the Tamar, for (to quote Carew’s Survey) ” certaine old ruines yet remaining con- firm the neighbours’ report that near the water’s side, there stood once a towne called West stone house until the French (1350?) by fire and sword over- threw it.”

St George’s (1798) is the oldest of the three parishes of Stonehouse, and on the site of the present church stood the chapel of St George in which, during the years 1681-1682, worshipped, in addition to the English congregation, one composed, as at Plymouth, of Huguenots who fled from France at the Revocation of the Edict of Nantes.

Facing the Sound are Stone Hall and the Winter Villa. The former, occupied by the lords of the manor before the building of Mount Edgcumbe House, was originally a castellated building, and the latter was built primarily as an alternative residence for a countess of Mount Edgcumbe. A fink with the past is the Mill Bridge Causeway, over what was the ” Dead Lake,” now a road, which, at the head of Stonehouse Creek, is the second approach to the Stoke Damerel portion of Devonport. Built in 1525, it possesses a toll-gate house at which payment from vehicles is still demanded.

In addition to the Victualling Yard, with its naval ordnance department, repairing shops and armoury, the Barracks, accom- modating some 1500 men, and the Naval Hospital of 24 acres abutting on the Creek, there are within the boundaries a theatre seating over 2000 persons, the Devonport

Corporation Electricity Works, a clothing factory and part of the Great Western Railway Docks. the stationary character of the township— which from its situation is incapable of expansion— is seen from the statistics of population :(i88 1), 15,041; (1901), 15,108; (1910), 15,111.

The "Port of Plymouth" in 131 1 embraced Plympton, Modbury and Newton Ferrers, and received a customs grant

from Richard II. In 1435 sixty-five cargoes were imported, and in the reign of Elizabeth it rose to be the foremost port in England. The 18th century saw a great development of trade with Virginia and the West Indies, resulting in the establishment of a sugar-refining industry that was maintained until a recent date.

In 1749 the " town's water " was carried to the Barbican to supply shipping. The port of Plymouth, as at present constituted, embraces " the waters of Plymouth Sound and the Hamoaze, including all bays, creeks, lakes, pools, ponds and rivers as far as the tide flows within or to the northward of a straight line drawn across the entrance of Plymouth Sound from Penlee Point on the west to the Shagstone on the east." The chief water area within the limits of the port is the Sound with its inlets, the Catwater (200 acres), Sutton Pool, Mill Bay, Stone- house Pool and the Hamoaze. The Sound itself covers an area of 4500 acres and is sheltered from south-west gales by the breakwater completed in 1841 at a cost of 15 million sterling. It lies 2§ m. south of the Hoe, and is nearly a mile long, 360 ft. wide at the base and 45 ft. at the top. Its cants bend inwards at angles of 120°; at the western end is a lighthouse and at the eastern extremity is a pyramidal beacon with a cage capable of accommodating several men.

The town is served by the Great Western and the London & South-Western railways. The former company has a main line entering from the west through Devonport and going east to Exeter, having Dartmoor on the west; the latter company has a terminal station in the eastern quarter of the town, and its route to Exeter is by way of the Tamar valley, and the western and northern moorland districts.

The industries of Plymouth include soap manufacture, prepara- tion of artificial manure and sulphuric acid and paper staining. The water supply, inaugurated by Drake in 1590, and drawn from the Dartmoor watershed,

is the most important municipal under- taking. The service of electricity both for lighting and tramway traction is in the hands of the town, but the gasworks belong to a private company.

Plymouth, the Suton of Domesday, was afterwards divided into the town of Sutton Prior, the hamlet of Sutton Valletort and the tithing of Sutton Ralph, the greater part belonging to the priory of Plympton. The market, established about 1253, became in 13 n town property, with the mayor as clerk of the market. In 1292 the town first returned members to parliament. In the 14th century it was frequently the port of embarcation and of disembarcation in connexion with expeditions to France, and suffered considerably at the hands of the French. In 141 2 the inhabitants petitioned for a charter, which, after strenuous opposition from the priors of Plympton, was granted by Henry VI. in 1439. In the discovery of the New World it played a part of great importance. Cockeram, a native of the town, sailed with John Cabot in 1497. Sir John Hawkins and his father William were also natives, the former being port admiral and (in 1571) M.P. From Plymouth in 1577 Drake set out on his voyage round the world; in 1581 he became mayor and represented the borough in parliament during 1592-1593. Sir Humphrey Gilbert (M.P. 1571) sailed on his second colonizing expedition to America in 1583 from the port, and hither Drake brought the remnant of Raleigh's Virginian colony. Plymouth supplied seven ships against the Armada, and it was in the Sound that the English fleet awaited the sighting of the Spaniards. A stone on a quay at the Barbican records the fact that this was the last port touched by the Pilgrim Fathers on their voyage to America.

During the Civil War Plymouth was closely invested by the Royalists, whose great defeat is commemorated by the monu- ment at Freedom Park. It was the only town in the west that never fell into their hands. It early declared for William of Orange, in whose reign the neighbouring dockyard was begun.

Authorities. — Histories of Plymouth by Jewitt and Worth; Wright's Plymouth with its Surroundings and Story of Plymouth; Whitfeld, Plymouth and Devonport, in times of War and Peace; Municipal Records (Plymouth Corporation); Worth, " Notes on Early History of Stonehouse " (Plymouth Instit. Proc).

(H.G.deW.)

PLYMOUTH, a township and the county-seat of Plymouth county, Massachusetts, U.S.A., in the southeastern part of the state, on Plymouth Bay, about 37 m. S.E. of Boston. Pop. (1905) 11,119; (1910) 12,141. It is served by the New York, New Haven & Hartford railway, by inter-urban

electric lines and in summer by steamers to Boston. The harbour is well sheltered but generally shallow; it has been considerably improved by the United States government and also by the state, which in 1909 was making a channel 18 ft. deep and 150 ft. wide from deep water to one of the township's wharves. The township has an area of 107-3 sq. m., is 18 m. long on the water front and is from 5 to 9 m. wide. Plymouth is a popular resort for visitors, having, in addition to its wealth of historic associations and a healthy summer climate, thousands of acres of hilly woodland and numerous lakes and ponds well stocked with fish. Morton Park contains 200 acres of woodland bordering the shores of Billington Sea (a freshwater lake).

Few, if any, other places in America contain so many interest- ing landmarks as Plymouth. The famous Plymouth Rock, a granite boulder on which the Pilgrims are said to have landed from the shallop of the " Mayflower," lies on the harbour shore near the site of the first houses built on Leyden Street, and is now sheltered by a granite canopy. Rising above the Rock is Cole's Hill, where during their first winter in America the Pilgrims buried half their number, levelling the graves and sowing grain over them in the spring in order to conceal their misfor- tunes from the Indians. Some human bones found on this hill when the 'town waterworks were built in 1855 have been placed in a chamber in the top of the canopy over the Rock. Burial Hill (originally called Fort Hill, as it was first used for defensive purposes) contains the graves of several Pilgrims and of many of their descendants. The oldest stone bears the date 1681; many of the stones were made in England, and bear quaint inscriptions. Here also are a tablet marking the location of the old fort (1621), which was also used as a place of worship, a tablet showing the site of the watch-tower built in 1643, an

Modern Plymouth has varied and important manufactures comprising cordage, woollens, rubber goods, &c. In 1905 the total value of the factory products was $11,115,713, the worsted goods and cordage constituting about nine-tenths of the whole product. The cordage works are among the largest in the world, and consume immense quantities of sisal fibre imported from Mexico and manila from the Philippine Islands; binder-twine

for binding wheat is one of the principal products. From 1900 to 1905 the capital invested in manufactures increased 83% and the value of the product 101%. Large quantities of cranberries are raised in the township.

Plymouth is a port of entry, but its foreign commerce is unimportant; it has a consider- able coasting trade, especially in coal and lumber. The town- ship owns its waterworks.

Plymouth was the first permanent white settlement in New England, and dates its founding from the landing here from the " Mayflower " shallop of an exploring party of twelve Pilgrims, including William Bradford, on the 21st of December (n.s.) 1620. The Indian name of the place was Patuxet, but the colonists called it New Plymouth, because they had sailed from Plymouth, England, and possibly because they were aware that the name of Plymouth had been given to the place six years before by Captain John Smith. When and how the town and the colony of Plymouth became differentiated is not clear. Plymouth was never incorporated as a township, but in 1633 the General Court of the colony recognized it as such by ordering that " the chief e government be tyed to the towne of Plymouth." In 1686 the colony submitted to Sir Edmund Andros, who had been commissioned governor of all New England, and chose representatives to sit in his council. Plymouth remained the seat of government of the colony until 1692, when Plymouth Colony, and with it the town of Plymouth, was united to Massa- chusetts Bay under the charter of 1691 (see Massachusetts: History). Part of Plymouth was established as Plympton in 1707, and part as Kingston in 1726.

Bibliography. — For the sources of the early history of Plymouth consult (George) Mourt's Relation, or Journal of the Plantation of Plymouth (Boston, 1865, and numerous other editions) ; William Bradford's History of the Plimouth Plantation (Boston, 1858, and several later editions), the most important source of information concerning Plymouth before 1646; the Plymouth Colony Records (12 vols., Boston, 1855-1861); the Records of the Town of Plymouth (3 vols., Plymouth, 1889-1903); J. A. Young's Chronicles of the Pilgrim Fathers (Boston, 1841); and E. Arber's Story of the Pilgrim Fathers (London, 1897), the two last containing excerpts from the leading sources. See also, James Thacher's History of the Town of Plymouth (Boston, 1832) ; W. T. Davis's History of the Town of Plymouth (Philadelphia, 1885); also his Ancient Landmarks of Plymouth (Boston, 2nd ed., 1899); and his Plymouth Memories of an Octogenarian (Plymouth, 1906) ; and John A. Goodwin, The Pilgrim Republic (Boston, 1888). For accounts in general histories, see J. G. Palfrey's History of New England, I. (Boston, 1858); the appreciative sketch by J. A. Doyle, in his English Colonies in America, II. (New York, 1889); and, especially, the monograph by Franklin B. Dexter, in Justin Winsor's Narrative and Critical History of America, vol. iii. (Boston, 1884). As to the truth of the tradition that the Pilgrims landed on Plymouth Rock, consult the Proceedings of the Massachusetts Historical Society (1903), 2nd series, vol. xvii. containing articles by E. Channing and W. W. Goodwin; the

article by Herbert B. Adams in the Magazine of American History, ix. 31 sqq., and that by S. H. Gay in the Atlantic Monthly, xlviii. 612 sqq.

PLYMOUTH, a borough of Luzerne county, Pennsylvania, U.S.A., on the north branch of the Susquehanna river, imme- diately west of and across the river from Wilkes-Barre, of which it is a suburb. Pop. (1910), 16,996. Plymouth is served by the Delaware, Lackawanna & Western railroad. The borough is finely situated in the Wyoming Valley among the rich anthracite coalfields of eastern Pennsylvania, and its inhabitants are chiefly engaged in the coal industry; in 1906 and 1907 (when it shipped 24,081,491 tons) Luzerne county shipped more anthracite coal than any other county in Pennsyl- vania. In 1905 the total value of the factory products was $902,738, 69-4% more than in 1900. Before the coming of white settlers there was an Indian village called Shawnee on the site of the present borough. The township of Plymouth was settled in 1769 by immigrants from New England — many originally from Plymouth, Litchfield county, Connecticut, whence the name — under the auspices of the Susquehanna Company, which claimed this region as a part of Connecticut, and Plymouth became a centre of the contest between the " Pennamites " and the " Yankees " (representing respectively Pennsylvania and Connecticut), which grew out of the conflict of the royal charter of Pennsylvania (granted in 1681) with the

royal charter of Connecticut (granted in 1662), a matter which was not settled until 1799. (See Wyoming Valley.) In its earlier history the region was agricultural. Two brothers, Abijah and John Smith, originally of Derby,. Conn., settled in Plymouth in 1806 and began shipping coal thence in 1808; this was the beginning of the anthracite coal trade in the United States. The borough was incorporated in 1866, being then separated from the township of Plymouth, which had a popula- tion in 1890 of 8363 and in 1900 of 9655.

See H. B. Wright's Historical Sketches of Plymouth (Philadelphia,

1873).

PLYMOUTH BRETHREN, a community of Christians who received the name in 1830 when the Rev. J. N. Darby induced many of the inhabitants of Plymouth, England, to associate themselves with him for the promulgation of his opinions. Although small Christian communities existed in Ireland and elsewhere calling themselves Brethren, and holding similar views, the accession to the ranks of Darby so increased their numbers and influence that he is usually reckoned the founder of Ply- mouthism. Darby (born in Nov. 1800 in London; graduated at Trinity College, Dublin, in 1819; died April 29, 1882, at Bournemouth) was a curate in Wicklow

1825-1827, when he felt himself constrained to leave the Anglican communion; going to Dublin, he became associated with several devout people who met statedly for public worship, and called themselves " Brethren." Among these were A. N. Groves and J. G. Bellett, who deserve to rank among the founders of the movement. In 1830 Darby at Plymouth won over many people to his way of thinking, among them James L. Harris, a Plymouth clergyman, and the well-known Biblical scholar Samuel Prideaux Tregelles. The Brethren started a periodical, The Christian Witness, continued from 1849 as The Present Testimony, with Harris as editor and Darby as the most important contributor. During the next eight years the progress of the sect was rapid, and communities were founded in many of the principal towns in England.

In 1838 Darby went to reside in French Switzerland, and made many disciples. Congregations were formed in Geneva, at Lausanne, where most of the Methodist and other dissenters joined the Brethren, at Vevey and elsewhere in Vaud. His opinions also found their way into France, Germany, German Switzerland, and Italy; but French Switzerland has always remained the stronghold of Plymouthism on the Continent, and for his followers there Darby wrote two of his most important tracts, Le Ministkre considSre dans sa nature and De la Prisence el de faction du S. Esprit dans I'eglise. The revolution in the canton Vaud, brought about by Jesuit intrigue in 1845, brought persecution to the Brethren in the canton and in other parts of French Switzerland, and Darby's life was in great jeopardy.

He returned to England, and his reappearance was followed by divisions among the Brethren at home. These divisions began at Plymouth. Benjamin Wills Newton, head of the community there, who had been a fellow of Exeter College, Oxford, was accused of departing from the testimony of the Brethren by reintroducing the spirit of clericalism. Unable to detach the congregation from the teacher, Darby began a rival assembly. The majority of the Brethren out of Plymouth supported Darby, but a minority remained with Newton. The separation became wider in 1847 on the discovery of supposed heretical teaching by Newton. In 1848 another division took place. The Bethesda congregation at Bristol, where George Muller was the most influential member, received into com- munion several of Newton's followers and justified their action. Out of this came the separation into Neutral Brethren, led by Muller, and Exclusive Brethren or Darbyites, who refused to hold communion with the followers of Newton or Muller. The Exclusives, who were the more numerous, suffered further divisions. An Irish clergyman named Samuel O'Malley Cluff had adopted views similar to those of Pearsall Smith, who preached a doctrine of sanctification called " Death to Nature " as an antidote to the supposed prevalent Laodiceanism, and when these were repudiated seceded with his followers. The most

important division among the Exclusives came to a crisis in 1881, when William Kelly and Darby became the recognized leaders of two sections who separated on a point of discipline. This was followed (1885) by the disruption of the strict Darbyite section, two communions being formed out of it upon points of doctrine.

There were thus six sections of Plymouthists: (1) the followers of B. W. Newton, who promulgated the prophetic views peculiar to their leader; (2) the Neutrals — open brethren, leaning to Baptist views and to the Congregationalist idea that each assembly should judge for itself in matters of discipline, headed by George Miiller; (3) the Exclusives, the Darbyites, holding what may be described as a Pauline view of the Church, who claim to be the original Brethren, represented by J. B. Stoney and C. H. Mackintosh; (4) the Exclusives associated in Great Britain with C. E. Stuart, in America with F. W. Grant; (5) the Exclusives who followed W. Kelly, giving a general adhesion to Darby but with a tendency to place con- science above church action, holding the Pauline view of the Church modified by Johannine elements; and (6) the Exclusives who followed Cluff. The fundamental principle of the Exclu- sives, " Separation from evil God's principle of unity," has led to many unimportant excommunications and separations besides those mentioned.

The theological views of the Brethren differ considerably from those held by evangelical Protestants (for a list of divergences, see Teulon, History and Doctrines of the Plymouth Brethren). They make the baptism of infants an open question and celebrate the Lord's Supper weekly. Their distinctive doctrines are ecclesiastical. They hold that all official ministry, whether on Episcopalian, Presbyterian or Congregationalist theories, is a denial of the spiritual priesthood of all believers, and sets aside the Holy Spirit's guidance. The gradual growth of this opinion, and perhaps the reasons for holding it, may be traced in Darby's earlier writings. While a curate in Ireland he was indignant with Archbishop Magee, who had stopped the progress of mission work among Roman Catholics by imposing on all who joined the church the oath of supremacy. This led Darby to the idea that established churches are as foreign to the spirit of Christianity as the papacy is (" Con- siderations addressed to the Archbishop of Dublin, &c, Coll. Works, i. 1). The parochial system, when enforced to the extent of prohibiting the preaching of the gospel within a parish where the incumbent was opposed to it, led him to consider the whole system a hindrance to the proper work of the church and therefore anti- Christian (" Thoughts on the present position of the Home Mission," Coll. Works, i. 78). And the waste

of power implied in the refusal to sanction lay preaching seemed to him to lead to the conclusion that an official ministry was a refusal of the gifts of the Spirit to the church (" On Lay Preaching," Coll. Works, p. 200). The movement, if it has had small results in the formation of a sect, has at least set churches to consider how they might make their machinery more elastic. Perhaps one of the reasons of the com- paratively small number of Brethren may be found in their idea that their mission is not to the heathen but to the " awakened in the churches."

The movement has a distinct interest for students of church history: (1) as illustrating again the desire of certain Christians to pass over the garnered experience of the centuries, and by going straight to the Bible to make a fresh start without any other autho rity, precedent or guidance; (2) in its development alongside the Evangelical, Tiactarian and Broad Church movements of the 19th eentjry and its affinities with them all, A certain haphazardism that has always marked the Brethren is responsible for the present lack of qualified leaders. The early enthusiasm has waned, and no provision was made for proper theological study.

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PLYMPTON ST MARY and PLYMPTON MAURICE (or

Earl's), two small adjacent towns in the southern parliamentary division of Devonshire, England, 5 m. E.N.E. of Plymouth, on the Great Western railway. Pop. (1901), Plympton St Mary, 3587; Plympton Maurice, 1139. Plympton St Mary contains a fine Decorated and Perpendicular church, with a lofty tower of the later period. Near it are remains of the former rich Augus- tinian priory of Plympton, founded by William Warelwast, bishop of Exeter (1107-1 136). They include an Early English refectory

TDa. 28

with Norman undercroft, the kitchen and other fragments; but there are no remains of the great priory church. At Plymp- ton Maurice are slight ruins of the castle built by Richard de Redvers, 1st earl of Devon (whence the variant of the name), in the time of Henry I. There are several picturesque old houses in the town, together with a guildhall dated 1696, and a grammar school founded in 1658, of which Sir Joshua Reynolds's father

was master.

Plympton (Plinlona) bears traces of very ancient settlement, the earthworks on which in the 1 2th century Richard de Redvers reared his Norman castle being probably of British origin, while a Saxon document dated 904 records a grant by Edward the Elder to Asser, bishop of Sherborne, of twelve manors in exchange for the monastery of " Plymentun." According to the Domesday survey " Plintona " was a royal manor assessed at i\ hides, and the fact that the canons of Plympton held two hides apart from these shows the origin of the later division into the priory parish of Plympton St Mary and the secular borough of Plympton Erie. In the 12th century Plympton appears as a mesne borough under the lordship of the Redvers, earls of Devon, and in 1224 the burgesses claimed to have received a charter from William, the 6th earl, of which however nothing further is known, and the first charter of which a copy is extant was issued by Baldwin de Redvers in 1242, granting to the burgesses of Plympton the borough, with fairs and markets, and the liberties enjoyed by the citizens of Exeter, in considera- tion of a yearly payment of £24, 2s. 2d. In 1437 a charter from Edward IV. granted to the burgesses an eight-days' fair at the Feast of the Nativity of St John the Baptist, but at this period the growing importance of Plymouth was steadily robbing Plympton of its position as head of the district. In 1602, in response to a petition of the burgesses, Elizabeth issued a charter of incorporation, instituting a common council to consist of a mayor and 8 principal burgesses; a Saturday market, and fairs at the Feasts of the Ascension and the Annunciation. A code of by-laws dated 1623 mentions a fair on St Luke's Day in addition to the three above mentioned. The borough surren- dered its charter to Charles II. in 1684, and in 1685 received a fresh charter from James II. instituting an additional market on Wednesday and a fair on the 1st of August. This charter was declared invalid in 1690, but its provisions were reaffirmed in 1692, with the addition of an eight-days' fair to begin on the 14th of February. The borough, which had returned two members to parliament since 1295, was disfranchised by the Reform Act of 1832 and from this date the municipal privileges gradually lapsed, and in 1859 were finally abolished.

See Victoria County History: Devonshire; William Cotton, Some Account of the Ancient Borough Town of Plympton St Maurice (London, 1859); J. Brooking Rowe, Notes of Plympton Castle (Plymouth, 1880).

PNEUMATIC DESPATCH, the name given to a system of transport of written despatches through long narrow tubes by the agency of air pressure. It was introduced in 1853 by J. Latimer Clark, between the Central and Stock Exchange stations of the Electric and International Telegraph Company in London. The stations were connected by a tube ij in. in diameter and 220 yds. long. Carriers containing batches of telegrams, and fitting piston-wise in the tube, were sucked through it (in one direction only) by the production of a partial vacuum at one end. In 1858 C. F. Varley improved the system by using compressed air to force the carriers in one direction, a partial vacuum being still used to draw them in the other direction. This improvement enables single radiating lines of pipe to be used both for sending and for receiving telegrams between a central station supplied with pumping machinery and outlying stations not so supplied.

Radial System. — In the hands of R. S. Culley and R. Sabine the radial system of pneumatic despatch was in 1870 brought to great perfection in connexion with the telegraphic department of the British post office, since that date the total length of tubes (which are employed for telegrams only) has been very largely increased (in 1909 there was in London a total length of

40 m.), whilst in all large and also in very many smaller provincial towns there are installations; these are constantly being added to, as it is found more economical to transmit local message-work by tube rather than by wire, as skilled telegraph- ists are not required, but only tube attendants. In some cases only a single tube is necessary, but three or four, or even more, are in use in some towns, according to local circumstances. Short tubes, known as " house tubes " are in use in a great number of offices; such tubes, which are worked either by hand- pumps (when the tubes are very short and the traffic incon- siderable) or by power, are usually 1% in. in diameter, and are used for the purpose of conveying messages from one part of a telegraph instrument-room to another, or from the instrument-room to the public counter. The underground, or " street " tubes are chiefly 2j in. in diameter, but there are also a number of 3-in. tubes in use; those in the large provincial towns (Birmingham, Bradford, Cardiff, Edinburgh, Glasgow, Grimsby, Liverpool, Manchester, Newport, Leeds, Newcastle, Southampton and Swansea) are 2j in. in diameter; but in Dublin, Gloucester, Lowestoft and Milford 15-in. tubes are employed. There are fifty street tubes in London, varying in length from 100 to 2000 yds. (central office to the Houses of Parliament), and also seventy-five house

tubes; the pumps for the whole system are worked by four 100 horse-power steam-engines. At Cardiff, Edinburgh, Gloucester, Leeds, Lowestoft, Newport, Southampton and Swansea the pumps are driven by electric motors; at Bradford and Grimsby gas- engines are used, and at Milford an oil-engine.

The tubes are in all cases of lead, the 2j-in. tubes weighing 8 lb per foot run and being made in lengths of 28 ft.; they are enclosed in 3-in. cast-iron pipes made in lengths of 9 ft.

Great care is exercised in making the joints in the lead pipes. Before the tube is placed in its trench a strong chain is passed through it, and a polished steel mandrel, 6 in. long and slightly less in diameter than the diameter of the tube, is heated and attached to the chain, and pushed half its length into the end of the tube already laid; the new length of tube is then forced over the projecting end of the mandrel until the tube ends (which have been previously cut flat) butt perfectly together; an ordinary plumber's joint is then made. By this means the tube is made perfectly air-tight, and the mandrel keeps the surface of the tube under the joint as smooth as at any other part of its length. After the joint is completed the mandrel is drawn out by the chain attached to it, the next length is drawn on, and the above process repeated. The tubes are laid about 2 ft. below the surface of the ground.

The tubes radiate from the central to the branch offices, the principal offices having two tubes, one for " inward " and the other for " outward " traffic. At the smaller offices both the inward and the outward traffic is carried on through one tube. The " carriers " are made with gutta- percha bodies, covered with felt, the front of the carrier being provided with a buffer or piston formed of several disks of felt which closely fit the tube; the messages are prevented from get- ting out of the carrier by the end being closed by an elastic band, which can be stretched sufficiently to allow the message forms to be inserted. The 3-in. carriers will hold 75 ordinary message forms, the 2j-in. carriers 25 forms, and the ij-in. carriers 20 forms. The carriers are propelled in one direction (from the central office) by " pressure," and drawn in the opposite direction by " vacuum," the standard pressure and vacuum being 10 lb and 6j lb per sq. in. respectively, which values give approxi- mately the same speed.

The time of transit of a carrier through a tube when the air pressure does not exceed 20 lb per square inch is given very ap- proximately by the empirical formula : —

/ = -oo872<\/^;

where Z = length of tube in yards, d = diameter of tube in inches, P = effective air-pressure in pounds per square inch, / = transit time in seconds. For vacuum the formula is : —

, – °825 , /7».

i—234Vi5-5-PiV d' where Pi = effective vacuum in pounds per square inch.

Working,

The horse-power required to propel a carrier is approximately, for pressure: —

H.P. = (- 5 74+-oouP)^/Ep; for vacuum : —

H.P. = (5 -i87-i.2i 4 Vi5-5-Pi)Pi\/t For a given transit time the actual horse-power required is much less in the case of vacuum than in the case of pressure working, owing to the density of the air column moved being much less: thus, for example, the transit time for 10 lb pressure is the same as for 6j lb vacuum, but the horse-power required in the two cases is as 1-83 to I. A tabe I m. long, 2| in. in diameter, and worked at 10 R> per square inch pressure, will have a transit time of 2\ minutes, and will theoretically require 3-35 horse-power to be expended in working it, although actually 25 % more horse-power than this must be allowed for, owing to losses through various causes. The transit time for a 2|-in. tube is 16% more than for a 3-in. tube of the same length, when both are worked at the same pressure, but the horse-power required is 50% less; it is not ad- visable, therefore, to use a tube larger than is absolutely necessary to carry the volume of traffic required.

The somewhat complicated pattern of " double sluice valve " originally used at the central stations has been superseded by a simpler form, known as the "D" box — so named Despatching from the shape of its cross section. This box is of and cast iron, and is provided with a close-fitting, Receiving brass-framed, sliding lid with a glass panel. This A P oaraius > lid fits air-tight, and closes the box after a carrier has been inserted into the mouth of the tube; the latter enters at one end of the box and is there bell-mouthed. A supply pipe, to which is connected a " 3-way " cock, is joined on to the box and allows communication at will with either the " pressure " or " vacuum " mains, so that the apparatus becomes available for either sending (by pressure) or receiving (by vacuum) a carrier. Automatic working, by which the air supply is automatically turned on on the introduction of the carrier into a tube and on closing of the D box, and is cut off when the carrier arrives, was introduced in 1909.

On the long tubes (over about 1000 yds.) a modification of the " D " box in its simplest form is necessary; this modification consists in the addition of a " sluice " valve placed at a distance of about 9 in. (i.e. rather more than the length of a carrier) from the mouth of the tube. The sluice valve, by means of an interlocking arrangement, is so connected with the sliding lid of the box that the lid cannot be moved to the open position unless the sluice valve has closed the tube, nor can the sluice valve be opened unless the sliding lid is closed. The object of this sluice valve is to prevent the back rush of air which would take place into the tube when the sliding lid is opened to take out a carrier immediately on the arrival of the latter; for although the vacuum may be turned off by the 3-way cock, yet, owing to the great length of the tube, equilibrium does not immediately take place in the latter, and the back rush of air into the vacuum when the lid is opened to extract the carrier will cause the latter to be driven back into the tube. The sluice also prevents a similar, but reverse, action from taking place when pressure working is being carried on.

As a rule, only one carrier is despatched at a time, and no second carrier is inserted in the tube until the arrival of the first one at the farther end is automatically signalled (by an electric apparatus) to the despatching office. On some of the long tubes a carrier, when it passes the midway point in the tube, strikes a trigger and sends back an electrical signal indicat- ing its passage; on the receipt of this signal a second carrier may be despatched. This arrangement has been almost entirely superseded by a signalling apparatus which by a clock movement actuates an indicating hand and moves the latter to " tube clear " a certain definite time (30 to 40 seconds) after a carrier has been inserted in the tube. By this arrangement carriers can be despatched one after the other at comparatively short intervals of time, so that several carriers (separated by distinct intervals) may be travelling through the tube simultaneously. It is necessary that the carriers be separated by a definite interval, otherwise they tend to overtake one another and become jammed

in the tube. Although the stoppage of a carrier in a tube is of exceedingly rare occurrence, it does occasionally take place, through picks being driven into the tube by workmen executing repairs to gas or water pipes, but the locality of such a stoppage is easily determined by a simple inspection along the route of the tube. In no case is any special means of testing for the locality from the central office found necessary.

Circuit System. — Another method of working, extensively used in Paris and other continental cities, is the circuit system, in which stations are grouped on circular or loop lines, round which carriers travel in one

direction only. In one form of circuit system — that of Messrs Siemens — a continuous current of air is kept up in the tube, and rocking switches are provided by which carriers can be quickly introduced or removed at any one of the stations on the line without interfering with the movement of other carriers in other parts of the circuit. More •usually, however, the circuit system is 'worked by despatching carriers, or trains of carriers, at relatively long intervals, the pressure or vacuum which gives motive power being applied only while such trains are on the line. On long circuits means are provided at several stations for putting on pressure or vacuum, so that the action may be limited to that section of the line on which the carriers are travelling at any time. In America, in New York, Boston and Philadelphia, tubes (Batcheller system) up to 8 in. in diameter are in use. The tubes are of cast iron made in 12-ft. lengths and are carefully bored; they resemble ordinary water pipe. Short bends are made in seamless brass tube carefully bent to a uniform radius of twelve times the diameter of the tube, the tube being slightly larger in diameter than the main tube. The sending apparatus, or transmitter, is similar to the Siemens switch before described, and consists of two sections of the tube supported in a swinging frame so arranged that either section can be brought into line with the main tube, in which a current of air is constantly flowing. One of these tube sections maintains the continuity of the main tube, while the other is swung to one side to receive a carrier. In despatching, a carrier is placed in an iron trough and then pushed into the open tube section. The frame carrying the two tube sec- tions is then swung until the section containing the carrier is brought into line with the main tube, when the carrier is swept along with the current of air. When the frame is swinging from one position to another the air is prevented from escaping by plates that cover the ends of the tube, and a by-pass is provided so that the current is not interrupted. An air- motor, consisting of a cylinder and piston, furnishes the power to swing the frame, the operation requiring an instant only. When the con- trolling [lever is pulled and latched the frame swings, and as the carrier passes out of the apparatus it trips the lever, and the frame swings back automatically^ into position to receive another carrier. To prevent carriers from being despatched too frequently and overtaking each other a time lock is attached to the sending apparatus; this locks the controlling valve when a carrier is despatched, and keeps it locked for a given period of time, varying from five to fifteen or twenty seconds, according to the adjustment of the lock. The carrier is received at the farther end of the tube into an air cushion formed by closing the end of the tube with a sluice-gate, and allowing the air to flow out into a branch pipe through slots in the tube located about 4 ft. in the rear of the sluice-gate. When a carrier arrives it passes over the slots, enters the air cushion and is brought to rest without injury or shock. The carriers are thin steel cylinders closed at the front end by a convex disk of the same material carrying a buffer of felt and

leather; the rear end is closed by a hinged lid secured by a lock. The shell of the carrier is 24 in. long and 7 in. in diameter for the 8-in. tube; it is secured by two bearing-rings of woven cotton fabric clasped between metal rings; the rings are renewed after about 2000 m. of travel. The tubes are worked at a pressure of 6 lb per sq. in., and for a distance of 4500 ft. require about 30 horse-power, the transit speed being 30 m. per hour.

In addition to its use for postal and telegraphic purposes the pneumatic despatch is employed for internal communication in offices, hotels, &c, and also in shops for the transport of money and bills between the cashier's desk and the counters.

References. — The system, as used in the United Kingdom is fully described in a paper by Messrs Culley and Sabine {Min. Proc. Inst. Civ. Eng. vol. xliii.). The same volume contains a description of the pneumatic telegraphs of Paris and of experiments on them by M. Bontemps, and also a discussion of the theory of pneumatic transmission by Professor W. C. Unwin. Reference should also be made to a paper, by C. Siemens (Min. Proc. Inst. Civ. Eng. vol. xxxiii.), describing the Siemens circuit system; and to Les Teli- graphes, by M. A. L. Ternant (Paris, 1881); General Post Office Technical Instructions, vol x., "Pneumatic Tubes"; Kempe's Engineers' Year-Book (1908 edition). (H. R. K.)

PNEUMATIC GUN. Air as a propellant has in recent years been applied to guns of large calibre, in which its comparatively gentle action has proved advantageous when high explosives contained in their shells are employed as projectiles. In 1883 Mr Mefford of Ohio utilized an air pressure of 500 lb per sq. in. in a 2-in. gun, and succeeded in propelling a projectile 2100 yds. The arrangement was of the simplest form — a hose with an ordinary cock by which the air was admitted into the gun behind the projectile. The question was then taken up by Capt. E. L. Zalinski (1840-1009) of the United States Artillery, who in 1888 reduced the so-called " dynamite gun " to a practical shape and obtained excellent firing results.

The principal features of his system are: (1) An extremely in- genious balanced valve admitting the air pressure into the gun. This valve is opened and closed by a simple movement of the firing lever, and is capable of adjustment so that the propelling force,

Dynamite gun, mounted at Sandy Hook, New York Harbour.

and consequently the range, can be regulated. (2) A light steel projectile carrying the bursting charge, and provided with a tail to which vanes are

attached in order to give rotation. (3) Electric fuses of entirely original design. Each shell carries a wet battery, the current from which fires the charge on impact with any solid object, and a dry battery which becomes active after the shell has dived below the surface of the water, and ignites the charge after delay capable of regulation. For safety all the electric circuits are made to pass through a disconnector, which prevents them from being completed until the shell has been fired. The gun is a built-up smooth-bore tube, 15 in. or less in diameter. The full-calibre shell weighs 1000 lb, and carries a bursting charge of 600 ft of blasting gelatine, cut into the form of cheeses, fitting the steel envelope, and provided with a core of dry gun-cotton as a primer. Sub-calibre projectiles, 10 in. and 8 in., can also be used. In their case, rotation is given by vanes or fins attached to the body of the shell. Air at 1000 lb pressure is stored in tubes close to the gun, and is supplied from primary reservoirs, to which it is directly

pumped at a pressure of about 2000 lb. There is always, there- fore, a considerable reserve of power available without pumping. Pneumatic guns of this description (see figure) have been mounted for the protection of New York and San Francisco. With a full- calibre shell (1000 lb) these guns have a range of 2400 yds.; with a sub-calibre 8-in. shell (250 lb) the maximum range is 6000 yds. The official trials showed remarkable accuracy. At 5000 yds. 75% of the projectiles fell in an area of 360X90 ft. When the gun was tried at Shoeburyness the accuracy was far greater than could be obtained with howitzer shells propelled by explosives. On account of the power of exploding the shell under water, and thus securing a torpedo action, a direct hit upon a ship is not required, and the target offered is largely in excess of the deck plan. The gun is, in fact, capable of replacing systems of sub- marine mines with economy, and without the great objection of interfering with a waterway.

The only employment of the dynamite gun afloat has been in the case of the U.S. gunboat " Vesuvius," carrying three in the bows. These guns are fixed at a constant angle of elevation, and the range is regulated by the air valve, training being given by the helm. Thus mounted on an unstable platform, the accuracy of fire obtainable must evidently be much less than on shore. The " Vesuvius " was employed during the Spanish- American War of 1898, when on several nights in succession she approached the defences of Santiago under cover of dark- ness and discharged three projectiles. Fire delivered under such conditions could not be sufficiently accurate to injure coast defences; but the shells burst well, and made large craters. A small dynamite gun on a field-carriage was used in the land

operations above Santiago in the same war.

PNEUMATICS (Gr. irvwua, wind, air), the branch of physical science concerned with the properties of gases and vapours (see Gas). A pneumatic trough is simply a basin con- taining water or some other liquid used for collecting gases.

PNEUMATOLYSIS (Gr. irvevˆa, vapour, and \veiv, to set free), in petrology, the discharge of vapours from igneous magmas and the effects produced by them on rock masses In all vol- canic eruptions the gases given off by the molten lavas are powerful agencies. The slaggy clots of lava thrown out from the crater are so full of gas that when they cool they resemble spongy pieces of bread. The lava streams as they flow down the slopes of the volcano are covered with white steam clouds, while over the orifice of the crater hangs a canopy of vapour which is often darkened by fine particles of ash. Most authors ascribe volcanic explosions to the liberation of steam from the magma which held it in solution, and the enormous expansive powers which free water vapour possesses at very high temperatures.

Of these gases the principal are water and carbonic acid, but by analysis of the discharges from the smaller fumaroles, for the active crater is generally too hot to be approached during an eruption, it has been ascertained that hydrogen, nitrogen, hydrochloric acid, boron, fluorine, sulphuretted hydrogen and sulphurous acid are all emitted by volcanoes. A recent lava flow has been likened to a great fumarole pouring out volatile substances at every crack in its slaggy crust. Many minerals are deposited in these fissures, and among the sub- stances produced in this way are ammonium chloride, ferric chloride and oxide, copper oxide (tenorite and euprite) and sulphur; by reacting on the minerals of the rock many zeolites and other secondary products are formed. These processes have been described as " juvenile " or " post eruptive," and it is believed that the amygdales which occupy the cavities of many porous lavas are not due really to weathering by sur- face waters percolating in from above, but to the action of the steam and other gases set free as the lava crystallizes. The zeo- lites are the principal group of minerals which originate in this way together with chlorite, chalcedony and calcite. The larger cavities (or geodes) are often lined with beautiful crystal groups of natrolite, scolecite, thomsonite, stilbite, and other minerals of this order.

The active gases were evidently in solution in the magma as it rose to the surface. Some geologists believe it is of subterranean origin like the lava itself, and is an essential or original component of the magma. They point to the exist-

ence of gases in considerable quantity in meteorites, and, com- paring the earth to a great aerolite, insist that it should con- tain gases in solution like the smaller masses of the same kind. Others hold it more probable that the water has percolated in from the surface, or seeing that many volcanoes stand near the sea margin and by their linear disposition may be dis- posed along fissures or lines of weakening in the crust, they argue that the water of the sea may have filtered down even in spite of the great outward pressure exerted by the steam generated by contact with the intensely heated rock. The abundance of chlorides and hydrochloric acid is appealed to also in favour of a marine origin for the water. Against this we may place the fact that at great depths whence active mag- mas ascend the rocks are under so great pressures that every fissure is closed up; in fact in some of the deepest mines the quantity of water found in the workings is often exceedingly small. Probably there is some truth in both theories, but the- balance of probability seems to incline in favour of the view that the water is an original and essential part of the magma and not an introduction from above.

Long after a lava has cooled down and become rigid the vapours continue to ooze out through its fissures, and around many volcanoes which are believed to be extinct there are orifices discharging gas in great quantities. This state of activity is said to be " solfataric," and a good example of it is the volcano called the Solfatara near Naples. The numerous "Soufrieres" of the West Indies are further instances. The prevalent gas is steam with sulphuretted hydrogen and car- bonic acid. At the Grotto del Cane in the Phlegraean Fields (Italy) the carbonic acid rising from fissures in the bottom of a cave covers the floor as a heavy layer, and a dog placed in the interior of the cave becomes stupefied by the narcotic gas; such gas-springs have been called " mofettes." Around them there is often a deposit of sulphur, produced by oxidation of the sulphuretted hydrogen, and the rocks are bleached, softened and decomposed. White crusts of alum, various sulphates, and sulphides such as pyrites, also carbonates of soda and other bases, are formed by the action of the acid vapours on the volcanic rocks. The final manifestation of volcanic activity in such a region may be the discharge of heated waters, which have ascended from the deep-seated magma far below the surface, and make their appearance as groups of hot springs; these springs persist long after the volcanoes which give rise to them have become quite extinct.

It is now believed by a large number of geologists and mining engineers that these ascending hot waters are of paramount im- portance in the genesis of some of the most important types of ore deposits. Analyses have proved that the igneous rocks often contain distinct though very small quantities of the heavy metals; it is also established beyond doubt that veins of gold, silver, lead, tin and mercury most commonly occur in the vicinity of

intrusive igneous masses. At Steamboat in Nevada, hot springs, probably of magmatic origin, are forming deposits of cinnabar. At Cripple Creek, Colorado, and in many other places gold-bearing veins occur in and around intrusive plugs of igneous rock. Tin ores in all parts of the world are found in association with tourmaline granites. In all cases the veins bear evidence of having been filled from below by hot waters set free during the cooling of the igneous intrusions. Volcanic rocks are consequently the parent sources of many valuable mineral deposits, and the agency by which they were brought into their present situations is the volatile products discharged as the magma crystallized. The process was no doubt a long one and it is most probable that both steam and water took part in it. Above 365 C. water is a gas under all pressures and the action is strictly pneumatolytic; below that temperature steam is changed to water by pressure and the action may be described as hydatogenetic. The distinction is unessential, and in our ignorance of the temperatures and pressures prevailing at con- siderable depths we lack the means of classification. In what con- dition the metallic ores are dissolved and by what reactions they are precipitated depends on many factors only partly understood. The tin ores are so often associated with minerals containing boron and fluorine that it is quite probable that they were combined with these elements in some way, but they were deposited in nearly all cases as oxides. Other gaseous substances, such as sulphuretted hydrogen, carbonic acid and hydrochloric acid, probably have an important part in dissolving certain metals; and the alkaline carbonates, sulphides and chlorides have been shown by experiment to act also as solvents. In these ore deposits not only the heavy

metals are found, but often a much larger quantity of minerals such as calcite, barytes, fluorspar, quartz and tourmaline which serve as a matrix or gangue, and have been deposited by the same agencies, and often at the same time as the valuable minerals.

In their passage upwards and outwards through the rocks of the earth's crust, these gases and liquids not only deposit minerals in the fissures along which they ascend, but attack the surrounding rocks and alter them in many ways. The granite or other plutonic mass from which the vapours are derived is especially liable to these transformations, probably because it is at a high temperature, not having yet completely cooled down. Around the tin-bearing veins in granite there is extensive replacement of felspar and biotite by quartz, tourmaline and white micas (the last-named often rich in lithia). In this way certain types of altered granite are produced, such as

greisen (q.v.) and schorl rock (see Schorl). In the slates adja- cent to the tin veins tourmalinization also goes on, converting them into schorl-schists. The alteration of felspar into kaolin or china clay is also a pneumatolytic process, and is often found along with tin veins or other types of mineral deposit; probably both fluorine and carbonic acid operated in this instance along with water. Equally common and important is the silicification of rocks near mineral veins which carry gold, copper, lead and other metals. Granites and felsites may be converted into hard cherty masses of silica. Limestones undergo this transformation very readily; at the same time they are regarded as rocks very favourable to the deposition of ores. Probably the great frequency with which they undergo silicification and other types of metasomatic replace- ment is one of the main causes of the abundance of valuable deposits in them. The process known as " propylitization," which has extensively affected the andesites of the Hungarian goldfields, is believed to be also a consequence of the action of pneumatolytic gases. The andesites change to dull, soft, greenish masses, and their original minerals are to a large extent replaced by quartz, epidote, chlorite, sericite and kaolin. Around granites intrusive into serpentine and other rocks containing much magnesia, there js often extensive " steatisation," or the deposit of talc and steatite in place of the original minerals of the rock. Some of the apatite veins of Canada and Norway accompany basic rocks of the gabbro group; it has been argued that the apatite (which contains phos- phorus and chlorine) was laid down by vapours or solutions contain- ing those gases, which may play a similar part in the basic rocks to that taken by fluorine and boron in the pneumatolytic veins around granites. In the country rock around the veins scapolite (q.v.), a lime alumina silicate, containing chlorine, often is substituted for lime-felspar.

These extensive changes attending the formation of mineral veins are by no means common phenomena, but in many plutonic masses pneumatolytic action has contributed to the formation of pegmatites (g.t/.). (J. S .F.)

PNEUMONIA (Gr. irvevyuv, lung), a term used for inflam- mation of the lung substance. Formerly the disease was divided into three varieties: (1) Acute Croupous or lobar pneumonia; (2) Catarrhal or Broncho-pneumonia; (3) Inter- stitial or Chronic pneumonia.

1. Acute Croupous or Lobar Pneumonia (Pneumonic Fever) is now classed as an acute infective disease of the lung, char- acterized by fever and toxaemia, running a definite course and being the direct result of a specific micro-organism or micro- organisms. The micrococcus lanceolatus (pneumococcus, or diplococcus pneumoniae) of Frankel and Weichselbaum is present in a large number of cases in the bronchial secretions, in the affected lung and in the blood. This organism is also present in many other infective processes which may com- plicate or terminate lobar pneumonia,

such as pericarditis, endocarditis, peritonitis and empyema. The bacillus pneu- moniae of Friedlander is also present in a proportion of cases, but is probably not the cause of true lobar pneumonia. Various other organisms may be associated with these, but they are to be regarded as in the nature of a secondary invasion. Lobar pneumonia may be considered as an acute endemic disease of temperate climates, though epidemic forms have been de- scribed. It has a distinct seasonal incidence, being most frequent in the winter and spring. Osier strongly supports the view that it is an infectious disease, quoting the outbreaks reported by W. L. Rodman of Frankfort, Kentucky, where in a prison of 735 inhabitants there were 118 cases in one year; but direct contagion does not seem to be well proved, and it is undoubted that the pneumococcus is present in the fauces of numbers of healthy persons and seems to require a lowered power of resistance or other favouring condition for the pro- duction of an attack.

Lobar Pneumonia begins by the setting up of an acute in- flammatory process in the alveoli. The changes which take place in the lung are chiefly three. (1) Congestion, or engorge- ment, the blood-vessels being distended and the lung more voluminous and heavier than normal, and of dark red colour. Its air cells still contain air. (2) Red Hepatization, so called from its resemblance to liver tissue. In this stage there is poured into the air cells of the affected part an exudation con- sisting of amorphous fibrin together with epithelial cells and red and white blood corpuscles, the whole forming a viscid mass which occupies not only the cells but also the finer bronchi, and which speedily coagulates, causing the lung to become firmly consolidated. In this condition the cells are entirely emptied of air, their blood-vessels are pressed upon by the exudation, and the lung substance, rendered brittle, sinks in water. The appearance of a section of the lung in this stage has been likened to that of red granite. It is to the character of the exudation, consisting largely of coagulable fibrin, that the term croupous is due. (3) Grey Hepatization. In this stage the lung still re- tains its liver-like consistence, but its colour is now grey, not unlike the appearance of grey granite. This is due to the change taking place in the exudation, which undergoes resolution by a process of fatty degeneration, pus formation, liquefaction and ultimately absorption — so that in a comparatively short period the air vesicles get rid of their morbid contents and resume their normal function. During resolution the changes in the exudate take place by a process of autolysis or peptonization of the inflammatory products by unorganized ferments, absorp- tion taking place into the lymphatics and circulation. The absorbed exudate is mainly excreted by the kidneys, excess of nitrogen being found in the urine during this period. This is happily the termination of the majority of cases of lobar pneu- monia. One of the most remarkable phenomena is the rapidity with which the lung tissue clears up, and its freedom from alteration or from

infiltration into the connective tissue as fre- quently takes place after broncho-pneumonia. When resolution does not take place, death may occur from extension of the disease and subsequent toxaemia, from circulatory failure, from the formation of one or more abscesses or more rarely from gangrene of the lung or from the complication mentioned below. Chronic interstitial pneumonia is infrequent, following on the acute variety. The most frequent seat of pneumonia is the base or lower lobes, but occasionally the apices are the only parts affected. The right lung is the most often attacked. Pneu- monia may extend to the entire lung or it may affect both lungs. The death rate of acute lobar pneumonia in the chief London hospitals is 20%. With an organism so prevalent as the pneumococcus it follows that alcoholism, diabetes and other general diseases and intoxications must render the body liable to an attack. Males are more commonly attacked than females, and a previous attack seems to give a special liability to another. The incubation period of pneumonia is unknown; it is probably very short.

The symptoms are generally well marked from the beginning. The attack is usually ushered in by a rigor (or in children a con- vulsion), and the speedy development of the febrile condition, the temperature rising to a considerable degree — 101 to 104° or more. The pulse is quickened, and there is a marked disturbance in the respiration, which is rapid, shallow and difficult, the rate being usually accelerated to some two or three times its normal amount. The lips are livid s and the face has a dusky flush. Pain in the side is felt, especially should any amount of pleurisy be present, as is often the case. Cough is an early symptom. It is at first frequent and hacking, and is accompanied with a little tough colourless expectoration, which soon, however, becomes more copious and of a rusty red colour, either tenacious or frothy and liquid. Micro- scopically this consists mainly of epithelium, casts of the air cells and fine bronchi, together with granular matter, blood and pus corpuscles and haematoidin crystals. The micro-organisms usually present are the pneumococcus, Friedlander's bacillus, and sometimes the influenza bacillus. The following are the chief physical signs in the various stages of the_ disease. In the stage of congestion fine crackling or crepitation is heard over the affected area; some- times there is very little change from the natural breathing. In the stage of red hepatization the affected side of the chest is seen to expand Jess freely than the opposite side; there is dullness on

percussion, and increase of the vocal fremitus; while on ausculta- tion the breath sounds are tubular or bronchial in character, with, it may be, some

amount of fine crepitation in certain parts. In the stage of grey hepatization the percussion note is still dull and the breathing tubular, but crepitations of coarser quality than before are also audible. These various physical signs disappear more or less rapidly during convalescence. With the progress of the inflammation the febrile symptoms and rapid breathing continue. The patient during the greater part of the disease lies on the back or on the affected side. The pulse, which at first was full, becomes small and soft owing to the interruption to the pulmonary circulation. Occasionally slight jaundice is present, due probably to a similar cause. The urine is scanty, sometimes albuminous, and its chlorides are diminished. In favourable cases, however severe, there generally occurs after six or eight days a distinct crisis, marked by a rapid fall of the temperature accom- panied with perspiration and with a copious discharge of lithates in the urine. Although no material change is as yet noticed in the physical signs, the patient breathes more easily, sleep returns, and convalescence advances rapidly in the majority of instances. In unfavourable cases death may take place either from the extent of the inflammatory action, especially if the pneumonia is double, from excessive fever, from failure of the heart's action or general strength at about the period of the crisis, or again from the disease assuming from the first a low adynamic form with delirium and with scanty expectoration of greenish or " prune juice " appear- ance. Such cases are seen in persons worn out in strength, in the aged, and especially in the intemperate.

The complications of acute pneumonia are pleurisy, which is practically inevitably present, empyema (in which the pneumococcus is frequently present and occasionally the streptococcus), peri- carditis and endocarditis, both due to septic poisoning, while perhaps the most serious complication is meningitis, which is responsible for a large percentage of the fatal cases. The pneumococcus has been found in the exudate. Secondary pneumonias chiefly follow the specific fevers, as diphtheria, enteric fever, measles and influenza, and are the result of a direct poisoning. Bacteriologically a number of different organisms have been found, together with the specific microbe of the primary disease; the striking features of primary lobar pneumonia are often masked in these types.

The treatment of acute pneumonia has of late undergone a marked change, and may be divided into 3 heads: (1) General hygienic treatment; (2) the treatment of special symptoms; (3) treatment by vaccines and sera. The same treatment of absolute rest should be carried out as in enteric fever; this absolute rest is necessary to limit the auto-inoculation by the absorption of toxins. Fresh air in abundance and even open- air treatment if possible has been attended with good results. Ice poultices over the affected part are useful in the relief of pain, while tepid sponging and tepid or even cold baths may be freely given, and the patient's strength supported

by milk, soups and other light forms of nourishment. Stimulants may be called for, and strychnine and digitalin are the most valu- able; disinfection of the sputum should be systematically carried out. Many trials have been made with antipneumo- coccic serum, but it has not been shown to haˆe a very marked effect in cutting short the disease. The polyvalent serum of Romer]jas given the best results. Much more favour- able results have been obtained from the use of a vaccine. The results of vaccine treatment obtained by Boellke in 30 cases of severe pneumonia and one case of pneumococcic endocarditis are encouraging. The vaccine, to produce the best effects, should be made from the patient's own pneumococcus, as it is evident there are different strains of pneumococci, the doses (5 to 50 million dead pneumococci) being regulated by the guidance of the opsonic index. The objection to the prepara- tion of the vaccine from the patient's own organisms is the time (several days) which is required, valuable time being thereby lost; but the results are much more certain than with the use of a " stock" vaccine.

2. Broncho- Pneumonia (Catarrhal or Lobular-Pneumonia or Capillary Bronchitis). An acute form of lobular pneumonia has been described, having all the characters of acute lobar pneumonia except that the pneumonic patches are disseminated. The term "broncho-pneumonia" is however here used to denote a widespread catarrhal inflammation of the smaller bronchi which spreads in places to the alveoli and produces consolidation. All forms of broncho-pneumonia depend on the invasion of the lung by micro-organisms. _ No one organism

has however been constantly found which can be said to be specific, as in lobar pneumonia; the influenza bacillus, micro- coccus catarrhalis, pneumococcus, Friedlander's bacillus and various staphylococci having been found. John Eyre, in Allbutt's System of Medicine, gives 62% of mixed infection in the cases investigated by him. Broncho-pneumonia may occur as an acute primary affection in children, but is more usually secondary. It may be a sequence of infectious fevers, measles, diphtheria, whooping cough, scarlet fever and sometimes typhoid fever. In these it forms a frequent and often a fatal com- plication. The large majority of the fatal cases are those of early childhood. In adults it may follow influenza or com- plicate chronic Bright's disease or various other disorders. Broncho-pneumonia also may follow operations on the mouth or trachea, or the inhalation of foreign bodies into the trachea. It is a frequent complication of pulmonary tuberculosis.

The following changes take place in the lung: at first the affected patches are dense, non-crepitant, with a bluish red appearance tending to become grey or yellow. Under the microscope the air vesicles and finer bronchi are crowded with cells, the result of the inflammatory process, but there is no

fibrinous exudation such as is present in croupous pneumonia. In favourable cases resolution takes place by fatty degenera- tion, liquefaction, and absorption of the cells, but on the other hand they may undergo caseous degenerative changes, abscesses may form, or a condition of chronic interstitial pneumonia be developed, in both of which cases the condition passes into one of pulmonary tuberculosis. Evidence of previous bronchitis is usually present in the lungs affected with catarrhal pneu- monia. In the great majority of instances catarrhal pneu- monia occurs as an accompaniment or sequel of bronchitis, either from the inflammation passing from the finer bronchi to the pulmonary air vesicles, or from its affecting portions of lung which have undergone collapse.

The symptoms characterizing the onset of catarrhal pneumonia in its more acute form are the occurrence during an attack of bronchitis or the convalescence from measles or whooping cough, of a sudden and marked elevation of temperature, together with a quickened pulse and increased difficulty in breathing. The cough becomes short and painful, and there is little or no expectora- tion. The physical signs are not distinct, being mixed up with those of the antecedent bronchitis; but, should the pneumonia be exten- sive, there may be an impaired percussion note with tubular breath- ing and some bronchophony. Dyspnoea may be present in a marked degree; and death frequently occurs from paralysis of the heart. Broncho- pneumonia is a serious disease, the death-rate in children under five has been estimated at 30 to 50 %.

The treatment of broncho-pneumonia is mainly symptomatic, At the outset a mild purgative is given, and should the secre- tion accumulate in the bronchial tubes an emetic is useful. Inhalations are useful to relieve the cough, and circulatory stimulants such as strychnine are valuable, together with bella- donna and oxygen. When orthopnoea and lividity are present, with distension of the right heart, venesection is necessary. The treatment of broncho-pneumonia by serum and vaccines is not so successful as in lobar pneumonia, owing to the difficulty of ascertaining the precise bacterial infection. The great danger of broncho-pneumonia is the subsequent development of pulmonary tuberculosis.

3. Chronic Interstitial Pneumonia (Cirrhosis of the Lung) is a fibroid change in the lung, chiefly affecting the fibrous stroma and may be either local or diffuse. The changes pro- duced in the lung by this disease are marked chiefly by the growth of nucleated fibroid tissue around the walls of the bronchi and vessels, and in the intervesicular septa, which proceeds to such an extent as to invade and obliterate the air cells. The lung, which is at first enlarged, becomes shrunken, dense in texture and solid, any unaffected portions being emphyse- matous; the bronchi are dilated, the pleura thickened, and the lung substance often deeply pigmented, especially

in the case of miners, who are apt to suffer from this disease. The other lung is always greatly enlarged and distended from emphysema; 1 the heart becomes hypertrophied, particularly the right ven- tricle; and there may be marked atheromatous changes in the

blood vessels. Later the lung becomes converted into a series of bronchiectatic cavities. This condition is usually present to a greater or less degree in almost all chronic diseases of the lungs and bronchi, but it is specially apt to arise in an extensive form from pre-existing catarrhal pneumonia, and not unfrequently occurs in connexion with occupations which necessitate the habitual inhalation of particles of dust, such as those of col- liers, flax-dressers, stonemasons, millers, &c, to which the term pneumonokoniosis is now applied (including anthracosis, siderosis, chalicosis and the so-called " grinder's rot").

The symptoms are very similar to those of chronic phthisis (see Tuberculosis), especially increasing difficulty of breathing, particu- larly on exertion, cough either dry or with expectoration, some- times copious and fetid. In the case of coal-miners the sputum is black from containing carbonaceous matter. The physical signs are deficient expansion of the affected side — the disease being mostly confined to one lung — increasing dullness on percussion, tubular breathing and moist sounds. As the disease progresses retraction of the side becomes manifest, and the heart and liver may be displaced. Ultimately the condition, both as regards physical signs and symptoms, takes the characters of the later stages of pulmonary phthisis with colliquative symptoms, in- creasing emaciation and death. Occasionally dropsy is present from the heart becoming affected in the course of the disease. The malady is usually of long duration, many cases remaining for years in a stationary condition and even undergoing temporary improvement in mild weather, but the tendency is on the whole downward.

See Allbutt and Rolleston, System of Medicine (1909) ; R. W. Allen, Vaccine Therapy and the Opsonic Method of Treatment (1908); Osier, Practice of Medicine (1909) ; The Practitioner (May 1908) ; Clinical Journal (Jan. 1908) ; American Journal of the Medical Sciences (Jan. 1908) ; W. C. Bosanquet and J. Eyre, Serums, Vaccines and Toxines (1909).

PNOM-PENH, a town of French Indo-China, capital, since 1866, of the protectorate of Cambodia and seat of the resident- superior. Pop. about

60,000, consisting of Cambodians, An- namese, Chinese, Malays, Indians and about 600 Europeans. It is situated on the Mekong about 173 m. from its mouth at the point where it divides into two arms and is joined by the branch connecting it with the Great Lake (Tonle-Sap). Its position makes it the market for the products of Cambodia, Laos, Upper Burma and part of Siam (dried fish, rice, cotton, indigo, cardamoms, &c.) The town is lighted by electricity. The palace of the king of Cambodia occupies a large space in the Cambodian quarter. The town gets its name from the Pnom, a central hill surmounted by an ancient pagoda.

PO (anc. Padus, Gr. IldSos), a river of northern Italy, and the largest in the whole country, with a total length of about 310 m. direct from the source to the mouth, but, including its many windings, of some 417 m. The navigable portion from Casale Monferrato to the mouth is 337 m.; the minimum width of this portion 656 ft., and its minimum depth 7 ft. Owing to the prevalence of shallows and sandbanks, navigation is difficult.

The Po is the dominating factor in north Italian geography, north Italy practically consisting of the Po basin, with the sur- rounding slopes of the Alps and Apennines. For a description of its course, and a list of its principal tributaries see Italy. The area of its basin, which includes portions of Switzerland and Austria, is estimated at 26,798 sq. m.

In the first 21 m. of its course, down to Revello (west of Saluzzo), the Po descends no less than 5250 ft., or a fall of 47-3: 1000, forming a very remarkable contrast to its fall lower down. From the con- fluence of the Ticino its fall is about 0-3:1000; from the beginning of the delta below Ferrara, 0-08:1000. At Turin it has an average width of 400 to 415 ft., a mean depth of 3! to 5J ft., and a velocity of 1 to 3 ft. in the second. The mean depth from the confluence of the Ticino (altitude 217 ft.) downwards is 6 to 15 ft. The river is embanked from Piacenza, and continuously from Cremona, the total length of the embankments exceeding 600 m. Owing to its confinement between these high banks, and to the great amount of sedimentary matter which the river brings down with it, its bed has been gradually raised, so that in its lower course it is in many places above the level of the surrounding country. A result of confining the stream between its containing banks is the rapid growth of the delta. Lombardini calculated that the annual increase in the area of the Po delta during the period 1300 to 1600 amounted to 127 acres; but during the period 1600 to 1830 it rose to 324 acres. Marinelii l estimated that between the years 1823

and 1893 the annual increase was at the average rate of 173 to 175 acres, and the total accretion at about 20 sq. m. ; and the total area of inundated land north and south of the delta at nearly 60 sq. m. 1 He further estimated that the Po della Maestra advances 282 ft. annually, the Po delle

Tolle 262 ft., the Po della Gnocca III I ft., and the Po di Goro 259 ft. The low ground between the lower Po and the lower Adige and the sea is known as Polesine, a name the derivation of which is much discussed. It is generally applied only to the province of Rovigo, but is sometimes extended to the neighbourhood of Adria and Ferrara. All along its course from Chivasso (below Turin) down to the delta the river is con- nected with several of its tributaries by canals, and at the same time other canals connect the tributaries and carry off their waters and the waters of the Po purely for purposes of irrigation.

The researches of Helbig (Die Italiker in der Po-Ebene, Leipzig, 1879) show that the lower valley of the Po was at an early period occupied by people of the Palaeolithic and Neolithic stages of civilization, who built houses on piles along the swampy borders of the streams. It is possible that even they may have begun by crude dikes the great system by which the waters are now con- trolled ; at least it is certain that these works date their origin from pre-Roman antiquity. Pliny refers them to the Etruscans. The reclaiming and protecting of the riparian lands went on rapidly under the Romans, and in several places the rectangular divisions of the ground, still remarkably distinct, show the military character of some of the agricultural colonies. During the time of the bar- barian invasions much of the protective system was allowed to fall into decay; but the latter part of the middle ages saw the works resumed with great energy, so that the main features of the present arrangement were in existence by the close of the 1 5th century.

The earlier Roman writers speak of the region between the northern boundaries of Etruria and Umbria and the Alps as Gallia Cisalpina. It was separate from Italy proper, the Aesis first and then the Rubicon being the boundary on the east, and the Arnus the boundary on the west, so that, for example, Luca remained outside the boundaries of Italy proper, even in 89 B.C. Romaniza- tion had, however, progressed considerably, the foundation of colonies and the construction of roads had gone on during the 2nd century, and the whole district as far as the Padus was given the Roman franchise in 89 B.C., while the Transpadanes received Latin rights, and were fully enfranchised forty years later. Cis- alpine Gaul was apparently formed into a province by Sulla in 81 B.C. and continued to be so until the fall of the Republic.

The Ligurian name of the Po was Bodincus or Bodencus, i.e. the bottomless. The name Padus was taken from the Celts or the Veneti. Thus we find Bodincomagus as a town name (Industria) on the upper course, and TLa&oa (Padua, Catull. 95, 7) as a name of one of the mouths of the river. The name 'HpiSavis (Eri- danus) of Greek poetry was identified with it at a comparatively late period.

POACH (probably from Fr. poche, bag, or Eng. " poke," thrust into), to trespass on private property in pursuit of game or fish; also, generally, to catch game or fish by means or at times not permitted by the law, or in an unsportsmanlike manner (see Game Laws). The etymology is rather obscure, but as used in the independent sense of " poaching" an egg, i.e. cooking by breaking into boiling water, the word appears to be from the same original.

POBEDONOSTSEV, CONSTANTINE PETROVICH (1827- 1907), Russian jurist, state official, and writer on philosophical and literary subjects. Born in Moscow in 1827, he studied at the School of Law in St Petersburg, and entered the public service as an official in one of the Moscow departments of the senate. From i860 to 1865 he was professor of Russian civil law in the Moscow University, and instructed the sons of Alex- ander II. in the theory of law and administration. In 1868 he became a senator in St Petersburg, in 1872 a member of the council of the empire, and in 1880 chief procurator of the Holy Synod. He always showed himself an uncompromising Con- servative, and never shrank from expressing boldly his opinions. Consequently, in the so-called Liberal camp he was always denounced an an " obscurantist" and an enemy of progress. In the early years of the reign of Alexander II. (1855-1881), Pobedonostsev maintained, though keeping aloof from the Slavophils, that Occidental institutions were radically bad in themselves and totally inapplicable to Russia. Parliamentary methods of administration, modern judicial organization and pro- cedure, trial by jury, freedom of the press, secular education — these were among the principal objects of his aversion. He

1 See G. Marinelii, in Atti inst. veneto set., 8th series, vol. viii. (1896-1897); and " L'Accrescimento del Delta del Po nel Secolo XIX.," in Riv. Georg. Ital. (1898), vol. v.

subjected all of them to a severe analysis in his Reflections of a Russian Statesman (English by R. C. Long, London, 1898). To these dangerous products of Occidental rationalism he found a counterpoise in popular vis inertiae, and in the respect of the masses for institutions developed slowly and automatically during the past centuries of national life. Among the practical deductions drawn from these premisses is the necessity of pre- serving the autocratic power, and of fostering among the people the traditional veneration for the ritual of the national Church. In the sphere of practical politics he exercised considerable influence by inspiring and encouraging the Russification policy of Alexander III. (1881-1894), which

found expression in an administrative Nationalist propaganda and led to a good deal of religious persecution. After the death of Alexander III. he lost much of his influence, for Nicholas II., while clinging to his father's Russification policy and even extending it to Fin- land, disliked the idea of systematic religious persecution, and was not wholly averse from the partial emancipation of the Russian Church from civil control. During the revolutionary tumult which followed the disastrous war with Japan Pobe-donostsev, being nearly 80 years of age, retired from public affairs. He died on the 23rd of March 1907.

POCHARD, Pockard, or Poker, 1 names properly belonging to the male of a species of duck (the female of which is known as the Dunbird), the Anas ferina of Linnaeus, and Nyroca ferina of later ornithologists — but names very often applied by writers in a general way to most of the group or sub-family Fuligulinae, commonly called Diving or Sea-Ducks (see Duck). The Pochard in full plumage is a very handsome bird, with a coppery-red head, on the sides of which sparkle the ruby irides of his eyes, relieved by the greyish-blue of the basal half of his broad bill, and the deep black of his breast, while his back and flanks appear of a light grey, being really of a dull white closely barred by fine undulating black lines. The tail-coverts both above and below are black, the quill feathers brownish-black, and the lower surface of a dull white. The Dunbird has the head and neck reddish-brown, with ill-defined whitish patches on the cheeks and chin; the back and upper tail-coverts are dull brown, and the rest of the plumage, except the lower tail-coverts, which are brownish-grey, resembles that of the Pochard. This species is very abundant in many parts of Europe, northern Asia, and North America, generally frequenting in winter the larger open waters, and extending its migrations to Barbary and Egypt, but in summer retiring northward and inland to breed. The American Pochard is slightly larger, has yellow eyes, and is now regarded as specifically distinct under the name of Nyroca americana; but America has a perfectly distinct though allied species in the celebrated canvas-back duck, iV. vallisneria, a much larger bird, with a longer, higher and narrower bill, which has no blue at the base, and, though the plumage of both, especially in the females, is very similar, the male canvas-back has a darker head, and the black lines on the back and flanks are much broken up and farther asunder, so that the effect is to give these parts a much lighter colour, and from this has arisen the bird's common though fanciful name. Its scientific epithet is derived from the fresh-water plant, a species of Vallisneria, usually known as " wild celery," from feeding on which its flesh is believed to acquire the delicate flavour that is held in so great a repute. The Pochard and Dunbird in Europe are in much request for the table (as the German name of the species, Tafelente, testi- fies) when they frequent fresh- water; birds killed on the sea- coast are so rank as to be almost worthless.

Among other species nearly allied to the Pochard that frequent the northern hemisphere may be mentioned the Scaup-Duck, Fuligula marila, with its American representative F. affinis, in

1 The derivation of these words, in the first of which the ch is pronounced hard (though Dr Johnson made it soft), and the in all of them generally long, is very uncertain. Cotgrave has pocheculier (modern French poche-cuiller), which he renders

Shoueler," nowadays the name of a kind of duck, but in his time meaning the bird we commonly call Spoonbill (?-».). Littr6 gives pochard as a popular French word signifying drunkard.

both of which the male has the head black, glossed with blue or green; but these are nearly always uneatable from the nature of their food, which is mostly gathered at low tide on the " scaups " or " scalps," — as the banks on which mussels and other marine molluscs grow are in many places termed. Then there are the Tufted Duck, F. cristata — black with a crest and white flanks— and its American equivalent F. collaris, and the White-eyed Pochard, F. nyroca, and the Red-crested Pochard, F. rufina — both peculiar to the Old World, and well known in India. In the southern hemi-sphere the genus is represented by three species, F. capensis, F. australis and F. novae-zealandiae, whose respective names indicate the country each inhabits, and in South America exists a some- what divergent form which has been placed in a distinct genus as Metopiana peposaca.

Generally classed with the Fuligulinae is the small group known as the Eiders, which differ from them in several respects: the bulb at the base of the trachea in the male, so largely developed in the members of the genus Fuligula, is here much smaller and wholly of bone ; the males take a much longer time, two or even three years, to attain their full plumage, and some of the feathers on the head, when that plumage is completed, are always stiff, glistening and of a peculiar pale-green colour. This little group of hardly more than half a dozen species may be fairly considered to form a separate genus under the name of Somateria. Many authors indeed have — unjustifiably, as it seems to the present writer — broken it up into three or four genera. The well-known Eider, S. mollissima, is the largest of this group, and, beautiful as it is, is excelled in beauty by the King-Duck, S. spectabilis, and the little 5. stelleri. A most interesting form generally, but obviously in error, placed among them, is the Logger-head, Racehorse or Steamer-Duck, Micropterus (or more probably Tachyeres) cinereus of Chile, the Falkland Islands and Straits of Magellan — nearly as large as a tame goose, and subject to the, so far as known, unique peculiarity of losing its power of flight after reaching maturity. Its habits have been well de- scribed by C. Darwin in his Journal of Researches, and its anatomy is

the subject of an excellent paper in the Zoological Society's Transactions (vii. 493-501, pis. lviii.-lxii.) by R. 0. Cunningham.

(A. N.)

POCKET, a small bag, particularly a bag-like receptacle either fastened to or inserted in an article of clothing. As a measure of capacity " pocket" is now only used for hops; it equals 168 lb. The word appears in Mid. Eng. as poket, and is taken from a Norman diminutive of O. Fr. poke, pouque, mod. poche, cf. " pouch." The form " poke " is now only used dialectically, or in such proverbial sayings as a " pig in a poke," and possibly in the " poke-bonnet," the coal-scuttle bonnet fashionable during the first part of the 19th century, and now worn by the female members of the Salvation Army; more probably the name of the bonnet is connected with " poke," to thrust forward, dig. The origin cf this is obscure. Dutch has poken, pook, a dagger; Swedish p&k, a stick.

POCKET-GOPHER (i.e. pouched rat), the name of a group- of, chiefly North, American rat-like rodents, characterized by the possession of large cheek-pouches, the openings of which are external to the mouth; while their inner surface is lined with fur. The cheek-teeth, which comprise two pairs of premolars and three of molars in each jaw, are in the form of simple prisms of enamel, which do not develop roots. The fore and hind limbs are of approximately equal length, but the second and third front-claws are greatly enlarged, and all the claws are furnished at the base with bristles. The eyes are small, and the external ears rudimentary.

Pocket-gophers, which typify a family, the Geomyidae, spend the whole of their time underground, and are specially organ- ized for such a mode of existence, their powerful claws being adapted for digging, while the bristles on the toes prevent the earth from passing between them. The upper incisor teeth are employed to loosen the ground, like a fork; and the little rodents are able to move both backwards and forwards in their runs. The cheek-pouches are employed solely in carrying food, which consists largely of roots. In the typical genus Geomys the upper incisors are grooved, but in the allied Thomomys they are smooth. The common pocket- gopher, Geomys bursarius, of the Mississippi Valley measures about 8 in. in length, with a tail of between 2 and 3 in. ; its colour being rufous brown and greyish beneath. A well-known representative of the second genus is Thomomys talpoides, which is considerably smaller than the former. To the farmer and the gardener pocket- gophers are an unmitigated source of annoyance. (See Rodentia.)

POCKET-MOUSE, the name of a number of small jerboa-like, chiefly North, American rodents belonging to the family Geo- myidae, and

constituting the genus Perognathus and Heteromys. They are nearly allied to the American kangaroo-rats (see

Kangaroo-Rat), but differ in having rooted molar teeth. The typical pocket-mouse P. fasciatus, which is a native of Mon- tana, Missouri, and Wyoming, is a sandy-coloured rodent marked with black lines above and with white beneath, and measuring about 6 in. in length, this length being equally divided between the head and body and the tail. (See Rodentia.)

POCOCK, SIR GEORGE (1 706-1 792), British admiral, son of Thomas Pocock, chaplain in the navy, was born on the 6th of March 1706, and entered the navy under the protection of his maternal uncle, Captain Streynsham Master (1682-1724), in the " Superbe " in 1718. He became lieutenant in April 1725, commander in 1733, and post-captain in 1738. After serving in the West Indies he was sent to the East Indies in 1754 as captain of the " Cumberland" (58) with Rear-Admiral Charles Watson (1714-1757). Watson's squadron co-operated with Clive in the conquest of Bengal. In 1755 Pocock became rear-admiral, and was promoted vice-admiral in 1756. On the death of Watson he took the command of the naval forces in the eastern seas. In 1758 he was joined by Commodore Charles Steevens (d. 1761), but the reinforcement only raised the squadron to seven small line-of-battle ships. War being now in pro- gress between France and England the French sent a naval force from their islands in the Indian Ocean into the Bay of Bengal to the assistance of Pondicherry. To intercept the arrival of these reinforcements for the enemy now became the object of Pocock. The French force was indeed of less intrinsic strength than his own. Count D'Ache (i7oo?i775), who commanded, had to make up his line by including several Indiamen, which were only armed merchant ships. Yet the number of the French was superior and Pocock was required by the practice of his time to fight by the old official fighting instructions. He had to bring his ships into action in a line with the enemy, and to preserve his formation while the en gagement lasted. All Pocock's encounters with D'Ache were indecisive. The first battle, on the 29th of April 1758, failed to prevent the Frenchmen from reaching Pondicherry. After a second and more severe engagement on the 3rd of August, the French admiral returned to the Mauritius, and when the monsoon set in Pocock went round to Bombay. He was back early in spring, but the French admiral did not return to the Bay of Bengal till September. Again Pocock was unable to prevent his opponent from reaching Pondicherry, and a well-contested battle between them on the 10th of September 1759 proved again indecisive. The French government was nearly bankrupt, and D'Ache could

get no stores for his squadron. He was compelled to return to the islands, and the English were left in possession of the Coromandel and Malabar coasts. Pocock went home in 1760, and in 1761 was made Knight of the Bath and admiral. In 1762 he was appointed to the com- mand of the naval forces in the combined expedition which took Havana. The siege, which began on the 7th of June, and lasted till the 13th of August, was rendered deadly by the climate. The final victory was largely attributable to the vigorous and intelligent aid which Pocock gave to the troops. His share in the prize money was no less than £122,697. On his return to England Pocock is said to have been disappointed because another officer, Sir Charles Saunders (1713-1775), was chosen in preference to himself as a member of the admiralty board, and to have resigned in consequence. It is certain that he re- signed his commission in 1766. He died on the 3rd of April 1792. His monument is in Westminster Abbey.

POCOCKE, EDWARD (1604-1691), English Orientalist and biblical scholar, was born in 1604, the son of a Berkshire clergy- man, and received his education at the free school of Thame in Oxfordshire and at Corpus Christi College, Oxford (scholar in 1620, fellow in 1628). The first-fruit of his studies was an edition from a Bodleian MS. of the four New Testament epistles (2 Peter, 2 and 3 John, Jude) which were not in the old Syriac canon, and were not contained in European editions of the Peshito. This was published at Leiden at the instigation of G. Vossius in 1630, and in the same year Pococke sailed for Aleppo as chaplain to the English factory. At Aleppo he made himself a profound Arabic

scholar, and collected many valuable MSS. At this time Wm. Laud was bishop of London and chancellor of the university of Oxford, and Pococke became known to him as one who could help his schemes for enriching the university. Laud founded an Arabic chair at Oxford, and invited Pococke home to fill it, and he entered on his duties on the 10th of August 1636; but next summer he sailed again for Constantinople to prosecute further studies and collect more books, and remained there for about three years. When he returned to England Laud was in the Tower, but had taken the precaution to place the Arabic chair on a permanent footing. Pococke does not seem to have been an extreme churchman or to have meddled actively in politics. His rare scholarship and personal qualities raised him up influential friends among the opposite party, foremost among these being John Selden and John Owen. Through their offices he was even advanced in 1648 to the chair of Hebrew, though as he could not take the engagement of 1649 he lost the emoluments of the post soon after, and did not recover them till the Restora- tion. These cares seriously hampered Pococke in his studies, as he complains in the preface to his Eutychius; he seems to have felt most deeply the attempts to remove him from his parish of Childrey, a college living which he had accepted in 1643. In 1649 he

published the Specimen historiae arabum, a short account of the origin and manners of the Arabs, taken from Barhebraeus (Abulfaragius), with notes from a vast number of MS. sources which are still valuable. This was followed in 1655 by the Porta Mosis, extracts from the Arabic commentary of Maimonides on the Mishna, with translation and very learned notes; and in 1656 by the annals of Eutychius in Arabic and Latin. He also gave active assistance to Brian Walton's poly- glot bible, and the preface to the various readings of the Arabic Pentateuch is from his hand. After the Restoration Pococke's political ajrd pecuniary troubles were removed, but the reception of his Magnum opus — a complete edition of the Arabic history of Barhebraeus (Greg. Abulfaragii historia compendiosa dynastia-rum), which he dedicated to the king in 1663, showed that the new order of things was not very favourable to profound scholarship. After this his most important works were a Lexicon heptaglotton (1669) and English commentaries on Micah (1677), Malachi (1677), Hosea (1685) and Joel (1691), which are still worthreading. An Arabic translation of Grotius's De veritate, which appeared in 1660, may also be mentioned as a proof of Pococke's interest in the propagation of Christianity in the East. This was an old plan, which he had talked over with Grotius at Paris on his way back from Constantinople. Pococke married in 1646, and died in 1691. One of his sons, Edward (1648-1727), published several contributions to Arabic literature — a fragment of Abdallatif's description of Egypt and the Philosophus autodidactus of Ibn Tufail.

The theological works of Pococke were collected, in two volumes, in 1740, with a curious account of his life and writings by L. T wells.

PODEBRAD, GEORGE OP (1420-1471), king of Bohemia, was the son of Victoria of Kunstat and Podebrad, a Bohemian noble- man, who was one of the leaders of the " Orphans" or modern Taborites during the Hussite wars. George himself as a boy of fourteen took part in the great battle of Lipan, which marks the downfall of the more advanced Taborites. Early in life, as one of the leaders of the Calixtine party, he defeated the Austrian troops of the German King Albert II., son-in-law and successor of King Sigismund. He soon became a prominent member of the national or Calixtine party, and after the death of Ptacek of Pirkstein its leader. During the minority of Ladislas, son of Albert, who was born after his father's death, Bohemia was divided into two parties — the Romanist or Austrian one, led by Ulrich von Rosenberg (1403-1462), and the national one, led by Podebrad. After various attempts at reconciliation, Podebrad decided to appeal to the force of arms. He gradually raised an armed force in north-eastern Bohemia, where the Calixtine cause had most adherents and where his ancestral castle was situated. With this army, consisting of about 9000 men, he marched in 1448 from Kutna Hora to Prague, and obtained possession of the capital almost without resistance. Civil war, however,

out, but Podfibrad succeeded in defeating the Romanist nobles. In 1451 the emperor Frederick III., as guardian of the young king Ladislas, entrusted Podebrad with the administration of Bohemia. In the same year a diet assembled at Prague also conferred on Podebrad the regency. The struggle of the Bohe- mians against Rome continued uninterruptedly, and the position of Podebrad became a very difficult one when the young king Ladislas, who was crowned in 1453, expressed his sympathies for the Roman Church, though he had recognized the compacts and the ancient privileges of Bohemia. In 1457 King Ladislas died suddenly, and public opinion from an early period accused Podebrad of having poisoned him. The Bohemian historian, Palacky, fifty years ago thoroughly disproved this accusation, and, though it has recently been revived by German historians, it must undoubtedly be considered as a calumny. On the 27th of February 1458 the estates of Bohemia unani- mously chose Podebrad as king; even the adherents of the Austrian party voted for him, not wishing at that moment to oppose the popular feeling, which demanded the election of a national sovereign. A year after the accession of Podebrad Pius II. (Aeneas Sylvius) became pope, and his incessant hostility proved one of the most serious obstacles to Podebrad's rule. Though he rejected the demand of the pope, who wished him to consent to the abolition of the compacts, he endeavoured to curry favour with the Roman see by punishing severely all the more advanced opponents of papacy in Bohemia. PodSbrad's persecution of the newly-founded community of the Bohemian brethren is certainly a blemish on his career. All Podebrad's endeavours to establish peace with Rome proved ineffectual, and though the death of Pius II. prevented him from carrying out his planned crusade against Bohemia, his successor was a scarcely less bitter enemy of the country. Though the rule of Podebrad had proved very successful and Bohemia had under it obtained a degree of prosperity which had been unknown since the time of Charles IV., the Calixtine king had many enemies among the Romanist members of the powerful Bohemian nobility. The malcontent nobles met at Zelena Hora (Grüneberg) on the 28th of November 1465, and concluded an alliance against the king, bringing forward many — mostly untrue — accusations against him. The confederacy was from its beginning supported by the Roman see, though Podebrad after the death of his im- placable enemy, Pius II., attempted to negotiate with the new pope, Paul II. These negotiations ended when the pontiff grossly insulted the envoys of the king of Bohemia. On the 23rd of December 1466 Paul II. excommunicated Podebrad and pronounced his deposition as king of Bohemia, forbidding all

Romanists to continue in his allegiance. The emperor Frederick III., and King Matthias of Hungary, Podebrad's former ally, joined the insurgent Bohemian nobles. King Matthias conquered a large part of Moravia, and was crowned in the capital of that country, Brno(Brunn), as king of Bohemiaon the3rdof May 1469. In the following year Podebrad was more successful in his resist- ance to his many enemies, but his death on the 22nd of March 1471 put a stop to the war. In spite of the misfortunes of the last years of his reign, Podebrad's memory has always been cherished by the Bohemians. He was the only king of Bohemia who belonged to that nation, and the only one who was not a Roman Catholic.

See H. Markgraf, Tiber das Verhdltniss des Konigs Georg von Podebrad zu Papst Pius II. (1867); Jordan, Das Konigthum Georgs von Podlbrad (1861); A. Bachmann, Ein Jahr bbhmischer Geschichte (1876), and Urkunden . . . zur oeslerreichischen Geschichte . . . im Zeiialter Georgs von Podebrad (1879); E.. W. Kanter, Die Ermordung Konig Ladislaus (1906) ; Novotry, Uber den Tod Konig Ladislaws Postumus (1906). All histories of Bohemia, particularly that of F. Palacky (1836-1867), contain detailed accounts of the career of King George of Podebrad. (L.).

PODESTA (Lat. potestas, power), the name given during the later middle ages to a high official in many Italian cities. Podes- tas or rectors were first appointed by the emperor Frederick I. when about 1158 he began to assert his Imperial rights over the cities of northern Italy. Their business was to enforce these rights; from the first they were very unpopular, and their

arbitrary behaviour was a factor in bringing about the formation of the Lombard league and the rising against Frederick in

1167.

Although the emperor's experiment was short-lived podestas soon became general in northern Italy, making their appearance in most communes about 1200. These officials, however, were now appointed by the citizens or by their representatives. They exercised the supreme power in the city, both in peace and war, both in foreign and domestic matters, but they only held office for a period of a year. In order to avoid the intestine strife so common in Italian civic life, it soon became the custom to select a stranger to fill this position. Venetians were in special request for this purpose during the 12th and 13th cen- turies, probably because at this time, at least, they were less concerned than other Italians in the affairs of the mainland. Afterwards in a few cases the term of office was extended to cover a period of years, or even a lifetime.

During the later part of the 12th and the whole of the 13th century most of

the Italian cities were governed by podestas. Concerning Rome, Gregorovius says that in 1205 " the pope changed the form of the civic government; the executive power lying henceforward in the hand of a single senator or podesta, who, directly or indirectly, was appointed by the pope." In Florence soon after n 80 the chief authority was transferred from the consuls to the podesta, and Milan and other cities were also ruled by these officials. There were, moreover, podestas in some of the cities of Provence. Gradually the podestas be- came more despotic and more corrupt, and sometimes a special official was appointed to hear complaints against them; in the 13th century in Florence and some other cities a capitano del popolo was chosen to look after the interests of the lower classes. In other ways also the power of the podestas was reduced; they were confined more and more to judicial functions until they disappeared early in the 16th century.

The officials who were sent by the Italian republics to ad- minister the affairs of dependent cities were sometimes called podestas. At the present day the cities of Trent and Trieste give the name of podesta to their chief magistrate.

The example of Italy in the matter of podestas was sometimes followed by cities and republics in northern Europe in the middle ages, notably by such as had trade relations with Italy. The officers thus elected sometimes bore the title of podesta or podestat. Thus in East Friesland there were podestas identical in name and functions with those of the Italian republics; sometimes each province had one, sometimes the federal diet elected a podesta-general for the whole country, the term of office being for a limited period or for life (see J. L. Motley, Dutch Republic, i. 44, ed. 1903).

Lists of the Italian podestas are given in Stokvis, Manuel d'histoire ; vol. iii. (Leiden, 1889). See also W. F. Butler, The Lombard Communes (1906).

PODGORITSA (Croatian, Podgorica), the largest town in Mon- tenegro; on the left bank of the river Moracha, and in a fertile valley which strikes inland for 18 m. from the shores of Lake Scutari to the mountains of central and eastern Montenegro. Pop. (1900), about 5500. Spread out on a perfectly flat plain, Podgoritsa has two distinct parts: the picturesque Turkish quarter, with its mosques and mined ramparts, and the Monte- negrin quarter, built since 1877, and containing a prison and an agricultural college. These quarters are separated by the river Ribnitsa, a tributary of the Moracha. A fine old Turkish bridge crosses the main stream. Podgoritsa receives from the eastern plains and the north-eastern highlands a great quantity of tobacco, fruit, rereals, honey, silk, livestock and other commodi- ties, which it distributes through Plavnitsa, its port on Lake Scutari, and through Riyeka to Cettigne and Cattaro. After being captured from Turkey in 1877, Podgoritsa was in 1878 recognized as

Montenegrin territory by the Treaty of Berlin.

PODIUM (Gr. t65iov, diminutive of toOs, foot), the name in architecture for a continuous pedestal, or low wall on which columns are carried, consisting of a cornice or capping, a dado or die, and a moulded plinth. In the Etruscan and Roman temples

the whole structure was raised on a podium, with a flight of steps on the principal front, enclosed between the prolongation of the podium wall.

PODOLIA, a government of south-western Russia, having Volhynia on the N.. Kiev and Kherson on the E. and S., Bess- arabia on the S.W., and Galicia (Austria) on the W., from which it is separated by the Zbrucz, or Rodvocha, a tributary of the Dniester. It has an area of 16,219 sq. m., extending for 200 m. from N.W. to S.E. on the left bank of the Dniester. In the same direction the government is traversed by two ranges of hills separated by the Bug, ramifications of the Avratynsk heights. These hills nowhere exceed an elevation of 1185 ft. Two large rivers, which numerous tributaries, drain the government — the Dniester, which forms its boundary with Bessarabia and is navigable throughout its length, and the Bug, which flows almost parallel to the former in a higher, sometimes swampy, valley, and is interrupted at several places by rapids. The Dniester is an important channel for trade, corn, spirits and timber being exported from Mogilev, Kalus, Zhvanets, Porog and other Podolian river-ports. The rapid smaller tributaries of the Dniester supply numerous flour-mills with motive power. The soil is almost throughout " black earth," and Podolia is one of the most fertile governments of Russia. Forests cover nearly 15% of the total area. Marshes occur only beside the Bug. The climate is moderate, the average temperature of the year at Kamenets being 48-3° (24-5° in January, 6o° in July).

The estimated population in 1906 was 3,543,700. It consists chiefly of Little Russians, Poles (3?), and Jews (12). There are besides a few Armenians, some Germans, and 50,000 Moldav- ians. There are many Nonconformists (18,000) among the Russians, Tulchin being the seat of their bishops and a centre of propaganda. After Moscow, Podolia is the most densely in- habited government of Russia outside Poland. It is divided into twelve districts, the chief towns of which are Kamenets- Podolskiy, the capital, Balta, Bratslav, Gaisin, Letichev, Litin, Mogilev-on-Dniester, Novaya-Ushitsa, Olgopol, Proskurov, Vinnitsa and Yampol. The chief occupations of the people are agriculture and gardening. The principal

crops are wheat, rye, oats, barley, maize, hemp, flax, potatoes, beetroot and tobacco. Podolia is famous for its cherries and] mulberries, its melons, gourds and cucumbers. Nearly 67,000 gallons of wine are – obtained annually. Large numbers of horses, cattle and sheep are bred, the cattle being famous. Bee-keeping is an important industry. Sugar factories, distilleries, flour-mills, woollen mills, tanneries, potteries, tobacco factories, breweries, candle and soap factories, have an annual output valued at £4,000,000. An active trade is carried on with Austria, especially through the Isakovets and Gusyatin custom-houses, corn, cattle, horses, skins, wool, linseed and hemp seed being exported, in exchange for wooden wares, linen, woollen stuffs, cotton, glass and agri- cultural implements. The trade with the interior is also carried on very briskly, especially at the twenty-six fairs, the chief of which are Balta and Yarmolintsy. Podolia is traversed by a railway which runs parallel to the Dniester, from Lemberg to Odessa, and has two branch lines, to Kiev (from Zhmerinka) and to Poltava (from Balta).

History. — The country has been inhabited since the beginning of the Neolithic period. Herodotus mentions it as the seat of the Graeco-Scythian Alazones and the Scythian Neuri, who were followed by the Dacians and the Getae. The Romans left traces of their rule in the Wall of Trajan, which stretches through the modern districts of Kamenets, Ushitsa and Proskurov. During the great migrations many nationalities passed through this territory, or settled within it for some time, leaving traces in numerous archaeological remains. Nestor mentions that the Bujanes and Dulebes occupied the Bug, while the Tivertsi and Ugliches, apparently all four Slav tribes, were settled on the Dniester. These peoples were conquered by the Avars in the 7th century. Oleg, prince of Kiev, extended his rule over this territory — the Ponizie, or " lowlands," which became later a part of the principalities of Volhynia, Kiev and Galicia. In the 13th century the Ponizie was plundered by the Mongols; a hundred

years afterwards Olgierd, prince of Lithuania, freed it from their rule, annexing it to his own territories under the name of Podolia, a word which has the same meaning as Ponizie. After the death (1430) of the Lithuanian prince Vitovt, Podolia was annexed to Poland, with the exception of its eastern part, the province of Bratslav, which remained under Lithuania until its union (1501) with Poland. The Poles retained Podolia until the third division of their country in 1793, when it was taken by Russia. (P.A.K.; J.T.Be.)

PODOLSK, a town of Russia, in the government of Moscow, 26 m. S. of the city of Moscow, at the junction of the two main roads from Moscow to the Crimea and to Warsaw. Pop. (1881), 1 1,000; (1897), 3808. It is picturesquely built on the hilly banks of the Pakhra, here crossed by a

suspension bridge for carriages as well as by the railway bridge. Down to 1781 the wealthy village of Podol was a dependency of the Danilov monastery in Moscow. Before the opening of the southern railway the caravans of wagons and sledges to and from Moscow used to halt here; the principal occupation of the inhabitants was innkeeping and supplying the caravans with provisions and other necessaries of travel. The limestone quarries, at the confluence of the Desna and the Pakhra, supply the capital with good building material; and there are a cement, lime and brick factory and a paper-mill.

PODOPHYLLIN, a drug obtained from the rhizome of the American mandrake or may apple, Podophyllum peltatum, an herbaceous perennial belonging to the natural order Berberi- daceae, indigenous in woods in Canada and the United States. The plant is about 1 ft. high, bearing two peltate, deeply- divided leaves, which are about 5 in. in diameter, and bear in the axil a solitary, stalked, white flower, about the size and shape of the garden anemone, with six or more petals and twice as many hypogynous stamens. The fruit is ripe in July, and is an oval, yellowish, fleshy berry, containing twelve or more seeds, each surrounded by a pulpy outer coat or aril. The rhizome, as met with in commerce, occurs in cylindrical pieces 2 or 3 in. long and about j in. in diameter, of a chocolate or purplish-brown colour, smooth, and slightly enlarged where the juncture of the leafy stem is indicated by a circular scar on the upper and a few broken rootlets on the under side. The odour is heavy and disagreeable, and the taste acrid and bitter.

Podophyllin is a resinous powder obtained by precipitating an alcoholic tincture of the rhizome by means of water acidulated with hydrochloric acid. It varies in colour from greyish to bright yellow or greenish-brown, the first-named being the purest. The powder is soluble in alcohol and strong solutions of alkalis, such as ammonia. Its composition is somewhat complex. There are certainly at least two resins in the powder (which is known offici- ally as Podophylli resina), one of them being soluble and the other insoluble in ether. Each of these contains an active substance, which can be obtained in crystalline foim, and is known as podo- phyllotoxin. It is soluble in alcohol, ether, chloroform and boiling water. Alkalis decompose it into picro-podophyllic acid and picro-podophyllin, minute traces of both of which occur in a free state in the rhizome. The acid is inert, but picro-podophyllin is the active principle. It is a crystalline body, soluble only in con- centrated alcohol. Hence the inutility of the pharmacopeial tinctura podophylli, which cannot be diluted before administration. The properties of podophyllin resin vary with the reaction of the tissue with which it is in contact ; where this is acid the drug is inert, the picro-podophyllin being precipitated.

The resin does not affect the unbroken skin, but may be ab- sorbed from a raw surface, and will then cause purging. When taken internally it is both a secretory and an excretory cholagogue, but so irritant and powerful that its use in cases of jaundice is generally undesirable. Its value, however, in certain cases of constipation of hepatic origin is undeniable. It is largely used in patent medicines, usually as an auxiliary to aloes. The best method of prescribing podophyllin is in pill form. In toxic doses podo- phyllin causes intense enteritis, with all its characteristic symptoms, and severe depression, which may end in death. The treatment is symptomatic, there being no specific antidote.

POE, EDGAR ALLAN (1800-1849), American poet, writer of fiction and critic, was born at Boston, Massachusetts, on the 19th of January 1809. The family was of English origin, but was settled in Ireland, whence the poet's great-grandfather emigrated to Maryland. His grandfather, David Poe, served with credit as a

soldier in the War of Independence, was known to Washington, and was the friend of Lafayette. His son David Poe was bred as a lawyer, but deeply offended his family by marrying an actress of English birth, Mrs Elizabeth Hopkins,n£e Arnold, and by himself going on the stage. In 181 1 he and his wife died, leaving three children — William, Edgar, and a daughter Rosalie — wholly des- titute. William died young, and Rosalie became mad. Edgar was adopted by John Allan, a tobacco merchant of Scottish ex- traction, seemingly at the request of his wife, who was childless. The boy was indulged in every way, and encouraged to believe that he would inherit Mr Allan's fortune. Mr Allan, having come to England in 1815, placed Edgar in a school at Stoke Newington, kept by a Dr Bransby. In 1820 Mr Allan returned to Richmond, Virginia, and Edgar was first placed at school in the town and then sent to the university of Virginia at Char- lottesville in 1826. Here the effects of a very unwise training on a temperament of inherited neurotic tendency were soon seen. He was fond of athletics, and was a strong and ardent swimmer ; but he developed a passion for gambling and drink. His dis- orders made it necessary to remove him, and he was taken away by Mr Allan, who refused to pay his debts of honour. He enlisted on the 26th of May 1827 at Boston, and served for two years in the United States army. As a soldier his conduct must have been exemplary, for he was promoted sergeant-major on the 1st of January 1829. It is to be noted that throughout his life, when under orders, Poe could be a diligent and capable subor- dinate. In May 1829 Mr Allan secured his discharge from the army, and in 1 830 obtained a nomination

for him to the West Point military academy. As a student he showed considerable faculty for mathematics, but his aloofness prevented him from being popular with his comrades, and he neglected his duty. When court-martialled he made no answer to the charges, and was expelled on the 6th of March 1831. Mr Allan's generosity was now exhausted. The death of his first wife in- 1829 had doubtless removed an influence favourable to Poe. A second marriage brought him children, and at his death in 1834 he left his adopted son nothing. A last meeting between the two, shortly before Mr Allan's death, led only to a scene of painful violence.

In 1827 Poe had published his first voiume of poetry, Tamer- lane and other Poems, at Boston. He did not publish under his name, but as " A Bostonian." In 183 1 he published a volume of Poems under his name at New York. His life immediately after he left West Point is very obscure, but in 1833 he was living at Baltimore with his paternal aunt, Mrs Clemm, who was throughout life his protector, and, in so far as extreme poverty permitted, his support. In 1833 he won a prize of $100 offered for the best story by the Baltimore Saturday Visitor. He would have won the prize for the best poem if the judges had not thought it wrong to give both rewards to one competitor. The story, MS. found in a Bottle, is one of the most mediocre of his tales, but his success gave him an introduction to editors and publishers, who were attracted by his striking personal appear- ance and his fine manners, and were also touched by his mani- fest poverty. From 1833 till his death he was employed on different magazines at Richmond, New York and Philadelphia. His famous poem " The Raven " was published first in 1845, and soon became extraordinarily popular; but Poe only got £2 for it.

The facts of his life have been the subject of very ill-judged controversy. The acrimonious tone of the biography by Rufus Griswold, prefixed to the first collected edition of his works in 1850, gave natural offence, and attempts have been made to show that the biographer was wrong as to the facts. But it is no real kindness to Poe's memory to deny the sad truth that he was subject to chronic alcoholism. He was not a boon companion, and never became callous to his vice. When it seized him he drank raw spirits, and was disordered by a very little. But when he was free from the maddening influence of alcohol he was gentle, well-bred, and a hard worker on the staff of a magazine, willing and able to write reviews, answer correspondents, pro- pound riddles or invent and solve cryptograms. His value as a contributor and sub-editor secured him successive engagements

on the Southern Literary Messenger of Richmond, on the New York Quarterly Review, and on Graham's Magazine at Phila- delphia. It enabled him in 1843 to have a magazine of his own, the Stylus. His mania sooner

or later broke ofl all his engage- ments and ruined his own venture. In 1835 he married his cousin, Virginia Clemm, a beautiful girl of fourteen years of age. A false statement as to her age was made at the time of the marriage. She died after a long decline in 1847. Poe made two attempts to marry women of fortune — Mrs Whitman and Mrs Shelton. The first of these engagements was broken off. The second was terminated by his death in hospital at Baltimore, Md., on the 7th of October 1849. ,

His life and death had many precedents, and will always recur among Bohemian men of letters and artists. What was indi- vidual in Poe, and what alone renders him memorable, was his narrow but profound and original genius (see American Litera- ture). In the midst of much hack-work and not a few failures in his own field he produced a small body of verse, and a hand- ful of short stories of rare and peculiar excellence. The poems express a melancholy sensuous emotion in a penetrating melody all his own. The stories give form to horror and fear with an exquisite exactness of touch, or construct and unravel mysteries with extreme dexterity. He was a conscientious literary artist who revised and perfected his work with care. His criticism, though often commonplace and sometimes ill-natured, as when he attacked Longfellow for plagiarism, was trenchant and sagacious at his best.

Bibliography. — The Life and Letters of Edgar Allan Poe, by J. A. Harrison (New York, 1903) and The Life of Edgar Allan Poe (Boston, new ed. 1909), by G. E. Woodberry, are the best biographies. The standard edition of his Works is that published in 1894-1895 at Chi- cago, in ten volumes, by E. C. Stedman and G. E. Woodberry. There have been many partial reprints. For Poe's influence in France, which has been great, see C. Baudelaire, Histoires extraordinaires (Paris, 1856); S. Mallarm6, Poemes d' Edgar Poe (Brussels, 1888); and Les Nevroses, by Arvede Barine (Paris, 1899). (D. H.)

POERIO, ALESSANDRO (1802-1848), Italian poet and patriot, was descended from an old Calabrian family, his father, Baron Giuseppe Poerio, being a distinguished lawyer of Naples. In 1815 he and his brother Carlo accompanied their father, who had been identified with Murat's cause, into exile, and settled at Florence. In 1818 they were allowed to return to Naples, and on the proclamation of the constitution in 1820 the Poerios were among the stoutest defenders of the newly-won freedom. Alles- sandro fought as a volunteer, under General Guglielmo Pepe, against the Austrians in 1821, but when the latter reoccupied Naples and the king abolished the constitution, the family was again exiled and settled at Gratz. Alessandro devoted himself to study in various German universities, and at Weimar he became the friend of Goethe. In 1835 the Poerios returned to Naples, and Alessandro, while practising law with his father, published a

number of lyrics. In 1848 he accompanied Pepe as a volunteer to fight the Austrians in northern Italy, and on the recall of the Neapolitan contingent Alessandro followed Pepe to Venice and displayed great bravery during the siege. He was severely wounded in the fighting round Mestre, and died on the 3rd of November 1848. His poetry " reveals the idealism of a tender and delicate mind which was diligent in storing up sensations and images that for others would, have been at most the transient impressions of a moment." But he could also sound the clarion note of patriotism, as in his stirring poem 77 Risorgimento.

His brother Carlo (1803-1867), after returning to Naples, practised as an advocate, and from 1837 to 1848 was frequently arrested and imprisoned; but when King Ferdinand, moved by the demonstration of the 27th of January of the latter year, promulgated a constitution, he was made minister of education. Discovering, however, that the. king was acting in bad faith, he resigned office in April and returned to Naples to take his seat in parliament, where he led the constitutional opposition. The Austrian victory of Novara (March 1849) set the king free to dissolve parliament and trample on the constitution, and on the 19th of July 1849 Poerio was arrested, tried, and condemned to

nineteen years in irons. Chained in pairs, he and other political prisoners were confined in one small room in the bagno of Nisida, near the lazaretto. The eloquent exposure (1851) of the horrors of the Neapolitan dungeons by Gladstone, who emphasized especially the case of Poerio, awakened the universal indignation of Europe, but he did not obtain his liberty till 1858. He and other exiles were than placed on board a ship bound for the United States, but the son of Settembrini, another of the exiles, who was on board in disguise, compelled the crew to land them at Cork, whence Poerio made his way to London. In the following year he returned to Italy, and in i860 he was elected deputy to the parliament of Turin, of which he was chosen vice-president in 1861. He died at Florence on the 28th of April 1867.

See Baldachini, Delia Vita e de' tempi di Carlo Poerio (1867); W. E. Gladstone, Two Letters to the Earl of Aberdeen (1851); Carlo Poerio and the Neapolitan Police (London, 1858); Vannucci, i" Martiri delta liberta italiana, vol. iii. (Milan, 1880) ; Imbriani, Ales- sandro Poerio a Venezia (Naples, 1884); Del Giudice, / Fratelli Poerio (Turin, 1899); Countess Martinengo Cesaresco, Italian Characters (London, 1901).

POETRY. In modern criticism the word poetry {i.e. the art of the poet, Gr.

ttoit/ttjs, maker, from iroielv, to make) is used sometimes to denote any expression (artistic or other) of imagin- ative feeling, sometimes to designate a precise literary art, which ranks as one of the fine arts. As an expression of imagin- ative feeling, as the movement of an energy, as one of those great primal human forces which go to the development of the race, poetry in the wide sense has played as important a part as science. In some literatures (such as that of England) poetic energy and in others (such as that of Rome) poetic art is the dominant quality. It is the same with individual writers. In classical literature Pindar may perhaps be taken as a type of the poets of energy; Virgil of the poets of art. With all his wealth of poetic art Pindar's mastery over symmetrical methods never taught him to " sow with the hand," as Corinna declared, while his poetic energy always impelled him to " sow with the whole sack." In English poetical literature Elizabeth Barrett Browning typifies, perhaps, the poets of energy; while Keats (notwithstanding all his unquestionable inspiration) is mostly taken as a type of the poets of art. In French literature Hugo, notwithstanding all his mastery over poetic methods, represents the poets of energy.

In some writers, and these the very greatest — in Homer, Aeschylus, Sophocles, Dante, Shakespeare, Milton, and perhaps Goethe — poetic energy and poetic art are seen in something like equipoise. It is of poetry as an art, however, that we have mainly to speak here; and all we have to say upon poetry as an energy is that the critic who, like Aristotle, takes this wide view of poetry — the critic who, like him, recognizes the importance of poetry in its relations to man's other expressions of spiritual force, claims a place in point of true critical sagacity above that of a critic who, like Plato, fails to recognize that importance. And assuredly no philosophy of history can be other than in- adequate should it ignore the fact that poetry has had as much effect upon human destiny as that other great human energy by aid of which, from the discovery of the use of fire to that of the electric light, the useful arts have been developed.

With regard to poetry as an art, most of the great poems of the world are dealt with elsewhere in this work, either in connexion with the names of the writers or with the various literatures to which they belong; consequently these remarks must be confined to general principles. Under Verse the detailed questions of prosody are considered; here we are concerned with the essential principles which underlie the meaning of poetry as such.

All that can be attempted is to inquire: (1) What is poetry?

(2) What is the position it takes up in relation to the other arts ?

(3) What is its value and degree of expressional power in relation to these ? and, finally, (4) What varieties of poetic art are the outcome of the two

great kinds of poetic impulse, dramatic imagination and lyric or egoistic imagination ?

1. What is Poetry? — Definitions are for the most part alike unsatisfactory and treacherous; but definitions of poetry are proverbially so. Is it possible to lay down invariable principles

of poetry, such as those famous " invariable principles " of William Lisle Bowles, which in the earlier part of the century awoke the admiration of Southey and the wrath n of Byron ? Is it possible for a critic to say of any metrical phrase, stanza or verse, " This is poetry," or " This is not poetry " ? Can he, with anything like the authority with which the man of science pronounces upon the natural objects brought before him, pronounce upon the qualities of a poem ? These are questions that have engaged the attention of critics ever since the time of Aristotle. Byron, in his rough and ready way, answered them in one of those letters to his publisher John Murray, which, rich as they are in nonsense, are almost as rich in sense. " So far are principles of poetry from being invariable," says he, " that they never were nor ever will be settled. These principles mean nothing more than the predilections of a particular age, and every age has its own and a different from its predecessor. It is now Homer and now Virgil; once Dryden and since Sir Walter Scott; now Corneille and now Racine; now Crebillon and now Voltaire." This is putting the case very strongly — perhaps too strongly. But if we remember that Sophocles lost the first prize for the Oedipus tyr -annus; if we remember what in Dante's time (owing partly, no doubt, to the universal ignorance of Greek) were the relative positions of Homer and Virgil, what in the time of Milton were the relative positions of Milton himself, of Shakespeare, and of Beaumont and Fletcher; again, if we remember Jeffrey's famous classification of the poets of his day, we shall be driven to pause over Byron's words before dismissing them. Yet some definition, for the purpose of this essay, must be here attempted; and, using , the phrase " absolute poetry " as the musical critics use the phrase " absolute music," we may, perhaps, without too great presumption submit the following: —

Absolute poetry is the concrete and artistic expression of the human mind in emotional and rhythmical language.

This at least will be granted, that no literary expression can, properly speaking, be called poetry that is not in a certain deep sense emotional, whatever may be its subject-matter, concrete in its method and its diction, rhythmical in movement, and artistic in form.

That the expression of all real poetry must be concrete in method and diction is obvious, and yet this dictum would exclude from the definition

much of what is called didactic poetry. With abstractions the poet has nothing to do, save to take them and turn them into concretions; for, as artist, he is simply the man who by instinct embodies in concrete forms that " universal idea" which Gravina speaks of — that which is essential and elemental in nature and in man; as poetic artist he is simply the man who by instinct chooses for his concrete forms metrical language. And the questions to be asked concerning any work of art are simply these — Is that which is here embodied really permanent, universal and elemental? and, Is the concrete form embodying it really beautiful — acknowledged as beautiful by the soul of man in its highest moods? Any other question is an impertinence.

As an example of the absence of concrete form in verse take the following lines from George Eliot's Spanish Gypsy: —

" Speech is but broken light upon the depth Of the unspoken ; even your loved words Float in the larger meaning of your voice As something dimmer."

Without discussing the question of blank verse cadence, and the weakness of a line where the main accent falls upon a positive hiatus, " of the unspoken," we would point out that this powerful passage shows the spirit of poetry without its concrete form. The abstract method is substituted for the concrete. Such an abstract phrase as " the unspoken " belongs entirely to prose.

As to what is called ratiocinative poetry, it might perhaps be shown that it does not exist at all. Not by syllogism, but per saltum, must the poet reach in every case his conclusions. We listen to the poet — we allow him to address us in rhythm or in rhyme — we allow him to sing to us while other men are only

allowed to talk, not because he argues more logically than they, but because he feels more deeply and perhaps more truly. It is for his listeners to be knowing and ratiocinative; it is for him to be gnomic and divinely wise.

That poetry must be metrical or even rhythmical in movement, however, is what some have denied. Here we touch at once the very root of the subject. The difference between all literature and mere " word-kneading " is that, while literature is alive, word-kneading is without life. This literary life, while it is only bipartite in prose, seems to be tripartite in poetry; that is to

say, while prose requires intellectual life and emotional life, poetry seems to require not only intellectual life and emotional life but rhythmic life, this last being the most important of all according to many critics, though Aristotle is not among these. Here indeed is the " fork " between the old critics and the new. Unless the rhythm of any metrical passage is so vigorous, so natural, and so free that it seems as though it could live, if need were, by its rhythm alone, has that passage any right to exist? and should it not, if the substance is good, be forthwith demetri- cized and turned into prose? Thoreau has affirmed that prose, at its best, has high qualities of its own beyond the ken of poetry; to compensate for the sacrifice of these, should not the metrical gains of any passage be beyond all cavil?

*This argument might be pressed farther still. It might seem bold to assert that, in many cases, the mental value of poetry may actually depend upon form and colour, but would it not be true ? The mental value of poetry must be judged by a standard not applicable to prose; but, even with regard to the different kinds of poetry, we must not compare poetry whose mental value consists in a distinct and logical enunciation of ideas, such as that of Lucretius and Wordsworth, and poetry whose mental value consists partly in the suggestive richness of passion or symbol latent in rhythm (such as that of Sappho sometimes, Pindar often, Shelley always), or latent in colour, such as that of some of the Importance P ers ' an poets. To discuss the question, Which of these ot Metrical twc kinds of poetry is the more precious ? would be Questions. 'die, Du * are we noi – driven to admit that certain poems whose strength is rhythm, and certain other poems whose strength is colour, while devoid of any logical state- ment of thought, may be as fruitful of thoughts and emotions too deep for words as a shaken prism is fruitful of tinted lights ? The mental forces at work in the production of a poem like the Excursion are of a very different kind from the mental forces at work in the production of a poem like Shelley's "Ode to the West Wind." In the one case the poet's artistic methods, like those of the Greek architect, show, and are intended to show, the solid strength of the structure. In the other, the poet's artistic methods, like those of the Arabian architect, contradict the idea of solid strength — make the structure appear to hang over our heads like the cloud pageantry of heaven. But, in both cases, the solid strength is, and must be, there, at the base. Before the poet begins to write he should ask himself which of these artistic methods is natural to him ; he should ask himself whether his natural impulse is towards the weighty iambic movement whose primary function is to state, or towards those lighter movements which we still call, for want of more convenient words, anapaestic and dactylic, whose primary function is to suggest. Whenever Wordsworth and Keats pass from the former to the latter they pass at once into doggerel. Nor is it difficult to*

see why English anapaestic and dactylic verse must suggest, and not state, as even so compara- tively successful a tour de force as Shelley's " Sensitive Plant " shows. Conciseness is a primary virtue of all statement. The moment the English poet tries to " pack " his anapaestic or dactylic line as he can pack his iambic line, his versification becomes rugged, harsh, pebbly — becomes so of necessity. Nor is this all: anapaestic and dactylic verse must in English be obtrusively alliterative, or the same pebbly effect begins to be felt. The anapaestic line is so full of syllables that in a language where the consonants dominate the vowels (as in English), these syllables grate against each other, unless their corners are artfully bevelled by one of the only two smoothing processes at the command of an English versifier — obtrusive alliteration, or an obtrusive use of liquids. Now these demands of form may be turned by the perfect artist to good account if his appeal to the listener's soul is primarily that of suggestion by sound or symbol, but if his appeal is that of direct and logical statement the diffuseness inseparable from good ana- paestic and dactylic verse is a source of weakness such as the true artist should find intolerable.

Using the word " form " in a wider sense still, a sense that includes " composition, " it can be shown that poetry, to be entitled to the name, must be artistic in form. Whether a poem be a Welsh triban or a stornello improvised by an Italian peasant girl,

*whether it be an ode by Keats or a tragedy by Sophocles, it is equally a work of art. The artist's command over form may be shown in the peasant girl's power of spontaneously rendering in simple verse, in her stornello or rispetto, M™ e *" her emotions through nature's symbols; it may be shown by Keats in that perfect fusion of all poetic elements of which he was such a master, in the manipulation of language so beautiful both for form and colour that thought and words seem but one blended loveliness; or it may be shown by Sophocles in a mastery over what in painting is called composition, in the exercise of that wise vision of the artist which, looking before and after, sees the thing of beauty as a whole, and enables him to grasp the eternal laws of cause and effect in art and bend them to his own wizard will. In every case, indeed, form is an essential part of poetry; and, although George Sand's saying that " L'art est une forme " applies perhaps more strictly to the plastic arts (where the soul is reached partly through mechanical means), its application to poetry can hardly be exaggerated.*

Owing, however, to the fact that the word irovtyrris (first used to designate the poetic artist by Herodotus) means maker, Aristotle seems to have assumed that the indispensable basis of poetry is invention. He appears to have thought that a poet is a poet more on account of the composition of the action than on account of the composition of his verses. Indeed he said as much as this. Of epic poetry he declared emphatically that it produces its

imitations either by mere articulate words or by metre superadded. This is to widen the definition of poetry so as to include all imaginative literature, and Plato seems to have given an equally wide meaning to the word 7roiJj(ro. Only, while Aristotle considered iroiricns to be an imitation of the facts of nature, Plato considered it to be an imitation of the dreams of man. Aristotle ignored, and Plato slighted, the importance of versification (though Plato on one occasion admitted that he who did not know rhythm could be called neither musician nor poet).

Perhaps the first critic who tacitly revolted against the dictum that substance, and not form, is the indispensable basis of poetry was Dionysius of Halicarnassus, whose treatise upon the arrange- ment of words is really a very fine piece of literary criticism. In his acute remarks upon the arrangement of the words in the sixteenth book of the Odyssey, as compared with that in the story of Gyges by Herodotus, was perhaps first enunciated clearly the doctrine that poetry is fundamentally a matter of style. The Aristotelian theory as to invention, however, dominated all criticism after as well as before Dionysius. When Bacon came to discuss the subject (and afterwards) the only division between the poetical critics was perhaps between the followers of Aristotle and those of Plato as to what poetry should, and what it should not, imitate. It is curious to speculate as to what would have been the result had the poets followed the critics in this matter. Had not the instinct of the poet been too strong for the schools, would poetry as an art have been lost and merged in such imaginative prose as Plato's ? Or is not the instinct for form too strong to be stifled ? By the poets themselves metre was always considered to be the one indispensable requisite of a poem, though, as regards criticism, even in the time of the appearance of the Waverley Novels, the Quarterly Review would sometimes speak of them as " poems "; and perhaps even later the same might be said of romances so concrete in method and diction, and so full of poetic energy, as Wuthering Heights and Jane Eyre, where we get absolutely all that Aristotle requires for a poem. On the whole, however, the theory that versification is not an indis- pensable requisite of a poem seems to have become nearly obsolete. Perhaps, indeed, many critics would now go so far in the contrary direction as to say with Hegel (Aesthetik, ii. 289) that " metre is the first and only condition absolutely demanded by poetry, yea even more necessary than a figurative picturesque diction." At all events this at least may be said, that the division between poetical critics is not now between Aristotelians and Baconians; it is of a different kind altogether. While one group of critics may still perhaps say with Dryden that " a poet is a maker, as the name signifies," and that " he who cannot make,

that is, invent, has his name for nothing," another group con- tends that it is not the invention but the artistic treatment, the form, which determines whether an imaginative writer is a poet or a writer of prose — contends, in short, that emotion is the basis of all true poetic expression, whatever be the subject- matter, that thoughts must be expressed in an emotional manner before they can be brought into poetry, and that this emotive expression demands even yet something else, viz. style and form.

Although many critics are now agreed that " L'art est une forme," that without metre and without form there can be no The impor- P oe try, there are few who would contend that poetry tanceof can exist by virtue of any one of these alone, or Ideas and even by virtue of all these combined. Quite inde- Atutude. p en(i en t f verbal melody, though mostly accompany- ing it, and quite independent of " composition," there is an atmosphere floating around the poet through which he sees everything, an atmosphere which stamps his utterances as poetry; for instance, among all the versifiers contemporary with Donne there was none so rugged as he occasionally was, and yet such songs as " Sweetest love, I do not go for weariness of thee " prove how true a poet he was whenever he could master those technicalities which far inferior poets find comparatively easy. While rhythm may to a very considerable degree be acquired (though, of course, the highest rhythmical effects never can), the power of looking at the world through the atmosphere that floats before the poet's eyes is not to be learned and not to be taught. This atmosphere is what we call poetic imagination. But first it seems necessary to say a word or two upon that high temper of the soul which in truly great poetry gives birth to this poetic imagination.

The " message " of poetry must be more unequivocal, more thoroughly accentuated, than that of any of the other fine arts. With regard to modern poetry, indeed, it may almost be said that if any writer's verse embodies a message, true, direct and pathetic, we cannot stay to inquire too curiously about the degree of artistic perfection with which it is delivered, for Wordsworth's saying " That which comes from the heart goes to the heart " applies very closely indeed to modern poetry. The most truly passionate poet in Greece was no doubt in a deep sense the most artistic poet; but in her case art and passion were one, and that is why she has been so cruelly misunderstood. The most truly passionate nature, and perhaps the greatest soul, that in recent years has expressed itself in English verse is Elizabeth Barrett Browning; at least it is certain that, with the single exception of Hood in the " Song of the Shirt," no writer of the 19th century really touched English hearts with a hand so powerful as hers — and this notwithstanding violations of poetic form, or defective rhymes, such as

would appal some of the contemporary versifiers of England and France " who lisp in numbers for the numbers [and nothing else] come." The truth is that in order to produce poetry the soul must for the time being have reached that state of exaltation, that state of freedom from self-consciousness, depicted in the lines: —

" I started once, or seemed to start, in pain,

Resolved on noble things, and strove to speak, As when a great thought strikes along the brain, And flushes all the cheek."

Whatsoever may be the poet's " knowledge of his art," into this mood he must always pass before he can write a truly poetic line. For, notwithstanding all that may be said upon poetry as a fine art, it is in the deepest sense of the word an " inspiration." No man can write a line of genuine poetry without having been " born again " (or, as the true rendering of the text says, " born from above "); and then the mastery over those highest reaches of form which are beyond the ken of the mere versifier comes to him as a result of the change. Hence, with all Mrs Browning's metrical blemishes, the splendour of her metrical triumphs at her best.

For what is the deep distinction between poet and proseman? A writer may be many things besides a poet; he may be a warrior like Aeschylus, a man of business like Shakespeare, a courtier

like Chaucer, or a cosmopolitan philosopher like Goethe; but the moment the poetic mood is upon him all the trappings of the world with which for years he may perhaps have been clothing his soul — the world's knowingness, its cynicism, its self-seeking, its ambition — fall away, and the man becomes an inspired child again, with ears attuned to nothing but the whispers of those spirits from the Golden Age, who, according to Hesiod, haunt and bless the degenerate earth. What such a man produces may greatly delight and astonish his readers, yet not so greatly as it delights and astonishes himself. His passages of pathos draw no tears so deep or so sweet as those that fall from his own eyes while he writes; his sublime passages overawe no soul so imperiously as his own; his humour draws no laughter so rich or so deep as that stirred within his own breast.

It might almost be said, indeed, that Sincerity and Conscience, the two angels that bring to the poet the wonders of the poetic dream, bring him also the deepest, truest delight of form. It might almost be said that by aid of sincerity and conscience the poet is enabled to see more clearly than other men the eternal limits of his own art — to see with Sophocles that nothing, not even poetry itself, is of any worth to man, invested as he is by

the whole army of evil, unless it is in the deepest and highest sense good, unless it comes linking us all together by closer bonds of sympathy and pity, strengthening us to fight the foes with whom fate and even Nature, the mother who bore us, sometimes seem in league — to see with Milton that the high quality of man's soul which in English is expressed by the word virtue is greater than even the great poem he prized, greater than all the rhythms of all the tongues that have been spoken since Babel — and to see with Shakespeare and with Shelley that the high passion which in English is called love is lovelier than all art, lovelier than all the marble Mercuries that " await the chisel of the sculptor " in all the marble hills.

2. What Position does Poetry take up in Relation to the other Arts? — Notwithstanding the labours of Lessing and his followers, the position accorded by criticism to poetry in Po e tryta relation to the other arts has never been so uncertain Relation to and anomalous as in recent years. On the one hand tne other there are critics who, judging from their perpetual s " comparison of poems to pictures, claim her as a sort of handmaid of painting and sculpture. On the other hand the disciples of Wagner, while professing to do homage to poetry, have claimed her as the handmaid of music. With regard to the relations of poetry to painting and sculpture, it seems necessary to glance for a moment at the saying of Simonides, as recorded by Plutarch, that poetry is a speaking picture and that painting is a mute poetry. It appears to have had upon modern criticism as much influence since the publication of Lessing's Laocoon as it had before. Perhaps it is in some measure answerable for the modern vice of excessive word-painting. Beyond this one saying, there is little or nothing in Greek literature to show that the Greeks recognized between poetry and the plastic and pictorial arts an affinity closer than that which exists between poetry and music and dancing. Understanding artistic methods more profoundly than the moderns, and far too profoundly to suppose that there is any special and peculiar affinity between an art whose medium of expression is marble and an art whose medium of expression is a growth of oral symbols, the Greeks seem to have studied poetry not so much in its relation to painting and sculpture as in its relation to music and dancing. It is matter of familiar knowledge, for instance, that at the Dionysian festival it was to the poet as "teacher of the chorus" (xopo5iSa(TKaAos) that the prize was awarded, even though the " teacher of the chorus " were Aeschylus himself or Sophocles. And this recognition of the relation of poetry to music is perhaps one of the many causes of the superiority of Greek to all other poetry in adapting artistic means to artistic ends. In Greek poetry, even in Homer's description of the shield of Achilles, even in the famous description by Sophocles of his native woods in the Oedipus coloneus, such word-painting as occurs seems, if not inevitable and unconscious, so alive with imaginative feeling as to become part and parcel

of the

dramatic or lyric movement itself. And whenever description is so introduced the reader of Greek poetry need not be told that the scenery itself rises before the listener's imagination with a clearness of outline and a vigour of colour such as no amount of detailed word painting in the modern fashion can achieve. The picture even in the glorious verses at the end of the eighth book of the Iliad rises before our eyes — seems actu- ally to act upon our bodily senses — simply because the poet's eagerness to use the picture for merely illustrating the solem- nity and importance of his story lends to the picture that very authenticity which the work of the modern word-painter lacks. That the true place of poetry lies between music on the one hand and prose, or loosened speech, on the other, was, we say, taken for granted by the one people in whom the artistic instinct was fully developed. No doubt they used the word music in a very wide sense, in a sense that might include several arts. But it is a suggestive fact that, in the Greek language, long before poetic art was called "making" it was called "singing." The poet was not 71-01177-17$ but aoifids. And as regards the Romans it is curious to see how every now and then the old idea that poetry is singing rather than making will disclose itself. It will be remembered for instance how Terence, in the prologue of Phormio, alludes to poets as musicians. That the ancients were right in this could well be shown by a history of poetry: music and the lyrical function of the poet began together, but here, as in other things, the progress of art from the implicit to the explicit has separated the two. Every art has its special function, has a certain work which it can do better than any one of its sister arts. Hence its right of existence. For instance, before the " sea of emotion " within the soul has become " curdled into thoughts," it can be expressed in inarticulate tone. Hence, among the fine arts, music is specially adapted for rendering it. It was perhaps a perception of this fact which made the Syrian Gnostics define life to be " moving music." When this sea of emotion has "curdled into thoughts," articulate language rhythmically arranged — words steeped in music and colour, but at the same time embodying ideas — can do what no mere word- less music is able to achieve in giving it expression, just as unrhythmical language, language mortised in a foundation of logic, that is to say prose, can best express these ideas as soon as they have cooled and settled and cleared themselves of emotion altogether. Yet every art can in some degree invade the domain of her sisters, and the nearer these sisters stand to each other the more easily and completely can this invasion be accomplished. Prose, for instance, can sometimes, as in the case of Plato, do some of the work of

poetry (however imperfectly, and however trammelled by heavy conditions); and sometimes poetry, as in Pindar's odes and the waves of the Greek chorus, can do, though in the same imperfect way, the work of music.

The poems of Sappho, however, are a good case in point. Here the poet's passion is expressed so completely by the mere sound of her verses that a good recitation of them to a person ignorant of Greek would convey something of that passion to the listener; and similar examples almost as felicitous might be culled from Homer, from Aeschylus and from Sophocles. Nor is this power confined to the Greek poets. The students of Virgil have often and with justice commented on such lines as Aen. v. 481 (where the sudden sinking of a stricken ox is rendered by means of rhythm), and such lines as Georg. ii. 44I, where, by means of verbal sounds, the gusts of wind about a tree are rendered as completely as though the voice were that of the wind itself. In the case of Sappho the effect is produced by the intensity of her passion, in the case of Homer by the intensity of the dramatic vision, in the case of Virgil by a supreme poetic art. But it can also be produced by the mere ingenuity of the artist, as in Edgar Poe's " Ulalume." The poet's object in that remarkable tour de force was to express dull and hopeless gloom in the same way that the mere musician would have expressed it — that is to say, by monotonous reiterations, by hollow and dreadful reverberations of gloomy sounds — though a6 an artist whose vehicle was articulate speech he was obliged to add gloomy ideas, in order to give to his work the intellec- tual coherence necessary for its existence as a poem. He evidently _ set out to do this, and he did it, and 'Ulalume" properly intoned would produce something like the same effect upon a listener knowing no word of English that it produces upon us.

On the other hand, music can trench very far upon the

domain of articulate speech, as we perceive in the wonderful instrumentation of Wagner. Yet, while it can be shown that the place of poetry is scarcely so close to sculpture and painting as to music on the one side and loosened speech on the other, the affinity of poetry to music must not be exaggerated. We must be cautious how we follow the canons of Wagner and the more enthusiastic of his disciples, who almost seem to think that inarticulate tone can not only suggest ideas but express them — can give voice to the Verstand, in short, as well as to the Vernunft of man. Even the Greeks drew a fundamental distinction between melic poetry (poetry written to be sung) and poetry that was written to be recited. It is a pity that, while modern critics of poetry have understood, or at least have given attention to painting and sculpture, so few have possessed any knowledge of music — a fact which makes Dante's treatise De vulgari eloquio so important. Dante was a musician, and seems to have had a

considerable knowledge of the relations between musical and metrical laws. But he did not, we think, assume that these laws are identical.

If it is indeed possible to establish the identity of musical and metrical laws, it can only be done by a purely scientific investi- gation; it can only be done by a most searching inquiry into the subtle relations that we know must exist throughout the universe between all the laws of undulation. And it is curious to re- member that some of the greatest masters of verbal melody have had no knowledge of music, while some have not even shown any love of it. All Greek boys were taught music, but whether Pindar's unusual musical skill was born of natural instinct and inevitable passion, or came from the accidental circumstance that his father was, as has been alleged, a musician, and that he was as a boy elaborately taught musical science by Lasus of Hermione, we have no means of knowing. Nor can we now learn how much of Milton's musical knowledge resulted from a like exceptional " environment," or from the fact that his father was a musician. But when we find that Shelley seems to have been without the real passion for music, that Rossetti disliked it, and that Coleridge's apprehension of musical effects was of the ordinary nebulous kiiiu, we must hesitate before accepting the theory of Wagner.

The question cannot be pursued here; but if it should on in- quiry be found that, although poetry is more closely related to music than to any of the other arts, yet the power over verbal melody at its very highest is so all-sufficing to its possessor, as in the case of Shelley and Coleridge, that absolute music becomes a superfluity, this would only be another illustration of that intense egoism and concentration of force — the impulse of all high artistic energy — which is required in order to achieve the rarest miracles of art.

With regard to the relation of poetry to prose, Coleridge once asserted in conversation that the real antithesis of poetry was not prose but science. If he was right the difference in kind lies, not between the poet and the prose writer, but between the literary artist (the man whose instinct is to manipulate language) and the man of facts and of action whose instinct impels him to act, or, if not to act, to inquire. One thing is at least certain, that prose, however fervid and emotional it may become, must always be directed, or seem to be directed, by the reins of logic. Or, to vary the metaphor, like a captive balloon it can never really leave the earth.

Indeed, with the literature of knowledge as opposed to the literature of power poetry has nothing to do. Facts have no place in poetry until they are brought into relation with the human soul. But a mere catalogue of ships may become poetical if it tends to show the strength and pride and'glory of the warriors who invested Troy; a detailed description of the

designs upon a shield, however beautiful and poetical in itself, becomes still more so if it tends to show the skill of the divine artificer and the invincible splendour of a hero like Achilles. But mere dry exactitude of imitation is not for poetry but for loosened speech. Hence, most of the so-called poetry of Hesiod is not poetry at all. The Muses who spoke to him about " truth " on Mt Helicon made the common mistake of confounding fact with

truth. And here we touch upon a very important matter. The reason why in prose speech is loosened is that, untrammelled by the laws of metre, language is able with more exactitude to imitate nature, though of course speech, even when " loosened," cannot, when actual sensible objects are to be depicted, compete in any real degree with the plastic arts in accuracy ©f imitation, for the simple reason that its media are not colours nor solids but symbols — arbitrary symbols which can be made to indicate, but never to reproduce, colours and solids. Accuracy of imita- tion is the first requisite of prose. But the moment language has to be governed by the laws of metre — the moment the conflict begins between the claims of verbal music and the claims of colour and form — then prosaic accuracy has to yield; sharpness of outline, mere fidelity of imitation, such as is within the com- pass of prose, have in some degree to be sacrificed. But, just as with regard to the relations between poetry and music the greatest master is he who borrows the most that can be borrowed from music, and loses the least that can be lost from metre, so with regard to the relations between poetry and prose the greatest master is he who borrows the most that can be borrowed from prose and loses the least that can be lost from verse. No doubt this is what every poet tries to do by instinct; but some sacrifice on either side there must be, and, with regard to poetry and prose, modern poets at least might be divided into those who make picturesqueness yield to verbal melody, and those who make verbal melody yield to picturesqueness.

With one class of poets, fine as is perhaps the melody, it is made subservient to outline or to colour; with the other class colour and outline both yield to metre. The chief aim of the first class is to paint a picture; the chief aim ot the second is to sing a song. Weber, in driving through a beautiful country, could only enjoy its beauty by translating it into music. The same may be said of some poets with regard to verbal melody. The supreme artist, however, is he whose pictorial and musical power are so interfused that each seems born of the other, as is the case with Sappho, Homer, Aeschylus, Sophocles, and indeed most of the great Greek poets. Among English poets (leaving the two supreme masters undiscussed) Keats and Coleridge have certainly done this. The colour seems born of the music

and the music born of the colour. In French poetry the same triumph has been achieved in Victor Hugo's magnificent poem " En marchant la nuit dans un bois," which, as a rendering through verbal music of the witchery of nature, stands alone in the poetry of France. For there the poet conquers that crowning difficulty we have been alluding to, the difficulty of stealing from prose as much distinctness of colour and clearness of outline as can be imported into verse with as little sacrifice as possible of melody.

If poetry can in some degree invade the domain of prose, so on the other hand prose can at times invade the domain of poetry, and no doubt the prose of Plato — what is called poetical prose — is a legitimate form of art. Poetry, the earliest form of litera- ture, is also the final and ideal form of all pure literature; and, when Landor insists that poetry and poetical prose are antago- nistic, we must remember that Landor's judgments are mostly based on feeling, and that his hatred of Plato would be quite sufficient basis with him for an entire system of criticism upon poetical prose. As with Carlyle, there was a time in his life when Plato had serious thoughts of becoming a poet. And perhaps, like Carlyle, having the good sense to see his true function, he himself desisted from writing, and strictly forbade other men to write, in verse. If we consider this, and if we consider that certain of the great English masters of poetic prose of the 17th century were as incapable of writing in metre as their followers Richter and Carlyle, we shall hardly escape the conclusion on the one hand that the faculty of writing poetry is quite another faculty than that of producing work in the arts most closely allied to it, music and prose, but that on the other hand there is nothing antagonistic between these faculties.

3. Comparative Value in Expressional Power. — There is one great point of superiority that musical art exhibits over metrical art. This consists, not in the capacity for melody, but in the capacity for harmony in the musician's sense. The finest music of Aeschylus, of Pindar, of Shakespeare, of Milton, is after all only a succession of melodious notes, and, in endeavouring to catch the harmonic intent of strophe, anti- strophe and epode in the Greek chorus and in the true ode (that

of Pindar), we can only succeed by pressing memory into our service. We have to recall by memory the waves that have gone before, and then to imagine their harmonic power in relation to the waves at present occupying the ear. Counterpoint, therefore, is not to be achieved by the metricist, even though he be Pindar himself; but in music this perfect ideal harmony was fore- shadowed perhaps in the earliest writing. We know at least that as early as the 12th century counterpoint began to show a vigorous life, and the study of it is now a familiar branch of musical science. Now, inasmuch as " nature's own hymn " is and must be the harmonic blending of apparently Rhvth independent and apparently discordant notes, among the

arts whose appeal is through the ear that which can achieve counterpoint must perhaps rank as a pure art above one which cannot achieve it. We are of course speaking here of metre only. We have not space to inquire whether the counterpoint of absolute poetry is the harmony underlying apparently discordant emotions — the emotion produced by a word being more persistent than the emotion produced by an inarticulate sound. But if poetry falls behind music in rhythmic scope, it is capable of rendering emotion after emotion has become disintegrated into thoughts, and here,- as we have seen, it enters into direct competition with the ar.t of prose. It can use the emphasis of sound, not for its own sake merely, but to strengthen the emphasis of sense, and can thus give a fuller and more adequate expression to the soul of man than music at its highest can give. With regard to prose, no doubt such writing as Plato's description of the chariot of the soul, his description of the island of Atlantis, or of Er's visit to the place of departed souls, comes but a short way behind poetry in imaginative and even rhythmic appeal. It is impossible, however, here to do more than touch upon the subject of the rhythm of prose in its relation to the rhythm of poetry; for in this matter the genius of each individual language has to be taken into account.

Perhaps it may be said that deeper than all the rhythm of art is that rhythm which art would fain catch, the rhythm of nature; for the rhythm of nature is the rhythm of life itself. This rhythm can be caught by prose as well as by poetry, such prose, for instance, as that of the English Bible. Certainly the rhythm of verse at its highest, such, for instance, as that of Shakespeare's greatest writings, is nothing more and nothing less than the metre of that energy of the spirit which surges within the bosom of him who speaks, whether he speak in verse or in impassioned prose. Being rhythm, it is of course governed by law, but it is a law which transcends in subtlety the conscious art of the metricist and is only caught by the poet in his most inspired moods, a law which, being part of nature's own sanctions, can of course never be formulated but only expressed, as it is expressed in the melody of the bird, in the inscrutable harmony of the entire bird-chorus of a thicket, in the whisper of the leaves of the tree, and in the song or wail of wind and sea. Now is not this rhythm of nature represented by that " sense rhythm " which prose can catch as well as poetry, that sense rhythm whose finest expressions are to be found m the Bible, Hebrew and English, and in the biblical movements of the English Prayer Book, and in the dramatic prose of Shakespeare at its best? Whether it is caught by prose or by verse, one of the virtues of the rhythm of nature is that it is translatable. Hamlet's peroration about man and Raleigh's apostrophe to death are as translatable into other languages as are the Hebrew psalms, or as is Manu's magnificent passage about the singleness of man: —

" Single is each man born into the world; single he dies; single he receives

the reward of his good deeds, and single the punishment of his evil deeds. When he dies his body lies like a fallen tree upon the earth, but his virtue accompanies his soul. Wherefore let man harvest and garner virtue, so that he may have an inseparable com- panion in traversing that gloom which is so hard to be traversed."

Here the rhythm, being the inevitable movement of emotion and " sense," can be caught and translated by every literature under the sun. While, however, the great goal before the poet is to compel the listener to expect his caesuric effects, the great goal before the writer of poetic prose is in the very opposite direction ; it is to make use of the concrete figures and impassioned

diction of the poet, but at the same time to avoid the recognized and expected metrical bars upon which the poet depends. The moment the prose poet passes from the rhythm of prose to the rhythm of metre the apparent sincerity of his writing is destroyed. As compared with sculpture and painting the great infirmity of poetry, as an " imitation " of nature, is of course that the medium is always and of necessity words — even when fmitatlon. n0 words could, in the dramatic situation, have been spoken. It is not only Homer who is obliged some- times to forget that passion when at white heat is never voluble, is scarcely even articulate; the dramatists also are obliged to for- get that in love and in hate, at their tensest, words seem weak and foolish when compared with the silent and satisfying triumph and glory of deeds, such as the plastic arts can render. This becomes manifest enough when we compare the Niobe group or the Lao- coon group, or the great dramatic paintings of the modern world, with even the finest efforts of dramatic poetry, such as the speech of Andromache to Hector, or the speech of Priam to Achilles, nay such as even the cries of Cassandra in the Agamem- non, or the waitings of Lear over the dead Cordelia. Even when writing the words uttered by Oedipus, as the terrible truth breaks in upon his soul, Sophocles must have felt that in the holiest chambers of sorrow and in the highest agonies of suffering reigns that awful silence which not poetry, but painting sometimes, and sculpture always, can render. What human sounds could render the agony of Niobe, or the agony of Laocoon, as we see them in the sculptor's rendering? Not articulate speech at all; not words but wails. It is the same with hate; it is the same with love. We are not speaking merely of the unpacking of the heart in which the angry warriors of the Iliad indulge. Even such subtle writing as that of Aeschylus and Sophocles falls below the work of the painter. Hate, though voluble perhaps, as Clytaem- nestra's when hate is at

that red-heat glow which the poet can render, changes in a moment whenever that redness has been fanned to hatred's own last complexion — whiteness as of iron at the melting-point— when the heart has grown far too big to be " unpacked " at all, and even the bitter epigrams of hate's own rhetoric, though brief as the terrier's snap before he fleshes his teeth, or as the short snarl of the tigress as she springs before her cubs in danger, are all too slow and sluggish for a soul to which language at its tensest has become idle play. But this is just what cannot be rendered by an art whose medium consists solely of words.

It is in giving voice, not to emotion at its tensest, but to the variations of emotion, it is in expressing the countless shifting movements of the soul from passion to passion, that poetry shows in spite of all her infirmities her superiority to the plastic arts. Hamlet and the Agamemnon, the Iliad and the Oedipus Tyrannus, are adequate to the entire breadth and depth of man's soul.

Varieties of Poetic Art. — We have now reached the inquiry: What varieties of poetic art are the outcome of the two kinds of poetic impulse, dramatic imagination and lyric or egoistic imagin- ation? It would be impossible here to examine fully the subject of poetic imagination. In order to do so we should have to enter upon the vast question of the effect of artistic environment upon the development of man's poetic imagination; we should have to inquire how the instinctive methods of each poet and of each group of poets have been modified and often governed by the methods characteristic of their own time and country. We should have to inquire, for instance, how far such landscape as that of Sophocles in the Oedipus Coloneus and such landscape as that of Wordsworth depends upon difference of individual temperament, and how far upon difference of artistic environ- ment. That, in any thorough and exhaustive discussion of poetic imagination, the question of artistic environment must be taken into account, the case of the Iliad is alone sufficient to show. Ages before Phrynichus, ages before an acted drama was dreamed of, a dramatic poet of the first order arose, and, though he was obliged to express his splendid dramatic imagina- tion through epic forms, he expressed it almost as fully as if he had inherited the method and the stage of Sophocles. And if

Homer never lived at all, then an entire group of dramatic poets arose in remote times whose method was epic instead of dramatic simply because there was then no stage. This, contrasted with the fact that in a single half-century the tragic art of Greece arose with Aeschylus, culminated with Sophocles, and decayed with Euripides, and contrasted also with the fact that in England at one time, and in Spain at one time, almost the entire poetic imagination of the country found expression in the acted drama alone, is sufficient to show that a poet's artistic methods are very largely

influenced by the artistic environments of his country and time. So vast a subject as this, however, is beyond our scope, and we can only point to the familiar instance of the troubadours and the trouveres and then pass on.

With the trouvere (the poet of the langue a" oil), the story or situation is always the end of which the musical language is the means; with the troubadour (the poet of the langue d'oc), the form is so beloved, the musical language so enthralling, that, however beautiful may be the story or situation, it is felt to be no more than the means to a more beloved and beautiful end. But then nature makes her own troubadours and her own trouveres irrespective of fashion and of time — irrespective of langue d'oc and langue d'o'il. And, in comparing the troubadours with the trouveres, this is what strikes us at once- — there are certain troubadours who by temperament, by original endow- ment of nature, ought to have been trouveres, and there are certain trouveres who by temperament ought to have been troubadours. Surrounding conditions alone have made them what they are. There are those whose impulse (though writing in obedience to contemporary fashions lyrics in the langue d'oc) is manifestly to narrate, and there are those whose impulse (though writing in obedience to contemporary fashions fabliaux in the langue d'o'il) is simply to sing. In other words, there are those who, though writing after the fashion of their brother- troubadours, are more impressed with the romance and wonder- fulness of the human life outside them than with the romance and wonderfulness of their own passions, and who delight in depicting the external world in any form that may be the popular form of their time; and there are those who, though writing after the fashion of their brother- trouveres, are far more occupied with the life within them than with that outer life which the taste of their time and country calls upon them to paint — born rhythmists who must sing, who translate everything external as well as internal into verbal melody. Of the former class Pierre Vidal, of the latter class the author of Le Lay de I'oiselet, may be taken as the respective types.

That the same forces are seen at work in all literatures few students of poetry will deny — though in some poetical groups these forces are no doubt more potent than in others, as, for instance, with the great parable poets of Persia, in some of whom there is perpetually apparent a conflict between the dominance of the Oriental taste for allegory and subtle suggestion, as expressed in the Zoroastrian definition of poetry — " apparent pictures of unapparent realities " — and the opposite yearning to represent human life with the freshness and natural freedom characteristic of Western poetry.

Allowing, however, for all the potency of external influences, we shall not be wrong in saying that of poetic imagination there are two distinct kinds

— (i) the kind of poetic imagina- yi6 SO /„te tion seen at its highest in Aeschylus, Sophocles, and Relative Shakespeare and Homer, and (2) the kind of poetic s “” imagination seen at its highest in Pindar, Dante and Milton, or else in Sappho, Heine and Shelley. The former, being in its highest dramatic exercise unconditioned by the personal or lyrical impulse of the poet, might perhaps be called absolute dramatic vision; the latter, being more or less conditioned by the personal or lyrical impulse of the poet, might be called relative dramatic vision. It seems impossible to classify poets, or to classify the different varieties of poetry, without drawing some such distinction as this, whatever words of definition we may choose to adopt.

For the achievement of all pure lyric poetry, such as the ode, the song, the elegy, the idyll, the sonnet, the stornello, it is

evident that the imaginative force we have called relative vision will suffice. And if we consider the matter thoroughly, in many other forms of poetic art — forms which at first sight might seem to require absolute vision — we shall, find nothing but relative vision at work.

Even in Dante, and even in Milton and Virgil, it might be difficult to trace the working of any other than relative vision. And as to the entire body of Asiatic poets it might perhaps be found (even in view of the Indian drama) that relative vision suffices to do all their work. Indeed the temper which produces true drama is, it might almost be said, a growth of the Western mind. For, unless it be Semitic, as seen in the dramatic narratives of the Bible, or Chinese, as seen in that remarkable prose story, The Two Fair Cousins, translated by R6musat, absolute vision seems to have but small place in the literatures of Asia. The wonderfulness of the world and the romantic possibilities of fate, or circumstance, or chance — not the wonderfulness of the character to whom these possibilities befall — are ever present to the mind of the Asiatic poet. Even in so late a writer as the poet of the Shah Nameh, the hero Irij, the hero Zal and the hero Zohreb are in character the same person, the virtuous young man who combines the courage of youth with the wisdom and forbear- ance of age. And, as regards the earlier poets of Asia, it was not till the shadowy demigods and heroes of the Asiatic races crossed the Caucasus, and breathed a more bracing air, that they became really individual characters. But among the many qualities of man’s mind that were invigorated and rejuvenated by that great exodus from the dreamy plains of Asia is to be counted, above all others, his poetic imagination. The mere sense of wonder, which had

formerly been an all-sufficing source of pleasure to him, was all-sufficing no longer. The wonderful adventure must now be connected with a real and interesting individual character. It was left for the poets of Europe to show that, given the interesting character, given the Achilles, the Odysseus, the Helen, the Priam, any adventure happening to such a character becomes interesting.

What then is this absolute vision, this true dramatic imagina- tion which can hardly be found in Asia — which even in Europe cannot be found except in rare cases? Between relative and absolute vision the difference seems to be this, that the former only enables the poet, even in its very highest exercise, to make his own individuality, or else humanity as represented by his own individuality, live in the imagined situation; the latter enables him in its highest exercise to make special individual characters other than the poet's own live in the imagined situation.

" That which exists in nature," says Hegel, " is a something purely individual and particular. Art, on the contrary, is essen- tially destined to manifest the general." And no doubt this is true as regards the plastic arts, and true also as regards literary art, save in the very highest reaches of pure drama and pure lyric, when it seems to become art no longer — when it seems to become the very voice of Nature herself. The cry of Priam when he puts to his lips the hand that slew his son is not merely the cry of a bereaved and aged parent; it is the cry of the in- dividual king of Troy, and expresses above everything else that most naive, pathetic and winsome character. Put the words into the mouth of the irascible and passionate Lear and they would be entirely out of keeping.

It may be said then that, while the poet of relative vision, even in hs very highest exercise, can only, when depicting the Lyric Epic external world, deal with the general, the poet of and absolute vision can compete with Nature herself

Dramatic an(j & tg \ w ;th both general and particular. If this mgers. j g rea jjy so we m3 y p er haps find a basis for a classi- fication of poetry and of poets. That all poets must be singers has already been maintained. But singers seem to be divisible into three classes: first the pure lyrists, each of whom can with his one voice sing only one tune; secondly the epic poets, save Homer, the bulk of the narrative poets, and the quasi-dramatists, each of whom can with his one voice sing several tunes; and thirdly the true dramatists, who, having, like the nightingale of Gongora, many tongues, can sing all tunes.

It is to the first-named of these classes that most poets belong. With regard to the second class, there are not of course many poets left for it: the first

absorbs so many. But, when we come to consider that among those who, with each his one voice, can sing many tunes, are Pindar, Firdausi, Jami, Virgil, Dante, Milton, Spenser, Goethe, Byron, Coleridge, Shelley, Keats, Schiller, Victor Hugo, the second class is so various that no generalization save such a broad one as ours could embrace its members. And now we come to class three, and must pause. The third class is necessarily very small. In it can only be placed such names as Shakespeare, Aeschylus, Sophocles, Homer and (hardly) Chaucer.

These three kinds of poets represent three totally different kinds of poetic activity.

With regard to the first, the pure lyrists, the impulse is pure egoism. Many of them have less of even relative vision at its highest than the mass of mankind. They are often too much engaged with the emotions within to have any deep sympathy with the life around them. Of every poet of this class it may be said that his mind to him " a kingdom is," and that the smaller the- poet the bigger to him is that kingdom. To make use of a homely image — like the chaffinch whose eyes have been pricked by the bird-fancier, the pure lyrist is sometimes a warbler because he is blind. Still he feels that the Muse loves him exceedingly. She takes away his eyesight, but she gives him sweet song. And his song is very sweet, very sad, and very beautiful; but it is all about the world within his own soul — its sorrows, joys, fears and aspirations.

With regard to the second class the impulse here is no doubt a kind of egoism too; yet the poets of this class are all of a different temper from the pure lyrists. They have a wide imagination; but it is still relative, still egoistic. They have splendid eyes, but eyes that never get beyond seeing general, universal humanity (typified by themselves) in the imagined situation. Not even to these is it given to break through that law of centrality by which every " me " feels itself to be the central " me " — the only " me " of the universe, round which all other spurious " me's " revolve. This "me " of theirs they can transmute into many shapes, but they cannot create other " me's " — nay, for egoism, some of them scarcely would, perhaps, if they could.*

The third class, the true dramatists, whose impulse is the simple yearning to create akin to that which made " the great Vishnu yearn to create a world," are " of imagination all com- pact " — so much so that when at work " the divinity " which Iamblichus speaks of " seizes for the time the soul and guides it as he will."

The distinction between the pure lyrists and the other two classes of poets is obvious enough. But the distinction between the quasi-dramatists and the

pure dramatists Examples of requires a word of explanation before we proceed Relative and to touch upon the various kinds of poetry that spring Absolute from the exercise of relative and absolute vision. ‘ son – Sometimes, to be sure, the vision of the true dramatists — the greatest dramatists — will suddenly become narrowed and obscured, as in that part of the Oedipus tyrannus where Sophocles makes Oedipus ignorant of what every one in Thebes must have known, the murder of Laius. And again, finely as Sophocles has conceived the character of Electra, he makes her, in her dispute with Chrysothemis, give expression to sentiments that, in another play of his own, come far more appropriately from the lofty character of Antigone in a parallel dispute with Ismene. And, on the other hand, examples of relative vision in its furthest reaches can be found in abundance everywhere, especially in Virgil, Dante, Calderon and Milton. Some of the most remarkable examples of that high kind of relative vision which may easily be mistaken for absolute vision may be found in those great prose epics of the North which Aristotle would have called poems. Here is one from the Volsunga Saga. While the brothers of Gudrun are about their treacherous business of murdering Sigurd, her husband, as he lies asleep in her arms, Brynhild, Sigurd’s former love, who in the frenzy of

” iove turned to hate ” has instigated the murderers to the deed, hovers outside the chamber with Gunnar, her husband, and listens to the wail of her rival who is weltering in Sigurd’s blood. At the sound of that wail Brynhild laughs: —

” Then said Gunnar to her, Thou laughest not because thy heart roots are gladded, or else why doth thy visage wax so wan ? ” 1

This is of course very fine; but, as any two characters in that dramatic situation might have done that dramatic business, fine as it is — as the sagaman gives us the general and not the particular — the vision at work is not absolute but relative at its . very highest exercise. But our examples will be more interest- ing if taken from English poets. In Coleridge’s ” Ancient Mariner ” we find an immense amount of relative vision of so high a kind that at first it seems absolute vision. When the ancient mariner, in his narrative to the wedding guest, reaches the slaying of the albatross, he stops, he can proceed no farther, and the wedding guest exclaims: —

” God save thee, Ancient Mariner,

From the fiends that plague thee thus ! Why look’st thou so ? ” ” With my

cross-bow

I shot the albatross."

But there are instances of relative vision — especially in the great master of absolute vision, Shakespeare — which are higher still — -so high indeed that not to relegate them to absolute vision seems at first sight pedantic. Such an example is the famous speech of Lady Macbeth in the second act, where she says: —

" Had he not resembled My father as he slept, I had done 't."

Marvellously subtle as is this speech, it will be found, if analysed, that it expresses the general human soul rather than any one special human soul. Indeed Leigh Hunt records the case of a bargeman who, charged with robbing a sleeping traveller in his barge, used in his confession almost identical words — " Had he not looked like my father as he slept, I should have killed as well as robbed him." Again, the thousand and one cases (to be found in every literature) where a character, overwhelmed by some sudden surprise or terror, asks whether the action going on is that of a dream or of real life, must all, on severe analysis, be classed under relative rather than under absolute vision — even such a fine speech, for instance, as that where Pericles, on discovering Marina, exclaims: — " This is the rarest dream that e'er dull sleep Did mock sad fools withai " ;

or as that in the third act of Titus Andronicus, where Titus, beholding his mutilated and ruined daughter, asks: —

" When will this fearful slumber have an end? " even here, we say, the humanity rendered is general and not particular, the vision at work is relative and not absolute. The poet, as representing the whole human race, throwing himself into the imagined situation, gives us what general humanity would have thought, felt, said or done in that situation, not what one particular individual and he alone would have thought, felt, said or done.

Now what we have called absolute vision operates in a very different way. So vividly is the poet's mere creative instinct at work that the ego sinks into passivity — becomes insensitive to all impressions other than those dictated by the vision — by the " divinity " which has " seized the soul." Shakespeare is full of examples. Take the scene in the first act of Hamlet where Hamlet hears for the first time, from Horatio, that his father's ghost haunts the castle. Having by short sharp questions elicited the salient facts attending the apparition, Hamlet says, " I would I had been there." To this Horatio makes the very commonplace reply, " It would have much amazed

you." Note the marvellously dramatic reply of Hamlet — " Very like, very like ! Stayed it long ? " Suppose that this dialogue had been attempted by any other poet than a true dramatist, or by a true dramatist in any other mood than his very highest, Hamlet, on hearing Horatio's commonplace remarks upon phenomena which to Hamlet were more subversive 1 Translation of Morris and Magnusson.

of the very order of the universe than if a dozen stars had fallen from their courses, would have burst out with: " Amazed me!" and then would have followed an eloquent declamation about the " amazing " nature of the phenomena and their effect upon him. But so entirely has the poet become Hamlet, so completely has " the divinity seized his soul," that all language seems equally weak for expressing the turbulence within the soul of the character, and Hamlet exclaims in a sort of meditative irony, " Very like, very like ! " It is exactly this one man Hamlet, and no other man, who in this situation would have so expressed himself. Charles Knight has some pertinent remarks upon this speech of Hamlet; yet he misses its true value, and treats it from the general rather than from the particular side. Instances of absolute vision in Shakespeare crowd upon us; but we can find room for only one other. In the pathetic speech of Othello, just before he kills himself, he declares himself to be: —

" One not easily jealous, but, being wrought, Perplexed in the extreme." ,

Consider the marvellous timbre of the word "wrought," as coming from a character like Othello. When writing this passage, especially when writing this word, the poet had become entirely the simple English soldier-hero, as the Moor really is — he had become Othello, looking upon himself " as not easily jealous," whereas he was " wrought " and " perplexed in the extreme " by tricks which Hamlet would have seen through in a moment.

While all other forms of poetic art can be vitalized by relative vision, there are two forms (and these the greatest) in which absolute vision is demanded, viz. the drama, and in Dramatic a lesser degree the Greek epic, especially the Iliad. imagine- This will be seen more plainly perhaps if we now tion – vary our definitions and call relative vision egoistic imagination; absolute vision dramatic imagination.

Very much of the dramatist's work can be, and in fact is, effected by egoistic imagination, while true dramatic imagination is only called into play on comparatively rare occasions. Not only fine but sublime dramatic poems have been written, however, where the vitalizing power has been entirely that of lyrical imagination. We need only instance the Prometheus Bound of Aeschylus, the most sublime poem in the world. The dramas of Shelley too, like those of Victor Hugo and Calderon, are informed entirely

by egoistic imagination. In all these splendid poems the dramatist places himself in the imagined situation, or at most he places there some typical conception of universal humanity. There is not in all Calderon any such display of dramatic imagination as we get in that wonderful speech of Priam's in the last book of the Iliad, to which we have before alluded. There is not in the Cenci such a display of dramatic imagination as we get in the sudden burst of anger from the spoilt child of gods and men, Achilles (anger which alarms the hero himself as much as it alarms Priam), when the prattle of the old man has carried him too far. It may seem bold to say that the drama of Goethe is informed by egoistic imagination only — assuredly the prison-scene in Faust is unsurpassed in the literatures of the world. Yet, perhaps, it could be shown of the passion and the pathos of Gretchen throughout the entire play that it betrays a female character general and typical rather than individual and particular.

The nature of this absolute vision or true dramatic imagination is easily seen if we compare the dramatic work of writers without absolute vision, such as Calderon, Goethe, Ben Jonson, Fletcher and others, with the dramatic work of Aeschylus and of Shake- speare. While of the former group it may be said that each poet skilfully works his imagination, of Aeschylus and Shakespeare it must be said that each in his highest dramatic mood does not work, but is worked by his imagination. Note, for instance, how the character of Clytaemnestra grows and glows under the hand of Aeschylus. The poet of the Odyssey had distinctly said that Aegisthus, her paramour, had struck the blow, but the dramatist, having imagined the greatest tragic female in all poetry, finds it impossible to let a man like Aegisthus assist such a woman in a homicide so daring and so momentous. And

when in that terrible speech of hers she justifies her crime (ostensibly to the outer world, but really to her own conscience), the way in which, by the sheer magnetism of irresistible person- ality, she draws our sympathy to herself and her crime is un- rivalled out of Shakespeare and not surpassed even there. In the Great Drama, in the Agamemnon, in Othello, in Hamlet, in Macbeth, there is an imagination at work whose laws are inexor- able, are inevitable, as the laws by the operation of which the planets move around the sun. But in this essay our business with drama is confined entirely to its relations to epic.

Considering how large and on the whole how good is the body of modern criticism upon drama, it is surprising how poor is Epic and the modern

criticism upon epic. Aristotle, compar- Drama ing tragedy with epic, gives the palm to tragedy

Compared. as ˆeing the more perfect art, and nothing can be more ingenious than the way in which he has marshalled his reasons. He tells us that tragedy as well as epic is capable of producing its effect even without action; we can judge of it perfectly, says he, by reading. He goes so far as to say that, even in reading as well as in representation, tragedy has an advantage over the epic, the advantage of greater clearness and distinctness of impression. And in some measure this was perhaps true of Greek tragedy, for as Müller in his Dissertations on the Eumenides has well said, the ancients always remained and wished to remain conscious that the whole was a Dionysian entertainment; the quest of a commonplace okoti) came after- wards. And even of Romantic Drama it may be said that in the time of Shakespeare, and .indeed down through the 18th century, it never lost entirely its character of a recitation as well as a drama. It was not till melodrama began to be recognized as a legitimate form of dramatic art that the dialogue had to be struck from the dramatic action " at full speed " — struck like sparks from the roadster's shoes. The truth is, however, that it was idle for Aristotle to inquire which is the more important branch of poetry, epic or tragedy. Equally idle would it be for the modern critic to inquire how much romantic drama gained and how much it lost by abandoning the chorus.

Much has been said as to the scope and the limits of epic and dramatic poetry. If in epic the poet has the power to take the imagination of his audience away from the dramatic centre and show what is going on at the other end of the great web of the world, he can do the same thing in drama by the chorus, and also by the introduction into the dramatic circle of messengers and others from the outside world. But, as regards epic poetry, is it right that we should hear, as we sometimes do hear, the voice of the poet himself as chorus bidding us contrast the present picture with other pictures afar off, in order to enforce its teach- ing and illustrate its pathos? This is a favourite method with modern poets and a still more favourite one with prose narrators. Does it not give an air of self-consciousness to poetry? Does it not disturb the intensity of the poetic vision? Yet it has the sanction of Homer; and who shall dare to challenge the methods of the great father of epic? An instance occurs in Iliad v. 158, where, in the midst of all the stress of fight, the poet leaves the dramatic action to tell us what became of the in- heritance of Phaenops, after his two sons had been slain by Diomedes. Another instance occurs in iii. 243-244, where the poet, after Helen's pathetic mention of her brothers, comments on the causes of their absence, " criticizes life " in the approved modern way, generalizes upon the impotence of human intelli- gence ˆ — the impotence even of human love — to pierce the dark- ness in which the web of human fate is woven.

Thus she spoke (the poet tells us); but the life-giving earth already possessed them, there in Lacedaemon, in their dear native land: —

o > s 0&To' tovs 5′ fj8t] k6.t€x €V valfoos ata iv AaKeSalfiovt av9i, 0t\j) iv waTplii yaiy.

This, of course, is " beautiful exceedingly," but, inasmuch as the imagination at work is egoistic or lyrical, not dramatic; inas- much as the vision is relative, not absolute, it does not represent that epic strength at its very highest which we call specially " Homeric," unless indeed we remember that with Homer the

Muses are omniscient: this certainly may give the passage a deep dramatic value it otherwise seems to lack.

The deepest of all the distinctions between dramatic and epic methods has relation, however, to the nature of the dialogue. Aristotle failed to point it out, and this is remarkable until we remember that his work is but a fragment of a great system of criticism. In epic poetry, and in all poetry that narrates, whether the poet be Homer, Chaucer, Thomas the Rhymer, Gottfried von Strasburg, or Turoldus, the action, of course, moved by aid partly of narrative and partly by aid of dialogue, but in drama the dialogue has a quality of suggestiveness and subtle inference which we do not expect to find in any other poetic form save perhaps that of the purely dramatic ballad. In ancient drama this quality of suggestiveness and subtle inference is seen not only in the dialogue, but in the choral odes. The third ode of the Agamemnon is an extreme case in point, where, by a kind of double entendre, the relations of Clytaemnestra and Aegisthus are darkly alluded to under cover of allusions to Paris and Helen. Of this dramatic subtlety Sophocles is perhaps the greatest master; and certain critics have been led to speak as though irony were heart-thought of Sophoclean drama. But the suggestiveness of Sophocles is pathetic (as Professor Lewis Campbell has well pointed out), not ironical. This is one reason why drama more than epic seems to satisfy the mere intellect of the reader, though this may be counterbalanced by the hardness of mechanical structure which sometimes disturbs the reader's imagination in tragedy.

When, for instance, a dramatist pays so much attention to the evolution of the plot as Sophocles does, it is inevitable that his characters should be more or less plot-ridden; they have to say and do now and then certain things which they would not say and do but for the exigencies of the plot. Indeed one of the advantages which epic certainly has over drama is that the story can be made to move as rapidly as the poet may desire without these mechanical modifications of character.

The only kind of epic for Aristotle to consider was Greek epic, between which and all other epic the difference is one of kind, if the Iliad alone is taken to represent Greek epic. ~ ft „ . In speaking of the effect that surrounding conditions P f seem to have upon the form in which the poetic energy p ft of any time or country should express itself, we instanced the Iliad as a typical case. The imagination vivifying it is mainly dramatic. The characters represent much more than the mere variety of mood of the delineator. Notwithstanding all the splendid works of Calderon, Marlowe, Webster and Goethe, it is doubtful whether as a born dramatist the poet of the Iliad does not come nearer to Aeschylus and Shakespeare than does any other poet. His passion for making the heroes speak for themselves is

almost a fault in the Iliad considered as pure epic, and the unconscious way in which each actor is made to depict his own character is in the highest spirit of drama. It is owing to this speciality of the Iliad that it stands apart from all other epic save that of the Odyssey, where, however, the dramatic vision is less vivid. It is owing to the dramatic imagination displayed in the Iliad that it is impossible to say, from internal evidence, whether the poem is to be classified with the epics of growth or with the epics of art. All epics are clearly divisible into two classes, first those which are a mere accretion of poems or traditionary ballads, and second, those which, though based indeed on tradition or history, have become so fused in the mind of one great poet, so stained, therefore, with the colour and temper of that mind, as to become new crystalliza- tions — inventions, in short, as we understand that word. Each kind of epic has excellencies peculiar to itself, accompanied by peculiar and indeed necessary defects. In the one we get the freedom — apparently schemeless and motiveless — of nature, but, as a consequence, miss that " hard acorn of thought " (to use the picturesque definition in the Volsunga Saga of the heart of a man) which the mind asks for as the core of every work of art. In the other this great requisite of an adequate central thought is found, but accompanied by a constriction, a lack of freedom, a cold artificiality, the obtrusion of a pedantic scheme, which would be intolerable to the natural mind unsophisticated by literary study. The flow of the one is as that of a river, the flow of the other as that of a canal. Yet, as has been already hinted, though the great charm of Nature herself is that she never teases us with any obtrusive exhibitions of scheme, she doubtless has a scheme somewhere, she does somewhere hide a " hard acorn of thought " of which the poem of the universe is the expanded expression. And, this being so, art should have a scheme too; but in such a dilemma is she placed in this matter that the epic poet, unless he is evidently telling the

story for its own sake, scornful of purposes ethic or aesthetic, must sacrifice illusion.

Among the former class of epics are to be placed the great epics of growth, such as the MahSbhUrata, the Nibelung story, &c; among the latter the Odyssey, the Aenetd, Paradise Lost, the Gerusalemme liberata, the Lusiadas.

But where in this classification are we to find a place for the Iliad? The heart-thought of the greatest epic in all literature is simply that Achilles was vexed and that the fortunes of the world depended upon the whim of a

sulky hero. Yet, notwithstanding all the acute criticisms of Wolff, it remains difficult for us to find a place for the Iliad among the epics of growth. And why? Because throughout the Iliad the dramatic imagination shown is of the first order; and, if we are to suppose a multiplicity of authors for the poem, we must also suppose that ages before the time of Pericles there existed a group of dramatists more nearly akin to the masters of the Great Drama, Aeschylus, Sophocles and Shake- speare, than any group that has ever existed since. Yet it is equally difficult to find a place for it amongst the epics of art. In the matter of artistic motive the Odyssey stands alone among the epics of art of the world, as we are going to see.

It is manifest that, as the pleasure derived from the epic of art is that of recognizing a conscious scheme, if the epic of art fails through confusion of scheme it fails altogether. What The Epic of j g (j emanc j ec j f the epic of art (as some kind of compensa- ˆ r ˆ tion for that natural freedom of evolution which it

can never achieve, that sweet abandon, which belongs to nature and to the epic of growth alike) is unity of impression, harmonious and symmetrical development of a conscious heart-thought or motive. This being so, where are we to place the Aeneid, and where are we to place the Shih Nameh? Starting with the intention, as it seems, of fusing into one harmonious whole the myths and legends upon which the Roman story is based, Virgil, by the time he reaches the middle of his epic, forgets all about this primary intent, and gives us his own thoughts and reflections on things in general. Fine as is the speech of Anchises to Aeneas in Elysium (Aen. vi. 724-755), its incongruity with the general scheme of the poem as developed in the previous books shows how entirely Virgil lacked that artistic power shown in the Odyssey of making a story become the natural and inevitable outcome of an artistic idea.

In the Shdh Nameh there is the artistic redaction of Virgil, but with even less attention to a central thought than Virgil exhibits. Firdausi relies for his effects upon the very qualities which characterize not the epic of art but the epic of growth — a natural and not an artificial flow of the story; so much indeed that, if the Sh&h NSmeh were studied in connexion with the Iliad on the one hand and with the Kalevala on the other, it might throw a light upon the way in which an epic may be at one and the same time an aggregation of the national ballad poems and the work of a single artificer. That Firdausi was capable of working from a centre not only artistic but philosophic his Yusuf and Zuleikha shows ; and if we consider what was the artistic temper of the Persians in Firdausi's time, what indeed has been that temper during the whole of the Mahommedan period, the subtle temper of the parable poet — the Shah Nameh, with its direct appeal to popular sympathies, is a standing wonder in poetic literature.

With regard, however, to Virgil's defective power of working from an artistic motive, as compared with the poet of the Odyssey, this is an infirmity he shares with all the poets of the Western world. Certainly he shares it with the writer of Paradise Lost, who, setting out to " justify the ways of God to man," forgets occasionally the original worker of the evil, as where, for instance, he substitutes chance as soon as he comes (at the end of the second book) to the point upon which the entire epic movement turns, the escape of Satan from hell and his journey to earth for the ruin of man: — " At last his sail-broad vans He spreads for flight, and, in the surging smoke Uplifted, spurns the ground; thence many a league, As in a cloudy chair, ascending rides Audacious; but, that seat soon failing, meets A vast vacuity ; all unawares, Fluttering his pinions vain, plumb down he drops Ten thousand fathoms deep, and to this hour Down had been falling, had not, by ill chance, The strong rebuff of some tumultuous cloud, Instinct with fire and nitre, hurried him As many miles aloft."

In Milton's case, however, the truth is that he made the mistake of trying to disturb the motive of the story for artistic purposes — a fatal mistake, as we shall see when we come to speak of the Nihelungenlied in relation to the old Norse epic cycle.

Though Vondel's mystery play of Lucifer is, in its execution, rhetorical more than poetical, it did, beyond all question, influence Milton when he came to write Paradise Lost. The famous line which is generally quoted as the keynote of Satan's character —

" Better to reign in hell than serve in heaven " —

seems to have been taken bodily from Vondel's play, and Milton's entire epic shows a study of it. While Marlowe's majestic move-

ments alone are traceable in Satan's speech (written some years before the rest of Paradise Lost, when the dramatic and not the epic form had been selected), Milton's Satan became afterwards a splendid amalgam not of the Mephistopheles but of the Faustus of Marlowe and the Lucifer of Vondel. Vondel's play must have possessed a peculiar attraction for a poet of Milton's views of human progress. Defective as the play is in execution, it is far otherwise in motive. This motive, if we consider it aright, is nothing less than an explanation of man's anomalous condition on the earth — spirit incarnate in matter, created by God, a little lower than the angels — in order that he may advance by means of these very manacles which imprison him, in order that he may ascend by the staircase of the world, the ladder of fleshly conditions, above those cherubim and seraphim who, lacking the education of sense, have not the knowledge wide and deep which brings man close to God.

Here Milton found his own favourite doctrine of human develop- ment and self-education in a concrete and vividly artistic form. Much, however, as such a motive must have struck a man of Milton's instincts, his intellect was too much chained by Calvinism to permit of his treating the subject with Vondel's philosophic breadth. The cause of Lucifer's wrath had to be changed from jealousy of human progress to jealousy of the Son's proclaimed superiority. And the history of poetry shows that once begin to tamper with the central thought around which any group of incidents has crystallized and the entire story becomes thereby rewritten, as we have seen in the case of the Agamemnon of Aeschylus. Of the motive of his own epic, after he had abandoned the motive of Vondel, Milton had as little permanent grasp as Virgil had of his. As regards the Odyssey, however, we need scarcely say that its motive is merely artistic, not philosophic. And now we come to philosophic motive.

The artist's power of thought is properly shown not in the direct enunciation of ideas but in mastery over motive. Here Aeschylus is by far the greatest figure in Western poetry — a proof perhaps among many proofs of the Oriental strain of his genius. (As regards pure drama, however, important as is motive, freedom, organic vitality in every part, is of more importance than even motive, and in this freedom and easy abandonment the concluding part of the Oresteia is deficient as compared with such a play as Othello or Lear.) Notwithstanding the splendid exception of Aeschylus, the truth seems to be that the faculty of developing a poetical narrative from a philosophic thought is Oriental, and on the whole foreign to the genius of the Western mind. Neither in Western drama nor in Western epic do we find, save in such rare cases as that of Vondel, anything like that power of developing a story from an idea which not only Jami but all the parable poets of Persia show.

In modern English poetry the motive of Shelley's dramatic poem Prometheus Unbound is a notable illustration of what is here contended. Starting with the full intent of developing a drama from a motive — starting with a universalism, a belief that good shall be the final goal of ill — Shelley cannot finish his first three hundred lines without shifting (in the curse of Prometheus) into a Manichaeism as pure as that of Manes himself: —

" Heap on thy soul, by virtue of this curse, 111 deeds, then be thou damned, beholding good; Both infinite as is the universe."

According to the central thought of the poem human nature, through the heroic protest and struggle of the human mind typified by Prometheus, can at last dethrone that supernatural terror and tyranny (Jupiter) which the human mind had itself installed. But, after its dethronement (when human

nature becomes infinitely perfectible), how can the supernatural tyranny exist apart from the human mind that imagined it? How can it be as " infinite as the universe "?

The motive of Paradise Lost is assailed with much vigour by Victor Hugo in his poem Religions et Religion. But when Hugo, in the after parts of the poem, having destroyed Milton's " God," sets up an entirely French " Dieu " of his own and tries " to justify " him, we perceive how pardonable was Milton's failure after all. Compare such defect of mental grip and such nebulosity of thought as is displayed by Milton, Shelley and Hugo with the strength of hand shown in the " Salaman " and " Absal " of Jami, and indeed by the Sufi poets generally.

There is, however, one exception to this rule that Western poetry is nebulous as to motive. There is, besides the Iliad, one epic that refuses to be classified, though for entirely different reasons. This is the Nibelung story, where we find unity of purpose and also entire freedom of movement. We find combined here beauties which are nowhere else combined — which are, in fact, at war with each other everywhere else. We find a scheme, a real " acorn of thought," in an epic which is not the self-conscious work of a single poetic artificer, but is as much the slow growth of various times and various minds as is the Mahdbharala, in which the heart-thought is merely that the Kauravas defeated their relatives at dice and refused to disgorge their winnings.

This Northern epic-tree, as we find it in the Icelandic sagas, the Norns themselves must have watered; for it combines the virtues

of the epic of growth with those of the epic of art. Though not written in metre, it may usefully be compared with the epics of Greece and of India and Persia. Free in movement as the wind, which " bloweth where it listeth," it listeth to move by law. Its action is that of free will, but free will at play within a ring of necessity. Within this ring there throbs all the warm and passionate life of the world outside, and all the freedom apparently. Yet from that world it is enisled by a cordon of curses — by a zone of defiant flames more impregnable than that which girdled the beautiful Brynhild at Hindfell. Natural laws, familiar emotions, are at work everywhere in the story; yet the " Ring of Andvari," whose circumference is but that of a woman's finger, encircles the whole mimic world of the sagaman as the Midgard snake encircles the earth. For this artistic perfection in an epic of growth there are, of course, many causes, some of

them traceable and some of them beyond all discovery — causes no doubt akin to those which gave birth to many of the beauties of other epics of growth. Originally Sinfiotli and Sigurd were the same person, and note how vast has been the artistic effect of the separation of the two ! Again, there were several different versions of the story of Brynhild. The sagamen, finding all these versions too interesting and too much beloved to be discarded, adopted them all — worked them up into one legend, so that, in the Volsunga Saga we have a heroine possessing all the charms of goddess, demi-goddess, earthly princess and amazon — a heroine surpassing perhaps in fascination all other heroines that have ever figured in poetry.

It is when we come to consider such imaginative work as this that we are compelled to pause before challenging the Aristotelian doctrine that metrical structure is but an accidental quality of epic. In speaking of the Nibelung story we do not, of course, speak of the German version, the Nibelungenlied, a fine epic still, though a degradation of the elder form. Between the two the differences are fundamental in the artistic sense, and form an excellent illustra- tion of what has just been said upon the disturbance of motive in epic, and indeed in all poetic art. It is not merely that the endings of the three principal characters, Sigurd (Siegfried), Gudrun (Kriemhilt), and Brynhild are entirely different; it is not merely that the Icelandic version, by missing the blood-bath at Fafnir's lair, loses the pathetic situation of Gudrun's becoming afterwards an unwilling instrument of her husband's death; it is not merely that, on the other hand, the German version, by omitting the early love passages between Brynhild and Sigurd at Hindfell, misses entirely the tragic meaning of her story and the terrible hate that is love resulting from the breaking of the troth; but the conclusion of each version is so exactly the opposite of that of the other that, while the German story is called (and very properly) " Kriemhilt's Revenge," the story of the Volsunga Saga might, with equal pro- priety, be called Gudrun's Forgiveness.

If it be said that, in both cases, the motive shows the same Titanic temper, that is because the Titanic temper is the special „ . characteristic of the North-Western mind. The temper

*Eastlai °^ revo 't against authority seems indeed to belong West. *° * nat ener gy which succeeds in the modern develop-*

ment of the great racial struggle for life. Although no epic, Eastern or Western, can exist without a struggle between good and evil — and a struggle upon apparently equal terms — it must not be supposed that the warring of conflicting forces which is the motive of Eastern epic has much real relation to the v/arring of conflicting forces which is the motive of Western epic.

And, as regards the machinery of epic, there is, we suspect, a deeper significance than is commonly apprehended in the fact that the Satan or Shaitan of the Eastern world becomes in Vondel and Milton. a sublime Titan who attracts to himself the admiration which in Eastern poetry belongs entirely to the authority of heaven. In Asia, save perhaps among the pure Arabs of the desert, underlying all religious forms, there is apparent a temper of resignation to the irresistible authority of heaven. And as regards the Aryans it is probable that the Titanic temper — the temper of revolt against authority — did not begin to show itself till they had moved across the Caucasus. But what concerns us here is the fact that the farther they moved to the north-west the more vigorously this temper asserted itself, the prouder grew man in his attitude towards the gods, till at last in the Scandinavian cycle he became their equal and struggled alongside them, shoulder to shoulder, in the defence of heaven against the assaults of hell. Therefore, as we say, the student of epic poetry must not suppose that there is any real parallel between the attitude of Vishnu (as Rama) towards Ravana and the attitude of Prometheus towards Zeus, or the atti- tude of the human heroes towards Odirf in Scandinavian poetry. Had Ravana been dothed with a properly constituted authority, had he been a legitimate god instead of a demon, the Eastern doctrine of recognition of authority would most likely have come in and the world would have been spared one at least of its enormous epics. Indeed, the Ravana of the Ramayana answers somewhat to the Fafnir of the Volsunga Saga; and to plot against demons is not to rebel against authority. The vast field of Indian epic, however, is quite fteyond us here.

Nor can we do more than glance at the Kalevala. From one point of view that group of ballads might be taken, no doubt, as a simple

sisters of the Pojohla men. But from another point of view the universal struggle of the male for the female seems typified in this so-called epic of the Finns by the picture of the ” Lady of the Rainbow ” sitting upon her glowing arc and weaving her golden threads, while the hero is doing battle with the malevolent forces of nature.

But it is in the Nibelung story that the temper of Western epic is at its best — the temper of the simple fighter, whose business it is to fight. The ideal Western fighter was not known in Greece till ages after Homer, when in the pass of Thermopylae the com- panions of Leonidas combed their long hair in the sun. The business of the fighter in Scandinavian epic is to yield to no power whatso- ever, whether of earth or heaven or hell — to take a buffet from the Allfather himself, and to return it; to look Destiny herself in the face, crying out for quarter neither to gods nor demons nor Norns. This is the true temper of pure ” heroic poetry ” as it has hitherto flourished on this side the Caucasus — the temper of the fighter who is invincible because

he feels that Fate herself falters when the hero of the true strain defies — the fighter who feels that the very Norns themselves must cringe at last before the simple courage of man standing naked and bare of hope against all assaults, whether of heaven or hell or doom. The proud heroes of the Volsunga Saga utter no moans and shed no Homeric tears, knowing as they know that the day prophesied is sure when, shoulder to shoulder, gods and men shall stand up to fight the entire brood of night, and evil, storming the very gates of Asgard.

That this temper is not the highest from the ethical point of view is no doubt true. Against the beautiful resignation of Buddhism it may seem barbaric, and if moral suasion could supplant physical force in epic — if Siddartha could take the place of Achilles or Sigurd — it might be better for the human race.

But we must now give undivided attention to pure egoistic or lyric imagination. This, as has been said, is sufficient to vitalize all forms of poetic art save drama and the TheLyrk Greek epic. It would be impossible to discuss Imagina- adequately here the Hebrew poets, who have pro- " ofl- duced a lyric so different in kind from all other lyrics as to stand in a class by itself. As it is equal in importance to the Great Drama of Shakespeare, Aeschylus and Sophocles, we may perhaps be allowed to call it the " Great Lyric." The Great Lyric must be religious — it must, it would seem, be an outpouring of the soul, not towards man but towards God, like that of the God-intoxicated prophets and psalmists of Scripture. Even the lyric fire of Pindar owes much to the fact that he had a childlike belief in the myths to which so many of his contemporaries had begun to give a languid assent. But there is nothing in Pindar, or indeed elsewhere in Greek poetry, like the rapturous song, combining unconscious power with unconscious grace, which we have called the Great Lyric. It might perhaps be said indeed that the Great Lyric is purely Hebrew. But, although we could hardly expect to find it among those whose language, complex of syntax and alive with self-conscious inflexions, bespeaks the scientific knowingness of the Western mind, to call the temper of the Great Lyiic broadly " Asiatic " would be rash. It seems to belong as a birthright to those descendants of Shem who, yearning always to look straight into the face of God and live, could (when the Great Lyric was sung) see not much else.

Though two of the artistic elements of the Great Lyric, unconsciousness and power, are no doubt plentiful enough in India, the element of grace is lacking for the most part. The Vedic hymns are both nebulous and unemotional, as compare'd with Semitic hymns. And as to the Persians, they, it would seem, have the grace always, the power often, but the unconsciousness almost never. This is inevitable if we consider for a moment the chief characteristic of the Persian imagination — an imagination whose

wings are not so much " bright with beauty " as heavy with it — heavy as the wings of a golden pheasant — steeped in beauty like the " tiger-moth's deep damasked wings." Now beauty of this kind does not go to the making of the Great Lyric.

Then there comes that poetry which, being ethnologically Semitic, might be supposed to exhibit something at least of the Hebrew temper — the Arabian. But, whatever may be said of the oldest Arabic poetry, with its deep sense of fate and pain, it would seem that nothing can be more unlike than the Hebrew temper and the Arabian temper as seen in later poets. It is not

record of how the men of Kalevala were skilful in capturing the ' with Hebrew but with Persian poetry that Arabian poetry can

be usefully compared. If the wings of the Persian imagination are heavy with beauty, those of the later Arabian imagination are bright with beauty — brilliant as an Eastern butterfly, quick and agile as a dragon-fly or a humming-bird. To the eye of the Persian poet the hues of earth are (as Firdausi says of the garden of Afrasiab) " like the tapestry of the kings of Ormuz, the air is perfumed with musk, and the waters of the brooks are the essence of roses." And to the later Arabian no less than to the Persian the earth is beautiful; but it is the clear and sparkling beauty of the earth as she " wakes up to life, greeting the Sabaean morning"; we feel the light more than the colour. But it is neither the Persian's instinct for beauty nor the Arabian's quenchless wit and exhaustless animal spirits that go to the making of the Great Lyric; far from it. In a word, the Great Lyric, as we have said, cannot be assigned to the Asiatic temper generally any more than it can be assigned to the European temper.

In the poetry of Europe, if we cannot say of Pindar, devout as he is, that he produced the Great Lyric, what can we say of any other European poet ? The truth is that, like the Great Drama, so straight and so warm does it seem to come from the heart of man in its highest moods that we scarcely feel it to be literature at all. Passing, however, from this supreme expression of lyrical imagination, we come to the artistic ode, upon which subject the present writer can only reiterate here what he has more fully said upon a former occasion. Whatever may have been said to the contrary, enthusiasm is, in the nature of things, the very basis of the ode; for the ode is a mono-

drama, the actor in which is the poet himself; and, as Marmontel has well pointed out, if the actor in the mono-drama is not affected by the sentiments he expresses, the ode must be cold and lifeless. But, although the ode is a natural poetic method of the poet considered as prophet — although it is the voice of poetry as a fine frenzy — it must not be supposed that there is anything lawless in its structure. " Pindar," says the Italian critic Gravina, " launches his verses upon the bosom of the sea; he spreads out all his sails; he con- fronts the tempest and the rocks ; the waves arise and are ready to engulf him; already he has disappeared from the spectator's view; when suddenly he springs up in the midst of the waters, and reaches happily the shore." Now it is this Pindaric dis- cursiveness, this Pindaric unrestraint as to the matter, which has led poets to attempt to imitate him by adopting an unre- straint as to form. Although no two odes of Pindar exhibit the same metrical structure (the Aeolian and Lydian rhythms being mingled with the Doric in different proportions), yet each ode is in itself obedient, severely obedient, to structural law. This we feel ; but what the law is no metricist has perhaps ever yet been able to explain.

It was a strange misconception that led people for centuries to use the word " Pindaric " and irregular as synonymous terms; whereas the very essence of the odes of Pindar (of the few, alas! which survive to us) is their regularity. There is no more difficult form of poetry than this, and for this reason: when in any poetical composition the metres are varied, there must, as the present writer has before pointed out, be a reason for such freedom, and that reason is properly subjective — the varying form must embody and express the varying emotions of the singer. But when these metrical variations are governed by no subjective law at all, but by arbitrary rules supposed to be evolved from the practice of Pindar, then that very variety which should aid the poet in expressing his emotion crystallizes it and makes the ode the most frigid of all compositions. Great as Pindar undoubtedly is, it is deeply to be regretted that no other poet survives to represent the triumphal ode of Greece— the digressions of his subject matter are so wide, and his volu- bility is so great.

In modern literature the ode has been ruined by theories and experiments. A poet like La Mothe, for instance, writes execrable odes, and then writes a treatise to prove that all odes should be written on the same model. There is much confusion ot mind prevalent among poets as to what is and what is not

an ode. All odes are, no doubt, divisible into two great classes: those which, following an arrangement in stanzas, are commonly called regular, and those which, following no such arrangement, are commonly called irregular.

We do not agree with those who assert that irregular metres are of necessity inimical to poetic art. On the contrary, we believe that in modern prosody the arrangement of the rhymes and the length of the lines in any rhymed metrical passage may be deter- mined either by a fixed stanzaic law or by a law infinitely deeper — by the law which impels the soul, in a state of poetic exaltation, to seize hold of every kind of metrical aid, such as rhyme, caesura, &c. for the purpose of accentuating and marking off each shade of emotion as it arises, regardless of any demands of stanza. But between the irregularity of makeshift, such as we find it in Cowley and his imitators, and the irregularity of the " fine frenzy " of such a poem, for instance, as Coleridge's Kubla Khan, there is a difference in kind. Strange that it is not in an ode at all but in this unique lyric Kubla Khan, descriptive of imaginative landscape, that an English poet has at last conquered the crowning difficulty of writing in irregular metres. Having broken away from all restraints of couplet and stanza — having caused his rhymes and pauses to fall just where and just when the emotion demands that they should fall, scorning the exigencies of makeshift no less than the exigencies of stanza — he has found what every writer of irregular English odes has sought in vain, a music as entrancing, as natural, and at the same time as inscrutable, as the music of the winds or of the sea.

The prearranged effects of sharp contrasts and antiphonal move- ments, such as some poets have been able to compass, do not of course come under the present definition of irregular sf anM jfc metres at all. If a metrical passage does not gain , –

immensely by being written independently of stanzaic K mo tio na t law, it loses immensely ; and for this reason, perhaps, that ■- the great charm of the music of all verse, as distinguished w ' from the music of prose, is inevitableness of cadence. In regular metres we enjoy the pleasure of feeling that the rhymes will inevitably fall under a recognized law of couplet or stanza. But if the passage flows independently of these, it must still flow inevitably — it must, in short, show that it is governed by another and a yet deeper force, the inevitableness of emotional expression. The lines must be long or short, the rhvmes must be arranged after this or after that interval, not because It is convenient so to arrange them, but because the emotion of the poet inexorably demands these and no other arrangements. When, however, Coleridge came to try his hand at irregular odes, such as the odes " To the Departing Year " and " To the Duchess of Devonshire," he certainly ■ did not succeed.

As to Wordsworth's magnificent " Ode on Intimations of Im- mortality," the sole impeachment of it, but it is a grave one, is that the length of the lines and the arrangement of the rhymes are not always inevitable; they are, except on rare occasions, governed neither by stanzaic nor by

emotional law. For instance, what emotional necessity was there for the following rhyme-arrange- ment?

" My heart is at your festival, My head hath its coronal, The fulness of your bliss I feel — I feel it all. Oh, evil day! if I were sullen , While earth herself is adorning, This sweet May morning; And the children are culling,

On every side, In a thousand valleys far and wide, Fresh flowers."

Beautiful as is the substance of this entire passage, so far from gaining, it loses by rhyme — loses, not in perspicuity, for Wordsworth like all his contemporaries^ (except Shelley) is mostly perspicuous, but in that metrical emphasis the quest of which is one of the impulses that leads a poet to write in rhyme. In spite, however, of its metrical defects, this famous ode of Wordsworth's is the finest irregular ode in the language; for, although Coleridge's " Ode to the De- parting Year " excels it in Pindaric fire, it is below Wordsworth's masterpiece in almost every other quality save rhythm. Among the writers of English irregular odes, next to Wordsworth, stands Dryden. The second stanza of the " Ode for St Cecilia's Day " is a great triumph.

Leaving the irregular and turning to the regular ode, it is natural to divide these into two classes: (l) those which are really Pindaric in so far as they consist of strophes, antistrophes and epodes, variously arranged and contrasted; and (2) those which consist of a regular succession of regular stanzas. Perhaps all Pindaric odes tend to show that this form of art is in English a mistake. It is easy enough to write one stanza and call it a strophe, another in a different movement and call it an antistrophe, a third in a different movement still and call it an epode. But in modern prosody, disconnected as it is from musical and frorfi terpsichorean science, what are these? No poet and no critic can say.*

What is requisite is that the ear of the reader should catch a great metrical scheme, of which these three varieties of movement

are necessary parts — should catch, in short, that inevitableness of structure upon which we have already touched. In order to justify a poet in writing a poem in three different kinds of move- ment, governed by no musical and no terpsichorean necessity, a necessity of another kind should make itself apparent ; that is, the metrical wave moving in the strophe should be metrically answered by the counter-wave moving in the antistrophe, while the epode — which, as originally conceived by

Stesichorus, was merely a standing still after the balanced movements of the strophe and antistrophe — -should clearly, in a language like ours, be a blended echo of these two. A mere metrical contrast such as some poets labour to effect is not a metrical answer. And if the reply to this criticism be that in Pindar himself no such metrical scheme is apparent, that is the strongest possible argument in support of our position. If indeed the metrical scheme of Pindar is not apparent, that is because, having been written for chanting, it was subordinate to the lost musical scheme of the musician. It has been contended, and is likely enough, that this musical scheme was simple — as simple, perhaps, as the scheme of a cathedral chant; but to it, whatever it was, the metrical scheme of the poet was subordinated. It need scarcely be said that the phrase " metrical scheme " is used here not in the narrow sense as indicating the position and movement of strophe and antistrophe by way of simple contrast, but in the deep metrical sense as indicating the value of each of these component parts of the ode, as a counter-wave balancing and explaining the other waves in the harmony of the entire composition. We touch upon this matter in order to show that the moment odes ceased to be chanted, the words strophe, antistrophe, and epode lost the musical value they had among the Greeks, and pretended to a complex metrical value which their actual metrical structure does not appear to justify. It does not follow from this that odes should not be so arranged, but it does follow that the poet's arrangement should justify itself by disclosing an entire metrical scheme in place of the musical scheme to which the Greek choral lyric was evidently subordinated. But even if the poet were a sufficiently skilled metricist to compass a scheme embracing a wave, an answering wave, and an echo gathering up the tones of each, i.e. the strophe, the antistrophe and the epode, the ear of the reader, unaided by the musical emphasis which supported the rhythms of the old choral lyric, is, it should seem, incapable of gathering up and remembering the sounds further than the strophe and the antistrophe, after which it demands not an epode but a return to the strophe. That is to say, an epode, as alternating in the body of the modern ode, is a mistake; a single epode at the end of a group of strophes and antistrophes (as in some of the Greek odes) has, of course, a different function altogether.

The great difficulty of the English ode is that of preventing the apparent spontaneity of the impulse from being marred by the apparent artifice of the form ; for, assuredly, no writer subsequent to Coleridge and to Keats would dream of writing an ode on the cold Horatian principles adopted by Warton, and even by Collins, in his beautiful ' Ode to Evening."

Of the second kind of regular odes, those consisting of a regular succession of regular stanzas, the so-called odes of Sappho are, of course, so transcendent that no other amatory lyrics can be compared with them. Never before these songs were sung and never since did the human soul, in

the grip of a fiery passion, utter a cry like hers ; and from the executive point of view, in directness, in lucidity, in that high imperious verbal economy which only nature herself can teach the artist, she has no equal, and none worthy to take the place of second — not even in Heine, nor even in Burns. Turning, however, to modern poetry, there are some magnificent examples of this simple form of ode in English poetry — Spenser's immortal " Epithalamion " leading the way in point of time, and probably also in point of excellence.

Fervour being absolutely essential, we think, to a great English ode, fluidity of metrical movement can never be dispensed with. The more billowy the metrical waves the better suited are they to render the emotions expressed by the ode, as the reader will see by referring to Coleridge's " Ode to France " (the finest ode in the English language, according to Shelley), and giving special atten- tion to the first stanza — to the way in which the first metrical wave, after it had gently fallen at the end of the first quatrain, leaps up again on the double rhymes (which are expressly . intro- duced for this effect), and goes bounding on, billow after billow, to the end of the stanza. Not that this fine ode is quite free from the great vice of the English ode, rhetoric. If we except Spenser and, in one instance, Collins, it can hardly be said that any English writer before Shelley and Keats produced odes independent of rhetoric and supported by pure poetry alone. But fervid as are Shelley's " Ode to the West Wind " and Keats's odes " To a Night- ingale " and " On a Grecian Urn," they are entirely free from rhetorical flavour. Notwithstanding that in the " Ode on a Grecian Urn " the first stanza does not match in rhyme arrangement with the others, while the second stanza of the " Ode to a Nightingale " varies from the rest by running on four rhyme-sounds instead of five, vexing the ear at first by disappointed expectation, these two odes are, after Coleridge's " France," the finest regular odes perhaps in the English language.

With regard to the French ode, Malherbe was the first writer

who brought it to perfection. Malherbe showed also more variety of mood than it is the fashion just now to credit him with. This may be especially noted in his " Ode to Louis XIII." His disciple Racan is not of much account. There is certainly much vigour in the odes of Rousseau, but it is not till we reach Victor Hugo that we realize what French poetry can achieve in this line; and con- temporary poetry can hardly be examined heve. We may say, however, that some of Hugo's odes are truly magnificent. As a pure lyrist his place among the greatest poets of the world is very high. Here, though writing in an inferior language, he ranks with the greatest masters of Greece, of England, and of Germany. Had he attempted no other kind of poetry than lyrical, his would still have been the first name in French poetry. Whatever is defective in his work arises, as in the case of

Euripides, from the importation of lyrical force where dramatic force is mainly needed. . The main varieties of lyrical poetry, such as the idyll, the satire, the ballad, the sonnet, &c, are treated in separate articles; but a word or two must be said here about the song „. „ and the elegy. To write a good song requires that simplicity of grammatical structure which is foreign to many natures — that mastery over direct and simple speech which only true passion and feeling can give, and which " corning from the heart goes to the heart." Without going so far as to say that no man is a poet who cannot write a good song, it may certainly be said that no man can write a good song who is not a good poet. In modern times we have, of course, nothing in any way representing those choral dance-songs of the Greeks, which, originating in the primitive Cretan war-dances, became, in Pindar's time, a splendid blending of song and ballet. Nor have we anything exactly representing the Greek scolia, those short drinking songs of which Terpander is said to have been the inventor. That these scolia were written, not only by poets like Alcaeus, Anacreon, Praxilla, Simonides, but also by Sappho and by Pindar, shows in what high esteem they were held by the Greeks. These songs seem to have been as brief as the stornelli of the Italian peasant. They were accompanied by the lyre, which was handed from singer to singer as the time for each scolion came round.

With regard to the stornello, many critics seem to confound it with the rispetto, a very different kind of song. The Italian rispetto consists of a stanza of inter-rhyming lines ranging from six to ten in number, but often not exceeding eight. The Tuscan and Umbrian stornello is rriuch shorter, consisting, indeed, of a hemistich naming some natural object which suggests the motive of the little poem. The nearest approach to the Italian stornello appears to be, not the rispetto, but the Welsh triban.

Perhaps the mere difficulty of rhyming in English and the facility of rhyming in Italian must be taken into account when we inquire why there is nothing in Scotland — of course there could be nothing in England — answering to the nature-poetry of the Italian peasant. Most of the Italian rispetti and stornelli seem to be improvisations; and to improvise in English is as difficult as to improvise is easy in Italian. Nothing indeed is more interesting than the improvisatorial poetry of the Italian peasants, such as the canzone. If the peasantry discover who is the composer of a canzone, they will not sing it. The speciality of Italian peasant poetry is that the symbol which is mostly erotic is of the purest and most tender kind. A peasant girl will improvise a song as impassioned as " Come into the Garden, Maud," and as free from unwholesome taint.

With regard to English songs, the critic cannot but ask — Wherein lies the lost ring and charm of the Elizabethan song- writers ? Since the Jacobean period at least, few have succeeded in the art of writing real songs as

distinguished from mere book lyrics. Between songs to be sung and songs to be read there is in our time a difference as wide as that which exists between plays for the closet and plays for the boards.

Heartiness and melody — the two requisites of a song which can never be dispensed with — can rarely be compassed, it seems, by one and the same individual. In both these qualities the Elizabethan poets stand pre-eminent, though even with them the melody is not so singable as it might be made. Since their time heartiness has, perhaps, been a Scottish rather than an English endowment of the song-writer. It is difficult to imagine an Englishman writing a song like " Tullochgorum " or a song

like " Maggie Lauder," where the heartiness and impulse of the poet's mood conquer all impediments of close vowels and rugged consonantal combinations. Of Scottish song-writers Burns is, of course, the head; for the songs of John Skinner, the heartiest song-writer that has appeared in Great Britain (not excluding Herrick), are too few in number to entitle him to be placed beside a poet so prolific in heartiness and melody as Burns. With regard to Campbell's heartiness, this is quite a different quality from the heartiness of Burns and Skinner, and is in quality English rather than Scottish, though, no doubt, it is of a fine and rare strain, especially in " The Battle of the Baltic." His songs illustrate an infirmity which even the Scottish song- writers share with the English — a defective sense of that true song -warble which we get in the stornelli and rispetti of the Italian peasants. A poet may have heartiness in plenty, but if he has that love of consonantal effects which Donne displays he will never write a first-rate song. Here, indeed, is the crowning difficulty of song-writing. An extreme simplicity of structure and of diction must be accompanied by an instinctive apprehension of the melodic capabilities of verbal sounds, and of what Samuel Lover, the Irish song-writer, called " singing " words, which is rare in this country, and seems to belong to the Celtic rather than to the Saxon ear. " The song-writer," says Lover, " must frame his song of open vowels with as few guttural or hissing sounds as possible, and he must be content sometimes to sacrifice grandeur and vigour to the necessity of selecting singing words and not reading words." And he exemplifies the distinction between singing words and reading words by a line from one of Shelley's songs —

" ' The fresh earth in new leaves drest,'

" where nearly every word shuts up the mouth instead of opening it." But

closeness of vowel sounds is by no means the only thing to be avoided in song- writing. A phrase may be absolutely unsingable, though the vowels be open enough, if it is loaded with consonants. The truth is that in song-writing it is quite as important, in a consonantal language like ours, to attend to the consonants as to the vowels; and perhaps the first thing to avoid in writing English songs is the frequent recurrence of the sibilant. But this applies to all the brief and quintessential forms of poetry, such as the sonnet, the elegy, &c.

As to the elegy— a form of poetic art which has more relation to the objects of the external world than the song, but less rela- tion to these than the stornello — its scope seems to be wide indeed, as practised by such various writers as Tyrtaeus, Theognis, Catullus, Tibullus, and our own Gray. It may almost be said that perfection of form is more necessary here and in the sonnet than in the song, inasmuch as the artistic pretensions are more pronounced. Hence even such apparent minutiae as those we have hinted at above must not be neglected here.

We have quoted Dionysius of Halicarnassus in relation to the arrangement of words in poetry. His remarks on sibilants are Phonetic e< 3 ua "y deserving of attention. He goes so far as to Perfection say tnat " xs ent ' re 'y disagreeable, and, when it often recurs, insupportable. The hiss seems to him to be more appropriate to the beast than to man. Hence certain writers, he says, often avoid it, and employ it with regret. Some, he tells us, have composed entire odes without it. But if sibilation is a defect in Greek odes, where the softening effect of the vowel sounds is so potent, it is much more so in English poetry, where the con- sonants dominate, though it will be only specially noticeable in the brief and quintessential forms such as the song, the sonnet, the elegy. Many poets only attend to their sibilants when these clog the rhythm. To write even the briefest song without a sibilant would be a tour de force; to write a good one would no doubt be next to impossible. It is singular that the only metricist who ever attempted it was John Thelwall, the famous " Citizen John," friend of Lamb and Coleridge, and editor of the famous Champion newspaper, where many of Lamb's epigrams appeared. Thelwall gave much attention to metrical questions, and tried his hand at various metres. Though " Citizen John's " sapphics might cer- tainly have been better, he had a very remarkable critical insight into the rationale of metrical effects, and his " Song without a Sibilant " is extremely neat and ingenious. Of course, however, it would be mere pedantry to exaggerate this objection to sibilants even in these brief forms of poetry. (T. W.-D.)

The Elegy.

POGGENDORFF, JOHANN CHRISTIAN (1796-1877), German physicist,

was born in Hamburg on the 29th of December 1796. His father, a wealthy manufacturer, having been all but ruined by the French siege, he had, when only sixteen, to apprentice himself to an apothecary in Hamburg, and when twenty-two began to earn his living as an apothecary's assistant at Itzehoe. Ambition and a strong inclination towards a. scientific career led him to throw up his business and remove to Berlin, where he entered the university in 1820. Here his abilities were speedily recognized, and in 1823 he was appointed meteorological observer to the Academy of Sciences. Even at this early period he had conceived the idea of founding a physical and chemical scientific journal, and the realization of this plan was hastened by the sudden death of L. W. Gilbert, the editor of Gilberts Annalen der Physik, in 1824. Poggendorff immediately put himself in communication with the publisher, Barth of Leipzig, with the result that he was installed as editor of a scientific journal, Annalen der Physik und Chetnie, which was to be a continuation of Gilberts Annalen on a somewhat extended plan. Poggendorff was admirably qualified for the post. He had an extraordinary memory, well stored with scientific knowledge, both modern and historical, a cool and impartial judgment, and a strong preference for facts as against theory of the speculative kind. He was thus able to throw himself into the spirit of modern experimental science. He possessed in abundant measure the German virtue of orderliness in the arrangement of knowledge and in the conduct of business. Further he had an engaging geniality of manner and much tact in dealing with men. These qualities soon made Poggendorff s Annalen the foremost scientific journal in Europe.

In the course of his fifty-two years' editorship of the Annalen Poggendorff could not fail to acquire an unusual acquaintance with the labours of modern men of science. This knowledge, joined to what he had gathered by historical reading of equally unusual extent, he carefully digested and gave to the world in his Biographisch-literarisches Handworterbuch zur Geschichte der exacten Wissenschaflen, containing notices of the lives and labours of mathematicians, astronomers, physicists, and chemists, of all peoples and all ages. This work contains an astounding col- lection of facts invaluable to the scientific biographer and historian. The first two volumes were published in 1863; after his death a third volume appeared in 1898, covering the period 1858-1883, and a fourth in 1904, coming down to the beginning of the 20th century.

Poggendorff was a physicist of high although not of the very highest rank. He was wanting in mathematical ability, and never displayed in any remarkable degree the still more impor- tant power of scientific generalization, which, whether accom- panied by mathematical skill or not, never fails to mark the highest genius in physical science. He was, however, an able and conscientious experimenter, and was very fertile and ingenious in devising physical apparatus. By far the greater and more important part

of his work related to electricity and magnetism. His literary and scientific reputation speedily brought him honourable recognition. In 1830 he was made royal professor, in 1834 Hon. Ph.D. and extraordinary professor in the university of Berlin, and in 1839 member of the Berlin Academy of Sciences. Many offers of ordinary professorships were made to him, but he declined them all, devoting himself to his duties as editor of the Annalen, and to the pursuit of his scientific researches. He died at Berlin on the 24th of January 1877.

POGGIO (1380-1459). Gian Francesco Poggio Bracciolini, Italian scholar of the Renaissance, was born in 1380 at Terra- nuova, a village in the territory of Florence. He studied Latin under John of Ravenna, and Greek under Manuel Chrysoloras. His distinguished abilities and his dexterity as a copyist of MSS. brought him into early notice with the chief scholars of Florence. Coluccio Salutati and Niccolo de' Niccoli befriended him, and in the year 1402 or 1403 he was received into the service of the Roman curia. His functions were those of a secretary; and, though he profited by benefices conferred on him in lieu of salary, he remained a layman to the end of his life. It is noticeable

that, while he held his office in the curia through that momentous period of fifty years which witnessed the Councils of Constance and of Basel, and the final restoration of the papacy under Nicholas V., his sympathies were never attracted to ecclesiastical affairs. Nothing marks the secular attitude of the Italians at an epoch which decided the future course of both Renaissance and Reformation more strongly than the mundane proclivities of this apostolic secretary, heart and soul devoted to the resuscitation of classical studies amid conflicts of popes and antipopes, cardinals and councils, in all of which he bore an official part. Thus, when his duties called him to Constance in 1 414, he employed his leisure in exploring the libraries of Swiss and Swabian convents. The treasures he brought to light at Reichenau, Weingarten, and above all St Gall, restored many lost masterpieces of Latin literature, and supplied students with the texts of authors whose works had hitherto been acces- sible only in mutilated copies. In one of his epistles he describes how he recovered Quintilian, part of Valerius Flaccus, and the commentaries of Asconius Pedianus at St Gall. MSS. of Lucretius, Columella, Silius Italicus, Manilius and Vitruvius were unearthed, copied by his hand, and communicated to the learned. Wherever Poggio went he carried on the same industry of research. At Langres he discovered Cicero's Oration for Caecina, at Monte Cassino a MS. of Frontinus. He also could boast of having recovered Ammianus

Marcellinus, Nonius Marcellus, Probus, Flavius Caper and Eutyches. If a codex could not be obtained by fair means, he was ready to use fraud, as when he bribed a monk to abstract a Livy and an Ammianus from the convent library of Hersfield. Resolute in recognizing erudition as the chief concern of man, he sighed over the folly of popes and princes, who spent their time in wars and eccle- siastical disputes when they might have been more profitably employed in reviving the lost learning of antiquity. This point of view is eminently characteristic of the earlier Italian Renais- sance. The men of that nation and of that epoch were bent on creating a new intellectual atmosphere for Europe by means of vital contact with antiquity. Poggio, like Aeneas Sylvius Piccolomini (Pius II.), was a great traveller, and wherever he went he brought enlightened powers of observation trained in liberal studies to bear upon the manners of the countries he visited. We owe to his pen curious remarks on English and Swiss customs, valuable notes on the remains of antique art in Rome, and a singularly striking portrait of Jerome of Prague as he appeared before the judges who condemned him to the stake. It is necessary to dwell at length upon Poggio's devotion to the task of recovering the classics, and upon his disengage- ment from all but humanistic interests, because these were the most marked feature of his character and career. In literature he embraced the whole sphere of contemporary studies, and distinguished himself as an orator, a writer of rhetorical treatises, a panegyrist of the dead, a violent impugner of the living, a translator from the Greek, an epistolographer and grave historian and a facetious compiler of fabliaux in Latin. On his moral essays it may suffice to notice the dissertations On Nobility, On Vicissitudes of Fortune, On the Misery of Human Life, On the Infelicity of Princes and On Marriage in Old Age. These com- positions belonged to a species which, since Petrarch set the fashion, were very popular among Italian scholars. They have lost their value, except for the few matters of fact embedded in a mass of commonplace meditation, and for some occasionally brilliant illustrations. Poggio's History of Florence, written in avowed imitation of Livy's manner, requires separate mention, since it exemplifies by its defects the weakness of that merely stylistic treatment which deprived so much of Bruni's, Carlo Aretino's and Bembo's work of historical weight. A somewhat different criticism must be passed on the Facetiae, a collection of humorous and indecent tales expressed in such Latinity as Poggio could command. This book is chiefly remarkable for its unsparing satires on the monastic orders and the secular clergy. It is also noticeable as illustrating the latinizing tendency of an age which gave classic form to the lightest essays of the fancy. Poggio, it may be observed, was a fluent and

copious writer in the Latin tongue, but not an elegant scholar. His knowledge of the ancient authors was wide, but his taste was not select, and his erudition was superficial. His translation of Xenophon's

Cyropaedia into Latin cannot be praised for accuracy. Among contemporaries he passed for one of the most formidable polemical or gladiatorial rhetoricians; and a considerable section of his extant works are invectives. One of these, the Dialogue against Hypocrites, was aimed in a spirit of vindictive hatred at the vices of ecclesiastics; another, written at the request of Nicholas V., covered the anti-pope Felix with scurrilous abuse. But his most famous compositions in this kind are the personal invectives which he discharged against Filelfo and Valla. All the resources of a copious and unclean Latin vocabulary were employed to degrade the objects of his satire; and every crime of which humanity is capable was ascribed to them without discrimination. In Filelfo and Valla Poggio found his match; and Italy was amused for years with the spectacle of their indecent combats. To dwell upon such literary infamies would be below the dignity of the historian, were it not that these habits of the early Italian humanists imposed a fashion upon Europe which extended to the later age of Scaliger's contentions with Scioppius and Milton's with Salmasius. The greater part of Poggio's long life was spent in attendance to his duties in the papal curia at Rome and else- where. But about the year 1452 he finally retired to Florence, where he was admitted to the burghership, and on the death of Carlo Aretino in r4S3 was appointed chancellor and historio-grapher to the republic. He had already built himself a villa in Valdarno, which he adorned with a collection of antique sculpture, coins and inscriptions. In 1435 he had married a girl of eighteen named Vaggia, of the famous Buondelmonte blood. His declining days were spent in the discharge of his honourable Florentine office and in the composition of his history. He died in 1459, and was buried in the church of Santa Croce. A statue by Donatello and a picture by Antonio del Pollajuolo remained to commemorate a citizen who chiefly for his services to humanistic literature deserved the notice of posterity.

Poggio's works were printed at Basel in 1538, " ex aedibus Henrici Petri. Dr Shepherd's Life of Poggio Bracciolini (1802) is a good authority on his biography. For his position in the history of the revival, see Voigt's Wiederbelebung des classischen Alterthums, and Symonds's Renaissance in Italy. (I. A. S.)

POGLIZZA (Serbo-Croatian, Poljica), a tract of mountainous land in Dalmatia, Austria; formerly the seat of an independent republic. The territories of Poglizza lay chiefly within the south-easterly curve made by the river Cetina before it enters the Adriatic at Almissa (Onus –). They also comprised the fastnesses of the Mossor range (4500 ft.) and the fertile strip of coast from Almissa to Stobrez, 10 m. W.N.W. The inhabi- tants lived in scattered villages, each ruled by its count, and all together ruled by the supreme count. These officers, with the three judges, were always of noble birth, though elected by the whole body of citizens. There were two

orders of nobles; the higher, including about 20 families, claimed Hungarian descent; the lower, claiming kinship with the Bosnian aristocracy. Below these ranked the commoners and the serfs. At a very early date the warlike highlanders of Poglizza became the friends and allies of the Almissan corsairs, who were thus enabled to harass the seaborne trade of their neighbours without fear of a sudden attack by land. Almissa received a charter from Andrew II. of Hungary in 1207, and remained under the nominal protection of Hungary until 1444, when both Almissa and Poglizza accepted the suzerainty of Venice, while retaining their internal freedom. The population of Poglizza numbered 6566 in 1806. In the following year, however, the republic incurred the enmity of Napoleon by rendering aid to the Russians and Montenegrins in Dalmatia; and it was invaded by French troops, who plundered its villages, massacred its inhabitants, and finally deprived it of independence.

See the Annuario Daltnatico for .1885 (published at Zara) ; and A. Fortis, Travels into Dalmatia (London, 1778).

POINCARt, RAYMOND (i860-), French statesman, was born at Bar-le-duc on the 20th of August i860, the son of Nicolas Antoinin Helene Poincare, a distinguished civil servant and meteorologist. Educated at the university of Paris, Raymond was called to the Paris bar, and was for some time law editor of the Voltaire. He had served for over a year in the department of agriculture when in 1887 he was elected deputy for the Meuse. He made a great reputation in the Chamber as an economist, and sat on the budget commissions of 1890-1891 and 1892. He was minister of education, fine arts and religion in the first cabinet (April-Nov. 1893) of Charles Dupuy, arid minister of finance in the second and third (May 1894-Jan. 1895). In the succeeding Ribot cabinet Poincare became minister of public instruction. Although he was excluded from the Radical cabinet which followed, the revised scheme of death duties proposed by the new ministry was based upon his proposals of the previous year. He became vice-president of the chamber in the autumn of 1895, and in spite of the bitter hostility of the Radicals retained his position in 1896 and 1897. In 1906 he returned to the ministry of finance in the short-lived Sarrien ministry. Poincare had retained his practice at the bar during his political career, and he published several volumes of essays on literary and political subjects.

His brother, Lucien Poincare (b. 1862), famous as a physicist, became inspector-general of public instruction in 1902. He is the author of La

Physique moderns (1906) and L' Electricite (1907). Jules Henri Poincare (b. 1854), also a distinguished physicist, belongs to another branch of the same family.

POINSETTIA. The Poinsettia pulckerrima of gardens (Euphor- bia pulcherrima of botanists), a native of Mexico and Central America, with its brilliant scarlet bracts, stands unrivalled amongst decorative plants. The white-bracted sort, var. alba, is not so effective, but the double-flowered, var. plenissima, in which the brilliant inflorescence is branched, is as brilliant as the type, and keeps long in flower. They are increased by cuttings in spring, which when taken off with a heel strike freely in brisk heat. They require good turfy loam, with an addition of one-sixth of leaf-mould and a little sand, and should be kept in a heat of from 65 to 70° at night, with a rise of io° by day. To prevent their growing lanky, they should be kept with their heads almost touching the glass; and as the pots get filled with roots they must be shifted into others, 7 or 8 in. in diameter. About August they may be inured to a heat of 50 at night, and should be brought to bear air night and day whilst the weather is warm, or they may be placed out of doors for a month under a south wall in the full sun. This treatment matures and pre- pares them for flowering. In autumn they must be removed to a house where the temperature is 50 at night, and by the end of September some of them may be put in the stove, where they will come into flower, the remainder being placed under heat later for succession. When in bloom they may be kept at about 55° by night, and s6 placed will last longer than if kept in a higher temperature.*

POINSOT, LOUIS (1777-1859), French mathematician, was born at Paris on the 3rd of January 1777. In 1794 he became a scholar at the ficole Polytechnique, which he left in 1796 to act as a civil engineer. In 1804 he was appointed professor of mathematics at the Lycee, in 1809 professor of analysis and mechanics, and in 1816 examiner at the ficole Polytechnique: On the death of J. L. Lagrange, in 1813, Poinsot was elected to his place in the Academie des Sciences; and in 1840 he became a member of the superior council of public instruction. In 1846 he was made an officer of the Legion of Honour; and on the formation of the senate in 1852 he was chosen a member of that body. He died at Paris on the 5th of December 1859.

Poinsot's earliest work was his Elemens de slalique (1803; 9th edition, 1848), in which he introduces the idea of statical couples and investigates their properties. In the Thiorie nouvelle de la rotation des corps (1834) he treats the motion of a rigid body geometrically, and shows that the most general motion of such a body can be represented at any instant by a rotation about an axis combined with a translation parallel to this axis,

and that any motion of a body of which one point is fixed may be produced by the rolling of a cone fixed in the body on a cone fixed in space. The previous treatment of the motion of a rigid body had in every case been purely analytical, and so gave no aid to the formation of a mental picture of the body's motion; and the great value of this work lies in the fact that, as Poinsot himself says in the introduction, it enables us to represent to ourselves the motion of a rigid body as clearly as that of a moving point. In addition to publishing a number of works on geometrical and mechanical subjects, Poinsot also contributed a number of papers on pure and applied mathematics to Lion- ville's Journal and other scientific periodicals.

See J. L. F. Bertrand, Discours aux funerailles de Poinsot (Paris, i860).

POINT PLEASANT, a town and the county-seat of Mason county, West Virginia, U.S.A., on the Ohio river, at the mouth of the Kanawha river, and about midway between Pittsburg and Cincinnati. Pop. (1900) 1934; (1910) 2045. It is served directly by the Baltimore & Ohio and the Kanawha & Michigan (controlled by the Hocking Valley) railways, and by the Hocking Valley railway on the opposite side of the Ohio river. The Kanawha river is navigable (by the use of locks and dams) for 90 m. above the town, and Point Pleasant is a re-shipping point for Kanawha coal. Coal and salt are mined in the vicinity, but the surrounding country is principally agricultural.

The battle of Point Pleasant, the only important engagement in " Lord Dunmore's War," was fought here on the 10th of October 1774 between about 1100 Virginia militiamen, under General Andrew Lewis (c. 1720-1781), 1 and about 1000 Shawnees and their allies, under their chief, Cornstalk (c. 17 20-17 tj)? Lewis had been ordered to meet Lord Dunmore here with a body of militiamen (recruited from Botetourt, West Augusta and Fincastle counties), but when he reached the mouth of the Kanawha, after marching 160 m. from Fort Union (now Lewis- burg, W. Va.), Dunmore's force, which was to have gone over the Braddock trail to Fort Pitt, and thence down the Ohio river, had not arrived. Early on the morning of the icth the Indians suddenly attacked, and the battle continued fiercely throughout the day. At night the Indians crossed the Ohio river, leaving behind many of their dead. The whites lost about 144 in killed and wounded, Colonel Charles Lewis (1733-1774), a brother of the commanding officer, being among the former. In December Lord Dunmore concluded a treaty with the Indians, by which they surrendered their claim to lands south of the Ohio and agreed not to molest Whites travelling to the western country. The battle, which overawed the Indians, and the treaty, which was not seriously broken for three years, made possible the rapid settlement of the western country, especially of Kentucky, during the early

years of the War of Indepen- dence. 3 Four years before the battle the Virginia House of Burgesses had awarded to General Lewis, for his earlier services in the French and Indian War, 9876 acres of land, including the

1 General Lewis was born in Donegal, Ireland ; served with Wash- ington at Fort Necessity and at Braddock's defeat ; was commissioner from Virginia to conclude the treaty with the Six Nations at Fort Stanwix (1768); was a member of the Virginia House of Burgesses for several years; served as a brigadier-general in the War of Independence; and in 1776 forced Lord Dunmore to retire from Gwynn's Island, in Chesapeake Bay, where he had taken refuge.

2 Cornstalk and his son were killed within the fort at Point Pleasant in November 1777 by Virginian soldiers (contrary to the protests of their commanding officers), who thus avenged the death of a comrade. He was at the time warning the garrison of his inability to hold the Shawnees to the terms of the treaty of 1774. There is a granite monument (erected in 1899) over his grave in the yard of the court-house.

3 Various American writers have asserted that Lord Dunmore incited the Indians to attack the frontier in order to divert the colonists from their opposition to Great Britain, and that he

Eurposely refrained from effecting a junction with Lewis, so that ewis might be defeated and Virginia thus be greatly crippled on the eve of the threatened war with the mother country; and the battle itself has accordingly frequently been referred to as the first battle of the War of Independence. The assertions with regard to Lord Dunmore, however, rest on circumstantial evidence alone, and have never been conclusively proved.

present site of Point Pleasant ; the survey of this grant was made by George Washington. After the battle General Lewis sent a detachment to build a fort (called Fort Blair) here; in 1776 Fort Randolph (abandoned in 1779) was erected on the same site, and in 1785 (from which year the permanent settlement of the town may be dated) a third fort was built here. Daniel Boone lived here from 1788 until about 1799. In 1794 the village of Point Pleasant was platted; it was incorporated as a town in 1833. A granite monument (86 ft. high) commemorat- ing the battle was unveiled on the 10th of October 1909.

See J. T. McAllister's article, " The Battle of Point Pleasant," in the Virginia Magazine of History and Biography (1901-1902), vol. x., and

Virgil A. Lewis, History of the Battle of Point Pleasant (Charleston, W. Va., 1909).

POISOK. An exact definition of the word "poison" (derived through Fr. from Lat. potio, potionem, a drink; i.e. a deadly draught) is by no means easy. There is no legal definition of what constitutes a poison, and the definitions usually proposed are apt to include either too much or too little. Generally, a poison may be defined to be a substance having an inherent deleterious property, rendering it capable of destroying life by whatever avenue it is taken into the system; or it is a substance which when introduced into the system, or applied externally, injures health or destroys life irrespective of mechanical means or direct thermal changes. In popular language a poison is a substance capable of destroying life when taken in small quantity; but a substance which destroys life by mechanical means as, e.g. powdered glass, is not, strictly speaking, a poison. The subject of toxicology forms one of the most important branches of medical jurisprudence (q.v.). The medical jurist should be familiar with the nature and actions of poisons, the symptoms which they produce, the circumstances which modify their working, the pathological results of their action, and the methods of combating these.

Action of Poisons. — Poisons may exert a twofold action. This may be either local, or remote, or both local and remote. The local action of a poison is usually one of corrosion, inflam- mation, or a direct effect upon the sensory or motor nerves. The remote actions of poisons are usually of a specific character, though some writers group the remote effects of poisons under two heads, and speak of the common and the specific remote effects of a poison. The local action of a poison of the corrosive class is usually so well marked and obvious that the fact of the administration of a poison of this class is generally unmistakable. The same may be said, in a less degree, of the irritant poisons, especially the mineral irritants; but here the symptoms some- times so closely simulate those of natural disease as to render the recognition of the administration of poison a matter of difficulty. Hence an accurate acquaintance with the remote specific effects of the various poisons is indispensable to the medical jurist. The class of poisons which has been adminis- tered or taken will thus be suggested to his mind by the observa- tion of the symptoms; and not unfrequently the specific poison taken will be suspected. It is almost universally admitted that absorption of a poison is necessary for the production of its specific remote effects, and the old notion that a poison may kill, by its action through the nervous system, without absorp- tion, is abandoned.

Modifying Circumstances. — The ordinary action of a poison may be greatly modified by the largeness of the dose, by the state of aggregation, admixture, or of chemical combination of the poison, by the part or

membrane to which it is applied, and by the condition of the patient. Thus, for example, opium may be a medicine or a poison, according to the dose in which it is given; and a dose of the drug which may be beneficial to an adult in certain states of the system may be fatal to a child, or to an adult when suffering from some forms of disease. All barium salts, again, are poisonous, except the quite insoluble sulphate. The simple cyanides, and many double cyanides, are highly poisonous; but yellow prussiate of potash, which is a double cyanide of iron and potassium, is almost without action upon the system. The part or tissue to which a poison is applied

greatly affects the activity of a poison, owing to the varying rapidity with which absorption takes place through the cuta- neous, mucous and serous surfaces, and by the other tissues of the body. Curare, an arrow poison, may be swallowed in con- siderable quantity without appreciable result, whilst a minute quantity of the same substance introduced into a wound is speedily fatal. Idiosyncrasy has an important bearing in toxicology. Pork, mutton, certain kinds of fish, more especially shell-fish so-called, and mushrooms have each produced all the symptoms of violent irritant poisoning, whilst other persons who have partaken of the same food at the same time have experienced no ill effects. Some persons are stated, on good authority, to be capable of taking with impunity such poisons as opium, corrosive sublimate, or arsenic, in enormous doses— and this irrespective of habit, which is known to have such an influence in modifying the effects of some poisons, notably the narcotics. A tolerance of poisons is sometimes engendered by disease, so that a poison may fail to produce its customary effect. Thus, opium is tolerated in large quantities in tetanus and in delirium tremens; and mercurial compounds may in some febrile affections fail to produce the usual constitutional effects of the metal. On the other hand, diseases which impede the elimination of a poison may intensify its effects.

The evidence that a poison has been administered is based upon the symptoms produced, on the appearances met with in the body after death, on the analysis of articles of food and drink, of excreta and ejecta, and of the organs of the body after death, and on physiological experiments made with substances extracted from the same articles. These physiological experiments are usually made upon animals, but in some cases, as for instance when aconite has to be searched for, the physiological experi- ments must be made also upon the human subject. The evidence obtained from one or more of these sources, as compared with the properties or effects of various known poisons, will enable the medical jurist to form an opinion as to the administra- tion or non-administration of a poison.

The symptoms exhibited by the patient during life rarely fail to afford some clue to the poison taken. Persons may, however, be found dead of whose

history nothing can be learned. Here post mortem appearances, chemical analysis, and, it may be, physiological experiments, are all-important for the elucidation of the nature of the case.

Poisoning may be acute or chronic. The general conditions which should arouse a suspicion of acute poisoning are the sudden onset of serious and increasingly alarming symptoms in a person previously in good health, especially if there be pain in the region of the stomach, or, where there is complete prostra- tion of the vital powers, a cadaveric aspect, and speedy death. In all such cases the aid of the analytical chemist must be called in either to confirm well-founded or to rebut ill-founded' suspicions.

The mode of treatment to be adopted in the case of poisoned persons varies greatly according to the nature of the poison. The first indication, when the poison has been swallowed, is to evacuate the stomach; and this may usually be done by means of the stomach-pump when the poison is not of the corrosive class; or the stomach may be gently washed out by means of a funnel and flexible siphon-tube. In many cases emetics are valuable. Antidotes and counter-poisons may then be given. The former are such substances as chalk to neutralize the mineral acids and oxalic acid; the latter have a physiological counter- action, and are such as atropine, which is a counter-poison to morphia. These may usually be administered most effec- tively by hypodermic injection. The stomach may to a certain degree be protected from the injurious effects of irritants by the administration of mucilaginous drinks; alkaloids may be rendered sparingly soluble by means of astringent substances containing tannin; and pain may be relieved by means of opium, unless contra-indicated by the nature of the poison. The effects of the convulsant poisons, such as strychnine, may be combated by means of the inhalation of chloroform.

The classification of poisons is a. matter of difficulty. Various

attempts have been made to classify them scientifically, but with no signal success; and perhaps the best system is that which groups the various poisons according to the more obvious symptoms which they produce. Our knowledge of the more intimate action of poisons is still too imperfect to admit of any useful classification according to the manner in which they specifically affect the vital organs. Poisons may in the manner indicated be classified as (i) Corrosives, (2) Irritants, (3) Neu- rotics, and (4) Gaseous Poisons.

1. Corrosives.

The typical member of this class is corrosive sublimate, the soluble chloride of mercury. In it are included also the concen- trated mineral acids (sulphuric, nitric and hydrochloric) ; oxalic acid; the alkalies (potash, soda, and ammonia) and their carbonates; acid, alkaline, and corrosive salts of the metals (such as bisulphate of potash, alum, butter of antimony and nitrate of silver) ; also carbolic acid.

The symptoms produced by the mineral acids and the alkalies are almost altogether referable to local action; but some corrosive poisons, such as carbolic acid, produce, besides a local action, remote and specific constitutional effects. The symptoms of corrosive poisoning are marked and unmistakable, except in infants. Immediately on swallowing the corrosive substance, an acid, caustic or metallic burning sensation is experienced in the mouth, fauces, gullet and region of the stomach, and this speedily extends over the whole belly ; as a rule vomiting speedily follows. In the case of the mineral acids, and in oxalic acid poisoning, the vomit is so acid that if it falls upon a marble or concrete floor effervescence ensues. No relief follows the evacuation of the stomach. The ejected matters contain blood, and even fragments of the corroded walls of the alimentary canal. The belly becomes distended with gas and horribly tender. High fever prevails. The mouth is found to be corroded. Death usually ensues within a few hours; or, if the patient survives, he or she may perish miserably, months after the poison was taken, through starvation consequent upon the gradual contraction of the gullet, brought about by its corrosion and subsequent healing.

The treatment of corrosive poisoning consists in very gently emptying and washing out the stomach by means of a soft siphon- tube. The stomach-pump cannot be used with safety in con- sequence of the weakening of the walls of the stomach by corrosion. Demulcents and opiates may be subsequently administered. After death from corrosive poisoning the walls of the stomach are found corroded and even perforated.

1. Corrosive Sublimate. — Here all the signs and symptoms of corrosive poisoning are produced in their severest form. A grain or two of this poison may prove fatal. Fortunately there is an efficient antidote in white of egg, the albumen of which, if adminis- tered at once, renders the salt insoluble. The eggs should be divested of their yolks, beaten up with water, and given promptly, repeatedly, and abundantly, followed by emetics. Poisoning by corrosive sublimate may be followed by the specific toxic effects of mercury, such as salivation and tremor.

Workers in mercury, such as water-gilders, looking-glass makers, and the

makers of barometers and thermometers, are apt to suffer from a peculiar form of shaking palsy, known as " the trembles," or mercurial tremor. This disease affects most frequently those who are exposed to mercurial fumes. The victim is affected with tremors when an endeavour is made to exert the muscles, so that he is unable, for instance, to convey a glass of water to the lips steadily, and when he walks he breaks into a dancing trot. The treatment consists in removal from the mercurial atmosphere, baths, fresh air, and the administration of iron and other tonics.

2. Mineral Acids. — These are oil of vitriol or sulphuric acid, aqua fortis or nitric acid, and spirit of salt or hydrochloric (muri- atic) acid. These, when taken in a concentrated form, produce well- marked symptoms of corrosion. When they are diluted, the symp- toms are those of an irritant poison. Nitric acid stains the mouth and skin of a yellow colour. The treatment consists in the admin- istration of the alkalies or other carbonates, chalk, whiting, or even uncoloured plaster scraped off the walls or ceiling, with the view of neutralizing the acid.

3. Oxalic acid is a vegetable acid. When taken in the state of concentrated solution it acts as a corrosive, but when diluted as an irritant. But it also exerts a specific effect, killing the patient by cardiac syncope not unfrequently within a few minutes. When a person after taking a crystalline substance, tasting strongly acid, dies within 15 or 30 minutes, after the manifestation of great weak- ness, small pulse and failure of the heart's power, poisoning by oxalic acid is almost certain. The treatment consists in promptly administering an emetic, followed by chalk, whiting, or any sub- stance containing carbonate of calcium. The alkaline carbonates are valueless, for the alkaline oxalates are almost as poisonous as oxalic acid itself.

4. The Alkalis. — Caustic potash and caustic soda produce symp- toms resembling those of the mineral acids, except that purging is a usual accompaniment.

5. Carbolic acid. when taken in the form of a concentrated liquid acts as a corrosive, causing whitening and shrinking of all the animal membranes with which it comes in contact. The patient, however, becomes speedily comatose, the poison acting profoundly upon the great nervous centres. A curious phenomenon — black or dark green urine — is commonly observed after the administration of this poison. Saccharated lime-water, diluted and drunk freely, and a solution of sulphate of soda are perhaps the most usefu remedies.*

2. Irritant Poisons.

Irritant poisons are of two classes — metallic irritants and vege- table and animal irritants, these latter being for convenience grouped together. Perhaps none of the irritants act purely as such, the irritant symptoms being usually accompanied by well-marked effects upon the nervous system. An irritant is a substance which causes inflammation of the part to which it is applied — usually the alimentary canal. Arsenic is by far the most important of the metallic irritants. Other irritants are the moderately diluted acids, many metallic salts, such as those of antimony, lead, copper, zinc and chromium. Elaterium, gamboge, aloes, colocynth and croton oil are good examples of vegetable irritants; and cantharidesr of animal irritants. Animal and vegetable food when decomposed, or infested with certain organisms known as bacteria, may produce violent irritant symptoms. The symptoms produced by irritant poisons are usually more slow in their development than where a corrosive has been administered. Usually, after an interval, greater or less according to the specific nature of the irritant swallowed, a burning pain is felt in the mouth, throat and gullet, with a sense of constriction of the parts, and followed by burning pain in the region of the stomach. This is increased, and not alleviated, by pressure, a mark which serves to distinguish the attack from one of ordinary colic. Nausea, vomiting and thirst ensue, speedily followed by distension of the whole abdomen, which is exceedingly tender to the touch. Ordinarily the vomiting is followed by profuse diarrhoea. Should the poison not be speedily eliminated in the vomited and faecal matters, inflammatory fever sets in, followed by collapse; and death may ensue in a few hours.

There is danger of confounding irritant poisoning with some forms of natural disease, such as gastritis and gastric ulcer, colic, perito- nitis, cholera and rupture of the intestines.

1. Arsenic is a specific irritant poison. Almost all the compounds of this metal are poisonous. The term " arsenic " is, however, most commonly applied, not to the metal itself, but to its lower oxide, arsenious oxide, which is also known as white arsenic. By whatever channel arsenic is introduced into the system, it invari- ably affects specifically the stomach and intestines, causing con- gestion or inflammation. The common sources of arsenical poisoning are the taking of white arsenic, which causes acute poisoning, and the inhalation of dust from arsenical wall-papers and textile fabrics, whereby a chronic form of poisoning is induced.

The symptoms and treatment of arsenical poisoning are described under Arsenic (q.v.).

Arsenic-eating, or the ability of some persons to take relatively large doses of arsenic habitually, is a well-established fact. The cause of this singular immunity from the ordinary results of arsenic is unknown.

2. Lead. — The salts of lead, more especially the acetate (sugar of lead), are irritant poisons of no very great activity; and, though occasionally death ensues, recovery is the rule. Chrome yellow, or lead chromate, is a powerful irritant poison. All chromates are, indeed, irritant poisons. (See Lead Poisoning.)

3. Copper. — The soluble salts of copper, such as blue vitriol (the sulphate) and verdigris (subcarbonate and subacetate), are emetic and irritant salts. Their emetic effects usually, but not invariably, secure their prompt rejection by the stomach. Occasionally fatal effects have resulted from their administration. Copper becomes accidentally mixed with articles of dietary in a variety of modes. It is also used for improving the colour of preserved fruits and vegetables. Its deleterious properties when thus used in minute quantities have been both asserted and denied. There is, however, a large body of evidence in favour of the at all events occasional poisonous effects of minute quantities of copper.

4. Zinc salts and barium salts, except the quite insoluble barium sulphate, are irritant poisons; and barium compounds act also upon the central nervous system.

5. Chromates, e.g. bichromate of potash, are violent irritants. Chrome yellow, ori lead chromate, has already been mentioned.

6. Phosphorus. — Of the two chief forms of the elements — the yellow or ordinary and the red or amorphous — the former only is poisonous. Rarely there is met with a chronic form of poisoning among workers in the material, arising from the inhalation of phosphorus vapours. Its special characteristic is a peculiar necrosis or death of the bony structure of the lower jaw. Acute phosphorus poisoning is more common. Phosphorus is used foi tipping matches, and is also the basis of several vermin destroyers, (See Phosphorus and Match.)

7. Vegetable Irritants. — These produce drastic purgative effects. Frequently the nature of the illness may be ascertained by the discovery of portions of the vegetable substance — recognizable by the microscope — in the matters ejected by the patient.

8. Cantharides. — The administration of cantharides (q.v.) is followed by vomiting, purging, strangury, or even entire inability to pass the urine. In the ejecta portions of the shining elytra or wing-cases of the fly may often be recognized. There is often great excitement of the sexual proclivities. The

active principle of the fly, cantharidin, may be extracted from suspected matters by means of chloroform, and the residue left after the evaporation of this blisters the lip or any tender mucous surface to which it is applied. Demulcent remedies, with opiate enemata and injections, afford the best relief by way of treatment.

3. Neurotics.

1. Prussic or Hydrocyanic Acid. — Hydrocyanic acid is one ofthe best known poisons, and a very deadly one. In the pure state it is said to kill with lightning-like rapidity. It is met with in commerce only in a dilute state. In Great Britain two kinds of acid are commonly sold — the pharmacopoeial acid, containing 2 % of anhydrous prussic acid, and Scheele's acid, containing 4 to 5%. Less than a teaspoonful of the 2 % acid has caused death. Given in fatal doses, the symptons of prussic-acid poisoning set in with great rapidity ; and, in consequence of the readiness with which the poison is absorbed from the stomach and diffused through the circulation, the onset of symptoms is reckoned by seconds rather than by minutes. Occasionally the victim may be able to perform a few voluntary actions before alarming symptoms are developed. There is first a very brief stage of difficult breathing, and slow action of the heart, with a tendency for the organ to stop in the state of dilatation. With widely-dilated pupils of the eye, the patient is then seized with violent irregular convulsive movements. The rhythm of the respiratory movements is disturbed, and the coun- tenance becomes of a bluish cast. The patient now sinks to the ground with complete loss of muscular power; and the third or asphyxial stage is reached, in which there are slow gasping respira- tions, loss of pulse, and paralysis of motion. Death is frequently preceded by muscular spasms. The foudroyant character of the illness, and the speedy death of the patient, coupled with the

Eeculiar odour of the acid in the breath and atmosphere around the ody, seldom leave any doubt as to the nature of the case. The treatment consists in inhalation of fumes of strong ammonia, drinks of warm and cold water alternately, friction of the limbs, and artificial respiration. The subcutaneous injection of atropine, which acts as a cardiac stimulant, may prove serviceable.

Other soluble cyanides, more especially cyanide of potassium, a salt largely used in photography and in the arts, are equally poisonous with hydrocyanic acid. (See Prussic Acid.)

2. Opium. — In consequence of the extent to which opium, its preparations, and its active alkaloid morphia are used for the relief of pain, poisoning by opium is of frequent occurrence. It is largely used by suicides ;

and children, being very susceptible to its influence, frequently die from misadventure after administration of an over- dose of the drug. The ordinary preparations of opium are the drug itself, which is the inspissated juice of the oriental poppy, and the tincture, commonly known as laudanum. Opium contains a variety of more or less active principles, the chief of which is the alkaloid morphia, which is present in good opium to the extent of about 10% in combination with meconic acid, which is physio- logically inactive. Opium is largely used by Eastern nations for smoking, and there is great discrepancy of opinion as to the extent to which opium smoking is deleterious. The preponderance of opinion is in favour of the view that opium smoking is a demoral- izing, degrading, and pernicious habit, and that its victims are sufferers both in body and mind from its use. (See Opium and Morphine.)

3. Strychnine and Strychnine-yielding Plants. — The alkaloids strychnine and brucine, as well as all the plants in which they are found, all act in the same manner, being highly poisonous, and causing death after spasms of a severe character. Many vermin- killers contain strychnine as their active ingredient.

Strychnine, and all substances containing that alkaloid, produce their effects within a very few minutes — usually within ten or fifteen minutes. The patient complains of stiffness about the neck, and his aspect exhibits terror. There is an impression of impending calamity or death. Very speedily the head is jerked back, the limbs extended, the back arched (opisthotonos), so that the body may rest on the head and heels only. In a few moments these symptoms pass off, and there is complete relaxation of the spasm. The spasmodic condition speedily returns, and is brought about by the slightest touch or movement of the patient. Accessions and remissions of the tetanic state ensue rapidly till the patient succumbs, usually within half an hour of the administration of the poison. The best treatment is to put, and keep, the patient under the influence of chloroform till time is given for the excretion of the alkaloid, having previously given a full dose of chloral hydrate. (See Strychnine.)

4. Aconite Poisoning. — The ordinary blue rocket, wolfsbane or monkshood, Acontium Napellus, and an alkaloid extracted from it, aconitine, are perhaps the most deadly of known poisons. One- sixteenth of a grain of aconitine has proved fatal to a man. All the preparations of aconite produce a peculiar burning, tingling, and numbness of the parts to which they are applied. When given in

large doses they produce violent vomiting, as a rule, more or less paralysis of motion and sensation, and great depression of the heart, usually ending in death from syncope. Intelligence remains unaffected till almost the last.

The treatment consists in the hypodermic injection of digitalin, which is a counter-poison in its action upon the heart. The root of aconite has been eaten in mistake for that of horse-radish.

5. Belladonna. — The belladonna or deadly nightshade, Atropa Belladonna, contains an alkaloid, atropine, which is largely used by oculists to procure dilatation of the pupils of the eye. The bright scarlet berries of the plant have been eaten by children, who are attracted by their tempting appearance. Belladonna produces dilatation of the pupils, rapid pulse, hot dry flushed skin, with an eruption not unlike that of scarlatina, soreness of the throat, with difficulty of swallowing, intense thirst, and gay, mirthful delirium. The treatment consists in evacuation of the poison by means of the stomach-pump, and the hypodermic injection of morphia as a counter-poison.

4. Gaseous Poisons. The effects of these are varied — some of them acting as irritants, while others have a specific effect, apparently in consequence of their forming chemical compounds with the red pigment of the blood, and thus destroying its capability of acting as a carrier of oxygen.

1. Chlorine and bromine act as powerful irritants. They provoke spasm of the glottis when inhaled, and subsequently induce in- flammation of the respiratory mucous membrane, which may prove speedily fatal. Inhalation of diluted ammonia vapour is the best remedy.

2. Hydrochloric or muriatic acid gas and hydrofluoric or fluoric acid gas are irritating and destructive to life. The former is more destructive to vegetable life than even chlorine. They are emitted in many processes of manufacture, and especially in the manufac- ture of carbonate of soda from common salt by Le Blanc's process, in the salt-glazing of earthenware, and in the manufacture of arti- ficial manures.

3. Sulphurous Acid Gas. — The gas given off by burning sulphur is most suffocating and irritating. Its inhalation, even in a highly diluted state, may cause speedy death from spasmodic closure of the glottis.

4. Nitrous vapours, or gaseous oxides of nitrogen (except nitrous oxide), are given off from galvanic batteries excited by nitric acid; also in the process of etching on copper. They produce, when diluted, little immediate irritation, but are exceedingly dangerous, setting up extensive and fatal inflammation of the lungs.

5. Ammonia gas is highly irritant, but does not often prove fatal.

6. Carbon dioxide gas is heavier than atmospheric air, is totally irrespirable when pure, and is fatal when present in large quantities in respired air. It is

given off from burning fuel, accumulates in pits and wells as choke-damp, and constitutes the deadly after- damp of coal-mines. It is also formed during alcoholic fermen- tation, and hence accumulates in partially filled vats in which fer- mented liquors are stored. When it is breathed in a concentrated state, death is almost instantaneous. Persons descending into wells foul with this gas sink down powerless, and are usually dead before they can be removed from the vitiated atmosphere. In these cases there is true asphyxia; but carbonic acid is also a narcotic gas. Persons exposed to an atmosphere partially composed of this gas, but not long enough to produce fatal results, are affected with stertorous breathings, oppression, flushed face, prominent eyes, swollen tongue and feeble pulse. The proper treatment is removal from the foul atmosphere, alternate cold and tepid douches to the chest, friction of the limbs and trunk, and artificial respiration. When animation is restored the patient should be put to bed and kept quiet, but should be carefully watched in case of relapse.

7. Carbon monoxide gas is given off by burning charcoal and other forms of fuel, mixed with carbonic acid. The poisonous effects of charcoal fumes are perhaps due rather to the more poisonous car- bonic oxide than to the less poisonous carbonic acid. An atmo- sphere containing less than 1 % of carbonic oxide would doubtless be fatal if breathed for many minutes. Carbonic oxide forms with haemoglobin, the red pigment of the blood, a bright scarlet compound. The compound is very stable, and the oxide cannot be displaced by atmospheric oxygen. Hence the blood after death from the inhalation of carbonic oxide is of a bright arterial hue, which it retains on exposure to air.

8. Coal-gas acts as an asphyxiant and narcotic. The appear- ances met with after death — more especially the fluid state of the blood — are similar to those observed after death from carbonic oxide gas, which is a constituent of coal-gas, and to which the chief effect of coal-gas may be due.

9. Sulphuretted hydrogen gas is highly poisonous by whatever channel it gains access to the body. In a concentrated form it produces almost instant death from asphyxia. Even in a diluted state it produces colic, nausea, vomiting and drowsiness. This may pass into insensibility with lividity and feeble respiration. The skin is cold and clammy, or bathed in perspiration. The red blood corpuscles are disintegrated. The treatment consists in removal from the contaminated atmosphere, friction to the surface

of the body, warmth, and the administration of stimulants. The inhalation of chlorine gas has been recommended on chemical grounds; but it must be remembered that chlorine is itself poisonous.

10. Anaesthetics. — Nitrous oxide, or laughing gas, and the gases or vapours of other anaesthetic substances, such as chloroform, may, if improperly administered, produce death by asphyxia, and perhaps otherwise. Obviously, as a rule, medical assistance is at hand. The treatment consists in artificial respiration, and the use of galvanic current.

1 1 . Vapours of Hydrocarbons. — The volatile vapours of the natural hydrocarbons known as benzoline, petroleum, &c, are poisonous when inhaled for lengthened periods. (T. S.)*

POISSON, SIMfiON DENIS (1781-1840), French mathemati- cian, was born at Pithiviers in the department of Loiret, on the 21st of June 1781. His father, Simeon Poisson, served as a common soldier in the Hanoverian wars; but, disgusted by the ill-treatment he received from his patrician officers, he deserted. About the time of the birth of his son, Simeon Denis, he occupied a small administrative post at Pithiviers, and seems to have been at the head of the local government of the place during the revolutionary period. Poisson was first sent to an uncle, a surgeon at Fontainebleau, and began to take lessons in bleeding and blistering, but made little progress. Having given promise of mathematical talent he was sent to the ficole Centrale of Fontainebleau, and was fortunate in having a kind and sympa- thetic teacher, M. Billy, who, when he speedily found that his pupil was becoming his master, devoted himself to the study of higher mathematics in order to follow and appreciate him, and predicted his future fame by the punning quotation from Lafontaine 1 : —

" Petit Poisson deviendra grand Pourvu que Dieu lui prgte vie."

In 1798 he entered the ficole Polytechnique at Paris as first in his year, and immediately began to attract the notice of the professors of the school, who left him free to follow the studies of his predilection. In 1800, less than two years after his entry, he published two memoirs, one on £. Bezout's method of elimina- tion, the other on the number of integrals of an equation of finite differences. The latter of these memoirs was examined by S. F. Lacroix and A. M. Legendre, who recommended that it should be published in the Recueil des savants Strangers, an unparalleled honour for a youth of eighteen. This success at once procured for Poisson an entry into scientific circles. J. L. Lagrange, whose lectures on the theory of functions he attended at the ficole Polytechnique, early recognized his talent, and became his friend; while P. S. Laplace, in whose footsteps Poisson followed, regarded him almost as his son. The rest of his career, till his death on the

25th of April 1IS40, was almost entirely occupied in the composition and publication of his many works, and in discharging the duties of the numerous educational offices to which he was successively appointed. Immediately after finishing his course at the ficole Polytechnique he was appointed repetiteur there, an office which he bad discharged as an amateur while still a pupil in the school; for it had been the custom of his comrades often to resort to his room after an unusually difficult lecture to hear him repeat and explain it. He was made professeur suppliant in 1802, and full professor in succession to J. Fourier in 1806. In 1808 he became astronomer to the Bureau des Longitudes; and when the Faculty des Sciences was instituted in 1809 he was appointed professeur de la mica-nique rationelle. He further became member of the Institute in 181 2, examiner at the military school at St Cyr in 1815, leaving examiner at the ficole Polytechnique in 1816, councillor of the university in 1820, and geometer to the Bureau des Longitudes in succession to P. S. Laplace in 1827. His father, whose early experiences led him to hate aristocrats, bred him in the stern creed of the first republic. Throughout the empire Poisson faithfully adhered to the family principles, and refused to worship Napoleon. When the Bourbons were restored, his hatred against Napoleon led him to become a Legitimist— a conclusion which says more for the simplicity of his character than for the strength or logic of his political creed. He was faithful to the Bourbons during the Hundred Days; in fact, was

‘ This prediction is sometimes attributed to Laplace.

with difficulty dissuaded from volunteering to fight in theh cause. After the second restoration his fidelity was recognized by his elevation to the dignity of baron in 1825; but he never either took out his diploma or used the title. The revolution of July 1830 threatened him with the loss of all his honours; but this disgrace to the government of Louis Philippe was adroitly averted by F. Arago, who, while his ” revocation ” was being plotted by the council of ministers, procured him an invi- tation to dine at the Palais Royale, where he was openly and effusively received by the citizen king, who ” remembered” him. After this, of course, his degradation was impossible, and seven years later he was made a peer of France, not for political rea’sons, but as a representative of French science.

As a teacher of mathematics Poisson is said to have been more than ordinarily successful, as might have been expected from his early promise as a repetiteur at the ficole Polytechnique. As a scientific worker his activity has rarely if ever been equalled. Notwithstanding his many official duties, he found time to publish more than three hundred works, several of them exten- sive treatises, and many of them memoirs dealing with the most abstruse branches of pure and applied mathematics. There are two

remarks of his, or perhaps two versions of the same remark, that explain how he accomplished so much: one, " La vie n'est bonne qu'a. deux choses — a. faire des mathematiques et a les professeur; " the other, " La vie c'est le travail."

A list of Poisson's works, drawn up by himself, is given at the end of Arago's biography, A lengthened analysis of them would be out of place here, and all that is possible is a brief mention of the more important. There are few branches of mathematics to which he did not contribute something, but it was in the applica- tion of mathematics to physical subjects that his greatest services to science were performed. Perhaps the most original, and certainly the most permanent in their influence, were his memoirs on the theory of electricity and magnetism, which virtually created a new branch of mathematical physics. Next (perhaps in the opinion of some first) in importance stand the memoirs on celestial mechanics, in which he proved himself a worthy successor to P. S. Laplace. The most important of these are his memoirs " Sur les inegalites seculaires des moyens mouvements des planetes," " Sur la variation des constantes arbitraires dans les questions de meca- nique," both published in the Journal of the ficole Polytechnique (1809) ; " Surlalibrationdelalune," in Connaiss. d. temps (i82i),&c. ; and " Sur la mouvement de la terre autour de son centre de gravity," in Mem. d. I'acad. (1827), &c. In the first of these memoirs Poisson discusses the famous question of the stability of the planetary orbits, which had already been settled by Lagrange to the first degree of approximation for the disturbing forces. Poisson showed that the result could be extended to a second approximation, and thus made an important advance in the planetary theory. The memoir is remarkable inasmuch as it roused Lagrange, after an interval of inactivity, to compose in his old age one of the greatest of his memoirs, viz. that Sur la theorie des variations des elements des planetes, et en particulier des variations des grands axes de leurs orbites. So highly did he think of Poisson's memoir that he made a copy of it with his own hand, which was found among his papers after his death. Poisson made important contributions to the theory of attraction. His well-known correction of Laplace's partial differential equation for the potential was first published in the Bulletin de la soctite philomatique (1813). His two most important memoirs on the subject are " Sur l'attraction des spheroides " {Connaiss. d. temps, 1829), and " Sur l'attraction d'un ellipsoide homogene " (Mem. d. I'acad., 1835). In concluding our selection from his physical memoirs we may mention his memoir on the theory of waves (Mem. d. I'acad., 1825).

In pure mathematics, his most important works were his series of memoirs on definite integrals, and his discussion of Fourier's series, which paved the way for the classical researches of L. Dirichlet and B. Riemann on the same subject ; these are to be found in the Journal of the ficole Polytechnique

from 1813 to 1823, and in the Memoirs de I'academie for 1823. In addition we may also mention his essay on the calculus of variations (Mem. d. I'acad., 1833), and his memoirs on the probability of the mean results of observations (Connaiss. d. temps, 1827, &c).

Besides his many memoirs Poisson published a number of treatises, most of which were intended to form part of a great work on mathe- matical physics, which he did not live to complete. Among these may be mentioned his Traite de mecanique (2 vols. 8vo, 18 1 1 and 1833), which was long a standard work; Thiorie nouvelle de faction cappillaire (4to, 1831); Theorie mathematique de la chaleur Uto, 1835); Supplement to the same (4to, 1837) ; Reckerch.es sur la probability des jugemenls en malikres criminelles, &c. (4to, 1 837) , all published at Paris. See F. Arago, Biographic de Poisson, read before the Academie des Sciences on the 16th of December 1850.

POISSY, a town of northern France, in the department of Seine-et-Oise, 17m. W.N.W. of Paris, on the railway from Paris to Rouen. Pop. (1906), 6043. The church, supposed to have been built in the first half of the 12th century, and eventually restored under the direction of Viollet le Due, is of special architectural interest, as affording one of the earliest and best examples of transition from the Romanesque to the Pointed style. The bridge of Poissy, a very ancient foundation, has been widened and modernized; of the mills which formerly bordered it one was known as Queen Blanche's. A statue of the painter J. L. E. Meissonier was erected in 1894, close to his house. Poissy supplied butchers' meat to Paris during six centuries, but in 1867 the market was removed to the metropolis. A handsome fountain stands in the old market-place. Distilling and the manufacture of chairs and flour-milling equipment are carried on and ragstone is quarried.

Poissy, the ancient Pinciacum, was the capital of the country of the Carnutes. In the time of Charlemagne it had a royal palace, where during the 9th century four national assemblies were held. Later it became a favourite residence of Blanche of Castille, and her son, afterwards St Louis, is supposed to have been born there. Philip the Fair gave the castle to the Dominicans, by whom it was completely transformed, and it was in the refectory of the abbey that the famous conference (see below) between the Roman Catholics and Protestants took place in 1561.

POISSY, COLLOQUY OF, a conference held in 1561 with the object of

effecting a reconciliation between the Catholics and Protestants of France. It was initiated by Queen Catherine de' Medici, regent during the minority of her son Charles IX. In the policy of which it was the outcome she enjoyed the support of the Chancellor Michel de l'Hopital and the lieutenant-general of the kingdom, Anthony of Navarre; while on the other hand the heads of the Catholic party had attempted to frustrate any form of negotiation. Theodore Beza from Geneva and Peter Martyr Vermigli from Zurich appeared at the colloquy; the German theologians to whom invitations had been despatched only arrived in Paris after the discussion was broken off. The conference was opened on the 9th of September in the refectory of the convent of Poissy, the king himself being present. The spokesman of the Reformed Church was Beza, who, in the first session, gave a lengthy exposition of its tenets, but excited such repugnance by his pronouncements on the Communion that he was interrupted by Cardinal Tournon. In the second session (Sept. 16) he was answered by the cardinal of Lorraine, who discharged his task with skill and moderation. On the motion, however, of Ippolito d'Este, the papal legate, exception was taken to the further conduct of the negotiations in full conclave; and a committee of twenty-four representatives, twelve from each party, was appointed — ostensibly to facilitate a satisfactory decision. On the Catholic side, as was speedily demonstrated, there existed no sort of tendency to conciliation. On the con- trary, the cardinal of Lorraine, by his question whether the Calvinists were prepared to sign the Confession of Augsburg, attempted to sow dissension between them and the Lutheran Protestants of Germany, on whose continued support they calcu- lated. The Catholic delegates, moreover, discovered a powerful auxiliary when Lainez, the general of the Jesuit order, which had been admitted into France a short time previously, entered the debate; and the acrimony with which he opposed the Protes- tants was of material service in clarifying the situation. Still a further reduction was made in the number of members, and a small residuum consisting of five Catholics and five Protestants undertook the task of devising a formula on which the two churches might unite with regard to the question of the Com- munion. Their difficult labours even seemed on the point of success when the assemblage of prelates refused assent, and the conference broke up on the 9th of October — a result which barred the way to a pacific understanding with the Huguenots.

See H. Kiipffel, Le Colloque de Poissy (Paris, 1 868) ; E. Lacheinmann in Herzog-Hauck, Realencyklopddie f. protest. Theologie (3rd ed., 1904), xv. 497. (C. M.)

XXI. 29

POITIERS, a town of western France, formerly the capital of Poitou, and now the chief town of the department of Vienne, 61 m. S.S.W. of Tours on

the railway to Bordeaux. Pop. (1906), town, 31,532; commune, 39,302. Poitiers is situated at the junction of the Boivre with the Clain (a tributary of the Loire by the Vienne), and occupies the slopes and summit of a plateau which rises 130 ft. above the level of the streams by which it is surrounded on three sides. The town is picturesque; and its streets are interesting for their remains of ancient architecture, especially of the Romanesque period, and the memories of great historical events. Blossac park, named after the intendant of the " generality " of Poitiers (1751-1786), and situated on the south side of the town, and the botanical garden on the north-east, are the two principal promenades. Till 1857 Poitiers contained the ruins of a Roman amphitheatre more extensive than that of Nimes; remains of Roman baths^ constructed in the 1st and demolished in the 3rd century, were laid bare in 1877; and in 1879 a burial-place and the tombs of a number of Christian martyrs were discovered on the heights to the south-east — the names of some of the Christians being preserved in paintings and inscriptions. Not far from these tombs is a huge dolmen (the " Pierre Levee "), 22 ft. long, 16 ft. broad and 6 or 7 ft. high, around which used to be held the great fair of St Luke.

The cathedral of St Peter, begun in 1162 by Henry II. of England and Eleanor of Guienne on the ruins of a Roman basilica, and well advanced by the end of the 12th century, is a building in the Romanesque and Early Gothic style, the latter predominating. It consists of three naves almost equal in height and width, both of which decrease towards the west, thus enhancing the perspective. Its length is 308 ft., and the keystone of the central vaulted roof is 89 ft. above the pavement. There is no apse, and the exterior generally has a heavy appear- ance. The principal front, the width of which is excessive in pro- portion to its height, has unfinished side-towers 105 and no ft. in height, begun in the 13th century. Most of the windows of the choir and the transepts preserve their stained glass of the 12th and 13th centuries; the end window, which is certainly the first in the order of time, contains the figures of Henry II. and Eleanor. The choir stalls, carved between 1235 and 1257, are among the oldest in France. The church of St Jean near the cathedral is the most ancient Christian monument in the country. Built as a baptistery in the first half of the 4th century, it was enlarged in the 7th century, since when it has suffered little structural alteration. It contains frescoes of the 12th century and a collection of tombs of the Merovingian period. The church of St Hilaire was erected at the close of the 4th century over the tomb of the celebrated bishop. At first an oratory, it was rebuilt on a larger scale by Clovis, and after- wards became, in the 10th, nth and 12th centuries, a sumptuous collegiate church, of which the nave was flanked by triple aisles and surmounted by six cupolas. Great damage was done to it in the Wars of Religion and the French Revolution, and the facade was entirely rebuilt in the 19th century.

The confes- sional or oratory under the choir contains the relics of St Hilary and a Christian sarcophagus of the 4th century. The church of St Radegonde, a great resort of pilgrims, commemorates the consort of Clotaire (d. 587), and preserves in its crypt the tomb of Radegonde, who founded at Poitiers the abbey of the Holy Cross, and two others reputed to be those of St Agnes and St Disciola. The choir and tower above the entrance are of the nth century, while the nave (late 1 2th century) is in the Angevin style. In a recess in the nave known as the Chapelle du Pas de Dieu, there is a footprint which tradition asserts to be that of Christ, who appeared in a vision to St Radegonde. Notre-Dame la Grande, which dates from the close of the nth century, and represents a collegiate church of one or two hundred years older, has a sculptured Romanesque facade rivalled in richness only by that of St Pierre of Angouleme. The first stone of the church of Montierneuf (Monasterium Novum) was laid in 1077 by William VI., duke of Aquitaine and count of Poitiers, who is buried within its walls; and the choir (in the 13th century

modified by the erection of a " lantern ") was solemnly conse- crated by Urban II. in 1096. Mutilated about 1640 and during the Revolution, the building was partly restored between 1850 and i860. The tower of St Porchaire, a precious remnant of nth-century architecture, was restored in the 19th century under the auspices of the well-known Socittt des antiquaires de I'ouest.

Among the secular buildings the first place belongs to the law courts, formerly the palace of the dukes of Aquitaine and counts of Poitiers, and rebuilt between the 12th and the 15th century. The Salle des Pas Perdus forms a fine nave 160 ft. long by 56 ft. wide, with a vaulted wooden roof. The southern wall is the work of duke Jean de Berry (d. 1416), brother of Charles V. ; above its three vast fireplaces are mullioned windows filled with stained glass. The Maubergeon tower attached to the palace by the same duke represented the feudal centre of all the lordships of the countship of Poitiers. The house known as the prevdti or provost's mansion, built about 1500, has a fine facade flanked by turrets, and there are other houses of the 15th, 16th and 17th centuries. In the H6tel de Ville, erected between 1869 and 1876, are museums of natural history and painting. The museum of the Antiquaires de I'ouest occupies the chapel and the great hall of the old university, adjoining the old H6tel de Ville; it is a valuable collection com- prising Roman antiquities, Merovingian sculptures, medals,

a fine Renaissance fireplace, &c. The building devoted to the faculties also contains the library. The municipal records are very rich in charters of Eleanor of Guienne, Philip Augustus, Alphonse of Poitiers, &c.

Poitiers is the seat of a bishop, a prefect, a court of appeal and a court of assizes, and centre of an educational division {acadtmie), and has tribunals of first instance and of commerce, a board of trade arbitration, a chamber of commerce and a branch of the Bank of France. Its educational institutions comprise a university with faculties of law, science and letters, and a preparatory school of medicine and pharmacy, a school of theology, training colleges for both sexes, a lycee for boys and a school of fine art. Trade is in farm produce, wine, cattle, wool, honey, goose-quills and leather. The industries include the preparation of goose-skins, printing, tanning, and the manufacture of brushes, paint and candles.

Poitiers, called Limonum at the time of the Roman Conquest, afterwards took the name of its Gallic founders, the Pictones or Pictavi. Christianity was introduced in the 3rd century, and the first bishop of Poitiers, from 350 to 367, was St Hilarius. Fifty years later the city had fallen into the hands of the Arian Visigoths, and became one of the principal residences of their kings. Alaric II., one of their number, was defeated by Clovis at Vouill6, not far from Poitiers, in 507, and the town became a part of the Frankish dominion. This was the first occasion on which the peoples of northern and southern Gaul met in conflict in the neighbourhood of the town which was destined to see them so frequently join battle. By his victory in 732 over the Mahommedans at Moussais-la-Bataille in this region, Charles Martel proved the saviour of Christendom. Eleanor of Guienne frequently resided in the city, which she embellished and fortified, and in n 99 entrusted with communal rights. Alphonse of Poitiers, at a plenary court held in 1241 in the great hall of the Palais de Justice, received the homage of his numerous vassals. After the battle of Poitiers in 1356 (see below), Poitou was recog- nized as an English possession by the treaty of Bretigny (1360); but by 1373 it was recovered by Bertrand Du Guesclin. It was at Poitiers that Charles VII. was proclaimed king (1432); and he removed thither the parlement and university of Paris, which remained in exile till the English withdrew from the capital in 1436. During this interval (1429) Joan of Arc was subjected to a formal inquest in the town. The university was founded in 1432. Calvin had numerous converts at Poitiers. Of the violent proceedings which attended the Wars of Religion the city had its share. In 1569 it was defended by Gui de Daillon, comte du Lude, against Gaspard de Coligny, who after an unsuccessful bombardment retired from the siege at the end of seven weeks.

Counts of Poitiers. — In the time of Charlemagne the countship of Poitiers, which was then a part of the kingdom of Aquitaine, was represented by a

certain Abbon. Renoul (Ranulph), who was created count of Poitiers by the emperor Louis the Pious in 839, was the ancestor of a family which was distinguished in the 9th and 10th centuries for its attachment to the Carolingian dynasty. One of his successors, Ebles the Bastard (d. 93 s), took the title of duke of Aquitaine; and his descendants, who bore the hereditary name of William, retained the same title. William IV., Fierebrace, joined Hugh Capet, his brother-in-law, in 987. William V. the Great (993-1030) was a patron of letters, and received from the Italian lords the offer of the imperial crown after the death of the emperor Henry II. in 1024. William IX. (1086-1127) went on crusade in 1100, and had violent quarrels with the Papacy. His son William X. (1127-1137) sided with the anti-pope Anacletus against Innocent II. In accordance with the dying wishes of William X. his daughter Eleanor was married in 1137 to Louis, the son of Louis VI. of France. Sole heiress of her father, she brought her husband a large dowry, comprising Poitou, Saintonge, Aunis, a part of Touraine and Berry, Marche, Angoumois, Perigord, Auvergne, Limousin, Bordelais, Agenois and Gascony. After the dissensions between Louis VII. and Eleanor had resulted in a divorce in n 52, Eleanor married the count of Anjou, Henry Plantagenet, who became king of England as Henry II. The west of France thus passed into the hands of England, a transfer which gave rise to long wars between the two kingdoms. Philip Augustus reconquered Poitou in 1204, and the province became in succession an apanage of Alphonse, son of Louis VIII., in 1 241; of Philip the Tall, son of Philip the Fair, in 1311; of John, son of Philip of Valois, in 1344; and of John, due de Berry, son of John the Good, in 1356; and passed to the dauphins John (1416) and Charles (1417), sons of Charles VI. When Charles VII. ascended the throne he finally united the countship of Poitiers to the Crown.

See P. Gue>in, Recueil des documents concernant le Poitou (Paris, 1 880-1906); and A. Richards, Histoire des comtes de Poitou (Paris,

1903)-

Battle of Poitiers. — This battle, fought on the 19th of Septem- ber 1356 between the armies of King John of France and Edward the " Black Prince," was the second of the three great English victories of the Hundred Years' War. From Bordeaux the prince had led an army of his father's Guienne vassals, with which there was a force of English archers and men-at-arms, into central France and had amassed an enormous booty. King John, hitherto engaged against the army of John of Gaunt duke of Lancaster, in Normandy, hurried south to intercept the raiding army and to bar its homeward road. The Black Prince, by forced marching, was able to slip past the French, but reaching Maupertuis, 7 m. south-east of Poitiers, with the king's army in chase, he found himself compelled to choose

between fighting and abandoning his spoil. He chose the former course, in spite of the enemy's great superiority in numbers (16,000 to 6500), and in order to give his trains time to draw off took up a defensive position on the 18th of September, with a slight hollow in front and a wood behind, between the Poitiers-Bordeaux main road and the River Maussion. 1 John, instead of manoeuvring to envelop the English, allowed the Cardinal Talleyrand de P6rigord to attempt to negotiate a peace. This proving vain, the French army attacked without any attempt at manoeuvre or reconnaissance, and on a front so narrow that the advantage of superior numbers was forfeited. Moreover, King John ordered all but the leading line to dismount and to attack on foot (tactics suggested by the success on the defensive of the dismounted English men-at-arms at Crecy and the Scots at Bannockburn), and thus condemned the best part of his army to a fatiguing advance on > foot across difficult country in full armour.

The French arblasters, who might have crushed the relatively

1 The view adopted is that of Professor Oman, Art of War Middle Ages, p. 631.

few English archers present, were mingled with the 300 picked mounted men in first line, but, as the latter charged, their advance masked the fire of the arblasters in the first few seconds, besides leaving the other, dismounted, lines far in rear. Thus the first attack on the Black Prince's line, which was greatly strengthened by trees and hedges in front of it, was promptly brought to a standstill by the arrows of the archers lining a hedge which overlooked the hollow in front; and the earl of Oxford hastily drawing out a body of archers beyond the defen- ders' left, into the low-lying ground of the Maussion valley, completed their rout by firing up the hollow into their flank. But it was not so easy to deal with the second line of dismounted men-at-arms, led by the dauphin, which was the next to arrive on the French side. The hedge indeed was held, and the assailants, unable to advance beyond the hollow, gave way, but to achieve this the prince had to use all but 400 of his men. Had the third body of the French advanced with equal spirit the battle would probably have ended there and then, but the duke of Orleans, who commanded it, was so demoralized by the retirement of the dauphin's division that he led his whole force off the field without striking a blow. Thereupon the king himself advanced furiously with the fourth and last line, and as it came on the situation of the English seemed so desperate that the prince was advised to retreat. But his determined courage was unshaken; seeing that this was the last attack

he put his reserve into line, and rallying around this nucleus all men who could still fight, he prepared not only to repulse but to counter-attack the French. He despatched a small force under the Captal de Buch to ride round the flank of the enemy and to appear in their rear at the crisis of the fight. Though a medieval knight, he knew as well as Napoleon at Areola that when the moral force of both sides has passed its culminating point even a materially insignificant threat serves to turn the balance. And so it fell out. When both lines were fighting hand-to-hand, the fifty horsemen of the Captal de Buch appeared in rear of the French. The front ranks fought on, but the rear of the French melted away rapidly, and at last only a group of the bravest, with King John and his son Philip, a boy of fourteen, in their midst, were left. This band continued their hopeless resistance for a: time, but in the end they were killed or captured to a man. The rest of the French army, totally dispersed, was pursued by the victors until nightfall. Two thousand five hundred of the French, 2000 of them knights and men-at-arms, were killed, including the constable, one of the marshals, the standard- bearer and six other great lords. The prisoners included the king and his son Philip, the other marshal and 25 great lords, and 1933 knights and men-at-arms as well as 500 others.

POITOU, one of the old provinces of France, which also formed one of the great military governments of the kingdom, was bounded on the N. by Brittany, Anjou and Touraine; on the S. by Angoumois and Aunis; on the E. by Touraine, Berri and Marche; and on the W. by the ocean. It was divided into Lower Poitou, which corresponded to the modern department of La Vendee, and Upper Poitou, now split into the departments of Deux-Sevres and Vienne. The principal towns in Upper Poitou were Poitiers the capital, Mirebeau, Chatellerault, Richelieu, Loudun, Thouars, Mauleon, Parthenay, Niort, &c; and in Lower Poitou Fontenay-le-Comte, Maillezais, Lucon and Roche-sur-Yon. lie d'Yeu or lle-Dieu and Noirmoutier belonged to the province. Ecclesiastically, Poitou was a diocese which was broken up in 13 17 to form two new dioceses of Lucon and Maillezais; the seat of the latter was transferred in the 17th century to La Rochelle. For the administration of justice, Poitou was attached to the parlement of Paris. After 778 it formed part of the domain of the counts of Poitiers (q.v.). Poitou (Poictou, Pictavia) takes its name from the Pictones or Pictavi, a Gallic nation mentioned by Caesar, Strabo and Ptolemy, and described by Strabo as separated from the Namnetes on the north by the Loire. It formed part of the territory known as Aquitaine (q.v.).

For the history see the Memoires of the Soci&e' des Antiquaires d 1'Ouest (1835 sqq.) and the documents published by the Archives*

historiques du Poitou (1872 sqq.) ; also the Dictionnaire topographiquc de la Vienne, by L. Redet (1881).

POKEBERRY, POKEWEED (from the American-Indian pocan, applied to any plant yielding a red or yellow dye), in botany, the popular name of Phytolacca decandra, a strong- smelling perennial herb, a native of North America, with ovate- lanceolate sharp-pointed leaves, racemes of small greenish-white flowers and flattish berries nearly | in. in diameter, which contain a crimson juice. The young asparagus-like shoots are sometimes used as a pot-herb, but the roots are poisonous. The plant is often cultivated in Europe, and has become naturalized in the Mediterranean region.

POKER, a game at cards. By most writers its origin has been ascribed to II Frusso, an Italian game of the 1 5th century, from which the game of Primiera, called in Spain Primer 0, and La Prime in France, in which country it was elaborated into L'Ambigu or Le MeslS. In England the game was played under the name of Post and Pair, of which the modern Brag is only a variation. But Mr R. F. Foster proves that, though poker is probably a descendant of Primer 0, and perhaps of a much more ancient Persian game called As ras, it is not a development of the English Brag, but was introduced from France into the colony of Louisiana, the name being merely an English mispro- nunciation of Poque, a game described as early as 1718 in the AcadSmie universelle des jeux, and still played in Germany under the name Pochen. The earliest mention of the game in America is in G. B. Zieber's Exposure of the Arts and Miseries of Gambling (1843), and it is probable that poker was generally played on the Mississippi steamboats as early as 1830, twenty cards being used, "full-deck poker" with 52 cards being invented later. " Draw-poker " was introduced about i860.

Poker is played for money stakes, markers or " chips" of different value being used. These are either divided equally among the players, or, more usually, one player acts as banker and sells chips to the other players, redeeming them at the end of the game. There are several varieties of the game, but Draw Poker, played by from 2 to 6 or even 7 persons with a pack of 52 cards, is the most popular. The player who wins the cut for deal shuffles the pack, which is then cut by the player at his right. He then deals five cards, one by one, to each player. If a card is faced during the deal the player must accept it; if two are exposed a new deal must ensue. Before the deal is complete the player at the dealer's left, who is said to hold the age, and is called " the age," places (or puts up) on the table in front of him half the stake for which he wishes to play. This is called blind. The player at the age's left then looks at his hand and announces whether he will play. If his hand seems too weak he throws his cards away face-down and " drops out " of the game. If he elects to play he puts up his ante, which is twice the amount of the blind. The other players, including the dealer, then either come in, i.e. elect to play, each putting up his ante, or, deeming their hands worthless, drop out. The age, who has the last say, may then himself

drop out, forfeiting his half-stake already put up, or he may come in and make good his ante, i.e. put up his unpaid half of the blind. Each player in his turn has the privilege of increasing the stake to any amount not exceeding the limit, 1 which is always agreed upon before the game begins. Thus, if the limit is £1, and the age has put up 6d. as his blind, any player may, when his turn comes to declare whether he will play, say, " I play and make it 10s. (or a sovereign) more to draw cards," at the same time placing the ante plus 10s. (or a sovereign) in the middle of the table. Thereupon all the other players, each in turn, must see the raise, i.e. pay in the additional sum, or drop out of the game, forfeiting what they have already paid into the pool. The " age " being the last to complete, is in the best position to raise, as a player who has already completed is less likely to sacrifice his stake and withdraw from the game. On the other hand each player

1 "Table stakes" means playing strictly for cash; " unlimited " explains itself, although even when this is the rule a certain high I limit is pretty generally observed.

has the right, in his turn, after paying the extra "stake called for, of raising it further on his own account, and this goes on until the players who have not dropped out have paid an equal sum into the pool and no one cares to raise further. Each player then throws away as many of his five cards as.he chooses and receives from the dealer new ones in their place. In this supplementary deal no player may accept a faced card, but receives one in its place after all the other players have been served. The number of new cards taken by each one should be carefully noted by the other players, as it gives a valuable clue to the probable value of his hand. The following list shows the value of hands, beginning with the lowest.

i. One Pair (accompanied by three cards of different denomi- nations). If two players each hold a pair, the higher wins; if similar pairs (e.g. a pair of kings each) then the next highest card wins.

2. Two Pairs.

3. Triplets or Threes of a Kind (e.g. three kings, accompanied by two other cards not forming a pair).

4. Straight, a sequence of five cards, not all of the same suit. Sometimes, but very rarely, these straights are not admitted. An ace may either begin or end a straight. For example: ace, king, queen, knave and 10 is the

highest straight; 5, 4, 3, 2, and ace is the lowest. An ace cannot be in the middle. For example, 3, 2, ace, king, queen is not a straight.

5. Flush, five cards of the same suit, not in sequence. If two flushes are held, that containing the highest card wins; if the highest cards are similar, the next highest wins, &c.

6. Full, or Full House, meaning three cards of the same denomina- tion together with a pair; e.g. three sixes and a pair of fours. If more than one player holds a full, the highest triplet wins.

7. Fours, or four cards of the same denomination; e.g. four queens, which beat four knaves and under.

8. Straight Flush, a sequence of five cards all of the same suit; e.g. knave, 10, 9, 8, 7, of hearts.

9. Royal Flush, the highest possible straight flush; e.g. ace, king, queen, knave and 10 of spades.

If no player holds at least erne pair, then the hand containing the highest card wins.

Each player having received the new cards called for, the betting is opened by the player sitting at the age's left, should he consider his hand worth it; otherwise he throws down his cards and is out of the game, and the next player (whom we will call C) makes the first bet, which may be of any amount up to the limit, but is usually a small one, with a view to later developments. The next player, D, either drops out, trails, i.e. puts up the amount bet by C (also called seeing and calling), or raises C's bet; in other words puts in the amount bet by C plus as much more (within the limit) as he cares to risk. This raise on D's part means either that he thinks he holds a better hand than G, or that he is trying to frighten C out. The last manoeuvre illustrates the principle of the bluff, the most salient characteristic of the game of Poker. If C, with two small pairs in the hand, bets half a crown, and D, with a hand of no value whatever, covers, or sees C's bet and raises it to a sove- reign, it is very likely that C will throw down his cards rather than risk a sovereign on his own by no means strong hand. In this case C has been bluffed by D, who, without even having to show his cards, wins the pool, although intrinsically his hand was far inferior to C's. The ability to bluff successfully depends upon self-command, keen observation, judgment and knowledge of character, so as to attempt the bluff when the bluffer is sure that there are no very strong hands out against him. Other wise he will surely be called in his turn, and, having nothing of value, will lose the pool, besides suffering the ignominy of

throwing away his money for nothing.

Two players with strong hands will often raise each other's bets repeatedly, until one of them calls the other, upon which the hands are shown and the stronger wins. The complete hands of the caller and the called must be shown. The common practice of throwing away unshown, for purposes of concealment, a losing hand that has called is illegal. No player who is not called is obliged to show his hand, so that the company is often in doubt whether or not the winner has bluffed. When two hands are of exactly equal value the pool is divided.

The game is often varied by a player going blind, i.e.. raising the ante before the deal. Another variation is straddling the

blind. This is done by the player sitting next the age, who puts up twice the amount of the blind with the words " I straddle." This has the effect of doubling the stake, as every player must then pay twice the amount of the straddle (instead of the blind) in order to play. The straddle may be straddled again in its turn if the aggregate amount does not pass the limit. The straddle does not carry with it the privilege of betting last, but merely raises the amount of the stake.

The regular Draw-Poker game is usually varied by occasional Jack-Pots, which are played once in so many deals, or when all have refused to play, or when the player deals who holds the buck, a marker placed in the pool with every jack-pot. In a jack-pot each player puts up an equal stake and receives a hand. The pot must then be opened by a player holding a hand of the value of a pair of knaves (jacks) or better. If no player holds so valuable a hand the deal passes and each player adds a small sum to the pot or pool. When the pot is opened the opener does so by putting up any sum he chooses, within the limit, and his companions must pay in the same amount or " drop." They also possess the right to raise the opener. The new cards called for are then dealt and the opener starts the betting, the play proceeding as in the regular game. If Progressive Jack-Pots are played, the minimum value of the opening hand is raised one degree every deal in which the pot is not opened. Thus the opening hand must in the first deal be at least a pair of knaves; but if the pot is not opened the minimum for the second deal is a pair of queens, for the third a pair of kings, &c. Jack-Pots were introduced about 1870.

Straight Poker, or Bluff, is played without drawing extra cards. It was the only variety of the game played, although 52 cards are now used instead of 20, as formerly. The first dealer is provided with a marker called a buck, and having, before dealing, put up the antes of all the players, passes the buck to the next dealer, who must in his turn ante for all when he deals.

The rules for betting, raising, &c, are the same as at Draw- Poker. The hands, of course, average smaller.

Stud-Poker is played like Draw-Poker, except that there is no draw and, in dealing, the first card only is dealt face down, the rest being exposed , Each player in turn looks at his turned card and makes his bet or raise. A common variation of Stud- Poker consists in stopping the deal after two cards, one face up and the other face down, have been dealt, and betting on those two cards. A third card is then dealt and betting again takes place, the process being repeated after the fourth and fifth cards have been dealt, the value of the different hands changing with each added card. A player failing to " stand " any raise must retire from that pot.

Whiskey-Poker is also played without a draw. An extra hand, called the widow, is dealt to the table face down. The first bettor then examines his hand and has the option of taking up the widow and placing his own hand on the table face up in its place, or of passing and allowing the following players in turn the choice. After an exposed hand has been laid on the table in place of the widow the next player may either take up one card from the new widow replacing it with one from his own hand, or he may exchange his entire hand for the widow, or he may knock on the table. If he knocks every other player in turn may exchange one card or his whole hand, and the betting then begins, or there may be an agreement that the best hand wins from all the rest, or that the poorest hand pays a chip to the pool.

Technical Terms. Big Dog. — Ace high and nine low; not usually played. If played it beats a Little Dog.

Blaze. — Five court cards; not usually played. If played it beats any two pairs.

Bobtail. — Four cards of a flush or straight, the fifth card not filling.

Bone. — The smallest counter or chip.

Buck. — A marker, to show when a jack-pot is to be played, viz. when it is the holder's deal.

Burnt Card. — Card on the bottom of the pack turned up to prevent being seen.

Chips. — Counters.

POLA

>oi

Cold Feet. — Any excuse of a winner for leaving the game before ‘ the time agreed upon.

Dead-wood. — The discard pile.

Deck. — Pack.

Fatten. — Adding chips and a jack-pot after a failure to open.

Freeze Out. — A game in which a player having lost a certain agreed capital must stop playing.

Inside Straight. — Intermediate straight, e.g. 2, 3, 5, 6.

Kilter. — Hand with no pair and no card above the nine; seldom played.

Kitty. — A fund, to pay for cards or refreshments, made by taking a chip from each jack-pot, or paid by a winner holding a valuable hand.

Little Dog. — Deuce low and seven high; not usually played. When played it beats a straight.

Milking. — Shuffling by taking a card from the top and one from the bottom of the pack with the same movement.

Mistigris. — Poker with the joker added; the joker may be called any card the holder chooses.

Monkey Flush. — Three cards of a flush.

Natural Jacks. — Jack-pots played because there has been no ante in the previous deal.

Openers. — A hand on which a jack-pot may be opened.

Pat Hand. — A hand to which no card is drawn.

Pool. — The chips in the middle of the table.

Show-down.— Laying the hands face-up on the table after a call.

Show. — Part of a pool to which a player is entitled who has bet as long as his capital lasted but is not able to stand further raises. If his hand is the best he wins whatever was in the pool at the time when he put into it the last of his capital.

Shy. — Not having put up the jack-pot ante.

Splitting. — -Having opened a jack-pot with one pair, and holding four other cards of one suit, to throw away one of the pair on the chance of making a flush.

Sweeten. — Chipping to a jack-pot after a failure to open.

Triplets.— Three of a kind.

Under the Gun. — The first player to bet.

Whangdoodle. — Compulsory round of jack-pots, usually agreed upon to follow a very large hand.

Widow. — An extra hand dealt to the table, as in Whiskey-Poker.

See Practical-Poker, by R. F. Foster (1904), the most authorita- tive work.

A very important attribute of a successful poker player is sound judgment in discarding, and this is principally based on the following mathematical table of approximate chances.

To improve any hand in the draw, the chances are : —

Having in Hand

To make the Hand below.

The Chance is

To get two pairs (3-card draw)

1 in 4!

1 pair

To get three of a kind (3-card draw)

1 in 9

1 pair

To improve either way average value

1 in 3

I pair and 1 odd card

To improve either way by drawing two cards .

1 in 7

2 pairs

To get a full hand drawing one card

1 in 12

3's

To get a full hand drawing two cards

I in 15!

3's

To get four of kind drawing two cards .

1 in 23!

3's

To improve either way drawing two cards .

1 in 9!

3's and I odd card

To get a full hand by drawing one card

1 in 15!

3's and I odd card

To improve either way by drawing one card

1 in 1 if

4 straight …

To fill when open at one end only or in middle

1 in n J

4 straight ….

To fill when open at both ends as 3 4 5 6

1 in 6

To fill the flush drawing one card ….

1 in 5

4-straight flush

To fill the straight flush drawing one card .

1 in 23!

3-card flush

To make a flush drawing two cards . . . .

1 in 24

Of course these chances are somewhat improved by the fact that, in actual play, pairs and threes are, on account of careless shuffling, apt to lie together more or less.

POLA (Gr. II6X0 or IldXai; Slovene, Pulj), a seaport of Austria, in Istria, 86 m. S. of Trieste by rail. Pop. (1900), 45,052. It is the principal naval harbour and arsenal of the Austro-

Hungarian monarchy, and is situated near the southern extremity of the peninsula of Istria. It lies at the head of the Bay of Pola, and possesses a safe and commodious harbour almost completely landlocked. An extensive system of fortifications, constructed on the hills, which enclose the harbour, defends its entrance, while it also possesses a good roadstead in the large channel of Fasana. This channel separates the mainland from the Brionian Islands, which dominate the entrance to the bay. The harbour has an area of 3 '32 sq. m., and is divided into two basins by a chain cf three small islands. The inner basin is sub- divided by the large Olive Island into the naval harbour, lying to the south, and the commercial harbour, lying to the north. The Olive Island is connected with the coast by a chain-bridge, and is provided with wharfs and dry and floating docks. The town proper lies opposite the Olive Island, round the base of a hill formerly crowned by the Roman capitol and now by a castle from the 17th century. Besides the castle the chief buildings are the cathedral, dating from the 15th century; the new garrison church, completed in 1898 in the Basilica style, with a fine marble facade; the Franciscan convent dating from the 13th century, and now used as a military magazine; the huge infantry barracks; and the town-hall, dating from the beginning of the 14th century.. To the south-west, along the coast, extends the marine arsenal, a vast and well-planned establish- ment possessing all the requisites for the equipment of a large fleet. It contains an interesting naval museum, and is supple- mented by the docks and wharves of the Scoglio Olivi. The artillery laboratory and the powder magaziue are on the north bank of the harbour. Behind the arsenal lies the suburb of San Policarpo, almost exclusively occupied by the naval popula- tion and containing large naval barracks and hospitals. In the middle of it is a pleasant park, with a handsome monument to the emperor Maximilian of Mexico, who had been a rear-admiral in the Austrian navy. To the north, between San Policarpo and the town proper, rises the Monte Zaro, surmounted by an observatory and a statue of Admiral Tegetthoff. Pola has no manufactures outside of its naval stores, ' but its shipping trade

is now considerable, the exports consisting of fish, timber and quartz sand used in making Venetian glass, and the imports of manufactured and colonial wares. To many people, however, the chief interest of Pola centres in its fine Roman remains. The most extensive of these is the amphitheatre built in a.d. 198-21 1, in honour of the emperors Septi- mius Severus and Caracalla, which is 79 ft. high, 400 ft. long and 320 ft. wide, and could accommodate 20,000 spectators. It is remarkable as the only Roman amphi- theatre of which, the outer walls have been preserved intact; the interior, how- ever, is now completely bare — though the arrangements for the naumachiae, or naval contests, can still be traced. The oldest Roman relic is the fine triumphal arch of the Sergii, in the Corinthian style, erected soon after the battle of Actium; and of not much later date is the elegant and well- preserved temple of Augustus and Roma erected in the year 19 B.C. Among the other antiquities are three of the old town gates and a fragment of a temple of Diana.

The foundation of Pola is usually carried back to the mythic period, and ascribed to the Colchian pursuers of Jason and the Argonauts. In all probability it was a Thracian colony, but its verifiable history begins with its capture by the Romans in 178 B.C. It was destroyed by Augustus on account of its espousal of the cause of Pompey, but was rebuilt on the inter- cession of his daughter Julia, and received (according to Pliny) the name of Pietas Julia. It became a Roman colony either

under the triumviri or under Octavian, and was mainly impor- tant as a harbour. It seems to have attained its greatest prosperity about the time of the emperor Septimius Severus (193-211 a.d.), when it was an important war harbour and contained 35,000 to 50,000 inhabitants. At a later period Pola became the capital of the margraves ofJstria, and was captured by the Venetians in 1148. It was several times captured and plundered by the Genoese, and recaptured by the Venetians. In 1379 the Genoese, after defeating the Venetians in a great naval battle off the coast, took and destroyed Pola, which disappears from history for the next four hundred and fifty years. It remained under Venetian supremacy down to 1797, and has been permanently united with Austria since 1815. In 1848 a new era began for Pola in its being selected as the principal naval harbour of Austria.

See Th. Mommsen in Corp. inscr. latin, v. 3 sqq. (Berlin, 1883); T. G. Jackson, Dalmatia, the Quarnero and Istria, vol. iii. (Oxford, 1887).

POLABS (.P0 = on, Laba^Elbe), the Slavs (q.v.) who dwelt upon the Elbe and eastwards to the Oder. Their chief tribes were the Vagri in Holstein, the Bodrici or Obotritae in Mecklenburg, the Ljutici or Wiltzi in western Pomerania, the Sprevane on the Spree and the Glomaci or Dalemintsi in Saxony. Except the Lithuanians they were the last Europeans to be christianized ; their chief sanctuary was at Arcona on the Isle of Riigen. They were converted and conquered by the 12th century and systematically germanized. By the 17th century Slavonic survived only in a tiny patch in the east of Hanover about Liichow, where a few words were still understood at the beginning of the 19th century. The population of the district still goes by the name of Wends (q.v.). The chief remains of the language are a paternoster, a few phrases and a short vocabulary written down by Pastor Chr. Henning (c. 1700), and the diary of J. Paruns Schultze (d. 1734). These were edited by A. Hilferding (St Petersburg, 1856), and a grammar was published there by A. Schleicher (1871). M. Porzezinski and Fr. Lorentz are the chief later authorities. Polabian agrees mostly with Polish and Kasube with its nasalized vowels and highly palatalized consonants. It had, however, long vowels and a free accent. The remains of it are most corrupt, having been written down when the language was full of Low German by people who did not know Slavonic.

POLACCA, the Italian name for a three-masted merchant vessel, formerly common in the eastern waters of the Mediter- ranean. The masts were of one piece and the sails were square or lateen-shaped. The name appears in various forms in other languages, e.g. Fr. polaque or polacre, Sp. polacra, Du. polaak or Ger. Polack, and certainly means Polish, although there is no explanation to be found for any connexion between Poland and such a Mediterranean vessel.

POLAND (Polish Polska, Ger. Polen), (see Poland, Russian, below), a country of Europe which till the end of the 18th century was a kingdom extending (with Lithuania) over the basins of the Warta, Vistula, Dwina, Dnieper and upper Dniester, and had under its dominion, besides the Poles proper and the Baltic Slavs, the Lithuanians, the White Russians and the Little Russians or Ruthenians.

We possess no certain historical data relating to Poland till the end of the 10th century. It would seem, from a somewhat obscure passage in the chronicle compiled from older Mand. sources by Nestor, a monk of Kiev (d. c. 1115), that the progenitors of the Poles, originally established on the Danube, were driven from thence by the Romans to the still wilder wilderness of central Europe, settling finally among the virgin forests and impenetrable morasses of the basin of the upper waters of the Oder and the Vistula. Here the Lechici, as they called themselves (a name derived from the mythical patriarch, Lech), seemed to have lived for centuries, in loosely

connected communities, the simple lives of huntsmen, herdsmen and tillers of the soil, till the pressure of rapacious neighbours compelled them to combine for mutual defence. Of this infant state, the so-called kingdom of the Piasts (from

*Piast its supposed founder), we know next to nothing. Its origin, its territory, its institutions are so many insoluble riddles. The earliest Polish chroniclers, from Gallus in the early 1 2th century to Janko of Czarnkow] in the 14th, are of little help to us. The only facts of importance to be gleaned from them are that Prince Ziemovit, the great-grandfather of Mieszko (Mieczyslaw) I. (962-992), wrested from the vast but tottering Moravian Empire the province of Chrobacyja (extending from the Carpathians to the Bug), and that Christianity was first preached on the Vistula by Greek Orthodox missionary monks. Mieszko himself was converted by Jordan, the chaplain of his Bohemian consort, Dobrawa or Bona, and when Jordan became the first bishop of Posen, the people seem to have followed the example of their prince. But the whole movement was appar- ently the outcome not of religious conviction, but of political necessity. The Slavonic peoples, whose territories then extended to the Elbe, and embraced the whole southern shore of the Baltic, were beginning to recoil before the vigorous impetus of the Germans in the West, who regarded their pagan neighbours in much the same way as the Spanish Conquistadores regarded the Aztecs and the Incas. To accept Christianity, at least formally, was therefore a prudential safeguard on the part of the Slavonians. This was thoroughly understood by Mieszko's son Boleslaus I. (992-1025), who went a considerable step fartherthan his father. Mieszko had been content to be received on almost any terms into the Christian community, Boleslaus aimed at securing the independence of the Polish Church as an additional conversion guarantee of the independence of the Polish nation. *» Christi- It was Boleslaus who made the church at Gnesen anit y' in Great Poland a national shrine by translating thither the relics of the martyred missionary, St Adalbert of Prague. Subsequently he elevated Gnesen into the metropolitan see of Poland, with jurisdiction over the bishoprics of Cracow, Breslau and Kolberg, all three of these new sees, it is important to notice, being in territory conquered by Boleslaus; for hitherto both Cracow and Breslau had been Bohemian cities, while Kolberg was founded to curb the lately subjugated Pomeranians. Boleslaus was also the first Polish prince to bear the royal title, which seems to have been conferred upon him by Otto III. in 1000, though as Boleslaus crowned K ° " aus "' himself king a second time in 1025, it is evident that he regarded the validity of his first coronation as somewhat doubtful. He was primarily a warrior, whose reign, an almost uninterrupted warfare, resulted in the formation of a vast king- dom extending from the Baltic to the Carpathians, and from the Elbe to the Bug. But this imposing superstructure*

rested on the flimsiest of foundations. In less than twenty years after the death of its founder, it collapsed before a combined attack of all Poland's enemies, and simultaneously a terrible pagan reaction swept away the poor remnants of Christianity and civilization. For a time Poland proper became a smoking wilderness, and wild beasts made their lairs in the ruined and desecrated churches. Under Boleslaus II. (1058-1079) and Boleslaus III. (1102-1139) some of the lost provinces, notably Silesia and Pomerania, were recovered and Poland was at least able to maintain her independence against the Germans. Boleslaus III., moreover, with the aid of St Otto, bishop of Bamberg, succeeded in converting the heathen Pomeranians (11 24-1 128), and making head against paganism generally.

The last act of Boleslaus III. was to divide his territories among his sons, whereby Poland was partitioned into no fewer than four, and ultimately into as many as eight, Partuional principalities, many of which (Silesia and Great Period, Poland, for instance) in process of time split n3S – 130S – up into still smaller fractions all of them more or less bitterly hostile to each other. This partitional period, as Polish historians generally call it, lasted from 1138 to 1305, during which Poland lost all political significance, and became an easy prey to her neighbours. The duke of Little Poland,

1 Archdeacon of Gnesen 1367: vice-chancellor of Poland; d. c. 1387.

Tatar Invasion.

Rise of Cities.

who generally styled himself duke of Poland, or dux totius Poloniae, claimed a sort of supremacy among these little states, a claim materially strengthened by the wealth and growing importance of his capital, Cracow, especially after Little Poland had annexed the central principality of Sieradia (Sieradz). But Masovia to the north, and Great Poland to the north-west, refused to recognize the supremacy of Little Poland, while Silesia soon became completely germanized. It was at the beginning of this period too, between 12 16 and 1224, that Pomerania, under an energetic native dynasty, freed herself from the Polish suzerainty. Nearly a generation later (1241) the Tatar hordes, under Batu, appeared for the first time on the confines of Poland. The Polish princes opposed a valiant but ineffectual resistance; the towns of Sandomir and Cracow were reduced to ashes, and all who were able fled to the mountains of Hungary or the

forests of Moravia. Pursuing his way to Silesia, Batu overthrew the confederated Silesian princes at Liegnitz (April 9), and, after burning all the Silesian towns, invaded Hungary, where he routed King Bela IV. on the banks of the Sajo. But this marked the limit of his triumph. Exhausted and diminished by the stout and successful opposition of the Moravians at Olmiitz, the Tatars vanished as suddenly as they had appeared, leaving a smoking wilderness behind 'them.

Batu's invasion had an important influence upon the social and political development of Poland. The only way of filling Foreign U P tne S a P s ' n tne population of the ravaged land immi- was to invite foreign immigrants of a superior class,

grants. chapmen and handicraftsmen, not only given to peace-

ful pursuits and accustomed to law and order, but capable of building and defending strong cities. Such immigrants could naturally be obtained only from the civilized west, and on their own terms. Thus it came about that the middle class element was introduced into Polish society for the first time. Immediately dependent upon the prince, from whom they obtained their privileges, the most important of which were self-government and freedom from taxation, these traders soon became an important factor -in the state, counterpoising, to some extent, the influence of the gentry, enriching the land by developing its resources, and promoting civilization by raising the standard of comfort.

Most of these German citizens in process of time were absorbed by the Polish population, and became devoted, heart and soul, The Knights to their adopted country; but these were not the only Germans with whom the young Polish state had now to deal. In the first year of the 13th century, the Knights of the Sword, one of the numerous orders of crusad- ing military monks, had been founded in Livonia to " convert " the pagan Letts, and, in 1208, the still more powerful Teutonic order was invited by Duke Conrad of Masovia to settle in the district of Kulm (roughly corresponding to modern East Prussia) to protect his territories against the incursions of the savage Prussians, a race closely akin to the Lithuanians. Conrad has been loudly blamed by Polish historians for introducing this foreign, and as it ultimately proved, dangerous element into Poland. But the unfortunate prince had to choose between dependence and extermination, for his unaided resources were powerless against the persistent attacks of the unconquerable The Prussians. The Teutonic Order, which had just

Teutonic been expelled from Hungary by Andrew II., joyfully Order. accepted this new domicile, and its position in the

north was definitely established by the compact of Kruschwitz in 1 230, whereby it obtained absolute possession of the maritime district between Pomerania and Courland, and southwards as far as Thorn. So far were the Poles from anticipating any danger from the Teutonic Order, that, from 1243 to 1255, they actually assisted it to overthrow the independent Pomeranian princes, the most formidable opponents of the Knights in the earlier years of their existence. A second Tatar raid in 1259, less dangerous, perhaps, but certainly more ruinous, than the first invasion — for the principalities of Little Poland and Sandomir were systematically ravaged for three months — still further

of the Sword. '

depressed the land, and, at this very time, another enemy appeared in the east — the Lithuanians.

This interesting people, whose origin is to this day the most baffling of ethnographical puzzles, originally dwelt amidst the forests and marshes of the Upper Niemen. Thanks to the impenetrability of their fastnesses, they aJLns "' preserved their original savagery longer than any of their neighbours, and this savagery was coupled with a valour so tenacious and enterprising as to make them formidable to all who dwelt near them. The Russians fled at the sight of them, " like hares before hunters." The Livs and Letts were as much the prey of the Lithuanians " as sheep are the prey of wolves." The German chroniclers describe them as the most terrible of all the barbarians. The Lithuanians first emerge into the light of history at the time of the settlement of the Teutonic Order in the North. Rumours of the war of extermination conducted against their kinsmen, the wild Prussians, by the Knights, first woke the Lithuanians to a sense of their own danger, and induced them to abandon their loose communal system in favour of a monarchical form of govern- ment, which concentrated the whole power of the state in a single hand. Fortunately, too, at this crisis of their history, the Lithuanians were blessed with an altogether exceptional series of great rulers, who showed themselves fully capable of taking care of themselves. There was, for instance, Mendovg (1240- 1263), who submitted to baptism for purely political reasons, checkmated the Teutonic Knights by adroitly seeking the protec- tion of the Holy See, and annexed the principality of Plock to his ever-widening grand duchy, which already included Black Russia, and formed a huge wedge extending southwards from Courland, thus separating Poland from Russia. A still greater prince was Gedymin (1315-1342) who did his utmost to civilize Lithuania by building towns, introducing foreigners, and tolerating all religions, though he himself remained a pagan for political reasons. Gedymin still further extended the limits of Lithuania by annexing Kiev, Chernigov and other old Russian principalities.

At the very time when Lithuania was thus becoming a com- pact, united, powerful state, Poland seemed literally to be dropping to pieces. Not even the exhortations of the popes could make her score of princes unite « (W _j 3 j i j # ”’ for mutual defence against the barbarians who en- vironed them. For a time it seemed highly probable that Poland would be completely germanized, like Silesia, or become a part of the new Bohemian Empire which Wenceslaus II. (crowned king of Poland in 1300) had inherited from his father, Ottakar II. From this fate she was saved by the valour of Wladislaus Lokietek, duke of Great Poland (1306-1333), who reunited Great and Little Poland, revived the royal dignity in 1320, and saved the kingdom from annihilation by his great victory over the Teutonic Knights at Plowce in 1332. The whole reign of Wladislaus I. was indeed an unceasing struggle against all the forces of anarchy and disintegration; but the fruits of his labours were richly reaped by his son Casimir III. the Great (1333-1370), Poland’s first great statesman in the modern sense of the word, who, by a most skilful system of matrimonial alliances, reintroduced isolated Poland Casimir ill. into the European system, and gave the exhausted the Great, country an inestimably beneficial breathing space t333 ‘ a7 °- of thirty-seven years. A born ruler, Casimir introduced a whole series of administrative and economical reforms. He was the especial protector of the cities and the peasants, and, though averse from violent measures, punished aristo- cratic tyranny with an iron hand. Casimir’s few wars were waged entirely for profit, not glory. It is to him that Poland owed the important acquisition of the greater part of Red Russia, or Galicia, which enabled her to secure her fair share of. the northern and eastern trade. In default of male issue,

Casimir left the Polish throne to his nephew, Louis of Hungary, who ruled the country (1370-1382) through his mother, Queen

Elizabeth, Wladislaus Lokietek’s daughter. Louis well deserved

the epithet of ” great “,kestpwed upon him by his contemporaries;

but Poland formed but a small portion of his vast domains, and Poland’s interests were subordinated to the larger demands of an imperial policy which embraced half Europe within its orbit

On the death of Louis there ensued an interregnum of two years marked by fierce civil wars, instigated by duke Ziemovit of Masovia, the northernmost

province of Poland, lausil' which continued to exist as an independent princi- Jagielio. pality alongside of the kingdom of Poland. Ziemo- Uoion ol vit aimed at the Polish crown, proposing to marry uth" d "i" 1 tne m ˆ ant princess Jadwiga of Hungary, who, as the daughter of Louis the Great and the grand- daughter of Wladislaus Lokietek, had an equal right, by inheritance, to the thrones of Hungary and Poland. By an agreement with the queen mother of Hungary at Kassa in 1383, the Poles finally accepted Jadwiga as their queen, and, on the 18th of February 1386, greatly against her will, the young princess, already betrothed to William of Austria, was wedded to Jagiello, grand duke of Lithuania, who had been crowned king of Poland at Cracow, three days previously, under the title of Wladislaus II.

The union of Poland and Lithuania as separate states under one king had been brought about by their common fear of the Teutonic Order. Five years after the death of Gedymin, Olgierd, the most capable of his seven sons, had been placed upon the throne of Lithuania by his devoted brother Kiejstut, and for the next two-and-thirty years (1345-1377) the two princes still further extended the sway of Lithuania, principally at the expense of Muscovy and the Tatars. Kiejstut ruled the western portion of the land where the Teutonic Knights were a constant menace, while Olgierd drove the Tatar hordes out of the south- eastern steppes, and compelled them to seek a refuge in the Crimea. During Olgieid's reign the southern boundaries of Lithuania touched the Black Sea, including the whole tract of land between the mouth of the Bug and the mouth of the Dnieper. Olgierd was succeeded by his son Jagiello as grand duke in 1377, while Kiejstut was left in possession of Samogitia, Troki and Grodno; but the Teutonic Order, alarmed at the growth of Lithuania, succeeded in estranging uncle and nephew, and Kiejstut was treacherously assassinated by Jagiello's orders, at Krewo, on the 15th of August 1382. Three weeks later Jagiello was compelled to cede Samogitia, as far as the Dubissa, to the Knights, and, in the following year they set up against him Kiejstut's son Witowt. The eyes of Jagiello were now opened to the fact that the machiavellian policy of the Knights aimed at subjugating Lithuania by dividing it. He at once made peace with his cousin; restored him his patrimony; and, to secure Lithuania against the future vengeance of the Knights, Jagiello made overtures to Poland for the hand of Jadwiga, and received the Polish crown along with it, as already men- tioned

Before proceeding to describe the Jagiellonic period of Polish history, it is necessary to cast a rapid glance at the social and political condition of the country in the preceding Piast period.

The paucity and taciturnity of our sources make it impossible to give anything like an adequate picture of Old Poland during Beginnings tne fi

rst f° ur centuries of its existence. A glimpse of the Polish here and there of the political development of the Constitu- country is the utmost that the most diligent scrutiny on ‘ can glean from the scanty record of the early chron-

icles. External pressure, here as elsewhere, created a patriotic military caste, and the subsequent partitional period, when every little prince had his own separate court, still further established the growing influence of the szlachta, or gentry, who were not backward in claiming and obtaining special privileges in return for their services. The first authentic pacta conventa rnade between the Polish nobility and the Crown dates from the compact of Kassa (September 17, 1374), when Louis of Hungary agreed to exempt the szlachta from all taxation, except two Polish groschen per hide of land, and to compensate them for the expenses of all military service rendered beyond the confines of the realm. The clergy received their chief

privileges much earlier. It was at the synod of Leczyca, nearly a century before the compact of Kassa, that the property of the Church was first safeguarded against the encroachments of the state. The beneficial influence of the Church of Poland in these early times was incalculable. To say nothing of the labours of the Cistercians as colonists, pioneers and church- builders, or of the missions of the Dominicans and Franciscans (the former of whom were introduced into Poland by Ivo, bishop of Cracow, 1 the personal friend of Dominic), the Church was the one stable and unifying element in an age of centrifugal particularism. The frequent synods represented the whole of Poland, and kept alive, as nothing else could, the idea of national solidarity. The Holy See had also a considerable share in promoting the political development of the land. In the 13th century alone no fewer than forty-nine papal legates visited Poland, and thirty provincial synods were held by them to regulate church affairs and promote good government. Moreover the clergy, to their eternal honour, consistently protected the lower from the tyranny of the upper classes.

The growth of the towns was slower. During the heroic Boleslawic period there had been a premature outcrop of civil life. As early as the nth century Kruschwitz, Growth the old Polish capital, and Gnesen, the metropolitan of the see, were of considerable importance, and played a “was.

leading part in public life. But in the ensuing anarchic period both cities were utterly ruined, and the centre of political gravity was transferred from Great Poland to Little Poland, where Cracow, singularly favoured by her position, soon became the capital of the monarchy, and one of the wealthiest cities in Europe. At the end of the 14th century we find all the great trade gilds established there, and the cloth manufactured at Cracow was eagerly sought after, from Prague to Great Novgorod. So wealthy did

Cracow become at last that Casimir the Great felt it necessary to restrain the luxury of her citizens by sumptuary ordinances. Towards the end of the 14th century the Polish towns even attained some degree of political influence, and their delegates sat with the nobles and clergy in the king's councils, a right formally conceded to them at Radom in March 1384. Even the peasants, who had suffered severely from the wholesale establishment of prisoners of war as serfs on the estates of the nobles, still preserved the rights of personal liberty and free transit from place to place, whence their name of lazigi. The only portion of the community which had no privileges were the Jews, first introduced into Poland by Boleslaus the Pious, duke of Great Poland, in 1264, when bitter persecutions had driven them northwards from the shores of the Adriatic. Casimir the Great extended their liberty of domicile over the whole kingdom (1334). From the first they were better treated in Poland than elsewhere, though frequently exposed to outbreaks of popular fanaticism.

The transformation of the pagan Lithuanian chieftain Jagiello into the catholic king of Poland, Wladislaus II., was an event of capital importance in the history of eastern Europe. „,. .. _ Its immediate and inevitable consequence was the laus n. formal reception of the Lithuanian nations into the and the fold of the Church. What the Teutonic Order had vainly endeavoured to bring about by fire and sword, for two centuries, was peacefully accomplished by Jagiello within a single generation, the Lithuanians, for the most part, willingly yielding to the arguments of a prince of their own blood, who promptly rewarded his converts with peculiar and exclusive privileges. The conversion of Lithuania menaced the very existence of the Teutonic Knights. Originally planted on the Baltic shore for the express purpose of christianizing their savage neighbours, these crusading monks had freely exploited the wealth and the valour of the West, ostensibly in the cause of religion, really for the purpose of founding a dominion of their own which, as time went on, lost more and more of its religious character, and was now little more than a German military forepost, extending from Pomerania to the Niemen, which deliberately excluded the Slavs from the sea and thrived

1 Archbishop of Gnesen 1219-1220. Died at Modena 1229.

Teutonic Order.

at their expense. The mere instinct of self-preservation had, at last, drawn the Poles and Lithuanians together against these ruthless and masterful intruders, and the coronation of Jagiello at Cracow on the 15th of February 1386, was both a warning and a challenge to the Knights. But if the Order had now become a superfluous anachronism, it had still to be disposed of, and this was no easy task. For if it had failed utterly as a mission in partibus, it had succeeded in establishing on the Baltic one of the strongest military organizations in Europe. In the art of war the Knights were immeasurably superior to all their neighbours. The pick of the feudal chivalry composed their ranks; with all Europe to draw upon, their resources seemed inexhaustible, and centuries of political experience made them as formidable in diplomacy as they were valiant in warfare. And indeed, for the next twenty years, the Teutonic Order more than held its own. Skilfully taking advantage of the jealousies of Poland and Lithuania, as they were accentuated by the personal antagonism of Jagiello and Witowt (g.v.), with the latter of whom the Knights more than once contracted profitable alliances, they even contrived (Treaty of Salin, 1378) to extend their territory by getting possession of the province of Samogitia, the original seat of the Lithuanians, where paganism still persisted, and where their inhuman cruelties finally excited the horror and indignation of Christian Europe. By this time, however, the prudent Jagiello had become convinced that Lithuania was too strong to be ruled by or from Poland, and yet not strong enough to stand alone, and by the compact of Vilna (January 18, 1401, confirmed by the compact of Radowo, March 10) he surrendered the whole grand duchy to Witowt, on the understanding that the two states should have a common policy, and that neither of them should elect a new prince without the consent of the other. The wisdom of this arrangement was made manifest in 1410, when Jagiello and Witowt combined their forces for the purpose of delivering Samogitia from the intolerable tyranny of the Knights. The issue was fought out on the field of Tannenberg, or Grunewald (July 15, 1410), when the Knights sustained a crushing defeat, which shook their political organization to its very foundations. A few weeks after the victory the towns of Thorn, Elbing, Braunsberg and Danzig submitted to the Polish king, and all the Prussian bishops voluntarily offered to render him homage. But the excessive caution of Jagiello gave the Knights time to recover from the blow; the Polish levies proved unruly and incompetent; Witowt was suddenly recalled to Lithuania by a Tatar invasion, and thus it came about that, when peace was concluded at Thorn, on the 1st of February 141 1, Samogitia (which was to revert to the Order on the death of Jagiello and Witowt), Dobrzyn, and a war indemnity of 100,000 marks payable in four instalments, were the best terms Poland could obtain from the Knights, whose territory practically remained intact. Jagiello's signal for the attack at the battle of Grunewald, " Cracow and Vilna " (the respective capitals of Poland and

Lithuania) had 'eloquently demonstrated the solidarity of the two states. This solidarity was still further strengthened by the Union of Horodlo (October 2, 1413) which enacted that henceforth Lithuania was to have the same order of dignitaries 1 as Poland, as well as a council of state, or senate, similar to the Polish senate. The power of the grand-duke was also greatly increased. He was now declared to be the equal of the Polish king, and his successor could be elected only by the senates of Poland and Lithuania in con- junction. The Union of Horodlo also established absolute parity between the nobility of Poland and Lithuania, but the privileges of the latter were made conditional upon their pro- fession of the Roman Catholic faith, experience having shown that difference of religion in Lithuania meant difference of politics, and a tendency Moscow-wards, the majority of the Lithuanian boyars being of the Greek Orthodox Confession.

1 All the chief offices of state were consequently duplicated, e.g. the hetman wielki koronny, i.e. " grand hetman of the crown," as the Polish commander-in-chief was called, had his counterpart in Lithuania, who bore the title of wielki hetman litewski, i.e. grand hetman of Lithuania," and so on.

During the remainder of the reign of Wladislaus II. the Teutonic Order gave Poland much trouble, but no serious anxiety. The trouble was due mainly to the repeated efforts of the Knights to evade the fulfilment of the obligations of the Treaty of Thorn. In these endeavours they were materially assisted by the emperor Sigismund, who was also king of Hungary. Sigismund, in 1422, even went so far as to propose a partition of Poland between Hungary, the empire and the Silesian princes, a scheme which foundered upon Sigismund's impecuniosity and the reluctance of the Magyars to injure the Poles. More than once Wladislaus II. was even obliged to renew the war against the Knights, and, in 1422, he compelled them to renounce all claims upon Samogitia; but the long struggle, still undecided at his death, was fought mainly with diplomatic weapons at Rome, where the popes, generally speak- ing, listened rather to the victorious monarch who had added an ecclesiastical province to the Church than to the discomfited and turbulent Knights.

Had Wladislaus II. been as great a warrior as Witowt he might, perhaps, have subdued the Knights altogether. But by nature he was pre-eminently a diplomatist, and it must in fairness be admitted that his diplomacy in every direction was distinctly beneficial to Poland. He successfully thwarted all the schemes of the emperor Sigismund, by adroitly supporting the revolutionary party in Bohemia (q.v.). In return Hussite mercenaries fought on the Polish side at Tannenburg, and Czech patriots repeatedly offered the crown of Bohemia to Wladislaus. The Polish king was always ready enough to support the Czechs against Sigismund; but the necessity of justifying his

own orthodoxy (which the Knights were for ever impugning) at Rome and in the face of Europe prevented him from accepting the crown of St Wenceslaus from the hands of heretics.

Wladislaus II. died at Lemberg in 1434, at the age of eighty- three. During his long reign of forty-nine years Poland had gradually risen to the rank of a great power, a result due in no small measure to the insight and sagacity of the first Jagiello, who sacrificed every other consideration to the vital necessity of welding the central Slavs into a compact and homogeneous state. The next ten years severely tested the stability of his great work, but it stood the test triumphantly. Neither a turbulent minority, nor the neglect of an absentee king; neither the revival of separatist tendencies in Lithuania, nor the out- breaks of aristocratic lawlessness in Poland, could do more than shake the superstructure of the imposing edifice. After the death at Varna, in 1444, of Jagiello's eldest son and successor, Wladislaus III. (whose history belongs rather to Hungary than to Poland), another great statesman, in nowise inferior to Wladis- laus II., completed and consolidated his work. This was Wladislaus's second son, already grandduke of Lithuania, who ascended the Polish throne as Casimir IV. in 1447, thus reuniting Poland and Lithuania under one monarch.

Enormous were the difficulties of Casimir IV. He instinc- tively recognized not only the vital necessity of the maintenance of the union between the two states, but also the fact that the chief source of danger to the union lay i 447 _i 4 g2 " in Lithuania, in those days a maelstrom of conflicting political currents. To begin with, Lithuania was a far less composite state than Poland. Two-thirds of the grandduchy consisted of old Russian lands inhabited by men who spoke the Ruthenian language and professed the Orthodox Greek religion, while in the north were the Lithuanians proper, semi- savage and semi-catholic, justly proud of their heroic forefathers of the house of Gedymin, and very sensitive of the pretensions of Poland to the provinces of Volhynia and Podolia, the fruits of Lithuanian valour. A Lithuanian himself, Casimir strenuously resisted the attempts of Poland to wrest these provinces from the grandduchy. Moreover, during the earlier years of his reign, he was obliged to reside for the most part in Lithuania, where his tranquilizing influence was needed. His supposed preference for Lithuania was the real cause of his unpopularity in Poland, where, to the very end of his reign, he was regarded

with suspicion, and where every effort was made to thwart bis far-seeing and patriotic political combinations, which were beyond the comprehension of his self-seeking and narrow- minded contemporaries. This was notably the case as regards his dealings with the old enemy of his race, the Teutonic Order, whose destruction was the chief aim of his ambition.

The Teutonic Order had long since failed as a religious institu- tion; it was now to show its inadequacy as a political organiza- tion. In the domain of the Knights the gentry, parochial clergy and townsmen, who, beneath its protection, had attained to a high degree of wealth and civilization, for long remained without the slightest political influence, though they bore nearly the whole burden of taxation. In 1414, however, intimidated by the growing discontent, which frequently took the form of armed rebellion, the Knights consented to the establishment of a diet, which was re-formed on a more aristocratic basis in 1430. But the old abuses continuing to multiply, the Prussian towns and gentry at last took their affairs into their own hands, and formed a so-called Prussian League, which demanded an equal share in the government of the country. This league was excommunicated by the pope, and placed under the ban of the empire almost simultaneously in 1453, whereupon it placed itself beneath the protection of its nearest powerful neighbour, the king of Poland, who (March 6, 1454) issued a manifesto incorporating all the Prussian provinces with Poland, but, at the same time, granting them local autonomy and free trade.

But provinces are not conquered by manifestoes, and Casimir's acceptance of the homage of the Prussian League at once involved him in a war with the desperate Teutonic Knights, which lasted twelve years, but might easily have been concluded in a twelvemonth had he only been loyally supported by his own subjects, for whose benefit he had embarked upon this great enterprise. But instead of support, Casimir encountered obstinate obstruction at every point. No patriotic Pole, we imagine, can read the history of this miserable war without feeling heartily ashamed of his countrymen. The acquisition of the Prussian lands was vital to the existence of Poland. It meant the excision of an alien element which fed like a cancer on the body politic; it meant the recovery, at comparatively little cost, of the command of the principal rivers of Poland, the Vistula and the Niemen; it meant the obtaining of a seaboard with the corollaries of sea-power and world-wide commerce. Yet, except in the border province of Great Poland, which was interested commercially, the whole enterprise was regarded with such indifference that the king, in the very crisis of the struggle, could only with the utmost difficulty obtain contribu- tions for war expenses from the half-dozen local diets of Poland, which extorted from the helplessness of their distracted and impecunious sovereign fresh privileges for every subsidy they grudgingly granted. Moreover Casimir's difficulties were materially increased by the necessity of paying for Czech mercenaries,

the pospolite ruszenie, or Polish militia, proving utterly useless at the very beginning of the war. Indeed, from first to last, the Polish gentry as a body took good care to pay and fight as little as possible, and Casimir depended for the most part upon the liberality of the Church and the Prussian towns, and the valour of the Hussite infantry, 170,000 of whom, fighting on both sides, are said to have perished. Not till the victory of Puck (September 17, 1462), one of the very few pitched battles in a war of raids, skirmishes and sieges, did fortune incline decisively to the side of the Poles, who maintained and improved their advantage till absolute exhaustion compelled the Knights to accept the mediation of a papal legate, and the second peace of Thorn (October 14, 1466) concluded a struggle which had reduced the Prussian provinces to a wilder- ness. 1 By the second peace of Thorn, Poland recovered the provinces of Pomerelia, Kulm and Michalow, with the bishopric of Ermeland, numerous cities and fortresses, including Marien-

- *18,000 of their 21,000 villages were destroyed, 1000 churches were razed to the ground, and the population was diminished by more than a quarter of a million.*

burg, Elbing, Danzig and Thorn. The territory of the Knights was now reduced to Prussia proper, embracing, roughly speak- ing, the district between the Baltic, the lower Vistula and the lower Niemen, with Konigsberg as its capital. For this territory the grand-masters, within nine months of their election, were in future to render homage to the Polish king; but, on the other hand, the king undertook not to make war or engage in any important enterprise without the consent of the Prussian pro- vince, and vice versa. Thus Prussia was now confederated with Poland, but she occupied a subordinate position as compared with Lithuania, inasmuch as the grand-master, though filling the first place in the royal council, was still a subject of the Polish crown. Thus the high hopes entertained by Casimir at the beginning of the war had not been realized. The final settlement with the Poles was of the nature of a compromise. Still the Knights had been driven beyond the Vistula, and Poland had secured a seaboard; and it was due entirely to the infinite patience and tenacity of the king that even as much as this was won at last.

The whole foreign policy of Casimir IV. was more or less conditioned by the Prussian question, and here also his superior diplomacy triumphantly asserted itself. At the beginning of the war both the empire and the pope were against him, but he neutralized their hostility by allying himself with George of Podvebrad, whom the Hussites had placed on the throne of Bohemia. On the death of George, Casimir's eldest son Wladis- laus was elected king of Bohemia by the Utraquist party, despite the determined opposition of Matthias Corvinus, king of Hungary, whose ability and

audacity henceforth made him Casimir's most dangerous rival. Sure of the support of the pope, Matthias (q.v.) deliberately set about traversing all the plans of Casimir. He encouraged the Teutonic Order to rebel against Poland; he entertained at his court anti- Polish embassies from Moscow; he encouraged the Tatars to ravage Lithuania; he thwarted Casimir's policy in Moldavia. The death of the brilliant adventurer at Vienna in 1490 came therefore as a distinct relief to Poland, and all danger from the side of Hungary was removed in 1490 when Casimir's son Wladislaus, already king of Bohemia, was elected king of Hungary also.

It was in the reign of Casimir IV. that Poland first came into direct collision with the Turks. The Republic was never, indeed, the " Buckler of Christendom." That glorious epithet belonged of right to Hungary, which t £ e Tur ˆ St had already borne the brunt of the struggle with the Ottoman power for more than a century. It is true that Wladislaus II. of Poland had fallen on the field of Varna, but it was as a Magyar king at the head of a Magyar army that the young monarch met his fate. Poland, indeed, was far less able to cope with the Turks than compact, wealthy Hungary, which throughout the 15th century was one of the most efficient military monarchies in Europe. The Jagiellos, as a rule, prudently avoided committing themselves to any political system which might irritate the still distant but much-dreaded Turk, but when their dominions extended so far southwards as to embrace Moldavia, the observance of a strict neutrality became exceedingly difficult. Poland had established a sort of suzerainty over Moldavia as early as the end of the 14th century; but at best it was a loose and vague overlordship which the Hospodars repudiated whenever they were strong enough to do so. The Turks themselves were too much occupied elsewhere to pay much attention to the Danubian principalities till the middle of the 15th century. In 1478 Mahomet II. had indeed attempted their subjugation, with but indifferent success; but it was not till 1484 that the Ottomans became inconvenient neighbours to Poland. In that year a Turkish fleet captured the strongholds of Kilia and Akkerman, commanding respectively the mouths of the Danube and Dniester. This aggression seriously threatened the trade of Poland, and induced Casimir IV. to accede to a general league against the Porte. In 1485, after driving the Turks out of Moldavia, the Polish king, at the head of 20,000 men, proceeded to Kolomea on the

Pruth, where Bayezid II., then embarrassed by the Egyptian war, offered

peace, but as no agreement concerning the captured fortresses could be arrived at, hostilities were suspended by a truce. During the remainder of his reign the Turks gave no trouble.

It was a fortunate thing for Poland that, during the first century of her ascension to the rank of a great power, political exigencies compelled her to appropriate almost more territory than her primitive and centrifugal government could properly assimilate; it was fortunate that throughout this period of expansion her destinies should, with one brief interval, have been controlled by a couple of superior statesmen, each of whom ruled for nearly fifty years. During the fourteen years (1492- 1 506) which separate the reigns of Casimir IV. and Sigismund I. she was not so lucky. The controlling hand of Casimir IV. was no sooner withdrawn than the unruly elements, ever present in the Republic, and ultimately the casue of its ruin, at once burst forth. The first symptom of this lawlessness was the separation of Poland and Lithuania, the Lithuanians proceeding to elect Alexander, Casiinir's fourth son, as their grand-duke, without even consulting the Polish senate, in flagrant violation of the union of Horodlo. The breach, happily, was of no very long duration. A disastrous war with Ivan III., the first Muscovite tsar, speedily convinced the Lithuanians that they were not strong enough to stand alone, and in 1499 they voluntarily renewed the union. Much more dangerous was the political revolution proceeding simultaneously in Poland, John 1. where John Albert, the third son of Casimir, had Albert, been elected king on the death of his father. The 1492-1501. na t ur e of this revolution will be considered in detail when we come to speak of the growth of the Polish constitution. Suffice it here to say that it was both anti- monarchical and anti-democratic, tending, as it did, to place all political authority in the hands of the szlachta, or gentry. The impecunious monarch submitted to the dictation of the diet in the hope of obtaining sufficient money to prosecute his ambitious designs. With his elder brother Wladislaus reigning over Bohemia and Hungary the credit of the Jagiellos in Europe had never been so great as it was now, and John Albert, bent upon military glory, eagerly placed himself at the head of what was to have been a great anti-Turkish league, but ultimately dwindled down to a raid upon Moldavia which ended in disaster. The sole advantage which John Albert reaped from his champion- ship of the Christian cause was the favour of the Curia, and the ascendancy which that favour gave him over the Teutonic Knights, whose new grand-master, Albert of Saxony, was reluc- tantly compelled to render due homage to the Polish king. Under Alexander (q.v.), who succeeded his brother

Alcxsnoct •*

1501-1506.' m I 5 OI > matters went from bad to worse. Alex- ander's

election cemented, indeed, once for all, the union between Poland and Lithuania, inasmuch as, on the eve of it (Oct. 3, 1501) the senates of both countries agreed that, in future, the king of Poland should always be grand-duke of Lithuania; but this was the sole benefit which the Republic derived from the reign of Alexander, under whom the Polish government has been well described as a rudderless ship in a stormy sea, with nothing but the grace of God between it and destruction. In Lithuania the increasing pressure of the Muscovite was the chief danger. Till the accession of Ivan III. in 1462 Muscovy had been a negligible factor in Lithuania. Polish politics. During the earlier part of the 15th century the Lithuanian princes had successfully contested Muscovite influence even in Pskov and Great Novgorod. Many Russian historians even maintain that, but for the fact that Witowt had simultaneously to cope with the Teutonic Order and the Tatars, that energetic prince would certainly have extinguished struggling Muscovy altogether. But since the death of Witowt (1430) the military efficiency of Lithuania had sensibly declined; single-handed she was no longer a match for her ancient rival. This was owing partly to the evils of an oligarchic government; partly to the weakness resulting from the natural attraction of the Orthodox-Greek element in Lithu-

ania towards Muscovy, especially after the fall of Constantinople, but chiefly to the administrative superiority of the highly cen- tralized Muscovite government. During the reign of Alex- ander, who was too poor to maintain any adequate standing army in Lithuania, the Muscovites and Tatars ravaged the whole country at will, and were prevented from conquering it altogether only by their inability to capture the chief fortresses. In Poland, meanwhile, something very like anarchy prevailed. Alexander had practically surrendered his authority to an incapable aristocracy, whose sole idea of ruling was systematically to oppress and humiliate the lower classes. In foreign affairs a policy of drift prevailed which encouraged all the enemies of the Republic to raise their heads, while the dependent states of Prussia in the north and Moldavia in the south made strenuous efforts to break away from Poland. Fortunately for the integ- rity of the Polish state the premature death of Alexander in 1506 brought upon the throne his capable brother Sigismund, the fifth son of Casimir IV., whose long reign of forty-two years was salutary, and would have been iso6™548. ”' altogether recuperative, had his statesmanship only been loyally supported by his subjects. Eminently practical, Sigismund recognized that the first need of Poland was a stand- ing army. The miserable collapse of the Polish chivalry during the Bukovinian campaign of 1497 had convinced every one that the ruszenie pospolite was useless for serious military purposes, and that Poland, in order to hold her own , must in future follow the example of the West, and wage her warfare with trained mercenaries. But professional soldiers could not be hired without

money, and the difficulty was to persuade the diet to loose its purse-strings. All that the gentry contributed at present was two pence (groschen) per hide of land, and this only for defensive service at home. If the king led the ruszenie pospolite abroad he was obliged to pay so much per pike out of his own pocket, notwithstanding the fact that the heavily mortgaged crown lands were practically valueless. At the diet of T510 the chancellor and primate, Adam Laski, proposed an income-tax of 50% at once, and 5% for subsequent years, payable by both the lay and clerical estates. In view of the fact that Poland was the most defenceless country in Europe, with no natural boundaries, and constantly exposed to attacks from every quarter, it was not unreasonable to expect even this patriotic sacrifice from the privileged classes, who held at least two-thirds of the land by military tenure. Nevertheless, the diet refused to consider the scheme. In the following year a more modest proposal was made by the Crown in the shape of a capitation of six gulden, to be levied on every nobleman at the beginning of a campaign, for the hiring of mercenaries. This also was rejected. In 1512 the king came forward with a third scheme. He proposed to divide the country into five circles, corresponding to the five provinces, each of which was to undertake to defend the realm in turn should occasion arise. Moreover, every one who so desired it might pay a commutation in lieu of personal service, and the amount so realized was to be re-used to levy troops. To this the dietines, or local diets, of Great Poland, and Little Poland, agreed, but at the last moment the whole project foundered on the question who was the proper custodian of the new assessment rolls, and the king had to be content with the renewal of former subsidies, varying from twelve to fifteen groats per hide of land for three years. Well might the disappointed monarch exclaim: " It is vain to labour for the welfare of those who do not care a jot about it them- selves." Matters improved somewhat in 1527, when the szlachta, by a special act, placed the mightiest magnates on the same level as the humblest squire as regards military service, and proposed at the same time a more general assessment for the purpose, the control of the money so realized to be placed in the hands of the king. In consequence of this law the great lords were compelled to put forces in the field proportioned to their enormous fortunes, and Sigismund was able in 1529 to raise 300 foot and 3200 horse from the province of Podolia alone. But though the treasury was thus temporarily replenished and the army increased, the gentry who had been so generous at

the expense of their richer neighbours would hear of no addi- tional burdens being laid on themselves, and the king only obtained what he wanted by sacrificing his principles to his necessities, and helping the szlachta to pull down the magnates. This fatal parsimony had the most serious political consequences, for it crippled the king at every step. Strive and scheme as he might, his needs were so urgent, his enemies so numerous, that, though generally successful in the end, he had always to be content with compromises, adjustments and semi-victories. Thus he was obliged, in 1525, to grant local autonomy to the province of Prussia instead of annexing it; he was unable to succour his unfortunate nephew, Louis of Hungary, against the Turkish peril; he was compelled to submit to the occupation of one Lithuanian province after the other by the Muscovites, and look on helplessly while myriads of Tatars penetrated to the very heart of his domains, wasting with fire and sword everything they could not carry away with them.

Again, it should have been the first duty of the Republic adequately to fortify the dzikie pola, or " savage steppe," as the vast plain was called which extended from Kiev Cossacks. t° the Black Sea, and some feeble attempts to do so were at last made. Thus, in the reign of Alexander, the fugitive serfs whom tyranny or idleness had driven into this wilderness (they were subsequently known as Kazaki, or Cossacks, a Tatar word meaning freebooters) were formed into companies (c. 1504) and placed at the disposal of the frontier starostas, or lord marchers, of Kaniev, Kamenets, Czerkask on the Don and other places. But these measures proved inade- quate, and in 1533 the lord marcher, Ostafi Daszkiewicz, the hero of Kaniev, which he had successfully defended against a countless host of Turks and Tatars, was consulted by the diet as to the best way of defending the Ukraine permanently against such inroads. The veteran expert advised the populating and fortifying of the islands of the Dnieper. Two thousand men would suffice, he said, and the Cossacks supplied excellent military material ready to hand. The diet unanimously approved of this simple and inexpensive plan; a special com- mission examined and approved of its details, and it was sub- mitted to the next diet, which rejected it. So nothing at all was done officially, and the defence of the eastern Ukraine was left to providence. Oddly enough the selfish prudence of Sigis- mund's rapacious consort, Queen Bona, did more for the national defence than the Polish state could do. Thus, to defend her immense possessions in Volhynia and Podolia, she converted the castles of Bar and Krzemieniec into first-class fortresses, and placed the former in the hands of her Silesian steward, who acquitted himself so manfully of his charge 1 that "the Tatars fell away from the frontier all the days of Pan Pretficz," and a large population settled securely beneath the walls of Bar, henceforth known as " the bastion of Podolia." Nothing, perhaps, illustrates so forcibly

the casual character of the Polish government in the most vital matters as this single incident.

The most important political event during the reign of Sigis- mund was the collapse of the ancient Hungarian monarchy at Mohacs in 1526. Poland, as the next neighbour of Hungary, was more seriously affected than any other European power by this catastrophe, but her politicians differed as to the best way of facing it. Immediately after the death of King Louis, who fell on the field of battle, the emperor Ferdinand and John Zapolya, voivode of Transylvania, competed for the vacant crown, and both were elected almost simultaneously. In Poland Zapolya's was the popular cause, and he also found powerful support in the influential and highly gifted Laski family, as represented by the Polish chancellor and his nephews John and Hieronymus. Sigismund, on the other hand, favoured Ferdinand of Austria. Though bound by family ties with both competitors, he regarded the situation from a purely political point of view. He argued that the best way to keep the Turk from Poland was for Austria to incorporate Hungary, in which case the Austrian dominion would be a strong and permanent barrier against a Mussulman invasion of Europe. History has 1 Pretficz won no fewer than 70 engagements over the Tatars.

more than justified him, and the long duel which ensued between Ferdinand and Zapolya (see Hungary: History) enabled the Polish monarch to maintain to the end a cautious but observant neutrality. More than once, indeed, Sigismund was seriously compromised by the diplomatic vagaries of Hieronymus Laski, who entered the service of Zapolya (since 1529 the protege of the sultan), and greatly alarmed both the emperor and the pope by his disturbing philo-Turk proclivities. It was owing to Laski's intrigues that the new hospodar of Moldavia, Petrylo, after doing homage to the Porte, intervened in the struggle as the foe of both Ferdinand and Sigismund, and besieged the Grand Hetman of the Crown, Jan Tarnowski, in Obertyn, where, however, the Moldavians (August 22, 1531) sustained a crush- ing defeat, and Petrylo was slain. Nevertheless, so anxious was Sigismund to avoid a collision with the Turks, that he forbade the victorious Tarnowski to cross the Moldavian frontier, and sent a letter of explanation to Constantinople. On the death of John Zapolya, the Austro-Polish alliance was still further cemented by the marriage of Sigismund's son and heir, Sigis- mund Augustus, with the archduchess Elizabeth. In the reign of Sigismund was effected the incorporation of the duchy of Masovia with the Polish crown, after an independent existence of five hundred years. In 1526 the male line of the ancient dynasty became extinct, and on the 26th of August Sigismund received the homage of the Masovians at Warsaw, the capital of the duchy and ere long of the whole kingdom. Almost every acre of densely populated Masovia was in the hands of her sturdy, ultra-conservative squires, in point of culture far below their

brethren in Great and Little Poland. The additional revenue gained by the Crown from Masovia was at first but 14,000 gulden per annum.

The four and twenty years of Sigismund II. 's reign was a critical period of Polish history. Complications with the Turk were avoided by the adroit diplomacy of the king, while the superior discipline and efficiency of the Polish armies under the great Tarnowski (q.v.) and his pupils overawed the Tatars and extruded the Muscovites, neither of whom were so trouble-some as they had been during the last reign. All the more disquieting was the internal condition of the country, due mainly to the invasion of Poland by the Reformation, and the coincidence of this invasion with an internal revolution of a quasi-democratic character, which aimed at substituting the rule of the szlachta for the rule of the senate.

Hitherto the Republic had given the Holy See but little anxiety. Hussite influences, in the beginning of the 15th century, had been superficial and transitory. The TheRetor- Polish government had employed Hussite mercen-mation in aries, but rejected Hussite propagandists. The p o , ^" a – edict of Wielun (1424), remarkable as the first anti-heretical decree issued in Poland, crushed the new sect in its infancy. Lutheranism, moreover, was at first regarded with grave sus- picion by the intensely patriotic Polish gentry, because of its German origin. Nevertheless, the extremely severe penal edicts issued during the reign of Sigismund I., though seldom applied, seem to point to the fact that heresy was spreading widely throughout the country. For a time, therefore, the Protestants had to be cautious in Poland proper, but they found a sure refuge in Prussia, where Lutheranism was already the estab- lished religion, and where the newly erected university of Konigsberg became a seminary for Polish ministers and preachers.

While Lutheranism was thus threatening the Polish Church from the north, Calvinism had already invaded her from the west. Calvinism, indeed, rather recommended itself to the Poles as being of non-German origin, and Calvin actually dedicated his Commentary on the Mass to the young krolewicz (or crown prince) Sigismund Augustus, from whom protestantism, erron- eously enough, expected much in the future. Meanwhile conversion to Calvinism, among the higher classes in Poland, became more and more frequent. We hear of crowded Calvinist conventicles in Little Poland from 1543 onwards, and Calvinism continued to spread throughout the kingdom during the latter

years of Sigismund I. Another sect, which ultimately found even more favour in Poland than the Calvinists, was that of the Bohemian Brethren. We first hear of them in Great Poland in 1548. A royal decree promptly banished them to Prussia, where they soon increased so rapidly as to be able to hold their own against the Lutherans. The death of the uncompromising Sigismund I. came as a great relief to the Protestants, who entertained high hopes of his son and successor. He was known to be familiar with the works of the leading reformers; he was surrounded by Protestant counsellors, and he was actually married to Barbara, daughter of Prince Nicholas Radziwill, " Black Radziwill," the all-powerful chief of the Lithuanian Calvinists. It was not so generally known that Sigismund II. was by conviction a sincere though not a bigoted Catholic; and nobody suspected that beneath his diplomatic urbanity lay a patriotic firmness and statesmanlike qualities of the first order. Moreover, they ignored the fact that the success of the Protestant propaganda was due rather to political than to religious causes. The Polish gentry's jealousy of the clerical estate, whose privi- leges even exceeded their own, was at the bottom of the whole matter. Any opponent of the established clergy was the natural ally of the szlachla, and the scandalous state of the Church herself provided them with a most formidable weapon against her. It is not too much to say that the condition of the Catholic Church in Poland was almost as bad as it was in Scotland during the same period. The bishops were, for the most part, elegant triflers, as pliant as reeds, with no fixed principles and saturated with a false humanism. Some of them were notorious evil- livers. " Pint-pot " Latuski, bishop of Posen, had purchased his office for 12,000 ducats from Queen Bona; while another of her creatures, Peter, popularly known as the " wencher," was appointed bishop of Przemysl with the promise of the reversion of the still richer see of Cracow. Moreover, despite her immense wealth (in the province of Little Poland alone she owned at this time 26 towns, 83 landed estates and 772 villages), the Church claimed exemption from all public burdens, from all political responsibilities, although her prelates continued to exercise an altogether disproportionate political influence. Education was shamefully neglected, the masses being left in almost heathen ignorance — and this, too, at a time when the upper classes were greedily appropriating the ripe fruits of the Renaissance and when, to use the words of a contemporary, there were " more Latinists in Poland than there used to be in Latium." The university of Cracow, the sole source of know- ledge in the vast Polish realm, still moved in the vicious circle of scholastic formularies. The provincial schools, dependent upon so decrepit an alma mater, were suffered to decay. This criminal neglect of national education brought along with it its own punishment. The sons of the gentry, denied proper instruction at home, betook themselves to the nearest univer- sities across the border, to Goldberg in Silesia, to Wittemberg, to Leipzig. Here they fell in with the adherents of the new

faith, grave, earnest men who professed to reform the abuses which had grown up in the Church; and a sense of equity as much as a love of novelty moved them, on their return home, to propagate wholesome doctrines and clamour for the reformation of their own degenerate prelates. Finally the poorer clergy, neglected by their bishops, and excluded from all preferment, took part with the szlachla against their own spiritual rulers and eagerly devoured and imparted to their flocks, in their own language, the contents of the religious tracts which reached them by divers ways from Goldberg and Konigsberg. Nothing indeed did so much to popularize the new doctrines in Poland as this beneficial revival of the long-neglected vernacular by the reformers.

Such was the situation when Sigismund II. began his reign. The bishops at once made a high bid for the favour of the new Sigis- king by consenting to the coronation of his Calvinist

muadlt.. consort (Dec. 7, 1550) and the king five days 1548-1S72. afterwards issued the celebrated edict in which he pledged his royal word to preserve intact the unity of the Church and to enforce the law of the land against heresy. Encouraged by this pleasing symptom of orthodoxy the bishops, instead

of first attempting to put their own dilapidated house in order, at once proceeded to institute prosecutions for heresy against all and sundry. This at once led to an explosion, and at the diet of Piotrkow, 1552; the szlachla accepted a proposition of the king, by way of compromise, that the jurisdiction of the clerical courts should be suspended for twelve months, on condition that the gentry continued to pay tithes as heretofore. Then began a religious interim, which was gradually prolonged for ten years, during which time Protestantism in Poland flourished exceedingly. Presently reformers of every shade of opinion, even those who were tolerated nowhere else, poured into Poland, which speedily became the battle-ground of all the sects of Europe. Soon the Protestants became numerous enough to form ecclesiastical districts of their own. The first Calvinist synod in Poland was held at Pinczow in 1550. The Bohemian Brethren evangelized Little Poland, but ultimately coalesced with the Calvinists at the synod of Kozminek (August 1555). In the diet itself the Protestants were absolutely supreme,, and invariably elected a Calvinist to be their marshal. A- the diet of 1555 they boldly demanded a national synod, absolute toleration, and the equalization of all the sects except the A'nti- trinitarians. But the king intervened and the existing interim was indefinitely prolonged. At the diet of Piotrkow, 1558-1559, the onslaught of the szlachla on the clergy was fiercer than ever, and they even demanded the exclusion of the bishops from the senate. The king, however, perceiving a danger to the constitution in the violence of the szlachla, not only supported the bishops, but*

quashed a subsequent reiterated demand for a national synod. The diet of 1558-1550 indicates the high-water mark of Polish Protestantism. From this time forward it began to subside, very gradually but unmistakably. The chief cause of this subsidence was the division among the reformers themselves. From the chaos of creeds resulted a chaos of ideas on all imaginable subjects, politics included. The Anti-trini- tarian proved to be the chief dissolvent, and from 1560 onwards the relations between the two principal Protestant sects, the Lutherans and the Calvinists, were fratricidal rather than fraternal. An auxiliary cause of the decline of Protestantism was the beginning of a Catholic reaction. The bulk of the popu- lation still held persistently, if languidly, to the faith of its fathers; the new bishops were holy and learned men, very unlike the creations of Queen Bona, and the Holy See gave to the slowly reviving zeal of both clergy and laity the very neces- sary impetus from without. For Poland, unlike Scotland, was fortunately, in those days of difficult inter-communication, not too far off, and it is indisputable that in the first instance it was the papal nuncios, men like Berard of Camerino and Giovanni Commendone, who reorganized the scattered and faint-hearted battalions of the Church militant in Poland and led them back to victory. At the diet of Piotrkow in 1562, indeed, the king's sore need of subsidies induced him, at the demand of the szlachta, to abolish altogether the jurisdiction of the ecclesiastical courts in cases of heresy; but, on the other hand, at the diet of 1564 he accepted from Commendone the Tridentine decrees and issued an edict banishing all foreign, and especially Anti-trinitarian, heretics from the land. At the diet of 1565 Sigismund went still farther. He rejected a petition for a national Tbe pacificatory synod as unnecessary, inasmuch as the Counter- council of Trent had already settled all religious Reformation questions, and at the same time consented to the " oao • introduction into Poland of the most formidable adversaries of the Reformation, the Jesuits. These had already been installed at Poltusk, and were permitted, after the diet rose, to found establishments in the dioceses of Posen, Ermeland and Vilna,. which henceforth became centres of a vigorous and victorious propaganda. Thus the Republic recovered her catholicity and her internal harmony at the same time.

With rare sagacity Sigismund II. had thus piloted the Republic through the most difficult internal crisis it had yet encountered. In purely political matters also both initiative and fulfilment came entirely from the Crown, and to the last of the Jagiellos Poland owed the important acquisition of Livonia and the

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welding together of her loosely connected component parts into a single state by the Union of Lublin.

In the middle of the 16th century the ancient order of the Knights of the Sword, whose territory embraced Esthonia, Livonia, Courland, Semgallen and the islands of Dago and Oesel, was tottering to its fall. All the Baltic powers were more or less interested in the apportionment of this vast tract of land, whose geographical position made it not only the chief commercial link between east and west, but also the emporium whence the English, Dutch, Swedes, Danes and Germans obtained their corn, timber and most of the raw products of Lithuania and Muscovy. Matters were complicated by the curious political intricacies of this long-coveted domain, where the grand-master, the archbishop of Riga, and the estates of Livonia possessed concurrent and generally conflicting jurisdictions. Poland and Muscovy as the nearest neighbours of this moribund state, which had so long excluded them from the sea, were vitally concerned in its fate. After an anarchic period of suspense, lasting from 1546 to 1561, during which Sweden secured Esthonia, while Ivan the Terrible fearlessly ravaged Livonia, in the hope of making it valueless to any other potentate, Sigismund II., to whom both the grand-master and the arch- bishop had appealed more than once for protection, at length intervened decisively. Both he and his chancellor, Piotr Myszkowski (d. 1501), were well aware of the importance of securing a coast-land which would enable Poland to become a naval power. But the diet, with almost incredible short-sighted- ness, refused to waste a penny on an undertaking which, they argued, concerned only Lithuania, and it was not as king of Poland, but as grand-duke of Lithuania, and with purely Lithuanian troops, that Sigismund, in 1561, occupied Livonia. At his camp before Riga the last grand-master, Gotthard von Ketteler, who had long been at the head of the Polish party in Livonia, and William of Brandenburg, archbishop of Riga, gladly placed themselves beneath his protection, and by a subse- quent convention signed at Vilna (Nov. 28, 1561), Livonia was incorporated with Lithuania in much the same way as Prussia had been incorporated with Poland thirty-six years previously. Ketteler, who had adopted Lutheranism during a visit to Germany in 1553, now professed the Augsburg Confession, and be- came the first duke of a new Protestant duchy, which he was to hold as a fief of the Polish crown, with local autonomy and abso- lute freedom of worship. The southern provinces of the ancient territory of the Order, Courland and Semgallen, had first been ceded on the 24th of June 1559 to Lithuania on similar condi- tions, the matter being finally adjusted by the compact cf March 1562.

The apathy of Poland in such a vital matter as the Livonian question must

have convinced so statesmanlike a prince as Sigismund II. of the necessity of preventing any possibility of cleavage in the future between the two halves of his dominions whose absolute solidarity was essential to their existence as a great power. To this patriotic design he devoted the remainder of his life. A personal union, under one monarch, however close, had proved inadequate. A further step must be taken — the two independent countries must be transformed into a single state. The great obstacle in the way of this, the only true solution of the difficulty, was the opposition of the Lithu- anian magnates, who feared to lose the absolute dominancy they possessed in the grand-duchy if they were merged in the szlachta of the kingdom. But, at the last moment, the dread of another Muscovite invasion made them more pliable and, at a Polish diet held at Warsaw from November 1363 to June 1364, which the Lithuanians attended, the question of an absolute union was hotly debated. When things came to a deadlock the king tactfully intervened and voluntarily relinquished his hereditary title to Lithuania, thus placing the two countries on a constitutional equality and preparing the way for fresh negotiations in the future. The death, in 1565, of Black Radziwill, the chief opponent of the union, still further weakened the Lithuanians, and the negotiations were reopened with more prospect of success at the diet which met at Lublin on the 10th

*of January 1 569. But even now the Lithuanians were indis- posed towards a complete union, and finally they quitted the diet, leaving two commissioners behind to watch their interests. Then Sigismund executed his master stroke. Knowing the sensitiveness of the Lithuanians as regards Volhynia and Podolia, he suddenly, of his own authority, formally incorporated both these provinces with the kingdom of Poland, whereupon, amidst great enthusiasm, the Volhynian and Podolian deputies took their places on the same benches as their Polish brethren. The hands of the Lithuanians were forced. Even a complete union on equal terms was better than mutilated independence. Accordingly they returned to the diet, and the complete union was unanimously adopted on the 1st of July Union of 1569. Henceforth the kingdom of Poland and the Lithuania grand duchy of Lithuania were to constitute one *l2 a Poland ‘ inseparable and indivisible body politic, under one sovereign, elected in common, with one diet and one currency. All dependencies and colonies, including Prussia and Livonia, were to belong to Poland and Lithuania in common. The retention of the old duality of dignities was the one reminis- cence of the original separation. No decision, however, could be come to as to the successor of the childless king, partly because of the multiplicity of candidates, partly because of Austrian intrigue, and this, the most momentous question of all, was still unsettled when Sigismund II. expired on the 6th of July 1572.*

The Jagiellonic period (1386-1572) is the history of the con- solidation

and fusion into one homogeneous, political whole of numerous national elements, more or less akin character ethnologically, but differing immensely in language, of the religion and, above all, in degrees of civilization. Jagiellonic Out of the ancient Piast kingdom, mutilated by the ˆtˆf.'. T2 loss of Silesia and the Baltic shore, arose a republic consisting at first of various loosely connected entities, naturally centrifugal, but temporarily drawn together by the urgent need of combination against a superior foe, who threatened them separately with extinction. Beneath the guidance of a dynasty of princes which, curiously enough, was supplied by the least civilized portion of this congeries of nationalities, the nascent republic gradually grew into a power which subjugated its former oppressors and, viewed externally, seemed to bear upon it the promise of empire. It is dangerous to prophesy, but all the facts and circumstances before us point irresistibly to the conclusion that had the Jagiellonic dynasty but endured this promise of empire might well have been realized. The extra- ordinary thing about the Jagiellos was the equable persistency of their genius. Not only were five of the seven great statesmen, but they were statesmen of the same stamp. We are disturbed by no such sharp contrasts as are to be found among the Plan- tagenets, the Vasas and the Bourbons. The Jagiellos were all of the same mould and pattern, but the mould was a strong one and the pattern was good. Their predominant and constant characteristic is a sober sagacity which instinctively judges aright and imperturbably realized its inspirations. The Jagiellos were rarely brilliant, but they were always perspicacious. Above all, they alone seem to have had the gift of guiding the most difficult of nations properly. Two centuries of Jagiellonic rule made Poland great despite her grave external difficulties. Had that dynasty been prolonged for another century, there is every reason to suppose that it would also have dealt satisfac- torily with Poland's still more dangerous internal difficulties, and arrested the development of that anarchical constitution which was the ruling factor in the ruin of the Republic.

Simultaneously with the transformation into a great power of the p"etty principalities which composed ancient Poland, another and equally momentous political transformation was proceeding within the country itself.

The origin of the Polish constitution is to be sought in the wiece or councils of the Polish princes, during the partitional period (c. 1279-1370). The privileges conferred upon the mag- nates of which these councils were composed, especially upon the magnates of Little Poland, who brought the Jagiellos to

the throne, directed their policy, and grew rich Upon their liberality, revolted the less favoured szlachta, or gentry, who, The Polish towards the end of the 14th century, combined for Coastitu- mutual defence in their sejmiki, or local diets, tioa. f w hich originally there were five, three in Great

Poland, one in Little Poland and one in Posen-Kalisz. 1 In these sejmiki the deputies of the few great towns were also represented. The Polish towns, notably Cracow, had obtained their privileges, including freedom from tolls and municipal government, from the Crown in return for important services, such as warding off- the Tatars, while the cities of German origin were protected by the Magdeburg law. Casimir the Great even tried to make municipal government as democratic as possible by enacting that one half of the town council of Cracow should be elected from the civic patriciate, but the other half from the commonalty. Louis the Great placed the burgesses on a level with the gentry by granting to the town council of Cracow jurisdiction over all the serfs in the extra-rural estates of the citizens. From this time forth deputies from the cities were summoned to the sejmiki on all important occasions, such, for instance, as the ratification of treaties, a right formally conceded to them by the sejmik of Radom in 1384. Thus at this period Poland was a confederation of half a dozen semi- independent states. The first general assembly of which we have certain notice is the zjazd walny which was summoned to Koszyce in November 1404, to relieve the financial embarrass- ments of Wladislaus, and granted him an extraordinary subsidy of twenty groats per hide of land to enable him to purchase Dobrzyn from the Teutonic Knights. Such subsidies were generally the price for the confirmation of ancient or the con- cession of new privileges. Thus at the diet of Brzesc Kujawski, in 1425, the szlachta obtained its first habeas corpus act in return for acknowledging the right of the infant krolewicz Wladislaus to his father's throne. The great opportunity of the szlachta was, of course, the election of a new king, especially the election of a minor, an event always accompanied and succeeded by disorders. Thus at the election of the infant Wladislaus III., his guardians promised in his name to confirm all the privileges granted by his father. If, on attaining his majority, the king refused to ratify these promises, his subjects were ipso facto absolved from their obedience. This is the first existence of the mischievous principle de prestanda obedientia, subsequently elevated into a statute. It is in this reign, too, that we meet with the first rokosz, or insurrection of the nobility against the executive. The extraordinary difficulties of Casimir IV. were freely exploited by the szlachta, who granted that ever impecu- nious

monarch as little as possible, but got full value for every penny they grudgingly gave. Thus by the Articles of Cerekwica presented to him by the sejmik or dietine of Great Poland in 1454 on the outbreak of the Teutonic War, he conceded the principle that no war should in future be begun without the consent of the local diets. A few months later he was obliged to grant the Privileges of Nieszawa, which confirmed and extended the operation of the Articles of Cerekwica. The sejmiki had thus added to their original privilege of self-taxation the right to declare war and control the national militia. 2 This was a serious political retrogression. A strongly centralized government had ever been Poland's greatest need, and Casimir the Great had striven successfully against all centrifugal ten- dencies. And now, eighty-four years after his death, Poland was once more split up into half a dozen loosely federated states in the hands of country gentlemen too ignorant and prejudiced to look beyond the boundaries of their own provinces. The only way of saving the Republic from disintegration was to concentrate all its political factors into a sejm-walny or general diet. But to this the magnates and the szlachta were equally opposed, the former because they feared the rivalry of a national assembly, the latter because they were of more importance in their local diets than they could possibly hope to be in a

1 The Red Russian sejmik was of later origin, c. 1433. 1 In view of the frequency of the Tatar inroads, the control of the militia was re-transferred to the Crown in 1501.

general diet. The first sejm to legislate for the whole of Poland was the diet of Piotrkow (1493), summoned by John Albert to grant him subsidies; but the mandates of its deputies were limited to twelve months, and its decrees were to have force for only three years. John Albert's second diet (1496), after granting subsidies the burden of which fell entirely on the towns and peasantry, passed a series of statutes benefiting the nobility at the expense of the other classes. Thus one statute permitted the szlachta henceforth to export and import goods duty free, to the great detriment of the towns and the treasury. Another statute prohibited the burgesses from holding landed property and enjoying the privileges attaching thereto. A third statute disqualified plebeians from being elected to canonries or bishoprics. A fourth endeavoured to bind the peasantry more closely to the soil by forbidding emigration. The condition of the serfs was subsequently (1520) still further deteriorated by the introduction of socage. In a word, this diet disturbed the equilibrium of the state by enfeebling and degrading the middle classes. Nevertheless, so long as the Jagiello dynasty lasted, the political rights of the cities were jealously protected by the Crown against the usurpations of the nobility. Deputies from the towns took part in the election of John Albert (1492), and the burgesses of Cracow, the most enlightened economists in the kingdom, supplied Sigismund I. with his most

capable counsellors during the first twenty years of his reign (1 506-1 526). Again and again the nobility attempted to exclude the deputies of Cracow from the diet, in spite of a severe edict issued by Sigismund I. in 1509, threatening to prosecute for treason all persons who dared to infringe the liberties of the citizens. During Sigismund's reign, moreover, the Crown recovered many of the prerogatives of which it had been deprived during the reign of his feeble predecessor, Alex- ander, who, to say nothing of the curtailments of the prerogative, had been forced to accept the statute nihil novi (1505) which gave the sejm and the senate an equal voice with the Crown in all executive matters. In the latter years of Sigismund I. (1 530-1 548) the political influence of the szlachta grew rapidly at the expense of the executive, and the gentry in diet assembled succeeded in curtailing the functions of all the great officers of state. During the reign of Sigismund II. (1548-1572) they diverted their attention to the abuses of the Church and con- siderably reduced both her wealth and her privileges. In this respect both the Crown and the country were with them, so that their interference,if violent,was on the whole distinctly beneficial. The childless Sigismund II. died suddenly without leaving any regulations as to the election of his successor. Fortunately for Poland the political horizon was absolutely later- unclouded. The Turks, still reeling from the shock rejourn, of Lepanto, could with difficulty hold their own 1572-1572. against the united forces of the pope, Spain and Venice; while Ivan the Terrible had just concluded a truce with Poland. Domestic affairs, on the other hand, were in an almost anarchical condition. The Union of Lublin, barely three years old, was anything but consolidated, and in Lithuania it continued to be extremely unpopular. In Poland proper the szlachta were fiercely opposed to the magnates; and the Protestants seemed bent upon still further castigating the clergy. Worst of all, there existed no recognized authority in the land to curb and control its jarring centrifugal political elements. It was nearly two hundred years since the Republic had suffered from an interregnum, and the precedents of 1382 were obsolete. The primate, on hearing of the demise of the Crown, at once invited all the senators of Great Poland to a conference at Lowicz, but passed over the szlachta altogether. In an instant the whole Republic was seething like a caldron, and a rival assembly was simultaneously summoned to Cracow by Jan Ferlej, the head of the Protestant party. Civil war was happily averted at the last moment, and a national convention, composed of senators and deputies from all parts of the country, assembled at Warsaw, in April 1573, for the purpose of electing a new king. Five candidates for the throne were already in the field. Lithu- ania favoured Ivan IV. In Poland the bishops and most of

the Catholic magnates were for an Austrian archduke, while the strongly anti-German szlachta were inclined to accept almost any candidate but a German, so long as he came with a gift in his hand and was not a Muscovite. In these circumstances it was an easy task for the adroit and energetic French ambassador, Jean de Montluc (d. 1579), brother of the famous marshal, and bishop of Valence, to procure the election of the French candidate, Henry, duke of Anjou. Well provided with funds, he speedily bought over many of the leading magnates, and his popularity reached its height when he strenuously advocated the adoption of the mode of election by the gentry en masse (which the szlachta proposed to revive), as opposed to the usual and more orderly " secret election " by a congress of senators and deputies, sitting with closed doors. The religious difficulty, meanwhile, had been adjusted to the satisfaction of all parties by the compact of Warsaw (Jan. 28, 1573), which granted absolute religious liberty to all non-Catholic denominations (dissidentes de religione, as they now began to be called) without exception, thus exhibiting a far more liberal intention than the Germans had manifested in the religious peace of Augsburg eighteen years before. Finally, early in April 1573, the election diet assembled at Warsaw, and on the nth of May, in the midst of intrigue, corruption, violence and confusion, Henry of Valois was elected king of Poland.

The election had, however, been preceded by a correctura jurum, or reform of the constitution, which resulted in the Henry of famous " Henrican Articles" which converted Valois, kittg, Poland from a limited monarchy into a republic 15T3-1574. witli an elective chief magistrate. Henceforward the king was to have no voice in the choice of his successor. He was not to use the word haeres, not being an hereditary sovereign. He was to marry a wife selected for him by the senate. He was neither to seek for a divorce nor . give occasion for one. He was to be neutral in all religious matters. He was not to lead the militia across the border except with the consent of the szlachta, and then only for three months at a time. Every year the senate was to appoint sixteen of its number to be in constant attendance upon the king in rotas of four, which sedecimvirs were to supervise all his actions. Should the king fail to observe any one of these articles, the nation was ipso facto absolved from its allegiance. This constitutional reform was severely criticized by contem- porary political experts. Some strongly condemned the clause justifying renunciation of allegiance, as tending to treason and anarchy. Others protested against the anomalous and helpless position of the so-called king, who, if he could do no harm, was certainly powerless for good. But such Cassandras prophesied to heedless ears. The Republic had deliberately cast itself upon the downward grade which was to lead to ruin.

The reign of Henry of Valois lasted thirteen months. The tidings of the death of his brother Charles IX., which reached him on the 14th of June 1574, determined him to exchange a thorny for what he hoped would be a flowery throne, and at midnight on the i8th.of June 1574 he literally fled from Poland, pursued to the frontier by his indignant and bewildered subjects. Eighteen months later (Dec. 14, 1575), mainly through the influence of Jan Zamoyski, Stephen Bathory, prince of Transyl- vania, was elected king of Poland by the szlachta in opposition to the emperor Maximilian, who had been elected two days previously by the senate, after disturbances which would have rent any other state but Poland to pieces.

The glorious career of Stephen Bathory (1575-1586) is dealt with elsewhere (see Stephen, King of Poland). His example Stephen demonstrates the superiority of genius and valour Bathory, over the most difficult circumstances. But his 1575-1586. reign was too brief to be permanently beneficial.

The Vasa period of Polish history which began with the election of Sigismund, son of John III., king of Sweden, was the sigis- epoch of last and lost chances. The collapse of the

mundlll., Muscovite tsardom in the east, and the submersion 1587-1632. f the German Empire in the west by the Thirty Years' War, presented Poland with an unprecedented oppor-

tunity of consolidating, once for all, her hard-won position as the dominating power of central Europe. Everywhere circum- stances were favourable to her, and in 2olkiewski, Chodkiewicz and Koniecpolski she possessed three of the greatest captains of that or any other age. With all the means at her disposal cheerfully placed in the hands of such valiant and capable ministers, it would have been no difficult task for the Republic to have wrested the best part of the Baltic littoral from the Scandinavian powers, and driven the distracted Muscovites beyond the Volga. Permanent greatness and secular security were within her reach at the commencement of the Vasa period; how was it, then, that at the end of that period, only fifty years later, Poland had already sunk irredeemably into much the same position as Turkey occupies now, the position of a moribund state, existing on sufferance simply because none was yet quite prepared to administer the coup de grdce? There is only one answer; the principal cause of this complete and irretrievable collapse is to be sought for in the folly, egotism and selfishness of the Polish gentry, whose insane dislike of all discipline, including even the salutary discipline of regular, government, converted Poland into something very like a primi- tive tribal community at the very time when every European statesman, including the more enlightened of the Poles them- selves, clearly recognized that the political

future belonged to the strongly centralized monarchies, which were everywhere rising on the ruins of feudalism. Of course there were other contributory causes. The tenacity with which Sigismund III, clung to his hereditary rights to the Swedish Crown involved Poland in a quite unnecessary series of wars with Charles IX> and Gustavus Adolphus, when her forces were sorely needed elsewhere. The adhesion of the same monarch to the League of the Catholic Reaction certainly added to the difficulties of Polish diplomacy, and still further divided the already distracted diet, besides alienating from the court the powerful and popular chancellor Zamoyski. Yet Sigismund III. was a far more clear- sighted statesman than any of his counsellors or contradictors. For instance, he was never misled by the successes of the false Demetrius in Muscovy, and wisely insisted on recovering the great eastern fortress of Smolensk rather than attempting the conquest of Moscow. His much-decried alliance with the emperor at the outbreak of the Thirty Years' War was eminently sagacious. He perceived at once that it was the only way of counteracting the restlessness of the sultan's proteges, the Protestant princes of Transylvania, whose undisciplined hordes, scarcely less savage than their allies the Turks and Tatars, were a perpetual menace both to Austria and to Poland. Finally he was bent upon reforming the Polish constitution by substitut- ing the decision of all matters by a plurality of votes for a unanimity impossible to count upon.

When we turn to the szlachta who absolutely controlled the diet, we find not the slightest trace, I will not say of political foresight — that they never possessed — but of common patriot- ism, or ordinary public spirit. The most urgent national necessities were powerless to stir their hearts or open their purses. The diets during the reign of Sigismund III. were even more niggardly than they had been under the Jagiellos, and on the single occasion when the terrors of an imminent Tatar invasion constrained them to grant extraordinary sub- sidies, they saw to it that such subsidies should rest entirely on the shoulders of the burgesses (who had in the meantime been deprived of the franchise) and the already overburdened peasantry. In the very crisis of the Swedish War, the diminutive army of the victorious Chodkiewicz was left unpaid, with the result that the soldiers mutinied, and marched off en masse. Both Chodkiewicz and Z\>lkiewski frequently had to pay the expenses of their campaigns out of their own pockets, and were expected to conquer empires and defend hundreds of miles of frontier with armies of 3000 or 4000 men at most. When they retreated before overwhelming odds they were publicly accused of cowardice and incompetence. The determination to limit still further the power of the executive was at the bottom of this fatal parsimony, with the inevitable consequence that,

while the king and the senate were powerless, every great noble or lord-marcher was free to do what he chose in his own domains, so long as he flattered his " little brothers," the szlachta. In- credible as it may seem, the expedition to place the false Demetrius on the Muscovite throne was a private speculation of a few Lithuanian magnates, and similar enterprises on the part of other irresponsible noblemen on the Danube or Dniester brought upon unhappy Poland retaliatory Tatar raids, which reduced whole provinces to ashes. Every attempt to improve matters, by reforming the impossible constitution, stranded on the opposition of the gentry. Take, for instance, the typical and highly instructive case of Zebrzydowski's rebellion. Nicholas Zebrzydowski, a follower of the chancellor Zamoyski, was one of the wealthiest and most respectable magnates in Poland. As palatine of Cracow he held one of the highest and most lucrative dignities in the state, and was equally famous for his valour, piety and liberality. Disappointed in his hope of obtaining the great seal on the death of Zamoyski, he at once conceived that the whole of the nobility had been insulted in his person, and proceeded to make all government impossible for the next three years. On the 7th of March 1606 Sigismund summoned a diet for the express purpose of introducing the principle of decision by majority in the diet, whereupon Zebrzy- dowski summoned a counter-confederation to Stenczyn in Little Poland, whose first act was to open negotiations with the prince of Transylvania, Stephen Bocskay, with the view of hiring mercenaries from him for further operations. At a subse-quent confederation, held at Lublin in June, Zebrzydowski was reinforced by another great nobleman, Stanislaus Stadnicki, called the Devil, who " had more crimes on his conscience than hairs on his head," and was in the habit of cropping the ears and noses of small squires and chaining his serfs to the walls of his underground dungeons for months at a time. This champion of freedom was very eloquent as to the wrongs of the szlachta, and proposed that the assembly should proceed in a body to Warsaw and there formally renounce their allegiance. The upshot of his oratory was the summoning of a rokosz, or national insurrection, to Sandomir, which was speedily joined by the majority of the szlachta all over the country, who openly pro- claimed their intention of dethroning the king and chastising the senate, and sent Stadnicki to Transylvania to obtain the armed assistance of Stephen Bocskay. Only the clergy, natur- ally conservative, still clung to the king, and Sigismund III., who was no coward, at once proceeded to Cracow to overawe the rokoszanie, or insurrectionists, by his proximity, and take the necessary measures for his own protection. By the advice of his senators he summoned a zjazd, or armed convention, to Wislica openly to oppose the insurrection of Sandomir, which zjazd was to

be the first step towards the formation of a general confederation for the defence of the throne. Civil war seemed inevitable, when the szlachta of Red Russia and Sieradz suddenly rallied to the king, who at once ordered his army to advance, and after defeating the insurrectionists at Janowiec (in October), granted them a full pardon, on the sole condition that they should refrain from all such acts of rebellion in future. Despite their promises, Zebrzydowski and his colleagues a few months later were again in arms. In the beginning of 1607 they sum- moned another rokosz to Jendrzejow, at the very time when the diet was assembling at Warsaw. The diet authorized the king to issue a proclamation dissolving the rokosz, and the rokosz retorted with a manifesto in which an insurrection was declared to be as much superior to a parliament as a general council was to a pope. In a second manifesto published at Jezierna, on the 24th of June, the insurrectionists again renounced their allegiance to the king. Oddly enough, the diet before dissolving had, apparently in order to meet the rokosz half-way, issued the famous edict De non praestanda obedientia, whereby, in case of future malpractices by the king and his subsequent neglect of at least two solemn warnings there-anent by the primate and the senate, he was to be formally deposed by the next succeeding diet. But even this was not enough for the insurrectionists. It was not the contingent but the actual deposition of the king

that they demanded, and they had their candidate for the throne ready in the person of Gabriel Bethlen, the new prince of Tran- sylvania. But the limits of even Polish complacency had at last been reached, and Zolkiewski and Chodkiewicz were sent against the rebels, whom they routed at Oransk near Guzow, after a desperate encounter, on the 6th of July 1607. But, though driven from the field, the agitation simmered all over the country for nearly two years longer, and was only terminated, in 1609, by a general amnesty which excluded every prospect of constitutional reform.

Wladislaus IV., who succeeded his father in 1632, was the most popular monarch who ever sat on the Polish throne. The szlachta, who had had a " King Log " in Sigis- wtadis- mund, were determined that Wladislaus should be lausiv., " a King Bee who will give us nothing but honey " — ■ l 632- i64&. in other words they hoped to wheedle him out of even more than they had wrested from his predecessor. Wladislaus submitted to everything. He promised never to declare war or levy troops without the consent of the sejm, undertook to fill all vacancies within a certain time, and released the szlachta from the payment of income-tax, their one remaining fiscal obligation. This boundless complacency was due to policy, not weakness. The second Polish Vasa was a man of genius, fully conscious of his powers, and determined to use them for the benefit of his country. The events of the last reign had demonstrated the incompetence of the Poles to govern themselves. Any ameliora- tion of the existing anarchy must be extra-

parliamentary and proceed from the throne. But a reforming monarch was inconceivable unless he possessed the confidence of the nation, and such confidence, Wladislaus naturally argued, could only be won by striking and undeniable public services. On these principles he acted with brilliant results. Within three years of his accession he compelled the Muscovites (Treaty of Polyan- kova, May 28, 1634) to retrocede Smolensk and the eastern provinces lost by Sigismund II., overawed the Porte by a military demonstration in October of the same year, and, by the Truce of Stumdorf (Sept. 12, 1635), recovered the Prussian provinces and the Baltic seaboard from Sweden. But these achievements excited not the gratitude but the suspicion of the szlachta. They were shrewd enough to guess that the royal triumph might prejudice their influence, and for the next five years they deliberately thwarted the enlightened and far-reaching projects of the king for creating a navy and increasing the revenue without burdening the estates, by a system of tolls levied on the trade of the Baltic ports (see Wladislaus IV.), even going so far as to refuse for nine years to refund the expenses of the Muscovite War, which he had defrayed out of his privy purse. From sheer weariness and disgust the king refrained from any intervention in public affairs for nearly ten years, looking on indifferently while the ever shorter and stormier diets wrangled perpetually over questions of preferment and the best way of dealing with the extreme dissenters, to the utter neglect of public business. But towards the end of his reign the energy of Wladislaus revived, and he began to occupy himself with another scheme for regenerating his country, in its own despite, by means of the Cossacks. First, however, it is necessary to describe briefly the origin and previous history of these romantic free- booters who during the second half of the 17th century were the determining factor of Polish and Muscovite politics.

At the beginning of the 16th century the illimitable steppe of south-eastern Europe, extending from the Dnieper to the Urals, had no settled population. Hunters and fishermen frequented its innumerable rivers, return- gˆswˆj,- ing home laden with rich store of fish and pelts, while runaway serfs occasionally settled in small communities beneath the shelter of the fortresses built, from time to time, to guard the southern frontiers of Poland and Muscovy. Obliged, for fear of the Tatars, to go about with arms in their hands, these settlers gradually grew strong enough to raid their raiders, selling the booty thus acquired to the merchants of Muscovy and Poland. Moreover, the Turks and Tatars being the natural enemies of Christendom, a war of extermination

against them was regarded by the Cossacks as a sacred duty. Curiously enough, these champions of orthodoxy borrowed the name, which has stuck to them ever since, from their " dog- headed " adversaries. The rank and file of the Tatar soldiery were known as Kazaki, or Cossacks, a word meaning " free- booters," and this term came to be applied indiscriminately to all the free dwellers in the Ukraine, or border-lands. As time went on the Cossacks multiplied exceedingly. Their daring grew with their numbers, and at last they came to be a constant annoyance to all their neighbours, both Christian and Mussul- man, frequently involving Poland in dangerous and unprofitable wars with the Ottoman Empire. Indeed, it is not too much to say that, until the days of Sobieski, the Cossacks were invariably the chief cause of the breaches between the Porte and the Republic. We have seen how carefully the Jagiellos avoided participating in any of the crusades directed by the Holy See against the arch-enemies of the Cross. So successful was their prudential abstention that no regular war occurred between Turkey and Poland during the two centuries of their sway. The first actual collisions, the Cecora campaign of 1620 and the Khotin War of 1621 (for John Albert's Moldavian raid does not count), were due to the depredations of the Cossacks upon the dominions of the sultan by land and sea, and in all subsequent treaties between the two powers the most essential clause was always that which bound the Republic to keep its freebooters in order.

But in the meantime the Cossacks themselves had become a semi-independent community. The origin of the Cossack state is still somewhat obscure, but the germs of it are visible as early as the beginning of the 16th century. The union of Lublin, which led to the polonization of Lithuania, was the immediate occasion of a considerable exodus to the lowlands of the Dnieper of those serfs who desired to escape from the taxes of the Polish government and the tyranny of the Polish land- lords. Stephen Bathory presently converted the pick of them into six registered regiments of 1000 each for the defence of the border. Ultimately the island of Hortica, just below the falls of the Dnieper, was fixed upon as their headquarters; and on the numerous islands of that broad river there gradually arose the famous Cossack community known as the Zaporozhshaya Syech, or Settlement behind the Falls, whence the Dnieperian Cossacks were known, generally, as Zaporozhians, or Backfallsmen. 1 The Cossack kosh, or commonwealth, had the privilege of electing its hetman, or chief, and his chief officers, the starshins. The hetman, after election, received from the king of Poland direct the insignia of his office, viz. the bulawa, or baton, the bunchuk, or horse-tail standard, and his official seal; but he was respon- sible for his actions to the kosh alone, and an inquiry into his conduct was held at the expiration of his

term of office in the obschaya shkoda, or general assembly. In time of peace his power was little more than that of the responsible minister of a constitutional republic; but in time of warfare he was a dictator, and disobedience to his orders in the field was punish- able by death.

The Cossacks were supposed to be left alone as much as possible by the Polish government so long as they faithfully fulfilled their chief obligation of guarding the frontiers of the Republic from Tatar raids. But the relations between a community of freebooters, mostly composed of fugitive serfs and refugees, and a government of small squires who regarded the Cossacks as a mere rabble were bound to be difficult at the best of times, and political and religious differences presently supervened. The Cossacks, mostly of Lithuanian origin, belonged to the Orthodox religion, so far as they belonged to any religion at all, and the Jagiellos had been very careful to safeguard the religious liberties of their Lithuanian subjects, especially as the Poles themselves were indifferent on the subject. But, at the beginning of the 17 th century, when the current of the Catholic reaction was running very strongly and the Jesuits, after subduing the Protestants, began to undermine the position of the Orthodox Church in Lithuania, a more intolerant spirit 1 Cf. American, Backwoodsmen.

began to prevail. The old Calvinist nobility of Lithuania were speedily reconverted; a Uniate Church in connexion with Rome was established; Greek Orthodox congregations, if not generally persecuted, were at least depressed and straitened; and the Cossacjcs began to hate the Pans, or Polish lords, not merely as tyrants, but as heretics. Yet all these obstacles to a good understanding might, perhaps, have been surmounted if only the Polish diet had treated the Cossacks with common fairness and common sense. In 1619 the Polish government was obliged to prohibit absolutely the piratical raids of the Cossacks in the Black Sea, where they habitually destroyed Turkish property to the value of millions. At the same time, by the compact of Rastawica, the sejm undertook to allow the Cossacks, partly as wages, partly as compensation, 40,000 (raised by the compact of Kurukow to 60,000) gulden and 170 wagons of cloth per annum. These terms were never kept, despite the earnest remonstrances of the king, and the complaints of the aggrieved borderers. Parsimony prevailed, as usual, over prudence, and when the Cossacks showed unmistakable signs of restiveness, the Poles irritated them still further by ordering the construction of the strong fortress of Kudak at the confluence of the Dnieper and the Samara, to overawe the Zaporozhian community. This further act of repression led to two ter- rible Cossack risings, in 1635 an d !636, put down only with the utmost difficulty, whereupon the diet of 1638 deprived the Cossacks of all their ancient privileges, abolished the elective hetmanship, and substituted for it a commission of Polish noblemen with absolute power, so that the Cossacks might well declare that those who

hated them were lords over them.

Such was the condition of affairs in the Ukraine when Wladis- laus IV. proposed to make the Cossacks the pivot of his foreign policy and his domestic reforms. His far-reaching plans were based upon two facts, the absolute devotion of the Zaporozhians to himself personally, and the knowledge, secretly conveyed to him by Stanislaus Koniecpolski (q.v.), that the whole of the Ukraine was in a ferment. He proposed to provoke the Tatars to a rupture by repudiating the humiliating tribute with which the Republic had so long and so vainly endeavoured to buy off their incessant raids. In case of such rupture he meant, at the head of 100,000 Cossacks, to fall upon the Crimea itself, the seat of their power, and exterminate the Khanate. This he calcu- lated would bring about a retaliatory invasion of Poland by the Turks, which would justify him in taking the field against them also with all the forces of the Republic. In case of success he would be able to impose the will of a victorious king upon a discredited diet, and reform the constitution on an English or Swedish model. Events seemed at first to favour this audacious speculation. Almost simultaneously a civil war broke out in the Crimea and the Porte declared war against the Venetian republic, with which Wladislaus at once concluded an offensive and defensive alliance (1645). He then bade the Cossacks prepare their boats for a raid upon the Turkish galleys, and secured the co-operation of the tsar in the Crimean expedition by a special treaty. Unfortunately, Venice, for her own safety's sake, insisted on the publication of Wladislaus's anti- Turkish alliance; the Porte, well informed of the course of Polish affairs, remained strictly neutral despite the most outrageous provocations; and Wladislaus, bound by his coronation oath not to undertake an offensive war, found himself at the mercy of the diet which, full of consternation and rage, assembled at Warsaw on the 2nd of May 1647. It is needless to say that the Venetian alliance was repudiated and the royal power still further reduced. A year later Wladislaus died at his hunting- box at Merecz, at the very moment when the long-impending tempest which he himself had conjured up burst with over- whelming fury over the territories of the Republic.

The prime mover of the great rebellion of 1648, which shook the Polish state to its very foundations, was the Cossack Bohdan Chmielnicki (q.v.), who had been initiated in all the plans of Wladislaus IV. and, with good reason, feared to be the first victim of the Polish magnates when the king's designs were

unmasked and frustrated. To save himself he hit upon the novel and terrible expedient of uniting the Tatars and the Cossacks Cossack in a determined onslaught upon the Republic, whose Rebellion of inward weakness, despite its brave outward show, l648m he had been quick to discern. On the 18th of April

1648, at the general assembly of the Zaporozhians, he openly expressed his intention of proceeding against the Poles and was elected hetman by acclamation; on the 19th of May he annihi- lated a small detached Polish corps on the banks of the river Zheltndya Vodui, and seven days later overwhelmed the army of the Polish grand-hetman, massacring 8500 of his 10,000 men and sending the grand-heiman himself and all his officers in chains to the Crimea. The immediate consequence of these victories was the outburst of a khlopskaya zioba, or " serfs' fury." Throughout the Ukraine the gentry were hunted down, flayed, burnt, blinded and sawn asunder. Every manor-house and castle was reduced to ashes. Every Uniate or Catholic priest •who could be caught was hung up before his own high altar, along with a Jew and a hog. The panic-stricken inhabi- tants fled to the nearest strongholds, and soon the rebels were swarming over the palatinates of Volhynia and Podolia. Mean- while the Polish army, 40,000 strong, with 100 guns, was assem- bling on the frontier. It consisted almost entirely of the noble militia, and was tricked out with a splendour more befitting a bridal pageant than a battle array. For Chmielnicki and his host these splendid cavaliers expressed the utmost contempt. " This rabble must be chased with whips, not smitten with swords," they cried. On the 23rd of September the two armies encountered near Pildawa, and after a stubborn three days' contest the gallant Polish pageant was scattered to the winds. The steppe for miles around was strewn with corpses, and the Cossacks are said to have reaped 10,000,000 guldens worth of booty when the fight was over. All Poland now lay at Chmiel- nicki's feet, and the road to the defenceless capital was open John 11. before him ; but he wasted two precious months in Casimir, vain before the fortress of Zamosc, and then the 1648-1668. new iy elected king of Poland, John Casimir, Wladis- laus IV. 's brother, privately opened negotiations with the rebel, officially recognized him by sending hirn the bulawa and the other insignia of the hetman's dignity, and promised his " faithful Zaporozhians " the restoration of all their ancient liberties if they would break off their alliance with the Tatars and await the arrival of peace commissioners at Pereyaslavl. But the negotiations at Pereyaslavl came to nothing. Chmielnicki's conditions of peace were so extravagant that the Polish com- missioners durst not accept them, and in 1649 he again invaded Poland with a countless host of Cossacks and Tatars. Again, however, he made the mistake of attacking a fortress, which delayed his advance for a month,

and gave John Casimir time to collect an army for the relief of the besieged. By the com- pact of Zborow (Aug 21, 1649) Chmielnicki was recognized as hetman of the Zaporozhians, whose registered number was now raised from 6000 to 40,000; a general amnesty was also granted, and it was agreed that all official dignities in the Orthodox palati- nates of Lithuania should henceforth be held solely by the Orthodox gentry. For the next eighteen months Chmielnicki ruled the Ukraine like a sovereign prince. He made Chigirin, his native place, the Cossack capital, subdivided the country into sixteen provinces, and entered into direct relations with foreign powers. His attempt to carve a principality for his son out of Moldavia led to the outbreak of a third war between suzerain and subject in February 1651. But fortune, so long Bohdan's friend, now deserted him, and at Beresteczko (July 1, 1651) the Cossack chieftain was utterly routed by Stephen Czarniecki. All hope of an independent Cossackdom was now at an end; yet it was not Poland but Muscovy which reaped the fruits of Czarniecki's victory.

Chmielnicki, by suddenly laying bare the nakedness of the Polish republic, had opened the eyes of Muscovy to the fact that her secular enemy was no longer formidable. Three years after his defeat at Beresteczko, Chmielnicki, finding himself unable to cope with the Poles single-handed, very reluctantly

transferred his allegiance to the tsar, and the same year the tsar's armies invaded Poland, still bleeding from the all but mortal wounds inflicted on her by the Cossacks. The war thus begun, and known in Russian history as the The Rus- Thirteen Years' War, far exceeded even the Thirty siansinvade Years' War in grossness and brutality. It resembled Polani – nothing so much as a hideous scramble of ravening beasts and obscene fowls for the dismembered limbs of a headless carcase, for such did Poland seem to all the world before the war was half over. In the summer of 1655, moreover, while the Republic was still reeling beneath the shock of the Muscovite invasion, Charles X. of Sweden, on the flimsiest of pretexts, i avas ion 0/ forced a war upon reluctant and inoffensive Poland, Charles x. simply to gratify his greed of martial glory, and of Sweden, before the year was out his forces had occupied the capital, the coronation city and the best half of the land. King John Casimir, betrayed and abandoned by his own subjects, fled to Silesia, and profiting by the cataclysm which, for the moment, had swept the Polish state out of existence, the Mus- covites, unopposed, quickly appropriated nearly everything which was not already occupied by the Swedes. At this crisis Poland owed her salvation to two events — the formation of a general league against Sweden, brought about by the appre- hensive court of Vienna and an almost simultaneous popular outburst of religious enthusiasm on the part of the Polish people. The first of these events, to be dated from the alliance between the emperor Leopold and

John Casimir, on the 27th of May 1657, led to a truce with the tsar and the welcome diversion of all the Muscovite forces against Swedish Livonia. The second event, which began with the heroic and successful defence of the monastery of Czenstochowa by Prior Kordecki against the Swedes, resulted in the return of the Polish king from exile, the formation of a national army under Stephen Czarniecki and the recovery of almost all the lost provinces from the Swedes, who were driven back headlong to the sea, where with difficulty they held their own. On the sudden death of Charles X. (Feb. 13, 1660), Poland gladly seized the opportunity of adjusting all her outstanding differences with Sweden. By the peace of Oliva (May 3, 1660), made under French mediation, John Casimir ceded Livonia, and renounced all claim to the Swedish crown. The war with Muscovy was then prosecuted with renewed energy and extraordinary success. In the autumn of 1661 the Russian commanders were routed at Zeromsk, and nearly all the eastern provinces were recovered. In 1664 a peace congress was opened at Durovicha and the prospects of Poland seemed most brilliant; but at the very moment when she needed all her armed strength to sustain her diplomacy, the rebellion of one of her leading magnates, Prince Lubomirsky, involved her in a dangerous civil war, compelled her to reopen negotiations with the Muscovites, at Andrussowo, under far more unfavourable conditions, and after protracted negotiations practically to accept the Muscovite terms. By the truce of Andrussowo (Feb. n, 1667) Poland received back The Trace from Muscovy Vitebsk, Polotsk and Polish Livonia, of Andms- but ceded in perpetuity Smolensk, Syeversk, Cherni-sowo > t667 – gov and the whole of the eastern bank of the Dnieper, including the towns of Konotop, Gadyach, Pereyaslavl, Mirgorod, Poltava and Izyum. The Cossacks of the Dnieper were henceforth to be under the joint dominion of the tsar and the king of Poland. Kiev, the religious metropolis of western Russia, was to remain in the hands of Muscovy for two years.

The " truce " of Andrussowo proved to be one of the most permanent peaces in history, and Kiev, though only pledged for two years, was never again to be separated from the Orthodox Slavonic state to which it rightly belonged. But for the terrible and persistent ill-luck of Poland it is doubtful whether the " truce " of Andrussowo would ever have been signed. The war which it concluded was to be the last open struggle between the two powers. Henceforth the influence of Russia over Poland was steadily to increase, without any struggle at all, the Republic being already stricken with that creeping paralysis which ultimately left her a prey to her neighbours. Muscovy

had done with Poland as an adversary, and had no longer any reason to fear her ancient enemy.

Poland had, in fact, emerged from the cataclysm of 1648-1667 a moribund state, though her not unskilful diplomacy had enabled her for a time to save appearances. Her territorial losses, though considerable, were, in the circumstances, not excessive, and she was still a considerable power in the opinion of Europe. But a fatal change had come over the country during the age of the Vasas. We have already seen how the ambition of the oligarchs and the lawlessness of the szlachta had reduced the executive to impotence, and rendered anything like rational government impossible. But these demoralizing and disintegrating influences had been suspended by the religious revival due to the Catholic reaction and the Jesuit propaganda, a revival which reached its height towards the end of the 16th century. This, on the whole, salutary and edifying move- ment permeated public life, and produced a series of great captains who cheerfully sacrificed themselves for their country, and would have been saints if they had not been heroes. But this extraordinary religious revival had wellnigh spent itself by the middle of the 17th century. Its last manifestation was the successful defence of the monastery of Czenstochowa by Prior Kordecki against the finest troops in Europe, its last representative was Stephen Czarniecki, who brought the fugitive John Casimir back from exile and reinstalled him on his tottering throne. The succeeding age was an age of unmitigated egoism, Orowiag in which the old ideals were abandoned and the old Corruption examples were forgotten. It synchronized with, and la Poland. was p ar tly determined by, the new political system which was spreading all over Europe, the system of dynastic diplomatic competition and the unscrupulous employment of unlimited secret service funds. This system, which dates from Richelieu and culminated in the reign of Louis XIV., was based on the secular rivalry of the houses of Bourbon and Habs- burg, and presently divided all Europe into two hostile camps. Louis XIV. is said to have expended 50,000,000 livres a year for bribing purposes, the court of Vienna was scarcely less liberal, and very soon nearly all the monarchs of the Continent and their ministers were in the pay of one or other of the antagonists. Poland was no exception to the general rule. Her magnates, having already got all they could out of their own country, looked eagerly abroad for fresh El Dorados. Before long most of them had become the hirelings of France or Austria, and the value demanded for their wages was, not infrequently, the betrayal of their own country. To do them justice, the szlachta at first were not only free from the taint of official corruption, but endeavoured to fight against it. Thus, at the election diet of 1669, one of the deputies, Pieniaszek, moved that a new and hitherto unheard-of clause should be inserted in the agenda of the general

confederation, to the effect that every senator and deputy should solemnly swear not to take bribes, while another szlacic proposed that the ambassadors of foreign Powers should be excluded permanently from the Polish elective assemblies. But the flighty and ignorant szlachta not only were incapable of any sustained political action, but they themselves uncon- sciously played into the hands of the enemies of their country by making the so-called liberum veto an integral part of the Polish constitution. The liberum veto was based on the assumption of the absolute political equality of every Polish gentleman, with the inevitable corollary that every measure introduced into the Polish diet must be adopted unanimously. Consequently, if any single deputy believed that a measure already approved of by the rest of the house might be injurious to his constituency, he had the right to rise and exclaim nie pozwalam, " I disap- prove," when the measure in question fell at once to the ground. Subsequently this vicious principle was extended still further. A deputy, by interposing his individual veto, could at any time dissolve the diet, when all measures previously passed had to be re-submitted to the consideration of the following diet. The liberum veto seems to have been originally devised to cut short interminable debates in times of acute crisis, but it was generally used either by highly placed criminals, anxious to avoid an

inquiry into their misdeeds, 1 or by malcontents, desirous of embarrassing the executive. The origin of the liberum veto is obscure, but it was first employed by the deputy Wladislaus Sicinski, who dissolved the diet of 1632 by means of it, and before the end of the 17 th century it was used so frequently and reck- lessly that all business was frequently brought to a standstill. In later days it became the chief instrument of foreign ambassa- dors for dissolving inconvenient diets, as a deputy could always be bribed to exercise his veto for a handsome consideration.

The Polish crown first became an object of universal com- petition in 1573, when Henry of Valois was elected. In 1575, and again in 1587, it was put up for public auction, when the Hungarian Bathory and the Swede Sigismund respectively gained the prize. But at all three elections, though money and intrigue were freely employed, they were not the determining factors of the contest. The Polish gentry were still the umpires as well as the stake-holders; the best candidates generally won the day; and the defeated competitors were driven out of the country by force of arms if they did not take their discomfiture, after a fair fight, like sportsmen. But with the £j ect i oao f election of Michael Wisniowiecki in 1669 a new era Michael began. In this case a native Pole was freely elected Wisnio- by the unanimous vote of his countrymen. Yet a ^^0.1^73, few weeks later the Polish commander- in-chief formed a whole series of conspiracies for the purpose of dethroning his lawful sovereign, and openly placed himself beneath the protec- tion of Louis XIV. of France, just as the rebels of the 18th century placed

themselves under the protection of Catherine II. of Russia. And this rebel was none other than John Sobieski, at a later day the heroic deliverer of Vienna ! If heroes could so debase themselves, can we wonder if men who were not heroes lent themselves to every sort of villainy? We have come, in fact, to the age of utter shamelessness, when disappointed place-hunters openly invoked foreign aid against their own country. Sobieski himself, as John III. (he sue- John ill. ceeded Michael in 1674), was to pay the penalty Sobieski, of his past lawlessness, to the uttermost farthing. Despite his brilliant military achievements (see John III., King of Poland), his reign of twenty-two years was a failure. His victories over the Turks were fruitless so far as Poland was concerned. His belated attempts to reform the constitution only led to conspiracies against his life and crown, in which the French faction, which he had been the first to encourage, took an active part. In his later years Lithuania was in a state of chronic revolt, while Poland was bankrupt both morally and materially. He died a broken-hearted man, prophesying the- inevitable ruin of a nation which he himself had done so much to demoralize.

It scarcely seemed possible for Poland to sink lower than she had sunk already. Yet an era was now to follow, compared with which even the age of Sobieski seemed to be an age of gold. This was the Saxon period which, with occasional violent interruptions, was to drag on for nearly seventy years. By the time it was over Poland was irretrievably doomed. It only remained to be seen how that doom would be accomplished.

On the death of John III. no fewer than eighteen candidates for the vacant Polish throne presented themselves. Austria supported James Sobieski, the eldest son of the late

king, France Francis Louis Prince of Conti (1664- 1697-1704." 1709), but the successful competitor was Frederick Augustus, elector of Saxony, who cheerfully renounced Lutheranism for the coveted crown, and won the day because he happened to arrive last of all, with fresh funds, when the agents of his rivals had spent all their money. He was crowned, as Augustus II., on the 15th of September 1697, and his first act was to expel from the country the prince of Conti, the elect of a respectable minority, directed by the cardinal primate Michal Radziejowski (1645-1705), whom Augustus II. subsequently bought over for 75,000 thalers.

1 Thus the Sapiehas, who had been living on rapine for years, dissolved the diet of 1688 by means of the veto of one of their hire- lings, for fear of an investigation into their conduct.

Good luck attended the opening years of the new reign. In 1699 the long Turkish War, which had been going on ever since 1683, was concluded by the peace of Karlowitz, whereby Podolia, the Ukraine and the fortress of Kamenets Podolskiy were retroceded to the Republic by the Ottoman Porte. Immediately afterwards Augustus was persuaded by the plausible Livonian exile, Johan Reinhold Patkul, to form a nefarious league with Frederick of Denmark and Peter of Russia, for the purpose of despoiling the youthful king of Sweden, Charles XII. (see Sweden: History). This he did as elector of Saxony, but it was War with the unfortunate Polish republic which paid for the Charles XII. hazardous speculation of its newly elected king. of Sweden. Throughout the Great Northern War (see Sweden: History), which wasted northern and central Europe for twenty years (1700-1720), all the belligerents treated Poland as if she had no political existence. Swedes, Saxons and Russians not only lived upon the country, but plundered it systematically. The diet was the humble servant of the conqueror of the moment, and the leading magnates chose their own sides without the slightest regard for the interests of their country, the Lithuanians for the most part supporting Charles XII., while the Poles divided their allegiance between Stanislaus Augustus and Stanislaus Leszczynski, whom Charles Leszczyh- placed upon the throne in 1704 and kept there till * kL 1700- At the end of the war Poland was ruined

materially as well as politically. Augustus attempted to indemnify himself for his failure to obtain Livonia, his covenanted share of the Swedish plunder, by offering Frederick William of Prussia Courland, Polish Prussia and even part of Great Poland, provided that he were allowed a free hand in the disposal of the rest of the country. When Prussia declined this tempting offer for fear of Russia, Augustus went a step farther and actually suggested that ” the four 1 eagles ” should divide the banquet between them. He died, however (Feb. 1, 1733) before he could give effect to this shameless design.

On the death of Augustus II., Stanislaus Leszczynski, who had. in the meantime, become the father-in-law of Louis XV., attempted to regain his throne with the aid of a small French army corps and 4,000,000 livres from Versailles. Some of the best men in Poland, including the Czartoryscy, were also in his favour, and on the 26th of August 1733 he was elected king for the second time. But there were many malcontents, principally among the Lithuanians, who solicited the intervention of Russia ‘n favour of the elector of Saxony, son of the late king, and in October 1733 a Russian army appeared before Warsaw and compelled a phantom diet (it

consisted of but 15 senators and Augustus 500 of the szlochtd) to proclaim Augustus III. From til., 1733- the end of 1733 till the 30th of June 1734 Stanislaus ,763 ‘ and his partisans were besieged by the Russians in

Danzig, their last refuge, and with the surrender of that for- tress the cause of Stanislaus was lost. He retired once more to his little court in Lorraine, with the title of king, leaving Augustus III. in possession of the kingdom.

Augustus III. was disqualified by constitutional indolence from taking any active part in affairs. He left everything to his omnipotent minister, Count Heinrich Briihl, and Briihl entrusted the government of Poland to the Czartoryscy, who had intimate relations of long standing with the court of Dresden. The Czartoryscy, who were to dominate Polish politics for the next half-century, came of an ancient Ruthenian stock which had intermarried with the Jagiellos at an early date, and had always been remarkable for their civic virtues and political sagacity. They had powerfully contributed to the adoption of the Union of Lublin; were subsequently received into the Roman Catholic Church; and dated the beginning of their influ- ence in Poland proper from the time (1674) when Florian Czartoryski became primate ihere. Florian’s nephews, Fryderyk Michal and Augustus, were now the principal representatives of ” the Family,” as their opponents sarcastically called them. The former, through the influence of Augustus’s minister and favourite Briihl, had become, in his twenty-eighth year, vice- 1 The fourth eagle was the White Eagle, i.e. Poland.

chancellor and subsequently grand chancellor of Lithuania, was always the political head of the family. His brother and Augustus, after fighting with great distinction against the Turks both by land and sea (Prince Eugene decorated him with a sword of honour for his valour at the siege of Belgrade), had returned home to marry Sophia Sieniawska, whose fabulous dowry won for her husband the sobriquet of ” the Family Croesus.” Their sister Constantia had already married Stanislaus Poniatowski, the father of the future king. Thus wealth, position, court influence and ability combined gave the Czar- toryscy a commanding position in Poland, and, to their honour be it said, they had determined from the first to save the Republic, whose impending ruin in existing circumstances they clearly foresaw, by a radical constitutional reconstruction which was to include the abolition of the liberum veto and the formation of a standing army.

Unfortunately the other great families of Poland were obstin- ately opposed to any reform or, as they called it, any “violation” of the existing constitution. The Potoccy, whose possessions in south Poland and the Ukraine covered thousands of square miles, the RadziwiHowie, who were omnipotent in Lithuania and included half a dozen millionaires 2 amongst

them, the Lubomirscy and their fellows, hated the Czartoryscy because they were too eminent, and successfully obstructed all their well-meant efforts. The castles of these great lords were the foci of the social and political life of their respective provinces. Here they lived like little princes, surrounded by thousands of re- tainers, whom they kept for show alone, making no attempt to organize and discipline this excellent military material for the defence of their defenceless country. Here congregated hundreds of the younger szlachta, fresh from their school benches, whence they brought nothing but a smattering of Latin and a determina- tion to make their way by absolute subservience to their " elder brethren," the pans. These were the men who, a little later, at the bidding of their " benefactors," dissolved one inconvenient diet after another; for it is a significant fact that during the reigns of the two Augustuses every diet was dissolved in this way by the hirelings of some great lord or, still worse, of some foreign potentate. In a word constitutional government had practically ceased, and Poland had become an arena in which contesting clans strove together for the mastery.

It was against this primitive state of things that the Czar- toryscy struggled, and struggled in vain. First they attempted to abolish the liberum veto with the assistance of the Saxon court where they were supreme, but fear of foreign complications and the opposition of the Potoccy prevented anything being done. Then they broke with their old friend Brühl and turned to Russia. Their chief intermediary was their nephew Stanislaus Poniatowski, whom they sent, as Saxon minister, to the Russian court in the suite of the English minister Hanbury Williams, in 1755. The handsome and insinuating Poniatowski speedily won the susceptible heart of the grand-duchess Catherine, but he won nothing else and returned to Poland in 1759 somewhat discredited. Disappointed in their hopes of Russia, the Czar-toryscy next attempted to form a confederation for the deposi- tion of Augustus III., but while the strife of factions was still at its height the absentee monarch put an end to the struggle by expiring, conveniently, on the 5th of October 1763.

The interregnum occurring on the death of Augustus III. befell at a time when all the European powers, exhausted by the Seven Years' War, earnestly desired peace. The position of Poland was, consequently, much more advantageous than it had been on every other similar occasion, and if only the contending factions had been able to agree and unite, the final catastrophe might, perhaps, even now, have been averted. The Czartoryscy, of all men, were bound by their principles and professions to set their fellow citizens an example of fraternal concord. Yet they rejected with scorn and derision the pacific overtures of their political opponents, the Potoccy, the Radzi- wiHowie, and the Braniscy, Prince Michal openly declaring that of two tyrannies he preferred the tyranny of the Muscovite to the 2 Michal Kazimierz Radziwill alone was worth thirty millions.

tyranny of his equals. He had in fact already summoned a Russian army corps to assist him to reform his country, which sufficiently explains his own haughtiness and the unwonted compliancy of the rival magnates.

The simplicity of the Czartoryscy was even more mischievous than their haughtiness. When the most enlightened statesmen of the Republic could seriously believe in the benevolent in- tentions of Russia the end was not far off. Their naive expecta- tions were very speedily disappointed. Catherine II. and Frederick II. had already determined (Treaty of St Petersburg, April 22, 1764) that the existing state of things in Poland must be maintained, and as early as the 18th of October 1763 Catherine had recommended the election of Stanislaus Poniatowski as " the individual most convenient for our common interests." The personal question did not interest Frederick: so long as Poland was kept in an anarchical condition he cared not who was called king. Moreover, the opponents of the Czartoryscy made no serious attempt to oppose the entry of the Russian troops. At least 40,000 men were necessary for the purpose, and these could have been obtained for 200,000 ducats; but a congress of magnates, whose collective fortunes amounted to hundreds of millions, having decided that it was impossible to raise this sum, there was nothing for it but to fight a few skirmishes and then take refuge abroad. The Czartoryscy now fancied themselves the masters of the situation. They at once proceeded to pass through the convocation diet a whole series of salutary measures. Four special commissions were appointed to super- intend the administration of justice, the police and the finances. The extravagant powers of the grand hetmans and the grand marshals were reduced. All financial and economical questions before the diet were henceforth to be decided by a majority of Stanislaus votes – Shortly afterwards Stanislaus Poniatowski //. Ponia- was elected king (Sept. 7, 1764) and crowned (Nov. towski, 25). But at the beginning of 1766 Prince Nicholas * Repnin was sent as Russian minister to Warsaw with instructions which can only be described as a carefully elaborated plan for destroying the Republic. The first weapon employed was the dissident question. At that time the population of Poland was, in round numbers, 11,500,000, of whom about 1,000,000 were dissidents or dissenters. Half of these were the Protestants of the towns of Polish Prussia and Great Poland, the other half was composed of the Orthodox population of Lithuania. The dissidents had no political rights, and their religious liberties had also been unjustly restricted; but two-thirds of them being agricultural labourers, and most of the rest artisans or petty

tradesmen, they had no desire to enter public life, and were so ignorant and illiterate that their new protectors, on a closer acquaintance, became heartily ashamed of them. Yet it was for these persons that Repnin, in the name of the empress, now demanded absolute equality, political and religious, with the gentlemen of Poland. He was well aware that an aristocratic and Catholic assembly like the sejm would never concede so preposterous a demand. He also calculated that the demand itself would make the szlachta suspicious of all reform, including the Czartoryscian reforms, especially as both the king and his uncles were generally un-popular, as being innovators under foreign influence. His calculations were correct. The sejm of 1766 not only rejected the dissident bill, but repealed all the Czartoryscian reforms and insisted on the retention of the liberum veto as the foundation of the national liberties. The discredit into which Stanislaus had now fallen encouraged the Saxon party, led by Gabriel Podoski (17 1 9-1 7 7 7), to form a combination for the purpose of dethroning the king. Repnin knew that the allied courts would never consent to such a measure; but he secretly encouraged the plot for his own purposes, with signal success. Early in 1767 the malcontents, fortified by the adhesion of the leading Catherine n. political refugees, formed a confederation at Radom, of Russia whose first act was to send a deputation to St and Poland. Petersburg, petitioning Catherine to guarantee the liberties of the Republic, and allow the form of the Polish constitution to be settled by the Russian ambassador at

Warsaw. With this carte blanche in his pocket, Repnin proceeded to treat the diet as if it were already the slave of the Russian empress. But despite threats, wholesale corrup- tion and the presence of Russian troops outside and even inside the izba, or chamber of deputies, the patriots, headed by four bishops, Woclaw Hieronim Sierakowski (1699-1784) of Lemberg, Feliks Pawel Turski of Chelm (1720-1800), Kajetan Ignaty Soltyk of Cracow (1715-1788), and Jozef Jendrzej Zaluski of Kiev (1702-17 74), offered a determined resistance to Repnin's demands. Only when brute force in its extremest form had been ruthlessly employed, only when three senators and some deputies had been arrested in full session by Russian grenadiers and sent as prisoners to Kaluga, did the opposition collapse. The liberum veto and all the other ancient abuses were now declared unalterable parts of the Polish constitution, which was placed under the guarantee of Russia. All the edicts against the dissidents were, at the same time, repealed.

This shameful surrender led to a Catholic patriotic uprising, known as the Confederation of Bar, which was formed on the 29th of February 1768, at Bar in the Ukraine, by a handful of small squires. It never had a chance tionofBar. of permanent success, though, feebly fed by French subsidies and French volunteers, it lingered on for four years, till finally suppressed in

1772. But, insignificant itself, it was the cause of great events. Some of the Bar confederates, scattered by the Russian regulars, fled over the Turkish border, pursued by their victors. The Turks, already alarmed at the progress of the Russians in Poland, and stimulated by Ver- gennes, at that time French ambassador at Constantinople, at once declared war against Russia. Seriously disturbed at the prospect of Russian aggrandizement, the idea occurred, almost simultaneously, to the courts of Berlin and Vienna that the best mode of preserving the equilibrium of Europe was for all three powers to readjust their territories at the expense of Poland. The idea of a partition of Poland was nothing new, but the vast- ness of the country, and the absence of sufficiently powerful and united enemies, had hitherto saved the Republic from spoliation. But now that Poland lay utterly helpless and surrounded by the three great military monarchies of Europe, nothing could save her. In February 1769 Frederick sent Count Rochus Friedrich Lynar (1708-ˆ83) to St Petersburg to sound the empress as to the expediency of a partition, in August Joseph II. solicited an interview with Frederick, and in the course of the summer the two monarchs met, first at Neisse in Silesia and again at Neustadt in Moravia. Nothing definite as to Poland seems to have been arranged, but Prince Kaunitz, the Austrian chancellor, was now encouraged to take the first step by occupy- ing, in r77o, the county of Zips, which had been hypothecated by Hungary to Poland in 1442 and never redeemed. This act decided the other confederates. In June 1770 Frederick sur- rounded those of the Polish provinces he coveted with a military cordon, ostensibly to keep out the cattle plague. Catherine's consent had been previously obtained by a special mission of Prince Henry of Prussia to the Russian capital. First Par- The first treaty of partition was signed at St Peters- tltion of burg between Prussia and Russia on the 6-1 7th of Poland, February 1772; the second treaty, which admitted Austria also to a share of the spoil, on the 5-1 6th of August the same year. It is unnecessary to recapitulate the unheard- of atrocities by which the consent of the sejm to this act of brigandage was at last extorted (Aug. 18, 1773). Russia obtained the palatinates of Vitebsk, Polotsk Mscislaw: 1586 sq. m. of territory, with a population of 550,000 and an annual revenue of 920,000 Polish gulden. Austria got the greater part of Galicia, minus Cracow: 17 10 sq. m., with a population of 816,000 and an annual revenue of r,4o8,ooo gulden. Prussia received the maritime palatinate minus Danzig, the palatinate of Kulm minus Thorn, Great Poland as far as the Nitza, and the palatinates of Marienburg and Ermeland: 629 sq. m., with a population of 378,000, and an annual revenue of 534,000 thalers. In fine, Poland lost about one-fifth of her population and one-fourth of her territory.

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In return for these enormous concessions the partitioning powers presented the Poles with a constitution superior to any- thing they had ever been able to devise for themselves. The most mischievous of the ancient abuses, the elective monarchy and the liberum veto, were of course retained. Poland was to be dependent on her despoilers, but they evidently meant to make her a serviceable dependant. The government was hence- forth to be in the hands of a rada nieustajaca, or permanent council of thirty-six members, eighteen senators and eighteen deputies, elected biennially by the sejm in secret ballot, sub- divided into the five departments of foreign affairs, police, war, justice and the exchequer, whose principal members and assist- ants, as well as all other public functionaries, were to have fixed salaries. The royal prerogative was still further reduced. The king was indeed the president of the permanent council, but he could not summon the diet without its consent, and in all cases of preferment was bound to select one out of three of the council's nominees. The annual budget was fixed at 30,000,000 Polish gulden, 1 out of which a regular army of 3o,ooo 2 men was to be maintained. Sentiment apart, the constitution of 1775 was of distinct benefit to Poland. It made for internal stability, order and economy, and enabled her to develop and husband her resources, and devote herself uninterruptedly to the now burning question of national education. For the shock of the first partition was so far salutary that it awoke the public con- science to a sense of the national inferiority; stimulated the younger generation to extraordinary patriotic efforts; and thus went far to produce the native reformers who were to do such wonders during the great quadrennial diet.

It was the second Turkish War of Catherine II. which gave patriotic Poland her last opportunity of re-establishing her independence. The death of Frederick the Great (Aug. 17, 1786) completely deranged the balance of power in Europe. The long-standing accord between Prussia and Russia came to an end, and while the latter drew nearer to Austria, the former began to look to the Western powers. In August 1787 Russia and Austria provoked the Porte to declare war against them both, and two months later a defensive alliance was concluded be- tween Prussia, England and Holland, as a counterpoise to the alarming preponderance of Russia. In June 1788 Gustavus III. of Sweden also attacked Russia, with 50,000 men, while in the south the Turks held the Muscovites at bay beneath the walls of Ochakov, and drove back the Austrian invaders into Transyl- vania. Prussia, emboldened by Russia's difficulties, now went so far as to invite Poland also to forsake the Russian alliance, and placed an army corps of 40,000 men at her disposal.

It was under these exceptional circumstances that the " four years' diet " assembled (Oct. 6, 1788). Its leaders, Stanislaw Reform of Malachowski, Hugo Kollontaj and Ignaty Potocki, the Con- were men of character and capacity, and its measures i7«s" 00 ' were correspondingly vigorous. Within a few months of its assembling it had abolished the permanent council; enlarged the royal prerogative; raised the army to 65,000 men; established direct communications with the Western powers; rejected an alliance which Russia, alarmed at the rapid progress of events, had hastened to offer; declared its own session permanent ; and finally settled down to the crucial task of reforming the constitution on modern lines. But the difficulties of the patriots were commensurate with their energies, and though the new constitution was drafted so early as Decem- ber 1789, it was not till May 1791 that it could safely be presented to the diet. Meanwhile Poland endeavoured to strengthen her position by an advantageous alliance with Prussia. Frederick William II. stipulated, at first, that Poland should surrender Danzig and Thorn, and Pitt himself endeavoured to persuade the Polish minister Michal Kleophas Oginski (1765-1833) that the protection of Prussia was worth the sacrifice. But the Poles proving obstinate, and Austria simultaneously displaying a disquieting interest in the welfare of the Republic, Prussia, on

1 1 Pol. gulden = 5 silber groschen.

! At the very next diet, 1776, the Poles themselves reduced the army to 18,000 men.

the 20th of March 1791, concluded an alliance with Poland which engaged the two powers to guarantee each other's possessions and render mutual assistance in case either were attacked.

But external aid was useless so long as Poland was hampered by her anarchical constitution. Hitherto the proceedings of the diet had not been encouraging. The most indispensable reforms had been frantically opposed, the debate on the re- organization of the army had alone lasted six months. It was only by an audacious surprise that Kollontaj and his associates contrived to carry through the new constitution. Taking advantage of the Easter recess, when most of the malcontents were out of town, they suddenly, on the 3rd of May, brought the whole question before the diet and demanded urgency for it. Before the opposition could remonstrate, the marshal of the diet produced the latest foreign despatches, which unani- mously predicted another partition, whereupon, at the solemn adjuration of Ignaty Potocki, King Stanislaus exhorted the deputies to accept the new constitution as the last means of saving their country, and himself set the example by swearing to defend it.

The revolution of the 3rd of May 1791 converted Poland into an hereditary 3 limited monarchy, with ministerial responsibility and duennial parliaments. The liberum veto and all the intricate and obstructive machinery of the anomalous old system were for ever abolished. All invidious class distinctions were done away with. The franchise was extended to the towns. Serfdom was mitigated, preparatorily to its entire abolition; absolute religious toleration was established, and every citizen declared equal before the law. Frederick William II. officially congratulated Stanislaus on the success of " the happy revolution which has at last given Poland a wise and regular government," and declared it should henceforth be his " chief care to maintain and confirm the ties which unite us." Cobenzl, the Austrian minister at St Petersburg, writing to his court immediately after the reception of the tidings at the Russian capital, describes the empress as full of consternation at the idea that Poland under an hereditary dynasty might once more become a considerable power. But Catherine, still in difficulties, was obliged to watch in silence the collapse of her party in Poland, and submit to the double humiliation of recalling her ambassador and withdrawing her army from the country. Even when the peace of Jassy (Jan. 9, 1792) finally freed her from the Turk, she waited patiently for the Polish malcontents to afford her a pretext and an opportunity for direct and decisive interference. She had not long to wait. The constitution of the 3rd of May had scarce been signed when Felix Potocki, Severin Rzewuski and Xavier Branicki, three of the chief dignitaries of Poland, hastened to St Petersburg, and there entered into a secret convention with the empress, whereby she undertook to restore the old constitu- tion by force of arms, but at the same time promised to respect the territorial integrity of the Republic. On the 14th of May 1792 the conspirators formed a confederation, consisting, in the first instance, of only ten other persons, at the little town of Targowica in the Ukraine, protesting against the constitution of the 3rd of May as tyrannous and revolutionary, and at the same time the new Russian minister at Warsaw presented a formal declaration of war to the king and the diet. The diet met the crisis with dignity and firmness. The army was at once despatched to the frontier; the male population was called to arms, and Ignaty Potocki was sent to Berlin to claim the assist- ance stipulated by the treaty of the 19th of March 1791. The king of Prussia, in direct violation of all his oaths and promises, declined to defend a constitution which had never had his "concurrence." Thus Poland was left entirely to' Russia her own resources. The little Polish army of 46,000 overthrows men, under Prince Joseph Poniatowski and Tadeusz theConsti- Kosciuszko, did all that was possible under the circumstances. For more than three months they kept back the invader, and, after winning three pitched battles, retired in perfect order on the capital (see Poniatowski, and

3 On the death of Stanislaus, the crown was to pass to the family of the elector of Saxony.

Kosciuszko). But the king, and even Kollontaj, despairing of success, now acceded to the confederation; hostilities were suspended; the indignant officers threw up their commissions; the rank and file were distributed all over the country; the reformers fled abroad; and the constitution of the 3rd of May was abolished by the Targowicians as " a dangerous novelty." The Russians then poured into eastern Poland; the Prussians, at the beginning of 1793, alarmed lest Catherine should appro- priate the whole Republic, occupied Great Poland; and a diminutive, debased and helpless assembly met at Grodno in order, in the midst of a Russian army corps," to come to an amicable understanding " with the partitioning powers. After Second Par- every conceivable means of intimidation had been tuioa of unscrupulously applied for twelve weeks, the second Poland. treaty of partition was signed at three o'clock on the morning of the 23rd of September 1793. By this pactum subjectionis, as the Polish patriots called it, Russia got all the eastern provinces of Poland, extending from Livonia to Moldavia, comprising a quarter of a million of square miles, while Prussia got Dobrzyn, Kujavia and the greater part of Great Poland, with Thorn and Danzig. Poland was now reduced to one-third of her original dimensions, with a population of about three and a half millions.

The focus of Polish nationality was now transferred from Warsaw, where the Targowicians and their Russian patrons k ich, k re ig ne d supreme, to Leipzig, whither the Polish ' patriots, Kosciuszko, Kollontaj and Ignaty Potocki among the number, assembled from all quarters. From the first they meditated a national rising, but their ignorance, enthusiasm and simplicity led them to commit blunder after blunder. The first of such blunders was Kosciuszko's mission to Paris, in January 1794. He was full of the idea of a league of republics against the league of sovereigns; but he was unaware that the Jacobins themselves were already considering the best mode of detaching Prussia, Poland's worst enemy, from the anti-French coalition. With a hypocrisy worthy of the diplo- macy of " the tyrants," the committee of public safety declared that it could not support an insurrection engineered by aristo- crats, and Kosciuszko returned to Leipzig empty-handed. The next blunder of the Polish refugees was to allow themselves to be drawn into a premature rising by certain Polish officers in Poland who, to prevent the incorporation of their regiments in the Russian

army, openly revolted and led their troops from Warsaw to Cracow. Kosciuszko himself condemned their hastiness; but, when the Russian troops began to concentrate, his feelings grew too strong for him, and early in April he himself appeared at Cracow. In an instant the mutiny became a revolution. The details of the heroic but useless struggle will be found elsewhere (see Kosciuszko, Kollontaj, Potocki, Ignaty, Dom- browski). Throughout April the Polish arms were almost universally successful. The Russians were defeated in more than one pitched battle; three-quarters of the ancient territory was recovered, and Warsaw and Vilna, the capitals of Poland and Lithuania respectively, were liberated. Kosciuszko was appointed dictator, and a supreme council was established to assist him. The first serious reverse, at Szczekociny (June 5), was more than made up for by the successful defence of Warsaw against the Russians and Prussians (July 9 to Sept. 6); but in the meantime the inveterate lawlessness of the Poles had asserted itself, as usual, and violent and ceaseless dissensions, both in the supreme council and in the army, neutralized the superhuman efforts of the unfortunate but still undaunted dictator. The death-blow to the movement was the disaster of Maciejowice (Oct. 10), and it expired amidst the carnage of Praga (Oct. 29), though the last Polish army corps did not capitulate till the 18th of November. Yet all the glory of the bitter struggle was with the vanquished, and if the Poles, to the last, had shown themselves children in the science of government, they had at least died on the field of battle like men. The greed of the three partitioning powers very nearly led to a rupture between Austria and Prussia; but the tact and statesmanship of the empress of Russia finally adjusted all

*difficulties. On the 24th of October 1795 Prussia acceded to the Austro-Russian partition compact of the 3rd of January, and the distribution of the ˆconquered provinces Third Par- was, finally regulated on the 10th of October 1796. titionof By the third treaty of partition Austria had to be p *> / ”””> content with Western Galicia and Southern Masovia; Prussia took Podlachia, and the rest of Masovia, with Warsaw; and Russia all the rest.*

The immediate result of the third partition was an immense emigration of the more high-spirited Poles who, during] the next ten years, fought the battles of the French Republic and of Napoleon all over Europe, but principally against their own enemies, the partitioning powers. They were known as the Polish legions, and were commanded by the best Polish generals, e.g. Joseph Poniatowski and Dombrowski. Only Kosciuszko stood aloof. Even when, after the peace of Tilsit, the inde- pendent grand-duchy of Warsaw was constructed out of the central provinces of Prussian Poland, his distrust of Napoleon proved to be invincible. He was amply justified by the course of events. Napoleon’s anxiety to conciliate Russia effectually prevented him from making Poland large and strong enough to

be self-supporting. The grand-duchy of Warsaw originally consisted of about 1850 sq. m., to which Western Galicia and Cracow, about 900 sq. m. more, were added in 1809. The grand-duchy was, from first to last, a mere recruiting-ground for the French emperor. Its army was limited, on paper, to 30,000 men; but in January 1812 65,000, and in November the same year 97,000 recruits were drawn from it. The con- stitution of the little state was dictated by Napoleon, and, subject to the exigencies of war, was on the French model. Equality before the law,, absolute religious toleration and local autonomy, were its salient features. The king of Saxony, as grand-duke, took the initiative in all legislative matters; but the administration was practically controlled by the French.

(R.N.B.)

The Congress Kingdom, 1813-1863. — The Grand Duchy of Warsaw perished with the Grand Army in the retreat from Moscow in 181 2. The Polish troops had taken a prominent part in the invasion of Russia, and their share in the plundering of Smolensk and of Moscow had intensified the racial hatred felt for them by the Russians. Those of them who survived or escaped the disasters of the retreat fled before the tsar's army and followed the fortunes of Napoleon in 1813 and 1814. The Russians occupied Warsaw on the 18th of February 1813 and overran the grand duchy, which thus came into their possession by conquest. Some of the Poles continued to hope ju exaa a e ri. that Alexander would remember his old favour for and Poland. them, and would restore their kingdom under his own rule. Nor was the tsar unwilling to encourage their delusion. He himself cherished the desire to re-establish the kingdom for his own advantage. As early as the 13th of January 18 13 he wrote to assure his former favourite and con- fidant, Prince Adam Czartoryski, that, " Whatever the Poles do now to aid in my success, will at the same time serve to forward the realization of their hopes." But the schemes of Alexander could be carried out only with the co-operation of other powers. They refused to consent to the annexation of Saxony by Prussia, and other territorial arrangements which would have enabled him to unite all Poland in his The Con- own hand. By the final act of the Congress of gressof Vienna, signed on the 9th of June 1815, Poland was vleana – divided between Prussia, Austria and Russia, with one trifling exception: Cracow with its population of 61,000 was erected into a republic embedded in Galicia. Posen and Gnesen, with a population of 810,000, were left to Prussia. Austria remained in possession of Galicia with its 1,500,000 inhabitants. Lithuania and the Ruthenian Palatinates, the spoil of former partitions, continued to be incorporated with Russia. The remnant was constituted as the so-called Congress Kingdom under the emperor of Russia as king (tsar) of Poland. It had been stipu- lated by the Final Act that the Poles under foreign rule should be endowed with institutions to preserve

their national existence

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according to such forms of political existence as the governments to which they belong shall think fit to allow them.

Alexander, who had a sentimental regard for freedom, so long as it was obedient to himself, had promised the Poles a The New constitution in April 1815 in a letter to Ostrov- Poiish Can- skiy, the president of the senate at Warsaw. His stitutloa, promise was publicly proclaimed on the 25th of ,8ls – May, and was reaffirmed in the Zamok or palace at

Warsaw and the cathedral of St John on the 20th of June. The constitution thus promised was duly drafted, and was signed on the 30th of November. It contained 165 articles divided under seven heads. The kingdom of Poland was declared to be united to Russia, in the person of the tsar, as a separate political entity. The kingdom was the Congress Kingdom, for the vague promises of an extension to the east which Alexander had made to the Poles were never fulfilled. Lithuania and the Ruthenian Palatinates continued to be incorporated with Russia as the Western Provinces and were divided from the Congress Kingdom by a customs barrier till the reign of Nicholas I. The kingdom of Poland thus defined was to have at its head a lieutenant of the emperor (namiestnik) , who must be a member of the Imperial house or a Pole. The first holder of the office, General Zajonczek (1752-1826), was a veteran who had served Napoleon. Roman Catholicism was recognized as the religion of the state, but other religions were tolerated. Liberty of the Press was promised subject to the passing of a law to restrain its abuses. Individual liberty, the use of the Polish language in the law courts, and the exclusive employment of Poles in the civil government were secured by the constitution. The machinery of government was framed of a council of state, at which the Imperial government was represented by a commissioner plenipotentiary, and a diet divided into a senate composed of the princes of the blood, the palatines and councillors named for life, and a house of nuntii elected for seven years, 77 chosen by the " dietines " of the nobles, and 51 by the commons. The diet was to meet every other year fcr a session of thirty days, and was to be renewed by thirds every two years. Poland retained its flag, and a national army based on that which had been raised by and had fought for Napoleon. The command of the army was given to the emperor's brother Constantine, a man of somewhat erratic character, who did much to offend the Poles by

violence, but also a good deal to please them by his marriage with Johanna Grudzinska, a Polish lady afterwards created Princess Lowicz, for whose sake he renounced his right to the throne of Russia (see Constantine Pavlovich).

The diet met three times during the reign of Alexander, in 1818, in 1820 and in 1825, and was on all three occasions opened by the tsar, who was compelled to address his subjects in French, since he did not speak, and would not learn, their language. It is highly doubtful whether, with the best efforts on both sides, a constitutional government could have been worked by a Russian autocrat, and an assembly of men who inherited the memories and characters of the Poles. In fact the tsar and the diet soon quarrelled. The Poles would not abolish the jury to please the tsar, nor conform as he wished them to do to the Russian law of divorce. Opposition soon arose, and as Alexander could not understand a freedom which differed from himself, and would not condescend to the use of corruption, by which the ancient Polish diets had been managed, he was driven to use force. The third session of the diet — 13th of May to 13th of June 1825 — was a mere formality. All publicity was sup- pressed, and one whole district was disfranchised because it persisted in electing candidates who were disapproved of at court. On the other hand, the Poles were also to blame for the failure of constitutional government. They would agitate by means of the so-called National Masonry, or National Patriotic Society as it was afterwards called, for the restoration of the full kingdom of Poland. The nobles who dominated the diet did nothing to remove the most crying evil of the country — the miserable state of the peasants, who had been freed from personal serfdom by Napoleon in 1807, but were being steadily

driven from their holdings by the landlords. In spite of the general prosperity of the country due to peace, and the execution of public works mostly at the expense of Russia, the state of the agricultural class grew, if anything, worse.

Yet no open breach occurred during the reign of Alexander, nor for five years after his death in 1825. The Decembrist movement in Russia had little or no echo in Poland. On the death of Zajonczek in 1826, the grand duke Constantine be- came Imperial lieutenant, and his administration, Tne 0raa(j though erratic, was not unfavourable to displays Duke Con- of Polish nationality. The Polish army had no slant!ae – share in the Turkish War of 1829, largely, it is said, at the request of Constantine, who loved parades and thought that war was the ruin of soldiers. No attempt was made to profit by the embarrassments of the Russians in their war with Turkey. A plot to murder Nicholas at his coronation on the 24th of May 1829 was not carried out, and when he held the fourth diet on the 30th of May 1830, the Poles made an osten- tatious show of their nationality

which Nicholas was provoked to describe as possibly patriotic but certainly not civil. Never- theless, he respected the settlement of 1815. In the meantime the Patriotic Society had divided into a White or Moderate party and a Red or Extreme party, which was subdivided into the Academics or Republicans and the Military or Terrorists. The latter were very busy and were supported by the Roman Catholic Church, which did little for the Prussian Poles and nothing for the Austrian Poles, but was active in harassing the schismatical government of Russia.

The outbreak of the French Revolution in 1830 and the revolt of Belgium produced a great effect in Poland. The spread of a belief, partly justified by the language of Polish Nicholas, that the Polish army would be used to Rising of coerce the Belgians, caused great irritation. At last, on the 1 29th of November 1830, a military revolt took place in Warsaw accompanied by the murder of the minister of war, Hauke, himself a Pole, and other loyal officers. The extra- ordinary weakness of the grand duke allowed the rising to gather strength. He evacuated Warsaw and finally left the country, dying at Vitebsk on the 27th of June 1831 (see Constantine Pavlovich). The war lasted from January till September 1831. The fact that the Poles possessed a well-drilled army of 23,800 foot, 6800 horse and 108 guns, which they were able to recruit to a total strength of 80,821 men with 158 guns, gave solidity to the rising. The Russians, who had endeavoured to over- awe' Europe by the report of their immense military power, had the utmost difficulty in putting 114,000 men into the field, yet in less than a year, under the leadership of Diebitsch, and then of Paskevich, they mastered the Poles. On the political and administrative side the struggle of the Poles was weakened by the faults which had been the ruin of their kingdom — faction pushed to the point of anarchy, want of discipline, intrigue and violence, as shown by the abominable massacre which took place in Warsaw when the defeat of the army was known. The Poles had begun by protesting that they only wished to defend their rights against the tsar, but they soon proceeded to proclaim his deposition. Their appeal to the powers of Europe for protection was inevitably disregarded.

When the Congress Kingdom had been reconquered it was immediately reduced to the position of a Russian province. No remnant of Poland's separate political existence Poland a remained save the minute republic of Cracow. Russian Unable to acquiesce sincerely in its insignificance Prov/ ' Ice ' and even unable to enforce its neutrality, Cracow was a centre of disturbance, and, after Russia, Prussia, and Austria had in 1846 agreed to its suppression, was finally occu- pied by Austria on the 6th of November 1848, as a consequence of the troubles, more agrarian than political, which convulsed Galicia. The administration established by Nicholas I. in Russian Poland was harsh and aimed avowedly at destroying the nationality, and even the language of Poland. The Polish universities of

Warsaw and Vilna were suppressed, and the students compelled to go to St Petersburg and Kiev. Polish

recruits were distributed in Russian regiments, and the use of the Russian language was enforced as far as possible in the civil administration and in the law courts. The customs barrier between Lithuania and the former Congress Kingdom was removed, in the hope that the influence of Russia would spread more easily over Poland. A very hostile policy was adopted against the Roman Catholic Church. But though these measures cowed the Poles, they failed to achieve their main purpose. Polish national sentiment was not destroyed, but intensified. It even spread to Lithuania. The failure of Nicholas was in good part due to mistaken measures of what he hoped would be conciliation. He supported Polish students at Russian universities on condition that they then spent a number of years in the public service. It was the hope of the emperor that they would thus become united in interest with the Russians. But these Polish officials made use of their positions to aid their countrymen, and were grasping and corrupt with patriotic intentions. The Poles in Russia, whether at the universities or in the public service, formed an element which refused to

assimilate with the Russians. In Poland itself the tsar left much of the current civil administration in the hands of the nobles, whose power over their peasants was hardly diminished and was misused as of old. The Polish exiles who filled Europe after 1830 intrigued from abroad, and maintained a constant agitation. The stern government of Nicholas was, however, so far effective that Poland remained quiescent during the Crimean War, in which many Polish soldiers fought in the Russian army. The Russian government felt safe enough to reduce the garrison of Poland largely. It was not till 1863, eight years after the death of the tsar in 1855, that the last attempt of the Poles to achieve independence by arms was made.

The rising of 1863 may without injustice be said to be due to the more humane policy of the tsar Alexander II. Exiles were allowed to return to Poland, the Church was ‘ propitiated, the weight of the Russian administration was lightened, police rules as to passports were relaxed, and the Poles were allowed to form an agricultural society and to meet for a common purpose for the first time after many years. Poland in short shared in the new era of milder rule which began in Russia. In April 1856 Alexander II. was crowned king in the Roman Catholic cathedral of Warsaw, and addressed a flattering speech to his Polish subjects in French, for he too could not speak their language. His warning, ” No nonsense, gentlemen ” {Point de reveries, Messieurs), was taken in very ill part, and it was perhaps naturally, but beyond question most unhappily, the truth that the tsar’s concessions only served to encourage the Poles to revolt, and to produce a strong Russian reaction against his liberal policy. As the Poles could no longer dispose of an army, they were unable to assail Russia as openly as in 1830. They had recourse to the so-called ” unarmed agitation,” which was in effect a policy of constant provocation designed to bring on measures of repression to be represented to Europe as examples of Russian brutality. They began in 1S60 at the funeral of the widow of General Sobinski, killed in 1830, and on the 27th of February 1861 they led to the so-called Warsaw massacres, when the troops fired on a crowd which refused to disperse. The history of the agitation which cul- minated

in the disorderly rising of 1863 is one of intrigue, secret agitation, and in the end of sheer terrorism by a secret society, which organized political assassination. The weakness of the Russian governor, General Gorchakov, in 1861 was a repetition of the feebleness of the Grand Duke Constantine in 1830. He allowed the Poles who organized the demonstration of the 27th of February to form a kind of provisional government. Alongside of such want of firmness as this were, however, to be found such measures of ill-timed repression as the order given in i860 to the agricultural society not to discuss the question of the settlement of the peasants on the land. Concession and repres- sion were employed alternately. The Poles, encouraged by the one and exasperated by the other, finally broke into the partial revolt of 1 863-1 864. It was a struggle of ill-armed partisans, who were never even numerous, against regular troops, and was

marked by no real battle. The suppression of the rising was followed by a return to the hard methods of Nicholas. The Polish nobles, gentry and Church — the educated classes generally — were crushed. It must, however, be noted that one class of the measures taken to punish the old governing part of the population of Poland has been very favourable to the majority. The peasants were freed in Lithuania, and in Poland proper much was done to improve their position. The Russian govern- ment has benefited by their comparative prosperity, and by the incurable hatred they continue to feel for the classes which were once their oppressors. The national history of Poland closes with the rising of 1863. (D. H.)

Bibliography. — The best general history of Poland is still Jozef Szujski's monumental History of Poland according to the latest inves- tigations (4 vols., Pol., Lemberg, 1865-1866), a work which has all the authority of careful criticism and easy scholarship. It adopts, throughout, the conservative-monarchical standpoint. Szujski's book has superseded even Joachim Lelewel's learned History of Poland (Pol., Brussels, 1837), of which there are excellent French (Paris, 1844) and German (Leipzig, 1846) editions. The best con- temporary general history is August Sokolowski's Illustrated History of Poland (Pol., Vienna, 1896-1900). The best independent German history of Poland is, on the whole, Roepell (Richard) and Caro's (Jakab) Geschichte' Polens (Hamburg and Gotha, 1840-1888). Scholars desiring to explore for themselves the sources of Polish history from the nth century to the 18th have immense fields of research lying open before them in the Acta historica res gestas Poloniae illustrantia (1878, &c), the Scriptores rerum polonicarum (1872, &c), and the Historical Dissertations (Pol., 1874, &c), all three collections published, under the most careful editorship, by the University of Cracow. To the same order belong Ludwik Finkel's Fontes rerum polonicarum (Lemberg, 1 901, &c), and the innumerable essays and articles in The Historical Quarterly Review of Poland (Pol., Lemberg, 1887, &c). The

soundest history of Lithuania, before its union with Poland, is still Lelewel's History of Lithuania (Pol., Leipzig, 1839), of which a French translation was published at Paris in 1861. Proceeding to the earlier history of Poland, Lelewel's Poland in the Middle Ages (4 vols., Posen, 1846-1851) is still a standard work, though the greatest authority on Polish antiquities is now Tadeusz Wojciechowski, who unites astounding learning with a perfect style. His Historical Sketches of the Eleventh Century (Pol., Cracow, 1904) is a very notable work. Karol Szajnocha's great monograph, justly described as " a pearl of historical litera- ture," Jadwiga and Jagiello (4 vols., Lemberg, 1 861), the result of twelve years of exhaustive study, is our best authority on the first union between Poland and Lithuania. On the other hand, his Boleslaus the Bold, &c. (Lemberg, 1859) would now be considered too romantic and picturesque. The relations between Poland, Prussia and Livonia are adequately dealt with by two sound German books, Theodor Schiemann's Russland, Polen und Livland bis ins xviii. Jahrhundert (Berlin, 1885-1887) and Max Perlbach's Preus- sisch-polnische Studien (Halle, 1886). A good guide to the history of the Jagiellonic period, 1386-1572, is also Adolf Pawinski's Poland in the 15th Century (Pol., Warsaw, 1883-1886). Of the numerous works relating to the reign of the heroic Stephen Bathory, 1575- 1586, Ignaty Janicki's Acta historica res gestas Stephani Bathorei illustrantia (Cracow, 1881), and Paul Pierling's Un arbitrage ponti- fical entre la Pologne el la Russie 1 581-1582 (Brussels, 1890) can be recommended. The best Polish work on the subject is Wincenty Zakrzewski's The Reign of Stephen Bathory (Pol., Cracow, 1887). Of the books relating to the Polish Vasas the most notable is Szaj- nocha's Two Years of our History, 16 46-1648 (Lemberg, 1865), which deals exhaustively with the little-known but remarkable attempt (the last practical attempt of its kind) of Ladislaus IV. to abolish the incurably vicious Polish constitution. Another first- class work, relating to the same period and dealing specifically with the mode of warfare of heroic Poland, is Jozef Tretiak's History of the War of Chocim (Pol., Lemberg, 1893). For works relating to the Sobieskian, Saxon and Partitional periods of Polish history, the reader is referred to the bibliographical notes appended to the biographies of John III., king of Poland, Michal Czartoryski, Stanis- laus II., Tadeusz Andrzej Kosciuszko, Jozef POniatowski, and the other chief actors of these periods. But the following additional authorities should also be noted. (1) Lelewel's History of the Reign of Stanislaus Augustus (Pol., Warsaw, 1831; Fr. ed., Paris, 1839); the book is important as being based on unpublished memoirs in the exclusive possession of the author's family. (2) Materials for the History of the last century of the Republic, by S. Korwin (Cracow, 1890). (3) Die letzte polnische Konigswahl, by Szymon Askenazy (Cracow, 1882-1886). (4) The extremely valuable Prince Repnin in Poland by Aleksander Kraushar (Warsaw, 1900), one of the most thorough of contemporary Polish historians. Innumerable are the

works relating to the Partitional period. Perhaps the best of all is Walery Jan Kalinka's great work in four volumes, Der vierjahrige polnische Reichstag (Berlin, 1896-1898). Kalinka is, however, far too severe upon the patriots and much too indulgent towards

King Stanislaus. Albert Sorel's La Question d 'Orient au XVIII". siecle (Paris, 1889) is lucid and accurate, but somewhat superficial. Wolfgang Michael's Englands Stellung zur ersten Teilung Polens (Hamburg, 1890) is of especial interest to Englishmen. Maryan Dubiecki's Karol Prozor (Pol., Cracow, 1897) shows with what self-sacrificing devotion the gentry and people supported Kosciu- szko's rising. For more complete bibliography see Jozef Korzeniow- ski's Catalogus actorum et documentarum res gestas Poloniae illus- trantium (Cracow, 1889), and Ludwik Finkel's Bibliography of Polish History (Pol., Lemberg, 1891). For the period 1815-1863 see also N. A. Day, The Russian Government in Poland (London, 1867); Theodor Schiemann, Russland unter Kaiser Nikolaus I., vol. i. (Berlin, 1904).

POLISH LITERATURE

The Polish language belongs to the western branch of the Slavonic tongues, and exhibits the closest affinities with the Czech or Bohemian and Lusatian Wendish. Unlike the people of other Slavonic countries, the Poles are comparatively poor in popular and legendary poetry, but such compositions un- doubtedly existed in early times, as may be seen by the writings of their chroniclers; thus Callus translated into Latin a poem written on Boleslaus the Brave, and a few old Polish songs are included in Wojcicki's Library of Ancient Writers. A great deal of the early literature written in Poland is in Latin. The earliest specimen of the Polish language is the so-called Psalter of Queen Margaret, discovered in 1826 at the convent of St Florian. The date of the manuscript appears to be the middle of the 14th century, and probably in its present form it is only a copy of a much older text; there is also a translation of the fiftieth psalm belonging to the 13th century. 1 The ancient Polish hymn or war song, Piesn Boga Rodzica, was an address to the Virgin, sung by the Poles when about to fight. The oldest manuscript of this production is dated 1408, and is preserved at Cracow. By a legend which subsequently grew up the composition of it was assigned to St Adalbert. John Lodzia, bishop of Posen from 133 5 to 1346, composed several religious songs in Latin.

The next monument of Polish literature to which we come is the Bible of Queen Sophia or Bible of Szaroszpatak. It is im- perfect, and only contains the early books, viz. the Pentateuch, Joshua, Ruth and Kings; there are, however, fragments of three others. It is said to have been written for Sophia, the fourth wife of Jagiello, about the year 1455. It has been edited with great care by Malecki. Five religious songs in Polish dating from the 15th century have been preserved; they are ascribed to Andrew Slopuchowski, prior of the monastery of the Holy Cross on Lysa Gora. There is also the fragment of a hymn in praise of Wycliffe. To these fragments may be added the prayer- book of a certain Wadaw, a sermon on marriage, and some Polish glosses. These are all the existing memorials of the Polish language before the i&th century.

Perhaps a few words should be said concerning the writers in Latin. Martin Gallus lived in Poland between 11 10 and 1135. From his name he has been supposed by some to Chronicles. have been a Frenchman or Walloon, and we must remember that Poland swarmed at that time with foreign ecclesiastics. Lelewel, the Polish historian, considers that it is merely a translation into Latin of some such name as Kura, signifying " a fowl." Others suppose him to have been an Italian, or a monk from the convent of St Gall in Switzerland. He has plenty of legends to tell us, and writes altogether in a poetical style, so that his prose seems to fall into rhythm unconsciously. His quotations from the classics, Sallust, Lucan and others, show the extent of his reading. Gallus was followed by Matthew Cholewa and Vincent Kadlubek, two bishops of Cracow, and Bogufal or Boguchwal (Gottlob), bishop of Posen, who all used Latin. The work of Kadlubek is more ornate in diction than that of Bogufal, and for a long time enjoyed great popularity. He was born in 11 60, educated at the university of Paris, and died in Poland in 1223 as a Cistercian monk. His Latin, like that of Gallus, is far from classical, but he writes with spirit and throws a good deal of light upon

1 The Psalter is called after Margaret, the first wife of King Louis, who died in 1349, by a mere conjecture. Caro thinks it more probable that the book belonged to Mary, his daughter.

the events of his time. The education of the country was wholly in the hands of the ecclesiastics, many of whom were foreigners. In this way we must explain the great prevalence of the Latin language. Such a system would be sure to stifle all national outgrowth, and accordingly we have among the Poles none of those early monuments of the language which other countries boast. For instance, there are no bilini or legendary poems, such as are found among the Russians, although many passages in the ancient chroniclers from their poetical colouring seem to be borrowed from old songs or legends, and the first verses of some of these compositions

have been preserved. Mention may here be made of other chroniclers such as Martin the Pole (Polonus), who died in 1279 or 1280, and Jan of Czarnkow, who died in 1389; the latter was the historian and panegyrist of Casimir the Great. With the reign of Casimir III. (1333-1370) must be associated the statutes of Wislica. Jadwiga, the wife of Jagiello, was mainly instrumental in creating the university of Cracow, which received a charter in 1364, but did not come into effective existence till its reconstitution in 1400. In this institution for many years all the great men of Poland were trained — among others Gregory of Sanok, Dlugosz and Copernicus. Casimir the Great may be said to have laid the foundation of this university. Having obtained the consent of Pope Urban V., he established at Cracow a studium generate on the model of the university of Bologna. It consisted of three faculties — Roman law, medicine and philosophy. But the aristocratic youth still preferred frequenting the universities of Prague, Padua and Paris, and accordingly the newly founded studium languished. Jadwiga, however, obtained from Boniface IX. permission to create a new chair, that of theology; and the university of Cracow was remodelled, having been reorganized on the same basis as that of Paris. Another university was founded later at Vilna by Batory, and one at Zamosd by the chancellor Zamoyski, There were also good schools in various places, such as the Collegium Lubranskiego of Posen and the school of St Mary at Cracow. In the year 1474 a press was set up in the latter city, where Gunther Zainer printed the first book. The first press from which books in the Polish language appeared was that of Hieronymus Wietor, a Silesian, who commenced publishing in 1515. A few fragments printed in Polish had appeared before this, as the Lord's Prayer in the statutes of the bishops of Breslau in 1475, the story of Pope Urban in Latin, German and Polish in 1505, &c; but the first complete work in the Polish language appeared from the press of this printer at Cracow in 1521, under the title, Speeches of the Wise King Solomon. The translation was executed by Jan Koszycki, as the printer informs us in the preface, and the work is dedicated to Anna Wojnicka, the wife of a castellan. In 1522, a Polish translation of Ecclesiastes appeared from that press, and before the conclusion of that year The Life of Christ, with woodcuts, translated into Polish by Balthasar Opec. Many other presses were soon established. Printers of repute at Cracow, during the 16th and beginning of the r7th century, were Sybeneicher and Piotrkowczyk.

Little as yet had been produced in Polish, as the chroniclers still adhered to Latin; and here mention must be made of Jan Dlugosz, who called himself Longinus. He was bishop _. of Lemberg, the capital of Galicia, and has left us a very valuable history which has merits of style and shows considerable research. So anxious was Dlugosz to make his work as perfect as he could that he learned Russian so as to be able to read the Chronicle of Nestor.

The best part of his book, is that which treats of the period between 1386 and 1480. About 1500 was written an interesting little work entitled " Memoirs of a Polish Janissary " (Pamietniki ianczara polaka). Although written in the Polish language, it was probably the production of a Serb, Michael Constantinovich of Ostrovitza. He was taken prisoner by the Turks in 1455 and served ten years among the Janissaries, after which he escaped into Hungary. About this time also flourished Nicholas Copernicus, a native of Thorn, one of the few Poles who have made themselves known beyond the limits of their country.

The Poles call the period between 1548 and 1606 their golden

age. Poland was the great land of eastern Europe, and owing to the universal toleration encouraged by the government, Protestantism was widely spread. Many of the chief nobility were Calvinists, and the Socini came to reside in the country. All this, however, was to pass away under the great Jesuit re- action. At Rakow in Poland was published the catechism of the Socinian doctrines in 1605. The Jesuits made their appear- ance in Poland in 1564, and soon succeeded in getting the schools of the country into their hands. Besides extirpating the various sects of Protestants, they also busied themselves with destroying the Greek Church in Lithuania. Latin poetry was cultivated with great success by Clement Janicki (1516-1543), but the earliest poet of repute who wrote in Polish is Rej of Naglowice (1 505-1 569) . After a somewhat idle youth he betook himself to poetry. He was a Protestant, and among other religious works translated the Psalms. His best work was Zwierciadlo albo zywot poczciwego czlowieka (The Mirror or Life of an Honourable Man) — a somewhat tedious didactic piece. He was also the author of a kind of play — a mystery we may term it, and productions of this sort seem to have been common in Poland from a very early time — entitled Life of Joseph in Egypt. This piece is interesting merely from an antiquarian point of view; there is but little poetry in it. It teems with anachronisms; thus we have mention of the mass and organs, and also of a German servant. Lucas Goinicki (1 527-1603) wrote many historical works, and Dworzanin polski, an imitation of the Cortegiano of Castiglione.

Jan Kochanowski 1 (1530-1584), called the prince of Polish poets, came of a poetical family, having a brother, a cousin and a nephew who all enriched the literature of skj. aaow ' their country with some productions.

Kochanowski studied for some time at the university of Padua, and also resided in Paris, where he made the acquaintance of Ronsard. Returning to Poland, he became in 1564 secretary to Sigismund Augustus. He has left The Game of Chess, an imitation of Vida, and Proporzec albo hold pruski (The Standard or Investiture of Prussia), where he describes the fealty done by Albert of Brandenburg to Sigismund Augustus. He also executed a translation of the Psalms. He wrote a play — a piece of one act, with twelve scenes — The Despatch of the Greek Ambassadors. It is written in rhymeless five-foot iambics, and is altogether a product of the Renaissance, reminding us of some of the productions of George Buchanan. Rhyme is employed in the choruses only. It was acted on the marriage of the chancellor Jan Zamoyski with Christine RadziwiH, in the presence of King Stephen and his wife, at Ujazdowo near Warsaw in 1578. The poet's most popular work, however, is his Treny or " Lamentations, " written on the death of his daughter Ursula. These beautiful elegies have been justly praised by Mickiewicz; they are enough to raise Kochanowski far above the level of a merely artificial poet. Besides poems in Polish, he also wrote some in Latin. It will be observed that we get this double-sided authorship in many Polish writers. They composed for an exclusive and learned circle, certainly not for the Jew, the German trader of the town, or the utterly illiterate peasant. It may be said with truth of Kochanowski that, although the form of his poetry is classical and imitated from classical writers, the matter is Polish, and there is much national feeling in what he has left us. Mention must also be made of his epigrams, which he styled " Trifles " (Fraszki); they are full of spirit and geniality. Stan- islaus Grochowski (1554-1612) was a priest; but his poetry is of little merit, although he was celebrated in his time as a writer of panegyrics. His satire Babie Kolo (The Women's Circle) gave offence on account of its personalities. A great partisan of the Catholics in the time of Sigismund III. was Caspar Miaskowski, whose Waleta Wloszlzonowska (Farewell to his Native Country) deserves mention. Szarzynski, who died young in 1581, deserves notice as having introduced the

'His collected works were printed in 1584; they were many times reprinted, the best edition being that of Warsaw (4 vols., 1884). His life was written by Przyborowski (Posen, 1 857).

sonnet to the Poles. This species of poetry was afterward to be carried to great perfection by Mickiewicz and Gaszynski.

Szymonowicz (1 554-1624) was a writer of good pastorals. Although they are imitated from classical writers, he has introduced many scenes of national life, which he describes with much vigour. Among the best are ˆf˜° a °" " The Lovers," " The Reapers," and " The Cake " (Kolacz). Mickiewicz is very loud in his praise, and considers him one of the best

followers of Theocritus. The condition, however, of the Polish peasants was too miserable to admit of their being easily made subjects for bucolic poetry. There is an artificial air about the idylls of Szymonowicz which makes one feel too keenly that they are productions of the Renaissance; one of their best features is the humane spirit towards the miserable peasantry which they every- where display. Another excellent writer of pastorals was Zimorowicz, a native of Lemberg, who died at the early age of twenty-five. Some of his short lyrics are very elegant, and remind us of Herrick and Carew — e.g. that beginning " Ukochana Lancellotol Ciebie nie prosze zloto." Another writer of pastorals, but not of equal merit, was Jan Gawinski, a native of Cracow. Some good Latin poetry was written by Casimir Sarbiewski, better known in the west of Europe as Sarbievius (d. 1640). He was considered to have approached Horace more nearly than any other modern poet, and a gold medal was given him by Pope Urban VIII. Martin Kromer (151 2-1 589) wrote a history of Poland in thirty books, and another volume, giving a description of the country and its institutions — both in Latin. The history is written in an easy style and is a work of great merit. A poet of some importance was Sebastian Fabian Klonowicz (1545-1602), who latinized his name into Acernus, Klon being the Polish for maple, and wrote in both Latin and Polish, and through his inclination to reform drew down on himself the anger of the clergy. Sometimes he is descriptive, as in his Polish poem entitled Flis (" The Boatman "), in which he gives a detailed account of the scenery on the banks of the Vistula. There is some poetry in this com- position, but it alternates with very prosaic details. In another piece, Rhoxolania, in Latin, he describes the beauties of Galicia. Occasionally he is didactic, as in Worek Judaszow (The Bag of Judas) and Victoria deorum, where, under the allegory of the gods of Olympus, he represents the struggles of parties in Poland, not without severely satirizing the nobility and ecclesiastics. A curious work called Quincunx, written by Orzechowski (1515-1566), is concerned with religious polemics. Andrew Modrzewski, a Protestant, in his work De republica emendanda (1551), recommended the establishment of a national church which should be independent of Rome, something upon the model of the Anglican.

A florid Jesuitical style of oratory became very popular in the time of Sigismund III., not without rhetorical power, but frequently becoming tawdry. The chief representa- tive of this school was Piotr Skarga (1536-1612), one of the main agents in extirpating Calvinism in Poland and the Greek Church in Lithuania. Among his numerous writings may be mentioned Lives of the Saints, Discourses on the Seven Sacra- ments, and especially his sermons preached before the diet, in which he lashed the Poles for their want of patriotism and prophesied the downfall of the country. Mecherzynski, in his " History of Eloquence in Poland " (Historya

wymowy w Polsce), especially praises his two funeral sermons on the burial of Anna Jagiellonka, widow of Stephen Batory, and Anna of Austria, first wife of Sigismund III. Besides the Latin histories of Wapowski and Gwagnin (Guagnini, of Italian origin), we have the first historical work in Polish by Martin Bielski, a Protestant, viz. Kronika polska, which was afterwards continued by his son. The author was born in 1495 on his father's estate, Biaia, and was educated, like so many other of his illustrious contemporaries, at the university of Cracow. He lived to the age of eighty; but, however great were the merits of his Chronicle, it was long considered a suspicious book on account of the leanings of the author to Calvinism. After his death his work was continued by

his son Joachim (1540-1599). There is also a Chronicle by Bartholomew Paprocki. In 1582 was also published the Chronicle of Stryjkowski, full of curious learning, and still of great use to the student of history. Five years later appeared the Annates Poloniae of Sarnicki. The last three works are in Latin.

A few words may be said here about the spread of Pro- testantism in Poland, which is so intimately mixed up with

the development of the national language. The fˆ ad t of t . doctrines of Hus had entered the country in very ism. ' early times, and we find Polish recensions of

Bohemian hymns; even the hymn to the Virgin previously mentioned is supposed to have a Czech basis. The bishops were soon active against those who refused to conform to the doctrines of the Roman church. Thus we find that Bishop Andrew of Bnin seized five Hussite priests and caused them to be burnt in the market of Posen in 1439. A hundred years afterwards a certain Katharina Malcher, on account of her Utraquist opinions, was condemned by Gamrat, the bishop of Cracow, to be burnt, which sentence was accordingly carried out in the ragmarket at Cracow. As early as 1530 Lutheran hymns were sung in the Polish language at Thorn. In Konigs- berg, John Seklucyan, a personal friend of Luther, published a collection of Christian Songs. He was born in Great Poland, and was at first a Roman Catholic priest in Posen, but afterwards embraced the Protestant faith and was invited by Duke Albert as a preacher to Konigsberg, where he died in 1578. He executed the first translation of the

New Testament in i55r. Four years afterwards appeared a com- plete Polish Bible published by Scharffenberg at Cracow. In r 553 appeared at Brzesc the Protestant translation of the whole Bible made by a committee of learned men and divines, and published at the expense of Nicholas RadziwiH, a very rich Polish magnate who had embraced the Protestant doctrines. This book is now of great rarity because his son Christopher, having been induced to become a Roman Catholic by the Jesuit Skarga, caused all copies of his father's Bible which he could find to be burnt. One, however, is to be seen in the Bodleian Library, and another in the library of Christ Church at Oxford. A Socinian Bible was issued by Simon Budny in 1570 at Nies- wiez, as he professed to find many faults in the version issued under the patronage of RadziwiH; in 1597 appeared the Roman Catholic version of the Jesuit Wujek; and in 1632 the so-called Danzig Bible, which is in use among Protestants and is still the most frequently reprinted.

Up to this time Polish literature, although frequently rhe- torical and too much tinctured with classical influences, had

still exhibited signs of genius. But now, owing Period"' t0 t ˆ le fri v0 ' ous studies introduced by the Jesuits,

the so-called macaronic period supervened, which lasted from 1606 to 1764, and was a time of great degradation for the language and literature. The former was now mixed with Latin and classical expressions; much of the literature con- sists of fulsome panegyric, verses written on the marriages and funerals of nobles, with conceits and fantastic ideas, devoid of all taste, drawn from their coats of arms. The poets of this period are, as may be imagined, in most cases mere rhymesters; there are, however, a few whose names are worth recapitulating, such as Wadaw Potocki (c. 1622-c. 1696), now known to have been the author of the Wojna Chocimska, or " War of Khotin," the same campaign which afterwards formed the subject of the epic of Krasicki. At first the author was supposed to have been Andrew Lipski, but the real poet was traced by the his- torian Szajnocha. The epic, which remained in manuscript till 1850, is a genuine representation of Polish life; no picture so faithful appeared till the Pan Tadeusz of Mickiewicz. More- over, Potocki had the good taste to avoid the macaronic style so much in vogue; his language is pure and vigorous. He does not hesitate to introduce occasionally satirical remarks on the luxury of the times, which he compares, to its disadvantage, with the simplicity of the old Polish life. There is also another poem attributed to Potocki called the New Mercury. In one

passage he censures King Michael for ceding Podolia to the Turks. Samuel Twardowski (1600-1660) was the most pro- lific poet of the period of the

Vasas. His most important poem is Wladystaus I V., King of Poland, in which he sings in a very bombastic strain the various expeditions of the Polish monarch. A bitter satirist appeared in the person of Christopher Opalinski (1609-1656). His works were published under the title of Juvenalis redivivus, and, although boasting but little poetical merit, give us very curious pictures of the times. Hieronymus Vespasian Kohcowski (1633-1699) was a soldier-poet, who went through the campaigns against the Swedes and Cossacks; he has left several books of lyrics full of vivacity, a Christian epic and a Polish psalmody. Another poet was Andrew Morsztyn (born about 1620, died about the commencement of the 18th century), an astute courtier, who was finance minister (pod- skdrbi) under John Casimir, and was a devoted adherent of the French party at court, in consequence of which, in the reign of Sobieski, he was compelled to leave his native country and settle in France. His poems are elegant and free from the conceits and pedantry of the earlier writers. In fact, he introduced into Poland the easy French manner of such writers as Voiture. He translated the Cid of Corneille, and wrote a poem on the subject of Psyche, based upon the well-known Greek myth. History in the macaronic period made a backward step: it had been written in the Polish language in the golden age; it was now again to take a Latin form, as in the Chronica Gestarum in Europa singularium of tlfe ecclesiastic Paul Piasecki (1 580-1649), who is an authority for the reigns of Sigismund III. and Wladislaus IV., and Rudawski, who describes events from the accession of John Casimir to the peace of Oliva (1648- 1660); and as valuable materials for history may be mentioned the five huge volumes of Andrew Chrysostom Zaluski (1711), bishop of Warmia. This work is entitled Epistolae historico- familiares. It would be impossible to recapitulate here the great quantity of material in the shape of memoirs which has come down, but mention must be made of those of John Chry- sostom Pasek, a nobleman of Masovia, who has left us very graphic accounts of life and society in Poland; after a variety of adventures and many a well-fought battle, he returned to ' the neighbourhood of Cracow, where he died between 1699 and 1 701. Some of the most characteristic stories illustrating Polish history are drawn from this book. A later period, that of the miserable epoch of Augustus III., is described very graphic- ally in the memoirs of Matuszewicz, first edited by Pawinski at Warsaw in 1876. Relating to the same period are also the memoirs of Bartholomew Michalowski (Pamietniki Bartlomieja Michalowskiego). A curious insight into the course of education which a young Polish nobleman underwent is furnished by the instructions which James Sobieski, the father of the celebrated John, gave to Orchowski, the tutor of his sons. This has been twice printed in comparatively recent times (Instrukcya Jakdba Sobieskiego kasztelana Krakowskiego dana panu Orchow- skiemu ze strony synow, Vilna, 1840). The old gentleman in his aristocratic imperiousness

frequently reminds us of the amusing directions given by Sir John Wynne to his chaplain, quoted in Pennant's Tour in Wales.

A History of the Lithuanians in Latin was published by the Jesuit Koialowicz; the first volume appeared at Danzig in 1650. A valuable work on the condition of Poland was written by Stanislaus Leszczynski, who was twice chosen king, entitled Gtos wolny wolnost ubezpieczajqcy (A Free Voice Guaranteeing Freedom), where he tells the Poles some homely and perhaps disagreeable truths illustrating the maxim Summa liberias eliam perire volentibus.

A notable man was Joseph Andrew Zaluski, bishop of Kiev, a Pole who had become thoroughly frenchified — so much so, that he preached in French to the fashionable congregations of Warsaw. He collected a splendid library of about 300,000 volumes and 15,000 manuscripts, which he bequeathed to the Polish nation; but it was afterwards carried off to St Petersburg, where it formed the foundation of the imperial public library. According to Nitschmann in his Geschichte der polnischen

Litteratur — a work which has been of service in the preparation of this article — the books were transported to Russia very care- lessly, and many of them injured by the way. It was especially rich in works relating to Polish history. Konarski edited in six volumes a valuable work entitled Volumina legum, containing a complete collection of Polish laws from the time of the statute of Wislica: He did much good also in founding throughout the country schools for the education of the sons of the upper classes, but as yet nothing had been done for popular educa- tion properly so-called. About the close of this period we have some valuable writers on Polish history, which now began to be studied critically, such as Hartknoch in his Alt- und Neues Preussen (1684), a work in which are preserved interesting specimens of the old Prussian language, and Lengnich (1689-1774), author of the valuable Jus publicum regni Poloniae, which appeared in 1742.

We now come to the reign of the last Polish king, Stan- islaus Poniatowski, and the few quiet years before the final division of the country, during which the French taste was all- powerful. This is the second great period of the development of Polish literature, which has known nothing of medieval romanticism. The literature of the first or Renaissance period gives us some

good poets, who although occasionally imitators are not without national feeling, and a goodly array of chron- iclers, most of whom made use of Latin. In the second or French period we get verse-makers rather than poets, who long to be Frenchmen, and sigh over the barbarism of their country; but the study of history in a critical spirit is beginning under the influence of Naruszewicz, Albertrandi and others. In the third period, that of modern romanticism, we get true nation- alism, but it is too often the literature of exile and despair. Here may be mentioned, although living a little time before the reign of Stanislaus, a Polish poetess, Elizabeth Druzbacka (1695-1760), whose writings show a feeling for nature at a time when verse-making of the most artificial type was prevalent throughout the country. The portrait prefixed to the Leipzig edition of her works is a striking one, representing a hand- some, intellectual-looking woman, dressed in the garb of some religious order. Her Life of David in verse appears tedious, but many of the descriptions in the Seasons are elegant. Un- fortunately she introduces latinisms, so that her Polish is by no means pure. A national theatre was founded at Warsaw in 1765 under the influence of the court, but it was not till long afterwards that anything really national connected with the drama appeared in Poland. Thomas Kajetan Wegierski (1755-1787), who was chamberlain to the king, enjoyed a con- siderable reputation among his countrymen for his satirical writing. He was a kind of Polish Churchill, and like his Eng- lish parallel died young. His life also appears to have been as irregular as Churchill's. In consequence of an attack on the empress of Russia, he was compelled to leave Poland, and accordingly made a tour in Italy, France, America, and Eng- land, dying at Marseilles at the early age of thirty-three. His poetry shows the influence of the French taste, then prevalent throughout Europe. In times of great national disasters he deserves to be remembered as a true patriot; but the spirit of his poetry is altogether unwholesome. It is the wailing cry of a moribund nation. The great laureate of the court of Stanislaus was Trembecki (1722-1812), whose sympathies were too much with the Russian invaders of his country. He was little more than a fluent poetaster, and is now almost for- gotten. One of his most celebrated pieces was Zofjowka, written on the country seat of Felix Potocki, a Polish magnate, for this was the age of descriptive as well as didactic poetry. Perhaps the English gave the hint in such productions as " Cooper's Hill." The old age of Trembecki appears to have been ignoble and neglected; he had indeed " fallen upon evil days and evil tongues "; and when he died at an advanced age all the gay courtiers of whom he had been the parasite were either dead or had submitted to the Muscovite yoke. He comes before us as a belated epicurean, whose airy trifles cannot be warbled in an atmosphere surcharged with tempests and gunpowder.

The end of the 18th century was not the period for a court poet in Poland.

The most conspicuous poet, however, of the time was Ignatius Krasicki, bishop of Warmia (1735-1801). He was the friend of Frederick the Great and a prominent member of Krasicki the king's literary club at Sans Souci. Krasicki wrote an epic on the war of Khotin — the same as had furnished the subject of the poem of Potocki, of which Krasicki in all probability had never heard, and also that of the Dalmatian Gundulich. Krasicki's poem is at best but a dull affair, in fact a pale copy of a poor original, the Henriade of Voltaire. His mock heroics are, to say the least, amusing, and among these may be mentioned Myszeis, where he describes how King Popiel, according to the legend, was eaten up by rats. His Monacho- machia is in six cantos, and is a satire upon the monks. The bishop was also the writer of some pretty good comedies. In fact most styles of composition were attempted by him — of course satires and fables among the number. He presents him- self to us much more like a transplanted French abbe than a Pole. In the year 1801 he travelled to Berlin, and died there after a short illness. Among his other works the bishop pub- lished in 1781-1782, in two volumes, a kind of encyclopaedia of belles lettres entitled Zbidr Wiadomosci. His estimates of various great poets are not very accurate. Of course he finds Shakespeare a very " incorrect " author, although he is willing to allow him considerable praise for his vigour. F. Morawski (1 783-1861) published some excellent Fables (1800) in the manner of Krasicki, and in 1851 an epic entitled My Grandfather's Farm. Adam Naruszewicz (1 733-1 796) was bishop and poet. The existence of so many ecclesiastical writers was a natural feature in Polish literature; they formed the only really cul- tured class in the community, which consisted besides of a haughty ignorant nobility living among their serfs, and (at a vast distance) those serfs themselves, in a brutalized condition. Burghers there were, properly speaking, none, for most of the citizens in the large towns were foreigners governed by the Jus magdeburgicum. Naruszewicz has not the happy vivacity of Krasicki; he attempts all kinds of poetry, especially satire and fable. He is at best but a mediocre poet; but he has suc- ceeded better as a historian, and especially to be praised is his " History of the Polish Nation " {Historya narodu polskiego), which, however, he was not able to carry further than the year 1386. He also wrote an account of the Polish general Chod- kiewicz, and translated Tacitus and Horace. Interesting memoirs have been published by Kilinski, a Warsaw shoemaker, and Kosmian, state referendary, who lived about this time and saw much of the War of Independence and other political affairs. Among the smaller poets of this period may be men- tioned Karpinski (1741-1828), a writer of sentimental elegies in the style then so very much in fashion, and Franciszek Dyonizy Kniaznin (1750-1807), who nourished his muse on classical themes and wrote several plays. He was the court poet of Prince Adam Czartoryski at Pulawy, and furnished odes in commemoration of all the important events which occurred in the

household. He lost his reason on the down- fall of Poland, and died after eleven years' insanity in 1807. Julian Ursin Niemcewicz (1758-1841) was one of the most popular of Polish poets at the commencement of the present century (see Niemcewicz). His most popular work is the " Collection of Historical Songs " (Spiewy historyczne) , where he treats of the chief heroes of Polish history. Besides these he wrote one or two good plays, and a novel in letters, on the story of two Jewish lovers. John Paul Woronicz (1757-1829) born in Volhynia, and at the close of his life bishop of Warsaw and primate of Poland, was a very eloquent divine, and has been called the modern Skarga. A valuable worker in the field of Slavonic philology was Linde, the author of an excellent Polish dictionary in six volumes. For a long time the culti- vation of Polish philology was in a low state, owing to the preva- lence of Latin in the 17th century and French in the 18th. No Polish grammar worthy of the name appeared till that of Kopczynski at the close of the 18th century, but the reproach

has been taken away in modern times by the excellent works by Malecki and Malinowski. Rakowiecki, who edited the Rousskaia Pravda, and Macieiowski (who died in 1883, aged ninety), author of a valuable work on Slavonic law, may here be mentioned. Here we have a complete survey of the leading codes of Slavonic jurisprudence. At a later period (in 1856) appeared the work of Helcel, Starodawne prawa pol- skiigo pomniki (" Ancient Memorials of Polish Law "). Aloysius Felinski (r77r-i82o) produced an historical tragedy, Barbara Radziwitl, and some good comedies were written by Count Polish Alexander Fredro (1793-1876). In fact Fredro may Drama. De considered the most entertaining writer for the stage which Poland has produced. He introduced genuine comedy among his countrymen. The influence of Moliere can be very clearly seen in his pieces; his youth was spent chiefly in France, where he formed one of the soldiers of the Polish legion of Napoleon and joined in the expedition to Russia. His first produc- tion was Pan Geldhab, written in 1810 and produced at Warsaw in 1 82 1. From 1819 to 1835 he wrote about seventeen pieces and then abandoned publishing, having taken offence at some severe criticisms. At his death he left several comedies, which were issued in a posthumous edition. There is a good deal of local colouring in the pieces of Fredro; although the style is French, the characters are taken from Polish life. From him may be said to date the formation of anything like a national Polish theatre, so that his name marks an epoch. The Poles, like many of the other nations of Europe, had religious plays at an early

period. They were originally performed in churches; but Pope Innocent II. finding fault with this arrangement, the acting was transferred to churchyards. Mention has already been made of plays written by Rej and Kochanowski; they are mere fruits of the Renaissance, and cannot in any way be considered national. The wife of John Casimir, a French- woman, Marie Louise, hired a troop of French actors and first familiarized the Poles with something which resembled the modern stage. The Princess Franciszka RadziwiH composed plays which were acted at her private residence, but they are spoken of as inartistic and long and tedious. The national theatre was really founded in the reign of Stanislaus Augustus; and good plays were produced by Bohomolec, Kaminski, Krop- \nski, Boguslawski, Zablocki, and others. Perhaps, however, with the exception of the works of Fredro, the Poles have not produced anything of much merit in this line. A great states- man and writer of the later days of Polish nationality was Kollataj, born at Sandomir in 1750. He was a man of liberal sentiments, and, had his plans been carried out, Poland might have been saved. He wished to abolish serfdom and throw open state employments to all. The nobility, however, were too infatuated to be willing to adopt these wise measures. Like the French aristocrats with the reforms of Necker, they would not listen till ruin had overtaken them. During the last war of Poland as an independent country Kollataj betook himself to the camp of Kosciuszko, but when he saw that there was no longer hope he went to Galicia, but was captured by the Austrians and imprisoned at Olmiitz till 1803. He died in 1812. An active co-operator with Kollataj was Salesius Jezierski, who founded clubs for the discussion of political questions, and Stanislaus Staszic, who did much for education and improved the condition of the university of Warsaw.

The reputation of all preceding poets in Poland was now destined to be thrown into the shade by the appearance of Mickiewicz (1798-1855), the great introducer of romanticism into the country (see Mickiewicz). Poland, as has been said before, is not rich in national songs and legendary poetry, in which respect it cannot com- pare with its sister Slavonic countries Russia and Servia. Collec- tions have appeared, however, by Waclaw Zaleski, who writes under the pseudonyms of Waclaw z Oleska, Wojcicki, Roger, Zegota Pauli, and especially Oskar Kolberg. Poland and Lithuania, however, abounded with superstitions and legends which only awaited the coming poet to put them into verse. In the year 1831 Romuald Zienkiewicz published Songs of the

Roman- ticism.

People of Pinsk, and collections have even appeared of those of the Kashoubes, a remnant of the Poles living near Danzig. Mickiewicz had had a predecessor, but of far less talent, Casimir Brodzinski (1791-1835). He

served under Napoleon in the Polish legion, and has left a small collection of poems, the most important being the idyl Wieslaw, in which the manners of the peasants of the district of Cracow are faithfully portrayed. The second great poet of the romantic school who appeared in Poland after Mickiewicz was Julius Slowacki (1800-1849), born at Krzemieniec. In 1831 he left his native country and chose Paris as his residence, where he died. His writings are full of the fire of youth, and show great beauty and elegance of expression. We can trace in them the influence of Byron and Victor Hugo. He is justly considered one of the greatest of the modern poets of Poland. His most celebrated pieces are Hugo; Mnich ("The Monk ") ; Lambro, a Greek corsair, quite in the style of Byron; Anhetti, a very Dantesque poem expressing under the form of an allegory the sufferings of Poland; Krol duck (" The Spirit King "), another mysterious and allegorical poem; Waclaw, on the same subject as the Mary a of Malczewski, to be afterwards noticed; Beniowski, a long poem in ottava rima on this strange adventurer, something in the style of Byron's humorous poems; Kordyan, of the same school as the English poet's Manfred; Lilla Weneda, a poem dealing with the early period of Slavonic history. The life of Slowacki has been published by Professor Anton Malecki in two volumes. Mickiewicz and Slowacki were both more or less mystics, but even more we may assign this characteristic to Sigismund Krasinski, who was born in 1812 at Paris, and died there in 1859. It would be impossible to analyse here his extraordinary poem Nieboska komedja (" The Undivine Comedy "), Irydion, and others. In them Poland, veiled under different allegories, is always the central figure. They are powerful poems Written with great vigour of language, but enveloped in clouds of mys- ticism. The life of Krasinski was embittered by the fact that he was the son of General Vincent Krasinski, who had become unpopular among the Poles by his adherence to the Russian government; the son wrote anonymously in consequence, and was therefore called " The Unknown Poet." Among his latest productions are his " Psalms of the Future " (Psalmy przy- sztosci) K which were attacked by the democratic party as a defence.of aristocratic views which had already ruined Poland. His friend Slowacki answered them in some taunting verses, and this led to a quarrel between the poets. One of the most striking pieces of Krasinski has the title " Resurrecturis." The sorrows of his country and his own physical sufferings have communicated a melancholy tone to the writings of Krasinski, which read like a dirge, or as if the poet stood always by an open grave — and the grave is that of Poland. He must be considered as, next to Mickiewicz, the greatest poet of the country. Other poets of the romantic school of considerable merit were Gorecki, Witwicki, Odyniec, and Gaszynski; the last-named wrote many exquisite sonnets, which ought alone to embalm his name. Witwicki (1800-1847) was son °f a professor at Krzemieniec. He was a writer of ballads and poems dealing with rural life, which enjoyed

great popularity among his countrymen and had the good fortune to be set to music by Chopin. The works of Lelewel have separate mention (see Lelewel) ; but here may be specified the labours of Narbutt, Dzieje starozytne arodu litewskiego (" Early History of the Lithuanian People "), pub- lished at Vilna in nine volumes, and the valuable Monumenta Poloniae historica, edited at' Lemberg by Bielowski, of which several volumes have appeared, containing reprints of most of the early chroniclers. Bielowski died in 1876.

A further development of romanticism was the so-called Ukraine school of poets, such as Malczewski, Goszczynski, and Zaleski. Anton Malczewski (1 793-1826) wrote one poem, Marya, a Ukrainian tale which passed school. unnoticed at the time of its publication, but after its author's death became very popular. Malczewski was one of Napoleon's officers; he led a wandering life and was in- timate with Byron at Venice; he is said to have suggested to

the latter the story of Mazeppa. Marya is a narrative in verse in the manner of Byron. It is written with much feeling and elegance, and in a most harmonious metre. The chief poem is Severin Goszczynski (1803-1876) is Zamek Kaniowski (" The Tower of Kaniow "). The most interesting poem of Bogdan Zaleski is his " Spirit of the Steppe " (Duch od stepu). Other poets of the so-called Ukraine school, which has been so well inspired by the romantic legends of that part of Russia, are Thomas or Timko Padoura (who also wrote in the Malo-Russian, or Little-Russian, language), Alexander Groza, and Thomas Olizarowski. For many of the original songs and legends we must turn to the work of Messrs Antonovich and Dragomanov. Bogdan Joseph Zaleski was born in 1802 in the Ukraine village, Bohaterka. In 1820 he was sent to the university of Warsaw, where he had Goszczynski as a fellow student. Besides the longer poem previously mentioned, he is the author of many charming lyrics in the style of the Little Russian poems, such as Shevchenko has written in that language. He died at Ville- preux, in France, in 1886, after more than fifty years of exile. Michael Grabowski (1805-1863) belongs also to this school by his fine Melodies of the Ukraine (1828). Maurice Goslawski also won fame by his Poems of a Polish Outlaw in the struggle of 1 830-1 83 1. A poet of great vigour was Stephen Garczynski (1 806-1 833), the friend of Mickiewicz, celebrated for his War Sonnets and his poem entitled The Deeds of Waclaw.

Wincenty Poi (1807-1872) was born at Lublin, and though of foreign extraction by both parents proved an ardent patriot. He wrote a fine descriptive work, Obrazy z zycia i podrozy (" Pictures of Life and Travel "),and also a poem, Piesn ziemi naszej (" Song of our Land "). For about three years from 1849 he was professor of geography in the university of Cracow. In 1855 he published Mohort, a poem relating to the times of Stanislaus Poniatowski. Ludwik Wiadyslaw Kondratowicz (who wrote chiefly under the name of Syrokorala) was born in 1823 in the government of Minsk, and died on the 15th of September 1862 at Vilna. His parents were poor, and he received a meagre education, but made up for it by careful self-culture. One of his most remarkable poems is his Jan Deborog, in which, like Mickiewicz, he has well described the scenery of his native Lithuania. He everywhere appears as the advocate of the suffering peasants, and has consecrated to them many beautiful lyrics. In Kaczkowski the Poles found a novelist who treated many periods of their history with great success. His sympathies, however, were mostly aristocratic, though modified by the desire of progress. An important writer of history is Karl Szajnocha (1818-1868), born in Galicia of Czech parents. He began his labours with The Age of Casimirthe Great (1848), and Bolestaw the Brave (1849), following these with Jadwiga and Jagiello, in three volumes (1855-1856) — a work which Spasovich, in his Russian History of Slavonic Literature, compares in vigour of style and fullness of colour with Macaulay's History of England and Thierry's Norman Conquest. Our author was still further to resemble the latter writer in a great misfortune ; from overwork he lost his sight in 1857. Szajnocha, however, like Thierry and the American Prescott, did not abandon his studies. His excellent memory helped him in his affliction. In 1858 he published a work in which he traced the origin of Poland from the Varangians {Lechicki poczatek polski), thus making them identical in origin with the Russians. He began to write the history of John Sobieski, but did not live to finish it. dying in 1868, soon after completing a history of the Cossack wars, Dwa lata dziejow naszych (" Two Years of Our History"). A writer of romances of considerable power was Joseph Korzeniowski (1797- 1863), tutor in early youth to the poet Krasinski, and afterwards director of a school at Kharkov. Besides some plays now forgotten, he was author of some popular novels, such as Wedrowki ory-ginata (" Tours of an Original "), 1 848 ; Garbaty (" The Hunchback ■'), 1852, &c. But the most fertile of Polish authors was J. I. Kraszew- ski (q.v.). His works constitute a library in themselves; they are chiefly historical and political novels, some or which treat of early times in Poland, and some of its condition under the Saxon kings. As lyrical poets may also be mentioned Jachowicz; Jaskowski, author of a fine poem, The Beginning of Winter; Edmund Wasilew- ski (18 1 4-1 846), the author of many popular songs;and Holowinski, archbishop of Mogilev (1807-1855),

author of religious poems. The style of poetry in vogue in the Polish parts of Europe at the present time is chiefly lyrical. Other writers deserving mention are Cornelius Ujeiski (1823-1897), the poet of the last revolt of 1863; Theophilus Lenartowicz (born 1822), who wrote some very graceful poetry; Sigismund Milkowski (T. T. Tez, born in 1820), author of romances drawn from Polish history, for the novel of the school of Sir Walter Scott still flourishes vigorously among the Poles. Among the very numerous writers of romances may be mentioned Henry Rzewuski (1791-1866); Joseph Dzierzkowski wrote novels on aristo- cratic life, and Michael Czajkowski (1808-1876) romances of the

Ukraine; Valerius Wieloglowski (1865) gave pictures of country life.

In 1882 the Poles lost, in the prime of life, a very promising historian Szujski (born in 1835), and also Schmitt, who died in his sixty-sixth year. Szujski commenced his literary career in 1859 with poems and dramas; in i860 appeared his first historical pro- duction, Rzutokana Historye Polski (" A Glance at Polish History "), which attracted universal attention; and in 1862 he commenced the publication in parts of his work Dzieje Polski (" The History of Poland "), the printing of which ceased in 1866. The value of this book is great both on account of the research it displays and its philosophical and unprejudiced style. One of the last works of Szujski, written in German, Die Polen und Ruthenen in Galizien, attracted a great deal of attention at the time of its appearance. Schmitt got mixed up with some of the political questions of the day — he was a native of Galicia and therefore a subject of the Austrian emperor — and was sentenced to death in 1846, but the penalty was commuted into imprisonment in Spielberg, whence he was re- leased by the revolution of 1848. In 1863 he took part in the Polish rebellion, and was compelled to fly to Paris, where he only returned in 1871. His chief works are History of the Polish People from the Earliest Times to the year 1763 (1854), History of Poland in the iSth and 19th Centuries (1866), and History of Poland from the time of the Partition (1868), which he carried down to the year 1832. In opposi- tion to the opinion of many historians, his contemporaries, that Poland fell through the nobility and the diets, Schmitt held (as did Lelewel) that the country was brought to ruin by the kings, who always preferred dynastic interests to those of the country, and by the pernicious influence of the Jesuits. Adalbert Ketrzynski, who succeeded Bielowski in 1877 in his post of director of the Ossolinski Institute at Lemberg, is the author of some valuable monographs on the history of Poland. He was born in 1838. Casimir Stadnicki has treated of the period of the Jagiellons; and Szaraniewicz, pro- fessor at the university of Lemberg, has written on the early history of Galicia. Thaddeus Wojciechowski has published a clever work on Slavonic antiquities. Xavier Liske, born in 1838, professor of universal history at Lemberg, has published many historical essays of

considerable value, and separate works by him have appeared in the German, Polish, Swedish, Danish and Spanish languages. The " Sketch of the History of Poland " {Dzieje Polskie w zarysie) by Michael Bobrzynski, born in 1849 in Cracow (professor of Polish and German law), is a very spirited work, and has given rise to a great deal of controversy on account of the opposition of many of its views to those of the school of Lelewel. Vincent Zakrzewski professor of history at Cracow, has written some works which have attracted considerable attention, such as On the Origin and Growth of the Reformationˆ in Poland, and After the Flight of King Henry, in which he describes the condition of the country during the period between that king's departure from Poland and the election of Stephen Batory. Smolka has published a history entitled Mieszko the Elder and his Age. Wiadyslaw Wislocki has prepared a catalogue of manuscripts in the Jagiellon library at Cracow. Dr Joseph Casimir PlebaAski, besides editing the Biblioteka warszawska, a very valuable literary journal which stands at the head of all works of the kind in Poland, has also written a dissertation (in Latin) on the liberum veto, which puts that institution in a new light. Felix Jezierski, the previous editor of the above-mentioned journal, published in it translations of parts of Homer, and is also the author of an excellent version of Faust.

The history of Polish literature has not been neglected. We first have the early history of Felix Bentkowski (1781-1852), followed by that of Michael Wiszniewski (1794-1865), which, how- ever, only extends to the 17th century, and is at best but a quarry of materials for subsequent writers, the style being very heavy. A " History of Eloquence " (Historya wymoivy w Polsce) was published by Karl Mecherzyski. An elaborate history of Polish litera- ture has been written by Anton Malecki, who is the author of the best Polish grammar (Gramatyka historyczno-porownawcza jezyka polskiego, 2 vols., Lemberg, 1879). The Polish bibliography of Karl Estreicher, director of the Jagiellon library at Cracow, is a work of the highest importance. One of the most active writers on Polish philology and literature is Wiadyslaw Nehring, whose numerous contributions to the Archiv fur slavische PhUologie of Professor Jagic entitle him to the gratitude of all who have devoted themselves to Slavonic studies. Wladimir Spasowicz, a lawyer of St Petersburg, assisted Pipin in his valuable work on Slavonic literature. The lectures of Professor Cybulski (d. 1867) on Polish literature in the first half of the 19th century are written with much spirit and appre- ciation. The larger poetical works which appear during that time are carefully analysed.

In recent times many interesting geological and anthropological investigations have been carried on in Poland. In 1868 Count Constantine Tyszkiewicz published a valuable monograph on the Tombs of Lithuania and Western Ruthenia. And Professor Joseph ■Lepkowski, of Cracow, has

greatly enriched the archaeological museum of his native city.

In philosophy the Poles (as the Slavs generally) have produced but few remarkable names. Goluchowski, the brothers Andrew and John Sniadecki, the latter of whom gained a reputation almost European, Bronislaw Trentowski, Karol Liebelt and Joseph Kremer

deserve mention. August Cieszkowski has written on philosophical and economic subjects. Moritz Straszewski, professor of philosophy at the university of Cracow, has also published some remarkable works.

Mention has already been made of the poetess Elizabeth Druz- backa. Female writers are not very common among Slavonic nations. Perhaps the most celebrated Polish authoress was Klemen- tina Hoffmann, whose maiden name was Tanska, born at Warsaw in 1798. She married Karl Boromaus Hoffmann, and accompanied her husband, in 1831, to Passy near Paris, where she died in 1845. Her novels still enjoy great popularity in Poland. Of the poetesses of later times Gabriele Narzyssa Zmichowska (1825-1878), Maria Ilnicka, translator of Scott's Lord of the Isles, and Jadwiga Luszczew- ska may be mentioned.

A poet of considerable merit is Adam Asnyk (1838-1897). In his poetry we seem to trace the steps between romanticism and the modern realistic school, such as we see in the Russian poet Nekrasov. In some of the flights of his muse he reminds us of Slowacki, in the melody of his verse of Zaleski. Besides showing talent as a poet, he has also written some good plays, as " The Jew " (Zid), Cola di Rienzi, and Kiejstut. Other poets worthy of mention are Zagor- ski, Czerwienski, and Maria Konopnicka, who has published two volumes of poems that have been very favourably noticed. Mention must also be made of Balucki (1837-1901), author of novels and comedies, and Narzymski (1839-1872), who was educated in France, but spent part of his short life in Cracow, author of some very popular tales.

The four centres of Polish literature, which, in spite of the attempts which have been made to denationalize the country, is fairly active, are Cracow, Posen, Lemberg and Warsaw. A cheap edition of the leading Polish classics, well adapted for dissemination among the people, has been published, under the title of Biblioteka Polska, at Cracow. Not only are the professors of Cracow University some of the most eminent living Poles, but it has been chosen as a place of residence by many Polish literary men. The academy

of sciences, founded in 1872, celebrated the bicentenary of the raising of the siege of Vienna by Sobieski by publishing the valuable Acta Joannis III. regis Poloniae. Some good Polish works have been issued at Posen. At Lemberg, the capital of Austrian Galicia, there is an active Polish press. Here appeared the Monumenta Polomae hislorica of Bielowski, previously mentioned; but Polish in this province has to struggle with the Red-Russian or Ruthenian, a language or dialect which for all practical purposes is the same as the Southern or Little Russian. At Warsaw, since the last insurrection, the university has become entirly Russianized, and its Transac- tions are published in Russian ; but Polish works of merit still issue from the press — among others the leading Polish literary journal, Biblioteka warsza-wska.

Perhaps the most popular modern writer in Poland is Eliza Orszeszko, of whose novels a complete " Jubilee " edition has appeared. Many of her tales — as, for instance, Argonauci (" The Argonauts ") — have appeared in the Tygodnik, or weekly illustrated journal of Warsaw. Meir Ezofowicz has enjoyed great popularity. The object of this tale is to bridge over the gulf between the Jew and Christian in Poland. Adolf Dygasinski writes clever village tales of the " kail-yard " school, as it has been sometimes termed in England. Waclaw Sieroszewski has written Twelve Years in the Land of the Jakuts, a contribution to the literature of folk-lore and ethnology such as only a real artist could produce. Among the latest poets' we may mention Wyspianski, Kisiliewski, Reymont, Mme Zapolska; the latter is the author of some powerful realistic novels and plays, and she has been called the Polish Zola. It is this kind of poetry and traces of the decadent school which we find in the later Polish poets. A pessimistic spirit is apparent, as in the writings of Wenceslaus Berent. Since the death of Asnyk and Ujejski the most prominent poet is Marya Konopnicka (1846). Some good critical work has been done in the leading reviews by Swietochowski and others. Historical work has been produced by Hirschberg, Pappee, Sobieski, Czermak and others, and the histories of Polish literature by Stanislaus Tarnowski and Piotr Chmielowski are of the highest value, the former dealing more with the aesthetic side of literature and the latter with the historical. The Poles are busy in reviving their great past. Hence the enthusiasm for historical studies, and the Biblioteka pisarzow polskich, which shows us what abundance of literature was produced in Poland in the 16th and beginning of the 17th century. In Henryk Sienkiewicz (q.v.~), the historical novelist, Poland has a modern writer of European reputation.

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POLAND, RUSSIAN, a territory consisting of ten governments which formerly constituted the kingdom of Poland (see' above), but now are officially described as the " governments on the xxi. 30

Vistula," or occasionally as the " territory on the Vistula." It is bounded N. by the Prussian provinces of West and East Prussia, W. by those of Posen and Prussian Silesia, S. by the Austrian crownland of Galicia, and E. by the Russian govern- ments of Volhynia, Vilna, Grodno, and Kovno.

Physical Features. — The territory consists for the most part of an undulating plain, 300 to 450 ft. above the sea, which connects the lowlands of Brandenburg on the west with the great plain of central Russia on the east. A low swelling separates it from the Baltic Sea; while in the south it rises gradually to a series

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of plateaus, which merge imperceptibly into the northern spurs of the Carpathians. These plateaus, with an average elevation of 800 to 1000 ft., are mostly covered with forests of oak, beech and lime, and are deeply cut by river valleys, some being narrow and craggy, and others broad, with gentle slopes and marshy bottoms. Narrow ravines intersect them in all directions, and they often assume, especially in the east, the character of wild, impassable, woody and marshy tracts. In the south-eastern corner of Poland they are called podlasie, and are in a measure akin to the polyesie of the Pripet. The Vistula, which skirts them on the south-west, cuts its way through them to the great plain of Poland, and thence to the Baltic. Its valley divides the hilly tracts into two parts — the Lublin heights on the east, and the Sedomierz (Sandomir) or central heights on the west. These last are diversified by several ranges which run east- south-east, parallel to the Beskides of the Carpathian system, the highest of them being the Lysa Gora, which reach 1910 ft. and 2010 ft. above the sea. Another short ridge, the Checinski hills in Kielce, follows the same direction along the Nida river and reaches 1345 ft. south of the Nida; the Olkusz hills, linked on to spurs of the Beskides, fill up the south-west corner of Poland, reaching 1620 ft., and containing the chief mineral wealth of the country; while a fourth range, 1000 to 1300 ft. high, runs north-west past Czenstochowa, separating the Oder from the Warta (Warthe). In the north, the plain of Poland is bordered by a flat, broad swelling, 600 to 700 ft. above the sea, dotted with lakes, and recalling the lacustrine regions of north- western Russia. Wide tracts of sand, marshes, peat-bogs, ponds,,

and small lakes, among which the streams lazily meander from one marsh to another, the whole covered with thin pine- forests and scanty vegetation, with occasional patches of fertile

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POLAND, RUSSIAN

soil — such are the general characters of the northern border- region of the great plain of central Poland. The rivers flow across the plain in broad, level valleys, only a few hundred or even only a few dozen feet lower than the watersheds; they separate into many branches, enclosing islands, forming creeks, and drowning wide tracts of land during inundations. Their basins, especially in the west, interpenetrate one another in the most intricate way, the whole bearing unmistakable evidences of having been in recent geological, and partly in historical times the bottom of extensive lakes, whose alluvial deposits now yield heavy crops. The fertility of the soil and the facility of communication by land and by water have made this plain the cradle of the Polish nationality. The very name of Poland is derived from it — Wielkopolska and Wielkopolane being the Slav terms for the great plain and its inhabitants.

Rivers and Canals. — Russian Poland belongs mostly, though not entirely, to the basin of the Vistula — its western parts extending into the upper basin of the Warta, a tributary of the Oder, and its north-east spur (Suwalki) penetrating into the basin of the Memel, of which it occupies the left bank. For many centuries, however, the Poles have been driven back from the mouths of their rivers by the German race, maintaining only the middle parts of their basins. About Jozefow (51 ° N.) the Vistula enters the great central plain and flows north and west-north-west between low banks, with a breadth of 1000 yds. Its inundations, dangerous even at Cracow, become still more so in the plain, when the accumulations of ice in its lower course obstruct the outflow, or the heavy rains in the Carpathians raise its level. Embankments 20 to 24 ft. high are maintained for 60 m., but they do not always prevent the river from inundating the plains of Opole in Lublin and Kozienice inRadom, the waters sometimes extending for 1 50 m. to the east. Thousands of rafts and boats of all descriptions descend the stream every year with cargoes of corn, wool, timber and wooden wares, giving occupa- tion to a large number of men. Steamers ply as far as Sandomir. The Wieprz (180 m.), a right-hand tributary of the Vistula, is the chief artery of the Lublin government; it is navigable for small boats and rafts for 105 m. from Krasnystaw. The Bug, another right-hand tributary of the Vistula, describes a wide curve concen- tric with those

of the middle Vistula and the Narew, and separates the Polish governments of Lublin and Siedlce from the Russian governments of Volhynia and Grodno. Only light boats (galary) are floated down this broad, shallow stream, whose flat and open valley is often inundated. Its tributary, the Narew (250 m.), brings the forest-lands of Byelovyezh in Grodno into communication with Poland, timber being floated down from Surazh and light boats from Tykocin in Lomza. The Pilica, which joins the Vistula from the left 30 m. above Warsaw, rises in the south-western corner of Poland, and flows for 200 m. north and east in a broad, flat, sandy and marshy valley, of evil repute for its unhealthiness.

The Warta (450 m.) rises in the Czenstochowa hills, 900 ft. above the sea, and flows north and west past Sieradz and Kolo. Below Czenstochowa it traverses a flat lowland, whose surface rises only 2 to 5 ft. above the level of the river, and the inhabitants have a constant struggle to keep it to its bed; every spring an immense lake is formed by the river at the mouth of the Ner, a little above Kolo.

The Memel flows along the north-east frontier of Poland, from Grodno to Yurburg, separating it from Lithuania. The yellowish sandy plains on its left will grow nothing except oats, buckwheat and some rye. The river often changes its bed, and, notwithstanding repeated attempts to regulate it, offers great difficulties to navigation. Still, large amounts of corn, wool and timber are floated down, especially after its confluence with the Black Hancza.

Though navigable for a few months only, the rivers of Poland have always been of considerable importance for the traffic of the country, and their importance is further increased by several canals connecting them with the Russian and German rivers. The Memel is connected with the Dnieper by the Oginsky canal, situated in the Russian government of Minsk. The Dnieper and Bug canal in Grodno connects the Mukhavets, a tributary of the Bug, with the Pina in the basin of the Pripet, that is, the Dnieper with the Vistula. The Vistula is connected also with the Oder by the Bromberg canal in Prussia, which links the Brahe, in the basin of the Vistula, with the Netze, a tributary of the Warta. All these canals are, however, beyond Russian Poland. In Poland proper, the Augus- towo canal connects the Vistula with the Memel, by means of the rivers Black Hancza, Netta, Biebrz and Narew. Another canal, to the west of Leczyca, connects the Bzura, a tributary of the Vistula, with the Ner and the Warta; and the bed of the former has been altered so as to obtain regular irrigation of the meadows along its banks.

Lakes. — Lakes are numerous in the government of Suwalki, but are all small and mostly hidden in thick coniferous or birch forests, and their

waters penetrate with undefined banks amidst marshes, sandy tracts and accumulations of moss-grown boulders. Another

group of small lakes is situated in the basin of the Warta (north part of Kalisz), the largest being Goplo, 18 m. long and 100 ft. deep.

Climate. — With the exception of the Lysa Gora hilly tracts (Kielce and south Radom), which lie within the isotherms of 41° and 42°, Poland is situated between the isotherms of 42° and 46 . The isotheres and isocheims (i.e. lines of equal mean summer and winter temperature respectively) crossing one another at right angles, and the former running east-north-east, Poland is included between the isotheres of 64 and 6l° and the isocheims of 35-7° and 39-2°. The prevailing winds are westerly, with north-north-east and south winds in autumn and winter, and east winds in spring. There is an average of 21-7 to 23-6 in. of rainfall in central Poland, and the quantity increases slowly towards the south on account of the proximity of the Carpathians, where it is 30-3 in. Owing to this distribution the snow-sheet in Poland is not very thick, and spring sets in early. Still, frosts of —4° to —22° Fahr. are not uncommon, and the rivers are generally icebound for two and a half to three months — the Warta being under ice for 70 to 80 days, the Vistula at Warsaw for 80 days and (exceptionally) even for 116, and the Memel for 100 (exceptionally for 140).

The following averages will serve to illustrate the climate of Poland :—

Absolute maximum temperature Absolute minimum temperature Annual rainfall (total) ....

Warsaw.

Vilna (in Russia).

Oct. 18 March 15

95-5° -37-6°

22-8 in.

Oct. 17 March 25 89-3° 39-0° 7-6 in.

Flora. — The flora of Poland is more akin to that of Germany than to that of Russia, several middle European species finding their north-east limits in the basin of the Memel or in the marshes of Lithuania. Coniferous forests, consisting mostly of pine (Pinus sylvestris) and birch, cover large tracts in Mazovia in the north, extend across the Baltic lake-ridge southwards as far

as the confluence of the Bug with the Narew, and join in the south-east the Polysie of the Pripet. The pine covers the Lysa Gora hills and the hills in the extreme south-west. The larch, which three centuries ago covered large tracts, has almost entirely disappeared. Pinus cembra is only remembered, as also Taxus baccata. Picea obovala is cultivated.

Of deciduous trees, the common beech is the most typical; it extends from the Carpathians to 52 ° N. and reaches three degrees farther north in small groups or isolated specimens; the confluence of the Bug and the Narew may be regarded as its eastern limit. The white beech (Carpinus betulus), the aspen, and two elms (Ulmus campestris, U. effusa) are found nearly everywhere. The lime appears in groves only in the east (Memel, Pripet, Lublin). It is the most popular tree with the Poles, as the birch with the Russians ; judgment of old was pronounced under its shade, and all the folk- songs repeat its name. The oak — a highly venerated tree in Poland, though not so much as in Lithuania — grows in forests only on the most fertile land, but it is of common occurrence in conjunction with the beech, elm, &c. The maples (Acer platanoides and A. pseudo- platanus) are somewhat rare; the black alder (Alnus glulinosa) lines the banks of the rivers and canals, and the Alnus incana is common. The willow and orchard trees — apple, pear, plum and cherry — are cultivated everywhere.

Fauna. — -The fauna of Poland belongs to the middle European zoological group ; within the historical period it has lost such species as formerly gave it a subarctic character. The reindeer now occurs only as a fossil; the sable, mentioned in the annals, has migrated eastwards; the wild horse, described by the annals as intermediate between the horse and the ass — probably similar to the Equus przewalskii of central Asia — is reputed to have been met with in the 13th century in the basin of the Warta, and two centuries later in the forests of Lithuania. The wild goat, bison and elk have migrated to the Lithuanian forests. The lynx and beaver have disappeared. The brown bear continues to haunt the forests of the south, but is becoming rarer; the wolf, the wild boar, and the fox are most common throughout the great plain, as also the hare and several species of Arvicola. The mammals in Poland, however, do not exceed fifty species. The avi-fauna, which does not differ from that of central Europe, is represented by some one hundred and twenty species, among which the singing birds (Dentirostrae and Conirostrae) are the most numerous. On the whole, Poland lies to the westward of the most frequented route of the migratory birds, and is less visited by them than the steppes of south-west Russia. Numerous aquatic birds breed on the waters of the Baltic lake-region.

Population. — The population of Poland, 6,193,710 in 1871, reached. 7,319,980 in 1881, and 10,500,000 in 1897. The esti- mated population

in 1906 was 10,747,300. Details for 1897 are shown in the subjoined table.

POLAND, RUSSIAN

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Governments.

Area, sq. m.

Domiciled

Population,

1897.

Urban Population.

Density

per

sq. m.

Kalisz …. Kielce …. Lomza Lublin Piotrkow . Plock …. Radom Siedlce Suwalki . Warsaw .

Total . . .

4,390 3,896 4,666 6,500

4,728

4,199 4,768

5,533 4.845 5,605

844.358 765,212

585.033

1,165,122

1 ,406,427

557.229

818,044

775.326

610,154

1,929,200

113,609

57,814

69,834

148,196

509,699 89,821

94,318

no,995

73.308 791,746

193 196

125

179 297

133 171 140 126 344

49,130

9.456,105

2.059,340

193

The non-domiciled population numbered about 1,000,000, and by 1904 the total was estimated to have increased to 12,000,000, the rate of increase between 1889 and 1904 having been 46-6. Poland, with 193 (domiciled) inhabitants or 213 inhabitants in all to the square mile in 1897, and 240 to the square mile in 1904, has a denser population than any other region in the Russian empire, the next to it being the governments of Moscow, with 189 inhabitants to the square mile, Podolia with 186, and Kiev with 181. The drift town- wards of the rural population began in

1890, when the urban popula- tion amounted to only 18 % of the whole, whereas in 1904 it reached 24%, as compared with 13% for the urban population of Russia as a whole. Of the towns of Poland 32 have a population each exceed- ing 10,000, the largest being Warsaw the capital, with 638,208 inhabi- tants in 1897 and 756,426 in 1901 ; Lodz, with 315,209 in 1897 and 351,570 in 1900; Czenstochowa, with 45,130 in 1897 and 53,650 in 1900; and Lublin, with 50,152 in 1897. According to nationalities, the population was made up as follows in 1897: 6,755,503 Poles, equal to 64-6 % of the total; 1,267,194 Jews, equal to 12-1%; 631,844 Russians (6%); 391,440 Germans (4%); 310,386 Lithuan- ians and Letts (3 %) ; with a few thousands each of Tatars, Bohemians, Rumanians, and Esthonians, and a few Gypsies and Hungarians.

During prehistoric times the basin of the Vistula seems to have been inhabited by a dolichocephalic race, different from the brachycephalic Poles of the present day; but from the dawn of history Slavs (Poles), intermingled to some extent with Lithuanians, have to be found on the plains of the Vistula and the Warta. The purest Polish type exists in the basin of the middle Vistula and in Posen. The Poles extend but little beyond the limits of Russian Poland. In East Prussia they occupy the southern slope of the Baltic swelling (the Mazurs), and extend down the left bank of the lower Vistula to its mouth (the Kaszubes or Kassubians). Westward they stretch down the Warta as far as Birnbaum (100 m. east of Berlin) ; and in the south they extend along the right bank of the Vistula to the river San in western Galicia. In Russia they constitute, with Jews, Lithuanians, Ruthenians and White Russians, the town population, as also the landed nobility and the country gentry, in several governments west of the Dvina and the Dnieper.

According to the localities which they inhabit, the Poles take different names. They are called Wielkopolanie on the plains of middle Poland, while the name of Malopolanie is reserved for those on the Warta. The name of Leczycanie is given to the inhabitants of the marshes of the Ner, that of Kurpie to those of the Podlasie; Kujawiacy, Szlacy in the Silesia, and G6rale in the Carpathians.

The Kaszubes, and especially the Mazurs, may be considered as separate stocks of the Polish family. The Mazurs are distinguished from the Poles by their lower stature, broad shoulders and massive frame, and still more by their national dress, which has nothing of the smartness of that of the southern Poles, and by their ancient customs; they have also a dialect of their own, containing many words now obsolete in Poland, and several grammatical forms bearing witness to Lithuanian influence. They submit without difficulty to German culture, and in Prussia are Lutherans. The language of the Kaszubes can also be considered as a separate dialect. The

Poles proper are on the whole of medium stature (5 ft. 4-6 in.), finely built, dark in the south and fair in the north, richly endowed by nature, inclined to deeds of heroism, but perhaps deficient in that energy which characterizes the northern races of Europe, and in that sense of unity which has been the strength of their present rulers.

The German element is annually increasing both in number and in influence. The Lodz manufacturing district, the Polish Birming- ham, is becoming more German than Polish; and throughout the governments west of the Vistula German immigration is going on at a steadily increasing rate, especially in the governments of Plock, Kalisz, Piotrkow and Warsaw.

The Jews, who are found everywhere throughout Poland, are nowhere agricultural ; in the larger towns many of them are artisans,

but in the villages they are almost exclusively engaged as shop- keepers, second-hand traders, dealers on commission, innkeepers and usurers. In the country, both commerce and agriculture arc in the hands of their intimately connected trading associations. Their relations with Poles and Ruthenians are anything but cordial, and " Jew-baiting " is of frequent occurrence. They are increasing mucR more rapidly than the Slavs.

Agriculture. — From remote antiquity Poland has been celebrated for the production and export of grain. Both, however, greatly declined in the 18th century; and towards the beginning of the 19th, the peasants, ruined by their proprietors, or abandoned to the Jews, were in a more wretched condition than even their Russian neighbours. Serfdom was abolished in 1807; but the liberated peasants received no allotments of land, and the old patrimonial jurisdictions were retained. Compelled to accept the conditions imposed by the landlords, the peasants had to pay rack-rents and to give compulsory labour in various forms for the use of their land. Only a limited number were considered as permanent farmers, while nearly one-half of them became mere proletaires. Pursuing a policy intended to reconcile the peasantry to Russian rule and to break the power of the Polish nobility, the Russian government promul- gated, during the outbreak in 1 864, a law by which those peasants who were holders of land on estates belonging to private persons, institutions (such as monasteries and the like), or the Crown were recognized as proprietors of the soil — the state paying compensation to the landlords in bonds, and the peasants having to pay a yearly annuity to the state until the debt thus contracted had been cleared off. The valuation of these allotments was made at a rate much more advantageous than in Russia, and the average size of holding amounted to 15 acres per family. Of those who held no land a number received grants out of the confiscated estates of the nobility and monasteries. At the same time the self-government of the peasants was

organized on democratic principles. The so-called " servitudes," however — that is, the right to pasture on and take wood from the landlord's estates — were maintained for political reasons. These reforms resulted in a temporary increase of pros- perity, or at any rate an alleviation of the previous misery of the peasants. But whereas between 1864 and 1873 the peasantry as a whole purchased, in addition to the land granted to them by the government, 297,000 acres, in the period 1873-1893, they bought 540,000 acres and between 1893 and 1905 as much as 1,620,000 acres. Thus the process of breaking up the larger estates is pro- ceeding rapidly and at an accelerated rate. In ten years (1864- 1873) the area of cultivated soil increased by 1 ,350,00a acres, while during the fourteen years 1845-1859 its increase had been only 540,000 acres. But the maintenance of the " servitudes," the want of pasture-land, the lack of money for improvements, and the very rapid increase in the price of land, all helped to counteract the bene- fits of the agrarian measures of 1864.

In 1904 the village communities (peasantry) owned 43-8% of the total area; private owners, mostly nobles, 40-6%; the Crown and imperial family, 6%; and public bodies, such as towns and monas- teries, 2-6 %; while 3 % was in the hands of the Jews. The holdings of the peasant families vary generally from 8 to 13 acres, the minimum in Russia being 16 to 22 acres. By a law of 1891 further subdivision below 8-3 acres is prohibited. But out of a total of some 7,000,000 peasants no fewer than 3,000,000 possess no land. In consequence of this every summer no fewer than 800,000 emigrate temporarily to Germany in quest of work.

Forests cover over 21-3% of the surface, of which nearly one- third belong to the Crown, and only 515,000 acres (7-7%) to the peasantry.

Agriculture in Poland is on the whole carried on according to more advanced methods than in Russia. The extensive cultivation of beetroot, of potatoes for distilleries, and of fodder crops has led to the introduction of a rotation of several years instead of the former " three-fields " system ; and agricultural machinery is in more general use, especially on the larger estates of the west. Winter wheat is extensively cultivated, especially in the south, the Sandomir (Sedo- mierz) wheat having a wide repute. Of the land in the possession of the peasants no less than 70 % is under crops, and of the land in the larger estates 52%; of the former category 11%, and of the latter 8%, is meadow. Altogether nearly 16 million acres of Russian Poland, or almost one-half of the total area, are under crops, principally rye, oats, wheat, barley, potatoes and hay, with some flax, hemp, peas, buckwheat and hops. After local wants are supplied, there remains every year a surplus of about 3I million quarters of cereals for export. Beetroot is largely grown for the manufacture of sugar. Potatoes are extensively grown for use in the distilleries. The cultivation of tobacco is successfully carried

on, especially in the governments of Warsaw, Plock and Lublin. The breeding of livestock (cattle, sheep and horses), is an important source of income. Fine breeds of horses and cattle are kept on the larger estates of the nobility, and cattle are exported to Austria. Bee-keeping is widely followed, especially in the south-east. Fishing is carried on remuneratively, more particularly on the Vistula and its tributaries.

Manufactures and Mines. — Since 1864, and more especially since 1875, there has been a remarkable development of manufacturing enterprise in Poland, the branch of industry which has shown the

greatest progress being the textile. Whereas in 1864 the annual production of all factories in Poland was valued at not more than 5i millions sterling, in 1875, when the workers numbered 27,000, the output was estimated at even less; but in 1905 the value of the industrial production reached 53 millions sterling. The principal industrial centres are Lodz (textiles), Warsaw (sugar, leather and miscellaneous) and Bendzin — Sosnowice — Dombrowa, in Piotrkow (mining). The sugar factories and refineries, situated chiefly in the governments of Warsaw, Lublin and Plock, turn out approximately one million tons of sugar in the year, the Polish sugar industry being exceeded in Russia only by that of Kiev. Cotton is the principal product of the mills at Lodz and Lask, both in Piotrkow; though woollen cloth, silk and linen are also produced. Tanning is centred in Warsaw and Radom; Polish {i.e. Warsaw) boots and shoes have a great reputation throughout the Russian empire. Other notable branches of manufacturing industry, besides those already named, are flour-mills, jute, hosiery, lace, paper, cement, hats, haberdashery, machinery, tobacco, soap and candle factories, iron and steel works, distilleries, breweries, potteries, vinegar, chocolate, varnish, furni- ture, clothing and brickworks. The cottage industries, such as pot- tery and basket-making, formerly of considerable importance, are gradually being replaced by the factory system of working.

Southern Poland possesses abundant minerals, especially in the, Kielce mountains and the region adjacent to Prussian Silesia. The Devonian sandstones contain malachite ores near Kielce, and copper has been worked there since the 15th century, though the mines are now neglected. The brown iron ores of Kielce contain no less than 40 % of iron. The zinc ores of the Olkusz district, more than 50 ft. thick, contain 8 to 14 %, sometimes 25 %, of zinc. The tin ores of Olkusz are still more ‘ important, and were extensively wrought as early as the 16th century. Brown iron

ores, appearing in the neighbourhood of Bendzin as lenticular masses 55 ft. thick, and containing 25 to 33 % of iron, accompany the zinc ores. Spherosider- ites and brown iron ores are plentiful also in the " Keuper forma- tion." Sulphur is wrought in the district of Pinczow; the deposits, which contain 25 % of sulphur, reach a thickness of 7 to 70 ft. Coal occurs in south-west Poland over an area of 200 sq. m. in the districts of Bendzin and Olkusz. Brown coal, or lignite, which appears in the Olkusz district in beds 3 to 7 ft. thick, has been worked out. The output of coal is 4,000,000 to 6,000,000 tons in the year, the number of hands employed being 18,000 to 20,000. The yield of lignite is less than 100,000 tons annually; of zinc 10,000 to 12,000 tons; of copper and lead small. The production of iron and steel increased from 13,000 tons in 1862 to about 500,000 tons in 1905. Of other mineral produce, chalk, exported from Lublin, a few quarries of marble and many of building stones, are worthy of notice. Mineral waters are used medicinally at Ciechocinek in Plock and Naleczow in Lublin.

Communications. — The railways of Poland have an aggregate length of 1300 m. A line of great importance, connecting Vienna with St Petersburg, crosses the country from south-west to north-east, passing through the mining district and through Warsaw, and sending a short branch to Lodz. Another important line, connecting Danzig with Odessa, crosses Poland from north-west to south-east. A branch line, parallel to this last, connects Skiernie- wice with Thorn and Bromberg; while a military railway connects the fortresses of Warsaw and Ivangorod with Brest-Litovsk, via Siedlce and Lukow. The line from Berlin to St Petersburg traverses the north of Suwalki for 54 m. between Eydtkunen and Kovno.

Commerce. — The general trade of Poland is merged in that of Russia, under which heading it is treated. With the extension of the railways the fairs have lost much of their importance, but their aggregate yearly returns are still estimated at £3,000,000. The principal fairs are held at Warsaw (wool, hemp, hops), Leczyca in Kalisz, Skaryszew in Radom, Ciechanoviec in Lomza, and Lowicz in Warsaw.

Administration. — The entire administration of Poland is under the governor-general residing at Warsaw. He is at the same time the commander of the military forces of the " Warsaw military district." Justice is represented by the gmina tribunals, which correspond to those of the mir in Russia; the justices of the peace (nominated by government); the syezd, or " court " of the justices of the peace; the district tribunals (assizes) in each government; and the Warsaw courts of appeal and cassation. Poland has had no separate budget since 1867; its income and expenditure are included in those of the empire.

After the insurrection of 1863 all towns with less than 2000 inhabitants were deprived of their municipal rights, and were included, under the designation of posads, in the gminas. Viewed with suspicion by the Russian government, the Polish towns received no self-government like the villages. The elective municipal councils, which enjoyed de jure very large rights, including that of maintaining their own police, although in reality they were under the rule of the nobility, were practically abolished, and Russian officials were nominated in their place

and entrusted with all their rights. The municipal councils were, however, maintained to carry out the orders of the military chiefs. The new municipal law of 1870, first introduced at Warsaw, reduced the functions of the municipal council almost to nothing. The burgomaster is entirely dependent upon the police and the chief of the district, and has to discharge all sorts of functions (bailiff, policeman, &c.) which have nothing to do with municipal affairs. In all official communications the Russian language is obligatory, and a gradual elimination of Poles from the administration has been effected.

Defence. — Poland contains the first line of defence of the Russian empire on its western frontier. The marshy lowlands, covered with forests on the western bank of the Vistula, are a natural defence against an army advancing from the west, and they are strengthened by the fortresses on that river. The centre of these latter is Warsaw, with Novogeorgievsk, formerly Modlin, in the north, at the mouth of the Bug, and Ivangorod, formerly Demblin, in the south, at the mouth of the Wieprz. Novogeorgievsk is a strongly fortified camp which requires a garrison of 12,000 men, and may shelter an army of 50,000 men. The town of Sierock, at the confluence of the Bug and the Narew, is fortified to protect the rear of Novogeorgievsk. The Vistula line of fortresses labours, however, under the great disadvan- tage of being easily turned from the rear by armies advancing from East Prussia or Galicia. Brest-Litovsk, at the western issue from the marshes of the Pripet, the towns of Dubno, Lutsk and Bob- ruisk constitute the second line of defence.

Religion and Education. — The prevalent religion is the Roman Catholic, to which over 75 % of the total population belong. Pro- testants (mostly Lutherans) amount to 6 %, while about 5 % are members of the Orthodox Greek Church. After the insurrection of 1863, measures were taken to reduce the numbers of the Roman Catholic clergy in Poland. One diocese (Podlasie) was abolished, and a new one established at Kielce, while several bishops were sent out of the country. Poland is now divided into four dioceses — Warsaw, Sedomierz, Lublin and Plock.

The educational institutions of Poland are represented by a university at

Warsaw, with 1500 students. Teaching has been carried on in Russian since 1873. There are excellent technical schools, an institute of agriculture and forestry at Nowa-Alexandrya, and several seminaries for teachers. At Warsaw there is a good musical conservatory. The Jewish children are mostly sent to the Jewish schools, but they receive almost no instruction at all. Although there has been a decided increase in the number of both the primary and the secondary schools, nevertheless the school accommodation has in neither categoiy of school kept pace with the growth of the population. The proportion of primary schools has in fact been steadily decreasing, and the applications for admission to the secondary schools and colleges are on the average twice as great as the number of vacancies. All the same, Poland compares very favourably with Russia in the general level of education, for whereas those able to read and write in 1897 amounted in Roland to 30-5% of the population (only 9-3% in 1862), in Russia it was 19-8%.

(P. A. K. ; J. T. Be.)

POLARITY (Lat. polaris, polus, pole), having two poles or parts at which certain properties are the opposite to one another, as in a'magnet the ends of which have opposite magnetic charac- ters. The act of producing polarity is termed polarization. For electrolytic polarization see Battery and Electrolysis, and for optical see Polarization or Light below.

POLARIZATION OF LIGHT. A stream of light coming directly from a natural source has no relation to space except that concerned in its direction of propagation, round which its properties are alike on all sides. That this is not a necessary characteristic of light was discovered by Christian, Huygens, who found that, whereas a stream of sunlight in traversing a rhomb of spar in any but one direction always gives rise to two streams of equal brightness, each of these emergent streams is divided by a second rhomb into two portions having a relative intensity dependent upon the position with respect to one another of the principal planes of the faces of entry into the rhombs — the planes through the axes of the crystals perpendicular to the refracting surfaces. In certain cases, indeed, one portion vanishes entirely: thus the stream ordinarily refracted in the first rhomb gives an ordinary or an extraordinary stream alone in the second, according as the principal planes are parallel or perpendicular, the reverse being the case with the extraordinary stream of the first rhomb. In intermediate cases the intensities of the two beams are proportional to the squares of the cosines of the angles that the principal plane of the second rhomb makes with the positions in which they have the greatest intensity.

POLARIZATION OF LIGHT

On the other hand, if the emergent streams overlap and the common part be examined, it is found to have all the properties of common light. To this phenomenon E. T Malus gave the name of polarization, as he attributed it, on the emission theory of light, to a kind of polarity of the light-corpuscles. This term has been retained and the ordinary stream is said to be plane polarized in the principal plane of the face of entry into the rhomb, and the extraordinary stream to be plane polarized in the perpendicular plane.

The phenomenon of polarization observed by Huygens remained an isolated fact for over a century, until Malus in 1808 discovered that polarization can be produced independently of double refraction, and must consequently be something closely connected with the nature of light itself. Examining the light reflected from the windows of the Luxemburg palace with a doubly refracting prism, he was led to infer (though more refined experiments have shown that this is not strictly the case) that light reflected at a certain angle, called the polarizing angle, from the surface of transparent substances has the same proper- ties with respect to the plane of incidence as those of the ordinary stream in Iceland spar with respect to the principal plane of the crystal. Thus in accordance with the definition, it is polarized in the plane of incidence. Further, if polarized light fall at the polarizing angle on a reflecting surface, the intensity of the reflected stream depends upon the azimuth of the plane of incidence, being proportional to the square of the cosine of the angle between this plane and the plane of the polarization. At angles other than the polarizing angle common light gives a reflected stream that behaves as a mixture of common light with light polarized in the plane of incidence, and is accordingly said to be partially polarized in that plane. The refracted light, whatever be the angle of incidence, is found to be partially polarized in a plane perpendicular to the plane of incidence, and D. F. J. Arago showed that at all angles of incidence the reflected and refracted streams contain equal quantities of polarized light. The polarizing angle varies from one transparent substance to another, and Sir David Brewster in 1813 enunciated the law that the tangent of the polarizing angle is equal to the refractive index of the substance. It follows then that if a stream of light be incident at the polarizing angle on a pile of parallel transparent plates of the same nature, each surface in turn will be met by the light at the polarizing angle and will give rise to a reflected portion polarized in the plane of incidence. Hence the total reflected light will be polarized in this plane and will of necessity have a greater intensity than that produced by a single surface. The polarization of the light transmitted by the pile is never complete, but tends to become more nearly so as the number of the plates is increased and at the same time the angle of inci- dence for which the polarization is a maximum approaches indefinitely, the polarizing angle (Sir G. G. Stokes,

Math, and Phys. Papers, iv. 145).

In order to isolate a polarized pencil of rays with a rhomb of Iceland spar, it is necessary to have a crystal of such a thick- ness that the emergent streams are separated, so that one may be stopped by a screen. There are, however, certain crystals that with a moderate thickness give an emergent stream of light that is more or less completely polarized. The polarizing action of such crystals is due to the unequal absorption that they exert on polarized streams. Thus a plate of tourmaline of from 1 mm. to 2mm. in thickness with its faces perpendicular to the optic axis is nearly opaque to light falling normally upon it, and a plate of this thickness parallel to the axis permits of the passage of a single stream polarized in a plane perpendicular to the principal section. Such a plate acts in the same way on polarized light, stopping it or allowing it to pass, according as the plane of polarization is parallel or perpendicular to the principal section. Certain artificial salts, e.g. iodo-sulphate of quinine, act in a similar manner.

From the above instances we see that an instrumental appliance that polarizes a beam of light may be used as a means of detecting and examining polarization. This latter process is termed analysation, and an instrument is called a polarizer

or an analyser according as it is used for the first or the second of these purposes.

In addition to the above facts of polarization mention may be made of the partial polarization, in a plane perpendicular to that of emission, of the light emitted in an oblique direction from a white-hot solid, and of the polarization produced by diffraction. Experiments with gratings have been instituted by Sir G. Gabriel Stokes, C. H. A. Holtzmann, F. Eisenlohr and others, with the view of determining the direction of the vibrations in polarized light (vide infra), but the results have not been consistent, and H. Fizeau and G. H. Quincke have shown that they depend upon the size and form of the apertures and upon the state of the surface on which they are traced. The polarization of the light reflected from a glass grating has also been investigated by I. Frohlich, while L. G. Gouy has studied the more simple case of diffraction at a straight edge. The polarization of the light scattered by small particles has been examined by G. Govi, J. Tyndall, L. Soret and A. Lallemand, and in the case of ultra- microscopic particles by H. Siedentopf and R. Zsigmondy (Drude Ann. 1903, x. 1); an interesting cast, of this phenomenon is the polarization of the light from the sky — a subject that has been treated theoretically by Lord Rayleigh in an important series of papers (See Sky, Colour of, and Rayleigh, Scientific Works, i. 87, 104, 518; iv. 397).

An important addition to the knowledge of polarization was made in 1816 by Augustin J. Fresnel and D. F. J. Arago, who summed up the results of a searching series of experiments in the following laws of the interference of polarized light: (1) Under the same conditions in which two streams of common light interfere, two streams polarized at right angles are without mutual influence. (2) Two streams polarized in parallel planes give the same phenomena of interference as common light.

(3) Two streams polarized at right angles and coming from a stream of common light can be brought to the same plane of polarization without thereby acquiring the faculty of interfering.

(4) Two streams polarized at right angles and coming from a stream of polarized light interfere as common light, when brought to the same plane of polarization. (5) In calculating the conditions of interference in the last case, it is necessary to add a half wave-length to the actual difference of path of the streams, unless the primitive and final planes of polarization lie in the same angle between the two perpendicular planes.

The lateral characteristics of a polarized stream lead at once to the conclusion that the stream may be represented by a vector, and since this vector must indicate the direction in which the light travels as well as the plane of polarization, it is natural to infer that it is transverse to the direction of propaga- tion. That this is actually the case is proved by experiments on the interference of polarized light, from which it may be deduced that the polarization-vector of a train of plane waves of plane polarized light executes rectilinear vibrations in the plane of the waves. By symmetry the polarization-vector must be either parallel or perpendicular to the plane of polarization: which of these directions is assumed depends upon the physical character- istic that is attributed to the vector. In fact, whatever theory of light be adopted, there are two vectors to be considered, that are at right angles to one another and connected by purely I geometrical relations.

The general expressions for the rectangular components of a vector transverse to the direction of propagation (z) in the case of waves of length X travelling with speed v are: —

u = a cos (T— a), v=b cos (T— /3),

where T=2?r(ztf— z)/X. The path of the extremity of the vector is then in general an ellipse, traversed in a right-handed direction to an observer receiving the light when a— /3 is between o and x, or between —k and — 27r, and in a left-handed direction if this angle be between w and 2ir, or between o and — jr. In conformity with the form of the path, the light is

said to be elliptically polarized, right- or left-handedly as the case may be, and the axes of the elliptic path are determined by the planes of

maximum and minimum polarization of the light. In the par- ticular case in which a = b and a — |8 = == (2»+ i) tr/2, the vibrations are circular and the light is said to be circularly polarized.*

These different types of polarization may be obtained from a plane polarized stream by passing it through a quarter-wave plate, i.e. a crystalline plate of such a thickness that it introduces a relative retardation of a quarter of a wave between the com- ponent streams within it. Such plates are generally made of mica or selenite, and the normal to the plane of polarization of the most retarded stream is called " the axis of the plate." If this axis be parallel or perpendicular to the primitive plane of polarization, the emergent beam remains plane polarized; it is circularly polarized if the axis be at 45° to the plane of polarization, and in other cases it is elliptically polarized with the axes of the elliptic path parallel and perpendicular to the axis of the plate. Conversely a quarter-wave plate may be employed for reducing a circularly or elliptically polarized stream to a state of plane polarization.

Two streams are said to be oppositely polarized when the one is, so far as relates to its polarization, what the other becomes when it is turned through an azimuth of 90° and has its character reversed as regards right and left hand. An analytical investi- gation of the conditions of interference of polarized streams of the most general type leads to the result that there will be no interference only when the two streams are oppositely polarized, and that when the polarizations are identical the interference will be perfect, the fluctuations of intensity being the greatest that the difference of intensity of the streams admits (Sir G. G. Stokes, Math, and Phys. Papers, iii. 233).

It remains to consider the constitution of common unpolarized light. Since a beam of common light can be resolved into plane polarized streams and these on recomposition give a stream with properties indistinguishable from those of common light, whatever their relative retardation may be, it is natural to assume that an analytical representation of common light can be obtained in which no longitudinal vector occurs. On the other hand a stream of strictly monochromatic light with a polarization-vector that is entirely transversal must be (in general elliptically) polarized. Consequently it follows that common light cannot be absolutely monochromatic. The conditions that are necessary in order that a stream of light may behave as natural light have been investigated by Sir G. Gabriel Stokes (loc. cit.) and by E. Verdet (Oeuvres, i. 281), and it may be shown that two polarized streams of a definite character are analytically equivalent to common light provided that they are of equal intensity and oppositely polarized and that there is no common phase relation between the corresponding monochro- matic constituents. Further a stream of light of the most general character is equivalent to the admixture of common and polarized light, the polarization being elliptical, circular or plane.

We see then that there are seven possible types of light: common light,

polarized light and partially polarized light; the polarization in the two latter cases being elliptical, circular or plane. Common light, circularly polarized and partially circularly polarized light all have the characteristic of giving two streams of equal intensity on passing through a rhomb of Iceland spar, however it may be turned. They may, however, be distinguished by the fact that on previous transmission through a quarter-wave plate this property is retained in the case of common light, while with the two other types the relative intensity of the streams depends upon the orientation of the rhomb, and with circularly polarized light one stream may be made to vanish. Plane polarized light gives in general two streams of unequal intensity when examined with a rhomb, and for certain positions of the crystal there is' only one emergent stream. Elliptically polarized, partially elliptically polarized and partially plane polarized light give with Iceland spar two streams of, in general, unequal intensity, neither of which can be made to vanish. They may be differentiated by first passing the light through a quarter-wave plate with its axis parallel or

perpendicular to the plane of maximum polarization: for elliptically polarized light thereby becomes plane polarized and one of the streams is extinguished on rotating the rhomb; but with the other two kinds of light this is not the case, and the light is partially plane or partially elliptically polarized according as the plane of maximum polarization remains the same or is changed.

Colours of Crystalline Plates. — It was known to E. T. Malus that the interposition of a doubly refracting plate between a polarizer and an analyser regulated for extinction has the effect of partially restoring the light, and he used this property to discover double refraction in cases in which the separation of the two refracted streams was too slight to be directly detected. D. F. J. Arago in 181 1 found that in the case of white light and with moderately thin plates the transmitted light is no longer white but coloured, a variation of brightness but not of tint being produced when the polarizer and analyser being crossed are rotated together, while the rotation of the analyser alone produces a change of colour, which passes through white into the complementary tint. This pheno- menon was subjected to a detailed investigation by Jean Baptiste Biot during the years 1812 to 1814, and from the results of his experi- ments Thomas Young, with his brilliant acumen, was led to infer that the colours were to be attributed to interference between the ordinary and extraordinary streams in the plate of crystal. This explanation is incomplete, as it leaves out of account the action of the polarizer and analyser, and it was with the purpose of removing this defect that Fresnel and Arago undertook the investigations mentioned above and thus supplied what was wanting in Young's explanation. In Biot's earlier experiments the beam of light em- ployed was nearly parallel: the phenomena of rings and brushes that are

seen with a conical pencil of light were discovered by Sir David Brewster in the case of uniaxal crystals in 1813 and in that of biaxal crystals in 1815.

Let a, |8, \j/ be the angles that the primitive and final planes of polarization and the plane of polarization of the quicker wave within the plate make with a fixed plane, and let p be the relative retardation of phase of the two streams on emergence from the plate for light of period t. On entry into the crystal the original polar- ized stream is resolved into components represented by

a cos(ˆ— a) cos T, a sin (

a cos (if/— o) cos T, a sin 0/"- a) cos (T— p). Finally after traversing the analyser the sum of the two resolved components is

dcos (4′ — a) cos (ˆ— /S) cos T+o sin (4> — a) sin (i//— /?) cos (T — p), of which the intensity is

{a cos (if' — a) cos ty—P) +0 sin ty — a) sin (if'—P) cos pj 2 + a i s\a l {4′ — a) sin 2 (ˆ — ;8) sin 2 p =

a 2 cos 2 (/S — a)— a 2 sin 2(1/- — a) sin 2(ˆ-/3) sin 2 |p.

When the primitive light is white, this expression must be summed for the different monochromatic constituents. In strictness the angle ip is dependent upon the frequency, but if the dispersion be weak rela- tively to the double refraction, the product sin 2(1ˆ — a)sin 2(ˆ-/3) has sensibly the same value for all terms of the summation, and we may write

I = cos 2 (/3-a)2a 2 -sin 2(t£-a) sin 2(-)2a 2 sin 2 |p. This formula contains the whole theory of the colours of crystalline plates in polarized light. Since the first term represents a stream of white light, the plate will appear uncoloured whenever the plane of polarization of either stream transmitted by it coincides with either the primitive or final plane of polarization. In intermediate cases the field is coloured, and the tint changes to its complementary as the plate passes through one of these eight positions, since the second term in the above expression then changes sign. If, however, the primitive and final planes of polarization be parallel or crossed, the field exhibits only one colour during a complete revolution of the plate. The crystalline plate shows no colour when it is very thin, and also when its thickness exceeds a moderate amount. In the former case the retardation of phase varies so little with the period that the intensity is nearly the same for all colours; in the latter case it alters so rapidly that for a small change in the period the intensity passes from a maximum or a minimum, and consequently so many constituents of the light are weakened and these are so close to one another in frequency, that the light presents to

the eye the appearance of being white. The true character of the light in this case may be revealed by analysing it with a spectroscope, when a spectrum is obtained traversed by dark bands corresponding to the constituents that are weakened or annulled. The phenomenon of colour may, however, be obtained with thick plates by superposing two of them in a suit- able manner, the combination acting as a thicker or a thinner plate according as the planes of polarization of the quicker waves within them are parallel or crossed. In this way a delicate test for slight traces of double refraction is obtained. When the retardation of phase for light of mean period is 1 or a small multiple of r a crystalline plate placed between a crossed polarizer and analyser

exhibits in white light a distinctive greyish violet colour, known as a sensitive tint from the fact that it changes rapidly to blue or red, when the retardation is very slightly increased or diminished. If then the sensitive plate be cut in half and the two parts be placed side by side after the one has been turned through 90 in its own plane, the tint of the one half will be raised and that of the other will be lowered when the compound plate is associated with a second doubly refracting plate.

When light from an extended source is made to converge upon the crystal, the phenomenon of rings and brushes localized at infinity is obtained. The exact calculation of the intensity in this case is very com- plicated and the resulting expression is too unwieldy to be of any use, but as an approximation the formula for the case of a parallel beam may be employed, the quantities \p an d p therein occurring being regarded as functions of the angle and plane of incidence and consequently as variables. In monochromatic light, then, the interference pattern is characterized by three systems of curves : the curves of constant retardation p = const. ; the lines of like polarization \j/ = const. ; the curves of constant intensity I = const. When p = 27Z7T and also when

With an uniaxal plate perpendicular to the optic axis, the curves of constant retardation are concentric circles and the lines of like polarization are the radii : thus with polarizer and analyser regulated for extinction, the pattern consists of a series of bright and dark circles interrupted by a black cross with its arms parallel to the planes of polarization and analysation. In the case of a biaxal plate perpendicular to the bisector of the acute angle between the optic axes, the curves of constant retardation are approximately Cassini's ovals, and the lines of like polarization are equilateral hyperbolae passing through the points corresponding to the optic

axes. With a crossed polarizer and analyser the rings are inter- rupted by a dark hyperbolic brush that cuts the plane of the optic axes at right angles, if this plane be at 45° to the planes of polariza- tion and analysation — the so-called diagonal position — and that becomes a rectangular cross with its arms parallel and perpendicular to the plane of the optic axes when this plane coincides with the plane of primitive or final polarization — the normal position.

When white light is employed coloured rings are obtained, pro- vided the relative retardation of the interfering streams be not too great. The isochromatic lines, unless the dispersion be excessive, follow in the main the course of the curves of constant retardation, and the principal lines of like polarization are with a crossed polarizer and analyser dark brushes, that in certain cases are fringed with colour. This state of things may, however, be considerably departed from if the axes of optical symmetry of the crystal are different for the various colours. The examination of dispersion of the optic axes in biaxal crystals (see Refraction, § Double) may be conveniently made with a plate perpendicular to the acute bisectrix placed in the diagonal position for light of mean period between a crossed polarizer and analyser. When the rings are coloured sym- metrically with respect to two perpendicular lines the acute bisec- trix and the plane of the optic axes are the same for all frequencies, and the colour for which the separation of the axes is the least is that on the concave side of the summit of the hyperbolic brushes.

Crossed, inclined and horizontal dispersion are characterized respec- tively by a distribution of colour that is symmetrical with respect to the centre alone, the plane of the optic axes, and the perpendicular plane.

The phenomenon of interference produced by crystalline plates is considerably modified if the light be circularly or elliptically polarized or analysed by the interposition of a quarter- wave between the crystal and the polarizer or analyser. Thus in the two cases described above the brushes disappear and the rings are continuous when the light is both polarized and analysed circularly. But the most important case, on account of its practical application to determining the sign of a crystal, is that in which the light is plane polarized and circularly analysed or the reverse. Let us suppose that the light is circularly analysed and that the primitive and final planes of polarization are at right angles. Then with an uniaxal plate perpendicular to the optic axis, the black cross is replaced by two lines, on crossing which the rings are discontinuous, expansion or contraction occurring in the quadrants that contain the axis of the quarter-wave plate, according as the crystal is positive or nega- tive. With a biaxal plate perpendicular to the optic axis in the diagonal position, the hyperbolic brush becomes an hyperbolic line and the rings are expanded or contracted

on its concave side, with a positive plate, according as the plane of the optic axes is parallel or perpendicular to the axis of the quarter-wave plate, the reverse being the case with a negative plate.

With a combination of plates in plane-polarized and plane-analysed light the interference pattern with monochromatic light is generally very complicated, the dark curves when polarizer and analyser are crossed being replaced by isolated dark spots or segments of lines. When, however, the field is very small, or when the primitive light is white so that interference is only visible for small relative retarda- tions, the problem becomes in many cases one of far less complexity. An instance of considerable importance is afforded by the combina- tion known as Savart's plate. This consists of two plates of an uniaxal crystal of equal thickness, cut at the same inclination of about 45° to the optic axis and superposed with their principal planes at right angles. The interference pattern produced by this combina- tion is, when the field is small, a system of parallel straight lines bisecting the angle between the principal planes of its constituents. These attain their maximum visibility when the plane of analysation is at 45 to these planes, and vanish when the plane of polarization is parallel to either of the principal planes.

The phenomena of chromatic polarization afford a ready means of detecting doubly refracting structure in cases, such as that pro- duced in isotropic bodies by strain, in which its effects aie very minute. Thus a bar of glass of sufficient thickness, placed in the diagonal position between a crossed polarizer and analyser and bent in a plane perpendicular to that of vision, exhibits two sets of coloured bands separated by a neutral line, the double refraction being posi- tive on the dilated and negative on the compressed side. Again, a system of rings, similar to those of an uniaxal plate perpendicular to the axis, may be produced with a glass cylinder by transmitting heat from its surface to its axes by immersion in heated oil, and glass that has been raised to a red heat and then cooled rapidly at its edges gives in polarized light an interference pattern of a regular form dependent upon the shape of the contour.

Rotary Polarization. — In general a stream of plane-polarized light undergoes no change in traversing a plate of an uniaxal crystal in the direction of its axis, and when the emergent stream is analysed, the light, if originally white, is found to be colourless and to be extinguished when the polarizer and analyser are crossed. When, however, a plate of quartz is used in this experiment, the light is coloured and is in no case cut off by the analyser, the tint, however, changing as the analyser is rotated. This phenomenon may be explained, as D. F. J. Arago pointed out, by supposing that in passing through the plate the plane of polarization of each monochromatic constituent is rotated by an amount dependent upon the

frequency — an explanation that may be at once verified either by using mono- chromatic light or by analysing the light with a spectroscope, the spectrum in the latter case being traversed by one or more dark bands, according to the thickness of the plate, that pass along the spectrum from end to end as the analyser is rotated. J. B. Biot further ascertained that this rotation of the plane of polarization varies as the distance traversed in the plate and very nearly as the inverse square of the wave-length, and found that with certain specimens of quartz the rotation is in a clockwise or right-handed direction to an observer receiving the light, while in others it is in the opposite direction, and that equal plates of the right- and left- hand varieties neutralize one another's effects.

A similar rotary property is possessed by other uniaxal crystals, such as cinnabar and the thiosulphates of potassium, lead and calcium, and as H. C. Pockiington (Phil. Mag., 1901 [61. ii. 361) and J. H. Dufet (Journ. de phys., 1904 [4], iii. 757) have shown by a few biaxal crystals, such as sugar and Rochelle salt, the rotation produced by a given thickness being in general different, and in some cases of oppo- site sign for the two optic axes. Further, certain cubic crystals, such as sodium chlorate and bromate, and also some liquids and even vapours, rotate the plane of polarization of the light that traverses them, whatever may be the direction of the stream.

In crystals the rotary property appears to be sometimes inhereat

in the crystalline arrangement of the molecules, as it is lost on fusion or solution, and in several cases belongs to enantiomorphous crystals, the two correlated forms of which are the one right-handed and the other left-handed optically as well as crystallographically, this being necessarily the case if the property be retained when the crystal is fused or dissolved. In organic bodies the rotary property, as the researches of J. A. Le Bel, J. H. van't Hoff and others have established, corresponds to the presence of one or more asymmetric atoms of carbon — that is, atoms directly united to elements or radicles all different from one another — and in every case there exists an isomer that rotates the plane of polarization to the same degree in the opposite direction. Absence of rotary power when asymmetric carbon atoms are present, may be caused by an internal compensa- tion within the molecule as with the inactive tartaric acid (meso- tartaric acid), or may be due to the tact that the compound is an equimolecular mixture of left- and right-hand varieties, this being the case with racemic acid that was broken by Louis Pasteur into laevo- and dextro-tartaric acid (see Stereo-Isomerism).

Substances that by reason of the structure or arrangement of their molecules rotate the plane of polarization are said to be structurally active, and the rotation produced by unit length is called their rotary power. If unit mass of a solution contain rn grammes of an active substance and if & be the density and p be the rotary power of the solution, the specific rotary power is defined by p/mS, and the molecular rotary power is obtained from this by multiplying by the hundredth part of the molecular mass. This quantity is not absolutely constant, and in many cases varies with the concentration of the solution and with the nature of the solvent. A mixture of two active substances, or even of an active and an inactive substance, in one solution sometimes produces anomalous effects.

Fresnel showed that rotary polarization could be explained kine- matically by supposing that a plane-polarized stream is resolved on entering an active medium into two oppositely circularly polarized streams propagated with different speeds, the rotation being right- or left-handed according as the right- or left-handed stream travels at the greater rate.

The polarization- vector of the primitive'stream being £ = o cos nt, the first circularly polarized stream after traversing a distance z in the medium may be represented by

£1 = a cos (nt — fez), iji = a sin (nt — kiz), and the second by

& = a cos (nt — fez), ij 2 = — a sin (nt — fez). The resultant of these is

£ = 2a cos | (fe — fe)z cos \nl — J(fe + fe)zj, 7j = 2tt sin 5 (fe — fe)z cos \nt — J(fe + fe)z}, which shows that for any fixed value of z the light is plane polarized in a plane making an angle \(k2-k 1)z = n(\J 1 — X7 1)z, with the initial plane of polarization, Xi and X2 being the wave-lengths of the circular components of the same frequency.

Since the two circular streams have different speeds, Fresnel argued that it would be possible to separate them by oblique refraction, and though the divergence is small, since the difference of their refractive indices in the case of quartz is only about 0-00007, he succeeded by a suitable arrangement of alternately right- and left-handed prisms of quartz in resolving a plaije-polarized stream into two distinct circularly polarized streams. A similar arrange- ment was used by Ernst v. Fleischl for demonstrating circular polarization in liquids. This result is not, however, conclusive ; for an application of Huygens's principle shows that it is a consequence of the rotation of the plane of polarization by an amount propor- tional to the distance traversed, independently of the state of affairs within the active medium. Not more convincing is a second experi- ment devised by Fresnel. If in the interference experiment with Fresnel's

mirrors or biprism the slit be illuminated with white light that has passed through a polarizer and a quartz plate cut perpendicu- larly to the optic axis, it is found on analysing the light that in addition to the ordinary central set of coloured fringes two lateral systems are seen, one on either side of it. According to Fresnel's explanation the light in each of the interfering streams consists of two trains of waves that are circularly polarized in opposite direction and have a relative retardation of phase, introduced by the passage through the quartz: the central fringes are then due to the similarly polarized waves ; the lateral systems are produced by the oppositely polarized streams, these on analysation being capable of interfering. A. Righi has, however, pointed out that this "experiment may be explained by the fact that the function of the quartz plate and analyser is to eliminate the constituents of the composite stream of white light that mask the interference actually occurring at the posi- tions of the lateral systems of fringes, and that any other method of removing them is equally effective. In fact, the lateral systems are obtained when a plate of selenite is substituted for the quartz.. Sir G. B. Airy extended Fresnel's hypothesis to directions inclined to the axis of uniaxal crystals by assuming that in any such direction the two waves, that can be propagated without alteration ot their state of polarization, are oppositely elliptically polarized with their planes of maximum polarization parallel and perpendicular to the principal plane of the wave, these becoming practically plane polar- ised at a small inclination to the optic asis. Several investigations

have been made to test the correctness of Airy's views, but it must be remembered that it is only possible to experiment on waves after they have Jeft the crystal, and L. G. Gouy (Journ. de phys., 1885 [2], iv. 149) has shown that the results deduced from Airy's waves of permanent type may be obtained by regarding the action of the medium as the superposition of the effects of ordinary double refraction and of an independent rotary power. As regards the course of the streams on refraction into the crystal, it is found that it is determined by the Huygenian law (see Refraction, § Double); as, however, the two streams in the direction of the axis have differ- ent speeds, the spherical and the spheroidal sheets of the wave-surface do not touch as in the case of inactive uniaxal crystals. On these principles Airy, by an elaborate mathematical investigation, successfully explained the interference patterns obtained with plates of quartz perpendicular to the optic axis. When the polarizer and analyser are parallel or crossed, the pattern is the same as with inactive plates, with the exception that the brushes do not extend to the centre of the field; but as the analyser is rotated a small cross begins to appear at the centre of the field, while the rings change their form and become nearly squares with rounded corners^ when the planes of polarization and analysation are at 45°. With two plates of equal thickness and of opposite rotations: the

pattern consists of a series of circles and of four similar spirals starting from the centre, each spiral being turned through 90 from that adjacent to it. When the light is circularly polarized or circularly analysed, a single plate gives two mutually inwrapping spirals, and similar spirals in circularly polarized light are obtained with plates of an active biaxal crystal perpendicular to one of the optic axes. It was in this way that the rotary property of certain biaxal crystals was first established by Pocklington.

F. E. Reusch has shown that a packet of identical inactive plates arranged in spiral fashion gives an artificial active system, and the behaviour of certain pseudosymmetric crystals indicates a formation of this character. On these results L. Sohncke (Math. Ann., 1876, ix. 504) and E. Mallard (Traite de cristallographie, vol. ii. ch. ix.) have built up a theory of the structure of active media, but in the instances in which static spirality has been shown to be effective in producing optical rotation the coarse-grainedness of the structure is comparable with the wave-length of the radiation affected.

The rotary property may be induced in substances naturally inactive. Thus A. W. Ewell (Amer. Jour, of Science, 1899 [4], viii. 89) has shown the existence of a rotational effect in twisted glass and gelatine, the rotation being opposite to the direction of the twist. But a far more important instance of induced activity is afforded by Michael Faraday's discovery of the rotary polarization connected with a magnetic field. There is, however, a marked difference between this magnetic rotation and that of a structurally active medium, for in the latter it is always right-handed or always left-handed with respect to the direction of the ray, while in the former the sense of rotation is determined by the direction of magnetization and therefore remains the same though the ray be reversed. This subject is treated in the article Magneto-Optics, to which the reader is also referred for John Kerr's discovery of the effect on polarization produced by reflection from a magnetic pole, and for the action of a magnetic field on the radiation of a source — the " Zeeman effect."

Reflection and Refraction. — Huygens satisfactorily explained the laws of reflection and refraction on the principles of the wave theory, so far as the direction of the waves is concerned, but his explanation gives no account of the intensity and the polarization of the reflected light. This was supplied by Fresnel, who, starting from a mechanical hypothesis, showed by ingenious but not strictly dynamical reasoning that if the incident stream have unit amplitude, that of the reflected stream will be

— sin (i-r)jsm (i + r) or tan (i-r)/ta.n (i--r), according as the incident light is polarized in or perpendicularly to the plane of incidence i, r, being

the angles of incidence and refraction connected by the formula sin i = n sin r. At normal incidence the intensity of the reflected light, measured by the square of the ampli- tude, is {(m-i)/(m+i)P ln both cases; but whereas in the former the intensity increases uniformly with i to the value unity for 2 = 90°, in the latter the intensity at first decreases as i increases, until it attains the value zero when i+r = 90°, or tan i = n — the polar- izing angle of Brewster — and then increases until it becomes unity at grazing incidence. If the incident light be polarized in a plane, making an angle a with the plane of incidence, the stream may be resolved into two that are polarized in the principal azimuths, and these will be reflected in accordance with the above laws. Hence if be the angle between the plane of incidence and that in which the reflected light is polarized

tan /3=-tan o cos (i--r)!cos (i-r). The expressions for the intensity of the refracted light may be obtained from those relating to the reflected light by the principle of energy. In order to avoid the question of the measurements of the intensity in different media, it is convenient to suppose that the refracted stream emerges into a medium similar to the first by a transition so gradual that no light is lost by reflection. The intensities of the incident, reflected and refracted streams are than measured in the same way, and we have merely to express thar

the square of the amplitude of the incident vibrations is equal to the sum of the squares of the amplitudes of the reflected and refracted vibrations.

Fresnel obtained his formulae by assuming that the optical differ- ence of media is due to a change in the effective density of the ether, the elasticity being the same — an assumption inconsistent with his theory of double refraction— and was led to the result that the vibrations are perpendicular to the plane of polarization. Franz Neumann and James MacCullagh, starting from the opposite assump- tion of constant density and different elasticities, arrived at the same formulae for the intensities of the reflected light polarized in the principal azimuths, but in this case the vibrations must be regarded as parallel to the plane of polarization. The divergence of these views has led to a large number of experimental investigations, instituted with the idea of deciding between them. In the main such investigations have only an academic interest, as, whatever theory of light be adopted, we have to deal with two vectors that are parallel and perpendicular respectively to the plane of polariza- tion. Thus certain experiments of Otto H. Wiener (Wied. Ann., 1890, xl. 203) show that chemical action is to be referred to the latter of these vectors, but whether

Fresnel's or Neumann's hypo- thesis be correct is only to be decided when we know if it be the mean kinetic energy or the mean potential energy that determines chemical action. Similarly on the electromagnetic theory the electric or the magnetic force will be perpendicular to the plane of polarization, according as chemical action depends upon the electric or the mag- netic energy. Lord Rayleigh {Scientific Papers, i. 104) has, however, shown that the polarization of the light from the sky can only be explained on the elastic solid theory by Fresnel's hypothesis of a different density, and from the study of Hertzian oscillations, in which the direction of the electric vibrations can be a priori assigned, we learn that when these are in the plane of incidence there is no reflection at a certain angle, so that the electric force is perpendicular to the plane of polarization.

It has been supposed in the above that the medium into which the light enters at the reflecting-surface is the more refracting. In the contrary case, total reflection commences as soon as sin i — /jT l , n being still the relative refractive index of the more highly refracting medium; and for greater angles of incidence r becomes imaginary. Now Fresnel's formulae were obtained by assuming that the incident, reflected and refracted vibrations are in the same or opposite phases at the interface of the media, and since there is no real factor that converts cos T into cos (T+p), he inferred that the occurrence of imaginary expressions for the coefficients of vibration denotes a change of phase other than ir, this being represented by a change of sign. If this be so, it is clear that the factor V —I denotes a change of phase of x/2, since this twice repeated converts cos T into cos (T + ?r) = — cos T, and hence that the factor a +&V —I represents a change of phase of ta.n~ l (b/a). Applying this interpretation to the formulae given above, it follows that when the incident light is polarized at an azimuth a to the plane of incidence and the second medium Is the less refracting, the reflected light at angles of incidence exceeding the critical angle is elliptically polarized with a difference of phase A between the components polarized in the principal azi muths that is given by

tan (A/2) = cot i'V(l — M -2 cosec 2 i).

Thus A is zero at grazing incidence and at the critical angle, and attains its maximum value x— 4 tan _1 (i/M) a t an angle of incidence given by sin 2 i = 2,'(/i 2 -)-i).

It is of some interest to determine under what conditions it is possible to obtain a specified difference of phase. Solving for cot 2 i we obtain

2 cot 2 i = (M 2 -l) 2 ± V [(M 2 -tan 2 (7r-A)/4){ M 2 -cot 2 (— -A)/4)],*

and since tan j(x — A)/4J is less than unity, ju must exceed cot |(V— A)/4J if cot 2 ; is to be real. Thus if A = 71-/2, jumust exceed 71-/8 or 2-414, that is, the substance must be at least as highly refracting as a diamond : if A = 71-/4, M must be greater than 371-/16 or 1 -4966, and when this is the case, it is possible by two reflections to convert into a circularly polarized stream a beam of light polarized at 45 to the plane of incidence. This is the principle of Fresnel's rhomb, that is sometimes employed instead of a quarter-wave plate for obtaining a stream of circularly polarized light. It consists of a parallelopiped glass so constructed that light falling normally on one end emerges at the other after two internal reflections at such an angle as to introduce a relative retardation of phase of 7r/4 between the components polar- ized in the principal azimuths.

Fresnel's formulae are sufficiently accurate for most practical purposes, but that they are not an exact representation of the facts of reflection was shown by Sir David Brewster and by Sir G. B. Airy. Detailed investigations by J. C. Jamin, G. H. Quincke, C. \V. Wernicke and others have established that in general light polarized in any but the principal azimuths becomes elliptically polarized by reflection, the relative retardation of phase of the components polarized in these azimuths becoming 71-/2 at a certain angle of incidence, called the principal incidence. In some cases it is the component polarized in the plane of incidence that is most retarded and the reflection is then said to be positive : in the case of negative reflection the reverse takes place. It was at first supposed

that the defect of Fresnel's formulae was due to the neglect of the superficial undulations that, on a rigorous elastic solid theory of the ether, are called into existence at reflection and refraction. But the result of taking these into account is far from being in accor- dance with the facts, and experiments of Lord Rayleigh and Paul Drude make it probable that we ought to assume that the transition from one medium to another, though taking place in a distance amounting to about one fiftieth of a wave-length, is gradual instead of abrupt. The effect of such a transition-layer can easily be calculated, at least approximately; but it is of little use to take account of it except in the case of a theory of reflection that gives Fresnel's formulae as the result of an abrupt transition. Lord Rayleigh has pointed out that all theories are defective in that they disregard the fact that one at least of the media is dispersive, and that it is probable that finite reflection would result at the interface of media of different dispersive powers, even in the case of waves for which the refractive indices are absolutely the same.

A more pronounced case of elliptic polarization by reflection is afforded by metals. Formulae for metallic reflection may be ob- tained from Fresnel's

expressions by writing the ratio sin i/sin r equal to a complex quantity, and interpreting the imaginary co- efficients in the manner explained above. The optical constants (refractive index and co-efficient of extinction) of the metal may then be obtained from observations of the principal incidence and the elliptic polarization then produced. A detailed investigation of these constants has been made by Drude (Wied. Ann , 1890, xxxix. 504), who has found the remarkable result that copper, gold, magne- sium and silver have refractive indices less than unity, and this has been completely confirmed by observations with metallic prisms of small refracting angle. He further showed that except in the cases of copper, lead and gold the dispersion is abnormal — the index for red light being greater than that for sodium light. The higher the co-efficient of extinction for light of a given period, the more copious will be reflection of that constituent of a mixed pencil. This fact has been employed for separating waves of large wave-length, and in this way waves of length 0-061 mm. have been isolated by five successive reflections from the surface of sylvite.

The Study of Polarization. — The best method of obtaining a strong beam of polarized light is to isolate one of the streams into which a beam of common light is resolved by double refraction. This is effected in polarizing prisms of the earlier type, devised by A. M. de Rochon, H. H. de Senarmont and W. H. Wollaston, by blocking off one of the streams with a screen, sufficient lateral separation being obtained by combining two equal crystalline prisms cut differently with respect to the optic axis — an arrangement that achromatizes more or less completely the pencil that is allowed to pass. In a second type, called Nicol's prisms, one stream is removed by total reflection. Theoretically the best construction for prisms of this class is the following: a rectangular block of Iceland spar, of length about four times the width and having its end and two of its side faces parallel to the optic axis, is cut in half by a plane parallel to the optic axis and making an angle of about 14 with the sides; the two halves are then reunited with a cement whose refractive index is between the ordinary and extraordinary indices of the spar and as nearly as possible equal to the latter. Thus constructed, the prism produces no lateral shift of the transmitted pencil; a conical pencil, incident directly, has nearly constant polarization over its extent, and consequently the error in determining the polarization of a parallel pencil, incident not quite normally, is a minimum. In a Nicol's prism it is the extraordinary stream that passes; in a prism suggested by E. Sang and sometimes called a Bertrand's prism, it is the ordinary stream that is utilized. This is made by fixing a thin crystalline plate between two glass prisms turned in opposite directions by a cement of the same refractive index as the glass. This refractive index should be equal to the greatest index of the plate, and with a biaxal plate the mean axis of optical symmetry should be parallel to its faces and in the normal section

of the prisms, while with an uniaxal plate the optic axis should be in a plane perpendicular to this normal section. These prisms have the advantage of economy of material and of a greater field than the ordinary Nicol's prism, but a difficulty seems to be experienced in finding a suitable permanent cement.

For an accurate determination of the plane of polarization analy- sers that act by extinction are not of much practical use, and a different device has to be employed. Savart's analyser consists of a Savart's plate (see above) connected to a Nicol's prism, the principal section of which bisects the angle between the principal planes of the plate: the plane of polarization is determined by turning the analyser until the bands, ordinarily seen, disappear, in which case it is parallel to one of the principal planes of the plate. Half-shade analysers depend upon the facility with which the eye can distinguish slight differences in the intensities of two streams seen in juxtaposition, when the illumination is not too bright. The field is divided into two parts that for most positions of the analyser have different intensities, and the setting is effected by turning the analyser until both halves are equally dark. These instruments are very sensitive, but care must be taken to avoid errors caused by changes in the relative intensities of parts of the source of light— a precaution that is sometimes overlooked in furnishing polarimeters with these analvsers. In J. H. Jellet's and M. A. Cornu's analysers

formed — the one from two parts of a rhomb of spar, the other from two portions of a Nicol's prism — the two halves of the field are ana- lysed in slightly different planes; but these, though they have certain advantages, are now seldom employed, partly on account of a diffi- culty in their construction and partly because their sensitiveness cannot be adjusted. The more usual half-shade analyser is avail- able for light of only one frequency, as it depends upon the action of a half-wave plate, in traversing which the plane of polarization is turned until it makes the same angle with the principal section as at first but on the opposite side : half the field is covered with the plate, to which is attached a Nicol's prism with its principal section inclined at a small angle to that of the plate. The eye must be focussed on the edge of the plate, and the two halves of the field will only be equally dark when the principal plane of the plate is parallel to the primitive plane of polarization. Another plan, due to J. H. Poynting, is before analysation to impress unequal rotations upon the plane of polarization of the two parts of the field, either by means of an active medium, or by oblique transmission through glass plates.

Elliptically polarized light is investigated by the reduction of the pencil to a state of plane polarization, and a determination of the resulting plane of prlarization. One method consists in finding directly the elliptic ccnstants of the vibration by means of a quarter- wave plate and an analyser; but the more usual plan is to measure the relative retardation of two rectangular components of the stream by a Babinet's compensator. This is a plate made of two equal wedges of quartz, that can be moved over one another so as to vary its thickness, and are cut so that the faces of the plate are parallel to the optic axis, which in the first wedge is perpendicular and in the second is parallel to the refracting edge. It is clear that direct transmission through the plate at a point where the thick- nesses of the prisms are &\ and dz will introduce a relative retardation of (m — Mo) {di — dz) between streams polarized in planes parallel and perpendicular to the edges of the prisms, Mo. and fi e , being the ordinary and the extraordinary refractive indices; and it is hence possible by an adjustment of the thickness to reduce elliptically polarized to plane polarization at an assigned point marked off by two parallel lines. A subsequent determination of the plane of polarization gives the ratio of the amplitudes of the vibrations in the component streams.*

For the observation and measurement of rings in crystals polari- scopes are constructed on the following principle. Light from an extended source passes after polarization through two convex systems of lenses, between which the crystalline plate is placed, and is then received in an eyepiece furnished with an analyser. If measurements be required, the plate must have a motion round an axis perpendicular to that of the optical systems, and also about an axis normal to its faces; the polarizer and analyser must also be capable of adjustment. All the rays through a given point in the first principal focal plane of the anterior system of lenses traverse the plate as a parallel beam and reunite at the corresponding point of the second focal plane of the posterior system, each in its passage being divided into two by the plate having a given relative retarda- tion. It is on this latter plane that the eyepiece must be focussed, and here the measuring web must be placed. The actual details of the systems of lenses depend upon the object for which the polari- scope is intended, and are given for some of the principal types of instruments in Th. Liebisch's Physikalische Kristallographie.

Of polarimeters for the study of rotary polarization there are three principal forms. In Wild's polaristrobometer, light from a soda flame, rendered parallel by a lens, is polarized by a Nicol's prism, and after traversing the space into which the active substance is to be inserted, falls on a Savart's plate placed in front of an astro- nomical cs'escope of low power, that contains in its eyepiece a Nicol's prism, which with the plate forms a Savart's analyser. A web in the focal plane of telescope marks the point in the field at which the bands are to be made to disappear; this is

effected by turning the polarizer by means of a rack and pinion worked by an arm from the observer's end of the instrument. The polarizing prism is fixed at the centre of a circular disk, that has a scale on its circumference, which with a fixed vernier determines the positions of the polarizer, for which the bands disappear at the assigned point of the field. Laurent's polarimeter is a half-shade instrument. Soda light, first sifted by passage through a plate of potassium bichromate, traverses in succession a lens, a Nicol's prism, and a glass plate half covered with a half-wave plate of quartz, that is cut parallel to the optic axis and has its principal section inclined at a small angle to that of the prism. This combination forms a half- shade polarizer, the sensitiveness of which can be varied by a slight adjustment that can be given to the Nicol. The light is finally received in a Galilean telescope, containing an analyser and carried at the centre of a circular plate, that is graduated on its rim and can be turned in front of a vernier by means of a rack and pinion. The telescope must be focussed on the edge of the quartz plate, and in order that all points of the field may be illuminated by the same part of the source, the flame must be so placed that its image is thrown by the lens on the diaphragm of the object glass of the telescope. The chief features of Soleil's saccharimeter are the biquartz and the compensator. The former consists of two semicircular plates of quartz, perpendicular to the optic axis and of opposite rotations,

placed so as to have a common diameter and having such a thickness that each rotates the plane of polarization of mean yellow light through the same multiple of 90 . If then a stream of polarized white light traverse the biquartz, it is possible by an analyser to cut off the mean yellow light from each half of the field, and the whole will then have the sensitive tint; but a small change in the plane of analysation will give the one half a red and the other half a blue tone. A rotation of the plane of polarization is not, however, measured by an adjustment of the analyser, but by annulling the rotation with a compensator. This is made of two plates of quartz, cut normally to the optic axis and of opposite rotations, placed the one in front of the other: the thickness of the one plate is fixed, while that of the other can be varied, as it is formed of two equal prisms that can be moved over one another along their common face. When the plates are of equal thickness, their combined effect is nil, but by adjusting the second, a rotation in the one or the other direction may be introduced, a scale attached to one prism and a vernier to the other giving the thickness of the resultant quartz plate. At one end of the instrument is placed a polarizer and the biquartz, and at the other a Galilean telescope, that must be focused on the edge of biquartz, having in front of its object-glass the compensator and an analyser that is regulated for producing the sensitive tint, when the plates of the compensator have the- same thickness. The sensitiveness of the instrument depends upon the exactness of the sensitive

tint, when the colour of the two halves of the field are the same, and this is liable to be upset by absorption in the substance under investigation. In order to correct this, the light after analysa- tion is passed through another plate of quartz and then the sensitive tint may be more or less restored by cutting off some colour, the same for the whole field, by a Nicol's prism placed in the eyepiece of the telescope. Soleil's saccharimeter, as its name implies, is designed for the study of solutions of sugar, and it is clear that it will only work satisfactorily with active media that have nearly the same rotary dispersion as quartz.

Bibliography. — A bibliography of the subjects treated in this article will be found at the end of the corresponding chapters of E. Verdet's Lecons d'optique physique (1869) ; this work has been brought to a later date in the German translation by Karl Exner (Braunschweig, 1881); references to later papers will be found in J. Walker's The Analytical Theory of Light (1904). In addition to the above the reader may consult for the general subject of polariza- tion the following treatises: Th. Preston (3rd. ed. by C. J. Joly), The Theory of Light (1901) ; A. Schuster, An Introduction to the Theory of Optics (1904) ; R. W. Wood, Physical Optics (1905) ; E. Mascart, Traite d'optique (1889); and for the phenomena exhibited by crystals F. Pockel, Lehrbuch der Kristalloptik (1906) ; Th. Liebisch, Physikalische Kristallographie (1891). (J. Wal.)*

POLAR REGIONS, a general term for the regions about the North or South Pole, otherwise called the Arctic or Antarctic regions. The ancients had no actual knowledge of History of the Polar regions. They had probably heard rumours Antic of the light summer nights and the dark winter Exploration. nights in the north, as is shown by Homer's description of the Laestrygons having the short nights and the Cimmerians living in perpetual darkness. By astronomical speculations the Greeks had come to the conclusion that north of the Arctic Circle there must be midnight sun at midsummer and no sun at midwinter. The general view was that the Polar regions, north and south, belonged to the uninhabitable frozen zones; while according to a less scientific notion there was a happy region north of the north wind (Boreas), where the sun was always shining and the Hyperboreans led a peaceful life. The first traveller of history who probably approached the Arctic Circle and reached the land of the midnight „„. sun was the Greek Pytheas (q.v.), from Massalia (Marseilles), who about 325 B.C. made a voyage of discovery northwards along the west coast of Europe, which is one of the most remarkable in history. He visited England, Scotland, the Scottish isles, and probably also northern Norway, which he called Thule. He moved the limits of the known world from the south coast of England northward to the Arctic Circle. It seems probable that he made two or perhaps several voyages. He also discovered the northern coasts of Germany as far east as Jutland.

We hear of no other voyages towards the Arctic regions before the Irish monk Dicuil, writing about 825, mentions the discovery by Irish monks of a group of small islands (the Irish Faeroes), and a greater island (Iceland), which he Discovery calls Thule, where there was hardly any night at of Iceland. midsummer. It is possible that Iceland and the Faeroes were inhabited by a small Celtic population before the Irish monks

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POLAR REGIONS

939

Ottar.

Eric the Red.

came thither. The fact that Irish monks lived in Iceland before the Norsemen settled there in the end of the 9th century- is verified by the Icelandic sagas.

In his translation of Orosius, King Alfred inserts the interesting story of the first known really Arctic voyage, told him by the Norwegian Ottar (Alfred calls him Ohthere), who about 870 rounded the North Cape, sailed eastwards along the Murman coast and discovered the White Sea, where he reached the south coast of the Kola Peninsula and the bound- ary of the land of the Biarmians (Beormas). Ottar told King Alfred that “he chiefly went thither, in addition to the seeing of the country, on account of the walruses.”

After Ottar’s time the king of Norway took possession of all land as far east as the White Sea and the land of the Biarmians, and the native ” Finns “had. to pay him tribute. Many voyages, mostly of hostile nature but also for trade purposes, were under- taken from Norway to the White Sea, and even kings went as far. It is told of King Eric, called Bloodyaxe, who died as king of York in England, that he made such a voyage, and fought with the Biarmians, about 920, and about 965 his son Harold Graafeld defeated the Biarmians and killed many people in a great battle near the river Dvina, where Archangel was built later.

After having settled in Iceland in the end of the 5th century, the Norsemen soon discovered Greenland and settled there. The first who is reported to have seen the coast of Greenland was a Norwegian, Gunnbjbrn Ulfsson, who on his way to Ice- land was storm-driven westwards. He came to some islands, afterwards called Gunnbjornskier, and saw a coast, but, without exploring the new land, he had evidently continued his way till lie reached Iceland. The real discoverer and explorer 'of Greenland was the Norwegian, Eric the Red, who, with his father had settled in Iceland. As he and his men had there been declared outlaws for having killed several people they had to leave Iceland for three years, and he went westward to find the land which Gunnbjorn was reported to have seen. He explored the west coast of Greenland for three years, probably about 982-985. He then returned to Iceland, but founded the following year a colony in Greenland (q.v.). Many colonists followed, and two Norse settlements were formed, viz. the Eystrabygd (i.e. eastern settlement) on the south-eastern part of the Greenland west coast, between Cape Farewell and about 61° N. lat., where Eric the Red had his house, Brattalid, at the Eiriksfjord; and the Vestrabygd (i.e. western settlement) in the region of the present Godthaab district, between 63 and 66° N. lat. The Norse settlers carried on their seal and whale- hunting still farther north along the west coast beyond the Arctic circle, and probably in the region of Disco Bay. A runic stone was found in a cairn on a small island in 72 55′ N. lat. north of Upernivik, showing that Norsemen had been there. The stone probably dates from the 14th century. About 1267 an expedition was sent northwards along the west coast and may possibly have reached some distance north of Upernivik. The last known communication between the Norse settle- ments in Greenland and Norway was in 1410, when some Icelanders returned, ' who four years previously had been storm-driven to Greenland. After that time we possess no reliable information about the fate of these settlements. When Greenland was rediscovered in the 16th century no descendants of the Norse settlers were found. The probability is that having gradually been cut off from all communications with Europe, the remaining settlers who had not returned to the motherland were obliged to adopt the Eskimo mode of life, which in those surroundings was far superior to the European, and by inter- marriage they would then soon be absorbed amongst the more numerous natives. There is evidence to show that an expedi- tion was probably sent from Denmark or Norway to Greenland in the latter part of the 1 5th century (perhaps about Scoivus x 476) under Pining and Pothorst (by Purchas called "Punnus and Pothorse"); and perhaps with Johan Scoivus as pilot. It is probable that this expedition had inter- course with the natives of Greenland, and possibly even reached

King Harold.

Labrador, but it is unknown whether any remains of the Norse settlements

were found on the Greenland west coast.

It is reported by Adam of Bremen (about 1070) that the Norwegian king Harold Haardraade (in the nth century) made an expedition into the Arctic Sea (probably north- wards) in order to examine how far it extended, but we know nothing more about this voyage.

The Icelandic annals report that a land called Svalbardi was discovered in n 94. The name means the cold side or coast.

The land was, according to the sagas, situated _ ,, . , ,,.,., , Tii 1 Spitsbergen.

four days sailing from north-eastern Iceland north- wards in the Hajsbotn (i.e. the northern termination of the sea, which was supposed to end as a bay). There can be no doubt that this land was Spitsbergen. The Norsemen carried on seal, walrus and whale hunting, and it is believed on good ground that they extended their hunting expeditions eastwards as far as Novaya Zemlya and northwards to Spitsbergen.

On his way to Greenland from Norway in the year 1000 Leif Ericsson found America, probably Nova Scotia, which he called Wineland the Good. A few years later Thorfinn Karlsefni sailed from Greenland with three ships to make a settlement in the land discovered by Leif. Tney first came to Labrador, which they called Helluland, then to Newfoundland, which was called Markland (i.e. woodland), and then to Cape Breton and Nova Scotia (V inland; Wineland). After three years they had to give up the undertaking on account of hostilities with the natives, probably Red Indians, and they returned to Greenland about 1006. We know of no later expedition of the Norsemen that reached Greenland; it is stated that Eric Uppri, the first bishop of Greenland, went in n 21 to seek Vinland, but it is not related whether he ever reached it, and the probability is that he never returned.

The Icelandic annals state that in 1347 a small Greenland ship which had sailed to Markland (Newfoundland) was after- wards storm-driven to Iceland with seventeen men. This is the last known voyage made by the Norse- Newfound- men of Greenland which with certainty reached ‘ aflA America.

The discoveries of the old Norsemen extended over the north- ern seas from Novaya Zemlya in the east to Labrador, New- foundland and Nova Scotia in the west; they had visited all Arctic lands in these regions, and had explored the White Sea, the Barents Sea, the Spitsbergen and Greenland Sea, Davis Strait, and even some part of Baffin Bay. They were the first

navigators in history who willingly left the coasts and sailed across the open ocean, and they crossed the Atlantic between Norway and America, thereby being the real discoverers of this ocean, as well as the pioneers in oceanic navigation. They were the teachers of the navigators of later centuries, and it is hardly an accident that the undertakings of England towards the west started from Bristol, where many Norwegians had settled, and which from the beginning of the 15th century had much trade with Iceland.

John Cabot, sent out by the merchants of Bristol, rediscovered the American continent in 1497. He came to Cape Breton and Nova Scotia, probably the same land where Leif Ericsson had landed 500 years before. John Cabot started on a new expedition towards the west in 1498, but no more is known of this expedition, not even whether Cabot returned or not. There is no reliable evidence to prove that John Cabot or his son Sebastian ever discovered Labrador, as has been generally believed.

The Portuguese Caspar Corte-Real rediscovered Greenland in 1500. He sailed along its east coast without being able to land on account of the ice. Whether he visited the west coast is uncertain. In 1501 he made a new expedition when he also rediscovered Newfoundland. One of his ships returned home to Lisbon, but he himself and his ship disappeared. His brother went in search of him the following year, but was heard of no more.

Cabot's and Corte-Reai's discoveries were followed by the development of the Newfoundland and Labrador fisheries,

' Corte-Real.

Sebastian Cabot.

John Rut.

Centurioae.

and a whole fleet of English, Portuguese, Basque and Breton fishermen was soon met with in these waters, and they probably went along the Labrador coast northward as far as Hudson Strait, without having left any report of their discoveries.

It is believed, on good grounds, that expeditions (combined English-

Portuguese) were sent out to the newly discovered regions from Bristol in 1501 and 1502. It is unknown what their discoveries were, but they may possibly have sailed along the coast of Labrador.

It is possible that John Cabot's son, Sebastian Cabot, made an Arctic expedition in 1508-1509, in search of a short passage to China towards the north-west, and later, in 1521, King Henry VIII. made an attempt to persuade the merchants of London to support him in sending out an expedition, under Sebastian Cabot, to the north-western countries. It is uncertain whether it ever started, but it is certain that it achieved nothing of importance.

John Rut sailed from Plymouth in 1527, in order to seek a passage to China through the Arctic seas towards the north- west, following the suggestion of Robert Thorne of Bristol. He met ice in 53 N. lat. and returned to Newfoundland. Several other expeditions were sent out from various countries towards the north-west and west during this period, but no discoveries of importance are known to have been made in the Arctic regions.

There are rumours that the Portuguese, as early as 1484, under King John II., had sent out an expedition towards Novaya Zemlya in search of a north-east passage to India. The Genovese Paolo Centurione probably proposed to King Henry VIII. of England, in 1525, to make an expedition in search of such a passage to India north of Russia, and there is evidence to show that there had been much talk about an undertaking of this kind in England and at the English court during the following period, as it was hoped that a new market might be found for English merchandise, especially cloth. But it led to nothing until 1553, when Sebastian Cabot was one of the chief promoters. Three ships and 112 men under Sir Hugh Willoughby sailed from Ratcliffe on the 10th (20th) May 1553. Richard Chancelor commanded one of the ships, which was separated from the two others in a gale off northern Norway on the 3rd (13th) August. Willoughby, after having sighted land in various places, probably Kolguev Island, where they landed, the coast near the Pechora river and Kanin Nos, came on the 14th (24th) September to a good harbour on the northern coast of the Kola Peninsula. His one ship being leaky, Willoughby resolved to winter there, but he and all his men perished. Chancelor, after his separation from the two other ships, rounded the North Cape, to which he or his sailing-master, Stephen Borough, gave this name. He reached Vardohus, and after having waited there in vain for Willoughby, he followed the route of the Norsemen to the White Sea and reached the bay of St Nicholas, with a monastery of this name, near the mouth of the Dvina river, where Archangel was built later. Chancelor undertook a journey to Moscow, made arrangements for commercial inter- course with Russia, and

returned next year with his ship, which was, however, plundered by the Flemings, but he reached London safely with a letter from the tsar. In spite of the disaster of Willoughby and his men this expedition became of fundamental importance for the development of English trade. Chancelor's success and his so-called discovery of the passage to the White Sea, which was well known to the Norwegian traders in that region, proved to people in England the practical utility of polar voyages. It led to a charter being granted to the Association of Merchant Adventurers, also called the Muscovy or Russia Company, and gave a fresh impulse to Arctic discovery. Chancelor undertook a new expedition to the White Sea and Moscow in 1555; on his way home in the following year he was wrecked on the coast of Scotland and perished.

In 1556 Stephen Borough (Burrough), who had served with Chancelor, was sent out by the Muscovy Company in a small pinnace called the "Search-thrift," in order to try to reach the

Willoughby.

Chancelor.

Pet.

river Ob, of which rumours had been heard. Novaya Zemlya, Vaigach Island, and the Kara Strait leading into the Kara Sea, were discovered. Borough kept a careful journal of his voyage. In 1580 the company fitted ° " s ' out two vessels under Arthur Pet and Charles Jackman, with orders to sail eastwards north of Russia and Asia to the lands of the emperor of Cathay (China). They penetrated through the Kara Strait into the Kara Sea; they possibly saw the west coast of Yalmal, but met with much ice and were compelled to return. The two ships were separated on the way home, Pet reached London on December 26th in safety; Jackman wintered with his ship in Norway and sailed thence in February, but was never heard of again.

About 1574 the Portuguese probably made an attempt to find the north-west passage under Vasqueanes Corte-Real. They reached "a great entrance," which may have been Hudson Strait, and they "passed above twentie corteˆReai leagues" into it, 'Without all impediment of ice," "but their victailes fayling them, . . . they returned backe agayne with ioy."

After the expeditions in search of the north-east passage achieved the success of opening up a profitable trade with Russia, via the White Sea, new life was inspired in the under- takings of England on the sea, at the same time the power of the Hanseatic merchants, called the Easterlings,

was much reduced. It was therefore only natural that the plan of seeking a north-west passage to China and India should again come to the front in England, a.nd it was much discussed. It was Sir Martin Frobisher who opened that long series of expeditions all of which during three hundred years were sent from England in search of the north-west passage until the last expedition, which actually accomplished it, sailed from Norway. " Being persuaded of a new and neerer passage to Cataya" (China) towards the north-west, Frobisher "determined and resolved wyth himselfe, to go make full proofe thereof . . . or else never to retourne againe, knowing this to be the onely thing of the worlde that was left yet undone, whereby a notable mind mighte be made famous and fortunate." After having attempted in vain for fifteen years to find support for his enter- prise, he at last obtained assistance from Ambrose Dudley, earl of Warwick, and through him the interest of Queen Elizabeth was also secured. The Muscovy Company was now obliged to give a licence for the voyage in 1574, and the necessary money was found by London merchants. Aided especially by Michael Lok, an influential merchant and diligent student of geography, Frobisher sailed, on the 7th (17th) of June 1576, from Deptford with two small vessels of 20 and 25 tons, called the " Gabriel " and "Michael," and a small pinnace of 10 tons; the crews amounted to 35 men all told. On the 8th (18th) of July they lost sight of the pinnace, which was seen no more. On the nth (21st) of July they sighted a high, rugged land, but could not approach it for ice. This was the east coast of Greenland, but, misled by his charts, Frobisher assumed it to be the fictitious Frisland, which was the fabrication of a Venetian, Niccolo Zeno, who in 1558 published a spurious narrative and map (which he pretended to have found) as the work of an ancestor and his brother in the 14th century. The Zeno map was chiefly fabricated on the basis of a map by the Swede Olaus Magnus of 1537 and the map by the Dane Claudius Clavus of the 15th century. It was accepted at the time as a work of high authority, and its fictitious names and islands continued to appear on subsequent maps for at least a century, and have puzzled both geographers at home and explorers in the field. These islands had also been intro- duced on the charts of Mercator of 1569 and of Ortelius of T570. which were probably used by Frobisher. Evidently frightened by the sight of the great quantities of ice off the Greenland coast, one ship, the " Michael," left him secretly, " and re- tourned home wyth greate reporte that he was cast awaye. " The gallant Frobisher continued his voyage towards the north- west in the " Gabriel " alone, although his mast was sprung, his topmast blown overboard, and his "mizen-mast" had had to be cut away in a gale. On the 29th of July (Aug. 8) he sighted high

land which he called Queen Elizabeth's Foreland. This was the southern part of Baffin Land (Resolution Island) in about 62 N. lat. He was stopped by ice, but nearly two weeks later he reached the coast and entered an inlet which he considered to be the strait of the north-west passage, and he gave it his own name (it is now Frobisher Bay on Baffin Land). The land was called "Meta Incognita." Frobisher was not well prepared for going much farther, and after his boat with five men had disappeared he returned home, where, unfortunately, some "gold-finders" in London took it into their heads that a piece of dark heavy stone brought back contained gold ore. This caused great excitement; it was now considered much more important to collect this precious ore than to find the north-west passage, and much larger expeditions were sent out in the two following years. As many as fifteen vessels formed the third expedition of 1578, and it was the intention to form a colony with a hundred men in the gold land, but this scheme was given up. Frobisher came into Hudson Strait, which was at first thought to be Frobisher Strait and therefore called Mistaken Strait. There was an open sea without any land or ice towards the west, and Frobisher was certain that he could sail through to the "Mare del Sur" (Pacific Ocean) and " Kathaya," but his first goal was the " gold mines," and the vessels returned home with full loads of the ore. One of them, a buss (small ship) of Bridgwater, called the "Emmanuel," reported that on her voyage home she had first sighted Frisland on the 8th (18th) of September, but four days later she had sighted another land in theAtlantic and sailed along it till the following day; they reckoned its southern end to be in about 57 j° N. lat. This land soon found its place on maps and charts south-west of Iceland under the name of Buss Island, and as it was never Buss. seen a g am if was after 1745 called "the sunken land

of Buss." The explanation is that, misled by- the maps, Frobisher assumed Greenland to be Frisland of the Zeno map and Baffin Land was afterwards assumed to be the east coast of Greenland. When the buss on her way home sighted Greenland in about 62 N., she therefore thought it to be Frisland, but when she four days later again sighted land near Cape Farewell and her dead reckoning probably had carried her about two degrees too far south, she naturally considered this to be a new land, which puzzled geographers and navigators for centuries. Owing to a similar mistake, not by Frobisher, but by later cartographers and especially by Davis, it was afterwards assumed that Frobisher Strait (and also Mistaken Strait) was not in Baffin Land but on the east coast of Greenland, where they remained on the maps till the 18th century.

John Davis, who made the next attempt to discover a north- west passage, was one of the most scientific seamen of that age. He made three voyages in three successive years aided and fitted out by William Sanderson and other merchants. Sailing from Dartmouth on the 7th (17th) of June 1585,

with two ships, he sighted on the 20th (30th) of July " the most deformed, rocky and mountainous land, that ever we sawe." He named it the Land of Desolation, although he understood that he had rediscovered " the shore which in ancient time was called Groenland." It was its east coast. He visited the west coast, where Frobisher had also landed mistaking it for Frisland. Davis anchored in a place called Gilbert's Sound in 64° 10′ (near the present Danish settlement of Godthaab) and had much intercourse with the Eskimo. He then, crossing the strait which bears his name, traced a portion of its western shore southwards from about 66° 40′ N. lat. and came into Cum- berland Sound, which he thought to be the strait of the north-west passage, but returned home on account of contrary winds. In the second voyage (with four ships) Davis traced the western shore of Davis Strait still farther southwards, and sailed along the coast of Labrador. In the third voyage (with three ships) in 1587 he advanced far up his own strait along the west coast of Greenland in a small leaky pinnace, the "Ellin," and reached a lofty granite island in 72 41′ N. lat., which he named Hope Sanderson. He met with ice in the sea west of this place, but

reported that there was not " any yce towards the north, but a great sea, free, large, very salt and blew, and of an unsearche- able depth." By contrary winds, however, he was prevented from sailing in that direction. He sailed into Cumberland Sound, but now found that there was no passage. He also passed on his way southwards the entrance to Frobisher Strait, which he named Lumley Inlet, and Hudson Strait, without under- standing the importance of the latter. When Davis came to Labrador, where his two larger ships were to have waited for him, they had sailed to England. The little " Ellin " now struck a sunken rock and sprung a leak, which was repaired, and he crossed the Atlantic in this small leaky craft. He still believed in the existence of a passage through Davis Strait, but could find no support for another Arctic voyage. Davis was not the first to discover this strait; it was well-known to the Norsemen. Gaspar Corte-Real had possibly also been there, and Frobisher had during his voyages crossed its southern part every year. The result of Davis's discoveries are shown on the Molyneux globe, which is now in the library of the Middle Temple; they are also shown on the "New Map" in Hakluyt's Principal Navigations (1 598-1 600). When Davis was trying to reconcile his discoveries with the previous ones, especially those of Frobisher, he made fatal mistakes as mentioned above.

As early as 1565, by the intervention of a certain Philip Winterkonig, an exile from Vardohus in Norway, Dutch mer- chants formed a settlement in Kola, and in 1578 . two Dutch ships anchored in the mouth of the river Dvina, and a Dutch settlement was established where Archangel was built a

few years later. The leading man in these under- takings was Olivier Brunei, who is thus the founder of the White Sea trade of the Dutch; he was also their first Arctic navigator. He had travelled both overland and along the coast to Siberia and reached the river Ob; he had also visited Kostin Shar on Novaya Zemlya. He propounded plans for the dis- covery of the north-east passage to China, and in 1581 he went from Russia to Antwerp to prepare an expedition. He probably started with one ship in 1582, on the first Arctic expedition which left the Netherlands. Little is known of its fate except that it ended unsuccessfully with the wreck of the ship in the shallow Pechora Bay, possibly after a vain attempt to penetrate through the Yugor Strait into the Kara Sea. In 1583 we find Olivier Brunei in Bergen trying to organize a Norwegian under- taking, evidently towards' the north-east, but it is uncertain whether it led to anything.

The Dutch, however, had begun to see the importance of a northern route to China and India, especially as the routes through the southern seas were jealously guarded by the Spani- ards and Portuguese, and after 1584 all trade with Portugal, where the Dutch got Indian goods, was forbidden. By Brunei's efforts their attention had been directed towards the north-east passage, but it was not until 1594 that a new expedition was sent out, one of the promoters being Peter Plancius, the learned cosmographer of Amsterdam. Four ships sailed from Huysdunen on the 5th (15th) of June 1594. Two of these ships from Amsterdam were under the command of Willem Barents, who sighted Novaya Zemlya, north of Matochkin Shar, on the 4th (14th) of July; and aa< iNay. from that date until the 1st (nth) of August Barents continued perseveringly to seek a way through the ice-floes, and discovered the whole western coast as far as the Great Ice Cape, the latitude of which he, with his admirable accuracy, determined to be 77 N. Having reached the Orange Islands at the north-west extremity, he decided to return. The two other ships under the command of Cornells Nay had discovered the Yugor Strait, through which they sailed into the Kara Sea on the 1st (nth) of August. They reached the west coast of Yalmal; being sure that they had passed the mouth of the river Ob, and finding the sea open, they thought they had found a free passage to Japan and China, and returned home on the nth (21st) of August. A new expedition was made the following year, 1595, with seven ships under the command of Cornelis Nay, as admiral, and Willem Barents as

chief pilot, but it merely made several unsuccessful attempts

to enter the Kara Sea through the Yugor Strait. The third

expedition was more important. Two vessels sailed from Amsterdam on the ioth (20th) of May 1596, under the command of Jacob van Heemskerck and Corneliszoon Rijp. Barents accompanied Heemskerck as pilot, and Gerrit de Veer, the historian of the voyage, was on board as mate. The masses of ice in the straits leading to the Sea of Kara, and the impenetrable nature of the pack near Novaya Zemlya, had suggested the advisability of avoiding the land and, by keeping a northerly course, of seeking a passage in the open sea. They sailed northwards, and on the 9th (19th) of June discovered Bear Island. Continuing on the same course they sighted a mountainous snow-covered land in about 8o° N. lat., soon afterwards being stopped by the polar pack ice. This important discovery was named Spitsbergen, and was believed to be a part of Greenland. Arriving at Bear Island again on the 1st of July, Rijp parted company, while Heemskerck and Barents proceeded eastward, intending to pass round the northern extreme of Novaya Zemlya. On the 26th of August (Sept. 5) they reached Ice Haven, after rounding the northern extremity of the land. Here they wintered in a house built out of driftwood and planks from the 'tween decks and the deck-house of the vessel. In the spring they made their way in boats to the Lapland coast; but Barents died during the voyage. This was the first time that an arctic winter was

successfully faced. The voyages of Barents stand in the first

rank among the polar enterprises of the 16th century. They

led to flourishing whale and seal fisheries which long enriched

the Netherlands.

The English enterprises were continued by the Muscovy

Company, and by associations of patriotic merchants of London;

11/ .,.. and even the East India Company sent an expedition

Way mouth. , TTr , , r

under Captain Waymouth in 1602 to seek for a

passage by the opening seen by Davis, but it had no success.

The best servant of the Muscovy Company in the work of

polar discovery was Henry Hudson. His first voyage was

„ . undertaken in 1607, when he discovered the most

Hudson, ... ■■ *ˆ i 1*

northern known point of the east coast of Greenland

in 73° N. named "Hold with Hope," and examined the ice between Greenland and Spitsbergen, probably reaching Hakluyt's Headland in 79 50′ N. On his way home he discovered the island now called Jan Mayen, which he named " Hudson's Tutches." In his second expedition, during the season of 1608, Hudson examined the edge of the ice between Spitsbergen and Novaya Zemlya. In his third voyage he was employed by the Dutch East India Company; he again approached Novaya Zemlya, but was compelled to return westwards, and he explored the coasts of North America, discovering the Hudson river. In 1610 he entered Hudson Strait, and discovered the great bay which bears and immortalizes his name. He was obliged to winter there, undergoing no small hardships. On his way home his crew mutinied and set him, his little son and some sick men adrift in a boat, and the explorer perished in the seas he had opened up.

The voyages of Hudson led immediately to the Spitsbergen whale fishery. From 1609 to 1612 Jonas Poole made four Spitsbergen voyages for the prosecution of this lucrative business, Whale and he was followed by

Fotherby, Baffin, Joseph,

Fishery. an(j jrˆge. These bold seamen, while in the pursuit of whales, added considerably to the knowledge of the archi- pelago of islands known under the name of Spitsbergen, and in 1617 Captain Edge discovered an island to the eastward, which he named Wyche's Land.

About the same period the kings of Denmark began to send expeditions for the rediscovery of the lost Greenland colony. In 1605 Christian IV. sent out three ships, Voyages. unQ, er the Englishmen Cunningham and Hall and a Dane named Lindenov, which reached the western coast of Greenland and had much intercourse with the Eskimo. Other expeditions followed in 1606-1607.

Meanwhile, the merchant adventurers of London continued

Button.

Baffin.

to push forward the western discovery. Sir Thomas Button, in command of two ships, the "Resolution" and "Discovery," sailed from England in May 161 2. He entered Hudson Bay, crossed to its western shore, and wintered at the mouth of a river in 57° 10′ N. which was named Nelson river after the master of the ship, who died and was buried there. Next year Button explored the shore of Southamp- ton Island as far as 65 N., and returned home in the autumn of 16 13. An expedition under Captain Gibbons despatched in 1614 to Hudson Bay was a failure; but in 1615 Robert Bylot as master and William Baffin as pilot and navigator in the "Discovery" examined the coasts of Hudson Strait and to the north of Hudson Bay, and Baffin, who was the equal of Davis as a scientific seaman, made many valuable observa- tions. In 1616 Bylot and Baffin again set out in the " Discovery." Sailing up Davis Strait they passed that navi- gator's farthest point at Sanderson's Hope, and sailed round the great channel with smaller channels leading from it which has been known ever since as Baffin Bay. Baffin named the most northern opening Smith Sound, after the first governor of the East India Company, and the munificent promoter of the voyage, Sir Thomas Smith. Lancaster Sound and Jones Sound were named after other promoters and friends of the voyage. The fame of Baffin mainly rests upon the discovery of a great channel extending north from Davis Strait; but it was unjustly dimmed for many years, owing to the omission of Purchas to publish the navigator's tabulated journal and map in his great collection of voyages. It was two hundred years before a new expedition sailed north through Baffin Bay. It may be mentioned, as an illustration of the value of these early voyages to modern science, that Professor Hansteen

of Christiania made use of Baffin's magnetic observations in the compilation of his series of magnetic maps. In 1619 Denmark sent out an expedition, under the command of Jens Munk, in search of the north-west passage, with two ships and 64 men. They reached the west coast of Hudson Bay, where they wintered near Churchill river, but all died with the exception of one man, a boy, and Munk himself, who managed to sail home in the smallest ship.

In 1631 two expeditions were despatched, one by the mer- chants of London, the other by those of Bristol. In the London ship "Charles" Luke Fox explored the western side of Hudson Bay as far as the place called " Sir JameSi ' Thomas Roe's Welcome." In August he en- countered Captain James and the Bristol ship "Maria" in the middle of Hudson Bay, and went north until he reached "North-west Fox his farthest," in 66° 47′ N. He then returned home and wrote an entertaining narrative. Captain James had to winter off Charlton Island, in James Bay, the southern extreme of Hudson Bay, and did not return until October 1632. Another English voyager, Captain Wood, attempted, without success, to discover a north-east passage in 1676 through the sea round the North Pole, but was wrecked on the coast of Novaya Zemlya. The 1 6th and 17th centuries were periods of discovery and daring enterprise. Hudson Strait and Bay, Davis Strait and Baffin Bay, the icy seas from Greenland to Spitsbergen and from Spitsbergen to Novaya Zemlya had all been explored; but much more was not discovered than had been well known to the Norsemen five or six centuries earlier. The following century was rather a period of reaping the results of former efforts than of discovery. It saw the settlement of the Hudson Bay Territory and of Greenland, and the development of the whale and seal fisheries.

The Hudson's Bay Company was incorporated in 1670, and Prince Rupert sent out Zachariah Gillan, who wintered at Rupert river. At first very slow progress was made. A voyage undertaken by Mr Knight, nearly 80 years old, who had been appointed governor of the factory at Nelson river, was unfortu- nate, as his two ships were lost and the crews perished. This was in 1719. In 1722 John Scroggs was sent from Churchill river in search of the missing ships, but merely entered Sir Thomas Roe's Welcome and returned. His reports were believed to offer decisive proofs of the existence

Moor.

Martens.

of a passage into the Pacific; and a naval expedition was de- spatched under the command of Captain Christopher Middleton, consisting of the " Discovery " pink and the " Fur- nace " bomb. Wintering in Churchill river, Middle- ton started in July 1742 and discovered Wager river and Repulse Bay. In 1746 Captain W. Moor made another voyage in the same direction, and explored the Wager Inlet. Later in the century the Hudson's Bay Company's servants made some important land journeys to discover the shores of the American polar ocean. From 176910 1772 Samuel Hearne descended the Coppermine River to the polar sea; and in 1789 Alexander Mackenzie discovered the mouth of the Mackenzie river. (For the establishment of the modern Danish settlements in Greenland, see Greenland.)

The countrymen of Barents vied with the countrymen of Hudson in the perilous calling which annually brought fleets Dutch of ships to the Spitsbergen seas during the 17th and

Whale 18th centuries. The Dutch had their large summer Fishery. station for boiling down blubber at Smeerenberg, near the northern extreme of the west coast of Spitsbergen. Captain Vlamingh, in 1664, advanced as far round the northern end of Novaya Zemlya as the winter quarters of Barents. In 1 700 Captain Cornelis Roule is said by Witsen to have sailed north in the longitude of Novaya Zemlya and to have seen an extent of 40 m. of broken land, but Theunis Ys, one of the most experienced Dutch navigators, believed that no vessel had ever been north of the 82nd parallel. In 1671 Frederick Martens, a German surgeon, visited Spitsbergen, and wrote the best account of its physical features and natural history that existed previous to the time of Scoresby. In 1707 Captain Cornelis Gilies went far to the eastward along the northern shores of Spitsbergen, and saw land to the east in 8o° N., which has since been known as Gilies Land. The Dutch geographical knowledge of Spitsbergen was embodied in the famous chart of the Van Keulens (father and son), 1700- 1728. The Dutch whale fishery continued to flourish until the French Revolution, and formed a splendid nursery for training the seamen of the Netherlands. From 1700 to 1775 the whaling fleet numbered 100 ships and upwards. In 17 19 the Dutch opened a whale fishery in Davis Strait, and continued to frequent the west coast of Greenland for upwards of sixty years from that time.

The most flourishing period of the British fishery in the Spits- bergen and Greenland seas was from 1752 to 1820. Bounties British of 40s. per ton were granted by act of parliament; Whale and in 1778 as many as 255 sail of whalers were Fishery. employed. In order to encourage discovery £5000 was offered in 1776 to the first ship that should sail beyond the 89th parallel (16 Geo. III. c. 6). Among the numerous daring and able

whaling captains, William Scoresby takes the first rank, alike as a successful whaler and a scientific observer. His admirable Account of the Arctic 'Regions is still a textbook for all students of the subject. In 1806 he succeeded in advancing his ship " Resolution " as far north as 8i° 12′ 42". In 1822 he forced his way through the ice which encumbers the approach to land on the east coast of Greenland, and surveyed that coast from 75 down to 69 N., a distance of 400 m. Scoresby combined the closest attention to his business with much valuable scientific work and no insignificant amount of exploration.

The Russians, after the acquisition of Siberia, succeeded in gradually exploring the whole of the northern shores of that vast _ . region. In 1648 a Cossack named Simon Dezhneff

is said to have equipped a boat expedition in the river Kolyma, passed through the strait since named after Bering, and reached the Gulf of Anadyr. In 1738 a voyage was made by two Russian officers from Archangel to the mouths of the Ob and the Yenisei. Efforts were then made to effect a passage from the Yenisei to the Lena. In 1735 Lieut. T. chel uskin Chelyuskin got as far as 77 25′ N. near the cape which 'bears his name; and in 1743 he rounded that most northern point of Siberia in sledges, in 77 41′ N. Captain

Scoresby.

Phipps.

Vitus Bering, a Dane, was appointed by Peter the Great to

command an expedition in 1725. Two vessels were built at

Okhotsk, and in July 1728 Bering ascertained the _ .

. . , a- ia • Bering.

existence of a strait between Asia and America.

In 1740 Bering was again employed. He sailed from Okhotsk in a vessel called the " St Paul," with G. W. Steller on board ' as naturalist. Their object was to discover the American side ot the strait, and they sighted the magnificent peak named by Bering Mt St Elias. The Aleutian Islands were also explored, but the ship was wrecked on an island named after the ill-fated discoverer, and scurvy broke out amongst his crew. Bering himself died there on the 8th of December 1741.

Thirty years after the death of Bering a Russian merchant named Liakhoff

discovered the New Siberia or Liakhoff Islands, and in 1771 he obtained the exclusive right from the ..

empress Catherine to dig there for fossil ivory. These islands were more fully explored by an officer named Hedenstrom in 1809, and seekers for fossil ivory annually resorted to them. A Russian expedition under Captain Chitschakoff, sent to Spitsbergen in 1764, was only able to attain a latitude of 8o° 30′ N.

From 1773 onwards to the end of the 19th century the objects of polar exploration were mainly the acquisition of knowledge in various branches of science. It was on these grounds that Daines Barrington and the Royal Society induced the British government to undertake arctic exploration once more. The result was that two vessels, the "Racehorse " and " Carcass " bombs, were commissioned, under the command of Captain J. C. Phipps. The expedition sailed from the Nore on the 2nd of June 1773, and was stopped by the ice to the north of Hakluyt Headland, the north-western point of Spits- bergen. Phipps reached the Seven Islands and discovered Walden Island; but beyond this point progress was impossible. When he attained their highest latitude in 8o° 48′ N., north of the central part of the Spitsbergen group, the ice at the edge of the pack was 24 ft. thick. Captain Phipps returned to England in September 1773. Five years afterwards James Cook received instructions to proceed northward from Kamchatka and search for a north-east or north-west passage from the Pacific to the Atlantic. In accordance with these orders Captain Cook, during his third voyage, reached Cape Prince of Wales, the western extremity of America, on the 9th of August 1778. His ships, the " Resolution " and " Discovery," arrived at the edge of the ice, after passing Bering Strait, in 70 41′ N. On the 17th of August the farthest point seen on the American side was named Icy Cape. On the Asiatic side Cook's survey extended to Cape North. In the following year Captain Clerke, who had succeeded to the command, made another voyage, but his ship was beset in the ice, and so much damaged that further attempts were abandoned.

The wars following the French Revolution put an end to voyages of discovery till, after the peace of 181 5, north polar research found a powerful and indefatigable advocate in Sir John Barrow. Through his influence a measure for promoting polar discovery became law in 1818 (58 Geo. III. c. 20), by which a reward of £20,000 was offered for making the north-west passage, and of £5000 for reaching 89° N., while the commissioners of longitude were empowered to award pro- portionate sums to those who might achieve certain portions of such discoveries. In 181 7 the icy seas were reported by Captain Scoresby and others to be remarkably open, and this circumstance enabled Barrow to obtain sanction for the despatch of two expeditions, each consisting of two whalers — one

to attempt discoveries by way of Spitsbergen and the other by Baffin Bay. The vessels for the Spitsbergen route, the " Dorothea " and " Trent," were commanded by Captain David Buchan and Lieut. John Franklin, and sailed in April 1818. Driven into the pack by a heavy swell from the south, both vessels were severely nipped, and had to return to England. The other expedition, consisting of the " Isabella " and " Alexander," commanded by Captain John Ross and Lieut.

Cook.

Edward Parry, followed in the wake of Baffin's voyage of 1616. Ross sailed from England in April 1818. The chief merit of his voyage was that it vindicated Baffin's accuracy as a discoverer. Its practical result was that the way was shown to a lucrative fishery in the " North Water " of Baffin Bay, which continued to be frequented by a fleet of whalers every year. Captain Ross thought that the inlets reported by Baffin were merely bays, while the opinion of his second in command was that a wide opening to the westward existed through the Lancaster Sound of Baffin. Parry was selected to command a new expedition in the following year. His two vessels, the " Hecla " and " Griper, " Parry's passed through Lancaster Sound, the continuation First and of which was named Barrow Strait, and advanced Second westward, with an archipelago on the right, since Voyages. j inown as the Parry Islands. He observed a wide opening to the north, which he named Wellington Channel, and sailed onwards for 300 m. to Melville Island. He was stopped by the impenetrable polar pack of vast thickness which surrounds the archipelago to the north of the American continent, and was obliged to winter in a harbour on the south coast of Melville Island. Parry's hygienic arrangements during the winter were judicious, and the scientific results of his expedition were valu- able. The vessels returned in October 1820; and a fresh ex- pedition in the " Fury " and " Hecla," again under the command of Captain Parry, sailed from the Nore on the 8th of May 1821, and passed their first winter on the coast of the newly discovered Melville Peninsula in 66° n' N. Still persevering, Parry passed his second winter among the Eskimo at Igloolik in 69° 20′ N., and discovered a channel leading westward from the head of Hudson Bay, which he named Fury and Hecla Strait. The expedition returned in the autumn of 1823. Meantime Parry's Franklin's friend Franklin had been employed in attempts to First reach by land the northern shores of America,

journey, hitherto only touched at two points by Hearne and Mackenzie.

Franklin went out in 1819, with Dr John Richard- son, George Back and Robert Hood. They landed at York factory, and proceeded to the Great Slave Lake. In August of the following year they started for the Coppermine river, and, embarking on it, reached its mouth on the 18th of July 1821. From that point 550 m. of coast-line were explored, the extreme point being called Cape Turnagain. Great sufferings, from starvation and cold, had to be endured during the return journey; but eventually Franklin, Richardson and Back arrived safely at Fort Chippewyan.

It was thought desirable that an attempt should be made to connect the Cape Turnagain of Franklin with the discoveries Parry's made by Parry during his second voyage; but the Third first effort, under Captain Lyon in the " Griper," was

Voyage. unsuccessful. In 1824 three combined attempts were organized. While Parry again entered by Lancaster Sound and pushed down a great opening he had seen to the south named Prince Regent Inlet, Captain Beechey was to enter Bering Strait, and Franklin was to make a second journey by land to the shores of Arctic America. Parry was unfortunate, but Beechey entered Bering Strait in the " Blossom " in August 1826, and extended our knowledge as far as Point Barrow Franklin's in 71 23′ 30″ N. lat. Franklin, in 1825-1826, de- Second scended the Mackenzie river to its mouth, and ex- Joumey, pi or ed the coast for 374 m. to the westward; while Dr Richardson discovered the shore between the mouths of the Mackenzie and Coppermine, and sighted land to the northward, named by him Wollaston Land, the dividing channel being called Union and Dolphin Strait. They returned in the autumn of 1826.

Work was also being done in the Spitsbergen and Barents Seas. From 1821 to 1824 the Russian Captain Liitke was surveying the west coast of Novaya Zemlya as far as Cape Nassau, and examining the ice of the adjacent sea. In May 1823 the " Griper " sailed, under the command of Captain Clavering, to convey Captain Sabine to

Lutke.

Qraah.

The Rosses.

Clavering.

the polar regions in order to make pendulum

observations. Clavering pushed through the ice in 75° 30′ N.,

and succeeded in reaching the east coast of Greenland, where observations were taken on Pendulum Island. He charted the coast -line from 76 to 72 N.

In Parry's attempt to reach the pole from the northern coast of Spitsbergen by means of sledge-boats (see Parry), the highest latitude reached was 82° 45′ N., and the attempt was persevered in until it was found that the ice as a whole was drifting to the south more rapidly than it was possible to travel over it to the north.

In 1829 the Danes undertook an interesting piece of explora- tion On the east coast of Greenland. Captain Graah of the Danish navy rounded Cape Farewell in boats, with four Europeans and twelve Eskimo. He advanced as far as 65 18′ N. on the east coast, where he was stopped by an insurmountable barrier of ice. He wintered in 63° 22′ N., and returned to the settlements on the west side of Greenland in

1830.

In the year 1829 Captain John Ross, with his nephew James Clark Ross, having been furnished with funds by a wealthy distiller named Felix Booth, undertook a private expedition of discovery in a small vessel called the " Victory. " Ross proceeded down Prince Regent Inlet to the Gulf of Boothia, and wintered on the eastern side of a land named by him Boothia Felix. In the course of exploring excursions during the summer months James Ross crossed the land and discovered the position of the north magnetic pole on the western side of it, on the 1st of June 1831. He also discovered a land to the westward of Boothia which he named King William Land, and the northern shore of which he examined. The most northern point was called Cape Felix, and thence the coast trended south- west to Victory Point. The Rosses could not get their little vessel out of its winter quarters. They passed three winters there, and then fell back on the stores at Fury Beach, where they passed their fourth winter, 1832-1833. Eventually they were picked up by a whaler in Barrow Strait, and brought home. Great anxiety was naturally felt at their prolonged absence, and in 1833 Sir George Back, with Dr Richard King as a companion, set out by land in search of the missing explorers. Wintering at the Great Slave Lake, they left Fort Reliance on the 7th of June 1834, and descended the Great Fish river for 530 m. The mouth was reached in 67 11′ N., and then the want of supplies obliged them to return. In 1836 Sir George Back was sent, at the suggestion of the Royal Geographical Society, to proceed to Repulse Bay in his ship, the " Terror, " and then to cross an assumed isthmus and examine the coast- line thence to the mouth of the Great Fish river; but the ship was obliged to winter in the drifting pack,, and was brought home in a sinking condition.

The tracing of the polar shores of America was completed by the Hudson's Bay Company's serva nts. In June 1 83 7 Thomas Simp- son and P. W. Dease left Chippewyan, reached the mouth of the Mackenzie, and connected that position aa ™^°^ e with Point Barrow, which had been discovered by the " Blossom " in 1826. In 1839 Simpson passed Cape Turnagain of Franklin, tracing the coast eastward so as to connect with Back's work at the mouth of the Great Fish river. He landed at Montreal Island in the mouth of that river, and then advanced eastward as far as Castor and Pollux river, his farthest eastern point. On his return he travelled along the north side of the channel, the south shore of the King William Island discovered by James Ross. The south- western point of this island was named Cape Herschel, and there Simpson built a cairn on the 26th of August 1839. Little remained to do in order to complete the delineation of the northern shores of the American continent, and this task was entrusted to Dr John Rae, a Hudson's Bay factor, in 1846. He went in boats to Repulse Bay, where he wintered in a stone hut nearly on the Arctic Circle; and there he and his six Orkney men maintained themselves on the deer they shot. During the spring of 1847 Dr Rae explored on foot the shores of a great gulf having 700 m. of coast-line. He thus connected the work of Parry, at the mouth of Fury and Hecla

Back.

Rae.

POLAR REGIONS

945

Wraagell.

Mlddeadorf. '

Strait, with the work of Ross on the coast of Boothia, proving that Boothia was part of the American continent.

While British explorers were thus working hard to solve some of the geographical problems relating to Arctic America, the Russians were similarly engaged in Siberia. In 1821 Aajou. LigiU. P. F. Anjou made a complete survey of the New Siberia Islands, and came to the conclusion that it was not possible to advance far from them in a northerly direction, owing to the thinness of the ice and to open water existing within 20 or 30 m. Baron Wrangell prose- cuted similar investigations from the mouth of the Kolyma between 1820 and 1823. He made four journeys with dog sledges, exploring the coast between Cape Chelagskoi and the Kolyma, and making attempts to extend his journeys to some distance from the land, but

he was always stopped by thin ice. In 1843 Middandorf was sent to explore the region ‘ which terminates in Cape Chelyuskin. He reached Taimyr Bay in the height of the short summer, whence he saw open water and no ice blink in any direction. The whole arctic shore of Siberia had now been explored and delineated, but no vessel had yet rounded the extreme northern point.

The success of Sir James Ross’s Antarctic expedition and the completion of the northern coast-line of America by the Hudson’s Bay Company’s servants gave rise in 1845 to a fresh Expedition attempt t0 make the passage from Lancaster Sound to Bering Strait. The story of the unhappy expedi- tion of Sir John Franklin, in the ” Erebus ” and ” Terror,” is told under Franklin; but some geographical details may be given here. The heavy polar ice flows south-east between Melville and Baring Islands, down M’Clintock Channel, and impinges on the north-west coast of King William Land. It was this branch from the ” palaeocrystic ” sea which finally stopped the progress of Franklin’s expedition. On leaving the winter quarters at Beechey Island in 1846 Franklin found a channel leading south, along the western shore of the land of North Somerset discovered by Parry ir> 1819. If he could reach the channel on the American coast, he knew that he would be able to make his way along it to Bering Strait. This channel, now called Peel Sound, pointed directly to the south. He sailed down it towards King William Island, with land on both sides. But directly the southern point of the western land was passed and no longer shielded the channel, the great ice stream from Melville Island, pressing on King William Island, was encountered and found impassable. Progress might have been made by rounding the eastern side of King William Island, but its insularity was then unknown.

It was not until 1848 that anxiety began to be felt about the Franklin expedition. In the spring of that year Sir James Ross Search was sent with two ships, the ” Enterprise ” and Expedition; ” Investigator, ” by way of Lancaster Sound. He Ross. wintered at Leopold Harbour, near the north-east

point of North Devon. In the spring he made a long sledge journey with Lieut. Leopold M’Clintock along the northern and western coasts of North Somerset, but found nothing.

On the return of the Ross expedition without any tidings, the country became thoroughly alarmed. An extensive plan of search was organized — the ” Enterprise ” and ” Investi- gator ” under Collinson and M’Clure proceeding by Bering Strait, while the ” Assistance ” and ” Resolute,” with two steam tenders, the ” Pioneer ” and ” Intrepid,” sailed on the 3rd of May 1850 to renew the search by Barrow Strait, under Captain Horatio

Austin. Two brigs, the " Lady Franklin " and " Sophia," under William Penny, an energetic and able whal- ing captain, were sent by the same route. He had with him Dr Sutherland, a naturalist, who did much valuable scientific work. Austin and Penny entered Barrow Strait, and Franklin's winter quarters of ˆ45-1846 were discovered at Beechey Island; but there was no record of any kind indicating the direction taken by the ships. Stopped by the ice, Austin's expedition wintered (1850-1851) in the pack off Griffith Island, and Penny found refuge in a harbour on the south coast of Cornwallis Island. Austin, who had been with Parry during his third voyage, was

Austin.

an admirable organizer. His arrangements for passing the winter were carefully thought out and answered perfectly. In concert with Penny he planned a thorough and extensive system of search by means of sledge-travelling in the spring, and Lieut. M'Clintock superintended every detail of this part of the work with unfailing forethought and skill. Penny under-took the search by Wellington Channel. M'Clintock advanced to Melville Island, marching over 770 m. in eighty-one days; Captain Ommanney and Sherard Osborn pressed southward and discovered Prince of Wales Island. Lieut. Brown examined the western shore Qf Peel Sound. The search was exhaustive; but, except the winter quarters at Beechey Island, no record was discovered. The absence of any record made Captain Austin doubt whether Franklin had ever gone beyond Beechey Island; so he also examined the entrance of Jones Sound, the next inlet from Baffin Bay north of Lancaster Sound, on his way home, and returned to England in the autumn of 1851. This was a thoroughly well conducted expedition, especially as regards the sledge-travelling, which M'Clintock brought to great perfection. So far as the search for Franklin was concerned, nothing remained to be done west or north of Barrow Strait.

In 1851 the " Prince Albert " schooner was sent out by Lady Franklin, under Captain Wm. Kennedy, with Lieut. Bellot of the French navy as second. They wintered on the east coast of North Somerset, and in the spring of Kennedy! 1852 the gallant Frenchman, in the course of a long sledging journey, discovered Bellot Strait, separating North Somerset from Boothia — thus proving that the Boothia coast facing the strait was the northern extremity of the continent of America.

The " Enterprise " and " Investigator " sailed from England in January 1850, but accidentally parted company before they reached Bering Strait. On the 6th of May 1851 the " Enterprise " passed the strait, and rounded Point Co,HDSOn – Barrow on the 25th. Collinson then made his way up the narrow Prince of Wales Strait, between Banks and Prince Albert

Islands, and reached Princess Royal Islands, where M'Clure had been the previous year. Returning southwards, the "Enter- prise " wintered in a sound in Prince Albert Island in 71 35′ N. and 117° 35′ W. Three travelling parties were despatched in the spring of 1852— one to trace Prince Albert Land in a southerly direction, while the others explored Prince of Wales Strait, one of them reaching Melville Island. In September 1852 the ship was free, and Collinson pressed eastward along the coast of North America, reaching Cambridge Bay (Sept. 26), where the second winter was passed. In the spring he examined the shores of Victoria Land as far as 70 26′ N. and ioo° 45′ W. : here he was within a few miles of Point Victory, where the fate of Franklin would have been ascertained. The " Enterprise " again put to sea on the 5th of August 1853, and returned west- ward along the American coast, until she was stopped by ice and obliged to pass a third winter at Camden Bay, in 70 8′ N. and r 45° 2 9′ W. In T854 this remarkable voyage was completed, and Captain Collinson brought the " Enterprise " back to England. Meanwhile M'Clure in the " Investigator " had passed the winter of 1850-1851 at the Princess Royal Islands, only 30 m. from Barrow Strait. In October M'Clure ascended a hill whence he could see the frozen surface of ure '

Barrow Strait, which was navigated by Parry in 1810—1820. Thus, like the survivors of Franklin's crews when they reached Cape Herschel, M'Clure discovered a north-west passage. It was impossible to reach it, for the stream of heavily packed ice which stopped Franklin off King William Land lay athwart their northward course; so, as soon as he was free in 1851, M'Clure turned southwards, round the southern extreme of Banks Land, and commenced to force a passage to the northward between the western shore of that land and the enormous fields of ice which pressed upon it. The cliffs rose like walls on one side, while on the other the stupendous ice of the " palaeocrystic sea " rose from the water to a level with the " Investigator's " lower yards. After many hairbreadth escapes M'Clure took refuge in a bay on the northern shore of Banks Land, which he named the Bay of

God's Mercy. Here the " Investigator " remained, never to move again. After the winter of 1851-1852 M'Clure had made a journey across the ice to Melville Island, and left a record at Parry's winter harbour. Abundant supplies of musk ox were fortunately obtained, but a third winter had to be faced. In the spring of 1853 M'Clure was preparing to abandon the ship with all hands, and attempt, like Franklin's crews, to reach the American coast; but succour arrived in time.

The Hudson's Bay Company continued the search for Franklin. In 1848 Sir John Richardson and Dr Rae examined the American coast from the mouth of the Mackenzie to that of the 'journeys. Coppermine. In 1849 and 1850 Rae continued the search ; and by a long sledge journey in the spring of 1 85 1, and a boat voyage in the summer, he examined the shores of Wollaston and Victoria Lands, which were afterwards explored by Captain Collinson in the " Enterprise. "

In 1852 the British government resolved to despatch another expedition by Lancaster Sound. Austin's four vessels were recommissioned, and the " North Star " was sent out as a dep6t ship at Beechey Island. Sir Edward Belcher com- Bekher. manded the « Assistance, " with the " Pioneer " under Sherard Osborn as steam tender. He went up Wellington Channel to Northumberland Bay, where he wintered, passing a second winter lower down in Wellington Channel, and then abandoning his ships and coming home in 1854. But Sherard Osborn and Com. G. H. Richards did good work. They made sledge journeys to Melville Island, and thus discovered the northern side of the Parry group. Captain Kellett Kellett rece i vec i command of the "Resolute, " with M'Clin- tock in the steam tender "Intrepid." Among Kellett's officers were the best of Austin's sledge-travellers, M'Clintock, Mecham, and Vesey Hamilton, so that good work was sure to be done. George S. Nares, leader of the future expedition of 1874-1875, was also on board the " Resolute." Kellett pressed onwards to the westward and passed the winter of 1852-1853 at Melville Island. During the autumn Mecham discovered M'Clure's record, and the position of the " Investigator " was thus ascer- tained. Lieut. Pim made his way to this point early in the following spring, and the officers and crew of the " Investigator," led by M'Clure, arrived safely on board the " Resolute " on the 1 7th of June 1853. They reached England in the following year, having not only discovered but traversed a north-west passage, though not in the same ship and partly by travelling over ice. For this great feat M'Clure received the honour of knighthood, and a reward of £10,000 was granted to himself, the other officers, and the crew, by a vote of the House of Commons.

The travelling parties of Kellett's expedition, led by M'Clin- tock, Mecham and Vesey Hamilton, completed the discovery of the northern and western sides of Melville Island, and the whole outline of the large island of Prince Patrick, further west. M'Clintock was away from the ship with his sledge party for one hundred and five days, and travelled over 1328 m. Mecham was away ninety-four days, and travelled over n 63 m. Sherard Osborn, in 1853, was away ninety-seven days, and travelled over 935 m. The " Resolute" was obliged to winter in the pack in 1853-1854, and in the spring of 1854 Mecham made a remarkable journey in the hope of obtaining news of Captain Collinson at the Princess Royal Islands. Leaving

the ship on the 3rd of April he was absent seventy days, out of which there were sixty-one and a half days of travelling. The distance gone over was 1336 statute miles. The average rate of the homeward journey was 23! m. a day, the average time of travelling each day nine hours twenty-five minutes.

Fearing detention for another winter, Sir Edward Belcher

ordered all the ships to be abandoned in the ice, the officers and

crews being taken home in the ” North Star,” and

lagleHeld. . q the u phcenix >, and « Ta i D ot,” which had come out

from England to communicate. They reached home in October 1854. In 1852 Captain Edward A. Inglefield, R.N., had made a voyage up Baffin Bay in the ” Isabel ” as” far as the entrance of Smith Sound. In 1853 and 1854 he came out in the ” Phcenix ” to communicate with the “North Star” at Beechey Island.

, , Drift of the whaler..£ eso/ „, e _„

Rae’s Discovery,

The drift of the ” Resolute ” was a remarkable proof of the direction of the current out of Barrow Strait. She was abandoned in 74 41′ N. and 101 n’ W. on the 14th of May 1854. r On the 10th of September 1855 an American sighted the ” Resolute ” in 67° N. lat. about twenty miles from Cape Mercy, in Davis Strait. She had drifted nearly a thousand miles, and having been brought into an American port, was purchased by the United States and presented to the British government.

In 1853 Dr Rae was employed to connect a few points which would quite complete the examination of the coast of America, and establish the insularity of King Willian Land. He went up Chesterfield Inlet and the river Quoich, wintering with eight men at Repulse Bay, where venison and fish were abundant. In 1854 he set out on a journey which occupied fifty-six days in April and May. He succeeded in connecting the discoveries of Simpson with those of James Ross, and thus established the fact that King William Land was an island. Rae also brought home the first tidings and relics of Franklin’s expedition gathered from the Eskimo, which decided the Admiralty to award him the £10,000 offered for definite news of Franklin’s fate. Lady Franklin, however, sent out the ” Fox ” under the command of M’Clintock (see Franklin). M’Clintock prosecuted an exhaustive search over part of the west coast of Boothia, the whole of the shores of King William Island, the mouth of the Great Fish river and

Montreal Island, and Allen Young completed the discovery of the southern side of Prince of Wales Island.

The catastrophe of Sir John Franklin's expedition led to 7000 m. of coast-line being discovered, and to a vast extent of unknown country being explored, securing very considerable additions to geographical knowledge.

The American nation was first led to take an interest in Polar research through a noble and generous sympathy for Franklin and his companions. Mr Grinnell of New York gave practical expression to this feeling. In 1850 ˆ Expedition. equipped two vessels, the " Advance " and " Rescue," to aid in the search, commanded by Lieuts. de Haven and Griffith, and accompanied by Dr E. K. Kane. They reached Beechey Island on the 27th of August 1850, and assisted in the examination of Franklin's winter quarters, but returned without wintering. In 1853 Dr Kane, in the little brig "Advance," of 120 tons, under- took to lead an American expedition up Smith Sound, the most northern outlet from Baffin Bay. The " Advance " reached Smith Sound on the 7th of August 1853, but was stopped by ice in 78 45′ N. only 17 m. from the entrance. Kane described the coast as consisting of precipitous cliffs 800 to 1200 ft. high, and at their base there was a belt of ice about 18 ft. thick, resting on the beach. Dr Kane adopted the Danish name of " ice-foot " (is fod) for this permanent frozen ledge. He named the place of his winter quarters Van Rens- selaer Harbour. In the spring some interesting work was done. A great glacier was discovered with a sea face 45 m. long and named the Humboldt glacier. Dr Kane's steward, Morton, crossed the foot of this glacier with a team of dogs, and reached a point of land beyond named Cape Constitution. But sickness and want of means prevented much from being done by travelling parties. Scurvy attacked the whole party during the second winter, although the Eskimo supplied them with fresh meat and were true friends in need. On the 17th of May 1855 Dr Kane abandoned the brig, and reached the Danish settlement of Upernivik on the 5th of August. Lieut. Hartstene, who was sent out to search for Kane, reached the Van Rensselaer Harbour after he had gone, but took the retreating crew on board on his return voyage.

On the 10th of July i860 Dr 1. 1. Hayes, who had served with Kane, sailed from Boston for Smith Sound, in the schooner " United States, " of 130 tons and a crew of fifteen men. His object was to follow up the line of research opened by Dr Kane. He wintered at Port Foulke, in 78 17′ N., but achieved nothing of importance, and his narrative is not to be depended on.

Hayes.

Charles Hall (q.v.), in his first journey (i860- 1862), discovered remains of a stone house which Sir Martin Frobisher built on the Countess of Warwick Island in 1578. In his second expedition (1864-1869) Hall reached the line of the retreat of the Franklin survivors, at Todd's Island and Peffer River, on the south coast of King William Island. He heard the story of the retreat and of the wreck of one of the ships from the Eskimo; he was told that seven bodies were buried at Todd Island; and he brought home some bones which are believed to be those of Lieut. Le Vescomte of the " Erebus." Finally, in*

1871 he took the " Polaris " for 250 m. up the channel which leads northwards from Smith Sound. The various parts of this long channel are called Smith Sound, Kane Basin, Kennedy Channel and Robeson Channel. The " Polaris " was beset in 82° 11′ N. on the 30th of August; her winter quarters were in Thank God Harbour, 81″ 38′ N., and here Hall died.

The Spitsbergen seas were explored during last century by Norwegian fishermen as well as by Swedish and German expedi- tions and by British yachtsmen. In 1827 the Nor- Exotorers" we S' an geologist Keilhau made an expedition to Bear Island and Spitsbergen which was the first purely scientific Arctic expedition. The Norwegian Spitsbergen fishery dates from 1820, but it was only in the latter part of thecentury that Professor Mohn of Christiania carefully collected information from the captains who had taken part in the work when at its height. In 1863 Captain Carlsen circumnavigated the Spits- bergen group for the first time in a brig called the " Jan Mayen." In 1S64 Captain Tobiesen sailed round North-East Land. In

1872 Captains Altmann and Nils Johnsen visited Wiche's Land, which was discovered by Captain Edge in 1617. In that year there were twenty-three sailing vessels from Tromso, twenty-four from Hammerfest, and one from Vardo engaged in the Arctic sealing trade, averaging from 35 to 40 tons, and carrying a dozen men. Exploration went on slowly, in the course of the sealing and fishing voyages, the records of which are not very full. In 1869 Carlsen crossed the Kara Sea and reached the mouth of the Ob. In 1870 there were about sixty Norwegian vessels in the Barents Sea, and Captain Johannesen circumnavigated Novaya Zemlya. In 1873 Captain Tobiesen was unfortunately obliged to winter on the Novaya Zemlya coast, owing to the loss of his schooner, and both he and his young son died in the spring. Two years previously Captain Carlsen had succeeded in reaching the winter quarters of Barents, the first visitor since 1597, an interval of two hundred

and seventy-four years. He landed on the 9th of September 1871, and found the house still standing and full of interesting relics, which are now in the naval museum at the Hague.

Between 1858 and 1872 the Swedes sent seven expeditions to Spitsbergen and two to Greenland, marking a new scientific Swedish era m Arctic exploration, of which Keilhau had been Expeditions, the pioneer. All returned with valuable scientific

results. That of 1864 under A. E. NordenskiSld and Duner made observations at 80 different places on the Spitsbergen shores, and fixed the heights of numerous mountains. In 1868, in an iron steamer, the " Sophia," the Swedes attained a latitude of 81° 42′ N. on the meridian of 18° E., during the month of September. In 1872 an expedition, consisting of the " Polhem " steamer and brig " Gladen," commanded by Professor Norderi- skiold and Lieut. Palander, wintered in Mossel Bay on the northern shore of Spitsbergen. In the spring an important sledging journey of sixty days' duration was made over North- East Land. The expedition was in some distress as regards supplies owing to two vessels, which were to have returned, having been forced to winter. But in the summer of 1873 they were visited by Mr Leigh Smith, in his yacht " Diana," who supplied them with fresh provisions.

Dr A. Petermann of Gotha urged his countrymen to take their share in the work of polar discovery, and at his own risk

he fitted out a small vessel called the " Germania,"

ewey. wn j c jj sa iled from Bergen in May 1868, under the

command of Captain Koldewey. His cruise extended to Hin-

lopen Strait in Spitsbergen, but was merely tentative; and in

1870 Baron von Heuglin with Count Zeil explored the Stor Fjord in a Norwegian schooner, and also examined Walter Thymen Strait. After the return of the " Germania " in 1868 a regular expedition was organized under the command of Captain Koldewey, provisioned for two years. It consisted of the " Germania," a screw steamer of 140 tons, and the brig " Hansa," commanded by Captain Hegemann. Lieut. Julius Payer, the future explorer of Franz Josef Land, gained his first Arctic experience on board the " Germania." The expedition sailed from Bremen on the 15th of June 1869, its destination being the east coast of Greenland. But in latitude 70 46′ N. the " Hansa " got separated from her consort and crushed in the ice. The crew built a house of patent fuel on the floe, and in this strange abode they passed their Christmas. In two months the current carried them 400

m. to the south. By May they had drifted 1:00 m. on their ice-raft, and finally, on the 14th of June 1870, they arrived safely at the Moravian mission station of Friedriksthal, to the west of Cape Farewell. Fairer fortune attended the " Germania." She sailed up the east coast of Greenland as far as 75° 30′ N., and eventually wintered at the Pendulum Islands of Clavering in 74 30′ N. In March 1870 a travelling party set out under Koldewey and Payer, and reached a distance of 100 m. from the ship to the northward, when want of pro- visions compelled them to return. A grim cape, named after Prince Bismarck, marked the northern limit of their discoveries. As soon as the vessel was free, a deep branching fjord, named Franz Josef Fjord, was discovered in 73 15′ N. stretching for a long distance into the interior of Greenland. The expedition returned to Bremen on the nth of September 1870.

Lieut. Payer was resolved to continue in the path of polar discovery. He and the naval officer Weyprecht chartered a Norwegian schooner called the " Isbjorn," and examined the edge of the ice between Spitsbergen wˆor"ˆ and Novaya Zemlya, in the summer of 1871. Their observations led them to select the route by the north end of Novaya Zemlya with a view to making the north-east passage. It was to be an Austro-Hungarian expedition, and the idea was seized with enthusiasm by the whole monarchy. Weyprecht was to command the ship, while Julius Payer conducted the sledge parties. The steamer " Tegethoff," of 300 tons, was fitted out in the Elbe, and left Tromso on the 14th of July 1872. The season was severe, and the vessel was closely beset near Cape Nassau, at the northern end of Novaya Zemlya, in the end of August. The summer of .1873 found her still a close prisoner drifting, not with a current, but chiefly in the direction of the prevailing wind. At length, on the 31st of August, a moun- tainous country was sighted about 14 m. to the north. In October the vessel was drifted within 3 m. of an island lying off the main mass of land. Payer landed on it, and found the latitude to be 79° 54′ N. It was named after- Count Wilczek, one of the warmest friends of the expedition. Here the second winter was passed. Bears were numerous and sixty-seven were killed, their meat proving to be an efficient preventive of scurvy. In March 1874 Payer made a preliminary sledge journey in intense cold (thermometer at 58° F.). On the 24th of March he started for a more prolonged journey of thirty days. Payer believed that the newly discovered country equalled Spits bergen in extent, and described it as consisting of two or more large masses — Wilczek Land to the east, Zichy Land to the west, intersected by numerous fjords and skirted by a. large number of islands. A wide channel, named Austria Sound, was supposed to separate the two main masses of land, and extend to 82° N. The whole country was named Franz Josef Land. Payer's large land-masses have by later discoveries been broken up into groups of islands and much of the land he

thought he saw towards the east was found by Nansen not to exist. Payer returned to the " Tegethoff " on the 24th of April; and a third journey was undertaken to explore a large island named after M'Clintock. It then became necessary to abandon the ship and attempt a retreat in boats. This perilous voyage was commenced on the 20th of May. Three boats stored with provisions were placed on sledges. It was not until the 14th of August that they reached

the edge of the pack in 77 40′ N., and launched the boats. Eventually they were picked up by a Russian schooner and arrived at Vartio on the 3rd of September 1874.

One of the most interesting problems connected with the

physical geography of the polar regions is the actual condition

of the vast elevated interior of Greenland, which is

ymper. ong enormous glacier. In 1867 Mr Edward Whymper planned an expedition to solve the question, and went to Green- land, accompanied by Dr Robert Brown; but their progress was stopped, after going a short distance over the ice, by the breaking down of the dog-sledges. The expedition brought home geo- logical and natural history collections of value. Dr H. Rink, for many years royal inspector of South Greenland and the most distinguished authority on all Greenlandic questions, also visited the inland ice. An important inland journey was undertaken by Norden- Professor A. E. Nordenskiold in 1870, accompanied skioidin by Dr Berggren, professor of botany at Lund. The Greenland, difficulty of traversing the inland ice of Greenland is caused by the vast ice-cap being in constant motion, advancing slowly towards the sea. This movement gives rise to huge crevasses which bar the traveller's way. The chasms occur chiefly where the movement of the ice is most rapid, near the ice streams which reach the sea and discharge icebergs. Nordenskiold therefore chose for a starting-point the northern arm of a deep inlet called Auleitsivikfjord, which is 60 m. south of the discharging glacier at Jakobshavn and 240 north of that at Godthaab. He commenced his inland journey on the 19th of July. The party consisted of himself, Dr Berggren, and two Greenlanders; and they advanced 30 m. over the glaciers to a height of 2200 ft. above the sea.

The gallant enterprises of other countries rekindled the zeal of Great Britain for Arctic discovery: and in 1874 the prime British minister

announced that an expedition would be

Expedition despatched in the following year. Two powerful of 1875. steamers, the " Alert " and " Discovery," were selected for the service, and Captain George S. Nares was recalled from the " Challenger " expedition to act as leader. Commander Albert H. Markham, who had made a cruise up Baffin Bay and Barrow Strait in a whaler during the previous year, Lieut. Pelham Aldrich, an accomplished surveyor, and Captain Hanry Wemyss Feilden, B.A., as naturalist, were also in the " Alert." The " Discovery " was commanded by Captain Henry F. Stephenson, with Lieut. Lewis A. Beau- mont as first lieutenant. The expedition left Portsmouth on the 29th of May 1875, and entered Smith Sound in the last days of July. After much difficulty with drifting ice Lady Franklin Bay was reached in 8i° 44′ N., where the " Discovery " was established in winter quarters. The " Alert " pressed onwards, and reached the edge of the heavy ice named by Nares the palaeocrystic sea, the ice-floes being from 80 to 100 ft. in thick- ness. Leaving Robeson Channel, the vessel made progress between the land and the grounded floe pieces, and passed the winter off the open coast and facing the great polar pack, in 82° 27′ N. Autumn travelling parties were despatched in September and October to lay out depots; and during the winter a complete scheme was matured for the examination of as much of the unknown area as possible, by the combined efforts of sledging parties from the two ships, in the ensuing spring. The parties started on the 3rd of April 1876. Captain Markham with Lieut. Parr advanced, in the face of great difficulties, over the polar pack to the latitude of 83 20′ N. Lieut. Aldrich explored the coast-line to the westward, facing the frozen polar ocean, for a distance of 220 m. Lieut. Beaumont made discoveries of great interest along the northern coast of Green- land. The parties were attacked by scurvy, which increased the difficulty and hardships of the work a hundredfold. The expedition returned to England in October 1876. The " Alert " reached a higher latitude and wintered farther north than any ship had ever done before. The results of the expedition were the discovery of 300 m. of new coast line, the examination of part of the frozen polar ocean, a series of meteorological, magnetic And tidal observations at two points farther north than any such

Dutch Ex- peditions.

observations had ever been taken before, and large geological and natural history collections.

In the same year 1875 Sir Allen Young undertook a voyage in his steam yacht the " Pandora " to attempt to force his way down Peel Sound to the magnetic pole, and if possible Voyages to make the north-west passage by rounding the of the eastern shore of King William Island. The "Pandora"

“Pandora.” entered Peel Sound on the 29th of August 1875, and proceeded down it much farther than any vessel had gone since it was passed by Franklin’s two ships in 1846. Sir Allen reached a latitude of 7 2 14′ N., and sighted Cape Bird, at the northern side of the western entrance of Bellot Strait. But here ice barred his progress, and he was obliged to retrace his track, returning to England on the 16th of October 1875. In the following year Sir Allen Young made another voyage in the ” Pandora ” to the entrance of Smith Sound.

Lieut. Koolemans Beynen, a young Dutch officer, who had shared Young’s two polar voyages, on his return successfully endeavoured to interest his countrymen in polar discovery. It was wisely determined that the first expeditions of Holland should be summer reconnais- sances on a small scale. A sailing schooner of 79 tons was built at Amsterdam, and named the “Willem Barents.” In her first cruise she was commanded by Lieut. A. de Bruyne, with Koolemans Beynen as second, and she sailed from Holland on the 6th of May 1878. Her instructions were to examine the ice in the Barents and Spitsbergen seas, take deep-sea soundings, and make natural history collections. She was also to erect memorials to early Dutch polar worthies at certain designated points. These instructions were ably and zealously carried out. Beynen died in the following year, but the work he initiated was carried on, the ” Willem Barents ” continuing to make annual polar cruises for many years.

In 1879 Sir Henry Gore-Booth and Captain A. H. Markham, R.N., in the Norwegian schooner ” Isbjorn ” sailed along the west coast of Novaya Zemlya to its most northern aore-Booth point, passed through the Matochkin Shar to the east and Mark- coast, and examined the ice in the direction of Franz bam – Josef Land as far as 7 8° 24′ N., bringing home collections in various branches of natural history, and making useful observations on the drift and nature of the ice in the Barents and Kara Seas.

In 1880 Mr B. Leigh Smith, who had previously made three voyages to Spitsbergen, reached Franz Josef Land in the polar steam yacht ” Eira.” It was observed that, while the Greenland icebergs are generally angular and peaked, those of Franz Josef Land are flat on the top, like the Antarctic bergs. The ” Eira ” sailed along the south side of Franz Josef Land to the westward and discovered no m. of coast-line of a new island named Alexandra Land, until the coast trended north-west. A landing was effected at several points, and valuable collec- tions were made in natural history. In the following year the same explorer left Peterhead on the 14th of July; Franz Josef Land was sighted on the 23rd of July, and the ” Eira ” reached a point farther west than had been possible in her previous voyage. But in August the ship was caught in the ice, was nipped, and sank. A hut was

built on shore in which Mr Leigh Smith and his crew passed the winter of 1881-1882, their health being well maintained, thanks to the exertions of Dr W. H. Neale. On the 21st of June 1882 they started in four boats to reach some vessels on the Novaya Zemlya coast. It was a most laborious and perilous voyage. They were first seen and welcomed by the " Willem Barents " on the 2nd of August, and soon afterwards were taken on board the "Hope," a whaler which had come out to search for them under the command of Sir Allen Young.

Professor A. E. Nordenskiold, when he projected the achieve- ment of the north-east passage, was a veteran polar explorer, for he had been in six previous expeditions to Greenland and Spits- bergen. In 1875 he turned his attention to the possibility of navigating the seas along the northern coast of Siberia. Cap- tain Joseph Wiggins of Sunderland was a pioneer of this route,

Leigh Smith.

and his voyages in 1874, 1875 and 1876 led the way for a trade between the ports of Europe and the mouth of the Yenisei River. Norden- ˆ n J une J 875 Professor Nordenskiold sailed from skioldaad Tromso" in the Norwegian vessel, the " Proven," the N.B. reached the Yenisei by way of the Kara Sea, and dis- Passage. CO vered an excellent harbour on the eastern side of its mouth, which was named Port Dickson, in honour of Baron Oscar Dickson of Gothenburg, the munificent supporter of the Swedish expeditions. It having been suggested that the success of this voyage was due to the unusual state of the ice in 1875, Nordenskiold undertook a voyage in the following year in the " Ymer," which was equally successful. By a minute study of the history of former attempts, and a careful consideration of all the circumstances, Professor Nordenskiold convinced himself that the achievement of the north-east passage was feasible. The king of Sweden, Baron Oscar Dickson, and M. Sibiriakoff, a wealthy Siberian proprietor, supplied the funds, and the steamer " Vega " was purchased. Nordenskiold was leader of the expedition, Lieut. Palander was appointed commander of the ship, and there was an efficient staff of officers and naturalists, including Lieut. Hovgaard of the Danish and Lieut. Bove of the Italian navy. A small steamer called the " Lena " was to keep company with the " Vega " as far as the mouth of the Lena, and they sailed from Gothenburg on the 4th of July 1878. On the morning of the roth of August they left Port Dickson, and on the 19th they reached the most northern point of Siberia, Cape Chelyuskin, in 77° 41′ N. On leaving the

extreme northern point of Asia a south-easterly course was steered, the sea being free from ice and very shallow. This absence of ice is to some extent due to the mass of warm water discharged by the great Siberian rivers during the summer. On the 27th of August the mouth of the river Lena was passed, and the " Vega " parted company with the little " Lena," continuing her course eastward. Professor Nordenskiold very nearly made the north-east passage in one season; but towards the end of September the " Vega " was frozen in off the shore of a low plain in 67 7′ N. and 173 20′ W. near the settlements of the Chukchis. During the voyage very large and impor- tant natural history collections were made, and the interest- ing aboriginal tribe among whom the winter was passed was studied with great care. The interior was also explored for some distance. On the 18th of July 1879, after having been imprisoned by the ice for 294 days, the " Vega " again proceeded on her voyage and passed Bering Strait on the 20th. Sir Hugh Willoughby made his disastrous attempt in 1553. After a lapse of 326 years of intermittent effort, the north-east passage had at length been accomplished without the loss of a single life and without damage to the vessel. The " Vega " arrived at Yokohama on the 2nd of September 1879.

In 1879 an enterprise was undertaken in the United States, with the object of throwing further light on the sad history of the retreat of the officers and men of Sir John Franklin's expedition, by examining the west coast of King William Island in the summer, when the snow is off the ground. The party consisted of Lieut. Schwatka of the United States army and three others. Wintering near the entrance of Chester- field Inlet in Hudson Bay, they set out overland for the estuary of the Great Fish river, assisted by Eskimo and dogs, on the 1st of April 1879. They took only one month's provisions, their main reliance being upon the game afforded by the region to be traversed. " The party obtained, during the journeys out and home, no less than 522 reindeer. After collecting various stories from the Eskimo at Montreal Island and at an inlet west of Cape Richardson, Schwatka crossed over to Cape Herschel on King William Land in June. He examined the western shore of the island with the greatest care for relics of Sir John Franklin's parties, as far as Cape Felix, the northern extremity. The return journey was commenced in November by ascending the Great Fish river for some distance and then marching over the intervening region to Hudson Bay. The cold of the winter months in that country is intense, the thermometer falling as low as— 70 F., so that the return journey was most

Schwatka.

De Long.

remarkable, and reflects the highest credit on Lieut. Schwatka and his companions. As regards the search little was left to be done after M'

Clintock, but some graves were found, as well as a medal belonging to Lieut. Irving of H.M.S. " Terror," and some bones believed to be his, which were brought home and interred at Edinburgh.

Mr Gordon Bennett, the proprietor of the New York Herald, having resolved to despatch an expedition of discovery at his own expense by way of Bering Strait, the " Pandora " was purchased from Sir Allen Young, and rechristened the " Jeannette." Lieut, de Long of the United States navy was appointed to command, and it was made a national undertaking by special act of Congress, the vessel being placed under martial law and officered from the navy. The " Jeannette " sailed from San Francisco on the 8th of July 1879, and was last seen steam- ing towards Wrangell Land on the 3rd of September. This land had been seen by Captain Kellett, in H.M.S. " Herald " on the r7th of August 1879, but no one had landed on it, and it was shown on the charts by a long dotted line. The " Jeannette " was provisioned for three years, but as no tidings had been received of her by 1881, two steamers were sent up Bering Strait in search. One of these, the " Rodgers," under Lieut. Berry, anchored in a good harbour on the south coast of Wrangell Land, in 70 57′ N., on the 26th of August 1881. The land was explored by the officers of the " Rodgers " and found to be an island about 70 m. long by 28, with a ridge of hills traversing it east and west, the 71st parallel running along its southern shore. Lieut. Berry then proceeded to examine the ice to the north- ward, and attained a higher latitude by 21 m. than had ever been reached before on the Bering Strait meridian — namely, 73° 44′ N. No news was obtained of the " Jeannette," but soon afterwards melancholy tidings arrived from Siberia. After having been beset in heavy pack ice for twenty-two months, the " Jeannette " was crushed and sunk on the 13th of June 1881, in 77° 15′ N. lat., and 155° E. long. The officers and men dragged their boats over the ice to an island which was named Bennett Island, where they landed on the 29th of July. They reached one of the New Siberia Islands on the 10th of September, and on the 1 2th they set out for the mouth of the Lena. But in the same evening the three boats were separated in a gale of wind. A boat's crew with Mr Melville, the engineer, reached the Lena delta and searching for the other parties found the ship's books on the r4th of November, and resuming the search at the earliest possible moment in spring, Melville discovered the dead bodies of De Long and two of his crew on the 23rd of March 1882. They had perished from exhaustion and want of food. Three survivors of De Long's party had succeeded in making their way to a Siberian village; but the third boat's crew was lost. The " Rodgers " was burnt in its winter quarters, and one of the officers, W. H. Gilder (1838-1000), made a hazardous journey homewards through north-east Siberia.

The Norwegian geologist Professor Amund Helland made an expedition to

Greenland in 1875 and discovered the marvellously rapid movements of the Greenland glaciers.

The Danes have been very active in prosecuting discoveries and scientific investigations in Greenland, since the journey of Nordenskiold in 1870. Lieut. Jensen made a gallant attempt to penetrate the inland ice in 1878, areeaiaad. collecting important observations, and Dr Steenstrup, with Lieut. Hammar, closely investigated the formation of ice masses at Omenak and Jacobshavn. In 1883 an expedi- tion under Lieuts. Holm and Garde began to explore the east coast of Greenland. In the summer of 1879 Captain Mourier, of the Danish man-of-war " Ingolf," sighted the coast from the 6th to the 10th of July, and was enabled to observe and delineate it from 68° 10′ N. to 65° 55′ N., this being the gap left between the discoveries of Scoresby in 1822 and those of Graah in 1829. Nansen sighted part of the same coast in 1882. Lieut. Hovgaard of the Danish navy, who accompanied Nordenskiold in his discovery of the north-east passage, planned an expedition to ascertain' if land existed to the north of

Helland.

Cape Chelyuskin. He fitted out a small steamer called the " Dymphna " and sailed from Copenhagen in July 1882, but was unfortunately beset and obliged to winter in the Kara Sea. In 1883 Baron A. E. Nordenskiold undertook another journey over the inland ice of Greenland. Starting from Auleitsivikf jord on the 4th of July, his party penetrated 84 m. eastward, and to an altitude of 5000 ft. The Laplanders who were of the party were sent farther on snow-shoes, travelling over a desert of snow to a height of 7000 ft. Useful results in physical geography and biology were obtained.

On the 18th of September 1875 Lieut. Weyprecht, one of the discoverers of Franz Josef Land, read a paper before a large meet- ing of German naturalists at Graz on the scientific stations" results to be obtained from polar research and the best means of securing them. He urged the im- portance of establishing a number of stations within or near the Arctic Circle, and also a ring of stations as near as possible to the Antarctic Circle, in order to record complete series of synchronous meteorological and magnetic observations. Lieut. Weyprecht did not live to see his suggestions carried into execution, but they bore fruit in due time. The various nations of Europe were represented at an international polar conference held at Hamburg in 1879 under the presidency of Dr Georg Neumayer, and at another at Berne in 1880; and it was decided that each

nation should establish one or more stations where synchronous observations should be taken for a year from August 1882. This fine project was matured and successfully carried into execution. The stations arranged for in the North Polar region were at the following localities: —

Norwegians: Bossekop, Alten Fjord, Norway (M. Aksel S. Steen). Swedes: Ice Fjord, Spitsbergen (Professor N. Ekholm). Dutch: Port Dickson, mouth of Yenisei, Siberia (Dr M. Snellen). ■q ■ \ Sagastyr Island, mouth of Lena, Siberia (Lieut. Jiirgens).

Kussians: J Nomya Zemlya, 72° 23′ N. (Lieut. C. Andreief). Finns: Sodankyla, Finland (Professor S. Lemstrom). . . 4 Point Barren", North America (Lieut. P. H. Ray, U.S.A.).

Americans: I x, a ˆ y /? ran fe/« Wj B y i 8 I « 44 'N. (Lieut.A.W.Greely,U.S.A). British : Great Slave Lake, Dominion of Canada (Lieut. H. P. Dawson). Germans: Cumberland Bay, west side of Davis Strait (Dr W. Giese). Danes: Godthaab, Greenland (Dr A. Paulsen). Austrians: Jan Mayen, North Atlantic, 71 °N. (Lieut. Wohlgemuth).

The whole scheme was successfully accomplished with the exception of the part assigned to the Dutch at Port Dickson. They started in the " Varna " but were beset in the Kara Sea and obliged to winter there. The " Varna " was lost, and the crew took refuge on board Lieut. Hovgaard's vessel, which was also forced to winter in the pack during 1882-1883. The scientific observations were kept up on both vessels during the time they were drifting with the ice.

The American stations commenced work in 1882 and one of these furnished a rare example of heroic devotion to duty in f a ce of difficulties due to the fault of those who should y ' have brought relief at the appointed time. Lieut. A. W. Greely's party consisted of two other lieutenants, twenty sergeants and privates of the United States army, and Dr Pavy, an enthusiastic explorer who had been educated in France and had passed the previous winter among the Eskimo of Greenland. On the nth of August 1881 the steamer " Proteus " conveyed Lieut. Greely and his party to Lady Franklin Bay during an exceptionally favourable season; a house was built at the " Discovery's" winter quarters, and they were left with two years' provisions. The regular series of observa- tions was at once commenced, and two winters were passed without accident. Travelling parties were also sent out in the summer, dogs having been obtained at Disco. Lieut. Lockwood with twelve men and eleven sledges made a journey along the north coast of Greenland and reached Lockwood Island in 83 24′ N. and 42° 45′ W., the highest latitude reached up to that time. From this island at a height of 2600 ft. on a clear day an unbroken expanse of ice was seen

stretching to the northward, the view extending far beyond the 84th parallel. A promontory of the north coast of Greenland seen to the north-east in 83° 35′ N. was named Cape Washington. Vegetation was found at the sxtreme position and animal life was represented by foxes, hares,

lemmings and ptarmigan. The party returned to Fort Conger on the 1st of June 1882 after an absence of 59 days. Greely made two journeys westward into the interior of Grinnell Land follow- ing up the northern branch of Chandler Fjord to a great sheet of frozen fresh water, Hazen Lake, with an area of about 500 sq. m. Beyond this, 17s m. from Fort Conger, he climbed Mt Arthur, 4500 ft., the highest summit of Grinnell Land, and saw distant mountains beyond a fjord tc the southwest. In the spring of 1883 Lockwood made still more extensive journeys, crossing Grinnell Land to Greely Fjord, which entered the western sea. The central depression of Grinnell Land abounded in musk oxen and was free from ice, though the higher land to north and south lay under permanent ice-caps. Important as these geo- graphical discoveries were, the main object of the expedition was the series of scientific observations at the headquarters, and these were carried out during the whole period with the most scrupu- lous exactness. As neither the relief ship which was to have been despatched in 1882, nor that in 1883, sent the expected relief to the station at Fort Conger, Lieut. Greely started from Lady Franklin Bay with his men in a steam launch and three boats on the 9th of August, expecting to find a vessel in Smith Sound. The boats were beset and had to be abandoned, the party reaching the shore across the ice with great difficulty, carrying their supplies of food, now rapidly diminishing. On the 21st of October 1883 they were obliged to encamp at Cape Sabine, on the western shore of Smith Sound, and build a hut for wintering. A few depots were found, which had been left by Sir George Nares and Lieut. Beebe, but all supplies were exhausted before the spring. Then came a time of indescribable misery and acute suffering. The party proved insubordinate and the sternest measures were required to maintain military discipline. When the sun returned in 1884 the poor fellows began to die of actual starvation; but it was not until the 22nd of June 1884 that the relieving steamers " Thetis " and " Bear " reached Cape Sabine. Lieut. Greely and six suffering companions were found just alive, but with all their scientific records, their instruments in order and the great collections of specimens intact. The failure of the relief expeditions to overcome difficulties which were child's play to what Greely and his companions had come through only enhances the splendid courage and determination of the heroic survivors.

Danish expeditions under Lieut. G. Holm explored the east coast of Greenland from Cape Farewell northwards in Eskimo boats between 1883 and 1885, and at Angmagssalik they encountered a tribe of Eskimo who had never seen white men before. Lieut. Ryder and Lieut. T. V. Garde

continued the exploration of East Greenland, and Ryder explored the great Scoresby Fjord. Captain Holm established a missionary and meteorological station at Angmagssalik Fjord in 1894, from which the Danish government take charge of the Eskimo of that region. In 1892-1893 an expedition sent out by the Berlin Geographical Society under Dr Erich von Drygalski studied the ice formations on the west of Greenland.

In July 1886 Lieut. Robert E. Peary, civil engineer, U.S. Navy, accompanied by the Dane Christian Maigaard, made a journey on the inland ice of Greenland eastward from Disco Bay in about 69 30′ N. They reached a height of p ea ry and 7500 ft., when according to Peary's observations Nansen in they were 100 m. from the coast, and then re-Greenland. turned. Dr Fridtjof Nansen with Otto Sverdrup and five other companions, after overcoming great difficulties in penetrating the ice-floes, succeeded in landing on the east coast of Greenland in August 18S8 in 64 23′ N. and reached a height of 8920 ft, on the inland ice, which was crossed on ski to the west coast. The interior was found to be a nearly flat plateau of snow resembling a frozen ocean, and at the high altitude of more than 8000 ft. the cold was intense. The crossing occupied more than two weeks, and the party not having dogs had themselves to haul all their gear on sledges. As they approached the western edge of the ice their progress was checked by dangerous crevasses; but on the 26th of September they succeeded in reaching the west I coast at the head of the Ameralik Fjord in 64° 12′ N., having

traversed 26c m. of glacier. Nansen discovered that in that latitude the inland ice of Greenland has the form of a huge shield rising rather rapidly but regularly from the east coast to nearly 9000 ft., flat and even in the middle and falling again regularly toward the western side, completely enveloping the land. An important principle acted on for the first time in Arctic travel on this journey was that of starting from the less accessible side and pushing straight through with no possibility of turning back, and thus with no necessity for forming a base or traversing the same route twice over.

Peary spent the winter of 1891-1892 at Inglefield Gulf on the north-west coast of Greenland, Mrs Peary, Dr F. A. Cook, Eivind Astrup and a coloured servant Matthew Henson being in his party, and a large number of the Etah Eskimo in the vicinity. In April 1892 he set out for a journey across the inland ice to the north-eastward in the hope of reaching the east coast and also the northern extremity of the land. After getting well up on

the ice-covered plateau a supporting party returned to winter quarters, while Peary and Astrup, with two companions and sixteen dogs, entered on the serious part of their work. The highest part of the inland ice was found to be about 5700 ft., and as usual after the first part of the descent, towards the north- east in this case, the surface was broken by numerous dangerous crevasses, progress amongst which was very slow. Great hardships were experienced from cold, insufficiency of food and the wearing out of sledges and clothes, but on the 4th of July, having left the ice and got on bare land in 81° 37′ N., where musk oxen and other game were found and flowers were growing, Peary was rewarded by a glimpse of the sea to the north-eastward, and named it from the date Independence Bay. He also traced a channel to the north beyond which lay a new land largely free from snow, no doubt the southern part of the island along the north of which Markham and Lock wood had travelled to their farthest north. The return journey to Inglefield Gulf was a wonderful feat of endurance, which was completed on the 4th of August ; the total distance marched on the whole journey out and home was 1300 m. Peary returned to northern Greenlandin 1893, having spent the whole time between the two expeditions in writing and lecturing in order to raise funds, for he travelled at his own charges. He landed on the shore of Inglefield Gulf on the 3rd of August and wintered there with a party of thir- teen, including Mrs Peary, and there their daughter was born. Astrup was taken ill after starting on the great journey in March 1894, which was to have extended the explorations of the pre- vious year, and had to return; others were severely frost-bitten, disease broke out amongst the dogs, and a month after the start Peary was only 130 m. from his base and had to return. Peary with two of his party, Hugh J. Lee and Matthew Henson, remained at Inglefield Gulf for another winter, and on the 1st of April 1895, with deer and walrus meat in place of pemmi- can, the supply of which had been lost, set out for Independence Bay. They reached the ice-free land when their food was exhausted and fortunately fell in with a herd of musk oxen, the meat from which made it possible to get back to Inglefield Gulf, though without adding anything material to the results of 1892. The experience of ice-travel and of Eskimo nature gained in the four years' almost continuous residence in northern Greenland were however destined to bear rich fruit.

Dr Nansen, after making an exhaustive study of the winds and currents of the Arctic Sea, and influenced largely by the Nansen; occurrence of driftwood on the shores past which the Drift of the ice-laden waters flowed southward between Green- •' Fram." j anc j anc [Spitsbergen, satisfied himself that there was a general drift across the polar basin and perhaps across the Pole. He planned an expedition to take advantage of this drift on the principle which guided his crossing of Greenland, that of entering at the least accessible point and not turning back, thus having no line of retreat

and making a relief expedition impossible. He planned a ship, the " Fram," which was immensely strong, to resist crushing, and of such a section that if nipped in the ice the opposing ice-masses would pass under her and lift her on to the surface. The plan of the expedition was based on scientific

reasoning, but the methods were totally at variance with those of previous explorers. Otto Sverdrup, who had been one of Nansen' s party in crossing Greenland, was captain of the " Fram," and the party included eleven others, the whole ship's company of thirteen living together on terms of social equality. Nansen paid the greatest possible attention to the provisions, and all the arrangements for the health and happiness of those on board were carefully thought out. The clothing of the expedition was as original in design as the ship; instead of having furs, thick woollen underclothing was adopted, with a light wind-proof material for the outer dress. The " Fram " left Christiania in the summer of 1893 and made her way through the Kara Sea and along the north coast of Asia until on the 20th of September she was run into the ice in 77° 30′ N., off the New Siberia Islands, and the great drift commenced. As anticipated, she rose to the pressure of the ice and was borne on an even keel high above the water for the whole duration of the drift. The movement of the ice was irregular, and on the 7th of November the " Fram " was back at her starting-point, but on the whole the movement was north-westward until the 15th of November 1895, when the highest latitude of the ship was attained, 85 55′ N. in 66° 31′ E., the meridian of the east of Novaya Zemlya; then it was westward and finally southward until the ice was broken by blasting round the ship in June in 83 N. lat. ; and after being afloat, though unable to make much progress until the middle of July, the " Fram " broke out of the ice off the north coast of Spitsbergen on the 13th of August 1896. No ship before or since has reached so high a latitude. In all her drift the "Fram" came in sight of no new land, but the soundings made through the ice proved that the Arctic Sea was of great depth, increasing towards the Pole, the greatest depth exceeding 2000 fathoms. The great mass of water filling the polar basin was comparatively warm, indicating free circula- tion with the Atlantic. It was established that the ice formed off the coast of Asia drifted across the polar basin in a period of from three to five years, and the hypothesis on the truth of which Nansen risked his success was abundantly verified by facts. The ship's company all returned in perfect health. After the second winter on the " Fram " at a time when the northward movement of the drift seemed to be checked, Nansen, accompanied by Lieut. Hjalmar Johansen, left the ship in order to explore the regions towards the Pole by travelling on ski with dog sledges carrying kayaks. It was obviously hopeless to attempt to find the drifting ship on their return, and Nansen intended to make for Spitsbergen in the hope of meeting one of the tourist steamers there. A more daring plan was never

formed, and it was justified by success. Leaving the ship on the 14th of March

1895 in 84 N. 102° E., they made a fairly rapid march northward, reaching a latitude of 86° 5′ N. on the 8th of April, the nearest approach to the Pole so far achieved. Turning south-westwards they travelled with much difficulty, sometimes on the ice, sometimes in kayaks in the open lanes of water, incur- ring great danger from the attacks of bears and walrus, but at length reaching a group of new islands east of Franz Josef Land. They travelled westward through this archipelago until the 28th of August, when they built a small stone hut roofed with their light silk tent, in which they passed the winter on a land since called Frederick Jackson Island. There they lived like Eskimo on bear and walrus meat cooked over a blubber lamp. The journey southward was resumed in the spring of 1896, and on the 15th of June they met Mr F. G. Jackson, in whose relief ship, the " Windward," they returned to Norway. Nansen and Johansen reached Vardo on the 13 th of August*

1896 full of anxiety for the fate of their old comrades, when by a coincidence unparalleled in the history of exploration, the " Fram " was on that very day breaking out of the ice off Spitsbergen and the original party of thirteen was reunited at Tromso the following week and returned together to Christiania. On this remarkable expedition no life was lost and the ship came back undamaged under the skilled guidance of Sverdrup with a great harvest of scientific results.

Mr Frederick George Jackson planned an exploring expedition

to attain a high latitude by the Franz Josef Land route and was supported financially by Mr A. C. Harmsworth (Lord North- Jackson- cliff e). He was accompanied by Lieut. Albert Harmsworth Armitage, R.N.R., as second in command and six Expedition, scientific men, including Dr Reginald Koettlitz; Dr W. S. Bruce also was one of the number in the second year. The Jackson-Harmsworth expedition sailed in 1894, and was landed at Cape Flora, where log houses were built. In the spring of 1895 Jackson made a journey northward to 8i° 19′ N., the highest latitude reached, and added considerably to our knowledge of the archipelago by discovering a channel between groups of islands west of the Austria Sound of Payer. He made numerous other journeys by land and in boats, and surveyed a considerable portion of the islands on which he landed, the most interesting being that of 1897, to the western portion of the group. The geological

collections were of some value and the specimens secured indicated that Franz Josef Land and Spitsbergen were parts of an extensive land existing in Tertiary times. The expedition returned in 1897.

In 1897 and subsequent years a party led by Sir Martin Conway explored the interior of Spitsbergen. Dr A. G. Nathorst, the Swedish geologist, explored the eastern coast and off-lying islands, and made important observations on North-East Land, circumnavigating the Spitsbergen archipelago in 1898. In 1899 Nathorst visited the north-east coast of Greenland in search of Andree's balloon expedition, and here he mapped Franz Josef Fjord and discovered the great King Oscar Fjord in waters that had never been navigated before.

In subsequent years valuable surveys and scientific observa- tions were made by the Prince of Monaco in his yacht "Princesse Alice," by Dr W. S. Bruce, notably on Prince Charles Foreland, and by others. Franz Josef Land was visited by the American explorer W. Wellman in 1898 and 1900, and his companion E. Baldwin in the former year made the discovery of several islands in the east of the archipelago. A wealthy American, W. Zeigler, also sent out expeditions to Franz Josef Land in 1901 and between 1903 and 1905, in the course of which A. Fiala reached the high latitude of 82 4′ N. in the " America," but the ship was afterwards lost in Teplitz Bay. These expeditions added little to our knowledge of polar geography, but some useful meteorological, magnetic and tidal observations were made.

The Italian expedition under the command of H.R.H. Prince Luigi, duke of the Abruzzi, was the most successful of all those which have attempted to reach high latitudes by way of Franz Josef Land. Embarking in the summer of 1899 on the " Stella Polare " (formerly the Norwegian whaler " Jason " which had landed Nansen on the east coast of Greenland in 1888) the expedition put into Teplitz Bay in Rudolf Land, where they wintered and there the ship was seriously damaged by the ice. In the spring of 1900 a determined effort was made to reach the North Pole by sledging over the sea-ice. The duke of the Abruzzi having been disabled by frost-bite, the leadership of the northern party devolved upon Captain Umberto Cagni of the Italian navy, who started on the nth of March 1900 with ten men (Alpine guides and Italian sailors) and nearly a hundred dogs. His plan was to sledge northward over the sea-ice, sending back two parties as the diminishing stores allowed the advance party to take on the whole of the supplies destined to support them on their way to the Pole and back. Before losing sight of Rudolf Island three men forming the first party started to return, but they never reached winter quarters and all must have perished. The second party went back from latitude 83 10′ N., and reached their base in safety. Cagni pushed on with three companions, determined if he

could not reach the Pole at least to outdistance his prede- cessor Nansen, and on the 25th of April 1900 he succeeded in reaching 86° 34′ N. in 65 20′ E. Diminishing food supplies made it necessary to turn at this point, and although he had reached it in 45 days it took Cagni 60 days to return. The advance of summer loosened the ice-floes, and the westward component of the drift of the pack became a more and more serious danger, threatening to carry the party past Franz Josef

Duke of the Abruzzi.

Andree.

Makarott.

Land without sighting it. Fortunately Cape Mill, a hesMiland of characteristic outline, was sighted just in time, and with this as a guide the party succeeded in reaching Teplitz Bay, having eaten the last of their dogs and been reduced to great extremities. At the farthest north no land was visible, the rough sea-ice extending to the horizon on every side.

As early as 1895 a scheme for an exploring expedition in a balloon was put forward seriously, and in 1897 the Swedish aeronaut S. A. Andree carried it out. He had brought a balloon to Danes Island, in the north of Spitsbergen, the previous year, but the weather was unpropitious and the ascent had to be postponed. On the nth of July 1897 he started in a new and larger balloon with about five tons of supplies and two companions. It was hoped that the balloon could be steered to some extent by the use of heavy guide ropes dragging over the ice, and Andree had already made successful flights in this way. Rising at 2.30 p.m. the balloon was out of sight of Danes Island in an hour. At 10 p.m. Andree threw out a buoy containing a message which was recovered, and this stated that the balloon was in 82 N. 25° E., moving towards the north-east at an altitude of 800 ft. above a rugged ice-field. This was the last news received, and although scarcely a year has passed without some rumour of the balloon having been found in Siberia or North America, nothing further has ever been ascertained.

In 1899 Admiral Makaroff of the Russian navy arranged for the trial trip of the great ice-breaker " Yermak," which he designed, to take the form of an expedition into the sea-ice off Spitsbergen. Though no high lati- tude was attained on this occasion he formed the opinion that a vessel of sufficient size and power could force a passage even to the Pole. The Russian- Japanese War put an end to the polar projects of this gifted man of science.

Captain Otto Sverdrup, who had been Nansen's companion on his two polar expeditions, planned an Arctic voyage for the circumnavigation of Greenland, and the " Fram " was altered and refitted to suit her for the work. Starting in 1899, he was obliged to abandon the attempt to get northward through Smith Sound, and making his way westward into Jones Sound he spent three years in exploring and mapping the portion of the Arctic archipelago which lay to the north of the field of labour of the Franklin search expeditions. Ellesmere and Grinnell Lands were shown to be part of one large land mass called King Oscar Land, which is separated by a narrow channel, Eureka Sound, from an extensive island named Axel Heiberg Land. Two of his party (Isachsen and Hassel) discovered and explored two islands west of Heiberg Land, and Dr Schei made most valuable observations on the geology of the whole of the district examined. Sverdrup's journeys cleared up a great deal of uncertainty regarding the geography of the least known portion of the Arctic archipelago, and leave little more to be done in that quarter. He brought the " Fram " safely back to Norway in 1903.

Many American whalers working in the sea reached through Bering Strait believe that land of considerable extent lies farther west than the Arctic archipelago, north of the mouth of the Mackenzie River, but neither the English traveller A. H. Harrison in 1905, nor the Dane Einar Mikkelsen in 1907, was able to find any trace of it, though the latter sledged over the sea ice as far as 72 N., where in 150 W. he got a sounding of 339 fathoms with no bottom. This depth makes it somewhat improbable that land exists in that quarter.

Russian surveyors and explorers continued to map portions of the Siberian coast, and in 1886 Dr Bunge and Baron Toll visited the New Siberia Islands and made known the remarkable remains of mammoths which exist there in great numbers. In 1893 Baron Toll made an important geological expedition to the islands, discovering many well-preserved remains of mammoths and other extinct mammals and finding evidence that in the mammoth period trees grew at least as far as 74 N. Indefatigable in the pursuit of his studies, Toll set out once more in 1901 on board the

Sverdrup.

Baron Toll.

Amundsea.

" Zarya," hoping to reach Sannikoff Island, the most northern and stiD unvisited portion of the New Siberia group. In August 1902 he reached Bennet Island with the astronomer Seeberg and two men; he found the island to be a plateau about 1 500 ft. in elevation, and remained there until November studying the geological features. Nothing more was heard of the expedi- tion, and a relief expedition in 1904, under Lieuts. Brusneff and Kolchak, failed to find any trace of the explorers beyond a record left on Bennet Island, which gave a summary of their movements up to the time of leaving the island.

In 1901 Captain Roald Amundsen, a Norwegian, who had been mate on the " Belgica " in her Antarctic voyage, planned an expedition to the area of the north magnetic pole visited by Sir James Ross in 1831, in order to re-locate it, and as a secondary object he had in view the accomplishment of the North-West Passage by water for the first time, M'Clure not having carried his ship through from sea to sea. A small Norwegian sealing sloop, the " Gjoa," the cabin of which measured only 9 ft. by 6, was fitted with a petroleum motor engine of 39 h.p. for use in calm weather and strengthened to withstand ice-pressure. She left Christian ia on the 17th of June 1903 with a total company of six men, second in command being Lieut. Godfred Hansen of the Danish navy. She passed through Lancaster Sound and worked her way down the west side of Boothia Felix in August, and took up winter quarters in Gjoa Harbour at the head of Petersen Bay in King William Land. Here the little vessel remained for two years while magnetic and meteorological observations were carried out, and sledging excursions were made to the magnetic pole and along the coasts of Victoria Land, which was charted up to ■j2° N. In August 1905 the " Gjoa " proceeded westward along the American coast but was frozen in off King Point for a third winter. On the nth of July 1906 she got free, and after much difficulty with the ice reached Bering Strait on the 30th of August and entered the Pacific, the first ship to pass from ocean to ocean north of Patagonia.

Danish explorers have continued to concentrate their attention on the problems of Greenland, and especially the geography of the east coast. Lieut. G D. Amdrup, in a series of expedi- tions between 1898 and 1900, charted the coast-line as far north as 70° 15′ N., and made important scientific observations and collections. From time to time whalers reached the east Green- land coast at points in high latitudes. The duke of Orleans in the " Belgica," under the command of Captain Gerlache, made an important voyage in 1905, in the course of which he cruised along the coast of Germania Land between 76 and 78° N., and fixed the general outline of the land up to that latitude. This expedition did a large amount of scientific work, especially in oceanography. The stream of sea-ice which presses out- wards from the polar basin every summer bears close against

the east coast of Greenland, and exploration by sea has always proved exceedingly difficult and precarious, success depending very much on the occurrence of chance leads amongst the ice. Taking advantage of all previous experience, the most important of the Danish expeditions was planned by L. Mylius-Erichsen in 1905, the expenses being partly raised by private Brichten. subscriptions and partly provided by the Danish government. He sailed in the " Danmark " in June 1906 and found winter quarters in Danmarkhaven, 75 43′ N., where the ship remained for two years, while systematic magnetic and meteorological observations were kept up at the base and the main work of exploring to the northward was carried on by sledge. From existing maps it was believed that about 620 m. of coast separated the winter quarters from the northern point of Greenland, but when the sledge expedition went out in 1907 the coast was found to curve much farther to the eastward than had been anticipated, and the outward journey extended to 800 m. Having left the winter quarters on the 28th of March 1907. Mylius-Erichsen, with Captain Koch, Hagen, an educated Eskimo, BrSnlund and two others, reached North-East Fore- land, the eastern extremity of Greenland (8i° 20′ N., n° 15′ W.). Here they divided; Koch with Berthelsen and the Eskimo

Tobias went north-westward to explore the east coast of Peary Land, and succeeded in reaching the northernmost extremity of the land beyond Cape Bridgman in 83 30′ N. From this great journey he returned in safety to winter quarters, arriving on the 24th of June. Meanwhile Mylius-Erichsen, with Hagen and the Eskimo Bronlund, followed the coast westward into what was believed to be the Independence Bay seen from a distance by Peary; this turned out to be a deep inlet now named Danmark Fjord. Keeping to the coast, they entered the great channel separating the mainland of Greenland from Peary Land, and surveyed Hagen Fjord on the southern shore and BrSnlund Fjord on the northern shore of the strait. They had pushed on to Cape Glacier in 82 N. and 35 W. by the 14th of June 1907, within sight of Navy Cliff, which had been Peary's farthest aoming from the west side, and here the softness of the snow kept them all summer. When they could travel, more than a fortnight was wasted adrift on a floe in the effort to cross Danmark Fjord. Here the sun left them, while they were without food, almost worn out and more than 500 m. from the ship. It was impossible to attempt the long journey round the coast, and the only chance of safety, and that a very slender one, was to make away south- ward over the inland ice and so cut off the eastern horn of Green- land which the expedition had discovered. Under the most terrible difficulties, with only four starved dogs, and their equip- ment going to pieces, they accomplished the feat of marching 160 m. in 26 days, and reached the east coast again in 79 N. Hagen died on the way; Mylius-Erichsen himself struggled on until he nearly reached the provisions left on

Lambert Island on the northern journey; but he too perished, and only Bronlund reached the supplies. He was frost-bitten and unable to proceed further, and after recording the tragedy of the return journey in his diary, he died also alone in the Arctic night. His body and the records of the great journey were discovered in the following year by Koch, who started on a relief expedition as soon as travelling became possible. The results of this expedition are a splendid monument to the courage and devotion of the leader and his followers. The channel between Spitsbergen and Greenland was shown by their efforts to be far narrower ' than had previously been supposed, and the outline of Greenland itself was fixed for the first time, and that by an extremely accurate survey.

There only remains one further episode to bring the history of polar exploration up to 1910, but that is the crowning event of four hundred years of unceasing effort, the attain- ment of the Pole itself; and it was accomplished by the undaunted perseverance of one man who would never accept defeat. After the return of the Jackson-Harmsworth expedi- tion, Lord Northcliffe presented the " Windward " to Lieut. Peary, who resumed in 1898 his systematic explorations of the Smith Sound region in the hope of finding a way to the Pole. He was not restrained by the precedents of earlier travellers and made some long sledge journeys in the winter of 1898-1899, having his feet badly frost-bitten and losing eight toes. Even this crippling did not stop his work. He wintered amongst the Etah Eskimo in 1899-1900 and next spring made a successful journey to the most northerly land north of Greenland in 83 35′ where the land had an abundant flora and fauna, and he pushed north over the sea-ice for twenty miles farther, reaching 83 54′ N. Peary wintered again at Fort Conger in 1900-1901, and for the fourth year in succession he went through the Arctic winter, 1901-1902, at Payer Harbour. In the spring of 1902 he made a great journey to Cape Hecla in the north of Grant Land and thence northward over the frozen sea to 84° 17′ N. in 70 W. Frequent open leads of water and the moving of the ice-floes made further advance impossible, and after an unparalleled sojourn in the farthest north, Peary returned to the United States. The Peary Arctic Club of New York, formed to support this indomitable explorer, provided funds for a new expedition and a ship differing in some respects from those hitherto em- ployed and named the " Roosevelt." In her he proceeded in the summer of 1905 through Smith Sound and the northern channels to Cape Sheridan on the north coast of Grant Land,

Peary.

Captain Robert Bartlett being in command of the ship. From this point he advanced by sledge to Cape Hecla, whence he made a most strenuous attempt to reach the North Pole. Organizing his large following of trained Eskimo, whose confidence in him had been won by many years of friendship, and his few white com- panions in separate parties, each complete in itself and well furnished with dogs and food, he set off at the end of February 1906. A very broad lead of open water was encountered in 84 38′ N., and as the party did not carry kayaks much time was lost in getting across. The floes had a marked eastward drift and it was difficult to make progress northward; however, Peary struggled on by forced marches to 87 6′ N.,' which he reached on the 21st of April 1906, the most northerly point so far attained. His return journey was the most dangerous in his experience; many leads had to be crossed, sometimes on ice so thin that it bent beneath the weight of the explorers, provisions were exhausted and the men were reduced to eating their dogs before they made land at Cape Neumayer in the north of Greenland, where game was found, and whence the return to the ship was comparatively easy.

*Returning to America, Peary prepared for a last attempt. The " Roosevelt " was overhauled and various defects made /Vho-'s good, but not in time for the summer of 1907. Journey to Leaving New York in July 1908 the " Roosevelt," p fe JVort * again under the command of R. Bartlett, brought the party, with the Eskimo who were picked up on the way, to Cape Sheridan by the 5th of September. During the winter all supplies were transported to Cape Columbia, farther west on the coast of Grant Land. Here there were ready to start in the first light of the Arctic day seven explorers, 17 picked Eskimo and 133 of the best dogs in Greenland with 19 sledges. As the outcome of all Peary's experience the expedition was arranged to consist of a lightly equipped advance party to select the route and make the trail by clearing a way 'through rough ice, and a main party composed of units of four men each with sledges containing all their requirements marching one day behind the pioneer party. From this unit parties were to return southward at intervals with the empty sledges, leaving the diminished main party to push on fully provisioned. The " big lead " which marks the edge of the continental shelf in 84 N. was crossed after some delay and here the sun appeared for the first time on the 5th. of March 1909. Dr MacMillan with three Eskimo and three sledges returned along the outward trail after the 7th of March from 84 29′ N. A sounding at this point showed the depth of the sea to be 825 fathoms. After five more marches G. Borup turned back in 85° 23′ with three Eskimo and three sledges, the best Eskimo and dogs remaining with the main party. From this point the advance was regular; the pioneer party started from the snow-houses they had built and slept in when the main party arrived, and while the latter slept the pioneers marched, selected a camp, built new snow-*

houses, and slept till the main party came up. At 86° 38′ N. Prof. R. G. Marvin turned back, as usual with the three worst Eskimo and the worst dogs. His party reached the ship, but he himself was drowned in recrossing the " big lead," the only casualty of the expedition. At 88° N. Bartlett turned back on the 1 st of April in accordance with the system with two Eskimo, one sledge and 18 dogs. Up to this point Peary had saved him- self as much as possible, leaving the path-finding and the observa- tions to his very competent colleagues; but now he put forth all his strength for the arduous 140 m. which separated him from the Pole. He was accompanied by Henson and four Eskimo. The ice improved as he went on and it was possible to do 25 m. in a daily march of 10 hours, and on one occasion 30 m. in 12 hours. On the 6th of April an observation gave 89 57′ N., and here a camp was made and observations taken throughout 24 hours to fix the position, as well as excursions a few miles farther on and a few miles to right and left so as to be sure of actually reaching the Pole. No land was to be seen, and a sounding through the ice gave a depth of 1500 fathoms with no bottom. The American flag was hoisted; the goal of all the ages of exploration had been reached.

The return journey was quick and easy. The tracks kept open by the passage of the various return parties were distinct enough to follow, the snow-houses stood ready for sheltering at the end of each march, and a northerly gale kept the ice pressed well together and the leads closed. On the 23rd of April Cape Columbia was reached and soon after the party was safe on board the " Roosevelt." Success was due to the accumulated experience of twenty-three years' constant Arctic work, and to the thorough acquaintance with the Eskimo and their dogs, which enabled the best work to be got out of them.

Dr F. A. Cook spent two years in the Arctic regions, 1907-1909, and claimed to have reached the Pole by sledging alone with two Eskimo a year before Peary. He submitted the evi- „ . Coo i dence for this achievement to the university of Copen- hagen, which failed to find it satisfactory, and Dr Cook did not appear to challenge this decision.

Physiography of the Arctic Region

Geology. — Although much remains to be done in the explora- tion of the North Polar area, the main features of the physical geography of the region have been determined beyond any reasonable doubt. Within the Arctic Circle the northern portions of Europe, Asia, America and Greenland surround a central area of deep sea, the southern margin of which forms a broad continental shelf bearing many islands. The ring of land and shallow sea is broken only by the broad channel between Greenland and Europe through which Atlantic water gains an entrance to the Arctic Sea. The

physical conditions of this sea, which covers the greater part of the Arctic regions, are dealt with later in detail; but there is less to be said regarding the land.

In a climate which taxes human powers to the utmost to carry on the simplest route-surveys in the course of an exploring expedition, and in the presence of a snow covering which is permanent on all high ground and only disappears for a short time in summer, even on the shores and islands, it is obvious that any knowledge of the geology must be difficult to obtain. On the earlier Arctic expeditions enthusiastic collectors brought together quantities of specimens, many of which it was found impossible to bring home, and they have been found abandoned by later travellers. As Arctic exploration was usually carried out on the sea or over the sea-ice even those expeditions in which experienced geologists took part furnished few opportunities for making investigations. The result is that the geology of the Arctic lands has to be inferred from observations made at isolated points where the fortune of the ice stopped the ship, or where on land journeys a favourable exposure was found. Almost every geological formation is known to be represented, from the Archaean to the Quaternary, and there is a general resemblance in the known geological features of most of the great Arctic islands. The fundamental rock in all appears to be Archaean gneiss. In the extreme north-east Carboniferous strata have recently been discovered similar to the Carboniferous rocks of Spitsbergen. The Jurassic rocks farther south are in places capped by Cretaceous beds, and closely resemble the Jurassic rocks of Spitsbergen, Franz Josef Land and the northern parts of Norway and Russia. Cretaceous and Tertiary rocks are found on the west coast of Greenland covered over by great flows of basalt, probably of Tertiary age, at Disco Island, Nugsuak Peninsula and various points farther north. The only mineral of economic value found in Greenland is cryolite, which is mined at Ivigtut in the south-west. Native iron occurs in considerable masses in several places, some of it undoubtedly of telluric origin, though some is probably meteoric.

The second " Fram " expedition confirmed and extended the geological observations of the Franklin search expeditions on the American Arctic archipelago, and showed the presence above the Archaean rocks of Cambrian, Silurian and Devonian strata, the Silurian being represented by a widespread brown limestone abounding in fossils. Carboniferous limestones also occur and less extensive beds of quartz sandstones, schists and limestones containing ammonites and other Mesozoic fossils. Tertiary

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rocks including beds of lignite and plant fossils of Miocene age also occur, and they are interstratified and overspread with basalts and other eruptive rocks as in Greenland. In Grant Land Tertiary coal occurs in Lady Franklin Bay (81° 45′ N.), the most northerly deposit of fossil fuel known. Arctic Canada consists of Archaean and Palaeozoic rocks worn down into plateaux or plains and bearing marks of glacial action, the absence of which is the most remarkable feature of the tundra region of Siberia. The Siberian coast is superficially formed to a large extent of frozen soil and gravel sometimes interbedded with clear ice, and in this soil the frozen bodies of mammoths and other Quaternary animals have been found preserved in a fresh condition by the low temperature. The absence of a glacial period in northern Siberia is probably indirectly due to the very low temperature which prevailed there, preventing the access of water vapour from without and so stopping the supply required to produce sufficient precipitation to form glaciers or ice-caps. On the New Siberia Islands Silurian and Tertiary rocks have been recognized, the latter with abundant deposits of fossil wood.

The geological evidence is complete as to the existence of a genial climate in Tertiary times as far north as the present land extends, and of a climate less severe than that of to-day in the Quaternary period. The existence of raised sea margins in many Arctic lands and especially in the American Arctic archi- pelago bears evidence to a recent elevation of the land, or a withdrawal of the sea, which has been influential in forming some of the most prominent features of the present configuration. It is noteworthy that no great mountain range runs into the Arctic region. The Rocky Mountains on the west and the Ural range on the east die down to insignificant elevations before reaching the Arctic Circle. The plateau of Greenland forms the loftiest mass of Arctic land, but the thickness of the ice cap is unknown. The one active volcano within the Arctic Circle is on the little island of Jan Mayen.

The Arctic Climate. — As the water of the Arctic Sea is free from ice around the margin only for a few months in summer, and is covered at all times over its great expanse with thick ice in slow uneasy motion, there is less contrast in climate between land and sea, especially in winter, than in other parts of the world. The climate of the polar area may be described as the most characteristic of all the natural features, and obser- vations of temperature and pressure are more numerous and systematic than any

other scientific observations. The Russian meteorological system includes Siberia, and long series of obser- vations exist from stations up to and within the Arctic Circle. The Canadian Meteorological Service has secured like observa- tions for the extreme north of North America, though the records are more fragmentary and of shorter duration. Norway and Iceland also yield many records on the margin of the Arctic Circle. The international circum-polar stations maintained during 1882 connected the Siberian, Norwegian and Canadian land stations with the more fragmentary work of the various polar expeditions which have wintered from time to time in high latitudes. The most valuable records and practically the only data available for the climate north of 84 are those of the first expedition of the " Fram " in her three years' drift across the polar basin. Later expeditions beyond the 84th parallel were merely dashes of a few weeks' duration, the records from which, however accurate, are of an altogether different order of importance. The data collected by the " Fram " were discussed in great detail by Professor H. Mohn in 1904, and that eminent authority combined them with all that had been known pre- viously, and all that was ascertained by later explorers up to the return of Captain Sverdrup from the second " Fram " expedition, so as to give the completest account ever attempted of the climate of the North Polar regions, and on this we rely mainly for the following summary.

Temperature. — From Professor Mohn's maps of the isotherms north of 6o° N. it is evident that the temperature reduced to sea-level is lowest in the winter months within an area stretching across the pole from the interior of Greenland to the middle of

Siberia, the long axis of this very cold area being in tiie meridian of 40° W. and 140 E. For every month from October to April the mean temperature of this cold area is below o° F., and in the two coldest months there are three very cold areas or poles of cold with temperatures below— 40° arranged along the axis. These are the interior of Greenland, an area around the North Pole and the centre of Northern Siberia. Professor Mohn is satisfied that these three poles of cold are separated by somewhat warmer belts, as observations on the north coast of Greenland show a temperature higher both than the temperature of the interior reduced to sea-level and the temperature on the frozen sea farther north. As summer advances the temperature rises to the freezing point most rapidly in North America, the mean temperature for June, July and August for the American coast and the Arctic archipelago being above the freezing point. In July and August the Arctic shores in America, Asia and Europe have a mean air- temperature of about 40 F., but the interior of Greenland and the area round the North Pole remain below 3 2 , those two poles of cold' persisting throughout the year while the winter cold pole in Asia disappears in summer. 1 There is no reason to doubt that in winter the Asiatic area is

the coldest part of the Arctic region, and as it is permanently inhabited it is plain that low temperature alone is no bar to the wintering of expeditions in any part of the North Polar region. The lowest temperature experienced during the drift of the " Fram " was — 62 F., on the 12th of March 1894 inlat. 79° 41', long. 134 17′ E. The minimum temperatures recorded on Sir George Nares's expedition were — 73-8° F- on the " Alert " in 82 27′ N. and-7o-8° on the " Discovery " in 8i° 44′ N., both in March 1876, and the minimum on Sverdrup's expedition ia Jones Sound in 76° 50′ N. was— 6o° F. in January 1901. In February 1882 Greely recorded— 66-2° at Fort Conger, 8i° 44′ N., and at Fort Constance in Canada (66° 40′ N. 119 W.) a temperature of — 72 F. was noted in January 1851. The lowest temperature ever recorded on the earth's surface was probably that experienced at Verkhoyansk in Siberia (67 34′ N.) where the absolute minimum in the month of February was —93-6°, and minima of —70° or more have been recorded in every winter month from November to March inclusive, and as the absolute maximum in July was +92-7° F. the total range experienced is no less than 186-3°, f ar exceeding that known in any other part of the world.

The normal monthly mean temperatures for various parallels of latitude are given as follows by Professor Mohn, the last column showing the calculated conditions at the North Pole itself expressed to the nearest degree.

Normal Air Temperature for Latitudes in.°F.

65° N.

70″ N. I 8o° N.

90″ N.

January .

- 9-4

-15-3

—26-0

-42

February .

- 6-7

-H-5

-26-5

-42

March . .

+ 3-o

- 8.3

-23-1

-31

April .

190

+ 6-8

- 8-9

-18

May .

347

24-1

+ 14-0

+ 9

Tune .

48-6

37-9

30-0

28

July . .

54-7

45-o

35-6

30

August

50-6

43-2

32-7

27

September

40-7

32-5

I8-I

9

October

24-6

15-3

- 2-4

— 11

November

5-8

- 06

— II-O

-27

December .

- 5-i

-10-5

-19-1

-36

Year

21-7

12-9

i'i

- 9

The interior of Greenland is believed to be below the normal temperature for the latitude in all months and so is the region between Bering Strait and the Pole; the Norwegian Sea, and the region north of it as far as the Pole, has a temperature above the normal for the latitude in all months; while the temperature

1 It must be remembered that for cartographical purposes temperature is reduced to its value at sea-level, allowing for a change of l° F. in about 300 ft. Thus the actual temperature on the snowcap of Greenland at the height of 9000 ft. is 30° F. lower at all seasons than is shown on an isothermal map, and that of Verkho- yansk (500 ft.) is only J -5° F. lower than is charted.

in the northern continents is below the normal in winter and above the normal in summer.

The " Fram " observations showed that while the ordinary diurnal range of temperature prevailed for the months when the sun was above the horizon during some part of the day, there was also a diurnal range in the winter months when the sun did not appear, the minimum then occurring about 2 p.m. and the maximum about 1 a.m., the " day " being colder than the " night." Except in July and August the temperature was always found to be lower with the weaker winds and higher with the stronger winds irrespective of direction. Extraor- dinarily rapid variations of temperature have been observed in the winter months, on one occasion in February 1896 (north of 84° N.) the thermometer rising within 24 hours from — 45-4° to +22-3° F., a rise of 67-7°.

Cloud and Precipitation. — The amount of cloud in the far north is greater

in the daytime than at night, the summer months being cloudy, the winter very clear, and the amount is greater with the stronger winds and less with the weaker winds. Precipitation is most frequent in the summer months, the " Fram " results showing an average of 20 days per month from May to September; while from October to April the average was only 1 1| days per month. Rain was only observed in the months from May to September ; but snow occurs in every month and is most frequent in May and June, least frequent in November and December, which are the months of minimum precipitation. It has never been possible to make satisfactory measurements of the amount of precipitation in the Arctic regions on account of the drifting of snow with high wind. Fogs occur most frequently in July and August (20 or 16 days per month); they are practically unknown between November and April.

Pressure. — The " Fram " observations enabled Professor Mohn to revise and extend the isobaric maps of Dr Buchan, the correctness of which was strikingly confirmed. The Atlantic and Pacific low pressure areas are found at all seasons on the margin of the Arctic area, the position shifting a little in longitude from month to month. The two low pressures are separated in the winter months by a ridge of high pressure (exceeding 30-00 in.) stretching from the Canadian to the Siberian side be- tween the North Pole and Bering Strait ; this ridge has been termed by Professor Supan " the Arctic wind divide." In April the high pressure over Asia gives way and an intense low pressure area takes its place during the summer, uniting in August with the less intense low-pressure area which develops later over Canada, and reducing the Arctic high pressure area to an irregular belt extending from North Greenland to Franz Josef Land on the Atlantic side of the Pole. The general pressure over the polar area is much higher in winter than in summer and the gradients are steeper also in the cold weather, giving rise to stronger winds. The isobaric conditions indicate light variable winds in summer along the route of the " Fram " from the New Siberia Islands to the north of Spitsbergen, and in winter south-easterly or easterly winds of greater force; this is in accord with the observations made during the drift. Professor Mohn believes that the maximum pressure at the North Pole takes place in April, when it is about 30-08 in.; and the minimum pressure from June to September, when it is about 29-88 in., the annual range of monthly mean pressure being thus only 0-20 in., so that the Pole may be said to be in a region of permanently high atmo- spheric pressure. Cyclonic depressions crossed the region of the " Fram's " track with considerable frequency, 73 being experi- enced in the three years, the frequency being greatest in winter but the wind velocity in cyclones greatest in summer; the most common direction of movement was from west to east. The average velocity of the cyclonic winds encountered by the " Fram " was only about 29 m. per hour, the highest 40 m. per hour, the portion of

the Arctic Sea she crossed being much less stormy than the coasts of the Arctic lands, where winds have been recorded of far greater severity, e.g. 45 m. per hour in Spitsbergen in 1882, 55 m. per hour in Teplitz Bay, Franz Josef Land, in 1900, 62 m. per hour on the Siberian coast in I he " Vega " in 1879, and as much as 90 m. per hour at Karmakul

in Novaya Zemlya in 1883. There seems little doubt that the interior of the polar area is a fair weather zone as compared with its margins, where the contrast of the seasons is more marked.

Flora. — The land flora of the Arctic regions, although neces- sarily confined to the lower levels which are free from snow for some time every year, and greatly reduced in luxuriance and number of species as compared with the flora of the temperate zone, is still in its own way both rich and varied, and it extends to the most northerly land known. In some of the fjords of western Greenland and also of Ellesmere Land almost on the 80th parallel the prevailing colour of the landscape in summer is due to vegetation and not to rock. The plants which occur on the margin of the Arctic Sea and in the polar islands represent the hardier species of the'North European, Asiatic and American flora, the total number of species amounting to probably about a thousand phanerogams and a still larger number of crypto- gams. The habit of all is lowly, but some grasses grow to a height of 1 ft. 6 in., and the mosses, of which the Eskimo make their lamp-wicks, frequently form cushions more than a foot in depth. Trees are absent north of 73° N., which is the extreme point reached in Siberia, or they are dwarfed to the height of shrubs as in southern Greenland, or farther north to that of the prevailing herbage. The flowers of many Arctic species of phanerogams have an intensely brilliant colour. The plains and lower slopes of the plateaux of Ellesmere Land and Heiberg Land and the plain of Peary Land north of Greenland are suffici- ently clothed with vegetation to support large numbers of rodents and ruminants, the plants occurring not as occasional curiosities, but as the normal summer covering of the ground, playing their full part in the economy of nature. The cold of winter is not sufficient to put a stop to plant life even at the pole of cold in northern Siberia; and there is no reason to doubt that if there were islands close to the North Pole they would bear vegetation.

Fauna. — Animal life is comparatively abundant in the waters of the Arctic Sea, though the whalebone whale, Balaena myste- celis, has become almost extinct by reason of the energy with which its pursuit has been carried on. The white whale and narwhal still abound in the open waters as far north as ships can go. The walrus and several species of seal prey on the marine life, and the polar bear, the king of Arctic beasts, probably roams the whole surface of the frozen sea in pursuit of seals and the larger fish. The other Arctic carnivora include the Arctic fox and wolf, the latter

attacking all the land mammalia except the polar bear and old musk-oxen. The wild reindeer is still found in all the circum-polar lands except Franz Josef Land; but its range does not extend so far to the north as that of the typical ruminant of the polar lands, the musk-ox {Ovibos moschatus), which now abounds only in Peary Land, north Green- land and in the American Arctic Archipelago, though it was formerly circum-polar in its distribution. The Arctic hare is almost equally characteristic and more abundant, and the lemming probably more common still. The ermine and other valuable fur-bearing animals also occur. The animals are either permanently white like the polar bear, or change their coats with the season, being brown in summer and white in winter like the hares and lemmings. The birds of the Arctic regions are all migrants, retreating southward in winter but nesting in incredible numbers on the Arctic coast-lands, and in summer probably finding their way as individuals to every part. They are mainly sea-birds, though the snow bunting, the Arctic owl and other land birds are amongst the summer visitors. It must be remembered that the elevated plateaux of the interior of Greenland and of many of the large islands are totally devoid of life of every kind on account of their unchanging covering of snow and the intensely rigorous climate due to their great altitude.

Arctic People. — The conditions of life in the continental parts of the Arctic regions are extremely severe as regards tempera- ture in the winter, but it has been found possible for civilized people to live permanently both in the extreme north of North

America and in the north of Siberia. In the north of Norway where the winter is mild on account of the warm south-westerly winds from the open Atlantic, organized communities dwell within the Arctic Circle in free communication with the south by telegraph, telephone, steamer, and in some cases by rail also, all the year round. The climate on the coast of Norway is scarcely less favourable in the north than in the south except for the absence of light in winter when the sun never rises, and the absence of darkness in summer when the sun never sets. If there were natural products of sufficient value permanent settlements might arise in any part of the Arctic regions where there is land free from snow in summer; but as a rule Arctic land is poor in mineral wealth and the pursuit of whales and seals requires only a summer visit. The original people of the farthest north of Europe are now represented by the Lapps, who lead a migratory life, depending mainly on fishing and on their herds of reindeer. Farther east their place is taken by the Samoyedes who live along the coast of the Kara

Sea and the Yalmal Peninsula; they have also a small settlement in Novaya Zemlya. The Samoyedes, like the Lapps, live on the produce of the sea in summer and on their herds of reindeer, moving rapidly ever the frozen country in winter by means of reindeer and dog sledges. Spitsbergen and Franz Josef Land appear never to have had native inhabitants. Along the coast of Siberia there is no continuous population, except in the land of the Chukchis in the extreme east between the Kolyma river and Bering Strait; but small settlements of many tribes of pagan hyperboreans occur here and there. North American Indian tribes wander far to the north of the Arctic Circle in Canada and Alaska, keeping their hereditary enemies the Eskimo to the coast and islands. The Eskimo of the American coast are intermingling not only with the American whalers but also with the Polynesians who come north as part of the crew of the whalers, and the pure race is tending to disappear. The traces of Eskimo encampments in the Polar archipelago, where no Eskimo now live, may mark a former wider range of hunting grounds, or a greater extension of the population. The Greenland Eskimo are the most typical and the best known of their race. A few hundred live on the east coast, where they were formerly much more numerous. The greater part of the west coast Eskimo are now civilized members of the Danish colonies, and it is stated that whereas in 1855 only about 30% of the population were half-breeds, the blending of the Eskimo and Europeans is now so complete that no full-blooded Eskimo remain in Danish Greenland. The tribe of Eskimo living to the north of Melville Bay, the glaciers of which separate them from the people of Danish Greenland, was first described by Sir John Ross, who called them Arctic Highlanders. They have been fully studied by Commander Peary, who succeeded in utilizing them in his great series of journeys, and to their aid he attributes the success of his method of Arctic travelling.

The Arctic Sea.

According to its geographical position, the Arctic Sea might be described as the sea situated north of the Arctic Circle; but according to its natural configuration, it is better defined as the gulf-like northern termination of the long and relatively narrow Atlantic arm of the ocean which extends north between Europe on one side and America on the other. By this situation as the northern end of a long arm of the ocean its physical conditions are to a very great extent determined. This Arctic gulf is bounded by the northern coasts of Europe, Siberia, North America, the American Arctic archipelago, Greenland and Iceland. Its entrance is the opening between Europe and Labrador divided by Iceland, Greenland and the American Arctic islands; and its natural southern boundary would be the submarine ridge extending from Scotland and the Shetland Islands through the Faeroe Islands and Iceland to Greenland, and continuing on the other side of Greenland across Davis Strait to Baffin Land. This ridge

separates the depression of the Arctic Sea, filled with cold water at the bottom, from the deep depression of the North Atlantic. The Arctic Sea communicates

with the Pacific Ocean through Bering Strait, which is, however, only 49 m. broad and 27 fathoms deep. The area of the Arctic Sea may be estimated to be about 3,600,000 sq. m., of which nearly two-thirds (or 2,300,000 sq. m.) is continuously covered by floating ice.

The Arctic Sea may be divided into the following parts: (1) The North Polar Basin (including the Siberian Sea), bounded by the northern coasts of Siberia (from Bering Strait to the western Taimyr Peninsula), Franz Josef Land, Spitsbergen, Greenland, Grinnell Land, Axel Heiberg Land, Ringnes Land, the Parry Islands and Alaska; (2) the Kara Sea, between Novaya Zemlya and the Siberian coast, south of a line from the north point of the former to Lonely Island (Ensomheden) and Norden- skiold Island; (3) the Barents and Murman Sea, bounded by Novaya Zemlya, Franz Josef Land, Spitsbergen, Bear Island and the northern coasts of Norway and Russia; (4) the Norwegian Sea, between Norway, Spitsbergen, Jan Mayen, Iceland and the Faeroes; (5) the Greenland Sea, between Spitsbergen, Jan Mayen, Iceland and Greenland; (6) Baffin Bay and Davis Strait, between Greenland, Ellesmere Land, North Devon and Baffin Land.

Depths. — The Arctic Sea forms an extended depression separating the two largest continental masses of the world — the European-Asiatic (Eurasia) and America. Along its centre this depression is deep, but around its whole margin, on both sides, it is unusually shallow — a shallow submarine plateau or drowned plain extending northward from both continents, forming the largest known continental shelf. North of Europe this shelf may be considered as reaching Spitsbergen and Franz Josef Land, extending over more than 10 degrees of latitude, although there is a somewhat deeper depression in between. North of Spitsbergen it reaches beyond 81° N., and north of Franz Josef Land probably somewhat north of 82 N. North of Siberia the shelf is 350 m. broad, or more, with depths of 50 to 80 fathoms, or less. In longitude 13 5 E. it reaches nearly 70 N., where the bottom suddenly sinks to form a deep sea with depths of 2000 fathoms or more. Farther east it probably has a similar northward extension. North of America and Greenland the shelf extends to about latitude 84° N. This shelf, or drowned plain, evidently marks an old extension of the continents, and its northern edge must be considered as the real margin of their masses, the coasts of which have probably been overflowed by the sea at some comparatively recent geological period. On this submarine plateau the Arctic lands are situated ■ — Spitsbergen (with Seven Islands to the north, Bear Island and Hope Island to the south), Franz Josef Land, Novaya Zemlya, Lonely Island, the New Siberia Islands, Wrangel Island, the

American Arctic archipelago. The depth of the shelf is, especi- ally north of Siberia, very uniform, and usually not more than 50 to 80 fathoms. North of Europe it is intersected by a sub- marine fjord-like depression, or broad channel, extending east- ward from the Norwegian Sea. Between Norway and Bear Island this depression is about 240 fathoms deep, and between Novaya Zemlya and Franz Josef Land 100 to 150 fathoms deep. It gives off several submerged fjords or channels towards the south-east into the shallow Murman Sea, e.g. one channel, more than 100 fathoms deep, along the Murman coast towards the entrance of the White Sea; another narrow channel, in parts 100 fathoms deep, along the south-west coast of Novaya Zemlya through Kara Strait. It also extends into the Kara Sea, rounding the north point of Novaya Zemlya and forming a narrow channel along its eastern coast. On the American side similar but much narrower submarine depressions, which may be called submarine fjords, extend from Baffin Bay into the continental shelf, northward through Smith Sound, Kane Basin and Kennedy Channel, and westward through Lancaster Sound. The greatest depths in the Arctic Sea have been found in the North Polar Basin, where depths of 2100 fathoms, in about 81° N. and 130 E., have been measured with certainty. It is deeper than 1650 fathoms along the whole route of the " Fram," from about 79 N. and 138° E. to near Spitsbergen. In 84I N. and about 75° E. the depth is 2020 fathoms,

and in 83 N. and 13 E. it is i860 fathoms. The northern and eastern extension of this deep basin is not known. Commander Peary reports a depth of 1500 fathoms with no bottom at 5 sea miles from the Pole (about 8o° 55′ N.) where he tried to obtain a sounding. It was formerly believed that still greater depths existed west of Spitsbergen, in the so-called Swedish deep, where 2600 fathoms had been sounded, but the Nathorst expedition in 1898 found no greater depths there than about 1.700 fathoms. The Norwegian Sea, farther south, is 2000 fathoms deep midway between Iceland and Norway, in about 68° N. This so-called Norwegian deep is, as before stated, separated from the North Atlantic Basin by the Wyville Thomson ridge and the FaeroeMceland ridge. Farther north there is a low transverse ridge extending eastwards from Jan Mayen, in about 72 N., which is about 1300 fathoms deep. North of this the sea is again deeper — 1985 fathoms in 75° N. From the north-west corner of Spitsbergen a submarine ridge extends in a north-westerly direction, with depths of about 430 fathoms in 8i° N. and about 4 E. How far this ridge extends is unknown, but there is a probability that it reaches Greenland, and thus separates the Swedish and the Norwegian deep from the deep depression of the North Polar Basin. Baffin Bay forms, probably, a relatively deep basin

of about 1000 or 1200 fathoms, which is separated from the West Atlantic Basin by the shallow submarine ridge from Greenland to Baffin Land in about 65° or 66° N.

The deposit composing the bottom of the Arctic Sea contains in its northern part, in the North Polar Basin, extremely little matter of organic origin. It is formed mainly of mineral material, sandy clay of very fine grain, to an extent which is hardly found in any other part of the ocean with similar depths. It contains only from 1 to 4% of carbonate of lime. Farther south, in the sea between Spitsbergen and Greenland, the amount of carbonate of lime gradually increases owing to the shells of foraminifera (especially biloculinae) ; west of Spitsbergen the proportion rises to above 20 or even 30%, while in the direction of Greenland it is considerably lower.

The circulation of the Arctic Sea may be explained firstly by the vertical and horizontal distribution of temperature and salinity (i.e. density); secondly, by the influence of the winds, especially on the ice-covered surface. The currents in this sea may to some extent be considered as convection currents, caused by the cooling of the water near the surface, which becomes heavier, sinks, and must be replaced on the surface by warmer water coming from the south, which is also influenced by the prevailing winds. On account of the rotation of the earth the northward-running water on the surface, as well as the sinking water, will be driven in a north-easterly or easterly direction, while the southward-flowing water along the bottom, as well as the rising water, is driven south-west or westward. This very simple circulation, however, is to a great extent complicated on the one hand by the irregular configuration of the sea-bottom, especially the transverse submarine ridges — e.g. the Spitsbergen ridge, the Jan Mayen ridge, and the Scotland- Faeroe-Iceland ridge; and on the other hand by the circumstance that the upper water strata of the sea are comparatively light in spite of their low temperature. These strata, about 100 or 120 fathoms thick, are diluted by the addition, of fresh water from the North European, Siberian, Canadian and Alaskan rivers, as well as by precipitation, while at the same time the evaporation from the surface of the mostly ice-covered sea is insignificant. The light surface strata will have a tendency to spread over the heavier water farther south, and thus the polar surface currents running southward along the east coasts of Greenland, Baffin Land and Labrador are formed, owing their westerly course to the rotation of the earth. These currents are certainly to a great extent helped and increased by the prevailing winds of the region. The winds get a firm hold on the rough surface of the floating ice, which, with its deep hum- mocks and ridges, gets a good grip of the water, transferring the movement of the surface immediately down to at least 5 or 10 fathoms.

The chief currents running into the Arctic Sea are the following : —

1. The Gulf Stream, or Atlantic drift, passing north-eastward over the Scotland-Faeroe-Iceland ridge, along the west coast of Norway, with one arm branching off eastward round the North Cape into the Barents Sea, and another branch running northward along the margin of the shelf between Norway, Bear Island and Spitsbergen, passing as a very narrow current along the west coast of the latter, over the Spitsbergen ridge (at its north-west corner), and into the North Polar Basin, where it flows gradually northward and eastward (on account of the rotation of the earth) below the cold but lighter layer, 100 fathoms thick, of polar water, and fills the whole basin below 100 or 120 fathoms to the bottom with Atlantic water.

2. The Irminger Current, running north along the west coast of Iceland. One part branches off westward and southward again in Denmark Strait, following the Greenland Polar Current, whilst another smaller part runs northward, eastward and south-eastward to the north and east of Iceland.

3. An Atlantic current runs northward along the west coast of Greenland, passes the ridge across Davis Strait, and flows into Baffin Bay, forming its deeper strata below the polar water in a similar way to the Gulf Stream in the North Polar Basin. There is a possibility that some slight portion of this current even reaches the latter along the bottom of the deep channel through Smith Sound.

4. A small current running northward into the North Polar Basin through Bering Strait.

The Arctic Sea receives also a contribution of fresh water from the rivers of northern Europe, Siberia and America, as well as from the glaciers of Greenland and the precipitation over the whole area of the sea itself.

The chief currents running out of the Arctic Sea are: (1) The Greenland Polar Current, running southward along the east coast of Greenland, and dividing into two branches north of Iceland — (a) the east Greenland branch, passing south through Denmark Strait and rounding Cape Farewell; (b) the east Iceland branch, running south-eastward between Iceland and Jan Mayen, towards the Faeroes. It seems as if only a small portion of this current actually passes the Faero-Iceland ridge and reaches the Atlantic Ocean. The greater part is partly mixed with the water of the Gulf Stream and is turned by the latter in a north-easterly direction, forming a kind of eddy or vortex movement in the southern Norwegian Sea. (2) The Labrador Polar Current, formed by the water running south through Smith Sound, Lancaster Sound and Jones Sound, as well as water from Baffin Bay, and also from the east Greenland current rounding Cape Farewell and crossing Davis Strait. (3) Along the south-east coast of Spitsbergen a polar

current also passes in a south-westerly or westerly direction past South Cape, where it meets the Gulf Stream. (4) A small current probably also runs out along the western side of Bering Strait.

Temperature and Salinity.- — While the temperature is compara- tively uniform, with small variations, the difference in salinity between the upper and lower strata is greater than in most other parts of the ocean. In the North Polar Basin the vertical distribution of temperature as well as salinity is very much the same in all places examined. Near the surface, from o down to 100 fathoms, the water is below the freezing point of fresh water — with a minimum of between 28-7° (— 1-8° C.) and 28-6° (— 1 -9° C.) at a depth of about 30 fathoms — and is much diluted with fresh water (see above), the salinity gradually increasing downward from about 29 or 30 per mille near the surface to nearly 35 per mille in 100 fathoms. Below 100 fathoms the temperature as well as the salinity gradually increases, until they approach their maximum in about 160 or 200 fathoms, where the temperature varies between 32-5° (0-3° C), north of the New Siberia Islands, and about 33-8° (1° C.) north of Franz Josef Land; and the salinity is about 35-1 per mille. From this depth the temperature gradually sinks downward; 32° (o° C.) is found at about 490 fathoms in the western part of the basin — e.g. between about 84° N. 15° E. and 8s§° N. 58 E., while it is found in about 400 fathoms farther east — e.g. in 8i|° N. and 123° E. In depths between 1400 and 1600 fathoms the tempera- ture has a second minimum between 30-6° (— 0-8° C.) and 30-4° (—0-9° C), below which depth the temperature again rises slowly, a few tenths of a degree towards the bottom. In all depths below 200 fathoms the salinity of the water remains very much the same, about 35-1 per mille, with very slight variations. This comparatively warm and saline water evidently originates from the branch of the Gulf Stream passing north across the submarine ridge from north-west Spitsbergen. The vertical distribution of temperature and salinity is very much the same,

summer and winter, throughout the North Polar Basin, except near the surface, which in summer is covered by a layer of fresh water arising from the melting of the snow-covered surface of the floe-ice. This fresh-water layer may attain a thickness of 5 or 6 ft. between the floes. North of the Siberian coast the sea is, during summer, covered with a layer of warm water from the Siberian rivers, and the temperature of the surface may rise to several degrees above freezing-point.

In the Norwegian and Greenland Seas there are greater varia- tions of

temperature. Below a certain limit, which in the northern part (on the eastern side) is about 550 fathoms deep, and in the southern part between 300 and 400 fathoms deep, the whole basin of this sea is filled with water which has an unusually uniform salinity of about 34-92 per mille, and the temperature of which is below zero centigrade, gradually sinking downward from the above-mentioned limit, where it is 32 (o° C.) ; and down to 29-8° (— 1-2° C.) or 29-6° (— i-3°C.)nearthebottomini40oor 1600 fathoms. This cold underlying water of such a remarkably uniform and comparatively low salinity is formed chiefly in a small area between Jan Mayen and Spitsbergen, by the formation of ice and cooling down of the Atlantic surface water by radiation of heat during the winter. In this manner the surface water becomes heavier than the underlying water and gradually sinks to the bottom. This water seems to be distinctly different from the hitherto known water filling the deep of the North Polar Basin, as it has a lower salinity and lower temperature; the known bottom temperature of the North Polar Basin being between 30-7° (— 0-7° C.) and 30-4° (—0-9° C), and the salinity about 35-1 per mille. This fact seems to indicate that there can be no direct communication between the deep depression of the North Polar Basin and the Norwegian-Greenland Sea, which are probably separated by a submarine ridge running from the north-west corner of Spitsbergen to Greenland.

The above-mentioned layer of uniform cold water of the Norwegian-Greenland Sea is, along its eastern side, covered by the warm and saline water of the Gulf Stream flowing northward along the west coast of Norway, Bear Island and Spitsbergen, and forming the upper strata of the sea about 300 to 500 fathoms deep. The maximum temperature of this water is on the surface about 46 (8° C.) to 50° (io° C.) west of northern Norway, and about 37 (3° C.) to 39 (4 C.) west of Spitsbergen. The salinity is generally between 35-0 and 35-3 per mille.

Along the western side of this sea, towards the east coast of Greenland, the underlying cold water is covered by the less saline water of the polar current, which in the upper strata of the sea, from the surface down to about 100′ fathoms, has very much the same temperature and salinity as in the upper cold and less saline strata of the North Polar Basin. Near the east coast of Greenland, a layer of comparatively warm and saline water, with a temperature of 32-7° (0-4° C.) and a salinity of 35-2 per mille, has been found (by the Ryder expedition in 1891) below the cold and lighter polar water in a depth of 70 to 90 fathoms. This warmer undercurrent is a continuation of the warm Spitsbergen current sending off a branch westward from Spitsbergen, and thus forming a great vortex movement in the Spitsbergen- Greenland Sea similar to the one mentioned farther south in the Norwegian Sea.

In Barents Sea the temperature and salinity are highest in the western part near Norway or between Norway and Bear Island, where the eastern branch of the Gulf Stream enters and where in summer the salinity generally is between 34-8 and 35 per mille from the surface down to the bottom, and the surface tempera- ture generally is about 41° or 43° (5 C. or 6° C), and the bottom temperature is above zero centigrade. The eastern part of Barents Sea is filled with water of a little lower salinity, the deeper strata of which are very cold, with temperature even as low as 28-9° (— 1-7° C.),.but often with salinity above 35-0 per mille. This cold and saline water is formed during the formation of ice on the sea-surface. The bottom temperature is every- where in the eastern part below zero centigrade and generally below -i° C.

The Kara Sea is covered near the surface with a layer of cold

water much diluted by the fresh water from the Siberian rivers, especially the Ob and the Yenisei. The salinity varies between 29 and 34 per mille; near the mouth of the rivers it is naturally much lower.

The vertical distribution of temperature and salinity in Baffin Bay seems to be very similar to that of the North Polar Basin, with a cold but less saline upper stratum of water — with a minimum temperature of about 28-9° (— 1-7° C.) — and a warmer and more saline deeper stratum from 100 to 200 fathoms down- wards, with a maximum temperature of 33-6° (0-9° C.) in about 200 fathoms, and the temperature slowly decreasing towards the bottom.

Arctic Ice. — As before mentioned, at least two-thirds of the Arctic Sea is constantly covered by drifting ice. This ice is mostly formed on the surface of the sea itself by freezing, the so-called floe-ice or sea-ice. A small part is also river-ice, formed on the rivers, especially those of Siberia, and carried into the sea during the spring or summer. Another comparatively small part of the ice originates from the glaciers of the Arctic lands. These pieces of glacier-ice or icebergs are, as a rule, easily distinguished from the floe-ice by their size and structure. They occur almost exclusively in the seas round Greenland, where they originate from the glaciers descending into the sea from the inland ice of Greenland. Some small icebergs are also formed in Franz Josef Land, Spitsbergen, Novaya Zemlya, Grinnell Land, &c, but they are comparatively insignificant, and are not as a rule carried far from the coasts. Sea-ice or floe-ice is formed during the autumn, winter and spring, especially in the North Polar Basin, but also in the Kara Sea, the greater part of Barents Sea, the northernmost part of the Norwegian Sea (near Bear Island and towards Jan Mayen), Greenland Sea and Baffin Bay. The floe-ice does not, as a rule, grow thicker than 7 or 8 ft. in one year, but when it floats in the water for some years it may attain a

thickness of 16 ft. or more directly by freezing. By the constant upheaval from pressure much greater thicknesses are attained in the piled-up hummocks and rubble which may be 20 to 30 ft. high above the water when floating. During the summer the floe-ice decreases again by melting partly on the surface owing to the direct radiation of heat from the sun, partly on the under side owing to the higher temperature of the water in which it floats. The first kind of melting is that which prevails in the North Polar Basin, which the second occurs in more southern latitudes. The floe-ice is constantly more or less in movement, carried by winds and currents. The changing wind, and also to a great extent the changing tidal current, causes diverging movements in the ice by breaking it into larger or smaller floes. When the floes separate, lanes and channels are formed; when they meet, ice-pressures arise, and the floes are piled up to form hummocks or ridges, and thus the uneven polar ice arises. In the North Polar Basin the floe-ice is slowly carried by the prevailing winds and the currents in an average direction from Bering Strait and the New Siberia Islands, north of Franz Josef Land and Spitsbergen, near the North Pole, towards the Greenland Sea and southward along the east coast of Greenland. Such a drift of an ice-floe from the sea north of Bering Strait to the east coast of Greenland probably takes, as a rule, four or five years, and the floes found in this part of the sea are not, therefore, generally older. What the drift of the ice is on the American side of the North Polar Basin is still little known. But there it is probably more or less blocked up in its southward movement by the islands of the American Arctic archipelago, and the ice-floes may thus grow very old and thick. Commander Peary found a strong easterly movement of the floes in the region north of Grant Land in 1907. The southward distribution of the drifting floe-ice (the pack ice) in Barents Sea, Norwegian-Greenland Sea and Davis Strait may differ much from one year to another, and these variations are evidently due to more or less periodical variations in the currents and also in the directions of the pre- vailing winds. In most places the ice has its most southerly distribution during the late winter and spring, while the late summer and autumn (end of August and September) is the most open season.

Biological Conditions. — The development of organic life is comparatively poor in those parts of the Arctic Sea which are continuously covered by ice. This is, amongst other things, proved by the bottom deposits, which contain exceptionally little carbonate of lime of organic origin. The reason is evidently that the thick ice prevents to a great extent the development of plant life on the surface of the sea by absorbing the light; and as the plant life forms the base for the development of animal life, this has also very

unfavourable conditions. The result is that — e.g. in the interior of the North Polar Basin — there is exceptionally little plant life in the sea under the ice-covering, and the animal life both near the surface and in deeper strata is very poor in individuals, whilst it is comparatively rich in species. Near the outskirts of the Arctic Sea, where the sea is more or less open during the greater part of the year, the pelagic plant life as well as animal life is unusually rich, and, especially during the early summer, there is often here such a development of plankton {i.e. pelagic life) on the sea-surface as is hardly found in any other part of the ocean. It seems as if the polar water is specially favourable for the development of pelagic plant life, which makes the flora, and consequently also the fauna, flourish as soon as the ice- covering disappears and the water surface is exposed to the full sunlight of the long Arctic day. At the same time the tempera- ture of the water rises, and thus the conditions for the chemical changes of matter and nutritive assimilation are much improved. The Arctic Sea, more especially the North Polar Basin, might thus be considered as a lung or reservoir in the circulation of the ocean where the water produces very little life, and thus, as it were, gets time to rest and accumulate those substances necessary for organic life, which are everywhere present only in quite minimal quantities. It is also a remarkable fact of interest in this connexion that the greatest fisheries of the world seem to be limited to places where waters from the Arctic Ocean and from more southern seas meet — e.g. Newfoundland, Iceland, Lofoten and Finmarken in Norway.

The mammalian life is also exceptionally rich in individuals along the outskirts of the Arctic Sea. We meet in those waters, especially along the margin of the drifting ice, enormous quantities of seals of various kinds, as well as whales, which live on the plankton and the fishes in the water. A similar development of mammalian life is not met with anywhere else in the ocean, except perhaps in the Antarctic Ocean and Bering Sea, where, however, similar conditions are present. In the interior of the Arctic Sea or the North Polar Basin mammalian life is very poor, and consists mostly of some straggling polar bears which probably occasionally wander everywhere over the whole expanse of ice; some seals, especially Phoca foetida, which has been seen as far north as between 84° and 85° N.; and a few whales, especially the narwhal, which has been seen in about 85° N.

The bird life is also exceptionally rich on the outskirts of the Arctic Sea, and the coasts of most Arctic lands are every summer inhabited by millions of sea-birds, forming great colonies almost on every rock. These birds are also dependent for their living on the rich plankton of the surface of the sea. In the interior of the Arctic Sea the bird life is very poor, but straggling sea- birds may probably be met with occasionally everywhere, during summer-time, over the whole North Polar Basin.

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*(H. R. M.;F. N.) Antarctic Region History of Antarctic Exploration. — Although the Antarctic region was not reached by the first explorer until the Arctic region had been for centuries a resort of adventurers in search of the route to the East, the discovery of J^'Jf? 1 ** the south polar region was really the more direct outcome of the main stream of geographical exploration. It was early understood by the Greek geographers that the known world covered only a small portion of the northern hemisphere and that the whole southern hemisphere awaited exploration, with its torrid, temperate and frigid zones repeating the climatic regions familiar in the northern hemisphere, the habitable land of the south temperate zone being separated from the known world by the practically impassable belt of the*

torrid zone. During the middle ages the sphericity of the earth came to be viewed as contrary to Scripture and was generally discredited, and it was not until Prince Henry the Navigator began in 141 8 to encourage the penetration of the torrid zone in the effort to reach India by circumnavigating Africa that the exploration of the southern hemisphere began. The doubling of the Cape of Good Hope in

1487 by Bartholomew Diaz first brought explorers within touch of the Antarctic cold, and proved that the ocean separated Africa from any Antarctic land that might exist. The passage of Magellan's Strait in 1520 showed that America and Asia also were separated from the Antarctic continent, which was then believed to extend from Tierra del Fuego southward. The xioubling of Cape Horn by Drake in 1578 proved that the Tierra del Fuego archipelago was of small extent and that any continent

ever died a harder death. It is not to the purpose here to describe in detail how Schouten and Le Maire rediscovered the southern extremity of Tierra del Fuego and named Cape Horn in 1615, how Quiros in 1606 took possession for the king of Spain of all the lands he had discovered in Australia del Espiritu Santo (the New Hebrides) and those he would discover " even to the Pole," or how Tasman in 1642 showed that New Holland (Australia) was separated by sea from any continuous southern continent.

which lay to the south must be within the region of perpetual winter. Before this, however, vague reports of land to the south of the Malay archipelago had led European geographers to connect on their globes the coast of Tierra del Fuego with the coast of New Guinea, and allowing their imaginations to run riot in the vast unknown spaces of the south Atlantic, south Indian and Pacific oceans, they sketched the outlines of a vast continent stretching in parts into the tropics. The search for this great south land or Third World was a leading motive of explorers in the 16th and the early part of the 17th centuries, and no illusion xxi. 3 j

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Voyagers round the Horn frequently met with contrary winds and were driven southward into snowy skies and ice-encumbered seas; but so far as can be ascertained none of them before 1770 reached the Antarctic circle, or knew it, if they did. The story of the discovery of land in 64 S. by Dirk Gerritsz on board the " Blijde Boodschap " in 1599 has recently been

shown to be the result of the mistake of a commentator, Kasper Barlaeus, in 1622. Much controversy has arisen as to whether South Georgia was sighted in 1675 by La Roche, but the point is of no import- ance in the development of the history of exploration. It may

safely be 3a id that, all the navigators who fell in with the southern ice up to 1750 did so by being driven off their course and not of set purpose. An exception may perhaps be made in favour of Halley's voyage in H.M.S. " Paramour " for magnetic investi- gations in the South Atlantic when he met the ice in 52° S. in January 1700; but that latitude was his farthest south. A determined effort on the part of the French naval officer Pierre Bouvet to discover the South Land described by a half legendary sieur de Gonneville resulted only in the discovery of Bouvet Island in 54° 10′ S., and in the navigation of 48 degrees of longi- tude of ice-cumbered sea nearly in 55 S. in 1739. In 1771 Yves Joseph Kerguelen sailed from France with instructions to proceed south from Mauritius in search of " a very large continent." He lighted upon a land in 50 S. which he called South France, and believed to be the central mass of the southern continent. He was sent out again to complete the exploration of the new land, and found it to be only an inhospitable island which he re- named in disgust the Isle of Desolation, but in which posterity has recognized his courageous efforts by naming it Kerguelen Land. The obsession of the undiscovered continent culminated in the brain of Alexander Dalrymple, the brilliant and erratic hydrographer who was nominated by the Royal Society to com- mand the Transit of Venus expedition to Tahiti in 1769, a post he coveted less for its astronomical interest than for the oppor- tunity it would afford him of confirming the truthfulness of his favourite explorer Quiros. The command of the expedition was given by the admiralty to Captain James Cook, whose geo- graphical results were criticized by Dalrymple with a force and persistence which probably had some weight in deciding the admiralty to send Cook out again with explicit instructions to solve the problem of the southern continent.

Sailing in 1772 with the " Resolution," a vessel of 462 tons under his own command and the " Adventure " of 336 tons under ■ Captain Tobias Furneaux, Cook first searched in vain

" for Bouvet Island, then sailed for 20 degrees of longitude to the westward in latitude 58 S., and then 30° east- ward for the most part south of 6o° S. a higher southern latitude than had ever been voluntarily entered before by any vessel. On the 17th of January 1773 the Antarctic Circle was crossed

for the first time in history and the two ships reached 67 1 5′ S. in 39 3 5′ E. , where their course was stopped by ice. There Cook turned northward to look for South France, of the discovery of which he had received news at Cape Town, but from the rough determi- nation of his longitude by Kerguelen, Cook reached the assigned latitude 10° too far east and did not see it. He turned south again and was stopped by ice in 61° 52′ S. and 95° E. and con- tinued eastward nearly on the parallel of 60 ° S. to 147° E. where on March 16th the approaching winter drove him northward for rest to New Zealand and the tropical islands of the Pacific. In November 1773 Cook left New Zealand, having parted com- pany with the " Adventure," and reached 6o c S. in 177 W., whence he sailed eastward keeping as far south as the floating ice allowed. The Antarctic Circle was crossed on the 20th of December and Cook remained south of it for three days, being compelled after reaching 67 31′ S. to stand north again in 135° W. A long detour to 47 50′ S. served to show that there was no land connexion between New Zealand and Tierra del Fuego, and turning south again Cook crossed the Antarc- tic circle for the third time in 109 30′ W., and four days later his progress was blocked by ice in 71° 10′ S., 106 54′ W. This point, reached on the 30th of January 1774, was the farthest south attained in the 18th century. With a great detour to the east, almost to the coast of South America, the expedition regained Tahiti for refreshment. In November 1774 Cook started from New Zealand and crossed the South Pacific without sighting land between 53 and 57° S. to Tierra del Fuego, then passing Cape Horn on the 29th of December he discovered the Isle of Georgia and Sandwich Land, the only ice-clad land he had seen, and crossed the South Atlantic to the Cape of Good Hope between 55° and 60° S., thereby wiping out Dalrymple's continent from all the oceans and laying open the way for future Antarctic exploration by exploding the myth of a

habitable southern continent. Cook's most southerly discovery of land lay on the temperate side of the 60th parallel, and he convinced himself that if land lay farther south it was practically inaccessible and of no economic value.

Soon after Cook's return sealers set out on voyages to South Georgia both from England and America, but no clear accounts of the southern limits of their voyages before the Sealers' year 1819 can now be obtained. In February of that Voyages. year William Smith of the brig " Williams " trading between Monte Video and Valparaiso, rounding the Horn with a wide sweep to the south, saw land in 62° 40′ S. Repeating the voyage in October he saw the land distinctly, and named it New South Shetland. The " Williams " was chartered by the British naval commander on the Pacific station, and in 1820 Edward Brans- field, master R.N., surveyed the group and went as far as 64° 30′ among the islands. Meanwhile American sealers from Stoning- ton, Connecticut, had begun operations on the newly dis-

covered land, and one of these, Nathaniel B. Palmer, discovered the mountainous archipelago still farther south which now bears his name. In 1821-1822 George Powell, apparently a British sealer, discovered and surveyed the South Orkney Islands which, though typical Antarctic lands, lie outside the Antarctic region.

A voyage only second in importance to that of Cook was planned in Russia and sent out by the emperor Alexander I. under the command of Fabian von Bellingshausen in the Belllngs- " Vostok," with Lieut. Lazareff in the " Mirni " hausen. in company, both vessels being about 500 tons. The object of the expedition was to supplement that of Cook by circum T navigating the Antarctic area, taking care to keep as far south as possible in those longitudes where Cook had made his northward detours. Bellingshausen entered on his exploring work by sight- ing South Georgia at the end of December 1819, discovered the Traverse Islands, sighted the Sandwich group and met a solid ice-pack in 6o° S., to get round which he made a wide detour, sailing east to the south of Cook's track, and getting south of the 60th parallel in 8° W. On the 26th of January he crossed the Antarctic Circle in 3° W. and by February 1st had reached 69° 25′ in 1° 11′ W., a latitude which has never been surpassed on that meridian. Being stopped by ice, Bellingshausen turned northward and then continued to the east well to the south of Cook's track, getting south again as the ice permitted and reaching 69° 6′ S. in 1 8° E. On this occasion he was able to sail for three degrees of longtitude within the circle before being forced north of it by a succession of heavy gales. He still kept eastward south of 65° S. and crossed the circle once more in 41 E., where the number of birds seen suggested the proximity of land, and in fact Enderby Land was not very far off, though out of sight. A storm of unexampled violence drove the ships northward, but they still held to the east south of 6o° S. as far as 87° E., having followed the edge of the ice through those meridians south of Kerguelen Land where Cook had made a great detour to the north. Bellingshausen now made for Sydney to rest and refit, arriving there on the 29th of March 1820, after 131 days under sail from his last port. At Sydney Bellingshausen heard of the discovery of the South Shetlands, and leaving early in November reached the sixtieth parallel a month later in longi- 1 tude 143 W., and sailing eastward kept south of that parallel through 145 degrees of longitude during sixty-five days, never out of sight of the ice, keeping close along the pack edge through the great gap left by Cook south of New Zealand. He managed to cross the circle three times more, in 164 30′ W., in 120° W. and in 92° 10′ W., where he reached 69 52′ S., the culminating point of the voyage. As the cruise was supplementary to Cook's, no attempt was made to get south of the meridian where that great navigator made his highest latitude. On the 22nd of January 1821, the day after reaching his highest latitude, Bellingshausen

sighted the first land ever seen within the Antarctic Circle, the little island named after Peter I. A week later another and larger land, named after Alexander I., was seen at a distance of 40 m. and sketches made of its bold outline in which the black rock stood out in contrast to the snow.

Bellingshausen then made for the South Shetlands, where he met the American sealers, and thence returned to Russia. The voyage was a worthy pendant to that of Cook; it was carried out with a faithful devotion to instructions and consummate seamanship, and as a result it left only half the periphery of the Antarctic Circle within which land could possibly project beyond the Frigid Zone.

The next episode in the history of Antarctic exploration was the voyage of James Weddell, a retired master R.N., in 1823. Weddell. Weddell was in command of the " Jane," a brig of 160 tons, with the cutter " Beaufoy " of 65 tons in company, and after cruising among the South Orkneys during January he started for the soutBWf exploration, and as he was well equipped with chronometers his positions may be taken as of a far higher degree of accuracy than those of ordinary sealers. On the 20th of February he reached the highest latitude yet attained, 74 1 5′ S. in 34 1 7′ W., having seen much ice but no impenetrable pack, and at the farthest point the sea was clear and open, but the lateness of the season and the length of the return voyage decided him to go no farther. Weddell made interesting collec- tions of Antarctic animals, including the type specimen of the seal which bears his name, and the book in which he describes his voyage testifies to the keenness of his observations and the soundness of his reasoning. The sea which he penetrated so far to the south he named after the reigning king, George IV., but it is now known as Weddell Sea.

In 1829 Captain Henry Foster, R.N., in H.M.S. " Chanti- cleer " spent some months in the South Shetlands carrying on pendulum and gravity observations at the most southerly harbour that could be found, and though he did not go south of 63 50′ S. the careful observations which were made threw much light on the physical conditions of the Antarctic regions.

*The firm of Enderby Brothers of London took a conspicuous part in the exploration of the Antarctic seas during the first Blscoe * our decades of the 19th century. They encouraged the masters of the whaling and sealing craft which they sent to the southern seas to take every opportunity that offered for exploration and to fix the position of any land seen with the greatest possible accuracy. The voyage of the Enderbys' brig " Tula," under*

the command of John Biscoe, R.N., with the cutter " Lively " in company, is worthy to rank with Cook's and Bellingshausen's expeditions, for it repeated and advanced upon their achievements with a mere fraction of their resources. Biscoe, who apparently had never heard of Bellingshausen's discoveries, was a keen explorer and a man given to thinking over and reasoning upon all that he saw, and in many of his conclusions he was far in advance of his time. At the beginning of January 183 1 Biscoe, who had been hunting vainly for seals on the Sandwich group, started on a voyage easterly to look for new islands, and in trying to get south of 6o° S. he had to coast the impenetrable ice-pack as far as io° W., and continuing he got within the Antarctic Circle in i° E. on a track parallel to that of Bellingshausen but farther east. Contrary winds delayed the little vessels, no seal-bearing lands were to be found, but in spite of difficulties, constant danger from fogs and icebergs, and disappointed crews he held on eastward for five weeks far to the south of Cook's track, and, except at one or two points, to the south of Bellingshausen's also. Though his highest latitude was only 69° S. in io° 43′ E. on the 28th of January, he remained south of the Antarctic Circle, or within a few miles of it, for another month, when, in longitude 49 18′ E., he was rewarded by the discovery of land. But just as he was entering on a clear lead of water running straight for a promontory which he named Cape Ann, a terrific storm descended on the vessels, damaged them seriously and drove them helpless before it with the driving ice. A fortnight's struggle with the wind and ice brought Cape Ann into sight again on the 16th of March, but the weather was not to be conquered, the sea was beginning to freeze and half the crew were helpless with the effects of exposure, so Biscoe was compelled to give up the fight and reluctantly let the land — now known as Enderby Land — drop out of sight astern. With only three men able to

stand, Biscoe brought the " Tula " into Hobart Town, Tasmania, and the " Lively," with only the master, one man, and a wounded boy alive, just escaped shipwreck in Port Philip Bay. After recruiting their health and completing their crews the two captains put to sea again and spent some time in sealing on the shores of New Zealand and neighbouring islands. They started south once more, and crossed 6o° S. in 13 1° W. on the 28th of January 1832. Biscoe kept between 6o° and the Antarctic Circle, north of Bellingshausen's route, for he dared not risk the lives of his second crew, but he got south to 67° S. in 72 W., and here, on the 14th of February, he again sighted land, which, in ignorance of Bellingshausen's discoveries in the same region, he believed was the most southerly land yet known. He named it Adelaide Land after the queen. A few days later he passed a row of low ice-covered islands— the Biscoe Islands — running from W.S.W. to E.N.E. Beyond these islands lay the mountains of an extensive land of which Biscoe took possession in the name of King William IV., and to

which the name of Graham Land was subsequently given. Biscoe returned home after an arduous two months' sealing in the South Shetlands, and the splendid results of his relentless determination as an explorer won for him the gold medals of the young Geographical Societies of London and Paris.

In 1833 another of Enderbys' captains named Kemp reported the discovery of land in 66° S. and 6o° E. about io° east of Enderby Land. The last of the great voyages of Balleny. exploration due to Enderby Brothers was the cruise of the " Eliza Scott " under the command of John Balleny, with the cutter " Sabrina " in company. This voyage is interesting because it was the first attempted in high latitudes from east to west, and all those made in the opposite direction had suffered much from the buffetings of head winds. Balleny left Campbell Island south of New Zealand on the 17th of January 1839 and crossed the Antarctic Circle in 178° E. on the 29th. Heavy pack ice stopped him in 69 S., a higher latitude than had previously been reached in that region. On the 9th of February, after the little vessels had been working north-westward along the edge of the pack ice for more than a week, land was seen and found to be a group of mountainous islands — the Balleny Islands — one of which rose to a height of 12,000 ft., and another was an active volcano. Captain Freeman of the " Sabrina " made a momentary landing on one of the islands and was nearly drowned in the attempt, but secured a few stones which showed the rocks to be volcanic. The vessels held on their way westward between latitudes 63 and 65 S., far south of any earlier voyager, and land, or an appear- ance of land, to which the name of the " Sabrina " was given, was reported in 121 E. In 103 40′ E. an iceberg was passed with a rock embedded in the ice, clear proof of land existing to the south- ward. A few days later the " Sabrina " was lost in a gale, but Balleny returned in safety.

About 1835 the importance of obtaining magnetic observations in the far south, and the scientific interest of the study of the south polar regions led to plans being put forward for expeditions in the United States, France and Great D'Urville. Britain. The French were first in the field; an expe- dition, equipped in the frigates " Astrolabe " and " Zalee " under Jules Dumont D'Urville for ethnographical research in the Pacific Islands, was instructed to make an attempt to surpass Weddell's latitude in the South Atlantic Ocean, and this D'Urville tried to do with conspicuous ill-success, for he never reached the Ant- arctic Circle though he spent the first two months of 1838 round the edge of the ice-pack south of the South Shetlands and the South Orkneys. Some portions of the land south of the South Shetlands were charted and named Joinville Island and Louis Philippe Land; but the addition to knowledge was not great. Two years later, after fulfilling the main purpose of his expedition in the Pacific, D'Urville resolved for the glory of France to attempt to reach the Magnetic Pole, towards which he was aware that a British and an American expedition were directing their

course. He left Hobart Town on the 1st of January 1840, and on the 20th he crossed the 66th parallel in 140 E. and discovered land 3000

or 4000 ft. high, which he named Adelie Land and took posses- sion of by landing on a rocky islet off the icebound coast. Ten days later in 64°3o' S. D'Urville cruised westward along a high ice-barrier, which he believed to be connected with land, from longitude 13 1° E. and he named it the Clarie Coast. A few days later he left the Antarctic regions for the Pacific.

As early as 1836 the United States Congress had authorized an American Exploring Expedition in the programme of which Antarctic exploration had a leading place. Lieut. Charles Wilkes was appointed to command the expedition of five vessels in August 1838, and his instructions, dated in that month, required him amongst other things (1) to follow Weddell's route as far as possible, (2) to visit the most southerly point reached by Cook in the Antarctic, and (3) to make an " attempt to penetrate within the Antarctic region, south of Van Diemen's Land, and as far west as longitude 45 E., or to Enderby Land." The ships were in bad repair and ill-adapted for navigation in the ice, and many of the officers were not devoted to their chief; but in spite of great difficulties Wilkes fulfilled his programme. In following Weddell's route Wilkes in March 1839 fared no better than D'Urville in the previous year, but the " Flying Fish " of 96 tons under Lieutenant Walker reached 70 S. in 105 W., thus nearly reaching Cook's position of 1774. The third item of the Antarctic programme was made the subject of the most strenuous endeavour. Wilkes sailed from Sydney in the " Vincennes " on the 26th of December 1839, accompanied by the " Peacock " under Lieut. William L. Hudson, the " Porpoise " under Lieut. Cadwaladar Ringgold, and the " Flying Fish " under Lieut. Pinkney. They went south to the west of the Balleny Islands, which they did not see, and cruised westward along the ice-barrier or as near it as the ice-pack allowed towards Enderby Land nearly on the Antarctic Circle. The weather was bad with fogs, snowstorms and frequent gales, and although land was reported (by each of the vessels') at several points along the route, it was rarely seen distinctly and the officers were not agreed amongst themselves in some cases. Unfortunate controversies have arisen at intervals during sixty years as to the reality of Wilkes's discoveries of land, and as to the justice of the claim he made to the discovery of the Antarctic continent. Some of the land claimed at the eastern end of his route has been shown by later expeditions not to exist; but there can be no doubt that Wilkes saw

land along the line where Adelie Land, Kemp Land and Enderby Land are known to exist, even if the positions he assigns are not quite accurate. No one, however, could establish a claim to the discovery of a continent from sighting a discontinuous chain of high land along its coast, without making a landing. It seems no more than due to a gallant and much-persecuted officer, who did his best in most difficult circumstances, to leave the name of Wilkes Land on the map of the region he explored.

Unlike the other two expeditions, that equipped by the British government in 1839 was intended solely for Antarctic exploration and primarily for magnetic surveys in the south polar seas. There were two ships, the " Erebus " of 370 tons, and the " Terror " of 340, stoutly built craft specially strengthened for navigation in the ice. Captain James Clark Ross, R.N., was in command of the " Erebus " and of the expedition; Commander Francis Rawdon Moira Crozier of the " Terror." A young surgeon, Joseph Dalton Hooker, joined the Royal Navy in order to go on the expedition, and he lived to take a keen interest in every subsequent Antarctic expedition down to that of Captain Scott in 1910. Ross had intended to make straight for the meridian of the Magnetic Pole, but, finding that D'Urville and Wilkes had already entered on those seas he deter- mined to try to make a high latitude farther east, and leaving Hobart Town on the 12th of November 1840 he crossed the Antarctic Circle on the 1st of January 1841 and entered the pack ice on the 5th in 174 E. Instead of proving an impenetrable obstacle, the pack let the two ships work through in five days, and they emerged into open sea. Sailing towards the Magnetic Pole they found a chain of great mountains rising from a coast which ran due south

from a prominent cape (Cape Adare) in 71 S. The continent was taken formal possession of for Queen Victoria by landing on Possession Island, the mainland being inaccessible, and the ships continued southward in sight of the coast of Victoria Land, where the loftiest mountain was named Mt Melbourne after the Prime Minister, until the twin volcanoes named Erebus and Terror were sighted in 78 S. on the 28th of January. From Cape Crozier, at the base of the mountains, a line of lofty cliffs of ice ran east- wards, the great ice-barrier, unlike any object in nature ever seen before, rising perpendicularly from the water to the height of 200 or 300 ft. and continuing unbroken for 250 m. Along the barrier the highest latitude of 78° 4′ S. was attained, and the farthest point to the east was 167 W., whence Ross turned to look for a winter harbour in Victoria Land. Being desirous to winter near the South Magnetic Pole, Ross did not explore McMurdo Bay between Mt Erebus and the north-running coast, where, as we now know, a harbour could have been found, and as he could not reach the land elsewhere on account of ice extending out from it for 15 or 16 m., after sighting the Balleny Islands at a great distance, on the 2nd of March

the ships returned to Hobart. This was the most remarkable Antarctic voyage for striking discoveries ever made.

In November 1841 the " Erebus " and " Terror " returned to Antarctic waters, steering south-east, from New Zealand and entering the ice-pack in about 60° S. and 146° W., the idea being to approach the great barrier from the eastward, but by the end of the year they had just struggled as far as the Antarctic Circle and they, together with the pack, were several times driven far to the northward by heavy gales in which the ships were at the mercy of the floating ice. During a storm of terrible severity on the 1 8th of January the rudders of. both ships were smashed, and not until the 1st of February did they break out of the pack in 67 29′ S., 159° W. The barrier was sighted on the 22nd and the ships reached 78° 10′ S. in 161 27′ W., the highest latitude attained for 60 years. To the eastward the barrier surface rose to a mountainous height, but although Ross believed it to be land, he would only treat it officially as " an appearance of land," leaving the confirmation of its discovery as King Edward Land to the next century. No more work was done in this quarter; the " Erebus " and " Terror " turned the edge of the pack to the northward and on getting into clear water sailed eastward to Cape Horn, meeting the greatest danger of the whole cruise on the way by colliding with each other at night while passing between two icebergs in a gale.

After wintering in the Falkland Islands and making good the damage received, Ross made his third and last attack on the southern ice, and for six weeks he cruised amongst the pack off Joinville Island and Louis Philippe Land trying in vain to reach the Antarctic Circle. Failing in this attempt he turned to follow Weddell's route and skirted the pack eastward in 65 S., crossing Weddell's track on the 14th of February 1843, more than a degree farther south than D'Urville in his attempt four years before, but on the edge of an equally impenetrable pack. Coasting it eastward to 12 W. the " Erebus " and " Terror " at last rounded the pack and found the way open to the south, crossing the circle on the 1st of March. Four days later the pack was met with again and the ships were forced into it for 27 miles to latitude 71 30′ S. in 14° 51′ W., nineteen degrees east of Weddell's farthest south. No sign of land was seen, a deep-sea sounding showed 4000 fathoms with no bottom, and although this was a mistake, for the real depth was later proved by Dr Bruce to be only 2660 fathoms, it showed at least that there was no land in the immediate neighbourhood.

This was Ross's last piece of Antarctic work, but the magnetic observations of his expedition were continued by Lieut. T. E. L. Moore, R.N., in the hired barque " Pagoda," which left Simon's Bay in January 1845 and proceeded south-east, crossing the Antarctic Circle in 30 45′ E. and reaching a farthest south of 67 50', nine degrees farther east. An attempt

to reach Enderby I Land was frustrated by the weather, and Moore continued his

voyage to Australia in a high latitude beating against contrary gales, a condition to which all previous experience pointed as likely to occur.

No further attempt at South Polar exploration was made for nearly thirty years, except a short cruise by Mr Tapsell in the ” Brisk,” one of Enderby’s ships which in February 1850, after passing the Balleny Islands, proceeded eastward to 143 E. at a higher latitude than Wilkes without sighting land. The first steamer to cross the Antarctic Circle was H.M.S. ” Challenger,” on the 16th of February 1874: she only penetrated to 66° 40′ S., in 78° 30′ E., south of Kerguelen Land; but she continued her course to Australia for some distance in a high latitude, passing within 15 m. of the position assigned to Wilkes’s Termination Land without seeing any sign of land. Her dredgings and soundings yielded evidence as to the~nature of the unknown region farther south. Sir John Murray believed that the soundings showed a general shoaling of the ocean towards the Antarctic ice, indicating the approach to a continent. By collect- ing and analysing all samples of deep-sea deposits which had been secured from the far south, he discovered a remarkable symmetry in the arrangement of the deposits. The globigerina ooze, or in deeper waters the red clay, carpeting the northern part of the Southern Oceans, merges on the southward into a great ring of diatom ooze, which gives place in turn, towards the ice, to a terrigenous blue mud. The fine rock particles of which the blue mud is composed are such as do not occur on oceanic islands, and the discovery of large blocks of sandstone dropped by icebergs proved the existence of sedimentary rocks within the Antarctic Circle.

During the southern summer in which the ” Challenger ” visited Antarctic waters, a German whale-ship, the ” Gronland,” D .. under Captain Dallmann, visited the western coast

of the Antarctic land south of Tierra del Fuego, and modified the chart in several particulars. The chief discovery was a channel, named Bismarck Strait, in 65 S., which seemed to run between Palmer Land and Graham Land.

When the International Circumpolar observations were set on foot in 1882, two scientific stations’ were maintained for a year in the southern

hemisphere in order to obtain data for comparison with the observations at twelve stations round the North Pole. One of these was occupied by French observers in Tierra del Fuego in 55 S., the other by German observers at Royal Bay on South Georgia in 54° 30′ S. The magnetic and meteorological observations were of considerable importance.

In 1892 four steamers of the Dundee whaling fleet — the " Balaena," " Active," " Diana " and " Polar Star " — went out to test Ross's statement that the " right whale " inhabited Antarctic waters. The surgeons of two of the vessels — on the " Balaena " Dr W. S. Bruce, on the "Active" Dr C. W. Donald — were selected for their scientific tastes, and equipped with all requisite instruments for observations and collecting. The result of the experiment was disappointing. No whales were obtained, and the ships devoted their attention to sealing on the east of Joinville Island and Louis Philippe Land, not going farther south than 65° S. (Geographical Journal, 1896, vii.

502-521, 625-643).

A Norwegian sealer, the " Jason," Captain Larsen, also visited those seas in the same season, but the captain landed and collected , fossils at several points north of 65 S. In 1893-1894

the " Jason," accompanied by two other Norwegian vessels,the " Hertha " and the " Castor," returned to the Antarctic and entered the ice-laden waters in November at the very begin- ning of summer. Captain Larsen in the " Jason " made his way as far south as 68° 10′ in 6o° W. on the eastern side of Graham Land, but several miles from the coast, which was bordered by a high ice-barrier. The land beyond this barrier was named Foyn Land, after a famous Norwegian whaleship owner. Returning northwards, two small islands, Lindenberg and Christensen, were discovered and found to be active volcanoes. Meanwhile the " Hertha," Captain Evensen, had reached the South Shetlands on the 1st of November 1893, and worked her way southward along the west side of Palmer Land and past the Biscoe Islands,

reaching the Antarctic Circle on the 9th of November without meeting ice. This was the first time the Antarctic Circle had been crossed since the " Challenger " did so twenty years before. Captain Evensen sighted Alexander Land, and without exper- iencing any trouble from ice-floes he reached his farthest south, 69° 10′ S. in 76° 12′ W. (Mitteilungen der Geographischen Gesell- schajt, Hamburg, 1895, pp. 245-304).

In 1894 the well-known Norwegian whaler, Svend Foyn, sent out one of his vessels, the " Antarctic, " Captain Christensen. to try his luck off the coast

of Victoria Land. The " Antarctic " sailed from Melbourne in September, v i akp \gg 4i having on board Carstens Egeberg Borchgrevink, a young Norwegian resident in Australia, who, being determined to take part in a voyage he could join in no other way, shipped as an ordinar seaman. He made notes of the voyage, and published an account of it on his return to Europe (Report of Sixth Inter- national Geographical Congress, London, 1895, pp. 169-175). The " Antarctic " entered the pack in 62 45′ S., 171° 30′ E., on the 8th of December 1894. The Balleny Islands were sighted on the 14th of December, and Cape Adare on Victoria Land two days later. On the 22nd of January 1895 the farthest point was reached at Coulman Island in 74° S.; the sea was then easily navigable to the south. On the 23rd of January a small party, including the captain and Mr Borchgrevink, landed on the mainland near Cape Adare, the first people to set foot on the Antarctic continent.

Efforts had been made from time to time, by Professor Georg von Neumayer in Germany and by Sir John Murray and others in Great Britain, to induce learned societies to in- augurate a new era of scientific Antarctic research «Betzica'." under Government or at least under national auspices. In 1895 Sir Clements Markham, as president of the Royal Geo- graphical Society and of the International Geographical Congress, also took the matter up, and interest in the Antarctic regions began to be aroused in every civilized country. Captain Adrien de Gerlache organized and led a Belgian expedition, for which he raised the funds with difficulty. M. Georges Lecointe, captain of the " Belgica," and Lieut. Danco, magnetic observer, were Belgians; Mr Roald Amundsen, the mate, a Norwegian; M. Arctowski, the geologist and physicist, a Pole; M. Racovitza, the biologist, a Rumanian; and Dr F. A. Cook, the surgeon, an American. On the 14th of January 1898, already long past mid- summer, the " Belgica," left Staten Island for Antarctic waters. She sighted the South Shetlands on the 21st and proceeded to Hughes Gulf, from which a channel, Gerlache Strait, was explored leading south-westward between continuous land, named Danco Land, on the east (the northern extension of Graham Land), and Palmer Land on the west. Palmer Land was found to be a group of large islands. On the 12th of February the " Belgica " re- entered the open sea to the west at Cape Tuxen in 65 i$' S. Much fog was experienced, but on the 16th Alexander Land was sighted in the distance. Continuing on a westerly course, the " Belgica " made every effort to enter the pack, which was successfully accomplished after a heavy storm on the 28th. By taking advantage of the leads, the expedition advanced to 71° 30′ S. in S5 15′ W. by the 2nd of March, but the ship was blocked next day by the growth of young ice soldering the pack into one continuous mass. For more than a year further inde- pendent movement was impossible; but the ship drifted with the ice between the limits of 80° 30′ W. and 102 ro' W., and of 69

40′ and 71 35′ S., which was the highest latitude attained (May 31, 1898). The sun did not rise for seventy days, and all on board suffered severely from depression of spirits and disorders of the circulation, which Dr Cook attributed to the darkness and to improper food. Lieut. Danco died during the period of darkness. On the 13th of March 1899, when a second winter in the ice began to seem probable, the " Belgica " was released in 69° 50′ S. and 102 10′ W. The geographical results of this expedition were insignificant so far as the dis- covery of land or penetration to a high latitude is. concerned. The ship passed several times to the south and west of Peter I. Island, proving that the land seen by Bellingshausen at that

point is of very limited extent. During the drift in the ice the soundings were usually between 200 and 300 fathoms, which, compared with the great depths to the north, clearly indicated a continental shelf of considerable breadth, probably connected with land in the south. The scientific collections were of unique value and have been worked up and the results published at the expense of the Belgian government.

The Hamburg America Company's steamer " Valdivia," chartered by the German Government for a scientific voyage ••valdivia " un d er tne leadership of Professor Carl Chun of Leip- zig, with Dr Gerhard Schott as oceanographer.left Cape Town on the 13th of November 1898, and on the 25th was fortunate in rediscovering Bouvet Island (54° 26′ S., 3° 24′ E.), which had been searched for in vain by Cook, Ross, Moore and many other sailors. Steering south, the " Valdivia," although an unprotected steel vessel, followed the edge of the pack from 8° E. to 58° E., reaching 64° 15′ S. in 54° 20′ E. on the 16th of December. At this point a depth of 2541 fathoms was found, so that if Enderby Land occupies its assigned position, 102 nautical miles farther south, the sub-oceanic slope must be of quite unusual steepness. The rocks dredged up contained specimens of gneiss, granite and schist, and one great block of red sandstone weighing 5 cwt. was secured, confirming the theory of the continental nature of the land to the south.

On his return to England in 1895 Mr Borchgrevink made strenuous efforts to organize an Antarctic expedition under his own leadership, and in August 1898 he left the Wnfc, W98. Thames on the " Southern Cross," in charge of a private expedition equipped by Sir George Newnes. His scientific staff included Lieut. Colbeck, R.N.R.; Mr Louis Bernacchi, a trained magnetic observer, and Mr N. Hanson, biologist. About fifty dogs were taken out, the intention being to land at Cape Adare and advance

towards the magnetic, and perhaps also towards the geographical pole by sledge. The " Southern Cross " sighted one of the Balleny Islands on the 14th of January 1899, and after in vain attempting to get south about the meridian of 164 E., the ship forced her way eastward and emerged from the pack (after having been beset for forty-eight days) in 70 S., 174 E. She reached Cape Adare, and anchored in Robertson Bay on the 17th of February. The land party, con- sisting of ten men, was established in a house built on the strip of beach at the base of the steep ascent to the mountains, and the ship left on the 2nd of March. Mr Borchgrevink found it impos- sible to make any land journey of importance and the party spent the first year ever passed by man on Antarctic land in making natural history collections and keeping up meteorological and magnetic observations. The " Southern Cross " returned to Cape Adare on the 28th of January 1900, and after taking the winter party on board — diminished by the death of Mr Hanson — set out for the south on the 2nd of February. Landings were made on several islands, on the mainland at the base of Mt Melbourne, and on the 10th of February at the base of Mt Terror, near Cape Crozier. From this point the ship steamed eastward along the great ice-barrier to a point in 164 10′ W., where an inlet in the ice was found and the ship reached her highest latitude, 78° 34′ S., on the 17th of February. The edge of the ice was found to be about 30 m.. farther south than it had been when Ross visited it in 1842. Mr Borchgrevink was able to land on the ice with sledges and dogs, and advanced southward about 16 m., reach- ing 78 50′ S. He discovered that plant life existed in the shape of mosses and lichens in some of the rocky islands, a fact not previously known.

In the autumn of 1901 three well-equipped expeditions left Europe for Antarctic exploration. The British National Ant- arctic expedition was organized by a joint committee of the Royal Society and the Royal Geographical Society, and equipped under the superintendence of Sir Clements Markham. Most of the cost was borne by the government, the rest mainly by Mr L. W. Longstaff, who provided £30,000, the Royal Geographical Society, and Mr A. C. Harmsworth (afterwards Lord Northcliffe). A strong wooden ship of about 700 tons register (1700 tons dis- placement) was built at Dundee, and named the " Discovery."

She was made entirely non-magnetic amidships, so that magnetic observations might be carried on without interference from local attraction. The expedition sailed under •fo°sc' reiy." the command of Commander R. F. Scott, R.N., with Lieut. Albert Armitage, R.N.R., as second in command, Lieuts. Royds and Barne, R.N., Lieut. Shackleton, R.N.R., and Engineer-Lieut. Skelton, R.N. The crew of forty men were almost entirely sailors of the Royal Navy. The scientific staff included Dr Koettlitz, who had shared with Mr Armitage in the Jackson-Harmsworth arctic expedition; Mr Louis

Bernacchi, who had wintered with Mr Borchgrevink at Cape Adare; Dr E. A. Wilson, Mr Hodgson, biologist, and Mr Ferrar, geologist. The " Discovery " sailed from New Zealand on the 24th of December 1901, met the pack ice on the Antarctic circle and was through into the open sea in 175° E. on the 8th of January 1902. She made a quick run to Cape Crozier and cruised along the great ice barrier, confirming Borchgrevink's discovery that it lay 30 m. farther south than in 1842, and at the eastern end of the barrier Scott discovered and named King Edward Land where Ross had recorded an " appearance " only. The sea in the neighbourhood had shoaled to less than 100 fathoms and the ice-barrier in places was so low that the " Discovery " was able to lie alongside as at a quay. A captive balloon ascent was made from the barrier but nothing was seen to the south. Returning to McMurdo Bay the "Discovery" found that Mts Erebus and Terror were on an island, the " bay " being really a sound. The ship was secured in winter quarters in 77° 49′ S. 166° E., and a hut erected on shore. From this base land-exploration in the Antarctic was initiated, and the history of exploration entered on a new phase. Although some symptoms of scurvy appeared during the winter they were checked by change of diet, and with the beginning of spring sledge journeys with dogs were commenced and a quantity of provisions was laid down in depots to assist the great journey which Scott had planned to the south. On the 2nd of November 1902 Captain Scott, with Lieut. E. H. Shackleton and Dr E. A. Wilson, set out with dog-sledges travel- ling south over the surface of the barrier in sight of a range of new mountains running parallel to their track on the west. The conditions of travelling were unlike those in the Arctic region, the weather being more inclement and the summer temperature much lower than in similar latitudes in the north. There were no bears to menace the safety of the travellers, and no wolves or foxes to plunder the depots; but on the other hand there was no game of any sort to be met with, and all food for men and dogs had to be carried on the sledges. The surface of the ice was often rough and much crevassed, especially near the western land, snow blizzards frequently occurred making travelling impossible and the heavy sledges had at first to be brought forward by relays, making it necessary to march three miles for every mile of south- ing made. The dogs also weakened and had to be killed one by one to feed the rest. On the 30th of December they were in 82 17′ S. and Scott determined to try to reach the mountains to the west; but on approaching the land he found the ice so much crevassed and disturbed that the attempt had to be given up. Great peaks in 83 S. were named Mt Markham (15,100 ft.) and Mt Longstaff (9700 ft.) after the chief promoters of the expedition. The outward journey of 380 m. had taken 59 days, and was a splendid achievement, for the conditions to be encountered were totally unknown, and new methods had to be devised as the necessity arose, yet no previous polar explorer had ever advanced so far beyond his

predecessor as Scott did. The return journey occupied 34 days and the ship was reached on the 3rd of February 1903, but Shackleton had broken down on the way and he had to return by the relief ship " Morning " on the 3rd of March, Lieut. Mulock, R.N., taking his place on the " Discovery." During the absence of the commander in the great southern journey Armitage and Skelton had found a way to ascend by a glacier in 78 S. to the summit of the vast snow-covered plateau beyond the granite summits of the western mountains. They reached a dis- tance of 130 m. from the ship and an elevation of 9000 ft. Many shorter journeys were made; Ferrar studied the geology of the

mountains and Hodgson was indefatigable in collecting marine fauna, while Bernacchi kept up the physical and meteorological observations. The second winter was lightened by the use of acetylene gas for the first time, and the dark months were passed in better spirits and better health than in the case of any previous polar wintering. In the spring of 1903-1904 Scott undertook a great journey on the western plateau, starting on the 26th of October without dogs. By the 30th of November he had reached a point on the featureless plateau of dead-level snow, 300 m. due west from the ship, the position being 77 59′ S., 146 33′ E. and 9000 ft. above sea-level. The ship was reached again on the 25th of December, and on the 5th of January the " Morning " arrived accompanied by a larger vessel, the " Terra Nova," sent out by the Admiralty with orders to Captain Scott to abandon the " Discovery " and return at once. Fortunately, although all the stores and collections had been transferred to the relief ships, the " Discovery " broke out of the ice on the 16th of February 1904 and Captain Scott had the satisfaction of bringing her home in perfect order. The relief ships bad provided so little coal that a most promising voyage to the westward of the Balleny Islands had to be abandoned in 155° E.;but it showed that the land charted by Wilkes east of that meridian did not exist in the latitude assigned.

Simultaneously with the " Discovery " expedition and in full co-operation with it as regards simultaneous meteorological and Drygalski; magnetic observations, the German government ••Qauss." equipped an expedition in the " Gauss " which was specially built for the occasion. The expedition was under the charge of Professor Erich von Drygalski and the scientific staff included Professor Vanhoffen as naturalist, Dr Emil Philippi as geologist and Dr Friedrich Bidlingmaier as meteorologist and magnetician. The ship was under the command of Captain Hans Ruser cf the Hamburg-American line. A supplementary expedi- tion set up a station for

simultaneous observations on Kerguelen Land. The " Gauss " crossed the parallel of 60° S. in 92 E. early in February 1902 and got within 60 m. of the charted position of Wilkes's Termination Land, where a depth of 1730 fathoms was found with no sign of land. The pack made it necessary to turn south-westward and land was seen to the east- ward on February 1902 on the Antarctic Circle in the direction of Termination Land. Soon afterwards the " Gauss " was beset and spent the winter in the ice. Land of considerable extent was seen to the south and was named Kaiser Wilhelm II. Land; the most conspicuous feature on it was a hill of bare black rock with an elevation of about 1000 ft., which was called the Gaussberg, and was situated in 67 S., 90° E. This was the only bare land seen, and its neighbourhood was thoroughly investi- gated by sledge parties, but no distant journey was undertaken. In February 1903 the " Gauss " was freed from the ice; but although Drygalski struggled for two months to thread the maze of floes to the eastward and south he could gain no higher latitude and was able to force his way only to 80° E. before seeking the open sea. The scientific observations and collections were most extensive and of great value.

Two private expeditions organized by men of science were in the Antarctic region simultaneously with the British and Nordeosk- German national expeditions, and the synchronous /old. meteorological and magnetic observations added

to the value of the scientific results of all the parties. Dr. Otto Nordenskjold, nephew of the discoverer of the North-East Passage, led a Swedish party in the " Antarctic," with Captain C. A. Larsen in command of the ship, and reached the South Shetlands in January 1902, afterwards exploring on the east side of Joinville Island and Louis Philippe Land, and wintering on shore on Snow Hill Island in 64 25′ S. From this point a long journey on ski over the flat sea ice bordering King Oscar Land was made to the south, but the Antarctic Circle was not reached. Meanwhile the " Ant- arctic " had succeeded in penetrating the pack in the Weddell Sea almost to the circle in 50 W., where D'Urville and Ross had failed to get so far south. A second winter was spent at the base on Snow Hill Island, and, the ship having been

lost in the ice on her way to take them off, the party was rescued by a brilliant dash of the Argentine gunboat " Uruguay," under Captain Irizar, before the relief ship sent from Sweden arrived.

Meanwhile Dr W. S. Bruce, largely aided financially by Mr James Coats and Captain Andrew Coats, equipped a Scottish expedition in the " Scotia," with Captain Thomas Robertson in command of the ship, and a scientific staff including Mr R. C. Mossman as meteorologist, Mr R. N. Rudmose

Brown as naturalist, and Dr J. H. H. Pirie as geologist. The principal object of the expedition was the exploration of the Weddell Sea. The " Scotia " sighted the South Orkneys on the 3rd of February 1903, and after a short struggle with the pack she found an open sea to 70° 25′ S., where she was beset on the 22nd in 18° W., and whence she returned by a more westerly course, re- crossing the Antarctic Circle in 40° W. This important voyage midway between the tracks of Weddell and Ross, who alone of all who tried had reached 70 S. in this region, pracr cally demonstrated the navigability of Weddell Sea in favour- able conditions, and the oceanographical observations made were the most valuable yet carried out in the Antarctic region. The following year, starting from the Sandwich group, Bruce crossed the Antarctic Circle about 22 W., and was able to make a straight run south to 74 1′ S., where the " Scotia " was stopped by the ice in 159 fathoms of water, the sea having shoaled rapidly from a great depth. From the 3rd of March to the 13th the " Scotia " remained in shallow water, catching occasional glimpses of a great ice wall with snow-covered heights beyond it, along a line of 150 m., and dredging quantities of continental rocks. On this evidence the name Coats Land was given to the land within the barrier. The " Scotia " crossed the Antarctic Circle northward in 11° W., having in the two years explored a totally unknown sea for a distance of thirty degrees of longitude. A meteorological station was established by Mr Mossman on Laurie Island, in the South Orkneys (6i ° S.) in March 1903, and kept up by him for two years, when it was taken over by the Argentine govern- ment, and it now has the distinction of being the most southerly station at which continuous observations have ever been taken for over five years.

In January 1904 Dr Jean B. Charcot, a man of science and

an accomplished yachtsman, left the Fuegian archipelago for

*the Antarctic in the " Francais," in command of a „ u _ * t, , , ... , , . Charcot.*

French exploring expedition equipped at his own

instance. He cruised through the islands of the Palmer Archipelago, and wintered in a cove of Wandel Island 65 5′ S. near the southern entrance of Gerlache Strait. On the 25th of December 1904 the " Francais " was free, and continued to cruise southward along the coast of Graham Land, to the south of which, on the 15th of January, when nearly in latitude 67°, a new coast appeared, mountainous and stretch- ing to the south-west, but Charcot could not determine whether it was joined to Graham Land or to Alexander Land. While approaching the land the " Francais " struck a rock, and was so much damaged that further exploration was impossible,

and after naming the new discovery Loubet Land, the expedition returned. Charcot organized a second expedition in 1908 on board the " Pourquoi Pas?" and, leaving Punta Arenas in December, returned to the Palmer Archipelago, and during January 1909 made a detailed examina- tion of the coast to the southward, finding that Loubet Land was practically continuous on the north with Graham Land and on the south with Alexander Land, which was approached within a mile at one point. Adelaide Island, reported by Biscoe as 8 m. long, was found to be a large island 70 m. in length, consisting of a series of summits rising out of an icefield. The Biscoe Islands were found to be much more numerous than was formerly supposed. The expedition wintered at Petermann Island in 65 10′ S., and attempts were made to reach the interior of Graham Land, though with little success. After coaling from the whalers' depdt at Deception

Island, the "~ Pourquoi Pas ? " sailed on the 6th of January ioio to the south-west, and reached 70 S. on the nth, whence views of Alexander Land were obtained from a new position, and a new land discovered farther to the south-west. The highest latitude reached was about 70 30′ S., and Charcot was able to steam westward nearly along this parallel crossing the region of the " Belgica's " drift, passing close to Peter I. Island across the meridian of Cook's highest latitude, where the ice seemed to promise an easy way south if coal had permitted, and on to 128 W. through an absolutely unknown sea, from which point a direct course was made for Punta Arenas. Frequent soundings and dredgings were made, and Dr Charcot satisfied himself from all the appearances that along the 20 degrees of longitude west of Gerlache's farthest, and more than half-way from Graham Land to King Edward Land, land was probably not far distant to the south.

After his return invalided from the " Discovery," Lieut. Shackleton planned a fresh expedition, which he equipped at stackletoa. ˆ s own ex P ense > aided by his personal friends, and he started in the small whaler " Nimrod " from Lyttelton, New Zealand, on the 1st of January 1908, being towed by a steamer to the Antarctic Circle, in order to save coal. The plan was to land a shore party on King Edward Land and return to take them off in the following year, but although a strenuous effort was made to reach the land the floe ice was too heavy, and it would have been madness to establish winter-quarters on the barrier, the coast-line of which had altered greatly since 1902, and was obviously liable to break off in great ice-islands. On the 26th of January the " Nimrod " began to return from the extreme east

of the barrier, and the landing of stores commenced on the 3rd of February at Cape Royds, at the base of Mt Erebus, 20 m. north of the " Discovery's " winter-quarters. The shore party in- cluded the leader and fifteen companions, amongst them Professor T. W. Edgeworth David, of Sydney University; Lieut. Jameson Boyd Adams, R.N.R.; Sir Philip Brockle- hurst, Bart.; Mr James Murray, biologist; Mr Raymond E. Priestley, geologist; Dr Aiistair Forbes Mackay; Dr Eric Marshall; Mr Douglas Mawson, geologist; and Ernest Joyce and Frank Wild of the Royal Navy, who had taken part in the " Discovery " expedition. No casualty occurred during the whole duration of the expedition, special care having been taken to supply the best provisions, including fresh bread baked daily and dried milk in unlimited quantity, while abundant artificial light was secured by the use of acetylene gas. A motor-car was taken in the hope that it might be used on the barrier surface, but this was found impracticable, although it did good work in laying depots on the sea-ice. Another and more successful experiment in traction was the use of Manchurian ponies. Eight of these extraordinarily hardy creatures were taken south in the " Nimrod," but four died in the first month after landing. The others did good service. Nine dogs were also taken, but the experience on the " Discovery " expedition did not lead to much dependence being placed on them. The " Nimrod " left for the north on the 22nd of February and the scientific staff at once began the observations and collections which were kept up to the end. The discovery of a considerable fresh-water fauna and of a poor but charac- teristic flora was one of the most unexpected results. Apart from many minor excursions and surveys, the expedition performed three journeys of the first importance, each of them surpassing any previous land work in the Antarctic regions. Before winter set in, Professor David, with five companions, made the ascent of Mt Erebus, starting from the winter quarters on the 5th of March, and gaining the summit at an altitude of 13,300 ft. on the 10th; this was found to be the edge of an active crater, the abyss within being 900 ft. deep, though rarely visible on account of the steam and vapours which rose in a huge cloud 1000 ft. above the summit.

The second achievement was the attainment of the South Magnetic Pole by Professor David, with Mr Douglas Mawson and Dr Mackay. They left winter-quarters on the 6th of October

1908, dragging two sledges over the sea-ice. Proceeding along the coast they were able to supplement their provisions and fuel by seal-meat and blubber, and on the 1st of December they reached the Drygalski ice barrier in 75 S., which proved very difficult to cross. Leaving this ice-tongue on the 19th, they proceeded to ascend the plateau with one sledge, and ran great risks from the crevasses into which they were constantly fall- ing. On reaching the summit of the plateau travelling became easier, and on the 16th of January 1909 the magnetic dip was 90 , and the position of the

magnetic pole was deter- mined as 72 25′ S., 155° 16′ E., at an altitude of 7260 ft. and 260 m. from the depot of provisions left at the Drygalski glacier. The return journey to this point was accomplished by forced marches on the 3rd of February, and next day the party was picked up by the " Nimrod," which was scouting for them along the coast.

The third and greatest achievement of this remarkable ex- pedition was Shackleton's great southern journey. Dep6ts had been laid out in advance on the barrier ice, and the main southern party, consisting of Messrs Shackleton, Adams, Marshall and Wild, started from winter-quarters on the 29th of October 1908, with the four ponies and four n-ft. sledges; a support- ing party of five men accompanied the main division for ten days. In order to avoid the disturbed and crevassed ice near the great south-running mountain range, Shackleton kept about 40 m. farther to the east than Scott had done. The ponies enabled rapid progress to be made, but after passing the 81st parallel on the 21st of November, one pony broke down and had to be shot, the meat being left in a depot for the return journey. In spite of cold weather and frequent high winds, progress was made at the rate of 15 m. per day, and on the 26th of November the farthest south of the " Discovery " expedition was passed, and Mts Markham and Longstaff were full in view. New mountains continued to appear beyond these, and the range changed its southerly to a south-easterly trend, so that the path to the Pole led through the mountains. On the 28th a second pony became used up and was shot, and a dep6t was formed with provisions and stores for the return in 82 38′ S., and progress was resumed with two sledges. The surface of the barrier ice formed great undulations of gentle slope. On the 1st of December a third pony had to be shot, in 83 16′ S., and horseflesh became the principal article of diet; the remaining pony hauled one sledge, the four men took the other. On the 4th of December the party left the barrier, passing over a zone of much disturbed ice, and commenced the ascent of a great glacier (the Beardmore glacier) which descended from the mountains between magnificent granite cliffs 2000 ft. high. On the 7th, when toiling amongst a maze of crevasses on the glacier, 2000 ft. above sea-level, the last pony fell into a crevasse and was lost, though the loaded sledge was saved; the pony was to have been shot that night as it could not work on the disturbed ice; but its loss meant so much less food, and as far as can be judged this alone made it impossible for the party to reach the Pole. For the next few days of laborious advance one or other of the party was continually falling into a crevasse, but the sledge harness saved them, and no serious harm resulted. After climbing upwards for 100 m. on the glacier, a dep6t was made at a height of 6100 ft. of everything that could possibly be left behind, including all the warm clothing, for it was found possible with Jaegers and wind-proof Burberrys to meet any weather in which exertion was possible. By

Christmas Day the plateau surface was fairly reached at a level of 9500 ft., in latitude 85° 55′ S., and there was no more difficulty to over- come as regarded the ground, but merely the effort of going on over a nearly level surface with insufficient food in a very low temperature, intensified by frequent blizzards. Rations were reduced in the hope of being able to push on to the Pole. Three days later the last crevasse was passed and the sur- face, now 12,200 ft. above sea-level, grew smoother, allowing 15 m. a day to be done with fair weather. At 4 a.m. on the 9th of January 1909 the four explorers left their sledge and

racing, half walking, half running, they reached 88° 23′ S. in 162 E. at 9 a.m., the height above sea being 11,600 ft. The utmost had been done, though more food would have enabled the remaining 07 geographical miles to the South Pole to be accomplished. The camp was reached again at 3 p.m. The return journey of over 700 m. to the ship was one long nightmare of toil and suffering, but the length of the marches was unsurpassed in polar travel. Once and again all food was exhausted the day before the dep6t, on which the only hope of life depended, was picked up in the waste of snow. Snow-blindness and dysentery made life almost unendurable, but, despite it all, the ship was reached on the 1st of March, and the geological specimens from the southernmost moun- tains, which prevented the sledges of the exhausted men being lightened as they went on, were safely secured. Never in the history of polar exploration had any traveller outdistanced his predecessor by so vast a step towards either Pole.

During the return journey of the ” Nimrod ” Shackleton was able to do a little piece of exploration to the south of the Balleny Islands, tracing the coast of the mainland for 50 m. to the south-west beyond Cape North, thus indicating that the Antarctic continent has not a straight coast-line running from Cape Adare to Wilkes Land. The British government contributed £20,000 to the expenses of the expedition in recognition of the great results obtained, and the king con- ferred a knighthood on the explorer, the first given for Antarctic exploration since the time of Sir James Clark Ross.

Captain R. F. Scott left England in the summer of 1010 with a new expedition in the ” Terra Nova,” promoted by his Expeditions own exertions, aided by a government grant, and of with with a carefully selected crew and a highly com- l9 “- petent scientific staff. He intended to arrange for

two parties, one leaving King Edward Land, the other McMurdo Sound, to

converge on the South Pole. A German expedition under Lieut. Wilhelm Filchner was announced to leave early in 1911 with the hope of exploring inland from a base in the western part of Weddell Sea, and Dr W. S. Bruce has announced for the same year an expedition to the eastern part of Weddell Sea mainly for oceanographical exploration. It appears that the greatest extension of know- ledge would now be obtained by a resolute attempt to cruise round the south polar area from east to west in the highest latitude which can be reached. This has never been attempted, and a modern Biscoe with steam power could not fail to make important discoveries on a westward circumnavigation.

Physiography of Antarctic Region. — In contrast to the Arctic region, the Antarctic is essentially a land area. It is almost certain that the South Pole lies on a great plateau, part of a land that must be larger and loftier than Greenland, and may probably be as large as Australia. This land area may be com- posed of two main masses, or of one continent and a great archipelago, but it can no longer be doubted that the whole is of continental character as regards its rocks, and that it is per- manently massed into one surface with ice and snow, which in some parts at least unites lands separated by hundreds of miles of sea. But all round the land-mass there is a ring of deep ocean cutting off the Antarctic region from all other land of the earth and setting it apart as a region by itself, more unlike the rest of the world than any continent or island. The expedition of the " Scotia " showed the great depth of the Weddell Sea area, and the attention paid to soundings on other expeditions — notably that of the " Belgica " — has defined the beginning of a continental shelf which it cannot be doubted slopes up to land not yet sighted. In the Arctic region large areas within the Polar Circle belong to climatically temperate Europe, and to habitable lands of Asia and America; but in the Antarctic region extensive lands — Graham Land, Louis Philippe Land, Joinville Island and the Palmer archipelago outside the Polar Circle — partake of the typically polar character of the higher latitudes, and even the islands on the warmer side of the sixtieth parallel are of a sub-Antarctic nature, akin rather to lands of the frigid than to those of the temperate zone.

Geology. — Definite information as to the geology of Antarctic land is available from three areas — Graham Land and the archipelago to the north of it, Kaiser Wilhelm Land and Victoria Land. In the Graham Land region there seems to be a fundamental rock closely resembling the Archaean. Palaeozoic rocks have not been discovered so far in this region, although a graptolite fossil, probably of Ordovician age, shows that they occur in the South Orkneys. Mesozoic rocks have been found in various parts of the archipelago, a very rich Jurassic fossil flora of ferns, conifers and cycads having been studied by Nordenskjold, some of the genera found being represented also in the rocks of South America, South Africa, India

and Australia. Cretaceous ammonites have also been found, and Tertiary fossils, both of land and of marine forms, bring the geological record down probably to Miocene times, the fauna including five genera of extinct penguins. Raised beaches show an emergence of the land in Quaternary times, and there is evidence of a recent glacial period when the inland ice on Graham Land was a thousand feet higher than it is now. The most prominent features of the scenery are due to eruptive rocks, which have been identified as belonging to the eruptive system of the Andes, suggesting a geologically recent connection between South America and the Antarctic lands. Volcanic activity is not yet extinct in the region.

As regards Kaiser Wilhelm Land, the Gaussberg is a volcanic cone mainly composed 4f leucite-basalt, but its slopes are strewn with erratics presumably transported from the south and these include gneiss, mica-schist and quartzite, apparently Archaean. Much more is known as to the geology of Victoria Land, and the results are well summarized by Professor David and Mr Priestley of Sir Ernest Shackleton's expedition, whom we follow. From Cape North (71° S.) to 86° S. a grand mountain range runs South curving to south-eastward, where it vanishes into the unknown; it is built up of gneiss and granite, and of horizontal beds of sandstone and limestone capped with eruptive rock, the peaks rising to heights of 8000, 10,000 and even 15,000 feet, the total length of the range so far as known being at least 1100 miles. This range rises abruptly from the sea, or from the ice of the Great Barrier, and forms a slightly higher edge to a vast snow plateau which has been traversed for several hundred miles in various directions, and may for aught we know extend farther for a thousand miles or more. The accumulated snows of this plateau discharge by the hugest glaciers in the world down the valleys between the mountains. About 78° S. a group of volcanic islands, of which Ross Island, with the active Mt Erebus is the largest, rise from the sea in front of the range, and at the northern extremity the volcanic peaks of the Balleny Islands match them in height. The composition of the volcanic rocks is similar to that of the volcanic rocks of the southern part of New Zealand. The oldest rocks of Victoria Land are apparently banded gneiss and gneissic granite, which may be taken as Archaean. Older Palaeozoic rocks are represented by greenish grey slates from the sides of the Beardmore glacier and by radiolarian cherts; but the most widespread of the sedimentary rocks occurring in vast beds in the mountain faces is that named by Ferrar the Beacon sandstones, which in the far south Shackleton found to be banded with seams of shale and coal amongst which a fossil occurred which has been identified as coniferous wood and suggests that the place of the formation is Lower Carboniferous or perhaps Upper Devonian. No Mesozoic strata have been discovered, but deposits of peat derived from fungi and moss are now being accumulated in the fresh-water lakes of Ross Island, and raised beaches

show a recent change of level. The coast-line appears to be of the Atlantic, not the Pacific type, and may owe its position and trend to a great fault, or series of faults, in the line of which the range of vckanoes, Mt Melbourne, Mt Erebus, and Mt Discovery, stand. Boulders of gneiss, quartzite and sandstone have been dredged at so many points between the Balleny Islands and the Weddell Sea that there can be no doubt of the existence of similar continental land along the whole of that side, at least within the Antarctic Circle.

Antarctic Ice-Conditions. — It is difficult to decide whether the ice of the polar regions should be dealt with as a geologi- cal formation or a meteorological phenomenon; but in the Antarctic the ice is so characteristic a feature that it may well be considered by itself. So far as can be judged, the total annual precipitation in the Antarctic region is very slight, probably not more than the equivalent of 10 in. of rain, and perhaps less. It was formerly supposed that the immense accumulation of snow near the South Pole produced an ice-cap several miles in thickness which, creeping outward all round, terminated in the sea in vast ice-cliffs, such as those of Ross's Great Barrier, whence the huge flat-topped ice-islands broke off and floated away. Evidence, both in the Graham Land and in the Victoria Land areas, points to a former much greater extent of the ice-cap. Thus Shackleton found that the summit of Mt Hope, in 83 30′ S., which stands 2000 feet above the ice of the surrounding glaciers, was strewn with erratics which must have been transported by ice from the higher mountains to the south and west. In McMurdo Sound, as in Graham Land, evidence was found that the surface of the ice-sheet was once at least a thousand feet above its present level. These facts appear to indicate a period of greater snowfall in the geologically recent past — i.e. a period of more genial climate allowing the air to carry more water vapour to the southern mountains. Whatever may have been the case in the past the Antarctic glaciers are now greatly shrunken and many of them no longer reach the sea. Others project into the sea a tongue of hard ice, which in the case of the Drygalski glacier tongue is 30 m. long, and afloat probably for a considerable distance. Some of these glacier tongues of smaller size appear now to be cut off at their shoreward end from the parent glacier. At one time the Victoria Land glacier tongues may have been confluent, forming a great ice barrier along the coast similar to the small ice-barriers which clothe the lower slopes of some of the islands in Gerlache Strait. The Great Ice Barrier is in many ways different from these. Cap- tain Scott showed that it was afloat for at least 400 m. of its extent from west to east. Sir Ernest Shackleton followed it for 400 m. from north to south, finding its

surface in part thrown into long gentle undulations, but with no evidence of the sur- face being otherwise than level on the average. The all-but-forgotten experiments and cogitations of Biscoe convinced that shrewd observer that all Antarctic icebergs were sea-ice thick- ened with snow "accumulated with time." The recent expeditions seem to confirm this view to a great extent in the case of the Barrier, which, so far as the scientific men on the " Nimrod " could see, was formed everywhere of compressed neve, not of true glacier ice. Instances have been seen of tabular bergs floating with half their bulk above water, showing that they

are of very much less density than solid ice. The thrust Of the glaciers which descend from the western mountains upon the Barrier throws it into sharp crevassed folds near the point of contact, the disturbance extending 20 m. from the tip of the Beardmore glacier, and the seaward creep of the whole surface of the Barrier is possibly due to this impulse; the rate of movement at the eastern side of the Barrier was found to be at the rate of 500 yds. per annum for the seven years between Scott's and Shackleton's expeditions.

Pack ice composed of broken-up sea-ice and fragments of icebergs appears to form a floating breakwater round the Ant- arctic area. It is penetrated by powerful steamers with ease or with difficulty according to the action of the wind which loosens the pack when it drives it towards the open sea, and closes it up when it drives it against a coast or a barrier of fast ice. At every point but one around the circumpolar area the pack, be it light or dense, appears to extend up to the southern per- manent ice or land, though, as in the Weddell Sea, the pack seems at times to be driven bodily away. The exceptional region is the opening of the Ross Sea east of Cape Adare, where a comparatively narrow band of pack ice has always been pene- trated by the resolute advance even of sailing ships and led to an extensive open sea to the south. No doubt the set of the ocean currents accounts for this, but how they act is still obscure. The great flat-topped ice-islands which in some years drift out from the Antarctic area in great numbers are usually met with in all parts of the Southern Ocean south of 50 S., and worn- down icebergs have been sighted in the Atlantic even as far north as 26 30′ S. The greater frequency of icebergs in the Southern Ocean in some years is attributed to earthquakes in the Antarctic breaking off masses of the floating edge of the Barrier.

Antarctic Climate. — Although a vast mass of observations has recently been accumulated, it is not yet possible to treat of the climate of the South Polar region in the same broad way as in the case of the North Polar region. The following table shows the mean temperatures of each month and of the year at all the stations at which the Antarctic winter has been passed. The result is to show that while the winter is on the whole less

severe at high latitudes than at equal latitudes in the north, the summer is very much colder, and has little relation to latitude. Even in the South Orkneys, in latitude 6o°, in the three warmest months the air scarcely rises above the freezing point as an average, while in Shetland (6o° N.) the temperature of the three summer months averages 54° F. But on the other hand, the warmest month of the year even in 77 S. has had a mean temperature as high as 30 . A study of the figures quoted in the accompanying table shows that until longer records

Jan. – Feb. . Mar. . Apr. . May . June . July . Aug. . Sep. . Oct. . Nov. . Dec. . Year .

Belgica ca. 70° S.

Cape Adare 71° S.

Snow Hill 64° 30′ S.

Gauss

65″ 2′ S.

Discovery 77°5l'S.

Caoe Royds 77”° 32′ S.

S. Orkneys 6o° 44′ S.

Wandel Island 65° s.

Peterman Island

05 10′ S.

1808.

1899.

1899.

1900.

1902.

1903.

1902.

1903-

1902.

1903.

1904.

1908.

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I9°5-

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1909.

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+33 'o

+30-0

+306

+26-1

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+26-1

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-r-32'9

+34-9) +34'5

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;+26- 4)

+177

+24‘4

(+25-9)

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(+ 2I-S)

+20-4

[+30-4)

+32-6

+31-2

+ I4’I

-f-iro

+169

+ 8-o

- o-8

+ 4‘9

(+30-2)

+32-4

+29-8

+337

+ IO-8

+ 10-3

+ 6-3

+ 67

+ 39

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+25-1

+ 22‘6

+23-0

+20-3

- 4‘6

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- i-6

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-118

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- 86

-119

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- 6-8

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+ i5‘4

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Mar. 1

to Feb. 28

Feb.

to

Jan. 31

Mar. 1

to Feb. 38

Feb. 19

to Feb. 18

Feb. 9

to Jan. 31

Feb. 1

to Jan. 31

Mar.

to Feb.

Feb.

to

Jan.

Dec. 26

to Nov. 36

become available it is impossible to speak definitely as to the normal distribution of monthly temperature throughout the year, for even at the same station in consecutive years the months vary greatly. Thus at Snow Hill (65° S.) the mean temperature of August 1903 was 13-5° higher than that of August 1902, though June had been 7° colder; and at the "“Discovery's" winter quarters July 1903 was 13 colder than July 1902 though June was 2 warmer, August having exactly the same mean temperature in each year. The mean tempera- ture of the year is evidently higher in the position of the " Belgica's " drift than in Victoria Land at the same latitude; but it is noticeable that on the west side of Graham Land, where Charcot wintered, the average mean temperature was (taking the average of his two winterings) 15 higher than on the east side, where Nordenskjold wintered in nearly the same latitude. The observations, however, were not synchronous, and it may not be right to compare them. We may perhaps say that along the whole of the known Antarctic coasts the temperature in the two midsummer months is within a degree or two of 32° F., and varies little from place to place or from year to year; but in the winter months the temperature is lower as the latitude increases and is subject to great variations from place to place and from year to year. It seems quite possible that at no place in the Antarctic region do the mean monthly sea-level winter tem- peratures fall so low as in the Arctic poles of cold, but data re- garding winter temperatures in the interior are lacking. All the complete yearly series of temperature show that the winter six months from April to September have a low and nearly equal temperature, there being a very abrupt fall in February and March, and an equally abrupt rise in October and November. The warmest day experienced at the " Discovery's " winter- quarters had a mean temperature of 34-7°, and the coldest -45-7°, the extreme range of daily temperature being thus 80-4°.

The absolutely lowest temperature recorded in the Antarctic region was -66

-8° on a journey southward from the" Discovery's " winter-quarters by Lieut. Barne on the 15th of September 1903; the lowest temperature at the winter-quarters was -58-5° on the 28th of September 1903. On Sir Ernest Shackle- ton's expedition the lowest temperature was -57°; but no other expedition met temperatures lower than -45-6° on the " Belgica," -43-1° at Cape Adare, and -41-4° on the " Gauss." Sudden rises of temperature during storms are common in the Antarctic region, from whichever quarter the wind blows.

During the ascent of Mt Erebus the temperature was found to fall as the height increased from o° F. at sea-level to -24 at 5000 ft.; it remained stationary to 8600 ft., fell to -28° at 10,650 ft., and then rose to 22 at 11,500 ft., and fell a few degrees at the summit. It might appear as if the " isothermal layer " of the upper atmosphere had been reached at a re markably low elevation; but the temperature variations may also be explained by differences in the temperature of the strong air currents which were passed through.

Pressure and Winds. — The normal fall of pressure south- ward, which gives rise to the strong westerly winds of the roaring forties, appears to be arrested about 65 S., and to be succeeded by a rise of pressure farther south. This view is supported by the frequency of south-easterly winds in the neighbourhood of the Antarctic Circle reported by all explorers, and the hypothesis of a south polar anticyclone or area of high pressure over the Antarctic continent has gained currency in advance of any observations to establish it. The complete data of Sir Ernest Shackleton's expedition are not available at the time of writing, but the yearly mean pressure as re- corded at the " Discovery's " winter-quarters was 29-35 in. for 1902, and 29-23 in. for 1903. At Cape Adare it was 29-13 in. for 1899, in the " Belgica " 29-31 in. for 1898, and in the " Gauss " 29-13 in. for 1902. These figures, so far as they are comparable, show distinctly higher pressures in the higher latitudes, and the wind observations bear out the inference of a scuth-polar high pressure area, as at the " Discovery's " winter-quarters 80 % of the winds had an easterly component, and only 3 % a westerly component. It is bewildering,

however, to find that on the sledge journeys there fras an equally marked preponderance of wind with a westerly component, and in discussing the result in the published records of the expedition Mr R. H. Curtis, of the Meteoro- logical Office, felt compelled to ask whether the correction for variation of the compass (in that region about 145) was possibly omitted in the case of the sledge journeys. The " Gauss " observations and those at Cape Adare bore out the frequency of easterly winds, and on the " Scotia " it was observed that practically all of the easterly winds met with were to the south of the Antarctic Circle. The " Belgica " found rather more

westerly than easterly wˆnds in her drift; easterly winds predominating in summer, westerly winds in winter. At Cape Royds Shackleton found easterly winds to predominate, the most frequent direction being south-east; but on the great southern journey, south-south-east winds prevailed, occasionally swinging round to south-south-west, and even at the farthest south (88° S.) the ridges into which the snow was blown, 10,000 ft. above the sea, showed that south-south- easterly winds. predominated. On the journey to the Magnetic Pole Professor David found that along the coast the prevailing winds were south-westerly, with occasional blizzards from the south-east, but he noticed that the westerly winds were of the nature of a land breeze, springing up soon after midnight and continuing to blow fresh until about 10 a.m. Thus the balance of probability inclines towards the hypothesis of a south-polar high-pressure area. An upper current of air blowing from a north-westerly direction was usually indicated by the clouds and smoke on Mt Erebus, and on the occasion of a great erup- tion, when the steam column reached more than 20,000 ft. above the sea it entered a still higher stratum of wind blowing from the south-east.

The intensity of the blizzards is worthy of remark, for the velo- city of the wind often reached 40 or even 60 m. an hour, and they were usually accompanied by a rapid rise of temperature.

Observations of sunshine made at the " Discovery's " winter- quarters yielded many records of continuous sunshine extend- ing throughout 24 consecutive hours, and in the summer months about 50 % of the possible sunshine was often recorded, the maximum being 490 hours, or 66% of the total possible for December 1903. Thus, although the sun was above the horizon only for 246 days, it shone sufficiently to yield more than 1725 hours of bright sunshine for the year, an amount exceeded in few parts of England, where the sun may s»hine on 365 days. The intensity of solar radiation in the clesr weather of the Antarctic makes it feel exceedingly hot even when the air temperature is far below the freezing point. There is a great difference between the clear skies of 78° S. and the extremely frequent fogs which shroud the coast near the Antarctic Circle and render navigation and surveying exceedingly difficult. Heavy snowstorms are frequent on the coast, but inland during the snow blizzards it is impossible to say whether the whirling snow-dust is falling from the air or being swept from the ground. Professor David is inclined to believe that the surface of the snow-plains is being lowered more by the action of the wind sweeping the snow out to sea than it is raised by precipitation, the total amount of which appears to be very small.

Flora and Fauna. — Recent expeditions have discovered that, despite the low temperature of the summer, in which no month has a mean temperature appreciably above the freezing point, there are on the exposed

Antarctic land patches of ground with a sparse growth of cryptogamic vegetation consisting of mosses, lichens, fungi and fresh-water algae. The richest vegeta- tion discovered on the " Nimrod " expedition consisted of sheets of a lichen or fungoid growth, covering the bottom of the fresh-water lakes near Cape Royds, and visible through the clear ice throughout the many months when the water is frozen. No flowering plants occur within the Antarctic Circle or in the immediately adjacent lands.

The marine fauna is very rich and abundant. All the expedi- tions obtained many new species, and the resemblance which occurs between many of the forms and those which inhabit

the Arctic seas has given rise to the hypothesis that certain species have been able to pass from one frigid zone to the other. It is argued on the other hand that all the forms which resemble each other in the two polar areas are cosmopolitan, and occur also in the intermediate seas; but the so-called " problem of bipolarity " is still unsettled. Bird life on sea and land is fairly abundant, the most common forms being the skua gull, snow petrels, and the various species of penguins. The penguins are specially adapted for an aquatic life, and depend for their food entirely on marine animals. The largest species, the emperor penguin, inhabits the most southerly coast known on the edge of the Great Barrier, and there it breeds at mid- winter, very interesting specializations of structure and habit making this apparently impossible feat practicable. The social organiza- tion and habits of the various species of penguins have been care- fully studied, and show that these birds have arrived at a stage of what might almost be called civilization worthy of the most intelligent beings native to their continent. The only mam- malian life in the Antarctic is marine, in the form of various species of whales, but not the " right whale," and a few species of seals which live through the winter by keeping open blow-holes in the sea-ice. There is no trace of any land animal except a few species of minute wingless insects of a degenerate type. The fresh-water ponds teem with microscopic life, the tardigrada, or " water bears " and rotifers showing a remarkable power of resistance to low temperature, being thawed out alive after being frozen solid for months and perhaps for years.

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POLDER, the Dutch name for a piece of low-lying, marshy land reclaimed from the sea or other water by drainage and diking (see Holland).

POLE (family). The family of the Poles, earls and dukes of Suffolk, which, but for Richard III.'s defeat at Bosworth, might have given the next king to England, had its origin in a house of merchants at Kingston-upon-Hull. It has been said that these Poles were the first English peers whose fortunes had been founded upon riches gained in trade; but the Berkeleys, de- scendants of Robert fitz Harding, the rich burghers of Gloucester,

must perhaps be reckoned before them. Their pedigree begins with one William atte Pole (d. c. 1329), a merchant of Ravens- rode who settled in Hull, where his widow became the wife of John Rotenhering, also a merchant. His sons, Sir Richard and Sir William atte Pole, were both famous for their wealth at a time when the Crown had great need of rich men's aid. Sir Richard (d. 1345), the king's butler in 1327, removed to London, and is styled a London citizen in his will. The male line of this, the elder branch of the Poles, failed with a grandson, John Pole, who by his marriage with Joan, daughter of John, Lord Cobham, was father of Joan, Lady of Cobham, the Kentish heiress whose lands brought her five knightly husbands, the fourth of them Sir John Oldcastle the Lollard.

Sir William atte Pole (d. 1366), the second son of William, joined his brother in advancing large sums to the government while keeping safely apart from politics. The first mayor of Hull, he sat for Hull in five parliaments, and was advanced to be knight banneret and a baron of the exchequer. He was counted " second to no merchant in England," but after his time his descendants left the counting-house, his four sons all serving in the French wars. The eldest son, Michael Pole, who had fought under the Black Prince and John of Gaunt, was summoned as a baron in 1366, before the father's death, and, as a stout supporter of the Crown, was appointed in 1381 governor of the person of the young king Richard II., whose marriage with the Lady Anne of Bohemia he had arranged on a visit to her brother the king of the Romans. In 1383 he became chancellor of England and thereafter, as the loyal servant and nearest counsellor of the king, he had to face the jealousy of the great lords and the hatred of the Commons. His wealth added to the envy of his enemies, for, to his inherited Yorkshire and Lincolnshire lands, his marriage with Catherine, daughter and heir of Sir John of Wingfield, added a great Suffolk estate, where, fortifying the manor-house of the Wingfields, he made his chief seat. In 1385 he was created earl of Suffolk, a grant from the Crown giving him the castle and honour of Eye with other East Anglian lands formerly held by the Ufford earls. In 1386 the opposition, led by Gloucester, the king's uncle, pulled him down. He was dismissed from his chancellor- ship, and impeached by the Commons on charges which, insuffi- cient upon the face of them, secured his conviction. Richard was forced to send his minister into ward at Windsor until the parliament was dissolved, when Suffolk once more appeared as the leader of the king's party. But the opposition was insistent, and Suffolk, after Richard had been compelled to give his word that those who had advised him ill should answer for it to the next parliament, fled over sea to Calais. One of the earliest of the many popular songs that bark against the Poles tells joyfully of this flight of the detested "Jake." Sentence of death by the gallows was passed in his absence. The over-zealous governor of Calais who found him at his gates, clad as a poor

Fleming, his chin shaved, packed him back to England, whence he escaped again, doubtless with the king's aid, reaching his native town of Hull, where he saw for the last time his " goodly house of brick." Old friends found him a ship that landed him in the Low Countries, and he died an exile in Paris in 1389.

The exile's son Michael, who had married Catherine, daughter of the earl of Stafford, was restored to the earldom in 1397, and, although his father's attainder was revived by the act of the first parliament of Henry IV., the earldom was restored once again in 1399, together with the castle and honour of Eye. His life was that of a soldier, and he was with the host before Har- fleur in 141 5, when he died of a violent dysentery. Michael, the eldest son and heir, marched from his father's deathbed to Agincourt, where he fell, Drayton's ballad recalling how he plied his axe on the great day. By his wife, a daughter of the first duke of Norfolk, he had three daughters, but no one of them marrying, his lands passed with the earldom to his brother William.

This William (1396-1450), the fourth earl of his name, had sailed with his father and elder brother to Harfleur, but had

been sent home sick after the siege. He returned with the j " viage " of 1417, leading thirty men-at-arms and ninety I archers. Henry V. made him admiral of Normandy, and until the crowning of Henry VI. in Paris in 1431 he served in France without, by his own account, coming home or seeing England. He held the chief command before Orleans after Salisbury had fallen to a cannon-shot from the city, but was forced to surrender to Joan of Arc at Jargeau, where his brother Alexander was killed, another brother, John, being taken prisoner with the earl. A fourth brother, Thomas, a clerk, became hostage to Dun'ois until the vast ransom of the earl was paid down. After 1431 Suffolk turned to English politics. Like his grandfather, he found a king's uncle, another Gloucester, the chief of his enemies. Defeating Gloucester's project of an Armagnac match, Suffolk arranged for the young king's marriage with Margaret of Anjou, and brought home the bride to Portsmouth in 1445. In the year before he had been created marquess of Suffolk, being the fourth Englishman to take the style of marquess. His party and the queen's were on the point of overthrowing their opponent, Gloucester, when the " good duke " died sud- denly in the hands of those who had arrested him. This dea.th, followed by that of Cardinal Beaufort, left the field to Suffolk. Under a patent of 1443 Suffolk became earl of Pembroke at Duke Humphrey's death. His honours

were capped in 1448 with a dukedom of Suffolk, he being then admiral of England, governor of Calais, constable of Dover, and warden of the Cinque Ports. But it seemed that long service in the foreign wars had not purged the offence of the name of Pole. All the old enmity which had driven his grandfather into exile was gathering against Suffolk. His peace policy had cost the cession of Maine and Anjou, while the blunders of his ally, Somerset, as lieutenant in France, lost Normandy to England. Early in 1450 the Commons, in spite of Suffolk's appeal to his years of loyal service, accused him of treason and he was sent to the Tower. A long indictment was reinforced by new accusations, and the king could do no more for his minister than set him free under a sentence of five years' banishment. He sailed from Ipswich on the May Day of 1450, but before he could enter the port of Calais he was cut off by a royal ship, the " Nicholas," whose master had him put overboard into the cock- boat, where his head was hacked off by an Irish knave's rusty sword. His body, cast headless upon Dover beach, was carried by the king's orders to the Poles' vault in Wingfield church, where his effigy may still be seen. Who sent out the " Nicholas," and by whose orders Suffolk died, are questions which remain unanswered. He was the third husband of Alice Chaucer, whom he married as the widow of Thomas, Earl of Salisbury, slain before Orleans. She was the daughter and heiress of Thomas Chaucer, of Ewelme, and, although direct evidence is wanting, the granddaughter, without doubt, of Geoffrey Chaucer, the poet. She lies at Ewelme, under a magnificent tomb.

John Pole (1442-1491), only son of the murdered duke, should have succeeded to the dukedom, his father having died un- attainted. But the honours were apparently regarded as forfeited, and the dukedom was formally restored to the boy in 1455, the earldom of Pembroke being allowed to lapse. Although three generations of warrior lords lay between him and the Hull warehouses, the origin of his house was still fresh in men's memories. John Paston, writing in 1465, could tell every name in the duke's pedigree back to " William Pool of Hull," who had been " first a merchant and after a knight," and " what the father of the said William was " John Paston knew " right well." The duke's father was an upstart for the crowd, whose ballads pelted him with the name of " Jac Napes," suggested by his familiar badge of the ape's clog and chain. Nevertheless a wife of royal blood was found for the young duke, King Edward IV.'s own sister Elizabeth. The marriage confirmed him a partisan of the White Rose. The son of Margaret's faithful minister rode against her man at the second battle of St Albans. Before he was of age he was steward of England at his brother-in-law's crowning, and at

Queen Elizabeth's crowning he bore her sceptre. Having held many offices under Edward IV. he was ready to bear a sceptre at Richard's coronation, and, after Bosworth, to swear fealty to the Tudor dynasty and to bear

another sceptre for another Queen Elizabeth. He died in 1491, having safely kept his lands, his dukedom, and his head through perilous years.

But each advance in rank had brought danger and misfor- tune to the Poles. Before the death of the second duke they had begun to pay the price of their matching with the royal house. In the next generation their name was blotted out. John Pole, eldest son of Duke John and the Lady Elizabeth, had been created Earl of Lincoln by his uncle, Edward IV. Before he followed Richard to Bosworth, the young man had been chosen as heir to the throne, Clarence's son Warwick being put aside. He survived King Richard and Henry VII. spared him. But he egged on Simnel's plot, joined the rebels in Ireland, and was killed at Stoke in 1487, leaving no issue by his wife, the daughter of the earl of Arundel. Edmund, his younger brother, (c. 1472-1513) should have succeeded in r4oi as duke of Suffolk, but on coming of age he agreed to satisfy himself with the title of earl of Suffolk, the king grudgingly restoring some portion of the estates forfeited by his brother. In 1499 ne suddenly left the kingdom, but was persuaded to return. But the death of the imprisoned earl of Warwick may have suggested to him that Henry's court was a dangerous place for those of the blood of York, and in 1501 he found his way to the emperor Maximilian in Tirol with a scheme for the invasion of England. Although the kaiser at first promised him men for the adventure, nothing came of his promises. Maxi- milian, p˚rsuaded by a gift of English money, bound himself not to succour English rebels. Suffolk, who had reassumed the ducal style, was attainted in 1504, and in the same year was seized by the duke of Guelders. From the duke's hands the prisoner was taken by Philip, king of Castile, who surrendered him to England on a promise that his life should be spared. But in 1513, when Richard, his brother, was in arms in the French service, Edmund Pole was taken from his prison in the Tower to the block.

Richard Pole, who in isor escaped from England with Edmund, had been received by the king of Hungary, and afterwards by Louis of France, who assigned him a pension. Commanding German Lanzknechts in the French service, he was the friend and companion in arms of the chevalier Bayard. At the death of his brother Edmund, he took the title of the duke of Suffolk, claiming the throne of England. In 1514 Louis gave him the leading of 12,000 riotous German mercenaries to essay the conquest of England. The treaty of peace stayed the adventure, but Louis refused to surrender Richard, and allowed him to depart for the imperial city of Metz. Francis I. continued the payment of his allowance, and gave him employment. In 1522 the anonymous writer of a journal describes the coming to Paris of " Richard de la Poulle, soydisant due de Suffort et la Blanche Rose." In 1525 the White Rose was killed by the French king's side at Pavia. With him died the last descendant in the male line of William Pole, the Hull merchant.

By one of the strange chances of history, another family of the name of Pole, having no kinship with the house of Suffolk, owed, like the Suffolks, their advancement and their fall to a match with a princess of the royal house. Sir Richard Pole, a Buckinghamshire knight, was the son of Geoffrey Pole, a squire whose wife, Edith St John, was sister of the half-blood to the mother of Hemy VII. About 1490 or 1491 he married the Lady Margaret, daughter of George, duke of Clarence. He died in 1505, and in 15 13 King Henry VIII. created the widow countess of Salisbury, as some amends for the judicial murder of her brother, the Earl of Warwick. Four years later, the barony of Montague was revived for her eldest son Henry. Until the king's marriage with Anne Boleyn, the countess of Salisbury was about the court as governess of her godchild, the Lady Mary. When her son, the famous Cardinal Pole, published his treatise,

De unitatc ecdesiastica, the whole family fell under the dis- pleasure of the king, who resolved to make an end of them. The Lord Montague was the first victim, beheaded in 1539 on a charge of treasonable conversations, evidence having been wrung from his unhappy brother, Sir Geoffrey Pole. In 1541 the aged countess, attainted with her son Montague, met her death at the barbarous hands of an unskilful heads- man. Sir Geoffrey Pole, seeing that his house was doomed, fled the country, and joined the cardinal in exile. He returned with him at Mary's accession, both dying in 1558. His sons Arthur and Edmund, taken in 1562 as plotters against Queen Elizabeth, were committed to the Tower of London, where they died after eight years of imprisonment.

See T. Rymer's Feodera; C. Frost, History of Hull (1827); Chronicon de Melsa (Rolls Series) ; G. E. C, Complete Peerage; Testamenta Eboracensia (Suttees Soc.) ; Hon. and Rev. H. A. Napier, Swincombe and Bwelnte (1858); Diet. Nat. Biog., s.v. "Pole"; E. Foss, Judges of England (1848-1864); Chronicon Angliae (Rolls Series); Paston Letters, edited by J. Gairdner; Sir J. H. Ramsay, Lancaster and York (1892); Letters and Papers of Richard III. and Henry VII. (Rolls Series); Inquests post mortem, Close and Patent Rolls, Rolls of Parliament. (O. Ba.)

POLE, REGINALD (1300-1558), English cardinal and arch- bishop of Canterbury, born at Stourton Castle, Staffordshire, was the third son of Sir Richard Pole, Knight of the Garter, and Margaret, countess of Salisbury, a daughter of George, duke of Clarence, and therefore niece of Edward IV. He was intended for the church from his youth; and when seven years old was sent for five years to the grammar school which Colet had founded

near the Carthusian monastery at Sheen. Here he had Linacre and William Latimer as teachers. In his thirteenth year he went to Magdalen College, Oxford, and two years after took his degree in arts. In 151 7 Henry VIII. appointed his young kinsman to a prebend in Salisbury, and soon afterwards to the deaneries of Wimborne and Exeter. He was a friend of Sir Thomas More, who says that Pole was as learned as he was noble and as virtuous as he was learned. In 1519, at the king's expense, he went to Padua, the Athens of Europe, according to Erasmus; and there, where Colet and Cuthbert Tunstall had also been educated, the " nobleman of England " as he was called, came into contact with the choicest minds of the later Italian Renaissance, and formed the friendships that influenced his life.

In 1525 he went to Rome for the Jubilee, and two years after returned to England and was initiated by Thomas Cromwell into the mysteries of statesmanship, that master telling him that the main point consisted in discovering and following the will of princes, who are not bound by the ordinary code of honour. When the divorce question arose, Pole, like many other excellent men, seems at first to have been in its favour. He prob- ably took the same view that Wolsey had, viz. that the dispen- sation of Julius II. was insufficient, as of two existing diriment impediments only one had been dispensed. When however the king raised the theological argument which ended in disaster, Pole could not accept it; and, after the failure of Campeggio's mission, when the king asked him for his opinion, he excused himself on the score of inexperience, but went by Henry's order to Paris (1530) to obtain the judgment of the Sorbonne, making the condition that another should be joined with him to do the necessary business. At this time, he says, the more he saw into the case the less he knew how to act as he was desired. On his return to England he spoke strongly against the project to the king, who seems to have dealt gently with him in the hope of using him for his own ends. He offered him the sees of York or Winchester, and kept them vacant for ten months for his acceptance. There was a stormy interview at York Place; but Pole succeeded in mollifying the king's rage so far that Henry told him to put into writing his reasons against the divorce. This was done, and, recognizing the difficulties of the situation, the king gave him leave to travel abroad, and allowed him still to retain his revenues as dean of Exeter. In 1535, which saw by the deaths of Bishop Fisher and Sir Thomas More a change in Henry's policy, Pole received orders to send*

a formal opinion on the royal supremacy, and the king promised to find him suitable employment in England, even if the opinion were an adverse one. The parting of the ways had been reached. Pole's reply, which took a year to write, and was afterwards published with additions under the title Pro unitate ecclesiae, was sent to England (May 25, 1536) and was meant for the king's eye alone. It contained a vigorous and severe attack upon the

royal policy, and did not shrink from warning Henry with temporal punishment at the hands of the emperor and the king of France if he did not repent of his cruelties and return to the Church. He was again summoned to return to England to explain himself, but declined until he could do so with honour and safety; but he was on the point of going at all risks, when he heard from his mother and brother that the whole family would suffer if he remained obstinate. Paul III. who had prepared a bull of excommuni- cation and deposition against Henry, summoned Pole to Rome in October, and two months after created him cardinal. In January 1537 he received a sharp letter of rebuke from the king's council, together with the suggestion that the differ- ences might be discussed with royal deputies either in France or Flanders, provided that Pole would attend without being commissioned by any one. He replied that he was willing and had the pope's leave to meet any deputies anywhere. Paul III. in the early spring of that year named him legate a latere to Charles V. and Francis I., for the purpose of securing their assistance in enforcing the bull by helping a projected rising in England against Henry's tyranny. The mission failed, as the mutual jealousy of the sovereigns would not allow either to begin operations. Moreover, the fear of Henry was suffi- cient to make the French king refuse to allow one who was attainted by act of parliament to remain in the kingdom; so Pole passed over to Flanders, to wait for the possible arrival of any royal deputies. The proposed conference never took place, and in August 1537 the cardinal returned to Rome. There he was appointed to the famous commission which Paul III. established for considering the reforms necessary for the church and Roman curia. The report Consilium delectorium car- dinalium is, in its plain-spoken directness, one of the most note- worthy documents of the history of the period. Towards the end of 1539, after Henry had destroyed the shrine of St Thomas Becket, another attempt was made to launch the bull of de- position, and Pole again was sent to urge Charles V. to assist. Once more his efforts were in vain, and he retired to his friend Sadoleto at Carpentras. As Pole had escaped Henry's power the royal vengeance now fell on his mother, who was executed as a traitor on the27thof May 1541. When the news came to the cardinal he said to his secretary Beccatelli that he had received good tidings: " Hitherto I have thought myself indebted to the divine goodness for having received my birth from one of the most noble and virtuous women in England; but hence- forth my obligation will be much greater, as I understand I am now the son of a martyr. We have one patron more added to those we already have in heaven "; and returning to his oratory Pole found peace in his sorrow.

On the 21st of August 1541 the cardinal was appointed legate at Viterbo, and for a few years passed a happy and congenial life amid the friends that gathered round him. Here he came into close relations with Vittoria

Colonna, Contarini, Sadoleto, Bembo, Morone, Marco Antonio, Fla.minio, and other scholars and leaders of thought; and many of the questions raised by the Reformation in Germany were eagerly discussed in the circle of Viterbo. The burning question of the day, justification by faith, was a special subject of discussion. The " dolce libriccino," the famous Tratlato ulilissimo del beneficio di Gesu Christo crocifisso verso i christiani, which was the composition of a Sicilian Benedictine and had been touched up by the great latinist Flaminio, just appeared at Mantua in 1542 under the auspices of Morone, and had a wide circulation (over 40,000 copies of the second edition, Venice 1543, were sold). Containing extracts from the Hundred and Ten Divine Considerations of Juan Valdes (q.v.),

it was soon regarded with the utmost horror by many. But at Viterbo it was in favour, and the orthodox interpreta- tion was regarded rather than the other which might be taken in the Lutheran sense. Pole's own attitude to the question of justification by faith is given by Vittoria Colonna, to whom he said that she ought to set herself to believe as though she must be saved by faith alone and to act as though she must be saved by works alone. In the excited temper of the times any defender of justification by faith was looked upon by the old school as heretical; and Pole, with the circle at Viterbo, was denounced to the Inquisition, with all sorts of crimes imputed to him. Though the process went on from the pontificate of Paul III. to that of Paul IV., nothing was done against the cardinal until the time of the latter pope, who was his personal enemy. It is by no means certain that Pole ever knew about the process begun against him; and immediate subsequent events show that no credence was given to the charges. 1

While at Viterbo his rule was firm but mild ; and no charge of persecuting heretics is made against him. He regained many, such as his friend Flaminio, by patience and kindliness, to a reconsideration of their errors. During this time also he was still engaged in furthering a proposed armed expedition to Scotland to aid the papal party, and in 1545 he was again asking help from Charles V. But the Council of Trent (q.v.), first sum- moned in 1536, was at last on the point of meeting, and this required all his attention. In 1542 he had been appointed one of the presiding legates and had written in preparation his work De concilio; and now in 1545, after a brief visit to Rome, he went secretly, on account of fear of assassination by Henry's agents, to Trent, where he arrived on the 4th of May 1545'. At the council he took a high spiritual line, and his learning and devout life made him a great leader in that assembly. He advocated that dogmatic decrees should go together with those on reform as affording

the only stable foundation. His views on the subject of original sin, akin as it is to that of justification, were accepted and embodied in the decree. He was present when the latter subject was introduced, and he entreated the fathers to study the subject well before committing themselves to a decision. On the 28th of June 1546 he left Trent on account of ill-health and went to Padua. While he was there frequent communications passed between him and the council and the draft of the decree on justification was sent to him. His sug- gestions and amendments were accepted, and the decree embodies the doctrines that Pole had always held of justification by a living faith which showed itself in good works. This effectually disproves the story that he left the Council of Trent so as to avoid taking part in an adverse decree.

On the death of Henry (Jan. 28, 1547), Pole, by name, was left out of the general pardon; and in the subsequent rising in the West the insurgents demanded that he should be sent for and made the first on the record in the council. He wrote several times to England to prepare a conference, but only received a rude reply from Somerset, who sent him a copy of the Book of Common Prayer. At the conclave of 1549 Pole received two-thirds of the votes, but by a delay, caused by his sense of responsibility, he lost the election and Julius III. succeeded. He then retired to Magazzano on the Lake of Garda and occupied himself by editing his book Pro unitate ecclesiae, with an intended dedication to Edward VI.

The accession of Mary opens the third period of his life. On the 5th of August 15 S3 he was appointed legate to the new queen and began his negotiations. But many difficulties were put in the way of return. He was still under attainder; and the temper of England was not yet ripe for the presence of a cardinal.

1 See, however, Herzog-Hauck, Realencyklopddie (ed. 3) § " Pole," where it is said that " only his procrastination, and then his death saved him from appearing before the Inquisition." Within the institution of the Inquisition his name continued to be regarded as that of a heretic and misleader of others, as is proved by the mass of evidence accumulated against him in the Compendium inquisitorum (v. archivio della socielci di storia patria, Rome, 1880), p. 283, &c— (Ed.)

The project of the queen's marriage was also an obstacle. A marriage between her and Pole, who was then only a deacon, was proposed by some, but this did not at all meet the views of the emperor, who therefore hindered him the more from setting out for England. The marriage with Philip, of which Pole did not approve, having taken place (July 25, 1554), and Rome yielding on the practical difficulties of the lay holders of Church lands, a parliament favourable to the proposed re- union now assembled,

and Pole was allowed to return to Eng- land as cardinal. On his landing he was informed that the attainder had been reversed; and he received the royal patent authorizing his performance of the legatine duties within the realm. Arriving at Whitehall, where he was received with joy by Mary and Philip on the 30th of November, he proceeded to parliament and there absolved the kingdom and accepted in the pope's name the demands respecting ecclesiastical property. He entered wisely on his work of reformation, for which he was well prepared. One of the most important matters he had to deal with was to rectify the canonical position of those who had been ordained or consecrated since the breach with Rome. Acting according to the instructions he had received from Rome, where the matter had been fully gone into, he made an investi- gation, and divided the clergy ordained after that period into two classes; one consisting of those ordained in schism, indeed, but according to the old Catholic rite, and the other of those who had been ordained by the new rite drawn up by Cranmer and enforced by act of parliament 1st of April 1550. The first class, after submission, were absolved from their irregu- larity, and, receiving penance, were reinstated; the second class were simply regarded as laymen and dismissed without penance or absolution. At his first convocation he exhorted the bishops to use gentleness rather than rigour in their dealings with heretics; and Pole, in himself, was true to his principle. He was not responsible for the cruel persecution by which the reign was disfigured. On the 4th of November 1535 Pole opened, in the chapel royal at Westminster, a legatine synod, consisting of the united convocations of the two provinces, for the purpose of laying the foundations of wise and solid re- forms. In the Reformatio Angliae which he brought out in 1556, based on his Legatine Constitutions of 1555, he ordered that every cathedral church should have its seminary, and the very words he uses on this subject seem to have been copied by the Council of Trent in the twenty-third session (1563). He also ordered that the Catechism of Caranza, who, like him, was to suffer from the Inquisition for this very book, should be translated into English for the use of the laity. On Cranmer's deprivation, Pole became archbishop of Canterbury; and, having been ordained priest two days before, he was consecrated on the 22nd of March 15S6, the day after Cranmer suffered at Oxford. Soon afterwards the clouds began to gather round him. His personal enemy Caraffa had become pope under the name of Paul IV. and was biding his time. When Rome quarrelled with Spain, and France, on behalf of the pope, took up arms, England could no longer observe neutrality. To injure Spain and heed- less of England's need, Paul IV. deprived Pole of his power both as legate a latere and legatus natus as archbishop of Can- terbury (June 14, 1557); he also reconstituted the process of the Inquisition against the cardinal and summoned him to Rome to answer to the crime and heresies imputed to him. No remonstrances on the part of the queen, of Pole or the English clergy could induce the pope to

withdraw hie sentence except to declare that the cardinal still held the. position of legatus natus inherent in the primatial see. In a dignified but strong letter Pole says: " As you are without example in what you have done against me, I am also without an example how I ought to behave to your Holiness": and he drew up a paper containing an account of the various acts of hostility he had experienced from the pope, but on second thoughts he burnt the document, saying it were not well to discover the shame of his father. Mary, who had been warned by her ambassador to the pope that prison awaited Pole, prevented the breve ordering the cardinal to proceed to Rome from being delivered,

and so Pole remained in England. Broken down as much by the blow as by ill-health the cardinal died at Lambeth on the 17th of November 1558, twelve hours after Mary's death and under the unmerited disgrace of the papacy in defence of which he had spent his life. He was buried at Canterbury near the spot where the shrine of St Thomas Becket once stood.

The chief sources for Pole's biography are his life written in Italian by his secretary Beccatelli, which was translated into Latin by Andrew Dudith as Vita Poli cardinalis (Venice, 1563), and his letters (Epistolae Reginaldi Poli) edited by Girolamo Quirini and published in 5 volumes (Brescia, 1 744-1 757), a new edition of which is in preparation at Rome with additions from the Vatican Archives. See also the State Papers (foreign and domestic) of Henry VIII., Edward VI. and Mary; the Spanish and Venetian State Papers; vol. i. of A. Theiner's Acta genuina S.S. Oecumenici Caecilii tridentini (1 874) ; the Compendia dei processi del santo uffizio di Roma da Paolo III. a Paolo IV. (Societa romana di storia patria, Archivio, iii. 261 seq.) ; T. Phillipp's History of the Life of R. Pole (Oxford, 1764-1767); Athanasius Zimmermann, S.J., Kardinal Pole sein Leben und seine Schriften (Regensburg, 1893); Martin Haiiie, Life of Reginald Pole (1910) ; and F. G. Lee, Reginald Pole. (E. TN.)

POLE, RICHARD DE LA (d. 1525), pretender to the English crown, was the fifth son of John de la Pole (1442-1491), 2nd duke of Suffolk, and Elizabeth, second daughter of Richard, duke of York and sister of Edward IV. His eldest brother John de la Pole, earl of Lincoln (c. 1464-1487), is said to have been named heir to the throne by his uncle Richard III., who gave him a pension and the reversion of the estates of Lady Margaret Beaufort. On the accession of Henry VII., however, Lincoln took the oath of allegiance, but in 1487 he joined the rebellion of Lambert Simnel, and was killed at the battle of Stoke. The second brother Edmund (c.

1472-1513), succeeded his father while still in his minority. His estates suffered under the attainder of his brother, and he was compelled to pay large sums to Henry VII. for the recovery of part of the forfeited lands, and also to exchange his title of duke for that of earl. In 1501 he sought the German King Maximilian in Tirol, and received from him a promise of substantial assis- tance in case of an attempt on the English crown. In con- sequence of these treasonable proceedings Henry seized his brother William de la Pole, with four other Yorkist noblemen. Two of them, Sir James Tyrell and Sir John Wyndham, were executed, William de la Pole was imprisoned and Suffolk out- lawed. Then in July 1502 Henry concluded a treaty with Maximilian by which the king bound himself not to countenance English rebels. Presently Suffolk fell into the hands of Philip, king of Castile, who imprisoned him at Namur, and in 1506 sur- rendered him to Henry VII. on condition that his life was spared. He remained a prisoner until 15 13, when he was beheaded at the time his brother Richard took up arms with the French king. Richard de la Pole joined Edmund abroad in 1504, and remained at Aix as surety for his elder brother's debts. The creditors threatened to surrender him to Henry VII., but, more fortunate than his brother, he found a safe refuge at Buda with King Ladislas VI. of Hungary. He was excepted from the general pardon proclaimed at the accession of Henry VIII. , and when Louis XII. went to war with England in 151 2 he recognized Pole's pretensions to the English crown, and gave him a command in the French army. In 1513, after the execution of Edmund, he assumed the title of earl of Suffolk. In 1514 he was given 12,000 German mercenaries ostensibly for the defence of Brittany, but really for an invasion of England. These he led to St Malo, but the conclusion of peace with Eng- land prevented their embarcation. Pole was required to leave France, and he established himself at Metz, in Lorraine, and built a palace at La Haute Pierre, near St Simphorien. He had numerous interviews with Francis I., and in 1523 he was permitted, in concert with John Stewart, duke of Albany, the Scottish regent, to arrange an invasion of England, which was never carried out. He was with Francis I. at Pavia and was killed on the field on the 24th of February 1525.

See Letters and Papers Illustrative of the Reigns of Richard III. and Henry VII., edited by J. Gairdner (2 vols., " Rolls Series," 24, 1861) ;

Calendar of Letters and Papers, Foreign and Domestic, of the Reign of Henry VIII. ; and Sir William Dugdale, The Baronage of England (London, 1675).

POLE, WILLIAM (1814-1900), English engineer, was bom at Birmingham on the 22nd of April 1814. He was a man of many accomplishments. Having spent his earlier years in various engineering occupations in England, he went out to India in 1844 as professor of engineering at

Elphinstone College, Bomba>, where he had to first organize the course of instruction for native students, but his health obliged him to return to England in 1848. For the next ten years he worked in London under James Simpson and J. M. Rendel, and the high reputation he achieved as a scientific engineer gained his appointment in 1859 to the chair of civil engineering in University College, London. He obtained a considerable amount of official work from the government. He served on the committees which considered the application of armour to ships and fortifications (1861-1864), and the comparative advantages of Whitworth and Armstrong guns (1863-1865). He was secretary to the Royal Commission on Railways (1865-1867), the duke of Richmond's Commission on London Water (1867-1869), also taking part in the subsequent proceedings for establishing a constant supply, the Royal Com- mission on the Disposal of London Sewage (1882-1884), and the departmental committee on the science museums at South Kensington in 1885. In 1871 he was employed by the War Office to report on the Martini-Henry rifle, and in the same year was appointed consulting engineer in London to the Japanese government, a position through which he exercised considerable influence on the development of the Japanese railway system. He was elected a fellow of the Royal Society in 1 861, in re- cognition of some investigations on colour-blindness. Music was also one of his chief interests. At the age of twenty-two he was appointed organist of St Mark's, North Audley Street, in open competition, the next selected candidate being Dr E. J. Hopkins (1818-1901), who subsequently was for fifty years organist of the Temple Church. He took the degree of Bachelor of Music at Oxford in i860, proceeding to his doctor's degree in 1867, and in 1879 published his Philosophy of Music. He was largely concerned in the institution of musical degrees by the University of London in 1877, and for many years acted as one of the examiners. His mathematical tastes found con- genial occupation in the study of whist, and as an exponent of the scientific principles of that game he was even earlier in the field than " Cavendish." His literary work included treatises on the steam-engine and on iron construction, biographical studies of famous engineers, including Robert Stephenson and I. K. Brunei, Sir William Fairbairn and Sir W. Siemens, several books on musical subjects and on whist, and many papers for reviews and scientific periodicals. He died on the 30th of December 1900. His son, William Pole (1852-), became known as an actor and writer under the stage-name of William Poel, more especially for his studies in Shakespearian drama and his work in connexion with the Elizabethan Stage Society.

POLE (1) (O. Eng. pdl, cf. Ger. Pfahl, Du. pool, from Lat. palus, stake), a tapering cylindrical post or stake of some considerable length, used as a support in scaffolding, for telegraph or tele- phone wires, hops, &c, and as

a means fcr taking jumps (see Poie-Vaulting), and also as a single shaft for a vehicle drawn by two or more horses. As a measure of length a "pole," also called " rod " or " perch," is equal to si yds. (16J ft.), as a measure of area it is equal to 30J sq. yds. (2) (Lat. polus, adapted from Gr. iroXos, pivot, axis), one or other of the extremities of the axis of the earth; the " celestial pole " is one or other of the points in the heavens to which the earth's axis points; in the northern hemisphere this point is near the star Ursae minoris, better known as the Pole-star or Polaris (see Ursa Major). For the regions lying about the north and south poles of the earth see Polar Regions.

In mathematics the word pole has several meanings. In spherical trigonometry the " pole of a circle on a sphere is the point where the diameter of the sphere perpendicular to the plane of the circle intersects the sphere. In crystallography (q.v.) the " pole " of a face is the intersection of a line perpendicular to the face with

the sphere of projection. The term is also applied to a point from which lines radiate, as, for instance, the origin in a system of polar co-ordinates, or the common point of a pencil of rays. In the geometry of conic sections the " pole " of a line, termed the " polar " of the point, is the intersection of the tangents (either real or imaginary) at the points where the line meets the conic (see Geometry: § Projective). The "magnetic poles" of the earth are the points on the earth's surface where the dipping needle is vertical (see Terrestrial Magnetism) ; and the "poles" of a magnet are the points of the magnet where the magnetic intensity is greatest. In electricity, the term is applied to the elements of a galvanic battery (q.v.), or to the terminals of a frictional electrical machine.

POLECAT, the common name given to any member of the Musteline genus Putorius (see Carnivora) . The polecats form a small group confined to the northern hemisphere, of which the best known and most widely distributed is the common polecat of Europe {P. foetidus or P. putorius). This animal, at least so far as its disposition, size and proportions are con- cerned, is well known in its domesticated condition as the ferret, which is but a tamed albino variety of the true pole- cat. The colour of the latter, however, instead of the familiar yellowish-white of the ferret, is of a dark brown tint above and black below, the face being variegated with dark brown and white markings. Its skull is rough, strongly ridged, and altogether of a far more powerful type than those of the stoats, weasels or martens; the skull of the female is very much smaller and lighter than that of the male. The

fur is long, coarse, and of comparatively small value, and changes its colour very little, if at all, at the different seasons of the year.

The Common Polecat.

The polecat ranges over the greater part of Europe, reaching northwards into southern Sweden and in Russia to the region of the White Sea. It does not occur in the extreme south, but is common everywhere throughout central Europe. In the Alps it ranges far above the tree-line during the summer, but retreats in winter to lower ground. It is confined to the northern counties of England and Scotland, where it is becoming very rare, owing to persecutions from game-keepers, and in Ireland it appears to be extinct. In fine weather it lives either in the open air, in holes, fox-earths, rabbit-warrens, under rocks or in wood-stacks; while in winter it seeks the pro- tection of deserted buildings, barns or stables. During the day it sleeps in its hiding place, sallying forth at night to plunder dovecots and hen-houses. It climbs but little, and shows far less activity than the marten. It feeds ordinarily on small mammals, such as rabbits, hamsters, rats and mice, on such birds as it can catch, especially poultry and pigeons, and also on snakes, lizards, frogs, fish and eggs. Its prey is devoured only in its lair; but, even though it can carry away but a single victim, it commonly kills everything that comes in its way, often destroying all the inhabitants of a hen-house in order to gratify its passion for slaughter. The pairing time is towards the end of the winter, and the young, from three to eight in number, are born in April or May, after a period of gestation of about two months. The young, if taken early, may be easily

trained, like ferrets, for rabbit-catching. The polecat is very tenacious of life and will bear many severe wounds before succumbing; it is also said to receive with impunity the bite of the adder. Its fetid smell has become proverbial. To this it is indebted for its generic name Putorius (derived, as are also the low Lat. putacius, Fr. putois, and Ital. puzzola, from puteo), as well as the designation foumart {i.e. foul marten) and its other English names, fitchet, fitchew. Attempts to account for the first syllable of the word polecat rest entirely on conjecture.

The Siberian polecat {Putorius eversmanni) is very like the European in size, colour and proportions, but with head and back both nearly or quite white, and skull more heavily built and sharply constricted behind the orbits, at least in fully adult individuals. It inhabits the greater part of south-western Siberia, extending from Tibet into the steppes of south-eastern European Russia.

The black-footed or American polecat {Putorius nigripes) is a native of the central plateau of the United States, and extends southwards into Texas. It

is often called the prairie- dog hunter, as it is nearly always found in the warrens of that animal. The fur is cream-yellow, the legs are brown, and the feet and tail-tip black.

*The mottled polecat {Putorius sarmaticus), a species occur- ring in southern Russia and south-western Asia, and extending from eastern Poland to Afghanistan, differs from other polecats both by its smaller size and its remarkable coloration, the whole of the upper-parts being marbled with large irregular reddish spots on a white ground, while the under-side, limbs and tail are deep shining black. Its habits appear to be much like those of the common polecat. (R. L. *)*

POLENTA, DA, the name of a castle in Romagna, from which came the noble and ancient Italian family of Da Polenta. The founder of the house is said to have been Guido, surnamed l'Antico or the Elder, who wielded great authority in Ravenna in the 13th century. His grandson Guido Novello upheld the power of the house and was also capitano del popolo at Bologna; he was overthrown in 1322 and died the following year. His chief claim to renown lies in the fact that in 13 21 he gave hos- pitality to the poet Dante, who immortalized the tragic history of Guido's daughter Francesca, unhappily married to Malatesta, lord of Rimini, in an episode of the Inferno. Guido's kinsman Ostasio I. was lord of Cervia and Ravenna from 1322 to 1329, and, after being recognized as a vassal of the Holy See, again became independent and went over to the house of Este, whom he served faithfully in their struggles with the Church until his death in 1346. His son Bernardino, who succeeded him as lord of Ravenna in 1346, was deposed in 1347 by his brothers, Pandolfo and Lamberto II., but was reinstated a few months later and ruled until his death in 1359; he was famous for his profligacy and cruelty. His son Guido III. ruled more mildly and died in 1390. Then followed Ostasio II. (d. 1396), Obizzo (d. 1431), Pietro (d. 1404), Aldobrandino (d. 1406), all sons of Guido III. Ostasio III. (or V.), son of Obizzo, was at first allied with the Venetians; later he went over to the Milanese, and, although he again joined the Venetians, the latter never forgave his intrigue with their enemies, and in 1441 they deprived him of his dominions. He died in a monastery in

1447.

POLE-VAULTING, the art of springing over an obstacle with the aid of a pole or staff. It is probable that an exercise of the kind was a feature of Greek gymnastics, but with this exception there is no record of its ancient practice as a sport. As a practical means of passing over such natural obstacles as canals and brooks it has been made use of in many parts of the world, for instance in the marshy provinces along the North Sea and the great level of the fens of Cambridgeshire, Huntingdon- shire,

Lincolnshire and Norfolk. The artificial draining of these marshes brought into existence a network of open drains or canals intersecting each other at right angles. In order to cross these dryshod, and at the same time avoid tedious round- about journeys over the bridges, a stack of jumping poles was

kept at every house, which were commonly used for vaulting over the canals.

As a sport, pole-vaulting made its appearance in Germany in the first part of the 19th century, when it was added to the gymnastic exercises of the Turner by Johann C. F. Guts- Muths and Frederich L. Jahn. In Great Britain it was first commonly practised at the Caledonian games. It is now an event in the athletic championships of nearly all nations. Al- though strength and good physical condition are essential to efficiency in pole-vaulting, skill is a much more important element. Broad-jumping with the pole, though the original form of the sport, has never found its way into organized athletics, the high jump being the only form recognized. The object is to clear a bar or lath supported upon two uprights without knocking it down. The pole, of hickory or som? other tough wood, is from 13 to 15 ft. long and if in. thick at the middle, tapering to i\ in. at the ends, the lower of which is truncated to prevent sinking into the earth and shod with a single spike to avoid slipping. A hole in which to place the end of the pole is often dug beneath the bar. In holding the pole the height of the cross-bar is first ascertained, and the right hand placed, with an undergrip, about 6 in. above this point, the left hand, with an over-grip, being from 14 to 30 in. below the right. The vaulter then runs towards the bar at full speed, plants the spiked end of the pole in the ground about 18 in. in front of the bar and springs into the air, grasping the pole firmly as he rises. As he nears the bar he throws his legs forward, and, pushing with shoulders and arms, clears it, letting the pole fall backwards. In Great Britain the vaulter is allowed to climb the pole when it is at the perpendicular. Tom Ray, of Ulverston in Lancashire, who was champion of the world in 1887, was able to gain several feet in this manner. In the United States climbing is not allowed. Among the best British vaulters, using the climbing privilege, have been Tom P.ay, E. L. Stones, R. Watson and R. D. Dickinson; Dickinson having cleared n ft. 9 in. at Kidderminster in 1891. The record pole-vault is 12 ft. 6-|- in., made by W. Dray of Yale in 1907.

POLICE (Fr. police, government, civil administration, a police force, Gr.

iroAireia, constitution, condition of a state, 7roXw, city, state), a term used of the enforcement of law and order in a state or community, of the department concerned with that part of the civil administration, and of the body or force which has to carry it into execution. The word was adopted in English in the 18th century and was disliked as a symbol of foreign oppression. The first official use appears, according to the New English Dictionary, in the appointment of " Commissioners of Police " for Scotland in 1714. A police system has been devised for the purpose of preventing evils and providing benefits. In its first meaning it protects and defends society from the dissidents, those who decline to be bound by the general standard of conduct accepted by the larger number of the law-abiding, and in this sense it is chiefly concerned with the prevention and pursuit of crime. It has a second and more extensive meaning as applied to the regula- tion of public order and enforcing good government.

United Kingdom. — The establishment of a systematic police force was of slow growth in England, and came into effect long after its creation abroad. A French king, Charles V., is said to have been the first to invent a police, " to increase the happiness and security of his people." It developed into an engine of horrible oppression, and as such was repugnant to the feelings of a free people. Yet as far back as the 13th century a statute, known as that of " Watch and Ward," was passed in the 13th year of Edward I. (1285), aimed at the maintenance of peace in the city of London. Two centuries later (1585) an act was passed for the better government of the city and borough of Westminster, and this act was re-enacted with extended powers in 1737 and soon succeeded by another (1777) with wider and stricter provisions. The state of London at that date, and indeed of the whole country at large, was deplorable. Crime was rampant, highwaymen terrorized the

roads, footpads infested the streets, burglaries were of constant occurrence, river thieves on the Thames committed depredations wholesale. The watchmen appointed by parishes were useless, inadequate, inefficient and untrustworthy, acting cften as accessories in aiding and abetting crime. Year after year the shortcomings and defects were emphasized and some better means of protection were constantly advocated. At the com- mencement of the 19th century it was computed that there was one criminal to every twenty-two of the population. The efforts made at repression were pitifully unequal. In the district of Kensington, covering 15 sq. m., the protection afforded was dependent on three constables and three head- boroughs. In the parish of Tottenham nineteen attempts at burglary were made in six weeks, and sixteen were entirely successful. In Spitalfields gangs of thieves stood at the street corners and openly rifled all who came near. In other parishes there was no police whatever, no defence, no protection afforded to the community but the voluntary exertions of

individuals and " the honesty of the thieves." In those days victims cf robberies constantly compounded with felonies and paid blackmail to thieves, promising not to prosecute on the restitution of a portion of the stolen property.

The crying need for reform and the introduction of a proper police was admitted by the government in 1829, when Sir Robert Peel laid the foundation of a better system. Much opposition was offered to the scheme, which was denounced as an insidious attempt to enslave the people by arbitrary and tyrannical methods. The police were to be employed, it was said, as the instruments of a new despotism, the enlisted members of a new standing army, under the centralized authority, riding roughshod over the peaceable citizens. But the guardians of order, under the judicious guidance of such sensible chiefs as Colonel Rowan and Sir Henry Maine, soon lived down the hostility first exhibited, and although one serious and lamentable collision occurred between the mob and the police in 1833, it was agreed two years later that the unfavourable impression at one time existing against the new police was rapidly diminishing, and that it had fully answered the purpose for which it was formed. Crime had already diminished; it was calculated that the annual losses inflicted on the public by the depredations of the dangerous classes had appreciably fallen and a larger number of convictions had been secured.

The formation of the metropolitan police was in due course followed by the extension of the principle to the provinces. Borough constabulary forces were established by the Municipal Corporation Act (1835), which entrusted their administration to the mayor and a watch committee, and this act was revised in 1882, when the general powers of this authority were defined Acts of 1839 and 1840 permitted the formation by the justices of a paid county police force. Action in this case was optional, but after an interval of fifteen years the Police Act of 1856 made the rule compulsory, it being found that an efficient police force throughout England and Wales was necessary for the more effectual prevention and detection of crime, the suppression of vagrancy and the maintenance of good order. Local acts had already endowed Scotland with a police system, and in 1857, and again in 1862, counties were formed into police districts, and the police of towns and populous places was generally regulated. Ireland has two police forces; the Dublin metropolitan police originated in 1808, and in 1829 the provisions of Sir Robert Peel's act for London were embodied in the Police Law for Ireland.

The extent to which the metropolitan police has developed will best be realized by contrasting its numbers on first creation and the nature of the duties and functions that then appertained to it. The first act (the Metropolitan Police Act 1829) applied to the metropolis, exclusive of the

city of London, and constituted a police area having a radius of 12 m. from Charing Cross. Two justices of the peace were appointed, presently named commis- sioners of police, to administer the act under the immediate direc- tion of the secretary of state for the home department. The first police office was located in Whitehall in Scotland Yard, from which it was removed in the autumn of 1890 to the new and imposing edifice on the Embankment, in which all branches are now con- centrated, known as New Scotland Yard. The first constables

appointed were 3000 in number, who, when sworn in, enjoyed all the powers of the old constables under the common law, for pre- serving the peace, preventing robberies and other felonies, and apprehending offenders. The subdivision of the district into divi- sions, on much the same lines as now existing, was at once made for administrative convenience, and a proportion of officers was allotted to each in the various grades then first constituted and still preserved, comprising in ascending order, constables, sergeants, inspectors and superintendents. Some time later the grade of district superintendent was created, held by gentlemen of superior status and intelligence, to each of whom the control of a large section of the whole force, embracing a wide area, was entrusted. This grade has since been merged in that of chief constable, of whom there are four exercising powers of disciplinary supeivision in the metropolitan districts, and a fifth who is assistant in the branch of criminal investigation. The supreme authority is vested in the home secretary, but the immediate command and control is exercised by the chief commissioner, with three assistants, re- placing the two commissioners provided for in 1829.

After various parliamentary reports and some legislation by way of extension, an important act was passed in 1839 reciting thac the system of police established had been found very inefficient and might be yet further improved (Metropolitan Police Act 1839). The metropolitan police district was extended to 15 m. from Charing Cross. The whole of the river Thames (which, in its course through London, so far as related to police matters, had been managed under distinct acts) was brought within it, and the collateral but not exclusive powers of the metropolitan police were extended to the royal palaces and ic m. round, and to the counties adjacent to the district. Various summary powers for dealing with street and other offences were conferred. When the police was put on a more complete footing and the area enlarged, provision was made for the more effectual administration of justice by the magistrates of the metropolis (Metropolitan Police Courts Act 1839). The changes that occurred in magisterial

functions are scarcely less remarkable than the transition from the parish constable to the organized police. The misdirected activity of the civil magistrate in the 17th century is illustrated by the familiar literature of Butler, Banyan and others. The zeal of that age was succeeded by apathetic reaction, and it became necessary in the metropolis to secure the services of paid justices. At the beginning of the 19th century, outside of the city of London (where magisterial duties were, as now, performed by the lord mayor and aldermen), there were various public offices besides the Bow Street and Thames police offices where magistrates attended. To the Bow Street office was subsequently attached the " horse patrol "; each of the police offices had a fixed number of constables attached to it, and the Thames police had an establishment of constables and sur- veyors. The horse patrol was in 1836, as previously intended, placed under the new police. It became desirable that the horse patrol and constables allotted to the several police offices not interfered with by the Act of 1828 should be incorporated with the metropolitan police force. This was effected, and thus magisterial functions were completely separated from the duties of the executive police; for although the jurisdiction of the two justices, afterwards called commissioners, as magistrates extended to ordinary duties (except at courts of general or quarter sessions), from the first they took no part in the examination or committal for trial of persons charged with offences. No prisoners were brought before them. Their functions were in practice confined to the discipline of the force and the prevention and detection of offences, their action limited to having persons arrested or summoned to be dealt with by the ordinary magistrates, whose courts were not interfered with.

The aim and object of the police force remain the same as when first created, but its functions have been varied and extended in scope and intention. To secure obedience to the law is a first and principal duty; to deal with breaches of the rules made by authority, to detect, pursue and arrest offenders. Next comes the preservation of order, the protection of all reputable people, and the maintenance of public peace by checking riot and disturbance or noisy demonstration, by enforc- ing the observance of the thousand and one regulations laid down for the general good. The police have become the minis- ters of a social despotism resolute in its watchful care and control of the whole community, well-meaning and paternal, although when carried to extreme length the tendency is to diminish self-reliance and independence in the individual. The police are necessarily in close relation with the state; they are the direct representatives of the supreme government, the servants of the Crown and legislature. In England every constable when he joins the force makes a declaration and swears that he will serve the sovereign loyally and diligently, and so acquires the rights and privileges of a peace officer of and for the Crown.

The state employs police solely in the interests of the public welfare. No sort of espionage is attempted, no effort made to penetrate privacy; no claim to pry into the secret actions of law-abiding persons is or would be tolerated; the agents of authority must«not seek information by underhand or unworthy means. In other countries the police system has been worked more arbitrarily; it has been used to check free speech, to inter- fere with the right of public meetings, and condemn the expres- sion of opinion hostile to or critical of the ruling powers. An all-powerful police, minutely organized, has in some foreign states grown into a terrible engine of oppression and made daily life nearly intolerable. In England the people are free to assemble as they please,' to march in procession through the streets, to gather in open spaces, to listen to the harangues, often forcibly expressed, of mob orators, provided always that no obstruction is caused or that no disorder or breach of the peace is threatened.

The strength of the metropolitan police in 1908 was 18,167, comprising 32 superintendents, 572 inspectors, 2378 sergeants and I5il85 constables. At the head is a commissioner, appointed by the home office; he is assisted by four assistant commissioners, one of whom was appointed under the Police Act 1909, in accord- ance with the recommendation of the Royal Commission on the Metropolitan Police 1906, his duty especially being to deal with complaints made by the public against the police. The metro- politan police are divided into 21 divisions, to which letters of the alphabet are assigned for purposes of distinction. _ There is in addition the Thames division, recruited mostly from sailors, charged with the patrol of the river and the guardianship of the shipping. To the metropolitan police also are assigned the control and guardianship of the various naval dockyards and arsenals. _

The city of London has its own distinct police organization under a commissioner and assistant commissioner, and its functions extend over an area of 673 statute acres containing two courts of justice, those of the Guildhall and Mansion House, where the lord mayor and the aldermen are the magistrates. Although the area is comparatively small the rateable value is enormous. The force comprises 2 superintendents, 48 inspectors, 86 sergeants and 865 constables; also some 60 constables on private service duty.

The total police force of England and Wales in 1908 was 30,376, almost equally divided between counties and boroughs; that of Scotland numbered 5575. In Ireland the Royal Irish Constabulary are a semi-military force, numbering over 10,500; they police the whole of Ireland, except the city of Dublin, which is under the Dublin metropolitan police, a particularly fine body. _

The most active and by no means the least efficient branch of the modern English police is that especially devoted to criminal investigation or the detection of crime. The detective is the direct descendant of the old " Bow Street runners " or " Robin Redbreasts "• — so styled from their scarlet waistcoats — officers in attendance upon the old-fashioned police offices and despatched by the sitting magistrates to follow up any very serious crime in the interests of the public or at the urgent request of private persons. The " runners had disappeared when the police organization introduced by Sir Robert Peel came into force in 1829, and at first no part of the new force was especially attributed to the detection of crime. They were much missed, but fifteen years elapsed before Sir James Graham (then home secretary) decided to allot a few constables in plain clothes for that purpose as a tentative measure. The first " detectives " appointed numbered only a dozen, three inspectors and nine sergeants, to whom, however, six constables were shortly added as " auxiliaries," but the number was gradually enlarged as the manifest uses of the system became more and more obvious.

Other Countries. — British India is divided into police districts, the general arrangements of the system of the regular police, which dates from the disappearance of the East India Company, resembling in most respects those of the English police, but differ- ing in details in the different presidencies. All are in uniform, trained to the use of firearms and drilled, and may be called upon to perform military duties. The superior officers are nearly all Europeans and many of them are military officers. The rest are natives, in Bombay chiefly Mahommedans. The organization of the police was not dealt with by the criminal code which came into force in 1883, but the code is full of provisions tending to make the force efficient. By that code as well as by the former code the police have a legal sanction for doing what by practice they do in England ; they take evidence for their own information and guidance in the investigation of cases and are clothed with the power to compel the attendance of witnesses and question them. The smallness of the number of European magistrates, and other circumstances, make the police more important and relatively far more powerful in India than in England (Stephen). The difficulties in the way of ascertaining the truth and investigating false statements and

suppressed cases are very great. As regards the rural police of India every village headman and the village watchman as well as the village police office are required by the code to communicate to the nearest magistrate or the officer in charge of the nearest police station, whichever is nearest, any

information respecting offenders. On the whole the system is very efficient. The police, which has numerous duties over ana above those of the prevention and detection of crime, greatly aids a government so paternal as that of India in keeping touch with the widely extended masses of the population.

France. — It is a matter of history that under Louis XIV., who created the police of Paris, and in succeeding times, the most un- popular and unjustifiable use was made of police as a secret instru- ment for the purposes of despotic government. Napoleon availed himself largely of police instruments, especially through his minister Fouche. On the restoration of constitutional government under Louis Philippe, police action was less dangerous, but the danger revived under the second empire. The ministry of police, created by the act of the Directory in 1796, was in 1818 suppressed as an independent office, and in 1852 it was united with the ministry of the interior. The regular police organization, which preserves order, checks evil-doing, and " runs in " malefactors, falls naturally and broadly into two grand divisions, the administrative and the active, the police " in the office " and the police "out of doors." The first attends to the clerical business, voluminous and incessant. An army of clerks in the numerous bureaus, hundreds of patient government employes, the ronds de cuir, as they are contemptuously called, because they sit for choice on round leather cushions, are engaged constantly writing and filling in forms for hours and hours, day after day. The active army of police out of doors, which con- stitutes the second half of the whole machine, is divided into two classes: that in uniform and that in plain clothes. Every visitor to Paris is familiar with the rather theatrical-looking policeman, in his short frock-coat or cape, smart kepi cocked on one side of his head, and with a sword by his side. The first is known by the title of agent, sergent de ville, gardien de la paix, and is a very useful public servant. He is almost invariably an old soldier, a serger.t who has left the army with a first-class character, honesty and sobriety being indispensable qualifications.

These uniformed police are not all employed in the streets and arrondissements, but there is a large reserve composed of the six central brigades, as they are called, a very smart body of old soldiers, well drilled, well dressed and fully equipped; armed, more- over, with rifles, with which they mount guard when employed as sentries at the doors or entrance of the prefecture. In Paris argot the men of these six central brigades are nicknamed " vais- seaux " (vessels), because they carry on their collars the badge of the city of Paris — an ancient ship — while the sergeants in the town districts wear only numbers, their own individual number, and that of the quarter in which they serve. These vaisseaux claim to be the elite of the force; they come in daily contact with the Gardes de Paris, horse and foot, a fine corps of city gendarmerie, and, as competing with them, take a

particular pride in themselves. Their comrades in the quarters resent this pretension and declare that when in contact with the people the vaisseaux make bad blood by their arrogance and want of tact. The principal business of four at least of these central brigades is to be on call when required to reinforce the out-of-door police at special times.

Of the two remaining central brigades one controls public car- riages, the other the Halles, the great central market by which Paris is provided with a large part of its food. Every cab-stand is under the charge of its own policeman, who knows the men, notes their arrival and departure, and marks their general behaviour. Other police officers of the central brigades superintend the street traffic.

So much for the police in uniform" That in plain clothes, en bourgeois, as the French call it, is not so numerous, but fulfils a higher, or at least a more confidential mission. Its members are styled inspectors, not agents, and their functions fall under four principal heads. There is, first of all, the service of the Surety — in other words, of public safety — the detective department, em- ployed entirely in the pursuit and capture of criminals; next comes the police, now amalgamated with the SOrete, that watches over the morals of the capital and possesses arbitrary powers under the existing laws of France; then there is the brigade de garnis, the police charged with the supervision of all lodging-houses, from the commonest " sleep-sellers' ' shop, as it is called, to the grandest hotels. Last of all there is the brigade for enquiries, whose business it is to act as the eyes and ears of the prefecture.

The pay of the gardiens de la paix is from 1400 to 1700 francs; brigadiers get 2000 francs; sous-brigadiers 1800 francs; officiers de paix 3000 to 6000 francs. The proportion of police to inhabitants is one in 352.

Germany. — Taking the Berlin force as illustrative of the police system in the German Empire, police duties are as various as in France; the system includes a political police, controlling all matters relating to the press, societies, clubs and public and social amuse- ments. Police duties are carried out under the direction of the royal police presidency, the executive police force comprising a police colonel, with, besides commissaries of criminal investigations,

captains, lieutenants, acting-lieutenants, sergeant-majors and a large body of constables (schutzmdnner).

It is computed that the proportion of population to police in Berlin is between 350 and 400 to each officer. The pay of the police is principally provided from fiscal sources and varies in an ascending scale from n 25

marks and lodging allowance for the lowest class of constable.

Austria. — Taking Vienna in the same way as illustrative of the Austrian police, it is to be observed that there are three branches: (1) administration; (2) public safety and judicial police; and (3) the government police. At the head of the police service in Vienna there is a president of police and at the head of each of the three branches there is an Oberpolizeirath or chief commissary. The head of the government branch sometimes fills the office of president. Each of the branches is subdivided into departments, at the head of which are Polizeirathe. Passing over the subdivisions of the administrative branch, the public safety and judicial branch includes the following departments: the office for public safety, the central inquiry office and the record or Evidenzbureau. The government police branch comprises three departments : the govern- ment police office, the press office, and the Vereinsbureau or office for the registration of societies. The proportion of police constables to the inhabitants is one to 436.

Belgium. — In Belgian municipalities the burgomasters are the heads of the force, which is under their control. The administrator of public safety is, however, specially under the minister of justice, who sees that the laws and regulations affecting the police are properly carried out, and he can call on all public functionaries to act in furtherance of that object. The administrator of public safety is specially charged with the administration of the law in regard to aliens, and this law is applied to persons stirring up sedi- tion. The duty of the gendarmerie, who constitute the horse and foot police, is generally to maintain internal order and peace. In Brussels as elsewhere the burgomaster is the head, but for executive purposes there is a chief commissary (subject, however, to the orders of the burgomaster), with assistant commissaries, and com- missaries of divisions and other officers and central and other bureaus, With a body of agents (police constables) in each.

There are two main classes of police functions recognized by law, the administrative and the judicial police, the former engaged in the daily maintenance of peace and order and so preventing offences, the latter in the investigation of crime and tracing offenders ; but the duties are necessarily performed to a great extent by the same agents. The two other functions of the judicial police are, however, limited to the same classes of officers, and they perform the same duties as in Paris — the law in practice there being expressly adopted in Brussels.

In Switzerland, which is sometimes classed with Belgium as among the least-policed states of Europe, the laws of the cantons vary. In some respects they are stricter than in Belgium or even in France. Thus a permis

de sejour is sometimes required where none is in practice necessary in Paris or Brussels.

Russia was till lately the most police-ridden country in the world ; not even in France in the worst days of the monarchy were the people so much in the hands of the police. To give some idea of the wide- reaching functions of the police, the power assumed in matters momentous and quite insignificant, we may quote from the list of circulars issued by the minister of the interior to the governors of the various provinces during four recent years. The governors were directed to regulate religious instruction in secular schools, to prevent horse-stealing, to control subscriptions collected for the holy places in Palestine, to regulate the advertisements of medicines and the printing on cigarette papers, to examine the quality of quinine soap and overlook the cosmetics and other toilet articles — such as soap, starch, brillantine, tooth-brushes and insect-powder — provided by chemists. They were to issue regulations for the proper construction of houses and villages, to exercise an active censorship over published price-lists and printed notes of invitation and visiting cards, as well as seals and rubber stamps. All private meetings and public gatherings, with the expressions of opinion and the class of subjects discussed, were to be controlled by the police.

The political or state police was the invention of Nicholas I. Alexander I. had created a ministry of the interior, but it was Nicholas who devised the second branch, which he designed for his own protection and the security of the state. After the in- surrection of 1865, he created a special bulwark for his defence, and invented that secret police which grew into the notorious " Third Section " of the emperor's own chancery, and while it lasted, was the most dreaded power in the empire. It was practic- ally supreme in the state, a ministry independent of all other ministries, placed quite above them and responsible only to the tsar himself.

United States. — The organization of police forces in the United States differs more or less in the different states of the Union. As a rule the force in cities i3 under municipal control, but to thie rule there are numerous exceptions. In Boston, for instance, the three commissioners at the head of the force are appointed by the governor of Massachusetts. The force in New York City, alike from the standpoint of numbers and of the size and character

of the city, is the most important in the United States. It included in 1910 a commissioner appointed by the mayor and exercising a wide range of

authority; four deputy commissioners; a chief in- spector, who has immediate charge of the force and through whom all orders are issued; he is assisted by 18 inspectors, who are in charge of different sections of the city, and who carry out the orders of the chief; 87 captains, each of whom is in direct charge of a precinct; 583 sergeants; and last of all, the ordinary policemen, or patrolmen, as they are often called from the character of their duties. There is a separate branch, the detective bureau, com- posed of picked men, charged with the investigation and, still more, the prevention of crime. The total number of patrol men in 1909 was 8562, Appointments are for life, with pensions in case of disability and after a given number of years of service.

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POLICE COURTS, courts of summary jurisdiction, held in London and certain large towns of the United Kingdom by specially appointed and salaried magistrates. They were originally called "public offices" (Middlesex Justices Act 1792), but after the establishment of the police force, in 1829, they came to be called " police offices," although no change had taken place in their nature. They are so described in a report of a select committee which inquired into the system in 1837 and 1838; in the same report the magistrates who presided in the courts were first described as " police magistrates." Police offices were first officially described by their modern title in the Metropolitan Police Courts Act 1839. In 1839 there were nine police courts; since 1792 there had been three magistrates to each court, and the act of 1839 retained twenty-seven as the maximum number at any time (s. 2). In 1835 unsalaried justices ceased to sit in the police courts along with the paid magistrates. The Metropolitan Police Courts Act 1840 gave power to map out the whole of the metropolitan police district into police court divisions, and to establish police courts wherever necessary, the artificial limit of twenty-seven magistrates being at the same time preserved. Additional courts have from time to time been established by orders in council, and in 1910 there were in London fourteen courts with twenty-five magis- trates. Their divisions are regulated

by orders in council of 1903 and 1905; the nine original courts are Bow Street, West- minster, Marylebone, Marlborough Street, Worship Street, Clerkenwell, Thames, Tower Bridge and Lambeth.

The courts are held every day from 10 a.m. to 5 p.m. except on Sunday, Christmas Day, Good Friday or any day appointed for a public fast or thanksgiving or bank holiday. The Greenwich and Woolwich court, which comprises one division, is held at Greenwich in the morning and at Woolwich in the afternoon. The chief magistrate (sitting at Bow Street) receives a salary of £1800 a year and the other magistrates £1500 each. The magistrates are appointed by the Crown; they must have been practising barristers for seven years or stipendiary magistrates for some place in England or Wales. One police magistrate has the same powers as two justices, but may not act in anything which has to be done at special or petty sessions of all the justices acting in the division or at quarter sessions. He can do alone when sitting in a police court any act which any justice or justices can do under the Indict- able Offences Act 1848, or under the Summary Jurisdiction Act; he has special powers under the Metropolitan Police Courts Act 1839, and is also given special powers under certain other acts. The Bow Street court has jurisdiction in extradition. The pre- cedent of appointing salaried magistrates was followed for certain towns in the provinces by particular acts, and in 1863 the Stipendiary Magistrates Act gave power to towns and boroughs of 25,000 inhabitants and upwards to obtain a stipendiary magistrate.

POLIGNAC, an ancient French family, which had its seat in the Cevennes near Puy-en-Velay (Haute Loire). Its authentic pedigree can be traced to the 9th century, but in 142 1 the male line became extinct. The heiress married Guillaume, sire de

Chalancon (not to be confused with the barons of Chalancon in Vivarais), who assumed the name and arms of Polignac. The first member of the family who was of any historical importance was Cardinal Melchior de Polignac (1661-1742), a younger son of Armand XVI., marquis de Polignac, who at an early age achieved distinction as a diplomatist. In 1695 he was sent as ambassador to Poland, where he contrived to bring about the election of the prince of Conti as successor to John Sobieski (1697). The subsequent failure of this intrigue led to his tem- porary disgrace, but in 1702 he was restored to favour, and in 1712 he was sent as the plenipotentiary of Louis XIV. to the Congress of Utrecht. During the regency he became involved in the Cellamare plot, and was relegated to Flanders for three years. From 1725 to 1732 he acted for France at the Vatican. In 1726 he received the archbishopric of Auch, and he died at Paris in 1742. He left unfinished a metrical refutation of Lucretius which was published after his death by the abbe de Rothelin (Anti-Lucretius,

1745), and had considerable vogue in its day. Count Jules de Polignac (d. 1817), grandnephew of the preceding, was created duke by Louis XVI. in 1780, and in 1782 was made postmaster-general. His position and influence at court were largely due to his wife, Gabrielle de Polastron, the bosom friend of Marie Antoinette; the duke and duchess alike shared the unpopularity of the court, and were among the first to "emigrate" in 1789. The duchess died shortly after the queen, but her husband, who had received an estate from Catherine II. in the Ukraine, survived till 181 7. Of their three sons the second, Prince Jules de Polignac (1780-1847), played a conspicuous part in the clerical and ultra-royalist reaction after the Revolution. Under the empire he was implicated in the conspiracy of Cadoudal and Pichegru (1804), and was imprisoned till 1813. After the restoration of the Bourbons he held various offices, received from the pope his title of " prince " in 1820, and in 1823 was made ambassador to the English court. On the 8th of August 1829 he was called by Charles X. to the ministry of foreign affairs, and in the following November he became president of the council. His appointment, was taken as symbolical of the king's intention to overthrow the constitution, and Polignac, with the other ministers, was held responsible for the policy which culminated in the issue of the Four Ordi- nances which were the immediate cause of the revolution of July 1830. On the outbreak of this he fled for his life, but, after wandering for some time among the wilds of Normandy, was arrested at Granville. His trial before the chamber of peers resulted in his condemnation to perpetual imprisonment (at Ham), but he benefited by the amnesty of 1836, when the sentence was commuted to one of exile. During his captivity he wrote Considerations politiques (1832). He afterwards spent some years in England, but finally was permitted to re-enter France on condition that he did not take up his abode in Paris. He died at St Germain on the 29th of March 1847.

POLIGNY, a town of eastern France, capital of an arrondisse- ment in the department of Jura, 18 m. N. N. E. of Lons-le-Saunier on the Paris-Lyons railway. Pop. (1906), 3756. The town lies in the valley of the Glantine at the base of a hill crowned by the ruins of the old castle of Grimont, once the repository of the archives of the county of Burgundy. The church of Monti- villard, its most remarkable building, dates in the oldest portions, from the 12th century, its chief features being a Romanesque tower and reredos of the Renaissance period. Amongst the other old buildings of the town, the church of St Hippolyte, of the first half of the 15th century, and a convent-church serving as corn market are of some interest. The tribunal of first instance belonging to the arrondissement is at Arbois. Poligny has a sub-prefecture, a communal college and a school of dairy instruction. Under the name of Polemniacum the town seems to have existed at the time of the Roman occupation.

POLISH SUCCESSION WAR (1733-1735), the name given to a war which arose out of the competition for the throne of Poland between the elector August of Saxony, son of August II. (the Strong), and Stanislaus Leszcynski, the king of Poland installed thirty years before by Charles XII. of Sweden and displaced by

August the Strong when Charles's projects collapsed. The claims of Stanislaus were supported by France, Spain and Sardinia, those of the Saxon prince by Russia and the empire, the local quarrel being made the pretext for the settlement of minor outstanding claims of the great powers amongst themselves. The war was therefore a typical 18th century " war with a limited object," in which no one but the cabinets and the professional armies were concerned. It was fought on two theatres, the Rhine and Italy. The Rhine campaigns were entirely unimportant, and are remembered only for the last appearance in the field of Prince Eugene and Marshal Berwick — the latter was killed at the siege of Philippsburg — and the baptism of fire of the young crown prince of Prussia, afterwards Frederick the Great. In Italy, however, there were three hard-fought — though indecisive — battles, Parma (June 29, 1734), Luzzara (Sept. 19, 1734) and Bitonto (May 25, 1735), the first and last won by the Austrians, the second by the French and their allies. In Poland itself, Stanislaus, elected king in September 1733, was soon expelled by a Russian army and was afterwards besieged in Danzig by the Russians and Saxons (Feb.- June 1733).

POLITIAN (1454-1494). Angelo Ambrogini, known in literary annals as Angelo Pollziano or Politianus from his birth- place, was born at Montepulciano in Tuscany on the 14th of July 1454. His father, Benedetto, a jurist of good family and dis- tinguished ability, was murdered by political antagonists for adopting the cause of Piero de' Medici in Montepulciano; and this circumstance gave his eldest son, Angelo, a claim on the family of Medici. At the age of ten the boy came to prosecute his studies at Florence, where he learned Latin under Cristoforo Landino, and Greek under Argyropulos and Andronicos Kallistos. From Marsilio Ficino he imbibed the rudiments of philosophy. The precocity of his genius for scholarship and poetry was early manifested. At thirteen years of age he began to circulate Latin letters; at seventeen he sent forth essays in Greek versifi- cation; at eighteen he published an edition of Catullus. In 1470 he won for himself the title of Homericus juvenis by translating four books of the Iliad into Latin hexameters. Lorenzo de' Medici, who was then the autocrat of Florence and the chief patron of learning in Italy, took

Poliziano into his household, made him the tutor of his children, and secured him a distin- guished post in the university of Florence. Before he reached the age of thirty, Poliziano expounded the humanities with almost unexampled lustre even for that epoch of brilliant professors. Among his pupils could be numbered the chief students of Europe, the men who were destined to carry to their homes the spolia opima of Italian culture. Not to mention Italians, it will suffice to record the names of the German Reuchlin, the English Grocyn and Linacre, and the Portuguese Tessiras. ,

Poliziano had few advantages of person to recommend him. He was ungainly in form, with eyes that squinted, and a nose of disproportionate length. Yet his voice was rich and capable of fine modulation; his eloquence, ease of utterance and copious stream of erudition were incomparable. It was the method of professors at that period to read the Greek and Latin authors with their class, dictating philological and critical notes, emend- ing corrupt passages in the received texts, offering elucidations of the matter, and pouring forth stores of acquired knowledge regarding the laws, manners, religious and philosophical opinions of the ancients. Poliziano covered nearly the whole ground of classical literature during the years of his professorship, and published the notes of his courses upon Ovid, Suetonius, Statius, the younger Pliny, Quintilian, and the writers of Augustan histories. He also undertook a recension of the text of the Pandects of Justinian, which formed the subject of one of his courses; and this recension, though it does not rank high in the scale of juristic erudition, gave an impulse to the scholarly criticism of the Roman code. At the same time he was busy as a translator from the Greek. His versions of Epictetus, Herodian, Hippocrates, Galen, Plutarch's Eroticus and Plato's Charmides delighted contemporaries by a certain limpid fluency of Latin style and grace of manner which distinguished him also

as an original writer. Of these learned labours the most uni- versally acceptable to the public of that time were a series of discursive essays on philology and criticism, first published in 1489 under the title of Miscellanea. They had an immediate, a lasting and a wide renown, encouraging the scholars of the next century and a half to throw their occasional discoveries in the field of scholarship into a form at once so attractive and so instructive. Poliziano was not, however, contented with these simply professorial and scholastic compositions. Nature had endowed him with literary and poetic gifts of the highest order. These he devoted to the composition of Latin and Greek verses, which count among the best of those produced by men of modern times in rivalry with ancient authors. The Manto, in which he pronounced a panegyric of Virgil; the Ambra, which contains a beautiful idyllic sketch of Tuscan landscape, and a studied eulogy of Homer; the Ruslicus, which celebrated the pleasures of country life in no frigid or scholastic spirit ; and the Nutricia, which was

intended to serve as a general introduction to the study of ancient and modern poetry — these are the masterpieces of Poliziano in Latin verse, displaying an authenticity of inspira- tion, a sincerity of feeling, and a command of metrical resources which mark them out as original productions of poetic genius rather than as merely professorial lucubrations. Exception may be taken to their style, when compared with the best work of the Augustan or even of the Silver age. But what renders them always noteworthy to the student of modern humanistic literature is that they are in no sense imitative or conventional, but that they convey the genuine thoughts and emotions of a born poet in Latin diction and in metre moulded to suit the characteristics of the singer's temperament.

Poliziano was great as a scholar, as a professor, as a critic, and as a Latin poet at an age when the classics were still studied with the passion of assimilative curiosity, and not with the scien- tific industry of a later period. He was the representative hero of that age of scholarship in which students drew their ideal of life from antiquity and fondly dreamed that they might so restore the past as to compete with the classics in production and bequeath a golden age of resuscitated paganism to the modern world. Yet he was even greater as an Italian poet. Between Boccaccio and Ariosto, no single poet in the mother tongue of Italy deserves so high a place as Poliziano. What he might have achieved in this department of literature had he lived at a period less preoccupied with humanistic studies, and had he found a congenial sphere for his activity, can only be guessed. As it is, we must reckon him as decidedly the foremost and indubitably the most highly gifted among the Italian poets who obeyed Lorenzo de' Medici's demand for a resuscitation of the vulgar literature. Lorenzo led the way himself, and Poliziano was more a follower in his path than an initiator. Yet what Poliziano produced, impelled by a courtly wish to satisfy his patron's whim, proves his own immeasurable superiority as an artist. His principal Italian works are the stanzas called La Giostra, written upon Giuliano de' Medici's victory in a tourna- ment; the Orfeo, a lyrical drama performed at Mantua with musical accompaniment ; and a collection of fugitive ˆpieces, reproducing various forms of Tuscan popular poetry. La Giostra had no plan, and remained imperfect; but it demon- strated the capacities of the octave stanza for rich, harmonious and sonorous metrical effect. The Orfeo is a slight piece of work, thrown off at a heat, yet abounding in unpremeditated lyrical beauties, and containing in itself the germ both of the pastoral play and of the opera. The Tuscan songs are distinguished by a " roseate fluency," an exquisite charm of half romantic, half humorous abandonment to fancy, which mark them out as improvisations of genius. It may be added that in all these departments of Italian composition Poliziano showed how the taste and learning of a classical scholar could be engrafted on the stock of the vernacular, and

how the highest perfection of artistic form might be attained in Italian without a sacrifice of native spontaneity and natural flow of language.

It is difficult to combine in one view the several aspects presented to us by this many-sided man of literary genius. At

a period when humanism took the lead in forming Italian charac- ter and giving tone to European culture, he climbed with facility to the height of achievement in all the branches of scholarship which were then most seriously prized — in varied knowledge of ancient authors, in critical capacity, in rhetorical and poetical exuberance. This was enough at that epoch to direct the attention of all the learned men of Europe on Poliziano. At the same time, almost against his own inclination, certainly with very little enthusiasm on his part, he lent himself so success- fully to Lorenzo de' Medici's scheme for resuscitating the decayed literature of Tuscany that his slightest Italian effusions exercised a potent influence on the immediate future. He appears before us as the dictator of Italian culture in a double capacity— as the man who most perfectly expressed the Italian conception of humanism, and brought erudition into accord with the pursuit of noble and harmonious form, and also as the man whose vernacular compositions were more significant than any others of the great revolution in favour of Italian poetry which culmi- nated in Ariosto. Beyond the sphere of pure scholarship and pure literature Poliziano did not venture. He was present, indeed, at the attack made by the Pazzi conspirators on the persons of Lorenzo and Giuliano de' Medici, and wrote an interesting account of its partial success. He also contributed a curious document on the death of Lorenzo de' Medici to the students of Florentine history. But .he was not, like many other humanists of his age, concerned in public affairs of state or diplomacy, and he held no office except that of professor at Florence. His private life was also uneventful. He passed it as a house-friend and dependant of the Medici, as the idol of the learned world, and as a simple man of letters for whom (with truly Tuscan devotion to the Saturnian country) rural pleasures were always acceptable. He was never married; and his morals incurred suspicion, to which his own Greek verses lend a certain amount of plausible colouring. In character Poliziano was decidedly inferior to the intellectual and literary eminence which he displayed. He died, half broken-hearted by the loss of his friend and patron Lorenzo de' Medici, on the 24th of September 1494, just before the wave of foreign invasion which was gathering in France swept over Italy.

For the life and works of Politian, see F. O. Mencken (Leipzig, 1736), a

vast repertory of accumulated erudition; Jac. Mahly, Angelus Politianus (Leipzig, 1864); Carducci's edition of the Italian poems (Florence, Earbera, 1863); Del Lungo's edition of the Italian prose works and Latin and Greek poems (Florence, Barbera, 1867); the Opera omnia (Basel, 1554); Greswell's English Life of Politian (1805); Roscoe's Lorenzo de' Medici (10th ed., 1851); J. Addington Symonds's Renaissance in Italy, and transla- tions from Poliziano's Italian poems in Symonds's Sketches and Studies in Italy, which include the Orfeo. (J. A. S.)

POLK, JAMES KNOX (1795-1849), eleventh president of the United States, was born in Mecklenburg county, North Carolina, on the 2nd of November 1795. In 1806 he crossed the mountains with his parents and settled in what is now Maury county, Tennessee. He graduated from the university of North Carolina in 1818, studied law in the office of Felix Grundy (1777-1840) at Nashville in 1819-1820, was admitted to the bar in 1820, and began to practise in Columbia, the county-seat of Maury county. After two years of service (1823-1825) in the state House of Representatives, he represented the sixth Tennessee district in the National House of Representatives from 1825 to 1839. In the party conflicts which succeeded the presidential election of 1824 he sided with the Jackson- Van Buren faction, and soon became recognized as leader of the Democratic forces. He was speaker. from 1835 until 1839, when he retired from Congress to become governor of Tennessee. His administration (1839-1841) was successful, but he was unable to overcome the popular Whig movement of that period, and was defeated in 1841 and again in 1843. When the Democratic national convention met in Balti- more in 1844 he was mentioned as a possible candidate for the vice-presidency, but was suddenly brought forward as a " dark horse " and selected to head the ticket. Finding it impossible under the two-thirds rule to nominate their candidate, the followers of Van Buren brought forward Polk, who was popular

in the South, in order to defeat Lewis Cass and James Buchanan. George Bancroft, the historian, has asserted that this suggestion came originally from him, and Gideon J. Pillow, Polk's intimate friend, did much to bring about the nomination.

The unequivocal stand of Polk and his party in favour of the immediate annexation of Texas and the adoption of a vigorous policy in Oregon contrasted favourably with the timid vacilla- tions of Henry Clay and the Whigs. Polk was elected, receiving 170 electoral votes to 105 for his opponent Clay. In forming his cabinet he secured the services of James Buchanan of Pennsylvania, as secretary of state, Robert J. Walker of Missis- sippi, as secretary of the treasury, William L. Marcy of New York, as secretary of war, and George Bancroft, then of Massachusetts, as

secretary of the navy. 1 There is no doubt that each of these men, and Bancroft in particular, influenced the policy of the administration, yet the historian James Schouler, who has made a careful study of the Polk papers, is doubtless correct in saying that the president himself was " the framer of the public policy which he carried into so successful execution, and that instead of being led (as many might have imagined) by the more famous statesmen of his administration and party who surrounded him, he in reality led and shaped his own executive course." Ban- croft's opinion is that Polk was " prudent, fat-sighted, bold, exceeding any Democrat of his day in his undeviatingly correct exposition of Democratic principles."

The four chief events of President Polk's administration were the final establishment of the independent treasury system, the reduction of the tariff by the Walker Bill of 1846, the adjustment of the Oregon boundary dispute with Great Britain by the treaty concluded on the 15th of June 1846, and the war with Mexico and the consequent acquisition of territory in the south-west and west. The first three of these were recommended in his first annual message, and he privately announced to Bancroft his determination to seize California. The independent treasury plan originated during Van Buren's administration as a Demo- cratic measure; it had been repealed by the Whigs in 1841, and was now re-enacted. Protectionists contend that the tariff legislation of 1846 was in direct violation of a pledge given to the Democrats of Pennsylvania in a letter written by Polk during the campaign to John K. Kane of Philadelphia. Briefly summarized, this letter approves of a tariff for revenue with incidental protection, whereas the annual message of the 2nd of December 1845 criticizes the whole theory of protection and urges the adoption of a revenue tariff just sufficient to meet the needs of the government conducted on an economical basis. It is difficult to determine whether this was always his idea of incidental protection, or whether his views were changed after 1844 through the influence of Walker and the example set by Sir Robert Peel in Great Britain, or whether he was •simply "playing politics" to secure the protectionist vote in Pennsylvania.

The one overshadowing issue of the time, however, was territorial expansion. Polk was an ardent expansionist, but the old idea that his policy was determined entirely by a desire to advance the interests of slavery is no longer accepted. As a matter of fact, he was personally in favour of insisting upon 54 40′ as the boundary in Oregon, and threw upon Congress the responsibility for accepting 49 as the boundary, and he approved the acquisition of California, Utah and New Mexico, territory from which slavery was excluded by geographical and climatic conditions. Furthermore a study of his manuscript diary now shows that he opposed the efforts of Walker and Buchanan in the Cabinet, and of Daniel S. Dickinson (1800-1866) of New York and Edward A. Hannegan (d. 1859) of

Indiana, in the Senate, to retain the whole of Mexico, territory in which slavery might have thrived. At the close of his term (March 4, 1849) Polk retired to his home in Nashville, Tennessee, where he died on the 15 th of the following June.

1 Bancroft served until September 1846, when he was appointed minister to England. He was succeeded as secretary of the navy by John J. Mason, who had previously hi'ld the office of attorney- general.

See John S. Jenkins, James Knox Polk (Auburn and Buffalo, 1850), and L. B. Chase, History of the Polk Administration (New York, 1850), both of which contain some documentary material, but are not discriminating in their method of treatment. George Bancroft contributed a good short sketch to J. G. Wilson's Presidents of the United States (New York, 2nd ed., 1894). He made copies of the Polk manuscripts and was working upon a detailed biography at the time of his death in 1 891. These copies, now deposited in the Lenox Library, New York City, contain a diary in 24 typewritten volumes, besides some correspondence and other private papers. They have been used by James Schouler in his Historical Briefs (New York, 1896), and by E. G. Bourne in an article entitled " The Proposed Absorption of Mexico in 1847- 1848," published in the Annual Report of the American Historical Association for 1899, i. 157-169 (Washington, 1900). Bourne dis- cusses the part which Polk took in preventing the complete absorp- tion of Mexico. See also the Diary of James K. Polk …. 1845 to

1840 (Chicago, 4 vols., 1910), edited by M. M. Quaife.

■ *K (W.R.S.*)*

POLK, LEONIDAS (1806-1864), American soldier, was born at Raleigh, North Carolina, on the 10th of April 1806, and was a cousin of James Knox Polk, president of the United States. He was educated at West Point, but afterwards studied theology and took orders in the Protestant Episcopal Church in 1831. In 1838 he became missionary bishop of the South-West, Arkansas, Indian Territory, Louisiana, Alabama and Mississippi, and in

1 841 he was consecrated bishop of Louisiana. His work in the Church was largely of an educational kind, and he played a prominent part in movements for the establishment of higher

educational institutions in the South. At the outbreak of the Civil War in

1861 he resigned his bishopric and, like many other clergymen and ministers of religion, entered the army which was raised to defend the Confederacy. His rank in the hierarchy and the universal respect in which he was held in the South, rather than his early military education, caused him to be appointed to the important rank of major-general. He forti- fied the post of Columbus, Kentucky, the foremost line of defence on the Mississippi, against which Brigadier- General U. S. Grant directed the offensive reconnaissance of Belmont in the autumn. In the following spring, the first line of defence having fallen, Polk commanded a corps at Shiloh in the field army commanded by Albert Sidney Johnston and Beauregard. In October 1862 he was promoted lieutenant-general, and thenceforward he commanded one of the three corps of the army of Tennessee under Bragg and afterwards was in charge of the Department of Alabama, Mississippi and East Louisiana. He was killed in the fighting in front of Marietta, while reconnoitring near Pine Mountain, Georgia, on the 14th of June 1864. See Life, by his son W. M. Polk, (1893).

POLKA (either from the Czech pulka, half, with an allusion to the short steps characteristic of the dance, or from the Polish Polka, feminine of Polah, a Pole), a lively dance of Bohemian origin, danced to music written in \ time. (See Dance.)

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Ernest Rutherford, F.R.S., D.Sc, LL.D., Ph.D. C

Langworthy Professor of Physics, University of Manchester. Nobel Prize for < Radio-activity. Chemistry, 1908. Author of Radio-activity; Radio-active Transformations; &c. [

Edwyn Robert Bevan, M.A. f

New College, Oxford. Author of The House of Seleucus; Jerusalem under the High< Ptolemies. Priests. [

Frederick Cornwallis Conybeare, M.A., D.Th. r

Fellow of the British Academy. Formerly Fellow of University College, Oxford. J Purification Editor of The Ancient Armenian Texts of Aristotle. Author of Myth, Magic and~\ Morals; &c. I

Pompeii (in part); Ptolemy (in part); Pytheas (in fart).

Protection.

Prebendary; Prelate; Prior; Procurator.

Portugal: Literature.

Vlll

F. C. S. S.

F. Dr. F. D. A.

F. E. W.

F. G. P.* F. H. D.*

F. J. H. M.

F. K.* F. LI. G.

F. M. L.*

F. P.

F. R. C. F. Wa. F. W. R.*

F. Y. E.

G. A. Gr.

G. C. W.

G. E.* G. G. S. G. J. A G. J. T.

INITIALS AND HEADINGS OF ARTICLES

Ferdinand Canning Scott Schiller, M.A., D.Sc.

Fellow and Tutor of Corpus Christi College, Oxford. Sphinx ; Studies in Humanism ; &c.

Francis M. D. Drummond.

Author of Riddles of the i Pragmatism,

■I Precedence (in part).

Frank Dawson Adams, Ph.D., D.Sc, F.G.S., F.R.S.

Dean of the Faculty of Applied Science and Logan Professor of Geology, McGill University, Montreal; President of Canadian Mining Institute. Author of Papers – dealing with problems of Metamorphism, &c, also Researches on Experimental Geology; &c.

Rev. Frederick Edward Warren, M.A., F.S.A.

Rector of Bardwell, Bury St Edmunds, and Honorary Canon of Ely. Fellow of St John's College, Oxford, 1 865-1 882. Author of The Old Catholic Ritual done into ' English and compared with the Corresponding Offices in the Roman and Old German Manuals ; The Liturgy and Ritual of the Celtic Church ; &c.

Frank George Pope.

Quebec (in part); Queen Charlotte Islands.

Prayer, Book of Common.

Lecturer on Chemistry, East London College (University of London).

{

Purin.

Frank Haigh Dixon, Ph.D., A.M. f „.,.„„„„„. , • D ■,

Professor of Economics, Dartmouth College, Hanover, N.H. Member of the 4 R a”ways. American Railway National Waterways Commission. Author of State Railroad Control. [Legislation.

Hon. Frederick James Hamilton Merrill, Ph.D., F.G.S. (America), M American Inst.M.E., &c.

Consulting Geologist and Mining Engineer. State Geologist of New York, “j Quarrying.

1899-1904. Author of Reports of New Jersey and New York Geological Surveys;

&c.

Fernand Khnopff.

See the biographical article: Khnopff, F. E. J. M.

Francis Llewellyn Griffith, M.A., Ph.D., F.S.A.

Reader in Egyptology, Oxford University. Editor of the Archaeological Survey and Archaeological Reports of the Egypt Exploration Fund. Fellow of Imperial German Archaeological Institute. Author of Stories of the High Priests of Memphis ; &c.

Francis Manley Lowe.

Major R.A. (retired). Member of the Staff of Sir W. G. Armstrong, Whitworth & Co., Ltd., Elswick Works. Assistant-Superintendent of Experiments, Shoebury- ness, 1898-1903. Author of articles in the Proceedings of the Royal Artillery Institution; &c.

Frank Podmore, M.A. (d. 1910). r

Pembroke College, Oxford. Author of Studies in Psychical Research; Modern 4 Premonition

Spiritualism; &c. |_

Frank R. Cana.

Author of South Africa from the Great Trek to the Union.

Francis Watt, M.A.

Barrister-at-Law, Middle Temple.

Portaels, J. F.

Psammetichus; Rameses (in part).

Range-finder.

Author of Law's Lumber Room.

f Portuguese East Africa; LRabah Zobeir.

< Pound (in part).

f Pyrites; Y Pyrope.

: 1

v

Probability.

Frederick William Rudler, I.S.O., F.G.S.

Curator and Librarian of the Museum of Practical Geology, London, 1879-1902. President of the Geologists' Association, 1 887-1 889.

Francis Ysidro Edgeworth, M.A., D.C.L.

Professor of Political Economy in the University of Oxford. Fellow of All Souls' College, Oxford, and of King's College, London. Editor of the Economic Journal. Author of Mathematical Psychics, and numerous papers on the Calculus of Proba bilities in the Philosophical Magazine ; &c.

George Abraham Grierson, CLE., Ph.D., D.Litt,

Indian Civil Service, 1873-1903. In charge of Linguistic Survey of India, 1898- 1902. Gold Medallist, Royal Asiatic Society, 1909. Vice-President of the Royal Asiatic Society. Formerly Fellow of Calcutta University. Author of The Languages of India ; &c.

George Charles Williamson, Litt.D. r

Chevalier of the Legion of Honour. Author of Portrait Miniatures ; Life

of Richard J _ . p .

Cosway, R.A.; George Engleheart; Portrait Drawings; &c. Editor of New Edition | *T" ieur > rierre. of Bryan's Dictionary of Painters and Engravers. [

Robert Geoffrey Ellis. f

Peterhouse, Cambridge. Barrister-at-Law, Inner Temple. Joint-editor of English < Privy Council. Reports. Author of Peerage Law and History. [

George Gregory Smith, M.A. r

Professor of English Literature, Queen's University, Belfast. Author of The J Ramsay Allan. Days of James IV.; The Transition Period; Specimens of Middle Scots; &c. . 1

Prakrit; Rajasthani.

George Johnston Allman, M.A., LL.D., F.R.S. , D.Sc (1824-1905).

Professor of Mathematics in Queen's College, Galway, and in Queen's University of Ireland, 1853-1893. Author of Greek Geometry from Thales to Euclid; &c.

Ptolemy (in part); Pythagoras: Geometry.

George James Turner.

Barrister-at-Law, Lincoln's Inn. Society.

[Provision; Editor of Select Pleas of the Forests for the Selden A Tj aD o

INITIALS AND HEADINGS OF ARTICLES

IX

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H. W. C. L. H. Y. I. A.

J. A. B.

J.

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Bl.

J.

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J.

A.

S.

J.

E.

S.*

Portraiture.

Quinet; Rabelais; Racine.

Rawendis.

Sir George Reid, LL.D.

See the biographical article: Reid, Sir George.

George Saintsburv, LL.D., D.C.L.

See the biographical article : Saintsbury, George E. B.

Rev. Griffithes Wheeler Thatcher, M.A., B.D.

Warden of Camden College, Sydney, N.S.W. Formerly Tutor in Hebrew and Old Testament History at Mansfield College, Oxford.

TTor atio Arthur V orkf C B i

Lieut.-Colonel, R.E. (retired). Chief Inspecting Officer of Railways, Board of \ X*Uvi&ys: British Railway Trade. Served in Afghan War, 1879-1880; Nile Expedition, 1884-1885. I Legislation.

Sir Henry Drummond Wolfe, G.C.B., G.C.M.G. (1830-1908). f

Ambassador Extraordinary and Plenipotentiary at Madrid, 1892-1900. M.P. forˆ Christchurch, 1874-1880; for Portsmouth, 1880-1885. Author of A Life of Napoleon at Elba ; &c.

Henri Frantz.

Art Critic, Gazette des beaux arts, Paris.

Primrose League.

Puvis de Chavannes.

Hans Friedrich Gadow, F.R.S., Ph.D. f Python;

Strickland Curator and Lecturer on Zoology in the University of Cambridge. Author -I Ratitae; of ” Amphibia and Reptiles ” in the’ Cambridge Natural History; &c. Rattlesnake (in Part)

Henry Francis Pelham, LL.D., D.C.L.

See the biographical article: Pelham, H. F.

i Polybius {in part).

Hugh Munro Ross. [”

Formerly Exhibitioner of Lincoln College, Oxford. Editor of The Times Engineering -i Supplement. Author of British Railways. {

Railways: Introduction, Con- struction, Rolling Stock.

Red Sea.

Henry Newton Dickson, M.A., D.Sc, F.R.S.(Edm.), F.R.G.S.

Professor of Geography at University College, Reading. Formerly Vice-President, . Royal Meteorological Society. Lecturer in Physical Geography, Oxford University. Author of Meteorology ; Elements of Weather and Climate ; &c.

Hermann Oelsner, M.A., Ph.D. r

Taylorian Professor of the Romance Languages in the University of Oxford. Mem- J Provencal Literature: ber of Council of the Philological Society. Author of A History of Provencal Litera- 1 Modem.

ture; &c.

Ji).

Porson (in part).

The Rev. Henry Richards Luard, M.A., D.D. (1825-1

Registrary of the University of Cambridge, 1862-1891. Formerly Fellow, Bursar and Lecturer at Trinity College. Honorary Fellow of King's College, London. – Editor of the Annates Monastici; the Historia of Matthew Paris and other works for the " Rolls " Series.

Henry Tiedemann. f

London Editor of the Nieuwe Rotterdamsche Courant. Author of a Dutch biography, < Potgieter. and various pamphlets and travel works, including Via Flushing. |_

Rev. Herbert Thomas Andrews. r

Professor of New Testament Exegesis, New College, London. Author of "The J Polycarp;

Commentary on Acts" in the Westminster New Testament; Handbook on the") Presbyter. Apocryphal Books in the " Century " Bible. [

Henry William Carless Davis, M.A. [

Fellow and Tutor of Balliol College, Oxford. Fellow of All Souls' College, Oxford, J Ralph Of Coggeshall. 1895-1902. Author of England under the Normans and Angevins; Charlemagne. |

Sir Henry Yule, K.C.S.I., C.B.

See the biographical article: Yule, Sir Henry.

J Polo, Marco (in part); \Prester John; Ramusio.

Israel Abrahams, M.A.

Reader in Talmudic and Rabbinic Literature in the University of Cambridge. Formerly President, Jewish Historical Society of England. Author of A Short History of Jewish Literature; Jewish Life in the Middle Ages; Judaism; &c.

Sir Jervoise Athelstane Baines, C.S.I.

President, Royal Statistical Society, 1909-1910. Census Commissioner under the Government of India, 1889-1893. Secretary to Royal Commission on Opium, 1894-1895. Author of Official Reports on Provincial Administration of Indian Census Operations; &c.

John A. Black.

Press reader of the New Volumes of the Encyclopaedia Britannica (10th ed.).

John Allen Howe, B.Sc.

Curator and Librarian of the Museum of Practical Geology, London. The Geology of Building Stones.

John Addington Symonds, LL.D.

See the biographical article: Symonds, John A.

John Edwin Sandys, M.A., Litt.D., LL.D.

Public Orator in the University of Cambridge. Fellow of St John's College, Cambridge. Fellow of the British Academy. Author of A History of Classical ' Scholarship; &c.

Proselyte; Qaraites; Qaro; Raba Ben Joseph Ben Hama Rabbah Bar Nahmani; Rapoport, Samuel; Rashbam; Rashi.

Population.

Proof-reading (in part).

f

Author of J Pre-Cambrian.

1

A Pontanus, Jovianus.

Porson (in pari).

X

J. F.-K.

J. G. C. A. J. G. F.

J. G. Fr.

J. G. K.

J. G. Sc. J. Hn.

J. H. M. I. Ja. J. L.*

J. M.

J. M. M. J. P. B.

J. P. P.

J. R.* J. S. F.

J. S. R. J. T. Be.

INITIALS AND HEADINGS OF ARTICLES

James Fitzmaurice-Kelly, Litt.D., F.R.Hist.S.

Gilmour Professor of Spanish Language and Literature, Liverpool University. Norman McColl Lecturer, Cambridge University. Fellow of the {British Academy. Member of the Royal Spanish Academy. Knight Commander of the Order of Alphonso XII. Author of A History of Spanish Literature; &c.

John George Clark Anderson, M.A.

Student, Censor and Tutor of Christ Church, Oxford. Formerly Fellow of Lincoln College. Craven Fellow, Oxford, 1896. Conington Prizeman, 1893.

Sir Joshua Girling Fitch, LL.D.

See the biographical article: Fitch, Sir Joshua Girling.

James George Frazer, M.A., D.C.L., LL.D., Litt.D.

Professor of Social Anthropology, Liverpool University. Fellow of Trinity College, Cambridge. Fellow of the British Academy. Author of The Golden Bough ; &c.

John Graham Kerr, M.A., F.R.S.

Regius Professor of Zoology in the University of Glasgow. Formerly Demon- strator in Animal Morphology in the University of Cambridge. Fellow of Christ's College, Cambridge, 1898-1904. Walsingham Medallist, 1898. Neill Prizeman, Royal Society of Edinburgh, 1904.

Quevedo y Villegas.

Pontus.

Polytechnic (in part).

Praefect (in part); Praeneste (in part); Praetor (in part); Proserpine (in part); Province (in

Ray (in part).

Author of Burma ; ■{ Rangoon.

University of Bonn. Author of < Puttkammer,

Sir James George Scott, K.C.I.E.

Superintendent and Political Officer, Southern Shan States. The Upper Burma Gazetteer.

Justus Hashagen, Ph.D.

Privatdozent in Medieval and Modern History, Das Rheinland unter der Franzosische Herrschaft.

John Henry Middleton, M.A., Litt.D., F.S.A., D.C.L. (1846-1896).

Slade Professor of Fine Art in the University of Cambridge, 1886-1895. Director of the Fitzwilliam Museum, Cambridge, 1889-1892. Art Director of the South J Raphael. Kensington Museum, 1892-1896. Author of The Engraved Gems of Classical Times; Illuminated Manuscripts in Classical and Mediaeval Times.

Joseph Jacobs, Litt.D. . r

Professor of English Literature in the Jewish Theological Seminary,

New York. Formerly President of the Jewish Historical Society of England. Corresponding J Purim. Member of the Royal Academy of History, Madrid. Author of Jews of Angevin England; Studies in Biblical Archaeology; &c. I

Sir Joseph Larmor, M.A., D.Sc, LL.D., F.R.S. r

Fellow of St John's College, Cambridge, and Lucasian Professor of Mathematics in _ j ioti -_ rr,T,.„„„ .«. the University. Secretary of the Royal Society. Professor of Natural Philosophy, \ KMUMKm, ineory 01, Queen's College, Galway, 1880-1885. Author of Ether and Matter, and various Radiometer. memoirs on Mathematics and Physics. I

Sir John Macdonell, C.B., LL.D.

Master of the Supreme Court. Counsel to the Board of Trade and London Chamber of Commerce. Formerly Quain Professor of Comparative Law, University College, London. Editor of State Trials; Civil Judicial Statistics; &c. Author of Survey of Political Economy; The Land Question; &c.

John Malcolm Mitchell.

Sometime Scholar of Queen's College, Oxford. Lecturer in Classics, East London < College (University of London). Joint-editor of Grote's History of Greece.

Jean Paul Hippolyte Emmanuel Adhemar Esmein.

Professor of Law in the University of Paris. Officer of the Legion of Honour. Member of the Institute of France. Author of Cours elementdire d'histoire du droit ' francais; &c.

John Percival Postgate, M.A., Litt.D.

Professor of Latin in the University of Liverpool. Fellow of Trinity College, Cambridge. Fellow of the British Academy. Editor of the Classical Quarterly. " Editor-in-chief of the Corpus Poetarum Latinorum ; &c.

John Randall.

Formerly Secretary of the London Association of Correctors of the Press. Sub- . editor of the Athenaeum and Notes and Queries.

John Smith Flett, D.Sc, F.G.S.

Petrographer to the Geological Survey. Formerly Lecturer on Petrology in Edin- burgh University. Neill Medallist of the Royal Society of Edinburgh. Bigsby ” Medallist of the Geological Society of London.

James Smith Reid, M.A., LL.D., Litt.D.

Professor of Ancient History and Fellow and Tutor of Gonville and Caius College, Cambridge. Browne’s and Chancellor’s Medals. Editor of editions of Cicero’s ” Academia, De Amicitia • &c.

John Thomas Bealby.

Joint-author of Stanford’s Europe. Formerly Editor of the Scottish Geographical . Magazine. Translator of Sven Hedin’s Through Asia, Central Asia and Tibet; &c.

Protectorate.

Pomponazzi, Pietro; Price, Richard.

Prefect;

Provost (in France).

Propertius, Sextus.

Proof-reading (in part).

Porphyry; Pumice;

Pyroxenite;

Quartzite; Quartz-Porphyry

Quintilian.

Poltava (in part); Pskov (in part); Radom (in part).

INITIALS AND HEADINGS OF ARTICLES

XI

J. T. Cr.

J. W.

J. W.* J. W. G.

K. G. J. K. S.

L. Bl.

L. J. So

L.

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P. A. K.

James Troubridge Critchell.

London Correspondent of the Australasian P astoralists' Review, North Queensland. Herald; &c. Fellow of the Royal Colonial Institute. Author of Polynesian Labour in Queensland ; Guide to Queensland ; &c.

Queensland: History.

James Williams, D.C.L., LL.D.

All Souls' Reader in Roman Law in the University of Oxford. College. Author of Wills and Succession ; &c.

James Ward, LL.D.

See the biographical article: Ward, James.

„ „ , . . , j Possession (law); Fellow of Lincoln | prescriDtion ˆ ˆ

\ Psychology.

John Walter Gregory, D.Sc, F.R.S. r

Professor of Geology at the University of Glasgow. Professor of Geology and J _ . , r ,

Mineralogy at the University of Melbourne, 1900-1904. Author of The Bead Heart | tjueensiana. Lreology of Australia; &c. L r

Kingsley Garland Jayne. f

Sometime Scholar of Wadham College, Oxford. Matthew Arnold Prizeman, 1903. -\

An + Vinr nf Vnsrn Jn Clnwin /rn/1 hi'; ˆijrrpwnr?

Author of Vasco da Gama and his Successors.

Kathleen Schlesinger.

Editor of the Portfolio of Musical Archaeology. Author of The Instruments of the Orchestra.

Portugal: Geography and History.

Pommer; Portative Organ; Positive Organ; Psaltery; Raekett; Ravanastron; Rebab; Rebec; Recorder (music); Reed Instruments.

Count Lutzow, Litt.D. (Oxon.), D.Ph. (Prague), F.R.G.S. f

Chamberlain of H.M. the Emperor of Austria, King of Bohemia. Hon. Member of the Royal Society of Literature. Member of the Bohemian Academy, &c. Author of Bohemia: a Historical Sketch; The Historians of Bohemia (Ilchester , Lecture, Oxford, 1904) ; The Life and Times of John Hus; &c. I

Louis Bell, Ph.D. f

Consulting Engineer, Boston, U.S.A. Chief Engineer, Electric Power Trans- J mission Department, General Electric Co., Boston. Formerly Editor of Electrical } World, New York. Author of Electric Power Transmission ; &c. , I

Leonard James Spencer, M.A.

Assistant in Department of Mineralogy, British Museum. Formerly Scholar of Sidney Sussex College, Cambridge, and Harkness Scholar. Editor of the Mineral- ogical Magazine. I

Lewis Wright.

Author of The Practical Poultry Keeper; The New Book of Poultry; &c.

L. W. Vernon-Harcourt (d. 1909).

Barrister-at-Law. Author of His Grace the Steward and the Trial of Peers.

Margaret Bryant.

Prague.

Formerly Fellow of the Royal in Cambridge Natural History;

Marcus Hartog, M.A., D.Sc, F.L.S.

Professor of Zoology, University College, Cork. University of Ireland. Author of ” Protozoa ‘ and papers for various scientific journals.

Sir Mancherjee Merwanjee Bhownaggree, K.C.I.E.

Fellow of Bombay University. M.P. for N.E. Bethnal Green, 1895-1906. Author of History of the Constitution of the East India Company ; &c.

Marcus Niebuhr Tod, M.A.

Fellow and Tutor of Oriel College, Oxford. University Lecturer in Epigraphy. Joint-author of Catalogue of the Sparta Museum.

Power Transmission:

Electrical.

Proustite; Pyrargyrite; Pyrolusite; Pyromorphite; Pyrrhotite; Quartz; Realgar.

Poultry and Poultry-farming,

Reclamation of Land.

Pope, Alexander (in part).

Proteomyxa; Radiolaria.

Readymoney, Sir Cowasji Jehangir.

Pylos.

J Polycrates;

Maximilian Otto Bismarck Caspari, M.A.

Reader in Ancient History at London University. Lecturer in Greek at Birmingham » n . ... University, 1 905 1908. [Funic wars,

Norman M'Lean, M.A. f

Lecturer in Aramaic, Cambridge University. Fellow and Hebrew Lecturer, Christ's ■< Rabbula. College, Cambridge. Joint-editor of the larger Cambridge Septuagint. [_

Northcote Whitridge Thomas, M.A. f

Government Anthropologist to Southern. Nigeria. Corresponding Member of the J p„ c . M .s AT1 f p M ,,j.i«., P '> Societe d'Anthropologie de Paris. Author of Thought Transference; Kinship and] rossesslon \rsycnoiogy,„ Marriage in Australia; &c: I

Rev. Owen Charles Whitehouse, M.A., D.D. f

Senior Theological Tutor and Lecturer in Hebrew, Cheshunt College, Cambridge. J Priest (in part) ; Formerly Principal and Professor of Biblical Exegesis and Theology in the Countess j Prophet (in part). of Huntingdon's College, Cheshunt. Author of Primer of Hebrew Antiquities; &c. L

Olaus Magnus Friedrich Henrici, Ph.D., LL.D., F.R.S. f

Professor of Mechanics and Mathematics in the Central Technical College of the J p_ n i p(> « nn City and Guilds of London Institute. Author of Vectors and Rotors; Congruent j iTOjecuon. Figures; &c. I.

Prince Peter Alexeivitch Kropotkin.

See the biographical article: Kropotkin, Prince P. A.

[Poltava (in part); ■i Pskov (in part); [Radom (in part).

Xll P. C. Y. P. G. P. Gi.

P. G. K.

P. G. T. P.M. P. McC.

R. H. K.

R. I. P. R. J. M.

R. L.*

INITIALS AND HEADINGS OF ARTICLES

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Philip Chesney Yorke, M.A.

Magdalen College, Oxford. Editor of Letters of Princess Elizabeth of England.

Percy Gardner, Litt.D., LL.D., F.S.A.

See the biographical article: Gardner, Percy.

Peter Giles, M.A., LL.D., Litt.D.

Fellow and Classical Lecturer of Emmanuel College, Cambridge, and University Reader in Comparative Philology. Formerly Secretary of the Cambridge Philological Society.

Paul George Konody.

Art Critic of the Observer and the Daily Mail. Formerly Editor of the Artist. – Author of The Art of Walter Crane; Velasquez, Life and Work; &c.

Peter Guthrie Tait, LL.D.

ˆee the biographical article: Tait, Peter Guthrie.

Paul Meyer.

See the biographical article: Meyer, Paul Hotacinthe.

Primrose McConnell, F.G.S. f

Member of the Royal Agricultural Society. Author of Diary of a Working Farmer; \ Reaping, &c. I

Rev. Robert Hatch Kennett, M.A., D.D. f

Regius Professor of Hebrew, Cambridge, and Canon of Ely. Formerly Fellow and Lecturer in Hebrew and Syriac, Queens' College, and University Lecturer in Aramaic. Author of A Short Account of the Hebrew Tenses; In our Tongues; &c.

Reginald Innes Pocock, F.Z.S.

Superintendent of the Zoological Gardens, London.

Ronald John McNeill, M.A.

Christ Church, Oxford. Barrister-at-Law. Formerly Editor of the St James's Gazette, London.

J" Prynne, William {in part); IPym, John.

f Polyclitus; Polygnotus; 1 Praxiteles.

Q; R.

Potter, Paul.

-j Quaternions {in part).

("Provencal Language;

I Provencal Literature {in part).

Psalms, Book of {in part).

{ Pyenogonida.

Racquets.

Porcupine {in part); Porpoise; Primates; Proboscidea; Prongbuck;

Rabbit {in part); Rat; Ratel.

I Railways: General Statistics 1 and Financial Organization.

j Pygmy.

{

Richard Lydekker, F.R.S., F.Z.S. , F.G.S.

Member of the Staff of the Geological Survey of India, 1874-1882. Author of Catalogues of Fossil Mammals, Reptiles and Birds in the British Museum ; The Deer of all Lands ; &c.

Ray Morris, M.A.

Formerly Managing Editor, Railway Age Gazette, New York. Author of Railroad A dministration.

Robert Murray Leslie, M.A., M.D., M.R.C.P.

Senior Physician, Prince of Wales's General Hospital, London. Lecturer on Medicine, London Post-Graduate College. ' Author of Clinical Types of Pneu- monia; &c.

R. Mortimer Wheeler.

Robert Nisbet Bain (d. 1909).

Assistant Librarian, British Museum, 1883-1909. Author of Scandinavia: the Political History of Denmark, Norway and Sweden, 15 13-1900; The First Romanovs, " 1613-1725 ; Slavonic Europe: the Political History of Poland and Russia from 1460 to 1706; &c.

Rene Poupardin, D.-es-L.

Secretary of the Ecole des Chartes. Honorary Librarian at the Bibliotheque Nationale, Paris. Author of Le Royaume de Provence sous les Carolingiens ; Recueil ' des chartes de Saint-Germain ; &c.

R. Phene Spiers, F.S.A., F.R.I.B.A.

Formerly Master of the Architectural School, Royal Academy, London. Past President of Architectural Association. Associate and Fellow of King's College, London. Corresponding Member of the Institute of France. Editor of Fergusson's History of Architecture. Author of Architecture: East and West; &c.

Robert Ranulf Marett, M.A.

Reader in Social Anthropology, Oxford University, and Fellow and Tutor of Exeter -i Prayer. College. Author of The Threshold of Religion.

Robert Seymour Conway, M.A., D.Litt. f Pompeii: Oscan Inscriptions;

Professor of Latin and Indo-European Philology in the University of Manchester. J pjaeneste (in part) – Formerly Professor of Latin in University College, Cardiff ; and Fellow of Gonville | „ . .... * ‘

Punch.

Poniatowski, Joseph A.; Potemkin, Prince; Potocki, Ignaty; Potocki, Stanislaw F.; Prokopovich; Pugachev; Rak6czy; Razin.

Provence;

Quierzy, Capitulary of.

- Porch.

and Caius College, Cambridge. Author of The Italic Dialects.

Viscount St Cyres.

See the biographical article: Iddesleigh, ist Earl of.

Sidney Frederic Harmer, D.Sc, F.R.S., F.Z.S.

Keeper of Zoology, Natural History Departments, British Museum. Fellow, formerly Tutor and Lecturer, King’s College, Cambridge. Joint-editor of The ‘ Cambridge Natural History.

St George Jackson Mivart, M.D., F.R.S.

See the biographical article: Mivart, St George Jackson.

Samuel Rawson Gardiner, LL.D., D.C.L.

See the biographical article: Gardiner, S. R.

Quesnel, Pasquier; Quietism.

Polyzoa; Pterobranchia.

\ Rattlesnake {in part).

J Prynne, William {in part).

INITIALS AND HEADINGS OF ARTICLES

Xlll

To As.

T. A. C.

T. A. I. T. Ba.

T. F. D.

T. H.

T. H. H.*

T. L. H.

T. Se.

T. Wo. W. A. B. C.

W. A L. W. A. P. W. Ba. W. B. P. W. E. D.

W. F. C. W. G.

W. H. F. W. H. L.

Thomas Ashby, M.A., D.Litt.

Director of British School of Archaeology at Rome. Formerly Scholar of Christ Church, Oxford. Craven Fellow, 1897. Conington Prizeman, 1906. Member of the Imperial German Archaeological Institute. Author of The Classical Topo- graphy of the Roman Campagna.

Timothy Augustine Coghlan, I.S.O.

Agent-General for New South Wales. Government Statistician, New South Wales, 1886-1905. Honorary Fellow of the Royal Statistical Society. Author of Wealth and Progress of New South Wales; Statistical Account of Australia and New Zealand; &c.

Pompeii (in part); Pomposa; Pomptine Marshes; Popilia, Via; Portus; Postumia, Via; Praeneste (in pari); Praenestina, Via; Puteoli; Pyrgi; .Ravenna (in part).

Queensland: Geography and Statistics.

rPost and Postal Service; i Pound (in part); <- Praemunire.

Thomas Allan Ingram, M.A., LL.D. Trinity College, Dublin.

Sir Thomas Barclay. f Privateer

Member of the Institute of International Law. Officer of the Legion of Honour. J _ . ‘

Author of Problems of International Practice and Diplomacy; &c. M.P. for] rnze – war, Blackburn, 1910. I R aio; Rebellion.

Thomas F. Dale, M.A. f

Queen’s College, Oxford. Steward and Member of the Council of the Polo and -l Polo. Riding Pony Society. Author of Polo, Past and Present; &c. [

Ravenna (in part).

Quetta.

Porism.

Thomas Hodgkin, D.C.L., Litt.D.

See the biographical article: Hodgkin, Thomas.

Sir Thomas Hungerford Holdich, K.C.M.G., K.C.I.E., D.Sc.

Superintendent, Frontier Surveys, India, 1892-1898. Gold Medallist, R.G.S., London, 1887. Author of The Indian Borderland; The Countries of the King’s Award; India; Tibet.

Sir Thomas Little Heath, K.C.B., Sc.D.

Assistant-Secretary to the Treasury, London. Fellow of Trinity College, Cambridge. . Author of Apollonius of Perga; Treatise on Conic Sections; The Thirteen Books of Euclid’s Elements ; &c. l

Thomas Seccombe, M.A. [

Balliol College, Oxford. Lecturer in History, East London and Birkbeck Colleges, J p„ ev „ rrenrv University of London. Stanhope Prizeman, Oxford, 1887. Assistant Editor of] Jteevc ‘ “«”»• Dictionary of National

Biography, 1891-1901. Author of The Age of Johnson; &c. I

Thomas Woodhouse. J*

Head of the Weaving and Textile Designing Department, Technical College, Dundee. I. ‘

Rev. William Augustus Brevoort Coolidge, M.A., F.R.G.S., Ph.D.

Fellow of Magdalen College, Oxford. Professor of English History, St David’s College, Lampeter, 1 880-1 881. Author of Guide du Haul Dauphine; The Range of the Todi; Guide to Grindelwald; Guide to Switzerland: The Alps in Nature and in History; &c. Editor of the Alpine Journal, 1880-1881 ; &c.

William Alexander Lindsay, K.C., M.A., J. P., D.L., F.S.A.

Windsor Herald. Bencher of the Middle Temple. Peerage Counsel Royal Household, 1837-1897; &c.

Walter Alison Phillips, M.A.

Ramie.

Ragatz; Rambert.

Author of The \ Precedence (in part).

Formerly Exhibitioner of Merton College and Senior Scholar of St John’s College, -i ” rince >

Knight of the Iron Crown. \ Rabbi.

Oxford. Author of Modern Europe; &c

Wilhelm Bacher, Ph.D.

Professor at the Rabbinical Seminary, Budapest. Author of Die Agada der Tannaiten; &c.

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Formerly Chief Engineer, Rapid Transit Commission, New York. Advisory – Engineer, Royal Commission on London Traffic. Author of Track; Turnouts; &c.

William Ernest Dalby, M.A., M.Inst.CE.

Professor of Civil and Mechanical Engineering at the City and Guilds of London Institute Central Technical College, South Kensington. Formerly University – Demonstrator in the Engineering Department, Cambridge. Author of The Balancing of Engines; Valves and Valve-Gear Mechanism; &c.

William Feilden Craies, M.A.

Barrister-at-Law, Inner Temple. Lecturer on Criminal Law, King's College, London. Editor of Archbold's Criminal Pleading (23rd edition).

William Garnett, M.A., D.C.L.

Educational Adviser to the London County Council. Formerly Fellow and Lecturer of St John's College, Cambridge. Principal and Professor of Mathematics, Durham College of Science, Newcastle-on-Tyne. Author of Elementary Dynamics; &c.

Sir William Henry Flower, F.R.S.

See the biographical article: Flower, Sir W. H.

William H. Lang, M.B., D.Sc.

Barker Professor of Cryptogamic Botany, University of Manchester.

\ Provost (in part).

Railways: Inlra-Urban Rail- ways.

Power Transmission: Intro- ductory and Mechanical; Railways: Locomotive Power.

Quarter Sessions, Court of; Recognizance.

Polytechnic (in part).

f Porcupine (in part) ; 1 Rabbit (in part).

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Pteridophyta.

XIV

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M.

INITIALS AND HEADINGS OF ARTICLES

William Lawson Grant, M.A. f Prince Edward Island;

Professor at Queen's University, Kingston, Canada. Formerly Beit Lecturer in J q„-i,m > " p rim ;„ rp f,„ *„wV Colonial History at Oxford University. Editor ;of Acts of the Privy Council (Colonial 1 q " . province {in part). Series) ; Canadian Constitutional Development (in collaboration). L «*uebec: Lily.

William Minto, M.A., LL.D.

See the biographical article: Minto, William.

William Matthew Flinders Petrie, F.R.S., D.C.L., Litt.D. See the biographical article: Petrie, W. M. F.

Ven. Winfrid Oldfield Burrows, M.A.

Archdeacon of Birmingham. Student and Tutor of Christ Church,

Oxford, l88< 1891. Principal of Leeds Clergy School, 1891-1900. Author of The Mystery of the' Cross.

Pope, Alexander (in part).

Pyramid.

Prayers for the Dead.

William Richard Morfill, M.A. (d. 1910). f

Formerly Professor of Russian and the other Slavonic Languages in the University J Pushkin. of Oxford. Curator of the Taylorian Institution, Oxford. Author of Russia;”] Slavonic Literature; &c.

W. R. S.

W. W. FV

W. Y.

William Robertson Smith, LL.D.

See the biographical article: Smith, William Robertson.

William Warde Fowler, M.A.

Fellow of Lincoln College, Oxford. Sub-Rector, 1881-1904. Gifford Lecturer, Edinburgh University, 1908. Author of The City-State of the Greeks and Romans; The Roman Festivals of the Republican Period ; &c.

(Priest (in pari); Prophet (in part); Psalms, Book of (in part); Rameses (in part).

Pontifex.

Rev. William Young.

Minister, Higher Broughton Presbyterian Church, Manchester, 1877-1901, Association Secretary for the Religious Tract Society in the North of England.

and J. Presbyterianism.

PRINCIPAL UNSIGNED ARTICLES

Pollination.

Potentiometer.

Prussic Acid.

Polygon.

Prerogative.

Public Health

Polyhedron.

Press Laws.

Publishing.

Polynesia.

Primrose.

Puffin.

Pomegranate.

Primulaceae.

Pugilism.

Pomerania.

Princeton University.

Pump.

Pontoon.

Principal and Agent.

Punjab.

Poor Law.

Probate.

Pyrazoles.

Poplar.

Procession.

Pyrenees.

Porto Rico.

Proctor.

Pyridine.

Portuguese Guinea.

Prohibition.

Pyrones.

Potassium.

Protestant.

Quarantine.

Potato.

Prussia.

Quinine.

Quinoline.

Quinones.

Radium.

Rainbow.

Ranunculaceae.

Rare Earths.

Raspberry.

Rationalism.

Ravenna, Exarchate ot

Real Property.

Red River.

ENCYCLOPEDIA BRITANNICA

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POLL, strictly the head, in men or animals. Skeat connects the word with O. Swed. kolle (initial p and k being interchange- able) and considers a Celtic origin probable; cf. Irish coll, Welsh col, peak, summit. ” Poll ” is chiefly used in various senses derived from that of a unit in an enumeration of persons or things, e.g. poll-tax (q.v.), or “challenge to the polls ” in the case of a jury (q.v.). The most familiar derivative uses are those connected with voting at parliamentary or other elections; thus ” to poll ” is to vote or to secure a number of votes, and ” the poll,” the voting, the number of votes cast, or the time during which voting takes place. The verb ” to poll ” also means to clip or shear the top of anything, hence ” polled ” of hornless cattle, or ” deed-poll ” (i.e. a deed with smooth or unindented edges, as distinguished from an “indenture”). A tree which has been “polled,” or cut back close in order to induce it to make short bushy growth, is called a ” pollard.”

At the university of Cambridge, a ” pass ” degree is known as a ” poll-degree.” This is generally explained as from the Greek oi iroXXoi, the many, the common people.

POLLACK (Gadus pollachius), a fish of the family Gadidae, abundant on rocky coasts of northern Europe, and extending as far south as the western parts of the Mediterranean, where, however, it is much scarcer and does not attain to the same size as in its real northern home. In Scotland and some parts of Ireland it is called lythe. It is distinguished from other species of the genus Gadus by its long pointed snout, which is twice as long as the eye, with projecting lower jaw, and without a barbel at the chin. The vent is below the anterior half of the first dorsal fin. A black spot above the base of the pectoral fin is another distinguishing mark. Although pollack are well-flavoured fish, and smaller individuals (from 12 to 16 in.) excellent eating, they do not form any considerable article of trade, and are not preserved, the majority being consumed by the captors. Specimens of 12 lb are common, but the species is said to attain occasionally as much as 24 lb in weight, (See also Coalfish.)

POLLAIUOLO, the popular name of the brothers Antonio and Piero di Jacobo Benci, Florentines who contributed much to Italian art in the 15th century. They were called Pollaiuolo because their father was a poulterer. The nickname was also extended to Simone, the nephew of Antonio.

Antonio (1429-1498) distinguished himself as a sculptor, jeweller, painter and engraver, and did valuable service in perfecting the art of enamelling. His painting exhibits an excess

of brutality, of which the characteristics can be studied in the ” Saint Sebastian,” painted in 1475, and now in the National Gallery, London. A ” St Christopher and the Infant Christ ” is in the Metropolitan Museum, New York. But it was as a sculptor and metal-worker that he achieved his greatest suc- cesses. The exact ascription of his works is doubtful, as his brother Piero did much in collaboration with him. The museum of Florence contains the bronze group ” Hercules strangling Cacus ” and the terra-cotta bust ” The Young Warrior “; and in the South Kensington Museum, London, is a bas-relief representing a contest between naked men. In 1489 Antonio took up his residence in Rome, where he executed the tomb of Sixtus IV. (1493), a composition in which he again manifested the quality of exaggeration in the anatomical features of the figures. In 1496 he went to Florence in order to put the finishing touches to the work already begun in the sacristy of Santo Spirito. He died in 1498, having just finished his mausoleum of Inno- cent VIII., and was buried in the church of San Pietro in Vincula, where a monument was raised to him near that of his brother.

Piero (1443-1496) was a painter, and his principal works were his ” Coronation of the Virgin,” an altar-piece painted in 1483, in the choir of the cathedral at San Gimignano; his ” Three Saints,” an altar-piece, and ” Prudence ” are both at the Uffizi Gallery.

Simone (1457-1508), nephew of Antonio Pollaiuolo, a cele- brated architect, was born in Florence and went to Rome in 1484; there he entered his uncle’s studio and studied architecture. On his return to Florence he was entrusted with the completion of the Strozzi palace begun by Benedetto de Maiano, and the cornice on the facade has earned him lasting fame. His highly coloured accounts of Rome earned for him the nickname of il Cronaca (chronicler). About 1498 he built .the church of San Francesco at Monte and the vestibule of the sacristy of Santo Spirito. In collaboration with Guiliano da Sangallo he designed the great hall in the Palazzo Vecchio. He was a close friend and adherent of Savonarola.

See also Maud Cruttwell, Antonio Pollaiuolo (1907).

POLLAN (Coregonus pollan), the name given to a species of the Salmonoid genus Coregonus (whitefish) which has been found in the large and deep loughs of Ireland only. A full ?,ccount of the fish by its first describer, W. Thompson, may be found in his Natural History of Ireland, iv. 168.

POLLARD, EDWARD ALBERT (1828-1872), American journalist, was born in Nelson county, Virginia, on the 27th of February 1828. He graduated at the university of Virginia in 1849, studied law at the College of William and Mary, and in Baltimore (where he was admitted to the bar), and was engaged in newspaper work in California until 1855. In 1857-1861 he was clerk of the judiciary committee of the National House of Representatives. By 1859 he had become an outspoken Secessionist, and during the Civil War he was one of the principal editors- of the Richmond Examiner, which supported the Con- federacy but was hostile to President Jefferson Davis. In 1864 Pollard sailed for England, but the vessel on which he sailed was captured as a blockade runner, and he was confined in Fort Warren in Boston Harbour from the 29th of May until the 12th of August, when he was paroled. In December he was placed in close confinement at Fort Monroe by order of Secretary Stanton, but was soon again paroled by General B. F. Butler, and in January proceeded to Richmond to be exchanged there for Albert D. Richardson (1 833-1 869), a well-known corre- spondent of the New York Tribune, who, however, had escaped before Pollard arrived. In 1867-1869 Pollard edited a weekly paper at Richmond, and he conducted the Political Pamphlet there during the presidential campaign of 1868.

His publications include Black Diamonds Gathered in the Darkey Homes of the South (1859), in which he advocated a reopening of the slave trade ; The Southern History of the War (3 vols. : First Year of the War, with B. M. DeWitt, 1862; Second Year of the War, 1864; Third Year of the War, 1864); Observations in the North: Eight Months in Prison and on Parole (1865) ; The Lost Cause (1866) ; Lee and His Lieutenants (1867); The Lost Cause Regained (1868), a southern view of reconstruction urging the necessity of white supremacy; The Life of Jefferson Davis (1869), an arraignment of the Confederate president; and The Virginia Tourist (1870).

POLLENTIA (mod. Pollenzo), an ancient town of Liguria, Italy, 10 m. to the north of Augusta Bagiennorum, on the left bank of the Tanarus (mod. Tanaro). Its position on the road from Augusta Taurinorum to the coast at Vada Sabatia, at the point of divergence of a road to Hasta (Asti) gave it military importance. Decimus Brutus managed to occupy it an hour before Mark Antony in 43 B.C.; and it was here that Stilicho on the 29th of March 403 fought the battle with Alaric which though undecided led the Goths to evacuate Italy. The place was famous for its brown wool, and for its pottery. Considerable remains of ancient buildings, an amphitheatre, a theatre and a temple still exist. The so-called temple of Diana is more probably a tomb.

See G. Franchi-Pont in Atti dell' accademia di Tornio (1805- 1808), p. 321 sqq.

POLLINATION, in botany, the transference of the pollen from the stamen to the receptive surface, or stigma, of the pistil of a flower. The great variety in the form, colour and scent of flowers (see Flower) is intimately associated with pollination which is effected by aid of wind, insects and other agencies. Pollen may be transferred to the stigma of the same flower — self-pollination (or autogamy) , or to the stigma of another flower on the same plant or another plant of the same species— cross- pollination (or allogamy). Effective pollination may also occur between flowers of different species, or occasionally, as in the case of several orchids, of different genera — this is known as hybridization.

The method of pollination is to some extent governed by the distribution of the stamens and pistil. In the case of unisexual flowers, whether monoecious, that is, with staminate and pistillate flowers on one and the same plant, such as many of our native trees — oak, beech, birch, alder, &c, or dioecious with staminate and pistillate flowers on different plants, as in willows and pop- lars, cross pollination only is possible. In bisexual or herma- phrodite flowers, that is, those in which both stamens and pistil are present, though self-pollination might seem the obvious course, this is often prevented or hindered by various arrange- ments which favour cross-pollination. Thus the anthers and stigmas in any given flower are often mature at different times; this condition, which is known as dichogamy and was first

pointed out by Sprengel, may be so well marked that the stigma has ceased to be receptive before the anthers open, or the anthers have withered before the stigma becomes receptive, when cross- pollination only is possible, or the stages of maturity in the two organs are not so

distinct, when self-pollination becomes possible later on. The flower is termed proterandrous or proterogynous according as anthers or stigmas mature first. The term homogamy is applied to the simultaneous maturity of stigma and anthers. Spontaneous self-pollination is rendered impossible in some homogamous flowers in consequence of the relative position of the anthers and stigma — this condition has been termed herkogamy. Flowers in which the relative position of the organs allows of spontaneous self-pollination may be all alike as regards length of style and stamens (homomorphy or homostyly), or differ in this respect (heteromorphy) the styles

(From Strasburger's Lehrbuch der Botanik, by permission of Gustav Fischer.)

Fig. 1. — Long-styled, L, and short-styled, K, flowers of Primula sinensis.

G, Level of stigma; 5, level of anthers; P, N, pollen grains and stigmatic papillae of long-styled form ; p, n, ditto of short-styled form.

and stamens being of different lengths in different flowers (heterostyly) or the stamens only are of different lengths (heter-anthery). Flowers which are closed at the time of maturity of anthers and stigmas are termed cleistogamous.

Self-pollination is effected in very various ways. In the simplest case the anthers are close to the stigmas, covering these with pollen when they open; this occurs in a number of small annual plants, also in Narcissus, Crocus, &c. In snowdrop and other pendulous flowers the anthers form a cone around the style and the pollen falls on to the underlying stigmas, or in erect flowers the pollen may fall on to the stigmas which lie directly beneath the opening anthers (e.g. Narthecium). In very many cases the pollen is carried to the stigma by elongation, curvature or some other movement of the filament, the style or stigma, or corolla or some other part of the flower, or by correlated move- ments of two or more parts. For instance, in many flowers the filaments are at first directed outwards so that self-pollina-tion is not possible, but later incline towards the stigmas and pollinate them (e.g. numerous Saxifragaceae, Cruciferae and others), or the style, which first projects beyond the anthers, shortens later on so that the anthers come into contact with the stigmas (e.g. species of Cactaceae), or the style bends so that the stigma is brought within the range of the pollen (e.g. species of Oenothera, Epilobium, most Malvaceae, &c.) . In Mirabilis Jalapa and others the filaments and style finally become intertwined, so that pollen is brought in contact

with the stigma. Self- pollination frequently becomes possible towards the end of the life of a flower which during its earlier stages has been capable only of cross-pollination. This is associated with the fact, so ably demonstrated by Darwin, that, at any rate in a large number of cases, cross-pollination yields better results, as measured by the number of seeds produced and the strength of the offspring, than self-pollination; the latter is, however, preferable to absence of pollination. In many cases pollen has no effect on the stigma of the same flower, the plants are self- sterile, in other cases external pollen is more effective (pre-potent) than pollen from the same flower; but in a very large number of cases experiment has shown that there is little or no difference

between the effects of external pollen and that from the same flower.

Cross-pollination may occur between two flowers on the same plant (geitonogamy) or between flowers on distinct plants [xenogamy). The former, which is a somewhat less favourable method than the latter, is effected by air-currents, insect agency, the actual contact between stigmas and anthers in neighbouring flowers, where, as in the family Compositae, flowers are closely crowded, or by the fall of the pollen from a

Fig. 3. — Cleistogamous

(From Darwin's Dijjerent Forms of Flowsrs by permission.)

Fig. 2. — Diagram of the flowers of the three forms of Lythrum salicaria in their natural position, with the petals and calyx removed on the near side. (X 6 times.)

The dotted lines with the arrow show the directions in which pollen must be carried to each stigma to ensure full fertility.

higher on to the stigmas of a lower flower. Anton Kerner has shown that crowded inflorescences such as those of Compositae and Umbelliferae are especially adapted for geitonogamy. Xenogamy is of course the only possible method in diclinous plants; it is also the usual method in monoclinous plants, owing to the fact that stamens and carpels often mature at different times (dichogamy), the plants being proterandrous or protero- gynous. Even in homogamous flowers cross-pollination is in a large proportion of cases the effective method, at any rate at first . owing to the relative position of anther and stigma or the fact that the plant is self-sterile.

The subject of heterostyly was investigated by Darwin (see his Forms of Flowers) and later by Hildebrand. In the case of a dimorphic flower, such as Primula, four modes of pollination are possible, two distinguished by Darwin as legitimate, between anthers and stigmas on corresponding levels, and two so-called illegitimate unions, between anthers and stigmas at different levels (cf. fig. 1). In a trimorphic flower such as Lythrum salicaria there are six possible legitimate unions and twelve illegitimate (see fig. 2). Experiment showed that legitimate unions yield a larger quantity of seed than illegitimate.

Many plants produce, in addition to ordinary open flowers, so-called cleistogamous flowers, which remain permanently closed but which notwithstanding produce fruit; in these the corolla is inconspicuous or absent and the pollen grows from the anther on to the stigma of the same flower. Species of Viola (see fig. 3), Oxalis acelosella (wood sorrel) and Lamium amplexi- caule are commonly occurring in- stances. The cleistogamous flowers are developed before or after the normal open flowers at seasons less favourable for cross-pollination. In some cases flowers, which open under normal circumstances, remain closed owing to unfavourable circumstances, and self-pollination occurs as in a typical cleistogamous flower — these flower of Viola sylvatica.

have been distinguished as pseudo- 1, nower X 4. , . . T “V .2, flower more highly

cleistogamous. Instances occur in magn if le{ j an(j cut ope n.

water plants, where flowers are un- a , anther; s, pistil; able to reach the surface (e.g. Alisma st, style; v, stigmatic. natans, water buttercup, &c.) or surface, where flowers remain closed in dull or cold weather.

Systems of classification of flowers according to the agency by which pollination is effected have been proposed by Delpino, H. Muller and other workers on the subject. Knuth suggests the following, which is a modification of the systems proposed hy Delpino and Muller.

A. Water-pollinated plants, Hydrophilae. A small group which is subdivided thus: —

a. Pollinated under the water; e.g. Najas where the pollen grains

are rather heavier than water, and sinking down are caught by the stigmas of the extremely simple female flowers.

b. Pollination on the surface, a more frequent occurrence than

(a). In these the pollen floats on the surface and reaches the stigmas of the female flowers as in Callitriche, Ruppia, Zostera, Elodea. In Vallisneria (fig. 4) the male flowers become detached and float on the surface of the water; the anthers are thus brought in contact with the stigmas of the female flowers. Wind-pollinated plants, Anemophilae. — In these the pollen grains are smooth and light so as to be easily blown about, and are produced in great quantity; the stigmas are brush' like or feathery, and usually long and protruding so as readily to catch the pollen. As no means of attraction are required the flowers are inconspicuous and without scent or _ nectar. The male inflorescence is often a pendulous catkin, as in hazel and many native English trees (fig. 5) ; or the anthers are loosely fixed on long thread-like filaments as in grasses (fig. 6).

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Fig. 4. — Vallisneria spiralis.

A, female flower; J, stigmas.

B, male flowers; 1 before; 2, after spreading of the petals. A male flower has floated alongside a female and one of its anthers, which have opened to set free the pollen, is in contact with a stigma, a, anther.

C. Animal-pollinated plants, Zoidiophilae, are subdivided according

to the kind of animal by agency of which pollination is

effected, thus: —

a. Bat-pollinated, Chiropterophilae. — A Freycinetia, native of

Java, and a species of Bauhinia in Trinidad are visited by

bats which transfer the pollen.

b. Bird-pollinated, Ornithophilae. — Humming-birds and honey-suckers are agents of pollination in certain tropical plants; they visit the generally large and brightly-coloured flowers either for the honey which is secreted in considerable quantity or for the insects which

have been attracted by the honey (fig. 7).

Fig.

Fig. 6. — Grass Flower show- 5. — Catkin of Male ing pendulous anthers and pro-

Flowers of Hazel. truding hairy stigmas.

Snail or slug-pollinated flowers, Malacophilae. — In small flowers which are crowded at the same level or in flat flowers in which the stigmas and anthers project but little, slugs or snails creeping over their surface may transfer to the stigma the pollen which clings to the slimy foot. Such a transfer has been described in various Aroids, Rohdea japonica (Liliaceae), and other plants.

{From a drawing in the Botanical Gallery at the British Museum.)

Fig. 7. — Flower of Datura sanguinea visited by humming-bird Docimastes ensiferus.

d. Insect-pollinated, Entomophilae, a very large class characterized by sticky pollen grains, the surface of which bears spines, warts or other projections (fig. 8) which facilitate adhesion to some part of the insect's body, and a relatively small stigma with a sticky surface. The flowers have an attractive floral envelope, are scented and often contain honey or a large amount of pollen; by these means the insect is enticed to visit it. The form, colour and scent of the flower vary widely, according to the class of insect whose

-1, anther; 2, pollen grain of Hollyhock {Althaea rosea) enlarged. The pollen grain bears numerous spines, the dark spots indicate thin places in the outer wall.

aid is sought, and there are also numerous devices for pro- tecting the pollen and nectar from rain and dew or from the visits of those insects which would not serve the purpose of pollen-transference (unbidden guests). 1 The following subdivisions have been suggested

A. Pollen Flowers. — These offer only pollen to their visitors,

as species of anemone, poppy, rose, tulip, &c. They are simple in structure and regular in form, and the generally abundant pollen is usually freely exposed.

B. Nectar Flowers. — These contain nectar and include the

following groups : — ■

1. Flowers with exposed nectar, readily visible and accessible

to all visitors. These are very simple, open and gener- ally regular flowers, white, greenish-yellow or yellow in colour and are chiefly visited by insects with a short proboscis, such as short-tongued wasps and flies, also beetles and more rarely bees. Examples are Umbelliferae as a family, saxifrages, holly, Acer, Rhamnus, Euonymus, Euphorbia, &c.

2. Flowers with nectar partly concealed and visible only in

bright sunshine. The generally regular flowers are completely open only in bright sunshine, closing up into cups at other times. Such are most Cruciferae, buttercups, king-cup (Caltha), Potentilla. White and yellow colours predominate and insects with a pro- boscis of medium length are the common pollinating agents, such as short-tongued bees.

3. Flowers with nectar concealed by pouches, hairs, &c.

Regular flowers predominate, e.g. Geranium, Cardamine pratensis, mallows, Rubus, Oxalis, Epilobium, &c, but many species show more or less well-marked median symmetry (zygomorphism) as Euphrasia, Orchis, thyme, &c, and red, blue and violet are the usual colours. Long-tongued insects such as the honey-bee are the most frequent visitors.

4. Social flowers, whose nectar is concealed as in (3), but the

flowers are grouped in heads which render them strikingly conspicuous, and several flowers can be simul- taneously pollinated. Such are Compositae as a class, also Scabiosa, Armeria (sea-pink) and others.

5. Hymenopterid flowers, which fall into the following groups:

Bee-flowers proper, humble-bee flowers requiring a longer proboscis to reach the nectar, wasp-flowers such as fig-wort (Scrophularia nodosa) and ichneumon flowers such as tway-blade {Lister a ovata).

The shapes and colours are extremely varied ; bilater- ally symmetrical forms are most frequent with red, blue or violet colours. Such are Papilionaceous flowers, Violaceae, many Labiatae, Scrophulariaceae and others. Many are highly specialized so that pollination can be effected by a few species only. Examples of more

special mechanisms are illustrated by Salvia (fig. 9). The long connective of the single stamen is hinged to the short filament and has a shorter arm ending in a blunt process and a longer arm bearing a half-anther. A large bee in probing for honey comes in contact with the end of the short arm of the lever and causes the longer arm to descend and the pollen is deposited on the back of the insect (fig. 9, 1). In a later stage (fig. 9, 2) the style elongates and the forked stigma occupies the same position as the anther in fig- 9. I-

(From Strasburger's Lehrbuchder Boianik, by Fig. 9. — Pollination

1, Flower visited by a humble- bee, showing the projection of the curved connective bearing the anther from the helmet- shaped upper lip and the depo- sition of the pollen on the back of the humble-bee.

2, Older flower.with connective drawn back, and elongated style.

permission of Gustav Fischer.) of Salvia pratensis.

4, The staminal apparatus at rest, with connective enclosed within the upper lip.

3, The same, when disturbed by the entrance of the proboscis of the bee in the direction of the arrow;/, filament; c, connective; s, the obstructing half of the anther.

1 See A. Kerner, Plants and their Unbidden Guests.

In Broom there is an explosive machanism; the pressure of the insect visitor on the keel of the corolla causes a sudden release of the stamens and the scatter- ing of a cloud of pollen over its body. 6. Lepidopterid flowers, visited chiefly by Lepidcptera, which are able to reach the nectar concealed in deep, narrow tubes or spurs by means of their long slender proboscis. Such are: (a) Butterfly-flowers, usually red in colour, as Dianthus carthusianorum; (b) Moth-flowers, white or whitish, as honeysuckle (Loniceta periclymenum) . 7. Fly flowers, chiefly visited by Diptera, a.nd including very different types: —

a. Nauseous flowers, dull and yellowish and dark purple in colour and often spotted, with a smell attractive to carrion flies and dung flies, e.g. species of Saxifraga.

b. Pitfall flowers ˆuch as Asarum, Aristolochia and Arum macu- latum, when the insect is caught and detained until pollination is effected (fig.

c. Pinch-trap flowers, as in the family Asclepiadaceae, where the proboscis, claw or bristle of the insect is caught in the clip to which the pairs of pollinia are attached. Bees, wasps and larger insects serve as pollinating agents

Fig. 10. — Spadix of Arum maculatum from which the greater part of the spathe has been cut away.

p, Pistillate, s, staminate flowers; h, sterile flowers form- ing a circlet of stiff hairs closing the mouth of the chamber formed by the lower part of the spathe.

(From Vines's Text Book of Botany, by permission.)

12. — Flower of Veronica. k, Calyx.

u, u, u, The three lobes of the lower lip of the rotate corolla. o, The upper lip. s, s, The two stamens.

Fig. 11. — Grass of Parnassus (Parnassia palustris).

1, One of the scales which form the coronet in the flower, enlarged.

d. Deceptive flowers such as Parnassia, where the conspicuous

coronet of glistening yellow balls suggests a plentiful supply of nectar drops (fig. 11).

e. Hoverfly flowers, small flowers which are beautifully coloured

with radiating streaks pointing to a sharply-defined centre in which is the nectar, as in Veronica chamaedrys (fig. 12). Literature. — Joseph Gottlieb Kolreuter l (d. 1806) was the first to study the pollination of flowers and to draw attention to the necessity of insect visits in many cases; he gave a clear account of cross-pollination by insect aid. He was followed by Christian Konrad Sprengel, whose work Das enldeckte Geheimniss der Natur iw- Bau und in der Befruchtung der Blumen (Berlin, 1793), contains a description of floral adaptations to insect visits in nearly 500 species of plants. Sprengel came very near to appreciating the meaning of cross-pollina- tion in the lite of plants when he states that " it seems that Nature is unwilling that any flower should be fertilized by its own pollen." In 1799 an Englishman,

Thomas Andrew Knight, after experiments on the cross-fertilization of cultivated Fig. plants, formulated the conclusion that no plant fertilizes itself through many genera- tions. Sprengel's work, which had been almost forgotten, was taken up again by Charles Darwin, who concluded that no organic being can fertilize itself through an unlimited number of generations; but a cross with other individuals is occasion- n, The stigma, ally— perhaps at very long intervals — indis- pensable. Darwin's works on dimorphic flowers and the fertiliza- tion of orchids gave powerful support to this statement. The study of the fertilization, or as it is now generally called " pollina- tion," of flowers, was continued by Darwin and taken up by other workers, notably Friedrich Hildebrand, Federico Delpino and the brothers Fritz and Hermann Miiller. Hermann Muller's work on The Fertilization of Flowers by Insects and their Reciprocal Adapta- tions (1873), followed by subsequent works on the same lines, brought together a great number of observations on floral mechanisms and their relation to insect-visits. Miiller also suggested a modification of the Knight-Darwin law, which had left unexplained the numer- ous instances of continued successful self-pollination, and restated it on these terms: " Whenever offspring resulting from crossing comes into serious conflict with offspring resulting from self- fertilization, the former is victorious. Only where there is no such struggle for existence does self-fertilization often prove satis- factory for many generations." An increasing number of workers in this field of plant biology in England, on the Continent and in America has produced a great mass of observations, which have recently been brought together in Dr Paul Knuth's classic work, Handbook of Flower Pollination, an English translation of which has been published (1908) by the Clarendon Press.

POLLIO, GAIUS ASINIUS (76 b.c.-a.d. 5; according to some, 75 b.c.a.d. 4), Roman orator, poet and historian. In 54 he impeached unsuccessfully C. Porcius Cato, who in his tribunate (56) had acted as the tool of the triumvirs. In the civil war between Caesar and Pompey Pollio sided with Caesar, was present at the battle of Pharsalus (48) , and commanded against Sextus Pompeius in Spain, where he was at the time of Caesar's assassination. He subsequently threw in his lot with M. Antonius. In the division of the provinces, Gaul fell to Antony, who entrusted Pollio with the administration of Gallia Trans padana. In superintending the distribution of the Mantuan territory amongst the veterans, he used his influence to save from confiscation the property of the poet Virgil. In 40 he helped to arrange the peace of Brundisium by which Octavian (Augustus) and Antonius were for a time reconciled. In the same year Pollio entered upon his consulship,

which had been promised him in 43. It was at this time that Virgil addressed the famous fourth eclogue to him. Next year Pollio conducted a successful campaign against the Parthini, an Illyrian people who adhered to Brutus, and celebrated a triumph on the 25th of October. The eighth eclogue of Virgil was addressed to Pollio while engaged in this campaign. From the spoils of the war he constructed the first public library at Rome, in the Atrium Libertatis, also erected by him (Pliny, Nat. hist. xxxv. 10), which he adorned with statues of the most celebrated

1 Vorldufige Nachricht von einigen das Geschlecht der Pflanzen betreffenden Versuchen und Beobachtungen, 3, 4, 6 (Leipzig, 1761).

authors, both Greek and Roman. Thenceforward he withdrew from active life and devoted himself to literature. He seems to have maintained to a certain degree an attitude of independence, if not of opposition, towards Augustus. He died in his villa at Tusculum, regretted and esteemed by all.

Pollio was a distinguished orator; his speeches showed ingenuity and care, but were marred by an affected archaism (Quintilian, Inst. x. I, 113; Seneca, Ep. 100). He wrote tragedies also, which Virgil (Eel. viii. 10) declared to be worthy of Sophocles, and a prose history' of the civil wars of his time from the first triumvirate (60) down to the death of Cicero (43) or later. This history, in the composition of which Pollio received assistance from the grammarian Ateius Praetextatus, was used as an authority by Plutarch and Appian (Horace, Odes, ii. 1 ; Tacitus, Annals, iv. 34). As a literary critic Pollio was very severe. He censured Sallust (Suetonius, Gram. 10) and Cicero (Quintilian, Inst. xii. 1, 22) and professed to detect in Livy's style certain provincialisms of his native Padua (Quintilian, i. 5, 56, viii. I, 3); he attacked the Commentaries of Julius Caesar, accusing their author of carelessness and credulity, if not of deliberate falsification (Suet. Caesar, 56). Pollio was the first Roman author who recited his writings to an audience of his friends, a practice which afterwards became common at Rome. The theory that Pollio was the author of the Bellum africanum, one of the supplements to Caesar's Commentarii, has met with little support. All his writings are lost except a few fragments of his speeches (H. Meyer, Orat. torn, frag., 1842), and three letters addressed to Cicero (Ad. Fam. x. 31-33).

See Plutarch, Caesar, Pompey; Veil. Pat. ii. 36, 63, 73, 76; Florus iv. 12, 11; Dio Cassius xlv. 10, xlviii. 15; Appian, Bell, civ. ; V.

Gardthausen, Augustus und seine Zeit (1891), i. ; P. Groebe, in Pau\y-\‘isso\va’ s Realencyclopddie (1896), ii. pt. 2 ; Teuffel-Schwaben, Hist, of Roman Literature (Eng. trans.), § 221 ; M. Schanz, Geschichte der romischen Litter atur, pt. 2, p. 20 (2nd ed., 1899); Cicero, Letters, ed. Tyrrell and Purser, vi. introd. p. 80.

POLLNITZ, KARL LUDWIG, Freiherr von (1692-1775), German adventurer and writer, was born at Issum on the 25th of February 1692. His father, Wilhelm Ludwig von Pollnitz (d. 1693), was in the military service of the elector of Branden- burg, and much of his son’s youth was passed at the electoral court in Berlin. He was a man of restless and adventurous disposition, unscrupulous even for the age in which he lived, visited many of the European courts, and served as a soldier in Austria, Italy and Spain. Returning to Berlin in 1735 he obtained a position in the household of King Frederick William I. and afterwards in that of Frederick the Great, with whom he appears to have been a great favourite; and he died in Berlin on the 23rd of June 1775- –

Pollnitz’s Memoires (Liege, 1734), which were translated into German (Frankfort, 1735), give interesting glimpses of his life and the people whom he met, but they are very untrustworthy. He also wrote Nouveaux memoires (Amsterdam, 1737); Etat abrigS de la cour de Saxe sous le regne d’Auguste III. (Frankfort, 1734; Ger. trans., Breslau, 1736); and Mimoires pour servir & Vhistoire des quatres derniers souverains de la maison de Brandenbourg, published by F. L. Brunn (Berlin, 1791; Ger. trans., Berlin, 1791). Per- haps his most popular works are La Saxe galante (Amsterdam, 1734), an account of the private life of Augustus the Strong, elector of Saxony and king of Poland; and Histoire secrete de la duchesse d’Hanovre, epouse de Georges I. (London, 1 732). There is an English translation of the Memoires (London, 1738-1739). See P. von Pollnitz, Stammtafeln der Familie von Pollnitz (Berlin, 1894); and J. G. Droysen, Geschichte der preussischen Politih, pt. iv. (Leipzig, 1870).

POLLOCK, the name of an English family which has con- tributed many important members to the legal and other profes- sions. David Pollock, who was the son of a Scotsman and built up a prosperous business in London as a saddler, had three distin- guished sons: Sir David Pollock (1780-1847), chief justice of Bombay; Sir Jonathan Frederick Pollock, Bart. (1783-1870), chief baron of the exchequer; and Sir George Pollock, Bart. (1786-1872), field-marshal. Of these the more famous were the two last. Field Marshal Sir George Pollock, who rendered valuable military service in India, and especially in Afghanistan in 1 841-1843, ended his days as constable of the Tower

of London, and was buried in Westminster Abbey; his baronetcy, created in 1872, descended to his son Frederick (d. 1874), who assumed the name of Montagu-Pollock, and so to his heirs. Chief Baron Sir J. Frederick Pollock, who had been senior wrangler at Cambridge, and became F.R.S. in 1816, was raised to the bench in 1844, and created a baronet in 1866. He was twice married

and had eight sons and ten daughters, his numerous descendants being prominent in many fields. The chief baton's eldest son, Sir William Frederick Pollock, 2nd Bart. (1815-1888), became a master of the Supreme Court (1846) and queen's remembrancer (1874); his eldest son, Sir Frederick Pollock, 3rd Bart. (b. 1845), being the well-known jurist and legal historian, fellow of Trinity College, Cambridge, and Corpus professor of jurisprudence at Oxford (1883-1903), and the second son, Walter Hemes Pollock (b. 1850), being a well-known author and editor of the Saturday Review from 1883 to 1894. The chief baron's third son, George Frederick Pollock (b. 1821), became a master of the Supreme Court in 1851, and succeeded his brother as queen's (king's) remembrancer in 1886; among his sons were Dr W. Rivers Pollock (1859-1909), Ernest Murry Pollock, K.C. (b. 1861), and the Rt. Rev. Bertram Pollock (b. 1863), bishop of Norwich, and previously head master of Wellington College from 1893 till 1910. The chief baron's fourth son, Sir Charles Edward Pollock (1823-1897), had a successful career at the bar and in 1873 became a judge, being the last survivor of the old barons of the exchequer; he was thrice married and had issue by each wife.

POLLOK, ROBERT (1798-1827), Scottish poet, son of a small farmer, was bcrn at North Moorhouse, Renfrewshire, on the 19th of October 1798. He was trained as a cabinet-maker and after- wards worked on his father's farm, but, having prepared himself for the university, he took his degree at Glasgow, and studied for the ministry of the United Secession Church. He published Tales of the Covenanters while he was a divinity student, and planned and completed a strongly Calvinistic poem on the spiri- tual life and destiny of man. This was the Course of Time (1827), which passed through many editions and became a favourite in serious households in Scotland. It was written in blank verse, in ten books, in the poetic diction of the 18th century, but with abundance of enthusiasm, impassioned elevation of feeling and copious force of words and images. The poem at once became popular, but within six months of its publication, on the 18th of September 1827, its author died of consumption.

POLLOKSHAWS, a police burgh and burgh of barony of Renfrewshire, Scotland, on the White Cart, now virtually a suburb of Glasgow, with

which it is connected by electric tramway and the Glasgow & South-Western and Caledonian railways. Pop. (1901), 11,183. It is named from the shaws or woods (and is locally styled ” the Shaws “) and the lands of Pollok, which have been held by the Maxwells since the 13th century. The family is now called Stirling-Maxwell, the estate and baronetcy having devolved in 1865 upon Sir William Stirling of Keir, who then assumed the surname of Maxwell. Pollok House adjoins the town on the west. The staple indus- tries are cotton-spinning and weaving, silk-weaving, dyeing, bleaching, calico-printing and the manufacture of chenille and tapestry, besides paper mills, potteries and large engineering works. Pollokshaws was created a burgh of barony in 181 3, and is governed by a council and provost. About 2 m. south- west is the thriving town of Thornliebank (pop. 2452), which owes its existence to the cotton-works established towards the end of the 18th century.

POLL-TAX, a tax levied on the individual, and not on property or on articles of merchandise, so-called from the old English poll, a head. Raised thus per capita, it is sometimes called a capitation tax. The most famous poll-tax in English history is the one levied in 1380, which led to the revolt of the peasants under Wat Tyler in 1381, but the first instance of the kind was in 1377, when a tax of a groat a head was voted by both clergy and laity. In 1379 the tax was again levied, but on a graduated scale. John of Gaunt, duke of Lancaster, paid ten marks, and the scale descended from him to the peasants, who paid one groat each, every person over sixteen years of age being liable. In 1380 the tax was also graduated, but less steeply. For some years after the rising of 1381 money was only raised in this way from aliens, but in 1513 a general poll tax was imposed. This, however, only produced about £50,000, instead I of £160,000 as was expected, but a poll-tax levied in 1641 I resulted in a revenue of about £400,600. During the reign of

Charles II. money was obtained in this way on several occasions, although in 1676-167 7 especially there was a good deal of resentment against the tax. For some years after 1688 poll- taxes were a favourite means of raising money for the prosecution of the war with France. Sometimes a single payment was asked for the year; at other times quarterly payments were required. The poll-tax of 1697 included a weekly tax of one penny from all persons not receiving alms. In 1698 a quarterly poll-tax produced £321,397. Nothing was required from the poor, and those who were liable may be divided roughly into three classes. Persons worth less than £300 paid one

shilling; those worth £300, including the gentry and the professional classes, paid twenty shillings; while tradesmen and shopkeepers paid ten shillings. Non-jurors were charged double these rates. Like previous poll-taxes, the tax of 1698 did not produce as much as was anticipated, and it was the last of its kind in England.

Many of the states of the United States of America raise money by levying poll-taxes, or, as they are usually called, capitation taxes, the payment of this tax being a necessary preliminary to the exercise of the suffrage.

See S. Dowell, History of Taxation and Taxes in England (1888), vol. iii. ; and W. Stubbs, Constitutional History (1896), vol. ii.

POLLUX, JULIUS, of Naucratis in Egypt, Greek grammarian and sophist of the 2nd century a.d. He taught at Athens, where, according to Philostratus (Vit. Soph.) , he was. appointed to the professorship of rhetoric by the emperor Commodus on account of his melodious voice. Suidas gives a list of his rhetorical works, none of which has survived. Philostratus recognizes his natural abilities, but speaks of his rhetoric in very moderate terms. Pollux is probably the person attacked by Lucian in the Lexiphanes and Teacher of Rhetoricians. In the Teacher of Rhetoricians Lucian satirizes a worthless and ignorant person who gains a reputation as an orator by sheer effrontery; the Lexiphanes, a satire upon the use of obscure and obsolete words, may conceivably have been directed against Pollux as the author of the Onomasticon. This work, which we still possess, is a Greek dictionary in ten books, each dedicated to Commodus, and arranged not alphabetically but according to subject-matter. Though mainly a dictionary of synonyms and phrases, chiefly intended to furnish the reader with the Attic names for indi- vidual things, it supplies much rare and valuable information on many points of classical antiquity. It also contains numerous fragments of writers now lost. The chief authorities used were the lexicological works of Didymus, Tryphon, and Pamphilus; in the second book the extant treatise of Rufus of Ephesus On the Names of the Parts of the Human Body was specially consulted.

The chief editions of the Onomasticon are those of W. Dindorf (1824), with the notes of previous commentators, I. Bekker (1846), containing the Greek text only, and Bethe (1900). There are mono- graphs on special portions of the vocabulary; by E. Rohde (on the theatrical terms, 1870), and F. von Stojentin (on constitutional antiquities, 1875).

POLLUX, or Pollucite, a rare mineral, consisting of hydrous caesium and aluminium silicate, H 2 Cs4Al 4 (Si03)9. Caesium oxide (CsoO) is present to the extent of 30-36 %, the amount varying somewhat owing to partial replacement by other alkalis, chiefly sodium. The mineral crystallizes in the cubic system. It is colourless and transparent, and has a vitreous lustre. There is no distinct cleavage and the fracture is conchoidal. The hardness is 65 and the specific gravity 2-90. It occurs sparingly, together with the mineral ” castor ” (see Petalite), in cavities in the granite of the island of Elba, and with beryl in pegmatite veins at Rumford and Hebron in Maine.

POLO, GASPAR GIL (?iS3o-iS9i), Spanish novelist and poet, was born at Valencia about 1530. He is often confused with Gil Polo, professor of Greek at Valencia University between 1566 and 1573; but this professor was not named Gaspar. He is also confused with his own son, Gaspar Gil Polo, the author of De origine et progressu juris romani (1615) and other legal treatises, who pleaded before the Cortes as late as 1626. A notary by profession, Polo was attached to the treasury

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commission which visited Valencia in 1571, became coadjutor to the chief accountant in 1572, went on a special mission to Barcelona in 1580, and died there in 1591. Timoneda, in the Sarao de amor (1561), alludes to him as a poet of repute; but of his miscellaneous verses only two conventional, eulogistic sonnets and a song survive. Polo finds a place in the history of the novel as the author of La Diana enamorada, a continuation of Monte- mayor’s Diana, and perhaps the most successful continuation ever written by another hand. Cervantes, punning on the writer’s name, recommended that ” the Diana enamorada should be guarded as carefully as though it were by Apollo himself “; the hyperbole is not wholly, nor even mainly, ironical.

The book is one of the most agreeable of Spanish pastorals; interesting in incident, written in fluent prose, and embellished with melodious poems, it was constantly reprinted, was imitated by Cervantes in the Canto de Caliope, and was translated into English, French, German and Latin. The English version of Bartholomew Young, published in 1598 but current in manu- script fifteen years earlier, is said to have suggested the Felismena episode in the Two Gentlemen of Verona; the Latin version of Caspar Barth, entitled Erotodidascalus (Hanover, 1625), is a per- formance of uncommon merit, as well as a bibliographical curiosity.

POLO, MARCO (c. 1 2 54-13 24), the Venetian, greatest of medieval travellers. Venetian genealogies and traditions of uncertain value trace the Polo family to Sebenico in Dalmatia, and before the end of the nth century one Domenico Polo is found in the great council of the republic (1094). But the ascertained line of the traveller begins only with his grandfather. Andrea Polo of S. Felice was the father of three sons, Marco, Nicolo and Maffeo, of whom the second was the father of the subject of this article. They were presumably ” noble,” i.e. belonging to the families who had seats in the great council, and were enrolled in the Libro d’ Oro; for we know that Marco the traveller is officially so styled (nobilis vir). The three brothers were engaged in commerce; the elder Marco, resident apparently in Constantinople and in the Crimea, (especially at Sudak), suggests, by his celebrated will, a long business partnership with Nicolo and Maffeo.

About 1260, and even perhaps as early as 1250, we find Nicolo and Maffeo at Constantinople. Nicolo was married and had left his wife there. The two brothers went on a speculation to the Crimea, whence a succession of chances and openings carried them to the court of Barka Khan at Sarai, further north up to Bolghar (Kazan), and eventually across the steppes to Bokhara. Here they fell in with certain envoys who had been on a mission from the great Khan Kublai to his brother Hulagu in Persia, and by them were persuaded to make the journey to Cathay in their company. Under the heading China the circumstances are noticed which in the last half of the 13th century and first half of the 14th threw Asia open to Western travellers to a degree unknown before and since— until the 19th century. Thus began the medieval period of intercourse between China and catholic Europe. Kublai, when the Polos reached his court, was either at Cambaluc (Khanbaligh, the Khan’s city), i.e. Peking, which he had just rebuilt, or at his summer seat at Shangtu in the country north of the Great Wall. It was the first time that the khan, a man full of energy and intelligence, had fallen in with European gentlemen. He was delighted with the Venetian brothers, listened eagerly to all they had to tell of the Latin world, and decided to send them back as his envoys to the pope, with letters requesting the despatch of a large body of educated men to instruct his people in Christianity and the liberal arts. With Kublai, as with his predecessors, religion was chiefly a political engine. Kublai, the first of his house to rise above the essential barbarism of the Mongols, had perhaps discerned that the Christian Church could afford the aid he desired in taming his countrymen. It was only when Rome had failed to meet his advance that he fell back upon Buddhism as his chief civilizing instrument.

The brothers arrived at Acre in April 1269. They learned that Clement

IV. had died the year before, and no new pope had yet been chosen. So they took counsel with an eminent church- man, Tedaldo, archdeacon of Liege and papal legate for the

whole realm of Egypt, and, being advised by him to wait patiently, went home to Venice, where they found that Nicolo's wife was dead, but had left a son Marco, now fifteen. The papal in- terregnum was the longest that had been known, at least since the dark ages. After the Polos had spent two years at home there was still no pope, and the brothers resolved on starting again for the East, taking young Marco with them. At Acre they again saw Tedaldo, and were furnished by him with letters to authenticate the causes that had hindered their mission. They had not yet left Lajazzo, Layas, or Ayas on the Cilician coast (then one of the chief points for the arrival and departure of the land trade of Asia), when they heard that Tedaldo had been elected pope. They hastened back to Acre, and at last were able to execute Kublai's mission, and to obtain a papal reply. But, instead of the hundred teachers asked for by the Great Khan, the new pope (styled Gregory X.) could supply but two Dominicans; and these lost heart and turned back, when they had barely taken the first step of their journey.

The second start from Acre must have taken place about November 1271; and from a consideration of the indications and succession of chapters in Polo's book, it would seem that the party proceeded from Lajazzo to Sivas and Tabriz, and thence by Yezd and Kirman down to Hormuz (Hurmua) at the mouth of the Persian Gulf, with the purpose of going on to China by sea; but that, abandoning their naval plans (perhaps from fear of the flimsy vessels employed on this navigation from the Gulf east- wards), they returned northward through Persia. Traversing Kirman and Khorasan they went on to Balkh and Badakshan, in which last country young Marco recovered from illness. In a passage touching on the climate of the Badakshan hills, Marco breaks into an enthusiasm whiqh he rarely betrays, but which is easily understood by those who have known what it is, with fever in the blood, to escape to the exhilarating mountain air and fragrant pine-groves. They then ascended the upper Oxus through Wakhan to the plateau of Pamir (a name first heard in Marco's book). These regions were hardly described again by any European traveller (save Benedict Goes) till the expedition in 1838 of Lieut. John Wood of the Indian navy, whose narrative abounds in incidental illustration of Marco

Polo. Crossing the Pamir the travellers descended upon Kashgar, Yarkand and Khotan (Khutan). These are regions which remained almost absolutely closed to our know- ledge till after i860, when the temporary overthrow of the Chinese power, and the enterprise of British, Russian and other explorers, again made them known.

From Khotan the Polos passed on to the vicinity of Lop-Nor, reached for the first time since Polo's journey by Prjevalsky in 1 87 1. Thence the great desert of Gobi was crossed to Tangut, as the region at the extreme north-west of China, both within and without the Wall, was then called.

In his account of the Gobi, or desert of Lop, as he calls it, Polo gives some description of the terrors and superstitions of the waste, a description which strikingly reproduces that of the Chinese pilgrim Suan T'sang, in passing the same desert in the contrary direction six hundred years before.

The Venetians, in their further journey, were met and welcomed by the Great Khan's people, and at last reached his presence at Shangtu, in the spring of 1275. Kublai received them with great cordiality, and took kindly to young Marco, by this time about twenty-one years old. The " young bachelor," as the book calls him, applied himself diligently to the acquisi- tion of the divers languages and written characters chiefly in use among the multifarious nationalities subject to the Khan; and Kublai, seeing that he was both clever and discreet, soon began to employ him in the public service. G. Pauthier found in the Chinese annals a record that in the year 1277 a certain Polo was nominated as a second-class commissioner or agent attached to the imperial council, a passage which we may apply to the young Venetian. Among his public missions was one which carried him through the provinces of Shansi, Shensi, and Szechuen, and the wild country on the borders of Tibet, to the remote province of Yunnan, called by the Mongols Karajang,

and into northern Burma (Mien). Marco, during his stay at court, had observed the Khan's delight in hearing of strange countries, of their manners, marvels, and oddities, and had heard his frank expressions of disgust at the stupidity of envoys and commissioners who could tell of nothing but their official business. He took care to store his memory or his note-book with curious facts likely to interest Kublai, which, on his return to court, he related. This south-western journey led him through a country which till about i860 was almost a terra incognita — though since the middle of the 19th century we have learned much regarding it through the journeys of Cooper, Gamier, Richthofen, Gill,

Baber and others. In this region there existed and still exists in the deep valleys of the great rivers, and in the alpine regions which border them, a vast ethnological garden, as it were, of tribes of various origin, and in every stage of semi-civilization or barbarism; these afforded many strange products and eccentric traits to entertain Kublai. Marco rose rapidly in favour and was often employed on distant missions as well as in domestic administration; but we gather few details of his employment. He held for three years the government of the great city of Yangchow; on another occasion he seems to have visited Kangchow, the capital of Tangut, just within the Great Wall, and perhaps Karakorum on the north of the Gobi, the former residence of the Great Khans: again we find him in Ciampa, or southern Cochin-China; and perhaps, once more, on a separate mission to the southern states of India. We are not informed whether his father and uncle shared in such employments, though they are mentioned as having rendered material service to the Khan, in forwarding the capture of Siang-yang (on the Han river) during the war against southern China, by the construction of powerful artillery engines — a story, however, perplexed by chronological difficulties.

All the Polos were gathering wealth which they longed to carry back to their home, and after their exile they began to dread what might follow Kublai's death. The Khan, however, was deaf to suggestions* of departure and the opportunity only came by chance.

Arghun, khan of Persia, the grandson of Kublai's brother Hulagu, lost in 1 286 his favourite wife, called by Polo Balgana {i.e. Bulughan or " Sable "). Her dying injunction was that her place should be filled only by a lady of her own Mongol tribe. Ambassadors were despatched to the court of Peking to obtain such a bride. The message was courteously received, and the choice fell on the lady Cocacin (Kukachin), a maiden of seventeen. The overland road from Peking to Tabriz was then imperilled by war, so Arghun's envoys proposed to return by sea. Having made acquaintance with the Venetians, and eager to profit by their experience, especially by that of Marco, who had just returned from a mission to the Indies, they begged the Khan to send the Franks in their company. He consented with reluctance, but fitted out the party nobly for the voyage, charging them with friendly messages to the potentates of Christendom, including the pope, and the kings of France, Spain and England. They sailed from Zaiton or Amoy Harbour in Fukien (a town corresponding either to the modern Changchow or less probably toTswanchoworChinchew),thenoneof the chief Chinese havens for foreign trade, in the beginning of 1292. The voyage in- volved long detention on the coast of Sumatra, and in south India, and two years

or more passed before they arrived in Persia. Two of the three envoys and a vast proportion of their suite perished by the way; but the three Venetians survived all perils, and so did the young lady, who had come to look on them with filial regard. Arghun Khan had died even before they quitted China; his brother reigned in his stead; and his son Ghazan succeeded to the lady's hand. The Polos went on (apparently by Tabriz, Trebizond, Constantinople and Negro- pont) to Venice, which they seem to have reached about the end of 1295.

The first biographer of Marco Polo was the famous geo- graphical collector John Baptist Ramusio, who wrote more than two centuries after the traveller's death. Facts and dates

sometimes contradict his statements, but he often adds detail, evidently authentic, of great interest and value, and we need not hesitate to accept as a genuine tradition the substance of his story of the Polos' arrival at their family mansion in St John Chrysostom parish in worn and outlandish garb, of the scornful denial of their identity, and the stratagem by which they secured acknowledgment from Venetian society.

We next hear of Marco Polo in a militant capacity. Jealousies had been growing in bitterness between Venice and Genoa throughout the 13th century. In 1298 the Genoese prepared to strike at their rivals on their own ground, and a powerful fleet under Lamba Doria made for the Adriatic. Venice, on hearing of the Genoese armament, equipped a fleet still more numerous, and placed it under Andrea Dandolo. The crew of a Venetian galley at this time amounted, all told, to 250 men, under a comito or master, but besides this officer each galley carried a sopracomito or gentleman-commander, usually a noble. On one of the galleys of Dandolo's fleet Marco Polo seems to have gone in this last capacity. The hostile fleets met before Curzola Island on the 6th of September, and engaged next morning. The battle ended in a complete victory for Genoa, the details of which may still be read on the facade of St Matthew's church in that city. Sixty-six Venetian galleys were burnt in Curzola Bay, and eighteen were carried to Genoa, with 7000 prisoners, one of whom was Marco Polo. The captivity was of less than a year's duration; by the mediation of Milan peace was made, on honourable terms for both republics, by July ■ 1299; and Marco was probably restored to his family during that or the following month.

But his captivity was memorable as the immediate cause of his Book. Up to this time he had doubtless often related his experiences among

his friends; and from these stories, and the frequent employment in them (as it would seem) of grand numerical expressions, he had acquired the nickname of Marco Millioni. Yet it would seem that he had committed nothing to writing. The narratives not only of Marco Polo but of several other famous medieval travellers (e.g. Ibn Batuta, Friar Odoric, Nicolo Conti) seem to have been extorted from them by a kind of pressure, and committed to paper by other hands. Examples, perhaps, of that intense dislike to the use of pen and ink which still prevails among ordinary respectable folk on the shores of the Mediterranean.

In the prison of Genoa Marco Polo fell in with a certain person of writing propensities, Rusticiano or Rustichello of Pisa, also a captive of the Genoese. His name is otherwise known as that of a respectable literary hack, who abridged and recast several of the French romances of the Arthurian cycle, then in fashion. He wrote down Marco's experiences at his dictation.

We learn little of Marco Polo's personal or family history after this captivity; but we know that at his death he left a wife, Donata (perhaps of the Loredano family, but this is uncertain), and three daughters, Fantina and Bellela (married, the former to Marco Bragadino), and Moreta (then a spinster, but married at a later date to Ranuzzo Dolfino). One last glimpse of the traveller is gathered from his will, now in St Mark's library. On the 9th of January 1324 the traveller, in his seventieth year, sent for a neighbouring priest and notary to make his testament. We do not know the exact time of his death, but it fell almost certainly within the year 1324, for we know from a scanty series of documents, beginning in June 1325, that he had at the latter date been some time dead. He was buried, in accordance with his will, in the Church of St Lorenzo, where the family burying-place was marked by a sarcophagus, erected by his filial care for his father Nicolo, which existed till near the end of the 16th century. On the renewal of the church in 1592 this seems to have disappeared.

The archives of Venice have yielded a few traces of our tra- veller. Besides his own will just alluded to, there are the wills of his uncle Marco and of his younger brother Maffeo; a few legal documents connected with the house property in St John Chrysostom, and other papers of similar character; and

two or three entries in the record of the Maggior Con- siglio. We have mentioned the sobriquet of Marco Millioni. Ramusio tells us that he had himself noted the use of this name in the public books of the

commonwealth, and this statement has been verified in an entry in the books of the Great Council (dated April 10, 1305), which records as one of the securities in a- certain case. the ” Nobilis vir Marchus Paulo Milion.” It is alleged that long after the traveller’s death there was always in the Venetian masques one individual who assumed the character of Marco Millioni, and told Munchausen-like stories to divert the vulgar. There is also a record (March 9, 13 n) of the judgment of the court of requests (Curia Peti- tionum) upon a suit brought by the ” Nobilis vir Marcus Polo ” against Paulo Girardo, who had been an agent of his, to recover the value of a certain quantity of musk for which Girardo had not accounted. Another document is a catalogue of certain curiosities and valuables which were collected in the house of Marino Faliero, and this catalogue comprises several objects that Marco Polo had given to one of the Faliero family.

The most tangible record of Polo’s memory in Venice is a portion of the Ca’ Polo — the mansion (there is reason to believe) where the three travellers, after their long absence, were denied entrance. The court in which it stands was known in Ramusio’s time as the Corte del millioni, and now is called Corte Sabbionera. That which remains of the ancient edifice is a passage with a decorated archway of Italo-Byzantine character pertaining to the 13th century.

No genuine portrait of Marco Polo exists. There is a medallion portrait on the wall of the Sala dello Scudo in the ducal palace, which has become a kind of type; but it is a work of imagination no older than iy6r. The oldest professed portrait is one in the gallery of Monsignor Badia at Rome, which is inscribed Marcus Polus venetus totius orbis et Indie peregrator primus. It is a good picture, but evidently of the 16th century at earliest. The Europeans at Canton have absurdly attached the name of Marco Polo to a figure in a Buddhist temple there containing a gallery of ” Arhans ” or Buddhist saints, and popularly known as the ” temple of the five hundred gods.” The Venetian municipality obtained a copy of this on the occasion of the geographical congress at Venice in 1881.

The book indited by Rusticiano is in two parts. The first, or prologue, as it is termed, is unfortunately the only part which con- sists of actual personal narrative. It relates in an interesting though extremely brief fashion the circumstances which led the two elder Polos to the Khan’s court, together with those of their second journey (when accompanied by Marco), and of the return to the west by the Indian seas and Persia. The second and staple part consists of a series of chapters of unequal length and unsystem- atic structure, descriptive of the different states and provinces of Asia (certain African islands and regions included),

with occasional notices of their sights and products, of curious manners and re- markable events, and especially regarding the Emperor Kublai, his court, wars and administration. A series of chapters near the close treats of sundry wars that took place between various branches of ‘the house of Jenghiz in the latter half of the 13th century. This last series is either omitted or greatly curtailed in all the MS. copies and versions except one (Paris, National Library, Fonds Fr. n 16).

It was long doubtful in what language the work was originally written. That this had been some dialect of Italian was a natural presumption, and a contemporary statement could be alleged in its favour. But there is now no doubt that the original was French. This was first indicated by Count Baldelli-Boni, who published an elaborate edition of two of the Italian texts at Florence in 1827, and who found in the oldest of these indisputable signs that it was a translation from the French. The argument has since been followed up by others; and a manuscript in rude and peculiar French, belonging to the National Libraiy of Paris (Fonds Fr. 1 1 16), which was printed by the Societe de geographie in 1824., is evidently either the original or a close transcript of the original dictation. A variety of its characteristics are strikingly indicative of the unrevised product of dictation, and are such as would necessarily have disappeared either in a translation or in a revised copy. Many illustrations could be adduced of the fact that the use of French was not a circumstance of surprising or unusual nature; for the language had at that time, in some points of view, even a wider diffusion than at present, and examples of its literary em- ployment by writers who were not Frenchmen (like Rusticiano himself, a compiler of French romances) are very numerous.

Eighty-five MSS. of the book are known, and their texts exhibit considerable differences. These fall under four principal types. Of these, type i. is found completely only in that old French codex which has been mentioned (Paris, National Library, Fr. 1116). Type ii. is shown by several valuable MSS. in purer French (Paris, Nat. Libr., Fr. 2810; Fr. 5631; Fr. 5649; Bern, Canton Library, 125), which formed the basis of the edition prepared by the late M. Pauthier in 1865. It exhibits a text condensed and revised from the rude original, but without any exactness, though perhaps under some general direction by Marco Polo himself, for an inscrip- tion prefixed to certain MSS. (Bern, Canton Libr. 125; Paris, Nat. Libr., Fr. 5649) records the

presentation of a copy by the tra- veller himself to the Seigneur Thiebault de Cepoy, a distinguished Frenchman known to history, at Venice in the year 1306. Type iii. is that of a Latin version prepared in Marco Polo's lifetime, though without any sign of his cognisance, by Francesco Pipino, a Dominican of Bologna, and translated from an Italian copy. In this, condensation and curtailment are carried a good deal further than in type ii. Some of the forms under which this type appears curiously illustrate the effects of absence of effective publication, not only before the invention of the press, but in its early days. Thus the Latin version published by Grynaeus at Basel in the Novus Orbis (1532) is different in its language from Pipino's, and yet is clearly traceable to that as its foundation. In fact it is a retranslation into Latin from some version of Pipino (Marsden thinks the Portuguese printed one of 1502). It introduces changes of its own, and is worthless as a text; yet Andreas Mtiller, who in the 17th century took so much trouble with Polo, unfortunately chose as his text this fifth-hand version. The French editions published in the middle of the 16th century were translations from Grynaeus's Latin. Hence they complete this curious and vicious circle of transmission — French, Italian, Pipino's Latin, Portuguese, Grynaeus's Latin, French.

Type iv. deviates largely from those already mentioned; its history and true character are involved in obscurity. It is only represented by the Italian version prepared for the press by John Baptist Ramusio, with interesting preliminary dissertations, and published at Venice two years after his death, in the second volume of the Navigationi e viaggi. Its peculiarities are great. Ramusio seems to imply that he made some use of Pipino's Latin, and various passages confirm this. But many new circumstances, and anec- dotes occurring in no other copy, are introduced ; many names assume a new shape; the whole style is more copious and literary than that of any other version. While a few of the changes and interpolations seem to carry us farther from the truth, others contain facts of Asiatic nature or history, as well as of Polo's alleged experiences, which it is difficult to ascribe to any hand but the traveller's own.

We recognize to a certain extent tampering with the text, as in cases where Polo's proper names have been identified, and more modern forms substituted. In some other cases the editorial spirit has gone astray. Thus the age of young Marco has been altered to correspond with a date which is itself erroneous. Ormuz is described as an island, contrary to the old texts, and to the fact in Polo's time. In speaking of the oil-springs of Caucasus the phrase " camel-loads " has been substituted for " ship-loads," in ignorance that the site was Baku on the Caspian.

But, on the other hand, there are a number of new circumstances certainly genuine, which can hardly be ascribed to any one but Polo himself. Such is the account which Ramusio's version gives of the oppressions exercised by Kublai's Mahommedan minister Ahmad, telling how the Cathayans rose against him and murdered him, with the addition that Messer Marco was on the spot when all this happened. Not only is the whole story in substantial accordance with the Chinese annals, even to the name of the chief conspirator {Vanchu in Ramusio, Wangcheu in the Chinese records), but the annals also tell of the frankness of " Polo, assessor of the privy council," in opening Kublai's eyes to the iniquities of his agent.

Polo was the first traveller to trace a route across the whole longitude of Asia, naming and describing kingdom after kingdom which he had seen ; the first to speak of the new and brilliant court which had been established at Peking; the first to reveal China in all its wealth and vastness, and to tell of the nations on its borders; the first to tell more of Tibet than its name, to speak of Burma, of Laos, of Siam, of Cochin-China, of Japan, of Java, of Sumatra and of other islands of the archipelago, of the Nicobar and Andaman Islands, of Ceylon and its sacred peak, of India but as a country seen and partially explored ; the first in medieval times to give any distinct account of the secluded Christian Empire of Abyssinia, and of the semi-Christian island of Sokotra, and to speak, however dimly, of Zanzibar, and of the vast and distant Madagascar; whilst he carries us also to the remotely opposite region of Siberia and the Arctic shores, to speak of dog-sledges, white bears and reindeer- riding Tunguses.

The diffusion of the book was hardly so rapid as has been some- times alleged. We know from Gilles Mallet's catalogue of the books collected in the Louvre by Charles V., dating c. 1370-1375, that five copies of Marco Polo's work were then in the collection ; but on the other hand, the 202 known MSS. and the numerous early printed

editions of " Mandeville," with his lying wonders, indicates a much greater popularity. Dante, who lived twenty-three years after the book was dictated, and who touches so many things in the seen and unseen worlds, never alludes to Polo, nor, we believe, to any- thing that can be connected with him; nor can any trace of Polo be discovered in the book of his contemporary, Marino Sanudo the Elder, though this worthy is well acquainted with the work, later by some years, of Hayton the Armenian, and though many of the subjects on which he writes in his own book {Secreta Fidelium Cruris 1) challenge a reference to Polo's experiences. " Mande- ville " himself, who plundered right and left, hardly ever plunders Polo (see one example

in Dawn of Modern Geography, iii. 323, note). The only literary works we know of the 14th century which show acquaintance with Polo's book or achievements are Pipino's Chronicle, Villani's Florentine History, Pietro d'Abano's Conciliator, the Chronicle of John of Ypres, and the poetical romance of Baudouin de Sebourc, which last borrows themes largely from Polo.

Within the traveller's own lifetime we find the earliest examples of the practical and truly scientific coast-charts (Portolani), based upon the experience of pilots, mariners, merchants, &c. In two of the most famous of the 14th century Portolani, we trace Marco Polo's influence — first, very slightly in the Laurentian or Medicean Portolano of 1 35 1 (at Florence), but afterwards with clearness and in remarkable detail in the Catalan Atlas of 1375 (now at Paris). Both of these represent a very advanced stage of medieval knowledge, a careful attempt to represent the known world on the basis of collected fact, and a disregard for theological or pseudo- scientific theory; in the Catalan Atlas, as regards Central and Further Asia, and partially as regards India, Marco Polo's Book is the basis of the map. His names are often much perverted, and it is not always easy to understand the view that the compiler took of his itineraries. Still we have Cathay placed in the true position of China, as a great empire filling the south-east of Asia. The trans-Gangetic peninsula is absent, but that of India proper is, for the first time in the history of geography, represented with a fair approximation to correct form and position.

It is curious that, in the following age, owing partly to his un- happy reversion to the fancy of a circular disk, the map of Fra Mauro (1459), one of the greatest map-making enterprises in history, and the result of immense labour in the collection of facts and the endeavour to combine them, gives a much less accurate idea of Asia than the Carta catalana. Columbus possessed a printed copy of the Latin version of Polo's book made by Pipino, and on more than seventy pages of this there are manuscript notes in the admiral's handwriting, testifying, what is sufficiently evident from the whole history of the Columbian voyages, to the immense in- fluence of the work of the Venetian merchant upon the discoverer of the new world.

When, in the 16th century, attempts were made to combine new and old knowledge, the results were unhappy. The earliest of such combinations tried to realize Columbus's ideas regarding the identity of his discoveries with the Great Khan's dominions; but even after America had vindicated its independent existence, and the new knowledge of the Portuguese had named China where the Catalan map had spoken of Cathay, the latter country, with the whole of Polo's

nomenclature, was shunted to the notth, forming a separate system. Henceforward the influence of Polo's work on maps was simply injurious; and when to his names was added a sprinkling of Ptolemy's, as was usual throughout the 16th century, the result was a hotchpotch conveying no approximation to facts (see further Map).

As to the alleged introduction of important inventions into Europe by Polo — although the striking resemblance of early Euro- pean block-books to those of China seems clearly to indicate the derivation of the art from that country, there is no reason for connecting this introduction (any more than that of gunpowder or the mariner's compass) with the name of Marco. In the 14th century not only were missions of the Roman Church established in some of the chief cities of eastern China, but a regular overland trade was carried on between Italy and China, by way of Tana (Azov), Astrakhan, Otrar, Kamul (Hami) and Kanchow. Many a traveller other than Marco Polo might have brought home the block-books, and some might have witnessed the process of making them. This is the less to be ascribed to Polo, because he so curiously omits to speak of the process of printing, when, in describing ihe block-printed paper-money of China, his subject seems absolutely to challenge a description of the art.

See the Recueil of the Paris Geographical Society (1824), vol. i., giving the text of the fundamental MS. (Nat. Libr. Paris, Fr. 1 1 16; see above), as well as that of the oldest Latin version; G. Pauthier's edition, Livre . . . de Marco Polo . . . (Paris, 1865), based mainly upon the three Paris MSS. (Nat. Libr. Fr. 2810; Fr. 5631; Fr. 5649; see above) and accompanied by a commentary of great value; Baldelli-Boni's Italian edition, giving the oldest Italian version (Florence, 1827); Sir Henry Yule's edition, which in its final shape, as revised and augmented by Henri Cordier (. . . Marco Polo . . . London, 1903)', is the most complete

1 Printed by Bongars in the collection called Gesta Dei per Francos (1611), ii. 1-281.

storehouse of Polo learning in existence, embodying the labours of all the best students of the subject, and giving the essence of such works as those of Major P. Molesworth Sykes {Ten Thousand Miles in Persia,

&c.) so far as these touch Marco Polo; the Archimandrite Palladius Katharov's " Elucidations of Marco Polo " (from vol. x. of the Journal of the North China Branch of the Royal Asiatic Society (1876), pp. 1-54; F. von Richthofen, Letters to Shangai Chamber of Commerce; E. C. Baber, Travels . . . in Western China; G. Phillips, Identity of . . . Zaitun with Chang- chau in T'oung Pao (Oct. 1890), and other studies in T'oung-Pao (Dec. 1895 and July 1896). There are in all 10 French editions of Polo as well as 4 Latin editions, 27 Italian, 9 German, 4 Spanish, I Portuguese, 12 English, 2 Russian, 1 Dutch, I Bohemian (Chekh), I Danish and I Swedish. See also E. Bretschneider, Mediaeval Researches from Eastern Asiatic Sources, i. 239, 167; ii. 8, 71, 81-84, 184; Leon Cahun, Introduction & Vhistoire de I'Asie, 339, 386; C. Raymond Beazley, Dawn of Modern Geography, iii. 15-160, 545-547. 554, 556-563. (H. Y.; C. R. B.)

POLO (Tibetan pulu, ball), the most ancient of games with stick and ball. Hockey, the Irish national game of hurling (and possibly golf and cricket) are derived from polo. The latter was called hockey or hurling on horse- back in England and Ireland respectively, but historically hockey and hurling are polo on foot.

The earliest records of polo are Persian. From Persia the game spread westward to Constantinople, eastwards through Turkestan to Tibet, China and Japan. From Tibet polo travelled to Gilgit and Chitral, possibly also to Manipur. Polo also flourished in India in the 16th century. Then for 200 years its records in India cease, till in 1854 polo came into Bengal from Manipur by way of Cachar and in 1862 the game was played in the Punjab.

There have been twelve varieties of the game during its existence of at least 2000 years. (1) A primitive form consisting of feats of horsemanship and of skill with stick and ball. (2) Early Persian, described in Shahnama, a highly organized game with rules, played four a side. (3) Later Persian, 16th century, the grounds 300 by 1 70 yds. Sir Anthony Shirley says the game resembled the rough football of the same period in England. (4) The game in the 17th century in Persia. A more highly organized game than No. 3, as described by Chardin. (5) The Byzantine form played at Constantinople in the 12th century. A leathern ball the size of an apple and a racquet were used. (6) The Chinese game, about a.d. 600 played with a light wooden ball. The goal was formed by two posts with a boarding between, in the latter a hole being cut and a net attached to it in the form of a bag. The side which hit the ball into the bag were the winners. Another Chinese form was two teams ranged on opposite sides of the ground, each defending its own goal. The object of the game was to drive the

ball through the enemy's goal. (7) The Japanese game, popular in feudal times, still survives under the name of Dakiu, or ball match. The Japanese game has a boarded goal; 5 ft. from the ground is a circular hole 1 ft. 2 in. in diameter with a bag behind. The balls are of. paper with a cover of pebbles or bamboo fibre, diameter 1-7 in., weight i\ oz. The sticks are racket shaped. The object is to lift over or carry the ball with the racket and place it in the bag. (8) Called rol, played with a long stick with which the ball was dribbled along the ground. (9) Another ancient Indian form in which the sides ranged up on opposite sides of the ground and the ball was thrown in. This is probably the form of the game which reached India from Persia and is represented at the present day by Manipur and Gilgit polo, though these forms are probably rougher than the old Indian game. (10) Modern English with heavy ball and sticks, played in England and the colonies and wherever polo is played in Europe. Its characteristics are: offside; severe penalties for breach of the rules; close combination; rather short parsing; low scoring, and a strong defence, (n) Indian polo has a lighter ball, no boards to the grounds, which are usually full-sized; a modified offside-rule, but the same system of penalties. ~It is a quicker game than the English. (12) The American game has no offside and no penalties, in the English sense. The attack is stronger, the passing longer, the pace greater and more sustained. American players are more certain

goal-hitters and their scoring is higher. They defeated the English players in 1909 with ease.

Polo was first played in England by the 10th Hussars in 1869. The game spread rapidly and some good play was seen at Lillie Bridge. But the organization of polo in England dates from its adoption by the Hurlingham Club in 1873. The ground was boarded along the sides, and this device, which was employed as a remedy for the irregular shape of the Hurlingham ground has become almost universal and has greatly affected the develop- ment of the game. The club committee, in 1874, drew up the first code of rules, which reduced the number of players to five a side and included offside. The next step was the foundation of the Champion Cup, in 1877. Then came the rule dividing the game into periods of ten minutes, with intervals of two minutes for changing ponies after each period, and five minutes at half- time. The height of ponies was fixed at 14-2, and a little later an official measurer was appointed, no pony being allowed to play unless registered at Hurlingham. The next change was the present scale of penalties for offside, foul riding or dangerous play. A short time after, the crooking of the adversary's stick, unless in the act of hitting the ball, was forbidden. The game grew faster, partly as the result of these

rules. Then the ten minutes' rule was revised. The period did not close until the ball went over the boundary. Thus the period might be extended to twelve or thirteen minutes, and although this time was deducted from the next period the strain of the extra minutes was too great on men and ponies. It was therefore laid down that the ball should go out of play on going out of bounds or striking the board, whichever happened first. In 1910 a polo handicap was established, based on the American system of estimating the number of goals a player was worth to his side. This was modified in the English handicap by assigning to each player a handicap number as at golf. The highest number is ten, the lowest one. The Hurlingham handicap is revised during the winter, again in May, June and July, each handicap coming into force one month after the date of issue. In tournaments under handicap the individual handicap numbers are added together, and the team with the higher aggregate concedes goals to that with the lower, according to the con- ditions of the to„urnament. The handicap serves to divide second from first class tournaments, for the former teams must not have an aggregate over 25.

The size of the polo ground is 300 yds. in length and from 160 to 200 yds. in width. The larger size is only found now where boards are not used. The ball is made of willow root, is 3 J in. in diameter, weight not over 5! oz. The polo stick has no standard size or weight, and square or cigar-shaped heads are used at the discretion of the player. On soft grounds, the former, on hard grounds the latter are the better, but Indian and American players nearly always prefer the cigar shape.

The goal posts, now generally made of papier mache, are 8 yds. apart. This is the goal line. Thirty yards from the goal line a line is marked out, nearer than which to the goal no one of a fouled side may be when the side fouling has to hit out, as a penalty from behind the back line, which is the goal line produced. At 50 yds. from each goal there is generally a mark to guide the man who takes a free hit as a penalty.

Penalties are awarded by the umpires, who should be two in number', well mounted, and with a good knowledge of the rules of the game. The Hurlingham and Ranelagh clubs appoint official umpires. There should also be a referee in case of disagreement between the umpires, and it is usual to have a man with a flag behind each goal to signal when a goal is scored. The Hurlingham club makes and revises the rules of the.game, and its code is, with some local modifications, in force in the United Kingdom, English-speaking colonies, the Argentine Republic, California, and throughout Europe. America and India are

governed by their own polo associations.

The American rules have no offside, and their penalties consist of subtracting a goal or the fraction of a goal, according to the offence, from the side which has incurred a penalty for fouling. The differences between the Hurlingham and Indian rules

are very slight, and they tend to assimilate more as time goes on.

Polo in the army is governed by an army polo committee, which fixes the date of the inter-regimental tournament. The semi-finals and finals are played at Hurlingham. The earlier ties take place at centres arranged by the army polo committee, who are charged by the military authorities with the duty of checking the expenditure of officers on the game. The value of polo as a military exercise is now fully recognized, and with the co-operation of Hurlingham, Ranelagh and Roehampton the expenses of inter-regimental tournaments have been regulated and restrained.

The County Polo Association has affiliated to it all the county clubs. It is a powerful body, arranging the conditions of county tournaments, constructing the handicaps for county players, and in conjunction with the Ranelagh club holding a polo week for county players in London. The London clubs are three — Hurlingham, Ranelagh and Roehampton. Except that they use Hurlingham rules the clubs are independent, and arrange the con- ditions and fix the dates of their own tournaments. Ranelagh has four, Roehampton three and Hurlingham two polo grounds. There are about 400 matches played at these clubs, besides members' games from May to July during the London season. At present the Meadowbrook still hold the cup which was won later- by an English team in 1886. In 1002 an American national team made an attempt to recover it and failed. Polo. They lacked ponies and combination; but they bought

the first and learned the second, and tried again successfully in 1909, thus depriving English polo of the championship of the world.

Polo in England has passed through several stages. It was always a game of skill. The cavalry regiments in India in early The Game. P°'° days, the 5th, 9th, 12th and 17th Lancers, the 10th Hussars and the 13th Hussars, had all learned the value of combination. In very early days regimental players had learned the value of the backhanded

stroke, placing the ball so as to give opportunities to their own side. The duty of support- ing the other members of the team and riding off opponents so as to clear the way for players on the same side was understood. This combination was made . easier when the teams -were reduced from five a side to four. Great stress was laid on each man keeping his place, but a more flexible style of play existed from early days in the 17 th Lancers and was improved and perfected at the Rugby Club by the late Colonel Gordon Renton and Captain E. D. Miller, who had belonged to that regiment. For a long time the Rugby style of play, with its close combination, short passes and steady defence, was the model on which other teams formed themselves. The secret of the success of Rugby was the close and unselfish combination and the hard work done by every member of the team. After the American victories of 1909 a bolder, harder hitting style was adopted, and the work of the forwards became more important, and longer passes are now the rule. But the main principles are the same. The forwards lead the attack and are supported by the half-back and back when playing towards the adversaries' goal. In defence the forwards hamper the opposing No. 3 and No. 4 and endeavour to clear the way for their own No. 3 and No. 4, who are trying not merely to keep the ball out of their own goal but to turn defence into attack*. Each individual player must be a good horseman, able to make a pony gallop, must have a control of the ball, hitting hard and clean and in the direction he wishes it to go. He must keep his eye on the ball and yet know where the goal-posts are, must be careful not to incur penalties and quick to take advantage of an opportunity. Polo gives no time for second thoughts. A polo player must not be in a hurry, but he must never be slow nor dwell on his stroke. He must be able to hit when galloping his best pace on to the ball and able to use the speed of his pony in order to get pace. He must be able to hit a backhander or to meet a ball coming to him, as the tactics of the game require. Polo has given rise to a new type of horse, an animal of 14 hands 2 in. with the power of a hunter, the courage of a

racehorse and the docility of a pony. At first the ponies were small, but now each pony must pass the Hurlingham official measurer and be entered on the register. The English The Polo system of measurement is the fairest and most Pony. humane possible. The pony stripped of his clothing is led by an attendant, not his own groom, into a box with a perfectly level floor and shut off from every distraction. A veterinary surgeon examines to see that the pony is neither drugged nor in any way improperly prepared. The pony is allowed to stand easily, and a measuring standard with a spirit-level is then placed on the highest point of the wither, and if the pony measures 14-2 and is five years

old it is registered for life. Ponies are of many breeds. There are Arabs, Argentines, Americans, Irish and English ponies, the last two being the best. The Polo and Riding Pony Society, with headquarters at 12 Hanover Square, looks after the interests of the English and Irish pony and encourages their breeders. The English ponies are now bred largely for the game and are a blend of thoroughbred blood (the best are always the race-winning strains) or Arab and of the English native pony.

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(1810).

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Polo in Constantinople: Cinnamus Joannes epitome rerum.ab loanne et Alexio Commenis gest. (Bonn, 1836).

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a Frontier (1899).

Polo in Gilgit and Chitral: ” Polo in Baltistan.” The Field (1888); Polo in Manipur, Captain McCulloch, Manipuri% and the Adjacent Tribes (1859). (T. F. D.)

POLONAISE {i.e. Polish, in French), a stately ceremonious dance, usually written in \ time. As a form of musical com- position it has been employed by such composers as Bach, Handel, Beethoven, and above all by Chopin. It is usual to date the origin of the dance from the election (1573) of Henry duke of Anjou, afterwards Henry III. of France, to the throne of Poland. The ladies of the Polish nobility passed in cere- monial procession before him at Cracow to the sound of stately music. This procession of music became the regular opening ceremony at royal functions, and developed into the dance.

The term is also given to a form of skirted bodice, which has been fashionable for ladies at different periods.

POLONNARUWA, a ruined city and ancient capital of Ceylon. It first became a royal residence in a.d. 368, when the lake of Topawewa was formed, and succeeded Anuradhapura as the capital in the middle of the 8th century. The principal ruins date chiefly from the time of Prakrama Bahu (a.d. 1153- 11 86). The most imposing pile remaining is the Jetawa- narama temple, a building 170 ft. in length, with walls about 80 ft. high and 12 ft. thick. The city is now entirely deserted, and, as in the case of Anuradhapura, its ruins have only recently been rescued from the jungle.

POLOTSK, a town of Russia, in the government of Vitebsk, at the confluence of the Polota with the Dvina, 62 m. by rail N.W. of the town of Vitebsk. Pop. 20,751. Owing to the continuous wars, of which, from its position on the line of communication between central Russia and the west it was for many centuries the scene, scarcely any of its remarkable anti- quities remain. The upper castle, which stood at the confluence of the rivers and had a stone wall with seven towers, is in ruins, as is the lower castle formerly enclosed with strong walls and connected with the upper castle by a bridge. The cathedral of St Sophia in the upper castle, built in the 12th century, fell to ruins in the 18th century, whereupon the United Greek bishop substituted a modern structure. Upwards of two-thirds of the inhabitants are Jews ;

the remainder have belonged mostly to the Orthodox Greek Church since 1839, when they were compelled to abandon the United Greek Church. Flax, linseed, corn and timber are the leading articles of commerce.

Polotesk or Poltesk is mentioned in 862 as one of the towns given by the Scandinavian Rurik to his men. In 980 it had a prince of its own, Ragvald (Rogvolod or Rognvald), whose daughter is the subject of many legends. It remained an independent principality until the 12th century, resisting the repeated attacks of the princes of Kiev; those of Pskov, Lithu- ania, and the Livonian Knights, however, proved more effective," and Polotsk fell under Lithuanian rule in 1320. About 1385 its independence was destroyed by the Lithuanian prince Vitovt. It was five times besieged by Moscow in 1500-18, and was taken by Ivan the Terrible in 1563. Recaptured by Stephen Bathory, king of Poland, sixteen years later, it became Polish by the treaty of 1582. It was then a large and populous city, and carried on an active commerce. Pestilences and conflagrations were its ruin; the plague of 1566 wrought great havoc among its inhabitants, and that of 1600 destroyed 15,000. The castles, the town and its walls were burned in 1607 and 1642. The Russians continued their attacks, burning and plundering the town, and twice, in 1633 and 1705, taking possession of it for a few years. It was not definitely annexed, however, to Russia until 1772, after the first dismemberment of Poland. In 181 2 its inhabitants resisted the French invasion, and the town was partially destroyed.

POLTAVA, a government of south-western Russia, bounded by the government of Chernigov on the N., Kharkov on the E-, Ekaterinoslav and Kherson on the S., and Kiev on the W., and having an area of 19,260 sq. m. Its surface is an undulating plain 500 to 600 ft. above sea-level, with a few elevations reach- ing £70 ft. in the north, and gently sloping to 300 and 400 ft. in the south-west. Owing to the deep excavations of the rivers, their banks, especially those on the right, have the aspect of hilly tracts, while low plains stretch to the left. Almost the whole of the surface consists of Tertiary deposits; Cretaceous rocks appear in the north-east, at the bottom of the deeper ravines. The government touches the granitic region of the Dnieper only in the south, below Kremenchug. Limestone with dolerite veins occurs in the isolated hill of Isachek, which rises above the marshes of the Sula. The whole is covered with a layer, 20 to 60 ft. thick, of boulder clay, which again is often mantled with a thick sheet of loess. Sandstone (sometimes suitable for grindstones) and limestone are quarried, and a few beds of gypsum and peat-bog are known within the government. With the exception of some sandy tracts, the soil is

on the whole very fertile. Poltava is drained by the Dnieper", which flows along its border, navigable throughout, and by its tributaries the Sula, Psiol, Vorskla, Orel, Trubezh, and several others, none of them navigable, although their courses vary from 150 to 270 m. each in length. Even those which used to be navigated within the historical period, such as the Trubezh and Supoi, are now drying up, while the others are being partially trans- formed into marshes. Deep sand-beds intersected by number- less ravines and old arms of the river stretch along the left bank of the Dnieper, where accordingly the settlements are few. Only 5% of the total area is under forest; timber, wooden wares, and pitch are imported.

The estimated population in 1906 was 3,312,400. The great majority are Little Russians.' Agriculture is the principal pursuit, 60% of the total area being arable land. The crops chiefly grown are wheat, rye and oats; the sunflower is largely cultivated, especially for oil, and the growing of tobacco, always important, has made a great advance. Kitchen gardening, the cultivation of the plum, and the preparation of preserved fruits are important branches of industry. At Lubny, where an apothecaries' garden is maintained by the Crown, the col- lection and cultivation of medicinal plants are a speciality. The main source of wealth in Poltava always has been, and still is, its live-stock breeding — horses, cattle, sheep, pigs. Some of the wealthier landowners and many peasants rear finer breeds of horses. The land is chiefly owned by the peasants, who possess 52% of the cultivable area; 42% belongs to private persons, and the remainder to the Crown, the clergy, and the municipalities.

Among the manufactures distilleries hold the leading place, after which come flour-mills, tobacco factories, machine-making, tanneries, saw-mills, sugar-works and woollen manufactures. In the villages and towns several domestic trades are carried on, such as the preparation of sheepskins, plain woollen cloth, leather, boots and pottery. The fair of Poltava is of great importance for the whole woollen trade of Russia, and leather, cattle, horses, coarse woollen cloth, skins, and various domestic wares are exchanged for manufactures imported from Great Russia. The value of merchandise brought to the fair averages over £2,500,000. Several other fairs, the aggregate returns for which reach more than one-half of the above, are held at Romny (tobacco), Kremenchug (timber, corn, tallow and salt), and Kobelyaki (sheepskins). Corn is exported to a considerable extent to the west and to Odessa, as also saltpetre, spirits, wool, tallow, skins and woollen cloth. The Dnieper is the principal artery for the exports and for the import — timber. The chief river-ports are Kremenchug and Poltava. Steamers ply between Kiev and Ekaterinoslav; but the navigation is

hampered by want of water and becomes active only in the south. Traffic mostly follows the railway. Poltava is divided into fifteen districts, of which the chief towns are Poltava, Gadyach, Khorol, , Kobelyaki, Konstantinograd, Kremenchug, Lokhvitsa, Lubny, Mirgorod, Pereyaslavl, Piryatin, Priluki, Romny, Zenkov and Zolotonosha.

History. — At the dawn of Russian history the region now occupied by Poltava was inhabited by the Slav tribe of the Syeveryanes. As early as 988 the Russians erected several towns on the Sula and the Trubezh for their protection against the Turkish Petchenegs and Polovtsi, who held the south- eastern steppes. Population extended, and the towns of Pereyaslavl, Lubny, Priluki, Piryatin, Romny, begin to be mentioned in the nth and 12th centuries. The Mongol invasion of 1239-42 destroyed most of them, and for two centuries afterwards they disappear from Russian annals. About 133 1 Gedimin, prince of Lithuania, annexed the so-called ” Syeversk towns ” and on the recognition of the union of Lithuania with Poland they were included in the united kingdom along with the remainder of Little Russia. In 1476 a separate principality of Kiev under Polish rule and Polish institutions was formed out of Little Russia, and remained so until the rising of the Cossack chief Bogdan Chmielnicki in 1654. By the Andrussowo Treaty, the left bank of the Dnieper being ceded to Russia, Poltava became part of the dominions of the Zaporogian Cossacks, and was divided into ” regiments,” six of which (Poltava, Pereyaslavl, Priluki, Gadyach, Lubny and Mirgorod) lay within the limits of the present government. They lost their independence in 1764. (P. A. K.; J. T. Be.)

POLTAVA, a town of Russia, capital of the government of the same name, on the right bank of the Vorskla, 88 m. by rail W.S.W. of Kharkov. Pop. 53,060. The town is built on a plateau which descends by steep slopes on nearly every side. Several suburbs, inhabited by Cossacks, whose houses are buried amid gardens, and a German colony, surround the town. The oldest buildings are a monastery, erected in 1650, and a wooden

church visited by Peter the Great after the battle of Poltava. There are a military school for cadets, a theological seminary and two girls’ colleges; also flour-mills, tobacco works and a tannery.

Poltava is mentioned in Russian annals in 1174, under the name of

Ltava, but does not again appear in history until 1430, when, together with Glinsk, it was given by Gedimin, prince of Lithuania, to the Tatar prince Leksada. Under the Cossack chief, Bogdan Chmielnicki, it was the chief town of the Poltava ” regiment.” Peter the Great of Russia defeated Charles XII. of Sweden in the immediate neighbourhood on the 27th of June 1 709, and the victory is commemorated by a column over 50 ft. in height.

POLTERGEIST (Ger. for ” racketing spirit “), the term applied to certain phenomena of an unexplained nature, such as movements of objects without any traceable cause, and noises equally untraced to their source; but in some cases exhibiting intelligence, as when raps answer a question by a code. In the word Poltergeist, the phenomena are attributed to the action of a Geist, or spirit: of old the popular explanation of all residuary phenomena. The hypothesis, in consequence of the diffusion of education, has been superseded by that of “electricity”; while sceptics in all ages and countries have accounted for all the phenomena by the theory of imposture. The last is at least a vera causa: imposture has often been detected; but it is not so certain that this theory accounts for all the circumstances. To the student of human nature the most interesting point in the character of poltergeist phenomena ‘is their appearance in the earliest known stages of culture, their wide diffusion, and their astonishing uniformity. Almost all the beliefs usually styled ” superstitious ” are of early occurrence and of wide diffusion: the lowest savages believe in ghosts of the dead and in wraiths of the living. Such beliefs when found thriving in our own civilization might be explained as mere survivals from savagery, memories of all

” The superstitions idle-headed eld Received and did deliver to our age.”

But wc have not to deal only with a belief that certain apparently impossible things may occur and have occurred in the past. We are met by the evidence of sane and credible witnesses, often highly educated, who maintain that they themselves have heard and beheld the unexplained sounds and sights. It appears, therefore, that in considering the phenomena of the poltergeist we are engaged with facts of one sort or another; facts produced either by skilled imposture, or resting on hallucinations of the witnesses; or on a mixture of fraud and of hallucination caused by ” suggestion.” There remains the chance that some agency of an unexplored nature is, at least in certain cases, actually at work.

A volume would be needed if we were to attempt to chronicle the

phenomena of the poltergeist as believed in by savages and in ancient and medieval times. But among savages they are usually associated with the dead, or with the medicine-men of the tribes. These personages are professional " mediums," and like the mediums of Europe and America, may be said to have do- mesticated the poltergeist. At their seances, savage or civilized, the phenomena are reported to occur — such as rappings and other noises, loud or low, and " movements of objects without physical contact." (See, for a brief account, A. Lang, Cock Lane and Common Sense, " Savage Spiritualism "; and see the Jesuit Lettres Sdifiantes, North America, 1620-1770, and Kohl's Kitchi Garni.) But :l induced phenomena," where professional mediums and professional medical men are the agents, need not here be considered. The evidence, unless in the case of Sir William Crookes's experiments with Daniel Dunglas Home, is generally worthless, and the laborious investigations of the Society for Psychical Research resulted only in the detection of fraud as far as " physical " manifestations by paid mediums were concerned.

The spontaneous poltergeist, where, at least, no professional is present, and no seance is being held, is much more curious and

interesting than the simple tricks played in the dark by impudent charlatans. The phenomena are identical, as reported, literally " from China to Peru." The Cieza de Leon (1549) tells us that the cacique of Pirza, in Popyan, during his conversion to Christianity, was troubled by stones falling mysteriously through the air (the mysterious point was the question of whence they came, and what force urged them), while Chris- tians saw at his table a glass of liquor raised in the air, by no visible hand, put down empty, and replenished! Mr Denny s {Folk Lore of China, 1876, p. 79) speaks of a Chinese householder who was driven to take refuge in a temple by the usual phenomena — throwing about of crockery and sounds of heavy footfalls — after the decease of an aggrieved monkey. This is only one of several Chinese cases of poltergeist; and the phenomena are described in Jesuit narratives of the 18th century, from Cochin China. In these papers no explanation is suggested. There is a famous example in a nunnery, recorded (1528) by a notable witness, Adrien de Montalembert, almoner to Francis I. The agent was supposed to be the spirit of a sister recently deceased.

Among multitudes of old cases, that of the " Drummer of Tedworth " (1662-1663; see Glanvil, Sadducismus iriumphatus, 1666); that at Rerrick, recorded by the Rev. Mr Telfer in 1695; that of the Wesley household (171 6- 171 7) chronicled in contemporary letters and diaries of the Wesley family (South ey's Life of John Wesley); that of Cideville (1851), from the records of the court which tried the law-

suit arising out of the affair (Proc. Soc. Psychical Research, xviii. 454-463) ; and the Alresford case, attested by the great admiral, Lord St Vincent, are ‘ among the most remarkable. At Tedworth we have the evidence of Glanvil himself, though it does not amount to much; at Rerrick, Telfer was a good chronicler and gives most respectable signed vouchers for all the marvels: Samuel Wesley and his wife were people of sense, they were neither alarmed nor superstitious, merely puzzled; while the. court which tried the Cideville case, only decided that ” the cause of the events remains unknown.” At Alresford, in Hampshire, the phenomena attested by Lord St Vincent and his sister Mrs Ricketts, who occupied the house, were pecu- liarly strange and emphatic: the house was therefore pulled down. At Willington Mill, near Morpeth (183ˆ1847), the phenomena are attested by the journal of Mr Procter, the occupant, a Quaker, a ” tee-totaller,” and a man of great resolution. He and his family endured unspeakable things for sixteen years, and could find no explanation of the sights and sounds, among which were phantasms of animals, as at Epworth, in the Wesley case.

Of all these cases that of the Wesleys has attracted most critical attention. It was not, in itself, an extreme instance of poltergeist: at Alresford, at the close of the 18th century, and at Willington Mill in the middle of the 19th the disturbances were much more violent and persistent than at Epworth, while our evidence is, in all three examples, derived from the contem- porary narratives, letters and journals of educated persons. The Wesleys, however, were people so celebrated and so active in religion that many efforts have been made to explain their ” old Jeffrey,” as they called the disturbing agency. These attempts at explanation have been fruitless. The poet Coleridge, who said that he knew many cases, explained all by a theory of contagious epidemic hallucination of witnesses. Dr Salmon, of Trinity College, Dublin, set all down to imposture by Hetty Wesley, a vivacious girl (Fortnightly Review, 1866). The documents on which he relied, when closely studied, did not support his charges, for he made several important errors in dates, and on these his argument rested. F. Podmore, in several works (e.g. Studies in Psychical Research), adopted a theory of exaggerative memory in the narrators, as one element, with a dose of imposture and of hallucination begotten of excited expectation. The Wesley letters and journals, written from day to day, do not permit of exaggerative memory, and when the records of 17.16-1717 are compared with the remini- scences collected from his family by John Wesley in 1726, the discrepancies are seen to be only such as occur in all human

evidence about any sort of events, remote by nine or ten years. Thus, in 1726, Mrs Wesley mentioned a visionary badger seen by her. She did not write about it to her son Samuel in 1717, but her husband and her daughter did then describe it to Samuel, as an experience of his mother at that date. The whole family, in 1717, became familiar with the phenomena, and were tired of them and of Samuel's questions. (Mr Podmore's arguments are to be found in the Journal of the Studies of Psychical Research, ix. 40-45. Some dates are mis- printed.) The theory of hallucination cannot account for the uniformity of statements, in many countries and at many dates, to the effect that the objects mysteriously set in motion moved in soft curves and swerves, or " wobbled." Suppose that an adroit impostor is throwing them, suppose that the spectators are excited, why should their excitement every- where produce a uniform hallucination as to the mode of motion? It is better to confess ignorance, and remain in doubt, than to invent such theories.

A modern instance may be analysed, as the evidence was given contemporaneously with the events (Podmore, Proc. Soc. Psychical Research, xii. 45-58: "Poltergeists"). On the 20th or 21st of February 1883 a Mrs White, in a cottage at Worksop, was " washing up the tea-things at the table," with two of her children in the room, when " the table tilted up at a considerable angle," to her amazement. On the 26th of February, Mr White being from home, Mrs White extended hospitality to a girl, Eliza Rose, " the child of an imbecile mother." Eliza is later described as " half-witted," but no proof of this is given. On the 1st of March, White being from home, at about- 11.30 p.m. a number of things " which had been in the kitchen a few minutes before " came tumbling down the kitchen stairs. Only Mrs White and Eliza Rose were then in the kitchen. Later some hot coals made an invasion. On the following night, White being at home in the kitchen, with his wife and Eliza, a miscellaneous throng of objects came in, Mr White made vain research upstairs, where was his brother Tom. On his return to the kitchen " a little china woman left the mantelpiece and flew into the corner." Being replaced, it repeated its flight, and was broken. White sent his brother to fetch a doctor; there also came a policeman, named Higgs; and the doctor and policeman saw, among other things, a basin and cream jug rise up automatically, fall on the floor and break. Next morning, a clock which had been silent for eighteen months struck; a crash was heard, and the clock was found to have leapt over a bed and fallen on the floor. All day many things kept flying about and breaking themselves, and Mr White sent Miss Rose about her business. Peace ensued.

Mr Podmore, who visited the scene on the 7th and 8th of April and collected depositions, says (writing in 1883): “It may be stated generally that there was no. possibility, in most cases, of the objects having been thrown by hand. . . . More- over it is hard to conceive by what mechanical appliances, under the circumstances described, the movements could have been effected. ... To suppose that these various objects were all moved by mechanical contrivances argues incredible stupidity, amounting almost to imbecility, on the part of all the persons present who were not in the plot,” whereas Higgs, Dr Lloyd and a miner named Curass, all ” certainly not wanting in intelligence,” examined the objects and could find no explana- tion. White attested that fresh invasions of the kitchen by inanimate objects occurred as Eliza was picking up the earlier arrivals; and he saw a salt-cellar fly from the table while Eliza was in another part of the room. The amount of things broken was valued by White at £9. No one was in the room when the clock struck and fell. Higgs saw White shut the cupboard doors, they instantly burst open, and a large glass jar flew into the yard and broke. ” The jar could not go in a straight line from the cupboard out of the door; but it certainly did go ” (Higgs). The depositions were signed by the witnesses (April

1883).

In 1806, Mr Podmore, after thirteen years of experience in examining reports of the poltergeist, produced his explana-

tions. (1) The witnesses, though ” honest and fairly intelli- gent,” were ” imperfectly educated, not skilled in accurate observation of any kind.” (They described, like many others, in many lands, the ” wobbling ” movement of objects in flight.) (2) Mr Podmore took the evidence five weeks after date; there was time for exaggerated memories. (Mr Podmore did not consult, it seems, the contemporary evidence of Higgs in the Retford and Gainsborough Times, 9th of March 1883. On examination it proves to tally as precisely as possible with the testimonies which he gave to Mr Podmore, except that in March he mentioned one or two miracles which he omitted five weeks later! The evidence is published in Lang’s The Making of Religion, 1898, p. 356.) (3) In the evidence given to Mr Podmore five weeks after date, there are discrepancies between Higgs and White as to the sequence of some events, and as to whether one Coulter was present when the clock fell: he asserts, Higgs and White deny it . (There is never evidence of several witnesses, five weeks after an event, without such discrepancies. If there were, the evidence would be suspected as ” cooked.” Higgs in April gave the same version as in March.) (4) As there are discrepancies, the statements that Eliza was not always

present at the abnormal occurrences may be erroneous. ” It is perhaps not unreasonable to conjecture that Eliza Rose herself, as the instrument of mysterious agencies, or simply as a half- witted girl gifted with abnormal cunning and love of mischief, may have been directly responsible for all that took place.” (How, if, as we have seen, the theory of mechanical appliances is abandoned, ” under the circumstances described ” ? We need to assume that all the circumstances are wrongly described. Yet events did occur, the breakages were lamentable, and we ask how could the most half-witted of girls damage so much property undetected, under the eyes of the owner, a policeman, a medical practitioner and others? How could she throw things from above into the room where she was picking up the things as they arrived? Or is that a misdescription? No evidence of Eliza’s half-wittedness and abnormal cunning is adduced. If we call her “the instrument of mysterious agencies,” the name of these agencies is — poltergeist! No later attempt to find and examine the abnormal girl is recorded.)

The explanations are not ideally satisfactory, but they are the result, in Mr Podmore’s mind, of examination of several later cases of poltergeist. 1 In one a girl, carefully observed, was detected throwing things, and evidence that the phenomena occurred, in her absence, at another place and time, is discounted. In several other cases, exaggerations of memory, malobservation and trickery combined, are the explanations, and the conclu- sion is that there is ” strong ground ” for believing in trickery as the true explanation of all these eleven cases, including the Worksop affair. Mr Podmore asserts that, at Worksop, ” the witnesses did not give their testimony until some weeks after the event.” That is an erroneous statement as far as Higgs goes, the result apparently of malobservation of the local news- paper. More or less of the evidence was printed in the week when the events occurred. Something more than unconscious exaggeration, or malobservation, seems needed to explain the amazing statements made by Mr Newman, a gamekeeper of Lord Portman, on the 23rd of January 1895, at Durmeston in another case. Among other things, he said that on the 18th of December 1894, a boot flew out of a door. ” I went and put my foot on the boot and said ‘ I defy anything to move this boot.’ Just as I stepped off, it rose up behind me and knocked my hat off. There was nobody behind me.” Gamekeepers are acute observers, and if the narrative be untrue, malobservation or defect of memory does not explain the fact. In this case, at Durmeston, the rector, Mr Anderson, gave an account of

1 The present writer criticized Mr Podmore’s explanation in The Making of Religion. Mr Podmore replied (Proc. Soc. Psychical

Research, xiv. 133, 136), pointing out an error in the critic's presentation of his meaning. He, in turn, said that the writer " champions the supernormal interpretation," which is not exact, as the writer has no theory on the subject, though he is not satisfied that " a naughty little girl " is a uniformly successful solution of the poltergeist problem.

some of the minor phenomena. He could not explain them, and gave the best character to the Nonconformist mother of the child with whom the events were associated. No trickery- was discovered.

The phenomena are frequently connected with a person, often a child, suffering from nervous malady or recent nervous shock. No such person appears in the Alresford, Willington, Epworth and Tedworth cases, and it is not stated that Eliza Rose at Worksop was subjected to a medical examination. In a curious case, given by Mrs Crewe, in The Night Side of Nature, the young person was the daughter of a Captain Molesworth. Her own health was bad, and she had been depressed by the death of a sister. Captain Molesworth occupied a semi-detached villa at Trinity, near Edinburgh; his landlord lived next door. The phenomena set in: the captain bored holes in the wall to discover a cause in trickery, and his landlord brought a suit against him in the sheriff's court at Edinburgh.

The papers are preserved, but the writer found that to discover them would be a herculean labour. He saw, how- ever, a number of documents in the office of a firm of solicitors employed in the case. They proved the fact of the lawsuit but threw no other light on the matter. We often find that the phenomena occur after a nervous shock to the person who may be called the medium. The shock is frequently consequent on a threat from a supposed witch or wizard. This was the case at Cideville in 1850-1851. (See an abstract of the documents of the trial, Proceedings S.P.R. xviii. 454-463. The entire report was sent to the writer.) In 1901 there was a case at Great Grimsby; the usual flying of stones and other objects occurred. The woman of the house had been threatened by a witch, after that the poltergeist developed. No explanation was forthcoming. In Proc. S.P.R. xvii. 320 the Rev. Mr Deanley gives a curious parallel case with detection of imposture. In Miss O'Neal's Devonshire Idylls is an excellent account of the phenomena which occurred after a Devonshire girl of the best character, well known to Miss O'Neal, had been threatened by a

witch. In the famous instance of Christian Shaw of Bargarran (1697) the child had been thrice formally cursed by a woman, who prayed to God that her soul ” might be hurled through hell.” Christian fell into a state which puzzled the medical faculty (especially when she floated in the air), and doubtless she herself caused, in an hysterical state, many phenomena which, however, were not precisely poltergeistish. A very marked set of phenomena, in the way of movements of objects, recently occurred in the Hudson Bay territory, after a half-breed girl had received a nervous shock from a flash of lightning that struck near her. Heavy weights automatically ” tobogganed,” as Red Indian spectators said, and there were the usual rappings in tent and wigwam. If we accept trickery as the sufficient explanation, the uniformity of tricks played by hysterical patients is very singular. Still more singular is a long series, continued through several years, of the same occurrences where no hysterical patient is known to exist. In a very curious example, a carpenter’s shop being the scene, there was concerned nobody of an hysterical temperament, no young boy or girl, and there was no explanation (Proc. S.P.R. vii- 383-394). The events went on during six weeks. An excellent case of hysterical fraud by a girl in France is given by Dr Grasset, professor of clinical medicine at Montpellier (Proc. S.P.R. xviii. 464-480). But in this instance, though things were found in unusual places, nobody over eight years old saw them flying about; yet all concerned were deeply superstitious.

On the whole, while fraud, especially hysterical fraud, is a vera causa in some cases of poltergeist, it is not certain that the explanation fits all cases, and it is certain that detection of fraud has often been falsely asserted, as at Tedworth and Willington. No good chronic case, as at Alresford, Epworth, Spraiton (Bovet’s Pandaemonium), Willington, and in other classical instances, has been for months sedulously observed by sceptics. In short-lived cases, as at Worksop, science appears on the scene long enough after date to make the theory of exaggeration of memory plausible. If we ask science to explain

how the more remarkable occurrences could be produced by a girl ex hypothese half-witted, the reply is that the occurrences never occurred, they were only ” described as occurring ” by untrained observers with ” patent double magnifying ” memo- ries; and with a capacity for being hallucinated in a uniform way all the world over. Yet great quantities of crockery and furniture were broken, before the eyes of observers, in a house near Ballarmina, in North Ireland, in January 1907. The experiment of exhibiting a girl who can break all the crockery without being detected, in the presence of a doctor and a policeman, and who can, at the same time, induce the spectators to believe that the flying objects waver, swerve and ” wobble,” has not

been attempted.

An obvious difficulty in the search for authentic information is the circumstance that the poor and imperfectly educated are much more numerous than the well-to-do and well educated. It is therefore certain that most of the disturbances will occur in the houses of the poor and ill educated, and that their evidence will be rejected as insufficient. When an excellent case occurs in a palace, and is reported by the margravine of Bayreuth, sister of Frederick the Great, in her Memoirs, the objection is that her narrative was written long after the events. When we have contemporary journals and letters, or sworn evidence, as in the affairs of Sir Philip Francis, Cideville and Willington, criticism can probably find some other good reasons for setting these testimonies aside. It is certain that the royal, the rich and the • well-educated observers tell, in many cases, precisely the same sort of stories about poltergeist phenomena as do the poor and the imperfectly instructed.

On the theory that there exist ” mysteribus agencies ” which now and then produce the phenomena, we may ask what these agencies can possibly be? But no answer worthy of considera- tion has ever been given to this question. The usual reply is that some unknown but intelligent force is disengaged from the personality of the apparent medium. This apparent medium need not be present; he or she may be far away. The High- landers attribute many poltergeist phenomena, inexplicable noises, sounds of viewless feet that pass, and so forth, to tdradh, an influence exerted unconsciously by unduly strong wishes on the part of a person at a distance. The phrase falbh air fdrsaing (” going uncontrolled “) is also used (Campbell, Witchcraft and Second Sight in the Scottish Highlands, 1902, pp. 144-147). The present writer is well acquainted with cases attributed to tdradh, in a house where he has often been a guest. They excite no alarm, their cause being well understood. We may call this kind of thing telelhoryby, a racket produced from a distance. A very marked case in Illinois would have been attributed in the Highlands to the tdradh of the late owner of the house, a dipsomaniac in another state. On his death the disturbances ceased (first-hand evidence from the disturbed lady of the house, May 1907). It may be worth while to note that the phenomena are often regarded as death-warnings by popular belief. The early incidents at the Wesleys’ house were thought to indicate the death of a kinsman; or to announce the approach- ing decease of Mr Wesley pere, who at first saw and heard nothing unusual. At Worksop the doctor was called in, because the phenomena were guessed to be ” warnings ” of the death of a sick child of the house. The writer has first-hand evidence from a lady and her son (afterwards a priest) of

very singular movements of untouched objects in their presence, which did coincide with the death of a relation at a distance.

Bibliography. — The literature of the subject is profuse, but scattered. For modern instances the Proceedings of the Society for Psychical Research may be consulted, especially an essay by F. W. H. Myers, vii. 146-198, also iv. 29-38; with the essay by Podmore, already quoted. Books like Dale Owen's Footfalls on the. Boundary of Another World, and Fresnoy's Recueil des dis- sertations sur les apparitions, are stronger in the quantity of anec- dotes than in the quality of evidence. A. Lang's Book of Dreams and Ghosts, contains outlandish and Celtic examples, and Telfair's (Telfer's) A True Relation of an Apparition (1694-1696) shows un- usual regard for securing signed evidence. Kiesewetter's Geschichte des neueren Occultismus and Graham Dalyell's Darker Super- stitions of Scotland, with any collections of trials for witchcraft

may be consulted, and Bovet's Pandaemonium (1684) is very rich in cases. The literature of the famous drummer of Tedworth (March 1662-April 1663) begins with an abstract of the sworn deposition of Mr Mompesson, whose house was the scene of the dis- turbances. The abstract is in the Mercurius publicus of April 1663, the evidence was given in a court of justice on the 15th of April. There is also a ballad, a rhymed news-sheet of 1662 (Anthony Wood's Collection 401 (193), Bodleian Library). Pepys mentions " books " about the affair in his Diary for June 1663. Glanvil's first known version is in his Sadducismus triumphatus of 1666. The sworn evidence of Mompesson proves at least that he was disturbed in an intolerable manner, certainly beyond any means at the disposal of his two daughters, aged nine and eleven or there- abouts. The agent may have been the taradh of the drummer whom Mompesson offended. Glanvil in 1666 confused the dates, and, save for his own experiences, merely repeats the statements curient in 1662-1663. The ballad and Mompesson's deposition are given in Proc. S.P.R. xvii. 304-336, in a discussion between the writer and Mr Podmore. The dated and contemporary narrative of Procter in the Willington Mill case (1835- 1847), is printed in the Journ. S.P.R. (Dec. 1892), with some contemporary letters on the subject. Mr Procter endured the disturbances for sixteen years before he retreated from the place. There was no naughty little girl in the affair; no nervous or hysterical patient. The Celtic hypothesis of taradh, exercised by " the spirit of the living," includes

visual apparitions, and many a so-called ” ghost ” of the dead may be merely the tiradh of a living person. (A. L.)

POLTROON, a coward, a worthless rogue without courage or, spirit. The word comes through Fr. poltron from Ital. poltrone, an idle fellow, one who lolls in a bed or couch (Milanese palter, Venetian polirona, adapted from Ger. Polster, a pillow; cf. English ” bolster”). The old guess that it was from Lat. pollice truncus, maimed in the thumb, and was first applied to those who avoided military service by self-mutilation, gave rise probably to the French application of poltron to a falcon whose talons were cut to prevent its attacking game.

POLTROT, JEAN DE (c. 153 7-1 563), sieur de Mere or Merey, a nobleman of Angoumois, who murdered Francis, duke of Guise. He had lived some time in Spain, and his knowledge of Spanish, together with his swarthy complexion, which earned him the nickname of the ” Espagnolet,” procured him employment as a spy in the wars against Spain. Becoming a fanatical Huguenot, he determined to kill the duke of Guise, and gained admission as a deserter to the camp of the Catholics who were besieging Orleans. In the evening of the 18th of February 1563 he hid by the side of a road along which he knew the duke would pass, fired a pistol at him, and fled. But he was captured the next day, and was tried, tortured several times, and sentenced to be drawn and quartered. On the 18th of March 1563 he underwent a frightful punishment. The horses not being able to drag off his limbs, he was hacked to pieces with cutlasses. He had made several contradictory declarations regarding the complicity of Coligny. The admiral protested emphatically against the accusation, which appears to have had no foundation.

See Memoires du prince de Conde (London, 1743) ; T. A. D’Aubign£, Histoire universelle (ed. by de Ruble, Soc. de Vhistoire de France, 1886) ; A. de Ruble, L’Assassinat du due Francois de Lorraine (Paris,

1897).

POLYAENUS, a Macedonian, who lived at Rome as a rhetori- cian and pleader in the 2nd century a.d. When the Parthian War (162-5) broke out, Polyaenus, too old to share in the campaign, dedicated to the emperors Marcus Aurelius and Lucius Verus a work, still extant, called Strategica or Strategemata, a historical collection of stratagems and maxims of strategy written in Greek and strung together in the form of anecdotes. It is not strictly confined to warlike stratagems, but includes also examples of wisdom, courage and cunning drawn from civil and political life. The work is uncritically written, but is

nevertheless important on account of the extracts it has preserved from histories now lost. It is divided into eight books (parts of the sixth and seventh are lost), and originally contained nine hundred anecdotes, of which eight hundred and thirty-three are extant. Polyaenus intended to write a history of the Parthian War, but there is no evidence that he did so. His works on Macedonia, on Thebes, and on tactics (perhaps identical with the Strategica) are lost.

His Strategica seems to have been highly esteemed by the Roman emperors, and to have been handed down by them as a sort of

heirloom. From Rome it passed to Constantinople; at the end of the 9th century it was diligently studied by Leo VI., who himself wrote a work on tactics; and in the middle of the loth century Constantine Porphyrogenitus mentioned it as one of the most valuable books in the imperial library. It was used by Stobaeus, Suidas, and the anonymous author of the work Ilepi InrioTuv (see Palaephatus). It is arranged as follows: bks. 1., ii., iii., strata- gems occurring in Greek history; bk. iv., stratagems of the Mace- donian kings and successors of Alexander the Great; bk. v., strata- gems occurring in the history of Sicily and the Greek islands and colonies; bk. vi., stratagems of a whole people (Carthaginians, Lacedaemonians, Argives), together with some individuals (Philopoemen, Pyrrhus, Hannibal) ; bk. vii., stratagems of the barbarians (Medes, Persians, Egyptians, Thracians, Scythians, Celts); bk. viii., stratagems of Romans and women. This dis- tribution is not, however, observed very strictly. Of the negligence or haste with which the work was written there are many instances : e.g. he confounds Dionysius the elder and Dionysius the younger, Mithradates satrap of Artaxerxes and Mithradates the Great, Scipio the elder and Scipio the younger, Perseus, king of Macedonia and Perseus the companion of Alexander; he mixes up the strata- gems of Caesar and Pompey; he brings into immediate connexion events which were totally distinct; he narrates some events twice over, with variations according to the different authors from whom he draws. Though he usually abridges, he occasionally amplifies arbitrarily the narratives of his authorities. He never mentions his authorities, but amongst authors still extant he used Herodotus, Thucydides, Xenophon, Polybius, Diodorus, Plutarch, Frontinus and Suetonius; amongst authors cf whom only fragments now remain he drew upon Ctesias, Ephorus, Timaeus, Phylarchus and Nicolaus Damascenus. His style is clear, but monotonous and inelegant. In the forms of his words he generally follows Attic usage.

The best edition of the text is Wolfflin and Melber (Teubner Series, 1887, with bibliography and editio princeps of the Strate- gemata of

the emperor Leo) ; annotated editions by Isaac Casaubon (1589) and A. Coraes (1809); I. Melber, Ueber die Quellen und Werth der Strategemensammlung Polydns (1885); Knott, De fide et fontibus Polyaeni (1883), who largely reduces the number of the authorities consulted by Polyaenus. Eng. trans, by R. Shepherd

(1793)-

POLYANDRY (Gr. iroXfe, many, and avqp, man), the system of marriage between one woman and several men, who are her husbands exclusively (see Family). The custom locally legal- izing the marriage of one woman to more than one husband at a time has been variously accounted for as the result of poverty and of life in unfertile lands, where it was essential to check popula- tion as the consequence of female infanticide, or, in the opinion of J. F. McLennan and L. H. Morgan, as a natural phase through which human progress has necessarily passed. Polyandry is to be carefully differentiated from communal marriage, where the woman is the property of any and every member of the tribe. Two distinct kinds of polyandry are practised: one, often called Nair, in which, as among the Nairs of India, the husbands are not related to each other; and the second, the Tibetan or fraternal polyandry, in which the woman is married to all the brothers of one family. Polyandry is practised by the tribes of Tibet, Kashmir and the Himalayan regions, by the Todas, Koorgs, Nairs and other peoples of India, in Ceylon, New Zealand, by some of the Australian aborigines, in parts of Africa, in the Aleutian archipelago, among the Koryaks and on the Orinoco.

See McLennan's Primitive Marriage (London, 1885) ; Studies in Ancient History (London, 1886); "The Levirate and Polyandry," in The Fortnightly Review, new series, vol. xxi. (London, 1877) ; L. H. Moigan, System of Consanguinity and Affinity of the Human Family (Washington, 1869); Lord Avebury, Origin of Civilization; E. Westermarck, History of Human Marriage.

POLYANTHUS, one of the oldest of the florists' flowers, is probably derived from P. variabilis, itself a cross between the common primrose and the cowslip; it differs from the primrose in having the umbels of flowers carried up on a stalk. The florists' polyanthus has a golden margin, and is known as the gold-laced polyanthus, the properties being very distinctly laid down and rigidly adhered to. The chief of these are a clear, unshaded, blackish or reddish ground colour, an even margin or lacing of yellow extending round each segment and cutting through its centre down to the ground colour, and a yellow band surrounding the tube of exactly the same hue as the yellow of

the lacing. The plants are quite hardy, and grow best in strong, loamy soil tolerably well enriched with well-decayed dung and leaf -mould;

they should be planted about the end of September or not later than October. Plants for exhibition present a much better and cleaner appearance if kept during winter in a cold well-aired frame.

For the flower borders what are called fancy polyanthuses are adopted. These are best raised annually from seed, the young crop each year blooming in succession. The seed should be sown as soon as ripe, the young plants being allowed to stand through the winter in the seed bed. In April or May they are planted out in a bed of rich garden soil, and they will bloom abundantly the following spring. A few of the better ” thrum- eyed ” sorts (those having the anthers in the eye, and the pistil sunk in the tube) should be allowed to ripen seed; the rest may be thrown away. In some remarkable forms which have been cultivated for centuries the ordinarily green calyx has become petaloid; when this is complete it forms the hose-in-hose prim- rose of gardeners. There are also a few well-known double- flowered varieties.

POLYBIUS (c. 204-122 B.C.), Greek historian, was a native of Megalopolis in Arcadia, the youngest of Greek cities (Paus. viii. 9), which, however, played an honourable part in the last days of Greek freedom as a stanch member of the Achaean League (q.v.). His father, Lycortas, was the intimate friend of Philopoemen, and on the death of the latter, in 182, succeeded him as leader of the league. The date of Polybius’s birth is doubtful. He tells us himself that in 181 he had not yet reached the age (? thirty years, Polyb. xxix. 9) at which an Achaean was legally capable of holding office (xxiv. 6). We learn from Cicero (Ad Fam. v. 12) that he outlived the Numantine War, which ended [in 132, and from Lucian [Macrob. 22) that he died at the age of eighty-two. The majority of authorities therefore place his birth between 214 and 204 B.C. Little is known of his early life. As the son of Lycortas he was naturally brought into close contact with the leading men of the Achaean League. With Philopoemen he seems to have been on intimate terms. After Philopoemen’s tragic death in Messenia (182) he was entrusted with the honour- able duty of conveying home the urn in which his ashes had been deposited (Plut. Phil. 21). In 181, together with his father, Lycortas and the younger Aratus, he was appointed, in spite of his youth, a member of the

embassy which was to visit Ptolemy Epiphanes, king of Egypt, a mission, however, which the sudden death of Ptolemy brought to a premature end (xxv. 7). The next twelve years of his life are a blank, but in 169 he reappears as a trusted adviser of the Achaeans at a difficult crisis in the history of the League. In 1 7 1 war had broken out between Rome and the Macedonian king Perseus, and the Achaean statesmen were divided as to the policy to be pursued; there were good reasons for fearing that the Roman senate would regard neutrality as indicating a secret leaning towards Macedon. Polybius therefore declared for an open alliance with Rome, and his views were adopted. It was decided to send an Achaean force to co- operate with the Roman general, and Polybius was selected to command the cavalry. The Roman consul declined the proffered assistance, but Polybius accompanied him throughout the campaign, and thus gained his first insight into the military system of Rome. In the next year (168) both Lycortas and Polybius were on the point of starting at the head of 1200 Achaeans to take service in Egypt against the Syrians, when an intimation from the Roman commander that armed interference was undesirable put a stop to the expedition (xxix. 23). The success of Rome in the war with Perseus was now assured. The final victory was rapidly followed by the arrival in Achaea of Roman commissioners charged with the duty of establishing Roman interests there. Polybius was arrested with 1000 of the principal Achaeans, but, while his companions were con- demned to a tedious incarceration in the country towns of Italy, he obtained permission to reside in Rome. This privilege he owed to the influence of L. Aemilius Paullus and his two sons, Scipio and Fabius (xxxii. 9). Polybius was received into Aemi- lius's house, and became the instructor of his sons. Between Scipio (P. Cornelius Scipio Africanus the younger), the future conqueror of Carthage ,and himself a friendship soon sprang up,

which ripened into a lifelong intimacy, and was of inestimable service to him throughout his career. It protected him from interference, opened to him the highest circles of Roman society, and enabled him to acquire a personal influence with the leading men, which stood him in good stead when he afterwards came forward to mediate between his countrymen and Rome. It placed within his reach opportunities for a close study of Rome and the Romans such as had fallen to no historian before him, and secured him the requisite leisure for using them, while Scipio's liberality more than once supplied him with the means of conducting difficult and costly historical investigations (Pliny, N.H. v. 9). In 151 the few surviving exiles were allowed to return to Greece. But the stay of Polybius in Achaea was brief. The estimation in which he was held at Rome is clearly shown by the

anxiety of the consul Marcus (or Manlius) Manilius (149) to take him as his adviser on his expedition against Carthage. Polybius started to join him, but broke off his journey at Corcyra on learning that the Carthaginians were inclined to yield (xxxvi. 3). But when, in 147, Scipio himself took the command in Africa, Polybius hastened to join him, and was an eye-witness of the siege and destruction of Carthage. During his absence in Africa the Achaeans had made a last desperate attempt to assert their independence of Rome. He returned in 146 to find Corinth in ruins, the fairest cities of Achaea at the mercy of the Roman soldiery, and the famous Achaean League shattered to pieces (see Achaean Leacue). All the influence he possessed was freely spent in endeavouring to shield his countrymen from the worst consequences of their rashness. The excesses of the soldiery were checked, and at his special intercession the statues of Aratus and Philopoemen were preserved (xxxix. 14). An even more difficult task was that entrusted to him by the Roman authorities themselves, of persuading the Achaeans to acquiesce in the new regime imposed upon them by their con- querors, and of setting the new machinery in working order. With this work, which he accomplished so as to earn the heartfelt, gratitude of his countrymen (xxxix. 16), his public career seems to have closed. The rest of his life was, so far as we know, devoted to the great history which is the lasting monument of his fame. He died, at the age of eighty-two, of a fall from his horse (Lucian, Macrob. 22). The base of a statue erected to him by Elis was found at Olympia in 1877. It bears the inscrip- tion 17 ir6\i.s ri ‘HXeicoy HoKvpiov Avuopra Me-y OLKoTroXirriv.

Of the forty books which made up the history of Polybius, the first five alone have come down to us in a complete form ; of the rest we have only more or less copious fragments. But the general plan and scope of the work are explained by Polybius himself. His intention was to make plain how and why it was that ” all the known regions of the civilized world had fallen under the sway of Rome ” (iii. 1). This empire of Rome, unprecedented in its extent and still more so in the rapidity with which it had been ac- quired, was the standing wonder of the age, and ” who,” he exclaims (i. 1), ” is so poor-spirited or indolent as not to wish to know by what means, and thanks to what sort of constitution, the Romans subdued the world in something less than fifty-three years? ” These fifty-three years are those between 220 (the point at which the work of Aratus ended) and 168 B.C., and extend therefore from the outbreak of the Hannibalic War to the defeat of Perseus at Pydna. To this period then the main portion of his history is devoted from the third to the thirtieth book inclusive. But for clearness’ sake he prefixes in bks. i. and ii. such a preliminary sketch

of the earlier history of Rome, of the First Punic War, and of the contemporary events in Greece and Asia, as will enable his readers more fully to understand what follows. This seems to have been his original plan, but at the opening of bk. iii., wiitten apparently after 146, he explains that he thought it desirable to add some account of the manner in which the Romans exercised the power they had won, of their temperament and policy and of the final catastrophe which destroyed Carthage and for ever broke np the Achaean League (iii. 4, 5). To this appendix, giving the history from 168-146, the last ten books are devoted.

Whatever fault may be found with Polybius, there can be no question that he had formed a high conception of the task before him. He lays repeated stress on two qualities as distinguishing his history from the ordinary run of historical compositions. The first of these, its synoptic character, was partly necessitated by the nature of the period. The various states fringing the basin of the Mediterranean had become so inextricably interwoven that it was no longer possible to deal with them in isolation. Polybius therefore claims for his history that it will take a comprehensive

view of the whole course of events in the civilized world, within the limits of the period (i. 4). He thus aims at placing before his readers at each stage a complete survey of the field of action from Spain to Syria and Egypt. This synoptic method proceeds' from a true appreciation of what is now called the unity of history, and to Polybius must be given the credit of having first firmly grasped and clearly enforced a lesson which the events of his own time were especially well calculated to teach. It is the great merit of his work that it gives such a picture of the 2nd and 3rd centuries B.C. as no series of special narratives could have supplied.

The second quality upon which Polybius insists as distinguishing his history from all others is its " pragmatic " character. It deals, that is, with events and with their causes, and aims at an accurate record and explanation of ascertained facts. This " pragmatic method " (ix. 2) makes history intelligible by explaining the how and the why; and, secondly, it is only when so written that history can perform its true function of instructing and guiding those who study it. For the great use of history, according to Polybius, is to contribute to the right conduct of human life (i. 35). But this it can do only if the historian bears in mind the true nature of his task. He must remember that the

historian should not write as the dramatist does to charm or excite his audience for the moment (ii. 56). He will aim simply at exhibiting events in their true light, setting forth ” the why and the how ” in each case, not confusing causes and occasions, or dragging in old wives’ fables, prodigies and marvels (ii. 16, iii. 48). He will omit nothing which can help to explain the events . he is dealing with : the genius and temperament of particular peoples, their political and military systems, the characters of the leading men, the geographical features of the country, must all be taken into account. To this conception of history Polybius is on the whole consistently faithful. It is true that his anxiety to instruct leads often to a rather wearisome iteration of his favourite maxims, and that his digressions, such as that on the military art, are occasionally provokingly long and didactic. But his comments and reflections are for the most part sound and instructive (e.g. those on the lessons to be learnt from the revolt of the mercenaries in Africa, i. 65; from the Celtic raids in Italy, ii. 35 ; and on the Roman character), while among his digres- sions are included such invaluable chapters as those on the Roman constitution (bk. vi), the graphic description of Cisalpine Gaul (bk. ii.) and the account of the rise and constitution of the Achaean League (ii. 38 seq.). To his anxiety again to trace back events to their first causes we owe, not only the careful inquiry (bk. iii.) into the origin of the Second Punic War, but the sketch of early Roman history in bk. i., and of the early treaties between Rome and Carthage in iii. 22 seq. Among the many defects which he censures in previous historians, not the least serious in his eyes are their inattention to the political and geographical surroundings of the history (ii. 16, iii. 36), and their neglect duly to set forth the causes of events (iii. 6).

Polybius is equally explicit as regards the personal qualifications necessary for a good historian, and in this respect too his practice is in close agreement with his theory. Without a personal knowledge of affairs a writer will inevitably distort the true relations and im- portance of events (xii. 28). Such experience would have saved accomplished and fluent Greek writers like Timaeus from many of their blunders (xii. 25a), but the shortcomings of Roman soldiers and senators like Q. Fabius Pictor show that it is not enough by itself. Equally indispensable is careful painstaking research. All available evidence must be collected, thoroughly sifted, soberly weighed, and, lastly, the historian must be animated by a sincere love of truth and a calm impartiality.

It is important to consider how far Polybius himself comes Up to his standard. In his personal acquaintance with affairs, in the variety of his experience, and in his opportunities for forming a correct

judgment on events he is without a rival among ancient historians. A great part of the period of which he treats fell within his own lifetime (iv. 2). He may just have remembered the battle of Cynoscephalae (197), and, as we have seen, he was actively engaged in the military and political affairs of the Achaean League. During his exile in Rome he was able to study the Roman constitu- tion, and the peculiarities of the Roman temperament; he made the acquaintance of Roman senators, and became the intimate friend of the greatest Roman of the day. Lastly, he was able to survey with his own eyes the field on which the great struggle between Rome and Hannibal was fought out. He left Rome only to witness the crowning triumph of Roman arms in Africa, and to gain a practical acquaintance with Roman methods of government by assisting in the settlement of Achaea. When, in 146, his public life closed, he completed his preparation of himself for his great work by laborious investigations of archives and monu- ments, and by a careful personal examination of historical sites and scenes. To all this we must add that he was deeply read in the learning of his day, above all in the writings of earlier historians.

Of Polybius's anxiety to get at the truth no better proof can be given than his conscientious investigation of original documents and monuments, and his careful study of geography and topography — both of them points in which his predecessors, as well as his successor Livy, conspicuously failed. Polybius is careful con- stantly to remind us that he writes for those who are ˆtXo/i«0e?s '•

lovers of knowledge, with whom truth is the first consideration. He closely studied the bronze tablets in Rome on which were in- scribed the early treaties concluded between Romans and Cartha- ginians. He quotes the actual language of the treaty which ended the First Punic War (i. 62), and of that between Hannibal and Philip of Macedon (vii. 9). In xvi. 15 he refers to a document which he had personally inspected in the archives at Rhodes, and in iii. 33 to the monument on the Lacinian promontory, recording the number of Hannibal's forces. According to Dionysius, i. 17, he got his date for the foundation of Rome from a tablet in the pontifical archives. As instances of his careful attention to geography and topography we have not only the fact of his widely extended travels, from the African coast and the Pillars of Hercules in the west, to the Euxine and the coasts of Asia Minor in the east, but also the geographical and topographical studies scattered throughout his history.

Next to the duty of original research, Polybius ranks that of impartiality. Some amount of bias in favour of one's own country may, he thinks, be pardoned as natural (xvi. 14) ; but it is unpardon-

able, he says, for the historian to set anything whatever above the truth. And on the whole, Polybius must be allowed here again to have practised what he preached. It is true that his affection for and pride in Arcadia appear in more than one passage (iv. 20, 21), as also does his dislike of the Aetolians (ii. 45, iv. 3, 16). His treatment of Aratus and Philopoemen, the heroes of the Achaean League, and of Cleomenes of Sparta, its most constant enemy, is perhaps open to severer criticism. Certainly Cleomenes does not receive full justice at his hands. Similarly his views of Rome and the Romans may have been influenced by his firm belief in the necessity of accepting the Roman supremacy as inevitable, and by his intimacy with Scipio. He had a deep admiration for the great republic, for her well-balanced constitution, for her military system, and for the character of her citizens. But just as his patriotism does not blind him to the faults and follies of his country- men (xxxviii. 4, 5, 6), so he does not scruple to criticize Rome. He notices the incipient degeneracy of Rome after 146 (xviii. 35). He endeavours to hold the balance evenly between Rome and Carthage ; he strongly condemns the Roman occupation of Sardinia as a breach of faith (iii. 28, 31); and he does full justice to Hannibal. Moreover, there can be no doubt that he sketched the Roman character in a masterly fashion.

His interest in the.study of character and his skill in its delinea- tion are everywhere noticeable. He believes, indeed, in an over- ruling fortune, which guides the course of events. It is fortune which has fashioned anew the face of the world in his own time (iv. 2), which has brought the whole civilized world into subjection to Rome (i. 4) ; and the Roman Empire itself is the most marvellous of her works (viii. 4). But under fortune not only political and geographical conditions but the characters and temperaments of nations and individuals play their part. The Romans had been fitted by. their previous struggles for the conquest of the world (i. 63) ; they were chosen to punish the treachery of Philip of Macedon (xv. 4); and the greatest of them, Scipio himself, Polybius regards as the especial favourite of fortune (xxxii. 15; x. 5).

In respect of form, Polybius is far the inferior of Livy, partly owing to his very virtues. His laudable desire to present a picture of the whole political situation at each important moment is fatal to the continuity of his narrative. Thus the thrilling story of the Second Punic War is broken in upon by digressions on the con- temporary affairs in Greece and Asia. More serious, however, than this excessive love' of synchronism is his almost pedantic anxiety to edify. For grace and elegance of composition, and for the artistic presentation of events, he has a hardly concealed : con- tempt. Hence a general and almost

studied carelessness of effect, which mars his whole work. On the other hand he is never weary of preaching. His favourite theories of the nature and aims of history, of the distinction between the universal and special histories, of the duties of an historian, sound as most of them are in them- selves, are enforced with wearisome iteration; more than once the effect of a graphic picture is spoilt by obtrusive moralizing. Nor, lastly, is Polybius's style itself such as to compensate for these defects. It is, indeed, often impressive from the evident earnest- ness of the writer, and from his sense of the gravity of his subject, and is unspoilt by rhetoric or conceit. It has about it the ring of reality; the language,, is sometimes pithy .and vigorous; and now and then we meet with apt metaphors, such as those borrowed from boxing (i. 57), from cock-fighting (i. 58), from draughts (i. 84). But, in spite of these redeeming features, the prevailing baldness of Polybius's style excludes him from the first rank among classical writers; and it is impossible to quarrel with the verdict pronounced by Dionysius of Halicarnassus, who places him among those authors of later times who neglected the graces of style, and who paid for their neglect by leaving behind them works " which no one was patient enough to read through to the end."

It is to the value and variety of his matter, to his critical insight, breadth of view and wide research, and not least to the surpassing importance and interest of the period with which he deals, that Polybius owes his place among the writers of history. What is known as to the fortunes of his histories, and the reputation they enjoyed, fully bears out this cSriclusion. The silence respecting

him maintained by Quintilian and by Lucian may reasonably be taken to imply their agreement with Dionysius as to his merits as a master of style. On the other hand, Cicero (De off. iii. 32) describes him as " bonus auctor in primis "; in the De republica (ii. 14) he praises highly his accuracy in matters of chronology; and Cicero's younger contemporary, Marcus Brutus, was a devoted student of Polybius, and was engaged on the eve of the battle of Pharsalia in compiling an epitome of his histories (Suidas, s.v. ; Plutarch, Brut. 4). Livy, however, notwithstanding the extent to which he used his writings (see Livy), speaks of him in such qualified terms as to suggest the idea that his strong artistic sensi- bilities had been wounded by Polybius's literary defects. He has nothing better to say of him than that he is ' by no means con- temptible " (xxx. 45), and " not an untrustworthy

author” (xxxiii. 10). Posidonius and Strabo, both of them Stoics like Polybius himself, are said to have written continuations of his history (Suidas, s.v. ; Strabo p. 515). Arrian in the early part of the 2nd and Aelian in the 3rd century both speak of him with respect, though with reference mainly to his excellence as an authority on the art of war. In addition to his Histories Polybius was the author of the following smaller works: a life of Philopoemen (Polyb. x. 24), a history of the Numantine War (Cic. Ad Fam. v. 12), a treatise on tactics (Polyb. ix. 20; Arrian, Tactica; Aelian, Tact. i.). The geographical treatise, referred to by Geminus, is possibly identical with the thirty-fourth book of the Histories (Schweighauser, Praef. p. 184.

Authorities. — The complete books (i.-v.) of the Histories were first printed in a Latin translation by Nicholas Perotti in 1473. The date of the first Greek edition, that by Obsopaeus, is 1530. For a full account of these and of later editions, as well as of the extant MSS., see Schweighauser’s Preface to his edition of Polybius. Our knowledge of the contents of the fragmentary books is derived partly from quotations in ancient writers, but mainly from two collections of excerpts; one, probably the work of a late Byzantine compiler, was first printed at Basel in 1549 and contains extracts from books vi.-xviii. (ircpJ irptafltUiiv, irepl aper>}s koI xaiaas) ; the other consists of two fragments from the ” select passages ” from Greek historians compiled by the directions of Constantine Porphyrogenitus in the 10th century. To these must be added the Vatican excerpts edited by Angelo Mai in the present century.

The following are the more important modern editions of Polybius : Ernesti (3 vols., 1763-1764); Schweighauser (8 vols., 1793, and Oxford, 1823); Bekker (2 vols., 1844); L. Dindorf (4 vols., 1866- 1868, 2nd ed., T. Buttner-Wobst, 5 vols., Leipzig, 1882-1904); Hultsch (4 vols., 1867-1871); J. L. Strachan-Davidson, Selections from Polybius (Oxford, 1888). For the literature of the subject, see Engelmann, Biblioth. script, class.: Script, graeci, pp. 646- 650 (8th ed. Leipzig, 1880). See also W. W. Capes, The History of the Achaean League (London, 1888); F. Susemihl, Gesch. d. griech. Litteratur in d. Alexandrinerzeit, ii. 80-128 (Leipzig, 1891- 1892); 0. Cuntz, Polybios und sein Werk (Leipzig, 1902); R. v. Scala, Die Studien des Polybios (Stuttgart, 1890); J. B. Bury, Ancient Greek Historians (1909), “a whole-hearted appreciation of Polybius”; J. L. Strachan-Davidson, in Hellenica, pp. 353- 387 (London, 1898), and in Appendix II. to Selections from Polybius pp. 642-668 (Oxford, 1888). (H. F. P.; X.)

POLYCARP (c. 69-e. 155), bishop of Smyrna and one of the Apostolic Fathers, derives much of his importance from the fact that he links

together the apostolic age and that of nascent Catholicism. The sources from which we derive our knowledge of the life and activity of Polycarp are: (1) a few notices in the writings of Irenaeus, (2) the Epistle of Polycarp to the Church at Philippi, (3) the Epistle of Ignatius to Polycarp, (4) the Epistle of the Church at Smyrna to the Church at Philomelium, giving an account of the martyrdom of Polycarp. Since these authori- ties have all been more or less called in question and some of them entirely rejected by recent criticism, it is necessary to say a few words about each.

1. The Statements of Irenaeus are found (a) in his Adversus haereses, iii. 3, 4, (b) in the letter to Victor, where Irenaeus gives an account of Polycarp's visit to Rome, (c) in the letter to Florinus — a most important document which describes the intercourse between Irenaeus and Polycarp and Polycarp's relation with St John. No objection has been made against the genuineness of the statements in the Adversus haereses, but the authenticity of the two letters has been stoutly contested in recent times by van Manen. 1 The main attack is directed against the Epistle to Florinus, doubtless because of its importance. " The manifest exaggerations," says van Manen, " coupled with the fact that Irenaeus never shows any signs of acquaintance with Florinus . . . enable us to perceive clearly that a writer otherwise unknown is speaking to us here." The criticism of van Manen has, however, found no supporters outside the Dutch school. The epistle is quoted by Eusebius

1 Ency. Bib. iii. 3490.

(v. 20), and is accepted as genuine by Harnack 8 and Kriiger.' The relevant statements in the letter, moreover, are supported by the references to Polycarp which we find in the body of Irenaeus's great work.

2. The Epistle of Polycarp. — Though Irenaeus states that Polycarp wrote many " letters to the neighbouring churches or to certain of the brethren " 4 only one has been preserved, viz. the well-known letter to the Philippians. The epistle is largely involved in the Ignatian controversy (see Ignatius). The testimony which it affords to the Ignatian Epistles is so striking that those scholars who regard these letters as spurious are bound to reject the Epistle of Polycarp altogether, or at any rate to look upon it as largely interpolated. The former course has been adopted by Schwegler, 6 Zeller, 6 and Hilgenfeld, 7 the latter by Ritschl 8 and Lipsius. 9 The rehabilitation of the Ignatian letters in modern times has, however, practically destroyed the attack on the Epistles of Polycarp. The external evidence

in its favour is of considerable weight. Irenaeus (iii. 3, 4) expressly mentions and commends a ” very adequate ” (kavuTOTt;) letter of Polycarp to the Philippians, and we have no reason for doubting the identity of this letter mentioned by Irenaeus with our epistle. Eusebius (iii. 36) quotes extracts from the epistle, and some of the extracts contain the very passages which the critics have marked as interpolations, and Jerome (De Vir. III. xvii.) testifies that in his time the epistle was publicly read in the Asiatic churches. The internal evidence is equally strong. There is absolutely no motive for a forgery in the contents of the epistle. As Harnack says, ” There is no trace of any tendency beyond the immediate purpose of maintaining the true Christian life in the church and warning it against covetousness and against an un- brotherly spirit. The occasion of the letter was a case of embezzle- ment, the guilty individual being a presbyter at Philippi. It shows a fine combination of mildness with severity; the language is simple but powerful, and, while there is undoubtedly a lack of original ideas, the author shows remarkable skill in weaving together pregnant sentences and impressive warnings selected from the apostolic epistles and the first Epistle of Clement. In these circum- stances it would never have occurred to any one to doubt the genuineness of the epistle or to suppose that it had been inter- polated, but for the fact that in several passages reference is made to Ignatius and his epistles.” The date of the epistle depends upon the date of the Ignatian letter;; and is now generally fixed between 112 and 118. An attempt has been made in some quarters to prove that certain allusions in the epistle imply the rise of the heresy of Marcion and that it cannot therefore be placed earlier than 140. Lightfoot, however, has proved that Polycarp’s statements may equally well be directed against Corinthianism or any other form of Docetism, while some of his arguments are absolutely inapplicable to Marcionism.

3. The Epistle of Ignatius to Polycarp. — This epistle has of course been subjected to the same criticism as has been directed against the other epistles of Ignatius (see Ignatius). Over and above the general criticism, which may now be said to have been completely answered by the investigations of Zahn, Lightfoot and Harnack, one or two special arguments have been brought against the Epistle to Polycarp. Ussher, for instance, while accepting the other six epistles, rejected this on the ground that Jerome says that Ignatius only sent one letter to Smyrna— a mistake due to his misinterpre- tation of Eusebius. Some modern scholars (among whom Harnack was formerly numbered, though he has modified his views on the point) feel a difficulty about the peremptory tone which Ignatius adopts towards Polycarp. There was some force in this argument when the Ignatian

Epistles were dated about 140, as in that case Polycarp would have been an old and venerable man at the time. But now that the date is put back to about 112 the difficulty vanishes, since Polycarp was not much over forty when he received the letter. We must remember, too, that Ignatius was writing under the consciousness of impending martyrdom and evidently felt that this gave him the right to criticize the bishops and churches of Asia.

4. The Letter of the Church at Smyrna to the Philomelians is a most important document, because we derive from it all our in- formation with regard to Polycarp's martyrdom. Eusebius has preserved the greater part of this epistle (iv. 15), but we possess it entire with various concluding observations in several Greek MSS., and also in a Latin translation. The epistle gives a minute description of the persecution in Smyrna, of the last days of Polycarp and of his trial and martyrdom; and as it contains many instructive details and professes to have been written not long after the events to which it refers, it has always been regarded as one of the most precious remains of the 2nd century. Certain recent critics, however, have questioned the authenticity of the narrative.

2 Geschichte der altchristlichen Litteratur, i. 593-594.

3 Early Christian Literature (Eng. trans., 1897), p. 150.

4 Letter to Florinus ap. Euseb. v. 20.

5 Nachapostolisches Zeitalter, ii. 154.

6 Apostolgeschichte, p. 52.

7 Apostolische Vater, p. 272.

8 Entstehung der altkatholischen Kirche, p. 584.

9 Ueber das Verhaltniss, &c, p. 14.

Lipsius brings 1 the date of the epistle down to about 260, though he admits many of the statements as trustworthy. Keim, too, 2 endeavours to show that, although it was based on good information, it could not have been composed till the middle of the 3rd century. A similar position has also been taken up by Schurer, 3 Holtzmann, 4

Gebhardt, 6 Reville, 6 and van Manen. 7 The last named regards the document “as a decorated narrative of the saint’s martyrdom framed after the pattern of Jesus’ martyrdom,” though he thinks that it cannot be put as late as 250, but must fall within the limits of the 2nd century. It cannot be said, however, that the case against the document has been at all substantiated, and the more moderate school of modern critics {e.g. Lightfoot, 8 Harnack, 9 Kruger) 10 is unanimous in regarding it as an authentic document, though it recognizes that here and there a few slight interpolations have been inserted. 11 Besides these we have no other sources for the life of Polycarp ; the Vita S. Polycarpi auctore Pionio (published by Duchesne, Paris, 1881, and Lightfoot Ignatius and Polycarp, 1885, ii. 1015-1047) is worthless.

Assuming the genuineness of the documents mentioned, we now proceed to collect the scanty information which they afford with regard to Polycarp’s career. Very little is known about his early life. He must have been born not later than the year 60, for on the day of his death (c. 155) he declared that he had served the Lord for eighty-six years (Martyrium, 9). The statement seems to imply that he was of Christian parentage; he cannot have been older than eighty-six at the time of his martyrdom , since he had paid a visit to Rome almost immediately before. Irenaeus tells us that in early life Polycarp “had been taught by apostles and lived in familiar intercourse with many that had seen Christ ” (iii. 3,4)- This testimony is expanded in the remarkable words which Irenaeus addresses to Florinus: ” I saw thee when I was still a boy (waZs en &v) in Lower Asia in company with Polycarp … I can even now point out the place where the blessed Polycarp used to sit when he discoursed, and describe his goings out and his comings in, his manner of life and his personal appearance and the discourses which he delivered to the people, how he used to speak of his intercourse with John and with the rest of those who had seen the Lord, and how he would relate their words. And everything that he had heard from them about the Lord, about His miracles and about His teaching, Polycarp used to tell us as one who had received it from those who had seen the Word of Life with their own eyes, and all this in perfect harmony with the Scriptures. To these things I used to listen at the time, through the mercy of God vouchsafed to me, noting them down, not on paper but in my heart, and constantly by the grace of God I brood over my accurate recollections.” These are priceless words, for they establish a chain of tradition (John-Polycarp-Irenaeus) which is without a parallel in early church history. Polycarp thus becomes the living link between the Apostolic age and the great writers who flourished at the end of the 2nd century. Recent criticism,

however, has endeavoured to destroy the force of the words of Irenaeus. Harnack, for instance, attacks this link at both ends. 12 (a) The connexion of Irenaeus and Polycarp, he argues, is very weak, because Irenaeus was only a boy {irals) at the time, and his recollections therefore carry very little weight. The fact too that he never shows any signs of having been influ- enced by Polycarp and never once quotes his writings is a further proof that the relation between them was slight, (b) The connexion which Irenaeus tries to establish between Polycarp and John the apostle is probably due to a blunder. Irenaeus has confused John the apostle and John' the presbyter. Polycarp was the disciple of the latter, not the former. In this second

1 Zeitschr.f. wissensch. Theol. (1874), p. 200 seq.

2 Aus dem Urchristenthy.m (1878), p. 90. : 3 Zeitschr.f. hist. Theol. (1870), p. 203 seq.

4 Zeitschr.f '. wissensch. Theol. (1877).

5 Zeitschr.f. hist. Theol. (1875).

6 De anno Polycarpi. (1881).

7 Oud-Christ (1861), and Ency. Bib. iii. 3479.

8 Ignatius and Polycarp, i. 589 seq.

9 Gesch. d. altchrist. Lit. II. i. 341.

10 Early Christian Lit. (Eng. trans., 1897), p. 380.

11 Amongst these we ought probably to include the expression v noBoKixii inK\ri

i? Chronologic, i. 325-329.

argument Harnack has the support of a considerable number of modern scholars who deny the Ephesian residence of John the apostle. But, as Gwatkin 13 has pointed out, Harnack's argu- ments are by no means decisive, (a) When Irenaeus describes himself as a boy (xcus), he need not have meant a very young lad, under thirteen, as Harnack makes out. Lightfoot has cited many instances which prove that the word could be used of a man of thirty. 14 Nor does the alternative phrase which Irenaeus uses in iii. 3,4 (ov /cat Otitis eupaKanev kv tJ; tt/xotJj fmuv iˆXwcta) militate against this interpretation, for

elsewhere Irenaeus him- self distinctly says ” triginta annorum aetas prima indoles est juvenis ” (ii. 22, 5). It is true that Harnack has adduced argu- ments which cannot be discussed here to prove that Irenaeus was not born till about 140 ; 16 but against this we may quote the decision of Lipsius, who puts the date of his birth at 130, 16 while Lightfoot argues for 120. 17 The fact that Irenaeus never quotes Polycarp does not count for much. Polycarp wrote very little. He does not seem to have been a man of great mental capacity. ” His influence was that of saintliness rather than that of intellect.” (b) A discussion of Harnack’s second line of argument is impossible here. His theory with regard to the confusion of names is a gratuitous assumption and cannot be proved. The tradition of St John’s residence at Ephesus is too strong to be easily set aside. In spite therefore of much modern criticism there seems to be no solid reason for rejecting the statements of Irenaeus and regarding Polycarp as the link between the Apostolic age and the first of the Catholic fathers.

Though Polycarp must have been bishop of Smyrna for nearly half a century we know next to nothing about his career. We get only an occasional glimpse of his activity, and the period between 115 and 155 is practically a blank. The only points of sure information which we possess relate to (1) his relations with Ignatius, (2) his protests against heresy, (3) his visit to Rome in the time of Anicetus, (4) his martyrdom.

1. His Relations with Ignatius. — Ignatius, while on his way to Rome to suffer martyrdom, halted at Smyrna and received a warm welcome from the church and its bishop. Upon reaching Troas he despatched two letters, one to the church at Smyrna, another addressed personally to Polycarp. In these letters Ignatius charged Polycarp to write to all the churches between Smyrna and Syria (since his hurried departure from Troas made it impossible for him to do so in person) urging them to send letters and delegates to the church at Antioch to congratulate it upon the cessation of the persecution and to establish it in the faith. The letters of Ignatius illustrate the commanding position which Polycarp had already attained in Asia. It was in the discharge of the task which had been laid upon him by Ignatius that Polycarp was brought into correspondence with the Philippians. The Church at Philippi wrote to Polycarp asking him to forward their letters to Antioch. Polycarp replied, promising to carry out their request and enclosing a number of the letters of Ignatius which he had in his possession.

2. Polycarp’s Attack on Heresy. — All through his life Polycarp appears to have been an uncompromising opponent of heresy. We find

him in his epistle (ch. vii.) uttering a strong protest against certain false teachers (probably the followers of Cerinthus) .

For every one who shall not confess that Jesus Christ is come in the flesh is antichrist; and whosoever shall not confess the testimony of the Cross is of the devil ; and whosoever shall pervert the oracles of the Lord to his own lusts and say that there is neither resurrection nor judgment, that man is the first-born of Satan. Wherefore let us forsake their vain doing and their false teaching and turn unto the word which was delivered unto us from the beginning.”

Polycarp lived to see the rise of the Marcionite and Valentinian sects and vigorously opposed them. Irenaeus tells us that on

ls Contemp. Review, February 1897.

14 Ignatius and Polycarp, i. 432, for instance, Constantine (Euseb. V.C. ii. 51) describes himself as koiiiSv ntus, though he must have been over thirty at the time.

15 Chronologie, i. 325-333.

16 See Lightfoot, op. at. i. 432.

17 Essays on Supernatural Religion, 264, 265.

one occasion Marcion endeavoured to establish relations with him and accosted him with the words, ” Recognize us.” But Polycarp displayed the same uncompromising attitude which his master John had shown towards Cerinthus and answered, ” I recognize you as the first-born of Satan.” The steady progress of the heretical movement in spite of all opposition was a cause of deep sorrow to Polycarp, so that in the last years of his life the words were constantly on his lips, ” Oh good God, to what times hast thou spared me, that I must suffer such things!”

3. Polycarp’ s Visit to Rome. — It is one of the most interesting and important events in the church history of the 2nd century that Polycarp, shortly before his death, when he was considerably over eighty years old, undertook a journey to Rome in order to visit the bishop Anicetus. Irenaeus, to whom we are indebted for this information (Haer. iii. 3, 4; Epist. ad victorem, ap. Euseb. v. 24), gives as the reason for the journey the fact that differences existed between

Asia and Rome ” with regard to certain things ” and especially about the time of the Easter festival. He might easily have told us what these ” certain things ” were and given us fuller details of the negotiations between the two great bishops, for in all probability he was himself in Rome at the time. But unfortunately all he says is that with regard to the certain things the two bishops speedily came to an understanding, while as to the time of Easter, each adhered to his own custom, without breaking off communion with the other. We learn further that Anicetus as a mark of special honour allowed Polycarp to celebrate the Eucharist in the church, and that many Marcionites and Valentinians were converted by him during his stay in Rome.

4. Polycarp’s Martyrdom. — Not many months apparently after Polycarp’s return from Rome a persecution broke out in Asia. A great festival was in progress at Smyrna. The pro- consul Statius Quadratus was present on the occasion, and the asiarch Philip of Tralles was presiding over the games. Eleven Christians had been brought, mostly from Philadelphia, to be put to death. The appetite of the populace was inflamed by the spectacle of their martyrdom. A cry was raised ” Away with the atheists. Let search be made for Polycarp.” Polycarp took refuge in a country farm. His hiding-place, however, was be- trayed and he was arrested and brought back into the city. Attempts were made by the officials to induce him to recant, but without effect. When he came into the theatre the proconsul urged him to ” revile Christ,” and promised, if he would consent to abjure his faith, that he would set him at liberty. To this appeal Polycarp made the memorable answer, ” Eighty and six years have I served Him and He hath done me no wrong. How then can I speak evil of my King who saved me? ” These words only intensified the fury of the mob. They clamoured for a lion to be let loose upon him there and then. The asiarch however refused, urging as an excuse that the games were over. When they next demanded that their victim should be burned, the proconsul did not interfere. Timber and faggots were hastily collected and Polycarp was placed upon the pyre. With calm dignity and unflinching courage he met his fate and crowned a noble life with an heroic death.

The question as to the date of the martyrdom has evoked considerable controversy. Eusebius in his Chronicon gives a.d. 166 as the date of Polycarp’s death, and until the year 1867 this statement was never questioned. In that year appeared Waddington’s Mimoire sur la chronologie de la vie du rheteur Aelius Aristide, in which it was shown from a most acute combin- ation of circumstances that the Quadratus whose name is men- tioned in the Martyrium was proconsul of Asia in 155-156, and that consequently Polycarp was martyred on the 23rd of February 155. Waddington’s conclusion has

received overwhelming support amongst recent critics. His views have been accepted by (amongst many others) Renan, 1 Hilgenfeld, 2 Gebhardt, 3 Lipsius, 4 Harnack, 6 Zahn, 6 Lightfoot, 7 Randell. 8 Against this

1 Antichrist (1873), p. 207. s Zeitschr.f. wiss. Theol. (1874), p. 325.

3 Zeitschr. f. hist. Theol. (1875), p. 356.

4 Jahrb. f. prot. Theol. (1883), p. 525. 6 Chronologic, i. 334-356.

6 Zeitschr. f. wiss. Theol. (1882), p. 227; (1884), p. 216.

7 Ignatius and Polycarp, i. 629-702. 8 Studia biblica (1885), i. 175.

array of scholars only the following names of importance can be quoted in support of the traditional view — Keim, 9 Wieseler 10 and Uhlhorn. 11 The problem is too complex to admit of treatment here. There seems to be little doubt that the case for the earlier date has been proved. The only point upon which there is division of opinion is as to whether Waddington's date 155, or — as is suggested by Lipsius and supported by C.H. Turner 12 — the following year 156 is the more probable. The balance of opinion seems to favour the latter alternative, because it leaves more room for Polycarp's visit to Anicetus, who only became bishop of Rome in 154. Harnack, however, after careful investigation, prefers 155.

The significance of Polycarp in the history of the Church is out of all proportion to our knowledge of the facts of his career. The violent attack of the Smyrnaean mob is an eloquent tribute to his influence in Asia. " This is the teacher of Asia," they shouted, " this is the father of the Christians: this is the des- troyer of our gods: this is the man who has taught so many no longer to sacrifice and no longer to pray to the gods." 13 And after the execution they refused to deliver up his bones to the Christians for burial on the ground that " the Christians would now forsake the Crucified and worship Polycarp." 14 Polycarp was indeed, as Polycrates says, 15 " one of the great luminaries " (ju«Y&Xa <7Totx«o) of the time. It was in no small degree due to his stanch and unwavering leadership that the Church was saved from the peril of being overwhelmed by the rising tide of the pagan revival which swept over Asia during the first half of the 2nd century, and it was his unfaltering allegiance to the Apostolic faith that secured the defeat of the many forms of heresy which threatened to destroy the Church from within. Polycarp had no creative genius. He was a " transmitter, not a maker," but herein lies his greatness. Much occurred between

the Apostolic age and the age when the faith of the Church was fixed in the earliest creed and protected by the determination of the canon of the New Testament. This intervening period was the most perilous epoch in the history of the ante-Nicene Church. The Apostolic tradition might have been perverted and corrupted. The purity of the Gospel might have been defiled. The Christian ideal might have been lost. That the danger was so largely averted Is to no small extent the result of the faithful witness of Polycarp. As Irenaeus says (iii. 3, 4), " Polycarp does not appear to have possessed qualifications for successfully conducting a controversial discussion with erroneous teachers . . . but he could not help feeling how unlike their speculations were to the doctrines which he had learned from the Apostles, and so he met with indignant reprobation their attempt to supersede Christ's gospel with fictions of their own devising." It is this that constitutes Polycarp's service to the Church, and no greater service has been rendered by any of its leaders in any age.

Bibliography— J- B. Lightfoot, Apostolic Fathers, pt. ii. (2nd ed., 1889). Polycarp is dealt with in i. 417-459, 530-704; ii. 897-1086; G. Volkmar, Epistula Polycarpi Smyrnaei genuine. (Zurich, 1885) ; T. Zahn, Forschungen zur Geschichte des Kanons, &c, iv. 249, 279; J. M. Cotterill, “The Epistle of Polycarp to the Philippians,” Journ. of Philol. (1891), xix., 241-285; Harnack, Chronologie der altchristlichen Litteratur (1897). See also Apo- stolic Fathers. (H. T. A.)

POLYCLITUS, the name of two Greek sculptors of the school of Argos; the first belonging to the fifth century, the second to the early part of the fourth.

1. The elder and best known Polyclitus was a contemporary of Pheidias, and in the opinion of the Greeks his equal. He made a figure of an Amazon for Ephesus which was regarded as superior to the Amazon of Pheidias made at the same time; and his colossal Hera of gold and ivory which stood in the temple near Argos was considered as worthy to rank with the Zeus of Pheidias.

9 Aus dent Urchristentum, p. 90.

10 Die Christenverjolgungen der Caesaren (1878), p. 34.

11 Studia biblica (1890), ii. 105-156.

12 Realencyk. f. prot. Theol., 2nd ed. xii. 105.

13 Martyrium, ch. 12.

14 Ibid/17.

15 A p. Euseb. v. 24.

It would be hard for a modern critic to rate Polyclitus so high: the reason is that balance, rhythm and the minute perfection of bodily form, which were the great merits of this sculptor, do not appeal to us as they did to the Greeks of the 5th century. He worked mainly in bronze.

As regards his chronology we have data in a papyrus pub- lished by Grenfell and Hunt containing lists of athletic victors. From this it appears that he made a statue of Cyniscus, a victori- ous athlete of 464 or 460 B.C., of Pythocles (452) and Aristion (452). He thus can scarcely have been born as late as 480 b.C, His statue of Hera is dated by Pliny to 420 B.C. His artistic activity must thus have been long and prolific.

Copies of his spearman (doryphorus) (see Greek Art, Plate VI. fig. 80), and his victor winding a ribbon round his head (diadu- menus) have long been recognized in our galleries. We see their excellence, but they inspire no enthusiasm, because they are more fleshy than modern figures of athletes, and want charm. They are chiefly valuable as showing us the square forms of body affected by Polyclitus, and the scheme he adopted, throwing the weight of the body (as Pliny says of him) on one leg. We must not, however, judge of a great Greek sculptor by Roman copies of his works. This has been enforced by the discovery at Delos, by the French excavators, of a diadumenus of far more pleasing type and greater finish, which also goes back to Poly- clitus. The excavations at Olympiaˆhave also greatly widened our knowledge of the sculptor. Among the bases of statues found on that site were three signed by Polyclitus, still bearing on their surface the marks of attachment of the feet of the statues. This at once gives us their pose; and following up the clue, A. Furtwangler has identified several extant statues as copies of figures of boy athletes victorious at Olympia set up by Polyclitus. Among these the Westmacott athlete in the British Museum is conspicuous. And it is certain that these boys, although the anatomy of their bodies seems to be too mature, yet have a real charm, combining beauty of form with modesty and unaffected simplicity. They enable us better to understand the merit of the sculptor.

The Amazon of Polyclitus survives in several copies, among the best of which is one in the British Museum (for its type see Greek Art, fig. 40). Here again we find a certain heaviness; and the womanly character of the Amazon scarcely appears through her robust limbs. But the Amazon of Pheidias, if rightly identified, is no better. The masterpiece of Polyclitus, his Hera of gold and ivory, has of course totally disappeared. The coins of Argos give us only the general type. Many archaeo- logists have tried to find a copy of the head. The most defen- sible of all these identifications is that of C. Waldstein, who shows that a head of a girl in the British Museum (labelled as Polyclitan) corresponds so nearly with that of Hera on 5th century coins of Argos that we must regard it as a reflex of the head of the great statue. It seems very hard and cold beside such noble heads of the goddess as those in the Ludovisi Gallery (Terme Museum) Rome. American archaeologists have in recent years conducted excavations on the site of the Argive temple of Hera (Argos and Greek Art, fig. 39) ; but the sculp- tural fragments, heads and torsos, which seem to belong to the temple erected in the time of Polyclitus, have no close stylistic resemblance to other statues recognized as his; and at present their position in the history of art is matter of dispute.

The want of variety in the works of Polyclitus was brought as a reproach against him by ancient critics. Varro says that his statues were square and almost of one pattern. We have already observed that there was small variety in their attitudes. Except for the statue of Hera, which was the work of his old age, he produced scarcely any notable statue of a deity. His field was narrowly limited; but in that field he was unsurpassed. 2. The younger Polyclitus was of the same family as the elder, and the works of the two are not easily to be distinguished. Some existing bases, however, bearing the name are inscribed in characters of the 4th century, at which time the elder sculptor cannot have been alive. The most noted work of the younger artist was a statue in marble of Zeus Milichius (the Merciful)

set up by the people of Argos after a shameful massacre which took place in 370 B.C. The elder artist is not known to have worked in marble. (P. G.)

POLYCRATES, tyrant of Samos (c. 535-515 B.C.). Having won popularity by donations to poorer citizens, he took advan- tage of a festival of Hera, which was being celebrated outside the walls, to make himself master of the city (about 535 B.C.). After getting rid of his brothers Pantagnotus and Syloson, who had at first shared his power, he established a despotism which is of great importance in the history of the island. Realizing clearly the value of sea-power for a

Greek state, he equipped a fleet of 100 ships, and so became master of the Aegean basin. This ascendancy he abused by numerous acts of piracy which made him notorious throughout Greece; but his real purpose in building his navy was to become lord of all the islands of the archipelago and the mainland towns of Ionia. The details of his conquests are uncertain, but it is known that in the Cyclades he maintained an alliance with the tyrant Lygdamis of Naxos, and curried favour with the Delian Apollo by dedi- cating to him the island of Rheneia. He also encountered and heavily defeated a coalition of two great naval powers of the Asiatic coast, Miletus and Lesbos. Doubtless with the object of expanding the flourishing foreign trade of Samos, he entered into alliance with Amasis, king of Egypt, who, according to Herodotus, renounced his ally because he feared that the gods, in envy of Polycrates' excessive good fortune, would bring ruin upon him and his allies. It is more probable that the breach of the compact was due to Polycrates, for when Cambyses of Persia invaded Egypt (525) the Samian tyrant offered to support him with a naval contingent. This squadron never reached Egypt, for the crews, composed as they were of Poly- crates' political enemies, suspecting that Cambyses was under agreement to slay them, put back to Samos and attacked their master. After a defeat by sea, Polycrates repelled an assault upon the walls, and subsequently withstood a siege by a joint armament of Spartans and Corinthians assembled to aid the rebels. He maintained his ascendancy until about 515, when Oroetes, the Persian governor of Lydia, who had been reproached for his failure to reduce Samos by force, lured him to the mainland by false promises of gain and put him to death by crucifixion.

Beside the political and commercial pre-eminence which he conferred upon Samos, Polycrates adorned the city with public works on a large scale — -an aqueduct, a mole and a temple of Hera (see Samos; Aqueducts). The splendour of his palace is attested by the proposal of the Roman emperor Caligula to rebuild it. Foreign artists worked for him at high wages; from Athens he brought Democedes, the greatest physician of the age, at an exceptional salary. He was also a patron of letters: he collected a library and lived on terms of intimate friendship with the poet Anacreon, whose verses were full of references to his patron. The philosopher Pythagoras, however, quitted Samos in order to escape his tyranny. " (M. O. B. C.)

POLYCRATES, Athenian sophist and rhetorician, flourished in the 4th century B.C. He taught at Athens, and afterwards in Cyprus. He composed declamations on paradoxical themes —an Encomium on Clytaemnestra, an Accusation of Socrates, an Encomium on Busiris (a mythical king of Egypt, notorious for his inhumanity); also

declamations on mice, pots and counters. His Encomium on Busiris was sharply criticized by Isocrates, in a work still extant, and Dionysius of Hali- carnassus characterizes his style as frigid, vulgar and inelegant.

POLYGAMY (Gr. 7roXfe, many, and yaftos, marriage), or as it is sometimes termed, Polygyny (yvvii, woman), the system under which a man is married to several women at the same time. Derivatively it includes the practice of polyandry, but it has become definitely restricted to expressing what has been, and still is, far the commonest type of relations between the sexes (see Family and Marriage). Among Oriental nations plurality of legal wives is customary. Mahommedans are allowed four. A Hindu can have as many as he pleases: the high-caste sometimes having as many as a hundred. Polygamy is the rule among

African tribes, and is common among those of Australia and Poly- nesia. In China, however, only one wife is lawful. In many polygamous countries the practical obstacle of expense prevents men from taking advantage of their privileges. While poly- gamy was the rule in biblical days among the ancient Jews, and was permitted and even enjoined in certain cases by the Mosaic law, the Christian Church, though it is nowhere forbidden, except for “bishops,” in the New Testament, has always set its face against it. There have, however, been divines who dissented from this general disapproval. The Anabaptists insisted on freedom in the matter, and Bernardino Ochino conditionally defended plurality of wives. When in 1 540 Philip the Magnani- mous, the reforming Landgrave of Hesse, determined (with his wife’s approval, she being a confirmed invalid) to marry a second wife, Luther and Melanchthon approved ” as his personal friends, though not as doctors of theology”; while Martin Bucer assisted at the marriage. In later times the Mormons (q.v.) in America provide the most notable instance of the revival of polygamy.

POLYGENISTS, the term applied to those anthropologists who contend that the several primary races of mankind are separate species of independent origin. (See Monogenists.)

POLYGLOTT (Gr. irokvs, many, and y\Snra, tongue) , the term for a book which contains side by side versions of the same text in several different languages; the most important polyglotts are editions of the

Bible, or its parts, in which the Hebrew and Greek originals are exhibited along with the great historical versions, which are of value for the history of the text and its interpretation. The first enterprise of this kind is the famous Hexapla of Origen in which the Old Testament Scriptures were written in six parallel columns, the first containing the Hebrew text, the second a transliteration of this in Greek letters, the third and fourth the Greek translations by Aquila and Sym- machus, the fifth the Septuagint version as revised by Origen, the sixth the translation by Theodotion. Inasmuch, however, as only two languages, Hebrew and Greek, were employed the work was rather diglott than polyglott in the usual sense. After the invention of printing and the revival of philological studies, polyglotts became a favourite means of advancing the knowledge of Eastern languages (for which no good helps were available) as well as the study of Scripture. The series began with the Complutensian printed by Acnaldus Guilielmus de Brocario at the expense of Cardinal Ximenes at the university at Alcala. de Henares (Complutum). The first volume of this, containing the New Testament in Greek and Latin, was completed on the 10th of January 1514. In vols, ii.v. (finished on July 10, 1517) the Hebrew text of the Old Testament was printed in the first column of each page, followed by the Latin Vulgate and then by the Septuagint version with an interlinear Latin trans lation. Below these stood the Chaldee, again with a Latin translation. The sixth volume containing an appendix is dated 1 51 5, but the work did not receive the papal sanction till March 1520, and was apparently not issued till 1522. The chief editors were Juan de Vergara, Lopez de Zuniga (Stunica), Nunez de Guzman (Pincianus), Antonio de Librixa (Nebrissensis) , and Demetrius Ducas. About half a century after the Complu- tensian came the Antwerp Polyglott, printed by Christopher Plantin (1560-1572, in 8 vols, folio). Of this the principal editor was Arias Montanus aided by Guido Fabricius Boderianus, Raphelengius, Masius, Lucas of Bruges and others. This work was under the patronage of Philip II. of Spain; it added a new language to those of the Complutensian by including the Syriac New Testament; and, while the earlier polyglott had only the Targum of Onkelos on the Pentateuch, the Antwerp Bible had also the Targum on the Prophets, and on Esther, Job, Psalms and the Salomonic writings. Next came Le Jay's Paris Poly- glott (1645), which embraces the first printed texts of the Syriac Old Testament (edited by Gabriel Sionita, a Maronite, but the book of Ruth by Abraham Ecchelensis, also a Maronite) and of the Samaritan Pentateuch and version (by Morinus). It has also an Arabic version, or rather a series of various Arabic versions. The last great polyglott is Brian Walton's (London, 1657), which is much less beautiful than Le Jay's but more complete

in various ways, including, among other things, the Syriac of Esther and of several apocryphal books for which it is wanting in the Paris Bible, Persian versions of the Pentateuch and Gospels, and the Psalms and New Testament in Ethiopic. Walton was aided by able scholars, and used much new manuscript material. His prolegomena, too, and collections of various readings mark an important advance in biblical criticism. It was in connexion with this polyglott that E. Castell produced his famous Heptaglott Lexicon (2 vols, folio, London, 1669), an astounding monument of industry and erudition even when allowance is made for the fact that for the Arabic he had the great MS. lexicon compiled and left to the university of Cambridge by the almost forgotten W. Bedwell. The liberality of Cardinal Ximenes, who is said to have spent half a million ducats on it, removed the Complu- tensian polyglott from the risks of commerce. The other three editions all brought their promoters to the verge of ruin. The later polyglotts are of little scientific importance, the best recent texts having been confined to a single language; but every biblical student still uses Walton and, if he can get it, Le Jay. Of the numerous polyglott editions of parts of the Bible it may suffice to mention the Genoa psalter of 1516, edited by Giustini- ani, bishop of Nebbio. This is in Hebrew, Latin, Greek, Chaldee and Arabic, and is interesting from the character of the Chaldee text, being the first specimen of Western printing in the Arabic character, and from a curious note on Columbus and the dis- covery of America on the margin of Psalm xix. (A. W. Po.)

POLYGNOTUS, Greek painter in the middle of the 5th century B.C., son of Aglaophon, was a native of Thasos, but was adopted by the Athenians, and admitted to their citizenship. He painted for them in the time of Cimon a picture of the taking of Ilium on the walls of the Stoa Poecile, and another of the marriage of the daughters of Leucippus in the Anaceum. In the hall at the entrance to the Acropolis other works of his were preserved. The most important, however, of his paintings were his frescoes in a building erected at Delphi by the people of Cnidus. The subjects of these were the visit to Hades by Odysseus, and the taking of Ilium. Fortunately the traveller Pausanias has left us a careful description of these paintings, figure by figure (Paus. x. 25-31). The foundations of the building have been recovered in the course of the French excavations at Delphi. From this evidence, some modern archaeologists have tried to reconstruct the paintings, excepting of course the colours of them. The best of these reconstructions is by Carl Robert, who by the help of vase-paintings of the middle of the fifth century has succeeded in recovering both the perspective of Polygnotus and the character of his figures (see Greek Art, fig. 29). The figures were detached and seldom overlapping,

ranged in two or three rows one above another; and the farther were not smaller nor dimmer than the nearer. The designs are repeated in Frazer's Pausanias, v. 360 and 372. It will hence appear that paintings at this time were executed on almost precisely the same plan as contemporary sculptural reliefs. We learn also that Polygnotus employed but few colours, and those simple. Technically his art was primitive. His excellence lay in the beauty of his drawing of individual figures; but especially in the "ethical" and ideal character of his art. The contemporary, and perhaps the teacher, of Pheidias, he had the same grand manner. Simplicity, which was almost childlike, sentiment at once noble and gentle, extreme grace and charm of execution, marked his works, in contrast to the more animated, complicated and technically superior paintings of a later age. (P. G.)

POLYGON (Gr. to\vs, many, and ytavia, an angle), in geo- metry, a figure enclosed by any number of lines— the sides — which intersect in pairs at the corners or vertices. If the sides are coplanar, the polygon is said to be " plane "; if not, then it is a "skew" or "gauche" polygon. If the figure lies entirely to one side of each of the bounding lines the figure is " convex"; if not it is "re-entrant" or "concave." A "regular" polygon has all its sides and angles equal, i.e. it is equilateral and equi- angular; if the sides and angles be not equal the polygon is I "irregular." Of polygons inscriptible in a circle an equilateral

figure is necessarily equiangular, but the converse is only true when the number of sides is odd. The term regular polygon is usually restricted to “convex” polygons; a special class of polygons (regular in the wider sense) has been named ” star polygons ” on account of their resemblance to star-rays; these are, however, concave.

Polygons, especially of the “regular” and “star” types, were extensively studied by the Greek geometers. There are two important corollaries to prop. 32, book i., of Euclid’s Elements relating to polygons. Having proved that the sum of the angles of a triangle is a straight angle, i.e. two right angles, it is readily seen that the sum of the internal angles of a polygon (necessarily convex) of re sides is re — 2 straight angles (2re— 4 right angles), for the polygon can be divided into n— 2 triangles by lines joining one vertex to the other vertices. The second corollary is that the sum of the supplements of the internal angles, measured in the same direction, is 4 right angles, and is thus independent of the number of sides.

The systematic discussion of regular polygons with respect to the inscribed and circumscribed circles is given in the fourth book of the Elements. (We may note that the construction of an equilateral triangle and square appear in the first book.) The triangle is discussed in props. 2-6; the square in props. 6-9; the pentagon (5-side) in props. 10-14; the hexagon (6-side) in prop. 15; and the quin- decagon in prop. 16. The triangle and square call for no special mention here, other than that any triangle can be inscribed or circumscribed to a circle. The pentagon is of more interest. Euclid bases his construction upon the fact that the isosceles triangle formed by joining the extremities of one side of a regular penta- gon to the opposite vertex has each angle at the base double the angle at the vertex. He constructs this triangle in prop. 10, by dividing a line in medial section, i.e. the square of one part equal to the product of the other part and the whole line (a construction given in book ii. 11), and then showing that the greater segment is the base of the required triangle, the remaining sides being each equal to the whole line. The inscription of a pentagon in a circle is effected by inscribing an isosceles triangle similar to that constructed in prop. 10, bisecting the angles at the base and producing the bisec- tors to meet the circle. Euclid then proves that these intersections and the three vertices of the triangle are the vertices of the required pentagon. The circumscription of a pentagon is effected by con- structing an inscribed pentagon, and drawing tangents to the circle at the vertices.

This supplies a general method for circumscribing a polygon if ttie inscribed be given, and conversely. In book xiii., prop. 10, an alternative method for inscribing a pentagon is indicated, for it is there shown that the sum of the squares of the sides of a square and hexagon inscribed in the same circle equals the square of the side of the pentagon. It may be incidentally noticed that Euclid's construction of the isosceles triangle which has its basal angles double the vertical angle solves the problem of quinquesecting a right angle; moreover, the base of the triangle is the side of the regular decagon inscribed in a circle having the vertex as centre and the sides of the triangle as radius. The inscription of a hexagon in a circle (prop. 15) reminds one of the Pythagorean result that six equilateral triangles placed about a common vertex form a plane; hence the bases form a regular hexagon. The side of a hexagon inscribed in a circle obviously equals the radius of the circle. The inscription of the quindecagon in a circle is made to depend upon the fact that the difference of the arcs of a circle intercepted by covertical sides of a regular pentagon and equilateral triangle is \ — \, = f%, of the whole circumference, and hence the bisection of this intercepted arc (by book iii., 30) gives the side of the quindecagon.

The methods of Euclid permit the construction of the following series of inscribed polygons: from the square, the 8-side or octagon, 16-, 32- . . ., or generally 4-2 n -side; from the hexagon, the 12-side or dodecagon, 24-, 48- . . ., or generally the 6-2"-side; from the pentagon, the 10-side or decagon, 20-, 40- . . ., or generally 5-2"- side; from the quindecagon, the 30-, 60- . . ., or generally 15-2"- side. It was long supposed that no other inscribed polygons were possible of construction by elementary methods {i.e. by the ruler and compasses); Gauss disproved this by forming the 17-side, and he subsequently generalized his method for the (2" + 1) -side, when this number is prime.

The problem of the construction of an inscribed heptagon, nonagon, or generally of any polygon having an odd number of sides, is readily reduced to the construction of a certain isosceles triangle. Suppose the polygon to have (2re + l) sides. Join the extremities of one

side to the opposite vertex, and consider the triangle so formed. It is readily seen that the angle at the base is n times the angle at the vertex. In the heptagon the ratio is 3, in the nonagon 4, and so on. The Arabian geometers of the 9th century showed that the heptagon required the solution of a cubic equation, thus resembling the Pythagorean problems of " duplicating the cube " and " tri- secting an angle." Edmund Halley gave solutions for the heptagon and nonagon

by means of the parabola and circle, and by a parabola and hyperbola respectively.

Although rigorous methods for inscribing the general polygons in a circle are wanting, many approximate ones have been devised. Two such methods are here given: (1) Divide the diameter of the circle into as many parts as the polygon has sides. On the diameter construct an equilateral triangle; and from its vertex draw a line through the second division along the diameter, measured from an extremity, and produce this line to intercept the circle. Then the chord joining this point to the extremity of the diameter is the side of the required polygon. (2) Divide the diameter as before, and draw also the perpendicular diameter. Take points on these diameters beyond the circle and at a dis- tance from the circle equal to one division of the diameter. Join the points so obtained; and draw a line from the point nearest the divided diameter where this line intercepts the circle to the third division from the produced extremity; this line is the required length.

The construction of any regular polygon on a given side may be readily performed with a protractor or scale of chords, for it is only necessary to lay off from the extremities of the given side lines equal in length to the given base, at angles equal to the interior angle of the polygon, and repeating the process at each extremity so obtained, the angle being always taken on the same side; or lines may be laid off at one half of the interior angles, describing a circle having the meet of these lines as centre and their length as radius, and then measuring the given base around the circumference.

Star Polygons. — These figures were studied by the Pythagoreans, and subsequently engaged the attention of many geometers — Boethius, Athelard . of Bath, Thomas Bradwardine, archbishop ot Canterbury, Johannes Kepler and others. Mystical and magical properties were assigned to them at an early date ; the Pythagoreans regarded the pentagram, the star polygon derived from the pentagon, as the symbol of health, the Platonists of well-being, while others used it to symbolize happiness. Engraven on metal, &c. it is worn in almost every country as a charm or amulet.

The pentagon gives rise to one star polygon, the hexagon gives none, the heptagon two, the octagon one, and the nonagon two. In general, the number of star polygons which can be drawn with the vertices of an n-point regular polygon is the number of numbers which are not factors of n and are less than \n.

Pentagrams.

Heptagrams.

Nonograms.

Number of n-point and n-side Polygons. A polygon may be regarded as determined by the joins of points or the meets of lines. The termination -gram is often applied to the figures determined by lines, e.g. pentagram, hexagram. It is of interest to know how many polygons can be formed with n given points as vertices (no three of which are collinear), or with n given lines as sides (no two of which are parallel) . Considering the case of points it is obvious that we can join a chosen point with any one cf the remaining (it — 1) points; any one of these (n — 1) points can be joined to any one of the remaining (n— 2), and by proceeding similarly it is seen that we can pass through the n points in (n — 1) («— 2) . . . 2-1 or (re — 1)! ways. It is obvious that the direction in which we pass is immaterial ; hence we must divide this number by 2, thus obtaining (n — 1)!/2 as the required number. In a similar manner it may be shown that the number of polygons determined by n lines is (re — 1)!/2. Thus five points or lines determine 12 pentagons, 6 points or lines 60 hexagons, and so on.

Mensuration. — In the regular polygons the fact that they can be inscribed and circumscribed to a circle affords convenient expressions for their area, &c. In a w-gon, i.e. a polygon with re-sides, each side subtends at the centre the angle 2ir/re, i.e. 36o°/«, and each internal angle is (n—2)ir/n or (re — 2) i8o°/n. Calling the length of side a we may derive the following relations: Area

Number

3

4

5

6

7

8

9

10

n

12

of sides.

Triangle.

Square.

Pentagon.

Hexagon.

Heptagon.

Octagon.

Nonagon.

Decagon.

Undecagon.

Dodecagon.

a

6o°

90°

108

120°

128$°

135°

140

144

147°

i5 °:

120

90°

72

6o°

5if°

45°

40°

36°

32t 8 t°

30°

A

0-43301

1

1-72048

2-59808

3-6339I

4-82843

6-18182

7-69421

9-36564

11-19615

R

o-S7735

0-70710

0-85065

1

1-1523

1-3065

1-4619

1-6180

1-7747

1-9318

r

0-28867

o-5

0-68819

0-86602

1-0383

1-2071

1-3737

1-5388

1-7028

i-866o

■

26

POLYGONACEAE

(A) = \ aht cot (x/») ; radius of circum-circle ® = J a cosec (v/n) radius of in-circle {r) = %a cot (ir/n).

The table at foot of p, 1592 gives the value of the internal angle (a), the angle /S subtended at the centre by a side, area (A), radius of the circum-circle ®, radius of the inscribed circle ® for the simpler polygons, the length of the side being taken as unity.

POLYGONACEAE, in botany, a natural order of Dicotyledons, containing 30 genera with about 700 species, chiefly in the north temperate zone, and represented in Great Britain by three genera, Polygonum, Rumex (Dock, q.v.) and Oxyria. They are

mostly herbs characterized by the union of the stipules into a sheath or ocrea, which protects the younger leaves in the bud stage (fig. 1). Some are climbers, as, for instance, the British Polygonum Convolvulus (black bindweed). In Muehlenbeckia platyclada, a native of the Solomon Islands, the stem and branches are flattened, form- ing ribbon-like cladodes jointed at the nodes. The leaves are alter- nate, simple and generally entire; the edges are rolled back in the bud. They are generally smooth, but sometimes, especially in mountain species, woolly. The small regular, generally her- maphrodite flowers are borne in large numbers in compound inflorescences, the branches of which are cymose. The parts of the flower are whorled (cyclic) or acyclic. The former arrange- ment may be derived from a regular trimerous flower with two whorls of perianth leaves, two staminal whorls and a three-sided ovary — such a flower occurs in the Californian genus Pterostegia (fig. 2). The flower of rhubarb {Rheum) is derived from this by doubling in the outer staminal whorl (fig. 3), and

the three inner leaves enlarge and envelope the fruit as three membranous wings one or more of which bear on the back large fleshy warts. Less often, as in the South American genus Triplaris, the three outer perianth leaves form the agent of distribution, developing into long flat membranous wings, the whole mechanism suggesting a shuttlecock. The number of the carpels is indicated by the three-sided (in dimerous flowers two- sided) ovary, and the number of the styles; the ovary is uni- locular and contains a single erect ovule springing from the top of the floral axis (fig. 7). The fruit is a dry one-seeded nut, two-

Fig. 1. — Leaf of Polygonum, with part of stem (g, ocrea).

Fig. 2. — Pterostegia. Fig. 3. — Rheum. Fig. 4. — Rumex.

that of the dock {Rumex) by doubling in the outer staminal whorl and suppression of the inner (fig. 4). In Koenigia, a tiny annual less than

an inch high, native in the arctic and sub-arctic regions and the Himalayas, there is one perianth and one staminal whorl only. Dimerous whorled flowers occur in Oxyria (mountain sorrel), another arctic and alpine genus, the flowers of which resemble those of Rumex but are dimerous (fig. 5). In the acyclic flowers a 5-merous perianth is followed

Fig. 6. — Polygonum.

Fig. 7. — Dry one-seeded fruit

of dock {Rumex) cut vertically

(enlarged).

of, Pericarp formed from ovary wall.

i, Seed.

e. Endosperm.

Embryo with radicle point- ing upwards and cotyledons downwards.

Ph

by s to 8 stamens as in Polygonum (fig. 6) . The perianth leaves are generally uniform and green, whit – ? or red in colour. They are free or more or less united, and persist till the fruit is ripe, dften playing a part in its distribution, and affording useful characters for distinguishing genera or species. Thus in the docks

Fig. 8. Rumex obtusifolius, Common Dock.

1. Upper part of plant, showing the flowers.

2. Leaf from base of the stem.

3. Fruit enlarged.

4. Fruit of Rumex Acetosa (sorrel) (enlarged).

sided in bicarpellary flowers, as in Oxyria. The straight or curved embryo is embedded in a mealy endosperm. The flowers are wind-pollinated, as in the docks {Rumex), where they are pendulous on long slender stalks and have large hairy stigmas; or insect-pollinated, as in Polygonum or rhubarb {Rheum), where the stigmas are capitate and honey is secreted by glands near the base of the stamens. Insect-

pollinated flowers are rendered conspicuous chiefly by their aggregation in large numbers, as for instance in Bistort {Polygonum Bistorta), where the perianth is red and the flowers are crowded in a spike. In buckwheat {q.v., P. Fagopyrum) the numerous flowers have a white or red perianth and are perfumed; they are dimorphic, i.e. there are two forms of flowers, one with long styles and short stamens, the other with short styles and long stamens. In other cases self-pollination is the rule, as in knot-grass {P. aviculare), where the very small, solitary odourless flowers are very rarely visited by insects and pollinate themselves by the incurving of the three inner stamens on to the styles.

Polygonaceae is mainly a north temperate order. A few genera are tropical, e.g. Coccoloba, which has 125 species restricted to tropical and sub-tropical America. Polygonum has a very wide distribution spreading from the limits of vegetation in the northern hemisphere to the mountains of tropical Africa and South Africa, through the highlands of tropical Asia to Australia, and in America as far south as Chile. Most of the genera have, however, a limited distribution. Of the three which are native in the British Isles, Polygonum ha?

12 species; Rumex (fig. 8) (n species) includes the Various species of dock .(q.v.) and sorrel (R. Acetosa); and Oxyria digyna, an alpine plant (mountain sorrel), takes its generic name (Gr. 6&s, sharp) from the acidity of its leaves. Rheum (Rhubarb, q.v.) is central Asiatic.

POLYGONAL NUMBERS, in mathematics. Suppose we have a number of equal circular counters, then the number of counters which can be placed on a regular polygon so that the tangents to the outer rows form the regular polygon and all the internal counters are in contact with its neighbours, is a “polygonal number ” of the order of the polygon. If the polygon be a triangle then it is readily seen that the numbers are 3, 6, 10, 15 ... and generally \n {n + 1) ; if a square, 4, 9, 16, . . . and gener- ally n 2 ; if a pentagon, 5, 12, 22. . . and generally »(3»-i);.if a hexagon, 6, 15, 28, . .. and generally «(2 »-i); and similarly for a polygon of r sides, the general expression for the corresponding polygonal number is §m[(»— 1) (r — 2) + 2].

Algebraically, polygonal numbers may be regarded as the sums of consecutive terms oi the arithmetical progressions having 1 for the first term and 1, 2, 3, ... for the common differences. Taking unit common difference we have the series 1; 1 + 2 = 3; J + 2 + 3 T z 6 ‘ ,’ ^ 2 L + 3 + 4 = 10; or generally 1 + 2 + 3 • • ‘• + » = 3 n(»i + i) ; these

are triangular numbers. With a common difference 2 we have 1; 1 + 3 = 4! 1 + 3 + 5 = 91 i + 3 + 5 + 7 = i6; or generally 1 + 3 + 5 + ... + (2n i) = n 2 ; and generally for the polygonal number of the rth order we take the sums of consecu tive terms of the series

1. i + (r-2), 1 + 2 (r-2), . . . i + n-i.r-2; and hence the nth polygonal number of the rth order is the surr of n terms of this series, i.e.,

i + i + (r- 2) + i + 2(r-2) + . . . (i w _i. r _ 2) = « + jtt.n — i.r — 2. The series 1, 2. 3, 4, . . . or generally n, are the so-called ” linear numbers ” (cf. Figurate Numbers).

POLYHEDRAL NUMBERS, in mathematics. These numbers are related to the polyhedra (see Polyhedron) in a manner similar to the relation between polygonal numbers (see above) and polygons. Take the case of tetrahedral numbers. Let AB, AC, AD be three covertical edges of a regular tetrahedron. Divide AB, . . . into parts each equal to A 1, so that tetrahedra having the common vertex A are obtained, whose linear dimensions increase arithmetically. Imagine that we have a number of spheres (or shot) of a diameter equal to the distance Ai. It is seen that 4 shot having their centres at the vertices of the tetrahedron Ai will form a pyramid. In the case of the tetra- hedron of edge A 2 we require 3 along each side of the base, i.e. 6, 3 along the base of Ai, and 1 at A, making 10 in all. To add a third layer, we will require 4 along each base, i.e. 9, and 1 in the centre. Hence in the tetrahedron A3 we have 20 shot. The numbers 1,4, 10, 20 are polyhedral numbers, and from their association with the tetrahedron are termed “tetrahedral numbers.”

This illustration may serve for a definition of polyhedral numbers: a polyhedral number represents the number of equal spheres which can be placed within a polyhedron so that the spheres touch one another or the sides of the polyhedron.

In the case of the tetrahedron we have seen the numbers to be I 4, 10, 20; the general formula for the «th tetrahedral number is tn(n + i)(n + 2). Cubic numbers are 1, 8, 27, 64 12s &c • or generally n». Octahedral numbers are 1, 6, 19, 44, &c.,or generally 4«(2n 2 + i) Dodecahedral numbers are 1, 20, 84, 220, &c • or generally |«(9n 2 – 9 «+ 2). Icosahedral numbers are 1, 12 48 124, &c, or generally i»(5n 2 -5« + 2). ‘

POLYHEDRON (Gr. ttoXus, many, t8pa, a base), in geometry, a solid figure contained by plane faces. If the figure be entirely to one side of any face the polyhedron is said to be ” convex, ” and it is obvious that

the faces enwrap the centre once; if, on the other hand, the figure is to both sides of every face it is said to be ” concave, ” and the centre is multiply enwrapped by the faces. ” Regular polyhedra ” are such as have their faces all equal regular polygons, and all their solid angles equal; the term is

usually restricted to the five forms in which the centre is singly enclosed, viz. the Platonic solids, while the four polyhedra in which the centre is multiply enclosed are referred to as the Kepler-Poinsot solids, Kepler having discovered three, while Poinsot discovered the fourth. Another group of polyhedra are termed the ” Archimedean solids,” named after Archimedes, who, according to Pappus, invented them. These have faces which are all regular polygons, but not all of the same kind, while all their solid angles are equal. These figures are often termed ” semi-regular solids,” but it is more convenient to restrict this term to solids having all their angles, edges and faces equal, the latter, however, not being regular polygons.

Platonic Solids. The names of these five solids are: (1) the tetrahedron, enclosed by four equilateral triangles; (2) the cube or hexahedron, enclosed by 6 squares; (3) the octahedron, enclosed by 8 equilateral triangles; (4) the dodecahedron, en- closed by 12 pentagons; (5) the icosahedron, enclosed by 20 equilateral triangles.

The first three were certainly known to the Egyptians; and it is probable that the icosahedron and dodecahedron were added by the Greeks. The cube may have originated by placing three equal squares at a common vertex, so as to form a trihedral angle. Two such sets can be placed so that the free edges are brought into coincidence while the vertices are kept distinct. This solid has therefore 6 faces, 8 vertices and 12 edges. The equi- lateral triangle is the basis of the tetrahedron, octahedron and icosahedron. 1 If three equilateral triangles be placed at a common vertex with their covertical sides coincident in pairs, it is seen that the base is an equal equilateral triangle; hence four equal equilateral triangles enclose a space. This solid has 4 faces, 4 vertices and 6 edges. In a similar manner, four covertical equilateral triangles stand on a square base. Two such sets placed base to base form the octahedron, which consequently has 8 faces, 6 vertices and 12 edges. Five equilateral triangles coverti- cally placed would stand on a pentagonal base, and it was found that, by forming several sets of such pyramids, a solid could be obtained which had 20 triangular faces, which met in pairs to form 30 edges, and in fives to form 12 vertices. This is the icosahedron. That the triangle could give rise to no other

solid followed from the fact that six covertically placed triangles formed a plane. The pentagon is the basis of the dodecahedron. Three pentagons may be placed at a common vertex to form a solid angle, and by forming several such sets and placing them in juxtaposition a solid is obtained having 12 pentagonal faces, 30 edges, and 20 vertices.

These solids played an important part in the geometry of the Pythagoreans, and in their cosmology symbolized the five ele- ments: fire (tetrahedron), air (octahedron), water (icosahedron), earth (cube), universe or ether (dodecahedron). They were also discussed by the Platonists, so much so that they became known as the ” Platonic solids.” Euclid discusses them in the thirteenth book of his Elements, where he proves that no more regular bodies are possible, and shows how to inscribe them in a sphere. This latter problem received the attention of the Arabian astronomer Abul Wefa (10th century a.d.), who solved it with a single opening of the compasses.

Mensuration of the Platonic Solids.— The mensuration of the regular polyhedra is readily investigated by the methods of elementary geometry the property that these solids may be inscribed in and circumscribed to concentric spheres being especially useful.

If F be the number of faces, n the number of edges per face, m the number of faces per vertex, and / the length, of an edge, and if we denote the angle between two adjacent faces by I, the area by A the volume by V, the radius of the circum-sphere by R, and of the ln-sphere by r, the following general formulae hold, a being written for 2-ir/n, and for 2ir/m : —

Sin |I =cos 0/sin a; tan §1 =cos 0/(sin 2 o-cos 2 0)1.

A = t PnF cot a. V = irA = fal’n F tan JI cot 2 a

= iil l n F cot 2 a cos 0/(sin 2 a— cos 2 0)|. R = |/ tan §1 tan = \l sin 0/(sin 2 a-cos 2 0)1. r = \l tan \ cot a = jl cot a cos 0/(sin 2 a-cos 2 0)1.

1 In the language of Proclus, the commentator: ” The equilateral triangle is the proximate cause of the three elements, ‘ fire,’ ‘ air ‘ and water ‘ ; but the square is annexed to the ‘ earth.’ ”

The following Table gives the values of A, V, R, r for the five Polyhedra:

A. Area.

Volume V.

Radius of Circum-sphere. R.

Radius of In-sphere. r.

P.V3 (I-732I P)

Z 3 /6V2

(0-11785/’)

/. V6/4

/.V6/12

Cube

6P

P

/.V3/2

¥

Octahedron

P.2V3 (3-4642 P)

/ 3 -V2/3 (0-47140 I 3)

IN 2

IN 6

Dodecahedron ….

/ 2 .i5V(i + 2V5) (20-64578 P)

‘ 3 -5Vi(47 + 2iV5)/40|

(7-663119 / 3)

/■W((5 + 3V5)/2)

/.V{(20 + nV5)/4o!

Icosahedron

P-5V3 (8-6605 P)

/ 3 -fVK7 + 3V5)/2i (2-18169 I 3)

/■IVi(5 + V5)/2!

UV{(7 + 3V5)/6)

Kepler- Poinsot Polyhedra. — These solids have all their faces equal regular polygons, and the angles at the vertices all equal. They bear a relation to the Platonic solids similar to the relation of ” star polygons ” to ordinary regular polygons, inasmuch as the centre is multiply enclosed in the former and singly in the latter. Four such solids exist: (1) small stellated dodecahedron; (2) great dodecahedron; (3) great stellated dodecahedron; (4) great icosahedron. Louis Poinsot discussed these solids in his memoir, ” Sur les polygones et les polyedres ” (Journ. Ecole poly, [iv.] 1810), three of them having been previously considered by Kepler. They were afterwards treated by A. L. Cauchy {Journ. Ecole poly, [ix.] 1813), who showed that they were derived from the Platonic solids, and that no more than four were possible. A. Cayley treated them in several papers (e.g. Phil. Mag., 1859, 17, p. 123 seq.), considering them by means of their projections on the circumscribing sphere and not, as Cauchy, in solido.

The small stellated dodecahedron is formed by stellating the Platonic dodecahedron (by ” stellating ” is meant developing the faces contiguous to a specified base so as to form a regular pyramid). It has 12 pentagonal faces, and 30 edges, which intersect in fives to form 12 vertices. Each vertex is singly enclosed by the five faces; the centre of each face is doubly enclosed by the succession of faces about the face ; and the centre of the solid is doubly enclosed by the faces. The great dodecahedron is determined by the intersections of the twelve planes which intersect the Platonic icosahedron in five of its edges; or each face has the same boundaries as the basal sides of five covertical faces of the icosahedron. It is the reciprocal (see below) of the small stellated dodecahedron. Each vertex is doubly enclosed by the succession of covertical faces, while the centre of the solid is triply enclosed by the faces. The great stellated dodecahedron is formed by stellating the faces of a great dodecahe- dron. It has 12 faces, which meet in 30 edges; these intersect in threes to form 20 vertices. Each

vertex is singly enclosed by the succession of faces about it ; and the centre of the solid is quadruply enclosed by the faces. The great icosahedron is the reciprocal of the great stellated dodecahedron. Each of the twenty triangular faces subtend at the centre the same angle as is subtended by four whole and six half faces of the Platonic icosahedron ; in other words, the solid is determined by the twenty planes which can be drawn through the vertices of the three faces contiguous to any face of a Platonic icosahedron. The centre of the solid is septuply enclosed by the faces.

A connexion between the number of faces, vertices and edges of regular polyhedra was discovered by Euler, and the result, which assumes the form E f 2: = F + V, where E, F, V are the number of edges, faces and vertices, is known as Euler's theorem on poly hedra. This formula only holds for the Platonic solids. Poinsot gave the formula E + 2k = eV + F, in which k is the number of times the projections of the faces from the centre on to the surface of the circumscribing sphere make up the spherical surface, the area of a stellated face being reckoned once, and e is the ratio " angles at a vertex /2ir" as projected on the sphere, E, V, F being the same as before. Cayley gave the formula E + 2D = eV + e'F, where e, E, V, F are the same as before, D is the same as Poinsot's k with the distinction that the area of a stellated face is reckoned as the sum of the triangles having their vertices at the centre of the face and standing on the sides, and e' is the ratio: " the angles subtended at the centre of a face by its sides /2ir."

The following table gives these constants for the regular poly- hedra ; n denotes the number of sides to a face, ni the number of faces to a vertex : —

F

V

E

n

«1

e

e'

D

k

Tetrahedron …...

Cube

Octahedron

Dodecahedron

Icosahedron ….

4

6

8

12

20

4

8

6

20

12

6 12 12

3°

30

3 4 3 5 3

3 3 4 3 5

1 1 1 1 1

Small stellated dodecahedron . Great dodecahedron Great stellated dodecahedron . Great icosahedron ….

12 12 12 20

12 12 20 12

30

3°

30 30

5 5 5 3

5 5 3 5

1 2 1

2

2 1 2 1

3 3

7 7

2 3 4 7

Archimedean Solids. — These solids are characterized by having all their angles equal and all their faces regular polygons, which are not all of the same species. Thirteen such solids exist.

1. The truncated tetrahedron is formed by truncating the vertices of a regular tetrahedron so as to leave the original faces hexagons. (By the truncation of a vertex or edge we mean the cutting away of the vertex or edge by a plane making equal angles with all the faces composing the vertex or with the two faces forming the edge.) It is bounded by 4 triangular and 4 hexagonal faces; there are 18 edges, and 12 vertices, at each of which two hexagons and one triangle are covertical.

2. The cuboctahedron is a tesserescae-decahedron (Gr. rco-o-apes-Kai-Sata, fourteen) formed by truncating the vertices of a cube so as to leave the original faces squares. It is enclosed by 6 square and 8 triangular faces, the latter belonging to a coaxial octahedron. It is a common crystal form.

3. The truncated cube is formed in the same manner as the cuboctahedron, but the truncation is only carried far enough to leave the original faces octagons. It has 6 octagonal faces (belonging to the original cube), and 8 triangular ones (belonging to the coaxial octahedron).

4. The truncated octahedron is formed by truncating the vertices of an octahedron so as to leave the original faces hexagons; con- sequently it is bounded by 8 hexagonal and 6 square faces.

5. 6. Rhombicuboctahedra. — Two Archimedean solids of 26 faces are derived from the coaxial cube, octahedron and semi- regular (rhombic) dodecahedron (see below). The ” small rhombi- cuboctahedron ” is bounded by 12 pentagonal, 8 triangular and 6 square faces; the ” great rhombicuboctahedra ” by 12 decagonal, 8 triangular and 6 square faces.

7. The icosidodecahedron or dyocaetriacontahedron (Gr. dvo-Kai-TptaKovra, thirty-two), is a 32-faced solid, formed by truncating the vertices of an icosahedron so that the original faces become triangles. It is enclosed by 20 triangular faces belonging to the original icosa- hedron, and 12 pentagonal faces belonging to the coaxial dodecahe- dron.

8. The truncated icosahedron is formed similarly to the icosidode- cahedron, but the truncation is only carried far enough to leave the original faces hexagons. It is therefore enclosed by 20 hexagonal faces belonging to the icosahedron, and 12 pentagonal faces belonging to the coaxial dodecahedron.

9. .The truncated dodecahedron is formed by truncating the vertices of a dodecahedron parallel to the faces of the coaxial icosahedron so as to leave the former decagons. It is enclosed by 20 triangular faces belonging to the icosahedron and 12 decagons belonging to the dodecahedron.

10. The snub cube is a 38-faced solid having at each corner 4 tri- angles and I square; 6 faces belong to a cube, 8 to the’eoaxial octahedron, and the remaining 24 to no regular solid.

11. 12. The rhombicosidodecahedra. — Two 62-faced solids are derived from the dodecahedron, icosahedron and the semi-regular

triacontahedron. In the ” small rhombicosidodecahedron ” there are 12 pentagonal faces belonging to the dodecahedron, 20 triangular faces belonging to the icosahedron and 30 square faces belonging to the triacontahedron. In the ” great rhombicosidodecahedron ” the dodeeahedral faces are decagons, the icosahedral hexagons and the

triacontahedral squares; this solid is sometimes called the ” truncated icosidodecahedron.”

13. The snub dodecahedron is a 92-faced solid having 4 triangles and a pentagon at each corner. The pentagons belong to a dodeca- hedron, and 20 triangles to an icosahedron ; the remaining 60 triangles belong to no regular solid.

Semi-regular Polyhedra. — Although this term is frequently given to the Archimedean solids, yet it is a convenient de- notation for solids which have all their angles, faces, and edges equal, the faces not being regular polygons. Two such solids exist: (1) the “rhombic dodecahedron,” formed by trun- cating the edges of a cube, is bounded by 12 equal rhombs; it is a common crystal form (see Crystallography); and (2) the ” semi-regular triacontahedron,” which is enclosed by 30 equal rhombs.

The interrelations of the polyhedra enumerated above are con- siderably elucidated by the introduction of the following terms: (1) Correspondence. Two polyhedra correspond when the radii vectores from their centres to the mid-point of the edges, centre of the faces, and to the vertices, can be brought into coincidence. (2) Reciprocal. Two polyhedra are reciprocal when the faces and ver- tices of one correspond to the vertices and faces of the other. (3) Summital or facial. A polyhedron (A) is said to be the summital or facial holohedron of another (B) when the faces or vertices of A correspond to the edges of B, and the vertices or faces of A corre- spond to the vertices and faces together of B. (4) Hemihedral. A polyhedron is said to be the hemihedral form of another poly- hedron when its faces correspond to the alternate faces of the latter or holohedral form; consequently a hemihedral form has half the number of faces of the holohedral form. Hemihedral forms are of special importance in crystallography, to which article the reader is referred for a fuller explanation of these and other modifications of polyhedra (tetartohedral, enantiotropic, &c).

It is readily seen that the tetrahedron is its own reciprocal, i.e. it is self-reciprocal ; the cube and octahedron, the dodecahedron and icosahedron, the small stellated dodecahedron and great dodeca- hedron, and the great stellated dodecahedron and great icosahedron are examples of reciprocals. We may also note that of the Archime- dean solids: the truncated tetrahedron, truncated cube, and trun- cated dodecahedron, are the reciprocals of the crystal forms triakis- tetrahedron, triakisoctahedron and triakisicosahedron. Since the tetrahedron is the hemihedral form of the octahedron, and the octa-

hedron and cnbe are reciprocal, we may term these two latter solids ” reciprocal holohedra ” of the tetrahedron. Other examples of reciprocal holohedra are: the rhombic dodecahedron and cubocta- hedron, with regard to the cube and octahedron; and the semi- regular triacontahedron and icosidodecahedron, with regard to the dodecahedron and icosahedron. As examples of facial holohedra we may notice the small rhombicuboctahedron and rhombic dode- cahedron, and the small rhombicosidodecahedron and the semi- regular triacontahedron. The correspondence of the faces of poly- hedra is also of importance, as may be seen from the manner in which one polyhedron may be derived from another. Thus the faces of the cuboctahedron, the truncated cube, and truncated octahe- dron, correspond; likewise with the truncated dodecahedron, trun- cated icosahedron, and icosidodecahedron; and with the small and great rhombicosidodecahedra.

The general theory of polyhedra properly belongs to combinatorial analysis. The determination of the number of different polyhedra of n faces, i.e. n-hedrons, is reducible to the problem : In how many ways can multiplets, i.e. triplets, quadruplets, &c, be made with n symbols, so that (1) every contiguous pair of symbols in one multiplet are a contiguous pair in some other, the first and last of any mul- tiplet being considered contiguous, and (2) no three symbols in any multiplet shall occur in any other. This problem is treated by the Rev T. P. Kirkman in the Manchester Memoirs (1855, 1857- 1860); and in the Phil. Trans. (1857).

See Max Bruckner, Vielecke und Vielflache (1900) ; V. Eberhard, Zur Morphologie der Polyeder (1891).

POLYMETHYLENES, in chemistry, cyclic compounds, the simplest members of which are saturated hydrocarbons of general formula C„H 2 „, where n may be 1 to 9, and known as tri-, tetra-, penta-, hexa-, and hepta-methylene, &c, or cyclo- propane, -butane, -pentane, -hexane, -heptane, &c. : —

/CH,, CH 2 -CH 2 XH 2 -CH 2 .CH 2 -CH 2V

CH< .| I I CH 2 < I I CH< >CH 2 ,&c.

X CH 2 , CH 2 C-H 2 \CH 2 -CH 2 , \CH 2 -CIl/

Cyc/o-propane, -butane, -pentane, -hexane.

The unsaturated members of the series are named on the

Geneva system in which the termination -ane is replaced by-ene, -diene, -triene, according to the number of double linkages in the compound, the position of such double linkages being shown by a numeral immediately following the suffix -ene\ for example I. is methyl-cyc/o-hexadiene — 1. 3. An alterna- tive method employs A. v. Baeyer's symbol A. Thus A 2-4 indicates the presence of two double bonds in the molecule situated immediately after the carbon atoms 2 and 4; for example II. is A 2-4 dihydrophthalic acid.

(2) (3) (2) (3)

,, CH-CH ˆ /C(C0 2 H):CH>

(i)CH r c{ >CH(4),(i)H0 2 C-CH/ >CH(4).

'\,

CHrCH,/

(6) (5)

I.

\CH 2 CH/

(6) (5)

II.

As to the stability of these compounds, most trimethylene derivatives are comparatively unstable, the ring being broken fairly readily; the tetramethylene derivatives are rather more stable and the penta- and hexa-methylene compounds are very stable, showing little tendency to form open chain compounds under ordinary conditions (see Chemistry: Organic).

Isomerism. — No isomerism can occur in the monosubstitution derivatives but ordinary position isomerism exists in the di- and poly-substitution compounds. Stereo-isomerism may occur: the simplest examples are the dibasic acids, where a cis- (maleinoid) form and a trans- (fumaroid) form have been ob- served. These isomers may frequently be distinguished by the facts that the m-acids yield anhydrides more readily than the trans-acids, and are generally converted into the trans-acids on heating with hydrochloric acid. O. Aschan (Ber., 1902, 35, p. 3389) depicts these cases by representing the plane of the carbon atoms of the ring as a straight line and

denoting the substituted hydrogen atoms by the letters X, Y, Z. Thus for dicarboxylic acids (C0 2 H = X) the possibilities are represented by

(cis), ˆ (trans),. jr (I).

The trans compound is perfectly asymmetric and so its mirror image (I) should exist, and, as all the trans compounds syn- thetically prepared are optically inactive, they are presumably racemic compounds (see O. Aschan, Chemie der alicyklischen Verbindungen, p. 346 seq.).

General Methods of Formation. — Hydrocarbons may be ob- tained from the dihalogen paraffins by the action of sodium or zinc dust, provided that the halogen atoms are not attached to the same or to adjacent carbon atoms (A. Freund, Monats., 1882, 3, p. 625; W. H. Perkin, jun., Journ. Chem. Soc, 1888, 53, p. 213):—

CH r CHrBr , „ v oM c , CH 2 -CH 2 CH 2 .CH 2 -Br+ 2Na = 2NaBr +CH 2 .CH 2 ;

by the action of hydriodic acid and phosphorus or of phos- phonium iodide on benzene hydrocarbons (F. Wreden, Ann., 1877, 187, p. 153; A. v. Baeyer, ibid., 1870, 155, p. 266), ben- zene giving methylpentamethylene ; by passing the vapour of benzene hydrocarbons over finely divided nickel at 180-250 C. (P. Sabatier and J. B. Senderens, Comptes rendus, 1901, 132, p. 210 seq.); and from hydrazines of the type C n H 2 „_i-NH-NH 2 by oxidation with alkaline potassium ferricyanide (N. Kijner, Journ. prak. Chem., 1901, 64, p. 113). Unsaturated hydro- carbons of the series may be prepared from the corre- sponding alcohols by the elimination of a molecule of water, using either the xanthogenic ester method of L. Tschugaeff (Ber. 1899, 32, p. 3332): CnHˆONa-ˆCnHzn-iO-CS-SNaCR) — 3 > C„H 2 „_ 2 -|-COS-)-R'SH; or simply by dehydrating with anhydrous oxalic acid (N. Zelinsky, Ber., 1901, 34, p. 3249); and by eliminating the halogen acid from mono- or di-halogen polymethylene compounds by heating them with quinoline.

Alcohols are obtained from the corresponding halogen com- pounds by the action of moist silver oxide, or by warming them with silver acetate and acetic acid; by the reduction of ketones with metallic sodium; by passing the vapours of monohydric phenols and hydrogen over finely divided nickel (P. Sabatier and J. B. Senderens, loc. cil.); by the reduction of cyclic esters with

sodium and alcohol (L. Bouveault and G. Blanc, Comptes renins, 1903. 136, P- 1676; 137, p. 60); and by the addition of the elements of water to the unsaturated cyclic hydrocarbons on boiling with dilute acids.

Aldehydes and Ketones. — The aldehydes are prepared in the usual manner from primary alcohols and acids. The ketones are obtained by the dry distillation of the calcium salts of di- basic saturated aliphatic acids (J. Wislicenus, Ann., 1893, 275, p. 309): [CH a -CH 2 C0 2] 2 Ca > [CH 2 -CH 2] !! CO; by the action of sodium on the esters of acids of the adipic and pimelic acid series (W. Dieckmann, Ber., 1894, 27, pp. 103, 2475): —

CH 2 -CH 2 -CH 2 -C0 2 R CH 2 -CH 2 -CH 2 .

CH 2 -CH 2 -C0 2 R ~*CH 2 -CH 2 C-0 ‘ by the action of sodium ethylate on 5-ketonic acids (D. Vor- lander, Ber., 1895, 28, p. 2348) : —

,CH 2 -CH 2 . /CH 2 -CH 2X

CH

> CO;

< x C0 2 H-> CH,. ..

X CO-CH 3 \CO-CH 2 /

from sodio-malonic ester and aj3-unsaturated ketones or ketonic esters: —

,CH 2 CO

(R0 2 C) 2 CH 2 + Ph-CH :CH-COCHfr_> PhCIl

V

CH 2

ˆCH(C0 2 R)-CO-

from aceto-acetic ester and esters of a/3-unsaturated acids, followed

by elimination of the carboxyl group : —

/CH 2 *CR 2\ CH 3 -CO-CH 2 -CO 2 R + R' 2 C:CH-C0 2 R- > CO <
> CHC0 2 R;

\CH 2 -CO /

by the condensation of two molecules of aceto-acetic ester with aldehydes followed by saponification (E. Knoevenagel, Ann., 1894, 281, p. 25; 1896, 288, p. 321; .Ber., 1904, 37, p. 4461):—

,CH 2 -CHR' X 2CH 3 -CO-CH 2 -C0 2 R + OHOR'-»CH 3 -c/ > CH 2 ;

»CH — CO / from 1 • 5-diketones which contain a methyl group next the keto-group (W. Kerp, Ann., 1896, 290, p. 123): —

/CH 2 -C(CH 3)

3CH 3 -CO-CHs-»(CH 3) 2 C <

CH 2

-co/

CH;

by the condensation of succinic acid with sodium ethylate, fol- lowed by saponification and elimination of carbon dioxide: —

„/-• ur tr*r\ tli\ CH 2 -CH 2 -CO

2C 2 H 4 (C0 2 H)^ Co . CHi . fcHt ;

and from the condensation of ethyl oxalate with esters of other dibasic acids in presence of sodium ethylate (W. Dieckmann, Ber., 1897, 30, p. 1470; 1899, 32, p. 1933):—

C0 2 R y C0 2 R CO-CH 2 .

.! + CH < _> I \CH 2 .

C0 2 R x C0 2 R CO-CH/

Acids may be prepared by the action of dihalogen paraffins on sodio-malonic ester, or sodio-aceto-acetic ester (W. H. Perkin, jun., Journ. Chem. Soc, 1888, 53, p. 194) : —

C 2 H 4 Br 2 +2NaCH(C0 2 R) 2 -*(CH 2) 2 C(C0 2 R) 2 +CH 2 (C0 2 R) 2 ; ethyl butane tetracarboxylate is also formed which may be converted into a tetramethylene carboxylic ester by the action of bromine on its disodium derivative (W. H. Perkin and Sinclair, ibid., 1829, 61, p. 36). The esters of the acids may also be obtained by condensing sodio-malonic ester with a-halogen derivatives of unsaturated acids: —

CH-CO R CHs-CH:CBr-C0 2 R4-NaCH(C0 2 R) 2 -»CH 3 -CH< / .| * ;

X C(C0 2 R) 2 by the action of diazomethane or diazoacetic ester on the esters of unsaturated acids, the pyrazoline carboxylic esters so formed losing nitrogen when heated and yielding acids of the cyclo-propane series (E. Buchner, Ber., 1890, 23, p. 703; Ann., 1895, 284, p. 212; H. v. Pechmann, Ber., 1894, 27, p. 1891): — ™. T CH-C0 2 R N:N-CH-C0 2 R /CHC0 2 R

CH 2 N 2 + II -► I ■ I -»H,c/ ;

CH-C0 2 R H 2 C— CH-C0 2 R X:HC0 2 R

and by the Grignard reaction (S. Malmgren, Ber., 1903, 36, pp. 668, 2622; N. Zelinsky, ibid., 1902, 35, p. 2687).

Cyclo-propane Group.

Trimethylene, C 3 H 6 , obtained by A. Freund (Monats., 1882, 3, p. 625) by heating trimethylene bromide with sodium, is a gas, which may be liquefied, the liquid boiling at —35° C. (749 mm.). It dissolves gradually^ in concentrated sulphuric acid, forming propyl sulphate. Hydriodic acid converts it into w-propyl iodide. It is decomposed by chlorine in the presence of sunlight, with explosive violence. It is stable to cold potassium permanganate.

Cyclo-propane carboxylic acid, C 3 H s -C0 2 H, is prepared by heating the 1 . 1 -dicarboxylic acid ; and by the hydrolysis of its nitrile, formed by heating 7-chlorbutyro-nitrilewith potash (L. Henry and P. Dalle, Chem. Centralblatt, 1901, I, p. 1357; 1902, 1, p. 913). It is a colour- less oil, moderately soluble in water.

The 1.1 dicarboxylic acid is prepared from ethylene dibromide and sodio-malonic ester. The ring is split by sulphuric or hydrobromic acids. The cis 1.2-cyclo-propane dicarboxylic acid is formed by eliminating carbon dioxide from cycfo-propane tricarboxylic acid -1.2.3 (from a/3-dibrompropionic ester and sodio-malonic ester). The trans-acid is produced on heating pyrazolin-4.5-dicarboxylic ester, or by the

action of alcoholic potash on o-bromglutaric ester. It does not yield an anhydride.

Cyclo-butane Group. Cyclo-butane, C 4 H 8 , was obtained by R. Willstatter (Ber., 1907, 40, p. 3979) by the reduction of cyclobutene by the Sabatier and Senderens method. It is a colourless liquid which boils at 1 1-12 C„ and its vapour burns with a luminous flame. Reduction at 180- 200° C. by the above method gives w-butane.

Cyclo-butene, C 4 H 6 , formed by distilling trimethyl-cye/o-butyl-ammonium hydroxide, boils at 1.5-2.0° C. (see N. Zelinsky, ibid., p. 4744; G. Schweter, ibid., p. 1604).

When sodio-malonic ester is condensed with trimethylene bromide the chief product is ethyl pentane tetracarboxylate, tetramethylene l.l-dicarboxylic ester being also formed, and from this the free acid may be obtained on hydrolysis. It melts at 154-156° C, losing carbon dioxide and passing into cye/o-butane carboxylic acid, C 4 H 7 C0 2 H. This basic acid yields a monobrom derivative which, by the action of aqueous potash, gives the corresponding hydroxy- cyc/o-butane carboxylic acid, C 4 H 6 (OH)-C0 2 H. Attempts to elimi- nate water from this acid and so produce an unsaturated acid were unsuccessful; on warming with sulphuric acid, carbon monoxide is eliminated and cycfo-butanone (keto-tetramethylene) is probably formed.

The truxillic acids, C J8 H. 6 4 , which result by the hydrolytic split-ting of truxilline, C 38 H 46 N 2 8 , are phenyl derivatives of cyc/o-butane. Their constitution was determined by C. Liebermann (Ber., 1888, 21, p. 2342; 1889, 22, p. 124 seq.). They are polymers of cinnamic acid, into which they readily pass on distillation. The o-acid on oxidation yields benzoic acid, whilst the /3-acid yields benzil in _ addition. The a-acid is diphenyl-24-cycfo-butane dicarboxylic acid -1.3; and the /3-acid diphenyl-34-cyclo-butane dicarboxylic acid -1.2. By alkalis they are transformed into stereo-isomers, the a-acid giving -y-truxillic acid, and the /3-acid S-truxillic acid. The o-acid was synthesized by C. N. Riiber (Ber., 1902, 35, p. 241 1; I9°4. 37. P-2274), by oxidizing diphenyl-2.4-cydo-butane-bismethy- lene malonic acid (fron cinnamic aldehyde and malonic acid in the presence of quinoline) with potassium permanganate.

Cyclo-/>e»toree Group. Derivatives may be prepared in many cases by the breaking down of the benzene ring when it contains an accumulation of negative atoms (T. Zincke, Ber., 1886-1894; A. Hantzsch, Ber., 1887, 20, p. 2780; 1889, 22, p. 1238), this type of reaction being generally brought about by the action of chlorine on

phenols in the presence of alkalis (see Chemistry: Organic). A somewhat related example is seen in the case of croconic acid, which is formed by the action of alkaline oxidizing agents on hexa-oxybenzene : —

HO-C-C(OH):C(OH) HO-C-CO-CO HO-C-CO.

HO-C-C(OH) ; C(OH) HO-C-CO-CO HO-C-CO^ Hexa-oxybenzene. Rhodizonic acid. Croconic acid. Cyc\o-pentane, C5H10, is obtained from cycfo-pentanone by reducing it to the corresponding secondary alcohol, converting this into the iodo-compound, which is finally reduced to the hydrocarbon (J. Wislicenus, Ann., 1893, 275, p. 327). It is a colourless liquid which boils at 50-51° C. Methyl-cyclo-pentane, C 6 H 9 CH 3 , first obtained by F. Wreden (Ann., 1877, 187, p. 163) by the action of hydriodic acid and red phosphorus on benzene, and considered to be hexahydro- benzene, is obtained synthetically by the action of sodium on' 1-5 dibromhexane ; and by the action of magnesium on acetylbutyl iodide (N. Zelinsky, Ber., 1902, 35, p. 2684). It is a liquid boiling at 72° C. Nitric acid (sp. gr. 1-42) oxidizes it to succinic and acetic acids. Cyclo-pentene, C 6 H S , a liquid obtained by the action of alcoholic potash on iodo-cycio-pentane, boils at 45° C. Cyclo- pentadiene, C 6 H 6 , is found in the first runnings from crude benzene distillations. _ It is a liquid which boils at 41° C. It rapidly poly- merizes to di-cyc/o-pentadiene. The -CH 2 – group is very reactive and behaves in a similar manner to the grouping -CO-CH 2 CO in open chain compounds, e.g. with aldehydes and ketones it gives the

POLYMETHYLENES

3i

fulvenes, substances characterized by their intense orange-red colour

HC:CH (J.Thiele, Ber., 1900, 33, p. 669). Phenylfulven, I >C:CHPh,

HCtCH 7 obtained from benzaldehyde and cyc/o-pentadiene, forms dark red plates. Diphenylfulven, from benzophenone and cyc/o-pentadiene, crystallizes in deep red prisms. Dimethylfulven is an orange- coloured oil which oxidizes rapidly on exposure. Concentrated sulphuric acid converts it into a deep red tar.

Cydo-pentanone, C 6 H 8 0, first prepared pure by the distillation of calcium adipate (J. Wislicenus, Ann., 1893, 275, p. 312), is also ob-tained by the action of sodium on the esters of pimelic acid; by the distillation of .calcium succinate; and by hydrolysis of the cyclo-

pentanone carboxylic acid, obtained by condensing adipic and oxalic esters in the presence of sodium ethylate. Reduction gives cyc/o-pentanol, C5H9OH.

Croconic acid (dioxy-cyc/o-pentene-trione) , C5H2OS, is formed when triquinoyl is boiied with water, or by the oxidation of hexa-oxybenzene or dioxydiquinoyl in alkaline solution (T. Zincke, Ber., 1887, 20, p. 1267). It has the character of a quinone. On oxidation it yields cyc/o-pentane-pentanone (leuconic acid).

Derivatives of the cye/o-pentane group are met with in the break- ing-down products of the terpenes (q.v.).

Campholactone, QH14O2, is the lactone of trimethyl-2-2-3-cyc/o-pentanol-5-carboxylic acid-3. For an isomer, isocampholactone (the lactone of trimethyl-2-2-3-cyc/o-pentanol-3-carboxylic acid-i) see W. H. Perkin, jun., Proc. Chem. Soc, 1903, 19, p. 61. Lauronolic acid, C9H14O5, is trimethyl-2-2-3-cyc/o-pentene-4-acid-i. Isolauro- nolic acid, C9H14O2, is trimethyl-2-2-3-cyc/o-pentene-3-acid-4.

Campholic acid, CioH 18 02, is tetrametnyl-i-2-2-3-cyc/o-pentane acid-3. Camphononic acid, CjHuOa, is trimethyl-2-2-3-cyc/o-penta-none- 1 -carboxylic acid-3. Camphorphorone, C 9 Hi40, is methyl-2-isobuty-lene-5-cyc/o-pentanone-i. Isothujone, Ci Hi 6 O, is dim- ethyl-i-2-isopropyl-3-cycto-pentene-l-one-5. (F. W. Semmler, Ber., I9°°, 33, p. 275.)

L. Bouveault and G. Blanc (Comples rendus, 1903, 136, p. 1460), prepared hydrocarbons of the cyc/o-pentane series from cyclo- hexane compounds by the exhaustive methylation process of A. W. Hofmann (see Pyridine). For phenyl derivatives of the cyclo- pentane group see F. R. Japp, Jour. Chem. Soc, 1897, 71, pp. 139, 144; H. Stobbe, Ann., 1901, 314, p. in; 315, p. 219 seq.; 1903, 326, p. 347.

Cydo-hexane Group. Hydrocarbons. — Cydo-hexane, or hexahydro benzene, C6H 12 , is obtained by the action of sodium on a boiling alcoholic solution of i-6-dibromhexane, and by passing the vapour of benzene, mixed with hydrogen, over finely divided nickel. It is a liquid with an odour like that of benzene. It boils at 80-81 ° C. Nitric acid oxidizes it to adipic acid. When heated with bromine in a sealed tube for some days at 150-200 C, it yields i-2-4‘5-tetrabrombenzene (N. Zelinsky, Ber., 1901, 34, p. 2803). It is stable towards halogens at ordinary temperature. Benzene hexachloride, C 6 H 6 C1 6 , is formed by the action of chlorine on benzene in sunlight. By recrystallization from hot benzene, the a form is obtained in large prisms which melt at

157 C, and at their boiling-point decompose into hydrochloric acid and trichlorbenzene. The /3 form results by chlorinating boiling benzene in sunlight, and may be separated from the a variety by distillation in a current of steam. It sublimes at about 310 C. Similar varieties of benzene hexabromide are known.

Hexakydrocymene (methyl-l-isopropyl-4-cyc/o-hexane), Ci H 2 o, is important since it is the parent substance of many terpenes (q.fl.). It is obtained by the reduction of 1-4 dibrommenthane with sodium (J. de Montgolfier, Ann. chim. phys., 1880 [5], 19, p. 158), or of cymene, limonene, &c, by Sabatier and Senderens's method. It is a colourless liquid which boils at 180 C.

Cydo-hexene (tetrahydrobenzene), C 6 H l0 , was obtained by A. v. Baeyer by removing the elements of hydriodic acid from iodo- cyc/o-hexane on boiling it with quinoline. It is a liquid which boils at 82 C. Hypochlorous acid converts it into 2-chlor-cyc/o-hexanol-i, whilst potassium permanganate oxidizes it to cyc/c-hexandi-ol.

Cydo-hexadiene (dihydrobenzene) , C«H g . — Two isomers are possible, namely cycto-hexadiene-i-3 and cycfo-hexadiene-i-4. A. v. Baeyer obtained what was probably a mixture of the two by heating I -4 dibrom-cyc/o-hexane with quinoline. C. Harries (Ann., 1903, 328, p. 88) obtained them tolerably pure by the dry distillation of the phosphates of l-3-diamino and l-4-diamino-cyc/o-hexane. The I -3 compound boils at 81-82° C. and on oxidation yields succinic and oxalic acids. The 1-4 compound also boils at 81-82° C. and on oxidation gives succinic and malonic acids.

Alcohols. — Cydo-hexanol, C«HuOH, is produced by the reduction of the corresponding ketone, or of the iodhydrin of quinite. Nitric acid oxidizes it to adipic acid, and chromic acid to cyc/o-hexanone. Quinite (cyc/o-hexanediol-l-4) is prepared by reducing the correspond- ing ketone with sodium amalgam, cm-, and ˆrani- modifications being obtained which may be separated by their acetyl derivatives. Phloroglucile _(cyc/o-hexane-triol-i-3-5) is obtained by reducing an aqueous solution of phloroglucin with sodium (W. Wislicenus, Ber., 1894, 27, p. 357). Quercile (cydo-hexane-pentol- i-2-3-4-5), isolated from acorns in 1849 by H. Braconnot (Ann. chim. phys. [3], 27,

392), crystallizes in colourless prisms which melt at 234° C. When heated in vacuo to 240° C. it yields hydroquinone, quinone and pyrogallol. It is dextro-rotatory. A laevo-form occurs in the leaves of Gymnema sylvestre (F. B. Power, Journ. Chem. Soc, 1904, 85, p. 624).

Inosite (cydo-hexane-hexol), CeH 6 (OH)e. — The inactive form occurs in the muscles of the heart and in other parts of the human body. The d-iortn is found as a methyl ether in pinite (from the juice of Pinus lambertina, and of caoutchouc from Mateza roritina of Madagascar), from which it may be obtained by heating with hydriodic acid. The Worm is also found as a methyl ether in quebrachite. By mixing the d- and I- forms, a racemic variety melting at 253° C. is obtained. A dimethyl ether of inactive inosite is dambonite which occurs in caoutchouc from Gabon.

Ketones. — Cydo-hexanone, CeH l0 O, is obtained by the distillation of calcium pimelate, and by the electrolytic reduction of phenol, using an alternating current. It is a colourless liquid, possessing a peppermint odour and boiling at 155° C. Nitric acid oxidizes it to adipic acid. It condenses under the influence of sulphuric acid to form dodecahydrotriphenylene, Ci ? H24, and a mixture of ketones (C. Mannul, Ber., 1907, 40, p. 153). M-ethyl-i-cydo-hexanone-$, CH 3 -C 6 H 9 0, is prepared by the hydrolysis of pulegone. It is an optically active liquid which boils at 168-169° C. Homologues of menthone may be obtained from the ketone by successive treatment with sodium amide and alkyl halides (A. Haller, Comples rendus, 1905, 140, p. 127). On oxidation with nitric acid (sp. gr. 1-4) at 60-70° C, a mixture of — and — -methyl adipic acids is obtained (W. Markownikoff, Ann., 1905, 336, p. 299). It can be transformed into the isomeric methyl-i-cydo-hexanone-2 (O. Wallach, Ann., 1904, 329, p. 368). For methyl-i-cydo-hexanone-4, obtained by distilling 7-methyl pimelate with lime, see O. Wallach, Ber., 1906, 39, p. 1492.

Cydo-hexane-dione-i-5 (dihydroresorcin), C«H 8 02, was obtained by G. Merling (Ann., 1894, 278, p. 28) by reducing resorcin in hot alcoholic solution with sodium amalgam. Cydo-hexane-dione-l-^ is obtained by the hydrolysis of succino-succinic ester. On reduction it yields quinite. It combines with benzaldehyde, in the presence of hydrochloric acid, to form 2-benzyl-hydroquinone. Cyclo- hexane-trione-l-3-5 (phloroglucin) is obtained by the fusion of many resins and of resorcin with caustic alkali. It may be prepared synthetically by" fusing its dicarboxylic ester (from malonic ester and sodio malonic ester at 145° C.) with potash (C. W. Moore, Journ. Chem. Soc, 1904, 85, p. 165). It crystallizes in prisms, which melt at 218° C. With ferric chloride it gives a dark violet coloration. It exhibits tautomerization, since in many of its reactions it shows the properties of a hydroxylic substance. Rhodizonic acid (dioxydiquinoyl), C 6 H 2 06, is probably the enolic form of an oxypentaketo-cyc/o-hexane. It is formed by the reduction of triquinoyl by aqueous sulphurous acid, or in the form of its potassium salt by washing potassium hexa-oxybenzene with alcohol

(R. Nietzki, Ber., 1885, 18, pp. 513, 1838). Triquinoyl (hexaketo-cycZo-hexane) C606-8H 2 0, is formed on oxidizing rhodi- zonic acid or hexa-oxybenzene. Stannous chloride reduces it to hexa-oxybenzene, and when boiled with water it yields croconic acid (dioxy-cyc/o-pentene-trione).

Cydo-hexenones.— Two types of ketones are to be noted in this group, namely the a/3 and 187 ketones, depending upon the position of the double linkage in the molecule, thus :

.0112:011 ˆCH-CH2 v

H 2 C/ ˆCO HC< >C0

X CH 2 CH 2 / X CH 2 -CH 2 /

(a/3) _ _ _ (0y)

These two classes show characteristic differences in properties.

For example, on reduction with zinc and alcoholic potash, the o/8

compounds give saturated ketones and also bi-molecular compounds,

the f)y being unaffected; the ffy series react with hydroxylamine

in a normal manner, the o/3 yield oxamino-oximes.

Methyl-i-cydo-hexene-i-one-3, CH 3 C 6 H70, isobtained by condens ing sodium aceto-acetate with methylene iodide, the ester so formed being then hydrolysed. Isocamphorphorone, C 9 Hi 4 0, is trimethyl i‘6-6.-cyc/o-hexene-l-one 6. Isocamphor, CioHhO, is methyl-i-isopropyl-3-cyc/o-hexene-i-one 6.

Acids. — Hexahydrobenzoic acid, CeHn-Qˆ‘H, is obtained by the reduction of benzoic acid, or by the condensation of 1-5 dibrompen-tane with disodio-malonic ester. It crystallizes in small plates which melt at 30-31 ° C. and boil at 232-233° C. (J. C. Lumsden, Journ. Chem. Soc, 1905, 87, p. 90). The sulphochloride of the acid on reduction with tin and hydrochloric acid gives hexahydrothiophenol, CeHnSH, a colourless oil which boils at 158-160° C. (W. Borsche, Ber., 1906, 39, p. 392),

Quinic acid, C 6 H7(OH)4C02H (tetra-oxy-cycfo-hexane carboxylic acid), is found in coffee beans and in quinia bark. It crystallizes in colourless prisms and is optically active. When heated to about 250°

C. it is transformed into quinide, probably a lactone, which on heating with baryta water gives an inactive quinic acid.

Hexahydrophthalic acids, C 6 Hio(C0 2 H)2 (cyc/o-hexanedicarboxylic acids). — Three acids of this group are known, containing the Carb-oxyl-groups in the 1-2, 1-3, and 1-4 positions, and each exists in two stereo-isomeric forms (cm- and trans-). The anhydride ofthecw-i-2

A2 and A4 Tetrahydroˆ-

-ii Heat

A I Tetrahydro

Hydrobromide on reduction

Hexahydro

Sodium amalgam

A 1* DlHVDROˆ-

acid obtained byheadingthe anhydride of the trans-acid, forms prisms which melt at 192° C. When heated with hydrochloric acid it passes into the trans-variety. The racemic trans-acid is produced by the reduction of the dihydrobromide of A 4 tetrahydrophthalic acid or A 2,6 dihydrophthalic acid. It is split into its active components by means of its quinine salt (A. Werner and H. E. Conrad, Ber., ‘899, 3 2 , P’ 3°4°) Hexahydroisophthalic acids (cyc/o-hexane-i-3- dicarboxylic acids) are obtained by the action of methylene iodide on disodio-pentane tetracarboxylic ester (W. H. Perkin, Journ. Chem. Soc, 1 89 1, 59, p. 798); by the action of trimethylene bromide on disodio-propane tetracarboxylic ester ; and by the reduction of isophthalic acid with sodium amalgam, the tetrahydro acids first formed being converted into hydrobromides and further reduced (A. v. Baeyer and V. Villiger, Ann., 1893, 276, p. 255). The cis- and trans- forms can be separated by means of their sodium salts. The trans-acid is a racemic compound, which on heating with acetyl chloride gives the anhydride of the CM-acid.

Hexahydroterephthalic acids (cyc/o-hexane-l-4-dicarboxylic acids). These acids are obtained by the reduction of the hydrobromides of the

di- and tetra-hydroterephthalic acids or by the action of ethylene dibromide on disodio-butane tetracarboxylic acid. An important derivative is succino-succinic acid, CeHeOjfCQjHˆ, or cydo-hexane-dione-2-5-dicarboxylic acid-i-4, which is obtained as its ester by the action of sodium or sodium ethylate on succinic ester (H. Fehling, Ann., 1844, 49, p. 192; F. Hermann, Ann., 1882, 211, p. 306). It crystallizes in needles or prisms, and dissolves in alcohol to form a bright blue fluorescent liquid, which on the addition of ferric chloride becomes cherry red. The acid on heating loses C0 2 and gives eyc/o-hexanedione-l-4.

Tetrahydrobenzoic acid (cydo-hsxene- i-carboxylic acid-i), C 6 H 9 C0 3 H. Three structural isomers are possible. The A) acid results on boiling the A 2 acid with alkalis, or on eliminating hydro bromic acid from i-brom-cycio-hexane- carboxylic acid- 1. The A 2 acid is formed on the reduction of benzoic acid with sodium amalgam. The A 3 acid is obtained by eliminating the elements of water from 4-oxy-cydo-hexane-l-carb- oxylic acid (W. H. Perkin, iun., Journ. Chem. Soc, 1904, 85, p. 431). Shikimic acid (sˆ-e-trioxy-A'-tetrahydrobenzoic acid) is found in the fruit of Illicium religiosum. On fusion with alkalis it yields para-oxybenzoic acid, and nas- cent hydrogen reduces it to hydro- shikimic acid. Sedanolic acid, C12H20O3, which is found along with sedanonic acid, C12H18O3, in the higher boiling fractions of celery oil, is an ortho-

oxyamyl-A 5 tetrahydrobenzoic acid, sedanonic acid being ortho valeryl-Aˆtetrahydrobenzoicacid CG. Ciamician and P. Silber, Ber., I 8 97 > 3°. PP. 49 2 > 501. I4'9 seq.). Sedanolic acid readily decom-poses into water and its lactone sedanolid, CuHigCX, the odorous constituent of celery oil.

Tetrahydrophthalic acids {cyclo – hexene dicarboxylic acids), C 6 H 8 (CO_2H) 2 . Of the ortho-series four acids are known. The A 1 acid is obtained as its anhydride by heating the A 2 acid to 220 C, or by distilling hydropyromellitic acid. Alkaline potassium permanganate oxidizes it to adipic acid. The A 2 acid is formed along with the A 4 acid by reducing phthalic acid with sodium amalgam in hot solutions. The A 4 acid exists in cm- and trans- forms. The trans- variety is produced by reducing phthalic acid, and the CM-acid by reducing A 2 " 4 dihydrophthalic acid.

In the meta-series, four acids are also known. The A 2 acid is formed along with the A 4 (cm) acid by reducing isophthalic acid. The trans A 4 acid is formed by heating the CM-acid with hydrochloric acid under pressure. The A s acid is formed when the anhydride of tetrahydro

rimesic acid is distilled (W. H. Perkin, junr., Journ. Chem. Soc, 1905, 87, p. 293).

In the para-series, three acids are known. The A 1 acid is formed by the direct reduction of terephthalic acid ; by boiling the A 2 acid with caustic soda; and by the reduction (in the heat) of A 1-4 dihydro-terephthalic acid. The A 2 acid exists in cm- and trans- forms; these are produced simultaneously in the reduction of A 1-3 or A 1-6 dihydro- terephthalic acids by sodium amalgam.

There are five possible dihydrobenzoic acids. One was obtained in the form of its amide by the reduction of benzamide in alkaline solution with sodium amalgam (A. Hutchinson, Ber., 1891, 24, p. 177). The A 1 ‘ 8 acid is obtained on oxidizing dihydrobenzalde- hyde with silver oxide or by the reduction of meta-trimethyl- aminobenzoic acid (R. Willstatter, Ber., 1904, 37, p. 1859).

Of the dihydrophthalic acids, five are known in the ortho-series, two of which are stereo-isomers of the cm- and trans-type, and a similar number are known in the para-series. The A 1-4 acid is obtained as its anhydride by heating A 2-4 dihydrophthalic anhydride

with acetic anhydride. When boiled with caustic soda it isomerizes

to a mixture of the A 2 ‘ 4 and A 2 ‘ 6 dihydrophthalic acids. The A 2-4 acid is obtained by boiling the dihydrobromide of the A 2 ‘ 6 acid with alcoholic potash or by continued boiling of the A 2 ‘ 6 acid with caustic soda.

The A 2 ‘ 6 acid is formed when phthalic acid is reduced in the cold by sodium amalgam or by heating the A 2 ‘ 4 and A 3 ‘ 5 acids with caustic soda. The irons- modification of A 3 ‘ 5 acid is produced when phthalic acid is reduced by sodium amalgam in the presence of acetic acid. When heated for some time with acetic anhydride it changes to the CM-form. The /ro?M-acid has been resolved by means of its strychnine salts into two opticalry active isomerides, both of which readily pass to A 2 ‘ 6 dihydrophthalic acid (A. Neville, Journ. Chem. Soc, 1906, 89, p. 1744).

Of the dihydroterephthalic acids, the A 1 ‘ 3 acid is obtained by heat ing the dibromide of the A 2 tetrahydro acid with alcoholic potash. It cannot be prepared by a direct reduction of terephthalic acid. On warming with caustic soda it is converted into the A 1 ‘ 4 acid. The A 1 ‘ 4 acid is also obtained by the direct reduction of terephthalic acid. It is the most stable of the dihydro acids. The A 1 ‘ 6 acid is obtained

by boiling the cis- and trans- A*’ h acids with water, which are obtained on reducing terephthalic acid with sodium amalgam in faintly alka- line solution. The relationships existing between the various hydrophthalic acids may be shown as follows : —

Sodium amalgam (hot)

- Phthalic acid •

Sodium amalgam + acetic acid

Sodium

Sodium amalgam (cold)

T

amalgam (hot)

- A 28 Dihydro <~

Alkali

Hydrobromide with alcoholic potash

A 2-4 Dihydro

Anhydride with I acetic anhydride

A 1-4 Dihydro

A3-5 Dihydro (trans.)

J, Acetic anhydridz A3- 5 Ddiydro (as.)

Boil with

water

A2-5 D

Ai-SD

4

Sodium amalgam in faintly alkaline solution

•

EHYDRO

, Boil with water

HYDRO

podium amalgam BqU + NaQR

Sodium

amalgam

(hot)

A 2 TETRAHYDRO’

Reduce

->A 1 Tetrahydro

Dibromide + alcoholic potash

A i‘3 Dihydro ˆ~

Remove H Br from

Hydrobromide on reduction

-Hexahydro

dibromide

Cyclo-heptane Group.

Cydo-heptane (suberane), C7H14, obtained by the reduction of suberyl iodide, is a liquid which boils at 117° C. On treatment with bromine in the presence of aluminium bromide it gives chiefly pentabromtoluene. When heated with hydriodic acid to 230 C. it gives methylhexamethylene. On oxidation with nitric acid (sp. gr. 1-4) it yields pimelic acid. Disuberyl, CjH.a-QHu, a thick oily liquid, boiling at 290-291 ° C, is obtained by the reduction of suberyl bromide.

Cyclo-heptene, C 7 H 12 , is obtained by the action of alcoholic potash on suberyl iodide; and from cyc/o-heptane carboxylic acid, the amide of which by the action of sodium hypobromite is converted into cya’o-heptanamine, which, in its turn, is destructively methylated (R. Willstatter, Ber., 1901, 34, 131). Cydo-heptadiene 1-3, C 7 H 10 , is

obtained from cyc/o-heptene (Willstatter, loc. cit.). It is identical with the hydrotropilidine, which results by the destructive methyla- tion of tropane.

Euterpene (trimethyl-I ^^-cydo-heptadiene I -5), C 10 Hi S is prepared from dihydroeucarveol. By the action of hydrobromic acid (in glacial acetic acid solution) and reduction of the resulting product it yields l-2-dimethyl-4-ethylbenzene (A. v. Baeyer, Ber., 1897, 30, P- 2075). Cydo-heptatriene (tropilidine), C 7 H 8 , is formed on dis- tilling tropine with baryta; and from cycfo-heptadiene by forming its addition product with bromine and heating this with quinoline to 150-160° C. (R. Willstatter, loc. cit.). Chromic acid oxidizes it to benzoic acid and benzaldehyde. With bromine it forms a di- bromide, which then heated to 110° C. decomposes into hydro- bromic acid and benzyl bromide.

Cy do-heptanol, CiH 13 OH, is formed by the reduction of suberone, and by the action of silver nitrite on the hydrochloride of cyclo- hexanamine (N. L?emjanow, Centralblatt, 1904, i. p. 1214).

Cydo-heptanone (suberone), C 7 Hi 2 0, is formed on the dis- tillation of suberic acid with lime, and from a-brom-cyc/o-heptane carboxylic acid by treatment with baryta and subsequent distilla- tion over lead peroxide (R. Willstatter, Ber.. 1898, 31, p. 2507). It is a colourless liquid having a peppermint odour, and boiling at I78-5-I79-5 C. Nitric acid oxidizes it to n-pimelic acid.

Tropilene, C7H10O, is obtained in small quantities by the distillation of a-methyltropine methyl hydroxide, and by the hydrolysis of 18-methyltropidine with dilute hydrochloric acid. It is an oily liquid, with an odour resembling that of benzaldehyde. It forms a benzai compound, and gives an oyxmethylene derivative and cannot be oxidized to an acid, reactions which point to it being a ketone con- taining the grouping -CH 2 CO. It is thus to be regarded as a cyc/o-heptene- 1 one 7 .

Cyc\o-heptane carboxylic acid (suberanic acid), C7HH1CO2H, is obtained by the reduction of cyc/o-heptene-l-carboxylic acid; from brom-cyc/o-heptane by the Grignard reaction ; and by the re- duction of hydrotropilidine carboxylic acid by sodium in alcoholic solution (R. Willstatter, Ber., 1898, 31. p. 2504). The corresponding oxyacid is

obtained by the hydrolysis of the nitrile, which is formed by the addition of hydrocyanic acid to suberone (A. Spiegel, Ann., 1882, 211, p. 117).

Four cyc2o-heptene carboxylic acids are known. Cyc\o-heptene--carboxylic acid-i is prepared from oxysuberanic acid. This acid when heated with concentrated hydrochloric acid to 120-130° C. yields a chlor-acid, which on warming with alcoholic potash is trans- formed into the cycio-heptene compound. Cyc\o-heptene-2-carboxylic acid-i is formed by the reduction of cye/o-heptatriene 246-carb- oxylic acid- 1. On boiling with caustic soda it isomerizes to the corresponding l-acid.

Cyclo-heptatriene carboxylic acids, C7H7CO2H. All four are known. According to F. Buchner (Ber., 1898, 31, p. 2242) they may be represented as follows : —

CH 2 —

CH-

-CH a

CH 2

■CH:CH

CH 2 HO

NM

: 8 CHj*-CHj

CH

CH 2 —

-CH =

= CH

CH 2

CHj-CH

irydo-octadiene

A.IA5«(. AlAtorji. il,4.6orV i2,4.8orS

The a-acid (a-isophenylacetic acid) is obtained by the hydrolysis of pseudophenylacetamide, formed bv condensing diazoacetic ester with benzene, the resulting pseudophenyl acetic ester being then left in contact with strong ammonia for a long time. 0-Isophenylacetic acid is formed by strongly heating pseudophenylacetic ester in an air-free sealed tube and hydrolysing the resulting |8-isophenylacetic ester, y-1 sophenylacetic acid is obtained by heating the and 8 acids for a long time with alcoholic potash (A. Einhorn, Ber., 1894, 27, p. 2828; E. Buchner, Ber., 1898, 31, p. 2249). 5-Isophenyl- acetic acid is obtained by heating the iodmethylate of anhydro- ecgonine ester with dilute caustic soda (A, Einhorn, Ber., 1893, 26, P- 329).

Numerous aminc-derivatives of the eycfo-heptane series have been prepared by R. Willstatter in the course of his investigations on the constitution of tropine (q.v.). Amino-cyc\o-heptane (suberylamine) is obtained by the reduction of suberone oxime or by the action of sodium hypobromite on the amide of cycloheptane carboxylic acid.

CycXo-octane Group.

Few members of this group are known. By the distillation of the calcium salt of azelaic acid H. Mayer (Ann., 1893, 275, p. 363) obtained azelain ketone, CgHˆO, a liquid of peppermint odour. It boils at 90-91 ° C. (23 mm.) and is readily oxidized by potassium permanganate to oxysuberic acid. It is apparently cycio-octanone (see also W. Miller and A. Tschitschkin, Centralblatt, 1899, 2 -> p. 181).

Pseudopelletierine (methyl granatonine), C 9 Hi 6 NO, an alkaloid of the pomegranate, is a derivative of cydo-octane, and resembles tropine in that it contains a nitrogen bridge between two carbon atoms. It is an inactive base, and also has ketonic properties. On oxidation it yields methyl granatic ester, which, by the exhaustive methylation process, is converted into homopiperylene dicarboxylic ester, H0 2 CCH:CH CH 2 CH 2 CH:CH C0 2 H, from which suberic acid may be obtained on reduction. When reduced in alcoholic solution by means of sodium amalgam it yields methyl granatoline, CsHuOH-NCFU; this substance, on oxidation with cold potassium permanganate, is converted into granatoline, CsHi 5 NO, which on distillation over zinc dust yields pyridine. Methyl granatoline on treatment with hydriodic acid and red phosphorus, followed by caustic potash, yields methyl granatinine, CgHisN, which when heated with hydriodic acid and phosphorus to 240° C. is converted into methyl granatanine, C 8 Hi4.NCH 3 , and granatanine, CsHuNH. The hydrochloride of the latter base when distilled over zinc dust yields a-propyl pyridine. By the electrolytic reduction of pseudopellet- ierine, TV- methyl

granatanine is obtained, and this by exhaustive methylation is converted into A Wei-dimethyl granatanine. This latter compound readily forms an iodmethylate, which on treatment with silver oxide yields the corresponding ammonium hydroxide. The ammonium hydroxide on distillation decomposes into trimefhyl- amine, water and cydo-octadienei 3.

CH 2 CH— CH 2 CH 2 NMe CO – CH3CH— CH 2 Pseudopelletierine

xxn. 2

CH 2 CH— CH 2

>CH 2 NMe CH 2

CH 2 CH— CH 2

iV-methyl

granatanine

CH 2 CH— CH 2

*CH 2 HONMe 2 CH 2 CH, CH— CH 2

CH2 *CH — CH2

CH,NMeCHˆ CH 2 CH = CH A – 4 de.s-methyl granatanine

Qyc\o-octadiene, CsHi 2 , as above prepared, is a strong-smelling oil which decolorizes potassium permanganate solution instantaneously. It readily polymerizes to a di-cyc/o-octadiene and polymer (C s Hi 2)„ (R. Willstatter, Ber., 1905, 38, pp. 1975, 1984; G. Ciamician and P. Silber, Ber., 1893, 26, p. 2750; A. Piccinini, Gazz., 1902, 32, 1 p. 260). {}-cyc\o-octadiene has been prepared from methyl granatinine iodmethylate.

Cyclo-octane, CsH 16 is obtained by the reduction of the above unsaturated hydrocarbon by the Sabatier and Senderens's method. It is a liquid which boils at 146-3-148° C. and possesses a strong camphor odour. On oxidation it yields suberic acid (R. Willstatter, Ber., 1907, 40, pp. 957). O. Doebner (Ber., 1902, 35, pp. 2129, 2538; 1903, 36, p. 4318) obtained compounds, which in all probabi- lity are cycto-octadienes, by the distillation of /3-vinylacrylic acid, sorbic acid, and cinnamenyl acrylic acid with anhydrous baryta.

Cyclo-nonane Group. According to N. Zelinsky (Ber., 1907, 40, p. 780)

cyclononanone, CgHieO, a liquid boiling at 95-97° C, is formed on distilling sebacic acid with lime, and from this, by reduction to the corresponding secondary alcohol, conversion of the latter into the iodide, and subsequent reduction of this with zinc, cyc\o-nonane, CgHis, a iiquid boiling at 1 70-1 72° C. is obtained.

POLYNESIA, (Gr. ttoKvs, many, and vrjcros, island), a term sometimes used to cover the whole of the oceanic islands in the central and western Pacific, but properly for the eastern of the three great divisions of these islands. The chief groups thus included are Hawaii, the Ellice, Phoenix, Union, Manihiki and Marquesas groups, Samoa and Tonga, the Cook, Society, Tubuai and Tuamotu groups, and many other lesser islands. (See Pacific Ocean, section on Island, and separate articles on the principal groups, &c.)

The Polynesian Race. — For the ethnological problems offered by Polynesia no thoroughly satisfactory solutions have yet been found. By some the term Polynesian has been treated as a synonym for Malayo-Polynesian, and has been made to include all the brown races of Malaysia, Melanesia, Micronesia and Polynesia. Linguistically, physically and mentally this view is untenable. Whatever be the origin of the Polynesians, they are not Malays, though, themselves of mixed blood, they have probably certain racial elements in common with the latter, who are undoubtedly hybrids. There is every reason to be- lieve that the Polynesians are ethnologically a far older race than the Malays, who, as they now exist, are a comparatively' modern people; and thus Friedrich Miiller's and D. G. Brinton's theory, that they form a branch of the Malays, fails. Joseph Deniker declares the Polynesians a separate ethnic group of the Indo-Pacific area, and in this view he is followed by A. H. Keane, who suggests that they are a branch of the Caucasie division of mankind who possibly migrated in the Neolithic period from the Asiatic mainland. Of the migration itself no doubt is now felt, but the first entrance of the Polynesians into the Pacific must have been an event so remote that neither by tradition nor otherwise can it be even approximately fixed. The journey of these Caucasians would naturally be in stages. Their earliest halting place was probably the Malay Archi- pelago, where a few of their kin linger in the Mentawi Islands on the west coast of Sumatra. Thence at a date within historic times a migration eastward took place. The absence of San- skrit roots in the Polynesian languages appears to indicate that this migration was in pre-Sanskritic times. Whether anything like a definite date can be fixed for it may well be questioned. Abraham Fornander 1 has, however, with great probability, traced back the history of the Hawaiians to the 5th century. He has studied the folk- lore of those islands exhaustively, and from this source comes to the

conclusion that the Polynesian migration from the Indian Archipelago may be approximately assigned to the close of the 1st or to the 2nd century. The traditions of many of the Polynesian peoples tend to make Savaii, the largest of the Samoan Islands, their ancestral home in the East Pacific, and linguistic and other evidence goes to 1 An Account of the Polynesian Race (1878), i. 168.

support the theory that the first Polynesian settlement in the East Pacific was in Samoa, and that thence the various branches of the race made their way in all directions. Most likely Samoa was the first group permanently occupied by them. Owing to the admixture of the Polynesians with the Papuans in Fiji some authorities have thought the first settlement was in those islands, and that the settlers were eventually driven thence by the Papuan occupiers. We can, however, account for the presence of Polynesian blood in Fiji in another way, viz. by the intercourse that has been kept up between the people of Tonga and Fiji. If the first resting-place of the Polynesians was in that group, there is good reason to believe that Samoa was the first permanent home of the race.

It used to be doubted whether these people could have gone from the Indian archipelago so far eastward, because the pre- vailing winds and currents are from the east. But it is now well known that at times there are westerly winds in the region over which they would have to travel, and that there would be no insuperable difficulties in the way of such a voyage. The Poly- nesians are invariably navigators. There is ample evidence that in early times they were much better seamen than they are at present. Indeed their skill in navigation has greatly declined since they have become known to Europeans. They used to construct decked vessels capable of carrying one or two hundred persons, with water and stores sufficient for a voyage of some weeks duration. These vessels were made of planks well fitted and sewn together, the joints being caulked and pitched. 1 It is only in recent times that the construction of such vessels has ceased. The people had a knowledge of the stars, of the rising and setting of the constellations at different seasons of the year; by this means they determined the favourable season for making a voyage and directed their course.

The Polynesians were by no means a savage people when they entered

the Pacific. Indeed their elaborate historical legends show that they possessed a considerable amount of civilization. Those who are familiar with these legends, and have studied native manners and customs, see many unmis- takable proofs that the Polynesians had, at their migration, considerable knowledge and culture, and that the race has greatly deteriorated.

The Polynesians are physically a very fine race. On some islands they average 5 ft. 10 in. in height. De Quatrefages, in a table giving the stature of different races of men, 2 puts the natives of Samoa and Tonga as the tallest people in the world. He gives 5 ft. 9-92 in. as their average height. They are well developed in proportion to their height. Their colour is a brown, lighter or darker generally according to the amount of their exposure to the sun — being darker on some of the atolls where the people spend much time in fishing, and among fishermen on the volcanic islands, and lighter among women, chiefs and others less exposed than the bulk of the people. Their hair is dark brown or black; smooth and curly, very different from the frizzly mop of the Papuan or the lank straight locks of the Malay. They have very little beard. Their features are gen- erally fairly regular and often beautiful; eyes invariably black, and in some persons oblique; jaws not projecting, except in a few instances; lips of medium thickness; the noses are naturally long, well shaped and arched, but many are artificially flat- tened at the bridge in infancy. Their foreheads are fairly high, but rather narrow. The young of both sexes are good-looking. The men often have more regular features than the women. Formerly the men paid more attention to personal appearance than the women. Polynesians generally are of singularly cleanly habits, love bathing, and have a taste for neatness and order. Their clothing is simple: a loin cloth for the men and for the women a girdle or petticoat of leaves. Sometimes women cover the shoulders, and on great occasions the men robe themselves in tapa, bark-cloth. The men are usually

1 Coco-nut fibre and the gum which exudes from the bread-fruit tree are generally used for ” caulking ” and ” pitching ” canoes. ‘ The Human Species (International Scientific Series), pp. 57-60.

tattooed in elaborate designs from the navel to the thigh, and often around mouth and eyes.

As a race the Polynesians are somewhat apathetic. An enervating climate and lavish natural resources incline them to lead easy lives. On the more barren islands, and on those more distant from the equator, they show more energy. Under certain circumstances they

become excitable, and manifest a kind of care-for-nothing spirit. As savages they were strict in their religious observances and religion came into almost every action of life, and they have been, in most instances, easily led to accept Christianity. Their essential trait is their per- ennial cheerfulness, and their fondness for dance and song and every sort of amusement. 3 They are shrewd, intelligent and possess much common sense. Where they have from early years enjoyed the advantages of a good education, Polynesian youths have proved themselves to possess intellectual powers of no mean order. They are almost invariably fluent speakers; with many of them oratory seems to be a natural gift; it is also carefully cultivated. An orator will hold the interest of his hearers for hours together at a political gathering, and in his speech he will bring in historical allusions and precedents, and will make apt quotations from ancient legends in a manner which would do credit to the best parliamentary orators. Many of them are very brave, and think little of self-sacrifice for others where duty or family honour is concerned.

Polynesian society is divided into the family and the clan. Each clan has a name which is usually borne by one of the oldest members, who is the chief or head for the time being. This clan system no doubt generally prevailed in early times, and was the origin of the principal chieftainships. But changes have been made in most of the islands. In some the head of one clan has become king over several. In many cases large clans have been divided into sections under secondary heads, and have even been subdivided.

As a rule near relations do not intermarry. In some islands this rule is rigidly adhered to. There have been exceptions, however, especially in the case of high chiefs ; but usually great care is taken to prevent the union of those within the prescribed limits of con- sanguinity. Children generally dwell with their kin on the father's side, but they have equal rights on the mother's side, and sometimes they take up their abode with their mother's family. The only names used to express particular relationships are father and mother, son and daughter, brother and sister. There is usually, no distinction between brothers (or sisters) and cousins, all the children of brothers and sisters speak of each other as brothers and sisters, and they call uncles and aunts fathers and mothers. Above the relationship of parents all are simply ancestors, no term being used for grandfather which would not equally apply to any more remote male ancestor. In the same way there is no distinctive term for grandchild. A man speaks of his grandchild as his son or daughter, or simply as his child. 4 Polygamy was often practised,, especially by chiefs, and also concubinage. In some places a widow was taken by the brother of her deceased

husband, or, failing the brother, by some other relative of the deceased, as an additional wife. Divorce was an easy matter, and of frequent occurrence; but as a rule, a divorced wife would not marry again without the consent of her former husband. An adulterer was always liable to be killed by the aggrieved husband, or by some member of his clan. If the culprit himself could not be reached, any member of the clan was liable to suffer in his stead. In some islands female virtue was highly regarded. Perhaps of all the groups Samoa stood highest in this respect. There was a special ordeal through which a bride passed to prove her virginity, and a proof of her immorality brought disgrace upon all her relatives. But in other islands there was much freedom in the relations of the sexes. Owing to the almost promis- cuous intercourse which prevailed among a portion of the race, in some groups titles descended through the mother and not through the father. In Hawaii there was a peculiar system of marriage

3 Wrestling and boxing, a kind of hockey and football, canoe and foot races, walking-matches, swimming, archery, cockfighting, fishing-matches and pigeon-catching are among their pastimes. Of indoor games they have a number, many being of a gambling nature. Much time is spent, especially after the evening meal, in asking riddles, in rhyming, &c. The recital of songs and myths is a common amusement, and on special occasions there is dancing. The night-dances were generally accompanied by much indecency and immorality.

4 Dr Lewis H. Morgan, in Ancient Society, -pp. 419-423, makes the Polynesians to have distinctive terms for grandfather, grandmother, grandson and granddaughter. In this he is mistaken. It is evident from his own lists that the Hawaiian kupuna means simply an ancestor. In like manner moopUna simply means a descendant of any generation after the first.

relationship," brothers with their wives, and sisters with their husbands, possessing each other in common." There also, especially in the case of chiefs and chieftainesses, brothers and sisters some- times intermarried. But these customs did not prevail in other groups. It is almost certain that they did not prevail in Hawaii in early times, but that they were the result of that deterioration in the race which their traditions and many of their customs indicate. 1

Women have always occupied a relatively high position among the Polynesians. In most groups they have great influence and are treated with much respect. In some cases they take hereditary titles and hold high offices. As among their congeners in Mada- gascar, so also in parts of Polynesia, there may be a queen or a chief- tainess in her own right ; and a woman in high position will command as much respect, and will exercise as great authority, as a man would in the same position. Everywhere infanticide prevailed; in some of the smaller islands it was regulated by law in order to prevent over- population. It was also a very common practice to destroy the foetus, but parents were affectionate towards their children. The practice of adopting children was, and still is, common. Often there is an exchange made between members of the same clan; but sometimes there is adoption from without. Tattooing generally prevailed among the men, different patterns being followed in differ- ent groups of islands. In some a larger portion of the body is tattooed than in others. A youth was considered to be in his minority until he was tattooed, and in former times he would have no chance of marrying until he had, by submitting to this process, proved himself to be a man. Puberty in the. other sex was generally marked by feasting, or some other demonstration, among the female friends. Old age is generally honoured. Often an inferior chief will give up his title to a younger man, yet he himself will lose but little by so doing. The neglect of aged persons is extremely rare.

Property belonging to a clan is held in common. Each clan usually possesses land, and over this no one member has an exclusive right, but all have an equal right to use it. The chief or recognized head of the clan or section alone can properly dispose of it or assign its use for a time to an outsider; and even he is expected to obtain the consent of the heads of families before he alienates the property. Thus land is handed down through successive generations under the nominal control of the recognized head of the clan. Changes have been made in many islands in this respect; but there can be little reason to doubt that the joint ownership of property in clans was common among the entire race in former times.

In early times the head of each clan was supreme among his own people, but in all matters he had associated with him the principal men or heads of families in the clan. Their united authority extended over all the members and the possessions of the clan, and they were independent of every other clan. There are in some places vestiges of this primitive state of society still remaining ; the transition to a limited or to a despotic monarchy may be traced by means of the ancient legends in some islands, and in others it is a matter of recent

history. One clan being more numerous and stronger than another, and its chief being ambitious, it is easy to see how by conquering a neighbouring clan he increased the import- ance of his clan and extended his own power. In some of the islands this transition process has hardly yet developed into an absolute monarchy. We may even see two or three stages of the progress. In one instance a certain clan has the right to nominate the principal chief over an entire district; though it is known as the ruling clan, its rule is mainly confined to this nomination, and to decision for or against war. In all other respects the district enjoys the privilege of self-government. In another case the nominal king over a dis- trict, or over an entire island, can be elected only from among the members of a certain clan, the monarchy being elective within that alone; but this king has little authority. In other cases a more despotic monarchy has grown up — the prowess of one man leading to the subjugation of other clans. Even in this case the chiefs or

1 Morgan has founded one of his forms of family — the consanguine — on the supposed existence in former times among the Malays and Polynesians of the custom of ” intermarriage of brothers and sisters, own and collateral, in a group.” All the evidence he finds in support of this is (i) the existence of the custom above mentioned in Hawaii; and (2) the absence of special terms for the relationship of uncle, aunt and cousin, this indicating, he thinks, that these were regarded as fathers, mothers, brothers and sisters. He admits that ” the usages with respect to marriage which prevailed when the system was formed may not prevail at the present time.” But he adds, . ” To sustain the deduction it is not necessary that they should ” (Ancient Society, p. 408). Morgan has given special terms for grand- father and grandmother, because it would prove too much to show that the people had no grandfathers, &c. But these terms are used for ancestors of any generation. The terms used for grandchildren, in like manner, are used for any generation of descendants. He says (p. 406) the terms of husband and wife are used in common by a group of sisters or brothers, but the fact is that the words used for husband and wife in Hawaii simply mean male and female. In some islands there are terms used for wife in the most strict sense. The word wife is not used more exclusively among us than among some Polynesian people.

heads of clans sometimes still hold their property and rule over their own people, only rendering a kind of feudal service and paying tribute to the king.

The Polynesians are exceedingly fond of rank and of titles. Much deference is paid to chiefs and to persons of rank; and special terms

are generally employed in addressing these. Every part of a chief's body and all his belongings have names different from those employed for common people. The grade of rank which a person occupies will often be indicated by the language in which he is addressed. Thus, in Samoa there are four different terms for to come: sau is for a common man; maliu mai is a respectful term for a person without a title; susu mai for a titled chief; and afio mai for a member of the royal family. In addressing chiefs, or others to whom one wishes to be respectful, the singular number of the personal pronoun is rarely used ; the dual is employed instead — the dual of dignity or of respect.

Offices and titles are seldom hereditary in our sense of the term, as descending from father to son. They are rather elective within the limits of the clan, or the division of a clan. A common practice is for the holder of a high titlt to nominate a successor; and his nomination is generally confirmed by the chiefs, or heads of house- holds, with whom the right of election rests. In ancient times the authority of a high chief or king did not usually extend to any details of government. But in Hawaii there are traditions of a wise king who interested himself in promoting the social well-being of the people, and made good laws for their guidance. 2 Usually all matters affecting a district or an island were settled by the chiefs of the district, while those of a single village were settled by a council consisting of the chiefs and heads of households in the village. In some islands each clan, or each village, would feel itself at liberty to make war on another clan or village without consulting the views of any higher authority. Indeed the rule was for each clan or dis- trict to settle its own affairs. In the case of offences against individuals, either the person injured, or another member of his elan, would avenge the injury done. For most offences there was some generally recognized punishment — such as death for murder or adultery; but often vengeance would fall upon another person instead of the wrongdoer. In avenging wrong, a member of the village or of the clan to which the offender belonged would serve equally well to satisfy their ideas of justice if the culprit himself could not be easily reached. Sometimes all the members of the family, or of a village, to which a culprit belonged would flee from their homes and take refuge in another village, or seek the protection of a powerful chief. In some places, in cases of crime, the members of the family or village would convey the culprit bound — sometimes even carrying him like a pig that is to be killed — and place him with apologies before those against whom he had transgressed. The ignominy of such a proceeding was generally considered sufficient atonement for the gravest offences. There were slaves in many islands, either persons conquered in war, or those who had been condemned

to lose their personal liberty on account of evil conduct. Pottery was not manufactured by the Polynesians: a fact which, it has been argued, goes far to prove the remoteness of the Poly- nesian migration from the Malay Archipelago, where there is not a single tribe which does not possess the art. It may, however, be that, moving among small coral islands for scores of generations and thus without materials, they lost the art. Those of them who possessed pottery obtained it from the Papuans. In most of their manufactures they were, however, in advance of the Papuans. They made use of the vegetable fibres abounding in the islands, the: women manufacturing cloth, chiefly from the bark of the paper mulberry (Morus papyrifera), but also in some islands from the bark of the bread-fruit tree and the hibiscus. This in former times furnished them with most of their clothing. They also made various kinds of mats, baskets and fans from the leaves of the pan- danus, the bark of the hibiscus, from species of bohmeria or other Urticaceous plants. Some of their mats are very beautifully made, and in some islands they are the most valuable property the people possess. The people also use the various fibre-producing plants for the manufacture of ropes, coarse string and fine cord, and for making fishing nets. The nets are often very large, and are netted with a needle and mesh as in hand-netting among ourselves.

The Polynesians, who have always been entirely without metals, are clever workers in wood. Canoe and house building are trades usually confined to certain families. The large canoes in which they formerly made long voyages are no longer built, but various kinds of smaller canoes are made, from the commonest, which is simply a hollowed-out tree cut into form, to the finely shaped one built upon a keel, the joints of the various pieces being nicely fitted, and the whole stitched together with cord made from the husk of coco- nuts. Some of the larger canoes are ornamented with rude carving; and in some islands they are somewhat elaborately decorated with inlaid mother-of-pearl. The houses are generally well and elabor- ately made, but nearly all the ornamentation is put on the inside of the roof.

They manufacture several wooden utensils for household use,

2 See a remarkable example in Fornander's Account of the Poly- | nesian Race, ii. 89.

such as dishes or deep bowls, head-rests and stools. Having no | metal or other vessels in which to boil water, all cooking is done by baking, generally in holes in the ground. They also make wooden j gongs, or drums. They used to make wooden fishhooks, clubs, | spears and bows. They still make wooden fishspears and carved and inlaid combs. They employ the bamboo for making drums and flutes. Formerly knives were made of bamboo, which is still some- times used for that purpose. In the manufacture of these things they employed adzes made of stone, shell or hard wood, and a wooden drill pointed with stone, shell or bone. They made mother-of-pearl fishhooks, and they still use a part of those old hooks — or artificial bait — in combination with steel hooks, the native-made portion being generally shaped like a small fish. For water-vessels, &c, they employ gourds and large coco-nut shells, in preparing which they pour in water and allow the pulp or the kernel to decay, so that it may be removed without breaking the rind or shell. Their drink- ing cups are made of half a coco-nut shell. Sharks' teeth, shells and bamboo were formerly generally used as cutting instruments for shaving and surgical operations. They employ vegetable dyes for painting their bark-cloth, calabashes, &c. In some islands they also use a red earth for this purpose. Their cloth is generally ornamented with geometrical patterns. Any drawings of animals, &c, which they make are exceedingly inartistic, and no attempt is made at perspective. Their musical instruments are few and rude — consisting of the drums and flutes already mentioned, and shell trumpets.

The Polynesians were all polytheists. Without doubt many of their gods are deified men ; but it is clear that some are the forces of Nature personified, while others appear to represent human passions which have become identified with particular persons who have an existence in their historical myths. 1 But the conception which they had of Tangaloa (Taaroa and Kanaloa in some islands) is of a higher order. Among the Tahitians he was regarded as " the first and principal god, uncreated and existing from the beginning, or from the time he emerged from po, or the world of darkness." 2 " He was said to be the father of all the gods, and creator of all things, yet was scarcely reckoned an object of worship." 3 Dr Turner says, " the unrestricted, or unconditioned, may fairly be regarded as the name of this Samoan Jupiter." 4

The worship of certain of the great gods was common to all the people in a group of islands. Others were gods of villages or of families, while others were gods of individuals. The gods of clans were probably the spirits of the ancestors in their own line. In some islands, when the birth of a child was expected, the aid of the gods of the family was

invoked, beginning with the god of the father. The god prayed to at the instant of birth became the god of the child. In other places the name of the child's god was declared when the umbilical cord was severed. The gods were supposed to dwell in various animals, in trees, or even in inanimate objects, as a stone, a shell, &c. In some islands idols bearing more or less resem- blance to the human shape were made. But in all cases the material objects were regarded simply as the abodes of the immaterial spirits of the gods.

Their temples were either national, for a single village, or for the god of a family. They were sometimes large stone enclosures (marae), sometimes a grove, or a house. The principal priests were a particular order, the priesthood being hereditary. In some cases, however, the father of a family was priest in his own household and presented offerings and prayers to the family god.

In some islands human sacrifices were of "frequent occurrence; in others they were offered only on very rare and exceptional occasions, when the demand was made by the priests for something specially valuable. The usual offerings to the gods were food. The system of taboo was connected with their religious rites. There were two ways by which things might become taboo: (i) by contact with anything belonging to the god, as his visible representation or his priest. Probably it was thought that a portion of the sacred essence of the god, or of a sacred person, was directly communicable to objects which they touched. (2) Things were made taboo by being dedicated to the god ; and it is this form of taboo which is still kept up. If, e.g., any one wishes to preserve his coco-nuts from being taken, he will put something upon the trees to indicate that they are sacred or dedicated. They cannot then be used until the taboo is removed. Disease and death were often connected with the violation of taboo, the offended gods thus punishing the offenders. Disease was generally attributed to the anger of the gods. Hence offerings, &c, were made to appease their anger. The first-fruits of a crop were usually dedicated to the gods to prevent them from being angry; and new canoes, fishing-nets, &c, were dedicated by prayers and offerings, in order that the gods might be propitious to their owners in their use

J The following books may be consulted on this subject: Rev. W. W. Gill's Myths and Songs from the South Pacific; Dr Turners Samoa; and Mr Shortland's Maori Religion and Mythology; Sir George Grey, Polynesian Mythology.

- Polynesian Researches i. 323.

- Tahitian Dictionary.
- Samoa, p. 5.J.

The Polynesians invariably believe in the existence of the spirit of man after the death of the body. Their traditions on the condi- tion of the dead vary considerably in different groups ; yet there is a general agreement upon main points. Death is caused by the departure of the spirit from the body. The region of the dead is subterranean. When the spirit leaves the body it is conveyed by waiting spirits to the abode of spirits. In most islands the place of descent is known. It is generally towards the west. In some traditions there is a distinction between chief and common people in the spirit world. In others all are much alike in condition. Some traditions indicate a marked distinction between the spirits of warriors and those of others: the former go to a place where they are happy and are immortal, while the latter are devoured by the gods and are annihilated. In some, however, the spirits are said to live again after being eaten. Some speak of the abode of spirits as being in darkness ; but usually the condition of things is similar to that which exists upon earth. Amongst all the people it is believed that the spirits of the dead are able to revisit the scenes of their earthly life. The visits are generally made in the night, and are often greatly dreaded, especially when there may be any supposed reason for spite oh the part of the dead towards living relatives. Some writers have connected Polynesian cannibalism with religion. In the Cook and Society Islands, when a human being was offered as a sacrifice, the priest presented an eye of the victim to the king, who either ate it or pretended to do so. Probably the earliest human sacrifices were the bodies of enemies slain in battle. As it was supposed by some that the spirits of the dead were eaten by the gods, the bodies of those slain in battle may have been eaten by their victors in triumph. Mr Shortland appears to think that cannibalism among the Maories of New Zealand may have thus originated. 6 Among the Polynesians generally it appears to have been the practice at times to eat a portion of a slain enemy to make his degradation the greater. But where cannibalism was practised as a means of subsistence, it probably originated in times of actual want, such as may have occurred during the long voyages of the people.

The Polynesian race has been continuously, and in some places rapidly, decreasing since their first contact with Euro- peans. Doubts have been thrown on the current statements regarding the rate of decrease, which some good authorities believe to be not so great as is commonly represented. They hold that former estimates of the number of inhabitants in the various insular groups were mere

guesswork. Thus it is pointed out that Cook's estimate of 240,000 for the Society Archipelago (Tahiti) was at the time reduced by his associate, Forster, to 150,000, so that the 300,000 credited by him to the Sandwich Islands should also be heavily discounted. That is probably true, and it may be admitted that, as a rule, the early calcula- tions erred on the side of excess. But when full allowance is made for all such exaggerations, the following facts will show that the decrease has been excessive. The Tahitians, 150,000 in 1774, fell from 17,000 in 1880 to 10,300 in 1899; and in this group, while the pure stock appears to be dying out, there is a small increase amongst the half-breeds. When New Zealand was occupied (1840) the Maori were said to number 120,000, and were doubtfully stated to be still 56,000 in 1857; since then the returns of the 1881 and 1891 censuses gave 44,000 and 40,000 respectively. During the last two decades of the 19th century the decrease has been from 30,000 to 17,500 in Tonga; from 11,500 to 8400 in the Cook group; from 8000 to 3600 in Wallis; from 1600 to 100 in Manahiki; from 1400 to 1000 in Tubuai; and from 600 to 100 in Easter Island. A general decline seems thus to be placed beyond doubt, though it may be questioned whether it is to be attributed to a decayed vitality, as some hold, or to external causes, as is the more general opinion. The prevalence of elephantiasis and the occurrence of leprosy, for instance, in Hawaii, would seem to point at least in some places to a racial taint, due perhaps to the unbridled licentiousness of past generations. On the other hand, such a decrease as has occurred in Tahiti and Tonga, can be accounted for only by an" accumulation of outward causes, such as wars, massacres, and raidings for the Australian and South American labour mar kets before this traffic was suppressed or regulated. Other destructive agencies were epidemics, such especially as measles and small-pox, which swept away 30,000 Fijians in 1875; the introduction of strong drinks, including, besides vile spirits, a most pernicious concoction brewed in Tahiti from oranges;

5 Maori Religion and Mythology, p. 26.

the too sudden adoption of European clothing, rendering the body supersensitive to changes of temperature; lastly, the action of over-zealous missionaries in suppressing the dances, merry- making and free joyous life of pagan times, and the preaching of a sombre type of Christianity, with deadening effects on the buoyant temperament of these children of Nature. Most of these abuses have been checked or removed, and the results may perhaps be detected in a less accelerated rate of decline, which no longer proceeds in geometric proportion, and

seems even almost arrested in some places, as in Samoa and New Zealand. If such be indeed the case, perhaps the noblest of all primitive races may yet be saved from what at one time seemed inevitable extinction; and the Maori, the Samoans, and Tahi- tians may, like the Hawaiians, take their place Reside the Europeans as free citizens of the various states of which they are now subjects.

Authorities— Jean L. A. de Quatrefages, Les Polynisiens et leur migrations (Paris, 1866); G. Turner, Nineteen Years in Polynesia (London 1861); Pierre Adolphe Lesson, Les Polynisiens, leur origxne, &c. Paris, 1 880-1 884); Henri Mager, Le Monde polynesien (Pans, 1902); Maximilien Albert H. A. Le Grand, Au pays des Unaques (Paris, 1893); Sir George Grey, Polynesian Mythology (London, 1855); T. A. Moerenhout, Voyages aux ties du Grand Ocean, &c (Pans, 1837); Abraham Fornander, An Account of the Polynesian Race (1878). The account given above reproduces the main descriptive passages in the Rev. S. J. Whitmee's article in the 9th ed of the Ency. Brit.

POLYP, the name given by zoologists to the form of animal especially characteristic of the subphylum Cnidaria of the Coelentera (q.v.). In the subdivision Anthozoa, comprising the sea-anemones and corals, the individual is always a polyp; in the Hydrozoa, however, the individual may be either a polyp or a medusa (q.v.).

A good example of a polyp may be seen in a common sea-anemone or in the well-known fresh-water polyp, Hydra (fig. 1). The body may be roughly compared in structure to

a sac, the wall of which is

composed of two layers of cells. The outer layer is known technically as the ectoderm, the inner layer as the endoderm. Between ectoderm and endoderm is a supporting layer of struc- q V tureless gelatinous substance / termed mesogloea, secreted by the cell-layers of the body-wall; the mesogloea may be a very thin layer, or may reach a fair thickness, and then sometimes contains skeletal elements formed by cells which have migrated into it from the ectoderm. The sac-like body built up in this way is attached usually to some firm object by its blind end, and bears _ rr , at the upper end the mouth

i-ic. 1— Hydra viri dis, the fresh- surrounded by a circle of waterpolyp. The animal is attached tent!lr ˆ JZh W 1 ■ to the stem of a plant, and is repre- tentacles – *

T^2c^LSiZ:°0^ d a Potion of its Z,mll te, testis. ‘ cavity, so that primarily the

tentacles are hollow; but in some cases the tentacle may become solid by obliteration of its cavity. The tentacles are organs which serve both for the tactile sense and for the capture of food. By means of the stinging nettle-cells or nematocysts with which the tentacles are thickly covered, living organisms of various kinds are firmly held and at the same time paralysed or killed, and by means of longitudinal muscular fibrils formed from the cells of the ectoderm the

tentacles are contracted and convey the food to the mouth By means of circularly disposed muscular fibrils formed from the endoderm the tentacles can be protracted or thrust out after contraction. By muscle-fibres belonging to the same two systems the whole body may be retracted or protruded.

We can distinguish therefore in the body of a polyp the column, circular or oval in section, forming the trunk, resting on a base or foot and surmounted by the crown of tentacles which enclose an area termed the peristome, in the centre of which again is the mouth. As a rule there is no other opening to the body except the mouth, but in some cases excretory pores are known to occur in the foot, and pores may occur at the tips of the tentacles. Thus it is seen that a polyp is an animal of very simple structure.

The name polyp was given to these organisms from their supposed resemblance to an octopus (Fr. poulpe) with its circle of writhing arms round the mouth. This comparison though far-fetched, is certainly more reasonable than the common name coral-insects ” applied to the polyps which form coral It cannot be too emphatically stated that a coral-polyp is as far removed in organization from either an octopus or an insect as it is from man himself.

The external form of the polyp varies greatly in different cases. In the first place the column may be long and slender or may be, on the contrary, so short in the vertical direction that the body becomes disk-like. The tentacles may number many hundreds or may be very few, in rare cases only one or two or even absent altogether; they may be long and filamentous,’ or short and reduced to mere knobs or warts; they may be simple and unbranched, or they may be feathery in pattern. All these types are well illustrated by different species of British sea-anemones. The mouth may be level with the surface of the peristome, or may be projecting and trumpet-shaped. As regards internal structure, polyps exhibit two well-marked types of organization, each

characteristic of one of the two classes Hydrozoa and Anthozoa. ‘

It is an almost universal attribute of polyps to possess the power of reproducing themselves non-sexually by the method of budding. This mode of reproduction may be combined with sexual reproductiveness, or may be the sole method by which the polyp produces offspring, in which case the polyp is entirely, without sexual organs. In many cases the buds formed do not separate from the parent but remain in continuity with it, thus forming colonies or stocks, which may reach a great size and contain a vast number of individuals. Slight differences in the method of budding produce great varia- tions in the form of the colonies, which may be distinguished in a general way as spreading, massive or arborescent. The reef-building corals are polyp-colonies, strengthened by the formation of a firm skeleton. For further details of colony- formation the reader is referred to the articles Anthozoa and Hydromedusae.

For figures of polyps see P. Gosse, A History of the British Sea-Anemones and Corals (London, i860); A. Andres, ” Le Attinie,” in tauna and Flora des Golf es von Neapel, ix. 1 (Leipzig, 1884)- G T Allman, A Monograph of the Gymnoblastic or Tubularian Hydroids (Ray Society, 1871-1872). (E. A.M.)

POLYPERCHON (incorrectly Polysperchon), one of Alex- ander’s generals, and the successor of Antipater as regent in Macedonia in 319 B.C. He was driven out by Cassander in 317 b.c. (See Phocion.)

POLYPHEMUS, in Greek mythology, the most famous of the Cyclopes, son of Poseidon and the nymph Thoosa. He dwelt in a cave in the south-west corner of Sicily, and was the owner of large flocks and herds. He was of gigantic stature, with one eye in the middle of his forehead, a consumer of human flesh, without respect for the laws of God or man. Odysseus, having been cast ashore on the coast of Sicily, fell into the hands of Polyphemus, who shut him up with twelve of his companions in his cave, and blocked the entrance with an enormous rock. Odysseus at length succeeded in making the giant drunk, blinded’ him by plunging a burning stake into his eye while he lay asleep, and with six of his friends (the others having been

devoured by Polyphemus) made his escape by clinging to the bellies of the sheep let out to pasture. Euripides in the Cyclops essentially

follows the Homeric account. A later story asso- ciates Polyphemus with Galatea (see Acis).

Homer, Odyssey, ix. ; Ovid, Metam. xiii. 749; Theocritus xi. See W. Grimm, Die Sage von Polyphem. (1857); G. R. Holland, in Leipziger Studien (1884), vii. 139-312.

POLYPODIUM, in botany, a large genus of true ferns (q.v.), widely distributed throughout the world, but specially developed in the tropics. The name is derived from Gr. irokvs, many, and irdbtov, a little foot, on account of the foot-like appear- ance of the rhizome and its branches. The species differ greatly in size and general appearance and in the character of the frond ; the sori or groups of spore-cases {sporangia) are borne on the back of the leaf, are globose and naked, that is, are not covered with a membrane (indusium) (see fig. 1). The common poly- pody (fig. 2) (P. mlgare) is widely diffused in the British Isles, where it is found on walls, banks, trees, &c. ; the creep- ing, densely-scaly rootstock bears deeply pinnately cut fronds, the fertile ones bear- ing on the back the bright yellow naked groups of sporangia (sori). It is also known as adder's foot, golden maidenhair and wood-fern, and is the oak- fern of the old herbals.

Fig. 1. — Portion of a pinna Fig. 2.— Poly podium vulgare,

of leaf of Polypodium bearing common polypody (about | nat. sori, s, on its back. size).

1. Group of spore-cases (sorus) on back of leaf.

There are a large number of varieties, differing chiefly in the form and division of the pinnae; var. cambricum (origin- ally found in Wales) has the pinnae themselves deeply cut into narrow segments; var. cornubiense is a very elegant plant with finely-divided fronds; var. cristatum is a handsome variety with fronds forking at the apex and the tips of all the pinnae crested and curled. P. dryopteris, generally known as oak- fern, is a very graceful plant with delicate fronds, 6 to 12 in. long, the three main branches of which are themselves pinnately divided; it is found in dry, shady places in mountain districts in Great Britain, but is very rare in Ireland. P. phegopteris (beechfern) is a graceful species with a black, slender root-stock, from which the pinnate fronds rise on long stalks, generally about 12 in. long, including the stalk; it is characterized by having the lower pinnae of the frond deflexed; it is generally distributed in Britain, though not common. Many other species from different parts of the world are known in green- house cultivation.

POLYPUS, a term signifying a tumour which is attached by a narrow neck to the walls of a cavity lined with mucous

membrane. A polypus or polypoid tumour may belong to any variety of tumour, either simple or malignant. The most com- mon variety is a polypus of the nose of simple character and easily removed. Polypi are also met with in the ear, larynx, uterus, bladder, vagina, and rectum. (See TuMoufc.)

POLYTECHNIC (Gr. xo\i>5, many, and r'txvn, an art), a term which may be held to designate any institution formed with a view to encourage or to illustrate various arts and sciences. It has, however, been used with different applications in several European countries. In France the first icole polytechnique was founded by the National Convention at the end of the 18th century, as a practical protest against the almost exclusive devotion to literary and abstract studies in the places of higher learning. The institution is described as one " ou l'on instruit les jeunes gens, destines a entrer dans les ecoles speciales d'artillerie, du genie, des mines, des ponts et chaussees, cre6 en 1794 sous le nom d'ecole centrale des travaux publiques, et en 1795 sous celui qu'elle porte aujourd'hui " (Littri). In Ger- many there are nine technical colleges which, in like manner, have a special and industrial rather than a general educational purpose. In Switzerland, the principal educational institution, which is not maintained or administered by the communal authorities, but is non T local and provided by the Federal govern- ment, is the Polytechnikum at Zurich. In all the important towns of the Federation there are trade and technical schools of a more or less special character, adapted to the local indus- tries; e.g. schools for silk-weaving, wood-carving, watchmaking, or agriculture. But the Zurich Polytechnikum has a wider and more comprehensive range of work. It is a college designed to give instruction and practical training in those sciences which stand in the closest relation to manufactures and commerce and to skilled industry in general and its work is of university rank.

To the English public the Word polytechnic has only recently become familiar, in connexion with some London institutions of an exceptional character. In the reign of William The First IV. there was an institution in London called after Polytechnics the name of his consort-^" The Adelaide Gallery " to England. —and devoted rather to the display of new scientific inven- tions and curiosities than to research or to the teaching of science. It enjoyed an ephemeral popularity, and was soon imitated by an institution called the Polytechnic in Regent Street, with a somewhat more pretentious programme, a diving- bell, electrical and mechanical apparatus, besides occasional illustrated lectures of a

popular and more or less recreative character. In the popular mind this institution is inseparably associated with ” Professor ” Pepper, the author of The Boy’s Playbook of Science and of Pepper’s Ghost. Both of these institutions, after a few years of success, failed financially; and in 1880 Mr Quintin Hogg, an active and generous philan- thropist, purchased the disused building in Regent Street, and reopened it on an altered basis, though still retaining the name of Polytechnic, to which, however, he gave a new significance. He had during sixteen years been singularly successful in gathering together young shopmen and artisans in London in the evenings and on Sunday for religious and social intercourse, and in acquiring their confidence. But by rapid degrees his enterprise, which began as an evangelistic effort, developed into an educational institution of a novel and comprehensive char- acter, with classes for the serious study of science, art, and literature, a gymnasium, library, reading circles, laboratories for physics and chemistry, conversation and debating clubs, organized country excursions, swimming, rowing, and natural history societies, a savings bank, and choral singing, besides religious services, open to all the members, though not obli- gatory for any. The founder, who from the first took the closest personal interest in the students, well describes his own aims: ” What we wanted to develop our institute into was a place which should recognize that God had given man more than one side to his character, and where we could gratify any reason- able taste, whether athletic, intellectual, spiritual or social. I The success of this effort was remarkable. In the first winter

6800 members joined, paying fees of 3s. per term, or 10s. 6d. per year; and the members steadily increased, until in 1900 they reached a total of 15,000 The average daily attendance is 4000; six hundred classes in different grades and subjects are held weekly; and upwards of forty clubs and societies have been formed in connexion with the recreative and social departments.

The precedent thus established by private initiative has since been followed in the formation of the public institutions which, Later under the name of ” Polytechnics,” have become

institutions so prominent and have exercised such beneficent of this influence among the working population of London. class – The principal resources for the foundation and

maintenance of these institutions have been derived from two funds — that administered under the City Parochial Charities Act of 1883, and that furnished by the London County Council, at first under the terms of the Local Taxation (Customs and Excise) Act of 1890, and the Technical Instruction Act 1889, but since the 1st of May 1904 under the Education Act 1902, as applied to London by the act of 1903. More detailed refer- ence to these two acts seems to be necessary in this place.

The royal commission of inquiry into the parochial char- ities of London was appointed in 1878, mainly at the instance The city °^ ^ r J ames Bryce, and under the presidency of Parochial the Duke of Northumberland. Its report appeared Charities i n 1880, giving particulars of the income of the Act ~ parishes, and revealing the fact that the funds had

largely outgrown the original purposes of the endowments, which were ill adapted to the modern needs of the class for whose benefit they were intended. The act of parliament of 1883 was designed to give effect to the recommendations of the commissioners It provided that while five of the largest parishes were to retain the management of their own charitable funds, the endowments of the remaining 107 parishes in the city should be administered by a corporate body, to be en- titled ” the Trustees of the London Parochial Charities” (other- wise known in relation to the polytechnics as ” the Central Governing Body”), this body to include five nominees of the Crown and four of the corporation of London. The remaining members were to be chosen under a subsequent scheme of the charity commission, which added four nominees of the Lon- don County Council, two of the Ecclesiastical Commissioners, and one each appointed by the university of London, Univer- sity College, King’s College, the City and Guilds institute, and the governing bodies of the Bishopsgate and the Cripplegate foundations. For the purpose of framing the scheme, a special commissioner, Mr James Anstie, Q.C., was temporarily attached to the charity commission, and it thus became the duty of the commission to prepare a statement of the charity property possessed by the 107 parishes, distinguishing between the secular and the ecclesiastical parts of the endowments. The annual income derived from the ecclesiastical fund was £35,000, and that from the secular portion of the fund £50,000. The scheme assigned capital grants amounting to £15.5,000 to the provision of open spaces, and £149,500 to various institutions, including free libraries in Bishopsgate and Cripplegate, the People’s Palace, the Regent Street and Northampton Institutes, and the Victoria Hall. A capital sum of £49,355 out of the ecclesiastical fund. was devoted to the repair of

city churches; and the balance of the annual income of this fund, after allowances for certain vested interests, was directed to be paid to the Ecclesiastical Commissioners. This balance has varied by slight increases from year to year, and amounted in 1906 to £20,875. The remaining fund thus set free for secular purposes was by the scheme largely devoted to the erection and main- tenance of polytechnic institutions, or ” industrial institutes,” as they were at first called. It was the opinion of Mr Anstie and his fellow-commissioners that in this way it would be possible to meet one of the most urgent of the intellectual needs of the metropolis, and to render service nearly akin to the original purposes of the obsolete charitable endowments. For the year 1906-1907 the grants made to the polytechnics and kindred institutions (the Working Men’s College, College for Working

Women, &c.) by the Central Governing Body amounted to £39,140, and the total amount contributed by the Central Governing Body since its creation amounts to £543,000.

The general scope and aims of the institutions thus con- templated by the commissioners are defined in the A Typlcal ” general regulations for the management of an Indus- Scheme trial institute,” which are appended as a schedule to underthe the several schemes, and which run as follows: — Act ‘

The object of this institution is the promotion of the industrial skill, general knowledge, health and well-being of young men and women belonging to the poorer classes by the following means: —

i. Instruction in —

a. The general rules and principles of the arts and sciences

applicable to any handicraft, trade or business.

b. The practical application of such general rules and

principles in any handicraft, trade or business.

c. Branches or details of any handicraft, trade or business,

facilities for acquiring the knowledge of which cannot usually be obtained in the workshop or other, place of business.

The classes and lectures shall not be designed or arranged so as to be in substitution for the practical experience of the workshop or place of business, but so as to be supplementary thereto.

ii. Instruction suitable for persons intending to emigrate.

iii. Instruction in such other branches and subjects of art, science, language, literature and general knowledge as may be approved by the governing body.

iv. Public lectures or courses of lectures, musical and other entertainments and exhibitions.

v. Instruction and practice in gymnastics, drill, swimming and other bodily exercises.

vi. Facilities for the formation and meeting of clubs and societies.

vii. A library, museum and reading room or rooms.

Within the limits prescribed, the governing body may from time to time, out of the funds at their disposal, provide and maintain buildings and grounds, including workshops and laboratories suitable for all the purposes herein specified, and the necessary furniture, fittings, apparatus, models and books, and may provide or receive by gift or on loan works of art or scientific construction, or objects of interest and curiosity, for the purpose of the institute, and for the purpose of temporary exhibition.

Other provisions in the scheme require: (1) that the educa- tional benefits of the institute shall be available for both sexes equally, but that common rooms, refreshment rooms, gymnasia and swimming-baths may be established separately, under such suitable arrangements as may be approved by the governing body; (2) that the fees and subscriptions shall be so fixed as to place the benefits of the institute within the reach of the poorer classes; (3) that no intoxicating liquors, smoking or gambling shall be allowed in any part of the building; (4) that the build- ings, ground and premises shall not be used for any political, denominational or sectarian purpose, although this rule shall not be deemed to prohibit the discussion of political subjects in any debating society approved by the governing body; (5) t!hat no person under the age of sixteen or above twenty-five shall be admitted to membership except on special grounds, and that the number thus specially admitted shall not exceed 5 % of the total number of members.

These and the like provisions have formed the common basis for all the metropolitan polytechnics. In 1890 a large sum was placed by the Local Taxation (Customs and Excise) Act at the disposal of the county and county n f`iBoard borough councils for the general purposes of

tech- of the nical education, and in 1893 the London County London Council determined to devote a considerable portion S!”””« of this revenue to the further development and sus- tentation of polytechnics. While the funds granted by : the Central Governing Body may be employed in aid of the social and recreative as well as the educational purposes of the various institutes, it is a statutory obligation that the sums contributed by the London County Council should be applied to educational work only.

- Dr William Garnett, the educational adviser of the London County Council, has, in a published lecture delivered before the international congress on technical education in June 1897, thus described the conditions under which the council offers financial help to the London polytechnics: —

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The objects which the technical education board has had in view in its dealings with the polytechnics have been : —

1 . To allow to the several governing bodies the greatest possible freedom in the conduct of social, recreative and even religious work within the provisions of the schemes of the Charity Com- missioners.

2. To secure to each polytechnic the services of an educational principal, who should be responsible to his governing body for the organization and conduct of the whole of the work of the institution.

3. To provide in each polytechnic a permanent staff of teachers, who should be heads of their respective departments and give their whole time to the work of the institution, and thus to establish a corporate or collegiate life in the polytechnic.

4. To ensure that all branches of experimental science are taught experimentally, and that the students have the opportunity of carrying out practical laboratory work, at an inclusive fee not exceeding ten shillings for any one subject.

5. To provide efficient workshop instruction in all practical trade subjects.

6. To secure that the number of students under the charge of any one teacher in laboratory or workshop classes, or in other classes in which personal supervision is of paramount importance, shall not exceed a

stated limit (fifteen in the workshop, or twenty in the laboratory).

7. To exclude from classes students who, for want of preliminary training, are incapable of profiting by the instruction provided; and to this end to restrict the attendance at workshop classes to those who are actually engaged in the trades concerned, and have thus opportunities of acquiring the necessary manual dexterity in the performance of their daily duties.

8. To furnish an adequate fixed stipend for all teachers, in place of a contingent interest in fees and grants.

9. To encourage private subscriptions and donations.

10. To establish an efficient system of inspection.

11. To facilitate the advertisement of polytechnic classes, and especially to invite the co-operation of trade societies in. supporting their respective classes.

12. To encourage the higher development of some special branch of study in each polytechnic.

13. To utilize the polytechnic buildings as far as possible in the daytime by the establishment of technical day schools, or otherwise.

14. To secure uniformity in the keeping of accounts.

The regulations under which the council has attempted to secure its objects by means of grants have been changed from time to time as the work of the polytechnics has developed, but they provide that the council's aid should be partly in the form of a fixed grant to each institution, partly a share of the salaries of the principal and the permanent teachers, partly a grant on attendance, the scale depending on the subject and character of the instruction, and partly a subsidy (15%) on voluntary contri- butions. In addition to the annual grants for maintenance, substantial grants for building and equipment are made from time to time.

The scale of grants adopted by the council for the session 1907-1908 was the following: —

i. A fixed grant assigned to each polytechnic.

ii. Three-fourths of the salary of the principal (subject to certain conditions).

iii. Fifty per cent, of the salaries of heads of approved departments.

iv. Ten per cent, of the salaries of other teachers.

v. Fifteen per cent, on (voluntary) annual subscriptions or donations.

vi. Attendance grants on evening classes varying from id. to 6d. per student-hour (subject to certain conditions of minimum attendance, eligibility, &c).

vii. Special grants not exceeding £50 for courses of lectures on particular subjects required or approved by the council.

viii. Special grants towards any departments which the council may desire to see established or maintained.

ix. Equipment grants and building grants in accordance with the special requirements of the institutions.

The above grants are independent of any contributions which the council may make towards secondary day schools or day schools of domestic economy or training colleges of domestic economy in the polytechnics.

With a view to a due division of labour, and also to the co- operation of the public bodies concerned, the “London Poly- technic Council” was created in 1894. It was composed of

representatives of the Central Governing Body, the technical education board of the London County Council, and the City and Guilds of London Institute, and its duty was to consult as to the appropriation of funds, the organiza- London tion of teaching, the holding of needful examina- Polytechnic tions, and the supervision of the work generally. CouacU – After ten years of work the London polytechnic council was dissolved in the summer of 1904 in consequence of the abolition of- the technical education board of the London County Council, when the council became responsible for all grades of education. A statement below shows the number and names of the several institutions, and the extent to which they have been severally aided by the Central Governing Body and the London County Council.

The ” People’s Palace” owes its origin in part to the popu- larity of a novel by Sir Walter Besant, entitled All Sorts and Conditions of Men, in which the writer pointed out The the sore need of the inhabitants of East London People’s for social improvement and healthy recreation, Palace. and set forth an imaginary picture of a ” Palace of Delight,”

wherein this need might be partly satisfied. Much public interest was awakened, large subscriptions were given, and the Central Governing Body aided the project; but the munificence of the drapers' company in setting aside £7000 a year for its permanent maintenance released the London County Council from any obligation to make a grant. Apart from the social and recreative side of this popular institution, the edu- cational section, under the name of the East London Technical College, steadily increased in numbers and influence under the fostering care of the drapers' company and has now been re- cognized as a "school" of the university of London under the title of " The East London College" and is being utilized by the London County Council in the same way as other " schools of the university."

Grants to the London Polytechnics during the Session 1906-1907.

Central Governing Body. London County Council.

Under Scheme.

Voluntary Grants.

Buildings

and

Equipment.

Main- tenance.

Battersea Polytechnic Birkbeck College . . Borough Road Polytechnic City of London College . East London College . Northampton Institute . Northern Polytechnic Regent Street Polytechnic South-Western Polytechnic Woolwich Polytechnic Sir John Cass's Institute .

2,500 1,000 2,500 1,000 3,500 3,350 1,500 3,500 1,500

nil

nil

1,701 1,005

1,563 901

224

1,555 2,183

3,9i6

2,091 1,000 50

1,545 445 820

515

nil

3,415 2,660

965 1,275 2,525

5IO

4,760 3,450 5,285

3,725

nil

4,525

4,H5

7,665 6,265

5,495 2,400

Total …. j

f

20,350

16,189

14,675

47,715

In the above table the grants are given to the nearest pound. Up to July 1907 the total expenditure of the council upon the polytechnics, apart from the day schools, training colleges, &c, conducted in them, was about £525,000, almost exactly the same as that of the Central Governing Body. The voluntary grants from the central governing body include a contribution towards a compassionate fund, and a

pension fund based on endowment assurances for all permanent officers of the poly- technics in receipt of salaries of not less than £106 a year.

The grants received from the board of education amount to about £30,000 a year, while the fees of students and members produce about £45,000. Voluntary subscriptions, including those from city companies and other sources of income, pro- duce about £30,000 in addition, so that out of a total expendi- ture of about £200,000 a year the council now contributes 30%, the Central Governing Body 18%, fees 22ˆ%, the board

of education

15%

15% and city companies and other subscribers

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The Goldsmiths' Institute at New Cross owed its existence and its annual maintenance to the generous initiative of the ancient city gild whose name it bore. It was therefore entirely independent of pecuniary subsidy from any other public body. In the year 1900 the number of class entries to this institute was 7574. In 1904 the goldsmiths' company presented the premises, together with an annual subsidy, to the university of London for the purposes of a training college for teachers, so that from that date it ceased to be one of the London poly- technics, although, pending the provision of other premises, many ' of the technical evening classes have been continued under the London County Council by permission of the university with the approval of the company. The clothworkers' com- pany has also contributed £18,000 to the Northern Polytechnic at Holloway.

In all these institutions the general aims have been practically the same, although special features have been differentiated Aims and in order to meet the local needs and the wishes of Methods, the inhabitants. In all there are laboratories and lecture rooms, trade classes, art studios, gymnasia, provision for manual training and domestic economy and applied science. In nearly all, at first, mechanical and manual instruction were the prominent objects in view, partly owing to the conditions under which grants were made by the science and art department. But of late increased attention has been paid year by year to literary and humaner studies, and to general

mental cultivation, pursued pari passu with technical and scientific training. The aid of the London organization for university extension, now a department of the university, has been especially serviceable in providing courses of lectures and classes in literary subjects at nearly all the polytechnics. As subsidiary to their main work, some of them have estab- lished junior continuation schools, with a view to provide suitable instruction for scholars who have left the public ele- mentary schools and are not yet prepared to enter the technical and trade classes. Although the workshops and the classes for artisans are used chiefly in the evenings, there is an increasing number of day students : e.g. at the Northampton Polytechnic Institute in Clerkenwell there is a very important day school of engineering conducted on the “sandwich system, ” the students entering engineering works for the summer months and returning to the polytechnic for the winter session; at the Battersea Polytechnic there is a very important training col- lege for teachers of domestic economy; at Regent Street there are day schools in engineering, architecture, photo-process and carriage-building; at the South- Western Polytechnic there are important schools of mechanical and electrical engineering and a training college for women teachers of physical exercises; at the Northern Polytechnic, as at Battersea, there is a training college for teachers of domestic economy, and there are departments of commerce and of physics and chemistry, while the Woolwich Polytechnic receives in the daytime, by special arrangement with the war office, a large number of engineering apprentices employed in the arsenal. In short, the schemes of the several institutions are so elastic that the governing bodies are at liberty to open any classes or to try any educational or recreative experiment for which they can find a genuine local demand. The total number of scholars in the polytechnics and their branch institutions is variously estimated at from 40,000 to 50,000. and the total number of regular scholars in the evening schools of the council does not exceed 100,000. These figures may be usefully compared with the census returns, which show that within the metropolitan area there are 704,414 persons between the ages of thirteen and twenty- one. It is a noteworthy fact that, whereas in the population statistics for the whole of England and Wales the number at each year of age is regularly diminished by death from eight years onwards, there is a steady increase in London, year by year, from fourteen up to the age of thirty. This fact is owing to the constant immigration of young men and women from the provinces to the metropolis. The census commis- sioners in their report for 1901 (p. 15) computed that more than

one-third of the population of London were not natives. They show

also that, if all England and Wales be taken together, the number of persons between twenty and twenty-one is less by 12-8% than the number between thirteen and fourteen; but that, taking London alone, the number of persons between twenty and twenty-one is greater by 14-4% than the number between thirteen and fourteen. Hence, the proportion of the inhabitants who are of an age to benefit by polytechnics and continuation schools is in London exceptionally large. It would not be right for Londoners to complain that there is thus cast upon them the duty of providing suitable instruction for so many immigrants, for if the great city drains the rural districts of some of their best brain and muscle, she gains much from their industry and productive power. The figures, however, point to the necessity for taking every means possible to raise the standard, both physical and intellectual, of the London boy. The immigration into London of youths and young men means to a great extent the substitution of the provincially trained improver or artisan for the less fit London boy, who consequently falls into the ranks of the unskilled, then of the unemployed and ultimately of the unemployable. But it follows from the particulars thus given that neither the supply of suitable provision for mental improvement and rational recreation for the wage-earning classes, nor the demand for such provision on the part of the workers themselves is commensurate with the moral and intellectual needs of a com- munity of nearly seven millions of people (four and a half millions within the administrative county). The provision in evening schools, institutes, classes and polytechnics is still in some respects far inferior to that which is to be found in most German and Swiss towns, and needs to be greatly increased. In matters relating to the higher life, demand does not always precede supply; it is simply which is needed not only to satisfy the public demand, but to create it. As new and well-devised opportunities for mental culture are placed within reach, they will be more and more appreciated, new and healthier appetites will be stimulated, the art of employing leisure wisely and happily will be more systematically studied, and the polytechnics will become still more important centres of civilizing and educating influence than they have hitherto been.

In particular, the reconstituted university of London has been placed in new and most helpful relation to the best of the polytechnics. By the statvites the senate of the university is empowered to include in the list of ” schools of the university ” all institutions which are duly equipped and able to furnish suitable instruction of an advanced and scholarly type; and also to recognize all thoroughly qualified professors in their several faculties and subjects as ” teachers of the university,” although some of their classes may meet in the evening

only, and no student is to be prevented from taking a degree as an internal student of the university solely because he can attend classes only in the evening. There is thus a way open for the due recognition of the polytechnics as part of the teaching machinery of the university, and for the admission of the best students as undergraduates, with all the rights of internal students. The great possibilities of the metropolitan univer- sity under its new conditions were at first hardly revealed or accurately foreseen. But there were during the session 1906-1907 no less than eighty-six recognized ” teachers of the university ” on the staffs of the London polytechnics and more than 750 students who were working for London University degrees in the polytechnic classes. There is no reason to fear that the recreative, social, manual and industrial training, to which at first the special attention of the founder of the Regent Street Polytechnic was directed, will suffer from a fuller expansion of the academic and literary side of ” polytechnic ” life. Rather it may be hoped that the due co-ordination of the practical with the purely intellectual purposes of these institutions will serve to give to all the students, whatever their future destination may be, a truer and broader conception of the value of mental culture for its own sake.

See also a paper by Mr Sidney Webb, The London Polytechnic Institutes, in the second volume of special reports on educational subjects (1898) issued by the Education Department; the Report of the Central Governing Body of the London Parochial Charities; the Annual Reports of the London County Council; the Polytechnic Magazine, published from time to time at the institute in Regent Street; and various memoirs and papers contained in the Proceed- ings of the International Congress on Technical Education (1897), especially two — -that by Mr Quintin Hogg, detailing his own early experience in founding the first polytechnic, and that of Dr William Garnett, then secretary of the Technical Education Board.

(J. G. F.;W. G.) POLYXENA, in Greek legend, daughter of Priam, king of Troy, and Hecuba. She had been betrothed to Achilles, who was slain by Paris in the temple of Apollo Thymbraeus, where the marriage was to have been celebrated (Hyginus, Fab. no). The shade of Achilles afterwards appeared to the returning Greeks in the Thracian Chersonese and demanded the sacrifice of Polyxena, who was put to death by Neoptolemus, son of Achilles, on his father’s grave (Ovid, Metam. xiii. 440 sqq.). The tragic story is the subject of

the Hecuba of Euripides, the Troades of Seneca and the Polyxena of Sophocles, of which only a few fragments remain. According to Philostratus {Heroica, 20, 18), Polyxena fled to the Greeks after the murder of Achilles and committed suicide on his tomb.

POLYZOA, in zoology, a term (introduced by J. V. Thompson, 1830) synonymous with Bryozoa (Ehrenberg, 183 1) for a group commonly included with the Brachiopoda in the Molluscoidea (Milne Edwards, 1843). The correctness of this association is questionable, and the Polyzoa are here treated as a primary division or phylum of the animal kingdom. They may be defined as aquatic animals, forming colonies by budding; with ciliated retractile tentacles and a U-shaped alimentary canal. The phylum is subdivided as follows.

Class I. Entoprocta (Nitsche). Lophophore circular, in- cluding both mouth and anus. Tentacles infolded, during retraction, into a vestibule which can be closed by a sphincter. Body-wall not calcified, body-cavity absent. Definite excretory organs present. Reproductive organs with ducts leading to the vesti- bule. Zooids possessing a high degree of individuality. Loxosoma Pedicellina (fig. 1), Urtatella.

Class II. Ectoprocta (Nitsche). Lophophore circular or horseshoe shaped, including the mouth but not the anus. Tentacles retractile into an introvert (” tentacle-sheath “). Body- wall membranous or calcified, body- cavity distinct. Specific excretory organs absent, with the doubtful excep- tion of the Phylactolaemata. Repro- ductive organs not continuous with ducts. Zooids usually connected laterally with their neighbours.

Order 1. Gymnolaemata (Allman). —

Lophophore circular, with no epistome.

Fig. 1. — Part of the Body-cavities of zooids not continuous

creeping stolon, with with one another. Body-wall not muscular.

zooids, of Pedicellina Sub-order 1. Trepostomata (Ulrich);

belgica. Fossil. — Zooecia, long and coherent, pris-

a, c, Stalks of zooids matic or cylindrical, with terminal orifices,

of different ages; b, their wall thin and simple in structure

DU d. proximally, thickened and complicated

distally. Cavity of the zooecium subdivided

by transverse diaphragms, most numerous in the distal portion.

Orifices of the zooecia often separated by pores (mesopores).

Sub-order 2. Cryptostomata (Vine); Fossil. — Zooecia usually short. Orifice concealed at the bottom of a vestibular shaft, sur- rounded by a solid or vesicular calcareous deposit.

Sub-order 3. Cyclostomata (Busk). — rZooecia prismatic or cylindrical, with terminal, typically circular orifice, not protected by any special organ. The ovicells are modified zooecia, and contain numerous embryos which in the cases so far investigated arise by fission of a primary embryo developed from an egg. Crisia (fig. 2), Tubuliportt, Hornera, Lichenopora. Suborder A. Ctbwostomata (Busk). — Zooecia with soft uncalci-

fied 1 walls, the external part of the introvert being closed during retraction by a membranous collar. Zooecia either arising from a stolon, without lateral connexion with one another, or laterally united to form sheets. Alcyonidium, Flustrella, Bowerbankia (fig- 3) > Farrella, Victorella, Paludicella.

(After van Beneden.)

(After Hincks.)

Fig. 2. — Part of a Branch of Crisia eburnea. g, zooecia ; x, imperfectly developed ovicell.

Sub-order 5. Cheilostomata (Busk). — Zooecia with more or less calcified walls. Orifice closed by a lid-like operculum. Poly- morphism usually occurs, certain individuals having the form of

avicularia or vibracula. The ovicells commonly found as globular swellings surmounting ;' the orifices are not direct modifications of zooecia, and each typically contains a single egg or embryo. Membranipora, Flustra, Onychocella, Lunu- lites, Steganoporella, Scrupo- cellaria, Menipea, Caberea, ;// Bicellaria, Bugula, Beania,

(After Hincks.) (After Hincks.)

Fig. 3.— Part of a branch of Fig. 4. — Zooecia of Umbonula Bowerbankia pustulosa, showing pavonella, showing a pair of the

thread-like stolon from which minute avicularia on either side arise young and mature zooecia. of the orifice of each zooecium. The tentacles are expanded in some of the latter.

Membraniporella, Cribrilina, Ccllaria, Micropora, Selenaria, Umbonula (fig. 4), Lepralia, Schizoporella, Cellepora, Mucronella, Smittia, Retepora, Catenicella, Microporella, Adeona,

Order 2. Phylactolaemata (Allman).— Lophophore horse-shoe shaped, or in Fredericella circular. Mouth guarded by an epistome. Body-cavities of zooids continuous with one another. Body-wall uncalcified and muscular. Reproduction sexual and by means of " statoblasts," peculiar internal buds protected by a chitinous shell. Fredericella, Plumatella (fig. 5), Lophopus, Crislatella, Pectinatella.

Hatschek (1888) treated the Entoprocta as a division of his group Scolecida, characterized by the possession of a primary body-cavity and of protonephridia; while he placed the Ecto- procta, with the Phoronida and Brachiopoda, in a disfinct group, the Tentaculata. Against this view may be urged the essential similarity between the processes of budding in Entoprocta and Ectoprocta (cf. Seeliger, Zeitschr. wiss. Zool. xlix. 168; 1., 560), and the resemblances in the development of the two classes.

Of the forms above indicated there is no palaeontological evidence with regard to the Entoprocta. The Trepostomata are in the main Palaeozoic, although Heteropora, of which recent species exist, is placed by Gregory in this division. The Cryptostomata are also Palaeozoic, and include the abundant and widely-distributed genus Fenestella. The Cyclostomata are numerous in Palaeozoic rocks, but attained a specially predominant position in the Creta- ceous strata, where they are represented by a profusion of genera and species; while they still survive in considerable numbers at the present day. The Ctenostomata are ill adapted for preserva- tion as fossils, though remains referred to this group have been

1 Calcareous spicules have been described by Lomas in Alcyoni- dium gelatinosum.

(After AUman.)

Fig. 5. — Zooid Plumatella, with ex- panded tentacles. a. Anus :

lopho-

shaped

phore ; Ectocyst ; Caecum of stomach.

described from Palaeozoic strata. They constitute a small proportion of the recent Polyzoa. The Cheilostomata are usually believed to have made their appearance in the Jurassic period. They are the dominant group at the present day, and are Represented by a large number of genera and species. The Phylactolaemata are a small group confined to fresh water, and possess clear indications of adaptation to that habitat. The fresh-water fauna also contains a representative of the Entoprocta (Urnatella), two or three Ctenostomes, such as Victorella and Palu- dicella, and one or two species of Cheilo- stomata. With these exceptions, the existing Polyzoa are marine forms, occur- ring from between tide-marks to abyssal depths in the ocean.

The Polyzoa are colonial animals, the colony (zoarium) originating in most cases from a free-swimming larva, which attaches itself to some solid object and becomes metamorphosed into the primary individual, or ” ancestrula.” In the Phylactolaemata, however, a new colony may originate not only from a larva, but also from a peculiar form of bud known as a statoblast, or by the fission of a fully-developed colony. The ancestrula inaugurates a process of budding, con- of tinued by its progeny, and thus gives rise to the mature colony. In Loxosoma the buds break off as soon as they become mature, and a colonial form is thus hardly br, Tentacles, arranged assumed. In other Entoprocta the buds on a horseshoe retain a high degree of individuality, a thread-like stolon giving off the cylindrical stalks, each of which dilates at its end into the body of a zooid. In some of the Ctenostomata the colony is similarly constituted, a branched stolon giving off the zooids, which are not connected with one another. In the majority of Ectoprocta there is no stolon, the zooids growing out of one another and being usually apposed so as to form con- tinuous sheets or branches. In the encrusting type, which is found in a large proportion of the genera, the zooids are usually in a single layer, with their orifices facing away from the sub- stratum; but in certain species the colony becomes multilaminar by the continued superposition of new zooids over the free surfaces of the older ones, whose orifices they naturally occlude. The zoarium may rise up into erect growths composed of a single layer of zooids, the orifices of which are all on one surface, or of two layers of zooids placed back to back, with the orifices on both sides of the fronds or plates. The rigid Cheilostomes which have this habit were formerly placed in the genus Eschara, but the bilaminar type is

common to a number of genera, and there can be no doubt that it is not in itself an indication of affinity. The body-wall is extensively calcified in the Cyclostomata and in most Cheilo- stomata, which may form elegant network-like colonies, as in the unilaminar genus Retepora, or may consist of wavy anastomosing plates, as in the bilaminar Lepralia foliacea of the British coasts, specimens of which may have a diameter of many inches. In other Cheilostomes the amount of calcification may be much less, the supporting skeleton being largely composed of the organic material chitin. In Flustra and other forms belonging to this type, the zoarium is accordingly flexible, and either bilaminar or unilaminar. In many calcareous forms, both Cheilostomes and Cyclostomes, the zoarium is rendered flexible by the interposition of chitinous joints at intervals. This habit is characteristic of the genera Crista, Cellaria, Catenicella and others, while it occurs in certain species of other genera. The form of the colony may thus be a good generic character, or, on the contrary, a single genus or even species may assume a variety of different forms. While nearly all Polyzoa are permanently fixed to one spot, the colonies of Cristatella and Lophopus among the Phylactolaemata can crawl slowly from place to place.

Anatomy. — The zooids of which the colonies of Ectoprocta are composed consist of two parts: the body-wall and the visceral mass (figs. 6, 9). These were at one time believed to represent two individuals of different kinds, together constituting a zooid. The visceral mass was accordingly termed the ” polypide ” and the body-wall which contains it the ” zooecium.” This view depended principally on the fact that the life of the polypide and of the zooecium are not coextensive. It is one of the most re- markable facts in the natural history of the Polyzoa that a single zooecium may be tenanted by several polypides, which successively degenerate. The periodical histolysis may be partly due to the absence of specific excretory organs and to the accumulation of pigmented excretory substances in the wall of the alimentary canal. On the degeneration of the polypide, its nutritive material is apparently absorbed for the benefit of the zooid, while the pig-

mented substances assume a spheroidal form, which either remains as an inert ” brown body” in the body-cavity or is discharged to the exterior by the alimentary canal of the new polypide. This is formed as a two-layered ” polypide-bud,” which usually develops from the inner side of the zooecial wall, and soon occupies the place of the previous polypide. The inner layer of the polypide-bud gives rise to the structures usually regarded as ectodermic and endodermic, the outer layer to the mesodermic organs.

The polypide consists of a ” lophophore ” bearing a series of ciliated tentacles by which Diatoms and other microscopic bodies are collected as food, of a U-shaped alimentary canal, and of a central nervous system. While the mouth is invariably encircled by the bases of the tentacles, the anus lies within the series in the Entoprocta and outside it in the Ectoprocta. The lophophore is a simple circle in all Polyzoa except in the Phylactolaemata, where it typically has the form of a horse shoe outlined by the bases of the tentacles. In Fredericella belonging to this order it is, however, circular, but the systematic position of the genus is sufficiently indicated by its possession of an ” epistome,” a lip-like structure . guarding the anal side of the mouth in all Phylactolaemata and absent throughout the Gymnolaemata. The cavities of the hollow tentacles open into a circular canal which surrounds the oesophagus at the base of the lophophore. This is continuous with the general body-cavity in the Phylactolaemata, while in the Gymnolaemata it develops in the bud as a part of the body-cavity, from which it becomes completely separated. In the Entoprocta the tentacles are withdrawn by being infolded into the ” vestibule,” a depression of the oral surface which can be closed by a sphincter muscle. In the Ectoprocta they are retractile into an introvert, the ” tentacle- sheath ” (fig. 9), the external opening of which is the ” orifice ” of the zooecium. In the Cyclostomata, further distinguished by the cylindrical or prismatic form of their highly calcified zooecia, the orifice is typically circular, without any definite cjosing organ. In the Cheilostomata it is closed by a chitinous (rarely calcareous) ” operculum ” (fig. 9, C), while in the Ctenostomata it is guarded by a delicate membrane similar to a piece of paper rolled into a longitudinally creased cylinder. During retraction this ” collar ” lies concealed in the beginning of the introvert. It becomes visible when the polypide begins to protrude its tentacles, making its appearance through the orifice as a delicate hyaline frill through which the tentacles are pushed.

In the Phylactolaemata the outermost layer of the body- wall is a flexible, uncalcified cuticle or ” ectocyst,” be- neath which follow in suc- cession the ectoderm, the muscular layers and the coelomic epithelium. In a few Gymnolaemata the ec- tocyst is merely chitinous, although in most cases the four vertical walls and the basal wall of the zooecium are calcareous. The free (frontal) wall may remain membranous and uncalcified, as in Membranipora (figs. 8 A, 9 A), but in many Cheilostomes the frontal surface is protected by a cal- careous shield, which grows from near the free edges of the vertical walls and com- monly increases in thickness as the zooecium grows older by the activity of the ” epi- theca,” a layer of living tissue outside it. The

body- wall is greatly simplified in the Gymnolaemata, in cor- relation with the functional importance of the skeletal part of the wall. Even the ectoderm can rarely be recog- nized as an obvious epithe- lium except in regions where budding is taking place, while muscular layers are always absent and a coelomic epi- thelium can seldom be ob- served. The body-cavity is, however, traversed by mus- cles, and by strands of meso- dermic ” funicular tissue,’

(After AUman.)

Fig. 6. — Zooid of Palvdicella articulata (= ehrenbergi). a, Anus.

br, Expanded tentacles. i, Ectocyst.

in, r’ , Parietovaginal muscles. mr, Retractor muscle. 0, Ovary. oe, Oesophagus. v. Caecum of stomach,

testis. Funiculi.

I,

X, X’

usually irregular, but sometimes constituting definite funiculi (fig. 6, x, x’). This tissue is continuous from zooecium to zooecium

through perforated ” ro6ette-plates ” in the dividing walls. In the Phylactolaemata a single definite funiculus passes from the body- wall to the apex of the stomach. This latter organ is pigmented in all Polyzoa, and is produced, in the Ectoprocta, beyond the point where the intestine leaves it into a conspicuous caecum (fig. 6, v). The nervous system is represented by a ganglion situated between the mouth and the anus. The ovary (o) and the testis (t) of Ectoprocta are developed on the body-wall, on the stomach, or on the funiculus. Both kinds of reproductive organs may occur in a single zooecium, and the reproductive elements pass when ripe into the body-cavity. Their mode of escape is unknown in most cases. In some Gymnolaemata, polypides which develop an ovary possess a flask-shaped ” intertentacular organ,” situated between two of the tentacles, and affording a direct passage into the introvert for the eggs or even the spermatozoa developed in the same zooecium. In other cases the reproductive cells perhaps pass out by the atrophy of the polypide,

whereby the body-cavity may become continuous with the exterior. The statoblasts of the Phylactolaemata originate on the funiculus, and are said to be derived partly from an ectodermic core possessed by this organ and partly from its external mesoderm (Braem), the former giving rise to the chitinous envelope and to a nucleated layer (fig. 7, ect), which later invaginates to form the inner vesicle of the polypide-bud. The mesodermic portion becomes charged with a yolk-like material (y), and, on the germina- tion of the statoblast, gives rise to the outer layer (mes) of the bud. The production of a polypide by the statoblast thus differs in no essential respect from the formation of a polypide in an ordinary zooecium. The statoblasts require a period of rest before germina- tion, and Braem has shown that their property of floating at the surface may be beneficial to them by exposing them to the action „, of frost, which in some

cases improves the ger- minating power. The occurrence of Phylac- tolaemata in the tropics would show, however, without further evidence, that frost is not a factor essential for germination. The withdrawal of the extended polypide is effected by the contrac- tion of the retractor muscles (fig. 6, mr), and must result in an in- crease in the volume of the contents of the body- cavity. The alternate increase and diminution of volume is easily under- stood in forms with flex- ible zooecia. Thus in the Phylactolaemata the con- traction of the muscular body-wall exerts a pressure on the fluid of the body-cavity and is the cause of the protrusion of the polypide. In the Gymno- laemata protrusion is effected by the contraction of the parietal muscles, which pass freely across the body-cavity from one part of the body-wall to another. In the branching Ctenostomes the entire body- wall is flexible, so that the contraction of a parietal muscle acts equally on the two points with which it is connected. In encrusting Ctenostomes and in the Membranipora-like Cheilo- stomes (figs. 8 A, 9 A) the free surface or frontal wall is the only

one in which any consider- able amount of movement can take place. The parie- tal muscles (p.m.), which pass from the vertical walls to the frontal wall, thus act by depressing the latter and so exerting a pressure on the fluid of the body- Fig. 8. — Diagrammatic Transverse cavity. In Cheilostomata Sections. w ‘th a rigid frontal wall

A, of Membranipora; B, of an J ull ˆ n sh ° wed th . at P ro ” immature zooecium of CribrUina; trusion and retraction were p.m., Parietal muscles. rendered possible by the

existence 01 a compensa- tion-sac,” in communication with the external water.

In its most fully-developed condition (fig. 9, C) the compensation- sac (c.s.) is a large cavity which lies beneath the calcified frontal wall and opens to the exterior at the proximal border of the oper- culum (fig. 10). It is joined to the rigid body-wall by numerous muscle-fibres, the contraction of which must exert a pressure on the fluid of the body-cavity, thereby protruding the polypide. The exchange of fluid in the sac may well have a respiratory signifi- cance, in addition to its object of facilitating the movements of the tentacles.

The evolution of the arrangements for protruding the polypide seems to have proceeded along several distinct lines: (i.) In certain

sp (After Braem.)

Fig. 7. — Section of a Germinating Statoblast of Cristatella mucedo. ann, Chitinous annulus, containing air- cavities which enable the stato- blast to float. Thickened part of the ectoderm, which will give rise to the inner layer of the polypide- bud. , Mesoderm, forming the outer layer of the bud. Anchoring spines of the statoblast. The yolk-like mesodermic mass.

ect.

sp,

species of Membranipora the ” frontal membrane,” or membranous free-wall, is protected by a series of calcareous spines, which start from its periphery and arch inwards. In CribrUina similar spines

Fig. 10. — Zooecium of CribrUina, showing the entrance to the

Fig. 9. — Diagrammatic Longitudinal Sections of Cheilostomatous

Zooecia.

A, Membranipora (after Nitsche) ; B, CribrUina; C, Some of the Lepralioid forms, b.c, Body-cavity, cr., Cryptocyst. t.s., Compensation-sac. f.m., Frontal membrane. 0., Orifice, through which the tentacles are protruded, op., Operculum, p.m., Parietal muscles, t.s.. Tentacle-sheath.

are developed in the young zooecium, but they soon unite with one

another laterally, leaving rows of pores along the sutural lines

(fig. 10). The operculum retains its

continuity with the frontal membrane
(fig. 9, B) into which the parietal muscles
are still inserted. As indications that
the conditions described in Membranipora
and CribrUina are of special significance
may be noted the fact that the ancestrula
of many genera which have well-developed
compensation-sacs in the rest of their
zooecia is a Membranipora-\ike individual
with a series of marginal calcareous spines,
and the further fact that a considerable
proportion of the Cretaceous Cheilos-
tomes belong either to the Membrani-
poridae or to the Cribrilinidae. (ii.) In
Scrupocellaria, Menipea and Caberea a
single, greatly dilated marginal spine, the
" scutum " or " fornix," may protect the
frontal membrane. (iii.) In Umbonula
the frontal membrane and parietal
muscles of the young zooecium are like compensation – sac on
those of Membranipora, but they become the P roxln »I side of the
covered by the growth, from the proximal °P er cuIum (op).
and lateral sides, of a calcareous lamina covered externally
by a soft membrane. The arrangement is perhaps derivable

from a CribrUina-like condition in which the outer layer of the

spines has become membranous while the spines themselves are laterally united from the first, (iv.) In the Microporidae and Steganoporellidae the body-cavity becomes partially subdivided by a calcareous lamina (" cryptocyst," Jullien) which grows from the proximal and lateral sides in a plane parallel to the frontal membrane and not far below it. The parietal muscles are usually reduced to a single pair, which may pass through foramina

' ("opesiules ") in the cryptocyst to reach their insertion. There is no compensation-sac in these families, (v.) Many of the Lepralioid forms offer special difficulties, but the calcareous layer of the frontal surface is probably a cryptocyst (as in fig. 9, C), the compensation- sac being developed round its distal border. The " epitheca " noticed above is in this case the persistent frontal membrane, (vi.) In Microporella the opening of the compensation-sac has become separated from the operculum by calcareous matter, and is known as the " median pore." Jullien believed that this pore opens into the tentacle-sheath, but it appears probable that it really communicates with the compensation-sac and not with the tentacle- sheath. The mechanism of protrusion in the Cyclostomata is a subject which requires further examination.

The most singular of the external appendages found in the Polyzoa are the avicularia and vibracula of the Cheilostomata. The avicularium is so called from its resemblance, in its most highly differentiated condition, to the head of a bird. In Bugula, for instance, a calcareous avicularium of this type is attached by a narrow neck to each zooecium. The avicularium can move as a whole by means of special muscles, and its chitinous lower jaw

or " mandible " can be opened and closed. It is regarded as a modified zooecium, the polypide of which has become vestigial, although it is commonly represented by a sense-organ, bearing tactile hairs, situated on what may be termed the palate. The operculum of the normal zooecium has become the mandible, while the occlusor muscles have become enormous. In the vibra- culum the part representing the zooecium is relatively smaller, and the mandible has become the " seta," an elongated chitinous lash which projects far beyond the zooecial portion of the structure. In Caberea, the vibracula are known to move synchronously, but co-ordination of this kind is otherwise

unknown in the Polyzoa. The avicularia and vibracula give valuable aid to the systematic study of the Cheilostomata. In its least differentiated form the avicularium occupies the place of an ordinary zooecium (" vicarious avicularium "), from which it is distinguished by the greater development of the operculum and its muscles, while the polypide is normally not functional. Avicularia of this type occur in the common Flustra foliacea, in various species of Membranipora, and in particular in the Onychocellidae, a remarkable family common in the Cretaceous period and still existing. In the majority of Cheilostomes, the avicularia are, so to speak, forced out of the ordinary series of zooecia, with which they are rigidly connected. There are comparatively few cases in which, as in Bugula, they are mounted on a movable joint. Although at first sight the arrange- ment of the avicularia in Cheilostomes appears to follow no general law some method is probably to be made out on closer study. They occur in particular in relation with the orifice of the zooecium, and with that of the compensation-sac. This delicate structure is frequently guarded by an avicularium at its entrance, while avicularia are also commonly found on either side of the operculum ■ or in other positions close to that structure. It can hardly be doubted that the function of these avicularia is the protection of the ten- tacles and compensation-sac. The suggestion that they are concerned in feeding does not rest on any definite evidence, and is probably erroneous. But avicularia or vibracula may also occur in other places — on the backs of unilaminar erect forms, along the sutural lines of the zooecia and on their frontal surface. These are probably important in checking overgrowth by encrusting organisms, and in particular by preventing larvae from fixing on the zoarium. Vibracula are of less frequent occurrence than avicularia, with which they may coexist as in Scrupocellaria, where they occur on the backs of the unilaminar branches. In the so-called Selenariidae, probably an unnatural association of genera which have assumed a free discoidal form of zoarium, they may reach a very high degree of development, but Busk's suggestion that in this group they " may be subservient to locomotion " needs verification.

Development and Affinities. — It is generally admitted that the larva of the Entoprocta (fig. 11) has the structure of a Trocho-

sphere. This appears to indicate that the Polyzoa are remotely allied to other phyla in which this type of larva prevails, and in particular to the Mollusca and Chaetopoda, as well as to the Rotifera, which are regarded as persistent Trochospheres. The praeoral portion (lower in fig. n) constitutes the greater part of the larva and contains most of the viscera. It is terminated by a well-developed structure (/g) corresponding with the apical sense-organ of ordinary Trocho-

spheres, and an excretory organ (nph) of the type familiar in these larvae occurs on the ventral side of the stomach. The central nervous system (x) is highly developed, and in Loxosoma bears a pair of eyes. The larva swims by a ring of cilia, which corre- sponds with the praeoral circlet of a Trochosphere. The oral surface, on which are situated the mouth (in) and anus (a), is relatively small . The apical sense- organ is used for temporary attach- ment to the maternal vestibule in which development takes place, but permanent fixation is effected by the oral surface. This is followed by the atrophy of many of the larval organs, including the brain, the sense-organ and the ciliated ring. The alimentary canal persists and revolves in the median plane through an angle of 180 , accompanied by part of the larval vestibule, the space formed by the retraction of the oral surface. The vestibule breaks through to the exterior, and the tentacles, which have been developed within it, are brought into relation with the external water.

In the common and widely-distributed Cheilostome, Membrani-

(After Ha tschek.)

Fig. ii. — Larva of Pedicellina.

a. Anus.

/g, Apical sense-organ.

kg, Intestine.

/, Ventral wall of stomach.

m, Mouth.

nph, Excretory organ.

x, Brain.

pora pilosa, the pelagic larva is known as Cyphonautes, and it has a structure not unlike that of the larval Pedicellina. The principal differences are the complication of the ciliated band, the absence of the excretory organ, the great lateral compression of the body, the possession of a pair of shells protecting the sides, the presence of an organ known as the ” pyriform organ,” and the occurrence of a sucker in a position corresponding with the depression seen between (m) and (a) in fig. II. Fixation takes place by means of this sucker, which is everted for the purpose, part of its epithelium becoming the basal

ectoderm of the ancestrula. The pyriform organ has probably assisted the larva to find an appropriate place for fixation (cf. Kupelwieser, 18); but, like the alimentary canal and most of the other larval organs, it undergoes a process of histo- lysis, and the larva becomes the ancestrula, containing the primary brown body derived from the purely larval organs. The polypide is formed, as in an ordinary zooecium after the loss of its polypide, from a polypide-bud.

The Cyphonautes type has been shown by Prouho (24) to occur in two or three widely different species of Cheilostomata and Cteno- stomata in which the eggs are laid and develop in the external water. In most Ectoprocta, however, the development takes place internally or in an ovicell, and a considerable quantity of yolk is present. The alimentary canal, which may be represented by a vestigial structure, is accordingly not functional, and the larva does not become pelagic. A pyriform organ is present in most Gymnolaemata as well as the sucker by which fixation is effected. As, in the case of Cyphonautes, the larval organs degenerate and the larva becomes the ancestrula from which a polypide is developed as a bud. In the Cyclostomata the primary embryo undergoes repeated fission without developing definite organs, and each of the numerous pieces so formed becomes a free larva, which possesses no alimentary canal. Finally, in the Phylactolaemata, the larva becomes an ancestrula before it is hatched, and one or several poly pides, may be present when fixation is effected.

The development of the Ectoprocta is intelligible on the hypo- thesis that the Entoprocta form the starting-point of the series. On the view that the Phylactolaemata are nearly related to Phoronis (see PhorOnidea), it is extremely difficult to draw any conclusions with regard to the significance of the facts of development. If the Phylactolaemata were evolved from the type of structure repre- sented by Phoronis or the Pterobranchia (g.».), the Gymnolaemata should be a further modification of this type, and the comparative study of the embryology of the two orders would appear to be meaningless. It seems more natural to draw the conclusion that the resemblances of the Phylactolaemata to Phoronis are devoid of phylogenetic significance.

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classification of Gymnolaemata, to 21, 14, 4, 13, 20; for Palaeontology, to 27, 22.

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” Fossil Polyzoa,” in Zittel’s Text-book of Palaeontology, Eng. ed. (1900), i. 257. (S. F. H.)

POMADE, or Pomatum, a scented ointment, used formerly for softening and beautifying the skin, as a lip-salve, &c, but now principally applied to the hair. It was made originally from the juice of apples (Lat. pomum), whence the name.

POMANDER (from Fr. pomme d'ambre, i.e. apple of amber), a ball made of perfumes, such as ambergris (whence the name), musk, civet, &c, and formerly worn or carried in a case, also known by the same name, as a protection against infection in times of pestilence or merely as a useful article to modify bad smells. The globular cases which contained the " pomanders " were hung from a neck-chain or attached to the girdle, and were usually perforated and made of gold or silver. Sometimes they contained several partitions, in each of which was placed a different perfume. There is an early Spanish pomander set with emeralds, and a fine 16th-century one, dredged from the Thames, in the British Museum.

POMBAL, SEBASTIAO JOSE DE CARVALHO E MELLO, Marquess of (1699-1782), Portuguese statesman, was born at Soure near Pomba, on the 13th of May 1699. He was the son of Manoel de Carvalho e Athayde, a country gentleman (fidalgo) and of his wife D. Theresa Luiza de Mendonca e Mello. He studied law at Coimbra University, served for a short time as a private in the army, and afterwards lived the life of a man about town in Lisbon, sharing in the diversions of the " Mohocks " who then infested the streets. In 1733 he abducted and married D. Theresa de Noronha, a widow belonging to one of the most distinguished families in Portugal. He then retired to Soure, where, on the recommendation of Cardinal de Motta, King John V. commissioned him to write a series of biographical studies. In 1739 he was sent as Portuguese ambassador to London, where he remained until 1745. He was then transferred to Vienna. His first wife having died on the 7th of January 1739, he married, on the 18th of December 17451 Leonora Ernestine Daun, daughter of General Count Daun. In 1749 he was recalled to take up the post of secretary of state for foreign affairs and war. The appointment was ratified on the 3rd of August 1 7 50, by King Joseph, who had succeeded John V. in that year. Carvalho's career from 1750 to 1777 is part of the history of Portugal. Though he came into power only in his 51st year, without previous administrative experience, he was able to reorganize Portuguese education, finance, the army and the navy. He also built up new industries, promoted the development of Brazil and Macao, and expelled the Jesuits. His complete ascendancy over the mind of, King Joseph dates from the time of the great Lisbon earthquake (Nov. 1, 1755)- Though the famous words " Bury the dead and feed the living " were probably not spoken by him, they summarize his action at this time of calamity. In June 1759 his suppression of the so-called " Tavora plot " gained for him the title of count of Oeyras; and in September 1770 he was made marquess of Pombal. His severe adminis- tration had made many enemies, and his life had been

attempted in 1769. Soon after the death of King Joseph, in 1777, Pombal was dismissed from office; and he was only saved from impeach- ment by the death of his bitterest opponent, the queen-mother, Mariana Victoria, in January 1781. On the 16th of August a royal decree forbade him to reside within twenty leagues of the court. He died at Pombal on the 8th of May 1782.

See, in addition to the works dealing with the period 1 750-1 777 and quoted under Portugal: History; S.J. CM. (Pombal), Relaˆao abremada, &c. (Paris, 1758) ; Memoirs of the Court of Portugal, &c. (London, 1765); Anecdotes du ministere de Pombal (Warsaw, 1781); Administration du marquis de Pombal (4 vols., Amsterdam, 1787); Cartas . . . do marques de Pombal (3 vols., Lisbon, 1820-1824) ; J. Smith, Count of Carnota, Memoirs of the Marquess of Pombal, &c. (London, 1843) ; F. L. Gomes, Le Marquis de Pombal, &c. (Paris, 1869); B. Duhr (S.J.), Pombal, &c. (Freiburg im Breisgau, 1891) ; C. J. de Merrezes, Os Jesuitas e marques de Pombal (Oporto, 1893). See also articles in the Revue des deux monies for September 1870; the Revue bleue for September 1889, and the Revue, historique for September 1895 and January 1896.

POMEGRANATE. The pomegranate {Punica Granatum) is of exceptional interest by reason of its structure, its history, and its utility. It forms a tree of small stature, or a bush, with opposite or alternate, shining, lance-shaped leaves, from the

axils of some of which proceed the brilliant scarlet flowers. These are raised on a short stalk, and consist of a thick fleshy cylindrical or bell-shaped calyx-tube, with five to seven short lobes at the top. From the throat of the calyx proceed five to

Fig. 1. — Pomegranate, Punica Granatum, flowering branch, half natural size.

1, Flower cut lengthwise; the 3, Same cut across, showing

petals have been removed. seeds.

2, Fruit, about one-third natural 4, Seed, natural size.

size.

seven roundish, crumpled, scarlet or crimson petals, and below them very numerous slender stamens. The pistil consists of two rows of carpels placed one above another, both rows embedded in, and partially inseparate from, the inner surface of the calyx- tube. The

styles are confluent into one slender column. The fruit, which usually attains the size of a large orange, consists

(After Eichler, from Strasburger's Lehrbuch der Botanik, by permission of Gustav Fischer.)

Fig. 2. — Punica Granatum.

A, Floral diagram. B, Longitudinal section of the ovary.

of a hard leathery rind, enclosing a quantity of pulp derived from the coats of the numerous seeds. This pulp, filled as it is with refreshing acid juice, constitutes the chief value of the tree. The more highly cultivated forms contain more of it than the wild or half-wild varieties. The great structural peculiarity consists in the presence of the two rows of carpels one above another (a state of things which occurs exceptionally in apples and oranges), and in the fact that, while in the lower series the seeds are attached to the inner border or lower angle of the cavity, they occupy the outer side in the upper series, as if during growth the upper whorl had become completely bent over.

By Bentham and Hooker the Punica is included as an anoma- lous genus in the order Lythraceae; others consider it more nearly allied to the myrtles; while its peculiarities are so great as, in the opinion of many botanists, to justify its inclusion in a

separate order, Punicaceae. Not only is the fruit valuable in hot countries for the sake of its pulp, but the rind and the bark and the outer part of the root (containing the alkaloid pelle- tierine) are valuable as astringents. The bark of the root is likewise valued as an anthelmintic in cases of tape-worm.

The tree is wild in Afghanistan, north-western India, and the districts south and south-west of the Caspian, but it has been so long cultivated that it is difficult to say whether it is really native in Palestine and the Mediterranean region. It has been cited as wild in northern Africa, but this appears to be a mistake. Professor Bayley Balfour met with a wild species, heretofore un- known, in the island of Socotra, the flowers of which have only a single row of carpels, which suggests the inference that it may have been the source of the cultivated varieties. But, on the other hand, in Afghanistan, where Aitchison met with the tree truly wild, a double row of carpels was present as usual. The antiquity

of the tree as a cultivated plant is evidenced by the Sanskrit name Dddimba, and by the references to the fruit in the Old Testament, and in the Odyssey, where it is spoken of as cultivated in the gardens of the kings of Phaeacia and Phrygia. The fruit is frequently represented on ancient Assyrian and Egyptian sculptures, and had a religious significance in connexion with several Oriental cults, especially the Phrygian cult of Gybele (Arnob. v. 5 seq.; see also Baudissin, Studien, ii. 207 seq.). It was well known to the Greeks and Romans, who were acquainted with its medicinal properties and its use as a tanning material. The name given by the Romans, malum punicum, indicates that they received it from Carthage, as indeed is expressly stated by Pliny ; and this circumstance has given rise to the notion that the tree was indigenous in northern Africa. ■ On a review of the whole evidence, botanical, literary and linguistic, Alphonse de Candolle (Origin of Cultivated Plants) pronounces against its African origin, and decides in favour of its source in Persia and the neighbouring countries. According to Saporta, the pomegra- nate existed in a fossil state in beds of the Pliocene epoch near Meximieux in Burgundy. The pomegranate is sometimes met with in cultivation against a wall in England, but it is too tender to withstand a severe winter. The double-flowered varieties are specially desirable for the beauty and long duration of their flowers.

POMERANIA (German, Pommern), a territory of Germany and a maritime province of Prussia, bounded on the N. by the Baltic, on the W. by Mecklenburg, on the S. by Brandenburg, and on the E. by West Prussia. Its area is 11,630 sq. m., and the population in 1905 was 1,684,125, showing a density of 145 inhabitants to the square mile. The province is officially divided into the three districts of Stralsund, Stettin and Koslin, but more historical interest attaches to the names of Vorpommern and Hinterpommern, or Hither and Farther Pomerania, the former being applied to the territory to the west, and the latter to that to the east of the Oder. Pomerania is one of the flattest parts of Germany, although east of the Oder it :s traversed by a range of low hills, and there are also a few isolated eminences to the west. Off the west coast, which is very irregular, lie the islands of Rugen, Usedom and Wollin; the coast of Farther Pomerania is smooth in outline and is bordered with dunes, or sandbanks. Besides the Oder and its affluents, the chief of which are the Peene, the ticker and the Ihna, there are several smaller rivers flowing into the Baltic; a few of these are navigable for ships, but the greater number only carry rafts. Many of them end in small lakes, which are separated from the sea by narrow strips of land, through which the water escapes by one or more outlets. The interior of the province is also thickly sprinkled

with lakes, the combined area of which is equal to about one-twentieth of the entire surface.

The soil of Pomerania is for the most part thin and sandy, but patches of good land are found here and there. About 55% of the whole is under tillage, while 16% consists of meadow and pasture and 21% is covered by forests. The principal crops are potatoes, rye and oats, but wheat and barley are grown in the more fertile districts; tobacco, flax, hops and beetroot are also cultivated. Agriculture is still carried on in a somewhat

primitive fashion, and as a rule the livestock is of an inferior quality, though the breed of horses, of a heavy build and mostly used in agriculture, is held in high esteem. Large flocks of sheep are kept, both for their flesh and their wool, and there are in the province large numbers of horned cattle and of pigs. Geese and goose feathers form lucrative articles of export. Owing to the long line of coast and the numerous lakes, fishing forms an important industry, and large quantities of herrings, eels and lampreys are sent from Pomerania to other parts of Germany. With the exception of the almost inexhaustible layers of peat, the mineral wealth of the province is insignificant. Its industrial activity is not great, but there are manufactures of machinery, chemicals, paper, tobacco and sugar; these are made chiefly in or near the large towns, while linen-weaving is practised as a domestic industry. Ship-building is carried on at Stettin and at several places along the coast. The commerce of Pomerania is in a flourishing condition, its principal ports being Stettin, Stralsund and Swinemiinde. Education is provided for by a university at Greifswald and by numerous schools. The province sends 14 members to the German Reichstag, and 26 to the Prussian house of representatives. The heir to the Prussian crown bears the title of governor of Pomerania.

History. — In prehistoric times the southern coast of the Baltic seems to have been occupied by Celts, who afterwards made way for tribes of Teutonic stock. These in their turn migrated to other settlements and were replaced, about the end of the 5th century of our era, by Slavonic tribes, the Wilzi and the Pomerani. The name of Pomore, or Pommern, meaning ” on the sea,” was given to the district by the latter of the tribes about the time of Charlemagne, and it has often changed its political and geo- graphical significance. Originally it seems to have denoted the coast district between the Oder and the Vistula, a territory which was at first more or less dependent on Poland, but which, towards the end of the 1 2th century, was ruled by two native princes, who took the title of duke about n 70 and

admitted the authority of the German king in 1181. Afterwards Pomerania extended much farther to the west, while being correspondingly curtailed on the east, and a distinction was made between Slavinia, or modern Pomerania, and Pomerellen. The latter, corresponding substantially to the present province of West Prussia, remained subject to Poland until 1309, when it was divided between Brandenburg and the Teutonic Order. Christianity was introduced in the 12th century, a bishopric being founded in the Island of Wollin, and its advance went rapidly hand in hand with the Germanizing of the district.

The history of Pomerania, as distinct from that of Pomerellen, consists mainly of an almost endless succession of divisions of territory among the different lines of the ducal house, and of numerous expansions and contractions of territory through constant hostilities with the elector of Brandenburg, who claimed to be the immediate feudal superior of Pomerania, and with other neighbouring rulers. The names of Vorpom- mern and Hinterpommern were at first synonymous with Pomerania proper, or Slavinia and Pomerellen, but towards the close of the 14th century they were transferred to the two duchies into which the former was divided. In 1625 the whole of Pomerania became united under the sway of Duke Bogislaus XIV., and on his death without issue, in 1637, Branden- burg claimed the duchy by virtue of a compact made in 1571. In the meantime, however, Pomerania had been devastated by the Thirty Years' War and occupied by the Swedes, who had taken possession of its towns and fortresses. At the peace of Westphalia they claimed the duchy, in opposition to the elector of Brandenburg, and the result was that the latter was obliged to content himself with eastern Pomerania (Hinterpommern), and to see the western part (Vorpommern) awarded to Sweden. In 1720, by the peace of Stockholm, Swedish Pomerania was cur- tailed by extensive concessions to Prussia, but the district to the west of the Peene remained in the possession of Sweden until the general European settlement of 1815. Then Sweden assigned her German possessions to Denmark in exchange for Norway, whereupon Prussia, partly by purchase and partly by the cession

of the duchy of Lauenburg, finally succeeded in uniting the whole of Pomerania under her rule.

For the history, see J. Bugenhagen, Pomerania, edited by O.

Heinemann (Stettin, 1900) ; von Bohlen, Die Erwerbung Pommerns durch die Hohenzollern (Berlin, 1865) ; H. Berghaus, Landbuch des Herzogtums Pommern (Berlin, 1 865-1 876); the Codex Pomeraniae diplomaticus, edited by K. F. VV. Hasselbach and J. G. L. Kose- garten (Greifswald, 1862); the Pommersches Urkundenbuch, edited by R. Klempin and others (Stettin, 1 868-1 896); W. von Sommer- feld, Geschichte der Germanisierung des Herzogtums Pommern (Leipzig, 1896) ; F. W. Barthold, Geschichte von Riigen und Pommern (Hamburg, 1839-1845); K. Mass, Pommersche Geschichte (Stettin, 1899); M. VVehrmann, Geschichte von Pommern (Gotha, 1904-1906); and Uecker, Pommern in Wort und Bild (Stettin, 1904). See also the publications of the Gesellschaft fur pommersche Geschichte und Altertumskunde.

POMEROY, a village and the county-seat of Meigs county, Ohio, U.S.A., on the Ohio river, about 85 m. S.S.E. of Columbus. Pop. (1890) 4726; (1900) 4639, including 453 foreign-born and 280 negroes; (1910) 4023. Pomeroy is served by the Hocking Valley and (across the river) Baltimore & Ohio railways, by inter-urban electric railway, and by passenger and freight boats to the leading river ports. It occupies a strip of ground between the river and a range of steep hills. Bituminous coal and salt abound in the district, and there are deposits of building stone, fireclay and glass sand. The first settlement here was established in 1816, coal mining was begun three years later,;and in 1827 a town was laid out and named Nyesville. There was little pro- gress, however, until 1833, when Samuel W. Pomeroy (in whose honour the present name was adopted) formed a company, which began mining coal on a large scale. Pomeroy was incor- porated as a village and was made the county-seat in 1841. In 1850 the first of several salt wells, from 1000 to 1200 ft. in depth, was operated.

POMFRET, JOHN (1667-1702), English poet, son of Thomas Pomfret, vicar of Luton, was born in 1667. He was educated at Bedford grammar school and at Queens' College, Cambridge. He became rector of Maulden, Bedfordshire, in 1695, and of Millbrook in the same county in 1702. Dr Johnson says that the bishop of London refused to sanction preferment for him because in his Choice he declared that he would have no wife, although he expressed a wish for the occasional company of a modest and sprightly young lady. The poet was married in real life all the same, and — while waiting to clear up the misunder- standing with the bishop — he died in November 1702. The Choice or Wish: A Poem written by a Person of Quality (1700) expresses the epicurean desires of a cultivated man of Pomfret's time. It is smoothly written in the heroic couplet, and was widely popular. His Miscellany Poems were published in 1702.

POMMEL (through O. Fr. pomel, from a diminutive pomellus of Lat. pomum, fruit, apple), any rounded object resembling an apple, e.g. the rounded termination of a saddle-bow; in archi- tecture, any round knob, as a boss, finial, &c. ; more particularly the rounded end to the hilt of a sword, dagger or other hand weapon, used to prevent the hand from slipping, and as a balance to the blade. ” Pommel ” is also a term used of a piece of grooved wood used in graining leather. This word may be the same in origin, or more probably from Fr. paumelle, from paume, the hand, palm.

POMMER, or Bombard (Fr. hautbois; Ital. bombardo, bomhar- done), the alto, tenor and basses of the shawm or Schalmey family, and the forerunners respectively of the cor-anglais, bassoon or fagotto, and double bassoon or contrafagotto. The main difference to the casual observer between the medieval instruments and those of our orchestra which were evolved from them would be one of size. In the Pommers no attempt had been made to bend the tube, and its length, equal to that of an open organ pipe of the same pitch, was outstretched in all its unwieldiness in an oblique position in front of the performer. The great contrabass Pommer was 9 ft. long without the crook and reed, which, however, were bent downwards. It had five open fingerholes and five keys working inside a perforated case; in order to bring the holes within reach of the finger, they were cut obliquely through the tube. The compass extended

from F below 8 ft. C to EorF in the bass stave, two octaves in all. The other members of the family were the bass Pommer, from 8 ft. C to middle C, corresponding to the modern bassoon or fagotto; the tenor or basset Pommer, a fifth higher in pitch; the alto pommer or nicolo, a fourth or a fifth above the tenor; and the high alto, or Klein Alt Pommer, an octave higher than the tenor, corresponding approximately to the cor-anglais.

For the history of the Pommer family see Oboe and Bassoon.

(K.S.)

POMONA, an old Italian goddess of fruit and gardens. Ovid {Mel. xiv. 623) tells the story of her courtship by the silvan deities and how Vertumnus, god of the turning year, wooed and won her. Corresponding to Pomona there seems to have been a male Italian deity, called Pomunus, who was perhaps identical with Vertumnus. Although chiefly worshipped in the country, Pomona had a special priest at Rome, the fiamen Pomo- nalis, and a sacred grove near Ostia, called the Pomonal. She was represented as a beautiful maiden, with

fruits in her bosom and a pruning-knife in her hand.

POMONA, a city of Los Angeles county, in southern Cali- fornia, U.S.A., about 33 m. E. of the city of Los Angeles. Pop. (1890) 3634; (1900) 5526 (567 foreign-born) ; (1910) 10,207. It is served by the Southern Pacific, the San Pedro, Los Angeles & Salt Lake, and the Atchison, Topeka & Santa Fe railways, and by an inter-urban electric line. The city is about 850 ft. above sea-level, and has a Carnegie library and several parks, including Ganesha park (45 acres), which commands a fine view. At Claremont, about 3 m. north, is Pomona College (1888, co- educational), which in 1908 had 34 instructors and 488 students. Pomona is in the midst of a prosperous fruit region, devoted especially to the growing of oranges. Orchards of oranges, lemons, apricots, peaches and prunes surround the city for miles, and some olives are grown; alfalfa and sugar-beets are raised in large quantities in the immediate neighbourhood. Pomona was settled by a colony of fruit-growers in 1875, and was chartered as a city in 1888.

POMONA, or Mainland, the ‘central andˆ largest island of the Orkneys, Scotland. Pop. (1901), 16,235. It is 25 m. long from N.W. to S.E. and 15 m. broad from E. to W.; area, 190 sq. m.; but where the coast is cut into, on the N. by Kirkwall Bay and on the S. by Scapa Flow, the land is less than 2 m. across. Consequently, the portion of the island to the west of the waist of Pomona is sometimes described as the West Island, and the portion to the East as the East Island. The west coast is almost unbroken, the bays of Birsay and Skaill being the only bays of any importance. The east and south shores, on the other hand, are extensively carved out. Thus on the east side are found Eynhallow Sound, Wood Wick, the bays of Isbister, Firth, Kirkwall, and Inganess and Dee Sound, and on the south Holm Sound, Scapa Bay, Swanbister Bay and Bay of Ireland. The highest points of the watershed from Costa Head to the Scapa shore are Milldoe (734 ft.) to the north-east of Isbister and Wideford Hill (740 ft.) to the west of Kirkwall. There are also a few eminences towards the south-west, Ward Hill (880 ft.) in the parish of Orphir being the highest peak in the island. There are numerous lakes, some of considerable size and most of them abounding with trout. Loch Harray is 45 m. long by from J m. to about 2 m. wide, and Loch Stenhess 3 1 m. long by from J to 2 J m. wide. Lochs Swannay, Board- house and Hundland are situated in the extreme north, while Loch Kirbister lies near the south coast and Loch Tankerness adjoins Deer Sound. Off the east coast lie the islands of Rpusay, Egilshay, Viera, Eynhallow, Gairsay and Shapinshay, and off the south Copinshay and Lamb Holm. The hilly country is mostly moorland, and peat-mosses are met with in some of the low-lying land, but many of the valleys contain fertile soil, and there are

productive tracts on the eastern and northern seaboard. Kirkwall, the capital of the Orkneys, and Stromness are the only towns.

In Harray, the only parish in the Orkneys not trenched at some point by the sea, Norse customs have survived longer than elsewhere in the group save in North Ronaldshay. In Deerness

the most easterly parish in Pomona, were buried 200 Covenanters, taken prisoners at the battle of Bothwell Brig. They were carried to Barbados, to be sold as slaves for the plantations, when the ship foundered in Deer Sound, and all were drowned. In Sandside Bay, in the same parish, the fleet of Malcolm Canmore was defeated by that of Jarl Thorfinn; and at Summersdale, towards the northern base of the hills of Orphir, Sir James Sinclair, governor of Kirkwall, vanquished Lord Sinclair and 500 Caithness men in 1529.

The antiquities of Pomona are of great interest. The examples of Pictish remains include brocks or round towers, chambered mounds, or buildings of stone covered in with earth, and weems, or underground dwellings afterwards roofed in. At Saverock, on the west wing of Kirkwall Bay, a good specimen of an earth- house will be found, and at Quanterness, 1 m. to the west of it, a chambered mound, containing seven rooms with beehive roofs. Farther west and 5 m. by road north-east of Stromness, and within a mile of the stone circles of Stenness, stands the great barrow or chambered mound of Maeshowe. The tumulus has the form of a blunted cone, is 36 ft. high, 300 ft. in circum- ference and 92 ft. in diameter, and at a distance of 90 ft. from its base is encircled by a moat 40 ft. wide and from 4 ft. to 8 ft. deep. The ground-plan shows that it was entered from the west by a passage, 54 ft. long, from 2 ft. to 3 ft. wide and from 25 ft. to 4§ ft. high, which led to a central apartment about 15 ft. square, the walls of which ended in a beehive roof, the spring of which began at a height of 13 ft. from the floor. This room and the passage are built of undressed blocks and slabs of sand- stone. About the middle of each side of the chamber, at a height of 3 ft. from the floor, there is an entrance to a small cell, 3 ft. high, 45 ft. wide and from 5! ft. to 7 ft. long. Mr James Farrer explored the mound in 1861, and discovered on the Walls and certain stones rude drawings of crosses, a winged dragon, and a serpent curled round a pole, besides a variety of Runic inscriptions. One of these inscriptions stated that the tumulus had been rifled by Norse pilgrims (possibly crusaders) on their way to

Jerusalem under Jarl Rognvald in the 12th century. There can be little doubt but that it was a sepulchral chamber. Joseph Anderson ascribes it to the Stone Age (that is, to the Picts), and James Fergusson to Norsemen of the 10th century.

The most interesting of all those links with a remote past are the stone circles forming the Ring of Brogar and the Ring of Stenness, often inaccurately described as the Stones of Stenness. The Ring of Brogar is situated to the north-west and the Ring of Stenness to the south-east of the Bridge of Brogar, as the narrow causeway of stone slabs is called which separates Loch Harray from Loch Stenness. The district lies some 43 m. north-east of Stromness. The Ring of Brogar, once known as the Temple of the Sun, stands on a raised circular platform of turf, 340 ft. in diameter, surrounded by a moat about 6 ft. deep, which in turn is invested by a grassy rampart. The ring originally comprised 60 stones, set up at intervals of 17 ft. Only 13 are now erect. Ten, still entire, lie prostrate, while the stumps of 13 others can yet be recognized. The height of the stones varies from 9 ft. to 14 ft. The Ring of Stenness — the Temple of the Moon of local tradition — is of similar construction to the larger circle, except that its round platform is only 104 ft. in diameter. The stones are believed to have numbered 12, varying in height from 15 ft. to 17 ft. but only two remain upright. In the middle of the ring may be seen the relic of what was probably the sacrificial altar. The Stone of Odin, the great monolith, pierced by a hole at a height of 5 ft. from the ground, which figures so prominently in Scott's Pirate, stood 1 50 yds. to the north of the Ring of Stenness. The stones of both rings are of the native Old Red Sandstone.

POMPADOUR, JEANNE ANTOINETTE POISSON LE NOR- MANT D'ETIOLES, Marquise de (1721-1764), mistress of Louis XV., was born in Paris on the 29th of December 1721, and baptized as the legitimate daughter of Francois Poisson, an officer in the household of the duke of Orleans, and his wife, Madeleine de la Motte, in the church of St Eustache; but she

was suspected, as well as her brother, afterwards marquis of Marigny, to be the child of a very wealthy financier and farmer- general of the revenues, Le Normant de Tournehem. He at any rate took upon himself the charge of her education; and, as from the beauty and wit she showed from childhood she seemed to be born for some uncommon destiny, he declared her " un morceau de roi," and specially educated her to be a king's mistress. This idea was confirmed in her childish mind by the prophecy of an old woman, whom in after days she pensioned for the correctness of her prediction. In 1741 she

was married to a nephew of her protector and guardian, Le Normant d'Etioles, who was passionately in love with her, and she soon became a queen of fashion. Yet the world of the financiers at Paris was far apart from the court world, where she wished to reign; she could get no introduction at court, and could only try to catch the king's eye when he went out hunting. But Louis XV. was then under the influence of Mme de Mailly, who carefully prevented any further intimacy with " la petite Etioles," and it was not until after her death that the king met the fair queen of the financial world of Paris at a ball given by the city to the dauphin in 1744, and he was immediately subjugated. She at once gave up her husband, and in 1745 was established at Versailles as " maltresse en titre." Louis XV. bought her the estate of Pompadour, from which she took her title of marquise (raised in 1752 to that of duchess). She was hardly established firmly in power before she showed that ambition rather than love had guided her, and began to mix in politics. Knowing that the French people of that time were ruled by the literary kings of the time, she paid court to them, and tried to play the part of a Maecenas. Voltaire was her poet in chief, and the founder of the physiocrats, Quesnay, was her physician. In the arts she was even more successful; she was herself no mean etcher and engraver, and she encouraged and protected Vanloo, Boucher, Vien, Greuze, arid the engraver Jacques Guay. Yet this policy did not prevent her from being lampooned, and the famous poissardes against her contributed to the ruin of many wits suspected of being among the authors, and notably of the Comte de Maurepas. The command of the political situation passed entirely into her hands; she it was who brought Belle-Isle into office with his vigorous policy; she corresponded regularly with the generals of the armies in the field, as her letters to the Comte de Clermont prove; and she introduced the Abbe de Bernis into the ministry in order to effect a very great alteration of French politics in 1756. The continuous policy of France since the days of Richelieu had been to weaken the house of Austria by alliances in Germany; but Mme de Pompadour changed this hereditary policy because Frederick the Great wrote scandalous verses on her; and because Maria Theresa wrote her a friendly letter she entered into an alliance with Austria. This alliance brought oh the Seven Years' War, with all its disasters, the battle of Rosbach and the loss of Canada; but Mme de Pompadour persisted in her policy, and, when Bernis failed her, brought Choiseul into office and supported hini in all his great plans, the Pacte de Famille, the suppression of the Jesuits, and the peace of Versailles. But it was to internal politics that this remarkable woman paid most attention; no one obtained office except through her; in imitation of Mme de Maintenon, she prepared all business for the king's eye with the ministers, and contrived that

they should meet in her room; and she daily examined the letters sent through the post office with Janelle, the director of the post, office. By this continuous labour she made herself indispensable to Louis. Yet, when after a year or two she had lost the heart of her lover, she had a difficult task before her; to maintain her influence she had not only to save the king as much trouble as possible, but to find him fresh pleasures. When he first began to weary of her she remembered her talent for acting and her private theatricals at Etioles, and established the " theatre des petits cabinets,'" in which she acted with the greatest lords about the court for the king's pleasure in tragedies and comedies, operas and ballets. By this means and the " concerts spirituels " she kept in favour for a time; but at last she found a

surer way, by encouraging the king in his debaucheries, and Louis wept over her kindness to his various mistresses. Only once, when the king was wounded by Damiens in 1757, did she receive a serious shock, and momentarily left the court; but on his recovery she returned more powerful than ever. She even ingratiated herself with the queen, after the example of Mme de Maintenon, and was made a lady-in-waiting; but the end was soon to come. " Ma vie est un combat," she said, and so it was, with business and pleasure she gradually grew weaker and weaker, and when told that death was at hand she dressed herself in full court costume, and met it bravely on the 15th of April 1764, at the age of forty-two.

See Capefigue, Madame la marquise de Pompadour (1858); E. and J. de Goncourt, Les Mattresses de Louis XV., vol. ii. (i860); and Campardon, Madame de Pompadour et la cour de Louis XV. au milieu du dix-huitieme siicle (1867). Far more valuable are Malassis's two volumes of correspondence, Correspondance de Madame de Pompadour avec son pere M. Poisson, et son frere M. de Vandieres, &c. (1878), and Bonhomme, Madame de Pompadour, general d'armbe (1880), containing her letters to the Comte de Clermont. For her artistic and theatrical tastes see particularly J. F. Leturcq, Notice sur Jacques Guay, graveur sur pierres fines du roi Louis XV.: Documents inidits emanant de Guay et notes sur les Ceuvres de gravure en taille douce et en pierres durs de la marquise de Pompadour (1873) ; and Adolphe Jullien, Histoire du ihedtre de Madame de Pompadour, dit Theatre des Pettis Cabinets (1874). See also P. de Nolhac, La Marquise de Pompadour (1903).

POMPEII, 1 an ancient town of Campania, Italy, situated near the river Sarnus, nearly 2 m. from the shore of the Bay of Naples, almost at the foot of Mt Vesuvius. Of its history before 79 b.c. comparatively little is recorded; but it appears that it had a population of a very mixed character, and passed succes- sively into the hands of several different peoples, each of which contributed an element to its composition. Its foundation was ascribed by Greek tradition to Heracles, in common with the neighbouring city of Herculaneum, but it is certain that it was not a Greek colony, in the proper sense of the term, as we know to have been the case with the more important cities of Cumae and Neapolis. Strabo (v. 4, 8), in whose time it was a populous and flourishing place, tells us that it was first occupied by the Oscans 2 (to whom we must attribute the Doric temple in the Foro Triangolare) , afterwards by the Tyrrhenians (i.e. Etruscans) and Pelasgians, and lastly, by the Samnites. The conquest of Campania by the last- mentioned people is an undoubted historical fact, and there can be no doubt that Pompeii shared the fate of the neighbouring cities on this occasion, and afterwards passed in common with them under the yoke of Rome. But its name is only once mentioned during the wars of the Romans with the Samnites and Campanians in this region of Italy, and then only incidentally (Liv. ix. 38), when a Roman fleet landed near Pompeii in 309 B.C. and made an unsuccessful marauding expedition up the river valley as far as Nuceria. 3 At a later period, however, it took a prominent part in the outbreak of the nations of central Italy, known as the Social War (91-89 B.C.), when it withstood a long siege by Sulla, and was one of the last cities of Campania that were reduced by the Roman arms. The inhabitants were admitted to the Roman franchise, but a military colony was settled in their territory in 80 B.C. by Sulla (Colonia Cornelia Veneria Pompeianorum), and the whole population was rapidly Romanized. The municipal administration here, as elsewhere, was in the hands of two duoviri iure dicundo and two aediles, the supreme body being the city council (decuriones) . Before the close of the republic it became a resort of the Roman nobles, many of whom acquired villas in the neighbourhood. Among them was Cicero, whose letters abound with allusions to his Pompeian villa. The same fashion continued under the empire, and there can be no doubt that, during the first century of the Christian era, Pompeii had become a flourishing place

1 The etymology of the name is uncertain ; the ancients derived it from pompa or ici/iira (Gr. send), in allusion to the journey of Heracles with the oxen of Geryon, but modern authorities refer it to the Oscan pompa (five).

2 For the Oscan incriptions found in Pompeii see below ad fin.

- Pompeii was attacked as a member of the Nucerine League. See Conway, Italic Dialects, p. 51 ; J. Beloch, Campanien, 2nd ed., P- ‘239-

with a considerable population. Two events only are recorded of its history during this period. In a.d. 59 a tumult took place in the amphitheatre between the citizens and visitors from the neighbouring colony of Nuceria. Many were killed and wounded on both sides. The Pompeians were punished for this violent outbreak by the prohibition of all theatrical exhibitions for ten years (Tacitus, Ann. xiv. 17). A characteristic, though rude, painting, found on the walls of one of the houses gives a representation of this event.

Four years afterwards (a.d. 63) an earthquake, which affected all the neighbouring towns, vented its force especially upon Pompeii, a large part of which, including most of the public buildings, was either destroyed or so seriously damaged as to require to be rebuilt (Tac. Ann. xv. 22; Seneca, Q.N. vi. 1). From the existing remains it is clear that the inhabitants were still actively engaged in repairing and restoring the ruined edifices when the whole city was overwhelmed by the great eruption of a.d. 79. Vesuvius (q.v.), the volcanic forces of which had been slumbering for unknown ages, suddenly burst into violent eruption, which, while it carried devastation all around the beautiful gulf, buried the two cities of Herculaneum and Pompeii under dense beds of cinders and ashes. It is singular that, while we possess a detailed description of this famous eruption in two letters of the younger Pliny (Epist. vi. 16, 20), he does not even notice the destruction of Pompeii or Herculaneum, though his uncle perished in the immediate neighbourhood of the former city. But their fate is noticed by Dio Cassius, and its circum- stances may be gathered with certainty from the condition in which the city has been found. These were such as to conduce to its preservation and interest as a relic of antiquity. Pompeii was merely covered with a bed of lighter substances, cinders, small stones and ashes, which fell in a dry state, while at Herculaneum the same substances, being drenched with water, hardened into a sort of tufa, which in places is 65 ft. deep. The whole of this superincumbent mass, attaining to an average thickness of from 18 to 20 ft., was the product of one eruption, though the materials may be divided generally into two distinct strata, the one consisting principally of cinders and small volcanic stones (called in Italian lapilli), and the other and uppermost layer of fine white ash, often consolidated by the action of water from above so as to take the moulds of objects contained in it (such as dead bodies, woodwork, &c), like clay or plaster of Paris. It was found impossible to rebuild the town, and its territory was joined to that of Nola. But the survivors

returned to the spot, and by digging down and tunnelling were able to remove all the objects of value, even the marble facing slabs of the large buildings.

In the middle ages, however, the very site was forgotten. Two inscriptions were found in making an underground aqueduct across the site in 1 594-1600, but it was not until 1748 that a more careful inspection of this channel revealed the fact that beneath the vineyards and mulberry grounds which covered the site there lay entombed ruins far more accessible, if not more inter- esting, than those of Herculaneum. It was not till 1763 that systematic excavations were begun; and; though they were carried on during the rest of the 18th century, it was only in the beginning of the 19th that they assumed a regular character; the work, which had received a vigorous stimulus during the period of the French government (1806-1814), was prosecuted, though in a less methodical manner, under the rule of the Bour- bon kings (1815-1861). Since 1861 it has been carried on under the Italian government in a more scientific manner, on a system devised by G. Fiorelli (d. 1896), according to which the town is for convenience divided into nine regions — though this rests on a misconception, for there is really no street between the Capua and the Nocera gates — and the results have been of the highest interest, though the rate of progress has been very slow.

The town was situated on rising ground less than a mile from the foot of Vesuvius. This eminence is itself due to an outflow of lava from that mountain, during some previous eruption in prehistoric times, for we know from Strabo that Vesuvius had

been quiescent ever since the first records of the Greek settle- ments in this part of Italy. Pompeii in ancient times was a prosperous seaport town situated close to the seashore, from which it is now nearly 2 m. distant, and adjoining the mouth of the river Sarnus or Sarno, which now enters the sea nearly 2 m. from its site. The present course of this stream is due in part to modern alteration of its channel, as well as to the effects of the great eruption. The prosperity of Pompeii was due partly to its commerce, as the port of the neighbouring towns, partly to the fertility of its territory, which produced strong wine, olive oil (a comparatively small quantity), and vegetables; fish sauces were made here. Millstones and pumice were also exported, but for the former the more gritty lava of Rocca Monfina was later on preferred.

The area occupied by the ancient city was of an irregular oval form, and about 2 m. in circumference. It was sur- rounded by a wall, which is still preserved for more than two-thirds of its extent, but no traces of this are found on the side towards the sea, and there is no doubt that on this side ft had been already demolished in ancient times, so as to give room for the free extension of houses and other buildings in that direction. 1 These walls are strengthened at intervals by numerous towers, occupying the full width of the wall, which occur in some parts at a distance of only about 100 yds., but in general much less frequently. They are, however, of a different style of construction from the walls, and appear to have been added at a later period, probably that of the Social War. Similar evidences of the addition of subsequent defences are to be traced also in the case of the gates, of which no less than eight are found in the existing circuit of the walls. Some of these present a very elaborate system oi defence, but it is evident from the decayed condition of others, as well as of parts of the walls and towers, that they had ceased to be maintained for the purposes of fortification long before the destruction of the city. The names by which the gates and streets are known are entirely of modern origin.

The general plan of the town is very regular, the streets being generally straight, and crossing one another at right angles or nearly so. But exceptions are found on the west in the street leading from the Porta Ercolanese (gate of Herculaneum) to the forum, which, though it must have been one of the principal thoroughfares in the city, was crooked and irregular, as well as very narrow, in some parts not exceeding 12 to 14 ft. in width, including the raised footpaths on each side, which occupy a considerable part of the space, so that the carriage-way could only have admitted of the passage of one vehicle at a time. The explanation is that it follows the line of the demolished city wall. Another exception is to be found in the Strada Stabiana (Stabian Street) or Cardo, which, owing to the existence of a natural depression which affects also the line of the street just east of it, is not parallel to the other north and south streets. The other main streets are in some cases broader, but rarely exceed 20 ft. in width, and the broadest yet found is about 32, while the back streets running parallel to the main lines are only about 14 ft. (It is to be remembered, however, that the standard width of a Roman highroad in the neighbourhood of Rome itself is about 14 ft.) They are uniformly paved with large poly- gonal blocks of hard basaltic lava, fitted very closely together, though now in many cases marked with deep ruts from the passage of vehicles in ancient times. They are also in all cases bordered by raised footways on both sides, paved in a similar

manner; and for the convenience of foot-passengers, which was evidently a more important consideration than the obstacle which the arrangement presented to the passage of vehicles, which indeed were probably only allowed for goods traffic, these are connected from place to place by stepping-stones raised above the level of the carriage-way. In other respects they must have resembled those of Oriental cities — the living apartments all opening towards the interior, and showing only blank walls towards

1 It consisted of two parallel stone walls with buttresses, about 15 ft. apart and 28 in. thick, the intervening space being filled with earth, and there being an embankment on the inner side.

the street; while the windows were generally to be found only in the upper storey, and were in all cases small and insignificant, without any attempt at architectural effect. In some instances indeed the monotony of their external appearance was broken by small shops, occupying the front of the principal houses, and let off separately; these were in some cases numerous enough to form a continuous facade to the street. This is seen especially in the case of the street from the Porta Ercolanese to the forum and the Strada Stabiana (or Cardo), both of which were among the most frequented thoroughfares. The streets were also diversified by fountains, small water-towers and reservoirs (of which an especially interesting example was found in 1902 close to the Porta del Vesuvio) and street shrines. The source of the water-supply is unknown.

The first-mentioned of the two principal streets was crossed, a little before it reached the forum, by the street which led directly to the gate of Nola (Strada delle Terme, della Fortuna, and di Nola). Parallel to this last to the south is a street which runs from the Porta Marina through the forum, and then, with a slight turn, to the Sarno gate, thus traversing the whole area of the city from east to west (Via Marina, Strada dell' Abbondanza, Strada dei Diadumeni). These two east and west streets are the two decumani.

The population of Pompeii at the time of its destruction cannot be fixed with certainty, but it may very likely have ex- ceeded 20,000. It was of a mixed character; both Oscan and Greek inscriptions are still found up to the last, and, though there is no trace whatever of Christianity, evidences of the presence of Jews are not lacking — such are a wall-painting, probably representing the Judgment of Solomon, and a scratched inscription on a wall, " Sodoma, Gomora." It has been estimated, from the number of skeletons discovered, that about 2000 persons perished in the city itself in the eruption of a.d. 79.

Almost the Whole portion of the city which lies to the west of the Strada Stabiana, towards the forum and the sea, has been more or less completely excavated. It is over one-half of the whole extent, and that the most important portion, inasmuch as it includes the forum, with the temples and public buildings adjacent to it, the thermae, theatres, amphitheatre, &c. The greater part of that on the other side of the Strada Stabiana remains still unexplored, with the exception of the amphi- theatre, and a small space in its immediate neighbourhood.

The forum at Pompeii was, as at Rome itself and in all other Italian cities, the focus and centre of all the life and movement of the city. Hence it was surrounded on all sides by public buildings or edifices of a commanding character. It was not, however, of large size, as compared to the open spaces in modern towns, being only 467 ft. in length by 126 in breadth (excluding the colonnades). Nor was it accessible to any description of wheeled carriages, and the nature of its pavement, composed of broad flags of travertine, shows that it was only intended for foot-passengers. It was adorned with numerous statues, some of the imperial family, others of dis- tinguished citizens. Some of the inscribed pedestals of the latter have been found. It was surrounded on three sides by a series of porticos supported on columns; and these porticos were originally surmounted by a gallery or upper storey, traces of the staircases leading to which still remain, though the gallery itself has altogether disappeared. It is, however, certain from the existing remains that both this portico and the adjacent buildings had suffered severely from the earthquake of 63, and that they were undergoing a process of restoration, involving material changes in the original arrangements, which was still incomplete at the time of their final destruction. The north end of the forum, where alone the portico is wanting, is occupied in great part by the imposing temple of Jupiter, Juno and Minerva being also worshipped here. It was raised on a podium 10 ft. high, and had a portico with six Corinthian columns in front. This magnificent edifice had, however, been evidently overthrown by the earthquake of 63, and is in its present condition a mere ruin, the rebuilding of which had not been begun at the time of the eruption, so that the cult of

the three Capitoline divinities was then carried on in the so- called temple of Zeus Milichius. On each side of it were two arches, affording an entrance into the forum, but capable of being closed by gates. On the east side of the forum were four edifices; all of them are of a

public character, but their names and attribution have been the subject of much controversy. The first (proceeding from the north), once known as the Pantheon, is generally regarded as a macellum or meat-market, consisting of a rectangular court surrounded by a colonnade, with a twelve- sided roofed building (tholus) in the centre. On the south side

and Q. Catulus (78 B.C.), and therefore belongs to the Oscai period of the city, before the introduction of the Roman colony. It was an oblong edifice divided by columns into a central hall and a corridor running round all the four sides with a tribunal opposite the main entrance; and, unlike the usual basilicae, it had, instead of a clerestory, openings in the walls of the corridor through which light was admitted, it being almost as lofty as the nave. The temple was an extensive edifice, having a com- paratively small cella; raised upon a podium, and standing in the midst of a wide space surrounded by a portico of columns,

Porta di Capua

POMPEII

Yards

50 100 150

1. Temple of Jupiter 8. Basilica

2. Macellum 9. Temple of Apollo

3. Sanctuary of Lares 10. Temple of Hercules 7

4. Temple of Vespasian 11. Temple of I sis

5. Building of Eumachia 12. Temple of Zeus Miliclti-js S.Comitium?
13. Temple of Fortuna Augusta

‘.Curia ate. 14. Temple of Venus Pompeiana

iRedrawn by permission from Baedeker’s Southern Italy.)

were shops, and in the centre of the east side a chapel for the worship of the imperial house. Next to this comes the sanctuary of the Lares of the city, a square room with a large apse; and beyond this, as Mau proves, the small temple of Vespasian. Beyond this again, bounded on the south by the street known as the Strada dell’ Abbondanza, is a

large and spacious edifice, which, as we learn from an extant inscription, was erected by a priestess named Eumachia. Its purpose is uncertain — possibly a cloth-exchange, as the fullers set up a statue to Eumachia here. It is an open court, oblong, surrounded on all four sides by a colonnade; in front is a portico facing the forum, and on the other three sides theie is a corridor behind the colonnade with windows opening on it. On the south side of the Strada dell' Abbondanza was a building which Mau conjectures to have been the Comitium. At the south end of the forum are three halls side by side, similar in plan with a common facade— the central one, the curia or council chamber, the others the offices respec- tively of the duumvirs and aediles, the principal officials of the city; while the greater part of the west side is occupied by two large buildings — a basilica, which is the largest edifice in Pompeii, and the temple of Apollo, which presents its side to the forum, and hence fills up a large portion of the surrounding space. The former, as we learn from an inscription scratched on its walls, was anterior in date to the consulship of M. Lepidus

finurv Walker sc.

outside which again is a wall, bounding the sacred enclosure. Between this temple and the basilica the Via Marina leads ofl direct to the Porta Marina.

Besides the temples which surrounded the forum, the remains of five others have been discovered, three of which are situated in the immediate neighbourhood of the theatres. Of these by far the most interesting, though the least perfect, is one which is commonly known as the temple of Hercules (an appellation wholly without foundation), and which is not only by far the most ancient edifice in Pompeii, but presents us with all the characters of a true Greek temple, resembling in its proportions that of the earliest temple of Selinus, and probably of as remote antiquity (6th century B.C.) . Unfortunately only the foundation and a few Doric capitals and other architectural fragments remain; they were coated with stucco which was brightly painted. In front of the temple is a monument which seems to have been the tomb of the founder or founders of the city; so that for a time this must have been the most important temple. The period of its destruction is unknown, for it appears certain that it cannot be ascribed wholly to the earthquake of 63. On the other hand the reverence attached to it in the later periods of the city is evidenced by its being left standing in the midst of a triangular space adjoining the great theatre, which is surrounded by a portico, so as to constitute a kind of forum (the so-called Fore

Triangolare). Not far off, and to the north of the great theatre, stood a small temple, which, as we learn from the inscription still remaining, was dedicated to Isis, and was rebuilt by a certain Popidius Celsinus at the age of six (really of course by his parents), after the original edifice had been reduced to ruin by the great earthquake of 63. Though of small size, and by no means re- markable in point of architecture, it is interesting as the only temple that has come down to us in a good state of preservation of those dedicated to the Egyptian goddess, whose worship became so popular under the Roman Empire. The decorations were of somewhat gaudy stucco. The plan is curious, and deviates much from the ordinary type; the internal arrangements are adapted for the performance of the peculiar rites of this deity. Close to this temple was another, of very small size, commonly known as the temple of Aesculapius, but probably dedicated to Zeus Milichius. More considerable and important was a temple which stood at no great distance from the forum at the point where the so-called Strada di Mereurio was crossed by the wide line of thoroughfare (Strada della Fortuna) leading to the gate of Nola. We learn from an inscription that this was dedicated to the Fortune of Augustus (Fortuna Augusta), and was erected, wholly at his own cost, by a citizen of the name of M. Tullius. This temple appears to have suffered very severely from ‘ the earthquake, and at present affords little evidence of its original architectural ornament; but we learn from existing remains that its walls were covered with slabs of marble, and that the columns of the portico were of the same material. The fifth temple, that of Venus Pompeiana, lay to the west of the basilica; traces of two earlier periods underlie the extant temple, which was in progress of rebuilding at the time of the eruption. Before the earthquake of 63 it must have been the largest and most splendid temple of the whole city. It was surrounded by a large colonnade, and the number of marble columns in the whole block has been reckoned at 296.

All the temples above described, except that ascribed to Her- cules, which was approached by steps on all four sides, agree in being raised on an elevated podium or basement — an arrange- ment usual with all similar buildings of Roman date. Neither in materials nor in style does their architecture exceed what might reasonably be expected in a second-rate provincial town; and the same may be said in general of the other public buildings. Among these the most conspicuous are the theatres/of which there were two, placed, as was usual in Greek

towns, in close juxta- position with one another. The largest of these which was partly excavated in the side of the hill, was a building of considerable magnificence, being in great part cased with marble, and fur- nished with seats of the same material, which have, however, been almost wholly removed. Its internal construction and arrangements resemble those of the Roman theatres in general, though with some peculiarities that show Greek influence, and we learn from an inscription that it was erected in Roman times by two members of the same family, M. Holconius Rufus and M. Holconius Celer, both of whom held important municipal offices at Pompeii during the reign of Augustus. It appears, however, from a careful examination of the remains that their work was only a reconstruction of a more ancient edifice, the date of the original form of which cannot be fixed; while its first alteration belongs to the ” tufa ” period, and three other periods in its history can be traced. Recent investigations in regard to the vexed question of the position of the actors in the Greek theatre have as yet not led to any certain solution. 1 The smaller theatre, which was erected, as we learn from an inscription, by two magistrates specially appointed for the purpose by the decuriones of the city, was of older date than the large one, and must have been constructed a little before the amphitheatre, soon after the establishment of the Roman colony under Sulla. We learn also that it was permanently covered, and it was probably used for musical entertainments, but in the case of the larger theatre also the arrangements for the occasional extension of an awning (velarium) over the whole are distinctly found. The

1 See A. Mau, Pompeii in Leben und Kunst (Leipzig, 1908), pp. 150 sqq.

smaller theatre is computed to have been capable of containing fifteen hundred spectators, while the larger could accommodate five thousand.

Adjoining the theatres is a large rectangular enclosure, sur- rounded by a portico, at first the colonnade connected with the theatres, and converted, about the time of Nero, into the barracks of the gladiators, who were permanently maintained in the city with a view to the shows in the amphitheatre. This explains why it is so far from that building, which is situated at the south-eastern angle of the town, about 500 yds. from the theatres. Remains of gladiators’ armour and weapons were found in some of the rooms, and in one, traces of the stocks used to confine insubordinate gladiators. The amphitheatre was erected by the same two magistrates who built the smaller theatre, C. Quinctius Valgus a nd M. Porcius (the former the father- in-law of that

P. Servilius Rullus, in opposition to whose bill relating to the distribution of the public lands Cicero made his speech, De lege agraria), at a period when no permanent edifice of a similar kind had yet been erected in Rome itself, and is indeed the oldest structure of the kind known to us. But apart from its early date it has no special interest, and is wholly wanting in the external architectural decorations that give such grandeur of character to similar edifices in other instances. Being in great part excavated in the surface of the hill, instead of the seats being raised on arches, it is wanting also in the picturesque arched corridors which contribute so much to the effect of those Other ruins. Nor are its dimensions (460 by 345 ft.) such as to place it in the first rank of structures of this class, nor are there any underground chambers below the arena, with devices for raising wild beasts, &c. But, as we learn from the case of their squabble with the people of Nuceria, the games celebrated in the amphitheatre on grand occasions would be visited by large numbers from the neighbouring towns. The seating capacity was about 20,000 2 (for illustration see Amphitheatre).

Adjoining the amphitheatre was found a large open space, nearly square in form, which has been supposed to be a forum boarium or cattle-market, but, no buildings of interest being discovered around it, the excavation was filled up again, and this part of the city has not been since examined. Between the entrance to the triangular forum (so-called) and the temple of Isis is the Palaestra, an. area surrounded by a colonnade; it is a structure of the pre-Roman period, intended for boys, not men.

Among the more important public buildings of Pompeii were the public' baths {thermae). Three different establishments of this character have been discovered, of which the first, exca- vated in 1824, the baths near the forum, built about 80 B.C., was for a long time the only one known. Though the smallest of the three, it is in some respects the most complete and interesting; and it was until of late years the principal source from which we derived our knowledge of this important branch of the economy of Roman life. At Pompeii the baths are so well preserved as to show at a glance the purpose of all the different parts — while they are among the most richly decorated of all the buildings in the city. We trace without difficulty all the separate apart- ments that are described to us by Roman authors — the apody- terium, frigidarium, tepidarium, caldarium, &c. together with the apparatus for supplying both water and heat, the places for de- positing the bather's clothes, and other minor details (see Baths). The greater thermae (the so-called " Stabian " baths), which were originally built in the 2nd century B.C., and repaired

about 80 B.C., are on a much more extensive scale than the others, and combine with the special purposes of the building a palaestra in the centre and other apartments for exercise or recreation. The arrangements of the baths themselves are, however, almost similar to those of the lesser thermae. In this case an inscription records the repair and restoration of the edifice after the 2 The interest taken by the Pompeians in the sports of the amphitheatre is shown by the contents of the numerous painted and scratched inscriptions relating tc them which have been found in Pompeii — notices of combats, laudatory inscriptions, including even references t6 the admiration which gladiators won from the fair sex, &c. 1

earthquake of 63. It appears, however, that these two establish- ments were found inadequate to supply the wants of the in- habitants, and a third edifice of the same character, the so- called central baths, at the corner of the Strada Stabiana and the Strada di Nola, but on a still more extensive scale, intended for men only, while the other two had separate accommodation for both sexes, was in course of construction when the town was overwhelmed.

Great as is the interest attached to the various public buildings of Pompeii, and valuable as is the light that they have in some instances thrown upon similar edifices in other ruined cities, far more curious and interesting is the insight afforded us by the numerous private houses and shops into the ordinary life and habits of the population of an ancient town. The houses at Pompeii are generally low, rarely exceeding two storeys in height, and it appears certain that the upper storey was generally of a slight construction, and occupied by small rooms, serving as garrets, or sleeping places for slaves, and perhaps for the females of the family. From the mode of destruction of the city these upper floors were in most cases crushed in and destroyed, and hence it was long believed that the houses for the most part had but one storey; but recent researches have in many cases brought to light incontestable evidence of the existence of an upper floor, and the frequent occurrence of a small staircase is in itself sufficient proof of the fact. The windows, as already mentioned, were generally small and insignificant, and contri- buted nothing to the external decoration or effect of the houses, which took both light and air from the inside, not from the outside. In some cases they were undoubtedly closed with glass, but its use appears to have been by no means generaL The principal living rooms, as well as those intended for the reception of

guests or clients, were all on the ground floor, the centre being formed by the atrium, or hall, which was almost always open above to the air, and in the larger houses was gener- ally surrounded with columns. Into this opened other rooms, the entrances to which seem to have been rarely protected by doors, and could only have been closed by curtains. At the back was a garden. Later, under Greek influences, a peristyle with rooms round it was added in place of the garden. We notice that, as in modern Italy until quite recent years, elaborate precautions were taken against heat, but none against cold, which was patiently endured. Hypocausts are only found in connexion with bathrooms.

All the apartments and arrangements described by Vitruvius and other ancient writers may be readily traced in the houses of Pompeii, and in many instances these have for the first time enabled us to understand the technical terms and details trans- mitted to us by Latin authors. We must not, however, hastily assume that the examples thus preserved to us by a singular accident are to be taken as representing the style of building in all the Roman and Italian towns. We know from Cicero that Capua was remarkable for its broad streets and widespread buildings, and it is probable that the Campanian towns in general partook of the same character. At Pompeii indeed the streets were not wide, but they were straight and regular, and the houses of the better class occupied considerable spaces, presenting in this respect no doubt a striking contrast, not only with those of Rome itself, but with those of many other Italian towns, where the buildings would necessarily be huddled to- gether from the circumstances of their position. Even at Pompeii itself, on the west side of the city, where the ground slopes somewhat steeply towards the sea, houses are found which consisted of three storeys or more.

The excavations have provided examples of houses of every description, from the humble dwelling-place of the artisan or proletarian, with only three or four small rooms, to the stately mansions of Sallust, of the Faun, of the Golden Cupids, of the Silver Wedding, of the Vettii, of Pansa, 1 &c. — the hist of which is among the most regular in plan, and may be taken as an almost

1 It may be observed that the names given in most cases to the houses are either arbitrary or founded in the first instance upon erroneous inferences.

perfect model of a complete Roman house of a superior class. But the general similarity in their plan and arrangement is very striking, and in all those that rise above a very humble class the leading divisions of

the interior, the atrium, tablinum, peristyle, &c. may be traced with unfailing regularity. Another peculi- arity that is found in all the more considerable houses in Pompeii, is that of the front, where it faces one of the principal streets, being occupied with shops, usually of small size, and without any communication with the interior of the mansion. In a few instances indeed such a communication is found, but in these cases it is probable that the shop was used for the sale of articles grown upon the estate of the proprietor, such as wine, fruit, oil, &c, a practice that is still common in Italy. In general the shop had a very small apartment behind it, and probably in most cases a sleeping chamber above it, though of this the only remaining evidence is usually a portion of the staircase that led to this upper room. The front of the shop was open to the street, but was capable of being closed with wooden shutters, the remains of which have in a few instances been preserved. Not only have the shops of silversmiths been recognized by the precious objects of that metal found in them, but large quantities of fruits of various kinds preserved in glass vessels, various de- scriptions of corn and pulse, loaves of bread, moulds for pastry, fishing-nets and many other objects too numerous to mention, have been found in such a condition as to be identified without difficulty. Inns and wine-shops appear to have been numerous; one of the latter we can see to have been a thermopolium, where hot drinks were sold. Bakers' shops are also frequent, though arrangements for grinding and baking appear to have formed part of every large family establishment. In other cases, how- ever, these were on a larger scale, provided with numerous querns or hand-mills of the well-known form, evidently intended for public supply. Another establishment on a large scale was a fullonica (fuller's shop), where all the details of the business were illustrated by paintings still visible on the walls. Dyers' shops, a tannery and a shop where colours were ground and manufactured — an important business where almost all the rooms of every house were painted — are of special interest, as is also the house of a surgeon, where numerous surgical instru- ments were found, some of them of a very ingenious and elaborate description, but all made of b7onze. Another curious discovery was that of the abode of a sculptor, containing his tools, as well as blocks of marble and half-finished statues, The number of utensils of various kinds found in the houses and shops is almost endless, and, as these are in most cases of bronze, they are generally in perfect preservation.

Of the numerous works of art discovered in the course of the excavations the statues and large works of sculpture, whether in marble or bronze, are inferior to those found at Herculaneum, but some of the bronze statuettes are of exquisite workmanship, while the

profusion of ornamental works and objects in bronze and the elegance of their design, as well as the finished beauty of their execution, are such as to excite the utmost admiration — more especially when it is considered that these are the casual results of the examination of a second-rate provincial town, which had, further, been ransacked for valuables (as Hercu- laneum had not) after the eruption of 79. The same impression is produced in a still higher degree by the paintings with which the walls of the private houses, as well as those of the temples and other public buildings, are adorned, and which are noWnerely of a decorative character, but in many instances present us with elaborate compositions of figures, historical and mythological scenes, as well as representations of the ordinary life and manners of the people, which are full of interest to us, though often of inferior artistic execution. It has until lately been the practice to remove these to the museum at Naples; but the present tendency is to leave them (and even the movable objects found in the houses) in situ with all due precautions as to their preservation (as in the house of the Vettii, of the Silver Wedding, of the Golden Cupids, &c), which adds im- mensely to the interest of the houses; indeed, with the help of judicious restoration, their original condition is in large

measure reproduced. 1 In some cases it has even been possible to recover the original arrangement of the garden beds, and to replant them accordingly, thus giving an appropriate frame- work to the statues, &c. with which the gardens were decorated, and which have been found in situ. The same character of elaborate decoration, guided almost uniformly by good taste and artistic feeling, is displayed in the mosaic pavements, which in all but the humbler class of houses frequently form the ornament of their floors. One of these, in the House of the Faun, well known as the battle of Alexander, presents us with the most striking specimen of artistic com- position that has been preserved to us from antiquity.

The architecture of Pompeii must be regarded as presenting in general a transitional character from the pure Greek style to that of the Roman Empire. The temples (as already observed) have always the Roman peculiarity of being raised on a podium of considerable elevation; and the same characteristic is found in most of the other public buildings. All the three orders of Greek architecture — the Doric, Ionic and Corinthian— are found freely employed in the various edifices of the city, but rarely in strict accordance with the rules of art in their

proportions and details; while the private houses naturally exhibit still more deviation and irregularity. In many of these indeed we find varieties in the ornamentation, and even in such leading features as the capitals of the columns, which remind one rather of the vagaries of medieval architecture than of the strict rules of Vitruvius or the regularity of Greek edifices. One practice which is especially prevalent, so as to strike every casual visitor, and dates from the early years of the empire, is that of filling up the flutings of the columns for about one-third of their height with a thick coat of stucco, so as to give them the appearance of being smooth columns without flutings below, and only fluted above. The unpleasing effect of this anomalous arrangement is greatly aggravated by the lower part of each column being almost always coloured with red or yellow ochre, so as to render the con- trast between the two portions still stronger. The architecture of Pompeii suffers also from the inferior quality of the materials generally employed. No good building stone was at hand; and the public as well as private edifices were constructed either of volcanic tufa, or lava, or Sarno limestone, or brick (the latter only used for the corners of walls). In the private houses even the columns are mostly of brick, covered merely with a coat of stucco. In a few instances only do we find them making use of a whitish limestone wrongly called travertine, which, though inferior to the similar material so largely employed at Rome, was better adapted than the ordinary tufa for purposes where great solidity was required. The portion of the portico sur- rounding the forum which was in the process of rebuilding at the time when the city was destroyed was constructed of this material, while the earlier portions, as well as the principal temples that adjoined it, were composed in the ordinary manner of volcanic tufa. Marble appears to have been scarce, and was sparingly employed. In some instances where it had been freely introduced, as in the great theatre, it would seem that the slabs must have been removed at a period subsequent to the entombment of the city.

These materials are used in several different styles of con- struction belonging to the six different periods which Mau . traces in the architectural history of Pompeii.

i. That of the Doric temple in the Foro Triangolare (6th century B.C.) and an old column built into a house in Region vi., Insula 5; also of the older parts of the city walls — date uncertain (Sarno limestone and grey tufa).

2. That of the limestone atriums (outer walls of the houses of ashlar-work of Sarno limestone, inner walls with framework of limestone

blocks, filled in with small pieces of limestone). Date, before 200 b.c.

3. Grey tufa period ; ashlar masonry of tufa, coated with fine white stucco; rubble work of lava. The artistic character is still Greek, and the period coincides with the first (incrustation) style of mural decoration, which (probably origin ating in Alexandria) aimed at

1 The paintings of the house of the Vettn are perhaps the best-preserved in Pompeii, and extremely fine in conception and execution, especially the scenes in which Cupids take part.

the imitation in stucco of the appearance of a wall veneered with coloured marbles. No wall paintings exist, but there are often fine floor mosaics. To this belong a number of private houses (e.g. the House of the Faun), and the colonnade round the forum, the basilica, the temples of Apollo and Jupiter, the large theatre with the colonnades of the Foro Triangolare, and the barracks of the gladiators, the Stabian baths, the Palaestra, the exterior of the Porta Marina, and the interior of the other gates — all the public buildings indeed (except the Doric temple mentioned under (1), which do not belong to the time of the Roman colony). Date, 2nd century B.C.

4. The ” quasi-reticulate ” period — walling faced with masonry not yet quite so regular as opus reticulatum, and with brick quoins, coinciding with the second period of decoration (the architectural, partly imitating marble like the first style, but without relief, and by colour only, and partly making use of architectural designs). It is represented by the small theatre and the amphitheatre, the baths near the forum, the temple of Zeus Milichius, the Comitium and the original temple of Isis, but only a few private houses. The ornamentation is much less rich and beautiful than that of the preceding period. Date, from 80 B.C. until nearly the end of the Republic.

5. The period from the last decades of the Republic to the earthquake of a.d. 63. No homogeneous series of buildings — we find various styles of construction (quasi-reticulate, opus reticulatum of tufa with stone quoins, of the time of Augustus, opus reticulatum with brick quoins or with mingled stone and brick quoins, a little later) ; and three styles of wall decoration fall within its limits. The second, already mentioned, the third or ornate, with its freer use of ornament and its introduction of designs which suggest an. Egyptian origin (originating in the time of Augustus), and the fourth or intricate, dating from about a.d. 50. Marble first appears as a building material in the temple of Fortuna Augusta (c. 3 B.C.).

6. The period from the earthquake of a.d. 63 to the final de- struction of the city, the buildings of which can easily be recognized. The only wholly new edifice of any importance is the central baths.

Outside the Porta Ercolanese, or gate leading to Herculaneum, is found a house of a different character from all the others, which from its extent and arrangements was undoubtedly a suburban villa, belonging to a person of considerable fortune. It is called — as usual without any authority — the villa of Arrius Diomedes; but its remains are of peculiar interest to us, not only for comparison with the numerous ruins of similar buildings which occur else- where—often of greater extent, but in a much less perfect state of preservation — but as assisting us in understanding the description of ancient authors, such as Vitruvius and Pliny, of the numerous appurtenances frequently annexed to houses of this description.

In the cellar of this villa were discovered no less than twenty skeletons of the unfortunate inhabitants, who had evidently fled thither for protection, and fourteen in other parts of the house. Almost all the skeletons and remains of bodies found in the city were discovered in similar situations, in cellars or underground apartments — those who had sought refuge in flight having appar- ently for the most part escaped from destruction, or having perished under circumstances where their bodies were easily recovered by the survivors. According to Cassius Dio, a large number of the inhabitants were assembled in the theatre at the time of the catas- trophe, but no bodies have been found there, and they were probably sought for and removed shortly afterwards. Of late years it has been found possible in many cases to take casts of the bodies found — a complete mould having been formed around them by the fine white ashes, partially consolidated by water.

An interesting farm-house (few examples have been so far dis- covered in Italy) is that at Boscoreale excavated in 1 893-1 894, which contained the treasure of one hundred and three silver vases now at the Louvre. The villa of P. Fannius Synhistor, not far off, was excavated in 1900; it contained fine wall paintings, which, despite their importance, were allowed to be exported, and sold by auction in Paris (some now in the Louvre). (See F. Barnabei, La Villa pompeiana di P. Fannio Sinistore; Rome, 1901.)

The road leading from the Porta Ercolanese towards Herculaneum is bordered on both sides for a considerable extent by rows of tombs, as was the case with all the great roads leading into Rome, and in- deed in all large Roman towns. These tombs are in many instances

monuments of considerable pretension, and of a highly ornamental character, and naturally present in the highest degree the peculiar advantage common to all that remains of Pompeii, in their perfect preservation. Hardly any scene even in this extraordinary city is more striking than the coup d'ceil of this long street of tombs, preserving uninjured the records of successive generations eighteen centuries ago. Unfortunately the names are all otherwise unknown; but we learn from the inscriptions that they are for the most part those of local magistrates and municipal dignitaries of Pompeii. Most of them belong to the early empire.

There appears to have been in the same quarter a considerable suburb, outside the gate, extending on each side of the road towards Herculaneum, apparently much resembling those which are now found throughout almost the whole distance from thence to Naples. It was known by the name of Pagus Augustus Felix

Suburbanus. Other suburbs were situated at the harbour and at the saltworks (saiinae).

No manuscripts have been discovered in Pompeii. Inscriptions have naturally been found in considerable numbers, and we are indebted to them for much information concerning the municipal arrangements of the town, as well as the construction of various edifices and other public works. The most interesting of these are such as are written in the Oscan dialect, which appears to have continued in official use down to the time when the Roman colony was introduced by Sulla. From that time the Latin language was certainly the only one officially employed, though Oscan may have still been spoken by a portion at least of the population. Still more curious, and almost peculiar to Pompeii, are the numerous writings painted upon the walls, which have generally a semi- pubiic character, such as recommendations of candidates for muni- cipal offices, advertisements, &c, and the scratched inscriptions (graffiti), which are generally the mere expression of individual impulse and feeling, frequently amatory, and not uncommonly conveyed in rude and imperfect verses. In one house also a whole box was found filled with written tablets — diptychs and triptychs — containing the record of the accounts of a banker named L. Caecilius Jucundus.

See A. Mau, Pompeii: its Life and Art (trans, by F. W. Kelsey, 2nd ed.,

New York and London, 1902; 2nd revised edition of the German original, Pompeii in Leben und-Kunst, Leipzig, 1908), the best general account written by the greatest authority on the subject, to which our description owes much, with full references to other sources of information; and, for later excavations, Notizie degli Scavi and Romische Mitteilungen (in the latter, articles by Mau), passim. For the inscriptions on the tablets and on the walls, Corpus inscriptionum latinarum, vol. iv. (ed. Zangemeister and Mau). Recent works on the Pompeian frescoes are those of Berger, in Die Maltechnik des Alterthums, and A. P. Laurie, Greek and Roman Methods of Painting (1910). (E. H. ; B. ; T. As.)

Oscan Inscriptions. — The surviving inscriptions which can be dated, mainly by the gradual changes in their alphabet, are of the 3rd and 2nd centuries B.C., some certainly belonging to the Gracchan period. The oldest of the Latin inscriptions are C.I.L. x. 794, the record of the building of colonnades in the forum by the ” quaestor ” V. Popidius, and two or three election placards (C.I.L. iv. 29, 30, 36) of one R. Caecilius, a candidate for the same office. It cannot be an accident that the alphabet of these inscriptions belongs distinctly to Sullan or pre-Sullan times, while no such officer as a quaestor appears in any later documents {e.g. in C.I.L. x. 844, it is the duoviri who build the small theatre), but does appear in the Oscan inscrip- tions. Hence it has been inferred that these oldest Latin inscrip— tions are also older than Sulla’s colony; if so, Latin must have been in use, and in fairly common use (if the programmata were to be of any service), in Pompeii at that date. On the other hand, the good condition of many of the painted Oscan inscrip- tions at the times when they were first uncovered (1797 onwards) and their subsequent decay and the number of Oscan graffiti appear to make it probable that at the Christian era Oscan was still spoken in the town. The two languages undoubtedly existed side by side during the last century B.C., Latin being alone recognized officially and in society, while Oscan was preserved mainly by intercourse with the country folk who frequented the market. Thus beside many Latin programmata later than those just mentioned we have similar inscriptions in Oscan, addressed to Oscan-speaking voters, where Illlner. obviously relates to the quattuorvirate, a title characteristic of the Sullan and triumviral colonies. An interesting stone containing nine cavities for measures of capacity found in Pompeii and now preserved in the Naples Museum with Oscan inscriptions erased in antiquity shows that the Oscan system of measurement was modified so as to correspond more closely with the Roman, about 14 B.C., by the duoviri, who record their work in a Latin inscription (C.I.L. x. 793; for the Oscan see Ital. Dial. p. 67).

See further Osca Lingua, and R. S. Conway, The Italic Dialects, pp. 54 sqq.; Nissen, Pompeianische Studien; J. Beloch, Campanien, 2nd ed. (R. S. C.)

POMPEY, the common English form of Pompeius, the name of a Roman plebeian family.

1. Gnaeus Pompeius (106-48 B.C.), the triumvir, the first of his family to assume the surname Magnus, was born on the 36th of September in the same year as Cicero. When only seventeen he fought together with his father in the Social War.

He took the side of Sulla against Marius and Cinna, but for a time, in consequence of the success of the Marians, he kept in the background. On the return of Sulla from the Mithradatic War Pompey joined him with an army of three legions, which he had raised in Picenum. Thus early in life he connected himself with the cause of the aristocracy, and a decisive victory which he won in 83 over the Marian armies gained for him from Sulla the title of Imperator. He followed up his successes in Italy by defeating the Marians in Sicily and Africa, and on his return to Rome in 81, though he was still merely an eques and not legally qualified to celebrate a triumph, he was allowed by general consent to enjoy this distinction, while Sulla greeted him with the surname of Magnus, a title he always retained and handed down to his sons. Latterly, his relations with Sulla were somewhat strained, but after his death he resisted the attempt of the consul M. Aemilius Lepidus to repeal the constitution. In conjunction with A. Lutatius Catulus, the other consul, he defeated Lepidus when he tried to march upon Rome, and drove him out of Italy (77). With some fears and misgivings the senate permitted him to retain the command of his victorious army, and decided on sending him to Spain, where the Marian party, under Sertorius, was still formidable. Pompey was fighting in Spain from 76 to 71, and though at first he met with serious reverses he was ultimately successful. After Sertorius had fallen a victim to assassination, Pompey easily defeated his successor Perperna and put an end to the war. In 71 he won fresh glory by finally crushing the slave insurrection of Spartacus, That same year, amid great popular enthusiasm, but without the hearty concurrence of the senate, whom he had alarmed by talking of restoring the dreaded power of the tribunes, he was elected with M. Licinius Crassus to the consulship, and entered Rome in triumph (December 31) for his Spanish victories. He was legally ineligible for the consulship, having held none of the lower offices of state and being under age. The following year saw the work of Sulla undone; the tribunate was restored, and the administration of justice was no longer left

exclusively to the senate, but was to be shared by it with the wealthier portion of the middle class, the equites (q.v.) and the tribuni aerarii} The change was really necessary, as the provincials could never get justice from a court composed of senators, and it was carried into effect by Pompey with Caesar's aid. Pompey rose still higher in popularity, and on the motion of the tribune Aulus Gabinius in 67 he was entrusted with an extraordinary command over the greater part of the empire, specially for the extermination of piracy in the Mediterranean, by which the corn supplies of Rome were seriously endangered, while the high prices of provisions caused great distress. He was completely successful; the price of corn fell immediately on his appointment, and in forty days the Mediterranean was cleared of the pirates. Next year, on the proposal of the tribune Manilius, his powers were still further extended, the care of all the provinces in the East being put under his control for three years together with the conduct of the war against Mithradates VI., who had recovered from the defeats he had sustained from Lucullus and regained his dominions. Both Caesar and Cicero supported the tribune's proposal, which was easily carried in spite of the interested opposition of the senate and the aristocracy, several of whom held provinces which would now be practically under Pompey's command. The result of Pompey's operations was eminently satisfactory. The wild tribes of the Caucasus were cowed by the Roman arms, and Mithradates himself fled across the Black Sea to Panticapaeum (modern Kertch). In the years 64 and 63 Syria and Palestine were annexed to Rome's empire. After the capture of Jerusalem Pompey is said to have entered the Temple, and even the Holy of Holies. Asia and the East generally were left under the subjection of petty kings who were mere vassals of Rome. Several cities had been founded which became centres of Greek life and civilization.

Pompey, now in his forty-fifth year, returned to Italy in 61 to

1 Their history and political character is obscure; they were at any rate connected with the knights (see Aerarium).

celebrate the most magnificent triumph which Rome had ever witnessed, as the conqueror of Spain, Africa, and Asia (see A. Holm, Hist, of Greece, Eng. trans., vol. iv.). This triumph marked the turning-point of his career. As a soldier everything had gone well with him; as a politician he was a failure. He found a great change in public

opinion, and the people indifferent to his achievements abroad. The optimates resented the extra- ordinary powers that had been conferred upon him; Lucullus and Crassus considered that they had been robbed by him of the honour of concluding the war against Mithradates. The senate refused to ratify the. arrangements he made in Asia or to provide money and lands for distribution amongst his veterans. In these circumstances he drew closer to Caesar on his return from Spain, and became reconciled to Crassus. The result was the so-called first triumvirate (see Rome: History). The remainder of his life is inextricably interwoven with that of Caesar. He was married to Caesar's daughter Julia, and as yet the relations between the two had been friendly. On more than one occasion Caesar had supported Pompey's policy, which of late had been in a decidedly democratic direction. Pompey was now in fact ruler of the greater part of the empire, while Caesar had only the two provinces of Gaul. The control of the capital, the supreme command of the army in Italy and of the Mediterranean fleet, the governorship of the two Spains, the superintendence of the corn supplies, which were mainly drawn from Sicily and Africa, and on which the vast population of Rome was wholly dependent, were entirely in the hands of Pompey, who was gradually losing the confidence of all political parties in Rome. The senate and the aristocracy disliked and distrusted him, but they felt that, should things come to the worst, they might still find in him a champion of their cause. Hence the joint rule of Pompey and Caesar was not unwillingly accepted, and anything like a rupture between the two was greatly dreaded as the sure beginning of anarchy throughout the Roman world. With the deaths of Pompey's wife Julia (54) and of Crassus (53) the relations between him and Caesar became strained, and soon afterwards he drew closer to what we may call the old conservative party in the senate and aristocracy. The end was now near, and Pompey blundered into a false political position and an open quarrel with Caesar. In 50 the senate by a very large majority revoked the extraordinary powers conceded to Pompey and Caesar in Spain and Gaul respectively, and called upon them to disband their armies. Pompey's refusal to submit gave Caesar a good pretext for declaring war and marching at the head of his army into Italy. At the beginning of the contest the advantages were decidedly on the side of Pompey, but the superior political tact of his rival, combined with extraordinary promptitude and decision in following up his blows, soon turned the scale against him. Pompey's cause, with that of the senate and aristocracy, was finally ruined by his defeat in 48 in the neighbourhood of the Thessalian city Pharsalus. That same year he fled with the hope of finding a safe refuge in Egypt, but was treacherously murdered by one of his old centurions as he was

landing. He was five times married, and three of his children survived him — Gnaeus, Sextus, and a daughter Pompeia.

Pompey, though he had some great and good qualities, hardly deserved his surname of ” the Great.” He was certainly a very good soldier, and is said to have excelled in all athletic exercises, but he fell short of being a first-rate general. He won great successes in Spain and more espec’ally in the East, but for these he was no doubt partly indebted to what others had already done. Of the gifts which make a good statesman he had really none. As plainly appeared in the last years of his life, he was too weak and irresolute to choose a side and stand by it. But to his credit be it said that in a corrupt time he never used his opportunities for plunder and extortion, and his domestic life was pure and simple.

Authorities. — Ancient: Plutarch, Pompey; Dio Cassius; Appian; Velleius Paterculus; Caesar, De bello civili; Strabo xii., 555-560; Cicero, passim; Lucan, Pharsalia.

Modern: Histories of Rome in general (see Rome: Ancient Vistory, ad fin.) ; works quoted under Caesar and Cicero. Also

G. Boissier, Cicero and His Friends (Eng. trans., A. D. Jones, 1897) ; J. L. Strachan- Davidson’s Cicero (1894); Warde Fowler’s Julius Caesar (1892); C. W. Oman, Seven Roman Statesmen of the Later Republic (1902); notes in Tyrrell and Purser’s Correspondence of Cicero (see index in vii. 80).

2. Gnaeus Pompeius, surnamed Strabo (squint-eyed), Roman statesman, father of the triumvir. He was successively quaestor in Sardinia (103 B.C.), praetor (94), propraetor in Sicily (93) and consul (89). He fought with success in the Social War, and was awarded a triumph for his services. Probably towards the end of the same year he brought forward the law (lex Pompeia de Gallia Transpadana) , which conferred upon the inhabitants of that region the privileges granted to the Latin colonies. During the civil war between Marius and Sulla he seems to have shown no desire to attach himself definitely to either side. He certainly set out for Rome from the south of Italy (where he remained as proconsul) at the bidding of the aristocratic party, when the city was threatened by Marius and Cinna, but he displayed little enetgy, and the engage- ment which he fought before the Colline gate, although hotly contested, was indecisive. Soon afterwards he was killed by lightning (87). Although he possessed great military talents, Pompeius was the best-hated general of his time owing to his cruelty, avarice and perfidy. His body was dragged from the bier, while being

conveyed to the funeral pile, and treated with the greatest indignity.

See Plutarch, Pompey, 1; Appian, Bell. civ. i. 50, 52, 66-68, 80;, Veil. Pat. ii. 21 ; Livy, Epit. 74-79; Florus iii. 18.

3. Gnaeus Pompeius Magnus (c. 75-45 B.C.), the elder son of the triumvir. In 48 B.C. during the civil war he commanded his father's fleet in the Adriatic. After the battle of Pharsalus he set out for Africa with the remainder of the Pompeian party, but, meeting with little success, crossed over to Spain. Having been joined by his brother Sextus, he collected a considerable army, the numbers of which were increased by the Pompeians who fled from Africa after the battle of Thapsus (46). Caesar, who regarded him as a formidable opponent, set out against him in person. A battle took place at Munda on the 17th of March 45, in which the brothers were defeated. Gnaeus managed to make his escape after the engagement, but was soon (April 12) captured and put to death. He was generally unpopular owing to his cruelty and violent temper.

See Pseudo-Oppius, Bellum hispaniense, 1-39; Lucan, Pharsalia, ix. 120; Dio Cassius xliii. 28-40.

4. Sextus Pompeius Magnus (75-35 b.c), the younger son of the triumvir. After his father's death he continued the struggle against the new rulers of the Roman Empire. From Cyprus, where he had taken refuge, he made his way to Africa, and after the defeat of the Pompeians at Thapsus (46) crossed over to Spain. After Caesar's victory at the battle of Munda (45), in which he took no actual part, he abandoned Corduba (Cordova), though for a time he held his ground in the south, and defeated Asinius Pollio, the governor of the province. In 43, the year of the triumvirate of Octavius, Antony, and Lepidus, he was proscribed along with the murderers of Caesar, and, not daring to show himself in Italy, he put himself at the head of a fleet manned chiefly by slaves or proscribed persons, with which he made himself master of Sicily, and from thence ravaged the coasts of Italy. Rome was threatened with a famine, as the corn supplies from Egypt and Africa were cut off by his ships, and it was thought prudent to negotiate a peace with him at Misenum (39), which was to leave him in possession of Sicily, Sardinia and Achaea, provided he would allow Italy to be freely supplied with corn. But the arrangement could not be carried into effect, as Sextus renewed the war and gained some considerable successes at sea. However, in 36 his fleet was defeated and destroyed by Agrippa at Naulochus off the north coast of Sicily. After his defeat he fled to Mytilene, and from there to Asia Minor. In the attempt to make his way to Armenia he was taken prisoner by

Antony's troops, and put to death at Miletus. Like his father, he was a brave soldier, but a man of little culture.

See Dio Cassius, xtvi-xlix. ; Appian, Bell. civ. iv. 84-117 v 2-143; Veil. Pat. ii. 73-87; Plutarch, Antony; Livy, Epit. \2\ 128, 129, 131; Cicero, Philippica, xiii., and many references in Letters to Atttcus.

POMPIGNAN, JEAN JACQUES LEFRANC, Marquis de (1709- 1784), French poet, was born on the 17th of August 1709, at Montauban, where his father was president of the cour des aides, and the son, who also followed the profession of the law, suc- ceeded in 1745 to the same charge. The same year he was also appointed conseiller d'konneur of the parlement of Toulouse, but his courageous opposition to the abuses of the royal powerˆ especially in the matter of taxation, brought down upon him so much vexation that he resigned his positions almost immedi- ately, his marriage with a rich woman enabling him to devote himself to literature. His first play, Didon (1734), which owed much to Metastasio's opera on the same subject, gained a great success, and gave rise to expectations not fulfilled by the Adieux de Mars (1735) and some light operas that followed. His reputa- tion was made by Poesies sacr&es et philosophiques (1734), much mocked at by Voltaire who punned on the title: " S acres Us sont, car personne n'y louche." Lefranc's odes on profane sub- jects hardly reach the same level, with the exception of the ode on the death of J. B. Rousseau, which secured him entrance to the Academy (1760). On his reception he made an ill-con- sidered oration violently attacking the Encyclopaedists, many of whom were in his audience and had given him their votes. Lefranc soon had reason to repent of his rashness, for the epigrams and stories circulated by those whom he had attacked made it impossible for him to remain in Paris, and he took refuge in his native town, where he spent the rest of his life occupied in making numerous translations from the classics, none of great merit.

La Harpe who is severe enough on Lefranc in his correspondence, does his abilities full justice in his Cours Utteraire, and ranks him next to J. B. Rousseau among French lyric poets. With those of other 18th-century poets his works may be studied in the Pelits poeles francais (1838) of M. Prosper Poitevin. His CEuvres com- pletes (4 vols.) were published in 1781, selections (2 vols.) in 1800,

Iolˆi Io22.

His brother, Jean Georges Lefranc de Pompignan (1715- 1790), was the archbishop of Vienne against whose defence of the faith Voltaire launched the good-natured mockery of Les Lettres d'un Quaker. Elected to the Estates General, he passed over to the Liberal side, and led the 149 members of the clergy who united with the third estate to form the National Assembly. He was one of its first presidents, and was minister of public worship when the civil constitution was forced upon the clergy.

POMPONAZZI, PIETRO (Petrus Pomponatius) (1462-1523), Italian philosopher, was born at Mantua on the 16th of Sep- tember 1462, and died at Bologna on the 18th of May 1525. His education, begun at Mantua, was completed at Padua, where he became doctor of medicine in 1487. In 1488 he was elected extraordinary professor of philosophy at Padua, where he was a colleague of Achillini, the Averroist. From about 1495 to 1500 he occupied the chair of natural philosophy until the closing of the schools of Padua, when he took a professorship at Ferrara where he lectured on the De anima. In 151 2 he was invited to Bologna where he remained till his death and where he produced. all his important works. The predominance of medical science at Padua had cramped his energies, but at Ferrara, and even more at Bologna, the study of psychology and theological speculation were more important. In 1516 he produced his great work De immortalitate animi, which gave rise to a storm of controversy between the orthodox Thomists of the Catholic Church, the Averroists headed by Agostino Nifo, and the so-called Alexandrist School. The treatise was burned at Venice, and Pomponazzi himself ran serious risk of death at the hands of the Catholics. Two pamphlets followed, the Apologia and the Defensorium, wherein he explained his paradoxical position as Catholic and philosophic materialist. His last two treatises, the De incantationibus and the De fato were posthumously published in an edition of his works printed at Basel.

Pomponazzi is profoundly interesting as the herald of the Renaissance. He was born in the period of transition when scholastic formalism was losing its hold over men both in the Church and outside. Hitherto the dogma of the Church had been based on Aristotle as interpreted by Thomas Aquinas. So close was this identification that any attack on Aristotle, or even an attempt to reopen the old discussions on the Aristo- telian problems, was regarded as a dangerous heresy. Pom- ponazzi claimed the right to study Aristotle for himself, and devoted himself to the De anima with the view of showing that Thomas Aquinas had entirely misconceived the Aristotelian theory of the

active and the passive intellect. The Averroists had to some extent anticipated this attitude by their contention that immortality does not imply the eternal separate existence of the individual soul, that the active principle which is common to all men alone survives. Pomponazzi's revolt went further than this. He held, with Alexander of Aprodisias, that, as the soul is the form of the body (as Aquinas also asserted), it must, by hypothesis, perish with the body; form apart from matter is unthinkable. The ethical consequence of such a view is important, and in radical contrast to the practice of the period. Virtue can no longer be viewed solely in relation to reward and punishment in another existence. A new sanction is required. Pomponazzi found this criterion in rod koXou evena —virtue for its own sake. " Praemium essentiale virtutis est ipsamet virtus quae hominem felicem facit," he says in the De immortalitate. Consequently, whether or not the soul be im mortal, the ethical criterion remains the same: " Neque aliquo pacta declinandum est a virtute quicquid accidat post mortem." In spite of this philosophical materialism, Pomponazzi declared his adherence to the Catholic faith, and thus established the principle that religion and philosophy, faith and knowledge, may be diametrically opposed and yet coexist for the same thinker. This curious paradox he exemplifies in the De incanla- tione, where in one breath he sums up against the existence of demons and spirits on the basis of the Aristotelian theory of the cosmos, and, as a believing Christian, asserts his faith in their existence. In this work he insists emphatically upon the orderly sequence of nature, cause and effect. Men grow to maturity and then decay; so religions have their day and succumb. Even Christianity, he added (with the usual proviso that he is speaking as a philosopher) was showing indications of decline.

See A. H. Douglas, Philosophy and Psychology of Pietro Pompo- nazzi (1910); also Ritter, Geschichte der Philosophies J. A. Symonds, J he Renaissance in Italy; Windelband, History of Philosophy (trans, by James H. Tufts, pt. 4 , c. 1); J. Burckhardt, Die Kultur der Renaissance in Italien; L. Ferri, La Psicologia di P. Pom- ponazzi. (J_ M _ jyˆy

POMPONIUS, LUCIUS, called Bononiensis from his birthplace Bononia, Latin comic poet, flourished about 90 b.c. (or earlier). He was the first to give an artistic form to the Atellanae Fabulae by arranging beforehand the details of the plot which had hitherto been left to improvisation, and providing a written text. The fragments show fondness for alliteration and playing upon words, skill in the use of rustic and farcical language, and a considerable amount of obscenity.

Fragments in O. Ribbeck, Scenicae romanorum poesis fratmenta

(1897-1898); see Mommsen, Hist, of Rome (Eng. tr.), bk. iv. ch. 13; leuffel-Schwabe, Hist, of Roman Literature (Eng. tr.), § 151.

POMPOSA, an abbey of Emilia, Ttaly, in the province of Ferrara, 2 m. from Codigoro, which is 30 m. E. of Ferrara in the delta of the Po. The fine church, a work of the 10th (?) century, with interesting sculptures on the facade and a splendid Roma- nesque campanile, contains a good mosaic pavement, and interest- ing frescoes_ of the 14th century — a " Last Judgment " of the school of Giotto and others; and there are also paintings in the refectory. It was abandoned in 1550 on account of malaria.. See G. Agnelli, Ferrara e Pomposa (Bergamo, 1902). (T. As.) POMPTINE MARSHES, a low tract of land in the province of Rome, Italy, varying in breadth between the Volscian mountains and the sea from 10 to 16 m., and extending N.W. to S.E. from

Velletri to Terracina (40 m.). In ancient days this low tract was fertile and well-cultivated, and contained several prosperous cities (Suessa Pometia, Ulubrae — perhaps the mod. Cisterna — &c), but, owing to the dying out of the small proprietors, it had already become unhealthy at the end of the Republican period. Attempts to drain the marshes were made by Appius Claudius in 312 B.C., when he constructed the Via Appia through them (the road having previously followed a devious course at the foot of the Volscian mountains), and at various times during the Roman period. A canal ran through them parallel to the road, and for some reason that is not altogether clear it was used in preference to the road during the Augustan period. Trajan repaired the road, and Theodoric did the same some four hundred years later. But in the middle ages it had fallen into disrepair. Popes Boniface VIII., Martin V., Sixtus V., and Pius VI. all attempted to solve the problem, the last-named reconstructing the road admirably. The difficulty arises from the lack of fall in the soil, some parts no less than 10 m. from the coast being barely above sea-level, while they are separated from the sea by a series of sand-hills now covered with forest, which rise at some points over 100 ft. above sea-level. Springs also rise in the district, and the problem is further complicated by the flood-water and solid matter brought down by the mountain torrents, which choke up the channels made. By a law passed in 1899, the proprietors are bound to arrange for . the safe outlet of the water from the mountains, keep the exist- ing canals open, and reclaim the district exposed to inundation, within a period of twenty-four years. The sum

of £280,000 has been granted towards the expense by the government.

See T. Berti, Paludi pontine (Rome, 1884); R. de la BlanchSre, Un Chapilre d'histoire pontine (Paris, 1889). (T. As.)

PONANI, a seaport on the west coast of India, in Malabar district, Madras, at a mouth of a river of the same name. Pop. (1901), 10,562. It is the headquarters of the Moplah or Map- pilla community of Mahommedans, with a religious college and many mosques, one of which is said to date from 1510. There is a large export of coco-nut products.

PONCA, a tribe of North-American Indians of Siouan stock. They were originally part of the Omaha tribe, with whom they lived near the Red River of the North. They were driven westward by the Dakotas, and halted on the Ponca river, Dakota. After a succession of treaties and removals they were placed on a reservation at the mouth of the Niobrara, where they were prospering, when their lands were forcibly taken from them, and they were removed to Indian Territory (Oklahoma). During the march thither and in their new quarters, the tribe's health suffered, so that in 1878 they revolted and made their way back to the Omahas. They were recaptured, but public attention having been drawn to their hard case they were liberated in 1880, after a long trial, which resulted in their being declared United States citizens. They number some 700, mostly in Oklahoma.

PONCE, a seaport and the second largest city of Porto Rico, the seat of government of the Department of Ponce, on the south coast, about 50 m. (84 m. by the military road) S.W. of San Juan. Pop. (1899), 27,952, of whom 2554 were negroes and 9942 of mixed races; (1910), 35,027. It is served by the American Railroad of Porto Rico, by a railway to Guayama (1910), and by steamboats from numerous ports; an old military road connects it with San Juan. Ponce consists of two parts: Ponce, or the city proper, and Ponce Playa, or the seaport; they are separated by the Portuguese River and are connected by an electric street railway. Ponce Playa is on a spacious bay and is accessible to vessels drawing 25 ft. of water; Ponce is 2 m. inland at the interior margin of a beautiful plain, with hills in the rear rising to a height of 1000 to 2000 ft. The city is supplied with water • by an aqueduct about 2 m. long. There are two attractive public squares in the heart of the city: Plaza Principal and Plaza de las Delicias. Among prominent public buildings are the city hall, the custom-house, the Pearl theatre, several churches- Roman Catholic (including a finely decorated cathedral) and Protestant; St Luke's hospital and insane

asylum, an asylum

for the blind, a ladies' asylum, a home for the indigent and aged, and a military barracks. At the Quintana Baths near the city are thermal springs with medicinal properties. The surrounding country is devoted chiefly to the cultivation of sugar cane, tobacco, oranges and cacao, and to the grazing of cattle. Among the manufactures are sugar, molasses, rum, and ice, and prepared coffee for the market. Ponce, named in honour of Ponce de Leon, was founded in 1752 upon the site of a settlement which had been established in the preceding century, was incorporated as a town in 1848, and was made a city in

1878.

PONCELET, JEAN VICTOR (1 788-1 867), French mathe- matician and engineer, was born at Metz on the 1st of July 1788. From 1808 to 1810 he attended the Ecole polytechnique, and afterwards, till 181 2, the licole d' application at Metz. He then became lieutenant of engineers, and took part in the Russian campaign, during which he was taken prisoner and was confined at Saratov on the Volga. It was during his imprison- ment here that, " prive de toute espece de livres et de secours, surtout distrait par les malheurs de ma patrie et les miens propres," as he himself puts it, he began his researches on pro- jective geometry which led to his great treatise on that subject. This work, the Traite des propriites projectives des figures, which was published in 1822 (2d ed., 2 vols. 1865-1866), is occupied with the investigation of the projective properties of figures (see Geometry). This work entitles Poncelet to rank as one of the greatest of those who took part in the development of the modern geometry of which G. Monge was the founder. From 1 81 5 to 1825 he was occupied with military engineering at Metz] and from 1825 to 1835 he was professor of mechanics at the Ecole d' application there. In 1826, in his M&moire sur les roues hydrauliques a aubes courbes, he brought forward im- provements in the construction of water-wheels, which more than doubled their efficiency. In 1834 he became a member of the Academie; from 1838 to 1848 he was professor to the faculty of sciences at Paris, and from 1848 to 1850 comman- dant of the Ecole polytechnique. At the London International Exhibition of 1851 he had charge of the department of machinery, and wrote a report on the machinery and tools on view at that exhibition. He died at Paris on the 23rd of December 1867.

See J. Bertrand, Aloge historique de Poncelet (Paris, 1875).

PONCHER, ETIENNE DE (1446-1524), French prelate and diplomatist.

After studying law he was early provided with a prebend, and became councillor at the parlement of Paris in 1485 and president of the Chambre des Enquetes in 1498. Elected bishop of Paris in 1503 at the instance of Louis XII., he was entrusted by the king with diplomatic missions in Germany and Italy. After being appointed chancellor of the duchy of Milan, he became keeper of the seals of France in 151 2, and retained that post until the accession of Francis I., who employed him on various diplomatic missions. Poncher became archbishop of Sens in 1519. His valuable Constitutions synodales was published in 1514.

PONCHIELLI, AMILCARE (1834-1886), Italian musical composer, was born near Cremona on the 1st of September 1834. He studied at the Milan Conservatoire. His first dramatic work, written in collaboration with two other composers, was II Sindaco Babbeo (185 1). After completing his studies at Milan he returned to Cremona, where his opera / Promessi sposi was produced in 1856. This was followed by La Savojarda (1861, produced in a revised version as Lina in 1877), Roderigo, re del Goti (1864), and La Stella del monte (1867). , A revised version of / Promessi sposi, which was produced at Milan in 1872, was his first genuine success. After this came a ballet, Le Due Gemelle (1873), and an opera, / Lituani (1874, produced in a revised version as Alduna in 1884). Ponchielli reached the zenith of his fame with La Gioconda (1876), written to a libretto founded by Arrigo Boito upon Victor Hugo's tragedy, Angelo, Tyran de Padoue. La Gioconda was followed by II Figliuol prodigo (1880) and Marion Delorme (1885). Among his less

important works are II Parlatore eterno, a musical farce (1873), and a ballet, Clarina (1873). In 1881 Ponchielli was made maestro di cappella of Piacenza Cathedral. His music shows the influence of Verdi, but at its best it has a distinct value of its own, and an inexhaustible flow of typically Italian melody. His fondness for fanciful figures in his accompaniments has been slavishly imitated by Mascagni, Leoncavallo, and many of their contemporaries. Ponchielli died at Milan on the 17 th of January 1886.

PONCHO (a South American Spanish word, adopted from the Araucanian poncho or pontho in the 17th century), a form of cloak worn originally by the South American Indians, and afterwards adopted by the Spaniards living in South America. It is merely a long

strip of cloth, doubled, with a hole for the head.

POND, JOHN (c. 1767-1836), English astronomer-royal, was born about 1767 in London, where his father made a fortune in trade. He entered Trinity College, Cambridge, at the age of sixteen, but took no degree, his course being interrupted by severe pulmonary attacks which compelled a long residence abroad. In 1800 he settled at Westbury near Bristol, and began to determine star-places with a fine altitude and azimuth circle of 2ˆ ft. diameter by E. Troughton. His demonstration in 1806 (Phil. Trans, xcvi. 420) of a change of form in the, Greenwich mural quadrant led to the introduction of astronomical circles at the Royal Observatory, and to his own appointment as its head. He was elected a fellow of the Royal Society on the 26th of February 1807; he married and went to live in London in the same year, and in 181 1 succeeded Maskelyne as astronomer-royal.

During an administration of nearly twenty-five years Pond effected a reform of practical astronomy in England comparable to that effected by Bessel in Germany. In 1821 he began to employ the method of observation by reflection; and in 1825 he devised means (see Mem. Roy. Astron. Soc. ii. 409) of Combin- ing two mural circles in the determination of the place of a single object, the one serving for direct and the other for reflected vision. Under his auspices the instrumental equipment at Greenwich was completely changed, and the number of assis- tants increased from one to six. The superior accuracy of his determinations was attested by S. C. Chandler's discussion of them in 1894, in the course of his researches into the variation of latitude {Astron. Journ. Nos. 313, 3.15)/ He persistently con- troverted (1810-1824) the reality of J. Brinkley's imaginary star-parallaxes (Phil. Trans, cviii. 477, cxiii. 53). Delicacy of health compelled his retirement in the autumn of 1835. He died at Blackheath on the 7th of September 1836, and was buried beside Halley in the churchyard of Lee. The Copley medal was conferred upon him in 1823, and the Lalande prize in 1817 by the Paris Academy, of which he was a corresponding member. He published eight folio volumes of Greenwich Observations, translated Laplace's Systbme du monde (in 2 vols. 8vo., 1809), and contributed thirty-one papers to scientific collections. His catalogue of n 12 stars (1833) was of great value.

See Mem. Roy. Astron. Soc. x. 357; Proc. Roy. Soc. iii. 434; Penny Cyclopaedia (De Morgan); F. W. Bessel, Pop. Varlesungen, p. 543; Report Brit. Assoc, i. 128, 136 (Airy); Sir G. Airy's Autobiography, p. 127; Observatory, xiii. 204, xxii. 357; Annual Biography and Obituary (1837); R- Grant, Hist, of Phys. Astron. p. 491 ; Royal Society's Cat. Scient. Papers.

POND, a small pool or body of standing water, a word often applied to one for which the bed has been artificially constructed. The word is a variant of ” pound ” (q.v.), an enclosure.

PONDICHERRY, the capital of the French possessions in India, situated on the Coromandel or western coast, 122 m. by rail S. of Madras. The territory, which is entirely surrounded by the British district of South Arcot, has an area of 115 sq. m. with a population (1901) of 174,456. The chief crops are dry grains, rice, earth-nuts and a little indigo. The territory is traversed by a branch of the South Indian railway from Villa- puram. The town has a population of 27,448. It is well laid

out with fine public buildings; the water-supply is derived from artesian wells. It has an open roadstead, with a small iron pier. The port is visited yearly by 500 vessels, and has trade of the value of about some £1,300,000. The principal imports are areca-nuts, wines and liqueurs, and the chief exports ground- nuts, oil, cotton fabrics and rice. Of the export trade more than one-half is with France, but of the import trade only one- fourth. The weaving of various fabrics forms the principal industry.

Pondicherry was founded in 1683 by Francois Martin, on the site of a village given him by the governor of Gingee. In 1693 the Dutch took Pondicherry, but restored it, with the fortifica- tions greatly improved, in 1697, at the peace of Ryswick. In 1748 Admiral Boscawen laid siege to it without success, but in 1 76 1 it was taken by Colonel Coote from Lally. In 1763 it was restored to the French. In 1778 it was again taken by Sir Hector Munro, and its fortifications destroyed. In 1783 it was retransf erred to the French, and in 1793 recaptured by the English. The treaty of Amiens in 1802 restored it to the French, but it was retaken in 1803. In 1816 it was finally restored to the French.

PONDO, a Kaffir people who have given their name to Pondo- land, the country comprising much of the seaboard of Kaffraria, Cape province, immediately to the south-west of Natal. The Pondo, who number about 200,000, are divided into several tribal groups, but the native government, since the annexation of the country to Cape Colony in 1894, has been subject to the control of the colonial authorities. (See Kaffirs.)

PONDWEED, a popular name for Potamogeton natans, a cosmopolitan aquatic plant found in ponds, lakes and ditches, with broad, more or less oblong-ovate, olive-green, floating leaves: The name is also applied to other species of Potamo- geton, one of the characteristic

genera of lakes, ponds and streams all over the world, but more abundant in temperate regions. It is the principal genus of the natural order of Monocotyledous Potamogetonaceae, and contains plants with slender branched stems, and submerged and translucent, or floating and opaque, alternate or opposite leaves, often with membranous united stipules. The small flowers are borne above the water in

(After Wossidlo. From Strasburger's Lehrbuch der Botanik.)
Potamogeton natans.

1, Apex of flowering shoot. 3, Flower viewed from the side.

2, Flower viewed from above. 4, Diagram of flower.

axillary or terminal spikes; they have four stamens, which bear at the back four small herbaceous petal-like structures, and four free carpels, which ripen to form four small green fleshy fruits, each containing one seed within a hard inner coat ; the seed contains a large hooked embryo. An allied genus Zannichellia (named after Zanichelli, a Venetian botanist), ' occurring in fresh and brackish ditches and pools in Britain, and also widely distributed in temperate and tropical regions, is known as horned pondweed, from the curved fruit.

PONIARD, a dagger, particularly one of small size, used for stabbing at close quarters. The French word poignard, from

which the English is a 16th-century adaptation, is formed from poing, fist, the clenched hand in which the weapon is grasped. (See Dagger.)

PONIATOWSKI, the name of a Polish princely family of Italian origin, tracing descent from Giuseppe Torelli, who married about 1650 an heiress of the Lithuanian family of Poniator, whose name he assumed.

The first of the Poniatowskis to distinguish himself was Stanislaus Poniatowski (1677-1762), who only belonged to the family by adoption, being the reputed son of Prince Sapieha and a Jewess. He was born at Dereczyn in Lithuania, and was adopted by Sapieha's intendant, Poniatowski. With his father he attached himself to the party of Stanislaus Leszczynski, and became major-general in the army of Charles XII. of Sweden. After the defeat of Pultowa he conveyed Charles XII. across the Dnieper, and remained with him at Bender. From there he was sent to Constantinople, where he extracted from

the sultan Achmet III. a promise to march to Moscow. When the grand vizier, Baltagi Mehemet, permitted the tsar Peter I. to retreat unharmed from the banks of the Pruth, Poniatowski exposed his treason. He rejoined Leszczynski in the duchy of Zweibrucken, Bavaria, of which he became governor. After the death of Charles XII. in 1 718 he visited Sweden; and was subsequently reconciled with Leszczynski's rival on the throne of Poland, Augustus II., who made him grand treasurer of Lithuania in 1724. On the death of Augustus II. he tried to secure the reinstatement of Leszczynski, who then resumed his claims to the Polish crown. ' He was taken prisoner at Danzig by the Russians, and presently gave his allegiance to Augustus III., by whom he was made governor of Cracow. He died at Ryki on the 3rd of August 1762.

His second son Stanislaus Augustus became king of Poland (see Stanislaus II.). Of the other sons, Casimir (1721-1780) was his brother's chancellor; Andrew (1 735-1773) entered the Austrian service, rising to the rank of feldzeugmeister; and Michael (1736-1794) became archbishop of Gnesen and primate of Poland. Joseph Anthony Poniatowski (q.v.), son of Andrew, became one of Napoleon's marshals.

Stanislaus Poniatowski (1757-1833), son of Casimir, shared in the aggrandisement of the family during the reign of Stanislaus II., becoming grand treasurer of Lithuania, starost of Podolia and lieutenant-general of the royal army. In 1793 he settled in Vienna, and subsequently in Rome, where he made a magnificent collection of antique gems in his house on the Via Flaminia. This collection was sold at Christie's in London in May 1839. He died in Florence on the 13th of February 1833, and with him the Polish and Austrian honours became extinct.

His natural, but recognized, son, Joseph Michael Xavier Francis John Poniatowski (1816-1873), was born at Rome and in 1847 was naturalized as a Tuscan subject. He received the title of prince in Tuscany (1847) and in Austria (1850). He had studied music under Ceccherini at Florence, and wrote numerous operas, in the first of which, Giovanni di Procida, he sang the title r61e himself at Lucca in 1838. He represented the court of Tuscany in Paris from 1848, and he was made a senator by Napoleon III., whom he followed to England in 1871. His last opera, Gelmina, was produced at Covent Garden in 1872. He died on the 3rd of July 1873, and was buried at Chislehurst. His son, Prince Stanislaus Augustus, married and settled in Paris. He was equerry to Napoleon III., and died in January 1908.

PONIATOWSKI, JOSEPH ANTHONY (1 763-1813), Polish prince and marshal of France, son of Andrew Poniatowski and the countess Theresa Kinsky, was born at Warsaw in 1763. Adopt- ing a military career, he joined the Imperial army when Austria declared war against the Turks in 1788, and distinguished himself at the storming of Sabac on the 25th of April, where he was seriously wounded. Recalled by his uncle King Stanis- laus when the Polish army was reorganized, he received the rank of major-general, and subsequently that of lieutenant-general, and devoted himself zealously to the improvement of the

national forces. In 1789, when Poland was threatened by the armed intervention of Russia, he was appointed commander of the Ukraine division at Braclaw on Bug. After the proclama- tion of the constitution of the 3rd of May 1791 he was appointed commander-in-chief, with instructions to guard the banks of the Dniester and Dnieper. On the outbreak of the war with Russia, Prince Joseph, aided by Kosciuszko, displayed great ability. Obliged constantly to retreat, but disputing every point of. vantage, he turned on the pursuer whenever he pressed too closely, and won several notable victories. At Polonna the Russians were repulsed with the loss of 3000 men; at Dubienka the line of the Bug was defended for five days against fourfold odds; at Zielence the Poles won a still more signal victory. Finally the Polish arms converged upon Warsaw, and were preparing for a general engagement when a courier from the capital informed the generals that the king had acceded to the confederation of Targowica (see Poland: History) and had at the same time guaranteed the adhesion of the army. All hostilities were therefore to be suspended. After an indig- nant but fruitless protest, Poniatowski and most of the other generals threw up their commissions and emigrated. During the Kosciuszko rising he again fought gallantly for his country under his former subordinate, and after the fall' of the republic resided as a private citizen at Warsaw for the next ten years. After Jena and the evacuation of the Polish provinces by Prussia, Poniatowski was offered the command of the National Guard; he set about reorganizing the Polish army, and on the creation of the grand duchy of Warsaw was nominated war minister. During the war of 1809, when an Austrian army corps under the archduke Ferdinand invaded the grand duchy, Poniatowski encountered them at the bloody battle of Radzyn, and though compelled to abandon Warsaw ultimately forced the enemy to evacuate the grand duchy, and captured Cracow. In Napoleon's campaign against Russia in 1812 Poniatowski commanded the fifth army corps; and after the disastrous retreat of the grand army, when many of the Poles began to waver in

their allegiance to Napoleon, Poniatowski remained faithful and formed a new Polish army of 13,000 men with which he joined the emperor at Liitzen. In the campaign of 1813 he guarded the passes of the Bohemian mountains and defended the left bank of the Elbe. As a reward for his brilliant services at the three days' battle of Leipzig he was made a marshal of France and entrusted with the honourable but dangerous duty of covering the retreat of the army. Poniatowski heroically defended Leipzig, losing half his corps in the attempt, finally falling back slowly upon the bridge over the Elster which the French in the general confusion blew up before he reached it. Contesting every step with the overwhelming forces of the pursuers, he refused to surrender, and covered with wounds plunged into the river, where he flied fighting to the last. His relics were conveyed to Poland and buried in Cracow Cathedral, where he lies by the side of Tadeusz Kosciuszko and Jan Sobieski. Poniatowski's Mes souvenirs sur la campagne de 1792 (Lemberg, 1863) is a valuable historical document.

See Stanislaw Kostka Boguslawski, Life of Prince Joseph Ponia- towski (Pol.; Warsaw, 1831); Franciszek Paszkowski, Prince Joseph Poniatowski (Pol.; Cracow, 1898); Correspondence of Poniatowski (ed. E. Raczynski, Posen, 1843); Bronislaw Dembinski, Stanislaus Augustus and Prince Joseph Poniatowski in the light of their Corre- spondence (Fr. ; Lemberg, 1904) ; Szymon Askenazy, Prince Joseph Poniatowski (Pol.; Warsaw, 1905). (R. N. B.)

PONS, JEAN LOUIS (176-1-1831), French astronomer, was born at Peyres (Hautes Alpes) on the 24th of December 1761. He entered the Marseilles observatory in 1789, and in 1819 became the director of the new observatory at Marlia near Lucca, which he, left in 1825 for the observatory of the museum at Florence. Here he died on the 14th of October 1831. Between 1801 and 1827 Pons discovered thirty-seven comets, one of which (observed on the 26th of November 1818) was named after J. F. Encke, who determined its remarkably short period.

See M. R. A. Henrion, Annuaire biographigue, i. 288 (Paris, 1834); Memoirs Roy. Astron. Soc. v. 410; R. Wolf, Geschichte der I Astronomie. p. 709; J. C. Poggendorff, Biog. lit. Handworterbuch.

PONSARD, FRANCOIS (1814-1867), French dramatist, was born at

Vienne, department of Isere, on the 1st of June 1814. He was bred a lawyer ˆ and his first performance in literature was a translation of Manfred (1837). His play Lucrece was represented at the Thtdtre Francais on the 1st of April 1843. This date is a kind of epoch in literature and dramatic history, because it marked a reaction against the romantic style of Dumas and Hugo. He received in 1845 the prize awarded by the Academy for a tragedy ” to oppose a dike to the waves of romanticism.” Ponsard adopted the liberty of the romantics with regard to the unities of time and place, but he reverted to the more sober style of earlier French drama. The tastes and capacities of the greatest tragic actress of the day, Rachel, suited his methods, and this contributed greatly to his own popularity. He followed up Lucrece with Agnes de Meranie (1846), Charlotte Corday (1850), and others. Ponsard accepted the empire, though with no very great enthusiasm, and received the post of librarian to the senate, which, however, he soon resigned, fighting a bloodless duel with a journalist on the subject. L’Honneur et I’argent, one of his most successful plays, was acted in 1853, and he became an Academician in 1855. For some years he did little, but in 1866 he obtained great success with Le Lion atnoureux, another play dealing with the revolutionary epoch. His GaliUe, which excited great opposition in the clerical camp, was produced early in 1867. He died in Paris on the 7th of July of the same year, soon after his nomination to the commandership of the Legion of Honour. Most of Ponsard’s plays hold a certain steady level of literary and dramatic ability, but his popularity is in the main due to the fact that his appearance coincided with a certain public weariness of the extravagant and unequal style of 1830.

His CEuvres completes were published in Paris (3 vols., 1865- 1876). See La Fin du thedtre romantique et Francois Ponsard d’apres des documents inedits (1899), by C. Latreille.

PONSONBY, JOHN (1713-1789), Irish politician, second son of Brabazon Ponsonby, 1st earl of Bessborough, was born on the 29th of March 1713. In 1739 he entered the Irish parliament and in 1744 he became first commissioner of the revenue; in 1746 he was appointed a privy councillor, and in 1756 Speaker of the Irish House of Commons. Belonging to one of the great families which at this time monopolized the government of Ireland, Ponsonby was one of the principal ” undertakers,” men who controlled the whole of the king’s business in Ireland, and he retained the chief authority until the marquess Townshend became lord-lieutenant in 1767. Then followed a struggle for supremacy between the Ponsonby faction and the party dependent on Townshend, one result of this being that Ponsonby resigned the speakership in 1771. He died on the 12th of December 1789. His wife

was Elizabeth, daughter of William Cavendish, 3rd duke of Devonshire, a connexion which was of great importance to the Ponsonbys.

Ponsonby's third son, George Ponsonby (1755-1817), lord chancellor of Ireland, was born on the 5th of March 1755 and was educated at Trinity College, Cambridge. A barrister, he became a member of the Irish parliament in 1776 and was chancellor of the Irish exchequer in 1782, afterwards taking a prominent part in the debates on the question of Roman Catholic relief, and leading the opposition to the union of the parliaments. After 1800 Ponsonby represented Wicklow and then Tavistock in the united parliament; in 1806 he was lord chancellor of Ireland, and from 1808 to 1817 he was the official leader of the opposition in the House of Commons. He left an only daughter when he died in London on the 8th of July 181 7. George Ponsonby's elder brother, William Brabazon Ponsonby, 1st Baron Ponsonby (1 744-1806), was also a leading Whig politician, being a member of the Irish, and after 1800, of the British parliament. In 1806 shortly before his death he was created Baron Ponsonby of Imokilly. Three of his sons were men of note. The eldest was John (c. 17 70-1 8 5 5), who succeeded to the barony and was created a viscount in 1839; he was ambassador at Constantinople from 1832 to 1837 and at Vienna from 1846 to 1850. The second son was Major-

General Sir William Ponsonby (1772-1815), who, after serving in the Peninsular War, was killed at the battle of Waterloo whilst leading a brigade of heavy cavalry. Another son was Richard Ponsonby (1772-1853), bishop of Derry. Sir William Ponsonby's posthumous son William (1816-1861) became 3rd Baron Ponsonby on the death of his uncle John, Viscount Ponsonby; he died childless and was succeeded by his cousin William Brabazon Ponsonby (1807-1866), only son of the bishop of Derry, on whose death the barony of Ponsonby became extinct. Among other members of this family may be mentioned Major- General Sir Frederick Cavendish Ponsonby (1783-1837), son of the 3rd earl of Bessborough, a soldier who distinguished himself at the battles of Talavera, Salamanca and Vittoria, in the Peninsular War, and was wounded at Waterloo; he was governor of Malta from 1826 to 1835. His eldest son, Sir Henry Frederick Ponsonby (1825-1895), a soldier who served in the Crimea, is best remembered as private secretary to Queen Victoria from 1870 until a few months before his death.

PONSON DU TERRAIL [Pierre Alexis de Ponson], Vicomte de (1829-1871), French romance writer, was born at Montmaur (Isere) on the 8th of July 1829. He was a prolific novelist, producing in the

space of two years some seventy- three volumes. Among his most successful productions were Les Coulisses du monde (1853), Exploits de Rocambole (1859), Les Drames de Paris (1865) and Le Forgeron de la Cour-Dieu (1869). He died at Bordeaux on the 20th of January 187 1.

PONT (or Kylpont), ROBERT (1524-1606), Scottish reformer, was educated at St Andrews. In 1562 he was appointed minister at Dunblane and then at Dunkeld; in 1563, commis- sioner for Moray, Inverness and Banff. Then in succession he became minister of Birnie (1567), provost of Trinity College n»ar Edinburgh (i57i),a lord of session (1572), minister of St Cuthbert's, Edinburgh (1573) and at St Andrews (1581). Pont was a. strenuous champion of ecclesiastical independence, and for protesting against parliamentary interference in church government he was obliged to leave his country. From 1584 to 1586 he was in England, but returning north he resumed his prominence in church matters and kept it until his death in 1606. His elder son Timothy Pont (is6o?-i6i4?) was a good mathematician, surveyor, and " the first projector of a Scottish atlas."

PONTA DEL6ADA, the capital of an administrative district, comprising the islands of St Michael's and St Mary in the Portuguese archipelago of the Azores. Pop. (1900), 17,620. Ponta Delgada is built on the south coast of St Michael's, in 37 40′ N. and 25° 36′ W. Its mild climate, and the fine scenery of its mountain background, render it very attractive to visitors; it is the commercial centre, and the most populous city of the archipelago. Besides the cathedral, it contains several inter- esting churches and monasteries, and an observatory. Formerly its natural inner harbour only admitted vessels of light draught, while larger ships were compelled to anchor in an open road- stead, which was inaccessible during the prevalence of southerly gales. But great improvements were effected after i860 by the construction of a breakwater 2800 ft. long.

PONT-A-MOUSSON, a town of northern France in the depart- ment of Meurthe-et-Moselle, 17 m. N.N.W. of Nancy by rail. Pop. (1906), 12,282. The Moselle, which is canalized, divides the town into two quarters, united by a bridge of the late 16th century. The church of St Martin, dating from the 13th, 14th and 15th centuries, has a handsome facade with two towers, and in the interior a choir screen and Holy Sepulchre of the 1 5th century. The lower ecclesiastical seminary occupies the build- ing of an old Premonstratensian convent. There are several interesting old houses. The town has a communal college and engineering workshops, blast furnaces, and manufactures of lacquered ware, paper, cardboard, cables and iron-ware. Dating

from the 9th or 10th century, Pont-a-Mousson constituted a lordship, which was made a marquisate in 1354. It was from 1572 to 1763 the seat of a well-known university.

PONTANUS, JOVIANUS (1426-1503), Italian humanist and poet, was born in 1426 at Cerreto in the duchy of Spoleto,

where his father was murdered in one of the frequent civil brawls which then disturbed the peace of Italian towns. His mother escaped with the boy to Perugia, and it was here that Pontano received his first instruction in languages and literature. Failing to recover his patrimony, he abandoned Umbria, and at the age of twenty-two established himself at Naples, which continued to be his chief place of residence during a long and prosperous career. He here began a close friendship with the distinguished scholar, Antonio Beccadelli, through whose in- fluence he gained admission to the royal chancery of Alphonso the Magnanimous. Alphonso discerned the singular gifts of the young scholar, and made him tutor to his sons. Pontano's connexion with the Aragonese dynasty as political adviser, military secretary and chancellor was henceforth a close one; and the most doubtful passage in his diplomatic career is when he welcomed Charles VIII. of France upon the entry of that king into Naples in 1405, thus showing that he was too ready to abandon the princes upon whose generosity his fortunes had been raised. Pontano illustrates in a marked manner the position of power to which men of letters and learning had arrived in Italy. He entered Naples as a penniless scholar. He wasr almost immediately made the companion and trusted friend of its sovereign, loaded with honours, lodged in a fine house, enrolled among the nobles of the realm, enriched, and placed at the very height of social importance. Following the example of Pomponio Leto in Rome and of Cosimo de' Medici at Florence, Pontano founded an academy for the meetings of learned and distinguished men. This became the centre of fashion as well as of erudition in the southern capital, and subsisted long after its founder's death. In 1461 he married his first wife, Adriana Sassone, who bore him one son and three daughters before her death in 1491. Nothing distinguished Pontano more than the strength of his domestic feeling. He was passionately attached to his wife and children; and, while his friend Beccadelli signed the licentious verses of Hermaphroditus, his own Muse celebrated in liberal but loyal strains the pleasures of conjugal affection, the charm of infancy and the sorrows of a husband and a father in the loss of those he loved. Not long after the death of his first wife Pontano took in second marriage a beautiful girl of Ferrara, who is only known to us under the name of Stella. Although he was at least sixty-five years of age at this period, his poetic faculty displayed itself with more than usual warmth and lustre in the glowing series of elegies, styled Eridanus, which he poured forth to

commemorate the rapture of this union. Stella's one child, Lucilio, survived his birth but fifty days; nor did his mother long remain to comfort the scholar's old age. Pontano had already lost his only son by the first marriage; therefore his declining years were solitary. He died in 1503 at Naples, where a remarkable group of terra-cotta figures, life-sized and painted, still adorns his tomb in the church of Monte Oliveto. He is there represented together with his patron Alphonso and his friend Sannazzaro in adoration before the dead Christ.

As a diplomatist and state official Pontano played a part of some importance in the affairs of southern Italy and in the Barons' War, the wars with Rome, and the expulsion and restora- tion of the Aragonese dynasty. But his chief claim upon the attentions of posterity is as a scholar. His writings divide themselves into dissertations upon such topics as the " Liberality of Princes " or " Ferocity," composed in the rhetorical style of the day, and poems. He was distinguished for energy of Latin style, for vigorous intellectual powers, and for the faculty, rare among his contemporaries, of expressing the facts of modern life, the actualities of personal emotion, in language sufficiently classical yet always characteristic of the man. His prose treatises are more useful to students of manners than the similar lucubrations of Poggio. Yet it was principally as a Latin poet that he exhibited his full strength. An ambitious didactic composition in hexameters, entitled Urania, embodying the astronomical science of the age, and adorning this high theme with brilliant mythological episodes, won the admiration of Italy. It still remains a monument of fertile invention,

exuberant facility and energetic handling of material. Not less excellent is the didactic poem on orange trees, De hortis Hesperi- dum. His most original compositions in verse, however, are elegiac and hendecasyllabic pieces on personal topics — the De conjugali amore, Eridanus, Tumuli, Naeniae, Baiae, &c. — in which he uttered his vehemently passionate emotions with a warmth of southern colouring, an evident sincerity, and a truth of painting from reality which excuse their erotic freedom.

Pontano's prose and poems were printed by the Aldi at Venice. For his life see Ardito, Giovanni Pontano e i suoi tempi (Naples, 1871); for his place in the history of literature, Symonds, Renais- sance in Italy. (J. A. S.)

PONTARLIER, a frontier town of eastern France, capital of an arrondissement in the department of Doubs, 36 m. S.E. of Besancon by road. Pop. (1906), 7896. It is situated 2750 ft. above sea-level on the

Doubs, about four miles from the Swiss frontier, and forms an important strategic point at the mouth of the defile of La Cluse, one of the principal passes across the Jura. The pass is defended by the modern fort of Larmont, and by the Fort de Joux, which was originally built in the 10th century by the family of Joux and played a conspicuous part in the history of Franche-Comte. Pontarlier is the junction of railway lines to Neuchatel, Lausanne, Lons-le-Saunier, Dole and Besancon. A triumphal arch of the 18th century com- memorates the reconstruction of the town after the destructive fire of 1736. It was at Pontarlier that the French army of the East made its last stand against the Prussians in 187 1 before crossing the Swiss frontier. The distillation of herbs, extensively cultivated for the manufacture of absinthe, kirsch and other liqueurs, is the chief industry. The town is the seat of a sub- prefect and has a tribunal of first instance and a communal college.

PONT AUDEMER, a town of north-western France, capital of an arrondissement in the department of Eure, 39 m. N.W. of Evreux, on the Risle, a left-bank affluent of the Seine, and on the railway from Evreux to Honfleur. Pop. (1906), 5700. The church of St Ouen, which has fine stained glass of the 1 6th century, combines the late Gothic and Renaissance styles; its choir is Romanesque. Local institutions are the sub-prefec- ture, a tribunal of first instance, a board of trade-arbitration, a chamber and tribunal of commerce. Manufacturing industry is active, and includes the founding of malleable metal, a spur factory, the manufacture of glue and paper, cotton-spinning and various branches of leather manufacture. There is trade in flax, wool, grain, cattle, cider, paper, iron, wood and coal. The port has a length of over half a mile on the Risle, which is navigable for small vessels from this point to its mouth (10 m.). The town owes its name to Audomar, a Frank lord, who in the 7th or 8th century built a bridge over the Risle at this point. It was the scene of several provincial ecclesiastical councils in the 1 2th and 13th centuries and of meetings of the estates of Normandy in the 13th century.

PONTE (Ital. for ” bridge “), a rough game peculiar to the city of Pisa, in which the players, divided into two sides and provided with padded costumes, contended for the possession of one of the bridges over the Arno. The weapon used, both for offence and defence, was a kind of shield which served as a club as well.

A history and description of the game may be found in William Heywood’s Polio and Ponte (London, 1904).

PONTECORVO, a city of Campania, Italy, in the province of Caserta,

on the Garigliano, about 48 m. from Caserta and 3 m. from Aquino on the railway from Rome to Naples. Pop. (1901), 10,518 (town); 12,492 (commune). The town is approached by a triumphal arch adorned with a statue of Pius IX. The princi- pality of Pontecorvo (about 40 sq. m. in extent), once an indepen- dent state, belonged alternately to the Tomacelli and the abbots of Monte Cassino. Napoleon bestowed it on Bernadotte in i8o£, and in 1 8 10 it was incorporated with the French Empire.

PONTECOULANT, LOUIS GUSTAVE LE DOULCET, Comte de (1764-1853), French politician, was born at Caen on the 17th of November 1764. He began a career in the army in 1778.

A moderate supporter of the revolution, he was returned to the Convention for the department of Calvados in 1792, and became commissary with the army of the North. He voted for the imprisonment of Louis XVI. during the war, and his banishment after tne peace. He then attached himself to the party of the Gironde, and in August 1793 was outlawed. He had refused to defend his compatriot Charlotte Corday, who wrote him a letter of reproach on her way to the scaffold. He returned to the Convention on the 8th of March 1795, and showed an unusual spirit of moderation by defending Prieur de la Marne and Robert Lindet. President of the Convention in July 1 795, he was for some months a member of the council of public safety. He was subsequently elected to the council of five hundred, but'was suspected of royalist leanings, and had to spend some time in retirement before the establishment of the consulate.. Becoming senator in 1805, and count of the empire in 1808, he organized the national guard in Franche Comte in 181 1, and the defence of the north-eastern frontier in 181 3. At the first restoration Louis XVIII. made him a peer of France, and although he received a similar honour from Napoleon during the Hundred Days, he sat in the upper house under the Second Restoration. He died in Paris on the 3rd of April 1853, leaving memoirs and correspondence from which were extracted four volumes (1861- 1865) of Souvenirs historiques et parlementaires 1764-1848.

His son Louis Adolphe Le Doulcet, comte de Pontecoulant (1794-1882), served under Napoleon in 1812 and 1814, and then emigrated to Brazil, where he took part in the abortive insurrec- tion at Pernambuco in 181 7. He also organized a French volunteer

contingent in the Belgian revolution of 1830, and was wounded at Louvain. The rest of his life was spent in Paris in the study of ancient music and acoustics. Among his works was one on the Musee instrumental du conservatoire de musique , (1864). A younger brother, Philippe Gustave Le Doulcet, comte de Pontecoulant (1795-1874), served in the army until 1849, when he retired to devote himself to mathematics and astronomy. His works include Thtorie analytique du systeme du monde (Paris, 1829-1846) and Traiti elementaire de physique celeste (2 vols., Paris, 1840).

PONTEFRACT (pronounced and sometimes written ” Pom- fret “), a market town and municipal and parliamentary borough in the West Riding of Yorkshire, England, 21 m. S.S.W. from York, served by the Midland, North-Eastern and Lancashire & Yorkshire railways. Pop. (1891), 9702; (1901), 13,427. It is well situated, mainly on an eminence, near the junction of the Aire and the Calder. The most important of the antiquarian remains are the ruins of the famous castle situated on a rocky height, originally covering with its precincts an area of over 8 acres, and containing in all eight round towers. The remains are principally of Norman date, and an unusual feature of the stronghold is the existence of various subterranean chambers in the rock. Below the castle is All Saints church, which suffered severely during the siege of the castle, but still retains some work of the 1 2th century. In 1837 the tower and transepts were fitted for divine service. The church of St Giles, formerly a chapel of ease to All Saints, but made parochial in the 18th century, is of Norman date, but most of the present structure is modern. The 17th-century spire was removed in 1707, and replaced by a square tower, which was rebuilt in 1797; the chan- cel was rebuilt in 1869. In Southgate is an ancient hermitage and oratory cut out of the solid rock, which dates from 1396. On St Thomas’s Hill, where Thomas, earl of Lancaster, was beheaded in 1322, a chantry was erected in 1373, the site of which is now occupied by a windmill built of its stones. At Monkhill there are the remains of a Tudor building called the Old Hall, probably constructed out of the old priory of St John’s. A grammar school of ancient foundation, renewed by Elizabeth and George III., occupies modern buildings. The town-hall was built at the close of the 18th century on the site of one erected in 1656, which succeeded the old moot-hall dating from Saxon times. Among other buildings are the court house, the market hall, the assembly rooms (a handsome building adjoining the town-hall), and large barracks. The foundation of the

principal almshouse, that of St Nicholas, dates from before the Conquest. Trinity Hospital was founded by Sir Robert Knolles (d.

1407), an eminent military commander in the French wars of Edward III. At Ackworth, in the neighbourhood, there is a large school of the. Society of Friends or Quakers (1778), in the foundation of which Dr John Fothergill (17 12-1780) was a prime mover. There are extensive gardens and nurseries in the neighbourhood of Pontefract, and liquorice is largely grown for the manufacture of the celebrated Pomfret cakes. The town possesses ironfoundries, sack and matting manufactories, tanneries, breweries, corn mills and brick and terra-cotta works. The parliamentary borough, falling within the Osgoldcross division of the county, returns one member (before 1885 the number was, two). The town is governed by a mayor, six aldermen and 18 councillors. Area, 4078 acres.

The, remains of a Roman camp have been discovered near Pontefract, but there is no trace of settlement in the town itself until after the Conquest. At the time of the Domesday Survey Tateshall (now Tanshelf, a suburb of the town) was the chief manor and contained 60 burgesses, while Kirkby, which after- awards became the borough of Pontefract, was one of its members, The change was probably owing to the fact that Ilbert de Lacy, to whom the Conqueror had granted the whole of the honour of Pontefract, founded a castle at Kirkby, on a site said to have been occupied by a fortification raised by Ailric, a Saxon thane. Several reasons are given for the change of name but none is at all satisfactory. One account says that it was caused by a broken bridge which delayed the Conqueror's advance to the north, but this is known to have been at Ferrybridge, three miles away; a second says that the new name was derived from a Norman town called Pontfrete, which, however, never existed; and a third that it was caused by the breaking of a bridge in 1 1 53 on the arrival of the archbishop of York, St William, when several people were miraculously preserved from drowning, although the town was already known as Pontefract in 1140 when Archbishop Thurstan died there. The manor remained in the Lacy family until it passed by marriage to Thomas, duke of Lancaster, who was beheaded on a hill outside the town after the battle of Boroughbridge. His estates were restored to his brother Henry, earl of Lancaster, on the accession of Edward III., and the manor has since then formed part of the duchy of Lancaster. The town took part in most of the rebellions in the north of England, and in 1399 Richard II. was imprisoned and secretly murdered in the castle. During the Wars of the Roses the town was loyal to Henry VI., and several of the Yorkist leaders were executed here after the battle of Wakefield. It was taken by Robert Aske, leader of the Pilgrimage of Grace, in 1536. In 1642 the castle was garrisoned for Charles I. and sustained four sieges, the second, in 1644, being

successful, but two years later it was retaken by the royalists, who held it until after the execution of the king, when they surrendered to General Lambert and the castle was destroyed.

Roger de Lacy in n 94 granted a charter to the burgesses confirming their liberties and right to be a free borough at a feeˆfarm of 1 2d. yearly for every toft, granting them the same privileges as the burgesses of Grimsby, and that their reeve should be chosen annually by the lord of the manor at his court leet, preference being given to the burgesses if they would pay as much as others for the office. Henry de Lacy cofirmed this charter in 1278 and in 1484 Richard III. incorporated the town under the title of mayor and burgesses and granted a gild merchant with a hanse. His charter was withdrawn on the accession of Henry VII. and a similar one was granted, while in 1489 the. king gave the burgesses licence to continue choosing a mayor as they had done in the time of Richard III. In 1606-1607 James I. confirmed the charter of Henry VII. and regulated the choice of the mayor by providing that he should be elected from among the chief burgesses by the burgesses themselves. The privilege of returning two members to parliament which had belonged to Pontefract at the end of the 13th century was revived in 1620-1621 on the grounds that the charter of 1606-1607 had restored all their privileges to the burgesses. Since the

Redistribution of Seats Act of 1885 one member only has been returned. Liquorice was largely grown as early as 1 700-1 701, when the corporation prohibited the sale of buds or sets of the plant. Richard III. by his incorporation charter granted the market rights in the borough to the burgesses, who still hold them under his charter.

See Victoria County History: Yorkshire; Eighth Report of the Royal Commission on Historical Manuscripts (1 870- 1 80,7) ; Book of Entries of the Pontefract Corporation, 1653-1726 (ed. by Richard Holmes, 1882) ; Benjamin Boothroyd, The History of the Ancient Borough of Ponte- fract (1807); George Fox, The History of Pontefract (1827).

PONTEVEDRA, a maritime province of north-western Spain, formed in 1833 of districts taken from Galicia, and bounded on the N. by Corunna, E. by Lugo and Orense, S. by Portugal and W. by the Atlantic. Pop. (1900), 457,262; area, 1695 sq. m. Pontevedra is the

smallest of the provinces of Spain except the three Basque Provinces; its density of population, 269-8 inhabitants per square mile, is only excelled in the provinces of Barcelona and Biscay (Vizcaya). Both of these are mining and manufacturing districts, while Pontevedra is dependent on agriculture and fisheries. The surface is everywhere moun- tainous, and consists almost entirely of arable land, pasture or forest. The coast-line is deeply indented; navigation is rendered difficult by the prevalence of fogs in summer and storms in winter. The river Mino (Portuguese Minho) forms the southern frontier, and is navigable by small ships as far as Salvatierra; .and the province is watered by many smaller streams, all flowing, like the Mino, into the Atlantic. The largest of these are the Ulla, which separates Pontevedra from Corunna, the Umia and the Lerez. Pontevedra has a mild climate, a fertile soil and a very heavy rainfall. Large agricultural fairs are held in the chief towns, and there is a considerable export trade in cattle to Great Britain and Portugal, hams, salt meat and fish, eggs, breadstuffs, leather and wine. Vigo is the headquarters of shipping, and one of the chief ports of northern Spain. There are also good harbours at Bayona, Carril, Marin, Villagarcia and elsewhere among the deep estuaries of the coast. At Tuy the Spanish and Portuguese railways meet, and from this town one line goes up the Mino valley to Orense, and another northward along the coast to Santiago de Gompostela.

PONTEVEDRA, the capital of the Spanish province of Ponte- vedra; on the Tuy-Corunna railway, and on the river Lerez, which here enters the Ria de Pontevedra, an inlet of the Atlantic. Pop. (1900), 22,330. The name of the town is derived from the ancient Roman bridge {pons vetus) of twelve arches, which spans the Lerez near its mouth. Pontevedra is a picturesque town, mainly built of granite, and still partly enclosed by medieval fortifications. It contains handsome provincial and municipal halls erected in the 19th century, and many convents, some of which have been converted into hospitals or schools. Marin and Sangenjo are ports on the Ria de Pontevedra, which is the seat of a thriving sardine fishery. There is an active trade in grain, wine and fruit; cloth, hats, leather and pottery are manufactured. PONTIAC (t. 1 7 20-1 769), Indian chief of the Ottawa and leader in the ” Conspiracy of Pontiac ” in 1763-64, was born between 1712 and 1720 probably on the Maumee river, near the mouth of the Auglaize. His father was an Ottawa, and his mother an Ojibwa. By 1755 he had become a chief of the Ottawa and a leader of the loose confederacy of the Ottawa, Potawatomi and Ojibwa. He was an ally of France and possibly commanded the Ottawa in the defeat (July 9, 1755) of General Edward Braddock. In November 1760 he met Major Robert Rogers, then on his way to occupy Michilimackinac

and other forts surrendered by the French, and agreed to let the English troops pass unmolested on condition that he should be treated with respect by the British. Like other Indians he soon realized the difference between French and English rule — that the Indians were no longer welcomed at the forts and that they would ultimately be deprived of their hunting grounds by en- croaching English settlements. French hunters and traders encouraged Indian disaffection with vague promises of help from France; in 1762 an Indian "prophet" among the Delawares on the Muskingum preached a union of the Indians to expel the xxii. 3

English; and in that year (as in 1761) there were abortive con ■ spiracies to massacre the English garrisons of Detroit, Fort Niagara and Fort Pitt (now Pittsburg). Pontiac seems to have been chief of a magic association (the Metai), and he took advan- tage of the religious fervour and the general unrest among the Indians to organize in the winter of 1762-63 a simultaneous attack on the English forts to be made in May 1763 at a certain phase of the moon. On the 27th of April 1763, before a meeting near Detroit of delegates from most of the Algonquian tribes, he outlined his plans. On the 7th of May, with 60 warriors, he attempted unsuccessfully to gain admission to Detroit, which then had a garrison of about 160 under Major Henry Gladwin (1730-1791); and then besieged the fort from the 9th of May to the end of October. On the 28th of May reinforcements from Fort Niagara were ambuscaded near the mouth of the Detroit. In June the Wyandot and Potawatomi withdrew from the siege, but on the 29th of July they attacked reinforcements (280 men, including 20 of Rogers's rangers) from Fort Niagara under Captain James Dalyell (or Dalzell), who, however, gained the fort, and in spite of Gladwin's opposition on the 31st of July attacked Pontiac's camp, but was ambuscaded on Bloody Run and was killed, nearly 60 others being killed or wounded. On the 1 2th of October the Potawatomi, Ojibwa and Wyandot made peace with the English; with the Ottawa Pontiac continued the siege until the 30th of October, when he learned from Neyon de la Valliere, commandant of Fort Chartres (among the Illinois) that he would not be aided by the French. Pontiac then withdrew to the Maumee.

Fort Pitt with a garrison of 330 men under Captain Simeon Eciiyer was attacked on the 22nd of June and was besieged from the 27th of July to the 1st of August, when the Indians withdrew to meet a relief expedition of 500 men, mostly High- landers, under Colonel Henry Bouquet (1719-1766), who had set out from Carlisle, Pennsylvania, on the 18th of July, and relieved Fort Ligonier (on the site of the borough of Ligonier, Westmoreland county, Penn.) on the 2nd of August, but was surprised on the 5th, and fought (5th and 6th) the battle of Bushy

Run (25 m. S.E. of Fort Pitt), finally flanking and routing the Indians after tricking them by a feinted retreat of a part of his force. Bouquet reached Fort Pitt on the 10th of August. At Michilimackinac (Mackinac), Michigan, on the 4th of June, the Indians gained admission to the fort by a trick, killed nearly a score of the garrison and captured the remainder, including Captain George Etherington, the commander, besides several English traders, including Alexander Henry (1739-1824). 1 Some of the captives were seized by the Ottawa, who had taken no part in the attack; a part of these were released, and reached Montreal on the 13th of August. Seven of the prisoners kept by the Ojibwa were killed in cold blood by one of their chiefs. Fort Sandusky (on the site of Sandusky, Ohio) was taken on the 1 6th of May by Wyandot; and Fort St Joseph (on the site of the present Niles, Mich.) was captured on the 25th of May and n men (out of its garrison of 14) were massacred, the others with the commandant, Ensign Schlosser, being taken to Detroit and exchanged for Indian prisoners. On the 27th of May Fort Miami (on the site of Fort Wayne, Indiana) surrendered to the Indians after its commander, Ensign Holmes, had been treacher- ously killed. Fort Ouiatanon (about 5 m. south-west of the present Lafayette, Indiana) and Fort Presque Isle (on the site of Erie, Penn.) were taken by the Indians on the 1st and 16th of June respectively; and Fort Le Boeuf (on the site of Waterford,

1 Henry, a native of New Brunswick, N.J., had become a fur- trader at Fort Michilimackinac in 1761. He was rescued by Wawatam, an Ottawa, who had adopted him as a brother; in 1764 he took part in Colonel John Bradstreet's expedition; in 1770, with Sir William Johnson, the duke of Gloucester and others, formed a Company to mine copper in the Lake Superior region; was a fur- trader again until 1796; and then became a merchant in Montreal. His Travels and Adventures in Canada and the Indian Territories between the Years 1760 and 1776 (1809; reprinted 1901) is a valuable account of the fur trade and of his adventures at Michilimackinac. He is not to be confused with his nephew of the same name, also a fur-trader, whose journal was published in 1897 in 3 vols., as New Light on the Early History of the Greater Northwest.

Penn.) was surprised on the 18th, but its garrison escaped, and seven (out of 13) got safely to Fort Pitt. Fort Venango (near the site of the present Venango, Penn.) was taken and burnt about the same time by

some Senecas (the only Iroquois in the conspiracy), who massacred the garrison and later burned the commander, Lieut. Gordon. About 500 Senecas on the 14th of September surprised a wagon train, escorted by 24 soldiers, from Fort Schlosser (2 m. above Niagara Falls), drove most of them over the brink of the Devil's Hole (below the cataract), and then nearly annihilated a party from Fort Niagara sent to the rescue.

In 1763, although the main attacks on Detroit and Fort Pitt had failed, nearly every minor fort attacked was captured, about 200 settlers and traders were killed, and in property destroyed or plundered the English lost about £100,000, the greatest loss in men and property being in western Pennsylvania. In June 1764 Colonel John Bradstreet (1711-1774) led about 1 200 men from Albany to Fort Niagara, where at a great gather- ing of the Indians several treaties were made in July; in August he made at Presque Isle a treaty (afterwards annulled by General Thomas Gage) with some Delaware and Shawnee chiefs; and in September made treaties (both unsatisfactory) with the Wyandot, Ottawa and Miami at Sandusky, and with various chiefs at Detroit. He sent Captain Howard to occupy the forts at Michilimackinac, Green Bay and Sault Ste Marie, and Captain Morris up the Maumee river, where he conferred with Pontiac, and then to Fort Miami, where he narrowly escaped death at the hands of the Miami; and with his men Bradstreet returned to Oswego in November, having accomplished little of value. An expedition of 1 500 men under Colonel Bouquet left Carlisle, Pennsylvania, in August, and near the site of the present Tuscarawas, Ohio, induced the Indians to release their prisoners and to stop fighting — the practical end of the conspiracy. Pontiac himself made submission to Sir William Johnson on the 25th of July 1766 at Oswego, New York. In April 1769 he was murdered, when drunk, at Cahokia (nearly opposite St Louis) by a Kaskaskia Indian bribed by an English trader; and he was buried near the St Louis Fort. His death occasioned a bitter war in which a remnant of the Illinois was practically annihilated in 1770 at Starved Rock (between the present Ottawa and La Salle), Illinois, by the Potawatomi, who had been followers of Pontiac. Pontiac was one of the most remarkable men of the Indian race in American history, and was notable in particular for his power (rare among the Indians) of organization.

See Francis Parkman, The Conspiracy of Pontiac (2 vols., Boston, 1851; 10th ed., 1896).

PONTIAC, a city and the county-seat of Oakland county, Michigan, U.S.A., on the Clinton river, about 26 m. N.W. of Detroit. Pop. (1890), 6200; (1900) 9769, of whom 2020 were foreign-born; (1910 U.S.

census) 14,532. It is served by the Grand Trunk and the Pontiac, Oxford & Northern railways (being the southern terminus of the latter), and by the Detroit & Pontiac and the North-Western electric inter-urban lines. In the sur- rounding country there are many small, picturesque lakes (the largest being Orchard, about 6 m. south-east of Pontiac, Cass and Elizabeth lakes), and there is good hunting and fishing in the vicinity. In Pontiac is the Eastern Michigan Asylum for the insane (1878), -with grounds covering more than 500 acres. The city has various manufactures, and the value of the factory products increased from $2,470,887 in 1900 to $3,047,422 in 1904, or 23-3%. Agricultural products, fruit and wool from the surrounding country are shipped in considerable quantities. The municipality owns and operates its waterworks. Pontiac, named in honour of the famous Indian chief of that name, was laid out as a town in 1818, became the county-seat in 1820, was incorporated as a village in 1837, and was chartered in 1861.

PONTIANUS, pope from 230 to 235. He was exiled by the emperor Maximinus to Sardinia, and in consequence of this sen- tence resigned (Sept. 28, 235). He was succeeded by Anteros.

PONTIFEX. The collegium of the Pontifices was the most important priesthood of ancient Rome, being specially charged with the administration of the jus divinum, i.e. that part of the

civil law which regulated the relations of the community with the deities recognized by the state officially, together with a general superintendence of the worship of gens and family. The name is clearly derived from pons and facere, but whether this should be taken as indicating any special connexion with the sacred bridge over the Tiber (Pons Sublicius) , or what the original meaning may have been, cannot now be determined. The college existed under the monarchy, when its members were probably three in number; they may safely be considered as legal advisers of the rex in all matters of religion. Under the republic they emerge into prominence under a pontifex maximus, who took over the king's duties as chief administrator of religious law, just as his chief sacrificial duties were taken by the rex sacrorum; his dwelling was the regia, " the house of the king." During the republican period the number of pontifices increased, probably by multiples of three, until after Sulla (82 B.C.) we find them fifteen; for the year 57 B.C. we have a complete list of them in Cicero (Harusp. resp. 6, 12). Included in the collegium were also the rex sacrorum, the flamines, three assistant pontifices (minores), and the vestal virgins, who were all chosen by the pontifex maximus. Vacancies in the body of pontifices were originally filled by

co-optation; but from the second Punic War onwards the pontifex maximus was chosen by a peculiar form of popular election, and in the last age of the republic this held good for all the members. They all held office for life.

The immense authority of the college centred in the pontifex maximus, the other pontifices forming his consilium or advising body. His functions were partly sacrificial or ritualistic, but these were the least important ; the real power lay in the adminis- tration of the jus divinum, the chief departments of which may briefly be described as follows: (1) the regulation of all expiatory ceremonials needed as the result of pestilence, lightning, &c. ; (2) the consecration of all temples and other sacred places and objects dedicated to the gods by the state through its magis- trates; (3) the regulation of the calendar both astronomically and in detailed application to the public life of the state; (4) the administration of the law relating to burials and burying-places, and the worship of the Manes, or dead ancestors; (5) the superin- tendence of all marriages by confarreatio, i.e. originally of all legal patrician marriages; (6) the administration of the law of adoption and of testamentary succession. They had also the care of the state archives, of the lists of magistrates, and kept records of their own decisions (commentarii) and of the chief events of each year (annales).

It is obvious that a priesthood having such functions as these, and holding office for life, must have been a great power in the state, and for the first three centuries of the republic it is probable that the pontifex maximus was in fact its most powerful member. The office might be combined with a magistracy, and, though its powers were declaratory rather than executive, it may fairly be described as quasi-magisterial. Under the later republic it was coveted chiefly for the great dignity of the position; Julius Caesar held it for the last twenty years of his life, and Augustus took it after the death of Lepidus in 12 B.C., after which it became inseparable from the office of the reigning emperor. With the decay of the empire the title very naturally fell to the popes, whose functions as administrators of religious law closely resembled those of the ancient Roman priesthood, hence the modern use of ” pontiff ” and ” pontifical.”

For further details consult Marquardt, Staatsverwaltung, iii. 2 35 se Q-! Wissowa, Religion und Kultus der Romer, 430 seq. ; Bouche-Leclercq, Les Pontifes, passim. (W. W. F.*)

PONTIVY, a town of western France, chief town of an arron-dissement in the department of Morbihan, 46 m. N.N.W. of Vannes by rail. Pop. (1906), 6312 (town); 9506 (commune). The town, situated

on the Blavet, at its confluence with the Nantes-Brest canal, comprises two distinct parts — the old town and that to the south known as Napoleonville. The latter, built by orderof Napoleon I., who desired to make it the military headquarters for Brittany, and consisting chiefly of barracks, subsequently gave its name to the whole town, but in 1871 the old name was resumed. The ancient castle (1485) of the dukes

of Rohan, whose capital the town was, is occupied by the Musee le Brigant of art and archaeology. A monument to commem- orate the Breton-Angevin Union, the deputies of which met at Pontivy in 1790, was erected in 1894, and there are statues of Dr Guepin, a democrat, and General de Lourmel (d. 1854). The town has a sub-prefecture, a tribunal of first instance, and a lycee for boys. Pontivy had its origin in a monastery founded in the 7th century by St Ivy, a monk of Lindisfarne.

PONT-L'ABBfi, a town of western France in the department of Finistere, 13 m. S.W. of Quimper by rail. Pop. (1906), of the town 4485, of the commune 6432. The town is situated on the right bank of the estuary or river of Pont-PAbbe, 2 m. from the sea. Its port carries on fishing, imports timber, coal, &c, and exports mine-props and the cereals and vegetables of the neigh- bourhood. Of the old buildings of the town the chief is a church of the 14th, 15th and 16th centuries, once attached to a Carmelite convent; an old castle is occupied by the h&tel de ville. The local costumes, trimmed with the bright-coloured embroideries for which the town is noted, are among the most striking in Brittany; the bigouden or head-dress of the women has given its name to the inhabitants. Pont-1'Abbe carries on flour-milling and the extraction of chemicals from seaweed.

PONTMARTIN, ARMAND AUGUSTIN JOSEPH MARIE FERRARD, Comte de (1811-1890), French critic and man of letters, was born at Avignon (Vaucluse) on the 16th of July 181 1. Imbued by family tradition with legitimist sympathies, he began by attacking the followers of the encyclopaedists and their successors. In the Assemblee nationale he published his Causeries litUraires, a series of attacks on prominent Liberals, which created some sensation. Pontmartin was an indefatigable journalist, and most of his papers were eventually published in volume form: Contes et reveries d'un planteur de choux (1845); Causeries du samedi (1857-1860); Nouveaux samedis

(1865-1881), &c. But the most famous of all his books is Les Jeudis de Mme. Charbonneau (1862), which under the form of a novel offered a series of malicious and witty portraits of contemporary writers. Pontmartin died at Avignon on the 29th of March

1890.

See Hatzfeld and Meunier, Les Critiques littiraires du XIX" siecle (1894).

PONTOISE, a town of northern France, capital of an arron- dissement of the department of Seine-et-Oise, 18 m. N.W. of Paris on the railway to Dieppe. Pop. (1906), 7963. Pontoise is picturesquely situated on the right bank of the Oise where it is joined by the Viosne. The traffic on the main river is large, and the tributary drives numerous mills. Of the many churches that used to exist in the town two only remain: St Maclou, a church of the 12 th century, altered and restored in the 15th and 1 6th centuries by Pierre Lemercier, the famous architect of St Eustache at Paris, and containing a fine holy sepulchre of the 1 6th century; and Notre-Dame, of the close of the 16th century, which contains the tomb of St Gautier, abbot of Meulan in the 1 2th century. At the top of the flight of steps by which St Maclou is approached is the statue of General Leclerc, a native of the town and husband of Pauline Bonaparte. Grain and flour are the principal staples of the trade; a well-known fair is held in November. The town has a sub-prefecture, tribunals of first instance and of commerce and a communal college. At Meriel, near Pontoise, there are interesting remains of the Cistercian abbey of Le Val. Pontoise existed in the time of the Gauls as Briva Isarae (Bridge of the Oise). It was destroyed by the Normans in the 9th century, united with Normandy in 1032, and acquired by Philip I. in 1064. Capital of the French Vexin, it possessed an important stronghold and played a conspicuous part in the wars between the French and the dukes of Normandy and in the Hundred Years' War. The English took it in 1419, and again in 1437. In 1441 Charles VII. took it by storm after a three months' siege. After belonging to the count of Charolais down to the treaty of Conflans, it was given as a dowry to Jeanne of France when she was divorced by Louis XII. The parlement of Paris several times met in the town; and in 1561 the states- general convoked at Orleans removed thither after the death of

Francis II. During the Fronde it offered a refuge to Louis XIV. and Mazarin. Henry III. made it an apanage for his brother the duke of Anjou. At a later period it passed to the duke of Conti. Down to the Revolution it remained a monastic town.

PONTOON (Fr. ponton, from Lat. pons, a bridge), a flat- bottomed boat, used as a ferry boat or lighter; especially a boat of particular design intended to form part of a military bridge. In modern hydraulic engineering the words ponton and pontoon are used to designate hollow water-tight structures which are secured to sunken wrecks and bring them up to the surface, and also the hollow chambers which serve as gates for docks and sluices, and are lowered and raised by the admission and pumping out of water.

Military Pontoon Bridges. — From time immemorial floating bridges of vessels bearing a roadway of beams and planks have been employed to facilitate the passage of rivers and arms of the sea. Xerxes crossed the Hellespont on a double bridge, one line supported on three hundred and sixty, the other on three hundred and fourteen vessels, anchored head and stern with their keels in the direction of the current. Darius threw similar bridges across the Bosporus and the Danube in his war against the Scythians, and the Ten Thousand employed a bridge of boats to cross the river Tigris in their retreat from Persia. Floating bridges have been repeatedly constructed over rivers in Europe and Asia, not merely temporarily for the passage of an army, but permanently for the requirements of the country; and to this day many of the great rivers in India are crossed, on the lines of the principal roads, by floating bridges, which are for the most part supported on boats such as are employed for ordinary traffic on the river.

But light vessels which can be taken out of the water and lifted on to carriages are required for transport with an army in the field. Alexander the Great occasionally carried with his army vessels divided into portions, which were put together on reaching the banks of a river, as in crossing the Hydaspes ; he is even said to have carried his army over the Oxus by means of rafts made of the hide tents of the soldiers stuffed with straw, when he found that all the river boats had been burnt. Cyrus crossed the Euphrates on stuffed skins. The practice of carrying about skins to be inflated when troops had to cross a river, which was adopted by both Greeks and Romans, still exists in the East. In the 4th century the emperor Julian crossed the Tigris, Euphrates and other rivers by bridges of boats made of skins stretched over osier frames. In the wars of the 17th century pontoons are found as regular components of the trains of armies, the Germans using a leather, the Dutch a tin and the French a copper ” skin ” over stout timber frames.

Modern military pontoons have been made of two forms, open as an undecked boat, or closed as a decked canoe or cylinder. During the

Peninsular War the English employed open bateaux; but the experience gained in that war induced them to introduce the closed form. General Colleton devised a buoy pontoon, cylindrical with conical ends and made of wooden staves like a cask. Then General Sir Charles Pasley introduced demi-pon- toons, like decked canoes with pointed bows and square sterns, a pair, attached sternwise, forming a single ” pier ” of support for the roadway; they were constructed of light timber frames covered with sheet copper and were decked with wood; each demi-pontoon was divided internally into separate compartments by partitions which were made as water-tight as possible, and also supplied with the means of pumping out water; when trans- ported overland with an army a pair of demi-pontoons and the superstructure of one bay formed the load for a single carriage weighing 27-75 cwt. when loaded. The Pasley was superseded by the Blanshard pontoon, a tin coated cylinder with hemis- pherical ends, for which great mobility was claimed, two pon- toons and two bays superstructure being carried on one waggon, giving a weight of about 45 cwt., which was intended to be drawn by four horses. The Blanshard pontoon was long used in the British army, but was ultimately discarded; and British engineers came to the conclusion that it was desirable to return to the form of the open bateau to which the engineers of all the

Continental armies had meanwhile constantly adhered. Captain Fowke, R.E., invented a folding open bateau, made of water- proof canvas attached to sliding ribs, so that for transport it could be collapsed like the bellows of an accordion and for use could be extended by a pair of stretchers. This was followed by the pontoon designed by Colonel Blood, R.E., an open bateau with decked ends and sides partly decked where the rowlock blocks were fixed. It consisted of six sets of framed ribs con- nected by a deep kelson, two side streaks, and three bottom streaks. The sides and bottom were of thin yellow pine with canvas secured to both surfaces by india-rubber solution, and coated outside with marine glue. The central interval between the pontoons in forming a bridge was invariably maintained at 15 ft.; for the support of the roadway five baulks were ordinarily employed, but nine for the passage of siege artillery and the heaviest loads; they fitted on to saddles resting on central saddle beams. The pontoons were not immersed to within 1 ft. of the tops of their ” coamings ” when carrying ordinary loads, as of infantry in marching order ” in fours ” crowded at a check, or the 16-pounder R.M.L. gun of

position weighing 43 cwt.; nor were they immersed to within 6 in. when carrying extraordinary loads, such as disorganized infantry, or the 64-pounder R.M.L. guii weighing 98 cwt. In designing this pontoon the chief points attended to were — (1) improvement in power of support, (2) simplification in bridge construction, (3) reduction of weight in transport, and (4) adaptation for use singly as boats for ferrying purposes. One pontoon with the superstructure for a single bay constituted a load for one waggon, with a total weight behind horses of about 40 cwt.

The following table (from Ency. Brit. 9th ed.) shows the powers of various pontoons in use by different nations in the past. Modern improvements are comparatively few. The ” working power of support ” has been calculated in most instances by deducting from the ” available buoyancy ” one-fourth for open and one-tenth for closed vessels: —

In the English and French equipment the pontoons were originally made of two sizes, the smaller and lighter for the ” advanced guard,” the larger and heavier for the “reserve;” in both equipments the same size pontoon is now adopted for general requirements, the superstructure being strengthened when necessary for very heavy weights. The German army has an undivided galvanized iron pontoon, 24 ft. 6 in. long, handy as a boat, but of inadequate buoyancy for heavy traffic, with the result that the span has to be diminished and ipso facto the waterway obstructed. The Austrian and Italian pontoons are made in three pieces, two with bows and a middle piece without ; not less than two pieces are ordinarily employed, and the third is introduced when great supporting power is required, but in all cases a constant interval is maintained between the pontoons. On the other hand, in the greater number of pontoon equipments greater supporting power is obtained not by increasing the number of supports but by diminishing the central interval between the pontoons, Within certain limits it does not matter whether the buoyancy is made up of a large number of small or a small number of large vessels, so long as the waterway is not unduly contracted and the obstruction offered to a swift current dangerously increased; but it is to, be remembered that pontoon bridges have failed as frequently from being washed away. as from insufficient buoyancy. In Austria efforts have been made to diminish the weight of the Birago equipment by the substitution of steel for iron. The present pontoon, in three pieces, is of steel, and 39 ft. 4 in. long, like the old pattern.

In the British army Colonel Blood’s equipment was later modified by. the introduction of a bipartite pontoon designed in 1889 by Lieut.

Clauson, R.E. Each pontoon is carried on one waggon with a bay of superstructure, and consists of two sections, a bow-piece and a stern-piece, connected together by easily manipulated couplings of phosphor bronze. Decks and ” coamings ” are dispensed with, and the rowlock holes are sunk in a strong gunwale. The detach- able saddle-beam, which receives the load on the centre of the thwarts, is made in sections, so as to form a continuous saddle of any length required. The baulks (or road-bearers) and chesses ■ (or planks) remain unaltered, but chess-holders and chess-bearers are added for use in constructing light bridges for infantry in file. In this kind of bridge each pontoon section is used separately, with a roadway of chesses placed longitudinally four abreast. In the normal or medium bridge two sections, and in heavy bridge three sections are joined together. The chief advantages of the

Pontoon.

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Gribeauval: open bateau, oak Austrian: open, wooden, 1799 Aust. - Birago: open, wooden; two pieces ,, ,, ,, three ,,

,, „ iron; two pieces

,, ,, ,, three ,,

French: open, wooden ; reserve

,, ,, ,, advanced guard

,, ,, ,, general .

Prussian: open, wooden; open order ,, ,, ,, close order

,, ,, iron; open order

,. ,, „■ ‘ close order

Italian : open wooden ; one piece ,, ,, „ two pieces

,, modified; one piece

,, ,, two pieces

Russian \ °P en – canvas on (open order (wooden framework ; \ close order Belgian: open, iron; one piece

,, ,, ,, two pieces

American \ india-rubber, three;) open order

(cylinders connected ; \ close order

English Pontoons. Peninsular (open, tin; reserve

equipment? ,, ,, advanced guard Pasley : closed demi-canoe ; copper Blanshard: cylinder, tin; open order .

,, ,, ,, close order .

.. ., ,, light pattern

Fowke: open, collapsible, canvas; open order Forbes: closed, spherangular, tin; open order Blood : open, wooden ; general ….

Ft.

36-3 27-0 28-0

39-4 28-0

39-4

3Q-9

19-7

3°-9

23-7 23-7 247 24-7 19-6 39-2 24-6 49-2 210

21-0

24-8

49-2

20-0 20-0

18-9

151

25-0

22-5 22-5

15-5

22-0 24-2 21-6

Cub. Ft.

593 354 303 445 353 : 530 325 156 321 164 164 214

214 283

565 325 649 209 209 297 595 130 130

209 120 141 109 109 26

134 128 280

tb

45,044 22,123 18,907

27,791 22,090

33,135 20,286

9,734 20,065 10,226 10,226 13,385 13,385 17,660 35,320 20,290 40,580 13,042 13,042 18,584 37,168 8,125 8,125

13,092 7,520 8,781 6,785 6,785 1,640 8,460

7,977 17,500

lb

8,044 3,332 3,249 3,884 3,698

4,5oi

3,668

1,506 3,153 2,393 2,213 2,209 2,029 3,582 4,572 3,401 4,489 2,355 2,083 3-336 4,548 1,980 1,824

2,374 1,654 2,103 1,600 1,408 340 1,246 1,689 2,300

lb

37,000 18,791 15,658 23,907 18,392 28,634 16,678 8,228 16,912

7,833 8,013 11,176

n,356

14,078 30,748 16,889 36,091 10,687

10,959 15,248 32,620

6,H5

6,301

10,718 5,866 6,678

5,i85

5,377 1,300

7,2H

6,288

15,200

lb

27,750 14,093

ii,744

17,930 ,13,794 21,476

12,509

6,171

12,684

5,875

6,010

8,382

8,517

io,559

23,061

12,669

27,068

8,015

8,219

ii,436

24,465

5,530

5,76i

8,039

16-8

4,400

14-0

6,010

12-5

4,667

12-5

4,839

8-3

1,170

5-3

5,4U

10-0

5,659

II-O

13,350

15-0

Ft.

22-8 16-6 21-7 21-7 21-7 21-7 19-7 16-4 19-7 15-3

1 1 -2

15-3

II-2

26-3 26-3 23-0 23-0 16-6

u-7

19-7 19-7 18-0 14-7

lb [,215

849 542 827 636 991 635 376 644

384 535

56i

759 402 878

55i

1,178

493 705 580

1-244 307 393

477 314 481

373

58i

220

54i 5H

890

lb,

840 560

56o

560 560 560

56o

560 560 560 560 560 560 560

56o

560 560 560 560

56o 56o

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560 560 560 560 560 280

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Ft.

15-6

114

93

9-3

9-3

9-3

10-5

9-3 9-8 9.9

9-9 9.9

9-9 9-8 9-8 9-8 9-8 10-4 10-4 9-5 9-5

II-O II-O

io-o

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lO-O

10-0 10-0

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IO-O

10-0 10-0

lb

35,568

18,924 20,181 20,181 20,181 20,181 20,685 15,252 19,306

15,147 11,088

15,147 11,088

25,774 25,774 22,540 22,540 17,264 12,168 18,715 18,715

19,800

18,370

800 600 500 ,500 ,300

,710

,000

,000 ,000 .

PONTOPPIDAN, E.— rPONTORMO

69

equipment are (1) the buoyancy of the piers can be proportioned to the weight of traffic and to the roughness of the water; (2) owing to the special design of the bows, boats and rafts are easy to row, while the pontoons in bridge oppose little resistance to the current, and so require less anchor power; (3) transport rafts, pier- heads and flying bridges can be constructed with great ease, owing to the flush gunwales on which baulks can rest if necessary ; (4) the pontoon sections are convenient to handle, easy to ship or to transport by rail, and can readily be replaced singly if damaged in bridge. A canoe pontoon and superstructure adapted for pack transport has also been adopted from designs by Colonel (Sir) Elliott Wood, C.B., R.E. The pontoon consists of four sections laced together, each section being a framework of wood covered with waterproof sheeting. Three pontoons and eight composite planks form a ” unit,” from which can be constructed 48 ft. of bridge for infantry in file, 84 ft. for infantry in

single file, or a raft to carry 15 men or an empty wagon.

For the British army in India the standard pontoon for many years was the Pasley; it was seldom used, however, for boats could almost always be procured on the spot in sufficient numbers where- ever a floating bridge had to be constructed. Later an equipment was prepared for the Indian army of demi-pontoons, similar to the Blood pontoon cut in half, and therefore more mobile ; each has a bow and a square stern, and they are joined at the sterns when required to form a ” pier ” ; they are fitted with movable covers and can therefore be used in much rougher water than pontoons of the home pattern, and their power of support and breadth of roadway are the same. The Chitral Relief Expedition of 1895, however, revealed certain defects. The shape of the bow was unsuited to rapid currents; the balance was not satisfactory, and the copper sheathing cracked. Experiments were then undertaken with the bipartite pontoon.

The india-rubber pontoon does not appear to have been generally employed even in America, where it was invented. The engineer officers with the army of the Potomac, after full experience of the india-rubber pontoon and countless other inventions of American genius, adopted the French equipment, which they found ” most excellent, useful and reliable for all military purposes.” The Russians, in crossing the Danube in their war with Turkey in 1878, employed the Austrian equipment. Aluminium pontoons have been tried in Germany, but have not been adopted.

For light bridging work the Berthon and other collapsible boats have been adopted in Germany and Great Britain, especially for cavalry work in advance of the army. The German folding boat is made of wood framework and canvas skin; two boats are easily carried on one ” folding-boat wagon.” The total length of the three sections together is 21 ft. 6 in. The British field troop R.E., attached to cavalry, carries two collapsible boats 18 ft. 6 in. long.

The methods of constructing pontoon bridges have been simpli- fied of late years in most armies, and are usually restricted to (1) adding pontoons one by one to the head of the bridge; (2) con- necting rafts of two or more pontoons into bridge by intermediate bays of superstructure; and (3) swinging across the river a bridge previously prepared alongside the shore. The formation of a bridge from rafts touching one another consumes an excessive amount of equipment, and opposes unnecessary resistance to the stream; it is therefore being discarded in most armies. ” Booming out ” the bridge bay by bay from the shore until the head teaches the opposite bank is unsuited for

rapid currents, and is almost obsolete except for light infantry bridges.

In every army the pontoon service is in the hands of technical specialists. 1 But there are many other forms of military bridging, in which the specialist only supervises the work of the ordinary soldier, or indeed, takes no part whatever. Troops of all arms are expected to be familiar with certain methods of rough temporary bridging. In the British service the forms of temporary timber bridge usually employed are called trestle, lock and floating. The trestle bridge in its Various forms Con- sists of a series of two-legged or three-legged trestles carrying the road-bearers and chesses which form the roadway. Trestles can be improvised, but some are carried, ready for use, by mobile engineer units and they are frequently combined with pontoon bridges at the shore ends, where holding ground for the feet of the trestles is found. Lock bridges never touch water, forming single spans over a chasm. These consist of spars made into frames of which the feet rest in the banks of the river and the heads are interlocked, the whole being securely lashed. Another type of frame-bridge is the cantilever, which has been used in Indian frontier expeditions to bridge swift

1 In Germany, however, as mentioned below, light bridging material has been placed in the hands of the cavalry. This tendency, in accordance with the needs of modern armies, will probably become more pronounced in the future. It began with the pro- vision of demolition equipment for the cavalry pioneers.

steep-banked streams. Improvised suspension bridges are also used. Floating bridges are made not only of pontoons but also of boats of all sorts, casks lashed together, and rafts. They are almost always combined with one or two bays of trestle bridging at the shore ends.

The organization of bridging personnel in different armies shows as much divergence of opinion as the design of pontoon equipment. In Great Britain, since the divisional reorganization, the bridging trains have been assigned to the ” army troops,” which include two_ ” bridging trains,” totalling 14 officers and 454 men with 92 vehicles, most of them six-horsed. Each train carries 32 pontoons and 3? bays of superstructure, as well as 16 trestles and 8 bays of the appropriate superstructure, and can construct 200 yds. of medium bridge in all. Besides these trains the divisional engineer units (2 field companies per division) bear with them in all 4 pontoons and 4 trestles, with the necessary bays of superstructure, their total bridging capacity being about 40 yds. of medium bridge. In France each army corps has a bridging train which admits of the construction of bridges to the

extent of about 120 yds. of medium and 140 yds. of light bridging and bears besides 2 ” advanced guard ” trains which can provide 33 yds. of medium bridging each. Besides the corps trains there are also ” army ” trains, five in all, which can furnish 280 yds. of medium bridging apiece. These would be allotted in accordance with the requirements of particular campaigns. In Germany the increasing importance attached to independent cavalry operations has led to the assignment of a folding-boat wagon to every cavalry regiment. . The regimental equipment provides for a ferry, capable of taking 25 to 30 infantrymen, one artillery vehicle or four horses at one journey, a foot-bridge 22 to 35 yds. in length, or a light bridge of 8 to 13 yds. By assembling the material of a whole cavalry division of 6 regiments, a foot-bridge of no to 210 yds. or a light bridge of 57 to 70 yds. can be constructed. The corps bridging train of a German army corps can construct 140 yds. of medium or 170 yds. of light bridging, and each of the two divisional trains, 40 yds. of medium and 48 yds. of light bridging.

PONTOPPIDAN, ERIK (1698-1764), Danish author, was born at Aarhus on the 24th of August 1698. He studied divinity at the university of Copenhagen, and for some time acted as a travelling tutor. In 173 s he became one of the chaplains of the king. In 1738 he was made professor extra- ordinary of theology at Copenhagen, and in 1745 bishop of Bergen, Norway, where he died on the 20th of December 1764.

His principal works are: Theatrum Daniae veteris et modernae (4to, 1730), a description of the geography, natural history, an- tiquities, &c, of Denmark; Gesta et vestigia danorum extra Daniam (3 vols. 8vo, 1740), a laborious but uncritical work; Annates ecclesiae danicae. (3 vols., 1741-1747); Marmora danica selectiora (2 vols, fol., 1739-1741); Glossarium norvegicum (1749); Det forste forsog Norges naturlige hislorie (4to, 1 752-1 754); Eng. trans., Natural History of Norway (2 vols., 1755), containing curious accounts, often referred to, of the Kraaken, sea-serpent, and the like; Origines hafnienses (1760); Menoza (3 vols., 1742-1743), a religious novel. His Danske Atlas (7 vols. 4to), an historical and topographical account of Denmark, was mostly posthumous.

See an article by S. M. Gjellerup in Danish Biografisk Lexikon (vol. xiii., 1899),

PONTOPPIDAN, HENRIK (1857-), Danish author, son of a pastor, was born at Fredericia on the 24th of July 1857. He studied physics and, mathematics at the university of Copen- hagen, and when he was

eighteen he travelled on foot through Germany and Switzerland. His novels show an intimate acquaintance with peasant life and character, the earlier ones showing clear evidence of the influence of Kjelland. An excellent example of his work is in the trilogy dealing with the history of Emanuel Hansted, a theorizing radical parson who marries a peasant wife. These three stories, Muld (" Soil," 1891), Det Forjaettede Land ("The Promised Land," 1892), and Dommens Dag (1895) are marked by fine discrimination and great narrative power. Among his other works are Fra Hytterne (1887), Folkelivsskildringer (2 parts, 1888-1890), and Skyer (1890). He began in 1898 a new series in Lykke Per, the story of a typical Jutlander.

See an article of Niels Moller in Dansk Biografisk Lexikon (vol. xiii., 1899).

PQNTORMO, JACOPO DA (1494-1557), whose family name

was Carucci, Italian painter of the Florentine school, was born

at Pantormo in 1494, son of a painter of ordinary ability, was

apprenticed to Leonardo da Vinci, and afterwards took lessons

I from Piero di Cosimo. At the age of eighteen he became a

journeyman to Andrea del Sarto, and was remarked as a young man of exceptional accomplishment and promise. Later on, but still in early youth, he executed, in continuation of Andrea's labours, the " Visitation," in the cloister of the Servi in Florence — one of the principal surviving evidences of his powers. The most extensive series of works which he ever undertook was a set of frescoes in the church of S. Lorenzo, Florence, from the " Creation of Man to the Deluge," closing with the " Last Judgment." By this time, towards 1546, he had fallen under the dangerous spell of Michelangelo's colossal genius and super- human style; and Pontormo, after working on at the frescoes for eleven years, left them incomplete, and the object of general disappointment and disparagement. They were finished by Angelo Bronzino, but have long since vanished under whitewash. Among the best works of Pontormo are his portraits, which include the likenesses of various members of the Medici family ; they are vigorous, animated and highly finished. He was fond of new and odd experiments both in style of art and in method of painting. From Da Vinci he caught one of

the marked physio- gnomic traits of his visages, smiles and dimples. At one time he took to direct imitation or reproduction of Albert Diirer, and executed a series of paintings founded on the Passion subjects of the German master, not only in composition, but even in such peculiarities as the treatment of draperies, &c. Pontormo died of dropsy on the 2nd of January 1557, mortified at the ill success of his frescoes in S. Lorenzo; he was buried below his work in the Servi.

PONTREMOLI, a town and bishop's see of the province of Massa and Carrara, Tuscany, Italy, in the upper valley of the Magra, 25 m. N. by E. of Spezia by rail and 49 m. S.S.W. of Parma, 843 ft. above sea-level. Pop. (1001), 4107 (town); 14,570 (commune). It has a 17th-century cathedral. The church of the Annunziata with its Augustinian monastery is interesting. There are also mineral springs. The town, which is well situated among the mountains, was an independent republic in the 12th and 13th centuries, and in 1495 was sacked by the troops of Charles VIII. of France. It was much damaged by an earthquake in 1834.

PONTUS, a name applied in ancient times to extensive tracts of country in the north-east of Asia Minor bordering on the Euxine (Black Sea), which was often called simply Pontos (the Main), by the Greeks. The exact signification of this purely territorial name varied greatly at different times. The Greeks used it loosely of various parts of the shores of the Euxine, and the term did not get a definite connotation till after the establishment of the kingdom founded beyond the Halys during the troubled period following the death of Alexander the Great, about 301 B.C., by Mithradates I., Ktistes, son of a Persian satrap in the service of Antigonus, one of Alexander's successors, and ruled by a succession of kings, mostly bearing the same name, till 64 B.C. As the greater part of this kingdom lay within the immense region of Cappadocia, which in early ages extended from the borders of Cilicia to the Euxine, the kingdom as a whole was at first called " Cappadocia towards the Pontus " (Trpos to) ILWcp), but afterwards simply " Pontus," the name Cappadocia being henceforth restricted to the southern half of the region previously included under that title. Under the last king, Mithradates Eupator, commonly called the Great, the realm of Pontus included not only Pontic Cappadocia but also the seaboard from the Bithynian frontier to Colchis, part of inland Paphlagonia, and Lesser Armenia (see under Mithra- dates). With the destruction of this kingdom by Pompey in 64 B.C., the meaning of the name Pontus underwent a change. Part of the kingdom was now annexed to the Roman Empire, being united with Bithynia in a double province called " Pontus and Bithynia " : this part included (possibly from the first, but certainly from about 40 B.C. onwards)

only the seaboard between Heracleia (Eregli) and Amisus (Samsun), the ora Pontica. Hereafter the simple name Pontus without qualification was regularly employed to denote the half of this dual province, especially by Romans and people speaking from the Roman point of view; it is so used almost always in the New Testament.

But it was also frequently used to denote (in whole or part) that portion of the old Mithradatic kingdom which lay between the Halys (roughly) and the borders of Colchis, Lesser Armenia, Cappadocia and Galatia — the region properly designated by the title ” Cappadocia towards the Pontus,” which was always the nucleus of the Pontic kingdom.

This region is regarded by the geographer Strabo (a.d. 19-20), himself a native of the country, as Pontus in the strict sense of the term (Geogr. p. 678). Its native population was of the same stock as that of Cappadocia, of which it had formed a part, an Oriental race often called by the Greeks Leucosyri or White Syrians, as distinguished from the southern Syrians, who were of a darker complexion, but their precise ethnological relations are uncertain. Geographically it is a table-land, forming the north-east corner of the great plateau of Asia Minor, edged on the north by a lofty mountain rim, along the foot of which runs a fringe of coast-land. The table-land consists of a series of fertile plains, of varying size and elevation separated from each other by upland tracts or mountains, and it is drained almost entirely by the river Iris (Yeshil Irmak) and its numerous tributaries, the largest of which are the Scylax {Tchekerek Irmak) with many affluents and the Lycus (Kalkid Irmak), all three rising in the highlands near, or on, the frontier of Armenia Minor and flowing first in a westerly and then in a north-westerly direction to merge their waters in a joint stream, which (under the name of the Iris) pierces the mountain-wall and emerges on the east of Amisus (Samsun). Between the Halys and the Iris the mountain rim is comparatively low and broken, but east of the Iris it is a continuous lofty ridge (called by the ancients Pary- adres and Scydises), whose rugged northern slopes are furrowed by torrent beds, down which a host of small streams (among them the Thermodon, famed in Amazon story) tumble to the sea. These inaccessible slopes were inhabited even in Strabo’s time by wild, half-barbarous tribes, of whose ethnical relations we are ignorant — the Chalybes (identified by the Greeks with Homer’s Chalybes), Tibareni, Mosynoeci and Macrones, on whose manners and condition some light is thrown by Xenophon (Anab. V). But the fringe of coast-land from Trebizond westward is one of the most beautiful parts of Asia Minor and is justly extolled by Strabo for its wonderful productiveness.

The sea-coast, like the rest of the south shore of the Euxine, was studded with Greek colonies founded from the 6th century onwards: Amisus, a colony of Miletus, which in the 5th century received a body of Athenian settlers, now the port of Samsun; Cotyora, now Ordu; Cerasus, the later Pharnacia, now Kerasund; and Trapezus (Trebizond), a famous city from Xenophon's time till the end of the middle ages. The last three were colonies of Sinope, itself a Milesian colony. The chief towns in the interior were Amasia, on the Iris, the birthplace of Strabo, the capital of Mithradates the Great, and the burial-place of the earlier kings, whose tombs still exist; Comana, higher up the river, a famous centre of the worship of the goddess Ma (or Cybele); Zela, another great religious centre, refounded by Pompey, now Zlleh; Eupatoria, refounded by Pompey as Magnopolis at the junction of the Lycus and Iris; Cabira, Pompey's Diospolis, afterwards Neocaesarea, now Niksar; Sebastopolis on the Scylax, now Sulu Serai; Sebasteia, now Sivas; and Megalopolis, a foundation of Pompey, somewhere in the same district.

The history of this region is the history of the advance of the Roman Empire towards the Euphrates. Its political position between 64 and 41 B.C., when Mark Antony became master of the East, is not quite certain. Part of it was handed over by Pompey to client princes: the coast-land east of the Halys (except the territory of Amisus) and the hill-tribes of Paryadres were given, with Lesser Armenia, to the Galatian chief Deiotarus, with the title of king; Comana was left under the rule of its high-priest. The rest of the interior was parti- tioned by Pompey amongst the inland cities, almost all of which were founded by him, and, according to one view, was included together with the seaboard west of Amisus and the corner of north- east Paphlagonia possessed by Mithradates in his new province

Pontus-Bithynia. Others maintain that only the seaboard was included in the province, the inland cities being constituted self-governing, " protected " communities. The latter view is more in conformity with Roman policy in the East, which did not usually annex countries till they reached (under the rule of client princes) a certain level of civilization and order, but it is difficult to reconcile with Strabo's statements (p. 541 sqq.). In any case, during the years following 40 B.C. all inland Pontus was handed over, like north-east Paphlagonia, to native dynasts. The Pontic possessions of Deiotarus (d. 40 B.C.) were given with additions (e.g. Cabira) in 39 B.C. to Darius, son of

Pharnaces, and in 36 B.C. to Polemon, son of a rhetorician of Laodicea on the Lycus. The high-priest of Comana, Lycomedes, received an accession of territory and the royal title. The territories of Zela and Megalopolis were divided between Lyco- medes, the high-priest of Zela and Ateporix, who ruled the principality of Carana (later Sebastopolis). Amasia and Amisus were also given to native princes.

After the battle of Actium (31 B.C.) Augustus restored Amisus as a " free city " to the province of Bithynia-Pontus, but made no other serious change. Polemon retained his king- dom till his death in 8 B.C., when it passed to his widow Pytho- doris. But presently the process of annexation began and the Pontic districts were gradually incorporated in the empire, each being attached to the province of Galatia, then the centre of Roman forward policy. (1) The western district was an- nexed in two sections, Sebastopolis and Amasia in 3-2 B.C., and Comana in a.d. 34-35. To distinguish this district from the province Pontus and Polemon's Pontus, it" was henceforth' called Pontus galaticus (as being the first part attached to Galatia). (2) Polemon's kingdom, ruled since a.d. 38 by Pole- mon II., grandson of the former king, was annexed by Nero in a.d. 64-65, and distinguished by the title of Pontus polemoniacus, which survived for centuries. [But the simple name Pontus, hitherto commonly used to designate Polemon's realm, is still employed to denote this district by itself or in conjunction with Pontus Galaticus, where the context makes the meaning clear {e.g. in inscriptions and on coins).] Polemoniacus included the sea-coast from the Thermodon to Cotyora and the inland cities Zela, Magnopolis, Megalopolis, Neocaesarea and Sebasteia (according to Ptolemy, but apparently annexed since 2 B.C., according to its coins). (3) Finally, at the same time (a.d. 64) was annexed the remaining eastern part of Pontus, which formed part of Polemon's realm but was attached to the province Cappadocia and distinguished by the epithet cappadocicus. These three districts formed distinct adminis- trative divisions within the provinces to which they were attached, with separate capitals Amasia, Neocaesarea and Trapezus; but the first two were afterwards merged in one, sometimes called Pontus mediterraneus, with Neocaesarea as capital, probably when they were definitively transferred (about a.d. 114) to Cappadocia, then the great frontier military province.

With the reorganization of the provincial system under Diocletian (about a.d. 295), the Pontic districts were divided up between four provinces of the dioecesis pontica: (1) Paphla- gonia, to which was attached most of the old province Pontus; (2) Diospontus, re-named Helenopontus by Constantine, con- taining the rest of the province Pontus and the adjoining dis- trict, eight cities in all (including Sinope,

Amisus and Zela) with Amasia as capital; (3) Pontus Polemoniacus, containing Comana, Polemonium, Cerasus and Trapezus with Neocaesarea as capital; and (4) Armenia Minor, five cities, with Sebasteia, as capital. This rearrangement gave place in turn to the Byzantine system of military districts {themes).

Christianity was introduced into the province Pontus (the Or a pontica) by way of the sea in the 1st century after Christ and was deeply rooted when Pliny governed the province (a.d. 111-113). But the Christianization of the inland Pontic districts began only about the middle of the 3rd century and was largely due to the missionary zeal of Gregory Thaumaturgus, bishop of Neocaesarea.

See Ramsay, Histor. Geogr. of Asia Minor (1890); Anderson and Cumont, Studia pontica (1903 et seq.) ; Babelon and Reinach, Recueil des monnaies d'Asie min., t. i. (1904) ; H. Gregoire, " Voyage dans le Pont " &c. in Bull, de cones, hell. (1909). (J. G. C. A.)

PONTUS DE TYARD (c. 1521-1605), French poet and member of the Pleiade (see Daurat), was seigneur of Bissy in Burgundy, where he was born in or about 1521. He was a friend of Antoine Heroet and Maurice Sceve, and to a certain extent anticipated Ronsard and Joachim Du Bellay. His Erreurs amoureuses, originally published in 1549, was augmented with other poems in successive editions till 1573. On the whole his poetry is inferior to that of his companions, but he was one of the first to write sonnets in French (the actual priority belongs to Melin de St Gelais). It is also said that he introduced the sestine into France, or rather reintroduced it, for it was originally a Provencal invention. In his later years he gave himself up to the study of mathematics and philosophy. He became bishop of Chalons-sur-Saone in 1578, and in 1587 appeared his Discours philosophiques. He was a zealous defender of the cause of Henry III. against the pretensions of the Guises. This attitude brought down on him the vengeance of the league; he was driven from Chalons and his chateau at Bissy was plundered. He survived all the members of the Pleiade and lived to see the onslaught made on their doctrines by Malherbe. Pontus resigned his bishopric in 1594, and retired to the chateau de Bragny, where he died on the 23rd of September 1605.

His Oeuvres poetiques may be found in the Pleiade francaise (ˆ875) of M. Ch. Marty-Laveaux..

PONTYPOOL, a market town in the northern parliamentary division of Monmouthshire, England, 8 m. N. of Newport, served by the Great Western, London & North- Western, and Rhymney railways. Pop. of

urban district (1901), 6126. It is beautifully situated on an acclivity above the Afon Lwyd, a tributary of the Usk. Its prosperity is due to its situation on the edge of the great coal- and iron-field of Monmouthshire and Glamorganshire. The earliest record of trade in iron is in 1588, but it was developed chiefly in the beginning of the 18th century by the family of Hanbury, the proprietors of Pontypool Park. Pontypool was formerly famed for its japanned goods, invented by Thomas Allwood, a native of Northampton, who settled in the town in the reign of Charles II., but the manu- facture has long been transferred elsewhere. The town and neighbourhood contain large forges and iron mills for the manu- facture of iron-work and tin-plate. Water communication is afforded with Newport by the Monmouthshire Canal. On the south-east of Pontypool is the urban district of Panteg, including Griffithstown, with a population (1901) of 7484.

PONTYPRIDD, a parish, market town, and urban district, in the eastern parliamentary division of Glamorganshire, Wales, situated on the Taff at its junction with the Rhondda, on the Taff Vale railway, and on the Glamorganshire Canal, 12 m. N.N.W. from Cardiff, 12 S. from Merthyr-Tydfil, and 169 by rail from London. It is also connected with Newport by a Great Western line i8i m. long. Pop. (1901), 32,316. It receives its name from a remarkable bridge of one arch spanning the Taff, erected in 1755 by William Edwards, a self-taught mason. The bridge is a perfect segment of a circle, the chord being 140 ft., and the height at low water 36 ft. A three-arched bridge was erected close to it in 1857. The town is built at the junc- tion of the three parishes of Llanwonno, Llantwit Fardre and Eglwysilan, out of portions of which Glyntaff was formed into an ecclesiastical parish in 1848, and from this Pontypridd was carved in 1884. The urban district was constituted into a civil parish in 1894. The church of St Catherine, built in 1868, enlarged in 1885, is in early Decorated style; other places of worship are the Baptist, Calvinistic Methodist, Congrega- tional, and Wesleyan chapels. The principal secular buildings are a masonic hall, town-hall built above the market, free library (1890), county intermediate school (1895) and court-house. Near the town is a far-famed rocking-stone 95 tons in weight, known as the Maen Chwyf, round which a circle of small stones was set up in the middle of the 19th century under the direction

of Myvyr Morganwg, who used to style himself archdruid of Wales.

The place became, for a time, famous as a meeting place for neo-Druidic gatherings. Pontypridd was an insig- nificant village till the opening of the Taff Vale railway into the town in 1840, and it owed its progress chiefly to the de- velopment of the coal areas of the Rhondda Valley, for which district it serves as the market town and chief business centre. It also possesses anchor, chain, and cable works, chemical works, and iron and brass foundries. Pontypridd has, jointly with Rhondda, a stipendiary magistrate since 1872.

PONY (from the Lowland Scots powney, probably from O. Fr. pouleriet, diminutive of poulain, a colt or foal; Late Lat. pullanus, Lat. pullus, a young animal), a horse of a small breed, sometimes confined to such as do not exceed 13 hands in height, but generally applied to any horse under 14 hands (see Horse). The word is of frequent use as a slang term— e.g. for a sum of £25; for a liquor measure or glass containing less than a half-pint; and in America for a literal translation of a foreign or classical author, a ” crib.”

PONZA (anc. Pontiae), the principal of a small group of islands belonging to Italy. Pop. (1901), 4621. The group is of volcanic origin, and includes Palmarola (anc. Palmaria),,Zannone (Sinonia), Ventotene (Pandateria, pop. in 1901, 1986) and San Stefano. It is situated about 20 m. S. of Monte Circeo and 70 m. W. of Naples, and belongs partly to the province of Caserta and partly to that of Naples (Ventotene). There is regular communication with Naples by steamer, and in summer with Anzio. The islands rise to a height of about 70 ft. above sea- level. They are now penal settlements, and their isolated character led to their being similarly used in ancient times. A colony with Latin rights was founded on Pontiae in 313 b.c. Nero, Germanicus’s eldest son, and the sisters of Caligula, were confined upon it; while Pandateria was the place of banishment of Julia, daughter of Augustus, of her daughter Agrippina the elder, and of Octavia, the divorced wife of Nero.

POOD, a Russian weight, equivalent to 40 lb Russian and about 36 lb avoirdupois. A little more than 62 poods go to the ton. The word is an adaptation of the Low German or Norse pund, pound.

POOL. (1) A pond, or a small body of still water; also a place in a river or stream where the water is deep and still,, so applied in the Thames to that part of the river known as The Pool, which reaches from below London Bridge to Limehouse. The word in Old English was p6l, which may be related to pull or pyll, and the similar Celtic words, e.g. Cornish pal, a creek, common on the Bristol Channel and estuary of the Severn, on the English side in the form ” pill.” A further connexion

has been suggested with Lat. palus, marsh; Gr. tt?X<4s, mud. (2) A name for the stakes, penalties, &c, in various card and other games when collected together to be paid out to the winners; also the name of a variety of games of billiards (q.v.). This word has a curious history. It is certainly adapted from Fr. poule, hen, chicken, apparently a slang term for the stakes in a game, possibly, as the New English Dictionary suggests, used as a synonym for plunder, booty. " Chicken-hazard " might be cited as a parallel, though that has been taken to be a cor- ruption of " chequeen," a form of the Turkish coin, a sequin. When the word came into use in English at the end of the 17th century, it seems to have been at once identified with " pool," pond, as Fr. fiche (ficher, to fix), a counter, was with "fish," counters in card games often taking the form of " fish " made of mother-of-pearl, &c. " Pool," in the sense of a common fund, has been adopted as a commercial term for a combination for the purpose of speculating in stocks and shares, the several owners of securities " pooling" them and placing them under a single control, and sharing all losses and profits. Similarly the name is given to a form of trade combination, especially in railway or shipping companies, by which the receipts or profits are divided on a certain agreed-upon basis, for the purpose of avoiding competition (see Trusts).

POOLE, MATTHEW (1624-1679), English Nonconformist theologian, was born at York, educated at Emmanuel College,

Cambridge, and from 1649 till the passing of the Act of Unifor- mity (1662) held the rectory of St Michael le Querne, London. Subsequent troubles led to his withdrawal to Holland, and he died at Amsterdam in 1679. The work with which his name is principally associated is the Synopsis criticorum biblicorum (5 vols, fol., 1669-1676), in which he summarizes the views of one hundred and fifty biblical critics. He also wrote English Anno- tations on the Holy Bible, as far as Isa. lviii.- — a work which was completed by several of his Nonconformist brethren, and published in 2 vols. fol. in 1683.

POOLE, PAUL FALCONER (1806-1879), English painter, was born at Bristol in 1806. Though self-taught his fine feeling for colour, poetic sympathy and dramatic power gained for him a high position among British artists. He exhibited his first work in the Royal Academy at the age of twenty-five, the sub- ject being ” The Well,” a scene in Naples. There was an interval of seven years before he next exhibited his ” Farewell, Farewell ” in 1837, which was followed by the ” Emigrant’s Departure,” ” Hermann and Dorothea ” and ” By the Waters of Babylon.” In 1843 his position was made secure by his ” Solomon Eagle,” and by his success in the Cartoon Exhibition, in which he

received from the Fine Art Commissioners a prize of £300 sterling. After his exhibition of the ” Surrender of Syon House ” he was elected an associate of the Royal Academy in 1846, and was made an academician in 1861. He died in 1879.

Poole’s subjects divide themselves into two orders — one idyllic, the other dramatic. Of the former his ” May Day ” (1852) is a typical example. Of both styles there were excellent examples to be seen in the small collection of his works shown at Burlington House in the Winter Exhibition of 1883-1884. Among his early dramatic pictures was ” Solomon Eagle ex- horting the People to Repentance during the Plague of 1665,” painted in 1843. To this class belongs also the ” Messenger announcing to Job the Irruption of the Sabeans and the Slaughter of the Servants ” (exhibited in 1850), and ” Robert, Duke of Normandy *ind Arietta” (1848). Finer examples of his more mature power in this direction are to be found in his ” Prodigal Son,” painted in 1869; the ” Escape of Glaucusand lone with the blind girl Nydia from Pompeii” (i860); and ” Cunstaunce sent adrift by the Constable of Alia, King of Northumberland,” painted in 1868. More peaceful than these are the ” Song of Troubadours ” (painted in 1854) and the ” Goths in Italy” (1851), the latter an important historical work of great, power and beauty. Of a less lofty strain, but still more beautiful in its workmanship, is the ” Seventh Day of the Decameron,” painted in 1857. In this picture Poole rises to his full height as a colourist. In his pastorals he is soft and tender, as in the ” Mountain Path ” (1853), the ” Water-cress Gatherers ” (1870), the ” Shepston Maiden ” (1872). But when he turns to the grander and more sublime views of nature his work is bold and vigorous. Fine examples of this style may be seen in the ” Vision of Ezekiel ” of the National Gallery, “Solitude” (1876), the ” Entrance to the Cave of Mammon ” (1875), the ” Dragon’s Cavern ” (1877), and perhaps best of all in the ” Lion in the Path ” (1873), a great representation of mountain and cloud form.

POOLE, REGINALD STUART (1832-1895), English archae- ologist and orientalist, was born in London on the 27th of January 1832. His father was the Rev. Edward Poole, a well- known bibliophile. His mother, Sopha, authoress of The Englishwoman in Egypt (1844), was the sister of E. W. Lane, the Arabic scholar, with whom R. S. Poole lived in Cairo from 1842 to 1849, thus imbibing an early taste for Egyptian antiquities. In 1852 he became an assistant in the British Museum, and was assigned to the department of coins and medals, of .which in 1870 he became keeper. In that capacity he did work of the highest value, alike as a writer, teacher and administrator. In 1882 he was largely responsible for founding the Egypt Exploration Fund, and in 1884 for starting the Society of English Medallists. He retired in

1893, and died on the 8th of February 1895. Some of Poole's best work was done in his articles for the Ency. Brit. (9th ed.) on Egypt, Hieroglyphics

and Numismatics, and considerable portions have been retained in the present edition, even though later research has been active in his sphere of work; he also wrote for Smith's Dictionary of the Bible, and published several volumes dealing with his special subjects. He was for some time professor of archae- ology at University College, London; and also lecturer at the Royal Academy.

His elder brother, Edward Stanley Poole (1830-1867), who was chief clerk in the science and art department at South Kensington, was an Arabic scholar, whose early death cut short a promising career. His two sons, Stanley Lane-Toole (b. 1854), professor of Arabic in Trinity College, Dublin, and Reginald Lane-Poole (b. 1857), keeper of the archives at Oxford, lecturer in diplomatic, and author 'of various historical works, carried on the family tradition of scholarship.

POOLE, a municipal borough, county in itself, market town and seaport in the eastern parliamentary division of Dor- setshire, England, 113I m. S.W. by W. from London by the London & South-Western railway. Pop. (1901), 19,463. It is picturesquely situated on a peninsula between Holes Bay and the shallow irregular inlet of Poole Harbour. There are several modern churches, a guildhall, public library and school of art. Poole Harbour, extending inland 6 m., with a general breadth of 4 m., has a very narrow entrance, and is studded with low islands, on the largest of which, Brownsea or Branksea, is a castle, transformed into a residence, erected as a defence of the harbour in Tudor times, and strengthened by Charles I. Potters' clay is worked here. At low water the harbour is entirely emptied except a narrow channel, when there is a depth of 8| ft. There are some valuable oyster beds. There is a considerable general coasting trade, and clay is exported to the Staffordshire potteries. Some shipbuilding is carried on, and there are manufacturers of cordage, netting and sail-cloth. The town also possesses potteries, decorative tileworks, iron foundries, agricultural implement works and flour-mills. Poole Park, containing 40 acres of land and 62 acres of water, was acquired in 1887 and 1889, and Branksome Park, of 40 acres, in 1895. The borough is under a mayor, 6 aldermen and 18 councillors. Area, 5333 acres.

Although the neighbourhood abounds in British earth- works and barrows, and there are traces of a Roman road lead- ing from Poole to Wimborne, Poole (La Pole) is not mentioned by the early chroniclers or in Domesday Book- The manor, part of that of Canford, belonged in 1086 to Edward of Salis- bury, and passed by marriage to William Longespee, earl of Salisbury, thence to Edmund de Lacy, earl of Lincoln, and with his heiress to Thomas, earl of Lancaster; and so to the Crown. Poole is first mentioned in a writ of 1224, addressed to the bailiffs and good men of La Pole, ordering them to retain all ships within their port. Entries in the Patent Rolls show that Poole had considerable trade before William de Longespee, earl of Salis- bury, granted the burgesses a charter about 1248 assuring to them all liberties and free customs within his borough. The bailiff was to be chosen by the lord from six men elected by the burgesses, and was to hold pleas for breach of measures and assizes. It is uncertain when the burgesses obtained their town at the fee-farm rent of £8, 13s. 4d. mentioned in 1312. The mayor, bailiffs and good men are first mentioned in 1311 and were required to provide two ships for service against Robert de Brus. In 1372 the burgesses obtained assize of bread and ale, and right to hold the courts of the lord of the manor, the prepositus being styled his mayor. The burgesses were licensed in 1433 t0 fortify the town; this was renewed in 1462, when the mayor was given cognisance of the staple. Elizabeth incorporated Poole in 1569 and made it a separate county; Charles II. gave a charter in 1667. The corporation was suspended after a writ of quo warranto in 1686, the town being governed by the commission of the peace until the charters were renewed in 1688. Poole returned two members to parliament in 1362 and 1368, and regularly from 1452 to 1867, when the representation was reduced, ceasing in 1885. It is uncertain when the Thursday market was granted, but the

present fairs on the Feasts of SS Philip and James and All Saints were granted in 1453. Poole, as the headquarters of the Parliamentary forces in Dorset during the Civil War, escaped the siege that crippled so many of its neighbours. When Charles II. visited the town in 1665 a large trade was carried on in stockings, though the prosperity of Poole still depended on its usefulness as a port.

POONA, or Puna, a city and district of British India, in the Central division of Bombay. The city is at the confluence of the Mutha and Mula rivers, 1850 ft. above sea-level and 119 m. S.E. from Bombay on the Great Indian Peninsula railway. Municipal area, about 4 sq. m.; pop. (1901), 153,320. It is pleasantly situated amid extensive gardens, with a large num- ber of modern public buildings, and also many temples and palaces dating from the 16th to the 19th century. The

palace of the peshwas is a ruin, having been destroyed by fire in 1827. From its healthy situation Poona has been chosen not only as the headquarters of the 6th division of the Southern army, but also as the residence of the governor of Bombay during' the raihy season, from June to September. The native town, along the river bank, is somewhat poorly built. The European quarter, including the cantonment, extends north-west towards Kirkee. The waterworks were constructed mainly by the munificence of Sir Jamsetjee Jeejeebhoy. Poona was never a great centre of trade or manufacture though still noted for brass-work, jewelry and other articles of luxury. Cotton-mills, paper- mills, a brewery (at Dapuri), flour-mills, factories of ice and mineral waters, and dairy farms furnish the chief industries. Educational institutions are numerous. They include the government Deccan College, with a law class; the aided Fer- gusson college; the government colleges of science and agricul- ture; high schools; training schools for masters and mistresses; medical school; and municipal technical school. The recent history of Poona has been painfully associated with the plague. During 1897, when the city was first attacked, the death-rate rose to 93 per 1000 in Poona city, 71 per 1000 in the canton- ment, and 93 per 1000 in Kirkee.

The District op Poona has an area of 5349 sq. m. Popula- tion (1901), 995,330, showing an increase of 18% after the dis- astrous famine of 1876-1877, but a decrease of 7% in the last decade. Towards the west the country is undulating, and nuftierous spurs from the Western Ghats enter the district; to the east it opens out into plains. It is watered by many streams which, rising in the ghats, flow eastwards until they join the Bhima, a river which intersects' the district from north to south. The principal crops are millets, pulses, oil-seeds, wheat, rice, sugar- cane, vegetables and fruit (including grapes). The two most important irrigation works in the Deccan are the Mutha canal, with which the Poona waterworks are connected, and the Nira canal. There are manufactures of cotton, silk and blankets. The district is traversed by the Great Indian Peninsula railway, and also by the Southern Mahratta line, which starts from Poona city towards Satara. It is liable to drought, from which it suffered severely in 1866-1867, 1876-1877, and again in

1896-1897.

In the 17th century the district formed part of the Mahom- medan kingdom of Ahmadnagar. Sivaji was born within its boundaries at Junriar in 1627, and he was brought up at Poona town as the headquarters of the hereditary fief of his father. The district thus was the early centre of the Mahratta power; and when Satara became first

the capital and later the prison of the descendants of Sivaji, Poona continued to be the seat of government under their hereditary ministers, with the title of peshwa. Many stirring scenes in Mahratta history were enacted here. Holkar defeated the last peshwa under its walls, and his flight to Bassein led to the treaty by which he put himself under British protection. He was reinstated in 1802, but, unable to maintain friendly relations, he attacked the British at Kirkee in 181 7, and his kingdom passed from him. POOP (Lat. puppis, stern), the stern or after-part of a ship; in the 16th and 1 7th centuries a lofty and castellated deck. The verb ” to poop ” is used of a wave breaking over the stern of a vessel.

POORE (or Poor), RICHARD (d. 1237), English bishop, was a son of Richard of Ilchester, bishop of Winchester. About 1 197 he was chosen dean of Sarum and, after being an un- successful candidate for the bishoprics of Winchester and of Durham, he became bishop of Chichester in 1214. In 1217 he was translated to Salisbury, where he succeeded his elder brother, Herbert Poore, and in 1228 to Durham. He died at Tarrant Monkton, Dorset, said by some to be his birthplace, on the 15th of April 1237. Poore took some part in public affairs, under Henry III., but the great work of his life was done at Salisbury. Having in 1219 removed his see from Old to New Sarum, or Salisbury, he began the building of the magnificent cathedral there; he laid the foundation stone in April 1220, and during his episcopate he found money and forwarded the work in other ways. For the city the bishop secured a charter from Henry III. and he was responsible for the plan on which it was built, a plan which to someextent it still retains. He had something to do with drawing up some statutes for his cathedral; he is said to be responsible for the final form of the ” use of Sarum,” and he was probably the author of the Ancren Riwle, a valuable ” picture of contemporary life, manners and feeling ” written in Middle English. His supposed identity with the jurist, Ricardus Anglicus, is more doubtful.

POOR LAW. The phrase “poor law” in English usage denotes the legislation embodying the measures taken by the state for the relief of paupers and its administration. The history of the subject and its problems generally are dealt with in the article Charity and Charities, and other information will be found in Unemployment and Vagrancy. This article will deal only with the practice in the United Kingdom as adopted after the reform of the poor law in 1834 and amended by

subsequent acts. This reform was brought about mainly by the rapid increase of the poor rate at the beginning of the 19th century, showing that a change was necessary either in the poor law as it then existed or in the mode of its adminis- tration.

A commission was appointed in 1832 “to make diligent and full inquiry into the practical operation of the laws for the relief of the poor in England and Wales, and into the manner in which those laws were administered, and to report their opinion as to what beneficial alterations could be made.” The com- missioners reported ” fully on the great abuse of the legislative provision for the poor as directed to be employed by the! statute of Elizabeth,” finding “that the great source of abuse was the outdoor relief afforded to the able-bodied on their own account or on that of their families, given either in kind or in money.” They also reported that ” great maladministration existed in the workhouses.” To remedy the evils they proposed con- siderable alterations in the law, and the principal portion of their suggestions was embodied in the Poor Law Amendment Act 1834. By virtue of this act three commissioners were appointed (originally for five years, but subsequently con- tinued from time to time), styled “the poor law commissioners for England and Wales,” sitting as a board, and appointing assistant commissioners and other officers. The administration of relief according to the existing laws was subject to their direction and control, and to their orders and regulations for the government of workhouses and the guidance and control of guardians and vestries and the keeping and allowing of accounts and contracts, without interfering with ordinary relief in individual cases. The whole of England and Wales was divided into twenty-one districts, to each of which an assistant commissioner was appointed. The commissioners under their powers formed poor law unions by uniting parishes for general administration, and building workhouses, guardians elected by the ratepayers (or ex officio) having the general government and administration of relief. The expense was apportioned to each parish on settled principles and rules, with power, however, to treat the united parishes as one for certain purposes. Out- door relief might be given, on the order of two justices, to poor persons wholly unable to work from old age or infirmity. The obstacles which the act had to contend with in London

chiefly arose from the confusion and perplexity of jurisdiction which existed in the one hundred and seventy parishes com- prised within the city of London and the metropolitan district, some of these containing governing bodies of their own ; in some the parish business was professedly managed by open vestries, in others by select vestries, and in addition to these there were elective vestries, while the

majority of the large parishes were managed under local acts by boards of directors, governors and trustees. These governing bodies executed a great variety of functions besides regulating the management of the poor. The power, patronage and the indirect advantages which arose from the administration of the local funds were so great that much opposition took place when it was proposed to interfere by constituting a board to be annually chosen and freely elected by the ratepayers, on which the duty of regulating the expenditure for the relief of the poor was to depend. The general management of the poor was, however, on a somewhat better footing in London than in the country.

The act of 1834 was rather to restore the scope and intention of the statute of Elizabeth by placing its administration in the hands of responsible persons chosen by the ratepayers, and themselves controlled by the orders of a central body, than to create a new system of poor laws. The agents and instruments by which the administration of relief is afforded are the fol- lowing. The description applies to the year 1010, but, as noticed below, the question of further reform was already to the fore, and the precise direction in which changes should go was a highly controversial matter.

The guardians of the poor regulate the cases and description of relief within the union; a certain number of guardians are elected from time to time by the ratepayers. The number was formerly determined by the central board, 1 by whom full directions as to the mode of election were given. In addition to those elected there were ex officio guardians, principally local magistrates. However, both these and nominated guardians were done away with by the Local Government Act 1894. The plural vote (which gave to the votes of the larger ratepayers a higher value) was also abolished; and in place of the old property qualification for the office of guardian a ratepaying or residential qualification was sub- stituted. In urban districts the act in other respects left the board of guardians untouched, but in rural districts it inaugu- rated a policy of consolidating l6cal authorities. In the rural districts the district council is practically amalgamated with the guardians, for, though each body retains a separate corporate existence, the district councillors are the guardians, and guar- dians as such are no longer elected. These electoral changes, extremely democratic in their character, brought about no marked general change in poor law administration. Here and there abrupt changes of policy were made, but the difficulty of bringing general principles to bear on the administration of the law remained much as before.

The guardians hold their meetings frequently, according to the

exigencies of the union. Individual cases are brought to their notice—most cases of resident poor by the relieving officer of the union; the case of casual paupers by him or by the work- house officers by whom they were admitted in the first instance. The resident poor frequently appear in person before the guar- dians. The mode of voting which the guardians follow in respect to any matter they differ on is minutely regulated, and all their proceedings, as well as those of their officers, are entered in pre- scribed books and forms. They have a clerk, generally a local solicitor of experience, who has a variety of responsible duties in advising, conducting correspondence and keeping books of

1 After an intermediate transfer in 1847 of the powers of the poor law commissioners, and the constitution of a fresh board styled ” commissioners for administering the laws for relief of the poor in England,” it was found expedient to concentrate in one department of the government the supervision of the laws relating to the public health, the relief of the poor and local government; and this concentration was in 1 87 1 carried out by the establishment (by Act of Parliament 34 & 35 Vict. c. 70) of the local government board.

accounts, and carrying out the directions of the guardians, who in their turn are subject to the general or special regulations of the local government board.

It may be mentioned here that the chief difficulty in under- standing the English poor law arises from the fact that there are three authorities, each of them able to alter its administration fundamentally. The poor law is not only the creation of statutes passed by parliament; it is also controlled by the subordinate jurisdiction of the local government board, which in virtue of various acts has the power to issue orders. In a single year the local government board may issue nearly two thousand orders, over a thousand of them having special reference to the poor law. It is not possible therefore even to summarize the mass of subordinate legislation. A third source of authority is the local board of guardians, which, within the discretion allowed to it by statutes and orders, can so variously administer the law that it is difficult to understand how procedure so fundamentally different can be based on one and the same law. This elasticity, admirable or mischievous, as we choose to regard it, is the most characteristic feature of the English poor law system. The various officers of the union, from the medical officers to workhouse porters, including masters and matrons of workhouses, are generally appointed by the guardians, and the areas, duties and salaries of all the paid officers may be prescribed by the local government board.

Among a multitude of miscellaneous duties and powers of the guardians, apart from the ordinary duties of ordering ‘or refusing relief in individual cases and superintending the officers of the union, the duties devolve on them of considering the adjustment of contributions to the common fund whether of divided or added

parishes, and matters affecting other unions, the building of workhouses and raising of money for that and other purposes, the taking of land on lease, the hiring of buildings, special provisions as to superannuation and allowances to officers, the maintenance and orders as to lunatics apart from individual instances, and the consideration of questions of settlement and removal. A paramount obligation rests on the guardians to attend to the actual visitation of workhouses, schools and other institutions and places in which the poor are interested, and to call attention to and report on any irregularity or neglect of duty. Guardians may charge the rates with the expenses of attending conferences for the discussion of matters con- nected with their duties (Poor Law Conferences Act 1883). In relation to expenditure the guardians have very considerable but restricted powers. Their accounts are audited by district auditors appointed by the local government board.

Overseers of the poor are still appointed under the statute of Elizabeth, and the guardians cannot interfere with the ap- _ pointment. As, however, the relief of the poor is

administered by boards of guardians, the principal duties of overseers relate to the making and collection of rates and payments. The guardians, by order of the local govern- ment board, may appoint assistant overseers and collectors.

The conditions of persons entitled to relief are indicated by the terms of the statute of Elizabeth. If they fall within the definitions there given they have right to relief. of Relief. A fundamental principle with respect to legal relief of the poor is that the condition of the pauper ought to be, on the whole, less eligible than that of the independent labourer. The pauper has no just ground for complaint, if, while his physical wants are adequately provided for, his condition is less eligible than that of the poorest class of those who contribute to his support. If a state of destitution exists, the failure of third persons to perform their duty, as a husband, or relative mentioned in the statute of Elizabeth, neglecting those he is under a legal obligation to support, is no answer to the application. The relief should be afforded, and is often a condition precedent to the right of parish officers to take proceedings against the relatives or to apply to other poor unions. The duty to give immediate relief must, however, vary with the circumstances. The case of wanderers under circumstances not admitting of delay may be different from

that of persons resident on the spot where inquiry as to all the circumstances is practicable. The statute of Elizabeth con- templated

that the relief was to be afforded to the poor resi- dent in the parish, but it is contrary to the spirit of the law that any person shall be permitted to perish from starvation or want of medical assistance. Whoever is by sudden emergency or urgent distress deprived of the ordinary means of subsistence has a right to apply for immediate relief where he may happen to be. Persons comprehended within this class are called ” casual poor,” although the term ” casuals ” is generally used in reference to vagrants who take refuge for a short time in the ” casual wards ” of workhouses. Various tests are applied to ascertain whether applicants are really destitute. Labour tests are applied to the able-bodied, and workhouse tests are applied to those to whom entering a workhouse is made a condition of relief.

As to the nature and kind of relief given under the poor laws the great distinction restored rather than introduced by the amendment of the poor law system in 1834 was Nature and giving all relief to able-bodied persons of their Kind of families in well-regulated workhouses (that is to * e/fc/ – say, places where they may be set to work according to the spirit and intention of the statute of Elizabeth), and confining outdoor relief to the impotent — that is, all except the able-bodied and their families. Although workhouses formed a conspicuous feature in legislation for the poor from an early period, the erection of those buildings for unions throughout the country where not already provided followed immediately on the amendment of the system in 1834. Since that time there has been a constant struggle between the pauper class and the administrators of the law, the former naturally wishing to be relieved at their own homes, and in many instances choosing rather to go without aid than to remove within the walls of the workhouse. Relief given in a workhouse is termed ” in (or indoor) maintenance ” relief, and when given at the homes of the paupers is termed ” outdoor relief.”

Admission to a workhouse may be by a written order of the board of guardians, or by the master or matron (or in their absence by the porter) without an order in any case of sudden ‘

or urgent necessity, or provisionally by a relieving Workhouse officer, or overseer or churchwarden. Any person who Ku ‘ es * is brought by a policeman as having been found wandering in a state of destitution may be admitted. It is to be observed generally, with respect to all persons who may apply for admission into the workhouse under circumstances of urgent necessity, that their destitution, coupled with the fact of being within the union or parish, entitles them to relief, altogether independently of their settlement, if they have one, which is a matter for subsequent inquiry.

The regulations for the government of workhouses fall under two classes: (1) those which are necessary for the maintenance of good order in any building in which considerable numbers of persons of both sexes and of different ages reside; (2) those which are necessary in order that these establishments may not be alms- houses, but workhouses in the proper meaning of the term.

The inmates of a workhouse are necessarily separated into certain classes. In no well-managed institution o£ this sort, in any country, are males and females, the old and the young, the healthy and the sick, indiscriminately mixed together. Guardians are required to divide the paupers into certain classes, and to subdivide any one or more of these classes in any manner which may be advisable, and which the internal arrangements of the workhouse admit; and the guardians are required from time to time, after consulting the medical officer, to make necessary arrangements with regard to per- sons labouring under any disease of body or mind, and, so far as cir- cumstances permit, to subdivide any of the enumerated classes with reference to the moral character or behaviour or the previous habits of the inmates, or to such other grounds as may seem expedient.

The separation of married couples was long a vexed question, the evils on the one hand arising from the former unrestricted practice being very great, while on the other hand the separation of old couples was felt as a great hardship, and by express statutory pro- vision in 1847 husband and wife, both being above the age of sixty, received into a workhouse cannot be compelled to live separate and apart from each other (10 & 11 Vict. c. 109, § 23). This exemption was carried somewhat further by contemporaneous orders of the board, under which guardians were not compelled to separate infirm couples, provided they had a sleeping apartment separate from that of other paupers; and in 1876 guardians were empowered, at their discretion, to permit husband and wife where either of them is

infirm, sick or disabled by any injury, or above sixty years of age to live together, but every such case must be reported to the local government board (39 & 40 Vict. c. 61, § 10).

The classification of children apart from adult paupers is per- emptory. Even in those unions where what is called a workhouse school is maintained the children are kept in detached parts of the

building, and do not associate with the adult paupers. The separate school is built on a separate and often distant site. Some- times the separate school is one building, sometimes detached " blocks," and sometimes a group of cottage homes. There still remain ten district schools. In some places an experiment which is called the scattered homes system has been adopted. This consists in lodging-homes for the children placed in different parts of the town, from which the children attend the local public ele- mentary schools. In the rural districts and in less populous unions the children generally attend the local public elementary school. To these expedients boarding-out must be added. The above refers of course only to those children who as inmates are under the charge of the guardians. Outdoor paupers are responsible for the education of their children, but guardians cannot legally continue outdoor relief if the children are not sent regularly to school.

The tendency too has been to improve administrative methods with reference to children.

Two important orders on the subject of the boarding-out of poor- law children were issued in 1889. By the Boarding of Children in Unions Order, orphan and deserted children can be boarded out with suitable foster-parents in the union by all boards of guardians except those in the metropolis. This can be done either through a voluntary committee or directly. By the Boarding Out Order, orphan and deserted children may be boarded out by all boards of guardians without the limits of their own unions, but in all cases this must be done through the offices of properly constituted local boarding-out committees. The sum payable to the foster-parents is not to exceed 4s. per week for each child. The local committee require to be approved by the Local Government Board.

The question of the education of poor law children was much discussed in later years. During the early years of the central authority, it was the object of the commissioners to induce boards of guardians to unite in districts for educational purposes. This was advocated on grounds of efficiency and economy. It was very unpopular with the local authorities, and the number of such districts has never exceeded a dozen. In London, where this aggregation was certainly less desirable than in rural unions, several districts were formed and large district schools were built. Adverse criticism, by Mrs Nassau Senior in 1874, and by a department committee appointed twenty years later, was directed against these large, or, as they are invidiously called, barrack schools. The justice of this condemnation has been disputed, but it seems probable that some of these schools

had grown too large. Many of these have been dissolved by order of the local government board on the application of the unions concerned. This con- demnation of some schools has in certain quarters been extended to all schools, and is construed by others as an unqualified recommendation of boarding out, a method of bringing up poor law children obviously requiring even more careful supervision than is needed in the publicity of a school.

Other acts to be noted are the Poor Law Act 1889 and the Custody of Children Act 1 891, § 3. The evil of allowing children who have been reputably brought up in poor law schools to relapse into vicious habits on return to the custody of unworthy parents has been the subject of frequent remark. By the act of 1889, guardians are authorized to detain children who are under their charge, as having been deserted by their parents, up to the age of 16 if boys and of 18 if girls. By the Poor Law Act 1899 the principle is extended to orphans and the children of bad parents chargeable to the rates. The act of 1 89 1 goes further, and enacts that where a parent has (a) abandoned or deserted his child, or (6) allowed his child to be brought up by another person at that person's expense, or by the guardians of a poor law union for such a length of time and in such circumstances as to satisfy the court that the parent was unmindful of his parental duties, the court shall not make an order for the delivery of the child to the parent unless the parent has satisfied the court that, having regard to the welfare of the child, he is a fit person to have the custody of the child.

Casual and poor wayfarers admitted by the master and matron are kept in a separate ward and dieted and set to work in such manner as the guardians by resolution direct; and whenever any vagrants or mendicants are received into a workhouse they are usually (as a precaution necessary for preventing the introduction of infectious or contagious diseases) kept entirely separate from the other inmates, unless their stay exceeds a single night.

For the guidance of guardians an important circular was issued from the local government board on the 15th of March 1886. It stated that while " the board have no doubt that the powers which the guardians possess are fully sufficient to enable them to deal with ordinary pauperism, and to meet the demand for relief from the classes who usually seek it," yet " these provisions do not in all cases meet the emergency. What is required to relieve artisans and others who have hitherto avoided poor law assistance, and who

are temporarily deprived of employment, is — (1) Work which will not involve the stigma of pauperism; (2) work which all can per- form,

whatever may have been their previous occupations; (3) work which does not compete with that of other labourers at present in employment; and lastly, work which is not likely to interfere with the resumption of regular employment in their own trades by those who seek it.”

The circular went on to recommend that guardians should confer with the local authorities, ” and endeavour to arrange with the latter for the execution of works on. which unskilled labour may be immediately employed.” The conditions of such work were

(1) the men to be employed must be recommended by the guardians;

(2) the wages must be less than the wages ordinarily paid for such work.

The circular was widely distributed. Many boards that were inclined in that direction regarded it as an encouragement to open or to promote the opening of relief works. Others, again, looked closely at the conditions, and declared roundly that it was impos- sible to fulfil them. A poor law authority, they said, cannot give relief which will not subject the recipients to the legal (if any) and economic disabilities attaching to the receipt of poor law relief. Work which all can perform can only be found in the shape of task-work under adequate supervision. If the work is of a useful and necessary character, it must compete with the labour of others belonging to the trades affected. If the relief works are opened by authorities other than the poor law guardians, the conditions that the men were only to be employed when recommended by the guardians, and then paid less than the current rate of wages, were calculated, it was urged, to secure bad work, discontent, and all the ” stigma of pauperism.” The ambiguity of the circular indeed was such, that both action and inaction seem amply justified by it.

In the administration of medical relief to the sick, the objects kept in view are: (1) to provide medical aid for persons who are really destitute, and (2) to prevent medical relief from „ generating or encouraging pauperism, and with this Relief view to withdraw from the labouring classes, as well as from the administrators of relief and the medical officers, all motives for applying for or administering medical relief, unless where the circumstances render it absolutely necessary.

Unions are formed into medical districts limited in area and population, to which a paid medical officer is appointed, who is

furnished with a list of all such aged and infirm persons and persons permanently sick or disabled as are actually receiving relief and residing within the medical officer's district. Every person named in the list receives a ticket, and on exhibiting it to the medical officer is entitled to advice, attendance and medicine as his case may require. Medical outdoor relief in connexion with dispen- saries is regulated in asylum districts of the metropolis by the Metropolitan Poor Act 1867 (30 & 31 Vict. c. 6). In connexion with medical relief must be noted the Medical Relief Disqualifica- tion Removal Act 1885. This act relieved voters from disquali- fication which would otherwise attach in consequence of the receipt by them or their families of medical or surgical assistance, or of medicine, at the expense of the poor rate. This does not apply to guardian elections, and it does not include persons who, in addition to medical relief, receive nourishment or other relief from the poor rate. The provisions which require the removal of the names of paupers from the electoral roll are, it is understood, very perfunctorily carried out. The Outdoor Relief Friendly Societies Act 1894 authorized guardians, in calculating the proper allowance to be made, to disregard an income derived from a friendly society, and to give relief as if the applicant in receipt of such an allowance was wholly destitute. This act is a curious illustration of the English poor law system. In earlier years, notably in what is known as Paget's letter (22nd Rep. Poor Law Board, p. 108), the central board, had, in answer to inquiry, pointed out that such preferential treatment given to men receiving benefit, insufficient to maintain them, from a friendly society, could not in equity be withheld from persons in receipt of an adequate benefit, or from those whose savings took the form of a deposit in a bank, of a share in a co-operative society, or of cottage property; and further, that an engagement on the part of guardians to supplement insufficient allowance from a friendly society was a bounty on inadequate and insolvent friendly society finance. The central board went so far as to say that relief given in such disregard of the pauper's income was illegal. They had, however, issued no peremptory order on the subject, nor had guardians been surcharged for neglect of the rule. The local authorities followed their own discretion, and a very general practice was to reckon friendly society allowances at half their value. The above act set aside the central board's earlier interpretation of the law. It -made, however, no attempt to enforce its procedure on the numerous boards of guardians who regard the course thereby authorized as contrary to public policy.

A lunatic asylum is required to be provided by a county or borough for the reception of pauper lunatics, with a committee of visitors who,

among other duties, fix a weekly sum to , ana tics be charged for the lodging, maintenance, medicine and clothing of each pauper lunatic confined in such asylum. Several acts were passed. The Lunacy Act 1890 consolidated the acts affecting lunatics. It was further amended by the Lunacy Act 1891.

An explanatory letter issued by the local government board will be found in the 20th Annual Report, p. 23. The tendency of this and of all recent legislation for an afflicted class has been to increase the care and the safeguards for their proper treatment.

A settlement is the right acquired in any one of the modes pointed out by the poor laws to become a recipient of the benefit of those laws in that parish or place where the right has been last acquired.

No relief is given from the poor rates of a parish to any person who does not reside within the union, except where such person The Ques- being casually within a parish becomes destitute by tioa ot sudden distress, or where such person is entitled to

•‘Settle’ receive relief from any parish where non-resident meat.” under justice’s order (applicable to persons under

orders of removal and to non-resident lunatics), and except to widows and legitimate children where the widow was resident with her husband at the time of his death out of the union in which she was not settled, or where a child under sixteen is maintained in a workhouse or establishment for the education of pauper children not situate in the union, and in some other exceptional cases.

Immediately before the passing of the Poor Law Amendment Act 1834 settlements were acquired by birth, hiring and service, apprenticeship, renting a tenement, estate, office or payment of rates. In addition to these an acknowledgment (by certificate), by relief or acts of acquiescence) has practically the effect of a settle- ment, for, if unexplained, such an acknowledgment stops the parish from disputing a settlement in the parish acknowledging. The Poor Law Amendment Act 1834 abolished settlement by hiring and service (or by residence under it) and by serving an office, and by apprenticeship in the sea service. Moreover the guardians of a union might agree (subject to the approval of the commissioners) that all the parishes forming it should for the purposes of settle- ment be considered as one parish.

It is to be observed that, for the purposes of relief, settlement and removal and burial, the workhouse of any parish is considered as situated in the parish to which each poor person is chargeable.

There may be a settlement by parentage, for legitimate children take the settlement of their father, or if he has no settlement they are entitled to the settlement of their mother; and it is only when both these sources fail discovery that their right of settlement by birth accrues; for until the settlement of the father or mother has been ascertained the settlement of a legitimate child, like that of a bastard, is in the place where the birth took place.

A settlement attaches to those persons who have a settlement of some kind. Foreigners born out of the country and not acquiring any in one of the modes pointed out must be provided for, if requiring relief, where they happen to be.

As the burden of maintaining the poor is thrown on the parish of settlement, when the necessity for immediate relief arises in another parish, the important question arises whether the pauper can be removed ; for, although the parish where the pauper happens to be must afford immediate relief without waiting for removal, the parish of settlement cannot in general be charged with the cost unless the pauper is capable of being removed. The question of removability is distinct from settlement. A pauper often acquires a status or irremovability without gaining a settlement.

Irremovability is a principle of great public importance quite irrespective of the incident of cost as between one parish or another. Before the introduction of a status of irremovability removal might take place (subject to powers of suspension in case of sickness and otherwise) after any interval during which no legal settlement was obtained ; mere length of residence without concurrent cir-cumstances involving the acquisition of a settlement on obtaining relief gave no right to a person to remain in the parish where he resided.

In 1846 it was enacted that no person should be removed nor any warrant granted for the removal of any person from any parish in which such persons had resided for five years (9 & 10 Vict. c. 66). In 1861 three years was submitted for five (24 & 25 Vict. c. 55); and only four years later one year was substituted for three (28 & 29 Vict. c. 79). Apart from these reductions of time in giving the status of irremovability, actual removals to the parish of settle-, ment were narrowed by provisions giving to residence in any part of a union the

same effect as a residence in any parish of that union (24 & 25 Vict. c. 55). On the other hand the time during which parish relief is received, or during which the person is in any poorhouse or hospital or in a prison, is excluded from the computa- tion of time (9 & 10 Vict. c. 66).

The removability as well as the settlement of the family, i.e. of the wife and unemancipated children, are practically subject to one and the same general rule. Wherever any person has a wife or children having another settlement, they are removable where he is removable, and are not removable from any parish or place from which he is not removable (n & 12 Vict. c. 211).

It is to be borne in mind that no person exempted from liability to be removed acquires, by reason of such exemption, any settle- ment in any parish ; but a residence for three years gives a qualified settlement (39 & 40 Vict. C. 61).

The cost of relief of paupers rendered irremovable is borne by the common fund of the union (11 & 12 Vict. c. no, § 3) as union expenses (§ 6), and any question arising in the union with reference to the

charging relief may be referred to and decided by the local govern- ment board (§4).

The poor rate is the fund from which the cost of relief is princi- pally derived. The statute of Elizabeth (extended in some respects as to places by 13 & 14 Charles II. c. 12) embraced „ „ . two classes of persons subject to taxation — occupiers oor ˆ e – of real property and inhabitants in respect of personal property, although the rateability under the latter head was reluctantly conceded by the courts of law, and was in practice only partially acted upon.

As regards occupiers of land and houses, the correct principles as to the persons liable to be rated were, after many erroneous views and decisions, established by the House of Lords in 1865 in the case of the Mersey docks. The only occupier exempt from the operation of the act of Elizabeth is the Crown, on the general prin- ciple that such liabilities are not imposed on the sovereign unless expressly mentioned, and that principle applies to the direct and immediate servants of the Crown, whose occupation is the occupa- tion of the Crown itself. If there is a personal private beneficial occupation, so that the occupation is by the subject, that occupa- tion is rateable. Thus for apartments in a royal palace, gratui- tously assigned to a subject, who occupies them by permission of the sovereign but for the subject's benefit, the latter is rateable; on the other hand, where a

lease of private property is taken in the name of a subject, but the occupation is by the sovereign or his subjects on his behalf, no rate can be imposed.

So far the ground of exemption is perfectly intelligible, but it has been carried a good deal further, and applied to many cases in which it can scarcely be said naturally, but only theoretically, that the sovereign or the servants of the sovereign are in occupation. A long series of cases have established that when property is occu- pied for the purposes of the government of the country, including under that head the police, and the administration of justice, no one is rateable in respect of such occupation. And this applies not only to property occupied for such purposes by the servants of the great departments of state and the post office, the Horse Guards, and the Admiralty, in all which cases the occupiers might strictly be called the servants of the Crown, but to county buildings occupied for the assizes and for the judge's lodgings, to stations for the local constabulary, to jails and to county courts where undertakings are carried out by or for the government and the government is in occupation; the same principles of exemption have been applied to property held by the office of works.

When the property is not de facto occupied by the Crown or for the Crown, it is rateable; and, although formerly the uses of property for public purposes, even where the Crown was not constructively interested in the way above pointed out, was treated as a ground for exemption, it is now settled that trustees who are in law the tenants and occupiers of valuable property in trust for public and even charitable purposes, such as hospitals or lunatic asylums, are in principle rateable notwithstanding that the buildings are actually occupied by paupers who are sick or insane, and that the notion that persons in the legal occupation of valuable property are not rateable if they occupy in a merely fiduciary character cannot be sustained.

With respect to the particular person to be rated where there is a rateable occupation, it is to be observed that the tenant, as dis- tinguished from the landlord, is the person to be rated under the statute of Elizabeth ; but occupiers of tenements let for short terms may deduct the poor rate paid by them from their rents, or the vestries may order such owners to be rated instead of the occupiers ; such payments or deductions do not affect qualification and fran- chises depending on rating (Poor Rate Assessment and Collection Act 1869 and Amendment Act 1882).

To be rated the occupation must be such as to be of value, and in this sense the word beneficial occupation has been used in many cases. But

it is not necessary that the occupation should be bene- ficial to the occupier; for, if that were necessary, trustees occupying for various purposes, having no beneficial occupation, would not be liable, and their general liability has been established as indicated in the examples just given.

As to the mode and amount of rating it is no exaggeration to say that the application of a landlord-and-tenant valuation in the terms already given in the Parochial Assessment Act, with the deductions there mentioned, has given rise to litigation on which millions of pounds have been spent with respect to the rating of railways alone, although the established principle applied to them, after much consideration, is to calculate the value of the land as increased by the line.

The Parochial Assessment Act referred to (6 & 7 Will. IV. c. 96), comprising various provisions as to the mode of assessing the rate so far as it authorized the making of a valuation, was repealed in 1869, in relation to the metropolis, and other provisions made for securing uniformity of the assessment of rateable property there (32 & 33 Vict. c. 67).

The mode in which a rate is made and recovered may be concisely stated thus. The guardians appoint an assessment committee of their body for the investigation and supervision of valuations, which are made out in the first instance by the overseers according to specific regulations and in a form showing among other headings the gross

estimated rental of all property and the names of occupiers and owners, and the rateable value after the deductions specified in the Assessment Act already mentioned, and as prescribed by the central board. This valuation list, made and signed by the overseers, is published, and all persons assessed or liable to be assessed, and other interested parties, may, including the officers of other parishes, inspect and take copies of and extracts from that list. A multitude of provisions exist in relation to the valuation and supplemental valuation lists. Objections on the ground of unfairness or incorrect- ness are dealt with by the committee, who hold meetings to hear and determine such objections. The valuation list, where approved by the committee, is delivered to the overseers, who proceed to make the rate in accordance with the valuation lists and in a prescribed form of rate book. The parish officers certify to the examination and

comparison of the rate book with the assessments, and obtain the consent of justices as required by the statute of Elizabeth. This consent or allowance of the rate is merely a ministerial act, and if the rate is good on the face of it the justices cannot inquire into its validity.

The rate is then published and open to inspection. Appeals may be made to special or quarter sessions against the rate, subject to the restriction that, if the objection were such that it might have been dealt with on the valuation lists, no appeal to sessions is permitted unless the valuation list has been duly objected to and the objector had failed to obtain such relief in the matter as he deemed to be just. In the metropolis a common basis of value for the purposes of government and local taxation is provided, including the promotion of uniformity in the assessment of rateable property. Provision is made for the appointment of an assessment committee by guardians or vestries, and for the preparation of valuation lists, and the deposit and distribution of valuation lists, and for the periodical revision of valuation lists.

Many endeavours have been made to readjust the burden of local expenditure. The system of making grants from the national taxes in aid of local rates has been extended. The principle of the metropolitan common poor fund, a device for giving metropolitan grants assessed on the whole of London in aid of the London local poor law authorities, has been followed, mutatis mutandis, in the relations between the national and the local exchequers. At the time of the repeal of the corn laws, Sir Robert Peel expressed an opinion that this fiscal change necessitated some readjustment of local rates. In that year, 1846, a beginning of grants from the national exchequer in aid of local expenditure was made. The salaries of poor-law teachers, medical officers and auditors were provided from the larger area of taxation, and in 1867 the salaries of public vaccinators were added to the list. In 1874 a grant of 4s. per head per week was made for each pauper lunatic passed by the guardians to the care of a lunatic asylum. By the Local Government Act 1888, supplemented by the Local Taxation (Customs and Excise) Act 1890, this principle was more widely extended. The various grants in aid were abolished, and in substitution the proceeds of certain specified taxes were set aside for local purposes. From this source, the gross amount of which of course varies, there are now distributed to local poor-law authori- ties some 4s. a week for lunatics in asylums, and allowances based on their average expenditure in previous years in salaries of officials and other specified charges. In London, in order not to conflict with the operation of the common poor fund, which had already spread these charges over a wide area, the grant takes the form of a sum equivalent

to about 4d. per diem for each indoor pauper. The number on which this calculation is based is not, however, to be the actual number, but the average of the last five years previous to the passing of the act. By this legislation something like one- quarter of the total expenditure on* poor law relief is obtained from national taxes as opposed to local rates. By the Agricultural Rates Act 1896 the occupier of agricultural land was excused one-half of certain rates, including the poor rate. The deficiency is supplied by a contribution from the national exchequer. Meanwhile, the spending authority continue to be elected by the local ratepayers. In this connexion two further anomalies deserve notice. By the Poor Rate Assessment and Collection Act 1869 owners who compound to pay the- rates in respect of tenement property are entitled to certain deductions by way of commission. Such payments by the owner are constructively payments by the occupier, who thereby is to be deemed duly rated for any qualification or franchise. Under these arrangements a large number of electors do not contribute directly to the rate. A converse process is also going on, whereby the ownership of an important and increasing body of property is practically unrepresented. This is due to the great growth of property in the hands of railway companies, docks and limited liability companies generally. The railways alone are said to pay considerably over 13% of the local taxation of the country, and they have no local representation. There is, in fact, in local administration a divorce between repre- sentation and taxation to a greater extent than is generally supposed, and it is impossible not to connect the fact with the rapid growth of local expenditure and indebtedness.

Royal Commission of iqos-iqoq. — The main points of the system of English poor relief, as still in force in 1910, are as

outlined above. That it has been inadequate in dealing with the various problems of unemployment and pauperism, which the constantly changing conditions of the industrial world necessarily evolve had however been long acknowledged. Accordingly in 1905 a royal commission was appointed to inquire into the working of the law relating to the relief of poor persons, and into the various means adopted outside of the poor laws for meeting distress arising from want of employment, particularly during the periods of severe industrial depression. The commis- sion took voluminous evidence 1 and its report was issued in 1 The appendix volumes to the Report of the Royal Commission number thirty-four. Their contents are as follows- vol. i. English Official Evidence, minutes of evidence mainly of the officers of the Local Government Board for England and Wales; vol. ii. London Evidence, minutes of evidence mainly of London

witnesses; vol. iii. Associations and Critics, minutes of evidence mainly of critics of the Poor Law and of witnesses representing Poor Law and Charitable Associations; vol. iv Urban Centres, minutes of evidence containing the oral and written evidence of the British Medical Association and of witnesses from the following provincial urban centres — Liverpool and Manchester districts, West Yorkshire, Midland Towns; vol. v. Minutes of Evidence containing the oral and written evidence of witnesses from urban centres in the following districts — South Wales and North Eastern Counties; vol. vi. Minutes of Evidence relating to Scotland; vol. vii. Minutes of Evidence containing the oral and written evidence of witnesses from various rural centres in the South Western, Western and Eastern Counties, from the parish of Poplar Borough and from the National Con- ference of Friendly Societies; vol. viii. Minutes of Evidence con- taining the oral and written evidence of witnesses relating chiefly to the subject of ” unemployment “; vol. ix. Evidence of further witnesses on the subject of unemployment; vol. x. Minutes of Evidence relating to Ireland ; vol. xi. Miscellaneous Papers. Com- munications from Boards of Guardians and others, &c, vol. xii. Reports, Memoranda and Tables prepared by certain of the Commissioners; vol. xiii. Diocesan Reports on the Methods of administering charitable assistance and the extent and intensity of poverty in England and Wales; vol. xiv. Report on the Methods and Results of the present system of administering indoor and outdoor poor law medical relief in certain unions in England and Wales, by Dr J. C. McVail; vol. xv. Report on the Administrative Relation of Charity and the Poor Law, and the extent and the actual and potential utility of Endowed and Voluntary Charities in England and Scotland, by A. C. Kay and H. V. Toynbee; vol. xvi. Reports on the Relation of Industrial and Sanitary Conditions to Pauperism, by Steel Maitland and Miss R. E. Squire; vol. xvii. Reports on the effect of Outdoor Relief on Wages and the Conditions of Employment, by Thomas Jones and Miss Williams; vol. xviii. Report on the Condition of the Children who are in receipt of the various forms of Poor Law Relief in certain Unions in London and in the Provinces, by Dr Ethel Williams and Miss Longman and Miss Phillips; vol. xix. Reports on the Effects of Employment or Assistance given to the Unemployed since 1886 as a means of relieving distress outside the Poor Law in London, and generally throughout England and Wales, and in Scotland and Ireland, by Cyril Jackson and Rev. J. C. Pringle; vol. xx. Report on Boy Labour in London and certain other typical towns, by Cyril Jackson, with a Memorandum from the General Post Office on the Conditions of Employment of Telegraph Messengers; vol. xxi. Reports on the Effect of the Refusal of Out-Relief on the Applicants for such Relief, by Miss G. Harlock; vol. xxii. Report on the Overlapping of the work of

the Voluntary General Hospitals with that of Poor Law Medical Relief in certain districts of London, by Miss M. B. Roberts; vol. xxii;. Report on the Condition of the Children who are in receipt of the various forms of Poor Law Relief in certain parishes in Scotland, by Dr C. T. Parsons and Miss Longman and Miss Phillips; vol. xxiv. Report on a Comparison of the Physical Condition of ” Ordinary ” Paupers in certain Scottish Poorhouses with that of the Able-bodied Paupers in certain English Workhouses and Labour Yards, by Dr C. T. Parsons; vol. xxv. Statistical Memoranda and Tables relating to England and Wales, prepared by the Staff of the Commission and by Government Departments and others, and Actuarial Reports; vol. xxvi. Documents relating more especially to the administration of charities; vol. xxvii. Replies by Distress Committees in England and Wales to Questions circulated on the subject of the Unemployed Workmen Act 1905 ; vol. xxviii. Reports of Visits to Poor Law and Charitable Institutions and to Meetings of Local Authorities in the United Kingdom; vol. xxix. Report on the Methods of Administering Charitable Assistance and the extent and intensity of Poverty in Scotland, prepared by the Committee on Church Interests appointed by the General Assembly of the Church of Scotland ; vol. xxx. Documents relating especially to Scotland ; vol. xxxi. Statistical Memoranda and Tables relating to Ireland, &c. ; vol. xxxii. Report on Visits paid by the Foreign Labour Colonies Committee of the Commis- sion to certain Institutions in Holland, Belgium, Germany and Switzerland; vol. xxxiii. Foreign and Colonial Systems of Poor

1909. It consists jf a majority report, signed by the chairman and 13 other members, and a minority report signed by 4 dis- sentient members. To this report and its appendices those who wish to obtain an exhaustive account of the working of the English poor law must necessarily have recourse.

The ” majority ” report opens with a statistical survey of poor law problems, gives an historical sketch of the poor laws Majority down to 1834, and proceeds to deal in detail with Report. thg historical development and present condition of the various branches of the poor law under their appro- priate headings: (a) the central authority; (b) the local authority; (c) the officers of the local authority; (d) areas of administration; (e) indoor relief; (/) outdoor relief; (g) the aged; ih) the children; (i) the able-bodied under the poor law and (7) the causes of pauperism. Other portions of the report deal with medical relief,

distress due to unemployment, and charities and the relief of distress. In reviewing these various subjects the commission lay bare the main defects of the present system, which they briefly summarize as follows: —

i. The inadequacy of existing poor law areas to meet the growing needs of administration.

ii. The excessive size of many boards of guardians.

iii. The absence of any general interest in poor law work and poor law elections, due in great part to the fact that poor lav/ stands in no organic relation to the rest of local govern- ment.

iv. The lack of intelligent uniformity in the application of principles and in general administration.

v. The want of proper investigation and discrimination in dealing with applicants.

vi. The tendency in many boards of guardians to give out- door relief without plan or purpose.

vii. The unsuitability of the general workhouse as a test or deterrent for the able-bodied; the aggregation in it of all classes without sufficient classification; and the absence of any system of friendly and restorative help.

viii. The lack of co-operation between poor law and charity.

ix. The tendency of candidates to make lavish promises of out-relief and of guardians to favour their constituents in its distribution.

x. General failure to attract capable social workers and leading citizens.

xi. The general rise in expenditure, not always accompanied by an increase of efficiency in administration.

xii. The want of sufficient control and continuity of policy on the part of the central authority.

The commission stated that these defects have produced a want of confidence in the local administration of the poor law, and that they have been mainly the cause of the introduction of other forms of relief from public funds which are unaccom- panied by such conditions as

are imperatively necessary as safeguards.

The commission proceed to formulate a scheme of reform, the main features of which are summarized below: —

Public Assistance. — The commissioners state that the name ” poor law ” has gathered about it associations of harshness, and still more of hopelessness, which might seriously obstruct the reforms they recommend, and they suggest that the title ” public assistance ” better expresses the system of help outlined in their report. They propose the abolition of the existing boards of guardians, the separation of their duties into two categories, and the calling into existence of two bodies for the discharge of the two sets of functions, viz. a local authority, known as the public assistance authority, with an area conterminous with the area of the county or county borough, for central administration and control; and local committees in existing union area.- for dealing with applications, investigating and supervising cases and under- taking such other duties as may be delegated by the public assistance authority. They recommend that the public assistance authority should be a statutory committee of the County Council, with one-half of its members appointed by the council from persons who are members of the council, and the other half of its members appointed by the council from outside their number, and to consist of persons experienced in the local administration of public assistance or

Relief, with a memorandum on the Relief of Famines in India; vol. xxxiv. Alphabetical Lists of Oral and Non-oral Witnesses.

other cognate work, women to be eligible for appointment in either case.

Working in co-operation with the public assistance authorities are to be voluntary aid councils and committees (the former super- vising, the latter executive) for aiding persons in distress whose cases do not appear to be suitable for treatment by the public assistance committee. The commission epitomize what they consider to be the main principles of a reformed poor law. They are (1) that the treatment of the poor who apply for public assistance should be adapted to the needs of the individual, and, if institutional, should be governed by classification; (2) that the public adminis- tration established for the assistance of the poor should work in co-operation with the local and private charities of the district; (3) that the system of public assistance thus established should include processes of help which would be preventive, curative, and restorative, and (4) that

every effort should be made to foster the instincts of independence and self-maintenance amongst those assisted. They proceed to recommend : —

Indoor or ” Institutional ” Relief. — That general workhouses should be abolished. That indoor relief should be given in separate institutions appropriate to the following classes of applicants, viz. (a) children, (b) aged and infirm, (c) sick, (d) able-bodied men, (e) able-bodied women, (/) vagrants, and (g) feeble-minded and epileptics. Powers of removal to and detention in institutions should be given, with proper safeguards, to the public assistance authority. The treatment of inmates should be made as far as possible curative and restorative.

Outdoor Relief or ” Home Assistance.” — This should be given only after thorough inquiry, except in cases of sudden and urgent necessity; it should be adequate to meet the needs of those to whom it is given; persons so assisted should be subject to supervision; that Such supervision should include in its purview the conditions, moral and sanitary, under which the recipient is living; that voluntary agencies should be utilized as far as possible for the personal care of individual cases, and that there should be one uniform order governing outdoor relief or home assistance.

Children. — Effective steps should be taken to secure that the maintenance of children in the workhouse be no longer recognized as a legitimate way of dealing with them. Boarding-out might and should be greatly extended. Power to adopt children of vicious parents should be more frequently exercised and accom- panied by a strict dealing with the parent, and the public assistance authorities should retain supervision of adopted children up to the age of twenty-one. A local government board circular of June 1910 to boards of guardians embodied many of the recommenda- tions of the commission. Some recommendations, of course, the guardians are not empowered, under existing legislation, to carry out.

The Aged. — As regards institutional relief, the aged should . have accommodation and treatment apart from the able-bodied, and be housed on a separate site, and be further subdivided into classes as far as practicable with reference to their physical condition and their moral character. As regards outdoor relief, greater care should be taken to ensure adequacy of relief.

Medical Relief or Assistance. — A general system of provident dispensaries should be established, of which existing voluntary

outdoor medical organizations should be invited to form an integral part, and every inducement should be offered to the working classes below a certain wage to become, or continue to be, members of a provident dispensary.

Unemployment. — The commission review the social and industrial developments since 1834, deal with the new problems, criticize the existing methods of relief, and on their summing up of the new factors and developments, arrive at the conclusions: (a) that there is an increasing aggregation of unskilled labour at the great ports and in certain populous districts ; (6) that this aggregation of low-grade labour is so much in excess of the normal local wants as to promote and perpetuate under-employment, and © that this normal condition of under-employment, when aggravated by periodic contraction of trade or by inevitable changes in methods of pro- duction, assumes such dimensions as to require special machinery and organization for its relief and treatment. The commission proceed to make the following recommendations : —

Labour Exchanges. — A national system of labour exchanges should be established and worked by the board of trade for the general purpose of assisting the mobility of labour and of collecting accurate information as to unemployment. (These were established by the Labour Exchanges Act 1909; see Unemployment.)

Education and Training of the Young for Industrial Life. — The education in the public elementary schools should be much less literary and more practical, and better calculated than at present to adapt the child to its future occupation. Boys should be kept at school until the age of fifteen; exemption below fifteen should be granted only for boys leaving to learn a skilled trade, and there should be school supervision till sixteen and replacing in school if not properly employed.

Regularization of Employment. — Government departments and local and public authorities should be enjoined to regularize their Work as far as possible, and to endeavour, as far as possible, to undertake their irregular work when the general demand for labour is slack.

Unemployment Insurance. — The establishment and promotion of unemployment insurance, especially amongst unskilled and

unorganized labour, is of paramount importance in averting distress arising from unemployment, and is of such national im- portance as to justify, under specified conditions, contributions from public funds towards its furtherance. The commission further state that this insurance can best be promoted by utilizing the agency of existing trade organizations, or of organizations of a similar character. They are of opinion that no scheme of unemployment insurance, either foreign or British, which has been brought before them, is so free from objections as to justify them in recommending it for general adoption.

Labour Colonies. — The commission recommend their establish- ment and use. (For these see Vagrancy.)

Four out of the seventeen members of the commission, being unable to agree with their colleagues, issued a separate report,

which is very nearly as voluminous as that of the Report! majority. Their recommendations were more drastic

than those of the majority, and had for their aim not a reform of the poor law as it exists, but its entire break- up. The minority agree with the majority in recommending the abolition of workhouses, but instead of setting up new authorities, they consider that the duties of the guardians should be transferred to the county authorities, with an appropriate distribution among four existing committees of the county council. They recommend that the education committee become responsible for the entire care of children of school age. That the health committee should care for the sick and permanently incapacitated, infants under school age, and the aged requiring institutional care. The asylums committee should have charge of the mentally defective and the pension committee of the aged to whom pensions are awarded. The minority consider there should be some systematic co- ordination, within each local area, of all forms of public assis- tance and, if possible, of all assistance dispensed by voluntary agencies, and they recommend the appointment, by the county or county borough council, of one or more responsible officers, called ” registrars of public assistance.” Their duties would be to keep a register of all persons receiving any form of public assistance within their districts; they would assess the charge to be made on individuals liable to pay any part of the cost of the service rendered to them or their dependants, and re- cover the amount thus due. They would also have to consider the proposals of the various committees of the council for the payment of out-relief, or, as the minority prefer to term it, ” home aliment.” Other various duties are allotted to them in the report.

The subject of unemployment was considered by the minority and they made the following recommendations: —

Ministry of Labour. — The duty of organizing the national labour market should be placed upon a minister responsible to parliament. The ministry of labour should have six distinct and separately organized divisions; viz. the national labour exchange; the trade insurance division; the maintenance and training division; the industrial regulation division; the emigration and immigration division, and the statistical division.

National Labour Exchange. — The function of the national labour exchange should be, not only, (a) to ascertain and report the surplus or shortage of labour of particular kinds, at particular places; and (6) to diminish the time and energy now spent in looking for work, and the consequent leaking between jobs; but also © so to dovetail casual and seasonal employments as to arrange for practical con- tinuity of work for those now chronically unemployed.

Absorption of Surplus Labour. — To reduce the surplus of labour the minority recommend (a) that no child should be employed, in any occupation whatsoever, below the age of fifteen; no young person under eighteen for more than thirty hours per week, and all so employed should be required to attend some suitable public institution for not less than thirty hours per week for physical training and technical education; (6) the hours of labour of railway, omnibus and tramway employees should be reduced to a maximum of sixty, if not of forty-eight in any one week; and © wage-earning mothers of young children should be withdrawn from the industrial world by giving them sufficient public assistance for the support of their families.

Regularization of the National Demand for Labour. — In order to meet the periodically recurrent general depressions of trade the government should take advantage of there being at these periods as much unemployment of capital as there is unemployment of labour; that it should definitely undertake, as far as practicable,

the regularization of the national demand for labour; and that it should, for this purpose, and to the extent of at least £4,000,000 a year, arrange a portion of the ordinary work required by each department on a ten years' programme ; £40,000,000 worth of work for the decade being then put in hand, not by equal annual instal- ments, but exclusively in the lean years of the trade cycle ; being paid for out of loans for short terms raised as they are required, and being

executed with the best available labour, at standard rates, engaged in the ordinary way. That in this ten years' programme there should be included works of afforestation, coast protection and land reclamation; to be carried out by the board of agriculture exclusively in the lean years of the trade cycle; by the most suitable labour obtainable, taken on in the ordinary way at the rates locally current for the work, and paid for out of loans raised as required.

Trade Union Insurance.— In view of its probable adverse effect on trade union membership and organization the minority com missioners cannot recommend the establishment of any plan of government or compulsory insurance against unemployment. They recommend, however, a government subvention not exceeding one half of the sum actually paid in the last preceding year as out- of-work benefit should be offered to trade unions or other societies providing such benefit.

Maintenance and Training. — For the ultimate residuum of men in distress from want of employment the minority recommend that maintenance should be freely provided, without disfranchise- ment, on condition that they submit themselves to the physical and mental training that they may prove to require. Suitable day training depots or residential farm colonies should be estab- lished, where the men's whole working time would be absorbed in such varied beneficial training of body and mind as they proved capable of; their wives and families being, meanwhile, provided with adequate home aliment.

Authorities. — The Report and Evidence of the Royal Com- mission of 1905-1909 is a library in itself on the subject of pauperism. The contents of the various volumes are given supra. Other im- portant publications are Report and Evidence of Royal Commission on Aged Poor (1895) ; Report and Evidence of Select Committee of House of Commons on Distress from Want of Employment (1895); Report of Departmental Committee on Vag r ancy (1906). See also the references in the bibliography to Charity and Charities; and Sir G. Nicholls and T. Mackay, A History of the English Poor Law (3 vols., 1899) ; the publications of the Charity Organization Society; Reports of Poor Law Conferences. For list of subjects discussed, see index to Report of Central Conferences.

POPAYAN, a city of Colombia, capital of the department of Cauca, about 240 m. S.W. of Bogota, on the old trade route between that city and Quito, in 2° 26′ N., 76 49′ W. Pop. (1870), 8485; (1906, estimate), 10,000. Popayan is built on a great plain sloping N.W. from the foot of the volcano Purace, near the source of the Cauca and on one of its

small tribu- taries, 5712 ft. above the sea. Its situation is singularly pic- turesque, the Purace rising to an elevation of 15,420 ft. about 20 m. south-east of the city, the Sotara volcano to approxi- mately the same height about the same distance south by east, and behind these at a greater distance the Pan de Azucar, 15,978 ft. high. The ridge forming the water-parting between the basins of the Cauca and Patia rivers crosses between the Central and Western Cordilleras at this point and culminates a few miles to the south. Popayan is the seat of a bishopric dating from 1547, whose cathedral was built by the Jesuits; and in the days of its prosperity it possessed a university of considerable reputation. It has several old churches, a college, two seminaries founded about 1870 by the French Lazarists, who have restored and occupy the old Jesuit convent, and a mint established in 1749. The city was at one time an important commercial and mining centre, but much of its importance was lost through the transfer of trade to Cali and Pasto, through the decay of neighbouring mining industries, and through political disturbances. Earth- quakes have also caused much damage to Popayan, especially those of 1827 and 1834. The modern city has some small manufacturing industries, including woollen fabrics for cloth- ing, but its trade is much restricted, and its importance is political rather than commercial.

Popayan was founded by Sebastian Benalcazar in 1538 on the site of an Indian settlement, whose chief, Payan, had the un- usual honour of having his name given to the usurping town. In 1558 it received a coat of arms and the title of ” Muy noble y muy leal ” from the king of Spain — a distinction of great

significance in that disturbed period of colonial history. It I is noted also as the birthplace of Caldas, the Colombian naturalist, and of Mosquera, the geographer. There are hot sulphurous springs near by on the flanks of the volcano Purace, especially at Coconuco, which are much frequented by Colombians.

POPE (Gr. voLTTras, post-classical Lat. papa, father), an ecclesiastical title now used exclusively to designate the head of the Roman Catholic Church. In the 4th and 5th Titles. centuries it was frequently used in the West of any bishop (Du Cange, s.v.); but it gradually came to be reserved to the bishop of Rome, becoming his official title. In the East, on the other hand, only the bishop of Alexandria seems to have used it as a title; but as a popular term it was applied to priests, and at the

present day, in the Greek. Church and in Russia, all the priests are called pappas, which is also translated ” pope.” Even in the case of the sovereign pontiff the word pope is officially only used as a less solemn style: though the ordinary signature and heading of briefs is, e.g. ” Pius P.P.X.,” the signature of bulls is ” Pius episcopus ecclesiae catholicae,” and the heading, ” Pius epi- scopus, servus servorum Dei,” this latter formula going back to the time of St Gregory the Great. Other styles met with in official documents are Pontifex, Summus pontifex, Romanus pontifex, Sanctissimus, Sanctissimus pater, Sanctissimus domi- nus nosier, Sanctitas sua, Beatissimus pater, Beatitudo sua; while the pope is addressed in speaking as ” Sanctitas vestra,” or ” Beatissime pater.” In the middle ages is also found ” Dominus apostolicus ” (cf. still, in the litanies of the saints), or simply ” Apostolicus.”

The pope is pre-eminently, as successor of St Peter, bishop of Rome. Writers are fond of viewing him as representing Various an tne degrees of the ecclesiastical hierarchy; they Degrees say that he is bishop of Rome, metropolitan of the of Juris- Roman province, primate of Italy, patriarch of the western Church and head of the universal Church. This is strictly correct, but, with the exception of the first and last, these titles are seldom to be found in documents. And if these terms were intended to indicate so many degrees in the exercise of jurisdiction they would not be correct. As a matter of fact, from the earliest centuries (cf. can. 6 of Nicaea, in 325), we see that the popes exercised a special metropolitan juris- diction not only over the bishops nearest to Rome, the future cardinal bishops, but also over all those of central and southern Italy, including Sicily (cf. Duchesne, Origines du culte, ch. 1), all of whom received their ordination at his hands. Northern Italy and the rest of the western Church, still more the eastern Church, did not depend upon him so closely for their administra- tion. His influence was exercised, however, not only in dogmatic questions but in matters of discipline, by means of appeals, petitions and consultations, not to mention spon- taneous intervention. This state of affairs was defined and developed in the course of centuries, till it produced the present state of centralization, according to a law which can equally be observed in other societies. In practice the different degrees of jurisdiction, as represented in the pope, are of no importance: he is bishop of Rome and governs his diocese by direct episcopal authority; he is also the head of the Church, and in this capacity governs all the dioceses, though the regular authority of each bishop in his own diocese is also ordinary and immediate, i.e. he is not a mere vicar of the pope. But the mode of exercise of a power and its intensity are subject to variation, while the

power remains essentially the same. This is the case with the power of the pope and his primacy, the exercise and manifestation of which have been continually developing. This primacy, a primacy of honour and jurisdiction, involving the plenitude of power over the teaching, the worship, the discipline and administration of the Church, is received by the pope as part of the succession of St Peter, together with the episcopate of Rome. The whole episcopal body, with the pope at its head, should be considered as succeeding to the apostolic college,

presided over by St Peter; and the head of it, now as then, as personally invested with all the powers enjoyed by the whole body, including the head. Hence the pope, as supreme in mat- ters of doctrine, possesses the same authority and the same in- fallibility as the whole Church; as legislator and judge he pos- sesses the same power as the episcopal body gathered around and with him in oecumenical council. Such are the two essential prerogatives of the papal primacy: infallibility in his supreme pronouncements in matters of doctrine (see Infallibility); and immediate and sovereign jurisdiction, under all its aspects, over all the pastors and the faithful. These two privileges, having been claimed and enjoyed by the popes in the course of centuries, were solemnly defined at the Vatican Council by the constitution " Pastor aeternus " of the 18th of July 1870. The two principal passages in it are the following. (1) In the matter of jurisdiction: " If any one say that the Roman Pontiff has an office merely of inspection and direction, and not the full and supreme power of jurisdiction over the whole Church, not only in matters of faith and morals, but also as regards discipline and the government of the Church scattered through- out the whole world; or that he has only the principal portion and not the plenitude of that supreme power; or that his power is not ordinary and immediate, as much over each and every church as over each and every pastor and believer: anathema sit." (2) In the matter of infallibility: " We decree that when the Roman Pontiff speaks ex cathedra, that is to say, when, in his capacity as Pastor and Doctor of all Christians he defines, in virtue of his supreme apostolic authority, a certain doctrine concerning faith or morals to be held by the whole Church, he enjoys, by the divine assistance promised to him in the Blessed Peter, that infallibility with which the divine Redeemer has thought good to endow His Church in order to define its doctrine in matters of faith and morals; consequently, these definitions of the Roman Pontiff are irreformable in themselves and not in consequence of the consent of the Church."

For the history of the papacy, and associated questions, see Papacy, Conclave, Curia Romana, Cardinal, &c.

The ordinary costume of the pope is similar to that of the other clergy and bishops, but white in colour; his shoes alone are different, being low open shoes, red in colour, with a cross embroidered on the front; these are what are called the ” mules,” a substitute for the compagi of ancient times, formerly reserved to the pope and his clergy (cf. Duchesne, op. cit. ch. n, 6). Over this costume the pope wears, on less solemn occasions, the lace rochet and the red mozetta, bordered with ermine, or the camauro, similar to the mozetta, but with the addition of a hood, and over all the stole embroidered with his arms. The pope’s liturgical costume consists, in the first place, of all the elements comprising that of the bishops: stockings and sandals, amice, alb, cincture, tunicle and dalmatic, stole, ring, gloves, chasuble or cope, the latter, however, with a morse ornamented with precious stones, and for head-dress the mitre (see Vestments). The tiara (q.v.), the pontifical head-dress, is not used strictly speaking in the course of the liturgical functions, but only for processions. To these vestments or insignia the pope adds: the falda, a kind of long skirt trailing on the ground all round, which the chaplains hold up while he is walking. Over the chasuble he wears the fanone (see Amice) ; and after that the pallium (q.v.). He is preceded by the papal cross, carried with the crucifix turned towards him. When going to solemn ceremonies he is carried on the sedia, a portable chair of red velvet with a high back, and escorted by two flabelli of peacock feathers. The papal mass, now rarely celebrated, has preserved more faithfully the ancient liturgical usages of the 8th and 9th centuries.

Bibliography. — Bellarmine, Be romano pontifice; Wilmers, De christi ecclesia (Regensburg, 1897) ; Turmel, Histoire de la iheo- logie positive, vol. ii. (Paris, 1906) ; Hinschius, Kirchenrecht, vol. i. (Berlin, 1869); Rudolph Sohm, Kirchenrecht (1892); Duchesne, Les Origines du culte Chretien (4th ed., Paris, 1908); Bouix, De papa (Paris, 1869) ; Vacant, Etudes theologiques sur les constitutions du concile du Vatican (Paris, 1895); Barbier de Montault, Le Costume el les usages ecclesiastiques (Paris, 1897). (A. Bo.*)

POPE, ALEXANDER

POPE, ALEXANDER (1688-1744), English poet, was born in Lombard Street, London, on the 21st of May 1688. His father, Alexander Pope, a Roman Catholic, was a linen-draper who afterwards retired from business with a small fortune, and fixed his residence about 1700 at Binfield in Windsor Forest. Pope’s education was desultory. His father’s religion would have excluded him from the public schools,

even had there been no other impediment to his being sent there. Before he was twelve he had obtained a smattering of Latin and Greek from various masters, from a priest in Hampshire, from a schoolmaster at Twyford near Winchester, from Thomas Deane, who kept a school in Marylebone and afterwards at Hyde Park Corner, and finally from another priest at home. Between his twelfth and his seventeenth years excessive application to study under- mined his health, and he developed the personal deformity which was in so many ways to distort his view of life. He thought himself dying, but through a friend, Thomas (after- wards the abbe) Southcote, he obtained the advice of the famous physician John Radcliffe, who prescribed diet and exercise. Under this treatment the boy recovered his strength and spirits. " He thought himself the better," Spence says, " in some respects for not having had a regular education. He (as he observed in particular) read originally for the sense, whereas we are taught for so many years to read only lor words." He afterwards learnt French and Italian, probably in a similar way. He read translations of the Greek, Latin, French and Italian poets, and by the age of twelve, when he was finally settled at home and left to himself, he was not only a confirmed reader, but an eager aspirant to the highest honours in poetry. There is a story, which chronological considerations make extremely improbable, that in London he had crept into Will's coffee-house to look at Dryden, and a further tale that the old poet had given him a shilling for a translation of the story of Pyramus and Thisbe; he had lampooned his schoolmaster; he had made a play out of John Ogilby's Iliad for his school- fellows; and before he was fifteen he had written an epic, his hero being Alcander, a prince of Rhodes, or, as he states else- where, Deucalion.

There were, among the Roman Catholic families near Bin- field, men capable of giving a direction to his eager ambition, men of literary tastes, and connexions with the literary world. These held together as members of persecuted communities always do, and were kept in touch with one another by the family priests. Pope was thus brought under the notice of Sir William Trumbull, a retired diplomatist living at Easthamp- stead, within a few miles of Binfield. Thomas Dancastle, lord of the manor of Binfield, took an active interest in his writings, and at Whiteknights, near Reading, lived another Roman Catholic, Anthony Englefield, " a great lover of poets and poetry." Through him Pope made the acquaintance of Wycherley and of Henry Cromwell, who was a distant cousin of the Protector, a gay man about town, and something of a pedant. Wycherley introduced him to William Walsh, then of great renown as a critic. 1 Before the poet was seventeen he was admitted in this way to the society of London " wits " and men of

fashion, and was cordially encouraged as a prodigy. Wycherley's correspondence with Pope was skilfully manipu- lated by the younger man to represent Wycherley as sub- mitting, at first humbly and then with an ill-grace, to Pope's criticisms. The publication (Elwin and Courthope, vol. v.) of the originals of Wycherley's letters from MSS. at Longleat showed how seriously the relations between the two friends, which ceased in 17 10, had been misrepresented in the version of the correspondence which Pope chose to submit to the public. Walsh's contribution to his development was the advice to study " correctness." " About fifteen," he says, " I got acquainted with Mr. Walsh. He used to encourage me much, and used to tell me that there was one way left of excelling;

1 The dates of Pope's correspondence with Wycherley are 1704- 1710; with Walsh, 1705-1707, and with Cromwell, 1708-1727; with John Caryll (1666-1736) and his son, also neighbours, 1710-

1735-

for, though we had several great poets, we never had any one great poet that was correct, and he desired me to make that my study and aim " (Spence, p. 280). Trumbull turned Pope's attention to the French critics, out of the study of whom grew the Essay on Criticism; he suggested the subject of Windsor Forest, and he started the idea of translating Homer.

It says something for Pope's docility at this stage that he recognized so soon that a long course of preparation was needed for such a magnum opus, and began steadily and patiently to discipline himself. The epic was put aside and afterwards burnt; versification was industriously practised in short "essays"; and an elaborate study was made of accepted critics and models. He learnt most, as he acknowledged, from Dryden, but the harmony of his verse also owed something to an earlier writer, George Sandys, the translator of Ovid. At the beginning of the 18th century Dryden's success had given great vogue to translations and modernizations. The air was full of theories as to the best way of doing such things. What Dryden had touched Pope did not presume to meddle with — Dryden was his hero and master; but there was much more of the same kind to be done. Dryden had rewritten three of the Canterbury tales; Pope tried his hand at the Merchant's Tale, and the Prologue to the Wife of Bath's Tale, and produced also an imitation of the House of Fame. Dryden had translated Virgil; Pope experimented on the Thebais of Statius, Ovid's Heroides and Metamorphoses, and the Odyssey. He knew little Latin and less Greek, but there were older versions in English which helped him to the

sense; and, when the correspondents to whom he submitted his versions pointed out mistranslations, he could answer that he had always agreed with them, but that he had deferred to the older translators against his own judgment. It was one of Pope's little vanities to try to give the impression that his metrical skill was more precocious even than it was, and we cannot accept his published versions of Statius and Chaucer (published in " miscellanies " at intervals between 1709 and 17 14) as incontrovertible evidence of his pro- ficiency at the age of sixteen or seventeen, the date, according to his own assertion, of their composition. But it is indisputable that at the age of seventeen his skill in verse astonished a veteran critic like Walsh, and some of his pastorals were in the hands of Sir George Granville (afterwards Lord Lansdowne) before 1706. His metrical letter to Cromwell, which Elwin dates in 1707, when Pope was nineteen, is a brilliant feat of versification, and has turns of wit in it as easy and spirited as any to be found in his mature satires. Pope was twenty-one when he sent the " Ode on Solitude " to Cromwell, and said it was written before he was twelve years old.

Precocious Pope was, but he was also industrious; and he spent some eight or nine years in arduous and enthusiastic discipline, reading, studying, experimenting, taking the advice of some and laughing in his sleeve at the advice of others, " poetry his only business," he said, " and idleness his only pleasure," before anything of his appeared in print. In these preliminary studies he seems to have guided himself by the maxim formulated in a letter to Walsh (dated July 2, 1706) that " it seems not so much the perfection of sense to say things that had never been said before, as to express those best that have been said oftenest." His first publication was his " Pastorals. " Jacob Tonson, the bookseller, had seen these pastorals in the hands of Walsh and Congreve, and sent a polite note (April 20, 1706) to Pope asking that he might have them for one of his miscellanies. They appeared accordingly in May 1709 at the end of the sixth volume of Tonson's Poetical Miscellanies, containing contributions from Ambrose Philips, Sheffield, Garth and Rowe, with " January and May," Pope's version of Chaucer's " Merchant's Tale."

Pope's next publication was the Essay on Criticism (1711), written two years earlier, and printed without the author's name. " In every work regard the writer's end " (1. 255) is one of its sensible precepts, and one that is often neglected by critics of the essay, who comment upon it as if Pope's end had been to produce an original and profound treatise on first principles.

His aim was simply to condense, methodize, and give as perfect and novel expression as he could to floating opinions about the poet's aims and methods, and the critic's duties, to " what oft was thought, but ne'er so well expressed " (1. 298). " The town " was interested in belles leltres, and given to conversing on the subject; Pope's essay was simply a brilliant contribution to the fashionable conversation. The youthful author said that he did not expect the sale to be quick because " not one gentleman in sixty, even of liberal education, could understand it." The sales were slow until Pope caused copies to be sent to Lord Lansdowne and others, but its success was none the less brilliant for the delay. The town was fairly- dazzled by the young poet's learning, judgment, and felicity of expression. Many of the admirers of the poem doubtless would have thought less of it if they had not believed all the maxims to be original. " I admired," said Lady Mary Wortley Montagu, " Mr Pope's Essay on Criticism at first very much, because I had not then read any of the ancient critics, and did not know that it was all stolen." Pope gained credit for much that might have been found, where he found it, in the Institutes of Quintilian, in the numerous critical writings of Rene Rapin, and in Rene le Bossu's treatise on epic poetry. Addison has been made responsible for the exaggerated value once set on the essay, but Addison's paper (Spectator, No. 253) was not unmixed praise. He deprecated the attacks made by Pope on contemporary literary reputations, although he did full justice to the poet's metrical skill. Addison and Pope became acquainted with one another, and Pope's sacred eclogue, " Messiah," was printed as No. 378 of the Spectator. In the Essay on Criticism Pope provoked one bitter personal enemy, in John Dennis, the critic, by a description of him as Appius, who " stares, tremendous, with a threat'ning eye." Dennis retorted in Reflections . . upon a late Rhapsody . . (17 11), abusing Pope among other things for his personal deformity. Pope never forgot this brutal attack, which he described in a note inserted after Dennis's death, as late as 1743, as written " in a manner perfectly lunatic."

The Rape of the Lock in its first form appeared in 17 12 in Linlot's Miscellanies; the " machinery " of sylphs and gnomes was an afterthought, and the poem was republished as we now have it early in 17 14. William, 4th Baron Petre, had surrep- titiously cut off a lock of Miss Arabella Fermor's hair, and the liberty had been resented; Pope heard the story from his friend John Caryll, who suggested that the breach between the families might be healed by making the incident the subject of a mock-heroic poem like Boileau's Lutrin. Pope caught at the hint; the mock-heroic treatment of the pretty frivolities

of fashionable life just suited his freakish sprightliness of wit, and his studies of the grand epic at the time put him in excellent vein. The Rape of the Lock is admitted to be a masterpiece of airiness, ingenuity, and exquisite finish. But the poem struck Taine as a piece of harsh, scornful, indelicate buffoonery, a mere succession of oddities and contrasts, of expressive figures un- expected and grinning, an example of English insensibility to French sweetness and refinement. Sir Leslie Stephen objected on somewhat different grounds to the poet's tone towards women. His. laughter at Pope's raillery was checked by the fact that women are spoken of in the poem as if they were all like Belinda. The poem shows the hand of the satirist who was later to assert that " every woman is at heart a rake," in the epistle addressed to Martha Blount.

Windsor Forest, modelled on Sir John Denham's Cooper's Hill, had been begun, according to Pope's account, when he was sixteen or seventeen. It was published in March 17 13 with a flattering dedication to the secretary for war, George Granville, Lord Lansdowne, and an opportune allusion to the peace of Utrecht. This was a nearer approach to taking a political side I han Pope had yet made. His principle had been to keep clear of politics, and not to attach himself to anv of the sets into which literary men were divided by parcy. Although inclined to the Jacobites by his religion, he never took any part in the plots for the restoration of the Stuarts, and he was on friendly terms with

the Whig coterie, being a frequent guest at the coffee-house kept by Daniel Button, where Addison held his " little senate." He had contributed his poem, " The Messiah " to the Spectator; he had written an article or two in the Guardian, and he wrote a prologue for Addison's Cato. Nevertheless he induced Lintot the bookseller to obtain from John Dennis a criti- cism of Cato. On the publication of Dennis's remarks, the violence of which had, as Pope hoped, made their author ridicu- lous, Pope produced an anonymous pamphlet, The Narrative of Dr Robert Norris concerning the . . . Frenzy of Mr John Dennis (1713), which, though nominally in defence of Addison, had for its main purpose the gratification of Pope's own hostility to Dennis. Addison disavowed any connivance in this coarse attack in a letter written on his behalf by Steele to Lintot, saying that if he noticed Dennis's attack at all it would be in such a way as to allow him no just cause of complaint. Coolness between Addison and Pope naturally followed this episode. When the Rape of the Lock was published, Addison, who is said to have praised the poem highly to Pope in private, dismissed it in the Spectator with two sentences of patronizing faint praise to the young poet, and, coupling it with

Tickell's " Ode on the Prospect of Peace," devoted the rest of the article to an elaborate puff of " the pastorals of Mr Philips."

When Pope showed a leaning to the Tories in Windsor Forest, the members of Addison's coterie made insidious war on him. Within a few weeks of the publication of the poem, and when it was the talk of the town, there began to appear in the Guardian (Nos. 22, 23, 28, 30, 32) a series of articles on " Pastorals." Not a word was said about Windsor Forest, but everybody knew to what the general principles referred. Modern pastoral poets were ridiculed for introducing Greek moral deities, Greek flowers and fruits, Greek names of shepherds, Greek sports and customs and religious rites. They ought to make use of English rural mythology — hobthrushes, fairies, goblins and witches; they should give English names to their shepherds; they should mention flowers indigenous to English climate and soil; and they should introduce English proverbial sayings, dress, and customs. All excellent principles, and all neglected by Pope in Windsor Forest. The poem was fairly open to criticism in these points; there are many beautiful passages in it, show- ing close though somewhat professional observation of nature, but the mixture of heathen deities and conventional archaic fancies with modern realities is incongruous, and the com- parison of Queen Anne to Diana was ludicrous. But the sting of the articles did not lie in the truth of the oblique criticisms. The pastorals of Ambrose Philips, published four years before, were again trotted out. Here was a true pastoral poet, the eldest born of Spenser, the worthy successor of Theocritus and Virgil!

Pope took an amusing revenge, which turned the laugh against his assailants. He sent Steele an anonymous paper in continuation of the articles in the Guardian on pastoral poetry, reviewing the poems of Mr Pope by the light of the principles laid down. Ostensibly Pope was censured for breaking the rules, and Philips praised for conforming to them, quotations being given from both. The quotations were sufficient to dispose of the pretensions of poor Philips, and Pope did not choose his own worst passages, accusing himself of actually deviating sometimes into poetry. Although the Guardian's principles were also brought into ridicule by bur- lesque exemplifications of them after the manner of Gay's Shepherd's Week, Steele, misled by the opening sentences, was at first unwilling to print what appeared to be a direct attack on Pope, and is said to have asked Pope's consent to the publication, which was graciously granted.

The links that attached Pope to the Tory party were strength- ened by a new friendship. His first letter to Swift, who became warmlv attached to him, is dated the 8th of December 1713. Swift had been a

leading member of the Brothers' Club, from which the famous Scriblerus Club seems to have been an offshoot. The leading members of this informal

literary society were Swift, Arbuthnot, Congreve, Bishop Atterbury, Pope, Gay and Thomas Parnell. Their chief object was a general war against the dunces, waged with great spirit by Arbuthnot, Swift and Pope.

The estrangement from Addison was completed in connexion with Pope's translation of Homer. This enterprise was definitely undertaken in 17 13. The work was to be published by subscription, as Dryden's Virgil had been. Men of all parties subscribed, their unanimity being a striking proof of the position Pope had attained at the age of twenty-five. It was as if he had received a national commission as by general consent the first poet of his time. But the unanimity was broken by a discordant note. A member of fhe Addison clique, Tickell, attempted to run a rival version. Pope suspected Addison's instigation; Tickell had at least Addison's encourage- ment. Pope's famous character of Addison as " Atticus " in the Epistle to Dr Arbuthnot (ii. 193-215) was, however, in- spired by resentment at insults that existed chiefly in his own imagination, though Addison was certainly not among his warmest admirers. Pope afterwards claimed to have been magnanimous, but he spoiled his case by the petty inventions of his account of the quarrel.

The translation of Homer was Pope's chief employment for twelve years. The new pieces in the miscellanies published in 1717, his " Elegy on an Unfortunate Lady," and his " Eloisa to Abelard," were probably written some years before their publication. His " Eloisa to Abelard " was based on an English translation by John Hughes of a French version of the Letters, which differed very considerably from the original Latin. The Iliad was delivered to the subscribers in instal- ments in 1715, 1717, 1718 and 1720. Pope's own defective scholarship made help necessary. William Broome and John Jortin supplied the bulk of the notes, and Thomas Parnell the preface. For the translation of the Odyssey he took Elijah Fen ton and Broome as coadjutors, who between them trans- lated twelve out of the twenty-four books. 1 It was completed in 1725. The profitableness of t the work was Pope's chief temptation to undertake it. His receipts for his earlier poems had totalled about £150, but he cleared more than

£8000 by the two translations, after deducting all payments to coadjutors — a much larger sum than had ever been received by an English author before.

The translation of Homer had established Pope's reputation with his contemporaries, and has endangered it ever since it was challenged. Opinions have varied on the purely literary merits of the poem, but with regard to it as a translation few have differed from Bentley's criticism, " A fine poem, Mr Pope, but you must not call it Homer." His collaboration with Broome (q.v.) and Fenton (q.v.) 2 involved him in a series of recriminations. Broome was weak enough to sign a note at the end of the work understating the extent of Fenton's assist- ance as well as his own, and ascribing the merit of their trans- lation, reduced to less than half its real proportions, to a regular revision and correction — mostly imaginary — at Pope's hands. These falsehoods were deemed necessary by Pope to protect himself against possible protests from the subscribers. In 1722 he edited the poems of Thomas Parnell, and in 1725 made a considerable sum by an unsatisfactory edition of Shake- speare, in which he had the assistance of Fenton and Gay.

Pope, with his economical habits, was rendered independent by the pecuniary success of his Homer, and enabled to live near London. The estate at Binfield was sold, and he removed with his parents to Mawson's Buildings, Chiswick, in 1716, and in 1719 to Twickenham, to the house with which his name is associated. Here he practised elaborate landscape gardening on a small scale, and built his famous grotto, which was really a tunnel under the road connecting the garden with the lawn on the Thames. He was constantly visited at Twickenham by his intimates, Dr John Arbuthnot, John Gay, Bolingbroke

1 I, 4, 19 and 20 are by Fenton; 2, 6, 8, 11, 12, 16, 18, 23, with notes to all the books, by Broome.

2 The correspondence with them is given in vol. viii. of Elwin and Courthope's edition.

(after his return in 1723), and Swift (during his brief visits to England in 1726 and 1727), and by many other friends of the Tory party. With Atterbury, bishop of Rochester, he was on terms of affectionate intimacy, but he blundered in his evidence when he was called as a witness on his behalf in 1723.

In 1 71 7 his father died, and he appears to have turned to the Blounts

for sympathy in what was to him a very serious bereavement. He had early made the acquaintance of Martha and Teresa Blount, both of them intimately connected with his domestic history. Their home was at Mapledurham, near Reading, but Pope probably first met them at the house of his neighbour, Mr Englefield of Whiteknights, who was their grandfather. He begun to correspond with Martha Blount in 1712, and after 17 17 the letters are much more serious in tone. He quarrelled with Teresa, who had apparently injured or prevented his suit to her sister; and although, after her father's death in 1718, he paid her an annuity, he seems to have regarded her as one of his most dangerous enemies. His friendship with Martha lasted all his life. So long as his mother lived he was unwearying in his attendance on her, but after her death in 1733 his association with Martha Blount was more constant. In defiance of the scandal-mongers, they paid visits together at the houses of common friends, and at Twickenham she spent part of each day with him. His earlier attachment to Lady Mary Wortley Montagu was apparently a more or less literary passion, which perished under Lady Mary's ridicule.

The year 1725 may be taken as the beginning of the third period of Pope's career, when he made his fame as a moralist and a satirist. It may be doubted whether Pope had the stay- ing power necessary for the composition of a great imaginative work, whether his crazy constitution would have held together through the strain. He toyed with the idea of writing a grand epic. He told Spence that he had it all in his head, and gave him a vague (and it must be admitted not very promising) sketch of the subject and plan of it. But he never put any of it on paper. He shrank as with instinctive repulsion from the stress and strain of complicated designs. Even his prolonged task of translating weighed heavily on his spirits, and this was a much less formidable effort than creating an epic. He turned rather to designs that could be accomplished in detail, works of which the parts could be separately laboured at and put together with patient care, into which happy thoughts could be fitted that had been struck out at odd moments and in ordinary levels of feeling.

Edward Young's satire, The Universal Passion, had just appeared, and been received with more enthusiasm than any thing published since Pope's own early successes. This alone would have been powerful inducement to Pope's emulous tem- per. Swift was finishing Gulliver's Travels, and came over to England in 1726. The survivors of the Scriblerus Club — Swift, Pope, Arbuthnot, and Gay — resumed their old amusement of parodying and otherwise ridiculing bad writers, especially bad writers in the Whig interest. Two volumes of their Miscellanies in Prose and Verse were published in 1727. A third volume

appeared in 1728, and a fourth was added in 1732. According to Pope's own history of the Dunciad, an Heroic Poem in Three Books, which first appeared on the 28th of May 1728, the idea of it grew out of this. Among the Miscellanies was a " Treatise of the Bathos or the Art of Sinking in Poetry," in which poets were classified, with illustrations, according to their eminence in the various arts of debasing instead of elevating their subject. No names were mentioned, but the specimens of bathos were assigned to various letters of the alphabet, which, the authors boldly asserted, were taken at random. But no sooner was the treatise published than the scribblers proceeded to take the letters to themselves, and in revenge to fill the news-papers with the most abusive falsehoods and scurrilities they could devise. This gave Pope the opportunity he had hoped for, and provided him with an excuse for the personalities of the Dunciad, which had been in his mind as early as 1720. Among the most prominent objects of his satire were Lewis

Theobald, Colley Cibber, John Dennis, Richard Bentley, Aaron Hill and Bernard Lintot, who, in spite of his former relations with Pope, was now classed with the piratical Edmund Curll. The book was published with the greatest precautions. It was anonymous, and professed to be a reprint of a Dublin edition. When the success of the poem was assured, it was republished in 1729, and a copy was presented to the king by Sir Robert Walpole. Names took the place of initials, and a defence of the satire, written by Pope himself, but signed by his friend William Cleland, was printed as " A letter to the Publisher." Various indexes, notes and particulars of the attacks on Pope made by the different authors satirized were added. To avoid any danger of prosecution, the copyright was assigned to Lord Oxford, Lord Bathurst and Lord Burlington, whose position rendered them practically unassailable. We may admit that personal spite influenced Pope at least as much as disinte- rested zeal for the honour of literature, but in the dispute as to the comparative strength of these motives, a third is apt to be overlooked that was probably stronger than either. This was an unscrupulous elfish love of fun, and delight in the creations of a humorous imagination. Certainly to represent the Dun- ciad as the outcome of mere personal spite is to give an exag- gerated idea of the malignity of Pope's disposition, and an utterly wrong impression of the character of his satire. He was not, except in rare cases, a morose, savage, indignant satirist, but airy and graceful in his malice, revengeful perhaps and excessively sensitive, but

restored to good humour as he thought over his wrongs by the ludicrous conceptions with which he invested his adversaries. The most unprovoked assault was on Richard Bentley, whom he satirized in the reconstruction and enlargement of the Dunciad made in the last years of his life at the instigation, it is said, of William Warburton. In the earlier editions the place of hero had been occupied by Lewis Theobald, who had ventured to criticize Pope's Shake- speare. In the edition which appeared in Pope's Works (1742), he was dethroned in favour of Colley Cibber, who had just written his Letter from Mr Cibber to Mr Pope inquiring into the motives that might induce him hi his satyrical writings to be so frequently fond of Mr Cibber's name (1742). Warburton's name is attached to many new notes, and one of the preliminary dissertations by Ricardus Aristarchus on the hero of the poem seems to be by him.

The four epistles of the Essay on Man (1733) were also intimately connected with passing controversies. They belong to the same intellectual movement with Butler's Analogy— the effort of the 18th century to put religion on a rational basis. But Pope was not a thinker like Butler. The subject was suggested to him by Henry St John, Lord Bolingbroke, who had returned from exile in 1723, and was a fellow-member of the Scriblerus Club. Bolingbroke is said — and the statement is supported by the contents of his posthumous works — to have furnished most of the arguments. Pope's contribution t.o the controversy consisted in brilliant epigram and illustra- tion. In this didactic work, as in his Essay on Criticism, he put together on a sufficiently simple plan a series of happy sayings, separately elaborated, picking up the thoughts as he found them in miscellaneous reading and conversation, and trying only to fit them with perfect expression. His readers were too dazzled by the verse to be severely critical of the sense. Pope himself had not comprehended the drift of the arguments he had adopted from Bolingbroke, and was alarmed when he found that his poem was generally interpreted as an apology for the free-thinkers. Warburton is said to have qualified its doctrines as " rank atheism, " and asserted that it was put together from the " worst passages of the worst authors." The essay was soon translated into the chief European languages, and in 1737 its orthodoxy was assailed by a Swiss professor, Jean Pierre de Crousaz, in an Examen de Pessay de M. Pope sur rhomme. Warburton now saw fit to revise his opinion of Pope's abilities and principles — for what reason does not appear. In any case he now became as enthusiastic in his praise of Pope's orthodoxy and his genius as he had before been

scornful, and proceeded to employ his unrivalled powers of sophistry in a defence of the orthodoxy of the conflicting and inconsequent

positions adopted in the Essay on Man. Pope was wise enough to accept with all gratitude an ally who was so useful a friend and so dangerous an enemy, and from that time onward Warburton was the authorized commentator of his works.

The Essay on Man was to have formed part of a series of philosophic poems on a systematic plan. The other pieces were to treat of human reason, of the use of learning, wit, education and riches, of civil and ecclesiastical polity, of the character of women, &c. Of the ten epistles of the Moral Essays, the first four, written between 1731 and 1735, are connected with this scheme, which was never executed.

There was much bitter, and sometimes unjust, satire in the Moral Essays and the Imitations of Horace. In these epistles and satires, which appeared at intervals, he was often the mouth- piece of his political friends, who were all of them in opposition to Walpole, then at the height of his power, and Pope chose the object of his attacks from among the minister's adherents. Epistle III., " Of the Use of Riches," addressed to Allen Bath- urst, Lord Bathurst, in 1732, is a direct attack on Walpole's methods of corruption, and on his financial policy in general; and the two dialogues (1738) known as the "Epilogue to the Satires," professedly a defence of satire, form an eloquent attack on the court. Pope was attached to the prince of Wales's party, and he did not forget to insinuate, what was indeed the truth, that the queen had refused the prince her pardon on her deathbed. The " Epistle to Dr Arbuthnot " contains a de- scription of his personal attitude towards the scribblers and is made to serve as a " prologue to the satires." The gross and unpardonable insults bestowed on Lord Hervey and on Lady Mary Wortley Montagu in the first satire " to Mr Fortescue " provoked angry retaliation from both. The description of Timon's ostentatious villa in Epistle IV., addressed to the earl of Burlington, was generally taken as a picture of Canons, the seat of John Brydges, duke of Chandos, one of Pope's patrons, and caused a great outcry, though in this case Pope seems to have been innocent of express allusion. Epistle II., addressed to Martha Blount, contained the picture of Atossa, which was taken to be a portrait of Sarah Jennings, duchess of Marlborough. One of the worst imputations on Pope's character was that he left this passage to be published when he had in effect received a bribe of £1000 from the duchess of Marl- borough for its suppression through the agency of Nathanael Hooke (d. 1763). As the passage eventually stood, it might be applied to Katherine, duchess of Buckingham, a natural daughter of James II. Pope may have altered it with the intention of diverting the satire from the original object. He was scrupulously honest in money matters, and always in- dependent in matters of patronage; but there

is some evidence for this discreditable story beyond the gossip of Horace Wal- pole (Works, ed. P. Cunningham, i. cxliv.), though not suffi- cient to justify the acceptance it received by some of Pope's biographers. To appreciate fully the point of his allusions requires an intimate acquaintance with the political and social gossip of the time. But apart from their value as a brilliant strongly-coloured picture of the time Pope's satires have a permanent value as literature. It is justly remarked by Mark Pattison 1 that "these Imitations are among the most original of his writings." The vigour and terseness of the diction i» still unsurpassed in English verse. Pope had gained complete mastery over his medium, the heroic couplet, before he used it to express his hatred of the political and social evils which he satirized. The elaborate periphrases and superfluous orna- ments of his earlier manner, as exemplified in the Pastorals and the Homer, disappeared; he turned to the uses of verse the ordinary language of conversation, differing from everyday speech only in its exceptional brilliance and point. It is in these satires that his best work must be sought, and by them that his position among English poets must be fixed. It was 1 In his edition of the Satires and Epistles (1866).

the Homer chiefly that Wordsworth and Coleridge had in their eye when they began the polemic against the " poetic diction " of the 18th century, and struck at Pope as the arch-corrupter. They were historically unjust to Pope, who did not originate this diction, but only furnished the most finished examples of it. At the beginning of the 19th century Pope still had an ardent admirer in Byron, whose first satires are written in Pope's couplet. The much abused pseudo-poetic diction in substance consisted in an ambition to " rise above the vulgar style," to dress nature to advantage — a natural ambition when the arbiters of literature were people of fashion. If one com- pares Pope's " Messiah " or " Eloisa to Abelard," or an im- passioned passage from the Iliad, with the originals that he paraphrased, one gets a more vivid idea of the consistence of pseudo-poetic diction than could be furnished by pages of an- alysis. But Pope merely made masterly use of the established diction of his time, which he eventually forsook for a far more direct and vigorous style. A passage from the Guardian, in which Philips was commended as against him, runs: "It is a nice piece of art to raise a proverb above the vulgar style and still keep it easy and unaffected. Thus the old wish, ' God rest his soul,' is very finely turned: —

” ‘ Then gentle Sidney liv’d, the shepherd’s friend, Eternal blessings on his shade attend ! ‘ ”

Pope would have despised so easy a metamorphosis as this at any period in his career, and the work of his coadjutors in the Odyssey may be distinguished by this comparative cheapness of material. Broome’s description of the clothes-washing by Nausicaa and her maidens in the sixth book may be compared with the original as a luminous specimen.

Pope’s wit had won for him the friendship of many distin- guished men, and his small fortune enabled him to meet them on a footing of independence. He paid long visits at many great houses, especially at Stanton Harcourt, the home of his friend Lord Chancellor Harcourt; at Oakley, the seat of Lord Bathurst; and at Prior Park, Bath, where his host was Ralph Allen. With the last named he had a temporary disagree- ment owing to some slight shown to Martha Blount, but he was reconciled to him before his death.

He died on the 30th of May 1744, and he was buried in the parish church of Twickenham. He left the income from his property to Martha Blount till her death, after which it was to go to his half-sister Magdalen Rackett and her children. His unpublished MSS. were left at the discretion of Lord Boling- broke, and his copyrights to Warburton.

If we are to judge Pope, whether as a man or as a poet, with human fairness, and not merely by comparison with standards of abstract perfection, there are two features of his times that must be kept steadily in view — the character of political strife in those days and the political relations of men of letters. As long as the succession to the Crown was doubtful, and political failure might mean loss of property, banishment or death, politicians, playing for higher stakes, played more fiercely and unscrupulously than in modern days, and there was no con- trolling force of public opinion to keep them within the bounds of common honesty. Hence the age of Queen Anne is pre-eminently an age of intrigue. The government was almost as unsettled as in the early days of personal monarchy, and there was this difference — that it was policy rather than force upon which men depended for keeping their position. Secondly, men of letters were admitted to the inner circles of intrigue as they had never been before and as they have never been since. A generation later Walpole defied them, and paid the rougher instruments that he considered sufficient for his purpose in solid coin of the realm; but Queen Anne’s statesmen, whether from difference of tastes or difference of policy, paid their prin- cipal literary champions with social privileges and honourable

public appointments. Hence men of letters were directly in- fected by the low political morality of the unsettled time. And the character of their poetry also suffered. The most promi- nent defects of the age — the lack of high and sustained imagination, the genteel liking for ” nature to advantage

dressed,” the incessant striving after wit — were fostered, if not generated, by the social atmosphere.

Pope’s own ruling passion was the love of fame, and he had no scruples where this was concerned. His vanity and his childish love of intrigue are seen at their worst in his petty manoeuvres to secure the publication of his letters during his lifetime. These intricate proceedings were unravelled with great patience and ingenuity by Charles Wentworth Dilke, when the false picture of his relations with his contemporaries which Pope had imposed on the public had been practically accepted for a century. Elizabeth Thomas, the mistress of Henry Cromwell, had sold Pope’s early letters to Henry Cromwell to the bookseller Curll for ten guineas. These were published in Curll’s Miscellanea in 1726 (dated 1727), and had considerable success. This surreptitious publication seems to have suggested to Pope the desirability of publishing his own correspondence, which he immediately began to collect from various friends on the plea of preventing a similar clandestine transaction. The publication by Wycherley’s executors of a posthumous volume of the dramatist’s prose and verse fur- nished Pope with an excuse for the appearance of his own correspondence with Wycherley, which was accompanied by a series of unnecessary deceptions. After manipulating his cor- respondence so as to place his own character in the best light, he deposited a copy in the library of Edward, second earl of Oxford, and then he had it printed. The sheets were offered to Curll by a person calling himself P.T., who professed a desire to injure Pope, but was no other than Pope himself. The copy was delivered to Curll in 1735 after long negotiations by an agent who called himself R. Smythe, with a few originals to vouch for their authenticity. P. T. had drawn up an adver- tisement stating that the book was to contain answers from various peers. Curll was summoned before the House of Lords for breach of privilege, but was acquitted, as the letters from peers were not in fact forthcoming. Difficulties then arose between Curll and P. T., and Pope induced a bookseller named Cooper to publish a Narrative of the Method by which Mr Pope’s Private Letters were procured by Edmund Curll, Book- seller (1735). These preliminaries cleared the way for a show of indignation against piratical publishers and a ” genuine ” edition of the Letters of Mr Alexander Pope (1737, fol. and 4to). Unhappily for Pope’s reputation, his friend Caryll, who

died before the publication, had taken a copy of Pope's letters before returning them. This letter-book came to light in the middle of the 19th century, and showed the freedom which Pope permitted himself in editing. The correspondence with Lord Oxford, preserved at Longleat, afforded further evidence of his tortuous dealings. The methods he employed to secure his correspondence with Swift were even more discreditable. The proceedings can only be explained as the measures of a desperate man whose maladies seem to have engendered a p'assion for trickery. They are related in detail by Elwin in the introduction to vol. i. of Pope's Works. A man who is said to have " played the politician about cabbages and turnips," and who " hardly drank tea without a stratagem," was not likely to be straightforward in a matter in which his ruling passion was concerned. Against Pope's petulance and " general love of secrecy and cunning " have to be set, in any fair judg- ment of his character, his exemplary conduct as a son, the affection with which he was regarded in his own circle of intimates, and many well-authenticated instances of genuine and continued kindliness to persons in distress.

Bibliography. — Various collected editions of Pope's Works appeared during his lifetime, and in 1751 an edition in nine volumes was published by a syndicate of booksellers " with the commentaries of Mr Warburton." Warburton interpreted his editorial rights very liberally. By his notes_ he wilfully misrepresented the meaning of the allusions in the satires, and made them more agreeable to his friends and to the court, while he made opportunities for the gratifi- cation of his own spite against various individuals. Joseph Warton's edition in 1797 added to the mass of, commentary without giving much new elucidation to the allusions of the text, which even Swiit, with his exceptional facilities, had found obscure. In 1 769-1 807 an I edition was issued which included Owen Ruffhead's Life of Alexander

Pope (1769), inspired by Warburton. The notes of many com- mentators, with some letters and a memoir, were included in the Works of Alexander Pope, edited by W. L. Bowles (10 vols., 1806). His Poetical Works were edited by Alexander Dyce (1856); by R. Carruthers (1858) for Bohn's Library; by A. W. Ward (Globe Edition, 1869), &c. Materials for a definitive edition were collected by John Wilson Croker, and formed the basis of what has become the standard version, The. Works of Alexander Pope (10 vols., 1871-1898), including unpublished letters and other new material, with

introduction and notes by W. Elwin and W. J. Courthope. The life of Pope in vol. v. was contributed by Professor Courthope. The chief original authority besides Pope's correspondence and Ruffhead's Life is Joseph Spence's Anecdotes, published by S. W. Singer in 1820. Samuel Johnson gives a good estimate of Pope in his Lives of the Poets. The best modern lives are that by Professor Courthope, already mentioned; and Alexander Pope, by Sir L. Stephen, in the English Men of Letters series (1880). See also George Paston, Mr Pope: His Life and Times (1909). The first check to the admiration that prevailed during Pope's lifetime was given by the publication of Joseph Warton's Essay on the Writings and Genius of Pope (vol. i., 1757; vol. ii., 1782). Warton had a sincere appreciation of Pope's work, but he began the reaction which culminated with the romantic writers of the beginning of the 19th century, and set the fashion of an undue disparagement of Pope's genius as a poet with enduring effects on popular opinion. Thomas Campbell's criticism in his Specimens of the British Poets provoked a controversy to which William Hazlitt, Byron and W. L. Bowles contributed. For a discussion of Pope's position as one of the great men of letters in the 1 8th century who emancipated themselves from patronage, see A. Beljame, Le Public et les hommes de lettres en Angleterre au dix- huitieme siecle (1881); a section of Isaac D'Israeli's Quarrels of Authors is devoted to Pope's literary animosities; and most impor- tant contributions to many vexed questions in the biography of Pope, especially the publication of his letters, were made by C. W. Dilke in Notes and Queries and the Athenaeum. These articles were reprinted by his grandson, Sir Charles Dilke, in 1875, as The Papers of a Critic. (W. M.; M. Br.)

POPE, ALEXANDER (1763-1835), Irish actor and painter, was born in Cork, and was educated to follow his father's profession of miniature painting. He continued to paint miniatures and exhibit them at the Royal Academy as late as 1821; but at an early date he took the stage, first appearing in London as Oroonoko in 1785 at Covent Garden. He remained at this theatre almost continuously for nearly twenty years, then at the Haymarket until his retirement, playing leading parts, chiefly tragic. He was particularly esteemed as Othello and Henry VIII. He died on the 22nd of March 1835. Pope was thrice married. His first wife, Elizabeth Pope (c. 1744- 1797), a favourite English actress of great versatility, was billed before her marriage as Miss Younge. His second wife, Maria Ann Pope (1775-1803), also a popular actress, was a member of an Irish family named Campion. His third wife, Clara Maria Pope (d. 1838), was the widow of the artist Francis Wheatley, and herself a skilful painter of figures and of flowers.

POPE, JANE (1742-1818), English actress, daughter of a London

theattical wig-maker, who began playing in a Lilli- putian company for Garrick in 1756. From this she speedily developed into soubrette roles. She was Mrs Candour in The School for Scandal at its first presentation (1777), and thereafter she had many important parts confided to her. She was the life-long friend of Mrs Clive, and erected the monument at Twickenham to the latter's memory. She was not only an admirable actress, but a woman of blameless life, and was praised by all the literary critics of her day — unused to such a combination. She died on the 30th of July 1818.

POPE, JOHN (1822-1892), American soldier, was the son of Nathaniel Pope (1784-1850), U.S. judge for the district of Illinois, and was born at Louisville, Kentucky, on the 16th of March 1822. He graduated at the United States Military Academy in 1842 and was assigned to the engineers. He served in the Mexican War, receiving the brevets of 1st lieutenant and captain for his conduct at Monterey and Buena Vista. Sub- sequently he was engaged in engineering and exploring work, mainly in New Mexico, and in surveying the route for a Pacific railroad. He was commissioned captain in 1856. He was actively opposed to the Buchanan administration, and a speech which he made in connexion with the presidential campaign of i860 caused him to be summoned before a court-martial. Early in the Civil War he was placed, as a brigadier-general

U.S. V., in charge of the district of Missouri, which by vigorous campaigning against /guerrilla bands and severe administration of the civil population he quickly reduced to order. In 1862, along with the gunboat flotilla (commanded by Commodore A. H. Foote) on the Mississippi, Pope obtained a great success by the capture of the defences of New Madrid and Island No. 10, with nearly 7000 prisoners. Pope subsequently joined Halleck, and in command of the Army of the Mississippi took part in the siege of Corinth. He was now a major-general U.S.V. The repu- tation he had thus gained as an energetic leader quickly placed him in a high command, to which he proved to be quite unequal. The " Army of Virginia," as his new forces were styled, had but a brief career. At the very outset of his Virginian campaign Pope, by a most ill-advised order, in which he con- trasted the performances of the Western troops with the failures of the troops in Virginia, forfeited the confidence of his officers and men. The feeling of the Army of the Potomac (which was ordered to his support) was equally hostile, and the short opera- tions culminated in the disastrous defeat of the second battle of Bull Run. Pope was still sanguine and ready for another trial of strength, but he was soon compelled to realize the impossibility of retrieving his position, and resigned the command. Bitter controversy arose over these events.

Halleck, the general-in- chief, was by no means free from blame, but the public odium chiefly fell upon generals McClellan and Fitz-John Porter, against whom Pope, while admitting his own mistakes, made grave charges. Pope was not again employed in the Civil War, but in command of the Department of the North- West he showed his former skill and vigour in dealing with Indian risings. In 1865 he was made brevet major-general U.S.A. (having become brigadier-general on his appointment to the Army of Virginia), and he subsequently was in charge of various military districts and departments until his retirement in 1886. In 1882 he was promoted to the full rank of major-general U.S.A. General Pope died at Sandusky, Ohio, on the 23rd of September 1892.

He was the author of various works and papers, including railway reports (Pacific Railroad Reports vol. iii.) and The Campaign of Virginia (Washington, 1865).

POPE, SIR THOMAS (c. 1507-1559), founder of Trinity College, Oxford, was born at Deddington, near Banbury, Oxfordshire, probably in 1507, for he was about sixteen years old when his father, a yeoman farmer, died in 1523. He was educated at Banbury school and Eton College, and entered the court of chancery. He there found a friend and patron in the lord- chancellor Thomas Audley. As clerk of briefs in the star chamber, warden of the mint (1534-1536), clerk of the Crown in chancery (1537), and second officer and treasurer of the court for the settlement of the confiscated property of the smaller religious foundations, he obtained wealth and influence. In this last office he was superseded in 1541, but from 1547 to 1553 he was again employed as fourth officer. He himself won by grarit or purchase a considerable share in the spoils, for nearly thirty manors, which came sooner or later into his possession, were originally church property. ” He could have rode,” said Aubrey, ” in his owne lands from Cogges (by Witney) to Banbury, about 18 miles.” In 1537 he was knighted. The religious changes made by Edward VI. were repugnant to him, but at the beginning of Mary’s reign he became a member of the privy council. In 1556 he was sent to reside as guardian in Elizabeth’s house. As early as 1555 he had begun to arrange for the endowment of a college at Oxford, for which he bought the site and buildings of Durham College, the Oxford house of the abbey of Durham, from Dr George Owen and William Martyn. He received a royal charter for the establishment and endowment of a college of the ” Holy and Undivided Trinity ” on the 8th of March 1 556. The foundation provided for a president, twelve fellows and eight scholars, with a schoolhouse at Hooknorton. The number of scholars was subsequently increased to twelve, the schoolhouse being given up. On the 28th of

March the members of the college were put in possession of the site, and they were formally admitted on the 29th of May 1556. Pope died at Clerkenwell on the 29th of January 1559, and was buried at St Stephen's,

VValbrook; but his remains were subsequently removed to Trinity College, where his widow erected a semi-Gothic alabaster monument to his memory. He was three times married, but left no children. Much of his property was left to charitable and religious foundations, and the bulk of his Oxfordshire estates passed to the family of his brother, John Pope of Wroxton, and his descendants, the viscounts Dillon and the earls of Guilford and barons North.

The life, by H. E. D. Blakiston, in the Diet. Nat. Biog., corrects many errors in Thomas Warton's Life of Sir Thomas Pope (1772). Further notices by the same authority are in his Trinity College (1898), in the " College Histories " Series, and in the English Historical Review (April, 1896).

POPE-JOAN, a round game of cards, named after a legendary female Pope of the 9th century. An ordinary pack is used, from which the eight of diamonds has been iemoved, and a special round board in the form of eight compartments, named respec- tively Pope- Joan, Matrimony, Intrigue, Ace, King, Queen, Knave and Game (King, Queen and Knave are sometimes omitted). Each player — any number can play — contributes a stake, of which one counter is put into the divisions Ace, King, Queen, Knave and Game, two into Matrimony and Intrigue, and the rest into Pope- Joan. This is called " dressing the board." The cards are dealt round, with an extra hand for " stops," i.e. cards which stop, by their absence, the completion of a suit; thus the absence of the nine of spades stops the playing of the ten. The last card is turned up for trumps. Cards in excess may be dealt to " stops," or an agreed number may be left for the purpose, so that all players may have an equal number of cards. If an honour or " Pope " (nine of diamonds) is turned up, the dealer takes the counters in the compartment so marked. Sometimes the turning-up of Pope settles the hand, the dealer taking the whole pool. The Ace is the lowest card, the King the highest. The player on the dealer's left plays a card and names it; the player who has the next highest then plays it, till a stop is played, i.e. a card of which no one holds the next highest. All Kings are of course stops, also the seven of diamonds; also the cards next

below the dealt stops, and the cards next below the played cards. After a stop the played cards are turned over, and the player of the stop (the card last played) leads again. The player who gets rid of all his cards first takes the counters in ” Game,” and receives a counter from each player for every card left in his hand, except from the player who may hold Pope but has not played it. The player of Ace, King, Queen or Knave of trumps takes the counters from that compartment. If King and Queen of trumps are in one hand, the holder takes the counters in ” Matrimony “; if a Queen and Knave, those in ” Intrigue “; if all three, those in the two compartments ; if they are in different hands these counters are sometimes divided. Unclaimed stakes are left for the next pool. Pope is sometimes considered a universal ” stop.”

POPERINGHE, an ancient town of West Flanders, 12 m. W. of Ypres. Pop. (1904), 11,680. It contains a fine church of the nth century, dedicated to St Betin. In the 14th century it promised to become one of the principal communes in Flanders; but having incurred the resentment of Ypres on a matter of trade rivalry it was attacked and captured by the citizens of that place, who reduced it to a very subordinate position. There are extensive hop gardens, bleaching grounds and tanneries in the neighbourhood of the town.

POPHAM, SIR HOME RIGGS (1762-1820), British admiral, was the son of Stephen Popham, consul at Tetuan, and was his mother’s twenty-first child. He entered the navy in 1778, and served with the flag of Rodney till the end of the war. In 1783 he was promoted lieutenant, and was for a time engaged on survey service on the coast of Africa. Between 1787 and 1793 he was engaged in a curious series of adventures of a commercial nature in the Eastern Sea — sailing first for the Imperial Ostend Company, and then in a vessel which he purchased and in part loaded himself. During this time he took several surveys and rendered some services to the East India Company, which were officially acknowledged; but in 1793 his ship was seized, partly

on the ground that he was carrying contraband and partly because he was infringing the East India Company’s monopoly. His loss was put at £70,000, and he was entangled in litigation. In 1805 he obtained compensation to the amount of £25,000. The case was a hard one, for he was undoubtedly sailing with the knowledge of officials in India. While this dispute was going on Popham had resumed his career as a naval officer. He served with the army under the duke of York in Flanders as ” superintendent of Inland Navigation ” and won his confidence. The protection of the duke was exercised with so much effect that Popham was promoted commander in 1794 and post captain in 1795. He was now engaged for years in co-operating in a

naval capacity with the troops of Great Britain and her allies. In the Red Sea he was engaged in transporting the Indian troops em- ployed in the expulsion of the French from Egypt. His bills for the repair of his ship at Calcutta were made the excuse for an attack on him and for charging him with the amount. It was just the time of the general reform of the dockyards, and there was much suspicion in the air. It was also the case that St Vincent did not like Popham, and that Benjamin Tucker (1762-1829), secretary to the admiralty, who had been the admiral's secretary, was his creature and sycophant. Popham was not the man to be snuffed out without an effort. He brought his case before Parliament, and was able to prove that there had been, if not deliberate dishonesty, at least the very grossest carelessness on the part of his assailants. In 1806 he co-operated with Sir David Baird in the occupation of the Cape. He then persuaded the authorities that, as the Spanish Colonies were discontented, it would be easy to promote a rising in Buenos Ayres. The attempt was made with Popham's squadron and 1400 soldiers; but the Spanish colonists, though discontented, were not disposed to accept British help, which would in all probability have been made an excuse for establishing dominion. They rose on the soldiers who landed, and took them prisoners. Popham was recalled, and censured by a court martial for leaving his station; but the City of London presented him with a sword of honour for his endeavours to " open new markets," and the sentence did him no harm. He held other commands in con- nexion with the movements of troops, was promoted rear admiral in 1 8 14, and made K.C.B. in 1815. He died at Cheltenham on the 10th of September 1820, leaving a large family. Popham was one of the most scientific seamen of his time. He did much useful, survey work, and was the author of the code of signals adopted by the admiralty in 1803 and used for many years.

POPHAM, SIR JOHN (c. 1531-1607), English judge, was born at Huntworth, in Somerset, about 1531. He was educated at Balliol College,Oxford, and called to the bar at the Middle Temple. Concerning his early life little is known, but he was probably a member of the parliament of 1558. He was recorder of Bristol, and represented that city in parliament in 1571 and from 1572 to 1583. He was elected Speaker in 1580, and in 1581 became attorney-general, a post which he occupied until his appoint- ment as lord chief justice in 1592. He presided at the trials of Sir Walter Raleigh and Guy Fawkes. Towards the end of his life Popham took a great interest in colonization, and was instrumental in procuring patents for the London and Plymouth companies for the colonization of Virginia. Popham was an advocate, too, of transportation abroad as a means of

punishing rogues and vagabonds. His experiment in that direction, the Popham colony, an expedition under the leadership of his brother George (c. 1550-1608), had, however, but a brief career in its settlement (1607) on the Kennebec river. Popham died on the 10th of June 1607, and was buried at Wellington, Somerset.

See Foss, Lives of the Judges; J. Winsor, History of America, vol. iii.

POPILIA (or Popiixia), VIA, the name of two ancient roads in Italy. (1) A highroad running from the Via Appia at Capua to Regium, a distance of 321 m. right along the length of the peninsula, and the main road through the interior of the country, not along the coast. It was built in 159 B.C. by the censor M. Popilius Laenias or in 132 B.C. by the consul P. Popilius. (2) A

highroad from Ariminum to Aquileia along the Adriatic coast. It no doubt originally came into use when Aquileia was founded as a frontier fortress of Italy in 181 B.C., and Polybius gives the distance correctly as 178 m. In 132 it was reconstructed (munita) by the consul P. Popilius, one of whose milestones has been found near Atria. It ran along the shore strip (Lido) from Ari- minum to Ravenna {33 m.), where it was usual in imperial times for travellers to take ship and go by canal to Altinum (q.v.), and there resume their journey by road, though we find the stations right through on the Tabula Peutingeriana, and Narses marched in 552 from Aquileia to Ravenna. (T. As.)

POPINJAY (O. Fr. papegai, or popingay, onomatopoeic, original), an old name for a parrot. Except in its transferred sense of a dressed-up, vain or conceited, empty-headed person, the word is now only used historically of a representation or image of a parrot swinging from a high pole and used as a mark for archery or shooting matches. This shooting at the popinjay (see Archery) was formerly a favourite sport. ” Popinjay ” is still the proper heraldic term for a parrot as a bearing or charge.

POPLAR, an eastern metropolitan borough of London, England, bounded N. by Hackney, S. by the river Thames, and W. by Stepney and Bethnal Green, and extending E. to the boundary of the county of London. Pop. (1001), 168,822. The river Lea, which the eastern boundary generally follows, is believed to have been crossed towards

the north of the modern borough by a Roman road, the existence of which is recalled by the district-name of Old Ford; while Bow (formerly Stratford- le-Bow or Stratford-atte-Bowe) was so named from the ” bow ” or arched bridge which took the place of the ford in the time of Henry II. South of these districts lies Bromley; in the south-east the borough includes Blackwall; and a deep southward bend of the Thames here embraces the Isle of Dogs. Poplar falls within the great area commonly associated with a poor and densely crowded population under the name of the ” East End.” It is a district of narrow, squalid streets and mean houses, among which, however, the march of modern improvement may be seen in the erection of model dwellings, mission houses and churches, and various public buildings. In the north a part of Victoria Park is included. In Blackwall and the Isle of Dogs streets give place to the extensive East and West India Docks (opened in 1806) and Millwall Dock, with shipbuilding, engineering, chemical and other works along the river. Blackwall has been a shipping centre from early times. From the south of the Isle of Dogs (the portion called Cubitt Town) a tunnel for foot- passengers (1902) connects with Greenwich on the opposite shore of the Thames, and lower down the river is the fine Black- wall tunnel, carrying a wide roadway, completed by the London County Council in 1897 at a cost, inclusive of incidental expenses, 01 £ I .383,502. Among institutions the Poplar Accidents Hospital may be mentioned. Near the East India Docks is the settlement of St Frideswide, supported by Christ Church, Oxford. In Canning Town, which continues this district of poverty across the Lea, and so outside the county of London, are Mansfield House, founded from Mansfield College, Oxford; and a Women’s Settlement, especially notable for its medical work. The metropolitan borough of Poplar includes the Bow and Bromley and the Poplar divisions of the Tower Hamlets parliamentary borough, each returning one member. The borough council consists of a mayor, 7 aldermen and 42 councillors. Area, 2327-7 acres.

POPLAR (Lat. Populus), the name of a small group of catkin- bearing trees belonging to the order Salicaceae. The catkins of the poplars differ from those of the nearly allied willows in the presence of a rudimentary perianth, of obliquely cup-shaped form, within the toothed bracteal scales; the male flowers contain from eight to thirty stamens; the fertile bear a one- celled (nearly divided) ovary, surmounted by the deeply cleft stigmas; the two-valved capsule contains several seeds, each furnished with a long tuft of silky or cotton-like hairs. The leaves are broader than in most willows, and are generally either deltoid or ovate in shape, often cordate at the base, and

frequently with slender petioles vertically flattened. Many of the species attain a large size, and all are of very rapid growth. The poplars are almost entirely confined to the north temperate zone, but a few approach or even pass its northern limit, and they are widely distributed within that area; they show, like the willows, a partiality for moist ground and often line the river-sides in otherwise treeless districts. There are about twenty species, but the number cannot be very accurately defined — several, usually regarded as distinct, being probably merely variable forms of the same type, and the ease with which the trees inter- cross has led to the appearance of many hybrids. All yield a soft, easily-worked timber, which, though very perishable when exposed to weather, possesses sufficient durability when kept dry to give the trees a certain economic value. Many of the species are used for paper-making.

Of the European kinds one of the most important and best marked forms is the white poplar or abele, P. alba, a tree of large size, with rounded spreading head and curved branches, which, like the trunk, are covered with a greyish white bark, becoming much furrowed on old stems. The leaves are ovate or nearly round in general outline, but with deeply waved, more or less lobed and indented margins and cordate base; the upper side is of a dark green tint, but the lower surface is clothed with a dense white down, which likewise covers the young shoots — giving, with the bark, a hoary aspect to the whole tree. As in all poplars, the catkins expand in early spring, long before the leaves unfold; the ovaries bear four linear stigma lobes; the capsules ripen in May. A nearly related form, which may be regarded as a sub-species, canescens, the grey poplar of the nurseryman, is distinguished from the true abele by its smaller, less deeply cut leaves, which are grey on the upper side, but not so hoary beneath as those of P. alba; the pistil has eight stigma lobes. Both trees occasionally attain a height of 90 ft. or more, but rarely continue to form sound timber beyond the first half- century of growth, though the trunk will sometimes endure for a hundred and fifty years. The wood is very white, and, from its soft and even grain, is employed by turners and toy-makers, while, being tough and little liable to split, it is also serviceable for the construction of packing cases, the lining of carts and waggons, and many similar purposes; when thoroughly seasoned it makes good flooring planks, but shrinks much in drying, weighing about 58 lb per cubic foot when green, but only 335 lb when dry. The white poplar is an ornamental tree, from its graceful though somewhat irregular growth and its dense hoary foliage; it has, however, the disadvantage of throwing up numerous suckers for some yards around the trunk.

The grey and white poplars are usually multiplied by long cuttings; the growth is so rapid in a moist loamy soil that, according to Loudon, cuttings 9 ft. in length, planted beside a stream, formed in twelve years trunks 10 in. in diameter. Both these allied forms occur throughout central and southern Europe, but, though now abundant in England, it is doubtful whether they are there indigenous. P. alba suffers much from the ravages of wood-eating larvae, and also from fungoid growths, especially where the branches have been removed by pruning or accident.

P. nigra, the black poplar, is a tree of large growth, with dark, deeply-furrowed bark on the trunk, and ash-coloured branches; the smooth deltoid leaves, serrated regularly on the margin, are of the deep green tint which has given name to the tree; the petioles, slightly compressed, are only about half the length of the leaves. The black poplar is common in central and southern Europe and in some of the adjacent parts of Asia, but, though abundantly planted in Britain, is not there indigenous. The wood is of a yellowish tint. In former days this was the preva- lent poplar in Britain, and the timber was employed for the purposes to which that of other species is applied, but has been superseded by P. monilifera and its varieties; it probably fur- nished the poplar wood of the Romans, which, from its lightness and soft tough grain, was in esteem for shield-making; in con- tinental Europe it is still in some request; the bark, in Russia, is used for tanning leather, while in Kamchatka it is sometimes

ground up and mixed with meal; the gum secreted by the buds was employed by the old herbalists for various medicinal purposes, but is probably nearly inert; the cotton-like down of the seed has been converted into a kind of vegetable felt, and has also been used in paper-making. A closely related form is the well-known Lombardy poplar, P. fastigiata, remarkable for its tall, cypress-like shape, caused by the nearly vertical growth of the branches. Probably a mere variety of the black poplar, its native land appears to have been Persia or some neighbouring country; it was unknown in Italy in the days of Pliny, while from remote times it has been an inhabitant of Kashmir, the Punjab, and Persia, wheie it is often planted along roadsides for the purpose of shade; it was probably brought from these countries to southern Europe, and derives its popular name from its abundance along the banks of the Po and other rivers of Lombardy, where it is said now to spring up naturally from seed, like the indigenous black

poplar. It was introduced into France in 1749, and appears to have been grown in Germany and Britain soon after the middle of the last century, if not earlier. The Lombardy poplar is valuable chiefly as an orna- mental tree, its timber being of very inferior quality; its tall, erect growth renders it useful to the landscape-gardener as a relief to the rounded forms of other trees, or in contrast to the horizontal lines of the lake or river-bank where it delights to grow. In Lombardy and France tall hedges are sometimes formed of this poplar for shelter or shade, while in the suburban parks of Britain it is serviceable as a screen for hiding buildings or other unsightly objects from view; its growth is extremely rapid, and it often attains a height of 100 ft. and upwards, while from 70 to 80 ft. is an ordinary size in favourable situa- tions.

P. canadensis, the ” cotton-wood ” of the western prairies, and its varieties are perhaps the most useful trees of the genus, often forming almost the only arborescent vegetation on the great American plains. It is a tree of rather large growth, sometimes 100 ft. high, with rugged grey trunk 7 or 8 ft. in diameter, and with the shoots or young branches more or less angular; the glossy deltoid leaves are sharply pointed, somewhat cordate at the base, and with flattened petioles; the fertile catkins ripen about the middle of June, when their opening capsules discharge the cottony seeds which have given the tree its common western name; in New England it is sometimes” called the ” river poplar.” The cotton-wood timber, though soft and perishable, is of value in its prairie habitats, where it is frequently the only available wood either for carpentry or fuel ; it has been planted to a considerable extent in some parts of Europe, but in England a form of this species known as P. monilifera is generally preferred from its larger and more rapid growth. In this well-known variety the young shoots are but slightly angled, and the branches in the second year become round; the deltoid short-pointed leaves are usually straight or even rounded at the base, but sometimes are slightly cordate; the capsules ripen in Britain about the middle of May. This tree is of extremely rapid growth, and has been known to attain a height of 70 ft. in sixteen years; it succeeds best in deep loamy soil, but will flourish in nearly any moist but well-drained situation. The timber is much used in some rural districts for flooring, and is durable for indoor purposes when protected from dry-rot ; it has, like most poplar woods, the property of resisting fire better than other timber. The native country of this form has been much disputed; but, though still known in many British nurseries as the ” black Italian poplar,” it is now well ascer- tained to be an indigenous tree in many parts of Canada and the States, and is a mere variety of P. canadensis; it seems

to have been first brought to England from Canada in 1772. In America it seldom attains the large size it often acquires in England, and it is there of less rapid growth than the prevailing form of the western plains; the name of " cotton-wood " is locally given to other species. P. macrophylla or candicans, commonly known as the Ontario poplar, is_ remarkable for its very large heart-shaped leaves, sometimes 10 in. long;_it is found in New England and the milder parts of Canada, and is frequently planted in Britain; its growth is extremely rapid in moist land ; the buds are covered with a balsamic secretion. The true balsam poplar, or tacamahac, P. balsamifera, abundant in most parts of Canada and the northern States, is a tree of rather large growth, often of somewhat fastigiate habit, with round shoots and oblong-ovate sharp- pointed leaves, the base never cordate, the petioles round, and the disk deep glossy green above but somewhat downy below. This tree, the " Hard " of the Canadian voyageur, abounds on many of the river sides of the north- western plains; it occurs in the neighbourhood of the Great Slave Lake and along the Mackenzie River, and forms much of the drift- wood of the Arctic coast. In these northern habitats it attains a large size; the wood is very soft; the buds yield a gum-like balsam,

from which the common name is derived ; considered valuable as an antiscorbutic, this is said also to have diuretic properties; it was formerly imported into Europe in small quantities under the name of " baume focot," being scraped off in the spring and put into shells. This balsam gives the tree a fragrant odour when the leaves are unfolding. The tree grows well in Britain, and acquires occasionally a considerable size. Its fragrant shoots and the fine yellow green of the young leaves recommend it to the ornamental planter. It is said by Aiton to have been introduced into Britain about the end of the 17th century.

P. euphratica, believed to be the weeping willow of the Scriptures, is a large tree remarkable for the variability in the shape of its leaves, which are linear in young trees and vigorous shoots, and broad and ovate on older branches. It is a native of North Africa and Western and Central Asia, including North-West India. With the date palm it is believed to have furnished the rafters for the buildings of Nineveh.

POPLIN, or Tabinet, a mixed textile fabric consisting of a silk warp with a weft of worsted yarn. As the weft is in the form of a stout cord the fabric has a ridged structure, like rep, which gives depth and softness to the lustre of the silky surface. Poplins are used for dress purposes, and for rich upholstery work. The manufacture is of French origin; but it was brought to England by the Huguenots, and has long

been specially associated with Ireland. The French manufacturers distinguish between popelines unies or plain poplins and popelines a dis- positions or £cossaises, equivalent to Scotch tartans, in both of which a large trade is done with the United States from Lyons.

POPOCATEPETL (Aztec popoca ” to smoke,” tepetl ” moun- tain “), a dormant volcano in Mexico in lat. 18 59′ 47″ N., long. 98 33′ 1″ W., which with the neighbouring Ixtaccihuatl (Aztec ” white woman “) forms the south-eastern limit of the great basin known as the ” Valley of Mexico.” As it lies in the state of Puebla and is the dominating feature in the views from the city of that name, it is sometimes called the Puebla volcano. It is the second highest summit in Mexico, its shapely, snow-covered cone rising to a height of 17,876 ft., or 438 ft. short of that of Orizaba. This elevation was reported by the Mexican geological survey in 1895, and as the Mexican Geo- graphical Society calculated the elevation at 17,888 ft., it may be accepted as nearly correct. The bulk of the mountain con- sists of andesite, but porphyry, obsidian, trachyte, basalt, and other similar rocks are also represented. It has a stratified cone showing a long period of activity. At the foot of the eastern slope stretches a vast lava field— the ” malpays ” (malapais) of Atlachayacatl — which, according to Humboldt, lies 60 to 80 ft. above the plain and extends 18,000 ft. east to west with a breadth of 6000 ft. Its formation must be of great antiquity. The ascent of Popocatepetl is made on the north- eastern slope, where rough roads are kept open by sulphur carriers and timber cutters. Describing his ascent in 1904, Hans Gadow states that the forested region begins in the foot- hills a little above 8000 ft., and continues up the slope to an elevation of over 13,000 ft. On the lower slopes the forest is composed in great part of the long-leaved Pinus liophylla, accompanied by deciduous oaks and a variety of other trees and shrubs. From about 9500 ft. to 11,500 ft. the Mexican ” oyamel,” or fir {Abies religiosa) becomes the principal species, interspersed with evergreen oak, arbutus and elder. Above this belt the firs gradually disappear and are succeeded by the short- leaved Pinus montezumae, or Mexican ” ocote ” — one of the largest species of pine in the republic. These continue to the upper tree-line, accompanied by red and purple Penlslemon and light blue lupins in the open spaces, some ferns, and occasional masses of alpine flowers. Above the tree line the vegetation continues only a comparatively short distance, consisting chiefly of tussocks of coarse grass, and occasional flowering plants, the highest noted being a little Draba. At about 14,500 ft. horses are left behind, though they could be forced farther up through the loose lava and ashes. On the snow-covered cone the heat of the sun is intense, though the thermometer recorded a temperature of 34 in September.

The reflection of light from the snow is blinding. The rim of the crater is reached at an elevation of about 17,500 ft. Another descrip- tion places the snow-line at 14,268 ft., and the upper tree-line

a thousand feet lower. A detailed description of the volcano was published by the Mexican geological survey in 1895 accord- ing to which the crater is elliptical in form, 2008 by 131 2 ft., and has a depth of 1657 ft. below the summit of the highest pinnacle and 673 ft. below the lowest part of the rim, which is very irregular in height. The steep, ragged walls of the crater show a great variety of colours, intensified by the light from the deep blue sky above. Huge patches of sulphur, some still smouldering, are everywhere visible, intermingled with the white streaks of snow and ice that fill the crevices and cover the ledges of the black rocks. The water from the melted snow forms a small lake at the bottom of the crater, from which it filters through fissures to the heated rocks below and thence escapes as steam or through other fissures to the mineral springs at the moun- tain's base. The Indian sulphur miners go down by means of ladders, or are lowered by rope and windlass, and the mineral is sent down the mountain side in a chute 2000 to 3000 ft. Some observers report that steam is to be seen rising from fissures in the bottom of the crater, and all are united in speaking of the fumes of burning sulphur that rise from its depths. That volcanic influences are still present may be inferred from the circumstance that the snow cap on Popocatepetl disappeared just before the remarkable series of earthquakes that shook the whole of central Mexico on the 30th and 31st of July 1909.

It is believed that Diego de Ordaz was the first European to reach the summit of Popocatepetl, though no proof of this remains further than that Cortes sent a party of ten men in 15 19 to ascend a burning mountain. In 1522 Francisco Montano made the ascent and had himself let down into the crater a depth of 400 or 500 ft. No second ascent is recorded until April and November 1827 (see Brantz Mayer, Mexico, vol. ii.). Other ascents were made in 1834, 1848 and subsequent years, members of the Mexican geological survey spending two days on the summit in

189.V

POPPER, DAVID (1846-), Bohemian violoncellist, was born at Prague, and educated musically at the conservatorium there, adopting the 'cello as his professional instrument. He was soon recognized, largely through von Btilow, as one of the finest soloists of the time, and

played on tours throughout the European capitals. In 1872 he married the pianist Sophi Menter, from whom he was separated in 1886. In 1896 he became professor at the Royal Conservatoire at Budapest. He published various works, mainly compositions for the ‘cello, together with four volumes of studies arranged as a violoncello school.

POPPO, ERNST FRIEDRICH (1794-1866), German classical scholar and schoolmaster, was born at Guben in Brandenburg on the 13th of August, 1794. In 1818 he was appointed director of the gymnasium at Frankfort-on-the-Oder, where he died on the 6th of November 1866, having resigned his post three years before. Poppo was an extremely successful teacher and organizer, and in a few years doubled the number of pupils at the gymnasium. He is chiefly known, however, for his exhaustive and complete edition of Thucydides in four parts (11 vols., 1821-1840), containing (i.) prolegomena on Thucydides as an historian and on his language and style (Eng. trans, by G. Burges, 1837), accompanied by historical and geographical essays; (ii.) text with scholia and critical notes; (iii.) commentary on the text and scholia; (iv.) indices and appendices. For the ordinary student a smaller edition (1843-1850) was prepared, revised after the author’s death by J. M. Stahl (1875-1889).

See R. Schwarze in Allgemeine deutsche Biographie and authorities there referred to.

POPPY, in botany, a genus of plants known botanically as papaver, the type of the family or natural order Papaveraceae. They are annual and perennial erect herbs containing a milky juice, with lobed or cut leaves and generally long-stalked regular showy flowers, which are nodding in the bud stage. The sepals, very rarely three, which are two in number, fall off as the flower opens, the four (very rarely five or six) petals, which are crumpled in the bud stage, also fall readily. The numerous stamens surround the ovary, which is composed of 4 to 16 carpels

and is surmounted by a flat or convex rayed disk bearing the stigmas. The ovary is incompletely divided into many chambers by the ingrowth of the placentas which bear numerous ovules and form in the fruit a many-seeded short capsule opening by small valves below the upper edge. The valves are hydroscopic, responding to increase in the amount of moisture in the atmo- sphere by closing the apertures. In dry weather the valves open, and the small seeds are ejected through the pores when the capsule is shaken by the wind on its long stiff slender stalk: The flowers contain no honey and are visited by pollen-seeking insects, which alight on the broad stigmatic surface.

The genus contains about 40 species, mostly natives of central and south Europe and temperate Asia. Five species are British; P. Rhoeas is the common scarlet poppy found in cornfields and waste places. Cultivated forms of this, with exquisite shades of colour and without any blotch at the base of the petals, are known as Shirley poppies. P. somniferum, the opium poppy, with large white or blue-purple flowers, is widely cultivated (see Opium). The Oriental poppy (P. orientate) and its several varieties are fine garden plants, having huge bright crimson flowers with black blotches at the base. Many hybrid forms of varying shades of colour have been raised of late years. The Iceland poppy (P. undicaule), is one of the showiest species, having grey-green pinnate leaves and flowers varying in colour from pure white to deep orange-yellow, orange-scarlet, &c. Specially fine varieties with stalks 18-24 m – high are cultivated on a large scale by some growers for market. The Welsh poppy belongs to an allied genus, Meconopsis; it is a perennial herb with a yellow juice and pale yellow poppy-like flowers. It is native in the south-west and north of England, and in Wales; also in Ireland. The prickly poppy (Argemone grandiflora) is a fine Mexican perennial with large white flowers.

To the same family belongs the horned poppy, Glaucium luteum, found in sandy sea-shores and characterized by the waxy bloom of its leaves and large golden-yellow short-stalked flowers. Another member of the family is Eschscholtzia cali- fornica, a native of western North America, and well-known in gardens, with orange-coloured flowers and a long two-valved fruit pod.

The plume poppy {Bocconia cordate and B. microcarpa) are ornamental foliage plants of great beauty. The cyclamen poppy (Eomecon chionantha) is a pretty Chinese perennial, having roundish slightly lobed leaves and pure white flowers about 2 in. across. The tree poppy (Dendromecon rigidum) is a Californian shrub about 3 ft. high, having golden-yellow flowers about 2 in. across. The Californian poppy (Platystemon cali- fornicus) is a pretty annual about a foot high, having yellow flowers with 3 sepals and 6 petals; and the white bush poppy (Romneya Coulteri) is a very attractive perennial and semi- shrubby plant 2-8 ft. high, with pinnatifid leaves and large sweet scented white flowers often 6 in. across.

POPPY HEADS, a term, in architecture, given to the finials or other ornaments which terminate the tops of bench ends, either to pews or stalls. They are sometimes small human heads, sometimes richly carved images, knots of foliages or finials, and sometimes fleurs-de-lis simply cut out of the thickness of the bench end and chamfered. The term is probably derived from the French poupie, doll, puppet, used

also in this sense, or from the flower, from a resemblance in shape.

POPPY OIL {Oleum papaveris), a vegetable oil obtained by pressure from the minute seeds of the garden or opium poppy, Papaver somniferum. The white-seeded and black-seeded varieties are both used for oil-pressing; but, when the production of oil is the principal object of the culture, the black seed is usually preferred. The qualities of the oil yielded by both varieties and the proportion they contain (from 50 to 60%) are the same. By cold pressing seeds of fine quality yield from 30 to 40% of virgin or white oil (huile blanche), a transparent limpid fluid with a slight yellowish tinge, bland and pleasant to taste, and with almost no perceptible smell. On second pressure with the aid of heat an additional 20 to 25% of inferior oil {huile de fabrique or huile russe) is obtained, reddish in colour, possessed

of a biting taste, and a linseed-like smell. The oil belongs to the linoleic or drying series, having as its principal constituent linolein; and it possesses greater drying power than raw linseed oil. Its specific gravity at 15° C. is 0-925. Poppy oil is a valu- able and much used medium for artistic oil painting. The fine qualities are largely used in the north of France (huile d' ceillette) and in Germany as a salad oil, and are less liable than olive oil to rancidity. The absence of taste and characteristic smell in poppy oil also leads to its being much used for adulterating olive oil. The inferior qualities are principally consumed in soap- making and varnish-making, and for burning in lamps. The oil is very extensively used in the valley of the Ganges and other opium regions for food and domestic purposes. By native methods in India about 30% of oil is extracted, and the remain- ing oleaginous cake is used as food by the poor. Ordinary poppy-oil cake is a valuable feeding material, rich in nitrogenous constituents, with an ash showing an unusually large proportion of phosphoric acid. The seed of the yellow horned poppy, Glaucium luteum, yields from 30 to 35% of an oil having the same drying and other properties as poppy oil; and from the Mexican poppy, Argemone mexicana, is obtained a non-drying oil used as a lubricant and for burning.

POPULATION (Lat. populus, people; populare, to populate), a term used in two different significations, (1) for the total number of human beings existing within certain area at a given time, and (2) for the " peopling " of the area, or the influence of the various forces of which

that number is the result. The popu- lation ota country, in the former sense of the word, is ascertained by means of a census (q.v.), which periodically records the number of people found in it on a certain date. Where, as is generally the case, detail of sex, age, conjugal condition and birthplace is included in the return, the census results can be co-ordinated with those of the parallel registration of marriages, births, deaths and migration, thus forming the basis of what are summarily termed vital statistics, the source of our information regarding the nature and causes of the process of " peopling," i.e. the movement of the population between one census and another. Neither of these two operations has yet reached perfection, either in scope or accuracy, though the census, being the subject of special and concentrated effort, is generally found the superior in the latter respect, and is in many cases taken in countries where registration has not yet been introduced. The countries where neither is in force aie still, unfortunately, very numerous.

The Population of the World, and its Geographical Distribution. — Man is the only animal which has proved able to pass from dependence upon its environment to a greater or less control over it. He alone, accordingly, has spread over every quarter of the globe. The area and population of the world, as a whole, have been the subject of many estimates in scientific works for the last three centuries and are still to a considerable extent matters of rough approximation. Every decade, however, brings a diminution of the field of conjecture, as some form of civilized administration is extended over the more backward tracts, and is followed, in due course, by a survey and a census. It is not necessary, therefore, to cite the estimates framed before 1882, when a carefully revised summary was published by Boehm and H. Wagner. Since then the laborious investigations of P. F. Levasseur and L. Bodio have been completed in the case of Europe and America, and, for the rest of the world, the figures annually brought up to date in the Statesman's Year Book may be taken to be the best avail- able. From these sources the abstract at foot of page has been derived.

The principal tracts still un- measured and unenumerated (in any strict sense) in the Old World are the Turkish Empire, Persia, Afghanistan, China and the Indo-Chinese peninsula

and nearly nine-tenths of Africa. In the same category must be placed a considerable proportion of central, southern and Polar America (see Census). There is little of the world which is entirely uninhabited; still less permanently uninhabitable and unlikely to be required to support a population in the course of the expansion of the race beyond its

present abodes. Probably the polar regions alone do not fall within the category of the poten- tially productive, as even sandy and alkaline desert is rendered habitable where irrigation can be introduced; and vast tracts of fertile soil adapted for immediate exploitation, especially in the temperate zones, both north and south, only remain unpeopled because they are not yet wanted for colonization. The geographical distribution of the population of the world is therefore extremely irregular, and, omitting from consideration areas but recently colonized, the density is regulated by the means of subsistence within reach. ” La population,” says G. de Molinari, ” a tendance de se proportionner a son debouche.” These, in their turn, depend mainly upon the character of the people who inhabit the country. Even amongst savages there are few communities, and those but sparse, which subsist entirely upon what is directly provided by nature. As human intelli- gence and industry come into play the means of livelihood are proportionately extended; population multiplies, and with this multiplication production increases. Thus, the higher densities are found in the eastern hemisphere, within the zone in which arose the great civilizations of the world, or, roughly speaking, between north parallels 25 and 40 towards the east, and 25 and 55 in the west. Here large areas with a mean density of over 500 to the sq. m. may be found either supported by the food directly produced by themselves, as in the great agricultural plains of the middle kingdom of China and the Ganges valley and delta; or else, as in western Europe, relying largely upon food from abroad, purchased by the products of manufacturing industry. In the one class the density is mainly rural, in the other it is chiefly due to the concentration of the population into large urban aggregates. It is chiefly from the populations of the south-west of Europe that the New World is being colo- nized; but the territories over which the settlers and their recruits from abroad are able to scatter are so extensive that even the lower densities of the Old World have not yet been attained, except in a few tracts along the eastern coasts of Australia and North America. Details of area and population are given under the headings of the respective countries, and the only general point in connexion with the relation between these two facts which may be mentioned here is the need to bear in mind that the larger the territory the less likely is its mean density-figure to be typical or really representative. Even in the case of small and comparatively homogeneous countries such as Holland, Belgium or Saxony there is considerable deviation from the mean in the density of the respective component subdivisions, a difference which when extended over more numerous aggre- gates often renders the general mean misleading or of little value.
Distribution of Population by Sex. — After geographical dis- persion,

the most general feature amongst the human race is its division by sex. The number of speculations as to the nature of this distinction has been, it is said, well-nigh doubled since Drelincourt, in the 18th century, brought together 262 ” ground- less hypotheses,” and propounded on his own part a theory

Table I.

Continent.

Sq. m. in

thousands

(1907).

Population, in thousands.

Population

per sq. m.

(1907).

Unascertained Percentage of :

1882.

1907.

Area un- surveyed.

Population Unenumerated.

Europe . Asia . Africa . . America . Oceania .

3,828* 15.773

n.507

17,208*

3.448

327.743 795.591 205,823 100,415 4.232

405.759 918,324 126,734 149,944 5,881

I06f

58

11

9t i-7

2-5* 43-2 90-1 50-0*

5-4

1-3 59-4 77-4

9-1 19-6

Total . .

51.764

1,433,804

1,606,542

3i-7t

50-4*

41-4

+ Including Polar regions.

t Excluding Polar regions.

which has since been held to be the 263rd in the series. It is not proposed to deal here with incidents appertaining to the ” ante-natal gloom,” and we are concerned only with human beings when once they have been born. In regard to the division of these into male and female, the first point to be noted is that, in all communities of western civilization, more boys are born than girls. The excess ranges from 20 to 60 per thousand. In Greece and Rumania it is exceptionally high, and in some Oriental or semi-Oriental countries it is said to give place to a deficit, though in the latter case the returns are probably

not trustworthy. From the more accurate statistics available it appears that the excess of male births varies amongst different races and also at different times in the same community. It is high in new colonies and amongst the Latin races, with the exception of the French. These, with the English, show a much smaller excess of boy-births than the average of western Europe, and the proportion, moreover, seems to be somewhat declining in both these countries and in Belgium, from causes which have not yet been ascertained. As the mortality amongst boys, especially during the first year, is considerably above that of the other sex, numerical equilibrium between the two .is estab- lished in early youth, and in most cases girls outnumber boys, except for a few years between twelve and sixteen. Then follows the chequered period of the prime of life and middle age, during which the liability of men to industrial accidents, war and other causes of special mortality, irrespective of their greater incli- nation to emigrate, is generally sufficient to outweigh the dangers of childbirth or premature decay among the women, who tend, accordingly, to predominate in number at this stage. In old age, again, their vitality rises superior to that of the men, and they continue to form the majority of the community. The general results are an excess of females over males throughout western Europe: but though the relative proportions vary from time to time, remaining always in favour of what is conventionally called the weaker sex, it is impossible, owing to disturbing factors like war and migration, to ascertain whether there is any general tendency for the proportion of females to increase or not. In comparatively new settlements, largely fed by immigration, the number of males is obviously likely to be greater than that of females, but in the case of countries in Asia and eastern Europe in which also a considerable deficiency of the latter sex is indi- cated by the returns, it is probable that the strict seclusion imposed by convention on women and the consequent reticence regarding them on the part of the householders answering the official inquiry tend towards a short count. On the other hand, the lower position there assigned to women and the very considerable amount of hard work exacted from them, may cause them to wear out earlier than under higher conditions, though not to the extent implied in the statistics. In the Table II.

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1049

946

‘ Galicia .

1019

941

J Norway

1064

944

Hungary

1009

949

] Finland

1022

948

Rumania

964

902

I Denmark

1053

950

, Greece .

921

879

f England

1069

966

Servia .

946

945

■i Scotland

1057

956

Bulgaria

959

927

(Ireland

1028

946

Russia .

(“Holland

1025

950

1 (Europe)

IOII

948

J Belgium

1013

956

C Russia (Asia) . J Japan . . .

893

J Germany

1029

950

983

—

(.Austria .

1042

947

| India

I Egypt . . .

9 6 3

—

f France .

1033

960

967

—

J Italy .

IOII

947

‘United States .

‘ 958

—

1 Spain

1049

938

Canada

952

—

t Portugal

1093

899

J Argentine .

893

—

I

Cape Colony .

977

—

1

Australia

906

950

I

ˆ New Zealand .

900

following table the latest available information on this head is given for representative countries of western and eastern Europe, the East and the New World.

Distribution by Age. — Few facts are more uncertain about an individual than the number of years he will live. Few, on the contrary, as was pointed out by C. Babbage, are less subject to fluctuation than the duration of life amongst people taken in large aggregates. The age-

constitution of a community does indeed vary, and to a considerable extent, in course of time, but the changes are usually gradual, and often spread over a genera- tion or more. At the same time, it must be admitted that those which have recently taken place amongst most of the communities of western Europe are remarkable for both their rapidity and their extent; and are probably attributable, in part at least, to influences which were almost inoperative at the time when Babbage wrote. The distribution of a population amongst the different periods of life is regulated, in normal circumstances, by the birth-rate, and, as the mortality at some of the periods is far greater than at others, the death-rate falls indirectly under the same influence. The statistics of age, there- fore, may be said to form a link between those of the population, considered as a fixed quantity, as at a census, and those which record its movement from year to year. To the correct interpre- tation of the latter, indeed, they are essential, as will appear below. Unfortunately, the return of age is amongst the less satisfactory results of a general enumeration, though its inaccu- racy, when spread over millions of persons, is susceptible of correction mathematically, to an extent to make it serve its purpose in the directions above indicated. The error in the original return generally arises from ignorance. An illiterate population is very prone to state its age in even multiples of five, and even where education is widely spread this tendency is not altogether absent, as may be seen from the examples given in Table III.

Number returned at each age

per 10,000 of Population.

United States,

Russia

, 1897.

Age.

Germany,

1900.

India,

1891

Native

Asia,

Females.

Whites.

Negroes.

Europe.

Females.

19

180

196

204

166

112

64

20

182

200

252

223

385

505

21

181

191

204

143

113

54

29

130

146

119

92

60

42

30

149

170

218

269

456

624

31

145

125

76

74

74

30

49

88

72

62

45

38

12

50

94

84

156

196

257

386

51

89

61

38

35

34

12

59

62

43

30

25

18

10

60

70

49

105

163

179

281

61

60

33

15

22

25

11

Table III. Deliberate mis-statements, too, are not unknown, especially amongst women. This has been repeatedly illustrated in the English census reports. Irrespective of the wish of women between 25 and 40 to return themselves as under 25, there appears to be the more practical motive of obtaining better terms in industrial insurance, whilst an overstatement of age often has, it is said, the object of getting better wages in domestic service, or better dietary in the workhouse! In all countries, moreover, there seems to be an inclination to exaggerate longevity after the three score years and ten have been passed. In order to minimize the results of such inaccuracy, the return of ages is compiled in aggregates of five or ten years and

then redistributed over single years by the method of differences. The present purpose being merely to illustrate the variation of distribution amongst a few representative countries, it is unnecessary to enter into more detail than such as will serve to distinguish the proportions of the population in main divisions of life. Thus it may be said that in the west of Europe about one-third of the people, roughly speaking, are under fifteen; about one-half, between that age and fifty, and the remaining sixth older than fifty. The middle period

may conveniently be extended to sixty and subdivided at forty, as is done in Table IV. The differences between the several countries in their age-constitution can best be appreciated by reference to some recognized general standard. The one here adopted is the result of the co-ordination of a long series of enumerations taken in Sweden during the last century and a half, prepared by Dr G. Sundbarg of Stockholm. It is true that for practical use in connexion with vital statistics for a given period, the aggregate age-distribution of the countries concerned would be a more accurate basis of comparison, but the wide period covered by the Swedish observations has the advantage of eliminating temporary disturbances of the balance of ages, and may thus be held to compensate for the compara- tively narrow geographical extent of the field to which it relates.

Table IV.

Country.

Census Year.

Per 1000 of Population.

Under 15.

15-40.

40-60.

Over 60.

Standard .

Sweden . Norway . Finland . Denmark

F.ngland . Scotland . Ireland .

Holland . . . Belgium . Germany Austria .

France

Italy . . .

Portugal .

Galicia

Hungary

Servia

Bulgaria

Greece

Russia (Furope) India (males) Japan . . .

United States Canada . Australasia . Cape Colony

1900

1901

1899 1900

1901 1900

1S89

1897 1891 1898

1900 1901

1904

336

324 354 345 339

324 334 304

348 317 348 344

261

34i

338

377 356 419 414 393’

35o 39i

335

334 346 349 415

389

366

36i

386 376

423 416

407

384 404

395 402

389 366

375

399 379 395 322 400

385 399 384

422 409

431 409

192

191 176

187 186

179

173 180

175 184

179

182

226 196 191

178 189 142 172 155

180 163 193

169

168

157 129

83

119 109

82 99

74

77

109

93 95

78 72

124

97 96

46 76

44 92

52

85 47 88

75 77 63 47

As regards correspondence with the standard distribution, it will be noted that Finland, the next country to Sweden geo- graphically, comes after Japan, far detached from northern Europe by both race and distance, and is followed by Portugal, where the conditions are also very dissimilar. The other Scandinavian countries, Norway and Denmark, appear, like Sweden itself in the present day, to bear in their age-distribution distinct marks of the emigration of adults, or, at least, the temporary absence from home of this class at the time of enume- ration. The same can be said of Italy in its later returns and of Germany in those before 1895. On the contrary, the effect of the inflow of adult migrants is very marked, as is to be expected, in the returns for the new countries, such as the United States, Canada and Australasia. In the case of the Old World, the divergence from the standard which most deserves notice is the remarkable preponderance of the young in all the countries of eastern Europe, as well as in India, accompanied by an equally notable deficiency of the older elements in the population. Again, there are in the west two well-known instances of deficient reinforcement of the young, France and Ireland, in which countries the proportion of those under 15 falls respectively 75 and 32 per miile below the standard; throwing those over 60 up to 41 and 26 per mille above it. The table does not in- clude figures for earlier enumerations, but one general character-

istic in them should be mentioned, viz. the far higher proportion borne in them of the young, as compared with the more recent returns. In England, for instance, those under. 1 5 amounted to 360 per mille in 1841, against 324 sixty years later. In Ireland the corresponding fall has been still more marked, from 382 to 304. The ratio in France was low throughout the 19th century, and during the last half fell only from 273 to 261, raising the proportion of the old above that resulting in northern Europe and Italy from emigration. It is remarkable that the same tendency for the proportion of the young to fall off is perceptible in new countries as well as in the older civilizations, setting aside the influence of immigration at the prime of life in depressing the proportion of children. The possible causes of this wide- spread tendency of the mean age of a western community to increase appertain to the subject of the movement of the population, which is dealt with below.

The Movement of Population. — ” The true greatness of a State ” says Bacon, ” consisteth essentially in population and breed of men ” ; and

an increasing population is one of the most certain signs of the well-being of a community. Successive accretions, however, being spread over so long a term as that of human life, it does not follow that the population at any given time is necessarily the result of contemporary prosperity. Con- versely, the traces left by a casual set-back, such as famine, war, or an epidemic disease, remain long after it has been succeeded by a period of recuperation, and are to be found in the age-constitution and the current vital statistics. Population is continually in a state of motion, and in large aggregates the direction is invariably towards increase. The forces underlying the movement may differ from time to time in their respective intensity, and, in highly exceptional cases, may approach equilibrium, their natural tendencies being interrupted by special causes, but the instances of general decline are confined to wild and comparatively small communities brought into contact with alien and more civilized races. The factors upon which the growth of a population depend are internal, operating within the community, or external, arising out of the relations of the community with other countries. In the latter case, population already in existence is transferred from one territory to another by migration, a subject which will be referred to later. Far more important is the vegetative, or ” natural ” increase, through the excess of births over deaths. The principal influences upon this, in civilized life, are the number of the married, the age at which they marry or bear children, the fertility of marriages and the duration of life, each of which is in some way or other connected with the others.

Marriage.— la every country a small and generally diminish- ing proportion of the children is born out of wedlock, but the primary regulator of the native growth of a community is the institution of marriage. Wherever, it has been said, there, is room for two to live up to the conventional standard of comfort, a marriage takes place. So close, indeed, up to recent times, was the connexion held to be between the prosperity of the country and the number of marriages, that Dr W. Farr used to call the latter the barometer of the former. The experience of the present generation, however, both in England and other countries, seems to justify some relaxation of that view, as will appear below. The tendency of a community towards matri- mony, or its ” nuptiality,” as it is. sometimes termed, is usually indicated by the ratio to the total population of the persons married each year. For the purpose of comparing the circum- stances of the same community at successive periods this method is fairly trustworthy, assuming that there has been no material shifting of the age-proportions during the intervals. It is not a safe guide, however, when applied to the comparison of different communities, the age-composition of which is

probably by no means identical, but in consideration of its familiarity it has been adopted in the first section of Table V. below, at three periods for each of the countries selected as representative.

One of the features which is prominent throughout the return is that in every country except Belgium the rate per mille attained a maximum in the early seventies, and has since shown

a descending tendency, notwithstanding the fact, noted in the preceding paragraph, that the youthful population, which, of course, weighs down the rate, has also been relatively decreasing. Countries of Oriental and semi-Oriental habits have not been shown, owing to the difference in their marriage system from that of western Europe. It may be mentioned, however, in passing, that their marriage rate is generally considerably higher than that here indicated, as may be seen from the example of Galicia, which is here shown separately from cis-Leithian Austria.

years of age and decreases rapidly as that period is left behind. A Swedish return of 1806-1900 shows that the annual births per thousand wives of 20-25 are fewer by nearly 17% than those of wives under 20. Between 25 and 30 the number falls off by one-fifth, and after 40 by about 44%. In the countries mentioned in Table V. the average proportion borne by wive? under 30 to the total under 45 is just over one-third. That proportion is exceeded in southern Europe, where women develop earlier, and in Galicia. In England and France it stands at

Table V.

Country.

Per 1000 of Population.

Persons Married Yearly.

1861-1870. 1871-1875. 1895-1904

Women, 15 to 45 (1900).

Total.

Married.

Unmarried.

Men, 20-50.

Unmarried.

Sweden . Norway . Finland . Denmark

England . Scotland . Ireland .

Holland . . Germany Belgium . Austria (W.)

France Italy .

Galicia

I3-I

13-3 15-5 149

16-7 14-0

io-S

16-4 17-0 15-0 161

15-6 15-2

19-7

14-0 14-6 17-9 15-9

17-1 14-9 10-7

16-6 18-9

177

16-9 15-6

19-7

12-0 13-2

14-1 14-6

15-8 14-3

IO-I

14-9 16-4 16-4 15-7

15-2

14-4

17-6

215 218 219 221

250 242 235

218 226 230 227

228 214

225

91 103 104

117

102

76

96 114 108 106

120 116

125

123 102

“5

in

127 135 153

118 107 117 115

100 92

94

83

7i

70 81

77 90

125

82 76 85 85

In the opposite direction will be noted the case of Ireland, where the rate is abnormally low; and returns more recent than those included in the table show that of late the rates in Sweden and Norway have also fallen to but little above 11 per mille. In regard to the necessity of taking into consideration the factor of age in the return of marriage-rates, an example may be here given from the data for England. The rate taken upon the total population was 16-7 per mille in 1870-1871 and 15-3 in 1905; by excluding the population under fifteen the corresponding figures are 57-2 and 46-6 per mille. Thus the decline, which by the first method is only 8%, becomes, by the second, 19%; and if the age-distribution of 1905 were reduced to that of the earlier period, the difference would increase to 22%, the most accurate figure of the three. For the present purpose it is sufficient to connect the rate of marriage with that of births by using as a basis for the former the number of women of conceptive age, or between 15 and 45 years old. The propor- tion of these is given in the latter portion of the table. Again taking England as an example, the women of the above ages bore the proportion to the total population of 23% in 1871 and had risen to 25% in 1901; but at the former time, 49-6% were married, whilst thirty years later, only 46-8 were thus situated. The table also shows that the proportion of the women of the ages in question who were married exceeds half only in Italy, France and Germany, not to mention Galicia. In other countries the average proportion is about 45%. In Sweden and Norway it is only 41 and in Ireland less than a third. In Scandinavia, and perhaps in Italy, the rate may be affected by the emigration of adult males, but the later columns of the table indicate that this is not the cause of the low rate in Ireland, which appears to be mainly due to abstinence from marriage at the ages specified.

Next to the proportion of the married to the total marriageable the most important factor connected with the natural increase of the population is the age at which marriage takes place. Where the proportion of the married is high, the average age of the wives is low, and early marriage is conducive to relatively rapid increase. In the first place, the interval between genera- tions is shortened, and the elder is contemporaneous with the younger for a longer period. Then, again, the fecundity of women amongst western peoples is at its maximum between 18 and 25

36. In Ireland and Sweden it is only 28, and in Denmark, Holland and Norway, too, it is below the average. The registrar- general of England has pointed out a marked tendency towards the postponement of marriage in that country. Between 1876 and 1905, for instance, the proportion of minors married receded by 43% in the case of men and 32% amongst women. The mean age of husbands married in 1873 was 25-6 years and of wives 24-2, whereas thirty years later the corresponding ages were 28-6 and 26-4. The general results of the decline of the marriage-rate and the postponement of marriage upon the natural growth of population will be discussed in connection with the birth-rate, though the statistics available do not permit of the accurate measurement of the respective influence of these factors, and there are others, too, which have to be taken into consideration, as will appear below.

Births.* Apart from the information which the statistics of birth furnish as to the growth of population, they have, like those of marriage, and perhaps to even a greater extent, a special social interest from their bearings upon the moral con- ditions of the community to which they relate. It is in their former capacity, however, that they enter into the present sub- ject. A birth-rate, taken as it usually is upon the total popu- lation, old and young, is open to the objections made above respecting the marriage-rate, and with even more force, as the basis is itself largely the product of the fact which is being measured by it. The internal variations of the rate in a single community, however, can be fairly indicated in this way, as is done in Table VI., which, it is to be noted, refers to those born alive only and excludes the still-born, statistics regarding whom are incomplete.

The crude birth-rate, it will be noted, is in general harmony with that of marriage. In the countries where the former is high the rate of marriage is also above the average. In eastern Europe, so far as the figures can be trusted, this is markedly the case, and the birth-rates range between 39 per mille in Hungary and 49 in Russia, where the tradition of encouraging prolificity amongst the peasantry has not been effaced. Among the lower rates which prevail in western Europe, however, the connexion is not so direct, and a low birth-rate is some- times found with a relatively higher marriage rate and vice versa, a deviation from the natural course of events which will

be discussed presently. The birth-rate, like the marriage-rate, seems to have reached its acme in the seventies, except in the three southern countries, France, Italy and Spain. The decline since the above period is very marked and exceeds that noted in the case of the rate of marriage. It is worth noting, too, that the fall in the crude birth-rate is not confined to the Old World, but has attracted special attention in Australia and New Zealand, where a rate of 40 per mille in the period 1861-1870 has now given place to one of 26. In Massachusetts and other of the older settlements of the United States, moreover, the same feature has been the subject of investigation.

other than abstinence from marriage, at all events at the princi- pal reproductive period; and perhaps to a decrease in marriage or remarriage after middle life, a period of which the weight in the age-distribution has been increasing of late. On the other hand, the postponement of marriage in the case of women of conceptive ages is a tendency which seems to be growing in other countries as well as in England and undoubtedly has a depressing effect upon the rate of births. It would conduce, therefore, to further accuracy in the comparison of the rates of different countries if the latter were to be correlated with greater subdivision of the ages amongst wives between 15 and 45. The proportion of wives below 30 to the total of that group was

Table VI.

Country.

(A) Born alive, per 1000 of Total Population.

(B) Legitimate Births, per

1000 Wives,

1 5 to 45 years old.

(C) Illegitimate

Births, per 1000

Unmarried and

Widowed Women,

15 to 45.

1841-1850.

1861-1870.

1871-1875.

1900-1905.

1880-1882.

1890-1892.

1 900- 1 902.

1896-1900.

Sweden Norway Finland Denmark .

England . Scotland . Ireland

Holland . . . Belgium . Germany Austria (W.) .

France

Italy . . . .

Spain . . . .

3i-i

30-7 35-5 30-5

34-6

33-0

30-5 36-1

35-9 27-3

31-4 309 34-7 31-0

36-0 34-8

26-1

35-3 31-6

37-2

35-7

26-3 37-5 37-8

30-7

3o-3 37-o

30-8

360

35-o

26-4

36-1 32-4 38-9 37-2

25-5 369

36-5

26-7

29-7 32-2

29-7

29-0

29-7 23-2

32-1 28-5 35-5 34-2

21-7

33-5 34-8

293

3H

309

287

286

3il

283

347 313 310 281

196 276

258

280

307 301

278

264 296

288

339 285 301 292

173 283 264

269 303

259

235 272 289

315 251

284 284

157 269

259

234 16-9 18-0 236

8-8

14-1

3 9

9-0 18-9

27-7 41-7

18-1

2I-I

The crude rates which have been discussed above afford no explanation of this change, nor do they always illustrate its full extent. It is necessary, therefore, to eliminate the difference in the age-constitution of the countries in question by excluding from the field of observation, as before, all except possible mothers, basing the rate upon the respective numbers of women of the conceptive age, that is between 15 and 45. The pro- portion borne by this group to the total population is in most cases fairly up to that set forth by Dr Sundbarg in his standard. It is well above it in all three parts of the United Kingdom and falls materially below it only in Scandinavia and Italy. Indeed, during the last generation, this proportion has been in most cases slightly increased, in consequence of the fall of the birth-rate which set in anterior to this period. The stock, then, from which wives are drawn is ample. The question remains, how far advantage is taken of it. According to the Sundbarg standard the percentage married is 48. As has been shown in the preceding paragraph, this is surpassed in Italy, France and Germany, and approached in most of the rest, with the exception of Sweden, Norway and Scotland, which are six or seven points below it, and Ireland, where less than a third are married. The proportion married, moreover, has slightly increased since 1880, except in the United Kingdom. In England the marriage-rate (on the age basis) fell off by 4-6% and in Scotland by 2%, whilst the crude birth-rate declined by 15 and n % respectively. In Ireland the case was different, as the marriage-rate declined by 1 2 % and the birth-rate by no more than 5-7%. In New South Wales and New Zealand, too, the marriage-rates fell off in the same period by 11 and 28% respectively, whilst the decline in the birth-rates amounted to 35 and 31 %. In the above countries, therefore, abstinence from matrimony may be said to have been a factor of some importance in the decline. On the continent of Europe, however, looking at the divergence in direction between the crude marriage-rate and that corrected to an age-basis, it is not improbable that the decline in the former may be attributable to some cause

mentioned in connexion with the marriage-rate, and in the figures relating to some 30 years back some traces can be found of a connexion between a high birth-rate and a high proportion of young

wives. In the present day, however, these indications do not appear, so it would seem that the tendency in question had been interrupted by some other influence, a point to which reference will be made below.

If abstinence from marriage and the curtailment of the reproductive period by postponement of marriage be insufficient to account for the material change which has taken place in the birth-rate within the last few decades, it is clear that the latter must be attributable to the diminished fertility of those who are married. On this question the figures in the second portion of Table VI. throws some light. Here the annual number of legitimate births is shown in its proportion to the mean number of married women of conceptive age at each of the three latest enumerations. The rate, it will be seen, has fallen in all the countries specified, except for a slight increase of 2 % in Ireland and an almost stationary condition in Austria and Spain. The decline in Italy and Norway is small, but in France, where for a long time the fertility of the population has been very much below that of any other European country, the birth-rate thus calculated fell by nearly 20%, the same figure' being approached in Belgium, where however, the fertility of married women is considerably greater. The case of England is remarkable. In the earlier period its crude birth and marriage-rates were above the average and its proportion of young wives well up to it. Its fertility-rate, however, which was by no means high in 1880, fell by nearly 18% by 1901, and since that date a further fall is reported by the registrar-general, to 24%, leaving the rate below that of all the other European countries except France. The States of Australasia, again, have experienced a decline even more marked. In 1880-1882 their fertility-rate ranged from 300 to 338, a low proportion for a new country, but nearly up to the European standard. By 1900-1902, however, the rate had fallen in all the larger States by from 23 to 31% and the

highest rate recorded, 253 per thousand conceptive wives, was ' lower than that of any European country except France and Belgium. The cessation of assisted immigration early in the life of the present generation is alleged to have had considerable influence upon the rate, in Victoria, at least, owing to the curtail- ment of the supply of adult women of the more conceptive ages and the ageing of those who had reached the country at an earlier date. But neither this nor the diminution of the marriage- rate amongst women of those ages

suffices to account for more than a fraction of the decline. The same tendency, moreover, is traceable in the New England States of America, so far as statistics are available.

It has been held by some that a phenomenon so widely diffused over the western world must be attributable to physio- logical causes, such as alcoholism, syphilis, the abuse of narcotics and so on. Herbert Spencer, again, before the decline in question set in, put forward the hypothesis that ” the ability to maintain individual life and the ability to multiply vary in- versely “; in other words, the strain upon the nervous system involved in the struggle for life under the conditions of modern civilization, by reacting on the reproductive powers, tends towards comparative sterility. These theories, however, being supported, according to the authorities of to-day, by no evidence, statistical or other, need not be here considered.

Nor, again, can the decline in fertility be connected with any diminution of material prosperity. On the contrary, the fertility-rate appears to be best maintained in countries by no means distinguished for their high standard of living, such as Spain, Italy, Ireland, and, perhaps, Austria. In this respect Holland stands by itself; but in the others mentioned, with the exception of Ireland, both marriage and birth-rates are high and there has been a comparatively insignificant fall in prolifi- city. The decline has been greatest where the standard of comfort is notoriously high, as in the United States, England and Australasia; also in France, where the general wellbeing reaches probably a lower depth in the community than in any other part of Europe. The comparison of the rates in France with those of Ireland is an instructive illustration of the point under consideration. In France more than half the women of conceptive age are married: in Ireland less than a third, and the proportion of youthful wives in the latter is 28 % below that in France. In both the crude birth-rate is far below that of any other European country. But the fertility of the Irish wife exceeded that of her French compeer by 44% in 1880 and by no less than 84% twenty years later. So steady, indeed, has been the prolificity of Ireland, that from being ninth on the list at the earlier period mentioned, it is now inferior only to Holland and perhaps Finland in this respect.

It need not be assumed, however, that because these rates cannot be associated with the comparative degree of prosperity attained by the individual community they are altogether inde- pendent of the economic factors mainly contributing to that condition, such as trade, employment and prices. It is difficult, indeed, if not impracticable, to disentangle the effects which should be respectively attributed to

influences so closely related to each other; but, of the three, prices alone tend to sufficient uniformity in their course in different countries to justify a supposition that they are in some way connected with a phenom- enon so widely diffused as that of the decline in marriage and fertility. It is not improbable, therefore, that the fall in whole- sale prices which, with temporary interruptions, persisted between 1870 and 1900, in general harmony with the other movement, may have conduced to reluctance on the part of those who have enlarged their notions of the standard of comfort to en- danger their prospects of enjoying it by incurring the additional expenses of family life. Matrimony may be postponed, or, when entered upon, may be rendered a lighter burden upon the bread- winner. The economic element in the situation, which is imposed upon the individual by circumstances, is thus modified voluntarily into a moral or prudential consideration. In this case diminished prolificity where unaccompanied by a decrease in the number of marriages at reproductive ages, is attributable xxii- 4

to the voluntary restriction of child-bearing on the part of the married. This explanation of the decline is supported by the almost unanimous opinion of the medical profession in the countries in question, and substantial evidence can be found everywhere of the extensive prevalence of the doctrine and practice of what has been termed, in further derogation of the repute of the ” much misrepresented Malthus,” Neomal- thusianism. Preventive measures of this kind have long been in use in France, with the result shown in Tables V. and VI., and from that country they have spread, mostly since 1870, nearly all over western Europe, as well as to the Anglo- Saxon world beyond the seas; but are scarcely apparent in countries where the Roman church has a strong hold on the people. It is generally held that the practice of thus limiting families usually prevails, in the first instance, among the better- off classes, and in time niters down, as ” the gospel of comfort ” is accepted by those of less resources, until the prolificity of the whole community is more or less affected by it. The registrar general for England, indeed, has stated that whilst no more than about 17% of the decline in the birth-rate can be attributed to abstinence or postponement of marriage, nearly 70% should be ascribed to voluntary restriction.

The question of illegitimate births is the last to be here mentioned. It appears to be connected to a considerable extent with the subject dealt with above. In nearly every country the rate of these births has of late years shown a marked fall, which is by some ascribed to the adoption of the same expedients in illicit intercourse as are becoming conventional amongst the married. The rates given at the end of Table

VI. are calculated upon the number of women most likely to produce them, that is, the spinsters, widows and divorced of conceptive age. In comparing the different countries, it may be noted that in some parts of Europe the rate is raised by the inclusion of the off- spring of marriages not registered as demanded by law, though duly performed in church. Then, again, the possibility of legitimization by subsequent marriage tends to raise the rate. Italy and Scotland may be taken as examples of these two influences, and in Germany, too, the rates in Saxony and Bavaria, which are among the highest in Europe, are in part due to the non-registration of marriages sanctioned by religious ceremony only. The low rates in Ireland, Holland and England are especially noticeable, and in the last named, the decrease between 1870 and 1905 amounted to more ttian 50%, not, however, entirely due, it is said, to improved morality.

Deaths. — The forces tending towards the natural growth of population, which have been described above, differ from that which acts in the opposite direction in two material features. Marriage and child-bearing, in the first place, are operative amongst a fraction of the population only — those of conceptive age; whereas to the Urn of Death, as Dr Farr expressed it, all ages are called upon to contribute in their differing degrees. Then, again, the former are voluntary acts, entirely under the control of the individual; but mortality, though not beyond human regulation, is far less subject to it, and in order to have sub- stantial results the control must be the outcome of collective rather than individual co-operation. The course of the marriage and birth-rates, set forth above, affords evidence that the control over both has been exercised of recent years to an un- precedented extent, and it will appear from what is stated below, that partly owing to this cause, partly, also, to improved hygienic conditions in western life, there has been an even more pronounced decline in the rate of mortality. The general results of both upon the natural increase of population in the countries selected for illustration of this subject will be found at the end of this paragraph. For the purpose of showing this, the crude death-rate, taken, like that of births, upon the whole population, without distinction of age or sex, will suffice. Where, however, the tendency to mortality, not its results, is in question, both the above factors must be taken into account, as they have been above in distinguishing the rate of fertility from that of births. The process of correcting the mere numbers of annual deaths per thousand of population into a form which renders

the return comparable with those for communities differently constituted is somewhat complicated, but it is amply justified by its necessity in adapting the figures to the important services they perform in actuarial and sanitary science. This subject can only be dealt with here in outline. In the first place, sex must be distinguished, because, from infancy upwards, except between the ages of 10 and 20, the mortality amongst females is considerably less than amongst the other sex, and appears, too, to be declining more rapidly. So far as adult life is con- cerned this superior vitality is no doubt attributable to com- parative immunity from the risks and hardships to which men are exposed, as, also, to the weaker inclination of women towards intemperance of different kinds. Thus, though the generally higher proportion of females in the community may seldom be enough to depress more than slightly the death-rate as a whole, it has a substantial effect upon it at the ages where women are in more marked numerical predominance, as in later life, and in places where the number of domestic servants is unusually great. Age is a factor still more important than sex in a return intended to serve as an index of mortality. The liability to death is extremely high amongst infants, decreasing with every month of life during the first year, but continuing above the mean rate until about the age of five. From the latter period until the fifteenth or sixteenth year vitality is at its best. The death-rate then gradually rises, slowly till 25, more rapidly later, when, from about 45 onward deterioration asserts itself more pronouncedly, and by three score years and ten the rate begins to exceed that of childhood. Thus, all other considera- tions being set aside, mortality tends to vary inversely with the proportion of the population at the healthy period 5 to 23. As the replenishment of this group depends upon the conditions prevailing at the earlier ages, it is to the mortality in childhood that most weight, from the standpoint of hygiene, must be attached. In most European countries not much less than half the annual deaths take place amongst children below five years of age, upon the total number of whom the incidence falls to the extent of from 40 to 1 20 per mille. The greater part of this is debitable, as just pointed out, to the first year, in which the mortality, calculated upon the number of births, ranged, in the

decennium 1895-1904, between 70 per mille, in the exceptionally favourable circumstances of the Australasian States, to nearly 270 in European Russia. It should be remarked, in passing, that thesje rates are enormously higher amongst illegitimate children than amongst those born in wedlock, and that the proportion of still-born amongst the former is also in excess of that amongst the latter by some 50%.

Infantile mortality is higher, too, in urban tracts, especially those associated with manufacturing industries. In Table VII. below, in which the crude rate alone is dealt with, evidence will be found of the general decline which has taken place in the mortality, thus expressed in different countries.

The difference in the rates for the various countries must not be taken as a measure of difference in mortality, since, as accord- ing to the table, much of it is ascribable to difference in age- constitution. At the same time, where the range is very wide, as between the rates in Scandinavia and Australia, and those in southern and eastern Europe, the variation, to a great extent, cannot be accounted for otherwise than by difference in hygienic conditions, more especially in the light thrown by the figures of infantile mortality in the second part of the table. The variations from period to period in the same country are more instructive. They show that in the 35 years covered the death-rate has generally declined by over 20%. The exceptional cases are, first, Ireland and Norway, with their emigrating tendencies; then Spain, where the returns have probably to be discounted for improved registration, and France, where the population is all but stationary. In Finland the death-rate at the earlier period taken for the comparison was abnormally swollen by epidemic disease, and if it be set on one side the decline appears to have been in harmony with that in its Scan- dinavian neighbours. The decline in mortality has been much greater than that in the crude birth-rate everywhere except in France, Australia, and, of course, Ireland; and it is only in the two former that it has been exceeded by that in the fertility- rate. The standard mortality of each community is deduced from a life-table, representing a “generation” of people assumed to be born at the same moment and followed throughout their hypothetical life, in the light of the distribution by age ascertained

Table VII.

Country.

(A) Death per 1000 of Total Population.

(B) Deaths under one year per 1000 Births.

(C) Decline per cent.

1 Probable Lifetime.

1861-1870 to

1895-1904.

Fertility- rate.

1841-1850.

1861-1870.

1895-1904.

1874-1883.

1895-1*904.

Death- rate.

Birth- rate.

1 880-1 882 to

1900-1902.

Years.

Sweden …. Norway . . . . Finland . . . . Denmark

20-6

l8-2

23-5 205

20-2

18-0 32-6 198

15-8

187 15-8

128 104 164 141

98 90

134 127

21-7 10-5 42-6 2

20-6

15-0

3-9

7.2 4-2

8-2

3-5 9-3

52-3 52-2 42-8 47-8

England . . . . Scotland . ‘ . Ireland .

23-7

24-0

21-8

166

17-2

17-3 18-0

149

122

96

150 126 103

28-3

20-6

＋8-4

19-4 147

ii-i

17-8

12-5

+2-r

45-9 46-2

Holland . . . . Belgium . . . . Germany Austria (W) . .

26-2

24-4 26-8 298

25-4 23-8 26-9 29-1

17-0 17-8

20-8

24-0

204 148 208 3 255

147 156

198 a

224

33 -o

25-2

22-6

i7‘5

90 9.8 4-6 4-2

9-2

19-8 8-4

27-8

45-1 407

France . . . .

Italy

Spain . . . .

232

23-6

30-9 30-6

20-4

22-7

27-8

165 208

153 170

182

13-5 26-5

9-r

17-5

107

8-o

19-8 2-5

47-4 43-0

Hungary

Galicia . . . . Servia . . . . Russia (Eur.)

—

33-0 33-5 30-9 37-1

27-4

27-8

23-6 31-2

267

216

154 268

17-0 17-0 23-6 15-9

6-2

2-3 9.9

2-2

—

40-1

N. S. Wales . . Victoria . . . . J New Zealand

—

l6-2

167

1 I3”2

117

13-3 9-8

| “7

108

105

79

27-7 20-4 257

32-2

37-2

35-i

307

24-1 24-5

51-2

| 55-4

1 Mean after lifetime at birth. 2 Finland from 1850-1891, decrease 20-4. 3 Prussia only; Saxony, 284 and 272; Bavaria, 308 257.

through the census and the number of deaths at each age observed for as many years, generally from 10 to 20, as suffice to furnish a trustworthy average. The population thus dealt with is supposed to be stationary, that is, the loss by death at each age is at once made good by the addition of an equal number of the same age, whilst the survivors pass on to the age above. Of the many calculations set forth in these valuable tables there is only room here to refer to the ” afterlifetime ” for such countries as it is available, which is quoted in the last column of Table VII. It shows the average number of years which persons of a given age, or, as here, of all ages, will live, on the assumption that they are subject to the calculated probabilities of survival. It is sometimes known as the ” expectation of life,” a term, however, which involves a mathematical hypothesis now discarded.

The relation between the birth and the death rates has been the subject of much analysis and controversy. Observation has demonstrated that the two rates are generally found to move along parallel lines. A high birth-rate is accompanied by high mortality; conversely, when one is low, so is the other. A birth- rate continuously in excess of the death-rate tends to lower the latter through the supply it affords of people annually reaching the more healthy ages. If the supply be diminished, the narrower field open to the risks of infancy has the immediate effect of further decreasing the mortality. In course of time, however,

Table VIII.

Country.

1

Serial order according to formula

b ‘

Per

1000 of Population.

Annual ex- cess of Births over Deaths.

Total annual increase.

Approximate

loss by emigration.

1895-1904.

1861- 1871.

1895- 1904.

1861- 1871.

1891- 1901.

1861-

1871.

1891- 1901.

Sweden . Norway . Finland .

7

4

10

1 1 -2

12-9

2-1

10-9 146 13-5

7-7 7-9

i-3

7-i n-3 ii-i

3-7

1-0

3-7

2-7

2-3

Denmark.

5

II-I

13-9

10-4

n-5

o-3

i-3

England . Scotland . Ireland .

8

9

13

13-6

13-0

9-6

u-8

119

5-2

12-5

9-3

6 9

“•5 io-6

-5-4

i-i

3-6

15-0

0-2

1-2

IO-7

Holland . . . Belgium . Germany. Austria (W.). .

6 11 12 16

9.9

7-8

10-3

7-9

151

10-7 14-7

IO-2

8-4

7-4 7-8 5-6

12-7 9-8

132

o-5

2-0

II

2-5

o-8

i-5

O-I

0-7

o-5

France

Italy …. Spain.

18 15 19

2-7

6-5

• 7-7

1-3

io-8

7-0

2-8

6-o

5-1

1-6

6-2

4.9

+ 0-2

0-9

2-1

+ 1-0

4.6 0-4

Russia Hungary. Servia Galicia

20 18

17

12-7

8-5 136 10-9

17-5

u-5

16-5

156

n-7

8-2

10-9

13-5 9-8

14-4 10-4

0-7 0-4

O-I

1-6

09

o-6

4-1

New South Wales Victoria . New Zealand

2

3 1

..

24-8 247 27-0

16-1

12-7

16-3

36-9 30-8 63-0

18-4

5-2

19-0

+ I2-I

+ 6-i

+36-0

+ 2-3

7-5

+ 2-7

under the same influence, those passing from their prime into the second period of danger acquire a numerical preponderance which throws its weight upon the general death-rate and tends to raise it. It is assumed that throughout the above course the hygienic conditions

of life remain unchanged. If, however, they undergo marked improvement, the duration of life is extended and both birth and death-rates, being spread over a wider field of the living, tend to decrease. On the other hand, an accidental set-back to population, such as that caused by famine or a disastrous war, leaves room which an increasing birth-rate hastens to occupy. A similar result follows in a lesser degree a wave of emigration. Examples of all the above tendencies may be gleaned from the returns of the countries named in the table, though space does not admit of their exhibtion. In both France and Germany, for instance, the process of replenish- ment after a great war can be traced both early and late in the

19th century. In England, the decrease in "natality" is in itself enough to account for the decline in the death-rate, apart from any considerations of improved hygiene. In France, on the contrary, the low natality having been so long continued, has raised the death-rate, by reason of the balance of propor- tion having been shifted by it from youth and the prime of life to old age. It may be inferred from the above that a high birth- rate does not imply a high rate of increase of population, any more than does a decreasing mortality, but the two rates must be considered in their relations to each other. The death-rate, however, is often taken by itself as the measure of the relatively favourable conditions or otherwise of the different countries; but it indicates at best the maintaining power of the community, whereas the increasing power, as manifested in the birth-rate, has also to be taken into account. Here, again, it is not sufficient to rely upon the mere rate of natural growth, or the difference between the two rates, since this may be the same in a community where both the rates are very high as in one where they are relatively low, a distinction of considerable importance. It has been suggested by Dr Rubin of Copenhagen, that if the death rate (d) be squared and divided by the birth-rate (6), due influence is allowed to each rate respectively, as well as to the difference in the height of the rates in different countries (Journ. R. Statist. Soc, London, 1897, p. 154). The quotient thus obtained decreases as the conditions are more favourable, and, on the whole, it seems to form a good index to the merit of the respective countries from the standpoint of vital forces. The first column of Table VIII. shows the order in which the countries mentioned are found to stand according to the above test.

The three Australasian states head the list in virtue of their remarkably low death-rate, which outweighs the relative paucity of their births. The next countries in order all belong to north-western Europe, and their index-quotients are all very close to each other. Sweden falls below its geographical neighbours owing to its low birth-

rate, and Finland because of its higher mortality. England and Scotland, in spite of their higher birth-rates, are kept below Scandinavia by the higher death-rate, but their birth-rate places them above Belgium. Ireland and France are pulled down by their low natality. The latter, with the same mortality as Germany, stands far below it for the above reason, as Ireland is raised by its lower death-rate above the prolific countries of eastern Europe. The rate of natural growth is given in the second part of the table. In the case of two of the Australasian states, of Holland, Finland, Spain and Italy, the order is in accord with that given by the test applied above, and the difference between the two in Austria, Ireland and France is not large. The great difference between the serial rank occupied in the respective lists by Russia, Servia and Galicia, with remarkably high rates of natural growth, as well as that found in the case of most of the other countries in question, shows that this factor is by no means a trustworthy guide in the estimate of hygienic balance. Migration. — Passing from the internal factors in the move- ment of population, the influence has to be taken into account of the interchange of population between different countries. The net results of such exchange can be roughly estimated by comparing the rate of natural growth with that of the total increase of the community between one census and another, as set forth in Table VIII., in the last section of which the approxi- mate loss by emigration, as calculated by Dr Sundbarg, is given. It will be seen that the only European country which gains by the exchange is France, and there the accretion is almost insig- nificant. Between many of the countries there is a good deal of migration which is only seasonal or temporary, according to the demand for labour. From Russia, too, there is a stream of colonization across the Urals into western Siberia, and amongst the western Mediterranean populations there is constant

migration to North Africa The greatest drain from Europe, however, has been across the sea to the United States, Canada and Australasia, especially to the first-named. Dr Sundbarg's returns give about 28 millions as the number which left Europe by sea during the 19th century, of whom all but 4 millions emigrated during the last half of that period. Between 1821 and 1904, about 22 millions landed from Europe in the United States; about 25 millions in Canada; 2 millions in Australia, besides a good number in Brazil, the Argentine and South Africa. The return of birthplace which usually forms part of the census inquiry, affords supplementary information on the subject of

immigration. In Canada, for instance, those born abroad numbered 17 % of the population in 1871, and about 13 % thirty years later. In New South Wales, the correspond- ing figures were 41 and 28 %, and in Victoria 55 and 27. In New Zealand the consequences of the cessation of special encourage- ment to emigration were still more marked, the foreign-born declining in proportion from 63 to 33 %. On the other hand, in the United States, from 9-7 % in 1850 the proportion rose to 13-7 in 1900, and has since reached still higher figures, as has been the case recently in Canada also. Up to the early ‘nineties the greater part of the immigrants into America were furnished by Germany, Ireland and Great Britain, but for the next fifteen years the place of those countries was taken by Italy and eastern Europe. The general results of the two movements in Europe have been thus summarised by Dr Sundbarg: —

Table IX.

Annual rate per 1000 of population.

1801-1850.

1850-1900.

Births.

Deaths.

Births

above

Deaths.

Census Increase.

Births.

Deaths.

Births

above

Deaths.

Census Increase.

Europe, N.W. S.W. E. .

Total Europe

35-4 33-6 45-9

26-5 28-3 38-1

8-9 5‘3

7-8

8-i 34-4 5-2 3i-4 7-7 j 46-2

23-4 26-3

34-7

II-O

5-i “•5

8-6

4-3

IO-6

38-6

31-2

7-4

7-1 J 38-0

28-4

9-6

8-2

United States Canada . Australasia .

—

—

■ —

29-9 — 38-7 — 85-9 —

—

—

24-0 16-2

48-2

Differences tend to be smoothened out, of course, in dealing with a population so large and varied as that of a continent, but the figures suffice to show the contrast between the early part of the century and the period following the great migratory movements to the new goldfields. In the countries receiving the stream of newcomers, the intercensal rate of increase was obviously very different from those of the older countries, though it seems to have largely spent itself or been counteracted by other influences. The latest rates, for instance, were only 18 per mille per annum in Australia; 11 in Canada and 19 in the United States.

Bibliography. — A very full bibliography up to 1899 is appended to von Fircke's Bevolkerungslehre und Bevblkerungspolitik. Reference may also be made to Matthews Duncan, Fecundity, Fertility and Sterility (ed. 1871); Newsholme, Elements of Vital Statistics (ed. 1899), and his paper on birth-rates, Journ. R. Statist. Soc. (1906); W. Farr, Vital Statistics (1885) ; Coghlan, Report on Decline in Birth- rate, New South Wales (1903), and report of Royal Commission on that decline (1904); Bonar, Malthus and his Work (1885); Bertillon, Elements de dtmographie; Gamier, Du Principe de population; de Molinari, Ralentissement du mouvement de la population; Bertheau, Essai sur les lots de la population; Starkenburg, Die Bevblkerungs-Wissenschaft; Stieda, Das sexual Verhdltniss der Ceborenen; Rubin and Westergaard, Statistik der Ehen; Westergaard, Die Lehre von der Mortalitdt und Morbilitat, and Die Grundziige der Theorie der Statistik ; Gonnard, V Emigration europeenne. (J. A. B.)

POPULONIUM (Etruscan Pupluna), an ancient seaport town of Etruria, Italy, at the north end of the peninsular of Monte Massoncello, at the south end of which is situated the town of Piombino (q.v.). The place, almost the only Etruscan town

built directly on the sea, was situated on a lofty hill 1 now crowned by a conspicuous medieval castle and a poor modern village (Populonia).

Considerable remains of its town walls, of large irregular, roughly rectangular blocks (the form is that of the natural splitting of the schistose sandstone), still exist, enclosing a circuit of about ij m. The remains existing within them are entirely Roman — a row of vaulted substructions, a water reservoir and a mosaic with representations of fishes. Strabo mentions the existence here of a look-out tower for the shoals of tunny-fish. There are some tombs outside the town, some of which, ranging from the Villanova period (9th century B.C.) to the middle of the 3rd century B.C., were explored in 1908. In one, a large circular tomb, were found three sepulchral couches in stone, carved in imitation of wood, and a fine statuette in bronze of Ajax committing suicide. Close by was found a horse collar with 14 bronze bells. The remains of a temple, devastated in ancient times (possibly by Dionysius of Syracuse in 384 B.C.), were also discovered, with fragments of Attic vases of the 5th century B.C., which had served as ex votos in it. Coins of the town have also been found in silver and copper. The iron mines of Elba, and the tin and copper of the mainland, were owned and smelted by the people of Populonia; hot springs too lay some 6 m. to the E. (Aquae Populaniae) on the high road — Via Aurelia — along the coast. At this point a road branched off to Saena (Siena). According to Virgil the town sent a contingent to the help of Aeneas, and it furnished Scipio with iron in 205 B.C. It offered considerable resistance to Sulla, who took it by siege; and from this dates its decline, which Strabo, who describes it well (v. 2, 6, p. 223), already notes as beginning, while four centuries later Rutilius describes it as in ruins. The harbour, however, continued to be of some importance, and the place was still an episcopal see in the time of Gregory the Great.

See G. Dennis, Cities and Cemeteries of Etruria (London, 1883, ii. 212 sqq.) ; I. Falchi in Notizie degli Scavi (1 903-1 904) ; L. A. Milani, ibid. (1908), 199 sqq.

PORBANDAR, a native state of India, in the Kathiawar political agency, Bombay, extending along the S.W. coast of the peninsula of Kathiawar. Area, 636 sq. m.; pop. (1901), 82,640, showing a decrease of 4 % in the decade. Estimated gross revenue, £65,000; tribute, £3,233. The chief, whose title is rana, is a Jethwa Rajput. Limestone is largely exported to Bombay. This limestone is used for buildings in Porbandar without mortar, and is said to coalesce into a solid block under the influence of moisture. The town of Porbandar is the maritime terminus of the Kathiawar railway system. Pop. (1901), 24,620. A large trade is conducted in native boats as far as the east coast of Africa.

PORCELAIN, the name of that kind of ceramic ware which is characterized by a translucent body, also loosely used for the finer kinds of ware generally, popularly known as ” china ” (see Ceramics). The French porcelaine, from which the word comes into English, is an adaptation of the Italian porcellana, a cowrie-shell, the beautifully polished surface of which caused the name to be applied to the ware. The Italian word is generally taken to be from porcella, diminutive of porco, pig, from a sup- posed resemblance of the shell to a pig’s back.

PORCH (through the Fr. porche, from Lat. porticus; the Ital. equivalent is portico, corresponding to the Gr. vapd-ql-; Ger. Vorhalle), a covered erection forming a shelter to the entrance door of a large building. The earliest known are the two porches of the Tower of the Winds at Athens; there would seem to have been one in front of the entrance door of the villa of Diomede outside the gate at Pompeii; in Rome they were

1 It commands a fine view, and Corsica Is sometimes visible, though not Sardinia, as Strabo (and following him, Lord Macaulay) erro- neously state.

probably not allowed, but on either side of the entrance door of a mansion, porticoes set back behind the line of frontage were provided, according to F. Mazois, as shelters from sun and rain for those who paid early visits before the doors were opened. In front of the early Christian basilicas was a long arcaded porch called ” narthex ” (q.v.) In later times porches assume two forms — one the projecting erection covering the entrance at the west front of cathedrals, and divided into three or more doorways, &c, and the other a kind of covered chamber open at the ends, and having small windows at the sides as a protection from rain. These generally stand on the north or south sides of churches, though in Kent there are a few instances (as Snodland and Boxley) where they are at the west ends. Those of the Nor- man period generally have little projection, and are sometimes so flat as to be little more than outer dressings and hood- moulds to the inner door. They are often richly ornamented, and, as at Southwell in England and Kelso in Scotland, have rooms over, which have been erroneously called parvises. Early English porches are much longer, and in larger buildings fre- quently have rooms above; the gables are

generally bold and high pitched. In larger buildings also, as at Wells, St Albans, &c, the interiors are as rich in design as the exteriors. Decorated and Perpendicular porches partake of much the same character- istics, the pitch of roof, mouldings, copings, battlements, &c, being, of course, influenced by the taste of the time. The later porches have rooms over them more frequently than in earlier times; these are often approached from the lower storey by small winding stairs, and sometimes have fire-places, and are supposed to have served as vestries; and sometimes there are the remains of a piscina, and relics of altars, as if they had been used as chantry chapels. It is probable there were wooden porches at all periods,' particularly in those places where stone was scarce ; but, as may be expected from their exposed position, the earliest have decayed. At Cobham, Surrey, there was one that had ranges of semicircular arches in oak at the sides, of strong Norman character. It is said there are several in which portions of Early English work are traceable, as at Chevington in Suffolk. In the Decorated and later periods, however, wooden porches are common, some plain, others with rich tracery and large boards; these frequently stand on a sort of half storey of stone work or bahut. The entrance porches at the west end of cathe- drals are generally called portals, and where they assume the character of separate buildings, are designated galilees; e.g. the porticoes on the west side of the south transept of Lincoln Cathedral, and at the west end of the nave of Ely Cathedral, and the chapel at the west end of Durham Cathedral. The finest example in England of an open projected porch is that of Peterborough Cathedral, attached to the Early Norman nave.

The term " porch " is also given to the magnificent portals of the French cathedrals, where the doors are so deeply recessed as to become porches, such as those of Reims, Amiens, Chartres, Troyes, Rouen, Bourges, Paris, and Beauvais cathedrals, St Ouen, Rouen, and earlier Romanesque churches, as in St Trophime, Aries and St Gilles. Many, however, have detached porches in front of the portals, as in Notre Dame at Avigon, Chartres (north and south), Noyon, Bourges (north and south), St Vincent at Rouen, Notre Dame de Louviers, the cathedrals of Albi and Le Puy, and in Germany those of Spires and Regens- burg, and the churches of St Laurence and St Sebald at Nuremberg. (R. P. S.)

PORCUPINE (Fr., pore-epic, " spiny pig "), the name of the largest European representative of the terrestrial rodent mammals, distinguished by the spiny covering from which it takes its name. The European porcupine (Hystrix cristata) is the typical representative of a family of Old World rodents, the Hystricidae., all the members of which have the same protective covering. These rodents are

characterized by the imperfectly rooted cheek-teeth, imperfect clavicles or collar-bones, cleft upper lip, rudimentary first front-toes, smooth soles, six teats and many cranial characters. They range over the south of Europe, the whole of Africa, India and the Malay Archipelago as far eaet as Borneo. They are all stout, heavily-built animals,

with blunt rounded heads, fleshy mobile snouts, and coats of thick cylindrical or flattened spines, which form the whole covering of their body, and are not intermingled with ordinary hairs. Their habits are strictly terrestrial. Of the three genera Hystrix is characterized by the inflated skull, in which the nasal chamber is often considerably larger than the brain-case, and

The Porcupine {Hystrix cristata). the short tail, tipped with numerous slender-stalked open quills, which make a loud rattling noise whenever the animal moves. The common porcupine (H. cristata), which occurs throughout the south of Europe and North and West Africa, is replaced in South Africa by H. africaeaustralis and in India by the hairy- nosed porcupine (H. leucura).

Besides these large crested species, there are several smaller species without crests in north-east India, and the Malay region from Nepal to Borneo. The genus Atherura includes the brush-tailed porcupines which are much smaller animals, with long tails tipped with bundles of flattened spines. Two species are found in the Malay region and one in West Africa. Trichys, the last genus, contains two species, T. fasciculata of Borneo and T. macrotis of Sumatra, both externally very like Atherura, but differing from the members of that genus in many cranial characteristics. In the New World the porcupines are represented by the members of the family Erethizontidae, or Coendidae, which have rooted molars, complete collar-bones, entire upper lips, tuberculated soles, no trace of a first front-toe, and four teats. The spines are mixed with long soft hairs. They are less strictly nocturnal in their habits; and with one exception live entirely in trees, having in correspondence with this long and power- ful prehensile tails. They include three genera, of which the first is represented by the Canadian porcupine (Erethizon dorsatus), a stout, heavily-built animal, with long hairs almost or quite hiding its spines, four front- and five hind-toes, and a short, stumpy tail. It is a native of the greater part of Canada and the United States, wherever there is any remnant of the original forest left. Synelheres, or Coendu, contains some eight or ten species, known as tree-porcu- pines, found throughout tropical South America, with one extending into Mexico. They are of a lighter build than the ground-porcupines, with short, close, many-coloured

spines, often mixed with hairs, and prehensile tails. The hind-feet have only four toes, owing to the suppression of the first, in place of which they have a fleshy pad on the inner side of the foot, between which and the toes boughs and other objects can be firmly grasped as with a hand. Chaetomys, distinguished by the shape of its skull and the greater complexity of its teeth, contains C. subspinosus, a native of the hottest parts of Brazil. (W. H. F.; R. L.*)

PORDENONE, IL (1483-1530), an eminent painter of the Vene- tian school, whose correct name was Giovanni Antonio Licinio, or Licino. He was commonly named II Pordenone from having been born in 1483 at Corticelli, a village near Pordenone (q.v.) in Italy. He ultimately dropped the name of Licinio, having quarrelled with his brothers, one of whom had wounded him in the hand; he then called himself Regillo, or De Regillo. His signature runs ” Antonius Portunaensis,” or ” De Portunaonis.” He was created a cavaliere by Charles V.

As a painter Licinio w’as a scholar of Pellegrino da S. Daniele, but the leading influence which governed his style was that of Giorgione; the popular story that he was a fellow-pupil with Titian under Giovanni Bellini is incorrect. The district

about Pordenone had been somewhat fertile in capable painters; but Licinio excelled them all in invention and design, and more especially in the powers of a vigorous chiaroscurist and flesh painter. Indeed, so far as mere flesh-painting is concerned he was barely inferior to Titian in breadth, pulpiness and tone; and he was for a while the rival of that great painter in public regard. The two were open enemies, and Licinio would sometimes affect to wear arms while he was painting. He excelled Giorgione in light and shade and in the effect of relief, and was distinguished in perspective and in portraits; he was equally at home in fresco and in oil-colour. He executed many works in Pordenone and elsewhere in Friuli, and in Cremona and Venice; at one time he settled in Piacenza, where is one of his most celebrated church pictures, ” St Catherine disputing with the Doctors in Alexandria”; the figure of St Paul in connexion with this picture is bis own portrait. He was formally invited by Duke Hercules II. of Ferrara to that court; here soon after- wards, in 1539, he died, not without suspicion of poison. His latest works are comparatively careless and superficial; and generally he is better in male figures than in female —

the latter being somewhat too sturdy — and the composition of his subject- pictures is scarcely on a level with their other merits. Pordenone appears to have been a vehement self-asserting man, to which his style as a painter corresponds, and his morals were not unexceptionable. Three of his principal scholars were Bernar- dino Licinio, named II Sacchiense, his son-in-law Porhponio Amalteo, and Giovanni Maria Calderari.

The following may be named among Pordenone's works: the picture of " S Luigi Giustiniani and other Saints," originally in S Maria dell' Orto, Venice; a " Madonna and Saints " (both of these in the Venice academy) ; the " Woman taken in Adul- tery," in the Berlin museum; trie " Annunciation," at TJdine, regarded by Vasari as the artist's masterpiece, now damaged by restoration. In Hampton Court is a duplicate work, the " Painter and his Family "; and in Burghley House are two fine pictures now assigned to Pordenone — the " Finding of Moses " and the " Adoration of the Kings." These used to be attributed to Titian and to Bassano respectively.

PORDENONE, a town of the province • of Udine, Venetia, Italy, 30 m. W. by S. of Udine on the railway to Treviso. Pop. (1901), 8425 (town); 12,409 (commune). It was the birthplace of the painter generally known as II Pordenone (q.v.). Paintings from his brush adorn the cathedral (which has a fine brick campanile), and others are preserved in the gallery of the town hall. Cotton industries are active, and silk and pottery are manufactured.

PORE, a small opening or orifice, particularly used of the open- ings of the ducts of the sweat-glands in the skin or of the stomata in the epidermis of plants or those through which the pollen or seed are discharged from anthers or seed capsules. The word is an adaptation through the French from Lat. porus, Gr. iropos, passage. In the sense of to look closely at, to read with persistent or close attention, " pore " is of obscure origin. It would seem to be connected with " peer," to look closely into, and would point to an 0. Eng. purian or pyrian. There is no similar word in Old French.

PORFIRIUS, PUBLILIUS OPTATIANUS, Latin poet, possibly a native of Africa, flourished during the 4th century A;D. He has been identified with Publilius Optatianus, who was prae- f edits urbi (329 and 333), and is by some authorities included amongst the Christian poets. For some reason he had been banished, but having addressed a panegyric to the Emperor Constantine the Great, he was allowed to return. Twenty- eight poems are extant under his name, of which twenty were included in the panegyric. They have no value except as curiosities

and specimens of perverted ingenuity. Some of them are squares (the number of letters in each line being equal), certain letters being rubricated so as to form a pattern or figure, and at the same time special verses or maxims; others represent various objects (a syrinx, an organ, an altar); others have special peculiarities in each line (number of words or letters) ; while the 28th poem (the versus anacyclici) may be read back-

wards without any effect upon sense or metre. A complimentary letter from the emperor and letter of thanks from the author are also extant. The best edition of the poem is by L. Muller (1877). See also O. Seeck, ” Das Leben des Dichters Porphyrius ” in Rheinisches Museum (1908), lxiii. 267.

PORISM. The subject of porisms is perplexed by the multitude of different views which have been held by geometers as to what a porism really was and is. The treatise which has given rise to the controversies on this subject is the Porisms of Euclid, the author of the Elements. For as much as we know of this lost treatise we are indebted to the Collection of Pappus of Alexandria, who mentions it along with other geometrical treatises, and gives a number of lemmas necessary for under- standing it. Pappus states that the porisms of Euclid are neither theorems nor problems, but are in some sort intermediate, so that they may be presented either as theorems or as problems; and they were regarded accordingly by many geometers, who looked merely at the form of the enunciation, as being actually theorems or problems, though the definitions given by the older writers showed that they better understood the distinction between the three classes of propositions. The older geometers regarded a theorem as directed to proving what is proposed, a problem as directed to constructing what is proposed, and finally a porism as directed to finding what is proposed («« iropi.criJ.6v avTov rod TrpoTHvofievov) . Pappus goes on to say that this last definition was changed by certain later geometers, who defined a porism on the ground of an accidental characteristic as to Xetroc vKodkau totlkov decoprifiaros, that which falls short of a locus-theorem by a (or in its) hypothesis.

Proclus points out that the word was used in two senses. One sense is that of ” corollary,” as a result unsought, as it were, but seen to follow from a theorem. On the ” porism ” in the other sense he adds nothing to the definition of ” the older geometers ” except to say (what does not really help) that the finding of the center of a circle and the finding of the greatest common measure are porisms (Proclus, ed. Friedlein, p.-30i).

Pappus gives a complete enunciation of a porism derived from Euclid, and an extension of it to a more general case. This porism, expressed in modern language, asserts that — given four straight lines of which three turn about the points in which they meet the fourth, if two of the points of intersection of these lines lie each on a fixed straight line, the remaining point of inter- section will also lie on another straight line. The general enuncia- tion applies to any number of straight lines, say (« + i), of which n can turn about as many points fixed on the (» + i)th. These n straight lines cut, two and two, in \n {n-i) points, \n {n-i) being a triangular number whose side is (n-i). If, then, they are made to turn about the n fixed points so that any {n-i) of their \n (n-i) points of intersection, chosen subject to a certain limitation, lie on {n-i) given fixed straight lines, then each of the remaining points of intersection, § {n-i) {n-2) in number, describes a straight line. Pappus gives also a complete enuncia- tion of one porism of the first book of Euclid's treatise. This may be expressed thus : If about two fixed points P, Q we make turn two straight lines meeting on a given straight line L, and if one of them cut off a segment AM from a fixed straight line AX, given in position, we can determine another fixed straight line BY, and a point B fixed on it, such that the segment BM' made by the second moving line on this second fixed line measured from B has a given ratio X to the first segment AM. The rest of the enunciations given by Pappus are incomplete, and he merely says that he gives thirty-eight lemmas for the three books of porisms; and these include 171 theorems.

The lemmas which Pappus gives in connexion with the porisms are interesting historically, because he gives (1) the fundamental theorem that the cross or an harmonic ratio of a pencil of four straight lines meeting in a point is constant for all transversals; (2) the proof of the harmonic properties of a com- plete quadrilateral; (3) the theorem that, if the six vertices of a hexagon lie three and three on two straight lines, the three points of concourse of opposite sides lie on a straight line.

During the last three centuries this subject seems to have had great fascination for mathematicians, and many geometers have attempted to restore the lost porisms. Thus Albert Girard says in his Traite de trigonomUrie (1626) that he hopes to publish a restora- tion. About the same time P. de Fermat wrote a short work under the title Porismatum euclidaeorum renovata doctrina et sub forma isagoges

recentioribus geometris exhibita (see Oeuvres de Fermat, i., Paris, 1891) ; but two at least of the five examples of porisms which he gives do not fall within the classes indicated by Pappus. Robert Simson was the first to throw real light upon the subject. He first succeeded in explaining the only three propositions which Pappus indicates with any completeness. This explanation was published in the Philosophical Transactions in 1723. Later he investigated the subject of porisms generally in a work entitled De porismatibus tractatus; quo doctrinam porismatum satis explicatam, et in posterum ab oblivione tutam fore spiral auctor, and published after his death in a volume, Roberti Simson opera quaedam reliqua (Glasgow, 1776). Simson's treatise, De porismatibus , begins with definitions of theorem, problem, datum, porism and locus. Respecting the porism Simson says that Pappus's definition is too general, and therefore he will substitute for it the following: " Porisma est propositio in qua proponitur demonstrare rem aliquam vel plures datas esse, cui vel quibus, ut et cuilibet ex rebus innumeris non quidem datis, sed quae ad ea quae data sunt eandem habent relationem, convenire ostendendum est affectionem quandam communem in propositione descriptam. Porisma etiam in forma problematis enuntiari potest, si nimirum ex quibus data demonstranda sunt, invenienda proponan- tur." A locus (says Simson) is a species of porism. Then follows a Latin translation of Pappus's note on the porisms, and the proposi- tions which form the bulk of the treatise. These are Pappus's thirty-eight lemmas relating to the porisms, ten cases of the proposi- tion concerning four straight lines, twenty-nine porisms, two pro- blems in illustration and some preliminary lemmas. John Play- fair's memoir (Trans. Roy. Soc. Edin., 1794, vol. hi.), a sort of sequel to Simson's treatise, had for its special object the inquiry into the probable origin of porisms — that is, into the steps which led the ancient geometers to the discovery of them. Playfair remarked that the careful investigation of all possible particular cases of a proposi- tion would show that (1) under certain conditions a problem becomes impossible; (2) under certain other conditions, indeterminate or capable of an infinite number of solutions. These cases could be enunciated separately, were in a manner intermediate between theorems and problems, and were called " porisms." Playfair accordingly defined a porism thus: "A proposition affirming the possibility of finding such conditions as will render a certain problem indeterminate or capable of innumerable solutions." Though this definition of a porism appears to be most favoured in England, Simson's view has been most generally accepted abroad, and has the support of the great authority of Michael Chasles. However, in Liouville's Journal de mathematiques pures et appliquees (vol. xx., July, 1855), P. Breton published Recherches nouvelles sur les

porismes d'Euclide, in which he gave a new translation of the text of Pappus, and sought to base thereon a view of the nature of a porism more closely conforming to the definitions in Pappus. This was followed in the same journal and in La Science by a controversy between Breton and A. J. H. Vincent, who disputed the interpretation given by the former of the text of Pappus, and declared himself in favour of the idea of Schooten, put forward in his Mathematicae exercita- tiones (1657), in which he gives the name of " porism" to one section. According to F. van Schooten, if the various relations between straight lines in a figure are written down in the form of equations or proportions, then the combination of these equations in all possible ways, and of new equations thus derived from them leads to the discovery of innumerable new properties of the figure, and here we have " porisms." The discussions, however, between Breton and Vincent, in which C. Housel also joined, did not carry forward the work of restoring Euclid's Porisms, which was left for Chasles. His work {Les Trois livres de porismes d'Euclide, Paris, i860) makes full use of all the material found in Pappus. But we may doubt its being a successful reproduction of Euclid's actual work. Thus, in view of the ancillary relation in which Pappus's lemmas generally stand to the works to which they refer, it seems incredible that the first seven out of thirty-eight lemmas should be really equivalent (as Chasles makes them) to Euclid's first seven Porisms. Again, Chasles seems to have been wrong in making the ten cases of the four-line Porism begin the book, instead of the intercept-Porism fully enunciated by Pappus, to which the " lemma to the first Porism " relates intelligibly, being a particular case of it. An'inter- esting hypothesis as to the Porisms was put forward by H. G. Zeuthen (Die Lehre von den Kegelschnitten imAltertum, 1886, ch. viii.). Observing, e.g., that the intercept-Porism is still true if the two fixed points are points on a conic, and the straight lines drawn through them intersect on the conic instead of on a fixed straight line, Zeuthen conjectures that the Porisms were a by-product of a fully developed projective geometry of conies. It is a fact that Lemma 31 (though it makes no mention of a conic) corresponds exactly to Apollonius's method of determining the foci of a central conic (Conies, iii. 45-47 with 42).

The three porisms stated by Diophantus in his Arithmetica are

propositions in the theory of numbers which can all be enunciated in the form " we can find numbers satisfying such and such condi- tions "; they are sufficiently analogous therefore to the geometrical porism as defined in Pappus and Produs.

A valuable chapter on porisms (from a philological standpoint) is

included in J. L. Heiberg's Litterargeschichtliche Studien uber Euklid (Leipzig, 1882) ; and the following books or tracts may also be mentioned: Aug. Richter, Porismen nach Simson bearbeitet (Elbing, 1837); M. Cantor, " Ueber die Porismen des Euklid und deren Divinatoren," in Schlomilch's Zeitsch. f. Math. u. Phy. (1857), and Literaturzeitung (1861), p. 3 seq.; Th. Leidenfrost, Die Porismen des Euklid (Programm der Realschule zu Weimar, 1863) ; Fr. Buch- binder, Euclids Porismen und Data (Programm der kgl. Landesschule Pforta, 1866). (T. L. H.)

POROS, or Poeo (" the Ford "), an island off the east coast of the Morea, separated at its western extremity by only a narrow channel from the mainland at Troezen, and consisting of a mass of limestone rock and of a mass of trachyte connected by a slight sandy isthmus. The town looks down on the beautiful harbour between the island and the mainland on the south.

The ancient Calauria, with which Poros is identified, was given, according to the myth, by Apollo to Poseidon in exchange for Delos; and it became in historic times famous for a temple of the sea-god, which formed the centre of an amphictyony of seven maritime states — Hermione, Epidaurus, Aegina, Athens, Prasiae, Na.uplia, and Orchomenus. Here Demosthenes took sanctuary with " gracious Poseidon," and, when this threatened to fail him, sought death. The building was of Doric architecture and lay on a ridge of the hill commanding a fine view of Athens and the Saronic Gulf, near the middle of the limestone part of the island. The site was. excavated in 1894, and traces of a sacred agora with porticoes and other buildings, as well as the temple, have been found. In the neighbourhood of Poros-Calauria are two small islands, the more westerly of which contains the ruins of a small temple, and is probably the ancient Sphaeria or Hiera mentioned by Pausanias as the seat of a temple of Athena Apaturia. The English, French, and Russian plenipotentiaries met at Poros in 1828 to discuss the basis of the Greek government. See Chandler, Travels; Leake, Morea; Le Bas, Voyage archS- ologique; Curtius, Peloponnesos; Pouillon-Boblaye, Recherches; Bursian, Geographie von Criechenland; Rangabe " Ein Ausflug nach Poros," in Deutsche Revue (1883) ; and S. Wide, in Mitteilungen d. deutsch. Inst. Aihen. (1895), vol. xx.

PORPHYRIO, POMPONIUS, Latin grammarian and com- mentator on Horace, possibly a native of Africa, flourished during the 2nd century a.d. (according to others, much later). His scholia on Horace, which are still extant, mainly consist of rhetorical and grammatical explanations. It is not probable that we possess the original work,

which must, have suffered from alterations and interpolations at the hands of the copyists of the middle ages, but on the whole the scholia form a valuable aid to the student of Horace.

Ed. W. Meyer (1874); A. Holder (1894); see also C. F. Urba, Melelemata porphyrionea (1885) ;R.Schweikert, DePorphyrionis. . . scholiis Horatianis (1865) ; F. Pauly, Quaestiones criticae de . . . Porphyrionis commentariis Horatianis (1858).

PORPHYRY (IIopc£i>pios) (a.d. 233-c. 304), Greek scholar, historian, and Neoplatonist, was born at Tyre, or Batanaea in Syria. He studied grammar and rhetoric under Cassius Long- inus (q.v.). His original name was Malchus (king), which was changed by his tutor into Porphyrius (clad in purple), a jesting allusion to the colour of the imperial robes (cf. porphyro- genitus, born in the purple). In 262 he went to Rom« attracted by the reputation of Plotinus, and for six years devoted himself to the study of Neoplatonism. Having injured his health by overwork, he went to live in Sicily for five years. On his return to Rome, he lectured on philosophy and endea- voured to render the obscure doctrines of Plotinus (who had died in the meantime) intelligible to the ordinary understanding. His most distinguished pupil was Iamblichus. When advanced in years he married Marcella, a widow with seven children and an enthusiastic student of philosophy. Nothing more is known of his life, and the date of his death is uncertain.

Of his numerous works on a great variety of subjects the following are extant : Life of Plotinus and an exposition of his teaching in the

‘A<2>opjuai irpos t& vo-i\to. (Sententiae ad intelligimtia ducentes, Aids to the study of the Intelligibles). The Life of Pythagoras, which is incomplete, probably formed part of a larger history of philosophy ((t>i\6croos laropia, in four books) down to Plato. His work on Aristotle is represented by the Introduction (tiaaywyo) to and Commentary (i£iiyi)tns, in the form of questions and answers) on the Categories. The first, translated into Latin by Boetius, was extensively used in the middle ages as a compendium of Aristotelian logic; of the second only fragments have been preserved. His Xpovuca, a chronological work, extended from the taking of Troy down to a.d. 270; to it Eusebius is indebted for his list of the Macedonian kings. The treatise i\o\oyos laropia is called an &/tp6ox<*i> (De

abstinentia) , on abstinence from animal food, is especially valuable as having preserved numerous original statements of the old philosophers and the substance of Theophrastus's ILepi tivtPtias (On Piety). It also contains a long fragment from the Cretans of Euripides. The IIpAs MapKtXKav is an exhortation to his wife Marcella to practise virtue and self-restraint and to study philosophy. The letter to the Egyptian priest Anebo, dealing with religious questions, was answered by a member of the school of Iamblichus, who called himself Abammon, in the De mysteriis. It is frequently referred to by Eusebius, Cyril and Augustine. Eusebius preserved fragments of the Ilepl ttjs he \oyiwv (£iXoa

There is no complete edition of the works of Porphyry. Separate editions: Vita Plolini in R. Volkmann's edition of the Enneades of Plotinus (1883); Sententiae, by B. Mommert (1907); Vita Pythagorae, De antro nympharum, De abstinentia, Ad Marcellam, by A. Nauck (1885); " Isagoge et in Aristotelis categorias commentarium," by A. Busse in Commentaria in Aristotelem graeca (1887), iv. I, with the translation of Boetius (ed. with introd., S. Brandt, 1906); fragments of the Chronica in C. W. Muller, Frag. hist, graec. (1849), iii. 688; Quaestiones homericae, by H. Schrader (1880, 1890); Letter to Anebo in W. Pharthey's edition of Iamblichus De mysteriis (1857); De philosophia ex oraculis haurienda, by G. Wolff (1856); fragments of the Adversus Christianos by A. Georgiades (Leipzig, 1891); English trans, of the De abstinentia, De antro nympharum and Sententiae, by Thomas Taylor (1823); of the Sententiae by T. Davidson in the Journal of Speculative Philosophy, iii. (1869); of the De abstinentia by S. Hibberd (1857), and of the Ad Marcellam by A. Zimmern

(1896).

On Porphyry and his works generally see Fabricius, Bibliotheca graeca (ed. Harles), v. 725; Eunapius, Vita philosophorum; article in Sui'das; Lucas Holstenius, De vita et scriptis Porphyrii (Cam- bridge, 1655); J. E. Sandys, Hist, of Classical Scholarship (1906), i. 343: W. Christ, Gesch. der griechischen Litteratur (1898), § 621 ; M. N. Bouillet, Porphyre, son role dans Vicole neoplatonicienne (1864); A. I. Kleffner, Porphyrius der Neuplatoniker und Christenfeind (Paderborn, 1896); on his philosophy, T. Whittaker, The Neo- Platonists (Cambridge, 1901), and Neoplatonism.

•PORPHYRY (Gr. irop

specimens show effects of crushing and in extreme cases this has produced brecciation. Another famous porphyry, hardly less beautiful,

is the verde antique, porfido verde antico, or marmor lacedaemonium viride of Pliny, which was obtained between Lebetsova and Marathonisi in Peloponnesus. It has the same structure as the red porphyry as it contains large white or green felspars in a fine ground-mass. The green colour arises from the abundant formation of chlorite and epidote in the large felspars and throughout the rock. In ancient times it was much used as an ornamental stone, these two varieties of porphyry making a fine contrast with one another. Green porphyries are not so rare as red. A similar rock is obtained at Lambay Island near Dublin. They are still used extensively, especially for small ornaments. Large pieces are difficult to obtain free from flaws, and marble is preferred for mural work, not only because of the greater variety of patterns but also because it is much softer and more easily cut and polished.

Many igneous rocks possess the structure which characterizes these porphyries (see Petrology, Plate III.): the presence of scattered crystals of larger size in a fine-grained ground-mass. Most lavas, and many of the rocks which occur as dikes and sills, have porphyritic structure. These may be called porphyries and this term has consequently been applied to a great variety of rocks, e.g. diorite-porphyry, granite-porphyry, greenstone- porphyry, augite-porphyry, liebenerite-porphyry, &c. More recently the use of the term has been restricted to a series of rocks which are of intrusive origin and contain much porphyritic felspar (with or without quartz or nepheline). The porphyritic intrusive rocks with large crystals of augite, olivine, biotite, and hornblende are for the most part grouped under the lampro- phyres; while the term porphyry is rarely now applied to any of the effusive rocks or lavas. Furthermore, it has become usual to subdivide the intrusive porphyries into two classes; in one of these the phenocrysts are mainly orthoclase, in the other mainly plagioclase felspar. The first series is known as the ” porphyries,” while the second group is called ” porphy- rites.” There are porphyries which correspond chemically and mineralogically to granites, syenites, and nepheline-syenites; while the porphyrites form a parallel series to the diorites, norites and gabbros. In each case the porphyritic type occurs generally as dikes and thin sheets which consolidated beneath the surface but probably at no great depth (hypabyssal rocks); while granite, gabbro and the other holocrystalline non-por- phyritic rocks belong to the plutonic or abyssal group which cooled very slowly at great depths and under enormous pressure.

The principal subdivisions of the group are the granite-porphyries, the syenite-porphyries and the elaeolite-porphyries. In all of them porphyritic orthoclase or alkali felspar is the characteristic mineral.

The granite-porphyries and quartz-porphyries (q.v.) consist mainly of orthoclase, quartz and ferro-magnesian mineral, usually biotite but sometimes hornblende, augite or enstatite.

Granite-porphyries are exceedingly common in all regions where acid intrusive rocks occur. Many granite masses are surrounded by dikes of this kind, and in some cases the chilled margin of a granite consists of typical porphyry.

The syenite-porphyries, like the syenites, are less common than the granite-porphyries and granites. They are characterized by an abundance of orthoclase and a scarcity or absence of quartz. The phenocrysts are orthoclase (and oligoclase), biotite, hornblende or augite ; the ground-mass is principally alkali felspar with sometimes a little quartz. In many specimens the felspars of the second generation form a mosaic of ill-shaped grains, in others they are little rectangular crystals which may have a fluxion arrangement (orthophyric type of ground-mass). Some of the rocks formerly known as orthoclase-porphyries belong to this group; others are ancient trachytic lavas (orthophyres). Closely related to the syenite-porphyries is the rhomben-porphyry of south Norway and West Africa. In these the large felspars have rhomb-shaped sections owing to their peculiar crystalline development. Olivine, augite and biotite occur in these rocks, but there is no quartz or soda-lime felspar. The porphyritic felspars contain both soda and potash and belong to anorthoclase. Rhomben-porphyries occur as dikes connected with the syenites (laurvikites of southern Norway), and many ice-borne boulders of these rocks have been found among the drift deposits of the east of England.

Elaeolite- and leucite- (syenite) porphyries form apophyses and dikes around nepheline- and leucite-syenite intrusions. The former contain porphyritic nepheline which is often weathered to soft,

finely crystalline aggregates of white mica and other secondary products as in the well-known liebenerite-porphyry of Tirol and gieseckite-porphyry of Greenland. The felspars of these rocks are albite, orthoclase and anorthoclase and they often con- tain soda-augite and amphiboles. Elaeolite-porphyries occur along with nepheline-syenites in such districts as the Serra de Monchique, south Norway, Kola, Montreal. Allied to them are the tinguaites (so called from the Serra de Tingua, Rio de Janeiro, Brazil), which are pale green rocks with abundant alkali felspar nepheline, needles of green

aegirine, and sometimes biotite and cancrinite. As a rule, however, these are not porphyritic. Some authors group the tinguaites with the aplites rather than the por- phyries. Grorudites are quartz-tinguaites free from nepheline, and solvsbergites are tinguaitic rocks in which neither quartz nor nepheline occur. The two last varieties have been described from the Christiania district in Norway, but tinguaites are known with nepheline-syenites in many parts of the world, e.g. Norway, Brazil, Portugal, Canada, Sweden, Greenland.

The following analyses of porphyries of different types will show the chemical composition of a few selected examples: —

r °5

Si0 2

AI2O3

Fe 2 3

FeO

MgO

CaO

K 2

Na 2

H 2

I.

11.

III.

IV.

V.

VI. VII.

72-51 67-18

71-60

58-82

45-18 54-46 75-20

I3-3I

16-65 13-60 21-06

23-31 19-96 12-65

tr.

o-55

2-40 3-26

3-87 2-15

0-70

1-50

i-54

0-21 1-38

1-45

o-6i

0-26

o-6o

2-35 2-30 3-03

4-62

2-12 0-60

6-6 5

2-9I

3-53

3-7o

II-I6

8-68 4-14

o-43

4-03

5-55 6-83

5-94 2-76

5-67

0-60

o-75

0-70

1-26

1-14

5-20 0-12

6- 2-34

i-53

11

3-33 0-28

I., Elvan or granite porphyry (with pinite after cordierite) — Prah sands, Cornwall. II., Granophyre — Armboth, Cumberland. III., Granophyre — Carrock Fell, Cumberland. IV., Rhomben-porphyry — Tonsterg, Norway. V., Elaeolite porphyry — Beemerville, New Jersey. VI., Tinguaite — Kola. VII., Grorudite — Assynt, Scotland.

Porphyriks. — The porphyrites as above mentioned are intrusive or hypabyssal rocks of porphyritic texture, with phenocrysts of plagioclase felspar and hornblende, biotite or augite (sometimes also quartz) in a fine ground-mass. The name has not always been used in this sense, but formerly signified rather decomposed andesitic and basaltic lavas of Carboniferous age and older. Both the red porphyry and the green porphyry of the ancients are more properly classified in

this group than with the granite-porphyries, as their dominant felspar is plagioclase and they contain little or- no primary quartz. Porphyrites occur as dikes which accompany masses of diorite, and are often called diorite-porphyrites; they differ from diorites in few respects except their porphyritic structure. The phenocrysts are plagioclase, often much zoned with central kernels of bytownite or labradorite and margins of oligoclase or even orthoclase. In a special group there are corroded blebs or porphyritic quartz: these rocks are called quartz-porphyrites, and are distinguished from the granite-porphyries by the scarcity or absence of orthoclase. The hornblende of the porphyrites is often green but sometimes brown, resembling that of the lamprophyres, a group from which the porphyrites are separated by their containing phenocrysts of felspar, which do not occur in normal lamprophyres. Augite, when present, is nearly always pale green; it is not so abundant as hornblende. Dark brown biotite is very common in large hexagonal plates. Muscovite and olivine are not represented in these rocks. The ground-mass is usually a crystalline aggregate of granular felspar in which plagioclase dominates, though orthoclase is rarely absent. The Alpine dike rocks known as ortlerites and suldenites are porphyrites containing much green or brown hornblende and augite; these, however, hardly require a dis- tinctive designation. Diorite-porphyrites have almost as wide a distribution as granite-porphyries, and occur in all parts of the world where intrusions of granite and diorite have been injected; they are in fact among the commonest hypabyssal rocks.

To gabbros and norites certain types of porphyrite correspond which have the same mineral and chemical composition as the parent rocks but with a porphyritic instead of granitic structure. Gabbro-porphyrites are not numerous; or rather most of these rocks are described as porphyritic basalts and dolcrites. The beerbachites are finely granular dike rocks resembling gabbros

in all respects except in their being less coarsely crystalline. Norite-porphyrites have porphyritic plagioclase (labradorite usually) with hypersthene or bronzite, often altered to bastite. They accompany norite masses in Nahe (Prussia) and Tirol. They have vitreous forms which are described as andesitic- pitchstones or hypersthene-andesites.

I.

II. III.

Si0 2

64-94 61-58 56-85

A1 2 3

i7-5o

18-84 16-70

Fe 2 O a

0-69 4-68 5-9=

FeO

3-94 7-13

CaO

MgO

2-59 6-59 5-97

2-83 2-04 3-25

K 2

3-ii

1-49 1-91

Na 2

3-44 4-27 2-78

H 2

1-36

i-6i

°‘54

I , Quartz-porphyrite — Lippenhof, Schwarzwald. II., Porphyria Esterel, France. III., Norite-porohyrite — Klausen, Tirol.

(J- S. F.)

PORPOISE (sometimes spelled Porpus and Porpesse), a name derived

from the O. Fr. porpeis, for porc-peis, i.e. pig-fish, Lat. porcus, pig, and piscis, fish; the mod. Fr. marsouin is borrowed from the Ger. meerschwein, although the word is commonly used by sailors to designate all the smaller cetaceans, especially those numerous species which naturalists call ” dolphins,” it is properly restricted to the common porpoise of the British seas {Phocaena communis, or P. phocaena).

The porpoise, when full grown, attains a length of 5 ft. or more; the dimensions of an adult female specimen from the

Fig. 1. — The Common Porpoise (Phocaena communis).

English Channel being: length from nose to notch between the flukes of the tail, 62ˆ in.; from the nose to the front edge of the dorsal fin, 29 in.; height of dorsal fin, 4J in,; length of base of dorsal fin, 8 in.; length of pectoral fin, 9ˆ in.; breadth of pectoral fin, si in.; breadth of tail flukes, 13 in. The head is rounded in front, and differs from that of dolphins in not having the snout produced into a distinct ” beak ” separated from the forehead by a groove. The under jaw projects about half an inch beyond the upper. The mouth is wide, bounded by stiff immobile lips, and curves slightly upwards at the hinder end. The eye is small, and the external ear represented by a minute aperture, scarcely larger than would be made by a pin, about 2 in. behind the eye. The dorsal fin, near the middle of the back, is low and triangular. The flippers are of moderate size, and slightly sickle-shaped. The upper-parts are dark grey or nearly black according to the light in which they are viewed and the state of moisture or otherwise of the skin; the under-parts pure white. The line of demarca- tion between these colours is not distinct, washes or splashes of grey encroaching upon the white on the sides, and varies some- what in different individuals. Usually it passes from the throat (the anterior part of which, with the whole of the under jaw, is dark) above the origin of the flipper, along the middle of the flank, and descends again to the middle line before reaching the tail. Both sides of the flippers and flukes are black. The an- terior edge of the dorsal fin is furnished with a row of small rounded horny spines or, rather, tubercles, of variable number. One of

the most characteristic anatomical distinctions between the porpoise and other members of the Delphinidae is the form of the teeth

(numbering twenty-three to twenty-six on each side of each jaw), which have expanded, flattened, spade-like crowns, with more or less marked vertical grooves, giving a tendency to a bilobed or often trilobed form (fig. 2).

The porpoise, which is sociable and gregarious, is usually seen in small herds, and frequents coasts, bays and estuaries rather

Fig. 2. — Teeth of Porpoise.

than the open ocean. It is the commonest cetacean in the seas round the British Isles, and not infrequently ascends the Thames, having been seen as high as Richmond; it has also been observed in the Seine at Neuilly, near Paris. It frequents the Scandinavian coasts, entering the Baltic in the summer; and is found as far north as Baffin's Bay and as far west as the coasts of the United States. Southward its range is more limited than that of the dolphin, as, though common on the Atlantic coasts of France, it is not known to enter the Mediterranean.

It feeds on mackerel, pilchards and herrings and, following the shoals, is often caught by fishermen in the nets along with its prey. In former times it was a common article of food in England and France, but is now rarely if ever eaten, being valuable only for the oil obtained from its blubber. Its skin is sometimes used for leather and boot-thongs, but the so-called "porpoise-hides" are generally obtained from the beluga. The Black Sea porpoise (P. relicta) is a distinct species. A third species, from the American coast of the North Pacific, has been described under the name of Phocaena vomerina, and another from the mouth of the Rio de la Plata as P. spinipennis. Nearly allied is Neophocaena phocaenoides, a small species from the Indian Ocean and Japan, with teeth of the same form as those of the por- poise, but fewer in number (eighteen to twenty on each side), of larger size, and more distinctly notched or lobed on the free edge. It is distinguished from the common porpoise externally by its black hue and the absence of a dorsal fin. (See Cetacea.)

(R. L.*) PORPORA, NICCOLA [or Niccolo] ANTONIO (1686-1767), Italian operatic composer and teacher of singing, was born in Naples on the 19th of August 1686. He was educated at the Conservatorio di Santa Maria di Loreto. His first opera, Basilio, was produced at Naples; his second, Berenice, at Rome. Both were successful, and he followed them up by innumerable compositions of like character; but his fame rests chiefly upon his unequalled power of teaching singing. At the Conservatorio di' Sant' Onofrio and the Poveri di Gesu Cristo he trained Farinelli, Caffarelli, Mingotti, Salimbeni, and other celebrated

vocalists. Still his numerous engagements did not tempt him to forsake composition. In 1725 he visited Vienna, but the Emperor Charles VI. disliked his florid style, especially his con- stant use of the tritlo, and refused to patronize him. After this rebuff he settled in Venice, teaching regularly in the schools of La Pieta and the Incurabili. In 1729 he was invited to London as a rival to Handel; but his visit was unfortunate. Little less disastrous was his second visit to England in 1734, when even the presence of his pupil, the great Farinelli, failed to save the dramatic company of Lincoln's Inn Fields theatre, known as the " Opera of the Nobility," from ruin. The sequence of dates and visits in Porpora's life are variously stated by different biographers. The electoral prince of Saxony and king of Poland had invited him to Dresden to become the singing master of the electoral princess, Maria Antonia, and in 1748 he is supposed to have been made Kapellmeister to the prince. Difficult relations, however, with Hasse and his wife resulted in his departure, of which the date is not knowrt. From Dresden he

is said to have gone to Vienna, where he gave lessons to Joseph Haydn {q.v.), and then to have returned in 1759 to Naples. From this time Porpora's career was a series of misfortunes. His last opera, Camilla, failed; and he became so poor that the expenses of his funeral were paid by subscription. Yet at the moment of his death in 1767 Farinelli and Caffarelli were living in splendour on fortunes for which they were largely indebted to the excellence of the old maestro's teaching. In George Sand's Consuelo much use is made of a romantic version of the life of young Haydn and his relations with the heroine, Porpora's pupil, and with Porpora himself. A good linguist and a man of considerable literary culture, Porpora was also celebrated for his power of repartee. His operas are, on the whole, tedious and conventional; but he produced some good work in the form of instrumental music and chamber-cantatas. A series of six Latin duets on the Passion (accessible in a modern edition published by Breitkopf and Haertel) is remarkable for dignity and beauty.

PORRIDGE (an altered form of " pottage," Fr. potage, soup, that which is cooked in a pot), a food made by stirring meal, especially oatmeal, in boiling water and cooking it slowly until the whole becomes soft. The dish and its name are particularly identified with Scotland; in Ireland it is commonly known as " stir-about." The former application to a broth made of vegetables or of meat and vegetables thickened with barley or other meal is obsolete, and the earlier " pottage " is the usual word employed. The form " porridge " apparently dates from the 16th century. In " porringer," a porridge-bowl, the n is inserted as in " passenger," " messenger."

PORSENA (or Porsenna), LARS, king of Clusium in,Etruria. He is said to have undertaken an expedition against Rome in order to restore the banished Tarquinius Superbus to the throne. He gained possession of the Janiculum, and was prevented from entering Rome only by the bravery of Horatius Codes (q.v.), Porsena then laid siege to the city, but was so struck by the courage of Mucius Scaevola that he made peace on condition that the Romans restored the land they had taken from Veii and gave him twenty hostages. He subsequently returned both the land and the hostages (Livy, ii. 9-15; Dion. Halic, v. 21-34; Plutarch, Poplicola, p. 16-19). This story is probably an attempt to conceal a great disaster and to soothe the vanity of the Romans by accounts of legendary exploits. According to other authorities, the Romans were obliged to surrender the city, to acknowledge Porsena's supremacy by sending him a sceptre, a royal robe, and an ivory chair, to abandon their territory north of the Tiber, to give up their arms, and in future to use iron for agricultural purposes only. It is curious that, in spite of his military success, Porsena made no attempt to restore the Tarquinian dynasty. Hence it is suggested that the attack on Rome was merely an incident of the march of the Etruscans, driven southward by the invasion of upper Italy by the Celts, through Latium on their way to Campania. This would account for its transitory effects, and the speedy recovery of the Romans from the blow. With the departure of Porsena all traces of Etruscan sovereignty disappear and Rome is soon vigorously engaged in the prosecution of various wars (see Tacitus, Hist. iii. 72; Pliny, Nat. Hist, xxxiv. 39 [14]; Dion. Halic. v. 35, 36, vii. 5). The tomb at Chiusi described by Pliny {Nat. Hist, xxxvi. 19) as that of Porsena cannot have been his burial-place (see Clusium).

For a critical examination of the story, see Schwegler, Romische Geschichte, bk. xxi. 18; Sir G. Corne wall Lewis, Credibility of Early Roman History, ch. xii. 5; W. Ihne, Hist, of Rome, vol. i. ; E. Pais, Storia di Roma, i. ch. iv. (1898). Macaulay's Lays of Ancient Rome gives a dramatic version of the story.

PORSON, RICHARD (1759-1808), English classical scholar, was born on Christmas Day 1759 at East Ruston, near North Walsham, in Norfolk, the eldest son of Huggin Porson, parish clerk. His mother was the daughter of a shoemaker named Palmer, of the neighbouring village of'Bacton. He was sent first to the village school at B acton, kept by John Woodrow, and afterwards to that of Happisburgh kept by Mr Summers.

Here his extraordinary powers of memory and aptitude for arithmetic were soon discovered; his skill in penmanship, which attended him through life, was due to the care of Summers, who became early impressed with his abilities, and long after- wards stated that during fifty years of scholastic life he had never come across boys so clever as Porson and his two brothers. He was well grounded in Latin by Summers, remaining with him for three years. His father also took pains with his education, making him repeat at night the lessons he had learned in the day. He would frequently repeat without making a mistake a lesson which he had learned one or two years before and had never seen in the interval. For books he had only what his father's cottage supplied — a book or two of arithmetic, Greenwood's England, Jewell's Apology, and an odd volume of Chamber's Cyclopaedia picked up from a wrecked coaster, and eight or ten volumes of the Universal Magazine.

When Porson was eleven years old the Rev. T. Hewitt, the curate of East Ruston and two neighbouring villages, took charge of his education. Mr Hewitt taught him with his own boys, taking him through the ordinary Latin authors, Caesar, Terence, Ovid and Virgil; before this he had made such progress in mathematics as to be able to solve ques- tions out of the Ladies' Diary. In addition to this Hewitt brought him under the notice of Mr Norris of Witton Park, who sent him to Cambridge and had him examined by Professor Lambert, the two tutors of Trinity, Postlethwaite and Collier, and the well-known mathematician Atwood, then assistant tutor; the result was so favourable a report of his knowledge and abilities that Mr Norris determined to provide for his educa- tion so as to fit him for the university. This was in 1773. It was found impossible to get him into Charterhouse, and he was entered on the foundation of Eton in August 1774.

Of his Eton life Porson had no very pleasant recollections, but he was popular among his schoolfellows; and two dramas he wrote for performance in the Long Chamber were remembered many years later. His marvellous memory was of course noticed; but at first he seems to have somewhat disappointed the expectations of his friends, as his composition was weak, and his ignorance of quantity kept him behind several of his inferiors. He went to Eton too late to have any chance of succeeding to a scholarship at King's College. In 1777 he suffered a great loss from the death of his patron Mr Norris; but contributions from Etonians to aid in the funds for his maintenance at the university were rapidly supplied, and he found a successor to

Norris in Sir George Baker, the physician, at that time president of the college of physicians. Chiefly through his means Porson was entered at Trinity College, Cambridge, as a pensioner on the 28th of March 1778, matriculating in April. It is said that what first biassed his mind towards critical researches was the gift of a copy of Toup's Longinus by Dr Davies, the head master of Eton, for a good exercise; but it was Bentley and Richard Dawes to whom he looked as his immediate masters. His critical career was begun systematically while an under-graduate. He became a scholar of Trinity in 1780, won the Craven university scholarship in 1781, and took his degree of B.A. in 1782, as third senior jptime, obtaining soon afterwards the first chancellor's medal for classical studies. The same year he was elected Fellow of Trinity, a very unusual thing for a junior bachelor of arts, as the junior bachelors were rarely allowed to be candidates for fellowships, a regulation which lasted from 1667 when Isaac Newton was elected till 1818 when Connop Thirlwall became a fellow. Porson graduated M. A. in 1785.

Having thus early secured his independence, he turned his thoughts to publication. The first occasion of his appearing in print was in a short notice of Schlitz's Aeschylus in Maty's Review, written in 1783. This review contains several other essays by his hand; especially may be mentioned the reviews of R. F. Brunck's Aristophanes (containing an able summary of the poet's chief excellencies and defects), Weston's Hermes- ianax, and Huntingford's Apology for the Monostrophics. But it was to the tragedians, and especially to Aeschylus, that his mind was then chiefly directed. He began a correspondence

with David Ruhnkea, the veteran scholar of Leiden, requesting to be favoured with any fragments of Aeschylus that Ruhnken. had come across in his collection of inedited lexicons and gram- marians, and sending him, as a proof that he was not under- taking a task for which he was unequal, some specimens of his critical powers, and especially of his restoration of a very corrupt passage in theSupplices (673-677) by the help of a nearly equally corrupt passage of Plutarch's Erolicus. As the syndics of the Cambridge press were proposing to re-edit Thomas Stanley's Aeschylus, the editorship was offered to Porson; but he declined to undertake it on the conditions laid down, namely, of reprint- ing Stanley's corrupt text and incorporating all the variorum notes, however worthless. He was especially anxious that the Medicean MS. at Florence should be collated for the new edition, and offered to undertake the collation at an expense not greater than it would have cost if done by a person on the spot ; but the syndics refused the offer, the vice-chancellor (Mr Torkington, master of Clare Hall) observing that Porson might collect his MSS. at home.

In 1786, a new edition of Hutchinson's Anabasis of Xenophon being called for, Porson was requested by the publisher to supply a few notes, which he did in conjunction with the Rev. W. Whiter, editor of the Etymologicon universale. These give the first specimen of that neat and terse style of Latin notes in which he was afterwards without a rival. They also show his intimate acquaintance with his two favourite authors, Plato and Athenaeus, and a familiarity with Eustathius's commentary on Homer.

In 1787 the Notae breves ad Toupii emendationes in Suidam were written, though they did not appear till 1790 in the new edition of Toup's book published at Oxford. These first made Porson's name known as a scholar of the first rank, and carried his fame beyond England. The letters he received from Christian G. Heyne and G. Hermann preserved in the library of Trinity College, and written before his Euripides was published, afford proof of this. In his notes he points out the errors of Toup and others; at the same time he speaks of Toup's book as " opus illud aureum," and states that his writing the notes at all is due to the admiration he had for it. They contain some brilliant emendations of various authors; but the necessity of having Toup's own notes with them has prevented their ever being reprinted in a separate form.

During this year, in the Gentleman's Magazine, he wrote the three letters on Hawkins's Life of Johnson which have been reprinted by Mr Kidd in his Tracts and Criticisms of Porson, and in a volume of Porson's Correspondence. They are admirable specimens of the dry humour so characteristic of the writer, and prove his intimate acquaintance with Shakespeare and the other English dramatists and poets. In the same periodical, in the course of 1788 and 1789, appeared the Letters to Archdeacon Travis, on the spurious verse 1 John v. 7 (collected in 1790 into a volume), which must be considered to have settled the question. Gibbon's verdict on the book, that it was " the most acute and accurate piece of criticism since the days of Bentley," may be considered as somewhat partial, as it was in defence of him that Porson had entered the field against Travis. But in the masterly sketch of Gibbon's work and style in the preface Porson does not write in a merely flattering tone. It is to be wished that on such a subject the tone of levity had been modified. But Porson says in his preface that he could treat the subject in no other manner, if he treated it at all: " To peruse such a mass of falsehood and sophistry and to write remarks upon it, without sometimes giving way to laughter and sometimes to indignation, was, to me at least, impossible." Travis has no mercy shown him, but he certainly deserved none. One is equally struck with the thorough grasp Porson

displays of his subject, the amount of his miscellaneous learning, and the humour that pervades the whole. But it was then the unpopular side: the publisher is said to have lost money by the book; and one of his early friends, Mrs Turner of Norwich, cut down a legacy she had left Porson to £30 on being told that he had written what was described to her as a book against Christianity.

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PORSON

During the years that followed he continued to contribute to the leading reviews, writing in the Monthly Review the articles on Robertson's Parian Chronicle, Edwards's Plutarch, and R. Payne Knight's Essay on the Greek Alphabet. He gave assistance to William Beloe in one or two articles in the British Critick, and probably wrote also in the Analytical Review and the Critical Review.

In 1792 his fellowship was no longer tenable by a layman; and, rather than undertake duties for which he felt himself unfit, and which involved subscription to the Articles (though he had no difficulty as to signing a statement as to his conformity with the liturgy of the Church of England when elected Greek professor), he determined not to take holy orders, which would have enabled him to remain a fellow, and thus deprived himself of his only means of subsistence. He might have been retained in the society by being appointed to a lay fellowship, one of the two permanent lay fellowships which the statutes then permitted falling vacant just in time. It is said that this had been promised him, and it was certainly the custom in the college always to appoint the senior among the existing laymen, who otherwise would vacate his fellowship. But the master (Dr Postlethwaite) , who had the nomination, used his privilege to nominate a younger man (John Heys), a nephew of his own, and thus Porson was turned adrift without any means of support. A subscription was, however, got up among his friends to provide an annuity to keep him from actual want; Cracherode, Cleaver Banks, Burney and Parr took the lead, and enough was collected to produce about £100 a year. He accepted it only on the condition that he should receive the interest during his lifetime, and that the principal, placed in the hands of trustees, should be returned to the donors at his death. When this occurred they or their survivors refused to receive the money, and it was with part of this sum that, in 1816, the Porson prize was founded to perpetuate his name at Cambridge. The remainder was devoted to the foundation of the Porson scholarship in the same univer- sity. This scholarship was first awarded in 1855.

After the loss of his fellowship he continued chiefly to reside in London, having chambers in Essex Court, Temple — occasion- ally visiting his friends, such as Dr Goodall at Eton and Dr Samuel Parr at Hatton. It was at Dr GoodalPs house that the Letters to Travis were written, and at one period of his life he spent a great deal of time at Hatton. While there he would generally spend his mornings in the library, and for the most part in silence; but in the evenings, especially if Parr were away, he would collect the young men of the house about him, and pour forth from memory torrents of every kind of literature. The charms of his society are described as being then irresistible. In 1792 the Greek professorship at Cambridge became vacant by the resignation of Mr Cooke. To this Porson was elected without opposition, and he continued to hold it till his death. The duties then consisted in taking, a part in the examinations for the university scholarships and classical medals. It was said he wished to give lectures; but lecturing was not in fashion in those days, and he did far more to advance the knowledge and study of the Greek language by his publications than h6 could have done by any amount of lecturing. It must be re- membered that the emoluments of the professorship were only £40 a year. The authors on which his time was chiefly spent were the tragedians, Aristophanes, Athenaeus, and the lexicons of Suidas, Hesychius and Photius. This last he twice tran- scribed (the first transcript having been destroyed by a fire at Perry's house, which deprived the world of much valuable matter that he had written on the margins of his books) from the original among the Gale MSS. in the library of Trinity College. Of the brilliancy and accuracy of his emendations on Aristophanes, the fragments of the other comic poets, and the lexicographers he had a pleasing proof on one occasion when he found how often in Aristophanes he had been anticipated by Bentley, and on another when Schow's collation of the unique MS. of Hesychius appeared and proved him right in " an incredible number " of instances. In 1795 there appeared from Foulis's press at Glasgow an

edition of Aeschylus in folio, printed with the same types as the Glasgow Homer, without a word of preface or anything to give a clue to the editor. Many new readings were inserted in the text with an asterisk affixed, while an obelus was used to mark many others as corrupt. It was at once recognized as Porson's work; he had superintended the printing of a small edition in two vols. 8vo, but this was kept back by the printer and not issued till 1806, still without the editor's name. There are corrections of many more passages in this edition than in the folio; and, though the text cannot be considered as what would have gone forth if with his name and sanction, yet more is done for the text of Aeschylus than had been accomplished by any

preceding editor. It has formed the substratum for all subse- quent editions. It was printed from a copy of Pauw's edition corrected, which is preserved in the library of Trinity College.

Soon after this, in 1797, appeared the first instalment of what was intended to be a complete edition of Euripides — an edition of the Hecuba.

In the preface he pointed out the correct method of writing several words previously incorrectly written, and gave some specimens of his powers on the subject of Greek metres. The notes are very short, almost entirely critical; but so great a range of learning, combined with such felicity of emendation whenever a corrupt passage was encountered, is displayed that there was never any doubt as to the quarter whence the new edition had proceeded. He avoided the office of interpreter in his notes, which may well be wondered at on recollecting how admirably he did translate when he condescended to that branch of an editor's duties.

His work, however, did not escape attack; Gilbert Wakefield had already published a Tragoediarum delectus; and, conceiving himself to be slighted, as there was no mention of his labours in the new Hecuba, he wrote a " diatribe extemporalis " against it, a tract which for bad taste, bad Latin and bad criticism it would not be easy to match. Gottfried Hermann of Leipzig, then a very young man, who had also written a work on Greek metres, which Dr Elmsley has styled " a book of which too much ill cannot easily be said," issued an edition of the Hecuba, in which Porson's theories were openly attacked. Porson at first took no notice of either, but went on quietly with his Euripides, publishing the Orestes in 1798, the Phoenissae in 1799 and the Medea in 1 801, the last printed at the Cambridge press, and with the editor's name on the title-page. But there are many allu- sions to his antagonists in the notes on such points as the final v, the use of accents, &c; and on v. 675 of the Medea he holds up Hermann by name to scorn in caustic and taunting language. And it is more than probable that to Hermann's attack we owe the most perfect of his works, the supplement to the preface to the Hecuba, prefixed to the second edition published at Cambridge in 1802. The metrical laws promulgated are laid down clearly, illustrated with an ample number of examples, and those that militate against them brought together and corrected, so that what had been beyond the reach of the ablest scholars of preceding times is made clear to the tyro. The laws of the iambic metre are fully explained, and the theory of the pause stated and proved, which had been only alluded to in the first edition. A third edition of the Hecuba appeared in 1808, and he left corrected

copies of the other plays, of which new editions appeared soon after his death; but these four plays were all that was accomplished of the projected edition of the poet. Porson lived six years after the second edition of the Hecuba was published, but his natural indolence and procrastination led him to put off the work. He found time, however, to execute his collation of the Harleian MS. of the Odyssey, published in the Grenville Homer in 1801, and to present to the Society of Antiquaries his wonderful conjectural restoration of the Rosetta stone.

In 1806, when the London Institution was founded (then in the Old Jewry, since removed to Finsbury Circus), he was appointed principal librarian with a salary of £200 a year and a suite of rooms; and thus his latter years were made easy as far as money was concerned.

Among his most intimate friends was Perry, the editor of the Morning Chronicle; and this friendship was cemented by his marriage with Perry's sister, Mrs Lunan, in November 1796. The marriage was a happy one for the short time it lasted, as Porson became more attentive to times and seasons, and would have been weaned from his habits of drinking; but she sank in a decline a few months after her marriage (April 12, 1797), and he returned to his chambers in the Temple and his old habits. Perry's friendship was of great value to him in many ways; but it induced him to spend too much of his time in writing for the Morning Chronicle; indeed he was even accused of " giving up to Perry what was meant for mankind," and the existence of some of the papers he wrote there can be only deplored.

For some months before his death he had appeared to be failing: his memory was not what it had been, and he had some symptoms of intermittent fever; but on the 19th of September 1808 he was seized in the street with a fit of apoplexy, and after partially recovering sank in the 25th of that month at the age of forty-nine. He was buried in Trinity College, close to the statue of Newton, at the opposite end of the chapel to where rest the remains of Bentley.

In learning Porson was superior to Valckenaer, in accuracy to Bentley. It must be remembered that in his day the science of comparative philology had scarcely any existence; even the com- parative value of MSS. was scarcely considered in editing an ancient author. With many editors MSS. were treated as of much the same value, whether they were really from the hand of a trustworthy scribe, or what Bentley

calls ” scrub manuscripts,” or ” scoundrel copies.” Thus, if we are to find fault with Porson’s way of editing, it is that he does not make sufficient difference between the MSS. he uses, or point out the relative value of the early copies whether in MS. or print. Thus he collates minutely Lascaris’s edition of the Medea, mentioning even misprints in the text, rather from its rarity and costliness than from its intrinsic value. And his wonderful quickness at emendation has sometimes led him into error, which greater investigation into MSS. would have avoided; thus, in his note on Eur., Phoem. 1373 an error, perhaps a misprint (k« for ixt), in the first edition of the scholiast on Sophocles has led him into an emendation of v. 339 of the Trachiniae which clearly will not stand. But his most brilliant emendations, such as some of those on Athenaeus, on the Supplices of Aeschylus, or, to take one single instance, that on Eur. Helen. 751 (0(8′ “EXeros for oiScf ye; see Maltby’s Thesaurus, p. 299), are such as convince the reader of their absolute certainty ; and this power was possessed by Porson to a degree no one else has ever attained. No doubt his mathematical training had something to do with this; frequently the process may be seen by which the truth has been reached.

A few words are called for on his general character. No one ever more loved truth for its own sake; few have sacrificed more rather than violate their consciences, and this at a time when a high standard in this respect was not common. In spite of his failings, few have had warmer friends; no one more willingly communicated his knowledge and gave help to others; scarcely a book appeared in his time or for some years after his death on the subjects to which he devoted his life without acknowledging assistance from him. And, if it be remembered that his life was a continued struggle against poverty and slight and ill-health, rather than complain that he did little, we should wonder how he accomplished so much.

His library was divided into two parts, one of which was sold by auction; the other, containing the transcript of the Gale Photius, his books with MS. notes, and some letters from foreign scholars, was bought by Trinity College for 1000 guineas. His notebooks were found to contain, in the words of Bishop Blomfield, ” a rich treasure of criticism in every branch of classical literature — every- thing carefully and correctly written and sometimes rewritten — quite fit to meet the public eye, without any diminution or addition/’ They have been carefully rearranged, and illustrate among other things his extraordinary penmanship and power of minute and accurate writing. Much remains unpublished. J. H. Monk, his successor as Greek professor, and C. J. Blomfield (both afterwards bishops) edited the Adversaria, consisting of the notes on Athenaeus and the Greek poets,

and his prelection on Euripides; P. P. Dobree, after- wards Greek professor, the notes on Aristophanes and the lexicon of Photius. Besides these, from other sources, Professor T. Gaisford edited his notes on Pausanias and Suidas, and Mr Kidd collected his scattered reviews. And, when Bishop Burgess attacked his literary character on the score of his Letters to Travis, Professor Turton (afterwards Bishop of Ely) came forward with a vindication. The chief sources for Porson's life will be found in the memoirs in the Gentleman's Magazine for September and October 1808, and other periodicals of the time (mostly reprinted in Barker's Porson- iana, London, 1852) ; Dr Young's memoir in former editions of the Ency. Brit, (reprinted ibid, and in his works); Weston's (utterly worthless) Short Account of the late Mr Richard Porson

(London, 1808; reissued with a new preface and title-page in 1814); Dr Clarke's narrative of his last illness and death (London, 1808; reprinted in the Classical Journal) ; Kidd's " Imperfect Outline of the Life of R.P.," prefixed to his collection of the Tracts and Criticisms; Beloe's Sexagenarian (not trustworthy), vol. i. (London, 181 7); Barker's Parriana, vol. ii. (London, 1829); Maltby's " Porsoniana," published by Dyce in the volume of Recollections of the Table-Talk of Samuel Rogers (London, 1856); a life in the Cambridge Essays for 1857 by H. R. Luard ; and a lengthy life by J. S. Watson (London, 1861). See also R. C. Jebb in Diet. Nat. Biog., and J. E. Sandys, History of Classical Scholarship, ii. 424-430 (with copy of portrait by Hoppner; 1908).

The dates of Porson's published works are as follows: Notae in Xenophontis anabasin (1786); Appendix to Toup (1790); Letters to Travis (1790); Aeschylus (1795, 1806); Euripides (1797-1802); collation of the Harleian MS. of the Odyssey (1801); Adversaria (Monk and Blomfield, 1812); Tracts and Criticisms (Kidd, 1815); Aristophanica (Dobree, 1820); Notae in Pausaniam (Gaisford, 1820); Photii lexicon (Dobree, 1822); Notae in Suidam (Gaisford, 1834) ; Correspondence (Luard, edited for the Cambridge Antiquarian Society, 1867). Dr. Turton's vindication appeared in 1827.

(H. R. L.;J. E. S.*)

PORT. (1) (From the Lat. partus, harbour), a place to which ships may resort for the unloading or taking in of cargo, or for shelter, a harbour, also a town possessing such a harbour, a " seaport," or " seaport town," especially one where custom- house officers are stationed. As the name of a dark red Portu- guese wine, the word is a shortened form of Oporto, i.e. the port, the chief centre of the wine-shipping

trade of Portugal (see Wine). (2) (Through the Fr. porte, from Lat. porta, gate), an entrance or opening, not often used in the sense of gate, except in such compounds as ” sallyport,” cf. ” portcullis,” and in the derivative “porter,” a keeper of a door or gate, especially of a public building, hotel, college, &c. The most general use of the word is for an opening for the admission of light and air in a ship’s side, and formerly in ships of war for an embrasure for cannon, a ” port-hole.” For the application of the word to the left side of a ship, taking the place of the earlier ” larboard,” and its disputed origin, see Starboard and Larboard. (3) (Through the Fr. porter, from Lat. portare, to carry, bear), properly outward bearing or deportment, whence ” portly,” originally of dignified or majestic bearing, now chiefly used in the sense of stout or corpulent. The verb ” to port ” is only used as a military term ” to port arms,” i.e. to hold the rifle across and close to the body, the barrel being placed opposite to the left shoulder. Derivatives are “port-fire” (Fr. porte-feu), a fuse for firing rockets, &c, and formerly for the discharge of artillery, and ” porter,” i.e. one who carries a burden, particularly a servant of a railway company, hotel, &c, who carries passengers’ luggage to and from a station, &c. The term ” porter ” has been applied, since the 18th century, to a particular form of beer, dark brown or almost black in colour (see Beer and Brewing). The finer kinds of this beer are generally now known as ” stout.” The name is almost certainly due to the fact that it was from the first a favourite drink among the London ” porters,” the street carriers of goods, luggage, &c, and in early uses the drink is called porter’s ale, porter’s beer, or porter-beer.

PORT ADELAIDE, a port of Adelaide county, South Australia, 75 m. by rail N.W. of Adelaide. Pop. of the town and suburbs (1901), 20,089. It is situated on an estuary 9 m. from St Vincent Gulf and is the principal shipping port of South Australia. Its wharves, equipped with steam and travelling cranes, and tram- ways, are 25 m. in extent; it has docks and a number of patent slips capable of taking up vessels of 300 to 1500 tons. There are also piers at Semaphore and Larg’s Bay, on the other side of Lefevre’s Peninsula some 2 m. distant, which are connected with Port Adelaide by rail. The industries comprise silver and copper smelting, brewing, sawmiUing, ropemaking, flourmilling, sugar-refining and yacht-building. The harbour is protected by two forts known as the Fort Glanville batteries. The suburbs, which are connected with the town by tramways, are Alberton, Queenstown, Yatala, Rosewater and Kingston-on-the-Hill.

PORTADOWN, a market town of county Armagh, Ireland, on the river Bann and the Great Northern railway, 25 m. W.S.W. of Belfast. Pop. (1901), 10,092. It is a junction of

lines from Dublin, Clones and Omagh. The Bann, which is connected with the Newry Canal and falls into Lough Neagh 5 m. north of the town, is navigable for vessels of 90 tons burden. It is crossed at Portadown by a stone bridge of seven arches, originally built in 1764, but since then re-erected. The manu- facture of linen and cotton is carried on, and there is a con- siderable trade in pork, grain and farm produce. In the reign of Charles I. the manor was bestowed on John Obyns, who erected a mansion and a few houses, which were the beginning of the town. A grain-market was established in 1780. The town is governed by an urban district council.

PORTAELS, JEAN FRANCOIS (18×8-1895), Belgian painter, was born at Vilvorde (Brabant), in Belgium, on the 30th of April 1818. His father, a rich brewer, sent him to study in the Brussels Academy, and the director, Francois Navez, ere long received him as a pupil in his own studio. About 1841 Portaels went to Paris, where he was kindly received by Paul Delaroche. Having returned to Belgium, he carried off the Grand Prix de Rome in 1842. He then travelled through Italy, Greece, Morocco, Algeria, Egypt, the Lebanon, Judaea, Spain, Hungary and Norway. On his return to Belgium in 1847 Portaels succeeded H. Vanderhaert as director of the academy at Ghent. In 1849 he married the daughter of his first master, Navez, and in 1850 settled at Brussels; but as he failed in obtaining the post of director of the academy there, and wished, nevertheless, to carry, on the educational work begun by his father-in-law, he opened a private studio-school, which became of great importance in the development of Belgian art. He again made several journeys, spending some time in Morocco; he came back to Brussels in 1874, and in 1878 obtained the directorship of the academy which had so long been the object of his ambition. Portaels executed a vast number of works. Decorative paint- ings in the church of St Jacques-sur-Caudenberg; biblical scenes, such as ” The Daughter of Sion Reviled ” (in the Brussels Gallery), “The Death of Judas,” “The Magi travelling to Bethlehem,” ” Judith’s Prayer,” and ” The Drought in Judaea “; genre pictures, among which are ” A Box in the Theatre at Budapest ” (Brussels Gallery), portraits of officials and of the fashionable world, Oriental scenes and, above all, pictures of fancy female figures and of exotic life. ” His works are in general full of a facile grace, of which he is perhaps too lavish,” wrote Theophile Gautier. Yet his pleasing and abundant productions as a painter do not constitute Portaels’s crowning merit. The high place his name will fill in the history of contemporary Belgian art is due to his

influence as a learned and clear-sighted instructor, who formed, among many others, the painters E. Wauters and E. Agneesens, the sculptor Ch. van der Stappen, and the architect Licot. He died at Brussels on the 8th of February 1895.

See E. L. de Taeye, Peintres beiges contemporains ; J. du Jardin, V Art flamand. (F. K.*)

PORTAGE, a city and the county-seat of Columbia county, Wisconsin, U.S.A., on the Wisconsin river, about 85 m. N.W. of Milwaukee. Pop. (1890) 5143; (1900) 5459, of whom 1184 were foreign-born; (1910 U.S. census) 5440. It is served by the Chicago, Milwaukee & St Paul, and the Minneapolis, St Paul & Sault Ste Marie railways. The city is situated at the west end of the government ship canal connecting the Fox and Wisconsin rivers, and river steamboats ply during the open season between Portage and Green Bay and intermediate points in the Fox River Valley, Portage being the head of navigation on the Fox. Portage is in the midst of a fertile farming region, and has a trade in farm and dairy products and tobacco. Its manufactures include brick, tile, lumber, flour, pickles, knit goods, steel tanks and marine engines and launches, and there are several tobacco warehouses and grain elevators. As the Fox and Wisconsin rivers are here only 2 m. apart, these rivers were the early means of communication between Lake Michigan and the Mississippi river. The first Europeans known to have visited the site of the city were Radisson and Groseilliers, who crossed the portage in 1655. The portage was used by Mar- quette and Joliet on their way to the Mississippi in 1673, and a

red granite monument commemorates their passage. About 1 71 2 the Fox Indians disputed the passage of the portage, precipitating hostilities which continued intermittently until 1743. The first settler was Lawrence Barth, who engaged in the carrying trade here in 1793. Jacques Vieau established a trading post here in 1797, and by 1820 it was a thriving depot of the fur trade. During the Red Bird uprising (1827) a tem- porary military post was established by Major William Whistler of the U.S. army. Fort Winnebago was begun in the following year, was remodelled and completed by Lieut. Jefferson Davis in 1832, and was subsequently abandoned. It was from there in the same year that the final and successful cam- paign against Black Hawk was begun. After several failures the Fox-Wisconsin canal was completed in 1856, and in June of that year the ” Aquila,” a stern-wheeler, passed through the canal on its way from Pittsburg to Green Bay. The shifting channel of the Wisconsin has retarded navigation, and the canal has never been as important commercially as was expected.

PORTAGE LA PRAIRIE, a port of entry and the chief town of Portage la Prairie county, Manitoba, Canada, situated 50 ni- W. of Winnipeg, on the Canadian Pacific and Canadian Northern railways, at an altitude of 854 ft. above the sea. Pop. (1901), 3901. It is in the midst of a fine agricultural district, into which several branch railways extend, and carries on a large export trade in grain and other farm produce.

PORTALEGRE, an episcopal city, capital of the district of Portalegre, Portugal; 8 m. N. of Portalegre station, on the Lisbon-Badajoz-Madrid railway. Pop. (1900), 11,820. Portal- egre is the Roman Amaea or Ammaia, and numerous Roman and prehistoric remains have been discovered in the neighbourhood. The principal buildings are the cathedral, the ruined Moorish citadel and two more modern forts. The administrative district of Portalegre, in which the rearing of swine, the pro- duction of grain, wine and oil, and the manufacture of woollen and cotton goods and corks are the principal industries, coincides with the northern part of the ancient province of Alemtejo (q.v.). Pop. (1900), 124,443; area, 2405 sq. m.

PORTALIS, JEAN ETIENNE MARIE (1746-1807), French jurist, came of a bourgeois family, and was born at Bausset in Provence on the 1st of April 1746. He was educated by the Oratorians at their schools in Toulon and Marseilles, and then went to the university of Aix; while a student there he published his first two works, Observations sur Entile in 1763 and Des Prejuges in 1764. In 1765 he became an avocat at the parlement of Aix, and soon obtained so great a reputation that he was in- structed by the due de Choiseul in 1770 to draw up the decree authorizing the marriage of Protestants. From 1778 to 1781 he was one of the four assessors or administrators of Provence. In November 1793, after the republic had been proclaimed, he came to Paris and was thrown into prison, being the brother- in-law of Joseph Jerome Simeon, the leader of the Federalists in Provence. He was soon removed through the influence of B. de V. Barere to a maison de sante, where he remained till the fall of Robespierre. On being released he practised as a lawyer in Paris; and in 1795 he was elected by the capital to the Con- seil des Anciens, becoming a leader of the moderate party opposed to the directory. As a leader of the moderates he was proscribed at the coup d'etat of Fructidor, but, unlike General Charles Pichegru and the marquis de Barbe-Marbois, he managed to escape to Switzerland, and did not return till Bonaparte became First Consul. Bonaparte made him a conseiller d'etat in 1800, and then charged him, with F, D. Tronchet, Bigot de Preameneu, and Jacques de Maleville, to draw up the Code Civil. Of this commission he was the most industrious member, and many of the most important titles, notably those on mar- riage and heirship, are his work. In 1801 he was placed in charge of the department of cultes or public worship, and in that capacity had the chief share in drawing up the provisions of the Concordat. In 1803 he became a member of the Institute, in 1804 minister of public worship, and in 1805 a knight grand cross of the Legion of Honour. He soon after became totally

blind; and after an operation he died at Paris on the 25th of August 1807.

The work of Portalis appears in the Code Napoleon, but see also Frederick Portalis's Documents, rapports, et travaux inedits sur le Code Civil (1844) and Sur le Concordat (1845); for his life, see the biography in the edition of his Oeuvres by F. Portalis (1823) and Rene Lavolee, Portalis, sa vie et ses oeuvres, (Paris,

1869).

His son, Joseph Marie Portalis (1778-1858), entered the diplomatic service, and obtaining the favour of Louis XVIII. filled many important offices. He was under-secretary of state for the ministry of justice, first president of the court of cassa- tion, minister for foreign affairs, and in 1851 a member of the senate.

PORTARLINGTON, a market town situated partly in King's county but chiefly in Queen's county, Ireland, on both banks of the river Barrow, here the county boundary. Pop. (1901), 1943. The railway station, a mile south of the town, is an important junction, 42 m. west by south from Dublin, of the Great Southern & Western system, where the branch line to Athlone leaves the main line. Monthly fairs are held, and there is considerable local trade. After the revocation of the edict of Nantes a colony of French refugees was established here in the reign of William III., and the beautiful church of St Paul (rebuilt in 1857) was devoted to their use, services being conducted in the French language, for which reason the church is still spoken of as the " French Church." The former name of the town was Cooltetoodera, but on the property passing into the hands of Lord Arlington in the reign of Charles II. the name was changed. Emo Park, 5 m. south of the town, is the fine demesne of the earls of Portarlington, a title granted to the family of Dawson in 1785. An obelisk on Spire Hill near the town is one of the many famine relief works in Ireland. On the river, close to the town, there are picturesque remains of Lea Castle, originally built c. 1260. Portarlington was incorporated in 1667, and was a parliamentary borough both before the Union and after, its representation in the imperial parliament (by one member) being merged in that of the county by the Redistribution Act of 1885.

PORT ARTHUR (formerly Prince Arthur's Landing), a town and harbour in Thunder Bay District, Ontario, Canada, on Lake Superior, and the Canadian Pacific, Grand Trunk Pacific, and Canadian Northern railways, and the lake terminus of the two latter. Pop. (1901), 3214. The lake terminus of the Canadian Pacific, originally here, has been moved to Fort William, 4 m. distant. Lumber and minerals are shipped from the surrounding district, and vast quantities of grain from the farther west.

PORT ARTHUR (Chinese, Lu-shun-k'ou), a fortress situated at the extreme south of the peninsula of Liao-tung in the Chinese principality of Manchuria. It was formerly a Chinese naval arsenal and fortress, but was captured by the Japanese in 1894, who destroyed most of the defensive works. In 1898 it was leased to Russia with the

neighbouring port of Talienwan, and was gradually converted into a Russian stronghold. In 1905 the lease was transferred to Japan. The port or harbour is a natural one, entirely landlocked except to the south. The basin inside is of limited extent. Barren and rocky hills rise from the water's edge all round. A railway 270 m. long connects the port with Mukden and the trans-Siberian line; there is also railway connexion with Pekin. The harbour is ice-free all the year round, a feature in which it contrasts favourably with Vladivostok.

The Liao-tung peninsula, separated from Korea by the Bay of Korea, and from the Chinese mainland by the Gulf of Liao-tung, runs in a south-westerly direction from the mainland of Manchuria, and is continued by a group of small islands which reach another peninsula projecting from the mainland of China in a north-easterly direction, and having at its north-eastern extremity the port of Wei-hai-wei. The Liao-tung peninsula is indented by several bays, two of which nearly meet, making an isthmus less than 2 m. wide, beyond which the peninsula slightly widens again, this part of it having the name of Kan-tun (regent's sword). Two wide bays open on the eastern shore of the latter: Lu-shun-k'ou (Port Arthur) and Talienwan. Both were leased to Russia. Lu-shun-k'ou Bay

is nearly 4 m. long and Ij m. wide, the entrance being only 350 yds. wide. The Chinese deepened the bay artificially and erected quays. The roadstead is exposed to south-easterly winds, and in this respect the wider Bay of Talienwan is safer. Coal is found near to the port. The climate is very mild, and similar to that of south Crimea, only moister.

While in occupation by the Russians Port Arthur became Europeanized. The military port, Tairen, is a few miles to the north. During the Russo-Japanese war the Japanese assailed Port Arthur both by land and sea and, after repeated assaults, on the 1st of January 1905, General Stoessel surrendered the citadel into the hands of the Japanese.

PORTAS, or Portuary, a breviary (q.v.) of such convenient size that it could be carried on the person, whence its Latin name portiforium (portare, to carry, foris, out of doors, abroad). The English word was adapted from the Old French portehors, and took a large number of forms, e.g. porthors, porteous, portes, &c. In Scots law, the " porteous-roll " was the name given formerly to a list of criminals drawn up by the justice-clerk on information given by the local authorities, together with the names of witnesses, and charges made.

PORTATIVE ORGAN, a small medieval organ carried by the performer, who manipulated the bellows with one hand and fingered the keys with the other. This small instrument was necessarily made as simple as possible. On a small rectangular wind chest or reservoir, fed by means of a single bellows placed at the back, in front, or at the right side, were arranged the pipes — one, two or three to a note — supported by more or less orna- mental uprights and an oblique bar. The most primitive style of keyboard consisted merely of sliders pushed in to make the note sound and restored to their normal position by a horn spring; the reverse action was also in use, the keys being furnished with knobs or handles.

Towards the middle of the 13th century the portatives repre- sented in the miniatures of illuminated MSS. first show signs of a real keyboard with balanced keys, as in the 13th century Spanish MS., known as the Cantigas de Santa Maria, 1 containing four full pages of miniatures of instrumentalists, fifty-one in number. From the position of the performer's thumb it is evident that the keys are pressed down to make the notes sound. There are nine pipes and the same number of keys, sufficient for the diatonic octave of C major with the B flat added. The pipes put into these small organs were flue pipes, their intonation must have been very unstable owing to the irregularity of the wind supply fed by a single bellows, the pressure being at the mercy of the performer's hand. Increased pressure in pipes with fixed mouthpieces, such as organ pipes, produces a rise in pitch. These medieval portative organs, so exten- sively used during the 14th and 15th centuries, were revivals of those used by the Romans, of which a specimen excavated at Pompeii in 1876 is preserved in the Museum at Naples. The case measures 14I in. by 9ˆ in. and contains nine pipes, of which the longest measures but 9i in. ; six of the pipes have oblong holes at a short distance from the top similar to those made in gamba pipes of modern organs to give them their reedy quality, and also to those cut in the bamboo pipes of the Chinese Cheng, which is a primitive organ furnished with free reeds. From the description of these remains by C. F. Abdy Williams, 2 it would seem that a bronze plate ll| in. by 2f in. having 18 rectangular slits arranged in three rows to form Vandykes was found inside the case, with three little plates of bronze just wide enough to pass through the slits lying by it ; this plate possibly formed part of the mechanism for the sliders of the keys. The small instrument often taken for a syrinx on a contorniate of Sallust in the Cabinet Imperial de France in Paris may be meant for a miniature portative. (K. S.)

PORT AUGUSTA, a seaport of Frome county, South Australia, on the east shore of Spencer Gulf, 259 m. by rail N.N.W. of Adelaide. Pop.

about 2400. It has a fine natural deep and landlocked harbour, and the government wharves have berthing for large vessels. The chief exports are wool, wheat, flour, copper, hides and tallow. Port Augusta is the seat of a Roman Catholic bishop arid has a cathedral, while its town-hall is the finest in the state, that of Adelaide excepted. It is also the start- ing point of the Great Northern railway. The largest ostrich farm in Australia lies 8 m. from the town. The neighbourhood is rich in minerals, copper, silver, iron and coal have been found,

1 For a reproduction see J. F. Riano, Studies of Early Spanish Music, pp. 1 19-127 (London, -1887).

2 Quarterly Musical Review (August, 1893).

and in 1900 valuable gold quartz reefs were discovered at Tarcoola.

PORT AU PRINCE (originally L'Hdpital, and for brief periods Port Henri and Port Republicain), the capital of the republic of Haiti, West Indies, situated at the apex of the triangular bay which strikes inland for about 100 m. between the two great peninsulas of the west coast, with its upper recesses protected by the beautiful island of Gonaives (30 m. long by 2 broad). The city is admirably situated on ground that soon begins to rise rapidly towards the hills. It was originally laid out by the French on a regular plan with streets of good width running north and south and intersected by others at right angles. Everything has been allowed to fall into disorder and disrepair, and to this its public buildings form no exception. Every few years whole quarters of the town are burned down, but the people go on building the same slight wooden houses, with only here and there a more substantial warehouse in brick. In spite of the old French aqueduct the water-supply is defective. From June to September the heat is excessive, reaching 95° to 99° F. in the shade. The population, mostly negroes and mulat- toes, is estimated at 61,000. Port au Prince was first laid out by M. de la Cuza in 1749. In 1751, and again in 1770, it was destroyed by earthquakes.

PORT BLAIR, the chief place in the convict settlement of the Andaman Islands in the Indian Ocean, situated on the south-east shore of the South Andaman Island, in n° 42′ N., 93 E. It derives its name from Lieut. Blair, R.N., who first occupied it in 1789, as a station for the suppression of piracy and the protection of shipwrecked crews.

Abandoned on account of sickness in 1796, it was not again occupied until 1856. It possesses one of the best harbours in Asia, while its central position in the Bay of Bengal gives it immense advantage as a place of naval rendezvous. (See Andaman Islands.)

PORT CHESTER, a village of Westchester county, New York, U.S.A., in the south-east part of the state, on Long Island Sound, and about 10 m. N.E. of New York City (26 m. from the Grand Central Station). Pop. (1900), 7440, of whom 2110 were foreign-born; (1910 census), 12,809. It is served by the New York, New Haven & Hartford railroad, and by daily steamers to and from New York City. The village is a summer resort as well as a suburban residential district for New York City. Among its public institutions are a library, a park and a hospital. The village has various manufactures, including bolts and nuts, motors for racing boats and automobiles; there are also large planing and wood-moulding mills. The earliest mention of Port Chester in any extant record is in the year 1732. Until 1837 it was known as Saw Pit, on account of a portion of the village, it is said, being used as a place for building boats. During the War of Independence the village was frequently occupied by detachments of American troops. Port Chester was incorporated as a village in 1868.

PORTCULLIS (from the Fr. porte-coulisse, porte, a gate, Lat. porta, and coulisse, a groove, used adjectivally for ” sliding,” from couler, to slide or glide, Lat. colore; the Fr. equivalents are herse, a harrow, and coulisse; Ger. Fallgatter; Ital. saracinesca), a strong-framed grating of oak, the lower points shod with iron, and sometimes entirely made of metal, hung so as to slide up and- down in grooves with counterbalances, and intended to protect the gateways of castles, &c. The defenders having opened the gates and lowered the ‘portcullis, could send arrows and darts through the gratings. A portcullis was in existence until modern times in a gateway at York. The Romans used the portcullis in the defence of gateways. It was called cataracta from the Gr. KaTappaK-rrjs, a waterfall {KarappirywadaL, to fall down). Vegetius {De re milit. iv. 4) speaks of it as an old means of defence, and it has been suggested that in Psalm xxiv. 7, 9, ” Lift up your heads, oh ye gates,” &c, there is an allusion to a similar contrivance. Remains of a cataracta are clearly seen in the gateway of Pompeii. The Italian name saracinesca originates from the crusades. (See Gate.)

PORTE, THE SUBLIME (Arab, babi-‘ali, the high gate, through the French translation la sublime porte), in Turkey, the

official name for the government, derived from the high gate giving access to the building where the offices of the principal state

departments are situated.

PORT ELIZABETH, a seaport of the Cape province, South Africa, in Algoa Bay, by which name the port is often designated. It lies in 35° 57′ S., 25 37′ E. on the east side of Cape Recife, being by sea 436 m. from Cape Town and 384 m. from Durban. In size and importance it is second only to Cape Town among the towns of the province. It is built partly along the seashore and partly on the slopes and top of the hills that rise some 200 ft. above the bay. The Baaken's River, usually a small stream, but subject (as in 1908) to disastrous floods, runs through the town, which consists of four divisions; the harbour and busi- ness quarter at the foot of the cliffs, the upper part, a flat table-land known as " The Hill "; " The Valley " formed by the Baaken's River; and " South Hill," east of the river.

The Town. — Jetty Street leads from the north jetty to the market square, in or around which are grouped the chief public buildings — the town-hall, court-house, post office, market buildings, public lib'rary ; St Mary's church (Anglican) and St Augustine's (Roman Catholic). Several of these buildings are of considerable architec- tural merit and fine elevation. The library, of Elizabethan design, contains some 45,000 volumes. The market buildings, at the south-east corner of the square, and partly excavated from the sides of the cliff, contain large halls for the fruit, wool and feather markets and the museum. Feather-Market Hall, where are held the sales of ostrich feathers, seats 5000 persons. The museum has valuable ethnographical and zoological collections. Other public buildings include a synagogue and a Hindu temple. Leading west from Market Square is Main Street, in which are the principal business houses. Between Main Street and the sea is Strand Street, also a busy commercial thoroughfare. Behind the lower town streets rise in terraces to " The Hill," a residential district. Here is an open plot of ground, Donkin Reserve, containing the lighthouse and a stone pyramid with an inscription in memory of Elizabeth, wife of Sir Rufane Donkin, described as " one of the most perfect of human beings, who has given her name to the town below." A fountain, surmounted by the statue of a war-horse, erected by public sub- scription in 1905 commemorates " the services of the gallant animals which perished in the Anglo-Boer war, 1899-1902." Farther west is a large hospital, one of the finest institutions of its kind in South Africa. At the southern end of The Hill is St George's Park, which has some fine trees, in marked contrast to the general treeless, barren aspect of the town. Port Elizabeth indeed possesses few natural amenities, but its golf links are reputed the finest in South Africa. The town, apart from its transit trade and the industries connected therewith, has some manufactures — jam and confectionery works;

oil, candle and explosive works; saw and flour mills; tanneries, &c. It has an excellent water supply.

The Harbour. — There is no enclosed basin, but the roadstead has excellent holding ground, protected from all winds except the south-east, the prevailing wind being westerly. No harbour or light dues are charged to vessels of any flag. The port has three jetties of wrought iron, respectively 1 162, 1 152 and 1462 ft. in length, extend- ing to the four fathoms line. These jetties are provided with hydraulic cranes, &c, and railways connect them with the main line, so that goods can be sent direct from the jetties to every part of South Africa. In favourable weather vessels drawing up to 21 ft. can discharge cargo alongside the jetties. In unfavourable condi- tions and for larger steamers tugs and lighters are employed. Rough weather prevents discharge of cargo by lighters, on an average, seven days in the year. The customs-house and principal railway station are close to the north jetty. The port is state owned, and is under the administration of the harbour and railway board of the Union.

Trade. — Port Elizabeth has a large import trade, chiefly in textiles, machinery, hardware, apparel and provisions, supplying to a con- siderable extent the markets of Kimberley, Rhodesia, the Orange Free State and the Transvaal. The exports are mainly the pro- ducts of the eastern part of the Cape province, the most important being ostrich feathers, wool and mohair. Skins, hides and maize are also exported. In 1855 the value of the imports was £376,000; in 1883 £2,364,000; in 1898 £6,248,000; in 1903 £10,137,000. Depression in trade brought down the imports in 1904 to £6,855,000. In 1906 they were £6,564,000 and in 1907 £6,004.000. The export trade has been of slower but more steady growth. It was valued at £584,000 in 1855, at £2,341,000 in 1883, £2,103,000 in 1898, £2,010,000 in 1903. Indicative of the fact that the agricultural community was little affected by the trade depression are the export figures for 1904 and 1906, which were £2,044,000 and £2,627,000 respectively. In 1907 goods valued at £3,150,000 were exported.

Population. — The population within the municipal area was at the 1904 census 32,959; that within the district of Port Elizabeth 46,626, of whom 23,782 were whites. Many of the inhabitants are of German origin and the Deutsche Liedertafel is one of the most popular clubs in the town.

History. — Algoa Bay was discovered by Bartholomew Diaz in 1488, and was by him named Bahia da Roca, probably with reference to the rocky islet in the bay, on which he is stated to have erected a cross (St Croix Island). After the middle of the 1 6th century the bay was called by the Portuguese Bahia da Lagoa, whence its modern designation. In 1754 the Dutch settlements at the Cape were extended eastwards as far as Algoa Bay. The convenience of reaching the eastern district by boat was then recognized and advantage taken of the road- stead sheltered by Cape Recife. In 1799, during the first occupation of Cape Colony by the British, Colonel (afterwards General Sir John) Vandeleur, to guard the roadstead, built a small fort on the hill west of the Baaken's River. It was named Fort Frederick in honour of the then duke of York, and is still preserved. A few houses grew up round the fort, and in 1820 besides the military there was a civilian population at Fort Frederick of about 35 persons. In April of that year arrived in the bay the first of some 4000 British immigrants, who settled in the eastern district of the colony (See Cape Colony: History). Under the supervision of Sir Rufane Donkin, acting governor of the Cape, a town was laid out at the base of the hills. In 1836 it was made a free warehousing port, and in 1837 the capital of a small adjacent district. To overcome the difficulty of landing from the road- stead a breakwater was built at the mouth of the Baakens River in 1856, but it had to be removed in 1869, as it caused a serious accumulation of sand. The prosperity which followed the construction of railways to the interior earned for the port the designation of " the Liverpool of South Africa." Railway work was begun in 1873 and Port Elizabeth is now in direct communication with all other parts of South Africa. At the same period (1873) the building of the existing jetties was undertaken. Port Elizabeth has possessed municipal govern- ment since 1836. Its predominant British character is shown by the fact that not until 1909 was the foundation stone laid of the first Dutch Reformed Church in the town.

PORTEOUS, JOHN (d. 1736), captain of the city guard of Edinburgh, whose name is associated with the celebrated riots of 1 736, was the son of Stephen Porteous, an Edinburgh tailor. Having served in the army, he was employed in 171 5 to drill the city guard for the defence of Edinburgh in anticipation of a Jacobite rising, and was promoted later to the command of the force. In 1736 a smuggler named Wilson, who had won popu- larity by helping a companion to escape from the Tolbooth prison, was hanged; and, some slight disturbance occurring at the execution, the city guard fired on the mob, killing a few and wounding a considerable number of persons. Porteous, who was said to have fired at the people with his own hand, was brought to trial

and sentenced, to death. The granting of a reprieve was hotly resented by the people of Edinburgh, and on the night of the 7th of September 1736 an armed body of men in disguise broke into the prison, seized Porteous, and hanged him on a signpost in the street. It was said that persons of high position were concerned in the crime; but although the government offered rewards for the apprehension of the perpetrators, and although General Moyle wrote to the duke of Newcastle that the criminals were ” well-known by many of the inhabitants of the town,” no one was ever convicted of participation in the murder. The sympathies of the people, and even, it is said, of the clergy, throughout Scotland, were so unmistakably on the side of the rioters that the original stringency of the bill introduced into parliament for the punishment of the city of Edinburgh had to be reduced to the levying of a fine of £2000 for Porteous’s widow, and the disqualification of the provost for holding any public office. The incident of the Porteous riots was used by Sir Walter Scott in The Heart of Midlothian.

See Sir Daniel Wilson, Memorials of Edinburgh in the Olden Time (2 vols. Edinburgh, 1848): State Trials, vol. xvii.; William Coxe, Memoirs of the Life of Sir R. Walpole (4 vols. London, 1816) ; Alex- ander Carlyle, Autobiography (Edinburgh, i860), which gives the account of an eye-witness of the execution of Wilson; pamphlets (2 vols, in British Museum) containing The Life and Death of Captain John Porteous, and other papers relating to the subject; W. E. H. Leckv History of England in the Eighteenth Century, ii. 324, note

(7 vols., London, 1892). See also Scott’s notes to The Heart of

Midlothian.

PORTER, BENJAMIN CURTIS (1843-), American artist, was born at Melrose, Massachusetts, on the 27th of August 1843. He was a pupil of A. H. Bicknell and of the Paris schools, and was elected an associate of the National Academy of Design, New York, in 1878, and a full academician in 1880. He is best known as a painter of portraits.

PORTER, DAVID (1 780-1843), American naval officer, was born in Boston, Massachusetts, on the 1st of February 1780. His father, David, and his uncie, Samuel, commanded American ships in the War of Independence. In 1796 he accompanied his father to the West Indies; on a second and on a third voyage he was impressed on British vessels, from which, however, he escaped. He became a midshipman in the United States Navy in April 1798; served on the ” Constellation ” (Captain Thomas Truxton) and was midshipman of the foretop when

the ” Constel- lation ” defeated the ” Insurgente ” ; was promoted lieutenant in October 1799, and was in four successful actions with French ships in this year. In 1803, during the war with Tripoli, he was first lieutenant of the ” Philadelphia ” when that vessel grounded, was taken prisoner, and was not released until June 1805. He was commissioned master commandant in April 1806; in 1807- 1810 served about New Orleans 1 , where he captured several French privateers, and in 181 2 was promoted captain. He commanded the frigate ” Essex ” in her famous voyage in 181 2- 1814. In the Atlantic he captured seven brigs, one ship, on the 13th of August 1812, the sloop “Alert,” the first British war vessel taken in the War of 181 2. Without orders from his superiors he then (February 1813) rounded Cape Horn, the harbours of the east coast of South America being closed to him. In the South Pacific he captured many British whalers (the British losses were estimated at £500,000), and. on his own authority took formal possession (November 1813) of Nuka- hivah, the largest of the Marquesas Islands; the United States, however, never asserted any claim to the island, which in 1842, with the other Marquesas, was annexed by France. During most of February and March 18 14 he was blockaded by the British frigates ” Cherub ” and ” Phoebe ” in the harbour of Valparaiso, and on the 28th of March was defeated by these vessels, which seem to have violated the neutrality of the port. He was released on parole, and sailed for New York on the ” Essex, Jr.,” a small vessel which he had captured from the British, and which accompanied the ” Essex.” At Sandy Hook he was detained by the captain of the British ship-of-war ” Saturn ” (who declared that Porter’s parole was no longer effective), but escaped in a small boat. He was a member of the new board of naval commissioners from 1815 until 1823, when he commanded a squadron sent to the West Indies to suppress piracy. One of his officers, who landed at Fajardo (or Foxardo), Porto Rico, in pursuit of a pirate, was imprisoned by the Spanish authorities on the charge of piracy. Porter, without reporting the incident or awaiting instructions, forced the authorities to apologize. He was recalled (December 1824), was court-martialled, and was suspended for six months. In August 1826 he resigned his commission, and until 1829 was commander-in-chief of the Mexican navy, then fighting Spain; in payment for his services he received government land in Tehuantepec, where he hoped to promote an inter-oceanic canal. President Andrew Jackson appointed him consul-general to Algiers in 1830, and in 1831 created for him the post of charge d’affaires at Constantinople, where in 1841 he became minister. He died in Pera on the 3rd of March 1843.

He wrote a Journal of a Cruise made to the Pacific Ocean in the U.S.

Frigate ” Essex ” in 1812-13-14 (2 vols., 1815; 2nd ed., 1822), and Constantinople and its Environs (2 vols., 1835), a valuable guide-book. See the Memoir of Commodore David Porter (Albany, New York, 1875), by his son, Admiral David D. Porter.

PORTER, DAVID DIXON (1 81 3-189 1), American naval officer, son of Captain David Porter, was born in Chester, Pennsyl- vania, on the 8th of June 1813. His first voyage, with his father

1 While he was in New Orleans he adopted David Farragut, who later served with him on the ” Essex.”

in West Indian waters in 1823-18 24, was terminated by the Fajardo affair (see Porter, David). In April 1826 he entered the Mexican navy, of which his father was commander-in-chief, and which he left in 1828, after the capture by the Spanish of the ” Guerrero,” on which he was serving under his cousin, David H. Porter (1804-1828), who was killed before the ship’s surrender. He became a midshipman in the United States navy in 1829, and was in the coast survey in 1836-1842. In 1839 he married the daughter of Captain Daniel Tod Patterson (1786-1839), then commandant of the Washington navy-yard. Porter became a lieutenant in February 1841; served at the naval observatory in 1845-1846; in 1846 he was sent to the Dominican Republic to report on conditions there. During the Mexican War he served, from February to June 1847, as lieutenant and then as command- ing officer of the ” Spitfire,” a paddle vessel built for use on the rivers, and took part in the bombardment of Vera Cruz and in the other naval operations under Commander M. C. Perry. From the close of the Mexican War to the beginning of the Civil War he had little but detail duty; in 1855 and again in 1856 he made trips to the Mediterranean to bring to the United States camels for army use in the south-west. In April 1861 he was assigned to the ” Powhatan,” and was sent under secret orders from the president for the relief of Fort Pickens, Pensacola, an expedition which he had urged. Porter was promoted commander on the 22nd of xˆpril, and on the 30th of May was sent to blockade the South- West Pass of the Mississippi. In August he left the gulf in a fruitless search for the Confederate cruiser ” Sumter.” Upon his return to New York in November he urged an expedition against New Orleans (q.v.), and recommended the appointment of Commander D. G. Farragut (q.v.), his foster-brother, to the chief command. In the expedition Porter himself commanded the mortar

flotilla, which, when Farragut's fleet passed the forts on the early morning of the 24th of April 1862, covered its passage by a terrific bombardment that neutralized the fire of Fort Jackson. At Vicksburg Porter's bombardment assisted Farragut to run past the forts (June 28). On the 9th of July Porter was ordered, with ten mortar boats, to the James river, where McClellan's army was concentrated. On the 15th of October he took command of the gun-vessels which had been built on the upper waters of the Mississippi, and to which he made important additions at an improvised navy-yard at Mound City, Illinois. With this he took part in the capture of Arkansas Post on the nth of January 1863. In the opera- tions for the capture of Vicksburg in 1863 unsuccessful attempts were made in February and March by Porter's vessels to penetrate through connecting streams and bayous to the Yazoo river and reach- the right rear of the Confederate defences on the bluffs. But in May the fleet ran past the Vicksburg batteries, mastered the Confederate forts at Grand Gulf, and made it possible for Grant's army to undertake the brilliant campaign which led to the fall of the place (see American Civil War and Vicksburg). Porter received the thanks of Congress for " opening the Mississippi River " and was promoted rear-admiral. He co-operated with Major-General N. P. Banks in the Red River expeditions in March-May 1864, in which his gun-boats, held above Alexandria by shallow water and rapids, narrowly escaped isolation, being enabled to return only by the help of a dam built by Lieut. Colonel (Brigadier General) Joseph Bailey (1827-1867). On the 12th of October 1864 he assumed command of the North Atlantic blockading squadron, then about to engage in a combined military and naval expedition against Fort Fisher, North Carolina. Porter claimed that his guns silenced Fort Fisher, but Major-General B. F. Butler, in command of the land forces, refused to assault, asserting that the fort was practically intact. After Butler's removal, Porter, co-operating with Major-General Alfred H. Terry, and com- manding the largest fleet assembled at any one point during the war, took the fort on the 15th of January 1865; for this he again received the thanks of Congress. From 1865 to 1869 he was superintendent of the U.S. Naval Academy at Annapolis, which he greatly improved; his most notable change being the introduction of athletics. On the 25th of July he became

vice-admiral. From the 9th of March to the 25th of June 1869, while Adolph E. Borie (1809-1880), of Pennsylvania, was secretary of the navy in President Grant's cabinet, Porter was virtually in charge of the navy department. In 1870 he succeeded Farragut in the grade of admiral, which lapsed after Porter's death until 1899, when it was re-established to reward Rear-Admiral George Dewey for his victory at

Manila. Porter urged the reconstruction of the navy, which he saw begun in 1882. He died in Washington, D.C., on the 13th of February 1891.

Porter wrote a Life of Commodore David Porter (1875), gossipy Incidents and Anecdotes of the Civil War (1885), a none too accurate History of the Navy during the War of the Rebellion (1887), two novels, Allan Dare and Robert le Diable (1885 ;. dramatized, 1887) and Harry Marline (1886), and a short ” Romance of Gettysburg,” published in The Criterion in 1903. See J. R. Soley, Admiral Porter (New York, 1903) in the ” Great Commanders ” Series.

Admiral Porter’s three brothers were in the service of the United States: William David Porter (1809-1864) entered the navy in 1823, commanded the ” Essex ” on the Tennessee and the Mississippi in the Civil War, and became commodore in July 1862 ;Theodoric Henry Porter (1817-1846) was the first officer of the American army killed in the Mexican War; and Henry Ogden Porter (1823-1872) resigned from the United States navy in 1847, after seven years’ service, fought under William Walker in Central America, returned to the American navy, was executive officer of the ” Hatteras ” when she was sunk by the ” Alabama,” and received wounds in the action from the effects of which he died several years later.

PORTER, ENDYMION (1587-1649), English royalist, de- scended from Sir William Porter, sergeant-at-arms to Henry VII.,’ and son of Edmund Porter, of Aston-sub-Edge in Gloucester- shire, by his cousin Angela, daughter of Giles Porter of Mickleton, in the same county, was brought up in Spain — where he had relatives — as page in the household of Olivares. He afterwards entered successively the service of Edward Villiers and of Buck- ingham, and through the latter’s recommendation became groom of the bedchamber to Charles I. In October 1622 he was sent to negotiate concerning the affairs of the Palatinate and the marriage with the Infanta. He accompanied Charles and Buckingham on their foolhardy expedition in 1623, acted as their interpreter, and was included in the consequent attack made by Lord Bristol on Buckingham in 1626. In 1628 he was employed as envoy to Spain to negotiate for peace, and in 1634 on a mission to the Netherlands to the Infante Ferdinand. During the Civil War Porter remained a constant and faithful servant of the king. He was with him during the two Scottish campaigns, attended him again on the visit to Scotland in August 1 64 1, and followed Charles on his last departure from London in 1642, receiving the nominal command of a regiment, and sitting in the Royalist parliament at Oxford in 1643. He had, however, little faith in the king’s measures. ” His Majesty’s

businesses," he writes in 1641, " run in their wonted channel — subtle designs of gaining the popular opinion and weak executions for the up- holding of monarchy." His fidelity to Charles was of a personal, not of a political nature. " My duty and loyalty have taught me to follow my king," he declares, " and by the grace of God nothing shall divert me from it." This devotion to the king, the fact that he was the agent and protege of Buckingham, and that his wife Olivia, daughter of John, Lord Boteler of Bramfield, and niece of Buckingham, was a zealous Roman Catholic, drew upon him the hostility of the opposite faction. As member of the Long Parliament, in which he sat as member for Droitwich, he was one of the minority of 59 who voted against Strafford's attainder, and was in consequence proclaimed a " betrayer of his country." On the 15th of February 1642 he was voted one of the dangerous counsellors, and specially excepted from pardon on the 4th of October and in the treaties of peace negotiated subsequently, while on the 10th of March 1643 he was excluded from parliament. Porter was also implicated in the army plot; he assisted Glamorgan in illegally putting the great seal to the commission to negotiate with the Irish in 1644; and was charged with having in the same manner affixed the

great seal of Scotland, then temporarily in his keeping, to that of O'Neill in 1641, and of having incurred some responsibility for the Irish rebellion. Towards the end of 1645, when the king's cause was finally lost, Porter abandoned England, and resided successively in France, Brussels, where he was reduced to great poverty, and the Netherlands. The property which he had accumulated during the tenure of his various appointments, by successful commercial undertakings and by favours of the court, was now for the most part either confiscated or encumbered. He returned to England in 1649, after the king's death, and was allowed to compound for what remained of it. He died shortly afterwards, and was buried on the 20th of August 1649 a t St Martin's-in-the-Fields, leaving as a special charge in his will to his sons and descendants to " observe and respect the family of my Lord Duke of Buckingham, deceased, to whom I owe all the happiness I had in the world." He left five sons, who all played conspicuous, if not all creditable, parts in the history of the time. According to Wood, Porter was " beloved by two kings: James I. for his admirable wit and Charles I. for his general bearing, brave style, sweet temper, great experience, travels and modern languages." During the period of his prosperity Porter had gained a great

reputation in the world of art and letters. He wrote verses, was a generous patron of Davenant, who especially sings his praises, of Dekker, Warmstrey, May, Herrick and Robert Dover, and w r as included among the 84 ” essentials ” in Bolton’s ” Academy Royal.” He was a judicious collector of pictures, and as the friend of Rubens, Van Dyck, Mytens and other painters, and as agent for Charles in his purchases abroad he had a considerable share in forming the king’s magnificent collection. He was also instrumental in procuring the Arundel pictures from Spain. The authorship of Ekcb! > mori), 1649, a vindication of the JZ’lkwv /3acn\iKrj, has been attributed with some reason to Porter.

Authorities. — Life and Letters of Endymion Porter, by D. Townshend (1897); article in the Diet, of Nat. Biog., by C. H. Firth and authorities there cited; Memoires, by D. Lloyd (1668), p.657; Burton’s Hist, of Scotland (1873), vi. 346-347; Eng. Hist. Rev. ii. 531, 692; Gardiner’s Hist, of England; Lives of the Lords Strangford (1877), by E. B. de Fonblanque (Life and Letters) ; Wood, Athenae Oxonienses; Clarendon’s History of the Rebellion; State Papers and Calendar of State Papers ; Calendar of State Papers: Dom. and of Committee for Compounding; The Chester s of Chichele, by Waters, i. 144-149; Eikon Basilike, by Ed. Almack, p. 94. There are also various references, &c, to Endymion Porter in Additional Charters, British Museum, 6223, 1633, ‘6225; Add. MSS. 15,858; 33, 374; and Egerton 2550, 2533; in the Hist. MSS. Comm. Series; MSS. of Duke of Portland, &c, and in Notes and Queries; also Thomason Tracts, Brit. Mus., E 118 (13).

PORTER, FITZ-JOHN (1822-1901), American soldier, was born at Portsmouth, New Hampshire, on the 31st of August 1822. He was the son of a naval officer, and nephew of David Porter of the frigate ” Essex.” He graduated at the United States Military Academy in 1845 an d wa s assigned to the artillery. In the Mexican War he won two brevets for gallantry — that of captain for Molino del Rey and that of major for Chapultepec. He served at West Point as instructor and adjutant (1849-1855), and he took part in the Utah expedition. At the outbreak of the Civil War in 1861 he was employed on staff duties in the eastern states, and rendered great assistance in the organization of Pennsylvanian volunteers. In the absence of higher authority Porter sanctioned on his own responsibility the request of Missouri Unionists for permission to raise troops, a step which had an important influence upon the struggle for the possession of the state. He became colonel of a new regiment of regulars on the 14th of May, and soon afterwards brigadier-general of volunteers. Under McClellan he commanded a division of infantry in the Peninsular campaign, and directed the Union siege operations against Yorktown, and he was

soon afterwards placed in com- mand of the V. army corps. When the Seven Days' battle (q.v.) began Porter's corps had to sustain alone the full weight of the Confederate attack, and though defeated in the desperately fought battle of Gaines's Mill (June 27, 1862) the steadiness of his defence was so conspicuous that he was immediately

promoted major-general of volunteers and brevet brigadier- general U.S.A. His corps, moreover, had the greatest share in the successful battles of Glendale and Malvern Hill. Soon after- wards, with other units of the Army of the Potomac, the V. corps was sent to reinforce Pope in central Virginia. Its inaction on the first day of the disastrous second battle of Bull Run (q.v.) led to the general's subsequent disgrace; but it made a splendid fight on the second day to save the army from complete rout, and subsequently shared in the Antietam campaign. On the same day on which McClellan was relieved from his command, Porter, his warm friend and supporter, was suspended. A few days later he was tried by court-martial on charges brought against him by Pope, and on the 21st of January 1863 was sentenced to be cashiered " and for ever disqualified from holding any office of trust under the government of the United States." After many years Porter's friends succeeded (1878) in procuring a revision of the case by a board of distinguished general officers. This board reported strongly in Porter's favour, but at the time the remission of the disqualifying penalty was all that was obtained in the way of redress. General Grant had now taken Porter's part, and wrote an article in vol. 135 of the North American Review entitled " An Undeserved Stigma." Against much opposition, partly political (1879-1886) andavetoon a legal point from President Arthur, a relief bill finally passed Congress, and Porter was on the 5th of August 1886 restored to the United States army as colonel and placed on the retired list, no provision, however, being made for compensation. After the Civil War General Porter was engaged in business in New York, and later held successively many important municipal offices. In 1869 he declined the offer made by the khedive of the chief command of the Egyptian army. He died on the 21st of May 1901, at Morristown, New Jersey.

See, besides General Grant's article, Cox, The Second Battle of Bull Run as connected with the Porter Case (Cincinnati, 1882); Lord, A Summary of the Case of F. J. Porter (1883), an d papers in vol. ii. of the publications of the Military Historical Society of Massachusetts.

PORTER, HENRY (fl. 1596-1599), English dramatist, author of The Two Angry Women of Abingdon, may probably be identified with the Henry Porter who matriculated at Brasenose College, Oxford, on the 19th of June 1389, and is described as aged sixteen and the son of a

gentleman of London. From 1596 to 1599 he was engaged in writing plays for Henslowe for the admiral's men, and his closest associate seems to have been Henry Chettle. The earlier entries in Henslowe's Diary are respectful in tone, and the considerable sums paid to " Mr Porter " prove that his plays were popular. Henslowe secured in February 1599 the sole rights of any play in which Porter had a hand, the consideration being an advance of forty shillings. As time goes on he is familiarly referred to as "Harry Porter"; his borrowings become more frequent, and the sums less, until on the 16th of April 1599 he obtained a loan of twelve pence in exchange for a bond to pay all he owed to Henslowe— twenty- five shillings — on pain of forfeiting ten pounds. Whether he paid or not does not appear, but his last loan is recorded on the 26th of May 1599, after which nothing further is known of him. It seems in the highest degree unlikely that he is the Henry Porter who took his degree as Mus. Bac. at Christ Church in 1600 after twelve years' study, and whose skill in sacred music is celebrated in an epigram by John Weever. The entries in Henslowe's Diary indicate that he wrote a play called Love Prevented (1598), Hot Anger soon Cold, with Chettle and Ben Jonson (1598), the second part of The Two Angry Women of Abingdon (1598), The Four Merry Women of Abingdon (1599), and The Spencers (1599), with Chettle. None of these are extant, unless, as has been suggested, Love Prevented is another name for The Pleasant History of the two angry women of Abingdon. With the humorous mirth of Dick Coomes and Nicholas Proverbes, two serving men (1599), the importance of which is well described by Professor Gayley: " As a comedy of unadulterated native flavour, breath ing rural life and manners and the modem spirit, constructed with knowledge of the stage, and without affectation or

constraint, it has no foregoing analogue except perhaps The Pinner of Wakefield. No play preceding or contemporary yields an easier conversational prose, not even the Merry Wives."

Alexander Dyce edited the Angry Women for the Percy Society in 1841 ; and it is included in W. C. Hazlitt's edition of Dodsley's Old Plays (1874). It was edited by Havelock Ellis in Nero and other plays (1888, " Mermaid Series,") and in Representative English Comedies (1903), with an introduction by the general editor, Professor CM. Gayley.

PORTER, HORACE (1837-), American diplomatist and soldier, was

born in Huntingdon, Pennsylvania, on the 15th of April 1837; son of David Rittenhouse Porter (1788-1867), governor of Pennsylvania in 1830-1845, and grandson of Andrew Porter (1743-1813), an officer in the Continental Army during the War of Independence, and surveyor-general of Pennsylvania from 1809 until his death. Horace Porter studied for a year (1854) at the Lawrence scientific school of Harvard University, and then entered the United States Military Academy, where he graduated in i860, third in his class. During the Civil War he was chief of ordnance at the capture of Fort Pulaski; then served in the Army of the Potomac until after Antietamjwas transferred to the west, where he took part in the battles of Chickamauga (for gallantry in which he received a congressional medal of honour in June 1902) and Chattanooga; and in April 1864 became aide-de-camp to General Grant, in which position he served until March 1869. He earned the brevet of captain at Fort Pulaski, that of major at the battle of the Wilderness, and that of lieutenant-colonel at New Market Heights, and in March 1865 was breveted colonel and brigadier-general. From August 1867 to January 1868, while General Grant was secretary of war ad interim, Porter was an assistant secretary, and from March 1869 to January 1873, when Grant was president, Porter was his executive secretary. He resigned from the army in December 1873, when he became vice-president of the Pullman Palace Car Company and held other business positions. From March 1897 to May 1905 he was United States ambassador to France. At his personal expense he conducted (1899-1905) a successful search for the body of John Paul Jones, 1 who had died in Paris in 1792. For this he received (May 9, 1906) a unanimous vote of thanks of both Houses of Congress, and the privileges of the floor for life. In 1907 he was a member of the American delegation to the Hague Peace Conference. General Porter became well-known as a public speaker, and delivered orations at the dedication of General Grant's tomb in New York, at the centennial of the founding of West Point, and at the re-interment of the body of John Paul Jones at Annapolis. His publications include West Point Life (1866) and Campaigning with Grant (1897).

PORTER, JANE (1776-1850), British novelist, daughter of an army surgeon, was born at Durham in 1776. Her life and reputation are closely linked with those of her sister, Anna Maria Porter (1780-1832), novelist, and her brother, Sir Robert Ker Porter (17 7 5-1842), painter and traveller. After their father's death, in 1779, the mother removed from Durham, their birth- place, to Edinburgh, where the children's love of romance was stimulated by their association with Flora Macdonald and the young Walter Scott. Mrs Porter moved to London, so that her son might study art, and the sisters

subsequently resided at Thames Ditton and at Esher with their mother until her death in 1831. Anna Maria Porter published Artless Tales in 1793- 1795, the first of along series of works of which the more note-worthy are Walsh Colville (1797), Octavia (1798), The Lake of Killarney (1804), A Sailor's Friendship and a Soldier' s Love (1805) , The Hungarian Brothers (1807), Don Sebastian (1809), Ballads, Romances and other Poems (1811), The Recluse of Norway (1814), The Knight of St John (1817), The Fast of St Magdalen (1818), The Village of Mariendorpt (1821), Roche Blanche (1822), Honor O'Hara (1826) and Barony (1830). Jane Porter— whose intel- lectual power, though slower in development and in expression, was greater than her sister's — had in the meantime gained imme- diate popularity by her first work, Thaddeus of Warsaw (1803),

1 See Jones, John Paul, and an article by General Porter, " The Recovery of the Body of John Paul Jones," in the Century Magazine, (1905), lxx. 927 sqq.

which was translated into several languages and procured her election as canoness of the Teutonic order of St Joachim. In 18 10, four years before the appearance of Waverley, she attempted national romance in her Scottish Chiefs. The story of Wallace had been a favourite one in her childhood, and she was probably well acquainted with the poem of Blind Harry (Henry the Minstrel). Although the book lacked historical accuracy, and the figure of Wallace is a sentimental conception of the least convincing kind, the picturesque power of narration displayed by Miss Porter has saved the story from the oblivion which has overtaken the works of most of Scott's predecessors in historical fiction. Her later works included The Pastor's Fireside (1815), Duke Christian of Liineburg (1824), Coming Out (1828) and The Field of Forty Footsteps (1828). In conjunction with her sister she published in 1826 the Tales round a Winter Hearth. She also wiote some plays, and frequent contributions to current periodical literature. Sir Edward Seaward' s Diary (183 1) was asserted by Miss Porter to be founded on documents placed in her hands by the author's family, but is generally regarded as pure fiction. The claim of her eldest brother, Dr William Ogilvie Porter, to its authorship rests on a memorial inscription in Bristol Cathedral, written by Jane. On the 21st of September 1832 Anna Maria died, and for the next ten years Jane became " a wanderer " amongst her relations and friends.

Robert Ker Porter had in his own way been scarcely less successful than his sisters. After two years of study at the Royal Academy he had gained reputation as a painter of altar- pieces and battle-scenes of

imposing magnitude. He went to Russia as historical painter to the emperor in 1804, travelled in Finland and Sweden, where he received knighthood from Gustavus IV. in 1806, and accompanied Sir John Moore to Spain in 1808. In 1811 he returned to Russia and married a Russian princess. He was knighted by the Prince Regent in 1813. Ini8i7he travelled to Persia by way of St Petersburg and the Caucasus, returning through Bagdad and western Asia Minor. He examined the ruins of Persepolis, making many valuable drawings and copying cuneiform inscriptions. In 1826 he became British consul in Venezuela. His services there were recognized by a knight commandership of the Order of Hanover. Accounts of his wanderings are to be found in his Travelling Sketches in Russia and Sweden (1808), Letters from Portugal and Spain (1809), Narrative of the late Campaign in Russia (1813), and Travels in Georgia, Persia, Armenia, Ancient Babylonia &°c, during the years 1817-1820 (1821-1822). After leaving Venezuela (1841) he again visited St Petersburg, and died there suddenly on the 4th of May 1842. Jane Porter, who had joined him in Russia, then returned to England and took up her residence with her eldest brother at Bristol, where she died on the 24th of May 1850.

PORTER, MARY (d. 1765), English actress, was brought to the attention of Betterton by Mrs Barry, who had seen her play the Fairy Queen at Bartholomew Fair. In his company she made her first appearance in 1699, in tragedy, in which she was at her best, although she also played a long list of comedy parts. When her friends, Mrs Barry, Mrs Bracegirdle and Mrs Oldfield, had retired from the stage, she was left its undisputed queen. She died on the 24th of February 1765.

PORTER, NOAH (1811-1892), American educationalist and philosophical writer, was born in Farmington, Connecticut, on the 14th of December 181 1. He graduated at Yale College, 1 83 1, and laboured as a Congregational minister in Connecticut and Massachusetts, 1836-1846. He was elected professor of moral philosophy and metaphysics at Yale in 1846, and from 1871 to 1886 he was president of the college. He edited several editions of Noah Webster's English dictionary, and wrote on education, &c. His best-known work is The Human Intellect, with an Introduction upon Psychology and the Human Soul (1868), comprehending a general history of philosophy, and following in part the " common-sense " philosophy of the Scottish school, while accepting the Kantian doctrine of intuition, and declaring the notion of design to be a priori. He died in New Haven on the 4th of March 1892.

PORTEUS, BEILBY (1731-1808), bishop of London, was born at York and educated at Christ's College, Cambridge, where he became fellow in 1752. He was ordained in 1757, and in 1762 was appointed domestic chaplain to the archbishop of Canterbury. In 1767 he became rector of Lambeth, and took his D.D. degree at Cambridge, preaching on that occasion a sermon which in- duced John Norris (1734-1777) to found the Norrisian professor- ship of divinity. About two years later he was appointed chaplain to the king and master of the hospital of St Cross, Winchester. In 1776 he became bishop of Chester, and in 1787 he was translated to London. He was a supporter of the Church Missionary and the British and Foreign Bible societies, and laboured for the abolition of slavery.

Of his published works the Review of the Life and Character of Archbishop Seeker (London, 1770), and the Summary of the principal Evidences for the Truth and Divine Origin of the Christian Revelation (London, 1800), have passed through numerous editions.

PORTFOLIO (shortened form of porto folio, adapted from the Ital. portafogli, portare, to carry, and fogli, sheets or leaves of paper, Lat. folium, leaf), a case for keeping papers, documents, prints, maps, &c, usually a leather book-cover with a flexible back. As the official documents of a state department are in the hands of the minister of that department, the word " port- folio " is frequently used figuratively of the office itself, par- ticularly on the continent of Europe, where the " portfolio " is the symbol of office, as, in English usage, the " seals " are for the secretaryships of state. The phrase " minister without port- folio " is applied to a member of a ministry to whom no special department is assigned.

PORT GLASGOW, a municipal and police burgh and seaport of Renfrewshire, Scotland, on the southern shore of the Firth of Clyde, 20j m. W.N.W. of Glasgow by the Caledonian railway. Pop. (1001), 16,857. The ground behind the town rises to a height of 700 ft. and is partly occupied by villas. Amongst the principal buildings are the town house (1815), with a tower and spire; the town hall (1873); the library (1887) founded by James Moffat, a merchant of the burgh, and the Carnegie Park Orphan- age, also provided from the same bequest. Birkmyre Park was opened in 1894. The industries include shipbuilding and allied trades, engineering works, and iron and brass foundries. The area of the port (which has wet and graving docks)

amounts to 16 acres, and there are 2000 yds. of quayage. The harbours are accessible at all stages of the tide. The district originally formed part of the parish of Kilmalcolm, the nucleus of the town being the village of Newark attached to the barony of that name. In 1668 it was purchased from Sir Patrick Maxwell of Newark by the Glasgow magistrates, who here constructed a harbour. In 1695 it was erected into a separate parish under the name of New Port Glasgow. In 1710 it became the chief custom-house port for the Clyde, until superseded by Greenock. The graving dock made in 1762 was the first dock of the kind in Scotland. In 1775 Port Glasgow was created a burgh of barony and since 1832 has formed one of the Kilmarnock parliamentary burghs (with Kilmarnock, Dumbarton, Renfrew and Rutherglen). It is governed by a council with provost and bailies. Adjoining the town on the east are the picturesque ruins of Newark Castle, a quadrangular building dating from the end of the 16th century. Formerly the property of the Dennistouns, it now belongs to the Shaw-Stewarts.

PORTHCAWL, a seaport and urban district in the mid- parliamentary division of Glamorganshire, South Wales, 30 m. by rail W. of Cardiff and 22 m. S.E. of Swansea. Pop. (1901) 1872. The urban district (formed in 1893) is conterminous with the civil parish of Newton Nottage, which, in addition to Porthcawl proper, built on the sea-front, comprises the ancient village of Nottage, 1 m. N., and the more modern village of New- ton, 1 m. N.E. of Porthcawl. The natural harbour of Newton (as it used to be called) was improved by a breakwater, and was connected by a tramway with Maesteg, whence coal and iron were brought for shipment. The tramway was converted into a railway, and in 1865 opened for passenger traffic. In 1866 a dock (7ˆ acres) and tidal basin (2ˆ acres) were constructed, but

since about 1902 they have fallen into disuse and the coal is diverged to other ports, chiefly Port Talbot. Porthcawl, however, has grown in popularity as a watering-place. Situated on a slightly elevated headland facing Swansea Bay and the Bristol Channel, it has fine sands, rocks and breezy commons, on one of which, near golf links resorted to from all parts of Glamorgan, is ” The Rest,” a convalescent home for the working classes, completed in 1891, with accommodation for eighty persons. The climate of Porthcawl is bracing, and the rainfall (averaging 25 in.) is about the lowest on the South Wales coast. The district is described by R. D. Blackmore in his tale The Maid of Sker (1872), based on a legend associated with Sker House, a fine Elizabethan building in the adjoining parish of Sker, which was formerly extra-parochial. The parish church (dedicated to St John the Baptist) has a pre-Reformation stone altar and an ancient carved stone pulpit, said to be the only relic of an earlier church now

covered by the sea.

PORT HOPE, a town and port of entry of Durham county, Ontario, Canada, on the north shore of Lake Ontario, 63 m. N.E. of Toronto by the Grand Trunk railway, and connected with Charlotte, the port for Rochester, New York, by a daily steamboat service. The population, 5585 in i88r, shrunk in 1901 to 4188, but is increasing owing to the popularity of the town as a summer resort. It is picturesquely situated on the side and at the foot of hills overlooking the lake; and Smith's Creek, by which it is traversed, supplies abundant water-power. Trade is carried on in lumber, grain and flour. Trinity College School, a residential school under Anglican control, has a long and creditable history.

PORT HUDSON, a village in East Baton Rouge Parish, Louisiana, U.S.A., on the left bank of the Mississippi, about r35 m. above New Orleans. At the sharp turn of the Missis- sippi here the Confederates in 1862 built on the commanding bluffs powerful batteries covering a stretch of about 3 m., their strongest fortifications along the Mississippi between New Orleans and Vicksburg. On the night of the 14th of March 1863 Admiral Farragut, with seven vessels, attempted to run past the batteries, commanded by Brigadier-General William M. Gardner, but four of his vessels were disabled and forced to turn back, one, the " Mississippi " was destroyed, and only two, the " Hartford " and the " Albatross " got past. General N. P. Banks's land attack, on the 27th of May, was unsuccessful, the Union loss, nearly 2000, being six times that of the Confederates. A second attack on the r4th of June, entailed a further Union loss of about 1800 men. But on the 9th of July, two days after the news of the surrender of Vicksburg, after a siege of 45 days, General Gardner surrendered the position to General Banks with about 6400 men, 50 guns, 5000 small arms and ammunition, and two river steamers. The Union losses during the siege were probably more than 4000; the Confederate losses about 800. The capture of Vicksburg and Port Hudson secured to the Union the control of the Mississippi.

PORT HURON, a city and the county-seat of Saint Clair county, Michigan, U.S.A., at the confluence of the Saint Clair and Black rivers, and at the lower end of Lake Huron, about 60 m. N.N.E. of Detroit. Pop. (1900), 19,158 of whom 7142 were foreign-born ; (1910 U.S. census) 18,863 . It is served by the Grand Trunk and other railways, and by steamboat lines to Chicago and other ports. A railway tunnel, 6025 ft. long, under the Saint Clair, connects the city with Sarnia, Canada. The tunnel, which has an inside diameter of 20 ft., was constructed by the Grand Trunk railway in i88o-i89r at a cost of about

$2,700,000, and was designed by Joseph Hobson (b. 1834). Port Huron is laid out with wide streets, on both sides of the Black river and along the shore of Lake Huron; it has attractive parks and mineral water springs, and is a summer resort. Among its buildings are the court house, the city hall, and a Modern Maccabee Temple — Port Huron being the headquarters of the Knights of the Modern Maccabees (1881), a fraternal society which, in 19T0, had a mem- bership of 107,737. Until 1908 Port Huron was the headquarters of the Knights of the Maccabees of the World (founded in 1883; 283,998 members in 1910). Port Huron has large shipping interests, and since 1866 has been the port of entry of the Huron

customs district. In 1908 its exports were valued at $16,958,080 and its imports at $4,859,120. The city has shipyards, dry docks, large shops of the Grand Trunk railway, publishing houses, and manufactories of agricultural implements, steel ships, automobiles, foundry products, paper and pulp, and toys. In 1904 the city's factory products were valued at $4,789,589.

In 1686 the French established Fort St Joseph, a fortified trading post, which came into the possession of the British in 1761 and was occupied by American troops in 1814. The fort was renamed Fort Gratiot in honour of General Charles Gratiot (1788-1855), who was chief-engineer in General W. H. Harrison's army in 1813-1814, and was chief-engineer of the U.S. Army in 1 828-1 838. The settlement which grew up round the fort, and was organized as a village in 1840, was also known as Fort Gratiot, and was annexed to Port Huron in 1893. The fort was abandoned during 1837-1848, during 1852- 1866, and, permanently, in 1879. The earliest permanent settlement, in what later became Port Huron, was made in 1790 by several French families. This settlement, distinct from that at the fort, was first called La Riviere De Lude, and, after 1828, Desmond. It was platted in 1835, incorporated as a village in 1840 (under its present name), and chartered as a city in 1857.

PORTICI, a town of Campania, Italy, in the province of Naples, 5 m. S.E. of Naples by rail, on the shores of the bay, and at the foot of Vesuvius. Pop. (1901), 14,239. The palace, erected in 1738, is traversed by the high road. It once contained the antiquities from Herculaneum, now removed to Naples, and since 1882 it has been a government school of agriculture. There is a small harbour. Just

beyond Portici, on the south east, is Resina (pop, in 1901, «o,i82), on the site of the ancient Herculaneum, with several fine modern villas. The inhabitants are engaged in fishing, silk-growing and silk-weaving. The town was com- pletely destroyed by the eruption of Vesuvius in 1631.

PORTICO (Ital. for ” porch,” Lat. porticus), a term in architecture for the covered entrance porch to a building, which is carried by columns, and either constitutes the whole front of the building, as in the Greek and Roman temples, or forms an important feature, as the portico of the Pantheon at Rome attached to the rotunda. A circular projecting portico, such as those to the north and south transepts of St Paul’s Cathedral, and that which forms the west entrance of St Mary le Strand, is known as cyclostyle. The term porticus is used to distinguish the entrance portico in an amphiprostylar or peripteral temple from that behind which is called the posticum.

PORTIERE, a hanging placed over a door, as its French name implies, or over the doorless entrance to a room. From the East, where doors are still rare, it came to Europe at a remote date — it is known to have been in use in the West in the 14th century, and was probably introduced much earlier. Like so many other domestic plenishings, it reached England by way of France, where it appears to have been originally called rideau de porte. It is still extensively used either as an ornament or as a means of mitigating draughts. It is usually of some heavy material, such as velvet, brocade, or plush, and is often fixed upon a brass arm, moving in a socket with the opening and closing of the door.

PORT JACKSON, or Sydney Harbour, a harbour of New South Wales, Australia. It is one of the safest and most beautiful harbours in the world; its area, including all its bays, is about 15 sq. m., with a shore line of 165 m.; it has deep water in every part, arid is landlocked and secure in all weathers. The entrance, between two rocky promontories known as North and South Heads, is 2; m. wide between the outer heads, and narrows down to 1 m. 256 yds. The port is flanked on both sides by promontories, so that, in addition to a broad and deep central channel, there is a series of sheltered bays with good anchorage. Sydney lies on the southern shore about 4 m. from the Heads. Port Jackson is the chief naval depot of Australasia, the headquarters of the admiral’s station, and is strongly fortified. The harbour has a number of islands, most of which are used for naval or government purposes — Shark Island is the quarantine station, Garden Island has naval foundries, hospital and stores, Goat Island is occupied by a powder magazine, Spectacle Island is used to store explosives, and on

Cockatoo Island are important government docks. Port Jackson was discovered by Captain

Phillip in 1788, though in 1770 Captain Cook, when coasting north, noticed what looked like an inlet, and named it after Sir George Jackson, one of the secretaries to the Admiralty. Captain Cook passed the harbour without recognizing its capacity; but the cliffs which guard the entrance are 300 ft. high, and no view of the basin can be seen from the masthead. Middle Head, which is opposite the entrance, closes it in, and it is necessary to enter, turn to the south, and then to the west before the best part of the harbour discloses itself.

PORT JERVIS, a city of Orange county, New York, U.S.A., on the Delaware river, at its junction with the Neversink, 88 m. N.W. of New York city by rail, and at the intersection of the boundary lines of the states of New York, New Jersey and Penn- sylvania. Pop. (1900), 9385, of whom 895 were foreign-born; (1910 census), 9564. It is Served by the Erie and the New York, Ontario & Western railways. The beauty of the scenery in its vicinity has made the city a summer resort. At Port Jervis are situated the extensive shops of the Erie railway. Among the manufactures are wearing apparel, silk, glass, and silver ware. The value of the factory products increased from $1,009,081 in 1900 to $1,635,215 in 1905, or 62%. Port Jervis was laid out in 1826, soon after work began on the Dela- ware & Hudson Canal; it owes its origin to that waterway (now abandoned), and was named in honour of John Bloomfield Jervis (1795-1885), the engineer who constructed the canal, who, in 1836, was in charge of the construction of the Croton Aqueduct, and wrote Railway Property (1859) and The Construction and Management of Railways (1861). Port Jervis was incorporated as a village in 1853, and was chartered as a city in 1907.

PORTLAND, EARL OF, an English title held by the family of Weston from 1633 to 1688, and by the family of Bentinck from 1689 to 1716, when it was merged in that of duke of Port- land. Sir Richard Weston (1577-1635), according to Clarendon ” a gentleman of very ancient extraction by father and mother,” was the son and heir of Sir Jerome Weston (c. 15 50-1 603) of Skreens, in Roxwell, Essex, his grandfather being Richard Weston (d. 1572) justice of the common pleas. A member of parliament during the reigns of James I. and Charles I., Sir Richard was sent abroad by James on two occasions to negotiate on behalf of the elector palatine Frederick V. ; after the murder of the duke of Buckingham, he became the principal counsellor of Charles I. In 1628 he was created Baron Weston of Neyland and in 1633 earl of Portland. Having in 1625 and 1626 had experience in’ the difficult

task of obtaining money for the royal needs from the House of Commons, Weston was made lord high treasurer in 1628. His own inclinations and the obstacles in the way of raising money made him an advocate of a policy of peace and neutrality. His conduct was frequently attacked in parliament, but he retained both his office and the confidence of the king until his death on the 13th of March 1635. His son Jerome, the 2nd earl (1605-1663), was imprisoned for plotting in the interests of Charles I. in 1643, and was nominally president of Munster from 1644 to 1660. He sat in the convention parliament of. 1660. He was succeeded by his son Charles (1639-1665), who was killed in a sea-fight with the Dutch off the Texel, and then by his brother Thomas (1609-1688), who died in poverty at Louvain, when the title became extinct. In 1689 it was revived by William III., who bestowed it upon his favourite William Bentinck (see below.)

Sir Richard Weston must be distinguished from a contemporary and namesake, Sir Richard Weston (c. 1579-1652), baron of the exchequer. Another Sir Richard Weston (c. 1466-1542) was a courtier and a diplomatist under Henry VIII. ; his son was Sir Francis Weston (c. 1511-1536), who was beheaded for his alleged adultery with Anne Boleyn. This Sir Richard had a brother, Sir William Weston (d. 1 540) , who distinguished himself at the defence of Rhodes in 1522, and was afterwards prior of the Knights of St John in England. A third Sir Richard Weston (1591-1652), was mainly reponsible for introducing locks on the Wey and thus making this river navigable.

Another family of Weston produced Robert Weston (c. 1515- 1573), lord chancellor of Ireland from 1566 until his death on the

20th of May 1573. Other famous Westons were Stephen Weston ! (1665-1742) bishop of Exeter from 1724 until his death, and his son Edward Weston (1703-17 70) the writer.

Much of the earl of Portland's correspondence is in the Public Record Office, London. For his political career see S. R. Gardiner, History of England (1883-1884), and L. von Ranke, Englische Geschichte (Eng. trans., Oxford, 1875).

PORTLAND, WILLIAM BENTINCK, Earl of (c. 1645-1709), English statesman, was born, according to the Dutch historian, Groen van Prinsterer, in 1645, although most of the other authorities give the

date as 1649. The son of Henry Bentinck of Diepenheim, he was descended from an ancient and noble family of Gelderland. He became page of honour and then gentleman of the bedchamber to William, prince of Orange. When, in 1675, the prince was attacked by small-pox, Bentinck nursed him assiduously, and this devotion secured for him the special and enduring friendship of William; henceforward, by his prudence and ability, he fully justified the confidence placed in him. In 1677 he was sent to England to solicit for the prince of Orange, the hand of Mary, daughter of James duke of York, afterwards James II., and he was again in England in 1683 and in 1685. When, in 1688, William was preparing for his invasion Bentinck went to some of the German princes to secure their support, or at least their neutrality, and he was also a medium of communication between his master and his English friends. He superintended the arrangements for the expedition and sailed to England with the prince.

The revolution accomplished, Bentinck was made groom of the stole, first gentleman of the bedchamber, and a privy councillor; and in April 1689 he was created Baron Cirencester, Viscount Woodstock and earl of Portland. He commanded some cavalry at the battle of the Boyne in 1690, and was present at the battle of Landen, where he was wounded, and at the siege of Namur. But his main work was of a diplomatic nature. Having thwarted the plot to murder the king in 1696, he helped to arrange the peace of Ryswick in 1697; in 1698 he was ambassador to Paris, where he opened negotiations with Louis XIV. for a partition of the Spanish monarchy, and as William's representative, he signed the two partition treaties. Portland had, however, become very jealous of the rising influence of Arnold van Keppel, earl of Albemarle, and, in 1699, he resigned all his offices in the royal household. But he did not forfeit the esteem of the king, who continued to trust and employ him. Portland had been loaded with gifts, and this, together with the jealousy felt for him as a foreigner, made him very unpopular in England. He received 135,000 acres of land in Ireland, and only the strong opposition of a united House of Commons prevented him obtaining a large gift of crown lands in North Wales. For his share in drawing up the partition treaties he was impeached in 1701, but the case against him was not proceeded with. He was occasionally employed on public business under Anne until his death at his residence, Bulstrode in Buckinghamshire, on the 23rd of Novem- ber 1709. Portland's eldest son Henry (1680-1724) succeeded as 2nd earl. He was created marquess of Titchfield and duke of Portland in 1716.

See G. Burnet, History of My Own Time (Oxford, 1833); Lord Macaulay, History 0] England (1854); L. von Ranke, Englische

Geschichte (Em*, trans., Oxford, 1875); and especially Onno Klopp, Der Fall des Hauses Stuart (Vienna, 1875-1888). See also Dr A. W. Ward's article in vol. iv. of the Diet. Nat. Biog.

PORTLAND, WILLIAM HENRY CAVENDISH BENTINCK,

3rd Duke of (i 738-1809), prime minister of England, son of William, 2nd duke (1709-1762), and grandson of the 1st duke. His mother, Margaret, granddaughter and heiress of John Holies, duke of Newcastle, brought to her husband Welbeck Abbey and other estates in Nottinghamshire. He was born on the 14th of April 1738, and was educated at Oxford, where he graduated M.A. in 1757. In 1761, as marquess of Titchfield, he became M.P. for the borough of Weobly (Hereford), but in May 1762 he was called to the upper house on the death of his father. Under the marquess of Rockingham he was, from July 1765 to December 1766, lord chamberlain, and on the return of Rockingham to power in April 1782 he was made lord-lieutenant

of Ireland. After the short ministry of Shelburne, succeeding the death of Rockingham, the duke of Portland was selected by Fox and North as a " convenient cipher " to become the head of the coalition ministry, to the formation of which the king was with great reluctance compelled to give his assent. The duke held the premiership from the 5th of April 1783 until the defeat of the bill for " the just and efficient government of British India " caused his dismissal from office on the 1 7th of December following. Under Pitt he was, from 1794 to 1801, secretary of state for the home department, after which he was, from 1801 to 1805, president of the council. In 1807 he was appointed a second time prime minister and first lord of the treasury. Ill health caused him to resign in October 1809, and he died on the 30th of that month. He owed his political influence chiefly to his rank, his mild disposition, and his personal integrity, for his talents were in no sense brilliant, and he was deficient in practical energy as well as in intellectual grasp.

He married in 1766 Lady Dorothy Cavendish (1750-1794), daughter of the 4th duke of Devonshire, and was succeeded as 4th duke by his son William Henry (1768-1854), who married a daughter of the famous gambler, General John Scott, and was brother-in-law to Canning. His son, the 5th duke, William John Cavendish Bentinck-Scott (1800-1879) died unmarried. He is notable for having constructed the underground halls at Welbeck Abbey, and for his retiring habits of life, which gave occasion for some singular stories. 1 He was succeeded by his cousin William John Arthur Charles James Cavendish- Bentinck (b. 1857) as 6th duke.

PORTLAND, a seaport of Normanby county, Victoria, Australia, 250 m. by rail S.W. of Melbourne. Pop. (1901), 2185. It stands on the western shore of a magnificent bay, 24 m. long and 12 m. broad, and is the outlet for a rich agri- cultural and pastoral tract.

PORTLAND, the largest city of Maine, U.S.A., the county- seat of Cumberland county, and a port of entry, on Casco Bay, about 115 m. by rail N.N.E. of Boston. Pop. (1890), 36,425; (1900), 50,145, of whom 34,918 were born in Maine, 3125 in the other New England states, 4476 in Canada, and 3273 in Ireland, and 291 were negroes; (1910 census) 58,571. Port- land is served by the Maine Central, the Boston & Maine, and the Grand Trunk railways; by steamboat lines to New York, Boston, Bar Harbor, Saint John, N.B., and other coast ports, and, during the winter season, by the Allan and Dominion transatlantic lines. It is connected by ferry with South Portland.

1 Public interest centred for some years round the allegation that he lived a double life and was identical with Mr T. C. Druce, an upholsterer of Baker Street, London, who, in 1851, married Annie May. The ” Druce case,” involving a claim to the title and estates, by Mrs Druce (widow of W. T. Druce, son of T. C. Druce by Annie May) on behalf of her son, aroused much attention from 1897 to 1908. The duke of Portland was undoubtedly buried in Kensal Green cemetery in 1879. ” Druce,” on the other hand, was supposed to have died in 1864 and been interred in Highgate cemetery, his will bequeathing over £70,000 in personal estate. Mrs Druce’s claims had two aspects, both as involving the revocation of probate of T. C. Druce’s will, and also as identifying Druce with the duke of Portland. But her application to have the grave in Highgate opened (with the object of showing that the coffin there was empty), though granted by Dr Tristram, chancellor of the diocese of London, was thwarted by a caveat being entered on the part of the executor of T. C. Druce’s will; and the case became the subject of constant proceedings in the law-courts without result. Meanwhile it was discovered that children of T. C. Druce by a former wife were living in Australia, and Mrs Druce’s claims fell into the background, the case being taken up independently by Mr G. H. Druce as the repre- sentative of this family, from 1903 onwards. A company to finance his case was formed in 1905, and in the autumn of 1907 he instituted a charge of perjury against Mr Herbert Druce, T. C. Druce’s younger son and executor, for having sworn that he had seen his father die in 1864. Sensational evidence of a mock burial was given by an American witness named Caldwell, and others; but eventually it was agreed that the grave at Highgate should be opened. This was done on December the 30th, and the body of Mr T. C. Druce was then found in the coffin. The charge of perjury at once collapsed

and was withdrawn on January 6th, the opening of the grave definitely putting an end to the story of an identity between the two men.

PORTLAND

The hilly peninsula, to which Portland was confined until the annexation of the town of Deering in 1899, is nearly 3 m. in length by about f m. in average width; at its east end is Munjoy Hill, 160 ft. above the sea, and its west end Bramhall Hill, 15 ft. higher. Portland's total land area is about 215 sq. m. The scenery in and about the city is noted for its picturesqueness, and this, with its delightful summer climate and historic interest, attracts a large number of visitors during the summer season. Munjoy Hill commands a fine view of Casco Bay, which is over- looked by other wooded heights. There is excellent yachting in the bay, which contains many beautiful islands, such as Peaks and Cushing's islands. Bramhall Hill commands an extensive view west and north-west of the bay, the mainland, and the White Mountains some 80 m. distant.

The city's park system includes the Western Promenade, on Bramhall Hill ; the Eastern Promenade, on Munjoy Hill ; Fort Allen Park, at the south extremity of the latter promenade ; Foit Sumner, another small park farther west, on the same hill; Lincoln Park, containing 2\ acres of beautiful grounds near the centre of the city; Deering's Oaks (made famous by Longfellow), the principal park (50 acres) on the peninsula, with many fine old trees, pleasant drives, and an artificial pond used for boating; and Monument Square and Boothby Square. There are many pleasant drives along the shore of the bay or the banks of rivers, and some of these lead to popular resorts, such as Riverton Park, on the Presumpscot ; Cape Cottage Park, at the mouth of the harbour; and Falmouth Foreside, boidering the inner bay.

The streets of Portland are generally well paved, are unusually clean, and, in the residence districts, where the fire of 1866 did not extend, they are profusely shaded by elms and other large trees — Portland has been called the " Forest City." Congress Street, the principal thoroughfare, extends along the middle of the peninsula north-east and south-west and from one end of it to the other, passing in the middle of its course through the shopping district.

In Portland's architecture, both public and private, there is much that is excellent ; and there are a number of buildings of historic interest.

The Post Office, at the corner cf Exchange and Middle streets, is of white Vermont marble and has a Corinthian portico. The granite Customs House, extending from Fore Street to Commer- cial Street, is large and massive. The Public Library building is Romanesque and elaborately ornamented; the building was presented to the city by James P. Baxter; in the library is the statue, by Benjamin Paul Akers (1825-1861), of the dead pearl-diver, well known from Hawthorne's description in The Marble Faun. The Cumberland County Court House, of white Maine granite, occupies the block bounded by Federal, Pearl, Church and Newbury streets ; immediately opposite (to the south-west) is the Federal Court build- ing, also of Maine granite. The Portland Observatory, on Munjoy Hill, erected in 1807 to detect approaching vessels, rises 222 ft. above tide-water. In Monument Square, the site of a battery in 1775 is a soldiers' and sailors' monument (1889), a tall granite pedestal surmounted by a bronze female figure, by Franklin Simmons; at the corner of State Street is a statue of Henry W. Longfellow by the same sculptor; and where Congress Street crosses the Eastern Promenade, a monument to the first settlers, George Cleeve and Richard Tucker. On the Western Promenade there is a monument to Thomas Brackett Reed, who was a native and a resident of Port- land. On Congress Street, below the Observatory, is the Eastern Cemetery, the oldest burying ground of the city ; in it are the graves of Commodore Edward Preble, and of Captain Samuel Blythe (178.1-1813) and Captain William Burroughs (1785-1813), who were killed in the engagement between the British brig " Boxer " and the American brig " Enterprise," their respective ships, off this coast on the 5th of September 1813. The cemetery also contains monu- ments to Alonzo P. Stinson, the first soldier from Portland killed in the Civil War, to the Portland soldiers in the War of Independence, and to Rear-Admiral James Alden (1810-1877), of the U.S. Navy, a native of Portland. Among the churches are the Cathedral of the Immaculate Conception (Roman Catholic), with a spire 236 ft. high, and St Luke's (Protestant Episcopal) Cathedral. In the Williston Church (Congregational), in Thomas Street, the Young People's Society of Christian Endeavor was founded in 1881 by the Rev. Francis E. Clark, then pastor of the church. The finest residence district is on Bramhall Hill. Many houses, especially in State, Danforth and Congress streets, are simple in style and old-fashioned in architecture. Of special interest to visitors is the Wadsworth-Longfellow House— the early home of Henry W. Longfellow — which was built in 1 785-1 786 by General Peleg Wadsworth (1748- 1829), a soldier of the War of Independence, a representative in Congress from 1793 to 1807, and the grandfather of the poet; was given by Longfellow's sister, Mrs Anne Longfellow Pierce (1810-1901) to the

Maine Historical Society; and contains interesting relics of the Wadsworth and Longfellow families, and especially of the poet himself. Behind the ” Home ” is the Library of the Maine Historical Society. The birthplace of Longfellow is now a tenement

house at the corner of Fore and Hancock streets, near the Grand Trunk railway station.

In Portland, as in Bangor, the Maine Music Festival (begun in 1897) is held every year in October, three concerts being given by a chorus composed of local choruses trained in different cities of the state for the festival.

Among the institutions are: The Medical School of Maine, the medical department of Bowdoin College — instruction being given here during the last two years of the course; Westbrook Seminary (chartered in 1 831, and empowered to grant degrees in 1 863); the Public Library, containing (1910) 65,000 vols.; the Library of the Maine Historical Society (30,000 vols.); the Mechanics’ Library, the Greenleaf Law Library, the Maine General Hospital, and the United States Marine Hospital. The Portland Society of Natural History, founded in 1843 and incorporated in 1850, has a building (1880) containing a library and natural history collections. The city is supplied with good water from Lake Sebago, 17 m. distant.

The harbour has an artificial breakwater and extensive modern fortifications (Fort Preble, on the Cape Shore; Fort Levett, on Cushing’s Island; Fort Williams, at Portland Head; and Fort McKinley, on Great Diamond Island) among the best equipped in the United States. For a long period the city was noted for its commerce with the West Indies, which began to decline about 1876, but the coast trade and commerce with Great Britain are still con- siderable, especially in the winter, when Portland is the outlet of much of the trade from the Great Lakes that in the other seasons passes through Montreal. The principal exports are grain, live- stock and fruit. In 1908 the exports were valued at f 1 1,353,339 and the imports at $1,189,964. The Grand Trunk Railroad Company has here two of the largest grain warehouses on the Atlantic Coast. In 1905 Portland was the first manufacturing city of the state, with a factory product valued at $9,132,801 (as against $8,527,649 for Lewiston, which outranked Portland in 1900) ; here are foundries and machine-shops, planing-mills, car and railway repair shops, packing and. canning establishments — probably the first Indian corn canned in the United States was canned near Portland in 1840 — potteries, and factories for making boots, shoes, clothing, matches, screens, sleighs, carriages,

cosmetics, &c. Ship- building and fishing are important industries.

The first permanent settlement on the peninsula was established by George Cleeve and Richard Tucker at the foot of Munjoy Hill in 1633 immediately after they had been ejected from land which they had claimed at the mouth of the Spurwink. Soon the hill at the east end became the property of George Munjoy and that at the west end the property of George Bram- hall. The Indian name of the peninsula was Machegonne, and the new settlement was during the next few years known by various names, such as Casco, Casco Neck, Cleeve's Neck, and Munjoy's Neck. In 1658 Massachusetts extended its jurisdiction over this part of Maine. The peninsula, with considerable neighbouring territory and Cape Elizabeth, was organized as a town in 1718 and was named Falmouth. The town suffered so severely from the Indians in 1676 that it was deserted until 1678. It was attacked in 1689, and in 1690 it was utterly destroyed by the French and Indians, and remained desolate until after the Treaty of Utrecht in 1713. When the port of Boston was closed by Great Britain in 1774 the bell of the old First Parish Church (Unitarian) of Portland (built 1740; the present building dates from 1825) was muffled and rung from morning till night, and in other ways the town showed its sympathy for the patriot cause. As a punishment, on the 1 8th of October 1775, the town was bombarded and burned by a British fleet. The peninsula portion of Falmouth was incorporated as a distinct town in 1786 and was named Portland. Portland was the capital of the state from 1820 to 1832 and in the latter year was chartered as a city. In 1886 a large central portion of the city, about 200 acres, was destroyed by a fire resulting from a Fourth of July celebration. Portland was the birthplace of Henry Wadsworth Longfellow, Thomas Brackett Reed, Edward Preble and his nephew George Henry Preble, Mrs Parton (" Fanny Fern "), Nathaniel Parker Willis, Seargent Smith Prentiss and Neal Dow, and it was the home of William Pitt Fessenden, Theophilus Parsons and Simon Greenleaf.

See W. Willis, The History of Portland (Portland, 1865), and William Goold, Portland in the Past (Portland, 1886).

PORTLAND, a city, port of entry and the county-seat of Multnomah county, Oregon, U.S.A., on the Willamette river, near its confluence with the Columbia, about 120 m. by water from the Pacific, 186 m. by rail S.S.W. of Seattle and about

772 m. N. of San Francisco. Pop. (1890), 46,385; (1900), 90,426, of whom 25,876 were foreign-born (6943 Chinese); (1910 census) 207,214. Portland is served by the Northern Pacific, the Southern Pacific, the Canadian Pacific, the Great Northern and other railways, by transpacific vessels to Hong- Kong and Yokohama, by coast-wise vessels to San Francisco, to ports on Puget Sound, in British Columbia, and in Alaska, and by river boats sailing 100 m. farther up the Willamette and up the Columbia and the Clearwater to Lewiston, Idaho. The city is built on both sides of the river (which is crossed by five bridges), and covers about 44 sq. m. On the western side the ground rises gradually for a distance of f to i| m., and then rises abruptly 500-1000 ft. to ” Portland Heights ” and ” Council Crest,” beyond the much-broken surface of which rises the Coast range; on the eastern side a slightly rolling surface extends to the foot- hills of the Cascade Mountains. From ” Portland Heights ” there are fine views of the Columbia and Willamette valleys, and, par- ticularly, of the snow-clad summits of Mt Hood, Mt Jefferson, Mt St Helen’s, Mt Adams and Mt Rainier (or Tacoma). In the residence districts (King’s Hill, Nob Hill, Portland Heights, Willamette Heights, Hawthorne Avenue, &c.) are pleasantly shaded streets, and grounds decorated with shrubs, especially roses, which sometimes bloom as late as January — an annual ” Rose Festival ” is held here in June. The city has 205 acres in parks and numerous beautiful drives. It has a fine climate, the mean temperature during the winter months from 1874 to 1903 was 41° F. ; the mean summer temperature for the same period 65 F. For the year ending the 31st of May 1900 the death-rate was reported to be only 9 per 1000, and in 1907 to be only 8-28 per 1000. The city’s water is brought through a pipe 30 m. in length from Bull Run river, which is fed by Bull Run Lake at an elevation of more than 3000 ft. in the Cascade Mountains.

Among the prominent buildings are the Court House; the City Hall, containing the rooms of the Oregon Historical Society; the Customs House; the Protestant Episcopal Cathedral; the Public Library (with 75,000 volumes in 1908); several tall office buildings with frames of steel; and the Art Museum (1905). There are large grain elevators and miles of wharfs and docks. Among educational institutions are the law and medical departments of the University of Oregon, Hill Military Academy (1901) and Columbia University (Roman Catholic, 1901). The Oregonian, which was established here in 1850, is one of the most influential newspapers on the Pacific Slope.

The harbour is accessible for vessels of 26 ft. draught and the city’s leading industry is the shipment by water and by rail of fish (especially salmon) and of the products (largely lumber, wheat and

fruits) of the rich Willamette and Columbia valleys. It is also an important jobbing centre. The value of the exports in 1908 amounted to $16,652,850 and the value of the imports to $2,937,513; the foreign trade is chiefly with Great Britain and its possessions, and with the Orient, where wheat and flour are exchanged for raw silk, tea and manila and other fibres. Portland is the principal manufacturing city of the state. The total value of its factory pro- duct in 1905 was §28,651,321. The principal manufactures were lumber and timber products ($3,577,465) and flour and grist mill pro- ducts ($2,712,735); other important manufactures were packed meat, planing-mill products, foundry and machine-shop products, railway cars (repaired), cordage and twine, and canned and preserved fish (salmon), oysters and fruits and vegetables.

Portland, named after Portland, Maine, was founded in 1845 by t wo real-estate men from New England, and was char- tered as a city in 185 1. Its early growth was promoted by the demand for provisions from California soon after the discovery of gold there, and although a considerable portion was swept by fire in 1873 the city had a population of nearly 20,000 before railway communication with the East was established by the Northern Pacific in 1883. East Portland and Albina were annexed to the city in July 1891. The Lewis and Clark Cen- tennial and American Pacific Exposition and Oriental Fair was held in Portland in 1905 in commemoration of the expedition of Meriwether Lewis and William Clark to this region in 1805. The forestry building, 205 ft. long by 108 ft. wide and built of logs of Oregon fir 6 ft. or more in diameter and 54 ft. long, and a building devoted entirely to the subject of irrigation, were of unusual interest. The forestry building is now maintained as a museum chiefly for timber and timber products.

PORTLAND, ISLE OF, properly a peninsula of the coast of Dorsetshire, England, as a prolongation of a narrow ridge of shingle, Chesil Bank (q.v.), connects it with the mainland. Pop. (1901), 15,262. It is 4 m. long and nearly if in extreme breadth, with an area of about 4! sq. m. The shores are wild and precipitous, and Portland is inaccessible from the sea except towards the south. The highest point, close upon 500 ft., is the Verne hill in the north. Wave action is seen in the numerous caverns, and south-east of Portland Bill, the southern extremity of the isle, is a bank called the Shambles, between which and the land there flows a dangerous current called the Race of Portland. A raised beach is seen at Portland Bill. The substratum of the island is Kimeridge Clay, above which rests beds of sand and strata of Oolitic limestone, widely famed as a building stone. Extensive quarries, which are Crown property, have supplied the materials for St Paul's Cathedral and

many other important public buildings. In the ” dirt-bed ” resting upon the Oolitic strata numerous specimens of petrified wood are found, some of great size. The soil, though shallow, is fertile, and mutton fed on the grass has a peculiar rich flavour. Quarrying, fishing and agriculture are the chief industries. Several curious local customs are retained by the inhabitants.

A joint railway of the Great Western and London & South Western companies runs south from Weymouth to Portland (4! m.) and Easton (85 m.) on the isle. The isle contains a convict prison with accommodation for about 1500 prisoners. Portland Castle, built by Henry VIII. in 1520, is generally occupied by the commander of the engineers or of the regiment stationed on the island. On a rock on the eastern side are remains of a more ancient fortress, Bow and Arrow Castle, ascribed to William Rufus.

A harbour of refuge, begun in 1847 under the direction of the Admiralty, was completed some fifteen years later. A breakwater stretching in a northerly direction from the north-east corner of the island partially enclosed a large area of water naturally sheltered on the south and west. An inner arm ran nearly east from the island and terminated in a masonry head and fort, and an outer detached arm bent to the north and terminated in a circular fort, a narrow entrance for shipping being left between the two. It was formed of a rubble mound quarried by convict labour at the summit of the island, and was lowered by a wire-rope incline to the sea. The harbour thus made was open on the north to Weymouth and the Channel, but the necessity for greater protection from torpedo attack made it advisable to complete the enclosure. Accordingly the Naval Works Acts of 1895 and subsequent years sanctioned works for closing the gap — about 2 m. long — between the end of the outer breakwater and the Bincleaves rocks near Weymouth, by two new breakwaters. One of these runs nearly east from the Bincleaves shore and is about 4642 ft. long, while from its extremity the other, about 4465 ft. long, stretches in a south-east_ direction towards the old outer breakwater, passages for navigation about 700 ft. wide separating it from its neighbours at each end. These new structures also consist of rubble mounds. The defensive harbour thus completely enclosed has an area of 2200 acres to the one-fathom line, of which 1500 acres have a depth of not less than 30 ft. at low water. There is no dockyard at Portland, but the watering and coaling arrangements for the supply of the fleet are of considerable importance. There is a coaling jetty and camber for the storage of both sea-borne and land-borne coal, with hydraulic appliances for handling it. The harbour and island are strongly fortified.

The isle of Portland is not mentioned in the time of the Romans. In 83 7 it was the scene of an action against the Danes, and in 1052 it was plundered by Earl Godwine. In 1643 the parliamentary party made themselves masters of the island and castle, but shortly afterwards these were regained by the Royalists through a clever stratagem, and not recovered again by the forces of the parliament till 1646.

PORTLANDIAN, in geology, a subdivision of the Upper Jurassic system that includes the strata lying between the Kimeridge Clay and the Purbeck beds. These rocks are well exposed on the isle of Portland, Dorsetshire, where they have been quarried for more than 200 years. J. Mitchell appears to have been the first to use the term ” Portland lime ” in geological literature (1788); T. Webster spoke of the ” Portland Oolite ” in 1812. In England the strata are very variable; the upper part consists principally of limestones, shelly, oolitic or

compact, or in places very closely resembling chalk (Upway, Portisham, Brill, Chilmark). Nodules and layers of chert are well developed in some of the limestones of Dorsetshire and elsewhere; and a silicified oolite occurs near St Alban’s Head. About Swindon, beds of sand are common in the Upper Portland beds with layers of calcareous sandstone (Swindon stone). Marly and sandy beds occur also at Shotover Hill. The lower portion is usually sandy and shows a gradual passage into the underlying Kimeridge Clay. W. H. Fitton in 1827 gave the name ” Portland Sand” to this division. The Upper Port- landian in Dorsetshire is 130-170 ft. thick; the Lower Portlandian in the same district is 100-120 ft. These rocks crop out from South Dorsetshire into Wiltshire, Oxfordshire and Buckingham- shire, and possibly extend beneath younger rocks into Bedford- shire and Cambridgeshire. They have been proved by borings in Sussex and Kent, and in Yorkshire they are represented by part of the Speeton Clays, and in Lincolnshire by part of the Spilsby Sand. At Swindon and Aylesbury a conglomeratic layer with small pebbles of lydite and phosphatized fossils lies at the base of the Portland Stone.

The Upper Portlandian of England is characterized by the ammonite Perisphinctes giganteus, along with Cytheria (Cyrena) rugosa, Trigonia gibbosa, Perisphinctes boloniensis and Trigonia incurva as subzonal forms. Olcostephanus gigas is the zonal ammonite in the Lower Portlandian, associated with Trigonia Pellati, Cyprina Brongniarti, Exogyra brantrutana and Astarte Saemanni as subzonal indices. Other

characteristic fossils are Cerithium portlandicum, the casts of which form the familiar ” Portland screw,” Isastraea oblonga, the Chelonian Slegochelys; the remains of saurians Pliosaurus and Cimoliosaurus and others are found; Mesodon, Ischyodus and other fishes occur in this formation. The Portland limestones have been much in demand for building purposes; at Portland the ” Top Roach,” the ” Whit Bed” or top freestone, and the ” Best Bed” (or Base Bed) are the best known. In the Vale of Wardour the lower Portlandian has been largely quarried; the stone from this neighbourhood is often described as Wardour, Tisbury or Chilmark stone. Swindon stone is a calcareous sandstone that occurs in the sands of the Upper Portland beds near Swindon.

Rocks of Portlandian age are well developed on the continent of Europe, but the grouping of the strata is different in some respects from that adopted by English geologists. In France the ” Port- landian ” is usually taken to include the Purbeckian as well as the equivalents of the English Portland beds, and some authors, e.g. E. Renevier, have included more or less of the Kimeridgian in this division. The Portlandian of north-west Germany includes the Eimbeckhauser Plattenkalk and the Lower Portland Kalk. Oppel’s ” Tithonian ” (tithonic) division, embracing Upper Kimeridge beds, Portlandian and Purbeckian beds in the Alpine district, is now recognized as a deeper water deposit of this time with many points of resemblance to the Russian development to which the name ” Volgian ” has been applied by S. Nikitin. The Portlandian beds of Yorkshire are more nearly related to the Volgian phase than to the beds of the same age in the south of England. The term Bono- nian (= Bolonian) was suggested by J. F. Blake in 1881 for a part of the Portlandian series, from their occurrence at Boulogne (Bononia) where they are similar to the beds of Dorset. He limited the name Portlandian to the Purbeckian and Upper Portlandian (Portland stone), while he placed the Portland Sands and upper part of the Kimeridge Clay in his Bolonian division: this scheme has not been accepted in England. See Jurassic.

PORTLOCK, JOSEPH ELLISON (1794-1864), British geologist and soldier, the only son of Nathaniel Portlock, captain in the Royal Navy, was born at Gosport on the 30th of September 1794. Educated at the Royal Military Academy he entered the Royal Engineers in 1813. In 1814 he took part in the frontier operations in Canada. In 1824 he was selected by Colonel (afterwards Major-General) T. F. Colby ˆ784-1852) to take part in Ordnance Survey of Ireland. He was engaged for several years in the trigonometrical branch, and subse- quently compiled information on the physical aspects, geology and economic products of Ireland. In 1837 he formed at Belfast a geological and statistical office, a museum for geological and

zoological specimens, and a laboratory for the examina- tion of soils. The work was then carried on by Portlock as

the geological branch of the Ordnance Survey of Ireland, and the chief results were embodied in his Report on the Geology oj the County of Londonderry and of parts of Tyrone and Fermanagh (1843), an elaborate and well-illustrated volume in which he was assisted by Thomas Oldham. After serving in Corfu and at Portsmouth he was, in 1849, appointed Commanding Royal Engineer at Cork, and from 1851-1856 he was Inspector of Studies at the Royal Military Academy, Woolwich. For a short time commanding officer at Dover, when the Council of Military Education was formed in 1857 he was selected as a member.

During these years of active service he contributed num- erous geological papers to the scientific societies of Dublin and to the British Association. He published in 1848 a useful treatise on geology in Weale's " Rudimentary Series" (3rd. ed., 1853). He was president of the geological section of the British Association at Belfast (1852), and of the Geological Society of London (1856-1858). He wrote a Memoir of the late Major- General Colby, with a Sketch of the Origin and Progress of the Trigonometrical Survey (reprinted in 1869 from Papers on Subjects connected with the Royal Engineers, vols, iii.v.). He also contributed several articles on military subjects to the 8th edition of the Encyclopaedia Britannica. He was elected a Fellow of the Royal Society in 1837. He died in Dublin on the 14th of February 1864.

PORT MAHON, or Mahon (Spanish Puerto Mahon), the capital and principal seaport of Minorca, in the . Spanish province of the Balearic Islands. Pop. (1900), 17,144. Port Mahon is situated on the east coast, at the head of a deep inlet which extends inland for 3! m. It is an important harbour (see Minorca). The city occupies a conspicuous hill, and presents a fine appearance from the sea; it is solidly built of excellent stone. Many of the houses date from the British occupation, which has also left curious traces in the customs and speech of the people. The King's Island (Isla del Rey, so called as the landing-place of Alphonso III. of Aragon in 1287) contains a hospital built by the admiral of the British squadron in 1722; farther south-east on the shore is the village of Villa Carlos or George Town, with ruins of extensive British barracks; and at the mouth of the port, on the same side, are the remains of Forte San Felipe, originally erected by Charles V. and twice the scene of the capitulation of British troops. Oppo- site San Felipe is the easily defended peninsula of La Mola (256 ft. high), which is occupied by extensive Spanish fortifi- cations. Mahon is one of the principal quarantine stations of Spain; the lazaretto, erected

between 1798 and 1803, stands on a long tongue of land, separated from La Mola by the inlet of Cala Taulera. The principal modern buildings are the military and naval hospitals, the theatre, museum, library and schools. There are an arsenal and extensive quays. From its position on the route of vessels plying between Algeria and the south of France, the harbour is much frequented by French cargo-steamers; it is also a Spanish naval station. The principal exports are grain, live stock and fruit; cement, coal, iron, machinery, flour, raw cotton and hides are imported. Shoes and cotton and woollen goods are manufactured. About 250 vessels enter the port every year, and the annual value of the foreign trade is, approximately, £200,000 to £250,000.

Mahon is the ancient Portus Magonis, which under the Romans was a municipium (Mun. flavium magontanum) , probably including the whole island under its authority. As the name suggests, it had previously been a Carthaginian settlement. The Moors, who occupied Minorca in the 8th century, were expelled by James I. of Aragon in 1232. Khair-ed-Din Barbarossa besieged and captured the city in 1535; and in 1558 it was sacked by a corsair called Piali. The British, who under James Stanhope, afterwards Earl Stanhope, seized the island in 1708, made Mahon a flourishing city, and in 1718 declared it a free port. In 1756 it fell into the hands of the French through the failure of Admiral Byng to relieve the garrison of St Philip's (San Felipe). Restored to the British in 1762, it was in 1782 heroically but unsuccessfully defended by General Murray. In 1802 it was finally ceded to Spain by the treaty of Amiens.

PORTMANTEAU, a leather case or trunk for carrying articles of personal use when travelling. The typical portmanteau of

the present day has two compartments which, fastened at the back by hinges, close together like a book. The original port- manteau (adopted from Fr. portemanteau, porter, to carry, manteau, cloak, mantle) was a flexible round leather case to hold a cloak or other garment and of such a shape as could conveni- ently be carried on a rider's saddle. In French the word was also applied to a bracket or set of pegs on which to hang clothes. C. L. Dodgson (" Lewis Carroll ") in Through the Looking Glass (" The Song of the Jabberwock ") used the expression " port- manteau word " of an invented word composed of two words run together and supposed to convey humorously the

combined meaning: thus ” slithy ” conveys slimy and lithe; ” mimsy,” flimsy and miserable.

PORTO ALEGftE, a city and port of Brazil, capital of the state of Rio Grande do Sul, at the northern extremity of Lagoa dos Patos on the eastern shore of an estuary called Rio Guahyba, about 160 m. from the port of Rio Grande do Sul at the entrance to the lake. The population which contains a large foreign element, chiefly German and Italian, was returned as 73,574 by the census of 1900, including some outlying districts not within urban limits. The municipio (commune), which has an area of 931 sq. m., had a population of nearly 100,000* in- cluding a large number of prosperous colonists. The railway from Porto Alegre to Novo Hamburgo and Taquara (55 m.) affords an outlet for some of the older German colonies. The railway from Porto Alegre to Uruguayana is completed from Margem da Taquary to Cacequy, 232 m. Its starting point, Margem da Taquary, is about 80 m. from the city, with which it is connected by river steamers. An extension of the railway is projected from Margem da Taquary to Neustadt on the Novo Hamburgo line, and will give the city direct railway connexion with the principal cities of western and southern Rio Grande do Sul. The Rio Guahyba, which is not a river, was once called ” Viamao ” because its outline is roughly that of the human hand, the rivers entering the estuary at its head corresponding to the fingers. The lower channels of these rivers (the Gravaty, Sinos, Cahy, Jacuhy and Taquary) are all navigable and bring considerable trade to the port. Its foreign trade is limited to light-draught steamers able to cross the bar at the entrance to the lake.

The city occupies a tongue of land projecting into the estuary, and extends along its shores and back to a low wooded hill. Its site, as seen from the water, is attractive, though its larger part is an almost level plain. There are pleasant suburbs along the shore and farther inland (Floresta, Gloria, Moinhos de Vento, i.e. ” Windmills,” Navigantes and Partenon). The climate is sub- tropical, cool and bracing in winter but insufferably hot in summer. The mean annual temperature is slightly under 69 ° F., the average maximum being a little over 82 and the average minimum 59 . The annual rainfall is about 30J in. The city is regularly laid out with broad, straight, well-paved streets, in great part lined with shady trees. The waterside streets, however, follow the curve of the beach. There are several public squares and gardens, the more important being the Praga Harmoma, the Praga d’Alfandega, Pra<;a da Independencia and the Parque, where an exposition was held in 1901. The public water supply is drawn from a range of hills 6 m. distant and is considered good. Porto Alegre, like many Brazilian cities, is in a transition stage, and handsome new structures of French

and Italian styles rise from among the low, heavy and plain old buildings of Portuguese origin. Brick and broken stone are chiefly used in the walls, which are plastered out- side and tinted. Tiles are used for roofing, and on modern edifices stucco ornamentation is lavishly employed. The most noteworthy public buildings are the Cathedral (Porto Alegre being the see of a Roman Catholic bishop), the handsome church of Nossa Senhora das Dores, the municipal palace, school of engineering, government palace, legislatiye halls, school of medicine, athenaeum, normal school and public library and military barracks. One of the hos- pitals — that of Caridade — is the largest in the state. The city is the chief commercial centre of the state and has shipyards for the con- struction of river and lake vessels. It manufactures cotton fabrics, boots and shoes, iron safes and stoves, carriages, furniture, butter and cheese, macaroni, preserves, candles, soap and paper.

Porto Alegre was founded in 1743 by immigrants from the Azores and was at first known as Porto dos Cazaes. Owing to the occupation of the southern part of the captaincy by the Spaniards, Governor Jose Marcellino de Figuereido selected this village in 1770 as his official residence and gave to it the name it

now bears. It was made a villa in 1803, and in 1807, when Rio Grande do Sul was made a captaincy-general, the transfer of the capital from Rio Grande to Porto Alegre was officially recognized. In 1822 it was raised to the rank of a city, and in 1841, as a reward for its loyalty in revolutionary wars of that province, it was distinguished by the title of leal e valorosa (loyal and valorous). The first German immigrants to settle near Porto Alegre arrived in 1825, and much of its prosperity and commercial standing is due to the German element.

PORTOCARRERO, LUIS MANUEL FERNANDEZ DE (163 5-1 709), cardinal archbishop of Toledo, was a younger son of the marquis of Almenara and was born on the 8th of January 1635. He became dean of Toledo early, and was made cardinal on the 5th of August 1669. Till 1677 he lived at Rome as cardinal protector of the Spanish nation. In 1677 he was ap- pointed interim viceroy of Sicily, counsellor of state and arch- bishop of Toledo. He ceased to be viceroy of Sicily in 1678. As archbishop of Toledo he exerted himself to protect the clergy from the obligation to pay the excises or octroi duties known as “.the millions ” and thereby helped to perpetuate the financial embarrassments of the government. His position rather than any personal qualities enabled him to play an important part in a great crisis of European politics. The decrepit King Charles II. was childless, and the disposal of his inheritance became a question of great interest

to the European powers. Porto- carrero was induced to become a supporter of the French party, which desired that the crown should be left to one of the family of Louis XIV., and not to a member of the king's own family, the Habsburgs. The great authority of Portocarrero as cardinal and primate of Spain was used to persuade, or rather to terrify the unhappy king into making a will in favour of the duke of Anjou, Philip V. He acted as regent till the new king reached Spain and hoped to be powerful under his rule. But the king's French advisers were aware that Spain required a thorough financial and administrative reform. Portocarrero could not see, and indeed had not either the intelligence or the honesty to see, the necessity. He was incapable, obstinate and per- fectly selfish. The new rulers soon found that he (must be removed and he was ordered to return to his diocese. When in 1706 the Austrian party appeared likely to gain the upper hand, Portocarrero was led by spite and vexation to go over ta them. When fortune changed he returned to his allegiance to Philip V., and as the government was unwilling to offend the Church he escaped banishment. In 1709 when Louis XIV. made a pretence of withdrawing from the support of his grand- son, the cardinal made a great display of loyalty. He died on the 14th of September and by his orders the words Hie jacet pulvis, cinis, el nihil were put on his tomb.

See Lord Stanhope, History of the War of Succession in Spain (London, 1832).

PORTO FARINA, a town of Tunisia about 20 m. E. of Bizerta, on the Ghar-el-Mela, a lagoon, also known as the Lake of Porto Farina, at the mouth of the Mejerda (the ancient Bagradas). Porto Farina was the naval arsenal of the piratical beys of Tunis and was bombarded by the English under Admiral Blake in 1655. The lagoon has become very shallow in consequence of the silt brought down by the Mejerda. The town has ceased to be important, and its inhabitants have dwindled to about 1500. The ruins 10 m. to the south-west, near the village of Bu Shater, are identified with the ancient Utica (g.v.).

PORTO MAURIZIO, a city of Liguria, Italy, the capital of the province of Porto Maurizio, on the coast of the Ligurian Sea, 46 m. by rail E. of Nice and 70 m. S.W. of Genoa, 115 ft. above sea-level. Pop. (1901), 7207. It consists of a picturesque old town on the heights and a modern town of villas on the lower slopes. The principal church, designed by Gaetano Cantone, is a large structure of 1780 with a dome rebuilt in 1821. A few remains of the old city walls may be seen. About 2 m. north- east of Porto Maurizio is the town of Oneglia, with a fine church, S. Giovanni Battista, designed by Gaetano Amoretti, a hospital (1785) and a large prison. It suffered considerably from the

earthquake of 1887. Maurizio and Oneglia lie on the same b\

and bcih have small but safe harbours, both are frequented for sea-bathing, and both are embowered amid olive groves; and the district is famous for the quality of its oil. The two towns together form one commune, called imperia, which had a population of 15,459 in 1907.

Porto Maurizio appears as Partus Maurici in the Maritime Itiner- ary. After being subject to the marquises of Turin (nth century) and of Clavesana, it was sold by Boniface of Clavesana in 1288 to Genoa in return for a yearly payment; in 1354 it became the seat of the Genoese vicar of the western Riviera, and remained in the possession of the republic till it was merged in the kingdom of Sardinia. Oneglia, formerly situated inland at the place called Castelvecchio (old castle), has occupied its present site from about 935. The bishops of Albenga sold it in 1298 to the Dorias of Genoa, who in their turn disposed of it in 1576 to Emanuel Philibert of Savoy. In the wars of the house of Savoy Oneglia often changed hands. In 1614 and 1649 the Spaniards and in 1623 and 1672 the Genoese obtained possession; in 1692 it had to repulse an attack by a French squadron; in 1 744-1 745 it was again occupied by the Spaniards, and in 1792 bombarded and burned by the French. Pellegrino Amoretti, assistant secretary to Charles V., and Andrea Doria, the famous admiral, were natives of Oneglia-

See G. Donaudi, Storia di Porto Maurizio (1889).

PORTO NOVO, a town of British India, on the Coromandel coast in the South Arcot district of Madras. Pop. (1901), 13,712. The English began trading here in 1683, when they found both the Danes and the Portuguese already established. The place is chiefly famous for the battle in July 1781, in which Sir Eyre Coote with 8000 men defeated Hyder Ali with 60,000 and saved the Madras presidency. In 1830 an attempt, finally unsuccessful mainly owing to the lack of fuel, was made to smelt iron from the ores found in the vicinity.

PORTO-RICHE, GEORGES DE (1849-), French dramatist, was born at Bordeaux. When he was twenty his pieces in verse began to be produced at the Parisian theatres; he also wrote some books of verse which met with a favourable reception, but these early works were not reprinted. In 1898 he published The&tre d’amour, which contained four of his best pieces, La Chance de Franqoise, L’Infidele,

Amour euse, Le Passe. The title given to this collection indicates the difference between the plays of Porto-Riche and the political or sociological pieces of many of his contemporaries. In Germaine, the passionate and exacting heroine of Amoureuse, Mme Rejane found one of her best parts. In Les Malefildtres (Odeon, 1904), also a drama of passion, the characters are drawn from the working classes.

PORTO RICO, or Puerto Rico (" Rich Harbour "), an island of the United States of America, the most easterly and the fourth in size of the Greater Antilles, situated between 17 50′ and 18 30′ N., and between 65 30′ and 67° 15′ W., about 70 m. E. of Haiti, and 500 m. E. by S. of Cuba. It is about 100 m. long from east to west, 40 m. wide near the west end, and somewhat narrower towards the east end, and has an area of 3435 sq. m.

Physical Features. — A range of mountains, varying in height from 2000 ft. to about 3750 ft. on El Yunque Peak in the north- east corner, traverses the island from west to east and descends abruptly to the sea at each end. The south slope rises precipi- tously from the foothills; the north slope is more gradual, but it is much broken by rugged spurs and deep gorges. On the north there is little coastal plain except at the mouths of rivers, but on the south coast there is a plain of considerable extent broken only by the remains oi eroded foothills. The water parting is about twice as far from the north coast as it is from the south coast, the rain- fall is greater on the north slope, and the principal rivers — Rio Loiza, Rio de la Plata, Rio Manati and Rio Arecibo are on the north side. There are eight other rivers on the same side, seventeen on the south side, six at the east end and four at the west end, besides more than 1200 smaller streams, and the deep valleys cut by the streams add to the broken surface of the country. None of the rivers is navigable for more than a mile or two from the coast. The coast-line has few indentations sufficient to afford safe harbour- age. Under the same jurisdiction as Porto Rico are the fertile island of Vieques (21 m. long and 6 m. wide) and the smaller and nearly barren island of Culebra off the east coast, the island of Mona, covered with deposits of guano, off the west coast, and numerous islets.

Fauna. — The native fauna is scanty. The agouti and the armadillo are practically extinct and the only other mammals are ground squirrels, rats, a few other small rodents, and some bats. A huge land-turtle is peculiar to the island. Reptiles are scarce,

and venomous reptiles unknown. Noxious insects are less numerous than is usual in tropical countries. There are no large game birds, but

song birds and doves are numerous on the mountains, and flamingoes and other water-birds frequent the coast. There are a few species of fresh-water fish, but food-fishes are scarce both in the rivers and along the coast.

Flora. — The flora is beautiful and varied. The more rugged districts and higher elevations are clad with such tropical forest trees as ebony, Spanish cedar, sandalwood, rosewood and mahogany. There are several species of palms, flowering trees, trees with beautifully coloured foliage, tree ferns, resinous trees and trees bearing tropical fruits. There are about thirty species of medicinal plants, twelve used for condiments, and twelve for dyes and tanning. In the semi-arid districts on the south slope of the mountains the flora consists chiefly of dry grasses, acacias, yuccas and cactuses.

Climate. — The climate is somewhat more healthy than that of the other West Indies. The temperature is moderated by the north-east trade winds, which, somewhat modified by local con- ditions, blow throughout the year, briskly during the day and more mildly during the night. It rarely reaches loo” F. or falls below 50 , and the mean annual temperature is about 8o° (75-2° in January, 80-4° in August). The mean daily variation at San Juan is 11-5°; on the mountains the mean daily variation is 23 . The average annual rainfall on the north-east coast, at the foot of

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El Yunque Mountain, is 120 in. or more, while other districts are semi-arid or subject to severe droughts. At San Juan the average annual rainfall is about 55 in. ; nearly two-thirds of this falls from June to November inclusive. Most of the rain is in showers, frequently heavy; and on the windward slope showers are an almost daily occurrence. The island is visited occasionally by hurricanes.

Soil. — Close to the coast the soil is for the most part a coral sand. Farther inland in the level districts and river bottoms it varies from a sandy to a clay loam containing much alluvium. On the foothills and in the less rugged mountain districts there is a thin but rich clay soil derived from coral limestone.

Industries. — A little more than one-fourth of the land is under cultivation and in 1899 more than three-fifths of the working population were engaged in agriculture. There were over 39,000 farms, nearly all of them small, and the average number of acres cultivated on each was not more than fifteen. Sugar on the lowlands, coffee on the upper, and tobacco on the lower mountain slopes are the principal crops. In 1909 there were 185,927 acres of sugar, yielding 244,257 tons for exportation, and valued at $18,432,446. The coffee plantations were greatly injured by a severe hurricane which visited the island on the 8th of August 1899, but the yield for export increased from 12,157,240 lb in 1901 to 38,756,750 lb, valued at $4,693,004, in 1907. The acreage, however, decreased from 178,155 acres in 1906 to 155,778 acres in 1909, and in the latter year the crop fell to 28,489,263 lb. Java coffee has been grown with success in Porto Rico. Tobacco of a superior quality is grown extensively on the lower northern slopes and much tobacco is now grown under cloth. The total acreage of tobacco increased from 12,871 acres in 1906 to 27,596 acres in 1909; the total value of the exported tobacco products increased from $681,642 in 1901 to $5,634,130 in 1909. Cotton, Indian corn, sweet potatoes, yams and rice are small crops. The culture of citrus fruits, principally oranges and grape-fruit, and of pineapples and coco-nuts has been rapidly extended. About 13,000 head of cattle were exported annually from 1901 to 1905, but much of the best grazing land has since been devoted to the cultivation of sugar-cane. A project for irrigating the district south of the mountains between Ponce and Patillas was adopted by the Porto Rican government in 1909. The Federal government has an agricultural experiment station at Mayaguez.

The mineral resources are very limited. Brick clay and lime- stone are abundant, and there are on the south coast a sand marl rich in phosphates and productive salt deposits. Iron ore, lignite, copper, mercury, molybdenite, nickel, platinum and other minerals have been found, but the quantity of each is too small, or the quality too poor, for them to be of commercial value. There are important mineral and thermal springs in various parts of the island.

The only manufacturing industries of much importance are the preparation of sugar, coffee and tobacco for market, and the manufacture of cigars, cigarettes, straw hats, soap, matches, vermicelli, sash, doors, ice, distilled liquors and some machinery.

Transport facilities are inadequate. The American Railroad of Porto Rico, about 190 m. long, connects the principal cities along the north and west coasts and those as far east as Ponce on the south coast; a railway between Ponce and Guayama, farther east, was virtually completed in 1910, and the Vega Alta railroad connects Vega Alta with Dorado on the north coast; but there are no inland railways and most of the products of the interior are carried to the coast in carts drawn by bullocks or on the backs of mules. The mileage of wagon roads was increased from about 170 m. in 1898 to 612 m. in 1909. The principal har- bours are San Juan on the north and Ponce on the south coast; the former is accessible to vessels of about 30 ft. draught, and the latter has a natural channel which admits vessels of 25 ft. draught. Two lines of steamboats afford regular communication between San Juan and New York; one of them runs to Venezuelan ports and one to New Orleans ; and there are lines to Cuba and direct to Spain.

The commerce of Porto Rico is principally with the United States. The value of its exports to the United States increased from $5,581,288 in the fiscal year ending on the 30th of June 1901 to $26,998,542 in 1909, and the value of its imports from the United States increased during this period from $7,413,502 to $25,163,678. In the meantime the value of its exports to foreign countries increased only from $3,002,679 to $4,565,598, and the value of its imports from foreign countries only from $1,952,728 to $3,054,318-

Population. — The population increased from 583,308 in i860 to 798,565 in 1887, and to 953,243, or 277-5 per sq. m., in 1899. Of the total population in 1899, 589,426, or 61 -8% were whites, 304,352 were of mixed blood, 59,390 were negroes and 75 were Chinese. In 1910 the census returned the population as 1,118,012. The proportion of whites is greater at the west end than at the east end, greater on the

north side than on the south side, and greater in the interior than along the coast. Only 13,872, or about 1-5% of the total population of 1899, were foreign-born, and of these more than one-half were born in Spain. The married portion of the population was only 16.6% in 1899. The principal towns, with the population of each in 1910, are: San Juan, 48,716; Ponce, 35,027; Mayaguez, 16,591 ; Arecibo, 9612. The Roman Catholic is the predominant church and the bishopric of Porto Rico (151 2) is one of the oldest in the New World.

Government. — The constitution of Porto Rico is contained in an act of the Congress of the United States (the Foraker Act) which came into operation in May 1900. The governor is appointed by the president of the United States with the advice and consent of the Senate for a term of four years, and associated with the governor is an executive council consisting of the secretary, treasurer, auditor, attorney-general, commissioner of the interior, commissioner of education, and five other members, all appointed in the same manner and for the same term as the governor. The constitution requires that at least five of the eleven members of the Executive Council shall be native inhabitants of Porto Rico; in practice the six members who are also heads of the administrative departments have been Americans while the other five have been Porto Ricans. The insular government, however, has created a seventh administra- tive department — that of health, charities and corrections — and requires that the head of this shall be chosen by the governor from among the five members of the Executive Council who are not heads of the other departments.

The Executive Council constitutes one branch of the legislative assembly; the House of Delegates the other. The House of Dele- gates consists of 35 members elected biennially, five from each of seven districts. The right to determine the electoral franchise is vested in the legislature itself and that body has conferred it upon practically all adult males. The governor has the right to veto any bill, and for passing a bill over his veto an affirmative vote

of two-thirds of the members of each house is required. All laws enacted by the insular legislature must also be submitted to the Congress of the United States, which reserves the right to annul them. Railway, street railway, telegraph and telephone franchises can be granted only by the Executive Council with the approval of the governor, and none can be operative until it has been approved by the President of the United States. The governor and Executive Council have the exclusive right to grant all other franchises of a public or quasi-public nature and Congress reserves the right to annul or modify any such grant. ,

The administration of justice is vested in a United States district court and a supreme court, district courts, municipal courts and justice of the peace courts of Porto Rico. The judge of the United States district court and the chief justice and associate justices of the supreme court are appointed by the President with the consent of the Senate, and the judges of the district courts by the governor with the consent of the Executive Council.

The principal local government is that of the municipalities or municipal districts, but for the Spanish municipal government the insular legislature has substituted one resembling that of small towns in the United States, and it has reduced the number of dis- tricts from 66 to 47. Each municipal district elects biennially a mayor and a municipal council, the membership of which varies from five to nine according to the population of the district. The mayor appoints practically all municipal employes and may veto any ordinance of the council; his veto, however, may be overridden by two-thirds of the council. The police force of each municipality, or rather of each of 66 police districts, is maintained and controlled by the insular government; justice in each municipality is also administered by the insular government; the building, maintenance and repair of public roads are under the management of a board of three road supervisors in each of the seven insular election districts; and matters pertaining to education are for the most part under the insular commissioner of education and a school board of three members elected biennially in each municipality; nearly all other local affairs are within the jurisdiction ef the mayor and municipal council.

Education. — In 1899 more than three-fourths of the inhabitants ten years of age or over were unable to read or write, and when in the following year the present system of government was estab- lished large powers were given to the commissioner of education. He controls the expenditure of public money for school purposes, the examination and the appointment of teachers, whose nomina- tions by the municipal school boards are referred to the commis- sioner. The school system comprises preparatory schools, rural schools, graded schools, three high schools and the university of Porto Rico. The university at Rio Piedras was established by act of the insular legislature in 1903, but in 1910 only two depart- ments had been organized — the insular normal school and the department of agriculture. Numerous scholarships have been established at government expense in Porto Rican schools and in colleges or universities of the United States. The average daily attendance in the public schools increased from 47,277 in 1906- 1907 to 74,522 in 1908-1909. Each municipality is required to pay to its school board

25% of its receipts from the general property tax.

Finance. — Trade between Porto Rico and the United States is free, but upon imports to Porto Rico from foreign countries the Federal government collects custom duties and pays the net proceeds to the insular government. Other principal sources of income are excise taxes, a general property tax, an inheritance tax. and a tax on insurance premiums. For the fiscal year ending June 1909 the net income of the insular government was $3,180,111.75 and the net bonded indebtedness was $3,759,231 -22.

History. — On his second voyage Columbus sighted the island, to which he gave the name San Juan Bautista, and remained in its vicinity from the 17th to the 22nd of November 1493. In 1508 Nicolas de Ovando, governor of Hispaniola (Haiti) rewarded the services of Juan Ponce de Leon, one of Columbus's companions in 1493, by permitting him to explore the island, then called by the natives " Borinquen," and search for its reputed deposits of gold. Ponce's hospitable reception by the native chief, Aquebana or Guaybana, and his fairly profitable search for the precious metal led King Ferdinand in 1 509 to give him an appointment as temporary governor of the island, where his companions had already established the settlement of Caparra (Pueblo Viejo, near the present San Juan). In 15 10 the king through Ovando's influence made this commission permanent. Meanwhile Ferdinand had also restored to Diego Columbus, son of the discoverer, the privileges of his father, including the control of the islands of Haiti and Porto Rico. The new admiral removed Ponce and appointed Juan Cer6n to administer the affairs of Porto Rico. The quarrels between these two leaders disturbed the affairs of the island for the next

two years, but in the end Ponce was forced to yield the political control to the representatives of Columbus. While Ponce was exploring Florida in 1513 the conquerors of Porto Rico had established their domination in the upper western portion of the island by a series of settlements. The ruthless methods by which the Spaniards forced the natives to labour for them caused a change in the attitude of the erstwhile friendly Borinquenos. Both Ponce and his rivals had introduced the system of repar- timientos established by Columbus in Haiti. A preliminary distribution of 1060 natives in 1500-1510 was the direct pre- cursor of the rebellion of the natives in 1511. For a

time the Borinquenos, aided by Caribs from the neighbouring islands, threatened to destroy all vestiges of white occupation in Porto Rico, but in the end the Spaniards prevailed. Immediately after this rebellion a second distribution of more than 4000 natives foreshadowed the rapid disappearance of those un- fortunates, despite the well-meaning regulations of the Council of the Indies. For some decades the inevitable extermination was postponed by the fact that the Spaniards were not numerous enough to occupy the southern and eastern portions of the island. Here a remnant of the Borinquenos, assisted by the Caribs, maintained a severe struggle with the conquerors, but in the end their Indian allies were subdued by English and French corsairs, and the unfortunate natives of Porto Rico were left alone to experience the full effect of forced labour, disastrous hurricanes, natural plagues and new diseases introduced by the conquerors. By 1520 philanthropic churchmen directed their attention to the miserable conditions of the natives; but remedial legislation was largely nullified by the rapacity of subordinate officials, and before the end of the 16th century the natives disappeared as a distinct race.

To replace the natives as a labour element and also to preserve them from extermination African slavery was early permitted, and by 1530 there were over 1500 negro slaves in Porto Rico. Although the extravagant prices paid at first almost ruined the planters, the traffic continued to flourish in hands of foreign concessionaires until 1820, when through English influence it was abandoned. At this period negroes were an important element of the population, but by no means the most numerous one.

At no period of its history has Porto Rico enjoyed great prosperity. Besides the causes already indicated the evil character of many of the white settlers conspired to retard its development. In 1515 its European population may have been 400. Until 1782 the island was divided into the eastern district of Puerto Rico and the western one of San German. In 1 5 13 the arrival of its first bishop, who later also exercised the function of general inquisitor, added one more to the dis- cordant elements ruling the island. About 1520 Caparra was abandoned for a more healthy site, and the city of San Juan de Puerto Rico was founded as the capital of the eastern district. In time Puerto Rico became the name of the whole island. In 1536 legislation for changing the method of general government and regulating common pasturages and public property caused extreme dissatisfaction, but for many years thereafter the form of control alternated between alcaldes selected by the inhabitants and annual governors appointed by the Council of the Indies.

To the difficulties caused by disaster, depopulation and mal-administration there was added the danger of foreign invasion when war broke out in Europe between Francis I. of France and the emperor Charles V. In 1528 San German was plun- dered by a French corsair and twenty-six years later utterly destroyed. In 1533 the fortaleza, now the governor's palace, was begun at San Juan, and in 1539-1584 Morro Castle was erected at the entrance of the harbour. Possibly these slight fortifications preserved the capital from the destruction which overwhelmed all the other settlements; but these measures for defence were due more to the loyalty of the inhabitants than to the efforts of the home government, which at this time remained indifferent to appeals for help from the island.

In 1595 San Juan was unsuccessfully attacked by an English fleet under Sir Francis Drake; two years later another English force, led by Sir George Cumberland, occupied the city for some weeks. The city was attacked in 1625 by a Dutch fleet, which was easily repulsed. The buccaneers or filibusters, who during the 17 th century were drawn to the West Indies by the prospect of plundering the possessions of decadent Spain, often invaded Porto Rico, but that island escaped the conquest which Haiti experienced. The English attacked the island in 1678, 1702, 1703 and 1743; and in 1797 an English force attempted to reduce San Juan, but was repulsed by the strong fortifications vigorously manned by resident volunteers. After this event the city was permitted to add the words " very noble and very loyal " to its coat of arms.

Porto Rico was comparatively unaffected by the great Spanish-American uprising of the early 19th century. During the struggle of Spain against Napoleon, the island, in common with the other American dominions, was represented in the Spanish Cortes and had its first legislative assembly. Trade with the United States was permitted in 181 5, although only in Spanish ships. The island suffered from the reactionary policy of Ferdinand VII., but the few sporadic attempts at revolution between 1815 and 1820 were readily suppressed. Columbian insurgents made ineffectual attempts to invade the island during 1819-29. Governor Miguel de la Torre, who ruled the island with vice-regal powers during the second period of Ferdinand's absolutism, sternly repressed all attempts at liberalism, and made the island the resort for loyal refugees from the Spanish mainland. This policy, coupled with certain administrative and revenue reforms, and some private attempts in behalf of public education, made the last seven years of his rule, from 1827 to 1834, the most prosperous in the Spanish regime. The unsettled political condition of Spain during the next forty years was reflected in the

disturbed political conditions of Porto Rico and Cuba. The suffrage was restricted, the Press was placed under a strict censorship, and the right of public assemblage was unknown. Economically the island in 1868 was in a much worse condition than thirty years before. The Revolu- tion of 1868 in Spain promised such salutary changes for the Antilles as the introduction of political parties, the restoration of representation in the Spanish Cortes, and the enfranchise- ment of the slaves; but the imprudent " Insurrection of Lares," and other outbreaks of 1867-68, delayed these anticipated reforms. The reactionaries feared separation from the mother country. Under the short-lived republican government in Spain Porto Rico was in 1870-1874 a province with a provincial deputation, and in 1873 slavery was abolished. After the restoration of the monarchy under Alphonso XII. there was some improvement in the commerce of the island, but politically it displayed all the evils of an obsolete system of administration disturbed by a premature liberalism. In 1877 the provincial deputation was re-established, but it was not untili895 that the home government attempted, far too late, to enact a series of adequate reform measures, and in November 1897 followed this by a grant of autonomy.

When in April 1898 war broke out between Spain and the United States the former strongly garrisoned the island, but the fortifications of the capital were largely of the massive stone construction that had repelled Abercrombie a century before, most of the artillery was of an obsolete pattern and the few cruisers in the harbour were antiquated in type. The American invasion of the island occurred in July. On the 25th of that month, while a few vessels made a demonstration before San Juan, the main American fleet was landing some 3400 troops under General Nelson A. Miles at Guanica, a small town on the southern shore, some 15 m. west of Ponce. Three days later the latter town surrendered, amid demonstrations of joy on the part of the inhabitants. The people seemed to regard the American flag as the harbinger of a new era. General Miles's policy in affording employment for the natives likewise served to make the new American regime acceptable.

Meanwhile the Spanish governor-general, Manuel Macias y

Casado, had ordered the forces under his command in the south- ern part of the island to fall back towards the ridge of mountains

intersecting it from east to west, just north of the town of Coamo. Reinforcements were also brought up from San Juan and preparations made to resist an attack by the Americans, despite the current rumours of approaching peace. On their part the American forces, now numbering about 10,000 men, prepared to advance by separate routes across the island in four columns. Guayama, Mayagtiezand Coamo were occupied ; one portion of the army was within 20 m. of the northern coast and another had advanced along the main military road nearly to Aibonito, when the signing of the peace protocol on the 12th of August caused an immediate suspension of hostilities. The advance of the Americans had been rapid and decisive, with a small loss of life — three killed and forty wounded — due to the skill with which the military manoeuvres were planned and executed and the cordial welcome given the invaders by the inhabitants. By November the Spaniards had evacuated the greater part of the island; after Captain General Macias em- barked for Spain, General Ricardo Ortega was governor from the 1 6th to the 18th of October, when the island was turned over to the American forces. In the work of policing the island, in the accompanying tasks of sanitation, construction of high- ways and other public works, accounting for the expenditure of public funds, and in establishing a system of public education, the military control, which under the successive direction of Generals John R. Brooke, Guy V. Henry and George W. Davis, lasted until the 1st of May 1900, proved most effective in bridg- ing over the period of transfer from the repressive control of Spain to the semi-paternal system under the American civil government. But it was hardly adapted to teach a people utterly without political experience the essential elements of self-government. To meet this problem the Congress of the United States passed the ” Foraker Act, ” under which civil government was instituted, and which, with certain modifica- tions is still in force (see Administration). Under this act the American element has exercised the controlling power, and this has proved distasteful to certain Porto Rican politicians.

On the 8th of August 1899 the island was visited by the most destructive cyclone in its history, causing a loss of about 3500 lives and a property damage amounting to 36,000,000 pesos, the coffee industry suffering most. This calamity afforded the American people an opportunity to display their generosity toward their new colony. Charles H. Allen became the first civil governor in May 1900; he was succeeded in August 1901 by William H. Hunt, who served until July 1904; Beekman Winthrop was governor in 1904-1907 and Regis H. Post from April 1907 until November 1909, when he was succeeded by George R. Colton. The island now has free trade with the United

States, and receives into its general revenue fund all customs duties and internal taxes collected in the island. Its political leaders in the House of Delegates are restive under the control exercised by the Executive Council, but an attempt to hold up necessary appropriations resulted in the passage in July 1909 of an act continuing the appropriations of the previous year, whenever for any cause the lower house fails to pass the necessary financial legislation. In 1910 the coffee industry had not yet recovered from the effect of the cyclone of 1899 and the unfortunate mortgage system that prevailed under the Spanish regime. The fact that its product is shut out of its natural markets, without gaining that of the United States, is also a great handicap. The civic status of the people is still unsettled, but there has been under American rule a notable advance in the well-being of the island.

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1903). R. H. Davis, The Cuban and Porto Rican Campaigns (New York, 1898), is a sketch of the invasion of the island in 1898. L. S. Rowe, The United States and Porto Rico (ibid., 1900) treats clearly and briefly of the problems arising from American control, and a like characterization may be made of W. F. Willoughby, Territories and Dependencies of the United States (New York, 1905). Van Middeldyk gives a brief bibliography of historical works, and a more extensive list is given in General George W. Davis's Report on the Military Government of Porto Rico. See also Annual Reports of the Governor of Porto Rico (Washington, 1901 sqq.); H. M. Wilson, " Porto Rico: Its Topography and Aspects," in the Bulletin Amer. Geogr. Soc. New York, vol. xxxii. (New York, 1900); W. A. Alexander, "Porto Rico: Its Climate and Resources," in the same, vol. xxxiv. (ibid., 1902); Report on the Census of Porto Rico (Washington, 1900); W. F. Willoughby, Insular and Municipal Finances in Porto Rico for the Fiscal Year 1902-1903, issued by the Bureau of the United States Census (ibid., 1905); R. T. Hill, Cuba and Porto Rico (New York, 1898).

PORTO TORRES (anc. Tunis Libisonis, q.v.), a seaport on the north coast of Sardinia, 12 J m. N.W. of Sassari by rail. Pop. (1901), 3762

(town); 4225 (commune). It is only 10 ft. above sea-level, and is malarious, but is a seaport of some importance, having regular steam communication with Ajaccio, Leghorn and Cagliari, and with the north and west coasts of Sardinia. The church of S. Gavino, formerly the cathedral, probably dates from the nth century. It is a Romanesque basilica with a nave and two aisles, divided by ancient columns; at each end of the nave is an apse. It has a 14th-century portal and two smaller doors at the sides added later in the Aragonese style. See D. Scano, Storia .dell' arte in Sardegna dal XI. al XIV. secolo (Cagliari-Sassari, 1907), 91 sqq. To the N.N.W. is the island of Asmara, the principal quarantine station of Italy. Porto Torres was the seat of the giudici of the north-west portion of the island (the district was called Torres or Logudoro) ; it was plundered by the Genoese in 1166, but remained the seat of the giudici until 1272, when it was divided between various Genoese families, the Doria, Malaspina, &c, and the giudici of Arborea. It was also the seat of a bishopric until 1441, when the see was transferred to Sassari, Porto Torres being practically deserted, owing to its unhealthiness. It did not become an independent commune again until 1842.

PORTO VENERE (anc. Portus Veneris), a town and summer resort of Liguria, Italy, in the province of Genoa, at the southern extremity of the peninsula which protects the Gulf of Spezia on the west, 7 m. S. of Spezia by road. Pop. (1901), 1553 (town); 5754 (commune). The fortress and walls with which it was provided by the Genoese in the 9th or 10th century have been destroyed for military reasons. The restored church of St Peter, of black and white marble (1118; destroyed by the Aragonese in 1494), is reputed to occupy the site of a temple of Venus. The parish church dates from 1098. Yellow- veined black marble, known as Portoro, and building-stone are quarried here and in the fortified island of Palmaria to the east of Portovenere. In the Grotta dei Colombi objects of the Palaeolithic age have been found.

PORT PHILLIP, the harbour of Melbourne, Victoria, Aus- tralia. An almost circular, landlocked sheet of water, it is 31 m. long, 20 m. at its widest, with an area of 800 sq. m. A narrow channel flanked by bold cliffs forms its entrance, and when the tide recedes through it a strong current is encountered outside. The broken and somewhat dangerous sea thus caused is called " the Rip. " Within the port on the eastern side are suburbs of Melbourne, such as Sorrento, Mornington, Frankston, Carrum, Mordialloc, Redcliff, Brighton and St Kilda. The wharves of Port Melbourne and Williamstown stand at the head of the port on an arm known as Hobson's Bay. On the western side the port of Geelong and the port and watering-place of Queens- cliff are the

only towns of importance. Port Phillip is well fortified with strong batteries at its entrance. The harbour was discovered in 1802 by Lieut. Murray, who named it in honour of Captain Phillip, first governor of New South Wales. The colony of Victoria was originally called the district of Port Phillip.

PORT PIRIE, a town of Victoria county, South Australia, on Gerjnein Bay, an arm of Spencer Gulf, i68f m. by rail N. by W.

of Adelaide. It is a prosperous and well-equipped port, from which enormous quantities of wheat are annually shipped. Pop. (iooi), 7983.

PORTRAITURE. The earliest attempts at individual por- traiture (see also Painting) are found in the eidolon and mummy-cases of the ancient Egyptians; but their painting never went beyond conventional representation — mere outlines filled in with a flat tint of colour. In Greece portraiture probably had its origin in skiagraphy or shadow-painting. The story of the Greek maiden tracing the shadow of her departing lover on the wall points to this. The art developed rapidly. In 46,3 B.C., Polygnotus, one of the first Greek painters of distinc- tion, introduced individual portraiture in the decoration of public buildings, and Apelles nearly a century later showed so much genius in rendering character and expression, that Alexander the Great appointed him “portrait painter in ordinary,” and issued an edict forbidding any one else to produce pictorial representations of his majesty. Similar edicts were issued in favour of the sculptor Lysippus and Pyrgoteles the gem en- graver. No works of the Greek painters survive, but the fate of two portraits by Apelles, which were in the possession of the emperor Claudius (a.d. 41-54), is known, the heads having been painted out to make room for the features of the divine Augustus!

After the time of Alexander (300 B.C.) Greek art rapidly deteriorated. There is, perhaps, nothing in the history of human intelligence to compare with the dazzling swiftness of its development or the rapidity of its decline. War was followed by pillage and devastation, and victorious Roman generals, mere depredators and plunderers, crowded Rome with the stolen treasures of Greece, with the result that Greek art and Greek influence soon made themselves felt in. the imperial city, and for generations its artists were almost exclusively Greeks, chiefly portrait painters and decorators. The Romans pos- sessed no

innate aptitude for art, and rather despised it as a pursuit little becoming the dignity of a citizen. Although lack- ing in appreciation of the higher conditions of art, they had from early times decorated their atria with effigies — originally wax moulds — of the countenances of their ancestors. These primitive ” wax-works ” ultimately developed into portrait busts, often vivid and faithful, the only branch of art in which Rome achieved excellence.

With the invasion of the Northern barbarians and the fall of the empire Graeco-Roman art ended. In the following centuries Christianity gradually became the dominant religion, but its ascetic temper could not find expression in the old artistic forms. Instead of joy in the ideals of bodily perfection, came a loathing of the body and its beauty, and artists were classed among ” persons of iniquitous occupations. ” Before the 5th century these prejudices had relaxed, and images and pictures again came into general favour for religious uses. In the 8th and 9th centuries, the iconoclasts commenced their systematic destruction, and it was not till the Renaissance in the 13th century that art began again to live. The great revival brought with it a closer observation of the facts of nature and a growing sense of beauty, and the works of Cimabue and Giotto prepared the way for those of Benozzo Gozzoli, Ghirlandaio and the long line of masters who raised Italian art to such a height in the 15th and 16th centuries. Although the works of the early painters of the Renaissance were mostly devoted to the expres- sion of the dogmas of the Church, the growing love and study of nature led them, as opportunity afforded, to introduce portraits of living contemporaries into their sacred pictures. Gozzoli (1420-1498) and Ghirlandaio (1449-1494) began the practice, followed by nearly all the old and great painters, of introducing portraiture into their works; Ghirlandaio especially filling some of his great fresco compositions with the forms and features of the living men and women of Florence, members of the Torna- buoni, Medici and other great families. Acuteness of observa- tion was innate in the race. By degrees it manifested itself in a marvellous subtlety in the rendering of individual character, in the portrayal of individual men and women, and a school of

portraiture was developed of which Titian became the crowning glory. This great Venetian painter, by universal consent reckoned one of the masters of portraiture, has handed down to us the features of many of the greatest historical and literary personages of his time — emperor, pope, king, doge — all sat by turn to him and loaded him with honours. The names of Bellini, Raffaelle, Tintoret, Verdriese and Moroni of Bergamo occur among those of the great Italian portrait painters of the 15th and 16th centuries. The last-named, some of

whose finest works are now in England, was highly praised by Titian.

A love of ugliness characterizes the artists of the early German and Flemish schools, and most of the portraits produced by them previous to Holbein's time suffer from this cause. Schon- gauer, Diirer and Lucas Cranach are never agreeable or pleasant, however interesting in other respects. Diirer, the typical German artist, the dreamer of dreams, the theorist, the thinker, the writer, was less fitted by nature for a portrait painter than Holbein, who, with a keen sense of nature's subtle beauty, was a far greater painter although a less powerful personality. He produced many fine works in other branches, but it is as a portrait painter that Holbein is chiefly known, and his highest claims to fame will rest on his marvellous achievements in that branch of art. He first came to England in 1526, bringing with him letters of introduction from Erasmus. Sir Thomas More received him as his guest, and during his stay he painted More's and Archbishop Warham's portraits. In 1532 he was again in London, where till his death in 1543 he spent much of his time. He was largely employed by the German merchants of the Steelyard and many Englishmen of note, and afterwards by Henry VIII., by whom he was taken into permanent service with a pension. As a portrait painter Holbein is remarkable not only for his keen insight into the character of his sitters, but for the beauty and delicacy of his drawing. As colourist he may be judged by an admirable example of his work, " The Ambas- sadors," in the National Gallery in London. Many of his drawings appear to have been made as preliminary studies for his portraits.

In Flanders Jan van Eyck (1390-1440), his brother Hubert, Quintin Matsys, Memlinc and other artists of the 15 th century occasionally practised portraiture. The picture of Jean Arnol- fini and his wife, in the National Gallery, London, is a remarkable sample of the first-named artist, and the small half-length of young Martin van Nieumenhoven, in the hospital of St John at Bruges, of the last-named. Nearly a century later the names of Antony Mor(or Moro), Rubens and Van Dyck appear. Rubens, although not primarily a painter of portraits, achieved no small distinction in that way, being much employed by royalty (Maria de Medici, Philip IV. and the English Charles I. among the number). His services were also in request as ambassador or diplomatist, and thrice at least he was sent on missions of that nature. His personal energy and industry were enor- mous, but a large proportion of the work attributed to him was painted by pupils, of whom Van Dyck was one of the most celebrated. Van Dyck (1599-1641) early acquired a high repu- tation as a portrait painter. In 1632 he was invited to England by Charles I., and settled there for the remainder of his life. He was knighted by Charles, and granted a

pension of £200 a year, with the title of painter to his majesty. Many of Van Dyck's portraits, especially those of the early and middle periods, are unsurpassed in their freshness, force and vigour of handling. He is a master among masters. England possesses many of his works, especially of his later period. To Van Dyck we owe much of our knowledge of what Charles I. and those about him were like. A routine practice, luxurious living, failing health, and the employment of assistants told upon his work, which latterly lost much of its early charm.

•In Holland in the 17th century portraiture reached a high standard. A reaction had set in against Italian influence, and extreme faithfulness and literal resemblance became the pre- vailing fashion. The large portrait pictures of the members of gilds and corporations, so frequently met with in Holland, are characteristically Dutch. The earliest works of the kind are

generally rows of portraits ranged in double or single lines, without much attempt at grouping or composition. Later, in the hands of painters like Rembrandt, Frans Hals and Van der Heist, these pictures of civic guards, hospital regents and masters of gilds assumed a very different character, and are among the very finest works produced by the Dutch portrait painters of the 17th century. They may be termed " subscrip- tion portraits " — each member of the gild who desired a place on the canvas agreeing, before the commission was given, to pay, according to a graduated scale, his share of the cost. Among the most famous examples of this class of portraits are " The Anatomy Lesson, " " The March-out of Captain Banning Kock and his Company " (erroneously called " The Night Watch "), and " The Five Syndics of the Cloth-Workers' Guild, " by Rembrandt. The magnificent portrait groups at Haarlem by Hals — the next greatest portrait painter of Holland after Rembrandt — and the " Schuttersmaaltyd " by Van der Heist in the Amsterdam Museum, which Reynolds considered " perhaps the first picture of portraits in the world, " must also be mentioned.

Of the pictorial art of Spain previous to the 15th century, little, if any, survives. Flemish example was long paramount and Flemish painters were patronized in high places. In the 16th century the names of native Spanish artists began to appear — Morales, Ribera, Zurbaran, a great though not a pro- fessed portrait painter; and in the last year of

the century Velasquez was born, the greatest of Spain's artists, and one of the great portrait painters of the world. None, perhaps, has ever equalled him in keen insight into character, or in the swift magic of his brush. Philip IV., Olivarez and Innocent X. live for us on his canvases. His constantly varying, though generally extremely simple, methods, explain to some extent the interest and charm his works possess for artists. Depth of feeling and poetic imagination were, however, lacking, as may be seen in his prosaic treatment of such subjects as the " Coronation of the Virgin," the " Mars " and other kindred works in the Madrid Gallery. Velasquez must be classed with those whose career has been prematurely cut short. His works often show signs of haste and of the scanty leisure which the duties of his office of " Aposentador Mayor " left him — duties which ended in the fatal journey to the Isle of Rhe.

In France the most distinguished portrait painters of the 16th and 17th centuries were the Clouets, Cousin, Vouet, Philippe de Champaigne, Rigaud and Vanloo. French portraiture, long inflated and artificial, reached the height of pomposity in the reigns of Louis XIV. and XV., the epoch of which the towering wig is the symbol. In the 18th and early part of the 19th centuries occur the names of Boucher, Greuze, David, Gerard and Ingres; but somehow the portraits of the French masters seldom attract and captivate in the same way as those of the Dutch and Italian painters.

Foreign artists were engaged for almost every important work in painting in England down to the days of Sir Joshua Reynolds and Gainsborough. Henry VIII. employed Holbein; Queen Mary, Sir Antonio Moro; Elizabeth, Zucchero and Lucas de Heere; James I. van Somer, Cornelius Janssens and Daniel Mytens; Charles I. Rubens, Van Dyck, Mytens, Petitot, Hon- thorst and others; and Charles II., Lely and Kneller, although there were native artists of merit, among them Dobson, Walker and Jamesone, a Scottish painter. Puritan England and Presby- terian Scotland did little to encourage the portrait painter. The attitude of the latter towards it may be inferred from an entry in the diary of Sir Thomas Hope, the Scottish Lord Advo- cate in 1638. " This day, Friday, William Jamesone, painter (at the earnest desyr of my sone Mr Alexander) was sufferit to draw my pictur." He does not even give the painter's name correctly, although Jamesone at the time was a man of some note in Scotland. At t he commencement of the reign of George I. art in England had sunk to about the lowest ebb. With the appearance of William Hogarth (1697-1 764) the English school of painting may be said to have commenced, and in Reynolds and Gainsborough it produced two portrait painters xxii. 5

whose works hold their own with those of the masters of the 16th and 17th centuries. Both Sir Joshua and Gainsborough are seen at their best in portraits of women and children.

George Romney (1734-1802) shared with Reynolds and Gainsborough the patronage of the wealthy and fashionable of his day. Many of his female portraits are of great beauty. For some unknown reason he never exhibited his works in the Royal Academy.

Sir Henry Raeburn (1756-1823) was a native of Edinburgh, and spent most of his life there. His portraits are broad and effective in treatment, masterly and swift in execution and often fine in colour. He painted nearly all the distinguished Scotsmen of his time — Walter Scott, Adam Smith, Braxfield, Robertson the historian, Dugald Stewart, Boswell, Jeffrey, Professor Wilson and many of the leading noblemen, lairds, clergy and their wives and daughters. For a considerable period his portraits were little known out of Scotland, but they are now much sought after, and fine examples appearing in London sale-rooms bring remarkable prices. Raeburn's immediate successor in Scotland, J. Watson Gordon (1788-1864), also painted many excellent portraits, chiefly of men. A very characteristic example of his art at its best may be seen in his " Provost of Peterhead " in the Scottish National Gallery.

Sir Thomas Lawrence (1769-1830) was the favourite English portrait painter of his time, and had an almost unrivalled career. He had an immense practice, and between the years 1787 and 1830 exhibited upwards of three hundred portraits in the Royal Academy alone. The Waterloo Gallery at Windsor contains some of his best work, chiefly painted in 1818-1819, including his portraits of the emperor Francis, Pope Pius VII. and Cardinal Gonsalvi. He was loaded with honours, and died President of the Royal Academy.

Sir J. E. Millais (1829-1896), although most widely known as a painter of figure subjects, achieved some of his greatest suc- cesses in portraiture, and no artist in recent years has approached him as a painter of children. His portraits of Gladstone, Sir James Paget, Sir Gilbert Greenall, Simon Fraser, J. C. Hook and Mrs. Bischoffsheim, to name only a few, are alone sufficient to give him a high place among British portrait painters.

Frank Holl (1845-1888) first came into note as a portrait painter in 1878, and during the subsequent nine years of his life he painted upwards of one hundred and ninety-eight portraits, an average of over twenty-two a year. The strain, however, proved too great for a

naturally delicate constitution, and he died at the age of forty-three — another instance of a brilliant career prematurely cut short. To G. F. Watts (1820-1904) we are indebted for admirable portraits of many of the leading men of the Victorian era in politics, science, literature, theology and art. Among more recent artists, Sir W. Q. Orchardson (1835-1910), like Millais more widely known as a painter of figure subjects, but also admirable as a portrait painter; John Sargent (1856-), whose brilliant and vigorous characteri- zation of his sitters leaves him without a rival; as well as Ouless, Shannon, Fildes, Herkomer and others, have worthily carried on the best traditions of the art.

In France contemporary portraiture is ably represented in the works of Carolus-Duran, Bonnat and Benjamin Constant, and in Germany by Lenbach, who has handed down to posterity with uncompromising faithfulness the form and features of Prince Bismarck.

Of portraiture in its other developments little need be said. Miniature painting, which grew out of the work of the illumina- tor, appears to have been always successfully practised in England. The works of Hilliard, Isaac and Peter Oliver, Samuel Cooper, Hoskins, Engleheart, Plimer and Cosway hold their own with the best of the kind; but this beautiful art, like that of the engraver, has been largely superseded by photo- graphy and the ” processes ” now in use.

It is unnecessary to refer to the many uses of portraiture, but one of its chiefest has been to transmit to posterity the form and features of those who have played a part, worthy or otherwise, in the past history of our race. Of its value to the

biographer and historian, Carlyle, in a letter written in 1854, says, ” In all my poor historical investigations it is one of the most primary wants to procure a bodily likeness of the personage inquired after; a good portrait, if such exists; failing that, even an indifferent, if sincere one; in short, any representation, made by a faithful human creature, of that face and figure which he saw with his eyes and which I can never see with mine. Often I have found the portrait superior in real instruction to half-a-dozen written biographies, or rather, I have found the portrait was as a small lighted candle, by which the biographies could for the first time be read, and some human interpretation be

made of them.” (G. Re.)

PORT RICHMOND, a part of the borough of Richmond in the city of New York, U.S.A., on the N. shore of Staten Island and on the Kill van Kull Channel. Before 1898 it was a separate village of Richmond county, New York, containing 6290 inhabitants in 1890. It is served by the Staten Island Rapid Transit railway, and by a ferry to Bergen Point, New Jersey, and has steam and electric railway connexions with the municipal ferry at St George, which furnishes easy access to the business districts on Manhattan Island. Among its places of historic interest are the Dutch Reformed Church, which is the direct successor of the church established on Staten Island in 1664 or 1665 by Waldenses and Huguenots; and the Danner Hotel, built soen after the War of Independence on the site of a tem- porary fort that had been erected by British troops, and used as a private dwelling until 1820. In this house Aaron Burr spent the last years of his life, dying there on the 14th of September 1836. Among the industrial establishments are a shipyard, dry dock and manufactories of flour, lumber, lead paint and builders’ supplies. On the first of January 1898, when the act creating Greater New York came into effect, the village became a part of the third ward of Richmond borough.

PORT ROYAL, a celebrated Cistercian abbey, occupied a low and marshy site in the thickly wooded valley of the Yvette, at what is now known as Les Hameaux near Marly, a few miles south-west of Paris. It was founded in 1204 by Mahaut de Garlande, wife of Mathieu de Montmorenci-Marli in 1204; the church was built in 1229 from the designs of Robert de Luzarches. During its early years the convent received a number .of papal privileges; the most important of these, granted by Honorius III. in 1223, authorized it to offer a retreat to women anxious to withdraw from the world without binding themselves by perpetual vows. Little is known of its history during the three succeeding centuries, except that its discipline became relaxed; reform was only attempted when Angelique Arnauld (q.v.) was appointed coadjutor to the elderly and invalid abbess in 1598. Angelique’s reforming energy soon brought her into contact with Jean Duvergier (q.v.) abbot of Saint Cyran, and chief apostle in France of the Jansenist revival, and the later history of her convent is indissolubly connected with this movement.

In 1626 constant visitations of ague drove the nuns to Paris; they settled at Port Royal de Paris, at the end of the Faubourg Saint Jacques. The deserted buildings of Port Royal des Champs were presently occupied by ” hermits,” laymen, mostly relatives of the abbess, who wished for a semi-monastic existence, though without

taking formal vows. In 1648, however, some of the nuns returned to the country, and the hermits retreated to buildings at a short distance from the abbey. Here they set up a ” little school ” for the sons of Jansenist parents; and here Jean Racine, the future poet, received his education. But in 1653 Innocent X. condemned the doctrines of Jansen. Three years later ” the hermitage ” and school were broken up, and the nuns were for- bidden to receive new members into their community. These rigours were much increased when Louis XIV. took -up .the reins of government in 1660; between 1664 and 1669 the archbishop of Paris laid under an’ interdict those of the nuns who refused to subscribe the papal censure on Jansen. In 1669, however, came the so-called ” Peace of Clement IX.,” when the Jansenists gener- ally were admitted to grace, and the interdict was removed from Port Royal, though the authorities broke up the convent into two distinct communities. The conformist nuns were gathered to- gether at Port Royal de Paris, under an independent abbess; their Jansenist sisters were united at the original building in the country. Thereupon followed ten years of peace, for the nuns had a powerful protector in the king’s cousin, Mme de Longueville. But in

1679 she died, and Louis at once ordered the nuns to send away their novices and boarders and to receive no others. Finally, in 1705, he got from Clement XI. a new condemnation of the Jansenists, which the few remaining nuns, all of whom were over sixty, refused to sign; and on the 29th of October 1709 they were forcibly removed from Port Royal by the police, and dis- tributed among various conformist convents. In the following spring the buildings were pulled down; even the cemetery was not spared. The land on which the convent had stood was made over to Mme de Maintenon’s college of St Cyr; in 1825 it was bought by some descendants of Jansenist families, who have done their best to restore the grounds to their original appearance, and have built a museum rich in Jansenist relics. Port Royal de Paris was secularized at the French Revolution, and is now a maternity hospital.

For a classified list of the chief books, ancient and modern, dealing with Port Royal, see the Abrege de I’histoire de Port Royal, by Jean Racine, ed. E. Gazier (Paris, 1908). See also C. A. Sainte- Beuve, Port Royal (6 vols, and index, Paris, 1882); Charles Beard, Port Royal (2 vols., London, 1861); H. Reuchlin, Geschichte von Port Royal (2 vols., Hamburg, 1839-1844), and the books recom- mended under the articles Arnauld, Jansenism and Pascal.

PORT ROYAL, an island in Beaufort county, South Carolina, U.S.A., at the head of Port Royal Sound, about 16 m. from the Atlantic coast,

and about 50 m. S.W. of Charleston. It is about 13 m. long (north and south) by about 7 m. wide. The surface is generally flat, and there is much marshland in its southern part, and along its north-eastern shore. The principal settle- ment is Beaufort, a port of entry, and the county-seat of Beaufort county, on the Beaufort river (here navigable for vessels drawing 18 ft.), about 11 m. from its mouth, and about 15 m. from the ocean. Pop. (1900) 4110 (3220 negroes); (1910) 2486. It is served by the Charleston & Western Carolina railway, has inland water communication with Savannah, Georgia, and its harbour, Port Royal Sound (between Bay Point on the north-east and Hilton Head on the south-west), is one of the largest and best on the coast of South Carolina. Beaufort's beautiful situation and delightful climate make it a winter resort. In the vicinity Sea Island cotton, rice, potatoes and other vegetables are raised — the truck industry having become very important; and there are groves of yellow pine and cypress. Large quantities of phosphate rock were formerly shipped from here. Among the manufactures are cotton goods, canned oysters, lumber and fertilizer. About 5 m. south of Beau- fort is the town of Port Royal (pop. in 1910, 363), a terminus of the Charleston & Western Carolina railway. On the Beau- fort River (eastern) shore of Paris Island, about 6 m. north of Bay Point, is a United States naval station, with a dry dock and repair shop.

Jean Ribaut (1520-1565), leading an expedition sent out by Admiral Gaspard de Coligny (1517-1572) tofounda Huguenot colony in New France, sailed into the harbour, which he named Port Royal, on the 27th of May 1562, took possession of the region in the name of Charles IX., and established the first settlement (Fort Charles), probably on Paris Island. In June he sailed for France, leaving 26 volunteers under Captain Albert de la Pierria. Soon afterward the garrison killed Pierria (probably because of the severity of his discipline), and put to sea in an insufficiently equipped vessel, from which, after much suffering,; they were rescued by an English ship, and taken to England. In 1670, a company under Colonel William Sayle (d. 1671) landed on Port Pvoyal Island, but probably because this site exposed them to Spanish attacks, proceeded along the coast and founded the original Charles Town (see Charleston). In 1683, several families, chiefly Scotch, led by Henry Erskine, third Lord Card- ross (1650-1693), established on the island a settlement named Stuart's Town (probably in honour of Cardross's family); but three years later most of the settlers were murdered by Spaniards from Florida and the remainder fled to Charleston. In 17 10, after the lords proprietors had issued directions for " the building of a town to be called Beaufort Town," in honour of Henry Somerset, duke of Beaufoit

(1629-1700), the first permanent settlement was established on the island. , The town was incorporated in 1803. In January 1779 about 200 British soldiers occupied the island by order of Colonel Augustine Prevost, but they were dislodged (Feb. 3) by about 300

Americans, mostly militiamen, under General William Moultrie. At the beginning of the Civil War the Confederates erected Fort Walker on Hilton Head, and Fort Beauregard on Bay Point. Captain (afterwards Admiral) Samuel F. Du Pont and General Thomas W. Sherman organized an expedition against these fortifications, which were reduced by a naval bombardment and were evacuated by the Confederates under General Thomas F. Drayton (d. 1891) on the 7th of November 1861. During the remainder of the war Port Royal Harbour was used as a coaling, repair and supply station by the Federal blockading squadron. Early in 1862 Port Royal Island and the neigh- bouring region became the scene of the so-called ” Port Royal Experiment ” — the successful effort of a group of northern people, chiefly from Boston, New York and Philadelphia, among whom Edward S. Philbrick (d. 1889) of Massachusetts was conspicuous, to take charge of the cotton plantations, deserted upon the occupation of the island by Union troops, and to employ the negroes under a system of paid labour. The volunteers organized as the Educational Commission for Freedmen (after- ward the New England Freedmen ‘s Aid Society), and the government granted them transportation, subsistence and quarters, and paid them small salaries.

See Edward McCrady’s History of South Carolina (New York, 1897-1901); and, for an account of the Port Royal Experiment, Letters from Port Royal (Boston, 1906), edited by Elizabeth W Pearson.

PORTRUSH, a seaport and the most popular seaside resort of Co. Antrim, Ireland; the terminus of a branch of the Northern Counties (Midland) railway. Pop. (1901), 1941. It is very picturesquely situated on the basaltic peninsula of Ramore Head, with a deep bay on either side, and a harbour protected by the natural breakwater known as the Skerries. A fine hotel, owned by the railway company, and an excellent golf course are the chief features, together with a town-hall with public reading room, and the place is much frequented for golf and sea-bathing. It is also the centre for visitors to the Giants’ Causeway, with which it is connected by an electric railway. Dunluce Castle, between Portrush and Bushmills, stands on a rock separated

from the mainland by a chasm which is spanned by a bridge. The ruins, which are extensive, are of unknown date. Portrush has a thriving trade in salmon. It is governed by an urban district council.

PORT SAID, a seaport of Egypt, at the northern entrance of the Suez Canal, in 31° 15′ 35″ N., 32 19′ 20″ E., and 145 m. by rail N.E. of Cairo. Pop. (1907), 49,884. It lies on the western side of the canal on the low, narrow, treeless and desolate strip of land which separates the Mediterranean from Lake Menzala, the land at this point being raised and its area increased by the draining of part of the lake and by the excavation of the inner harbour. The outer harbour is formed by two breakwaters which protect the entrance to the canal; altogether the harbour covers about 570 acres and accommodates ships drawing 28 ft. Originally besides the central basin of the inner harbour there were three docks; between 1903 and 1909 the harbour accommodation was doubled by the construction of new docks on the eastern side of the canal and by enlarging the western docks. The port possesses a floating dock 295 ft. long, 85 ft. broad and 18 ft. deep, capable of lifting 350° tons, and a patent slip taking 300 tons and ships drawing 9 ft. 9 in. of water. On the western breakwater is a colossal statue of Ferdinand de Lesseps by E. Fremiet, unveiled in 1899, and a lighthouse 174 ft. high. Among the few buildings of note in the town are the offices of the Suez Canal Company and the British barracks, the last named having been built by Prince Henry of the Netherlands (d. 1879) as a depot for Dutch trade.

Port Said dates from 1859 and its situation was determined by the desire of the engineers of the Suez Canal to start the canal at the point on the Mediterranean coast of the isthmus of Suez nearest to deep water, and off the spot where Port Said now stands there was found a depth of 26 ft. at about 2 m. from the shore. For many years after its foundation it depended entirely upon the traffic of the canal, being the chief coaling station of all ships massing through and becoming the largest coaling station in the

world. The population was of a very heterogeneous character, but mainly of an undesirable class of Levantines; this with the damp heat and the dirt and noise of the incessant coaling operations gave the town an unenviable reputation. In 1902, however, a new industry was added in the export of cotton from the eastern provinces of the Delta, the cotton being brought from Mataria by boat across Lake Menzala. In 1904 the opening of a standard gauge railway to Cairo placed Port Said in a position to compete with Alexandria for the external trade of Egypt generally, besides making it a tourist route to the capital from Europe. The result was to attract to the town a considerable

commercial community and to raise its social status. A new suburb was created by re- claiming land on the north foreshore, and another suburb was created on the eastern side of the canal. The average annual value of the trade of the port for the five years 1902-1906 was £2,410,000. This figure includes the value of the coal used by vessels passing through the Suez Canal.

PORTSMOUTH, EARLS OF. In 1743 John Wallop (1690- 1762) of Farley Wallop in Hampshire was created earl of Portsmouth. He belonged to an old Hampshire family and had been a lord of the treasury from 171 7 to 1720, when he was created Baron Wallop. The earldom has since been held by his descendants, one of whom, Newton Wallop (b. 1856), became the 6th earl in 1891. This earl was a member of parliament from 1880 to 1891 and was under secretary of state for war from 1905 to 1908.

PORTSMOUTH, LOUISE DE KEROUALLE, Duchess of (1649-1734), mistress of the English king Charles II., was the daughter of Guillaume de Penancourt and his wife Marie de Plaeuc de Timeur. The name of Keroualle was derived from an heiress whom her ancestor Francois de Penhoet had married in 1330. The family were nobles in Brittany, and their name was so spelt by themselves. But the form Querouailles was com- monly used in England, where it was corrupted into Carwell or Carewell, perhaps with an ironic reference to the care which the duchess took to fill her pocket. In France it was variously spelt Queroul, Keroual and Keroel. The exact date of her birth is apparently unknown. Louise was placed early in life in the household of Henriette, duchess of Orleans, sister of Charles II. Saint-Simon asserts that her family threw her in the way of Louis XIV. in the hope that she would be pfomoted to the place of royal mistress. In 1670 she accompanied the duchess of Orleans on a visit to Charles II. at Dover. The sudden death of the duchess, attributed on dubious evidence to poison, left her unprovided for, but the king placed her among the ladies in waiting of his own queen. It was said in after times that she had been selected by the French court to fascinate the king of England, but for this there, seems to be no evidence. Yet when there appeared a prospect that the king would show her favour, the intrigue was vigorously pushed by the French ambassador, Colbert de Croissy, aided by the secretary of state, Lord Arling- ton, and his wife. Louise, who concealed great cleverness and a strong will under an appearance of languor and a rather childish beauty (Evelyn the diarist speaks of her ” baby face “), yielded only when she had already established a strong hold on the king’s affections and character. Her son, ancestor of the dukes of Richmond, was born in 1672.

The support she received from the French envoy was given on the undei standing that she should serve the interests of her native sovereign. The bargain was confirmed by gifts and honours from Louis XIV. and was loyally carried out by Louise. The hatred openly avowed for her in England was due as much to her own activity in the interest of France as to her notorious rapacity. The titles of Baroness Petersfield, countess of Fareham and duchess of Portsmouth were granted her for life on the 19th of August 1673. Her pensions and money allowances of various kinds were enormous. In 1677 alone she received £27,300. The French court gave her frequent presents, and in December 1673 conferred upon her the ducal fief of Aubigny at the request of Charles II. Her thorough understanding of the king's character enabled her to retain her hold on him to the end. She contrived to escape uninjured during the crisis of the Popish Plot in 1678. She was strong enough to maintain her position during a long illness in 1677, and a visit to France in 1682. In February 1685 she took measures to see that the king, who was secretly a Roman Catholic, did not die without confession and absolution. Soon after the king's death she retired to France, where, except for one short visit to England during the reign of James II., she remained. Her pen- sions and an outrageous grant on the Irish revenue given her by

Charles II. were lost either in the reign of James II. or at the Revolu- tion of 1688. During her last years she lived at Aubigny, and was harassed by debt. The French king, Louis XIV., and after his death the regent Orleans, gave her a pension, and protected her against her creditors. She died at Paris on the 14th of November

1734-

See H. Forneron, Louise de Keroualle (Paris, 1886) ; and Mrs Colquhoun Grant, From Brittany to Whitehall (London, 1909).

PORTSMOUTH, a municipal, county and parliamentary borough, and seaport of Hampshire, England, 74 m. S.W. from London, on the London & South-Western and the London, Brighton & South Coast railways. Pop. (1891), 159,278; (1901), 188,133. This great naval station and arsenal is an

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aggregate of four towns, Portsmouth, Portsea, Landport and Southsea, and occupies the south-western part of Portsea Island, which lies between Portsmouth Harbour and Langstone Harbour, two inlets of the English Channel. Portsmouth Harbour opens into Spithead, one of the arms of the Channel separating the Isle of Wight from the mainland. The harbour widens inwards in bottle form, Portsmouth lying on the east shore of the neck, with Gosport opposite to it on the west side. Portsmouth proper may be distinguished as the garrison town; Portsea as the naval station with the dockyards; Landport is occupied chiefly by the houses of artisans; and Southsea is a residential quarter and a favourite watering-place. Besides a number of handsome modern churches, among which is a Roman Catholic cathedral, Portsmouth possesses, in the church of St Thomas a Becket, a fine cruciform building dating from the second half of the 12th century, in which the chancel and transepts are original, but the nave and tower date from 1698, and the whole was extensively restored in 1904. The garrison chapel originally belonged to the hospital of St Nicholas, a foundation of the 13th century. Among other buildings worthy of mention (apart from those having naval or military connexion) the principal is the town-hall (1890), a fine classic building

standing alone in a square, and surmounted by a handsome clock tower. Among educational institutions there are a large grammar school (1879), on a foundation of 1732, Roman Catholic schools adjoining the cathedral, schools for engineering students and dockyard apprentices, and seamen and marines' orphan school. Aria College in Portsea was opened in 1874 for the training of Jewish ministers. Victoria Park, in the heart of the town, contains a monument to Admiral Napier. There are recreation grounds for the naval and military forces in the vicinity. There is a railway station (Portsmouth Harbour) on the Hard, from which passenger steamers serve Ryde in the Isle of Wight. A ferry and a floating bridge connect with Gosport. The port has a considerable trade in coal, timber, fruits and agricultural produce. The parliamentary borough returns two members. The county borough was created in 1888. The municipal borough is under a mayor, 14 aldermen and 42 councillors. Area, 5010 acres.

The dockyard seems to have been regularly established about 1540, but long before that date the town was of importance as a naval station and was used for the accommodation of the king's ships. In 1540 it covered 8 acres of ground, abutting on the harbour near the " King's Stairs." Cromwell added 2 acres in 1658, and Charles II. added 8 in 1663 and 10 more in 1667. By 1710 30 acres more had been reclaimed or bought, and by the end of the 1 8th century the total area was 90 acres. In 1848 a steam basin, cover- ing 7 acres, and four new docks were opened, the dockyard ground being extended to 115 acres in all. In 1865 large extension works were decided upon, increasing the area to 293 acres. These included a tidal basin and, opening out of it, a deep dock and two locks, in themselves serving as large docks, which lead to three basins and four docks. An entrance

was also formed between the new tidal basin and the steam basin of 1848, and large additions were made to the wharfage accommodation as well as to the storehouses and factories. Subsequent improvements included the formation of two new dry docks (1896) with a floor-length of 557 ft. and a depth of 33I ft. over the sill at high water of spring tides; the construction of new jetties at the entrance to the tidal basin and at the north wall; the establishment of a coal wharf with hydraulic appliances; a torpedo range in the harbour; the erection of various buildings such as torpedo and gun-mounting stores, electrical shops and numerous subsidiary works; and extensive dredging of the harbour to increase the berthing accommodation for the fleet. Altogether the dockyard comprises 15 dry docks, 60 acres of enclosed basins, 18,400 ft. of wharfage and about 10 m. of railway. There is a gunnery establish- ment in the harbour on Whale Island, the area of which has been increased to nearly 90 acres by the accretion of material excavated from the dockyard extension works, and various barracks including those of the royal marine artillery at Eastney, beyond Southsea.

Portsmouth (Portsmue, Portcsmuth) owes its origin to the retreat of the sea from Porchester, and its importance to its favourable position for a naval station. Though probably the site had long been recognized as a convenient landing-place, no town existed there until the 12th century, when the strategical advan- tage it offered induced Richard I. to build one. He granted a charter in 11 94 declaring that he retained the borough in his hand, and granting a yearly fair and weekly market, freedom from certain tolls, from shire and hundred court and sheriffs' aids. In October 1200 King John repeated the grants, and Henry III. in 1229 gave the " men of Portsmouth " the town in fee farm and granted a merchant gild. Confirmations were made by successive kings, and a charter of incorporation was given by Elizabeth in 1 599-1 600. A new and enlarged charter was granted by Charles I. in 1627, by which the borough is now governed subject to changes by the municipal acts of the 19th century. Portsmouth has returned two members to parliament since 1295. A fair on the 1st of August and fourteen following days was granted by Richard I. The first day was afterwards changed to the 29th of June and later to the nth of July. It was important as a trading fair for cutlery, earthenware, cloth and Dutch metal, and was abolished in 1846. The market, dating from n 94 and originally held on Thursday only, is now held on Tuesday and Saturday in addition. Portsmouth was important in the middle ages not only as a naval station but a trading centre. There was a considerable trade in wool and wine, and the building of the dockyards by Henry VII. further increased its prosperity.

See Victoria County History: Hampshire, iii. 172 seq.; R. East, Extracts from the Portsmouth Records.

PORTSMOUTH, a city, port of entry and one of the county- seats of Rockingham county, New Hampshire, U.S.A., on the Piscataqua river, about 3 m. from the Atlantic Ocean, about 45 m. E.S.E. of Concord, and about 54 m. N.N.E. of Boston. Pop. (1910 U.S. census) 11,269. Area, 17 sq. m. Portsmouth is served by the Boston & Maine railway, by electric lines to neighbouring towns, and in summer by a steamboat daily to the Isles of Shoals. The city is pleasantly situated, mainly on a peninsula, and has three public parks. Portsmouth attracts many visitors during the summer season. In Portsmouth are an Athenaeum (1817), with a valuable library; a public library (i88i);a city hall; a county court house; a United States customs-house; a soldiers' and sailors' monument; an equestrian

monument by James Edward Kelly to General Fitz John Porter; a cottage hospital (1886); a United States naval hospital (1891); a home for aged and indigent women (1877) ; and the Chase home for children (1877).

A United States navy yard, officially known as the Portsmouth Navy Yard, is on an island of the Piscataqua but within the township of Kittery, Maine. In 1800 Fernald's Island was purchased by the Federal 'government for a navy yard; it was the scene of considerable activity during the War of 181 2, but was of much greater importance during the Civil War, when the famous " Kearsarge " and several other war vessels were built here. 1 In 1866 the yard was enlarged by connecting Seavey's Island with Fernald's; late in the 19th century it was equipped for building and repairing steel vessels. It now has a large stone dry dock. On Seavey's Island Admiral Cervera and other Spanish officers and sailors captured during the Spanish- American War were held prisoners in July — September 1898. Subsequently a large naval prison was erected. In 1905 the treaty ending the war between Japan and Russia was negotiated in what is known as the Peace Building in this yard.

In 1905 the city's factory products were valued at $2,602,056. During the summer season there is an important trade with the neighbouring watering-places; there is also a large transit trade in imported coal, but the foreign commerce, consisting wholly of imports, is small.

Portsmouth and Dover are the oldest permanent settlements in the state. David Thomson with a small company from Plymouth, England, in the spring or early summer of 1623 built and fortified a house at Little Harbor (now Odiorne's Point in the township of Rye) as a fishing and trading station. In 1630 there arrived another band of settlers sent over by the Laconia Company. They occupied Thomson's house and Great Island (New Castle) and built the " Great House " on what is now Water Street, Portsmouth. This settlement, with jurisdiction over all the territory now included in Portsmouth, New Castle and Greenland, and most of that in Rye, was known as " Strawberry Banke " until 1653, when it was incor- porated (by the government of Massachusetts) under the name of Portsmouth. There was from the first much trouble between its Anglican settlers sent over by Mason and the Puritans from Massachusetts, and in 1641 Massachusetts extended her juris- diction over this region. In 1679, however, New Hampshire was constituted a separate province, and Portsmouth was the capital until 1775. In 1693 New Castle (pop. 1900, 581), then including the greater part of the present township of Rye, was set apart from Portsmouth, and in 1703 Greenland (pop. 1900, 607) was likewise set apart. One of the first military exploits of the War of Independence occurred at New Castle, where there was then a fort called William and Mary. In December 1774 a copy of the order prohibiting the exportation of military stores to America was brought from Boston to Portsmouth by Paul Revere, whereupon the Portsmouth Committee of Safety organized militia companies, and captured the fort (Dec. 14). In 1849 Portsmouth was chartered as a city.

Portsmouth was the birthplace of Governor Benning Wentworth (1696-1770) and his nephew Governor John Wentworth (1737- 1820); of Governor John Langdon (1739-1819); of Tobias Lear (1762-1816), the private secretary of General Washington from 1785 until Washington's death, consul-general at Santo Domingo in 1 802-1 804, and negotiator of a treaty with Tripoli in 1805; of Benjamin Penhallow Shillaber (1814-1890), humorist, who is best known by his Life and Sayings of Mrs Partington (1854); of James T. Fields, of Thomas Bailey Aldrich and of General Fitz John Porter. From 1807 to 1816 Portsmouth was the home of Daniel Webster.

PORTSMOUTH, a city and the county-seat of Scioto county, Ohio, U.S.A., picturesquely situated at the confluence of the Scioto and Ohio rivers, 95 m. S. of Columbus. Pop. (1910 U.S. census) 23,481. Portsmouth is served by the Baltimore &

1 See Captain G. H. Preble, " Vessels of War built at Portsmouth, N. H.

1690-1868," in New England Historical and Genealogical Register, vol. xxii. (Boston, 1868); and W. E. Fentress, Centennial History of the U.S. Navy Yard at Portsmouth, N. H. (Portsmouth,

1876).

Ohio South- Western, the Chesapeake & Ohio and the Norfolk & Western railways, also by passenger and freight boats to Pittsburg, Cincinnati and intermediate ports. The city has a Carnegie library, a municipal hospital, an aged women's home and a children's home. Extending along the Ohio for 8 m. and arranged in three groups are works of the " Mound Builders." There are two small city parks, and a privately owned resort, Millbrook Park. The surrounding country is a fine farming region, which also abounds in coal, fire-clay and building stone. Natural gas is used for light, heat and power. In 1905 the city's factory products were valued at $7,970,674, of which $4,258,855 was the value of boots and shoes. The Norfolk & Western has division terminals here.

The first permanent settlement in the immediate vicinity was made in 1796. In 1799 Thomas Parker, of Alexandria, Virginia, laid out a village (which was named Alexandria) below the mouth of the Scioto, but as the ground was frequently flooded the village did not thrive, and about 1810 the inhabitants removed to Portsmouth. Portsmouth was laid out in 1803, incorporated as a town in 1815, and chartered as a city in 1851. The Ohio and Erie canal was opened from Cleveland to Portsmouth in 1832.

PORTSMOUTH, a city of Norfolk county, Virginia, U.S.A., on the Elizabeth river opposite Norfolk. Pop. (1910, census), 33,190. Portsmouth is served by the Atlantic Coast Line, the Seaboard Air Line, the Chesapeake & Ohio and the New York, Philadelphia & Norfolk (Pennsylvania system), the Southern, and the Norfolk & Western railways, by steamboat lines to Washington, Baltimore, New York, Providence and Boston, by ferries to Norfolk, and by electric lines to numerous suburbs. There is a 30-ft. channel to the ocean. Portsmouth is situated on level ground only a few feet above the sea; it has about 25 m. of water-front, and adjoins one of the richest trucking districts in the Southern States. Among the principal buildings are the county court house, city hall, commercial building, United States naval hospital, post office building, high school and the Portsmouth orphan asylum, King's Daughters' hospital and the old Trinity Church (1762). In the southern part of the city is a United States navy yard and station, officially the Norfolk Yard (the second largest in the country), of about 450 acres, with three immense dry

docks, machine shops, ware- houses, travelling and water cranes, a training station, torpedo- boat headquarters, a powder plant (20 acres), a naval magazine, a naval hospital and the distribution headquarters of the United State Marine Corps. The total value of the city's factory products in 1905 was only $145,439. The city is a centre of the Virginia oyster " fisheries." Portsmouth and Norfolk form a customs district, Norfolk being the port of entry, whose exports in 1908 were valued at $11,326,817, and imports at $1,150,044. Portsmouth was established by act of the Virginia assembly in 1 752, incorporated as a town in 1852 and chartered as a city in 1858. Though situated in Norfolk county, the city has been since its incorporation administratively independent of it. Shortly before the War of Independence the British established a marine yard where the navy yard now is, but during the war it was confiscated by Virginia and in 1801 was sold to the United States. In April 1861 it was burned and abandoned by the Federals, and for a year afterwards was the chief navy yard of the Confederates. Here was constructed the iron-clad " Virginia " (the old " Merrimac "), which on the 9th of March 1862 fought in Hampton Roads (q.v.) the famous engagement with the " Monitor." Two months later, on the 9th of May, the Confederates abandoned the navy yard and evacuated Norfolk and Portsmouth, and the " Virginia " was destroyed by her commander, Josiah Tattnall.

PORT SUDAN, a town and harbour on the west coast of the Red Sea, in 19 37′ N. 37 12′ E., 700 m. by boat S. of Suez and 495 m. by rail N.E. of Khartum. Pop. (1906), 4289. It is the principal port of the Anglo-Egyptian Sudan and the headquar- ters of the customs administration. The coral reefs fringing the coast are here broken by a straight channel with deep water giving access to the harbour, which consists of a series of natural

channels and basins. The largest basin is 900 yds. long by 500 broad and has a minimum depth of 6 fathoms. On the north side of the inlet are quays (completed 1909), fitted with electric cranes, &c. Here are the customs-house, coal sheds and goods station. The town proper lies on the south side of the inlet, connected with the quays by a railway bridge. Besides govern- ment offices the public buildings include hospitals, and a branch of the Gordon College of Khartum. Beyond the bridge in the upper waters of the inlet is a dry dock. The climate of Port Sudan is very hot and damp and fever is common. Adjacent to the town is an arid plain without vegetation other than mimosa thorns. Some 10 m. west is a line of hills parallel to *he coast.

The port dates from 1905. It owes its existence to the desire of the Sudan administration to find a harbour more suitable than Suakin (q.v.) for the commerce of the country. Such a place ‘ was found in Mersa Sheikh Barghut (or Barud), 36 m. north of Suakin, a harbour so named from a saint whose tomb is promi- nent on the northern point of the entrance. When the building of the railway between the Nile and the Red Sea was begun, it was determined to create a port at this harbour — which was renamed Port Sudan (Bander es-Sudan). Up to the end of 1909 the total expenditure by the government alone on the town and harbour-works was ££914,320. The railway (which has termini both at Port Sudan and Suakin) was opened in January 1906 and the customs-house in the May following. Port Sudan immediately attracted a large trade, the value of goods passing through it in 1906 exceeding £470,000. In 1908 the imports and exports were valued at about £750,000. It is a regular port of call of British, German and Italian steamers. The imports are largely cotton goods, provisions, timber and cement; the exports gum, raw cotton, ivory, sesame, durra, senna, coffee (from Abyssinia), goat skins, &c. Forty miles north of Port Sudan is Mahommed Gul, the port for the mines of Gebet, worked by an English company.

The Foreign Office Report, Trade of Port Sudan for the Year igo6, by T. B. Hohler, gives a valuable account of the beginnings of the port. A chart of the harbour was issued by the British Admiralty in 1908. See also Sudan : § Anglo-Egyptian.

PORT TOWNSEND, a city, port of entry and the county-seat of Jefferson county, Washington, U.S.A., on Quimper Peninsula, at the entrance to Puget Sound, about 40 m. N.N.W. of Seattle. Pop. (1905), 5300; (1910), 4181. The city is served by the Port Townsend Southern railway (controlled by the Northern Pacific, but operated independently) and by steamship lines to Victoria (British Columbia), San Francisco, Alaska and Oriental ports. The harbour is 7! m. long and 3J m. wide, and is deep, well sheltered and protected by three forts, of which Fort Worden is an excellently equipped modern fortification ranking with the forts at Portland (Maine), San Francisco, Boston and New York. The United States government has at Port Townsend a customs- house, a revenue cutter service, a marine hospital, a quarantine station and an immigration bureau. Port Townsend is the port of entry for the Puget Sound customs district. In 1908 its exports were valued at $37,547,553, much more than those of any other American port of entry on the Pacific; its imports were valued in 1908 at $21,876,361, being exceeded among the Pacific ports by those of San Francisco only. The city has a considerable trade in grain, lumber, fish, livestock, dairy products and oil; its manufactures include boilers, machinery and canned and pickled fish, especially salmon and herring. Port Townsend was settled in 1854, incorporated as a town in i860 and chartered as a city in 1890.

PORTUGAL, a republic of western Europe, forming part of the Iberian Peninsula, and bounded on the N. and E. by Spain, and on the S. and W. by the Atlantic Ocean. Pop. (1900), 5,016,267; area, 34,254 sq. m. These totals do not include the inhabitants and area of the Azores and Madeira Islands, which are officially regarded as parts of continental Portugal. In shape the country resembles a roughly drawn parallelogram, with its greatest length (362 m.) from N. to S., and its greatest breadth (140 m.) from E. to W. For map, see Spain. The

land frontiers are to some extent defined by the course of the' four principal rivers, the Minho and Douro in the north, the, Tagus and Guadiana in the south; elsewhere, and especially in the north, they are marked by moun-a^^L tain ranges; but in most parts their delimitation was originally based on political considerations. In no sense can the boundary-line be called either natural or scientific, apart from the fact that the adjacent districts on either side are poor, sparsely peopled, and therefore little liable to become a subject of dispute. The

Portuguese seaboard is nearly 500 m. long, and of the six ancient provinces all are maritime except Traz-os- Montes. From the extreme north to Cape Mondego and thence onward to Cape Carvbeiro the outline of the coast is a long and gradual curve; farther south is the prominent mass of rock and mountain terminating westward in Capes Roca and Espichel; south of this, again, there is another wide curve, broken by the headland of Sines, and extending to Cape St Vincent, the south- eastern extremity of the country. The only other conspicuous promontory is Cape Santa Maria, on the south coast. The only deep indentations of the Portuguese littoral are the lagoon of Aveiro (q.v.) and the estuaries of the Minho, Douro, Mondego, Tagus, Sado and Guadiana, in which are the principal harbours. The only islands off the coast are the dangerous Farilhoes and Berlings (Portuguese Berlengas) off Cape Carvoeiro.

Physical Features. — Few small countries contain so great a variety of scenery as Portugal. The bleak and desolate heights of the Serra da Estrella and the ranges of the northern frontier; are almost alpine in character, although they nowhere reach the limit of perpetual snow. At a lower level there are wide tracts of moorland, covered in many cases with sweet-scented cistus and other wild flowers. The lagoon of Aveiro, the estuary of the Sado and the broad inland lake formed by the Tagus above Lisbon (q.v.), recall the waterways of Holland. The sand-dunes of the western coast and the Pinhal de Leiria (q.v.) resemble the French Landes. The Algarve and parts of Alemtejo might be- long to North- West Africa rather than to Europe. The Paiz do Vinho, on the Douro, and the Tagus near Abrantes, with their terraced bush- vines grown up the steep banks of the rivers, are, often compared with the Rhine and the Elbe. The harbours of Lisbon and Oporto are hardly inferior in beauty to those of Naples and Constantinople. Apart from this variety, and from the historic interest of such places as Braga, Bussaco, Cintra, Coimbra, or Torres Vedras, the attractiveness of the country is due to its colouring, and not to grandeur of form. Its landscapes are on a small scale; it has no vast plains, no inland seas, no mountain as high as 7000 ft. But its flora is the richest in ■ Europe, and combines with the brilliant sunshine, the vivid but harmonious costumes of the peasantry, and the white or pale- tinted houses to compensate for any such deficiency. This wealth of colour gives to the scenery of Portugal a quite distinc- tive character and is the one feature common to all its varieties. The orography of Portugal cannot be scientifically studied except' in relation to that of Spain, for there is no dividing line between the principal Portuguese ranges and the highlands of Galicia, Leon and Spanish Estremadura. Three so-called Portuguese systems are

sometimes distinguished: (1) the Transmontane, stretching between the Douro and the Minho; (2) the Beirene, between the Douro and the Tagus; (3) the Transtagine, south of, the Tagus. The following ranges belong to the Transmontane system, which is the southern extension of ‘ the mountains of Galicia: Peneda (4728 ft.), forming the watershed between the river Lima and the lower Minho; the Serra do Gerez (4817 ft.), which rises like a gigantic wall between the Lima and the Homem, and sends off a spur known as the Amarella, Oural and Nora, south-westward between the Homem and the Cavado; La Raya Seca, a continuation of Gerez, which culminates in Larouco (4390 ft.) and contains the sources of the Cavado; Cabreira (4196 ft.), which contains the sources of the river Ave and separates the basin of the Tamega from that of the Cavado; Marao (4642 ft.), Villarelho (3547 ft.) and Padrella (3763 ft.), forming together a large massif between the rivers Tamega, Tua and Douro; and Nogueira (4331 ft.) and Bornes (3944 ft.), which divide the valley of the Tua from that of the Sabor. The Beirene system comprises two quite distinct mountain regions. ‘ North of the Mondego it includes Montemuro (4534 ft.), separating the Douro from the upper waters of its left-hand tributary the Paiva; Gralheira (3681 ft.) between the Paiva and the Vouga; the Serra do Caramullo

(351 1 ft.), between the Vouga and the Dao; and the Serra da Lapa (3215 ft.)> which gives rise to the Paiva, Tavora, Vouga and Dao. South of these ranges, but nominally included in the same system, is the Serra da Estrella, the loftiest ridge in Portugal (6532 ft.). The Estrella Mountains, which enclose the headwaters of the Mondego in a deep ravine, stretch from north-east-to south-west and are continued in the same direction by the Serra de Lousa (3944 ft.). They form the last link in the chain of mountain ranges, known to Spanish geographers as the Carpetano-Vetonica, which extends across the centre of the Peninsula from east to west. The greater part of the Serra da Estrella constitutes the watershed between the Mondego and Zezere. Lesser ranges, which are included in the Beirene system and vary in height from 2000 to 4000 ft., are the Mesas, between the rivers C6a and Zezere; the Guardunha and Moradal, separating the Zezere from the Ponsul and Ocreza, tributaries of the Tagus ; the Serra do Aire, and various ridges which stretch south-westward as far as the mountains of Cintra {q.v.). The Transtagine Mountains cannot rightly

be described as >a single system, as they consist for the most part of isolated ranges or massifs. The Serra da Arrabida (1637 ft.) rises between Cape Espichel and Setubal. Sao Mamede (3363 ft.), with the parallel and lower Serra de Portalegre, extends along part of the frontier of northern Alemtejo. Ossa (2129 ft.), Caixeiro (1483 ft.), Monfurado (1378 ft.) and Mendro (1332 ft.) form the high ground between the rivers Sado, Sorraia and Guadiana. East of the Guadiana the outliers of the Spanish Sierra Morena enter Portuguese territory. The Serra Grandola and Monte Cereal, two low ranges stretching from north to south, skirt the coast of southern Estremadura. In the extreme south the ranges are more closely massed together. They include Monchique, with the peak of Foya or Foia (2963 ft.), and various lower ranges. There are numerous large expanses of level country, the most notable of these being the plains (campos) of the Tagus valley, and of Aviz or Benavilla, Beja and Ourique, in Alemtejo; the high plateaux (cimas) of Mogadouro in Traz-os-Montes and Ourem between the Tagus and the upper Sorraia; the highly cultivated lowlands (yeigas) of Chaves and Valenca do Minho in the extreme north; and the marshy flats (baixas) along the coast of Alemtejo and the southern shore of the lower Tagus.

The three principal rivers which flow through Portugal to the sea — the Douro, Tagus and Guadiana — are described in separate articles. The chief Portuguese tributaries of the Douro are the Tamega, Tua and Sabor on the north, the Agueda, C6a and Paiva on the south ; of the Tagus, the Ocreza, Ponsul and Zezere on the north, the Niza and Sorraia on the south, while into the Guadiana, on its right or Portuguese bank, flow the Caia, Degebe, Cobres, Oeiras and Vascao. The whole country drains into the Atlantic, to which all the main rivers flow in a westerly direction except the Guadiana, which turns south by east in the lower part of its course. The Minho (Spanish Mino) is the most northerly river of Portugal, and in size and importance is only inferior to the three great waterways already mentioned. It rises in the highlands of Galicia, and, after forming for some distance the boundary between that province and Entre-Minho-e-Douro, falls into the sea below the port of Caminha. Its length is 170 m. Small coasters can ascend the river as far as Salvatierra in Galicia (20 m.), but larger vessels are excluded by a sandy bar at the mouth. Between the Minho and Douro the chief rivers are the Lima (Spanish Limia or Antela), which also rises in Galicia, and reaches the sea at Vianna do Castello; the Cavado, which receives the Homem on the right, and forms the port of Espozende in its estuary ; and the Ave, which rises in the Serra da Cabreira and issues at the port of Villa do Conde. Between the Douro and Tagus the Vouga rises in the Serra da

Lapa and reaches the sea through the lagoon of Aveiro; the Mondego flows north-east through a long ravine in the Serra da Estrella, and then bends back so as to flow west-south-west. Its estuary contains the important harbour of Figueira da Foz; its chief tributaries are the Dao on the right, and the Alva, Ceira and Arunca on the left; its length is 125 m. of which 52 m. are navigable by small coasters. Several comparatively unimportant streams, chief among which are the Liz and Sizandro, enter the Atlantic between the mouths of the Mondego and Tagus. Between the Tagus and Cape St Vincent the principal rivers are the Sado, which is formed by the junction of several lesser streams and flows north-west to the port of Setubal; and the Mira, which takes a similar direction from its headwaters south of Monte Vigia to the, port of Villa Nova de Milfontes. On the south coast the united waters of the Odelouca and Silves form the harbour of Villa Nova de Portimao, and the Algoz, Algibre or Quarteira, and the Asseca flow into the sea farther east. Portugal abounds in hot and medicinal springs, such as those of Caldas de Monchique, Caldas da Rainha and Vidago.

Geology. — By far the greater part of Portugal is occupied by ancient rocks of Archean and Palaeozoic age, and by eruptive masses which probably belong to various periods. All the higher mountains are formed of these rocks, and it is only near the coast and in the plain of the Tagus that later deposits are found. The Mesozoic beds form an irregular triangle extending from Lisbon and Torres Novas on the south to Oporto on the north. There are also a narrow strip along the southern shores of the Algarve and a

few smaller patches along the western coast. The Tertiary deposits cover the plain of the Tagus and are found in other low-lying areas near the coast. Of the Lower Palaeozoic rocks the Ordovician appears to be the most widely-spread. Large areas have been referred to the Cambrian, but it is only at Villa Boim, about 6 m. W.S.W. of Elvas, that Cambrian fossils have been found. The Ordovician beds have yielded fossils in several places, Vallongo and Bussaco being amongst the best-known localities. The suc- cession is similar to that of Brittany and Spain. Supposed Silurian beds have been described at Portalegre, and in the same neigh- bourhood Devonian fossils have been found. The Lower Carboni- ferous, which belongs to the ” Culm ” facies so widely spread in central Europe, occupies a wide area in southern Portugal; but the Upper Carboniferous is very restricted in extent, and occurs in small basins like those of the Central Plateau of France, resting unconformably upon the rocks below. The deposits in these basins consist largely of coarse sandstones and conglomerates, amongst which lie seams of coal. It is possible that some of these

deposits may belong to the Permian or at least to the Perma-Carboniferous. Of the Mesozoic systems the Jurassic is the most widely-spread. Supposed Triassic beds are found, but they are confined chiefly to the eastern margin of the Mesozoic area north of Lisbon. The Jurassic deposits are partly marine and partly fresh-w»ter or terrestrial, including beds of lignite. On the whole, excepting in eastern Algarve, the Upper Jurassic beds indicate the neighbourhood of a shore-line. The Cretaceous system is very limited in extent. Its most interesting feature is the occurrence near its summit, north of Cape Mondego, of sands and gravels containing plant remains. Here both Cretaceous and Tertiary forms are found, and the Mondego beds seem to represent the passage between the two systems. At the close of the Cretaceous period great eruptions of basalt and basaltic tuff took place, especially in the Lisbon area. The volcanic rocks then formed are followed by marine deposits of Oligocene and Miocene age. Towards the north these are associated with fresh-water limestones, indicating the presence of land in that direction. Marine Pliocene beds occur at the mouth of the Tagus. The contemporaneous beds inland are of fresh- water origin. Eruptive masses of various age are found in many localities. The Cintra granite sends veins into the base of the Upper Jurassic, and is very probably of Tertiary age. The Serra de Monchique is petrographically of great interest. It consists chiefly of elaeolite-syenite and other rocks derived from the same igneous magma.

Climate. — The climate of Portugal is equable and temperate. Lisbon, Coimbra, Evora and Oporto have mean temperatures between 60 ° and 61-5° F., and the daily variation nowhere exceeds 23 . This equability of temperature is partly caused by the very heavy rainfall precipitated on Portugal as one of the westernmost countries of Europe and the one most exposed to the Atlantic. The rainfall has been as heavy as 16 ft. in a year, and sometimes, as in the winter of 1909-1910, great damage is wrought by floods. Heavy fogs are also common along the coast, rendering it dangerous to ships. The rainfall is heaviest in the north and on the Serra da Estrella ; it is least in Algarve. A fine climate and equability of temperature are not universal in Portugal ; they are to be enjoyed mainly in Beira and Estremadura, especially at Cintra and Coimbra, and in the northern provinces. In the deep valleys where the mountains keep off the cool winds, it is excessively hot in summer; while on the summits of the mountains snow lies for many months. The meteorological station on the Serra da Estrella, with a mean annual temperature of 44-7° F., is the coldest spot in Portugal in which systematic observations are taken. Montalegre has a mean of 48-3° and Guarda of 50-3°. Even in Lisbon the yearly variation is not

less than 50 . In Alemtejo the climate is very unfavourable, and, though the heat is not so great as in Algarve (where Lagos has a mean of 63 °), the country has a more deserted appearance; while in winter when the Tagus overflows, un- healthy swamps are left. Notwithstanding that Algarve is hotter than Alemtejo, a profuse vegetation takes away much of the tropical effect. Portugal is very rarely visited by thunderstorms; but shocks of earthquake are frequently felt, and recall the great earth- quake of Lisbon {q.v.) in 1755.

Fauna and Flora. — An account of the fauna of the Iberian Peninsula as a whole is given under Spain. Woives are found in the wilder parts of the Serra da Estrella, and wild boars are preserved in some districts. As far as the constituents of its flora are concerned Portugal is not very dissimilar from Spain, but their distribution is peculiar. The vegetation of Spain is distributed in clearly marked zones ; but over the whole of Portugal, except the hottest parts of Algarve and Alemtejo, the plants of northern Europe flourish side by side with cacti, palms, aloes and tree-ferns (see Cintra). This is largely due to the fact that the moisture- laden winds from the Atlantic penetrate almost as far inland as the Portuguese frontier, but do not reach the interior of Spain. The soil is fertile, and the indigenous flora has been greatly enriched by the importation of such plants as the agave, the Mexican opuntia, the American maple, the Australian eucalyptus, the Scotch fir and the so-called Portuguese cypress {Cupressus lusitanica) from the Azores. There are many fine tracts of forest, among which may be mentioned the famous convent-wood of Bussaco {q.v.); cork

railways meet the Spanish at Valenca do Minho on the northern frontier, at Barca d'Alva, at Villar Formoso, near Valencia de Alcantara, and near Badajoz on the eastern frontier. In some of the chief towns there are electric tramways. The most important internal waterways are the lower Tagus and the Douro between Oporto and the Paiz do Vinho. In 1908, 11,045 vessels of 19,354,967 tons entered Portuguese seaports, but a very large majority of these ships were foreign, and especially British. The postal and 'telegraphic services are adequate; telephone systems are installed in Lisbon, Oporto and other large towns; and the Eastern Telegraph Co. has an important cable station at Carcavellos near Lisbon (q.v.).

Land Tenure. — Four modes of land tenure are common in Portugal. The poor and thinly-peopled region of Alemtejo is divided into large estates, and cultivated by tenant farmers. Numerous estates in various provinces are held on the metayage system (q.v.). In the north, where. the land is much subdivided, peasant proprietorship and a kind of emphyteusis (see Roman Law) are the most usual tenures. The Portuguese form of emphy- teusis is called aforamento; the landlord parts with the user of his property in exchange for a quit-rent (foro or canon). He may evict his tenant should the rent be in arrear for five years, and may at any time distrain if it be overdue ; but he cannot otherwise interfere with the holding, which the tenant may improve or neglect. Should the tenant sell or exchange his interest in the property, the right of pre-emption is vested in the landlord, and a corresponding right is enjoyed by the tenant should the quit- rent be for sale. As this tenure is very ancient, though modified in 1832 and 1867, the value of such holdings has been greatly enhanced with the improvement of the land and the decline in the purchasing power of currency.

Agriculture. — Many of the instruments and processes of Portu- guese agriculture and viticulture were introduced by the Romans, and are such as Columella described in the 1st century a.d. The characteristic springless ox-cart which is used for heavy loads may be seen represented on Roman frescoes of even earlier date. One form of plough still used consists of a crooked bough, with an iron share attached. Oxen are employed for all field-work; those of the commonest breed are tawny, of great muscular power, very docile, and with horns measuring 5 or 6 ft. from tip to tip. The ox-yokes are often elaborately carved in a traditional pattern in which Gothic and Moorish designs are blended. The Moors intro- duced many improvements, especially in the system of irrigation ; the characteristic Portuguese wells with their perpetual chains or buckets are of Moorish invention, and retain their Moorish name of noras. In all, rather more than 45 % of the country is uncultivated, chiefly in Alemtejo, Traz-os-Montes and the Serra da Estrella. The principal grain-crops are maize, wheat and rye; rice is grown among the marshes of the coast. Gourds, pumpkins, cabbages and other vegetables are cultivated among; the cereals. The large onions sold in Great Britain as Spanish are extensively pro- duced in the northern provinces. Every district has its vine- yards, the finest of which are in the Paiz do Vinho (see Oporto and Wine). The bush vines of this region are more exposed to the attacks of Oidium Tuckeri, which invaded the country in 1851, and of Phylloxera vastatrix, which followed in 1863, than the more deeply-rooted vines trained on

trellises or trees. Both these pests have been successfully combated, largely by the use of sulphur and by grafting immune American vines upon native^ stocks. In addition to grapes the commoner fruits include quinces, apples, pears, cherries, limes, lemons and loquats (Port, nespras) ; Condeixa is famous for oranges, Amarante for peaches, Elvas for plums, the southern provinces for carobs and figs; Large quantities of olive oil are manufactured south of the Douro. Almost all cattle, except fighting-bulls, are stall-fed. The fighting-bulls are chiefly reared in the marshes and alluvial valleys; they are bred for strength and swiftness rather than size, and a good specimen should be sufficiently agile to leap over the inner barrier of the arena (about 68 in. high). Large herds of swine are fed in the oak and chestnut woods of Alemtejo ; sheep and goats are reared in the mountains, where excellent cheeses are made from goats' milk.

Fisheries. — About 50,000 Portuguese are classed as hunters and fishermen. The majority of these are employed in the sardine and tunny fisheries. This industry is carried on in a fleet of more than 10,000 small vessels, including the whalers of the Azores and the cod-boats which operate outside Portuguese waters. The fishermen and fisherwomen form a quite distinct class of the people ; both sexes are noted for their bodily strength, and the men for their bold and skilful seamanship. Tunny and sardines are cured and exported in large quantities, oysters are also exported, and many other sea fish, such as hake, sea-bream, whiting, conger and various flat-fish are consumed in the country. In the early years of the 20th century the competition of foreign steam trawlers inflicted much hardship on the fishermen. The average yearly value of the fish landed in Portugal (exclusive of cured fish from foreign countries) is about £800,000. Salmon, lampreys and eels are caught in some of the larger rivers; trout abound in the streams of the northern provinces; but many fresh-water fish common elsewhere in Europe, including pike, perch, tench and chub, are not found.

Mines. — It is usually stated that Portugal is rich in minerals, especially copper, but that want of capital and, especially in the south, of transport and labour, has retarded their exploitation. The mineral deposits of the country are very varied, but their extent is probably exaggerated. The average yearly output from 1901 to 1905 was worth less than £300,000. Copper is mined in southern Portugal. Common salt (chiefly from Alcacer do Sal near Setubal), gypsum, lime and marble are exported; marble and granite of fine quality abound in the southern provinces. . Iron is obtained near Beja and Evora, tin in the district of Braganza. Lead, wolfram, antimony and auriferous quartz exist in the dis- tricts of Coimbra, Evora, Beja and Faro. Lignite occurs

at many points around Coimbra, Leiria and Santarem; asphalt abounds near Alcobaca; phosphorite, asbestos and sulphur are common south of the Tagus. Petroleum has been found near Torres Vedras; pitchblende, arsenic, anthracite and zinc are also mined. Gold was washed from some of the Portuguese rivers before the Christian era, and among the Romans the auriferous sands of the Tagus were proverbially famous; it is, however, extremely improbable that large quantities of gold were ever obtained in this region, although small deposits of alluvial gold may still be found in the valleys of the Tagus and Mondego.

Manufactures. — The Methuen Treaty of 1703 prevented the establishment of some manufacturing industries in Portugal by securing a monopoly for British textiles, and it was only after 1892 that Portuguese cotton-spinning and weaving were fostered by heavy protective duties. In 20 years these industries became the most important in the country after agriculture, the wine and cork trades and the fisheries. In connexion with the wine trade there are many large cooperages; cork products are extensively manufactured for export. Lisbon is the headquarters of the ship-building trade. Here, and in other cities, tanning, distilling, various metallurgical industries, and manufactures of soap, flour, tobacco, &c, are carried on; the entire output is sold in Portugal or its colonies. There is a steady trade in natural mineral waters, which occur in many parts of continental Portugal and the Azores. From the 1 6th century to the 1 8th many artistic handicrafts were practised by the Portuguese in imitation of the fine pottery, cabinet- work, embroideries, &c, which they imported from India and Persia. Portuguese cabinet-work deteriorated in the 19th century; the glass- works and potteries of the Aveiro and Leiria districts have lost much of their ancient reputation; and even the exquisite lace of Peniche and Vianna do Castello is strangely neglected abroad. The finest Caldas da Rainha china-ware, with its fantastic repreˆ sentations of birds, beasts and fishes, still commands a fair price in foreign markets; but the blue and white ware originally copied from Delft and later modified under the influence of Persian pottery is now only manufactured in small quantities, of inferior quality.. Skilful copies of Moorish metal-work may be purchased in the gold- smiths' and silversmiths' shops of Lisbon and Oporto; conspicuous among these are the filigree ornaments which are bought by the peasant women as investments and by foreign visitors as curiosities. In 1900 the total industrial population of Portugal was 455,296.

Commerce. — The annual value of the foreign trade of Portugal amounts approximately to £19,000,000. The following table shows the value for five years of the exports, and of all imports not re- exported

(exclusive of coin and bullion) : — – - – - .

Years.

Exports.

Imports.

1901 1902 1903 1904 1905

£6,284,800 £6,318,888 £6,800,710 £6,824,692 £6,460,000

£12,849,622 £12,354,800 £13,068,000 £13,801,622 £13,486,666

In 1910 the principal exports, in order of value, were wine (chiefly port, common wines and Madeira), raw and manufactured cork, preserved fish, fruits and vegetables, cottons and yarn, copper ore, timber, olive oil, skins, grain and flour, tobacco and wool. The imports were raw and manufactured cotton, wool and silk, wheat and maize, coal, iron and machinery, dried codfish, sugar, rice, hides and skins, oils. The United Kingdom, which annually purchases wine to the value of about £900,000 and cork to the value of about £500,000, is the chief consumer of Portuguese goods, and the chief exporter to Portugal. Germany and the United States rank respectively second and third among the countries which export to Portugal; Spain, which buys bullocks and pigs, Brazil, which buys wine, and the Portuguese colonies, which buy textiles, are among the chief purchasers of Portuguese products. In addition to its direct foreign commerce Portugal derives much benefit from its share in the trade between South America and Europe. Large liners from Liverpool, Southampton, London, Hamburg, Havre and Antwerp call regularly for passengers or cargo at Leixoes or Lisbon, or both ports, on their way to and from South America (especially Brazil). In connexion with this trade an important tourist traffic, chiefly from Great Britain and Germany, was developed towards the end of the 19th century.

Banks and Money. — In 1910 the Bank of Portugal, to which the

trees are extensively cultivated, Barbary oaks (Quercus ballota, Port, azinheira) furnish edible acorns and excellent timber for charcoal, and

carob-trees (Ceratonia siliqua, Port, alfarrobeira) also produce edible seed-pods somewhat resembling beans. Elms, limes and poplars are common north of the Tagus, ilexes, arau- carias, myrtles, magnolias and a great variety of conifers in all parts. The Serra da Estrella has a rich alpine flora, and the lagoon of Aveiro contains a great number of aquatic plants.

Inhabitants. — The population of Portugal numbered 4,550,699 in 1878, 5,049,729 in 1890 and 5,423,132 in 1900. These totals include the inhabitants of the Azores and Madeira, which together amounted to 406,865 in 1900. Few immigrants enter the country, but the birth-rate is about 30 per 1000, while the mortality is only about 20 per 1000. Large bodies of emigrants, chiefly recruited from the sober, hardy and industrious peasantry of the northern provinces, annually leave Portugal to seek fortune in America. A few go to the Portuguese colonies, the great majority to Brazil. Many of these emigrants return with considerable savings and settle on the land. The mortality is highest among male children, and the normal excess of females is in the proportion of 109 to 100. Six-sevenths of the popula- tion of continental Portugal inhabit the provinces north of the Tagus. The density of population is greatest in Madeira (479-5 per sq. m. in 1900), Entre-Minho-e-Douro (419-5) and the Azores (277-9), nowhere else does it reach 200 per sq. m. In Alemtejo the percentage sinks to 45-1, and for the whole country, including the islands, it amounts only to 152-8.

The Portuguese people is composed of many racial elements. Its earliest known ancestors were the Iberians (q.v.). The peas- antry, especially in the north, are closely akin to the Galician and Asturian Spaniards in character, physique and dialect ; and these three ethnical groups — Portuguese of the north, Galicians, Astu- rians — may perhaps be regarded as the purest representatives of the Spanish stock. The first settlers with whom they inter- married were probably Carthaginians, who were followed in smaller numbers by Greeks; but the attempts which have some- times been made to ascribe certain attributes of the Portuguese to the influence of these races are altogether fanciful. The Romans, whose supremacy was not seriously threatened for some six centuries after the Punic Wars, gave to Portugal its language and the foundation of its civilization; there is, however, no evidence that they seriously modified the physical type or character of its people. In these respects the Suevic and Visigothic conquests left a more permanent impression, especially in the northern provinces. After 711 came the long period of Moorish (i.e. Arab and Berber) predominance. The influence of the Moors was greatest south of the Tagus. In Alemtejo, and still more in Algarve,

Arab and Berber types are common; and the influence of these races can everywhere be discerned in the architecture, handicrafts and speech of the peasantry. So complete was the intellectual triumph of the Moors that an intermediate ” Mozarabic ” population arose, Portuguese in blood, Christian in religion, but Arab in language and manners. Many of the Mozarabs even adopted the characteristic Mahom- medan rite of circumcision. Under the tolerant rule of Islam the Portuguese Jews rose to a height of wealth and culture unparalleled in Europe; they intermarried with the Christians both at this period and after their forced conversion by King Emanuel I. (1495-1521). After 1450 yet another ethnical element was introduced into the nation, through the importation of African slaves in vast numbers. Negroid types are common throughout central and southern Portugal. No European race confronted with the problem of an immense coloured population has solved it more successfully than the Portuguese and their kinsmen in Brazil; in both countries intermarriage was freely resorted to, and the offspring of these mixed unions are superior in character and intelligence to most half-breeds.

National Characteristics. — The normal type evolved from this fusion of many races is dark-haired, sallow-skinned, brown- eyed and of low stature. The poorer classes, above all the fisher- men and small farmers, are physically much finer than the well- to-do, who are prone to excessive stoutness owing to their more sedentary habits. The staple diet of the labouring classes and

small farmers is fish, especially the dried codfish called bacalhdo, rice, beans, maize bread and meal, olive oil, fruit and vegetables. Meat is rarely eaten except on festivals. In Alemtejo chestnuts and figs are important articles of diet. Drunkenness is extremely rare. There is no single national dress, but a great variety of picturesque costumes are worn. The sashes, broad-brimmed hats and copper-tipped quarterstaves of the men, and the bril- liant cotton dresses and gold or silver filigree ornaments worn on holidays by the women are common throughout the country; but many classes have their own costumes, varying in detail according to the district or province. These costumes may be seen at their best at bull-fights and at such popular festivals as the romarias or pilgrimages, which combine religion with the attractions of a fair. The national sport of bull-fighting (q.v.) is conducted as humanely as possible, for the Portuguese are lovers of animals. The artistic sense of the nation is perhaps greatest among the peasantry, although Portugal has the most illiterate peasantry in western Europe. It is manifested in their poetry and music even more than in their admirable costumes and in the good taste which has preserved the Roman or Moorish forms of their domestic pottery. Even

the men and women who till the soil are capable of improvizing verse of real merit, and sometimes excel in the ancient and difficult art of composing extempore amoebean rhymes. In this way, although the ancient ballads are not forgotten, new words are also fitted to the plaintive folk-tunes (fados) which every farm-hand knows and sings, accompanied sometimes by a rude clarinet or bag- pipes, but more frequently by the so-called Portuguese guitar — an instrument which resembles a mandolin rather than the guitars of Italy and Spain. The native dances, slow but not ungraceful, and more restrained than those of Andalusia or the south of France, are obviously Moorish in origin, and depend for their main effects on the movement of the arms and body. Many curious superstitions survive in the country districts, including the beliefs in witches (jeiticeiras, bruxas) and werewolves (lobis- homens) ; in sirens (sereias) which haunt the dangerous coast and lure fishermen to destruction; in fairies (fadas) and in many kinds of enchantment. It will be observed that the nomen- clature of Portuguese folk-lore suggests that the popular supersti- tions are of the most diverse origin — Latin, Greek, Arabic, native: lobishomem is the Latin lupus homo, wolf -man, sereia is the Greek atipi\v, bruxa is Arabic, feiliceira and fad a Portuguese. Other beliefs can be traced to Jewish and African sources.

Chief Towns. — The chief towns of Portugal are Lisbon (pop. 1900, 356,009), the capital and principal seaport; Oporto (167,955), the capital of the northern provinces and, after Lisbon, the most important centre of trade; the seaports of Setubal (22,074), Ilhavo (12,617), Povoa de Varzim (12,623), Tavira (12,175), Faro (11,789), Ovar (10,462), Olhao (10,009) Vianna do Castello (10,000), Aveiro (9975), Lagos (8291), Leixoes (7690) and Figueira da Foz (6221); and the inland cities or towns of Braga (24,202), Louie (22,478), Coimbra (18,144), Evora (16,020), Covilha. (15,469), Elvas (13,981), Portalegre (11,820), Palmella (11,478), Torres Novas (10,746), Silves (9687), Lamego (9471), Guimaraes (9104), Beja (8885), Santarem (8628), Vizeu (8057), Estremoz (7920), Monchique (7345), Castello Branco (7288), Abrantes (7255), Torres Vedras (6900), Thomar (6888), Villa Real (6716), Chaves (6388), Guarda (6124), Cintra (5914), Braganza (5535), Mafra (4769), Leiria (445°), Batalha*(3858), Almeida (2330), Alcobaca (2309), Bussaco (1661). All these are described in separate articles.

Communications. — Up to 1851 there was practically no good carriage road in the country except the highway between Lisbon and Cintra. In 1853 the work of constructing a proper system of roads was undertaken, and by the end of the century all the larger towns were linked together by the main or ” royal ” highways to which the ”

district ” and ” municipal ” roads were subsidiary. Each class of road was named after the authority responsible for its construction and upkeep. In some of the remoter rural districts there are only bridle-paths, or rough tracks, which become almost impassable in wet seasons, and are never suitable for vehicles less solid than the Portuguese ox-carts. The first railway was opened in 1853 to connect Lisbon with Badajoz. In 1910 1758 m. were completed, of which 672 m. were state lines. The Portuguese

treasury was deeply indebted, had a capital of £1,500,000, and a monopoly of note issue in continental Portugal, but the notes of the Ultramarine Bank circulated in the colonies. The notes of the Bank of Portugal in circulation amounted in value to about £14,000,000. For an account of the Monte Pio Geral, which is a combined bank, pawnbroking establishment and benefit society, see Pawnbroking; the deposits in the Monte Pio and the State Savings Bank amounted in 1910 to some £5,228,000. There are also many private banks, including savings banks. Gold is the standard of value, but the actual currency is chiefly Bank of Portugal notes. The values of coin and notes are expressed in multiples of the real (plural rets), a monetary unit which does not actually exist. The milreis, 1000 reis of the par value of 4s. 5d. (or 4-5 milreis to the pound sterling) and the conto of reis (1000 milreis) are used for the calculation of large sums. Gold pieces of 10, 5, 2 and 1 milreis were coined up to 1891; 10, 5, and 2 testoon (testao) pieces, worth respectively 1000, 500 and 200 reis, are coined in silver; testoons of 100 reis and half testoons of 50 reis, in nickel; pieces of 20, 10 and 5 reis in bronze. The milreis fluctuates widely in value, the balance of exchange being usually adverse to Portugal; for the purposes of this article the milreis has been taken at par. The British sovereign is legal tender for 4500 reis, but in practice usually commands a premium. The metric system of weights and measures has been officially adopted, but many older standards are used, such as the libra (1-012 ft avoirdupois), alqueire (0-36 imperial bushel), moio (2-78 imp. bushels), almude of Lisbon (3-7 imp. gallons) and almude of Oporto (5-6 imp. gallons).

Finance. — For the five financial years, 1901-1902 to 1905-1906, the average revenue of Portugal was about £13,300,000 and the average expenditure £13,466,000. The chief sources of revenue were customs

duties, taxes on land and industries, duties on tobacco and breadstuff's, the Lisbon octroi, receipts frcto national property, registration and stamps, &c. The heaviest expenditure (nearly £5,000,000) was incurred for the service of the consolidated debt; payments for the civil list, cortes, pensions, &c, amounted to more than £2,000,000, and the cost of public works to nearly as large a sum. The ministries of war and marine together spent about £2,500,000 each year. The practice of meeting deficits by loans, together with the great expenditure, after 1853, on public works, especially roads and railways, explains the rapid growth of the national debt in modern times. In 1853 the total public debt, internal and external, amounted to £2,082,680. It exceeded £90,000,000 in 1890, and in 1 891-1892 the finances of the kingdom reached a crisis, from which there was no escape except by arrang- ing for a reduction in the amount payable as interest (see History, below). By the law of the 26th of February 1892 30% was de- ducted from the internal debt payable in currency; by the law of -the 20th of April 1893 66f % was deducted from the interest on the external debt, due in gold. A law of the 9th of August 1902 provided for the conversion of certain gold debts into three series of consolidated debt, at reduced interest. In 1909 the total outstanding debt amounted to £161,837,430, made up as follows: new external 3% converted in three series, £34,223,465; 4i % tobacco loan £7,267,480; internal 3% (quoted in London) £113,132,979. Internal debt at 3, 4 and 43% was also outstanding to the amount of £7,213,506.

Constitution. — Up to October 1910 the government was an hereditary and constitutional monarchy, based on the constitu- tional charter which was granted by King Pedro IV. on the 29th of April 1826, and was afterwards several times modified; the most important changes were those effected by the acts of the 5th of July 1852, the 24th of July 1885, and the 28th of March and 25th of September 1895. The revolution of the 5th of October 1910 brought the monarchy to an end and substituted republican government for it. The monarchical constitution recognized four powers in the state — the executive, moderating, legislative and judicial. The two first of these were vested in the sovereign, who might be a woman, and who shared the legislative power with two chambers, the Camara dos Pares or House of Peers, and the Camara dos Deputados or House of Commons; these were collectively styled the Cortes Geraes, or more briefly the Cortes. The royal veto could not be imposed on legislation passed twice by both houses. The annual session lasted four months, and a general election was necessary at the end of every four years, or immediately after a dissolution. A committee repre- senting both

houses adjudicated upon all cases of conflict between Peers and Commons; should it fail to reach a decision, the dispute was referred to the sovereign, whose award was final. Up to 1885 some members sat in the House of Peers by hereditary right, while others were nominated for life. It was then decided that such rights should cease, except in the case of princes of royal blood and members then sitting, and that

when all the hereditary peerages had lapsed the house should be composed of the princes of the royal blood, the archbishops and bishops of the continental dioceses, a hundred legislative peers appointed by the king for life, and fifty elected every new parliament by the Commons. In 1895 the number of nominated life peers was reduced to ninety and the elective branch was abolished. Subject to certain limitations and to a property qualification, any person over 40 years of age was eligible to a peerage. The titles and social position of the Portuguese aristocracy were not affected when its political privileges were abolished. In the nomination of life peers, and in certain administrative matters the sovereign was advised by a council of state, whose twelve members were nominated for life and were principally past or present ministers. The sovereign exercised his executive power through a cabinet which was responsible to the cortes, and consisted of seven members, representing the ministries of (1) the interior, (2) foreign affairs, (3) finance, (4) justice and worship, (5) war, (6) marine and colonies, (7) public works, industry and commerce. The House of Commons was composed of 148 members, representing the 26 electoral divisions of Portugal, the Azores and Madeira, which returned 113 elected members and 35 representatives of minorities, and of 7 members representing the colonies. Peers, naturalized foreigners and certain employees of the state were unable to sit in the House of Commons; members were required to be graduates of one of the highest, secondary or professional schools, or to possess an income of not less than 400 milreis (£88). AD members might, in connexion with their official duties, travel fret on railways and ships owned by the state; but since 1892 none had received any salary except the colonial members, who were paid 100 milreis (£22) per month during the session, and 50 milreis (£11) per month during the remainder of the year. All male citizens 21 years old who could read and write, or who paid taxes amounting to 500 reis yearly, had the parliamentary franchise, except convicts, beggars, undischarged bankrupts, domestic servants, workmen permanently employed by the state and soldiers or sailors below the rank of commissioned officer. (For changes made under republican rule, see History, § 8.)

Local Government. — Continental Portugal was formerly divided for administrative purposes into six provinces which corresponded to a great extent with the natural geographical divisions of the country and are described in separate articles; the names of these, which are still commonly used, are Entre-Minho-e-Douro (also called Entre-Douro-e-Minho or Minho), Traz-os-Montes, Beira, Estremadura, Alemtejo and Algarve. The province of Douro, another administrative division of less antiquity, comprised the present districts of Aveiro and Oporto, or part of Beira and Entre- Minho-e-Douro. The six ancient provinces were subdivided on the 28th of June 1833 into districts, each named after its chief town, as follows: Entre-Minho-e-Douro into Vianna do Casteilo, Braga, Oporto; Traz-os-Montes, into Villa Real, Braganza; Beira, into Aveiro, Vizeu, Coimbra, Guarda, Casteilo Branco ; Estremadura, into Leiria, Santarem, Lisbon; Alemtejo, into Portalegre, Evora, Beja ; Algarve was renamed Faro. In 1910 the Azores comprised three districts and Madeira formed one. Each district was governed by a commission composed of (1) the civil governor, who was nominated by the central authority and presided over the commission ; (2) the administrative auditor; and (3) three members chosen by indirect suffrage. The districts were divided into communes (concelhos), each administered by an elected council, and a mayor nominated by the central authority. The mayor could not preside over the council, which appointed one of its own members to preside and to give effect to its decisions. The communes were subdivided into parishes (freguesias), which were administered by the elected council (junta de parochia) over which the parish priest (presbitero) presided, and by the regedor, an official who represented the mayor of the commune and was nominated by the civil governor. The central authority had almost complete control over local administration through its representatives, the civil governor, mayors and regedores.
Justice. — In 1910 Portugal was divided into 193 judicial districts (comarcas) , in each of which there was a court of first instance. The three courts of appeal (tribunaes de relacao) sat at Lisbon, Oporto and Ponta Delgada (Azores), and there was a Supreme Court in Lisbon.

Colonics. — At the beginning of the 19th century Portugal possessed a larger colonial empire than any European power except Great Britain and Spain. At the beginning of the 20th century its transmarine possessions had been greatly reduced in size by the loss of Brazil, but were still only surpassed in extent

by those of three powers — Great Britain, France and Germany. Their total area was about 803,000 sq. m., of which 794,000 sq. rri. are in Africa. They comprised, in Africa, the Cape Verde Islands, St Thomas and Prince's Islands, Portuguese Guinea, Angola and Portuguese East Africa, or Mozambique; in India, Goa, Damaun and Diu; in China, Macao; and in the Malay Archipelago part of Timor. All these are described in separate articles. In all the white population is in a minority; in most the climate is unsuitable for European colonization, nor is the commercial value of the colonies commensurate with their extent. Viewed as a whole, Portuguese administration has been carried on under difficulties which have rendered it costly and inefficient, the home government being compelled to contribute a large annual subsidy towards its maintenance. The amount paid in subsidies from 1870 to 1900 was about £15,000,000.

Religion. — Roman Catholicism was the state religion until 1910, but other creeds were tolerated, and the Church lost its temporal authority in 1834, when the monasteries were suppressed and their property confiscated for the first time. There are three ecclesiastical provinces — Braga, Lisbon and Evora, each under an archbishop. The archbishop of Braga, whose see is the most ancient, has the title of Primate ; the archbishop of Lisbon has the honorary title of Patriarch, and is usually elected a cardinal. His province includes Madeira, the Azores and the West African colonies. There are four- teen dioceses, of which Oporto is the most important. The annual revenues of the upper hierarchy of the Church amounted, up to 1910, to about £65,000. In some of the larger towns the foreign residents have their own places of worship. (See further under History.)

Education. — Primary education is regulated by a law of 1844, under which children between the ages of 7 and 15 are bound to attend a school, should there be one within a mile, under penalty to the parents of a fine and deprivation of civil rights. This law has not been strictly enforced; primary education was never properly organized; and, according to census returns, the pro- portion of the population (including children) unable to read was 82-4% in 1878, 79-2 in 1890 and 78-6 in 1900. There were in 1910 5250 public and 1750 private primary schools. In the chief towns there are training schools for teachers. The system of secondary education was reorganized in 1894. In 1905 there were state lyceums in each district capital and in Guimaraes, Lamego and Amarante ; 5 municipal lyceums, at Celorico de Basto, Chaves, Ponte de Lima, Povoa de Varzim and Setubal; military and naval colleges; a secondary school for girls in Lisbon;

numerous private secondary schools and ecclesiastical seminaries; industrial, com- mercial and technical schools; and pilot schools at Lisbon, Oporto, Faro and Ponta Delgada (Azores). Other important educational institutions are described under Lisbon and Oporto. The national university is at Coimbra (q.v.).

Defence. — Under the monarchy, the army was maintained at its normal strength partly by voluntary enlistment and conscription, the chief law regulating it being that of 1887, as variously modified in subsequent years. The cortes fixed the number of conscripts to be enrolled in each year: in 1905, 15,000 men for the army, 1000 for the navy, 500 for the municipal guards and 400 for the fiscal guards. The organization of the army was based on the acts of the 7th of September 1899 and the 24th of December 1901. With cer- tain exceptions all men over 21 years of age were liable for service — 3 years in the regular army, 5 years in the first reserve and 7 years in the second reserve ; but exemption could always be purchased. In time of war, the municipal guards, numbering about 2200, and the fiscal guards, numbering about 5200, might be incorporated in the army. The total effective force of the active army on a peace footing was 1787 officers, 31,281 men, 6479 horses and mules and 100 guns. The total effective force on a war footing, inclusive of re- servists, municipal guards and fiscal guards, was 4221 officers, 178,603 men, 19,600 horses and mules and 336 guns. Lisbon, Elvas and Angra in the Azores, were considered first-class fortresses, but only Lisbon had modern defences. The Portuguese navy in 1910 con- sisted of I armoured vessel, 5 protected cruisers, 2 third-class cruisers, 19 gunboats, 1 torpedo gunboat, 4 torpedo boats, 16 river gunboats, 4 transports and 3 training ships. Twelve other vessels, including 2 submarines, were under construction. The whole fleet was manned by about 5000 men.

Bibliography. — Numerous official reports, chiefly statistical, are published periodically in Lisbon; a few are written in French, the majority in Portuguese. Read in conjunction with the British consular and diplomatic reports, they afford a comprehensive survey of the movement of population, the progress of trade, &c. The following state papers deserve special notice: Caminhos de ferro (1877, &c), Commercio e navigacao (annual, issued by the Ministry of Marine), Le Portugal vinicole (1900), Le Portugal . . . . agricole (1900), Notas sobre Portugal (2 vols., 1908). For geology, see the section of Le Portugal …. agricole written by P. Choffat and entitled ” Apercu de la geologie de Portugal,” also ” The Work of the Portuguese Geological Survey,” by Philip Lake, in Science

Progress (1896) v. 439-453; both these summaries refer to the most important original papers. Two illustrated volumes by Oswald Crawford, Portugal Old and New (London, 1880) and Round the Calendar in Portugal (London, 1890) contain much valuable information on agriculture, viticulture and peasant life in the northern pro- vinces. Through Portugal, by Major Martin Hume (London, 1907) and Lisbon and Cintra, by A. A. Inchbold (London, 1908), describe the towns, &c, most frequently visited by tourists, and are illus- trated in colours. Le Portugal (Paris, 1899), by 18 writers, is a brief but encyclopaedic description of continental Portugal. See also Portugal: its Land and People, by W. H. Koebel (London, 1909), and Portuguese Architecture, by W. C. Watson (London, 1908). The following books deal comprehensively with the Portuguese colonies; As Colonias portuguezas, by E. J. de Vascon- cellos (2nd ed., Lisbon, 1903), Les Colonies portugaises, by A. de Almada Negreiros (Paris, 1908). (K. G. J.)

History

Throughout the centuries which witnessed the destruction of Carthaginian power by Rome, the establishment and decline of Latin civilization, the invasion by Alani, Suevi and other barbarian races, the resettlement under Visigothic rule and the overthrow of the Visigoths by Arab and Berber tribes from Africa, Portugal remained an undifferentiated part of Hispania, without sign of national consciousness. The Iberian Peninsula was one: and its common history is related under Spain. It is true that some Portuguese writers have sought to identify their race with the ancient Lusitani, and have claimed for it a separate and continuous existence dating from the 2nd century B.C. The revolt of Lusitania against the Romans has been regarded as an early manifestation of Portuguese love of liberty, Viriathus as a national hero. But this theory, which originated in the 15th century and was perpetuated in the title of The Lusiads, has no historical foundation. In 1095 Portugal was an obscure border fief of the kingdom of Leon. Its territories, far from the centres of European civilization and consisting largely of mountain, moorland and forest, were bounded on the north by the Minho, on the south by the Mondego. Its name (Porlu- calia, Terra portucalensis) was derived from the little seaport of Portus Cale or Villa Nova de Gaia, now a suburb of Oporto, at the mouth of the Douro. Its inhabitants, surrounded by Moorish or Spanish enemies and distracted by civil war, derived such rudiments of civilization as they possessed from Arabic or Leonese sources. But from these obscure beginnings Portugal rose in four centuries to be the greatest maritime, commercial and colonial power in Europe.

The history of the nation comprises eight periods. (1) Be- tween 1095 and 1279 a Portuguese kingdom was established and extended until it reached its present continental limits. (2) Between 1279 and 141 5 the monarchy was gradually consolidated in spite of resistance from the Church, the nobles and the rival kingdom of Castile. (3) In 141 5 began a period of crusades and discoveries, culminating in the discovery of an ocean-route to India (.1497-1499). (4) From 1499 to 1580 Portugal acquired an empire stretching from Brazil eastward to the Moluccas, reached the zenith of its prosperity and entered upon a period of swift decline. (5) Spanish kings ruled over Portugal from 1 581 to 1640. (6) The chief event of the years 1640 to 1755 was the restoration of the Portuguese monarchy. (7) Between 1755 and 1826 the reforms of Pombal and the Peninsular War prepared the country for a change from absolutism to constitutional monarchy. (8) In 1826 the era of constitutional government began.

1 . The Establishment of the Monarchy. — The origin of Portugal, as a separate state, was an incident in the Christian reconquest of Spain. Towards the close of the nth century crusading knights came from every part of Europe Henry. to aid the kings of northern and central Spain in driving out the Moors. Among these adventurers was Count Henry of Burgundy, an ambitious warrior who, in 1095, married Theresa, natural daughter of Alphonso VI., king of Leon. The county of Portugal, which had already been won back from the Moors (1055-1064), was included in Theresa's dowry. Count Henry ruled as a vassal of Alphonso VI., whose Galician marches were thus secured against any sudden Moorish raid. But in

1 109 Alphonso VI. died, bequeathing all his territories to his legitimate daughter Urraca, and Count Henry at once invaded Leon, hoping to add to his own dominions at the expense of his suzerain. After three years of war against Urraca and other rival claimants to the throne of Leon, Count Henry himself died in 1112. He left Theresa to govern Portugal north of the Mondego during the minority of her infant son Affonso Henriques (Alphonso I.): south of the Mondego the Moors were still supreme.

Theresa renewed the struggle against her half-sister and suzerain Urraca in 1116-1117, and again in 1120; in 1121 she was besieged in

Lanhoso and captured. But a U12-1I28. P eace was negotiated by the archbishops Diogo Gelmires of Santiago de Compostela and Burdino of Braga, rival churchmen whose wealth and military resources enabled them to dictate terms. Bitter jealousy existed between the two prelates, each claiming to be primate of ” all the Spains,” and their antagonism had some historical importance in so far as it fostered the growth of separatist tendencies among the Portuguese. But the quarrel was temporarily suspended because both Gelmires and Burdino had reason to dread the extension of Urraca ‘s authority. It was arranged that Theresa should be liberated and should continue to hold the county of Portugal as a fief {honor) of Leon. During the next five years she lavished wealth and titles upon her lover Fernando Peres, count of Trava, thus estranging her son, the archbishop of Braga and the nobles, most of whom were foreign crusaders. In n 28, after her power had been crushed in another unsuccessful conflict with Leon and Castile, she was deposed by her own rebellious subjects and exiled in company with Peres. She died in 1130.

Alphonso, who became count of Portugal in n 28, was one of the warrior heroes of medieval romance; his exploits were sung by troubadours throughout south-western Europe, and even in Africa ” ibn Errik ” — the son of Henry — was known and feared. The annals of his reign have been encum- 1128-1185 “bered with a mass of legends, among which must be included the account of a cortes held at Lamego in 1 1 43; probably also the description of the Valdevez tournament, in which the Portuguese knights are said to have vanquished the champions of Leon and Castile. Alphonso was occupied in almost incessant border fighting against his Christian or Moorish neighbours. Twelve years of campaigning on the Galician frontier were concluded in 1 143 by the peace of Zamora, in which Alphonso was recognized as independent of any Spanish sover- eign, although he promised to be a faithful vassal of the pope and to pay him a yearly tribute of four ounces of gold. In 1167, however, the war was renewed. Alphonso succeeded in con- quering part of Galicia,but in attempting to capture the frontier fortress of Badajoz he was wounded and forced to surrender to Ferdinand II. of Leon (1169). Ferdinand was his son-in-law, and was probably disposed to leniency by the imminence of a Moorish invasion in which Portugal could render useful assistance. Alphonso was therefore released under promise to abandon all his conquests in Galicia.

He had already won many victories over the Moors. At the beginning of his reign the religious fervour which had sustained the Almoravide dynasty was rapidly subsiding; in Portugal independent Moorish chiefs ruled over cities and petty states, ignoring the central government; in

Africa the Almohades were destroying the remnants of the Almoravide power. Alphonso took advantage of these dissensions to invade Alemtejo, reinforced by the Templars and Hospitallers, whose respective headquarters were at Soure and Thomar. On the 25th of July 1 139 he defeated the combined forces of the Moors on the plains of Ourique, in Alemtejo. Legend has magnified the victory into the rout of 200,000 Moslems under five kings; but so far was the battle from being decisive that in 1 140 the Moors were able to seize the fortress of Leiria, built by Alphonso in 1135 as an outpost for the defence of Coimbra, his capital. In 1144 they defeated the Templars at Soure. But on the 15th of March 1 147 Alphonso stormed the fortress of Santarem, and about the same time a band of crusaders on their way to Palestine landed

at Oporto and volunteered for the impending siege of Lisbon. Among them were many Englishmen, Germans and Flemings, who were afterwards induced to settle in Portugal. Aided by these powerful allies, Alphonso captured Lisbon on the 24th of October 1147. This was the greatest military achievement of his reign. The Moorish garrisons of Palmella, Cintra and Almada soon capitulated, and in n 58 Alcacer do Sal, one of the chief centres of Moorish commerce, was taken by storm. At this time, however, the Almohades had triumphed in Africa and invaded the Peninsula, where they were able to check the Portuguese reconquest, although isolated bands of crusading adventurers succeeded in establishing themselves in various cities of Alemtejo. The most famous of these free-lances was Giraldo Sempavor (" Gerald the Fearless "), who captured Evora in 1166. In 1171 Alphonso concluded a seven years' truce with the Moors; weakened by his wound and by old age, he could no longer take the field, and when the war broke out afresh he delegated the chief command to his son Sancho. Between 1 1 79 and 1 184 the Moors retrieved many of their losses in Alem- tejo, but were unable to retake Santarem and Lisbon. Alphonso died on the 6th of December 1185. He had secured for Portugal the status though not the name of an independent kingdom, and had extended its frontier southwards from the Mondego to the Tagus. He had laid the foundation of its navy and had strength- ened, if he did not inaugurate, that system of co-operation between the Crown and the military orders which afterwards proved of incalculable service in the maritime and colonial development of the nation.

Sancho I. continued the war against the Moors with varying fortune. In 1189 he won Silves, then the capital of Algarve; in 1 192 he lost not only Algarve but the greater part of Alemtejo, including Alcacer do Sal. A peace was iiss-1211'.' then arranged, and for the next eight

years Sancho was engaged in hostilities against Alphonso IX. of Leon. The motives and course of this indecisive struggle are equally obscure. It ended in 1201, and the last decade of Sancho's reign was a period of peaceful reform which earned for the king his popular name of Povoador, the " maker of towns." He granted fresh charters to many cities, legalizing the system of self-government which the Romans had bequeathed to the Visigoths and the Moors had retained or improved. Lisbon had already (11 79) received a charter from Alphonso I. Sancho also endeavoured to foster immigration and agriculture, by granting estates to the military orders and municipalities on condition that the occupiers should cultivate or colonize their lands. Towards the close of his reign he became embroiled in a dispute with Pope Innocent III. He had insisted that priests should accompany their flocks in battle, had made them amenable to secular jurisdiction, had withheld the tribute due to Rome and had even claimed the right of disposing of ecclesiastical domains. Finally he had quarrelled with Martinho Rodrigues, the unpopu- lar bishop of Oporto, who was besieged for five months in his palace and then forced to seek redress in Rome (1209). As Sancho was in weak health and had no means of resisting Papal pressure, he made full submission (1210); and after bestowing large estates on his sons and daughters, he retired into the monas- tery of Alcobaca (g.v.), where he died in 121 1.

The reign of Alphonso II. (" the Fat ") is noteworthy for the first meeting of the Portuguese cortes, to which the upper hierarchy of the Church and the nobles (fidalgos and Alphonso ricos homens) were summoned by royal writ. The //., /di- king was no warrior, but in 121 2 a Portuguese con- 1223 ' tingent aided the Castilians to defeat the Moors at Las Navas de Tolosa, and in 121 7 the ministers, bishops and captains of the realm, reinforced by foreign crusaders, retook Alcacer do Sal. Alfonso II. repudiated the will of his father, refused to surren- der the estates left to his brothers, who went into exile, and only gave up the property bequeathed to his sisters after a prolonged civil war in which Alphonso IX. of Leon took part against them. Even then he compelled the heiresses to take the veil. His attempts to strengthen the monarchy and fill the treasury at the expense of the Church resulted in his excommunication by

Pope Honorius III., and Portugal remained under interdict until

Alphonso II. died in 1223.

Sancho II. succeeded at the age of thirteen. To secure the

removal of the interdict the leading statesmen who were identified with the policy of his father — Goncalo Mendes the chancellor, Pedro Annes the lord chamberlain

Saacho II.,

1223-1248.

(mordomo-mdr) and Vicente, dean of Lisbon — resigned their offices. Estevao Soares, archbishop of Braga, placed himself at the head of the nobles and churchmen who threatened to usurp the royal power during Sancho II. ‘s minority, and negotiated an alliance with Alphonso IX., by which it was arranged that the Portuguese should attack Elvas, the Spaniards Badajoz. Elvas was taken from the Moors in 1226, and in 1227 Saneho assumed control of the kingdom. He reinstated Pedro Annes, made Vicente chancellor, and appointed Martim Annes chief standard-bearer (alferes mor). He continued the crusade against the Moors, who were driven from their last strongholds in Alemtejo, and in 1 239-1 244, after a dispute with Rome which was once more ended by the imposition of an interdict and the submission of the Portuguese ruler, he won many successes in the Algarve. But his career of conquest was cut short by a revolution (1245), for which his marriage to a Castilian lady, D. Mecia Lopez de Haro, furnished a pretext. The legiti- macy of the union has been questioned, on grounds which appear insufficient; but of its unpopularity there can be no doubt. The bishops, resenting the favour shown by Sancho to his father’s anti-clerical ministers, took advantage of this unpopularity to organize the rebellion. They found a leader in Sancho’s brother Alphonso, count of Boulogne, who owed his title to a marriage with Matilda, countess of Boulogne. The pope issued a bull of deposition in favour of Alphonso, who reached Lisbon in 1246; and after a civil war lasting two years Sancho II. retired to Toledo, where he died in January 1248.

One of the first acts of the usurper, and one of the most important, was to abandon the semi-ecclesiastical titles of visitor Alphonso (visitador) or defender (curador) of the realm, and to iu., 1248- proclaim himself king (rei). Hitherto the position J 279 ‘ of the monarchy had been precarious; as in Aragon

the nobles and the church had exercised a large measure of con- trol

over their nominal head, and though it would be pedantry to over-emphasize the importance of the royal title, its assump- tion by Alphonso III. does mark a definite stage in the evolution of a national monarchy and a centralized government. A second stage was reached shortly afterwards by the conquest of Algarve, the last remaining stronghold of the Moors. This drew down upon Portugal the anger of Alphonso X. of Leon and Castile, surnamed the Wise, who claimed suzerainty over Algarve. The war which followed was ended by Alphonso III. consenting to wed Donna Beatriz de Guzman, illegitimate daughter of Alphonso X., and to hold Algarve as a fief of Castile. The celebration of this marriage, while Matilda, countess of Boulogne and first wife of Alphonso III., was still alive, entailed the imposition of an interdict upon the kingdom. In 1254 Alphonso III. summoned a cortes at Leiria, in which the chief cities were represented, as well as the nobles and clergy. Forti- fied by their support the king refused to submit to Rome. At the cortes of Coimbra (1 261), he further strengthened his position by conciliating the representatives of the cities, who denounced the issue of a debased coinage, and by recognizing that taxation could not be imposed without consent of the cortes. The clergy suffered more than the laity under a prolonged interdict, and in 1262 Pope Urban VI. legalized the disputed marriage and legitimized Dom Diniz, the king's eldest son. Thus ended the con- test for supremacy between Church and Crown. The monarchy owed its triumph to its championship of national interests, to the support of the municipalities and military orders, and to the prestige gained by the royal armies in the Moorish and Castilian wars. In 1263 Alphonso X. renounced his claim to suzerainty over Algarve, and thus the kingdom of Portugal simultaneously reached its present European limits and attained its complete independence. Lisbon was henceforth recognized as the capital. Alphonso III. continued to reign until his death in 1279, but the

peace of his later years was broken by the rebellion (1277-1279) of D. Diniz, 1 the heir-apparent.

2. The Consolidation of the Monarchy: 1279-1415. — The chief problems now confronting the monarchy were no longer military, but social, economic and constitutional. It is true that the reign of Diniz was not a period of uninterrupted peace. At the outset his legitimacy was disputed by his brother Alphonso, and a brief civil war ensued. Hostilities between Portugal and the reunited kingdoms of Leon and Castile were terminated in 1297 by a treaty of alliance, in accordance with which Ferdinand IV. of Leon and Castile married Constance, daughter of Diniz, while Alphonso, son of Diniz, married Beatrice of Castile, daughter of Ferdinand. A further outbreak of civil war,

between the king and the heir-apparent, was averted in 1293 by the queen-consort Isabella of Portugal, who had married Diniz in 1281, and was canonized for her many virtues in the 1 6th century. She rode between the hostile camps, and succeeded in arranging an honourable peace between her husband and her son.

These wars were too brief to interfere seriously with the social reconstruction to which the king devoted himself. At his accession the Portuguese people was far from homogeneous; it would be long before its component i?T9-t32S races — Moors and Mozarabs of the south, Galicians of the north, Jews and foreign crusaders — could be fused into one nationality. There were also urgent economic problems to be solved. The Moors had made Alemtejo the granary of Portugal, but war had undone their work, and large tracts of land were now barren and depopulated. Commerce and educa- tion had similarly been subordinated to the struggle for national existence. The machinery of administration was out of date and complicated by the authority of feudal and ecclesiastical courts. The supremacy of the Crown, though recognized, was still unstable. It was Diniz who initiated the needful reforms. He earned his title of the rei lavrador or “farmer king ” by intro- ducing improved methods of cultivation and founding agricul- tural schools. He encouraged maritime trade by negotiating a commercial treaty with England (1294) and forming a royal navy (13 17) under the command of a Genoese admiral named Emmanuele di Pezagna (Manoel Pessanha). In 1290 he founded the university of Coimbra (g.v.). He was a poet and a patron of literature and music (see Literature, below). His chief administrative reforms were designed to secure centralized government and to limit the jurisdiction of feudal courts. He encouraged and nationalized the military orders. In 1290 the Portuguese knights of Sao Thiago (Santiago) were definitely separated from the parent Spanish order. The orders of Crato and of St Benedict of Aviz had already been established, the traditional dates of their incorporation being 11 13 and n 62. After the condemnation of the Templars by Pope Clement V. (13 1 2) an ecclesiastical commission investigated the charges against the Portuguese branch of the order, and found in its favour. As the Templars were rich, influential and loyal, Diniz took advantage of the death of Clement V. to maintain the order under a new name; the Order of Christ, as it was henceforth called, received the benediction of the pope in 1319 and subsequently played an important part in the colonial expansion of Portugal.

Alphonso IV. adhered to the matrimonial policy initiated by Diniz. He arranged that his daughter Maria should wed Alphonso XL of Castile (1328), but the marriage Alphonso precipitated the war it was

intended to avert, and iv., 132s- peace was only restored (1330) after Queen Isabella 13S7 ‘ had again intervened. Pedro, the crown prince, afterwards married Constance, daughter of the duke of Penafiel (near Valladolid), and Alphonso IV. brought a strong Portuguese army to aid the Castilians against the Moors of Granada and their African allies. In the victory won by the Christians on the banks of the river Salado, near Tarifa, he earned his title of Alphonso the Brave (1340). In 1347 he married his daughter Leonora ‘ ‘Throughout this article the abbreviation D. is used for the Portuguese title Dom and for its feminine form Dona (see Dominus) ,

(Lenor) to Pedro IV. of Aragon. The later years of his reign were darkened by the tragedy of Inez de Castro (q.v.). He died in 1357, and the first act of his successor, Pedro the Severe, / was t0 talse vengeance on the murderers of Inez. 13S7-X367. Throughout his reign he strengthened the central government at the expense of the aristocracy and the Church, by a stern enforcement of law and order. In 1361, at the cortes of Elvas, it was enacted that the privileges of the clergy should only be deemed valid in so far as they did not conflkt with the royal prerogative. Pedro maintained friendly relations with England, where in 1352 Edward III. issued a proclamation in favour of Portuguese traders, a ■■;’ in 1353 the Portuguese envoy Affonso Martins Alho signed a covenant with the merchants of London, guaranteeing mutual good faith in all commercial dealings.

The foreign policy of Diniz, Alphonso IV. and Pedro I. had been, as a rule, successful in its main object, the preservation of peace with the Christian kingdoms of Spain; in consequence, the Portuguese had advanced in prosperity and culture. They had supported the monarchy because it was a national institu- tion, hostile to the tyranny of nobles and clergy. During the reign of Ferdinand (1367-1383) and under the regency of Leonora the ruling dynasty ceased to represent the national will; the Portuguese people therefore made an end of the dynasty and chose its own ruler. The complex events which brought about this crisis may be briefly summarized.

Ferdinand, a weak but ambitious and unscrupulous king, claimed the thrones of Castile and Leon, left vacant by the Ferdinand death of Pedro I. of Castile (1369); he based his and Leonora, claim on the fact

that his grandmother Beatrice 1367-1385. belonged to the legitimate line of Castile. .When the majority of the Castilian nobles refused to accept a Portuguese sovereign, and welcomed Henry of Trastamara (see Spain: History), as Henry II. of Castile, Ferdinand allied himself with the Moors and Aragonese; but in 137 1 Pope Gregory XI. intervened, and it was decided that Ferdinand should renounce his claim and marry Leonora, the daughter of his successful rival. Ferdinand, however, preferred his Portuguese mistress, Leonora Telles de Menezes, whom he eventually married. To avenge this slight, Henry of Castile invaded Portugal and besieged Lisbon. Ferdinand appealed to John of Gaunt, who also claimed the throne of Castile, on behalf of his wife Constance, daughter of Pedro I. of Castile. An alliance between Portugal and England was concluded; and although Ferdinand made peace with Castile in 1374, he renewed his claim in 1380, after the death of Henry of Castile, and sent Joao Fernandes Andeiro, count of Ourem, to secure English aid. In 1381 Richard II. of England despatched a powerful force to Lisbon, and betrothed his cousin Prince Edward to Beatrice, only child of Ferdinand, who had been recognized as heiress to the throne by the cortes of Leiria (1376). In 1383, however, Ferdinand made peace with John I. of Castile at Salvaterra, deserting his English allies, who retaliated by ravaging part of his territory. By the treaty of Salvaterra it was agreed that Beatrice should marry John I. Six months later Ferdinand died, and in accordance with the terms of the treaty Leonora became regent until the eldest son of John I. and Beatrice should be of age.

Leonora had long carried on an intrigue with the count of Ourem, whose influence was resented by the leaders of the The aristocracy, while her tyrannical rule also aroused

Rebellion of bitter opposition. The malcontents chose D.John, 1383. grand-master of the knights of Aviz and illegitimate

son of Pedro the Severe, as their leader, organized a revolt in Lisbon, and assassinated the count of Ourem within the royal palace (Dec. 6, 1383). Leonora fled to Santarem and summoned aid from Castile, while D. John was proclaimed defender of Portugal. In 1384 a Castilian army invested Lisbon, but encountered a heroic resistance, and after five months an outbreak of plague compelled them to raise the siege, John I. of Castile, discovering or alleging that Leonora had plotted to poison him, imprisoned her in a convent at Tordesillas, where

she died in 1386. Before this, Nuno Alvares Pereira, con- stable of Portugal, had gained his popular title of “The Holy Constable ” by

twice defeating the invaders, at Atoleiro and Trancoso in the district of Guarda.

On the 16th of April 1385 the cortes assembled at Coimbra declared the crown of Portugal elective, and at the instance of Joao das Regras, the chancellor, D. John was chosen king. No event in the early constitutional c°f* e f ° history of Portugal is more important than this election, which definitely affirmed the national character of the monarchy. The choice of the grand-master of Aviz ratified the old alliance between the Crown and the military orders; his election by the whole cortes not only ratified the alliance between the Crown and the commons, but also included- the nobles and the Church. The nation was unanimous.

Ferdinand had been the last legitimate descendant of Count Henry of Burgundy. With John I. began the rule of a new dynasty, the House of Aviz. The most urgent , . ,

i.i i- ,11. John 1.,

matter which confronted the king — or the group isss-1433. of statesmen, led by Joao das Regras and the ” Holy Constable ” who inspired his policy — was the menace of Castilian aggression. But on the 14th of August 1385 the Por- tuguese army, aided by 500 English archers, utterly defeated the Castilians at Aljubarrota. By this victory the Portuguese showed themselves equal in military power to their strongest rivals in the Peninsula. In October the ” Holy Constable ” won another victory at Valverde; early in 1386 5000 English soldiers, under John of Gaunt, reinforced the Portuguese; and by the treaty of Windsor (May 9, 1386), the alliance between Portugal and England was confirmed and extended. Against such a combination the Castilians were powerless; a truce was arranged in 1387 and renewed at intervals until 1411, when peace was concluded. D. Diniz, eldest son of Inez de Castro, claimed the throne and invaded Portugal in 1398, but his supporters were easily crushed. The domestic and foreign policy pursued by John I. until his death in 1433 may be briefly described. At home he endeavoured to reform administration, to encourage agriculture and commerce, and to secure the loyalty of the nobles by grants of land and privileges so extensive that, towards the end of his reign, many nobles who exercised their full feudal rights had become almost independent princes. Abroad, he aimed at peace with Castile and close friendship with England. In 1387 he had married Philippa of Lancaster, daughter of John of Gaunt; Richard II. sent troops to aid in the expulsion of D. Diniz; Henry IV., Henry V. and Henry VI. of England successively ratified the treaty of Windsor;

Henry IV. made his ally a knight of the Garter in 1400. The convent of Batalha {q.v.), founded to commemorate the victory of Aljubarrota, is architecturally a monument of the English influence prevalent at this time throughout Portugal.

The cortes of Coimbra, the battle of Aljubarrota and the treaty of Windsor mark the three final stages in the consoli- dation of the monarchy. A period of expansion oversea began in the same reign, with the capture of Ceuta in Morocco. The three eldest sons of King John and Queen Philippa — Edward, Pedro and Henry, afterwards celebrated as Prince Henry the Navigator — desired to win knighthood by service against the Moors, the historic enemies of their country and creed. In 141 5 a Portuguese fleet, commanded by the king and the three princes, set sail for Ceuta. English men-at-arms were sent by Henry V. to take part in the expedition, which proved suc- cessful. The town was captured and garrisoned, and thus the first Portuguese outpost was established on the mainland of Africa.

3. The Period of Discoveries: 1415-1499. — Before describing in outline the course of the discoveries which were soon to render Portugal the foremost colonizing power in Europe it is necessary to indicate the main causes which contributed to that result. As the south-westernmost of the free peoples of Europe, the Portuguese were the natural inheritors of that work of ex- ploration which had been carried on during the middle ages.

chiefly by the Arabs. They began where the Arabs left off, by penetrating far into the Atlantic. The long littoral of their country, with its fine harbours and rivers flowing westward to the ocean, had been the training-ground of a race of adven- turous seamen. It was impossible, moreover, to expand or reach new markets except by sea: the interposition of Castile and Aragon, so often hostile, completely prevented any intercourse by land between Portugal and other European countries. Consequently the Portuguese merchants sent their goods by sea to England, Flanders, or the Hanse towns. The whole history of the nation had also inspired a desire for fresh conquests among its leaders. Portugal had won and now held its independence by the sword. The long struggle to expel the Moors, with the influence of foreign Crusaders and the military orders, had given a religious

sanction to the desire for martial fame. Nowhere was the ancient crusading spirit so active a political force. To make war upon Islam seemed to the Portu- guese their natural destiny and their duty as Christians.

It was the genius of Prince Henry the Navigator (q.v.) that co-ordinated and utilized all these tendencies towards ex- Priace ‘ pansion. Prince Henry placed at the disposal of Henry the his captains the vast resources of the Order of Navigator. ch r ; s t) (-jjg Des t, information and the most accurate instruments and maps which could be obtained. He sought to effect a junction with the half-fabulous Christian Empire of ” Prester John ” by way of the ” Western Nile,” i.e. the Senegal, and, in alliance with that potentate, to crush the Turks and liberate Palestine. The conception of an ocean route to India appears to have originated after his death. On land he again defeated the Moors, who attempted to re-take Ceuta in 1418; but in an expedition to Tangier, undertaken in 1436 by King Edward (1433-1438), the Portuguese army was defeated, and could only escape destruction by surrendering as a hostage Prince Ferdinand, the king’s youngest brother. Ferdinand, known as ” the Constant,” from the fortitude with which he endured captivity, died unransomed in 1443. By sea Prince Henry’s captains continued their exploration of Africa and the Atlantic. In 1433 Cape Bojador was doubled; in 1434 the first consignment of slaves was brought to Lisbon; and slave trading soon became one of the most profitable branches of Portuguese commerce. The Senegal was reached in 1445, Cape Verde was passed in the same year, and in 1446 Alvaro Fernandes pushed on almost as far as Sierra Leone. This was probably the farthest point reached before the Navigator died (1460). Meanwhile colonization progressed in the Azores and Madeira, where sugar and wine were produced; above all, the gold brought home from Guinea stimulated the commercial energy of the Portuguese. It had become clear that, apart from their religious and scientific aspects, these voyages of dis-covery were highly profitable. Under Alphonso V., surnamed the African (1443-1481), the Gulf of Guinea was explored as far as Cape St Catherine, and three expeditions (1458, 1461, 1471) were sent to Morocco; in 1471 Arzila (Asila) and Tangier were captured from the Moors. Under John II. (1481-1495) the fort- ress of Sao Jorge da Mina, the modern Elmina (q.v.), was founded Exploration ˆ or t ˆ le protection of the Guinea trade in 1481-1482; under Diogo Cain (q.v.), or Cao, discovered the Congo in

Alphonso v. 1482 and reached Cape Cross in i486; Bartholomeu andJohnll. D j az (? ˆ doubled the Cape of Good Hope ; n I4 g 8>

thus proving that the Indian Ocean was accessible by sea. After 1492 the discovery of the West Indies by Columbus ren- dered desirable a delimitation of the Spanish and Portuguese spheres of exploration. This was accomplished by the treaty of Tordesillas (June 7, 1494) which modified the delimitation authorized by Pope Alexander VI. in two bulls issued on the 4th of May, 1493. The treaty gave to Portugal all lands which might be discovered east of a straight line drawn from the Arctic Pole to the Antarctic, at a distance of 370 leagues west of Cape Verde. Spain received the lands discovered west of this line. As, however, the known means of measuring lon- gitude were so inexact that the line of demarcation could not in practice be determined (see J. de Andrade Corvo in Journal

das Sciencias Malhematicas, xxxi. 147-176, Lisbon, 1881), the treaty was subject to very diverse interpretations. On its provisions were based both the Portuguese claim to Brazil and the Spanish claim to the Moluccas (see Malay Archipelago: History). The treaty was chiefly valuable to the Portuguese as a recognition of the prestige they had acquired. That prestige was enormously enhanced when, in 1497-1499, Vasco da Gama (q.v.) completed the voyage to India,

While the Crown was thus acquiring new possessions, its authority in Portugal was temporarily overshadowed by the growth of aristocratic privilege. At the cortes Tke of Evora (1433) King Edward had obtained the Monarchy enactment of a law 1 declaring that the estates and the granted by John I. to his adherents could only be Nob,es ‘ inherited by the direct male descendants • of the grantees, and failing such descendants, should revert to the Crown. After the death of Edward further attempts to curb the power of the nobles wete made by his brother, D. Pedro, duke of Coimbra, who acted as regent during the minority of Alphonso V. (1438- 1447). The head of the aristocratic opposition was the duke of Braganza, who contrived to secure the sympathy of the king and the dismissal of the regent. The quarrel led to civil war, and in May 1449 D. Pedro was defeated and killed. Thence- forward the grants made by John I. were renewed, and ex- tended on so lavish a scale that the Braganza estates alone comprised about a third of the whole kingdom. An unwise foreign policy simultaneously injured the royal prestige, for Alphonso married his own niece, Joanna, daughter of Henry IV. of Castile, and claimed that kingdom in her name. At the battle of Toro, in 1476, he was defeated by Ferdinand and Isabella, and in 1478 he was compelled to sign the treaty of Alcantara, by which Joanna was relegated to a convent. His successor, John II. (1481-1495) reverted to the policy of matri- monial alliances with Castile and friendship with England. Finding, as he said, that the liberality of former kings had left the Crown ” no estates

except the high roads of Portugal," he determined to crush the feudal nobility and seize its territories. A cortes held at Evora (1481) empowered judges nominated by the Crown to administer justice in all feudal domains. The nobles resisted this infringement of their rights; but their leader, Ferdinand, duke of Braganza, was beheaded for high treason in 1483; in 1484 the king stabbed to death his own brother-in-law, Ferdinand, duke of Vizeu; and 80 other members of the aristocracy were afterwards executed. Thus John " the Perfect," as he was called, assured the supre- macy of the Crown. He was succeeded in 1495 by Emanuel (Manoel) I., who was named " the Great " or " the Fortunate," because in his reign the sea route to India was discovered and a Portuguese Empire founded.

4. The Portuguese Empire: 1499-1580. — In 1500 King Emanuel assumed the title " Lord of the conquest, navigation and commerce of India, Ethiopia, Arabia and Persia," which was confirmed by Pope Alexander VI. in 1502. It was now upon schemes of conquest that the energy of the nation was to be concentrated, although the motives which called forth that energy were unchanged. " We come to seek Christians and spices," said the first of Vasco da Gama's sailors who landed in India: and the combination of missionary ardour with commercial enterprise which had led to the exploration of the Atlantic led also to the establishment of a Portuguese Empire. This expansion of national interests proceeded rapidly in almost every quarter of the known world. In the North Atlantic Gaspar and Miguel Corte-Real penetrated as far as Green- land (their " Labrador ") in 1 500-1 501; but these voyages were politically and commercially unimportant. Equally barren was the intermittent fighting in Morocco, which was regarded as a crusade against the Moors. In the South Atlantic, however, the African coast was further explored, new settlements were founded, and a remarkable development of Portuguese-African civilization took place in the kingdom of Kongo (see Angola).

1 Known as the lei mental,ˆ because it was supposed to fulfil the intention which John I. had in mind when the grants were made.

Pedro Alvares Cabral, sailing to India, but steering far westward to avoid the winds and currents of the Guinea coast, reached Brazil (1500) and claimed it for his sovereign. Joao da Nova discovered

Ascension (1501) and St Helena (1502); Tristao da Cunha was the first to sight the archipelago still known by his name (1506). In East Africa the small Mahommedan states along the coast — Sofala, Mozambique, Kilwa, Brava, Mombasa, Malindi — either were destroyed or became subjects or allies of Portugal. Pedro de Covilham had reached Abyssinia (q.v.) as early as 1490; in 1520 a Portuguese embassy arrived at the court of " Prester John," and in 1541 a military force was sent to aid him in repelling a Mahommedan invasion. In the Indian Ocean and Arabian Sea, one of Cabral's ships discovered Madagascar (1501), which was partly explored by Tristao da Cunha (1507); Mauritius was discovered in 1507, Socotra occupied in 1506, and in the same year D. Lourenco d'Almeida visited Ceylon. In the Red Sea Massawa was the most northerly point frequented by the Portuguese until 1-541, when a fleet under Estevao da Gama penetrated as far as Suez. Hormuz, in the Persian Gulf, was seized by Alphonso d' Albu- querque (1515), who also entered into diplomatic relations with Persia. On the Asiatic mainland the first trading-stations were established by Cabral at Cochin and Calicut (1501); more important, however, were the conquest of Goa (1510) and Ma- lacca (1511) by Albuquerque, and the acquisition of Diu (1535) by Martim Affonso de Sousa. East of Malacca, Albuquerque sent Duarte Fernandes as envoy to Siam (15 n), and despatched to the Moluccas two expeditions (1512, 151 4), which founded the Portuguese dominion in the Malay Archipelago (q.v.). Fernao Pires de Andrade visited Canton in 1517 and opened up trade with China, where in 1557 the Portuguese were permitted to occupy Macao. Japan, accidentally discovered by three Portuguese traders in 1542, soon attracted large numbers of merchants and missionaries (see Japan, § viii.). In 1522 one of the ships of Ferdinand Magellan (q.v.) — a Portuguese sailor, though in the Spanish service — completed the first voyage round the world.

Up to 1505 the Portuguese voyages to the East were little more than trading ventures or plundering raids, although a Almeida f ew " factories " for the exchange of goods were and Alba- founded in Malabar. In theory, the objects of querque. King Emanuel's policy were the establishment of friendly commercial relations with the Hindus (who were at first mistaken for Christians " not yet confirmed in the faith," as the king wrote to Alexander VI.) and the prosecution of a cru- sade against Islam. But Hindu and Mahommedan interests were found to be so closely interwoven that this policy became imprac- ticable, and it was superseded when D. Francisco d'Almeida (q.v.) went to India as first Portuguese viceroy in 1505. Almeida sought to subordinate all else to sea power and commerce, to concentrate the whole naval and military force of the kingdom on the

maintenance of maritime ascendancy; to annex no territory, to avoid risking troops ashore, and to leave the defence of such factories as might be necessary to friendly native powers, which would receive in return the support of the Portu- guese fleet. Almeida's statesmanship was to a great extent sound. The Portuguese could never penetrate far inland; throughout the 16th century their settlements were confined to the coasts of Asia, Africa or America, and the area they were able effectively to occupy was far less than the area of their empire in the 20th century. A Chinese critic, quoted by Faria y Sousa, said of them that they were like fishes, " remove them from the water and they straightway die." It is thus absurd to speak of a " Portuguese conquest of India "; in a land campaign they would have been outnumbered and destroyed by the armies of any one of the greater Indian states. But their artillery and superior maritime science made them almost invulnerable at sea, and their principal military achievements consisted in the capture or defence of positions accessible from the sea, e.g. the defence of Cochin by Duarte Pacheco Pereira in 1504, the defence of Diu (qv.) iu 15.38 and 1546.

AlDhonso d'Albuquerque (qv.), who succeeded Almeida in

1509, found it necessary to modify the policy formulated by his predecessor. Command of the sea could not be maintained — least of all in the monsoon months — while the Portuguese fleets were based on Lisbon, which could only be reached after a six months' voyage; and experience had proved that almost every Portuguese factory required a fortress for its defence when the fleets were absent. Portugal, like every great maritime trading community from Carthage to Venice, discovered that the ideal of " sea power and commerce " led directly to empire. In 1 5 10 Albuquerque seized Goa, primarily as a naval base, and in so doing recognized the fact that his country was com mitted to a policy of territorial aggrandisement. Other sea- ports and islands were conquered or colonized in rapid succession, and by 1 540 Portugal had acquired a line of scattered maritime possessions extending along the coasts of Brazil, East and West Africa, Malabar, Ceylon, Persia, Indo-China and the Malay Archipelago. The most important settlements in the East were Goa, Malacca and Hormuz.

To a superficial observer the prosperity of Portugal might well seem to have culminated during this period of expansion. Vast profits were derived from the import trade in the innumer- able products of the tropics, of which Portugal was the sole purveyor in Europe. This influx of wealth furnished the economic basis for a sudden development of literary and artistic activity, inspired by contrast with the new world of the tropics. The 1 6th century was the golden age of Portuguese

literature; humanists, such as Damiao de Goes (q.v.), and scientists, such as the astronomer Pedro Nunes (Nonius), played conspicuous parts in the great intellectual movements of the time; a dis- tinctive school of painters arose, chief among them being the so-called ” Grao Vasco ” (Vasco Fernandes of Vizeu); in architecture the name ot King Emanuel was given to a new and composite style (the Manoeiine or Manoellian), in which decorative forms from India and Africa were harmonized with Gothic and Renaissance designs; palaces, fortresses, cathedrals, monasteries, were built on a scale never before attempted in Portugal; and even in the minor arts and handicrafts — in gold-smith’s work, for example, or in pottery — the influence of’ the East made itself felt. Oriental splendour and Renaissance culture combined to render social life in Lisbon hardly less brilliant than in Rome or Venice.

In order to understand the apparently sudden collapse of Portuguese power in 1578-1580 it is necessary to examine certain facts and tendencies which from the first rendered a catastrophe inevitable. Chief among these were the extent of the empire and its organization, the financial and commercial policy of its rulers, the hostility, often wantonly provoked, of the chief Oriental states, the depopulation of Portugal and the slave trade, the expulsion of the Jews, the growth of ecclesiastical influence in secular affairs, and the decadence of the monarchy.

It is necessary to exclude Brazil from any survey of the Portu- guese imperial system, because the colonization of Brazil (q.v.) was effected on distinctive lines. Otherwise the imperial whole empire was governed on a more or less uniform Organtza- system, although it included communities of the most tion ‘ diverse nature — protectorates such as Hormuz and Ternate in the Moluccas, colonies such as Goa and Madeira, captaincies under military rule such as Malacca, tributary states such as Kilwa,’ fortified factories as at Colombo and Cochin. West of the Cape the settlements in Africa and the Atlantic were governed, as a rule, by officials directly nominated by the king. East of the Cape the royal power wa.s delegated to a viceroy or governor — the distinction was purely titular — whose legislative and execu- tive authority was almost unlimited during his term of office. The viceroyalty was created in 1505, and from 1511 the Indian capital was Goa. Between 1505 and 1580 only four holders of the office — Almeida (1505-1509), Albuquerque (1509-1515), D. Vasco da Gama (1524) and D. Joao de Castro (1545-1548) — were men of marked ability and high character. All officials, including the viceroy and naval and military officers, were usually appointed for no more than three years. Although few large

Finance.

salaries were paid, the perquisites attached to official positions were enormous; at the beginning of the 17th century, for example, the captain of Malacca received not quite £300 yearly as his pay, but his annual profits from other sources were estimated at £20,000. Even judges were expected to live on their perquisites, in the shape of bribes. The competition for appointments was naturally very keen; Couto mentions the case of one grantee who received the reversion of a post to which y> applicants had a prior claim. 1 Such reversions could be sold, bequeathed, or included in the dowries of married women; the right of trading with China might be part of the endowment of a school; a monastery or a hospital might purchase the command of a fortress. In 1538 the viceroy, D. Garcia de Noronha, publicly sold by auction every vacant appointment in Portuguese India — an example followed in 16 14 by the king. Hardly less disas- trous than the system by which officials were chosen and paid was the influence exercised by the Church. Simao Botelho, an able revenue officer, was denied absolution in 1543 because he had reorganized the Malacca customs-house without previously consulting the Dominicans in that city. In 1560 a supposed tooth of Buddha was brought to Goa; the raja of Pegu offered £100,000 for the relic, and as Portuguese India was virtually bankrupt the government wished to accept the offer; but the archbishop intervened and the relic was destroyed.

The empire in the East was rarely solvent. Almeida and Albuquerque had hoped to meet the expense of administration mainly out of the fees extorted for safe-conducts at sea and trading-licences, with the tribute wrung from native states and the revenue from Crown lands in India. But the growth of expenditure — chiefly of an unremunerative kind, such as the cost of war and missions — soon rendered these resources inadequate; and after 151 5 the empire became ever more dependent on the spoils of hostile states and on subsidies from the royal treasury in Lisbon. Systematic debasement of the coinage was practised both in India, where the monetary system was extremely complex, 2 and in Portugal; and owing to the bullionist policy adopted by Portuguese financiers little permanent benefit accrued to the mother country from its im- mense trade. Seeking for commercial profit, not in the exchange of commodities, but solely in the

acquisition of actual gold and silver, and realizing that the home market could not absorb a tithe of the merchandise imported, the Lisbon capitalists sent their ships to discharge in Antwerp (where a Portuguese staple was established in 1503), or in some other port near the central markets of Europe. The raw materials purchased by Flemish, German or English traders were used in the establishment of productive industries, while Portugal received a vast influx of bullion, most of which was squandered on war, luxuries or the Church.

In theory the most lucrative branches of commerce, such as the pepper trade, were monopolies vested in the Crown; Commercial the chartered companies and associations of merchant Policy. adventurers, which afterwards became the pioneers of British and Dutch colonial development, had no counterpart in Portuguese history, except in the few cases in which trading concessions were granted to military or monastic orders. But the Crown frequently farmed out its monopolies to individual merchants, or granted trading- licences by way of pension or reward. These were often of great value; e.g. in 161 2 the right of sending a merchant ship to China was valued at £25,000. Great loss was necessarily inflicted on native traders by the monopolist system, which pressed most hardly on the Mahom-medans, who had been the chief carriers in Indian waters. Two great powers, Egypt and Turkey, challenged the naval and commercial supremacy of the Portuguese, but an Egyptian armada was destroyed by Almeida in 1509, and though Ottoman fleets were on several occasions (as in 1517 and 1521) despatched from Suez or Basra, they failed to achieve any success, and the Portuguese were able to close the two principal trade routes

1 Decadas, XII. i. 10.

- See R. S. Whiteway, Rise of the Portuguese Power, &c. (London, 1898), pp. 67-72.

between India and Europe. One of these trade routes passed up the Persian Gulf to Basra, and thence overland to Tripoli, for Mediterranean ports, and to Trebizond, for Constantinople. The other passed up the Red Sea to Suez, and thence to Alexandria, for Venice, Genoa and Ragusa. But by occupying Hormuz the Portuguese gained command of the Gulf route; and though they thrice failed to capture Aden (1513, 1517, 1547), and so entirely to close the Red Sea, they almost destroyed the traffic between India and Suez by occupying Socotra and sending fleets to cruise in the Strait of Bab el-Mandeb. In Malacca they possessed the connecting link between the trade- routes of the Far and Middle East, and thus they controlled the three sea-

gates of the Indian Ocean and Arabian Sea — the Straits of Hormuz, Bab el-Mandeb and Malacca — and diverted the maritime trade with Europe to the Cape route.

During the critical period in which their empire was being established (c. 1505-15 50) the Portuguese were fortunate in escaping conflict with any Oriental power of the first g e i a n oas rank except Egypt and Turkey; for the Bahmani w ith sultanate of the Deccan had been already disinte- Oriental grated before 1498, and the Mughals and Mahrattas states – were still far off. A coalition of the minor Mahommedan states was prevented by the great Hindu kingdom of Vijayanagar, which comprised the southern half of the Indian Peninsula. Vijaya- nagar gave the militant Mahommedanism of Northern India no opportunity for a combined attack on the Portuguese settle- ments. After 1565, when the power of Vijayanagar was broken at the battle of Talikot, a Mussulman coalition was at last formed, and the Portuguese were confronted by a line of hostile states stretching from Gujarat to Achin; but by this time they were strong enough to hold their own. It is characteristic of their native policy that they had not only refrained from aiding Vijayanagar in 1565, but had even been willing to despoil their Hindu allies. In 1543 Martim Affonso de Sousa, governor of India, organized an expedition to sack the Hindu temples at Conjeveram in Vijayanagar itself, and similar incidents are common in Indo-Portuguese history. Albuquerque was almost the only Portuguese statesman who strove to deal justly with both Hindus and Mahommedans, to respect native customs, and to establish friendly relations with the great powers of the East. Apart from the rigorous restrictions imposed by his successors upon trade, the sympathies of the natives were estranged by the harshness and venality of Portuguese administration, by such barbarities as the wholesale mutilation of non-combatants in war-time, and by religious persecution. After the arrival of the Franciscan missionaries, in 1517, Goa gradually became the headquarters of an immense proselytizing organization, which by 1 561 had extended to East Africa, China, Japan and the Malay Archipelago (see Goa: Ecclesiastical History). Wherever the Portuguese were supreme they endeavoured to obtain con- verts by force. The widespread resentment thus aroused was a frequent cause of insurrection, and between 1515 and 1580 not a single year passed without war between the Portuguese and at least one African or Asiatic people.

Centuries of fighting against the Moors and Castilians had already left Portugal thinly populated; large tracts of land were uncultivated, especially in Alemtejo, and wolves Depopu- were still common throughout the kingdom. It was tation impossible, from the first, to

garrison the empire with trained men. As early as 1505 one of Almeida's ships contained a crew of rustics unable to distinguish between port and starboard; soon afterwards it became necessary to recruit convicts and slaves, and in 1538 a royal pardon was granted to all prisoners who would serve in India, except criminals under sentence for treason and canonical offences. Linschoten estimates that of all those who went to the East not one in ten returned. The heaviest losses were due to war, shipwreck and tropical diseases, but large numbers of the underpaid or unpaid soldiers deserted to the armies of native states. It is impossible to give more than approximately accurate statistics of the resultant depopulation of Portugal; but it seems probable that the inhabitants of the kingdom decreased from about 1,800,000 or 2,000,000 in 1500 to

about 1,080,000 in 1586. The process of decay was hastened by frequent outbreaks of plague, sometimes followed by famine; a contemporary manuscript estimates that no fewer than 500 persons died daily in Lisbon alone during July, August and September 1569, and in some other years the joint effects of plague and famine were little less disastrous.

While the country was being drained of its best citizens, hordes of slaves were imported to fill the vacancies, especially into the southern provinces. 1 Manual labour was Trade. tnus discredited; the peasants sold their farms and emigrated or flocked to the towns; and small hold- ings were merged into vast estates, unscientifically cultivated by slaves and comparable with the latifundia which caused so many agrarian evils during the last two centuries of the Roman republic. The decadence of agriculture partly explains the prevalence of famine at a time when Portuguese maritime commerce was most prosperous. The Portuguese intermarried freely with their slaves, and this infusion of alien blood profoundly modified the character and physique of the nation. It may be said without exaggeration that the Portuguese of the " age of discoveries " and the Portuguese of the 17th and later centuries were two different races. Albuquerque, foreseeing the dangers that would arise from a shortage of population in his colonies, had encouraged his soldiers to marry captive Brahman and Mahommedan women, and to settle in India as farmers, shop- keepers or artisans. Under his rule the experiment was fairly successful, but

the married colonists afterwards became a privi- leged caste, subsisting upon the labour of their slaves, and often disloyal to their rulers. Intermarriage led to the adoption, even by the rich, and especially by women (see Goa), of Asiatic dress, manners and modes of thought. Thus in the East, as in Europe, slavery reacted upon every class of the Portuguese.

The banishment, or forcible conversion, of the Jews deprived Portugal of its middle class and of its most scientific traders and The Perse- financiers. Though the Jews had always been cation of compelled to reside in separate quarters called the Jews. Juderias, or Jewries, they had been protected by the earlier Portuguese kings. Before 1223 their courts had received autonomy in civil and criminal jurisdiction; their chief rabbi was appointed by the king and entitled to use the royal arms on his seal. Alphonso V. even permitted his Jewish subjects to live outside the Juderias, relieved them from the obligation to wear a distinctive costume (enforced in 1325), and nominated a Jew, Isaac Abrabanel (q.v.), as his minister of finance. In culture the Portuguese Jews surpassed their rulers. Many of them were well versed in Aristotelian and Arabic philosophy, in astronomy, mathematics, and especially in medicine. Three Hebrew printing-presses were established between 1487 and 149s; both John II. and Emanuel I. employed Jewish physicians; it was a Jew — Abraham Zacuto ben Samuel — who supplied Vasco da Gama with nautical instruments; and Jews were employed in the overland journeys by which the Portuguese court first endeavoured to obtain information on Far Eastern affairs.

The Jews paid taxes on practically every business transaction, besides a special poll-tax of 30 dinheiros in memory of the 30 pieces of silver paid to Judas Iscariot; and for this reason they were protected by the Crown. For centuries they were also tolerated by the commons; but the other orders — ecclesiastics and nobles — resented their religious exclusiveness or envied their wealth, and gradually fostered the growth of popular prejudice against them. In 1449 the Lisbon Juderias were stormed and sacked, and between 1450 and 1481 the cortes four times petitioned the Crown to enforce the anti-Jewish provisions of the canon law. John II. gave asylum to 90,000 Jewish refugees from Castile, in return for a heavy poll-tax and on condition that they should leave the country within eight months, in ships furnished by himself. These ships were not provided in time, and the Jews who were thus unable to depart were enslaved,

1 In the north, which had been relatively immune from wars agriculture was more prosperous and the peasants more tenacious of their land; hence the continuance of peasant proprietorship and the rarity of African types between the Douro and the Minho.

while their children were deported to the island of St Thomas, and there left to survive as best they might. In 1496 Emanuel I. desired to wed Isabella, daughter of Ferdinand and Isabella, but found that he was first required to purify his kingdom of the Jews, who were accordingly commanded to leave Portugal before the end of October 1497. But in order to avoid the economic dangers threatened by such an exodus, every Jew and Jewess between the ages of 4 and 24 was seized and forcibly baptized (19th March): “Christians” were not required to emigrate. In October 20,000 adults were treated in the same way. These ” New Christians ” or ” Maranos,” as they were called, were forbidden to leave the country between 1498 and 1507. In April 1506 most of those who resided in Lisbon were massacred

during a riot, but throughout the rest of Emanuel's reign they were immune from violence, and were again permitted to emigrate — an opportunity of which the majority took advantage. Large numbers settled in Holland, where their commercial talent afterwards greatly assisted the Dutch in their rivalry with the "Portuguese.

The Reformation never reached Portugal, but even here the critical tendencies which elsewhere preceded Reform, were already at work. Their origin is to be sought not The so much in the Revival of Learning as in the fact that inquisition the Portuguese had learned, on their voyages of aad the discovery, to see and think for themselves. The esu s " true scientific spirit may be traced throughout the Roteiros of D. Joao de Castro (q.v.) and the Colloquios of Garcia de Orta— men who deserted books for experiment and manifested a new interest in the physical world. But orthodox churchmen feared that even in Portugal this appeal from authority to experience would lead to an attack upon religious doctrines previously regarded as beyond criticism. To check this dangerous move- ment of ideas, they demanded the introduction of the Inquisition info Portugal. The agents of the " New Christians " in Rome long contrived, by lavish bribery and with the support of many enlightened Portuguese, to delay the preliminary negotiations; but in 1536 the Holy Office was established in Lisbon, where the first auto-da-fe was held in 1 540, and in 1 560 its operations were extended to India. It seems probable that the influence of the tribunal upon Portuguese life and thought has been exaggerated. Autos-da-fe' were rare events; their victims were not as a rule serious thinkers, but persons accused of sorcery or Judaizing, nor were they more numerous than the victims of the English laws relating to witchcraft and heresy. But the worst vices of the Inquisition were the widespread system of delation it encouraged by paying informers out of the property of the con- demned, and its action as a trading and landholding association. Quite as serious, in their effects upon national life, were the severe censorship to which all printed matter was liable before publication and the control of education by the Jesuits. Poetry and imaginative literature usually escaped censure; but histories were mutilated and all original scientific and philosophical work was banned. Portuguese education centred in the national university of Coimbra, which had long shown itself ready to assimilate new ideas; between 1537 and 1547 John III. persuaded many eminent foreign teachers — among them the Scottish humanist George Buchanan (q.v.) and the French mathematician Elie Vinet— to lecture in its schools. But the discipline of the university needed reform, and the task was entrusted to the Jesuits. By 1555 they had secured control over Coimbra — a control which lasted for two

centuries and extended to the whole educational system of the country. The effects of this change upon the national character were serious and permanent. Portugal sank back into the middle ages. The old initiative and self-reliance of the nation, already shaken by years of disaster, were now completely undermined, and the people submitted without show of resistance to a theocracy disguised as absolute monarchy.

Emanuel I. had been a fearless despot, such as Portugal needed if its scattered dependencies were to remain subject to the central government. During his reign (1495-1521) the Church was never permitted to encroach upon the royal

prerogative. He even sent ambassadors to Rome to protest against ecclesiastical corruption, as well as to checkmate the Venetian Decadence diplomatists who threatened Europe with Ottoman of the vengeance if the Portuguese commercial monopoly Monarchy. were not re i axec j. The Oriental magnificence of these embassies, notably that of 1514, and the fact that a king of Portugal dared openly to criticize the morals of the Vatican, temporarily enhanced the prestige of the monarchy. But Emanuel I. was the last great king of the Aviz dynasty. He had pursued the traditional policy of intermarriage with the royal families of Castile and Aragon, hoping to weld together the Spanish and Portuguese dominions into a single world-wide

” Sebastianism ” became a religion; its votaries were numbered by thousands, and four impostors arose in succession, each claiming to be the ret encuberto, or ” hidden king,” whose advent was so ardently desired (see Sebastian).

There was no surviving prince of the Aviz dynasty except the aged, feeble and almost insane Cardinal Prince Henry, who, as a younger son of Emanuel I., now became king. Henry died on the 31st of January 1580, and the throne was thus left vacant. There were five principal claimants — Philip II. of Spain; Phili- bert, duke of Savoy; Antonio, prior of Crato; Catherine, duchess of Braganza; and Ranuccio, duke of Parma — whose relationship to Emanuel I. is shown in the following table : —

John III.,

b. 1502, d. 1557,

. Catherine of Austria.

Isabel,

b. 1303, d. 1530,

m. Charles V.

Emanuel. I

John,

b. 1537, d. 1554,

m. Joanna of Spain.

Sebastian, b. 1554, d. 1578.

Beatrice,

b. 1504, d. 1538,

ra. Charles III. of

Savoy.

Louis, Ferdinand, Alphonso,

b. 1506, d. IS45, b- 1507, d. 1534, b. 1509, d. 1540,

duke of Beja. duke of Guarda.

Philip II. of Spain.

Philibert Emmanuel, duke of Savoy.

cardinal and

archbishop of

Lisbon.

Henry,

b. 1512, d. 1580,

cardinal and

king.

I

Edward,

b. isi5,d. IS4S,

duke of Guimaraes,

m. Isabel of Braganza.

I

Antonio, prior of Crato. (illegitimate).

empire ruled by the house of Aviz. His ambition narrowly I missed fulfilment, for Prince Miguel, his eldest son, was recognized (1498) as heir to the Spanish thrones. But Miguel died in infancy, and his inheritance passed to the Habsburgs. Frequent inter- marriage, often so far within the prohibited degress as to require a papal dispensation, may possibly explain the weakened vitality o£ the Portuguese royal family, which was now subject to epilepsy, insanity and premature decay. The decadence of the monarchy as a national institution was reflected in the decadence of the cortes, which was rarely summoned between 1521 and 1580. John III. (1521-1557) was a ruler of fair ability, who became in his later years wholly subservient to his ecclesiastical advisers. He was succeeded by his grandson Sebastian (1557— 1578), aged three years. Until the king came of age (1568), his grandmother, Queen Catherine, a fanatical daughter of Isabella the Catholic, and his great-uncle, Prince Henry, cardinal and inquisitor-general, governed as joint regents. Both were dominated by their Jesuit confessors, and a Jesuit, D. Luiz Goncalves da Camara, became the tutor and, after 1568, the principal adviser of Sebastian. The king was a strong-willed and weak-minded ascetic, who entrusted his empire to the Jesuits, refused to marry, although The the dynasty was threatened with extinction, and

Disaster of spent years in preparing for a crusade against the AlKasr. Moors. The wisest act of John III. had been his withdrawal of all the Portuguese garrisons in Morocco except those at Ceuta, Arzila and Tangier. Sebastian reversed this policy. His first expedition to Africa (1574) was a mere recon- naissance, but four years later a favourable opportunity for invasion arrived. A dethroned sultan of Morocco,

named Mulai Ahmad (Mahommed XL), offered to acknowledge Portuguese suzerainty if he were restored to the throne by Portuguese arms, and Sebastian eagerly accepted these terms. The flower of his army was in Asia and his treasury was empty; but he contrived to extort funds from the ” New Christians,” and col- lected a force of some 18,000 men, chiefly untrained lads, worn- out veterans, and foreign free-lances. At Arzila, where he landed, he was joined by Mulai Ahmad, who could only muster 800 soldiers. Thence Sebastian sought to proceed overland to the seaport of El Araish, despite the advice of his ally and of others who knew the country. After a long desert march under an August sun, he took up an indefensible position in a valley near Al Kasr al Kebir (q.v.). On the morrow (Aug. 4, 1578) they were surrounded by the superior forces of Abd el Malek, the reigning sultan, and after a brave resistance Sebastian was killed and his army almost annihilated. So. overwhelming was the disaster that the Portuguese people refused to believe the truth. It was rumoured that Sebastian still lived, and would sooner or later return and restore the past greatness of his country.

I

Catherine, Maria,

m. duke of Braganza. m. duke of Parma.

Ranuccio, duke of Parma.

Tentative and hardly serious claims were also put forward by Pope Gregory XIII., as ex officio heir-general to a cardinal, and by Catherine de’ Medici, as a descendant of Alphonso III. and Matilda of Boulogne.

5. The ” Sixty Years’ Captivity “: 1581-1640. — The university of Coimbra declared in favour of Catherine, duchess of Braganza, but the prior of Crato was the only rival who offered any serious resistance to Philip II. D. Antonio proclaimed himself king and occupied Lisbon. The advocates of union with Spain, however, were numerous, influential, and ably led by their spokesmen in the cortes, Christovao de Moura and Antonio Pinheiro, bishop of Leiria. The duke of Braganza was won over to their side, chiefly by the promise that he should be king of Brazil if Philip II. became king of Portugal — a promise never fulfilled. Above all, the Church, including the Society of Jesus, naturally favoured the Habsburg claimant, who represented its two foremost champions, Spain and Austria. In 1581 a Spanish army, led by the duke of Alva, entered Portugal and easily defeated the levies of D. Antonio at Alcantara. The prior escaped to Paris and

appealed to France and England for assistance. In 1582 a French fleet attempted to seize the Azores in his interest, but was defeated. In 1 580 an English fleet was sent to aid the prior in a projected invasion of Portugal, but owing to a quarrel between its commanders, Sir Francis Drake and Sir John Norris, the expedition was abandoned. D. Antonio returned to Paris, where he died in 1594.

Meanwhile the victory of Alcantara left Philip II. supreme in Portugal, where he was soon afterwards crowned king. His constitutional position was defined at the Cortes of Thomar (1581). Portugal was not to be regarded as a conquered or annexed province, but as a separate kingdom, joined to Spain solely by a personal union similar to the union between Castile and Aragon under Ferdinand and Isabella. At Thomar Philip II. promised to maintain the rights and liberties conceded by his predecessors on the Portuguese throne, to summon the Cortes at frequent intervals, and to create a Portuguese privy council which should accompany the king everywhere arid be consulted on all matters affecting Portuguese interests. Brazil and the settlements in Africa and Asia were still to belong to Portugal, not to Spain, and neither in Portugal nor in its colonies was any alien to be given lands, public office, or jurisdiction. On these terms the political union of the Iberian Peninsula was accom- plished. It was the final stage in a process of accretion dating back to the beginnings of the Christian reconquest in the 8th century. Asturias had been united with Leon, Leon with CastHe, Castile with Aragon. All these precedents seemed to indicate that Spain and Portugal would ultimately form one state; and I despite the strong nationalism which their separate language and

history had inspired among the Portuguese, the union of 1581 might have endured if the terms of the Thomar compact had been observed. But few of the promises made in 1581 were kept by the three Spanish kings who ruled over Portugal — Philip II. (1581-1598), Philip III. (1598-1621) and Philip IV. (1621-1640). 1 The cortes was only once summoned (1619), and the government of Portugal was entrusted by Philip III. chiefly to Francis duke of Lerma, by Philip IV. chiefly to Olivares (q.v.). The kingdom and its dependencies were also involved in the naval disasters which overtook Spain. Faro in Algarve was sacked in 1595 by the English, who ravaged the Azores in 1596; and

in many parts of the world English, French and Dutch combined to harass Portuguese trade and seize Portuguese possessions. (See especially Brazil; India; Malay Archi- pelago.) Union with Spain had exposed Portugal to the hostility of the strongest naval powers of western Europe, and had deprived it of the power to conclude an independent peace.

Insurrections in Lisbon (1634) and Evora (1637) Dore witness to the general discontent, but until 1640 the Spanish ascendancy The was never seriously endangered. In 1640 war with

Rebellion France and a revolution in Catalonia had taxed the of 1640. military resources of Spain to the utmost. The royal authority in Portugal was delegated to Margaret of Savoy, duchess of Mantua, whose train of Spanish and Italian courtiers aroused the jealousy of the Portuguese nobles, while the harsh rule of her secretary of state, Miguel de Vasconcellos de Brito, provoked the resentment of all classes. Even the Jesuits, whose influence in Portugal had steadily increased since 1555, were now prepared to act in the interests of Cardinal Richelieu, and therefore against Philip IV. A leader was found in John, 8th duke of Braganza, who as a grandson of the duchess Catherine was descended from Emanuel I. The duke, however, was naturally indolent, and it was with difficulty that his ambitious and energetic Castilian wife, D. Luiza de Guzman, obtained his assent to the proposed revolution. He refused to take any active part in it; but D. Luiza and her confidential adviser, Joao Pinto Ribeiro, recruited a powerful band of conspirators among the disaffected nobles. Their plans were carefully elaborated, and on the 1st of December 1640 various strategic points were seized, the few partisans of Spain who attempted resistance were overpowered, and a provisional government was formed under D. Rodrigo da Cunha, archbishop of Lisbon, who was appointed lieutenant- general of Portugal.

6. The Restoration: 1640-175$. — On the 13th of December 1640 the duke of Braganza was crowned as John IV., and on the 19th of January 1641 the cortes formally accepted him as king. The whole country had already declared in his favour and expelled the Spanish garrisons, an example followed by all the Portuguese dependencies. Thus the ” Sixty Years’ Captivity ” came to an end and the throne passed to the house of Braganza. But the Portuguese were well aware that they could hardly maintain their independence without foreign assistance, and ambassadors were at once sent to Great Britain, the Netherlands and France. The struggle between the Crown and the parliament prevented Charles I. from offering aid, but he immediately

recognized John IV. as king. Richelieu and the states-general of the Nether- lands despatched fleets to the Tagus; but commercial rivalry in Brazil and the East led soon afterwards to a colonial war with the Dutch, and Portugal was left without any ally except France.

The Portuguese armies were at first successful. D. Matheus d'Albuquerque defeated the Spaniards under the baron of Warwith Molingen at Montijo (May 26, 1644), and through- Spain, out the reign of John IV. (1640-1656) they suffered 1640-1668. no serious reverse. But great anxiety was caused by a plot to restore Spanish rule, in which the duke of Caminha and the archbishop of Braga were implicated; and especially by the action of Mazarin, who had assumed control of French foreign policy in 1642. At the congress of Miinster (1643) he refused to make the independence of Portugal a condition of 1 Philip I., II. and III. of Portugal.

peace between France and Spain; and in a letter dated the 4th of October 1647 he even offered the Portuguese Crown to the duke of Longueville — an offer which illustrates the weakness of John IV. and the dependence of Portugal upon France.

John IV. was succeeded by his second son, Alphonso VI. (1656-1683), who was then aged thirteen. During the king's minority the queen-mother, D. Luiza, acted as regent. She prosecuted the war with vigour, and on the 14th of January 1659 a Portuguese army commanded by D. Antonio Luiz de Menezes, count of Cantanhede, defeated the Spaniards under D. Luiz de Haro at Elvas. In March 1659, however, the war between France and Spain was ended by the treaty of the Pyrenees; and D. Luiz de Haro, acting as the Spanish plenipotentiary, obtained the inclusion in the treaty of a secret article by which France undertook to give no further aid to Portugal. Neither Louis XIV. nor Mazarin desired the aggrandisement of Spain at the expense of their own ally; they therefore evaded the secret article by sending Marshal Schomberg to reorganize the Portuguese army (1660), and by helping forward a marriage between Charles II. of England and Catherine of Braganza, the sister of Alphonso VI. This project had been already mooted by D. Luiza, who had foreseen the restoration of the Stuart monarchy, and had in 1650 welcomed the exiled princes Rupert and Maurice at the court of John IV. The dowry to be paid by Portugal was fixed at £500,000 and the cession to Great Britain of Bombay and Tangier. In May 1663 the marriage was celebrated, and thus Great Britain took the place of France as the active ally of Portugal.

Meanwhile, on the 20th of June 1662, the regency had been terminated by a palace revolution. Alphonso VI. declared himself of

age and seized the royal authority; D. schomberg Luiza retired to a convent. The king was feeble and Castetto and vicious, but had wit enough to leave the M elb ° r – conduct of affairs to stronger hands. D. Luiz de Sousa e Vasconcellos, count of Castello Melhor, directed the policy of the nation while Schomberg took charge of its defence. The army, reinforced by British troops under the earl of Inchiquin and by French and German volunteers or mercenaries, was led in the field by Portuguese generals, who successfully carried out the plans of Schomberg. On the 8th of June 1663 the count of Villa Flor utterly defeated D. John of Austria, and retook Evora, which had been captured by the invaders; on the 7th of July 1664 Pedro de Magalhaes defeated the duke of Osuna at Ciudad Rodrigo; on the 17th of June 1665 the marquess of Marialva destroyed a Spanish army led by the marquess of Carracena at the battle of Montes Claros, and Christovao de Brito Pereira followed up this victory with another at Villa Vicosa. The Spaniards failed to gain any compensating advantage, and on the 13th of February 1668 peace was concluded at Lisbon, Spain at last consenting to recognize the independence of the Portuguese kingdom.

The signature of the treaty of Lisbon had been preceded by another palace revolution. Castello Melhor, hoping to secure, further French support for his country, had arranged a ■ marriage between Alphonso VI. and Marie Francoise Elisabeth, daughter of Charles Amadeus of Nemours, and grand-daughter of Henry IV. of France. The marriage, celebrated in 1666, caused the down- fall both of Castello Melhor and of the king. Queen Marie detested Alphonso and fell in love with his brother D. Pedro; and after four months of a hated union she left the palace and applied to the chapter of Lisbon cathedral to annul her marriage on the ground of non-consummation. D. Pedro imprisoned the king and assumed the regency; on the 1st of January 1668 his authority was recognized by the cortes; on the 24th of March the annulment of the queen's marriage was pronounced and confirmed by the pope; on the 2nd of April she married the regent. Castello Melhor was permitted to escape to France, while Alphonso VI. was banished to Terceira in the Azores. A conspiracy to restore him to the throne was discovered in 1674, and he was removed to Cintra, where he died in 1683.

Pedro II., who had acted as regent for fifteen years, now

became king. His reign (1683-1706) is a period of supreme importance in the economic and constitutional history of Por- Th Corf s tu 8 al – The goldfields of Minas Geraes in Brazil, and the discovered about 1693, brought a vast revenue in Mettuen royalties to the Crown, which was thus enabled to Treaty. govern without summoning the cortes to vote supply. In 1697 the cortes met for the last time before the era of con- stitutional government. Even more important was the change effected when the Whig ministry of Great Britain sent John Nlethuen to Lisbon to negotiate a commercial agreement. The Methuen Treaty, signed on the 27th of December 1703, detached Portugal from the French alliance, and made her for more than 150 years a commercial and political satellite of Great Britain. Its most far-reaching provisions were those which admitted Portuguese wines to the British market at a lower rate of duty than was imposed upon French and German wines, in return for a corresponding preference to English textiles. The demand for “Port” and “Madeira” was thus artificially stimulated to such an extent that almost the whole productive energy of Portugal was concentrated upon the wine and cork trades. Other industries, including agriculture, were neglected, and even food-stuffs were imported from Great Britain. The disastrous economic results of the treaty were temporarily concealed by the influx of gold from Brazil, the check upon emigration from the wine-growing northern provinces, and the military advantages of alliance with Great Britain. Nor was the virtual abolition of the cortes seriously felt at first, owing to the excellent internal administration of Pedro II. and his minister the duke of Cadaval.

Pedro II. had at first wished to remain neutral in the impend- ing struggle between Philip V. and the archduke Charles, rival War of the claimants for the throne of Spain. But Queen Spanish Marie had died in 1683, and in 1687 Cadaval had succession, induced the king to marry Maria Sophia de Neuberg, daughter of the elector-palatine. Louis XIV. of France, who had hoped through the influence of Queen Marie to secure Portuguese support for his own grandson Philip V., realized that this second marriage might thwart his policy, and strove to redress the balance by creating a strong party at the court of Lisbon. He so far succeeded that in 1700 Pedro II. recognized Philip V. as king of Spain and in 1701 protected a French fleet in the Tagus against the British. It was this incident that caused the despatch of the Methuen mission and the renewal of the Anglo- Portuguese alliance in 1703. On the 7th of March 1704 a British fleet under Sir George Rooke reached Lisbon, convoying the archduke Charles and 10,000 British troops, who were joined by a Portuguese army under D. Joao de Sousa, marquess das Minas, and at once invaded Spain. (For the

campaigns of 1704-13, see Spanish Succession, War or the.) In 1705 Pedro II. was compelled by failing health to appoint a regent, and chose his sister, Catherine of Braganza, queen-dowager of England. On the death of the king (Dec. 9, 1706) Cadaval arranged a marriage between his successor John V. (1706- 1750) and the archduchess Marianna, sister of the archduke Charles, thus binding Portugal more closely to the Anglo- Austrian cause. The strain of the war was acutely felt in Portugal, especially in 1711, when the French admiral Duguay-Trouin sacked Rio de Janeiro and cut off the Brazilian treasure- ships. At last, on the 6th of February 1715, nearly two years after the treaty of Utrecht, peace between Spain and Portugal was concluded at Madrid.

Never was the Portuguese Crown richer than in the years 1715-1755; rarely had the kingdom prospered less. The The Moo- commercial and financial evils rife under the last archy and kings of the Aviz dynasty were now repeated. the cbuKb – More gold had been discovered in Matto Grosso, diamonds in Minas Geraes. As in the 16th century immense quantities of bullion were imported by the treasury, and were lavished upon war, luxury and the Church, while agriculture and manufactures continued to decline, and the countryside was depopulated by emigration to Brazil. John V. was a spendthrift ard & bigot. He gave and lent enormous sums to successive

popes, and at the bidding of Clement XI. he joined a ” crusade ” against the Turks in which his ships helped to win a naval action off Cape Matapan (1717). For these services he received the title of Fidelissimus, “Most Faithful”; “Majesty” had already been adopted by John IV. instead of the medieval ” Highness,” and the new style was intended to place the king of Portugal on an equality with his Most Christian Majesty of France and his Most Catholic Majesty of Spain. John V. was also empowered to create a multitude of new ecclesiastical dignities, and the archbishop of Lisbon was granted the rank and style of Patriarch ex officio. To the patriarchate was appended a Sacred College of 24 prelates, who were privileged to officiate in the scarlet robes of cardinals, while the patriarch wore the vestments of a second pope. Though regiments were disbanded, fleets put out of commission and fortresses dismantled to save the cost of their upkeep, the Crown paid nearly £100,000 yearly for the maintenance of this new hierarchy, and squandered untold wealth on the erection of churches and monasteries. In the church of Sao Roque in Lisbon, the decoration of a single chapel measuring 17 ft. by 12 ft. cost £225,000; the expenditure on the convent-palace of Mafra (q.v.) exceeded £4,000,000.

John V. was succeeded by his son Joseph (1750-1777). Five years afterwards Portugal was overtaken by the tremendous disaster of the Lisbon earthquake (see Lisbon), which, as Oliveira Martins justly observes, was ” more than a cataclysm of nature; it was a moral revolution.” It brought the Restoration period to an end (1755). Throughout that period themonarchy had occupied a precarious position, dependent until 1668 for its very existence, and after 1668 for its stability, on foreign support. Its policy had been moulded to suit France or Great Britain, while its internal administration had normally been directed by the Church. The cortes had grown obsolete; the feudal aristocracy were become courtiers. Once more, as in 1580, Portugal was governed by ecclesiastics in the name of an absolute monarch: once more, as in 1580, the chief strength of the ecclesi- astical party was the Society of Jesus, which still controlled the conscience and mind of the nation and of its nominal rulers, through the confessional and the schools.

7. The Reform of the Monarchy: 17 55- 1826. — The unity of Portuguese history is hard to perceive in the years which witnessed the rise and fall of the Pombaline r6gime, the reign of the mad queen Maria, the Peninsular War and the subsequent chaos of revolutionary intrigue. At first sight it seems absurd to characterize this period of despotism ending in war, ruin and anarchy as a period of reform. Nevertheless, it is possible to trace through the apparent chaos an uninterrupted move- ment from absolutism to representative institutions. Pombal liberated the monarchy from clerical domination, and thus unwittingly opened the door to those ” French principles,” or democratic ideas, which spread rapidly after his downfall in 1777. The destruction of an obsolete political system, begun by Pombal, was completed by the Peninsular War; while French invaders and British governors together quickened among the Portuguese a new consciousness of their nationality, and a new desire for political rights, which rendered inevitable the change to constitutional monarchy.

Two days after the accession of King Joseph, Sebastiao Jos6 dc Carvalho e Mello, better known as the marquess of Pombal (q.v.), was appointed secretary of state for foreign affairs and war. In a few months he gained an ascendancy ?5Sf™ r over the king’s mind which lasted until the end of the reign, and was strengthened by the courage and wisdom shown by Pombal at the time of the great earthquake. His policy was to strengthen the monarchy and to use it for the furtherance of a comprehensive scheme of reform. Beginning with finance and commerce, he reversed the bullionist policy of his predeces- sors and reorganized the entire system of taxation. He sought to undo the worst consequences of the Methuen treaty by the

creation of national industries, establishing a gunpowder factory and a sugar refinery in 1 751, a silk industry in 1752, wool, paper and glass factories after 1759. Colonial development was fostered, and the commercial dependence of Portugal upon

Great Britain was reduced, by the formation of chartered companies, the first of which (1753) was given control of the Algarve sardine and tunny fisheries. The Oldembourg Company (1754) received a monopoly of trade with the Portuguese colonies in the East; extensive monopolist rights were also conceded to the Para and Maranhao Company (1755) and the Pernambuco and Parahyba Company (1759). In Lisbon a chamber of com- merce {Junta do commercio) was organized in 1756 to replace an older association of merchants, the Meza dos homens de negocio, which had attacked the Para Company; and in the same year the Alto Douro Company was formed to control the port-wine trade and to break the monopoly enjoyed by a syndicate of British wine merchants. This company met with strong opposition, culminating in a rising at Oporto (February 1757), which was savagely suppressed.

Both his commercial policy and his desire to strengthen the Crown brought Pombal into conflict with the Church and the aristocracy. In 1 751 he had made all sentences passed by the Inquisition subject to revision by the Crown. The liberation of all slaves in Para and Maranhao except negroes (1755), and the creation of the Para Company, were prejudicial to the interests of the Jesuits, whose administrative authority over the Indians of Brazil was also curtailed. Various charges were brought against the Society by Pombal, and in September 1759, after five years of heated controversy (see Jesuits), he published a decree of expulsion against all its members in the Portuguese dominions. His power at court had previously been strengthened by the so-called Tavora plot. The marquess and marchioness of Tavora and their two sons, with the duke of Aveiro, the count of Atouguia and other noblemen, were accused of complicity in an attempt upon the life of King Joseph (September 1758). Pombal appointed a special tribunal to judge the case; many of the accused, including those already mentioned, were found guilty and executed; and an attempt was made to implicate the Jesuits. Pombal's enemies declared that he himself had organized the attack

upon the king, in such a manner as to throw suspicion upon his political opponents and to gain credit for himself. This accusation was not proved, but the history of the Tavora plot remains extremely obscure. The expulsion of the Jesuits involved Portugal in a dispute with Pope Clement XIII.; in June 1760 the papal nuncio was ordered to leave Lisbon, and diplomatic relations with the Vatican were only resumed after the condemnation of the Jesuits by Clement XIV., in July 1773.

His victory over the Jesuits left Pombal free to develop his plans for reform. He devoted himself especially to education and defence. A school of commerce was founded in 1759; in 1760 the censorship of books was transferred from an ecclesi- astical to a lay tribunal; in 1761 the former Jesuit college in Lisbon was converted into a college for the sons of noblemen; in 1768 a royal printing-press was established; in 1772 Pombal provided for a complete system of primary and secondary educa- tion, entailing the foundation of 837 schools. He founded a college of art in Mafra; he became visitor of Coimbra University, recast its statutes and introduced the teaching of natural science. Funds for these reforms were to a great extent provided out of the sequestrated property of the Jesuits; Pombal also effected great economies in internal administration. He abolished the distinction between Old and New Christians, and made all Portuguese subjects eligible to any office in the state. Far- reaching reforms were at the same time carried out in the army, navy and mercantile marine. In 1760 Admiral Boscawen had violated Portuguese neutrality by burning four French ships off Lagos; Pombal protested and the British government apologized, but not before the military weakness of Portugal had been demonstrated. Two years later, when the Family Compact involved Portugal in a war with Spain, Pombal called in Count William of Lippe-Biickeburg to reorganize the army, which was reinforced by a British contingent under Brigadier-General John Burgoyne, and was increased from 5000 to 50,000 men. The Spaniards were at first successful, and captured Braganza and Almeida; but they were subsequently defeated at Villa Velha and Valencia de Alcantara, and the Portuguese fully held their

own up to the signature of peace at Fontainebleau, in February 1763. Towards the close of the reign, a long-standing contro- versy with Spain as to the frontier between Brazil and the Spanish colonies threatened a renewal of the war; but in this crisis Pombal was deprived of power by the death of King Joseph (Feb. 20, 1777) and the accession of his daughter Maria I. The queen was married to her uncle, who became king consort as Pedro III. Pombal's dismissal, brought about by the influence of the queen-mother Mariana Victoria,

Maria /., did not involve an immediate reversal of his policy. Pedro Hi. The controversy with Spain was amicably settled and D.John. by the treaty of San Udefonso (1777J; and further industrial and educational reforms were inaugurated, chief among them being the foundation, in 1780, of the Royal Academy of Sciences. Queen Maria, who had previously shown signs of religious mania, became wholly insane after 1788, owing to the deaths of Pedro III. (May 1786), of the crown prince D. Joseph, and of her con- fessor, the inquisitor-general D. Ignacio de San Caetano. Her second son, D. John, assumed the conduct of affairs in 1792, although he did not take the title of regent until 1799. Mean- while a two-fold reaction — on one side clericalist, on the other democratic — had set in against the reforms of Pombal. D.John told William Beckford in 1786 that ” the kingdom belonged to the monks,” and his consort Carlota Joaquina, daughter of Charles IV. of Spain, exercised a powerful influence in favour of the Church. But new ideas had been introduced with the new system of education, and the inevitable revolt against absolutism had resulted in the formation of a Radical party, which sympa- thized with the Revolution in France and carried on an active propaganda through the numerous masonic lodges which were in fact political clubs. D. John became alarmed, and the intendant of police in Lisbon, D. Diogo Ignacio de Pina Manique, organized an elaborate system of espionage which led to the imprisonment or exile of many harmless enthusiasts.

From similar motives, a treaty of alliance with Spain was signed at Aranjuez in March 1793; 5000 Portuguese troops were sent to assist in a Spanish invasion of France; a „ Iatloos Portuguese squadron joined the British Mediterranean w i tn Spain, fleet. But in July 1795 Spain concluded a peace France and with the French republic from which Portugal, as Great the ally of Great Britain, was deliberately excluded. ˆfl’f’f.L, In 1796 Spain declared war upon Great Britain, and in 1797 a secret convention for the partition of Portugal was signed by the French ambassador in Madrid, General Perignon, and by the Spanish minister Godoy. D. John appealed for help to Great Britain, which sent him 6000 men, under Sir Charles Stuart, and a subsidy of £200,000. Though Spain, through the influence of D. John’s father-in-law Charles IV., still remained neutral, a state of war between Portugal and France existed until 1799. D. John then reopened negotiations with Napoleon, and Lucien Bonaparte was sent to dictate terms in Madrid. But D. John dared not consent to close the harbours of Portugal against British ships. England was the chief market for Portuguese wine and grain ; and the long Portuguese littoral was at the mercy of the British navy. Compelled to choose between fighting on land and fighting at sea, D. John rejected the demands of Lucien Bonaparte,

and on the 10th of February 1801 declared war upon Spain. His territories were at once invaded by a Franco- Spanish army, and on the 6th of June 1801 he was forced to conclude the peace of Badajoz, by which he ceded the frontier fortress of Olivenza to Spain, and undertook to pay 20,000,000 francs to Napoleon and to exclude British ships from Portuguese ports. Napoleon was dissatisfied with these terms, and although he ultimately ratified the treaty, he sent General Lannes to Lisbon as his ambassador, instructing him to humiliate the Portuguese and if possible to goad them into a renewal of the war. The same policy was continued by General Junot, who succeeded Lannes in 1804. Junot required D. John to declare war upon Great Britain, but this demand was not immediately pressed owing to the preoccupation of Napoleon with greater affairs, and in October 1805 Junot left Portugal.

By his Berlin decree of the 21st of November 1806 Napoleon

required all continental states to close their ports to British ships. As Portugal again refused to obey, another secret Franco- The Spanish treaty was signed at Fontainebleau on the

Peninsular 27th of October 1807, providing for the partition War ‘ of Portugal. Entre-Minho-e-Douro was to be given

to Louis II. of Etruria in exchange for his Italian kingdom; Algarve and Alemtejo were to form a separate principality for Godoy ; the remaining provinces were to be garrisoned by French troops until a general peace should be concluded. To give effect to these terms, General Junot hastened westward across Spain, at the head of 30,000 French soldiers and a large body of Spanish auxiliaries. So rapid were his movements that there was no time to organize effective resistance. On the 29th of November D. John, acting on the advice of Sir Sidney Smith, British naval commander in the Tagus, appointed a council of regency and sailed for Brazil, convoyed by Sir Sidney Smith’s squadron. For a detailed account of the subsequent military operations, see Peninsular War.

Junot, who was everywhere well received by the Portuguese democrats, entered Lisbon at the end of November 1807. He assumed command of the Portuguese army, divided junot, the kingdom into

military governments, and, on the

November 1st of February 1808 announced that the Braganza 1807-
dynasty had forfeited its right to the throne. He him-

1808 se ˆ hoped to succeed D. John, and sought to conciliate

the Portuguese by reducing the requisition demanded by Napoleon from 40,000,000 francs to 20,000,000. But the action of the French troops in occupying the fortresses of northern Spain provoked in May 1808 a general rising in that country, which soon spread to Portugal. The Spanish garrison in Oporto expelled the French governor and declared for the Braganzas, compelling Junot to march towards the north. He left Lisbon under the control of a regency, headed by the bishop of Oporto, who applied to Great Britain for help, promoted an insurrection against the French, and organized juntas (committees) of government in the larger towns. On the 1st of August 1808 Sir Arthur Wellesley, with 9000 British troops, landed at Figueira da Foz. He defeated a French division at Rolica (" Roleia ") on the 17th, and on the 21st won a victory over Junot at Vimeiro ("Vimiera")- Fearing an attack by Portu- guese auxiliaries and the arrival of British reinforcements under Sir John Moore, Junot signed the convention of Cintra by which, on the 30th of August 1808, he agreed to evacuate Portugal (see Wellington). The regency appointed by D. John was now reconstituted and in October Sir John Moore assumed command of all the allied troops in Portugal. From Lisbon Moore marched north-eastward with about 32,000 men to assist the Spanish armies against Napoleon; his subsequent retreat to join Sir David Baird in Galicia, in January 1809, diverted the pursuing army under Napoleon to the north-west, and temporarily saved Portugal from attack.

In February Major-General William Carr Beresford was given command of the Portuguese army. Organized and invasion by disciplined by British officers, the native troops played Souit, a gallant part in the subsequent campaigns. In

March-May March 1809 the second invasion of Portugal began; 180
Soult crossed the Galician frontier and captured

Oporto, while an auxiliary force under General Lapisse advanced from Salamanca. On the 22nd of April, however, Wellesley, who had been recalled after the convention of Cintra, landed in Lisbon. On the 12th of May he forced the passage of the Douro, subsequently retaking Oporto and pursuing Soult into Spain. Valuable assistance had been rendered by the Portu- guese generals Antonio da Silveira and Manoel

de Brito Mousinho — the first a leader, the second an organizer.

After the battle of Wagram (July 6, 1809) the French armies in the Peninsula received large reinforcements, and invasion m, Marshal Massena, with 120,000 men, was ordered Massena, to operate against Portugal. He crossed the frontier June 1810- i n June 1810 and besieged Almeida, which capitu- Apmmt. Iated on the 27th of August. Wellesley, who had now become Viscount Wellington, opposed his march south-

wards, and won a victory at Bussaco on the 27th of September, but Massena subsequently turned the position of the allied army on the Serra de Bussaco, and caused Wellington to fall back upon the fortified lines which he had already constructed at Torres Vedras. Here he stood upon the defensive until the invaders should be defeated by starvation. The Portuguese troops cut Massena's communications; the peasants, under instructions from Wellington, had already laid waste their own farms, destroyed the roads and bridges by which Massena might retreat, and burned their boats on the Tagus. On the 5th of March 181 1, after a winter of terrible sufferings, Massena's retreat began; he was harassed by the allied troops all the way to Sabugal, where the last rearguard action in Portugal took place on the 3rd of April. The invaders retired with a loss of nearly 30,000 men; Almeida was retaken on the 6th; and the remainder of the war was fought out on Spanish and French soil. The Portuguese troops remained under Wellington's command until 1814, and distinguished themselves in many actions, notably at Salamanca and on the Nivelle.

At the congressof Vienna (1814-181 5) Portugal was represented by three plenipotentiaries, who were instructed to press for the retrocession of Olivenza and to oppose the restora- tion of French Guiana, which the Brazilians had tbfwar. conquered in 1809. Neither object was attained; and this failure, which was attributed to the lack of British support, hastened the reaction against British influence which had already begun. Since 1808 Portugal had theoretic- ally been governed by the regency representing D. John. But as the regency was corrupt and unable to co-operate with Wellington and Beresford, the British government had demanded that Sir Charles Stuart (son of the Sir Charles Stuart mentioned above) should be appointed one of its members. The real control of affairs soon afterwards passed into the strong hands of Stuart and Beresford; and while the war lasted the Portuguese acquiesced in what was in fact an autocracy exercised by foreigners. In 181 5, however, they desired to resume their independence. A further cause of dissatisfaction was the mutual jealousy of Portugal and Brazil. The colony claimed as high a

political status as the mother-country, and by a decree dated the f 6th of January 181 5 it was raised to the rank of a separate kingdom. Thenceforward, until 1822, the Portuguese sover- eignty was styled the United Kingdom of Portugal, Brazil and the Algarves. The importance of this change became apparent when Queen Maria I. died (March 1816) and D. John succeeded to the united thrones as John VI. The king refused to leave Brazil, partly owing to the intrigues of Carlota Joaquina, who hoped to become queen of an independent Brazilian kingdom. Thus Portugal, which had been almost ruined by the war, was now humiliated by the failure of her diplomacy at Vienna and by her continued dependence upon Great Britain and Brazil. The resultant discontent found expression in the cry of ” Por- tugal for the Portuguese ” and in the demand for a constitution. In 181 7 a military revolt (pronunciamento) in Lisbon was crushed by Beresford, and the leader, General Gomes Freire de Andrade, was executed; but on the 16th of August f Be co a . 1820, after Beresford had sailed to Brazil to secure stitutional the return of John VI., a second rising took place Movement, in Oporto. It soon spread southward. A new 1820 ~ t826 ‘ council of regency was established in Lisbon, the British officers were expelled from the army; Beresford, on his return from Brazil, was not permitted to land; a constituent assembly was summoned. This body suppressed the Inquisition and drew up a highly democratic constitution, by which all citizens were declared equal before the law and eligible to any office; all class privileges were abolished, the liberty of the Press was guaranteed, and the government of the country was vested in a single chamber, subject only to the suspensive veto of the Crown. So extreme a change was disliked by most of the powers and by, many Portuguese, especially those of the clerical party. Great Britain insisted on the return of John VI., who entrusted the government of Brazil to his elder son D. Pedro and landed in Portugal on the 3rd of July 1821. In 1822, on the advice of

D. Pedro, he swore to obey the constitution (thenceforward known as the ” constitution of 1822 “)• But his younger son, D. Miguel, and the queen, Carlota Joaquina, refused to take the oath; and in December 1822 sentence of banishment was pro- nounced against them, though not enforced. They had many supporters at home and abroad. French troops had invaded Spain in the interests of Ferdinand VII. (1823),

and the French government was prepared to countenance the absolutist party in Portugal in order to check British influence there. Another military revolt broke out in Traz-os-Montes on the 3rd of February 1823, its leader being the count of Amarante, who was opposed to the constitution. D. Miguel appealed to the army to ” restore liberty to their king,” and the army, incensed by the loss of Brazil (1822), gave him almost unanimous support. At this juncture John VI., vainly seeking for a compromise, abrogated the constitution of 1822, but appointed as his minister D. Pedro de Sousa Holstein, count (afterwards duke) of Palmella and leader of the ” English ” or constitutional party. These half-measures did not satisfy D. Miguel, whose soldiers seized the royal palace in Lisbon on the 30th of April 1824. Palmella was arrested, and John VI. forced to take refuge on the British flagship in the Tagus. But the united action of the foreign ministers restored the king and reinstated Palmella; the insur- rection was crushed; D. Miguel submitted and went into exile (June 1824).

In Brazil also a revolution had taken place. The Brazilians demanded complete independence, and D. Pedro sided with them. The Portuguese garrison of Rio de Janeiro was over- powered; on the 7th of September 1822 D. Pedro declared the country independent, and on the 12th of October he was pro- claimed constitutional emperor. He took no notice of the constituent assembly in Lisbon, which on the 19th of September had ordered him to return to Portugal on pain of forfeiting his right to inherit the Portuguese Crown. By the end of 1823 all Portuguese resistance to the new regime in Brazil had been overcome.

John VI. died on the 10th of March 1826, leaving (by will) his daughter D. Isabel Maria as regent for Pedro I. of Brazil, who now became Pedro IV. of Portugal. A crisis was evidently imminent, for Portugal would not tolerate an absentee sovereign who was far more Brazilian than Portuguese. The unsatisfied ambition of Carlota Joaquina and the hostility between abso- lutists and constitutionalists might at any moment precipitate a civil war. To conciliate the Portuguese, Pedro IV. drew up a charter (known as the ” charter of 1826 “) which provided for moderate parliamentary government on the British model. To conciliate the Brazilians, he undertook (by decree dated May 2nd 1826) to surrender the Portuguese Crown to his daughter D. Maria da Gloria (then aged seven); but this abdication was made contingent upon her marriage with her uncle D. Miguel, who was first required to swear fidelity to the charter.

8. Constitutional Government. — The charter of 1826 forms the basis of the present Portuguese constitution and the starting- point of

modern Portuguese history. That history comprises four periods: (a) From 1826 to 1834 the clerical and absolutist parties led by D. Miguel united every reactionary element throughout the kingdom in a last unsuccessful stand against constitutional government; (b) From 1834 to 1853 the main problem for Portuguese statesmen was whether the constitution, now accepted as inevitable, should embody the radical ideas of 1822 or the moderate ideas of 1826; (c) From 1853 to 1889 there was a period of transition marked by the rise of three new parties — Progressive, Regenerator, Republican; (d) From 1889 to 1908 the Progressives and Regenerators monopolized the control of public affairs, but the strength of Republicanism was not to be gauged by its representation in the cortes. At the beginning of the 20th century the question whether the monarchy should be replaced by a republic had become a living political issue, which was decided by the revolution of October 5, 1910.

The charter was brought to Lisbon by Sir Charles Stuart in July 1826. The absolutists had hoped that D. Pedro would abdicate unconditionally in favour of D. Miguel, and the council

of regency at first refused to publish the charter. They were forced to do so (July 12) by a pronunciamento issued by D. Joao Carlos de Saldanha de Oliveira e Daun, count The of Saldanha and commander of the army in Oporto. Absolutist Saldanha, a prominent constitutionalist, threatened Reactlon – to march on Lisbon if the regency did not swear obedience to the charter by the 31st of July. Amid wild enthusiasm the charter was proclaimed on that day, and on the 3rd of August Saldanha became head of a Liberal ministry. An absolutist counter-revolution at once broke out in the north. It was organized by the marquess of Chaves, and supported openly by the Church and the Miguelite majority of the army; secret assistance was also given by Spain. As civil war appeared imminent, Canning despatched 5000 British troops under Sir William Clinton to restore order, and to disband the troops under Chaves. By March 1827 Clinton and Saldanha had secured the acceptance of the charter throughout Portugal.

In October 1826 D. Miguel also swore to obey the charter and was betrothed to his niece D. Maria da Gloria (Maria II.). Pedro IV. appointed him regent in July 1827 and in February 1828 he landed in Lisbon, where he was received with cries of ” Viva D. Miguel I., rei absoluto! ” In March he dissolved the parliament which had met in accordance with the charter. In April the Tory ministry under Wellington withdrew Clinton’s division, which was the mainstay of the charter. In May D. Miguel summoned a cortes of the ancient type,

which offered him the Crown; and on the 7th of July 1828 he took the oath as king. Saldanha, Palmella, the count of Villa Flor (afterwards duke of Terceira), and the other constitutionalist leaders were driven into exile, while scores of their adherents were executed and thousands imprisoned. Austria and Spain supported D. Miguel, who was able to dispose of the vast wealth of Carlota Joaquina; Great Britain and France remained neutral. Only the emperor D. Pedro and a handful of exiles upheld the cause of Maria II., who returned to Brazil in 1829.

The Azores, although the majority of their inhabitants favoured absolutism, now became a centre of resistance to D. Miguel. In 1828 the garrison of Angra declared The for Maria II., endured a siege lasting four months, Miguelite and finally took refuge in the island of Terceira, Wars – where it was reinforced by volunteers from Brazil and constitu- tionalist refugees from England and France. In March 1829 Palmella established a regency on the island, on behalf of Maria II.; and D. Miguel's fleet was defeated in Praia Bay on the 1 2th of August. Fortune played into the hands of Palmella, Saldanha, Villa Flor and their followers in Terceira. In 1830 a Whig ministry came into office in Great Britain; the " July revolution " placed Louis Philippe on the throne of France; Carlota Joaquina, the power behind D. Miguel's throne, died on the 7th of January. The fanaticism of the clerical and abso- lutist parties in Portugal (collectively termed apostolicos) was enhanced by recrudescence of Sebastianism. Men saw in the brutal boor D. Miguel (q.v.) a personification of the hero-king Sebastian, whose second advent had been expected for two and a half centuries. In the orgy of persecution, outrages were committed on British and French subjects; and a French squad- ron retaliated by seizing D. Miguel's fleet in the Tagus (July 1831). In Brazil, D. Pedro abdicated (April 1831); he deter- mined to return to Europe and conduct in person a campaign for the restoration of Maria II. He was received with enthusiasm by Louis Philippe. In Great Britain Palmella raised a loan of £2,000,000 and purchased a small fleet, of which Captain Sartor- ius, a retired British naval officer, was appointed admiral. In February 1832 the " Liberators," as they were styled, sailed from Belleisle to the Azores, with D. Pedro aboard the flagship. In July they reached Portugal and occupied Oporto, but the expected constitutionalist rising did not take place. The country was almost unanimous in its loyalty to D. Miguel, who had 80,000 troops against the 6500 (including 500 French and 300 British) of D. Pedro. But the Miguelites had no navy, and no competent general. They besieged D. Pedro in Oporto from July 1832 to July 1833, when the duke of Terceira and

Captain Charles Napier, who had succeeded Sartorius, effected a daring and successful diversion which resulted in the capture of Lisbon (July 24, 1833). Maria II. arrived from France in September. The war went in her favour, largely owing to the brilliant generalship of Saldanha and the financial straits to which D. Miguel was reduced. In April 1834 a Quadruple Alliance was concluded between France, Spain, Great Britain and the government of Maria II. The allied army defeated the Miguelites at Asseiceira on the 16th of May, and D. Miguel surrendered at Evora-Monte on the 24th. By the convention of Evora-Monte he was condemned to perpetual banishment from the Peninsula. On the 24th of September D. Pedro died. During the few months in which he acted as regent for his daughter, he had transformed Portugal from a semi-feudal into a modern state. Tithes, many hereditary privileges and all monopolies were abolished; every convent was closed and its property nationalized; the Jesuits, who had returned after the death of Pombal, were again expelled; the charter of 1826 was restored.

Maria II. was fifteen years old at her accession. She was twice married — in December 1834 to Augustus, duke of Leuch- tenberg, who died four months afterwards; and in 1834-1853. Ap ru ‘836 to Ferdinand of Saxe-Coburg, who received the title of king consort in September 1837. Both the queen and the king consort were strangers to Portugal, and could exercise little control over the turbulent factions whose intrigues and pronunciamentos made orderly govern- ment impossible. There were three political parties: the Miguelites, who were still strong enough to cause trouble; the Chartists, who advocated the principles of 1826; the Septembrists, who advocated those of 1822 and took their name from the successful coup d’ttat of the gth-nth of September 1836. By this coup d’etat the constitution of 1822 was sub- stituted for the charter of 1826; and a Septembrist ministry under the Viscount Sa da Bandeira replaced the Chartist ministry under Saldanha, Terceira and Palmella. A counter- revolution, planned in the royal palace at Belem and hence known as the Belcmzada, was frustrated in November 1836; and in 1837 a Chartist insurrection was crushed after severe fighting. This was known as the ” War of the Marshals, ” from the rank of the two Chartist leaders, Saldanha and Terceira. In 1839 a moderate ministry took office, with Antonio Bermudo da Costa Cabral as its real, though not its ostensible, head. A

pronunciamento by Costa Cabral led to the restoration of the charter on the 10th of February 1842, and a Cabral government was formed under the nominal leadership of Terceira. Costa Cabral, who became count of Thomar in 1845, ruled despotically, despite many insurrections, until May 1846, when a coalition of Miguelites, Septembrists and Chartist malcontents drove him into exile. On this occasion the rebellion — known as the ” War of Maria da Fonte ” — proved formidable. Oporto was held by a revolutionary junta, and Saldanha, who had become prime minister, persuaded the Quadruple Alliance to intervene. In June 1847 the Oporto junta surrendered, under promise of an amnesty, to a combined British and Spanish force, and the convention of Gramido (July 24, 1847) ended the war. Saldanha was rewarded with a dukedom, and retained office until June 1849. The dictatorial rule of his successor — the returned exile, Thomar — provoked another successful rising on the 7th of April 1 85 1. Thomar again fled from the country; Saldanha again became prime minister, but at the head of a moderate coalition. He remained in power during five years of unbroken peace (1851-1856), and carried many useful reforms. The most important of these was the so-called Additional Act of the 5th of July 1852, which amended the charter of 1826 by pro- viding for the direct election of deputies, the decentralization of the executive, the creation of representative municipal councils, and the abolition of capital punishment for political offences. Maria II. died on the 13th of November 1853, and was succeeded by her eldest son D. Pedro, during whose ministry the king consort D. Ferdinand acted as regent.

Under the brothers Pedro V. (1853-1861) and Luiz (1861-

1889) Portugal obtained a respite from civil strife. Both monarchs delegated the conduct of affairs to their ministers, who constructed new railways, reformed the edu- cational system, and gradually improved the economic a ndLuiz. condition of the kingdom and its colonies. Pedro V. came of age and assumed the government on the 16th of November 1855, in 1857 he married Princess Stephanie of Hohenzollern. The only political disturbance which marred the peace of his reign arose out of the seizure of the “Charles et Georges,” a French slave-trader which was captured off Mozambique. Napoleon III. sent a fleet to the Tagus and demanded an indemnity, which Portugal was compelled to pay. In 1 860-1 86 1 cholera ravaged the whole kingdom, and especially the capital. The king died of this disease on the nth of November 1861, and two of his brothers, D. Ferdinand and D. John, died shortly afterwards. D. Luiz was absent at the time, and his father D. Ferdinand again became regent until his return, soon after which (1862) the new king married Maria Pia,

daughter of Victor Emanuel II. of Italy. In 1869 slavery was abolished in every Portuguese colony. In 1870 the duke of Saldanha, the last survivor of the turbulent statesmen of Queen Maria's reign, threatened an appeal to arms if the king would not dismiss his minister, the duke of Louie, an advanced Radical and freemason, whose influence, dating from the reign of Pedro V., was viewed with disfavour by Saldanha, as well as by more conservative politicians. The king yielded; and Saldanha himself became prime minister, retaining office until 1874, when, at the age of 80, he was sent as ambassador to London. He had been by far the most influential man in Portugal, and his death in 1876 was followed by a regrouping of political parties.

The party of the Regenerators (Regeneradores) , formed in 1852 out of a coalition of Septembrists and Chartists, had already been disintegrated. Its more radical ele- ments, known at first as the Historic Left, were in parties 1877 reorganized as the Progressives (Progressistas). Its more conservative elements carried on the tradition and retained the name of the original Regenerators. Besides these two monarchist parties — the Regenerators or Conser- vative right and the Progressives or Constitutional left — a strong Republican party was formed in 1881. There were also the Miguelites, active but impotent intriguers; and the advocates of Iberian union, who became prominent in 1867, 1869, 1874, and especially in July 1872, when many well-known politicians were implicated in a fantastic conspiracy for the establishment of an Iberian republic. Portuguese nationalism was too strong for these advocates of union with Spain, whose propaganda was discredited as soon as any national interest was seriously endangered. This was the case in 1872, when Great Britain claimed the southern part of Delagoa Bay. The claim was submitted to the arbitra- tion of M. Thiers, the French president, whose successor, Marshal Macmahon, delivered an award in favour of Portugal on the 19th of April 1875 (see Delagoa Bay).

King Luiz died on the 19th of October 1889, and was succeeded by his son D. Carlos (q.v.). Colonial affairs had for some time received close attention. In 1885 Portugal recog- Co/onte/ nized the Congo Free State, and admitted its Affairs; sovereignty over the north bank of the Lower Relations Congo, although, in an unratified treaty of 1884, w** Great Great Britain had recognized both banks of the Bntaln – river as Portuguese territory. In 1886 Germany, France and Portugal defined by treaty the limits of their adjacent spheres of influence, and on the 26th of March 1887 Macao, hitherto leased to Portugal, was formally ceded by the Chinese government. In 1889 a resolution unanimously adopted by both chambers invited the ministry, of which Jose de Castro was president and Barros Gomes foreign minister, to press

forward the territorial claims of Portugal in East and Central Africa. Shortly after the accession of King Carlos this active, policy led to a dispute with Great Britain (seeAFKiCA, § 5). A Portuguese force under Major Serpa Pinto had invaded the

Shire highlands in order to forestall their annexation by the British, and the British government demanded satisfaction. Public opinion rendered compliance difficult until a British squadron was despatched to the mouth of the Tagus, and the British minister presented an ultimatum (Jan. n, 1890), requiring the withdrawal of all Portuguese forces from the Shire. Barros Gomes was then able to yield under protest; but disturbances at once broke out in Lisbon and Oporto, and the ministry resigned. A coalition government took office on the 14th of January, with Serpa Pimentel as prime minister and J. Hintze-Ribeiro as foreign minister. The king, in a letter to Queen Victoria, declined for the time being to receive the Order of the Garter, which had just been offered him, and on the 6th of February the government addressed a circular letter to the powers, proposing to submit the issues in dispute to a European conference. Meanwhile a Republican rising was suppressed in Lisbon, and many suspected officers were degraded. On the 20th of August an Anglo-Portuguese agreement was negotiated in London, but the cortes refused to ratify it. The ministry therefore resigned, and on the 14th of October Abreu e Sousa fomed a new cabinet, which arranged with Great Britain a modus vivendi for six months, pending the conclusion of another agreement. The British government was ready to make con- cessions, but more than one collision took place between Portu- guese troops in Manica and the forces of the British South Africa Company. The defeat of the Portuguese was the chief cause of a serious military rising in Oporto, which broke out on the 30th of January 1891. The suppression of this rising so far enhanced the prestige of the cabinet that the cortes forthwith approved the convention with Great Britain; and the definitive treaty, by which Portugal abandoned all claim to a trans-African dominion, was ratified by the cortes on the 28th of May. Relations with Great Britain, however, remained far from cordial until the celebration of the fourth centenary of Vasco da Gama's voyage to India afforded the opportunity for a rapprochement in 1898.

The extravagant management of the railways guaranteed by the state

had entailed such heavy deficits that the payment of Financial the coupon of the railway state loan, due on the Crisis of 2nd of January 1892 had to be suspended. Thus 1892. arose a serious financial crisis, involving three changes

of ministry. In May the Portuguese government committed a formal act of bankruptcy by issuing a decree reducing the amount then due to foreign bondholders by two-thirds. The bondholders' committees, supported by some of the powers concerned, protested against this illegal action. A compromise was at last arranged by Hintze-Ribeiro, who assumed office in February 1893 as head of a Progressive government. His cabinet promised only slightly better terms to the foreign bondholders, but it relieved the financial tension in some degree; and by coming to an agreement with Germany in East Africa and with Great Britain in South Africa as to the delimitation of frontiers, he minimized the risks of conflict with either country.

Portugal observed neutrality on the outbreak of the Anglo- Boer War, but the permission it conceded to the British consul at Lourenco Marques to search for contraband of war among goods imported there, and the free passage accorded to an armed force under General Carrington from Beira through Portu- guese territory to Rhodesia, were vehemently attacked in the Press and at public meetings. The award of the Swiss arbi- trators in the matter of the Delagoa Bay railway was given in 1900 (see L0UREN50 Marques). Portugal was condemned to ˆay 15,314,000 francs compensation; and this sum (less than was expected) was immediately raised by loan from the Portuguese Tobacco Company.

A law of the 8th of August 1901 regulated the conditions of election to the lower house, thus ending a long series of parlia- mentary reforms. The most important of these had provided for the gradual extinction of the right of hereditary peers to sit in the upper house (July 24, 1885), had reduced the number of deputies and fixed the qualifications required for the exercise of

the franchise (March 28, 1895); and had abolished the elective branch in the upper house (Sept. 25, 1895). These changes left untouched the most serious evil in Portuguese cnnstl- public life. The two great parties, Progressives and tutional Regenerators, were largely composed of professional Changes, politicians whose votes were determined by their tS8S ~' 90i – private interests. Skilful manipulation of the electoral returns enabled these two parties to hold office in fairly regular rota- tion; hence arose the popular nickname of rotativos, applied to Progressives and Regenerators alike. The same

methods enabled them to obstruct the election of Republican and Independent candidates.

Under such a system of government it was natural that economic issues should still dominate Portuguese politics at the beginning of the 20th century. Year by year Republican- the budget showed a deficit, and the indebtedness ‘ sm znd of the state increased. A large proportion of the tne Arm y- expenditure was unproductive, corruption was rife in the public services, and the poverty of the overtaxed peasant and artisan classes gave rise to sporadic outbreaks of violence. In 1902 the students at Coimbra and Oporto organized an agitation against the proposed conversion of the gold debt; and anti-clerical riots, followed by a strike, rendered necessary the proclamation of martial law in Aveiro. In January 1903 an insurrection of peasants armed with scythes took place at Fundao; the imposi- tion of a new market tax provoked riots at Coimbra in March; a serious strike of weavers took place at Oporto in June. In the same year the general distress was intensified by the failure of the Rural and Mortgage Bank of Brazil. In these circum- stances Republicanism rapidly gained ground. Its real strength was masked by the system which enabled any ministry in power to control the election of candidates to the cortes. In April 1806, for example, only one Republican deputy was returned, although it was notorious that the Republican party could command a majority in many constituencies. Though the army as a. whole was monarchist, certain regiments had become imbued with revolutionary ideals, which were fortified by the unwise employment of soldiers and sailors for the suppression of industrial disputes. During the weavers’ strike the cruiser ” Rainha D. Amelia ” was converted into a temporary prison, and at Fundao, Aveiro and elsewhere troops had been ordered to fire on men with whom they sympathized. In November 1902, while King Carlos was in England, a military rising was organized in Oporto, but never took place. On the 23rd of April 1903 a body of cavalry and artillery mutinied in Lisbon and proclaimed a republic; but they were overpowered and ultimately transported to Mozambique. Such incidents, unim- portant in themselves, were symptoms of a dangerous state of public opinion, which was debarred from expression in the cortes.

The constitution empowered the sovereign to veto any bill, to dissolve or prorogue the cortes, and to govern by means of ministerial decrees. The use of these extraordinary The Die powers would be a breach of constitutional practice, tatorship, but not of law. King Carlos had already been 1906-1908. criticized for alleged excessive interferences in politics. An experiment in government by decree had been made in

May — October 1894; it was repeated in September 1905, when the king consented to prorogue the cortes until January 1906 in order to postpone discussion of the terms upon which the tobacco monopoly was to be allocated. A general election, in February 1906, was followed by three changes of ministry, the last of which, on the 19th of May, inaugurated the regime known in Portugal as the dictadura or dictatorship. Joao Franco, the new prime minister, was conspicuous among Portuguese politicians for his integrity, energy and courage; he intended to reform the national finances and administration — by constitutional means, if possible. The cortes, opened on the 6th of June 1906, was dissolved on the 14th; another election took place, preceded by an official announcement that on this occasion all votes would be fairly counted; and the Franquistas or ” New Regenerators ” obtained a majority. When the

cortes met, on the 29th of September, the opposition accused King Carlos of complicity in grave financial scandals. It was admitted that he had borrowed largely from the treasury, on the security of his civil list, and the Republican deputies accused him of endeavouring to assign the tobacco monopoly to one of his own foreign creditors, in settlement of the debt. Franco organized a coalition in defence of the Crown, but in January 1907 business in the cortes was brought to a standstill and many sittings ended in uproar. The attacks on the king were repeated at the trial of the poet Guerra Junqueiro, who was indicted for lese-majestg. All parties believed that the ministry would fall, and the rotativos prepared once more to divide the spoils of office, when, on the 2nd of May 1907, Joao Franco reconstructed his cabinet, secured the dissolution of the cortes and announced that certain bills still under discussion would receive the force of law. His partisans in the press hailed the advent of a second Pombal, and their enthusiasm was shared by many enlightened Portuguese, who had previously held aloof from politics but now rallied to the support of an honest dictator. Backed by these forces, as well as by the king and the army, Franco effected some useful reforms. But his opponents included not only the Republicans, the professional politicians and those officials who feared inquiry, but also the magistracy, the district and municipal councils, and the large body of citizens who still believed in parliamentary government. The existing debt owed by D. Carlos to the nation was assessed at £154,000. This sum was

ostensibly paid by the transference to the treasury of the royal yacht ” Amelia ” and certain palaces; but the cost and upkeep of the ” Amelia ” had been paid with public money, while the palaces had long been maintained as state property. These transactions, though perhaps necessary to save the credit of the sovereign at the least possible cost, infuriated the opposition. Newspapers and politicians openly advocated rebellion; Franco had recourse to coercion. Sedi- tious journals were suppressed; gaols and fortresses were crowded with prisoners; the upper house, which was hostile to the dictator, was deprived of its judicial powers and reconstituted on a less democratic basis (as in 1826) ; the district and muni- cipal councils were dissolved and replaced by administrative commissions nominated by the Crown (Jan. 1, 1908).

The ministerial press from time to time announced the dis- covery of sensational plots against the king and the dictator. . _ It is, however, uncertain whether the assassination tioaofKiag˚t King Carlos and the crown prince (see Carlos I.), Carlos. on the 1st of February 1908, was part of a widely / *f˜ ss ‘ oi * organized conspiracy; or whether it was the act of an isolated band of fanatics, unconnected with any political party. The republican press applauded the murder; the professional politicians benefited by it. But the regicide Buica and his associates probably acted on their own initiative. The immediate results were the accession of Prince Manoel or Manuel (Emanuel II.) to the throne and the resignation of Franco, who sailed for Genoa. A coalition ministry, representing all the monarchist parties, was formed under the presidency of Admiral Ferreira do Amaral. The administrative commissions appointed by Franco were dissolved; the civil list was reduced; the upper house was reconstituted. A general election took place; in April the cortes met and the balance of power between Progressives and Regenerators was restored. On the 6th of May 1908 D. Manoel swore to uphold the constitution and was acclaimed king by the cortes. His uncle D. Affonso (b. 1865) took a similar oath as crown prince on the 22nd of March 1910. The failure of the dictatorship and the inability of the monarchists to agree upon any common policy had discredited The Revo- the existing regime, and at the general election of lutioBof August 19 10 the Republican candidates in Lisbon l910 ‘ and Oporto were returned by large majorities. On

the 3rd of October the murder of a distinguished Republican physician, Dr Miguel Bombarda, precipitated the revolution which had been organized to take place in Lisbon ten days later. The Republican soldiers in Lisbon, aided by armed civilians and by the warships in the Tagus, attacked the loyal

garrison and municipal guards, shelled the Necessidades Palace, and after severe street-fighting (Oct. 4th-6th) became masters of the capital. The king escaped to Ericeira, and thence, with the other members of the royal family, to Gibraltar. Soon afterwards they travelled undisturbed to England, where the king was received by the duke of Orleans. Through- out Portugal the proclamation of a republic was either welcomed or accepted without further resistance. A provisional government was formed under the presidency of Dr Theophilo Braga (b. 1843), a native of the Azores, who had since 1865 been prominent among Portuguese men of letters (see Literature, below). The new government undertook to carry out part of the Republican programme before summon- ing a constituent assembly to remodel the constitution. Among its most important acts were the expulsion of the religious con- gregations which had returned after 1834, the nationalization of their property, and the abolition, by decree, of the council of state, the upper house and all hereditary titles or privileges. The Republican programme also included the separation of Church and State, and the concession of local autonomy (on federal lines, if possible) to the provinces and colonies of Portugal. Bibliography. — 1. Sources. — There are separate articles on the Portuguese 15th- and 16th-century chroniclers, G. E. de Azurara, J. de Barros, D. de Goes, F. Lopes, J. Osorio da Fonseca, R. de Pina, G. de Resende and L. de Sousa, and on the 19th-century historians, A. Herculano and J. P. Oliveira Martins. The most important collections of documents are Colleccao dos livros in- editos, &c, ed. J. F. Correa da Serra (11 vols., Lisbon, 1790-1804); Quadro elementar das relacoes politicas e diplomaticas de Portugal, ed. first by the Viscount de Santarem (1856-1861) and afterwards, under the title of Corpo diplomatic/) portuguez, by L. A. Rebello da Silva (vols, i.-iv.), J. J. da Silva Mendes Leal (v.-ix.) and J. C. de Freitas Moniz (x., &c). The Colleccao de tratados, &c. (30 vols., Lisbon, 1856-1879), was ed. successively by Viscount J. F. Borges de Castro and J. Judice Biker; it was continued by the Royal Academy as the Nova colleccao de tratados (2 vols., Lisbon, 1890- 1891). See also Portugaliae monumenta historica, ed. A. Herculano and J. J. da Silva Mendes Leal (12 parts, Lisbon, 1856-1897); Diogo Barbosa Machado, Bibliotheca lusitana (4 vols., Lisbon, 1741-1759); Innocencio da Silva and (after vol. x.) P. W. de Brito Aranha, Diccionario bibliographico portuguez (Lisbon, 1858, &c). Periodicals containing valuable historical matter are the Archivo historico portuguez (Lisbon, 1903, &c), the Boletim of the Lisbon Geographical Society (1873, &c), and Portugalia (Oporto, 1898, &c).

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Literature The Portuguese language can be most conveniently described in relation to the other languages of the Peninsula (see Spain: Language). Portuguese literature is distinguished by the wealth and variety of its lyric poetry, by its primacy in bucolic verse and prose, by the number of its epics and historical books, by the relative slightness of the epistolary element, and by the almost complete absence of the memoir. Rich as its romanceiro is, its volume is far less than the Spanish, but the capcioneiros

remain to prove that the early love songs of the whole Peninsula were written in Portuguese, while the primitive prose redaction of A madis, the prototype of all romances of chivalry, was almost certainly made in Portugal, and a native of the same country produced in the Diana of Montem6r (Montemayor) the masterpiece of the pastoral novel. The Lusiads may be called at once the most successful epic cast in the classical mould, and the most national of poems, and the great historical monuments and books of travel of the 16th and 17th centuries are worthy of a nation of explorers who carried the banner of the Quinas to the ends of the earth. On the other hand Portugal gave birth to no considerable dramatist from the time of Gil Vicente, in the 16th century, until that of Garrett in the 19th, and it has failed to develop a national drama.

Its geographical position and history have rendered Portugal very dependent for intellectual stimulus and literary culture on foreign countries, and writers on Portuguese literature are wont to divide their subjects into periods corresponding to the literary currents from abroad which have modified its evolution. To summarize, the first literary activity of Portugal was derived from Provence, and Provencal taste ruled for more than a century; the poets of the 15th century imitated the Castilians, and the 16th saw the triumph of Italian or classical influence. Spain again imposed its literary standards and models in the 17th century, France in the 18th, while the Romantic movement reached Portugal by way of England and France; and those countries, and in less degree Germany, have done much to shape the literature of the 19th century. Yet as regards the Peninsula, the literatures of Portugal and Castile act and react on one another and if the latter gave much, she also received much, for nearly every Portuguese author of renown from 1450 until the 18th century, except Antonio Ferreira, wrote in Spanish, and some, like Jorge de Montemor and Manoel de Mello, pro- duced masterpieces in that language and are numbered as Spanish classics. Again, in no country was the victory of the Italian Renaissance and the classical revival so complete, so enduring.

But notwithstanding all its dependence on classical and foreign authors, Portuguese literature has a distinct individuality which appears in the romanceiro, in the songs named caviares de amigo of the cancioneiros, in the Chronicles of Fernao Lopes, in the Historia tragico-maritima, in the plays of Gil Vicente, in the bucolic verse and prose of the early 16th century, in the Letters of Marianna Alcoforado

and, above all, in The Lusiads.

Early Period. — Though no literary documents belonging to the first century of Portuguese history have survived, there is Poet— evidence that an indigenous popular poetry both sacred and profane existed, and while Provenpal influences moulded the manifestations of poetical talent for nearly two hundred years, they did not originate them. The close relations that prevailed between the reigning houses of Portugal, Provence and Aragon, cemented by intermarriages, introduced a knowledge of the gay science, but it reached Portugal by many other ways — by the crusaders who came to help in fighting the Moors, by the foreign prelates who occupied Penin- sular sees, by the monastic and military orders who founded establishments in Portugal, by the visits of individual singers to court and baronial houses, but chiefly perhaps by the pilgrims who streamed from every country along the Frankish way to the far-famed shrine of Santiago de Compostela. Already by the end of the 1 2th century the lyric poetry of the troubadours had found cultivators in Portugal, and a few compositions which have come down to us bear a date slightly anterior to the year 1200. One of the earliest singers was D. Gil Sanches, an ille- gitimate son of Sancho I., and we possess a cantar de amigo in Galician-Portuguese, the first literary vehicle of the whole Peninsula, which appears to be the work of Sancho himself, and addressed to his concubine, A. Ribeirinha. The pre- Alphonsine period to which these men belong runs from 1200 to 1245 and produced little of moment, but in 1248 the accession of King Alphonso III., who had lived thirteen years in France, inaugurated a time of active and rich production which ‘s

illustrated in the Cancioneiro da Ajuda, the oldest collection of Peninsular verse. The apogee of palace poetry dates from 1275 to 1280, when young King Diniz displayed his exceptional talents in a circle formed by the best troubadours of his father Alphonso III. and the veterans of his grandfather Alphonso II., whose song-book, Cantigas de S. Maria, contains the choicest religious verse of the age. Diniz, who had been educated by Amyeric of Cahors, proved himself the most fecund poet- king of his day, though the pleiad of fidalgos forming his court, and the jograes who flocked there from all parts, were fewer in number, less productive, and lacked the originality, vigour and brilliance of the singers who versified round Alphonso III.

The principal names of the Dionysian period (1284-1325) which is illustrated in the Cancioneiro da Vaticana are the king himself and his bastards D. Alphonso Sanches and D. Pedro, count of Barcellos. Of the two last, the former sings of love well and sincerely, while the latter is

represented by love songs replete with false sentiment and by some rather gross songs of maldizer, a form which, if it rarely contains much poetical feeling or literary value, throws considerable light on the society of the time.

The verses of Diniz, essentially a love poet, are conventional in tone and form, but he can write pretty ballads and pastorals when he allows himself to be natural. The Portuguese trouba- dours belonged to all social classes, and even included a few priests, and though love was their favourite topic they used every kind of verse, and in satire they hold the palm. In other respects they are inferior to their Provencal masters. Speaking generally, the cancioneiros form monotonous reading owing to their poverty of ideas and conventionality of metrical forms and expression, but here and there men of talent who were poets by profession and better acquainted with Provencal literature endeavoured to lend their work variety by the use of difficult processes like the lexaprem and by introducing new forms like the paslorela and the descort. It is curious to note that no heroic songs are met with in the cancioneiros; they are all with one exception purely lyrical in form and tone. The death of King Diniz proved a severe blow to troubadour verse, and the reign of his successor Alphonso IV. witnessed a profound decadence of court poetry, while there is not a single poem by a Portuguese author in the last half of the 14th century, and only the names of a few authors have survived, among them the Galicians Vasco Pires de Camoens, an ancestor of Luiz de Camoens, and the typical lover Macias. The romanceiro, comprising romances of adventures, war and chivalry, together with religious and sea songs, forms a rich collection of ballad poetry which continued in process of elaboration throughout the whole of the middle ages, but unfortunately the oldest specimens have perished and scarcely any of those existing bear a date anterior to the 15th century.

Epic poetry in Portugal developed much later than lyric, but the signal victory of the united Christian hosts over the Moors at the battle of the Salado in 1340 gave occasion to an epic by Alphonso Giraldes of which some fragments remain.

The first frankly literary prose documents appear in the 14th century, and consist of chronicles, lives of saints and genealogical treatises. The more important are the Chronica breve do archivo nacional, the Chronicas de S. Cruz y de Coimbra, the Chronica da conquista do Algarve and the Livros dos Linhagens, aristocratic registers, portions of which, like the story of King Arthur, have considerable literary interest. All the above may be found in the Portugaliae monumenta

historica, scriptores, while the Life of St Elizabeth of Portugal is included in the Monarchia lusitana; Romania has printed the following hagiographical texts belonging to the same century — the Vida de Eufrosina, the Vida de Maria Egypcia and the Vida de Sancto Amaro; the Vida de Santo Eloy has appeared in the Instituto and the Vida dos Santos Barlado e Josafate has been issued by the Lisbon Academy of Sciences.

Romances of chivalry belonging to the various cycles must have penetrated into Portugal at an early date, and the Nobili- ario of the Conde D. Pedro contains the genealogy of Arthur and the adventures of Lear and Merlin. There exists a mid- i4th-century Historia do Santo Graal, and an unprinted Josep

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ab Aramadia, while, though the MS. is lost, we have abundant evidence of the existence of a primitive Portuguese prose redaction of Amadis de Gaula anterior to the present Spanish text. Furthermore, the Livro de Esopo published by Dr Leite de Vasconcellos also belongs to the period, and there are other works in MS.

The ijth Century. — In the reign of John I. the court became an important literary centre, the king himself composed a Livro de Montaria, so far unedited, and his sons are rightly described as Camoens as ” inclyta geraqao, altos Infantes.” King Edward (Duarte) collected a precious library composed of the ancient classics, some translated by his order, as well as medieval poems and histories, and he wrote a moral treatise Leal comselheiro, and hints on horsemanship, or Livro da ensinanca de hem cavalgar toda sella. His brother D. Pedro also wrote a moral treatise Da virtuosa Bemfeitoria, and caused Vegetius’s De re militari and Cicero’s De officiis to be turned into Portuguese. This travelled prince brought back from Venice a MS. of Marco Polo, the gift of the Senate, and is still remembered by the people through the story Livro das viagens do Infante D. Pedro qual andou ds sete partidas do mundo, reprinted almost yearly, of which he is the hero. All the monarchs of the 15th century were highly educated men and patrons of letters; indeed, even that typical medieval knight Alphonso V. confesses, in his

correspondence with Azurara, that the sword avails nothing without the pen. The age is noted for its chronicles, beginning with the anonymous life of the Portuguese Cid, the Holy Con- stable Nuno Alvares Pereira, told in charming infantile prose, the translated Chronica da fundicao do moesteyro de Sam Vicente, and the Vida de D. Tello. Fernao Lopes (q.v.), the father of Portuguese history and author of chronicles of King Pedro, King Ferdinand and King John I., has been called by Southey the best chronicler of any age or nation. Gomes Eannes de Azurara completed Lopes's chronicle cf King John by describing the capture of Ceuta, and wrote a chronicle of D. Pedro de Menezes, governor of the town down to 1437, and a chronicle of D. Duarte de Menezes, captain of Alcacer, but his capital work is the chronicle of the conquest of Guinea (see Azurara).

Though not a great chronicler or an artist like Lopes, Ruy de Pina (q.v.) is free from the rhetorical defects of Azurara, and his chronicles of King Edward and King Alphonso V. are character- ized by unusual frankness, and meritorious both as history and literature. All these three writers combined the posts of keeper of the archives and royal chronicler, and were, in fact, the king's men, though Lopes at least seems rather the historian of a people than the oracle of a monarch. Garcia de Resende (q.v.) appropriated Pina's chronicle of King John II., and after adding a wealth of anecdote and gossip and casting the glamour of poetry over a somewhat dry record, he reissued it under his own name. The taste for romances of chivalry continued throughout the 15th century, but of all that were produced the only one that has come down to us is the Estorea do Imperador Vcspasiano, an introduction to the Graal Cycle, based on the apocryphal gospel of Nicodemus.

The Constable D. Pedro of Portugal, son of the prince of that name already referred to, has left some verses marked by elevation of thought and deep feeling, the Satyra de felice e infelice vida, and the death of his sister inspired his Tragedia de la reina Isabel; but he is best remem- bered by his Coplas del contempto del mundo in the Cancioneiro Geral. Though he actually drafted the first in his native tongue, all these poems are in Castilian, and D. Pedro is one of the first representatives of those Spanish influences which set aside the Provencal manner and in its place adopted a taste for allegory and a reverence for classical antiquity, both imported from Italy. It was to the constable that the marquis de Santillana addressed his historic letter dealing with the origins of Peninsular verse. The court poetry of the reigns of King Alphonso V. and King John II., so far as it survives, is contained in the lyrical collection known Us the Cancioneiro Geral, compiled by Garcia de Resende and printed in 1516- Nearly three

hundred authors are there represented by pieces in Portuguese and Castilian, and they

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include D. Joao Manuel, D. Joao de Menezes, Joao Rodrigues de Sa e Menezes, Diogo Brandao, Duarte de Brito and Fernao da Silveira. The literary progenitors of the cancioneiro were the Spanish poets Juan tie Mena, Jorge Manrique, Garci-Sanchez de Badajos and Rodriguez del Padron, and its main subjects are love, satire and epigram. The epic achievements of the Portuguese in that century, the discoveries and the wars in Africa, hardly find an echo, even in the verses of those who had taken part in them. Instead, an atmosphere of artificiality surrounds these productions, and the verses that reveal genuine poetical feeling are very few. They include a lament of Garcia de Resende on the death of Ignez de Castro which probably inspired the inimitable stanzas dedicated to the same subject in The Lusiads, the Fingimento de Amores by Diogo Brandao, the Coplas of D. Pedro already referred to, and a number of minor pieces. However, some names appeared in the Cancioneiro Gerale which were to be among the foremost in Portuguese literature, e.g. Bernardim Ribeiro, Christovam Falcao, Gil Vicente, and Sa de Miranda, who represent the transition between the Spanish school of the 15th and the Italian school of the 1 6th century, the members of which are called Os Quinhenlislas. Ribeiro and Falcao, the introducers of the bucolic style, put new life into the old forms, and by their eclogues in redondilhas, breathing the deepest and most genuine feeling in verses of perfect “harmony, they gave models which subsequent writers worked by but could never equal.

The Drama. — The history of the modern drama begins with religious plays, followed at a later period by moralities, and thence, by an easy transition, by the farce. This transition from the presentment of traditional types to the modern play can be traced in the works of Gil Vicente, the father of the Portuguese theatre. His first efforts belonged to the religious drama, and some of the more notable had edification for their object, e.g. the Barca do Inferno, but even in this class he soon introduces the comic element by way of relief, and in course of time he arrives at pure comedy and develops the study of character. For a detailed description and criticism of his work, see Vicente. In the various towns where he stayed and produced his plays, writers for the stage sprang up, and these formed the Eschola Velha or school of Gil Vicente. To name the best anvicente known, Evora, the city of culture, produced Affonso ana the Alvarez, author of religious pieces, Antonio Ribeiro, Eschola nicknamed “the Chiado,” an unfrocked friar with

VeH,a • a strong satirical vein who wrote farces in the Bazochian style, and his brother Jeronimo Ribeiro. In Santarem appeared Antonio Prestes, a magistrate who drew from his judicial experience but evinced more knowledge of folk-lore than dramatic talent, while Camoens himself was so far influenced by Gil Vicente, whose plays he had perhaps seen performed in Lisbon, that in spite of his Coimbra training he never exchanged the old forms for those of the classical comedy. His Amphi- tryons is a free imitation of the Latin, yet thoroughly national in spirit and cast in the popular redondilha; the dialogue is spirited, the situations comic. King Seleucus derives from Plutarch and has a prose prologue of real interest for the history of the stage, while Filodemo is a clever tragi-comedy in verse with prose dialogues interspersed. Another poet cf the same school is Balthazar Dias, the blind poet, whose simple religious autos are still performed in the villages, and are continually reprinted, the best liked being the Auto of St Alexis, and the Auto of St Catherine. He is purely medieval in subject and spirit, his lyrics are perfect in form and expression, his diction thoroughly popular. One of the last dramatists of the 16th century belonging to the old school was Simao Machado, who wrote the Comedy of Diu and the Enchantments of Alfea, two long plays almost entirely in Spanish, and full of digressions only made tolerable by the beauty of their lyrics.

Except Camoens, all these men, though disciples of Gil Vicente, are decidedly inferior to him in dramatic invention, fecundity and power of expression, and they were generally of humble social position. Moreover the favour of the court was with- drawn on the death of Gil Vicente, and this meant much, for

there existed no educated middle class to support a national theatre. At the same time the old dramatists had to face the opposition of the classical school, which appealed to the cultured, and the hostility of the Inquisition, which early declared war on the popular plays on account of their grossness, and after- wards through the index prohibited altogether even the religious autos, as it had condemned the Italian comedies. The way was thus clear for the Jesuits, who, with their Latin tragi-comedies or dramatized allegories written to commemorate saints or for scholastic festivals, succeeded for a time in supplanting both the popular pieces of the old school and the plays

modelled on the masterpieces of Greece and Rome. The old dramatists came to write for the lower classes only, and though the school lingered on, its productions were performed solely by travelling companies at country fairs. Though we know that much has perished, the four Indexes of the 16th century give some idea of the rich repertory of the popular theatre, and of the efforts necessary to destroy it; moreover, the Spanish Index of 1559, by forbidding autos of Gil Vicente and other Portuguese authors, is interesting evidence of the extent to which they were appreci- ated in the neighbouring country.

The Renaissance. — The movement commonly called the Renaissance reached Portugal both indirectly through Spain and directly from Italy, with which last country it maintained close literary relations throughout the 15th century. King Alphonso V. had been the pupil of Matthew of Pisa and sum- moned Justus Balduinus to his court to write the national history in Latin, while later King John II. corresponded with Politian, and early in his reign the first printing-press got to work. In the next century many famous humanists took up their abode in Portugal. Nicholas Cleynarts taught the Infant Henry, afterwards cardinal and king, and lectured on the classics at Braga and Evora, Vasaeus directed a school of Latin at Braga, and George Buchanan accompanied other foreign professors to Coimbra when King John III. reformed the university. Many distinguished Portuguese teachers returned from abroad to assist the king at the same time, among them Ayres Barbosa from Salamanca, Andre de Gouveia of the Parisian college of St Barbe, whom Montaigne dubbed ” the greatest principal of France,” Achilles Estaco and Diogo de Teive.

At home Portugal produced Andre de Resende (q.v.), author of the Historia da antiguidade da cidade de Evora and De antiquitatibus Lusitaniae, and Francisco de Hollanda, painter, architect, and author of, inter alia, the Quatro dialogos da pintura antiga. Moreover, women took a share in the intel- lectual movement of the time, and the sisters Luisa and Angela Sigea, Joanna Vaz and Paula Vicente, daughter of Gil Vicente, constituted an informal female academy under the presidency of the Infanta D. Maria, daughter of King Manoel. Luisa Sigea was both an orientalist and a Latin poetess, while Publia Hortensia de Castro, after a course of humanities, philosophy and theology, defended theses at Evora in her eighteenth year.

The Italian school was founded by Sa de Miranda (q.v.), a man of noble character who, on his return in 1526 from a six The Italian y ears ‘ stav m Italy, where he had foregathered with school or Os the leading writers of the day, initiated a reform of Quiahen- Portuguese

literature which amounted to a revolu- tion. He introduced and practised the forms of the sonnet, canzon, ode, epistle in oitava rima and in tercets, and the epigram, and raised the whole tone of poetry. At the same time he gave fresh life to the national redondilha metre (medida velha) by his Cartas or Saliras which with his Eclogues, some in Portu- guese, others in Castilian, are his most successful compositions. His chief disciple, Antonio Ferreira (q.v.), a convinced classicist, went further, and dropping the use of Castilian, wrote sonnets much superior in form and style, though they lack the rustic atmosphere of those of his master, while his odes and epistles are too obviously reminiscent of Horace. D. Manoel de Portugal, Pero de Andrade Caminha, Diogo Bernardes, Frei Agostinho da Cruz and Andre Falcao de Resende continued the erudite school, which, after considerable opposition, definitely triumphed in the person of Luiz de Camoens. The Lima of Bernardes

contains some beautiful eclogues as well as cartas in the bucolic style, while the odes, sonnets, and eclogues of Frei Agostinho are full of mystic charm. Camoens (q.v.) is, as Schlegel remarked, an entire literature in himself, and some critics rate him even higher as a lyric than as an epic poet. He unites and fuses the best elements of the Italian and the popular muse, using the forms of the one to express the spirit and traditions of the other, and when he employs the medida velha, it becomes in his hands a vehicle for thought, whereas before it had usually served merely to express emotions.

His Lusiads, cast in the Virgilian mould, celebrates the combination of faith and patriotism which led to the discoveries and conquests of the Portuguese, and though the„ . _ voyage of Vasco da Gama occasioned its composition and formed the skeleton round which it grew, its true subject is the peito illusire lusitano. Immediately on its appearance The Lusiads took rank as the national poem par excellence, and its success moved many writers to follow in the same path; of these the most successful was Jeronymo Corte Real (q.v.). All these poems, like the Elegiada of Luis Pereira Brandao on the disaster of Al Kasr, the Primeiro cerco de Diu of the chronicler Francisco de Andrade, and even the AJfonso Africano of Quevedo, for all its futile allegory, contain striking episodes and vigorous and well-coloured descriptive passages, but they cannot compare with The Lusiads in artistic value.

The return of Sa de Miranda from Italy operated to transform the drama as well as lyric poetry. He found the stage occupied mainly by religious plays in which there appeared The no trace of the Greek or Roman theatre, and, classical admiring what he had seen in Italy, he and his Comedyand followers protested against the name auto,

restored Tra s e

The principal form taken by prose writing in the 16th century was historical, and a pleiad of distinguished writers arose to narrate the discoveries and conquests in Asia, Africa and the ocean. Many of them saw the achievements they relate and were inspired by patriotism to record them, so that their writings

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lack that serene atmosphere of critical appreciation which is looked for if history is to take its place as a science. In the four I6th- decades of his Asia, Joao de Barros, the Livy

Century of his country, tells in simple vigorous language

the “deeds achieved by the Portuguese in the dis- coverˆ and conquest of the seas and lands of the Orient.” His first decade undoubtedly influenced Camoens, and together the two men fixeti the Portuguese written tongue, the one by his prose, the other by his verse. The decades, which were continued by Diogo do Couto, a more critical writer and a clear and correct stylist, must be considered the noblest historical monument of the century (see Barros). Couto is also responsible for some acute observations on the causes of Portuguese decadence in the East, entitled Soldado practico.

The word encyclopaedist fits Damiao de Goes, a diplomatist, traveller, humanist and bosom friend of Erasmus. One of the most critical spirits of the age, his chronicle of King Manoel, the Fortunate Monarch, which he introduced by one of Prince John, afterwards King John II., is worthy of the subject and the reign in which Portugal attained the apogee of its greatness. Goes (q.v.) wrote a number of other historical and descriptive works in Portuguese and Latin, some of which were printed during his residence in the Low Countries and contributed to his deserved fame. After twenty years of investigation at Goa, Fernao Lopes de Castanheda issued his Historia do de- scobrimento e conquista da India pelos Portuguezes (Lisbon, 1552- 1554 and 1561), a book that ranks besides those of Barros and Couto. Antonio Galvao, who, after governing the Moluccas with rare success and integrity, had been offered the native throne of Ternate, went home in 1540,

and died a pauper in a hospital, his famous treatise only appearing posthumously. The Tratado dos diversos . . . caminhos por onde a pimenta e especiaria veyo da India . . . e assim de todos os descubrimentos . . . que sao feilos em a era de 1560 has been universally recog- nized as of unique historical value. Like the preceding writers, Caspar Correia or Correa lived long years in India and embodied his intimate knowledge of its manners and customs in the picturesque prose of the Lendas da India, which embraces the events of the years 1497 t0 ˆS – Among other historical works dealing with the East are the Commentaries de Ajfonso d' Albuquerque, an account of the life of the great captain and administrator, by his natural son, and the Tratado das cousas da China e de Ormuz, by Frei Caspar da Cruz.

Coming back to strictly Portuguese history, we have the uncritical Chronica de D. Joao III. by Francisco de Andrade, and the Chronica de D. Sebastiao by Frei Bernardo da Cruz, who was with the king at Al Kasr al Kebir, while Miguel Leitao de Andrade, who was taken prisoner in that battle, related his experiences and preserved many popular traditions and customs in his Miscellanea. Bishop Osorio (q.v.), a scholar of European reputation, wrote chiefly in Latin, and his capital work, a chronicle of King Manoel, is in that tongue.

The books of travel of this century are unusually important because their authors were often the first Europeans to visit or at least to study the countries they refer to. They include, to quote the more noteworthy, the Descobrimento de Frolida, the Itinerario of Antonio Tenreiro, the Verdadeira informacao das terras do Presle Joao by Francisco Alvares ,and the Ethiopia oriental by Frei Joao dos Santos, both dealing with Abyssinia, the Itinerario da terra santa by Frei Pantaleao de Aveiro, and that much-translated classic, the Historia da vida do padre Francisco Xavier by Padre Joao de Lucena. Fernao Cardim in his Narrativa epislolar records a journey through Brazil, and Pedro Teixeira relates his experiences in Persia. But the work that holds the palm in its class is the Peregrinacao which Fernao Mendes Pinto (q.v.), the famous adventurer, composed in his old age for his children's reading. While Mendes Pinto and his book are typically Portuguese of that age, the Historia tragico- maritima, sometimes designated the prose epic of saudade, is equally characteristic of the race of seamen which produced it. This collection of twelve stories of notable wrecks which befell Portuguese ships between 1552 and 1604 contains that of the

galleon " St John " on the Natal coast, an event which inspired Corte-Real's epic poem as well as some poignant stanzas in The Lusiads, and

the tales form a model of simple spontaneous popular writing.

The romance took many forms, and in two of them at least works appeared which exercised very considerable influence abroad. The Mcnina e nioQa of Bernardim Ribeiro, a tender pastoral story inspired by saudade for his ˆ maaces ‘ lady-love, probably moved Montemor or Montemayor (q.v.) to write his Diana, and may some fifty years later have suggested the Lusitania transformada to Fernao Alvares do Oriente, who, however, like Ribeiro, owes some debt to San- nazaro’s Arcadia. To name the Palmeirim d’Inglaterra of Moraes (q.v.) is to mention a famous book from which, we are told, Burke quoted in the House of Commons, while Cervantes had long previously declared that it ought to be guarded as carefully as the works of Homer. Like most successful ro- mances of chivalry, it had a numerous progeny, but its sequels, D. Duardos by Diogo Fernandes, and D. Clarisel de Bretanha by Goncalves Lobato, are quite inferior. The historian Barros tried his youthful pen in a romance of chivalry, the Chronica do Imperador Clarimundo, while in another branch, and a popular one in Portugal, the Arthurian cycle, the dramatist Ferreira de Vasconcellos wrote Sagramor or Memorial das proesas da segunda Tavola Redonda. A book of quite a different order is the Contos de proveito e exemplo by Fernandes Trancoso, con- taining a series of twenty-nine tales derived from tradition or imitated from Boccaccio and others, which enjoyed deserved favour for more than a century.

Samuel Usque, a Lisbon Jew, deserves a place to himself for his Consolacam ds tribulagoes de Israel, where he exposes the persecutions endured by his countrymen in every age down to his time; the book takes the dialogue form, and its diction is elegant and pure. The important part taken by Portuguese prelates and theologians at the Council of Trent stimulated religious writing, most of it in Latin, but Frei Bartholomeu dos Martyres, archbishop of Braga, wrote a Cathecismo da doutrina Christa, Frei Luiz de Granada a Compendia de Doutrina Chrisld and Sermoes, all in Portuguese, and other notable pulpit orators include Diogo de Paiva de Andrade, Padre Luiz Alvares, Dom Antonio Pinheiro and Frei Miguel dos Santos, who preached at the obsequies of King Sebastian.

Among the moralists of the time three at least deserve the title of masters of prose style, Heitor Pinto for his Imagens da vida Christa, Bishop Arraez for his Dialogos, and Frei Thome de Jesus for his noble devotional treatise Trabalhos de Jesus, while the maxims of Joanna da Gama, entitled Dilos da Freira, though lacking depth, form a curious psychological document. The ranks of scientists include the cosmographer Pedro Nunes (Nonius), a famous mathematician, and

the botanist Garcia da Orta, whose Colloquios dos simples e drogas was the first book to be printed in the East (1563), while the form of Aristotelian scholastic philosophy known as Philosophia conimbricensis had a succession of learned exponents. As, however, their vehicle was Latin, a mere mention must suffice, and for the same reason only the title of a notable book by Francisco Sanches can be given, the De nobili et prima universali scientia quod nihil scitur.

In 1536 Fernao de Oliveira published the first Portuguese grammar, and three years later the historian Barros brought out his Cartinha para aprender a ler, and in 1540 his Grammatica. Magalhaes Gandavo printed some rules on orthography in 1574. Nunes de Leao also produced a treatise on orthography in 1576 and a work on the origins of the language in 1605, an d Jeronymo Cardoso gave his countrymen a Latin and Portuguese dictionary. The 17th Century. — The gigantic efforts put forth in every department of activity during the 16th century led to the inevitable reaction. Energy was worn out, patriotic osSeiscen- ardour declined into blind nationalist vanity, and tistas. rhetoric conquered style. From a literary as from L y rlc a political point of view the 17th century found Poetry – Portugal in a lamentable state of decadence which dated from

the preceding age. In 1536 the Inquisition began its work, while between 1552 and 1555 the control of higher education passed into the hands of the Jesuits. Following the Inquisition and the Jesuits came two other obstacles to the cultivation of letters, the censorship of books and the Indexes, and, as if these plagues were not enough, the Spanish domination followed. Next the taint of Gongorism appeared, and the extent to which it affected the literature of Portugal may be seen in the five volumes of the Fenix renascida, where the very titles of the poems suffice to show the futilities which occupied the attention of some of the best talents. The prevailing European fashion of literary academies was not long in reaching Portugal, and 1647 saw the foundation of the Accidentia dos Gencrosos which included in its ranks the men most illustrious by learning and social position, and in 1663 the Academia dos Singulares came into being; but with all their pedantry, extravagances and bad taste, it must be confessed that these and similar corporations tended to promote the pursuit of good literature. In bucolics there arose a worthy disciple of

Ribeiro in Francisco Rodrigues Lobo (q.v.), author of the lengthy pastoral romances Corle na aldea and Primavera, the songs in which, with his eclogues, earned him the name of the Portuguese Theocritus. The fore- most literary figure of the time was the encyclopaedic Francisco Manoel de Mello (q.v.), who, though himself a Spanish classic, strove hard and successfully to free himself from subservience to Spanish forms and style. Most of the remaining lyricists of the period were steeped in Gongorism or, writing in Spanish, have no place here. It suffices to mention Soror Violente do Ceo, an exalted mystic called ” the tenth muse,” Bernarda Ferreira de Lacerda, author of the Soledades de Bussaco, the Laura do A nfrizo of Manoel Tagarro, the Sylvia de Lizardo of Frei Bernardo de Brito, and the poems of Frei Agostinho das Chagas, who, however, is better represented by his Cartas espirituaes. Satiri- cal verse had two notable cultivators in D. Thomas de Noronha and Antonio Serrao de Castro, the first a natural and facile writer, the second the author of Os Ratos da Inquisiqao, a facetious poem composed during his incarceration in the dungeons of the Inquisition, while Diogo de Sousa Camacho showed abundant wit at the expense of the slaves of Gongorism and Marinism.

The gallery of epic poets is a large one, but most of their productions are little more than rhymed chronicles and have almost passed into oblivion. The Ulyssea of Gabriel Pereira de Castro describes the foundation of Lisbon by Ulysses, but, notwithstanding its plagiarism of The Lusiads and faults of taste, these ten cantos contain some masterly descriptive passages, and the ottava rima shows a harmony and flexibility to which even Camoens rarely attained; but this praise cannot be extended to the tiresome Ulyssipo of Sousa de Macedo. The Malaca conquistada of Francisco de Si de Menezes, having Alphonso d’Albuquerque for its hero, is prosaic in form, if correct in design. Rodriguez Lobo’s twenty cantos in honour of the Holy Constable do him no credit, but the Viriato tragico by that travelled soldier Garcia de Mascarenhas has some vigorous descriptions, and critics reckon it the best epic of the second class.

In point of style the historians of the period are laboured

and rhetorical ; they were mostly credulous friars who wrote in

History their cells, and no longer, as in the 16th century,

travellers and men of action who described what

they had seen.

Frei Bernardo de Brito began his ponderous Monorchia Lusitana with the creation of man and ended it. where he should have begun, with the coming of Count Henry to the Peninsula. His contribution is a mass of legends destitute of foundation or critical sense, but both here and in the Chronica de Cister he writes a good prose. Of the four continuers of Brito's work, three are no better than their master, but Frei Antonio Brandao, who dealt with the period from King Alphonso Henriques to King John II., proved himself a man of high intelligence and a learned, conscientious historian.

Frei Luiz de Sousa, a typical monastic chronicler, although he had begun life as a soldier, worked up the materials collected by

Epic Poetry.

Oratory,

others, and after much labor limae produced the panegyrical Vida de D. Frei Barlholemeu dos martyres, the Historia de S. Domingos, and the Annaes d'el rei D. Joao III. His style is lucid and vivid, but he lacks the critical sense, and the speeches he puts into the mouths of his characters are imaginary. Manoel de Faria y Sousa (q.v.), a voluminous writer on Portuguese history and the arch-commentator of Camoens, wrote, by an irony of fate, in Spanish, and MellrJ's classic account of the Catalonian War is also in that language, while, by a still greater irony, Jacinto Freire de Andrade thought to picture and exalt the Cato-like viceroy of India by his grandiloquent Vida de D. Joao de Castro.

Other historical books of the period are the valuable Discursos of Severim de Faria, the Portugal restaur ado of D. Luis de Menezes, conde de Ericeira, the ecclesiastical histories of Arch- bishop Rodrigo da Cunha, the Agiologio lusitano of Jorge Cardoso and the Chronica da Companhia de Jesus by Padre Balthazar Telles. The last also wrote an Historia da Ethiopia, and, though the travel literature of this century compares badly with that of the preceding, mention may be made of the Itinerario da India por terra ate a ilha de Chipre of Frei Gaspar de S. Bernardino, and the Relacao do novo caminho atraves da Arabia e Syria of Padre Manoel Godinho.

In the 17th century the religious orders and especially the Jesuits absorbed even more of the activities and counted for more in the public affairs of Portugal than in the preceding age. The pulpit discharged some of the functions of the modern press, and men who combined the gifts of oratory and writing filled it and distinguished

themselves, their order and their country. The Jesuit Antonio Vieira (q.v.), missionary, diplomat and voluminous writer, repeated the triumphs he had gained in Bahia and Lisbon in Rome, which proclaimed him the prince of Catholic orators. His 200 sermons are a mine of learning and experience, and they stand out from all others by their imaginative power, originality of view, variety of treatment and audacity of expression. His letters are in a simple conversational style, but they lack the popular locutions, humour and individuality of those of Mello. Vieira was a man of action, while the oratorian Manoel Bernardes lived as a recluse, hence his sermons and devotional works, especially Luz e Calor and the Nova Floresta, breathe a calm and sweetness alien to the other, while they are even richer treasures of pure Portuguese. Perhaps the truest and most feeling human documents of the century are the five epistles written by Marianna Alcoforado (q.v.) known to history as the Letters of a Portuguese Nun. Padre Ferreira de Almeida's translation of the Bible has considerable linguistic importance, and philological studies had an able exponent in Amaro de Roboredo.

The popular theatre lived on in the Comedias de Cordel, mostly anonymous and never printed its existence would hardly be known were it not for the pieces which The Drama. were placed on the Index. The popular autos that have survived are mainly religious, and show the abuse of metaphor and the conceits which derive from Gongora. All through this century Portuguese dramatists, who aspired to be heard, wrote, like Jacintho Cordeiro and Mattos Fragoso, in Castilian, though a brilliant exception appeared in the person of Francisco Manoel de Mello (q.v.), whose witty Auto do fidalgo aprendiz in redondilhas is eminently national in language, subject and treatment. Until the Restoration of 1640 the stage remained spellbound by the Spaniards, and when a court once more came to Lisbon it preferred Italian opera, French plays, and zarzuelas to dramatic performances in the vernacular, with the result that both Portuguese authors and actors of repute disappeared.

The 18th Century. — The first part of the 18th century differs little from the preceding age except that both affectation and bad taste tended to increase, but gradually signs appeared of a literary revolution, which preceded the political and developed into the Romantic movement. Men of liberal ideas went abroad, chiefly to France, to escape the stupid tyranny that ruled in Church and state, and to their exhortation and example

are largely due the reforms which were by degrees inaugurated in every branch of letters. Their names were among others Alexandre de Gusmao, the Cavalhciro de Oliveira, Ribeiro Sanches, Correa da Serra, Brotero and Nascimento. They had a forerunner in Luiz Antonio Verney, who poured sarcasm on the prevailing methods of education, and exposed to good effect the extraordinary literary and scientific decadence of Portugal in an epoch-making work, the Verdadeiro melhodo de esludar. From time to time literary societies, variously called academies or arcadias, arose to co-operate in the work of reform. In 1720 King John V., an imitator of Louis XIV.,

“fe™ established the academ of history. The fifteen History. . , , • , , <•

volumes of its Memorias, published from 172 1 to

1756, show the excellent work done by its members, among whom were Caetano de Sousa, author of the colossal Historia da Casa Real portugueza, Barbosa Machado, compiler of the invaluable Bibliolheca Lusitana, and Soares da Silva, chronicler of the reign of King John I.

The Royal Academy of Sciences founded in 1780 by the 2nd duke of Lafoes, uncle of Queen Maria I., still exists, though its Royal output and influence are small. Its chief contribu-

Academyot tions to knowledge were the Diccionario da lingua Sciences. portugueza, still unfinished, and the Memorias (1788- 1795), and it included in its ranks nearly all the learned men of the last part of the 18th century. Among them were the ecclesi- astical historian Frei Manoel do Cenaculo, bishop of Beja, the polygraph Ribeiro dos Santos, Caetano do Amaral, a patient investigator of the origins of Portugal, Joao Pedro Riberio, the founder of modern historical studies, D. Francisco Alexandre Lobo, bishop of Vizeu, whose essays on

Camoens and other authors show sound critical sense and a correct style, Cardinal Saraiva, an expert on ancient and modern history and the voyages of his countrymen, and Frei Fortunato de S. Boaven- tura, a historical and literary critic.

In 1756 Cruz e Silva (q.v.), with the aid of friends, established the Arcadia Ulysiponense, ” to form a school of good sayings and good examples in eloquence and poetry.” The most Arcadias, considered poets of the day joined the Arcadia and Lyric individually wrote much excellent verse, but they

Poetry, Ac. a u l ac ked creative power. The principal Greek and Latin authors were the models they chose, and Garcao, the most prominent Arcadian, composed the Cantata de Dido, a gem of ancient art, as well as some charming sonnets to friends and elegant odes and epistles. The bucolic verse of Quita, a hair- dresser, has a tenderness and simplicity which challenge com- parison with Bernardim Ribeiro, and the Marilia of Gonzaga contains a celebrated collection of bucolic-erotic verse. Their conventionality sets the lyrics of Cruz e Silva on a lower plane, but in the Hyssope he improves on the Lutrin of Boileau. After a chequered existence, internal dissensions caused the dissolution of the Arcadia in 1774. It had only gained a partial success because the despotic rule of Pombal, like the Inquisition before him, hindered freedom of fancy and discussion, and drove the Arcadians to waste themselves on flattering the powerful. In 1790 a New Arcadia came into being. Its two most distin- guished members were the rival poets Bocage (q.v.) and Agostinho de Macedo (q.v.). The only other poet of the New Arcadia who ranks high is Curvo Semedo; but the Dissidents, a name bestowed on those who stood outside the Arcadias, included two distinguished men now to be cited, the second of whom became the herald of a poetical revolution. No Portuguese satirist possessed such a complete equipment for his office as Nicolao Tolentino, and though a dependent position depressed his muse, he painted the customs and follies of the time with almost photographic accuracy, and distributed his attacks or begged for favours in sparkling verse. The task of purifying and enriching the language and restoring the cult of the Quin- hentistas was perseveringly carried out by Francisco Manoel de Nascimento (q.v.) in numerous compositions in prose and verse, both original and translated. Shortly before his death in Paris he became a convert to the Romantic movement, and he prepared the wav for its definite triumph in the person of xxii. 6

Almeida Garrett, who belonged to the Filintistas, or followers of Nascimento, in opposition to the Elmanistas, or disciples of Bocage.

Early in the 18th century the spirit of revolt against despotism led to an attempt at the restoration of the drama by authors sprung from the people, who wrote for spectators as coarse as they were ignorant of letters. Its centres were the theatres of the Bairro Alto and Mouraria, and the numerous pieces staged there belong to low comedy. The Operas portuguezas of Antonio Jose da Silva (q.v.), produced between 1733 and 1741, owe their name to the fact that arias, minuets and modinhas were interspersed with the prose dialogue, and if neither the plots, style, nor language are remarkable, they have a real comic force and a certain originality. Silva is the legitimate representative in the 18th century of the popular theatre inaugurated by Gil Vicente, and though born in Brazil, whence he brought the modinha, he is essentially a national writer. Like Silva's operas, the comedies of Nicolao Luiz contain a faithful picture of contemporary society and enjoyed consider- able popularity. Luiz divided his attention between heroic comedies and comedies de capa y espada, but of the fifty-one ascribed to him, all in verse, only one bears his name, the rest appeared anonymously. His method was to choose some Spanish or Italian play, cut out the parts he disliked, and substitute scenes with dialogues in his own way, but he has neither ideals, taste nor education; and, except in Os Maridos Per alias, his characters are lifeless and their conventional passions are expressed in inflated language. Notwithstanding their de- merits, however, his comedies held the stage from 1760 until the end of the century.

Meanwhile the Arcadia also took up the task of raising the tone of the stage, but though the ancients and the classic writers of the 16th century were its ideals, it drew immediate inspiration from the contemporary French theatre. All its efforts failed, however, because its members lacked dramatic talents and, being out of touch with the people, could not create a national drama.

Garcao (q.v.) led the way with the Theatro Novo, a bright little comedy in blank verse, and followed it up with another, Assemblea ou partida; but he did not persevere. Figueiredo felt he had a mission to restore the drama, and wrote thirteen volumes of plays in prose and verse, but, though he chose national subjects, and could invent plots and draw characters, he could not make them live. Finally, the bucolic poet Quita produced the tragedies Segunda Castro, Hermione and two others, but these imitations from the French, for all the taste they show, were stillborn, and in the absence of court patronage, which was exclusively bestowed on the Lisbon opera, then the best equipped in Europe, Portugal remained without a drama of its own.

Sacred eloquence is represented by Fr. Alexandre Palhares, a student

of Vieira, whose outspoken attack on vice in high places in a sermon preached before Queen Maria led to his exile from court. The art of letter-writing had cultivators in Abbade Costa, Ribeiro Sanches, physician of Catherine II. of Russia, Alexandre de Gusmao, and the celebrated Cavalheiro de Oli- veira, also author of Memorias politicas e literarias, published at the Hague, whither he had fled to escape the Inquisition. Philological studies were pursued with ardour and many valuable publications have to be recorded, among them Bluteau's Voca- bulario Portuguez, the Reflexoes sobre a lingoa portugueza and an Arte poetica by Francisco Jos6 Freire, the Exercicios and Espirito da lingoa e eloquencia of Pereira de Figueiredo, trans- lator of the Vulgate, and Viterbo's Elucidario, a dictionary of old terms and phrases which has not been superseded. Finally the best literary critic and one of the most correct prose writers of the period is Francisco Dias Gomes.

The igth Century and After. — The 19th century witnessed a general revival of letters, beginning with the Romantic move- ment, of which the chief exponents were Garrett (q.v.) and Herculano (q.v.), both of whom had to leave Portugal on account of their political liberalism, and it was inaugurated in the

field of poetry. Garrett read the masterpieces of contemporary foreign literature during his exiles in England and France, and, Tbe imbued with the national spirit, he produced in 1825

Romantic the poem Camoes, wherein he broke with the estab-
Movement- Hshed rules of composition in verse and destroyed ry ' the
authority of the Arcadian rhymers. His poetry like that of his fellow emigre, the austere Herculano, is eminently sincere and natural, but while his short lyrics are personal in subject and his longer poems historical, the verse of Herculano is generally subjective and the motives religious or patriotic. The movement not only lost much of its virility and genuineness, but became ultra-Romantic with A. F. de Castilho (q.v.), whose most conspicuous followers were Joao de Lemos and the poets of the collection entitled O Trovador; Soares de Passos, a singer for the sad; the melodious Thomas Ribeiro, who drew his inspiration from Zorilla and voiced the opposition to a political union with Spain in the patriotic poem D. Jayme. Mendes Leal, a king in the

heroic style, Gomes de Amorim and Bulhao Pato, belong more or less to the same school. On the other hand Jose Simoes Dias broke with the Romantic tradition in which he had been educated, and successfully sought inspiration from popular sources, as his Peninsular es proves.

In 1865 there arose a serious and lengthy strife in the Por- tuguese Parnassus, which came to be known as the Coimbra The question, from its origin in the university city.

Coimbra Its immediate cause was the preface which Castilho Question. con tributed to the poem Moci&ade of Pinheiro Chagas, and it proclaimed the alliance of poetry with philosophy. The younger men of letters regarded Castilho as the self-elected pontiff of a mutual-praise school, who, ignorant of the literary movement abroad, claimed to direct them in the old paths, and would not tolerate criticism. The revolt against his primacy took the form of a fierce war of pamphlets, and led ultimately to the dethronement of the blind bard. The leaders in the movement were Anthero de Quental (q.v.) and Dr Theophilo Braga, the first a student of German philosophy and poetry, the second a disciple of Comte and author of an epic of humanity, Visao dos tempos, whose immense work in the spheres of poetry, criticism and literary history, marred by contradictions, but abounding in life, cannot be judged at present. In the issue literature gained considerably, and especially poetry, which entered on a period of active and rich production, still un- checked, in the persons of Joao de Deus (q.v.) and the Coim- brans and their disciples. The Campo de flores contains some of the most splendid short poems ever written in Portuguese, and an Italian critic has ventured to call Joao de Deus, to whom God and women were twin sources of inspiration, the greatest love poet of the 19th century. Simplicity, spontaneity and harmony distinguished his earlier verses, which are also his best, and their author belongs to no school but stands alone. A preponderance of reflection and foreign influences distinguish the poets now to be mentioned. Anthero de Quental, the chief of the Coimbrans, enshrined his metaphysical neo-Buddhistic ideas overshadowed by extreme pessimism, and marked the stages of his mental evolution, in a sequence of finely-wrought sonnets. These place him in the sacred circle near to Heine and Leopardi, and, though strongly individualistic, it is curious to note in them the influence of Germanism on the mind of a southerner and a descendant of the Catholic navigators of the 1 6th century. Odes modernas, written in youth, show ” Santo Anthero,” as his friends called him, in revolutionary, free- thinking and combative mood, and are ordinary enough, but the prose of his essays, e.g. Considerations on the

Philosophy of Portuguese Literary History, has that peculiar refinement, clearness and conciseness which stamped the later work of this sensitive thinker. A subtle irony pervades the Rimas of Joao Penha, who links the Coimbrans with Guerra Junqueiro and the younger poets. Partly philosophical, partly Verse. naturalistic, Junqueiro began with the ironical com- position, A Morte de D. Joao; in P atria he evoked in a series of dramatic scenes and lashed with satire the kings of

The Drama.

the Braganza dynasty, and in Os Simples he interprets in sonorous stanzas the life of country-folk by the light of his powerful imagination and pantheistic tendencies. The Clari- dades de Sul of Gomes Leal, a militant anti-Christian, at times recall Baudelaire, and flashes of genius run through Anli- Christo, which is alive with the instinct of revolt. The Sd of the invalidish Antonio Nobre is intensely Portuguese in subjects, atmosphere and rhythmic sweetness, and had a deep influence. Cesario Verde sought to interpret universal nature and human sorrow, and the Parnassian Goncalves Crespo may be termed a deeper, richer Coppee. His Miniaturas and Noc- turnos have been re-edited by his widow, D. Maria Amalia Vaz de Carvalho, a highly gifted critic and essayist whose personality and cercle call to mind the 18th-century poetess, the Marqueza de Alorna. The French symbolists found an enthusiastic adept in Eugenio de Castro. Antonio Feijo and Jose de Sousa Monteiro have written verse remarkable by its form, while perhaps the most considered of the later poets are Antonio Correa de Oliveira and Lopes Vieira. Many other genuine bards might be mentioned, because the Portuguese race can boast of an unceasing flow of lyric poetry.

Garrett took in hand the reform of the stage, moved by a desire to exile the translations on which the playhouses had long subsisted. He chose his subjects from the national , history, and began with the Auto de Gil Vicente, in ‘ which he resuscitated the founder of the theatre, and followed this up with other prose plays, among which the Alfageme de Santarem takes the palm; finally he crowned his labours by Frei Luiz de Sousa, a tragedy of fatality and pathos and one of the really notable pieces of the century. The historical bent thus given to the drama was continued by the versatile Mendes Leal, by Gomes da Amorim and by Pinheiro Chagas, who all however succumbed more or less to the atmosphere and machi- nery of ultra-Romanticism, while the plays of Antonio Ennes deal with questions of the day in a spirit of combative liberalism. In the social drama, Ernesto Biester, and in comedy Fernando Caldeira, also no mean lyric poet, are two of the

principal names, and the latter's pieces, A Mantilha da Renda and A Madrugada, have a delicacy and vivacity which justifies their success. The comedies of Gervasio Lobato are marked by an easy dialogue and a sparkling wit, and some of the most popular of them were written in collaboration with D. Joao de Camara, the leading dramatist of the day, one of whose pieces, Os Velhos, has been translated and staged abroad. To Henrique Lopes de Men- donca, scholar, critic and poet, we owe some strong historical plays as well as the piece Zt Palonso, written with Lobato, which made a big hit. The playwrights also include Julio Dantas, and Dr Marcellino Mesquita, author of Leonor Telles and other historical dramas, as well as of a powerful piece, Ddr suprema.

Herculano led the way in the historical romance by his Lendas e narrativas and O Monasticon, two somewhat laboured pro- ductions, whose progenitor was Walter Scott; they still find readers for their impeccable style. Their most popular successors have been A Mocidade de D. Joao V. and A ultima corrida de touros reaes em Salvaterra by Rebello da Silva, and Um Anno na Corte by the statesman, Andrade Corvo, the first and the last superior books. The novel shares with poetry the predominant place in the modern literature of Portugal, and Camillo Castello Branco (q.v.), Gomes Coelho and Eca de Queiroz are names which would stand very high in any country. The first, a wonderful impressionist though not per- haps a great novelist, describes to perfection the domestic and social life of Portugal in the early part of the 19th century. His remarkable works include Amor de Perdicao, Amor de Sal- vaqao, Retrato de Ricardina, and the series entitled Novellas do Minho; moreover some of his essays in history and literary criticism, such as Bohemia do Espirito, rank only next to his romances. Gomes Coelho, better known as Julio Diniz, records his experiences of English society in Oporto in A Familia ingleza, and for his romantic idealism he has been dubbed British; Portuguese critics have accused him of imitating Dickens.

The Novel.

His stories, particularly As Pupillas- do Snr. Reitor, depict country life and scenery with loving sympathy, and hold the reader by the charm of the characters, but Diniz is a rather subjective monotonous writer who lacks the power to analyse, and he is no psychologist. Eca de Queiroz (q.v.) founded the Naturalist school in Portugal by a powerful

book written in 1871, but only published in 1875, under the title The Crime of Father Amaro; and two of his great romances, Cousin Basil and Os Maias, were written during his occupancy of consular posts in England. The Relic conveys the impressions of a journey in Palestine and in parts suggests his indebtedness to Flaubert, but its mysticism is entirely new and individual; while the versatility of his talent further appears in The Cor- respondence of Fradique Mendes, where acute observation is combined with brilliant satire or rich humour. The later por- tion of The City and the Mountains, for the truth and beauty of its descriptive passages, is highly praised, and many pages are already quoted as classic examples of Portuguese prose. Among other novelists are Oliveira Marreca, Pinheiro Chagas, Arnaldo Gama, Luis de Magalha.es and Teixeira de Queiroz, the last of whom is almost as distinctly national a writer as Castello Branco himself.

Years of persevering toil in archives and editions of old

chronicles prepared Herculano for his magnum opus, the Historia

de Portugal. The Historia da Origem e Estabele-

s ory ‘ cimento da Inquisicao em Portugal followed and confirmed the position of its author as the leading modern historian of the Peninsula, and he further initiated and edited the important series Porlugaliae Monumenta historica. The Visconde de Santarem, and Judice Biker in geography and diplomatics, produced standard works; Luz Soriano com- piled painstaking histories of the reign of King Joseph and of the Peninsular War; Silvestre Ribeiro printed a learned account of the scientific, literary and artistic establishments of Portugal, and Lieut. Colonel Christovam Ayres was the author of a history of the Portuguese army. Rebello da Silva and the voluminous and brilliant publicists, Latino Coelho and Pin heiro Chagas, wrote at second hand and rank higher as stylists than as historians. Gama Barros and Costa Lobo followed closely in the footsteps of Herculano, the first by a Historia da AdministraQdo publica em Portugal nos Seculos XII. a XV., positively packed with learning, the second by a Historia da Sociedade em Portugal no Seculo XV. Though he had no time for original research, Oliveira Martins (q.v.) possessed psycho- logical imagination, a rare capacity for general ideas and the gift of picturesque narration; and in his philosophic Historia de Portugal, his sensational Portugal contemporaneo, Os Filhos de D. Joao and Vida de Nun’ Alvarez, he painted an admirable series of portraits and, following his master Michelet, made the past live again. Furthermore the interesting volumes of his Bibliotheca das Sciencias Sociaes show extensive knowledge, freshness of views and critical independence and

they have greatly contributed to the education of his countrymen.

Ramalho Ortigao, the art critic, will be remembered prin- cipally for the Farpas, a series of satirical and humorous sketches of Portuguese society which he wrote in collabora- Criticlsm. tion wi(. h Q ueiroz _ j ulio Cesar Machado and Fialho

de Almeida made their mark by many humorous publications, and, in the domain of pure literary criticism, mention must be made of Antonio Pedro Lopes de Mendonca, Rebello da Silva, Dr Joaquim de Vasconcellos, Mme Michaelis de Vascon- cellos, Silva Pinto, the favourite disciple of Castello Branco, and of Luciano Cordeiro, founder of the Lisbon Geographical Society, whose able monograph, Soror Marianna, vindicated the authenticity of the Letters of a Portuguese Nun and showed Marianna Alcoforado to be their authoress. Excellent critical work was also done by Moniz Barreto, whose early death was a serious loss to letters.

In scientific literature hardly a single department lacks a name of repute even outside Portugal. The press has accompanied the general progress, and ever since Herculano founded and wrote in the Panorama, the leading writers have almost without

exception made both name and livelihood by writing for the papers, but as pure journalists none has excelled Antonio Rodriguez Sampaio, Antonio Augusto Teixeira de Vasconcellos and Emygdio Navarro.

The leading Portuguese orators of the 19th century, with the exception of Malhao, were not churchmen, as in the past, but politicians. The early days of parliamentary rule produced Manoel Fernandes Thomas and Manoel r * ory ‘ Borges Carneiro, but the most brilliant period was that of the first twenty-five years of constitutional government after 1834, and the historic names are those of Garrett, Manoel da Silva Passos, and the great tribune and apostle of liberty, Jose Estevao Coelho de Magalhaes. The ill-fated Vieira de Castro excited the greatest admiration by his impassioned speeches in the Chamber of Deputies during the ‘sixties; the nearest modern counterpart to these distinguished men is the orator Antonio Candido Ribeiro da Costa.

Bibliography. — The corner-stones are the Bibliotheca Lusitana of Barbosa Machado and the Diccionario bibliographico portuguez, by Innocencio da Silva, with Brito Aranha’s supplement ; while the Bibliotheca Hispana Nova of Nicolao Antonio (1 783-1 788) may also be referred to. Subsidiary to these are the Manual bibliographico

portuguez of Dr Pinto de Mattos, the admirable Catalogo razonado de los Autores Portugueses que escribieron en Castellano, compiled by Garcia Peres (1890), and such publications as Figaniere's Catalogo dos Manuscriptos portuguezes no Museu Britannico (1853). The only full general history of the literature comes from the prolific pen of Dr Theophilo Braga (second and revised edition in 32 vols.). The volumes positively bulge with information and contain much acute criticism, but their value is diminished by frequent and need- less digressions and by the fantastic theorizings of their author, a militant Positivist. Of one-volume books on the same subject, Dr Braga's Curso da Historia da Litteratura portugueza and his Theoria da Historia da Litteratura portugueza (3rd ed., 1881) may be recommended, though the plainer Historia da Litteratura portu- gueza, by Dr Mendes dos Remedios (3rd ed., 1908) has the consider- able advantage for foreign students of including a large number of selected passages from the authors named. See also the Chresto- mathia archaica of J. J. Nunes (1905). .Among foreign studies the palm must be given to the " Geschichte der portugiesischen Litteratur " by the eminent scholar, Mme Michaelis de Vasconcellos, in the Grundriss der rom. Philologie of Grober (1893-1894). Among general critical studies are Costa e Silva's Ensaio biographice-critico and the masterly work of Menendez y Pelayo, Historia de las ideas estaticas en Espana.

Coming to special periods, the student may consult, for the cancioneiros, Mme Michaelis de Vasconcellos, op. cit., and her great edition of the Cancioneiro da Ajuda (1904) ; also H. R. Lang, Das Liederbuch der Konigs Denis von Portugal (1894). Lopes de Mendonca treats of the literature of the 16th and 17th centuries in articles in the Annaes das sciencias e letras; and the Memorias de litteratura portugueza printed by the Lisbon Academy of Sciences (1792-1814) contain essays on the drama and the Arcadia, but the 19th century has naturally received most attention. For that period, see Lopes de Mendonca, Memoiras da litteratura contem- poranea (1855); Romero Ortiz, La Liter atura portugueza en el siglo XIX. (1869), containing much undigested information; and Maxime Formont, Le Mouvement poetique contemporain en Portugal, an able sketch; but the soundest review is due to Moniz Barreto, whose " Litteratura portugueza contemporanea " came out in the Revista de Portugal for July 1889. Students of the modern novel in Portugal should refer to the essays of J. Pereira de Sampaio (" Bruno ") A Geraqao Nova (1886).

Portugal still lacks a collection equivalent to Rivadeneyra's Biblioteca de autores espanoles, contenting itself with the Par- nasso lusitano (6 vols., 1826) and a Corpus illustrium poetarum lusitanorum qui laline scripserunt (1 745-1 748), and though much has been accomplished to

make the classics more available, even yet no correct, not to say critical, texts of many notable writers exist. The Cancioneiro de Ajuda by Mme Vasconcellos,. is the perfection of editing, and there are diplomatic editions of other cancioneiros, e.g. II Canzoniere portoghese delta Bibliotheca Vaticana K by E. Monaci (1875), of which Dr Braga hurriedly prepared a critical edi- tion; // Canzoniere portoghese Colocci-Brancutt by E. Molteni (1880), and the Cancioneiro Geral (1846). The Romanceiro portuguez of V. E. Hardung is incomplete. . r (E. Pr.)

PORTUGUESE EAST AFRICA, or Mozambique. This Por- tuguese possession, bounded E. by the Indian Ocean, N. by German East Africa, W. by the Nyasaland Protectorate, Rho- desia and the Transvaal, S. by Tongaland (Natal), has an area of 293,500 sq. m. It is divided in two by the river Zambezi. The northern portion, between the ocean and Lake Nyasa and the Shire river, is a compact block of territory, squarish in

shape, being about 400 m. long by 360 m. broad. South of the Zambezi the province consists of a strip of land along the coast varying from 50 to 200 m. in depth. Along the Zambezi itself Portuguese territory extends west as far as the Loangwa confluence, some 600 m. by river.

Physical Features. — The coast-line extends from 26° 52′ S. to 10 40′ S., and from south to north makes a double curve with a general trend outward, i.e. to the east. It has a length of 1430 m. Some 40 m. north of the Natal (Tongoland) frontier is the deep indentation of Delagoa Bay (g.v.). The land then turns outward to Cape Cor- rientes, a little north of which is Inhambane Bay. Bending westward again and passing several small islands, of which the chief is Bazaruto, Sofala Bay is reached. Northward the Zambezi with a wide delta pours its waters into the ocean. From this point onward the coast is studded with small islands, mainly of coral formation. On one of these islands is Mozambique, and immediately north of that port is Conducia Bay. Somewhat farther north are two large bays — Fernao Veloso and Memba. There is a great difference in the charac- ter of the coast north and south of Mozambique. To the north the coast is much indented, abounds in rocky headlands and rugged cliffs while, as already stated, there is an almost continuous fringe of islands. South of Mozambique the coast-line is low, sandy and lined with mangrove

swamps. Harbours are few and poor. The difference in character of these two regions arises from the fact that in the northern half the ocean current which flows south between Madagascar and the mainland is close to the coast, and scours out all the softer material, while at the same time the coral animalcules are building in deep waters. But south of Mozambique the ocean current forsakes the coast, allowing the accumulation of sand and alluvial matter. North of Fernao Veloso and Memba the largest bays are Pemba (where there is commodious anchorage for heavy draught vessels), Montepuesi and Tunghi, the last named having for its northern arm Cape Delgado, the limit of Portuguese territory. Orographically the backbone of the province is the mountain chain which forms the eastern escarpment of the continental plateau. It does not present a uniformly abrupt descent to the plains, but in places — as in the lower Zambezi district — slopes gradually to the coast. The Lebombo Mountains, behind Delagoa Bay, nowhere exceed 2070 ft. in height; the Manica plateau, farther north, is higher. Mt Doe rises to 7875 ft. and Mt Panga to 7610 ft. The Gorongoza massif with Mt Miranga (6550 ft.), Enhatete (6050 ft.), and Gogogo (5900 ft.) lies north-east of the Manica plateau, and is, like it, of granitic formation. Gorongoza, rising isolated with precipitous outer slopes, has been likened in its aspect to a frowning citadel. The chief mountain range, however, lies north of the Zambezi, and east of Lake Chilwa, namely, the Namuli Mountains, in which Namuli Peak rises to 8860 ft., and Molisani, Mruli and Mresi attain altitudes of 6500 to 8000 ft. These moun- tains are covered with magnificent forests. Farther north the river basins are divided by well-marked ranges with heights of 3000 ft. and over. Near the south-east shore of Nyasa there is a high range (5000 to 6000 ft.) with an abrupt descent to the lake — some 3000 ft. in six miles. The country between Nyasa and Ibo is remarkable for the number of fantastically shaped granite peaks which rise from the plateau. The plateau lands west of the escarpment are of moderate elevation — perhaps averaging 2000 to 2500 ft. It is, however, only along the Zambezi and north of that river that Portuguese territory reaches to the continental plateau.

Besides the Zambezi (g.».) the most considerable river in Portu- guese East Africa is the Limpopo (q.v.) which enters the Indian Ocean about 100 m. north of Delagoa Bay. The Komati {a.v.), Sabi, Busi and Pungwe south of the Zambezi; the Lukugu, Lurio, Montepuesi (Mtepwesi) and Msalu, with the Rovuma (q.v.) and its affluent the Lujenda, to the north of it, are the other rivers of the province with considerable drainage areas. The Sabi rises in Mashonaland at an altitude of over 3000 ft., and after flowing south for over 200 m. turns east and pierces the mountains some 170 m. from the coast, being

joined near the Anglo-Portuguese frontier by the Lundi. Cataracts entirely prevent navigation above this point. Below the Lundi confluence the bed of the Sabi becomes considerably broader, varying from half a mile to two miles. In the rainy season the Sabi is a large stream and even in the ” dries ” it can be navigated from its mouth by shallow draught steamers for over 150 m. Its general direction through Portuguese territory is east by north. At its mouth it forms a delta 60 m. in extent. The Busi (220 m.) and Pungwe (180 m.) are streams north of and similar in character to the Sabi. They both rise in the Manica plateau and enter the ocean in Pungwe Bay, their mouths but a mile or two apart. The lower reaches of both streams are navigable, the Busi for 25 m., the Pungwe for about 100 m. At the mouth of the Pungwe is the port of Beira. Of the north-Zambezi streams the Lukugu, rising in the hills south-east of Lake Chilwa, flows south and enters the ocean not far north of Quilimane. The Lurio, rising in the Namuli Mountains, flows north-east, having a course of some 200 m. The Montepuesi and the Msalu drain the country between the Lurio and Rovuma basins. Their banks are in general well defined and the wet season rise seems fairly constant.

Geology. — The central plateau consists of gneisses, granites and schists of the usual East African type which in part or in whole are to be referred to the Archaean system. The next oldest rocks belong to the Karroo period. Their principal occurrence is in the Zambezi basin, where at Tete they contain workable seams of coal, and have yielded plant remains indicating a Lower Karroo or Upper Carboni- ferous age. Sandstones and shales, possibly of Upper Karroo age, form a narrow belt at the edge of the foot-plateau. Upper Cretaceous rocks crop out from beneath the superficial deposits along the coast belt between Delagoa Bay and Mozambique. The Cenomanian period is represented in Conducia by the beds with Puzosia and Acanthoceras, and in Sofala and Busi by the beds with Alectryonia ungulata and Exogyra columba. The highest Cretaceous strata occur in Conducia, where they contain the huge ammonite Pachy- discus conduciensis. The Eocene formation is well represented in Gazaland by the nummulitic limestones which have been found to extend for a considerable distance inland. Basalts occur at several localities in the Zambezi basin. On the flanks of Mount Milanje there are two volcanic cones which would appear to be of compara- tively recent date; but the most interesting igneous rocks are the rhyolitic lavas of the Lebombo range.

Climate. — The climate is unhealthy on the coast and along the banks of the Zambezi, where malaria is endemic. With moderate care, however, Europeans are able to enjoy tolerably good health. On the uplands and the plateaus the climate is temperate and healthy. At

Tete, on the lower Zambezi, the annual mean tempera- ture is 77-9° F., the hottest month being November, 83-3°, and the coldest July, 72-5°. At Quilimane, on the coast, the mean temperature is 85-1°, maximum 106-7° and minimum 49-1°. The cool season is from April to August. The rainy season lasts from December to March, and the dry season from May to the end of September. November is a month of light rains. During the mon- soons the districts bordering the Mozambique Channel enjoy a fairly even mean temperature of 76- 1°, maximum mean 88-7°, and minimum mean 65-3°.

Fauna.— -The fauna is rich, game in immense variety being plentiful in most districts. The carnivora include the lion, both of the yellow and black-maned varieties, leopard, spotted hyena, jackal, serval, civet cat, genet, hunting dog {Lycaon pictus) in the Mozambique district, mongoose and spotted otter, the last-named rare. Of ungulata the elephant is plentiful, though large tuskers are not often shot. The black rhinoceros is also common, and south of the Zambezi are a few specimens of white rhinoceros (R. simus). The rivers and marshes are the home of numerous hippopotami, which have, however, deserted the lower Zambezi. The wart-hog and the smaller red hog are common. A species of zebra is plentiful, and herds of buffalo (Bos caffer) are numerous in the plains and in open woods. Of antelopes the finest are the eland and sable antelope. The kudu is rare. Waterbuck, hartebeeste (Bubalis lichtensteini) , brindled gnu and tsesebe (south of the Zambezi, replaced north of that river by the lechwe and puku), reedbuck, bushbuck, impala, duiker, klipspringer and oribi are all common. The giraffe is not found within the province. Of edentata the scaly ant-eater and porcupine are numerous. Among rodentia hares and rabbits are abundant. There are several kinds of monkeys and lemuroids, but the anthropoids are absent. Crocodiles, lizards, chameleons, land and river tortoises are all very numerous, as are pythons (some 18 ft. long), cobras, puff-adders and vipers. Centipedes and scorpions and insects are innumerable. Among insects mosquitos, locusts, the tsetse fly, the hippo-fly, cockroaches, phylloxera, ter- mites, soldier ants and flying ants are common plagues. As has been indicated, the Zambezi forms a dividing line not crossed by certain animals, so that the fauna north of that river presents some marked contrasts with that to the south. /

Bird-life is abundant. Among the larger birds flamingoes are especially common in the Mozambique district. Cranes, herons, storks, pelicans and ibises are numerous, including the beautiful crested crane and the saddle-billed stork (Mycteria senegalensis) , the last-named comparatively rare. The eagle, vulture, kite, buzzard and crow are well represented, though the crested eagle is not found. Of game birds

the guinea fowl, partridge, bustard, quail, wild goose, teal, widgeon, mallard and other kinds of duck are all common. Other birds numerously represented are parrots (chiefly a smallish green bird — the grey parrot is not found), ravens, hornbills, buntings, finches, doves, a variety of cuckoo, small wag- tails, a starling with a beautiful burnished bronze-green plumage, spur-winged plovers, stilt birds, ruffs and kingfishers.

Flora. — The flora is varied and abundant, though the custom of the natives to burn the grass during the dry season gives to large areas for nearly half the year a blackened, desolate appearance. Six varieties of palms are found — the coco-nut, raphia, wild date, borassus (or fan palm), hyphaene and Phoenix spinosa. The coco- nut is common in the coast regions and often attains 100 ft. ; the date palm, found mostly in marshy ground and by the banks of small rivers, is seldom more than 20 ft. in height. Of the many timber trees a kind of cedar is found in the lower forests; ironwood and ebony are common, and other trees resemble satin and rosewood The Khaya senegalensis, a very large tree found in ravines and by river banks, affords durable and easily-worked timber; there are

several varieties of vitex and of ficus, notably the sycamore, which bears an edible fruit. Excellent hardwood is obtained from a species of grewia. Other characteristic trees are the mangrove (along the sea shore), sandal-wood, gum copal, baobab and bombax, and, in the lower plain, dracaenas (dragon trees), candalabra euphorbia, and many species of creepers and flowering shrubs. The thorny smilax and many other prickly creepers and shrubs are abundant. Acacias are numerous, including the gum- yielding variety, while landolphia rubber vines grow freely in the forests. Among plants of economic value the coffee, cotton, indigo and tobacco plants are found, as well as the castor oil and other oleaginous plants. Bananas, mangoes and pineapples grow in great profusion. Among flowers crinum lilies, lotus, gentians, gladioli, lobelias, violets (scentless), red and yellow immortelles (confined to the higher elevations) and yellow and blue amomums are common. Of grasses the bamboo is common. Phragmites communis, spear grass, with its waving, snowy plumes, grows 12 to 14 ft. and is abundant along the river banks and along the edges of the marshes. (For the flora of the Nyasa region see British Central Africa.)

Inhabitants. — Portuguese East Africa is sparsely inhabited, the estimated population (1909) being 3,120,000; 90% of the inhabitants belong to various Bantu tribes, from whose ranks most of the natives employed in the Transvaal gold mines are recruited. The most important in the northern half of the province are the Yaos (q.v.) and the Ma Kua (Makwa). The Makwa, notwithstanding the presence of Arabs, Banyans (Hindus) and Battias in all the coast districts, have preserved in a remarkable degree their purity of race, although their language has undergone considerable change (see Bantu Languages). Most of the country between the Rovuma and the Zambezi is populated by branches of this race, governed by numerous petty chiefs. The Makwa are divided into four families or groups — the Low Makwa, the Lomwe or Upper Makwa, the Maua and the Medo. Yao possess the country between the Msalu river and Nyasa. The dominant race be- tween the Zambezi and the Mazoe are the Tavala, other tribes in the same region being the Maravi, Senga, Muzimba and Muzuzuro. They are mainly of Zulu origin. Between the Zambezi and the Pungwe are the Barue, Batoka, &c. In the district south of the Pungwe river, known as Gazaland, the ruling tribes are of Zulu origin, all other tribes of different stock being known as Tongas. For the most part these Tongas resemble the Basutos. They are of peaceful disposition. They occupy themselves with stock-raising and agriculture. The white inhabitants numbered about 9000 in 1909. They are chiefly Portuguese and British and nearly a half live in Lourenco Marques. There are many Portuguese half-castes.

Chief Towns. — The chief towns are Lourenco Marques, Mozambique, Quilimane, Inhambane, Beira, Chinde and Sofala, all separately noticed. The other European settlements are Chingune (see Sofala), Angoxa and Ibo on the coast, and Sena, Tete and Zumbo on the Zambezi. Angoxa lies midway between Quilimane and Mozambique, dates from the 17th century, and is a small and little frequented port. Ibo, founded by the Portu- guese at the beginning of the 17th century, is built on an island, likewise called Ibo, in 12 20′ S., 40° 38′ E. off the northern arm of Montepuesi Bay, and 180 m. north of Mozambique. Ibo Island is one of a group known as the Querimba archipelago. The harbour is sheltered but shallow. The town attained considerable dimensions in the 17th century and was made the headquarters of the Cape Delgado district in the 18th century. The most prominent buildings are two forts, one disused. The other, called San Joao, is star-shaped and was built, according to an inscription over the gateway, in 1791. The Zambezi towns (Sena, Tete and Zumbo) mark the limits of penetration made by the Portuguese inland. Comparatively important places in the 17th and early part of the 18th

centuries, with the decline of Portuguese power they fell into a ruinous condition. The opening up of Rhodesia and British Central Africa in the last quarter of the 19th century gave them renewed life. Sena, some 150 m. by river from Chinde, is built at the foot of a hill on the southern side of the Zambezi, from which it is now distant 2 m., though in the middle of the 16th century the river flowed by it. Sena possesses an 18th-century fort, a

modern government house and a church dedicated to St Marcal.

Tete, founded about the same time as Sena, is ajso on the south bank of the Zambezi. It is about 140 m. by the river above Sena. Since 1894 there has been a regular service of steamers between Tete and Chinde. Of the ancient town little remains save the strongly-built fort and the church. The new town dates from about 1860, when there was a revival of the trade in gold dust and ivory. This trade, however, became practi- cally extinct by 1903; the gold dust traffic through exhaustion of supplies, and the ivory trade through diversion to other routes. A transit trade to British possessions north and south of Tete has been developed, and in 1906 some gold mines in the neighbourhood began crushing ore. Zumbo is picturesquely situated just below the Loangwe confluence and commands large stretches of navigable water on the Loangwe and middle Zambezi. The 17th-century town was deserted in consequence of the hostility of the natives. In 1859 David Livingstone found on its site nothing but the ruins of a few houses. Since then a new settlement has been made, and Zumbo has acquired some transit trade with Rhodesia.

On the line of railway from Beira to Rhodesia the most important town is Massi Kessi (Portuguese Macequece) in the centre of the Manica goldfields. It lies 2500 ft. above the sea, 194 m. north-west of Beira by rail, and is close to the British frontier. Along the railway from Lourenco Marques to the Transvaal frontier are stations marking the position of small settlements. The last Portuguese station is named Ressano Garcia; the first Transvaal station Komati Poort.

Communications. — The Zambezi is navigable by light draught steamers throughout its course in Portuguese territory with one break at the Kebrassa Rapids — 400 m. from its mouth. By means of the Shire affluent of the Zambezi there is direct steamer and rail- way connexion with British Central Africa. The navigability of the other rivers of the province has been indicated. From Lourengo Marques railways run to Swaziland and the Transvaal, and from Beira there is a railway to Rhodesia. These lines, built to foster trade with countries beyond Portuguese territory, link the ports named to the British

railway systems in South and Central Africa. The route for a railway to connect Beira with Sena was surveyed in 1906-1907, a route from Quilimane to the Zambezi being also surveyed. A light railway (50 m. long) goes inland from Matamba, on Inhambane Bay, serving northern Gazaland. Native caravan routes traverse every part of the country, but these are mere tracks, and in general communication is difficult and slow.

Lourengo Marques, Beira, Mozambique and other ports are in telegraphic communication with Europe via South Africa and Zanzibar, and a cable connects Mozambique with Madagascar. Inland telegraph lines connect the ports with the adjacent British possessions. British, German and Portuguese steamship lines maintain regular communication between Lourengo Marques and other ports and Europe and India. In 1908 some 1700 vessels of 3,400,000 tons visited the ports of the province.

Agriculture and Other Industries. — The country from the Rovuma to the Zambezi is of great fertility, the richest portion being that between Angoxa and Quilimane. In -the basin of the Zambezi the soil is fertilized by the inundations of the river. The low coast land of the Gaza country is almost equally fruitful. A great part of the country is suitable for the growth of the sugar-cane, rice, ground-nuts, coffee and tobacco. The two last named plants, as also cotton, vanilla, tea and cloves, are not a success in the Quili- mane region, where coco-nuts and ground-nuts are the chief crops. Rubber vines are largely grown in the Mozambique district and the Mpzambique Company has large plantations of coffee and sugar. There are numerous sugar factories and rice plantations in the Zam- bezi district. The natives devote their attention to the raising of oleaginous crops and of maize, cassava, beans, &c. Wheat and other cereals are grown in the valley of the Zambezi. Large herds of cattle are raised. The system prevails in many districts of dividing the land into prazos (large agricultural estates) in which the natives cultivate various crops for the benefit of the European leaseholder, who is also tax-collector for his district and can claim the tax either in labour or produce.

Fish are plentiful along the coast, and pearls are obtained off the Bazaruto Isles. Turtles are caught in the Querimba archipelago. Spirits, sugar, fibres and pottery are practically the only commodi- ties manufactured. The hunting of game for ivory and skins affords employment to large numbers of people.

Mineral Resources. — There are immense deposits of coal in the neighbourhood of Tete and near Delagoa Bay, and adjoining the

coalfields ironstone of the best quality is plentiful. Malachite and copper are found in the interior, north-west of Mozambique. The

whole of the region north of Delagoa Bay to the Zambezi and inland to and beyond the Portuguese frontier is auriferous, and ancient gold workings abound. Many writers have sought to identify this region with the land of Ophir. In Manica several gold mines are worked. In 1906-1907 a rich formation similar to the American ” placer ” deposits was discovered in the Manica goldfields. Gold mines are also worked at Missale and Chifumbaze, to the north of Tete. The Missale mines are just south of the frontier of British Central Africa. Petroleum is found near Inhambane, as is also a curious elastic- like substance named inhangellite, resembling bitumen, chiefly de- rived from masses of a gelatinous alga (see Kew Bulletin, No. 5,

1907).

Commerce. — The chief exports are rubber, sugar, coal (from the Transvaal), beeswax, coco-nuts, copra and mangrove bark, ivory (including hippopotamus teeth and rhinoceros horns), skins and hides, ground-nuts, and oilseeds, monkey-nuts, mealies, cattle (to Madagascar), cotton, tobacco, gold and other minerals. The prin- cipal imports for consumption in the province are cotton goods, hardware and foodstuffs. The ” Kaffir ” trade is largely in cheap wines of a highly deleterious character, blankets, hats and shoes, brass wire and Venetian beads. Immense quantities of cheap wine are bought by the natives. There is at Lourengo Marques and at Beira a large transit trade to and from the Transvaal and Rhodesia respectively. The average annual value of the external trade of the province for the five years 1901-1905 was about £5,500,000. In 1909 the total trade of the province — including re-exports and goods in transit — exceeded £10,000,000. Fully 50% of this trade was in transit to or from the Transvaal. (See further LoURENgo Marques; Beira, &c.) The trade of the province is chiefly with Great Britain, India, Germany and Portugal. The retail trade both at the seaports and in the settlements inland is largely in the hands of British Indians — Banyans, Battias and Parsees.

On the coast there are several native ports of call, between which and Madagascar a large surreptitious trade in slaves was carried on until 1877. With this island, and also with Zanzibar, there is a large general

coasting trade.

Administration, Revenue, &c. — Formerly called Mozambique, the province since 1 891 bears the official title of State of East Africa. It is under a governor-general, appointed for three years, and for administrative purposes is divided into several districts. There is a government council, instituted in 1907, composed partly of officials and partly of elected representatives of the commercial, industrial and agricultural communities. There is also a provincial coun- cil " with the attributions of an administrative and account tribunal." In each district is a subsidiary council. The governor-general resides at Lourengo Marques and has under his immediate direction the Delagoa Bay district. Gazaland (5.11.) and the district of Inhambane are also governed directly by Portu- guese officials. The greater part of the country between the Sabi River and the Zambezi, including the Manica and Sofala regions, is administered, under a charter granting sovereign rights for 50 years from 1 89 1, by the Companhia de Mogambique, which has its head- quarters at Beira. The Quilimane, Chinde and Zambezi regions are administered by representatives of the governor-general, with headquarters at Mozambique. The Zambezi Company has large trading concessions over this district. North of the Quilimane district the coast region and adjacent islands go under the name of Angoxa. The territory between the Lurio and Rovuma rivers and Lake Nyasa is governed by the Companhia do Nyasa under a royal charter. Revenue is obtained largely from customs and a hut tax on natives. The annual revenue of the province is about £1,000,000. A military force, about 4000 strong, is maintained, including 1200 to 1400 Europeans. Education is chiefly in the hands of Roman Catholic missionaries.

History. — It is uncertain at what period the east coast of Africa south of Somaliland was first visited by the maritime races of the east. There is, however, no reason to doubt that by the 10th century a.d. the Arabs had occupied the seaboard as far south as Sofala, and that they carried on an active trade between East Africa and Arabia, the Persian Gulf and India. The Arabs built fine towns and exercised control over the coast peoples, but do not appear to have pushed their conquests far inland. They had extensive commercial dealings, chiefly in gold, ivory and slaves, with the Bantu potentates who ruled over the middle Zambezi valley and the country now known as Mashonaland. Until the close of the 15th century the Arab supremacy was unchallenged. But in 1498 Vasco da Gama entered the mouth of a river which he called Rio dos Bons Sinaes (River of Good Tokens), as there he first found himself in contact with the civilization of the East. This stream was the Quilimane River, taken by the Portuguese a little later to be the

main mouth of the Zambezi. From this river da Gama continued his voyage, putting in at Mozambique and Mombasa on his way to India. Hostilities between the Arabs and Portu-

guese broke out almost immediately; da Gama, indeed, in his first voyage had some trouble with the sultan of Mozambique. In 1502 da Gama paid a visit to Sofala to make inquiries concerning the trade in gold carried on at that place, and the reports as to its wealth which reached Portugal led to the despatch in 1 505 of a fleet of' six ships under Pedro da Nhaya with instructions to establish Portuguese influence at Sofala. Da Nhaya was allowed to build a fort close to the Arab town. The fort, built in three months, was shortly afterwards attacked by a band of Bantus, who acted on the instigation of the Arabs. The attackers were driven off and the Arabs forced to acknowledge Portuguese rule. In 1 509 a captain of Sofala and a factor, or chief trader, were sent out, and from this time the trade of the port fell to the Portuguese. Sofala, however, was not a suitable harbour for the refitting and provisioning of ships on the way to India, and to obtain such a port Mozambique was seized and fortified in 1507. By 1510 the Portuguese were masters of all the former Arab sultanates on the East African coast . The northern half of this region, from Kilwa to Mukdishu, has passed out of their possession; here it is only necessary to out- line the history of the country still under the Portuguese Crown. For forty years Sofala was their only station south of the Zambezi. Thence they traded with the monomotapa or chief of the " Mocaranga " (i.e. the Makalanga or Karanga) in whose territory were the mines whence the gold exported from Sofala was obtained. At that time this chief was a powerful potentate exercising authority over a wide area (see Monomotapa). The efforts made by the Portuguese from Sofala to reach him were unsuccessful. It was probably the desire to penetrate to the "land of gold" by an easier route that led, in 1544, to the establishment of a station on the River of Good Tokens, a station from which grew the town of Quilimane. About the same time the Portuguese penetrated inland along the Zambezi, known then as the River of Sena, and founded the trading ports of Sena and Tete, or, perhaps, annexed already existing Arab towns of those names. It was at this period also that Lourengo Marques and a companion, sent out by the captain of Mozambique, entered Delagoa Bay and opened up trade with the natives. This was the most southerly point occupied by the Portuguese. For three centuries however the fine har- bour was little used, and its ultimate development was due to the discovery of another " land of gold " — the Witwaters- rand — beyond Portuguese territory. In the 16th century the Portuguese turned their energies towards the Zambezi valley. In 1569 their East African dominions,

hitherto dependent on the viceroyalty of India, were made a separate government with headquarters at Mozambique.

Francisco Barreto, a former viceroy of India, appointed governor of the newly formed province, was instructed by King Sebastian to conquer the country of the gold mines. The route via the Zambezi, and not that by Sofala, was chosen by Bar- reto — in opposition to the desires of his council, but in accord with the advice of a Dominican friar named De Monclares. This advice proved fatal owing to the deadly "climate of the Zambezi valley. Barreto's expedition, including over 1000 Europeans, started in November 1569, and from Sena marched south, an arrangement having been come to with the monomo- tapa by which the Portuguese were granted a right of way to the gold mines on condition of their attacking a rebel vassal of that chieftain. Barreto attacked and defeated this rebel, but received no help from the monomotapa, and his force was so greatly weakened by deaths and disease that he was obliged to return to Sena, whence he went to Mozambique to put down disorder among the Portuguese there. He returned to Sena in. 1 5 70, only to die a few days after his arrival. His successor Vasco Fernandes Homem, got together another expedition and made his way inland from Sofala to a region where he saw the ground being worked for gold. The comparative poorness of the mine filled him, it is stated, with disappointment, and he returned to Sofala. Thus these, the most important efforts made by the Portuguese to obtain possession of the interior, ended in failure.

Towards the end of the 16th century the Portuguese posts on the Zambezi were attacked by hordes of savages known as Muzimba, and Tete and Sena were destroyed. The captain- general of Mozambique — the province had been again attached to the- Indian viceroyalty — was only able to make peace on promise not to interfere with matters which concerned only the native tribes. Thereafter the Portuguese often had to defend even the coast towns from attacks by the Bantus. Still they held one or two posts in the interior besides those on the Zam- bezi. Of these the chief appears to have been Masapa, on the river Mansovo, i.e. Mazoe, in what is now Mashonaland, and about 150 m. by road from Tete. Near Masapa dwelt the monomotapa, an insignificant chieftain, the power of the Maka- langa having been broken by revolts of once subject tribes and by dissensions among the Makalanga themselves. In 1629 a treaty was concluded with a claimant to the chieftainship who embraced Christianity. This man,

known as the Monomotapa Filippe, declared himself a vassal of Portugal, and with the help of Dominican friars and a number of half-breeds established his authority.

The Portuguese, however, failed to make any effective use of their East African possessions. Among the causes of their non-success in the years immediately following the period of con- quest must be reckoned the " Sixty Years' Captivity" (1580- 1640), when the Spanish and Portuguese crowns were united, and the neglect of Africa for the richer possessions in India and the Far East. A more important and permanent reason for the non-development of Mozambique province was its unhealthy and enervating climate, which prevented European colonization. The few thousands of Portuguese who went out were chiefly officials, and they and the small body of planters led in general a life of indolence and debauchery. Commerce too was ham- pered and good government rendered impossible through the system of farming out the administration to officials who were in return granted a monopoly of trade, and even when this system was abandoned trade was confined to Portuguese sub- jects. 1 But for many years the Jesuits and Dominicans were unceasing in their endeavours to win the native races to Christianity, the friars being the most energetic section of the white community. The first Jesuit missionaries began work in the province in the neighbourhood of Inhambane in 1560; in the same year another Jesuit, Goncalo da Silveira, made his way to the Zimbabwe (chief kraal) of the monomotapa, by whose orders he and his converts were strangled (March 16, 1561). Mission work was soon afterwards begun by the Dominicans and the two orders between them had agents spread over the greater part of the country from Mozambique southward. They gained thousands of at least nominal converts, notably the heir of one of the monomotapas, who was baptized in 1652 and who, renouncing his heirship, became vicar of the convent of Santa Barbara in Goa. But during the 18th century the zeal of the missionaries declined; in 1750 the Jesuits were expelled, and two years later the Dominicans were sent to Goa. At that time they had been, together with a few white, Goanese and half-caste traders, for fully a century practically the only re- presentatives of Portugal in the interior (the towns on the Zam- bezi excepted). Portugal's influence was confined to helping one tribe in its quarrel with another, in return for favours re- ceived. The Portuguese were quite unable to take advantage of the disunion of the natives to establish their own supremacy. The exhaustion and enfeeblement of Portugal had, in short, its natural effect in Africa. In the early years of the 18th century the Arabs wrested from the Portuguese their African possessions north of Cape Delgado; the Dutch, French and British had

been for some time menacing their trade and possessions in the south. In 1604, 1607 and again in 1662 the Dutch unsuccessfully attacked Mozambique, which was also attacked by the Arabs in 1670. The merchants of Sofala and Mozambique had, since the middle of the 17th century, found a new source of wealth in the export of slaves to Brazil, a trade due directly to the capture of the ports of Angola by the Dutch (1640-1:648), but 1 Until 1853, when commerce was made free to all nations.

continued until nearly the middle of the 19th century. 2 Other trade declined steadily, the continual state of warfare among the tribes of the inland plateaus greatly reducing the production of gold.

In 1752 the government of the East African possessions was again separated from that of Goa, and twenty years later Francisco Jose Maria de Lacerda e Almeida, a man of high attainments, made governor of the province at his own request, endeavoured to reform the administration. Lacerda is chiefly remembered for his journey to the heart of Central Africa, where he died in October 1798. Lacerda had conceived the idea of establishing a chain of Portuguese posts across the continent from Mozambique to Angola, and his statesmanlike prescience was shown by his prediction that the seizure of Cape Town by the British would lead to the extension of British rule over Central Africa, thus isolating the Portuguese provinces on the east and west coasts. After Lacerda's death a state of apathy and decay was again manifest throughout Portuguese East Africa. During the greater part of the 19th century the country south of the Zambezi .was devastated by hordes of savages of, Zulu origin (see Gazaland).

The discoveries of David Livingstone in the Zambezi basin in the period 1850-1865 attracted the attention of the British to those regions and led to the establishment of British settle- ments at the southern end of Lake Nyasa and in the Shire high- lands. These events aroused anxiety in Lisbon, which was increased when the British obtained a prepondering influence in Matabele, Mashona and Manica lands — the lands of the earlier monomotapas. With sudden energy the Portuguese engaged in the " scramble for Africa," and though the result was disappointing to the patriotic feelings of the people they secured from their powerful neighbours — Great Britain and Germany — much better terms than might have been antici- pated, having regard to the extremely limited area over which they exercised any sort of jurisdiction. The story of the par- tition is set forth fully in Africa, § 5. Before the "scramble" began, Portugal had been fortunate in securing, in 1875, as the result of arbitration, complete possession of the fine harbour of Delagoa Bay, the southern half of which had

been claimed by Great Britain in virtue of acts of annexation in 1823 and later years. _ ‘.._. ■

The pressure of political events and the commercial activity of her rivals induced Portugal to take steps to develop the agricultural and mineral resources of the territory secured to her by international agreements. Imitating the policy of Great Britain, charters conveying sovereign powers were granted to the Mozambique Company in 1891, and to the Nyasa Company in 1893. Both these companies, as well as the Zambezi Company (which lacks a charter), undertook to open up the territory com- mitted to their care. In all of them British capital is largely engaged. The total decay of Sofala, the removal of the seat of government from Mozambique to Lourenco Marques, the rise of the last named port and of Beira (both largely dependent on the transit trade with British possessions), all served to mark the changed condition of affairs. An agreement concluded in 1909 between the Transvaal and Portugal gave Delagoa Bay from 50 to 55% of the import trade with the Transvaal, the Portuguese agreeing further to facilitate the recruitment of natives in the province for work on the Rand mines. The development, in the early years of the 20th century, of rubber, rice, sugar and other plantations also gave a new impetus to commerce.

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2 Slavery was not abolished until 1878.

see W. B. Worsfold, Portuguese Nyassaland (London, 1899); Major J. Stevenson-Hamilton’s paper in Geog. Journ. (Nov. 1909); V. A. d’Ega, ” Esbogo geographico-historico dos territorios Portugueses entreo Indicoeo Nyassa ” in Bol. soc. geo. Lisboa (1901). Forgeology consult A. A. F. de Andraada, ” A Geological Reconnaissance of the

Portuguese Territories between Lorenzo Marques and the Zambezi River," review in Geol. Mag. (1897); R. B. Newton, " Note on the Occurrence of Nummulitic Limestone in South-eastern Africa," Geol. Mag. (1896); Paul Choffat, Cretacique de conducia, com. d. service geol. du Portugal (1903). Ethnology and philology have received considerable attention. See M. M. Feio, Indigenes de Mozambique (Lisbon, 1900); J. V. do Sacramento, " Apontames sobre a lingua maciia " in Bol. soc. geo. Lisboa, 22nd and 23rd series (1904 and 1905) ; H. A. Junod, Les Chants et les contes des Ba-Ronga de la bate de Delagoa (Lausanne, 1897). For history see G. M'C. Theal's Records of South-Eastern Africa (9 vols., London, 1898-1903), containing texts of original documents and MSS., with translations in English ; History and Ethnography of South Africa to 179$ (3 vols., London, 1907-1910); and The Portuguese in South Africa (London, 1896) ; Pere Courtois, Notes chronologiques sur les anciennes missions catholiques au Zambezi (Lisbon, 1889) ; Joao dos Santos, Ethiopia oriental . . . (Lisbon, 1609), an account of the travels of one of the early missionaries in Mozambique. A reprint, edited by M. D'Aze-vendo, was published at Lisbon in 1891. Valuable records of the state of the country in the last half of the 19th century are contained in the reports to the foreign office of the British consuls at Mozam- bique, notably those of Lieut. H. E. O'Neill, R.N., and Lyons McLeod. See also O'Neill's The Mozambique and Nyassa Slave Trade (London) 1885); McLeod's Travels in Eastern Africa, with the Narrative of a Residence in Mozambique (London, i860); and Travels . . . [in] Eastern and Central Africa (London, 1879) from the journals of Captain J. F. Elton (consul at Mozambique), compiled by H. B. Cotterill. See further D. and C. Livingstone, Narrative of an Expedition to the Zambesi and its Tributaries, &c. (London, 1 865), and the works cited under Delagoa Bay and Zimbabwe. Reference may also be made to the bibliography under British Central Africa. (F. R. C.)

PORTUGUESE GUINEA, a Portuguese colony in West Africa, extending along the Guinea coast from Cape Roxo in 12 19′ N. to the Cogon estuary in 10° 50′ N. Inland it reaches to 13 40′ W., being enclosed landward by French territory, the Casamance district of Senegal to the N., and French Guinea E. and S. (For map, see French West Africa.) The colony has an area of about 14,000 sq. m., and a population variously estimated at from 200,000 to 800,000. It consists largely of a low-lying deltaic region, together with an adjacent archipelago of small islands called the Bissagos.

The coast-line is deeply indented by estuaries into which flow numerous rivers whose sources are in the elevated region on the eastern border of the colony. The largest estuary, the Geba, receives

the river of the same name, the Mancoa, a northern affluent, and the Rio Grande or Comba ; the last a large stream rising in the highlands of Futa jallon. North of the Geba estuary is the Rio Cacheo, while in the south is the Rio Cassini, in reality an arm of the sea. These rivers and estuaries are connected with one another and with many smaller rivers by a network of lagoons ; and the Bissagos Islands, which lie off the Geba estuary, formed at one time part of the mainland. The Bissagos, protected seaward by dangerous breakers, consist of over thirty islands, besides many small reefs. The largest island, Orango, is the most southerly of the group and some 30 m. from the coast. Bulama and Bissao, islands of more importance, lie close to the mainland. The larger rivers can be ascended by vessels of considerable size for distances of 40 to 150 m., but navigation is rendered difficult by strong currents and the shift- ing nature of the channels as well as by hidden rocks and the great difference between high and low water. The climate is unhealthy, with a mean temperature of about 78° F. The rainfall is heavy, thunderstorms being frequent in the wet season, which lasts from May to October.

Flora and Fauna. — Large forest regions extend behind the mangrove-lined lagoons. Their characteristic trees are the oil and date palms, the baobab, the shea-butter tree, ebony, mahogany and calabash trees, and the acacia. Rubber vines are fairly abundant. Besides the forests, densest along the river valleys, there are extensive tracts of grassland and park-like country. Fruit trees include the papaw, with fruit the size of ostrich eggs, the guava, custard apple, mango, the banana, the orange and the citron. The tobacco, indigo and cotton plants grow wild, and the coffee plant is also found. Ground-nuts and kola nuts are cultivated, and rice and millet are the chief crops grown.

The elephant is found in the district between the Geba and Grande rivers, and hippopotamus are numerous. Other animals include the panther, wild boar, various antelopes, baboons, chimpanzees and large snakes. Crocodiles and sharks abound in the rivers. Birds include the pelican, heron, marabout, the trumpet bird and innumerable yellow parrots. Partridges and woodcock are also

found. The hills of the termites are a notable feature in many parts of the country.

Inhabitants. — The people of the interior are mostly Mandingo (q.v.) and Fula (q.v.). The coast regions and the islands are inhabited by negro tribes which live side by side without mixing, each pre- serving their own customs, dress, language and type. They .exhibit great

attachment to the soil and are profoundly religious, being noted specially for their respect for family life and ancestral worship. Neither Christianity nor Mahommedanism has made much headway among them. Going from south to north the chief tribes are the Nalu, who dwell by the Cassini and are keen traders and lovers of peace; the Biafare or Biaffade, who occupy the region between the sea and the Rio Grande and jealously guard their country from strangers; the Bulam (Mankaie), living in the island of Bulama, and much given to adorning their bodies by long cuts formed into patterns; the Balanta, a piratical folk inhabiting the banks of the Geba; the Papel of the island of Bissao, formerly cannibals, an industrious agricultural tribe which furnishes the majority of the educated Africans employed by the Portuguese; the Manjak or Mandiago, and a branch of the Felup peoples, these last living near the Rio Cacheo in savage isolation and much given to waylaying and pillaging strangers. The Manjak inhabit the country between the Mancoa and the Cacheo, and the neighbouring islands. They are a hospitable and clever people, very adaptable, do not object to leaving their tribal lands, and are said to keep their word. Excellent seamen, good artisans and sharp traders, they maintain a sort of feudal system. Their houses are surrounded by walls, which are pierced with loopholes and provided with towers at the angles. The rooms are built round a courtyard. They examine the entrails of fowl to foretell good or evil events. The burial customs are elaborate. The body is smoked and, the skin having been removed, it is sewn up in a number of pagns (native cloths) and placed in a coffin fastened by gilded nails. Bright tissues are wrapped round the coffin, on which are hung little bells of copper and small brass mirrors. The seaward islands of the Bissagos are inhabited by an independent and warlike tribe of fishers and pirates called Bidiogos. Their women wear a short skirt made of palm leaves.

The natives who adopt Portuguese names and who form the bulk of the townsmen in the European settlements are called Gurmettes. They furnish the levies with which the authorities occasionally make war on the native tribes. The chief centres of trade are Bissao, on the island of the same name, which is sur- rounded by old fortifications; Cacheo, on the Rio Cacheo, also fortified; and Bulama (Boulam) on Bulama Island, the seat of the government. The European population consists of a few Portu- guese officials, soldiers, traders and convicts, and a few traders of other nationalities.

History. — Bulama Island was discovered by Portuguese navigators in 1446, but was not formally claimed by Portugal until 1752, about which time she founded a station at Bissao, while in 1669 a post had been established on the Rio Grande. In 1870 a claim made by Great

Britain to Bulama and a part of the mainland was disallowed by the arbitrator appointed (Presi- dent Grant of the U.S.A.). The inland limits of the Portuguese sphere were fixed by a convention concluded with France in 1886, and the frontier was delimited during 1 900-1 903. Though so long settled in the district — the only part of the Guinea coast west of the Gabun left in her possession — Portugal has done little towards its development. With a fertile and well-watered soil, exceedingly rich in natural products, there is not much commerce, and such trade as exists, chiefly in non- Portuguese hands, is hampered by excessive customs duties and vexatious regulations. In 1905 the external trade of the colony was not more than £160,000 and was less than it had' been twenty years previously. Ground-nuts, rubber, wax and ivory are the principal exports. Revenue and expenditure are about £50,000 a year. Portuguese authority does not in fact extend much beyond the few stations maintained, nor has the local government won the confidence of the natives. In 1908 Bissao and some European settlements on the mainland were besieged by the Papel and other tribes and troops had to be sent from Portugal before order could be restored. If however agriculture and commerce suffer, the ethnologist and zoologist find in this easily accessible little enclave a rich field for investi- gation, the almost nominal sovereignty of Portugal having left the country, practically uninfluenced by European culture, in much the same condition that it was in the 16th and 17th centuries.

See J. E. Giraud, " La Guinee portugaise " in Bull. soc. geog. Marseille (1905), vol. xxix. ; A. L. de Fonseca, " Guin6 " in Bull, soc. geog. Lisboa (1905), vol. xxiii. ; R. Wagner, " Portugiesisch

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PORTUNUS, or Portumnus, in Roman mythology, originally the god of gates and doors (Lat. porta), and as such identified with Janus and represented with a key in his hand. Gradually he came to be recognized as a separate deity, who protected the harbours (porlus) and ensured a safe return to seafarers. (Cicero, Nat. deor. ii. 26; Virgil, Aen. v. 241). With the in- troduction of the Greek gods, he became merged in Palaemon- Melicertes. He had a special priest (flamen

portunalis) and temples on the Tiber near the Aemilian bridge and near Ostia, where a festival was celebrated in his honour on the 17th of August. Mommsen unhesitatingly identifies Portunus with the river-god Tiberinus, from the fact that the festival is also called Tiberinalia in the fasti of Philocalus; Marquardt regards him rather as the tutelary deity of warehouses.

See J. Marquardt, Romische Staatsverwaltung (1885), iii. 327, note 10.

PORTUS, an ancient harbour of Laiium, Italy, on the right bank of the Tiber, at its mouth. For its origin see Ostia. Claudius constructed the first harbour here, 2-| m. north of Ostia, enclosing an area of 170 acres, with two long curving moles projecting into the sea, and an artificial island, bearing a light- house, in the centre of the space between them; the harbour thus opened directly to the sea on the north-west and communicated with the Tiber by a channel on the south-east. The object was to obtain protection from the prevalent south-west wind, to which the river mouth was exposed. Though Claudius, in the in- scription which he caused to be erected in a.d. 46, boasted that he had freed the city of Rome from the danger of inundation, his work was only partially successful. Nero gave the harbour the name of Portus Augusti. It was probably Claudius who constructed hither the direct road from Rome, the Via Portuensis (15 m.) which ran over the hills as far as the modern Ponte Galera, and then straight across the plain. An older road, the Via Campana, ran along the foot of the hills, following the right bank of the Tiber, and passing the grove of the Arval Brothers at the sixth mile, to the Campus salinarum romanarum,, the saltmarsh on the right bank — from which indeed it derived its name (see Notizie degli Scavi, 1888, p. 228).

The site can still be fairly clearly traced in the low ground to the east of Fiumicino, and the lighthouse is represented in bas-reliefs. The harbour is generally supposed to have been protected by two moles with a breakwater in front, on which stood the lighthouse, with an entrance on each side of it. Trial soundings made in 1907 showed that the course of the right-hand mole is represented by a low sandhill, while the central breakwater was only some 190 yds. long, and probably divided from each of the two moles by a channel some 125 yds. wide. The existence of two entrances is, indeed, in accordance with the evidence of coins and literary tradition, though the position of that on the left is not certain, and it may have been closed in later times. The whole course of the left-hand mole has not yet been traced, but it seems to have protected not only the south-west but a

considerable portion of the north-west side of the harbour. In a.d. 103 Trajan constructed another harbour farther inland — a hexagonal basin enclosing an area of 97 acres, and communicating by canals with the harbour of Claudius, with the Tiber direct, and with the sea, the last now forming the navig- able arm of the Tiber (reopened for traffic by Gregory XIII. and again by Paul V.), and bearing the name Fossa trajana, though its origin is undoubtedly due to Claudius. The basin itself is still preserved, and is now a reedy lagoon. It was surrounded by exten- sive warehouses, remains of which may still be seen: the fineness of the brickwork of which they are built is remarkable. Farther to the cast is a circular building in brick with niches; it is called the temple of Portumnus. To the east again is the so-called Arco di Nostra Donna, a gateway (possibly originally built by Trajan) in the fortifications which surround the port and are attributed to the time of Constantine. Many other remains of buildings exist; they were more easily traceable in the 16th century when Pirro Ligorio and Antonio Labacco made plans of the harbour. Considerable excavations were carried on in 1868, but unfortunately with the idea of recovering works of art and antiquities; and the plan and description given by R. Lanciani (Annali del institute, 1868, 144 sqq.) were made under unfavourable circumstances. By means of these works Portus captured the main share of the harbour traffic of Rome, and though the importance of Ostia did not at once decrease we find Portus already an episcopal see in Constantine's time not very

long (if at all) after Ostia, and as the only harbour in the time of the Gothic wars. Its abandonment dates from the partial silting up of the right arm of the Tiber in the middle ages, which restored to Ostia what little traffic was left. To the west of the harbour is the cathedral of S. Rufina (10th century, but modernized except for the campanile) and the episcopal palace, fortified in the middle ages, and containing a number of ancient inscriptions from the site. On the island (Isola Sacra) just opposite is the church of S. Ippolito, built on the site of a Roman building, with a picturesque medieval campanile (13th century ?) ; 2 m. to the west is the modern village of Fiumicino at the mouth of the right arm of the Tiber, which is 21 m. west- south-west by rail from Rome. It is a frazione, or portion of the commune of Rome. Three miles to the north is the pumping station by which the lowland (formerly called Stagno di Maccarese, now reclaimed and traversed by many drainage canals) between here and Maccarese is kept drained (Bonifica di Maccarese) (see Tiber). See H. Dessau in Corp. inscr. latin, xiv. I sqq. (Berlin, 1887) ; J. Carcopino in Notizie degli Scavi (1907), p. 734. (T. As.)

PORT-VENDRES, a seaport of south-western France, in the department

of Pyrenees-Orientales, in an inlet of the Medi- terranean Sea, 19! m. S.S.E. of Perpignan by rail. Pop. (1906), 2525. Port-Vendres, the ancient Portus Veneris, is fourth in importance of the French Mediterranean ports, arid forms a good harbour of refuge. Its trade, which is with Spain, Greece and Algeria, is in cork, carobs, grain and wine, &c.

PORUS (4th century B.C.), an Indian prince, ruler of the country between the rivers Hydaspes and Acesines at the time of the invasion of Alexander the Great. In the battle on the banks of the Hydaspes he off ered a desperate resistance, and Alexander, struck by his independent spirit, allowed him to retain his kingdom, which he increased by the addition of territory. From this time Porus was a loyal supporter of Alexander. He still held' the position of a Macedonian satrap when assassinated some time between 321 and 315 B.C.

See Arrian v. 18, 19; Plutarch, Alexander, 60; Quintus Curtius viii. 14.

PORZIO, CAMILLO (1526-1580?), Italian historian, belonged to a wealthy and noble Neapolitan family, and was the son of the philosopher, Simone Porzio. He studied law, first at Bologna and later at Pisa, and after graduating in utroque jure, practised as a lawyer in Naples. He died in 1580. His chief literary work is La Congiura dei baroni, a history of the unsuccessful conspiracy of the Neapolitan barons against King Ferdinand I. of Naples in 1485; it is based on the authentic records of the state trials, but is prejudiced in favour of the royal power. It was first published by Manutius in Rome in 1565. Of Porzio's other works, the Storia d'ltalia (from 1547 to 1552), of which only the first two books have survived, is the most important. The best edition of these two works is that edited by C. Monzani (Florence, 1855).

PORZIO, SIMONE (1497-1554), Italian philosopher, was born and died at Naples. Like his greater contemporary, Pomponazzi, he was a lecturer on medicine at Pisa (1546-1552), and in later life gave up purely scientific study for speculation on the nature of man. His philosophic theory was identical with that of Pomponazzi, whose De immortalitate animi he defended and amplified in a treatise De mente humana. There is told of him a story which illustrates the temper of the early humanistic revival in Italy. When he was beginning his first lecture at Pisa he opened the meteorological treatises of Aris- totle. The audience, composed of students and townspeople, interrupted him with the cry Quid de anima ? (We would hear about the soul), and Porzio was constrained to change the subject of his lecture. He

professed the most open materialism, denied immortality in all forms and taught that the soul of man is homogeneous with the soul of animals and plants, material in origin and incapable of separate existence.

POSEIDON, in Greek mythology, god of the sea and of water generally, son of Cronus and Rhea, and brother of Zeus and Pluto. The connexion of his name with iroffis, tovtos, irorapbs, is generally accepted. When the three brothers deposed their father Cronus the kingdom of the sea fell by lot to Poseidon. His home was in a golden palace in the depths of the sea near Aegae in Achaea. In his hand he bore a trident, wherewith he lashed the sea into fury, split the rocks, and caused horses and

fountains to spring from them. But, while he caused storms and shipwrecks, he could also send favouring winds; hence he was known as Soler, ” the preserver.” Another of his titles was Gaeeochos, ” the supporter of earth,” the sea being supposed to support the earth and keep it firmly in its place. He was the god of navigation and his temples stood especially on headlands and isthmuses. Every occupation connected with the sea was under his protection, and seafaring people, especially the Ionians, regarded themselves as his descendants. As god of the sea he disputed with other deities for the possession of the land. Earthquakes were thought to be produced by Poseidon shaking the earth — hence his epithet of Enosichthon, ” Earth-shaker ” — ■ and hence he was worshipped even in inland places which had suffered from earthquakes. The seismic wave was also his work; the destruction of Helice in Achaea by such a wave (373 B.C.) was attributed to his wrath (Strabo viii. 384). The island of Delos was thought to have been raised by him, and about 198, when a new island appeared between Thera and Therasia, the Rhodians founded a temple of Poseidon on it (Strabo i. 57). Thessaly was said to have been a lake until he opened a way for the waters through the Vale of Tempe (Hero- dotus vii. 129). Poseidon was also the god of springs, which he produced by striking the rock with his trident, as he did on the acropolis of Athens when disputing with Athena for the sovereignty cf Athens (Herodotus viii. 55; Apollodorus hi. 14). As such he was called Nymphagetes, the leader of the nymphs of springs and fountains, a god of fresh water, probably his original character, and in this connexion was 4>uraXˆtos {phytalmius) , a god of vegetation, frequently associated with Demeter. In regard to the contest with

Athena, it is probable that Poseidon is really Erechtheus, a local deity ousted by Athena and trans- formed into an agricultural hero. Dr Farnell, however, holds that Erechtheus and Poseidon were originally independent figures, and that both Erechtheus and Athena were prior to Poseidon, As he gave, so he could withhold, springs of water; thus the waterless neighbourhood of Argos was supposed to be the result of his anger. Black bulls, symbolical of the stormy sea, were sacrificed to him, and often thrown alive into rivers; in Ionia and Thessaly bull-fights took place in his honour; at a festival of his at Ephesus the cupbearers were called ” bulls,” and the god himself was surnamed ” Bull Poseidon.” The horse was especially associated with his worship; he was said to have produced the first horse by striking the ground in Thessaly with his trident (Virgil, Georgics, i. 12). At the fountain of Dine in Argolis horses bitted and bridled were sacrificed to him by being drowned (Pausanias viii. 7, 2), and similarly Sextus Pompeius sought to propitiate him by throwing horses into the sea (Dio Cassius xlviii. 48). He bore the surname of ” Horse Neptune ” (Hocrei&cav hnnos), and was regarded as the tamer as well as the creator of the steed. In the deme of Colonus he was worshipped with Athena, the reputed inventor of the bridle. Various explanations of the title ‘iirmos have been given: (1) that the horse represented the corn-spirit; (2) the resemblance of the crested waves to horses; (3) the impression of horses’ hoofs near the god’s sacred springs, and the shaking of the earth by them when galloping (see Farnell, Cults of the Greek States, iv. 20). Poseidon plays a considerable part in Greek legend. In the Trojan War he takes the side of the Greeks, because he had been cheated of his reward by Laomedon, king of Troy, for whom he had built the walls of the city. The binding of his son Poly phemus by Odysseus brings upon the hero the wrath of Poseidon, from which he is only protected by the united influence of the rest of the gods. He is famous for his numerous amours, especially with the nymphs of springs and fountains; his offspring were mostly wild and cruel, like the sea — the Laestrygones, Polyphemus, Antaeus, Procrustes and the like. He was wor- shipped as a national god by the Ionians, who took his worship over with them from Peloponnesus to Asia Minor. His chief sanctuary ‘ was at Mycale, where the Panionia, the national festival of the Ionians, was held. Other seats of his worship were in Thessaly, Boeotia and Peloponnesus. At Taenarum in Laconia he had a famous cave-like temple, with an asylum.

and on the island of Tenos he was worshipped as the physician, probably in reference to the health-giving properties of the sea air. By far the most famous of his festivals was that celebrated every alternate year on the isthmus of Corinth, at which the ” Isthmian games ” were

held. Here a colossal statue of him was set up in bronze by the Greeks after their victory over the Persians. The horse, the dolphin (the symbol of the calm sea) and the pine-tree, with wreaths of which the Isthmian victors were crowned, were sacred to him. Horses and black bulls, boars and rams were offered to him, sometimes human beings. His attributes are the trident and the dolplun (sometimes the tunny fish.)

As represented in art Poseidon resembles Zeus, but possesses “less of his majestic calm, his muscles are more emphasized, and his hair is thicker and somewhat dishevelled. He is generally naked ; his right leg rests on a rock or the prow of a ship; he carries a trident in his hand, and is gazing in front of him, apparently out to sea; sometimes he is standing on the water, swinging his trident, or riding in his chariot over the waves, accompanied by his wife Amphitrite, the Nereids and other inhabitants of the sea. It is in keeping with his restless character that he is rarely found sitting. He sometimes wears a long robe, sometimes a light scarf. Scopas, in a famous group, represented him surrounded by the denizens of the sea, escort- ing Achilles to the islands of the blest. In modern Greece St Nicholas has taken the place of Poseidon as patron of sailors. But the Zacynthians have a special seagod, half man, half fish, who dwells under the sea, rides on dolphins or in a car drawn by dolphins, and wields a trident. By the Romans Poseidon was identified with -Neptune (q-v.).

See E. Gerhard, fiber Ur sprung, Wesen und Geltung des Poseidon (1851), with references to authorities in conveniently arranged notes; Preller-Robert, Griechische Mythologie (1894); O- Gruppe, Griechische Mythologie (1906), vol. ii. ; and especially L. R. Farnell, Cults of the Greek States (1907), vol. iv., where special attention is drawn to the ethnological aspect of the cult of Poseidon.

POSEN, an eastern province of the kingdom of Prussia, in the German Empire, bounded N. by the Prussian province of West Prussia, E. by Russian Poland and S. and W. respectively by the Prussian provinces of Silesia and Brandenburg. Its area is 11,186 sq. m. and the population shows a density of 177-5 inhabitants to the square mile. Posen belongs to the north German plain, and consists of a low plateau intersected by the beds of the Netze, the Warthe and the Obra. These three rivers drain into the Oder, but part of the province falls within the basin of the Vistula, which forms the frontier for a short distance on the north-east. By means of the Bromberger canal the Netze is joined with the Brake and then through this river with the Vistula. The surface is dotted with small lakes and ponds, and there are many broad fens and marshes. The soil is light and sandy, but

much of the land reclaimed in the boggy districts is very fertile. Upwards of 61% of the area is under tillage, 13% is occupied by pasture and meadows and 20% by forests, mostly fir. The principal crops are rye, the chief cereal grown, wheat, oats, barley, potatoes, beets and hops. The vine is cultivated to some extent in the south-west corner, and tobacco is also grown. The marshy tracts often afford excellent pasture and support large numbers of cattle, sheep and goats. The mineral resources of the province are practically restricted to lignite and salt. Besides brewing and distilling, the chief pro- ducts are machinery, sugar, cloth, tobacco and bricks. Trade in timber and agricultural produce is facilitated by the network of railways, navigable rivers and canals, but both industry and trade are somewhat cramped by the duties imposed at the Russian frontier. The population of the province in 1905 was 1,986,637, including 1,347,958 Roman Catholics, 605,312 Protestants and 30,433 Jews. The Roman Catholics are mainly Poles, of whom there are upwards of 1,000,000 in Posen, while the great bulk of the 900,000 Germans are Protestants. About 57% of the population was returned in 1905 as “rural,” in spite of the large number of so-called ” towns,” only five of which, however, have more than 20,000 inhabitants — Posen, Bromberg, Hohensalza, Gnesen and Schneidemiihl. The pro- vince of Posen was long the worst-educated part of the German dominions, but of recent years this blemish has been removed. Thus while in 1882-1883 the ratio of illiterate recruits amounted to 9-75%* in 1501 less than oae quarter per cent oi

the military drafts were without schooling. The province returns 15 members to the Reichstag, 29 to the Prussian Lower House of the Prussian Diet, and is represented in the Upper House by 19 members. It is divided into two districts, those of Bromberg and Posen.

History. — The history of Posen, comprehending some part of the old kingdom of Poland, including its most ancient capital, Gnesen, falls within the scope of the article Poland. Its political connexion with Prussia began in 1772, when the districts to the north of the Netze fell to the share of that power in the first partition of Poland. The rest, followed in 1793, and was united with the Netze district to form the province of South Prussia. In 1807, after the peace of Tilsit, Posen was incorporated with the grand duchy of Warsaw, but in 181 5 it reverted to Prussia under the style of the grand duchy of Posen. In 1848 the Polish inhabitants of the province revolted and had to be put down by

force, and, in spite of the efforts of the Prussian government, they remain in language and culture separated from their German compatriots.

The tide of German immigration into Posen began at an early period and flowed strongly in the 13th and following centuries. The industrious German settlers were welcomed by the Polish nobles and were the founders of most of the towns, in which they lived after their own customs and were governed by their own laws. They established manufactures, introduced the cultivation of hops, reclaimed the waste soil, and did much to improve agriculture. In the 1 6th century Protestantism was widely diffused by their means. A strong reaction set in in the following century, and per- secution of the Protestants went hand in hand with the ravages of war in hastening the political, intellectual and agricultural decline of the district. By the 18th century the burghers had sunk to the level of " stiidtische Bauern," or peasants with municipal privileges", and poverty and misery were widely spread.

In the latter part of the 19th century, however, this state of things began to be greatly modified owing to the strong Polish national move- ment which threatened to drive back the boundaries of Germanism in the eastern provinces of Prussia, as they had already been driven back in Bohemia. Hitherto the most important class in Posen had been the Polish nobles, of whom many were very poor; but the economic development of the country and the break-up of the large estates into peasant holdings, which created a comparatively wealthy Polish middle class, threatened German ascendancy more seriously than had the traditional nationalism of the nobles. To combat this the Prussian government entered on a policy of the compulsory Germanization of the Polish population. In 1872 an administrative ordinance made German the medium of instruction in the schools " wherever possible," and the police commissaries who attended public meetings were instructed to close any meeting at which speeches were delivered in Polish. In April 1888 the Prussian par- liament passed a law establishing a commission for the purpose of buying the land of the Poles in Posen and West Prussia, and letting it out to German colonists. The sum of 100,000,000 marks (£5,000,000) was voted for this work, to which in 1898 a like sum was added. In fifteen years an area of nearly 600 sq. m. of land was bought from the Poles, over one-half in Posen, and on this over 4000 families were settled. In spite of this policy, however, the Polish element continued to gain, this being partly due to immigration over the eastern border, partly to the repressive policy of the Prussian government, which converted what had been an aristocratic opposi- tion into one that is

popular and radical. In 1902 much scandal was caused by the revelation made in the Prussian parliament of the methods used in the attempt to Germanize the Poles; and Count Biilovv had to confess that “corporal punishment was out of place in religious instruction”; Polish children having been beaten for refusing to say the Lord’s Prayer in German (see Ann. Reg., 1901, p. 278). In his speech of the 13th of January 1903, in which he made the above admission, Count Billow also had to admit the failure of the Prussian policy. Fresh legislation was passed in May, devoting another 250,000,000 marks (£12,500,000) to the policy of German colonization, and forbidding the German colonists to sell their land to Poles. ‘ The laws forbidding the use of the Polish language in the schools were retained, in spite of an agitation in Germany itself for their repeal. Yet, three years later, Baron von Rheinbaben, the Prussian minister of finance, complained that in fifteen years the German population of East Prussia had diminished by 630,000, while Polish immigrants had in five years numbered 300,000; at the same time he confessed that the Poles were vastly increasing their economic resources at the expense of the German element. As a result of this report a further sum of £100,000 was voted for ” provincial colonization ” and to prevent German emigration.

In 1906 the Prussian government was made somewhat ridiculous by the strike of some 100,000 Polish school children, who objected to being whipped for refusing to answer questions in German. The petition of the archbishop of Posen that the children should be allowed to receive religious instruction in Polish having been re- jected by the Prussian minister of education, he issued on the 17th of October a pastoral allowing parents to confine religious instruction

1 Annual Register (1902), p. 280 seq.

to home or priestly teaching. As a result parents were fined or imprisoned for withdrawing their children from religious instruction. The repressive efforts of the government, however, culminated in the bill, introduced in the session of 1907 by Prince Billow, pro- viding for the compulsory expropriation of Polish landowners in favour of Germans. This bill, which applied to ” the districts in which the safety of the endangered German element could only be ensured by additional allotments to German settlers ” — i.e. Posen and West Prussia — was passed, in spite of the strenuous opposition of some of the most conspicuous nobles in Prussia, in the session of 1908. At the same time under the Public Meetings Bill, introduced in 1907 and now passed, no language save German was to be used at any public meetings other than international congresses, &c. — save during

actual parliamentary elections (Ann. Reg., 1908, p. 290). How opposed to the general sentiment of Germany the Prussian policy in Posen was, was shown in February 1909, when it was condemned, though without effect, by a resolution of the German imperial parliament. In January 1910 the Prussian policy was again arraigned in the German parliament in connexion with the ” Kattowitz incident,” Herr von Delbrtlck justifying the removal of a number of minor officials, for voting for Polish candidates at a municipal election, on the ground that the officials of the empire deserted the ground on which the constitution of the empire rested if they failed to support Prussia in her struggle (The Times, January 13, 1910, 5 d.). Herr von Bethmann Hollweg expressed himself later in the Prussian parliament to the same effect (ibid. January 20 and 22).

For the history of Posen see Wuttke, Stadtebuch des Landes Posen (Leipzig, 1864) ; C. Meyer, Geschichte des Landes Posen (Posen, 1887), and Geschichte der Provinz Posen (Gotha, 1891); Knoop, Sagen und Erzahlungen aus der Provinz Posen (Posen, 1894); E. von Bergmann, Zur Geschichte der Entwickelung deutscher, polnischer und jiidischer Bevblkerung in der Provinz Posen seit 1824 (Tubingen, 1883) ; E. Schmidt, Geschichte des Deutschtums im Lande Posen unter polnischer Herrschaft (Bromberg, 1904) ; Stumpfe, Polenfrage und Ansiedelungskommission. Darstellung der staatlichen Kolonisatinn in Posen (Berlin, 1902); Wegener, Der wirtschaftliche Kampf der Deutschen mit den Polen um die Provinz Posen (Posen, 1903); the Handbuch fur die Provinz Posen, Nachweisung der Behorden, An- stalien, Institute und Vereine (Posen, 1905) ; and the publications of the THstorische Gesellschaft fur die Provinz Posen (Posen, 1882 seq.). See further the official work Zwanzig Jahre deutscher Kulturarbeit 1886-1906 (Berlin, 1907). A good account of the Prussian policy in Posen, from an outside point of view, will be found in the Annual Register, passim.

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POSEN (Polish Poznan), a city, archiepiscopal see and fortress of Germany, capital of the province of Posen, situated in a wide and sandy plain at the confluence of the Cybina and the Warthe, 150 m. E. from Berlin and 103 m. from Breslau. Pop. (1885), 68,315; (1895), 73,239; (1905), 136,808, of whom nearly one-half are Germans and about one-tenth Jews. Posen lies at the centre of a network of railways connecting it with Berlin, Breslau, Thorn, Kreuzburg, and Schneidemuhl. The inner line of fortifi- cations was removed in 1902 and the city has been completely modernized. The principal part of Posen, on the left bank of the Warthe, comprises the old town

(Alstadt) and the modern quarter created by the Prussians after 1793. On the right bank lie Wallischet (a district inhabited by Poles) and some other suburbs. Posen has fifteen Roman Catholic and. three Evangelical churches and several synagogues. The cathedral contains many interesting objects of art, but, with the exception of the Gothic Marienkirche of the 15th century, none of the churches is notable. The old town-hall is a quaint Slavonic adaptation of Romanesque forms. The royal castle, begun in 1905 and completed in 1910 at a cost of £250,000, is a pretentious build- ing in what is officially called Romanesque style. It was intended as an effort to conciliate the Poles, and was opened by the emperor William II., with imposing ceremonies, on the 20th of August 1910. Posen possesses an " Emperor William " library with 200,000 volumes, and the Raczynski library with 50,000. Other principal buildings are the two theatres, the Emperor Frederick museum, founded in 1894, the Polish museum and the various public offices. Industries include the manu- facture of agricultural machinery, spirits, furniture and sugar, also milling and brewing. There is an active trade, both by rail and river, in corn, cattle, wood, wool and potatoes. Posen is the headquarters of the V. army corps, and has a garrison of 6000 men.

Posen, one of the oldest towns in Poland and the residence of some of the early Polish princes, including Boleslaus I.,

became the seat of a Christian bishopric about the middle of the ioth century. The original settlement was on the right bank of the Warthe, but the new town, established on the opposite bank by German settlers about 1250, soon became the more important part of the double city. Posen became a great depot for the trade between Germany and western Europe on the one hand and Poland and Russia on the other. Many foreign merchants made the city their residence, and these included a colony of Scots, who exported produce to Edinburgh. The city attained the climax of its prosperity in the 16th century, when its population, according to one estimate, reached 80,000. The intolerance shown to the Protestants, the troubles of the Thirty Years' War, the plague and other causes, soon conspired to change this state of affairs, and in the 18th century the population sank to 12,000. New life was infused into the city after its annexation by Prussia at the second partition of Poland in 1 793, and since this date its growth has been rapid.

See Lukaszewicz, Historisch-statistisches Bild der Stadt Posen Q68-17Q3 (Ger. trans., Posen, 1881); Ohlenschlager, Kurzgefasste Geschichte und Beschreibung der Stadt Posen (Posen, 1886); Warschauer, Stadtbuch von Posen (Posen, 1892); and Fuhrer durch Posen (Posen, 1895).

POSIDIPPUS (3rd cent. B.C.), Greek dramatist, of Cassandrea in Macedonia, the last and one of the most distinguished of the writers of the new comedy. He began to write for the stage in 289 B.C., and, according to Suiidas, wrote 40 plays, of which 17 titles and some fragments have been preserved. He appears to have gone somewhat out of the beaten track in his choice of subjects, and it is evident that cooks held an important position in his list of characters. His comedies were frequently imitated by the Romans (Aulus Gellius ii. 23), and it is considered very probable that the Menaechmi (a comedy of errors) of Plautus is an adaptation either from the "Ofioiot, or from some unknown comedy of Posidippus, called AiSvuoi, or perhaps M&'cuxjuot. His statue in the Vatican is considered a masterpiece of ancient art.

Fragments in A. Meineke, Poetarum fragmenla (1855).

Posidippus is also the name of a writer of epigrams (c. 270 B.C.), of which about 30 are preserved in the Greek Anthology.

See \V. Christ, Griechische Litter ■atur -geschichte (1898).

POSIDONIUS (c. 130-50 B.C.), nicknamed " the Athlete," Stoic philosopher, the most learned man of his time' (so Strabo tu>v Kad' rifxas4>i.\owv!ToKvixa9ko-TaTos, Galen knarrnuaiuciiTaTos) and perhaps of all the school. A native of Apamea in Syria and a pupil of Panaetius, he spent after his teacher's death many years in travel and scientific researches in Spain (particularly at Gades), Africa, Italy, Gaul, Liguria, Sicily and on the eastern shores of the Adriatic. When he settled as a teacher at Rhodes (hence his surname " the Rhodian ") his fame attracted numer- ous scholars; next to Panaetius he did most, by writings and personal intercourse, to spread Stoicism in the Roman world, and he became well known to many leading men, such as Marius, Rutilius Rufus, Pompey and Cicero. The last-named studied under him (78-77 b.c), and speaks as his admirer and friend. He visited Rome, e.g. on an embassy in 86 B.C., but probably did not settle there as a teacher.

His works, now lost, were written in an attractive style and proved a mine of information to later writers. The titles and subjects of more

than twenty of them are known. In common with other Stoics of the middle period, he displayed eclectic tendencies, follow- ing the older Stoics, Panaetius, Plato and Aristotle. His admiration for Plato led him to write a commentary on the Timaeus; in another way it is shown by important modifications which he made in psychological doctrine. Unquestionably more of a polymath than a philosopher, he appears uncritical and superficial. But at the time his spirit of inquiry' provoked Strabo's criticism as something alien to the school (to alTioXoyiKov ko.1 rd dptorrorcXifoy, oirep tKKhivovatv oi riiicTtpot.) . In natural science, geography, natural history, mathematics and astronomy he took a genuine interest. He sought to determine the distance and magnitude of the sun, to calculate the diameter of the earth and the influence of the moon on the tides. His history of the period from 146 to 88 B.C., in fifty-two books, must have been a valuable storehouse of facts. Cicero, who submitted to his criti- cism the memoirs which he had written in Greek of his consulship,

comicorum graecorum

made use of writings of Posidonius in De natura deorum, bk. ii., and De divinatione, bk. i., and the author of the pseudo-Aristotelian treatise De mundo also borrowed from him.

See Zeller, Philosophie der Griechen, iii. 1, 570-584 (in Eng. trans., Eclecticism, 56-70) ; C. Miiller, Fragmenta historicorum graecorum, iii. 245-296; J. Bake, Posidonii Rhodii reliquiae (Leiden, 1810), a valuable monograph; R. Scheppig, De Posidonio rerum gentium terrarum scriptore (Berlin, 1869); R. Hirzel, Untersuchungen zu Ciceros philosophischen Sckriften, i. 191 seq., ii. 257 seq., 325 seq., 477 _ 535. 756-789, iii- 342-378 (Leipzig, 1877); Thiaucourt, Essai sur les traites philosophiques de Ciceron (Paris, 1885) ; Schmekel, Die Philosophie der mittlern Stoa (1892); Arnold, Untersuchungen uber Theophanes von Mytilene und Posidonius von Apamea (1882). (See also Stoics,)

POSITIVE (or Portable) ORGAN, a medieval chamber organ which could be carried from place to place without being taken to pieces, and when played was placed on a table or stool and required a blower for the bellows, as well as a performer. It was larger and more cumbersome than the portative {a. v.), with which it has often been confounded. The positive had usually but one kind of pipe, the open diapason of 2 ft. tone, and in the 1 6th century the best typas had three registers by means of which each note could be sounded with its fifth and octave, or each by itself, or again in combinations of twos. The positive differed from the regal in having flue pipes, whereas the

latter had beating reeds in tiny pipes, one or two inches long, concealed behind the keyboard. During the early middle ages most of the pneumatic organs belonged to this type.

A well-known instance of an early positive or portable organ of the 4th century occurs on the obelisk erected to the memory of Theodosius the Great, on his death in a.d. 395. Among the illuminated manuscripts of the British Museum miniatures abound representing interesting varieties of the portable organ of the middle ages ; such as Add. MS. 29902 (fol. 6) and Add. MS. 27695b (lol. 13), Cotton MS. Tiberius A VII. fol. I04d., all of the 14th century, Add. MS. 28962, Add. MS. 17280, both of the 15th century. These little organs were to be found at every kind of function, civil and religious; they were used in the dwellings and chapels of the rich ; at banquets and court functions; in choirs and music schools; and in the small orchestras of Peri and Monteverdi at the dawn of the musical drama or opera. (K. S.)

POSITIVISM (derived from ponere, whence positus, that which is laid down, certain), a. philosophical term, applied some- what loosely to any system which confines itself to the data of experience and declines to recognize a priori or metaphysical speculations. In this sense the term may be applied to empirical philosophers in general. Thus Hume is a positivist in the sense that he specifically restricts philosophy to the sphere of observa- tion, and regards the causal relation as being nothing more than what we have been accustomed to expect. Similarly Mill, Spencer and physical scientists generally view the universe from the positivist standpoint. In its commonest acceptation, however, positivism is both narrower and wider than this. The term is specifically used of the philosophy of Auguste Comte, who applied the term to his system according to which knowledge is based exclusively on the methods and discoveries of the physical or ” positive ” sciences. According to Comte human thought passes through three stages — theological, metaphysical and positive. The final stage, positivism, is the understanding of the universe not as composed of a multitude of individuals each with volition, but as an ordered organism governed by necessary laws (see further Comte). The outcome of this positivism is the substitution for revealed religion of a religion of humanity — according to Huxley ” Catholicism minus Christianity ” — in which God is replaced by Humanity. This religion was to have its special priesthood, ritual and organiza- tion.

Positivism has, therefore, two distinct sides, the philosophical and the religious or mystical. Philosophical positivism has had dis- tinguished representatives in France, Germany and England, and in the wider

sense indicated above may be regarded as one of the two or three chief influences on modern philosophical development. Though the details of Comte's philosophic structure, e.g. the classi- fication of the sciences, are without important significance, the posi- tivistic tendency is prominent in all systems of thought which deny the supernatural and the metaphysical. Agnosticism, Phenomenal- ism, Rationalism, Materialism all manifest the positivist spirit, denying what may be succinctly described as the metempirical.

In France the Comtian tradition was maintained with important reservations and the abandonment of the religious aspect by Littre (g.v.), Taine and others. In Germany many of the followers of Kant have in greater or less degree maintained the view that all true knowledge depends upon the observation of objective phenomena. The distinctly religious aspect has been comparatively unimportant, except in so far as modern social evolutionist ethics may be regarded as religious in character. In England, however, a number of pro- minent Positivists have carried out Comte's original ideal of a Church of Humanity with ritual and organization. The chief building (in Chapel Street, Lamb's Conduit Street, London) is adorned with busts of the saints of humanity, and regular services are held. Positivist hymns are sung and addresses delivered. Among the leaders of this movement have been Frederic Harrison, Richard Congreve, E. S. Beesly and J. H. Bridges (d. 1906). Services are also held weekly in Essex Hall, London, and there are a few other centres in the provinces, including a prosperous church in Liverpool.

POSSE COMITATUS (Lat. " power of a county "), a summons to every male in the county, between the ages of fifteen and twenty, to be ready and apparelled, at the command of the sheriff and the cry of the county, to maintain peace and pursue felons. Ecclesiastical persons, peers and such as laboured under any infirmity were not compellable to attend. Owing to the establishment of county police, the sheriff does not now pursue felons, but by the Sheriffs Act (1887, sec. 8, sub- sec. 2) the calling out of the posse comitatus is expressly authorized if the sheriff finds any resistance in the execution of a writ. In view of the sheriff's duty to raise, if necessary, the posse comitatus it is no answer by him, for non-execution of a writ, to say that he was resisted.

See P. E. Mather, Sheriff Law.

POSSESSION (Lat. possessio, possidere, to possess), in law, a term derived from Roman law. The Roman conception of possession has been generally adopted, but not the Roman deduc- tions from the conception. The subject of possession has become more difficult owing to the various senses in which the term has been interpreted. Thus it has been said to be either a right or a fact conferring a right, or both together. The latter is the view of Savigny, the leading authority upon the subject (Recht des Besitzes, translated by Sir Erskine Perry, 1848). Further, there is a want of agreement among legal writers as to the amount of right or rights that it confers. All that can be said with safety is that possession stands in a position intermediate between simple detention and absolute ownership, and that it implies two elements, physical detention and mental intention to hold the thing possessed as one's own. These difficulties being borne in mind, the definition of W. A. Hunter may be accepted: " Possession is the occupation of anything with the intention of exercising the rights of ownership in respect of it " (Roman Law, p. 209). Possession is inchoate or incomplete ownership; it is on its way to become ownership. In the case of the public domain of Rome (ager publicus) the possession was really the important matter, the dominium being practically of no value. Possession in Roman law was either natural or civil. The former was mere occupation, the latter such occupation as ripened by prescription into ownership. Possession exclusive against the world (including the true owner) was called " adverse possession." A servitude, such as a right of way, could not be held in true possession, but was said to be in " quasi-possession." The quasi-possessor, however, had possessory remedies. In Roman law a broad distinction was drawn between possession and ownership (dominium). 1 They were protected by different remedies — possession by interdict, ownership by action. This difference can only be explained by history. Here again, unfortunately, authorities differ. According to Savigny, a Roman citizen who had become a tenant of part of the ager publicus could not by any length of holding obtain more than a quasi-ownership, but one of which it would have been morally unjust to have deprived him. " The only legal remedies of which the tenants could avail themselves, if ejected or threatened with disturbance, were the possessor)' interdicts, summary processes of Roman law which were either expressly devised by

1 The distinction is very important, as it affects the contract of sale. The contract was not to transfer ownership, as in English law, but only vacua possessio.

the praetor for their protection, or else, according to another theory, had in older times been employed for the provisional maintenance of

possessions pending the settlement of questions of legal right ” (Maine, Ancient Law, ch. viii.). Savigny regards the protection of possession as an extension of the protection of the person. The same view was taken by the English court of exchequer in Rogers v. Spence, 13 M. & W. R. p. 581. According to Hunter (Roman Law, pp. 206, 221), Savigny overlooked the needs of aliens. It was the needs of aliens, incapable of the full proprietary rights of Roman citizens, that led to the invention by the praetor of a means of giving them equitable rights in the land, and protecting them in the enjoyment of these rights. Savigny attributes only two rights to possession in Roman law — acquisition of ownership by possession for a given time (usucapio, longi temporis possessio) and protection of possession from disturbance (interdicium) . Others have included further rights — inter alia, the right to use force in defence of possession, and the right to have the burden of proof, in a contest as to the title, thrown upon the adversary: ” In pari causa possessor potior haberi debet.” The position of the possessor in Roman law was very strong. If a bona fide possessor, he could bring an action for furtum even against the owner, if a mala fide possessor of land, he was so far protected that he could not be ejected by force, A mala fide possessor of movables could, however, acquire no rights. 2

It has been already stated that there is both a physical and a mental element in the conception of possession. This does not necessarily mean that corporal contact is in all cases requisite, or that the intention to hold the thing possessed as one’s own may not be abandoned for a time. The control may be potential as well as actual. An estate may be possessed without the possessor going upon the land at all, and the possession of goods may be given by delivering the key of the warehouse in which they are stored. In international law the possession of part as giving a title to the whole has been of great importance (see International Law). Where goods are pledged or bailed for a specific purpose the intention of the pledgor or bailor to hold them as his own is suspended during the existence of the limited right of the pledgee or bailee, to whom a fragment of the possession has passed. In Roman law the pledgor had possessio ad usucapionem, the pledgee possessio ad interdicta. The possession of the pledgee or bailee has been called ” derivative possession.” Possession may be exercised through another (” animo nostra, corpore alieno “), as through a servant, who has not true possession. 3 Possession so exercised has been called ” representative possession.” As soon as the representative determines to assume control on his own behalf or to submit to the control of another, the possession of the principal is gone. Possession may be transferred or lost.’ It is lost when either the

corpus or the animus (to use the terms of Roman law) ceases to exist. It may be lost by the representa- tives in cases where the principal might have lost it.

In both Roman and English law the possessory tended to supersede the proprietary remedies from their greater con- venience — that is to say, the plaintiff based his claim or the defendant his right upon possession rather than property. The English possessory action may have been directly suggested by the interdict. Bracton (103b) identifies the assise of novel disseisin, the most common form of possessory action, with the interdict unde vi. In England ejectment had practically superseded other real actions before the latter were (with the exception of dower, writ of dower and, quare impedit) expressly abolished by the Real Property Limitation Act 1833, s. 36. The action for the recovery of land, introduced by the Judicature Acts, is the modern representative of the action of ejectment.

2 This does not agree with English law, where in certain cases a thief can give a good title to stolen goods, though he has no title himself.

3 Much of the law of master and servant is based upon the Roman law of master and slave. The servant, like the slave, has not posses- sion of his master's goods even though they are in his custody, unless, indeed, the circumstances are such that he ceases to be a servant and becomes a bailee.

The right of a party to recover possession is enforced by a writ of possession.

Possession gives in English law, speaking generally, much the same rights as in Roman law. Thus it serves to found a title (see Limitation, Statutes of; Prescription), and to throw the onus of proof upon the claimant. In an action for the recovery of land the defendant need only allege that he is in possession by himself or by his tenant, and (where such an allegation is necessary) that he had no notice to quit. The chief differences between Roman and English law, arising to some extent from the differences in the history of the two systems, are that the former did not give to derivative possessors (except in the case of pledge) the remedies of possessors, as does English law, and that Roman law is stricter than English in requiring that possession to found usucapio should (except in the case of jus aquae ducendae) be

exjusto titulo, or under colour of right (see Prescription). There is one case of constructive possession which is peculiar to English law — that is, where possession is said to be given by a deed operating under the Statute of Uses (see " Orme's Case," L. R. 8, C. P. p. 281).

In English law the doctrine of possession becomes practically important in the following cases. . (1) Possession serves as a convenient means of division of estates (see Real Property). One of the divisions of estates is into estates in possession and estates in reversion or remainder. It also serves as a division of personal property (q.v.). A close in action is said to be reduced into pos- session when the right of recovery by legdl proceedings has become a right of enjoyment. (2) Possession gives a title against a wrong- doer. In the case of real property it is regarded as prima facie evidence of seisin. 1 In the case of personal property the mere possession of a finder is sufficient to enable him to maintain an action of trover against one who deprives him of the chattel 2 (see the leading case of Armoryˆ v. Delamirie, 1 Str. 504). (3) What is called " unity of possession " is one of the means whereby an easement is extinguished. Thus the owner of close A may nave had a right of way over close B, while the latter belonged to a different owner. If the two closes come to be owned by the same person, the right of way is extinguished, but may under certain circumstances revive on the separation of the ownership. (4) Possession is very important as an element in determining the title to goods under 13 Eliz. c. 5, the Bills of Sale Act 1878 and the Bankruptcy Acts 1883 to 1890. It may be said that as a general rule retention of possession by the transferor or an absolute assignment or a colourable delivery of possession to the transferee is strong prima facie evidence of fraud. (5) Possession of goods or documents of title to goods is generally sufficient to enable agents and others to give a good title under the Factors' Acts (see Factor). (6) In criminal law the question of possession is important in founding the distinction between larceny and embezzle- ment. If the goods are in the possession of the master and he gives them to the custody of his servant for a specific purpose and the servant steals them, it is larceny ; if they have never come into the master's possession, as if a clerk receives money on his master's behalf, it is embezzlement. Recent possession of stolen goods is always regarded as a presumption that the person in whose pos- session they are stole them or received them knowing them to have been stolen. In the case of a charge of receiving stolen goods evidence may be given that there was found in the possession of the accused other property stolen within the preceding period of twelve months, 34 & 35 Vict. c. 112, s. 19. (For possession in criminal law, see Stephen, Digest of the Criminal Law, note xi.) (7)

Actions of possession of ships fall within the jurisdiction of the admiralty division. This jurisdiction in the case of British vessels depends upon the Admiralty Court Act 1861 (24 Vict. c. 10, s. 8), in the case of foreign vessels (in which the jurisdiction is rarely exercised) upon the general powers of the court as a maritime court.

The doctrines of- adverse possession (in the old English sense, which was not identical with the Roman law, for the real owner must have actually or by fiction been disseised) and of possessio fratris are now of only antiquarian interest. The Statutes of Limitation have superseded the first. The only question now is, not whether possession has been adverse or not, but whether twelve years have elapsed since the right accrued. The maxim ” possessio fratris de feodo simplici sororem facit esse haeredem ” (Coke upon Littleton,

1 ” Seisin ” and ” possession ” are used sometimes as synonyms, as generally by Bracton ; at other times they are distinguished : thus there can be possession of a term of years, but no seisin (Njy, Maxims, p. 2). It seems doubtful, however, how far in English law a tenant for years has true possession, for he is in law only a bailiff or servant of the landlord. But he certainly has possessory remedies, like the quasi-possessor in Roman law.

2 Compare the Code Napolion, art. 2279: ” En fait de meubles la possession vaut titre.”

14b) has been altered by the rule of descent introduced by the Inheritance Act 1833, under which descent is traced from the purchaser. At one time possessory suits were occasionally main- tained in England, and more frequently in Ireland, for the quieting of possession after proof of three years’ possession before the filing of the bill. But such suits are now obsolete (see Neill v. Duke of Devonshire, 8 A. C. 146). There was one characteristic case in old English law in which possession was maintained by means of what was called ” continual claim,” made yearly in due form, where the person having the right was prevented by force or fear from exercising it (Coke upon Littleton, 253b). Continual claim was abolished by the Real Property Limitation Act 1833, s. 11.

Scotland. — In Scotland possessory actions still exist eo nomine. Actions of molestation, of removing, and of maills (payments) and duties are examples. A possessory judgment is one which entitles a person who has been in possession under a written title for seven years to continue his possession (Watson, Law Diet., s.v. ” Possessory Judgment “).

United States. — Here the law in general agrees with that of England. Possessory rights are taxed in some of the states. Louisiana follows Roman law closely. Possession of incorporeal rights (to use the unscientific language of the Code) is called quasi- possession, and the division of possession into natural and civil is maintained (Civil Code, ss. 3389-3419).

In addition to the authorities cited may be mentioned Smith, Diet, of Antiquities, s.v. ” Possessio “; Markby, Elements of Law; Holland, Elements of Jurisprudence; Holmes, The Common Law (lect. vi.) ; Pollock and Wright, Possession in the Common Law.

(J- W.)

POSSESSION, the term given to the supposed control of a human body and mind by an alien spirit, human or non-human; or the occupation by an alien spirit of some portion of a human body, causing sickness, pain, &c. The term obsession (Lat. for siege) is sometimes used as equivalent to possession; some- times it denotes spirit control exercised from without, or it may mean no more than a maniacal monoideism. From an anthro- pological point of view possession may be conveniently classed as (a) inspirational, (b) demoniacal, (c) pathological, according to the view taken of the reason for or effect of the spiritual invasion of the possessed person.

a. In inspirational possession the oracle spirit is held to have entered the person in order to foretell the future or to proclaim the will of a god ; the god himself may be regarded as speaking through the mouth of his devotee; among peoples in the lower stages of culture possession by spirits of the dead is inspirational, especially where there is any kind of ancestor worship in vogue. This kind of possession, so far as is known, does not appear among some of the lowest peoples, e.g. the Australians; but it is common in Africa, Polynesia and Asia, where European influence has not led to its decay. Many of the classical oracles were regarded as due to divine inspiration. The manifestations are often voluntarily induced and are provoked in many different ways; in classical times the eating of laurel leaves, the inhaling of fumes which ascended from a cleft in the rocks of Delphi, the drinking of intoxicating liquors, or of a more widely found means of inducing the phenomena — blood — were all in use. In the Malay Peninsula the medicine- man inhales incense which rises in clouds from a censer and hangs like a mist round his head ; similar hypnotic effects are produced in Egypt in the case of divining boys by means of drugs. In Fiji the priest sat before a dish of scented oil and anointed himself with it, till in a few minutes he began

to tremble and was finally strongly convulsed. In parts of India, draughts of blood from the neck of the newly decapitated victim were the means of rousing the priest to frenzy ; while in Siberia, America and many parts of Africa drumming, contortions and orgiastic dancing are more commonly found. According to another account, the Fijian priest provoked the onset of the trance by a method in use in ordinary hypnotic practice ; he sat amid dead silence before a whale's tooth, at which he gazed steadfastly.

The symptons of supposed possession by a god differ as widely as do those of the hypnotic trance. In Hawaii the god Oro gave his oracles by inspiring the priest, who ceased to speak or act as a voluntary agent, his frenzied utterances being interpreted by the attendant priests. In the Malay Peninsula the pawang, after censing himself, lies down on his back, with his head shrouded, and awaits the moment of inspiration. The tiger spirit which is the familiar of all Malay pawangs manifests its presence by a low lifelike growl and the pawang scratches at the mat, gives a series of catlike leaps and licks up from the floor the handfuls of rice scattered there. But his state seems to be far removed from the ecstasy of the Hawaiian priest, though it must be remembered that no test of bona fides is possible in either case. We meet with another stage in Tahiti in the lofty declamation of the possessed priests, who thus afford a parallel to the utterances of many modern mediums. Finally in Africa, where the frenzied form of possession is also common, we find at Sofala the manifestations of possession

were confined to the simple dramatic imitation of the voice of the dead king, whose soul was believed to give counsel in this manner to his successor.

b. Demoniacal possession is a widely spread explanation of such psychopathological conditions as epilepsy, somnambulism, hysteria, &c. ; especially in the East Indian field lycanthropy (q.v.) and magical power (for evil) are commonly attributed to possession. Much of the evidence is that of native witnesses, and where European observers have succeeded in examining a case for themselves they have generally been guiltless of all knowledge of psychopathology and of the possibilities of suggestion; their statements are therefore to be accepted only with reserve. Demoniacal possession is familiar to us from the New Testament narratives; there seems to be no reason to

suppose that the cases there recorded were due to anything but disease; but the view is still occasionally maintained by Christian apologists that real demon possession existed in Judaea. Demoniacs in the New Testament are stated to live among the tombs, to be deaf and dumb, or blind, to be possessed by a multitude of evil spirits or to suffer from high fever as a result of possession ; the demons are said to pass into the bodies of animals or to reside in waterless places. No facts are recorded which are not explicable either as the ordinary symptoms of mental disease or as the result of suggestion (q.v.).

c. In the lower stages of culture all diseases are explained as due to the invasion of the body by disease spirits (see Animism), but the effects are supposed to be physiological, not psychical as in demoniacal possession. The infringement of a totemic tabu, the wrath of an ancestor or other dead person or the malice of a disease spirit, such as the Malay hantus, or of any non-human spirit, may set up pathological conditions, according to animistic philosophy. Such cases, as well as those of demoniacal possession, which may be distinguished from the inspirational form by their invariably involuntary character, are dealt with by a variety of means such as spells, purifications, sacrifices to the possessing spirit, or coercion of various sorts (see Exorcism).

We have few data as to the distribution of the phenomena here classified. Cases of inspirational or demoniacal possession were known in classical times; but the demon of Socrates must rather be classed as a case of sensory automatism. In our own day they are reported from the greater part of Asia, Africa and Polynesia, and they seem to occur in America, though our information is scanty. On the other hand in New Guinea and Australia they are practically unknown, though automatisms are put down to the agency of the dead.

From the psychological point of view the classification is again threefold: (a) as noted abovs, the majority of cases of so-called possession are simply psychopathological; (b) another class, the existence of which has only been recognized within recent times are the cases of secondary or multiple personality; the apparent independence and occasional conflict of primary and secondary selves has been explained by the theory of possession; but it has been possible in one of the most severe cases on record to unify the two personalities and memories after what the patient described as a struggle between them for supremacy, which would inevitably have suggested possession as the explanation, had not the issue of the case been the amalga- mation of the two streams of consciousness, (c) The problem of the third class of cases, which may be termed mediumistic,

is still unsolved. The medium (q.v.) or sensitive appears to have at command in the trance state a store of memories connected with the lives of deceased friends of a sitter (i.e. a person present at the seance), such memories being dealt with from the stand- point of the deceased person (who is termed the communicator) ; sometimes the memories are connected with the friends of a person not actually present or with articles placed in the hands of the medium, the owners being absent or dead. Mediumistic cases have undergone elaborate inveitigation at the hands of the Society for Psychical Research, and no serious attempt has been made to invalidate the facts set forward by the investi- gators; but so far no satisfactory explanation has been suggested. On the one hand thought transference or telepathy (q.v.) appears to be insufficient, unless we assume that the powers of a medium far transcend anything demonstrable in ordinary telepathic experiments; for the facts stated by or through the medium about the communicator seem in many cases to be known in their entirety to no single living person. If thought transference is the explanation, we must admit that the medium can (i) ransack all living brains for facts, (2) select those which are

pertinent (i.e. known to the communicator) and (3) combine them in such a way as to suggest that the source of the informa- tion is the dead person. On the other hand, although, as ws have seen, the communications show knowledge homologous to that of the deceased, they demonstrably do not include the whole of his knowledge; more than one attempt has been made to obtain from communicators the contents of sealed letters, written during their lifetime and kept from the knowledge of all other human beings till the seal was broken; but such attempts have so far failed, and the failure seems to form conclusive evidence both against possession and against other explanations based on the supposition that the dead are communicating.

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viii. I-167, xiii. 284-582, xvi. 1-536, xvii. 61-244, & c – For medical and psychological observations see Griesinger, Mental Pathology; James, Principles of Psychology; Janet, Nevroses et idees fixes; Kraft-Ebbing, Psychiatrie; bidis and S. P. Goodhart, Multiple Personality. (N. W. T.)

POSSNECK, a town of Germany, in the duchy of Saxe- Meiningen, 21 m. by rail S. of Jena, on the Kotschau. Pop. (1905), 12,702. It has a Gothic Evangelical church built about 1390, and a Gothic town-hall erected during the succeeding cen- tury. Its chief industries are the making of flannel, porcelain, furniture, machines, musical instruments and chocolate. The town has also tanneries, breweries, dyeworks and brickworks. Possneck, which is of Slavonic origin, passed about 1300 to the landgrave of Thuringia. Later it belonged to Saxony and later still to the duchy of Saxe-Coburg-Saalfeld, passing to Saxe- Meiningen in 1826.

See E. Koch, Aus Possnecks Vergangenheit (POssneck, 1894-1895); the same writer, Beitrage zur urkundlichen Geschichte der Stadt Possneck (Possneck, 1896-1900); and the Geschichte der Stadt Possneck, published by the Pbssnecker Zeitung (Possneck, 1902).

POST. 1. (An adaptation in 0. Eng. of the Lat. posits, from ponere, to place), a stock, stake or stump, particularly an upright timber used as a support in building, as part of the framework of a door, as a boundary mark, &c, and formerly as a convenient object to which to attach public notices, &c, whence the verb ” to post,” to publish a notice, advertisement, &c, by affixing it in a conspicuous position, hence to make a statement with regard to an event or person, e.g. the ” posting ” of a defaulter, or of a ship as overdue or missing at Lloyd’s.

2. (An adaptation of the Fr. poste, station, position, Ital. posta or posto, formed from the past participle positus, of Lat. ponere, to place), position, station, a position occupied by a soldier or body of soldiers, especially one specifically allotted to a soldier, such as the round of a sentry, hence a place of employ- ment, an office. The sense of station has developed into the particular application of the word and its various derivatives, ” postal,” ” postage,” &c, to the service connected with the delivery of letters (see Post and Postal Service). From the earliest times as we see from the ayyapeia of the Persian kings (Herod, viii. 98), the speedy despatch of messages, letters, &c, was attained by relays of men and horses stationed at regular intervals. This is paralleled by the dispositi equites of Roman times and by the elaborate system of the Great Khan which Marco Polo describes on the roads of China. The New English Dictionary finds the

earliest use of the O. Fr. poeste and the Ital. posta for these stations of men and horses in Marco Polo's account. The Medieval Latin expression for the couriers was caballarii postarum, riders of the posts. From the stations or relays of horses the word was early applied to the riders them- selves, and later to the mail carried by means of the " posts," and thence to the whole service. At the first establishment of

regular posts in the 16th century in England, they served two purposes, the carrying of the king's letters and the exclusive supply of horses for his couriers and for other travellers, the first being called the " posts of the pacquet," the second " the thorough posts." When, in 1780, the monopoly of supplying post-horses was taken away from the " postmasters," the term was retained for the " posting " establishments for travellers throughout the country, as well as in such words as " post-boy " and " post-chaise." The expression " post-haste," generally used adverbially in the sense of " with the utmost speed," was originally a superscription, " haste, post, haste," on letters that needed the greatest despatch, and was a command addressed to the " post," the bearer of the message. The peculiar use of " postmaster " as the name of the " scholars " of Merton College, Oxford, has not been explained. It occurs in the college records first as the name of a building (Postmasters' Hall) outside the college, in which the scholars (called porcion- istae or portionistac) lived until about 1575. The suggestion that " postmaster " is a corruption of portionista is far-fetched, and there is nothing to support the theory that the scholars, as servitors to the masters, stood behind them at table and were thus called post-magistri.

POST, and POSTAL SERVICE. The germ of modern postal systems is to be looked for in the earliest organized establishment of a staff of government couriers. In the postal system of Spain and the German empire there is express record of permission to government couriers to carry letters for individuals in April 1544; and within fifteen or sixteen years that permission had grown into a legalized and regulated monopoly, whence the counts of Taxis drew part of their profits as postmasters-general. In Great Britain existing private letters of the 15th century — some, perhaps, of the 14th — bear endorsements which show that they were conveyed by relays of men and horses maintained under the control of the government, and primarily intended for its special service. In several states on the continent of Europe the universities had inland postal establishments of a rudimen-

tary sort at an early date. The university of Paris organized a postal service almost at the beginning of the 13th century, and it lasted in a measure until 17 19. In various parts of Europe mercantile gilds and brotherhoods were licensed to establish posts for commercial purposes. But everywhere — as far as the accessible evidence extends — foreign posts were under state control.

Great Britain

Early History (c. 1 533-1836).

As early as the middle of the 13th century entries occur in the wardrobe accounts of the kings of England of payments to

royal messengers for the conveyance of letters. In Century. tne supervision of these royal messengers lies the

germ of the office of postmaster-general. The first English postmaster of whom a distinct account can be given is Sir Brian Tuke, who is described (1533) in the records as ” Magis- ter Nunciorum, Cursorum, sive Postarum,” ” both in England and in other parts of the king’s dominions beyond the seas.” But long subsequent to this appointment of a postmaster- general the details of the service were frequently regulated by proclamations and by orders in council. Thus, among the royal proclamations in the library of the Society of Antiquaries, there is one of Philip and Mary (undated, but apparently of 1555) which regulates the supply of horses for the conveyance of letters to Dover. Again, in July 1556 the lords of the council ordered ” that the postes betweene this and the Northe should eche of them keepe a booke, and make entrye of every lettre that he shall receive, the tyme of the deliverie thereof unto his hands, with the parties names that shall bring it unto him.” Much of the business of the foreign postal service to and from England during the earlier years of Queen Elizabeth was managed by the incorporated ” merchant strangers,” who appointed a special postmaster. When that office fell vacant in 1568 they quarrelled about a successor; and the quarrel cost them their privilege. 1 1 F. Windebank to Sir W. Cecil: ” All the Italians were unwilling

The accession of James I. to the English throne, by neces- sitating a more frequent communication between London and Scotland, led to improvements in the postal service. Special posts had already been established by the jame 1 magistrates of certain Scottish towns to convey their despatches to and from the court. Thus in 1590 a messenger was appointed by the magistrates of Aberdeen with the title of “council-post.” 2 The new royal orders of 1603 directed (1)

that the postmasters at the various stages should enjoy the privilege of letting horses to ” those riding in post (that is to say) with horn and guide,” by commission or otherwise, and to that end they were charged to keep or have in readiness a sufficient number of post-horses; (2) that the lawful charge for the hire of each horse should be, for public messengers, at the rate of 25 d. a mile, ” besides the guides’ groats,” private travellers being left to make their own agreements. Finally, it was directed that every post- master should keep at least two horses for the express conveyance of government letters, and should forward such letters within a quarter of an hour of their receipt, and that the posts should travel at the rate of not less than 7 m. an hour in summer and 5 m. in winter. 3

In 1607 the king granted to John Stanhope, first Baron Stanhope of Harrington, and to his son Charles Stanhope, after- wards second Lord Stanhope, jointly and to the survivor of them, the postmastership of England under the title of ” Master of the Posts and Messengers,” with a fee of 100 marks a year, together with all ” avails and profits ” belonging to the office. In 1619 a separate office of “postmaster-general of England for foreign parts ” was created in favour of Matthew de Quester 4 and Matthew de Quester the younger. The new office was regarded by the exist- nalsters. ing postmaster-general, Charles, Lord Stanhope, as an infringement of his own patent. A long dispute ensued in the king’s bench and before the lords of the council. 5 In 1626 by an order in council liberty was granted to all companies of merchants, including the merchant adventurers, to send their letters and despatches by messengers of their own choosing. A year afterwards this liberty was revoked, except for the Company of Merchant Adventurers. Lord Stanhope, however, continued to carry letters abroad by his agents, and obtained a warrant prohibiting De Quester from interfering. It shows strikingly the confusion of postal affairs at this period to find a statement addressed to the privy council by the postmasters of England to the effect that they had received no payments ” ever since the last day of November 1621 till this present time, June 1628 ” — the arrears amounting to £22,626.

The rights of the postmasters were also infringed by private individuals, as by one Samuel Jude in 1629 in the west of England. 6 In 1632 the foreign postmastership was assigned by De Quester, who had lost his son, to William Frizell and Thomas Witherings. Letters-patent were granted to them to give their voices to Raphael, . . . but inclined to favour Godfrey ” (Dom. Cor. Eliz. xlviii. § 65, State Paper Dept., Rolls Office). Raphael was a German, Godfrey an Englishman.

2 Kennedy, Annals of Aberdeen, i. 262.

3 Book of Proclamations, p. 67 (S. P. O. ; now in Rolls House) ; Report from the Secret Committee on the Post Office, (1 844) appendix, pp. 38-40.

4 Or ” De l’Equester,” as he is called in Latch’s Reports of King’s Bench Cases, p. 87.

5 These disputes were much embittered by the growing jealousies of English against foreign merchants. The proofs of this in the state correspondence of Elizabeth’s day are abundant, but there were many statesmen who took larger views. See, e.g. John John- son’s ” Brief Declaration for the . ., . erecting and maintaining of the Staple … in England ” (June 1582), Dom. Corresp. Eliz. cliv. No. 30; and compare the same writer’s ” Discourse for the repairing the decayed State of the Merchants,” &c. (July 22, 1577), ibid. cxiv. No. 39, with Leake’s ” Discourse,” &c, of the same year (ibid. cxi. 1 seq.), and with John Hales’s ” Letter to Sir W. Cecil ” (March 20, 1559), ibid, in., where he describes the merchant strangers as being ” spies for foreign princes,” and with Cecil’s ” Reasons to move a Forbearing of the Restitution of the Intercourse to Antwerp ” (1564), ibid. xxxv. No. 33 (in Rolls House).

6 See Analytical Index to the Remembrancia, p. 418, as quoted by H. B. Wheatley in the Academy of the 27th of December 1879, p. 464.

POST, AND POSTAL SERVICE

*77

WHhetings.

jointly, the 15th of March 1633. 1 Witherings took the labouring oar, and ranks as the first of many conspicuous postal reformers. Under him one Richard Poole obtained a special postmastership for the service of the court. Among the earliest measures of improvement taken under the new patent was an acceleration of the continental mail service. For this purpose the patentees made a contract with the count of Thurn and Taxis, hereditary postmaster of the Empire and of Spain. At this time there was still but one mail weekly between London, Antwerp and Brussels, and the transit occupied from four to five days. By a subsequent contract with Count Thurn two mails weekly were secured and the transit made ordinarily in two days. 2 In June 1635 Wither- ings submitted to the king a proposal ” for settling of staffets or pacquet-posts betwixt London and all parts of His Majesty’s dominions, for the carrying and re-carrying of his subjects’

letters," which contains curious notices of the state of internal communications. The net charge to the Crown of the existing posts is stated to be £3400 per annum. Letters, it is said, " being now carried by carriers or footposts 16 or 18 m. a day, it is full two months before any answer can be received from Scot- land or Ireland to London. If any of His Majesty's subjects shall write to Madrid in Spain, he shall receive answer sooner and surer than he shall out of Scotland or Ireland." By the new plan it was proposed that all letters for the northern road should be put into one " portmantle," and directed to Edinburgh, with separate bags directed to such postmasters as lived upon the road near to any city or town corporate. The journey from London to Edinburgh was to be performed within three days. The scheme was approved on the 31st of July 1635, the procla- mation establishing eight main postal lines — namely, the great northern road, to Ireland by Holyhead, to Ireland by Bristol, to the marches of Wales by Shrewsbury, to Plymouth, to Dover, to Harwich and to Yarmouth. The postage of a single letter was fixed at 2d. if under 80 m., 4d. if between 80 and 140 m., 6d. if above 140 m., 8d. if to Scotland. It was provided that no other messengers or footposts should carry letters to any places so provided, except common known carriers, or a particular messenger " sent on purpose with a letter by any man for his own occasions," or a letter by a friend, on pain of exem- plary punishment. 3 In February 1638 another royal procla- mation ratified an agreement between Witherings and De Noveau, postmaster to the French king, for the conveyance of the mails into France by Calais, Boulogne, Abbeville and Amiens. 4

But in 1640 the active postmaster was accused of divers abuses and misdemeanours, and his office sequestrated into the hands of Philip Burlamachi of London, merchant, who was to execute the same under the inspection of the principal secretary of state. 5 Witherings then assigned his patent to Robert Rich, earl of Warwick, and a long contest ensued in both houses of parliament. The sequestration was declared by a vote in parliament in 1642 to be illegal. Nevertheless the dispute gave repeated occupation to both houses during the period from 1641 to 1647, and was diversified by several affrays, in which violent hands were laid upon the mails. In 1643 the post office yielded only £5000 a year. In 1644 the Lords and Commons by a joint ordinance appointed Edmund Prideaux " to be master of the posts, messengers and couriers." In 1646 the opinion of the judges was taken on the validity of Wither- ings's patent (assigned to Lord Warwick), and they pronounced that " the clauses of restraint in the said patent are void and not good in law; that, notwithstanding these clauses be void, the patent is good for the rest." 6 It is evident, therefore, that

any

1 Minute in ” House of Lords’ Papers ” (1633), Fourth Report of Hist. MSS. Commission (1874), a PP- The papers there calendared contain many proofs of Witherings’s activity and ability. See also appendix to Fifth Report (1875), and ” A proclamation concerning the Postmaster of England for Forraigne Parts ” (July 19, 1632), in Rvmer’s Foedera, xix. 385.

2 Egerton MS. (Brit. Mus.), No. 2543, fol. 5 seq.

3 Rymer, Foedera, xix. 649. 4 Ibid. xx. 192. 6 Ibid. xx. 429. • Journals of the House of Commons, ii. 81, 82, 95, 470, 493, 500,

prohibition to carry letters must be by act of parliament to have force of law.

In 1650 an attempt was made by the common council of London to organize a new postal system on the great roads, to run twice a week. This scheme they temporarily carried into effect as respects Scotland. But Mr Cromwell. Attorney-General Prideaux urged on the council of state that, if the new enterprise were permitted, besides intrenching on the rights of the parliament, some other means would have to be devised for payment of the postmasters. Both houses resolved (1) that the offices of postmasters, inland and foreign, were, and ought to be, in the sole power and disposal of the parliament, and (2) that it should be referred to the council of state to take into consideration all existing claims in relation thereto. Of these there were five under the various patents which had been granted. Thereupon the Protector was advised that the management of the post office should be entrusted to John Thurloe by patent upon the expiration of John Manley’s existing contract. Thurloe was to give security for payment of the existing rent of £10,000 a year. Ultimately the posts, both inland and foreign, were farmed to John Manley for £10,000 a year, by an agreement made in 1653. Meanwhile an attorney at York, named John Hill, placed relays of post- horses between that city and London, and undertook p e / ormSi the conveyance of letters and parcels at half the former rates. He also formed local and limited partnerships in various parts of the kingdom for the extension of his plan, which aimed to establish eventually a general penny postage for England, a twopenny postage for Scotland and a fourpenny postage for Ireland. But the post office was looked upon by the government of the day as, first, a means of revenue, and secondly, a means of political espionage. 7 The new letter- carriers were ” trampled down ” by Cromwell’s soldiery. The inventor had a narrow escape from severe punishment. He lived to

publish (1659) the details of his plan, at the eve of the Restoration, in a pamphlet entitled A Penny Post: or a Vindica- tion of the Liberty and Birthright of every Englishman in carrying Merchants and other Man's letters, against any Restraint of Farmers, &c. It is probable that this publication 8 helped to prepare the way for those measures of partial but far-reaching reform which were effected during the reign of Charles II. The rates of postage and the rights and duties of postmasters were settled under the Protectorate by an act of parliament of 1657, c. 30. In 1659 the item, " by postage of letters in farm, £14,000," appears in a report on the public revenue. 9

The government of the Restoration continued to farm the post office upon conditions similar to those imposed by the act of 1657, but for a larger sum. Henry Bishop, the first postmaster-general in the reign of Charles II., ctariesll. contracted to pay a yearly rent of £21,500, these new arrangements being embodied in the Act 12 Charles II. c. 35 (1660), entitled " An Act for Erecting and Establishing a Post Office." A clause proposing to frank all letters addressed to or sent by members of parliament during the session was

501, 658 seq.; Journals of the House of Lords, v. 343, 387, 450, 469-473, 500 seq.; Report from Secret Committee on the Post Office, Appendix, pp. 60-69.

7 Illustrations of this may be seen (in the state-paper department of the general record office) among the correspondence between Sir John Coke and Lord Conway, and also in many other state letters, as well after the outbreak of the great rebellion as before it. There is in the Bodleian Library (MS. Rawlinson, A. 477) a minute account of the methods alleged to have been pursued in the systematic and periodical examination of letters entrusted to the post office. The paper is not authenticated by any signature, and is undated. But it is an original document of the time of Charles II., addressed to Mr. Bridgman, clerk of the council, and drawn up to recommend the adoption of a like practice, but with greater dexterity than that used by Dr Dorislaus and Samuel Morland, who, according to this narrative, formed the Cromwellian board of examiners for post-office letters, and who read all that were addressed to foreign parts.

8 There is a copy in the library of the British Museum, from which H. B. Wheatley has given the abstract quoted above.

9 Journals of the House of Commons, vii. 627.

rejected by the Lords. But the indenture enrolled with the letters-patent contained a proviso for the free carriage of all letters to or from the king, the great officers of state and also the single inland letters only of the members of that present parlia- ment during that session. It also provided that the lessee should permit the secretaries of state, or either of them, to have the survey and inspection of all letters at their discretion. Bishop was succeeded by Daniel O'Neill 1 in 1662, on similar terms. In the consequent proclamation, issued on the 25th of May 1663, it was commanded that " no postmasters or other officers that shall be employed in the conveying of letters, or distributing of the same, or any other person or persons, . . . except by the immediate warrant of our principal secretaries of state, shall presume to open any letters or pacquets not directed unto themselves." In 1677 the general post office comprised in the chief office, under Henry Bennet, earl of Arlington, as postmaster-general, seventy-five persons, and its profits were farmed for £43,000 a year. There were then throughout England and Scotland 182 deputy postmasters, and in Ireland 18 officers at the Dublin office and 45 country postmasters. " The number of letters missive," says a writer of the same year, " is now prodigiously great. ... A letter comprising one whole sheet of paper is conveyed 80 m. for twopence. Every twenty-four hours the post goes 120 m., and in five days an answer may be had from a place 300 m. distant." 2 By an act of the 15th Charles II. (" An Act for Settling the Profits of the Post Office on the duke of York, and his Heirs-Male "), and by a subsequent proclamation issued in August 1683, it was directed that the postmaster-general should " take effectual care for the convey- ance of all bye-letters, by establishing correspondences … in all considerable market-towns with the next adjacent post- stage," and the rights of the postmasters as to hiring horses were again emphasized.

During the possession of the post-office profits by the duke of York a London penny post was established by the joint enter- Dockwra's prise of William Dockwra, a searcher at the customs- Londoo house, and of Robert Murray, a clerk in the excise Peany Post. office The work i ng _ out of tne plan fell to the first- named, and in his hands it gave in April 1680 — although but for a short time — far more extensive postal facilities to the Londoners than even those afforded 160 years later by the plans of Sir Rowland Hill. Dockwra carried, registered and insured, for a penny, both letters and parcels up to a pound in weight and £10 in value. He took what had been the mansion of Sir Robert Abdy in Lime Street as a chief office, established seven sorting and district offices, and between 400 and 500 receiving-houses and wall-boxes. He established hourly collections, with a maximum of ten

deliveries daily for the central part of the city, and a minimum of six for the suburbs. Outlying villages, such as Hackney and Islington, had four daily deliveries; and his letter-carriers collected for each despatch of the general post office throughout the whole of the city and suburbs. Suits were laid against him in the court of king's bench for infringing on the duke of York's patent, and the jealousies of the farmers eventually prevailed. The penny post was made a branch of the general post. Dockwra, after the Revolution of 1688, obtained a pension of £500 a year (for a limited term) in compensation of his losses. In 1697 he was made comptroller of the London office. Eleven years later his improvements were outvied by Charles Povey, the author of schemes for improving coinage, and also of a curious volume, often wrongly ascribed to Defoe, entitled The Visions of Sir Heister Ryley. Povey took upon himself to set up a foot-post under the name of the " halfpenny carriage," appointed receiving-houses, and employed several persons to collect and deliver letters for hire within the cities of London and West- minster and borough of Southwark," to the great prejudice of

1 The trusted friend but not always the trusted adviser of the duke of Ormonde. O'Neill's correspondence exists among the duke's papers, in part at Kilkenny Castle, in part (extensively) among the Carte MSS. in the Bodleian ; and it abounds in incidental illustrations of postal administration in both England and Ireland.

2 Quoted in Gent. Mag. (1815), xxxv. 309, 310.

the revenue," as was represented by the postmaster-general to the lords of the treasury. Povey was compelled to desist.

At this period the postal system of Scotland was distinct from that of England. It had been reorganized early in the reign of Charles II., who in September 1662 had appointed Patrick Grahame of Inchbrakie to be postmaster- general of Scotland for life at a salary of £500 Scots. But it would seem from the proceedings of the Scottish privy council that the rights and duties of the office were ill defined ; for immediately after the appointment of Grahame the council commissioned Robert Mein, merchant and keeper of the letter-office in Edinburgh, to establish posts between Scotland and Ireland, ordained that Linlithgow, Kilsyth, Glasgow, Kilmarnock, Dumboag, Ballantrae and Portpatrick should be stages on the route, and granted him the sum of £200 sterling to build a packet r boat to carry the mail from Portpatrick to Donaghadee. 3

Perhaps the earliest official notice of the colonial post is to be seen in the following paragraph from the records of the general court of Massachusetts in 1639. ” It is ordered that „ . notice be given that Richard Fairbanks his house in c Initial Boston is the place appointed for all letters which are pˆ s t s brought from beyond the seas, or are to be sent thither to be left with him; and he is to take care that they are to be delivered or sent according to the directions ; and he is allowed for every letter a penny, and must answer all miscarriages through his own neglect in this kind.” The court in 1667 was petitioned to make better postal arrangements, the petitioners alleging the frequent ” loss of letters whereby merchants, especially with their friends and employers in foreign parts, are greatly damnified; many times the letters are imputed (?) and thrown upon the exchange, so that those who will may take them up, no person, without some satisfaction, being willing to trouble their houses therewith.” In Virginia the postal system was yet more primitive. The colonial law of 1657 required every planter to provide a messenger to convey the despatches as they arrived to the next plantation, and so on, on pain of forfeiting a hogshead of tobacco in default. The government of New York in 1672 established ” a post to goe monthly from New York to Boston,” advertising ” those that bee disposed to send letters, to bring them to the secretary’s office, where, in a lockt box, they shall be preserved till the messenger calls for them, all persons paying the post before the bagg be sealed up.” 4 Thirty years later this monthly post had become a fortnightly one. The office of postmaster-general for America had been created in 1692.

The act of the 9th of Queen Anne which consolidated the posts of the empire into one establishment, and, as to organiza- tion, continued to be the great charter of the post office until the reforms of 1838-1850 mainly intro- so ua a tioa’. duced by Sir Rowland Hill. The act of Anne largely increased the powers of the postmaster-general. It reorganized the chief letter-offices of Edinburgh, Dublin and New York, and settled new offices in the West Indies and elsewhere. It established three rates of single postage, viz. English, 3d. if under 80 m. and 4d. if above, and 6d. to Edinburgh or Dublin. It continued to the postmaster- general the sole privilege ” to provide horses to persons riding post.” And it gave, for the first time, parliamentary sanction to the power, formerly questionable, of the secretaries of state with respect to the opening of letters, by enacting that ” from and after the first day of June 1 7 1 1 no person or persons shall presume … to open, detain or delay . . . any letter or letters . . . after the same is or shall be delivered into the general or other post office, . . . and before delivery to the persons to whom they are directed, or for their use, except by an express warrant

in writing under the hand of one of the principal secretaries of state, for every such opening, detaining or delaying.”

Nine years after the passing of the act of Anne the cross-posts were farmed to the well-known ” humble ” Ralph Allen — the lover of peace and of humanity. 5 Allen became the inventor of the cross-roads postal system, p osts] having made an agreement that the new profits so created should be his own during his lifetime. His im- provements were so successful that he is said to have netted during forty-two years an average profit of nearly £12,000 a year.

‘ Lang, Historical Summary of the Post Office in Scotland, pp. 4, 5. 4 Miles, ” History of the Post Office,” in the American Banker’s Magazine, new series, vol. vii. p. 358 seq.

” Is there a variance ? enter but this door, Balked are the courts; the contest is no more.” Pope’s ” humble Allen ” was also the ” Allworthy ” of Fielding.

POST, AND POSTAL SERVICE

The postal revenue of Great Britain, meanwhile, stood thus: Gross and Net Income, 1724-1774.

Gross Produce.

Net Revenue.

i s- d.

£ 8. d.

1724

178,071 16 9

96,339 7 5

1734

176,334 3 1

91,701 11

1744

194,461 8 7

85.“4 9 4

1754

214,300 10 6

97.365 5 1

1764

225,326 5 8

116,182 8 5

1774

3I3.03 2 H 6

164,077 8 4

The system of burdening the post-office revenue with pensions, nearly all of which had no public connexion with the postal service, and some of which were unconnected with any public Permanent serv j cei was begun by Charles II., who granted to Pensions. B arrjara) duchess of Cleveland, £4700 a year, and to the earl of Rochester £4000 a year, out of that revenue. The example was followed until, in 1694, the pensions so chargeable amounted to £21,200. Queen Anne granted a pension of £5000 to the duke of Marlborough, charged in like manner. In March 1857 the existing pensions ceased to be payable by the post office, and became chargeable to the consolidated fund.

In October 1782 the notice of the manager of the Bath theatre, John Palmer (1742-1818), was attracted to the postal service. Palmer’s So habitual were the robberies of the post that they Mali- came to be regarded as necessary evils. The officials

coaches. ur g ec j the precaution of sending all bank-notes and bills of exchange in halves, and pointed the warning with a philosophical remark that ” there are no other means of prevent- ing robberies with effect.” At this period the postal system was characterized by extreme irregularity in the departure of mails and delivery of letters by an average speed of about 3j m. in the hour, and by a rapidly increasing diversion of corre- spondence into illicit channels. The net revenue, which had averaged £167,176 during the ten years ending with 1773,

averaged but £159,625 during the ten years ending with 1783. Yet, when Palmer suggested that by building mail-coaches expressly adapted to run at a good speed, by furnishing a liberal supply of horses, and by attaching an armed guard to each coach the public would be greatly benefited, and the post-office revenue considerably increased, the officials maintained that the existing system was all but perfect. Lord Camden, however, brought the plan under the personal notice of Pitt, who insisted on its being tried. The experiment was made in August 1784, and its success exceeded all anticipation. The following table shows the rapid increase of revenue under the new arrangements: —

Gross and Net Income, 1784-1805.

Year.

Gross Income.

Net Revenue.

£ s. d.

£ s. d.

1784

420,101 1 8

196,513 16 7

1785

463.753 8 4

261,409 18 2

1790

533,198 1 9

331,179 18 8

1795

745,238

414,548 11 7

1800

1,083,950

720,981 17 1

1805

1,317,842

944,382 8 4

It had been at first proposed to reward Palmer by a grant for life of 25% on a certain proportion of the increased net revenue, which would eventually have given him some £10,000 a year, but this proposition fell through. Pitt, however, appointed Palmer to be comptroller-general of postal revenues, an office which was soon made too hot for him to hold. He obtained a pension of £3000 a year, and ultimately, by the act 53 Geo. III. c. 157 (1813), after his case had received the sanction of five successive majorities against government, an additional sum of £50,000. Every sort of obstruction was placed in the way of his reward, although nearly a million had been added to the annual public revenue, and during a quarter of a century the mails had been conveyed over an aggregate of some seventy millions of miles without the occurrence of one serious mail robbery. 1

1 Debates of both Houses of Parliament in 1808 relative to the Agreement for the Reform and Improvement of the Post Office, passim. See also H. Joyce, The History of the Post Office (1893).

Scotland shared in the advantages of the mail-coach system from the first. Shortly before its introduction the local penny post was set on foot in Edinburgh by Peter Williamson, the keeper of a coffee-room in the hall of Parliament House. He°™* , employed four letter-carriers, in uniform, appointed ™' , ,y 0/j **receivers in various parts of the city, and established ™j hourly deliveries. 2 The officials of the post, when the ' success of the plan had become fully apparent, gave Williamson a pension, and absorbed his business, the acquisition of which was subsequently confirmed by the Act 34 Geo. III. c. 17 (1794)- A dead-letter office was established in 1784. But in Ireland in 1 801 only three public carriages conveyed mails. There were, indeed, few roads of any sort, and none on which coaches could travel faster than four miles an hour. 3 At this period the gross receipts of the Irish post office were £80,040; the**

charges of management and collection were £59,216, or at the rate of more than 70%; whilst in Scotland the receipts were £100,651, and the charges £16,896, or somewhat less than 17%.

In the American colonies postal improvements may be dated from the administration of Franklin, who was virtually the last colonial postmaster-general, as well as the best. In one shape „

or another he had forty years' experience of postal _ aa ”' work, having been appointed postmaster at Philadelphia in October 1737. When he became postmaster-general in 1753 he visited all the chief post offices throughout Pennsylvania, New Jersey, New York and New England, looking at everything with his own eyes. His administration cannot be better summed up than we find it to be in a sentence or two which he wrote soon after his dismissal. Up to the date of his appointment, he says, ” the American post office had never paid anything to that of Britain. We [i.e. himself and his assistant] were to have £600 a year between us, if we could make that sum out of the profits of the office. ... In the first four years the office became above £900 in debt to us. But it soon after began to repay us ; and before I was displaced by a freak of the minister's, we had brought it to yield three times as much clear revenue to the Crown as the post office of Ireland. Since that imprudent transaction they have received from it — not one farthing.” The interval between the development of Palmer's methods, and the reforms introduced twenty-seven years later by Sir Rowland Hill, is chiefly marked by the growth of the packet system, under the influence of steam navigation, and by the elaborate investiga- tions of the revenue commissioners of 1826 and the following years. In some important particulars these mark out practical and most valuable reforms, but they contrasted unfavourably with the lucidity and reasoning of Rowland Hill's Post Office Reform.

As early as 1788 the cost of the packets employed by the post office attracted parliamentary attention. In that year the ” com- missioners of fees and gratuities ” reported that in the preceding seventeen years the total cost of this branch ™ c *^« had amounted to £1,038,133; and they naturally laid Servlces – stress on the circumstance that many officers of the post office were owners of such packets, even down to the chamber-keeper. At this time part of the packet service was performed by hired vessels, and part by vessels which were the property of the Crown. The commissioners recommended that the latter should be sold, and the entire service be provided for by public and competitive tender. The subject was again inquired into by the finance com- mittee of 1798, which reported that the recommendation of 1788 had not been fully acted upon, and expressed its concurrence

in that recommendation. The plan was then to a considerable extent enforced. But the war rapidly increased the expenditure. The average (£61,000) of 1771-1787 had increased in 1797 to £78,439, in 1810 to £105,000, in 1814 to £160,603. In the succeeding years of peace the expense fell to an average of about £85,000. As early as 1818 the ” Rob Roy ” plied regularly between Greenock and Belfast; but no use was made of steam navigation for the postal service -until 1 821, when the postmaster-general established Crown packets. The expenditure under the new system, from that date to 1829 inclusive, was thus reported by the commissioners of revenue inquiry in 1830: —

Cost of Packet Service, 1820-1829.*

Year.

1820 6

1821′

1822

1823

1824

The general adm

£ Year. £

85,000 1825 110,838

134,868 1826 144,592

115,429 1827 159.250

93,725 1828. 117,260

116,602 1829 108,305

nistration of postal affairs at this period was

still characterized by repeated advances in the letter rates, and the

2 Lang, Historical Summary of the Post Office in Scotland, 15.

3 Minutes of Evidence before Select Committee on Taxation of In-

ternal Communication (1837), evidence of Sir Edward Lees, p. 397.

4 Report, &c. , of Select Committee on Postage.

6 Twenty-second Report of the Commissioners of Revenue Inquiry, pp. 4-6.

6 Last year of exclusive sailing packets.

7 First year of steam-packets.

twenty years previous to Rowland Hill's reforms by a stationary revenue. The following table will show the gross receipts, the charges of collection and management, and the net revenue (omitting fractions of a pound) of the ˆ>ost office of Great Britain. We give the figures for the year 1808 for the purpose of comparison.

Year.

Gross Income.

Charges of Col- lection, &c.

Charges per cent, of Gross

Income.

Net Revenue.

Population of United Kingdom.

1808

1815-16

1 81 8-19

1820-21

1824-25

1826-27

1836-37

1838-39

£

1.552.037 2,193,741 2,209,212 2.132,235

2,255.239 2,392,272 2,206,736 2,346,278

1

45lT43i

594.045 719,622 636,290

655.9H

747.018 609,220 686,768

29

27

32 i

29 29

31

27*

29

£

1,100,606 1,599,696 1,489,590

L495.945

1.599.325 1.645,254

1. 597. 516 1,659,510

I9.552,ooo

20,928,000 22,362,006

25 > 605,ooo

Before passing to the reform of 1839 we have to revert to that important feature in postal history — the interference with corre- _ _ spondence for judicial or political purposes. We have

mental' already seen (1) that this assumption had no parlia- Interterence mentarv sanction until the enactment of the 9th of with Com- Q ueen Anne ; (2) that the enactment differed from the spondence. ro Y a l proclamations in directing a special warrant for each opening or detention of correspondence. It is a sig- nificant gloss on the statute to find that for nearly a century (namely, until 1798 inclusive) it was not the practice to record such warrants regulatly in any official book. 1 Of the use to which the power was applied the state trials afford some remarkable instances. At the trial of Bishop Atterbury, for example, in 1723 certain letters were offered in evidence which a clerk of the post office deposed on oath " to be true copies of the originals, which were stopped at the post office and copied, and sent forward as directed." Hereupon Atter- bury asked this witness " if he had any express warrant under the hand of one of the principal secretaries of state for opening the said letters." But the lords shelved his objection on the grounds of public inexpediency. Twenty-nine peers recorded their protest against this decision. 2 But the practice thus sanctioned appears to have been pushed to such lengths as to elicit in April 1735 a strong protest and censure from the House of Commons. A committee of inquiry was appointed, and after receiving its report the house resolved that it was " an high infringement of the privileges of the . . . Commons of Great Britain in Parliament that letters of any member should be opened or delayed without a warrant of a principal secretary of state."

Sir Rowland Hill's Reforms (1836-1842).

Rowland Hill's pamphlet (Post Office Reform) of 1837 took for its starting-point the fact that, whereas the postal revenue showed for the past twenty years a positive though slight diminution, it ought to have showed an increase of £507,700 a year in order to have simply kept pace with the growth of population, and an increase of nearly four times that amount in order to have kept pace with the growth of the analogous though far less exorbitant duties imposed on stage-coaches. The stage- coach duties had produced, in 1815, £217,67'; in 1835 they produced £498,407. In 1837 there did not exist any precise account of the number of letters transmitted through the general post office. Hill, however, was able to prepare a sufficiently approximate estimate from the data of the London district post, and from the sums collected for postage. He thus calculated the number of chargeable letters at about 88,600,000, that of franked letters at 7,400,000, and that of

newspapers at 30,000,000, giving a gross total of about 126,000,000. At this period the total cost of management and distribution was £696,569. In the finance accounts of the year (1837) deductions are made from the gross revenue for letters " refused, missent, redirected," and the like, which amount to about £122,000. An analysis of the component parts of this expenditure assigned £426,517 to cost of primary distribution and £270,052 to cost of secondary distri- bution and miscellaneous charges. A further analysis of the primary distribution expenditure gave £282,308 as the probable outgoings for receipt and delivery, and £144,209 as the probable outgoings for transit. In other words, the expenditure which hinged upon the distance the letters had to be conveyed was

1 Report of Secret Committee on the Post Office (1844), p. 9. 5 Lords' Journals, xxii. 183-186; State Trials, xvi. 540 seq.

£144,000, and that which had nothing to do with distance was £282,000. Applying to these figures the estimated number of letters and newspapers (126,000,000) passing through the office, there resulted a probable average cost of ˆ 8 q 4 ˆ of a pennyfor each, of which ffls was cost of transit and ^^ cost of receipt, delivery, &c. Taking into account, however, the greater weight of news- papers and franked letters as compared with chargeable letters, the apparent average cost of transit became, by this estimate, but about iˆts, or less than -ˆ of a penny.

A detailed estimate of the cost of conveying a letter from London to Edinburgh, founded upon the average weight of the Edinburgh mail, gave a still lower proportion, since it reduced the apparent cost of transit, on the average, to the thirty-sixth part of one penny. Hill inferred that, if the charge for postage were to be made pro- portionate to the whole expense incurred in the receipt, transit and delivery of the letter, and in the collection of its postage, it must be made uniformly the same from every post-town to every other post- town in the United Kingdom, unless it could be shown how we are to collect so small a sum as the thirty-sixth part of a penny. And, inasmuch as it would take a ninefold weight to make the expense of transit amount to one farthing, he further inferred that, taxation apart, the charge ought to be precisely the same for every packet of moderate weight, without reference to the number of its enclosures.

At this period the rate of postage actually imposed (beyond the limits of the London district office) varied from 4d. to is. 8d. for a single letter, which was interpreted to mean a single piece of paper not exceeding an ounce in weight; a second piece of paper or any other

enclosure, however small, constituted the packet a double letter. A single sheet of paper, if it at all exceeded an ounce in weight, was charged with fourfold postage. The average charge on inland general post letters was nearly 9d. for each. It was proposed that the charge for primary distribu- tion — that is to say, the postage on all letters received in a post-town, and delivered in the same or in any other post-town in the British Isles — should be at the uniform rate of one penny for each half-ounce — all letters and other papers, whether single or multiple, forming one packet, and not weighing more than half an ounce, being charged one penny, and heavier packets, to any convenient limit, being charged an additional penny for each additional, half-ounce. It was further proposed that stamped covers should be sold to the public at such a price as to include the postage, which would thus be collected in advance. 3 By the public generally, and pre-eminently by the trading public, the plan was received with favour. By the p a riia- functionaries of the post office it was denounced as mentary ruinous and visionary. In 1838 petitions poured Action. into the House of Commons. A select committee was appointed, which reported as follows: —

” The principal points which appear to your committee to have been established in evidence are the following: (1) the exceed- ingly slow advance and occasionally retrograde movement of the post office revenue during the . . . last twenty years; (2) the fact of the charge of postage exceeding the cost in a manifold propor- tion; (3) the fact of postage being evaded most extensively by all classes of society, and of correspondence being suppressed, more especially among the middle and working classes of the people, and this in consequence, as all the witnesses, including many of the post office authorities, think, of the excessively high scale of taxation; (4) the fact of very injurious effects resulting from this state of things to the commerce and industry of the country, and to the social habits and moral condition of the people; (5) the fact, as far as conclusions can be drawn from very imperfect data, that whenever on former occasions large reductions in the rates have been made, these reductions have been followed in short periods of time by an extension of correspondence proportionate to the contraction of the rates; (6) and, as matters of inference from fact and of opinion — (i.) that the only remedies for the evils above stated are a reduction of the rates, and the establish- ment of additional deliveries, and more frequent despatches of letters; (ii.) that owing to the rapid extension of railroads there is an urgent and daily increasing necessity for making such changes; (iii.) that any moderate reduction in the rates would 3 Post Office Reform, 27 seq.

occasion loss to the revenue, without in any material degree diminishing the present amount of letters irregularly conveyed, or giving rise to the growth of new correspondence; (iv.) that the principle of a low uniform rate is just in itself, and, when combined with prepayment and collection by means of a stamp, would be exceedingly convenient and highly satisfactory to the public."

A bill to enable the treasury to establish uniform penny postage was carried in the House of Commons by a majority of ioo, and became law on the 17th of August 1839. A temporary office was created to enable Rowland Hill to superintend the working out of his plan. The first step taken was to reduce, on the 5th of December 1839, the London district postage to id. and the general inland postage to 4d. the half -ounce (existing lower rates being continued). On the 10th of January 1840 the uniform penny rate came into operation throughout the United Kingdom— the scale of weight advancing from id. for each of the first two half-ounces, by gradations of 2d for each additional ounce, or fraction of an ounce, up to 16 oz. The postage was to be prepaid, and if not to be charged at double rates. Parliamentary franking was abolished. Postage stamps were introduced in May following. The facilities of despatch were soon afterwards increased by the establishment of day mails.

But on the important point of simplification in the internal economy of the post office, with the object of reducing its cost without diminishing its working power, little was done. The plan had to work in the face of rooted mistrust on the part of the workers. Its author was (for a term of two years, afterwards prolonged to three) the officer, not of the post office, but of the treasury. He could only recommend measures the most indis- pensable through the chancellor of the exchequer. It happened, too, that the scheme had to be tried at a period of severe com- mercial depression. Nevertheless, the results actually attained in the first two years were briefly these: (1) the chargeable letters delivered in the United Kingdom, exclusive of that part of the government correspondence which theretofore passed free, had already increased from the rate of about 75,000,000 a year to that of 196,500,000; (2) the London district post letters had increased from about 13,000,000 to 23,000,000, or nearly in the ratio of the reduction of the rates;

(3) the illicit conveyance of letters was substantially suppressed;

(4) the gross revenue, exclusive of repayments, yielded about a million and a half per annum, which was about 63% of the amount of the gross revenue in 1839. These results at so early a stage, and in the face of so many obstructions, vindicated the new system.

Seven years later (1849) the 196,500,000 letters delivered throughout the United Kingdom in 1842 had increased to nearly 329,000,000. In addition, the following administrative improve- ments had been effected: (1) the time for posting letters at the London receiving-houses extended; (2) the limitation of weight abolished; (3) an additional daily despatch to London from the neighbouring (as yet independent) villages; (4) the postal arrange- ments of 120 of the largest cities and great towns revised; (5) un- limited writing on inland newspapers authorized on payment of an additional penny ; (6) a summary process established for recovery of postage from the senders of unpaid letters when refused; (7) a book-post established; (8) registration reduced from one shilling to sixpence; (9) a third mail daily put on the railway (without additional charge) from the towns of the north-western district to London, and day mails extended within a radius of 20 m. round the metropolis; (10) a service of parliamentary returns, for private bills, provided for; (11) measures taken, against many obstacles, for the complete consolidation of the two heretofore distinct corps of letter-carriers — an improvement (on the whole) of detail, which led to other improvements thereafter. 1

Later History (1842-1905). When Sir R. Hill initiated his reform the postmaster-general was the earl of Lichfield, the thirty -first in succession to that

1 Hill, History of Penny Postage (1880), appendix A (Life, &c, ii. 438). Part of the strenuousness of the opposition to this measure arose, it must be owned, from the ” high-handedness ” which in Sir R. Hill’s character somewhat marred very noble faculties. The change worked much harm to some humble but hardworking and meritorious functionaries.

office after Sir Brian Tuke. Under him the legislation of 1839 was carried out in 1840 and 1841. In September 1841 he was succeeded by Viscount Lowther.

In the summer of 1844 the statement that the letters of Mazzini, then a political refugee, long resident in England, had been systematically opened, and their contents opening and communicated to foreign

governments, by Sir James Detention of Graham, secretary of state for the home department, Letters. aroused much indignation. The arrest of the brothers Bandiera, 2 largely in consequence of information derived from their correspondence with Mazzini, and their subsequent execution at Cosenza made a thorough investigation into the circumstances a public necessity. The consequent parlia- mentary inquiry of August 1844, after retracing the earlier events connected with the exercise of the discretional power of inspection which parliament had vested in the secretaries of state in 17 10, elicited the fact that in 1806 Lord Spencer, then secretary for the home department, introduced for the first time the practice of recording in an official book all warrants issued for the detention and opening of letters, and also the additional fact that from 1822 onwards the warrants themselves had been preserved. The whole number of such warrants issued from 1806 to the middle of 1844 inclusive was stated to be 323, of which no less than 53 had been issued in the years 1841-1844 inclusive, a number exceeding that of any previous period of like extent.

The committee of 1844 proceeded to report that ” the warrants issued during the present century may be divided into two classes — 1st, those issued in furtherance of criminal justice . . . ; 2nd, those issued for the purpose of discovering the designs of persons known or suspected to be engaged in proceedings dangerous to the State, or (as in Mazzini’s case) deeply involving British interests, and carried on in the United Kingdom or in British possessions beyond the seas. . . . Warrants of the second descrip- tion originate with the home office. The principal secretary of state, of his own discretion, determines when to issue them, and gives instructions accordingly to the under-secretary, whose office is then purely ministerial. The mode of preparing them, and keeping record of them in a private book, is the same as in the case of criminal warrants. There is no record kept of the grounds on which they are issued, except so far as correspondence preserved at the home office may lead to infer them. 3 . . . The letters which have been detained and opened are, unless retained by special order, as sometimes happens in criminal cases, closed and resealed, without affixing any mark to indicate that they have been so detained and opened, and are forwarded by post according to their respective superscriptions.” 4

Almost forty years later a like question was again raised in the House of Commons (March 1882) by some Irish members, in relation to an alleged examination of correspondence at Dublin for political reasons. Sir William Harcourt on that occasion spoke thus: ” This power is with the secretary of state in Eng- land. ... In Ireland it belongs to the Irish

government. ... It is a power which is given for purposes of state, and the very essence of the power is that no account [of its exercise] can be rendered. To render an account would be to defeat the very object for which the power was granted. If the minister is not fit to exercise the power so entrusted, upon the responsibility cast upon him, he is not fit to occupy the post of secretary of state.” 6 The House of Commons accepted this explanation; and in view of many grave incidents, both in Ireland and in America, it would be hard to justify any other conclusion.

The increase in the number of postal deliveries and in that of the receiving-houses and branch-offices, together i ncreaseul with the numerous improvements introduced into Postal the working economy of the post office, when Business, Rowland Hill at length obtained the means of fully 183 9-i857. carrying out his reforms by his appointment as secretary,

2 Ricordi dei fratelli Bandiera e dei loro compagni di martirio in Cosenza, p. 47 (Paris, 1844).

3 Report from the Secret Committee on the Post Office (1844), p. 11. * Ibid., pp. 14-17.

‘ 6 Hansard, Debates, vol. cclxvii. cols. 294-296 (session of 1882).

speedily gave a more vigorous impulse to the progress of the net revenue than had theretofore obtained. During the seven years 1845-1851 inclusive the average was but £810,951. During the six years 1852-1857 inclusive the average was £1,166,448 — the average of the gross income during the same septennial period having been £2,681,835.

Number of Letters: Gross and Net Income, 1838-1857.

Year ending

Jan

Dec

5, 1838 1842 1847 1852

31.1857

Estimated

No. of

Chargeable

Letters.

196,500,191 299.586,762 360,647,187 504,42 1 ,000

Gross Income.

£

2,339,737

i,499.4!8

1,963,857 2,422,168

3.035,713

Cost of Manage- ment.

£

687,313 938,168

1,138,745 1,304,163 1,720,815

Net Revenue.

£

1,652,424

561,249

825,112

1,118,004

1,314,898

charged on Gov- ernment.

£

38,528

113-255 100,354 167,129

i35,5i7

Within a period of eighteen years under the penny rate the number of letters became more than sixfold what it was under the rates of 1838. When the change was first made the increase of letters was in the ratio of 122-25% during the year. The second year showed an increase on the first of about 16%. During the next fifteen years the average increase was at the rate of about 6% per annum. Although this enormous increase of business, coupled with the increasing preponderance of railway mail conveyance (invaluable, but costly), carried up the post office expenditure from £757,000 to £1,720,800, yet the net revenue of 1857 was within £350,000 of the net revenue of 1839. During the year 1857 the number of newspapers delivered in the United Kingdom was about 71 millions, and that of book-packets (the cheap carriage of which is one of the most serviceable and praiseworthy of modern postal improvements) about 6 millions.

Since 1858 the achievements of the period 183 5-1857 have been eminently surpassed. This period includes the establishment of postal savings banks (1861) and the transfer to the state of Growth tne telegraphic service (1870). These improvements and are dealt with in separate articles. The British

Changes, postal business has grown at a more rapid rate than 18S8-I90S. the p 0pu i at ; on of the United Kingdom. Some of the causes of this development must be sought within the post office department, e.g. improved facilities, lower charges and the assumption of new functions; but others are to be found in the higher level of popular education, the increase of wealth, industry and commerce, and the rapid expansion of Greater Britain.

The following table shows the growth of letters delivered: — United Kingdom. — Estimated inland delivery of letters, 1839-1905, with the increase per cent, per annum. Also the average number to each person, 00,000's omitted.

The rates of inland letter postage have been altered as follows. From the 5th of October 187 1 to the 1st of July 1885 the charges were: not exceeding 1 oz. one penny; inland over 1 oz. and not exceeding 2 oz. three halfpence, Letter and an additional halfpenny for every 2 oz., so

Rates, that the postage on a letter weighing between 10 and 12 oz. was 4d. On a letter weighing over 12 oz. and not exceeding 13 oz. the postage was is. id., and increased id. for each succeeding ounce. On the 1st of July 1885 the postage on letters over 12 oz. was reduced, and the gradation of charge beyond 2 oz. was made uniform, at the rate of one halfpenny for each additional ounce. Thus a letter weighing over 12 and not exceeding 14 oz. was charged 45d., 14 to 16 oz. sd., and so on. Notwithstanding this change, it was found as late as 1895 that 95% of the letters sent' through the post weighed not more than 1 oz. each.

Among a number of postal and telegraphic concessions made to the public on the 22nd of June 1897, the sixtieth anniversary of Queen Victoria's accession to the throne, were new rates for letters as follows: —

d.

Not exceeding 4 oz I

Over 4 oz. and not exceeding 6 oz 1 5

„ 6 „ „ „ 8 ,, 2

with jd. for each succeeding 2 oz.

This change, while it saved both the post office and the public the trouble of testing the weight of a large number of letters, had also the advantage of simplicity of calculation — one half- penny is charged for each 2 oz., with a minimum charge of id.

Arrangements were at the same time made to ensure a delivery of letters by postmen at every house in the United Kingdom. It was estimated that 16 millions of letters, whose owners had previ- ously to fetch them from the post office or from some point on a postman's walk, would thus be added to the official delivery. The estimate proved to be much under the mark, some 60 millions being added to the letters brought annually into the official delivery under this arrangement. Financial considerations have now been entirely disregarded for the benefit of these letters, and the cost of their delivery alone greatly exceeds the whole revenue derived from them.

In studying the statistics of letters delivered, it should be re- membered that the figures for any particular year are affected by circumstances like a general election or a boom in trade, as well as by changes in the rates or condition of the post office services. The letters

from foreign countries have been stimu- lated by lower charges, and those from the colonies by the imperial penny post, to which reference is made below.

Year ending 31st December until 1876, and

Delivered in England and Wales.

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thereafter the Financial Year ending 31st March.

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Estimated No. of Letters, 1839 . ,, Franks. 1839 .

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8,0

1,0

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H

76,0

6,5

U

,, Letters, 1840 .

88,0

—

44-0

—

132,0

120-0

8

19,0

143-5

7

18,0

II9-2

2

169,0

22-2

7

Average of 5 years, 1841-1845

122,0

10-7

57,0

90

i79,o

10-2

II

24,0

9-2

9

24,0

9-5

3

227,0

IO-O

8

,, 1846-1850

180,0

5-5

79-o

5-5

259,0

5-2

15

34,o

4-2

12

34,0

5-o

4

327,0

5-o

12

1851-1855 .

233,0

0-5

97-0

5-o

330,0

6-0

18

41,0

5-2

h

39,0

3-5

6

410,0

5-7

15

1856-1860

302,0

4-2

125,0

5 ‘5

427,0

4-5

22

51,0

3-2

16

45,0

3-0

7

523,0

4-2

18

1861-1865

373,0

57

161,0

5-7

534,0

5-7

29

61,0

0-5

20

53,0

3-2

9

648,0

5-5

22

1866-1870

472,0

4-2

192,0

3-2

664,0

4-0

31

76,0

4-7

24

60,0

3-2

11

800,0

4-0

26

Year 1871

501,0

0-5

220,0

7-0

721,0

2-5

32

80,0

1-2

24

66,0

3-0

13

867,0

2-3

27

„ 1875

580,0

4-8

266,7

6-5

846,8

5-3

35

90,9

0-9

2b

70,5

o-8

13

1,008,3

4-b

31

,, 1880-1881

650,9

i-7

330,4

6-6

98i,3

3-3

38

104,9

3-o

29

78,7

3-8

15

1,165,1

3-3

34

,, 1884-1885

757,2

2-7

39i,i

4-1

1,148,3

3-2

42

122,9

2-6

32

89,1

i-6

18

1,360,3

2-9

38

,, 1890-1891

924,4

3-3

538,4

4-0

dec.

1,462,8

3-5

dec.

50

143,2

2-1

30

99,8

3-i

21

1,709,0

3-4

dec.

45

,, 1894-1895 l

993-3

2-0

508,8

n-6

1,502,1

3-1

50

156,0

1-4

38

112,8

4-0

24

i,77o,9

2-3

46

1,312,7

2-9

664,3

5-0

i,977,o

3-6

61

202,4

2-8

47

144,2

2-2

32

2,323,6

3-4

57

1,559,9

3-2

753,4

3”6

2,313,3

3-3

68

238,1

3-7

5i

155,8

0-1

dec.

30

2,707,2

3-1

t > 2

1 It was discovered in the course of this year that the estimated figures for previous years had been swollen by an imperfect method of reckoning the London letters, &c. In 1883 as many as 2,770,000 valentines were sent through the post. The numbers gradually

decreased until in 1890 only 320,000 were observed. Christmas cards have, however, considerably increased.

2 Since the 22nd of June 1897, all packets over 2 oz., formerly counted as book packets, are reckoned as letters.

On the 1 2th of February 1 imprinted penny stamp, and made to be fastened against in spection, were issued to the public at a charge of is. for 10 cards. The charge was reduced

Letter and Post Cards.

almost at once to 9d. for 8 cards. Similar cards have long been in use on the continent of Europe, but they do not enjoy much popularity in

Great Britain either with the post office, which finds them inconvenient to handle in sorting and stamping, or with the public. The number issued annually is about 10 millions, not counting those of private manufacturers. The following table gives the number of post cards: — •

2 letter cards bearing an the purpose of detecting letters, &c, sent by the halfpenny post.

The book post received a great impetus in 1892 (May 28) by the permission to enclose book packets in unsealed envelopes. Com- plaint is, however, made that such envelopes form a dangerous trap for small letters, which are liable to slip inside the flaps of open envelopes. But as the rate of postage for articles weighing over 2 oz. is now the same for letters and for book packets, articles over that weight derive no, advantage from being sent in open covers.

Sample Post.— The sample or pattern post, which was confined to bona-fide trade patterns and samples on the 1st of October 1870, was then assimilated to the book post (|-d. for 2 oz.) ; but the re- striction was difficult to enforce and irritating to the public, and the sample post was abolished on the 5th of October 187 1, when the rates of letter postage were lowered. It was re-established on the

1st of October 1887 (id. for 4 oz. or Estimated Number of Post Cards delivered in the United Kingdom, under, and |d. for each succeeding

and the Increase per cent, per Annum. 2 oz.) ; but when the Jubilee letter

rates were introduced (June 22, 1897) it lost its raison d'ltre, and ceased to exist for inland purposes.

Newspapers. — The table on next page shows the estimated number of newspapers delivered in the United Kingdom, and the increase per cent, per annum.

The carriage of newspapers by the post office does not show the same elasticity as other post office business. This is due largely to the improved system of distri- bution adopted by newspaper managers and especially to the extension of the halfpenny press. The practice of posting a news- paper after reading it, under a co-operative arrangement, has practically ceased to exist. The carriage of newspapers by post is conducted by the post office at a loss.

It has been frequently stated on behalf of the post office that the

halfpenny post is unremunerative. Representations are, however, made from time to time in favour of lower Halfpenny postage for literature of all kinds. It may therefore £«s< be of interest to mention that the postmaster- general of the United States has, in successive annual reports, deplored the effect on the post office service of the cheap rates for " second-class matter." The cost of carriage over so large a territory is heavier than in the United Kingdom ; but the postmaster-general states that the low rates of postage " involve a sheer wanton waste of $20,000,000 or upwards a year." Facilities like the extension of free delivery are stifled, and the efficiency of the whole service cramped by the loss thus sustained. In the United Kingdom the rules respecting the halfpenny post were greatly simplified and brought into effect on the 1st of October 1906. The halfpenny post can be used only

Year.

England and Wales.

Scotland.

Ireland.

United Kingdom.

3

3

3

b c

CD G O 3

Number.

^ s

a 0!

a! c a, 1— 1

Number.

K S

U CD

c a

Number.

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■e 0. t— 1

Number.

- S V G

aco

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1872 . .

64,000,000

—

8,000,000

—

4,000,000

—

76,000,000

1875 ■ •

73,369,100

u-6

9,206,300

6-7

4,540,900

5-5

87,116,300

10-7

1881-1882

114,251,500

10-4

14,651,400

9-3

6,426,100

b-9

135,329,000

IO-I

1884-1885

134,100,000

4-3

18,400,000

5-5

7,900,000

3-i

160,400,000

4.4

1889-1890

184,400,000

8-4

22,900,000

5-0

9,800,000

5-4

217,100,000

7-8

1 893- 1 894

209,100,000

1-4

27,400,000

2-2

12,000,000

6-2

248,500,000

1-6

1894-1895*

271,600,000

29-9

dec.

28,700,000

47

12,500,000

4-2

312,800,000

25-9

1895-1896

268,300,000

1-2

inc.

4-9

32,200,000

12-2

14,000,000

12-0

314,500,000

o-6

1900-1901

359,400,000

41,600,000

2-0

18,000,000

6-5

419,000,000

4-7

1 905- 1 906

676,500,000

9-6

91,000,000

5-o

32,800,000

6-8

800,300,000

9-o

*Private cards with adhesive stamps first allowed in this year.

Post cards were first introduced in Austria on the 1st of October

1869, and were first issued in Great Britain on the 1st of October

1870. Only one kind of card was employed, and this was sold for one halfpenny; but on the complaints of the stationers, a charge of 3d. per dozen for the material of the card was made in 1872, and permission was given for private persons to have their own cards stamped at Somerset House. In 1875 a stouter card was put on sale, and the charges were raised to 7d. per dozen for thin cards and 8d. per dozen for stout cards. In 1889 the charges were reduced, and they are now sold at 10 for 5jd. and II for 6d. respectively. On the 1st of September 1894, private post cards with an adhesive halfpenny stamp were allowed to pass by post, and the result has been greatly to diminish the number of cards purchased through the post office. It is estimated that 232 out of the 400 millions of cards delivered in 1899-1900 were private cards. The sizes of the official cards were again altered in January 1895 and November 1899. The regulations forbidding anything but the address to be written on the address side of a post card were made less stringent on the 1st of February 1897; and in 1898 unpaid post cards, which were previously charged as unpaid letters, were allowed to be delivered on payment of double the post card rate. These various changes, espe- cially the use of the private

card and the popularity of illustrated post cards, have contributed to the rapid increase in the number of post cards sent by post. Reply post cards were first issued on the 1st of October 1893. Their use has not been exten- sive. Only about 1 2 million are issued yearly.

Book Packets and Samples. — The table at foot of page shows the estimated number of book packets, circulars and samples delivered in the United Kingdom, and the in- crease per cent, per annum. The rate of 5-d. for 2 oz. for the book post has remained unaltered since the 1st of October 1870. Changes have been made in the regulations defining the articles which may be sent by book post, and prescribing the mode of packing them so as to admit of easy examination for

Finance.

Year.

England and Wales.

Scotland.

Ireland.

United Kingdom.

B a

CD c

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aj B

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O 3

Number.

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Number.

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Number.

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Number.

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0) B

am g a

1872 . .

90,000,000

—

13,000,000

—

11,000,000

—

114,000,000

1875 • ■

1881-1882 1884-1885 1 889-1 890 1 894-1 895

133,394,900 228,999,400 269,400,000 378,200,000 522,500,000

15-2

12-3

8-i

7-5

6-7

dec.

15,723,700 27,875,000 34,500,000 42,100,000 60,800,000

15-0

10-0

3-7

8-2

dec.

9,548,000 14,164,300 16,500,000 21,600,000 31,300,000

16-9

18-9

9-6

10-2

dec.

158,666,600 271,038,700 320,400,000 441,900,000 614,600,000

n-7

12-8

8-8

7-3

7-0

dec.

1898-1899 1

590,900,000

.3-6

inc.

75,100,000

.2-3

inc.

35,500,000

.5-3

inc.

701,500,000

.3-5

inc.

1 900-1 90 1

619,300,000

4-0

77,800,000

3-7

35,300,ooo

8-6

732,400,000

4-2

Book packets over 2 oz. transferred to the letter post as a result of the Jubilee changes.

i8 4

POST, AND POSTAL SERVICE

for packets not exceeding 2 oz. in weight. The length of a packet must not exceed 2 ft., while 1 ft. is the limit in width or depth. Any printed or written matter not in the nature of a letter may be sent by the halfpenny post, but every packet must be posted either without a cover or in an unfastened envelope, or in a cover which can be easily removed. The number of halfpenny packets delivered in 1906-1907 was 933,200,000.

Year.

England a Wales.

nd

Scotland.

Ireland.

United Kingdom.

4J . C P

3

- s

CJ P

ft a

4J .

c p

O 3

c S u 3

C P

O 3

Number.

Number.

ta

Number.

P

Number.

ft M

►5 a

ss.

c a

C ft

1872 . .

87,000,000

—

12,000,000

—

10,000,000

—

109,000,000

1875 ■ •

93.345.6oo

2-3

13,819,100

4-5

13,884,700

10-2

121,049,400

3-4

1881-1882

108,651,700

57

15477.300

2-4

16,660,100

47

140,789,100

5-2

1 884-1 885

1 10,700,000

7

16,900,000

0-9

16,100,000

°-5

143,700,000

0-7

1889-1890

126,600,000

6-1

dec.

16,700,000

o-6

dec.

16,000,000

dec.

159.300,000

4.9

dec.

1894-1895 <■

117,500,000

.9-5

inc.

17,300,000

2-3

inc.

17,000,000

.2-3

inc.

151,800,000

7-9

inc.

1 899- 1 900

125,000,000

5-9

!9. 300,000

7-8

19,100,000

4-9

163,400,000

6-0

1900-1901

127,800,000

2-2

19,300,000

20,700,000

8-4

167,800,000

2-7

Railway Letters.

The inland parcel post began on the 1st of August 1883. No parcel might exceed 7 lb in weight, 3! ft. in length, of 6 ft. in length and girth combined. The rates were: not exceeding 1 lb, 3d.; exceeding 1 lb, but not exceeding 3ft, 6d.; exceeding 3 lb, but not exceeding 5 lb, 9d.; exceeding 5 lb, but not exceeding 7 lb, is. The following table shows the number of parcels delivered in the United Kingdom : —

Inland Parcels.

ding 31st

March.

Number of Parcels

1884 .

14,000,000

1885 .

22,910,040

1890 .

. 42,852,600

1895 •

. 57,136,000

1900 .

. 75,448,000

1905 •

. 97,231,000

Arrangements were made with the railway companies, under which they receive 55 % of the postage on each parcel sent by train. This arrangement, which was to hold good for 21 years, proved, however, an onerous one, and on the 1st of June 1887 the post office started a parcel coach between London and Brighton. The coach, replaced in 1905 by a motor van, travelled by night, and reached Brighton in time for the first delivery. The experi- ment proving successful, other coach and motor services were started at different dates between London and other places in the provinces, the mail services performed by motor vans amounting in 1906 to nearly forty. Nearly n J millions of parcels were con- veyed by the post office in 1900-1901 without passing over a railway.

On the 1st of May 1896, the maximum weight was increased to 11 lb, and the postage rates were reduced : not exceeding 1 lb, 3d.; for each

succeeding lb, ijd. ; the charge for a parcel of 11 lb was thus is. 6d. New rates were subsequently introduced and the rates for parcels now are: not exceeding I ft), 3d.; 2 lb, 4d. ; 3 lb, 5d; 5 lb, 6d. ; 7 lb, 7d. ; for each succeeding ft up to 11 lb, id. The length of a parcel must not exceed 3 ft. 6 in.; length and girth combined must not exceed 6 ft. By the Post Office (Literature for the Blind) Act 1906, the postage on packets of papers and books impressed for the use of the blind was greatly reduced, the rates being fixed at: not exceeding 2 oz., Jd.; exceeding 2 oz. and not exceeding 2 lb, id.; not exceeding 5 lb, ijd. ; not exceeding 6 lb, 2£d.

The number of letters registered by the public in the United Kingdom in 1884-1885 amounted to 11,365,151. In the next ten years the numbers oscillated between 10,779,555 Letters™ (1886-1887) and 12,132,144 (1892-1893); but since 1894-1895, when 11,958,264 letters were registered, the number steadily increased, until it stood at 19,029,114 for 1903-1904. It decreased, however, 2-8% in 1904-1905, in- increased -7 in the following year, but declined again by -8% in 1906-1907. It has been surmised 2 that the introduction of

1 See note to table of Letters Delivered.

2 Thirty-second Report of Postmaster-General.

postal orders checked the growth of registered letters for some years after 1880. In 1886 a system of insurance for registered letters was adopted. The ordinary registration fee entitled the owner, in case of loss, to recover compensation from the post office up to a limit of £2. For an additional insurance fee of id. the limit was raised to £5, and for 2d. to £10. Various changes have since been made, and the separate insurance system

has been abolished. At present a registration fee of 2d. entitles to compensation up to £5, 3d. £20, and each additional penny to a further £20, up to a maximum of £400. The system of registra- tion has also been extended to parcels.

On the 1st of February 1891 the railway letter service came into operation. At passenger stations on the principal railways a letter not exceeding 4 oz. in weight may be handed in at the booking office for conveyance by the next train. A fee of 2d. is payable to the railway company as well as the ordinary postage of id. The letter may be addressed to a railway station to be called for. If it bears any other

address it is posted on arrival at its proper station. The number of packets so sent is about 200,000 a year.

The express delivery service dates from the 25th of March 1891. A private company formed for the purpose of supplying the public on demand with an express messenger to execute errands was found to be infringing the postmaster-general's monopoly both as regards the conveyance of letters and the transmission of communi- cations by electricity. The services of the company were, however, much appreciated by the public. The government accordingly authorized the post office to license the existing company to continue its business, on the payment of royalties, till 1903,' and to start an express service of its own.

Messengers can be summoned from the post office by telephone, and arrangements can be made with the post office for the special delivery of all packets arriving by particular mails in advance of the ordinary postman. The sender of a packet may have it con- vej'ed by express messenger all the way, or may direct that, after conveyance by ordinary post to the terminal post office, it shall then be delivered by special messenger. The fees, in addition to ordinary postage, were originally fixed at 2d. for the first mile, 3d. for the second mile, and is. a mile additional when the distance exceeded 2 m. and there was no public conveyance. Under the present regulations the fee is 3d. for each mile covered by special messenger before delivery. No charge is made for post- age in respect of the special service, but if the packet is very weighty or the distance considerable, and no public conveyance is available, the sender must pay for a cab or other special conveyance.

Letters and parcels to or from a number of foreign countries and colonies may also be marked for express delivery after trans- mission by post; and residents in London, not having a delivery of ordinary letters on Sunday, may receive on that day express letters from home or abroad which have come to hand too late for express delivery on Saturday nights. The total number of express services in 1905-1906 was 1,578,746. In many cases one of these services included the delivery of batches of letters, so that in London alone 1,010,815 express services were performed, in- cluding 47,601 deliveries in advance of the postmen.

There are various central depots for dealing with " dead " or returned letters. The principal office is in London. In the year 1905-1906 10,868,272 letters were received at the various returned letter offices, of which 1,008,017 could neither be delivered to the addresses nor re-

turned to the -senders. Such of these as contain nothing of value are at once destroyed, and no record of them is kept. The

3 Afterwards extended to the 31st of March 1922.

Returned Letters.

others are recorded, and (if not previously claimed by the owners) their contents are sold by auction at intervals. If the owner applies after the sale, the proceeds are handed over to him. In addition to these 10 millions of letters, there were many others disposed of at head post offices, whence they were returned direct and unopened to the senders, whose names and addresses appeared on the outside of the letters. The total number of post cards received in the various offices as undelivered was

oo’s omitted.

Country or Colony.

Despatched from

the United Kingdom.

Destined for the United Kingdom.

Letters and Post

Cards.

Circulars,

Book Packets, Patterns, News- papers.

Letters and Post

Cards.

Circulars,

Book Packets,

Patterns, News- papers.

Europe.

Austria-Hungary

Belgium and Luxemburg .

Denmark, Norway and Sweden

France (including Algeria and Tunis) ....

Germany

Gibraltar (including Tan- gier), Malta and Cyprus.

Holland

Italy

Russia

Spain, Portugal and Azores

Switzerland ....

Turkey, Greece, Rumaria and Balkan States .

Totals

ft

52,0

88,0

78,0

329,0 310,0

46,0 140,0 73,0 49,0 50,0 66,0

25,5

ft

392,0

358,o

3H,o

1,426,0 1,656,0

413.0 302,0 613,0 325,0 536,0 490,0

305,0

ft

41,0

87,0

65,0

354,o

378,0

64,0 90,0 66,0

35,o 47,o 55,o

23,0

ft .

118,0 201,0

132,0

1.152,0 1 ,090,0

44,o

450,o

172,0

92,0

85,0

147,0

65,0

1,306,5

7,130,0

1,305,0

3,748,o

Asia. Asiatic Turkey and Persia India (including Aden) Ceylon, Straits Settle- ments and East Indies . China and Japan .

Totals

ft

8,5 230,0

56,0

54,o

ft

100,0 2,828,0

755,o

762,0

ft

5,o

164,0

40,0

55,o

ft

35,o 432,o

90,0 84,0

348,5

4,445,o

264,0

641,0

Africa.

South African Colonies

East Coast of Africa (Bri- tish and Portuguese Pos- sessions), Mauritius, &c. .

West Coast of Africa, Madeira, Canary Islands, Cape Verde, St Helena and Ascension

Egypt

Totals

ft

323,0

16,0

3L0

40,0

ft

2,671,0

186,0

382,0 398,0

ft

237,0

10,0

32,0 28,0

ft

530,0

15,0

20,0 64,0

410,0

3,637,0

307,0

629,0

America.

Canada and Newfoundland Mexico and Central Ameri- can States …. J Brazil, Argentine Republic,] Uruguay and Paraguay . Chile, Peru and Bolivia Ecuador, Colombia and Venezuela …. West Indies (British and Foreign) .

Totals

ft

397,o

248,0

11,0

39,o

15,0

7,o

49,0

ft

2,850,0 1,891,0

177,0

621,0

i95.o

83,0

449,0

ft

43LO

187,0

11,0

35,o

17,0

3,0 31,0

ft

2,488,0 616,0

13,0

78,0

34,o

4,0

47,o

766,0

6,266,0

7 T 5.o

3,280,0

Australasia. Commonwealth of Aus- tralia . New Zealand, Fiji, &c.

Totals . .

Grand totals

ft

122,0 56,0

ft

1 ,600,0 753.0

ft

80,0 40,0

ft

534,o 333.o

178,0

2,353.0

120,0

867,0

3,009,0

23,831,0

2,711,0

9,165,0

2,656,770; halfpenny packets, 12,439,377; newspapers, 473,346; and parcels, 248,526; 195,145 of these last were re-issued. Articles sent by the halfpenny post are destroyed at the head offices if they cannot be delivered; but the sender may have such articles returned if he writes a request to that effect on the outside of the packet, together with his name and address, and pays a second postage on the return of the packet. The number of registered letters and letters containing property sent through the post with insufficient addresses was 320,041. These letters contained £16,887 in cash and bank-notes, and £656,845 in bills, cheques, money orders, postal orders and stamps. The coin found loose in the post amounted to £1,380, as well as £12,272 in cheques and other forms of remit- tance.

The table in opposite column shows the estimated weight of the mails (excluding parcels) exchanged with the British colonies and foreign countries in 1905-1906. Jij > ‘h* D The number of letters and post cards may be roughly taken at 40 to the lb.

During the same year 2,474,003 parcels were despatched out of the

United Kingdom, and 1,431,035 were received from the British colonies and other countries. Germany, with 356,423, received the largest number of any one country, and easily heads the list of countries from which parcels were imported into the United Kingdom, with 474,669, France coming next with 254,490.

On theˆ 1st of January 1889 a weekly all-sea service to the Australasian colonies was opened. The rates were 4d. per i oz. for letters, and 2d. for post cards, as compared p , with 6d. and 3d. by the quicker route. In the Budget CoteiS/"' of 1890 provision was made for a lower and uniform Letter rate of postage from the United Kingdom to India Rates – and the British colonies generally. The rates, which had hitherto varied from 2H to 4d., 5d., or 6d. per § oz., were fixed at 2ˆd. per % oz. The change took effect on the 1st of January 1891, and resulted at the outset in a loss of £100,000 a year. The fourth postal union congress, which met at Vienna in May and June 1891 (third congress at Lisbon, February and March 1885), took a further step in the direction of uniformity, and on the 1st of October 1891 the 2|d. rate was extended to foreign as well as colonial letters from the United Kingdom. The Australasian colonies gave their adhesion to the Union at this congress, and the Cape signified its adhesion at the next congress (Washington, May and June 1897), while British Bechuanaland and Rhodesia entered in 1900, and the whole of the British Empire is now included in the international union. Abyssinia, Afghanistan, Arabia, China and Morocco are the chief countries

The rate was 2§d. the first oz., and ltd.

which remain outside per oz. afterwards.

Advantage was taken of the presence in England of special representatives of India and the principal British colonies to hold an imperial postal conference in London in June and July 1897, under the presidency of the ˆnnyLst duke of Norfolk, postmaster-general. Chiefly at the instance of Canada the duke announced that on and from Christmas Day 1898 an imperial penny post would be established with such of the British colonies as were prepared to reciprocate. The new rates (id. per J oz.), which had long been advocated by Mr Henniker Heaton, were adopted then or shortly afterwards by the countries within the empire, with the ex- ceptions of Australasia and the Cape, where the 2§d. rate re- mained unaltered. The Cape came afterwards into the scheme, and New Zealand joined in 1902. Australia did not see its way to make the necessary financial arrangements, but in 1905 agreed to receive without surcharge letters from other parts of the empire prepaid at id. per § oz. and reduced its

outward postage to 2d. per \ oz., raised to 1 oz. in 1907. In 1911 penny postage was adopted throughout the commonwealth and to the United Kingdom. Owing to the special relations existing between the governments of Egypt and the United Kingdom, penny postage for letters passing between the United Kingdom and Egypt and the Sudan was introduced in December 1905; and

the Egyptian post office subsequently arranged for the adoption of this rate with many of the British colonies. On the ist of October 1908 penny postage was established between Great Britain and the United States on the same lines as the imperial penny post.

At the 1897 conference it was proposed that the parcel rates with British possessions should be lowered and simplified by the adoption of a triple scale for parcels exchanged by sea, namely, is. up to 3 lb, 2s. from 3 to 7 lb, and 3s. from 7 to II lb. This scale has been adopted by many of the British colonies. The parcel P os t has been gradually extended to nearly the whole civilized world, while the rates have in many cases been considerably re- duced. The United States remained an exception, and in 1902 an agreement was concluded with the American Express Company for a parcel service. In April 1904 an official service was estab- lished with the United States post office, but the semi-official service is still maintained with the American Express Company. By the official service the limit of weight was 4 lb 6 oz., and the postage 2s. per parcel; by the semi-official service parcels up to 11 lb in weight may be sent, the rates ranging from 3s. to 6s. On the ist of July 1908 the rates were revised. The limit of weight was increased to n lb, the rate for a parcel being is. 6d. for a parcel up to 3 lb in weight, 2s. 6d. up to 7 lb, 3s. 6d. up to 9 lb and 4s. 6d. for 1 1 lb.

On the ist of January 1885 the post office at Malta was transferred from the control of H.M. postmaster-general to that of the local administration, and a similar change was made as regards Gibraltar on the ist of June 1896.

Remarkable improvements have been effected in the speed and frequency of the mails sent abroad, and contracts are Foreign entered into from time to time with the various s 3 ” mail steamship companies for additional or improved

erv • services. The transit charges for special trains conveying mails

through France and Italy for Egypt, India, Australia and the Far East have been successively reduced until they now stand at the ordinary Postal Union transit rates.

Mention should be made of the Army post office, which is now an essential accompaniment of military operations. On ArmyPost the outbreak of hostilities in South Africa in 1899, Office the British post office supplied 10 officers and 392

rps – men to deal with the mails of the forces, sell postage stamps, deal in postal orders, &c. Contingents were also sent by the Canadian, Australian, and Indian post offices. Including telegraphists and men of the army reserve, 3400 post office servants were sent to the front.

Money Order Department

The money order branch of the post office dates from 1792. ‘ It was begun with the special object of facilitating the safe Money conveyance of small sums to soldiers and sailors, Orders. t }j e thefts of letters containing money being fre- quent. Two schemes were put forward, one similar to the present money order system. There were doubts whether the post office had power to adopt the system, and it was not officially taken up. Six officers of the post office, however, called the ” clerks of the roads,” who were already conducting a large newspaper business with profit to themselves, came forward with a plan, which was encouraged by the postmaster-general, who also bore the cost of advertising it, and even allowed the advices of the money orders to go free by post under the ” frank ” of the secretary to the post office. In 1798 the clerks of the roads gave up the scheme, and three post office clerks known as ” Stow and Company ” took it over. The death of Stow in 1836 left one sole proprietor who had a capital of £2000 embarked in the concern. In 1838 the government determined to take over the business and compensated the proprietor with an allowance of over £400 a year. The rates of commission fixed by the government were is. 6d. for sums exceeding £2 and under £5, and 6d. for all sums not exceeding £2. In 1840 these rates were reduced to 6d. and 3d. respectively. The number and aggregate amount of the orders issued (inland, colonial and

1 An historical outline is given in the Forty-Second Report of Postmaster-General (1896), p. 26.

foreign) in different periods from the reorganization until 1905 is as follows: —

Years.

Number.

Amount.

1839

188,921

£

313,124

1849

4,248,891

8,152,643

1861-1865

8,055,227

16,624,503

(average)

1875

16,819,874

27,688,255

1880-1881

16,935,005

26,003,582

1 885-1 886

11,318,380

24,832,421

1 890-1 89 1

10,260,852

27,867,887

1 895-1 896

10,900,963

29,726,817

1900-1901

13,263,567

39,374-665

1905-1906

13,596,153

44,612,785

The decrease in the number of inland money orders till 1890-1891 was due to the competition of postal orders, and to the reduction (Jan. 1, 1878) of the charge for registering a letter from 4d. to 2d. 2

In 1862 the issue of orders for larger sums was allowed: not exceeding £7, 9 d.; not exceeding £10, is.

On the 1st of May 1871 a scale of charges was fixed as follows- orders not exceeding 10s., id.; not exceeding £1, 2d.; not exceeding £2, 3d.; and so on, an additional penny being charged per £. For sums of £10 the rate was is. It was found, however, that the low rate of id. for small orders did not provide a profit, and the rates were raised on the 1st of January 1878 to: orders not exceeding ios., 2d.; not exceeding £2, 3d. On the 1st of September 1886 the rates were altered as follows: orders not exceeding £1, 2d.; not exceeding £2, 3d.; not exceeding £4, 4d. ; not exceeding £7, 5 d. ; not exceeding £10, 6d. On the Ist of February 1897 new rates were introduced; on orders not exceeding £3, 3d.; over £3 and not exceeding £10, 4d.

The cost of a money order transaction (at least 3d.) is very little affected by the amount of the remittance, and it was thought undesirable to continue the unremunerative business of sending small sums by money order at less than cost price at the expense of the senders of larger orders. The needs of smaller remitters appeared to be sufficiently met by postal orders and the registered letter post. It

appeared, however, that the new charges fell with great severity upon mutual benefit societies, like the Hearts of Oak, which sent large numbers of small money orders every week, and on the ist of May 1897 the 2d. rate was restored for orders not exceeding £1. This society and others now use postal orders instead of money orders. In 1905 the limit for money orders was extended to £40, and the rates are: sums over £10 and not exceeding £20, 6d.; sums over £20 and not exceeding £30, 8d. ; sums over £30 and not exceeding £40, iod.

Money orders may be sent to almost any country in the world. Ihe rates are as follows: for sums not exceeding £1, -id.; £2, 6d.; £4, 9 d.; £6, Is.; £8, is. 3d.; £10, is. 6d. ; Porclgnand and for countries on which orders may be issued for Co,onlaI higher amounts (limit £40), 3d. for every additional "°? ey £2 or fraction of £2. Orders.

The money order system is largely used by the British govern- ment departments for the payment of pensions, separation allow- ances, remittance of bankruptcy dividends, &c. ; and free orders may be obtained by the public, under certain conditions, for the purpose of remitting their taxes. The cost of management of the money order office was reduced by the substitution, since 1898, of a number of women clerks for men and boys.

On the 2nd of September 1889 the issue of telegraphic money orders between London and seventeen large towns was begun as an experiment, and on the ist of March 1890 the system was extended to all head post offices, and branch offices Tefe 2™P* in the United Kingdom. Two years later it was ex- Moae y tended to every office which transacts both money order ° rders – and telegraph business. The rates, which have been several times revised, are (1) a poundage at the ordinary rate for inland money orders, (2) a charge for the official telegram of advice to the office of payment at the ordinary rate for inland telegrams, the minimum being 6d., and (3) a supplementary fee of 2d. for each order. The sender of a telegraph money order may give instructions that, instead of being left at the post office to be called for, it should be delivered at the payee's residence, and t hat it should be crossed

2 The total sums remitted did not fall off to the same extent, showing that the small orders alone were effected. The average amount for ordinary inland orders is now £2, 19s. 5d.

for payment through a bank. He may also, on paying for the extra words, send a short private message to his correspondent in the telegram of advice.

Telegraph money orders may also be sent to Algeria, Austria, Belgium, Bulgaria, Denmark, Egypt, Faeroe Islands, France, Germany, Holland, Hungary, Iceland, Italy, Luxemburg, Monaco, Norway, Rumania, Sweden and Switzerland. A fee of 2d. is re- quired in addition to the usual money order commission and the cost of the telegram. The system is being rapidly extended to other countries.

The telegraph inland money orders in 1905-1906 amounted to 5°3,543. a “d the sums so remitted to £1,646,882, an average of £3, is. The number of telegraph money order transactions between the United Kingdom and foreign countries amounted to 18,787, representing £139,402.

Postal orders were first issued on the 1st of January 1881. For some years before that date postmasters-general had con- sidered the possibility of issuing orders for fixed amounts at a small commission to replace money orders for sums under 20s., which had failed to be remunerative. When the plan was submitted to a committee appointed by the treasury, it was objected that postal orders as remitting media would be less secure than money orders. This was met in part by giving a discretionary power to fill in the name of the post office and also of the payee. Another objection which was urged, namely, that they would prove to be an issue of government small notes under another name, was quickly disproved. Parliament sanctioned the scheme in 1880. The first series were: —

is., is. 6d. 2s. 6d., 5s., 7s. 6d.

Poundage jd. id.

10s., 12s. 6d., 15s., 17s. 6d., 20s.

Postal Orders,

Poundage 2d.

In 1884 a new series was issued and a provision made that broken amounts might be made up by affixing postage stamps, to the value of sd., to the orders. Postal orders have become increasingly popular as a means of remitting small amounts, especially since the introduction in 1903 of new denominations, rendering it possible to obtain a postal order for every complete sixpence from 6d. to 21s. From 6d. to 2s. 6d.

the poundage is Id., from 3s. to 15s., id., from 15s. 6d. up to 21s., iˆd. Postal orders are also furnished with counterfoils, as a means of keeping a record of the number and amount of each order posted. Orders for amounts of 10s. and upwards are printed in red ink. A system of interchange of postal orders between the United Kingdom and India and the British colonies, and also between one colony and another, has been instituted. British postal orders are obtainable also at post offices in Panama, Constan- tinople, Salonica and Smyrna, and on H.M. ships. The fol- lowing table shows the number and value of postal orders issued from the beginning to the 31st of March 1907 (ooo's omitted): —

Year.

Number.

Value.

1881-1882

4,462

£

2,006

1883-1884

12,286

5,028

1 885-1 886

25.790

10,788

1890-1891

48,841

19,178

1 895-1 896

64,076

23,896

1900-1901

85.390

29,881

1906-1907

101,658

40,484

Savings Banks. 1

The establishment of post office savings banks was prac- tically suggested in the year i860 by Charles William Sykes of Huddersfield, whose suggestion was cordially re- ceived by W. E. Gladstone, then chancellor of the Banks* exchequer, to whose conspicuous exertions in par- liament the effectual working-out of the measure and also many and great improvements in its details are due. Half a century earlier (1807) it had been proposed to utilize the then existing and rudimentary money order branch of the post office for the collection and transmission of savings from all parts of the coun- try to a central savings bank to be established in London. A bill to that effect was brought into the House of Commons by S. Whitbread, but it failed to receive adequate support, and was withdrawn. When Sykes revived the proposal of 1807 the number of savings banks managed by trustees was 638, but of these about 350 were open only for a few hours on a single day of the week. Only twenty throughout the kingdom were open daily. Twenty-four towns containing upwards of ten thousand inhabitants each were without any savings bank. Fourteen counties were without any. In the existing banks the average amount of a deposit was £4, 6s. 5d.

Gladstone's Bill, entitled " An Act to grant additional facilities for depositing small savings at interest, with the security of Government for the due repayment thereof, " be- came law on the 17th of May 1861, and was brought into opera- tion on the 1 6th of September following. The banks first opened were in places theretofore unprovided. In February 1862 the act was brought into operation in Scotland and in Ireland. Within two years nearly all the money order offices of the United Kingdom became savings banks, and the expansion of the business was continual. The growth of business is shown in the following table: —

It remains to be added that the various statutes relating to the post office, except those relating to telegraphs and the car- riage of mails, were consolidated by the Post Office Act 1908. The act repealed and superseded 26 acts wholly and 10 acts in parts. Sections 1-11 deal with the duties of postage; §§ 12-19 with the conditions of transit of postal packets; §§ 20-22 with newspapers; §§ 23-25 with money orders; §§26-32 with ship letters; §§ 33-44 with the postmaster-general and officers; §§ 45-47 with the holding, &c, of land; §§ 48-49 with the extension of postal facilities and accommodation; §§ 50-69 with post office offences; §§ 70-78 with legal proceedings, and §§ 7°~94 w 'th regulations, definitions, &c.

Year ending

Average

Average

Average

Average

Number of

Amount of

Balance in

Number

31st December.

Accounts.

Deposits.

each Account.

of Offices.

I 863-1 868

663,000

7,000,000

£ » d

11 3 5

3,390

1869-1874

l,373,ooo

18,000,000

13 5 3

4,498

1875-1880

1,889,000

29,000,000

15 12 5

5,742

1881-1885

3,088,000

42,000,000

13 11 3

7,348

1 886-1 890

4,248,000

59,000,000

13 16 10

9.025

1891-1895

5,776,000

83,000,000

14 7

10,888

The code of the 1st of November 1888 did not enlarge the limits of deposits or make any great and conspicuous change in the general system, but the postmaster-general obtained power to offer certain facilities for the transfer of money from one account to another, for the easier disposal of the funds of deceased depositors by means of nominations, and in various ways for the convenience of the customers of the bank. Arrange- ments were made for reducing to is. the cost of certificates of births, deaths and marriages required for savings bank pur- poses. In July 1889 Local Loans 3 % Stock was made available for purchase through the post office savings bank.

" In July 1891," says the report of the postmaster-general in 1897, " another Act of Parliament was passed by which the maxi- mum amount which might be deposited was raised from £150 to £200, inclusive of interest. The annual limit remained at £30, but it was provided that, irrespective of that limit, depositors might replace in the bank the amount of any one withdrawal made in the same year. The object of this provision was to avoid curtailing the saving power of a person who might be _ driven by emergency to make an inroad upon his store, but who might never- theless, when the emergency had passed, find himself none the poorer and able to replace the money withdrawn.

" The act provided also that where on any account the principal and interest together exceeded £200, interest should cease only on the amount in excess of £200, whereas previously interest ceased altogether when it had brought the balance of an account up to £200.

" The next striking development of the Savings Bank arose out of the Free Education Act, passed in September 1891. The

1 For a succinct account of the history of the post office savings bank, " so far as depositors and the general public are concerned," see Forty-third Report of Postmaster-General (1897), PP- 3 2 seq-

government of the day desired that advantage should be taken of the

opportunity to inculcate upon parents and children alike a lesson of thrift — that they should save the school pence which they were no longer bound to pay. The Education Department and the postmaster-general worked in concert to realize this end. School managers were urged to press the matter upon all concerned, special stamp slips were prepared and issued, managers were supplied on credit with stocks of stamps to be sold to the children, and clerks from the nearest post offices attended at schools to open accounts and receive deposits. The arrangement began in January 1892; about 1400 schools adopted the scheme at once, and three years later this number had risen to 3000. A sum of nearly £14,000 was estimated to have been deposited in schools in 5 months, and about £40,000 in the first year. Concurrently with the spread of the stamp-slip system in the schools, the extension of School Penny Banks, connected intimately with the Savings Bank, was a con- spicuous result of the effort to turn into profitable channels the pence which no longer paid school fees.

” In December 1893 another Act of Parliament extended the annual limits of deposits from £30 to £50. The maximum of £200 remained unchanged, but it was provided that any accumulations accruing after that amount had been reached should be invested in government stock unless the depositor gave instructions to the contrary.

“In December 1893 arrangements were made for the use of the telegraph for the withdrawal of money from the savings bank. Postmasters-general had hesitated long before sanctioning this new departure. It was known that the system was in force abroad, and it was recognized that there might be, and doubtless were, cases in the United Kingdom where the possibility of withdrawing money without delay might be all-important, and might save a depositor from debt and distress. But, on the other hand, it was strongly held that the cause of thrift was sometimes served by interposing a delay between a sudden desire to spend and its realization ; and it was also held to be essential to maintain a marked distinction between a bank of deposit for savings and a bank for keeping current accounts.”

On the whole, the balance of opinion was in favour of the change, and two new methods of withdrawal were provided. A depositor might telegraph for his money and have his warrant sent to him by return of post, or he might telegraph for his money and have it paid to him in an hour or two on the authority of a telegram from the savings bank to the postmaster. The first method cost the depositor about od., the second cost him about is. 3d. for the transaction. On the 3rd of July 1905 a new sys- tem of withdrawal was instituted, under which a depositor, on presentation of his book at any post office open for

savings bank business, can withdraw immediately any sum not exceeding £1. Depositors have availed themselves extensively of this system. During 1906, 4,758,440 withdrawals, considerably more than one-half of the total number of withdrawals, were made “on demand,” and as a consequence the number of withdrawals made by telegraph fell to 122,802, against 168,036 in the pre- vious year (during only half of which the ” on demand ” system was in force).

By an act which came into force on the 1st of January 1895 building societies, duly incorporated, were enabled to deposit at any one time a sum not exceeding £300, and to buy government stock up to £500 through the savings bank.

Savings Bank Finance. — The increase in the deposits lodged in the post office savings bank must be ascribed to a variety of causes. Numbers of trustee banks have been closed, and have transferred their accounts to the post office bank; greater facilities have been offered by the bank; the limits of deposit in one year, and of total deposit, have been raised; and, since October 1892, deposits may be made by cheque; while the long-continued fall in the rate of interest made the assured 25% of the post office savings bank an increasing temptation to a class of investors previously accustomed to look elsewhere. The high price of consols, due in part to the magnitude of purchases on savings bank account, proved a serious embarrassment to the profitable working of the bank, which had shown a balance of earnings on each year’s work- ing until 1896, after paying its expenses and 25% interest to its depositors. Economical working minimized, but did not remove the difficulty. The average cost of each transaction, originally nearly 7d., has been brought down to 5fd. Down to the year 1896, £1,598,767 was paid into the exchequer under § 14 of the Act 40 Vict. c. 13, being the excess of interest which had accrued year by year. But since 1895 there have been deficits in each year, and in 1905, owing principally tc the reduced rate on consols, the expenditure exceeded the income by £88,094.

The central savings bank having outgrown its accommo- dation in Queen Victoria Street, London, a new site was

purchased in 1898 for £45,000 at West Kensington, and the foundation-stone of a new building, costing £300,000, was laid by the prince of Wales on the 24th of June 1899. The entire removal of the business was carried out in 1903.

Under the Workmen’s Compensation Act of 1897, sums awarded as compensation might be invested in the post office savings bank. This

arrangement proved so convenient that an act of 1900 authorized a similar investment of money paid into an English county court in ordinary actions at common law, and ordered to be invested for the benefit of an infant or lunatic. In 1906 a committee was appointed to go into the question as to whether the post office should provide facilities for the insurance of employers in respect of liabilities under the Workmen's Compensation Acts, but no scheme was recommended involving post office action either as principal or agent. Post offices, however, exhibit notices drawing attention to the liabilities imposed by the act of 1906, and sub-postmasters are encouraged to accept agencies in their private capacity for insurance companies undertaking this class of insurance.

Inducements to Thrift. — By arrangement with the war office in July 1893, the deferred pay of soldiers leaving the army was invested on their behalf in the post office savings bank, but it was found that the majority of the soldiers draw out practically the whole amount at once, and the experiment was discontinued in 1 901. At the request of large employers of labour, an officer of the savings bank attends at industrial establishments on days when wages are paid, and large numbers of workmen have thus been induced to become depositors. The advantages of the savings bank appear to be now thoroughly appreciated throughout the United Kingdom, as shown by the following table : —

On the 31st of December 1900.

Number of Depositors.

Total Amount to Credit of Depositors.

Average Amount

to Credit of each

Depositor.

1 11

England and Wales . Scotland …. Ireland ….

Totals .

7,685,317 372,801 381,865

122,365,193 5,126,299 8,058,153

£. s. d.

15 18 5 13 15 21 2 1

1 in 4 1 in 12 1 in 12

8,439,983

135,549,645

16 1 3

1 in 5

On the 31st of December 1905.

England and Wales . Scotland …. Ireland ….

Totals

9,027,112 451,627 484,310

£

135,668,450 6,205,339 10,237,351

£. s. d.

15 7

13 H 10

2129

1 in 3-8 1 in 10-4 1 in 9′ 1

9,963,049

152,111,140

15 5 4

1 in 4-3

Between the foundation of the bank and the end of 1899, upwards of £648,000,000, inclusive of interest, was credited to depositors, of which £474,000,000 was ‘ withdrawn. There were 232,634,596 deposits, 81,804,509 withdrawals, 27,071,556 accounts opened, and

18,631,573 accounts closed. The cross-entries, or instances where the account is operated upon at a different office from that at which it was opened, amounted to 33 %. It is chiefly in respect of this facility that the post office savings bank enjoys its advan- tage over the trustee savings bank. In 1905, 16,320,204 deposits were made, amounting to £42,300,617. In the same year the with- drawals numbered 7,155,283, the total sum withdrawn being £42,096,037. The interest credited to depositors was £3,567,206, and the total sum standing to their credit on the 31st of December 1900 was £152,111,140.

A classification of accounts opened for 3 months in 1896, and assumed to be fairly typical, showed the following results: —

Occupation as stated by Depositors Percentage

in opening Account. to Total

Professional 1-55

Official 2-8l

Educational I -01

Commercial 3-88

Agricultural and fishing 1-83

Industrial 18-43

Railway, shipping and transport Tradesmen and their assistants .

Domestic service

Miscellaneous

Married women, spinsters and children

2-96 8-14

8-6l o-37 5Q-4I

I0O-0O

Women and children of all ranks are believed to be 60 59 of the total number of depositors.

The accounts open at the end of 1895 showed the following division of deposits: —

Per cent.

Balances not exceeding . .

• £50 ■

• 36-1

Exceeding £50 and not exceeding .

100

■ 24-5

,, 100 ,, ,, ,,

• 150 .

17-3

150 ,

200

. 14-8

,, 200

7-3

The division according to number of accounts, in the same groups, was 90-8, 5-3, 2-2, 1-3 and 0-4 respectively.

Investments in Government Stock. — In September 1888 the minimum amount of government stock which might be purchased or sold through the post office savings bank was reduced from £10 to is., and it was also provided that any person who had purchased stock through the savings bank could, if he so desired, nave it transferred to his own name in the books of the Bank of England. The act of 1893 raised the limit of stock to £200 in one year, and £500 in all; but any depositor might purchase stock, to replace stock previously sold, in one entire

sum during that year. If a depositor exceeds the authorized limits of deposit in the post office savings bank, the excess is invested in stock by the post office on his behalf. The investments of depositors in government stock, however, have a tendency to decrease, and the sales, on the other hand, to increase, as will be seen from the following table: —

Year.

Investments.

Sales.

Average price of Consols.

No. of Depositors.

Total

holding of

Stock.

No.

Amount.

No.

Amount.

1901 1902 1903 1904 1905

46,550 40,893 47,726

39,633 32,301

£

3,192,154 2,694,447

3,131,172 2,507,546 2,212,285

13,574 17,221 17,742 18,848 22,824

£

761,629

1,054,193 1,085,578

1,131,543 1,507,219

94*

94l

90!

88i 1 89}

109,509 118,696

131,343 138,582 139,992

£

12,786,190 14,285,617 16,165,548 17,357,950 17,877,644

Annuities and Life Insurances. — The act of 1882, which came into operation on the 3rd of June 1884, utilized the machinery of the post office savings bank for annuities and life insurances, which had been effected through the post office at selected towns in England and Wales since the 17th of April 1865. Under the act of 1882 all payments were to be made by means of money deposited in the savings bank, and an order could be given by a depositor that any sum — even to id. a week — should be devoted to the purchase of an annuity or insurance so long as he retained a balance in the savings bank. In February 1896 new life insur- ance tables came into operation, with reduced annual rates, and with provision for payment of sums insured at various ages as desired. The following table shows the business done from 1901 to 1905: —

additional five words, the addresses of sender and receiver being sent free. In 1885 the charge was reduced to a halfpenny a word throughout, including addresses (a system of abbreviated addresses, which could be registered on payment of a guinea a year, being introduced), with a minimum charge of sixpence. To obviate the damage and interruption resulting from storms large numbers of wires have been laid underground.

In 1891 the terms under which a new telegraph office was opened, on the request of a person or persons who undertook to guarantee the post office against loss, were reduced. In 1892 rural sanitary authorities were empowered to give such guarantees out of the rates.

In 1897, as part of the Jubilee concessions, the government undertook to pay one-half of any deficiency under guarantees. During the six years ended in 1891 the average number of telegraph offices guaranteed each year was 77. From 1892 to 1897 the average rose to 167. In 1905 and 1906 it amounted to 152. The number of telegraph offices opened without guarantee has increased apace, and there are now 12,993 telegraph offices in all. As part of the Jubilee scheme the charges for porterage were reduced as follows: Up to 3 miles free; beyond 3 m., 3d. per m., reckoned from the post office; and arrangements were made for the free delivery at all hours of the day or night of any telegram within the metro- politan postal district. The cost of free delivery up to 3 m. was estimated at £52,000 a year.

Foreign Telegrams. — The sixth international telegraph conference, held at Berlin in 1884, effected a reduction in the charges to many countries. E.g. the rate per word was reduced for Russia from 9d. to 63d., Spain 6d. to 43d., Italy 5d. to 4fd., and India 4s. 7d. to 4s. The cost of repeating a message was reduced from one-half to one-fourth of the original charge for transmission. At the next con- ference (1890) held at Paris, further considerable reductions were effected. The rates to Austria- Hungary and Italy were reduced from 4ˆd. to 3d., Russia 6jd. to 5|d., Portugal 53d. to 43d., Sweden 5d. to 4d., Spain 4|d. to 4d., Canary Islands is. 73d. to is., &c. The minimum charge for any foreign (European) telegram was fixed at iod. The eighth conference (Budapest, 1896) succeeded in making the following reductions, among others, from the United Kingdom: China 7s. to 5s. 6d., Java 6s. to 5s., Japan 8s. to 6s. 2d., Mauritius 8s. 9d. to 5s., Persia 2s. 5d. to is. 9d. At this conference it was made incumbent upon every state adher- ing to the union to fix in its currency an equivalent approaching as nearly as possible the standard rate in gold, and to correct and declare the equivalent in case of any important fluctuation.

Year.

Annuities.

Immediate.

Deferred.

Life Insurances.

Contracts entered into.

Receipts.

Payments.

Contracts entered into.

Receipts.

Payments.

Contracts entered into.

Receipts.

Payments.

No.

“.22

c.S

5 3

a

< <

Amount.

No.

Amount.

No.

Hi 5 = >

a

< <

No.

Amount.

No.

Amount.

No.

2

i

No.

Amount.

No.

5 o’c S

Ejsgg

1901 1902

I903

1904

I905

1,764 1,679 1,763 1,768 1,840

£

42,268

42,791 43,973 41,000

45,488

£

562,159 558,770 557,981 520,538 573,205

33,269

34,375 35,463 36,607 37,686

£

527,371 548,251 571,904 594,502 614,406

142 139

157 128 158

£

3,066

2,973 3,424 2,492 3,204

1,365

i,353

1,366 1,366 1,386

£

23,630 21,764 24,489 21,011 24,287

1,075 1,164 1,210 1,297

1,347

£

14,175 17,172 14,689 16,167 16,965

920

722 592 517 741

£

44,296 34,646 31,413 28,629 37,011

21,972

22,553 22,672 22,323 21,836

£

22,647

23,045 23,063 23,031 23,376

380 389 387 465

449

£

12,992 14,646 13,126 16,878 15,593

Telegraphs and Telephones

The history of the development of telegraphy and the early

proposals for the transference to the state of ihe telegraph

monopoly will be found in the article Telegraphy.

Telegraphs.ˆ the ˆ q£ February l870 the Telegraph Act

of the previous year took effect. The post office assumed control of telegraphic communication within the United King- dom, and it became possible to send telegrams throughout the country at a uniform charge irrespective of locality or dis- tance. In 1885 sixpenny telegrams were introduced. The charge for a written telegram which came into force in 1870 was one shilling for the first twenty words, and threepence for every

The limit of letters in one word of plain language was raised from 10 to 15, and the number of figures from 3 to 5. The International Telegraph Bureau was also ordered to compile an enlarged official vocabulary of code words, which it is proposed to recognize as the sole authority for words which may be used in cypher telegrams sent by the public. (See Appendix to Postmaster-General's Report, 1897.) See further Telegsaph.

Ten years of state administration of the telegraphs had not passed before the postmaster-general was threatened with a formidable rival in the form of the telephone, which

Telephones.

first exchange in the United Kingdom being established in

assumed a practical shape about the year 1878, the

the City of London in that year. The history of the telephone service and the growth of the industry are set out in the article Telephone.

Post Office Staff The staff of the post office on the 31st of March 1906 amounted to 195,432. Of these 41,081 were women, a proportion of over one-fifth of the staff. The postmasters numbered 875 (in- cluding 10 employed abroad), and the sub-postmasters 21,027.

preference was given to army, navy and royal marine pensioners, and men of the army reserve. Due regard was paid to the legitimate claims of telegraph messengers or other persons who had prospects of succeeding to these situations. In August 1897 the government decided to reserve one-half of all suitable vacancies for ex-soldiers and sailors, as postmen, porters and labourers, and preference has been shown to them for employment as lift-attendants, care- takers, &c.

Finance. — The following table shows the financial working of the post office: —

Year.

Revenue.

Expenditure.

Net Revenue.

Postal Receipts.

Extra Receipts.

“3 8

I 2 !

m

Total.

Sites and Buildings.

9 ‘ 8

2 ff

s >

S3 »

2 o >

Salaries, Wages, &c.

Convey- ance of Mails.

Packet Service.

Other Expenditure.

Total.

Pur- chase.

Erec- tion.

Under P.O.

Votes.

Under other Votes.

1884-1885 1889-1890 1894-1895 1899-1900

igoo-1901

1005-1906

£

7,808,911

9,467,16s

10,748,014 13,192,020 13.776,886 16,823,349

£

382,002

36,279

24,363

£

198,336 218,037 277,446 202,315 218,584 216,311

£

8,389,249 9,721,481 11,025,460 13,394,335 13,995,470 17,064,023

£

72,464 70,000 12,597

HS,294

81, 949 75,759

£

80,234 79,840 175,390 169,098 175,000 250,127

£

150,742 153,921 188,919 269,092 286,238 377,131

£

2,829,210 3.359,563 4.597,355 5.963,399 6,277,275 7,737,010

£

1,154,211 1,249,821 1,395,282 1,474,118 1,516,859 1,821,758

£

728,413 664,342 729,813 759,307 764,804 687,109

£

515,892

553,9io

677,524 719,944 726,101 604,927

£

136,999 142,788 178,464 213,747 236,677 295,191

£

5,668,165 6,275,085 7,955,344 9,683,999 10,064,903 11,849,012

£

2,721,084 3,446,396 3,070,116 3,710,336 3,930.567 5,540,897

The total number of offices (including branch offices) was 22,088. The unestablished staff, not entitled to pension, made up chiefly of telegraph boys, and of persons who are employed for only part of the day on post office business, included 87,753 out of the grand total, and almost the whole of the sub-postmasters. The pay and prospects of almost all classes have been greatly improved since 1884, when the number stood at 91,184. The principal schemes of general revision of pay have been: 1881, Fawcett's scheme for sorting-clerks, sorters and telegraphists (additional cost £210,000 a year), and for postmen, 1882, £110,000: Raikes's various revisions, 1888, chief clerks and supervising officers, £6230; 1890, sorting-clerks, sorters and telegraphists, £179,600; 1890, supervising force, £65,000;

1890, London sorters, £20,700; 1891, London overseers, £9400;

1891, postmen, £125,650: Arnold Morley, 1884, London overseers, £1400, and rural auxiliaries, £20,000.

A committee was appointed in June 1895 with Lord Tweedmouth as chairman, to consider the pay and position of the post office staff, excluding the clerical force and those employed at head- quarters. The committee reported on the 15th of December 1896 and its recommendations were adopted at an immediate increased ex- pense of £139,000 a year, which has since risen to £500,000. In 1897 additional concessions were made at a cost of £100,000 a year.

In July 1890 a number of postmen in London went out on strike. Over 450 were dismissed in one morning, and the work of the post office was carried on without interruption. The men received no sympathy from the public, and most of them were ultimately successful in their plea to be reinstated. A quasi-political agitation was carried on during the general elec- tion of 1892 by some of the London sorters, who, under the plea of civil rights, claimed the right to influence candidates for parliament by exacting pledges for the promise of parliamentary support. The leaders were dismissed, and the post office has upheld the principle that its officers are to hold themselves free to serve either party in the State without putting themselves prominently forward as political partisans. Parliament has been repeatedly asked to sanction a parliamentary inquiry to reopen the settlement of the Tweedmouth Committee, and the telegraphists have been especially active in pressing for a further committee. The rates of pay at various dates since 1 881 are set out with great fullness in the Parliamentary papers (Postmen, No. 237 of 1897; Sorters, Telegraphists, &c, No. 230

of 1898, and Report of the Select Committee on Post Office Servants, 1907; this latter contains important recommendations for the removal of many grievances which the staff had been long agitating to have removed).

In November 1891 an important change was made in the method of recruiting postmen, with the object of encouraging military service, and providing situations for those who after serving in the army or navy are left without employment at a comparatively early age. In making appointments to the situation of postman,

Postage Stamps

For all practical purposes the history of postage stamps begins in the United Kingdom. A post-paid envelope was in common use in Paris in the year 1653. Stamped postal letter-paper (carta postale bollata) was issued to the public by the govern- ment of the Sardinian States in November 1818, and stamped postal envelopes were issued by the same government from 1820 until 1836. 1 Stamped wrappers for newspapers were made experimentally in London by Charles Whiting, under the name of ” go-frees,” in 1830. Four years later (June 1834), and in ignorance of what Whiting had already done, Charles Knight, the well-known publisher, in a letter addressed to Lord Althorp, then chancellor of the exchequer, recommended similar wrappers for adoption. From this suggestion apparently Rowland Hill, who is justly regarded as the originator of postage stamps, got his idea. Meanwhile, however, the adhesive stamp was made experimentally by James Chalmers in his printing-office at Dundee in August 1834. 2 These experimental stamps were printed from ordinary type, and were made adhesive by a wash of gum. Chalmers had already won local distinction by his successful efforts in 1822, for the acceleration of the Scottish mails from London. Those efforts resulted in a saving of forty-eight hours on the double mail journey, and were highly appreciated in Scotland.

Rowland Hill brought the adhesive stamp under the notice of the commissioners of post office inquiry on the 13th of February 1837. Chalmers made no public mention of his stamp of 1834 until November 1837.

Rowland Hill’s pamphlet led to the appointment of a com- mittee of the House of Commons on the 22nd of November 1837, “to inquire into the rates and modes of charging postage, with a view to such a reduction thereof as may be made without injury to the revenue.” This committee reported in favour of Hill’s proposals; and an act was

passed in 1839, authorizing the treasury to fix the rates of postage, and regulate the mode of their collection, whether by prepayment or otherwise. A premium of £200 was offered for the best, and £100 for the next best, proposal for bringing stamps into use, having regard to

1 Stamp- Collector's Magazine, v. 161 seq.; J. E. Gray, Illustrated Catalogue of Postage Stamps, 6th ed., 167.

2 Patrick Chalmers, Sir Rowland Hill and James Chalmers, Inventor of the Adhesive Stamp (London, 1882), passim. See also the same writer's pamphlet, entitled The Position of Sir Rowland Hill made plain (1882), and his The Adhesive Stamp: a Fresh Chapter in the History of Post-Office Reform (1881). Compare Pearson Hill's tract, A Paper on Postage Stamps, in reply to Chalmers, reprinted from the Philatelic Record of November 188 1. Pearson Hill has therein shown conclusively the priority of publication by Sir Rowland Hill. He has also given proof of James Chalmers's express acknow- ledgment of that priority. But he has not weakened the evidence of the priority of invention by Chalmers.

" (1) the convenience as regards the public use; (2) the security against forgery; (3) the facility of being checked and distin- guished at the post office, which must of necessity be rapid; and (4) the expense of the production and circulation of the stamps." To this invitation 2600 replies were received, but no improvement was made upon Rowland Hill's suggestions. A further Minute, of the 26th of December 1839, announced that the treasury had decided to require that, as far as practicable, the postage of letters should be prepaid, and such prepayment effected by means of stamps. Stamped covers or wrappers, stamped envelopes, and adhesive stamps were to be issued by government. The stamps were engraved by Messrs Perkins, Bacon & Petch, of Fleet Street, from Hill's designs, and the Mulready envelopes and covers by Messrs Clowes & Son, of Blackfriars. The stamps were appointed to be brought into use on the 6th of May 1840, but they appear to have been issued to the public as early as the 1st of May. The penny stamp, bearing a profile of Queen Victoria, was coloured black, and the twopenny stamp blue, with check-letters in the lower angles (in all four angles from April 1858). Up to the 28th of January 1854 the stamps were not officially perforated, except in the session of 1851, when stamps, perforated by a Mr Archer, were issued at the House of Commons post office. In 1853 the government

purchased Archer's patent for £4000. The stamps were first water-marked in April 1840.

The canton of Zurich was the first foreign state to adopt postage stamps, in 1843. The stamps reached America in the same year, being introduced by the government of Brazil. That of the United States did not adopt them until 1847; but a tentative issue was made by the post office of New York in 1845. An adhesive stamp was also issued at St Louis in the same year, and in Rhode Island in the next. In Europe the Swiss cantons of Geneva (1844) and of Basel (1845) soon followed the example set by Zurich. In the Russian Empire the use of postage stamps became general in 1848 (after preliminary issues at St Petersburg and in Finland in 1845). France issued them in 1849. The same year witnessed their intro- duction into Tuscany, Belgium and Bavaria, and also into New South Wales. Austria, Prussia, Saxony, Spain, Italy, followed in 1850. The use of postage stamps seems to have extended to the Hawaiian Islands (1851?) a year before it reached the Dutch Netherlands (1852). Within twenty-five years of the first issue of a postage stamp in London, the known varieties, issued in all parts of the world, amounted to 1391. Of these 841 were of European origin, 333 were American, 59 Asiatic, 55 African. The varieties of stamp issued in the several countries of Oceania were 103. Of the whole 1391 stamps no less than 811 were already obsolete in 1865, leaving 580 still in currency.

English Issues (i.) Line-engraved Stamps.

Halfpenny Stamp. — First issue, October I, 1870: size 18 mm. by 14 mm.; lake-red varying to rose-red.

One Penny Stamp. — First issue, 1st (for 6th) May 1840 : the head executed by Frederick Heath, from a drawing by Henry Corbould of William Wyon's medal struck to commemorate her majesty's visit to the City of London on the 9th of November 1837 : size 22 J mm. by I8f mm.; black, watermarked with a small crown; a few sheets in 1841 struck in red, two essays were made in April and October 1840 in blue and blue-back; imperforate. The second issue, January 20, 1 841, differed only from the first issue as to colour — red instead of black. I(is stated 1 that the colour, " though always officially referred to as ' red,' was really a red- brown, and this may be regarded as the normal colour; but con- siderable variations in tone and shade (brick-red, orange-red, lake- red) occurred from time to time, often accentuated by the blueing of the paper, though primarily due to a want of uniformity in the method employed for preparing the ink." The change of colour from black was made in order to render the

obliteration (now in black instead of red ink) more distinct; imperforate. Third issue, February 1854: small crown watermark; perforated 16 (i.e. 16 holes to 2 centimetres). The fourth issue, January 1855, differed only from the third issue in being perforated 14. Fifth issue, February 1855: from a new die, with minute variations of engraving. In the second die the eyelid is more distinctly shaded, the nostril more curved, and the band round the hair has a thick dark line forming its lower edge. Small crown watermark; perfor- ated 16 and 14. Sixth issue, July 1855: large crown watermark; perforated 14; a certain number 16. Seventh issue, January 1858: carmine-rose varying from pale to very deep. Large crown watermark; perforated, chiefly 14. Eighth issue, April 1, 1864:

1 Wright and Creeke, History of the Adhesive Stamp of the British Isles available for Postal and Tefegrapk Purposes (London, 1899).

check-letters in all four corners instead of two only; large crown watermark; perforated 14.

In 1880 the line-engraved one penny stamps were superseded by the surface-printed one of similar value in Venetian red, designed and printed by Messrs De la Rue & Co.

Three-halfpenny Stamp. — October I, 1870: large crown water- mark; lake-red; perforated 14. Superseded in October 1880 by De la Rue's surface-printed stamp.

Twopenny Stamp. — First issue, 1st (for 6th) May 1 840: small crown watermark; light blue, dark blue; imperforate. Second issue, March 1841: small crown watermark; white line below " Postage" and above "Twopence"; dull to dark blue; imper- forate. Third issue, February (?) 1854: small crown watermark ; blue, dark blue; perforated 16. Fourth issue, March 1855: small crown watermark; blue, dark blue; perforated 14. Fifth issue, July 1855: large crown watermark; blue; perforated 16; blue, dark blue; perforated 14. Sixth issue, May (?) 1857: large crown watermark; white lines thinner, blue, dark blue; perforated 14; dark blue; perforated 16. Seventh issue, July 1858: large crown watermark; white lines as in fifth issue; deep to very deep blue; perforated 16. Eighth issue, April (?) 1869: large crown water- mark; white lines thinner; dull blue, deep to very deep blue, violet blue; perforated 14. Superseded in December 1880 by De la Rue's surface-printed stamp.

(ii.) Embossed Stamps.

Produced by Dryden Brothers, of Lambeth, from designs sub- mitted by Mr Ormond Hill of Somerset House, engraved after Wyon's medal.

Sixpence. — March 1, 1854: violet, reddish lilac, dark violet; imperforate. Superseded in October 1856 by De la Rue's surface-printed stamp.

Tenpence. — November 6, 1848: pale to very deep chestnut- brown; imperforate. Superseded by De la Rue's surface-printed stamp in 1867.

One Shilling. — September II, 1847: emerald green, pure deep green, yellow-green; imperforate. Superseded in November 1856 by De la Rue's surface-printed stamp.

(iii.) Surface-printed Stamps before 1880.

Twopence-half -penny. — First issue, July 1, 1875: small anchor watermark; lilac-rose; perforated 14. Second issue, May 1876: orb watermark; lilac-rose, perforated 14. Third issue, February 5, 1880: orb watermark; cobalt, and some ultramarine; perforated 14. Fourth issue, March 23, 1881: large crown watermark; bright blue; perforated 14.

Threepence. — All perforated 14. First issue, May 1, 1862: heraldic emblems watermark; carmine (pale to deep). Second issue, March I, 1865: same watermark as above; carmine-pink. Third issue, July 1 867: watermarked with a spray of rose; carmine- pink, carmine-rose. Fourth issue, July 1873- watermark as third issue; carmine- rose. Fifth issue, January 1, 1881: watermark large crown; carmine-rose. Sixth issue, January 1, 1883; watermark as fifth issue; purple shades overprinted with value in deep pink.

Fourpence. — All perforated 14. First issue, July 31, 1855: watermark small garter; deep and dull carmine. Second issue, February 1856: watermark medium garter; pale carmine. Third issue, November I, 1856: watermark medium garter; dull rose. Fourth issue, January 1857: watermark large garter; dull and pale to deep rose, pink. Fifth issue, January 15, 1862: water- mark large garter; carmine- vermilion, vermilion-red. Sixth issue, July 1865: watermark large garter; pale to dark vermilion. Seventh issue, March 1, 1876: watermark large garter; pale vermilion. Eighth issue, February 27, 1877: watermark large garter; pale sage-green. Ninth issue, July 1880: watermark large garter; mouse-brown. Tenth issue, January I, 1881: watermark large crown; mouse-brown.

Sixpence. — All perforated 14. First issue, October 21, 1856: no letters

in angles; watermark heraldic emblems; dull lilac. Second issue, December 1 , 1 862 : small white letters in angles ; otherwise as first issue. Third issue, April 1, 1865: large white letters in angles; otherwise as first issue. Fourth issue, June 1867: water- mark spray of rose; otherwise as third issue; some in bright lilac. Fifth issue, March 1869: as fourth issue; lilac, deep lilac, purple- lilac. Sixth issue, April 1, 1872: as fourth issue; bright chestnut- brown. Seventh issue, October 1872: as fourth issue; buff. Eighth issue, April 1873: as fourth issue; greenish grey. Ninth issue, April 1 , 1 874 : watermarked as fourth issue ; large coloured letters in angles; greenish grey. Tenth issue, January I, 1881: large crown watermark; otherwise as ninth issue. Eleventh issue, January 1, 1883: as tenth issue; purple, overprinted with value in deep pink.

Eighlpence. — September n, 1876: watermark large garter; chrome-yellow, pale yellow; perforated 14.

Ninepence. — All perforated 14. First issue, January 15, 1862: watermark heraldic emblems; ochre-brown, bright bistre. Second issue, December I, 1865: watermark as above; bistre-brown, straw. Third issue, October 1867: watermark spray of rose; straw.

Tenpence. — July 1, 1867: watermark spray of rose; red-brown; perforated 14.

One Shilling. — All perforated 14. First issue, November 1, 1856: watermark heraldic emblems; no letters in angles; dull green, pale to dark green. Second issue, December I, 1862: as above; small white letters in angles; pale to dark green. Third issue, February 1865: as above; large white letters in angles; pale to dark green, bluish green. Fourth issue, August 1867: water mark spray of rose; otherwise as third issue; pale to dark green, bluish green. Fifth issue, September 1873: large coloured letters in angles; otherwise as fourth issue; light to dark green, bluish green. Sixth issue, October 14, 1880: as fifth issue; pale red- brown. Seventh issue, June 15, 1881 : watermark large crown; otherwise as sixth issue ; pale red-brown.

Two Shillings. — Watermark spray of rose; perforated 14. First issue, July I, 1867: pale to full blue, very deep blue. Second issue, February 1880: light brown.

Five Shillings. — First issue, July 1, 1867: watermarked with a cross

pate; pink, pale rose; perforated 15 J by 15. Second issue, November 1882: watermark large anchor; carmine-pink; perfor- ated 14.

Ten Shillings. — First issue, September 26, 1878: watermark cross pale; green-grey; perforated 15J by 15. Secondissue, February 1883: watermark large anchor; green-grey; perforated 14.

One Pound. — First issue, September 26, 1878: watermark cross pate; brown-violet; perforated 15 J by 15. Secondissue, December 1882 : watermark large anchor; brown-violet; perforated 14. (iv.) After 1880. In 1880-1881 the halfpenny, penny, three-halfpenny and two- penny surface-printed stamps superseded the line-engraved stamps of the same value, and a new surface-printed stamp of fivepence was introduced. These stamps are distinguished from the stamps already described by the absence of plate-numbers and (except in the penny stamp) of check-letters in the corners; also by the coarser style of engraving necessary for printing by machines driven by steam-power.

One Halfpenny. — -First issue, October 14, 1880: large crown watermark; pale green, bluish green, dark green; perforated 14. Second issue, April 1, 1884: slate-blue.

One Penny. — January I, 1880: large crown watermark; Venetian red; perforated 14.

Three-halfpence. — October 14, 1880: large crown watermark ; Venetian red; perforated 14.

Twopence. — December 8, 1880: large crown watermark; pale to very deep carmine red; perforated 14.

Fivepence. — March 15, 1881 : large crown watermark; dark dull indigo, indigo-black; perforated 14.

The Customs and Inland Revenue Act which came into force on June I, 1881, made it unnecessary to provide separate penny stamps for postal and fiscal purposes. By an act of 1882 (45 & 46 Vict. c. 72) it became unnecessary to provide separate stamps for postal and fiscal purposes up to and including stamps of the value of as. 6d. A new series was therefore issued : —

One Penny. — All perforated 14. First issue, July 12, 1881: large crown watermark; 14 pearls in each angle; purple-lilac, purple. Second issue, December 12, 1 881: as first issue; 16 pearls in each angle; purple.

Three-halfpence. — April 1,. 1884: large crown watermark; purple; perforated 14.

Twopence. — Ditto. Twopence-halfpenny. — Ditto. Threepence. — Ditto.

Four pence. — Ditto, except in colour (sea-green). Fivepence. — As fourpence. Sixpence. — Ditto. Ninepence. — Ditto.

One Shilling. — Ditto. ,- ‘

Two Shillings and Sixpence. — July 22, 1883: watermark large anchor; purple, dull lilac, dark purple; perforated 14.

Five Shillings. — April I, 1884: ditto; pale to very deep carmine.

Ten Shillings. — Ditto ; pale blue, cobalt, light to dull blue.

One Pound. — First issue, April 1, 1884: large crown watermark,

3 appearing in each stamp; brown- violet ; perforated 14. Second,

issue, January 27, 1891: same watermark; bright green; perforated

14.

Five Pounds. — March 21, 1882: large anchor watermark; orange-vermilion, vermilion, bright vermilion; perforated 14.

Following upon the report of a committee of officials of the General Post Office and Somerset House, a series of new stamps, commonly known as the ” Jubilee ” issue, was introduced on January I, 1887, all of which between one halfpenny and one shilling exclusive were printed eithf.r in two colours or on a coloured paper, so that each stamp was printed in part in one or other of the doubly fugitive inks—green and purple.

One Halfpenny. — January I, 1887: large crown watermark; orange-vermilion to bright vermilion; perforated 14.

Three-halfpence. — January 1, 1887: as the halfpenny; green and purple.

Twopence. — Ditto : green and scarlet to carmine. Twopence-halfpenny. — January 1, 1887: blue paper; watermark large crown ; dark purple ; perforated 14.

Threepence.ra.mxaiy I, ,1887: yellow paper; watermarked with a large crown; purple; perforated 14.

Fourpence.—]a.ii\ia.ry 1, 1887: watermark and perforation as in threepence; green and 1 brown.

Fourpence-half penny. — September 15, 1892: as the fourpence; green and carmine.

Fivepence. — January 1, 1887: as the fourpence; purple and blue. Sixpence. — January I, 1887: pale red paper; watermarked with a large crown; purple; perforated 14.

Ninepence. — January 1, 1887: large crown watermark; purple and. blue; perforated ,14. ;

Tenpence.— February 24, 1890: as the ninepence; purple and carmine-red.

One Shilling. — January 1 , 1 887 : as the ninepence ; green. • The various fiscal stamps admitted to postage uses, the over- printed official , stamps for use by government departments, and the stamps specially , surcharged for use in the Ottoman Empire, do not call for detailed notice in this article.

The distinctive telegraph stamps are as follows : — One Halfpenny. — ‘April 1, 1880: shamrock watermark; orange vermilion; perforated 14.

One Penny. — February 1, 1876: as the halfpenny; reddish brown.

Threepence.— -Perforated 14. First issue, February 1, 1876: watermark spray of rose; carmine. Second issue, August 1881: watermark large crown ; carmine.

Fourpence. — March I, 1877: watermark large garter; pale sage-green; perforated 14.

Sixpence. -ˆVe-rl orated 14. First issue, March 1, 1877: water- mark spray of rose; greenish-grey. Second issue, July 1881 : as first issue; watermark large crown.

One Shilling. — Perforated 14. First issue, February I, 1876: watermark spray of rose; green. Second issue, October 1880: watermark spray of rose; pale red-brown. Third issue, February 1 88 1 : watermark large crown; pale red brown.

Three Shillings. — Perforated 14; slate blue. First issue, March I, 1877: watermark spray of rose. Second issue, August 1 881: watermark large crown.

Five Shillings. — First issue, February 1, 1876: watermark cross pate; dark to light rose; perforated 15 by 155. Second issue, August 1 881: watermark large anchor; carmine-rose; perforated

14.

Ten Shillings. — March 1, 1877; watermark cross pate; green- grey; perforated 15 by 15J.

One Pound. — March I, 1877: watermark shamrock; brown- purple; perforated 14.

Five Pounds. — March I, 1877: watermark shamrock; orange-vermilion: perforated 15! by 15,

In addition to these, there were stamps specially prepared for the army telegraphs.

British Colonies and Dependencies

Australian Commonwealth. — In 1905 there were 6654 post offices open; 311,401,539 letters and cards, 171,844,868 news- papers, book-packets and circulars, 2,168,810 parcels, and 13,680,239 telegrams were received and despatched; the revenue was £ 2 >73 8 ,i46 and the expenditure £2,720,735.

New Zealand. — In 1005 there were 1937 post offices open; 74,767,288 letters and cards, 47,334,263 newspapers, book- packets and circulars, 392,017 parcels,, and 5,640,219 telegrams were dealt with. T: he revenue from the post office was £410,968, and from telegraphs £273,911, while the expenditure on the post office was £302,146 and on telegraphs £276,581.

Dominion of Canada. — In 1905 there were 10,879 post offices open; 331,792,500 letters and cards, 60,405,000 newspapers, book-packets and circulars,: and 58,338 parcels were received and despatched. The revenue from the post office amounted to £1,053,548, and from telegraphs £28,727, while the expendi- ture was, on the post office £952,652 and on telegraphs £78,934.

Cape of Good Hope. — The number of post offices open in 1905 was 1043; 7,596,606 letters and cards, 3,706,960 newspapers, book-

packets and circulars, 536,800 parcels, and 6,045,228 telegrams were dealt with. The revenue from the post office was £423,056, and from telegraphs £206,842 the expenditure being, £456,171 on the post office and £272,863 on telegraphs.

British India. — In 1905 there were 16,033 P ost offices open; 597,707,867 letters and cards, 76,671,197 newspapers, book- packets and circulars, 4,541,367 parcels, and 9,098,345 tele- grams were dealt with. The revenue from the post office was £1,566,704 and from telegraphs £733,193, while the expenditure was, on the post office, £1,199,557 and on telegraphs £546,914.

POST, AND POSTAL SERVICE

r 93

France

The French postal system was founded by Louis XI. (June 19, 1464), was largely extended by Charles IX. (1565), and received considerable improvements at various History. periods under the respective governments of Henry IV. and Louis XIII. (1603, 1622, 1627 seq.). 1 In 1627 France originated a postal money-transmission system, a system of cheap registration for letters. The postmaster who thus anticipated modern improvements was Pierre d'Almeras, a man of high birth, who gave about £20,000 (of modern money) for the privilege of serving the public. The turmoils of the Fronde wrecked much that he had achieved. The first farm of postal income was made in 1672, and by farmers it was adminis- tered until June 1790. To increase the income postmaster- ships for a long time were not only sold but made hereditary. Many administrative improvements of detail were introduced, indeed, by Mazarin (1643), by Louvois (c. 1680 seq.), and by Cardinal de Fleury (1728); but many formidable abuses also continued. The revolutionary government transferred rather than removed them. Characteristically, it put a board of post- masters in room of a farming postmaster-general and a con- trolling one. Napoleon (during the consulate 2) abolished the board, recommitted the business to a postmaster-general as it had been under Louis XIII., and greatly improved the details of the service; Napoleon's organization of 1802 is, in substance, that which now obtains, although, of course, large modifications and developments have been made from time to time. 3

The university of Paris, as early as the 13th century, pos- sessed a special postal system, for the abolition of which in the 1 8th it

received a large compensation. But it continued to possess certain minor postal privileges until the Revolution. 4

Mazarin's edict of the 3rd of December 1643 shows that France at that date had a parcel post as well as a letter post. That edict creates for each head post office throughout the kingdom three several officers styled respectively (1) comptroller, (2) weigher, (3) assessor; and, instead of remunerating them by salary, it directs the addition of one-fourth to the existing letter rate and parcel rate, and the division of the surcharge between the three. Fleury's edicts of 1728 make sub-postmasters directly respon- sible for the loss of letters or parcels; they also make it necessary that senders should post their letters at an office, and not give them to the carriers, and regulate the book-post by directing that book parcels (whether MS. or printed) shall be, open at the ends. 5 In 1758, almost eighty years after Dockwra's estab-lishment of a penny post in London, an historian of that city published an account of it, which in Paris came under the eye of Claude Piarron de Chamousset, 6 who obtained letters-patent to do the like, and, before setting to work or seeking profit for himself, issued a tract with the title, Memoire sur la petile-poste etablie a Londres, sur la modele de laquelle on pourrait en itablir de semblables dans les plus grandes villes d'Europe. The reform was successfully carried out.

By this time the general post office of France was producing

1 For the details, see Ency. Brit., 8th ed., xviii. 420-424, and Maxirne Du Camp, " L' Administration des Postes," in Revue des deux monies (1865), 2nd series, vol. lxvii. 169 seq.

2 28 Pluviose, an XII. = the 18th of February 1804.

3 Le Quien de la Neufville, Usages des postes (1730), pp. 59-67, 80, 121-123, 147-149, 286-291; Maxime du Camp, op. cit. passim; Pierre Clement, Appreciation des consequences de la reforme postale, passim: Loret, Gazette rime'e (Aug. 16, 1653); Furetiere, Le Roman Bourgeois (in Du Camp, ut supra) ; " Die ersten Posteinricht- urtgen, u.s.w., " in L' Union postale, viii. 138; Ordonnances des Rois de France, as cited by A. de Rothschild, Histoire de la poste-aux- lettres (3rd ed., 1876), i. 171, 216, 269. We quote M. de Rothschild's clever book with some misgivings. It is eminently sparkling in style, and most readable; but its citations are so given that one is constantly in doubt lest they be given at second or even at third hand instead of from the sources. The essay of M. du Camp is, up to its date, far more trustworthy. He approaches his subject as a publicist, M. de Rothschild as a stamp-collector.

4 There are several charters confirmatory of this original privilege. The earliest of these is of 1296 (Philip ” the Fair “).

6 Ordonnances, &c, as above.

6 There is an interesting biographical notice of Piarron de Chamousset in Le Journal officiel of July 5, 1875. XXII. 7

a considerable and growing revenue. In 1676 the farmers had paid to the king £48,000 in the money of that day. A century later they paid a fixed rent of £352,000, and covenanted to pay in addition one-fifth of their net profits. In 1788 — the date of the last letting to farm of the postal revenue- — the fixed and the variable payments were commuted for one settled sum of £480,000 a year. The result of the devastations of the Revolu- tion and of the wars of the empire together is shown strikingly by the fact that in 18 14 the gross income of the post office was but little more than three-fifths of the net income in 1788. Six years of the peaceful government of Louis XVIII. raised the gross annual revenue to £928,000. On the eve of the Revolution of 1830 it reached £1,348,000. Towards the close of the next reign the post office yielded £2,100,000 (gross). Under the revolutionary government of 1848-1849 it declined again (falling in 1850 to £1,744,000); under that of Napoleon III. it rose steadily and uniformly with every year. In 1858 the gross revenue was £2,296,000, in 1868 £3,596,000.

The ingenuity of the French postal authorities was severely tried by the exigencies of the German War of 1870-71. The first contrivance was to organize a pigeon service (see p»_ eo „ „_ d also Pigeon Post), carrying microscopic despatches B fn ooa prepared by the aid of photographic appliances. 7 The Posts _ number of postal pigeons employed was 363, of which number fifty-seven returned with despatches. During the height of the siege the English postal authorities received letters for transmission by pigeon post into Paris by way of Tours, subject to the regulations that no information concerning the war was given, that the number of words did not exceed twenty, that the letters were delivered open, and that 5d. a word, with a registra- tion fee of 6d., 8 was prepaid as postage. At this rate the postage of the 200 letters on each folio was £40, that on the eighteen pellicles of sixteen folios each, carried by one pigeon, £11,520. Each des- patch was repeated until its arrival had been acknowledged by balloon post ; consequently many were sent off twenty and some even more than thirty times. The second step was to establish a regular system of postal balloons, fifty-one being employed for letter service and six for telegraphic service. To M. Durnouf

belongs much of the honour of making the balloon service successful. On the basis of experiments carried out by him a decree of the 26th of September 1870 regulated the new postal system. Out of sixty- four several ascents, each costing on the average about £200, fifty-seven achieved their purpose, notwithstanding the building by Krupp of twenty guns, supplied with telescopic apparatus, for the destruction of the postal balloons. Only five were captured, and two others were lost at sea. The aggregate weight of the letters and newspapers thus aerially mailed by the French post office amounted to about eight tons and a half, including upwards of 3,000,000 letters; and, besides the aeronauts, ninety-one passengers were conveyed. The heroism displayed by the French balloon postmen was equalled by that of many of the ordinary letter- carriers “in the conveyance of letters through the catacombs and quarries of Paris and its suburbs, and, under various disguises, often through the midst of the Prussian army. Several lost their lives in the discharge of their duty, in some cases saving their despatches by the sacrifice. 9 During the war the Marseilles route for the Anglo-Indian mails was abandoned. They were sent through Belgium and Germany, by the Brenner Pass to Brindisi, and thence by Italian packets to Alexandria. The French route was resumed in 1872. 10

‘ The despatches carried by the pigeons were in the first instance photographed on a reduced scale on thin sheets of paper, the original writing being preserved, but after the ascent of the twenty-fifth balloon leaving the city an improved system was organized. The communications, whether public despatches, newspapers or private letters, were printed in ordinary type, and micro-photographed on to thin films of collodion. Each pellicle measured less than 2 in. by I, and the reproduction of sixteen folio pages of type contained above 3000 private letters. These pellic’es were so light that 50,000 despatches, weighing less than. I gramme, were regarded as the weight for one pigeon. In order to ensure their safety during transit the films were rolled up tightly and placed in a small quill which was attached longitudinally to one of the tail feathers of the bird. On their arrival in Paris they were flattened out and thrown by means of the electric lantern on to a screen, copied by clerks, and despatched to their destination. This method was afterwards improved upon, sensitive paper being substituted for the screen, so that the letters were printed at once and distributed.

8 Seventeenth Report of the Postmaster-General, p. 7.

9 Boissay, ” La Poste et la t<51egraphie pendant le siSge de Paris," in Journal des economistes, 3rd series, vol. xxii. pp. 1 17-129 and pp.

273-282. Cf. Postal Gazette (1883), i. 7.

10 Sixteenth Report of the Postmaster-General, p. 8.

The comparative postal statistics for all France during the years 1900 and 1905 stands thus; —

1900.

1905-

Letters

Post-cards

Newspapers, printed matter,

samples, circulars, &c. Value of money (French francs

orders . . (Internatl. ,, Value of postal orders . ,,

Receipts j ‘j-

No.

980,629,000 62,591,000

1,390,246,000

1,422,736,000

56,210,000

40,688,000

209,982,000

8,399,000

No.

1,113,090,000

450,889,000

1,441,713,000

1,834,360,000

73,229,000

54,582,000

261,454,000

10,458,000

The savings banks system of France, so far as it is connected with the postal service, dates only from 1875, and began then (at first) simply by the use of post offices as agencies and feeders for the pre-existing banks. Prior to the postal connexion the aggre- gate of the deposits stood at £22,920,000. In 1877 it reached £32,000,000. Postal savings banks, strictly so called, began only during the year 1881. At the close of 1882 they had 210,712 depositors, with an aggregate deposit of £1,872,938 sterling; in 1905 thev had 12,134,523 depositors, with an aggregate deposit of £229,094,155.

The union of the telegraph with the post office dates only from 1878. The following table gives the figures for 1900 and 1905:—

1900.

1905-

Length of line. . i kilometres & (miles .

Length of wire . j “|jˆ letres

Total gross receipts] rancs •

Number of messages forwarded:

Home service

International

Amount of International tele- graphic money orders: From foreign countries to France . (Total francs) From France to foreign countries . . (Total francs)

H7,559

73.004

388,814

24L453

43,977,ooo

1,759,000

36,723,000

3,374,ooo

6,145,455 6,124,913

129,826 80,622

418,331

259.784

46,490,000

1,860,000

39,433,ooo

3,686,000

10,239,546 4,754,960

The postal telephonic system began in 1879. table gives the figures for 190 1 and 1905: —

The following

1901.

1905.

Length of line . . j £»£*”• Length of wire . j £££*””

Receipts . . . j £ ancs ‘ ;

30,142

18,718

453,287

281,491

175,340,000

17,518,000

701,000

46,992 29,182

498,389

309,500

232,727,645

23,495,ooo

940,000

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mondes (1865), 3rd series; Revue des posies et telegraphes (pub. at various periods) ; A. de Rothschild, Histoire de la poste- lux-letlres (1875); ” Entwickelung des Post- u. Telegraphenwesens in Frankreich,” in Archiv f. Post. u. Telegraphic (1882); ” Die franzosischen Postsparkassen,” and other articles, in L’ Union poslale (Berne).

Austria-Hungary The Austrian postal system is among the oldest on record. Vienna possessed a local letter post and a parcel post, on the plan of prepayment, as early as May 1772, at which date no city in Germany possessed the like. This local post was es- tablished by a Frenchman (M. Hardy) and managed by a Dutch- man (Schooten). 1 Thirteen years after its organization it became merged in the imperial post. The separate postal organizations of the empire (Austria) and of the kingdom (Hungary) date from 1867. In Austria the post office and the telegraph office are

1 Loeper, ” Organisation des postes de ville,” in V Union postale vii. I seq.

placed under the control of the minister of commerce, in Hun- gary under that of the minister of public works. The following table gives the figures for 1900 and 1904: —

A ustria.

Post offices

Letters and post-cards

Newspapers

Packet post :

Ordinary packets .

Registered packets and letters .

Receipts …. Expenses ….

.No.

kilogs. kronen £ ■ ■ kronen

£ ■ ■

kronen

£ ■ ■

1900.

6,895

1,193,418,000

116,000,000

37,521,000

8,043,570,000

335,148,000

107,718,000

4,488,000

98,412,000

4,100,000

1904.

8,327

1,421,107,000

144,986,000

44,624,000

8,323,179,000

346,799,000

123,919,000

5,163,000 121,749,000

5,073,000

Hungary.

1900.

1904.

Post offices

. . No.

4,923

5,097

Letters, newspapers, &c. ,,

487,670,000

584,081,000

Packet post:

Ordinary packet

s . . ,,

17,730,000

21,367,000

Packets with

„ j 1 korona

and)£ ■ .

6,256,900,000

4,936,403,000

clared value

260,704,000

205,683,000

money letters

Reimbursements

and { korona

■ (£ ■ .

1,095,591,000

1,253,440,000

money orders

45,649,000

52,226,000

Postal orders

S korona

■{£ ■ •

27,470,000

30,397,000

1,145,000

1,266,000

Receipts

(korona .

■■(£..

47,103,000 1,962,000

57,067,000 2,378,000

Expenses .

(korona

■■ > £■■

39,912,000 1,663,000

44,560,000 1,857,000

German Empire The Prussian postal system developed mainly by the ability and energy of Dr Stephan, to whom the organization of the

International Postal Union 2 was so largely indebted, into the admirably organized post and telegraph office of the empire; — began with the Great Elector, and with the establishment in 1646 of a Government post from Cleves to Memel. Frederick II. largely extended it, and by his successor the laws relating to it were consolidated. In Strasburg a messenger code existed as early as 1443. A postal service was organized at Nurem- berg in 1570. In 1803 the rights in the indemnity-lands (Entschddigungsldnder) of the counts of Taxis as hereditary imperial postmasters were abolished. The first mail steam-packet was built in 1821; the first transmission of mails by railway was in 1847; the beginning of the postal administration of the telegraphs was in 1849; and, by the treaty of postal union with Austria, not only was the basis of the existing system of the posts and telegraphs of Germany fully laid, but the germ was virtually set of the International Postal Union. That treaty was made for ten years on the 6th of April 1850, and was immediately accepted by Bavaria. It came into full operation on the 1st of July following, and then included Saxony, Mecklenburg-Strelitz and Holstein. Other German states followed; and the treaty was renewed in August i860. The following table gives figures for 1900 and 1905: —

1900.

1905.

Post offices …. No. Letters received … ,, Letters and parcels {

received (value ■] . ,,

declared) . . ‘ 1000 marks Parcels received (value not j NT

declared) j 1

Postal orders re- (. . ,,

ceived . . } 1000 marks

32,135 2,893,555,000

10,508,000 15,984,425

I53,985,o o

126,217,209

7,868,860

33,105 3,855,369,000

10,518,000 16,215,800

186,038,000

162,800,261 9,807,934

2 The International Postal Union was founded at Berne in 1874. All the countries of the world belong to it, with the exception of Afghanistan, Baluchistan, China, Abyssinia and Morocco. Con- gresses have been held at Paris (1878), Lisbon (1885), Vienna (1891), Washington (1897) and Rome (1906).

POST, AND POSTAL SERVICE

J 95

Telegraphs. ‘

Length of line . \

of which under- < ground . . l

Length of wire . J

of which under- ground . Number of offices open to the public

Receipts .

kilometres

miles

kilometres

miles

kilometres

miles

kilometres

miles

(Marks • I £

Number of messages: Home service . International .

1900.

108,500

67.378

10,969

6,812

424,500

263,614

49.934 31,009

20,768

33.o65.590

1,625,724

28,643,849 12,356,840

I905-

H7,738

73,U5

1 1 ,460

7,117

469,801

291,746

52,014

32,301

26,912

39,592,009

1,946,607

30,275,833 15,300,309

1 Exclusive of Wurttemburg and Bavaria. Telephones.

1901.

1905.

Length of line . .miles Length of wire . . . ,, Number of messages

59,46o

731.174 766,226,337

85.450

1,672,415

1,207,400,000

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Italy

The origin of the Italian post office may be traced virtually to Venice and to the establishment of the ” Corrieri di Venezia ” early in the 16th century. As early as 1818 the Sardinian post office issued stamped letter-paper. The total number of letters, newspapers and book-packets conveyed in 1862 was but 1 n, 733, 3 10 – I n 19 00 there were 7234 post offices; letters con- veyed amounted to

180,349,449, post, cards 82,544,547, news- papers, &c, 301,495,580, samples 9,117,526, official letters, franked, 46,302,121, postal packets 8,170,988, and registered letters of a declared value of £12,931,026. The receipts amounted to £2,429,000 and the expenses to £1,980,000.

United States

The early history of the post office in the British colonies in North America has been referred to above. Benjamin Franklin was removed by the home department from his office of post- master-general in America in 1774. On the 26th of July 1775 the American Congress assumed direction of the post offices, re-appointing Franklin to his former post. Shortly afterwards, when Franklin was sent as ambassador to France, his son-in-law, Richard Bache, was made postmaster-general in November 1775.

In 1789 the number of post offices was 75; in 1800, 903; in 1825, 5677; in 1875, 35,734; in 1885, 51,252; in 1890, 62,401; in 1895, 70,064; in 1900, 76,688; and in 1905, 68,131.

The following table gives the financial statements for a num- ber of years: —

Year.

Extent of post routes in miles.

Revenue.

Expenditure.

1875 1880 1885 1890

1895 1900

1905

277,873 343.888

365.251 427,991 456,026 500,982 486,805

$26,791,360

33,315.479 42,560,844 60,882,097 76,983,128

102,354.579 152,826,585

$33,611,309 36,542,804

49,533.i5o

65.930,717 86,790,172 107,740,268 167,399,169

The revenue quoted does not include any allowance for the large quantity of official matter carried for other public departments, &c, indeed, the postmaster-general, in his Report for 1906, estimated that if the due allowance were made it would add approximately $20,000,000 to the revenue. The post office department is compelled to carry anything sent under a penalty frank, and franks are used by all the departments and their agents for the purpose of carrying everything they choose to send {Report, postmaster-general, 1893). The expenditure does not include the amounts certified to the Treasury for the transportation of mails over aided Pacific railways, or any allowance for the use of such buildings as are provided by the government.

Contrary to expectations repeatedly expressed, each year shows a deficit. This is partly explained by reductions in charges. The rate of postage on first-class matter was reduced from three cents to two cents on the 1st of October 1883, and the unit of weight was increased from half an ounce to one ounce on the 1st of July 1885. On the latter date, also, the postage on second-class matter was reduced from two cents to one cent per pound. This low rate has led to wholesale violation of the purpose of the law. In his report for 1899 Mr Emory Smith, postmaster-general, estimated that ” fully one-half of all the matter mailed as second-class, and paid for at the pound rate, is not properly second-class within the intent of the law”; and that the cost of mere transportation of this wrongly classed matter exceeded the revenue derived from it by more than $12,000,000 for the year.

Until 1863 the rates of postage were based upon the dis- tances over which the mails were conveyed. In 1846 these rates were — not exceeding 300 m., three cents; exceeding 300 m., ten cents. In 1851 the rates were reduced to three cents for distances not exceeding 3000 m. and ten cents for distances exceeding 3000 m. The use of adhesive postage stamps was first authorized by act of Congress, approved on the 3rd of March 1847, and on the 1st of June 1856 prepay- ment by stamps was made compulsory. In 1863 a uniform rate of postage without regard to distance was fixed at three cents, and on the 1st of October 1883, the rate was further reduced to two cents, the equivalent of the British penny postage.

All mail matter for distribution within the United States is divided into four classes. First-class matter includes letters, postal cards, post cards and anything sealed or closed against inspection. Second- class matter includes all newspapers and periodicals exclusively in print that have been ” entered as second-class matter,” and are regularly issued at stated intervals as frequently as four times a year from a known office of publication and mailed by publishers or newsagents to actual subscribers or to newsagents for sale, and newspapers and publications of this class mailed by persons other than publishers. The rates of postage to publishers are one cent a pound, and to other than publishers, one cent for each four ounces. Third-class matter includes printed books, pamphlets, engravings and circulars in print or reproduced by a copying process. The rate for third-class matter is one cent for each two ounces. Fourth-class matter is all mailable matter not included in the three preceding classes which is so prepared for mailing as to be easily withdrawn from the wrapper and examined. The rate is one cent for each ounce.

The franking privilege, which had grown to be an intolerable abuse, was temporarily abolished in 1 873, but the post office now carries free under official ” penalty ” labels or envelopes {i.e. envelopes containing a notice of the legal penalty for their un- authorized use) matter which is of an official character, the privilege being extended to congressmen and government officials (see Franking). As late as i860 the mails conveyed nothing but written and printed matter. They now admit nearly every known substance which does not exceed four pounds in weight (this re- striction does not apply to single books), and which from its nature is not liable to injure the mails or the persons of postal employes.

A delivery system existed in a number of cities of the Union in 1862, the carriers remunerating themselves by the collection of a voluntary fee of from one to two cents on each piece of mail delivered. A uniform free delivery system was first authorized by law on the 3rd of March 1863, and was established on the succeeding 1st of July in forty-nine cities. The number of carriers employed the first year was 685. On the 1st of July 1884 there were 3890 letter-carriers in one hundred and fifty- nine ” free delivery cities.”

The free delivery service has grown rapidly. On the 1st of July 1 901, 866 cities and towns were included in the scheme, and

16,389 letter-carriers were serving a population of 32,000,000. An extension to rural districts was started in 1896, and by December 1901, 4,000,000 of the rural population were within the scope of free delivery. Since the 1st of October 1885 a system has been in force for the immediate delivery by special messengers of letters, parcels, &c, for addresses within certain areas. A special ten-cent stamp (or its equivalent) is required in addition to the ordinary postage.

The registry system did not attain any degree of excellence until after i860; and the money-order system was first established in 1864. The aggregate number of money orders, domestic and foreign, issued during the fiscal year 1906 was 61,497,861, of the value of $507,563,719. A step towards the popularization of the registry system was authorized in December 1899; letter-carriers in many city districts now accept and register letters at the door of the householder. Sea post offices for sorting mails during the Atlantic transit were established in December 1890 on the steamers of the North German Lloyd and Hamburg-American lines, and later on the vessels of the International Navigation Company. This plan effects a saving of from two to fourteen hours in the delivery of mails from Europe. The issue of ” postal notes,” commenced in 1883, was abandoned in 1894. The introduction of ” postal checks ” for small fixed amounts has been advocated. A new postal convention with Canada, removing the former restriction against sending merchandise, came into force on the 1st of March 1888. Uniformity of postage rates having been previously estab- lished, the United States and Canada became virtually one postal territory.

A convention for an exchange of parcels with Jamaica, admitting articles not exceeding 11 lb, was agreed to in 1887; and since then conventions on similar lines have been concluded with other colonies and countries in America. The first arrangement of the kind with any European country was made with Germany, and came into operation on the 1st of October 1899. The postal laws, regulations and domestic conditions of the United States have been extended, by act of Congress, to Porto Rico and Hawaii. The ” island possessions ” (Guam, the Philippine Archipelago and Tutuila) have also been brought within the scope of the domestic conditions, including the rates of postage. The service introduced into Cuba, though modelled on the American plan, is practically autonomous.

Telegraphs. — The formation of a postal telegraph system has continued to be a subject of discussion by the postmasters- general. In his report for the year 1888 D. M. Dickinson pro- posed the appointment of an expert commission authorized to erect short

experimental lines. His successor, John Wana- maker, for four years vigorously advocated a limited postal telegraph service. Under this proposal, contracting telegraph companies were to furnish lines, instruments and operators, and to transmit messages at rates fixed by the government; the department was to receive a small sum per message, to cover its expenses in collection and delivery. In 1894 Mr Bissell expressed the opinion that a government system would be unprofitable and inexpedient.

Savings Banks. — The establishment of postal savings banks was also recommended by Mr Wanamaker in his reports for the years 1889 to 1892, and by J. A. Gary in 1897. What is regarded as a step in this direction was taken in 1898, when the postal regulations were modified to allow money orders to be made payable at the office of issue, — a ” mild and very convenient adaptation of the European savings bank system, without the payment of interest” (Mr Emory Smith). Finally in 1910 a system of postal savings banks was authorized by Congress. Authorities. — Postmaster-General’s Annual Reports: Joyce, History of the British Post Office (1893); J. Wilson Hyde, The Post in Grant and Farm (1894); A. H. Norway, History of the Packet Service (1895); F. E. Baines, Forty Years at the Post Office (1895); Raikes, Life of Rt. Hon. II. C. Raikes (1898); L’ Union postale universelle, sa fondation et son developpement (Lausanne, 1900) ; memoire publie par le bureau international a l’occasion de la celebration du xxv me anniversaire de l’union 2-5 juillet 1900; Sta- tislique generate du service postal (Bern) ; Statistique generate de la telegraphie (Bern).

The various postal and telegraph rates and regulations of the United Kingdom appear in the quarterly Post Office Guide (price 6d.). For the United States, see the U.S. Official Postal GuideSJ. A. I.)

POST AND PAIR, a card game popular in the 16th and 17th centuries. A hand consisted of three cards, a pair royal ranking highest, or failing this, the highest pair. Another name of the game was Pink.

POSTER, a placard in the form either of letterpress or illustration, for posting up or otherwise exhibiting in public to attract attention to its contents. According to Brewer’? Dictionary of Phrase and Fable, before the Fire of London the rails and posts which protected foot-passengers in the streets were used for affixing theatrical and other announcements, whence the name of posting-bills or posters; and in later times the name has come more generally into use for any fairly large separate sheet, illustrated or not, used to attract publicity, even though not actually posted up. In the article Advertisements the use of

posters is discussed, and newspaper posters (or contents bills) under Newspapers. But the illustrated poster has come to represent a special form of artistic design.

The earliest examples of pictorial posters were adorned with rough woodcuts. When lithography became a common commercial process, wood-blocks ceased to be employed. The modern artistic poster made a definite beginning in France about 1836, with a design by Lalance to advertise a book entitled Comment meurent les femmes. His example was followed by C. Nanteuil, D. A. M. Raffet, Gavarni, Bertrand, Grandville, Tony Johannot, E. de Beaumont, T. H. Frere, Edouard Manet and other artists of high repute. Most of these early designs were printed in black on white or tinted paper. Between i860 and 1866 crude attempts at print- ing posters in colours were made in both France and England; In 1866 Jules Cheret began what was destined to be the most noticeable series of pictorial placards in existence, a series containing over a thousand items. Cheret was originally employed in a litho- graphic establishment in England before he began to work for him- self, and he used his knowledge there acquired to adapt all three primary colours, economically used, to astonishingly brilliant ends. For a considerable time he remained without a rival, though he had hosts of imitators. Eugene Grasset, a decorative designer of great versatility, produced the first of a small number of placards which, though inferior as advertisements tp those of Cheret, were learned and beautiful decorations. Somewhat later a sensation was caused in Paris by the mordantly grotesque posters of Henri de Toulouse-Lautrec, in which the artist reduced detail to a mini- mum and obtained bold effects by the. employment of large masses of flat colour. Important work, similar in character to Lautrec's, was produced by Ibels, Bonnard, T. A. Steinlen and others. A new and contrary direction was given. to poster design by Mucha, a Hungarian resident in Paris, whose placards are marked by delicate colour and richness of detail. The ;following are amongst French artists who have designed posters of conspicuous merit: J. L. Forain, Willette, Paleologue, Sinet, Jossot, Roedel, Mayet, Cazals, Biais, De Feure, A. Guillaume, Ranft, Realier-Dumas, F. Valloton and Metivet. Occasionally eminent French painters, such as Carriere, Boutet de Monvel, Aman-Jean, Schwabe, have made essays in poster-designing.

In England the first artists of repute to attempt the pictorial placard were Godfroy Durand and Walter Crane; but the first bill to attract widespread attention was one by Fred Walker to advertise a dramatized Version of The Woman in White (1871). This was engraved on wood by W. H. Hooper. Shortly after this time pictures by Royal Academicians and others began to be re- produced as

advertisements (the best-known case being that of Sir John Millais's " Bubbles "), but these have nothing directly to do with poster-designing. Stacy Marks, Hubert von Herkomer (the great poster for the Magazine of Art), Sir Edward Poynter and Sir James Linton are among popular painters who have made special drawings for reproduction as posters.

About 1894 the English poster began to improve. Designs by Aubrey Beardsley for the Avenue Theatre, by Dudley Hardy for various plays, and by Maurice Greiffenhagen for The Pall Mall Budget, were widely noticed by reason Of their originality, sim- plicity and effectiveness. Simplicity was carried even farther by " the Beggarstaff Brothers " (James Pryde and William Nicholson), whose posters are perhaps the most original yet produced by Englishmen. Among other British designers the following have executed artistic and interesting placards: Frank Brangwyn, R. Anning Bell, John Hassall, Cecil Aldin, Phil May, Leonard Raven-Hill, Henry Harland, Robert Fowler, Wilson Steer, Charles R. Mackintosh, MacNair and MacDonald, Edgar Wilson, Charles I. Foulkes, Mabel Dearmer, Albert Morrow and C. Wilhelm.

Poster design on the continent of Europe has been largely influ- enced by French work, but designs of much originality have been made in Germany, Belgium, Italy and Spain. In Germany, among the most typical posters are those of Sattler, Otto Fischer, Gysis, T. T. Heine, Speyer, Max Klinger, Dasio, Hofmann and L. Zumbrusch. The principal Belgian designers include Privat Livemont, Rassenfosse, Berchmans, Meunier, Duyck and Crespin, V. Mignot, Donnay, Evenepoel, Cassiers and Toussaint. Of Italian designers those whose work is most characteristic are Mata- loni and Hohenstein; while the best Spanish posters — those to advertise bull-fights and fairs — are mostly anonymous. The Spanish artists Utrillo and Casas have signed posters of more than

ordinary merit. Curious if not very artistic bills have been pro- duced in Russia; and in Austria good work has been done by Orlik, Schliessmann, Oliva and Hynais.

In the United States of America, however, with the exception of some designs by Matt Morgan, few posters of artistic interest were produced before 1889, in which year Louis J. Rhead commenced a notable series of decorative placards. Will H. Bradley began to produce his

curious decorative grotesque posters a little later. If American artists are behind Europeans in the artistic designing of large posters they have no rivals in the production of small illustrated placards for publishers of books and magazines. Chief among those who have devoted themselves to this branch of poster design is Edward Penneld. Others who have achieved success in it include Maxfield Parrish, Ethel Reed, Will Carqueville, J. J. Gould, J. C. Leyendecker, Frank Hazenplug, Charles Dana Gibson, Will Denslow, Florence Lundbourg and Henry Mayer.

Exhibitions of artistic posters have been held in the chief cities of Europe and America, and the illustrated placard has already a literature of its own. In England a monthly magazine (The Poster) was for a time specially devoted to its interests, and col- lectors are numerous and enthusiastic.

See Ernest Maindron, Les Affiches illustrees (Paris, 1895); Les Maitres de I'affiche (Paris) ; Les Affiches etrangeres illustrees (Belgium, Austria, Great Britain, United States, Germany and Japan) (Paris, 1897); Charles Hiatt, Picture Posters (London, 1895); J. L. Spousel, Das Moderne Plakat (Dresden, 1897); Arsene Alexandre, M. H. Spielmann, H. C. Bunner and A. Jaccacci, The Modern Poster (New York, 1895). ' (C. Hi.)

POSTERN (from 0. Fr. posterne, posterle, Late Lat. posterula, small back-door, posterus, behind), a small gateway in the enceinte of a castle, abbey, &c, from which to issue and enter unobserved. They are often called " sally ports." (See Gate.) POSTHUMOUS, that which appears or is produced after the author or creator, and thus applied to a literary work or work of art published or produced after its author's death, or especially to a child born after the death of its father. The Latin postumus, latest, last, from which the word is derived, is formed from post, after, but it was in Late Latin connected with humare, to place in the ground (humus), to bury.

POSTICHE, a French term for a pretentious imitation, a counterfeit, particularly used of an inartistic addition to an otherwise perfect work of art. The French word was adapted from the Italian posticcio, from' Latin positus, placed, added.

POSTIL, or Apostil, properly a gloss on a scriptural text, particularly on a gospel text, hence any explanatory note on other writings. The word is also applied to a general commen- tary, and also to a homily or discourse on the gospel or epistle appointed for the day. The word in Medieval Latin was postilla, and this has been taken to represent

post ilia sc. verba textus, i.e. ” after these words of the text ” (see Du Cange, Glossarium, s.v. postillae), but the form ” apostil ” may point to the Latin appositum, placed near or next to.

POSTILION (through the Fr. from the Ital. postiglione), a postboy, rider of a post-horse, hence any swift messenger, but more particularly the rider of the near horse of a vehicle drawn by two or more horses where there is no driver. The swift travelling postchaises of the 18th and early 19th centuries were usually driven by postilions.

POSTUMIA, VIA, an ancient highroad of northern Italy, constructed in 148 B.C. by the consul Spurius Postumius Albinus. It ran from the coast at Genua through the mountains, to Dertona, Placentia (the termination of the Via Aemilia Lepidi) and Cremona, just east of the point where it crossed the Po. From Cremona the road ran eastward to Bedriacum, where it forked, one branch running to the left, to Verona and thence to the Brenner, the other to the right to Mantua, Altinum and Aquileia. The military occupation of Liguria depended upon this road, and several of the more important towns owed their origin largely to it. Cremona was its central point, the distances being reckoned from it both eastwards and westwards.

(T. As.)

POSY (a shortened form of poesy, Fr. poesie, poetry), a

verse of poetry or a motto, either with a moral or religious

sentiment or message of love, often inscribed in a ring or sent

with a present, such as a bouquet of flowers, which may be the

It has been suggested that this use is due to the custom of the symbolic use of flowers. Skeat quotes the title of a tract (Heber’s MSS. No. 1442), ” A new yeare’s guifte, or a posie made upon certen flowers,” &c. ” Posy rings,” plain or engraved gold rings with a ” posy ” inscribed on the inside of the hoops, were very frequently in use as betrothal rings from the 16th to the 18th centuries. Common ” posies ” were such lines as ” In thee my choice I do rejoice,” ” As God decreed so we agreed,” and the like. There are several rings of this kind in the British Museum;

POTASHES, the crude potassium carbonate obtained by lixiviating wood ashes and evaporating the solution to dryness, an operation at one time carried out in iron pots — hence the name from ” pot ” and ” ashes.” The term potash or caustic potash is frequently used for

potassium hydroxide, whilst such a phrase as sulphate of potash is now appropriately replaced by potassium sulphate. (See Potassium.)

POTASSIUM [symbol K (from kalium), atomic weight 39-114 = i6)], a metallic chemical element, belonging to the group termed the metals of the alkalis. Although never found free in nature, in combination the metal is abundantly and widely distributed. In the oceans alone there are estimated to be 1141X10 12 tons of sulphate, K2SO4, but this inexhaustible store is not much drawn upon; and the “salt gardens” on the coast of France lost their industrial importance as potash-producers since the deposits at Stassfurt in Germany have come to be worked. These deposits, in addition to common salt, include the following minerals: sylvine, KC1; carnallite, KCl-MgCl 2 -6H 2 (transparent, deliquescent crystals, often red with diffused oxide of iron); kainite, K 2 S04-MgS0 4 MgCl 2 6H 2 (hard crystalline masses, permanent in the air) ; kieserite MgS0vH 2 O (only very slowly dissolved by water) ; besides polyhalite, MgSGvK 2 SOV2CaSGv2H 2 0 anhydrite, CaS0 4 ; salt, NaCl, and some minor components. These potassium minerals are not con- fined to Stassfurt; larger quantities of sylvine and kainite are met with in the salt mines of Kalusz in the eastern Carpathian Mountains. The Stassfurt minerals owe their industrial import- ance to their solubility in water and consequent ready amenability to chemical operations. In point of absolute mass they are insignificant compared with the abundance and variety of potas- siferous silicates, which occur everywhere in the earth’s crust; orthoclase (potash felspar) and potash mica may be quoted as prominent examples. Such potassiferous silicates are found in almost all rocks, both as normal and as accessory components; and their disintegration furnishes the soluble potassium salts which are found in all fertile soils. These salts are sucked up by the roots of plants, and by taking part in the process of nutrition are partly converted into oxalate, tartrate, and other organic salts, which, when the plants are burned, are converted into the ckrbonate, K 2 C0 3 . It is a remarkable fact that, although in a given soil the soda-content may predominate largely over the potash salts, the plants growing in the soil take up the latter: in the ashes of most land plants the potash (calculated as K 2 0) forms upwards of 90% of the total alkali. The proposition holds, in its general sense, for sea plants likewise. In ocean water the ratio of soda (Na 2 0) to potash (K 2 0) is 100:3-23 (Dittmar); in kelp it is, on the average, 100: 5-26 (Richardson). Ashes particularly rich in potash are those of burning nettles, wormwood (Artemisia absinthium), tansy (Tanacetum vulgar e), fumitory (Fumaria officinalis), and tobacco. In fact, the ashes of herbs generally are richer in potash than those of the trunks and branches of trees; yet, for obvious reasons, the latter are of

greater industrial importance as sources of potassium car- bonate. According to Liebig, potassium is the essential alkali of the animal body; and it may be noted that sheep excrete most of the potassium which they take from the land as sweat, one-third of the weight of raw merino consisting of potassium compounds.

To Sir Humphry Davy belongs the merit of isolating this

element from potash, which itself had previously been considered

an element. On placing a piece of potash on a platinum plate,

origin of the common use of the word for a nosegay or bouquet. ‘ connected to the negative of a powerful electric battery, and

bringing a platinum wire, connected to the positive of the battery, to the surface of the potassium a vivid action was observed: gas was evolved at the upper surface of the fused globule of potash, whilst at the lower surface, adjacent to the platinum plate, minute metallic globules were formed, some of which immediately inflamed, whilst others merely tarnished. In 1808 Gay-Lussac and Thenard (Ann. Mm. 65, P- 325) obtained the metal by passing melted potash down a clay tube containing iron turnings or wire heated to whiteness, and Caradau (ibid. 66, p. 97) effected the same decomposition with charcoal at a white heat. This last process was much improved by Brunner, Wohler, and especially by F. M. L. Donny and J. D. B. Mareska-(ˆ4««. Mm. phys., 1852, (3)> 35> P- I 47)- Brunner’s process consisted in forming an intimate mixture of potassium carbonate and carbon by igniting crude tartar in covered iron crucibles, cooling the mass, and then distilling it at a white heat from iron bottles, the vaporized metal being condensed beneath the surface of paraffin or naphtha contained in a copper vessel. It was found, however, that if the cooling be not sufficiently rapid explosions occurred owing to the combination of the metal with carbon monoxide (produced in the oxidation of the charcoal) to form the potassium salt of hexaoxybenzene. In Mareska and Donny’s process the con- densation is effected in a shallow iron box, which has a large exposed surface, capable of being cooled by damped cloths. When the distillation is finished the iron box, after cooling, is undamped and the product turned out beneath the surface of paraffin. It is purified by redistilling and condensing directly under paraffin. Electrolytic

processes have also been devised. Linnemann (Journ. Prak. Chem., 1858, 73, p. 413) obtained the metal on a small scale by electrolysing potassium cyanide between carbon electrodes; A. Matthiessen (Journ. Chem. Soc, 1856, p. 30) electrolysed an equimolecular mixture of potassium and calcium chlorides (which melts at a lower temperature than potassium chloride) also between carbon electrodes; whilst Castner's process, in which caustic potash is electrolysed, is employed commercially. The metal, however, is not in great demand, for it is generally found that sodium (q.v.), which is cheaper, and, weight for weight, more reactive, will fulfil any purpose for which potassium may be desired.

Pure potassium is a silvery white metal tinged with blue; but on exposure to air it at once forms a film of oxide, and on prolonged exposure deliquesces into a solution of hydrate and carbonate. Perfectly dry oxygen, however, has no action upon it. At temperatures below o° C. it is pretty hard and brittle; at the ordinary temperature it is so soft that it can be kneaded between the fingers and cut with a blunt knife. Its specific gravity is 0-865; hence it is the lightest metal known except lithium. It fuses at 62-5°C. (Bunsen) and boils at 667 , emitting an intensely green vapour. It may be obtained crystallized in quadratic octahedra of a greenish-blue colour, by melting in a sealed tube containing an inert gas, and inverting the tube when the metal has partially solidified. When heated in air it fuses and then takes fire, burning into a mixture of oxides. Most remarkable, and characteristic for the group it represents, is its action on water. A pellet of potassium when thrown on water at once bursts out into a violet flame and the burning metal fizzes about on the surface, its extremely high temperature precluding absolute contact with the liquid, exceDt at the very end, when the last remnant, through loss of temperature, is wetted by the water and bursts with explosive violence. The reaction may be written $2K + 2H_2O = 2KOH + H_2$, and the flame is due to the combustion of the hydrogen, the violet colour being occasioned by the potassium vapour. The metal also reacts with alcohol to form potassium ethylate, while hydrogen escapes, this time without inflammation: $K + C_2H_5\text{-}OH = C_2H_5\text{-}OK\text{-}r\text{-}H$. When the oxide-free metal is heated gently in dry ammonia it is gradually transformed into a blue liquid, which on cooling freezes into a yellowish-brown or flesh-coloured solid, potassamide, KNH_2 . When heated to redness the amide is decomposed into ammonia and potassium nitride, NK_3, which is an almost black solid. Both it and the amide

decompose water readily with formation of ammonia and caustic potash. Potassium at temperatures from 2oo°to 40o°C. occludes hydrogen gas, the highest degree of saturation corresponding

approximately to the formula K 2 H. In a vacuum or in suffi- ciently dilute hydrogen the compound from 200 upwards loses hydrogen, until the tension of the free gas has arrived at the maximum value characteristic of that temperature (Troost and Hautefeuille) .

Compounds.

Oxides and Hydroxide. — Potassium forms two well-defined oxides, K 2 and K2O4, whilst several others, of less certain existence, have been described. The monoxide, K 2 0, may be obtained by strongly heating the product or burning the metal in slightly moist air; by heating the hydroxide with ,the metal: 2KH0-)-2K = 2K2O + H2; or by passing pure and almost dry air over the molten metal (Kuhnemann, Chem. Centr., 1863, p. 491). It forms a grey brittle mass, having a conchoidal fracture; it is very deliquescent, combining very energetically with water to form caustic potash. According to Holt and Sims (Journ. Chem. Soc, 1894, p. 438), the substance as obtained above always contains free potassium.

Potassium hydroxide or caustic potash, KOH, formerly considered to be an oxide but shown subsequently to be a hydroxide of potas- sium, may be obtained by dissolving the metal or monoxide in water, but is manufactured by double decomposition from potassium carbonate and slaked lime: K2C03-)-Ca(OH)2 = 2KOH + CaC03. A solution of one part of the carbonate in 12 parts of water is heated to boiling in a cast-iron vessel (industrially by means of steam- pipes) and the milk of lime added in instalments until a sample of the filtered mixture no longer effervesces with an excess of acid. The mixture is then allowed to settle in the iron vessel, access of air being prevented as much as practicable, and the clear liquor is syphoned off. The remaining mud of calcium carbonate and hydrate is washed, by decantation, with small instalments of hot water to recover at least part of the alkali diffused throughout it, but this process must not be continued too long or else some of the lime passes into solution. The liquors after a concentration in iron vessels are now evaporated in a silver dish, until the heavy vapour of the hydrate is seen to go off. The residual oily liquid is then poured out into a polished iron tray, or into an iron mould to pro- duce the customary form of ” sticks,” and allowed to cool. The solid must be at once bottled, because it attracts the moisture and carbonic acid of the air with great avidity and deliquesces. According to Dittmar (Journ. Soc. Chem. Ind., May 1884), nickel basins are far better adapted than iron basins for the preliminary concentration of potash ley. The latter begin to oxidize before the ley has come up to the traditional strength of specific gravity 1-333 when cold, while nickel is not attacked so long as the

percent- age of real KHO is short of 60. For the fusion of the dry hydrate nickel vessels cannot be used; in fact, even silver is perceptibly attacked as soon as all the excess of water is away; absolutely pure KHO can be produced only in gold vessels. Glass and (to a less extent) porcelain are attacked by caustic potash ley, slowly in the cold, more readily on boiling.

Solid caustic potash forms an opaque, white, stone-like mass of dense granular fracture; specific gravity 2 – 1. It fuses consider- ably below and is perceptibly volatile at a red heat. At a white heat the vapour breaks down into potassium, hydrogen and oxygen. It is extremely soluble in even cold water, and in any proportion of water on boiling. On crystallizing a solution, the hydrate KOH-2H 2 is deposited; 2KOH-9H 2 and 2KOH-5H 2 have also been obtained. The solution is intensely ” alkaline ” to test- papers. It readily dissolves the epidermis of the skin and many other kinds of animal tissue — hence the former application of the ” sticks ” in surgery. A dilute potash readily emulsionizes fats, and on boiling saponifies them with formation of a soap and glycerin. All commercial caustic potash is contaminated with excess of water (over and above that in the KHO) and with potassium carbonate and chloride; sulphate, as a rule, is absent. A preparation sufficing for most purposes is obtained by digesting the commercial article in absolute alcohol, decanting and evaporating the solution to dryness and fusing in silver vessels.

The peroxide, K 2 0<, discovered by Gay-Lussac and Thenard, is obtained by heating the metal in an excess of slightly moist air or oxygen. Vernon Harcourt (Journ. Chem. Soc, 1862, p. 267) recommends melting the metal in a flask filled with nitrogen and gradually displacing this gas by oxygen; the first formed grey film on the metal changes to a deep blue, and then the gas is rapidly absorbed, the film becoming white and afterwards yellow. It is a dark yellow powder, which fuses at a high temperature, the liquid on cooling depositing shining tabular crystals; at a white heat it loses oxygen and yields the monoxide. Exposed to moist air it loses oxygen, possibly giving the dioxide, K 2 2 ; water reacts with it, evolving much heat and giving caustic potash, hydrogen peroxide and oxygen; whilst carbon monoxide gives potassium carbonate and oxygen at temperatures below ioo°. A violent reaction ensues with phosphorus and sulphur, and many metals are oxidized by it, some with incandescence.

POTASSIUM

Halogen Compounds. — Potassium fluoride, KF, is a very deliquescent salt, crystallizing in cubes and having a sharp saline taste, which is formed by neutralizing potassium carbonate or hydroxide with hydrofluoric acid and concentrating in platinum vessels. It forms the acid fluoride KHF2 when dissolved in aqueous hydro- fluoric acid, a salt which at a red heat gives the normal fluoride and hydrofluoric acid. Other salts of composition KF-2HF and KF3HF, have been described by Moissan (Compt. rend., 1888, 106, p. 547).

Potassium chloride, KC1, also known as muriate of potash, closely resembles ordinary salt. It is produced in immense quantities at Stassfurt from the so-called ” Abraumsalze. ” For the purpose of the manufacturer of this salt these are assorted into a raw material containing approximately, in 100 parts, 55-65 of carnallite (representing 16 parts of potassium chloride), 20-25 of common salt, 15-20 of kieserite; 2-4 of tachhydrite (CaCl 2 -2MgCl 2 -i2H 2 0), and minor components. This mixture is now wrought mainly in two ways. (1) The salt is dissolved in water with the help of steam, and the solution is cooled down to from 60° to 70 , when a quantity of impure common salt crystallizes out, which is removed. The decanted ley deposits on standing a 70 % potassium chloride, which is purified by washing with cold water. Common salt principally goes into solution, and the percentage may thus be brought up to from 80 to 95. The mother-liquor from the 70% chloride is evaporated, the common salt which separates out in the heat removed as it appears, and the sufficiently concentrated liquor allowed to crystallize, when almost pure carnallite separates out, which is easily decomposed into its components (see infra). (2) Ziervogel and Tuchen’s method. — The crude salt is ground up and then heated in a concentrated solution of magnesium chloride with agitation. The carnallite principally dissolves and crystal- lizes out relatively pure on cooling. The mother-liquor is used for a subsequent extraction of fresh raw salt. The carnallite produced is dissolved in hot water and the solution allowed to cool, when it deposits a coarse granular potassium chloride containing up to 99 % of the pure substance. The undissolved residue produced in either process consists chiefly of kieserite and common salt. It is worked up either for Epsom salt and common salt, or for sodium sulphate and magnesium chloride. The potassiferous by-products are utilized for the manufacture of manures.

Chemically pure chloride of potassium is most conveniently prepared from the pure perchlorate by heating it in a platinum basin at the lowest temperature and then fusing the residue in a well- covered platinum crucible. The fused product solidifies on cooling into a colourless glass.

When hydrochloric acid gas is passed into the solution the salt is completely precipitated as a fine powder. If the original solution contained the chlorides of magnesium or calcium or sulphate of potassium all impurities remain in the mother-liquor (the sulphur as KHSOj), and can be removed by washing the precipitate with strong hydrochloric acid. The salt crystallizes in cubes of specific gravity 1.995; it melts at about 800° and volatilizes at a bright red heat. When melted in a current of hydrogen or electro- lysed in the same condition, a dark blue mass is obtained of uncer- tain composition. It is extensively employed for the preparation of other potassium salts, but the largest quantity (especially of the impure product) is used in the production of artificial manures.

Potassium bromide, KBr, maybe obtained by dissolving bromine in potash, whereupon bromide and bromate are first formed, evapor- ating and igniting the product in order to decompose the bromate: 6KHO + 3Br 2 = 5KBr + KBrOs + 3H2O; 2KBr0 3 = 2KBr + 30 2 (cf. Chlorates) ; but it is manufactured by acting with bromine water on iron filings and decomposing the iron bromide thus formed with potassium carbonate. In appearance it closely resembles the chloride, forming colourless cubes which readily dissolve in water and melt at 722 °. It combines with bromine to form an unstable tribromide, KBr 3 (see F. P. Worley, J own. Chem. Soc.,

I9°5. 87, P- 1107). . . .. .

Potassium iodide, KI, is obtained by dissolving iodine in potash, the deoxidation of the iodate being facilitated by the addition of charcoal before ignition, proceeding as with the bromide. The commercial salt usually has an alkaline reaction ; it may be purified by dissolving in the minimum amount of water, and neutralizing with dilute sulphuric acid; alcohol is now added to precipitate the potassium sulphate, the solution filtered and crystallized. It forms colourless cubes which are readily soluble in water, melt at 685 , and yield a vapour of normal density. It is sparingly soluble in absolute alcohol. Both the iodide and bromide are used in photography. Iodine dissolves in an aqueous solution of the salt to form a dark brown liquid, which on evaporation over sulphuric acid gives black acicular crystals of the tri-iodide, KI3. This salt is very deliquescent; it melts at 45°, and at loo” decomposes into iodine and potassium iodide. For the oxy- halogen salts see Chlorate, Chlorine, Bromine and Iodine.

Potassium carbonate, K2CO3, popularly known as ” potashes,” was originally obtained in countries where wood was cheap by lixiviating wood ashes in wooden tubs, evaporating the solution to dryness in

iron pots and calcining the residue ; in more recent practice the calcination is carried out in reverberatory furnaces. This product, known as ” crude potashes,” contains, in addition

to carbonate, varying amounts of sulphate and chloride and also insoluble matter. Crude potash is used for the manufacture of glass, and, after being causticized, for the making of soft soap. For many other purposes it must be refined, which is done by treating the crude product with the minimum of cold water re- quired to dissolve the carbonate, removing the undissolved part (which consists chiefly of sulphate), and evaporating the clear liquor to dryness in an iron pan. The purified carbonate (which still contains most of the chloride of the raw material and other impurities) is known as ” pearl ashes.” Large quantities of carbon- ate used to be manufactured from the aqueous residue left in the distillation of beet-root spirit, i.e. indirectly from beet-root molasses. The liquors are evaporated to dryness and the residue is ignited to obtain a very impure carbonate, which is purified by methods founded on the different solubilities of the several components. Most of the carbonate which now occurs in commerce is made from the chloride of the Stassfurt beds by an adaptation of the ” Leblanc process ” for the conversion of common salt into soda ash (see Alkali Manufacture).

Chemically pure carbonate of potash is best prepared by igniting pure bicarbonate (see below) in iron or (better) in silver or platinum vessels, or else by calcining pure cream of tartar. The latter opera- tion furnishes an intimate mixture of the carbonate with charcoal, from which the carbonate is extracted by lixiviation with water and filtration. The filtrate is evaporated to dryness (in iron or platinum vessels) and the residue fully dehydrated by gentle ignition. The salt is thus obtained as a white porous mass, fusible at a red heat (838° C, Carnelley) into a colourless liquid, which solidifies into a white opaque mass. The dry salt is very hygro- scopic; it deliquesces into an oily solution (“oleum tartari “) in ordinary air. The most saturated solution contains 205 parts of the salt to 100 of water and boils at 135°. On crystallizing a solution monoclinic crystals of 2K2COs.3H 2 are deposited, which at ioo° lose water and give a white powder of K4CO3.H2O; this is completely dehydrated at 130°. The carbonate, being insoluble in strong alcohol (and many other liquid organic compounds), is much used for dehydration of the corresponding aqueous prepara- tions. The pure carbonate is constantly used in the laboratory as a basic substance generally, for the disintegration of silicates, and as a precipitant. The industrial preparation serves for the making of flint glass, of potash soap (soft soap) and of caustic potash.

Potassium bicarbonate, KHCO3, is obtained when carbonic acid is passed through a cold solution of the ordinary carbonate as long as it is absorbed. Any silicate present is also converted into bicarbonate with elimination of silica, which must be filtered off. The filtrate is evaporated at a temperature not exceeding 60° or at most 70° C. ; after sufficient concentration it deposits on cooling anhydrous crystals of the salt, while the potassium chloride, which may be present as an impurity, remains mostly in the mother- liquor; the rest is easily removed by repeated recrystallization. If an absolutely pure preparation is wanted it is best to follow Wohler and start with the ” black flux ” produced by the ignition of pure bitartrate. The flux is moistened with water and exposed to a current of carbonic acid, which, on account of the condensing action of the charcoal, is absorbed with great avidity. The bicarbonate forms large monoclinic prisms, permanent in the air. When the dry salt is heated to 190° it decomposes into normal carbonate, carbon dioxide and water.

Potassium sulphide, K 2 S, was obtained by Berzelius in pale red crystals by passing hydrogen over potassium sulphate, and by Berthier as a flesh-coloured mass by heating the sulphate with carbon. It appears, however, that these products contain higher sulphides. On saturating a solution of caustic potash with sulphur- etted hydrogen and adding a second equivalent of alkali, a solution is obtained which on evaporation in a vacuum deposits crystals of K2S.5H2O. The solution is strongly caustic. It turns yellow on exposure to air, absorbing oxygen and carbon dioxide and forming thiosulphate and potassium carbonate and liberating sulphuretted hydrogen, which decomposes into water and sulphur, the latter combining with the monosulphide to form higher salts. The solution also decomposes on boiling. The hydrosulphide, KHS, was obtained by Gay-Lussac on heating the metal in sulphur- etted hydrogen, and by Berzelius on acting with sulphuretted hydro- gen on potassium carbonate at a dull red heat. It forms a yellowish- white deliquescent mass, which melts on heating, and at a sufficiently high temperature it yields a dark red liquid. It is readily soluble in water, and on evaporation in a vacuum over caustic lime it deposits colourless, rhombohedral crystals of 2KHS.H2O. The solution is more easily prepared by saturating potash solution with sulphuretted hydrogen. The solution has a bitter taste, and on exposure to the air turns yellow, but on long exposure it recovers its original colourless appearance owing to the formation of thiosulphate. Liver of sulphur or hepar sulphuris, a medicine known to the alchemists, is a mixture of various poly- sulphides with the sulphate and thiosulphate, in variable proportions, obtained by gently heating the carbonate with sulphur in covered vessels. _ It forms a

liver-coloured mass. In the pharmacopoeia it is designated potassa sulphurata.

Potassium sulphite, K 2 S03, is prepared by saturating a potash solution with sulphur dioxide, adding a second equivalent of potash,

and crystallizing in a vacuum, when the salt separates as small deliquescent, hexagonal crystals. The salt K 2 S03-H20 may be obtained by crystallizing the metabisulphite, K2S2O5 (from sulphur dioxide and a hot saturated solution of the carbonate, or from sulphur dioxide and a mixture of milk of lime and potassium sul- phate) with an equivalent amount of potash. The salt K2S03-2H20 is obtained as oblique rhombic octahedra by crystallizing the solution over sulphuric acid. On the isomeric potassium sodium sulphites see Sulphur.

Potassium sulphate, K2SO4, a salt known early in the 14th century, and studied by Glauber, Boyle and Tachenius, was styled in the 17th century arcanum or sal duplicatum, being regarded as a com- bination of an acid salt with an alkaline salt. It was obtained as a by-product in many chemical reactions, and subsequently used to be extracted from kainite, one of the Stassfurt minerals, but the process is now given up because the salt can be produced cheaply enough from the chloride by decomposing it with sulphuric acid and calcining the residue. To purify the crude product it is dis- solved in hot water and the solution filtered and allowed to cool, when the bulk of the dissolved salt crystallizes out with character- istic promptitude. The very beautiful (anhydrous) crystals have the habit of a double six-sided pyramid, but really belong to the rhombic system. They are transparent, very hard and absolutely permanent in the air. They have a bitter, salty taste. The salt is soluble in water, but insoluble in caustic potash of sp. gr. 1-35, and in absolute alcohol. It fuses at 1078 . The crude salt is used occasionally in the manufacture of glass. The acid sulphate or bisulphate, KHSO4, is readily produced by fusing thirteen parts of the powdered normal salt with eight parts of sulphuric acid. It forms rhombic pyramids, which melt at 197°. It dissolves in three parts of water of o c C. The solution behaves pretty much as if its two congeners, K2SO4 and H2SO4, were present side by side of each other uncombined. An excess of alcohol, in fact, precipitates normal sulphate (with little bisulphate) and free acid remains in solution. Similar is the behaviour of the fused dry salt at a dull red heat; it acts on silicates, titanates, &c, as if it were sulphuric acid raised beyond its

natural boiling point. Hence its frequent application in analysis as a disintegrating agent. For the salts of other sulphur acids, see Sulphur.

Potassamide, NH2K, discovered by Gay-Lussac and Thfinard in 1 87 1, is obtained as an olive green or brown mass by gently heat- ing the metal in ammonia gas, or as a white, waxy, crystalline mass when the metal is heated in a silver boat. It decomposes in moist air, or with water, giving caustic potash and ammonia, in the latter case with considerable evolution of heat. On strong heating Tithesley (Journ. Chem. Soc, 1894, p. 511) found that it decomposed into its elements. For the nitrite, see Nitrogen, for the nitrate see Saltpetre and for the cyanide see Prussic Acid; for other salts see the articles wherein the corresponding acid receives treatment.

Analysis, &c. — All volatile potassium compounds impart a violet coloration to the Bunsen flame, which is masked, however, if sodium be present. The emission spectrum shows two lines, Ko, a double line towards the infra-red, and K/3 in the violet. The chief insoluble salts are the perchlorate, acid-tartrate and platinochloride. The atomic weight was determined by Stas and more recently by T. W. Richards and A. Stahler, who obtained the value 39-114 from analyses of the chloride, and by Richards and E. Meuller, who obtained the values 39-1135 and 39-1143 from analyses of the bromide (see Abs. J. C. S., 1907, ii. 615).

Medicine. Pharmacology. — Numerous salts and preparations of potassium are used in medicine; viz. Potassii Carbonis (salt of tartar), dose 5 to 20 grs., from which are made (a) Potassii Bicarbonas, dose 5 to 30 grs. ; [b) Potassa Caustica, a powerful caustic not used internally. From caustic potash are made (1) Potassii Permanganas, dose 1 to 3 grs., used in preparing Liquor Potassii Permanganatis, a I % solution, dose 2 to 4 drs. (2) Potassh Iodidum, dose 5 to 20 grs. ; from this are made the Linamentum Potassii Iodidi cum sapone, strength 1 in 10, and the Unguentum Potassii Iodidi, strength 1 in 10. (3) Potassii Bromidum, dose 5 to 30 grs. (4) Liquor Potassae, strength 27 grs. of caustic potash to the oz. Potassii Citras, dose 10 to 40 grs. Potassii Acetas, dose 10 to 60 grs. Potassii Chloras, dose 5 to 15 grs., from which is made a lozenge, Trochiscus Potassii Chloratis, each containing 3 grs. Potassii Tartras Acidus (cream of tartar), dose 20 to 60 grs., which has a subpreparation Potassii Tartras, dose 30 to 60 grs. Potassii Nitras (saltpetre), dose 5 to 20 grs. Potassii Sulphas, dose 10 to 40 grs. Potassii Bichromas, dose ˆ to I gr.

Toxicology. — Poisoning by caustic potash may take place or poisoning by pearl ash containing caustic potash. A caustic taste in the

mouth is quickly followed by burning abdominal pain, vomiting and diarrhoea, with a feeble pulse and a cold clammy skin; the post-mortem appearances are those of acute gastro- intestinal irritation. The treatment is washing out the stomach or giving emetics followed by vinegar or lemon juice and later oil and white of egg.

Therapeutics. — Externally : Caustic potash is a most powerful irritant and caustic,- it is used with lime in making Vienna paste,

which is occasionally used to destroy morbid growths. Liquoi potassae is also used in certain skin diseases. The permanganate of potash is an irritant if used pure. Its principal action is as an antiseptic and disinfectant. If wet it oxidizes the products of decomposition. It is used in the dressing of foul ulcers. The I % solution is an antidote for snake-bite.

Internally: Dilute solutions of potash, like other alkalis, are used to neutralize the poisonous effects of strong acids. In the stomach potassium salts neutralize the gastric acid, and hence small doses are useful in hyperchloridia. Potassium salts are strongly diuretic, acting directly on the renal epithelium. They are quickly excreted in the urine, rendering it alkaline and thus more able to hold uric acid in solution. They also hinder the forma- tion of uric acid calculi. The acetate and the citrate are valuable mild diuretics in Bright's disease and in feverish conditions, and by increasing the amount of urine diminish the pathological fluids in pleuritic effusion, ascites, &c. In tubal nephritis they aid the excretion of fatty casts. The tartrate and acid tartrate are also diuretic in their action and, as well as the sulphate, are valuable hydragogue saline purgatives. Potassium nitrate is chiefly used to make nitre paper, which on burning emits fumes useful in the treatment of the asthmatic paroxysm. Lozenges of potassium chlorate are used in stomatitis, tonsilitis and pharyngitis, it can also be used in a gargle, 10 grs. to I fl. oz. of water. Its thera-peutic action is said to be due to nascent oxygen given off, so it is local in its action. In large doses it is a dangerous poison, con- verting the oxyhaemoglobin of the blood into methaemoglobin. Internally the permanganate is a valuable antidote in opium poisoning. The action of potassium bromide and potassium iodide has been treated under bromine and iodine (q.v.). All potas- sium salts if taken in large doses are cardiac depressants, they also depress the nervous system, especially the brain and spinal cord. Like all alkalis if given in quantities they increase metabolism.

POTATO (Solatium tuberosum), a well-known plant which owes its value to the peculiar habit of developing underground slender leafless

shoots or branches which differ in character and office from the true roots, and gradually swelling at the free end produce the tubers (potatoes) which are the common vegetable food. The nature of these tubers is further rendered evident by the presence of ” eyes ” or leaf-buds, which in due time lengthen into shoots and form the haulm or stems of the plant. Such buds are not, under ordinary circumstances, formed on roots. The determining cause of the formation of the tubers is not certainly known, but Professor Bernard has suggested that it is the presence of a fungus, Fusarium solani, which, growing in the underground shoots, irritates them and causes the swelling; the result is that an efficient method of propagation is secured independently of the seed. Starch and other matters are stored up in the tubers, as in a seed, and are rendered avail- able for the nutrition of the young shoots. When grown under natural circumstances the tubers are relatively small and close to the surface of the soil, or even lie upon it. In the latter case they become green and have an acrid taste, which renders them unpalatable to human beings, and as poisonous qualities are produced similar to those of many Solanaceae they are unwhole-some. Hence the recommendation to keep the tubers in cellars or pits, not exposed to the light. Among the nine hundred species of Solarium less than a dozen have this property of forming tubers, but similar growths are formed at the ends of the shoots of the common bramble, of Convolvulus sepium, of Helianthus tuberosus, the so-called Jerusalem artichoke, of Sagittaria, and other plants. Tubers are also sometimes formed on aerial branches, as in some Aroids, Begonias, &c. The production of small green tubers on the haulm, in the axils bl the leaves of the potato, is not very unfrequent, and affords an interesting proof of the true morphological nature of the under-ground shoots and tubers. This phenomenon follows injury to the phloem in the lower parts of the stem, preventing the downward flow of elaborated sap. The injury may be due to gnawing insects, and particularly to the fungus Corticium vagum, var. Solani (Rhizoctonia) .

The so-called fir-cone potatoes, which are elongated and provided with scales at more or less regular intervals, show also very clearly that the tuber is only a thickened branch with ” eyes ” set in regular order, as in an ordinary shoot. The potato tuber consists mainly of a mass of cells filled with starch and encircled by a thin corky rind. A few vessels and woody fibres traverse the tubers.

The chief value of the potato as an article of diet consists in ihe starch

it contains, and to a less extent in the potash and other salts. The quantity of nitrogen in its composition is small, and hence it should not be relied on to constitute the staple j article of diet. Letheby gives the following as the average composition of the potato —

Nitrogenous matters Starch, &c. Sugar …. Fat ….

3-2

0-2

Saline matter Water

■ 0-7 •75-0

IOO'O

— a result which approximates closely to the average of nineteen analyses cited in How Crops Grow from Grouven. In some analyses, however, the starch is put as low as 13 -30, and the nitrogenous matter as 0-92 (Deherain, Cours de chimie agricole, p. 159). Boussingault gives 25'2% of starch and 3% of nitro- genous matter. Warington states that the proportion of nitrogenous to non-nitrogenous matter in the digestible part of potatoes is as 1 to io-6. The composition of the tubers evidently varies according to season, soils, manuring, the variety grown, &c, but the figures cited will give a sufficiently accurate idea of it. The " ash " contains on the average of thirty-one analyses as much as 59-8% of potash, and 19-1% of phosphoric acid, the other ingredients being in very minute proportion. Where, as in some parts of northern Germany, the potato is grown for the purpose of manufacturing spirit great attention is necessarily paid to the quantitative analysis of the starchy and saccharine matters, which are found to vary much in particular varieties, irrespective of the conditions under which they are grown.

It is to the Spaniards that we owe this valuable esculent. The Spaniards met with it in the neighbourhood of Quito, where it was cultivated by the natives. In the Cronica de Peru of Pedro Cieca (Seville, 1553), as well as in other Spanish books of about the same date, the potato is mentioned under the name " battata " or " papa." Hieronymus Cardan, a monk, is supposed to have been the first to introduce it from Peru into Spain, from which country it passed into Italy and thence into Belgium. Carl Sprengel, cited by Professor Edward Morren in his biographical sketch entitled Charles de I'Escluse, sa vie et ses ceuvres, states that the potato was introduced from Santa Fe into England by John Hawkins in 1563 {Garten

Zeitung, 1805, p. 346). If this be so, it is a question whether the English and not the Spaniards are not entitled to the credit of the first introduction; but, according to Sir Joseph Banks, the plant brought by Drake and Hawkins was not the common English potato but the sweet potato.

In 1587 or 1588 De I'Escluse (Clusius) received the plant from Philippe de Sivry, lord of Waldheim and governor of Mons, who in his turn received it from some member of the suite of the papal legate. At the discovery of America, we are told by Humboldt; the plant was cultivated in all the temperate parts of the continent from Chile to Colombia, but not in Mexico. In 1585 or 1586, potato tubers were brought from what is now North Carolina to Ireland on the return of the colonists sent out by Sir Walter Raleigh, and were first cultivated on Sir Walter's estate near Cork. The tubers introducer! under the auspices of Raleigh were thus imported a few y_e"assiater than those mentioned by Clusius in 1588, which must have been in cultiva- tion in Italy and Spain for some years prior to that time. The earliest representation of the plant is to be found in Gerard's Herbal, published in 1597. The plant is mentioned under the name Papus orbiculatus in the first edition of the Catalogus of the same author, published in 1596, and again in the second edition, which was dedicated to Sir Walter Raleigh (1599). It is, however, in the Herbal that we find the first description of the potato, accompanied by a woodcut sufficiently correct to leave no doubt whatever as to the identity of the plant. In this work (p. 781) it is called " Battata virginiana sive Virginia- norum, et Pappus, Potatoes of Virginia."

The " common potatoes " of which Gerard speaks are the tubers of Ipomoea Batatas, the sweet potato, which nowadays would not in Great Britain be spoken of as common. A second

edition of the Herbal was published in 1636 by Thomas Johnson, with a different illustration from that given in the first edition, and one which in some respects, as in showing the true nature of the tuber, is superior to the first. The phenomenon of growing out or ," super-tuberation " is shown in this cut.

Previous to this (in 1629) Parkinson, the friend and associate of Johnson, had published his Paradisus, in which (p. 517) he gives an indifferent figure of the potato under the name of Papas seu Battatas Virginianorum, and adds details as to the method of cooking the tubers which seem to indicate that they were still luxuries. Chabraeus, who wrote in 1666, tells us that the Peruvians made bread from the tubers, which they called " chunno." He further tells us that by the

natives Virginieae insulae the plant was called ” openauk,” and that it is now known in European gardens, but he makes no mention of its use as an esculent vegetable, and, indeed, includes it among ” plantae malignae et venenatae.” Heriot (De Bry’s Collection of Voyages), in his report on Virginia, describes a plant under the same name ” with roots as large as a walnut and others much larger; they grow in damp soil, many hanging together as if fixed on ropes; they are good food either boiled or roasted.” The plant (which is not a native of Virginia) was probably introduced there in consequence of the intercourse of the early settlers with the Spaniards. The cultivation of the potato in England made but little progress, even though it was strongly urged by the Royal Society in 1663; and not much more than a century has elapsed since its cultivation on a large scale became general.

Botanists are agreed that the only species in general cultivation in Great Britain is the one which Bauhin, in his Phytopinax, p. 89 (1596), called Solanum tuberosum esculentum, a name adopted by Linnaeus (omitting the last epithet), and employed by all botanical writers. This species is probably native in Chile, but it is very doubtful if it is truly wild farther north. Baker {Journ. Linn. Soc., 1884, xx. 489), has reviewed the tuber-bearing species of Solanum from a systematic point of view as well as from that of geographical distribution. Out of twenty so-called species he con- siders six to be really distinct, while the others are merely synony- mous or trifling variations. The six admitted tuber-bearing species are 5. tuberosum, S. Maglia, S. Commersoni, S. cardiophyllum, S. Jamesii and .S. oxycarpum.

S. tuberosum is, according to Mr Baker, a native not only of the Andes of Chile but also of those of Peru, Bolivia, Ecuador and Colombia, also of the mountains of Costa Rica, Mexico and the south-western United States. It seems most probable, however, that some at least of the plants mentioned in the northern part of America are the descendants of cultivated forms. S. Maglia is a native of the Chilean coast as far south as the Chonos Archipelago, and was cultivated in the garden of the Horticultural Society at Chiswick in 1822, being con- sidered by Sabine, in his paper on the native country of the wild potato, to be the true S. tuberosum and the origin of the cultivated forms. This species was also found by Darwin in Chile, and was con- sidered by him, as by Sabine before him, to be the wild potato. Baker refers to the plants figured by Sabine {Trans. Hort. Soc. Lond. v. 249) (fig. 1) as being without doubt 5. Maglia, but A. de Candolle (Origine des Plantes cultivees, p. 40) is equally emphatic in the opinion that it is 5. tuber- osum. S. Commersoni occurs in Uruguay, Buenos Aires and the Argentine Republic, in rocky situations at a low level. Under the name

of 5. Ohrondii it has been introduced into western France, where it is not only hardy but produces abundance of tubers, which are palatable, but have a slightly acid taste. Lindjey in the Journ. Hort. Soc

(From Sabine's figure in the Trans. Hori. Soc. Lond., 1S24, vol. v. pi. ii. See text.)

Fig. 1. — Wild Potato-plant in

bloom. (I nat. size.)

S. cardiophyllum, described by . is a native of the mountains of central Mexico at elevations of 8000 to 9000 ft. 5. Jamesii is a well-defined species occurring in the mountains of Colorado, New Mexico and Arizona, and also in Mexico. In a wild state the tubers are not larger than marbles. S. oxycarpum is a

little known but very distinct tuberous species from central Mexico. 1

A review of the localities in which the presence of 5. tuberosum and its tuber-bearing allies has been ascertained shows that, broadly, these varieties may be divided into mountainous and littoral. In either case they would not be subjected, at least in their growing season, to the same extremes of heat, cold and drought as plants growing on inland plains. Again, those forms growing at a high elevation would probably start into growth later in the season than those near the coast. The significance of these facts from a cultural point of view is twofold: for, while a late variety is desirable for culture in Great Britain, as ensuring more or less immunity from spring frost, it is, on the other hand, undesirable, because late varieties are more liable to be attacked by the potato disease (Phytophthora infestans) which as a rule appears about the time when the earliest varieties are ready for lifting, but before the late varieties are matured.

In cultivation the potato varies very greatly not only as to the season of its growth but also as to productiveness, the vigour and luxuriance of its foliage, the presence or relative absence of hairs, the form of the leaves, the size and colour of the flowers, &c. The tubers vary greatly in size, form and colour; gardeners divide them into rounded forms and long forms or " kidneys," and there are of course varieties intermediate in form. The colour of the rind, yellowish, brown or purple, furnishes distinctions, as does the yellow or white colour of the flesh.

The colour of the eyes and their prominence or depression are relatively very constant characteristics. These variations have arisen chiefly through cross-breeding, though not entirely so, there being a few cases upon record of the production of ” sports ” from tubers that have become the parents of new varieties, but authentic cases of the sporting of tubers are few and far between. If, on the other hand, the true seeds of any of our cultivated varieties are sown, the seedlings show very wide variations from one another and from the parents. In this connexion it is very interesting to observe that Messrs Sutton of Reading find that the seedlings of many of the varieties of potato that occur spontaneously in different parts of America come quite true to type from seed.

The potato thrives best in a rather light friable loam ; and in thin sandy soils the produce, if not heavy, is generally of very good quality. Soils which are naturally wet and heavy, as well as those which are heavily manured, are not suitable. Indeed it is best, except when there is ample space, to grow only the earlier kinds in gardens. If the soil is of fair quality the less manure used upon it the better, unless it be soot or lime. Gypsum, bone-dust, superphosphate of lime and nitrate of soda may also be used, and wood ashes are advantageous if the soil contains much vegetable matter; but the best results are usually obtained when farmyard manure is supple- mented by artificials, not by using artificials alone.

Potatoes arc commonly propagated by planting whole tubers or by dividing the tubers, leaving to each segment or ” set ” one or two eyes or buds. The ” sets ” are then planted in rows at a distance varying from 15 in. to 3 ft., the distance being regulated by the height of the stems, and that between the sets varying from 6 to 12 in., 8 in. being a good average space for garden crops, with 2 ft. between the rows. The sets may be put in 6 in. deep. The planting of whole tubers instead of the cut sets usually gives a better return.

1 Although these six are the only species admitted as such by Baker, it is well to note some of the varieties. The S. etuberosum of Lindley, differing from the common S. tuberosum in not producing tubers, was found in Chile, and is probably not specifically distinct, although exceptional, for it is by no means very unusual to find even cultivated plants produce no tubers. S. Fernandezianum is, according to Baker, a form of S. tuberosum, but if so its habitat in the mountain woods of Juan Fernandez is climatically different from that in the dry mountains of central Chile, where the true S. tuberosum grows. S. otites was found more recently by Andr6 on the summit of Quindiu in Colombia, at a height of 11,483 ft. It produces tubers of the size of a

nut. S. Andreanum, found by Andre at Cauca (6234 ft.), was considered by the traveller to be the true 5. tuberosum, but this view is not shared by Baker, who named it after the discoverer. Its tubers, if it produces any, have not been seen. 5. immite is probably only a slight variety of 5. tubero- sum, as are also the Venezuelan S. colombianum, S. verrucosum, S. demissum and 5. utile. S. Fendleri, a native of the mountains of New Mexico and Arizona, was considered by Asa Gray to be likewise a form of 5. tuberosum.

The full-sized tubers are, however, preferable to smaller ones, as their larger buds tend to produce stronger shoots, and where cut sets are used the best returns are obtained from sets taken from the points of the tubers — not from their base. Thomas Dickson of Edinburgh long ago observed that the most healthy and productive crop was to be obtained by planting unripe tubers, and proposed this as a preventive of the disease called the ” curl,” which sometimes attacks the young stems, causing them and also the leaves to become crumpled, and few or no tubers to be produced; in this connexion it is interesting to note that Scottish and Irish seed potatoes give a larger yield than English, probably on account of their being less matured. It has also been noted that the sprouting of the eyes of the potato may be accelerated if, while still unripe, it is taken up and exposed for some weeks to the influence of a scorching sun. The best sets are those obtained from plants grown in elevated and open situations, and it is also beneficial to use sets grown on a different soil.

The earliest crops should, if possible, be planted in a light soil and in a warm situation, towards the end of February, or as early as possible in March. In some cases the tubers for early crops are sprouted on a hotbed, the plants being put out as soon as the leaves can bear exposure.

The main crop should be planted by the middle of March, sprouted sets being used ; late planting is very undesirable. Those in- tended for storing should be dug up as soon as they are fairly ripe, unless they are attacked by the disease, in which case they must be taken up as soon as the murrain is observed ; or if they are then sufficiently developed to be worth preserving, but not fully ripe, the haulms or shaws should be pulled out, to prevent the fungus passing down them into the tubers; this may be done without dis- turbing the tubers, which can be dug afterwards.

Forcing. — The earliest crop may be planted in December, and successional ones in January and February; the varieties specially suited for forcing being chosen. The mode of cultivation adopted by

the London market gardeners is thus in substance explained by Cuthill: A long trench, 5 ft. wide and 2 ft. deep, is filled with hot dung, on which soil to the depth of 6 in. is put. The sets employed are middle-sized whole potatoes, which are placed close together over the bed, covered with 2 in. of mould, and then hooped and protected with mats and straw, under which conditions they will sprout in about a month. A bed of the requisite length (sometimes 100 yds.) is then prepared of about 2 ft. thickness of hot dung, soil is put on to the depth of 8 in., and the frames set over all. The potatoes are then carefully taken up from the striking bed, all the shoots being removed except the main one, and they are planted 4 in. deep, radishes being sown thinly over them and covered lightly with mould. When the haulm of the potato has grown to about 6 in. in height the points are nipped off, in order to give the radishes fair play; and, although this may stop growth for a few days, still the potato crop is always excellent. After planting nothing more is required but to keep up the temperature to about 70°, admitting air when practicable, and giving water as required. The crop is not dug up until it has come to maturity.

Potatoes are also grown largely in hooped beds on a warm border in the open ground. The sets after having been sprouted, as above, are planted out in January in trenches 2 ft. deep filled with hot dung, the sets being planted 5 in. deep, and over all radishes are sown. The ridges are then hooped over, allowing about 2 ft. of space in the middle, between the mould and the hoop, and are covered with mats and straw, but as soon as the radishes come up they are uncovered daily, and covered again every night as a pro- tection against possible frosts. This is continued till the potatoes are ready for digging in May.

Potatoes are sometimes grown in pots in heat, sprouted sets being planted in 11 -in. pots about two-thirds full of soil, and placed near the glass in any of the forcing-houses, where a temperature of from 65° to 70 is to be maintained. The plants are duly watered and earthed up as they advance in growth.

Potato Diseases

There are few agricultural subjects of greater importance than the culture of the potato and the losses entailed by potato disease. It is not unusual in bad seasons for a single grower to lose £30 per acre in one season. In extreme cases every tuber is lost, as the produce will not even pay the cost of lifting.

The best-known disease of potatoes is caused by the growth of a

fungus named Phytophthora infestans, within the tissues of the host plant, and this fungus has the peculiar property of piercing and breaking up the cellular tissues and setting up putrescence in the course of its growth. The parasite, which has a somewhat restricted range of host plants, chiefly invades the potato, Solanum tuberosum; the bittersweet, 5. Dulcamara, and other species of Solanum. It is also very destructive to the tomato, Lycopersicum esculentum, and to all or nearly all

the other species of Lycopersicum. At times it attacks petunias and even scrophulariaceous plants, as Anthocersis and Schiz- anthus.

As a rule, although there are a few exceptions, the disease occurs wherever the potato is grown. It is known in South America in the home of the potato plant. In England the disease is generally first seen during the last ten days of July; its extension is greatly favoured by warm and showery weather. To the unaided eye the disease is seen as purplish brown or blackish blotches of various sizes, at first on the tips and edges of the leaves, and ultimately upon the leaf-stalks and the larger stems. On gathering the foliage for examination, especially in humid weather, these dark blotches are seen to be putrid, and when the disease takes a bad form the dying leaves give out a highly offensive odour. The fungus, which is chiefly within the leaves and stems, seldom emerges through the firm upper surface of the leaf; it commonly appears as a white bloom or mildew on the circumference of the disease- patches on the under surface. It grows within the tissues from central spots towards an ever-extending circumference, carrying putrescence in its course. As the patches extend in size by the growth of the fungus they at length become confluent, and so the leaves are destroyed and an end is put to one of the chief vital functions of the host plant. On the destruction of the leaves the fungus either descends the stem by the interior or the spores are washed by the rain to the tubers in the ground. In either case the tubers are reached by the fungus or its spores, and so become diseased. The fungus is very small in size, and under the microscope appears slightly whitish or colourless. The highest powers are required to see all parts of the parasite.

The accompanying illustration shows the habit and structure of the fungus. The letters A B show a vertical section through a frag- ment of a potato leaf, enlarged 100 diameters; A is the upper surface line, and

B the lower ; the lower surface of the leaf is shown at the top,

Fig. 2. — Phytophthora infestans. Fungus of Potato Disease.

the better to exhibit the nature of the fungus growths. Between A and B the loose cellular tissue of which the leaf is partly built up is seen in section, and at C the vertical palisade cells which give firmness to the upper surface of the leaf. Amongst the loose tissue of the leaf numerous transparent threads are shown; these are the mycelial threads or spawn of the fungus; wherever they touch the leaf-cells they pierce or break down the tissue, and so set up decomposition, as indicated by the darker shading. The lower surface of the potato leaf is furnished with numerous organs of transpiration or stomata, which are narrow orifices opening into the leaf and from which moisture is transpired in the form of vapour. Out of these small openings the fungus threads emerge, as shown at D, D, D. When the threads reach the air they branch in a tree-like manner, and each branch (sporangiophore) carries one or more ovate sporangia, as shown at E, E, E, which fall off and are carried by the wind. One is shown more highly magnified (400 diameters) at F ; the contained protoplasm breaks up into a definite number of parts as at G, forming eight minute mobile bodies called ” zoospores,” each zoospore being furnished with two

extremely attentuated vibrating hairs termed ” cilia,” as shown at H. These zoospores escape and swim about in any film of moisture, and on going to rest take a spherical form, germinate and produce threads of mycelium as at K. The sporangia may also germinate directly without undergoing division. The mycelium from the germinating sporangia or zoospores soon finds its way into the tissues of the potato leaf by the organs of transpiration, and the process of growth already described is repeated ‘over and over again till the entire potato leaf, or indeed the whole plant, is reduced to putridity.

The germinating spores are not only able to pierce the leaves and stems of the potato plant, and so gain an entry to its interior through the epidermis, but they are also able to pierce the skin of the tuber, especially in young examples. It is therefore obvious that, if the tubers are exposed to the air where they are liable to become slightly cracked by the sun, wind, hail and rain, and injured by small animals and insects, the spores from the leaves will drop on to the tubers, quickly germinate upon the slightly injured places, and cause the potatoes to become diseased. Earthing up therefore prevents these injuries, but where practised to an immoderate extent it materially reduces the produce of tubers. The labour entailed in repeated earthing up is also

considered a serious objection to its general adoption.

The means of mitigating the damage done by this disease are (1) the selection of varieties found to resist its attacks; (2) the collection and destruction of diseased tubers so that none are left in the soil to become a menace to future crops; (3) care that no tubers showing traces of the disease are planted; (4) spraying with Bordeaux mixture at intervals from midsummer onwards. The last measure prevents the germination of the spores of the fungus on the leaves, and is a most useful mode of checking the spread of the disease; to be successful in its use, how- ever, entails care in the preparation of the spray and thorough- ness in its application. In spite of the many efforts in the direc- tion of obtaining a resistant variety no great measure of success has been attained. The earlier varieties of potato appear to escape the disease almost entirely, as they are usually ready to be lifted before it becomes troublesome; while certain of the later varieties are much less prone to it than the majority. They do not appear, however, to maintain the same degree of immunity over a long period of years, but to become more and more open to the attack as the variety becomes older; nor do they always exhibit the same degree of immunity in different localities. Something may be done to mitigate the loss arising from the ‘ disease by selecting comparatively immune varieties from time to time.

Many ingenious attempts have been made to obtain a variety perfectly immune. Maule, thinking a hardier blood might be infused into the potato by crossing it with some of the native species, raised hybrids between it and the two common species of Solanum native in this country, S. Dulcamara and S. nigrum, but the hybrids proved as susceptible as the potato itself. Maule also tried the effect of grafting the potato on these two species and, though he succeeded, there is no record to show whether the product was any hardier than the parents. Dean (Gard. Chron., Sept. 1876, p. 304) succeeded in grafting the potato on the tomato, and Messrs Sutton have carried out similar experiments on an extensive scale (Journ. Roy. Hort. Soc. 1899, xxiii. Proc. p. 20), but in no case have the variations produced proved disease-proof. Various experimenters, especially Fenn, have asserted that by engrafting an eye of one variety into the tuber of another, not only will adhesion take place but the new tubers will present great variety of character; this seems to be the case, but it can hardly be considered as established that the variations in ques- tion were the result of any commingling of the essences of the two varieties. The wound may simply have set up that variation in the buds the occasional existence of which has been already noted.

It is possible that the hybridizing of the potato with one or other of the wild types of tuberous Solanums may give rise to a variety which shall be immune, though unfortunately most are themselves liable to the attacks of the fungus, and one of the few crosses so made between the common potato and Solarium Maglia has exhibited the same undesirable trait. The form cultivated in England for some time under the name Solanum tuberosum (which, however, forms tubers and is probably not that known under this name by Lindley) seems so far to have escaped. In view of the fact that Biffen has proved that immunity from the attacks of a certain fungus in wheat is a transmissible recessive character reappearing in some of the individuals of the second generation, it would appear that there is great hope of securing an immune variety with the aid of this form. It is possible, too, that continued cultivation in the rich soil of gardens may induce that tendency to vary when seedlings are raised that is so marked a feature of the potato of commerce, in one or more of the other species of tuberous Solanums.

Another fungus attacking the leaves is Macrosporium Solani (fig. 3), but this attack usually comes earlier in the season than the foregoing. It is characterized by the curling of the

leaves, which later show black spots due to the production of numerous dark spores in patches on the diseased leaves. The damage is often considerable, as the crop is greatly lessened by the interference with the func- tions of the leaf. The parasite may be held in check by spraying with Bordeaux mixture early in the season. The fungus passes the winter on pieces of leaf, &c, left on the ground. All such refuse should be cleared up and burned. A third fungus, Cerco-spora concors, also forms spots on the leaves and may be kept in check by the same means.

Wilting of the foliage followed by the discoloration of the stem and branches is characteristic of a disease of the potato awn as ” Blackleg.” This disease is due to the presence of large numbers of Bacillus solanacearum in the tubes through which water is conveyed to the leaves from the roots. Their presence causes the appearance of blackish streaks in the stem and a dark ring some little distance below the surface in the tissues of the tuber. Tubers showing any trace of such a ring

Fig. 3. — Portion of Leaf of Potato-Plant showing patches of a black mould, Macrosporium “* Solani, on the surface. knov

(From the Journal of the Board of Agriculture and Fiskeries, by permission of the controller of H. M. Stationery Office.) Fig. 4. — Chrysophlyctis endobiotica {Oedomyces leproides) in the

Potato. I and 2, Tubers deformed by the fungus.

3, Section through diseased tissue showing dark masses of spores. 4 and 5, Tissue-cell, more highly magnified, showing enclosed spores.

should not be used for seed, and rotation of crops should be observed as a means of preventing the infection of the crop with the germ. Biting and sucking insects have been found to carry the bacilli from one plant to another.

The tubers frequently show scurfy or scab-like spots upon their surface, thus greatly depreciating their value for market purposes. The fungus, Sorosporium scabies, which is the cause of the scab, does not penetrate into the flesh of the tuber, nor detract from ‘its edible properties. Excess of lime in the soil is said to favour the development of the fungus. Similar spots are produced on potatoes in America by the fungus Oospora scabies, and in both cases, if affected ” seed ” potatoes are steeped in a solution of | pint formalin in 15 gallons of water for two hours before planting, the attack on the resulting crop is materially lessened. The fungus, Oedomyces leproides, produces large, blackish, irregular warts which sometimes involve the whole surface of the tuber. This disease is of recent introduction into Great Britain, but bids fair to be- come very troublesome. The spores of the fungus pass the winter in the soil and the delicate mycelium attacks the young shoots in the summer. These become brown, finally blackish and greatly contorted until a large scab is formed on the developing tuber, whence the name by which the disease is known — ” black scab.” Diseased potatoes left in the soil and even slightly diseased ” sets ” are a source of infection of succeeding crops. Rotation must be observed and no diseased sets planted.

The rotting of tubers after lifting may be due to various causes, but the infection of the tubers by the Phytophthora already men- tioned is a frequent source of this trouble, while ” Winter Rot ” is due to the fungus Nectria Solani. This fungus finds conditions suitable for growth when the potatoes are stored in a damp con- dition; rotting from this cause rarely occurs when they are dried before being placed in heaps. The first signs of this fungus is the appearance of small white tufts of

mycelium bursting through the skin of the tuber, the spores of the fungus being carried at the tips of the threads forming these tufts. This form of fruit is suc- ceeded by others which have received different names, and lastly by the mature Nectria which forms minute red flask-shaped peri- thecia on parts of the rotted potatoes that have dried up. The intermediate forms are known as Monosporium, Fusarium and Cephalosporium. The pieces of dried-up potato with the spores of Nectria upon them are a source of infection in the succeeding year, and care should be taken that diseased tubers are not planted. Flowers of sulphur plentifully sprinkled over the potatoes before storing has been found to check the spread of the rot in the heap.

POTATO RACE, a running contest, where the winner is the first who collects in a basket or other receptacle a number of potatoes, usually eight, placed, as a rule two yards apart, along a straight line, and then crosses a finish line five or ten yards farther on.

POTATO WAR (Karlojfelkrieg) , the name given by the Prus- sians to the War of the Bavarian Succession in 1778-79. The Prussians and a Saxon contingent, commanded by Frederick the Great and his brother Prince Henry, were opposed to two Austrian armies under Loudon and Lacy. The operations consisted almost entirely of manoeuvres which had for their object the obtaining or the denial to the enemy of food-supplies. The war thus acquired the name of Karlojfelkrieg. Its duration was from the 3rd of July 1778 to the assembly of the congress of Teschen on the 10th of March 1 7 79, and its total cost £4,350,000 and 20,000 men to all parties. The war may be studied from the military point of view as an extreme example of what Clausewitz calls ” war with a restricted aim.”

POTAWATOMI (properly Potewatmik, fire-makers, in allusion to their secession from the Ojibway, and their establish- ment of a separate council-fire), a tribe of North-American Indians of Algonquian stock. When first known (about 1670), they lived around Green Bay, Wisconsin. They subsequently moved south and*eventually settled in lower Michigan. They were allied with the French in their wars against the Iroquois and took part in the conspiracy of Pontiac (q.v.). In the War of Independence they fought for England, as also in that of 181 2. In 1846 most of them were removed to a reservation in Kansas. Of these the majority have abandoned their tribal relations and become citizens. Others are in Wisconsin and the bulk in Oklahoma. They now number some 2500.

POTCHEFSTROOM, a town of the Transvaal, 88 m. S.W. of Johannesburg and 222 m. N.E. of Kimberley by rail. Pop. (1904),

9348, of whom 6014 were whites. The town stands 4100 ft. above the sea on the banks of the Mooi River, 15 m.

above its junction with the Vaal. The streets are lined with fine willow trees, and there are public grounds in which are nurseries and a showyard. Golf links add to the attractions of the place, which is one of the healthiest in the Transvaal. In the neighbourhood are gold-mines; the reef appearing to be a continuation of the Witwatersrand reefs. The Vaal river goldfields, of which Venterskroon is the centre, are 16 to 20 m. south-east of Potchefstroom.

Potchefstroom was founded in November 1838 by Hendrik Potgieter, and is the oldest town in and first capital of the Transvaal. In 1862 it was the scene of civil war between rival Boer factions. In 1880-81 the garrison camped outside the town was besieged by Boers under Commandant P. A. C-onje. The British troops (250 in number) were confined to a fort 25 yds. square and lost over a third of their strength in killed and wounded before they surrendered on the 21st of March, the investment having begun on the 18th of December 1880. Charges of treachery were brought against Cronje for failing to notify the besieged that an armistice had been agreed to by the Boer leaders. Of this armistice Colonel R. W. C. VVinsloe, who was in command of the British, became aware before the surrender took place. On the suggestion of Com- mandant General Joubert the capitulation was considered as cancelled and a detachment of British troops reoccupied the town until the conclusion of peace. In the Anglo-Boer War of 1 899-1 902 Potchefstroom was occupied by the British without opposition. (See Transvaal: History.)

POTEMKIN, GRIGORY ALEKSANDROVICH, Prince (1739-1791), Russian statesman, was born at Chizheva near Smolensk. He was educated at the Moscow University, and in 1755 entered the ” Reiter ” of the Horse Guards. His participation in the coup d’etat of the 8th of July 1762 attracted the attention of the new empress, Catherine II., who made him a Kammcrjanker and gave him a small estate. The biographical anecdotes relating to him during the next few years are obscure and mostly apocryphal. In 1768 he quitted the Guards and was attached to the court as a Kammerherr, but in 1769 he volunteered for the Turkish War and distinguished himself at Khotin, Focshani and Larga, besides routing the Turks at Olta. It was not till 1771 that he became Catherine’s prime favourite. In that year he was

made an adjutant-general, lieutenant-colonel of the Preobrazhensky Guards, a member of the council of state, and, in the words of a foreign contemporary diplomatist, ” the most influential personage in Russia.” Somewhat later he was created a count, and appointed commander-in-chief and governor-general of ” New Russia,” as the conquered provinces in the Ukraine were then called. In. 1776, at Catherine’s request, the emperor Joseph II. raised Potemkin to the rank of a prince of the Holy Roman Empire. In 1775 he was superseded in the empress’s graces by Zavadovsky; but the relations between Catherine and her former lover continued to be most friendly’ and his influence with her was never seriously disturbed by any of her subsequent favourites. A whole mass of facts testify to the enormous and extraordinary influence of Potemkin during the next ten years. His corre- spondence with the empress was uninterrupted. The most important state documents passed through his hands. Catherine loaded him with gifts. He was deeply interested in the question of the southern boundaries of Russia and consequently in the fate of the Turkish Empire. It was he who, in 1776, sketched the plan for the conquest of the Crimea which was subsequently realized; and about the same period he was busy with the so- called ” Greek project,” which aimed at restoring the Byzantine Empire under one of Catherine’s grandsons. In many of the Balkan states he had well-informed agents. After he became field marshal, in 1784, he introduced many reforms into the army, and built a fleet in the Black Sea, which, though constructed of very bad materials, did excellent service in Catherine’s second Turkish War (1787-92) His colonizing system was exposed to very severe criticism, yet it is impossible not to admire the results of his stupendous activity. The arsenal of Kherson, begun in 1778, the harbour of Sevastopol and the

new fleet of fifteen liners and twenty-five smaller vessels, were monuments of his genius. But there was exaggeration in all he attempted. He spared neither men, money, nor himself in attempting to carry out his gigantic scheme for the coloniza- tion of the south Russian steppes; but he never calculated the cost, and more than three-quarters of the design had to be abandoned when but half finished. Catherine’s famous expedi- tion to the south in 1787 was a veritable triumph for Potemkin; for he contrived to conceal all the weak points of his administra- tion and to present everything in a rose-coloured light. On this occasion he received the title of prince of Tauris. The same year the second Turkish War began, and the founder of New Russia took upon himself the responsibilities of commander-in-chief. But the army was ill-equipped and unprepared; and Potemkin in an hysterical fit of depression gave everything up for lost, and

would have resigned but for the steady encourage- ment of the empress. Only after Suvarov had valiantly defended Kinburn did he take heart again, and besiege and capture Ochakov and Bender. In 1 790 he conducted the military operations on the Dniester and held his court at Jassy with more than Asiatic pomp. In 1791 he returned to St Petersburg where, along with his friend Bezborodko (q.v.), he made vain efforts to overthrow the new favourite, Zubov, and in four months spent 850,000 roubles in banquets and entertainments, a sum subsequently reimbursed to him from the treasury. Then the empress grew impatient and compelled him (1791) to return to Jassy to conduct the peace negotiations as chief Russian plenipotentiary. On the 5th of October, while on his way to Nikolayev, he died in the open steppe, 40 m. from Jassy, in con- sequence of eating a whole goose while in a high state of fever.

Very various are the estimates of Potemkin. Neither during his life nor after his death did any two people agree about him. The German pamphlet: Pansalim Fiirst der Finsterniss und seine Geliebte, published in 1794, is a fair specimen of the opinion of those who regarded him as the evil genius of Catherine and of Russia. But there were many, including the empress herself, who looked upon him as a man of manifold and commanding genius. He was indubitably the most extraordinary of all the Catherinian favourites. He was an able administrator, but wanting in self-control. Licentiousness, extravagance and an utter disregard for human life were his weak points, but he was loyal, generous and magnanimous. Nearly all the anecdotes related of him by Helbig, in the biography contributed by him to the journal Minerva (1797-1800), and freely utilized by later biographers, are absolutely worthless.

See V. A. Bilbasov, Geschichte Katharinas II. (Berlin, 1891-1893); C. de Larivi&re, Catherine la Grande d'apres sa correspondance (Paris, 1895) ; Anonymous, La Cour de Catherine II. Ses collabora- teurs (St Petersburg, 1899); A. V. Lopukhin, Sketch of the Congress of Jassy, ijqi (Rus. ; St Petersburg, 1893); The Papers of Prince Potemkin, 1744-1793 (Rus.; St Petersburg, 1893-1895). (R. N. B.)

POTENTILLA (nat. order Rosaceae, q.v.), a border and rock- garden plant. Many of the species bear brilliantly coloured flowers and graceful foliage. A soil of a good loamy staple, enriched with rotten dung, will grow the potentilla to perfection. Potentillas may be increased, though not very freely, by parting them into as many pieces as there are crowns, the side growths being those which can usually be thus separated. This may be done in autumn or spring, and the plants will generally bloom the following season. The species and

some of the varieties reproduce true from seed, and are readily increased by that means. The following are some of the best kinds: aurea, atrosanguinea, davurica, formosa, nitida, n. atro-rubra, speciosa, tridenlata and villosa.

POTENTIOMETER, an instrument for the measurement of electromotive force and also of difference of electric potential between two points. The term potentiometer is usually applied to an instrument for the measurement of steady or continuous potential difference between two points in terms of the potential difference of the terminals of a standard voltaic cell of some kind, such as a Clark or Weston cell. The modern potentio- meter has been developed out of an arrangement due to J. C. Poggendorff, employed also by J. Latimer Clark, but converted

into its modern direct reading form by J. A. Fleming in 1885 (see Industries, 1886, i. 152). In principle the modern potentio- meter consists of an arrangement by means of which any potential difference not exceeding a certain assigned value can be compared with that of a standard cell having a known electromotive force. In simplest form it consists of a long, straight, fine, uniform wire stretched over a divided scale. The ends of this wire are connected to one or more secondary cells of constant electromotive force, a variable resistance being interposed so as to regulate the current flowing through the fine wire. To one end of this fine wire is attached one terminal of a sensitive galvanometer. Sliding contacts can be moved along the fine wire into any position. Supposing that the scale under this wire is divided into 2000 parts and that we are in possession of a standard Clark cell, the electromotive force being known at various temperatures, and equal, say, to 1-434 volts at 1 5 C. The first process is to set the potentio- meter. The slider is placed so as to touch the fine wire at division No. 1434 on the fine wire, and the Clark cell is connected in between the sliding contact and one terminal of the galvano- meter, so that its negative pole is connected through the galvano- meter with that end of the fine wire to which the negative pole of the working battery is attached. The resistance in circuit with the fine wire is then altered until the galvanometer shows no deflexion. We then know that the fall of potential down the 2000 divisions of the fine wire must be exactly 2 volts. If then we substitute for the standard cell any other source of electromotive force, we can move the slider into another position in which the galvanometer will show no deflection. The scale reading

then indicates directly the electromotive force of this second source of potential. Thus, for instance, if an experiment were made with a Leclanche cell, and if the balancing-point were found to be at 1 500 divisions on the scale, the electromotive force would be determined as 1-500 volts. Instead of adjusting in this manner the electromotive force of any form of cell, if we pass any constant current through a known resistance and bring wires from the extremities of that resistance into connexion with the slider and the galvanometer terminal, we can in the same way determine the fall of potential down the above resistance in terms of the electromotive force of the standard cell and thus measure the current flowing through the standard resistance.

In the practical form the potentiometer wire is partly replaced by a number of coils of wire, say 14 (see fig. 1), and the potentio- meter wire itself has a resistance equal to one of these coils. One terminal of the galvanometer can then be shifted to the junction

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Fig. 1.

between any pair of consecutive coils and the slider shifted to any point on the potentiometer wire. By such an arrangement the potential difference can be measured of any amount from o to 1-5 volts. In some cases the potentiometer wire is wholly replaced by a series of coils divided into small subdivisions. We may employ such a potentiometer to measure large potential difference greater than the electromotive force of the working battery, as follows: The two points between which the potential difference is required are connected by high resistance, say of 100,000 ohms or more, and from the extremities of a known fraction of this resistance, say, 1/100 or 1/1000 or 1/10,000 wires are brought to the potentio- meter and connected in between the slider and the corresponding galvanometer

terminal. We can thus measure as described the drop in volts down a known fraction of the whole high resistance and therefore calculate the fall in potential down the whole of the high resistance, which is the potential difference required. The potentio- meter and the divided resistance constitute a sort of electrical

scaleyard by means of which any electromotive force or difference of potential can be compared with the electromotive force of a standard cell. Very convenient and practical forms of potentiometer have been devised by Crompton (fig. 2), Nalder, Elliot Bros., Fleming

c2lfpo

OAO OBO OcO

ODO OEO OFO

Fig. 2. — Diagram of the Internal Connexions of a Crompton Potentiometer. a b, The scale wire.

c, The set of equal potentiometer coils in series with it.

d, The double pole switch connecting the 6 pairs of terminals

A B c D E F in succession to the slide contacts.

e, The resistance coils. /, The rheostat.

g, The galvanometer key.

A, B, C, D, E, F, Terminals to which standard cell or voltages to be

tested are attached, and others. An essential accompaniment therefore of the potentio- meter is a series of standard low resistances, say of o-i, o-oi, o-ooi ohm, and also a series of higher resistances divided into known fractions. In practical work, the low resistances take the form of certain strips of metal which have on them two pairs of terminals, one termed ” current terminals,” and the other ” potential ter- minals.” These resistance strips, as they are called, are carefully adjusted so that the resistance between the potential terminals has a known low value. In order to measure the value of a con- tinuous electric current, and therefore to calibrate any amperemeter we proceed as follows: The amperemeter is placed in series with a suitable low resistance strip, say of o-oi ohm. From the potential terminals of the strip, wires are brought to the potentiometer so as to determine their potential difference in terms of the electromotive

force of the standard Clark cell. An observation is then taken of the reading of the amperemeter and of the fall of resistance down the low resistance when a certain steady current is passing through the strip and amperemeter. Supposing that the potential fall down the strip is found to be -981 volt, the strip difference having a resistance of o-l ohm, it would be seen that the current passing through the strip was 98-1 amperes. If then the amperemeter scale reading was 100 it would show an error of that scale reading of minus 1-9 amperes or nearly 2 %. In the same manner the potentio- meter may be used to calibrate a voltmeter by the aid of a divided resistance of known value.

In electrical measurements connected with incandescent electric lamps the potentiometer is of great use, as it enables us to make accurately and nearly simultaneously two measurements, one of the current through the lamp and the other of the potential differ- ence of the terminals. For this purpose a resistance, say, of one ohm is placed in series with the lamp and a resistance of 100,000 ohms placed across the terminals of the lamp; the latter resistance is divided into two parts, one consisting of 1000 ohms and the other of 99,oop ohms. The potentiometer enables us to measure therefore the current through the lamp by measuring the drop in volts down a resistance in series with it and the potential difference of the ter- minals of the lamp by measuring the drop in volts down the 100th part of the high resistance of 100,000 ohms connected across the terminals of the lamp.

Standard Cells. — A necessary adjunct to the potentiometer is some form of standard cell to be used as a standard of electromotive force. In the case of the Clark standard cell above mentioned the elements are mercury and zinc separated by a paste of mercurous sulphate mixed with a saturated solution of zinc sulphate. Other voltaic standards of electromotive force are in use, such as the Weston cadmium cell, the Helmholtz calomel cell, and the standard Daniell cell. The Clark cell is made in two forms, the board of trade or tubular form, and the H form of cell devised by Lord Rayleigh. The German experts seem to favour the latter form; the specifica- tion issued by the Physikalisch-Technische Reichsanstalt of Berlin may be found in the Electrician, xxxi. 265-266. The electromotive force of the cell diminishes with rise of temperature, the board of trade value being 1-434 volts at 15° C. 1 and 1-434 (1—0-00077 (t — 15)) volts at t” C. A more exact expression is obtained if instead of 0-00077 the quantity 0-00078 + 0-000017 (t — 15) is used. In the Weston standard cell cadmium and cadmium sulphate are substi- tuted for zinc and zinc sulphate; it has the advantage of a much smaller coefficient of temperature variation than the Clark cell. It is most conveniently made up in a glass vessel of H form, pure mercury and cadmium

amalgam being the two elements (fig. 3),

1 According to K. Kahle and W. Wien, the electromotive force of the H form of Clark cell is 1-4322 volts at 15 C.

Fig. 3. — Lord Rayleigh's H form of Standard Voltaic Cell.

and when made as directed below it has at t° C. an electromotive force Ei volts, such that

E = 1-0184— 0-0000406 (t — 20)— 0.00000095 (/— 20) 2 +

o-ooooooi (< — 20) 3 .

After the platinum wires have been sealed through the glass, a

little aqua regia is placed in the cell legs until bubbles pf gas arise

from the platinum, when it is thrown out and replaced by a solution of mercurous nitrate. Then, by the use of another piece of platinum as anode, mercury is electro- lytically deposited upon the platinum, which may also be amalgamated by making it white hot in a Bunsen flame and plunging it in mercury. To prepare the cadmium amalgam, one part of pure cadmium is dissolved in six parts of pure mercury, and the product while warm and fluid is placed in one limb of the cell and warmed, to ensure perfect contact with the platinum wire. The cad- mium sulphate solution is prepared by digesting a saturated solution of cadmium sulphate with cadmium hydroxide to remove free acid, care being taken not to raise the temperature above 70 C, and then by digesting it still further with mercurous sulphate until no more precipitation occurs. The cadmium sulphate solution must be saturated and have free crystals of the salt in it. The mercurous sulphate must be free from acid, and made neutral by trituration with finely divided mercury. In making the paste, so much cadmium sulphate must be added that a saturated solution of that salt is formed and is present in the cell. The cell has the electromotive force above stated if the amalgam of cadmium has from 6 to 13 parts of mercury to I of cadmium. The German investigators seem to have a great preference for the H form of cell, but it is clear that a narrow tubular cell of the British board of trade form not only comes more quickly to the temperature of the water bath in which it is placed, but is more certain to be wholly at one temperature. In a modification of the H

form devised by F. E. Smith, of the National Physical Laboratory (Phil. Trans., A, 207, pp. 393-420), a contraction formed in the side of the vertical tube tends to hold the contents in place. Fig. 4 shows this cell, hermetically sealed, mounted in a brass case.

In cases when great accuracy is not required, a Daniell cell can be used as a standard of electromotive force. The form designed

by J. A. Fleming (Phil. Mag., 20, p. 126) consists of a U tube, one leg of which contains a rod of pure amalgamated zinc, and the other a rod of freshly electrotyped copper. The legs are filled with solutions of zinc sulphate and copper sulphate, the zinc rod being in the zinc sulphate and the copper rod in the copper sulphate. When so made, the cell has an electromotive force of 1-072 volts and no sensible temperature variation. The solu- tions are made by dissolving the purest recrystallized sulphate of copper and sulphate of zinc in dis- tilled water. For the zinc solution, take 55-5 parts by weight of crys- tals of zinc sulphate (ZnSCˆOI-h) and dissolve in 44-5 parts by weight of distilled water; the resulting solution should have a specific gravity of I -200 at about 20 C. For the sulphate of copper solution, take 16-5 parts by weight of pure crystals of copper sulphate (CUSO45OH2) and dissolve in 83-5 parts by weight of water; the resulting solution should have a specific gravity of 1.100 at 20° C. The solutions should be adjusted exactly to these densities and kept in stock bottles, from which the reservoirs of the cell should be filled up as required.

A form of potentiometer employing a vibration galvanometer and suitable for alternating current measurement by null methods has been devised by Dr Drysdale (see Proc. Phys. Soc. Lond. 1909,

21, 561.)

See J. A. Fleming, Handbook for the Electrical Laboratory and Testing Room, vol. i. (London, 1903) — vol. i contains on pp. 108-110 an extensive list of various original memoirs published on the Clark and Weston cells; G. D. Aspinall Parr, Electrical Engineering Measuring Instruments (London, 1903) ; W. C. Fisher, The Potentio- meter and its Adjuncts (London, 1906).

Fig. 4. — Method of mount- ing Weston Normal Cell. Brass case removed.

POTENZA (anc. Potentia), a town and episcopal see of Basil- icata, Italy, capital of the province of Potenza, 103 m. by rail E. by S. of Naples. Pop. (1901), 12,313 (town); 16,163 (com- mune). Situated

2700 ft. above sea-level on an isolated hill above the Basento (anc. Casuentus), it is much exposed to winds and has a far more northerly climate than its position (40° 40′ N.) implies, and is indeed one of the coldest places in Italy (mean temp. Jan 37-8°, July 70-9°, for whole year 53 F.). It has been almost entirely rebuilt since the earthquake of 1857. It has a school of the industrial arts and sciences, grows good wine, and makes bricks.

The ancient Potentia lay some 470 ft. lower, by the river. Its name shows that it was of Roman origin, and its importance was no doubt due to its position at the intersection of the road leading west to the Via Popillia and north-east to the Via Appia, with the Via Herculia. No remains are visible, but a consider- able number of inscriptions have been found.

Potentia must be distinguished from Potentia in Picenum, on the Adriatic coast, near the modern Porto di Recanati, a colony founded in 184 B.C., the same year as Pisaurum, but of which little is known.

The abandonment of the old site and the erection of the new town probably date from the earthquake of 1273. By the Angevines Potenza was made a domain of the San Severino family; in the beginning of the 15th century it was held by Francesco Sforza, and in 1435 it passed to the Guevara family; the Loffredi, who succeeded by marriage, continued in possession till the abolition of the great fiefs. In 1694 there was a severe earthquake; and the more terrible earthquake which on the 16th and the 17th of December 1857 passed through southern Italy, and in Basilicata alone killed 32,475 persons, laid the greater part of Potenza in ruins. In i860 it was the first town to rise against the Neapolitan government.

POTGIETER, EVERHARDES JOHANNES (1808-1875), Dutch prose writer and poet, was born at Zwolle, in Overyssel, on the 17th of June 1808. He started life in a merchant's office at Antwerp. In 183 1 he made a journey to Sweden, described in two volumes, which appeared at Amsterdam in 1836-1840. Soon afterwards he settled in Amsterdam, engaged in commercial pursuits on his own account, but with more and more inclination towards literature. With Heije, the popular poet of Holland ' in those days, and Bakhuizen van den Brink, the rising historian (see also Groen van Prinsterer), Potgieter founded De Muzen (" The Muses," 1834-1836), a literary review, which was, how- ever, soon superseded by De Gids (" The Guide "), a monthly, which became the leading magazine of Holland. In it he wrote,

mostly under the initials of " W. D g," a great number of

articles and poems. The first collected edition of his poems (1832-1868) appeared in 2 vols. (Haarlem, 1868-18 7 5), preceded by some of his contributions to De Gids, in 2 vols, also (Haar- lem, 1864), and followed by 3 vols, of his Studien en Schetsen (" Studies and Sketches," Haarlem, 1879). Soon after his- death (Feb. 3, 1875) a more comprehensive edition of Potgieter's Verspreide en Nagelalen Werken ('" Miscellaneous and Posthumous Works ") was published in 8 vols, by his friend and literary executor, Johan C. Zimmerman (Haarlem, 1875-1877), who likewise supervised a more complete edition of Potgieter's writings which appeared at Haarlem in 1885-1890 in 19 vols. Of Potgieter's Het Noorden in Omtrekken en Tafreelen (" The North in Outlines and Pictures ") the third edition was issued in 1882, and an edition de luxe of his poems followed at Haarlem in 1893. Under the title of Personen en Onderwerpen (" Persons and Subjects ") many of Potgieter's criticisms had collectively appeared in 3 vols, at Haarlem in 1885, with an introduction by Busken-Huet.

Potgieter's favourite master among the Dutch classics was Hooft, whose peculiarities in style and language he admired and imitated. The same vein of altruistic, if often exaggerated and biased, abhor- rence of the wonted conventionalities of literary life runs through all his writings, even through his private correspondence with Huet, parts of which have been published. Potgieter remained to his death the irreconcilable enemy of the Dutch " Jan Salie," as the Dutchman is nicknamed who does not believe in the regeneration of the Dutch people. Potgieter held up the Netherlanders of the golden age of the

16th and 17th centuries as models to be emulated. In these views he essentially differed from Huet. Yet the two friends worked harmoniously together; and when Potgieter reluctantly gave up De Gids in 1865, it was Huet whom he chose as his successor. Both then proceeded to Italy, and were present at the Dante festivities at Florence, which in Potgieter's case resulted in a poem in twenty stanzas, Florence (Haarlem, 1868). In Holland Potgieter's influence has been very marked and beneficial ; but his own style, that of ultra-purist, was at times somewhat forced, stilted and not always easily understood. (H, Tl.)

POTHIER, ROBERT JOSEPH (1699-1772), French jurist, was born at Orleans on the 9th of January 1699. He studied law for the purpose of

qualifying for the magistracy, and was appointed in 1720 judge of the presidial court of Orleans, thus following in the footsteps of his father and grandfather. This post he held for fifty-two years. He paid particular atten- tion to the correction and co-ordination of the text of the Pandects, his Pandectae Justinianae in novum ordinem digestae (Paris and Chartres, 1748-1752) being a classic in the study of Roman law. In 1749 he was made professor of law in the university of Orleans. He wrote many learned monographs on French law, and much of his work was incorporated almost textually in the French Code Civil. He died at Orleans on the 2nd of March 1772. Of his numerous treatises the following may be specially mentioned: Traite des obligations (1761); Du Contrat de vente (1762) ; Du Contrat de bail (1764) ; Du Contrat de societe (1765); Des Contrats de prM de consomption (1766); Du Contrat de depot et de mandat (1766); Du Contrat de nantisse- ment (1767), &c. His works have several times been published in collected form (edited by Giffrein, 1820-1824; by Dupin, 1823- 1825, and by Bugnet, 2nd ed. 11 vols. 1861-1862).

See Dupin, Dissertation sur la vie et les ouvrages de Pothier (Paris, 1825), and Fremont, Vie de R. J. Pothier (Orleans, 1850).

POTHOOK, an S-shaped metal hook for suspending a pot over a fire. While one extremity is hooked to the handle of the pot, the other is caught upon an iron crane moving on a pivot over the fire. Modern cooking-ranges have obviated the necessity for this arrangement, but it is still to be seen in great numbers of country cottages and farmhouse kitchens all over England, and in small artisans' houses in the west midlands and . the north. In the elementary teaching of writing the " pot- hook " is a script of similar shape.

POTI, a seaport of Russian Transcaucasia, in the government of Kutais, at the mouth of the Rion on the coast of the Black Sea, 193 m. by rail W.N.W. of Tifiis and 35 m. by sea N. of Batum. Pop. (1882), 3112; (1897), 7666. The white walls of the fortress contrast with the green tiees which surround them, and the lighthouse, 117 ft. high, is visible 17 m. Situated in a marshy delta not more than 2! ft. above the level of the river, Poti is extremely unhealthy, fever and ague prevailing in summer and autumn. The Russians have improved the town and port, but the latter is still exposed to west and south-west gales. A new tntrance was constructed in 1905, and a new inner harbour was at the same time under construction. The shipping trade amounts to £500,000 to £600,000 a year, almost entirely manganese ore, with some maize.

Poti represents the ancient Phasis, a commercial colony of the Greek

city of Miletus. The present fortress was built in 1578 by Sultan MuradHI. of Turkey at the time of a war with Persia. In 1640 it was destroyed by the Imeretians (Georgians), but it was restored and enlarged. The town was a great slave market. It was captured by the Russians in 1812 and 1829.

POTLATCH, a term, corrupted from a Nootka Indian word for ” gift,” for a ceremonial custom among some of the Indian tribes of north-west America, consisting in the distribution by an individual of his property among his friends and neighbours, who make equivalent gifts, with interest, in return.

POTOCKI, IGNATY (1741-1809), Polish statesman and writer, son of Eustachy Potocki, general of artillery of the army of Lithuania, was born at Podhajce. He was educated first at Warsaw beneath the eye of the pedagogic reformer Stanislaw Konarski (1700-17 73), and subsequently in Italy, where he proposed to take orders. On returning home, however, he

abandoned this idea, and as a member of the newly instituted commission of education rendered invaluable services to his country for the next sixteen years. He earnestly desired a reform of the constitution also, and was thus attracted to the party of the Czartoryscy. Elected deputy to every diet since 1778, he was a conspicuous member of the patriotic opposition. In matters of importance nothing was done without his advice, and he was esteemed as much for his character as for his talents. His influence was at its height during the Four Years’ Diet, 1788-1792. He was appointed a member of the committee for the reform of the constitution, defended eloquently the right of the towns to the franchise, and was an advocate of an alliance with Prussia. Thus he was one of the creators of the constitu- tion of the 3rd of May 1791, although his aristocratic antecedents prevented him from going the lengths of the more radical reformers. On the formation of the confederation of Targowica, Potocki emigrated to Dresden; but on the outbreak of the revolution of 1794 returned to Poland, was appointed a member of the national government, and entrusted with the conduct of foreign affairs. ‘ On the fall of Warsaw he surrendered to Suvarov and was sent to Russia, where he remained till 1796. On his return to Poland he retired to the village of Klimuntowo, where for the next thirteen years he devoted himself to literature. At the end of the war of 1809 he was commissioned to go to Vienna -to present to Napoleon the petitions of the Galicians for the incorporation of their province with the grand duchy of Warsaw. He died at Vienna the same year. The most notable of Potocki’s works is: Vom Entstehen und

Untergange der polniscken Konstitutionen vom jten May 1791 (Lemberg,

I793)-

See August Sokolowski, Illustrated History of Poland (Pol.), vol. iv. (Vienna, 1901). (R. N. B.)

POTOCKI, STANISLAW FELIX (1752-1805), Polish politician, son of Franciszek Salezy Potocki, palatine of Kiev, of the Tulczyn line of the family, was born in 1752. He entered the public service, and owing to the influence of his relations became grand standard-bearer of the Crown at the age of twenty-two. In 1782 he was made palatine of Russia, in 1784 a lieutenant- general, and in 1789 he purchased the rank of a general of artillery from the Saxon minister, Briihl, for 20,000 ducats. Elected deputy for Braclaw at the famous Four Years' Diet, he began that career of treachery which was to terminate in the ruin of his country. Yet his previous career had awakened many hopes in him. A grand seigneur ruling patriarchally in his vast estates, liberal, enlightened, a generous master and a professed patriot, his popularity culminated in 1784 when he presented an infantry regiment of 400 men as a free gift to the republic. But he identified the public welfare with the welfare of the individual magnates. His scheme was the division of Poland into an oligarchy of autonomous grandees exercising the supreme power in rotation (in fact a perpetual interregnum), and in 1788 he won over to his views two other great lords, Xavier Branicki and Severin Rzewuski. The election of Malachowski (q.v.) and Kazimierz Sapieha as marshals of the diet still further alienated him from the Liberals; and, after strenuously but vainly opposing every project of reform, he retired to Vienna whence he continued to carry on an active propaganda against the new ideas. He protested against the constitution of the 3rd of May 1791, and after attempting fruitlessly to induce the emperor Leopold to take up arms " for the defence of the liberties of the republic," proceeded with his friends in March 1792 to St Petersburg, and subsequently with the connivance of the empress Catherine formed the confederation of Targowica for the maintenance of the ancient institutions of Poland (May 14, 1792), of which he was the marshal, or rather the dictator, directing its operations from his castle at Tulczyn. When the May constitution was overthrown and the Prussians were already in occupation of Great Poland, Potocki (March 1793) went on a diplomatic mission to St Petersburg; but, finding himself duped and set aside, retired to Vienna till 1797, when he settled down at Tulczyn and devoted himself for the remainder of his life to the improvement of his estates. He wrote On the

Polish Siwcession (Pol.) (Amsterdam, 1789); Protest against the Succession to the Throne (Pol.) (ibid. 1790); and other political works.

See Friedrich Schulz, Poland in the year 1793 (Pol.) (Warsaw, 1899); Josef Zajaczek, History of the Revolution of 171)4 (Pol.) (Lemberg, 1881). (R. N. B.)

POTOMAC, a river in the east central part of the United States, having its source in the Alleghany Mountains and flowing S.E. into Chesapeake Bay. It is formed by the union of its north and south branches, about 15 m. S.E. of Cumberland, Maryland. The main stream has a length of about 450 m. and is navigable for large vessels for 1 13 m. above its mouth. The north branch, about no m. long, rises in the north-eastern part of West Virginia, pursues a north-easterly course, and forms part of the boundary between Maryland and West Virginia. The south branch has its sources in Highland county, Va., and in Pendleton county, W.Va., and flows north-east for about 140 m. until it joins the north branch. From the junc- tion of these two streams until it reaches Harper's Ferry the Potomac river separates Maryland from West Virginia. At Harper's Ferry it receives the waters of the Shenandoah river and cuts through the Blue Ridge Mountains in a gorge noted for its scenic beauty. From this point to its mouth it forms the boundary between Virginia and Maryland. The stream crosses the Blue Ridge Mountains at an elevation of about 245 ft., and at Georgetown (Washington), 62 m. distant, it meets tidewater. Of this descent about 90 ft. occurs about 15 m. above Washing- ton, at the Great Falls, a series of rapids about a mile long and including a cataract about 35 ft. high. Three and a half miles above Washington are the Little Falls, which mark the head of navigation. Large vessels, however, are prevented by a bridge from proceeding above Georgetown. At Washington there are two channels, with respective depths at mean low water of 18 and 21 ft. Large sums have been spent since 1870 on improving these channels. A few miles below the city the river broadens into a deep tidal estuary from 25 to 7 m. wide; and channels 24 ft. deep and 200 ft. wide through all the shoals were secured by the project of 1899. The Anacostia river, or " East Branch," which flows into the Potomac just south of Washington, is navigable for large vessels for about 2 m. and for small scows and lighters as far as Bladensburg, Md., 8f m. above its mouth; its natural channel was narrow and tortuous, and about 18 ft. deep; in 1909 improvements (begun in 1902) had procured a channel 20 ft. deep at mean low

water and 380 ft. wide. The Chesapeake & Ohio Canal, from Georgetown to Cumberland, Md., follows the Potomac closely on the Maryland side. The shipments over the Potomac above Washington in 1907 were valued at $7,596,494, and those below Washington at $21,093,800, the principal commodities being sand and gravel, ice, oils, naval ordnance and supplies, and building and paving materials. The shipments on the Anacostia river were of much the same character, and in 1907 were valued at $4,312,687.

POTOROO, or Rat Kangaroo, any member of the diprotodont marsupial sub-family Potoroinae (see Marstjpialia). None of them exceed a common rabbit in size. They inhabit Australia and Tasmania, are nocturnal, and feed on the leaves of grasses and other plants, as well as roots and bulbs, which they dig up with their forepaws; in this way some of them do considerable damage to cultivated crops. About ten species are known, presenting a considerable range of diversity in minor characters. The members of the type genus (Potorous) run, rather than leap, and do not use the hind feet for kicking. In the genus Bcttongia the tail is prehensile, and with it they collect grass and twigs for making nests in their burrows.

POTOSf , a department of Bolivia occupying the south-western angle of that republic, bounded N. by Oruro, Cochabamba and Chuquisaca, E. by the two last departments and Tarija, S. by Argentina and W. by Chile and Oruro. Pop. (1900), 325,615, the larger part Indians; area, 48,801 sq. m. The eastern part of the department is traversed north to south by the eastern branch of the Andes, locally known as the Cordillera de los

Frailes and the Sierras de Chichas. Spurs and broken ranges project eastward from these, between which are the headstreams of the Pilcomayo and Guapay, the first flowing south-east to the La Plata, and the second north-east to the Madeira and Amazon. The Pilcomayo itself rises in the department of Oruro, but several of its larger tributaries belong to Potosi — the San Juan, Cota- gaita and Tumusla in the south, and Cachimayo in the north. The western part of the department belongs to the great Bolivian altaplanicie, or southern extension of the Titicaca basin. It is a barren, saline waste, almost uninhabitable. In the north, bordering on the transverse ridge of which the Cerro de Tahua (17,454 ft.) forms a part, is the depression known as the Pampa de Empeza, 12,080 ft. above sea-level, which is largely a region of morasses and saline plains. On and near the southern frontier is another transverse ridge, in part formed by the Sierra de Lipez, and in part by apparently detached groups of high peaks; it is a wate/less desert like the Puna de Atacama.

Potosi is essentially a mining department, though agriculture and grazing occupy some attention in the eastern valleys. The western plateau is rich in minerals, especially silver and copper. The Huanchaca group of mines, situated on the slopes of the eastern Cordillera, overlooking the Pampa de Empeza, has the largest output of silver in Bolivia. The Pulacayo mine, belonging to this group, I 5. I 53 ft. above sea-level, ranks next to the Broken Hill mine of Australia in production. Between 1873 and 1901 it yielded 4520 tons of silver, of an estimated value of £23,200,000. Farther south are the Portugalete mines, once very productive, and near the Argentine border are the Lipez mines. East of the Cordilleras are the famous " silver mountain " of Potosi, once the richest silver mine in the world; the snow-capped peak of Chorolque (18,452 ft.), which is claimed to have the highest mine in the world; Porco, a few miles south-west of Potosi; Guadalupe, Colquechaca and Aullagas. Besides silver, the Chorolque mines also yield tin, copper, bismuth, lead and wolfram. In 1907 the national government undertook railways from Potosi to Oruro, 205 m., and from Potosi to Tupiza, 155 m., to connect with the Central Northern line of Argentina, which was opened to Quiaca on the frontier on the 25th of May 1908. In western Potosi the department is traversed by the Antofagasta & Oruro railway (0-75 metre gauge). Besides Potosi, the capital of the department, the principal towns are Huanchaca (pop. about 10,000 in 1904), the seat of famous silver mines, 13,458 ft. elevation, and overlooking the Pampa de Empeza; Uyuni, 9 m. from Huan- chaca, 12,100 ft. above sea-level, a small town but an important railway junction and commercial centre on the waterless plain, the shipping point and supply station for an extensive mining region; and Tupiza (pop. about 5000 in 1906), a prettily situated town near the Argentine frontier, on a small branch of the San Juan river, 9800 ft. above sea-level.

POTOSf , a city of Bolivia, capital of the department of Potosi, 47 m. (direct) S.W. of Sucre, or 88 m. by the post-road. Pop. (1906, estimate), 23,450. Potosi stands on a barren terrace on the northern slope of the Cerro Gordo de Potosi, 12,992 ft. above sea-level, and is one of the highest towns in the world. The famous cerro from which its name is taken rises above the town to a height of 15,381 ft., a barren, white-capped cone honeycombed with mining shafts. The town is regularly laid out with streets crossing each other at right angles. The smoke- begrimed buildings, many of which are unoccupied and in ruins, are commonly of adobe. A large plaza forms the conventional centre, around which are grouped various religious edifices, the government house, town hall, national college, the old " royal mint " dating from 1585, and the treasury. The city has a

massive, plain cathedral, which in part dates from early colonial times, and in part from the closing years of Spanish rule. The water supply is derived from a costly system, of reservoirs and aqueducts constructed by the Spanish government during the years of the city's greatest prosperity. There are 27 of these artificial lakes, and the aqueducts originally numbered 32, some of which are no longer serviceable. Rough mountain roads and pack animals are the only means of transportation to and from Potosi, but a railway from Oruro to Tupiza via Potosi, forming part of the projected Pan-American route, was con- tracted for in 1908. In 161 1 the population of Potosi was reported to be 160,000, which probably included the whole mining district. A part of the diminution since then is explained by the fact that the great majority of the mines on the cerro have been abandoned.

The foundation of the city dates from 1547, two years after the first discovery of silver on the cerro by an Indian herder named Gualci. Charles V. conferred upon it the title of " villa imperial." From 1545 to 1800 the crown tax of one-fifth upon the mineral product amounted to £32,600,000, showing an acknowledged output of £163,000,000. The actual output, however, must have been much greater, as Spain was flooded with contraband silver, and there was a large trade in it at La Plata ports, whence it was taken to Brazil and Portugal. The total output to 1864 has been estimated at more than £400,000,000, but the annual output at the beginning of the 20th century barely exceeded 400,000 ozs. The struggle for independence began in Potosi on the 9th of November 1810, but the Spanish forces succeeded in retaining possession down to 1822.

POTOTAN, a town of the province of Iloilo, island of Panay, Philippine Islands, on the Jalaur river, about 17 m. N. of Iloilo. Pop. (1903), 37,373, including the population of Dingle (12,129) an d Mina (4280), annexed after the census was taken. There is a fine church in the old town and a large stone church in Dingle; in the old town are several other buildings of masonry and some beautiful " fire " trees for shade. The principal industries are the cultivation of sugar-cane, Indian corn, rice, tobacco and hemp, and the raising of cattle, carabaos, sheep and horses.

POTSDAM, a town of Germany, the administrative capital of the Prussian province of Brandenburg, and one of the principal residences

of the German Emperor, beautifully situated on the river Havel, 16 m. S.W. of Berlin, on the main line of railway to Magdeburg. Pop. (1905), 61,414. It is also connected with the capital by two local lines and by a steamboat service through the chain of lakes formed by the river. The greater part of the town lies on the right bank of the Havel and is connected with the Teltow suburb on the opposite bank by a long bridge (Lange Briicke). At the north end of this bridge rises the royal palace, a large quadrangular building of the 17 th century, with a colonnade, chiefly interesting for the numerous relics it contains of Frederick the Great, who made it his favourite residence. At the south-eastern corner of the palace, close to the bridge, is the tree under which petitioners waited for the answer to their grievances, which Frederick the Great gave from an opposite window. It also contains reminiscences of Voltaire, who resided here for several years. The principal churches are the Nikolai- kirche; the Church of the Holy Ghost, built in 1728; the garrison church, containing the remains of Frederick the Great and his father, Frederick William I.; and the Friedenskirche, or Church of Peace, erected by Frederick William IV. in 1845-1850. To the Friedenskirche is attached a mausoleum built after the model of a chapel at Innichen in Tirol, in which are buried Emperor Frederick III. and his consort, the Princess Royal of Great Britain, and two of their children who died in infancy. Among other conspicuous buildings are the large barracks and other military establishments; the town hall; and the Brandenburg gate, in the style of a Roman triumphal arch. The town has fine statues of several of the Prussian kings, including Frederick the Great. The Lustgarten, the Wilhelmsplatz and the Plantage are open spaces laid out as pleasure-grounds and adorned with statues and busts. In spite of its somewhat sleepy appearance, Potsdam has manufactures of silk goods, chemicals, furniture, chocolate, tobacco and optical instruments. Market-gardening affords occupation to many of the inhabitants, and the cultiva- tion of winter violets is a specialty. The Havel is well stocked with fish. On a wooded eminence to the south of the town lies the observatory with extensive premises.

Potsdam is almost entirely surrounded by a fringe of royal palaces, parks and pleasure-grounds, which fairly substantiate its claim to the title of a ” German Versailles.” Immediately to the west is the park of Sans Souci, laid out by Frederick the Great, and largely extended by Frederick William IV. It is in the formal French style of the period, and is adorned with fountains, statuary and artificial ruins. Near the palace is the famous windmill ; now royal property, which, according to a tradition now regarded as doubtful, its owner refused to sell to the king, meeting threatened violence

by an appeal to the judges of Berlin. A little farther on is the Orangery, an extensive edifice in the Italian style, containing numerous pictures and other works of art. The park also includes the Charlottenhof, a reproduction of a Pompeian villa. At the west end of the park stands the New Palace, a huge brick edifice 375 ft. in length, erected by Frederick the Great at enormous expense in 1 763-1 769. It was occupied for a while by the emperor Frederick III., and was rechristened by him " Friedrichskron." On the accession of the emperor William II. its original name was restored. It is now the residence of the emperor. It contains reminiscences of Frederick and of Voltaire, a few pictures by ancient masters, a theatre, and a large hall decorated with shells and minerals. The spacious buildings at the back are devoted to the "Lehrbataillon, " a battalion of infantry composed of drafts from different regiments trained here to ensure uniformity of drill throughout the army. To the north of Potsdam lies a small Russian village, Alexandrowka, built-in 1826 to accommodate the Russian singers attached to the Prussian guards. A little to the east of it, on the Heiligersee, is the New Garden, containing the Marble Palace. The list of Potsdam palaces may be closed with two situated on the left bank of the Havel — one at Klein-Glienicke, formerly the country-seat of Prince Frederick Charles of Prussia (the " Red Prince "), and the other on the hill of Babelsberg. The latter, designed as a miniature copy of Windsor Castle, in the midst of a park in the English taste, was formerly the summer residence of the emperor William I.

Potsdam was originally a Slavonic fishing- village named Poztupimi, and is first mentioned in a document of 993. It became a town in the 14th century, but was unimportant until the great elector built a palace here between 1660 and 1682; and even at the close of his reign it only contained 3000 inhabitants. The elector Frederick William I. greatly enlarged Potsdam, and his stiff military tastes are reflected in the monotonous uniformity of the streets. Frederick the Great continued his father's work, and is the real creator of the modern splendour of the town, to which all his successors have contributed.

See H. C. P. Schmidt, Geschichte und Topographie der Residenz- stadt Potsdam (Potsdam, 1825); G. Sello, Potsdam und Sanssouci (Breslau, 1888); Mtigge, Fiihrer durch Potsdam und Vmgebung (Potsdam, 1896); Kopisch, Die koniglichen Schlbsser und Garten zu Potsdam (Berlin, 1854); and Bethge, Die Hohenzollernanlagen Potsdams (Berlin, 1889).

POTSDAM, a village of St Lawrence county, New York, U.S.A., in the township of Potsdam, on the Raquette river, about 68 m. N.E.of Watertown. Pop. of the village (1905) 4162; (1910) 4036; of the

township (1905) 8992; (1910) 8725. The village is served by the New York Central & Hudson River railway. It has a public library and is the seat of a state Normal School (1869), an outgrowth of St Lawrence Academy (founded in 1810 by Benjamin Raymond and maintained by him until 18 16, when it was incorporated) ; of the Thomas S. Clarkson Memorial School of Technology (1896), founded by his sisters in honour of Thomas Streatfield Clarkson (1837-1894); and of the Crane Normal Institute of Music. The village has a considerable trade in dairy products. In the neighbourhood are extensive quarries of the well-known ” Potsdam sandstone,” the uppermost division of the Cambrian system, described as a ” fine-grained sandstone cemented with silica,” and very durable. The House of Parlia- ment at Quebec, All Saints Cathedral at Albany, New York, and many other public edifices were built of this stone.

The ” Ten Towns ” of St Lawrence county, including the township of Potsdam, were sold by the state in 1787. The first settlement was made on the Raquette river, close to the present village, in 1803; the township was incorporated in 1806 and the village in 1831. Potsdam was named after Potsdam in Prussia because of the occurrence in each locality of reddish sandstone.

POTT, AUGUST FRIEDRICH (1802-1887), German philologist, was born at Nettelrede, Hanover, on the 14th of November 1802. He studied in Gottingen, and in 1825 became schoolmaster at Celle, Hanover; but after two years removed to Berlin, where he became privatdozent at the university. He studied comparative philology, and in 1883 was made professor at Halle, where he lived till his death on the 5th of July 1887. His Etymologische Forschungen (1834-1836) entitled him to rank as Bopp’s foremost disciple in the Indo-Germanic science of language. Pott also devoted much attention to the origins of the gipsies.

POTT, PERCIVALL (1714-1788), English surgeon, was born in London on the 6th of January 17 14. He served his appren- ticeship with Edward Nourse, assistant surgeon to St Bartholo- mew’s Hospital, and in 1736 was admitted to the Barbers’

Company and licensed to practise. He became assistant surgeon to St Bartholomew’s in 1744 and full surgeon from 1749 till 1787. He died in London on the 22nd of December 1788. The first surgeon of his day

in England, excelling even his pupil, John Hunter, on the practical side, he introduced various important innovations in procedure, doing much to abolish the extensive use of escharotics and the actual cautery that was prevalent when he began his career. A particular form of fracture of the ankle which he sustained through a fall from his horse in 1756 is still described as Pott's fracture, and his book, Some few Remarks upon Fractures and Dislocations, published in 1768 and translated into French and Italian, had a far-reaching influence in Great Britain and France. " Pott's disease " is a spinal affection of which he gave an excellent clinical description in his Remarks on that kind of Palsy of the Lower Limbs which is frequently found to accompany a Curvature of the Spine (1779). Among his other writings the most noteworthy are A Treatise on Ruptures (1756), Observations on the Nature and Consequences of those Injuries to which the Head is liable from external violence (1768), and Chirurgical Observations (1775). There are several editions of his collected works; that published by Sir James Earle in 1790 contains a sketch of his life.

POTTER, ALONZO (1800-1865), American bishop of the Protestant Episcopal Church, was born at Beekman (now La Grange), Dutchess county, New York, on the 6th of July 1800. His ancestors, English Friends, settled in Portsmouth, Rhode Island, between 1640 and 1660; his father was a farmer, a Quaker, and in 1798 and in 1814 was a member of the New York Assembly. The son graduated at Union College in 1818, and in 1821-1826 was professor of mathematics and natural philo- sophy there. In 1824 he was ordained priest, and married a daughter of President Eliphalet Nott of Union College; she died in 1839, and in 1841 he married her cousin. He was rector of St Paul's Boston, from 1826 to 1831, when he became professor of moral and intellectual philosophy and political economy at Union. In 1838 he refused the post of assistant bishop of the eastern diocese (Maine, New Hampshire, Massachusetts and Rhode Island). He was vice-president of Union College in 1838-1845. After the suspension of Henry Ustick Onderdonk (1789-1858) from the bishopric of Pennsylvania Potter was chosen to succeed him, and was consecrated on the 23rd of September 1845. Owing to his failing health he visited England and France in 1858, and in April 1864 sailed from New York for California, but died on board ship in San Francisco harbour on the 4th of July 1865.

In 1846 he established the western and north-eastern convocations of priests in his diocese; from 1850 to i860, when its corner-stone was laid, he laboured for the " Hospital of the Protestant Episcopal Church in Philadelphia"; and in 1861 he established the Phila- delphia

Divinity School. In 1842 with George B. Emerson (1797- 1871) he published The School and the Schoolmaster, which had a large circulation and great influence. In 1847, 1848, 1849 and 1853 he delivered five courses of lectures on the Lowell Institute founda- tion. He advocated temperance reform and frequently delivered a lecture on the Drinking Usages of Society (1852) ; he was an oppon- ent of slavery and published a reply to the pro-slavery arguments of Bishop John Henry Hopkins (1 792-1 868) of Vermont. He edited many reprints and collections of sermons and lectures, and wrote: Political Economy (1840), The Principles of Science applied to the Domestic and Mechanic Arts (1841), Handbook for Readers and Students (1843), and Religious Philosophy (1870).

See M. A. de Wolfe Howe, Memoirs of the Life and Services of the Right Reverend Alonzo Potter, D.D. (Philadelphia, 1871).

His brother, Horatio Potter (1802-1887), was born in Beek- man, New York, on the 9th of February 1802. He graduated at Union College in 1826, was ordained a priest of the Protestant Episcopal Church in 1828, was rector for several months in Saco, Maine, and in 1828-1833 was professor of mathematics and natural philosophy at Washington (now Trinity) College, Hart- ford, Connecticut. In 1833-1854 he was rector of St Peter's, Albany; in November 1854 he was elected provincial bishop of New York in place of Benjamin Tredwell Onderdonk (1791- 1861), who had been suspended, and upon Onderdonk's death he became bishop. In 1868 his diocese was divided, the new dioceses of Albany, Central New York and Long Island being

separated from it. Bishop Potter attended the Lambeth conferences of 1867 and 1868. His failing health put an end to his active service in 1883, when his nephew, H. C. Potter (q.v.), became his assistant. He died in New York City on the 2nd of January 1887.

POTTER, HENRY CODMAN (1835-1908), American Protes- tant Episcopal bishop, the son of Bishop Alonzo Potter, was born in Schenectady, New York, on the 25th of May 1835. He was educated in the Philadelphia Academy of the Protestant Episcopal Church and in the Theological Seminary of Virginia, where he graduated in 1857. He was ordained deacon in 1857 and priest in 1858; was rector of Christ Church, Greensburg, Pennsylvania, in 1858-1859, and of St John's Church, Troy, N. Y., in 1859-1866; refused the presidency of Kenyon College in 1863 and the bishopric of Iowa in 1875; was secretary of the House of Bishops in 1866-1883; and was assistant rector of Trinity Church, Boston, in 1866-1868, and rector of Grace Church, New York

City, in 1868-1884. In October 1883 he was consecrated assistant to his uncle, Horatio Potter, bishop of New York, and in 1887 succeeded him. The Rev. David Hummell Greer (b. 1844) became his coadjutor in September 1903, and succeeded to the bishopric after the death of Bishop Potter in Cooperstown, N. Y., on the 21st of July 1908. During Bishop Potter's administration the corner-stone of the Cathedral of St John the Divine was laid (in 1892).

He was notable for his interest in social reform and in politics: as rector of Grace Church he worked to make it an " institutional church " with working-men's clubs, day nurseries, kindergartens, &c, and he took part in the summer work of the missions on the east side in New York City long after he was bishop; in 1900 he attacked the Tammany mayor (Robert A. Van Wyck) of New York City, accusing the city government of protecting vice, and was a leader in the reform movement which elected Seth Low mayor in the same year; he frequently assisted in settling labour disputes; he worked for the re-establishment of the army canteen and attempted to improve the saloon, which he called the " poor man's club " — notably by his taking part in the opening (August, 1904) of the unsuccessful Subway Tavern. He published: Sisterhoods and Deaconesses at Home and Abroad (1872); The Gates of the East (1876), a book of travels; Sermons of the City (1881); Waymarks (1892) ; The Scholar and the State (1897) ; The East of To-day and To- morrow (1902); The Industrial Situation (1902); Law and Loyalty (!9°3), an d Reminiscences of Bishops and Arch-Bishops (1906).

See Harriett A. Kayser, Bishop Potter, the People's Friend (New York, 1910).

His brother, Clarkson Nott Potter (1825-1882), was a civil engineer, then (1 848-1 868) a practising lawyer in New York City, and in 1869-1875 and in 1877-1881 a Democratic member of the National House of Representatives. Another brother, Robert Brown Potter (1829-1887), a lawyer and a soldier, commanded the 51st New York Volunteers at Cedar Mountain, Second Bull Run and Antietam, was wounded at Antietam and at Petersburg, was commissioned major-general of volunteers in September 1 865, and was mustered out in 1866. A third brother, Eliphalet Nott Potter (1836-1901), was rector of the Church of the Nativity, South Bethlehem, Pennsylvania, in 1 862-1 869, was professor of ethics in Lehigh University in 1 869-1 871, and was president of Union College in 1871-1884, of Hobart College in 1884-1897, and of Cosmopolitan University, a correspondence school, in 1897-1901.

POTTER, JOHN (c. 1674-1747), archbishop of Canterbury, was the son of a linen-draper at Wakefield, Yorkshire, and was born about 1674. At the age of fourteen he entered University College, Oxford, and in 1693 he published notes on Plutarch's De audiendis poetis and Basil's Or alio ad juvenes. In 1694 he was elected fellow of Lincoln College, and in 1697 his edition of Lycophron appeared. It was followed by his Archaeologia graeca (2 vols. 8vo, 1697-1798), the popularity of which endured till the advent of Dr William Smith's dictionaries. A reprint of his Lycophron in 1702 was dedicated to Graevius, and the Antiquities was afterwards published in Latin in the Thesaurus of Gronovius. Besides holding several livings he became in 1704 chaplain to Archbishop Tenison, and shortly afterwards was made chaplain-in-ordinary to Queen Anne. From 1708 he was regius professor of divinity and canon of Christ Church, Oxford; and from 1715 he was bishop of Oxford. In the latter year appeared his edition of Clement of Alexandria. In 1707 he published a Discourse on Church Government, and he took a prominent part in the controversy with Benjamin Hoadly,

bishop of Bangor. In January 1737 Potter was unexpectedly appointed to succeed Wake in the see of Canterbury. He died on the 10th of October 1747. His Theological Works, consisting of sermons, charges, divinity lectures and the Discourse on Church Government, were published in 3 vols. 8vo, in 1753.

POTTER, PAUL (1625-1654), Dutch animal painter, was born at Enkhuizen, Holland. He was instructed m art by his father, Peter Potter, a landscape and figure painter of some merit, and by Nicolas Moeyaert, of Amsterdam. Other masters and influences are mentioned by various writers, but more than any other of his contemporaries he learnt through direct study from nature. By the time he had attained his fifteenth year his productions were already much esteemed. In 1646 he went to Delft, where he became a member of the gild of St Luke. At the age of twenty he settled at the Hague, and there married in 1650. He was patronized by Maurice, prince of Orange, for whom he painted the life-size picture of the " Young Bull," now one of the most celebrated works in the gallery of the Hague. In 1652 he was induced by Burgomaster Tulp of Amsterdam to remove to that city. His constitution seems to have been feeble, and his health suffered from the unremitting diligence with which he pursued his art. He died on the 15th of January 1654 at the age of twenty-nine.

His paintings are generally small; early in life, however, he attempted, but with ill success, to work on a monumental scale, as in the ” Bear Hunt ” at the Rijks Museum and the ” Boar Hunt ” of the Carstanjen collection, Berlin. Even the famous ” Equestrian Portrait of Tulp ” in the Six collection, Amsterdam, is awkward and stiff and hard in handling. His animals are designed with careful accuracy, while the landscape backgrounds are introduced with spirit and appropriateness. His colour is clear and transparent, his execution firm and finished without being laboured. His view of nature is purely objective and unemotional; he painted with the greatest directness and simpli- city the things he saw before him, and his paintings of horses and cattle are so individualized that they become faithful portraits of the animals. The best among his small portraits of horses are in the Louvre and in the Schwerin Gallery; and certain of his studies are the most brilliant of all.

The earliest dated picture of importance is ” Abraham Entering Into Canaan ” (1642), at the Germanic Museum in Nuremberg, in which he makes the Scriptural subject an excuse for painting the patriarch’s herds, just as in his ” Orpheus ” of 1650 (Rijks Museum, Amsterdam) he makes similar use of the Greek myth. Among his finest works on a small scale are a cattle piece (1653) in the Due d’Arenberg’s collection, and a similar, though earlier, picture in the Munich Pinakothek. In spite of his early death Paul Potter produced a great number of works. He worked with feverish appli- cation, as though he were aware of the short span of life that was granted him. He executed a series of some twenty etchings, mainly of animals, which are simple and direct in method and handling. Here, as in painting, his precocity was remarkable: his large plate of the ” Herdsman,” produced when he was only eighteen, and that of the ” Shepherd,” which dates from the following year, show him at his best as an accomplished master of the point.

Potter’s works have been engraved by Bartolozzi, Danckerts, Visscher, Le Bas and others. Authentic paintings from his brush command very considerable prices. At the Stover sale in 1890 ” The Dairy Farm ” realized the record price of £6090. There are two of his paintings at the National Gallery, three in Buckingham Palace and a few in the duke of Westminster’s collection. On the continent of Europe the most numerous and representative examples are to be found at the Rijks Museum in Amsterdam, the Hermitage in St Petersburg, and the Dresden Gallery.

See Paulus Potter, sa vie et ses ozuvres, by T. van Westrheene (the Hague, 1 867) ; Eaux-fortes de Paul Potter, by Georges Gratet

Duplessis ; and an old but interesting volume, Paul Potter, peintre de I'ecole hollandaise, by C. L. F. Lecarpentier (Rouen, 1818). (P. G. K.)

POTTER, PHILIP CIPRIANI HAMBLEY (1792-1871), English musician, was born in London, the son of a pianoforte teacher, and godson of a sister of G. B. Cipriani, the painter. He was educated for the musical profession under Attwood, Callcott, Crotch and Woelfl; later at Vienna, where he received encourage- ment from Beethoven. In 1816 an overture by him was per- formed at a Philharmonic concert, and he began a distinguished career as a pianist. In 1822 he became a professor, and in 1832 principal (resigning in 1859) of the Royal Academy of Music; in

i860 an exhibition was founded there in his honour. Cipriani Potter composed many works, now mostly forgotten, though important in their day. He died on the 28th of September

1871.

POTTERIES, THE, a name popularly applied to a district of north Staffordshire, the principal seat of the china and earthen- ware industry in England. It lies in the valley of the Trent a little south of its source, and extends into tributary valleys and up the hills flanking them. For a distance of 9 m. from south-east to north-west, and about 3 m. from north-east to south-west, the district resembles one great town, but the chief centres are Burslem, Hanley, Longton, Stoke-on-Trent, Fenton and TunstalL Under the " Potteries federation " scheme (1908) these towns were amalgamated in 19 10 as one municipal borough under the name of Stoke-on-Trent. New- castle-under-Lyme, though not sharing in the staple industry, may also be reckoned in the district. Among the lesser manufac- turing centres Etruria, ranking as a suburb of Hanley, is well known for its connexion with Josiah Wedgwood, who founded works here in 1769. The Wedgwoods and the Mintons are the two most famous family names connected with the china industry of the district. Coal and coarse clay are the only local natural products necessary to the industry; the finer clay and other ingredients are brought from Cornwall and elsewhere. Ironstone is raised in the district. The North Staffordshire and London & North-Western railways and the Grand Trunk canal are the principal means of communication.

POTTHAST, AUGUST (1824-1898), German historian, was born at Hoxter on the 13th of August 1824, and was educated at Paderborn, Munster and Berlin. He assisted G. H. Pertz, the editor of the Monumenta Germaniae historica, and edited the Regesta pontificum

romanorum, ng8-ijo4 (Berlin, 1874-1875). From 1874 to 1894′ he was librarian of the German Reichstag. Potthast is chiefly known through his monumental Bibliotheca historica medii aevi (1862), a guide to the sources of European history in the middle ages. The work, in the form of an index, gives particulars of practically all the historical writers of Europe and their work between 375 and 1500. A new and enlarged edition appeared at Berlin in 1896. Potthast died on the 13th of February 1898.

POTTINGER, ELDRED (1811-1843), Anglo-Indian soldier and diplomatist, entered the Bombay Artillery in 1827, and after some years of regimental duty was appointed to the political department under Colonel (afterwards Sir Henry) Pottinger. In 1837 he made a journey through Afghanistan in disguise. Arriving at Herat, he found it threatened by a Persian army (with which were some Russian officers) and immediately made himself known to the Afghan commander, offering his services. The attack which soon followed was conducted with the greatest vigour, but the defence, inspired by Pottinger, was invariably successful, and after a year the siege was raised. For this great service Pottinger was thanked by the governor-general, the earl of Auckland, made brevet-major, and also received the C.B. He was also appointed political officer at Herat. In 1841 he was political officer in Kohistan when the revolt against Shah Shuja broke out there. Taking refuge with the Gurkha garrison of Charikar, Major Pottinger stood a siege of fourteen days, and then made an. adventurous retreat to Kabul. Less than a fortnight after his arrival Sir William Macnaghten was murdered, and Pottinger succeeded to his position as envoy to the Afghan court. The apathy of the military leaders made resistance hopeless, and it only remained to negotiate for the withdrawal of the British mission. Pottinger himself was one of the hostages handed over to Akbar Khan, and thus escaped the massacre in the Khyber Pass. Released, after many months' captivity, by Sir George Pollock's army, he returned to India, and a year later died while visiting Hong-Kong.

POTTO, the native name of the West African slow-lemurs, popularly miscalled " sloths," and scientifically known as Perodicticus, a name referring to the aborted condition of the index finger, which forms their most distinctive feature. The ordinary potto (P. potto) is about the size of a squirrel, but with

large staring eyes, and a mere stump of a tail: its general colour is rufous brown. Bates's potto (P. batesi), of the Congo, is nearly allied;

but the awantibo {P. [Arctocebus] calabarensis) , of Old Calabar, differs by the complete loss of the tail (see Primates).

POTTSTOWN, a borough of Montgomery county, Penn- sylvania, U.S.A., on the Schuylkill river, 40 m. N.W. of Phila- delphia. Pop. (1010 census) 15,599. Pottstown is served by the Pennsylvania and the Philadelphia & Reading railways, and by electric lines to neighbouring towns. In the borough is the Hill School (1851), an excellent secondary school for boys. There is trade with the surrounding country, which is devoted to farming and dairying and abounds in iron ore and limestone, but the principal industry is the manufacture of iron and steel, the first commercially important iron furnaces in Pennsylvania having been established near the site of Pottstown in 1716-1718. In 1905 the factory products were valued at $8,144,723 (10-7% more than in 1900). Three miles from Pottstown, in an amuse- ment park, are the ” ringing rocks’,” which cover about an acre, and have varying tones when struck, so that tunes may be played upon them. Pottstown was settled and laid out in 1752 and was named Pottsgrove in honour of its founder, John Potts (1710-1768); in 1815 it was incorporated as a borough and in 1829 the present name was adopted.

POTTSVILLE, a borough and the county-seat of Schuylkill county, Pennsylvania, U.S.A., at Schuylkill Gap through Sharp Mountain on the Schuylkill river, about 90 m. N.W. of Phila- delphia. Pop. (1910 census) 20,236. It is served by the Pennsylvania, the Lehigh Valley and the Philadelphia & Reading railways, and by the Eastern Pennsylvania railway company to the borough of Minersville (pop., 1910, 7240), about4§m. N.N.E., and to the other boroughs in the immediate neighbourhood, for which Pottsville is a business and shipping centre. It is picturesquely situated in the famous Schuylkill coalfield and on the old Schuylkill canal and Tumbling Run, and has a con- siderable number of summer visitors. There are large repair shops of the Pennsylvania and of the Philadelphia & Reading railways at Pottsville. In 1905 the total value of the factory products was $5,805,788.

The first settlers here, a single family, were massacred by the Indians in August 1780; a second settlement was established about 1795, and an iron furnace was erected a few years later. In 1804 this furnace was purchased by John Pott (1759-1827), the founder of the borough; in 1807 coal was discovered; in 1816 the town was laid out: in 1828 it was incorporated as a borough; and in 1851 the borough became the county-seat. In 1854-1877 Pottsville was a centre of the Molly Maguire disturbances, and here a number of the leaders were tried

and convicted in 1876-1877. In 1908 the borough of Yorkville (pop., 1900, 1125) was annexed to Pottsville.

POTWALLOPER, or Potwaixer, the name of a class of persons who were entitled in certain English boroughs to the parliamentary franchise. The word is usually taken to mean literally ” one who boils a pot,” from ” wallop ” or ” gallop,” which Skeat (Etym. Diet., 1898) connects with the Old Low Ger. wallen, to boil, cf. ” well,” i.e. which springs or boils up. The ” Potwalloper ” was defined in Curry’s Case, 1838 {Pale and Pitz., p. 311) as “one, whether he be a householder or a lodger, who has the sole dominion over a room with a fireplace in it, and who furnishes and cooks his own diet at his own fireplace.” The Representation of the People Act (1832) reserved these ancient franchise rights to their then holders only. In the Return of Parliamentary Constituencies (Electors, &c), 1898, there was one ” potwalloper ” on the register.

POUCHED MOUSE, the colonial name for any member of the polyprotodont marsupial genus Phascologale (see Marsupi- alia). There are over a dozen species, none larger, the most much smaller than a rat. The food of these animals is almost entirely insects, which some pursue among the branches of trees, while others are purely terrestrial. Pouched mice are found throughout Australia, where all the species have uniformly coloured fur, and also in New Guinea and the Aru and some

of the adjacent islands, most of the Papuan forms being distinguished by striping on the back. In the view of Oldfield Thomas these marsupials fill the place held in Malaya by the tree-shrews, and in South America by the smaller opossums.

POUGHKEEPSIE, a city and the county-seat of Dutchess county, New York, U.S.A., and on the east bank of the Hudson river, 73 m. N. of New York City. Pop. (1910 census), 27,936. It is served by the New York Central & Hudson River, the New York, New Haven & Hartford, the West Shore, the Central New England, and the Poughkeepsie & Eastern (merged in the Central New England) railways, and by river steamboat lines on the Hudson. A cantilever railway bridge, 2260 ft. long (6767 ft., including approaches) and 200 ft. above the water, spans the Hudson at this point. The city is built partly on terraces rising 200 ft. above the river and partly on a level plateau above. On the Hudson here is the course for the inter- collegiate boat-races in which the American college crews (save those of Yale and Harvard, which row on the Thames at New London) have rowed annually, beginning in 1895, except in 1896, when the race was rowed at

Saratoga. In the north-eastern part of the city is College Hill Park, and in the centre is Eastman Park (n acres, originally the home of Harvey Gridley Eastman). Vassar College (

Poughkeepsie was settled by the Dutch about 1698, taking its name from an Indian word ” Apokeepsing,” or ” Pooghkepe- singh,” which seems to have been the name of a waterfall on the river front. The New York legislature met in Poughkeepsie in 1778, 1780, 1781, 1782, 1788 and 1795, and here in 1788 met the convention which ratified for New York the Federal constitution (July 28). Poughkeepsie was incorporated as a village in 1799 and was chartered as a city in 1854.

POULTICE, a mass of linseed-meal, bread or other substance, sometimes of medicinal herbs, mixed with boiling water and enclosed in muslin or linen and applied to the skin to reduce inflammation, to induce warmth, or when mixed with mustard, &c, as a counter-irritant. The word seems to have been taken from the plural pultes of the Lat. puis, pottage, pulse, Gr. irokros. POULTRY AND POULTRY-FARMING. The term ” poultry ” (from ” poult,” Fr. poulet, dim. of poule, a fowl) is usually regarded as including the whole of the domesticated’ birds reclaimed by man for the sake of their flesh and their eggs. The most important is the common fowl, which is remarkable as having no distinctive English name; but the present article also deals with the poultry-farming side of the turkey, the guinea-fowl, the duck and the goose. For purely zoological details the separate articles referred to should be consulted.

Fowls. — The common fowl (see Fowl) belongs to the restricted genus Gallus, of which four wild species are known — the Bankiva jungle fowl (G. ferrugineus) , the Sonnerat jungle fowl (G. sonnerali), the Ceylon jungle fowl (G. stanleyi), and the forked- tail jungle fowl (G. furcatus). The origin of the domesticated breeds is ascribed by Darwin, Blyth and other naturalists to the Bankiva fowl, much stress being laid on the comparative want of fertility in the hybrids produced between this species

or the domesticated breeds and the other three forms of wild Galli, but it is probable that this want of fertility was due in great part to the unnatural conditions under which the parent and offspring were placed, as, if bred under more natural condi- tions, there is no difficulty in rearing these hybrids or in breeding from them with the

domesticated varieties.

Breeds. — The number of poultry exhibitions has nowadays multiplied to such an extent that as many as twenty shows have been criticized in print in one week in Great Britain. Competition has increased the money value of prize fowls and created a large class— almost a profession — who have considerable pecuniary in- terests embarked in breeding and exhibiting such birds. This professionalism, and the interests at stake, have in turn naturally given rise to many proceedings of doubtful character, which it has been found needful to keep in check by an organization known as the Poultry Club. An enormous multiplication of varieties is another phase of this development, nearly all breeds having had their older subdivisions supplemented by new colours, produced through crossing and skilful selection, amidst which buff or orange, now bred in nearly all fowls, has had a curious popularity. While formerly the diminutive bantams were confined to a few well- marked varieties, all the large breeds of poultry have now been dwarfed into bantam size by the skill of breeders. To enter farther into this branch of the subject is beyond the scope of the present article, but it may be interesting to state that at a public auction in 1 90 1 one prize fowl was sold for £150.

Came Fowls. — Game fowls differ less from the wild Bankiva than any other variety; they are, however, considerably larger, and carry the tail more erect than the wild birds. Game fowls in England were long cultivated not only as useful poultry, but on account of their combative tendencies for the cock-pit. The comb in the game is single, the beak massive, the' spurs strong and very sharp. There is a tendency towards the assumption of the female plumage by the males, and distinct breeds of " henny " game are known. Game are highly esteemed for the table on account of their plumpness, the amount of the breast-meat, owing to the size of the pectoral muscles, being very great, from which cause, combined with their hardihood, they are most valuable for crossing with other breeds, as the Dorking. English-bred game have been reared of many varieties of colour, retaining in all cases their distinctive peculiarities of form. Game fowls have been reduced in size by selective breeding, and exceedingly minute game bantams have been produced with the distinguishing characters of the larger breed. But the long-legged and long-necked " stilty " game fowls, which resulted at one time from breeding for exhibition purposes, have been again superseded in favour of the old and genuine type.

Cochins. — This type, which must be regarded as including not only the birds generally so-called but also the Brahmas and Langshans, is of

very large size, some of the males reaching the great weight of 16 or 17 lb. They are distinguished by a profusion of downy plumage, with small wings and tails; they are incapable of long flight, and the pectoral muscles are consequently but feebly developed. The Cochins originally imported from Shanghai were of several colours ; some of the grey birds in America were crossed with the grey Chittagong, the Brahmas being the result of the cross, and they became established as a pure breed, faithfully reproducing their own type. The Langshans, a later importation, have fuller breasts and less abundant plumage. The exaggeration of fluff and leg-feather has removed all Cochins — it is to be feared per- manently — from amongst popular and useful breeds, and in only less degree the Brahma, once the most popular breed of the day. On the other hand, new sub-breeds, based upon a cross from one or the other of the Asiatic races, have been multiplied and largely bred, these being all of smooth-legged type and somewhat less in size. A sub-variety of Cochin, raised in America, by crossing with a cuckoo- coloured breed long known as Dominiques, became fashionable under the name of Plymouth Rocks. They are cuckoo-coloured, viz. each feather is marked with transverse grey stripes on a lighter ground, and, as in all cuckoo-coloured breeds, the cocks are of the same colour as the hens; their legs are not feathered, and the plumage is not so loose as that of the more typical Cochins. To the original cuckoo-coloured Plymouth Rock have been added buff and white varieties ; and by crossing Cochins and Brahmas with other fowls, American breeders produced another useful race of compact form with smooth yellow legs, and white feathers laced with black round the edges, called the silver-laced Wyandotte, to which were speedily added other colours and patterns of plumage. The feathered Lang- shan has given rise to the black Orpington with smooth legs ; and a local cross of Cochin and Dorking prevalent in Lincolnshire, to a buff breed with smooth white legs, now called the buff Orpington, though quite unrelated to the former. All these are useful for table, and good layers.

Malayan Fowls. — The Malayan type has been long recognized as of Eastern origin. The birds are of large size, close and scant in plumage, with very long legs and necks. The Gallus giganteus -of Temminck, which he regarded erroneously as a distinct species, belonged to this group, as did the Kulm fowl and the grey Chittagong of the United States. The Malays are of savage disposition. Several

smaller breeds of a somewhat similar type are known as Indian Game; some of these, as the Aseels, are of indomitable courage. Until the arrival of the so-called Cochin breeds from the north of China, Malays were the largest fowls known in Europe and were employed to impart

size to other varieties by crossing.

Spanish. — The Spanish or Mediterranean type is well marked. The birds are of moderate size, with large single erect combs and white ear-lobes. In the black Spanish the whiteness of the ear-lobe extends over the face, and its size has been so greatly developed by cultivation that in some specimens it is 6 or 7 in. in length and several in breadth. Closely related to the Spanish, differing only in colour of plumage and extent of white face and ear-lobe, are the white and brown Leghorns, the slaty-blue Andalusians, the black Minorcas, &c. All are non-incubators, the desire to sit having been lost in the tendency to the increased production of eggs, which has been developed by the persistent and long-continued selection of the most fertile layers. The white-faced black Spanish, once the most widely kept, has almost disappeared; but the allied red-faced Minorca and the blue Andalusian have achieved great popularity as free layers of large white eggs; and the yellow-legged Leghorns of similar type, though rather smaller, have spread on all sides with much multiplication of varieties, the latest of which, with mottled black and white plumage, is termed the Ancona.

Hamburghs. — The Hamburghs, erroneously so called from a name given them in the classification adopted at the early Birmingham shows, are chiefly breeds of English origin. They have double combs and small white ear-lobes. There are various sub-varieties. Those with a dark crescent-like mark on the end of each feather of the hen are termed Spangled Hamburghs. Others are of uniform black plumage. A somewhat similar breed of smaller size, with each feather of the hens marked with transverse bands of black on a white or bay ground, is termed Pencilled Hamburghs; they were formerly known as Dutch Everyday-layers. These breeds are all non- sitters and lay a remarkably large number of eggs. Hamburghs in England have been depressed in recent years by the complicated system of breeding separate strains for each sex ; but there has been introduced from Europe the hardy Campine or Braekel, resembling the pencilled Hamburgh in plumage, but larger and with a single comb, and laying a large egg in great numbers.

Crested Fowls. — The crested breeds (non-incubating) have long been cultivated on the continent of Europe and are admirably delineated in the pictures by Hondekoeter and other early Dutch artists. In Great Britain they are erroneously termed Polish. The develop- ment of the feathered crest is accompanied by a great diminution in the size of the comb, which is sometimes entirely wanting. The wattles also are absent in some breeds, their place being occupied by a large tuft of

feathers, forming what is termed the ” beard.” In all the crested breeds there is a remarkable alteration of the cranium, the anterior part of the skull forming a prominent hollow tuberosity which contains a very large part of the brain. This portion of the brain-case is rarely entirely ossified. There are numerous sub-varieties of crested fowls. The best-known breeds in England are the spangled, with a dark mark at the end of each feather. This mark often assumes a crescent shape, the horns of the crescent sometimes running up each margin of the feather so as to form a black border; feathers so marked are termed ” laced ” by poultry-fanciers. There are also white Polish and a buff variety. A very distinct sub-variety is the black breed with a white crest on the head and large pendent wattles. A variety with the arrange- ment of these colours reversed was formerly known, but it has now become extinct. Some of the larger breeds of the west of Europe are closely related to the Polish. The Creve-cceur is a crested breed of uniform black colour ; it is of large size and of great value for the table and for egg-production.

The Houdan is a black and white breed of very similar character. In some breeds the form of the body and structure of bones of the face closely resemble those of the Polish, but there is an absence of the feathered crest, the crescent-shaped comb becoming more largely developed ; such are those known as Guelders, Bredas, and La Fleche, the latter being the best French fowl for eating. A small white- crested variety, profusely feathered on the legs, was received about 1864 from Turkey; they are known as Sultans. The older French breeds are less kept than formerly, but a race originated in France by crossing Houdans with Dorkings and light Brahmas, and known as the Faverolles, is a tender and quick-growing table fowl, and even in the Houdan district itself is displacing the Houdan, one of its ancestors. The Faverolles have single upright combs, beards and whiskers, slightly feathered legs, and five toes on each foot ; and the general colour of the hen is salmon or fawn, with an almost white breast.

Dorkings. — The Dorking type includes fowls that have for many generations been bred for the supply of the London markets. They are all fleshy on the breast and of fine quality. The Dorkings have an extra toe, a monstrosity which leads to disease of the feet. The Surrey and Sussex fowls are four-toed. The coloured Dorkings were greatly increased in size by crossing with an Indian breed of the Malay type. The birds of the Dorking type are fair layers and good sitters. They are rather delicate in constitution, and are chiefly bred_ in the south of England. “Crossed with the game breed they furnish a hardy fowl, plumper than the Dorking and larger than the

Game, which is of unsurpassed excellence for the table. Mating a Dorking cock with large game hens is found to be the most advantageous.

Silk Fowls. — These constitute a singular variety, in which the barbs of the feathers are not connected by barbules and the entire plumage has a loose fibrous appearance; similar variations are found amongst other species of birds, but are soon lost in a wild state. The silk fowl best known is that in which the plumage is perfectly white, whilst the skin, cellular tissue between the muscles, and the periosteum covering the bones are a deep blue-black, the comb and wattles being a dark leaden blue. The birds are admirable sitters and mothers, and are much valued for rearing pheasants, being of somewhat small size. Though of remarkable appearance when cooked, they are of good quality. In crosses with other breeds the silky character of the plumage is generally lost, but the dark skin and intermuscular cellular tissue remain and greatly lessen the value of the birds in the market.

Frizzled Fowls are birds in which each feather curls outwards away from the body. They are common in India, but are not adapted to the climate of Britain, as the plumage offers an imperfect protection against wet.

Rumpless Fowls are those in which the coccygeal vertebrae are absent ; there is consequently no tail. By crossing, rumpless breeds of any variety may be produced. They are not desirable to cultivate, as, from the structural peculiarities, the eggs are very apt to escape being fertilized.

Dumpies or Creepers are birds in which the bones of the legs are so short that their progression is considerably interfered with. The best known are the Scotch dumpies.

Long-tailed Fowls, under the various names of Yokohama or Phoenix fowls, or Shinotawaro fowls, are singular varieties recently introduced from Japan, in which the sickle-feathers of the tail are 6 or 7 ft. long. In Japan they are said to assume a much greater length. One bird in the museum at Tokio is stated to have sickle- feathers 17 ft. long. In other respects the fowls are not peculiar, resembling the birds of the Game type.

Bantam. — This term is applied to fowls of a diminutive size without

any reference to the particular breed. By careful selection and crossing with small specimens any variety can be reduced to the desired size. The Chinese had in the Summer Palace at Peking small Cochins weighing not more than I lb each. The Japanese have long possessed a dwarf breed with enormous tail and comb, and with very short legs. One of the most artificial breeds is the Sebright bantam, named after its originator. This bird has the laced or marginal feather of the Polish combined with the absence of male plumage in the cocks, so that it may be described as a hen-feathered breed with laced plumage. When perfect in marking it is of singular beauty, but is not remarkable for fertility.

Most of the modern changes in breeds, broadly speaking, have been in the direction of replacing poultry with chiefly fancy points by really useful fowls, yet it is noteworthy that they have been carried out by fanciers, or breeders for exhibition, proving that there has not been that practical antagonism between the aims of these breeders and the production of food which some have alleged. But there has further been, since 1890 especially, a remarkable development of what has been termed ” utility ” poultry-breeding.

Feeding and Egg-production.— These aspects of poultry- culture are closely connected, and in both such advances have been made as almost amount to a revolution. The breeders of the United States have led the way, and, though it had first been taught in England, were the first to practise generally the systematic breeding, year after year, from the best layers only. It had always been known that some hens would lay from 150 to 200 eggs in a year whilst many did not exceed 100, and some laid much less. This was tested (on a better stock than the average) at the Maine experimental station in 1898-1899, 260 pullets being selected, of which 5 died and 19 were stolen. Of the remainder, 39 laid 160 eggs each or more, and 22 less than 100, the rest coming between these figures; the five best laid 200, 201, 204, 206 and 208 eggs in twelve months, and the three worst only 36, 37 and 38 in the same time. From such figures the money value of selective breeding is apparent. As a proof of what may be done by systematic breeding, one American breeder obtained an average of 196 eggs per annum from as many as 600 white Leghorns, and another 194 eggs from 140 Plymouth Rocks; greater numbers have been obtained from single birds or small pens of fowls, but these are results from considerable flocks.

It has been proved, however, that such averages as these cannot be obtained unless they are fed for as well as bred for.

The most successful egg-farmers now feed their poultry on definite ” rations,” compounded so as to give what is termed a proper ” nutritive ratio,” or proportion of albuminoids to carbonaceous material. The basis of such feeding is analysis of foodstuffs, in some form which shows simply their percentages of albuminoids, fats or hydrocarbons, carbohydrates (starch, sugar, &c), salts, crude husk or fibre, and water. Fats, being relatively much richer in carbon than the starch compounds, are generally multiplied by 2-25, and this product added instead to the carbohydrates; then the ratio of albuminoids or nitrogenous matter to this total of carbonaceous compounds is the ” nutritive ratio.” The following is a useful table of analyses made out in this way, taken from The Book of Poultry: — ■

Analyses of Poultry Foods.

Articles of Food.

Grains and Meals. Linseed meal Beans and peas Malt sprouts Oatmeal Middlingsor FineSharps Sunflower seed Bran …. Oats and ground oats Wheat …. Barley (and meal) Millet seed Maize …. Rye …. Buckwheat . Hempseed . Dari …. White bread

Rice

Brewers’ grains

Vegetables. Potatoes Red clover . Meadow grass . Hay …. Cabbage

Onions …. Turnips ….

S 5

Animal Foods. Dry meat meal. Flesh of fowls . Horse-flesh . Lean of beef Fresh-cut bone Dried fish

Milk …. Skim milk (separated) Eggs (yolk only) ,, (white only) .

32-9 24-0 23-2 18-0 16-0 16-0

15-5 15-0

12-0 12-0

“•3

10-5 10-5

IO-O

100

9-5

8-8 6-6 5‘4

6-5

5-o

3-5 8-4 2-4

i-5 Q-5

71-2

21-0

21-7 20-5

20-2 48-4

4-0

3-i

16-0

12-0

X.31

7-9 =

i-5 =

1-7 =

6-o- 4-o:

2i-5 : 4-o:

5-5 =

i-8’

i-4 :

4-0: 8-0′

i-8:

2-2 :

21-0

4-5

i-8

0-4 1-6

o-o = o-8 = i-o =

2-6 =

0-4 =

0-2 = 0-1 =

i37 :

3-8 =

2-6:

3‘5 :

26-1

n-6

3-5

o-3

30-0

2-0

= 17-8 = 3-4 = 3”8 = 13-5 = 9-0

= 48-4 = 9-0 = 12-4 = 4-0 = 3-2 = 9-0 = 18-0 = 4-0

= 5-o

= 47-2

= 10-1

= 4-0 = 0-9 = 3-6

= o-o

= 1-8

= 2-2

= 5-8 = 0-9 = 0-5

= 30-8 = 8-5 = 5-8 = 7-9 = 58-7 = 26-1

= 7-9 = 0-7

= 67-5

= 4-5

35-4 48-0

48-5 63-5

57-o

21-4 44-0 48-0 70-1 56-0

6o-o

66-5 72-5

62-2

45-0 68-7

56-4

8o-o

12-5

41-0 13-3 13-5 41-0

3-8 4-8 4-0

o-3

0-0

o-o o-o o-o

0-0

4-8

5-3

o-o o-o

J?S

5-7 2-5 57

2-0

4-5

2-6

6-0

2-5

i-8

3-6

3-o i-5

1-9

2-0 2-0 1-5

o-5

0-0

I-O

2-0

2-4

2-0 6-2

i‘4 o-5

1-0

4-1

1-2

1-4 1-6 24-0 29-2 0-7 0-7

i-o

1-2

8-9

9-2

10-0

14-0

10-7

IO-2

i-5

9-0

4-5

14-0

29-0

9-5

ib-5

14-0

19-0

IO-O

2-3

I2-0

14-0

13-0

9-4

12-3

2-5

II-O

i-7

n-6

II-O

12-6

14-0

8-0

3-3

12-5

o-o

32-5

0-0

13-0

3-8

75-7

o-o

50-5

0-5

72-0

4-7

75-3

27-2

14-6

i-5

90-5

2-0

91-0

1-4

93-0

0-0

10-7

0-0

74-0

0-0

74-3

0-0

74-4

0-0

29-7

0-0

io-8

00

87-0

o-o

90-6

0-0

53-o

o-o

84-8

Many writers have introduced unnecessary complication into a very simple matter. Some elaborately compute the amount of ” dry matter,” which is needless if our analyses show the proportion of water, as above. Others have calculated ” digestibility,” on the theory that food not rejected as excrement is ” retained in the body.” This theory has a basis in the case of animals which consume a large amount of hard indigestible fibre, excreted in such a form as horse manure ; but fowls macerate all they eat in the crop, and grind it in the gizzard, and in their case the excreta represent very little undigested food, but mainly the final result of the vital processes, and of food usefully employed in carrying these on. We may be sure that we more than allow for any factor of indigestibility if we merely leave out any crude husk or fibre, giving that to the fowl for whatever it is worth, and calculate our ratio direct from the figures of the table.

Two extremely simple cases will suffice as examples of the modern method. Potatoes are often cheap, but on account of their starchy composition require a ” balance,” and the same may be said of maize : one method of balancing each will show what is meant and the simplicity of the calculation. We will take potatoes and bran first.

Ratio of Potatoes and Bran.

Albumi- noids.

FatX2i.

Carbo- hydrates.

Salts.

I ft Potatoes

I ft Bran ….

6-5 15-5

o-o 9-o

41-0

44-o

2-0

6-0

22-0

9-o

85-0

+9-o

8-0

94-o

Adding here the fats X 2| to the carbohydrates, we get the ratjo of the mixture as 22 : 94, or about 1:41, which is very good. Coming next to the maize, let us suppose that it is desired to feed this as grain in the evening, and to ” balance ” it by an equal weight of ” mash ” or soft mixture in the morning. One way would be as follows : —

A Diet containing Maize.

Albumi- noids.

FatX2j.

Carbo- hydrates.

Salts.

3 lb Maize (X 3) ■ •

1 ft Horse-flesh.

2 lb Ground oats (X2).

31-5 21-7 30-0

54-o

5-8

24-8

199-5

o-o

96-0

4-5

I-O

5-o

83-2

84-6

295-5 + 84-6

10-5

380-1

This ration explains how in such a case we must multiply the figures for maize by 3, and those for oats by 2, being the proportions we are taking to one portion of horse-flesh. The ratio of this dietary comes out slightly lower than 1 -.45.

The proper ratio for feeding fowls has received much discussion. Dietetic authorities mostly agree that about I : 5 is the best for maintenance of animal life generally, and more specifically that there should be of albuminoids about 18 parts in 100, of .fats 7 and carbo-hydrates 75. That should suffice for growing chickens; but it is fairly obvious that fowls fattening may require more fat, while the constant production of eggs, whose high ratio is shown in the analyses, must require a larger amount of albuminoids. This fact is indicated by the hen herself, which when laying devours large earthworms, usually rejected with disgust at other times. She shows by this appetite how specially she needs albumen ; and fowls on a wide range, though only fed with corn, may thus in summer ” balance ” a dietary for themselves by the worms and insects which they procure. When they cannot do this, more albumen must be supplied, and the general opinion of practical egg-farmers has tended towards a ratio of 1 : 4 or 1 : 4i for hens in full lay. One successful American breeder feeds as high as 1 : 3, and states that his results have been best at that figure.

Passing from theory, the greatest practical advance in poultry- feeding has probably been the discovery of the benefit to be derived from dividing the extra supply of albumen between fresh bones cut up small

in a mill (known amongst breeders as ” cut bone “) and such green food as clover or cabbage. The bones contain a good proportion of fat, and of mineral salts also, which careful experiments have shown to be of great importance both in egg-production and for growing stock. Green food had until recently been looked upon chiefly as a corrective, or neces- sity for health, though it was known that fowls on a pasture grazed largely. But the nutritive ratio of clover is as high as 1:3, and American poultry-farmers now use it largely as really albuminous food, to promote laying. Its use in this way also allows more animal food to be used without ill effect; and to this free use of clover and cut bone in conjunction the improved results upon American egg-farms are largely due. The following is the ” mash ” ration on a successful American egg-farm, and represents a high forcing diet: middlings or sharps 100 lb, maize- meal 75 lb, gluten-meal (a highly nitrogenous by-product of American flour-milling) 25 lb, clover-meal 80 lb, meat-meal 35 lb, all weighed dry, mixed with boiling water in the evening, and kept covered all night.

The majority of poultry-farmers give their stock each day one feed of grain, and one of soft meal-food or ” mash,” but by no means agree as to the times for these meals. In England, morning mash and evening grain are almost universal, the latter giving more support during the long fast at night, and the former more rapid recuperation on cold mornings. But in America

and Canada, where the climate compels confinement of the fowls for months together in enclosed sheds, health and eggs can only be secured by constant ” scratching,” to promote which the grain is scattered amongst loose litter spread several inches deep. Many, therefore, prefer to scatter the grain in the morning and feed the mash at night, alleging that a good breakfast of mash makes the fowls lazy, with bad results. Others state that this is avoided by a rather scantier morning feed of mash, with a slight sprinkle of grain in the litter afterwards. In 1890 a careful experiment was made by the Massachusetts Agricultural College, two similar lots of pullets being fed upon similar food, on the two plans, for two periods of several months each, in summer and winter seasons, and each lot receiving, besides the morning and evening feeds, a slight sprinkle of millet in the. litter, to promote exercise. In egg-production there was scarcely any difference, what little there was being in favour of the morning mash; and the birds thus fed became also somewhat the heaviest. The most remarkable result was that the weight of manure voided in the night was nearly double in the case of the evening-mash birds, showing the rapid digestion of mash food.

Artificial Incubation and Rearing. — In the separate article on Incubator, details are given concerning the appliances used in artificial hatching and rearing, and the subject may be only briefly treated here.

Even in England the eggs hatched in incubators now probably equal, or nearly equal, those hatched under hens: in America the wide practice of artificial incubation is difficult to realize. Of small-sized machines one Illinois maker sold 14,800 in 1899; and in regard to large sizes, in 1900 at least seven names and addresses were known of operators who each used from 55 to as many as 85 machines, every machine holding 300 or more eggs: somewhat smaller plants were of course far more numerous. Experience on such a vast scale has led to a practical advance of considerable importance. While in England it is still usual to effect empirical adjustment of ventilation and moisture, the better American incubators now dispense with direct moisture altogether. It was remembered that the hen hatches without moisture, and equally so the egg-ovens of Egypt; the absence of direct air-current, and consequently of any rapid evaporation, being the obvious explanation. The manufacturers therefore set themselves to slow the movement of the air; and when this object was effectually accomplished, it was found that there was no need for moisture, and that the chicks also hatched out stronger and in higher proportion. The general opinion in the United States, where many farmers tested both hens and machines on a large scale, whilst still undecided between them, is that the proceeds of artificial incubation are superior by about 10%, and this is based upon hatches of thousands annually.

Artificial hatching necessitates artificial brooding, and in this also great changes have taken place, any real success in rearing having been for some years far behind that in hatching. The method universally attempted at first might be called the ” coverlet ” system, nestling material such as strips of flannel or wool, warmed from above, being provided for the chicks to nestle under, as they do under the feathers of the hen. Many were reared in this way, but failures were also terribly general, and these were ultimately traced to confinement and pollution and heating and rebreathing of the air, caused by the nestling material. That system is now abandoned, warmed but open chambers being provided, which the chicks use at pleasure, but which have no coverlet to rest upon their bodies. In some, heated pipes traverse the upper part of the chamber, some inches above the chicks; in others a warm iron plate radiates heat in the same way; in others warmed air is brought in by flues or openings; in some small ones the lamp itself burns in the chamber of the brooder: but the principle is common to all of a warmed shelter, open

above, and generally with an outer chamber also, sheltered but not heated, which breaks the transi- tion to the open air outside. In America a very large propor- tion of the chickens reared are brought up till hardy in the large ” brooder-houses ” mentioned below.

Poultry-farming. — Poultry-farming in a practical sense is now carried on somewhat extensively in various ways, under- standing that term to include any case where poultry-culture is carried on for substantial profit, or as an important interest of the holding, beyond the mere breeding of prize birds for exhibition. The difficulty never had been, as some have stated, in ground getting tainted or rent costing too much. It is now well understood that in the English climate 100 birds per acre must not be exceeded, though it is far better to confine them to one-half or one-third of the space, while some crop is got off the remainder when they go yearly to absolutely fresh ground. The mere rent of an acre is not much for 100 fowls, but the real difficulty was and is that a fowl is such a small unit, entailing constant liability to small losses and wastes, and necessity for labour and oversight out of proportion. Hence at a time when 100 eggs per annum was thought a fair return for each bird, and there was but a poor and uncertain market for them, this difficulty was insuperable. A very different average production would now be worked for; while, on the other hand, the greater crowding into cities, and growing appreciation of eggs as an article of diet, have caused a market for ” new-laid ” eggs at good prices which previously did not exist. It is these changes which have altered the conditions.

The chief development in England at the beginning of the 20th century was a very large increase in the poultry kept upon farms. Formerly very few were kept, looked after casually by the mistress or a boy, and only expected to provide for the house- hold and occasionally a few shillings in cash, while any food expressly fed to them was grudged. It has now been taught all over the country, by lecturers under the county council tech- nical instruction committees, that poultry pay best of any branch upon a farm. It has become generally known that, provided they can be run over the farm by using detached houses, and not huddled together, a dozen hens per acre can be kept upon a holding without interfering with any other stock; indeed, the curious fact is observed that horses and cattle prefer to graze over grass that might be thought soiled by the fowls. Where the statement was once derided, it is now a commonplace of county

council lecturers, that the additional manure thus made is really worth to the farm from sixpence per bird per annum for small breeds to as much as one shilling for very large ones. Out of a large number of similar instances collected in 1900, one specimen may be given. In Worcester- shire 210 fowls had the run of 100 acres, lots of 20 to 30 being kept in detached houses. From 20,000 to 25,000 eggs per annum were marketed, and 150 to 200 chickens, the food averaging about £40, and the cash return £90 to £100. The almost universal opinion is that the manure pays for the labour, and that the annual profit averages from 4s. to 5s. 6d. per head.

Poultry-farming on a larger scale than this is also carried on in connexion with the Sussex fattening industry, presently described. That was until recently a separate business, chickens being bought from neighbouring small rearers, or imported from Ireland, to .go directly into fattening cages; and it has often been stated that rearing and fattening together were incompatible. This was so far true that the manure made by numbers of fattening poultry was very considerable, and had to be used upon a small holding kept in order to use it; such a holding, therefore, received as much as it could possibly bear, and was thereby ” sickened ” for live poultry running at large. But with an extra holding or larger holding this is not the case, and increasing competition and the desire for the two profits have led to a large amount of rearing and fattening combined. In 1894 one of the officers of the agricultural commission found 8000 chickens being reared and fattened annually on one farm of 200 acres, and this proved only a pioneer: in 1900 he found (amongst many such instances) 4000 reared upon 80 acres, 1500 upon 22 acres and 5000 upon an extra holding (taken for the purpose) of 40 acres. In most ‘cases the main cereal crop was oats, to be fed to the fowls; and some cows were kept, the skim milk from which was used in the same way; but the poultry was the controlling interest of the whole.

On any such scale as this the manure becomes of great impor- tance. About 1880 Dr Augustus Voelcker, chemist to the Royal Agricultural Society, made the following analysis of two samples, one moist or fresh dropped, the other freed from much moisture by storing under cover for four weeks: —

Moisture

Organic matter and ammonia salts Tribasic phosphate of lime . Magnesia, alkaline salts, &c. Insoluble silicious matter (sand)

Fresh

Partially Dried

Manure.

Manure.

6163

41-06

20-19

38-19

2-97

5-13

2-63

3-13

12-58

12-49

100-00

10000

Containing nitrogen Equal to ammonia

.... 1-71 3-78

.... 2-09 4-59

Valued in the usual way, Dr Voelcker found that the moist manure was worth £2 per ton, and the drier stored manure £4 4s. per ton; but though the figures were indisputable, for many years such manure was practically unsaleable. Gradually in Sussex it became saleable at 6d. per bushel, and in 1900 some of the smaller fatters were selling it at prices varying from 4s. to 15s. per load; the larger men either used it themselves or obtained higher prices.

Really large poultry-farms are few in England, and to give quite recent facts would be to run the risk that they might prove ephemeral. It has been supposed that the common experience is failure after two years'

trial, but this is unduly pessimistic. Even in 1901 two farms in Berkshire were selling eggs from over 2000 and 3000 laying hens; and" there was one farm in the west of England, occupying 300 acres with the poultry (besides a shorthorn herd and other branches), which had a stock of 5000 pullets for laying, and had been in existence four years, a large capital amounting to thousands of pounds having been sunk in it. The owner explained that two years was the critical period, simply because for about that time there were practically no returns, and that in his case he had only " turned the corner " after three years. Though a practical man already, he had begun in a small way with one incubator and training one man; gradually extending, building up his own market, organizing his own selling agency, and building a mill to grind his own grain. Only such gradual extension by practical men can ever lead to success.

Besides the breeding of prize poultry, the changes mentioned in the early portion of this article have led to another class of breeding directed to the supply of pure races from good stock, but bred mainly for purposes of utility. The demand for such stock, at fair prices, though far below those for prize stock, is a good index of the development of the poultry industry. The establishments which supply it furnish eggs for hatching, or stock birds, or newly hatched chickens, which are now hatched in incubators and sold by thousands when only one day old, at which age they travel without needing food. Some of such establishments are quite large. One in Yorkshire occupies 43 acres solely devoted to this business.

Poultry-farming has reached its fullest development in the United States, owing no doubt to the apparently inexhaustible market; butcher's meat being far less eaten than in England, and poultry and eggs to a large extent replacing it as national food. More especially is there an enormous demand for small chickens, known as " broilers," weighing from i| lb to 2 lb only, destined to be split in half and broiled on a gridiron. These birds being unfattened, and ready at ten or twelve weeks, give a quick turnover with less expense and risk than older fatted birds; and this peculiar demand has largely dominated American poultry-farming, a great deal of which runs in the direction of great " broiler-plants " solely devoted to the hatching and rear- ing of these broilers, while large " brooder-houses," similar to those used in that business, are prevalent on more miscellaneous farms. The broiler business started at Hammonton in New Jersey about 1880-1885, when plant after plant was rapidly erected, some of which have since shut down; but many others

have taken their place, and some of the originals are still running. The chicks are all hatched in incubators (many plants running from 20 to 40 machines), and then transferred to long ” brooder- houses,” built with a corridor all along one side, the rest being divided into successive pens for the chickens. These latter are moved along every few days to the next of the pens, which are arranged so as to give rather more space as the birds grow larger. Each pen has next the corridor a ” hover ” or brooding- shelter. These have no nestling material, but only a roof or cover somewhat to retain the heat, closed by a curtain cut into strips in front; and are warmed by hot-water pipes running along the building. Generally these pipes run some inches above the chicks reposing on the floor, and are set rather on a slant, so as to be higher for the bigger chicks in the larger pens; but in some cases they run under the floor, and warm the air which enters under the hovers. Every hover, with its inmates, can be reached from the corridor at the back of all. In many cases the chickens are confined in these small pens until large enough, the floors being littered and regularly cleaned; but some raisers have also small outside yards which they use in fine weather. The mortality in nearly all plants is great, as might be supposed. There are said to be some at Hammonton which only market 30% of the eggs incubated, yet pay a modest profit at that, which is allowed for. On the one hand, a broiler realizes about four times the cost of its own hatching and food; on the other hand, the labour is very heavy and the loss considerable: these factors obviously give a very wide margin of possibilities as regards success or failure.

The most remarkable establishment of this kind, embody- ing some novel features, was erected in Ohio at the end of 1896 by J. Loughlin. The plant cost over $60,000, and was designed to market 250 to 300 broilers per day regularly, weigh- ing 1 1 lb each, which were sold alive to one large dealer at $3 per dozen. Each day an average of 450 eggs were started, the chicks from which went into one pen. For the chicks, while small, there were 30 small pens, each with 5 by 10 ft. of floor space, or at the rate of six chickens per sq. foot; and there were 60 larger pens each 8 by 12 ft. with outer runs to each of 8 by 20 ft. Every day the chickens were marketed from the ninetieth pen, and all the rest moved one pen forward, leaving the first small pen vacant for the day’s hatch : thus fully 22,000 birds were in the plant at one time.

In more general American poultry-farms the same system of ” brooder-houses ” largely prevails, and from many great numbers of broilers are sent to market; but as both heart and liver are perceptibly affected by

such rearing, birds intended for stock are either taken out of doors early, or reared in detached brooders, as in England. Some establishments are mainly egg- farms, high averages being obtained by the system before described. Many breeders have a high reputation for their stock as layers, and derive large profit from selling stock or eggs to other farms. There are many immense duck-farms or ” ranches,” as mentioned below, which sell nothing except stock ducks or market ducklings. A great many combine the breeding and sale of exhibition poultry with some or all of these objects, fancy points being on the whole less distinct from useful qualities than in England, and the farmer and exhibitor far more commonly combined.

As a rule, American poultry-farmers employ long ranges of buildings divided into pens or houses, with enclosed yards in front; and the most remarkable fact is that interest can be paid upon the capital sunk in such buildings. The explanation in some cases is that much is put up by personal labour, while the cheapness of land and feed are also favourable. But the climatic conditions also differ. During the winter months the birds have to be confined in what are called ” scratching-sheds,” and American farmers have successfully reduced to a system the keeping of them healthy and in profit by scratching amongst litter in a small space. During this period the outer runs sweeten and recuperate; smaller runs therefore suffice, and the stock is kept closer and more compact. Another system is pursued, more especially about Rhode Island, called the ” colony ”

plan; detached rough houses, holding forty or fifty hens each, being scattered over the farm: there may be a hundred houses, but there is no fencing. This is very economical in buildings, but expensive in the labour of feeding and collecting eggs, and the system is only possible near the sea or where there is little snow. In several cases it has been abandoned for the system of housing and scratching-sheds.

There are a few very large establishments indeed in the United States, combining almost every branch. At the Meadow Brook Farm in Pennsylvania, occupying 80 acres, the buildings total 112,000 sq. ft. under cover, and the farm has sent to market in one year 25,000 chickens and 20,000 ducklings, besides selling many stock birds, and an enormous number of eggs for hatch- ing at an average price of $40 per 1000. Businesses like this are very exceptional; but farms on a more moderate scale are numerous, and intelligent American farmers reckon to make a profit of a dollar per annum for each head of their laying or breeding stock.

Table Poultry. — National taste governs the market for tabU poultry

to a large extent. In England white meat, skin and leg& are preferred, and at one time black legs or yellow skin were heavily discounted. More knowledge has largely removed that prejudice, but white has a market value still. In France exceedingly white and smooth skin is preferred, but buyers are indifferent to black legs. In America yellow skin and legs are actually preferred, such fowls being thought more juicy; but there has been some tendency towards white meat of late. Belgian feeders think the best result follows from crossing a yellow-skinned race upon a white-fleshed one. It is some confirmation of this idea that one of the best English table fowls is the produce of a cross between Dorkings and the yellow- skinned Indian game, while other similar instances might be cited. For some years past the quality of British table poultry has been shown by displays of plucked birds in connexion with the Christmas Smithfield Cattle Show. For many years France had a reputation for greatly surpassing British production; and as the best French fowls readily sell for £1 each and more in the Paris market, it would not be surprising if they were superior to such as have to be sold for 15s. per couple. French fatters appear to seek and obtain a smooth whiteness of fat under the skin— almost like that of a bladder of lard — which does not find favour in the British market; but the best judges have considered that the finest English specimens staged were equal to all comers, and some realized high prices. Foreign experts, equally with English, admit that England has now little to learn from any foreign feeders.

The chief supply of the best fowls for the London market has long come from the Sussex district whose centre is Heathfield: these are termed ” Surrey ” fowls, though Surrey now sends few in comparison. This local industry has been founded in a curious way upon the ” ground oats ” of the district, the whole grain being ground up, husk and all, nearly as fine as flour. This is done by a peculiar local dressing of the stones, which are ” stitched ” into little pits by a pointed pick, instead of being dressed into narrow grooves, as for flour-milling; and this meal is found specially suitable for feeding and fattening poultry. In early times cottagers crammed a few fowls with pellets of meal dipped in milk, but this method is now quite superseded by machine cramming, a rubber tube from the machine being introduced into the crop of each fowl, and a stroke of the foot on a pedal squeezing out a ration of thin, almost creamy, paste, composed of the ground oats, fat and sour skim-milk, a food which puts on flesh fast and makes it white and delicate. Great experience is required in this business. When killed and plucked, the fowls are placed in a trough whilst still warm, close side by side, and their backs and breasts pressed closer together by a board loaded with heavy

weights. This combination of fattening and subsequent shaping constitutes the Sussex system, which is extending in some other parts of England; many excellent fowls, well fed, but unfat- tened, are also supplied from Lincolnshire (known as ” Bostons “) and other districts. The largest provincial towns have similar sup- plies in less degree.

In America larger fowls are called ” roasters,” to distinguish them from the broilers above described; and there has grown up in the eastern states a system of rearing these also in confinement. Hatch- ing them begins in September, and the birds are at first reared in brooder-houses; but when large enough are placed about fifty together in small houses, with 6 by 8 ft. of floor, in small yards about 20 ft. square. One very successful raiser puts 200 birds into one pen 10 by 17 ft., in a warmed house, where they remain till killed at 7 lb or 8 lb weight. One firm had raised in this way, for seven years in succession, 2000 birds per annum upon half an acre of ground, but occasionally there is serious mortality in this kind of business, and as a rule only 60% are reared of those hatched, the loss of the rest being averaged and allowed for.

In western Europe there is some demand for chickens fattened quite young, weighing only 8 oz. to 12 oz. each, and known as petits poussins, or ” milk chickens.” In Belgium somewhat older ones,

weighing up to 15 lb, are sold as poulets de grains. The demand for such birds in England is small, and confined to the West End of London, the flesh being too excessively tender for average English palates. Birds of similar sizes have lately been finding a market in the United States, as ” squab broilers,” but are split and broiled, and not fattened, the difference being that a whole bird is served for one portion.

Turkeys. — The varieties of the turkey {q.v.) differ chiefly as to colour. The principal English breeds are the bronze or Cam- bridge, the black or Norfolk, the fawn and the white. Of these the first, especially when crossed with the American, is the largest and most desirable.

Turkey-breeding has been largely dominated by the magnificent American bronze breed, derived from wild blood, and distinguished for size and weight. There is some question whether it does not

require more space and fresher ground than the older English strains, and may not be more delicate on small holdings. French birds come largely to the Christmas market in London, but, as compared with English, are small. The chicks, when hatched after twenty- eight days' incubation, should be left undisturbed for twenty-four or thirty hours, during which time they are digesting the yolk that is absorbed into the intestinal canal at birth. No attempt should be made to cram them; their first food should consist of sweet fresh meal, soft custard made with equal parts of egg and milk set by a gentle heat, and, above all, abundance of some bitter milky herb, as dandelion, or, much better, lettuce running to seed, on which they can be reared successfully with very little food of any other description. The young turkeys progress much better if the hen has the range of a small enclosure from the first than if she is confined to a coop; thus reared they are much hardier than when cooped and corn-fed, and not so susceptible to injury from slight showers; but a damp locality should be avoided. Turkey-hens are most persevering sitters, and are employed in France to hatch successions of sittings of hens' eggs. Turkeys can often be most advantageously reared by cottagers, as one or two hens only can be kept, one visit to the male being sufficient to fertilize the entire batch of eggs. The young turkeys find a larger proportion of their own food than fowls, and with a good free range cost but little until they are ready for fattening for the table. In places where the oppor- tunity serves they may be allowed to roost in the trees with great advantage. Some wild flocks treated like pheasants are to be found in several of the large parks in Scotland as well as in England.

Guinea-fowls. — The guinea-fowl (q.v.) may be successfully reared in any dry locality provided it has a good range and trees in which to roost. The hen lays an abundance of eggs, which are generally hidden. The birds are useful as furnishing a supply of poultry for the table in the interval that ensues between the time when game are out of season and that before chickens arrive at maturity. On a dry, sandy and chalky soil and in a warm situation they are reared with ease, but are quite unsuited to damp, cold localities. The continued vociferation of the hen- birds renders their maintenance near a house very objectionable, as the cry is continued throughout great part of the night. Several variations of colour exist, but they do not require any detailed description.

Ducks. — All the varieties of the domesticated duck are descended from the common mallard or wild duck, Anas boschas, a species which, though timid in its wild state, is easily domesti- cated, and suffers changes of form and colour in a few genera- tions. The most important breeds are: the Rouen, which, retaining the colour of the

original species, grows to a large size; the Aylesbury, a large white breed with an expanded lemon- coloured bill; the Peking, a white breed with a pale yellowish tint in the plumage, and a very bright orange bill; two breeds which are entirely black. The smaller of these, which has been bred down to a very diminutive size, is remarkable for the extreme lustre of its feathers and the fact that its eggs are covered with a dark black pigment, which becomes less in quantity as each successive egg is deposited. It is known by the equally absurd names of East Indian, Labrador or Buenos Aires duck. The larger black variety, the Cayuga duck, has been introduced into England. Decoy or call ducks are small breeds of a very loquacious character, which were originally bred for the purpose of attracting the wild birds to the decoys. Some are of the natural colour, others are white. Amongst the less known breeds are the Duclair ducks of France, evidently the result of crossing white and coloured varieties. Among the breeds differing in structure may be mentioned the Indian Runner

duck, formerly called Penguin duck from its erect attitude, the hook-billed and the tufted ducks, &c. During the last fifteen years of the 19th century the first of these became very popular in England as a hardy forager and good layer, many birds laying 150 to 180 eggs in a year. It is small in body but good in flavour, and is a great favourite in many districts.

Formerly the' greater number of ducklings came to the London market from the Vale of Aylesbury. This trade still continues, but the adherence of the Aylesbury duckers to old-fashioned methods, and the increasing demand, has led to great competition in other districts, such as Norfolk, Lancashire, Kent, &c. Some of the new duck-farmers market 10,000 to 15,000 annually, mostly hatched in incubators, and never allowed in the water or out of the small rearing- pens. In America, however, this kind of rearing has found its fullest development, the number who raise 10,000 ducklings or more being considerable, and a few sending to market, as above indicated, very large numbers indeed, requiring 40 to 80 incubators to keep up the supply. It is remarkable that while in England the Aylesbury is generally preferred, in America the Peking duck is universally used, and has been made by selection both larger and a better layer. Some duck-farmers in England have, however, also adopted the Peking. By good feeding the ducks are caused to lay in the winter months, when the eggs are hatched under hens, the young ducklings being reared in artificially warmed buildings or in the labourers' Cottages; they are fed most liberally on soft food, soaked grits, boiled rice with tallow-melters' greaves, and in ten or twelve weeks are fit for the market; if killed before moulting their quills, which they do when about twelve

weeks old, they are heavier than after- wards and much better eating. When ducklings are required for the early spring markets the old birds must be fed most freely to cause the production of eggs in cold weather, corn being given in vessels of water, and the birds must be shut up at night, or the eggs will be laid in the water, where they sink and become putrid. Duck-rearing is a very profitable industry, very high prices being paid for ducklings in the early months of the year. The so-called Muscovy duck is a Brazilian species, Cairina moschata, which is not reared for the market, although the young birds are edible. The drake not unfrequently mates with the common duck, and large but sterile hybrids are the result.

Geese. — The domestic goose (q.v.) of Europe is undoubtedly the descendant of the migratory Gray lag goose, Anser cinereus, from which it differs chiefly by its increased size. Although domesticated since the time of the Romans, it has not been sub- ject to much variation. The most important breeds are the large grey variety known as the Toulouse, the white breed known as the Embden, and the common variety frequently marked with dark feathers on the back, and hence termed ” saddlebacks.” After the Crimean War a Russian variety was introduced into England in which the feathers are singularly elongated, and even curled and twisted; this breed, termed the Sebastopol, is of small size and more important as a fanciers’ breed than from a practical point of view. In some countries a second species is domesti- cated; it is usually termed the Chinese, knob-fronted or swan goose, Anser cygnoides. Though perfectly distinct as a species, having a different number of vertebrae in the neck and a loud clanging voice, it breeds freely with the common goose, and the hybrids produced are perfectly fertile.

Geese in England are declining in relative popularity. In Germany they are consumed to an enormous extent, and the British consul- general at Berlin reports that even the large domestic supplies have to be supplemented by considerable imports from Russia, a special ” goose-train ” of fifteen to forty cars arriving daily from the Russian frontier at that city. In America there has been in- creased interest in goose-breeding, and in the Chinese goose especially, which has been largely bred (with some trifling peculiari- ties) under the name of the African goose, and crossed with the Embden and Toulouse. The produce of this African cross is con- sidered very fertile and profitable to rear.

Geese are much more exclusively vegetable feeders than ducks, and can only be kept to profit where they can obtain a large propor- tion of their food by grazing. The old birds should not be killed off, as they continue fertile to a great age. Geese are readily fattened on oats

thrown into water, and the young, when brought rapidly forward for the markets, afford a very good profit. The Chinese, if well fed, lay at a much earlier date than the common species, and, if their eggs are hatched under large Cochin hens, giving three or four to each bird, the young are ready for the table at a very early period. The nest, as in all cases of ground-nesting birds, should be made on the earth and not in boxes, which become too dry and over-heated. In breeding for the market or for the sake of profit, the very large exhibition birds should be avoided, as many are barren from over-fatness, and none are so prolific as birds of fair average, si.ze.

National Interests and Commerce. — The foreign importations of eggs into Great Britain increased rapidly during the later years of the 19th century. Taking only alternate years for brevity's sake, the following table shows the amount, value and average price per 120 between 1870 and 1900: —

Number, Value and Price of Imported Eggs.

Year.	Number of Eggs.	Value.	Average Price.
		£	s. d.
1870	430,842,240	1,102,080	6 ii
1872	53i,59L720		

1,762,000

7 “I

1874

680,552,280

2,433.134

8 7

1876

753,026,040

2,620,396

8 4

1878

783,714,720

2,511,096

7 8|

1880

747,408,600

2,235,451

7 2

1882

811,922,400

2,385,263

7 1

1884

993,608,760

2,910,493

7

1886

1,035,171,000

2,884,063

6 8

1888

1,126,793,000

3,083,167

6 6

1890

1,234,950,000

3,428,806

6 8

1892

1,336,730.000

3.794.718

6 10

1894

1,425,236,000

3,786,329

6 5

1896

1,589,401,000

4,184,656

6 4

1898

i,730,952,ooo

4,457,H7

6 2

1900

2,025,820,560

5,406,141

| 6 5?

From such figures the conclusion might be drawn that foreign eggs were “ousting” British to a formidable extent; but such a conclusion is dispelled when we take into consideration questions of price and nationality. Imported eggs are of very different qualities and prices, France averaging for the year 1900, 7s. 7|d. per 120, Denmark 7s. 6|d., Belgium 6s. 2d., Germany 5s. 9|d. and Russia 5s. 6d., many of the latter being almost putrid when sold in England, and chiefly used in manufactures, for which, at a low price, they answer perfectly. Many eggs are sent from Russia to Germany, Belgium and even Denmark, so that some of these also come from her, at an original price with which no British producer could com- pete. A steady decline in imports of the higher priced French eggs, and an enormous increase of low-priced eggs, explain the drop in average price from 8s. 7d. per 120 in 1874 to 6s. 5ˆd. in 1900; and were this all, the inference would be simply that the selling price of eggs had fallen. But this is not so. While the higher priced foreign eggs have thus been largely displaced from the market, there has grown up a very large demand for British ” new-laid ” eggs, at prices much higher than any of the above. There is a wholesale market for such eggs in London. The lowest price (in May) for 1900 was 7s. 6d. to 8s. 6d., and the highest (in December) 19s. to 20s. pˆr 120. The quantity of reputed ” new-laid ” British eggs now sold is enormous, and has grown up in the face of foreign imports, the native producer selling in spite of them, and at far better prices, many times more than he did, say, in 1875.

The following were the British imports of dead poultry and game for

the last three years of the 19th century: —

Value of British Imports of Poultry and Game.

Year.

France.

Russia.

Belgium.

Other Countries.

1898 1899 1900

£

217,703

296,555 333,148

£

164,498

139,834 199,282

£

127,923 165,803 213,603

£

127,368 183,102 264,327

The total for 1900 thus amounted to £1,010,360. The imports from France and Belgium are largely for the Christmas market. Those from Russia are chiefly very small fowls wrapped in paper and packed in cases of a hundred each, which come over frozen, to be sold at Is. 2d. or is. 3d. each. Other sources include America, Canada and Australia, which have been sending smaller but increasing quantities of larger birds, packed in smaller numbers, and which realize 2s. 6d. to 3s. 6d. each, a few of the largest as much as 4s. each. Such supplies have somewhat affected the Sussex fattening industry, necessitating the production of a lower class of bird at a lower price and narrower margin; but they look rough and inferior in colour, and chiefly supply

restaurant and hotel demand. The foreign birds being cold-storage goods, which must be consumed quickly when taken out, a fresh Sussex fowl of the same weight will always sell for considerably more.

There are no statistics of British poultry; in Ireland they are collected. The year 1851 closed a decade in which the number of holdings under ten acres had decreased enormously, and the number of poultry in Ireland was then returned as 7,470,694. In 1889 this number had doubled to 14,856,517, and in 1899 there were 18,233,520. The Irish Agricultural Organization Society is doing much to improve breeds and management, and the packing of eggs, of which Ireland is a considerable exporter to Great Britain. There is also now a considerable export of lean chickens for fattening to

Sussex and other parts of England, and a smaller number have also been fattened in Ireland.

In Australia most of the federated states have a produce export department, which receives eggs and dead poultry into cold storage and ships to London, managing, if desired, the whole business. That of South Australia shipped a good many eggs to England in 1895, but the temperature was found too low for eggs, and this trade has so far not developed. Dead poultry come in a similar way from West Australia and Victoria to London. In New South Wales such arrangements have inaugurated a small export business which seems the most active of any, and more seems known about the poultry industry in this state than in others. The government statistician estimated the number kept in 1900 at 3,180,000 fowls, 320,000 ducks, 234,000 turkeys and 97,000 geese, the annual consumption being about three-fourths of this, and of eggs about 97,000,000. In Canada the government makes considerable effort to encourage poultry. It has established several stations where systematic fattening of chickens in the English manner is taught, and official experiments are also made on the results of various feeding-rations and other matters. From these stations shipments of fatted chickens were first made to Liverpool and London, commencing an export trade which shows signs of growth.

The poultry industry in the United States is the most gigantic in the world. By the census of 1900, which tabulates returns from 5,096,252 out of the 5,739,657 farms in the States, the number of fowls over three months old on the 1st of June 1900 was returned as 233,598,085, with 6,599,367 turkeys, 5,676,863 geese, and 4,807,358 ducks, or 250,681,673 birds in all, valued at 85,794,996 dollars. This, however, would include very few of the chickens raised that year, which would not have reached the age stated, and mainly represents

breeding and laying stock, which thus averages about 49 birds to every holding; it also of necessity omits many of the smaller city-lot raisers. The value of the poultry raised during the whole year 1899 is given as 136,891,877 dollars, and of the eggs produced (1,293,819,186 dozen) at 144,286,186 dollars; a total year's product of over £56,000,000. Adding only a very moderate amount for city-lot and other small producers not making return, the poultry industry in America exceeded in value either the wheat crop, or swine or cotton crop.

The importance of poultry in France has long been recognized, being due mainly to the prevalence of moderately small holdings and the national disposition to small rural industries. The eggs exported are collected from the farmers by such a well-organized system that eggs collected on Wednesday are in the London market the following Tuesday. The home consumption of eggs is also enormous, so that when prices for foreign eggs decreased in England, the Paris market paid better. In 1900 the Paris Municipal Council reported the consumption of eggs in that city alone in the previous year as 212 per head. Eggs are imported from Italy to some extent. The conditions in Belgium are somewhat similar to those in France. Some eggs are imported from Italy, and much of the home production is from imported Italian hens, kept laying for a year and then killed : eggs are exported chiefly to France, Great Britain and Germany. There is a fattening industry somewhat similar to that in Sussex, lean chickens being bought for fattening in certain markets. The chief export of these is to Germany, but there is some to the London market, especially in December.

In the Netherlands the number of poultry increased consider- ably during_ the last decade of the 19th century, excepting turkeys, which diminished. Taking 1900 as a typical year, there were 4,083,312 fowls, 430,022 ducks, 36,307 geese, and 13,130 turkeys; and there were about 70 special establishments for poultry-rearing, which were rather on the increase, chiefly for local requirements. Of eggs there were exported to Belgium 656,898, England 370,418 and Germany 3ˆ12,845 kilos; but the imports were in excess of this by 2,916,269 kilos, and came chiefly from Russia. Dead fowls and ducks also go to the countries above named.

In Denmark there were in 1900 about 9,000,000 fowls, mostly local and Italian. The eggs exported numbered 332,000,000, practically all to England; there were imported 35,600,000, practically all Russian, re-exported to England. The flourishing export trade is due to a good co-operative system.

Germany is a large consumer rather than a producer of poultry products, and chiefly a carrier of her nominal exports. She imports eggs from Italy and Austria-Hungary as well as from Russia.

Austria-Hungary has a large trade in poultry and eggs. In 1900 the dual monarchy imported poultry to the value of £268,240 and eggs to the value of £1,230,655. But the exports of poultry amounted to £977,051, and of eggs to no less than £3,750,078. This country is therefore a very large producer, most of the eggs going to Germany, and some of them through her on to England. Italy sends live fowls, for laying, to northern Europe, and eggs to Belgium and France.

In Russia the growth of the poultry industry has been very great since 1890. In that year her British trade was small: in 1900 she bulked largest of all countries in eggs sent to England direct, and some nominally from others really came from her. Her exports of eggs (reckoned as £1 =10 roubles) were valued in 1898 at £3,113.386, and of live poultry (chiefly geese) at £637,000; but this latter sum is now exceeded by geese alone sent to Germany, as above noticed.

Hervast southern provinces are, of course, the origin of this produce, which is collected by dealers from the farmers, the price realized by the latter for eggs being in summer sometimes less than a rouble per hundred. The government has shown considerable interest in this growing industry in several ways, and produce is carried at almost incredibly low rates on the State railways; but the vast distances involved must always confine Russian produce to the supply of the cheaper class of demand in western Europe. (L. Wr.)

POUNCE, (i) To drop upon and seize: properly said of a bird of prey seizing its victim in its claws. The substantive ” pounce,” from which the verb is formed, was the technical name in falconry for the claws on the three front toes of a hawk’s claws, and so The Book of St Albans (i486) ” Fryst the grete Clees behynde … ye shall call hom talons. . . . The Clees within the fote ye shall call of right her Pownces.” (2) To decorate metal by driving or punching a design into it from the under or back part of the surface; also to decorate cloth or other fabrics by punching or ” pinking ” holes, scalloping the edges, &c. Both these words seem to be variants of ” punch ” {q.v.), which comes ultimately from the Latin pungere, punctum, to prick, pierce. From them must be distinguished (3) ” pounce, ” a preparation of

powdered cuttle-fish or sandarach, the resin of the sandarach-tree, formerly used for drying ink on the roughened surface of vellum, parchment or paper where an erasure had been made; later, the word was also given to the black sand used generally as a dusting-powder for drying ink before the invention of blotting-paper. The ” pounce-box ” or ” pouncet-box ” was a familiar object on all writing-tables till that time. A similar box with pierced lid for holding perfumes or aromatic vinegar also bore the name. This word is formed from the Lat. pumex, pumice-stone, which was employed for securing a smooth surface on vellum, parchment, &c. The term ” pounce ” is also applied to a finely powdered gum of the juniper or to pipe-clay darkened with charcoal used in trans- ferring designs to fabrics, wall-surfaces, &c, through holes pricked in the original drawing.

POUND. 1 (1) An enclosure in which cattle or other animals are retained until redeemed by the owners, or when taken in distraint until replevised. such retention being in the nature of a pledge or security to compel satisfaction for debt or damage done. Animals may be seized and impounded when (1) distrained for rent; (2) damage feasant, i.e. doing harm on the land of the person seizing; (3) straying; (4) taken under legal process. A pound belongs to the township or village or manor where it is situated. The pound-keeper is obliged to receive everything offered to his custody and is not answerable if the thing offered be illegally impounded.

By a statute of 1554, no distress of cattle can be driven out of the hundred where taken unless to a pound in the same county, within three miles of the place of seizure. This statute also fixes 4d. as the fee for impounding a distress. Where cattle are impounded the impounder is bound to supply them with sufficient food and water (Cruelty to Animals Acts 1849 and 1854); any person, moreover, is authorized to enter a place where animals are impounded without food and water more than twelve hours and supply them; and the cost of such food is to be paid by the owner of the animal before it is removed. A statute of. 1690 gives treble damages and costs against persons guilty of pound breach; and by statute of 1843 (Pound Breach) persons releasing or attempting to release cattle impounded or damaging any pound are liable to a fine not exceeding £5, awardable to the person on whose behalf the cattle were distrained, with imprisonment with hard labour in default. In the old law books

1 Pound, in sense (1), is represented late in O.E. by the compounds pund-fold and pund-breche and by the derivative pyndan, to dam up, enclose, and for-pyndan, to shut out. The origin is unknown; ” pen,” an enclosure, is from a different root; ” pond ” a small pool of water,

is a Middle English variant of ” pound.” In sense (2) the O.E. and M.E. pund, Du. pond, Ger. Pfund, are derivatives of the Lat. indeclinable substantive pondo — really an ablative singular as if from pondus (2nd declension) — a variant of pondus, ponderis, weight. The Lat. pondo is used as a shortened form of libra pondo, pound by weight. Finally is the verb ” to pound,” to crush by beating, to strike or beat; this in O.E. is punian, the d being excrescent as in ” sound,” noise. The word is rare outside English ; cf. Mod. Du. puin, rubbish, broken stone.

varieties of pounds — as a common pound, an open pound and a close pound — are enumerated. By the Distress for Rent Act 1737 any person distraining for rent may turn any part of the premises into a pound pro hoc vice for securing the distress. Pounds are not now much used. (F. Wa.)

Pound (2) — (a) a measure of weight; (b) an English money of account, (a) The English standard unit of weight is the avoirdupois pound of 7000 grains. The earliest weight in the English system was the Saxon pound, subsequently known as the Tower pound, from the old mint pound kept in the Tower of London. The Tower pound weighed 5400 grains and this weight of silver was coined into 240 pence or 20 shillings, hence pound in sense (2) (a pound weight of silver). The pound troy, probably introduced from France, was in use as early as 141 5 and was adopted as the legal standard for gold and silver in 1 527. The act which abolished the Tower pound (18 Hen. VIII. : the ” pounde Troye which exceedeth the pounde Tower in weight iii quarters of the oz.”) substituted a pound of 5760 grains, at which the pound troy still remains. There was in use together with the pound troy,, the merchant’s pound, weighing 6750 grains, which was established about 1270 for all commodities except gold, silver and medicines, but it was generally superseded by the pound avoirdupois about 1330. There was also in use for a short time another merchant’s pound, introduced from France and Germany; this pound weighed 7200 grains. The pound avoirdupois has remained in use continuously since the 14th century, although it may have varied slightly at different periods — the Elizabethan standard was probably 7002 grains. The standard pound troy, placed together with the standard yard in the custody of the clerk of the House of Commons by a resolution of the House of the 2nd of June 1758, was destroyed at the burning of the houses of parliament in 1834. In 1838 a commission was appointed to consider the restoration of the standards, and in consequence of their report in 1841 the pound avoirdupois of 7000 grains was substituted for the pound troy as the standard. A new standard pound avoirdupois was made under the direction of a

committee appointed in 1834 (which reported in 1854), by comparison with authenticated copies of the original standard (see Phil. Trans. 1856). This standard pound was legalized by an act of 1855 (18 & 19 Vict. c. 72). The standard avoirdu- pois pound is made of platinum, in the form of a cylinder nearly 1-35 in. high and 1-15 in. in diameter. It has a groove or channel round it to enable it to be lifted by means of an ivory fork (for illustration see Weights and Measures) and is marked ” P.S. 1844. 1 lb.” P.S. meaning Parliamentary Standard. It is preserved at the Standards Office, in the custody of the Board of Trade. Copies were also deposited at the Houses of Parlia- ment, the Royal Mint, the Royal Observatory and with the Royal Society.

See the Reports of the Standards Commission (6 parts, 1 868-1 873), especially 3rd report (on the abolition of troy weight) and 5th report (on the business of the Standards Dept. and the condition of the official standards and apparatus; description of the reveri- fication of the various official standards, with diagrams).

(6) The English monetary unit is the pound; it was originally a pound weight of silver (hence written £ for libra, Lat. pound weight), coined into twenty shillings, and is now represented by the gold sovereign (q.v.). The pound Scots was at one time of the same value as the English pound, but through gradual debasement of the coinage was reduced at the accession of James I. to about one-twelfth of the value of the English pound, and was divided into twenty shillings, each about the value of an English penny. The Egyptian pound, written £E, is a gold coin of 100 piastres, and was made the monetary unit of the country by a decree of the 14th of November 1885. Its weight is 8-544 grammes of gold 0-875 nne an< l i ts value in English standard gold is £1, os. 6£d. The Turkish pound is written £T. The Turkish monetary system is dealt with at length under Turkey: Monetary System.

Valuable information from the historical point of view will be found in the Reports of the Standards Commission quoted above, and in H. W. Chisholm’s On the Science of Weighing and Measuring (1877) and his Seventh Annual Report as warden of the standards;

R. Ruding, Annals of the Coinage (1819) and H. J. Chaney, Our Weights and Measures (1897). (T. A. I.)

POUSSIN, NICOLAS (1594-1665), French painter, was born at Les Andelys (Eure) in June 1594. Early sketches attracted the notice of Quentin Varin, a local painter, whose pupil Poussin became, till he went to Paris, where he entered the studio of Ferdinand Elle, a Fleming, and then of the Lorrainer L'Alle- mand. He found French art in a stage of transition: the old apprenticeship system was disturbed, and the academical schools destined to supplant it were not yet established; but, having met Courtois the mathematician, Poussin was fired by the study of his collection of engravings after Italian masters. After two abortive attempts to reach Rome, he fell in with the chevalier Marini at Lyons. Marini employed him on illustrations to his poems, took him into his household, and in 1624 enabled Poussin (who had been detained by commissions in Lyons and Paris) to rejoin him at Rome. There, his patron having died, Poussin fell into great distress. Falling ill he was received into the house of his compatriot Dughet and nursed by his daughter Anna Maria to whom in 1629, Poussin was married. Among his first patrons were Cardinal Barberini, for whom was painted the " Death of Germanicus " (Barberini Palace); Cardinal Omodei, for whom he produced, in 1630, the "Triumphs of Flora" (Louvre); Cardinal de Richelieu, who commissioned a Bacchanal (Louvre) ; Vicenzo Giustiniani, for whom was executed the " Massacre of the Innocents," of which there is a first sketch in the British Museum; Cassiano dal Pozzo, who became the owner of the first series of the " Seven Sacraments " (Belvoir Castle); and Fieart de Chanteloup, with whom in 1640 Poussin, at the call of Sublet de Noyers, returned to France. Louis XIII. conferred on him the title of " first painter in ordinary," and in two years at Paris he produced several pictures for the royal chapels (the " Last Supper," painted for Versailles, now in the Louvre) and eight cartoons for the Gobelins, the series of the " Labours of Hercules " for the Louvre, the " Triumph of Truth " for Cardinal Richelieu (Louvre), and much minor work. In 1643, disgusted by the intrigues of Simon Vouet, Feuquieres and the architect Lemercier, Poussin withdrew to Rome. There, in 1648, he finished for De Chanteloup the second series of the " Seven Sacraments " (Bridgewater Gallery), andalso his noble landscape with Diogenes throwing away his Scoop (Louvre); in 1649 he painted the " Vision of St Paul " (Louvre) for the comic poet Scarron, and in 1651 the " Holy Family " (Louvre) for the duke of Crequi. Year by year he continued to produce an enormous variety of works, many of which are included in the list given by Felibien. He died on the 19th of November 1665 and was buried in the church of St Lawrence in Lucina, his wife having predeceased him.

The finest collection of Poussin's paintings as well as of his drawings is

possessed by the Louvre; but, besides the pictures in the National Gallery and at Dulwich, England possesses several of his most considerable works: The ” Triumph of Pan ” is at Baisildon (Berkshire), and his great allegorical painting of the ” Arts ” at Knowsley. At Rome, in the Colonna and Valentini Palaces, are notable works by him, and one of the private apartments of Prince Doria is decorated by a great series of landscapes in distemper. Through- out his life he stood aloof from the popular movement of his native school. French art in his day was purely decorative, but in Poussin we find a survival of the impulses of the Renaissance coupled with conscious reference to classic work as the standard of excellence. In general we see his paintings at a great disadvantage, for the colour, even of the best preserved, has changed in parts, so that the keeping is disturbed; and the noble construction of his designs can be better seen in engravings than in the original. Amongst the many who have reproduced his works Audran, Claudine Stella, Picart and Pesne are the most successful.

Poussin left no children, but he adopted as his son Gaspar Dughet (Gasparo Duche), his wife’s brother, who took the name of Poussin. Gaspar Poussin (1613-1675) devoted himself to landscape painting and rendered admirably the severer beauties of the Roman Campagna; a noteworthy series of works in tempera representing various sites near Rome is to be seen in the Colonna Palace; but one of his finest easel-pictures, the ” Sacrifice of Abra- ham,” formerly the property of the Colonna, is now, with other works by the same painter, in the National Gallery, London. The frescoes executed by Gaspar Poussin in S. Martino di Monti are in a bad state of preservation. The Louvre does not possess a single work by his hand. Gaspar died at Rome on the 27th of May 1675.

See Sandrart, Acad. nob. art. pict. ; Lettres de Nicolas Poussin (Paris, 1824); Felibien, Entretiens; Gault de St Germain, Vie de Nicolas Poussin (1806); D’Argenville, Abrege de la vie des peintres; Bouchitte\ Poussin et son ceuvre (1858); Emilia F. S. Pattison (Lady Dilke), Documents inedits, Le Poussin, in L’Art (1882).

POUT, also whiting-pout or bib (Gadus luscus), a fish of the family Gadidae. It is a small species abundant on the coasts of northern and western Europe, but less so in the Mediterranean. It is distinguished from other species of the genus Gadus by having a deep short body, with more or less distinct dark bars; a short and obtuse snout, not longer than the eye; the upper jaw the longer; and a long barbel at the chin. A black spot occupies the upper part of the base of the pectoral fin. Pout affect certain localities of limited extent, where a number

may be caught with hook and line. They are excellent food, but must be eaten soon after capture. A pout of 5 lb is considered a very large specimen.

POUVILLON, EMILE (1840-1906), French novelist, was born at Montauban (Tarn et Garonne). He published in, 1878 a collection of stories entitled Nouvelles realistes. Making himself the chronicler of his native province of Quercy, he painted its scenery and its life with great clearness of outline and without exaggeration. His books include CSsette (1881), the story of a peasant girl; L'Innocent (1884); J ean-de- Jeanne (1886); Le Cheval bleu (1888); Le Vceu d'etre chaste (1900); Chante-pleure (1890); Les Antibel (1892); Petites dmes (1893); Mademoiselle CUmence (1896); Pays et paysages (1895); Petites gens (1905); Bernadette de Lourdes (1894), a mystery; and Le Roi de Rome (1898), a play. He died at Chambery.

POVINDAH, a class of warrior nomadic traders in Afghanistan, who belong chiefly to the Nasir and Suliman Kuel tribes of Ghilzais. Their name, which designates their occupation, is derived from the same root as the Pushtu word for " to graze." They are almost wholly engaged in the carrying trade between India and Afghanistan and Central Asia. They assemble every autumn in the plains east of Ghazni, with their families, flocks, herds and long strings of camels and horses, laden with the goods of Bokhara and Kandahar; and forming caravans march through the Kakar and Waziri countries by the Zhob and Gomal passes of the Suliman hills. Entering Dera Ismail Khan district about October they leave their families and flocks, their arms and some two-thirds of their fighting men in the great grazing grounds which lie on either side of the Indus, and while some wander in search of employment, others pass on with their merchandise to the great cities of India, and even by rail as far as Calcutta, Karachi and Bombay. In the spring they again assemble, and return by the same route to their homes in the hills about Ghazni and Kalat-i-Ghilzai. When the hot season begins, the men, leaving their belongings "behind them, move off again to Kandahar, Herat and Bokhara, with the Indian and European merchandise which they have brought from Hindustan. For generations the Waziris have carried on war to the knife with these merchant traders. To meet the opposition that awaited them on the road the Povindahs used to move heavily armed, in bodies of from 5000 to 10,000, and regular marches and encampments were observed under an elected khan or leader. But since the Gomal Pass was taken over by the British and opened up in 1889 there has been comparative security on the border. During the Second Afghan War the tribes on the Tank border were stirred up by emissaries from Kabul, and the Suliman Khel joined the Mahsud

Waziris in their daring raid on the town of Tank in January 1879. Colonel Boisragon, who commanded at Dera Ismail Khan, moved out against the Povindah settle- ments in the mouth of the Gomal Pass and severely punished them. The Povindahs paid a fine of nearly Rs. 60,000 (£6000), and agreed that in future their migratory bands should be dis- armed on their entry into British territory, their weapons to be deposited in a military arsenal, and returned to their owners when they again crossed the border.

POVOA DE VARZIM, a seaport of northern Portugal, in the district of Oporto; on a small and ill-sheltered bay, 18 m. N. of Oporto by the branch railway to Villa Nova de Familicao. Pop. (1900), 12,623. In summer Povoa de Varzim is the most

frequented sea-bathing resort in northern Portugal; it is also the headquarters of important sardine, hake, and sea-bream fisheries.

POWDER (through O. Fr. puldre, modern poudre, from Lat. pulvis, pulveris, dust), the small loose particles into which solid matter is disintegrated by such processes as grinding, crushing, pounding, &c, hence any preparation which takes the form of such loose uncompacted particles, the most familiar example of such preparation being that of gunpowder (q.v.). Many powders are found in medical uses, some of which have retained the name of their inventor, such as the compound powder of rhubarb, ” Gregory powder,” named after a Scottish doctor, James Gregory (1758-1822). Various preparations in form of powder are used for toilet purposes. During the period when the hair or wig was worn ” powdered ” or whitened, houses had a special room set apart for the process, known as the powdering-room or closet. In some birds, such as the herons, certain down-feathers or plumulae break off into a fine dust as fast as they are formed and form tracts defined in size and situa- tion and known as ” powder-down patches.”

POWELL, FREDERICK YORK (1850-1904), English his- torian and scholar, was born in Bloomsbury, London, on the 14th of January 1850. Much of his childhood was spent in France and Spain, so that he early acquired a mastery of the language of both countries and an insight into the genius of the people. He was educated at Rugby School, and matriculated at Oxford as an unattached student, subsequently joining Christ Church, where he took a first-class in law

and modern history in 1872. He was called to the bar at the Middle Temple in 1874, and married in the same year. He became law-lecturer and tutor of Christ Church, fellow of Oriel College, delegate of the Clarendon Press, and in 1894 he was made regius professor of modern history in succession to J. A. Froude. Although he never made any extensive contribution to history, he was a particularly stimulating teacher. He had been attracted in his school days to the study of Scandinavian history and literature, and he was closely allied with Professor Gudbrandr Vigfusson (d. 1889) , whom he assisted in his Icelandic Prose Reader (1897), Corpus poeticum boreale (1887), Origines islandicae (1905), and in the editing of the Grimm Centenary papers (1886). He took a keen interest in the development of modern French poetry, and Verlaine, Mallarme and Verhaeren all lectured at Oxford under his auspices. He was also a connoisseur in Japanese art. In politics his sympathies were with the oppressed of all nationalities; he had befriended refugees after the Commune, counting among his friends Jules Valles 1 the author of Les Refractaires ; and he was also a friend of Stepniak and his circle. He died at Oxford on the 8th of May 1904.

See the Life, with letters and selections, by Oliver Elton (1906).

POWELL, GEORGE (c. 1658-1714), English actor and playwright, was the son of an actor of the same name (d. c. 1698), with whom, as the king of Bakam, he first appeared in 1687, as Emanuel in The Island Princess, Tate's version of Fletcher's play. He wrote or adapted Alphonso, King of Naples (1661), Treacherous Brothers (1676), and Very Good Wife (1693), and acted in them and in a long list of contemporary plays almost until his death. As a tragedian he succeeded to many of Betterton's parts, but not to his genius.

POWELL, JOHN WESLEY (1834-1902), American ' geologist and ethnologist, was born at Mount Morris, New York, on the 24th of March 1834. His parents were of English birth, but had moved to America in 1830, and- he was educated at Illinois and Oberlin colleges. When the Civil War broke out he entered the Union Army as a private, and at the battle of Shiloh he lost his right arm. He continued, however, on active service and served as division chief of artillery before Vicksburg, reaching the rank of major of volunteers. In 1865 he was appointed professor of geology and curator of the museum in the Illinois Wesleyan University at Bloomington, and afterwards at the Normal University. In 1867 he commenced a series of expeditions to

1 (1833-1885), member of the Commune of 1871.

the Rocky Mountains and the canyons of the Green and Colorado rivers, during the course of which (1869) he made a daring boat-journey of three months, through the Grand Canyon, the river channel not having previously been explored. In these travels he gathered much valuable information on the geology, and he also made a special study of the Indians, and their languages. His able work led to the establishment under the U.S. government of the geographical and geological survey of the Rocky Mountain region with which he was occupied in 1870-1879. This survey, with those of Ferdinand Hayden (1829-1887) and Captain George M. Wheeler (b. 1842) was incorporated with the United States Geological and Geographical Survey under Clarence King (1842-1901) in 1879, when Powell became director of the Bureau of Ethnology, a department he had assisted in founding. On King's resignation in 1881, Powell was appointed director also of the Geological Survey, a post which he occupied until 1894. To him the present thorough organization of the U.S. Geological Survey is largely due.

His principal publications were Exploration of the Colorado River of the West and its Tributaries (1875), Report on the Geology of the Eastern Portion of the Uinta Mountains (1876), Report on the Lands of the Arid Region of the United States (1879) > Introduction to the Study of Indian Languages (1880), Canyons of the Colorado (1895), Truth and Error (1898). Especially important were his observations on what is now termed the " Uinta type " of mountain structure: a broad, flattened anticline, from which the strata descend steeply into bordering low grounds and quickly resume their horizontality — being sometimes faulted, and affording evidence of enormous denudation. He died in Haven, Maine, on the 23rd of September 1902.

• See F. S. Dellenbaugh, Romance of the Colorado River (New York, 1903), and Canyon Voyage: Second Powell Expedition (New York,

1908).

POWELL, VAVASOR (1617-1670), Welsh Nonconformist, was by birth a Radnorshire man and was educated at Jesus College, Oxford. About 1639 he entered upon the career of an itinerant preacher, and for preaching in various parts of Wales he was twice arrested in 1640; however, he was not punished and during the Civil War he preached in and around London. In 1646, when the victory of the parliamentary cause was assured, Powell returned to Wales, having received a certificate of cha- racter from the Westminster Assembly, although he had refused to be ordained by the Presbyterians. With a salary granted to him by parliament he resumed his itinerant preaching in Wales. In

1650 parliament appointed a commission ” for the better propagation and preaching of the gospel in Wales,” and Powell acted as one of the principal advisers of this body. For three years he was actively employed in removing from their parishes those ministers whom he regarded as incompetent. In 1653 he returned to London, and having denounced Cromwell for accept- ing the office of Lord Protector he was imprisoned. At the Restoration in 1660 he was arrested for preaching, and after a short period of freedom he was again seized, and he remained in prison for seven years. He was set free in 1667, but in the following year he was again a prisoner, and he was in custody when he died on the 27th of October 1670. Powell wrote several treatises and also some hymns, but his chief gifts were those of a preacher.

See The Life and Death of Mr Vavasor Powell (1671), attributed to Edward Bagshaw the younger; Vavasoris Examen et Purgamen (1654), by E. Allen and others; D. Neal, History of the Puritans (1822); and T. Rees, History of Protestant Nonconformity in Wales

(1861).

POWER [WILLIAM GRATTAN] TYRONE (1797-1841), Irish actor, was born near Kilmacthomas on the 2nd of Novem- ber 1797. At the age of fourteen he joined a company of strolling players, eventually getting small parts in the London theatres. On the sudden death of Charles Connor he was given his parts and was immediately recognized as the best stage Irishman of his generation, becoming a popular favourite in London, Dublin and America. He was on board the ill-fated ” President ” when she foundered at sea in March 1841. Power wrote and

performed several Irish plays, and published three novels and his Impressions of America (1836). He had married when twenty and left a widow and seven children, the oldest of whom, Sir William Tyrone Power, K.C.B. (b. 1819), became Commis- sary-general of the British army and was knighted in 1865.

POWER OF ATTORNEY, or Letter or Attorney, is an authority under hand and seal empowering the person named therein to do some act on behalf of the principal, which other- wise could only be done by the principal himself. It is either general or special. A general power of attorney authorizes the agent to act for his principal in all matters, or

in matters of a particular nature only, or in respect of a particular business. A special act of attorney authorizes the agent to represent his principal only in some particular specified act. It expires with death of the principal, and is revocable at his will, even by a verbal notice, unless it has been given for a valuable considera- tion. Moreover, the terms of the power are construed literally, and give such authority only as they confer expressly or by necessary implication. The Conveyancing Act of 1881 provides protection for any person making any payment or doing any act in good faith, in pursuance of a power of attorney, if before the time of trˆe payment or act the donor of the power had died or become lunatic, of unsound mind, or bankrupt, or had revoked the power. The law relating to powers of attorney is a branch of the law of agency. (See Agent; Principal and Agent.)

POWERS, HIRAM (1805-1873), American sculptor, the son of a farmer, was born at Woodstock, Vermont, on the 29th of June 1805. In 1819 his father removed to Ohio, about six miles from Cincinnati, where the son attended school for about a year, staying meanwhile with his brother, a lawyer in Cincinnati. After leaving school he found employment in superintending a reading-room in connexion with the chief hotel of the town, but, being, in his own words, ” forced at last to leave that place as his clothes and shoes were fast leaving him,” he became a clerk in a general store. His second employer in this line of business having invested his capital in a clock and organ factory, Powers set himself to master the construction of the instruments, displaying an aptitude which in a short time enabled him to become the first mechanic in the factory. In 1826 he began to frequent the studio of Mr Eckstein, and at once conceived a strong passion for the art of sculpture. His proficiency in modelling secured him the situation of general assistant and artist of the Western Museum, kept by a Frenchman named Dorfeuille, where his ingenious representation of the infernal regions to illustrate the more striking scenes in the poem of Dante met with extraordinary success. After studying thoroughly the art of modelling and casting, at the end of 1834 he went to Washington, where his remarkable gifts soon awakened general attention. In 1837 he settled in Florence, where he remained till his death. While he found it profitable to devote the greater part of his time to busts, his best efforts were bestowed on ideal work. In 1839 his statue of ” Eve ” excited the warm admiration of Thorwaldsen, and in 1843 he produced his celebrated ” Greek Slave,” which at once gave him a place among the leading sculptors of his time. Among the best known of his other ideal statues are the ” Fisher Boy,” ” II Penseroso,” ” Proserpine,” ” California,” ” America ”

(modelled for the Crystal Palace, Sydenham), and the ” Last of his Tribe.” He died on the 27th of June 1873.

See an article by T. A. Trollope in Lippincotfs Magazine for February 1875.

POWER TRANSMISSION. The appliances connected with installations for the utilization of natural sources of energy may be classified into three groups: —

1. Prime movers, by means of which the natural form of energy is transformed into mechanical energy. To this group belong all such appliances as water turbines, steam turbines, steam engines and boilers, gas producers, gas engines, oil engines, &c.

2. Machinery of any kind which is driven by energy made available by the prime mover. To this group belong all machine

tools, textile machinery, pumping machinery, cranes — in fact every kind of machine which requires any considerable quantity of energy to drive it.

3. The appliances by means of which the energy made avail- able by the prime mover is transmitted to the machine designed to utilise it. The term power is used to denote the rate at which energy is transmitted. The unit of power in common use is the horse power, and one horse power means a rate of transmis- sion of 550 foot-pounds per second.

In many cases the prime mover is combined with the machine in such a way that the transmitting mechanism is not distinctly differentiated from either the prime mover or the machine, as in the case of the locomotive engine. In other cases the energy made available by the prime mover is distributed to a number of separate machines at a distance from the prime mover, as in the case of an engineer’s workshop. In this case the trans- mitting mechanism by means of which the energy is distributed to the several machines has a distinct individuality. In other cases prime movers are located in places where the natural source of energy is abundant, namely, near waterfalls, or in the neighbourhood of coal-fields, and the energy made available is transmitted in bulk to factories, &c, at relatively great dis- tances. In this case the method and mechanism of distribution become of paramount importance, since the distance between the prime mover and the places where the energy is to be utilized by machines is only limited by the efficiency of the mechanism of distribution.

Prime movers are considered in the articles Steam Engine; Gas Engine; Oil Engine, and Hydraulics, and machines in various special articles. The methods and mechanisms of distribution or transmission alone form the subjects of the present article, and the different methods in general use readily fall into four divisions : —

1. Mechanical. 3. Pneumatic.

2. Hydraulic. 4. Electrical.

I. — Mechanical

§ 1. Methods. — The mechanical transmission of power is effected in general by means of belts or ropes, by shafts or by wheel gearing and chains. Each individual method may be used separately or in combination. The problems involved in the design and arrangement of the mechanisms for the mechanical distribution of power are conveniently approached by the con- sideration of the way in which the mechanical energy made avail- able by an engine is distributed to the several machines in the factory. By a belt on the fly-wheel of the prime mover the power is transmitted to the line shaft, and pulleys suitably placed along the line shaft by means of other belts transmit power, first, to small countershafts carrying fast and loose pulleys and striking gear for starting or stopping each engine at will, and then to the driving pulleys of the several machines. (See also Pulleys.)

§ 2. Quantitative Estimation of the Power Transmitted. — In dealing with the matter quantitatively the engine crank-shaft may be taken as the starting point of the transmission, and the first motion-shaft of the machine as the end of the transmission so far as that particular machine is concerned.

Let T be the mean torque or turning effort which the engine exerts continuously on the crank shaft when it is making N revolu- tions per second. It is more convenient to express the revolutions per second in terms of the angular velocity a, that is, in radians per second. The relation between these quantities is u = 2?rN. Then thˆrate at which work is done by the engine crank shaft is Tw foot-pounds per second, equivalent to Tw/550 horse power. This is now distributed to the several machines in varying proportions. Assuming for the sake of simplicity that the whole of the power is absorbed by one machine, let Ti be the torque on the first motion- shaft of the machine, and let u>i be its angular velocity, then the rate at which the machine is absorbing energy is Tiiai foot-pounds per second. A certain quantity of energy is absorbed by the transmit- ting mechanism itself for the

purpose of overcoming frictional and other resistances, otherwise the rate of absorption of energy by the machine would exactly equal the rate at which it was produced by the prime mover assuming steady conditions of working. Actually therefore Tia > i would be less than Tin so that

Tiwi = i?T«, (1)

where r; is called the efficiency of the transmission. Considering now the general problem of a multiple machine transmission, if Ti, cji, T2, a > 2,T 3 , W3,. . • • are the several torques and angular velocities of the respective first motion shafts of the machines,

(T1W1 + T2W2 + T3W3 + ...) = ifToi (2)

expresses the relations which must exist at any instant of steady motion. This is not quite a complete statement of the actual conditions because some of the provided energy is always in course of being stored and unstored from instant to instant as kinetic energy in the moving parts of the mechanism. Here, 7; is the over-all efficiency of the distributing mechanism. We now consider the separate parts of the transmitting mechanism.

§ 3. Belts. — Let a pulley A (fig. 1) drive a pulley B by means of a leather belt, and let the direction of motion be as indicated by the arrows on the pulleys. When the pulleys are revolving uniformly, A

td0

t + dt

Fig. 1. transmitting power to B, one side of the belt will be tight and the other ˆide will be slack, but both sides will be in a state of tension. Let t and u be the respective tensions on the tight and slack side; then the torque exerted by the belt on the pulley B is (t — u)r, where r is the radius of the pulley in feet, and the rate at which the belt does work on the pulley is (t — «)ru > foot-pounds per second. If the horse-power required to drive the machine be represented by h.p., then

(/-«)?•« = 550 h.p., (3)

assuming the efficiency of the transmission to be unity. This equation contains two unknown tensions, and before either can be found another condition is necessary. This is supplied by the relation between the tensions, the arc of contact 8, in radians (fig. 2), the coefficient of friction ji between the belt and the pulley, the

mass of the belt and t the speed of the belt.

Consider an element of the belt (fig. 2) sub- tending an angle d$ at the centre of the pul- ley, and let t be the tension on one side of _ {t- g } i$ the element and (t+dt) the tension of the other side. The ten- sion tending to cause the element to slide bodily round the sur- face of the pulley is dt. The normal pressure between the element and the face of the pulley due to the tensions is / dd, but this is diminished by the force necessary to constrain the element to move in the circular path determined by the curvature of the pulley. If W is the weight of the belt per foot, the constraining force required for this purpose is Wvˆ dS/g, where v is the linear velocity of the belt in feet per second. Hence the frictional resistance of the element to sliding is (t — \W/ g)nd6, and this must be equal to the difference of tensions dt when the element is on the point of slipping, so that (t — Wv 2 , ! g)iidd = dt. The solution of this equation is

u-ˆTg' ' M)

where / is now the maximum tension and u the minimum tension, and e is the base of the Napierian system of logarithms, 2-718. Equations (3) and (4) supply the condition from which the power transmitted by a given belt at a given speed can be found. For ordinary work the term involving v may be neglected, so that (4) becomes

t/u = en*. (5)

Equations (3) and (5) are ordinarily used for the preliminary design of a belt to calculate /, the maximum tension in the belt necessary to transmit a stated horse power at a stated speed, and thenthe cross section is proportioned so that theˆ stress per square inch shall not exceed a certain safe limit determined from practice.

To facilitate the calculations in connexion with equation (5), tables are constructed giving the ratio t/u for various values of m and 6. (See \V. C. Unwin, Machine Design, 12th ed., p. 377.) The ratio should be calculated for the smaller pulley. If the belt is arranged as in fig. 1 , that is, with the slack side uppermost, the drop of the belt tends to increase and hence the ratio t/u for both pulleys. xxii. 8

Fig. 2.

§ 4. Example of Preliminary Design of a Belt. — The following example illustrates the use of the equations for the design of a belt in the ordinary way. Find the width of a belt to transmit 20 h.p. from the flywheel of an engine to a shaft which runs at 180 revolu- tions per miunte (equal to 18-84 radians per second), the pulley on the shaft being 3 ft. diameter. Assume the engine flywheel to be of such diameter and at such a distance from the driven pulley that the arc of contact is 120”, equal to 2-094 radians, and further assume that the coefficient of friction m = 0‘3- Then from equation (5) tju = 02.094X0.3 = 2 -7 180.6282; that is log

The effect of the force constraining the circular motion in diminish- ing the horse power transmitted may now be ascertained by calcu- lating the horse power which a belt of the size found will actually transmit when the maximum tension t is 838 ft. A belt of the area found above would weigh about 1-4 ft. per foot. The velocity of the belt, v = wr= 18-84X1-5 = 28-26 ft. per second. The term Wu 2 /g therefore has the numerical value 34-7. Hence equation (2) becomes (/ — 34-7)/(« — 34-7) = 1-87, from which, inserfmg the value 838 for /, 7ˆ = 464-5 ft. Using this value of u in equation (1)

H p (8 3 8-46 4 -5)Xi8-84Xi-5 Tn T . • ,_ 550 9 5 ”

Thus with the comparatively low belt speed of 28 ft. per second the horse power is only diminished by about 5 %. As the velocity increases the transmitted horse power increases, but the loss from this cause rapidly increases, and there will be one speed for every belt at which the horse power transmitted is a maximum. An increase of speed above this results in a diminution of transmitted horse power.

§ 5. Belt Velocity for Maximum Horse Power. — If the weight of a belt per foot is given, the speed at which the maximum horse power is transmitted for an assigned value of the maximum tension / can be calculated from equations (3) and (4) as follows -. — ■

*Let t be the given maximum tension with which a belt weighing W ft per foot may be worked. Then solving equation (4) for u, subtracting I from each side, and changing the signs all through: I— M = (/— WD ! /g) (1 — «”> *). And the rate of working U, in foot-pounds per second, is*

*U = («-»> = (to-Wi) 3 /g)(i -e – * 9). Differentiating U with regard to v, equating to zero, and solving for zj, we have v = V (tg/ˆW). Utilizing the data of the previous example to illustrate this matter, (= 838 ft per*

square inch, W = i-4 ft per foot, and consequently, from the above expression, k = 8o ft. per second approximately. A lower speed than this should be adopted, however, because the above investigation does not include the loss incurred by the continual bending of the belt round the circumference of the pulley. The loss from this cause increases with the velocity of the belt, and operates to make the velocity for maximum horse power considerably lower than that given above.

§ 6. Flexibility. — When a belt or rope is working power is absorbed in its continual bending round the pulleys, the amount depending upon the flexibility of the belt and the speed. If C is the couple required to bend the belt to the radius of the pulley, the rate at which work is done is Co > foot-pounds per second. The value of C for a given belt varies approximately inversely as the radius of the pulley, so that the loss of power from this cause will vary inversely as the radius of the pulley and directly as the speed of revolution. Hence thin flexible belts are to be preferred to thick stiff ones. Besides the loss of power in transmission due to this cause, the bending causes a stress in the belt which is to be added to the direct stress due to the tensions in the belt in order to find the maximum stress. In ordinary leather belts the bending stress is usually negligible; in ropes, however, especially wire rope, it assumes paramount importance, since it tends to overstrain the outermost strands and if these give way the life of the rope is soon determined.

§ 7. Rope Driving. — About 1856 James Combe, of Belfast, introduced the practice of transmitting power by means of ropes running in grooves turned circumferentially in the rim of

(From Abram Combe, Proc. Insl. Mech. Eng.)

Fig. 3. — Rope driving; half-crossed rope drive, separate rope to each groove.

the pulley (fig. 3). The ropes may be led off in groups to the different floors of the factory to pulleys keyed to the distributing shafting. A groove was adopted having an angle of about 45°,

and this is the angle now used in the practice of Messrs Combe, Barbour and Combe, of Belfast. A section of the rim of a rope driving wheel showing the shape of the groove for a rope 1 1 in. diameter is shown in fig.

4, and a rope driving pulley

designed for six ifin.

» s'/r Pitoii---^_---» ropes is shown in fig.*

5. A rope is less flex- ible than a belt, and therefore care must be taken not to arrange rope drives with pul- leys having too small a diameter relatively to the diameter of the rope. The principles of §§ 3, 4, 5 and 6, apply equally to ropes, but with the practical modification that the working stress in the rope is a much smaller fraction of the ultimate strength than in the

Fig. 4.

Fig. 5. — Rope Pulley, 10 ft. diam., 6 grooves, 2J in. pitch, weight about 35 cwt. Constructed by Combe, Barbour & Combe, Ltd., Belfast.

case of belting and the ratio of the tensions is much greater. The following table, based upon the experience of Messrs Combe, presents the practical possibilities in a convenient form: —

Diameter of Rope.

Smallest diameter of Pulley, which should be used with the Rope.

H.P. per Rope for smallest Pulley at 1 00 revs, per minute.

in.

3 4

1

5

in.

14 21 42

66

5

8

I

8

The speed originally adopted for the rope was 55 ft. per second. This speed has been exceeded, but, as indicated above, for any particular case there is one speed at which the maximum horse power is transmitted, and this speed is chosen with due regard to the effect of centrifugal tension and the loss due to the con- tinual bending of the rope round the pulley. Instead of using one rope for each groove, a single continuous rope may be used, driving from one common pulley several shafts at different speeds. For further information see Abram Combe, Proc. Inst. Mech. Eng. (July 1896). Experiments to compare the efficiencies of rope and belt driving were carried out at Lille in 1894 by the SociftS Induslrielle du Nord de la France, for an account of which see D. S. Capper, Proc. Inst. Mech. Eng. (October 1896). Cotton ropes are used extensively for trans- mitting power in factories, and though more expensive than Manila ropes, are more durable when worked under suitable conditions.

§ 8. Shafts. — When a shaft transmits power from a prime mover to a machine, every section of it sustains a turning couple

or torque T, and if u> is the angular velocity of rotation in radians per second, the rate of transmission is T w foot-pounds per second, and the relation between the horse power, torque and angular velocity is

T tt = 55oH.P. (6)

The problem involved in the design of a shaft is so to proportion the size that the stress produced by the torque shall not exceed a certain limit, or that the relative angular displacement of two sections at right angles to the axis of the shaft at a given distance apart shall not exceed a certain angle, the particular features of the problem determining which condition shall operate in fixing the size. At a section of a solid round shaft where the diameter is D inches, the torque T inch-pounds, and the maximum shearing stress / pounds per square inch, the relation between the quantities is given by

T = ff D'//i6, (7)

and the relation between the torque T, the diameter D, the

relative angular displacement 6 of two sections L inches apart by

T = C0rf)V32L, (8)

where C is the modulus of rigidity for the material of the shaft. Observe that 6 is here measured in radians. The ordinary problems of shaft

transmission by solid round shafts subject to a uniform torque only can be solved by means of these equations.

Calculate the horse power which a shaft 4 in. diameter can trans- mit, revolving 120 times per minute (12-56 radians per second), when the maximum shearing stress / is limited to 11,000 lb per square inch. From equation (7) the maximum torque which may be applied to the shaft is T = 138,400 inch-pounds. From

(6) H.P. = 'A, =264. The example may be continued to

find how much the shaft will twist in a length of 10 ft. Substituting the value of the torque in inch-pounds in equation (8), and taking 11,500,000 for the value of C,

138,400X120X32

fl = ;

= 0-057 radians,

11,500,000X3-14X256" and this is equivalent to 3-3°.

In the case of hollow round shafts where D is the external diameter and d the internal diameter equation (7) becomes

T = 7r/(D 4 -d 4)/i6D, (9)

and equation (8) becomes

T = C07r(D 4 -d 4)/32L. (10)

The assumption tacitly made hitherto that the torque T remains constant is rarely true in practice ; it usually varies from instant to instant, often in a periodic manner, and an appropriate value of / must be taken to suit any particular case. Again it rarely happens that a shaft sustains a torque only. There is usually a bending moment associated with it. For a discussion of the proper values of/, to suit cases where the stress is variable, and the way a bending moment of known amount may be combined with a known torque, see Strength of Materials. It is sufficient to state here that if M is the bending moment in inch-pounds, and T the torque in inch-pounds, the magnitude of the greatest direct stress in the shaft due to the effect of the torque and twisting moment acting together is the same as would be produced by the application of a torque of

M+V(T 2 -r-M 2) inch-pounds. (11)

It will be readily understood that in designing a shaft for the distribution ot power to a factory where power is taken off at different places along the shaft, the diameter of the shaft near the engine must be proportioned to transmit the total power transmitted whilst the parts of the shaft more remote from the engine are made smaller, since the power transmitted there is smaller.

§ 9. Gearing Pitch Chains. — Gearing is used to transmit power from one shaft to another. The shafts may be parallel; or inclined to one another, so that if produced they would meet in a point ; or inclined to one another so that if produced they would not meet in a point. In the first case the gear wheels are called spur wheels, sometimes cog wheels; in the second case bevel wheels, or, if the angle between the shafts is 90 , mitre wheels; and in the third case they are called skew bevels. In all cases the teeth should be so shaped that the velocity ratio between the shafts remains

constant, although in very rare cases gearing is designed to work with a variable velocity ratio as part of some special machines. For the principles governing the shape of the teeth to fulfil the condition that the velocity ratio between the wheels shall be constant, see Mechanics, § Applied. The size of the teeth is determined by the torque the gearing is required to transmit.

Pitch chains are closely allied to gearing; a familiar example is in the driving chain of a bicycle. Pitch chains are used to a limited extent as a substitute for belts, and the teeth of the chains and the teeth of the wheels with which they work are shaped on the same principles as those governing the design of the teeth of wheels.

If a pair of wheels is required to transmit a certain maximum horse power, the angular velocity of the shaft being co, the pressure P which the teeth must be designed to sustain at the pitch circle is 550 H.P./uR, where R is the radius of the pitch circle of the wheel, whose angular velocity is w.

§ 10. Velocity Ratio. — In the case of transmission either by belts, ropes, shafts or gearing, the operating principle is that the rate of working is constant, assuming that the efficiency of the transmission is uijity, and that the product To> is therefore constant, whether the shafts are connected by ropes or gearing. Considering therefore two shafts, Tiw l = Tjw2; that is wj/o>2 = T2/Ti; i.e. the angular velocity ratio is inversely as the torque ratio. Hence the higher the speed at which a shaft runs, the smaller the

torque for the transmission of a given horse power, and the smaller the tension on the belts or ropes for the transmission of a given horse power.

§ 11. Long Distance Transmission of Power. — C. F. Hirn origin- ated the transmission of power by means of wire ropes at Colmar in Alsace in 1850. Such a telodynamic transmission consists of a series of wire ropes running on wheels or pulleys supported on piers at spans varying from 300 to s°° ft. between the prime mover and the place where the power is utilized. The slack of the ropes is supported in some cases on guide pulleys distri- buted between the main piers. In this way 300 h.p. was trans- mitted over a distance of 6500 ft. at Freiberg by means of a series of wire ropes running at 62 ft. per second on pulleys 177 in. diameter. The individual ropes of the series, each transmitting 300 h.p., were each 1-08 in. diameter and contained 10 strands of 9 wires per strand, the wires being each 0-072 in. diameter. Similar installations existed at Schaffhausen, Oberursal, Bellegarde, Tortona and Zurich. For particulars of these transmissions with full details see W. C. Unwin's Howard Lectures on the " Development and Transmission of Power from Central Stations " (Journ. Soc. Arts, 1893, published in book form 1894). The system of telodynamic transmission would no doubt have developed to a much greater extent than it has done but for the advent of electrical transmission, which made practicable the transmission of power to distances utterly beyond the possibilities of any mechanical system.

See W. J. M. Rankine, Treatise on Machinery and Millwork; and W. C. Unwin, Elements of Machine Design ; and for telodynamic transmission see F. Reuleaux, Die Konstrukteur. (W. E. D.)

II. — Hydraulic The first proposal for a general transmission of hydraulic power was made by Bramah in 1802. In 1846 Lord Armstrong's hydraulic crane was erected at Newcastle, and was worked from the town water mains, but the pressure in such mains was too low and uncertain to secure satisfactory results. The invention of the accumulator in 1850 enabled much higher pressures to be used; since then 700 lb per square inch has been adopted in most private hydraulic power transmission plants. An attempt to give a public supply of hydraulic power was made in 1859, when a company was formed for laying mains in London along the river Thames between the Tower and Blackfriars, the engineer being Sir George Bruce; but though an act of parlia- ment was obtained, the works were not carried out. The first public hydraulic supply station was established at Hull in 1877. In 1883 the General Hydraulic Power Works, Messrs Ellington and Woodall being the engineers, were started in London, and they now form the largest system of hydraulic power transmission in existence. Works of a similar character have since been established in several other towns. The general features of

hydraulic power transmissions are: (1) a central station where the hydraulic pressure is created, usually by means of steam pumping engines; (2) a system of distribution mains; (3) machines for utilizing the pressure. In cases of public supplies there is the further important matter of registration.

When dealing with any practical problem of hydraulic power transmission it is of the first importance to determine the maxi- mum demand for power, its duration and frequency. If the duration of the maximum demand is limited station. and the frequency restricted — for instance, when a swing bridge has to be opened and closed only a few times in the course of a day — a small pumping plant and a large accumulator will be desirable. If the maximum demand is more or less continuous, as when hydraulic pressure is used for working a pump in a mine or a hydraulic engine in a work- shop, the central station pumping engine must be capable of supplying the maximum demand without the aid of an accumulator, which may or may not, according to circum- stances, be provided to serve as a regulator. A hydraulic accumulator (fig. 1) ordinarily consists of a hydraulic cylinder

Fig. 1.

£nd ram, the ram being loaded with sufficient weight to give the pressure required in the hydraulic mains. If a pressure of 700 lb per square inch is wanted, the weight of the ram and its load, neglecting friction, must be 700 lb for each square inch of its area, and if the cylinder is full, i.e. the ram elevated to its full extent, the accumulator is a reservoir of power, exactly as if it were a tank at the same cubical extent placed at an elevation of about 1600 ft. above the mains and connected with them. The function of accumulators in hydraulic power distribution is frequently misunderstood, and it has been urged that as in practice the size of the reservoirs of power that can be obtained by their use is small, they are of little value. An accumulator having a ram 20 in. diameter by 20 ft. stroke loaded to 700 lb is

a fairly large one, but it contains only 439,740 foot-pounds of available energy. If the accumulator ram descended in one minute the horse power developed during that time would be 13-3, and until again pumped up its function would cease. Is so small a reservoir worth much? The correct answer to this question depends upon the surrounding circumstances. In the

case of any general system of hydraulic power transmission it is certain that there will be very large and frequent variations in the combined demand for power, the periods of approximate maximum rarely exceeding in the aggregate 2 or 3 hours a day (see fig. 2). Where the area of supply is very extensive there are further subsidiary variations in small sections of the area. The main features of the combined load curves are fairly constant, but the local peaks are very erratic. Such conditions are favourable to the extensive use of accumulators.

When comparing the economy of hydraulic machinery which works intermittently, such as cranes and hoists, with other systems the effect of the hydraulic accumulator in reducing the maximum horse power required is often neglected. In con- sequence the comparison is vitiated, because the minimum cost of running a central station depends to a great extent upon the

Fig. 2. maximum demand, even though the maximum may be required only during a few minutes of the day. In the hydraulic system accumulators at the central stations perform the two distinct functions of reducing the maximum load on the pumps which supply the demand, and regulating automatically the speed of the pumps as the demand varies from minute to minute. In any large system where a number of pumping units are required they also allow a sufficient interval of time to start any addi- tional units. Accumulators connected to the mains at a con- siderable distance from the central station reduce the variations

of pressure, and the size of mains required for a given supply of power, and therefore have a most important influence on the economy of distribution. The mechanical efficiency of hydraulic accumulators is very high, being from 95% to 98%, and they are practically indestructible.

When designing central stations the aim should be to employ pumping engines of such capacity that they can be worked as nearly as possible continuously at about their maximum output; the same consideration should, in the main, determine the size of the pumping units in a station where more than a single unit is employed. With a number of units, each can be worked, when in use, at or near the most economical speed. Moreover, reserve plant is necessary if the supply of power is to be constant, and where the units are many the actual reserve required is less than where the units are few.

An effect of the multiplication of power units is to increase the capital outlay; indeed, it may be stated quite generally that economy in working and maintenance cannot be obtained without a larger capital outlay than would be required for a simpler and less economical plant. A high degree of

economy estimated on financial data — the ultimate base on which these practical questions rest — can only be obtained in large installations where the averaging effect of the combination of a large number of comparatively small intermittent demands for power is greatest. The term load- factor, since it was first coined by Colonel R. E. Crompton in 1891 , has come into common use as an expression of the relation between the average and the maximum output from any central source of supply. No argument is required to show that a given central station plant working continuously at its maximum speed day and night all the year round, say for 8760 hours in a year, should produce the power more cheaply per unit, not only as to the actual running cost, but also as to the capital or interest charges, than the same plant running on the average at the same speed for, say, one-third the time, or 2920 hours. In this case the load-factor 2920/8760 = -333, or 33 – 37°%- The saving on the whole expenditure per unit is not in direct proportion to an increase in the load-factor, and its effect on the various items of expenditure is extremely variable. The influence is greatest on the capital charges, and it has no influence at all, or may even have a detrimental effect, on some items ; for instance, the cost of repairs per unit of output may be increased by a high load- factor. Its effect on the coal consumption depends very much on the kind and capacity of the boilers in use; on whether the engines are condensing or non-condensing ; on the hours of work of the engine staff, &c. The economic value of the load-factor is of great import- ance in every installation, but its influence on the cost of supply varies at each central station, and must be separately determined. There is a load-factor peculiar to each use for which the power is supplied, and the whole load-factor can only be improved by the combination of different classes of demands, which differ in regard to the time of day or season at which they attain their maximum. It is in this respect that the great economy of a public distribution of power is most apparent though there is also, of course, a direct economy due simply to the presumably large size of the central stations of a public supply. Demands for power of every kind have unfortunately a tendency to arise at the same time, so that in the absence of storage of power there seems no prospect of the load-factors for general, supply of power in towns exceeding, in the most favourable conditions, 40%. The load -factor of most public hydraulic power supplies is considerably under 30 %. It is questionable, however, whether a very high load-factor conduces to economy of working expenses as a whole in any general supply of energy. The more continuous the supply during the twenty-four hours of the day the greater is the difficulty of executing repairs, and the greater the amount of the reserve plant required.*

In all central station work where fluctuating loads have to be dealt with it is most important that there should be ample boiler power. In a

comprehensive system of power supply demand arises in a very sudden and erratic manner, and to meet this by forcing the boilers involves greater waste of coal than keeping steam up in sufficient reserve boilers. For this purpose boilers with large water capacity, such as the Lancashire, are preferable to the tubular type, if sufficient space is available. Superheated steam and also thermal storage are advantageous. Feed water heaters or economizers should always be used, all steam and feed pipes should be carefully protected from radiation, and the pipe flanges should be covered ; in short, to secure good results in coal consumption every care must be taken to minimise the stand-by losses which are such serious items in central station economy when the load-factor is low. Though hydraulic power has the peculiar advantage, as regards coal consumption, that it is the speed of the engines which varies with an intermittent demand, nevertheless at the London stations it has been found that during a year's working only from 60 to 75 % of the coal efficiency of trial runs of the engines can be obtained — i.e. at least 25 % of the coal is wasted through the stand-by losses and through the pumping engines having to run at less than full power.

To determine the scale on which a central station plant should be designed is frequently a difficult matter. The rate of growth of the expected demand for the power is an important factor, but it has been clearly established that the reduction of working expenses resulting from the increase of size of an undertaking proceeds in a diminishing ratio. Increase in output is in fact sometimes accom- panied by more than a proportionate increase of expenses. During recent years there have been causes at work which have raised con- siderably the price of labour, fuel, other items of expense, and the law of the " diminishing ratio " has been masked

On the diagram (fig. 3) of the costs of the London undertaking and the amount of power supplied, have been plotted points marking the total expenses of each year in relation to the output of power. These points for the years 1884-1899, and for output of from 50 to 700 million gallons followed approximately a straight line. Since 1899, however, though the output has increased from 708 millions to 1040 million gallons, the costs per unit of output have been always considerably above the preceding periods. The details of the London supply given in table 1 partly explain this by the relatively high price of fuel, but an equally important factor has been the rise in the local rates, which in the period 1899-1909 have risen

from 2d. up to 3d. per 1000 gallons. If the cost of fuel, rates and wages had remained constant the plotting of expenses in relation to output would have been approximately along the extension .of the line AB. This line cuts the vertical axis at A above the origin O, and the line OA indicates the minimum amount of the expenses, and by implication the initial size of the first central station erected in London. The curve in this diagram gives the cost per 1000 gallons.

Whether it is more economical to have several smaller stations in any particular system of power transmission, or a single centre of supply, is mainly governed by the cost of the mains and the facilities for laying them in the area served. No general rule can, however, be formulated, for it is a question of balance of advantages, and the

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*Cluuioni w 9*t*.Qft**

Fig. 3.

solution must be obtained by consideration of the special circum- stances of each case. It has been found desirable as the demand for the power and the area within which it is supplied has enlarged, not only to increase the number of central stations but also their capacity. The first pumping station erected was installed with 4 pumping engines of 200 h.p. each. The pumping capacity of this station has been increased to 7 units. The station at Rotherhithe completed in 1904 has 8 units together 1600 h.p., and the plant at the new station at Grosvenor Road has 8 units equalling 2400 h.p. The pumping stations are situated about 3 m. apart and concurrently with the increase in their size it has been found desirable to intro- duce a system of feeder mains (see below).

There are in all five central stations at work in connexion with the public supply of hydraulic power in London, having an aggregate of 7000 i.h.p. All the stations and mains are connected together and worked as one system. There are 14 accumulators with a total capacity of 4000 gallons, most of them having rams 20 in. diameter by 23 ft. stroke. The pumping engines are able together to deliver 1 1 ,000 gallons per minute. Details of the London supply are given in fig. 3 and in table 1.

Table I.

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S 22

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3 d ■

iS.SJ

Year.

Gallons Pumped.

22.

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1 ft O*

u- d v

£2-3

Sua

•SS

*1 « **

» a

■S’a

S3

d.

s. d.

I889

163,883,000

0-328

0-524

3-n

10 9

1022

38

1894

400,316,000

0-338

o-553

1-96

10

2204

73

1898

620,662,000

0-340

0-483

1-98

11 3 ,

3515

109

1903

888,925,000

0-361

0-491

2-7

14 3i

5337

146

1909

1,027,147,000

0-354

0-495

2-78

15 1

6504

168

The load-factors are calculated on the actual recorded maximum output, and not on the estimated capacity of the plant running 01 installed. The daily periods of maximum output are shown in fig. 2. The table shows that the load-factors have not been much affected eicher by the increase of the area of supply or by the in- creased consumption of power. The coal used has been principally Durham small. The capital cost of the London undertaking has been about £950,000. In the central station at Wapping, erected in 1891, there are six sets of triple-expansion, surface-condensing vertical pumping engines of 200 i.h.p. each ; six boilers with a working pressure of 150 lb per square inch, and two accumulators with rams 20 in. diameter by 23 ft. stroke loaded up to 800 lb per square inch. The engines run at a maximum piston speed of 250 ft. per minute, and the pumps are single-acting, driven directly from the piston rods. The supply given from this station in 1909 was approximately 6,800,000 gallons per week, and the cost for fuel, wages, superintendence, lighting, repairs and sundry station expenses 4-28d. per 1000 gallons, the value of the coal used being 14s. 1 1 -3d. per ton in bunkers. The capital cost of the station, including the land, was £70,000. The load-factor at this station for 1909 was •49, and the supply was maintained for 168 hours per week. The conditions are exceptionally favourable, and the figures represent the best result that has hitherto been obtained in hydraulic power central station work, having regard to the high price of fuel.

The installation in Hull differs little from the numerous private plants at

work on the docks and railways of the United Kingdom. The value of the experiment was chiefly commercial, and the large public hydraulic power works established since are to be directly attributed to the Hull undertaking. In Birmingham gas engines are employed to drive the pumps. In Liverpool there are two central stations. The working pressure is 850 lb per square inch. There are 27 m. of mains, and about 1100 machines at work. In Manchester and Glasgow the pressure adopted is 1 100 lb per square inch. In Manchester this pressure was selected principally in view of the large number of hydraulic packing presses used in the city, and the result has been altogether satisfactory. The works were established by the corporation in 1894, the central station being designed for 1200 i.h.p. Another station has since been built of equal capacity, and nearly 5 million gallons per week are being supplied to work about 2100 machines. Twenty-three miles of mains are laid.

In Antwerp a regular system of high-pressure hydraulic power transmission was established in 1894 specially to provide electric light for the city. The scheme was due to von Ryssleburgh, an electrical engineer of Ghent, who came to the conclusion that the most economical way of installing the electric light was to have a central hydraulic station, and from it transmit the power through pipes to various sub-stations in the town, where it could be converted by means of turbines and dynamos into electric energy. The coal cost of the electricity supplied — o-88d. per kw. hour — compares favourably with most central electric supply stations, although the efficiency of the turbines and dynamos used for the conversion does not exceed 40%. Von Ryssleburgh argued that hydraulic pumping engines would be more economical than steam-engines and dynamos, and that the loss in transmission from the central station to the consumer would be less with hydraulic converters than if the current were distributed directly. The loss in conversion, however, proved to be twice as great as had been anticipated, owing largely to defec- tive apparatus and to under-estimation of the expense of maintaining the converting stations; and the net result was commercially un- satisfactory.

At Buenos Aires hydraulic mains are laid in the streets solely for drainage purposes. Each of the sumps, which are provided at intervals, contains two hydraulic pumps which automatically pump the sewage from a small section of the town into an outfall sewer at a higher level. The districts where this system is at work lie below the general drainage level of Buenos Aires. The average efficiency (pump h.p. to i.h.p.) is 41 %, which is high, having regard to the low heads against which the pumps work. In this application all the conditions are favourable to hydraulic power transmission. The work is intermittent, there is direct action of the hydraulic pressure in the machines, and the load at each stroke of the pumps is constant. The same system has been adopted for the drainage of

Woking and district, and a somewhat similar installation is in use at Margate.

Hydraulic power is supplied from the hydraulic mains on a sliding scale according to the quantity consumed. The minimum charge in London except for very large quantities is is. 6d. per 1000 gallons. In 1000 gallons at 750 lb per square inch there is an energy of

io,oooXi73Q = 8 . 74 h.p. hours; thus is. 6d. per 1000 gallons = 2d. 33,000X60 it f ^ ^ f &

per h.p. hour nearly. This amount is made up approximately of 9d.

per 1000 gallons for the cost of generation, distribution and general

expenses including rates and 9d. for capital charges. The average

rate charged to consumers in 1908 was about 2S. 4d. per 1000 gallons.

Even under the most favourable circumstances it does not appear

probable that hydraulic power at 750 lb per square inch can be

supplied from central stations in towns on a commercial basis over

any considerable areas at less than is. per 1000 gallons. Allowing

75% as the efficiency of the motor through which the power is utilized, this rate would give I -83d. per brake or effective h.p. hour. This cost seems high, and it is difficult to believe that it is the best hydraulic power transmission can accomplish having regard to the well-established fact that the mechanical efficiency of a steam pump- ing engine is greater than any other application of a steam-engine, and that the power can be conveyed through mains without any material loss for considerable distances. Still, no other system of power transmission except gas seems to be better off, and there is no method of transmission by which energy could, at the present time, be supplied retail in towns with commercial success at such an average rate when steam is employed as the prime mover. The average rate charged for hydraulic power in London and elsewhere

Fig. 4.

is much the same as the average rate charged for the supply of electrical energy to the ordinary consumer. Gas is undoubtedly cheaper, but in a large number of cases is mechanically inconvenient in its application. Hydraulic pressure, electrical energy and com- pressed air (with reheating) can all be transmitted throughout towns with approximately the same losses and at the same cost, because the power is obtained in each system from coal, boilers, and steam-engines, and the actual loss in transmission can be kept down to a small percentage. The use of any particular system of power does not, however, primarily depend upon the cost of running the central station and distributing the power, but mainly upon the mechanical convenience of the system for the purpose to which it is applied. One form of energy is, in practice, found most useful for one purpose, another form for another and no one can command the whole field.

*Xxmcithudtiutt Sectu/n**

A few gas jets judiciously distributed are of value where there is a difficulty in properly protecting the machinery by clothing.

From the central station the hydraulic power must be transmitted through a system of mains to the various points at which it is to be used. In laying out a network of mains it is first neces- sary to determine what velocity of flow can be allowed. Owing to the weight of water, the medium usually employed for hydraulic transmission, a low velocity is necessary in order to avoid shocks. The loss of pressure due to the velocity is

Disirlbu- tioa.

Fig. 5.

When water is employed as the fluid in hydraulic transmission

the effects of frost must usually be provided against. In London

and other towns, the water, before being pumped

Precautions j ntQ) .j]e ma ; nSj ; s p assec j through the surface condensers

VrosL °^ tne en 8I' nes > so as t0 raise its temperature. The mains

are laid 3 ft. below the surface of the ground. Exposed pipes and cylinders are clothed, and means provided for draining them when out of use. When these simple precautions are adopted damage from frost is very rare. In special cases oil having a low freezing point is used, and in small plants good results have been obtained by mixing glycerin and methylated spirit

with the water.

Fig. 6. — Half section and elevation at AB. Detail of io" steel pipe.

independent of the actual pressure employed, and at moderate velocities of 3 to 4 ft. per second the loss per 1000 yds. is almost a negligible quantity at a pressure of 700 lb per square inch. For practical purposes Box's formula is sufficiently accurate —

Loss of head= ^" on ^ Xle "g thin .y ard f v .. . There is a further (diameter 01 pipes in inches X'3)

loss due to obstruction caused by valves and bends, but it has been

found in London that a pressure of 750 lb at the central accumulators

is sufficient to ensure a pressure of 700 lb throughout the system.

The greatest distance the power is conveyed from the central stations

in London is about 4 m. The higher the initial velocity the more

variable the pressure ; and in order to avoid this variation in any large

system of mains it is usual to place additional accumulators at a

Fig. 6. — Half back elevation, half front elevation. Detail of 10" steel pipe.

distance from the central station. They act in the same way as air-vessels. The mains should be laid in circuit, and valves placed at intervals, so that any section can be isolated for repairs or for making connexions without affecting the supply at other points. The main valves adopted in London are shown in fig. 4. Valves are also fixed to control all branch pipes, while relief valves, washouts and air valves are fixed as required.

The largest pipes used in London are 10 in. internal diameter, and the smallest laid in the streets are 2 in. The pipes from 8 in. and below are usually made in cast iron, flanged and provided with spigots and faucets. The joint (fig. 5) is made with a gutta-percha ring, though sometimes asbestos and leather packing rings are used. Cast iron pipes for hydraulic power transmission have been standardized by the Engineering Standards

Committee. Fig. 6 shows the 10 in. steel main as used in London. The main was laid in 1903 from the Rotherhithe Pumping Station of the London Hydraulic Power Company through the Tower Subway, and is used as a feeder main for supply to the City. It is the first instance of the use of feeder mains in hydraulic transmission. The velocity of flow is 6 ft. per second, and is automatically disconnected from the general system should the pressure in this main fall below that of accumula- tor pressure. Other mains, similarly controlled, are now in use. Ellington's system of hydraulic feeder mains has been developed by the laying of a 6-in. steel main from the Falcon Wharf Station at Blackfriars to the Strand, over Waterloo Bridge.

The Falcon Wharf Pumping Station at Blackfriars was the original central station in London, and the accumulators there are loaded to 750 lb per square inch. The other pumping stations are situated about 3 m. from Falcon Wharf and about the same distance from each other. The accumulator pressure at the outlying stations is during the busy time of the day maintained at about 800 lb per square inch. Consequently the smaller variations in demand for power throughout the system caused very intermittent running of the plant at Falcon Wharf, and the load-factor there is very low. The pumping plant has now been considerably increased, and part of the plant is constructed to pump into the feeder main at pressures of 800, 900, or 1000 lb per square inch according to the demand existing from hour to hour in the Strand district. By this means the output from Falcon Wharf has been doubled with a much improved load- factor. The accumulator in this system is of special construction (fig. 7). The pressure 750 lb per square inch is main- tained in the cylinder A from the ordinary hydraulic supply main. The working ram B forms the cylinder for the fixed hollow ram C which is connected to the 6 in. bore feeder main D. The balancing rams E, E attached to the fixed head F serve the purpose of adjusting the pres- sure in the feeder main from 800 to 1000 lb per square inch according to the quantity of pressure water required to be transmitted through it. The higher pressure is required when the velocity in, this main is 10 ft. per second. There is an automatic control valve at the junction of the feeder main with the service mains in the Strand, adjusted so that the same effect is produced as if a pumping station were in operation at that point of equal capacity to the maxi- mum flow through the 6 in. main. The length of the feeder main in this case is 2000 yds., and at 10 ft. per second there js a loss of pressure of 240 lb per square

Fig.

inch, but the effect on the coal consumption is almost negligible, as the maximum flow is seldom needed. The engines are specially con- structed to take the pressure overload. The feeder main is made of steel. The

economical limit of the use of feeder mains is reached when the additional running expenses involved equal' the annual value of the saving effected in the capital expenditure.

*In public supplies the power used is in all cases registered by meters, and since 1887 automatic instruments have been used at the central stations to record the amount supplied at each instant during the day and night. The ratio between Regisira- the power registered at the consumers' machines and the "**

power sent into the mains is the commercial efficiency of the whole system. The loss may be due to leakage from the mains or to defects in the meters ; or if , as is often the case, the exhaust from the machines is registered, to waste on the consumers' premises. The automatic recorders give the maximum and minimum supplies during 24 hours every day, the maximum record showing the power required for a given number and capacity of machines, and the minimum giving an indication of the leakage. It has been found practicable to obtain an efficiency of 95% in most public power transmission plants over a series of years, but great care is required to produce so good a result. In some years 98 % has been registered. Until 1888 no meters were available for registering a pressure of 700 lb per square inch, and all that could be done was to register the water . after it had passed through the machines and lost its pressure. This method is still largely adopted; but now high-pressure meters give excellent results, exhaust registration is being superseded to a con- siderable extent by the more satisfactory arrangement of registering the power on its entry into the consumers' premises. In Manchester Kent's high-pressure meters are now used exclusively. Venturi meters have also been used with success for registering automatically the velocity of flow, and, by integration, the quantity in hydraulic power mains, and form a most useful check on the automatic recorders. The water after the pressure has been eliminated by passage through the machines, may run to a drain or be led back to the central station in return mains ; the method adopted is a question of relative cost and convenience.

We proceed to the machines actuated by hydraulic power, and by a comparison of the useful work done by them with the work done by the engines and boilers at the central station Machinery the mechanical efficiency of the system as a whole can be gauged. At the central station and in the distribution there is no great difficulty in determining the efficiency within narrow limits ; it should be 80% at the point of entry to the machine in which the pressure is used.

Where feeder mains are in use the efficiency of the system is neces- sarily reduced, owing to the higher velocities allowable in the feeder mains.

Mechanical efficiency is then sacrificed for the sake of economy. The mechanical efficiency of the machines is a very uncertain quantity; the character of the machines and the nature of the conditions are so variable that a really accurate general statement is impossible. In most cases the losses in the machine are practically constant for a given size and speed of working ; con- sequently the efficiency of a given machine may vary within very wide limits according to the work it has to do. For instance, a hydraulic pump of a given capacity, delivering the water to an elevation of 100 ft., will have an efficiency of 80%; but if the eleva- tion of discharge is reduced to 15 ft., even though the hydraulic- pressure rams may be proportioned to the reduced head, the efficiency

falls below 50 %. The ultimate efficiency of the system, or £ 2™P h P-

l.n.p., in the one case is 64 %, and in the other under 40 %. In crane or lift work the efficiency varies with the size of the apparatus, with the load and with the speed. Efficiency in this sense is a most uncertain guide. Some of the most useful and successful applications of hydraulic power — as, for instance, hydraulic capstans for hauling wagons in railway goods yards — have a very low efficiency ex- pressed on the ratio of work done to power expended. Hydraulic cranes for coal or grain hoisting have a high efficiency when well designed, but it is now very usual to employ grabs to save the labour of filling the buckets, and their use lowers the efficiency, expressed in tons of coal or grain raised, by 33 % or even 50 . When hydrau- lic machines are fully loaded, 50 to 60% of the indicated power of the central station engine is often utilized in useful work done with a radius of 2 or 3 m. from the station. In very favourable circumstances the efficiency may rise to over 70% and in a great many cases in practice it no doubt falls below 25%. If, however, energy in any form can be obtained ready for use at a moderate rate, the actual efficiency of the machines (i.e. the ratio of the useful work done to the energy absorbed in the process) is not of very great importance where the use is intermittent.

Hydraulic pressure is more particularly advantageous in cases where the incompressibility of the fluid employed can be utilized, as in hydraulic lifts, cranes and presses. Hydraulic machines for these purposes have the peculiar and distinct advantage of direct action of the pressure on the moving rams, resulting in simplicity of construction, slow and steady movement of the working parts, absence of mechanical brakes and greatest safety in action. When the valve regulating the admission of the pressure to the hydraulic cylinder is closed, the water is shut in, and, as it is

incompressible, the machine is locked. Thus all hydraulic machines possess an inherent brake; indeed, many of them are used solely as brakes.

Hydraulic power transmission does not possess the flexibility of electricity, its useful applications being comparatively limited, but the simplicity, efficiency, durability and reliability of typical hydrau- lic apparatus is such that it must continue to occupy an important position in industrial development.

Sometimes a much higher pressure than 700 lb or 1000 lb per square inch is desirable, more particularly for heavy presses and for machine tools such as are used for riveting, for punching, shearing, &c. The development of these applications has been largely due to the very complete machinery invented and perfected by R. H. Tweddell. One of the principal installations of this kind was erected in 1876 at Toulon dockyard, where the machines are all connected with a system of mains of 2ˆ-in. bore and about 1700 yds. long, laid throughout the yard, and kept charged at a pressure of 1500 lb per square inch by engines of 100 h.p. with two large accumulators. Marc Berrier-Fontaine, the superintending engineer of the dockyard, stated that the economy of the system over the separately-driven geared machines formerly used is very great. But while pressures so high as 3 tons per square inch (as in the 12,000-ton Armstrong- Whitworth press) have been used for forging and other presses, it is not desirable, in the distribution of hydraulic power for general purposes, that 1000 lb per square inch should be much exceeded ; otherwise the rams, which form the principal feature in nearly all hydraulic machines, if proportioned to the work required, will often become inconveni- ently small, and other mechanical difficulties will arise. The cost of the machinery also tends to become greater. In particular cases the working pressure can be increased to any desired extent by means of an intensifier (fig. 8).

An important application of hydraulic power transmission is for ship work, the system being largely adopted both in H.M. navy and for merchant vessels. Hydraulic coal-discharging machinery was fitted by Armstrong as early as 1854 on board a small steamer, and in 1868 some hopper barges on the Tyne were supplied with hydraulic cranes. A. Betts Brown of Edinburgh applied hydraulic power to ship work in 1873, and in the same year the first use of this power for gunnery work was effected by G. M.Rendel on H.M.S. ” Thunderer.” The pressure usu- ally employed in H.M. navy is 1000 lb per square inch. Accumulators are not used and the engines have to be fully equal to supply directly the whole demand. The distance through which the power has to be trans- mitted is, of course, very short, and the high velocity of 20 ft. per second is allowed in the main

pipes. The maximum engine-power required under these conditions on the larger ships is very consider- able. A recent development of hydraulic power on board ship is the Stone-Lloyd system of closing bulkhead doors. In hydraulic transmission of power it is usually the pressure which is employed, but there are one or two important cases in which the velocity of flow due to the pressure is utilized in the machine. Reference has already been made to the use of turbines working at 750 lb per square inch at Antwerp. The Pelton wheel has also been found to be adapted for use with such high pressures. Another useful ap- plication of the velocity due to the head in hydraulic transmission is in an adaptation of the well-known jet pump to fire hydrants. The value of the system of hydraulic transmission for the extinction of fire can hardly be overestimated where, as in London and most large towns, the ordinary pressure in the water mains is insufficient for the purpose.

Authorities. — Armstrong, Proc. Inst. C.E. (1850 and 1877), Proc. Inst. Mech. E. (1858 and 1868); Blaine, Hydraulic Machinery (1897) ; Davey, Pumping Machinery (1905) ; Dunkerley, Hydraulics (1907) ; Ellington, Proc. Inst. C.E. (1888 and 1893), Proc. Inst. Mech. E. (1882 and 1895), Proc. Liverpool Eng. Sic. (1880 and 1885); Greathead, Proc. Inst. Mech. E. (1879); Marks, " Hydraulic Power," Engineering (1905); Parsons, "Sanitary Works, Buenos Aires," Proc. Inst. C.E. (1896); Robinson, Hydraulic Power and Hydraulic Machinery (1887); Tweddell, Proc. Inst. C.E. (1883 and 1894), Proc. Inst. Mech. E. (1872 and 1874) ; Unwin, Transmission of Power (1894), Treatise on Hydraulics (1907). (E. B. E.)

III. — Pneumatic

Every wind that blows is an instance of the pneumatic

transmission of power, and every windmill or sail that catches

the breeze is a demonstration of it. The modern or technical

use of the term, however, is confined to the compression of air

Fig. 8.

at one point and its transmission to another point where it is used in motors to do work. The first recorded instance of this being done was by Denis Papin (b. 1647), who compressed air with power derived from a water-wheel and transmitted it through tubes to a distance. About 1800 George Medhurst (1759- 1827) took out patents in England for compressing air. He compressed and transmitted air which worked motors, and he built a pneumatic automobile. William Mann in 1829 took out a patent in England for a compound air compressor. In his application he states: "The

condensing pumps used in compressing I make of different capacities, according to the densities of the fluid to be compressed, those used to compress the higher densities being proportionately smaller than those previously used to compress it to the first or lower densities," &c. This is a very exact description of the best methods of compressing air to-day, omitting the very important inter-cooling. Baron Van Rathen in 1849 proposed to compress air in stages and to use inter-coolers between each stage to get 750 lb pressure for use in locomotives. For the next forty years inventors tried without success all manner of devices for cooling air during compression by water, either injected into the cylinder or circulated around it, and finally, with few exceptions, settled down to direct compression with no cooling worthy of mention. Only in the last ten years of the 19th century were the funda- mental principles of economical air compression put into general practice, though all of them are contained in the patent of William Mann and the suggestion of Van Rathen.

The first successful application of compressed air to the trans- mission of power, as we know it, was at the Mont Cenis Tunnel in 1 86 1. The form of compressor used was a system of water rams — several of them in succession — in which water was the piston, compressing the air upwards in the cylinder and forcing it out. Although the air came in contact with the water, it was not cooled, except slightly at the surface of the water and around the walls of the cylinders. The compressors were loca- ted near the tunnel, and the compressed air was transmitted through pipes to drilling machines working at the faces in the tunnel. Rotary drills were tried first, but were soon replaced by percussion drills adapted from drawings in the United States Patent Office, copied by a French and Italian commission from the patent of J. W. Fowle of Philadelphia. H. S. Drinker {Tunneling, Explosive Compounds and Rock Drills, New York, 1893) states positively that the first percussion drill ever made to work successfully was patented by J. J. Couch of Philadelphia in 1849. Shortly afterwards Fowle patented his drills, in which the direct stroke and self-rotating principle was used as we use it now. The first successful drill in the Hoosac Tunnel was patented in 1866 by W. Brooks, S. F. Gates and C. Burleigh, but after a few months was replaced by one made by Burleigh, who had bought Fowle's patent and improved it. Burleigh made a compressor, cooling the air during compression by an injected spray of water in the cylinders. The successful work in the Mont Cenis and Hoosac Tunnels with the percussion drilling machines caused the use of compressed air to spread rapidly, and it was soon found there were many other purposes for which it could be employed with advantage.

The larger tunnels and metal mines were naturally the earliest to adopt pneumatic transmission, often using it for pumping and hoisting as well as drilling. In Paris and Nantes, in Berne and in Birmingham (England), street

tramways have been operated by pneumatic power, the transmission in these, however, being in tanks rather than, pipes. Tanks on the cars are filled at the central loading stations with air at very high pressure, which is used in driving the motors, enough being taken to enable the car to make a trip and return to the loading station. Several attempts in pneumatic street traction were made in America, but failed owing to financial troubles and the successful intro- duction of electric traction. It is used very successfully, however, both in Europe and in America, in underground mine haulage, being especially adapted to coal mines, where electricity would be dangerous from its sparks. The copper smelting works at Anaconda, Montana, U.S.A., uses twelve large pneumatic

locomotives for charging the furnaces, removing slag, &c. Many stone quarries have a central plant for compressing air, which is transmitted through pipes extending to all working points, and operates derricks, hoists, drills, stone cutters, &c, by means of motors. Every considerable ironworks, railroad shop or foundry has its pneumatic transmission plant. Also in the erection of the larger steel bridges or buildings a pneumatic transmission system is part of the contractor's outfit, and many railways have a portable compressing plant on a car ready to be moved to any point as needed.

Dr Julius G. Pohle, of Arizona, patented in 1886, and intro- duced extensively, the use of compressed air for lifting water directly, by admitting it into the water column. His plan is largely adopted in artesian wells that do not flow, or do not- flow as much as desired, and is so arranged that the air supply has a back pressure of water equal to at least half the lift. If it is desired to lift the water 30 ft. the air is admitted to the water column at least 30 ft. below the standing water surface. The air admitted being so much lighter than the water it dis- places, the column 60 ft. high becomes lighter than the column 30 ft. high and is constantly released and flows out at the top. The efficiency of this method is only 20 to 40%, depending on the lift, but its adaptation to artesian wells renders it valuable in many localities.

A remarkable pneumatic transmission system was installed in 1890 by Priestly in the Snake River Desert, Idaho, U.S.A. On the north side of the river is a cliff, nearly perpen- dicular, about 300 ft. high. One hundred and ninety feet above the river, for a considerable distance along the cliff, streams of water gush out from between the bottom of the great lava bed

and the hardened clay of the old lake bottom. Priestly, without knowledge of Pohle's system, built a pipe line down the bluff and trained the water into it in such a way that it carried a very considerable quantity of air in the form of bubbles along with it down the pipe, compressing it on the way. The air was col- lected at the bottom in a covered reservoir, and taken up the cliff again to the lower part of an inverted siphon pipe, one side of which reached down from the water-supply about 60 ft. and the other side reached up and over the bluff. Allowing the water to fill both sides of the pipe to the level of the water-supply, he admitted his compressed air at about 75 lb pressure into the long side of the pipe near the bottom, and soon had water flowing upwards over the cliff and irrigating a large tract of rich lava land. He had made a power, a transmission and a motor plant without a moving part. A similar compressor was installed near Montreal, Canada, in 1896; another at Ainsworth, British Columbia, in 1898; and another at Norwich, Connecticut, U.S.A., in 1902. These are called hydraulic air compressors and show an efficiency of about 70%. They are particularly adapted to positions where there is a large flow of water with a slight fall or

head.

The actual transmission of power by air from the compressor to the motor is simple and effective. The air admits of a velocity of 15 to 20 ft. per second through pipes, with very slight loss by friction, and consequently there is no necessity for an expensive pipe system in proportion to the power transmitted. It is found in practice that, allowing a velocity as given above, there is no noticeable difference in pressure between the compressor and the motor several miles away. Light butt-welded tubing is largely used for piping, and if properly put in there is very slight loss from leakage, which, moreover, can be easily detected and stopped. In practice, a sponge with soap-suds passed around a joint furnishes a detective agency, the escaping air blowing soap bubbles. In good practice there need not be more than 1 % loss through leakage and 1 % possibly through friction in the pneumatic transmission of power.

Air develops heat on compression and is cooled by expansion, and it expands with heat and contracts with cold. For the purpose of illustration suppose a cylinder 10 ft. long containing 10 cub. ft. of air at 6o° F., with a frictionless piston at one end. if this piston be moved 7! ft. into the cylinder, so that the air is compressed to one- quarter of its volume, and none of the heat developed by compression be allowed to escape, the air will be under a pressure of 90 lb per square inch and at a temperature of 460° F. If this air be cooled down to 6o° F. the pressure will be reduced to 45 lb per square inch, showing that the heat produced in the air itself during compression gives it an additional expansive force of 45 ft per

square inch. The average force or pressure in compressing this air without loss of heat

is 21 lb per square inch, whereas if all the heat developed during compression had been removed as rapidly as developed the average pressure on the piston would have been only 11 lb per square inch, showing that the heat developed in the air during compression, when not removed as fast as developed, caused in this case an extra force of 10 lb per square inch to be used on the piston. If this heated air could be transmitted and used without any loss of heat the extra force used in compressing it could be utilized ; but in practice this is impossible, as the heat is lost in transmission. If the piston holding the 2\ cub. ft. of air at 45 lb per square inch and at 60 ° F. were released the air expanding without receiving any heat would move it back within 3! ft. of the end only, and the temperature of the air would be lowered 170° F., or to uo° F. below zero. If the air were then warmed to 6o° F. again it would move the piston the remaining 3I ft. to its starting point.

It is seen that the ideal air-compressing machine is one which will take all the heat from the air as rapidly as it is developed during compression. Such " isothermal compression " is never reached in practice, the best work yet done lacking 10% of it. It follows that the most inefficient compressing machine is one which takes away no heat during compression — that is, works by " adiabatic compres- sion," which in practice has been much more nearly approached than the ideal. It also follows that the ideal motor for using com- pressed air is one which will supply heat to the air as required when it is expanding. Such " isothermal " expansion is often attained, and sometimes exceeded, in practice by supplying heat artificially. Finally, the most inefficient motor for using compressed air is one which supplies no heat to the air during its expansion, or works by adiabatic expansion, which was long very closely approached by most air motors. In practice isothermal compression is approached by compressing the air slightly, then cooling it, compressing it slightly again, and again cooling it until the desired compression is com- pleted. This is called compression in stages or compound compres- sion. Isothermal expansion is approximately accomplished by allowing the air to do part of its work (as expanding slightly in a cylinder) and then warming it, then allowing it to do a little more and then warming it again, and so continuing until expansion is complete. It will be seen that the air is carefully cooled during compression to prevent the heat it develops from working against compression, and even more carefully heated during expansion to prevent loss from cold developed during expansion. More stages of compression of course give a higher efficiency, but the cost of machinery and friction losses have to be considered. The reheating of air is often a disadvantage, especially in mining, where there are great objections to' having any kind of combustion

underground; but where reheating is possible, as W. C. Unwin says, " for the amount of heat supplied the economy realized in the weight of air used is surprising. The reason for this is, the heat supplied to the air is used nearly five times as efficiently as an equal amount of heat employed in generating steam." Practically there is a hot- air engine, using a medium much more effective than common air, in addition to a compressed-air engine, making the efficiency of the whole system extremely high. (A. De W. F.)

IV. — Electrical Though the older methods of power transmission, such as wire ropes, compressed air and high-pressure water, are still worked on a comparatively small scale, the chief commercial burden has fallen upon the electric generator and motor linked by a transmission line. The efficiency of the conversion from mechanical power to electrical energy and back again is so high, and the facility of power distribution by electric motors is so great, as to leave little room for competition in any but very exceptional cases. The largest single department of electrical power transmission — that is, transmission for traction purposes — is at present almost wholly carried on by continuous currents. The usual voltage is 500 to 600, and the motors are almost uni- versally series-wound constant-potential machines. The total amount of such transmission in daily use reaches probably a million and a half horse power. In long distance power trans- mission proper continuous currents are not used to any con- siderable extent, owing mainly to the difficulty of generating continuous currents at sufficient pressure to be available for such work, and the difficulty of reducing such pressure, even if it could be conveniently obtained, far enough to render it available for convenient distribution at the receiving end of the line. Single continuous current machines have seldom been built successfully for more than about 2000 to 3000 volts, if at the same time they were required to deliver any considerable amount of current. About 300 to 500 kilowatts per machine at this voltage appears to be the present limit, although it is by no means unlikely that the use of commutating poles and

other improvements may considerably increase these figures. For distances at which more than this very moderate voltage is desirable one must either depend on alternating currents or use machines in series. In American practice the former alter- native is universally taken. On the continent of Europe a very creditable degree of success has been achieved by adopting

the latter, and many plants upon this system are in use, mostly in Switzerland. In these generators are worked at constant current, a sufficient number in series being employed to give the necessary electromotive force.

Power Transmission at Constant Current. — In this system, which has been developed chiefly by M. Thury, power is trans- mitted from constant current generators worked in series, and commonly coupled mechanically in pairs or larger groups driven by a single prime mover. The individual generators are wound for moderate currents, generally between 50 and 150 amperes, and deliver this ordinarily at a maximum voltage of 2000 to 3500, the output per armature seldom being above 300 kw. For the high voltages needed for long distance transmission as many generators as may be required are thrown in series. In the Mou tiers-Lyons transmission of no m., the most considerable yet installed on this system, there are four groups, each consisting of four mechanically-coupled genera- tors. The common current is 75 amp., and the maximum voltage per group is about 15,000 volts, giving nearly 60,000 volts as the transmission voltage at maximum load. In the St Maurice-Lausanne transmission of about 35 m. the constant current is 150 amp. and the voltage per armature is 2300, five pairs being put in series for the maximum load voltage of

23,000.

Regulation in such plants is accomplished either by varying the field strength through an automatic governor or by similarly varying the speed of the generators. Either method gives sufficiently good results. The transmission circuit is of the simplest character, and the power is received by motors, or for local distribution by motor generators, held to speed by centrifugal governors controlling field- varying mechanism. For large output the motors, like the generators, are in groups mechanically coupled and in series. In the Moutiers- Lyons transmission motor-generators are even designed to give a three-phase constant potential distribution, and in reverse to permit interchange of energy between the continuous current and several polyphase transmission systems.

The advantages of the system reside chiefly in easier line insulation than with alternating currents and in the abolition of the difficulties due to line inductance and capacity. It is probably as easy to insulate for 100,000 volts continuous current as for 50,000 volts alternating current. Part of the difference is due to the fact that in the latter case the crest of the E.M.F. wave reaches nearly 75,000 volts, and in addition static effects and minor resonant rise of voltage must be reckoned with. There is some possibility, therefore, of the advantage- ous use of continuous current in case very great distances, requiring enormous voltages, have to be covered. In

addition, a constant current plant is at full voltage only at brief and rare periods of maximum load instead of all the time, which greatly increases the average factor of safety in insulation.

On the other hand, the constant current generators are relatively expensive and of inconveniently small individual output for large transmission work, and require very elaborate precautions in the matter of insulation. Their efficiency is a little less than that of large alternators, but the difference is partially off-set by the transformers used with the latter for any considerable voltage. A characteristic advantage of the constant current system is the extreme simplicity and cheapness of the switching arrangements as compared with the complication and cost of the ordinary switch-board for a polyphase station at high voltage. Comparing station with station as a whole it is at least an open question whether the poly-phase system would have any material advantage in cost per kw. in an average case. The principal gains of the alternating systems appear in the relative simplicity of the distribution. In dealing with a few large power units the constant current system has the best of the argument in efficiency, but in the ordinary case of widespread distribution for varied purposes the advantage is quite the other way.

The high-voltage constant-current plant lends itself with especial ease to operation, at least in emergency, over a grounded circuit. In some recent plants, e.g. Moutiers-Lyons, provision is made at the sub-stations for grounding the central point of the system and either line in case of need, and in point of fact the voltage drop in working grounded is found to be within moderate and practicable limits.

The possibilities of improvement in the system have by no means been worked out, and although it has been overshadowed by the

enormous growth of polyphase transmission it must still be considered seriously.

Transmission by Alternating Current. — The alternating current has conspicuous advantages. In the first place, whatever the voltage of transmission, the voltage of generation and that of distribution can be brought within moderate limits at a very high degree of efficiency by the use of transformers; and, in the second place, it is possible to build alternating-current generators of any required capacity, and for voltages high enough to permit the abolition of raising transformers except in unusual circum- stances. At present such generators, giving 10,000 to 13,500 volts directly from the armature windings, are in common and highly successful use; and while the use of raising transformers is preferred by some engineers, experience shows that they cannot be considered

essential, and are probably not desirable for the voltages in question, which are as great as at the present time seem necessary for the numerical majority of transmission plants. Polyphase generators, especially in large sizes, can be successfully wound up to more than double the figures just mentioned. The plant at Manojlovac, Dalmatia, has been equipped with four 30,000 volt three-phase generators, giving each about 5000 kw. at 42 ~ with 420 revolutions per minute, the full load efficiency being 94%. But for very large trans- mission work to considerable distances where much higher voltages are requisite such transformers cannot be dispensed with. Alternating currents are practically employed in the polyphase form, on account both of increased generator output in this type of apparatus and of the extremely valuable proper- ties of the polyphase induction motors, which furnish a ready means for the distribution of power at the receiving end of the line. As between two- and three-phase apparatus the present prac- tice is about equally divided; the transmission lines themselves, however, are, with rare exceptions, worked three-phase, on account of the saving of 25% in copper secured by the use of this system. Inasmuch as transformers can be freely combined vectorially to give resultant electromotive forces having any desired magnitudes and phase relations the passage from two- phase to three-phase, and back again, is made with the utmost ease, and the character of the generating and receiving apparatus thus becomes almost a matter of indifference. As regards such apparatus it is safe to say that honours are about even: some- times one system proves more convenient, sometimes the other. The difficulty of obtaining proper single-phase motors for the varied purposes of general distribution has so far prevented any material use of single-phase transmission systems.

Generators for Power Transmission. — The generators are usually large two- or three-phase machines, and in the majority of instances they are driven by water-wheels. Power transmission on a large scale from steam plant has, up to the present, made no substantial progress, save as the networks of large electrical supply stations have in some cases grown to cover radii of many miles. The size of these generators varies from 100 or 200 kw. in small plants, up to 10,000 or more in the larger ones. Their efficiency ranges from 92 % or thereabouts in the smaller sizes up to 96 % or a fraction more in the largest, at full load. The voltage of these generators varies greatly. When raising transformers are used it is usually from 500 to 2500 volts; without them the genera- tors are usually wound for 10,000 to 13,500 volts. Intermediate voltages have sometimes been employed, but are rather passing out of use, as they seem to fulfil no particularly useful purpose. The tendency at the present time whatever the voltage, is towards the use of machines with stationary armatures and revolving field magnets, or towards a pure inductor type having all its windings stationary. At moderate voltages such an arrangement is merely a

matter of convenience, but' in high-voltage generators it is practi- cally a necessity. Low-voltage machines are usually provided with polyodontal windings, these windings having several separate arma- ture teeth per pole per phase, while the high-voltage machines are generally monodontal ; in both classes the edges of the pole pieces are usually chamfered away in such form as to produce at least a close approximation to the sinusoidal form for the electromotive force. For this purpose, and to obtain a better inherent regulation under variations of load, the field magnets are, or should be, par- ticularly powerful. In the best modern generators the variation of electromotive force from no load to full load, non-inductive, is less than 10% at constant field excitation. Closeness of inherent regulation is an important matter in generators for transmission work,

inasmuch as there is as yet no entirely successful method of automatic voltage regulation on very large units; and the less hand regulation the better. Moreover, the design which secures this result also tends to secure stability of wave form in the electromotive force, a matter of even greater importance. There has been much discussion as to the best wave form for use on alternating circuits, it having been conclusively shown that for a given fundamental frequency the sinusoidal wave does not give the most economical use of iron in the transformers. For transmission work, however, particularly over long lines, this is a matter of inconceivably small importance compared with the stability and the freedom from troubles from higher harmonics that result from the use of a wave as nearly sinu- soidal as can possibly be obtained. In every alternating circuit the odd harmonics are considerably in evidence in the electromotive force, either produced by the structure of the generator or introduced by the transformers and other apparatus. These are of no particular moment in work upon a small scale, but in transmission on a large scale to long distances, or especially through underground cables, they are, as will be seen in the consideration of the transmission line itself, a serious menace. Inasmuch as the periodicity of an alter- nating circuit must be maintained sensibly constant for successful operation, great care is usually exercised to secure such governing of the prime movers as will give constant speed at the generators. This can now be obtained, in all ordinary circumstances, by several forms of sensitive hydraulic governors which are now in use. The mat- ter of absolute periodicity has not yet settled itself into any final form. American practice is based largely upon 60 cycles per second, which is probably as high a frequency as can be advantageously employed. Indeed, even this leads to

some embarrassment in securing good motors of moderate rotative speed, and the tendency of the frequency is rather downward than upward. An inferior limit is set by the general desirability of operating incandescent lamps off the trans- mission circuits. For this purpose the frequency should be held above 30 cycles per second ; below this point, flickering of the lamps becomes progressively more serious, especially with lamps having the very slender metallic filaments now commonly employed — so serious, indeed, as practically to prohibit their successful use — and plants installed for such low frequencies are generally confined to motor practice, or to the use of synchronous converters, which are somewhat easier to build in large units at low than at high periodici- ties. Occasional plants for railway and heavy motor service operate at' as low as 15 ~, and more at 2J ~. Nearly all the general work of power transmission, however, is carried on between 30 and 60 ~. The inferior limit at which it is possible successfully to operate alternating arc lamps is about 40 ~ ; and if these are to be an impor- tant feature in transmission systems the indications are that practice will tend towards a periodicity above 40 ~, at which all the accessory apparatus can be successfully operated. European practice is based generally upon a frequency of 50 ~, which admirably meets average conditions of distribution.

Transmission Lines. — Power transmission lines differ from those used for general electric distribution principally in the use of higher voltage and in the precautions entailed thereby. The economic principles of design are precisely the same here as elsewhere, save that the conductors vary less in diameter and far more in length. Inasmuch as transmission systems are frequently installed prior to the existence of a well-developed distribution system the conditions of load and the market for the power transmitted can seldom be predicted accurately; consequently, the cases are very rare in which Kelvin's law can be applied with any advantage; and as it is at best confined to determining the most economical conditions at a particular epoch this law is probably of less use in power transmission than in any other branch of electric distribution. A superior limit is set to the permissible loss of energy in the line by the difficulty attending regulation for constant potential in case the line loss is considerable. The inferior limit is usually set by the undesirability of too large an investment in copper, and lines are usually laid out from the standpoint of regulation rather than from any other. In ordinary practice it seldom proves advantageous to allow more than 15% loss in the line even under extreme conditions, and the cases are few in which less than 5 % loss is advisable. These few cases comprise those in which the demand for power notably over runs the supply as limited by the maximum power available at the generating station, and also the few cases in which a loss greater than 5 % would indicate the use of a line wire too small from a mechanical standpoint. It is not advisable to

attempt to construct long lines of wire smaller than No. 2 American wire-gauge (-257 in. diameter), although occasionally wire as small as No. 4 (204 in. diameter) may safely be employed. Smaller diameter than this involves considerable added difficulty of insulation in lines operated at voltages in excess of about 50,000. The vast majority of trans mission lines are composed of overhead conductors. In rare instances underground cables are used. In single-phase work these are preferably of concentric form, which, however, gets too com- plicated in the three-phase lines generally employed to secure economy in copper; for the latter, triplicate cables, lead sheathed, laid in glazed earthenware ducts, seem to give the best results. On account of the cost and the difficulty of repair of such lines they are not extensively used, and cables have not yet been produced for the extremely high voltages desirable in some very long circuits,

although they are readily obtainable for voltages up to 30,000 or 40,000. As to the material of the conductors, copper is almost universally used. For very long spans, however, bronze wire of high tensile strength is occasionally employed as a substitute for copper wire, and more rarely steel wire ; aluminium, too, is beginning to come into use for general line work. Bronze of high tensile strength (say 8o,qoo to 100,000 lb per square inch) has unfortunately less than half the conductivity of copper ; and unless spans of many hundred feet are to be attempted it is better to use hard-drawn copper, which gives a tensile strength of from 60,000 to 65,000 lb to the square inch, with a reduction in conductivity of only 3 to 4 . As to aluminium, this metal has a tensile strength slightly less than that of annealed copper, a conductivity about 60 that of copper, and for equal conductivity is almost exactly one-half the weight. Mechanically, aluminium is somewhat inferior to copper, as its coefficient of expansion with temperature is 50% greater; and its elastic limit is very low, the metal tending to take a permanent set under comparatively light tension, and being seriously affected at less than half its ultimate tensile strength. Joints in aluminium wire are difficult to make, since the present methods of soldering are little better than cementing the metal with the flux ; in practice the joints are purely mechanical, being usually made by means of tight-fitting sleeves forced into contact with the wire. With suitable caution in stringing, aluminium lines can be successfully used, and are likely to serve as a useful defence against increase in the priee of copper. Whatever the material, most important lines are now built of stranded cable, sometimes with a hemp core to give added flexibility.

With respect to line construction the introduction of high voltages, say 40,000 and upwards, has made a radical change in the situation. The earlier transmission lines were for rather low voltages, seldom above 10,000. Insulation was extremely easy, and the transmission of any considerable amount of power implied heavy or numerous conductors. The

line construction therefore followed rather closely the precedents set in telegraph and telephone construction and in low tension electric light service. In American practice the lines were usually of simple wooden poles set 40 to 50 to the mile, and carrying wooden cross-arms furnished with wooden pins carrying insulators of glass or porcelain. The poles were little larger than those used in telegraph lines, a favourite size being a 40-ft. pole about 8 in. in diameter at the top and 15 in. at the butt, set 6 to 7 ft. in the earth. Such poles commonly bore two cross- arms, the lower and longer carrying 4 pins, and the shorter upper arm 2 pins, so disposed that the upper pin on each side of the pole would form with the nearer pins below an equilateral triangle 18 to 24 in. on the side. The poles therefore carried two three- phase circuits one on either side, one or both circuits being spiralled. In European practice iron poles have been more frequently used, again following rather closely the model of telegraph practice, with similar spacing of poles, and with insulators, usually of porcelain, somewhat enlarged and improved over telegraph and electric light insulators, and spaced somewhat more widely. As between wooden and steel poles, the latter are of course the more durable and much the more costiy. The difference in cost depends largely on the locality, and ultimately on the life of the wooden poles. This ranges from two or three up to ten or fifteen years, the latter figures only in favourable soils and when the lower ends of the poles have been thoroughly treated with some preservative. Under such conditions wood is often ultimately the cheaper material.

The use of very high voltages results in, for all moderate powers, the use of small and consequently light wires and in the necessity for heavy, large and costly insulators. For security against leakage and failure it becomes desirable to reduce the numer of insulation points, and with the resulting lengthening of span to design the line as a mechanical structure. A transmission line is subject to three sets of stresses. The most considerable are those due to the longi- tudinal pull of the catenary depending on the weight and tension of the wires. Under ordinary conditions these strains are balanced and come into play only when there is breakage of one or more wires and consequent unbalancing. It has been the common practice to give the poles sufficient strength to withstand this pull without failing. The maximum amount of the pull may be safely taken at the sum of the elastic limits of the wires, since it is unsafe so to design the spans as to be subject to larger stresses.

There is also lateral stress on a line due to wind acting upon the poles and wires, the latter amounting to little unless their diameter is increased by a coating of sleet, a condition which gives maximum stresses on the line. Wind then tends to push the line over, and it also increases the longitudinal stresses, being added geometrically to the catenary stress. The actual possibility of wind pressure is very generally over-estimated, and has

resulted in much needlessly costly construction. In the first place, save for actual tornadoes, for which no estimates can be given, even the highest winds at the level of any ordinary transmission line are of modest actual velocity. It is probable that no transmission line save on mountain peaks at a very high elevation is ever exposed to an actual wind velocity of 75 m. per hour, and only at intervals of years is a velocity of even 60 m. reached near the ground level. Further, the maximum wind velocities are practically never reached at very low temperatures when the line is under its maximum catenary stress, and sleet

formation, which takes place only within a very limited temperature range, is practically unknown under conditions of maximum wind. The relation of wind velocity to pressure in case of a suspended wire or cable may be approximately expressed by the equation $P = o\text{-}oo25V\ 2$ *, where P is the pressure per square foot of projected area of cable, and V is the actual wind velocity in miles per hour. Except for sleet conditions the wind pressure is, then, a matter of little concern. At times sleet may accumulate on bare wires to a thickness of half an inch to an inch. Even under these conditions the lateral stability of the line is a matter of less concern than the added component of stress in the catenary. The third element of line stress, the actual crushing stress of the wire load, is of no consequence in high voltage transmission work.*

In scientific line design the best example has been set by the Italian engineers, who, realizing that the longitudinal strains, which are very severe in case of breakage of spans rigidly supported from pole to pole, are immediately relieved by a slight increase in catenary drop, have introduced the principle of longitudinal flexibility. The poles or towers of structural steel are so designed as to be fairly stiff against lateral pressure and are given secure foundation against overturning, but are deliberately designed to deflect length- wise the line in the extreme case of breakage of wires so as at once to relieve the catenary tension without passing their elastic limit. In this way complete security is attained with a minimum of material and expense.

In recent construction both in America and Europe the tendency is to use steel poles or towers of ample height, 40 to 60 ft. and spans ranging from 300 to 600 ft., occasionally more. The catenary drop allowed is considerable, often 3 to 4% of the span length. Cross- arms and pins, when

used, are commonly of iron or steel, and the interiors of the insulators are therefore fairly at earth potential. The insulators are of dense and hard-baked porcelain, built up of three or four shells cemented together to form a whole, with several deep petticoats to protect the inner surfaces from wetting. Such insulators may be 12 to 18 in. in diameter over all, and from top groove to base a little more. If well designed and made, insulators of this type can endure even under very heavy precipitation alter- nating voltages of 60,000 to 100,000 effective without flashing over, and double these figures when dry. For line voltages above 60,000 to 70,000 it is apparent that the insulating factor of safety would be seriously reduced, and some recent lines have been equipped with suspension insulators. These are in effect porcelain bells from 10 in. diameter upward strung together like a string of Japanese gongs. The bells are all the same size and are spaced about a foot apart, the suspensions being variously designed. These insulating groups can be as large as need be, and it is easy to push the aggregate insula- tion resistance, both dry and wet, far beyond the figures just men- tioned. This suspension requires higher poles than the ordinary, but allows a considerable amount of longitudinal back lash, in case a wire burns off. Too extensive slip along the line is checked by guys fitted with strain insulators, like the suspension ones, at suitable intervals. The suspension insulator gives promise of successful use of voltages much higher than 100,000 volts. The wires on high voltage systems are generally widely spaced: very seldom less than 2 ft. between centres, and for the higher voltages something like I ft. for each 10,000 volts.

Voltage. — The most important factor in the economy pf the con- ducting system is the actual voltage used for the transmission. This varies within very wide limits. For transmissions only a few miles in length the pressures employed may be from 2000 to 5060 volts, but for the serious work of power transmission less than 10,000 volts are now seldom used. This pressure, under all ordinary con- ditions and in all ordinary climates, can be and is used with complete success, and apparently without any greater difficulty than would be encountered at much lower voltage. It is regarded as the stan- dard transmission voltage in American practice for short distances up to 10 or 15 m. Beyond this, and sometimes even on shorter lines, it is greatly increased ; up to 20,000 volts there seems to be no material difficulty whatever in effecting and maintaining a sufficient insulation of the line. In the higher voltages there were in 1908 more than fifty plants in regular operation at 40,000 volts and above. Of these more than a score are operated at 60,000 volts and above. The highest working voltage employed in 1 909 was 110,000 volts, which was successfully used in two American plants: that of the Grand Rapids — Muskegon (Michigan) system, and in the transmission work of the Central Colorado system. These both employ suspen- sion insulators with five bells in series, and

operate with no more trouble than falls to the lot of systems using ordinarily high voltages. The Rio de Janeiro transmission system, operates at 88,000 volts with large porcelain insulators, 17-5 in. in over-all diameter and 19-75 in height, carried on steel pins; the Kern River (California) plant at 75,000 volts with similar construction; the Missouri River Power Co. (Montana) at 70,000 volts, using glass insulators on wooden pins saturated with insulating material. There is no especial difficulty in building transformers for still higher pressures, the real problem lying in the insulation of the line. Taken as a whole these high voltage lines have given good service, those near the upper limit doing apparently as- well as those near the lower, owing to more careful precautions in construction. Likewise the distances of

transmission have steadily risen. There are, all told, nearly a score of power transmissions over 100 m. in length, the longest distance yet covered being from De Sabla to Sausalito (California), a distance of 232 m. This, like most other long American transmissions, is at 60 ~, and it is interesting to note that even over such distances there seems to be very little evidence of trouble due to frequency. In point of fact, those who have had the most experience with long distance transmission are the last to worry about the difficulties of using alternating current. Some unusual phenomena turn up in high voltage work, but they are rather interesting than alarming. The lines become self-luminous from " coronal " discharge at a little above 20,000 volts, and at 40,000 or 50,000 volts the phenomenon, which is sometimes aggravated by resonance, becomes of a striking, not to say startling, character. At above 100,000 volts this coronal discharge must be given serious consideration.

Resonance, in substance, is due to synchronism of the periodic electromotive force, or a harmonic thereof, with the electro-magnetic time-constant of the system. The frequency of the currents actually employed in transmission work is so low that resonance with the fundamental frequency must be extremely rare; resonance with the harmonics is, however, common — much commoner than is generally supposed. In every electromotive force wave the odd harmonics are more or less in evidence, particularly the third, fifth and seventh. If the electromotive force wave departs notably from a sinusoidal form, traces of harmonics up to at least the 15th may generally be found ; the third, seventh and the alternate higher har- monics are manifest in flattening the crest of the wave. Supposing, what is seldom quite true, that the harmonics are symmetrically disposed in phase with the fundamental, all the harmonics tend somewhat to elevate the shoulders of the wave; a wave, therefore, with peaked shoulders and a depression in the centre is certain to be affected by harmonics, while if it has a high central crest, there is evidence of great predominance of the fifth and higher harmonics. Generally the harmonics

are slightly out of phase with the fundamen- tal, so that the wave is both deformed and unsymmetrical. As to the amplitude of these harmonics, the third is usually the largest, and may sometimes in commercial machines amount to as much as 20 % of the amplitude of the fundamental, and frequently 10%. In machines giving nearly sinusoidal waves it is of course much less, but it is not difficult to find even the seventh and higher harmonics producing variations as great as 5 %. Since, other things being equal, the rise in electromotive force due to resonance is directly proportional to the magnitude of the harmonics, and the chance of getting it increases rapidly with the presence of those of the higher orders, the desirability of using the closest possible approximation to a sinusoidal wave is self-evident. The greater the inductance and capacity of the system and the less its ohmic resistance, the greater the chance of getting serious resonance. As regards the distributed capacity and inductance due to the line alone, the ordinary conditions are not at all formidable; the general effect of such distributed capacity and inductance is to produce in the system a series of static waves, their length varying inversely with the frequency. At commercial frequencies the wave length is very great, so great that even in the longest lines at present employed only a small fraction of a single wave length appears; the total length of the line is generally much less than one quarter the com- plete wave length, and the only notable effect is a moderate rise of potential along the line. The time-constant of the alternating circuit is T = -00629 V (LC), where L is the absolute self-induction in henrys and C the capacity in microfarads; and if the frequency, or a marked harmonic thereof, coincide with this time-period, resonance may safely be looked for, and resonance of the harmonics may appear conspicuously in lines of ordinary lengths. The follow- ing table gives the values, both L and C, per mile of three-phase circuit, of the sizes (American wire-gauge) ordinarily employed for transmission circuits, the wires being assumed to be strung 48 in. apart and about the height already indicated : —

Size No.

Diameter.

L.

1

C.

inch.

0000

0-460

0-00312

0-0167

000

0-410

0-00322

0-0164

00

0-365

0-00328

00160

0-325

0-00336

0-0157

1

0-289

0-00338

0-0154

2

0-2 5 8

0-00347

0-0151

3

0-229

0-00351

0-0148

4

0-204

0-00358

0-0145

*In cases where underground cables form a part of the system, the above values of C are very largely increased, and the probability of resonance is in proportion enhanced. A still further complication is introduced by the capacity and inductance of the apparatus used upon the system, which may often be far greater than that due to the entire line, even if the latter be of considerable length. In point of fact, it is altogether probable that resonance due to the distributed capacity and inductance of the overhead line alone is of rare occur- rence and generally of trivial amount, while it is equally probabl**

that resonance due to localized capacity and inductance other than that of the line conductors may, and often does, cause very serious disturbances upon the system. The subject has never been ade- quately investigated, but the tendency towards formidable sparking and arcing at various points on long-distance transmission systems is generally far greater than can be accounted for by consideration of the nominal voltages alone. The conditions may be still further complicated by the effect of earths or open circuits, which sometimes may produce, temporarily, appalling resonance phenomena, through bringing into action the capacity and inductance of the apparatus and introducing surges. In ordinary working the resonance of the harmonics is not very conspicuous, and the fact that it occurs not systematically, but only in special ways and under special conditions, indicates more strongly than anything else that the vital point is not the time-constant of the line alone, but those of the apparatus connected thereto. A definite and persistent tendency towards resonance may sometimes be effectively checked by the introduction of suitable inductance in the parts of the system most seriously affected, but the best general policy is to avoid as far as possible the presence of the higher harmonics, which are the chief sources of danger.

Closely allied to and connected with resonance is the phenomenon known as " surging," which is due to the discharge of the electro- magnetic energy stored in a circuit containing inductance and capa- city when that circuit is broken. This discharge is an oscillatory one, going on with decreasing amplitude until it is frittered away by resistance and other sources of loss. Its frequency is that of the system affected, and the surge may get reinforcement from resonance proper. It is sufficiently serious on its merits, however, since the resulting rise of voltage increases directly with the current and may produce terrific results when the break comes as the result

of a short circuit. Minor surging occurs when there is a sudden and violent change in the conditions of the circuit even without an actual break. Such a change produces an impulsive redistribution of energy that may give a sharp rise in voltage. Every point of abrupt variation in the electrical constants on the system is liable to be affected by minor surges. Such disturbances when trivial are commonly referred to as " static." Surging, depending as it does on the current ruptured, may, and indeed often does, give particularly formidable effects on circuits of moderate voltage, while on high voltage transmission circuits the usually moderate current and the large margin of safety in the insulation are important ameliorating influences.

Maintenance. — Transmission lines are, when practicable, laid out through open country, and along roads which furnish easy access for inspection and repairs. The chief sources of danger in temperate climates are mechanical injury from the falling of branches of trees across the circuits, sleet and wind storms, and lightning. The first- mentioned difficulty may be avoided by keeping clear, so far as possible, of wooded country, and it should be remembered that, at the voltages customarily used for transmission, a twig the size of a lead-pencil falling across the wires may set up arcing, and it will end by burning the wires completely off — not directly by fusion, but by persistent arcing. A properly constructed overhead line is practically safe against all storms, save those of most extraordinary violence, and with care may be made secure even against these. As a matter of practice, interruptions of service upon transmission systems are very rarely due to trouble upon the main line itself, but are far more likely to occur in some part of the distributing system. The most dangerous combination of circumstances is a sleet storm sufficient to coat the wires with ice, followed by heavy winds ; if the line, however, is constructed with proper factors of safety, bearing this particular danger in mind, there need be very little fear of serious results. Lightning is a much more formidable enemy. The lightning discharges observed upon electric circuits are of two general descriptions: first, a direct discharge of lightning upon the line, more or less severe, and always to be dreaded; and secondly, induced discharges due to lightning flashes which do not hit the line, or to static disturbances which may or may not produce actual lightning. Discharges of the former class are vastly more severe than those of the latter, and, fortunately, are somewhat rare. They may actually shatter the line, or may distribute themselves along it for a considerable distance, leaping from wire to pole, and thence to earth, without actually damaging the line to any marked degree. The induced discharges are felt principally in the apparatus, causing many of the burn-outs observed in transformers and generators. There is no complete protection against the effects of lightning upon the apparatus. Even the best lightning arresters are palliatives rather than

preventives. If, however, a number of arresters are put in parallel, with reactance coils between them on the way towards the apparatus, the vast majority of lightning discharges, to whatever cause they may be due, will be deflected harmlessly to earth. Moreover, the apparatus itself has a considerable power of resistance, due to its high insulation. The ends of the line should be very thoroughly protected by such lightning arresters, and other points, such as prominent elevations along the line, should receive similar additional protection. In some cases a substantial steel-wire cable stretched along the tops of the poles several feet above the line wires and well grounded at frequent intervals has been found very advantageous. With the best protection at present available.

lightning is not a serious menace to continuity of service, and the apparatus of the distributing system is far more difficult to protect than the main line and its apparatus.

Sub-stations. — In most long-distance transmission work the trans- mission line itself terminates in a sub-station, which bears to the general distribution system precisely the same relations which are borne by a central electric supply station to its distributing lines. Such a sub-station should be treated, in fact, as a central station, receiving its electric energy from a distance instead of employing local generators driven by prime movers. The design of the sub- station, however, is somewhat different from that of the ordinary central station. The transmission lines terminate generally in a bank of reducing transformers, bringing the voltage from the 10,000 or higher voltage employed upon the line to the 2000 or more generally used in the distribution. These transformers are usually large, and their magnitude should be determined by the same con- siderations which apply to determining the size of the units to be employed in a generating station. The general rule to be followed is that the separate units shall be of such size that one of them may be dispensed with without serious inconvenience. In the case of transformers, the unit in two- or three-phase working is the bank of transformers, which must be used together. In Continental practice three-phase reducing transformers are frequently made to include all three phases in a single structure ; this practice is less frequently followed in American plants, separate transformers being more often used in each phase. In this case, two or three transformers, accord- ing as the two- or three-phase system is used, constitute a single transformer unit in the sense just mentioned. If a change is to be made from three-phase line to two-phase distribution, the change is made by the appropriate vector connexion of the transformers. The full-load efficiency of large sub-station transformers is commonly 97 to 98 %. In any case, the sub-station is furnished with voltage regulating appliances, to enable the voltage upon the distribution lines to be held constant and uniform. These regulators are, in practice, transformers with a variable transformation

ratio. This is obtained in divers ways — sometimes by changing the inductive relations of the primary and secondary coils, sometimes by changing the relative number of effective turns in primary and secondary. Sets of these inductive regulators enable the voltage to be controlled over a sufficiently wide range to secure uniform potential on the system, and with a degree of delicacy that obviates any undesirable changes in voltage. The regulation is usually manual, no automatic regulator yet having proved entirely satisfactory. In very large systems it is worth noting that the so-called " skin effect " in alternating current conductors may become conspicuous. In the transmission circuits them- selves the wires are, in practice, never large enough to produce any sensible difference in conductivity for continuous and for alter- nating currents. In the heavy omnibus-bars of a large sub-station this immunity may not be continued, but in such cases flat strips are frequently employed. If these are not more than, say, a centi- metre in thickness, the " skin effect " is practically insignificant for all frequencies used commercially. Not infrequently the sub-station also contains devices for the changing of alternating to continuous current, usually synchronous converters feeding either traction system or electric lighting mains. Beyond these converters the system becomes an ordinary continuous-current system, and is treated as such. When very close regulation is necessary, motor- generators are often preferred to synchronous converters. Series arc lighting from transmission circuits is a much more serious problem. At the present time two methods are in vogue: first, the operation of continuous-current series-arc machines by synchronous or induction motors driven from the transmission system; and, secondly, series alternating apparatus for feeding alternating arcs. This apparatus consists either of constant- current transformers with automatically moving secondaries, or of inductive regulators, also automatic in their action, supplemented by transformers to supply them with the necessarily rather high voltage employed for arc distribution. As between these two systems practice is at present divided; electrically, the alternating apparatus gives a rather higher real efficiency, but in- volves the use of alternating arcs, which are somewhat less efficient, watt for watt, as light producers than the continuous-current arcs. The apparatus, however, requires practically no care, while the arc machines, driven by motors, require the same amount of care as if they were driven by other power. Arc light transformers, however, are likely to have low power factors, hardly above o-8 at full load, and rapidly falling off at lower ioads. Synchronous rectifiers changing the alternating current into a unidirectional current, suit- able for use with arc lights, have been employed with some success, but not to any considerable extent. They are satisfactory in avoid- ing the use of alternating currents in the arc, and consume but little energy in the transformation from one form of current to the other, but involve the use of static transformers automatically giving con- stant current, which are

somewhat objectionable on the score of low- power factor. Mercury rectifiers are now used rather extensively and give excellent results, although they are as yet of somewhat uncertain life, and, like the synchronous rectifiers, require special transformers when worked at constant current. In Continental practice arc lights are almost universally worked off constant

potential circuits, and hence the difficulties just considered are for the most part peculiar to American systems.

Distances of Transmission. — The ultimate determining factor in the distance to which power can be commercially transmitted is the economic side of the transmission, the maximum distance being the maximum distance at which the transmission will pay. As a mere engineering feat the transmission of power to a distance of many hundred miles is perfectly feasible, and, judging from the data available, the phenomena encountered in increasing the length of lines have not been of such character as to cause any hesitation in going still farther, provided the increase is commercially feasible. In American practice, it is within the truth to say that nearly all transmissions of reasonable size (say a few hundred kilowatts) to distances of twenty miles, or less, are pretty certain to pay. At distances up to fifty miles, in a large proportion of cases power can be delivered at prices which will enable it to compete with power locally generated by steam. From fifty to one hundred miles (on a large scale — several thousand kilowatts) the chances for commercial success are still good. The larger the amount of power transmitted, the better on the whole is the commercial outlook. The longest one yet operated has already been noted, and may be regarded as a commercial success. In certain localities where the cost of fuel is extremely high, transmissions of several hundred miles may prove successful from a commercial as well as an engineering standpoint, but the growth of industry, which indicates the necessity for such a transmission, may go on until, through improved facilities of trans- port, the cost of fuel may be greatly lowered and the economic conditions entirely changed. Such a modification of the con- ditions sometimes takes place much more quickly than would be anticipated at first sight, so that when very long distance trans- missions are under consideration, the permanence of the conditions which will render them profitable should be a very serious subject of consideration. (L. Bl.)

POWIS, EARLS AND MARQUESSES OF. Before the Norman Conquest the Welsh principality of Powis, comprising the county of Montgomery and part of the counties of Brecknock, Radnor, Shropshire, Merioneth and Denbigh, was subject to the princes of North Wales. Early in the 12th

century it was divided into upper and lower Powis. In 1283 Owen ap Griffin, prince of upper Powis, formally resigned his princely title (nomen el circulum principatus) and his lands to the English king Edward I. at Shrewsbury, and received the lands again as an English barony. (See Montgomeryshire Collections, 1868, vol. i.). This barony of Powis passed through female inherit- ance to the family of Cherleton and in 142 1 to that of Grey. It fell into abeyance in 1551.

In 1 587 Sir Edward Herbert (d. 1 594) , a younger son of William Herbert, earl of Pembroke, purchased some of the lands of the barony, including Red castle, afterwards Powis castle, near Welshpool, and in 1629 his son William (c. 1 573-1656) was created Baron Powis. William's grandson, William, the 3rd baron (c. 1629-1696), was created earl of Powis in 1674 and Viscount Montgomery and marquess of Powis in 1687. The recognized head of the Roman Catholic aristocracy in England, Powis was suspected of complicity in some of the popish plots and was imprisoned in the Tower of London from 1678 to 1684. He followed James II. into exile and was created duke of Powis by the dethroned king. The English government deprived him of his estates, but these were restored to his son William, the 2nd marquess, in 1722. William, who had a somewhat chequered career as a Jacobite, died in October 1745, and when his son William, the 3rd marquess, died in 1748 the titles became extinct.

In 1748 Henry Arthur Herbert (d. 1772), who had been made Baron Herbert of Chirbury in 1743, was created Baron Powis and earl of Powis. He allied himself with the earlier holders of these titles, with which family he was distantly connected, by marrying Barbara, a niece of the 3rd marquess. The titles became extinct a second time when his son George Edward died in January 1801. George's sister and heiress, Henrietta Antonia (1758-1830), married Edward Clive (1754-1829), son and heir of the great Lord Clive. In 1794 he was made Baron Clive of Walcot, and in 1804, after serving as governor of Madras from 1798 to 1803, he was created Baron Powis and earl of Powis. His son Edward, the 2nd earl (1785-1848), took the name of Herbert in 1807 in lieu of that of Clive. He was a member of parliament from 1806 to 1839, and was elected in opposition to the Prince Consort, as chancellor of the university of

Cambridge in 1847. His second son was Lieut.-General Sir Percy Egerton Herbert (1822-1876), who distinguished him- self in the Crimean War, and Sir Percy's son, George Charles (b. 1862), became the 4th earl in 1891.

POWNALL, THOMAS (1722-1805), British colonial states- man and soldier, was born at Saltfleetby, Lincolnshire, Eng- land, in 1722. He was educated at Lincoln and at Trinity College, Cambridge, where he graduated

in 1743. He entered the office of the lords commissioners of trade and plantations, of which his brother John was then secretary; and in 1753 he went to America as private secretary to Sir Danvers Osborn, just appointed governor of New York. Osborn committed suicide soon after reaching New York (Oct. 6), but Pownall remained in America, devoting himself to studying the con- dition of the American colonies. At the Albany Congress, in 1754, he met Benjamin Franklin, and a life-long friendship between the two resulted. In 1756 he returned to England, and presented to Pitt a plan for a campaign against the French in Canada, to begin with the investment of Quebec. In 1757 Pitt appointed him governor of Massachusetts, 1 in which office he heartily supported Pitt's policy during the Seven Years' War, and in 1758 encouraged the equipment of a force of 7000 men, to be recruited and armed in New England; but the French power in America once broken, Pownall came more directly under the influence of the lords of trade, and his unwillingness to carry out the repressive policies of that body caused his transfer to the governorship of South Carolina in February 1760. This office he held nominally for about a year; but he never went to South Carolina, and in June 1760 he returned to Eng- land. In 1762-1763 he was commissary-general of the British troops in Germany. As member of parliament for Tregony in 1768-1774 and for Minehead in 1774-1780, he at first sided with the Whigs in opposing all plans to tax the American colonists, but he supported North's administration after the outbreak of the War of Independence. He died at Bath on the 25th of February 1805. In 1764 he published (at first anonymously) his famous Administration of the Colonies (other editions appeared in 1765, 1766, 1768 and 1774), in which he advocated a union of all British possessions upon the basis of community of commercial interests.

For an extended account of Pownall's career and a bibliography of his publications see Thomas Pownall, M.P., F.R.S. (London, 1908), by Charles A. W. Pownall, a distant kinsman, who attempts to prove that Pownall was the " author behind the scenes " of the " Letters of Junius " and " that Francis was his subordinate."

POYET, GUILLAUME (1473-1548), French magistrate, was born at Angers. After practising successfully as a barrister at Angers and Paris, he was instructed by Louise of Savoy, mother of the king, Francis I., to uphold her rights against the constable de Bourbon in 1521. This was the beginning of his fortunes. Through the influence of the queen-mother he obtained the posts of advocate-general (1530) and president of the parlement of Paris (1534), and became chancellor of France in 1538. He was responsible for the legal reform con- tained in the ordinance of Villers-Cotterets (1539), the object of which was to shorten procedure. This ordered the keeping of registers of baptisms and deaths, and enjoined the exclusive use of the French language in legal procedure. With the con-

stable de Montmorency he organized an intrigue to ruin Admiral Chabot, and procured his condemnation in 1541; but after the admiral was pardoned, Poyet was himself thrown into prison, deprived of his offices, and sentenced to a fine of 100,000 livres. He recovered his liberty in 1545, and died in April 1548.

See C. Poree, Guillaume Poyet (Angers, 1898).

POYNINGS, SIR EDWARD (1459-1521), lord deputy of Ire- land, was the only son of Robert Poynings, second son of the 5th Baron Poynings. His mother was a daughter of Sir William Paston, and some of her correspondence is to be found in the

1 In September 1755 Pownall had been made lieutenant-governor of New Jersey, but he had little to do with the affairs of that province and resigned soon after his appointment to Massachusetts.

Paston Letters. Robert Poynings was implicated in Jack Cade's rebellion, and Edward was himself concerned in a Kentish rising against Richard III., which compelled him to escape to the Continent. He attached himself to Henry, earl of Rich- mond, afterwards King Henry VII., with whom he returned to England in 1485. By Henry VII. Poynings was employed in the wars on the Continent, and in 1493 he was made governor of Calais. In the following year he went to Ireland as lord deputy under the viceroyaity of Prince Henry, afterwards King Henry VIII. Poynings immediately set about Anglicizing the government of Ireland, which he thoroughly accomplished, after inflicting punishment on, the powerful Irish clans who supported the imposture of Perkin Warbeck. He then sum- moned the celebrated parliament of Drogheda, which met in December 1404, and enacted the " Statutes of Drogheda," famous in Irish history as " Poynings's law " (see Statute: Ireland), which made the Irish legislature subordinate to, and completely dependent on, that of England, till its repeal in 1782. After defeating Perkin Warbeck at Waterford and driving him out of Ireland, Poynings returned to England in 1496, and was appointed warden of the Cinque Ports. He was employed both in military commands and in diplomatic missions abroad by Henry VII., and later by Henry VIII., his most important achievement being the successful negotiation of the " holy league " between England, Spain, the emperor, and the pope, in 1513. In 1520 he was present at the Field of the Cloth of Gold, in the arrangement of which he had taken an active part. He died in 1521. By his wife, Elizabeth Scot, Poynings left no surviving issue, and his estates passed through a collateral female line to the earl of Northumberland. He had several illegitimate children, one of whom, Thomas Poynings, was created

Baron Poynings in 1545, but died in the same' year without heirs.

See Sir Francis Bacon, The History of the Reign of King Henry VII (London, 1641); Richard Bagwell, Ireland under the Tudors (2 vols London, 1885); J. T. Gilbert, History of the Viceroys of Ireland (Dublin, 1865) ; J. A. Froude, The English in Ireland (3 vols., London 1 872-1 874) ; Wilhelm Busch, England under the Tudors, ed. by Tames Gairdner (London, 1895).

POYNTER, SIR EDWARD JOHN, Bart. (1836-), English painter, son of Ambrose Poynter, architect, was born in Paris on the 20th of March 1836. He pursued his art studies in England and in Paris (under Gleyre, 1856-1859), and exhibited his first picture at the Royal Academy in 186 1. In 1869, after the exhibition of " Israel in Egypt " and " The Catapult," he was elected an Associate of the Royal Academy, and in 1876, the year of " Atalanta's Race," full Academician.

In the decorative arts he practised freely as a designer in fresco, mosaic, stained glass, pottery, tile-work and the like. While still quite a young man, he was encouraged by the architect William Burges, A.R.A., to design panels for his quaint Gothic cabinets; Messrs Powell obtained from him cartoons of designs for stained glass ; for the decoration of Waltham Abbey church he was employed on a series of thirty important designs. Attracted by these, Dalziel Brothers commissioned a number of full-page drawings on wood for the illustration of their celebrated " Bible Gallery." The car- toons for " St George " and " St David," the mosaic panels now embellishing the outer lobby of the Palace of Westminster, were produced in 1870, and they were followed by the " Apelles " and " Pn 'dias," in the same method of reproduction, in the Victoria and Albert Museum; by the important series of frescoes in St Stephen's, Dulwich — scenes from the life of the saint ; by the decoration of the grill room at the Museum at South Kensington, with the tiles en cama'ieu — an achievement strikingly successful and pregnant with results. Always a lover of water-colour drawing and of the art of landscape painting, he was elected to the Royal Society of Painters in Water Colours in 1883. In 1874 he designed the Ashantee medal; and in 1892, for the coinage of that year, the reverse of the shilling and florin, to the obverse of Mr Thomas Brock, R.A.

When the art teaching centre of South Kensington was assuming the importance it has since attained, Mr Poynter was appointed director for art in the Science and Art Department, and principal of the National Art Training Schools (now the Royal College of Art), and by virtue of his vigorous and successful administration he invested his office with a distinction which, after his resignation in 1881, it soon notoriously lacked.

The directorship of the National Gallery became vacant in 1894, and Poynter, profoundly versed in the works of the Old Masters, especially of the Italian schools, was appointed to the post, which he held for ten years. Under his rule the National Gallery of British Art, at Millbank, presented by the late Sir Henry Tate, became a department of the National Gallery, and thither were removed many pictures formerly in the British rooms at Trafalgar Square, as well as the Chantrey Collection from South Kensington, &c. One of the most important services by the director was the editing of the great Illustrated Catalogue of the National Gallery (1 889-1 900), in which every picture in the collection is reproduced— an unprecedented achievement in the annals of art-publishing.

On the death of Sir John Millais in 1896, Poynter was elected to the presidency of the Royal Academy, and was knighted. He was made a baronet in 1902.

Paintings.— Among Sir Edward Poynter's most notable pictures have been the following: "Israel in Egypt" (1867)- "The Catapult " (1868) ; " Perseus and Andromeda " (1872) ; " Atalanta's Race (1876) ; " 'The Fortune-Teller " (1877) ; " Nausicaa and Her Maidens (1879) ; Visit to Aesculapius " (1880), now in the Chan- }[% C , ollectlon ln the Tate Gallery; " The Ides of March " (1883) • « S^™ 6 " 6 " (l88 5). now destroyed; " On the Terrace " (1889) :

1 he Meeting of Solomon and the Queen of Sheba " (1891)- " Horae Serenae and " Idle Fears " (1894), and numerous portraits and water-colour drawings.

Lectures.— In his series of Slade Lectures, delivered from 187s to 1879 and first published in 1879 (republished, with additions, in 1897), Sir Edward Poynter deals with the whole subject of art education, considering in turn Decorative Art, Old and New Art Systems of Art Education, Hints on the Formation of a Style' Training of Art Students, The Study of Nature, The Value of Things Objects of Study, Professor Ruskin on Michelangelo (hotly con- troversial in tone), Influence of Art in Social Life, and Ancient Decorative Art.

See also Cosmo Monkhouse, " Sir E. J. Poynter P R A • His Life and Work," Art Annual (1897); M. H. Spielmann, '" SirE. T Poynter, P.R.A., and his Studies," The Magazine of Art (1897).

POZHAREVATS (also written Passarowitz and Pozarevac), a town in Servia, situated in the Morava valley, 4 m. E. of the Morava river and 8 m.

S. of the Danube. The station for steamers, Dubravitsa, with its custom-house, standing on the banks of the Danube, forms practically the harbour of Pozhare- vats. The town has no special industry, but is the principal market of a very extensive and fruitful plain between the rivers Morava, Mlava and Danube. It is the capital of a depart- ment bearing the same name, and the seat of a prefecture, a tribunal of justice, a college and several national or normal schools. It has a large modern penitentiary, with a department for political offenders and a prison for women. Two miles to the west, towards Morava, is situated Lubichevo, a model farm and stud belonging to the government. The shady park and flower gardens are a popular resort of the people of Pozharevats. The town is known in the history of international treaties as the place at which the famous peace of Passarowitz between Austria and Turkey was concluded in 1718. Pop. (1900), 12,957.

Lignite is worked at Kostolats, 7 m. N. by E., and" the hills between Pozharevats and Kostolats show many traces of Roman mines. A number of coins, sarcophagi and inscriptions found in the neighbourhood are also Roman.

POZOBLANCO, a town of southern Spain in the province of Cordova, near the head-waters of the Guadamatillas and of other small sub-tributaries of the Guadiana. Pop. (1900), 12,792. Pozoblanco is one of the chief towns in the lowlands of' Los Pedroches, which lie between the Sierra de la Alctidia on the north and the Sierra Morena on the south. Although there is no railway in the district, Pozoblanco has a thriving trade. Its fairs are famed for their exhibits of live stock and agricultural products. There are zinc and argentiferous lead mines in the neighbourhood, and manufactures of cloth and leather in the town itself.

POZZO DI BORGO, CARLO ANDREA, Count (1 764-1842), Russian diplomatist, was born at Alata, near Ajaccio, of a noble Corsican family, on the 8th of March 1764, some four years before the cession of the island to France. He was educated

at Pisa, and in early life was closely associated with Napoleon and Joseph Bonaparte, the two families being at that time closely allied in politics. Pozzo was one of the two delegates sent to the National Assembly in Paris to demand the political incorporation of Corsica in France, and was subsequently one of the Corsican deputies to the Legislative Assembly, where he sat on the benches of the right until the events of August 1792.

On his safe return to Corsica he was warmly received by Paoli, but found himself in opposition to the Bonaparte brothers, who were now veering to the Jacobin party. Under the new con- stitution Pozzo was elected procureur-general-syndic, that is, chief of the civil government, while Paoli commanded the army. With Paoli he refused to obey a summons to the bar of the Convention, and the definite breach with the Bonaparte family, who actively supported the revolutionary authorities, dates from this time. Eventually Paoli and Pozzo accepted foreign help, and from 1794 to 1796, during the English pro- tectorate of Corsica, Pozzo was president of the council of state under Sir Gilbert Elliot. When Napoleon sent troops to occupy the island he was excepted from the general amnesty, and took refuge in Rome, but the French authorities demanded his ex- pulsion, and gave orders for his arrest in northern Italy. After a short stay in London he accompanied in 1798 Sir Gilbert Elliot (now become Lord Minto) on an embassy to Vienna, where he lived for six years and was well received in political circles. Hatred of Napoleon was his dominant passion, and even as an exile of no official standing he was recognized as a dangerous enemy. In 1804 through the influence of Prince Adam Czar- toryski he entered the Russian diplomatic service, and was em- ployed in 1805 as Russian commissioner with the Anglo-Neapoli- tan, and in 1806 with the Prussian army. He was entrusted with an important mission to Constantinople in 1807, but the conclusion of the alliance between Alexander I. and Napoleon at Tilsit in July interrupted his career, necessitating a tem- porary retirement after the completion of his business with the Porte. He returned to Vienna, but on the demand of Napoleon for his extradition Metternich desired him to leave the capital. In London, where he found safety from Napoleon, he renewed many old ties, and remained in England until 1812, when he was recalled by Alexander. He diligently sought to sow dis- sension in the Bonaparte household, and in a mission to Sweden he secured the co-operation of Bernadotte against Napoleon. On the entry of the allies into Paris he became commissary general to the provisional government. At the Bourbon restora- tion General Pozzo di Borgo became Russian ambassador at the Tuileries, and sought to secure a marriage between the duke of Berry and the Russian grandduchess Anna, Alexander's sister. He assisted at the Congress of Vienna, and during the Hundred Days he joined Louis XVIII. in Belgium, where he was also instructed to discuss the situation with Wellington. The tsar dreamed of allowing an appeal to the people of France on the subject of the government of France in accordance with his vague liberalizing tendencies, but Pozzo's suggestions in this direction were met by violent opposition, the duke refusing to make any concessions to what he regarded as rebellion; but in Petersburg, on the other hand, his attachment to the Bourbon dynasty was considered excessive. During the early years of his residence in Paris Pozzo laboured tirelessly to lessen the burdens laid on France by the allies and to

shorten the period of foreign occupation. That his French sympathies were re- cognized in Paris is shown by the strange suggestion that he should enter the French ministry with the portfolio of foreign affairs. He consistently supported the moderate party at court, and stood by the ministry of the due de Richelieu, thus earning the distrust and dislike of Metternich, who held him responsible for the revival of Liberal agitation in France. His influence at the Tuileries declined with the accession of Charles X., whose reactionary tendencies had always been dis- tasteful to him; but at the revolution of 1830, when the Tsar Nicholas was reluctant to acknowledge Louis Philippe, he did good service in preventing difficulties with Russia. In 1832 he visited Petersburg; the next year he was in London renewing

his relations with Wellington, and early in 1835 he was sud- denly transferred to the London embassy in succession to Prince Lieven. Although he did not lose in official standing, Pozzo was aware that this change was due to suspicions long har- boured in various quarters in St Petersburg that his diplomacy was too favourable to French interests. In London his health suffered, and he retired from the service in 1839 to spend the rest of his days in Paris, where he died on the 1 5th of February 1842. He had been made a count and peer of France in 1818. See Ouvaroff, Stein et Pozzo (St Petersburg, 1846) ; Correspondance diplomatique du comte Pozzo di Borgo et du comte de Nesselrode, ed. by Charles Pozzo di Borgo (2 vols., Paris, 1 890-1 897); Vicomte A. Maggiolo, Corse, France et Russie. Pozzo di Borgo, 1764-1842 (Paris, 1890) ; J.B.H.R. Capefigure, Les Diplomates europeens (4 vols.,

1843-1847).

POZZUOLI (anc. Puteoli, q.v), a seaport and episcopal see of Campania, Italy, in the province of Naples, 7I m. W. of it by rail. Pop. (1906), 17,017 (town); 22,838 (commune). It is situated on and at the base of a hill projecting into the bay at Pozzuoli, separated from the main portion of the Gulf of Naples by the promontory of Posilipo. Its mineral baths are frequented in summer; and the volcanic pozzolana earth (also found near Rome), used now as in Roman times for making cement and concrete, derives its name from the place. In the middle ages Pozzuoli was frequently sacked and also damaged by the natural convulsions of 1198 and 1538. To the north- east of the town is the Solfatura, a half extinct volcano crater, in which sulphurous gases are exhaled.

PRABHU, the writer caste of Western India, corresponding to the Kayasth of Bengal. Though numbering only 21,941 in Bombay in 1901, they occupy a very high position socially and in the professions. The first Indian to be appointed to the executive council at Bombay was a Prabhu, of the

well-known Chaubal family.

PRADIER, JAMES (1792-1852), French sculptor, was born at Geneva. He was a member of the French Academy, and a popular sculptor of the pre-Romantic period, representing in France the drawing-room classicism which Canova illustrated at Rome. His chief works are the Niobe group (1822), "Ata- lanta" (1850), "Psyche" (1824), "Sappho" (1852) (all iu the Louvre), " Prometheus " (Tuileries Gardens), a bas-relief on the triumphal arch of the Carrousel, the figures of " Fame " on the Arc de l'Etoile, and a statue of J. J. Rousseau for Geneva. Besides these mention should be made of his " Three Graces "

(1821).

PRADILLA, FRANCISCO (1847-), Spanish painter, was born at Villanueva da Gallago (Saragossa). Having studied first at the Fernando Academy, and then at the Spanish Academy in Rome, of which he was afterwards director, he became the leading historical painter of modern Spain. In 1896 he was appointed director of the Madrid Museum. Though he is best known for such large historical compositions as " Joan the Mad " (gold medal, Paris, 1878), and " The Surrender of Granada " (gold medal, Munich, 1883), in which he discarded the heavy colouring of Laurens for a lighter and more atmospheric key, he has painted many excellent genre pictures in the manner of Fortuny, and some decorative compositions in which he follows the example of Tiepolo. The best of these are his decorations in the Murgo Palace in Madrid. Among his best known works are " Elopement," " Strand at Vigo," " Procession in Venice," " La Fiorella," " Reading on the Balcony," " Don Alfonso the Warrior," and " Don Alfonso the Scholar." He became member of the Berlin Academy in 1892.

PRAED, WINTHROP MACKWORTH (1802-1839), English poet, was born in London on the 26th of July 1802. The old family name was Mackworth, the additional name of Praed being derived from the marriage of the poet's great grand- father with a Cornish heiress. His father, William Mackworth Praed, was a serjeant-at-law. His mother belonged to the English branch of the New England family of Winthrop. In 1 8 14 Praed was sent to Eton College. He there founded a manuscript periodical called Apis matina. This was suc- ceeded in October 1820 by the Etonian, a paper projected and

edited by Praed and Walter Blount, which appeared every month until July

1821, when the chief editor, who signed his contributions " Peregrine Courtenay," left Eton, and the paper died. Henry Nelson Coleridge, William Sidney Walker, and John Moultrie were the three best known of his coadjutors in this periodical, which was published by Charles Knight, and of which many interesting particulars are given in Knight's A utobiography and in Maxwell Lyte's Eton College. Before Praed left school he succeeded in establishing over a shop at Eton a " boys' library," the books of which are now amalgamated in the School Library. His career at Cambridge, where he matricu- lated at Trinity College, October 1821, was marked by excep- tional brilliancy. He gained the Browne medal for Greek verse four times, and twice the chancellor's medal for English verse. He was bracketed third in the classical tripos in 1825, won a fellowship at his college in 1827, and three years later carried off the Seatonian prize. At the Union his speeches were only rivalled by those of Macaulay and of Charles Austin (1799- 1874), who subsequently made a great reputation at the par- liamentary bar. The character of Praed during his university life is described by Bulwer Lytton in the first volume of his Life. He began to study law, and in 1829 was called to the bar at the Middle Temple. He went the Norfolk circuit, where his prospects of advancement were bright, but the bias of his feelings inclined him towards politics, and after a year or two he devoted himself entirely to political life. Whilst at Cam- bridge he leaned to Whiggism, and even to the autumn of 1829 his feelings were bent towards the same side, but during the agitation for parliamentary reform his opinions changed, and when he was returned to parliament for St Germans (Dec. 17, 1830) his election was due to the Tory party. He sat for that borough until December 1832, and on its extinction contested the borough of St Ives, within the limits of which the Cornish estates of the Praeds were situated. The squibs which he wrote on this occasion were collected in a volume printed at Penzance in 1833 and entitled Trash, dedicated without respect to James Halse, Esq., M.P., his successful competitor. Praed sat for Great Yarmouth from 1835 to 1837, and was secretary to the Board of Control during Sir Robert Peel's short adminis- tration. He sat for Aylesbury from 1837 until his death. During the progress of the Reform Bill he advocated the creation of three-cornered constituencies, in which each voter should have the power of giving two votes only, and maintained that freeholds within boroughs should confer votes for the boroughs and not for the county. Neither of these suggestions was then adopted, but the former ultimately formed part of the Reform Bill of 1866. He married in 1835 Helen Bogle. He died of consumption at Chester Square, London, on the 15th of July

1839.

Praed's lighter poetry was the perfection of ease. Mr Austin Dobson has justly praised his " sparkling wit, the clearness and finish of his style, and

the flexibility and unflagging vivacity of his rhythm " (Ward's English Poets). It abounded in happy allusions to the characters and follies of the day. In his humorous effusions he found numerous imitators.

His poems were first edited by R. W. Griswold (New York, 1844) ; another American edition, by W. A. Whitmore, appeared in 1859; an authorized edition with a memoir by Derwent Coleridge appeared in 1864: The Political and Occasional Poems of W. M. Praed (1888), edited with notes by his nephew, Sir George Young, included many pieces collected from various newspapers and periodicals. Sir George Young separated from his work some poems, the work of his friend Edward Marlborough Fitzgerald, generally confused with his. Praed's essays, contributed to various magazines, were published in Morley's Universal Library in 1887.

PRAEFECT (praefectus), the title of various Roman officials, both civil and military. A praefect was not one of the magis- trates proper; he was, strictly speaking, only the deputy or lieutenant of a superior magistrate or commander. The fol- lowing were the most important.

1. The city praefect {praefectus urbis) acted at Rome as the deputy of the chief magistrate or magistrates during his or their absence from the city. Thus he represented in the earliest

times the king and in later times the consul or consuls when he or they were absent on a campaign or on other public duties, such as the celebration of the annual Latin festival on the Alban Mount. The absence of the chief magistrate for more than a single day rendered the appointment of a praefect obligatory; but the obligation only arose when all the higher magistrates were absent. Hence so long as the consuls were the only higher magistrates their frequent absence often rendered the appoint- ment of a praefect necessary, but after the institution of the praetorship (367 B.C.) the necessity only arose exceptionally, as it rarely happened that both the consuls and the praetor were absent simultaneously. But a praefect continued to be regularly appointed, even under the empire, during praefectus the enforced absence of all the higher magistrates Urbis at the Latin festival. The right and duty of appoint- Ferlamm ing a praefect belonged to the magistrate (king, //,an " n " dictator or consul) whose deputy he was, but it seems to have been withdrawn from the consuls by the Licinian law (367), except that they still nominated praefects for the time of the festival. No formalities in the appointment and no legal qualifications on the part of the praefect were required. The praefect had all the powers of the magistrate whose deputy he was, except that he could not nominate a deputy to him- self. His office expired on the return of his superior. There could only be one city praefect at a time, though the dictator Caesar broke the rule by appointing six or eight praefects

simultaneously.

Under the empire there was introduced a city prefecture which differed essentially from the above. Augustus occa- sionally appointed a city praefect to represent him in his absence from Italy, although the praetors, or even one of the consuls, remained in the capital. In the absence of Tiberius from Rome during the last eleven years of his reign (a.d. 26-37) the city prefecture, hitherto an exceptional and temporary office, be- came a regular and permanent magistracy; in all subsequent reigns the praefect held office even during the presence of the emperor in Rome. He was always chosen by the emperor and usually from men who had held the consulship; his office was regarded, like the censorship under the republic, as the crown- ing honour of a long political career. It was not conferred for any definite length of time, but might be held for years or for life. As under the republic, the praefect was not allowed to quit the city for more than a day at a time. His duty was the preservation of peace in the capital; he was, in fact, the chief of the police, being charged with the superintendence of the streets, markets and public buildings. He was further entrusted by Augustus with a summary criminal jurisdiction over slaves and rioters, which was, however, gradually extended till in the time of Severus or even earlier it embraced all offences by whomsoever committed. Further, he had the power of dealing with civil cases where his interference seemed requisite in the interests of the public safety, but such occasions were naturally few. By the beginning of the 3rd century, and perhaps earlier, appeals to the emperor in civil cases were handed over by him to be dealt with by the praefect. Except where special re- strictions interfered, an appeal lay from the praefect to the emperor. Though not a military officer, the praefect com- manded the city cohorts (cohortes urbanae), which formed part of the garrison of Rome and ranked above the line regiments, though below the guards (see Praetorians). The military power thus placed in the hands of the chief of the police was one of the most sorely-felt innovations of the empire. The con- stitutional changes of Diocletian and Constantine extended still further the power of the praefect, in whom, after the dis- banding of the guards and the removal from Rome of the highest officials, the whole military, administrative and judicial powers were centred.

2. Under the republic judicial praefects {praefecti jure dicendo) were sent annually from Rome as deputies of the praetors to administer justice in certain towns of the Italian allies. These towns were called prefectures (praefecturae) . After the Social War (90-89 B.C.), when all Italy had received the Roman

franchise, such prefectures ceased to exist in fact, though the name was sometimes retained.

3. Under the empire the praetorians or imperial guards were commanded by one, two, or even three praefects (praefecti praetorio), who were chosen by the emperor from among the knights and held office at his pleasure. From the time of Alex- ander Severus the post was open to senators also, and if a knight was appointed he was at the same time raised to the senate. Down to the time of Constantine, who deprived the office of its military character, the prefecture of the guards was regu- larly held by tried soldiers, often by men who had fought their way up from the ranks. In course of time the command seems to have been enlarged so as to include all the troops in Italy except the corps commanded by the city praefect (cohortes urbanae). Further, the praetorian praefect acquired, in addition to his military functions, a criminal jurisdiction, which he exercised not as the delegate but as the representative of the emperor, and hence it was decreed by Constantine (331) that from the sentence of the praetorian praefect there should be no appeal. A similar jurisdiction in civil cases was acquired by him not later than the time of Severus. Hence a knowledge of law became a qualification for the post, which under Marcus Antoninus and Commodus, but especially from the time of Severus, was held by the first jurists of the age, {e.g. Papinian, Ulpian and Paullus), while the military qualification fell more and more into the background. Under Constantine the insti- tution of the magistri militum deprived the praetorian pre- fecture altogether of its military character,' but left it the highest civil office of the empire.

The title of " praefect " was borne by various other Roman officials, of whom we may mention the following: —

4. Praefectus Socium (sociorum). — Under the republic the con- tingents furnished to the Roman armies by the Italian allies were commanded by Roman officers called praefecti socium (sociorum), who were nominated by the consuls and corresponded to the tribunes in the legions.

5. Praefectus Classium. — Down to near the close of the republic a naval command was never held independently but only in connexion with the command of an army, and, when the general appointed an officer to command the fleet in his room, this lieutenant was styled " praefect of the fleet " (praefectus classium). When in 311 B.C. the people took the appointment of these lieutenants into their own hands the title was changed from " praefects " to duo viri navales, or "two naval men"; but under the empire the admirals went by their old name of praefects.

6. Praefectus Fabrum. — The colonel of the engineer and artillery corps

(fabri) in a Roman army was called a praefect; he did not belong to the legion, but was directly subordinate to the general in command.

7. Praefectus Annonae. — The important duty of provisioning Rome was committed by Augustus (between a.d. 8 and 14) to a praefect, who was appointed by the emperor from among the knights and held office at the imperial pleasure.

8. Praefectus Aegypti (afterwards Praefectus augustalis). — Under the empire the government of Egypt was entrusted to a viceroy with the title of " praefect," who was selected from the knights, and was surrounded by royal pomp instead of the usual insignia of a Roman magistrate. He stood under the immediate orders of the emperor. The exceptional position thus accorded to Egypt was due to a regard on the part of the emperors to the peculiar character of the population, the strategic strength of the country, and its political importance as the granary of Rome. (J. G. Fr.)

9. Praefectus Castrorum, from the time of Augustus to Severus the title of the commander of the fixed camps of the legions in different parts of the empire. He was a purely military man appointed by the emperor, usually a centurion whose term of service was com- pleted. From the time of Domitian, when each legion had a separate camp, the name of the legion was added to the title, e.g. praefectus castrorum legionis xiii. gem. (C.I.L. iii. 454). The duties of this officer included : the arrangement of the camp and medical service, the transport of the baggage, the construction of roads, bridges and fortifications, the supply of ammunition and engines of war.

10. Praefectus Vigilum, the commander of the seven cohortes vigilum, a night police force instituted by Augustus (a.d. 6). To each cohort, consisting of about 1000 men (chiefly freedmen), was entrusted the care of two of the fourteen city districts; one of its chief duties was that of a fire brigade. The policing of the city had formerly been one of the' duties of the aediles, but was now trans- ferred to the praefectus vigilum, appointed by the emperor from the equites. He exercised criminal jurisdiction in cases of incendiarism and offences committed against the law during the night, and in later times this jurisdiction was considerably extended.

The different kinds of praefects are fully discussed in Mommsen, Romisches Staatsrecht (1887) vols, ii., iii. ; see also T. M. Taylor, Con- stitutional and Political History of Rome (1899). There is an excellent monograph on the Praefectura urbis by P. E. Vigneaux (1896). Mommsen deals very cursorily with the praefectus castrorum, but there is a special article by G. Wilmanns, in Ephemeris epigraphica (1872), vol. i.," De praefecto castrorum et praefecto legionis."

For the French prefet see Prefect. (X.)

PRAEMUNIRE (Lat. praemonere, to pre-admonish or fore- warn), in English law an offence so called from the introductory words of the writ of summons issued to the defendant to answer the charge, " Praemunire facias A.B.," &c, i.e. " cause A.B. to be forewarned." From this the word came to be used to denote the offences, usually ecclesiastical, prosecuted by means of such a writ, and also the penalties they incurred. The statute of Richard II., Purchasing bulls from Rome (1392), is usually designated the Statute of Praemunire, but it is only one of numerous stringent measures (some still unrepealed, and, as a body, of the most confused character) passed for the pur- pose of putting restraint on the papal usurpation of authority in England. From the beginning of the 14th century papal aggression had been particularly active, more especially in two forms. The one, the disposal of ecclesiastical benefices, before the same became vacant, to men of the pope's own choosing; the other, the encouragement of resort to himself and his curia rather than to the courts of the country. The Statute of Provisors 1306, passed in the reign of Edward I., was, according to Coke, the foundation of all subsequent statutes of praemunire. This statute enacted " that no tax imposed by any religious persons should be sent out of the country whether under the name of a rent, tallage, tribute or any kind of imposition." A much greater check on the freedom of action of the popes was imposed by the Statute of Provisors (13 50-13 51) and the Statute of Praemunire passed in the reign of Edward III. The former of these, after premising " that the Pope of Rome, accroaching to him the seignories of possession and benefices of the holy Church of the realm of England doth give and grant the same benefices to aliens which did never dwell in England, and to cardinals, which might not dwell here, and to others as well aliens as denizens, as if he had been patron or advowee of the said dignities and benefices, as he was not of right by the laws of England . . . ," ordained the free election of all dignities and benefices elective in the manner as they were granted by the king's progenitors. The Statute of Praemunire (the first statute so called) 1353, though expressly levelled at the pre- tensions of the Roman curia, excludes any direct reference to it in actual words. By it, the king " at the grievous and clam- orous complaints of the great men and commons of the realm of England " enacts " that all the people of the king's Iigeance of what condition that they be, which shall draw any out of the realm in plea " or any matter of which the cognizance properly belongs to the king's court shall be allowed two months in which to answer for their contempt of the king's rights in transferring their pleas abroad. The penalties which were attached to the offence under this statute involved the loss of all civil rights, forfeiture of lands, goods and . chattels, and imprisonment during the royal pleasure.

Many other statutes followed that of 13 S3, but that passed in the sixteenth

year of Richard II. 's reign is, as mentioned before, usually referred to as the Statute of Praemunire. This statute, after first stating " that the right of recovering the present- ments to churches, prebends, and other benefices . . . be- longeth only to the king's court of the old right of his crown, used and approved in the time of all his progenitors kings of England," proceeds to condemn the practice of papal trans- lation, and after rehearsing the promise of the three estates of the realm to stand with the king in all cases touching his crown and his regalty, enacts " that if any purchase or pursue, or cause to be purchased or pursued in the court of Rome, or elsewhere, any such translations, processes, and sentences of excommunications, bulls, instruments or any other things what- soever … he and his notaries, abettors and counsellors " shall be put out of the king's protection, and their lands

tenements, goods and chattels forfeit to the king, and they shall be attached by their bodies or process made against them by praemunire facias. This statute, says Stubbs, was one of the strongest defensive measures taken during the middle ages against Rome and was called for by the conduct of the pope, who had forbidden the bishops to execute the sentences of the royal courts in suits connected with ecclesiastical patronage. The last ancient statute concerning praemunire, until the Refor mation, was an extension in the reign of Henry IV. (1400) of the Statute of Provisors, by which all persons who accepted any provision from the pope to be exempt from canonical obedience to their proper ordinary were subjected to the penalties pre- scribed. The range and description of offences subject to the penalties of praemunire were greatly widened after the Refor- mation, so that acts of a very miscellaneous character were from time to time brought within the scope of enactments passed for a very different purpose. For instance, the penalties of praemunire were incurred, under an act of Queen Elizabeth (1 571), for denying the Queen's title; and under an act of James I. the Statute of Monopolies (1623), for obtaining any stay of proceedings (other than by arrest of judgment or a writ of error) in any suit for a monopoly; under an act of Charles I. (1640) the attempting to restrain the importation or making of gunpowder was a praemunire; in the reign of Charles II. an act of 1661 made the asserting maliciously and advisedly, by speaking or writing, that both or either house of parliament has a legis- lative authority without the king, a praemunire. In the same reign, the Habeas Corpus Act 1679 made the committing of any man to prison out of the realm a praemunire, unpardonable even by the king. It thus appears that while the Crown by its prerogative might at any time remit the whole or any pa.rt of the punishment incurred by a praemunire, an exception was

made in transgressions of the Statute of Habeas Corpus. 1 An act of William III. (1695) made Serjeants, counsellors, proctors, attorneys, and all officers of courts practising without having taken the proper oaths guilty of a praemunire. By the Suc- cession to the Crown Act 1707, verbally to assert the rights of a person to the Crown contrary to the Acts of Settlement and Union is praemunire (to do so by writing or printing is treason). The Royal Marriages Act 1772 is the last statute which sub- jects anyone to the penalties of a praemunire. A peer charged with praemunire is not entitled to trial by his peers, but is to be tried by a jury. The most famous historical instance of a prosecution of the Statute of Praemunire was that of Cardinal Wolsey in 1529.

Authorities. — Statutes of the Realm; Coke, Institutes; Collier, Ecclesiastical History, Hallam, Middle Ages; Reeves' History of English Law, Stephen's Commentaries on the Laws of England; Sir J. Stephen's History of Criminal Law ; Sir T. E. Tomlin's Law Diction- ary ; Stubbs, Constitutional History. (T. A. I.)

PRAENESTE (mod. Palestrina), a very ancient city of Latium, lies 23 m. E. of Rome by the Via Praenestina (see below), on a spur of the Apennines facing the Alban Hills. To the natural strength of the place and its commanding situation Praeneste owed in large measure its historical importance. There are various legends as to its foundation. Objects in metal and ivory discovered in the earliest graves prove that as early as the 8th or 7th century B.C. Praeneste had reached a considerable degree of civilization and stood in commercial relations not only with Etruria but with the East. At this time the city was pro- bably under the hegemony of Alba Longa, then the head of the Latin League. In 499 B.C., according to Livy, Praeneste with- drew from the Latin League, in the list of whose members given by Dionysius (v. 61) it occurs, and formed an alliance with Rome. After Rome had been weakened by the Gallic invasion (390) Praeneste joined its foes in a long struggle with Rome. The struggle culminated in the great Latin War (340-38), in which the Romans were victorious, and Praeneste was punished for

1 Sir T. E. Tomlins says that there is only one instance of a prose- cution on a praemunire to be found in the state trials, in which case the penalties were inflicted upon some persons for refusing to take the oath of allegiance to Charles II.

its share in the war by the loss of part of its territory. It was not, however, like most other Latin cities, embodied in the Roman state, but continued in the position of a city in alliance with Rome down to the Social War, when it received the Roman franchise (in 90 B.C., probably as one of those cities which had not rebelled or had laid down their arms at once), which in 215

B.C. some of its citizens — who had bravely held Casilinum against Hannibal, and only surrendered when pressed by hunger — had refused to accept.

As an allied city it furnished contingents to the Roman army and possessed the right of exile (jus exilii), i.e. persons banished from Rome were allowed to reside at Praeneste. To judge from the works of art and inscriptions of this period (338 to 90 B.C.), it must have been for the place a time of prosperity, and even luxury. The nuts of Praeneste were famous and its roses were amongst the finest in Italy. The Latin spoken at Praeneste was somewhat peculiar, 2 and was ridiculed to some extent by the Romans. In the civil wars of Sulla the younger Marius was blockaded in the town by the Sullans (82 B.C.); and on its capture Marius slew himself, the male inhabitants were mas- sacred in cold blood, and a military colony was settled on part of its territory, though, possibly owing to the extravagance of the new coloni, we find that in 63 B.C. this was already in the possession of large proprietors. It was probably in 82 B.C. that the city was removed from the hill-side to the lower ground at the Madonna dell' Aquila, and that the temple of Fortune was enlarged so as to include much of the space occupied by the ancient city. From an inscription found in 1907 it appears that Sulla delegated the foundation of the new colony to M. Terentius Varro Lucullus, who was consul in 73 B.C. Under the empire Praeneste, from its elevated situation and cool salubrious air, became a favourite summer resort of the wealthy Romans, whose villas studded the neighbourhood. Horace ranked it with Tibur and Baiae, though as a fact it never became so fashionable a residence as Tibur or the Alban Hills. Still, Augustus resorted thither; here Tiberius recovered from a dangerous illness, and here Hadrian probably built himself a villa. Marcus Aurelius also had a villa here. Amongst private persons who owned villas at Praeneste were Pliny the younger and Symmachus. Inscriptions show that the inhabitants of Praeneste were especially fond of gladiatorial shows.

But Praeneste was chiefly famed for its great temple of Fortune and for its oracle, in connexion with the temple, known as the " Praenestine lots " (sortes praentstinae) . The oldest portion of the sanctuary was, however, that situated on the lowest terrace but one. Here is a grotto in the natural rock, containing a beautiful coloured mosaic pavement, representing a sea-scene — • a temple of Poseidon on the shore, with various fish swimming in the sea. To the east of this is a large space, now open, but once very possibly roofed, and forming a basilica in two storeys, built against the rock on the north side, and there decorated with pilasters also; and to the east again is an apsidal hall, often identified with the temple itself, in which the famous mosaic with scenes from the Nile, now in the Palazzo Barberini on the uppermost terrace, was found. Under this hall is a chamber, which, as an inscription on its walls shows, served as a treasury in the 2nd century

b.c. In front of this temple an obelisk was erected in the reign of Claudius, fragments of which still exist. The modern cathedral, just below the level of this temple, occupies the civil basilica of the town, upon the facade of which was a sun-dial, described by Varro (traces of which may still be seen). In the modern piazza the steps leading up to this latter basilica and the base of a large monument were found in 1907; so that only a part of the piazza represents the ancient forum. As extended by Sulla the sanctuary of Fortune occu- pied a series of five vast terraces, which, resting on gigantic

2 Thus the Praenestines shortened some words: they said conia for ciconia, tammodo for tantummodo (Plaut. True. iii. 2, 23; Id. Trinum. iii. I, 8; cf. Comment, on Festus, p. 731, ed. Lindemann), and inscriptions exhibit the forms Acmemeno and Tondrus for Agamemno and Tyndarus. They said nef rones for nefrendes in the sense of lesticuli and tongitio for notio (Festus, s.v. " nefrendes " and " tongere "). Cf. Quintilian, Instit. i. 5, 56.

substructions of masonry and connected with each other by grand staircases, rose one above the other on the hill in the form of the side of a pyramid, crowned on the highest terrace by the round temple of Fortune. This immense edifice, probably by far the largest sanctuary in Italy, must have presented a most imposing aspect, visible as it was from a great part of Latium, from Rome, and even from the sea. The ground at the foot of the lowest terrace is 1476 ft. above sea-level; here is a cistern, divided into ten large chambers, in brick-faced concrete. The goddess Fortuna here went by the name of Primigenia (First-Born, but perhaps in an active sense First-Bearer); she was represented suckling two babes, said to be Jupiter and Juno, and she was especially worshipped by matrons. The oracle continued to be consulted down to Christian times, until Constantine, and again later Theodosius, forbade the practice and closed the temple. A bishop of Praeneste is first mentioned in a.d. 313. In 1297 the Colonna family, who then owned Praeneste (Palestrina), revolted from the pope, but in the following year the town was taken and razed to the ground. In 1437 the city, which had been rebuilt, was captured by the papal general Cardinal Vitelleschi and once more utterly destroyed. It was rebuilt and fortified by Stefano Colonna in 1448. In 1630 it passed by purchase into the Barberini family. Prae- neste was the native town of Aelian, and in modern times of the great composer (Giovanni) Pierluigi da Palestrina.

The modern town of Palestrina, a collection of narrow and filthy alleys, stands on the terraces once occupied by the temple of Fortune. On the

summit of the hill (2471 ft.), nearly a mile from the town, stood the ancient citadel, the site of which is now occupied by a few poor houses (Castel San Pietro) and a ruined medieval castle of the Colonna. The magnificent view embraces Soracte, Rome, the Alban Hills and the Campagna as far as the sea. Considerable portions of the southern wall of the ancient citadel, built in very massive Cyclopean masonry of blocks of limestone, are still to be seen; and the two walls, also polygonal, which formerly united the citadel with the town, can still be traced. The ruins of the villa attributed to Hadrian stand in the plain near the church of S. Maria della Villa, about three-quarters of a mile from the town. Here was discovered the Braschi Antinoiis, now in the Vatican. The calendar, which, as Suetonius tells us, was set up by the grammarian, M. Verrius Flaccus in the forum of Praeneste (the reference being to the forum of the imperial period, at the Madonna dell' Aquila), was discovered in the ruins of the church of S. Agapitus in 1771, where it has been used as building material (C. Hiilsen in Corp inscr. lat. 2nd ed. i. 230). Excavations made, especially since 1855, in the ancient necropolis, which lay on a plateau surrounded by valleys at the foot of the hill, and of the town, have yielded important results for the history of the art and manufactures of Praeneste. Of the objects found in the oldest graves, and supposed to date from about the yth century B.C., the cups of silver and silver-gilt and most of the gold and amber jewelry are Phoenician (possibly Carthaginian), or at least made on Phoenician models; but the bronzes and some of the ivory articles seem to be Etruscan. No objects have been discovered belonging to the period intermediate between the 7th and 3rd centuries B.C. ; but " from about 250 B.C. onwards we have a series of Praenestine graves surmounted by the characteristic ' pine-apple ' of local stone, containing stone coffins with rich bronze, ivory and gold ornaments beside the skeleton. From these come the bronze cistae and specula with partly (but far from wholly) Etruscan inscriptions, for which Praeneste is renowned " (Conway, Hal. Dial.). Among these is the famous Ficoroni casket, engraved with pictures of the arrival of the Argonauts in Bithynia and the victory of Pollux over Amycus. It was found in 1738. " The caskets are unique in Italy, but a large number of mirrors of precisely similar style have been discovered in Etruria and are published in full by the German Archaeological School at Rome: Etruskische Spiegeln, vol. v. sqq. (Berlin,[l884). Hence, although a priori it would be reasonable to conjecture that objects with Etruscan character-istics came from Etruria, the evidence, positive and negative, points decisively to an Etruscan factory in or near Praeneste itself " (Con- way, ibid.). Most of the objects discovered in the necropolis are preserved in the Roman collections, especially in the Kircherian Museum (which possesses the Ficoroni casket) and the Barberini library.

See E. Fernfque, Preneste (Bibliotheque des Ecoles Frangaises, fasc. 17,

Paris, 1880); H. Dessau in Corp. inscr. lat. xiv. 288 sqq., Corp. inscr. etrusc. vol. ii.; O. Marucchi, Guida archeologica dell' antica Preneste (Rome, 1885), and in Bullettino comunale (1904), 233 sqq. ; R. S. Conway, Italic Dialects, i. 31 1 sqq. (Cambridge, 1897) I T. Ashby in Papers of the British School at Rome, i. 132 sqq.; R. Delbriick, Hellenistische Bauten in Latium, p. 47 sqq. (Berlin, 1907) ; Notizie degli Scavi, passim; and especially D. Vaglieri (1907), p. 132, &c. ; R. van Deman Magoffin, Topography and Municipal History of

Praeneste (Johns Hopkins University Studies, xxvi. 9, 10); (Balti- more. 1908). (J.G. Fr.; R. S. C; T. As.)

PRAENESTINA, VIA, an ancient road of Italy, leading from Rome E. by S. to Praeneste, a distance of 23 m., Gabii being situated almost exactly half-way. At the ninth mile the road crosses a ravine by the well-preserved and lofty Ponte di Nona, with seven arches, the finest ancient bridge in the neigh- bourhood of Rome. The line of the road is, considering the – difficulty of the country beyond Gabii, very straight. In the stretch beyond Gabii it is only used as a track, and well preserved. Half-way between Gabii and Praeneste is the well-preserved single-arched bridge, known as Ponte Amato.

See T. Ashby in Papers of the British School at Rome, i. 149 sqq.

(T. As.)

PRAETOR (Lat. prae-itor, " he who goes before," "a leader"), originally a military title, was in classical times the designation of the highest magistrates in the Latin towns. The Roman consuls were at first called praetors; in the early code of the Twelve Tables (450 B.C.) they appear to have had no other title. By the Licinian law of 367, which abolished the military tribunes with consular power and enacted that the supreme executive should henceforward be in the hands of the two consuls, a new magistrate was at the same time created who was to be a colleague of the consuls, though with lower rank and lesser powers. This new magistrate was entrusted with the exclusive jurisdiction in civil cases; in other respects his powers resembled those of the consuls. His distinctive title was the city praetor (praetor urbanus), and in aftertime, when the number of praetors was increased, the city praetor always ranked first. To this new magistrate the title of " praetor " was thenceforward properly restricted. 1 About 242 the increase of a foreign population in Rome necessitated the creation of a second praetor for the decision of suits between foreigners (peregrini) or between citizens and foreigners. This praetor was known at a later time as the " foreign praetor " (praetor peregrinus) . 2 About 227 two more praetors were added to administer the recently acquired provinces of Sicily

and Sardinia. The conquest of Spain occasioned the appointment of two more in 197, of whom one governed Hither and the other Further Spain. The number of praetors, thus augmented to six, remained stationary till Sulla's time (82). But in the interval their duties vastly multiplied. On the one hand, five new provinces were added to the Roman dominions — Macedonia and Achaia in 146, Africa in the same year, Asia in 134, Gallia Narbonensis in 118, Cilicia probably in 102. On the other hand, new and permanent jury courts (quaestiones perpetuae) were instituted at Rome, over which the praetors were called on to preside. To meet this increase of business the tenure of office of the praetors and also of the consuls was practically prolonged from one to two years, with the distinction that in their second year of office they bore the titles of propraetor and proconsul instead of praetor and consul. The prolongation of office, together with the participation of the proconsuls in duties which properly fell to the praetors, formed the basis of Sulla's arrangements. He increased the number of the praetors from six to eight, and ordained that henceforward all the eight should in their first year administer justice at Rome and in their second should as propraetors undertake the government of provinces. The courts over which the praetors presided, in addition to those of the city praetor and the foreign praetor, dealt with the following offences: oppression of the provincials by governors (repetundar urn) , bribery (ambitus), embezzlement (peculatus), treason (majestatis), murder (de sica- riis et veneficis), and probably forgery (falsi). A tenth province

1 Some writers, following Livy vi. 42, assert that at first the praetorship was open to patricians only, but Mommsen (Rom. Staatsrecht ii. 195 [204] shows that this is probably a mistake. The election of a plebeian to the office for the first time in 337 was certainly opposed by the consul who presided at the election, but there appears to have been no legal obstacle to it.

2 [His official title in republican times was Praetor qui inter pere- grinos jus dicit, under the empire Praetor qui inter cives peregrinos jus dicit, until the time of Vespasian, when the abbreviated title praetor peregrinus came into use.]

(Gallia cisalpina) was added to the previous nine, and thus the number of judicial and provincial departments corresponded to the annual number of praetors, propraetors and proconsuls. The proportion, however, was not long maintained: new pro- vides were added to the empire — Bithynia in 74, Cyrene about the same time, Crete in 67,. Syria in 64 — and one or

more new law courts were instituted. To keep pace with the increase of duties Julius Caesar increased the number of praetors successively to ten, fourteen and sixteen; after his time the number varied from eight to eighteen.

The praetors were elected, like the consuls, by the people assembled in the comitia centuriata and with the same formal- ities. 1 They regularly held office for a year; only in the transition period between the republic and the empire was their tenure of office sometimes limited to a few months. 2 The insignia of the praetor were those common to the higher Roman magistrates — the purple-edged robe {toga praetexta) and the ivory chair {sella curulis) ; in Rome he was attended by two lictors, in the provinces by six. The praetors elect cast lots to determine the department which each of them should ad- minister. A praetor was essentially a civil judge, and as such he was accustomed at or before his entry on office to publish an edict setting forth the rules of law and procedure by which he intended to be guided in his decisions. As these rules were often accepted by his successors, the praetor thus acquired an almost legislatorial power, and his edicts, thus continued, corrected and amplified from year to year, became, under the title of the " perpetual " edicts, one of the most important factors in mould- ing Roman law. Their tendency was to smooth away the occasional harshness and anomalies of the civil law by substitu- ting rules of equity for the letter of the law, and in this respect the Roman praetor has been compared to the English chancellor. His functions were considerably modified by the introduction of the standing jury courts {quaestiones perpetuae). Hitherto the praetor had conducted the preliminary inquiry as to whether an action would lie, and had appointed for the actual trial of the case a deputy, whom he instructed in the law applicable to the case and whose decisions he enforced. The proceedings before the praetor were technically known as jus in distinction from judicium, which was the actual trial before the deputy judge. But in the standing jury courts (of which the first — that for repetundae — was instituted in 149), or rather in the most im- portant of them, the praetors themselves presided and tried the cases. These new courts, though formally civil, were sub- stantially criminal courts; and thus a criminal jurisdiction was added to the original civil jurisdiction of the praetors. Under the empire various special functions were assigned to certain praetors, such as the two treasury praetors (praetores aerarii), 3 appointed by Augustus in 23; the spear praetor {praetor has- tarius), who presided over the court of the Hundred Men, which dealt especially with cases of inheritance; the two trust praetors (praetores jideicommissarii) , appointed by Claudius to look after cases of trust estates, but reduced by Titus to one; the ward praetor (praetor lutelaris), appointed by Marcus Aurelius to deal with the affairs of minors; and the liberation praetor {praetor de liberalibus causis), who tried cases

turning on the liberation of slaves. 4 There is no evidence that the praetors continued to preside over the standing courts after the beginning of the 3rd century A.D., and the foreign praetorship disappears about this time. 5 Even the jurisdiction of the city praetor seems not to have survived the reforms of Diocletian, though the office itself continued to exist. But of the praetorships with special juris- diction (especially the ward praetorship and the liberation

1 [Until the time of Tiberius, when their election was transferred to the Senate.]

2 [The age for the office was forty under the republic, thirty under the empire.]

3 [They took the place of the quaestors; this arrangement continued till the time of Claudius.]

4 [The fiscal praetor (praetor fiscalis) was appointed by Nerva to hear claims preferred against the imperial fiscus.]

5 Marquardt conjectures with much probability that when Caracalla extended the Roman franchise to the whole empire he at the same time abolished the foreign praetorship.

praetorship) some lasted into the 4th century and were copied in the constitution of Constantinople.

Besides their judicial functions, the praetors, as colleagues of the consuls, possessed, though in a less degree, all the con- sular powers, which they regularly exercised in the absence of the consuls; but in the presence of a consul they exercised them only at the special command either of the consul or, more usually, of the senate. Thus the praetor possessed military power {imperium) ; even the city praetor, though attached by his office to Rome, could not only levy troops but also in certain cir- cumstances take the command in person. As provincial gover- nors the praetors had frequent occasion to exercise their military powers, and they were often accorded a triumph. The city praetor presided over popular assemblies for the election of certain inferior magistrates, but all the praetors officiating in Rome had the right to summon assemblies for the purpose of legislation. In the absence of the consuls the city praetor, and in default of him the other praetors, were empowered to call meetings of the senate. Public religious duties, such as the fulfilment of state vows, the celebration of sacrifices and games, and the fixing of the dates of movable feasts, probably only fell to the praetors in the absence of the consuls. But since in the early times the consuls as a rule spent only the first months of their year of office in Rome,

it is probable that a consider- able share of religious business devolved on the city praetor; this was certainly the case with the Festival of the Cross-roads {compitalia), and he directed the games in honour of Apollo from their institution in 212. Augustus in 22 placed the direction of all the popular festivals in the hands of the praetors, and it is not without significance that the praetors continued thus to minister to the pleasures of the Roman mob for centuries after they had ceased almost entirely to transact the business of the state. (For the praetor as provincial governor see Province.) (J. G. Fr. ; X.)

A full account of the praetorship will be found in Mommsen, Romisches Staatsrecht (1887), vol. ii. and P. Willems, Le Droit public romain (1883); T. M. Taylor's Constitutional and Political History of Rome (1899) will also be found useful. There is a monograph by E. Labatut, Histoire de la preture (1868).

PRAETORIANS. In the early Roman republic, praetor {q.v.) meant commander of the army: in the later republic praetor and propraetor were the usual titles for provincial gover- nors with military powers. Accordingly, the general's quarters in a camp came to be called praetorium^ and one of the gates porta praetoria, and the general's bodyguard cohors praetoria, or, if large enough to include several cohorts, cohortes prae- toriae. Under the empire the nomenclature continued with some changes. In particular cohortes praetoriae now designated the imperial bodyguard. This, as founded by Augustus, con- sisted of nine cohorts, each 1000 strong, some part of which was always with the emperor, whether in Rome or elsewhere. In a.d. 23 his successor Tiberius concentrated this force on the eastern edge of Rome in fortified barracks: hence one cohort in turn, clad in civilian garb, was sent to the emperor's house on the Palatine, and large detachments could be despatched to foreign wars. The men were recruited voluntarily, in Italy or in Italianized districts, and enjoyed better pay and shorter service than the regular army : they were under praefecti praetorio (usually two; later, sometimes three, rarely only one), who during most of the empire might not be senators. This force was the only body of troops in Rome (save a few cohortes urbanae, a fire brigade, and some non-Roman personal guards of the emperor), or, indeed, anywhere near the capital. Accordingly it could make or unmake emperors in crises — at the accession of Claudius in a.d. 41, in 68-69, and again late in the second century. But its normal influence was less than is often asserted. Moreover, its prefects, since they were two and liable to be disunited, and since they could not be senators, neither combined with the

6 In permanent forts and fortresses, praetorium probably denoted strictly a residence : the official headquarters building (though commonly styled praetorium by moderns) was the principia. On the other hand praetorium

could denote any lord's residence, even on a civilian's estate.

senators to restore an oligarchy nor themselves aspired as pretenders to the throne. These prefects were at first, soldiers, but later mostly lawyers who relieved the emperors of various civil and criminal jurisdiction. In the second century the praetorian cohorts became ten in number, and at the end of it Septimius Severus reorganized them so that they consisted practically of barbarian soldiers and held constant conflict with the people of Rome. At the end of the third century the praefecti praetorio were reconstituted as four officers, each ruling one quarter of the now divided empire. In 312 the Praetorian Guard was suppressed by Constantine. Their barracks at Rome covering a rectangle of 39 acres (1210 by 1410 ft.), were included by Aurelian in the walls of Rome, and three sides of the enceinte can still be seen near the Porta Pia, with brickwork as old as Tiberius: the interior (now barracks for the Italian army) is archaeologically less interesting.

PRAETORIUS, MICHAEL (1571-1621), German musical historian, theorist and composer, was born at Kreuzberg, in Thuringia, on the 15th of February 1571. His father's name was Michael Schultheis. 1 While he was still quite young he visited the university of Frankfort on the Oder for three years. Here he studied philosophy, and on the death of his brother, on whose support he relied, he was given a post as organist in the town. He acted as kapellmeister at Liineburg early in life, was engaged first as organist and later as kapellmeister and secretary to the duke of Brunswick-Wolfenbiittel, and was eventually rewarded for his long services with the priory of Ringelheim, near Goslar. He died at Wolfenbiittel on the 15th of February 1621. Of his very numerous compositions copies are now very scarce. The most important are : Polyhymnia (15 vols.), Musae Sioniae (16 vols.), and Musa Aonia (9 vols.), all written partly to Latin and partly to German words. But more precious than all these is the Syntagma musicum (3 vols, and a cahier of plates, 4to, Wittenberg and Wolfenbiittel, 161 5-1620). In the original prospectus of the work four volumes were promised, but it is certain that no more than three were ever published. The fourth volume mentioned in Forkel's catalogue is clearly nothing but the cahier of plates attached to vol. ii.

The chief value of this very remarkable work lies in the information it gives concerning the condition of instrumental music in the early years of the 17th century. The plates include excellent representations of all the musical instruments in use at the time they were published, together with many

forms even then treated only as antique curiosities. The work thus throws a light upon the earlier forms of instrumental music which to the historian is invaluable. In fact, without the information bequeathed to us by Praetorius it would be impossible to reconstruct in theory the orchestra of the earlier half of the 1 7th century, during which the opera and the oratorio both sprang into existence, or even to understand the descrip- tions left us by other less careful writers.

PRAETUTTII (also called JlpaiTtrriol) , a tribe of ancient Italy inhabiting the south of Picenum. Their territory lay between the rivers Vomanum and Tessinnus (Pliny iii. § no), and therefore included Castrum Novum, Interamnia and the Truentus, as well as probably the original of Hadria. From – this name was derived the medieval form Aprutium (quoted by Kiepert in his Alte Geographie), and hence the modern Abruzzo (more commonly in the plural gli Abruzzi), denoting the whole central mountain land of Italy. We have no evidence, except their name, and that throws no light on their language, for separating them from the other inhabitants of Picenum (q.v.).

(R. S. C.) PRAGMATIC SANCTION (Lat. pragmatica sanctio, from the Gr. irpayna, business), originally a term of the later Roman law. It is found in the Theodosian and Justinian codes, together with such variants as a pragmaticum, pragmatica jussio, com- mand; annotatio, an imperial rescript; constitution a regulation;

1 German Schvltzar Schultze (Schultheiss), meaning the head-man of a township, latinized into praetor or praetorius. Many other members of the family of Praetorius were eminent as musicians.

and pragmaticum rescriptum. It was a decision of the state dealing with some interest greater than a question in dispute between private persons, and was given for some community (universitas hominum) and for a public cause. In more recent times it was adopted by those countries which followed the Roman law, and in particular by despotically governed countries where the rulers had a natural tendency to approve of the maxims and to adopt the language of the imperial Roman lawyers. A pragmatic sanction, as the term was used by them, was an expression of the will of the sovereign or " the prince," defining the limits of his own power, or regulating the succession. Justinian regulated the government of Italy after it had been reconquered from the Ostrogoths by pragmatic sanctions. In after ages the king of France, Charles VII., imposed limits on the claims of the popes to exercise jurisdiction in his dominions by the pragmatic sanction of Bourges in 1438. The emperor Charles VI. settled the law of succession for the dominions of the house of Habsburg by pragmatic sanction first published on the 19th of April 17 13, and thereby prepared

the way for the great war which ensued upon his death. Philip V., the first of the Bourbon kings of Spain, introduced the Salic law by a pragmatic sanction, and his descendant, Ferdinand VII., revoked it by another. The term was not used in England even for such things as the will by which Henry VIII. regulated the succession to the throne, which would have been a pragmatic sanction in a country of the Roman law. The term and the thing signified by it have become obsolete owing to the spread of constitutional government in modern Europe.

PRAGMATISM, in philosophy, etymologically a theory or method of dealing with real things (Gr. Trpayfiara: cf. irpayna-TiKos, versed in affairs). "Pragmatic, " as here employed is not used in the common colloquial sense of " pragmatical," i.e. " fussy and positive," nor in the historical sense, as in " Pragmatic Sanction," of " relating to affairs of state," but in the sense of practical or efficient. 2 Pragmatism, as a general philosophic doctrine or mental attitude, can only be understood as part of a reaction against the intellectualistic speculation which has characterized most of modern metaphysics. It arises from a general awakening to the fact that the growth of our psychological and biological knowledge must profoundly transform the traditional epistemology. It follows that " prag- matic " lines of thought may originate from a multiplicity of considerations and in a variety of contexts. These, however, may be conveniently classified under four main heads — psycho- logical, logical, ethical and religious — and the history of the subject shows that all these have contributed to the develop- ment of pragmatism.

1 . Psychologically, pragmatism starts from the efficacy and all-pervasiveness of mental activity, and points out that interest, attention, selection, purpose, bias, desire, emotion, satisfaction, &c, colour and control all our cognitive processes. It insists that all thought is personal and purposive and that " pure " thought is a figment. A judgment which is not prompted by motives and inspired by interest, which has not for its aim the satisfaction of a cognitive purpose, is psychologically impossible, and it is, therefore, mistaken to construct a logic which abstracts from all these facts. Nor is the presence of such non-intellectual factors in thinking necessarily deleterious: at any rate they are ineradicable. Truths are always on one side matters of belief, and beliefs are ultimately rules for action. The whole function- ing of our mental apparatus is directed upon yielding the right response to the stimulations of the environment, and is valuable if and in so far as it does this. The " psychologism " thus introduced into logic amounts to a systematic protest against the notion of a dehumanized thought and the study of logic in abstraction from actual psychic process.

2. In its logical aspect pragmatism originates in a criticism of fundamental conceptions like " truth," " error," " fact "

2 The New English Dictionary quotes for nine distinct senses of the word, of which the philosophic is the eighth. The seven earlier ones are all more or less obsolescent, and their very number shows that the meaning of the word was very vague.

and " reality, " the current accounts of which it finds untenable or unmeaning. " Truth," for example, cannot be defined as the agreement or correspondence of thought with " reality," for how can thought determine whether it correctly " copies " what transcends it? Nor can our truth be a copy of a trans- cendent and absolute truth (Dewey). If it be asked, therefore, what such phrases mean, it is found that their meaning is really defined by their use. The real difference between two concep- tions lies in their application, in the different consequences for the purposes of life which their acceptance carries. When no such " practical " difference can be found, conceptions are identical; when they will not " work," i.e. when they thwart the purpose which demanded them, they are false; when they are inapplicable they are unmeaning (A. Sidgwick). Hence the " principle of Peirce " may be formulated as being that " every truth has practical consequences, and these are the test of its truth." It is clear that this (1) implicitly considers truth as a value, and so connects it with the conception of good, and (2) openly raises the question — What is truth, and how is it to be distinguished from error? This accordingly becomes the central problem of pragmatism. This same issue also arises independently out of the breakdown or rationalistic theories of knowledge (F. H. Bradley, H. H. Joachim). Logical analysis, after assuming that truth is independent and not of our making, has to confess that all logical operations involve an apparently arbitrary interference with their data (Bradley). Again, it assumes an ideal of truth which turns out to be humanly unat- tainable and incompatible with the existence of error, and an ideal of science which no human science can be conceived as attaining. The obvious way of avoiding the scepticism into which rationalism is thus driven is to revise the assumptions about the nature and postulates of truth which lead to it.

*3. The ethical affinities of pragmatism spring from the perception that all knowing is referred to a purpose. This at once renders it " useful," i.e. a means to an end or " good." Completely " useless " knowledge becomes impossible, though the uses of knowledge may still vary greatly in character, in directness, and in the extent and force of their appeal to different minds. This relation to a " good " must not, however, be construed as a doctrine of ethics in the Harrower sense; nor is its "utilitarianism" to be confused with the hedonism *of the British*

associationists. ” Useful ” means ” good for an (any) end,” and the ” good ” which the ” true ” claims must be understood as cognitive. But cognitive ” good ” and moral ” good ” are brought into close connexion, as species of teleo- logical ” good ” and contributory to ” the Good.” Thus only the generic, not the specific, difference between them is abolished. The ” true ” becomes a sort of value, like the beautiful and the (moral) good. Moreover, since the ” real ” is the object of the ” true,” and can be distinguished from the ” unreal ” only by developing superior value in the process of cognition which arrives at it, the notions of ” reality ” and ” fact ” also turn out to be disguised forms of value. Thus the dualism between judgments of fact and judgments of value disappears: whatever ” facts ” we recognize are seen to be relative to the complex of human purposes to which they are revealed. It should further be noted that pragmatism conceives ” practice ” very widely: it includes everything related to the control of experi- ence. The dualism, therefore, between ” practice ” and ” theory ” also vanishes; a ” theory ” unrelated to practice (however indirectly) is simply an illusion. Lastly it may be pointed out that, as asserting the efficacy of thought and the reality of choice, pragmatism involves a real, though determinable, indetermination in the course of events.

4. Pragmatism has very distinctly a connexion with religion, because it explains, and to some extent justifies, the faith- attitude or will to believe, and those who study the psychology of religion cannot but be impressed with the pragmatic nature of this attitude. If the whole of a man’s personality goes to the making of the truth he accepts, it is clear that his beliefs are not matters of “pure reason,” and that his passional “and volitional nature must contribute to them and cannot validly

be excluded. His religion also is ultimately a vital attitude which rests on his interests and on his choices between alterna- tives which are real for him. It is not however asserted that his mere willing to believe is a proof of the truth of what he wishes to believe, any more than a will to disbelieve justifies disbelief. His will to believe merely recognizes that choice is necessary and implies risk, and puts him in a position to obtain verification (or disproof). The pragmatic claim for religion, therefore, is that to those who will take the first step and will to believe an encouraging amount of the appropriate verifications accrues. It is further pointed out that this procedure is quite consonant with the practice of science with regard to its axioms. Origin- ally these are always postulates which have to be assumed before they can be proved, and thus in a way ” make ” the evidence which confirms them. Scientific and religious verification therefore, though superficially distinct, are alike in kind.

The pragmatic doctrine of truth, which it is now possible to outline, results from a convergence of the above lines of argument. Because truth is a value

and vitally valuable, and all meaning depends on its context and its relation to us, there cannot be any abstract " absolute " truth disconnected from all human pur- poses. Because all truth is primarily a claim which may turn out to be false, it has to be tested. To test it is to try to dis- tinguish between truth and falsity, and to answer the question — What renders the claim of a judgment to be true, really true? Now such testing, though it varies greatly in different depart- ments of knowledge, is always effected by the consequences to which the claim leads when acted on. Only if they are " good " is the claim validated and the reasoning judged to be " right ": only if they are tested does the theory of truth become intelligible and that of error explicable. If, therefore, a logic fails to employ the pragmatic test, it is doomed to remain purely formal, and the possibility of applying its doctrines to actual knowing, and their real validity, remain in doubt. By applying the pragmatic test on the other hand, it is possible to describe how truths are developed and errors corrected, and how in general old truths are adjusted to new situations. This "making of truth" is conceived as making for greater satisfaction and greater control of experience. It renders the truth of any time relative to the knowledge of the time, and precludes the notion of any rigid, static or incorrigible truth. Thus truth is continually being made and re-made. If the new truth seems to be such that our cognitive purposes would have been better served by it than they were by the truth we had at the time, it is antedated and said to have been " true all along." If an old truth is improved upon, it is revalued as " false. " To this double process there is no actual end, but ideally an " absolute " truth (or system of truths) would be a truth which would be adequate to every purpose.

Extensions of pragmatism in a variety of directions readily suggest themselves, and indeed only the doctrine of truth in the above sketch can be treated as strictly indispensable. If however the logical method of pragmatism is critically applied to all the sciences, many doctrines will be cut out which have little or no " pragmatic value." This all-round application of the pragmatic method has received the name of " humanism." It expressly refers itself to the maxim of Protagoras that " man is the measure of all things," and is best conceived as a protest against the assumption that logic can treat thought in abstrac- tion from its psychological context and the personality of the knower, i.e. that knowledge can be dehumanized. To arbitrary and unverifiable metaphysical speculation, and to forms of " absolutism " which have lost touch with human interests, this humanism is particularly destructive. It emphasizes still more than pragmatism the personal aspect of all knowing and its contribution to the " making of reality " which neces- sarily accompanies the making of truth. B;jr4.t also g° es on to raise the question whether the making f reality for our knowledge does not, in view of the

essentially practical nature of knowledge, imply also a real making of reality by us, and so throw light upon the whole genesis of reality. In this direction pragmatism may ultimately lead to a number of metaphysics,

each of which will represent a personal guess at a final synthesis of experience, while remaining essentially undogmatic and improvable. The great variety and impermanence of meta- physical systems in the past thus find their explanation: they were all along what they are now recognized as being, viz. personal efflorescences provoked by a totality of experiences which differed in each case.

As regards the history and bibliography of pragmatism, the term was first invented by C. S. Peirce in discussions with William James at Harvard University, and its meaning was expounded by him in an article on " How to make our Ideas clear " in the Popular Science Monthly for January 1878. The pragmatic test of truth was referred to by James in his Will to Believe (1896, p. 124, in a paper first published in 188 1). The validity of the argument from consequences and the connexion of truth with what " works " was asserted a propos of A. J. Balfour's Foundations of Belief by A. Seth Pringle-Pattison in his Man's Place in Cosmos (1897, p. 307). But the word " pragmatism " itself first occurs in print in 1898, in James's pamphlet on Theoretical Conceptions and Practical Results, and again in his Varieties of Religious Experience (1902, p. 444). It was rapidly taken up, first by W. Caldwell in Mind (1900, new series, No. 36), and by F. C. S. Schiller in Personal Idealism (1902). James himself at first developed chiefly the psychological and ethical aspects of the doctrine in his epoch-making Principles of Psychology (1890) and his

Will to Believe. The application to logic, therefore, was mainly made by his followers, John Dewey and his pupils, in the Chicago Decennial Publications and especially in their Studies in Logical Theory (1903), where, however, the term used is " instrumentalism," and by F. C. S. Schiller, in " Axioms as Postulates " (in Personal Idealism, ed. H. Sturt, 1902), in Humanism (1903), in which that term was proposed for the extensions of pragmatism, in Studies in Humanism (1907), and in Plato or Protagoras (1908). All these logical and philosophic developments were popularly expounded by James in his Pragmatism (1907), followed by A Pluralistic Universe (1908) and The Meaning of Truth (1909). H. H. Bawden's The Principles of Pragmatism (1910) is a popular sketch. Alfred Sidgwick's logical writings, especially his Distinction (1892) and The Use of Words in Argument (1901), represent an independent development. For the religious applications see G. Tyrrell (Lex orandi, 1903, Lex credendi, 1906). Among critical writers on the pragmatic side may be mentioned H. Sturt (Idola theatri, 1906), and H. V. Knox [Mind, new series, No. 54). There is already a large controversial literature in the philosophic journals, and two critical works appeared in 1909: J. B. Pratt, What is Pragmatism? (1909), and A. Schinz, Anti-Pragmatism(igog). Outside the English-writing world, identical or kindred tendencies are represented in France by Leroy, Poincare, Bergson, Milhaud, Blondel, Duhem, Wilbois, Pradines; in Germany by Mach, Ostwald,

Simmel, Jerusalem, Goldscheid, Jacoby; in Italy by Papini, Prezzolini, Vailati, Troiano. In addition there are numbers of partial pragmatists, e.g. G. Santayana (The Life of Reason, 1905). Various anticipations of pragmatism in the history of philosophy are noted in Schiller's Plato or Protagoras ? (1908). (F. C. S. S.)

PRAGUE (Ger. Prag; Bohemian Praha), the ancient capital of the Bohemian kingdom, residence of an archbishop and an Imperial governor, and the meeting-place of the Bohemian Diet. The population of the town, including the suburbs that have not yet been incorporated with it, was 460,849 in 1906. Somewhat under a fifth of the population are. Germans, the rest belong to the Bohemian (Czech) nationality. Prague is situated on both banks of the river Vltava (Ger. Moldau) in S°°S' N., i4°25′ E., 150 m. N.W. of Vienna and 75 S.S.E. of Dresden. The city is divided into eight districts, which are numbered thus: I. Stare mesto (the old town), II. Nove mesto (the new town); III. Mala strana (the small side "quarter"); IV. Hradcany; V. Josefske mesto (Joseph's, formerly the Jewish, town); VI. Vysehrad; VII. Holesovic-Bubna; VIII. the suburbs Karlin (Ger. Karolinenthal), Vinohrady and Smichov are not yet incorporated with the city. Prague was by its geographical situation naturally destined to become the capital of Bohemia, as it lies in the centre of the country. The origin of Prague goes back to a very early date, though, as is the case with most very ancient cities, the tales connected with its origin are no doubt legendary. The earliest inhabited spot within the pre- cincts of the present city was the hill named Vysehrad (higher castle, acropolis) on the right bank of the Vltava. Here the semi-mythical prince Krok, his daughter Libusa, and her husband the peasant Premysl are stated to have resided. To Libusa is attributed also the foundation of a settlement on the opposite bank of the Vltava on the Hradcany hill. The ancient

Bohemian chronicler Cosmas of Prague gives a very picturesque account of this semi-mythical occurrence.

It is probable that at an early period buildings sprang up in those parts of the present Stare mesto and Mala strana that are situated nearest to the banks of the river. These banks were from a very remote period connected by a bridge. This bridge was probably situated very near the spot where Charles IV. afterwards built the famed " bridge of Prague." It is probable that independently of the Hradcany and Vysehrad settlements a certain number of buildings existed as early as 993 on the site of the present Pofic Street (near the station of the state railway). The city continued to

increase, and during the reign of King Vratislav (1 061-109 2) many Germans were attracted to Prague. In 1235 King Wenceslaus I. surrounded the old town — that is to say, the buildings on the right bank of the Vltava — with a wall and ditch. These fortifications, starting from the river, followed the line of the present Elisabeth Street, the Pfikopy or Graben — which therefrom derives its name, signifying ditch or trench — and then that of the Ovocna and Ferdinandova Streets. The Jewish quarter was included in the fortifications, but it was divided by gates and a wall from the old town. King Ottakar II. also contributed greatly to the enlargement of Prague. The still extant fortified towers of the Hradcany belong to his reign. The sovereign, however, to whom Prague is most indebted is the emperor Charles IV. (Charles I., as king of Bohemia). He has rightly been called the second founder of Prague. He founded the university, one of the oldest on the Continent. It immediately became famous all over Europe and students flocked to it from all countries. The town soon became too small, and it is probably in consequence of this that Charles determined to found the " new town." This, which includes the greater part of the modern city, was surrounded by walls, which starting from the foot of the Vysehrad included the small already-existing settlement of Pofic and then adjoined the borders of the old town from the beginning of the present Pfikopy Street up to the river. During the Hussite wars Prague suffered greatly. Two of the greatest battles of the Hussite wars, that of the 2izkov and that of the Vysehrad (both 1420), were fought on the outskirts of Prague, and after the last-named battle the ancient Vysehrad castle was entirely destroyed. The Bohemian nobles in alliance with the citizens of the old town attacked and conquered the new town, which for a time lost its privileges and became subject to the old town. Prague gradually recovered during the reign of King George of Podebrad., and became yet more prosperous during that of King Vladislav. During the reign of Ferdinand I. of Habsburg (1 526-1 564) Prague played a considerable part in the opposition to that prince caused in Bohemia by his endeavour to reduce both the political and religious liberty of the country. When the antagonism between the Romanist dynasty and the Bohemian Protestants culminated in the troubles of 1546 and 1547 and the Bohemians, after a weak and unsuccessful attempt to assert their liberties, were obliged to submit unconditionally to the house of Habsburg, Prague was deprived of many of its liberties and privileges. The burgomaster of the old town was one of those who were decapitated in the Hradcany Square (Aug. 20, 1547). Ferdinand had summoned a meeting of the estates on that day at the adjoining Hradcany palace, and it became known as the " bloody diet " (Krvavy snlm).

The importance of the city of Prague greatly increased during the reign of Rudolph II. That sovereign chose Prague as his permanent residence and it thus became — as Rudolph, besides being king of Bohemia, was also

German emperor, king of Hungary and ruler of the hereditary Habsburg lands — the centre of his vast domains. It was in Prague that the Thirty Years' War broke out. On the 23rd of May 1618 the Protes- tant nobles of Bohemia threw from the windows of the council chamber of the Hradcany palace two of the Imperial councillors who were accused of having influenced in a manner unfavourable to the Bohemians the emperor Matthias, who was also king of Bohemia. War broke out and continued when in 1619 Matthias was succeeded by Ferdinand. In the same year the Bohemians

elected as their king Frederick of the Palatinate, and both he and his wife Elizabeth of England were crowned in St Vitus's Cathedral. On the 8th of November 1620 the Bohemian forces were decisively defeated by the Imperialists on the White Mountain at the outskirts of Prague. The town submitted on the following day and the whole country was quickly subdued by the Imperialist armies. On the 21st of June 1621 the principal leaders of the rising against the house of Habsburg were beheaded in the market of the old town near the town hall. In 163 1 Prague was occupied for a short time by the Saxon allies of Gustavus Adolphus, king of Sweden, but the Imperial army led by Wallenstein soon obliged them to retire. In 1648 a Swedish army stormed the Mala, strana and Hradcany. The citizens, now entirely Romanists, bravely defended the bridge, and the Swedes were unable to obtain possession of the part of Prague situated on the right bank of the Vltava. In November the news of the conclusion of the peace of Westphalia reached Prague and put a stop to hostilities.

Henceforth the history of Prague continues uneventful for a considerable period. During the Austrian War of Succession it again became the scene of important events. On the 26th of November 1741 Prague was stormed by an army consisting of Bavarians, French and Saxons which upheld the cause of Charles, elector of Bavaria, who claimed the succession to the Bohemian throne and to the other domains of the house of Habsburg. A large part of the Bohemian nobility did homage to Charles, and he was crowned king of Bohemia in St Vitus's Cathedral on the 17th of December 1741- The rule of the Bavarian prince lasted, however, but a very short time. On the 27th of June 1742 the armies of the empress Maria Theresa began to besiege the French army of Marshal Belle-Isle in Prague, and the French commander was obliged to evacuate the city in December 1742. In the spring of the following year Maria Theresa arrived at Prague and was crowned there, but in 1744 the city was again the scene of warfare. In that year Frederick the Great of Prussia invaded Bohemia and obtained

possession of Prague after a severe and prolonged bombardment, in the course of which a large part of the town was destroyed. The Prussian occupation was, however, of short duration. At the beginning of the Seven Years' War Prague was — in 1757 — again besieged by Frederick the Great after he had defeated the Austrians in a battle between the Zizkov and Pocernic (com- monly called the battle of Prague, see Seven Years' War). In June of the same year the Austrian victory at Kolin obliged the Prussians to raise the siege. Prague, which had suffered even more during the second bombardment, now enjoyed a long period of quiet.

In the beginning of the 19th century Prague, which had become almost a German city, became the centre of a movement that endeavoured to revive the almost extinct Bohemian nation- ality. This movement was greatly aided by the foundation of the " Society of the Bohemian Museum " in 1822. Several patriotic Bohemian noblemen founded this association. The collections belonging to it and its library were at first housed in the Mala strana, then in a somewhat larger building in the Pfikopy. They are now in a large handsome building at the top of the Vaclavske Namesti. In connexion with the Bohemian museum a society named Malice (treasury) was founded, which published editions of the ancient Bohemian works, as well as writings of modern Bohemian authors.

This movement was at first purely literary, and only in 1848 assumed a political character. It was determined to hold at Prague a " Slavic congress " at which all Slavic countries were to be represented. During the sittings of the congress troubles broke out which originated in an insignificant conflict between students and soldiers of the garrison. Barricades were erected and the town finally surrendered unconditionally after a severe bombardment (June 1848). In 1866 the Prussians, who had invaded Bohemia, occupied Prague (July 8) without encounter- ing any resistance. At the " Blue Star " hotel in Prague also was signed the treaty which ended the war between Austria and Prussia (Aug. 23).

In the years of peace that followed, the development of Prague was constant and vast. The removal of the fortifications greatly assisted this development. The communities of Vyseh- rad (1883), Holesovic-Bubna (1884) and Liben (1001) were consecutively included in the city. Occasional riots, such as in 1897, when the Bohemians were exasperated by the action of the Vienna government which restricted the use of the national language in the law courts; and in 1905, when the people demanded an extension of the suffrage, have not interfered with the increasing prosperity of the city, and their importance has been greatly exaggerated.

Though numerous ancient monuments at Prague have been destroyed in

consequence of intestine strife and foreign warfare, the city still contains many of great value and may be considered one of the most interesting cities of central Europe. The natural situation of the town has also at all periods been greatly admired. The centre of the old town and indeed of the entire community of Prague is the town hall (staromestska radnice), which is surrounded by the market-place, the scene of the execution of the Bohemian patriots in 1621. The builchngs of the town hall date from various periods. Its oldest parts are the tower and the chapel of St Lawrence, built in 1 38 1. The adjoining ancient council chamber dates from the reign of King Vladislav (1471-1516). The modern hall that is now used for the meetings of the town council is decorated by two paintings of the Bohemian artist Wenceslaus Brozik, which represent Hus before the council of Constance, and the election of George of Podebrad as king of Bohemia. In the market-place opposite the town hall is situated the ancient Tyn church, memorable as having been the religious centre of the Hussite movement. A chapel connected with the so-called Tyn or market-place of the German traders stood here from the earliest times, but the present building was begun in the 14th century, and completed in the 15th during the reign of George of Podebrad. The fine facade built by that king was formerly adorned with a statue of King George, who was represented as holding a sword pointing upward to a representa- tion of the chalice, the emblem of the Hussite Church. Both statue and chalice were removed by the Jesuits in 1623. In the interior of the church the tomb of the astronomer Tycho Brahe is notable, as is the very ancient pulpit from which the Hussite archbishop John of Rokycan preached. In earlier days the Church reformers Milic and Hus also preached here. Close to the town hall is the Joseph-Stadt, the ancient ghetto of Prague. The synagogue is one of the oldest in Europe, and the adjoining cemetery — part of which has unfortunately been destroyed in the course of the modern sanitary improvement of this part of Prague — has great historical interest. The university founded by Charles IV. in 1348 played a great part in the history of Bohemia during the Hussite wars. The lecture-rooms and other institutions connected with the two univer- sities — in 1881 and 1882 a Bohemian university was founded though the German one continued to exist — are now housed in two vast buildings known as the Carolinum and the Clementinum. The Carolinum, first built about the year 1383 but frequently altered, has a closer connexion with Hus and the Hussite movement than any other building at Prague. It was the scene of many religious discussions, and it was here also that the Bohemian nobles met before the uprising of 1618. The large part of the lecture-rooms, the observatory and the very valuable library are in the Clementinum. This building was formerly a college of the Jesuits, who established themselves in Prague in 1 556 and erected these extensive buildings at various periods between 1578 and 1715. The Celetna ulice, which leads from the town hall

to the limits of the old town contains at its extremity the so-called powder tower {prasna brand). It occupies the spot where one of the old town gates was situated, and was built by King Vladislav in that elaborate style of architecture which is known as the style of Vladislav. The building was very skilfully restored in 1 880-1 883. The powder tower stands at the corner of the Pfikopy (in Ger. Graben) which with its continuations, the Ovocna. ulice and the Ferdinandova ulice, is the most animated part of modern Prague. At the extreme end of the Ferdinandova ulice is the modern Bohemian national theatre.

The " new town " of Prague, though not equal in interest to the " old town," is also well worth notice. At the extremity of the place of Wenceslaus (Vaclavske Namesti) is situated the handsome building that contains the collections and library of the Bohemian museum. The museum was opened by the Archduke Charles Louis of Austria on the 18th of May 1891. Of the many interesting churches in the " new town " the Karlov deserves special mention. It was built by Charles IV. in 1350 in the Gothic style, but was restored in the 18th century. The monastery that formerly ad- joined this church has been suppressed and its buildings are now used as a hospital. Near the Karlov church is the Karlovo Namesti (place of Charles), in which is situated the former town hall of the " new town," from the windows of which the councillors were thrown at the beginning of the Hussite wars. The Vysehrad, now a part of Prague, adjoins the " new town." It has preserved but slight traces of its ancient splendour. It contains, however, the

Romanesque chapel of S Martin, the Church of SS Peter and Paul, and .the adjoining cemetery where many of the leaders of the Bohemian national movement are buried.

The districts of Prague situated on the left bank of the Vltava are connected with the other parts of the city by bridges, of which the oldest is the Karlovo most (bridge of Charles). The present structure was begun by Charles IV. in 1357, but in consequence of frequent storms and inundations it was only completed in 1503. The statues on the bridge are of an even later date. Not far from the bridge in the centre of the Mala strana is the monument to Radetzlcy, erected in 1858 out of captured Piedmontese cannon. Near here are the palaces of the governor of Bohemia and that in which the Bohemian diet (snem) now meets. At the extreme end of the Mala strana is the extensive Strahov monastery, from the terraces of which the finest view of the city of Prague can be obtained. The

monastery possesses one of the most valuable libraries in Prague and a small picture gallery. The church of the monastery contains the tomb of the famous General Pappenheim. In the Mala strana and the adjoining Hradcany are situated the winter residences of the wealthy Bohemian nobility. Of the many palaces, the Waldstein, Schwarzenberg — formerly Rosenberg — palaces, the two palaces of the counts Thun and that of Prince Lobkowitz are the most interesting, On the summit of the Hradcany is the vast palace of the ancient kings of Bohemia, which also contains the hall where the estates of Bohemia formerly met. During the Hussite wars most of the buildings on the Hradcany hill were destroyed, and a large part of the castle still known as the halls of Vladislav was rebuilt by the kings of that name. The handsome halls known as the Spanish and German halls were erected by Ferdinand I., and additions were made by other sovereigns also. The Hradcany was for a time the residence of Rudolph, crown prince of Austria, and it is also occupied by the emperor of Austria during his visits to Prague. Adjoining the Hradcany palace is the famed Cathedral of St Vitus, where the kings of Bohemia were crowned. The earliest church on this spot was built by St Wen- ceslaus, and the present building was begun by Charles IV. and has as yet remained unfinished. The cathedral contains the chapel of St Wenceslaus, where the insignia of the Bohemian kings are preserved, the tomb of St John of Nepomuk, and a monument to the Bohemian sovereigns who are buried here, the work of Colin of Malines. On the slope of the Hradcany hill are the ancient towers named Mikulka, Daliborka, the white tower and the black tower, which formed part of the fortified works erected by Ottakar II. (1253-1278).

The suburbs of Prague contain few objects of interest, but they are centres of the rapidly increasing trade and industry of Prague.

See Count Liitzow, Prague, in " Mediaeval Towns" Series (London, 1902) ; Tomek, Dejepis Mesta Prahy (History of the town of Prague), the standard work on Prague, which the author only continued up to the year 1608. (L.)

PRAGUERIE, THE, a revolt of the French nobility against King Charles VII. in 1440. It was so named because a similar rising had recently taken place in Prague, Bohemia, at that time closely associated with France through the house of Luxemburg, kings of Bohemia, and it was caused by the re- forms of Charles VII. at the close of the Hundred Years' War, by which he sought to lessen the anarchy in France. The attempt to reduce the brigand-soldiery, and especially the ordinances passed by the estates of Languedoil at Orleans in 1439, which not only gave the king an aid of 100,000 francs (an act which was later used by the king as though it were a perpetual grant and so freed him from that parliamentary control of the purse so important in England), but demanded as well royal nomina- tions to officerships in the army, marked a gain in the royal prerogative which the

nobility resolved to challenge. The main instigator was Charles I., duke of Bourbon, who three years before had attempted a similar rising, and had been forced to ask pardon of the king. He and his bastard brother, Alexander, were joined by the former favourite, Georges de la Tremoille, John V., duke of Brittany, who allied himself with the English, the duke of Alencon, the count of Vend&me, and captains of mercenaries like Antoine de Chabannes, or Jean de la Roche. The duke of Bourbon gained over to their side the dauphin Louis — afterwards Louis XL — then sixteen years old, and proposed to set aside the king in his favour, making him regent. Louis was readily induced to rebel; but the country was saved from a serious civil war by the energy of the king's officers and the solid loyalty of his " good cities." The constable de Richemont marched with the king's troops into Poitou, his old battleground with Georges de la Tremoille, and in two months he had subdued the country. The royal artillery battered down

the feudal strongholds. The dauphin and the duke of Alencon failed to bring about any sympathetic rising in Auvergne, and the Praguerie was over, except for some final pillaging and plundering in Saintonge and Poitou, which the royal army failed to prevent. Charles VII. then attempted to ensure the loyalty of the duke of Bourbon by the gift of a large pension, forgave all the rebellious gentry, and installed his son in Dau- phine (see Louis XL). The ordinance of Orleans was enforced. PRAHRAN, a city of Bourke county, Victoria, Australia, 3ˆ m. by rail S.E. of Melbourne and suburban to it. Pop. (1901), 41,161. It is connected with Melbourne by cable tram over a fine iron girder bridge across the Yarra. Many of its streets are planted with trees and it has numerous handsome shops and villas. Prahran was proclaimed a city in 1879.

PRAIRIE (adopted from the Fr. prairie, a meadow-tract. Late Lat. pratdria, Lat. pratum, meadow), a level tract of grassy and treeless country, generally restricted to tracts so character- ized in the central parts of North America. In the United States the prairies may be taken to extend from southern Michigan and western Ohio over Illinois (especially designated the Prairie State), Indiana, Missouri, Iowa, Wisconsin and Minnesota, and west of the Missouri to the foothills of the Rocky Mountains (see articles on the several states, and United States). In Canada they extend from the same mountains to a line somewhat to the east of Winnipeg. The word prairie is used in a large number of compounds referring to natural and other features, flora, fauna, &c, characteristic of the prairies. Examples are: prairie-chicken or prairie-hen, a name for the pinnated grouse (Cupidonia or Tympanucus cupido), also applied to Pedioecetes phasinellus, the sharp-tailed grouse; prairie-dog, a rodent of the squirrel family, genus Cynomys, a gregarious burrowing animal, and other animals noticed below; prairie-schooner, a name for the covered wagons in which

emigrants used to cross the plains; prairie-grass, &c. PRAIRIE DU CHIEN, a city and the county-seat of Crawford county, Wisconsin, U.S.A., on the east bank of the Mississippi river about 3 m. above the mouth of the Wisconsin, about 98 m. W. of Madison. Pop. (1890) 3131; (1900) 3232; (1905)3179; (1910) 3149. It is served by the Chicago, Milwaukee & St Paul, and the Chicago, Burlington & Quincy railways. The city has a fine location, its natural attractiveness and mineral springs in the vicinity combining to make it a summer and health resort. It has an excellent artesian water-supply. Among its buildings are the Crawford county court-house, the city hospital and a sanatorium. It is the seat of St Mary's Academy (1872; R.C.) for young women, and the College of the Sacred Heart (1880; R.C.) for men. Among the manufactures are beer, Wagons, wool, and pearl buttons, and the city is a centre of the fresh-water pearl fisheries along the Mississippi. Prairie du Chien is one of the most interesting places, historically, in Wisconsin. The first white man known to have visited the site was Father Hennepin in 1680; later in the same year the trader Du Lhut (or Duluth) was here. In 1685 Nicholas Perrot, the French commandant in the West, built Fort St Nicholas near the site of the present city. After the close of the French and Indian War, British authorities assumed possession, but no garrison was regularly maintained. In 1779-1780 Prairie du Chien was the scene of plots and counterplots of American and British sympathizers and of the activities of Godefrey Linctot, the agent of George Rogers Clark. About 1780-1781 apermanent settlement began to grow up around the post. Prairie du Chien was formally surrendered in 1796 to the United States authorities under the Jay treaty, and by them Fort Shelby was erected. On the 17th of July 1814 a force of British, Canadians and Indians under Major William McKay captured the fort, and renamed it Fort McKay, but abandoned it in May 181 5. In 1 816 Fort Crawford was erected — it was rebuilt on a different site in 1829 — and in 1820 one of the principal depots of the American Fur Company was established here. Here in 1823 Judge James Duane Doty (1 799-1865) opened the first United States court in what is now the state of Wisconsin. At the time of the Red Bird rising in 1827, Governor Lewis Cass of Michigan

Territory made Prairie du Chien his temporary headquarters. During the Black Hawk War (1832) Zachary Taylor, then a lieutenant-colonel, was in command of Fort Crawford, and to him Black Hawk was entrusted after his capture. The Chicago, Milwaukee & St Paul railroad was completed to Prairie du Chien in 1857. The city was chartered in 1872.

PRAIRIE-MARMOT, a zoological emendation for the Ameri- can name " prairie-dog," applied to a small North American rodent allied to the squirrels and marmots, and technically known as Cynomys ludovicianus (see Marmot). In a great degree prairie-marmots, of which there are several species in North America, ranging as far south as Mexico, are intermediate between marmots and sousliks (see Souslik), having the cheek- pouches much smaller than in the latter, and the first front-toe, which is rudimentary in marmots and sousliks, well developed. The cheek-teeth are more complex than those of marmots, and the two series converge behind. In their slender build and small size, prairie-marmots are much more like sousliks than marmots. In habits these rodents are very like marmots, the typical species inhabiting the open prairies, while the others are found in mountains. The prairie species (C. ludovicianus) makes a raised, funnel-shaped entrance to its burrow. All feed on the roots of grass; and when disturbed, like marmots, utter a whistling cry. Rattlesnakes, owls and weasels are commonly found in the burrows; but their presence is no indica- tion of the existence of a kind of " happy family " arrangement, the snakes, at any rate, preying on the young marmots. The hibernation of these rodents is only partial, and confined to seasons of intense cold. (See Rodentia.)

PRAKRIT (pjakrta, natural), a term applied to the ver- nacular languages of India as opposed to the literary Sanskrit (samskrta, purified). The place which the Prakrits occupy in regard to the Indo-European languages (q.v.), ancient and modern, is treated under that head. There were two main groups of ancient Indo-Aryan dialects, or Primary Prakrits, viz. the language of the Midland or Aryavarta, and that of what is called the Outer Band. The language of the Midland became the language of literature, and was crystallized in the shape of literary Sanskrit about 300 B.C. Beside it all the Primary Prakrits continued to develop under the usual laws of phonetics, and, as vernaculars, reached a secondary stage marked by a tendency to simplify harsh combinations of consonants and the broader diphthongs, the synthetic processes of declension and conjugation remaining as a whole unaltered. The process of development closely resembles that of old Italian from the Italic dialects of Latin times. It should be noted that although the literary dialect of the Midland became fixed, the vernacular of the same tract continued to develop along with the other Primary Prakrits, but owing to the existence of a literary standard by its side its development was to a certain extent retarded, so that it was left somewhat behind by its fellows in the race.

The Secondary Prakrits, in their turn, received literary culture. In their earliest stage one of them became the sacred language of Buddhism, and under the name of Pali {q.v.) has been widely studied. In a still later stage several Secondary Prakrits became generally employed for a new literature,

both sacred and profane. Not only were three of them used for the propagation of the Jaina religion (see Jains), but they were also dealt with as vehicles for independent secular works, besides being largely employed in the Indian drama. In the last-named Brahmans, heroes and people of high rank spoke in Sanskrit, while the other characters expressed themselves in some Secondary Prakrit according to nationality or profession. This later stage of the Secondary Prakrits is known as the Prakrit par excellence, and forms the main subject of the present article. A still further stage of development will also be dis- cussed, that of the Apabhramsa, or " corrupt language." The Prakrit par excellence, which will throughout the rest of this article be called simply " Prakrit," underwent the common fate of all Indian literary languages. In its turn it was fixed by grammarians, and as a literary language ceased to grow, while

as a vernacular it went on in its own course. From the point of view of grammarians this further development was looked upon as corruption, and its result hence received the name of Apabhramsa. Again in their turn the ApabhramSas received literary cultivation and a stereotyped form, while as vernaculars they went on into the stage of the Tertiary Prakrits and become the modern Indo-Aryan languages.

In the Prakrit stage of the Secondary Prakrits we see the same grouping as before — a Midland language, and the dialects of the Outer Band. The Prakrit of the Midland was known as Sauraseni, from Surasena, the name of the country round Mathura (Muttra). It was the language of the territories having the Gangetic Doab for their centre. To the west it probably extended as far as the modern Lahore and to the east as far as the confluence of the Jumna and the Ganges. Conquests carried the language much further afield, so that it occupied not only Rajputana, but also Gujarat. As stated above, the development of Sauraseni was retarded by the influence of its great neighbour Sanskrit. Moreover, both being sprung from the same original — the Primary Prakrit of the Midland — its vocabulary, making allowances for phonetic changes, is the same as in that language.

The Prakrits of the Outer Band, all more closely connected with each other than any one of them was to Sauraseni, were Magadhi, Ardhamagadhi, Maharastrl, and an unknown Prakrit of the North-west. Magadhi was spoken in the eastern half of the Gangetic plain. Its proper home was Magadha, the modern South Bihar, but it extended far beyond these limits at very early times. Judging from the modern vernaculars, its western limit must have been about the longitude of the city of Benares. Between it and Sauraseni (i.e. in the modern Oudh and the country to its south) lay Ardhamagadhi or " half- Magadhl." Maharastrl was the language of

Maharastra, the great kingdom extending southwards from the river Nerbudda to the Kistna and sometimes including the southern part of the modern Bombay Presidency and Hyderabad. Its language therefore lay south of Sauraseni. West of Sauraseni, in the Western Punjab, there must have been another Prakrit of which we have no record, although we know a little about its later ApabhramSa form. Here there were also speakers of PaisacI (see Indo-Aryan Languages), and the local Prakrit, if we are to judge from the modern Tertiary vernacular, was a mixed form of speech. We have a detailed description of only one ApabhrathSa — the Nagara — the Apabhramsa of the Sauraseni spoken in the neighbourhood of Gujarat, and therefore somewhat mixed with Maharastrl. We may, however, conclude that there was an Apabhramsa corresponding to each Prakrit, so that we have, in addition to Saurasena, a Magadha, an Ardhamagadha and a Maharastra Apabhramsa. Native writers describe more than one local ApabhramSa, of which we may mention Vracada, the ancient dialect of Sind. There were numerous Prakrit subdialects to which it is not necessary to refer.

Of all these Prakrits, Maharastrl is that which is best known to us. It early obtained literary pre-eminence, and not only was the subject of long treatises by native grammarians, but became the language of lyric poetry and of the formal epic (kdvya). Dramatic works have been written in it, and it was also the vehicle of many later scriptures of the Jaina religion. We also know a good deal about Ardhamagadhi, in which the older Jaina writings were composed. With Magadhi we have, unfortunately, only a partial acquaintance, derived from brief accounts by native grammarians and from short sentences scattered through the plays. We know something more about Sauraseni, for it is the usual prose dialect of the plays, and is also employed for the sacred writings of one of the Jaina sects. The materials extant for the study of the Prakrit are either native grammars or else literary works written in accord with the rules laid down therein. Originally real ver- LaBgu age. naculars with tendencies towards certain phonetic changes, the dialects were taken in hand by grammatical systematizers, who pruned down what they thought was over- luxuriant growth, trained errant shoots in the way they thought

they ought to have gone, and too often generalized tendencies into universal rules. Subsequent writers followed these rules and not the living speech, even though they were writing in what was meant to be a vernacular. Moreover, at an early date, the Prakrits, qua literary languages, began to lose their characteristics as local forms of speech. A

writer composed in Maharastri, not because it was his native language, but because it was the particular Prakrit employed for lyrics and in ■ formal epics. In the same way, in dramatic literature, Sauraseni and Magadhl were put into the mouths of characters in particular walks in life, whatever the nationality of the dramatist might have been. There was thus a tendency for these literary Prakrits to adopt forms from the vernacular dialects of those who wrote them, and, en revanche, for the very popular lyric poetry of Maharastri to influence the local dialects of the most distant parts of India. On the other hand, although to a certain extent artificial, the literary Prakrits are all based on local vernaculars, a fact entirely borne out by a comparison with the modern Indian languages, which closely agree with them in their mutual points of difference. We now proceed to consider the general points in which the Prakrits differ from Sanskrit and from each other. The reader is throughout assumed to be familiar with the general outline of the article Sanskrit.

[Contractions: Skr. = Sanskrit. Pr. = Prakrit. S. = Sauraseni. Mg. = Magadhl. AMg. = Ardhamagadhi. M. = Maharastri. Ap. = Nagara Apabhrarhsa.]

Vocabulary. — The vocabulary of S. is to all intents and purposes the same as that of Skr. In the languages of the Outer Band there are numerous provincial words (desi or desya), the originals of which belonged to Primary Prakrits other than those of the Midland. In the Outer Band there is also a rich variety of grammatical forms, many of which are found in the Veda and not in classical Sanskrit, and some {e.g. Pr. -hi, Pali -dhi, Greek -6i) which cannot be traced to any known Primary Prakrit form, but which must have existed in that stage and beyond it, back into Indo-European times.

Phonetics. — The Skr. diphthongs e and o are treated in Pr. as pure vowelsj and may each be either long or short. At and au become either I and 5 or a'i and ail respectively. The vowel f becomes a, i, or, under the influence of a neighbouring labial, u. Before two con- sonants an original long vowel becomes short, and i and u are (according to the grammarians) changed to e and o respectively. The last rule is an instance of grammarians' over-generalization, and is not universally true. Examples, Skr. marga-, Pr. magga-; Skr. sindura-, Pr. sendura-; Skr. pustaka-, Pr. potthaa-. Conversely, a short vowel before two consonants is lengthened on one of them being elided. Thus, Skr. isvara-, Pr. issara- or isara-; Skr. jihva, Pr. jihd. In Ap. the quantity of vowels is very loosely observed.

In all dialects n becomes 11 unless it is followed by a dental mute, but in Jaina works nn and initial n remain unchanged. Judging from modern vernaculars, the latter seems to have been the real state of affairs. In Mg. j

becomes y and r becomes I. Here also 5 and s become s, a peculiarity still preserved by the modern Bengali. Elsewhere s and s usually become s, but the change of a sibilant to h is not uncommon in the Outer Prakrits (even in Mg.), though rare in the more archaic S.

Initial y becomes j except in Mg., in which, on the contrary, j becomes y. Subject to the foregoing general rules, all other initial consonants usually remain unchanged. As regards medial single consonants: —

I. K, g, c, j, t, d and y are usually elided. As a hiatus is caused by the elision, a faintly sounded y (or in some cases v) is substituted for the elided consonant, though only written in Jaina MSS. Ex- amples: Skr. loka-, . Pr. lo{y)a-; Pr. maa — Skr. mata-, mada-, maya-, mrga or mrta-. The latter example illustrates the extraordinary confusion which results from the strict application of this rule of elision of medial consonants. Such a Prakrit would have failed in the main object of a language — the connotation of distinct ideas by distinct sounds. To the present writer it seems impossible that such a language could ever have existed, and he is persuaded that the rule just given is merely another instance of grammarians' over-generalization. A rule has been made out of a tendency, and this tendency was evidently, first, to soften a hard letter, and then (but not necessarily) to elide it. We see this well illustrated by Apabhrarhsa, in which k, t and p are usually preserved under the forms g, d and b. In the Outer Prakrits also k often becomes g, as in Skr. sravaka-, Jaina M. and AMg. savaga-, Mg. savaga-. S. and Mg. always preserve a medial /, changing it to d; thus, Skr. gata-, S. Mg. gada-, elsewhere ga(y)a-.

2. Kh, gh, th, dh, ph and bh similarly become h. Also, as above, S. and Mg. change th to dh. Th becomes dh, and ph may become bh. The other aspirates {ch, jh, dh), and also sometimes bh, remain

unchanged. In Ap., as before, kh, th and ph are usually preserved in gh, dh and bh respectively.

3. T becomes d, d becomes I (often written I), which when doubled becomes dentalized to 11, as in the case of the Jaina nn. P and b usually become v. The Outer languages often cerebralize dental sounds and change / to /.

4. N, m, I and h remain unchanged. V disappears before u, but otherwise generally remains unchanged. In Ap. m may become a v nasalized by anunasika; thus, Skr. bhramara-, Ap. bhavara-.

Final consonants usually disappear altogether, except nasals, which become anusvara. Thus, Skr. samantat, phalam, Pr. samanta, phalam.

The following rules will be found to include the great majority of possible cases of compound consonants. They show clearly the character of all] changes from Primary to Secondary Prakrit, viz. the substitution, mainly by a process of assimilation, of a slurred for a distinct pronunciation : —

1. In Pr. a conjunct consonant cannot consist of more than two elements, and, except in Mg. and Ap., can only be a double consonant or a consonant preceded by a nasal, a consonant followed by r, or one of the following : ■nh,nh,mh,lh. The consonants r and h cannot be doubled.

*2. In Pr. the only conjuncts which can begin a word are nh, nh, mh, and Ih. If any other conjunct consonant be initial, the first member of the Pr. form of it is dropped. Thus, in Pr. hr becomes kk, and the Skr. akramati becomes Pr. akkamai. If we omit the initial preposition a- (Pr. a-), the kk becomes initial, and we have kama'i, not *kkamai. Similarly, Skr. sihira- becomes Pr. thira- for *tthira-.*

3. L and v are elided when they stand first or last in a compound, and the remaining letter is doubled, if it admits of doubling. Thus, Skr. ulka, Pr. ukka; Skr. pakva, Pr. pakka-. The same rule is followed regarding r, but when it follows a consonant it is sometimes, especially in Ap., retained even when initial. Thus, Skr. arka-, Pr. akka; Skr. priya-, Pr. pia- or (Ap.) pria-.

4. M, n and y are elided when standing last in a compound, and the remaining letter is doubled ; thus, Skr. rasmi-, Pr. rassi-.

*5. K, g, {, d, t, d, p, i, ˆ and .? are elided when standing first in a compound, and the remaining letter is doubled as before; thus, Skr. bhakta-, Pr. bhatta-; Skr. skhalita-, Pr. khalia- for *kkhalia- (see rule 2).*

6. The above rules hold in the order given above; that is to say, rule 3 holds in preference to rules 4 and 5, and rule 4 in preference to rule 5. Thus, in the Skr. compound kr, the r is elided under rule 3, and not the k under rule 5, so that the Pr. form is kk.

7. Special Rules for Mg. — In this form of Pr. there are several peculiar changes. Dy, rj, ry, all become yy ; ny, ny, jit, nj become nn, ; medial cch becomes sc ; ft, st, sth become st ; and rth, sth become st. Other changes also occur, besides dialectic variations of those given above.

Declension. — Pr. has preserved the three genders of Skr., but has lost the dual number. As a rule, the gender of a noun follows that of the Skr. original, though in AMg. there is already a tendency to substitute the masculine for the neuter, and in Ap. these two genders are frequently confused, if the distinction is not altogether neglected. In the formation of cases, the phonetic rules just given are fully applied, but there are also

other deviations from the Skr. original. The consonantal stems which form an important part of Skr. declen- sion are frequently given vocalic endings, and there is a general tendency to assimilate their declension to that of a-bases, corre- sponding to the first and second declensions in Latin. This tendency is strongly helped by the free use of pleonastic suffixes ending in a, which are added to the base without affecting its meaning. Of these the most common are ka, da, and alia, ilia or ulla. The first of these was also very common in Skr., but its use became much extended in Pr. In accordance with the general rule, the k is liable to elision ; thus, Skr. ghota-ka-, Pr. ghoda-a-. It may even be doubled, as in Skr. bahu-, much, Pr. bahu-a-a-, for bahu-ka-ka-. Da is confined to Ap., and may be used alone or together with the other two, as in Skr bahubala-, strength of arm, Ap. bahubal-ulla- da-{k)a-. Ilia- is most common in the Outer languages, and especi- ally so in AMg. and M.; thus, Skr. pura-, M. pur-illa-.

All the Skr. cases are preserved except the dative, which has altogether disappeared in the Midland, but has survived in the singu- lar number in the Outer languages. Everywhere the genitive can be employed in its place. Most of the case-forms are derived from Sanskrit according to the phonetic rules, but Ap. has a number of dialectic forms which cannot be referred to that language (cf. the remarks above about hi = Qi). It also rarely distinguishes between the nominative and the accusative. As an example, we may give the commoner forms of the declension of the Skr. putra, Pr. pvtta, a son (see next page). It should be understood that numerous other forms were also in use, but the ones given here are selected because they are both common and typical.

The declension of neuter a-bases closely resembles the above, differing only in the. nominative and accusative singular and plural. Ap. has almost lost the neuter termination in the singular. Feminine a-stems are declined on the same lines, but the cases have run more into each other, the instrumental, genitive and locative singular

being identical in form. Very similarly are declined the bases ending in other vowels. The few still ending in consonants and which have not become merged in the a-declension, present numerous apparent irregularities, due to the inevitable phonetic changes, which must be learned from the textbooks.

Skr.

S.

Ap.

u:

AMg.

Mg.

Singular: Nom. Ace. Instr. Dat. Abl. Gen.

Loc.

Plural : Nom. Ace.

Instr.

Abl.

Gen.

Loc.

putras

putram

putrena

putraya

putrat

putrasya

*putre *putrasmin*

putras putran

**putrebhis putrebhyas putrandm*

putresu

putto

puttam

puttena

puttado puttassa

putte

putta putte

puttehim

puttdhim-to

puttanarh

puttesu{m)

putlu puttu putti

puttahu puttaho, puttaha putti,

puttaht

putta

putte

putta

puttaht

puttahu

puttaha

puttaht

putte

puttarh

puttena{m)

puttaa

puttao

puttassa

putte, puttammi

putta

putte

putta

puttehim’

puttdhim-to

puttanarh

puttesu

putte

puttam

puttena(m)

puttae

puttao

puttassa,

putte, ■*puttammi*

putta

putte,

putta

puttehim

puttehim-to

puttanarh

puttesu

putte

puttam

puttena

puttaa

puttado

puttassa

puttaha

putte,

puttammi,

puttahim

putta putte

puttehim

puttahirh-to

puttanarh,

puttaha

puttesu(m)

All the Skr. pronouns appear in Pr., but often in extremely abraded shapes. It would, for instance, be difficult to recognize the Skr. tvdm in the Ap. pa'i. There is also a most luxuriant growth of by-forms, the genitive plural of the pronoun of the second person being, e.g., represented by no less than twenty-five different words in M. alone. We also find forms which have no original in classical Skr. Thus, in that language, the pronoun sa-, he, is only used in the nominative singular of two genders, but occurs also in other cases in Pr.

Conjugation. — The Pr. verb shows even more decay than does the noun. With a few isolated exceptions, all trace of the second, or consonantal, conjugation of Skr. has disappeared, and (much as has happened in the case of nouns) all verbs are now conjugated after the analo'gy of the a-conjuga- tion. This a-conjugation, on the other hand, falls into two classes, the first being the a-conjuga- tion proper, and the second the e-conjugation, in which the e represents the aya of the Skr. 10th class and of causal and denominative verbs. The dtmanepada voice of Skr. has practically disappeared in the Midland, and even in the Outer languages it is not common. The present participle is the only form which has everywhere survived. The other forms are supplied by the paras- maipada. All the past tenses (imperfect, perfect and aorists) have fallen into disuse, leaving only a few sporadic remains, their place being supplied, as in the case of the tertiary vernaculars, by the participles, with or without auxiliary verbs. The present tense of the verb substantive has survived from Skr., but it is usual to employ atthi (= Skr. asti) for both numbers and all persons of the present, and asl (= dsit) for both numbers and all persons of the past. It is interesting to note that the latter has survived in the modern Panjabi si, was, in which language it is universally, but wrongly, described as a feminine. Another verb substantive (Skr. V bhu) has also survived, generally in the form hoi or huva'i for bhavati. In AMg. and M. we also have bhavai pretty frequently, and the same form also occurs, but less often, in S. and Mg. Its usual past participle is hua- or Mg. hiida-, S. bhuda-. The forms are given here as they are important when the history of the Tertiary Prakrits comes under consideration. These two verbs substantive make periphrastic tenses with other participles, and, in the case of the past participles and gerundives of transitive verbs (both of which are passive in signification), the agent or subject is put into the instrumental case, the participle being used either personally or impersonally, as in the tertiary languages. Thus, Una girivaro diftho, by him a mountain was seen, i.e. he saw a mountain; Una padivannam, it was acknowledged by him, he acknowledged. The gerundive, or future passive participle, is also used impersonally in the case of intransitive verbs, as in iuram gantawarh, it is to be gone far, we must go far.

Besides the participles, the infinitive and the indeclinable parti- ciple (gerund) have also survived. So also the passive voice, con- jugated in the same tenses as the active, and generally with paras- maipada terminations. The causal has been already mentioned. There are also numerous denominative verbs (many of them onoma- topoeic), and a good supply of examples of frequentative and desiderative bases, mostly formed, with the necessary phonetic modifications, as in Skr. The present participle in the parasmaipada ends in anta (enta), declined according to the a-declension, and in the dtmanepada in mdna. The termination to of the Skr.

past participle passive has survived under the form ia. Many direct representatives of Skr. participles in to (without the i) and na also appear. Thus, Skr. drsfta-, Pr. dittha-, seen; Skr. lagna-, Pr. lagga-, attached. As usual there is a tendency to simplification, and the termination ia is commonly added to the Pr. present base,

instead of following Skr. analogy. Thus, not only have we tatta- formed directly from the Skr. tapta-, but we have also tavia- from the Pr. present stem tav-ai (= Skr. tapati) , he is hot. All the three forms of the future passive participle or gerundive, in tavya, aniya and ya, have sur- vived. The infinitive has survived, not only with the form corresponding to the classical Sanskrit termination -turn, but also with several old Vedic forms. The same is the case with the gerund, in which both the classical forms in -tva and -{t)ya have survived, but with the loss of the distinctive use which obtained in Sanskrit. Besides these there are also survivals of Vedic forms, and even of Primary Prakrit forms not found in the Veda. The passive is generally formed by adding -jja or, in S. and Mg., ia, to the root or, more often, to the present stem. Thus, M. pucch'ijjai or S. pucchiadi, he is being asked.

The following are therefore the only tenses which are fully conjugated in Pr. : the present, the imperative, the future and the optative. Except in Ap., the personal terminations in general correspond to the Skr. ones, but in Ap. there are some forms which probably go back to unrecorded Primary Prakrits and have not as yet been explained. As an example we take the conjugation of the base puccha-, ask (Skr. pr,cchatt), in the present tense.

Skr.

S.

Ap.

M.

AMg.

Mg.

Sing.

1. 2.

3-

Plur.

1.

2.

3-

prcchami prcchasi prcchati

prcchdmas

prcchatha

prcchanti

pucchdmi

pucchasi

pucchadi

pucchamo pucchadha pucchanti

pucchau pucchasi or-hi pucchai

pucchahu pucchahu pucchaht

pucchami

pucchasi

pucchai

pucchamo pucchaha pucchanti

pucchdmi

pucchasi

pucchai

pucchamo pucchaha pucchanti

puscami

puscasi

puhadi

puscdmo puicadha puscanti

The imperative similarly follows the Skr. imperative. The S. second person singular is generally puccha, while the Outer languages often have a form corresponding to pucchehi. The base of the optative is generally formed by adding ejja in the Outer languages and ea in §:; thus, S. puccheam, others pucchejjdmi, Sec, may I ask. The Skr. future termination isya is represented by issa or ihi ; thus, pucchissdmi or pucchihimi, I shall ask.

Prakrit Literature. — The great mass of Prakrit literature is devoted to the Jaina religion, and, so far as it is known, is described under the head of Jains. Here it is i jlerataTe sufficient to state that the oldest Jaina sutras were in Ardhamagadhi, while the non-canonical books of the Svetam- bara sect were in a form of Maharastri, and the canon of the Digambaras appears to have been in a form of Saurasenl. Besides these religious works, Prakrit also appears in secular literature. In artificial lyric poetry it is pre-eminent. The most admired work is the Sattasai {Saptaiaptika), compiled at some time between the 3rd and 7th centuries a.d. by Hala. The grace and poetry of this collection, in which art most happily succeeds in concealing art, has rarely been exceeded in literature of its kind. It has had numerous imitators, both in Sanskrit and in the modern vernaculars, the most famous of which is the Satsai of Biharl Lai (17th century a.d.). Hala's work is important, not only on its own account, but also as showing the existence of a large Prakrit literature at the time when it was compiled. Most of this is now lost. There are some scholars (including the present writer) who believe that Sanskrit literature owes more than is generally admitted to works in the vernacular, and that even the Mahabharata first took its form as a folk-epic in an early Prakrit, and was sub- sequently translated into Sanskrit, in which language it was further manipulated, added to, and received its final shape. In literary Prakrit we have two important specimens of formal

epic poetry — the Rdvanavaha or Setubandha (attributed to Pravarasena, before a.d. 700), dealing with the subject of the Rdmdyana, and the Gaiidavaha of Vakpati (7th-8th century A.D.), celebrating the conquest of Bengal by Yasovarman, king of Kanauj. Reference must also be made to the Kumarapala- carita, the title of the last eight cantos of the huge Dvyasraya Mahdkdvya of Hemacandra (a.d. 1150). The whole work was written to serve as a series of illustrations to the author's Sanskrit and Prakrit grammar, the Siddha-hemacandra. The last eight cantos are in Prakrit, and illustrate the rules of the corresponding portion of his work. Its hero is Kumara-pala of Anhilvada. Dramatic literature has also an admired example in the Karpura- manjari (" Camphor-cluster," the name of the heroine) by Raja-sekhara (a.d. 900), an amusing comedy of intrigue. An important source of our knowledge of Prakrit, and especially of dialectic Prakrit, is the Sanskrit drama. It has already been pointed out that in works of this class many of the characters speak in Prakrit, different dialects being employed for different purposes. Generally speaking, Saurasem is employed for prose and Maharastri (the language of lyric poetry) for the songs, but special characters also speak special dialects according to their supposed nationality or profession. In India there is nothing extraordinary in such a polyglot medley. It is paralleled by the conditions of any large house in Bengal at the present day, in which there are people from every part of India, each of whom speaks his own language and is understood by the others, though none of them attempts to speak what is not his mother tongue. The result is that in the Sanskrit drama we have a valuable reflection of the local dialects. It is some- what distorted, for the authors wrote according to the rules laid down by technical handbooks, and the dialects which they employed were, in the case of the later writers, as dead as Sanskrit. But nevertheless, if not an absolutely true representa- tion, it is founded on the truth, and it is almost our only source of information as to the condition of the Indian vernaculars in the first five centuries a.d. The drama which gives the best examples of these dialects is the Mˆcchakatikd. For further particulars regarding the Sanskrit drama, reference should be made to the article Sanskrit.

Authorities. — The father of Prakrit philology was Ch. Lassen, the author of the Institutiones linguae pracriticae (Bonn, 1837). This famous work, a wonderful product of the learning of the time, is now out of date, and has been definitely superseded by R. Pischel's Grammatik der Prdkritsprachen (Strasburg, 1900). As an introduc- tion to the study of the language, the best work is H. Jacobi's AusgewMte Erzahlungen in Mdhdrdshtri zur Einfuhrung in das Studium des Prakrit, Grammatik, Text, Wbrterbuch (Leipzig, 1886). The best editions of the native grammars are E. B. Cowell's of Vararuci's Prakrta-prakas'a (London, 1868), R. Pischel's of Hemacandra (Halle, 1877, 1889) [see above], and E. Hultzsch's of

Simharaja's Prakrtarupavatdra (London, 1909). For Desya words, see Pischel's The Desindmamdld of Hemachandra (Bombay, 1880). For A pabhramsa, in addition to his edition of Hemacandra's grammar, see the same author's Materialen zur Kenntnis des Apabhramsa (Berlin, 1902). For the mutual relationship of the various Prakrits, see S. Konow, " MahSr&shtri and MUrathi," in the Indian Antiquary , (1903), xxxii., 180 sqq. For Jaina Prakrit, see under Jains. As regards the secular texts mentioned above the following are the best editions : A. Weber, Das Saptatacatakam des Hdla (Leipzig, 1 88 1) ; another edition by Durgaprasad and Kasinath PSndurang Parab under the title of The Gdthasapatasati of Sdtavdhana (Bombay, 1889) [a good commentary] ; S. Goldschmidt, Rdvanavaha oder Setubandha (Strasburg, 1 880-1 883) [text and translation]; Sivadatta and Parab, The Setubandha of Pravarasena (Bombay, 1895) ; Shankar Pandurang Pandit, The Gaudavaho, a Historical Poem in Prdkrit, by Vdkpati (Bombay, 1887) ; the same editor, The Kum&rapdla-charita (Bombay, 1900) ; Rajacekhara' s Karpuramanjari, edited by S. Konow, trans- lated by C. R. Lanman (Cambridge, Mass., 1901).

The literature of the Sanskrit drama is given under Sanskrit.

(G. A. Gr.) PRAM (Du. praam), the name of a flat-bottomed boat or barge used as a " lighter " for discharging

PRANTL, KARL VON (1820-1888), German philosopher, was born at Landsberg on the Lech on the 28th of January 1820, and died on the 14th of September 1888 at Oberstdorf. In 1843 he became doctor of philosophy at Munich Observatory, where he was made professor in 1859. He was also a member of the Academies of Berlin and Munich. Strongly in agreement with the Hegelian tradition, he defended and amplified it in Die gegenwdrtige Aufgabe der Philosophic (1852) and Verstehen und Beurteilen (1877). In these works he emphasized the identity of the subjective and the objective for consciousness, and the fact that the perception of this unity is peculiar to man. He is more important, however, as a commentator and scholar, and made valuable contributions to the study of Aristotle. He published Aristoteles iiber die Farben (1849), Aristoteles' acht Biicher der Physik (1857), and numerous minor articles on smaller points, such as the authenticity of the thirty-eight books of the Problems. The work by which he is best known is the Geschichte der Logik im Abendland (Leipzig, 1855-1870). Chr. Sigwart, in the preface to the first edition of his Logic, makes " special mention " of the assistance he obtained from this book.

PRATI, GIOVANNI (1815-1884), Italian poet, was born at Dasindo and educated in law at Padua. Adopting a literary career, he was inspired by

anti-Austrian feeling and devotion to the royal house of Savoy, and in early life his combination of a sympathy for national independence with monarchical senti- ments brought him into trouble in both quarters, Guerrazzi expelling him from Tuscany in 1849 for his praise of Carlo Alberto. In 1862 he was elected a deputy to the Italian parlia- ment, and in 1876 a senator. He died at Rome on the 9th of May 1884. Prati was a prolific poet, his volumes of verse ranging from his romantic narrative Ermenegarda (1841) to the lyrics collected in Psiche (1875) and Iside (1878). His Opere varie were published in five volumes in 1875, and a selection in one volume in 1892.

PRATINAS (the quantity of the second vowel is doubtful), one of the oldest tragic poets of Athens, was a native of Phlius in Peloponnesus. About 500 B.C. he competed with Choerilus and Aeschylus, when the latter made his first appearance as a writer for the stage. Pratinas was also the introducer of satyric dramas as a species of entertainment distinct from tragedy, in which the rustic merry-makings and the extravagant dances of the satyrs were retained. The associations of his home, not far from Corinth, where Arion was said to have established the cyclic choruses of satyrs, may account for his preference for this kind of drama. Pratinas was also a writer of dithyrambs and the choral odes called hyporchemata (a considerable fragment of one of these is preserved in Athenaeus xiv. 617). It is related that, during the performance of one of his plays, the scaffolding of the wooden stage gave way, in consequence of which the Athenians built a theatre of stone; but recent excava- tions make it doubtful whether a stone theatre existed in Athens at so early a date. A monument was erected by the inhabitants of Phlius in honour of Pratinas's son Aristias, who, with his father, enjoyed the reputation of excelling all, with the exception of Aeschylus, in the composition of satyric dramas, one of which was called Cyclops.

See Pausanias ii. 13; Suidas q.v. ; fragments in T. Bergk, Poetae lyrici graeci, vol. iii.

PRATINCOLE, a word apparently invented by J. Latham {Synopsis, v. 222), being the English rendering of Pratincola, applied in 1756 by P. Kramer {Elenchus, p. 381) to a bird which had hitherto received no definite name, though it had long before been described and even recognizably figured by Aldrovandus (Ornithologia, xvii. 9) under the vague designation of " hirundo marina." It is the Glareola pratincola of modern ornithologists, forming the type of a genus Glareola, founded by M. J. Brisson in 1760, belonging to the group Limicolae, and constituting to- gether with the coursers (Cursorius) a separate family, Glareolidae. The pratincoles, of which some eight or nine species have been described, are all small birds, slenderly built and mostly delicately coloured, with a short

stout bill, a wide gape, long pointed wings,

aad a tail more or less forked. In some of their habits they are thoroughly plover-like, running very swiftly and breeding on the ground, but on the wing they have much the appearance of swallows, and, like them, feed, at least partly, while flying. 1 The ordinary pratincole of Europe, G. pratincola, breeds abun- dantly in many parts of Spain, Barbary and Sicily, along the valley of the Danube, and in southern Russia, while owing to its great powers of flight it frequently wanders far from its home, and more than a score of examples have been recorded as occur- ring in the British Islands. In the south-east of Europe a second and closely-allied species, G. nordmanni or G. melanoptera, which has black instead of chestnut inner wing-coverts, accom- panies or, farther to the eastward, replaces it; and in its turn it is replaced in India, China and Australia by G. orientalis. Australia also possesses another species, G. grallaria, remarkable for the great length of its wings and much longer legs, while its tail is scarcely forked — peculiarities that have led to its being considered the type of a distinct genus or sub-genus Stiltia. Two species, G. lactea and G. cinerea, from India and Africa respectively, seem by their pale coloration to be desert forms, and they are the smallest of this curious little group. The species whose mode of nidificatkm is known lay either two or three eggs, stone-coloured, blotched, spotted, and streaked with black or brownish-grey. The young when hatched are clothed in down and are able to run at once — just as are young plovers. (A. N.)

PRATO, a town and episcopal see of Tuscany, Italy, in the province of Florence, 11 m. by rail N.W. of Florence, 207 ft. above sea-level. Pop. (1906), 20,197 (town); 55,298 (com- mune). It is situated on the Bisenzio, and is dominated by a medieval castle and surrounded by walls of the nth and 14th centuries. The cathedral of St Stephen was begun in the 12th century in the Tuscan Romanesque style; to this period belongs . the narrow nave with its wide arches; the raised transepts and the chapels were added by Giovanni Pisano in 1317-1320; the campanile dates from 1340 (it is a much smaller and less elabo- rate version of Giotto's campanile at Florence), while the facade, also of alternate white sandstone and green serpentine, belongs to 1413. It has a fine doorway with a bas-relief by Andrea della Robbia over it ; but the most striking external feature is the lovely open-air pulpit at an angle of the building, erected by Donatello and Michelozzo for displaying to the people without risk the Virgin's girdle, brought from the Holy Land by a knight of Prato in n 30. The pulpit itself has beautiful reliefs of dancing children; beneath it is a splendid bronze

capital. The contract was given out in 1428, but the work was seriously begun only in 1434 and finished in 1438. The Chapel of the Girdle has good frescoes by Agnolo Gaddi (1365), a statue of the Virgin by Giovanni Pisano, and a handsome bronze open-work screen. The frescoes in the choir, with scenes from the life of St John the Baptist and St Stephen, are by Fra Filippo Lippi (1456-1466) and are his best work; the dance of Salome and the lying in state of St Stephen are the finest of the series. Among other works of art may be mentioned the clay statue of the Madonna dell' Ulivo by Benedetto da Maiano. The massive old Palazzo Pretorio (13th century) has been somewhat modified in details; the adjacent Palazzo Comunale contains a small picture gallery

1 This combination of characters for many years led systematizers astray, though some of them were from the first correct in their notions as to the Pratincole's position. Linnaeus, even in his latest publication, placed it in the genus Hirundo ; but the interleaved and annotated copies of his Systema naturae in the Linnean Society's library show the species marked for separation and insertion in the Order Grallae— Pratincola trachelia being the name by which he had meant to designate it in any future edition. He seems to have been induced to this change of view mainly through a specimen of the bird sent to him by John White, the brother of Gilbert White; but the opinion published in 1769 by Scopoli (Ann. I. hist, naturalis, p. no) had doubtless contributed thereto, though the earlier judgment to the same effect of Brisson, as mentioned above, had been disregarded. Different erroneous assignments of the form have been made even by recent authors, who neglected the clear evidence afforded by the internal structure of the Pratincole. For instance, Sundevall in 1873 (Tentamen, p. 86) placed Glareola among the Caprimulgidae, a position which osteology shows cannot be maintained for a moment.

with works by Filippo and Filippino Lippi. A beautiful Madonna by the latter (1497) is in a small street shrine at the corner of the Via S. Margherita. The Church of S. Domenico is a Gothic edifice of 1281; that of S. Francesco has an almost Renaissance facade, fine cloisters with a good 15th-century tomb, and a chapter-house with Giottesque frescoes. The Madonna del Buon Consiglio has some good reliefs by Andrea della Robbia, by whom is also the beautiful frieze in the Madonna delle Carceri. This church, by Giuliano da Sangallo (1485-1491), is a Greek cross, with barrel vaults over the arms, and a dome; it is a fine work, and the decoration of the exterior in marble of different colours (unfinished) is of a noble simplicity. Some remains exist of the 13th-century fortress, and the large Piazza Mercatale is picturesque. The works of art visible in Prato are due, as will be seen, entirely to Florentine artists. As a whole the town has a somewhat modern aspect. The industries of Prato embrace the manufacture of woollens (the most important), straw-plaiting, biscuits,

hats, macaroni, candles, silk, olive oil, clothing and furniture, also copper and iron works, and printing.

Prato is said to be first mentioned by name in 1107, but the cathedral appears as early as 1048 as the parish church of Borgo Cornio or Santo Stefano. It was subject to the Alberti until 1180, and was then under the Imperial supremacy. It appears to hava freed itself from this at the end of the 13th century. In 1313 the town acknowledged the authority of Robert, king of Naples, and in 1350 Niccola Acciajoli, seneschal of Joanna, sold it to the Florentines for 17,500 florins of gold. In 1512 it was sacked by the Spaniards under General Cardona. In 1653 it obtained the rank of city.

See E. Corradini, Prato (Bergamo, 1905).

PRATT, ORSON (1811-1881), Mormon apostle, was born of humble parents at Hartford, New York. In 1830 he joined the Mormon Church, becoming a member of its council of twelve in 1834 and one of its twelve apostles in 1835. Pratt was also a mathematician of some note. He was professor of mathematics in the university of Deseret and wrote several books on this subject, these including Cubic and Biquadratic Equations (1866). He was a member, and several times speaker, of the Utah House of Representatives. Among his writings may be mentioned Key to the Universe (1866), and The Bible and Polygamy (1870). PRAWN, the name of an edibfe large shrimp-like crustacean in Great Britain usually applied to Leander serratus (see Shrimp). The word is in M. Eng. prayne or prane, and no cognate forms are found in any other languages. It has been often referred to the Lat. perna, a ham-shaped shellfish, but this is due to Florio, who by a mistake glosses parnocchie, prawne-fishes or shrimps. The O. Ital. perna and pernocchia meant a shellfish which yielded " nacre " or mother-of-pearl.

PRAXIAS and ANDROSTHENES, Greek sculptors, who are said by Pausanias (x. 19, 4) to have executed the pediments of the temple of Apollo at Delphi. Both were Athenians; Praxias a pupil of Calamis. The statement raises historic difficulties, as, according to the leaders of the recent French excavations at Delphi, the temple of Apollo was destroyed about 373 B.C. and rebuilt by 339 B.C., a date which seems too late for the lifetime of a pupil of Calamis. In any case no fragments of the pediments of this later temple have been found, and it has been suggested that they were removed bodily to Rome.

PRAXILLA, of Sicyon, Greek lyric poetess, one of the so-called nine " lyric " Muses, flourished about 450 B.C. According to Athenaeus (xv. 694), she was famous as a composer of scolia (short lyrical poems sung after dinner), which were considered equal to those of Alcaeus and Anacreon.

She also wrote dithyrambs and hymns, chiefly on mystic and mythological subjects, genealogies, and the love-stories of the gods and heroes. A dactylic metre was also called by her name.

Fragments in T. Bergk, Poetae lyrici graeci, vol. iii. ; see also C. F. Neue, De Praxillae Sicyoniae reliquiis (progr. Dorpat, 1844).

PRAXITELES, of Athens, the son of Cephissodotus, the greatest of the Attic sculptors of the 4th century B.C., who has left an imperishable mark on the history of art. It has been maintained by some writers that there were two sculptors of the name, one a contemporary of Pheidias, the other, more

celebrated, of two generations later. This duplication is de- fended in Furtwangler's Masterpieces of Greek Sculpture (pp. 99, 102, seq.) but on insufficient grounds. There is, however, no reason why the great Praxiteles should not have had a grand- father of the same name: all that we can say is that at present we have no certain evidence that this was the case.

Though Praxiteles may be considered as in some ways well known to us, yet we have no means for fixing his date accurately. It seems clear that he was no longer working in the time of Alexander the Great, or that king would have employed him. Pliny's date, 364 b.c, is probably that of one of his most noted works.

Our knowledge of Praxiteles has received a great addition, and has been placed on a satisfactory basis, by the discovery at Olympia in 1877 of his statue of Hermes bearing the infant Dionysus, a statue which has become famous throughout the world (Greek Art, fig. 43 and Plate VI. fig. 82). Hermes is represented as in the act of carrying the child Dionysus to the nymphs who were charged with his rearing. He pauses on the way, and holds out to the child a bunch of grapes to excite his desire. The young child can hardly be regarded as a success; he is not really childlike. But the figure of the Hermes, full and solid without being fleshy, at once strong and active, is a 'masterpiece, and the play of surface is astonishing. In the head we have a remarkably rounded and intelligent shape, and the face expresses the perfection of health and enjoyment.

This statue must for the future be our best evidence for the style of Praxiteles. It altogether confirms and interprets the statements as to Praxiteles made by Pliny and' other ancient critics. Gracefulness in repose, and an indefinable charm are also the attributes of works in our museums which appear to be copies of statues by Praxiteles. Perhaps the most

notable of these are the Apollo Sauroctonus, or the lizard-slayer, a youth leaning against a tree and idly striking with an arrow at a lizard, and the Aphrodite at the bath (Greek Art, Plate V., fig. 71) of the Vatican, which is a copy of the statue made by Praxiteles for the people of Cnidus, and by them valued so highly that they refused to sell it to King Nicomedes, who was willing in return to discharge the whole debt of the city, which, says Pliny, was enormous.

The Satyr of the Capitol at Rome has commonly been regarded as a copy of one of the Satyrs of Praxiteles; but we cannot identify it in the list of his works. Moreover, the style is hard and poor; a far superior replica exists in a torso in the Louvre. The attitude and character of the work are certainly of Praxitelean school.

Excavations at Mantineia in Arcadia have brought to light the basis of a group of Leto Apollo and Artemis by Praxiteles. This basis was doubtless not the work of the great sculptor him- self, but of one of his assistants. Nevertheless it is pleasing and historically valuable. Pausanias (viii. 9, 1) thus describes the base, " on the base which supports the statues there are sculptured the Muses and Marsyas playing the flutes." Three slabs which have survived represent Apollo, Marsyas, a slave, and six of the Muses, the slab which held the other three having disappeared.

A head of Aphrodite at Petworth in England, and a head of Hermes in the British Museum (Aberdeen Hermes), have lately been claimed by competent authorities as actual works of Praxiteles. Both are charming works, but rather by the suc- cessors of Praxiteles than by himself.

Besides these works, connected with Praxiteles on definite evidence, there are in our museums works without number of the Roman age, statues of Hermes, of Dionysus, of Aphrodite, of Satyrs and Nymphs and the like, in which a varied amount of Praxitelean style may be discerned. Four points of composi- tion may be mentioned, which appear to be in origin Praxitelean : (1) a very flexible line divides the figures if drawn down the midst from top to bottom; they all tend to lounging; (2) they are adapted to front and back view rather than to being seen from one side or the other; (3) trees, drapery and the like are used for supports to the marble figures, and included in the

design, instead of being extraneous to it; (4) the faces are presented in three-quarter view.

The subjects chosen by Praxiteles were either human beings or the less elderly and dignified deities. It is Apollo, Hermes and Aphrodite who attract him rather than Zeus, Poseidon or Athena. And in his hands the

deities sink to the human level, or, indeed, sometimes almost below it. They have grace and charm in a supreme degree, but the element of awe and reverence is wanting.

Praxiteles and his school worked almost entirely in marble. At the time the marble quarries of Paros were at their best; nor could any marble be finer for the purposes of the sculptor than that of which the Hermes is made. Some of the statues of Praxiteles were coloured by the painter Nicias, and in the opinion of the sculptor they gained greatly by this treatment.

(P. G.) PRAYER (from Lat. precari, entreat; Ital. pregaria, Fr. priere), a term used generally for any humble petition, but more technically, in religion, for that mode of addressing a divine or sacred power in which there predominates the mood and intention of reverent entreaty.

Prayer and its Congeners.— -Prayer in the latter sense is a characteristic feature of the higher religions, and we might even say that Christianity or Mahommedanism, ritually viewed, is in its inmost essence a service of prayer. At all stages of religious development, however, and more especially in the case of the more primitive types of cult, prayer as thus understood occurs together with, and shades off into, other varieties of observance that bear obvious marks of belonging to the same family.

Confining ourselves for the moment to forms of explicit address, we may group these under three categories according as the power addressed is conceived by the applicant to be on a higher, or on much the same, or on a lower plane of dignity and authority as compared with himself. (1) Only if the deity be regarded as altogether superior is there room for prayer proper, that is, reverent entreaty. Of this we may perhaps roughly distinguish a higher and a lower type, according as there is either complete confidence in the divine benevolence and justice, or a disposition to suppose a certain arbitrariness or at any rate condition- ality to attach to the granting of requests. In the first case prayer will be accompanied with disinterested homage, praise and thankgiving, and will in fact tend to lose its distinctive character of entreaty or petition, passing into a mystic commun- ing or converse with God. In the second case it will be supported by pleading, involving on the one hand self-abasement, with confession of sins and promises of repentance and reform, or on the other hand self-justification, in the shape of the expression of faith and recitation of past services, together with reminders of previous favour shown. (2) If, however, the worshipper place his god on a level with himself, so far at any rate as to make him to some extent dependent on the service man contracts to render him, then genuine prayer tends to be replaced by a mere bargaining, often conjoined with flattery and with insincere promises. This spirit of do ut des will be found to go closely with the gift-theory of sacrifice, and to be

especially character- istic of those religions of middle grade that are given over to sacrificial worship as conducted in temples and by means of organized priesthoods. Not but what, when the high gods are kind for a consideration, the lower deities will likewise be found addicted to such commerce; thus in India the hedge-priest and his familiar will bandy conditions in spirited dialogue audible to the multitude (cf. W. Crooke, Things Indian, s.v. " Demon- ology," pp. 132, 134). (3) Lastly, the degree of dependency on human goodwill attributed to the power addressed may be so great that, instead of diplomatic politeness, there is positive hectoring, with dictation, threats and abuse. Even the Italian peasant is said occasionally to offer both abuse and physical violence to the image of a recalcitrant saint; and antiquity wondered at the bullying manner of the Egyptians towards their gods (cf. Iamblichus, De mysteriis, vi. 5-7). This frame of mind, however, is mainly symptomatic of the lower levels

of cult. Thus the Zulu says to the ancestral ghost, " Help me or you will feed on nettles "; whilst the still more primitive Australian exclaims to the " dead hand " that he carries about with him as a kind of divining-rod, " Guide me aright, or I throw you to the dogs."

So far we have dealt with forms of address explicitly directed towards a power that, one might naturally conclude, has personality, since it is apparently expected to hear and answer. At the primitive stage, however, the degree of personification is, probably, often far slighter than the words used would seem to suggest. The verbal employment of vocatives and of the second person may have little or no personifying force, serving primarily but to make the speaker's wish and idea intelligible to himself. When the rustic talks in the vernacular to his horse he is not much concerned to know whether he is heard and understood; still less when he mutters threats against an absent rival, or kicks the stool that has tripped him up with a vicious "Take that!"

These considerations may help towards the understanding of a second class of cases, namely forms of implicit address shading off into unaddressed formulas. Wishings, blessings, cursings, oaths, vows, exorcisms, and so on, are uttered aloud, doubtless partly that they may be heard by the human parties to the rite, but likewise in many cases that they may be heard, or at least overheard, by a consentient deity, perhaps represented visibly by an idol or other cult-object. The ease with which explicit invocations attach themselves to many of these appar- ently self-contained forms proves that there is not necessarily any perceived difference of kind, and that implicit

address as towards a " something not-ourselves " is often the true designation of the latter. On the other hand, there is reason to believe that the magical spell proper is a self-contained and self- sufficient form of utterance, and that it lies at the root of much that has become address, and even prayer in the fullest sense.

From Spell to Prayer. — Of course to address and entreat a fellow-being is a faculty as old as that of speech, and, as soon as it occurred to man to treat sacred powers as fellow-beings, assuredly there was a beginning of prayer. We do not know, and are not likely to know, how religion first arose, and the probability is that many springs went to feed that immense river. Thus care for the dead may well have been one amongst such separate sources. It is natural for sorrow to cry to the newly dead " Come back! " and for bereavement to add " Come back and help!" Another source is mythologic fancy, which, in answer to childlike questions; "Who made the world?" "Who made our laws?" and so on, creates " magnified non- natural men," who presently made their appearance in ritual (for to think a thing the savage must dance it) ; whereupon personal intercourse becomes possible between such a being and the tribesmen, the more so because the supporters of law and order, the elders, will wish to associate themselves as closely as possible with the supreme law-giver. From Australia, where we have the best chance of studying rudimentary religion in some bulk, comes a certain amount of evidence showing that in the two ways just mentioned some inchoate prayer is being evolved. On the other hand, it is remarkable how conspicuous, on the whole, is the absence of prayer from the magico-religious ritual of the Australians. Uttered formulas abound; yet they are not forms of address, but rather the self-sufficient pronounce- ments of the magician's^a/. Viewed analytically in its developed nature, magic is a wonder-working recognized as such, the core of the mystery consisting in the supposed transformation of suggested idea into accomplished fact by means of that sugges- tion itself. To the magician, endowed in the opinion of his fellows (and doubtless of himself) with this wonderful power of effective suggestion, the output of such power naturally repre- sents itself as a kind of unconditional willing. When he cries " Rain, rain," or otherwise makes vivid to himself and his hearers the idea of rain, expecting that the rain will thereby be forced to come, it is as if he had said " Rain, now you must come," or simply "Rain, come!" and we find as a fact that xxii. 9

magical formulas mostly assume the tone of an actual or virtual imperative, " As I do this, so let the like happen," " I do this in order that the like may happen," and so on. Now it is easy to " call spirits from the vasty deep," but disappointed experience shows that they will not always come. Hence such imperatives have a tendency to dwindle into optatives. " Let the demon of small-pox depart!" is replaced by the more humble

“Grand- father Smallpox, go away!” where the affectionate appellative (employed, however, in all likelihood merely to cajole) signalizes an approach to the genuine spirit of prayer. Again, the magician conscious of his limitations will seek to supplement his influence — his mana, as it is termed in the Pacific — by tapping, so to speak, whatever sources of similar power lie round about him; and these the ” magomorphism ” of primitive society perceives on every hand. A notable method of borrowing power from another magic-wielding agency is simply to breathe its name in connexion with the spell that stands in need of reinforcement ; as the name suggests its owner, so it comes to stand for his real presence. It is noticeable that even the more highly developed forms of liturgical prayer tend, in the recitation of divine titles, attributes and the like, to present a survival of this magical use of potent names.

Prayer as a Part of Ritual. — An exactly converse process must now be glanced at, whereby, instead of growing out of it, prayer actually generates spell. In advanced religion, indeed, prayer is the chosen vehicle of the free spirit of worship. Its mechanism is not unduly rigid, and it is largely autonomous, being rid of subservience to other ritual factors. In more primitive ritual, however, set forms of prayer are the rule, and their function is mainly to accompany and support a ceremony the nerve of which consists in action rather than speech. Hence, suppose genuine prayer to have come into being, it is exceedingly apt to degenerate into a mere piece of formalism; and yet, whereas its intrinsic meaning is dulled by repetition according to a well-known pyschological law, its virtue is thereby hardly lessened for the undeveloped religious consciousness, which holds the saving grace to lie mainly in the repetition itself. But a formula that depends for its efficacy on being uttered rather than on being heard is virtually indistinguishable from the self- sufficient spell of the magician, though its origin is different. A good example of a degenerated prayer-ritual comes from the Todas (see W. H. R. Rivers, The Todas, ch. x.) . The prayer itself tends to be slurred over, or even omitted. On the other hand, great stress is laid on a preliminary citation of names of power followed by the word idith.. This at one time seems to have meant ” for the sake of,” carrying with it some idea of supplica- tion; but it has now lost this connotation, seeing that it can be used not merely after the name of a god, but after that of any sacred object or incident held capable of imparting magic efficacy to the formula. Even the higher religions have to fight against the tendency to ” vain repetitions ” (often embodying a certain sacred number, e.g. three), as well as to the use of prayers as amulets, medicinal charms, and so on. Thus, Buddhism offers the striking case of the praying-wheel. It remains to add that throughout we must carefully distinguish in theory, however hard this may be to do in practice, between legitimate ritual understood as such, whether integral to prayer, such as its

verbal forms, or accessory, such as gestures, postures, incense, oil or what not, and the formalism of religious decay, such as generally betrays itself by its meaninglessness, by its gibberish phrases, sing-song intonation and so forth.

Silent Prayer. — A small point in the history of prayer, but one that has an interesting bearing on the subject of its relation to magic, is concerned with the custom of praying silently. Charms and words of power being supposed to possess efficacy in themselves are guarded with great secrecy by their owners, and hence, in so far as prayer verges on spell, there will be a disposition to mutter or otherwise conceal the sacred formula. Thus the prayers of the Todas already alluded to are in all cases uttered " in the throat," although these are public prayers, each village having a form of its own. At a later stage ; when the distinction between magic and religion is more clearly recognized

and an anti-social character assigned to the former on the ground that it subserves the sinister interests of individuals, the overt and as it were congregational nature of the praying comes to be insisted on as a guarantee that no magic is being employed (cf. Apuleius, Apol. 54, " tacitas preces in templo dis allegasti: igitur magus es "), a notion that suffers easy translation into the view that there are more or less disreputable gods with whom private trafficking may be done on the sly (cf . Horace, Ep. I. xvi. 60, " labra movet metuens audiri, Pulchra Laverna, da mihi fallere "). Thus it is quite in accordance with the out- look of the classical period that Plato in his Laws (909-910) should prohibit all possession of private shrines or performance of private rites; " let a man go to a temple to pray, and let any one who pleases join with him in the prayer." Nevertheless, instances are not wanting amongst the Greeks of private prayers of the loftiest and most disinterested tone (cf. L. R. Farnell, The Evolution of Religion, p. 202 seq.). Finally we may note in this connexion that in advanced religion, at the point at which prayer is coming to be conceived as communion, silent adoration is sometimes thought to bring man nearest to God.

The Moralization of Prayer. — When we come to consider the moral quality of the act of prayer, this contrast between the spirit of public and private religion is fundamental for all but the most advanced forms of cult. In its public rites the com- munity becomes conscious of common ends and a common edification. We may observe how even a very primitive people such as the Arunta of Australia behaves with the greatest solemnity at its ceremonies, and professes to be made " glad " and " strong " thereby;

whilst of his countrymen, whom he would not trust to pray in private, Plato testifies that in the temples during the sacrificial prayers " they show an intense earnestness and with eager interest talk to the Gods and beseech them " (Laws, 887). We may therefore assume that, in acts of public worship at any rate, prayer and its magico-religious congeners are at all stages resorted to as a " means of grace," even though such grace do not constitute the expressed object of petition. Poverty of expression is apt to cloak the real spirit of primitive prayer, and the formula under which its aspirations may be summed up, namely, " Blessings come, evils go," covers all sorts of confused notions about a grace to be acquired and an impurity to be wiped away, which, as far back as our clues take us, invite interpretations of a decidedly spiritualistic and ethical order. To explicate, however, and purge the meaning of that " strong heart " and " clean " which the savage after his fashion can wish and ask for, remained the task of the higher and more self-conscious types of religion. A favourite contrast for which there is more to be said is that drawn between the magico-religious spell-ritual, that says in effect, " My will be done," and the spirit of" Thy will be done " that breathes through the highest forms of worship. Such resignation in the face of the divine will and providence is, however, not altogether beyond the horizon of primitive faith, as witness the following prayer of the Khonds of Orissa: " We are ignorant of what it is good to ask for. You know what is good for us. Give it to us." (Tylor, Prim. Culture, 4. 369.) At this point prayer by a supreme paradox virtually extinguishes itself, since in becoming an end in itself, a means of contemplative devotion and of mystic communing with God, it ceases to have logical need for the petitionary form. Thus on the face of it there is something like a return to the self-sufficient utterance of antique religion; but, in reality, there is all the difference in the world between a suggestion directed outwardly in the fruitless attempt to conjure nature without first obeying her, and one directed towards the inner man so as to establish the peace of God within the heart.

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PRAYER, BOOK OF COMMON, the title of the official service book of the Church of England. One of the most important steps taken at the Reformation was the compilation and provi- sion of a comprehensive service book for general and compulsory use in public worship in all cathedral and parish churches throughout the Church of England.

Apart from alterations in detail, both as to doctrine and ritual, which will be referred to later, the following main advantages were achieved from the very first and apply to all editions of the Prayer Book equally.

1. The substitution of the English language for the Latin language, which had hitherto been in universal and almost complete use, and in which all the old service books were written.

2. Unification and ' simplification. The number of books required for the performance of divine service in pre-Reformation days was very large; the most important being the Missal for the service of Holy Communion or the Mass; the Breviary for the daily service or performance of the divine office; the Manual for the minor sacramental offices usually performed by the parish priest; and the Pontifical, containing such services as were exclusively reserved for performance by the bishop. Many of the contents of these larger volumes were published in separate volumes known by a great variety — over one hundred — different names. The Prayer Book represents in a much condensed and abbreviated form the four chief ancient service books, viz.: the Missal, Breviary, Manual and Pontifical.

In addition to a multiplicity of books there was much variety of use. Although the Sarum Use prevailed far the most widely, yet there were separate Uses of York and Hereford, and also to a less degree of Lincoln, Bangor, Exeter, Wells, St Paul's, and probably of other dioceses and

cathedral churches as well. Cranmer's preface " Concerning the Service of the Church " expressly mentions the abolition of this variety as one of the things to be achieved by a Book of Common Prayer. It says: " And whereas heretofore there hath been great diversity in saying and singing in Churches within this Realm ; some following Salisbury Use, some Hereford Use, and some the Use of Bangor, some of York, some of Lincoln; now from henceforth all the whole Realm shall have but one Use."

We will next enumerate the sources from which the Prayer Book was compiled. 1. It has been already indicated that the older pre-Reformation service books formed the main quarry, especially those according to the Use of Sarum. Morning and Evening Prayer, including the psalter and the lessons, were taken from the Breviary, Matins being compiled out of Nocturns (or Matins), Lauds and Prime; and Evensong out of Vespers and Compline. The Order of Holy Communion, including the collects, epistles and gospels, was taken from the Missal. The sacramental and other offices which occupy a position in the Prayer Book between the Order of Holy Communion and the Psalms were taken from the Manual ; and the services for consecration or ordering of bishops, priests and deacons were taken from the Pontifical; but in all cases not only with a change of Latin into English, but with numerous alterations, omissions and additions.

2. The reformed Latin Breviary of Cardinal Quignon, Francis de Quinones, a Spaniard, a Franciscan and cardinal of the Holy Cross, brought out a reformed Latin breviary with papal sanction in 1535. A second and revised edition appeared in 1537. It met with considerable favour, and was adopted into use in many places, without, however, winning universal acceptance, and in 1558 papal

sanction was withdrawn and it ceased to be printed. From this reformed breviary the compilers of the Prayer Book borrowed the following, (a) Many passages — almost verbatim — in the preface " Concerning the Service of the Church." It would occupy too much space to print them in parallel columns here. (6) Making the Sunday and Holy-day services identical in structure with the week-day services, (c) The removal of all antiphons and responds. This refers to Quignon's first edition only, (i) The increased amount of Holy Scripture read. Quignon provided a first lesson from the Old Testament ; a second lesson from the New Testament ; and on Saints' Days a third lesson from the Lives of the Saints, though this lesson was also occasionally taken from Holy Scripture, (e) The prefixing to every service a form of confession and absolu- tion. The idea, not the actual

language, is borrowed by the Prayer Book. (/) The substitution of the Athanasian Creed for the Apostles' Creed on certain days instead of the former being an addition to the latter. So in the Prayer Book, when used, the Athanasian Creed is substituted for, not added to, the shorter creed, (g) The uniform assignment of three Psalms to each hour suggests the average number and arrangement of the Psalms in the Prayer Book at Matins and Evensong.

3. The Mozarabic Missal, (a) The four short prayers preceding the prayer for the consecration of the water in the office for the public baptism of infants are adapted from the benediction of the font in the Mozarabic Liturgy (Migne, Pat. Lai. torn, lxxxv. col. 465). The evidence for this borrowing is still plainer in the larger form of prayer for this purpose provided in the first book of Edward VI. The Mozarabic Liturgy was printed and published under Cardinal Ximenes in 1 500, and may well have been in Cranmer's hands; whereas the Missale gallicanum, a Gallican Sacramentary, contain- ing the same prayers with slight variations, was first published by Cardinal Thomesius in 1680 and must have been unknown to Cranmer. (b) According to F. Procter and W. H. Frere (A New History of the Book of Common Prayer, p. 375: London, 1902), the use of the plural number instead of the singular in the form of the opening versicles of Morning and Evening prayer is a following of Mozarabic usage. But we have been unable to verify this statement, (c) Many of the new collects introduced into the Prayer Book, though not transferred bodily from any Mozarabic service book, are modelled upon a Mozarabic pattern, and preserve some Mozarabic ideas and phrases, e.g. the references to the Second Advent in the collects for the first and third Sundays in Advent take their tone from the Mozarabic Advent services. The collect for Christmas Day is based on a collect for Christmas Day Lauds in the Mozarabic Breviary (Migne, Pat. Lat. torn, lxxxvi., col. 122). The collect for the first Sunday in Lent is based on a preface (Inlatio) in the Mass for the Wednesday after the fifth Sunday in Lent (ibid., torn, lxxxv., col. 382). The collect for the first Sunday after Easter is based upon an " Alia Oratio " (ibid., col. 517), and an " Oratio ad pacem " (col. 518) for the Saturday in Easter week. The collect for St Andrew's Day is based on a Missa in the Mozarabic Mass for the same festival (ibid., col. 159). Other examples might be given, but this is hardly the place for complete details, (a) The many addresses, beginning with" Dearly beloved brethren" ("the Scripture moveth us," &c), introduced into most of the services in the Prayer Book, correspond to the addresses which, under the title of " Missa," and generally addressed to " fratres dilectissimi " or " carissimi," form part of every Mozarabic Mass. (e) The prayer of consecration in the Order of Holy Communion, especially as regards the recital of the words of institution commencing " Who in the same night," &c, follows a Mozarabic rather

than the Sarum or Roman model in several respects, but the same features are found in the consecra- tion prayer in the Brandenburg- Nilrnberg agenda of 1533, and it is doubtful whether the Anglican borrowing is from a Mozarabic or a Lutheran source. Possibly both the Anglican and Lutheran formulae are derived independently from the Mozarabic ; because, as we have seen, a Mozarabic missal was certainly in Cranmer's hands and studied by him.

4. Eastern Liturgies. These were certainly known to Cranmer, but it is remarkable how little he borrowed from them, (a) The prayer which was placed at the end of the Litany in 1549, and now stands as the last prayer but one at the end of Matins and Evensong, as well as of the Litany, was undoubtedly borrowed from the Liturgy of St Chrysostom, where, as likewise in the Liturgy of St Basil, it forms the prayer of the third antiphon after the Deacon's Litany in the Mass of the Catechumens, (b) The concluding prayer of Matins and Evensong, " The Grace of our Lord," &c, which was added in 1662, may have been taken from Greek liturgies. It is the opening salutation in the Mass of the Catechumens in the Clementine Liturgy, where it occurs again, as it does in the Greek Liturgies before the " Sursum corda"; though there is no evidence to prove that it was not taken directly from Holy Scripture (2 Cor. xiii. 14). (c) The Epiklesis or invocation of the Holy Spirit upon the elements, must have been copied from an Eastern Liturgy. It occurs in the 1549 Prayer Book, but has been omitted in all subsequent editions. It runs thus: " Hear us, O merciful Father, we beseech Thee, and with Thy holy Spirit and word vouchsafe to blfess and sancftify these Thy gifts and creatures of bread and wine, that they may be unto us the body and blood of Thy most dearly beloved Son Jesus Christ."

This is not an exact translation of any known epiklesis, and Cranmer altered its position from after to immediately before the words of institution, (d) Four petitions in the Litany. " That it may please Thee to illuminate all Bishops, Priests and Deacons," &c. (altered in 1661 from all Bishops, pastors and ministers) and " That it may please Thee to give to all nations unity, peace and concord," and " That it may please Thee to succour, help and comfort all that are in danger, necessity and tribulation," and " That it may please Thee to preserve all that travel by land or by water, all women labouring of child, all sick persons, and young children, and to show Thy pity upon all prisoners and captives!" are almost certainly modelled on corresponding petitions in the Deacon's Litany in the Liturgy of St Chrysostom (ed. F. E. Brightman, p. 362, i. 35, and p. 363, lines 4, 17, 15). At least, they resemble far more closely the Greek petitions than they do any correspond- ing Latin petitions in the Old Sarum Litany.

5. Lutheran and other continental Protestant service books. The most

considerable quantity of the new material which was imported into the Prayer Book was drawn from Lutheran and Genevan service books. The Litany, for example, in the Prayer Book is based upon the medieval Latin Litany, but great variation both in substance and language and by way of addition and omission, are made in it. These variations are largely borrowed from and closely follow the language of various Lutheran litanies, especially that given in the consultation of Archbishop Hermann of Cologne issued in 1543. Lutheran influence can likewise be traced in way of variation introduced into the baptismal and other sacramental or occasional offices. So in the Communion service the most striking departures from ancient precedent have a Protestant origin. The introduction of the Ten Commandments in 1553 seems to be derived from the order of service published by Valerandus Pollanus (Pullain) in 1551 ; and that of the Comfortable Words in 1549 is borrowed, though all the texts chosen are not identical, from the Consultation of Hermann. It is impossible to pursue this subject here further in detail.

6. Original compositions of the compilers of the Prayer Book, not traceable to ancient or 16th-century originals. These are not numerous. They include most of the collects on Saints' Days, for which, though no direct evidence of authorship is as yet forthcoming, Cranmer is probably responsible, and certain other collects, such as that for the Royal Family (Archbishop Whitgift) ; that for the high court of parliament (Archbishop Laud) ; that for all conditions of men (Bishop Gunning), &c.

We proceed to describe next the various stages through which the Book of Common Prayer has passed and the leading features of each revision. Of changes preceding the first Prayer Book it will only be necessary to mention here: (a) The compiling and publishing of the Litany in English by Cranmer in 1544. (b) Royal injunctions in August 1 547 ordering the Epistle and Gospel to be read in English at High Mass. (c) A royal proclamation, dated the 8th of March 1548, imposing for use at the coming Easter The Order of the Communion. This was an order or form of service in English for the communion of the people in both kinds. It was to be inserted into the service after the communion of the priest, without making any other alteration in the Latin Mass. It comprised the long exhortation or notice to be given on Sunday, or on some other day, previous to the Communion, the longer exhortation, and the shorter invitation, the confession, absolution, comfortable words, prayer of humble access, formulae of administration and the concluding peace, all as they exist at present, though with variations of some importance.

The first complete vernacular Book of Common Prayer was issued in 1549. It was carried through both houses of parliament by the 21st of January 1549, by an Act of Uniformity which made its use compulsory on and after

the following Whit-Sunday. The exact date of the giving of the royal assent, and the question whether this Book received the assent of Convocation, are historical points of difficulty and uncertainty which cannot be treated at length here.

Some of the chief points of difference between this and subse- quent Prayer Books were the following: Matins and Evensong began with the Lord's Prayer, and ended with the third collect; there were no alternative Psalm-canticles for Benedictus, Magnificat and Nunc Dimittis; the Athanasian Creed was introduced after the Benedictus on six festivals only, and in addition to the Apostles' Creed; the Litany was placed after the Communion service, for which an alternative title was given, viz.: "commonly called the Mass." Introits were provided for use on every Sunday and Holy-Day; after the offertory

intending communicants were directed to " tarry still in the quire or in some convenient place nigh the quire"; in the prayer " for the whole state of Christ's church," the blessed Virgin Mary was commemorated by name among departed saints; prayer for the departed was explicitly retained; also an invoca- tion of the Holy Spirit before the words of institution, the prayer of oblation immediately following them. The mixed chalice was ordered to be used, and the Agnus Dei to be sung during the Communion of the people. A large selection of short scriptural post-Communions was provided. Unleavened bread was to be used and placed not in the hand but in the mouth of the communicant. The sign of the cross was to be made not only in the eucharistic consecration prayer, but also in Baptism, Confirmation, Holy Matrimony and the Visitation of the Sick. Reservation for the sick and unction of the sick were retained; and exorcism, unction, trine immersion and the chrisom were included in the baptismal service. The prayer in the burial service, as in the Communion service, contained distinct inter- cessions for the departed; and a form of Holy Communion was provided for use at funerals with proper introit, collect, epistle and gospel.

As to vestments, in the choir offices, the surplice only was to be used; the hood being added in cathedrals and colleges; and by all graduates when preaching, everywhere.

At Holy Communion the officiating priest was to wear " a white Albe plain with a vestment or Cope," and the assistant clergy were to wear " Albes with tunicles." Whenever a bishop was celebrant he was to wear, " beside

his rochette, a surplice or albe, and a cope or vestment," and also to carry " his pastoral staff in his hand, or else borne or holden by his chaplain." The mitre was not mentioned.

The ordinal was not attached to this Prayer Book at its first appearance, but it was added under another act of parliament in the following year, 1550. It was very similar to the present ordinal except that the words " for the office and work of a Priest in the Church of God, now committed unto thee by the Imposition of our hands " were wanting, and the chalice or cup with the bread were delivered, as well as a Bible, to each newly-ordained priest.

We pass on to 1552 when a new and revised edition of the Prayer Book was introduced by an act of parliament which ordered that it should come into use on All Saints' Day (Nov. 1). The alterations made in it were many and important, and as they represent the furthest point ever reached by the Prayer Book in a Protestant direction, they deserve special mention and attention.

1. The introductory sentences, exhortation, confession and absolution were prefixed to the Order for Morning Prayer daily throughout the year and ordered to be read before Evening Prayer as well. Alternative Psalms were provided for Benedictus, Magnificat and Nunc Dimittis.

2. Numerous and most important alterations were made in the Order for Holy Communion, in the title of which the words " commonly called the Mass " were left out. (a) The Introits tvere omitted, (b) Gloria in excelsis was transferred from near the beginning to near the end of the service, (c) The ten com- mandments with, an expanded tenfold Kyrie eleison were intro- duced, (d) The long new English canon of 1549 was split up into three parts: the first part becoming the prayer for the church militant; the second part becoming the prayer of consecration, the third part, or prayer of oblation, becoming the first post- Communion collect; the epiklesis or invocation of the Holy Ghost upon the elements was entirely omitted, (e) The mixed chalice, the use of the sign of the cross in the consecration prayer; the commemoration of the blessed Virgin Mary and of various classes of saints were omitted. (J) The Agnus Dei and the post- Communion anthems were omitted, (g) The words of adminis- tration in the 1549 book were abolished, viz.: " The body of our Lord Jesus Christ which was given for thee, preserve thy body and soul unto everlasting life," and " The blood of our Lord Jesus Christ which was shed for thee preserve thy body and soul unto everlasting life," and the following words were

substituted : " Take and eat this in remembrance that Christ died for thee, and feed on him in thy heart by faith, with thanks- giving," and " Drink

this in remembrance that Christ's blood was shed for thee, and be thankful." (h) A long rubric was added at the end of the service explanatory of the attitude of kneeling at the reception of Holy Communion, in which it was stated that "it is not meant hereby that any adoration is done, or ought to be done, either unto the sacramental bread and wine there bodily received, or to any real and essential presence there being of Christ's natural flesh and blood," &c. (i) Exorcism, unction, trine immersion and the chrisom were omitted from the baptismal service, (k) Unction and communion with the reserved sacrament were removed from the services for the visitation and the communion of the sick. (/) Prayers for the dead and provision for a celebration of Holy Communion at a funeral were removed from the burial service, {m) The vest- ments retained and ordered under the Prayer Book of 1549 were abolished by a new rubric which directed that both at the time of Communion and at all other times of ministration a bishop should wear a rochet and that a priest or deacon should have and wear a surplice only; (n) on the other hand, the directions as to daily service were extended to all clergy and made much stricter, (0) and the number of days on which the Athanasian Creed was to be used was raised from six to thirteen.

The main objects of these drastic alterations have been thought to have been two-fold.

1. To abolish all ritual for which there was not scriptural warrant. If this was their object it was not consistently or completely carried out. No scriptural warrant can be found for the use of the surplice, or for the use of the sign of the cross in baptism, both of which were retained.

2. To make the services as unlike the pre-Reformation services as possible. This object too was not fully attained; no liturgical precedent can be found for the violent dislocation of certain parts of the Order for Holy Communion, especially in the case of the prayer of oblation and of the Gloria in Excelsis; but the orders for Morning and Evening Prayer and the Holy Communion retained features of the Breviary and Missal services, the bulk of their component material being still drawn from them. While the alterations, therefore, were violent enough to alarm and offend the Catholic party, they were not violent enough to satisfy the extreme Puritan party, who would no doubt have agitated for and would probably have obtained still further reformation and revision. But this Prayer Book only lived for eight months. It came into use on All Saints' Day (Nov. 1) 1552, and on the 6th of July 1553 Edward VI. died and was succeeded by his sister Mary, under whom the Prayer Book was abolished and the old Latin services and service books resumed their place.

On the death of Queen Mary and the accession of her sister Elizabeth

(Nov. 17, 1558) all was reversed, and the Book of Common Prayer was restored into use again.

The Act of Uniformity, which obtained final parliamentary authority on the 28th of April 1559, ordered that the Prayer Book should come again into use on St John the Baptist's Day (June 24, 1559). This was the second Prayer Book of King Edward VI., with the following few but important alterations, which, like all the alterations introduced at subsequent dates into the Prayer Book, were in a Catholic rather than in a Protestant direction.

1. Morning and Evening Prayer were directed to be " used in the accustomed place of the church, chapel or chancel, instead of " in such place as the people may best hear."

2. The rubric ordering the use of the rochet only by the bishop and of surplice only by a priest or deacon was abolished. The eucharistic vestments ordered in the first Prayer Book of Edward VI. were brought back by a new rubric which directed that " the minister at the time of the communion and at all other times in his ministration, shall use such vestments in the church as were in use by authority of parliament in the second year of the reign of King Edward the VI. according to the act of parliament set in the beginning of this book.

3. In the Litany the following petition found in both the

Edwardian Prayer Books was omitted " from the tyranny of the bishop of Rome and all his detestable enormities, good Lord deliver us."

4. In the Communion service the two clauses of administration found in the first and second Prayer Books of King Edward's reign were combined.

5. The rubric explanatory of " kneeling for reception," com- monly known as " the Black Rubric " was omitted.

6. In the Ordinal in the rubric before the oath of the queen's sovereignty the words " against the power and authority of all foreign potentates " were substituted for " against the usurped power and authority of the Bishop of Rome," and in the oath itself four references to the bishop of Rome, by name, were omitted.

There were a few more minor alterations, without doctrinal or political

significance which need not be described in detail here.

The only further addition or alteration made in Queen Elizabeth's reign was in 1561, when all the present black letter Holy Days were added to the Kalendar except St George (April 23) Lammas (Aug. 1), St Laurence (Aug. 10) and St Clement (Nov. 22), which already existed, and except St Enurchus (Sept. 7), added in 1604, and the Venerable Bede (May 27) and St Alban (June 17) added in 1662.

A smouldering and growing Puritan discontent with the Prayer Book, suppressed with a firm hand under Queen Elizabeth, burst out into a flame on the accession of King James I. in 1603. A petition called the millenary petition, because signed by no less than one thousand ministers, was soon presented to him, asking, among other things, for various alterations in the Prayer Book and specifying the alterations desired. As a result the king summoned a conference of leading Puritan divines, and of bishops and other leading Anglican divines, which met under his presidency at Hampton Court in January 1604. After both sides had been heard, certain alterations were determined upon and were ordered by royal authority, with the general assent of Convocation. These alterations were not very numerous nor of great importance, but such as they were they all went in the direction of catholicizing rather than of puritanizing the Prayer Book; the one exception being the substitution of some chapters of the canonical scriptures for some chapters of the Apocrypha, especially of the book of Tobit. Other changes were : —

1. The addition of one more black letter Saint's Day, viz.: Enurchus (by error for Evurtius) on the 7th of September. This was a small but a very extraordinary and an inexplicable change to make. The only explanation offered, which is a pure guess and seems barely possible, is that it was desired to place some mark of dignity upon a day which during the late reign had been kept with great festivity as the birthday of Queen Elizabeth.

2. The words, " The absolution to be pronounced by the minister alone " at Morning and Evening Prayer, were altered to " The Absolution, or Remission of Sins, to be pronounced by the priest alone, standing; the people still kneeling."

3. A prayer for the royal family was added after the prayer for the king, and a petition was added in the Litany to the same effect, both exhibiting slight verbal differences from the prayer and petition as used to-day.

4. Thanksgiving prayers were added for rain, for fair weather, for plenty, for peace and victory.

5. Important alterations were introduced into the service for the private baptism of children in houses, with the object of doing away with lay baptism and securing the administration by the minister of the parish, or some other lawful minister.

6. The confirmation service was entitled and explained thus: " The Order of Confirmation, or Laying on of Hands upon Children Baptized, and able to render an account of their faith according to the Catechism following."

7. The concluding portion of the Catechism, consisting of eleven questions on the sacraments, was now added.

There were other slight changes of a verbal kind, involving no doctrinal or political significance and which therefore need not be described here.

The next important stage in the history of the Prayer Book was its total suppression in 1645 Ior a period of fifteen years. " the Directory for the Public Worship of God in the Three Kingdoms " being established in its place. The restoration of King Charles II. in 1660 brought with it toleration at once, and soon afterwards complete restoration of the Prayer Book, but not exactly in the same form which it had before. Non- conformists pressed upon the king, either that the Prayer Book should not be re-introduced, or that if it were re-introduced, features which they objected to might be removed. The result was that a conference was held in 1661, known from its place of meeting as the Savoy Conference, the church being represented by twelve bishops and the Nonconformists by twelve eminent Presbyterian divines, each side accompanied by nine coadjutors.

The objections raised from the Nonconformist point of view were numerous and varied, but they were thoroughly discussed between the first meeting on the 15th of April and the last on the 24th of July 1661; the bishops agreeing to meet the Puritan wishes on a few minor points but on none of fundamental importance. Later in the year, between the 20th of November and the 20th of December, Convocation assembled and under- took the revision of the Prayer Book. In the earlier part of the following year the book so revised came before parliament. No amendment was made in it in either house and it finally received the royal assent on the 19th of May 1662, being annexed to an Act of Uniformity which provided for its coming into general and compulsory use on St Bartholomew's Day (Aug. 24).

The alterations thus introduced were very numerous, amount- ing to many hundreds, and many of them were more important than any which had been introduced into the Prayer Book since 1552. Their general tendency was distinctly in a Catholic as opposed to a Puritan direction, and the two thousand Puritan incumbents who vacated their benefices on St

Bartholomew's Day rather than accept the altered Prayer Book bear eloquent testimony to that fact.

It is impossible to give here an exhaustive list of the alterations: but the following were some of the principal changes made in 1662. (a) The preface " It hath been the wisdom of the Church of England," &c, composed by Sanderson, bishop of Lincoln, was prefixed to the Prayer Book, (b) The authorized version of the Bible of 161 1 was taken into use, except in the case of the Psalms, where the great Bible of 1 539-1 540 was retained as much smoother for singing, and in parts of the Communion service, (c) The rubric preceding the absolution in Morning and Evening Prayer, viz.: " The absolu- tion to be pronounced by the minister alone," was altered into " The Absolution, or Remission of Sins, to be pronounced by the priest alone, standing; the people still kneeling." (d) In the Litany the phrase " Bishops, Pastors and Ministers of the Church," was altered into " Bishops, Priests and Deacons," and in the clause commencing " From all sedition and privy conspiracy," &c, the words " rebellion " and " schism " were added, (e) Among the " Prayers and Thanks- givings upon several occasions, " were added the two Ember week prayers, the prayer for the high court of parliament, the collect or prayer for all conditions of men, the general thanksgiving, and that " For restoring Public Peace at Home." (/) In the Communion service two rubrics were prefixed to the prayer " for the whole state of Christ's Church militant here in earth " ordering the humble presentation and placing of the alms upon the Holy Table, and the placing thereon then of so much Bread and Wine as the priest shall think sufficient; and (g) the commemoration of the departed was added to the prayer itself, (h) The rubric explanatory of the posture of kneeling for reception, known as the Black Rubric, which had been added in 1562, but omitted in 1559 and 1604, was re-introduced; but the words " to any real and essential presence there being of Christ's natural flesh and blood " were altered to " unto any Corporal Presence of Christ's natural Flesh and Blood " — a very important and significant alteration which affected the meaning of the whole rubric, {i) Rubrics were also added ordering the manual acts by the priest in the prayer of consecration, and the covering of the remainder of the consecrated elements after Communion with a fair linen cloth, (k) A new office was added for the Ministration of Baptism to such as are of riper years. (I) A rubric was prefixed to the Order for the Burial of the Dead, forbidding that order to be used " for any that die unbaptized, or excommunicate, or have laid violent hands upon themselves." (m) In the " Ordering of Priests," and " the Consecration of Bishops," in the formula for ordination, after the words, " Receive the Holy Ghost," these words were added " for the Office and Work of a Priest (or Bishop) in the Church of God, now committed unto thee by the Imposition of our hands." (n) The ornaments rubric, regulating the vesture of the

clergy was thrown into its present shape, referring back not to 1604 or 1559 or 1552, but to the first Prayer Book of Edward VI. in 1549 for the rule to be followed.

The above are the important alterations, among numerous others of minor significance, introduced into the Prayer Book in 1662. Their general trend is obvious. It is not in the Puritan direction, but intended to emphasize and to make more clear church doctrine and discipline, which in recent years had become obscured or decayed. No substantial alteration has been made in the Prayer Book since 1662, but two alterations must be chronicled as having obtained the sanction of the Convocations of Canterbury and York, and also legal force by act of parliament. In 187 1 a new Lectionary was substituted for the previously existing one, into the merits and demerits of which it is not possible to enter here; and in 1872, by the Act of Uniformity Amendment Act, a shortened form of service was provided instead of the present form of Morning and Evening Prayer for optional use in other than cathedral churches on all days except Sunday, Christmas Day, Ash Wednesday, Good Friday and Ascension Day; provision was also statutably made for the separation of services, and for additional services, to be taken, however, except so far as anthems and hymns are concerned, entirely out of the Bible and the Book of Common Prayer.

In the year 1907 letters of business were issued by the Crown to the Convocations inviting and enabling them to make altera- tions in the Prayer Book (afterwards to be embodied in an act Df parliament). These letters were issued in compliance with the second recommendation (1906) of the Royal Commission on Ecclesiastical Discipline, viz.: that "Letters of business should be issued to the Convocations with instructions: (a) to consider the preparation of a new rubric regulating the orna- ments (that is to say, the vesture) of the ministers of the church, at the times of their ministrations, with a view to its enact- ment by parliament; and (b) to frame, with a view to their enactment of parliament, such modifications in the existing law relating to the conduct of Divine Service, and to the orna- ments and fittings of churches as may tend to secure the greater elasticity which a reasonable recognition of the comprehensive- ness of the Church of England and of its present needs seems to demand."

A few words are added in conclusion about the state services. Until the year 1859 they were four in number.

1. A Form of Prayer with Thanksgiving to be used yearly upon the Fifth

Day of November, to commemorate the happy deliverance of King James I. and the Three Estates of England from the Gun- powder Plot in 1604.

2. A Form of Prayer with Fasting to be used yearly on the Thirtieth Day of January, to commemorate the Martyrdom of the Blessed King Charles the First in 1649.

3. A Form of Prayer with Thanksgiving to be used yearly on the Twenty-ninth Day of May, to commemorate the Restoration to the throne of King Charles the Second in 1660.

4. A Form of Prayer with Thanksgiving to be used yearly on the Day of the Accession of the reigning Monarch.

The first three of these services were abolished in 1859 by royal warrant — that is to say by the exercise of the same authority which had instituted them. The fourth form of service was retained in its old shape till 1901, when a new form, or rather new forms of service, having been prepared by Convocation, were authorized by royal warrant on the 9th of November. (F. E. W.)

PRAYERS FOR THE DEAD. Wherever there is a belief in the continued existence of man's personality through and after death, religion naturally concerns itself with the relations between the living and the dead. And where the idea of a future judg- ment obtains, prayers are often offered on their behalf to the Higher Powers. Prayers for the dead are mentioned in 2 Mac- cabees xii. 43-45, where the writer is uncertain whether to regard the sacrifice offered by Judas as a propitiatory sin-offering or as a memorial thank-offering, a distinction of great importance in the later history of the practice. Prayers for the dead form part of the authorized Jewish services. The form in use in England contains the following passage: " Have mercy upon him; pardon all his transgressions . . . Shelter his soul in the shadow of Thy wings. Make known to him the path of life." The only passage in the New Testament which is held to bear

directly on the subject is 2 Tim. i. 18, where, however, it is not certain that Onesiphorus, for whom St Paul prayed, was dead. Outside the Bible the proof of the early use of prayers for the dead has been carried a step farther by Professor Ramsay's discoveries, for it is now impossible to doubt the genuineness of the copy (contained in the spurious acts of the saint) of the inscription on the torrb of Abercius of Hieropolis in Phrygia (see Lightfoot, Apostolic Fathers, pt. ii. vol. i. p. 492 sqq.). The 19th line of the inscription runs thus: " Let every friend who observeth this pray for me," i.e. Abercius, who throughout speaks in the first person: he died in the latter part of the 2nd century. The inscriptions in the Roman catacombs

bear similar witness to the practice, by the occurrence of such phrases as " Mayst thou live among the saints " (3rd century) ; " May God refresh the soul of . . . "; " Peace be with them." Among Church writers Tertullian is the first to mention prayers for the dead, and that not as a concession to natural sentiment, but as a duty: " The widow who does not pray for her dead husband has as good as divorced him." This passage occurs in one of his later Montanistic writings, dating from the beginning of the 3rd century. Subsequent writers similarly make incidental mention of the practice as prevalent, but not as unlawful or even disputed (until Aerius challenged it towards the end of the 4th century). The most famous instance is St Augustine's prayer for his mother, Monica, at the end of the 9th book oi his Confessions.

An important element in the liturgies of the various Churches consisted of the diptychs or lists of names of living and dead who were to be commemorated at the Eucharist. To be inserted in these lists was an honour, and out of the practice grew the canonization of saints; on the other hand, to be excluded was a condemnation. In the middle of the 3rd century we find Cyprian enjoining that there should be no oblation or public prayer made for a deceased layman who had broken a Church rule by appoint- ing a cleric trustee under his will: " He ought not to be named in the priests' prayer who has done his best to detain the clergy from the altar." Although it is not possible, as a rule, to name dates for the exact words used in the ancient liturgies, yet the universal occurrence of these diptychs and of definite prayers for the dead in all parts of the Church in the 4th and 5th centuries tends to show how primitive such prayers were. The language used in the prayers for the departed is very reserved,and contains no suggestion of a place or state of pain. We may cite the following from the so-called liturgy of St James: —

" Remember, O Lord, the God of Spirits and of all Flesh, those whom we have remembered and those whom we have not remem- bered, men of the true faith, from righteous Abel unto to-day; do thou thyself give them rest there in the land of the living, in thy kingdom, in the delight of Paradise, in the bosom of Abraham, Isaac and Jacob, our holy fathers, from whence pain and sorrow and sighing have fled away, where the light of thy countenance visiteth them and always shineth upon them."

Public prayers were only offered for those who were believed to have died as faithful members of Christ. But Perpetua, who was martyred in 202, believed herself to have been encouraged by a vision to pray for her brother, who had died in his eighth year, almost certainly unbaptized; and a later vision assured her that her prayer had been answered and he translated from punishment. St Augustine thought it needful to point out that the narrative was not canonical Scripture, and contended that the

child had perhaps been baptized. Similarly, a medieval legend relates that Gregory the Great was so struck with the justice of the emperor Trajan, that he prayed for him, and in consequence he was admitted to Paradise (cf. Dante, Purg. x., Parad. xx.).

As time went on, further developments took place. Petitions to God that he would hear the intercessions of the departed became direct requests to them to pray (Ora pro nobis); and, finally, the saints were asked themselves to grant grace and help. Again, men felt difficulty in supposing that one who repented at the close of a wicked life could at once enjoy the fellowship of the saints in Paradise (St Luke xxiii. 43), and it seemed unfair that they should be made equal with those who had borne the

burden and heat of the day (St Matt. xx. 12). And so the simple severance between good and bad indicated in St Luke vi. 26, became the threefold division made familiar by Dante. These speculations were further fixed by the growth of the theory of satisfaction and of Indulgences: each forgiven soul was supposed to have to endure an amount of suffering in proportion to the guilt of its sins, and the prayers and pious acts of the living availed to shorten this penance time in Purgatory (see Indul- gences). It thus came about that prayers for the dead were regarded only as aiming at the deliverance of souls from pur- gatorial fires; and that application of the Eucharist seems to have overshadowed all others. The Council of Trent attempted certain reforms in the matter, with more or less success; but, broadly speaking, the system still remains in the Roman Catholic Church, and masses for the dead are a very important part of its acts of worship.

The Reformation took its rise in a righteous protest against the sale of Indulgences; and by a natural reaction the Protestants, in rejecting the Roman doctrine of Purgatory, were inclined to disuse all prayers for the dead. Important changes have been made, in the successive revisions of the Prayer Book, in the commemorations of the dead at the Eucharist and in the Burial Service.

In the Communion Service of 1549, after praise and thanks were offered for all the saints, chiefly the Blessed Virgin, came the following: " We commend into thy mercy all other thy servants, which are departed hence from us with the sign of faith and now do rest in the sleep of peace: grant unto them, we beseech thee, thy mercy and everlasting peace." The Burial Service of the same date contained explicit prayers for the deceased, and introit, collect, epistle and gospel were provided for " the Celebration of the

Holy Communion when there is a Burial of the Dead." In 1552, under the influence of Bucer, all mention of the dead, whether commemorative or intercessory, was cut out of the Eucharist; the prayers in the Burial Service were brought into their present form; and the provision for Holy Communion at a Burial was omitted. The thankful commemoration of the dead in the Eucharist was restored in 1661, but prayers for them remained, if they remained at all, veiled in ambiguous phrases.

The Church of England has never forbidden prayers for the dead, however little she has used them in her public services. It was proposed in 1552 to condemn the scholastic doctrine De precatione pro defunctis in what is now the 22nd of the Thirty- Nine Articles, but the proposal was rejected. And these inter- cessions have been used in private by a long list of English divines, among whom Andrewes, Cosin, Ken, Wesley and Keble form an almost complete chain down to the present day. On the tomb of Bishop Barrow (1680) stands a request to passers-by to pray for their fellow-servant. And in a suit (1838) as to the lawfulness of an inscription, " Pray for the soul of . . .," the Court decided that " no authority or canon has been pointed out by which the practice of praying for the dead has been expressly prohibited." As Jeremy Taylor put it {Dissuasive from Popery, I. 1. iv.), " General prayers for the dead the Church of England never did condemn by any express articles, but left it in the middle."

H. M. Luckock, After Death (1st ed., London, 1879) ; E'H.Pfumptre, The Spirits in Prison (London, 1884). (W. O. B.)

PRAYING WHEEL, a mechanical apparatus used by the Lamaist Buddhists in Tibet and elsewhere for offering prayers. Strips of paper bearing a manifold repetition of the words " The Jewel in the Lotus, Amen," are wrapped round cylinders of all sizes — from hand-mills to wind- or water-mills. As the wheel revolves these uncoil and the prayer is considered to be offered.

PREACHING (Fr. precher, from Lat. praedicare, to proclaim), the proclamation of a Divine message both to those who have not heard it, and to those who, having heard it, have not accepted it, and the regular instruction of the converted in the doctrines and duties of the faith, is a distinctive though not a peculiar feature of the Christian religion. The Mahommedans exercise

it freely, and it is not unknown among the Buddhists. The history of Christian preaching with which alone this article is concerned has its roots (1) in the activity of the Hebrew prophets and scribes, the former representing the broader appeal, the latter the edification of the faithful, (2) in the ministry of Jesus Christ and His apostles, where again we have

both the evan- gelical invitation and the teaching of truth and duty. Whichever element is emphasized in preaching, the preacher is one who believes himself to be the ambassador of God, charged with a message which it is his duty to deliver.

1. The Patristic Age, to the Death of St Augustine, a.d. 430. — Of the first two centuries we have very little information. From the Acts of the Apostles we gather something as to the methods adopted by St Peter and St Paul, and these we may believe were more or less general. The Apostles who had known the Lord would naturally recall the facts of His life, and the story of His words and works would form a great deal of their preaching. After they had passed away and before the Christian Scriptures were canonically sifted and collected there was a gap which for us is only slenderly filled by such productions as the so-called 2nd Epistle of Clement, really a rambling homily on repentance and confession (see Clementine Literature), and by what we can imagine was the practice of men like Ignatius and, on the other hand, the Apologists. Most of these were primarily writers, but Justin Martyr has left a reputation for speaking, especially in debate, as well. Some of the writings of Tertullian (c. 200), e.g. those on Patience and Penitence, read as though they had been spoken, and it is hard to believe that this brilliant rhetorician did not consecrate his powers of address to his new faith. Cyprian (d. 258), too, was a finished speaker; his Epistle to Donatus emphasizes the need of a simple and un- decorated style in the proclamation of the gospel. None of his sermons, however, unless we regard his book on the Lord's Prayer as a homily, has come down to us.

By this time the canon of New Testament Scripture was fairly settled, and with Origen (d. 254) we find the beginning of preach- ing as an explanation and application of definite texts. Origen was pre-eminently a teacher, and the didactic side of preaching is thus more conspicuous in his work. When we allow for his excessive use of the allegorical method, there is still left a great deal of power and suggestiveness. In his hands, as may be seen from the 19 homilies on Jeremiah that have been preserved in the Greek (and others in the Latin of Rufinus), the crude homily of his predecessors began to take a more dignified, orderly and impressive form. Alongside Origen we may rank Hippolytus of Rome on the strength of the one sermon of his which is extant, a panegyric on baptism based on the theophany which marked the baptism of Jesus.

The 4th century marks the culmination of early Christian preaching. The imperial patronage had made education and social distinctions a greater possibility for the preacher, and the decline of political eloquence furnished an opening for pulpit oratory. The didactic element was no longer in sole possession of the field, for the inrush of multitudes to the Christian faith and the building of large churches necessitated a return to the evangelical

or proclamatory type of sermon. It was the age of doctrinal controversy, and the intellectual presentation of the Christian position was thus sharpened and developed. The Antiochene school had set a worthy example of careful exegesis of scripture. It was in the East especially that preaching flourished : Eusebius of Caesarea, Eusebius of Emesa, Athanasius, Macarius, Cyril of Jerusalem, Ephraem Syrus among the ortho- dox; and of the Arians, Arius himself and Ulfilas the great Gothic missionary, are all of high quality; but above even these stand out the three Cappadocians,Basil (q.v.) of Caesarea,cultured, devout and practical; his brother Gregory (q.v.) of Nyssa, more inclined to the speculative and metaphysical, and Gregory (q.v.) of Nazianzus, richly endowed with poetic and oratorial gifts, the finest preacher of the three. At the apex of the pyramid stands John of Antioch, Chrysostom (q.v.), who in 387, at the age of 40, began his 1 2 years' ministry in his native city and in 399, the six memorable years in Constantinople, where he loved

the poor, withstood tyranny and preached with amazing power. His sermons, says Dr E. C. Dargan, " show the native oratorical instinct highly trained by study and practice, a careful and sensible (not greatly allegorical) interpretation of Scripture, a deep concern for the spiritual welfare of his charge, and a thorough consecration to his work. His style is impetuous, rich, torrential at times; his thought is practical and imaginative rather than deeply philosophical. His knowledge of human nature is keen and ample, and his sermons are a remarkable reflection of the manners and customs of his age. His ethical appeal is constant and stimulating."

In the West the allegorical method of Alexander had more influence than the historical exegesis of Antioch. This is seen in Ambrose of Milan, with whom may be named Hilary of Poitiers and Gaudentius of Brescia, the friend of Chrysostom, and a link between him and Ambrose. But the only name of first rank in preaching is that of Augustine, and even he is curiously unequal. His fondness for the allegorical and his manifest carelessness of preparation disappoint as often as his profundity, his devout mysticisms, his practical application attract and satisfy. Augustine's De doctrina Christiana, bk. iv., is the first attempt to formulate the principles of homiletics.

2. The Early Middle Ages, 430-1100. — After the days of Chrysostom and Augustine there was a great decline of preaching. With the poor exceptions of one or two names like those of Theodore of Mopsuestia and John of Damascus, the Eastern Church produced no preachers of distinction. The

causes of the ebb were both internal and external. Within the Church there was a departure from the great experimental truths of the Gospel, their place being taken by the preaching of nature and morality on a theistic basis. To this we may add a fantastic and absurd allegorization, the indiscriminate laudation of saints and martyrs, polemical strife, the hardening of the doctrine into dogma, the development of a narrow ecclesiasticism, and the failure of the missionary spirit in the orthodox section of the Eastern Church (as contrasted with the marvellous evangelistic activity of the Nestorians (q.v.). Outside the Church the break-up of old civilizations, the confused beginnings of medieval kingdoms, with the attendant war and rapine, the inroads of the Saracens and the rise of Islam, were all effective silencers of the pulpit. Yet the night was not without its stars; at Rome Leo the Great and Gregory the Great could preach, and the missionaries Patrick, Columba, Columbanus, Augustine, Wilfrid, Willibrord, Gall and Boniface are known by their fruits. The homilies of Beda are marked by a tender devoutness, and here and there rise to glowing eloquence. In the 8th century Charlemagne, through the Capitularies, tried in vain to galvanize preaching; such specimens as we have show the sermons of the times to be marked by superstition, ignorance, formality and plagiarism. It was the age when the papacy was growing out of the ruins of the old Roman Empire, and the best talents were devoted to the organization of ecclesiasticism rather than to the preaching of the Word. Liturgies were taking shape, penance was deemed of more importance than repentance, and there was more insistence on discipline than on Christian morality. Towards the end of the period we note the beginnings of the triple division of medieval preaching into cloistral, parochial and missionary or popular preaching, a division based at first on audiences rather than on subject-matter, the general character of which — legends and popular stories rather than exposition of Scripture — was much the same everywhere. About this time, no doubt, some preachers began to use the vernacular, though no examples of such a practice have been preserved. There are few great names in the 9th, 10th and nth centuries: Anselm was a great Churchman, but no great preacher; perhaps the most worthy of mention is Anskar, the missionary to the Scandinavians. Rabanus Maurus published an adaptation of Augustine's De doctrina Christiana, bk. iv. But certain forces were at work which were destined to bring about a great revival, viz. the rise of the scholastic theology, the reforms of Pope Hilde- brand, and the preaching of the First Crusade by Pope Urban II. (d. 1090) and Peter the Hermit.

3. The Later Medieval Age, 1100-1500. — In the 12th century the significant feature is the growing use of the various national languages in competition with the hitherto universal Latin. The most eminent preacher of the century was Bernard of Clairvaux (1091-1153), esteemed alike by

gentle and simple, and summing up the popular scholastic and mystical types of preaching. His homilies, though tediously minute, still breathe a charm and power (see Bernard, St).

Alongside Bernard may be placed the two mystics of St Victor, Hugo and Richard, and a little later Peter Waldo of Lyons, who, like Henry of Lausanne, preached a plain message to the poor and lowly. The 13 th century saw the culmination of medieval preaching, especially in the rise of the two great mendicant orders of Francis and Dominic. Representative Franciscan names are Antony of Padua (d. 1231), who travelled and preached through southern Europe; Berthold of Regensburg (d. 1272), who, with his wit and pathos, imagination and insight, drew huge crowds all over Germany, as in homeliest vernacular he denounced sin with all the severity of a John the Baptist; and Francis Bonaventura, the schoolman and mystic, who wrote a little book on The Art of Preaching. Of the Dominicans Thomas Aquinas (d. 1274), the theologian, was perhaps also the greatest preacher. With the 14th century a new note, that of reformation, is struck; but on the whole there was a drop from the high level of the 13th. In Italy Bernardino of Siena on the scholastic side, Robert of Lecce and Gabriel Barletta on the popular, are the chief names; in Germany these phases are represented by John Gritsch and John Geiler of Kaiserburg respectively. Among the popular preachers vigour was often blended with coarseness and vulgarity. Mysticism is represented by Suso, Meister Eckhart, above all Johann Tauler (q.v.) of Strassburg (d. 1461), a true prophet in an age of degeneration. Towards the close of the century comes John Wycliffe (q.v.) and his English travelling preachers, who passed the torch to Hus and the Bohemians, and in the next age Savonarola, who was to Florence what Jeremiah had been to Jerusalem.

4. The Reformation Period, 1500-1700. — It is here that the story of modern preaching may be said to begin. The Reformers gave the sermon a higher place in the ordinary service than it had previously held, and they laid special stress upon the interpretation and application of Scripture. The controversy with Rome, and the appeal to the reason and conscience of the individual, together with the spread of the New Learning, gave preaching a new force and influence which reacted upon the old faith, as John Wild (d. 1554), one of the best Roman Catholic

preachers of the day, a man noted for his " emphasis on Scripture, his grasp of evangelical truth, his earnest piety, amiable character and sustained power in the pulpit," fully admitted; Other famous preachers on the same side were the Spaniards Luiz of Granada and Thomas of Villanova, the Italians Cornelio Musso, Egidio of Viterbo and Carlo Borromeo, and the German Peter Canisius. Among the Reformers were, of course, Martin Luther and most of his German collaborators; the Swiss Zwingli, Bullinger, Farel and Calvin; the English Latimer, John Bradford, John Jewel; the Scot John Knox. Nor can even so cursory a sketch omit to mention Bernardino Ochino and the Anabaptist Hiibmaier. In all these cases fuller details will be found in the articles bearing their names. Most of the Reformation preachers read their sermons, in contrast to the practice of earlier ages. The English Book of Homilies was compiled because competent preachers were comparatively rare.

The 17th-century preaching was, generally speaking, a continu- ation of that of the 16th century, the pattern having been set by the Council of Trent and by the principles and practice of the Reformers. In Spain and Germany, however, there was a decline of power, in marked contrast to the vigour manifested in France and England. In France, indeed, the Catholie pulpit now came to its perfection, stimulated, no doubt, by the toleration accorded to the Huguenots up to 1685 and by the patronage of Louis XIV. The names of Bossuet, Flechier, Bourdaloue, Fenelon and Massillon, all supreme preachers, despite a certain artificial pompousness, belong here, and on the reformed side

are Jean Claude (d. 1687), author of the Essay on the Sermon, and Jacques Saurin (d. 1730). In England the rivalry was not between Catholic and Reformer, but between Anglican and Nonconformist, or, if we may use the wide but less correct term, Puritan. On the one hand are Andrewes, Hall, Chillingworth, Jeremy Taylor, Barrow and South; on the other Baxter, Calamy, the Goodwins, Howe, Owen, Bunyan, in each case but a few names out of many. The sermons of these men were largely scriptural, the cardinal evangelical truths being emphasized with reality and vigour, but with a tendency to abstract theology rather than concrete religion. The danger was felt by the university of Cambridge, which in 1674 passed a statute for- bidding its preachers to read their sermons.

Germany, harassed by the Thirty Years' War and deadened by a rigid Lutheranism, can show little besides Andrea and Johann Arndt until the coming of the Pietists (see Pietism), A. H. Francke and Philipp Spencer, with Paul Gerhardt and his cousin Johann. The early years of the 18th century were a time of deadness as regards preaching. The Illumination in Germany and Deism in England were largely responsible for this, though the names of J. A. Bengel (better known as a commentator), Zinzendorf, Butler and the Erskines helped to redeem the time from the reproach of being the dark age of Protestantism. In the Roman Catholic Church the greatest force was Bridaine in France, a popular preacher of high worth. But, generally speaking, there was no heart in preaching, sermons were unimpassioned, stilted and formal presentations of ethics and apologetics, seldom delivered extempore.

5. The Modern Period may be said to begin in 1738, the year in which John Wesley began his memorable work. Preaching once more was based on the Bible, which was expounded with force and earnestness, and though throughout the century there remained a good many pulpiteers who produced nothing but solemn fudge, the example and stimulus given by Wesley and Whitefield were almost immeasurably productive. Whitefield was the greater orator, Wesley the better thinker; but, diverse in temperament as they were, they alike laid emphasis on open- air preaching. In their train came the great field preachers of Wales, like John Elias and Christmas Evans, and later the Primitive Methodists, who by their camp meetings and itiner- ancies kept religious enthusiasm alive when Wesleyan Methodism was in peril of hardening. Meanwhile, in America the Puritan tradition, adapted to the new conditions, is represented by Cotton Mather, and later by Jonathan Edwards, the greatest preacher of his time and country. Whitefield's visits raised a band of pioneer preachers, cultured and uncultured, men who knew their Bibles but often interpreted them awry.

In the early 19th century the pulpit had a great power, especially in Wales, where it was the vehicle of almost every kind of knowledge. And it may be

doubted whether, all in all, preaching has ever reached so uniformly high a level or been so powerful a force as during the 19th century, and this in spite of other forces similarly making for enlightenment and morality. It shared to the full in all the quickening that transformed so many departments of civilization during that epoch, and has been specially influenced by the missionary enterprise, the discoveries of science, the fuller knowledge of the Bible, the awakened zeal for social service. Modern preaching, like ancient preaching, has been so varied, depending, as it so largely does, on the personality of the preacher, that it is not possible to speak of its characteristics. Nor can one do more than enumerate a few outstanding modern names, exclusive of living preachers. In the Roman Catholic Church are the Italians Ventura and Curci, the Germans Diepenbrock and Foerster, the French Lacordaire, Dupanloup, Loyson (Pere Hyacinthe) and Henri Didon. Of Protestants, Germany produced Schleiermacher, Claus Harms, Tholuck and F. W. Krummacher; France, Vinet and the Monods. In England representative Anglican preachers were Newman (whose best preaching preceded his obedience to Rome), T. Arnold, F. W. Robertson, Liddon, Farrar, Magee; of Free Church- men, T. Binney, Thomas Jones, R. W. Dale and Joseph Parker (Congregationalist) ; Robert Hall, C. H. Spurgeon and Alexander

Maclaren (Baptists); W. M. Punshon, Hugh Price Hughes and Peter Mackenzie (Wesleyan); James Martineau (Unitarian). The Scottish Churches gave Edward Irving, Thos. Chalmers, R. S. Candlish, R. M. McCheyne and John Caird. In America, honoured names are those of W. E. Channing, Henry Ward Beecher, Horace Bushnell, Phillips Brooks, to mention only a few.

See J. M. Neale, Medieval Preachers and Preaching (1857); R. Rothe, Geschichte der Predigt vom Anfang bis auf Schleiermacher (1881); J. P. Mahaffy, Decay of Modern Preaching (1882); E. C. Durgan, A History of Preaching (1906), and preface to The Pulpit Encyclopaedia, vol. i. (1909) ; and the various volumes of the Yale Lectures on Preaching. Also Sermon. (A. J. G.)

PREAMBLE (Med. Lat. praeambulum, from praeambulare, to walk before), an introductory statement, a preliminary explana- tion. The term is particularly applied to the opening paragraph of a statute which summarizes the intention of the legislature in passing the measure; thus the preamble of the statute, of which the title is the Children Act 1908, is as follows: " An Act to consolidate and amend the Law relating to the Protection of Children and Young Persons, Reformatory and Industrial Schools and Juvenile Offenders, and otherwise to amend the Law with respect to Children and Young Persons." The procedure in the British parliament differs in regard to the preambles of public and private bills.

The second reading of a public bill affirms the principle, and therefore in committee the' preamble stands postponed till after the consideration of the clauses, when it is considered in reference to those clauses as amended and altered if need be (Standing Order 35). On the other hand, the preamble of a private bill, if opposed, is considered first in committee, and counsel for the bill deals with the expediency of the bill, calls witnesses for the allegation in the preamble, and petitions against the bill are then heard; if the preamble is negatived the bill is dropped, if affirmed it is gone through clause by clause. On unopposed private bills the preamble has also to be proved, more especially with regard to whether the clauses required by the standing orders are inserted (see May, Parliamentary Practice, 1906, pp. 483, 808 seq.). PREANGER, a residency of the island of Java, Dutch East Indies, bounded S. by the Indian Ocean, W. by Bantam, N. by Batavia and Krawang, and N.E. and E. by Cheribon and Banyumas. It is officially termed the Preanger Regencies, of which there are five, covering the several administrative divisions. It also includes the small island of Nusa Were. The natives are Sudanese. The whole residency is mountainous, but there are two main parallel ranges of peaks along the northern boundary and through the middle. Among these are to be found a singu- larly large number of both active and inactive volcanoes, includ- ing the well-known Salak and Gede in the north, and bunched together at the eastern end the Chikorai, Papandayan, Wayang, Malabar, Guntur, &c, ranging from 6000 to 10,000 ft. in height. The rivers of the province belong to the basins of the Indian Ocean and the Java Sea respectively, the water-parting being formed by the western and eastern ends respectively of the northern and southern lines of mountain peaks. The two which drain the largest basin are the Chi Manuk and the Chi Tarum, both rising in the eastern end of the province and flowing north- east and north-west respectively to the Java Sea. The Chi Tandui, also rising here, flows south-east to the Indian Ocean, and alone of all the rivers in this province is navigable. Large stretches of marsh occur on each side of this river, as well as here and there among the hills where inland lakes formerly existed, as, for instance, near Bandung. Crater lakes are Telaga (lake) Budas, in the crater of the volcano of the same name in the south-east, and Telaga Warna, on the slopes of the Gede, famous for its beautiful tinting. On the same side of the Gede is the health resort of Sindanglaya (founded 18 50-1 860), with a mineral spring containing salt, and close by is the country residence of Chipanas, belonging to the governor-general.

Numerous warm springs are scattered about this volcanic region. Petroleum and coal have been worked, and there is a rich yield of chalk, while a good quality of bricks is made from the

red clay. The soil is in general very fertile, the principal products being rice, maize and pulse (kachang) in the lower grounds, and cinchona, coffee and tea, as well as cocoa, tobacco and fibrous plants in the hills. The coffee cultivation has, however, consider- ably diminished. Forest culture, mat-making, weaving and fish-breeding are also practised, the last-named in the marshes after the rice harvest. The plantations are almost entirely owned by the government and Europeans, but the rice mills are in the hands of Chinese. Irrigation works have been carried out in various parts. The principal towns are Bandung, the capital of the residency, Sukabumi, Chianjar, Sumedang, Chichalengka, Garut, Tasik Malaya and Manon Jaya, all with the exception of Sumedang connected by railway.

PREBENDARY (Lat. praebendo = give or grant, through Low Lat. praebenda) , one who holds a prebend, namely an endowment in land, or pension in money, given to a cathedral or conventual church in praebendam — that is, for the maintenance of a secular priest or regular canon. In the early Church the title had a more general signification. The word praebenda originally signified the daily rations given to soldiers, whence it passed to indicate daily distributions of food and drink to monks, canons, &c. It became a frequent custom to grant such a prebend from the resources of a monastery to certain poor people or to the founder. Such persons were, literally, prebendaries. At a later date, when the custom in collegiate churches of living in common had become less general, a certain amount of the church revenue was divided among the clergy serving such a church, and each portion (no longer of meat or drink only) was called a prebend. The clergy of such churches were generally canons, and the titles canon and prebendary were, and are, sometimes used as synonymous. A member of such a college is a canon in virtue of the spiritual duties which he has to perform, and the assignation to him of a stall in choir and a place in chapter; he is a prebendary in virtue of his benefice. In the Roman Catholic Church the duties of a prebendary as such generally consist in his attendance at choral office in his church. In the Anglican Church he usually bears his part in the conducting of the ordinary church services, except when he has a vicar, as in the old cathedral foundations (see Cathedral) . A prebendary may be either simple or a dignitary. In the former case he has no cure and no more than his revenue for his support ; in the latter he has always a jurisdiction annexed. In the Anglican Church the bishop is of common right patron of all prebends, and if a prebend is in the gift of a lay patron he must present his candidate to the bishop who institutes as to other benefices. No person may hold more than one prebend in the same church; therefore, if a prebendary accepts a deanery in his church his prebend becomes void by cession. A prebend is practically a sinecure, and the holder has no cure of souls as such. He may, and often

does, accept a parochial office or chaplaincy in addition.

In the middle ages there were many less regular kinds of prebends: e.g. praebenda doctoralis, with which teaching duties were connected, praebenda lectoralis, praebenda missae, to which the duty of saying a certain number of masses was attached, praebenda mortuaria, founded for the saying of masses for the dead. Chantries belonged to this class. All these prebends were generally assigned to special holders, but there were also praebendae currentes, which were not held by any persons in particular. Sometimes prebends were held by boys who sang in choir, praebendae pueriles. Occasionally the name of prebendary was applied to those servants in a monastery who attended to the food. In England the word prebendary was some- times used as synonymous with prebend, as prebend was occasionally used for prebendary.

Du Cange, Glossarium mediae et infimae latinilatis, ed. L. Favre (Niort. 1883, &c); Migne, Encyclopedie theologique, 1st series, vol. x. (s. Droit Canon) ; Sir R. J. Phillimore, Ecclesiastical Law of the Church of England (2nd ed., 1895). (E. O'N.)

PRE-CAMBRIAN, in geology, the enormously long and indistinctly defined period of time anterior to the Cambrian period. In the restricted sense in which it is now often employed it embraces a period or group of periods subsequent to the Archean (q.v.) and anterior to the Cambrian, although some writers still prefer to include the former. The superior limit of pre-Cambrian rocks is fixed by the Olenellus fauna at the base

of the Cambrian (some geologists speak of certain pre-Olenellus beds as eo-Cambrian) ; the lower limit has not yet been generally established, though it is sufficiently clear in certain regions. The rocks of this period are much more obviously of sedimentary origin than those of the Archean; they include conglomerates, sandstones, greywackes, quartzites, slates, limestones and dolomites, which appear to have been formed under conditions similar to those which obtained in later epochs. Although the sediments prevail, they are often very highly metamorphosed and distorted by crustal movements; igneous rocks occur in great bulk in some regions. Fossils are usually extremely rare and very ill-preserved; but indications of protozoa, coelenterates, echinoderms, molluscoids, mollusca, worms and arthropods have been distinguished. The name pre-Cambrian is the equivalent of the " Algonkian " of the United States Geological Survey, and of the " Proterozoic " of other American authorities; the terms eozoic, archaeozoic, agnotozoic, cryptozoic, eparchaic and others have also been applied to the same period.

Three or more great stratigraphical breaks have been recog- nized within

the system of pre-Cambrian rocks; but how far these breaks synchronize in widely separated regions where they are found is difficult to determine in the absence of good palae- ontological evidence.

The most striking development of pre-Cambrian rocks in Great Britain is the Torridonian (q.v.) group of the north-west highlands of Scotland, which lies with strong unconformability between the Lewisian gneiss and the basal quartzite of the Cambrian. The Eastern or Dalradian (q.v.) schists of Scotland and their equivalents in Ireland and Anglesey may be, in part at least, of the same age. In Shropshire, in the neighbourhood of the Welsh border, is the remnant of an ancient ridge now forming the Longmynd and the smaller hills to the west, Caer Caradoc, the Wrekin, and the Carding- ton Hills. The latter are built mainly of much altered porphyries and tuffs which C. Callaway named the Uriconian series ; this series is clearly of pre-Cambrian age. The great mass of grits, flags and slates forming the Longmynd cannot yet be definitely assigned to this period, though they may be provisionally retained here under Callaway's name, Londmyndian. Probably contemporaneous with the Uriconian are the volcanic series of Barnt Green, Licky Hill and Caldecote. The micaceous schists of Rushton (Salop) may be placed here. In the Charnwood Forest a group of crystalline rocks, named Charnian by W. W. Watts, rises up in the form of small hills amid the surrounding Trias; they are classed as follows in descending order: The Brand series, including the slates of Swithland and Groby, quartzite and conglomerate and purple and green beds; the Maplewell series, including the olive hornstones of Bradgate, the Woodhouse beds, the slate-agglomerate of Roecliffe, the Beacon Hill hornstones and a felspathic agglomerate; and the Blackbrook series of grits and hornstones. The ancient volcanic rocks of St Davids, Pembrokeshire, were formerly regarded by H. Hicks as of pre-Cambrian age, in which he recognized a lower, " Dimetian," a middle, " Arvonian," and an upper, " Pebidian," series. The pre- Cambrian age of these rocks was for a long time disputed, but J. F. N. Green (Q. J. Geol. Soc, 1908, 64, p. 363) made it clearthat there is an Upper Pebidian (Rhyolitic group), and a Lower Pebidian (Trachytic group), and that Hicks's " Dimetian," the St Davids granophyre, is a laccolitic mass intrusive in the Pebidian. Both the Pebidian volcanic rocks and the intruded granophyre are separated from the Cambrian by an unconformity.

In Finno-Scandinavia pre-Cambrian rocks are well developed. In the Scandinavian mountain ranges are the Seve and Sparagmite formations ; the latter, a coarse-grained felspathic sandstone, is very similar to the Torridonian of Scotland; it occurs also in Enontekis in Finland. Next in descending order come the Jotnian sandstones (2000 metres), which retain ripple-marks; they are associated with conglomerates and slates and intrusive diabase and the Rapakiwi granite. The Jotnian group rests

unconformably upon the Jatulian quartzites and schists, with slates, dolomite and carbonaceous beds (north of Lake Onega is a bed of anthracite 2 metres thick). Out- flows of diabase and gabbro occur in this series, which is from 1600 to 2000 metres in thickness. Below the Jatulian is another group of schistose sediments, the Kalevian, more strongly folded than the former and separated from the groups above and below by unconformable junctions. These rocks are regarded by J. J. Sederholm as older than the Huronian of North America (possibly analogous to the Keewatin formation), and yet several groups of sediments in this region (Botnian schists, &c.) lie between the Kalevian series and the granitic (Archean) complex.

Pre-Cambrian rocks occupy large areas and attain an enormous thickness in North America; all types of sediment are represented in various stages of metamorphism, and with these are igneous rocks, often developed upon a vast scale. They have been subdivided into the following groups or formations: an upper Keweenawan

and a lower Huronian group; the latter is subdivided into an upper Animikean (north-east Minnesota) or Penokean (north-west Wisconsin) ; a middle and a lower division. Each ol these four groups is separated by marked unconformity from the rocks above and below. Huronian rocks are well developed in the following districts: the Marquette region of northern Michigan, comprising quartzites, slates and conglomerates, with important iron-bearing slates and schists and ferruginous cherts; \n the Menominee district of Michigan and Wisconsin similar rocks occur; the Penokee-Gogebic district of Wisconsin and Michigan comprises quartzites, shales and limestones, with beds and dikes of diabase and olivine-gabbro ; the same rocks occur in the Crystal Falls, north Michigan ; the Mesabi and Vermilion districts, Minnesota, and north of Lake Michigan rock groups of this age take an important place. The valuable iron ores of Mesabi, Penokee-Gogebic and Menominee belong mainly to the Animikean group; in the Penokee rocks of this age vast thicknesses of igneous rocks constitute the greater part of the formation. The Keweenawan rocks are said to attain the enormous thickness of 50,000 ft. ; the higher beds are mainly sandy sediments and conglomerates; in the lower portions are great igneous masses, gabbros, diabase and porphyries ; thus in the St Croix valley, north- west Wisconsin and Minnesota, no fewer than 65 lava flows and 5 conglomeratic beds have been counted, which together aggregate some 20,000 ft. in thickness. Some of these lava flows appear to have been due to fissure eruptions. The native copper deposits of this age in north

Michigan are the most extensive known.

Pre-Cambrian rocks occupy large areas and reach great thicknesses in the eastern provinces of Canada; in Newfoundland 10,000 ft. of strata lie between the Archean and Cambrian (the Terranovian series of South Hunt; Avalon group of others); similar rocks occur also north of the Great Lakes and in the Hudson Bay region. They are found also in great force in the Colorado Canyon, in the Adirondack Mountains, and Black Hills of S. Dakota and elsewhere.

Turning to Europe, we find pre-Cambrian rocks in Brittany, the " phyllades de Saint L6," or Brioverian of Chas. Barrois; and along the western border of France and south-west of the central massif. In the Fichtelgebirge, the Silesian mountains and east Thuringia similar rocks occur; the Przibramer Schiefer of Lipoid and rocks in J. Barrande's stage A are of this age. Probably the metamor- phosed eruptive rocks on the southern border of the Hunsriick and Taunus are pre-Cambrian. Large tracts of metamorphic sedimentary rocks that may be classed here are found in Shantung and north China, and probably also in Brazil, India and Australia. In South Africa the gold-bearing Witwatersrand beds of the Transvaal and the overiying Ventersdorp and Potchefstroom systems; the Griqua- land system and Cango and Ibeques systems of Cape Colony, all occur above Archean rocks and below those of Devonian age; they cannot as yet, therefore, be classed as pre-Cambrian and their age is still uncertain.

Little can be said of the climatic conditions of this remote period, the fossil evidence being so poor; but it is of interest to note that in certain regions, viz. in the Lake Huron region, in the Gaisa series of Varanger Fjord, Norway, and in the Yangtse district in China, conglomerate beds are found in which many of the boulders are scratched like those of the Dwyka beds of South Africa, and thus suggest the possibility of glacial conditions at some stages of the period.

For literature see Geological Literature added to the Geological Society's Library (annual). (J. A. H.)

PRECARIOUS, literally, held on the good-will of another, or on entreaty (Lat. prex, precis, prayer) to another. The word is used, in law, of a tenure of land, office, &c, held at the pleasure of another. In general usage it has the significance of something uncertain, dangerous or risky.

PRECEDENCE (from Lat. praecedere, to go before, precede). This word in the sense in which it is here employed means priority of place, or superiority of rank, in the conventional system of arrangement under which the more eminent and dignified orders of the community are classified on

occasions of public ceremony and in the intercourse of private life. In the United Kingdom there is no complete and comprehensive code whereby the scheme of social gradation has been defined and settled, once and for all, on a sure and lasting foundation. The principles and rules at. present controlling it have been formulated at different periods and have been derived from various sources. The Crown is the fountain of honour, and it is its undoubted prerogative to confer on any of its subjects, in any part of its dominions, such titles and distinctions and such rank and place as to it may seem meet and convenient. Its discretion in this respect is altogether unbounded at common law, and is limited in those cases only wherein it-has been submitted to restraint

by act of parliament. In the old time all questions of precedence came in the ordinary course of things within the jurisdiction of the court of chivalry, in which the lord high constable and earl marshal presided as judges, and of which the kings of arms, heralds and pursuivants were the assessors and executive officers. When, however, points of unusual moment and magnitude "happened to be brought into controversy, they were occasionally considered and decided by the sovereign in person, or by a special commission, or by the privy council, or even by the parliament itself. But it was not until towards the middle of the 16th century that precedence was made the subject of any legislation in the proper meaning of the term. 1

In 1539 an act " for the placing of the Lords in Parliament " (31 Hen. VIII. c. 10) was passed at the instance of the king, and by it the relative rank of the members of the royal family, of the great officers of state and the household, and of the hierarchy and the peerage was definitely and definitively ascertained. In 1563 an act "for declaring the authority of the Lord Keeper of the Great Seal and the Lord Chancellor to be the same " (5 Eliz. c. 18) also declared their precedence to be the same. Questions concerning the precedence of peers are mentioned in the Lords Journals 4 & 5 Ph. and M. and 39 Eliz., but in the reign of James I. such questions were often referred to the commissioners for executing the office of earl marshal. In the reign of Charles I. the House of Lords considered several ques- tions of precedency and objected in the earl of Banbury's case to warrants overruling the statute of 31 Hen. VIII. In 1689 an act " for enabling Lords Commissioners of the Great Seal to execute the office of Lord Chancellor or Lord Keeper " (1 Will, and Mary c. 21) gave to the commissioners not being peers of the realm place next to the speaker of the House of Commons and to the speaker place next to the peers of the realm. In 1707 the Act of Union with Scotland (6 Anne c. 11) provided that all peers of Scotland should be peers of Great Britain 2 and should have rank immediately after the peers of the like degrees in England at the time of the union and before all peers of Great Britain of the like degrees created after the union. In 1800 the Act of Union with Ireland (39 & 40 Geo. III. c. 67)

provided that the lords spiritual of Ireland should have rank immediately after the lords spiritual of the same degree in Great Britain, and that the lords temporal of Ireland should have rank immediately after the lords temporal of the same degree in Great Britain at the time of the union, and further that " peerages of Ireland created after the union should have precedence with peerages of the United Kingdom created after the union according to the dates of their creation." At different times too during the current century several statutes have been passed for the reform and extension of the judicial organization which have very materially affected the precedence of the judges, more especially the Judicature Act of 1873 (36 & 37 Vict. c. 66), under which the lords justices of appeal and the justices of the High Court now receive their appointments. But the statute of Henry VIII. " for the placing of the Lords " still remains the only legislative measure in which it has been attempted to deal directly and systematically with any large and important section of the scale of general precedence; and the law, so far as it relates to the ranking of the sovereign's immediate kindred whether lineal or collateral, the principal ministers of the Crown and court, and both the spiritual and temporal members of the House of Lords, is to all practical intents and purposes what it was made by that statute nearly 350 years ago. Where no act of parliament applies precedence is determined either by the will and pleasure of the sov- ereign or by what is accepted as " ancient usage and established

1 Ample materials for the satisfaction of the curiosity of those who are desirous of investigating the history of precedence under its wider and more remote aspects will be found in such writers as Selden or Mackenzie, together with the authorities quoted or referred to by them : Selden, Titles of Honor, pt. ii. p. 740 seq. (London, 1672) ; Mackenzie, Observations upon The Laws and Customs of Nations as to Precedency (Edinburgh, 1680; and also reprinted in Guillim, Display of Heraldry, 6th ed., London, 1724).

2 For the parliamentary rights of Scottish peers see article Peerage.

custom." Of the sovereign's will and pleasure the appropri- ate method of announcement is by warrant under the sign- manual, or letters patent under the great seal. But, although the Crown has at all periods very frequently conceded special privileges of rank and place to particular persons, its interference with the scale of general precedence has been rare and excep- tional. In 1540 it was provided by warrant from Henry VIII. that certain officers of the household therein named should precede the

secretaries of state when and if they were under the degree of barons. 1 In 1612 James I. directed by letters patent, not without long and elaborate argument in the Star Chamber, that baronets, then newly created, should be ranked after the younger sons of viscounts and barons, and that a number of political and judicial functionaries should be ranked between knights of the Garter and such knights bannerets as should be made by the sovereign in person " under his standard displayed in an army royal in open war." 2 Four years later he further directed, also by letters patent, that the sons of baronets and their wives and the daughters of baronets should be placed before the sons of knights and their wives and the daughters of knights " of what degree or order soever." 3 And again in 1620 the same king commanded by warrant " after solemn argument before his majesty " that the younger sons of earls should precede knights of the privy council and knights of the Garter not being "barons or of a higher degree." 4 If we add to these ordinances the provisions relating to precedence contained in the statutes of several of the orders of knighthood which since then have been instituted or reconstructed, we shall nearly, if not quite, exhaust the catalogue of the interpositions of the sovereign with regard to the rank and place of classes as distinguished from individuals. Of " ancient usage and established custom " the records of the College of Arms furnish the fullest and most trustworthy evidence. Among them in particular there is a collection of early tables of precedence which were published by authority at intervals from the end of the 14th to the end of the 15th century, and to which peculiar weight has been attached by many successive generations of heralds. On them, indeed, as illustrative of and supplementary to the action of parliament and the Crown, all subsequent tables of precedence have been in great measure founded. The oldest is the " Order of All Estates of Nobles and Gentry," prepared apparently for the coronation of Henry IV. in 1399, under the supervision of Ralph Nevill, earl of Westmorland and earl marshal; and the next is the " Order of All States of Worship and Gentry," prepared, as announced in the heading, for the coronation of Henry VI. in 1429, under the supervision of the lord protector Humphrey, duke of Gloucester, and the earl marshal, John Mowbray, duke of Norfolk. Two more are of the reign of Edward IV., and were severally issued by John Tiptoft, earl of Worcester and lord high constable, in 1467, and by Anthony Widvile, Earl Rivers and lord high constable, in 1479. The latest is commonly and shortly known as the " Series Ordinum," and was drawn up by a special commission presided over by Jasper Tudor, duke of Bedford, it is presumed for observance at the marriage of Henry VII. and Elizabeth of York in i486. To these may be added the " Order for the Placing of Lords and Ladies," taken at a grand entertainment given by command of Henry VIII. at the king's manor-house of Richmond in 1520 by Charles Somerset, earl of Worcester, lord chamberlain of the household, to the French ambassador, Olivier de la

Vernade, seigneur de la Batie; the " Precedency of All Estates," arranged in 1594 by the commissioners for

1 Quoted by Sir Charles Young from State Papers: published by Authority (4to, 1830), p. 623, in Privy Councillors and their Precedence (1850), p. 15.

2 Patent Rolls, 10th Jac, pt. x. mem. 8. It is commonly stated that the bannerets here referred to could be made by the prince of Wales as well as by the king. But the privilege was conferred by James I. on Henry, the then prince of Wales, only (Selden, Titles of Honor, pt. ii. p. 750).

3 Ibid., 14th jac, part ii. mem. 24; Selden, Titles of Honor, part ii. p. 752.

4 Cited by Sir Charles Young, Order of Precedence, with Authorities and Remarks, p. 27 (London, 1851).

executing the office of earl marshal; and the " Roll of the King's Majesty's most Royal Proceeding through London " from the Tower to Whitehall on the eve of the coronation of James I., also arranged by the commissioners for executing the office of earl marshal. On many isolated points, too, of more or less importance, special declaratory decisions have been from time to time propounded by the earls marshal, their substitutes and deputies; for example, in 1594, when the younger sons of dukes were placed before viscounts; in 1625, when the rank of knights of the Bath and their wives was fixed; and in 1615 and 1677, when the eldest sons of the younger sons of peers were placed before the eldest sons of knights and of baronets. It is from these miscellaneous sources that the precedence among others of all peeresses, the eldest sons and their wives and the daughters of all peers, and the younger sons and their wives of all dukes, marquesses and earls is ascertained and established. And further, for the purpose of proving continuity of practice and disposing of minor questions not otherwise and more conclusively set at rest, the official programmes and accounts preserved by the heralds of different public solemnities and processions, such as coronations, royal marriages, state funerals, national thanks-givings and so on, have always been considered to be of great historical and technical value. 5

1. — General Precedence of Men. The sovereign; (1) prince of Wales; (2) younger sons of the sovereign; (3) grandsons of the sovereign; (4) brothers of the sovereign; (5) uncles of the sovereign; (6) nephews of the sovereign; 6 (7) ambassadors; (8) archbishop of Canterbury, primate of all England; (9) lord high chancellor of Great Britain or lord keeper of the great seal; (10) archbishop of York, primate of England; 7 (n) prime minister; (12) lord high treasurer of Great

5 Selden, Titles of Henor, pt. ii. p. 753.

6 The precedence of the members of the royal family depends on their relationship to the reigning sovereign and not on their relation- ship to any of the predecessors of the reigning sovereign. It is pro- vided by 31 Hen. VIII. c. 10 that no person, " except only the King's children," shall have place " at the side of the Cloth of Estate in the Parliament Chamber," and that " the King's Son, the King's Brother, the King's Nephew, or the King's Brother's or Sister's Sons," shall have place before all prelates, great officers of state and peers. Lord Chief Justice Coke was of opinion that the king's nephew meant the king's grandson or nepos {Institutes, vol. iv. ch. 77). But, as Mr Justice Blackstone says, " under the description of the King's children his grandsons are held to be included without having recourse to Sir Edward Coke's interpretation of nephew " (Commentaries, vol. i. ch. 4). Besides, if grandson is to be understood by nephew, the king's grand- son would be placed after the king's brother. The prince of Wales is not specifically mentioned in the statute " for the placing of the Lords " ; but, as he is always, whether the son or the grandson of the sovereign, the heir-apparent to the Crown, he is ranked next to the sovereign or the queen-consort. With the exception of the prince of Wales, all the male relations of the sovereign are ranked first in the order of their degrees of consanguinity with him or her, and secondly, in the order of their proximity to the succession to the Crown ; thus the members of the several groups into which the royal family is divided take precedence according to their own seniority and the seniority of their fathers or mothers, the sons of the sons or brothers of the sovereign being preferred to the sons of the daughters or sisters of the sovereign among the sovereign's grandsons and nephews.

7 By 31 Hen. VIII. c. 10, the king's vicegerent " for good and due ministration of justice in all causes and cases touching the ecclesiastical jurisdiction " is placed immediately before the arch- bishop of Canterbury. The office of vicegerent or vicar-general was then held by Thomas, Lord Cromwell, afterwards earl of Essex, together with that of lord privy seal, and it was never conferred on any other person. By the Act of Union with Ireland the archbishops of Ireland had place next to the archbishops of England, and if consecrated before and not after the disestablishment of the Church in Ireland they retain this position under the Irish Church Act of 1869. At the coronation of William IV. the lord chancellor of Ireland walked next after the lord chancellor of Great Britain and before the lord president of the council and lord privy seal. In Ireland, if he is a peer he has precedence between the archbishops of Armagh and Dublin, and if he is not a peer after the archbishop of Dublin. But, except in the House of Lords, the precedence of the lord chancellor of Great Britain or the lord keeper of the great seal is the same whether he is a peer or a commoner.

The lord keeper has the same precedence as the lord chancellor under 5 Eliz. c. 18. But the last appointment to the lord keepership was that of Sir Robert Henley, afterwards Lord Henley, lord chancellor, and earl of Northington, in 1757, and the office is not likely to be revived.

Britain; (13) lord president of the privy council; (14) lord keeper of the privy seal; 1 (15) lord great chamberlain of England; (16) lord high constable of England; (17) earl marshal; (18) lord high admiral; (19) lord steward of the household; (20) lord chamber- lain of the household; 2 above peers of their own degree; (21) dukes; 3 (22) marquesses; (23) dukes' eldest sons; 4 (24) earls; (25) marquesses' eldest sons; {26) dukes' younger sons; (27) viscounts; (28) earls' eldest sons; (29) marquesses' younger

1 The lord president of the council and the lord privy seal, if they are peers, are placed by 31 Hen. VIII. c. 10 before all dukes except dukes related to the sovereign in one or other of the degrees of consanguinity specified in the act. And, since the holders of these offices have been and are always peers, their proper precedence if they are commoners has never been determined.

2 It is provided by 31 Hen. VIII. c. 10 that " the Great Chamber- lain, the Constable, the Marshal, the Lord Admiral, the Grand Master or Lord Steward, and the King's Chamberlain shall sit and be placed after the Lord Privy Seal in manner and form following: that is to say, every one of them shall sit and be placed above all other person- ages being of the same estates or degrees that they shall happen to be of, that is to say the Great Chamberlain first, the Constable next, the Marshal third, the Lord Admiral the fourth, the Grand Master or Lord Steward the fifth, and the King's Chamberlain the sixth." The office of lord high steward of England, then under attainder, is not mentioned in the act for the placing of the Lords, " because it was intended," Lord Chief Justice Coke says, " that when the use of him should be necessary he should not endure longer than hac vice " (Inst. iv. 77). But it may be noted that, when his office is called out of abeyance for coronations or trials by the House of Lords, the lord high steward is the greatest of all the great officers of state in England. The office of lord great chamberlain of England is hereditary in the coheirs of the last duke of Ancaster, who inherited it from the De Veres, earls of Oxford, in whose line it had descended from the reign of Henry I. The office of lord high constable of England, also under attainder, is called out of abeyance for and pending coronations only. The office of earl marshal is

hereditary in the Howards, dukes of Norfolk, premier dukes and, as earls of Arundel, premier earls of England, under a grant in special tail male from Charles II. in 1672. The office of lord high admiral, like the office of lord high treasurer, is practically extinct as a dignity. Since the reign of Queen Anne there has been only one lord high admiral, namely, William, duke of Clarence, afterwards William IV., for a few months in the Canning administration of 1827. The lord steward and the lord chamberlain of the household are always peers, and have seldom been under the degree of earls. We may here remark that both the Scottish and Irish Acts of Union make no reference to the precedence of the great officers of state of Scotland and Ireland. Not to mention the prince of Wales, who is by birth steward of Scot- land, the earl of Shrewsbury is hereditary great seneschal of Ireland; the duke of Argyll is hereditary master of the household; the eari of Errol is hereditary lord high constable of Scotland; but what places they are entitled to in the scale of general precedence is alto- gether doubtful and uncertain. In Ireland the great seneschal ranks after the lord chancellor if he is a commoner, and after the archbishop of Dublin if the lord chancellor is a peer, and in both cases before dukes (" Order of precedence," Dublin Gazette, June 3, 1843). Again, on George IV.'s visit to Edinburgh in 1821, the lord high constable had place as the first subject in Scotland immediately after the members of the royal family. At every coronation from that of George III. to that of Queen Victoria, the lord high constable of Scotland has been placed next to the earl marshal of England, and, although no rank has been assigned on these occasions to the hereditary great seneschal of Ireland, the lord high constable of Ireland appointed for the ceremony has been at all or most of them placed next to the lord high constable of Scotland. It is worthy of notice, however, that Sir George Mackenzie, writing when lord advocate of Scotland in the reign of Charles II., says that " the Constable and Marischal take not place as Officers of the Crown but according to their creation as Earls," and he moreover expresses the opinion that " it seems very strange that these who ride upon the King's right and left hand when he returns from his Parliaments and who guard the Parliament itself, and the Honours, should have no precedency by their offices " (Observations, &c, p. 25, in Guillim's Display of Heraldry, p. 461 seq. ; but see also Wood-Douglas, Peerage of Scotland, i. 557).

3 Both Sir Charles Young and Sir Bernard Burke place " Dukes of the Blood Royal " before dukes, their eldest sons before marquesses, and their younger sons before marquesses' eldest sons. In the " Ancient Tables of Precedence," which we have already cited, dukes of the blood royal are always ranked before other dukes, and in most of them their eldest sons and in some of them their younger sons are placed in a corresponding order of precedence. But in this connexion the words of the act for the placing of

the Lords are perfectly plain and unambiguous: " All Dukes not aforementioned," i.e. all except only such as shall happen to be the king's son, the king's brother, the king's uncie, the king's nephew, or the king's brother's or sister's son, " Marquesses, Earls, Viscounts and Barons, not having any of the offices aforesaid, shall sit and be placed after their ancienty as

sons; (30) bishops; (31) barons; 5 (32) speaker of the House of Commons; (33) commissioners of the great seal; 6 (34) treasurer of the household; (.35) comptroller of the household; (36) master of the horse; (37) vice-chamberlain of the household; (38) secretaries of state; 7 (39) viscounts' eldest sons; (40) earls' younger sons; (41) barons' eldest sons; (42) knights of the Garter; 8 (43) privy councillors; 9 (44) chancellor of the exchequer; (45) chancellor of the duchy of Lancaster; (46) lord chief it hath been accustomed." As Lord Chief Justice Coke and Mr Justice Blackstone observe, the degrees of consanguinity with the sovereign to which precedence is given by 31 Hen. VIII. c. 10 are the same as those within which it was made high treason by 28 Hen. VIII. c. 18 for any man to contract marriage without the consent of the king. Queen Victoria, by letters patent under the great seal in 1865, ordained that, " besides the children of Sovereigns of these realms, the children of the sons of any of the Sovereigns of Great Britain and Ireland shall have and at all times hold and enjoy the style or attribute of ' Royal Highness ' with their titular dignity of Prince or Princess prefixed to their respective Christian names, or with their other titles of honour." But, notwithstanding this, their rank and place are still governed by the act for the placing of the Lords. The duke of Cumberland has no precedence as a cousin of the king, being the grandson of a son of George III. and would not be a " Royal Highness " at all if his father had not been, like his grandfather, king of Hanover. In Garter's Roll of the Lords Spiritual and Temporal, the official list of the House of Lords, the duke of Cumberland is entered in the precedence of his dukedom after the duke of Northumberland. Under the combined operation of the act for the placing of the Lords and the Acts of Union with Scotland (art. 23) and with Ireland (art. 4), peers of the same degrees, as dukes, marquesses, earls, viscounts and barons, severally, have precedence according to priority in the creation of their respective peerages. But peerages of England created before 1707 precede peerages of Scotland created before 1707, peerages of Great Britain created between 1707 and 1801 precede peerages of Ireland created before 1801, and peerages of Ireland created before 1801 precede peerages of the United Kingdom and of Ireland created after 1801, which take precedence in common. The relative precedence of the members of the House of Lords, including the representative peers of Scotland and Ireland, is officially set forth in Garter's roll, which is prepared by the Garter king of arms at the commencement of each session

of parliament, that of the Scottish peers generally in the Union Roll, and that of the Irish peers generally in Ulster's Roll, a record which is under the charge of and is periodically corrected by the Ulster king of arms. The Union Roll is founded on the " Decreet of Ranking " pronounced and promulgated by a royal commission in 1606, which, in the words of an eminent authority in such matters, " was adopted at once as the roll of the peers in Parliament, convention and all public meetings, and continued to be called uninterruptedly with such alterations upon it as judgments of the Court of Session upon appeal in modification of the precedency of certain peers rendered necessary, with the omission of such dignities as became extinct and with the addition from time to time of newly created peerages — down to the last sitting of the Scottish Parliament on the 1st of May 1707 " (The Earldom of Mar, &c, by the earl of Crawford (25th) and Balcarres (8th), ii. 16).

4 Eldest sons of peers of any given degree are of the same rank as, but are to be placed immediately after, peers of the first degree under that of their fathers; and the younger sons of peers of any given degree are of the same rank, but are to be placed after peers of the second degree and the eldest sons of peers of the first degree under that of their fathers.

6 Secretaries of state, if they are barons, precede all other barons under 31 Hen. VIII. c. 10. But if they are of any higher degree their rank is not influenced by their official position.

6 Under 1 Will, and Mary, c. 21, being the only commissioners for the execution of any office who have precedence assigned to them.

7 The officers of the household who, under Henry VIII. 's warrant of 1540, precede the secretaries of state have been for a long time always peers or the sons of peers, with personal rank higher, and usually far higher, than their official rank. The practical result is, seeing also that the great seal is only very rarely indeed in commission, that the secretaries of state, when they are commoners whose personal precedence is below a baron's, have official precedence immediately after the speaker of the House of Commons. The principal secretaries, for so they are all designated, are officially equal to one another in dignity, and are placed among themselves according to seniority of appointment.

8 During more than two centuries only one commoner has been indebted for his precedence to his election into the order, and that was Sir Robert Walpole, the minister, who at the coronation of George II. in 1727 was placed as a knight of the Garter immediately before privy councillors. The proper precedence of both knights of the Thistle and knights of St Patrick is undecided.

9 Privy councillors of Great Britain and of Ireland take precedence in common according to priority of admission. The chancellors of the exchequer and of the duchy of Lancaster, the lord chief justice

justice of England; (47) master of the rolls; (48) lords justices of appeal; 1 (49) judges of the High Court of Justice; 2 (50) knights bannerets made by the sovereign in person; (51) vis- counts' younger sons; (52) barons' younger sons; (53) sons of lords of appeal; 3 (54) baronets; 4 (55) knights bannerets not made by the sovereign in person; (56) knights of the first class of the Bath, the Star of India, St Michael and St George; 6 (57) the Indian Empire, the Royal Victorian Order; (58) knights of the second class of the Bath, the Star of India, and St Michael and St George; 6 other orders K.C.I.E., &c; (59) knights bache- lors; 7 (60) sons of commanders of the Royal Victorian Order; (61) judges of county courts; 8 (62) eldest sons of the younger sons of peers; (63) baronets' eldest sons; (64) knights' eldest sons; (65) baronets' younger sons; (66) knights' younger sons; 9

of England, the master of the rolls, and the lords justices of appael are always members of the privy council, and have rank and place as privy councillors, if they are not also peers.

1 The lords justices of appeal have precedence among themselves according to seniority of appointment. Until recently they were preceded by the lord chief justice of the common pleas and the lord chief baron of the exchequer (divisions of the High Court of Justice). But under existing arrangements these offices have fallen into abey- ance, although they have not been formally abolished. The vice- chancellors used to follow the lords justices of appeal; but, in spite of the fact that there is still one vice-chancellor remaining, the office of vice-chancellor is extinct and will altogether disappear on his decease. In Ireland all these offices are in existence, but they have no precedence allotted to them in England; as the judges holding them are invariably privy councillors, however, they are ranked accordingly. And it is the same with regard to the lord justice- general and the lord justice-clerk in Scotland.

2 The judges of all the divisions of the High Court of Justice are ranked together according to seniority of appointment. Neither the senators of the College of Justice in Scotland nor the judges of the various divisions of the High Court in Ireland have any precedence in England. The precedence of the Scottish judges among them- selves is settled by a royal warrant of Nisbet in his System of Heraldry. The precedence of the Irish judges among

themselves is the same as the precedence of the English judges among themselves used to be before the offices of chief justice of the common pleas and chief baron of the exchequer were suspended.

3 By warrants of the 30th of March 1898, although lords of appeal rank with hereditary barons in order of creation, their sons stand in a class by themselves.

4 It is a question whether baronets ought or ought not to have precedence, like peers, according as they are of England, Scotland, Great Britain, Ireland or the United Kingdom. Baronets are not referred to in either the Scottish or the Irish Act of Union; and Sir Bernard Burke contends that, since the Acts of Union are silent with regard to them, they are still entitled to whatever pre- cedence was originally conferred on them. He therefore places the whole body of the baronets together in the order merely of the dates of their several creations, and in this he appears to us to have both law and reason on his side.

6 These knights consist of grand crosses of the first, grand commanders of the second, and grand crosses of the third order, and have precedence in their respective orders according to seniority of creation. By the statutes of the order of the Bath, as revised in 1847, it is ordained that the knights grand crosses are to be placed " next to and immediately after baronets," thus superseding knights bannerets not created by the sovereign in person.

6 Knights commanders of all three orders are placed in each order according to seniority of creation.

7 Knights bachelors are ranked together according to seniority of creation, whether they are made by the sovereign or the lord lieutenant of Ireland.

8 Royal x. Warrant of 1884.

9 The sons of all persons, when any specified rank is assigned to them, are placed in the precedence of their fathers. Eldest sons of the younger sons of peers were ranked before the eldest sons of knights by order of the earl marshal, the 18th of March 1615, and before the eldest sons of baronets by order of the earl marshal, the 6th of April 1677. But no precedence has been given to the younger sons of the younger sons of peers, although precedence is given to the younger as well as the eldest sons of baronets and knights by James I.'s decree of 1616. Moreover, no precedence has been given to either the eldest or the younger sons of the eldest sons of peers. But in practice this omission is generally disre- garded, and the children of the eldest sons of dukes, marquesses and earls, at all events, are accorded the same rank and titles which they would have if their fathers

were actual instead of quasi peers of the degree next under that of their grandfathers. Sir Charles Young says that " by decision (Chap. Coll. Arms of 1680) if the eldest son of an earl died in his father's lifetime leaving a son and heir, such son and heir during the life of the earl his grandfather is

(67) companions of the Bath, the Star of India, St Michael and St George and the Indian Empire; 10 (68) members of the 4th class of the Royal Victorian Order; (69) companions of the Distinguished Service Order; (70) members of the 5th class of the Royal Victorian Order; (71) esquires; 11 (72) gentlemen. 12

2. — General Precedence of Women

The Queen; 13 (1) queen dowager; (2) princess of Wales; (3) daughters of the sovereign; (4) wives of the sovereign's younger sons; (5) granddaughters of the sovereign; (6) wives of the sovereign's grandsons; (7) sisters of the sovereign; (8) wives of the sovereign's brothers; (9) aunts of the sovereign; (10) wives of the sovereign's uncles; (n) nieces of the sovereign;

entitled to the same place and precedence as was due to his father : so had the father been summoned to parliament as the eldest son of a peer the grandson would succeed to the dignity even during the grandfather's lifetime " (Order of Precedence, p. 27). And, of course, what applies to the grandson and heir of an earl applies equally to the grandsons and heirs of dukes and marquesses. But the grandsons and heirs of viscounts and barons are differently situated, and have neither honorary additions to their names nor any ascer- tained place and precedence even by the etiquette of society.

'".Companions are members of the third class of the first three orders and the only members of the fourth order, except the sovereign and the grand master. Sir Charles Young and Sir Bernard Burke concur in placing the companions of these orders before the eldest sons of the younger sons of peers, on the ground that under their statutes they are entitled to precede " all Esquires of the Realm." But the sons of peers themselves — the eldest as well as the younger — are merely esquires, and are ranked before, and not among, other esquires because they have a particular preced- ence of their own assigned to them. Similarly the eldest sons of the younger sons of peers and the eldest sons of baronets and of knights who are also esquires, and likewise the younger sons of baronets and of knights who are not esquires, have a particular precedence of their own assigned to them. All of them are placed before esquires as a specific grade in the scale of general precedence, and it seems clear enough that it is before esquires, considered as a specific grade, that the companions of the orders ought to be placed

and not before any other persons who, whether they are or are not esquires, have a definite and settled rank which is superior to that specific grade in the scale of general precedence.

11 It appears to be admitted on all hands that the following persons are esquires and ought to be so described in all legal docu- ments and processes: first, the eldest sons of peers in the lifetime of their fathers, and the younger sons of peers both in and after the lifetime of their fathers; secondly, the eldest sons of the younger sons of peers and their eldest sons in perpetual succession, and the eldest sons of baronets and knights; thirdly, esquires created with or without the grant of armorial bearings by the sovereign; fourthly, justices of the peace, barristers-at-law and mayors of corporations; and fifthly, those who are styled esquires in patents, commissions or appointments to offices under the Crown in the state, the household, the army or navy and elsewhere. Sir Bernard Burke accords precedence to serjeants-at-law and masters in lunacy, not only before esquires as such, but also before the companions of the orders of knighthood. It is, however, enough to observe with regard to the first, since no more of them are to be created, that, in spite of the extravagant pretensions which have been fre- quently urged by them and on their behalf, " they have not in the general scale," as Sir Charles Young says, " any precedence, and when under the degree of a Knight rank only as Esquires "; and with regard to the second, that the statute 8 & 9 Vict. c. 100, on which the Ulster king of arms bases their claims, simply provides that they " shall take the same rank and precedence as the masters in ordinary of the High Court of Chancery," who are now extinct, " apparently," to recur to Sir Charles Young, " assuming the rank of the masters without defining it." " The masters, however," he adds, " as such have not a settled place in the order of general precedency emanating from any authority by statute or otherwise " (Order of Precedence, p. 71). Sir William Blackstone says that before esquires " the Heralds rank all Colonels, Serjeants-at-Law and Doctors in the three learned professions " (Commentaries, vol. i. ch. 12). But the only foundation for this statement seems to be a passage in Guillim, which is obviously without any authority.

12 The heralds and lawyers are agreed that gentlemen are those who, by inheritance or grant from the Crown, are entitled to bear coat armour (see Coke, Inst. iv. ch. 77; Blackstone, Comm. i. ch. 12; Selden, Titles of Honor, pt. ii. ch. 8; Guillim, Display of Heraldry, pt. ii. ch. 26).

13 The queen-consort is the second personage in the realm, and has precedence of the queen-dowager. But the husband of a reign- ing queen has no rank or place except such as is specially accorded to him by the sovereign.

(12) wives of the sovereign's nephews; 1 (13) wives of dukes of the blood royal; (14) duchesses; 2 (15) wives of eldest sons of dukes of the blood royal; (16) marchionesses; (17) wives of the eldest sons of dukes; (18) dukes' daughtersj 3 (19) countesses; (20) wives of younger sons of dukes of the blood royal; (21) wives of the eldest sons of marquesses; (22) marquesses' daughters; (23) wives of the younger sons of dukes; (24) viscountesses; (25) wives of the eldest sons of earls; (26) earls' daughters, (27) wives of the younger sons of marquesses; (28) baronesses; (29) wives of the eldest sons of viscounts; (30) viscounts' daughters; (31) wives of the younger sons of earls; (32) wives of the eldest sons of barons; (a) barons' daughters; (34) maids of honour to the queen; 4 (33) wives of knights of the Garter; (36) wives of knights bannerets made by the sovereign in person; (37) wives of the younger sons of viscounts; (38) wives of the younger sons of barons; (39) baronets' wives; (40) wives of knights bannerets not made by the sovereign in person; (41) wives of knights of the Thistle; (42) wives of knights of St Patrick; (43) wives of knights grand crosses of the Bath, grand commanders of the Star of India, and grand crosses of St Michael and St George; (44) wives of knights commanders of the Bath, the Star of India, and St Michael and St George; (45) knights bachelors' wives; (46) wives of the eldest sons of the younger sons of peers; (47) daughters of the younger sons of peers; (48) wives of the eldest sons of baronets; (49) baronets' daughters; (50) wives of the eldest sons of knights; (51) knights' daughters; (52) wives of the younger sons of baronets; (53) wives of the younger sons of knights; 5 (54) wives of commanders of the Royal Victorian Order, companions of the Bath, the Star of India, St Michael and St George, and the Indian Empire; (55) wives of members of the 4th class Royal Victorian Order; (56) wives of esquires; 6 (57) gentlewomen; 7

A special table of precedence in Scotland is regulated by a royal warrant dated the 16th of March 1905, and a special table of precedence in Ireland was set forth by authority of the Lord Lieutenant (Jan. 2, 1895). Both contain errors and will probably be revised.

Attention to the foregoing tables will show that general precedence is of different kinds as well as of several degrees. It is first either personal or official, and secondly either substan- tive or derivative. Personal precedence belongs to the royal

1 There is no act of parliament or ordinance of the Crown regu- lating the precedence of the female members of the royal family. But the above is the gradation which appears to have become established among them, and follows the analogy supplied by the act for the placing of the lords in the case of their husbands and brothers.

2 Peeresses in their own right and peeresses by marriage are ranked together, the first in their own precedence and the second in the precedence of their husbands.

3 Among the daughters of peers there is no distinction between the eldest and the younger as there is among the sons of peers. Their precedence is immediately after the wives of their eldest brothers, and several degrees above the wives of their younger brothers. They are placed among themselves in the precedence of their fathers. But the daughter of the premier duke or baron ranks after the wife of the eldest son of the junior duke or baron.

4 Maids of honour to the queen are the only women who have any official precedence. They have the style or title of honour- able, and are placed immediately after barons' daughters by Sir Bernard Burke, the rank which is accorded to them by the eti- quette of society. But Sir Charles Young does not assign any precedence to them, and we do not know on what authority the Ulster king of arms does so, although he is by no means singular in the course he has taken.

6 The wives of baronets and knights, the wives of the eldest sons and the daughters of the younger sons of peers, and the wives of the sons and the daughters of baronets and knights are all placed severally in the precedence of their respective husbands, husbands' fathers and fathers.

6 " Esquire " and " gentleman " are not names of " dignity " but names of " worship," and esquires and gentlemen do not, in strictness, convey or transmit any precedence to their wives or children (see Coke, Inst, ii., " Of Additions," p. 667).

7 " And generosus and generosa are good additions: and if a gentlewoman be named Spinster in any original writ, i.e. appeal or indictment, she may abate and quash the same, for she hath as good right to that addition as Baroness, Viscountess, Marchioness or Duchess have to theirs " (Coke, Inst,

ii., "Of Additions," p. 668).

family, the peerage and certain specified classes of the com- monalty. Official precedence belongs to such of the dignitaries of the Church and such of the ministers of state and the household as have had rank and place accorded to them by parliament or the Crown, to the speaker of the House of Commons and to the members of the privy council and the judicature. Substantive precedence, which may be either personal or official, belongs to all those whose rank and place are enjoyed by them indepen- dently of their connexion with anybody else, as by the arch- bishop of Canterbury, the lord high chancellor or the lord great chamberlain, peers and peeresses, baronets, knights and some esquires. Derivative precedence, which can only be personal, belongs to all those whose rank and place are determined by their consanguinity with or affinity to somebody else, as the lineal and collateral relations of the sovereign, the sons, daugh- ters and daughters-in-law of peers and peeresses in their own right, and the wives, sons, daughters and daughters-in-law of baronets, knights and some esquires.. It is to be observed, however, that the precedence of the sovereign is at once official and personal, and that the precedence of peeresses by marriage is at once derivative and substantive. In the case of the sover- eign it is his or her actual tenure of the office of king or queen which regulates the rank and place of the various members of the royal family, and in the case of peeresses by marriage, although their rank and place are derivative in origin, yet they are substantive in continuance, since during coverture and widow- hood peeresses by marriage are as much peeresses as peeresses in their own right, and their legal and political status is precisely the same as if they had acquired it by creation or inheritance.

Bearing the above definitions and explanations in mind, the following canons or rules may be found practically useful: —

1. Anybody who is entitled to both personal and official precedence is to be placed according to that which implies the higher rank. If, for example, a baron and a baronet are both privy councillors, the precedence of the first is that of a baron and the precedence of the second is that of a privy councillor. And similarly, except as hereafter stated, with respect to the holders of two or more personal or two or more official dignities.

2. Save in the case of the sovereign, official rank can never supply the foundation for derivative rank. Hence the official precedence of a husband or father affords no indication of the personal precedence of his wife or children. The wives and children, for example, of the archbishop of Canterbury, the lord high chancellor or the speaker of the House of Commons do not participate in their official rank but only in their personal

rank, whatever it may be.

3. Among subjects men alone can convey derivative rank, except in the case of the daughters and sisters of the sovereign, or of peeresses in their own right. But no man can acquire any rank or place by marriage. The sons-in-law or brothers-in-law of the sovereign and the husbands of peeresses in their own right have as such no precedence whatever. And the daughter and heiress of the premier duke of England, unless she happens to be also a peeress in her own right, does not transmit any rank or place to her children.

4. Within the limits of the peerage derivative rank is as a rule always merged in personal, as distinguished from official, substantive rank. If, for example, the younger son of a duke is created a baron or inherits a barony, his precedence ceases to be that of a duke's younger son and becomes that of a baron. But where the eldest son of a duke, a marquess or an earl is summoned to the House of Lords in a barony of his father's, or succeeds as or is created a baron, he is still, as before, " com- monly called " by some superior title of peerage, as marquess, earl or viscount, and retains his derivative precedence on all occasions, except in parliament or at ceremonies which he attends in his character as a peer. The younger sons of all peers, however, who are created or who inherit peerages — which they often do under special limitations — are everywhere placed according to their substantive rank, no matter how inferior it may be to their derivative rank. But if the son of a duke or a

marquess, whether eldest or younger, or the eldest son of an earl is consecrated a bishop his derivative rank is not merged in his substantive rank, because it is official, and his derivative and personal rank implies the higher precedence. Again, the daugh- ters of dukes, marquesses and earls who become peeresses by marriage or creation, or who inherit as peeresses, are placed according to their substantive and not according to their deriva- tive rank, although they may thereby be assigned a far lower precedence than that to which their birth entitles them.

5. The widows of peers and baronets have precedence imme- diately before the wives or widows of the next successors in their husbands' dignities. But the sons and daughters of peers and baronets have precedence immediately before the sons and daughters of the holders of the dignities to whom their fathers succeeded. The reason of this is that the first are senior in the dignities and the second are nearer in the line of succession to them.

6. The widows of peers who marry again either share the precedence of their second husbands or resume the precedence belonging to them independently of their marriage with their first husbands. Thus, if the daughter of a duke or an esquire marries first an earl and secondly a baron, although she remains a peeress, she is placed as a baroness instead of a countess. But if either of them should marry a commoner as her second husband, whatever may be his rank or degree, she ceases to be a peeress. While, however, the duke's daughter, if her second husband were not the eldest son of a duke, would resume her precedence as the daughter of a duke, the esquire's daughter would share the precedence of her second husband, whether he were a peer's son, a baronet, a knight or an esquire. The widows of peers have long kept their former rank in society, but they have no such right unless by permission of the sovereign, which permission has on several recent occasions been refused.

7. The widows of the eldest and younger sons of dukes and marquesses and of the eldest sons of earls, and also the widows of baronets and knights who marry again, are permitted by the etiquette of society to keep the titles and rank acquired by their first marriage if their second marriage is with a commoner whose precedence is considerably lower. But the widows of the younger sons of earls and of the eldest and younger sons of viscounts and barons, although their precedence is higher than that of the widows of baronets and knights, are not allowed to retain it, under any circumstances, after a second marriage.

8. Marriage does not affect the precedence of peeresses in their own right unless their husbands are peers whose peerages are of a higher degree, or, being of the same degree, are of more ancient creation than their own. If, for example, a baroness in her own right marries a viscount she is placed and described as a viscountess, or if she marries a baron whose barony is older than hers she is placed in his precedence and described by his title. But if she marries a baron whose barony is junior to hers she keeps her own precedence and title.

9. The daughters of peers, of sons of peers, baronets and knights retain after marriage the precedence they derive from their fathers, unless they marry peers of any rank or commoners of higher rank than their own. Hence, for example, the daughter of a duke who marries the eldest son of a marquess is placed as a duke's daughter, not as the wife of a marquess's eldest son, and the daughter of a baronet who marries the younger son of a knight is placed as a baronet's daughter and not as the wife of a knight's younger son.

10. What are termed " titles of courtesy " are borne by all the sons and daughters of peers and peeresses in their own right, who in this connexion

stand on exactly the same footing. The eldest sons of dukes, marquesses and earls are designated by the names of one or other of the inferior peerages of their fathers, usually a marquessate or an earldom in the first, an earldom or a viscounty in the second and a viscounty or barony in the third case. The rule applicable in former times, still adhered to by the older English dignities, was that a duke's eldest son was styled earl, the son of a marquess, viscount, the son of an earl,

baron. No such rule obtained in Scotland. But, whatever it may be, it is altogether without effect on the rank and place of the bearer, which are those belonging to him as the eldest son of his father. The younger sons of dukes and marquesses are styled " lords," followed by both their Christian names and surnames. The younger sons of earls and both the eldest and the younger sons of viscounts and barons are described as " honourable" before both their Christian names and surnames. The daughters of dukes, marquesses and earls are styled ' ' ladies " before both their Christian names and surnames. The daughters of viscounts and barons are described as "honourable " before both their Christian names and surnames. If the eldest son of a marquess or an earl marries a woman of rank equal or inferior to his own, she takes his title and precedence; but if she is of superior rank she retains, with her own precedence, the prefix " lady " before her Christian name followed by the name of her husband's title of courtesy. Again, if the younger son of a duke or a marquess marries a woman of rank equal or inferior to his own, she is called " lady," with his Christian and sur- name following, and is placed in his precedence, but, if she is of superior rank, she retains, with her own precedence, the prefix " lady " before her Christian name and his surname. If the daughter of a duke, a marquess or an earl marries the younger son of an earl, the eldest or younger son of a viscount or baron, a baronet, a knight or an esquire, &c, she retains, with her own precedence, the prefix " lady " before her Christian name and her husband's surname. If the daughter of a viscount marries the younger son of an earl or anybody of inferior rank to him, or the daughter of a baron marries the younger son of a viscount or anybody of inferior rank to him, she retains her own precedence with the prefix " honourable " before the addition " Mrs " and his surname or Christian name and surname. But, if her husband is a baronet or a knight, she is called the Honour- able Lady Smith or the Honourable Lady Jones, as the case may be. The wives of the younger sons of earls and of the eldest and younger sons of viscounts and barons, if they are of inferior rank to their husbands, take their precedence and are described as the Honourable Mrs, with the surnames or Christian names and surnames of their husbands following. The judges were placed by James I. before the younger sons of viscounts and barons and accorded the title of " honourable " (q.v.). But in this addition their wives do not participate, since it is merely an official

distinction.

It is manifest on even a cursory examination of the tables we have given that, although they embody the only scheme of general precedence, whether for men or for women, which is authoritatively sanctioned or recognized, they are in many respects very imperfectly fitted to meet the circumstances and requirements of the present day. 1 In both of them the limits prescribed to the royal family are pedantically and inconveni- ently narrow, and stand out in striking contrast to the wide and ample bounds through which the operation of the Royal Marriage Act (12 Geo. III. c. n) extends the disabilities but not the privileges of the sovereign's kindred. Otherwise the scale ot general precedence for women compares favourably enough with

1 " There are no doubt certain public ceremonials of State, such as Coronations, Royal Public Funerals and Processions of the Sovereign to Parliament, &c, wherein various public functionaries walk and have for the occasion certain places assigned to them, but which they may not at all times find the same, as it by no means follows that they are always entitled to the same place for having been there once: there is to a certain extent a precedent furnished thereby, and in some cases the uniformity of precedence in regard to one class over another has in such cases become estab- lished. This applies, for instance, to the places of the Gentlemen of the Privy Chamber, Law Officers of the Crown and Masters and Six Clerks in Chancery, who have no definite or fixed place in the tables of precedency regulating the. general orders of society, though in reference to State ceremonials they have certain places assigned in the order of procession in right of their offices, which, however, give them no general rank. Upon such occasions, never- theless, the legal rank and precedence which they hold in the Courts of Law is observed, and so far establishes among themselves, and in respect to their several classes, their precedency " (Sir Charles Young, Order of Precedence, Sec., pp. 59-61).

the scale of general precedence for men. If, indeed, it includes the queen's maids of honour and the wives of the companions of the knightly orders, there certainly does not seems to be any good reason why it should omit the mistress of the robes and the ladies of the bedchamber, or the ladies of the royal order of Victoria and Albert and the imperial order of the Crown of India. But these are trifling matters in themselves, and concern only a minute fraction of the community. The scale of general precedence for men is now in substantially the same condition as that in which it has been for between two and three centuries, and the political, to say nothing of the

social, arrangements to which it was framed to apply have in the interval undergone an almost complete transformation. The consequence is that a good deal of it has come down to us in the shape of a survival, and has ceased to be of any practical use for the purpose it was originally designed to effect. While it comprises several official and personal dignities which are virtually obsolete and extin- guished, it entirely omits the great majority of the members of Government in its existing form, and whole sections of society on a less exalted level, to whom it is universally felt that some rank and place at all events are both in public and in private justly due. And, when it does confess the presence of any of the sovereign's principal ministers, it commonly places them in positions which are out of all keeping with their actual eminence and importance. It ranks the lord president of the council and the lord privy seal before dukes, while it places the chancellor of the exchequer after the younger sons of earls and the eldest sons of barons, and the secretaries of state after the master of the horse and the vice-chamberlain of the household. The lord chancellor still has precedence as the first of the great officers of state, which was allotted to him not as what he is, the head of the judicature, but as what he once was, the prime minister of the sovereign; and the lord chief justice, who is next to him in regular judicial rank, as presiding over the common law courts, as he presides over the courts of equity, is placed after the chancellors of the exchequer and of the duchy of Lancaster, who still have the precedence which was allotted to them not as ministers, which they are, but as judges, which they are no longer. Neither the lord-lieutenant of Ireland, the viceroy of India, nor the governor-general of Canada has any rank or place at St James's, where, as well as at Westminster, the lord steward or the lord chamberlain of the household is a much greater and more splendid personage. Again, in the scale of general precedence there are no clergymen except bishops, no lawyers except judges, and no officers of either the army or the navy from field marshals and admirals of the fleet downwards. Nor, of course, are any colonial governors or lieutenant-governors entered on it. It contains no mention of under-secretaries of state, chairmen or commissioners of administrative boards, comptrollers or secretaries of government departments, lord- lieutenants or sheriffs of counties, deputy lieutenants or justices of the peace, members of the House of Commons or graduates of the universities. It is true that among some of these classes definite systems of subordination are established by either authority or usage, which are carefully observed and enforced in the particular areas and spheres to which they have reference. But we have seldom any means of determining the relative value of a given term in one series as compared with a given term in another series, or of connecting the different steps in the scales of local, professional or academical precedence with the different steps in the scale of general precedence, to which such scales of special precedence ought to be contributory and supplementary. We know, for

example, that major-generals and rear-admirals are of equal rank, that with them are placed commissaries-general and inspectors-general of hospitals and fleets, that in India along with civilians of thirty-one years' standing they immediately follow the vice-chancellors of the Indian universities, and that in relation to the consular service they immediately precede agents-general and consuls-general. But there is nothing to aid us in determining whether in England they should be ranked with, before or after deans, king's counsel or doctors in divinity, who are as destitute as they are themselves of any recognized

general precedence, and who, as matters now stand, would certainly have to give place to the younger sons of baronets and knights and the companions of the knightly orders.

No foreigner has any legal precedence in Great Britain, 1 but it is suggested that it being proper courtesy to accord to guests the precedence due to the rank they bear in their own countries, they should rank in society with and immediately before those of the relative rank in England. It should, however, be remembered that the younger sons of counts and other nobles bear the title of count with the addition of the Christian name, and they should be ranked with younger sons of British earls, &c, whatever title they bear. The eldest son of a duke for example is sometimes called prince, but the place accorded to him by the above rule would be next after a British marquess. Some persons of authority consider, however, that a foreigner should be given precedence over every native whatever the rank may be.

It has now become usual to recognize ecclesiastical rank derived from the pope, even when held by subjects of the king. Cardinals, therefore, rank by international usage above arch- bishops, as princes of the blood royal, and in Ireland, Roman Catholic and Protestant bishops rank as such by authority of the warrants there in force.

An order respecting precedence was sent by the secretary of state for the colonies to the governor-general of Canada (July 24, 1868). Precedence in India is regulated by a Royal Warrant dated the 6th of May 1871, a copy of which is subjoined.

Victoria, by the Grace of God, of the United Kingdom of Great

Britain and Ireland, Queen, Defender of the Faith.

To all to whom these presents shall come, greeting.

Whereas it hath been represented unto Us that it is advisable to regulate the Rank and Precedence of persons holding appoint- ments in the East Indies. In order to fix the same, and prevent all disputes, We do hereby declare

that it is Our will and pleasure that the following Table be observed with respect to the Rank and Precedence of the persons hereinafter named, viz. : —

Governor-General and Viceroy of India. Governor of Madras. Governor of Bombay. President of the Council of the Governor- General. Lieutenant-Governor of Bengal. Lieutenant-Governor of North-West Provinces. Lieutenant-Governor of the Punjaub. Commander-in-Chief in India, when a Member of Council. Chief Justice of Bengal. Bishop of Calcutta, Metropolitan of India. Chief Justices of Madras, Bombay and North-Western Provinces. Commanders-in-Chief in Madras and Bombay, when also Members of Council. Ordinary Members of the Council of the Governor- General. Bishops of Madras and Bombay. Ordinary Members of Council in Madras and Bombay.

Commander-in-Chief in India, when not a Member of Council. Puisne Judges of the High Courts of Calcutta, Madras, Bombay and North-Western Provinces. Commanders-in-Chief, Madras and Bombay, when not Members of Council. Chief Commissioners and Resident at Hyderabad. Military Officers above rank of Major-General. Additional Members of the Council of the Governor- General when assembled to make laws, &c. Commodore command- ing Her Majesty's Naval Forces in India. Judge Advocate General of India. Secretaries to the Government of India. Additional Members of the Councils of the Governors of Madras and Bombay when assembled to make laws, &c. Members of the Legislative Council of the Lieutenant-Governor of Bengal. Agents to the Governor-General in Rajpootana and Central India. Commissioner in Sind. J udges of the Chief Court, Punjaub. Chief Secretaries to the Governments of Madras and Bombay.

First Class

Civilians of 28 years' standing to rank with Major-Generals.

Advocate General, Calcutta. Residents at Foreign Courts and Residents at Aden, the Persian Gulf and Bagdad. Recorders of Moulmein and Rangoon. Advocates-General, Madras and Bombay. Members of the Boards of Revenue, Bengal, Madras, North-West Provinces. Secretaries to Local Governments. Chief Engineer, 1st Class. Comptroller-General of Accounts in India. Directors- General, Post Office, Telegraphs and Irrigation. Judicial Com- missioners, Oude, Central Provinces, Mysore and Sind. Financial Commissioners in the Punjaub, Oude and Central Provinces. Arch- deacon of Calcutta. Secretary to Council of Governor-General for making Laws, &c. Officers Commanding Brigades.

1 This subject was considered by the House of Lords in February 1628, on the proposition of a committee that no foreign nobility has right of precedence within this realm before any peer of this kingdom.

Second Class Civilians of 20 years' standing ranking with Colonels. Commissioners of Divisions. Directors of Public Instruction under Governments. Private Secretary to Viceroy. Military Secretary to Viceroy. Archdeacons of Madras and Bombay. Surveyor-General of India. Superintendent, Great Trigonometrical Survey. Sanitary Commissioner with Government of India. Superintendent of the Geological Survey in India. Inspector- General of Forests in India.

Sˆ G G e e n n e e r r a al° f ˆ \ U™kr Local Governments. Standing Counsel to Government of India. Remembrancers of Legal Affairs, and Legal Advisers to the Government in the North- West Provinces and the Punjaub. Commissioners of Revenue Survey and Settlement. Chief Engineers, 2nd and 3rd Class, and Superintendents of Irrigation.

Third Class

Civilians of 12 years' standing ranking with Lieutenant-Colonels.

Political Agents. Under-Secretaries to Government of India. Inspector-General of Education, Central Provinces, and Directors- General of Education, Oude, British Burmah, Berer and Mysore. Officers, 1st Grade, Education Department. Officers, 1st Grade, Financial Department. Private Secretaries to Governors. Military Secretaries to Governors. First Judges of Presidency Courts of Small Causes. Chief Magistrates of Presidency Towns. Adminis- trator-General, Calcutta. Administrators-General, Madras and Bombay.

Inspectors-General of Jails.]

Sanitary Commissioners. [-Under Local Governments. Conservators of Forests. J

Superintending Engineers, 1st Class. Deputy Directors of Post Office and Telegraphs and Directors of Traffic and Construction. Postmasters-General. Senior Chaplains. Officers, 1st Grade, Geological Survey. Officers, 2nd Grade, Education Department. Officers, 2nd Grade, Financial Department. Superintendents, 1st Grade, Telegraph Department.

Fourth Class Civilians of 8 years' standing ranking with Majors. Assistant Political Agents. Officers, 2nd Grade, Geological Survey. Officers, 3rd Grade, Education Department. Officers, 3rd Grade, Financial Department. Superintendents, 2nd Grade, Telegraph Department. Government Solicitors.

Fifth Class Civilians of 4 years' standing ranking with Captains. Junior Chaplains. Officers, 4th Grade, Education Department.

Sixth Class Civilians of less than 4 years' standing to rank with Subalterns.

Note 1 . — Commissioners of Divisions within their own Divisions, and Residents and Political Agents within the limits of their respec- tive charges, to take precedence immediately before Civilians of the 1st Class.

Note 2. — Collectors and Magistrates of Districts, and Deputy Commissioners of Districts, and the Chief Officer of each Presidency Municipality, to take precedence within their respective charges before the 3rd Class and Lieutenant-Colonels in the Army.

Sheriffs to rank within their charges immediately after Lieu- tenant-Colonels in the Army.

All Officers not mentioned in the above table, whose rank is regulated by comparison with rank in the Army, to have the same rank with reference to Civil Servants as is enjoyed by Military Officers of equal grades.

All other persons who may not be mentioned in this table to take rank according to general usage, which is to be explained and determined by the Governor-General in Council in case any question shall arise.

Nothing in the foregoing rules to disturb the existing practice relating to precedence at Native Courts, or on occasions of inter- course with Natives, and the Governor-General in Council to be empowered to make rules for such occasions in case any dispute shall arise.

All ladies to take place according to the rank herein assigned to their respective husbands, with the exception of wives of Peers, and of ladies having precedence in England, independently of their husbands, and who are not in rank below the daughters of Barons ; such ladies to take place according to their several ranks, with reference to such precedence in England, immediately after the wives of Members of Council at the Presidencies in India.

Given at Our Court at Windsor, this sixth day of May, in the year of our Lord one thousand eight hundred and seventy-one, and in the thirty-fourth year of our Reign. By Her Majesty's Command. (Signed) Argyll.

(F. Dr.; W. A. L.)

PRECENTOR (Late Lat. praecentor, from praecinere, to sing before, lead in singing), the title of the principal director of the singing or musical portions of the service in a cathedral or cathedral church. In the English Church in cathedrals of the " Old Foundation " the precentor is a member of the cathedral chapter and officially ranks next to the dean. His musical duties are usually performed by the " succentor," one of the vicars choral. In cathedrals of the " New Foundation " the " precentor " is not a member of the chapter, but is one of the minor canons.

PRECEPT (Lat. praeceptum, a rule, from praecipere, literally to take beforehand, to give rules, instructions or orders), a com- mand or rule, especially one with regard to conduct or action, a moral rule or injunction, a maxim. Apart from this general use, the word was used, in law, of many orders in writing issuing from a court or other legal authority; it is now chiefly used of an order demanding the payment of money under a rate by poor law or other local authorities (see Rate). The Latin form praecipe, i.e. enjoin, command, is used of the note of instructions delivered by a plaintiff or his solicitor to be filed by the officer of the court, giving the names of the plaintiff and defendant, the nature of the writ, &c. For the obsolete writ of praecipe quod reddat see Writ.

PRECEPTOR, a teacher or instructor, the classical meaning of the Latin praeceptor, from praecipere, literally to take in advance, hence to give rules or " precepts," advise, teach. As an educational term in English the word is familiar through the College of Preceptors, a chartered society chiefly composed of private teachers; it was incorporated in 1849 and was one of the first professional bodies to institute regular courses of pedagogic lectures and to award after examination the titles of licentiate and associate to teachers. It also holds examinations for pupils. In post-classical Latin praeceptor meant a commander, praecipere, to order, enjoin, and the term was adopted by the Knights Templars for the heads of the provincial communities of knights established on their estates. These communities and the estates themselves were known as " preceptories," and answered to the " commanderies " of the Hospitallers.

PRECESSION OF THE EQUINOXES, in astronomy, the term assigned to the progressive motion of the equinox, because it takes place in a direction from east towards west, opposite to that in which planets move, and in which longitudes are measured. The equinox being defined as the point of intersec- tion of the equator and ecliptic, its motion arises from the fact that both of these great circles are in continuous though slow motion. The motion of the ecliptic is due to the action of the planets on the earth, which produces a slow progressive change in the position of the plane of the

earth's orbit, and therefore of the ecliptic. This motion takes place round a diameter of the celestial sphere as an axis or nodal line, which intersects the sphere in two points, which are at present in longitudes about 1 73 and 353°. The direction of the motion around this axis is such that from the limits 353 through o° to 173°, which includes the vernal equinox, the motion is towards the south, while, in the remainder of the circle, it is towards the north. At the present time the rate of the motion is 46.7″ per century. In consequence of the smallness of the angle, 7°, which the axis of motion makes with the line of the equinoxes, its effect on the precession is quite small, now amounting to only 0.14″ per annum. Owing to its cause this small part of the precession is called " planetary."

The motion of the equator is due to the combined action of the sun and moon on the equatorial protuberance of the earth (see Astronomy). Owing to its cause this largest part of the precession is called " luni-solar." Its fundamental law is that the mean celestial pole at each instant (see. Nutation) moves at right angles to the circle joining it to the pole of the ecliptic as that instant. Hence if the pole of the ecliptic were fixed, the celestial pole would revolve around it in a circle at a constant distance equal to the obliquity of the ecliptic. Owing, however, to the slow change in the position of the pole of the ecliptic, the motion is only approximately in a circle, and the obliquity

varies slowly from century to century. At the present time the rate of motion measured on a great circle is about 20″ per year; that is to say both the pole and the plane of the equator move through this angle annually. But when measured around the pole of the ecliptic as a centre the motion is about 2-5 times this or, at present, 50-37″ annually. This is the present amount of the luni-solar precession which, if it remained constant, would carry the pole completely round in a period of 25,730 years. But the exact period varies slightly, owing to the motion of the pole of the ecliptic. The combined effect of the luni-solar and planetary precession or the total motion of the equinox is called the general precession. Its annual amount during our time is 50- 2 564 + 0-022 20″ T, T being the time reckoned from 1900 in centuries.

PRECINCT (from Lat. praecingere, to encircle, enclose, sur- round, prae and cingere, to gird), an enclosure, a space within the boundaries, marked by walls or fences or by an imaginary line, of a building or group of buildings, especially used of such a space belonging to a cathedral or other religious building. The word is frequently used, indefinitely, of the

neighbourhood or environs of a place or building. In the United States of America it is applied to various minor territorial divisions or districts, for electoral or judicial purposes. In some of the states they correspond to the " township " as the principal subdivision of the " county."

PRECIOUS (O. Fr. precios, mod. precieux, Lat. pretiosus, of high value or price, pretium), costly or of high value, particularly used in political economy of those metals which are " valuable enough to be used as a standard of value and abundant enough for coinage" {The Century Dictionary). The term is thus practically confined to gold and silver. Platinum in theory may be included as it was used for coinage in Russia in 1828; the fluctuations in the value of the metal caused its discontinu- ance in 1845 (see Gold, Silver and Money). " Precious stones " include those gems which are valued for ornament and jewelry. " Strictly speaking the only precious stones are the diamond, ruby, sapphire and emerald, though the term is often extended to the opal, notwithstanding its lack of hardness, and to the pearl . . . strictly an animal product," G. F. Kunz, Gems and Precious Stones of North America (1890) (see Gem, and Lapidary and Gem-Cutting) . A particular use of " precious " as meaning fastidious, over-refined, is taken from the French prScieux, familiar in the appellation of Les Precieuses, given to the social and literary circle of ladies which centred round the Hotel de Rambouillet in the 17th century (see Rambouillet; Catherine de Vivonne, Marquise de).

PRECONIZATION (Late Lat. praeconizatio, from praeconizare, to proclaim, Lat. praeco, a public crier) , a public proclamation or announcement. In this sense it is practically obsolete; but the word is still technically used of the solemn proclamation of new bishops, and of the sees to which they are appointed, made by the pope in the consistory of cardinals (see Bishop). In the English ecclesiastical courts " praeconize " is also still used in the sense of " to summon by name."

PREDELLA, the Italian word for a footstool or kneeling- stool, hence applied to the step or platform on which an altar rests, and to a shelf raised above the altar at the back, a super- altar or gradino. The face both of the step and shelf are fre- quently decorated with sculpture or painting, and the term " predella " is frequently given to the sculpture or painting so used, and, further, to any painting that is a pendant to a larger work.

PREDESTINATION (from Late Lat. praedestinare, to deter- mine beforehand; from the root sta, as in stare, stand), a theologi- cal term used in three senses: (1) God's unchangeable decision from eternity of all that is to be; (2) God's destination of men to everlasting happiness or misery; (3) God's appointment unto life or " election " (the appointment unto death being called " reprobation," and the term " foreordination " being preferred

to " predestination " in regard to it). In the first sense the conception is similar to that of fate; this assumes a moral character as nemesis, or the inevitable penalty of transgression.

Sophocles represents man's life as woven with a " shuttle of adamant " {Antigone, 622-624). Stoicism formulated a doctrine of providence or necessity. Epicurus denies a divine superin- tendence of human affairs. A powerful influence in Scandinavian religion was exercised by the belief in " the nornir, or Fates, usually thought of as three sisters." In Brahminic thought Karma, the consequences of action, necessitates rebirth in a lower or higher mode of existence, according to guilt or merit. With some modifications this conception is taken over by Buddhism. The Chinese too, the order of heaven, which should be the order for earth as well, may also be compared. Accord- ing to Josephus {Antiq. xviii. 1, 3, 4; xiii. 5, 9) the Sadducees denied fate altogether, and placed good and evil wholly in man's choice; the Pharisees, while recognizing man's freedom, laid emphasis on fate; the Essenes insisted on an absolute fate. This statement is exposed to the suspicion of attempting to assimilate the Jewish sects to the Greek schools. In Islam the orthodox theology teaches an absolute predestination, and yet some teachers hold men responsible for the moral character of their acts. The freethinking school of the Mo'tazilites insisted that the righteousness of God in rewarding or punishing men for their actions could be vindicated only by the recognition of human freedom.

The question of the relation of divine and human will has been the subject of two controversies in the Christian church, the Augustinian-Pelagian and the Calvinistic-Arminian. Pelagius maintained the free-will of man, and held that man's conduct, character, destiny are in his own hand. Grace, by enlightening, forgiving sin and strengthening his moral powers, helps man to fulfil this purpose. While grace is meant for all, men make them- selves worthy of it by striving after virtue. This doctrine as minimizing grace was repugnant to Augustine. He regarded mankind as sinful, guilty, ruined, incapable of any good. God alone can save. His grace is effectual and irresistible. As what God has done He has eternally willed to do, grace involves pre- destination. God has from eternity chosen those whom He wills to save (" election "), and consequently He has also passed over those whom He leaves to perish (" praeterition "). As all deserve damnation, there is no injustice in leaving them to their deserts. The "reprobation" of the wicked is not the cause of their sin; God's foreknowledge does not make the sin necessary; how repro- bation and foreknowledge are related is not made plain.

The doctrine of Augustine was revived in the 9th century by Gottschalk, who taught that God's passing over the lost meant their predestination to punishment. Hincmar of Reims perse- cuted him for not distinguishing the

two positions. This dispute would have little interest now, had not Hincmar appealed to John Scotus Erigena, who attempted to solve the theological problem by philosophical conceptions. He denied that foreknowledge or predestination as temporal relations could be properly predicated of God as eternal ; he described sin and its consequences as negations, neither caused by nor known to God ; he maintained that as evil is only a stage in the development of good, there will ultimately be a universal return to God. Thus the doctrine of reprobation was emptied of meaning. This defence of orthodoxy was con- demned as heretical. The controversy was kept up during the scholastic period. Thomas Aquinas followed Augustine. Duns Scotus leaned toward Semi-Pelagianism, which rejected the doctrine of predestination, and maintained a co-operation of freedom and grace. While Aquinas affirmed the positions of Augustine, he deduced them from his Aristotelian conception of God as " first mover, itself unmoved." His original contribution to the subject was his theory of divine concurrence. He distinguishes secondary causes as natural and necessary, and as voluntary and contingent; though both are set in motion by God, yet as the natural remain natural, so do the voluntary remain voluntary. But this is clearly only a verbal solution.

At the Reformation the Augustinian position was accepted by both Luther and Calvin. Melanchthon modified his earlier view in the direction of synergism, the theory of a co-operation of divine grace and human freedom. The later Lutheran doctrine is " that man, unable as he is to will any good thing, can yet use the means of grace, and that these means of grace, carrying in themselves a divine power, produce a saving effect on all who do not voluntarily oppose their influence. Baptism, e.g. confers grace, which if not resisted is saving. And God, foreseeingˆ who will and who will not, resist the grace offered, predestinates to life all who are foreseen as believers." Calvin's view is the same as Augustine's. He held the sublapsarian view that the fall was decreed, but not the supralapsarian view that it " was decreed as a means towards carrying out a previous decree to save some and leave others to perish." The latter view was held by Beza and other Calvinists, and, it is said, repelled Arminius from

Calvinism, and led him to formulate the doctrine that as repentance and faith are the divinely decreed conditions of eternal life, God has determined to give that life to all whom He foresees as fulfilling these conditions. According to Calvinism God's election unto salvation is absolute, determined by His own inscrutable will; according to Arminianism it is conditional, dependent on man's use of grace. The Synod of Dort

(1618-1619) which affirmed the sublapsarian without excluding the supralapsarian form of Calvin- ism, condemned the views of Arminius and his followers, who were known as Remonstrants from the remonstrance " which in four articles repudiates supralapsarianism and infralapsarianism (which regarded the Fall as foreseen, but not decreed), and the doctrines of irresistibility of grace, and of the impossibility of the elect finally falling away from it, and boldly asserts the universality of grace." In the Church of Rome the Dominicans favoured Augustinianism, the Jesuits Semi-Pelagianism; the work of Molina on the agreement of free-will with the gifts of grace provoked a controversy, which the pope silenced without deciding; but which broke out again a generation later when Jansen tried to revive the decaying Augus- tinianism. The church of England has passed through several dis- putes regarding the question whether the Thirty-Nine Articles are Calvinistic or not; while there is some ambiguity in the language, it seems to favour Calvinism. At the Evangelical Revival the old questions came up, as Wesley favoured Arminianism and George Whitefield Calvinism. In Scotland Calvinism was repudi- ated by James Morison, the founder of the Evangelical Union, who declared the three universalities, God's love for all, Christ's death for all, the Holy Spirit's working for all.

While retained in the creeds of several denominations, in the public teaching of the churches the doctrine of predestination has lost its place and power. While the doctrine of election magnified God's grace, and so encouraged humility in man, it minimized man's freedom, and so produced either an over-confi- dence in those who believed themselves elect, or despair in those who could not reach the assurance. Now it is recognized that God's sovereignty must be conceived as consistent with man's liberty. While God fulfils His all-embracing purpose, that fulfilment leaves room for the exercise of individual freedom; the freedom God has bestowed on man He can so restrain and direct as to overrule even its abuse for His own gracious ends. That God desires that all should be saved, and that the salvation of each depends on his own choice — these are the general con- victions of modern theology. The problem now is the reconcili- ation of human freedom with divine foreknowledge. Martineau accepts Dugald Stewart's solution. " There is no absurdity in supposing that the deity may, for wise purposes, have chosen to open a source of contingency in the voluntary actions of his creatures, to which no prescience can possibly extend." Others hold the problem to be insoluble, and not needing to be solved.

(A. E. G.)*

PREDICABLES (Lat. praedicabilis, that which may be stated or affirmed), in scholastic logic, a term applied to a classification of the possible relations in which a predicate may stand to its subject. The list given by the

schoolmen and generally adopted by modern logicians is based on the original fivefold classification given by Aristotle {Topics, a iv. 101 b. 17-25): definition (opos), genus {ykvos), differentia (diaopa) , property (jSlov), accident (cruˆi)3e/3r)(c6s) – 1 The scholastic classification, obtained from Boetius's Latin version of Porphyry's Eisagoge, modified Aristotle's by substituting species (ef5os) for definition. Both classifications are of universals, concepts or general terms, proper names of course being excluded. There is, however, a radical difference between the two systems. The standpoint of the Aristotelian classification is the predication of one uni- versal concerning another. The Porphyrian, by introducing species, deals with the predication of universals concerning individuals (for species is necessarily predicated of the indi- vidual), and thus created difficulties from which the Aristotelian is free (see below).

The Aristotelian classification may be briefly explained: (1) The Definition of anything is the statement of its essence (Arist. to tI fiv tlvai), i.e. that which makes it what it is: e.g. "a triangle is a three-sided rectilineal figure." (2) Genus is that part of the essence which is also predicable of other things different from them in kind. A triangle is a rectilineal figure; i.e. in fixing the genus of a thing, we subsume it under a higher universal, of which

1 Strictly Aristotle's classification is into four as Bitvfropa really Delongs to ykvo%.

it is a species. (3) Differentia is that part of the essence which distinguishes one species from another. As compared with quadri- laterals, hexagons, &c, all of which are rectilineal figures, a triangle is " differentiated " as having three sides. (4) A Property is an attribute which is common to all the members of a class, but is not part of its essence {i.e. need not be given in its definition). The fact that the interior angles of all triangles are equal to two right angles is «ot part of the definition, but is universally true. (5) An Accident is an attribute which may or may not belong to a subject. The colour of the human hair is an accident, for it belongs in no way to the essence of humanity.

This classification, though it is of high value in the clearing up of our conceptions of the essential contrasted with the accidental, the relation of genus, differentia and definition and so forth, is of more significance in connexion with abstract sciences, especially mathematics, than for the physical sciences. It is superior on the whole to the Porphyrian scheme, which has grave defects. As has been said it classifies universals as predicates of individuals and thus involves the difficulties which gave rise to the controversy between realism and nominalism {a.v.). How are we to distinguish species from genus ? Napoleon was a Frenchman, a man, an

animal. In the second place how do we distinguish property and accident? Many so-called accidents are predicable necessarily of any particular persons. This difficulty gave rise to the distinction of separable and inseparable accidents, which is one of considerable difficulty.

See the modern logic textbooks.

PREDICAMENT, now used only in the sense of a dangerous or unpleasant position or situation. It meant properly that which is " predicated " or affirmed (Lat. praedicare) of anything, in logic, one of the ten Aristotelian categories (see Category), and so any definite state or condition. The use of " predica- ment " in the sense of " bad predicament," without the limiting adjective, is paralleled by " plight," for " bad plight," " success " for " good success."

PREDICATION (from Lat. praedicare, to state, assert), in logic, the term which denotes the joining of a predicate to a subject in a judgment or proposition. The statement " all men are mortal " is to predicate mortality of all men. In other words a judgment is made up of a subject and a predicate joined by a copula. Since the true unit of thought is the judgment, since all concepts or universals exist only in continuous thinking (judging), the theory of predication is a fundamental part of logic. The true relation of subject and predicate has not been deter- mined with unanimity, various logicians emphasizing different aspects of the process (see Logic). The logical use of " predi- cate " is to be distinguished from the grammatical, which includes the verb, whether it be the verb " to be " in its various forms, or another verb. The simple grammatical sentence " he strokes the dog " the first word is the subject, while " strokes the dog " is the predicate, including verb and object. In logic every proposition is reducible to the form " A is B," " B " being the predicate. Thus the logical form of "he strokes the dog " would be "he is stroking the dog " or some other periphrasis which liberates and determines the logical predicate. The true significance of the logical copula is difficult. It cannot be described simply as a third {i.e. separate part) of the judgment, because until two terms are enjoined by it they are not subject and predicate. Much discussion has raged round the question whether the use of the verb "to be " as the copula implies that existence is predicated by the subject. It may be taken as generally agreed that this is not the case (see further Logic, and the textbooks).

PRE-EXISTENCE, DOCTRINE OF, in theology, the doctrine that Jesus Christ had a human soul which existed before the creation of the world — the first and most perfect of created things — and subsisted, prior to His human birth, in union with the Second Person of the Godhead. It was this human soul which suffered the pain and sorrow described in the Gospels. The chief exposition of this doctrine is that of Dr Watts {Works, v. 274,

&c); it has received little support. In a wider form the doctrine has been applied to men in general — namely, that in the beginning of Creation God created the souls of all men, which were subsequently as a punishment for ill-doing incarnated in physical bodies till discipline should render them fit for spiritual existence. Supporters of this doctrine, the Pre-existants or Pre-existiani, are found as early as the 2nd century, among

them being Justin Martyr and Origen (q.v.), and the idea not only belongs to metempsychosis and mysticism generally, but is widely prevalent in Oriental thought. It was condemned by the Council of Constantinople in 540, but has frequently reappeared in modern thought (cf. Wordsworth's Intimations of Immortality) being in fact the natural correlative of a belief in immortality.

PREFACE (Med. Lat. prefatia, for classical praefatio, praefari, to speak beforehand), an introduction to a book, also any preliminary or introductory statement. In liturgical use the term is applied to that portion of the Eucharistic service which immediately precedes the canon or central portion; the preface, which begins at the words Vere dignum, " It is very meet, right, &c," is ushered in, in all liturgies, with the Sursum Corda, "Lift up your hearts," and ends with the Sanctus, "Holy, Holy, Holy, &c." In the Western liturgies proper prefaces are appointed for particular occasions (see Liturgy).

PREFECT (prSfet), in France, the title of a high official. The prefects of the department were created by a law of the 28th Pluviose in the year VIII. (Feb. 17, 1800). They were intended to be the chief organs of internal administration, and have, in fact, discharged this function, especially under the First and Second Empire, surviving, though with diminished importance, under the other forms of government which modern France has seen. In comparison with other French officials, they are well paid (the salary nowadays ranges from 39,000 to 18,000 francs according to the class).

In the administration of the ancien regime the term " prefect " was not employed; practically the only case in which it occurs was in the organization of the establishment of institutions opened by the religious orders, in which there was generally a " prefect of the studies " (prefet des etudes). In the year VIII., in the discussion of the law of the 28th Pluviose, no reason was stated for the choice of this term. But like the " Tribunes " and " Consuls " of the constitution of the year VIII., it was taken from the Roman institutions which were then so fashion- able (see Praefect); it may

also be recalled that Voltaire had used the term " prefecture " in speaking of the authority of Louis XIV. over the free towns of Alsace.

The prefect has to a certain extent a double character and two series of functions. Firstly he is the general representative of the government, whose duty it is to ensure execution of the govern- ment's decisions, the exercise of the law, and the regular working of all branches of the public service in the department. In so far the role of the prefect is essentially political ; he guarantees the direct and legal action of the government in his department. He has the supervision of all the state services in his department, which pro- cures the necessary uniformity in the working of the services, each of which is specialized within a narrow sphere. He serves as a local source of information to the government, and transmits to it complaints or representations from those under his adminis- tration. In the name of the state he exercises a certain adminis- trative control over the local authorities, such as the conseil general, the mayors and the municipal councils. This control, though considerably restricted by the law of the loth of August 1 87 1, on the conseils gencraux, and that of the 5th of April 1884, on municipal organization, still holds good in some important respects. The prefect can still annul certain decisions of the conseil general. He can suspend for a month a municipal council, mayor or deputy-mayor; certain decisions of the municipal councils require his approval; and he may annul such of their regulations as are extra vires. He can annul or suspend the moire's decrees and he has also considerable control over public institutions, charit- able and otherwise. He may make regulations (reglements) both on special points, in virtue of various laws, and for the general administration of the police.

When the prefects were created in the year VIII. the intendants of provinces of the ancien regime were taken as a model, and there is a great resemblance between their respective functions. The prefect, however, is no more than an intendant in miniature, being only at the head of a department, whereas the intendant was over a generality, which was a much larger district. In the same way the sous-prefets correspond to the subdelegues of the intendants, with the difference that they are actual officials sub- ordinate to the prefects, while the subdelegues were merely the representatives with whom the intendants provided themselves, and to whom they gave powers.

Secondly, the prefect is not only the general representative of the government, but the representative of the department in the management of its local interests. But his unfettered powers in

this respect have been reduced under the third Republic. This has chiefly been the effect of the law of the 10th of August 1871, which has led to

decentralization, by increasing the powers of the conseils generaux. The law created a departmental committee {commission departementale) , elected by the conseil general which, in the interval of the sessions of the latter, takes part in matters concerning the administration of the departmental interests, either in virtue of the law, or by a delegation of powers from the conseil general.

The sous-prefets, having very limited powers of deciding ques- tions, serve above all as intermediaries between the prefect and the persons under his administration. This function was most useful in the year VIII., when communications were difficult, even within a department, but nowadays it only leads to complications. As a matter of fact their chief service to the administration lies in keeping up good relations with the maires of the communes in their arrondissement, and thus acquiring a certain amount of influence over them. The National Assembly, which passed the law of the 10th of August 1871, had also decided to suppress the sous-prefets, but M. Thiers, who was then president of the Republic, persuaded them to reconsider this decision. Since then the Chamber of Deputies has on several occasions taken advantage of the budget to attempt the suppression of the sous-prkfels by refusing to vote the amount necessary for the payment of their salaries. But the government has always opposed this unconstitutional measure, holding that the suppression could only be effected by an organic law, and that it would necessarily involve a remodelling of the administrative organization. So far their view has prevailed in the Chambers. (J. P. E.)

PREHNITE, a mineral consisting of calcium hydrogen ortho- silicate, $H_2Ca_2Al_2(SiO_4)_3$. It crystallizes in the hemimorphic class of the orthorhombic system, but the hemimorphic character is usually obscured by twinning. Crystals are generally platy in habit, but they rarely occur singly and distinctly shaped; almost invariably they are closely aggregated together to form barrel-shaped or globular groups with a crystalline surface. This form, together with the pale oil-green colour, gives the mineral a very characteristic appearance. It is translucent and has a vitreous lustre. The hardness is rather over 6 and the spec. grav. 2-80-2-95. Crystals are pyro-electric. Prehnite is sometimes classed with the zeolites, since it occurs under the same condi- tions as these minerals and often in association with them: the small amount of water (4-4%) is, however, expelled only at a red heat and is therefore not water of crystallization.

Prehnite occurs as a mineral of secondary origin in the amygda- loidal cavities of basic igneous rocks, such as basalt and diabase, and less often, in veins in granite and gneiss. Fine specimens are found with zeolites in the volcanic rocks of several places in the south of Scotland, e.g. Old Kilpatrick in Dumbartonshire, Bishopton in Renfrewshire, Campsie Hills in

Stirlingshire and in the neighbourhood of Edinburgh ; also at Paterson and Bergen Hill in New Jersey, and with native copper in the trap-rocks of the Lake Superior region. In the French (at Le Bourg d'Oisans) and Tyrolese Alps it occurs with axinite, epidote, felspar, &c, lining crevices in gneiss. Large masses have been found at Cradock in Cape Colony, from which locality it was brought in the 18th century by Colonel Prehn, the governor of the colony; hence the names " Cape chrysolite " and prehnite (of A. G. Werner, 1789). Prehnite is sometimes cut and polished for small ornaments ; it then somewhat resembles chrysoprase in appearance.

PREJUDICE (Lat. praejudicium) , literally judgment or decision beforehand, which in classical usage meant a precedent, a preceding judgment, also a special form of judicial examination precedent to a trial, especially in matters relating to status. The transferred sense, of injury or damage inflicted by decisions or judgments disregarding interests affected, does not appear till post-classical times in Latin. This last use of damage appears in English in relation to legal matters, especially in the phrase " without prejudice," i.e. without detriment to rights or claims. When two parties are negotiating for the settlement of a dispute, statements or admissions made by or on behalf of either, with a stipulation, expressed or implied, that the statements are made " without prejudice " to the party's claims in the dispute, cannot be put in evidence in litigation to settle the dispute (see Evidence). The general meaning of the word is that of opinion, favourable or hostile, based on prepossessions, and therefore biassed or unreasonable.

PREL, KARL, Freiherr von (1839-1899), German philo- sopher, was born at Landshut on the 3rd of April 1839. After studying at the university of Munich he served in the Bavarian

army from 1859 to 1872, when he retired with the rank of captain. He then gave himself up to philosophical work, especially in connexion with the phenomena of hypnotism and occultism from the modern psychological standpoint. He attempted to deduce the existence of spirit, apart from, and yet entering from time to time into connexion with, the phenomena of the senses, by an examination of the relation between the ego of thought and the age of sensible experience as understood by Kant. In 1868 he received the degree of doctor from the university of Tubingen in recognition of a treatise on the psychology of Dreams (Oneirokritikon. Der Traum vom Standpunkt des transcendenialen Idealismus).

Subsequently, he published numerous works on various psycho- logical and scientific subjects, of which the more important are: Der gesunde Menschenver stand vor den Problemen der Wissen- schaft (1872); Der Kampf urns Dasein am Himmel (1874), repub- lished in 1882 under the title Entwickelungsgeschichte des Weltalls; Die Planetenbewohner und die Nebularhypothese (1880); Die Philo- sophie der Mystik (1 885) ; Justinus Kerner und die Seherin von Prevorst (1886); Die monistische Seelenlehre (1888); Die Mystik der alien Griechen (1888); Kants mystische Weltanschauung (1889); Studien aus dem Gebiete der Geheimwissenschaften (1890); Der Spiritismus (1893); Die Entdeckung der Seele durch die Geheim- wissenschaften (1894-1895). In Der Kampf urns Dasein am Himmel von Prel endeavoured to apply the Darwinian doctrine of organic evolution not only to the sphere of consciousness but also even more widely as the philosophical principle of the world. He was one of a large number of German thinkers who during the latter half of the 19th century endeavoured to treat the mind as a mechanism. He died on the 4th of August 1899.

See Evolution; in Philosophy.

PRELATE (Lat. praelatus, set above, from praefero, prefer), an ecclesiastical dignitary of high rank. In the early middle ages the title prelate was applied to secular persons in high positions and thence it passed to persons having ecclesiastical authority. The De prelalis of Valerian is concerned with secular princes, and even as late as the 14th century the title was occasionally applied to secular magistrates. In medieval ecclesiastical usage the term might be applied to almost any person having ecclesiastical authority; it was very commonly given to the more dignified clergy of a cathedral church, but often also to ordinary priests charged with the cure of souls and, in the early days of monasticism, to monastic superiors, even to superiors of convents of women. The term occurs very frequently in the Rule of St Benedict and other early monastic rules.

In more modern usage in the Roman Catholic Church prelates, properly so-called, are those who have jurisdiction in foro externo, but a liberal interpretation has given the title a more general significance. Prelacy is defined by the canonists as " pre-eminence with jurisdiction " {praeeminentia cum juris- diclione), and the idea supposes an episcopal or quasi-episcopal jurisdiction. But gradually the title was extended to ecclesias- tical persons having a prominent office even without jurisdiction, and later still it has come to be applied to ecclesiastical persons marked by some special honour though without any definite office or jurisdiction.

We may therefore distinguish " true " from " titular " prelates. The true prelacy is composed of the persons who constitute the ecclesiastical

hierarchy; jurisdiction is inherent in their office and gives pre-eminence, as with patriarchs, arch- bishops and bishops. A good example of the dependence of prelacy on jurisdiction is found in those religious orders, such as the Dominicans, where authority is strictly elective and temporary. Thus a Dominican prior ranks ipso facto as a prelate during his three years of office, but, if not re-elected, loses this dignity with his jurisdiction.

The true, no less than the titular, prelates have their various ranks, differing as regards title, precedence, clothing and other insignia. The distinguishing colour of a prelate's clothing is violet; the form, like the greater or less use of violet, depends on the rank of the prelate. Four classes may be distinguished:

(1) Great prelates, e.g. cardinals, archbishops and bishops.

(2) Exempt prelates (praelati nullius dioeceseos, praelati nullius), i.e. abbots and religious superiors, who are withdrawn from the ordinary diocesan jurisdiction and themselves possess episcopal

jurisdiction (Jurisdictio quasi episcopalis). (3) Roman prelates, (a) active and (b) honorary. The title is applied to numerous ecclesiastics attached by some dignity, active or honorary, to the Roman court (see Curia Romana). In the list of these prelates are protonotaries apostolic, domestic prelates, private chamberlains, participanti and supernumerary. Of these last there are two kinds, honorary and honorary extra urbem. Only protonotaries and domestic prelates are for life; the others lose their dignity at the death of the pope who appointed them. A special class of Roman prelatures exist at Rome, endowed as a kind of ecclesiastical majority to which those members of certain families who are destined for the clerical life naturally succeed.

In the reformed churches the title was retained in England, Sweden, Denmark and Germany. The cathedral chapter of Brandenburg consists of two prelates, the dean and the senior, besides eight other members. The chapter of Merseburg con- tains five prelates, viz. the dean, senior, provost, custos and scholasticus. In Baden the general synod is presided over by the prelate (prelat), i.e. the principal " superintendent." In the Church of England the term prelate has been since the Reformation applied only to archbishops and bishops. The word " prelacy," meaning no more originally than the office and dignity of a prelate, came to be applied in Presbyterian Scotland and Puritan England — especially during the 17th century — to the episcopal form of church government, being used in a derogatory sense.

See Du Cange, Glossarium mediae el infimae latinitatis (new ed., by L.

Favre, Niort, 1883); Paul Hinschius, Kirchenrecht (Berlin, 1869) ; F. H. Vering, professor of law at Prague, Lehrbuch des katho- lischen, orientalischen und protestantischen Kirchenrechts (1893).

(E. O'N.)

PRELLER, FRIEDRICH (1804-1878), German landscape- painter, was born at Eisenach on the 25th of April 1804. After studying drawing at Weimar, he went in 1821, on Goethe's advice, to Dresden, where in 1824 he was invited to accompany the grand duke of Weimar to Belgium. He became a pupil in the academy at Antwerp. From 1827 to 1831 he studied in Italy, and in 183 1 received an appointment in the Weimar school of art. In 1834-1836 he executed in tempera six pictures on subjects taken from the Odyssey in the " Roman House " at Leipzig, in 1.836-1837 the landscapes with scenes from Oberon in the Wieland room in the grand-ducal palace at Weimar, and in 1836-1848 six frescoes on Thuringian subjects commissioned by the grand duchess. In 1840 he visited Norway and produced a number of easel works, some of which are preserved at Weimar. In 1859 he revisited Italy, and on his return in 1861 he completed for the grand-ducal museum the frescoes illustrative of the Odyssey, which are held to constitute his chief claim to fame. Preller, who was also a successful etcher, died at Weimar on the 23rd of April 1878.

PRELLER, LUDWIG (1 809-1 861), German philologist and antiquarian, was born at Hamburg on the 15th of September 1809. After having studied at Leipzig, Berlin and Gottingen, in 1838 he was appointed to the professorship of philology at Dorpat, which, however, he resigned in 1843. He afterwards spent some time in Italy, but settled in Jena in 1844, where he became professor in 1846. In the same year he removed as head librarian to Weimar, where he died on the 21st of June 1861. His chief works are: Demeter u. Persephone (1837); Griechische Mythologie (1854-1855; 4th ed., by C. Robert, 1887 seq.); and Rdmische Mythologie (1858; 3rd ed. by H. Jordan, 1881-1883). He also co-operated with H. Ritter in the preparation of the most useful Historia philosophiae graecae et romanae ex fontium locis contexta (1838; ed. E. Wellmann, 1898). He contributed extensively to Ersch and Gruber's Allgemeine Encyklopddie and Pauly's Realencyklopddie der classischen Altertumswissenschaft. A complete list of his works will be found in Ausgeivahlte Aufsdlze aus dem Gebiete der klassischen Altertumswissenschaft (ed. R. Kohler, 1864).

See G. T. Stichling, Ludwig Preller. Eine Gedachtnissrede (Weimar, 1863); C. Bursian, Geschichte der classischen Philologie in Deutschland (1883).

PREMIUM (Lat. praemium, profit, reward, prae + emere, to buy), in general, a reward or prize; a consideration. In the law of insurance, the sum of money or consideration (either annual or in a lump sum) which the insured pays the insurers in order to gain a certain amount in the event of some specific loss happening is termed a premium. The word is applied to the fee paid in consideration of being taught a trade or profession. It is also used in the sense of " bonus," as something beyond or additional, as in the phrases, " premium bonus system," " premium system," where a bonus or sum is given in addition to wages in proportion to the value of the work done. On the stock exchange, when a security has not yet been fully paid up, it is customary to quote its price at par, or so much premium or discount. Par represents the amount actually paid up on it, while if it is above the level it is said to be at a premium of so much, or if below at a discount.

PREMONITION (from Lat. prae, before, monere, to advise or warn), an impression relating to a future event. Strictly the word should mean a warning proceeding from an external source. Its modern extension to all forms of impression sup- posed to convey information as to the future is justified on the assumption that such intimations commonly originate in the subliminal consciousness of the percipient and are thence trans- ferred to the ordinary consciousness. In modern times the best attested premonitions are those relating to events about to occur in the subject's own organism. It was observed by the animal magnetists at the beginning of the 19th century in France and Germany, that certain of their subjects, when in the " magnetic " trance, could foretell accurately the course of their diseases, the date of the occurrence of a crisis and the length of time needed to effect a cure. Similar observations were subsequently recorded in Great Britain and in America (see, for instance, the case of Anna Winsor, 1860-1863, reported by Dr Ira Barrows). The power of prediction possessed by the subject in such cases may be explained in two ways: (1) As due to an abnormal power of perception possessed by certain persons, when in the hypnotic trance, of the working of their own pathological processes; or (2) more probably, as the result of self-suggestion; the organism is " set " to explode at a given date in a crisis, or to develop the fore-ordained symptoms.

Apart from these cases there are two types of alleged pre- monitions. (1) The future event may be foreshadowed by a symbol. Amongst the best known of these symbolic impressions are banshees, corpse lights, phantom funeral processions, ominous animals or sounds and symbolic dreams (e.g. of teeth falling out). Of all such cases it is enough to say that it is impossible for the serious inquirer to establish any causal con- nexion

between the omen and the event which it is presumed to foreshadow. (2) There are many instances, recorded by educated witnesses, of dreams, visions, warning voices, &c, giving precise information as to coming events. In some of these cases, where the dream, &c, has been put on record before its " fulfilment " is known, chance is sufficient to explain the coin- cidence, as in the recorded cases of dreams foretelling the winner of the Derby or the death of a crowned head. In cases where such an explanation is precluded by the nature of the details foreshadowed, the evidence is found to be defective, generally from the absence of contemporary documents. The persistent belief on the part of the narrators in the genuineness of their previsions indicates that in some cases there may be a halluci- nation of memory, analogous to the well known feeling of " false recognition." Prof. Josiah Royce has suggested for this supposed form of hallucination the term " pseudo-presentiment."

Bibliography. — See Puysegur, Du MagnMisme animal (1807); Alexandre Bertrand,' Traite du somnambulisme (1823); Mrs H. Sidgwick, Proceedings S.P.R., vol. v.; F. W. H. Myers, Proceed- ings S.P.R., vol. xi. ; F. W. H. Myers, Human Personality (1903) ; F. Podmore, Studies in Psychical Research (1897); Proceedings American Society for Psychical Research (1889, Report on Phantasms and Presentiments); Annates des sciences psychiques (Jan.-Feb., 1889, Article on Premonitions by G. B. Ermacora). (F. P.)

PREMONSTRATENSIANS, also called Norbertines, and in England White Canons, from the colour of the habit: an order

of Augustinian Canons founded in n 20 by St Norbert, after- wards archbishop of Magdeburg. He had made various efforts to introduce a strict form of canonical life in various communities of canons in Germany; in n 20 he was working in the diocese of Laon, and there in a desert place, called Premontre, in Aisne, he and thirteen companions established a monastery to be the cradle of a new order. They were canons regular and followed the so-called Rule of St Augustine (see Augustinians), but with supplementary statutes that made the life one of great austerity. St Norbert was a friend of St Bernard of Clairvaux — and he was largely influenced by the Cistercian ideals as to both the manner of life and the government of his order. But as the Premonstra- tensians were not monks but canons regular, their work was preaching and the exercise of the pastoral office, and they served a large number of parishes incorporated in their monasteries. The order was founded in 11 20; in n 26, when it received papal approbation, there were nine houses; and others were established in quick succession throughout western Europe, so that at the middle of the 14th century there are said to have been over 1300 monasteries of men and 400 of women. The Premonstra- tensians played a predominant part

in the conversion of the Wends and the Christianizing and civilizing of the territories about the Elbe and the Oder. In time mitigations and relaxations crept in, and these gave rise to reforms and semi-indepen- dent congregations within the order. The Premonstratensians came into England (c. 1143) first at Newhouse in Lincoln, and before the dissolution under Henry VIII. there were 35 houses. At the beginning of the 19th century the order had been almost exterminated, only eight houses surviving, all in the Austrian dominions. There are now some 20 monasteries and 1000 canons, who serve numerous parishes; and there are two or three small houses in England. The strength of the order now lies in Belgium, where at Tongerloo is a great Premonstratensian abbey that still maintains a semblance of its medieval state.

Helyot, Histoire des ordres rehgieux (1714), ii. chs. 23-26; Max Heimbucher, Orden u. Kongregationen (1907), ii. § 56; articles in Wetzer u. Welte Kirchenlexicon (2nd ed.) and Herzog Realencyklopadie (3rd ed.). The best special study is F. Winter, Die Pramonstratenser des 12. Jahrh. und ihre Bedeutung filr das nordostliche Deutschland (1865). _ . .. (E. C. B.) 1

PREMYSL, the reputed ancestor of the line of dukes and kings which ruled in Bohemia from 873 or earlier until the murder of Wenceslaus III. in 1306, and which was known as the Pfemy- slide dynasty. According to legend Pfemysl was a peasant of Staditz who attracted the notice of Libussa, daughter of a certain Krok, who ruled over a large part of Bohemia, and is said to have been descended from Samo. Pfemysl married Libussa, the traditional "foundress of Prague, and during the 8th century became prince of the Bohemian Cechs. His family became extinct when Wenceslaus III. died, but through females the title to Bohemia passed from the Pfemyslides to the house of Luxemburg and later to the house of Habsburg.

See F. Palacky, Geschichte von Bohmen, Bd. I. (Prague, 1844).

PRENZLAU, or Prenzlow, a town of Germany, in the Prussian province of Brandenburg. It lies on the lower Ucker See, 30 m. W. by S. of Stettin by rail. Pop. (1905), 20,929. The Gothic church of St Mary (Evangelical), dating from 1340, is one of the finest churches in the district, and the remains of the town gates, walls and towers are also interesting. The industries include wool- spinning, iron-founding, brewing and sugar-refining. Tobacco is grown in the neighbourhood, and cigars are manufactured in the town.

Prenzlau is first mentioned in a document of the close of the 1 2th century, and received its municipal charter in 1235. As the capital of the old

Uckermark it was a frequent object of dispute between Pomerania and Brandenburg until incorporated with the latter about 1480. At Prenzlau Prince Hohenlohe, with his corps of 12,000 men, surrendered to Murat on the retreat after the battle of Jena in October 1806.

See I. Ziegler, Prenzlau, die ehemalige Hauptstadt der Uckermark (Prenzlau, 1886).

PRERAU (Czech, Pferov), a town of Austria, in Moravia, I 56 m. E.N.E. of Brunn by rail. Pop. (1900), 16,738, chiefly

Czech. It is one of the oldest towns in Moravia, and possesses a Gothic town-hall and an old castle, once occupied by Matthias Corvinus. It has an important cloth industry, and manufactures of sugar, ropes, machinery and agricultural implements. Prerau was at one time the chief seat of the Moravian Brethren.

PREROGATIVE, in law, an exclusive privilege of the Crown. The word, originally an adjective, is derived from the centuria praerogativa, or century which voted first on a proposed law (rogatio) in the Roman comitia centuriata. In English law, Blackstone says, " by the word prerogative we are to understand the character and power which the sovereign hath over and above all other persons, in right of his regal dignity; and which, though part of the common law of the country, is out of its ordinary course. This is expressed in its very name, for it signifies, in its etymology, something that is required or demanded before, or in preference to, all others " (Stephen's Comm. vol. ii. bk. iv. pt. i. ch. vi.). The prerogative is sometimes called jura regalia or regalia, the regalia being either majora, the regal dignity and power, or minora, the revenue of the Crown.

The theory of English law as to the prerogative of the king seems to be not quite consistent. On the one hand, he is a perfect and irresponsible being, holding his office by divine right ; George V., "by the Grace of God of Great Britain and Ireland King," 1 is still the heading of every writ. On the other band, his powers are defined and limited by law. This is laid down as early as the 13th century (Bracton, 5b). A consequence of this position is that the prerogative may be confined or extended by the supreme legislative authority, and that the courts have jurisdiction to decide whether or not any alleged right falls within the prerogative. The prerogative of the Crown, still of great extent, has been gradually limited by a long series of enact-

ments, the most worthy of notice being Magna carta, Confir- matio cartarum, Prerogativa regis, the Petition of Right, the Habeas Corpus Act, the Bill of Rights and the Act of Settlement. The most important of the obsolete prerogatives which have been at one time claimed and exercised are the following: (1) the right to impose a tax upon the subject without the consent of parlia- ment. (2) The right to dispense with the obligation of statutes, by the insertion in a grant of the clause non obstante statuto (see Dispensation). (3) The right of purveyance and pre-emption — that is, of buying up provisions at a valuation without the consent of the owner — and the right of impressing carriages and horses (see Purveyance). (4) The authority to erect tribunals not proceeding according to the ordinary course of justice was declared illegal by 16 Car. I. c. 10 (the act dissolving the Star Chamber, the court of the marches of Wales, and the court of the president and council of the north). (5) The revenue from first-fruits and tenths (see Annates). (6) The right of corody — that is, of sending one of the royal chaplains to be maintained by a bishop until the bishop promotes him to a benefice — has become obsolete by disuse. (7) The right by forfeiture to the property of a convict upon his conviction for treason or felony was abolished by the Felony Act 1870. (8) The immunity of the Crown from payment of costs has been taken away in almost all cases. (9) The right to alienate crown lands by grant at pleasure was taken away by 1 Anne c. 8. In very few cases has the prerogative been extended by statute; the Regulation of the Forces Act was an example of such extension. By that act the jurisdiction of lords-lieutenant of counties over the auxiliary forces was revested in the Crown.

The prerogative may be exercised in person or by delegation. The prerogative of conferring honours is generally (though not necessarily) exercised by the king in person, as in the case of investment with knighthood and military or civil decorations. The delegation of the prerogative often takes place by commis- sion, issued with or without a joint address from both houses of parliament. Parts of the prerogative — generally in the nature of profit, and so in derogation of the revenue of the Crown — may be

1 There is no difference in the prerogative as exercised by a king or a queen regnant, so that the word " king " in its constitutional sense includes queen. That the queen regnant has the same rights as a king was declared by I Mary sess. 3, c. 1.

conferred upon subjects by grant in letters patent, which will be presumed after enjoyment by the subject for a certain time. What in the king is a prerogative becomes a franchise in the subject, e.g. chases, warrens, wrecks, treasure-trove, courts-leet. The existing prerogatives may be divided, with Blackstone, into such as are direct and such as are by way of

exception; or perhaps better, with Chief Baron Comyns, into those affecting external relations and those affecting internal relations. Under the first class would fall the power of making war and concluding peace. As incidents to this power the king has the right of sending and receiving ambassadors, of concluding treaties, and of granting passports, safe-conducts, letters of marque and reprisals. These rights may be limited by international agreement ; thus the Declara- tion of Paris, 1856, abolished privateering as far as the assenting nations (of whom Great Britain was one) were concerned.

The prerogatives affecting internal relations may be conveni- ently, if not scientifically, classified as personal, political, judicial, ecclesiastical and fiscal.

Personal. — In order that there may always be an existing head of the state the king is regarded as a corporation. He cannot die; there can only be a demise of the Crown — that is, a transfer of the royal authority to a different person. On the same principle the king cannot be under age, though in cases where the king has been of tender years a protector or regent has usually been appointed for administrative purposes. The king is personally irresponsible for crime or tort, it being an ancient common law maxim that the king can do no wrong, and that any injury suffered by a subject at the hands of the king is to be attributed to the mistake of his advisers, A curious consequence of this irresponsibility is that the king is apparently the only person in the realm who cannot under .any circumstances arrest a suspected felon, for no action for false imprisonment would lie against him, and in the event of the arrest of an innocent person there would be a wrong without a remedy. He cannot be guilty of laches, or negligence. The maxim of the common law is " Nullum tempus occurrit regi." This is still the law in criminal matters. With a very few exceptions, such as prosecutions for treason and offences against the customs, no lapse of time will in England (though it is otherwise in Scotland) bar the right of the Crown to prosecute. The king is exempt from taxation on the ground that, as the revenue of the realm is his prerogative, it is useless for him to tax himself. But lands purchased by the privy purse are liable to taxation (39 & 40 Geo. III. c. 88, s. 6). He is also exempt from tolls (which can only exist as a franchise granted by him), and from the poor-rate, as he is not mentioned in the Poor Law Acts. His person cannot be arrested or his goods distrained or taken in execution. The privilege of exemption from taxation applies to his palaces and to the public buildings of the state. No kind of judicial process can be executed in a palace as long as it continues to be a royal residence. The privilege does not attach to palaces which the king has ceased to use as a dwelling, such as Hampton Court. The king has also several personal privileges of minor importance, such as the title of " majesty," the right to a royal salute, to the use of the royal standard and of

special liveries, &c.

Political. — The king is the supreme executive and co-ordinate legislative authority. As such authority he has the attribute of sovereignty 2 or pre-eminence, and the right to the allegiance of his subjects. All land is mediately or immediately held of him. Land derelict suddenly by the sea, land newly discovered by sub- jects and islands arising in the sea are his. As paramount authority in parliament he can dissolve or prorogue it at pleasure, but cannot prolong it beyond seven years. In theory parliament only exists at his will, for it is summoned by his writ, and the vote for a member of parliament is only a franchise, not a right existing independently of his grant. He can refuse his assent to a bill passed by the houses of parliament.' This right has, however, not been exercised since 1707, when Queen Anne refused the royal assent to a Scottish Militia Bill. The king has power to issue proclamations and (with the assent of the privy council) orders in council, in some cases as part of the ancient prerogative, in others under the provisions of an act of parliament. Proclamations are only binding so far as they are founded upon and enforce the laws of the realm. They cannot alter the common law or create a new offence. The king is the fountain of honour; as such he has the valuable power of granting peerages at will, so far as he is not restrained by any act of parliament, and so far as he keeps within certain constitu- tional limits, e.g. he cannot insert a shifting clause in a patent of peerage. He also confers all other titles of honour, whether heredi- tary or not, and grants precedence and armorial bearings. The great officers of state are appointed by the king. The only restric- tion upon the creation of offices is that he cannot create new offices with new fees attached to them, or annex new fees to old offices, for this would be to impose a tax upon the subject without an act

2 The word " sovereign " is frequently applied to the king in legal works. It should be borne in mind at the same time that the king is not a sovereign in the strict sense in which the term is used by Austin.

of parliament. The king, as head of the state, is in supreme com- mand of the army and navy for the defence of the realm. This right, contested by the Long Parliament, was finally declared by 13 Car. II. c. 6 to be in the king alone. The right of command carries with it as an incident the right to build forts and defences, to impress seamen in case of necessity, and to prohibit the im- portation of munitions of war (39 & 40 Vict. c. 36, s. 43), also the right to the soil of the foreshore and of estuaries of rivers, and the jurisdiction over territorial waters. Other rights which fall under the

political branch of the prerogative may be called the commercial rights, including the coining of money, the regulating of weights and measures, the establishing of markets and fairs, and the erecting of beacons, lighthouses and sea-marks. As parens patriae he is ex officio guardian of infants, idiots and lunatics. It is scarcely necessary to point out that all these prerogatives (except the conferring of honours and such prerogatives as are purely personal) are exercised through responsible ministers, practically in these days members of the party to which the majority of the House of Commons belongs. Thus the jurisdiction over infants, &c, is exercised in England by the lord chancellor, and over beacons, &c , by the Trinity House, under the general superintendence of the Board of Trade.

Judicial. — The king is the fountain of justice, and the supreme conservator of the peace of the realm. As supreme judge the king has the appointment of all judicial officers (other than those in certain local courts), who act as his deputies. He may constitute legal courts for the administration of the general law of the land, but he cannot erect tribunals not proceeding according to the known and established law of the realm, such as the Star Chamber or the commissions of martial law forbidden by the Petition of Right. Nor can he add to the jurisdiction of courts; thus he cannot give a spiritual court temporal powers. The king was in theory supposed to be present in court. Actions in the king's bench were until modern times said to be coram rege ipso, and the king could not be non-suited, for a non-suit implied the non-appearance of the plaintiff in court. The king enforces judgment by means of the sheriff, who represents the executive authority. As supreme conservator of the peace, the king, through the lord-lieutenant in counties, and through the lord chancellor in cities and boroughs, appoints justices of the peace. In the same capacity he is the prosecutor of crimes. All indictments still conclude with the words " against the peace of our lord the king, his crown and dignity." As it is the king's peace that is broken by the com- mission of a crime, the king has, as the offended party, the power of remission. The king cannot be sued by ordinary action. He may sue by ordinary action, but he has the advantage of being able to use prerogative process (see below). He has the right of inter- vention in all litigation where his rights are concerned, or in the interests of public justice, as where collusion is alleged between the decree nisi and the decree absolute in divorce. Crown debts have priority in administration and bankruptcy.

Ecclesiastical. — The king is recognized as " supreme governor " of the Church by 26 Hen. VIII. c. 1, and 1 Eliz. c. 1. By this preroga- tive he convenes and dissolves convocation and nominates to vacant bishoprics and other ecclesiastical preferments. The dean and chapter of a cathedral cannot proceed to the election of a bishop without the king's permission to elect (see Conge d'Elire). When any benefice is vacant by the promotion of

the incumbent to a bishopric other than a colonial bishopric the king has the patronage pro hac vice. The king cannot create new ecclesiastical jurisdiction in England or in colonies other than crown colonies. Where a new bishopric is created it is under the powers of an act of parliament.
Fiscal. — The theory of the constitution is that the king, being entrusted with the defence of the realm and the administration of justice, must have sufficient means given him for the purpose. The bulk of the revenue of the Norman and Plantagenet kings was derived from crown lands and feudal dues. At the present day the rents of crown lands form a very small part of the revenue, and the feudal dues do not exist except in the pecuniarily unimportant cases of escheat, royal fish, wrecks, treasure trove, waifs and strays, &c. Of the revenue a comparatively small part (the civil list) is paid to the king in person, the rest (the. consolidated fund) is applied to public purposes.

Prerogative Process. — This is the name given to certain methods of procedure which the Crown alone has the right of using; such are inquest of office (an inquiry by jury concerning the right of the Crown to land or goods), extent (a mode of execution), scire facias (for the resumption of a grant), and information (by which pro- ceedings are commenced in the name of the attorney-general for a public wrong or for injury to crown property).

Prerogative Writs. — Certain writs are called " prerogative writs," as distinguished from writs of right, because it is within the pre- rogative to issue or reissue them (see Writ).

Besides the authorities cited, see Allen, Inquiry into the Rise and Growth of the Royal Prerogative in England; Chitty, The Prerogative of the Crown; Staunforde, Exposition of the King's Prerogative; Comyns, Digest, art. " Praerogative "; Broom, Constitutional Law ; and the works of W. Bagehot, S. Low, A. V. Dicey and Sir W. Anson, on the Constitution.

PREROGATIVE COURTS, the name given to the English provincial courts of Canterbury and York, as far as regarded their jurisdiction over the estates of deceased persons.

They had jurisdiction to grant probate or administration where the diocesan courts could not entertain the case owing to the de- ceased having died possessed of goods above the value of £5 {bona notabilia) in each of two or more dioceses. The jurisdiction of the prerogative courts was transferred to the Court of Probate in 1857 by the Probate Court Act, and is now vested in the Probate, Divorce and Admiralty Division of the High Court of Justice by the Judicature Act 1875. In the state of New Jersey, United States, the court having jurisdiction over probate matters is called

the Prerogative Court.

PRESBYTER (Gr. irpeo-fivrepos, elder, the comparative of irpecrfivs, an old man), the title borne from very early times by certain officers or ministers of the Christian Church intermediate between " bishops " and " deacons." The specialized use of the word as implying not only age, but consequently wisdom and authority, is analogous to that of " senate " (from senior), of " gerousia " (from yepcov), and of "elder." It is the original form of priest (q.v.). The word is not found in pre-Christian writings except in the Septuagint, though as Deissmann has shown it is found on the Papyri as an official title for the village magistrates of Egypt and the members of the yepovoia, or senate, of many towns in Asia Minor. The office is, however, closely analogous to, and perhaps founded on, a similar office in the Jewish synagogue organization among the officials of which were the zekenim, or elders, sometimes identified with the archi-synagogues. In the New Testament the Greek word is used both for the ancient Jewish official and for the Christian elder. On Jewish tombstones of the Hellenistic period the title is frequently found, sometimes applied to women. The head official of the English Jews prior to their expulsion bore the title of Presbyter judaeorum; opinions differ as to whether this officer was eccles- iastical or had merely the secular duty of supervising the exchequer of the Jews (see further The Jewish Encyclopedia, 1905, x. 190, 191).

The history of presbyteral government as opposed to episcopacy and pure Congregationalism is not known in detail. After the Reformation, however, it was adopted by Calvin and his followers, who created that system which has ever since been known as Presbyterianism (q.v.). There are many theories as to the origin of the office of presbyter in the Christian Church. (1) Some connect it with the appointment of the seven recorded in Acts vi. This is the view taken by Boehmer, 1 Ritschl 2 and Lindsay. 3 It is urged that the traditional view which regards the seven as deacons is untenable because the term " deacon " is never used in the narra- tive, and there is no reference to the office in the Acts. On the other hand the officials of the Jerusalem church are always called " elders " and when they are first introduced (Acts xi. 30) appear to be discharging the functions for which " the seven " were specially set apart. (2) The view adopted by the majority of English scholars is, while refusing to accept the connexion between the presbyters and the seven, to regard the office as distinctly primitive and say that it was taken over by the earliest Christian community at Jerusalem from the Jewish synagogue. 4 (3) Harnack and a few other modern scholars 5 maintain that the office of presbyter did not come into existence till the 2nd century. During the last quarter of the 1st century, a three-fold organization is found in the Church: (a) a spiritual organization composed of "apostles, prophets and teachers who had been awakened by the spirit

and by the spirit endowed "; (b) an administrative organization, " For the care of the poor, for worship, for correspondence, the congregation needed controlling officials. These were the bishop and the deacons, the former for higher, the latter for inferior services "; (c) a patri- archal organization based upon the natural deference of the younger to the older members of the Church. The senior members of the community, by virtue of their age and experience, watched over the conduct and guided the action of the younger and less experi- enced portion of the Church, though they held no official position and were not appointed for any particular work like the bishops and deacons. In the 2nd century the patriarchal element in the organization was merged in the administrative, and the presbyters

1 Diss. jur. eccl. p. 373.

2 Entstehung der altkatholischen Kirche, 2nd ed. p. 355.

3 The Church and the Ministry, p. 116; cf. also Brown, Apos- tolical Succession, p. 144.

4 Lightfoot, Ep. to the Philippians, p. 192.

6 E.g. Sohm, Kirchenrecht, 92 ; YVeizsacker, Apostolic Age (Eng. trans, ii. 330); Allen, Christian Institutions, p. 38; A. C. McGiffert, Apostolic Age, p. 663 (1897).

became a definite order in the ministry. The time at which the change occurred cannot be definitely fixed. " In some congrega- tions," as Harnack says, " it may have been long before the elders were chosen, in others this may have come very soon; in some the sphere of the competency of the presbyters and patrons may have been quite indefinite and in others more precise." Harnack's theory is based upon the following arguments: (a) The silence of the genuine Epistles of St Paul and the Epistle to the Hebrews. In I Cor. xii. 28 Paul says that God has given to the Church apostles,

Crophets, teachers, miracles, gifts of healing, helps, governments; ut of presbyters he has not a word to say. Even from passages where he is speaking of the jurisdiction of the congregation, as for example in I Cor. v., vi., the presbyters are absent, while in Phil. i. 1 it is the bishops and deacons that he mentions, (b) The documents in which presbyters are mentioned in an official sense, viz. the Epistle of James, the first Epistle of Peter, the Acts of the Apostles and the Pastoral Epistles belong to a later age and reflect the customs of their own day rather than those of the

primitive Church, (c) Even Clement of Rome does not say that the apostles had appointed presbyters in the congregation, he speaks only of bishops and deacons. For this reason the statement in Acts xiv. 23 is to be looked upon with suspicion. These arguments, however, are not absolutely decisive. It is true that presbyters are not mentioned in the genuine Epistles of St Paul, but there are hints that similar officers existed in some of the churches founded by the apostle. There is a reference in 1 Thess. v. 12 to " those who rule over you " {irpoiaranevoi.), and the same word occurs in Rom. xii. 8. 1 The term " governments " (KvfJepvJiaas) in I Cor. xiv. 28 obviously refers to men who discharged the same functions as presbyters. If too, as seems most probable, bishops and pres- byters were practically identical, there is of course a specific refer- ence to them in Phil. i. I. The "leaders" who are mentioned three times in Hebrews xiii. were also probably "presbyters" under another name. Harnack's second argument depends for its validity upon certain conclusions with regard to the date of James and 1 Peter, which are not universally accepted. Few English scholars, for instance, would accept as late a date as 120- 140 for James, and 1 Peter may be as early as 65, as Harnack himself admits, though he prefers a date in the reign of Domitian. If this possibility in regard to I Peter is granted, it is fatal to the theory, because at the time when the epistle was written official presbyters were so well established that abuse and degeneration had already begun to creep in and some of the elders were already guilty of " lording it over their heritage " and making a profit out of their office (1 Pet. v. 1-4). With regard to the testimony of Acts, the only question, since Harnack admits the Lucan author- ship, 2 is whether Luke is describing the organization of the Church as it existed at the time of the events recorded or reflecting the arrangements which prevailed at the time when the book was written. It is difficult to see how Luke can have been wrong with regard to the " Ephesian elders " who came to meet Paul at Miletus since he was present on the occasion (xx. 15-17). The only mistake that seems possible is that he may have conferred a later title upon the emissaries of the Church of Ephesus. This is not likely, but, at all events, it would only prove that the office under another name existed at Ephesus, for otherwise Luke could not possibly have put into the mouth of Paul the address which follows. Neither is there prima facie ground for objecting to the statements with regard to the presbyters of Jerusalem. If the Church at Jerusalem had any officials, it is highly probable that those officials bore the name and took over the functions of the elders of the synagogue. The statement in Acts xiv. 23, that Paul and Barnabas appointed elders in the churches of South Galatia, is more open to objection perhaps, owing to the silence of the Epistle to the Galatians. With regard to the evidence of the Epistle of Clement, Harnack seems to be incorrect in his conclusions. Scholars of such opposite schools of thought as Schmiedel 3 and Lindsay 4 maintain that the epistle contains the most

explicit references to presbyters of the official type. The crucial passage (xliv. 4-6) seems to bear out their contention. " It will be no light sin for us if we thrust out of the oversight (iirurKoiri)) those who have offered the gifts unblameably and holily. Blessed are those presbyters who have gone before . . . for they have no fear lest any one should remove them from their appointed place " (Airo tou Idpvfiivov rb-rrov). There is an equally specific reference in liv. 2: "Only let the flock of Christ keep peace with its duly-appointed presbyters" (nerd, t&v naBi.aTay.kvwv irpe&fiuTepaiv) .

The conclusions which we seem to reach are as follows: (1) In the earliest stage (between 30 and 60) there is no uniform organization

1 Hort translates vpoiaraixtvoi " those who care for you," but I Tim. iii. 12 and v. 17 seem to be against this. In Justin Martyr, Apol. 1. 67, irpoeaTws evidently refers to "the president of the church," and in a recently discovered papyrus which Ramsay dates 303 a certain bishop is described as XaoD irpoiaTap,tvov, Studies in Roman Provinces, pp. 125-126.

2 Lukas der Arzt (1906), cap. I. ' Ency. Bib. p. 3134 sqq.

4 The Church and the Ministry, p. 160. Cf. also Loening, Die Gemeindeverfassung des Urchristentums, p. 58.

in the Christian Church. Presbyters are found in Jerusalem from primitive times. In the Pauline churches the name is not found except at Ephesus and possibly in south Galatia, though there are traces of the office, at any rate in germ, under different titles in other churches. (2) In the second stage (between 60 and 100) there is an increasing tendency towards uniformity. The office is found definitely mentioned in connexion with the churches of Asia Minor (1 Pet. i. 1), Corinth (Epistle of Clement) and Crete (Titus). The officials were called by two names, " elders " and " bishops," the former denoting the office, the latter the function (exercising the oversight). The substantial identity of the two titles cannot be doubted in the light of such passages as Acts xx. 17, 28.; 1 Pet. v. I, 2; 1 Tim. iii. 1-7, v. 17-19 and Titus i. 5-7.

There is far less controversy with regard to the later history of the presbyters. The third stage of the development of the office is marked by the rise of the single episcopus as the head of the individual church (see Bishop; Episcopacy). The first trace of this is to be found in the Epistles of Ignatius which prove that by the year 115 " the three orders " as they were afterwards called — bishop, presbyters and deacons — already existed, not indeed universally, but in a large proportion of the churches. The presbyters occupied an intermediate position between the bishop and the deacons. They constituted " the council of the bishop." It was some time before the

threefold ministry became universal. The Didache knows nothing of the presbyters; bishops and deacons are mentioned, but there is no reference to the second order. The Shepherd of Hernias knows nothing of the single bishop; the churches are under the control of a body of presbyter-bishops. Before the close of the 2nd century however the three orders were established almost everywhere. The sources of the Apostolic Canons (which date between 140-180) lay down the rule that even the smallest community of Christians, though it contain only twelve mem- bers, must have its bishop and its presbyters. The original equality of bishops and presbyters was still however theoreti- cally maintained. The Canons of Hippolytus which belong to the end of the 2nd century distinctly lay it down that " at the ordination of a presbyter everything is to be done as in the case of a bishop, save that he does not seat himself upon the throne. The same prayer shall also be said as for a bishop, the name of the bishop only being left out. The presbyter shall in all things be equal with the bishop, save in the matter of pre- siding and ordaining, for the power to ordain is not given him." The presbyters formed the governing body of the church. It was their duty to maintain order, exercise discipline, and superintend the affairs of the Church. At the beginning of the 3rd century, if we are to believe Tertullian, they had no spiritual authority of their own, at any rate as far as the sacra- ments are concerned. The right to baptize and celebrate the communion was delegated to them by the bishop. 5

In the fourth stage we find the presbyters, like the bishops, becoming endowed with special sacerdotal powers and functions. Up to the end of the 2nd century the universal priesthood of all believers was the accepted doctrine of the Church. It was not till the middle of the 3rd century that the priesthood was restricted to the clergy. Cyprian is largely responsible for the change, though traces of it are found during the previous half century. Cyprian bestows the highest sacerdotal terms upon the bishops of course, but his references to the priestly character of the office of presbyter are also most definite. 6 Henceforth pres- byters are recognized as the secundum sacerdotium in the Church.

With the rise of the diocesan bishops the position of the presbyters became more important. The charge of the indi- vidual church was entrusted to them and gradually they took the place of the local bishops of earlier days, so that in the 5th and 6th centuries an organization was reached which approximated in general outline to the system which prevails in the Anglican Church to-day.

See Hatch, Organization of the Early Christian Churches (2nd ed., 1882), and Harnack's " excursus " in the German edition of this

6 Tertull. De bapt, 17 : " Baptismi dandi habet jus summus sacerdos qui est

episcopus ; dehinc presbyteri …. non tamen sine episcopi auctoritate. ”

6 Cf. Ep. 58 : “Presbyteri eumepiscoposacerdotalihonore conjunct!.”

work (1883); Harnack, Die Lehre der zwolf Apostel (1884); Loening, Die Gemeindeverfassung des Urchrislentums (1889); Sohm, Kirchen- recht (1892); an article by Loofs, in Studien und Kritiken, for 1890 (pp. 619-658) ; Lindsay, The Church and the Ministry in the Early Centuries (1902): Schmiedel, article ” Ministry,” in Enc. Bib.

(H. T. A.)

PRESBYTERIANISM, a highly organized form of church government in which presbyters or elders occupy a prominent place. As one of the three principal systems of ecclesiastical polity known to the Christian Church, Presbyterianism occupies an intermediate position between episcopacy and Congrega- tionalism. A brief comparison with these will indicate its salient features. In episcopacy the supreme authority is a diocesan bishop; in Congregationalism it is the members of the congregation assembled in church meeting; in Presbyterianism it is a church council composed of representative presbyters. In episcopacy the control of church affairs is almost entirely withdrawn from the people; in Congregationalism it is almost entirely exercised by the people; in Presbyterianism it rests with a council composed of duly appointed office-bearers chosen by the people. The ecclesiastical unit in episcopacy is a diocese, comprising many churches and ruled by a prelate; in Congrega- tionalism it is a single church, self-governed and entirely inde- pendent of all others; in Presbyterianism it is a presbytery or council composed of ministers and elders representing all the churches within a specified district. It may be said broadly, therefore, that in episcopacy the government is monarchical; in Congregationalism, democratic; and in Presbyterianism, aristocratic or representative.

I. — The System Described

As compared with the Church of England (Episcopal) in which there are three orders of clergy — bishops, priests and deacons, the Presbyterian Church recognizes but one spiritual order, viz. presbyters. These are ecclesiastically of equal rank, though differentiated, according to their duties, as ministers who preach and administer the sacraments, and as elders who are associated with the ministers in the oversight of the people. There are deacons in Presbyterianism inferior in rank to presbyters, their

duties being regarded as non-spiritual.

The membership of a Presbyterian Church consists of all who are enrolled as communicants, together with their children. Member- Others who worship regularly without becoming ship. communicants are called adherents. Only com-

municants exercise the rights of membership. They elect the minister and other office-bearers. But, in contrast with Con- gregationalism, when they elect and " call " a minister their action has to be sustained by the presbytery, which judges of his fitness for that particular sphere, of the measure of the congregation's unanimity, and of the adequacy of financial support. When satisfied, the presbytery proceeds with the ordination and induction. The ordination and induction of ministers is always the act of a presbytery. The ordination and induction of elders in some branches of the Church is the act of the kirk-session; in others it is the act of the presbytery.

The kirk-session is the first of a series of councils or church courts which are an essential feature of Presbyterianism. It consists of the ministers and ruling elders. The minister is ex officio president or moderator. Without his presence or the presence of his duly-appointed deputy the meeting would not be in order nor its proceedings valid. The moderator has not a deliberative, but only a casting vote. (This is true of the moderator in all the church courts.) Neither the session nor the congregation has jurisdiction over the minister. He holds his office ad vitam aut culpam; he cannot demit it or be deprived of it without consent of the presbytery. In this way his inde- pendence among the people to whom he ministers is to a large extent secured. The kirk-session has oversight of the congregation in regard to such matters as the hours of public worship, the arrange- ments for administration of the sacraments, the admission of new members and the exercise of church discipline. New members are either catechumens or members transferred from other churches, The former are received after special instruction and profession of faith ; the latter on presenting a certificate of church membership from the church which they have left. Though the admission of new members is, strictly speaking, the act of the session, this duty usually devolves upon the minister, who reports his procedure to

Kirk- Session,

the session for approval and confirmation. Matters about which there is any doubt or difficulty, or division of opinion in the session, may be carried for settlement to the next higher court, the presbytery.

The presbytery consists of all the ministers and a selection of the ruling

elders from the congregations within a prescribed area. The presbytery chooses its moderator periodically from _. among its ministerial members. His duty is to see pr es hvterv that business is transacted according to Presbyterian principle and procedure. The moderator has no special power or supremacy over his brethren, but is honoured and obeyed as primus inter pares. The work of the presbytery is episcopal. It has oversight of all the congregations within its bounds; hears refer- ences from kirk-sessions or appeals from individual members; sanctions the formation of new congregations; superintends the education of students for the ministry; stimulates and guides pastoral and evangelistic work; and exercises discipline over all within its bounds, including the ministers. Three members, two of whom must be ministers, form a quorum; a small number com- pared with the important business they may have to transact, but the right of appeal to a higher court is perhaps sufficient safe- guard against abuse. Presbytery meetings are either ordinary or occasional. The former are held at prearranged intervals. Occasional meetings are either in hunc effectum or pro re nata. The presbytery fixes the former for specific business; the latter is summoned by the moderator, either on his own initiative or on the requisition of two or more members of presbytery, for the transac- tion of business which has suddenly emerged. The first question considered at a pro re nata meeting is the action of the moderator in calling the meeting. If this is approved the meeting proceeds; if not, the meeting is dissolved. Appeals and complaints may be taken from the presbytery to the synod.

The synod is a provincial council which consists of the ministers and representative elders from all the congregations within a specified number of presbyteries, in the same way as _. „ . the presbytery is representative of a specified number e yno ‘ of congregations. Though higher in rank and larger than most presbyteries it is practically of less importance, not being, like the presbytery, a court of first instance, nor yet, like the general assembly, a court of final appeal. The synod at its first meeting chooses a minister as its moderator whose duties, though somewhat more restricted, are similar to those of presbyterial moderators. The synod hears appeals and references from presbyteries; and by its discussions and decisions business of various kinds, if not settled, is ripened .for consideration and final settlement by the general assembly, the supreme court of the Church.

The general assembly is representative of the whole Church, either, as in the Irish General Assembly, by a minister and elder sent direct to it from every congregation, or, as in the Scottish General Assemblies, by a proportion of dele- T>> e General gates, ministers and elders from every presbytery. A ssemby. The general assembly annually at its first meeting chooses one of its ministerial members as moderator. He takes precedence, primus inter pares, of all the members, and is recognized as the official

head of the Church during his term of office. His position is one of great honour and influence, but he remains a simple presbyter, without any special rule or jurisdiction. The general assembly reviews all the work of the Church; settles con- troversies; makes administrative laws; directs and stimulates missionary and other spiritual work ; appoints professors of theology ; admits to the ministry applicants from other churches; hears and decides complaints, references and appeals which have come up through the inferior courts; and takes cognizance of all matters connected with the Church's interests or with the general welfare of the people. As a judicatory it is the final court of appeal; and by it alone can the graver censures of church discipline be reviewed and removed. The general assembly meets once a year at the time and place agreed upon and appointed by its predecessor.

By means of this series of conciliar courts the unity of the Church is secured and made manifest; the combined, simultaneous effort of the whole is made possible; and disputes, instead of Conciliar being fought out where they arise, are carried for settle- courts ment to a larger and higher judicatory, free from local feeling and prejudice. As access to the church courts is the right of all, and involves but slight expense, the liberty of even the humblest member of the Church is safeguarded, and local oppression or injustice is rendered difficult.

The weak point in the system is that episcopal superintendence being exercised in every case by a plurality of individuals there is no one, moderator or senior member, whose special duty it is to take initial action when the unpleasant work of judicial investigation or ecclesiastical discipline becomes necessary. This has led in some quarters to a desire that the moderator should be clothed with greater responsibility and have his period of office prolonged; should be made, in fact, more of a bishop in the Anglican sense of the word.

Though the jus divinum of presbytery is not now insisted upon as in some former times, Presbyterians claim that it is the church polity set forth in the New Testament. The case is usually stated somewhat as follows. With the sanction and under the

guidance of the Apostles, officers called elders and deacons were appointed in every newly-formed church. 1 They were elected by fl ew the people, and ordained or set apart for their sacred

Testament wor k by the Apostles. 2 The elders were appointed to Authority, teach and rule; 3 the deacons to minister to the poor. 4 There were elders in the church at Jerusalem, 6 and in the church at Ephesus; 8 Paul and Barnabas appointed elders in the cities of Lycaonia and Pisidia;' Paul left Titus in Crete to appoint elders" in every city; 8 the elders amongst the strangers scattered throughout Pontus, Galatia, Cappadocia, Asia and Bithynia re- ceived a special exhortation by Peter. 9 These elders were rulers, and the only rulers in the New Testament Church. Just as in the synagogue there was a plurality of rulers called elders, so there was in every Christian church a plurality of elders. The elders were different from the deacons, but there is no indication that any one elder was of higher rank than the others. The elder was not an officer inferior and subordinate to the bishop. The elder was a bishop. The two titles are applied to the same persons. See Acts xx. 17, 28 ; " he sent and called for the elders of the church. . . . Take heed to all the flock over which the Holy Ghost hath made you bishops." See also Titus i. 5, 6: " ordain elders . . . for a bishop must be blameless." This is now admitted by modern expositors. 10 The elders were chosen by the people. This is not expressly stated in the New Testament but is regarded as a necessary inference. When an apostle was about to be chosen as successor to Judas, the people were invited to take part in the election; 11 and when deacons were about to be appointed the Apostles asked the people to make the choice. 12 It is inferred that elders were similarly chosen. It is worthy of notice that there is no account at all of the first appointment of elders as there is of deacons. Probably the recognition and appointment of elders was simply the transfer from the synagogue to the Church of a usage which was regarded as essential among Jews; and the Gentile churches naturally followed the example of the Jewish Christians. 13 The elders thus chosen by the people and inducted to their office by the Apostles acted as a church court. Only thus could a plurality of rulers of equal rank act in an efficient and orderly way. They would discharge their pastoral duties as individuals, but when a solemn ecclesiastical act, like ordination, was performed, it would be done, as in the case of Timothy, by " the laying on of the hands of the presbytery " ; 14 and when an authoritative decision had to be reached, as in regard to circumcision, a synod or court was called together for the purpose. 15 The action of Paul and Barnabas at Antioch 16 seems to accord with Presbyterian rather than Congregational polity. The latter would have required that the question should have been settled by the church at Antioch instead of being referred to Jerusalem. And the decision of the council at Jerusalem was evidently more than advisory; it was authoritative and meant to be binding on all the churches. 17 The principle of ministerial parity which is fundamental in Presbyterian- ism is founded not merely on apostolic example but on the words of Christ Himself: " Ye know that the princes of the Gentiles exercise dominion over them, and they that are great

exercise authority upon them. But it shall not be so among you." 18

From the foregoing outline it will be seen that Presbyterianism may be said to consist in the government of the Church by

representative assemblies composed of the two Definitions. c l asses °f presbyters, ministers and elders, and so

arranged as to manifest and realize the visible unity of the whole Church. Or it may be described as denying (1) that the apostolic office is perpetual and should still exist in the Christian Church; (2) that all church power should be vested in the clergy; (3) that each congregation should be independent of all the rest; and as asserting (1) that the people ought to have a substantial part in the government of the Church; (2) that presbyters, i.e. elders or bishops, are the highest permanent officers in the Church and are of equal rank; (3) that an outward and visible Church .is one in the sense that a smaller part is controlled by a larger and all the parts by the whole. 19

Though Presbyterians are unanimous in adopting the general system of church polity as here outlined, and in claiming New

1 Phil. i. 1. 6 Acts xx. 17.

2 Acts vi. 2-6. 7 Acts xiv. 23.

3 1 Tim. v. 17; Titus i. 9. s Titus i. 5.

4 Acts vi. 1,2. 9 I Peter v. 1. 6 Acts xi. 29, xv. 2, 4, 6, xvi. 4.

10 See Bishop Lightfoot's exhaustive essay in his volume on the Epistle to the Philippians.

11 Acts i. 15-26. ls Acts xv. 6-20.

12 Acts vi. 2-6. 1B Acts xv. 2.

13 Acts xiv. 23. " Acts xvi. 4.

14 1 Timothy iv. 14. 18 Matt.xx.25,26;Lukexxii.25,26.

19 Proceedings of Seventh General Council of the Alliance of Re- formed Churches holding the Presbyterian System (Washington,

1899).

Testament authority for it, there are certain differences of view in regard to

details which may be noticed. There is no doubt that considerable indefiniteness in regard to the precise status and rank of the ruling elder is com- yˆˆf 8 ” monly prevalent. When ministers and elders are associated in the membership of a church court their equality is admitted; no such idea as voting by orders is ever entertained. Yet even in a church court inequality, generally speaking, is visible to the extent that an elder is not usually eligible for the moderator’s chair. In some other respects also a certain disparity is apparent between a minister and his elders. Practi- cally the minister is regarded as of higher standing. The duty of teaching and of administering the sacraments and of always presiding in church courts being strictly reserved to him invests his office with a dignity and influence greater than that of the elder. It was inevitable, therefore, that this question as to the exact status of the ruling elder should claim attention in the discussions of the Pan-Presbyterian Alliance. At its meeting in Belfast in 1884 a report was submitted by a ” committee on the eldership ” which had been previously appointed. Accord- ing to this committee there are prevalent three distinct theories in regard to the office and function of ruling elders: —

I. That while the New Testament recognizes but one order of presbyters there are in this order two degrees or classes, known as teaching elders and ruling elders. In teaching, in ~ h . . dispensing the sacraments, in presiding over public .. ˆ e .f ° worship, and in the private functions by which he™,, ng ministers to the comfort, the instruction and the improve- ment of the people committed to his care, a pastor acts within his parish (or congregation) according to his own discretion; and for the discharge of all the duties of the pastoral office he is accountable only to the presbytery from whom he received the charge of the parish (or congregation). But in everything which concerns what is called discipline — the exercise of that jurisdiction over the people with which the office-bearers of the church are conceived to be invested, he is assisted by lay-elders. They are laymen in that they have no right to teach or to dispense the sacraments, and on this account they fill an office in the Presbyterian Church inferior in rank and power to that of the pastors. Their peculiar business is expressed by the term ” ruling elders.” 20

II. A second theory is contended for by Principal Campbell in his treatise on the eldership, and by others also, that there is no warrant in Scripture for the eldership as it exists in the Presby- terian Church; that the ruling elder is not, and is not designed to be, a counterpart of the New Testament elder; in other words, that he is not a presbyter, but only a layman chosen to represent the laity in the church courts and permitted to assist in the govern- ment of the church.

III. A third theory, advanced by Professor Witherow and others, is that the

modern elder is intended to be, and should be, recog- nized as a copy of the scriptural presbyter. Those who take this view hold that " in everything except training and the conse- quences of training the elder is the very same as the minister," and they base their opinion on the fact that the terms " overseer " or " bishop," " presbyter " and " elder," are used interchangeably throughout the New Testament. It is consistent with this view to argue the absolute parity of ministers and elders, conceding to all presbyters " equal right to teach, to rule, to administer the sacra- ments, to take part in the ordination of ministers, and to preside in church courts."

*The practice of the Presbyterian churches of the present day is in accord with the first-named theory. Where attempts are made to reduce the third theory to practice the result is not satisfactory. Nor is the first-named / Vacate" * y theory less in harmony with Scripture teaching than the third. In the initial stages of the Apostolic Church it was no doubt sufficient to have a plurality of presbyters with abso- lutely similar duties and powers. At first, indeed, this may have been the only possible course. But apparently it soon became desirable and perhaps necessary to specialize the work of teaching by setting apart for that duty one presbyter who should withdraw from secular occupation and devote his whole time to the work of the ministry. There seems to be evidence of this in the later writings of the New Testament. 21 It is now held by all Presbyterian churches that one presbyter in every congregation should have specially committed to him the work*

20 Hill's View of the Constitution of the Church of Scotland, pp. 37,

38-

21 I Tim. iv. 15, v. 17; Col. iv. 17.

of teaching, administering the sacraments, visiting the flock pastorally, and taking oversight, with his fellow elders, of all the interests of the church. To share with the minister such general oversight is not regarded by intelligent and influential laymen as an incongruous or unworthy office; but to identify the duties of the eldership, even in theory j with those of the minister is a sure way of deterring from accepting office many whose counsel and influence in the eldership would be in- valuable. 1

Another subject upon which there is a difference of opinion in the Presbyterian churches is the question of Church Establish- ments. The view, originally held by all Presbyterian churches in Great Britain and on the

Continent, that union with and support by the civil government are not only lawful but also desirable, is now held only by a minority, and is practically exemplified among English-speaking Presbyterians only in the Church of Scotland (see Scotland, Church of). The law- fulness of Church Establishments with due qualifications is perhaps generally recognized in theory, but there is a growing tendency to regard connexion with the state as inexpedient, if not actually contrary to sound Presbyterian principle. That this tendency exists cannot be doubted, and there is reason to fear that its influence, by identifying Presbyterianism with dissent in England and Scotland, is unfavourable to the general tone and character of the Presbyterian Church.

Those who favour state connexion and those who oppose it agree in claiming spiritual independence as a fundamental principle of Presbyterianism. That principle is Spiritual in- e q ua iiy opposed to Erastianism and to Papacy, to the civil power dominating the Church, and to the ecclesiastical power dominating the state. All Presby- terians admit the supremacy of the state in things secular, and they claim supremacy for the Church in things spiritual. Those who favour a Church Establishment hold that Church and state should each be supreme in its own sphere, and that on these terms a union between them is not only lawful but is the highest exemplification of Christian statesmanship. So long as these two spheres are at all points clearly distinct, and so long as there is a desire on the part of each to recognize the supremacy of the other, there is little danger of friction or collision. But when spiritual and secular interests come into unfriendly contact and entanglement; when controversy in regard to them becomes inevitable; from which sphere, the spiritual or the civil, is the final decision to come? Before the Reformation the Church would have had the last word; since that event the right and the duty of the civil power have been generally recognized.

The origin of Presbyterianism is a question of historical interest. By some it is said to have begun at the Reformation; Oririn ˆy some it is traced b3ck to the days of Israel in Egypt; 2 by most, however, it is regarded as of later Jewish origin, and as having come into existence in its present form simultaneously with the formation of the Christian Church. The last is Bishop Lightfoot's view. He connects the Christian ministry, not with the worship of the Temple, in which were priests and sacrificial ritual, but with that of the synagogue, which was a local institution providing spiritual edification by the reading and exposition of Scripture. 3 The first Christians were regarded, even by themselves, as a Jewish sect. They were spoken of as " the way." 4 They took with them, into the new communities which they formed, the Jewish polity or rule and oversight by elders. The appointment of these would be regarded as a matter of course, and would not seen; to call for any special notice in such a narrative as the Acts of the

Apostles.

But Presbyterianism was associated in the 2nd century with a kind of episcopacy. This episcopacy was at first rather con- gregational than diocesan; but the tendency of its growth was undoubtedly towards the latter. Hence for proof that their

1 Report of Proceedings, Third General Council of the Alliance of Reformed Churches, &c. (1884), pp. 373 seq. and App. p. 131.

2 Exodus iii. 16; iv. 29.

*» St Luke iv. 16 seq. * Acts ix. 2.*

church polity is apostolic Presbyterians are accustomed to appeal to the New Testament and to the time when the apostles were still living; and for proof of the apostolicity of prelacy Episcopalians appeal rather to the early Episcopacy. Church fathers and to a time when the last of the Apostles had just passed away. 5 It is generally admitted that dis- tinct traces of Presbyterian polity are to be found in unexpected quarters (e.g. Ireland, Iona, the Culdees, &c.) from the early centuries of church history and throughout the medieval ages down to the Reformation of the 16th century. Only in – a very modified sense, therefore, can it be correctly said to date from the Reformation.

At the Reformation the Bible was for the great mass of both priests and people a new discovery. The study of it shed floods of light upon all church questions. The leaders of the _, Reformation searched the New Testament not only for „ f ormefs doctrinal truth but also to ascertain the polity of the primitive Church. This was specially true of the Reformers in Switzerland, France, Scotland, Holland and in some parts of Germany. Luther gave little attention to New Testament polity, though he believed in and clung passionately to the universal priesthood of all true Christians, and rejected the idea of a sacer- dotal caste. He had no dream or vision of the Church's spiritual independence and prerogative. He was content that ecclesiastical supremacy should be with the civil power, and he believed that the work of the Reformation would in that way be best preserved and furthered. In no sense can his " consistorial " system of church government be regarded as Presbyterian.

*It was different with the Reformers outside Germany. While Luther studied the Scriptures in search of true doctrine and Christian life and was indifferent to forms of church polity, they studied the New Testament not only in f?5 ers search of primitive church doctrine but also of primitive ?, , . church polity. One is struck by the unanimity with *[formed which,*

*working individually and often in lands far apart, ure * they reached the same conclusions. They did not get their ideas of church polity from one another, but drew it directly from the New Testament. For example, John Row, one of the five commis- sioners appointed by the Scottish Privy Council to draw up what is now known as the First Book of Discipline, distinctly says that "they took not their example from any kirk in the world; no, not from Geneva "; but they drew their plan from the sacred Scrip- tures. 6 This was true of them all. They were unanimous in rejecting the episcopacy of the Church of Rome, the sanctity of celibacy, the sacerdotal character of the ministry, the confessional, the propitiatory nature of the mass. They were unanimous in adopting the idea of a church in which all the members were priests under the Lord Jesus, the One High Priest and Ruler; the officers of which were not mediators between men and God, but preachers of One Mediator, Christ Jesus; not lords over God's heritage, but ensamples to the flock and ministers to render service. They were unanimous in regarding ministerial service as mainly pastoral; preaching, administering the sacraments and visiting from house to house; and, further, in perceiving that Christian ministers must be also spiritual rulers, not in virtue of any magical influence transmitted from the Apostles, but in virtue of their election by the Church and of their appointment in the name of the Lord Jesus. When the conclusions thus reached by many independent investi- gators were at length reduced to a system by Calvin, in his famous Institutio, it became the definite ideal of church government for all the Reformed, in contradistinction to the Lutheran, churches.*

Yet we do not find that the leaders of the Reformed Church succeeded in establishing at once a fully-developed Presbyterian polity. Powerful influences hindered them from realiz- ing their ideal. We notice two. In the first place, the ^^ances people generally dreaded the recurrence of ecclesiastical " r tyranny. So dreadful had been the yoke of Rome, which they had shaken off, that they feared to submit to anything similar even under Protestant auspices. When their ministers, moved by an intense desire to keep the Church pure by means of the exercise of scriptural discipline, claimed special spiritual rule over the people, it was not wonderful that the latter should have been reluctant to submit to a new spiritual despotism. So strong was this feeling in some places that it was contended that the discipline of ex- communication, if exercised at all, should be exercised only by the secular power. A second powerful influence was of a different kind, viz. municipal jealousy of church power. The municipal authority in those times claimed the right to exercise a censorship over the citizens' private life. Any attempt on the part of the Church to exercise discipline was resented as an intrusion. It has been a common mistake to think of Calvin and contemporary Reformers

6 See Lightfoot's Essay in Commentary on the Epistle to the Philippians.

6 Knox, Winran, Spotswood and Douglas — all of them John — were the other commissioners.

as introducing a discipline of stern repression which made the in- nocent gaieties of life impossible, and produced a dull uniformity of straitlaced manners and hypocritical morals. The discipline was there before the Reformers. There were civil laws which regulated clothing, food and social festivity. Hence friction, at times, between the Reformers and civic authorities friendly to the Reformation; not as to whether there should be "discipline" (that was never doubted) but as to whether it should be ecclesi- astical or municipal. Even, therefore, where people desired the Reformation there were powerful influences opposed to the setting up of church government and to the exercise of church discipline after the manner of the apostolic Church ; and one ceases to wonder at the absence of complete Presbyterianism in the countries which were forward to embrace and adopt the Reformation. Indeed the more favourable the secular authorities were to the Reformation the less need was there to discriminate between civil and ecclesi- astical power, and to define strictly how the latter should be exer- cised. We look in vain, therefore, for much more than the germs and principles of Presbyterianism in the churches of the first Reformers. Its evolution and the thorough application of its principles to actual church life came later, not in Saxony or Switzer- land, but in France and Scotland; and through Scotland it has passed to all English-speaking lands.

The doctrines of Presbyterianism are those generally known

as evangelical and Calvinistic. The supreme standard of

belief is the Word of God in the original languages.

eoogy. ˆ e su ij 0rc [j nate standards have been numerous, though marked by striking agreement in the main body of Christian doctrine which they set forth. Much has been done of late years to make these subordinate standards of reformed doctrine more generally known. The following list is fairly complete: —

Switzerland. — First Helvetic Confession (1536). Geneva Con- fession (1536). Geneva Catechism (1545).

England. — Forty-two Articles (1553). Thirty-eight Articles (1563). Thirty-nine Articles (1571). Lambeth Articles (1595). Irish Articles (1615). Westminster Confession (1644-1647). Larger and Shorter

Catechisms (1647).

France. — Confessio gallicana (1559).

Scotland. — Scottish Confession (1560). Westminster Confession (1647). Larger and Shorter Catechisms (1647).

Netherlands. — Frisian Confession (1528). Confessio belgica (1561). Netherlands Confession (1566).

Hungary. — Hungarian Confession (1562).

Bohemia. — Bohemian Confession (1609).

The form of worship associated with Presbyterianism has been marked by extreme simplicity. It consists of reading of Pnsby- Holy Scripture, psalmody, non-liturgical prayer teriaa and preaching. There is nothing in the standards Worship. f the Presbyterian Church against liturgical worship. In some of the early books of order a few forms of prayer were given, but their use was not compulsory. On the whole, the preponderating preference has always been in favour of so-called extemporaneous, or free prayer; and the Westminster Directory of Public Worship has to a large extent stereotyped the form and order of the service in most Presbyterian churches. Within certain broad outlines much, perhaps too much, is left to the choice of individual congregations. It used to be customary among Presbyterians to stand during public prayer, and to remain seated during the acts of praise, but this peculiarity is no longer maintained. The psalms rendered into metre were formerly the only vehicle of the Church's public praise, but hymns are now also used in most Presbyterian churches. 1 Organs used to be. regarded as contrary to New Testament example, but their use is now all but universal. The public praise used to be led by an individual called the " precentor," who occupied a box in front of, and a little lower than, the pulpit. Choirs of male and female voices now lead the church praise.

Presbyterianism has two sacraments, baptism and the Lord's Supper. Baptism is administered both to infants and adults by «» » m ,rf« pouring or sprinkling, but the mode is considered acrame immaterial. The Lord's Supper, as generally ob- served throughout the various Presbyterian churches, is a close

imitation of the New Testament practice ; and where it is not marred by undue prolixity commends itself to most Christia.n people as a solemn and impressive service. The old plan of coming out and taking one's place at the communion table in the body of the church is unhappily seen no more; communicants now receive the sacred elements seated in their pews. The

dispensing of this rite is strictly reserved to an ordained minister, who is assisted by elders in handing the bread and the cup to the people. The administra- tion of private communion to the sick and dying is extremely rare in Presbyterian churches, but there is less objection to it than formerly, and in some churches it is even encouraged.

Presbyterian discipline is now entirely confined to exclusion from membership or from office. Though it is the duty of a minister to warn against irreverent or profane participation in n; sc («>jine the Lord's Supper, he himself has no right to exclude any one from communion; that can only be done as the act of himself and the elders duly assembled in session. A code of in- structions for the guidance of church courts when engaged in cases of discipline is in general use, and bears witness to the extreme care taken not only to have things done decently and in order, but also to prevent hasty, impulsive and illogical procedure in the investigation of charges of heresy or immorality. Cases of dis- cipline are now comparatively rare, and, when they do occur, are not characterized by the bigoted severity which prevailed in former times and was rightly denounced as unchristian.

The extent to which the Presbyterian form of church govern- ment prevails throughout the world has been made more manifest in recent years by the formation of a " General

General Statistics.

1 Principal Rous's version is the best known and most widely used. It is an English work. Somewhat reluctantly it was ac- cepted by Scottish Presbyterianism as a substitute for an older version with a greater variety of metre and music. " Old Hundred " and " Old 124th " mean the 100th and 124th Psalms in that old book.

Council of the Alliance of Reformed Churches holding the Presbyterian System." At a representa- tive conference in London in 1875 the constitution of the council was agreed upon. The first council met in Edinburgh in 1877. Since then it has met in Philadelphia, Belfast, London, Toronto, Glasgow, Washington and Liverpool. Churches which are organized on Presbyterian principles and hold doctrines in harmony with the reformed confessions are eligible for admis- sion to the alliance. The object is not to form one great Presbyterian organization, but to promote unity and fellowship among the numerous branches of Presbyterianism throughout the world. On the roll of the general council held at Washington in 1899 there were sixty-four churches. The statistics of these and of sixteen others not formally in the alliance were 29,476 congregations, 26,251 ministers, 126,607 elders and 4,852,096 communicants. Of these

eighty churches, twelve were in the United Kingdom, twenty on the continent of Europe, sixteen in North America, three in South America, ten in Asia, nine in Africa, six in Australia, two in New Zealand, one in Jamaica and one in Melanesia. The desire for union which led to the formation of the alliance has, since 1875, borne remarkable fruit. In England in 1876 two churches united to form the Presbyterian Church of England; in the Netherlands two churches be- came one in 1892; in South Africa a union of the different branches of the Presbyterian Church took place in 1897; in Scotland the Free Church and the United Presbyterian became one in 1900 under the designation of the United Free Church; in Australia and Tasmania six churches united in 1 901 to form the Presbyterian Church of Australia; and a few months later the two churches in New Zealand which represented respectively the North and South Islands united to form the Presbyterian Church of New Zealand. " In no portion of the empire," it has been said, " does the British flag now fly over a divided Presbyterianism, except in the British Isles themselves."

II. — History in Different Countries From this general outline of Presbyterianism we now turn to consider its evolution and history in some of the countries with which it is or has been specially associated. We omit, however, one of the most important, viz. Scotland, as the history is fully covered under the separate headings of Scotland, Church of, and allied articles.

Switzerland. The Swiss, owing to their peculiar geographical position and to certain political circumstances, early manifested indepen- dence in ecclesiastical matters, and became accustomed to the

management of their church affairs. The work of Zwingli as a Reformer, important and thorough though it was, did not con- cern itself mainly with church polity. Ecclesiastical affairs were, as a matter of course, wholly under the management of the cantonal and municipal authorities, and Zwingli was content that it should be so. The work of Farel, previous to his coming to Geneva, was almost entirely evangelistic, and his first work in Geneva was of a similar character. It was the town council which made arrangements for religious disputations, and pro- vided for the housing and maintenance of the preachers. When Calvin. Calvin, at Farel's invitation, settled in Geneva (1536) the work of reformation became more constructive. " The need of the hour was organization and familiar instruction, and Calvin set himself to work at once." The first reforms he wished to see introduced concerned the Lord's Supper, church praise,

religious instruction of youth and the regulation of marriage. In connexion with the first he desired that the discipline de I' excommunication should be exercised. His plan was partly Presbyterian and partly consistorial. Owing to certain circumstances in its past history, Geneva was notoriously immoral. " The rule of dissolute bishops, and the example of a turbulent and immoral clergy, had poisoned the morals of the city. Even the nuns of Geneva were notorious for their conduct." 1 Calvin suggested that men of known worth should be appointed in different quarters of the city to report to the ministers those persons in their district who lived in open sin; that the ministers should then warn such persons not to come to the communion; and that, if their warnings were unheeded, discipline should be enforced. It was on this subject of keeping pure the Lord's Table that the controversy arose between the ministers and the town councillors which ended in the banish- ment of Calvin, Farel and Conrad from Geneva. In 1538 the ministers took upon themselves to refuse to administer the Lord's Supper in Geneva because the city, as represented by its council, declined to submit to church discipline. The storm then broke out, and the ministers were banished

(1538).

It may be convenient at this point to consider Calvin's ideal church polity, as set forth in his famous Christianae religionis institutio, the first edition of which was published in 1536. Briefly it was as follows: —

A separate ministry is an ordinance of God {Inst. iv. 3, i. 3).

Ministers duly called and ordained may alone preach and ad- minister the sacraments (iv. 3, 10).

A legitimate ministry is one appointed with the consent and approbation of the people under the presidency of other pastors by whom the final act of ordination (with laying on of hands) shall be performed (iv. 3, 15).

Governors or persons of advanced years selected from the people and associated with the ministers in admonishing and exercising discipline (iv. 3, 8). This discipline is all-important, and is the special business of the governors. His system, while preserving the democratic theory by recognizing the congregation as holding the church power, was in practice strictly aristocratic inasmuch as the congregation is never allowed any direct use of power, which is invested in the whole body of elders. His great object was discipline. With regard to the relations between the Church and the civil power, Calvin was opposed to the Zwinglian theory whereby all ecclesiastical power was handed over to the state. Calvin's refusal to administer the sacrament, For which he was banished from Geneva, is

important as a matter of ecclesiastical history, because it is the essence of the whole system which he subsequently introduced. It rests on the principles that the Church has the right to exclude those who are un- worthy, and that she is in no way subject to the civil power in spiritual matters. During the three years of his banishment Calvin was at Strassburg, where he had been carrying out his ideas. His recall was greatly to his honour. The town had become a prey to anarchy. One party threatened to return to Romanism; another threatened to sacrifice the independence of Geneva and submit to Berne. It was felt to be a political necessity that he should return, and in 1541, somewhat reluctantly, he returned on his own terms. These were the recognition of the Church's spiritual inde- pendence, the division of the town into parishes, and the appoint- ment (by the municipal authority) of a consistory or council of elders in each parish for the exercise of discipline.

These terms were embodied in the famous Ordonnances ecclesi- asliques de Veglise de Geneve (1541). The four orders mentioned

1 Lindsay, Hist, of the Reform, ii, 90,

in the Institutio are recognized : pastors, doctors, elders and deacons. The pastors were to preach, administer the sacraments, and in conjunction with the elders to exercise discipline. In their totality they form the venerable compagnie. A newly-made pastor was to be settled in a fixed charge by the magistrate with the consent of the congregation, after having been approved as to knowledge and manner of life by the pastors already in office. By them he was to be ordained, after vowing to be true in office, faithful to the church system, obedient to the laws and to the civil govern- ment, and ready to exercise discipline without fear or favour. The doctors were to teach the faithful in sound learning, to guard purity of doctrine, and to be amenable to discipline. The elders (Anciens, commis, ou deputez par la seigneurie ou consistoire) were regarded as the essential part of the system. They were the bond of union between Church and state. Their business was to supervise daily life, to warn the disorderly, and to give notice to the consistory of cases requiring discipline. To form the consistory all the elders with the ministers were to meet every Sunday under the presidency of one of the syndics or magistrates. This court could award censures up to exclusion from the sacrament.

Manifestly the arrangement was a compromise. The state retained control of the ecclesiastical organization, and Calvin secured his much-needed system of discipline. Fourteen years of friction and struggle followed, and if there came after them a period of comparative triumph and repose for the great reformer it must still be remembered that he was never able to have his ideal ecclesiastical organization fully realized in the city of his

adoption.

The early Presbyterianism of Switzerland was defective in the following respects: (i) It started from a wrong definition of the Church, which, instead of being conceived as an organized community of believers in the Lord Jesus Christ, was made to depend upon the preaching of the gospel and the administration of the sacraments. As these implied a duly appointed minister, the existence of the Church was made to depend upon an organized ministry rather than an organized membership. It calls to mind the Romish formula: "Ubi episcopus ibi ecclesia." (2) It did not maintain the scriptural right of the people to choose their minister and other office-bearers. (3) Its independence of civil control was very imperfect. (4) And it did not by means of church courts provide for the manifestation of the Church's unity and for the concentration of the Church's influence.

" Calvin," says Principal Lindsay, " did three things for Geneva all of which went far beyond its walls. He gave its Church a trained ministry, its homes an educated people who could give a reason for their faith, and the whole city an heroic soul which enabled the little town to stand forth as the citadel and city of refuge for the oppressed Protestants of Europe." 2

France.

It is pathetic and yet inspiring to study the development of Presbyterianism in France; pathetic because it was in a time of fierce persecution that the French Protestants organized themselves into churches, and inspiring, because it showed the power which scriptural organization gave them to withstand incessant, unrelenting hostility. It would be difficult to exaggerate the influence of Calvin upon French Protest- antism. His Christianae religionis institutio became influence. a standard round which his countrymen rallied in the work and battle of the Reformation. Though under thirty years of age, he became all over Europe, and in an exceptional degree in France, the leader, organizer and consolidator of the Reformation. The work which the young Frenchman did for his countrymen was immense. 3

The year 1555 may be taken as the date when French Protestant- ism began to be organized. A few churches had been organized earlier, at Meaux in 1546 and at Nimes in 1547, but their members had been dispersed by persecution. (?" . ni Prior to 1555 the Protestants of France had been for^£ the most part solitary Bible students or little companies meeting together for worship without any organization. But in that year the following incident was the beginning of a great movement. A small company had been accustomed to meet in the lodging of the sieur de la*

Ferri&re in Paris near the Prti-aux- Clercs. At one of the meetings the father of a newly-born child explained that he could not go outside France to seek a pure baptism and that his conscience would not permit his child to be baptized according to the rites of the Romish Church. After prayer the company constituted themselves into a church: chose Jean le Macon to be their minister, and others of their number to be elders and deacons. It seemed as if all France had been waiting for this event as a signal, for organized churches began to spring up every –

2 Hist, of the Reform, ii. 31. 3 Ibid. ii. 158.

where immediately afterwards. Within two years Meaux, Poitiers, Angers, les lies de Saintonge, Agen, Bourges, Issoudun, Aubigny, Blois, Tours, Lyon, Orleans and Rouen were organized. Thirty- six more were completely organized by 1560. 1 According to Beza there were about this time 2150 organized churches. A few years later Cardinal St Croix reckoned that the Huguenots were one half of the population. One hundred and twenty-seven pastors had been sent to France from Geneva before 1567.

In 1558 a further stage in the development of Presbyterian church polity was reached. Some doctrinal differences having pi— arisen in the church at Poitiers, Antoine de Chandieu,*

General minister at Paris, went to compose them, and, as the Synod. result of a conference, a synod was convened to meet in Paris the following year (1559). It was the first general synod of the French Protestant Church, and consisted of representatives from, some say sixty-six, others, twelve churches. It adopted a confession of faith and a book of order or discipline. The confession consisted of forty articles. It was based on a short confession drafted by Calvin in 1557, and may still be regarded, though once or twice revised, as the confession of the French Protestant Church. The book of order, Discipline ecclesiastique des eglises reformees de France, regulated the organization and pro- cedure of the churches. It contains this fundamental statement of Presbyterian parity, " Aucune eglise ne pourra pretendre primaute ni domination sur l'autre; ni pareillement, les ministres d'une eglise les uns sur les autres; ni les anciens ou diacres, les uns sur les autres." The various church courts, familiar to us now as Presbyterian, are explained. The consistoire or session consisted of the minister, elders and deacons (the latter without a vote), and was over the congregation. The colloque or presbytery was composed of representative ministers and elders (anciens) from a group of congregations. Next in order was the provincial

synod which consisted of a minister and an elder or deacon from each church in the province. Over all was the general or national synod. Some of the arrangements are worthy of notice. When a church w r as first formed the office bearers were elected by the people, but there the power of the congregation ceased. Future vacancies in the eldership were filled up by the office-bearers. The eldership was rot for life, but there was always a tendency to make it so. When the ministry of a church became vacant the choice of a successor rested with the colloque or with the provincial synod. The people, however, might object, and if their objection was considered valid redress was given. Later the synod of Nimes (1572) decreed that no minister might be imposed upon an unwilling people. Deacons, in addition to having charge of the poor and sick, might catechize, and occasionally offer public prayer or read a written sermon. The president or moderator 01 each church court was primus inter pares. The remarkable feature of French church polity was its aristocratic nature, which it owed to the system of co-optation ; and the exclusion of the congregation from direct and frequent interference in spiritual matters prevented many evils which result from too much intermeddling on the part of the laity. Up to 1565 the national synod consisted of a minister with one or -two elders or deacons from every church ; after that date, to avoid overcrowding, its numbers were restricted to representatives from each provincial synod. On questions of discipline elders and deacons might vote; on doctrinal questions only as many of these as there were ministers.

"If is interesting to see how in a country whose civil rule was becoming gradually more absolutist, this ' Church under the cross ' framed for itself a government which reconciled, more thoroughly perhaps than has ever been done since, the two principles of popular rights and supreme control. Its constitution has spread to Holland, Scotland (Ireland, England), and to the great American (and Colonial) churches. Their ecclesiastical polity came much more from Paris than from Geneva." 2

To trace the history of Presbyterianism in France for the next thirty years would be to write the history of France itself during that period. We should have to tell of the great and rapid increase of the Church; of its powerful influence among the nobles and the bourgeoisie ; of its direful persecutions ; of its St Bartholomew massacre with 70,000 victims; of its regrettable though perhaps inevitable entanglements in politics and war; and finally of its attaining not only tolerance but also honourable recognition and protection when Henry IV. in 1598 signed the famous edict of Nantes. This secured complete liberty of conscience everywhere within the realm and the free right of public worship in all places in which it existed during the years 1596 and 1597, or where it had been granted by the edict of Poitiers (1577) interpreted by the convention of Nerac (1578) and the treaty of Fleix (158°) — in all some two hundred towns; in two places in every

bailliage and senechaussee ; in the castles of Protestant seigneurs hauls justiciers (some three thousand) ; and in the houses of lesser nobles, provided the audience did not consist of more than thirty persons over and above relations of the family. Protestants were granted full civil rights and protection, and were permitted to hold their ecclesiastical assemblies — consistories, colloquies and synods,

1 Lindsay, Hist, of the Reform, ii. 166. 2 Ibid. ii. 169.

national and provincial. Under the protection of the edict the Huguenot Church of France flourished. Theological colleges were established at Sedan, Montauban and Saumur, and French theo- logy became a counterpoise to the narrow Reformed scholastic of Switzerland and Holland. 3

The history of the Church from the passing of the edict of Nantes till its revocation in 1685 cannot be given here. That event was the climax of a long series of horrors. Under the persecution, a large number were killed, and between four and five millions of Pro- testants left the country. Early in the 18th century Antoine Court made marvellous efforts to restore Presbyterianism. In momentary peril of death for fifteen years, he restored in the Vivarais and the Cevennes Presbyterian church polity in all its integrity. In 1715 he assembled his first colloque. Synods were held in 1718, 1723, 1726 and 1727; and in a remote spot in Bas Languedoc in 1744 a national synod assembled — the first since 1660 — which consisted of representatives from every province formerly Protestant.

From 1760 owing to the gradual spread of the sceptical spirit and the teaching of Voltaire more tolerant views prevailed. In 1787 the Edict of Tolerance was published. In 1789 all citizens were made equal before the law, and the position of Presbyterianism improved till 1791. In 1801 and 1802 Napoleon took into his own hands the independence of both Catholic and Protestant Churches, the national synod was abolished, and all active religious propaganda was rigorously forbidden. In 1848 an assembly representative of the eglises consistoriales met at Paris. When it refused to discuss points of doctrine a secession took place under the name of the Union des eglises evangeliques de France. This society held a synod at which a confession of faith and a book of order were drawn up. Meanwhile the national Protestant Church set itself to the work of reconstruction on the basis of universal suffrage, with restrictions, but no result was arrived at. In 1852 a change took place in its constitution. The eglises consistoriales were abolished, and in each parish a presbyterial council was appointed, the minister being president, with four to seven elders chosen by the people. In the large towns there were consistories composed of all the ministers and of delegates from the various parishes. Over all was the

central provincial council consisting of the two senior ministers and fifteen members nominated by the state in the first instance. In 1858 there were 617 pastors and the Union des eglises evangeliques numbered 27 churches.

The Netherlands. From the geographical position of the Netherlands, Presbyterianism there took its tone from France. In 1562 the Confessio belgica was publicly acknowledged, and in 1563 the church order was arranged. In 1574 the first provincial synod of Holland and Zealand was held, but William of Orange would not allow any action to be taken independently of the state. The Reformed churches had established themselves in independence of the state when that state was Catholic; when the government became Protestant the Church had protection and at the same time became dependent. It was a state church. By the union of Utrecht the communes and provinces had each the regulation of its own religion; hence constant conflict. In most cases it was insisted on as necessary that church discipline should remain with the civil authority. In 1576 William, with the support of Holland, Zeeland and their allies, put forth forty articles, by which doctors, elders and deacons were recognized, and church discipline given to the elders, subject to appeal to the magistrate and by which the Church was placed in absolute dependence on the state. These articles, however, never came into operation; and the decisions of the synod of Dort in 1578, which made the Church independent, were equally fruitless. In 1581 the Middelburg Synod divided the Church, created provincial synods and presbyteries, but could not shake off the civil power in connexion with the choice of church officers. Thus, although the congregations were Presbyterian, the civil government retained overwhelming influence. The Leiden magistrates said in 1581 : " If we accept everything determined upon in the synod, we shall end by being vassals of the synod. We will not open to churchmen a door for a new mastership over government and subjects, wife and child." From 1618 a modified Presbyterian polity predom- inated. As a rule elders held office for only two years. The " kerk-raad " (kirk-session) met weekly, the magistrate being a member ex officio. The colloque consisted of one minister and one elder from each congregation. At the annual provincial synod, held by consent of the states, two ministers and one 3 Ibid. ii. 222, 223.

elder attended from each colloque. Every congregation was visited by ministers appointed by the provincial synod. In 1795, of course, everything was upset, and it was not until after the restoration of the Netherland States that a new organization was formed in 1816. Its main features were strictly Presby- terian, but the minister was greatly superior to the elder,

and the state had wide powers especially in the nomination of higher officers. In 1851 the system now in force was adopted. The congregation chooses all the officers, and these form a church council.

England. Presbyterian principles and ideas were entertained by many of the leading ecclesiastics in England during the reign of Edward VI. Even the archbishop of Canterbury favoured a modification of episcopacy, and an approach to Presbyterian polity and dicipline; but attention was mainly directed to the settlement of doctrine and worship. Cranmer wrote that bishops and priests were not different but the same in the beginning of Christ's religion. Thirteen bishops subscribed this proposition: that in the New Testament there is no mention made of any distinctions or degrees in orders but only deacons and priests or bishops. Cranmer held that the consecration of a bishop was an unnecessary rite, and not required by Scripture; that election and appointment to office were sufficient. The bishop of St Davids was of the same opinion. Latimer and Hooper maintained that Bishops and presbyters were identical; and Pilkington, bishop of Durham, and Bishop Jewel were of the same mind. The latter, about the time of Elizabeth's succession, expressed his hope that the bishops would become pastors, labourers and watchmen; and that the great riches of bishoprics would be diminished and reduced to mediocrity; that, being delivered from courtly and regal pomp, the bishops might take care of the flock of Christ. During the reign of Edward, the title of superintendent was often adopted instead of bishop, and it will be recollected that John Knox was an honoured worker in England with the title of superintendent during this reign. As an indication of sympathy with Presbyterianism, it may be noted that Cranmer favoured a proposal for the formation of a council of presbyters in each diocese, and for provincial synods.

*During 1567 and 1568 the persecutions in France and Holland drove thousands of Protestants, mostly Presbyterians, to England. In 1570 Presbyterian views found a distinguished exponent in Dr Thomas Cartwright at Cambridge; and the temper of parliament was shown by the act of 1 571, for the reform of disorders in the Church, in which, while all mention of doctrine is omitted, the doctrinal articles alone being sanctioned, ordination without a bishop is implicitly recognized. In 1572 a formal manifesto was published, entitled an Admonition to Parliament, the leading ideas in which were: parity of ministers, appointment of elders and deacons; election of ministers by the congre- gation; objection to prescribed prayer and antiphonal chant- ing; preaching, the cnief duty of a minister; and the power of the magistrates to root out superstition and idolatry. On Pre hvt t ˆ le 20t h °ˆ November 1572 the authors of the *' Ad- t Wands- mon ition " set up at Wandsworth what has been*

rtft " called the first presbytery in England. They adopted "' " a purely

Presbyterian system which was published as the Orders of Wandsworth. Similar associations or presbyteries were formed in London and in the midland and eastern counties; but the privy council was hostile. Only in Jersey and Guernsey, whither large numbers of Huguenots had fled after the St Bartholo- mew massacre, was Presbyterianism fully permitted. Cartwright and Edmund Snape were ministers there; and from 1576 to 1625 a completely appointed Presbyterian Church existed, under the rule of synods, and authorized by the governor. The action of the Commons in 1584, stimulated by the opposition of the Lords, showed that the principles of Presbyterianism were strongly heid. Bills were introduced to reduce the position of a bishop to well-nigh that of primus inter pares; to place the power of veto in the con- gregation; to abolish the canon law and to establish a presbytery in every parish. These proposals were rendered abortive by the unflinching use of the queen's prerogative.

In 1640 Henderson, Baillie, Blair and Gillespie came to London as commissioners from the General Assembly in Scotland, in response to a request from ministers in London who desired to see the Church of England more closely modelled after the Reformed type. They were able men, whose preaching drew great crowds, and increased the desire for the establishment .of

XXII. 10

Presbyterianism. In 1642 the Long Parliament abolished Episcopacy (the act to come into force on the 5th of November _. West . 1643); and summoned an assembly of divines to meet m / ns ˆ er at Westminster in June 1643 to advise parliament Assembly. as to the new form of Church government. The West- minster Assembly, through its Confession, Directory and Catechisms, has become so associated with the Presbyterian Church that it is difficult to realize that it was not a church court at all, much less a creation of Presbyterianism.

It was a council created by parliament to give advice in church matters at a great crisis in the nation's history; but its acts, though from the high character and great learning of its members worthy of deepest respect, did not per se bind parliament or indeed any- one. It was, in a very real sense, representative of the whole country, as two members were chosen by parliament from each county. The number summoned was 151, viz. ten lords, twenty members of the House of Commons, and one hundred and twenty- one ministers. The ministers were mostly Puritans; by their ordination, &c, Episcopalian; and for the most part strongly impressed with the desirability of nearer agreement with the Church cf Scotland, and other branches of the Reformed Church on the Continent. About one-half of the members attended regularly. Those who were out-and-out Episcopalians did

not attend at all. Apart from these, there were three well-defined parties: (1) those with Presbyterian ideas and sympathies, a great majority; (2) Erastians, ably represented and led by Selden, Lightfoot and Cole- man; (3) Independents, ten or eleven in number, led by Philip Nye, and assured of Cromwell's support. Then there were the Scot- tish commissioners who, though without votes, took a leading part in the proceedings. Judged by the objects for which it was summoned the Westminster Assembly was a failure, a remarkable failure. Episcopacy, Erastianism and Independency, though of little account in the assembly, were to bulk largely in England's future; while the church polity which the assembly favoured and recommended was to be almost unknown. Judged in other ways, however, the influence of the assembly's labours has been very great. The Confession of Faith and the Larger and Shorter Cate- chisms are recognized and venerated standards in all the lands where British Presbyterianism, with its sturdy characteristics, has taken root. And the Directory of Public Worship has shaped and coloured, perhaps too thoroughly, the ritual and atmosphere of every group of Protestant Anglo-Saxon worshippers throughout the world, except Episcopalians.

In June 1646 the ordinance establishing presbyteries wasratified by both houses of parliament, and a few days afterwards it was ordered to be put into execution. Twelve presbyteries were erected in London; Shropshire and Lancashire were organized; and Bolton was so vigorous in the cause as to gain the name of the Gene /a of Lancashire. But the system never took root. Not only were there well-known adverse influences, but the soil seems to have been uncongenial. As compared with Scotland, English Presbyterianism had more of the lay element. In every classis or presbyteiy there were two elders to each minister. The Synod of London met half-yearly from 1647 till 1655. Synods also were held in the north. But during the Common- ^° wealth Independency gained ground. Then with the " oa '

Restoration came Episcopacy, and the persecution of all who were not Episcopalians; and the dream and vision of a truly Reformed English Church practically passed away. •«

After the Revolution and during the reign of William and Mary the hatred of the Church of England to the Presbyterians and other dissenters had been obliged to lie dormant. Decadence. With the accession of Anne, however, began an attempt _ apparently to make up for lost time. From the beginning of the 1 8th century the greater number of the Presbyterian congregations became practically independent in polity and Unitarian in doctrine. Indigenous Presbyterianism became almost unknown. _ The Presbyterianism now visible in England is of Scottish origin and Scottish type, and beyond the fact of embracing a few congregations which date from, or before, the Act of Uniformity and the Five Mile Act, has little in

common with the Presbyterianism which was for a brief period by law established.

In 1876 the union of the Presbyterian Church in England with the English congregations of the United Presbyterian Church of Scotland gathered all English Presbyterians (with unloato some exceptions) into one church, " The Presbyterian jgT6. Church of England." " What kept these bodies apart was their separate historic origin and development, but especially the alienation caused by the ' Voluntary Controversy ' which had its roots in the difficult problems of civil law in its relation to religion, and the stumbling-block of the civil magistrate's authority in relation to the Christian conscience." 1 Since the union the growth of the Church has been considerable. Presbyterianism is compara- tively strong in three districts of England, namely Northumberland, Lancashire and London. Elsewhere it is either weak or non- existent. Even where it is comparatively strong it is largely exotic. The membership is mainly Scottish, and the ministers

Drysdale, History of the Presbyterians in England, p. 625.

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have been imported principally from Scotland. To English people, therefore, the Presbyterian is still the " Scotch_ Church," and they are as a whole slow to connect themselves with it. Efforts have been made to counteract this feeling by making the Church more distinctly English. The danger in this direction is that when Presbyterianism has been modified far enough to suit the English taste it may be found less acceptable to its more stalwart sup- porters from beyond the Tweed. Following the lead of the Inde- pendents, who set up Mansfield College at Oxford, the Presby- terian Church has founded Westminster College at Cambridge as a substitute for its Theological Hall in London. It was opened in 1899 with the view of securing a home-bred ministry more conversant with English academic life and thought.

In common with the general Presbyterianism of the British Isles, the Presbyterian Church of England has in recent years been readjusting its relation to the Westminster Confession of Faith. Without setting aside the Confession as the church's standard, twenty-four " Articles of the Faith " have been adopted. In these no change, it is alleged, has been made in regard to the substance of the Westminster doctrine, but there is an alteration of emphasis and proportion.

There are in England fourteen congregations in connexion with the Church of Scotland, six of them in London and the remainder in Berwick, Northumberland, Carlisle and Lancashire.

Many Unitarians in England still call themselves Presbyterians. This, except historically, is a misnomer, for, though descended from the old English Presbyterians, they retain nothing of their distinctive doctrine or polity — nothing of Presbyterianism, indeed, but the name.

Ireland.

Presbyterianism in Ireland, in modern times at least, dates from the plantation of Ulster in the reign of James I. The infusion of a considerable Scottish element into the population necessitated the formation of a congenial church. The immi- grants from England took with them, in like manner, their attachment to the Episcopal Church. But these two sections of Protestantism, in their common exile and in presence of the preponderating Roman Catholicism of the country, seemed at first inclined to draw closer together than had been thought possible in Great Britain. A confession of faith, drawn up by Archbishop Usher at the convocation of 1615, implicitly ad- mitted the validity of Presbyterian ordination, and denied the distinction between bishop and presbyter. Within the Episcopal Church and supported by its endowments, Robert Blair, John Livingstone and other ministers maintained a Scottish Presbyterian communion.

From 1625 to 1638 the history of Irish Presbyterians is one of bare existence. Their ministers, silenced by Wentworth, after an ineffectual attempt to reach New England, fled to Scotland, and there took a leading part in the great movement of 1638. After the Irish rebellion of 1641 the Protestant interest for a time was ruined. A majority of the Ulster Protestants were Presbyterians, and in a great religious revival which took place the ministers of the, Scottish regiments stationed in Ireland took a leading part. Kirk-sessions were formed in four regiments, and the first regular presbytery was held at Carrickfergus on the 10th of Prˆht J une 1642, attended by five ministers and by ruling Presbytery. e [(j ers f rom ˆ ne regimental sessions. This presbytery supplied ministers to as many congregations as possible; and for the remainder ministers were sent from Scotland. By the end of 1643 the Ulster Church was fairly established. Notwithstanding intervening reverses there were by 1647 nearly thirty ordained ministers in fixed charges in Ulster besides the chaplains of the Scottish regiments.

At the Restoration, in which they heartily co-operated, there were in Ulster seventy ministers in fixed charges, with nearly eighty parishes or congregations containing one hundred thousand persons. There were five presbyteries holding monthly meetings ' and annual visitations of all the congregations within their bounds, and coming together in general synod four times a year. Entire conformity with the Scottish Church was maintained, and strict discipline was enforced by pastoral visitations, kirk-sessions and presbyteries.

After the Restoration the determination of the government to put down Presbyterianism was speedily felt in Ireland. In 1661 the lords justices forbade all unlawful assemblies, and in these they included meetings of presbytery as exercising ecclesiastical jurisdiction not warranted by the law. Bishop Jeremy Taylor was forward in this work of persecution. The ministers refused to take the Oath of Supremacy without the qualification suggested by Usher. Their parishes were declared vacant, and episcopal clergy appointed to them. The ejected ministers were forbidden to preach or administer the sacraments. In Ulster sixty-one ministers were ejected. Of seventy only seven conformed. Under

Presbyterian worship and discipline, and for several years the Church prospered not only in Ulster but also in the south and west. In 1672 she received a yearly grant from Charles II. of £600 (regium donum), and under William III. the amount was considerably increased. It was continued till 1869.

In 1679 the rising in Scotland which ended in the battle of Both- well Bridge brought trouble on the Irish Presbyterians in spite of their loyal addresses disowning it. It was not, however, till 1682 that they again lost the privilege of public ministry, and suffered severe oppression. They were opposed to James II., though they had benefited by his Declaration of Indulgence, and they were the first to congratulate the Prince of Orange on his arrival in England. The heroic defence of Londonderry owed much to them, as they were a majority of the population, and some of their ministers rendered conspicuous service. There were then in Ireland about a hundred congregations, seventy-five with settled ministers, under five presbyteries. Their preponderance in Ulster and their consciousness of their great service to England led them first of all to hope that Presbyterianism might be substituted for Episcopacy in Ulster, and afterwards, that it might be placed on an equal I footing with the latter.

During the 18th century Irish Presbyterianism became infected with Arianism. Under the leadership of Dr Henry Cooke, a minister of rare ability and eloquence, the evangelical party triumphed in the church courts,

and the Unitarians seceded and became a separate denomination. In 1840 the Synod of Ulster and the Secession Synod united to form the General Assembly of the Presbyterian Church in Ireland.

The Presbyterian Church in Ireland is the most conservative of the great Presbyterian churches in the United Kingdom. Her attitude is one of sturdy adherence to the old paths of evangelical doctrine and Presbyterian polity. She has been a zealous supporter of Irish national education, which is theoretically " united secular and separate religious instruction." The Church Act of 1869 which disestablished and disendowed the Irish Episcopal Church took away the Presbyterian regium donum. The ministers with all but absolute unanimity decided to commute their life-interest and form therewith a great fund for the support of the Church. The commutation fund thus formed is a permanent memorial of a generous and disinterested act on the part of her ministry. It amounted in 1902 to £588,028. The interest accruing from it is added to the yearly sustentation contributions, and forms a central fund for ministerial support. Since the state endowment ceased the average income of ministers from their congregations has considerably increased.

The Irish Presbyterian Church has set an example to all her sister churches by her forwardness to care for the poor. Her " Presbyterian Orphan Society " undertakes the support of every poor orphan child throughout the Church. _ No Presbyterian orphan child now needs to seek workhouse relief. The orphans are boarded in the homes of respectable poor people, who thus also benefit by the society. A scheme of pensions for her aged poor has been instituted.

Three small communities of Presbyterians maintain a separate autonomy in Ireland, viz. the Reformed Presbyterian Church, with thirty-six; the Eastern Reformed, with six; and the Secession Church, with ten congregations.

Ormonde, in 1665, ministers were again permitted to revive ' periods.

Wales. The Presbyterian Church of Wales, commonly known as the " Calvinistic Methodist," had its origin in the great evangelical revival of the 18th century. Its polity has been of gradual growth, and still retains some features peculiar to itself. In 181 1 its preachers were first presbyterially ordained and author- ized to administer the sacraments. In 1823 a Confession of Faith was adopted. In 1864 the two associations or synods of North and South Wales were united in a general assembly. Great attention is given to the education of the ministry, a considerable number of whom, in recent years, have taken arts degrees at Oxford and Cambridge. As far as the difference in language will permit, there is cordial fellowship and co-operation with the Presbyterian Church of England. The appetite of the

Welsh people for sermons is enormous, and the preachers are characterized by an exceptionally high order of pulpit power.

(W. Y.) United States. Presbyterianism in the United States is a reproduction and further development of Presbyterianism in Europe. The history of the American Presbyterian churches, excluding the two "Reformed" Churches (see Reformed Church in the United States for the German body, and Reformed Church in America for the Dutch body), may be divided into three

I. The Colonial Period. — The earliest Presbyterian emigration consisted of French Huguenots under the auspices of Admiral Coligny, led to Port Royal, South Carolina, by Jean Ribaut in 1562, and to Florida (near the present St Augustine) by Rene de Laudonniere in 1564, and by Ribaut in 1565. The former enter- prise was soon abandoned, and the colonists of the latter were massacred by the Spaniards. Under Pierre de Guast, sieur de Monts, Huguenots settled in Nova Scotia in 1604 but did not remain after 1607. Huguenot churches were formed on Staten Island, New York, in 1665; in New York City in 1683; at Charleston, South Carolina, in 1686; at Boston, Massachusetts, in 1687; at New Rochelle, New York, in 1688; and at other places. The Charleston church alone of these early churches maintains its independence of any American denomination.

English Puritans emigrated under the auspices of the Virginia Company to the Bermudas in 1612; and in 1617 a Presbyterian Church, governed by ministers and four elders, was established there by Lewis Hughes, who used the liturgy of the isles of Guernsey and Jersey. Beginning with 1620, New England was colonized by English Presbyterians of the two types which developed from the discussions of the Westminster Assembly (1643-1648) into Presbyterianism and Congregationalism. The Plymouth colony was rather of the Congregational type, and the Massachusetts Bay colony rather of the Presbyterian. These types co-operated as in Old England in the county associations; and a mixed system was produced, called by Henry M. Dexter " a Congregationalized Presbyterianism or a Presbyterianized Congregationalism." Presby- terianism was stronger in Connecticut than in Massachusetts. Thence it crossed into the Dutch settlements on the Hudson and the Delaware, and mingled with other elements in Virginia, Mary- land and the Carolinas. Nine of these Puritan Presbyterian churches were established on Long Island between 1640 and 1670 — one at Southampton and one at Southold (originally of the Congre- gational type) in 1640, one at Hempstead about 1644, one at Jamaica in 1662, and churches at

Newtown and Setauket in the next half century; and three Puritan Presbyterian churches were established in Westchester county, New York, between 1677 and 1685. In New York City, Francis Doughty preached to Puritan Presbyterians in 1643; in 1650 he was succeeded by Richard Denton (1586-1662). Doughty preached in Virginia and Maryland in 1650-1659, and was the father of British Presbyterianism in the Middle Colonies. His work in Virginia and Maryland was carried on twenty-five years later by Francis Makemie (d. 1708).

Irish Presbyterianism was carried to America by an unknown Irish minister in 1668. Its foremost representative was Francis Makemie, already mentioned, who, in 1683, as an ordained minister of the presbytery of Laggan, was invited to minister to the Mary- land and Virginia Presbyterians. In 1684 he acted as pastor of an Irish church at Elizabeth River, Virginia; in 1699 received permission from the colonial authorities to preach at Pocomoke and Onancock on the eastern shore of Virginia, and about 1700 organized a church at Snow Hill in Worcester county, Maryland ; in 1 704 he returned to America from a trip to Great Britain in which he had interested the Presbyterians of London, Dublin and Glasgow in the American churches, and brought back with him two ordained missionaries, John Hampton (d. c. 1 721) and George McNish (1660-1723); in 1707 was imprisoned in New York City for preaching without licence, but was acquitted in 1708.

To the banks of the Delaware the clergy of New England sent missionaries: Benjamin Woodbridge went to Philadelphia in 1698 and was followed almost immediately by Jedediah Andrews (1674- 1746), who was ordained in 1701, and under whom the first Presby- terian church in Philadelphia was organized; in 1698 John Wilson (d. 1712) became pastor of a Presbyterian Church at New Castle, Delaware; Samuel Davis (d. 1725) seems to have preached as early as 1692 at Lewes, Delaware, and Nathaniel Taylor (d. 17 10) was another of the New England missionaries along the Delaware river and bay. About 1695 Thomas Bridge, with Presbyterians from Fairfield county, Connecticut, settled at Cohansey, in West Jersey. These New England ministers in the Delaware valley, with Francis Makemie as moderator, organized in 1706 the first American presbytery, the presbytery of Philadelphia. In 1716 this presbytery became a synod by dividing itself into four " sub- ordinate meetings or presbyteries," after the Irish model. The synod increased the number of its churches by a large accession from New York and from New Jersey, where there had been large Presbyterian settlements. The synod seems to have remained without a constitution and without subscription until 1729, when it adopted the Westminster standards. In 1732 the presbytery of " Dunagall " (Donegal) was established in Lancaster county, Pennsylvania.

Two parties had developed with the growth of the Church. The stricter party urged the adoption of the Westminster standards and conformity thereto; the broader party were unwilling to sacrifice their liberty. The former followed the model of the Church of Scotland; the liberal party sympathized with the London and Dublin Presbyterians. The two parties united under the act oi 1729, which adopted the Westminster symbols " as being, in all the essential and necessary articles, good forms of sound words

and systems of Christian doctrine." This adopting act allowed scruples as to " articles not essential and necessary in doctrine, worship or government " — the presbytery being judge in the case and not the subscriber. In 1730-1732 the stricter party in the presbyteries of New Castle and Donegal insisted on full subscrip- tion, and in 1736, in a minority synod, interpreted the adopting act according to their own views. The liberals put themselves on guard against the plotting of the other side. Friction was increased by a contest between Gilbert Tennent and his friends, who favoured Whitefield and his revival measures, and Robert Cross (1689-1766), pastor at Jamaica in 1723-1758, and his friends. The Tennents erected the Log College (on the Neshaminy, about 20 m. north of Philadelphia) to educate candidates for the ministry ; and the synod in 1738 passed an act, aimed at the Log College, providing that all students not educated in the colleges of New England or Great Britain should be examined by a committee of synod, thus depriving the presbyteries of the right of determining in the case. The presbytery of New Brunswick declined to yield (!739)- The Cross party charged the Tennents with heresy and disorder; the Tennents charged their opponents with ungodliness and tyranny. When the synod met in 1741 the moderate men remained away ; and thus the synod broke in two. The New York presbytery declined at first to unite with either party, worked in vain for reconciliation, and finally joined with the Tennents in establishing the synod of New York (1745) which was called the New Side, in contradistinction to the synod of Philadelphia, the Old Side.

During the separation the New Side established the college of New Jersey at Elizabethtown (now Elizabeth) in 1747, and the Log College of the Tennents was merged into it. It was removed to Princeton in 1755, funds for its aid being received from England, Ireland and Scotland. The Old Side adopted the academy at New London, Chester county, Pennsylvania, which had been organ- ized by Francis Alison in 1 74 1, as their own; but the New London school broke up when Alison became a professor in the Philadelphia Academy (afterwards the university of Pennsylvania). During the separation the synod of Philadelphia decreased from twenty- six to twenty-two ministers, but the synod of New York grew from twenty to seventy-two ministers, and the New Side reaped all the fruits of the Great Awakening under Whitefield and his successors. Different views on subscription and discipline, and the arbitrary act of excision were the

barriers to union, but these were removed; in 1758 the adopting act was re-established in its original breadth, the " Synod of New York and Philadelphia " was formed, and the reunion was signalized by the formation of the presbytery of Han- over in Virginia. Under John Witherspoon the college of New Jersey was the favoured school of the reunited church. The union was not perfect; the presbytery of Donegal was for three years in revolt against the synod; and in 1762 a second presbytery of Philadelphia was formed ; but the strength of the synod increased rapidly and at the outbreak of the War of Independence it had 11 presbyteries and 132 ministers.

Presbyterianism had an independent development in the Carolinas, whither there was a considerable Scotch migration in 1684-1687. William Dunlop (c. 1650-1700) ministered to them until 1688, when he became principal of the university of Glasgow. At Charleston a mixed congregation of Scotch Presbyterians and English Puritans was organized in 1690. What is now Dorchester county, South Carolina, was settled in 1695 by members of a church established in Dorchester, Massachusetts. In 1710 there were five churches in the Carolinas; in 1722-1723 they formed the presbytery of James Island, which (after 1727) went through the same struggle as the synod of Philadelphia in reference to subscription; and in 1 73 1 the parties separated into subscribers and non-subscribers.

From New England, as has been seen, Puritan settlers estab- lished Presbyterian churches (or churches which immediately became Presbyterian) in Long Island, on New Jersey, and in South Carolina; but the Puritans who remained in New England usually established Congregational churches. But there were exceptions: Irish Presbyterians from Ulster formed a church at Londonderry, New Hampshire, which, about 1729, grew into a presbytery; the Boston presbytery, organized in 1745, became in 1774 the synod of New England with three presbyteries and sixteen ministers; and there were two independent presbyteries, that of " the East- ward " organized at Boothbay, Maine, in 1771, and that of Grafton, in New Hampshire, founded by Eleazar Wheelock and other ministers interested in Dartmouth College.

The Presbyterians from the Scotch Established Church combined with the American Presbyterian Church, but the separating churches of Scotland organized independent bodies. The Reformed Presby- terian Church (Covenanters) sent John Cuthbertson in 1751 ; he was joined in 1773 by Matthew Lind and Alexander Dobbin from the Reformed Presbytery of Ireland, and they organized in March 1774 the Reformed Presbytery of America. The Anti-Burgher Synod sent Alexander Gellatly and Andrew Arnot in 1752, and two years later they organized the Associate Presbytery of Pennsyl- vania; they were joined in 1757 by the Scotch Church in New

York City, which had split off because of objections to the growing use of Watts's Psalms; they had grown to two presbyteries and thirteei>

ministers in 1776. The Burgher Synod in 1764 sent Thomas Clarke of Ballybay, Ireland, who settled at Salem, Washington county, New York, and in 1776 sent David Telfair, of Monteith, Scotland, who preached in Philadelphia; they united with the Associate Presbytery of Pennsylvania; in 1 771 the Scotch Synod ordered the presbytery to annul its union with the Burghers, and although Dr Clarke of Salem remained in the Associate Presbytery, the Burgher ministers who immigrated later joined the Associate Reformed Church. In 1769-1774 there was a futile attempt to secure the union of the Associate Presbytery with the main American Church.

2. From the War of Independence to the Civil War. — During the War of Independence the Presbyterian churches suffered severely. Ministers and people with few exceptions^-the most notable being the Scotch Highlanders who had settled in the valley of the Mohawk in New York and on Cape Fear river in North Carolina — sided with the patriot or Whig party: John Witherspoon was the only clergyman in the Continental Congress of 1776, and was otherwise a prominent leader; John Murray of the Presbytery of the Eastward was an eloquent leader in New England; and in the South the Scotch-Irish were the back- bone of the American partisan forces, two of whose leaders, Daniel Morgan and Andrew Pickens, were Presbyterian elders.

At the close of the War the Presbyterian bodies began at once to reconstruct themselves. In 1782 the presbyteries of the Associate and Reformed churches united, forming the Associate and Reformed Synod of North America; but as there were a few dissenters in both bodies the older Associate and Reformed Presbyteries remained as separate units — the Associate Presby- tery continued to exist under the same name until 1801, when it became the Associate Synod of North America; in 1818 it ceased to be subordinate to the Scotch General Synod. The Associate Reformed Synod added in 1794 a fourth presbytery, that of Londonderry, containing most of the New England churches, but in 1801 " disclaimed " this presbytery because it did not take a sufficiently strict view of the question of psalm- singing. The Reformed Presbytery of North America was reconstituted by two ministers from Ireland in 1798; it became a synod of three presbyteries in 1809 and a general synod in 1823; in the first decade of the century the presbytery required all members to free their slaves. The synod of New York and Philadelphia, which in 1781 had organized the

presbytery of Redstone, the first of western Pennsylvania, in 1788 resolved itself into a General Assembly, which first met in Philadelphia in 1789, and after revising the chapters on Church and state, adopted the Westminster symbols as to their constitution, " as containing the system of doctrine taught in the Holy Scrip- tures," and they made them unalterable without the consent of two-thirds of the presbyteries and the General Assembly. In 1801 a " plan of union " proposed by the General Association (Congregational) of Connecticut was accepted by the General Assembly, and the work of home missions in the western section of the country was prosecuted jointly. The result was mixed churches in western New York and the new states west of the Alleghany Mountains, which grew into presbyteries and synods having peculiar features midway between Presbyterianism and Congregationalism.

The general strictness of the church in its requirements for ministerial education occasioned it great loss in this period when the territory beyond the Appalachians was being settled so largely by Scotch-Irish and Presbyterians. The revivals in Kentucky brought about differences which resulted in the high-handed ex- clusion of the revivalists. These formed themselves into the presbytery of Cumberland, on the 4th of February 1810, which grew in three years into a synod of three presbyteries and became the "Cumberland Presbyterian Church." In 1813 they revised the Westminster Confession and excluded, as they claimed, fatalism and infant damnation. If they had appealed to the General Assembly they might have received justice, or possibly the separation might have been on a larger scale. In 1822, under the influence of John Mitchell Mason (1770-1829), the Associate Reformed Synod com- bined with the General Assembly of the Presbyterian Church, but the majority was too slender to make the union thorough. The greater part of the ministers decided to remain separate, and accordingly organized three independent synods — New York, Scioto and the Carolinas. In 1858 the associate synods of the north and west united with the Associate Synod as the United

Presbyterian Church. In 1833 the Reformed Presbyterian Church divided into New Lights and Old Lights in a dispute as to the propriety of Covenanters exercising the rights of citizenship under the constitution of the United States.

A great and widespread revival marked the opening years of the century, resulting in marvellous increase of zeal and numbers. New measures were adopted, doctrines were adapted to the times, and ancient disputes were revived between the conservative and progressive forces. Theological seminaries had been organized: the Theological Seminary of the Presbyterian Church at Princeton, N.J., founded in ;8l2 by the General Assembly; the Auburn Theological Seminary at Auburn, N.Y., founded in

1819 by the synod of Geneva, and afterwards associated with the New School; a school at Hampden Sidney, Virginia, founded by the synod of Virginia in 1824, named Union Theological Seminary in Virginia after 1826, supported after 1828 by the synods of Virginia and North Carolina, and in 1898 removed to Richmond, Va. ; the Western Theological Seminary, founded at Allegheny (Pittsburg), Pa., in 1827 by the General Assembly; the Presbyterian Theological Seminary at Columbia, South Carolina, founded in 1828 by the synod of South Carolina ; Lane Theological Seminary, founded indepen- dently in 1829 by the New School at Cincinnati, Ohio; and Union Theological Seminary, founded in 1836 by independent action of New School men, in New York City. Differences in doctrine as well as polity and discipline became more and more prominent. The doctrinal differences came to a head in the trials of George Duffield (1832), Lyman Beecher (1835) and Albert Barnes (1836) which, however, resulted in the acquittal of the accused, but which increased friction and ill feeling. The differences developed were chiefly between general atonement and atonement for the elect only and between mediate imputation and immediate imputation. The agitation with reference to African slavery threw the bulk of the Southern Presbyterians on the Old Side, which was further strengthened by the accession of the Associate Reformed. The ancient differences between Old and New Side were revived, and once more it was urged that there should be (1) strict subscription, (2) exclusion of the Congregationalized churches, and strict Presby- terian polity and discipline, and (3) the condemnation and exclusion of the new divinity and the maintenance of scholastic orthodoxy. In 1834 a convention of the Old Side was held in Philadelphia, and the " Act and Testimony " was adopted charging doctrinal unsoundness and neglect of discipline upon the New Side, and urging that these should be excluded from the Church. The moderate men on both sides opposed this action and strove for peace or an amicable separation, but in vain. In 1837 the Old Side obtained the majority in the General Assembly for the second time only in seven years; they seized their opportunity and abrogated the " Plan of Union of 1801 with the Connecticut Congregationalists," cut off the synod of Western Reserve and then the synods of Utica, Geneva and Genesee, without a trial, and dissolved the third presbytery of Philadelphia without providing for the standing of its ministers. The New Side men met in convention at Auburn, N.Y., in August 1837, and adopted measures for resisting the wrong, but in the General Assembly of 1838 the moderator refused to re- cognize their commissioners. On an appeal to the assembly the moderator's decision was reversed, a new moderator was chosen, and the assembly adjourned to another place of meeting. The Old Side remained after the adjournment and organized them- selves, claiming the historic succession. Having the moderator and clerks from the assembly of 1837, they retained the books and papers. Thus two General Assemblies

were organized, the Old and the New School. An appeal was made to the civil courts, which decided (1839) in favour of the New School; but this decision was overruled and a new trial ordered. It was deemed best, however, to cease litigation and to leave matters as they were.

Several years of confusion followed. In 1840 we have the first safe basis for comparison of strength.

Ministers.

Churches.

Communicants.

Old School . . New School .

1308 1234

1898 1375

126,583 102,060

The " sides " remained separate throughout the remainder of this period. The North was especially agitated by the slavery ques- tion. 1 In 1847 the synod of the Free Presbyterian Church was formed by the anti-slavery secession of the presbytery of Ripley, O. (New School), and a part of the presbytery of Mahoning, Pa., (Old School) ; this synod, then numbering five presbyteries with 43 ministers, joined the New School Assembly during the Civil War. In 1850 the New School Assembly declared slave-holding, unless excusable for some special reason, a cause for discipline; in 1853 it asked the Southern presbyteries to report what action they had taken to put themselves in accord with the resolution of 1850;

1 The separation of the southern part of the Associate Reformed Church from the northern in 1821, and the establishment of the Associate Reformed Synod of the South had not been due to slavery, but was for convenience in administration.

■ *11 1858, 6 synods, 21 presbyteries and about 15,000 communi- cants withdrew and organized the United Synod. Just before the outbreak of the Civil War in 1861 these churches numbered: —*

Synods.

Presby- teries.

Ministers.

Churches.

Communicants.

Old School . New School. United Synod Cumberland Presbyterian

33 22

4 23

171 104

15 96

2656

1523

113

890

3531

1482

197

1 189

292,927 (i860)

134,933 (i860)

10,205 (1858)

82,008 (1859)

3. Since the beginning of the Civil War. — The Southern presby- teries of the Old School Assembly withdrew in 1861, and dele- gates from ten southern synods (47 presbyteries) met in Augusta, Georgia, in December, and organized as the General Assembly of the Presbyterian Church in the Confederate States of America, which included 700 ministers, 1000 churches and 75,000 com- municants. Its strength was increased by the

addition: in 1863 of the small Independent Presbyterian Church of South Carolina; in 1865 of the United Synod (New School), which at that time had 120 ministers, 190 churches, and 12,000 com- municants; in 1867 of the presbytery of Patapsco; in 1869 of the synod of Kentucky; and in 1874 of the synod of Missouri. At the close of the Civil War this Southern Church adopted the name of the General Assembly of the Presbyterian Church in the United States.

In 1867 there was an unsuccessful attempt to combine all the Presbyterian bodies of the North. In 1869 the Old and New Schools in the North combined on the basis of the common standards; to commemorate the union a memorial fund was raised which amounted in 1871 to $7,607,492. Between 1870 and 1881 three presbyteries of the Reformed Presbyterian General Synod (New School) joined the northern General Assembly. In 1906 the greater part of the Cumberland Presbyterian Church (then having 195,770 members) united with the northern General Assembly. Although the differ- ences between the Old School and the New School were much less in 1869 than in 1837 — during the separation the New School was conservative, the Old School liberal, in tendency — there were serious dissensions in the northern church after the union. The first of these was due to the adoption by certain teachers in theological seminaries of the methods and results of the " higher criticism," and two famous heresy cases followed. Charles Augustus Briggs, tried for heresy for his inaugural address in 189 1 as professor of biblical theology at Union Seminary (in which he attacked the inerrancy of the Bible, held the composite character of the Hexa- teuch and of the Book of Isaiah and taught that sanctification is not complete at death), was acquitted by the presbytery of New York, but was declared guilty and was suspended from its ministry by the General Assembly of 1893. Henry Preserved Smith, pro- fessor of Hebrew and Old Testament exegesis in Lane Seminary, for a pamphlet published in 1891 denying the inerrancy but affirm- ing the inspiration of the Scriptures, was suspended in 1892 by the presbytery of Cincinnati, and was unsuccessful in his appeal to the synod and to the General Assembly. Dr Briggs remained a member of the Union Seminary faculty but left the Presbyterian Church to enter the Protestant Episcopal. Dr Smith resigned his chair at Lane Seminary, and entered the Congregational ministry. In 1 892-1 893 there was an open break between the General Assembly and Union Seminary, which repudiated the agreement of 1870 l between the seminaries and the assembly; the assembly disclaimed responsibility for the Seminary's teachings and withheld financial aid from its students. In 1896 McCormick Theological Seminary (which in 1858 as New Albany Theological Seminary had come under the control of the assembly) and Auburn Seminary refused to make the changes desired by the General Assembly; a satisfactory arrangement

with McCormick was made. Lane and Auburn remained practically independent.

But although the conservative party was successful in inducing successive general assemblies to lay repeatedly stronger stress on the verba! inerrancy of Holy Scripture and to make belief in such inerrancy a requisite of teachers in theological seminaries and of candidates for the ministry, there was in other matters an increas- ing liberal tendency. In 1902 the General Assembly adopted a Brief Statement of the Reformed Faith, not as a legal standard but as an interpretation of the confession ; it repudiated the doctrine of infant damnation, insisted on the consistency of predestination with God's universal love, and incorporated new chapters on the Holy Spirit, the love of God, and missions. The Assembly of 1906 authorized (but did not make mandatory) the use of a book of common worship; the question of a liturgy had been opened in

1 This agreement, proposed to the General Assembly in 1870 by the directors of Princeton and of Union, gave the Assembly a veto on the election and removal of professors.

1855 by C. W. Baird's Eutaxia; in 1864 Charles W. Shields (1825- 1904), who afterwards entered the Protestant Episcopal Church, republished and urged the adoption of the Book of Common Prayer as amended by the Westminster Divines in the royal commission of 1 66 1 ; and Henry Van Dyke was prominent in the latter stage of the movement for a liturgy.

The northern General Assembly and the Cumberland Church, which united with it in 1906, are the only Presbyterian bodies in America that have done anything tangible for Christian union in the last fifty years: the southern Assembly is much more conservative than the northern — in 1866 it suspended James Woodrow (1828-1907), professor of natural science in connexion with revealed religion, for holding evolutionary views, and it declared that Adam's body was " directly fashioned by Almighty God, without any natural animal parentage of any kind, out of matter previously created out of nothing"; and in 1897 it ordered that women were not to speak in pro- miscuous meetings — and its attitude toward the negro, insisting in separate church organizations for blacks and whites, makes union with the northern bodies difficult; the United Presbyterian Church in North America in 1890 refused to join the union of Presbyterian and Reformed missions in India, and its opposition to instrumental music and to the use of any songs but the psalms of the Old Testament, although this is decreasing in strength, are bars to union; the synod of the Reformed Presby- terian Church of North America in 1888 refused to unite with the United Presbyterian Church because the latter did not object to the secular character of the constitution of the United States; and with the general

synod of the Reformed Presby- terian Church the synod could not unite in 1890 because the general synod allowed and the synod did not allow its members to " incorporate " themselves with the political system of the United States. A loose union, called the " Federal Council of the Reformed Churches in America," was formed in 1894 by the churches mentioned (excepting the Southern Assembly) and the Dutch and German Reformed churches.

More or less closely connected with the Northern Church are the theological seminaries at Princeton, Auburn, Pittsburg (formerly Allegheny — the Western Seminary), Cincinnati (Lane), New York (Union) and Chicago (McCormick), already named, and San Fran- cisco Seminary (1871) since 1892 at San Anselmo, Cal., a theo- logical seminary (1891) at Omaha, Nebraska, a German theological seminary (1869) at Bloomfield, New Jersey, the German Presby- terian Theological School of the North-west (1852) at Dubuque, Iowa, and the Presbyterian Theological Seminary of Kentucky, which is under the control and supervision of the northern and southern churches. Seminaries of the Southern Church are the Union Theological Seminary at Richmond, Virginia, and the Columbia Theological Seminary at Columbia, South Carolina, already mentioned, the Austin Presbyterian Theological Seminary (1902) at Austin, Texas, the theological department in the South- western Presbyterian University at Clarksville, Tennessee, and, for negroes, Stillman Institute (1877), at Tuscaloosa, Alabama. The United Presbyterian Church has two seminaries, one at Xenia, Ohio, and one at Allegheny (Pittsburg). Of the Covenanter bodies the synod of the Reformed Presbyterian Church has a theological seminary in Allegheny (Pittsburg), established in 1856, and the general synod in 1887 organized a college at Cedarville, Ohio. The Associate Reformed Synod of the South has the Erskine Theo- logical Seminary (1837) in Due West, South Carolina.

The foreign missionary work of the General Assembly had been carried on after 1812 through the (Congregational) American Board of Commissioners for Foreign Missions (organized in 1810) until the separation of 1837, when the Old School Assembly established its own board of foreign missions; the New School continued to work through the American board; after the union of 1869 the separate board was perpetuated and the American board trans- ferred to it, with the contributions made to the American board by the New School churches, the missions in Africa (1833), in Syria (1822), and in Persia (1835). The Church now has, besides these missions, others in India (1834), Siam (1840), China (1846), Colombia (1856), Brazil (1859), Japan (1859), Laos (1867), Mexico (transferred in 1872 by the American and Foreign Christian Union), Chile (transferred in 1873 by the same Union; first established in 1845), Guatemala (1882), Korea (1884) and the Philippine

Islands (1899). A board of home missions was organized in 18 16; a board of education in 18 19; a woman's board of foreign missions in 1869; a women's executive committee for home mission work (which takes particular interest in the work for the freedmen) in 1878; a board of publication in 1838 (after 1887 called the board of Publication and Sunday School Work) ; a board of aid for colleges

(1883); a board of church erection in 1844; a board of work for freedmen; and a board of ministerial relief; after the union of 1869 the Board of Home Missions was removed from Philadelphia to New York City.

The Southern Church, unlike the Northern, is not working through " boards," but through executive committees, which were formerly more loosely organized, and which left to the presbyteries the more direct control of their activities, but which now differ little from the boards of the northern Church. It has: an executive com- mittee on foreign missions (first definitely organized by the Assembly in 1877), which has missions in China (1867), Brazil (1869), Mexico (1874), Japan (1885), Congo Free State (1891), Korea (1896) and Cuba (1899); and executive committees of home missions (1865), of publication and sabbath school work, of minis- terial education and relief, of schools and colleges and of colored evangelization (formed in 1891). Permanent committees on the " sabbath and family religion," the " Bible cause " and " evangelistic work " report to the General Assembly annually.

The United Presbyterian Church has a board of foreign missions (reorganized in 1859) with missions in Egypt (1853), now a synod with four presbyteries (in 1909, 71 congregations, 70 ministers and 10,341 members), in the Punjab (1854), now a _ synod with four presbyteries (in 1909, 35 congregations, 51 ministers and 17,321 members), and in the Sudan (i90l);and boards of home missions (reorganized, 1859), church extension (1859), publication (1859), education (1859), ministerial relief (1862), and missions to the freedmen (1863).

Presbyterians of diflerent churches in the United States in 1906 numbered 1,830,555; of this total 322,542 were in Penn- sylvania, where there were 248,335 members of the Presbyterian Church in the United States of America (the Northern Church), being more than one-fifth of its total membership; 56,587 mem- bers of the United Presbyterian Church of North America, being more than two-fifths of its total membership; 2709 mem-

bers of the Synod of the Reformed Presbyterian Church of North America, three-tenths of its total membership; the entire membership of the Reformed Presbyterian Church in the United States and Canada (440) , 3 1 50 members of the Welsh Calvinistic Methodist Church, nearly one-fourth of its total membership; and 2065 members of the Reformed Presbyterian Church in North America, general synod, about five-ninths of its total membership. The strength of the Church in Penn- sylvania is largely due to the Scotch-Irish settlements in that state. Philadelphia is the home of the boards of publication and of Sunday schools of the Northern Church; and in Allegheny (Pittsburg) are the principal theological seminary of the United Presbyterian body and its publishing house. In New York state there were 199,923 Presbyterians, of whom 186,278 were members of the Northern Church and 10,115 of the United Presbyterian Church of North America. In Ohio there were 138,768 Presby- terians, 114,772 being of the Northern and 18,336 of the United Presbyterian Church. The other states with a large Presbyterian population were Illinois (n 5,602; 86,251 of the Northern Church; 17,208 of the Cumberland Church; 9555 of the United Presby- terian Church); New Jersey (79,912; 78,490 of the Northern Church); Tennessee (79,337; 42,464 being Cumberland Presby- terians, more than one-fifth of the total membership; 6640 of the Colored Cumberland Church, more than one-third of its membership; 21,390 of the Southern Church; and 6786 of the Northern Church); Missouri (71,599; 28,637 of the Cumberland Church; 25,991 of the Northern Church; 14,713 of the Southern Church); Texas (62,090; 31,598 of the Cumberland Church; 23,934 of the Southern Church; 4118 of the Northern Church; and 2091 of the Colored Cumberland Church); Iowa (60,081; 48,326 of the Northern Church; 8890 of the United Presbyterian Church) ; and North Carolina (55, 837541, 322of the Southern and 10,696 of the Northern Church). The Northern Church had a total membership of 1,179,566. The Southern Church had a total membership of 266,345. The Cumberland Presbyterian Church had (in 1906, when it became a part of the Northern Church) 195,770 members. The Colored Cumberland Church had a membership of 18,066. The United Presbyterian Church of North America had a total membership of 130,342. The Welsh Calvinistic Methodist Church had a total membership of 13,280. The Associate Reformed Synod of the South had a membership of 13,201. The Synod of the Reformed Presby- terian Church in North America had in 1906 a membership of

9122. The "Reformed Presbyterian Church in North America, General Synod," had a membership of 3620. The Associate Presbyterian Church, or Associated Synod of North America had a membership of 786. The Reformed Presbyterian Church in the United States and Canada had a membership in the United States of 440.

On American Presbyterianism, see Charles Hodge, Constitutional History of the Presbyterian Church in the United States of America, 1706-1788 (2 vols., Philadelphia, 1 839-1 840); Records of the Presby- terian Church in the United States of America from 1706 to if 88 (ibid., 1841); Richard Webster, History of the Presbyterian Church in America (ibid., 1858); E. H. Gillett, History of the Presbyterian Church in the United Stales of America (2nd ed., ibid., 1873); C. A. Briggs, American Presbyterianism (New York, 1885). There is a good bibliography on pp. xi-xxxi of R. E. Thompson's History of the Presbyterian Churches in the United States (ibid., 1895), vol. vi. of the American Church History Series; in the same series in vol. xi. are sketches of " The United Presbyterians," by J. B. Scouller, " The Cumberland Presbyterians," by R. N. Foster, and " The Southern Presbyterians," by Thomas C. Johnson. Other works on the separate churches are: E. B. Crisman, Origin and Doctrines of the Cumberland Presbyterian Church (St Louis, 1877) and W. M. Glasgow, History of the Reformed Presbyterian Church in America (Baltimore, 1888).

PRESBYTERY, in architecture, that portion of the choir of a church in which the high altar is placed, and which is generally raised by a few steps above the rest of the church. It is reserved for the priests, and in that respect differs from the choir, the stalls in which are occasionally occupied by the laity. In Westminster Abbey the space east of the transept is the presbytery, and the same arrangement is found in Canterbury Cathedral. In San Clemente at Rome the presbytery is enclosed with a marble balustrade or screen. For the use of the word in Church government see Presbyter and Presbyterianism.

PRESCOT, a market town and urban district in the Ormskirk parliamentary division of Lancashire, England, 8 m. E. of Liverpool by the London & North Western railway. Pop. (1901), 7855. It is of considerable antiquity, and received a grant for a market and fair in the 7th year of Edward III. A church existed in the 13th century. The present church of St Mary is in various styles, with a lofty tower and spire and carved timber roof. The chief industry is the making of watches, and the town has long been celebrated for the production of watch movements and tools. The industry was first introduced in 1 730 by John Miller from Yorkshire. There is also a manufacture of electric cables. John Philip Kemble, the actor, was born at Prescot in 1757. To the north of the town is Knowsley Park, the demesne of the earls of Derby, with a mansion of various dates from the 15th century onward, containing a fine collection of pictures. Prescot was formerly of greater importance in relation to the now populous district of south-west Lan- cashire; it was also a postal centre, and it is curious to notice that such addresses as " Liverpool, near Prescot " were necessary.

PRESCOTT, WILLIAM HICKLING (1796-1859), American historian, was born in Salem, Massachusetts, on the 4th of May 1796. His grandfather was Colonel William Prescott (1726- 1795), who commanded at the battle of Bunker Hill; and his father was a well-known lawyer. He received his earlier educa- tion in his native city, until the removal of his family in 1808 to Boston. He entered Harvard College in the autumn of 1811, but almost at the outset his career was interrupted by an accident which affected the subsequent course of his life. A hard piece of bread, flung at random in the Commons Hall, struck his left eye and destroyed the sight. After graduating honourably in 1 8 14 he entered his father's office as a student of law; but in January 18 15 the uninjured eye showed dangerous symptoms of inflammation. When at last in the autumn he was in condition to travel, it was determined that he should pass the winter at St Michael's and in the spring obtain medical advice in Europe. His visit to the Azores, which was constantly broken by con- finement to a darkened room, is chiefly noteworthy from the fact that he there began the mental discipline which enabled him to compose and retain in memory long passages for subse- quent dictation; and, apart from the gain in culture, his journey

to England, France, and Italy (April 1816 to July 181 7) was scarcely satisfactory. The verdict of the physicians was that the injured eye was hopelessly paralysed, and that the preserva- tion of the sight of the other depended upon the maintenance of his general health. His further pursuit of the legal profession seemed to be out of the question, and on his return to Boston he remained quietly at home. On 4th May 1820 he was married to Miss Susan Amory. Prior to his marriage he had made a few experiments in composition, but he now finally decided to devote his life to literature. A review of Byron's Letters on Pope in 1821 constituted his first contribution to the North A merican Review, to which he continued for many years to send the results of his slighter researches. He next turned to French literature, and to the early English drama and ballad literature. Of the direction and quality of his thought at this time he has left indications in his papers on Essay-Writing (1822) and on French and English Tragedy (1823). In pursuance of his method of successive studies he began in 1823 the study of Italian literature, passing over German as demanding more labour than he could afford. In the following year he made his first acquaint- ance with the literature of Spain under the influence of his friend and biographer, Ticknor; and, while its attractiveness proved greater than he had at the outset anticipated, the com- parative novelty of the subject as a field for research served as an additional stimulus.

In the meantime his aims had been gradually concentrating. History had always been a favourite study with him, and Mably's Observations sur I'histoire appears to have had considerable influence in determining him to the choice of some special period for historic research. The selection, however, was not finally made without prolonged hesitation. It was not till the 19th of January 1826 that he recorded in the private memoranda begun by him in 1820 his decision " to embrace the gift of the Spanish subject." The choice was certainly a bold one. He could only use the eye which remained to him for brief and intermittent periods, and as travelling affected his sight pre- judicially he could not anticipate any personal research amongst unpublished records and historic scenes. He was happy, how- ever, in the possession of ample means and admirable friends; and he sketched with no undue restriction or hesitancy the plan of the History of the reign of Ferdinand and Isabella — his first great work. Mr English, one of his secretaries, has furnished a picture of him at this period seated in a study lined on two sides with books and darkened by green screens and curtains of blue muslin, which required readjustment with almost every cloud that passed across the sky. His writing apparatus — a nocto- graph — lay before him, and he kept his ivory style in his hand to jot down notes as the reading progressed. In accordance with his general method these notes were in turn read over to him until he had completely mastered them, when they were worked up in his memory to their final shape. So proficient did he become that he was able to retain the equivalent of sixty pages of printed matter in his memory, turning and returning them as he walked or drove. The rate of progress was necessarily slow, apart from any liability to interruption by other undertakings and failures in bodily health. He still continued his yearly experimental contributions to the North American Review, elaborating them with a view as much to ultimate historical proficiency as to immediate literary effect, the essays on Scottish Song (1 8 26) , Novel-Writing (1827), Moliere (1828), and Irving's Granada (1829) belonging to this preparatory period. On the 6th of October 1829 he began the actual work of composition, which was continued without more serious interruptions than those occasioned by the essays on Asylums for the Blind (1830), Poetry and Romance of the Italians (1831), and English Literature of the igth Century (1832), until the 25th of June 1836, when the concluding note was written. Another year, during which his essay on Cervantes appeared, was spent in the final revision of the History for the press. Its success upon its publication in Boston was immediate. Arrangements were speedily made for its publication in England, and there its success was not less marked. From the position of an obscure reviewer Prescott

suddenly found himself elevated to the first rank of contemporary historians.

After coquetting for a short time with the project of a life of Moliere he decided to follow in the track of his first work with a History of the Conquest of Mexico. Washington Irving, who had already made preparations to occupy the same field, generously withdrew in his favour. The work was completed in August 1843, the five years' labour having been broken by the composition of reviews of Lockhart's Zi/e of Scott (1838), Kenyon's Poems (1839), Chateaubriand (1839), Bancroft's United Stales (1841), Mariotti's Italy (1842), and Madame Calderon's Life in Mexico (1843), and by. the preparation of an abridgment of his Ferdinand and Isabella in anticipation of its threatened abridgment by another hand. On the 6th of December 1843 the Conquest of Mexico was published with a success propor- tionate to a wide reputation won by his previous work. The careful methods of work which he had adopted from the outset had borne admirable fruit. While the consultation of authorities had been no less thorough, his style had become more free and less self-conscious; and the epic qualities of the theme were such as to call forth in the highest degree his powers of picturesque narration.

It was only a step from the conquest of Mexico to that of Peru, and scarcely three months elapsed before he began to break ground on the latter subject. In February 1845 he received the announcement of his election as corresponding member of the French Institute in place of the Spanish historian Navarrete, and also of the Royal Society of Berlin. The winter found him arranging for the publication in England of the selection from his articles and reviews which appeared in 1845, under the title of Critical and Historical Essays, and was issued almost contemporaneously at New York under the title of Biographical and Critical Miscellanies. The Conquest of Peru was completed in November 1846 and published in March following. His misgivings as to its reception were at once set at rest, and it was speedily issued in translations into French, Spanish, German and Dutch, in addition to the English editions of New York, London and Paris.

He was now over fifty and his sight showed serious symptoms of enfeeblement. Although during the composition of the Ferdinand and Isabella it had been of very intermittent service to him, it had so far improved that he could read with a certain amount of regularity during the writing of the Conquest of Mexico, and also, though in a less degree, during the years devoted to the Conquest of Peru. Now, however, the use of his remaining eye had been reduced to an hour a day, divided into portions at wide intervals, and he was driven to the conclusion that whatever plans he made must be formed on the same calculations as those of a blind man. He had been for many years collecting materials for a history of Philip II., but he hesitated for some time to attempt a work of such magnitude, occupying himself in the meantime with the slighter labours of a memoir of John

Pickering for the Massachusetts Historical Society and the revision of Ticknor's History of Spanish Literature. But in March 1848 he set himself with characteristic courage to the accomplishment of the larger project. He had been fortunate in obtaining the aid of Don Pascual de Gayangos, then professor of Arabic literature at Madrid, by whose offices he was enabled to obtain material not only from the public archives of Spain but from the muniment rooms of the great Spanish families. With an exceptional range of information thus afforded him, he wrote the opening of his history in July 1849; but, finding himself still unsettled in his work, he decided in the spring of the following year to carry out a long projected visit to England. The idea of writing memoirs was dismissed in favour of the more elaborate form, and in November 1855 the first two volumes of his uncom- pleted History of Philip II. were issued from the press, their sale eclipsing that of any of his earlier books. This was his last great undertaking; but as Robertson's Charles V., in the light of new sources of information, was inadequate to take its place as a link in the series, he republished it in an improved and extended form in December 1856. A slight attack of

apoplexy on the 4th of February 1858 foretold the end, though he persevered with the preparation of the third volume of Philip II. for the press, and with the emendation and annotation of his Conquest of Mexico. On the morning of the 27th of January 1859 a second attack occurred, and he died in the afternoon of the same day in his sixty-third year.

As an historian Prescott stands in the direct line of literary descent from Robertson, whose influence is clearly discernible both in his method and style. But, while Robertson was in some measure the initiator of a movement, Prescott came to his task when the range of information was incomparably wider and when progress in sociologic theory had thrown innumerable convergent lights upon the progress of events. He worked, therefore, upon more assured ground ; his sifting of authorities was more thorough and his method less restricted. At the same time he cannot be classed as in the highest sense a philosophic historian. His power lies chiefly in the clear grasp of fact, in selection and synthesis, in the vivid narration of incident. For extended analysis he had small liking and faculty ; his critical insight is limited in range, and he confines himself almost wholly to the concrete elements of history. When he does venture upon more abstract criticism his standards are often commonplace and superficial, and the world scheme to which he relates events is less profound than the thought of his time altogether warranted. Moreover, the authorities on whom he relied have had to be corrected since in many points of detail in the light of

later archaeological research. If these things, however, indicate Prescott's deficiencies from the point of view of ideal history, few historians have had in a higher degree that artistic feeling in the broad arrangement of materials which ensures popular interest. The course of his narrative is unperplexed by doubtful or insoluble problems. The painting is filled in with primary colours and with a free hand ; and any sense of crudity which may be awakened by close inspection is compensated by the vigour and massive effectiveness of the whole.

Prescott's works in 16 vols, were edited by J. F. Kirk in 1 870-1 874. His Life was written by George Ticknor (1864; revised 1875). There are later lives by R. Ogden (1904) and H. T. Peck (1905).

PRESCRIPTION, in the broadest sense, the acquisition or extinction of rights by lapse of time. The term is derived from the praescriptio of Roman law, originally a matter of procedure, a clause inserted before the formula on behalf of either the plaintiff or, in early times, the defendant, limiting the question at issue. It was so called from its preceding the formula} One of the defendant's praescriptiones was longi temporis or longae possessionis praescriptio (afterwards superseded by the exceptio), limiting the question to the fact of possession without interrup- tion by the defendant for a certain time. It seems to have been introduced by the praetor to meet cases affecting aliens or lands out of Italy where the usucapio of the civil law (the original means of curing a defect of title by lapse of time) could not apply. The time of acquisition by usucapio was fixed by the Twelve Tables at one year for movables and two years for immovables. Praescriptio thus constituted a kind of praetorian usucapio. In the time of Justinian usucapio and praescriptio (called also longi temporis possessio), as far as they affected the acquisition of ownership, differed only in name, usucapio being looked at from the point of view of property, praescriptio from the point of view of pleading. By the legislation of Justinian movables were acquired by three years' possession, immovables by ten years' possession where the parties had their domicile in the same province (inter praesentes), twenty years' possession where they were domiciled in different provinces (inter absentes). Servitudes could not be acquired by usucapio proper, but were said to be acquired by quasi usucapio, probably in the same time as sufficed to give a title to immovables. There was also a longissimi temporis possessio of thirty years, applicable to both movables and immovables, and requiring nothing but bona fides on the part of the possessor. Where the right sought to be estab- lished was claimed against the Church, a still longer period of forty years (at one time a hundred) was necessary. Immemorial prescription was required in a few cases of a public character, as roads. 2 Praescriptio was also the term applied to lapse of time as barring actions upon contracts or torts under various provisions corresponding to the English Statutes of Limitation. The prescription of

Roman law (and of modern systems based upon it) is thus both acquisitive and extinctive. It looks either

1 " Praescriptiones autem appellatas esse ab eo quod ante formula praescribuntur " (Gaius iv. § 132).

2 " Viae vicinales, quarum memoria non extat " (Dig. xliii. 7. 3)-

to the length of time during which the defendant has been in possession, or to the length of time during which the plaintiff has been out of possession. In English law the latter kind of prescription is called limitation. The tendency of law is to substitute a definite for an indefinite period of prescription.

In English law prescription is used in a comparatively narrow sense. It is acquisitive only, and is very limited in its application. A title by prescription can be made only to incorporeal hereditaments — that is, in legal language, hereditaments that are or have been appendant or appurtenant to corporeal hereditaments — and to certain exemptions and privileges. 3 The rights claimable by pre- scription for the most part consist of rights in alieno solo. The most important are advowsons, tithes, commons, ways, watercourses, lights, offices, dignities, franchises, pensions, annuities and rents. Land or movables cannot be claimed by prescription. The founda- tion of prescription is the presumption of law that a person found in undisturbed enjoyment of a right did not come into possession by an unlawful act (see Williams, Rights of Common, 3). In the English courts this presumption was, perhaps still is, based upon the fiction of a lost grant, viz. that there had been a grant of the hereditament by a person capable of granting it to a person capable of taking it, and that the grant had been lost. The jury were instructed to find the loss of a once existing grant in whose existence no one really believed. The enjoyment of the right must have been from a time whereof the memory of man runneth not to the contrary. The period of legal memory was after a time necessarily fixed for purposes of convenience at a certain date. The date adopted varied at first with the time during which the demandant in a writ of right must have proved seisin in himself or his ancestors. After one or two previous enactments the date was finally fixed by the Statute of Westminster the First (3 Edw. I. c. 39) at the reign of Richard I., which was interpreted to mean the first year of the reign of Richard I. (1189). The inconvenience of this remote date, as time went on, led to the gradual growth of a rule of evidence that proof of enjoyment for twenty years was prima facie evidence of enjoyment from time immemorial. But evidence of the beginning of the enjoyment at however remote a date, if subsequent to 1 Richard I., was sufficient to destroy the claim. This is still the law with respect to claims not falling within the Prescription Act, mostly rights in

gross — that is, where there is no dominant or servient tenement, e.g. a right to a pew or to a several fishery in gross. The twenty years' rule was of comparatively late introduction; it does not seem to have been known in the time of Elizabeth, and was perhaps introduced in analogy to the Statute of Limitations, 21 Jac. I. c. 16. With respect to claims of profits a prendre and easements a change was made by the Prescription Act 1832 (extended to Ireland by an act of 1858, but not to Scotland). By that act claims to rights of common and other profits d, prendre are not to be defeated after thirty years' enjoyment by any person claiming right thereto without interruption for thirty years by showing only the commencement of the right, and after sixty years' enjoyment the right is absolute and indefeasible unless had by consent or agreement by deed or writing (§1). In claims of rights of way or other easements the periods are twenty years and forty years respectively (§ 2). The before-mentioned periods are to be deemed those next before suits, and nothing is to be deemed to be an interruption unless acquiesced in for one year (§ 4). In pleading, the enjoyment as of right may be alleged during the period mentioned in the act, and without claiming in the name or right of the owner of the fee (§ 5). No presumption is to be made in favour of a right exercised for a less period (§ 6). The time during which a person otherwise capable of resisting a claim is an infant, idiot, non compos mentis, feme covert, or tenant for life, or during which an action or suit has been pending until abated by the death of a party, is to be excluded in the com- putation of the periods unless where the right or claim is declared to be absolute and indefeasible (§ 7). An act to define the period of prescription for a modus decimandi, or an exemption from tithes by composition, was passed the same year. The Prescription Act is only supplemented to the common law, so that a claim may be based upon the act or, in the alternative, upon the common law. Nor does the act alter the conditions necessary at common law for a good claim by prescription. The claim under the statute must be one which may be lawfully made at common law. The principal rules upon the subject are these. (1) The tide is founded upon actual usage. The amount of actual usage and the evidence necessary to prove it vary according to the kind of claim. (2) The enjoyment must (except in the case of light) be as of right — that is to say, peace- able, openly used, and not by licence. (3) The prescription must be certain and reasonable. Inhabitants cannot, however, claim by prescription, as they are an uncertain and fluctuating body, unless under a grant from the Crown, which constitutes them a corporation for the purposes of the grant. (4) The prescription must be alleged in a que estate or in a man and his ancestors. Prescription in a

3 Prescription seems at one time to have borne a wider meaning. A claim by prescription to land is mentioned in 32 Hen. VIII. c. 2. And it seems that tenants in common may still make title to land by prescription (Littleton's

Tenures, § 310).

que estate lies at common law by reason of continuous and immemorial enjoyment by the claimant, a person seised in fee, and all those whose estate he had (toux ceux que estate V- ad). The Prescription Act fixes a definite period and does away with the necessity which existed at common law of prescribing in the name of the person seised in fee. Prescription in a man and his ancestors is not of ordinary occurrence in practice. Corporations, however, occasionally claim by a prescription analogous to this, viz. in the corporation and its predecessors. Such claims by either a person or a corporation are not within the Prescription Act, which applies only where there are dominant and servient tenements. By 32 Hen. VIII. c. 2 (1540) no person can makeany prescription by the seisin or possession of his ancestor unless such seisen or possession had been within threescore years next before such prescription made. (5) A pre- scription cannot lie for a thing which cannot be granted, as it rests upon the presumption of a lost grant. Thus a lord of a manor cannot prescribe to raise a tax or toll upon strangers, for such a claim could never have been good by any grant.

Prescription and Custom. — Prescription must be carefully dis- tinguished from custom. Prescription, as has been said, is either in a que estate or in a man and his ancestors — that is to say, it is a personal claim; custom is purely local — that is to say, it is a usage obtaining the force of law within a particular district. In the time of Littleton the difference between prescription and custom was not fully recognized (see Littleton's Tenures, § 170), but the law as it exists at present had become established by the time of Sir Edward Coke. A custom must be certain, reasonable and exercised as of right. Like prescription at common law, it must have existed from time immemorial. On this ground a custom to erect stalls at statute sessions for hiring servants was held to be bad, because such sessions were introduced by the Statute of Labourers, 23 Edw. III. st. 1 (Simpson v. Wells, L.R., 7 Q.B., 214). Some rights may be claimed by custom which cannot be claimed by prescription, e.g. a right of inhabitants to dance on a village green, for such a right is not connected with the enjoyment of land. On the other hand, profits a prendre can be claimed by prescription but not by custom, unless in two or three exceptional cases, such as rights of copy-holders to common in the lord's demesne, or to dig sand within their tenements, rights to estovers in royal forests, and rights of tin- bounders in Cornwall.

United States. — The Law of the United States (except in Louisiana) is

based upon that of England, but the period of enjoyment necessary to found a title by prescription varies in the different states. An easement or profit i prendre is acquired by twenty years' enjoyment in most states, following the English common law rule. In Louisiana the period varies according to the subject from three to thirty years, and property other than incorporeal hereditaments may be claimed by prescription as in Roman law (see Kent's Comm. iii. 442).

International Law uses the term " prescription " in its wider or Roman sense. " The general consent of mankind has established the principle that long and uninterrupted possession by one nation excludes the claim of every other " (Wheaton, Int. Law, § 165). Historic instances of rights which were at one time claimed and exercised by prescription as against other nations are the sovereignty of Venice over the Adriatic and of Great Britain over the Narrow Seas, and the right to the Sound dues long exacted by Denmark. But such claims were rejected by the highest authorities on inter- national law {e.g. Grotius), on the ground that they were defective both in Justus titulus and in de facto possession. There is no special period fixed, as in municipal law, for the acquirement of international rights by lapse of time. In private international law prescription is treated as part of the lex fori or law of procedure. (J. W.)

Scotland. — In the law of Scotland " prescription " is a term of wider meaning than in England, being used as including both pre- scription and limitation of English law. In its most general sense it may be described as the effect which the law attaches to the lapse of time, and it involves the idea of possession held by one person adverse to the rights of another. Though having its basis in the common law, its operation was early defined by statute, and it is now in all respects statutory. Prescription in Scots law may be regarded (1) as a mode of acquiring rights — the positive prescrip- tion ; (2) as a mode of extinguishing rights — the negative prescription ; (3) as a mode of limiting rights of action — the shorter prescriptions. It must, however, be observed with reference to this division that the distinction between (1) and (2) is rather an accidental (due to a loose interpretation of the language of the act of 161 7, c. 12) than a logically accurate one. It is, moreover, strictly confined to heritable rights, having no application in the case of movable property. But, though the distinction has been complained of by the highest authority as tending to create embarrassment in the law (see opinion of Lord Chancellor St Leonards in Dougall v. Dundee Harbour Trustees, 1852, 24 Jurist, 385), it is now too well settled to be departed from.

1. Positive Prescription. — The positive prescription was introduced by the act of 1617, c. 12. After setting forth in the preamble the inconvenience resulting from the loss of titles and the danger of forgery after the means of

improbation are lost by the lapse of time, it enacts that whatever heritages the lieges, their predecessors or authors have possessed by themselves or others in their names peaceably, in virtue of infeftments for the space of forty years,

continually and together, from the date of their said infeftments, and without any lawful interruption during the said space, they shall not be disturbed therein, provided they produce a written title on which their possession has proceeded. Such written title must be either a charter and sasine preceding the forty years, or, when no charter is extant, instruments of sasine proceeding upon retours or precepts of dare constat. Though the statute in its literal construc- tion only applied to such heritable subjects as had been conveyed by charter and sasine, it was at an early date interpreted so as to include other heritable rights, as servitudes, tacks, public rights of way, &c, where no charter could be supposed to exist. The act of 161 7 was so well framed that it continued to regulate the pre-scription of land rights till 1874. By the Conveyancing Act of that year (37 & 38 Vict. c. 94, § 34) the period of prescription was shortened from forty years to twenty. It was provided that posses- sions for twenty years upon "an ex facie valid irredeemable title recorded in the appropriate register of sasines " should in future give the same right as forty years' possessions upon charter and sasine under the earlier law. The act of 1874 does not, however, apply to all the cases which fell under the act of 161 7. Thus it has been decided that twenty years' possession on a charter of adjudica-tion followed by sasine and a declarator of expiry of the legal is insufficient to give an unchallengeable right, an adjudication not being an " ex facie irredeemable title " (Hinton v. ConneVs Trustees, 1883, 10 Rettie's Reports, p. 11 10). It is further specially provided by the act of 1874 that the twenty years' prescription is not to apply to servitudes, rights of way, and public rights generally. The following rules apply to the positive prescription, (a) The possession which is required for it must be peaceable, continuous (" continually and together," as the act of 1617 has it), and uninterrupted, (b) The prescription runs de momento in momentum, (c) The person against whom the prescription runs must be major and sui juris — a rule which, as regards minority, was specially provided for by the act of 1617, and as regards other cases of incapacity by the application of the principles of the common law. Under the Conveyancing Act, however, it is provided that in all cases where the twenty years' prescription applies, the lapse of thirty years is to exclude any plea on the ground of minority or want of capacity.

2. Negative Prescription. — This prescription was introduced by the act of 1469, c. 28, and substantially re-enacted by the act of 1474, c. 55. At first restricted to personal claims of debt, it was gradually extended in practice and ultimately made applicable to heritable bonds and other heritable

rights by the above-mentioned act of 1617. By the act of 1469 it is declared that the person having interest in an obligation must follow the same within the space of forty years and take document thereupon, otherwise it shall be prescribed. The negative prescription accordingly extinguishes in toto the right to demand performance of an obligation after forty years, the years being reckoned from the day on which fulfilment of the obligation can be first demanded. The lapse of this period of time creates a conclusive presumption — one incapable of being redargued — that the debt or obligation has been paid or fulfilled. But it must be kept in view that the negative prescription does not perse — without the operation of the positive — establish a right to heritable property (Erskine, Inst. b. iii. tit. 7, § 8). As regards the character of the prescription, it is requisite, in the same way as in the case of the positive, that the years shall have run continuously and without interruption, i.e. without any act done on the part of the creditor which indicates his intention to keep alive the right. Such inter- ruption may, for instance, take place by the payment of interest on the debt, or citation of the debtor in an action for the debt, or by a claim being lodged in the debtor's sequestration. In the same way as in the positive, the currency of the negative prescription is suspended by the debtor being minor or non valens agere.

3. Shorter Prescriptions. — There are certain short prescriptions recognized by Scots law — corresponding to the limitations of English law — which operate not as extinguishing rights but as excluding the ordinary means of proving them. The following require to be noticed, (a) Vicennial prescription protecting a person who has been served as heir for twenty years against action by any other person claiming to be heir, (b) Decennial prescription requiring all actions by minors against their tutors and curators, and vice versa, to be prosecuted within ten years from the expiration of the guardianship, (c) Septennial prescription providing that no person bind himself, under certain exceptions, for and with another, conjunctly and severally, in any bond or contract for sums of money shall be bound for more than seven years after the date of the obligation. There are also other shorter prescriptions limiting rights of action in different matters as the sexennial, quinquennial and triennial.

PRESENT, an adjective, adverb and substantive meaning that which is at hand or before one in place or in time. Also another substantive meaning a gift, and a verb meaning to bring into the presence of, to offer, to deliver. The verb is pronounced present; the others present. The first group is due to the Latin praesens, the present participle of praeesse, to be before one or at hand ; from this participle was formed the verb praesentare, to bring before one, exhibit, show. The sense of " gift " is due to

the O. Fr. phrase mettre en present a quelqu'un, to bring something into the presence of a person, to offer, give. The legal formal phrase " these presents " is common, especially in the form " know all men by these presents," as an opening to a deed, more particu- larly to a deed-poll which cannot be referred to as an " indenture." The phrase " these present words, documents, writings," &c. is an adaptation of a similar phrase in O.Fr. ces presentes (sc. eltres). As ecclesiastical terms " to present " or " presentation " are used of the " presenting " or nomination by the patron to the bishop of the person chosen by him to fill a vacant benefice. When the bishop is patron he does not " present," but " collates." " Presentiment," foreboding, the feeling of something impending, must be distinguished in ety- mology; it is derived from the Lat. praesentire, to perceive beforehand.

PRESENTATIONISM (from Lat. prae-esse, praesens, present), a philosophical term used in various senses deriving from the general sense of the term " presentation." According to G. F. Stout (cf. Manual of Psychology, i. 57), presentations are " what- ever constituents or our total experience at any moment directly determine the nature of the object as it is perceived or thought of at that moment." In Baldwin's Dictionary of Philosophy, vol. ii., a presentation is " an object in the special form under which it is cognized at any given moment of perceptual or ideational process." This, the widest definition of the term, due largely to Professor James Ward, thus includes both perceptual and ideational processes. The term has, indeed, been narrowed so as to include ideation, the correlative " representation " being utilized for ideal presentation, but in general the wider use is preferred. When the mind is cognizing an object, the object " presents " itself to the senses or to thought in one of a number of different forms (e.g. a picture is a work of art, a saleable commodity, a representation of a house, &c). Pre- sentation is thus essentially a cognitive process. Hence the most important use of the term " presentationism," which is defined by Ward, in Mind, N.S. (1893), ii. 58, as " a doctrine the gist of which is that all the elements of psychical life are primarily and ultimately cognitive elements." This use takes precedence of two others: (1) that of Hamilton, for presentative as opposed to representative theories of knowledge, and (2) that of some later writers who took it as equivalent to phenomenon (q.v.). Ward traces the doctrine in his sense to Hume, to whom the mind is a " kind of theatre " in which perceptions appear and vanish continually (see Green and Grose edition of the Treatise, i. 534). The main problem is as to whether psychic activity is " presented " or not. Ward holds that it is not presented or presentable save indirectly.

For the problems connected with Presentation and Presenta- tionism see especially the article Psychology and authorities there quoted.

PRESIDENCY, an administrative unit of the Indian empire. The word is derived from the title of president or chief of the council of a principal factory under the early East India Company — a title which lasted until governors were appointed under act of parliament in 1784. It thence came to be applied to the three original provinces of Bengal, Madras, and Bombay. It is now restricted to Madras and Bombay, in distinction to the lieu- tenant-governorships. In Anglo-Indian usage, " presidency " was also applied to the capital city as opposed to the country beyond, termed the " mofussil "; and this usage lingers in such phrases as " presidency town," " presidency magistrate," and " presidency college."

PRESIDENT (Fr. president, from Lat. praesidens, post- Augustan Lat. for praeses, director, ruler, from praesidere, to sit in front of, preside), a style or title of various connotation, but always conveying the sense of one who presides. In classical Latin the title praeses, or president, was given to all governors of provinces, but was confined in the time of Diocletian to the procurators who, as lieutenants of the emperor, governed the smaller provinces. In this sense it survived in the middle ages. Du Cange gives instances from the capitularies of Charlemagne of the style praeses provincial as applied to the count; and later

examples of praeses, or praesidens, as used of royal seneschals and other officials having jurisdiction under the Crown.

In England the word survived late in this sense of royal lieutenant. Thus, John Cowell, in his Interpreter of Words (1607) defines " President " as " used in Common Law for the King's lieutenant in any province or function; as President of Wales, of York, of Berwick. President of the King's Council." In some of the British North American colonies (New Hamp- shire, Pennsylvania, South Carolina) there was a president of the council, usually elected by the council; and when Pennsyl- vania and New Hampshire became states, one member of the Executive Council was called president. The chief (and single) executive head in Delaware, South Carolina and New Hamp- shire (1 784-1 792) was called president.

During the revolutionary struggle in America from 1774 onwards, the presiding officer of the Continental Congress was styled "President" and when the present constitution of the United States was framed in 1787 (in effect 1789) the title of President was transferred to the head of the Federal government. " President " thus became the accepted style for the elected chief of a modern republic, the example of the United States being followed by the South American republics,' by France in 1849, an d by Switzerland.

In the simple sense of " one who presides " the word " president " preserved

its meaning alongside the technical use implying royal delegation. In this sense the New English Dictionary quotes its use by Chaucer {Troylus, iv. 185) in 1374. In ecclesiastical terminology praesidens was sometimes used for the head of cathedral chapters, instead of dean or provost; and it was sometimes the title given to the principal visitor of monasteries, notably in the reformed congre- gation of Cluny (Du Cange). In the United Kingdom the heads of many colleges are styled " president," the title being of consider- able antiquity in the case of one college at Cambridge (Queens', founded in 1448) and four at Oxford (St John's, Magdalen, Corpus Christi, Trinity). At five Cambridge colleges (Pembroke, Gonville and Caius, St Catherine's, St John's, Magdalene) the title " president" is borne by the second in authority, being the equivalent of " vice- master." In the United States " president " is the usual style of the head of a college and also of a university wherever this has developed out of a single college. " President " is also the style of persons elected to preside over the meetings of learned, scientific, literary and artistic academies and societies, e.g. the president of the Royal Academy (P.R.A.) in London; the title of the president of the Royal Society (P.R.S.) dates from its foundation in 1660. In the United States the style " president " is also given to the person who presides over the proceedings of financial, commercial and industrial corporations (banks, railways, &c.) , in Great Britain usually styled " chairman," but in the case of the Bank of England and certain other banks "governor."

In Great Britain the title " president " is also borne by certain ministers of the Crown and certain judges, and preserves some of the ancient connotation of a royal lieutenancy explained above. Thus the style of " president " applied to the heads of the board of agriculture, local government board, board of education, board of trade, &c, which are all committees of the privy council, is derived from that of the lord president of the council, the representative of the king. The presidents of the court of session in Scotland, and of the probate and divorce division, &c. in England, also bear thir. style ultimately as representatives of the Crown.

In France, besides the president of the republic, there are presi- dents of the senate and of the chamber of deputies. In Germany the word Prasident is used in most of the English senses of " president," e.g. of a corporation, society, assembly or political body. As a judicial title Prasident is confined to the head of any one of the corporations (Kollegien) on the basis of which the judicial system of the empire is organized (Landgericht, Gberlandesgericht, Reichs- gerichl) , and must be distinguished from that of Vorsitzender (literally also praesidens) , i.e. the judge (who may or may not be the Prasident) selected to preside over a division of the court appointed to try particular cases.

In Prussia Prasident also retains its old sense of " governor," Oberprasident being the title of the chief of the administration of a province, Prasident that of the head of a government district (Regierungsbezirk) . The consistories of the established Protestant Church are also presided over by a Prasident, who is a royal official. PRESS (through Fr. presse from Lat. pressare, frequentative of premere, to crush, squeeze, press), a word which appears in English in the 13th and 14th centuries with three particular 1 The style "president " was in every case exchanged for that of " governor " within a few years of the proclamation of the inde- pendence of the United States. The title " president " is no longer used for any governor under the British Crown, but relics of past usage survive in the " presidencies " of Madras and Bombay.

meanings, viz. (1) crowd or throng, often used of the melee in a battle, (2) a shelved cupboard for books or clothes, and (3) an apparatus for exerting pressure on various substances, and for various purposes. The first meaning is still current, though usually it has a literary air; a specific use is the nautical one of " press of sail," i.e. as much sail as the wind will allow; cf. the similar use of " crowd." The second use has given way to other words, but is still the technical term in use in libraries, where the books bear " press-marks " specifying the case or shelf where they may be found. As' a term for a machine or apparatus for exerting pressure, there are innumerable examples, usually with a qualifying word giving the purpose for which the pressure is applied, either for attaining compression into a small space, or a required shape, or for extracting juices or liquids, or the methods adopted for exerting the pressure. The printing-press has given rise to obvious transferred uses of the word " press ": thus it is applied to an establishment for printing, e.g. the Clarendon Press, at Oxford, or the Pitt Press, at Cambridge, to a printing-house and to the staff which conduct the business, to the issue of printed matter and especially to its daily or periodical issue, hence newspapers and periodicals generally. According to the New English Dictionary this use originated in phrases such as " the liberty of the press," " to write for the press," &c. The earliest quotation given is from the first number of the Dublin Press, 1797. For the history of the liberty or freedom of the press see Press Laws; also Newspapers and Periodicals. For the punishment of " pressing " see Peine Forte et Dure. It is now recognized that " press " in " press gang," " to press," i.e. to force or compulsorily enlist men for naval or military service, is a word distinct from the above. It stands for the earlier " prest," and is ultimately due to French preter, to lend (see Impressment).

PRESSBURG (Hung. Pozsony, Lat. Posonium), a town of Hungary, capital of the county of the same name, 133 m. N.W. of Budapest by rail. Pop. (1900), 61,537, about half of whom are Germans. Pressburg is picturesquely situated on the left bank of the Danube, at the base of the outlying spurs of the Little Carpathians, in a position of strategical importance near the Porta Hungarica. Pressburg was the capital of Hungary from 1541 until 1784, while the Hungarian parliament held its sittings here till 1848. One of the most conspicuous buildings of the town is the royal palace, situated on the Schloss- berg, a plateau 270 ft. above the Danube, which was destroyed by fire in 181 1 and has since been in ruins. Other noteworthy buildings are the cathedral, a Gothic edifice of the 13th century, restored in 1861-1880, in which many of the Hungarian kings were crowned; the town hall, also a 13th-century building, several times restored, and containing an interesting museum ; the Franciscan church, dating from 1272; and the law-courts, erected in 1783, where the sittings of parliament were held from 1802 to 1848. The Grassalkowitch palace is now the residence of an archduke, and there is an archiepiscopal palace. Educa- tional establishments include an academy of jurisprudence, a military academy, a Roman Catholic and a Protestant seminary, a training school for female teachers, and several secondary and technical schools. A large business is carried on in wooden furniture, tobacco and cigars, paper, ribbons, leather wares, chemicals, liqueurs, confectionery and biscuits. There is, besides, a dynamite factory, which produces over 2,000,000 ft) of explosives annually, a large cloth factory and several flour- mills. Trade in grain and wine is active. Besides the extensive traffic on the Danube, the town is also an important railway junction. The first railway line in Hungary was that from Pressburg to Tyrnau through the valley of the Waag. The town has many points of interest in its environs. About twenty-five minutes by steamer down the Danube, the exten- sive ruins of the castle of Theben (Hung. Deveny), the former gate of Hungary, are situated at the point where the March, which forms the boundary between Austria and Hungary, falls into the Danube. Opposite on the left bank is Hamburg, the gateway of Hungary from the Austrian side. Eastward and southward of Pressburg stretches a long and fertile plain,

known as the Upper or Little Hungarian plain. It has an area of 2825 sq. m., of which two-thirds lay on the right bank of the Danube, and the whole is bounded by the rivers Neutra and Raab. In the extreme south-west of this plain is situated the lake of Ferto-Tava (Ger. Neusiedler See), which has an area of about 100 sq. m., but it is of varying size, and sometimes dries up in part. Eastward it is united with the extensive marsh called the Hansag, through which it is in communication with the river Raab and with the Danube. In the Roman period it was known as Pe'iso or Pelso. In several places of the dry bed traces of prehistoric lake-dwellings have been

discovered. In conjunction with the regulation of the river Raab, and the drainage of the Hansag marsh, plans for the drainage of the lake have been proposed.

Little is known of the early history of Pressburg, which was founded about 1000. It was soon strongly fortified, though it was captured by the king of Bohemia, Ottakar II., in 1271. It received many privileges from the Hungarian kings, especi- ally from the emperor Sigismund, and its strategic situation made it an important fortress. Sigismund held Imperial diets in the town. After the battle of Mohacs in 1526 and the capture of Buda by the Turks, Pressburg became the capital of Hungary. Here in 1608 the Austrian and Hungarian malcontents concluded a treaty with the archduke Matthias, afterwards emperor, against their lawful sovereign, the emperor Rudolf II. Ini6ig the town was taken by Bethlen Gabor, but it was recovered by the Imperialists in 1621. In 1687 it was the scene of the session of the estates of Hungary during which the Hungarians renounced their right of choosing their own king and accepted the hereditary succession of the Habsburgs. Here also was held the diet of 1741 when the members swore to assist their sovereign, Maria Theresa, against Frederick the Great. In 1784 Buda took the place of Pressburg as the capital of Hungary, but the latter town continued to be the seat of the parliament until 1848. On the 26th of December 1805 peace was signed here between Napoleon and the emperor Francis I., and in 1809 the town was bombarded by the French.

See J. Kiraly, Geschichte des Donau- Mauth- und Urfahr-Rechts der Freistadt Pressburg (Pressburg, 1890) ; T. Ortvay, Geschichte der Stadt Pressburg (Pressburg, 1892), and Pressburgs Strassen und Pldtze (Pressburg, 1905).

PRESSENSE, EDMOND DEHAULT DE (1824-1891), French Protestant divine, was born at Paris on the 7 th of January 1824. He studied at Lausanne under Alexander Vinet, and at Halle and Berlin under F. A. G. Tholuck and J. A. W. Neander, and in 1847 became pastor in the Evangelical Free Church at the chapel of Taitbout in Paris. He was a powerful preacher and a good political speaker; from 1871 he was a member of the National Assembly, and from 1883 a senator. In 1890 he was elected a member of the Academy of Sciences. Pressense laboured for the revival of biblical studies. He contended that the Evangelical Church ought to be independent of the power of the state. He died on the 8th of_ April 1891.

He founded in 1854 the Revue chretienne, and in 1866 the Bulletin theologique. His works include: Histoire des trois premiers siecles de t'eglise chretienne (6 vols. 1856-1877; new ed. 1887-1889), L'ltglise et la

revolution francaise (1864; 3rd ed., 1889), Jesus-Christ, son temps, sa vie, son ceuvre (against E. Renan, 1866; 7th ed. 1884), Les Origines, le probleme de la connaissance ; le probleme cosmologique (1883; 2nd ed. 1887). See T. Roussel, Notice sur la vie et les ceuvres de Pressensi

(1894).

PRESS GANG, the popular name for trie companies of officers and men who were commissioned to execute the warrants for the impressment of seamen in Great Britain (see Impressment). These bodies consisted of a captain, one or more lieutenants, and a band of trustworthy men. They were sent to seaports, or occasionally to inland towns where sailors were likely to be met when going from one coast to another. A " rendezvous " was opened, volunteers were enlisted, deserters arrested, and such " able bodied persons " as were liable to be pressed for service in the fleet were seized, and sent to the guard ships (q.v.).

PRESS LAWS, the laws concerning the licensing of books and the liberty of expression in all products of the printing-press,

especially newspapers. The liberty of the press has always been regarded by modern political writers as of supreme import- ance. " Give me liberty to know, to utter, and to argue freely according to conscience, above all other liberties," says Milton in the Areopagitica.

At the present day the liberty of the press in English-speaking countries is a matter of merely historical importance. But this liberty was a plant of slow growth. Before the invention of printing the Church assumed the right to control the expression of all opinion distasteful to her. When the printing-press was invented German printers established themselves at various important centres of western Europe, where already numbers of copyists were employed in multiplying manuscripts. In 1473 Louis XI. granted letters patent (giving the right of printing and selling books) to " Uldaric Quering " (Ulrich Gering), who three years earlier had set up a press in the Sorbonne (the theological faculty of the university at Paris), and before long Paris had more than fifty presses at work. The Church and universities soon found the output of books beyond their control. In 1496 Pope Alexander VI. began to be restive, and in 1501 he issued a bull against unlicensed printing, which introduced the principle of censorship. 1 Between 1524 and 1548 the Imperial Diet in Germany drew up various stringent regulations; and in 1535 Francis I., in France, prohibited by edict,

under penalty of death, the printing of books. This was too severe, however, and shortly afterwards the Sorbonne was given the right of deciding, a system which lasted to the Revolution.

In England the authority of parliament was invoked to aid the ecclesiastical authority. There is an ordinance as early as 1382, 5 Ric. II. st. 2, c. 5 (not assented to by the Commons, but appearing upon the parliament roll), directed against unlicensed preachers. After the invention of printing the ecclesiastical censorship was still asserted, but only as collateral with the censorial rights of the Crown, claimed by virtue of its general prerogative. After the Reformation the greater part of the rights of censorship passed to the Crown, which at the same time assumed the power of granting by letters patent the right of printing or selling books as a monopoly. The grant, if made to the author himself, was an equivalent of copyright; if made to a person other than the author, it seems to have always been subject to the author's copyright as it existed at common law.

Censorship was either restrictive or corrective, i.e. it interfered to restrict or prevent publication, or it enforced penalties after publication. Repression of free discussion was regarded as so necessary a part of government that Sir Thomas More in his Utopia makes it punishable with death for a private individual to criticize the conduct of the ruling power. Under Mary print- ing was confined to members of the Stationers' Company, founded by royal charter in 1556. Under Elizabeth the Star Chamber assumed the right to confine printing to London, Oxford and Cambridge, to limit the number of printers and presses, to prohibit all publications issued without proper licence, and to enter houses to search for unlicensed presses and publications (Order of 1585, Strype's Whit gift, app. 94). The search for unlicensed presses or publications was entrusted to an officer called the " messenger of the press." In 1637 was issued an order of the Star Chamber forbidding the importa- tion of books printed abroad to the scandal of religion or the 1 The principle of the censorship is still uncompromisingly main- tained by the Roman Catholic Church; and this, though in general binding only in foro conscientiae, has necessarily had considerable importance in states which recognize the papacy as an independent power relations with which are established by concordat. Thus in Italy, under the Sardinian constitution of 1848, Bibles, catechisms and liturgical words had to be licensed by the bishop. The principle of the censorship, consecrated anew in Pope Pius IX.'s Syllabus of 1864, was reaffirmed in the apostolic constitution Officiorum of Leo XIII. and in 1907 in the encyclical Pascendi of Pius X. This last expresses " the highest esteem for this institution of censors " and orders censors to be appointed in all episcopal curias for the revision of books intended for publication, at the same time direct- ing that their names shall not be made known to the authors of the books condemned. (See also Index Librorum Prohibitorum.)

Church or the government, and the printing of any book not first lawfully licensed. Law books were to be licensed by one of the chief justices or the chief baron, books of history and state affairs by one of the secretaries of state, of heraldry by the earl marshal, of divinity, philosophy, poetry and other subjects by the archbishop of Canterbury or the bishop of London, or the chancellors or vice-chancellors of the universities. There were to be only twenty master printers and four letter- founders. The punishment was at the discretion of the court (Rushworth, Historical Collections, vol. iii. app. 306). The same principle of press restriction was carried out by the Long Parliament after the abolition of the Star Chamber, and it was an ordinance of that body issued in 1643 that called forth Milton's Areopagitica, a Speech for the Liberty of Unlicensed Printing, itself an unlicensed book. The parliament appointed committees for printing, who appointed licensers, but the licens- ing was really left in a great measure to the wardens of the Stationers' Company. At the Restoration Sir John Birkenhead acted as licenser, appointed apparently under the general prerogative. It was, no doubt, too, under the general pre- rogative that Charles II., by a proclamation in 1660, called in and suppressed Milton's Defensio pro populo angiicano. Then followed the Licensing Act of 1662 (13 & 14 Car. II. c. 33), limited to two years. The provisions as to importation of books, the appointment of licensers, and the number of printers and founders were practically re-enactments of the similar pro- visions in the Star Chamber order of 1637. Printing presses were not to be set up without notice to the Stationers' Company. A king's messenger had power by warrant of the king or a secretary of state to enter and search for unlicensed presses and printing. Severe penalties by fine and imprisonment were denounced against offenders. The act was successively renewed up to 1679. Under the powers of the act Sir Roger L'Estrange was appointed licenser, and the effect of the supervision was that practically the newspaper press was reduced to the London Gazette. The objections made to lines 594-599 of the first book of Paradise Lost by the archbishop of Canterbury's chaplain, acting as licenser, are well known. The act expired in 1679, and for the remainder of the reign of Charles II., as in the reign of George III., the restrictions on the press took the form of prosecutions for libel. In 1685 the Licensing Act was renewed for seven years (1 Jac. II. c. 8, § 15). No mention of the liberty of the press was made in the Bill of Rights. On the expiration of the Licensing Act in 1692 it was continued till the end of the existing session of parliament (4 & 5 Will, and Mary, c. 24, § 14). In 1695 the Commons refused to renew it. The immediate effect of this was to lay authors open to the attacks of literary piracy, and in 1709 the first Copyright Act (8 Anne, c. 19) was enacted for their protection. The power of a secretary of state to issue a warrant, whether general or special, for the pu r pose of searching for and seizing the author of a libel or the libellous papers themselves — a power exercised by the Star

Chamber and confirmed by the Licensing Act — was still asserted, and was not finally declared illegal until the case of Entick v. Carrington in 1765 (St. Tr. xix. 1030). In 1776 the House of Commons came to a resolution in accordance with this decision. The compulsory stamp duty on newspapers was abandoned in 1855 (18 Vict. c. 27), the duty on paper in 1861 (24 Vict. c. 20), the optional duty on newspapers in 1870 (33 & 34 Vict. c. 38). From that time the English press may be said to date its complete freedom, which rests rather upon a constitutional than a legal foundation. It is not confirmed by any provision of the supreme legislative authority, as is the case in many countries. A declaration in favour of the liberty of the press is usually a prominent feature in the written constitutions of foreign states.

The few existing restrictions on the liberty of the press are pre- sumed to be imposed for the public benefit. They are in some cases of great historical interest. The rights of private persons are in general sufficiently protected in one direction by the law of Libel Xq.v.), in another by the law of Copyright (q.v.), while the criminal law provides for the cases of press offences against morality, public justice, &c. Thus the courts have power to punish summarily as a contempt the publication of comments upon proceedings subjudice

or reflections upon the conduct of judicial officers. (See Contempt of Court.) The last relic of the censorship before publication is to be found in the licensing of stage plays. By 6 & 7 Vict. c. 68 no new plays or additions to old plays can be acted for hire at any theatre in Great Britain until they have been submitted to the lord chamberlain, who may forbid any play or any part of a play. The penalty for acting a play before it has been allowed or after it has been disallowed is a sum not exceeding £50 for every offence and the forfeiture of the licence of the theatre in which the offence occurred. This jurisdiction is exercised by an official of the lord chamberlain's department called the " examiner of stage plays." The last relic of the monopoly of printing formerly granted to licensees of the Crown is found in the exclusive right of the king's printer and the universities of Oxford and Cambridge to print the Bible 1 and the Book of Common Prayer, and of the king's printer to print acts of parliament and other state documents. The privileges of the universities are confirmed by 13 Eliz. c. 29. The rights of the king's printer are protected by severe penalties. A maximum term of seven years' penal servitude is incurred by any person who prints any act of parliament or other government document, falsely pur- porting to be printed by the king's printer or under the authority of His

Majesty's stationery office (8 & 9 Vict. C. 113; 45 Vict. c. 9). The rights of the printers of the journals of either house of parliament are protected by 8 & 9 Vict. c. 113. The publication of parliamentary debates in any form by any other persons than the printers of the journals of the two houses is still in theory a breach of privilege, but in practice they have been fully reported since 177^ The other restrictions upon the press are to a great extent those imposed for police purposes. By 32 & 33 Vict. c. 24 (confirming in part previous enactments applying to Great Britain) the printer of any paper or book for profit'is required under penalties to print thereon his name and address or the name of a university press, and is to keep a copy of everything printed, with a few exceptions. Penalties must be sued for within three months, and no proceeding for penalties can be begun unless in the name of the attorney-general or solicitor- general of England or the lord advocate of Scotland. By the News- paper Libel and Registration Act 1881 (44 & 45 Vict. c. 60), which applies to England and Ireland, but not to Scotland, newspaper proprietors are, except in the case of joint-stock companies, to be registered and to make annual returns of the title of the newspaper and the names of all the proprietors, with their occupations, places of business and places of residence. By the Corrupt Practices Prevention Acts 1883 and 1884 (46 & 47 Vict. c. 51, § 18, and 47 & 48 Vict. c. 70, § 14), the name and address of the printer must be printed on all bills, placards, &c, referring to a parliamentary or municipal election. By 6 & 7 Vict. c. 68, § 7, the name and place of abode of a manager of a theatre are to be printed on every play-bill announcing a representation at such theatre. Offences against decency by the press are provided for by 20 & 21 Vict. c. 83 ; 25 & 26 Vict. c. 101, § 251 (for Scotland), and 2 & 3 Vict. c. 47, § 54 (for the metropolis). The importation of obscene literature into the United Kingdom is forbidden by 39 & 40 Vict. c. 36, § 42. By the Larceny Act 1 861, any person who prints or publishes an advertisement offering a reward for the return of stolen goods without questions asked is subject to a penalty (24 & 25 Vict. c. 96, §102). This penalty cannot, however, be sued for without the sanction of the attorney- general or solicitor-general of England or Ireland (33 & 34 Vict. c. 65). The advertisement in the United Kingdom of foreign or illegal lotteries is prohibited by 6 & 7 Will. IV. c. 66, betting advertisements by 16 & 17 Vict. c. 119, § 7, and 37 Vict. c. 15.

The right of an author or publisher to the full profits of his under- taking was at one time restricted by the Copyright Act of Anne (8 Anne, c. 19, § 4), by which the archbishop of Canterbury and other authorities were empowered to lower the price of a book upon com- plaint that the price was unreasonable. The only restriction of the kind now existing is the obligation of delivering (without request) to the British Museum a copy of any work published within the United Kingdom, and of delivering (on

request) copies for the use of the university libraries at Oxford and Cambridge, the library of the faculty of advocates at Edinburgh, and the library of Trinity College, Dublin (5 & 6 Vict. c. 45, §§ 6-10).

Scotland. — Printing became, as in England, a royal monopoly. The exclusive right of printing was granted by James IV. to Walter Chepman, who printed the first book in Scotland. The monopoly of printing acts of the Scottish parliament was granted by James V. to the printer chosen by the clerk register and specially licensed by the king (1540, c. 127). Printers are forbidden by 1551, c. 27, to print, whether in Latin or English, without licence from ordinaries deputed in that behalf by the Crown. No book treating of religion or of the kirk was to be printed without a licence from the general assembly (1646, c. 164), or of the kingdom without a licence from one of the judges or the secretary (c. 165). The council were empowered to prohibit presses at their discretion by the order of the 30th of March 1655. The importation of " famous " books and libels in defence of the pope was prohibited by 1581, c. 106. Press

1 The monopoly of the king's printer does not extend to any translation other than the Authorized Version, and not to that if it be accompanied by new notes or marginal readings.

offences were treated with the utmost severity. By 1585, c. 1, the author of a libellous writing against the king was punishable with death. It is scarcely necessary to say that since the union the press of Scotland has enjoyed no less liberty than that of England.

In the case of Bibles, Old and New Testaments, Psalm Books, the Book of Common Prayer, the Confession of Faith, and the Larger and Shorter Catechisms a licence for printing is still required. The licensing authority is the lord advocate, but all proposed publications are submitted for approval to the body officially known as " His Majesty's sole and only Master Printers in Scotland," consisting of the lord advocate, the solicitor-general, the moderator of the general assembly, and four other members. A licence is also required for printing acts of parliament; but a general licence granted in 1848 to a firm of printers in Edinburgh is still operative, and their publica- tions are not submitted, for approval. As its work is practically confined to Bibles and the other religious publications enumerated, the above-mentioned body commonly receives the name of the Bible Board.

Ireland. — By the Prevention of Crime Act 1882 (45 & 46 Vict, c. 25), the lord-lieutenant was empowered to order the seizure of any newspaper appearing to contain matter inciting to the commis- sion of treason or of any act of violence or intimidation (§ 13). He may also by warrant direct

the search for and seizure of any papers or documents suspected to be used or to be intended to be used for the purpose of or in connexion with any secret society existing for criminal purposes (§ 14).

The British Dominions. — In the British colonies the press is as free as it is in England. Each colony has its special legislation on the subject for police and revenue purposes. Where there is a government printer, his monopoly is protected by the Documentary Evidence Act 1868 (31 & 32 Vict. c. 37), which imposes a maximum penalty of five years' penal servitude upon any person printing a copy of any proclamation, order, or regulation which falsely purports to have been printed by the government printer, or to be printed under the authority of the legislature of any British colony or possession. The act is, however, subject to any law made by the colonial legislature.

India. — During the governor-generalship of Lord Lytton was passed the " Act for the better control of publications in Oriental languages," Act ix. of 1878. (1) By this act copies of newspapers published out of British India were liable to forfeiture and seizure by warrant throughout the whole of British India if the papers contained any words, signs or visible representations likely to excite disaffection to the government established by law in British India, or antipathy between any persons of different races, castes, religions or sects in British India. The governor-general might by notifica- tion in the Gazette of India, exclude newspapers, books, &c, from British India. (2) In places to which the act was extended by order of the governor-general in council a magistrate might require the printer and publisher of a newspaper to enter into a bond, with a deposit, not to publish a newspaper containing " any words, signs," &c. (as in I), or to use or attempt to use it for the purpose of extortion or threat. The consequences of offending were forfeiture of the deposit, papers, press, &c. Books used for the illegal purposes above mentioned were subject to forfeiture, but no bond or deposit was required previous to publication of books, 'as in the case of news- papers.

This act, which remained in force until 1910, was found, owing principally to the restriction of its operation to newspapers published in the vernacular, to be ineffective in coping with the spread of news sheets exciting disaffection amongst the natives towards the govern- ment of India. It was consequently repealed and replaced by an act of February 1910, which applies to all newspapers published after the act. The deposit requiring to be made is now obligatory on all new printing-presses, whether issuing a newspaper or not, and independently of the deposit on the newspaper. The requirement of a formal bond has been abolished. There are provisions for forfeiture of the deposit and confiscation of the press on repetition of the offence. The 1910 act gives power to the authorities to open postal packets,

other than letters, suspected of containing seditious matter, and requires the printer of a newspaper to deposit with the government two copies of each issue at the time of publication. It includes a long list of offences incitement to which is punishable under the act, and in giving power to stop a seditious newspaper after conviction, and in fixing responsibility on the actual printers of seditious matter, has considerably strengthened the power of the law.

Egypt. — The press is subject to a special law (The Press Law of 1881) and to certain articles of the penal code which define press offences and prescribe penalties (both fine and imprisonment) for them. Owing to the capitulations, which are in force in Egypt as part of the Ottoman Empire, the penal code cannot be applied to foreign subjects, and its application had not (up to 1910) been found sufficient to repress abuses. The probable result of strengthening the law would be that conductors of native papers desirous of indulging in violent language or sedition would engage a foreign subject as nominal proprietor or editor and thereby escape local jurisdiction. The Press Law of 1881 is a more powerful instrument than the penal code, inasmuch as there are decisions of the mixed

*R ˆ hi l * -ˆ at – laW r 1S ‘ ln P” ncl P’e. applicable to foreigners.*

By this law registration of newspapers is obligatory, and the govern- ment has power of control, defined in art. t 3 as follows- “In the interests of public order, of religion or of morality, eve?y newspaperˆ or periodica can be suspended or suppressed by order of the minister hv-Hˆ 110 ‘?ˆ tW ° warnin gs, or, without previous ˆning by a decision of the council of ministers. Each warning may be

fS?™r d v y iA fine K 0f fr ° m £E5 t0 ˆ E20 -” If a newspaper or periodica which has been suppressed continues to appear, the responsible parties can be fined, and the printing-press which issues the suppressed publication can be dosed by order of the iS of the interior The closure or seizure of the prihting-press wou d however, m the case of a foreigner require the co-operation of hb

This law was from about 1900 allowed to fall into disuse. Owing to the excesses of the Arabic newspapers the law was revived in thi early part of 1909, but was applied with great moderation. During the year two native papers were warned and one was suppressed The tribunals remained alone competent to inflict any penalty (apart

a fin/oP/Ffnˆ ˆ ˆˆ ° £ i he Pˆing-press) more severe than a hne of £E 2 o, and in 1909 under the penal code the editor of one

,1ˆ rt" sentenced to a y. ear ‘ s imprisonment and the editor of another to three months' imprisonment. (See Sir Eldon Gorst's

7 T EgyPt f ° r I9 ° 8 and '» specially Egypt No. 1 / 9 %,*

The United States —The first constitutions of Pennsylvania, Dela- ware, Maryland and North Carolina, enacted in 1776, are interesting as containing the earliest declarations of any legislative authority Za V ° U a of , ˆe. l>berty of the press. The same principle was after wards adopted in the constitution of the United States. The acts of Congress dealing with the press are not numerous, as each state has tor the most part its own legislation on the subject, dealing*

fh™ y W ‘, th ‘ ?T" g ° ther matterS ‘ the registration of newspaperˆ the monopoly of the state printer, and the right of giving the truth

of Aulsf.Sˆf fe KH ˆ P roceedingS f ° r libe " The act of the 18 h

01 August 1856 forbids diplomatic or consular officers of the United States to correspond with any foreign newspaper in regard to the affairs of a foreign state The act of the 3rd of March 1873 prohibits the printing and circulation of obscene literature. Legislation by Congress has provided that all printing (unless otherwise ordered by law) for the Senate and House of Representatives and the executive and judicial departments, shall be done by the govern- ment printer, J B re "

1861 t,Xf Un /Z y -~ ln th f Au f nan Em Pire, which from 1804 to 1 867 embraced Hungary also, the press laws under Metternich's regime were extremely severe. By the penal code of 1808 all printing had to be licensed, under heavy penalties, and in 1810 two censors were appointed. In short, the press had no shadow of liberty ? h "™S the reV °'VV u °Jl ! 8 48-i849 the principle of the freedom of the press was established, but the censorship was restored in 1852 and not abolished until 1863. The actual press lawsof Austria are based on the press law of the 17th of December 1862 as modified by later supplementary enactments. In principle the freedom of the press was secured by art 13 of the constitution of the 21st of December 1807. ln practice, however, it was still restricted by the obligation on newspaper proprietors to deposit " caution money " (Kautions zwang) with the authorities, and the retention of the government stamp on newspapers. The caution money was abolished by a press kw of the 9 th of July 1894, and the stamp by that of the 27th of December 1899. The police, however, still have the right either on their own initiative or under the instructions of

the public prosecutor (Staatsanwalt) ,_ " provisionally " to confiscate printed matter which in their opinion offends against the terms of the press law or is contrary to the public interest. The public prosecutor has within eight days, to justify this action in court, either by proceeding ag t'r S u j OSe res P. onsl Me for the publication, or by proving the published matter is offensive and ought to be suppressed. This latter objective procedure (objektives Verfahren) is peculiar to Austria and obviously places vast powers of control in the hands \i auth °"ties. In 1902 the government introduced a bill greatly modifying these and other provisions of the press law in a liberal sense, but the bill was postponed to more urgent matters

in Hungary the liberty of the press was secured by art 18 of the constitution of 1848, which was restored in 1867. Under this the censorship was abolished; but, in addition to provision for the cases oihbel, incitement to violence and crime, &c, the law also provided penalties for certain political press offences (§§ 6-8) ie attacks on the king or members of his family, incitements to (a) the dissolution of the territorial unity of the state or of the dynastic \ ,! \ \, Wlt u £ ustna > (*) the forcible alteration of the constitution: (c) disobedience to lawful authorities; (d) commission of crime nX °f T,? ?£ tned b y special i u Of courts. Under the Criminal Lode of 1878 (§§ 170-174) further offences were made subject to penalty, including ' direct incitement of one class of the popu- lation, one nationality or religious denomination to hatred of another, _ instigation against the constitution and parliament, and glorification of any one who has suffered punishment for such onences. Direct incitement " (§ 172), was subsequently inter- preted by the curia to mean " any spoken or written word

Sal?ty!T" e ° f Pr ° dUCing ˆ an ° ther hatred a S ainst a The result of these provisions has been that liberty of the press has existed ,n practice only for the Magyars, constant prosecutbns having been directed against the editor? and proprietorsˆof publka! tions giving voice to the grievances of the other Hungarian races conviction being all buc inevitable owing to the special juries tdue

tK« ;I? t ? n y – 1Vania ' Tu ere £? old stringent Austrian press law of „ 5 rnnfi force, the public prosecutor has discretionary powers

to confiscate obnoxious literature, powers freely used against the Rumanian press. (See R. W. Seton Watson, Facial Problems il Hungary, London, 1908, pp. 293 sqq.) rrooiems in

Belgium.— It was the prosecution of political writers by the Dutch

*?8ˆ r X n t t h P th R t , dlreCtly ' ed *-° the independence of Fˆelgiumln 8i;*

; A) aTI institution of the 7 th of February i8 3 i,art. ll£ h , Kr d u tl i at J he press is free > that censorship shall never again be established that sureties cannot be exacted from writers editors or printers, and that when the author is known and dornkfled*

art ofrTsˆff Pnnter °J book ? el X r cannot be prosecuted By art. 98 press offences are to be tried by jury. The oenal law of thi press is contained in the decree of thi 2Mh of July i 8 ,7 made perpetual in 1833. By this law it is made an offence, apartTrora the penal code, (1) to incite to the commission of a crime bv placard

forced e it W , ntmgS ln a – PU ˆ lic m J e ? tin ˆ < a > t0 attackThe obhgatory lorce of the kws, or to incite to disobedience of them- (x) to attack the constitutional authority or inviolability of the king the conˆ stitutional authority of the dynasty, or the authority S a nd rights

gpi&

seveZT'nVˆf?ˆ – Were at , °, ne tIme Punished with great fSv andVard UU ° f V* 1 “, 8 ˆ” V -, (? r 68 3) libel was punished with intamy and hard labour for life, and, if against a magistrate, with*

frt 86 of fhf rShlP 7f S abolis hed and the press deckred free by art. 8b of the constitution granted' by Frederick VII. on the Sth of /nrMH ?(? and u c , onnrmed b y Christian IX. in 866. Art 81 uˆ d s\trTu r dlcL , r =2 PHnted ˆˆ ” a M °

able with death to print without authority. The university of Paris pngmal y cla.med the right of licensingnew theoSwoks a jurisdiction vested in the Crown by an ordinance of 1566 ShoAie| ga, T?„r I, S 0n W ?- re severe ly punished by the secukr the stake in Tfirn f . P arham ent of Toulouse sent Vanini to the stake in 1619 for the crime of publishing a heretical work A few years later, in 1626, Cardinal Richllieu declared T a iT?J 2 fZ» t0 ,P ublish a work against religion or tne sate booksdltrs P to dˆl a – re P latIon forbidding Iny but licensed Dooksellers to deal in books. Many ater regulations were

thSr ff Jf fnSt un ' icens ed Presses, the employment of more than a certain number of workmen, &c. At the Revolution all

oTetnfri.hrnfˆ 6 a ˆ- lished ' and the Assemblyfeiared ” to be the right of every citizen to print and publish his opinions

*JarirariTˆTutˆ 10 ˆ Tˆ * Check ' wWch was 'ttoffi ItX J2 9 t fe l no effec tual restraint was imposed until the law lˆ.S* of February 1810 established a direction of the prST The charter of Louis XVIII. in 1814 gave liberty to*

the press in express terms, but restrictions soon followed. In 1819 aˆvstem of sureties (cauttonnements) replaced the censorship. The RevoU?

cZd (\X Zt T8 U ,ˆ d f by ‘ inteT ˆ °? e ° f the ordinances of° St Lioud (July 25, 1830) for suspension of the liberty of the press

?8<2 on?"? °K tHe Ube , rt J Were reraoved for th e time in 1830 aS 8S2′ Dur n, t e h rˆ eed ˆ aS " SUal by the preSS laws of 1835 and wrp'nˆH g Se f C °, nd ˆ mplre government prosecutions for libel were used as a powerful engine against the press. The proceedings if a 8 n fnd T °«ˆ lembert in l858 a te a well-known instance 9 Between Wilh the repubh ? c a hLrt WSP fT rS W6re su PP res sed by proclamarion A dˆ o?th? lˆhˆ I th6 o PreSS w as.completely re-established, bv iurv 1 Th! I 7 °f Oftober 1870 submitted press offences to trial by jury.* The law of the 29th of July 1881, by which the French press is now regulated, begins by asserting the liberty of theˆil and of bookselling. The principal limitations of this libertv are PubHc ˆ 1 ˆ 11 f° P ubI Jsh. criminal proceedings before hearing n public, or lists of subscriptions for indemnifying an accused oerton and the power of forbidding the entrance of foreign “S S certain circumstances. The order of responsibly fo? orinted matter ,s (1) the manager or editor, (2) theauthor,T 3) the S er*

can on 6 l T der ° r d ‘st nbut0r – The P rinter a “d the vender however can only be punished for acts not falling within their proper functions

rnon t h dmg A f ? r breaches of the law must be taken within three

Xolished fhVZˆˆr,’ the deCree ° f the 5 th of September 1870 abolished the stamp duty upon newspapers, but it is still imposed

, ‘ , Se , e , P a ll oz . Jurisprudence generate, s v alphabeliques (1845-1877), s.v. ” Presse.”

‘ Presse ” ; ibid. Titles

PRESS LAWS

upon public notices (affiches) other than those of public authorities. None but the notices of public authorities may be printed on white paper.

Germany. — Censorship was introduced by the diet of Spires in 1529. From that time till 1848 there were numerous restrictions on the liberty of the press. One of the most important was a resolution of the diet of the German confederation, passed on the 20th of September 1819 as a sequel to the Carlsbad decrees (o.n.), by which newspapers were subject to licence and police supervision in each state. Liberty dates, as in Austria and Italy,

from 1848. Soon after that year, however, it became necessary to establish press laws in most of the German states, as in Bavaria in 1850, Prussia and Baden in 1 85 1 . Since the establishment of the new empire censorship has disappeared. By art. 74 of the constitution of the empire (1871) every one attacking the empire or its officers through the press is liable to punishment in his own state. By art. 4 the laws relating to the press are under imperial and not local control. The press law of the 7th of May 1874 is therefore in force throughout the whole empire. At its beginning it affirms the liberty of the press. Its main provisions are these: The name and address of the printer must appear on all printed matter. Newspapers and periodicals must in addition bear the name of some one person, domiciled in the empire, as responsible editor, and a copy of every number must be deposited with the police authorities of the district in which it is published. _ Foreign periodicals may be excluded by proclamation of the Imperial chancellor for two years, if twice within the year they have been guilty of certain offences against the penal code. Criminal proceedings are not to be reported while still sub judice. The order of responsibility for offences is the same as in France. Proceedings must be taken within six months. In certain cases printed matter may be seized without the order of a court. This may take place where (1) the publication does not bear the name of printer or editor, (2) military secrets are revealed in time of war, (3) justice would be defeated by the publication not being immedi- ately seized. A judicial tribunal is to decide at once upon the legality of the seizure. The press law is not to affect regulations made in time of war or internal disturbance. A temporary law passed in 1878 gave the police large powers in the case of socialistic publica- tions. Only offences involving heavy penalties are tried by jury. The proposal of the Reichstag that all press offences should be so tried was rejected by the governments, except as regards those states (Bavaria, Wurttemberg, Baden, Oldenburg) where this principle was already in force.

Greece. — Under King Otto censorship was exercised up to 1844. By the constitution of the 18th of March 1844 every one may publish his thoughts by means of the press, observing the laws of the state. The press is free, and censorship (\oy okpkt la) is not permitted. Responsible editors, publishers and printers of news- papers are not required to deposit money on the ground of surety. Publishers of newspapers must be Greek citizens (art. 10). The legislature may exclude reporters from its sittings in certain cases (art. 48). Press offences are to be tried by jury, except when they deal only with private life (art. 93).

Holland. — The press has been free since the existence of the present kingdom of the Netherlands, which dates from 1815. Liberty of the press is expressly secured by art. 8 of the constitu- tion of 1848. By art. 286 of the penal code seditious books and newspapers may be seized. By art. 283 of

the same code and by a royal decree of the 25th of January 1814 the name of the printer must appear upon newspapers. Press offences are not tried by jury.

Italy.— By art. 27 of the political code of Sardinia, granted by Charles Albert on the 4th of March 1848, and still in force, the press is free, but abuses of the liberty are restrained by law. The present press law of Italy is contained in the law of the 26th of March 1848, as altered by later enactments. Everything printed m typographical characters, or by lithography or any similar means, must indicate the place and the date of printing and the name of the printer. A copy of everything printed must be deposited with certain officials and at certain libraries. Before the publication of any newspaper or periodical, notice of the intended publication must be given at the office of the secretary of state for internal affairs. The notice must contain (1) a declaration of the legal qualification of the person intending to publish, whether as pro- prietor or editor, (2) the nature of the publication, and (3) the name and residence of the responsible editor. Every newspaper is bound to insert gratuitously a contradiction or explanation of any charge made against a person in its columns. For contravention of these and other regulations there is a statutory penalty not exceeding iooo lire (£40). The publication of a newspaper may be suspended until the payment of a fine. The publication of parliamentary debates is permitted. Press offences are tried by a jury of twelve. By a law of the nth of May 1877 it is forbidden to publish any indication of the way in which individual judges or jurors voted in their deliberations.

Norway. — The liberty of the press is secured by art. 100 of the constitution of 1814. No one can be punished for any writing unless he, or some one by his instigation, offend against the state, law, religion or decency, or make infamous accusations against any one. Criticism of the government is expressly permitted.

Ottoman Empire.— By art. 12 of the constitution of the 23rd of December 1876 the press was recognized as free, subject to the limits imposed by law. The constitution was, however, " sus pended," and a rigorous censorship was enforced, under the direction of Sultan Abd-ul-Hamid II., until the revolution of 1908.

Portugal. — It is stated by Braga and others that a free press existed up to the establishment of the Inquisition, and that Gil Vicente (d. 1536) was the last writer who dared to express his thoughts freely. At a later period Bocage was imprisoned for writings displeasing to the authorities. Boards of

censorship under the names of the " Real mesa censoria," or the " Mesa do desembargo do paco," assumed to license publications. Liberty of the press was, however, finally secured, and censorship limited, by art. 7 of the constitution granted by John VI. in 182 1. By art. 8 a special tribunal was constituted in both Portugal and Brazil to protect the liberty of printing. The censorship was con- fined to that exercised by the bishops over theological or dogmatic works. _ The debates in the legislature and proceedings in the courts of justice are not generally reported.

Rumania. — By the constitution of the 30th of June 1866, art. 5, Rumanians enjoy liberty of the press. By art. 24 the constitution guarantees to all the liberty of communicating and publishing ideas through the press, every one being liable for abuse in cases deter- mined by the penal code. Press offences are to be tried by jury. Censorship is abolished, and is never to be re-established. No previous authorization is necessary for the publication of newspapers. No sureties are to be demanded from journalists, writers, editors or printers. The press is not to be subjected to regulation of ad- vertisements. No newspaper or publication is to be suspended or suppressed. Every author is responsible for his writings; in default of the author, the manager or editor is responsible. Every news- paper must have a responsible manager in the possession of civil and political rights.

Russia. — The position of the Russian press generally was, previously to the revolution of 1905, regulated by a law of the 6th of April 1865. The effect of that law was to exempt from preventive censorship (if published in St Petersburg or Moscow) all newspapers, periodicals and original works and translations not exceeding a certain number of pages, and (wherever published) all government publications, matter printed by academies, universities and scientific bodies, and maps, plans, and charts. Everything printed and published that did not fall within, any of these categories had, before issue to the public, to be submitted for the approval of government censors stationed in different parts of the empire. The minister of the interior had power to dispense with the preventive censorship in the case of provincial newspapers and periodicals. In St Peters- burg and Moscow the periodical press was subject to corrective censorshipfor infringement of the numerous restrictive regulations contained in the code, and supplemented at times by secret instruc- tions from the minister of the interior to editors and publishers. Apart from the code, the sustained display of a spirit hostile to the government rendered the publisher of a periodical liable to punish- ment. The penalties established by the law of 1865 for offences against the press regulations consisted in the infliction of a series of warnings published in the Official Gazette. A first warning merely enjoined more care for the future; a second was followed by suspension for a certain period, sometimes by a prohibition to insert advertisements; a third by suppression,

and perhaps prosecution of the offending conductor. By Imperial ukaz of the 2nd of June 1872 the jurisdiction of the judicial tribunals over press offences was practically transferred to the minister of the interior, except in the case of violation of private rights, as by libel. The law of 1865 was modified in 1874 by a regulation to the effect that all publications appearing at longer intervals than one week should be submitted to the central board of censors. This applied to all periodicals that had been formerly published without preventive censorship. By a ukaz issued in 188 1 a committee of four members was entrusted with the decision of all matters relating to the press submitted to it by the minister of the interior. The strictest supervision was exercised oyer the foreign press, periodical and otherwise. None but a few privileged individuals, such as members of the royal family, foreign diplomatists, and editors of newspapers in the capital, might receive foreign publications free of censorship. The censorship consisted in blackening out, and sometimes in the excision, of whole columns and sheets of publications that might be deemed pernicious. Only such periodicals as were placed on a list approved by the board of censors were allowed to be received through the post office by non-privileged persons. Telegraphic messages to newspapers were subject to strict censorship. The Russian telegraphic press agency is under official management.

Full liberty of the press was guaranteed by the Imperial ukaz of the 17th of October 1905, and though no special legislation followed the censorship was for a time de facto abolished. With the progress of the reaction, however, the old conditions were to a certain extent re-established. In St Petersburg, for instance, the newspapers were in 1909 again under the absolute jurisdiction of chief of police and were forbidden to publish any reference to members of the Imperial family or to the affairs of Poland (except official notices). In 1908 as many as 73 newspapers and periodicals were suppressed, of which 28 were in St Petersburg alone.

Spain. — There was probably no country where restrictions on the liberty of the press were at one time more stringent than in Spain. From the first use of printing up to 1521 censorship was exercised by the Crown: after that date the Inquisition began to assume the right, and continued to do so up to its suppression in 1808. In 1558 Philip II. denounced the penalty of death against even the possessor of a book upon the Index expurgatorius of the Inquisition. Some of the greatest names in Spanish literature- were sufferers : Castillejo, Mendoza, Mariana and Quevedo incurred the displeasure of the Inquisition; Luis Ponce de Leon was imprisoned for his

translation of the Song of Solomon. The last Index appeared in 1790. l In 1812 the constitution promulgated by the regency in the name of Ferdinand VII. provided by art. 371 that all Spaniards should have liberty to write, print and publish their political ideas without any necessity for licence, examination or approbation pre- vious to publication, subject to the restrictions imposed by law. Art. 13 of the constitution of the 30th of June 1876, promul- gated on the accession of Alphonso XII. , practically re-enacts this provision.

Sweden. — The press law of the 16th of July 1812 is one of the fundamental laws of Sweden. It is an expansion of art. 86 of the constitution of the 6th of June 1809. Liberty of the press is declared to be the privilege of every Swede, subject to prosecution for libellous writing. Privileges of individuals as to publication are abolished. The title and place of publication of every newspaper or periodical must be registered, and every publication must bear the name of the printer and the place of printing. Press offences are tried by a jury of nine, chosen respectively by the prosecutor, the prisoner, and the court. The verdict of two-thirds of the jury is final.

Switzerland. — Liberty of the press is secured by art. 45 of the constitution of 1 848, re-enacted by art. 55 of the constitution of the 29th of May 1874. Each canton has its own laws for the repres- sion of abuse of the liberty, subject to the approbation of the federal council. The confederation can impose penalties on libels directed against itself or its officers.

PRESTEIGN, a market town, urban district, and assize and county town of Radnorshire, Wales, situated on the Lug amidst beautiful scenery. Pop. (1901), 1245. Presteign is the terminus of a branch of the Great Western railway running north from Titley Junction in Herefordshire. The old-fashioned town contains the fine parish church of St Andrew, dating chiefly from the 15th century, and an interesting old inn, the " Radnor- shire Arms," once the residence of the Bradshaw family in the 17th century. To the west rises the Wardon, a wooded hill laid out as a public park. Presteign is the most easterly spot on the Welsh border, a circumstance that is noted in the Cymric expression to mark the extreme breadth of the Principality — o Tyddewi i Llanandras (" from St Davids to Presteign ").

Although the Welsh name of Llanandras is said to denote a foundation by St Andras ap Rhun ap Brychan in the 5th century, the place seems to have been an obscure hamlet in the lordship of Moelynaidd until the 14th century, when Bishop David Martyn of St Davids (1200-1328) conferred valuable market privileges upon this his native place, which on doubtful authority is said to derive its English name from this priest. In 1542 Presteign was named as the meeting place of the county sessions for

Radnorshire in conjunction with New Radnor, and it has ever since ranked as the county town. Although an ancient borough by prescription, Presteign was not included in the Radnor parliamentary district until the 19th century, and of this privilege it was deprived by the Redistribution Act of 1S85.

PRESTER JOHN, a fabulous medieval Christian monarch of Asia. The history of Prester John no doubt originally gathered round some nucleus of fact, though what that was is extremely difficult to determine. But the name and the figure which it suggested occupied so prominent a place in the mind of Europe for two or three centuries that a real history could hardly have a stronger claim to exposition. Before Prester John appears upon the scene we find the way prepared for his appearance by a kindred fable, which entwined itself with the legends about him. This is the story of the appearance at Rome (11 22), in the pontificate of Calixtus II., of a certain Oriental ecclesiastic, whom one account styles " John, the patriarch of the Indians," and another " an archbishop of India." This ecclesiastic related wonderful stories of the shrine of St Thomas in India, and of the miracles wrought there by the body of the apostle, including

1 See Ticknor, Hist, of Span. Lit. i. 422 seq., iii. 366

the distribution of the sacramental wafer by his hand. We cannot regard the appearance at Rome of the personage who related, these marvels in presence of the pope as a mere popular fiction : it rests on two authorities apparently independent (one of them a letter from Odo of Reims, abbot of St Remy from 1 1 18 to 11 51), for their discrepancies show that one was not copied from the other, though in the principal facts they agree. Nearly a quarter of a century later Prester John appears upon the scene, in the character of a Christian conqueror and potentate who combined the characters of priest and king, and ruled over vast dominions in the Far East. This idea was uni- versal in Europe from about the middle of the 12th century to the end of the 13th or beginning of the 14th. The Asiatic story then died away, but the name remained, and the royal presbyter was now assigned a locus in Ethiopia. Indeed, it is not improbable that from a very early date the title was assigned to the Abyssinian king, though for a time this identifi- cation was overshadowed by the prevalence of the Asiatic legend. At the bottom of the double allocation there was, no doubt, that confusion of Ethiopia with India which is as old as Virgil and perhaps older.

The first mention of Prester John occurs in the chronicle of Otto, bishop of Freisingen. This writer states that when at the papal court in 1145 he met with the bishop of Gabala (Jibal in Syria), who related how "not many years before one John, king and priest (rex et sacerdos), who dwelt in the

extreme Orient beyond Persia and Armenia, and was, with his people, a Christian but a Nestorian, had made war against the brother kings of the Persians and Medes, who were called Samiards (or Sanjards), and captured Ecbatana their capital. After this victory Presbyter John — for so he was wont to be styled — advanced to fight for the Church at Jerusalem; but when he arrived at the Tigris and found no means of transport for his army, he turned northward, as he had heard that the river in that quarter was frozen over in winter-time. After halting on its banks for some years in expectation of a frost he was obliged to return home. This personage was said to be of the ancient race of the Magi mentioned in the Gospel, to rule the same nations that they ruled, and to have such wealth that he used a sceptre of solid emerald. Whatever impression was made by this report, or by other rumours of the event on which it was founded, was far exceeded, about 1165, by the circulation of a letter purporting to be addressed by Prester John to the emperor Manuel. This letter, professing to come from " Presbyter Joannes, by the power and virtue of God and of the Lord Jesus Christ, Lord of Lords," claimed that he was the greatest monarch under heaven, as well as a devout Christian. The letter dealt at length with the wonders of his empire. It was his desire to visit the Holy Sepulchre with a great host, and to subdue the enemies of the Cross. Seventy-two kings, reigning over as many kingdoms, were his tributaries. His em- pire extended over the three Indies, including that Farther India, where lay the body of St Thomas, to the sun-rising, and back again down the slope to the ruins of Babylon and the tower of Babel. All the wild beasts and monstrous creatures commemo- rated in current legend were to be found in his dominions, as well as all the wild and eccentric races of men of whom strange stories were told, including those unclean nations whom Alex- ander Magnus walled up among the mountains of the north, and who were to come forth at the latter day — and so were the Amazons and the Bragmans. His dominions contained the monstrous ants that dug gold and the fish that gave the purple; they produced all manner of precious stones and all the famous aromatics. Within them was found the Fountain of Youth ; the pebbles which give light, restore sight, and render the possessor invisible; the Sea of Sand was there, stored with fish of wondrous savour; and the River of Stones was there also; besides a subterranean stream whose sands were of gems. His territory produced the worm called " salamander," which lived in fire, and which wrought itself an incombustible envelope from which were manufactured robes for the presbyter, which were washed in flaming fire. When the king went forth to war thirteen

great crosses made of gold and jewels were carried in wagons before him as

his standards, and each was followed by 10,000 knights and 100,000 footmen. There were no poor in his dominions, no thief or robber, no flatterer or miser, no dissen- sions, no lies, and no vices. His palace was built after the plan of that which St Thomas erected for the Indian king Gondo- pharus. Of the splendour of this details are given. Before it was a marvellous mirror erected on a many-storeyed pedestal (described in detail); in this speculum he could discern every- thing that went on throughout his dominions, and detect conspiracies. He was waited on by 7 kings at a time, by 60 dukes and 365 counts; 12 archbishops sat on his right hand, and 20 bishops on his left, besides the patriarch of St Thomas's, theprotopope of the Sarmagantians (Samarkand?), and the archprotopope of Susa, where the royal residence was. There was another palace of still more wonderful character, built by the presbyter's father in obedience to a heavenly command, in the city of Bribric. Should it be asked why, with all this power and splendour, he calls himself merely " presbyter," this is because of his humility, and because it was not fitting for one whose sewer was a primate and king, whose butler an archbishop and king, whose chamberlain a bishop and king, whose master of the horse an archimandrite and king, whose chief cook an abbot and king, to be called by such titles as these.

How great was the popularity and diffusion of this letter may be judged in some degree from the fact that Zarncke in his treatise on Prester John gives a list of close on 100 MSS. of it. Of these there are 8 in the British Museum, 10 at Vienna, 13 in the great Paris library, 15 at Munich. There are also several renderings in old German verse. Many circumstances of the time tended to render such a letter accept- able. Christendom would welcome gladly the intelligence of a counterpoise arising so unexpectedly to the Mahommedan power; while the statements of the letter itself combined a reference to and corroboration of all the romantic figments con- cerning Asia which already fed the curiosity of Europe, which figured in the world-maps, and filled that fabulous history of Alexander which for nearly a thousand years supplanted the real history of the Macedonian throughout Europe and western Asia. The only other surviving document of the 12th century bearing on this subject is a letter of which MS. copies are preserved in the Cambridge and Paris libraries, and which is also embedded in the chronicles of several English annalists, including Benedict of Peter-borough, Roger Hovedon and Matthew Paris. It purports to have been indited from the Rialto at Venice by Pope Alexander III. on the 5th day before the calends of October (Sept. 27), data which fix the year as n 77. The pope addresses it, carissimo in Christo ftlio Johanni, illustro et magniftco indorum regi [Hovedon's copy here inserts sacerdoti sanctissimo]. He recites how he had heard of the monarch's Christian profession, diligence in good works and piety, by manifold narrators and

common report, but also more particularly from his (the pope's) physician and confidant {medicus et familiaris noster), Master Philip, who had received information from honourable persons of the monarch's kingdom, with whom he had intercourse in those (Eastern) parts. Philip had also reported the king's anxiety for instruction in Catholic discipline and for reconciliation with the apostolic see in regard to all discrepancies, and his desire to have a church in Rome and an altar at Jerusalem. The pope goes on to say that he found it too difficult, on account of the length and obstructions of the way, to send any one (of ecclesiastical position?) a latere, but he would despatch Philip to communicate instruction to him. And on accepting Philip's communications the king should send back honourable persons bearing letters sealed with his seal, in which his wishes should be fully set forth. " The more nobly and magnanimously thou conductest thyself, and the less thou vauntest of thy wealth and power, the more readily shall we regard thy wishes both as to the concession of a church in the city and of altars in the church of SS. Peter and Paul, and in the church of the Lord's Sepulchre at Jerusalem, and as to other reasonable requests."

There is no express mention of the title " Prester John " in what seem the more genuine copies of this letter. But the address and the expression in the italicized passage just quoted (which evidently alludes to the vaunting epistle of 1165) hardly leave room for doubt that the pope supposed himself to be addressing the author of that letter. We do not know how far the imaginations about Prester John retained their vitality in 122 1, forty-four years after the letter of Pope Alexander, for we know of no mention of Prester John in the interval. But in that year again a rumour came out of the East that a great Christian conqueror was taking the hated Moslems in

reverse and sweeping away their power. Prophecies current among the Christians in Syria of the destruction of Mahomet's sect after six centuries of duration added to the excitement attending these rumours. The name . ascribed to the conqueror was David, and some called him the son or the grandson of Prester John of India. He whose conquests and slaughters now revived the legend was in fact no Christian or King David but the famous Jenghiz Khan. The delusion was dissipated slowly, and even after the great Tatar invasion and devastation of eastern Europe its effects still influenced the mind of Christendom and caused popes and kings to send missions to the Tatar hordes with a lingering feeling that their khans, if not already Christians, were at least always on the verge of conversion.

Before proceeding further we must go back to the bishop of Cabala's story. M. d'Avezac first showed to whom the story must apply. The only conqueror whose career suits in time and approximates in circumstances is the founder of Kara-Khitai, which existed as a great empire in Central Asia

during the latter two-thirds of the 13th century. This personage was a prince of the Khitai or Khitaian dynasty of Liao, which had reigned over northern China and the regions beyond the Wall during a great part of the 10th and nth centuries, and from which came the name Khitai (Cathay), by which China was once known in Europe and still is known in Russia. On the overthrow of the dynasty about 1 125 this prince, who is called by the Chinese Yeliu Tashi, and had gone through a complete Chinese education, escaped westward with a body of followers. Being well received by the Uighurs and other tribes west of the desert, subjects of his family, he gathered an army and commenced a course of conquest which eventually extended over eastern and western Turkestan. He took the title of Gur Khan or Kor Khan, said to mean " universal " or " supreme " khan, and fixed at Balasaghun, north of the T'ian Shan range, the capital of his empire, which became known as that of Kara-Khitai (Black Cathay). In 1141 the assistance of this Khitaian prince was invoked by the shah of Kharezm against Sanjar, the Seljuk sovereign of Persia, who had expelled the shah from his kingdom and killed his son. The Gur Khan came with a vast army of Turks, Khitaians, and others, and defeated Sanjar near Samarkand (Sept. 1 141) in a battle which the historian Ibn al-Athir calls the greatest defeat that Islam had ever undergone in those regions. Though the Gur Khan himself is not described as having extended his con- quests into Persia, the shah of Kharezm followed up the victory by invading Khorasan and plundering the cities and treasuries of Sanjar. In this event — the defeat of Sanjar, whose brother's son, Mas'ud, reigned over western Persia — occurring four years before the story of the Eastern conqueror was told at Rome to Bishop Otto, we seem to have the destruction of the Samiardi fratres or Sanjar brothers, which was the germ of the story of Prester John.

There is no evidence of any profession of Christianity on the part of the Gur Khan, though the daughter of the last of his race is recorded to have been a Christian. The hosts of the Gur Khan are called by Moslem historians Al-Tiirk-al-Kuj/far, the kafir or infidel Turks; and in later days the use of this term " kafir " led to mis- apprehensions, as when Vasco da Gama's people were led to take for Christians the Banyan traders on the African coast, and to describe as Christian sovereigns so many princes of the Farther East of whom they heard at Calicut. How the name John arose is one of the obscure points. Oppert supposes the title " Gur Khan " to have been confounded with Yukhanan or Johannes; and it is probable that even in the Levant the stories of " John the patriarch of the Indies," repeated in the early part of this article, may have already mingled with the rumours from the East.

The failure in the history of the Gur Khan to meet all points in the story of the bishop of Gabala led Professor Bruun of Odessa to bring forward

another candidate for identity with the original Prester John, in the person of the Georgian prince John Orbelian, the " sbasalar," or generalissimo under several kings of Georgia in that age. He shows instances, in documents of the 15th century, of the association of Prester John with the Caucasus. In one at least of these the title is applied to the king of Abassia, i.e. of the Abhasians of Caucasus. Some confusion between Abash (Abyssinia) and Abhas seems to be possibly at the bottom of the imbroglio. An abstract of Professor Bruun's argument will be found in the 2nd edition of Sir H. Yule's Marco Polo, ii. 539-542. As regards any real foundation for the title of " Presbyter " we may observe that nothing worth mentioning has been alleged on behalf of any candidate.

When the Mongol conquests threw Asia open to Frank travellers in the middle of the 13th century their minds were full of Prester John; they sought in vain for an adequate representative, nor was it in the nature of things that they should not find some repre- sentative. In fact they found several. Apparently no real tradition existed among the Eastern Christians of such a personage; the myth had taken shape from the clouds of rumour as they rolled westward from Asia. But the persistent demand produced a supply; and the honour of identification with Prester John, after hovering over one head and another, settled for a long time upon that of the king of the Nestorian tribe of Kerait, famous in the histories of Jenghiz under the name of Ung or Awang Khan.

In Carpini's (1248) single mention of Prester John as the king

of the Christians of India the Greater, who defeats the Tatars by an elaborate stratagem, Oppert recognizes Jalaluddin of Kharezm and his brief success over the Mongols in Afghanistan. In the Armenian prince Sempad's account (1248), on the other hand, this Christian king of India is aided by the Tatars to defeat and harass the Saracens, and becomes the vassal of the Mongols. In the nar- rative of William Rubruquis (1253), though distinct reference is made to the conquering Gur Khan under the name of Coir Cham of Caracatay, the title of " King John " is assigned to Kushluk, king of the Naimans, who had married the daughter of the last lineal representative of the gur khans. 1 And from the remarks which Rubruquis makes in connexion with this King John, on the habit of the Nestorians to spin wonderful- stories out of nothing, and of the great tales that went forth about King John, it is evident that the intelligent traveller supposed this king of the Naimans to be the original of the widely spread legend. He mentions, however, a brother of this John called Unc who ruled over the

Crit and Merkit (or Kerait and Mekrit, two of the great tribes of Mongolia), whose history he associates with that of Jenghiz Khan. Unc Khan reappears in Marco Polo, who tells much about him as " a great prince, thesame that we call Prester John, him in fact about whose great dominion all the world talks." This Unc was in fact the prince of the Kerait, called by the Chinese Tuli, and by the Persian historians of the Mongols Toghral, on whom the Kin emperor of north China had conferred the title of " wang " or king, whence his coming to be known as Awang or Ung Khan. He was long the ally of Jenghiz, but a breach occurred between them, and they were mortal enemies till the death of Ung Khan in 1203. In the narrative of Marco Polo " Unc Can," alias Prester John, is the liege lord of the Tatars, to whom they paid tribute until Jenghiz arose. And this is substantially the story repeated by other European writers of the end of the 13th century, such as Ricold of Monte- croce and the sieur de Joinville, as well as by one Asiatic, the famous Christian writer, Gregory Abulfaraj. We can find no Oriental corroboration of the claims of Ung Khan to supremacy over the Mongols. But that his power and dignity were consider- able appears from the term " Padshah," which is applied to him by the historian Rashiduddin.

We find Prester John in one more phase before he vanishes from Asiatic history, real or mythical. Marco Polo in the latter part of the 13th century, and Friar John of Montecorvino, afterwards archbishop of Cambaluc, in the beginning of the 14th,. speak of the descendants of Prester John as holding territory under the great khan in a locality which can be identified with the plain of Kuku- Khotan, north of the great bend of the Yellow river and about 280 m. north-west of Peking. The prince reigning in the time of these two writers was named King George, and was the " 6th in descent from Prester John," i.e. no doubt from Awang Khan. Friar Odoric, about 1326, visited the country still ruled by the prince whom he calls Prester John; " but," he says, " as regards him, not one-hundredth part is true that is told of him." With this mention Prester John ceases to have any pretension to histori- cal existencein Asia (for we need not turn aside to Mandeville's fabulous revival of old stories or to the barefaced fictions of his contemporary, John of Hese, which bring in the old tales of the miraculous body of St Thomas), and his connexion with that quarter of the world gradually died out of the memory of Europe. 2

When next we begin to hear his name it is as an African, not as an Asiatic prince; and the personage so styled is in fact the Christian king of Abyssinia. Ludolf has asserted that this applica- tion was an invention of the Portuguese and arose only in the 15th century. But this is a mistake; for in fact the application had begun much earlier, and probably long before the name had ceased to be attached by writers on Asia to the descendants of the king of the Kerait. It is true that the Florentine Simone

Sigoli, who visited Cairo in 1384, in his Viaggio al Monte Sinai still speaks of " Presto Giovanni " as a monarch dwelling in India; but it is the India which is conterminous with the dominions of the soldan of Egypt, and whose lord is master of the Nile, to close or open its discharge upon Egypt. Thirty years earlier (c. 1352) the Franciscan Giovanni de' Marignolli, apostolic legate in Asia, speaks in his Chronica of Ethiopia where the Negroes are, and which is called the land of Prester John. 3 Going back still further, Friar Jordanus

1 It has been pointed out by Alexander Wylie that Kushluk was son of a powerful king of the Naimans, whose name Ta- Yang-Khan is precisely " Great King John " as nearly as that could be expressed in Chinese.

2 The stories of Khitai as a Christian empire, which led the Jesuits at the court of Akbar to despatch Benedict Goes in search of it (1601), did, however, suggest to Jerome Xavier, their chief, that the country in question " was the Cathay of Marco Polo, and its Christian king the representative of the famous Prester John " — a jumble of inaccuracy.

3 In a Spanish work of about the same date, by an anonymous Franciscan, we are told that the emperor called " Abdeselib, which means ' servant of the Cross,' is a prote tor of Preste Juan, who is the patriarch of Nubia and Ethiopia, and is lord of many great lands, and many cities of Christians, though they be black as

" Catalani," who returned from the East before 1328, speaks at the emperor of the Ethiopians " quem vos vocatis Prestre Johan."

But, indeed, we shall have strong probability on our side if we go back much further still, and say that, however vague may have been the ideas of Pope Alexander III. respecting the geographical position of the potentate whom he addressed from Venice in 1 177, the only real person to whom the letter can have been sent was the king of Abyssinia. Let it be observed that the " honourable per- sons of the monarch's kingdom " whom the leech Philip had met with in the East must have been the representatives of some real power, and not of a phantom. It must have been a real king who professed to desire reconciliation with the Catholic Church and the assignation of a church at Rome and of an altar at Jerusalem. Moreover, we know that the Ethiopic Church did long possess a chapel and altar in the Church of the Holy Sepulchre, and, though we have been unable to find travellers' testimony to this older than about 1497, it is quite possible that the appropriation may have originated much earlier. 4 We know from Marco Polo that about a century after the date of Pope Alexander's epistle a mission was sent by the king of Abyssinia to Jerusalem to make offerings on his part at the Church of the Sepulchre. It must be remembered that at

the time of the pope's letter Jerusalem, which had been taken from the Moslem in 1099, was still in Christian possession. Abys- sinia had been going through a long period of vicissitude and dis- traction. In the 10th century the royal line had been superseded by a dynasty of Falasha Jews, followed by other Christian families; but weakness and disorder continued till the restoration of the " House of Solomon " (c. 1268). Nothing is more likely than that the princes of the " Christian families " who had got possession of the throne of northern Abyssinia should have wished to strengthen themselves by a connexion with European Christendom, and to establish relations with Jerusalem, then in Christian hands. We do not know whether the leech Philip ever reached his destination, or whether a reply ever came back to the Lateran. 6

Barqnius, who takes the view for which we have been arguing, sup- poses it possible that the church in Rome possessed in his own time by the Abyssinians (St Stephen's in the Vatican) might have been granted on this occasion. But we may be sure that this was a modern concession during the attempts to master the Ethiopian Church early in the 1 6th century. Ludolf intimates that its occu- pancy had been taken from them in his own time after it had been held " for more than a century."

In the legendary history of the Translation of the three Blessed Kings by John of Hildesheim (c. 1370), of which an account and extracts are given by Zarncke (Abhandl. ii. 154 seq.), we have an evident jumble in the writer's mind between the Asiatic and the African location of Prester John; among other matters it is stated that Prester John and the Nubians dug a chapel out of the rock under Calvary in honour of the three kings: " et vocatur ilia capella in partibus illis capella Nubiyanorum ad reges in praesentem diem, sed Sarracini . . . ob invidiam obstruxerunt " (p. 158).

From the 14th century onwards Prester John had found his seat in Abyssinia. It is there that Fra Mauro's great map (1459) presents a fine city with the'rubric, " Qui il Preste Janni fa residentia principal." When, nearer the end of the century (1481-1495), King

pitch, and brand themselves with the sign of the cross in token of their baptism " (Libro del conocimiento de todos reynos, &c, printed at Madrid, 1877).

4 Indeed, we can carry the date back half a century further by the evidence of a letter translated in Ludolf {Comment, p. 303). This is addressed from Shoa by the king Zara Jacob in the eighth year of his reign (1442) to the Abyssinian monks, dwellers at Jerusalem. The king desires them to light certain lamps in the Church of the Sepulchre, including " three in our chapel." In the Pilgerfahrt des Ritters Arnold von Harff (1496-1499:

Cologne, i860, p. 1 75), we find it stated that the Abyssinians had their chapel, &c, to the left of the Holy Sepulchre, between two pillars of the Temple, whilst the Armenian chapel was over theirs, reached by a stone staircase alongside of the Indians (or Abyssinians). This exactly corresponds with the plan and reference given in Sandys's Travels (1615), p. 162, which show the different chapels. The first on the south, i.e. the left looking from the body of the church, is " No. 35.— The chappell of the Abisines, over which the chappell of the Armenians." A reference to Jerusalem, which we procured through the kindness of Mr Walter Besant, shows that the Abyssinians no longer have a chapel or privileges in the Church of the Sepulchre. Between the Armenians and the Copts they have been deprived of these, and even of the keys of their convent. The resentment of King Theodore at the loss of these privileges was one of the indirect causes which led to the war between him and England in 1867-68.

6 Matthew Paris gives a letter from Philip, prior of the Dominicans in Palestine, which reached the pope in 1237, and which speaks of a prelate from whom he had received several letters, "qui praeest omnibus quos Nestoriana haeresis ab ecclesia separavit (cujus praelatio per Indiam Majorem, et per regnum sacerdotis Johannis, et per regna magis proxima Orienti dilatatur)." We have little doubt that Abyssinia was the " regnum " here indicated, though it was a mistake to identify the Abyssinian Church with the Nestorians.

John II. of Portugal was prosecuting inquiries regarding access to India his first object was to open communication with " Prester John of the Indies," who was understood to be a Christian potentate in Africa. And when Vasco da Gama went on his voyage from Mozambique northwards he began to hear of " Preste Joham " as reigning in the interior — or rather, probably, by the light of his preconceptions of the existence of that personage in East Africa he thus interpreted what was told him. More than twenty years later, when the first book on Abyssinia was composed — that of Alvarez — the title designating the king of Abyssinia is " Prester John," or simply " the Preste."

On the whole subject in its older aspects, see Ludolf's Historia Aethiopica and its Commentary, passim. The excellent remarks of M. d'Avezac, comprising a conspectus of almost the whole essence of the subject, are in the Recueil de voyages et de memoires pub- lished by the Societe de Geographie, iv. 547-564 (Paris, 1839). Two German works of importance which have been used in this article are the interesting and suggestive Der

Presbyter Johannes in Sage und Geschichte, by Dr Gustav Oppert (2nd ed., Berlin, 1870), and, most important of all in its learned, careful and critical collec- tion and discussion of all the passages bearing on the subject, Der Priester Johannes, by Friedrich Zarncke of Leipzig (1876-1879). See also Sir H. Yule's Cathay and the Way Thither, p. 173 seq., and in Marco Polo (2nd ed.), i. 229-233, ii. 539-543- (H – Y -)

PRESTIDIGITATION (from Lat. praesto, ready, and digitus, finger), the art of conjuring by nimble-fingered dexterity, particularly as opposed to the use of mechanical devices (see Conjuring). The Latin praestigium, illusion, praesligiae tricks, and praestigiator, juggler (from prae, before, and stingere, to prick), cover the same meaning though differently derived.

PRESTIGE, influence and authority exercised by reason of nigh reputation. It is one of the few words which have gained a meaning superior to that of original usage. The word in French, from which it has been borrowed by English, as in Latin praestigium or praesligiae, meant jugglers' tricks, deceit, imposture, and so is found in the 16th century. The Latin "•tands for praestrigium, from praestringere, to bind or fasten tight, hence to blindfold; others derive from praestinguere, to darken, obscure, deceive. The word was at first generally used as foreign and italicized; thus the New English Dictionary quotes Sir Walter Scott (Paul's Letters to his Kinsfolk, 1815) for the earliest example in English of the modern usage, " Napoleon needed the dazzling blaze of decisive victory to renew the charm or prestige . . . once attached to his name and fortunes." Other words derived from praestigium through the French retain the original meaning of juggling or conjuring (see Prestidigitation) .

PRESTON, JOHN (1587-1628), English Puritan divine, was born at Heyford in Northamptonshire and was educated at Queens' College, Cambridge (fellow 1609). He took orders, and on becoming dean of his college drew large crowds to hear his preaching. On the duke of Buckingham's advice he was appointed chaplain to Prince Charles in 1620; in 1622 he became preacher at Lincoln's Inn and master of Emmanuel College, Cambridge. After the accession of Charles I. he worked hard on behalf of the Puritan cause, but could accomplish little or nothing against Archbishop Laud. In theology he was a stanch Calvinist and his writings had considerable popularity.

PRESTON, a municipal, county, and parliamentary borough and port, of Lancashire, England, on the river Ribble, 209 m. N.W. by N. from London by the London & North-Western railway, served also by the Lancashire & Yorkshire railway. Pop. (1891), 107,573; (i°oi), 112,989; at the beginning of the 19th century it was about 17,000. The nucleus of its site consists of a ridge rising sharply from the north bank of the river, while the

surrounding country, especially to the west about the estuary, is flat. Among the numerous parish churches that of St John, built in Decorated style in 1855, occupies a site which has carried a church from early times. Among several Roman Catholic churches, that of St Walpurgis (1854) is a handsome building of Early Decorated character. Of public buildings the most noteworthy is the large town hall, with lofty tower and spire, in Early English style, built in 1867 from designs by Sir Gilbert Scott.

The free public library and museum were established in 1879 by the trustees of E. R. Harris, a prominent citizen. A new

building was opened in 1893. Here is placed Dr Shepherd's library founded in 1761, of nearly 9000 volumes, as well as a collection of pictures, &c, valued at £40,000, bequeathed by the late R. Newsham. The Harris Institute, endowed by the above-named trustees with £40,000, is established in a building of classical style erected in 1849, wherein are held science and art classes, and a chemical laboratory is maintained. For the grammar school, founded in 1550, a building in the Tudor style was erected in 1841 by private shareholders, but in i860 they sold it to the corporation, who now have the management of the school. The blue-coat school, founded in 1701, was in 1817 amalgamated with the national schools. A Victoria Jubilee technical school was established under a grant from the Harris trustees in 1897. There is also a deaf and dumb school. Preston is well supplied with public recreation grounds, including Avenham Park, the Miller Park, with a statue of the 14th earl of Derby (d. 1869), the Moor Park, the Marsh, and the Deepdale grounds, with an observatory. Preston is one of the principal scats of the cotton manufacture in Lancashire. There are also iron and brass foundries, engineering works, cotton machinery works, and boiler works, and some shipbuilding is carried on. In 1826 Preston became a creek of Lancaster, in 1839 it was included in the new port of Fleetwood, and in 1843 it was created an independent port. The trade of the port was insignificant until the construction of spacious docks, in conjunction with the deepening of the river from the quays of Preston to its outfall in the Irish Sea, a distance of 16 m., was begun in 1884, and was carried out at a cost of over one million sterling. The main wet dock, opened in 1892, is 3240 ft. long and 600 ft. wide. The total quayage is over 8500 lineal feet. The channel of the river has been made straighter, and from docks to sea deepened, so that the dock is accessible for vessels of 17 ft. draught on ordinary spring tides. A canal connects Preston with Lancaster.

The parliamentary borough, which returns two members, falls between the Blackpool and Darwen divisions of the county. The corporation consists of a mayor, 12 aldermen and 36 councillors. Area of municipal borough, 3971 acres.

Preston, otherwise Prestune, was near the minor Roman station at Walton-le-Dale and the great Roman road running from Warrington passed through it. It is mentioned in Domes- day Book as one of Earl Tostig's possessions which had fallen to Roger of Poictou, and on his defection it was forfeited to the Crown. 1 Henry II. about the year 11 79 granted the burgesses a charter by which he confirmed to them the privileges he had granted to Newcastle-under-Lyme, the chief of which were a free borough and a gild merchant. This is the first of fourteen royal charters which have been granted to Preston, the chief of which are as follows: John in 1199 confirmed to Preston all the rights granted by Henry II. 's charter and also " their fair of eight days " from the Assumption (Aug. 15) and a three days' fair from the eve of Saints Simon and Jude (Oct. 28). Henry III. in 121 7 confirmed the summer fair, but for five days only, and granted a weekly market on Wednesday. Edward III. (1328), Richard II. (1379), Henry IV. (1401), Henry V. (1414), Henry VI. (1425) and Philip and Mary (1557) confirmed the previous charters. The weekly market, though granted for Wednesday, was held as early as 1292 on Saturday. Elizabeth in 1566 granted the town its great charter which ratified and extended all previous grants, including the gild merchant, the weekly market on Saturday and the two annual fairs, in August for eight days and in October for seven days. Charles II. in 1662 and 1685 granted charters, by the latter of which an additional weekly market on Wednesday was conceded and a three days' fair beginning on the 16th of March. The most important industry used to be woollen weaving. Elizabeth's charter granted to the corporation all fees received from the sealing of cloth within the borough, and in 15 71 the mayor reported that the cloths usually made near Preston were " narrow white kearses." Other early industries were glove-making and linen cloth. The first cotton-spinning mill was built in 1777 in Moor Lane, and in 1791 John Horrocks built the Yellow Factory. In 1835 there were forty factories, chiefly spinning, yielding 70,000 lb of cotton yarn weekly. A gild existed perhaps in Saxon times, but the grant of a gild merchant dates from Henry II.'s charter, about n 79. The first gild of which there was any record was celebrated in 1328, at which it was decided to hold a gild every twenty years. Up to 1542, however, they do not appear to have been very regularly celebrated, but

1 The Court leet was held twice a year up to 1835.

since that year they have been and still are held at intervals of twenty years. A special gild mayor is appointed on each occa- sion. The first mention of a procession at the gild is in 1500. One of the most important

items of business was the enrolling of freemen, and the gild rolls are records of the population. In 1397 the gild roll contained the names of over 200 in-burgesses and 100 foreign burgesses; in 1415 the number of in-burgesses was 188, which in 1459 had declined to 72. In 1582 there were over 500 in-burgesses and 340 out-burgesses. There is no evidence for, but rather against, the common statement that Preston was burnt or razed to the ground during the Scottish invasion of 1322. The town suffered severely from the Black Death in 1349-1350, when as many as 3000 persons are said to have died, and again in the year November 1630 to November 1 63 1, 1 1 00 died of pestilence. During the Civil War Preston sided with the king and became the headquarters of the Royalists in Lancashire. In February 1643 Sir John Seaton with a Parliamentary force marched from Manchester and successfully assaulted it. A strong Parliamentary garrison was established here and its fortifications repaired, but in March the earl of Derby recaptured the town. The Royalists did not garrison it, but after demolishing the greater part of the works left it un-fortified. After the battle of Marston Moor Prince Rupert marched through Preston in September 1644 and carried the mayor and bailiffs prisoners to Skipton Castle, where they were confined for twelve months. On the 17th of August 1648 the Royalist forces under the duke of Hamilton and General Langdale were defeated at Preston by Cromwell with a loss of 1000 killed and 4000 taken prisoners. During the Rebellion of 1715 the rebel forces entered Preston on the 9th of November, and after proclaiming the Chevalier de St George king at the cross in the market-place, remained here for some days, during which the government forces advanced. The town was assaulted, and on the 14th of November General Forster surrendered his army of about 1400 men to the king's forces. In 1745 Prince Charles Edward marched through on the way south and north, but the town took no part in the rebellion. The borough returned two members from 1295 to 1331, then ceased to exercise the privilege on account of poverty till 1529, but since that date (except in 1653) it has always sent two representatives to parliament. The curious institution of the mock mayor and corporation of Walton, which was at its foundation in 1701 a Jacobite association, ceased after 1766 to be of any political significance and lapsed in 1800. There was probably a church here in Saxon times and it is believed to be one of the three churches in Amounderness mentioned in Domesday Book. In 1094 it is named in a charter of Roger de Poictou. The early dedication was to St Wilfrid, but probably about 1 531, when it was rebuilt, it was re-dedicated to St John. At the time of the Reformation, many, especially among the neighbouring gentry, clung to the old faith, and there is still a large Roman Catholic population. There were two monastic foundations here: aliospital dedicated to St Mary Magdalene, which stood on the Maudlands, and a Franciscan convent of Grey Friars situated to the west of Friargate. In the 18th century Preston had a high reputation as a

centre of fashionable society, and earned the epithet still familiarly associated with it, " proud."

See H. Fishwick, History of the Parish of Preston (1900).

PRESTONPANS, a police burgh and watering-place of Haddingtonshire, Scotland, on the Firth of Forth, 9J m. E. of Edinburgh by the North British railway. Pop. (1901), 2614. A mile to the east of the village is the site of the battle of the . 2 1 st of September 1745, in which Prince Charles Edward and his highlanders gained a complete victory over the royal forces under Sir John Cope. Colonel James Gardiner was mortally wounded after an heroic stand, and an obelisk in the grounds of his house at Bankton, close to the battlefield, commemorates his valour, while the ballad of Adam Skirving (1719-1803), " Hey, Johnnie Cope!" has immortalized the rout of Cope.

Until the beginning of the 19th century, the salt trade was prosecuted with great success, the pans having been laid down as long ago as 1 185, but the industry has declined. There are manu-

factures of fire-bricks, tiles and pottery, besides brewing and soap- making. In the vicinity there is an extensive coal-field. Fisheries are still of importance, although the bed of Pandore oysters (an esteemed variety) has lost something of its former fertility. There are harbours at Morrison's Haven to the west and at Cockenzie and Port Seton to the north-east, which practically form one village, with a population of 1687. The cross of the barony of Preston dates from 1617. Schaw's Hospital Trust, at one time intended for the education and maintenance of the children of poor parents, has been modified, and the bequest is used to provide free education and bursaries, while the building has been leased by the trustees of Miss Mary Murray, who bequeathed £20,000 (afterwards increased to £30,000) for the training of poor children as domestic servants.

PRESTWICH, SIR JOSEPH (1812-1896), English geologist, was born at Clapham, Surrey, on the 12th of March, 181 2. He was educated in Paris, Reading and at University College, London, where under Dr D. Lardner and Edward Turner, he paid special attention to natural philosophy and chemistry, and gained some knowledge of mineralogy and geology. Circumstances compelled him to enter into commercial life, and until he was sixty years of age he was busily engaged in the City as a wine merchant. He devoted all his leisure to geology. His business journeys enabled him to see and learn much of the general geology of England, Scotland and France, and this so effectively that at the time of his death he ranked as the most eminent of British geologists. As early as 1831 he commenced, during holiday visits, to make a study of the coal-field of Coal- brookdale in

Shropshire, and the results of his observations were communicated to the Geological Society of London in 1834 and 1836, and embodied in a memoir published in 1838. His name is, however, especially known in connexion with his researches on the Eocene strata of the London and Hampshire Basins (1846-1857): he defined the Thanet Sands and the Woolwich and Reading Beds, and studied the sequence of deposits and of organic remains and the method of formation of these and the succeeding strata of London clay and Bagshot Beds. So highly appreciated were his essays on the subject that in 1849 he was awarded the Wollaston Medal by the Geological Society of London; and in 1853 he was elected F.R.S. In the course of his observations he was led to study questions of water supply and published in 1851 A Geological Inquiry respecting the Water-bearing Strata of the Country around London, a work that at once became a standard authority; and his extensive knowledge in that respect procured him a seat on the Royal Commission on Water Supply, appointed in 1866. From 1858 the question of the antiquity of man engaged his attention. On various occasions statements had been made as to the association of flint implements formed by man with the bones of extinct mammals which belonged to more remote periods than those generally assigned for the appearance of the human race on this earth, but the evidence adduced had usually been disregarded by geologists as not affording sufficient proof of the point. Prestwich, together with Dr Hugh Falconer and Sir John Evans, saw the desirability of a closer examination of the facts, particularly in regard to the implements discovered by Boucher de Perthes in the gravels of the Somme valley; and their investigations in France and England yielded evidence which proved that man existed contemporaneously with the Pleistocene mammalia {Phil. Trans. 1861 and 1864). In 1865 a Royal Medal was awarded to Prestwich by the Royal Society. In 1866 he was chosen one of the commissioners appointed to inquire into the several matters relating to coal in the United Kingdom; and he subsequently contributed an important

Report on the Quantities of Coal, wrought and unwrought, in the Coalfields of Somersetshire and part of Gloucestershire, and another

Report on tlte Probabilities of finding Coal in the South of England

(1871). His researches on the Crag Beds of Suffolk and Norfolk, his report on Brixham Cave, his papers on the Channel Tunnel and the Chesil Bank, among others published during the years

1868-1875, may be mentioned. In 1870 he married Grace Anne McCall (nee Milne), niece of

Dr H. Falconer, and author of the Harbour Bar and other

works (see Essays Descriptive and Biographical, by Grace, Lady

Prestwich; edited by L. E. Milne, 1901). Prestwich retired from business in 1872, and two years later he was invited to take the chair of geology at Oxford, vacant through the death of John Phillips. This post he occupied until 1887. During his professorship he wrote his great work entitled Geology: Chemical, Physical and Stratigraphical (vol. i., 1886; vol. ii.,

On leaving Oxford Prestwich spent his remaining years in his country house, Darent-Hulme, Shoreham, Kent, erected by him in 1869. There, although seventy-six years of age, he maintained marvellous activity in geological research, devoting his attention to the superficial deposits of the Darent valley, to the occurrence of palaeolithic flint implements in the valleys and of an earlier type since called eolithic, on the chalk plateau of Kent; he likewise dealt generally with the raised beaches and rubble-drift of the south of England and their relation to recent changes of level. His latest publications were Collected Papers on some Controverted Questions of Geology, and On Certain Phenomena belonging to the Close oj the Last Geological Period and on their Bearing upon the Tradition 0} the Flood (1895). He was knighted in 1896, and died on the 23rd of June in the same year, at Shoreham in Kent.

See Life and Letters of Sir Joseph Prestwich, edited by his wife

(1899).

PRESTWICH, an urban district in the Prestwich parlia- mentary division of Lancashire, England, 5 m. N.N.W. of Man- chester on the Lancashire & Yorkshire railway. Pop. (1901), 12,839. It possesses cotton manufactures, but consists chiefly of handsome mansions and villas inhabited by Manchester merchants.

PRETORIA, the administrative capital of the Union of South Africa and of the province of the Transvaal, 46 m. by rail N. by E. of Johannesburg. Pop. (1904) 36,839, of whom 21,114 were whites. Pretoria is situated on the banken veld or northern slopes of the high veld, on both banks of the Aapies tributary of the Limpopo, and is 4470 ft. above the sea, being 1300 ft. lower than Johannesburg. Built in a hollow surrounded by hills, the aspect of the town with the river flowing through it and its broad streets lined with willows is picturesque. In summer the heat and moisture are excessive, and the Aapies (which is spanned by four bridges) is liable to floods.

The town is regularly laid out in rectangular blocks of uniform width. The older part lies on the west side of the Aapies River and between it and a smaller stream known as the Spruit. In the centre of this part of Pretoria is Church Square, so named from the Dutch Reformed Church which stood in it, but was demolished in 1905. Government buildings on the south side of the square contain the chambers of the Provincial Council and other public offices. They were erected in 1892 and are a handsome block in Renaissance style, three-storied, with a cen- tral tower surmounted by a statue of Liberty. On the north side of the square are the law courts, on the west side the Post Office. The chief banking offices are also in the square.

Running east and west from Church Square is Church Street, the chief business thoroughfare. A little east of Church Square this street opens on to Market Square, with commodious market buildings. The former Presidency, the residence of Paul Kruger, is at the western end of the street near the Spruit. Opposite it is the Dopper Church, in which Kruger used occasionally to preach. Other churches in the heart of the town include the Anglican cathe- dral, dedicated to St Alban, and the Presbyterian Church, both in Schoemans Street, the Roman Catholic Church in Koch Street with schools, convent buildings and extensive grounds, and the new Dutch Reformed Church in Vermeulen Street. In the north of the town is the National Museum and adjacent are the Zoological Gardens. Other public buildings are the government library, the University College and the opera house. East of the Aapies and on the slopes of the hills are the residential districts of Arcadia, Sunnyside and Muckleneuk. Bryntirion, a suburb on the northern slopes of the hills, contains the residences of the chief officials, including Government House. Here is Meintjes Kop, with a broad natural shelf midway below the summit. This shelf was chosen in 1909 as the site of the public offices of the Union. The designs of Mr Herbert Baker were accepted for two large blocks of identical design connected by a semicircular colonnade (passing behind the narrow kloof which bisects the shelf). Besides other open spaces

there is Burger's park, originally planned, during the first British occupation, as a botanical garden. It is beautifully wooded and through it runs the Spruit. A park and sports ground at the western end of the town contains the pedestal for a statue of President Kruger. The statue itself remained for years at Lourengo Marques and appears to have been lost. Adjoining this park on the north is the cemetery. Among those buried there are Kruger and many of the British who fell during the war of 1899-1902. Signal Hill, which rises 400 ft. above the plain, is west of the park. The plateau at its foot was the site of the English laager during the war of 1880-81, and is now occupied by the central railway station and workshops. North of the cemetery is the prison, a building which replaces a notoriously insanitary gaol used during the republican regime.

The water supply of Pretoria is drawn from the source of the Aapies River, where rise magnificent springs. The Fountains, as they are called, are 3 m. west of Pretoria. Some 3 m. north of the town is the Wonderboom, an enormous wild fig-tree, the only one of its kind in the district. At West Fort, 7 m. from the town, is a leper asylum; at Waterval, 15 m. north, the British prisoners captured by the Boers up to the fall of Pretoria were confined. Thirty miles east by north of Pretoria is the Premier Diamond mine. Bronkhorst Spruit, where in December 1880 a detachment of British soldiers was ambushed by the Boers, lies about 30 m. east by south of the town.

History. — Pretoria was founded in 1855, the ground on which it stands being purchased by the Boer government from Mar- thinus Pretorius. It was made the centre of a new district created at the same time, both town and district being named in honour of Andries Pretorius. By treaty between the South African Republic (then comprising the districts of Potchef- stroom, Rustenburg, Pretoria and Zoutpansberg) and the re- public of Lydenburg, concluded at Pretoria in i860, the two republics were united and Pretoria chosen as the capital of the whole state, and in September of that year the Volksraad held its first meeting in the new capital. Until 1864, however, when the civil war in the Transvaal ended, Potchefstroom remained the virtual capital of the country. From that year the seat of government has always been at Pretoria. There in 1877 Sir Theophilus Shepstone proclaimed the annexation of the Trans- vaal to Great Britain. In December 1880 it was invested by the Boers, but held out until the conclusion of peace. In 1881 the convention restoring self-government to the Transvaal was signed at Pretoria. From that time until 1900 the dominating figure in the town was that of the president — Paul Kruger. As revenue flowed in from the gold-mines on the Rand many fine buildings were erected in the capital, which was placed in rail- way communication with Cape Town in 1893 and with Lourenco Marques and Durban in 1895. To Pretoria Dr Jameson and his troopers were brought prisoners (January 1896) after the fight at Doornkop (to be handed over in a few days to the British govern- ment), and thither also were brought the Reform Committee prisoners from Johannesburg. In May 1900 Kruger fled from the town, which on the 5th of June surrendered without re- sistance to Lord Roberts, despite its formidable encircling forts, which however were never effectively armed. On the 31st of May 1902 the articles of peace whereby the Boer leaders re- cognized British sovereignty were signed at Pretoria, and five years later there assembled in the capital the first parliament of the Transvaal as a self-governing state of the Brkish Empire. On the establishment of the Union of South Africa in 19 10 Pretoria became its administrative capital, the seat of the legis- lature being however at Cape Town. The Transvaal parlia- ment was replaced by a Provincial Council

(see Transvaal: § History).

The town is governed by a municipality, which since 1903 has acquired control of the sanitary service, water supply, electric lighting and tramways. In 1909 the proportional representation system was adopted for the election of town councillors.

PRETORIUS, the family name of two of the early leaders of the " Trek " Boers — Andries Wilhelmus Jacobus Pretorius and Marthinus Wessels Pretorius, father and son.

1. Andries Pretorius (1 799-1 853), a Dutch farmer of Graaff-Reinet, Cape Colony, and a descendant from one of the earliest Dutch settlers in South Africa, left his home in the Great

Trek, and by way of what is now the Orange Free State crossed the Drakensberg into Natal, where he arrived in November 1838, at a time when the emigrants there were without a re- cognized leader. Pretorius was at once chosen commandant- general and speedily collected a force to avenge the massacre of Piet Retief and his party, who had been treacherously killed by the Zulu king Dingaan the previous February. Pretorius's force was attacked on the 16th of December (" Dingaan's Day ") by over 10,000 Zulus, who were beaten off with a loss of 3000 men. In January 1840 Pretorius with a commando of 400 burghers helped Mpande in his revolt against his brother Dingaan and was the leader of the Natal Boers in their opposition to the British. In 1842 he besieged the small British garrison at Durban, but retreated to Maritzburg on the arrival of re- inforcements under Colonel (subsequently Sir) Josias Cloete and afterwards exerted his influence with the Boers in favour of coming to terms with the British. He remained in Natal as a British subject, and in 1847 was chosen by the Dutch farmers there to lay before the governor of Cape Colony the grievances under which they laboured owing to the constant immigration of natives, to whom locations were assigned to the detriment of Boer claims. Pretorius went to Grahams Town, where Sir Henry Pottinger (the governor) then was; but Sir Henry re- fused to see him or receive any communication from him. Pretorius returned to Natal determined to abandon his farm and once more trek beyond the British dominions. With a con- siderable following he was preparing to cross the Drakensberg when Sir Harry Smith, newly appointed governor of the Cape, reached the emigrants' camp on the Tugela (Jan. 1848). Sir Harry promised the farmers protection from the natives and persuaded many of

the party to remain, but Pretorius departed, and on the proclamation of British sovereignty up to the Vaal fixed his residence in the Magalisberg, north of that river. He was chosen by the burghers living on both banks of the Vaal as their commandant-general. At the request of the Boers at Winburg Pretorius crossed the Vaal in July and led the anti- British party in their " war of freedom," occupying Bloem- fontein on the 20th of the same month. In August he was de- feated at Boomplaats by Sir Harry Smith and thereupon re- treated north of the Vaal, where he became leader of one of the largest of the parties into which the trans- Vaal Boers were divided, and commandant-general of Potchefstroom and Rust- enburg, his principal rival being Commandant-General A. H. Potgieter. In 185 1 he was asked by the Boer malcontents in the Orange River Sovereignty and by the Basuto chief Moshesh to come to their aid, and he announced his intention of crossing the Vaal to " restore order " in the Sovereignty. His object, however, was rather to obtain from the British an acknowledg- ment of the independence of the Transvaal Boers. The British cabinet having decided on a policy of abandonment, the pro- posal of Pretorius was entertained. A reward of £2000 which had been offered for his apprehension after the Boomplaats fight, was withdrawn, Pretorius met the British commissioners at a farm near the Sand River, and with them concluded the convention (Jan. 17, 1852) by which the independence of the Transvaal l?oers was recognized by Great Britain. Pretorius recrossed the Vaal and at Rustenburg on the J6th of March was reconciled to Potgieter, the followers of both leaders approving the convention, though the Potgieter party was not represented at the Sand River. In the same year Pretorius paid a visit to Durban with the object of opening up trade between Natal and the new republic. He also in 1852 attempted to close the road to the interior through Bechuanaland and sent a commando to the western border against Sechele. During this expedition David Livingstone's house at Kolobeng was looted. Pretorius died at his home at Magalisberg on the 23rd of July 1853. He is described by Theal as " the ablest leader and most perfect representative of the Emigrant Farmers." In 1855 a new dis- trict and a new town were formed out of the Potchefstroom and Rustenburg districts and named Pretoria in honour of the late commandant -general.

2. Marthinius Pretorius (1819-1901), the eldest son of

Andries, was appointed in August 1853 to succeed his father as commandant-general of Potchefstroom and Rustenburg, two of the districts into which the Transvaal was then divided. In 1854 he led his burghers against a chief named Makapan, who had murdered a party of twenty-three Boers, including ten women and children. The natives were blockaded in a great cave in the Zoutpansberg and about 3000 were starved to death or shot as they attempted to escape. Having thus chastised Makapan's clan,

Pretorius turned his energies to the creation of a strong central government, and from 1856 onward his dominating idea appears to have been the formation of one Boer state to include the Orange River burghers. In December 1856 repre- sentatives of the districts of Potchefstroom, Rustenburg and Pretoria met and drew up a constitution and on the 6th of January the "South African Republic" was formally constituted Pretorius having been elected president on the previous day. Though the Boers of the Lydenburg, Utrecht and Zoutpans- berg districts refused to acknowledge the new republic, Pretorius, with the active co-operation of Commandant Paul Kruger (after- wards President Kruger), endeavoured (1857) to bring about the union of the Orange Free State and the Transvaal, and a commando crossed the Vaal to support Pretorius. The attempt at coercion failed, but in December 1859 the partisans of Pre- torius in the Free State secured his election as president of that republic. Pretorius had just effected a reconciliation of the Lydenburg Boers with those of the other districts of the Trans- vaal, and hoping to complete his work of unification he accepted the presidency of the Free State, assuming office at Bloemfon- tein in February i860. But the condition of anarchy into which the Transvaal fell shortly afterwards effectually weaned the Free State burghers from any thought of immediate amal- gamation with their northern neighbours. Pretorius however continued to intervene in the affairs of the Transvaal and at length (April 15, 1863) resigned his Free State presidency. Acting as mediator between the various Transvaal parties Pre- torius in January 1864 succeeded in putting an end to the civil strife and in May following once more became president of the South African Republic — now for the first time a united com- munity. Conciliation was a marked feature of his character and to Pretorius more than any other man was due the welding of the Transvaal Boers into one nation. Pretorius shared the ideas of his father and the Emigrant Farmers generally con- cerning the title of the state to indefinite expansion north, east and west. Although he had much difficulty in maintaining the authority of the republic over the natives within its recog- nized borders, yet in April 1868, on the report of gold discoveries at Tati, he issued a proclamation annexing to the Transvaal on the west the whole of Bechuanaland arid on the east territory up to and including part of Delagoa Bay. As to Delagoa Bay Portugal at once protested and in 1869 its right to the bay was acknowledged by Pretorius, who in the same year was re-elected president. The right of the Boers to the whole of Bechuana- land was not pressed by Pretorius in the face of British op- position, but in 1870, when the discovery of diamonds along the lower Vaal had led to the establishment of many diggers' camps, an attempt was made to enforce the claims of the Transvaal to that district. Pretorius aroused the hostility of the diggers by granting an exclusive concession to one firm. Realizing his mistake, the concession was cancelled and in September 1870 he issued a proclamation notable as offering to the diggers

very large powers of self-government. Pretorius went to the western frontier and in repeated conferences with the Bechuana chiefs attempted to get them to acknowledge the Boer contention and by joining the Transvaal to " save " their territory from the British. His diplomacy failed, and finally, without consulting his colleagues, he agreed to refer the question of the boundary to the arbitration of Mr R. W. Keate, then lieutenant-governor of Natal. The award, given on the 17th of October 1871, was against the Boer claims. Pretorius loyally accepted the decision, but it aroused a storm of indignation in the Transvaal. The Volksraad refused to ratify the award and Pretorius resigned the presidency (November 1871).

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From this time Pretorius took little further part in public affairs until after the first annexation of the state by Great Britain. In 1878 he acted as chairman of the committee of Boer leaders who were seeking the restoration of the independence of their country, and for his action in that capacity he was arrested in January 1880 by order of Sir Garnet Wolseley on a charge of treason. (See the Blue Book [C. 2584] of 1880 for details of this charge.) He was admitted to bail and shortly afterwards urged by Wolseley to accept a seat on the executive council. This offer Pretorius declined, but he consented to tour the country with a proclamation by Wolseley counselling the Boers to submit, and promising them self-government. In December of the same year he was appointed, with Paul Kruger and P. Joubert, to carry on the government on the part of the insurgent Boers. He was one of the signatories to the Pretoria Conven- tion and continued to act as a member of the Triumvirate until the election of Kruger as president in May 1883. He then with- drew from public life; but lived to see the country re-annexed to Great Britain, dying at Potchefstroom on the 19th of May 1001. He is stated to have disapproved the later developments of Krugerism, and within four months of his death visited Louis Botha and Schalk Burger, on behalf of Lord Kitchener, with the object of bringing the war to an end.

For the elder Pretorius see G. M. Theal, Compendium of the History and Geography of South Africa, 3rd ed. (London, 1878), and History of South Africa, vol. iv. [1834-1854] (London, 1893). For the younger Pretorius see vol. v. of the same series.

PRETTY, a word usually applied in the sense of pleasing in appearance, without connoting those qualities which are described as beautiful or handsome. In Old English praettig meant tricky, cunning or wily, and is thus used to translate the Latin sagax, astutus, callidus, in a vocabulary of

about 1000. Praett meant a trick, and this word is seen in many forms in Dutch, cf. the words prettig, sportive, part, trick. A connexion has been suggested with the Greek wpanriKos, irpaTreiv, to do, make, through Latin praclica, practice, performance; but the New English Dictionary rejects these, as also Celtic sources, as un- founded. From " cunning " to skilful, and thence to its use as a term of general appreciation as is so often used by Pepys, the development is easy.

PREVARICATION, a divergence from the truth, equivoca- tion, quibbling, a want of plain-dealing or straightforwardness, especially a deliberate misrepresentation by evasive answers, often used as a less offensive synonym for a lie. The Latin praevaricatio was specifically applied to the conduct in an action at law in which an advocate (praevaricator) in collusion with his opponent put up a bad case of defence. Praevari- care meant literally to walk with the legs very wide apart, to straddle, hence to walk crookedly, to stray from the direct road, varicus, straddling, being derived from varus, bow-legged, a word which has been connected etymologically with German quer, transverse, across, and English "queer."

PREVEZA, or Prevesa, a seaport of Albania, European Turkey, in the vilayet of Iannina; at the entrance to the Gulf of Arta, an inlet of the Ionian Sea. Pop. (1905), 6500, of whom about four-fifths are Christian Albanians or Greeks, and one- fifth Moslems. The town is surrounded by dense olive groves, and most of its houses stand in their own gardens. The har- bour is small, and closed to large vessels by a bar of sand; but it is a port of call for the Austrian Lloyd steamers, and annually accommodates about 1500 small vessels, the majority of which are engaged in the coasting trade. Preveza exports dairy produce, valonia, hides and wool, olives and olive oil. The yearly value of its trade varies from about £70,000 to £80,000. About 3 m. north are the ruins of Nicopolis (q.v.).

PREVOST, ANTOINE FRANCOIS (1697-1763), French author and novelist, was born at Hesdin, Artois, on the 1st of April 1697. He first appears with the full name of Pr6vost d'Exiles in a letter to the booksellers of Amsterdam in 1731. His father, Lievin Prevost, was a lawyer, and several members of the family had embraced the ecclesiastical estate. Prevost was educated at the Jesuit school of Hesdin, and in 1713 became a novice of

the order in Paris, pursuing his studies at the same time at the college of La Fleche. At the end of 17 16 he left the Jesuits to join the army, but he soon tired of life in barracks, and returned to Paris in 17 19 with the idea, apparently, of resuming his novitiate. He is said to have travelled in Holland about this time; in any case he returned to the army, this time with a commission. Some of his biographers have assumed that he suffered some

of the misfortunes assigned to his hero Des Grieux. However that may be, he joined in 1719-1720 the learned com- munity of the Benedictines of St Maur, with whom he found refuge, he himself says, after the unlucky termination of a love affair. He took the vows at Jumieges in 172 1 after a year's novitiate, and received in 1726 priest's orders at St Germer de Flaix. He resided for seven years in various houses of the order, teaching, preaching and studying. In 1728 he was at the abbey of St Germain-des-Pres, Paris, where he was engaged on the Gallia Christiana, the learned work undertaken by the monks in continuation of the works of Denys de Sainte-Marthe, who had been a member of their order. His restless spirit made him seek from the Pope a transfer to the easier rule of Cluny; but without waiting for the brief, he left the abbey without leave (1728), and, learning that his superiors had obtained a lettre de cachet against him, fled to England.

In London he acquired considerable knowledge of English history and literature, traceable throughout his writings. Before leaving the Benedictines Prevost had begun his most famous romance, Memcires et avantures d'un homme de qualite qui s'est retire du monde, the first four volumes of which were published in Paris in 1728, and two years later at Amsterdam. In 1729 he left England for Holland, where he began to publish (Utrecht, 1730) a romance, the material of which, at least, had been gathered in London — Le Philosophe anglois, ou Histoire de Monsieur Cleveland, fils naturel de Cromwell, ecrite par lui-mesme, et traduite de I' anglois (Paris ! 73 I_I 739′ 8 vols., but most of the existing sets are partly Paris and partly Utrecht). A spurious fifth volume (Utrecht, 1734) contained attacks on the Jesuits, and an English translation of the whole appeared in 1734. Meanwhile, during his residence at the Hague, he engaged on a translation of the Historia of De Thou, and, relying on the popularity of his first book, published at Amster- dam a Suite in three volumes, forming volumes v., vi., and vii. of the original Memoires et avantures d'un homme de qualite. The seventh volume contained the famous Manon Lescaut, separately published in Paris in 1731 as Les Aventures du chevalier des Grieux et de Manon Lescaut, par Monsieur D. ...The book was eagerly read, chiefly in pirated copies, as it was forbidden in France. In 1733 he left the Hague for London in company with a lady whose character, as given by Prevost's enemies, was far from desirable. In London he edited a weekly gazette on the model of Addison's Spectator, Le Pour et contre, which he continued to produce, with short intervals, until 1740.

In the autumn of 1734 Prevost was reconciled with the Bene- dictines, and, returning to France, was received in the Bene- dictine monastery of La Croix-Saint-Leufroy in the diocese of Evreux to pass through a new, though brief, novitiate. In 1735 he was dispensed from residence in a monastery by becoming almoner to the prince de Conti, and in 1754 obtained the

priory of St Georges de Gesnes. He continued to pro- duce novels and translations from the English, and, with the exception of a brief exile (1741-1742) spent in Brussels and Frankfort, he resided for the most part at Chantilly until his death, which took place suddenly while he was walking in the neighbouring woods on the 23rd of December 1763. Hideous particulars have been added, but the cause of his death, the rupture of an aneurism, has been definitely established. Stories of crime and disaster were related of Prevost by his enemies, and diligently repeated, but they have proved to be as apocryphal as the details given of his death.

Manon Lescaut, one of the greatest novels of the century, is very short; it is entirely free from improbable incident, it is penetrated by the truest and most cunningly managed feeling _; and almost every one of its characters is a triumph of that analytic portraiture which is the secret of the modern novel. The chevalier des Grieux, the hero, is probably the most perfect example of the carrying out of the sentiment " All for love and the world well lost " that existsin fiction, at least where the circumstances are those of ordinary and probable life. Tiberge, his friend, is hardly inferior in the difficult part of mentor and reasonable man. Lescaut, the heroine's brother, has vigorous touches as a bully and Bohemian; but the triumph of the book is Manon herself. Animated by a real affection

for her lover, and false to him only because her love of splendour, comfort and luxury prevents her from welcoming privation with him or for him, though in effect she prefers him to all others, perfectly natural and even amiable in her degradation, and yet showing the moral of that degradation most vividly, Manon is one of the most remarkable heroines in all fiction. She had no literary ancestress; she seems to have sprung entirely from the imagination, or perhaps the sympathetic observation, of the wandering scholar who drew her. Only the Princesse de Cleves can challenge comparison with her before or near to her own date, and in Manon Lescaut the plot is much more complete and interesting, the sentiments less artificial, and the whole story nearer to actual life than in Madame de la Fayette's masterpiece. Prevost's other works include: Le Doyen de Killerine, histoire morale, composie sur les memoires d'une illustre jamille d' Ireland (Paris, 1735; 2nd part, the Hague, 1739, 3rd, 4th and 5th parts, 1740); Tout pour Vamour ('735)i a translation of Dryden's tragedy; Histoire d'une Grecque moderne (Amsterdam [Paris] 2 vols., 1740); Histoire de Marguerite d'Anjou (Amsterdam [Paris] 2 vols., 1740); Memoires pour servir a l' histoire de Malte (Amsterdam, 1741); Campagnes philosophiques , ou memoires . . . contenant I'histoire de la guerre d

Irelande (Amsterdam, 1741); Histoire de Guillaume le Conquerant (Paris, 1742); Histoire generate des voyages (15 vols., Paris, 1746-1759), continued by other writers; translations from Samuel Richardson, Pamela (4 vols., 1742), Lettres anglaises ou Histoire de Miss Clarisse Harlowe (6 vols., London, 1741); Nouvelles lettres anglaises, ou Histoire du chevalier Grandisson (Amsterdam, 3 vols., 1755); Memoires pour servir a I'histoire de la vertu (Cologne, 4 vols., 1762), from Mrs Sheridan's Memoires of Miss Sidney Bidulph ; Histoire de la maison de Stuart (3 vols., 1740) from Hume's History of England to 1688; Le Monde morale, ou Memoires pour servir a I'histoire du cceur humain (2 vols., Geneva, 1760), &c.

For the bibliography of Prevost's works, which presents many complications, and for documentary evidence of the facts of his life see H. Harrisse, L 'Abbe Prevost (1896); also a thesis (1898) by V. Schroeder.

PROVOST, CONSTANT (1787-1856), French geologist, was born in Paris on the 4th of June 1787, and was son of Louis Prevost, receiver of the rentes of that city. He was educated at the Central Schools, where, inspired by the lectures of G. Cuvier, Alexandre Brongniart and A. Dumeril, he determined to devote himself to natural science. He took his degree in Letters and Sciences in 181 1, and for a time pursued the study of medicine and anatomy. Mainly through the influence of Brongniart he turned his attention to geology, and during the years 1816-1819 made a special study of the Vienna Basin where he pointed out for the first time the presence of Tertiary strata like those of the Paris Basin, but including a series of later date. His next work (182 1) was an essay on the geology of parts of Normandy, with special reference to the Secondary strata, which he compared with those of England. From 182 1- 1829 he was professor of geology at the Athenaeum at Paris, and he took a leading part with Ami Boue, G. P. Deshayes and Jules Desnoyers in the founding of the Geological Society of France (1830). In 1831 he became assistant professor and afterwards honorary professor of geology to the faculty of sciences. Having studied the volcanoes of Italy and Auvergne, he opposed the views of von Buch regarding craters of elevation, maintaining that the cones were due to the material succes- sively errupted. Like Lyell he advocated a study of the causes or forces now in action in order to illustrate the past. One of his more important memoirs was De la Chronologie des terrains et du synchronisme des formations (1845). He died in Paris on the 17th of August 1856.

Memoir with portrait, by J. Gosselet, Ann. soc. geol. du nord, tome xxv. 1896.

PREVOST, EUGENE MARCEL (1862-), French novelist, was born in Paris on the 1st of May 1862. He was educated at Jesuit schools in Bordeaux

and Paris, entering the Ecole Poly technique in 1882. He published a story in the Clair on as early as 1881, but for some years after the completion of his studies he applied his technical knowledge to the manu- facture of tobacco. He published in succession, Le Scorpion (1887), Chonchetle (1888), Mademoiselle Jaujfre (1889), Cousine Laura (1890), La Confession d'un amanl (1891), Lettres defemmes (1892), L'Automne d'une femme (1893), and in 1894 he made a great sensation by an exaggerated and revolting study of the results of Parisian education and Parisian society on young

girls, Les Demi-vierges, which was dramatized and produced with great success at the Gymnase on the 21st of May 1895. Le Jardin secret appeared in 1897; and in 1900 Les Vierges fortes, and a study of the question of women's education and independence in two novels Frederique and Lea. L'Heureux minage (1901), Les Lettres d Franqoise (1902), La Princesse d'Erminge (1904), and L'Accordeur aveugle (1905) are among his later novels. An amusing picture of modern German manners is given in his Monsieur et Madame Moloch (1906). He had a great success in 1904 with a four act play La Plus faible, produced at the Comedie Francaise. In 1909 he was elected to the Academy.

PREVOST, PIERRE (1751-1839), Swiss philosopher and physicist, son of a Protestant clergyman in Geneva, was born in that city on the 3rd of March 1751, and was educated for a clerical career. But he forsook it for law, and this too he quickly deserted to devote himself to education and to travelling. He became intimate with J. J. Rousseau, and, a little later, with Dugald Stewart, having previously distinguished himself as a translator of and commentator on Euripides. Frederick II. of Prussia secured him in 1780 as professor of philosophy, and made him member of the Akademie der Wissenschaften in Ber- lin. He there became acquainted with Lagrange, and was thus led to turn his attention to physical science. After some years spent on political economy and on the principles of the fine arts (in connexion with which he wrote, for the Berlin Memoirs, a remarkable dissertation on poetry) he returned to Geneva and began his work on magnetism and on heat. Interrupted occasionally in his studies by political duties, in which he was often called to the front, he remained professor of philosophy at Geneva till he was called in 18 10 to the chair of physics. He died at Geneva on the 8th of April 1839.

Prevost published much on philology, philosophy, and political economy; but he will be remembered mainly for having published, with additions of his own, the Traite de physique of G. L. Le Sage, and for his enunciation of the law of exchange in radiation. His scientific publications included De VOrigine des forces magnetiques (1788), Recherches physico-mecaniques sur la chaleur (1792), and Essai sur le calorique rayonnant (1809).

PREVOST-PARADOL, LUCIEN ANATOLE (1829-1870), French man of letters, was born in Paris on the 8th of August 1829. He was educated at the College Bourbon and entered the Ecole Normale. In 1855 he was appointed professor of French literature at Aix. He held the post, however, barely a year, re- signing it to become a leader-writer on the Journal des debats. He also wrote in the Courrier du dimanche, and for a very short time in the Presse. His chief works are Essais de politique et de litterature (three series, 1859-1866), and Essais sur les moralistes francais (1864). He was, however, rather a journalist than a writer of books, and was one of the chief opponents of the empire on the side of moderate liberalism. He underwent the usual difficulties of a journalist under that regime, and was once im- prisoned. In 1865 he was elected an Academician. The ac- cession of Emile Ollivier to power was fatal to Prevost-Paradol, who apparently believed in the possibility of a liberal empire, and consequently accepted the appointment of envoy to the United States. This was the signal for the most unmeasured attacks on him from the republican party. He had scarcely installed himself in his post before the outbreak of war between France and Prussia occurred. He shot himself at Washington on the nth of July 1870, and died on the 20th.

PREY (O. Fr. preie, mod. proie, Lat. praeda, booty, from prae and the root hed — seen in prehendere, prendere, to grasp), booty, spoil, plunder taken in war, by robbery, or other violent means; particularly the quarry, the animal killed for food by a carnivorous animal; a beast or bird of prey. A particular usage for that which is saved from any trial of strength or battle is familiar from the Bible (Jer. xxi. 9) " his life shall be unto him for a prey."

PRIAM (Gr. Ilpiafios), in Greek legend, the last king of Troy, son of Laomedon and brother of Tithonus. Little is known of him before the Trojan War, which broke out when he was ad- vanced in years. According to Horner (Iliad, iii. 184) in his

youth he fought on the side of the Phrygians against the Ama- zons. He had fifty sons and fifty daughters, and possessed im- mense wealth. He appears only twice on the scene of action during the war— to make arrangements for the duel between Paris and Menelaus, and to beg the body of Hector for burial from Achilles, whom he visits in his tent by night. He was said to have been slain by Neoptolemus, son of Achilles, during the sack of Troy (Virgil, Aeneid, ii. 512). See under Troy, on the legends. PRIAPEIA, a collection of poems (about eighty in number) in various metres on the subject of Priapus. It was compiled from literary works and inscriptions on images of the god by an unknown editor, who composed the introductory

epigram. From their style and versification it is evident that the poems belong to the best period of Latin literature. Some, however, may be interpolations of a later period. They will be found in F. Bachelor's Petronius (1904), L. Hurler's Catullus (1870), and E. Bahrens, Poctae latini minores, i. (1879).

PRIAPULOIDEA, a small group of vermiform marine crea- tures; they have been usually placed in the neighbourhood of the Gephyrea, but their position is uncertain and it is doubtful if they are to be regarded as coelomate animals. They are cylindrical worm-like animals, with a median anterior mouth quite devoid of any armature or tentacles. The body is ringed, and often has circles of spines, which are continued into the slightly protrusible pharynx. The alimentary canal is straight, the anus terminal, though in Priapidus one or two hollow ventral diverticula of the body-wall stretch out behind it. The nervous system, composed of a ring and a ventral cord, retains its primitive connexion with the ectoderm. There are no specialized sense-organs or vascular or respiratory systems. There is a wide body-cavity, but as this has no connexion with the renal or reproductive organs it cannot be regarded as a coelom, but probably is a blood-space or haemo- coel.

The Priapuloidea are dioecious, and their male and female organs, which are one with the excretory organs, consist of a pair of branching tufts, each of which opens to the exterior on one side of the anus. The tips of these tufts enclose a flame- cell similar to those found in Platyhel- minths, &c, and these probably function as excretory organs. As the animals become adult, diverticula arise on the tubes of these organs, which develop either spermatozoa or ova. These pass out through the ducts. Nothing is known of the development. There are three genera: (i.) Priapulus, with the species P. caudatus, Lam., of the Arctic and Antarctic and neighbouring cold seas, and P. bicaudatus, Dan., of the north Atlantic and Arctic seas; (ii.) Priapuloides australis, de Guerne, of the southern circumpolar waters; and (iii.) Halicryptus, with the species H. spinulosus, v. Sieb., of northern seas. They live in the mud, which they eat, in comparatively shallow waters up to 50 fathoms.

Authorities.— Ape\, Zeitschr. wiss. Zool. (1885), vol xlii.; Scharff Quart Journ. Mtc._ Sci. (1885), vol. xxv. ; Ehlers. Zeitschr. wiss. Zool. (1861), vol. xi.; Schauinsland, Zool. Anz. (1886), vol. ix. • De Guerne, Mission saentifique du Cap Horn (1891), vol vi ■ Michael- sen, Jahrb. Hamburg-Aust. (1888), vol. vi. (A. E. S.)

PRIAPUS, in Greek mythology, son of Dionysus (or Adonis or Hermes) and Aphrodite (or Chione). He is unknown to Homer and Hesiod. The chief seat of his worship was the coast of the Hellespont, especially at Lampsacus, which claimed to be his birthplace. Thence his cult extended to Lydia, and by way of the islands of Lesbos and Thasos to the whole of Greece (es- pecially Argolis), whence it made its way to Italy, together with that of Aphrodite. Priapus is the personification of the fruit-

Priapulus caudatus Lam. (Nat. size.) a, Mouth, surrounded by spines.

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fulness of nature. Sailors invoked him in distress and fisnermen prayed to him for success. He gradually came to be regarded as the god of sensuality. His symbol was the phallus, an em- blem of productivity and a protection against the evil eye. The first fruits of the gardens and fields, goats, milk and honey, and occasionally asses, were offered to him. He was sometimes represented as an old man, with a long beard and large genitals, wearing a long Oriental robe and a turban or garland of vine- leaves, with fruit and bunches of grapes in his lap. Amongst the Romans, rough wooden images, after the manner of the hermae, with phallus stained with vermilion, were set up in gardens. His image was placed on tombs, as symbolizing the doctrine of regeneration and a future life, and his name occurs on sepulctiral inscriptions. In his hand he carried a bill-hook or club, while a reed on his head, shaking backwards and forwards in the wind, acted as a scarecrow.

PRIBILOF ISLANDS (often called the Fur Seal Islands, Russian equivalent, " Kotovi "), a group of four islands, part of Alaska, lying in Bering Sea in about 56 50′ N. and 170 W., about 200 m. N. of Unalaska and 200 m. S. of Cape Newenhamj the nearest point on the mainland. The principal islands are St Paul (about 35 sq. m.; 13 m. long, from N.E. to S.W.; max- imum width about 6 m.; named from St Peter and St Paul's Day, on which it was discovered) and St George (about 27 sq.m.; 10 m. long, maximum width, 4 m.; probably named after Pri- bilof's ship) about 30 m. S.E.; Otter and Walrus islets, the former covering about 4 sq. m., and the latter merely a reef covering about 64 acres, are near St Paul. In 1907 the native popula- tion was 263—170 on St Paul and 93 on St George. Only agents of the United States or employes of the lessees are permitted as residents on the islands. The islands are hilly and vol- canic— Bogoslof, a crater on St Paul, is 600 ft. high— without harbours, and have a mean annual temperature of about 35-7° F. and a rainfall of about 35 in. There are only two seasons- rainy summers lasting from May to October, and dry winters from November to April. 'The flora is restricted to ferns, mosses and

grasses, though there are some creeping willows and small shrubs. The largest seal rookery, containing about 80 % of the seals in the Pribilofs, is on St Paul. The seals found here are a distinct variety (Callorhinus alascanus) with much better fur than that of any other variety. Besides the fur seal there are blue and grey foxes (more on St George than on St Paul), and on St George Island and on the Walrus reef there are great bird rookeries— the breeding places of immense numbers of gulls, sea-parrots, auks, cormorants and arries (Lomvia ana).

The islands were first sighted in 1767 by Joan Svnd, and were visited in 1786 by Gerasim Pribiloff, who discovered the fur seal rookeries for which they became famous. From Russia the islands passed with Alaska to the United States in 1867. From 1870 to 1890 the United States government leased the islands to the Alaska Commercial Company. In 1890-1910 the North American Commercial Company held the monopoly. But the industry shrank considerably owing to pelagic sealing. The season during which land hunting is allowed on the islands includes June, July, September and October. (See also Seal and v BERiNG Sea Arbitration.)'

PRIBRAM, a town of Bohemia, Austria, 39 m. S.W. of Prague by rail. Pop. (1900), 13,576, together with the adjoining town- ship of Birkenberg, 19,119, almost exclusively Czech. It lies in a valley between the hills of Birkenberg and Heiliger Berg, and in its neighbourhood are the lead and silver mines which belong to the Austrian government and are worked in nine shafts, two of which, the Adalbert shaft (3637 ft.) and the Maria shaft, (.3575 ft.) are the deepest in the world. The mines have been worked for several centuries, but their actual prosperity dates from 1770, when the sinking of the Adalbert shaft began. They yield yearly an average of 80,000 lb of silver and 1900 tons of lead. At the top of the Heiliger Berg (1889 ft.) is a church with a wonder-working image of the Virgin, which is the chief place of pilgrimage in Bohemia.

PRICE, BARTHOLOMEW (1818-1898), English mathematician and educationist, was born at Coin St Denis, Gloucestershire,

in 1818. He was educated at Pembroke College, Oxford, of which college (after taking a first class in mathematics in 1840 and gaining the university mathematical scholarship in 1842) he became fellow in 1844 and tutor and mathematical lecturer in 1845. He at once took a leading position in the mathematical teaching of the university, and published trea- tises on the Differential calculus (in 1848) and the Infinitesimal calculus

(4 vols., 1852-1860), which for long were the recognized textbooks there. This latter work included the differential and integral calculus, the calculus of variations, the theory of attractions, and analytical mechanics. In 1853 he was ap- pointed Sedleian professor of natural philosophy, resigning it in June 1898. His chief public activity at Oxford was in con- nexion with the hebdomadal council, and with the Clarendon Press, of which he was for many years secretary. He was also a curator of the Bodleian Library, an honorary fellow of Queen's College, a governor of Winchester College and a visitor of Greenwich Observatory. In 1891 he was elected Master of Pembroke College, which dignity carried with it a canonry of Gloucester Cathedral. He died on the 29th of December 1898. See Monthly Notices of the Royal Astronomical Society (1899).

PRICE, BONAMY (1 807-1 888), English political economist, was born at St Peter Port, Guernsey, on the 22nd of May 1807. He entered at Worcester College, Oxford, in 1825, where he took a double first in 1829. From 1830 to 1850 he was an assistant master at Rugby school. He then lived for some years in London, being engaged in business and literary work, and was appointed to serve on various royal commissions. He married in 1864. In 1868 he was elected Drummond professor of politi- cal economy at Oxford, and was thrice re-elected to the post, which he held till his death. In 1883 he was elected an honorary fellow of his college. In addition to his professorial work, he was in much request as a popular lecturer on political economy. He died in London on the 8th of January 1888. His principal publications, exclusive of pamphlets, were: The Principles of Currency (1869), Currency and Banking (1876), Chapters on Practical Political Economy (1878).

PRICE, RICHARD (1723-1791), English moral and political philosopher, son of a dissenting minister, was born on the 23rd of February 1723, at Tynton, Glamorganshire. He was educated privately and at a dissenting academy in London, and became chaplain and companion to a Mr Streatfield at Stoke Newington. By the death of Mr Streatfield and of an uncle in 1756 his cir- cumstances were considerably improved, and in 1757 he married a Miss Sarah Blundell, originally of Belgrave in Leicestershire. In 1767 he published a volume of sermons, which gained him the acquaintance of Lord Shelburne, an event which had much influence in raising his reputation and determining the char- acter of his subsequent pursuits. It was, however, as a writer on financial and political questions that Price became widely known. In 1769, in a letter to Dr Franklin, he wrote some observations on the expectation of lives, the increase of mankind, and the population of London, which were published in the Philosophical Transactions of that year; in May 1770 he communicated to the Royal Society a paper on the proper method of calculating the values of contingent reversions. The publication of these

papers is said to have exercised a beneficial influence in draw- ing attention to the inadequate calculations on which many insurance and benefit societies had recently been formed. In 1769 Price received the degree of D.D. from the university of Glasgow. In 1771 he published his Appeal to the Public on the Subject of the National Debt (ed. 1772 and 1774). This pamphlet excited considerable controversy, and is supposed to have influenced Pitt in re-establishing the sinking fund for the extinction of the national debt, which had been created by Walpole in 1716 and abolished in 1733. The means, however, which Price proposed for the extinction of the debt are described by Lord Overstone ‘ as ” a sort of hocus-pocus machinery,” sup- posed to work ” without loss to any one,” and consequently unsound.

1 Lord Overstone reprinted in 1857, for private circulation, Price’s and other rare tracts on the national debt and the sinking fund.

Price then turned his attention to the question of the American colonies. He had from the first been strongly opposed to the war, and in 1776 he published a pamphlet entitled Observations on Civil Liberty and the Justice and Policy of the War with America. Several thousand copies of this work were sold within a few days; a cheap edition was soon issued; the pamphlet was ex- tolled by one set of politicians and abused by another; amongst its critics were Dr Markham, archbishop of York, John Wesley, and Edmund Burke; and Price rapidly became one of the best- known men in England. He was presented with the freedom of the city of London, and it is said that his pamphlet had no in- considerable share in determining the Americans to declare their independence. A second pamphlet on the war with America, the debts of Great Britain, and kindred topics followed in the spring of 1777. His name thus became identified with the cause of American independence. He was the intimate friend of Franklin; he corresponded with Turgot; and in the winter of 1778 he was invited by Congress to go to America and assist in the financial administration of the states. This offer he refused from unwillingness to quit his own country and his family connexions. In 1781 he received the degree of D.D. from Yale College.

One of Price’s most intimate friends was Dr Priestley, in spite of the fact that they took the most opposite views on morals and metaphysics. In 1778 appeared a published correspon- dence between these two liberal theologians on the subjects of materialism and necessity, wherein Price maintains, in opposi- tion to Priestley, the free agency of man and the unity and immateriality of the human soul. Both Price and Priestley were what would now vaguely be called ” Unitarians,” though they occupied respectively the extreme right and the extreme left position of that school. Indeed, Price’s opinions would seem to have been rather Arian than Socinian.

The pamphlets on the American War made Price famous. He preached to crowded congregations, and, when Lord Shel- burne acceded to power, not only was he offered the post of private secretary to the premier, but it is said that one of the paragraphs in the king's speech was suggested by him and even inserted in his words. In 1786 Mrs Price died. There were no children by the marriage, his own health was failing, and the remainder of his life appears to have been clouded by solitude and dejection. The progress of the French Revolution alone cheered him. On the 19th of April 1791 he died, worn out with suffering and disease.

The philosophical importance of Price is entirely in the region of ethics. The Review of the Principal Questions in Morals (1757, 3rd ed. revised 1787) contains his whole theory. It Ethical is divided into ten chapters, the first of which, though Theory a small part of the whole, completes his demonstration _

of ethical theory. The remaining chapters investigate details of minor importance, and are especially interesting as showing his relation to Butler and Kant (ch. iii. and ch. vii.). The work is pro- fessedly a refutation of Hutcheson, but is rather constructive than polemical. The theory he propounds is closely allied to that of Cudworth, but is interesting mainly in comparison with the sub- sequent theories of Kant.

I. Right and wrong belong to actions in themselves. By this he means, not that the ethical value of actions is independent of their motive and end (see ch. vi), but rather that it is unaffected by consequences, and that it is more or less invariable for intelligent beings. II. This ethical value is perceived by reason or under- standing (which, unlike Kant, he does not distinguish), which intui- tively recognizes fitness or congruity between actions, agents and total circumstances. Arguing that ethical judgment is an act of discrimination, he endeavours to invalidate the doctrine of the moral sense (see Shaftesbury and Hutcheson). Yet, in denying the importance of the emotions in moral judgment, he is driven back to the admission that right actions must be " grateful " to us ; that, in fact, moral approbation includes both an act of the under- standing and an emotion of the heart. Still it remains true that reason alone, in its highest development, would be a sufficient guide. In this conclusion he is in close agreement with Kant; reason is the arbiter, and right is (1) not a matter of the emotions and (2) not relative to imperfect human nature. Price's main point of differ- ence with Cudworth is that while Cudworth regards the moral criterion as a vbt \y.a or modification of the mind, existing in germ and developed by circumstances, Price regards it as acquired from the contemplation of actions, but acquired necessarily, immediately, intuitively. In his view of disinterested action (ch. iii.) he adds

nothing to Butler. III. Happiness he regards as the only end, conceivable by us, of divine Providence, but it is a happiness wholly dependent upon rectitude. Virtue tends always to happi- ness, and in the end must produce it in its perfect form.

Works. — Besides the above-mentioned, Price wrote an Essay on the Population of E.nglaiid (2nd ed., 1780); two Fast-day Sermons, published respectively in 1779 and 1781; and Observations on the importance of the American Revolution and the means of rendering it a benefit to the World (1784). A complete list of his works is given as an appendix to Dr Priestley's Funeral Sermon. His views on the French Revolution are denounced by Burke in his Reflections on the Revolution in France. Notices of Price's ethical system occur in Mackintosh's Progress of Ethical Philosophy, Jouffroy's Introduction to Ethics, Whewell's History of Moral Philosophy in England; Bain's Mental and Moral Sciences. See also Ethics, and T. Fowler's monograph on Shaftesbury and Hutcheson. For Price's life see memoir by his nephew, William Morgan. (J. M. M.)

PRICE, the equivalent in money for which a commodity is sold or purchased, the value of anything expressed in terms of a medium of exchange (see Value and Wealth). The word is a doublet of " praise," commendation, eulogy, Lat. laus, and " prize," a reward of victory, the ultimate source of which is the Lat. pretium; the Aryan root par-, to buy, is seen in Skr. pana, wages, reward, Gr. irnrpaaneiv, to sell, &c. The O. Fr. pris, mod. prix, was taken from a Late Latin form precium, and had the various meanings of the English, " price," " prize," and " praise "; it was adapted in English as pris or prise and was gradually differentiated in form for the different meanings; thus " praise " was developed from an earlier verbal form preise or preyse in the 15th century; the original meaning survives in " appraise," to set a value to anything, cf. the cur- rent meaning of " to prize," to value highly. " Prize," re- ward, does not appear as a separate form till the 16th century. In " prize-fight," a boxing contest for money, the idea of reward seems clear, but the word appears earlier than the form " prize " in this sense and means a contest or match, and may be a differ- ent word altogether; the New English Dictionary compares the Greek use of &0\ov, literally reward, hence contest. " Prize " in the sense of that which is captured in war, especially at sea, is a distinct word. It comes through the Fr. prise, early Romanic presa for prensa, from Lat. praehendere, to seize, capture. For the international law on the subject see Prize.

PRICHARD, JAMES COWLES (1786-1848), English phy- sician and ethnologist, was born on the nth of February 1786 at Ross in Herefordshire. His parents were of the Society of Friends, and he was educated at home, especially in modern languages and general literature. He adopted medicine as a profession mainly because of the facilities it offered for anthro- pological investigations. He took his M.D. at Edinburgh, afterwards reading for a year at Trinity College, Cambridge, whence, joining the Church of England, he migrated to St John's College, Oxford, afterwards entering as a gentleman commoner at Trinity College, Oxford, but taking no degree in either uni- versity. In 1810 he settled at Bristol as a physician, and in 18 13 published his Researches into the Physical History of Man, in 2 vols., afterwards extended to 5 vols. The central principle of the book is the primitive unity of the human species, acted upon by causes which have since divided it into permanent varieties or races. The work is dedicated to Blumenbach, whose five races of man are adopted. But where Prichard excelled Blumenbach and all his other predecessors was in his grasp of the principle that people should be studied by combining all available characters. One investigation begun in this work requires special mention, the bringing into view of the fact, neglected or contradicted by philologists, that the Celtic nations are allied by language with the Slavonian, German and Pelas- gian (Greek and Latin), thus forming a fourth European branch of the Asiatic stock (which would now be called Indo-European or Aryan). His special treatise containing Celtic compared with Sanskrit words appeared in 183 1 under the title Eastern Origin of the Celtic nations. It is remarkable that the essay by Adolphe Pictet, De I'Affiniti des langues celtiques avec le sanserif, which was crowned by the French Academy and made its author's reputation, should have been published in 1837 in evident

ignorance of the earlier and in some respects stricter inves- tigations of Prichard.

In 1843 Prichard published his Natural History of Man, in which he reiterated his belief in the specific unity of man, point- ing out that " the same inward and mental nature is to be re- cognized in all the races." Prichard may fairly be honoured with the title of the founder of the English branch of the sciences of anthropology and ethnology. In 181 1 he was appointed physician to St Peter's hospital, Bristol, and in 1814 to the Bristol infirmary. In 1822 he published Treatise on Diseases of the Nervous System (pt. i.), and in 1835 a Treatise on Insanity and other Disorders affecting the Mind, in which he advanced the theory of the existence of a distinct mental disease, " moral insanity." In 1842, following up this suggestion, he published On the different forms of Insanity in relation to Jurisprudence designed for the use of Persons concerned in Legal Questions regarding Unsoundness of Mind. In 1845 he was made a com- missioner in

lunacy, and removed to London. He died there three years later, on the 23rd of December, of rheumatic fever. At the time of his death he was president of the Ethnological Society and a fellow of the Royal Society. Among his less important works were : A Review of the Doctrine of a Vital Principle (1829); On the Treatment of Hemiplegia (1831); On the Extinction of some Varieties of the Human Race (1839); Analysis of Egyptian Mythology (18 19).

See Memoir by Dr Thomas Hodgkin (1 798-1 866) in the Journal of the Ethnological Society (Feb. 1849); Memoir read before the Bath and Bristol branch of the Provincial Medical and Surgical Association (March 1849) by Dr J. A. Symonds (Journ. Eth. Soc, (1850) ; Prichard and Symonds in Special Relation to Mental Science, by Dr Hack Tuke (1891).

PRICK POSTS, an old architectural name given sometimes to the queen posts of a roof, and sometimes to the filling in quarters in framing. (See Post and Pane.)

PRIDE, THOMAS (d. 1658), parliamentarian general in the English Civil War, is stated to have been brought up by the parish of St Bride's, London. Subsequently he was a drayman and a brewer. At the beginning of the Civil War he served as a captain under the earl of Essex, and was gradually promoted to the rank of colonel. He distinguished himself at the battle of Preston, and with his regiment took part in the military occupation of London in December 1648, which was the first step towards bringing the king to trial. The second was the expulsion of the Presbyterian and Royalist elements in the House of Commons, for which Pride is chiefly remembered. This, resolved by the army council and ordered by the lord general, Fairfax, was carried out by Colonel Pride's regiment. Taking his stand at the entrance of the House of Commons with a written list in his hand, he caused the arrest or exclusion of the obnoxious members, who were pointed out to him. After about a hundred members had been thus dealt with (" Pride's Purge "), the mutilated House of Commons proceeded to bring the king to trial. Pride was one of the judges of the king and signed his death-warrant, appending to his signature a seal showing a coat of arms. He commanded an infantry brigade under Cromwell at Dunbar and Worcester. He took no con- spicuous part in Commonwealth politics, except in opposing the proposal to confer the kingly dignity on Cromwell. He was knighted by the Protector in 1656, and was also chosen a mem- ber of the new House of Lords. He died at Nonsuch House, an estate which he had bought in Surrey, on the 23rd of October 1658. After the Restoration his body was ordered to be dug up and suspended on the gallows at Tyburn along with those of Cromwell, Ireton and Bradshaw, though it is said that the execution of this sentence was evaded.

Noble, Lives of the Regicides; Bate, Lives of the Prime Actors and Principal Contrivers of the Murder of Charles I. ; Carlyle, Cromwell's Letters and Speeches.

PRIDEAUX, HUMPHREY (1648-1724), English divine and Oriental scholar, was born of good family at Place, in Cornwall, on the 3rd of May 1648, and received his early education at the grammar schools of Liskeard and Bodmin. In 1665 he was placed at Westminster under Busby, and in 1668 went on to

Christ Church, Oxford, where he took his degrees in the following order: B.A., 1672; M.A., 1675; B.D., 1682; and D.D., 1686. His account of the famous Arundel marbles just given to the university appeared in 1676. In 1670 he was appointed to the rectory of St Clement's, Oxford, and Hebrew lecturer at Christ Church, where he continued until February 1686, holding for the last three years the rectory of Bladon with Woodstock. In 1686 he exchanged for the benefice of Saham in Norfolk. The sympathies of Prideaux inclined to Low Churchism in religion and to Whiggism in politics, and he took an active part in the controversies of the day, publishing the following pamph- lets: " The Validity of the Orders of the Church of England " (1688), "Letter to a Friend on the Present Convocation" (1690), "The Case of Clandestine Marriages stated" (1691). Prideaux was promoted to the archdeaconry of Suffolk in Decem- ber 1688, and to the deanery of Norwich (he had long been one of the canons) in June 1702. In 1694 he was obliged, through ill health, to resign the rectory of Saham, and after having held the vicarage of Trowse for fourteen years (1696-17 10) he found himself incapacitated from further parochial duty. He died at Norwich on the 1st of November 1724.

Many of the dean's writings were of considerable value. His Life of Mahomet (1697) was really a polemical tract against the deists and has now no biographical value. Both it and his Directions to Churchwardens (1701) passed through several editions. Even greater success attended The Old and New Testament connected in the History of the Jews (1716), a work which not only displayed but simulated research. Biographical details of his numerous publications and of his manuscripts are given in the Bibliotheca Lornubiensis, 11. 527 r 533, and iii. 1319. A volume of his letters to John tllis, some time under-secretary of state, was edited by £.. M. Inompson for the Camden Society in 1875; they contain a vivid picture of Oxford life after the Restoration. 5 ' An anonymous life (probably by Thomas Birch) appeared in 1748; it was mainly compiled from

information furnished by Prideaux's son Edmund.

PRIE, JEANNE AGNES BERTHELOT DE PLENEUF,

Marquise de (1698-1727), French adventuress, was the daughter of a rich but unscrupulous father and an immoral mother. At the age of fifteen she was married to Louis, marquis de Pne, and went with him to the court of Savoy at Turin, where he was ambassador. She was twenty-one when she returned to France, and was soon the declared mistress of Louis Henri, due de Bourbon. During his ministry (1723-1725) she was in several respects the real ruler of France, her most notable triumph being the marriage of Louis XV. to Marie Leszczynska instead of to Mile de Vermandois. But when, in 1725, she sought to have Bourbon's rival Fleury exiled, her ascendancy came to an end. After Fleury's recall and the banishment of Bourbon to Chantilly Mme de Prie was exiled to Courbepine, where she committed suicide the next year.

See M. H. Thirion, Madame de Prie (Paris, 1905).

PRIE-DIEU, literally « pray God," strictly a prayer desk, primarily intended for private use, but often found in churches of the European continent. It is a small ornamental wooden desk furnished with a sloping shelf for books, and a cushioned kneeling piece. It appears not to have received its present name until the early part of the 17th century. At that period in France a small room or oratory was sometimes known by the same name. A similar form of chair, in domestic furniture, is called prie-dieu by analogy.

PRIEGO DE CORDOBA, a town of southern Spain in the extreme S.E. of the province of Cordova, near the headwaters of the river Guadajoz, and on the northern slope of the Sierra de Pnego. Pop. (1900), 16,902. The district abounds in cattle and mules and agricultural products, especially wine and oil. The local industries also include tanning and manufactures of esparto fabrics, rugs and cotton goods. The oldest church was built in the 13th century and subsequently restored; it has a fine chapel There are ruins of an old castle— Priego having been a fortified city of the Moors which was captured by the Christians in 1226, lost again, and finally retaken in 1407.

PRIENE (mod. Samsun kale), an ancient city of Ionia on the foot-hills of Mycale, about 6 m. N. of the Maeander. It was

formerly on the sea coast, but now lies some miles inland. It is said to have been founded by Ionians under Aegyptus, a son of Neleus. Sacked by Ardys of Lydia, it revived and attained great prosperity under its " sage," Bias, in the middle of the 6th century Cyrus captured it in 545; but it was able to

send twelve ships to join the Ionian revolt (500-494). Disputes with Samos, and the troubles after Alexander's death, brought I nene low, and Rome had to save it from the kings of Pergamum and Cappadocia in 155. Orophernes, the rebellious brother of the Cappadocian king, who had deposited a treasure there and recovered it by Roman intervention, restored the temple of Athena as a thankoffering. Under Roman and Byzantine dominion Pnene had a prosperous history. It passed into Moslem hands late in the 13th century. The ruins, which lie on successive terraces, were the object of missions sent out by the English Society of Dilettanti in 1765 and 1868, and have been thoroughly laid open by Dr Th. Wiegand (1895-1899) for the Berlin Museum. The city, as rebuilt in the 4 th and 3rd centuries, was laid out on a rectangular scheme. It faced south its acropolis rising nearly 700 ft. behind it. The whole area was enclosed by a wall 7 ft. thick with towers at intervals and three principal gates. On the lower slopes of the acropolis was a shrine of Demeter. The town had six main streets, about 20 ft wide running east and west and fifteen streets about 10 ft wide crossing at right angles, all being evenly spaced; and it was thus divided into about 80 insulae. Private houses were apportioned four to an insula. The systems of water-supply and drainage can easily be discerned. The houses present many analogies with the earliest Pompeian. In the western half of the city on a high terrace north of the main street and approached by a fine stairway, was the temple of Athena Polias, a hexastyle peripterial Ionic structure built by Pythias, the architect of the Mausoleum Under the basis of the statue of Athena were found in 1870 silver tetradrachms of Orophernes, and some jewelry, probably deposited at the time of the Cappadocian restoration. Fronting the main street is a series of halls, and on the other side is the fine market place. The municipal buildings, Roman gymnasium, and well preserved theatre lie to the north, but, like all the other public structures, in the centre of the plan. Temples of Isis and Asclepms have been laid bare. At the lowest point on the south, within the walls, was the large stadium, con- nected with a gymnasium of Hellenistic times.

Aj;? ee S ? c!et y of Dilettanti, Ionian Antiquities (1821), vol ii • Th Wiegand and H. Schrader, Priene (1904); on inscriptions ' (360) see Hiller von Gartnngen, Inschriften von Priene (Berlin; 1907) with collection of ancient references to the city. (D. G. H.)

ˆ PRIEST (Ger. Priester, Fr. pretre), the contracted form of presbyter ' {irpˆhnpos, "elder"; see Presbyter), a name of office m the early Christian Church, already mentioned in tiie New Testament. But in the English Bible the presbyters of the New Testament are called " elders," not " priests "; the latter name is reserved for ministers of pre-Christian religions, the Semitic B'Jr£ (kdh&mm, sing, kohen) and on-? (kemarim), or the Greek lepels. The reason of this will appear more clearly m the sequel; it is enough to

observe at present that, before our English word was formed, the original idea of a presbyter had been overlaid with others derived from pre-Christian priest- hoods, so that it is from these and not from the etymological force of the word that we must start in considering historically what a priest is. The theologians of the Greek and Latin churches expressly found the conception of a Christian priest- hood on the hierarchy of the Jewish temple, while the names by which the sacerdotal character is expressed— Upeh, sacerdos —originally designated the ministers of sacred things in Greek and Roman heathenism, and then came to be used as transla- tions into Greek and Latin of the Hebrew kohen. Kohen Uptte sacerdos, are, in fact, fair translations of one another; they all denote a minister whose stated business was to perform on behalf of the community, certain public ritual acts, particularly sacrifices, directed godwards. Such ministers or priests existed in all the great religions of ancient civilization. The term

: ‘ priest ” is sometimes taken to include ” sorcerer,” but this use is open to criticism and may produce confusion.

The close inter-relation which existed in primitive society between magic, priesthood and kingship has been indicated by Frazer in his Early History of the Kingship. His remarks throw some light on the early character of priesthood as well as king- ship. ” When once a special class of sorcerers has been segre- gated from the community and entrusted by it with the dis-charge of duties on which the public safety and welfare are believed to depend, these men gradually rise to wealth and power till their leaders blossom out into sacred kings.” Ac- cording to Frazer’s view, ” as time goes on the fallacy of magic becomes more and more apparent and is slowly displaced by religion; in other words the magician gives way to the priest. Hence the king starting as a magician tends gradually to exchange the practice of magic for the functions of prayer and sacrifice.” We are not concerned here with the debatable question whether magic preceded religion. Probably magic was always accompanied by some primitive form of animism whether the Melanesian mana or fetishism (see Dr Haddon’s Magic and Fetishism, pp. 58-62, 64-90).

The investigations which have been carried on in recent years by King, Tallquist and Zimmern, as well as by Briinnow and Craig, on the magic and ritual of Babylonia and Assyria have been fruitful of results. The question, however, remains to be settled how far the officials and their functions, which in the much more highly developed civilization of

Babylonia came to be differentiated and specialized, can be stiictly included under the functions of priesthood. The answer to this question will be in many cases negative or affirmative according to our strict adherence or the reverse to the definition of the priest set forth above as " a minister whose stated business it was to perform on behalf of the community certain ritual acts, in some cases sacrifices (or the recitation of prayers), directed Godwards." On the other hand the seer, diviner and prophet is a minister whose function it is to communicate God's will or word to man. This is not a distinction which governs Zimmern and other writers. Our chief source of information is Zimmern's Beitrage zur Kenntniss der Babylon: Religion, pp. 81-05, from which Lagrange in his Etudes sur les religions semitiques 1 has chiefly derived his materials (ch. vi. p. 222 sqq.) respecting Babylonia and Assyria. Zimmern's results are summarized in K.A.T 3 . p. 589 sqq. Here we find magic and soothsaying closely intertwined with priestly functions as, we shall see, was the case in early Hebrew pre-exilian days with the Kohen. It must be borne in mind that primitive humanity is not governed by logical distinctions. Among the Babylonians and Assyrians the baru (from baru to see, inspect) was a sooth- saying priest who was consulted whenever any important undertaking was proposed, and addressed his inquiries to Samas the sun god (or Adad) as bti biri or lord of the oracle (accompanied by the sacrifice of lambs). The signs were usually obtained from the inspection of the liver (according to Johns, that of the lamb that was sacrificed): or it took place through birds; hence the name in this case given to the baru of dagil issure " bird in- spector." Johns, however, is disposed to regard him as a distinct functionary. Sometimes divination took place through vessels filled with water and oil (see Omen and Divination).

As contrasted with the bam or soothsaying priest, as he is called by Zimmern, we have the asipu, who was the priest- magician who dealt in conjurations (siptu), whereby diseases were removed, spells broken, or in expiations whereby sins were expiated. Tallquist's edition of the MaklA series of incantations and his explanations of the ritual, and also the publications by Zimmern of the Surpu series of tablets in his Beitrage have rendered us familiar with the functions of the asipu. See article " Magic " in Hastings's Diet. Bible, where examples are given of incantations with magical by-play. Also compare Jastrow's Religion of Babylonia (189S), ch. xvi., " The Magical Texts," where a fuller treatment will be found. Now, as the conjura- tions were addressed to the deity, asipu, according to the definition given above, comes more reasonably under the category

of priest. But the priest belongs to the realm of religion proper, which involves a relation of dependence on the superior power, whereas the asipu belongs to the realm of magic, which is coercive and seeks " to constrain the hostile power to give way " (Lagrange).

There was also a third kind of priest called the zammaru, whose function it was to sing hymns.

In the earlier period of the Assyrian monarchy we find the king holding the office of pa-te-si or isakku or (more definitely) the sangu, i.e. priest of Asur, the patron-deity of Assyria. This high-priestly office towaids the tutelary deity of the nation appears to have belonged to the king by virtue of his royal rank. In Babylonia under the last empire (except in the case of Nebuchadrezzar, who calls himself patesi siri, "exalted priest," K.I.B. iii. p. 60) no such high-priestly function attached to the king, for in Babylonia the priesthoods were endowed with great wealth and power, and even the king stood in awe of them (see Johns, Babylonian and Assyrian Laws, Contracts and Letters, p. 212 sqq). These powerfully-organized priesthoods, as well as the elaborate nature of their ritual and apparatus of worship, must have deeply and permanently impressed the exiled Jewish community. Thus arose the more developed system of Ezekiel's scheme (xl.-xlviii.) and of the Priestercodex and the high dignity which became attached to the person of the High Priest (reflected in the narrative of Uzziah's leprosy in 2 Chron. xxvi. 16-20). Other parallels to the sacer-dotal system of the Priestercodex may here be noted. (1) According to Zimmern the baru and the asipu formed close gilds and the office passed from father to son. This is certainly true of the langutu or priesthood, which was connected with a special family attached to a particular temple and its worship. (2) Johns also points out the existence of the rab-baru, chief soothsayer, and the rab-masmasu or chief magician. (3) Bodily defects (as squinting, lack of teeth, maimed finger) was disquali- fications for priesthood (cf. Lev. xxi. 17 sqq.). (4) In the ritual tablets for the asipu published in Zimmern's Beitrage, No. 26, col. iii. 19 sqq., we read " that the masmasu (priest's magician) is to pass forth to the gateway, sacrifice a sheep in the palace portal, and to smear the threshold and posts of the palace gateway right and left with the blood of the lamb." We are reminded of Exod. xii. 7 (P). (5) The Babylonian term kuppuru (infin. Pael) is used of the magician-priest or asipu and means " wipe out." This confirms the view that the Hebrew kipper, which appears to be a late word (specially employed in Ezek, and P.), originally had the meaning which belongs to the Aramaic viz. " wipe off " and not " cover " as in Arabic. Zimmern thinks that the meaning " atone " " expiate," which belongs to the Pael form of the root k-p-r in both Aramaic and Arabic was borrowed from the Babylonian (cf. Driver's note in "Deuteronomy," Int. Commentary, p. 425 sqq, and especially his article " Propitiation " in Hastings's Diet. Bible). The Rev. C. H. W. Johns, to whom reference has already been made, demurs (in a communication to the writer) to the fusion of the priest and the magician, and to the custom of " calling every unknown official a priest or a eunuch." " If a Babylonian said sangu he meant one thing, by

issipu another, and by ramku another. I do not deny that the same man might unite all three functions in one person. Thus a sangu had a definite share in the offerings, a masmasu a different share. It seems to me that the priests belonged to the old families who were descended from the original tribe or clan, &c, that founded the city, and they could not admit outsiders save by adoption into the family. If a new god had a temple set up he had a new set of priests, but this priesthood descended in its line, e.g. a Samas priest did not beget a man who became a priest of NabO. Further ' priest ' implied a peculiar relation to the god. A soothsayer was a general practitioner in his art, not attached to any one god or temple. Anyone could be a ramku who actually poured out libations; that a priest usually did it was no exception to that rule. The priest was only a sort of specialist in the practice. The priest also offered prayer, interceded, &c. I cannot see that he taught. An oracle of the god came through him. If the modus operandi was akin to soothsaying it was only because that special form of soothsaying was peculiar to the particular cult of that god, and even this as a secondary development. I do not think that early priests received oracles save in dreams, &c. That magic early invaded religion is possible, but there are many traces of its being a foreign element. This is not usually pointed out."

*3*8*

PRIEST

Among the ancient Egyptians the local god was the protector and lord of the district. Consequently it was the interest and duty of the inhabitants to maintain the cultus of the patron- deity of their city who dwelt in their midst. Moreover, in the earlier times we find the prince of the nome acting as the High Priest of the local god, but in course of time the state, repre- sented by the king, began to an ever-increasing degree to take oversight over the more important local cults. Thus we find that the Egyptian monarch was empowered to exercise priestly functions before all the gods. We constantly see him in the wall-paintings portrayed as a priest in the conventional attitudes before the images of the gods. In the chief sanctuaries the chief priests possessed special privileges, and it is probable that those in the immediate entourage of the king were elected to these positions. The highest nobility in the nome sought the honour of priesthood in the service of the local deity. One special class called kher heb were charged with reciting the divine formulae, which were popularly held to possess magical virtue. In the middle empire (Vllth to XHth Dynasties) the lay element main- tains its position in religious cultus despite its complexity. But under the new empire (Dynasties X VIII th and following) the pro- fessional priest had attained to ominous power. The temples possessed larger estates and became more wealthy. Priests increased in

number and were divided into ranks, and we find them occupying state offices, just as in Babylonia the priest acts as judge or inspector of canals (Johns, Babyl. and Assyr. Laws, &c, p. 213).

We now turn to the priesthood as we find it in ancient Greece and Italy. Homer knows special priests who preside over ritual acts in the temples to which they are attached; but his kings also do sacrifice on behalf of their people. The king, in fact, both in Greece and in Rome, was the acting head of the state religion, and when the regal power came to an end his sacred functions were not transferred to the ordinary priests, but either they were distributed among high officers of state, as archons and prytanes, or the title of " king " was still preserved as that of a religious functionary, as in the case of the rex sacrorum at Rome and the archon basileus at Athens. In the domestic circle the union of priesthood and natural headship was never disturbed; the Roman paterfamilias sacrificed for the whole family. On the other hand, gentes and phralriae, which had no natural head, had special priests chosen from their members; for every circle of ancient society, from the family up to the state, was a religious as well as a civil unity, and had its own gods and sacred rites. The lines of religious and civil society were identical, and, so long as they remained so, no antagonism could arise between the spiritual and the temporal power. In point of fact, in Greece and Rome the priest never attained to any considerable independent importance; we cannot speak of priestly power and hardly even of a distinct priestly class. In Greece the priest, so far as he is an independent functionary and not one of the magistrates, is simply the elected or hereditary minister of a temple charged with " those things which are ordained to be done towards the gods " (see Aristotle, Pol. vi. 8), and remunerated from the revenues of the temple, or by the gifts of worshippers and sacrificial dues. The position was often lucrative and always honourable, and the priests were under the special protection of the gods they served. But their purely ritual functions gave them no means of establishing a considerable influence on the minds of men, and the technical knowledge which they possessed as to the way in which the gods could be acceptably approached was neither so intricate nor so mysterious as to give the class a special importance. The funds of the temples were not in their control, but were treated as public moneys. Above all, where, as at Athens, the decision of questions of sacred law fell not to the priests but to the college of iˆrtyrjTai, one great source of priestly power was wholly lacking. There remains, indeed, one other sacred function of great importance in the ancient world in which the Greek priests had a share. As man approached the gods in sacrifice and prayers, so too the gods declared themselves to men by divers signs and tokens, which it was possible to read by the

art of Divination (q.v.). In many nations divination and priest- hood have always gone hand in hand; at Rome, for example, the augurs and the XV

viri sacrorum, who interpreted the Sibylline books, were priestly colleges. In Greece, on the other hand, divination was not generally a priestly function, but it did belong to the priests of the Oracles (see Oracle). The great oracles, however, were of Panhellenic celebrity and did not serve each a particular state, and so in this direction also the risk of an independent priestly power within the state was avoided. 1

In Rome, again, where the functions of the priesthood were politically much more weighty, where the technicalities of religion were more complicated, where priests interpreted the will of the gods, and where the pontiffs had a most important jurisdiction in sacred things, the state was much too strong to suffer these powers to escape from its own immediate control : the old mon- archy of the king in sacred things descended to the inheritors of his temporal power; the highest civil and religious functions met in the same persons (cf. Cic. De dom. i. 1); and every priest was subject to the state exactly as the magistrates were, referring all weighty matters to state decision and then executing what the one supreme power decreed. And it is instructive to observe that when the plebeians extorted their full share of political power they also demanded and obtained admission to every priestly college of political importance, to those, namely, of the pontiffs, the augurs, and the XV viri sacrorum. The Romans, it need hardly be said, had no hereditary priests. 2

We can only glance briefly at the ancient religions of India (Aryan). " In historical times the priesthood is rigidly confined to members of the Brahman caste, who are regarded as the repre- sentatives of God on earth. But there are indications that at an earlier date the Kshatriya or warrior caste often became priests. The power of the priesthood began with the delegation by the king of his sacrificial duties to a ' president ' (purohita). This power grew with the growing importance of the sacrifice and the complication of its ceremonial. In the post-Vedic period ' right ' or ' wrong ' simply means the exact performance or the neglect, whether intentional or unintentional — of all the details of a prescribed ritual, the centre of which was the sacri- fice. At this period the priestly caste gained its unbounded power over the minds of men " (Professor Rapson). For further details as to the development of the priestly caste and wisdom in India the reader must refer to Brahminism; here it is enough to observe that among a religious people a priesthood which forms a close and still more an hereditary corporation, and the assistance of which is indispensable in all religious acts, must rise to practical supremacy in society except under the strongest form of despotism, where the sovereign is head of the Church as well as of the state.

Among the Zoroastrian Iranians, as among the Indian Aryans, the aid of a priest to recite the sacrificial liturgy was necessary at every offering

(Herod, i. 132), and the Iranian priests (athra- vans, later Magi) claimed, like the Brahmans, to be the highest order of society; but a variety of conditions were lacking to give them the full place of their Indian brethren. Zoroas- trianism is not a nature religion, but the result of a reform which never, under the old empire, thoroughly penetrated the masses; and the priesthood, as it was not based on family tradi- tion, did not form a strict hereditary caste. It was open to any one to obtain entrance into the priesthood, while on the other hand it was only as a priest that he could exercise sacerdotal functions, for these were strictly reserved to priests. Accord- ingly the clergy formed a compact hierarchy not inferior in influence to the clergy of the Christian middle ages, had great power in the state, and were often irksome even to the great king.

1 For the Greek priests, see, besides Schomann and other works on Greek antiquities, Newton, Essays on Art and Archaeology, p. 136 seq. (from epigraphic material). See also for Greek as well as Roman priest, art. " Sacerdos " (Sacerdotium) in Warre Cornish's Concise Diet, of Greek and Roman Antiquities.

2 On the Roman priests, see in general Marquardt, Rbmische Slaatsverwaltung, vol. iii., and for the pontiffs in particular the art. " Sacerdos " in Warre Cornish's Concise Diet., also Pontifex-.

But the best established hierarchy is not so powerful as a caste, and the monarchs had one strong hold on the clergy by retaining the patronage of great ecclesiastical places, and another in the fact that the Semitic provinces on the Tigris, where the capital lay, were mainly inhabited by men of other faith. 1

The duties of the priests were not restricted to the services of the temple, but they also took part in the household cults. The ritual had a mechanical character and was by no means attractive. It is impossible to enter into the manifold details of the fire cultus which forms the main part of the worship in the Avesta. They belong to an earlier period than the Zoroas- trian, nor was this fire cultus restricted to the temples. Portable fire altars were carried about and the worship could be celebrated in any spot. It may be noted that in all the ceremonies in the religion of the Avesta, incantations, prayers and confessions play a very large part. The prevailing element in the incanta- tions consists in the exorcism of devils. In fact, the Persian religion throughout all its multitude of purifications, observances and expiations was a constant warfare against impurity, death and the devil.

Amid all the ceremonialism of its priesthood there were also high ideals set forth in Zoroastrian religion of what a priest should be. Thus we read in Vendidad xviii., " Many there be, noble Zarathustra, who bear the mouth bandage, who have yet not girded their loins with the law. If such a one says ' I am an Athravan ' he lies, call him not Athravan, noble Zarathustra, said Ahura Mazda, but thou shouldst call him priest, noble Zarathustra, who sits awake the whole night through and yearns for holy wisdom that enables man to stand on death's bridge fearless and with happy heart, the wisdom whereby he attains the holy and glorious world of paradise."

In this rapid glance at some of the chief priesthoods of anti- quity we have hitherto passed over the pure Semites, whose priesthoods call for closer examination because of the profound influence which one of them — that of the Jews — has exercised on Christianity, and so on the whole history of the modern world. But before we proceed to this it may be well to note one or two things that come out by comparison of the systems already before us. Priestly acts — that is, acts done by one and accepted by the gods on behalf of many — are common to all antique religions, and cannot be lacking where the primary subject of religion is not the individual but the natural com- munity. But the origin of a separate priestly class, distinct from the natural heads of the community, cannot be explained by any such broad general principle; in some cases, as in Greece, it is little more than a matter of convenience that part of the religious duties of the state should be confided to special ministers charged with the care of particular temples, while in others the inter- vention of a special priesthood is indispensable to the validity of every religious act, so that the priest ultimately becomes a mediator and the vehicle of all divine grace. This position, we see, can be reached by various paths: the priest may become indispensable through the growth of ritual observances and precautions too complicated for a layman to master, or he may lay claim to special nearness to the gods on the ground, it may be, of his race, or, it may be, of habitual practices of purity and asceticism which cannot be combined with the duties of ordinary life, as, for example, celibacy was required of priestesses of Vesta at Rome. But the highest developments of priestly influence are hardly separable from something of magical superstition, the opus operatum of the priest has the power of a sorcerer's spell. The strength of the priesthood in Chaldaea and in Egypt stands plainly in the closest connexion with the survival of a magical element in the state religion, and Rome, in like manner, is more priestly than Greece, because it is more superstitious. In most cases, however, where an ancient civilization shows us a strong priestly system we are unable to make out in any detail the steps by which that system was elaborated; the clearest case perhaps is the priesthood of the Jews, which is not less interesting from its origin and growth

‘ Cf. especially Noldeke’s Tabari, p. 450 seq.

than from the influence exerted by the system long after the priests were dispersed and their sanctuary laid in ruins.

Among the nomadic Semites, to whom the Hebrews belonged before they settled in Canaan, there has never been any developed priesthood. The acts of religion partake of the general simplicity of desert life; apart from the private worship of household gods and the oblations and salutations offered at the graves of departed kinsmen, the ritual observances of the ancient Arabs were visits to the tribal sanctuary to salute the god with a gift of milk, first-fruits or the like, the sacrifice of firstlings and vows (see Nazarite and Passover), and an occasional pilgrimage to discharge a vow at the annual feast and fair of one of the more distant holy places (see Mecca). These acts required no priestly aid; each man slew his own victim and divided the sacrifice in his own circle ; the share of the god was the blood which was smeared upon or poured out beside stone {nosb, ghabghab) set up as an altar or perhaps as a symbol of the deity. It does not appear that any portion of the sacrifice was burned on the altar, or that any part of the victim was the due of the sanctuary. We find therefore no trace of a sacrificial priesthood, but each temple had one or more doorkeepers {sadin, hajib), whose office was usually hereditary in a certain family and who had the charge of the temple and its treasures. The sacrifices and offerings were acknowledgments of divine bounty and means used to insure its continuance; the Arab was the ” slave ” of his god and paid him tribute, as slaves used to do to their masters, or subjects to their lords; and the free Bedouin, trained in the solitude of the desert to habits of absolute self-reliance, knew no master except his god, and acknowledged no other will before which his own should bend. The voice of the god might be uttered in omens which the skilled could read, or conveyed in the inspired rhymes of soothsayers, but frequently it was sought in the oracle of the sanctuary, where the sacred lot was administered for a fee by the sadin. The sanctuary thus became a seat of judgment, and here, too, compacts were sealed by oaths and sacrificial ceremonies. These institutions, though known to us only from sources belonging to an age when the old faith was falling to pieces, are certainly very ancient. The fundamental type of the Arabic sanctuary can be traced through all the Semitic lands, and so appears to be older than the Semitic dispersion ; even the technical terms are mainly the same, so that we may justly assume that the more developed ritual and priesthoods of the settled Semites sprang from a state of things not very remote from what we find among the heathen Arabs. Now among the Arabs, as we have seen, ritual service is the affair of the individual, or of a mass of individuals gathered in a great feast, but still doing worship each for himself and his own private circle ; the only public aspect of religion is found in connexion with divina- tion and the oracle to which the

affairs of the community are sub- mitted. In Greece and Rome the public sacrifices were the chief function of religion, and in them the priesthood represented the ancient kings. But in the desert there is no king and no sovereignty save that ofthe divine oracle, and therefore it is from the soothsayers or ministers of the oracle that a public ministry of religion can most naturally spring. With the beginning of a settled state the sanctuaries must rise in importance and all the functions of revela- tion will gather round them. A sacrificial priesthood will arise as the worship becomes more complex (especially as sacrifice in antiquity is a common preliminary to the consultation of an oracle), but the public ritual will still remain closely associated with oracle or divination, and the priest will still be, above all things, a revealer. That this was what actually happened may be inferred from the fact that the Canaanite and Phoenician name for a priest (kohen) is identical with the Arabic kdhin, a " soothsayer." Soothsaying was no modern importation in Arabia; its characteristic form- — a monotonous croon of short rhyming clauses — is the same as was practised by the Hebrew " wizards who peeped and muttered " in the days of Isaiah, and that this form was native in Arabia is clear from its having a technical name (saj'), which in Hebrew survives only in derivative words with modified sense. 2 The kdhin, therefore, is not a degraded priest but such a soothsayer as is found in most primitive societies, and the Canaanite priests grew out of these early revealers. In point of fact some form of revelation or oracle appears to have existed in every great shrine of Canaan and Syria, 8 and the importance of this element in the cultus may be measured from the fact that at Hierapolis it was the charge of the chief priest, just as in the Levitical legislation. But the use of " kahin ' for " priest " in the Canaanite area points to more than this: it is connected with the orgiastic character of Canaanite religion. The soothsayer differs from the priest of an oracle by giving his revelation under excitement and often in a frenzy allied to madness. In natural soothsaying this frenzy is the neces sary physical accompaniment of an afflatus which, though it seems supernatural to a rude people, is really akin to poetic inspiration.

2 Meshugga', 2 Kings ix. 11, Jer. xxix. 26 — a term of contempt applied to prophets. (See Hebrew Religion.)

8 For examples, see Palmyra and Philistines; see further, Lucian, De dea syria, 36, for HierapoIiS; Zosimus i. 58, for Aphaca; Pliny, H. N. xxxvii. 58 (compared with Lucian, ut supra, and Movers, Phoenizier, i. 655), for the temple of Melkart at Tyre.

But it is soon learned that a similar physical state can be pro- duced artificially, and at the Canaanite sanctuaries this was done on a large scale. We see from I Kings xviii., 2 Kings x., that great Baal temples had two classes of ministers, kohanlm and nebhnm, priests " and " prophets," and as the former bear a name which primarily denotes a soothsayer, so the latter are also a kind of priests who do sacrificial service with a wild ritual of their own How deeply the orgiastic character was stamped on the priesthoods of north Semitic nature-worship is clear from Greek and Roman accounts, such as that of Appuleius (Metam. bk. viii.).

The Hebrews, who made the language of Canaan their own, took also the Canaanite name for a priest. But the earliest forms of Hebrew priesthood are not Canaanite in character; the priest, as he appears in the older records of the time ot the Judges, Eli at Shiloh, Jonathan in the private temple of Micah and at Dan, is much liker the sadin than the kahin. 1 The whole structure of Hfeorew society at the time of the conquest was almost precisely th«t of a federation of Arab tribes, and the religious ordinances are scu/cely distinguishable from those of Arabia, save oniy that the great deliverance of the Exodus and the period when Moses, sitting in judgment at the sanctuary of Kadesh, had for a whole generation impressed the sovereignty of Jehovah on all the tribes, had created an idea of unity between the scattered settlements in Canaan such as the Arabs before Mahomet never had. But neither in civil nor in religious life was this ideal unity expressed in fixed institutions, the old individualism of the Semitic nomad still held its ground. Thus the firstlings, first-fruits and vows are still the free gift of the individual which no human authority exacts, and which every householder presents and

consumes with his circle in a sacrificial feast without priestly aid. As in Arabia, the ordinary sanctuary is still a sacred stone ("tJP = nosh) set up under the open heaven, and here the blood of the victim is poured out as an offering to God (see especially I Sam. xiv. 34, and cf. 2 Sam. xxiii. 16, 17). The priest has no place in this ritual; he is not the minister of an altar, 2 but the guardian of a temple, such as was already found here and there in the land for the custody of sacred images and palladia or other consecrated things (the ark at Shiloh, I Sam. iii. 3; images in Micah's temple, Judges xvii. 5. ; Goliath's sword lying behind the " ephod " or plated image at Nob, I Sam. xxi. 9 ; no doubt also money, a sin the Canaanite temple at Shechem, Judges ix. 4). Such treasures required a guardian; but, above all, wherever there was a temple there was an oracle, a kind of sacred lot, just as in Arabia (1 Sam. xiv. 41, Sept.), which could only be drawn where there was an " ephod " and a priest (1 Sam. xiv. 18, Sept., and xxiii. 6 seq.). The Hebrews had already possessed a tent-temple and oracle of this kind in the wilderness (Exod. xxxiii. 7 seq.), of which Moses was the priest and Joshua the aedituus, and ever since that time the judgment of God through the priest at the sanctuary had a greater weight than the word of a seer, and was the ultimate solution of every controversy and claim (1 Sam. ii. 25; Exod. xxi. 6, xxii. 8, 9, where for " judge," " judges," of A.V. read " God " with R.V.). The temple at Shiloh, where the ark was preserved, was the lineal descendant of the Mosaic sanctuary

— for it was not the place but the palladium and its oracle that were the essential thing — and its priests claimed kin with Moses himself. In the divided state of the nation, indeed, this sanctuary was hardly visited from beyond Mt Ephraim; and every man or tribe that cared to provide the necessary apparatus (ephod, teraphim, &c.) and hire a priest might have a temple and oracle of his own at which to consult Jehovah (Judges xvii., xviii.); but there was hardly another sanctuary of equal dignity. The priest of Shiloh is a much greater person than Micah's priest Jonathan; at the great

1 This appears even in the words used as synonyms for " priest " mso, >pn "cr, which exactly corresponds to sadin and hdjib. That the name of ra was borrowed from the Canaanites appears certain, for that out of the multiplicity of words for soothsayers and the like common to Hebrew and Arabic (either formed from a common root or expressing exactly the same idea — '}iry, ' arraf ; ■on, habir; nirr, .txn, hazi; op'p, cf. istiksam) the two nations should have chosen the same one independently to mean a priest is, in view of the great difference in character between old Hebrew and Canaanite priesthoods, inconceivable. Besides J"Q Hebrew has the word "C3 (pi. dhds), which, however, is not applied to priests of the national religion. This, in fact, is the old Aramaic word for a priest (with suffixed article, kumra). Its origin is obscure. In the Aramaic papyri discovered near Assouan (Syene) 103 is priest of the gods (Cowley and Sayce, Pap. E. line 15), presumably Khnum and Set; and in Sachau's Pap. I. line 5, n'idd definitely mean the priests of the god Hnflb. This coincides with the Hebrew use of the term as idolatrous priests, Hos. x. 5; Zeph. i. 4; 2 Kings xxiii. 5.

2 It is not clear from I Sam. ii. 15 whether even at Shiloh the priest had anything to do with sacrifice, whether those who burned the fat were the worshippers themselves or some subordinate ministers of the Temple. Certainly it was not the " priest " who did so, for he in this narrative is always in the singular. Hophni and Phinehas are not called priests, though they bore the ark and so were priests in the sense of Josh. iii.

feasts he sits enthroned by the doorway, preserving decorum among the worshippers ; he has -certain legal dues, and, if he is disposed to exact more, no one ventures fo resist (1 Sam. ii. 12 seq., where the text needs a

slight correction). The priestly position of the family survived the fall of Shiloh and the capture of the ark, and it was members of this house who consulted Jehovah for the early kings until Solomon deposed Abiathar. Indeed, though priesthood was not yet tied to one family, so that Micah's son, or Eleazar of Kirjath-jearim (1 Sam. vii. 1), or David's sons (2 Sam. viii. 18) could all be priests, a Levite — that is, a man of Moses' tribe — was already preferred for the office elsewhere than at Shiloh (Judges xvii. 13), and such a priest naturally handed down his place to his posterity (Judges xviii. 30).

Ultimately, indeed, as sanctuaries were multiplied and the priests all over the land came to form one well-marked class, " Levite " and legitimate priest became equivalent expressions, as is explained in the article Levites. But between the priesthood of Eli at Shiloh or of Jonathan at Dan and the priesthood of the Levites as described in Deut. xxxiii. 8 seq. there lies a period of the inner history of which we know almost nothing. It is plain that the various priestly colleges regarded themselves as one order, that they had common traditions of law and ritual which were traced back to Moses, and common interests which had not been vindicated without a struggle (Deut., ut supra). The kingship had not deprived them of their functions as fountains of divine judgment (cf. Deut. xvii. 8 seq.); on the contrary, the decisions of the sanctuary had grown up into a body of sacred law, which the priests administered according to a traditional precedent. According to Semitic ideas the declaration of law is quite a distinct function from the enforcing of it, and the royal executive came into no collision with the purely declaratory functions of the priests. The latter, on the contrary, must have grown in importance with the unification and progress of the nation, and in all probability the consolidation of the priesthood into one class went hand in hand with a consolidation of legal tradition. And this work' must have been well done, for, though the general corruption of society at the beginning of the Assyrian period was nowhere more conspicuous than at the sanctuaries and among the priesthood, the invective of Hos. iv. equally with the eulogium of Deut. xxxiii. proves that the position which the later priests abused had been won by ancestors who earned the respect of the nation as worthy representatives of a divine Torah.

The ritual functions of the priesthood still appear in Deut. xxxiii. as secondary to that of declaring the sentence of God, but they were no longer insignificant. With the prosperity of the nation, and especially through the absorption of the Canaanites and of their holy places, ritual had become much more elaborate, and in royal sanctuaries at least there were regular public offerings main- tained by the king and presented by the priests (cf. 2 Kings xvi. 15). Private sacrifices, too, could hardly be offered without some priestly aid now that ritual was more complex; the provision of Deut. xviii.

as to the priestly dues is certainly ancient, and shows that besides the tribute of first-fruits and the like the priests had a fee in kind for each sacrifice, as we find to have been the case among the Phoenicians according to the sacrificial tablet of Marseilles. Their judicial functions also brought profit to the priests, fines being exacted for certain offences and paid to them (2 Kings xii. 16; Hos. iv. 8; Amos ii. 8). The greater priestly offices were therefore in every respect very important places, and the priests of the royal sanctuaries were among the grandees of the realm (2 Sam. viii. 18; 2 Kings x. II, xii. 2); minor offices in the sanctuaries were in the patronage of the great priests and were often miserable enough, 3 the petty priest depending largely on what " customers " he could find (2 Kings xii. 7 [8] ; Deut. xviii. 8). That at least the greater offices were hereditary — as in the case of the sons of Zadok, who succeeded to the royal priesthood in Jerusalem after the fall of Abiathar — was almost a matter of course as society was then con- stituted, but there is not the slightest trace of an hereditary hierarchy officiating by divine right, such as existed after the exile. The sons of Zadok, the priests of the royal chapel, were the king's servants as absolutely as any other great officers of state; they owed their place to the fiat of King Solomon, and the royal will was supreme in all matters of cultus (2 Kings xii., xvi. 10 seq.) ; indeed the monarchs of Judah, like those of other nations, did sacrifice in per.'on when they chose down to the time of the captivity (1 Kings ix. 25; 2 Kings xvi. 12 seq.; Jer. xxx. 21). And as the sons of Zadok had no divine right as against the kings, so too they had no claim to be more legitimate than the priests of the local sanctuaries, who also were reckoned to the tribe which in the 7th century B.C. was recognized as having been divinely set apart as Jehovah's ministers in the days of Moses (Deut. x. 8, xviii. I seq.).

The steps which prepared the way for the post-exile hierarchy, the destruction of the northern sanctuaries and priesthoods by the Assyrians, the polemic of the spiritual prophets against the corrup- tions of popular worship, which issued in the reformation of Josiah, the suppression of the provincial shrines of Judah and the transference of their ministers to Jerusalem, the successful resistance of the sons

3 See 1 Sam. ii. 36, a passage written after the hereditary dignity of the sons of Zadok at Jerusalem was well established.

of Zadok to the proposal to share the sanctuary on equal terms with these new-comers, and the theoretical justification of the degradation of the latter to the position of mere servants in the Temple supplied by Ezekiel

soon after the captivity, need not here be dealt with. Further details respecting priestly offices and hereditary

Criesthoods and the relation of Aaronids to Zadokids will be found riefly discussed in Ency. Bib. vol. iii. cols. 3843-3845. Cf . Hastings's Diet. Bible, iv. 72-75 ; Camb. Bib. Essays (1909), pp. 100 seq., 112 seq.

It is instructive to observe how differently the prophets of the 8th century speak of the judicial or "teaching" functions of the priests and of the ritual of the great sanctuaries. For the latter they have nothing but condemnation, but the former they acknow- ledge as part of the divine order of the state, while they complain that the priests have prostituted their office for lucre. In point of fact the one rested on old Hebrew tradition, the other had taken shape mainly under Canaanite influence, and in most of its features was little more than the crassest nature-worship. In this respect there was no distinction between the Temple of Zion and ether shrines, or rather it was just in the greatest sanctuary with the most stately ritual that foreign influences had most play, as we see alike in the original institutions of Solomon and in the innovations of x\haz (2 Kings xvi. 10 seq., xxiii. 11 seq.). The Canaanite influence on the later organization of the Temple is clearly seen in the association of Temple prophets with the Temple priests under the control of the chief priest, which is often referred to by Jeremiah ; even the viler ministers of sensual worship, the male and female prostitutes of the Phoenician temples, had found a place on Mt Zion and were only removed by Josiah's reformation. 1 All this necessarily tended to make the ritual ministry of the priests more important than it had been in old times; but it was in the reign of Manasseh, when the sense of divine wrath lay heavy on the people, when the old ways of seeking Jehovah's favour had failed and new and more powerful means of atonement were eagerly sought for (Micah vi. 6 seq.; 2 Kings xxi.; and cf. Moloch), that sacrificial functions reached their full importance. In the time of Josiah altar service and not the function of " teaching " has become the essential thing in priesthood (Deut. x. 8, xviii. 7) ; the latter, indeed, is not forgotten (Jer. ii. 8, xviii. 18), but by the time of Ezekiel it also has mainly to do with ritual, with the distinction between holy and profane, clean and unclean, with the statutory observances at festivals and the like (Ezek. xliv. 23 seq.). What the priestly Torah was at the time of the exile can be seen from the collection of laws in Lev. xvii.-xxvi., which includes many moral precepts, but regards them equally with ritual precepts from the point of view of the maintenance of national holiness. The holiness of Israel centres in the sanctuary, and round the. sanctuary stand the priests, who alone can approach the most holy things without profanation, and who are the guardians of Israel's sanctity, partly Dy protecting the one meeting-place of God and man from profane contact, and partly as the mediators of the continual atoning rites by which breaches of holiness are expiated.

The bases of priestly power under this system are the unity of the altar, its inaccessibility to laymen and to the inferior ministers of the sanctuary, and the specific atoning functions of the blood of priestly sacrifices. All these things were unknown in old Israel. So fundamental a change as lies between Hosea and the Priestly Code was only possible in the general dissolution of the old life of Israel produced by the Assyrians and by the prophets; and indeed the new order did not take shape as a system till the exile had made a great change in old institutions. It was meant also to give expression to the demands of the prophets for spiritual service and national holiness, but this it did not accomplish so successfully; the ideas of the prophets could not be realized under any ritual system, but only in a new dispensation (Jer. xxxi. 31 seq.), when priestly Torah and priestly atonement should be no longer required. Nevertheless, the concentration of all ritual at a single point, and the practical exclusion of laymen from active participation in it — for the old sacrificial feast had now shrunk into entire insignificance in compari- son with the stated priestly holocausts and atoning rites 2 — -lent powerful assistance to the growth of a new and higher type of personal religion, the religion which found its social expression not in material acts of oblation, but in the language of the Psalms. In the best times of the old kingdom the priests had shared the place of the prophets as the religious leaders of the nation; under the second Temple they represented the unprogressive traditional side of religion, and the leaders of thought were the psalmists and the scribes, who spoke much more directly to the piety of the nation.

But, on the other hand, the material influence of the priests was greater than it had ever been before ; the Temple was the only visible centre of national life in the ages of servitude to foreign power, and the priests were the only great national functionaries, who drew to themselves all the sacred dues as a matter of right and even appropriated the tithes paid of old to the king. When the High Priest stood at the altar in all his princely state, when he poured

l 2 Kings xxiii. 7; cf. Deut. xxiii. 18, where "dogs" = the later Galli; cf. Corp. insc. sem. i. 93 seq.

2 Cf . the impression which the ritual produced on the Greeks, Bernays's Theophrastus , pp. 85, m seq.

out the libation amidst the blare of trumpets, and the singers lifted up their voice and all the people fell prostrate in prayer till he descended and raised his hands in blessing, the slaves of the Greek or the Persian forgot for a moment their bondage and knew that the day of their redemption was near (Ecclus. 1.). The High Priest at such a moment seemed to embody all the glory of the nation, as the kings had done of old, and when the time came

to strike a successful blow for freedom it was a priestly house that led the nation to the victory which united in one person the functions of High Priest and prince. From the foundation of the Hasmonean state to the time of Herod the history of the high-priesthood merges in the political history of the nation ; from Herod onward the priestly aristocracy of the Sadducees lost its chief hold over the nation and expired in vain controversy with the Pharisees.

The influence of the Hebrew priesthood on the thought and organization of Christendom was the influence not of a living institution, for it hardly began till after the fall of the Temple, but of the theory embodied in the later parts of the Pentateuch. Two points in this theory were laid hold of — the doctrine of priestly mediation and the system of priestly hierarchy. The first forms the text of the principal argument in the Epistle to the Hebrews, in which the author easily demon- strates the inadequacy of the mediation and atoning rites of the Old Testament, and builds upon this demonstration the doctrine of the effectual high-priesthood of Christ, who, in his sacrifice of himself, truly " led His people to God," not leaving them outside as He entered the heavenly sanctuary, but taking them with Him into spiritual nearness to the throne of grace. This argument leaves no room for a special priesthood in the Christian Church, and in fact nothing of the kind is found in the oldest organization of the new communities of faith. The idea that presbyters and bishops are priests and the successors of the Old Testament priesthood first appears in full force in the writings of Cyprian, and here it is not the notion of priestly mediation but that of priestly power which is insisted on. Church office is a copy of the old hierarchy. Now among the Jews, as we have seen, the hierarchy proper has for its necessary condition the destruction of the state and the bondage of Israel to a foreign prince, so that spiritual power is the only basis left for a national aristocracy. The same conditions have produced similar spiritual aristocracies again and again in the East in more modern times, and even in antiquity more than one Oriental priesthood took a line of development similar to that which we have traced in Judaea. Thus the hereditary priests of Kozah (Kof k) were the chief dignitaries in Idumaea at the time of the Jewish conquest of the country (Jos. Ant. xv. 7, 9), and the High Priest of Hierapolis wore the princely purple and crown like the High Priest of the Jews (De dea syria, 42). The kingly insignia of the High Priest of the sun at Emesa are described by Herodian (v. 3, 3), in connexion with the history of Elagabalus, whose elevation to the Roman purple was mainly due to the extraordinary local influence of his sacer- dotal place. Other examples of priestly princes are given by Strabo in speaking of Pessinus (p. 567) and Olbe (p. 672). As no such hierarchy existed in the West, it is plain that if the idea of Christian priesthood was influenced by living institu- tions as well as by the Old Testament that influence must be sought in the East (cf.

Lightfoot, Philippians, p. 261). The further development of the notion of Christian priesthood was connected with the view that the Eucharist (g.fl.) is a pro- pitiatory sacrifice which only a consecrated priest can perform. It is sufficient to remark here that the presentation of the sacrifice of the mass came to be viewed as the. essential priestly office, so that the Christian presbyter really was a sacerdos in the antique sense. Protestants, in rejecting the sacrifice of the mass, deny also that there is a Christian priesthood " like the Levitical," and have either dropped the name of "priest" or use it in a quite emasculated sense. For further details as to the history and doctrine of priesthood in Christendom the reader is referred to the article, " Priest ertum: Priesterweihe in der Christlichen Kirche," in P.R.E., 3rd ed., Bd. xvi. p. 47 sqq. There is probably no nature religion among races above mere savagery which has not had a priesthood; but an examination of other examples would scarcely bring out any important

feature that has not been already illustrated. Among higher religions orthodox Islam has never had real priests, doing relig- ious acts on behalf of others, though it has, like Protestant churches, leaders of public devotion (imams) and an important class of privileged religious teachers ("ulema). But a distinction of grades of holiness gained by ascetic life has never been entirely foreign to the Eastern mind, and in the popular faith of Mahom- medan peoples something very like priesthood has crept in by this channel. For where holiness is associated with ascetic practices the masses can never attain to a perfect life, and naturally tend to lean on the professors of special sanctity as the mediators of their religious welfare. The best example, how- ever, of a full-blown priestly system with a monastic hierarchy grafted in this way on a religion originally not priestly is found in Tibetan Buddhism (see Lamaism), and similar causes undoubt- edly had their share in the development of sacerdotalism in the Christian Church. The idea of priestly asceticism expressed in the celibacy of the clergy belongs also to certain types of heathen and especially Semitic priesthood, to those above all in which the priestly service is held to have a magical or theurgic quality.

(W. R. S.; O. C. W.) PRIESTLEY, JOSEPH (1733-1804), English chemist and Nonconformist minister, was born on the 13th of March 1733 at Fieldhead, a hamlet near Birstal in the West Riding of York- shire. He was the eldest of a family of six. His father, Jonas Priestley, a woollen-cloth dresser of moderate means, was the son of a member of the Established

Church, but both he and his wife, the only daughter of a farmer named Swift, were Non- conformists. Three years after the death of Mrs Priestley in 1739, Joseph's father's sister, Mrs Keighley, took him to live with her, and sent him at the age of twelve to a neighbouring grammar school. In his holidays he learned Hebrew from Mr Kirkby, a dissenting minister at Heckmondwike, who subse- quently took entire charge of his education. From the age of sixteen to nearly twenty his health was so unsatisfactory that he attended neither school nor college, but worked at Chaldee and Syriac, began to read Arabic, and mastered 'S Gravesande's Natural Philosophy, together with various textbooks of logic and metaphysics. An uncle having promised him a place in a counting-house at Lisbon, he also learned French, German and Italian to fit himself for the post. But his aunt was anxious for him to be a minister, as he himself desired, and therefore in 1752, when his health had improved, he went to Daventry to attend the Nonconformist academy formerly carried on by Dr P. Doddridge at Northampton. There he stayed three years, exchanging his early Calvinism for a system of " neces- sarianism " under the influence of D. Hartley's Observations on Man and A. Collins's Philosophical Enquiry concerning Human Liberty. In 1755 he was appointed to a small congregation at Needham Market, in Suffolk, where he was not very successful. In 1758 he obtained a more congenial congregation at Nant- wich, where he opened a school at which the elementary lessons were varied with experiments in natural philosophy. Three years later he removed to Warrington as classical tutor in a new academy, and there he attended lectures on chemistry by Dr Matthew Turner of Liverpool and pursued those studies in electricity which gained him the fellowship of the Royal Society in 1 766 and supplied him with material for his History of Electricity. In 1762 he had married the daughter of Isaac Wilkinson, a Wrexham ironmaster. In 1767 he was appointed to the charge of Mill Hill Chapel at Leeds, where he again changed his religious opinions from a loose Arianism to definite Socinian- ism and wrote many political tracts hostile to the attitude of the government towards the American colonies. He also began his researches into " different kinds of airs," getting a plentiful supply of " fixed air " from a brewery next door to his house. By the end of 1771 his scientific reputation was such that he was suggested for the post Of " astronomer " to Captain Cook's second expedition to the South Seas, but his unorthodox opinions were objectionable to certain members of the board of longitude and the appointment was not ratified. In 1772, the year in which he was chosen a foreign associate of the French Academy of

Sciences, he accepted the position of librarian and literary companion to Lord Shelburne (afterwards 1st Marquess of Landsdowne) at Calne, with a salary of £250 a year and a house. With that nobleman he travelled on the Continent; the month of October 1774 he spent in Paris, and meeting

Lavoisier and his friends, gave them an account of the experiment by which on the previous 1st of August he had prepared " dephlogisticated air " (oxygen). In 1780 he parted company with his patron, who allowed him an annuity of £150 for life, and settling at Birmingham was appointed junior minister of the New Meeting Society. There he continued his literary and scientific labours, enjoying congenial intercourse with such men as Matthew Boulton, James Keir, James Watt and Erasmus Darwin at the periodical dinners of the Lunar Society. On the 14th of July 1791 the Constitutional Society of Birmingham arranged a dinner to celebrate the anniversary of the fall of the Bastille. Priestley, according to his own account, " had little to do with it " But his predilections in favour of the revolutionists were notorious, and the mob seized the occasion to burn his chapel and sack his house at Fairhill. He and his family escaped, but his material possessions were destroyed and the labour of years annihilated. He retreated to London, where he felt safe, though he continued to be an object of " troublesome attention," and even the fellows of the Royal Society shunned him. But he received an invitation to become morning preacher at Gravel Pit Chapel, Hackney. This he accepted, and performed the duties of the charge till 1794, when he determined to follow his three sons, who had emigrated to America in the previous year. On the 7th of April he embarked with his wife at Gravesend and reached New York on the 4th of June. Finally settling at Northumberland, Pennsylvania, he lived there for nearly ten years, until on the 6th of February 1804, after clearly and audibly dictating a few changes he wished made in some of his writings, he quietly expired.

Priestley was a most voluminous writer, and his works (excluding his scientific writings) as collected and edited by his friend J. T. Rutt in 1817-1832 fill 25 octavo volumes. (The first volume, con- taining his life and correspondence, was issued separately in two parts, 1831-1832.) His first appearance as an author was in 1761, when he published the Scripture Doctrine of Remission and the Rudiments of English Grammar. His chief theological and philo- sophical works were Institutes of Natural and Revealed Religion (3 vols., 1772-1774); History of the Corruption of Christianity (2 vols., 1782); General History of the Christian Church to the Fall of the Western Empire, vols. i. and ii. (1790), vols. iii. and iv. (1802-1803) ; Disquisitions relating to Matter and Spirit (1777), and various essays and letters on necessarianism. But his theological writings are forgotten, and he is chiefly remembered as a scientific investi- gator who contributed especially to the chemistry of gases. Yet judged by modern standards he had an inadequate conception of the meaning of ordered research. In reference to his preparation of oxygen he says, " It provides a striking illustration of a remark I have more than once made in my philosophical writings and which can hardly be too often repeated, viz. that

more is owing to what we call chance — that is, philosophically speaking, to the observation of events arising from unknown causes — than to any proper design or preconceived theory in this business." If in this sentence he scarcely does justice to the powers of logical inference and inductive reasoning displayed in much of his work, it remains true that blind experiment — heating a substance, or treating it with some reagent, to see what would happen — was his characteristic method of inquiry. Thus by heating spirits of salt he obtained " marine acid air" (hydrochloric acid gas), and he was able to collect it because he happened to use mercury, instead of water, in his pneumatic trough. Then he treated oil of vitriol in the same way, but got nothing until by accident he dropped some mercury into the liquid, when " vitriolic acid air " (sulphur dioxide) was evolved. Again he heated fluorspar with oil of vitriol, as K. W. Scheele had done, and because he was employing a glass vessel he got " fluor acid air " (silicon fluoride). Heating spirits of hartshorn, he was able to collect " alkaline air " (gaseous ammonia), again because he was using mercury in his pneumatic trough; then, trying what would happen if he passed electric sparks through the gas, he decomposed it into nitrogen and hydrogen, and " having a notion " that mixed with hydrochloric acid gas it would produce a " neutral air," perhaps much the same as common air, he synthesized sal ammoniac. Dephlogisticated air (oxygen) he prepared in August 1774 by heating red oxide of mercury with a burning-glass, and he found that in it a candle burnt with a remarkably vigorous flame and mice lived well. He concluded that it was not common air, but the substance, " in much greater perfection," that rendered common air respirable

and a supporter of combustion. Of the analogy between combustion and respiration — both true phlogistic processes in his view — he had convinced himself three years before, and his paper, " On Different Kinds of Air" (Phil. Trans., 1772) described experiments which showed that growing plants are able to " restore ' air which has been vitiated, whether by being breathed or by having candles burnt in it. Priestley displayed much ingenuity in devising ap- paratus suited to his requirements and in carrying out and varying his experiments; it was in the interpretation of results that he was deficient. Had this not been the case he could scarcely have remained a firm believer in the phlogistic doctrine. At one time, indeed, he found Lavoisier's views so specious that he was much inclined to accept them, but he overcame this wavering, and so late as 1800 he wrote to the Rev. Theophilus Lindsey (1723-1808), " I have well considered all that my opponents have advanced and feel perfectly confident of the ground I stand upon. . . . Though nearly alone I am under no apprehension

of defeat."

His chief books on chemistry were six volumes of Experiments and Observations on different Kinds of Air, published between 1774 and 1786; Experiments on the Generation of Air from Water (1793); Experiments and Observations relating to the Analysis of Atmospheric Air, and Considerations on the Doctrine of Phlogiston established and that of the Composition of Water refuted (1800). He also published (1767) a treatise on the History and Present State of Electricity, which embodies some original work, and (1772) a History of Discoveries relating to Vision, Light and Colours, which is a mere compilation.

PRIEUR, PIERRE (c. 1626-c. 1676), French enamel painter. He married Marie (1610-1677), sister of Jean Petitot, as her second husband. In 1669 he was in England, painting a miniature of Charles II. and another of Lady Castlemaine, both after Cooper, for the king of Denmark. In 1670 he was in Poland, painting for the Danish monarch a portrait of King Michael, and in the following year was in Denmark executing a remarkable series of portraits of the children of Frederick III. All these, with some beautiful enamel badges for the Order of the Elephant, are in the Danish royal collection. By Christian V. he is said to have been sent to Spain and Russia, where several examples of his work, dated 1676, are to be seen in the Hermitage. In the following year he died in Denmark. He was a Huguenot, and was said to possess secret colours in enamel, especially a blue, which were not known to his Petitot relations. His work in England is of great rarity, Lord Dartrey possessing the finest example, and there are two remarkable works in the Pierpont Morgan collection and one at Windsor Castle. Two in the Propert collection have been lost sight of. (G. C. W.)

PRIEUR DE LA MARNE [Pierre Louis Prieur] (1756- 1827), French politician, was born at Sommesous (Marne) on the 1st of August 1756. He practised as a lawyer at Chalons- sur-Marne until 1789, when he was elected to the states-general. He became secretary to the Assembly, and the violence of his attacks on the ancien regime won him the nickname of " Crieur de la Marne." In 1791 he became vice-president of the criminal tribunal of Paris. Re-elected to the Convention, he was sent to Normandy, where he directed bitter reprisals against the Federalists. He voted for the death of Louis XVI., and as a member of the committees of national defence and of public safety he was despatched in October 1793 to Brittany, where he established the Terror. In May 1794 he became president of the Convention. The counter-revolutionaries drove him into hiding from May 1795 until the amnesty proclaimed in the autumn of that year. He took no part in public affairs under the directory, the consulate or the empire, and in 1816 was banished as a regicide. He died in Brussels on the 31st of May 1827.

See Pierre Bliard, Le Conventionnel Prieur de la Marne en mission dans Vouest 1793-1794 d'apres des documents inidits (1906).

PRIEUR-DUVERNOIS, CLAUDE ANTOINE, Comte (1763- 1832), French politician, was born at Auxonne on the 2nd of December 1763, and was commonly known as Prieur de la Cote d'Or, after his native department. As an officer of engineers he presented to the National Assembly in 1790 a Mimoire on the standardization of weights and measures. In 1791 he was returned by the Cote d'Or to the Legislative Assembly, and in 1792 to the Convention. After the revolution of the 10th of August 1792 he was sent on a mission to the army of the Rhine

to announce the deposition of Louis XVI., for whose death he voted in the Convention. In 1793 he was employed in breaking up the Federalist movement in Normandy, but he was arrested by the Federalist authorities of Caen, and only released in July 1793 after the defeat of their forces at Vernon. On the 14th of August 1793 he became a member of the committee of public safety, where he allied himself closely with Lazare Carnot in the organization of national defence, being especially charged with the provision of the munitions of war. Under the Direc- tory he sat in the Council of the Five Hundred, retiring after the coup d'Stat of 18 Brumaire (November 9, 1799). In 1808 he was created a count of the empire, and in 181 1 he retired from the army with the grade of chef de brigade. He was one of the founders of the Ecole Polytechnique, and shared in the establishment of the Institute of France; the adoption of the metric system and the foundation of the bureau of longitude were also due to his efforts. Prieur died at Dijon on the nth of August 1832.

See J. Gros, Le Comite de salut public (1893); and E. Charavay, Correspondance de Carnot, vol. i., which includes some documents drawn up by Prieur.

PRIM, JUAN, Marquis de los Castillejos, Count de Reus (1814-1870), Spanish soldier and statesman, was the son of Lieut.-Colonel Pablo Prim, and was born at Reus in Catalonia on the 1 2th of December 1814. He entered the free corps known as the volunteers of Isabella II. in 1834, and in the course of the Carlist War he rose to the rank of lieutenant-colonel and had two orders of knighthood conferred upon him. After the pacification of 1839, as a progressist opposed to the dictatorship of Espartero, he was sent into exile. However, in 1843 he was elected deputy for Tarragona, and after defeating Espartero at Bruch he entered Madrid in triumph with Serrano. The regent Maria Christina promoted him major-general, and made him count of Reus. Narvaez, the prime minister, failed to understand what constitutional freedom meant, and Prim, on showing signs of opposition, was sentenced to six years' imprisonment in the

Philippine Islands. The sentence was not carried out, and Prim remained an exile in England and France until the amnesty of 1847. He then returned to Spain, and was first employed as captain-general of Porto Rico and afterwards as military representative with the sultan during the Crimean War. In 1854 he was elected to the cortes, and gave his support to O'Donnell, who promoted him lieutenant-general in 1856. In the war with Morocco he did such good service at Los Castillejos or Marabout, Cabo Negro, Guad al Gelu and Campamento in i860 that he was made marquis de los Castillejos and a grandee of Spain. He commanded the Spanish army in Mexico when he refused to consent to the ambitious schemes of Napoleon III. On his return to Spain he joined the opposition, heading pronunciamentos in Catalonia against Narvaez and O'Donnell. All his attempts failed until the death of Narvaez in April 1868, after which Queen Isabella fell more and more under the influence of the Jesuits, and became increasingly tyrannical, until at last even Serrano was exiled. In September 1868 Serrano and Prim returned, and Admiral Topete, commanding the fleet, raised the standard of revolt at Cadiz (see Spain). In July 1869 Serrano was elected regent, and Prim became president of the council and was made a marshal. On the 16th of November 1870 Amadeo, duke of Aosta, was elected king of Spain, but Prim, on leaving the chamber of the cortes on the 28th of December, was shot by unknown assassins and died two days later. The cortes took his children as wards of the country; three days afterwards King Amadeo I. swore in the presence of the corpse to observe the new Spanish constitution.

Two biographies of Prim down to i860 were published in that year by Gimenez y Guited and Gonzalez Llanos. See also L. Blairet, Le General Prim et la situation actuelle de I'Espagne (Paris, 1867); Guillaumot, Juan Prim et I'Espagne (Paris, 1870); and Prim, by H. Leonardon (in French, 1901), which contains a useful biblio- graphy.

PRIMAGE (adopted from the Fr. primage, from prime, recompense, Lat. praemium, reward), a commercial term

signifying originally a small customary payment over and above the freight made to the master of the ship for his care and trouble. It is now generally included in the freight, as an additional percentage. It varies according to the usages of different ports and particular trades.

PRIMATE (from Low Lat. primas = one who held the first place, primas partes). During the 4th and 5th centuries a.d. the title was applied to both

secular and ecclesiastical officials. The Theodosian Code mentions primates of towns, districts and fortified places {Primates urbium, vicorum, castellorum) . The Pragmatic Sanction of Justinian also mentions primates govern- ing a district, primates regionis; and in this sense the title sur- vived, under Turkish rule, in Greece until the 19th century. An official called " primate of the palace " is mentioned in the laws of the Visigoths. Primas also seems to have been used loosely during the middle ages for " head " or " chief." Du Cange cites primas castri. The title, however, has been more generally used to denote a bishop with special privileges and powers. It was first employed almost synonymously with metropolitan to denote the chief bishop of a province having his see in the capital and certain rights of superintendence over the whole pro- vince. At the Council of Nicaea (a.d. 325) the metropolitan con- stitution was assumed as universal, and after this the terms " metropolitan," and " primate," to denote the chief bishop of a province, came into general use. The title of primate was used more generally in Africa, while elsewhere metropolitan was more generally employed. The primates in Africa differed from those elsewhere in that the title always belonged to the longest ordained bishop in a province, who had not necessarily his see in the capital, except in the case of the bishop of Carthage, who was head also of the other five African provinces. There were also three sorts of honorary primates: (1) primates aevo, the oldest bishop in a province next to the primate, on whom power de- volved when the primate was disabled or disqualified; (2) titular metropolitans, the bishops of certain cities which had the name and title of civil metropoles bestowed on them by some emperor; (3) the bishops of some mother-churches which were honoured by ancient custom but were subject to the ordinary metropolitan, e.g. the bishop of Jerusalem, who was subject to his metropolitan at Caesarea.

At a later date " primate " became the official title of certain metropolitans who obtained from the pope a position of episcopal authority over several other metropolitans and who were, at the same time, appointed vicars of the Holy See. This was done in the case of the bishops of Aries and Thessalonica as early as the 5th century. Such primates were sometimes also called patriarchs, primates diocesearum (political, not episcopal dioceses), primates provinciae, summi primates, praesules omnium sacer- dotum in partibus suis. In this sense the Western primate was considered the equivalent of the Eastern patriarch. The archbishop of Bfeims received the title of primas inter primates. By the False Decretals an attempt was made to establish such a primacy as a permanent institution, but the attempt was not successful and the dignity of primate became more or less honorary. The overlapping of the title is illustrated by the case of England, where the archbishop of York still bears the title of primate of England and the archbishop of Canterbury that of primate of all England. A less general

use of the title is its application in medieval usage to the head of a cathedral school or college {primas scholarum) and to the dignitaries of a cathedral church. The abbot of Fulda received from the pope the title of primas inter abbates. In the Episcopal Church of Scotland the senior bishop is styled the primas.

Du Cange, Glossarium; Hinschius, KirchenrecJtl (Berlin, 1869); Moeller, History of the Christian Church, translated from the German by Andrew Rutherford, B.D. (London, 1902); Bingham, Origines ecclesiastical (1840).

PRIMATES (Lat. primus, first), the name given by Linnaeus to the highest order of mammals (see Mammalia), which was taken by him to include not only man, apes, monkeys and lemurs, but likewise bats. The latter group is now separated as a distinct order (see Chiroptera). It has also been proposed

to remove from the Primates the lemurs, constituting the group Prosimiae, or Lemur oidea, to form an order by themselves; but general opinion is now against this view, and they are accord- ingly here regarded as representing a sub-order of Primates, all the other members of which are included in a second sub- ordinal group — the Anthropoidea, or Simiae. Support to the view that lemurs should be included in the order is afforded by the discovery in Madagascar of an extinct species {Neso- pithecus) presenting certain characters connecting it with monkeys on the one hand and with lemurs on the other.

In this broader sense the Primates may briefly be defined as follows. All the members of the order are plantigrade mammals, normally with five fingers and five toes, which are generally armed with broad flattened nails, although these are rarely replaced on single digits, or on all the digits, by claws or claw-like nails. The dental formula is i.\, c.\, d. f (f), w.f (•§■); all the teeth in advance of the molars being normally preceded by milk-teeth. The molars are three-, four- or five-cusped, but the cusps may in some cases coalesce into transverse ridges. The thumb and great toe are, as a rule, opposable to the other digits. The clavicles (collar-bones) are complete; there is nearly always a free centrale bone in the wrist, or carpus, in which the scaphoid and lunar are likewise generally separate. The orbits (and the eyes) are directed more or less forwards, and generally surrounded by bone (fig. 1), while the lower jaw has a vertical movement on the upper. With a few exceptions the stomach is simple; and a duodeno-jejunal flexure of the in- testine and a caecum are piesent. The diet is gener- ally vegetable, but may be mixed, or, rarely,consisting of insects. The uterus may be either bicornuate or simple; and the placenta either discoidal and de- ciduate, or diffuse and , non-deciduate, with a great development of the allan- tois. The clitoris may or may not be perforate;

the penis is pendent; and the testes are extra-abdominal, situate either in a scrotum behind the penis or in a similarly situated fold of the integument. At most the teats are four in num- ber, but generally only two situated on the breast, although occasionally ab- dominal or even inguinal. As a rule only a single offspring is produced at a birth, such offspring being always born in a completely helpless condition.

With the exception of man, who has adapted himself to exist in all climates, the Primates are essentially a tropical and sub- tropical group, although some of the monkeys inhabit districts where the winter climate is severe. The great majority — in fact nearly all— of the members of the order are arboreal in their habits. In size there is great variation, the extremes in this respect being represented by man and the gorilla on the one side, arid the marmosets and tarsiers, which are no larger than squirrels, on the other.

As regards the proper meaning of the popular names " monkey," " baboon " and " ape," it appears that these are in the main general terms which, with the exception of the second,

Fig. 1 . — Lateral and lower views of the Skull of a Langur Monkey (Semno- pithecus), to show the forward direction and complete closure of the orbits, and the characters of the dentition of the Old World Catarhini.

may be applied indifferently to all the members of the first sub-order. " Baboon " appears to be properly applicable to the dog-faced African species, and may therefore be conveniently restricted to the members of the genus Papio and their immediate relatives. " Ape," on the other hand, may be specially used for the tailless man-like representatives of the order; while the term " monkey " may be employed for all the rest, other than lemurs; monkeys being, however, divisible into sub-groups, such as macaques, langurs, guerezas, mangabeys, &c. This usage cannot, however, be universally employed, and the term " monkeys " may be employed for the entire group.

Anthropoidea. — The Primates, as already mentioned, are divisible into two main groups, or sub-orders, of which the first includes man, apes, baboons and monkeys. For this group Professor Max Weber employs the name Simiae (in contradistinction to Prosimiae for the lemurs). Since, however, to take as the title for a group which includes man himself the designation of creatures so much lower in the scale is likely to be

repugnant, it seems preferable to employ the designation Anthropoidea for the higher division of the order.

As the essential features distinguishing the Anthropoidea from the second sub-order may best be indicated under the heading of the latter, reference may at once be made to some of the more striking characters of the members of the former group. The proportions of the body as regards the relative lengths of the two pairs of limbs to one another and to that of the trunk vary con- siderably. Both pairs may be much elongated, as in Ateles and Hylobates, and either sub-equally, as in the first of these, or with the arms greatly in excess, as in the second. The legs may be excessively short, and the arms, at the same time, excessively long, as in the orang-utan. Both pairs may be short and sub-equal, as in many of the baboons (Papio). Only in Nyctipithecus and the Hapalidae does the excess in length of the lower limbs over the upper exceed or equal that which is found in man. The length of the tail presents some noteworthy points. It is found at its greatest absolute length, and also greatly developed relatively, being about twice the length of the trunk, in such monkeys as the Indian langurs; but its greatest relative length is attained in the spider- monkeys (Ateles), where it reaches three times the length of the trunk. The constancy of the degree of its development varies much in different groups. In the greater number of genera it is long in all the species, and in some (Simia, Anthropopithecus and Hylobates) it is absent in all. In others it may be long or short, or completely absent, as in macaques (Macacus).

The form of the head presents great differences — it may be rounded, as in Ateles; produced vertically, as in Simia; drawn out posteriorly to an extreme degree, as in Chrysothrix; or anteriorly, as in the baboons. A production of the muzzle, necessitated by the presence of large teeth, exists in the chimpanzee (Anthropopithecus), but in the baboons, not only is this prolongation carried farther, but the terminal position of the nostrils gives a dog-like aspect to the face.

The eyes may be small compared with the size of the head, as in the baboons; but they may, on the contrary, attain a relatively enormous size, as in Nyctipithecus. They are always forwardly directed, and never much more separated one from another than in man ; they may, however, be more closely approximated, as in the squirrel-monkeys (Chrysothrix) of South America.

The ears are always well developed, and very generally have their postero-superior angle pointed. They may be large and small in the same genus, as in Anthropopithecus (chimpanzee and gorilla); but only in the gorilla do we find, even in a rudimentary condition, that soft depending portion of the human ear termed the " lobule." The nose has scarcely ever more than a

slight prominence, and yet an enormous development is to be met with in the proboscis-monkey (Nasalis) ; while in the snub-nosed monkeys (Rhinopithecus) we find a sharply prominent, though smaller and extremely upturned nose. The hoolock gibbon also possesses a prominent but slightly aquiline nose. The terminal position of the nostrils in the baboons has already been mentioned. These apertures may be closely approximated, as in all the man-like apes (Simiidae and Hylobatidae) , or they may be separated one from the other by a broad septum, as in the Cebidae, its breadth', however, varying somewhat in different genera, as in Ateles and Eriodes, and Callithrix and Nyctipithecus. The lips are generally thin, but may be very extensile, as in the orang-utan.

The hands are generally provided with thumbs, though these organs (as in the African guerezas, Colobus, and the American spider-monkeys, Ateles) may be represented only by small nailless tubercles. The thumb is more human in its proportions in the chimpanzee than in any other of the higher apes. As compared with the length of the hand, it is most man-like in the lowest American monkeys, such as Chrysothrix and Hapale. In spite of greater relative length it may, however, little merit the name of thumb, as it is but slightly opposable to the other digits in any of the American monkeys, and is not at all so in the Hapalidae. The " great toe " is never rudimentary and, except in man, in place of being the

longest digit of the foot, is constantly the shortest. As compared with the entire length of the foot, it is most man-like in the chim- panzee and some gibbons, and smallest of all in the orang-utan, and next smallest in Hapale. Every digit is provided with a nail, except the great toe of the orang-utan and the rudimentary tubercle representing the thumb in Ateles and Colobus. The nail of the great toe is flat in every species, but the other nails are never so flat as are the nails of man. The lateral compression of the nails becomes more strongly marked in some Cebidae, e.g. Eriodes, but attains its extreme in the Hapalidae, where every nail, except that of the great toe, assumes the form of a long, curved and sharply pointed claw.

With the single exception of man, the body is almost entirely clothed with copious hair, and never has the back naked. In the gibbons, the langurs, the macaques and the baboons, naked spaces (ischiatic callosities) are present on that part of the body which is the main support in the sitting posture. These naked spaces are subject to swelling at the season of sexual excitement. Such naked spaces are never found in any of the American monkeys. No ape or monkey has so exclusive and preponderating a development of hair on the head and face as exists in man. As to the head, long hair is found thereon in Hapale oedipus and in some of the langurs and guerezas, whilst certain macaques, like the Chinese bonnet- monkey (Macacus sinicus), have the hair of the head long and radiat- ing in all

directions from a central point on the crown. A beard is developed in the male orang-utan; and the Diana monkey (Cercopi- thecus diana) has long hair on the cheeks and chin. The wanderoo (Macacus silenus) has the face encircled by a kind of mane of long hairs ; and many of the marmosets have a long tuft of hairs on each side of the head. American monkeys exhibit some extremes respecting hair-development. Thus in some of the howlers (as in some of the guerezas of the Old World) the hair of the flanks is greatly elongated. Some also have an elongated beard, but the latter structure attains its maximum of development in thecouxio (Pithecia satanas). Some of the species of the American genus Pithecia have the hair of the body and tail very long, others have the head of the female furnished with elongated hair; while the allied Uacaria calva has the head bald. Long hair may be developed from the shoulders as in Papio hamadryas and Theropithecus gelada. Very long hair is also developed on the back of the snub-nosed monkeys (Rhinopithecus) in winter. The direction of the hair may sometimes vary in nearly allied forms, the hairs on the arm and fore-arm respectively being often so directed that the tips converge towards the elbow. Such is the case in most of the higher apes, yet in Hylobates agilis all the hair of both these segments is directed towards the wrist. The hair presents generally no remarkable character as to its structure. It may, however, be silky, as in Hapale rosalia, or assume the character of wool, as in the woolly spider-monkeys (Eriodes) and Macacus tibetanus, which inhabits Tibet.

Fig. 2. — Skeleton of Chacma Baboon (Papio porcarius), showing the great relative length of the facial part of the Skull.

Great brilliance of colour is sometimes found in the naked parts of the body, particularly in the baboons and some of the other Cercopithecidae , and especially in the regions of the face and sexual organs. Among these latter rose, turquoise-blue, green, golden- yellow and vermilion appear, in various combinations, in one or other or both of these regions, and become especially brilliant at the period of sexual excitement.

The skeleton, more especially in the higher forms, is in the main similar to that of man, so that only a brief notice is necessary. In the skull considerable variation in regard to the proportionate length of the face to that of the brain-case (cranial portion) exists in the two sexes, owing to the general development of large tusks in the males (other than in man, who is not now under consideration). Generally speaking, the elongation of the facial portion, as compared to the cranial, increases as we pass from the higher to the lower forms. The increase does not, however, occur regularly, being

greater in the orang-utan and chimpanzee than in some of the langurs {Semnopithecus, fig. i); the maximum development of this feature occurs in the dog-faced baboons (Papio, fig. 2). In American monkeys, with the exception of the howlers (Alouata, fig. 3), the facial part is relatively smaller than in Old World monkeys and

Fig. 3. — Skull and Hyoid-bone of a Howler-Monkey (Alouata). In nature the hyoid-bone, which is bladder-like, is placed between the two branches of the lower jaw.

apes; while in the squirrel-monkeys (Chrysothrix) it is even smaller than in man himself. In none of the Old World group does the forehead present that rounded and elevated contour characteristic of man, although the height of this region is great in the orang-utan (fig. 4). Curiously enough, American monkeys, especially those included in Pithecia, are the most man-like in this respect. The skull of the male gorilla is characterized by the great development of the crests for muscular attachment, one of these (superciliary) overhanging the orbits, a second (sagittal) traversing the middle line of the upper surface, while a third (lambdoid) forms an inverted V on the occiput, and affords attachment for the muscles of the neck.

Fig. 4. — Skull of adult male Orang-utan (Simla satyfrus).

In the gorilla the orbits are much as in man, but in the orang-utan they are more rounded. They become very large in Hylobates, but attain an enormous size in the American Nyctipithecus. The extent to which each orbit opens into the adjacent temporal fossa, i.e. the size and shape of the sphenomaxillary fissure, varies con- siderably ; this is narrow and much elongated in the gorilla and the baboons, but short in the langurs and spider-monkeys. It is most closed in the howlers, where it sometimes all but disappears entirely. The mastoid process never attains the large relative size it has in man; but it is prominent in the baboons and larger macaques, as well as in the chimpanzee and gorilla, its development bear- ing relation to the size and weight of the head. As the mastoid

diminishes, the under surface of the petrosal assumes a swollen or bladder-like condition.

The plane of the foramen magnum, as compared with the basi- cranial axis, varies with the projection of the occiput; it generally forms a less open angle with that axis than in man, but in Chryso- thrix the angle is yet more open than in the human skull. The cheek, or zygomatic, arches bend

outwards and upwards in the gorilla and some baboons, but decrease in relative as well as absolute size in the smaller forms — notably in Chrysothrix. No long slender styloid process is normally attached to the skull, though such may be the case in the baboons. An external bony auditory meatus (or tube) is present in Old World but absent in New World monkeys. In all apes and monkeys the premaxillae have a distinct- ness of development and a relative size not found in man; the sutures separating them from the maxillae remaining visible, except in the chimpanzee, after the adult dentition has been attained. The maxillae develop great swollen tuberosities in the baboons and the black ape of Celebes. The nasal bones are small, and generally flatter than in man; being in the orang-utan quite flat. They are convex in some langurs and all baboons ; but the proboscis-monkey has its nasals no more developed than those of other species. The nasals seem to attain their maximum of relative size in the howlers. The lower jaw, or mandible, is always in one piece in adults; and is most man-like in the siamang, which alone has a slight chin. On the other hand, in other gibbons the angle is produced downwards and backwards, as also in marmosets. Its

Fig. 5. — Skeleton of South American Spider-Monkey (Ateles), to illustrate the length of the limbs and tail, and the slenderness of the former.

maximum of relative size is attained in the howlers (fig. 3), where the broad ascending part serves to protect and shelter the enormously developed body of the hyoid. Air-cells may be developed, as in the gorilla, in the parts adjacent to the mastoid. Frontal sinuses are generally absent in the Old World group, being replaced by coarse cellular bone. In old age the sutures of the skull become obliterated, the one between the two nasals disappearing at an early age in Old World monkeys. In the spider-monkeys and howlers the tentorium, or membrane dividing the hemispheres of the brain from the cerebellum, becomes bony.

The spinal column of apes and monkeys always lacks the S-like curvature of that of man, the nearest approach to this occurring in the baboons (fig. 2). The number of dorsal vertebrae varies from eleven in some species of Cercopithecus and Macacus to fourteen in certain gibbons or fifteen in the American night-apes (Nycti- pithecus). In the American Cebidae the number seldom falls below thirteen ; in the orang-utan it is twelve, as in man, but thirteen in the chimpanzee and gorilla. In most cases the dorsal and lumbar regions are about equal in length, but the lumbar region is the shorter in the man-like group, and less than half the length of the dorsal in the gorilla. The lumbar spinous processes are vertical, or project backwards in the man-like apes, gibbons and spider-monkeys; in the others they project forwards, especially in Cebidae. The lumbar transverse processes project outwards, more or less at right angles to the axis of the spine, or

else forwards. The sacrum attains its greatest absolute length in the gorilla, but is relatively longer than in man in all the man-like group. Hylobates has the relatively longest sacrum. The number of vertebrae included in the sacrum varies more or less with age ; with the excep- tion of the Simiidae and Hylobatidae, there are generally only two or three; but in Ateles, Hylobates, and Vacaria there may be four; while in the Simiidae there are always five, and sometimes six. In most apes the sacrum and lumbar vertebrae lie in one slightly curved line, the gorilla and champanzee presenting in this respect a great contrast to the human structure. In the orang-utan the sacro- vertebral angle is rather more marked; but in some baboons it is so much so as almost to rival that of man.

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With the exception of the man-like apes and gibbons and the Barbary ape {Macacus inuus), the caudal vertebrae of monkeys exceed four in number; but the mandril, Papio (Maimon) maimon, has sometimes only five. The short-tailed macaques and uakaris have from about fifteen to seventeen, the shortness of the tail being occasioned rather by a diminution in the size of the component vertebrae than by a decrease in number. In the other forms the number varies between twenty and thirty-three, the latter being the number attained in the spider-monkeys (fig. 5). The proportion borne by this region of the spine to the more anterior parts is greatest in the spider-monkeys of the genus Aides, almost three to one; in the other longest-tailed genera it is rarely so large as two to one. The absolute length of the tail is greatest in the langurs and guerezas, where also the individual caudal vertebrae attain their greatest length, namely two inches. The caudal vertebrae generally increase in length from the sacrum till about the seventh, eighth or ninth, which, with the tenth and eleventh, are the longest in most long- tailed forms. In A teles the eleventh, twelfth, thirteenth and fourteenth vertebrae are the longest. In most members of the sub-order the breast-bone, or sternum, is narrow, and consists of a more or less enlarged upper portion, or manubrium, followed by a chain of sub-equal elongated bones from three to six in number. In man, man-like apes and gibbons there is, however, a broad sternum; pr one consisting of a manubrium, followed by one bone only, as in Hylobates. In the orang-utan the breast-bone long remains made up of ossifications arranged in pairs, side by side, successively. The true ribs are seven in number on each side in the highest forms, but in Hylobates there are sometimes eight; in A teles there are sometimes nine pairs; in Hapale the number varies from six to eight, and from seven to eight in the other genera. The ” angles ” of the ribs are never so marked as in man; most so in Hylobates. Pithecia is distinguished by the greater relative breadth of the ribs. In no ape or monkey is the thorax half

as broad again as it is deep from back to breast. Nevertheless, in the Simiidae and Hylobatidae, its transverse diameter exceeds its depth by from about one-fourth to a little under one-third of the latter. In Ateles (and sometimes also in Alouata) the thorax is wider than deep, but in the rest it is deeper than wide.

The greatest absolute length of the fore-limb occurs in the gorilla (fig. 6) and the orang-utan. The humerus never has a perforation

(entepicondylar) on the inner side of its lower extremity. Except in the man-like apes, the ulna articu- lates with the wrist (carpus). The hand is capable of pronation and supination on the fore-arm; and except in man, the chimpanzee and the gorilla there is a centrale in the carpus. The phalanges are the same in number in apes and monkeys as in man, except that in Ateles and Colobus the thumb may have but one small nodular phalange or none. The phalanges are generally more curved than in man, and, except in the Hapalidae, the terminal ones are flattened from back to front. In the Hapalidae they are laterally compressed, curved, and pointed to support the claws characteristic of that family. The length of the thumb with its metacarpal bears a much greater proportion to that of the spine in Hylobates and Simla than in man. With the exception of Ateles and Colobus, the shortest thumb, thus estimated, is found in Nyctipithecus and Chrysothrix.

The hind-limb, measured from the summit of the femur to the tip of the longest digit, is absolutely greatest in the gorilla, and then in the orang-utan and the chimpanzee. If the foot be removed, the leg of the chimpanzee is longer than that of the orang-utan. The ankle, or tarsus, consists of the same seven bones as in man, and these bones sternum, the broad and shallow are so arranged, or bound together thorax, and the great length of by ligaments, as to form a trans- the fore-limbs. verse and an antero-posterior arch.

In no ape or monkey, however, do the lower ends of the inner metatarsals form the anterior point of support of the antero-posterior arch, as in man. The calcaneum, except in the gorilla, is shorter compared with the spine than in man. The phalanges of the foot are the same in number as in man, except that the great toe of the orang-utan has often but one. They are very like their representatives in the hand, and are convex above, concave and flattened below. Only

Fig. 6. — Skeleton of the Gorilla (Anthropopithecus gor- illa), to exhibit the flattened

in the Hapalidae are the terminal phalanges laterally compressed instead of

flattened. The toes are never nearly so short relatively in apes and monkeys as in man; yet the proportion borne by the great toe, with its metatarsal, to the spine closely approximates in the gorilla to the proportion existing in man, and this proportion is exceeded in Hylobates and Ateles.

Omitting all reference to the muscles, we find that in apes and monkeys the absolute size of the brain never approaches that of man; the cranial capacity being never less than 55 cub. in. in any normal human subject, while in the orang-utan and chimpanzee it is but 26 and 27J cub. in. respectively. The relative size of the brain varies inversely with the size of the whole body, as is the case in warm-blooded vertebrates generally. The hemispheres of the brain are almost always so much developed as to cover over the cerebellum, the only exceptions being the howlers and the siamang (Hylobates syndactylus) . In the latter the cerebellum is slightly uncovered, but it is considerably so in the former. In Chrysothrix the posterior lobes are more largely developed relatively than in man. As in mammals generally, much convoluted hemispheres are correlated with a considerable absolute bulk of body. Thus in Hapale (and here only) we find the hemispheres quite smooth, the only groove being that which represents the Sylvian fissure. In Simia and Anthropopithecus, on the contrary, they are richly convoluted. A hippocampus minor is present in all apes and monkeys, and in some Cebidae is larger relatively than in man, and absolutely larger than the hippocampus major. Of all apes and monkeys the orang-utan has a brain most like that' of man; indeed it may be said to be like man's in all respects save that it is much inferior in size and weight, and that the hemispheres are more symmetrically convoluted and less complicated by minor foldings. The human brain, as known by European specimens, has been supposed to differ from that of apes and monkeys by the absence of the so-called simian fold (Affenspalte) on the posterior portion of the main hemispheres. On studying a large series of Egyptian and Sudani brains, Professor G. Elliot Smith finds, however, that this simian fold, or sulcus, can be distinctly recognized. " It is easy," he writes, " to select examples from the series of Egyptian and Sudanese brains in my possession, in which the pattern formed by the occipital sulci on the lateral surface of the hemisphere in individual anthropoid apes is so exactly reproduced that the identity of every sulcus is placed beyond reasonable doubt. . . . And if we take individual examples of gorilla-brains, it becomes still easier to match the occipital pattern of each of them to numerous human brains. ... It is easy to appreciate the difficulties which have beset investigators of European types of brain, and to understand the reasons for the common belief in the absence of the supposed distinctly simian sulci in the lateral aspect of the occipital region of the human brain."

In no ape or monkey does the series of teeth form so perfect an arch as in man, the opposite series of cheek-teeth tending to become more parallel.

None has the teeth placed in one uninterrupted series in each jaw, as is the case in the human species; but there is always a small gap between the upper canine and the adjacent incisor, and between the lower canine and the adjacent premolar. This condition is due to the excessive size of the canines, the inter- spaces giving passage to the tips of these teeth. This prolongation of the canines into tusk-like weapons of offence and defence (especially developed in the males) makes a great difference between the aspect of the dentition in apes and man. The number of the teeth is the same as in man in all Old World Primates. The New World Cebidae have an additional premolar on each side of each jaw, while the Hapalidae have a molar the less. The incisors are nearly vertical, save in Pithecia and its allies, where their tips project forward. The canines are considerably longer than the incisors, except in Hapale, where the lower incisors equal them in length. The premolars differ structurally from the molars much as in man, except that the first lower one may be modified in shape to give passage to the upper canine, as in the baboons. The grinding surface of the molars consists generally of two incomplete transverse ridges, the end of each ridge projecting more than the intermediate part, indicating the position of the four original tubercles. In the man-like apes there is, however, in the upper molars a ridge running obliquely from the front inner tubercle, or cusp, outwards and backwards to the hind outer tubercle. In the Cercopithecidae this ridge is wanting, but it reappears in Ateles and Alouata amongst the Cebidae. In the Hapalidae the tubercles of the molars are more produced and sharp-pointed, in harmony with the insectivorous habits of the marmosets. The last lower molar may be reduced or much enlarged as compared with the others. Thus in Cercopithecus talapoin it has but three tubercles, while in the macaques and baboons it is very large, and has five well-developed cusps. The number of milk-teeth is as in man, except that American monkeys have an additional one. In general the canines are the last teeth to be cut of the permanent dentition, their cutting sometimes causing such constitutional disturbance as to produce convulsions and death. In the gibbons, however, the canines accompany, if they do not precede, the appearance of the hindmost molar, while in the orang-utan they at least sometimes make their appearance before the latter.

The stomach is simple in all apes and monkeys except langurs,

guerezas, and their allies. It is especially human in shape in Hylobates , except that the pylorus is somewhat more elongated and distinct. It is of a rounded form in Pitheci-a, and in Hapale the cardiac orifice is exceptionally near the pylorus. In the langur group it is sacculated,

especially at the cardiac end, being, in fact, very like a colon spirally coiled. The intestine is devoid of valvulae conniventes, but provided with a well-developed caecum, which is, however, short and conical in the baboons. Only in the man-like apes is there a vermiform appendix. The colon may be much longer relatively than in man, as in the man-like apes; it may be greatly sacculated, as in Hylobates; or devoid of sacculations, as in Cebus. The liver may be very like man's, especially in gibbons, the orang- utan, and the chimpanzee; but in the gorilla both the right and left lobes are cleft by a fissure almost as much as in the baboons. In the langur group the liver is much divided, and placed obliquely to accommodate the sacculated stomach. The lateral lobes in Hapale are much larger than the central lobe. The caudate lobe is very large in Cebidae, especially in A teles, and above all in Pithecia. There is always a gall-bladder.

The larynx in many members of the sub-order is furnished with sac-like appendages, varying in different species as regards number, size and situation. They may be dilatations of the laryngeal ventricle (opening into the larynx below the false vocal chords), as in the man-like apes; or they may open above the false vocal chords so as to be extensions of the thyro-hyoid membrane, as in gibbons. There may be but a single median opening in the front part of that membrane at the base of the epiglottis, as in Cerco-pithecidae, or there may be a single median opening at the back of the trachea, just below the cricoid cartilage, as in spider-monkeys; and while there is in some instances only a single sac, in other instances, as in the howlers, there may be five. These may be enormous, meeting in the middle line in front, and extending down to the axillae, as in the gorilla and orang-utan. Finally a sac may occupy the cavity of the expanded body of the hyoid-bone, as in howlers (fig. 3). The hyoid has its basilar part generally somewhat more convex and enlarged than in man; but in howlers it becomes greatly enlarged and deeply excavated, so as to form a great bony bladder-like structure (fig. 3). The cornua of the hyoid are never entirely absent, but the anterior or lesser cornua may be so, as in the howlers. The anterior cornua never exceed the posterior cornua in length; but they may be (Cercopithecus) more developed relatively than in man, and may even be jointed, as in Lagothrix.

The lungs are generally similar to those of man, although, as in gibbons, the right one may be four-lobed. In the man-like apes the great arteries are likewise of the human type; but in the Hylobatidae and Cercopithecidae the left carotid may arise from the innominate. The discoidal and deciduate placenta is generally two-lobed, although single in the howlers; in the marmosets it is unusually thick. American monkeys differ from their Old World

(From a sketch by Wolf from life.) FlG. 7. — An Immature Chimpanzee

(Anthropopithecus troglodytes). cousins in having two umbilical veins in place of a single one. In the Cercopithecidae gestation lasts about seven months, but in the marmosets is reduced to three. The young, which are generally carried on the breast, are suckled for about six months in most monkeys.

Man-like Apes. — In common with man, the apes and monkeys of the Old World form a section — Catarrhina — of the sub-order Anthropoidea, characterized by the following features: There are only two pairs of premolar teeth, so that the complete dental formula is i, §, c. |, p. f, m. §-. The tympanum has an external bony tube, or meatus ; but there is no tympanic bulla. A squamoso- frontal suture causes the frontal and the alisphenoid bones to enter largely into the formation of the orbital plate; and the orbito- temporal foramen is small. Cheek-pouches and callosities on the buttocks are frequently present. The nails are flat or rounded, the descending colon of the intestine has an S-like (sigmoid) flexure;

Fig. 8. — Adult Male Gorilla (Anthropopithecus gorilla).

the caecum is simple, and there may be a vermiform appendix. The inter-nasal septum is thin, and the nostrils are directed outwards. The tail, which may be rudimentary, is never prehensile. The ethmoturbinal bones of the nasal chamber are typically united. Laryngeal sacs are commonly developed. In addition to the primary discoidal placenta, a secondary, and sometimes temporary one is developed.

It does not come within the province of this article to treat of man (see Anthropology); but it may be mentioned that the distinctive characteristics of the family Hominidae (including the single genus Homo), as compared with those of the Simiidae, or man-like apes, are chiefly relative. These are shown by the greater size of the brain and brain-case as compared with the facial portion of the skull, smaller development of the canine teeth of the males, more complete adaptation of the structure of the vertebral column to the vertical position, greater length of the lower as compared with the upper extremities, and the greater length of the great toe, with almost complete absence of the power of bringing it in opposition to the other four toes. The last and the small size of the canine teeth are perhaps the most marked and easily defined distinctions that can be drawn between the two groups, so far as purely zoological characters are concerned. The regular arch formed by the series of teeth is, however, as already mentioned, another feature distinguishing man from the man-like apes.

In common with the gibbons {Hylobatidae) the man-like apes, or Simiidae, are distinguished from the lower representatives of the present sub-order by the following features: The sternum is short and broad, and the thorax

wide and shallow (fig. 6), while the pelvis, as shown in the same figure, is more or less laterally expanded, and hollow on its inner-surface; and the number of dorso-lumbar verte- brae ranges from sixteen to eighteen. The arm is longer than the leg; and while the hair on the fore-arm is directed upwards, that of the upper-arm slopes downwards to meet it at the elbow. Cheek-pouches are absent. The cusps of the molars are separate; and five in number above and four below. The caecum has a vermi- form appendix; and the secondary placenta merely forms a tem- porary fold. The Simiidae are specially characterized by the absence of callosities on the buttocks; the presence of sixteen or seventeen dorso-lumbar vertebrae, and of twelve or thirteen pairs of ribs ; the wrinkling of the enamel of the cheek-teeth ; the great expansion and concavity of the iliac bones of the pelvis; and the application of only the edge of the sole of the foot to the ground in walking.

The existing members of the family are referable to at least two genera, the one African and the other Asiatic. The first genus, Anthropopithecus, 1 is typified by the West African chimpanzee, A. troglodytes (fig. 7), and is characterized by the absence of excessive elevation in the skull, by the fore limb not reaching more than half-way down the shin, the presence of thirteen pairs of ribs, the well-developed great toe, the absence of a centrale in the carpus, and the black or grey hair. There is a well-developed laryngeal sinus, which may extend downwards to the axilla. Chimpanzees are characterized by the large size of the ears, and typically by the small development of the supra-orbital ridges. The latter are, however, more developed in the Central African A. tchego (of which the kulu-kamba is a local phase) ; this form — whether regarded as a species or a race — being thus more gorilla-like (see Chimpanzee).

The gorilla {Anthropopithecus gorilla, fig. 8), of which there are likewise several local forms, ranging from the West Coast through the forest -tract to East Central Africa, and apparently best regarded as sub-species, is frequently made the type of a second genus — – Gorilla; but is extremely close to the chimpanzee, from which it is perhaps best distinguished by its much smaller ears. It is the largest of the apes, although the females are greatly inferior in stature and bulk to the males. The gorilla is also a much less completely arboreal ape than the chimpanzee, in consequence of which more of the sole of the foot is applied to the ground in walking. The enormous supra-orbital ridges of the skull of the male, and like- wise the large and powerful tucks in that sex are very characteristic. A full-grown gorilla will stand considerably over six feet in height. According to Dr A. Keith, in addition to its smaller and flatter ears, the gorilla may be best

distinguished from the chimpanzee by the presence of a nasal fold running to the margin of the upper lip ; by the large size and peculiar characters of the tusks and cheek- teeth; by its broad, short, thick hands and feet, of which the fingers and toes are partially webbed ; by the long heel ; and by the relative length of the upper half of the arm as compared with the fore-arm. An important distinctive feature of the skull of the gorilla is the great length of the nasal bones. Finally, in adult life the gorilla is sharply differentiated from the chimpanzee by its sullen, untameable, ferocious disposition.

As regards the relationship existing between the gorilla and the chimpanzee, Dr Keith observes: "An examination of all the structural systems of the African anthropoids leads to the inference that the gorilla is the more primitive of the two forms, and ap- proaches the common parent stock more nearly than does the chimpanzee. The teeth of the gorilla, individually and collectively, form a complete dentition, a dentition at the very highest point of development; the teeth of the chimpanzee show marked signs of retrogression in development both in size and structure. The muscular development and the consequent bony crests for muscular attachment of the gorilla far surpass those of the chimpanzee. The muscular development of the adult chimpanzee represents that of the adolescent gorilla. Some of the bodily organs of the gorilla belong to a simpler and earlier type than those of the chimpanzee. But in one point the chimpanzee evidently represents more nearly the parent form — its limbs and body are more adapted for arboreal locomotion; of the two, the gorilla shows the nearer approach to the human mode of locomotion. On the whole the evidence at our disposal points to the conclusion that the chimpanzee is a derivative from the gorilla stock, in which, with a progressive brain development, there have been retrograde changes in most of the other parts of the body. The various races of chimpanzee differ according to the degree to which these changes have been carried." (See Gorilla.)

From both the chimpanzee and the gorilla the orang-utan, or mias (Simia satyrus), of Borneo and Sumatra is broadly distinguished by the extreme elevation of the skull (fig. 4), the excessive length of the fore limbs, which reach to the ankle, the presence of only twelve pairs of ribs and of a centrale in the carpus, the short and rudi- mentary great toe, and the bright-red colour of the hair. Adult males are furnished with a longish beard on the chin, and they may also develop a large warty prominence, consisting of fibro- cellular tissue, on each side of the face, which thus assumes an extra- ordinary wide and flattened form. There is no vestige of a tail. The hands are very long; but the thumb is short, not reaching the end of the metacarpal bone of the index-finger. The feet have exceedingly long toes, except the great toe, which only reaches to the middle of the first

joint of the adjacent toe, and is often destitute not only of a nail, but of the second phalange also. It nevertheless possesses an opponens muscle. The brain has the hemispheres greatly convoluted, and is altogether more like the brain of man than is that of any other ape. A prolongation is developed from each ventricle of the larynx, and these processes in the adult become enormous, uniting together in front over the windpipe and forming one great sac which extends down between the muscles to the axilla. The canine teeth of adult males are very large. In Borneo the orang-utan displays great variability, and has accordingly been divided into a number of local races, in some of which the males

1 It has been proposed to transfer the name Simia to the chim- panzee, on the ground that it was originally given to that animal.

apparently lack the lateral expansion of the face. Whether the Sumatran orang-utan should be regarded as a distinct species, with two local races, may be left an open question. (See Orang-Utan). Gibbons. — The comparatively small, long-armed and tailless Asiatic apes known as gibbons have been very generally included in the same family as the man-like apes; but since they differ in several important features — to say nothing of. their smaller bodily size — it has recently been proposed to refer them to a family apart, the Hylobatidae. The distinctive features of this family include the presence of small naked callosities on the buttocks, the possession of eighteen dorso-lumbar vertebrae and thirteen pairs of ribs, the absence of foldings in the enamel of the molar teeth, the. slight lateral expansion and concavity of the iliac bones of the pelvis, and the application of the whole sole of the foot to the ground in walking. The vertebral column presents no trace of the sigmoid flexure which is developed partially in the Simiidae and completely in the Hominidae. None of the gibbons have any rudiment of a tail; and the canines are elongated and tusk-like. When the body is erect, the arms are so long that they reach the ground. The great toe is well developed, reaching to the middle or end of the first joint of the adjacent toe; but the thumb only attains to, or reaches a little beyond, the upper end of the first joint of the index-finger. There is a centrale in the carpus. The laryngeal sacs are no longer prolongations of the laryngeal ven- tricles, but open into the larynx above the false vocal chords. The group is distributed throughout the forest-regions of south-eastern Asia, eastwards and southwards from Assam, and is represented by a considerable number of species. Among these, the siamang, Hylobates syndactylus, of Sumatra and the Malay Peninsula, differs from all the rest by the union of the index and third fingers up to the base of their terminal joints, in consequence of which this species is regarded as representing a sub-genus (Symphalangus) by itself, while all the others belong to Hylobates proper. The general colour of gibbons is either pale fawn or black, with or without a white band across the

forehead. In a female from Hainan in the menagerie of the Zoological Society of London, the colour of the coat changed from black to fawn about the time full maturity was attained. Apparently no such change takes place in the male. According to Dr W. Volz, the two banks of the Lematang River in the Palembang district of Sumatra are respectively inhabited by two different species of gibbons — on the west bank is found the siamang (Hylobates syndactylus), while the country to the east of the river is the home of the agile gibbon, or waw-waw (H. agilis). It is not necessary to capture, or even to see, specimens of the two species in order to satisfy oneself as to their limitations, for they may be readily distinguished by their cries: the siamang calling in a single note, whereas the cry of the waw-waw forms two notes. The remarkable thing about their distribution in Palembang is that the two species are found in company throughout the rest of Sumatra; and even in Palembang itself they inhabit the mountain districts, where the river is so narrow that they could easily leap over it, and yet they keep to the opposite banks. Gibbons are perhaps the most agile of all the Old World monkeys, rivalling in this respect the American spider-monkeys, despite their lack of the prehensile tails of the latter (see Gibbon).

Langur Group. — The well-known long-tailed langur monkeys of India and the adjacent regions are the first representatives of the third family of apes and monkeys, which includes all the remaining members of the sub-order now under consideration. In the Cercopi- thecidae, as the family is called, the following features are distinctive: The sternum, or breast-bone, is narrow and elongated, ana the thorax compressed and wedge-shaped, while the iliac bones of the pelvis are narrow, with the inner surface flat; the dorso-lumbar vertebrae are nineteen or twenty in number. The front limbs are shorter than the hind pair; the whole sole of the foot is applied to the ground in walking ; and the hair on the arm is directed down- wards from the shoulder to the hand. There are always bare callosities on the buttocks, and very generally cheek-pouches. The caecum is conical. Transverse ridges connect the cusps of the molars. The secondary placenta is fully developed.

The first group of the family is represented by the langurs and their allies, collectively forming the sub-family Semnopithecinae, in which the tail and hind limbs are very long, and the body is slender; there are no cheek-pouches, but, on the other hand, the stomach is complicated by sacculations or pouches, and the last lower molar has a posterior heel, thus carrying five cusps. The thumb is small or absent, the callosities on the buttocks are also small, and the nails are narrow and pointed. The laryngeal sac (or throat-sac) opens in the middle line of the front of the larynx, and is formed by an extension of the thyro-hyoid membrane. Tne true langurs, of the genus Semnopitheciis, in which a small thumb is retained, form a large group confined to south-eastern Asia, where it ranges

from India and the Himalaya to Borneo and Sumatra by way of Burma, Cochin China and the Malay Peninsula. A well-known representative is the sacred hanuman monkey (5. entellus) of India, which, like the larger Himalayan S. schistaceus, is slate-coloured ; the Bornean 5. hosei, on the other hand, is wholly maroon-red. Other species, like the Indian S. johni, have the head crested. The allied genus Rhinopithecus, as typified by the orange

snub-nosed monkey, R. roxellanae (fig. 9), of eastern Tibet and Szechuen, is characterized by the curiously short and upturned nose and the long silky hair of the back, especially in the winter coat. In the typical species the predominating colour is orange, tending to yellowish-olive on the back; but in R. bieti of the mountains border- ing the valley of the Mekon and R. brelichi of Central China it is slaty-grey. The third Asiatic genus is represented by the proboscis monkey (Nasalis larvatus) of Borneo, in which the nose is extra- ordinarily elongated. The nose of the adult male is commonly

(From Milne-Edwards.) Fig. 9. — The Orange Snub-nosed Monkey [Rhinopithecus roxellanae) . represented as projecting straight out from the face, but it really bends down to overhang the upper lip; it is much shorter in the female, and quite small and bent upwards in the young. (SeeLANGUR and Proboscis Monkey.)

The African guerezas, forming the genus Colobus, differ from their Asiatic cousins by the total loss of the thumb. Some of these monkeys, like Colobus satanas of West Africa, are wholly black; but in others, such as C. guereza (or abyssinicus), C. sharpei and C. caudatus of North-east and East Africa, forming the sub-genus Guereza, there is much long white hair, which in the species last- named forms a mantle on the sides of the body and an elongated fringe to the tail, thus assimilating the appearance of the animal to the long lichens hanging from the boughs of the trees in which it dwells. Most or all of the Semnopithecinae feed on leaves; a circumstance doubtless correlated with the complex structure of their stomach.

Cercopitheques, Mangabeys, Macaques and Baboons. — The whole of the remaining members of the family Cercopithecidae are included in the sub-family Cercopithecinae, which presents the following charac- teristics: The hind limbs are not longer than the front pair; the tail may be either long, short or practically absent; cheek-pouches are present; the stomach is simple; the callosities on the buttocks are often very large; the last lower

molar may or may not have a posterior heel; and the thumb is well developed. Whereas all the Semnopithecinae are completely arboreal, many of the Cercopithe- tinae, and more especially the baboons, are to a great extent or entirely terrestrial. The typical representatives of the group are the African monkeys, forming the genus Cercopithecus, which in- cludes, a very large number of species with the following characters in common : the tail, although shorter than in the Semnopithecinae, is long, as are the hind limbs, while the general form is slender. The jaw and muzzle are short and the cheek-pouches large; while the nose is not prominent, with the nostrils approximated ; whiskers and a beard of variable length are usually developed. The fingers of the long hands are united by webs at the base; the thumb is small in comparison with the great toe. The callosities are of moderate size; and the hairs of the thick and soft fur are in most cases marked by differently-coloured rings. For convenience of description the numerous species of this genus may be arranged in a number of groups or sub-genera. The first of these groups includes the spot-nosed forms (Rhinostictus), characterized by the presence of a spot of white, red or blue on the nose ; well-known species,

being the lesser white-nosed guenon (C. petaurista) of West Africa and the hocheur, C. nictitans, which is also West African. In the typical group, as represented by the malbrouck monkey (C. cyno~ surus) of the West Coast, and the Abyssinian grivet (C. sabaeus), the fur of the back is of a more or less olive-green hue, while the under surface and whiskers are white and the limbs grey. The large patas monkey (C. patas) of West Africa and the red-backed monkey (C. pyrrhonotus) of Kordofan typify a third section (Erythro- cebus), characterized by the red upper and white lower surface of the body. A fourth section (Mona) includes the mona (C. mona) of Western, and Sykes's monkey (C. albigularis) of Eastern Africa, with a number of allied species, characterized by the presence of a black band running from the outer angle of the eye to the ear, and the black or dark-grey limbs. The bearded monkey (C. pogonias) of Fernando Po and Guinea, with two sub-species, typifies a small section (Otopithecus) , characterized by large rufous or yellowish ear-tufts and the presence of three black stripes on the forehead. Pogonocebus is another small section, including the well-known Diana monkey (C. diana) of Western, and De Brazza's monkey (C. neglectus) of Eastern Africa, easily recognized by the long (generally white) beard and frontal crest. Finally, the little talapoin (C. talapoin) of the Gaboon alone represents a group (Miopithecus) broadly distinguished by having three, in place of four, cusps on the crowns of the lower molars.

The next group is that of the African mangabeys (Cercocebus) , the more typical species of which are easily recognized by their bare flesh-coloured eyelids, and the absence of rings of different colours on the hair, or at least

on that of the back. In these monkeys the general form is intermediate between that of the cercopitheques and the macaques, to be lext mentioned, the head being more oval and the muzzle more produced than in the former, but less so than in the latter. The limbs are longer and the body is more slender than in the macaques, and the callosities are also smaller. On the other hand, the thumb is smaller than in the guenons, and the tail is carried curled over the back instead of straight; while these monkeys differ from the former in having a posterior heel to the last lower molar, which is thus five-cusped, as in the macaques. The laryngeal air sacs of the latter are, however, wanting. Well-known representatives of the typical section of the group are the sooty mangabey (C. fuliginosus) and the white-collared mangabey (C. collaris) of West Africa, the latter easily recognized by the bright red crown of the head. A second group of the genus, Lophocebus (or Semnocebus) is typified by the white-cheeked mangabey (C. albigena) of the equatorial forest-region, in which the head is crested and the eyelids lack bare flesh-coloured rims. The rhesus monkey (Macacus rhesus) of India is the typical representative of the macaques, which may be regarded as the Asiatic representatives of the mangabeys. From that group the macaques differ by their heavier and stouter build (fig. 10), thicker limbs, the presence of large laryngeal sacs, the larger size of the callosities, and the more produced muzzle, while many of them have the tail (which may be absent) much shorter. The nostrils are not terminal, and the hairs are generally ringed. In habits the macaques are much more terrestrial than the mangabeys, some of them being completely so. In the typical group, which, in addition to the rhesus, includes the Himalayan macaque (M. assamensis), the brown macaque {M. arctoides) of Burma and Tibet (fig. 10), the tail may be about

(From Milne-Edwards.) Fig. 10. — The Tibet Macaque {Macacus arctoides tibetanus).

equal to half the length of the body or less; but in the Barbary ape, M. (Inuus) inuus, of North Africa and Gibraltar, this appendage is wanting. In a third group (Nemestrinus), represented by the pig-tailed macaque (M. nemestrinus), ranging from Burma to Borneo, and the lion-macaque {M. leoninus) of Siam, the tail, which is carried erect, is about one-third the length of the body. The lion-tailed macaque (M. silenus) of southern India, often miscalled the wanderoo, represents a group by itself (Vetulus) characterized by

the long hair fringing the face and meeting under the chin and the tufted hon-like tail, which is from one-half to three quarters L e a d ng H th ° f "^ The. last group {Cynomllgus) now oten regarded as a distinct genus, is

typified by the widely-spread crab" eating macaque (M. cynomolgus), characterized b/its produced muzzle, short and stout limbs, and basally-swolhj tail, which is nearly as long as the body. It also includes the South Indian bonnet-macaque (M .aniens) and the Ceylon toque-macaque (M. ptUatus), taking their names from the elongated ha "on thl crown, which are nearly allied, and with the first-named srec£s approach the baboons in their elongated muzzles (see SScS A still nearer approach to the baboons is made by the black ape (Cynopithecusmger) of Celebes and the neighbouring islands whl?h is represented by several sub-species, among then? the so-S ed

Fig. ii.— The Yellow Baboon (Papio cynocephalus).

lˆtl'ˆfˆL i Macacus .™™rus)- Some difference of opinion exists as to the proper serial position of this species, which is in-

as a genus It is characterized by the marked elongation of the muzzle, which like the neck, hands and feet, is naked" 8 The nostrils are, however, directed outwards and downwards, as in the maca- ques; but, on the other hand, there are baboon- ike ridges oTthe sides of the muzzle and heavy supra-orbital ridges There are large cheek-pouches; and the tail is a mere stump. The colour is sooty-black The weird-looking gelada baboon (TheropithZs gelada) of southern and the allied T obscurus of eastern Abyssinia represent a genus which ie essentially baboon-like in general charac^ ter.st.es, but has the nostrils of the macaque-type, while the facial portion of the skull ,s shorter than the cranial. ' The preorbita are ve"rv lon^ ^ ^ onca ve with the ridges rounded, and^he tusk are very long The long tail is tufted at the tip, and the hair is fe?, oW' d 7 el °, pin ? int °u a ma «tle-like mane on the fore? ?s dark brown "rl^ .H™ the che ? t bare – T he general colour Lf^hT The last representatives of the Cercopithecidae are the baboons, or dog-faced baboons, of Africa and Arab4 forming the genus Papio These are for the most part large m S associating ,n herds under the leadership of an old mal? and dwell- ing chiefly among rocks, although they ascend trees in Search of gum. They are easily recognized by their long dog-like faces (fig. n) in which the nostrils open at the extremity of the greltfv eongated muzzle. On the sides of the muzzle are promfnent longitudmal ridges covered with bare skin which may be brXntlv*

areTrse- In! the^" f ? ' ^ F alS ,° genera!1 y bright-coloured are large , and the tail is of moderate length or short The hairs are ringed with different colours, and the^eneral colour is olive? >ellow, grey or brownish The typical, and at the same time the smallest representative^ of the group t is the yellow babooT (P cynocephalus or P. babuin) (fig it) rantriiKr fro^T ik • ■ . Angola and Mozambique, aUVbguisnef^y ts rlthe'/shoTand grooved muzzle and longish tail, which is nearl/as loTg as the bodv The majority of*

the species, such as the widely spread P anubi's with several local races) P. sphinx of West Africa, and the'ehaema {P porcarius)oi South Africa, are included in the sub "genus ChaZ- pithecus, and have the muzzle longer and undivided aˆthe fall shorter ,n most the colour is golden-olive with very dfstinct ring but in the chacma it is darker. The hamadryad baboon P hama- dryas, of north-east Africa and Arabia, and the closelv' alHed

chaˆc XS bˆ U th h e er a n h Arabla ' T"" ? "ub-genV&S characterized by the ashy-grey colour and the profuse mantle-like*

bodv Latriv ,hl w'T & tail bein , g sli ˆy ˆorte™than he IP U„rn% ,\ f T Af r can mand "» (P- maimon) and drill (P. leucophaeus) form the sub-genus Maimon, distinguished bv the extremely short tail, and the great development of the Sial ridges »hich are strongly fluted. In the mandrill, which if the most brilliantly 'coloured of all mammals, the ridges are verm lion and

out" n ttt -n 6 Ca u"°fr S °\ t . he buttocks are of equa bmance but in the drill, which has white ear-tufts, the colouring is more sombre (see Baboon and Mandrill). colouring is more

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American Monkeys and Marmosets. —The monkeys and marmosets of tropical America constitute the Platyrrhina or second section of the Anthropoidea, and are characterized as follows: An additional premolar is present in both jaws bringing up the number of these teeth to three pairs The tympanum is ring-like, with no external bony-tube, or meatus- and a tympanic bulla exists. A parieto-zygomatic suture causes the jugal bone to be included in the orbital plate; and the orbito-temporal foramen is large. Cheek-pouches and callos- ities on the buttocks are wanting. The descending colon does not form a sigmoid flexure; and the caecum is generally bent in a hook-hke form, with, at most, very slight narrowing of its terrnmal extremity. The cartilage forming the inter-nasal septum is broad, and the nostrils are directed obliquely out- wards. The tail, which never has fewer than fourteen verte- brae, is generally as long as the body, and frequently prehensile. I he ethmoturbinals are originally separate; and the laryngeal sac, when present, is of peculiar type. Usually there is only a simple primary discoid placenta, but rudiments of a secondary one have been recently described.

*The first family, or Cebidae, includes the American monkevs j, fsricrVhe " 1 marmosets ' wh j < * Pˆsent the followˆ" characier? nVnt ?fu ea ? are fflo ? or less "aked externally. The terminal*

thnmh I ” gerS and t0eS Carf y flat or curved nails; an™ the thumb, when present, ,s opposable to the other fingers Except m the uakans, the tail ,s long, generally short-haired, and frequently with a terminal bare surface for prehension. Dentition i \ c. % f;ˆ f

wtrˆsfma’Zof”ˆ T” ” « « bSS; S so many of the animals are more or less arboreal in their

than V -KK 6 monke y s are completely arboreal, more so, indeed th an the gibbons among the Catarrhina.

*. i f e br ,st sub-family, Alouatinae, is represented only by the howlers Alouala (or Mycetes), characterized by the long prehens e ™t 1 l he Ftrenuty naked below, the well-develoled thumb chamber 6 X r t f f” sl ? n ° f * h f hyoid-bone into an enormous bladder-Hke (fi ˆ , > Tn I am K d betW ˆ n the – two bra nches of the lower jaw ™?i 3; ‘ 4u b0ny CU P ls recelve d one of the three or five laryn- geal sacs. There are about half a dozen species, with several*

a U ndT C1 Slw e %° f th6 , beSt k u n °,r being A – Renins, A. btlzcTul

\a A \ u r nna – Several are brilliantly coloured, with bright or

golden hair on the flanks; but in the Amazonian A. nigra thl mate

Ln a + t nd ˆ th , e v female T s traw-coloured. The muzzle is longer than in other Cebidae (see Howler). s

Fig. 12.— The White-cheeked Capuchin (Cebus lunatus).

. The Cebinae include the typical members of the family, character- ifj , Y t u lar S e , brain, of which the elongated hemispheres cover

in oronnS 1 t Ti bra ! n ” C r e ° f the ? ul1 being ‘ of course ‘ elongated in proportion. The lumbar vertebrae are short, with upright comb-like processes, instead of the rhomboidal ones of the howlfrs 1 he lower jaw and hyoid are of normal form. In the first section ot the sub-family the tail is evenly haired throughout, the thumb

well developed, the limbs of medium length, with the front not longer than the hind pair, the nails curved, and the humerus with an entepicondylar forarileil. _ The typical genus Cebus includes the numerous species of

capuchins, many of which are so commonly seen in captivity. They are stouter in build and smaller in size than the spider-monkeys, and their tails are only prehensile to a small extent, but are commonly carried spirally rolled. The conical tipper canines project below the upper lip, and the molars have blunt low cusps. Well-known species are the white-cheeked capuchin, C. lunatus (fig. 12), of south Brazil; the true capuchin, C. capucinus, ranging from Guiana to Brazil ; and the brown capu- chin, C. faiuellus, of Guiana; all of these showing the black crown from which these monkeys take their popular name. The most northern representative of the group is the white-throated C. hypoleucus, which ranges to Costa Rica. The squirrel-monkeys, Chrysothrix (or Saimiris), of which C. sciureus is the most familiar representative, are not unfrequently placed in the Nyctipithecinae, although their true position seems to be here. They differ from Cebus by their smaller size and more delicate build, by the tail being scarcely at all prehensile, by the smaller canines, smaller and more sharply cusped molars, and the large and closely-approxi- mated orbits, whose inner walls are partly membranous (see Capu- chin and Squirrel-Monkey).

The second section of the sub-family includes the spider-monkeys (fig. 13), and is characterized by the completely prehensile tail,

Fig. 13. — Geoffrey's Spider-Monkey {Ateles geoffroyi).

with the inner surface of the tip naked, the rudimentary condition or absence of the thumb, the laterally compressed and more or less pointed nails, and the absence of an entepicondylar foramen to the humerus. The limbs, too, are very long and slender, with the front pair of greater length than the hind ones. The caecum approximates to that of the Catarrhina, having its terminal ex- tremity pointed. The true spider-monkeys (Ateles) lack the thumb, and have the nails but slightly compressed and pointed, the limbs very long, the nasal septum of ordinary width, and the fur not woolly. Nearly all have the hair on the head, except that of the forehead, directed forwards. There are nearly a dozen species. In these monkeys so powerful is the grasp of the tail that the whole body can be sustained by this organ alone. It even serves as a fifth hand, as detached objects, otherwise out of reach, can be grasped by it, and brought towards the hand or mouth. Their prehension is in other respects exceptionally defective, owing to the loss of the thumb. Spider-monkeys are very gentle in dis- position; and, by this and their long limbs and fitness for tree-life, seem to represent the gibbons of the Old World. Nevertheless, in spite of their admirable adaptation for arboreal life, their com- paratively slow progression offers a marked contrast to the vigorous agility of the gibbons (see Spider-Monkey). The brown spider- monkey (Brachyteles arachnoides) of south Brazil alone represents a genus connecting the preceding in some degree with the next, a rudimentary thumb being present,

while the fur is woolly, the nails are much compressed, and the nostrils more approximated

than usual. In the woolly spider-monkeys of the genus Lagothrix (fig. 14) not only is the fur woolly, but the thumb is fairly well developed; the nails are like those of Brachyteles, but the nostrils are normal. Humboldt's spider-monkey, L. humboldti (or L. lagotrica) and the dusky spider-monkey, L. infumata, both of which occur in Brazil and Amazonia, alone represent this genus.

Fig. 14. — Humboldt's Woolly Spider-Monkey (Lagothrix humboldti).

Some half-dozen species of the monkeys known as sakis (Piihecia) form the typical representatives of the sub-family Pithecinae, in which the tail, even when long, is non-prehensile, while the lower incisors are slender and inclined forwards in a peculiar manner, with a gap on each side separating them from the long canine. The hemispheres of the brain cover the cerebellum, the brain-case is elongated, and, despite the absence of a laryngeal sac, the lower jaw is deep with a large angle, thus recalling that of the howlers. There is no caecum. In all cases the thumb is well developed. The arrangement of the hair is very variable. From the other members of the group the sakis are sufficiently distinguished by the long and bushy tail; while they are further characterized by having a large head. In some cases the hair on the crown of the

Fig. 15. — Lemur-like Douroucouli (Nyctipithecus felinus).

head is divided by a transverse parting, so as to overhang the upper part of the face. P. satanas of Para and P. chiropotes of Guiana are well-known species. The uakaris (Uacaria or Cothurus) of Amazonia are broadly distinguished from all other Cebidae by their short or rudimentary tails ; Ua. calva being remarkable for its brilliant red jaw and pale chestnut hair (see Uakari).

The last and lowest representatives of the Cebidae constitute the sub-family Nyctipithecinae, the members of which are cat-like monkeys, with woolly or bushy hair, short, conical muzzles, non- prehensile tails and well - developed thumbs. The brain-case of the skull is not elongated, and the hemispheres of the brain do not cover the cerebellum. The lumbar vertebrae are elongated, with long, sharp, backwardly directed spinal processes; the hinder part of the lower jaw is tall; and there is no laryngeal sac. The

Fig. 16. — The Moloch Titi {Callithrix moloch).

long and hooked caecum has its terminal portion constricted. In accordance with their nocturnal habits, the douroucoulis {Nycti- pithecus) are easily recognized by their large and closely approxi- mated eyes, which are, however, separated by a complete septum, the comparatively narrow nasal septum, small ears buried in the

with more forwardly directed eyes, which are not surrounded by a radiating fringe of hair and a wider nasal septum. The titis are" represented by about ten species, of which C. moloch is represented in fig. 1 6. Most of them are confined to Amazonia, but a few among them C. moloch, reach the east coast. Like the marmosets, they feed largely upon insects and grubs.

The second and last family of the Platyrrhina is represented by the marmosets or oustitis {Hapalidae) , all of which are small monkeys, with the ears hairy externally, and the nails, except that of the great toe, claw-like, the thumb non-opposable, the tail long, bushy and non-prehensile, and only two molars in each jaw, the dental formula thus being i. §, c. }, p. g, m. f. The humerus has no entepicondylar foramen. Three young are produced at a birth. Marmosets are divided into two genera, those in which the lower canines are not markedly larger than the incisors constituting the typical Hapale, while such as have the lower canines taller than the teeth between them form the genus Midas. These squirrel-like little monkeys, in which the great toe can be opposed to the other toes, range as far north as 15 N., where they are represented by Midas geoffroyi, and as far in the opposite direction as the southern tropic, where M. chrysopygus and M. rosalia occur. The colour and the length of the hair are very variable, some species having long silky pale-chestnut hair (fig. 17) and tufted ears, while in others the hair is comparatively short and black, or black with brown bars, while the ears are not tufted (see Marmoset).

Lemurs, Prosimiae — Although the likeness generally takes the form of a more or less grotesque caricature, the faces of all monkeys and apes present, in greater or less degree, some resemblance to the human countenance. In the lower group of Primates, commonly known as lemurs, or lemuroids, this resemblance is wholly lost, and the face assumes an elongated and fox-like form, totally devoid of that " expression " which is so characteristic of man and the higher apes and monkeys.

Fig. 17. — The Golden Marmoset {Hapale chrysoleuca).

woolly fur, and long bushy tail. Well-known species are the lemur-like douroucouli {N. felinus, fig. 15) of Amazonia, Peru and Ecuador, and N.

vociferans, with a nearly similar distribution. The titis, Callithrix (or Callicebus ‘) , are smaller monkeys (fig. 16),

1 Apparently the name Callithrix was originally given to the marmosets, and if transferred to that group should be replaced by CaUicebus.

Fig. 18. — Skull of Ring-tailed Lemur {Lemur catta). uc, Upper canine. pm, Premolars.

Ic, Lower canine. m, True molars.

Lemurs, Prosimiae or Lemuroidea, which form a group con- fined to the tropical regions of the Old World and more numer- ously represented in Madagascar than elsewhere, are arboreal and for the most part crepuscular or nocturnal Primates, feeding on insects or fruits, or both together and collectively character- ized as follows. The tail, which is generally long and thickly haired, is never prehensile. As a rule, there is a single pair of pectoral teats, but an additional abdominal or even inguinal pair may be present. The thumb and great toe are opposable to the other digits, the former being provided with a flat nail, while the second toe is always furnished with a claw; the fourth toe is longer than all the rest, and the second, or index, finger is small or rudimentary. In the skull (fig. 18) the orbital ring is formed by the frontal and jugal bones, and, except in the Tarsi-idae, there is a free communication between the orbit and the temporal fossa; the lachrymal foramen is situated outside the orbit (fig. 18); the tympanic either forms a, free semicircle in the auditory bulla or enters into the formation of the latter; and the foramen rotundum is generally fused into the sphenoidal fissure. Interparietal bones are frequently developed, and the two halves of the lower jaw are generally welded together in front. Except in the genus Perodicticus, the humerus is fur- nished with an entepicondylar foramen at the lower end; the centrale of the carpus is generally free; and the femur is usually provided with a third trochanter. The cerebellum is only partially covered by the hemispheres of the brain, which in the medium-sized and larger species conform to the general type of the same parts in monkeys and apes. The normal dental

formula is ». $, c. \, p. f , m. f , or the same as in American monkeys; but the upper incisors are small and separated from each other, while the lower ones are large and approximated to the incisor-like canine; the molars have three or four cusps. In all cases the stomach is simple and a caecum

present. The testicles are contained in a scrotum, the penis has a bone, the uterus is bicornuate and the urethra perforates the clitoris. The placenta may be either diffuse, with a large allantoic portion, and non-deciduate, or discoidal and deciduate. As a rule, only a single offspring is produced at a birth. Very note- worthy is the occurrence in the females of the Asiatic lorisis of what appears to be the vestige of a marsupial apparatus, attached to the front of the pelvis. Lemur catta also possesses the rudiment of a marsupial fold; while in both sexes of the aye-aye occurs a skin-muscle corresponding to the sphincter marsupii of marsupials.

The distribution of existing lemurs is very peculiar, the majority of the species inhabiting Madagascar, where they for the most part dwell in small patches of forest, and form about one-half the entire mammalian fauna of the island. The remain- ing species inhabit Africa south of the Sahara and the Indo-Malay countries.

Tarsier. — The tiny little large-eyed Malay lemuroid known as the tarsier, Tarsius spectrum (or T. tarsius), of the Malay Peninsula and islands, together with its Celebean and Philippine representa- tives, alone constitutes the section Tarsiina (and the family Tar- siidae), which has the following distinctive characteristics: The lower incisor is vertical and the canine of normal form, while the upper incisors are in contact ; the orbit is cut off from the temporal fossa by a bony plate, leaving only a small orbital fissure; the tympanum enters into the formation of the auditory meatus, through which passes the canal for the internal carotid artery; the tibia and fibula in the hind-leg are fused together, and the calcaneum and navicular of the tarsus elongated. The tarsier seems to be a primitive form which makes a certain approximation to the Anthropoidea, and differs from other lemuroids in the structure of its placenta. The dental formula isi. f, c. \, p. f, m. |, total 34. Tarsiers have enormous eyes, occupying the whole front of the orbital region, and are purely nocturnal in their habits, living in trees on the branches of which they move by hopping, a power they possess owing to the elongation of the tarsal bones (see Tarsier).*

Malagasy Lemurs. — All the other Prosimiae may be grouped in a second section, the Lemurina, characterized as follows: The lower incisors and the canine are similar in form and inclined forwards (fig. 18); the upper incisors are small and separated by an interval in the middle line; the orbits communicate largely with the temporal fossae; the internal carotid artery enters the skull in advance of the auditory meatus through the foramen lacerum anterius; and the tibia and fibula are separate. The Malagasy lemurs are now all included in the single family Lemuridae, which is confined to Madagascar and the Comoro Islands, and character- ized by the tympanic ring lying free in the auditory bulla. The typical sub-family Lemurinae, which includes the majority of the family group, is

*characterized by all the fingers except the index having flat nails, the elongation of the facial portion of the skull, the large hemispheres of the brain not covering the cerebellum, the occasional presence of two inguinal in addition to the normal pectoral teats, the dental formula *. §, c. {, p. §, m. |, with the first upper incisor generally small and sometimes wanting, and the hinder cusps of the upper molars smaller than the front ones. These lemurs are woolly-haired animals, often nearly as large as cats, with the legs longer than the arms, the tail long and bushy, and the spinal processes of the last dorsal and the lumbar vertebrae inclined. In the typical genus Lemur (fig. 19), the tarsus is of normal length, the tail at least half as long as the body, the ears are tufted, there are no inguinal teats, the last premolar is not markedly broader than the others, and the upper molars have a conspicuous cingulum. These lemurs have long fox-like faces, and habitually walk on the ground or on the branches of trees on all fours, although they can also jump with marvellous agility. They are gregarious, living in small troops, are diurnal in their habits, but most active towards evening, when they make the woods resound with their loud cries, and feed, not only on fruits and buds, but also on eggs, young birds and insects. When at rest or sleeping, they generally coil their long, bushy tails around their bodies, apparently for the sake of the warmth it affords. They have usually a single young one at a birth, which is at first nearly naked, and is carried about, hanging close to and almost concealed by the hair of the mother's belly. After a while the young lemur changes its position and mounts upon the mother's back, where it is carried about until able to climb and leap by itself. One of the most beautiful species is the ring-tailed lemur (£. catta, fig. 19), of a delicate grey colour, and with a long tail marked with alternating rings of black and white. This is said*

by G. A. Shaw to be an exception to other lemurs in not being arboreal, but living chiefly among rocks and bushes. Pollen, however, says that it inhabits the forests of the south-west parts of Madagascar, living, like its congeners, in considerable troops, and not differing from them in its habits. He adds that it is ex- tremely gentle, and active and graceful in its movements, and utters at intervals a little plaintive cry like that of a cat. All the others have the tail of uniform colour. The largest is L. varius, the ruffed lemur, sometimes black and white, and sometimes reddish-brown, the variation apparently not depending on sex or age, but on the individual. In L. macaco the male is black and the female red L. mongoz, L. fulvus and L. rubriventer are other well-known species.

Fig. 19. — The Ring-tailed Lemur (Lemur catta).

In all these lemurs the small upper incisors are not in contact with one another or with the canine, in front of which they are both placed. In the species of Hapalemur, on the other hand, the upper incisors are very small,

sub-equal and separated widely in the middle line; those of each side in contact with each other and with the canine, the posterior one being placed on the inside, and not in front of the latter. Muzzle very short and truncated. Two inguinal teats, in addition to the normal pectoral pair, are present. The last premolar is broader than those in front, and the upper molars lack a distinct cingulum. The typical H. giiseus is smaller than any of the true lemurs, of a dark-grey colour, with round face and short ears. It is quite nocturnal, and lives chiefly among bamboos, subsisting on the young shoots. The second species has been named H. simus. In Hapalemur there is no free centrale to the carpus, and the same is the case with the six or seven species of Lepidolemur (Lepilemur), in which the first upper incisor is rddimentary or wanting, while the second may also be wanting in the adult. There are small lemurs, with small pre- maxillae, short snouts, tails shorter than the body, bladder-like mastoid processes, and the upper molars with an inconspicuous cingulum and the hind-cusps of the last two rudimentary; the fourth upper premolar being relatively broad. Mixocebus caniceps is an allied generic type (see Lemur).

The small Malagasy lemurs of the genera Chirogale, Microcebus and Opolemur differ from the preceding in the elongation of the calcaneum and navicular of the tarsusˆ on which grounds they have been affiliated to the African galagos. The difference in the struc- ture of the tympanum in the two groups indicates, however, that the elongation of the tarsus has been independently developed in each group. These lemurs have short, rounded skulls, large eyes, long hind limbs and tail, large ears, the first upper incisor larger than the second, the last upper premolar much smaller than the first molar and furnished with only one outer cusp, and the mastoid not bladder-like. Some are less than a rat in size, and all are nocturnal. One of the largest, Microcebus furcifer, is reddish-grey, and distinguished by a dark median stripe on its back which divides on the top of the head into two branches, one of which passes forwards above each eye The most interesting peculiarity of these

lemurs is that certain species (Opolemur samati, Chirogale milii, &c.) during the dry season coil themselves up in holes of trees, .and pass into a state of torpidity, like that of the hibernating animals in the winter of northern climates. Before this takes place an immense deposit of fat accumulates upon certain parts of the body, especially the basal portion of the tail. The smallest species, M. pusillus, lives among the slender branches on the tops of the highest trees, feeding on fruit and insects, and making nests like those of birds.

In the sub-family Indrisinae the dentition of the adult consists of thirty teeth, usually expressed by the formula i. \ , c. {, p. f, m. |; but possibly i. f, c. J, p. f, m. i. In the milk-dentition there are twenty-two teeth, the two additional teeth in the fore part of the lower jaw having no successors in the permanent series. Hind limbs greatly developed, but the tarsus normal , the great toe of large size, and very opposable ; the other toes united at their base by a fold of skin, which extends as far as the end of the first phalange. The thumb is but slightly opposable; and all the fingers and toes are hairy. The length of the tail is variable Two pectoral teats. Caecum very large, and colon extremely long and spirally coiled. The brain is large and the thorax wide.

The animals of this group are essentially arboreal, and feed exclusively on fruit, leaves, buds and flowers. When they descend

teats, inguinal in position, a feature peculiar to this species. All the digits of both feet with pointed, rather compressed claws, except the great toe, which has a flattened nail; middle digit of the hand excessively attenuated. Vertebrae: C.7, D.12, L.6, S.3, Ca.27 (see Aye- Aye).

(From Milne-Edwards and Grandidier.)

Fig. 20. — The Indri {Indris brevicattdalus).

to the ground, wnich is but seldom, they sit upright on their hind legs, and move from one clump of trees to another by a series of short jumps, holding their arms above them in the air. Among them are the largest members of the order. The genus Indris has the upper incisors sub-equal in size; upper canine larger than the first premolar, muzzle moderately long, ears exserted. Carpus without an os centrale. Tail rudimentary. Vertebrae: C.7, D.12, L.9, S.4, Ca.9. The indri (/. brevicaudatus, fig. 20), discovered by Sonnerat in 1780, is the largest of the group, and has long woolly hair, partly brown and partly white. In the sifakas, Propithecus, of which there appear to be three species, with numerous local races, the second upper incisor is much smaller than the first. Upper canine larger than the first premolar. Muzzle rather short. Ears short, concealed by the fur. An os centrale in the carpus. Tail long. v ertebrae: C.7, D.12, L.8, S.3, Ca.28. In Avahis, represented only by A. laniger, the second upper incisor is larger than the first. Upper canine scarcely larger than the first premolar. Muzzle very short. Ears very small and hidden in the fur, which is very short and woolly. Carpus without os centrale. Tail long. Vertebrae: C.7, D.II, L.9, S.3, Ca.23 (see Indri and Sifaka). . The last sub-family, Chiromyinae (formerly regarded as a family), is represented only by the aye-aye, Chiromys (or Daubentonia) madagascariensis, and has the following characteristics: Dentition of adult, t. {, C. %, p. J, m. |, total 18. Incisors

(fig. 21) very large, compressed, curved, with persistent pulps and enamel only in front, as in rodents. Teeth of cheek-series with flat indistinctly tuber- culated crowns. In the young, the first set of teeth more resemble those of normal lemurs, being i. §, c. J, m. f, all very small. Four

Fig. 21. — Skull of the Aye-aye {Chiromys madagascariensis).

Galagos and Lorises. — The lemurs of Africa and the Indo-Malay countries — commonly miscalled sloths — differ from the Lemuridae in that the tympanic enters into the formation of the auditory meatus, in consequence of which they are referred to a family by themselves, the Nycticebidae, which is in turn divided into two sub-families, Galaginae and Nycticebinae. The African galagos or Galaginae, which have the same dental formula as the Lemuridae, are distinguished by the elongation of the calcaneum and navicular of the tarsus. In the single genus Galago, with the sub-genera Otolemur and Hemigalago, the last upper premolar, which is nearly as large as the first molar, has two large external cusps. Verte- brae: C.7, D.13, L.6, S.3, Ca.22-26. Tail long, and generally bushy. Ears large, rounded, naked and capable of being folded at the will of the animal. Teats four, two pectoral and two inguinal (see Galago). The lorises, Nycticebinae (Lorisinae), are distinguished as follows: Index-finger very short, sometimes rudimentary and nailless. Fore and hind limbs nearly equal in length. Tarsus not specially elongated. Thumb and great toe diverging widely from the other digits, the latter especially being habitually directed backwards. Tail short or rudimentary. Teats two or four. Lorises and pottos (as the African representatives of the group are called) are essentially nocturnal, and remarkable for the slowness of their movements. They are completely arboreal, their limbs being formed only for climbing and clinging to branches, not for jumping or running. They have rounded heads, very large eyes, short ears and thick, short, soft fur. They feed, not only on veget- able substances, but, like many of the Lemuridae, also on insects, eggs and birds, which they steal upon while roosting at night. One of the greatest anatomical peculiarities of these animals is the breaking up of the large arterial trunks of the limbs into numerous small parallel branches, constituting a rete mirabile, which is found also in the sloths, with which the lorises are sometimes confounded on account of the slowness of their movements. The Asiatic lorises, which are divided into two genera, are characterized by the retention of the normal number of phalanges in the small index-finger, and the presence of a pair of minute abdominal teats

(From A. Milne-Edwards.)

Fig. 22. — The Slow Loris (Nyclicebus tardigradus).

(the existence of which has only recently been discovered by Messrs

Annandale and Willey). In the slow lorises, forming the genus Nycticebus (fig. 22), the first upper incisor is larger than the second, which is often early deciduous. Inner margin of the orbits separated from each other by a narrow flat space. Nasal and

premaxillary bones projecting but very slightly in front of the maxillae. Body and limbs stout. No tail. Vertebrae: C.7, D.17, L.6, S.3, Ca.12. The single species N. tardigradus , with several races, in- habits eastern Bengal, the Malay countries, Sumatra, Borneo, Java, Siam and Cochin China. These lorises lead solitary lives in the recesses of large forests, chiefly in mountainous districts, where they sleep during the day in holes or fissures of large trees, rolled up into a ball,, with the head between the hind legs. On the approach of evening they awake, and during the night ramble among the branches of trees slowly, , in search of food, which consists of leaves and fruit, small birds, insects and mice. When in quest of living prey they move noiselessly till quite close, and then sud- denly seize it with one of their hands. The female produces but one young at a time. In the second genus, represented only by the slender loris (Loris gracilis) of southern India and Ceylon, the upper incisors are very small and equal. Orbits very large, and only separated in the middle line above by a thin vertical plate of bone. Nasals and premaxillae produced forwards con- siderably beyond the anterior limits of the maxillae, and support- ing a pointed nose. Body and limbs slender. No external tail. Vertebrae: C.7, D.14, L.9, S.3, Ca.6. The slender loris is about the size of a squirrel, of a yellowish-brown colour, with large, prominent eyes, pointed nose, long thin body, long, angularly bent, slender limbs and no tail. Its habits are like those of the rest of the group. The Indian and Ceylon races are distinct (see Lqris).

The African pottos, Perodicticus, differ by the reduction of the index-finger to a mere nailless tubercle, and apparently by the absence of abdominal teats. In the typical section of the genus there is a short tail, about a third of the length of the trunk. Two or three of the anterior dorsal vertebrae have very long slender spinous processes which in the living animal project beyond the general level of the skin forming distinct conical prominences, covered only by an exceedingly thin and naked integument. P. potto, the potto, is one of the oldest known members of the lemuroids having been described in 1705 by Bosman, who met with it in his voyage to Guinea. It was, however, lost sight of until 1835, when it was rediscovered in Sierra Leone. It is also found in the Gaboon and the Congo, and is strictly nocturnal and slower in its movements even than Nycticebus tardigradus, which otherwise it much resembles in its habits. A second species, P. batesi,

in- habits the Congo district. A third species, the awantibo (P. calabarensis) , rather smaller and more delicately made, with smaller hands and feet and rudimentary tail, constitutes the sub-genus Arctocebus. It is found at Old Calabar, and is very rare. Vertebrae: C.7, D.15, L.7, S.3, Ca.9.

Extinct Primates The most interesting of all the extinct representatives of the order is Pithecanthropus erectus (q.v.), which is represented by the imperfect roof of a skull, two molars and a femur, discovered in a bed of volcanic ash in Java. The forehead is extremely low, with beetling brow-ridges, and the whole calvarium presents a curiously gibbon-like aspect. The capacity of the brain-case is estimated to have equalled two-thirds that of an average modern man. The creature is regarded as transitional between the higher apes, more especially the Hylobatidae and the lowest representatives of the genus Homo, such as the Neanderthal men. From the Lower Pliocene of India has been obtained the palate of a chimpanzee-like ape, which by some is referred to the existing Anthropopitheci{s, while by others it is considered to represent a genus by itself — Palaeopithecus. The same formation has yielded the canine tooth of a large ape, apparently referable to the existing Asiatic genus Simia. From the Miocene of Europe has been described the genus Dryopithecus, typified by D. fontani, a generalized ape of the size of a chimpanzee, related, perhaps, both to the Simiidae and the Hylobatidae. The Lower Pliocene of Germany has yielded other remains referred 'to a distinct genus under the name of Paidopithex rhenanus. From the Miocene of the Vienna basin Dr O. Abel has described certain ape-remains under the name of Gripho- pithecus suessi, as well as others regarded as representing a species of Dryopithecus with the name D. darwini. As regards the first, all that can be said is that it indicates a member of the group to which Dryopithecus belongs. It has been suggested that the latter genus is closely related to man, but this idea is discountenanced by the great relative length of the muzzle and the small space for the tongue. Teeth of another man-like ape from the Tertiary of Swabia, described under the pre- occupied name Anlhropodus, have been re-named Neopithecus. The genus Anlhropodus is represented by remains of an ape of doubtful position from the French Pliocene. Pliopithecus

from the French Miocene is certainly a gibbon, perhaps not distinguishable from Hylobates.

Oreopithecus, from the Miocene of Tuscany, is perhaps in- termediate between gibbons and baboons (Papio), the latter of which, as well as Macacus, are represented in the Indian Pliocene. Mesopilhecus, of the Grecian Lower Pliocene, presents some characters connecting it with Sewnopithecus and others with Macacus. An allied type from the Lower Pliocene of France is Dolichopithecus, taking its name from the elongated skull; while Macacus occurs in the Upper Pliocene and Pleistocene of

several parts of Europe. Cryptopithecus, from the Swiss Oligocene, appears to be the oldest known Old World monkey. From the Miocene of Patagonia are known certain monkeys described as Homunculus, Anthropops, &c, apparently more akin to the Cebidae but perhaps representing an extinct family.

Passing on to the lemurs, it may be mentioned in the first place that G. Grandidier has described an extinct lemur from the Tertiary of France, which he believes to be nearly related to the slow lorises, and has accordingly named Pronycticebus gaudryi. If the determination be correct the discovery is of interest as tending to link the modern faunas of southern India and West Africa (which possess many features in common) with the Tertiary fauna of Europe. Certain remarkable extinct lemuroids of large size have been discovered in the superficial deposits of Madagascar, in one of which (Megaladapis) the upper cheek-teeth are of a tritubercular type (fig. 23), while in the second and smaller form (Nesopithecus) the dentition makes a notable approximation to that of the Cercopithecidae. Each

Fig. 23. — Skull and Hinder Right Upper Cheek-teeth of

Megaladapis madagascariensis.

of these genera, which probably survived till a very late date, is generally regarded as typifying a family group. In Megala- dapis the skull is distinguished by its elongation and the small size of the eye-sockets, the tritubercular upper molars presenting considerable resemblance to those of the living Lepidolemur. The brain is of a remarkably low type. In one species the approximate length of the skull is 250, and in the second 330 millimetres. Even more interesting are the two large species of Nesopithecus, one of which was at first described as Globilemur. They show a very complicated type of brain, and were at first regarded as indicating Malagasy representatives of the Anthro- poidea. In regard to the character of the tympanic region of the skull this genus shows several features characteristic of the more typical Malagasy lemuroids; and the eye-sockets are open behind, while the dentition is numerically the same as in some of the latter. On the other hand, in several features Nesopithecus resembles the Anthropoidea; the upper incisors are not separated in the middle line, and the upper molars

present the pattern found in the Cercopithecidae, while in one species the lachrymal bone and foramen are within the orbit. The resemblances to apes are not confined to the skull, but are found in almost all the bones. Probably the genus may be regarded as a specialized lemuroid. The Oligocene and Eocene formations of Europe and North America have yielded remains of a number of primitive lemuroids, grouped together under the name of Mesodonta or Pseudolemures, and divided into families severally typified by the genera Hyopsodus, Notharctus, Anaptomorphus and Microchoerus (Necrolemur), of which the last two are European and the others American. To particu- larize the characteristics of the different families would occupy too much space, and only the following features of the group can be mentioned. The dental formula is i.f , c.\, p.\ or \ , m.. The canines are often large; the upper molars carry from three to six cusps, while the lower ones are of the tuberculo-sectorial type with either four or five cusps. The lachrymal foramen may be either within or without the orbit, which is in free communication with the temporal fossa, with or without a complete bony ring. The humerus has an entepicondylar foramen. It is specially noteworthy that Adapts resembles the Lemuridae in the form and relations of the tympanic ring. Anaptomorphus has large

orbits and tritubercular molars. Certain Middle and Lower Eocene North American genera, such as Mixodectes and Pelycodus, together with the European Plesiadapis and Protoadapis, which have been regarded as lemuroids, are now frequently referred to the Rodentia (q.v.). On the other hand, Metachiromys, of the Bridger Eocene of America, originally described as a relative of Chiromys, has been stated to be an armadillo.

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PRIME, PRIMER and PRIMING. These three words are to be referred to Lat. primus, first, " prime," in O. Eng. prim, occurs first in the ecclesiastical sense of the Latin prima hora, the first hour, one of the lesser canonical hours of the Roman Church (see Breviary). Hence the word " primer " (Med. Lat. primarius) , i.e. a book of hours. This was a book for the use of the laity and not strictly a service book. These books originally contained parts of the offices for the canonical hours, the penitential and other psalms, the Litany, devotional prayers and other matter. There were several " Primers " printed in the reign of Henry VIII.; the King's Primer of 1545 contained the Calendar, the Commandments, Creed, Lord's Prayer, the penitential psalms, Litany and prayers for special occasions. The primer of William Marshall, the printer and reformer, 1534, is entitled The Prymer in Englyshe, with certeyn prayers and godly meditations, very necessary for all people that understande not the Latyne Tongue. Later . these primers

contained the Catechism, graces before and after meals, and the A. B. C. They were published for children, like the earlier Sarum Primer C 1 S37)i and became educational in purpose, as reading books. The earlier primers were also used in this way, as is shown

by the " litel child " of Chaucer's Prioress's Tale, who sitting " at his prymer, redemptorie herde synge." Thus " primer " or " primmer " became the regular name for an elementary book for learners. For the type known as " great primer " and " long primer," see Typography.

Apart from the use of " prime " as the period of greatest vigour of life, the first of the guards in fencing, and for those numbers which have no divisors except themselves and unity (see Arithmetic), the principal use is that of the verb, in the sense of to insert in the pan of an old-fashioned small arm, the " primer," containing powder which, on explosion by percussion, fires the charge. This use seems to be due to " priming " being the first stage in the discharge of the weapon. Finally " prim- ing " is the first coat of size or colour laid on a surface as a preparation for the body colour.

PRIME MINISTER, or Premier, in England, the first minister of the Crown. Until 1905 the office of prime minister was unknown to the law, 1 but by a royal warrant of the 2nd of December of that year the holder of the office, as such, was given precedence next after the archbishop of York. The prime minister is the medium of intercourse between the cabinet and the sovereign; he has to be cognizant of all matters of real importance that take place in the different departments so as to exercise a controlling influence in the cabinet; he is virtually responsible for the disposal of the entire patronage of the Crown; he selects his colleagues, and by his resignation of office dissolves the ministry. Yet he was until 1905, in theory at least, but the equalof the colleagues he appointed. The prime minister is nominated by the sovereign. " I offered," said Sir Robert Peel on his resignation of office, " no opinion as to the choice of a successor. That is almost the only act which is the personal act of the sovereign; it is for the sovereign to determine in whom her confidence shall be placed." Yet this selection by the Crown is practically limited. No prime minister could carry on the government of the country for any length of time who did not possess the confidence of the House of Commons. The prime minister has no salary as prime minister, but he usually holds the premiership in connexion with the first lordship of the treasury, the chancellorship of the exchequer, a secretaryship of state or the privy seal. Sir Robert Walpole must be regarded as the first prime minister — that is, a minister who imposed harmonious action upon his colleagues in the cabinet. This was brought about partly by the capacity of the man himself, partly by the lack of interest of George I. and II. in English home affairs. This Creation, as it were, of a superior minister was so gradually and silently effected that it is

difficult to realize its full importance. In previous ministries there was no prime minister except so far as one member of the administration dominated over his colleagues by the force of character and intelligence. In the reign of George III. even North and Adding- ton were universally acknowledged by the title of prime minister, though they had little claim to the independence of action of a Walpole or a Pitt.

British Prime Ministers. Sir R. Walpole . . 1 721-1742 Earl of Shelburne John, Lord Carteret (afterwards Mar-

(afterwards Earl quess of Lans-

Granville) . . . 1742-1744 downe) . . . 1782-1783 Henry Pelham . . 1 744-1 754 Lord North (after- Duke of Newcastle . 1 754-1 756 wards Earl of Guil- William Pitt and ford …. 1783

Duke of Newcastle 1756-1762 W.Pitt 1783-1861

Earl of Bute . . . 1 762-1 763 h. Addington (after- George Grenvdle . 1 763-1 765 wards Viscount Marquess of Rock- Sidmouth) . . 1S01-1804

1765-1766 w.Pitt 1804-1806

1 766-1 767 k° rc ˆ Grenville . . 1806-1807 Duke of Grafton .1767-1770 Duke of Portland . 1 807-1 809 Lord North . . . 1770-1782 Spencer Perceval . 1809-1812 Marquess of Rock- Earl of Liverpool . 1812-1827

ingham . . . 1782 G. Canning . . . 1 827

1 The first formal mention in a public document appears to be in 1878, where, in the opening clause of the treaty of Berlin, the earl of Beaconsfield is referred to as " First Lord of Her Majesty's Treasury, Prime Minister of England."

ingham W. Pitt, Earl Chatham

of

338 PRIMERO— PRIMITIVE METHODIST CHURCH, THE

Viscount Goderich (afterwards Earl of Ripon) .

Duke of Wellington .

Earl Grey

Viscount Melbourne

Sir R. Peel . . .

Viscount Melbourne

Sir R. Peel . . .

Lord John Russell (afterwards Earl Russell) . . .

Earl of Derby

Earl of Aberdeen

Viscount Palmerston

Earl of Derby

Viscount Palmerston

Earl Russell

Earl of Derby

i 827-1 828

1828-1830

1 830-1 834

1834

1 834-1 835

1835-1841

1841-1846

1 846-1 852 1852

1852-1855 1855-1858 1858-1859 1 859-1 865 1865-1866 1 866-1 868

B. Disraeli (after-

wards Earl of

Beaconsfield) .

1868

W. E. Gladstone

1 868-1 874

B. Disraeli (Beacons

field) . . .

1874-1880

W. E. Gladstone.

1 880-1 885

Marquess of Salis-

bury

1885-1886

W. E. Gladstone.

1886

Marquess of Salis-

bury

1 886-1 892

W. E. Gladstone.

1 892-1 894

Earl of Rosebery

1 894-1 895

Marquess of Salis-

bury

1 895-1902

A. J. Balfour

. 1902-1905

Sir H. Campbell-

Bannerman

1905-1908

H. H. Asquith .

. 1908-

PRIMERO (Span, first), a card game of Spanish origin, which Strutt calls " the oldest game of cards played in England." It is described as having a close resmblance to Ombre (q.v.), by which it had been superseded. In both games the spadillo or ace of spades was the best card, but Primero was played with six cards and Ombre with nine. The exact method of play is uncertain.

PRIME VERTICAL, in astronomy, the vertical circle passing east and west through the zenith, and intersecting the horizon in its east and west points (see Astronomy).

PRIMITIVE METHODIST CHURCH, THE, a community of nonconformists, which owes its origin to the fact that Methodism as founded by the Wesleys tended, after the first generation, to depart from the enthusiasm that had marked its inception and to settle down to the task of self-organization. There were, however, some ardent spirits who continued to work along the old lines and whose watchword was revivalism, and out of their efforts came the Bible Christian, the Independent Methodist and the Primitive Methodist denominations. These enthusiastic evangelists esteemed zeal a higher virtue than discipline and decorum, and put small emphasis on church systems as compared with conversions. One of the men to whom Primitive Methodism owes its existence was Hugh Bourne (1772-1852), a millwright of Stoke-upon-Trent. He joined a Methodist society at Burslem, but business taking him at the close of 1800 to the colliery district of Harrisehead and Kidsgrove, he was so impressed by the prevailing ignorance and debasement that he began a religious revival of the district. His open-air preaching was accompanied by prayer and singing, a departure from Wesley's practice and the forerunner of the well-known " Camp Meeting." A chapel was built at Harrisehead, and a second revival occurred in- September 1804, largely the result of a meeting held at Congleton by some enthusiasts from Southport. One of the after-fruits of this revival was the conversion (Jan. 1805) of the joint founder of Primitive Methodism, William Clowes (1780-1851), a native of Burslem, who had come to Tunstall. Clowes was a man of fine appearance and open disposition, with a compelling personality that found expression in a steady

glance and a thrill- ing voice. He was a potter by trade, and had a national reputa- tion as a dancer. . He joined a Methodist class, threw his house open for love-feasts and prayer-meetings, and did a great deal of itinerant evangelization among the cottages of the country- side. Lorenzo Dow (1 7 7 7-1 834) , an eccentric American Methodist revivalist, visited North Staffordshire and spoke of the camp- meetings held in America, with the result that on the 31st of May 1807 the first real English gathering of the kind was held on Mow Cop, since regarded as the Mecca of Primitive Methodism. It lasted from 6 a.m. to 8 p.m., and Bourne and his friends determined to continue the experiment as a counterblast to the parish wakes of the time, which were little better than local saturnalia. Opposition from a master potter of the district, who threatened to put the Conventicle Act in force, was overcome, but more serious difficulties were presented by the antagonism of the Wesleyan Methodist circuit authorities. But Bourne and his friends persisted against both Conference and the local super-

intendent, who issued bills declaring that no camp-meeting would be held at Norton in August 1807. The meeting was held and ten months later Bourne was expelled by the Burslem Quarterly Meeting, ostensibly for non-attendance at class (he had been away from home, evangelizing), really, as the Wesleyan super- intendent told him " because you have a tendency to setup other than the ordinary worship " which was precisely the reason why, fifty years earlier, the Anglican Church had declined to sanction the methods of John Wesley. The camp-meetings went steadily on, and their influence is reflected in the writings of George Eliot, George Borrow and William Howitt. The societies which Bourne formed were for a time allowed to go under (Wesleyan) Methodist protection, but the crisis came in 1810, when the Stanley class of ten members declined to wash theii hands of the Camp-Meeting Methodists, and so were refused admission. About this time, too (1809), Bourne appointed James Crawfoot, a Wesleyan local preacher who had been removed from the list for assisting the Independent Methodists, as a travelling preacher at 10s. a week, instructing him to give his whole time to evangelization and to get his converts to join the denomina- tions to which they were most inclined. Clowes, who, in spite of his revivalist sympathies, was more attached to Methodism than Bourne, was cut off from his church for taking part in camp-meetings at Ramsor in 1808 and 1810. His personality drew a number of strong men after him, and a society meeting held in a kitchen and then in a warehouse became the nucleus of a circuit, a chapel being built at Tunstall in July 1811, two months after the fusion of the Bourne and Clowes forces. Clowes, like Crawfoot, was set apart as a preacher to " live by the gospel," and in February 1812 the name "Primitive Methodist" was formally adopted, although for nearly a generation the name " Clowesites " survived in local use.

The first distinct period in the history of Primitive Methodism proper is 1811-1843. It wa -s a time of rapid expansion, marked by great missionary fervour, and may be called the Circuit Period, for even after the circuits were grouped into districts in 1 82 1 they did not lose their privilege of missionary initiative. The line of geographical progress first followed the valley of the Trent. The original circuit at Tunstall no sooner felt its feet than it favoured consolidation rather than extension. But irrepressibles like John Benton broke through the " non-mission law," and pressed forward through the " Adam Bede " country to Derby (which became the 2nd circuit in 1816); Nottingham, where a great camp-meeting on Whit Sunday 1816 was attended by 12,000 people; Leicestershire, where Loughborough became the 3rd circuit, with extensions into Rutland, Lincolnshire and Norfolk; and ultimately to Hull, which became the 4th circuit, and where a meeting which deserves to be called the First Conference was held in June 18 19. The Hull circuit during the next five years, through its Yorkshire, Western, North- western and Northern Missions, carried on a vigorous campaign with great success, especially among the then semi-savage colliers of Durham and Northumberland. During the five years 1810-1824 there had been made from Hull 17 circuits with a membership of 7600, and Hull itself had 3700 more.

Simultaneously with this work in the north, Tunstall circuit, having thrown off its lethargy at the Wrine Hill camp-meeting on the 23rd of May 1819, was carrying on an aggressive evan- gelism. In the Black Country, Darlaston circuit was formed in 1820, and John Wedgewood's Cheshire Mission, begun in 1819, led to work in Liverpool on the one hand and in Salop on the other. From Macclesfield a descent was made on Manchester; from Oakengates in South Shropshire came extensions to Here- fordshire, Glamorganshire and Wiltshire, where the famous Brinkworth circuit was established. The succeeding years, however, 1825-1828, showed a serious set-back, due to the lack of discipline. But drastic measures were taken, and in one year thirty preachers were struck off the list. Thenceforward, while the Oxford Movement was awakening one section of the people of England the Primitive Methodists were making themselves felt among other classes of the population. John Oxtoby, who evangelized Filey and became known as " Praying Johnny,"

was known to spend six hours at a time in intercession. Robert Key at Saham Tony in 1832 won over a young woman who converted her brother, Robert Eaglen, who, eighteen years later at Colchester, proved so decisive a factor in the life of Charles Haddon Spurgeon.

The Times of the 27th of December 1830, referring to the disaffected state of the southern counties, said: " The present population must be provided for in body and spirit on more liberal and Christian principles, or the whole mass of labourers will start into legions of banditti — banditti less criminal than those who have made them so, and who by a just and fearful retribution will soon become their victims." These were the classes the Primitive Methodists tried to reach, and in doing so they found themselves between two fires. On the one hand there was the mob violence that often amounted to sheer ruffianism, especially in Wessex and the home-counties. On the other hand there was legal persecution all over the country, and the preachers suffered many things from the hands of rural clergy and county magistrates. There are a score of cases of serious imprisonment, and a countless number of arrests and temporary detention. Local preachers received notice to quit their holdings, labourers were discharged, those who opened their cottages for meetings were evicted, and to show any hospitality to a travelling preacher was to risk the loss of home and employment. But the spirit of the evangelists was unquenchable.

At the Conference of 1842 both Clowes and Bourne became supernumeraries with a pension of £25 a year each. Clowes, indeed, had been free from circuit work since 1827, and he continued to pray and preach as he was able till his death in March 1851. Bourne, who worked at his trade more or less all through life, spent his last ten years in advocating the temper- ance cause; he died in October 1852. The years 1842-1853 mark a transition period in the history of Primitive Methodism. It was John Flesher who chiefly guided the movement from a loosely jointed Home Missionary Organization on to the lines of a real Connexionalism. One of the first steps was to move the Book Room and the meeting place of the executive committee from Bemersley to London. Soon after came the gradual process by which the circuits handed over their mission-work to a central Connexional Committee. The removal to London was proof that the leaders were alive to the necessity of grappling with the rapid growth of towns and cities, and that the Connexion, at first mainly a rural movement, had also urban work to accomplish. The famous Hull circuit long retained a number of powerful branches, a survival of the first period, but by 1853 it had come into line with what was by that time regarded as the normal organization.

The period 1853-1885 (where typical names are W. and S. Antliff, Thomas Bateman and Henry Hodge) finds Primitive Methodism as a connexion of federated districts, a unity which may be described as mechanical rather than organic. The districts between 1853 and 1873 were ten in number, Tunstall, Nottingham, Hull, Sunderland, Norwich, Manchester, Brink- worth, Leeds, Bristol and London. Conference — the supreme assembly — was a very jealously guarded preserve, being attain-

able only to preachers who had travelled 18 and superintended 1 2 years, and to laymen who had been members 1 2 and officials 10 years. This exclusiveness naturally strengthened the popular- ity and power of the districts, where energy and talent found a scope elsewhere denied. Thus Hull district inaugurated a bold policy of chapel-buildings; Norwich that of a foreign mission; Sunderland and Manchester the ideal of a better-educated ministry, Sunderland institute being opened in 1868; Nottingham district founded a middle-class school; Leeds promoted a union of Sunday-schools, and the placing of chapel property on a better financial footing. The period as a whole had some anxious moments; emigration to the gold-fields and the strife which afflicted Wesleyan Methodism brought loss and confusion between 1853 and i860. Yet when Conference met at Tunstall in the latter year to celebrate its jubilee it could report 675 ministers and 11,384 local preachers, 132,114 members,

2267 chapels, 167,533 scholars and 30,988 teachers. Over-seas, too, there was much activity and success. Work begun in Australia and New Zealand prospered, and the former country finally contributed over 11,000 members to the formation of the United Methodist Church of Australia, New Zealand with its 2600 members preferring to remain connected with the home country. In the United States there had been a quiet but steady growth since the first agents went out in 1829 and Hugh Bourne's advisory visit in 1844. There are now three Conferences — the Eastern, Pennsylvania and Western, with about 70 ministers, 100 churches and 7000 members. The Canadian churches had a good record, consummated in 1884 when they contributed 8000 members and 100 ministers to the United Methodist Church of the Dominion. In January 1870 the first piece of real foreign missionary work was begun at Fernando Po, followed in Decem- ber of the same year by the mission at Aliwal North on the Orange River in South Africa. This station is the centre of a polyglot circuit or district 1 50 m. by 50 m., and there is a member- ship of 1 73 1 and an efficient institution for training teachers," evangelists and artisans. In 1899 another South African mission was started, ultimately locating itself at Mashukulumbwe, and a few years later work was begun in Southern Nigeria.

Since 1885 Primitive Methodism has been developing from a " Connexion " into a " Church," the designation employed since 1902. At home a Union for Social Service was formed in 1906, the natural outcome of Thomas Jackson's efforts for the hungry and distressed in Clapton and Whitechapel, and of similar work at St George's Hall, Southwark. Other significant episodes have been the Unification of the Funds, the Equalization of Districts and the reconstruction of Conference on a broader basis, the Ministers' Sustentation Fund and the Church Exten- sion Fund, and the enlargement and reorganization of the college at Manchester. This

undertaking owes much to the liberality of Sir William P. Hartley, whose name the college, which is a school of the Victoria University, now bears. The Christian Endeavour movement in Great Britain derives, perhaps, its greatest force from its Primitive Methodist members; and the appointment of central missions, connexional evangelists and mission-vans, which tour the more sparsely populated rural districts, witness to a continuance of the original spirit of the denomination, while the more cultured side is fostered by the Hartley lecture. In celebration of the centenary of the Church, a fund of £250,000 was launched in 1907, and this was brought to a successful issue. Statistics for 1909 show 1178 ministers, 16,158 local preachers, 212,168 members, 4484 chapels, 465,531 Sunday scholars, 59,557 teachers. In the United States there were, in 1906, 101 church edifices and a total membership of

7558.

See H. B. Kendall, The Origin and History of the Primitive Method- ist Church (2 vols., 1906) ; and What hath God Wrought ? A Cente- nary Memorial of the P.M. Church (1908). (A. J. G.)

PRIMOGENITURE (Lat. primus, first, and genitus, born, from gignere, to bring forth), a term used to signify the preference in inheritance which is given by law, custom or usage, to the eldest son and his issue, or in exceptional cases to the line of the eldest daughter. The practice is almost entirely confined to the United Kingdom, having been abolished by the various civil codes of the European states, and having been rejected in the United States as contrary to the spirit of the constitution. The history of primogeniture is given in the article Succession, while the existing English law will be found in the articles Heir; Inheritance; Will, &c. But it may be briefly said here that the English law provided that in ordinary cases of inherit- ance to land of intestates the rule of primogeniture shall prevail among the male children of the person from whom descent is to be traced, but not among the females; and this principle is applied throughout all the degrees of relationship. There are exceptions to this rule, as in the cases of " gavelkind " and " borough-English, " and in the copyhold lands of a great number of manors, where customs analogous to those of gavelkind and borough-English have existed from time immemorial. In another class of exceptions the rule of primogeniture is applied

to the inheritance of females, who usually take equal shares :n each degree. The necessity for a sole succession has, for example, introduced succession

by primogeniture among females in the case of the inheritance of the Crown, and a similar necessity led to the maxim of the feudal law that certain dignities and offices, castles acquired for the defence of the realm, and other inheritances under " the law of the sword," should not be divided, but should go to the eldest of the co-heiresses (Bracton, De Legibus, ii. c. 76; Co. Litt., 165a). There are also many other special customs by which the ordinary rule of primogeniture is varied. It may be remarked that the English law of inherit- ance of land creates a double preference, subject to certain exceptions and customs, in favour of the male over the female and of the first-born among the males. This necessitates the rule of representation by which the issue of children are regarded as standing in the places of their parents, called " representative primogeniture." The rule appears to have been firmly established in England during the reign of Henry III., though its application was favoured as early as the 12th century throughout the numerous contests between brothers claiming by proximity of blood and their nephews claiming by representation, as in the case of King John and his nephew Prince Arthur (Glanvill, vii. c. 3; Bracton, De Legibus, ii. c. 30).

See Pollock and Maitland, History of English Law; K. E. Digby, History of the Law of Real Property; Sir H. Maine, Ancient Law and Early History of Institutions; C. S. Kenny, Law of Primogeniture in England.

PRIMROSE. 1 The genus Primula contains numerous species distributed throughout the cooler parts of Europe and Asia, and found also on the mountains of Abyssinia and Java; a few are American. They are herbaceous perennials, with a permanent stock from which are emitted tufts of leaves and flower-stems which die down in winter; the new growths formed in autumn remains in a bud-like condition ready to develop in spring. They form the typical genus of Primulaceae (q.v.), the floral conforma- tion of which is very interesting on several accounts independently of the beauty of the flowers. The variation in the length of the stamens and of the style in the flowers of Primula has attracted much attention since Charles Darwin pointed out the true significance of these varied arrangements. Briefly it may be said that some of the flowers have short stamens and a long style, while others have long stamens, or stamens inserted so high up that the anthers protrude beyond the corolla tube, and a short style. Gardeners and florists had for centuries been familiar with these variations, calling the flowers from which the anthers protruded " thrum-eyed " and those in which the stigma appeared in the mouth of the tube " pin-eyed." Darwin showed by experiment that the most perfect degree of fertility, as shown by the greatest number of seeds and the healthiest seedlings, was attained when the pollen from a short-stamened flower was transferred to the stigma of a short-styled flower, or when the pollen from the long stamens was applied to the long style. As in any given

flower the stamens are short (or low down in the flower-tube) and the style long, or conversely, it follows that to ensure a high degree of fertility cross fertilization must occur, and this is effected by the transfer of the pollen from one flower to another by insects. Incomplete fertility arises when the stigma is impregnated by the pollen from the same flower. The size of the pollen-grains and the texture of the stigma are different in the two forms of flower (see figure under Primulaceae). The discovery of the physiological significance of these variations in structure, which had long been noticed, was made by Darwin, and formed the first of a series of similar observations and experiments by himself and subsequent observers (see Darwin, Different Forms of Flowers, &c). Among British species may be mentioned the Common Primrose (P. vulgaris); the cowslip (P. veris); the true Oxlip (P. elatior), a rare plant only found in the eastern counties; and the common

1 Lat. primula; Ital. and Span, primavera; Fr. primevere, or in some provinces primerole. Strangely enough, the word was applied^ according to Dr Prior, in the middle ages to the daisy (Bellis perennis), the present usage being of comparatively recent origin.

oxlip, the flowers of which recall those of the common primrose, but are provided with a supporting stem, as in the cowslip; it is, in fact, a hybrid between the cowslip and the primrose. In addition to these two other species occur in Britain, namely, P. farinosa, found in Wales, the north of England and southern Scotland, and P. scotica, which occurs in Orkney and Caithness. These two species are found also in high Arctic latitudes, and P. farinosa, or a very closely allied form, exists in Fuegia.

The Auricula {q_.v.) of the gardens is derived from P. Auricula, a yellow-flowered species, a native of the Swiss mountains. The Polyanthus (q.v.), a well-known garden race, is probably derived from a cross between the primrose and cowslip. The Himalayas are rich in species of primrose, often very difficult of determination or limitation, certain forms being peculiar to particular valleys. Of these P. denticulata, Stuartii, sikkimmensis, nivalis, floribunda, may be mentioned as frequently cultivated, as well as the lovely rose-coloured species P. rosea.

The Royal Cowslip (P. imperialis) resembles P. japonica, but has leaves measuring 18 in. long by 5 in. wide". It grows at an elevation of 9000 ft. in Java, and has deep yellow or orange flowers.

The primrose is to be had in cultivation in a considerable variety of shades of colour, ranging from the palest yellow to deep crimson and blue. As the varieties do not reproduce quite true from seed, it is necessary to increase special kinds by division. The primrose is at its best in heavy soils in slight

shade, and with plenty of moisture during the summer.

One of the most popular of winter and early spring decorative plants is the Chinese primrose, Primula sinensis, of which some superb strains have been obtained. For ordinary purposes young plants are raised annually from seeds, sown about the beginning of March, and again for succession in April and, if needed, in May. The seed should be sown in well-drained pots or pans, in a compost of three parts light loam, one part well-rotted leaf-mould, and one part clean gritty sand, as it does not germinate freely if the soil contains stagnant moisture, afterwards placing a sheet of glass over the pans to prevent evaporation of moisture. When the seeds germinate, remove the glass and place the pans in a well- lighted position near the glass, shading them from the sun with thin white paper, and giving water moderately as required. When the seedlings are large enough to handle, prick them out in pans or shallow boxes, and, as soon as they have made leaves an inch long, pot them singly in 3-in. pots, using in the soil a little rotten dung. They should then be placed in a light frame near the glass in an open situation, facing the north. When their pots are filled with roots they should be moved into 6-in. or 7-in. pots. The soil should now consist of three parts good loam broken with the hand, one part rotten dung and leaf-mould, and as much sand as will keep the whole open. They should be potted firmly, and kept in frames close up to the glass till September, excess in watering being carefully avoided. In the autumn they should be transferred to a light house and placed near the glass, the atmosphere being kept dry by the occasional use of fire-heat. The night temperature should be kept about 45°. When the flowering stems are growing up, manure water once or twice a week will be beneficial. The semi-double varieties are increased from seeds, but the fully- double ones, and any particular sort, can only be increased by cuttings. Primula japonica, a bold-growing and very beautiful Japanese plant, is hardy in sheltered positions in England. P. cortusoides, var. Sieboldn (Japan), of which there are many lovely forms, is suitable for outdoor culture and under glass. There are several small-growing hardy species which should be accommodated on the best positions on rockeries where they are secure from ex- cessive dampness during winter; excess of moisture at that season is the worst enemy of the choice Alpine varieties. They are propa- gated by seed and by division of the crowns after flowering. P. Forrestii is a quite new orange-yellow flowered species from China; as is also P. Bulleyi. They are probably hardy — at least in favoured spots.

Evening primrose belongs to the genus Oenothera (natural order Onagraceae), natives of temperate North and South America. The common evening primrose, Oe. biennis, has become naturalized in Britain and elsewhere in Europe; the form or species known as var. grandiflora or Oe. Lamarckiana is a very showy plant with larger flowers than in the common

form. Other species known in gardens are Oe. missouriensis (macrocarpa) , 6 to 12 in., which has stout trailing branches, lance-shaped leaves and large yellow blossoms; Oe. taraxacifolia, 6 to 12 in., which has a stout crown from which the trailing branches spring out, and these bear very large white flowers changing to delicate rose ; this perishes in cold soils, and should therefore be raised from seed annually. Of erect habit are Oe. speciosa, 1 to 2 ft., with large white flowers; Oe. fruticosa,

2 to 3 ft., with abundant yellow flowers.

The name of Cape Primrose has been given by some to the hybrid

forms of Streptocarpus, a South African genus belonging 5 to the

natural order Gesneraceae.

PRIMROSE LEAGUE, THE— PRIMULACEAE

34i

PRIMROSE LEAGUE, THE, an organization for spreading Conservative principles amongst the British democracy. The primrose is associated with the name of Lord Beaconsfield (?.».), as being preferred by him to other flowers. On a card affixed to the wreath of primroses sent by Queen Victoria to be placed upon his coffin was written in Her Majesty's own handwriting: " His favourite flowers: from Osborne: a tribute of affectionate regard from Queen Victoria." On the day of the unveiling of Lord Beaconsfield 's statue all the members of the Conservative party in the House of Commons were decorated with the primrose. A small group had for some time discussed the means for obtain- ing for Conservative principles the support of the people. Sir H. D. Wolff therefore said to Lord Randolph Churchill, " Let us found a primrose league." The idea was accepted by several gentlemen in the habit of working together, and a meeting was held at the Carlton Club shortly afterwards, consisting Lord Randolph Churchill, Sir H. Drummond Wolff, Mr (afterwards Sir John) Gorst, Mr Percy Mitford, Colonel Fred Burnaby and some others, to whom were subsequently added Mr Satchell Hopkins, Mr J. B. Stone, Mr Rowlands and some Birmingham supporters of Colonel Fred Burnaby, who also wished to return Lord Randolph Churchill as a Conservative member for that city. These gentlemen were of great service in remodelling the original statutes first drawn up by Sir H. Drummond Wolff. The latter had for some years perceived the influence exercised in benefit societies by badges and titular appellations, and he further endeavoured to devise some quaint phraseology which would be attractive to the working classes. The title of Knight Harbinger was taken from an office no longer existing in the

Royal Household, and a regular gradation was instituted for the honorific titles and decorations assigned to members. This idea, though at first ridiculed, has been greatly developed since the foundation of the order; and new distinctions and decorations have been founded, also contributing to the attractions of the league. The League was partially copied from the organization of the Orange Society in Ireland. In lieu of calling the different subsidiary associations by the ordinary term " Lodges," the name was given of " Habitations," which could be constituted with thirteen members. These were intended as a substitute for the paid canvassers, about to be abolished by Mr Gladstone's Reform Bill. The principles of the League are best explained in the declaration which every member is asked to sign: " I declare on my honour and faith that I will devote my best ability to the maintenance of religion, of the estates of the realm, and of the imperial ascendancy of the British Empire; and that, consistently with my allegiance to the sovereign of these realms, I will promote with discretion and fidelity the above objects, being those of the Primrose League." The motto was " Imperium et libertas "; the seal, three primroses; and the badge, a monogram containing the letters PL, sur- rounded by primroses. Many other badges and various articles of jewellery have since been designed, with this flower as an emblem.

A small office was first taken on a second floor in Essex Street, Strand; but this had soon to be abandoned, as the dimensions of the League rapidly increased. Ladies were generally included in the first organization of the League, but subsequently a separate Ladies' Branch and Grand Council were formed. The founder of the Ladies' Grand Council was Lady Borthwick (afterwards Lady Glenesk), and the first meeting of the committee took place at her house in Piccadilly on the 2nd of March 1885. The ladies who formed the first committee were: Lady Borth- wick, the dowager-duchess of Marlborough (first lady president), Lady Wimborne, Lady Randolph Churchill, Lady Charles Beresford, the dowager-marchioness of Waterford, Julia marchioness of Tweeddale, Julia countess of Jersey, Mrs (subse- quently Lady) Hardman, Lady Dorothy Nevill, the Honourable Lady Campbell (later Lady Blythswood), the Honourable Mrs Armitage, Mrs Bischoffsheim, Miss Meresia Nevill (the first secretary of the Ladies' Council).

When the Leaeue had become a success, it was joined by Lord Salisbury and Sir Stafford Northcote, who were elected Grand

Masters. Its numbers gradually increased to a marvellous extent, as may be seen by the following figures: —

Year.

Knights.

Dames.

Associates.

Total.

Habita- tions.

1884

747

153

57

957

46

1885

8071

1381

1914

11,366

169

1886

32,645

23,381

181,257

237,283

1200

1887

50,258

39,215

476,388

565,861

1724

1888

54,58o

42,791

575,235

672,606

1877

1889

58,180

46,216

705,832

810,228

1986

1890

60,795

48,796

801,261

910,852

2081

1 891

63,251

5o,973

887,068

1,001,292

2143

1901

75,26o

64,906

i,4i6,473

1,556,639

2392

1910

87,235

80,038

1,885,746

2,053,019

2645

See an article in the Albemarle of January 1892, written by Miss Meresia Nevill; and the Primrose League Manual, published at the offices at Westminster. The latter publication is interesting as a history of the organization. (H. D. W.)

PRIMULACEAE, in botany, an order of Gamopetalous Dicotyledons belonging to the series Primulcles and containing 28 genera with about 350 species. It is cosmopolitan in dis- tribution, but the majority of the species are confined to the tem- perate and colder parts of the northern hemisphere and many are arctic or alpine. Eight genera are represented in the British flora.

The plants are herbs, sometimes annual as in pimpernel {Anagallis

arvensis) (fig. 1), but generally perennial as in Primula,

(After Wossidlo. From Strasburger's Lehrbuch der Botanik, by permission of Gustav Fischer.)

Fig. 1. — Anagallis arvensis (pimpernel).

1, Flowering branch. 3, Capsule.

2, A flower cut through longi- 4, Seed, tudinally, showing the central 2, 3, 4, Enlarged, placenta.

where the plant persists by means of a sympodial rhizome, or in Cyclamen by means of a tuber formed from the swollen hypocotyl. The leaves form a radical rosette as in Primula (primrose, cowslip, &c), or there is a well-developed aerial stem which is erect, as in species of Lysimachia, or creeping, as in Lysimachia Nummularia (creeping jenny or money-wort). Hottonia (water violet) is a floating water plant with submerged leaves cut into fine linear segments. The leaves are generally simple, often with a toothed margin; their arrangement is alternate, opposite or whorled, all three forms occurring in one and the same genus Lysimachia. The flowers are solitary in the leaf-axils as in pimpernel, money-wort, &c, or umbelled as in primrose, where the umbel is sessile, and cowslip, where it is stalked, or in racemes or spikes as in species of Lysimachia. Each flower is subtended by a bract, but there are no bracteoles, and corresponding with the absence of the latter the two first developed sepals stand right and left (fig. 2). The flowers are hermaphrodite and regular with parts in fives (pentamerous) throughout, though exceptions from the pentamerous arrangement occur. The sepals are leafy and persistent; the corolla is generally divided into a longer or shorter tube and a limb which is spreading, as in primrose, or reflexed, as in Cyclamen; in SoManella it is bell-shaped; in Lysimachia the tube is often very short, the petals appearing almost free; in Glaux the petals are absent. The five stamens spring from the corolla-tube and are

Fig. 2.

Diagram of a typical flower of Priraula- ceae.

opposite to its lobes; this anomalous position is generally explained by assuming that an outer whorl of stamens opposite the sepals has disappeared, though sometimes represented by scales as in Samolus and

Soldanclla. Another explanation is based on the late appearance of the petals in the floral develop- ment and their origin from the backs of the primordia of the stamens; it is then assumed that three alternating whorls only are present, namely, sepals, stamens bearing petal-like dorsal outgrowths, and carpels. The superior ovary — half-inferior in Samolus — bears a simple style ending in a capitate entire stigma, and contains a free-central placenta bearing generally a large number of ovules, which are exceptional in the group Gamopetalae in having two integuments. The fruit is a capsule dehiscing by 5 sometimes 10 teeth or valves, or sometimes transversely (a pyxidium) as in Anagallis.

Cross pollination is often favoured by dimorphism of the flower, as shown in species of Primula (fig. 3). The two forms have long and short styles repectively, the stamens occupying corresponding positions half-way down or at the mouth of the corolla-tube; the long-styled flowers have smaller pollen-grains, which correspond with smaller stigmatic papillae on the short styles.

The order is divided into five tribes by characters based on differences in position of the ovules — which are generally semi- anatropous so that the seed is peltate with the hilum in the centre on one side (or ventral), but sometimes, as in Hottonia and

% &

(From Strasburger's Lehrbuch der Botanik.)

Fig. 3. — Primula sinensis, L, Long-styled flowers. P, Pollen grains, and N, stig-

K, Short-styled flowers. matic papillae of long-styled

G, Style. form.

S, Anthers. p, n, Ditto of short-styled form.

(P, N, p, n.)

Samolus, anatropous with the hilum basal — together with the method of dehiscence of the capsule and the relative position of the ovary. The chief British genera are Primula, including P. vulgaris, primrose, P. veris, cowslip, P. elatior, oxlip, and the small alpine species P. farinosa, with mealy leaves; Lysimachia, loose strife, including L. Nummularia, money-wort; Anagallis, pimpernel; and Hottonia, water violet.

PRIMULINE, a dye-stuff containing the thiazole ring system conjointly with

a benzene ring. The primulines are to be considered as derivatives of dehydrothiotoluidine (aminoben- zenyltoluylmercaptan), which is obtained when para-tolui-

,S CH

•C 6 H,.NH 2 (£)

Primuline. dine is heated with sulphur for eighteen hours at 180-190 C. and then for a further six hours at 200-2 20 C. (P. Jacobson, Ber., 1889, 22, p. 333; L. Gattermann, ibid. p. 1084). Dehy- drothiotoluidine is not itself a dye-stuff, but if the heating be carried out at a higher temperature in the presence of more sulphur, then a base is formed, which gives primuline-yellow on sulphonation (A. G. Green, Journ. Soc. Chem. Ind., 1888, 1, p. 194). Primuline-yellow is a mixture of sodium salts and probably contains in the molecule at least three thiazole rings

in combination. It is a substantive cotton dye of rather fugitive shade, but can be diazotized on the fibre and then developed with other components, so yielding a series of ingrain colours.

Thioflavine T is obtained by the methylation of dehydro- thiotoluidine with methyl alcohol in the presence of hydrochloric acid [German Patent 51738 (1888)]. Thioflavine S results from the methylation of dehydrothiotoluidine sulphonic acid. This sulphonic acid on oxidation with bleaching powder or with lead peroxide, in alkaline solution yields chloramine yellow, which dyes cotton a beautiful yellow.

PRIMUS, MARCUS ANTONIUS, Roman general, was born at Tolosa in Gaul about a.d. 30-35. During the reign of Nero he was resident in Rome and a member of the senate, from which he was expelled for forgery in connexion with a will and was banished from the city. He was subsequently reinstated by Galba, and placed in command of the 7th legion in Pannonia. During the civil war he was one of Vespasian's strongest sup- porters. Advancing into Italy, he gained a decisive victory over the Vitellians at Bedriacum (or Betriacum) in October 69, and on the same day stormed and set fire to Cremona. He then crossed the Apennines, and made his way to Rome, into which he forced an entrance after considerable opposition. Vitellius was seized and put to death. For a few days Primus was virtually ruler of Rome, and the senate bestowed upon him the rank and insignia of a consul. But on the arrival of Licinius Mucianus he was not only obliged to surrender his authority, but was treated with such ignominy that he left Rome. Primus must have been alive during the reign of Domitian, since four epigrams of Martial are addressed to him. Tacitus describes him as brave in action, ready of speech, clever at bringing others

into odium, powerful in times of civil war and rebellion, greedy, extravagant, in peace a bad citizen, in war an ally not to be despised.

See Tacitus, Histories, ii., iii., iv. ; Dio Cassius lxv. 9-21.

PRINA, GIUSEPPE (1768-1814), Italian statesman. He gave early proofs of rare talent, and after studying at the university of Pavia he passed as doctor of law in 1789. He was a firm adherent of Napoleon Bonaparte, and when Eugene Beauharnais became viceroy of Italy, was appointed minister of finance. Genial in private life, he was harsh and unyielding in his official capacity, and his singular skill in devising fresh taxes to meet the enormous demands of Napoleon's government made him the best-hated man in Lombardy, the more so that, being a Piedmontese, he was regarded as a foreigner. The news of the emperor's forced abdication on the nth of April 1814 reached Milan on the 16th, and roused hopes of independence. The senate assembled on the 19th and Prina's party moved that delegates should be despatched to Vienna to request that Eugene Beauharnais should be raised to the throne of a free Italian kingdom. In spite of precautions this fact became public and provoked the formidable riot styled " The battle of the um- brellas " that broke out the next day. A furious mob burst into the senate, pillaged its halls and sought everywhere for the execrated Prina. Not finding him there, the rioters rushed to his house, which they wrecked, and seizing the doomed minister, who was discovered in a remote chamber donning a disguise, dur- ing four hours dragged him about the town, until wounded, mutilated, almost torn to pieces, he received his death-blow. The mob then insulted his miserable remains, stuffing stamped- paper into his mouth. These horrors were enacted by day, in a thoroughfare crowded with " respectable " citizens sheltered from the rain by umbrellas. The authorities were passive, and although some courageous persons actually rescued the victim at an early stage and concealed him in a friendly house, the blood- thirsty mob soon discovered his refuge and were about to force an entrance, when the dying man surrendered to save bis deliverer's property. The riots directly contributed to the re-establishment of Austrian rule in Milan.

See M. Fabi, Milano ed il ministro Prina (Novara, i860); F. Lemmi, La Restaurazione austriaca a Milano net 1814 (Bologna,

1902) ; Ugo Foscolo, Alcune parole intorno alia fine del regno d' Italia. The story of the murder of Prina forms the subject of a play by G. Rovetta, entitled Principio di secolo.

PRINCE (Lat. princeps, from primus capio, " I am the first to take "; Ital. principe, Fr. prince), a title implying either political power or social rank. The Latin word princeps originally signified " the first " either in place or action (cf. Ger. Fiirst; O.H.G. forislo = English " first "). As an honorary title it was applied in the Roman republic to the princeps senatus, i.e. the senator who stood first on the censor's list, and the princeps juventutis, i.e. the first on the roll of the equestrian order. The assumption of the style of princeps senatus by Augustus {q.v.) first associated the word with the idea of sovereignty and dominion, but throughout the period of the empire it is still used as a title of certain civil or military officials (e.g. princeps officii, for the chief official of a provincial governor, in the Theodosian code, leg. I., De offic. red. prov. i. 7; princeps militiae, i.e. the commander of a cohort or legion) ; while in the middle ages the term is still applied vaguely in charters to the magnates of the state or the high officials of the palace, principes being treated as the equivalent of proceres, optimates or seniores. Yet the idea of sovereignty as implied in the word princeps, used as a title rather than as a designation, survived strongly. In the Visigothic and Lombard codes princeps is the equivalent of rex or imperator; and when, after the overthrow of the Lombard kingdom by the Franks, Arichis II. (d. 787) of Beneventum wished to assert his independent sovereignty, he had himself anointed and crowned, and exchanged his style of duke for that of prince.

From Italy the use of the title spread — first, with the Crusaders, to the Holy Land, where Bohemund, son of Tancred, took the style of prince of Antioch; next, with the Latin conquerors, into the East Roman Empire, where in 1205 William de Champlette, a cadet of the house of Champagne, founded the principality of Achaea and the Morea. This example was followed by lesser magnates, who styled themselves loosely, or were so styled by the chroniclers, " princes," even though they had little claim to independent sovereignty. From the East the fashion was carried back to France; but there the erection of certain fiefs into " principalities," which became common in the 15th and 16th centuries, certainly implied no concession of independent sovereignty, and the title of " prince " thus bestowed ranked below that of " duke," being sometimes borne by cadet branches of ducal houses, e.g. the princes of Leon and of Soubise, cadets of the house of Rohan. On the other hand, the title of " prince " was borne from the time of Charles VII. or Louis XL by the sons of the royal house, so-called " princes of the blood " {princes du sang), who took precedence in due order after the king. To these were added, from the time of Louis XIV., the princes legitimes, recognized bastards of the sovereign, who ranked next after the princes of the blood. Thus, e.g. the princes of Conde, Conti and Lamballe owed their exalted precedence, not to their principalities, but to their royal descent. In Germany, Austria and other

countries formerly embraced in the Holy Roman Empire the title of " prince " has had a some- what different history. During the first period of the empire, the " princes " were the whole body of the optimates who took rank next to the emperor. In the nth century, with the growth of feudalism, all feudatories holding in chief of the Crown ranked as " princes," from dukes to simple counts, together with archbishops, bishops and the abbots of monasteries held directly of the emperor. Towards the end of the 1 2th century, however, the order of princes (Fiirstenstand) was narrowed to the more important spiritual and temporal feudatories who had a right to a seat in the diet of the empire in the " college of princes " (Fiirstenbank). Finally, in the 13th century, seven of the most powerful of these separated themselves into a college which obtained the sole right of electing the emperor. These were called "prince electors " (Kurfiirsten) , and formed the highest rank of the German princes (see Elector). The formal designation of " prince " (Fiirst) was, however, extremely rare in Germany in the middle ages. Examples are

France.

Germany.

the princes of Mecklenburg (Prilislav I., prince of the Holy Roman Empire in n 70) and Rtigen, the latter title now belonging to the kings of Prussia. In the 17th century some half-dozen more principalities were created, of which that of Schwarzburg- Sondershausen (1697) survives as a sovereign house. The 18th century increased their number, and of the princely houses of this period those of Schwarzburg-Rudolstadt (1710), Waldeck (17 12) and Reuss, elder branch (1778), have preserved their sovereignty. Of the other sovereign " princes " in Germany, Reuss, cadet branch, obtained the title in 1806, Schaumburg-Lippe in 1807. Outside the German Empire the prince of Liechtenstein, whose title dates from 1608, still remains sovereign.

Thus, in Germany, with the decay of the empire the title "prince" received a sovereign connotation, though it ranks, as in France, below that of " duke." There are, however, in the countries formerly embraced in the Holy Roman Empire other classes of " princes." Some of these inherit titles, sovereign under the old empire, but " mediatized " during the years of its collapse at the beginning of the 19th century, e.g. Thurn and Taxis (1695), Hohenlohe (1764), Leiningen (1779); others received the title of " prince " immediately before or after the end of the empire as " compensation " for ceded territories, e.g. Metternich-Winneburg (1803). Besides these mediatized princes, who transmit their titles and their privilege of " royal " blood to all their legitimate descendants, there are also in Austria and Germany " princes," created by the various German sovereigns, and some

dating from the period of the old empire, who take a lower rank, as not being " princes of the Holy Roman Empire " nor entitled to any royal privileges. Some of these titles have been bestowed to give a recognized rank to the morganatic wives and children of royal princes, e.g., the princes of Battenberg, or the title of " princess " of Hohenberg borne by the consort of the Archduke Francis Ferdinand d'Este; others as a reward for distinguished service, e.g. Hardenberg, Bliicher, Bismarck. In this latter case the rule of primogeniture has been usual, the younger sons taking the title of " count " (Graf). These non-royal princes are ranked in the Almanack de Gotha with British and French dukes and Italian princes. All these various classes of princes are styled Fiirst and have the predicate " Serene Highness " (Durchlaucht) . The word Prinz, actually synonymous with Fiirst, is reserved as the title of the non-reigning members of sovereign houses and, with certain exceptions (e.g. Bavaria), for the cadets of mediatized ducal and princely families. The heir to a throne is " crown prince " (Kronprinz), " hereditary grand duke " (Erbgrossherzog) or " hereditary prince " (Erbprinz). The heir to the crown of Prussia, when not the son of the monarch has the .title of " prince of Prussia " (Prinz von Preussen). 1

In Italy the title " prince " (principe) is also of very unequal value. In Naples, following the precedent set by Arichis II., " much affecting the glory of a greater name than duke," it ranked above that of duke. In other parts y '

of Italy the heads of great families sometimes bear the title of " prince," e.g. Prince Corsini, duke of Casigliano; sometimes that of " duke," e.g. the Caetani, princes of Teano, whose chief is styled " duke of Sermoneta," the title of " prince of Teano " being borne by his eldest son. The title of " prince of Naples " is attached to the eldest son of the king of Italy. The excessive multipli- cation of the title has tended to deprive it of much social value in itself, and under the democratic constitution of Italy it confers neither power nor precedence.

" Prince " is also the translation of the Russian title knyaz, though veliky knyaz, the style of the Imperial princes, is rendered " grand duke." Some of the Russian, or Polish- Russian, princely families are of great importance — e.g.the Czartoryskis,the Swiatopolk-Czetwertynskis,or the Russian

1 Fiirst may or may not be a sovereign or territorial title, but it is only borne by the head of the family, e.g. Heinrich XIV., regie- render Fiirst (reigning prince) von Reuss or Fiirst Bismarck. Prinz always implies cadetship, e.g. Prinz Heinrich XLV. Reuss. The title Prinz von Preussen, therefore, excludes any idea of territorial sovereignty, whereas the correct German rendering of that of prince of Wales, which originally at least

implied such sovereignty, would be Fiirst von Wales.

Russia.

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branch of the Lubomirskis. But, in general, though the title ” prince ” implies descent from one or other of the ruling dynasties of Russia, it is in itself of little account, being exceed- ingly common owing to its being borne by every member of the family. The predicate of ” Serene Highness,” though borne by certain magnates who were princes before they became Russians — as in the case of the families mentioned above — is not attached to the Russian title of “prince.” In some cases, however, it is conferred with the title by imperial warrant (e.g. Lieven, 1826).

The title of ” prince ” is also borne by the descendants of those Greek Phanariot families (see Phanariots), e.g. Mavrocordato, Ypsilanti, Soutzo, who formerly supplied hospodars ur ey ‘ to the Turkish principalities on the Danube. In the Ottoman Empire the rulers appointed to the quasi-independent Christian communities subject to it have usually been designated ” prince, ” and the title has thus come to signify in connexion with the Eastern Question a sovereignty more or less subordinate. As such it was rejected on behalf of the Bavarian prince Otho, when he accepted the throne of Greece, in favour of that of ” king. ” On the other hand, the substitution, in 1852, in Montenegro of the title of ” prince and lord ” (knyaz i gospodar) for the ancient title of vladika (archbishop) certainly implied no such subordination. The only other instance in Europe of ” prince ” as a completely sovereign title is that of the prince of Monaco, the formal style having been adopted by the Grimaldi lords in 1641.

In Great Britain ” prince ” and ” princess ” as titles are confined to members of the royal family, though non-royal dukes are so described in their formal style (see Duke). Nor is this use of great antiquity; the custom of giving the courtesy title of ” prince ” to all male descendants of the sovereign to the third and fourth generation being of modern growth and quite foreign to English traditions. It was not till the reign of Henry VII. that the king’s sons began to be styled ” princes “; and as late as the time of Charles II., the daughters of the duke of York, both of whom became queens regnant, were called simply the Lady Mary and the Lady Anne. The title of ” princess royal, ” bestowed on the eldest daughter of the sovereign

was borrowed by King George II. from Prussia. Until recent years the title " prince " was never conferred on anybody except the heir-apparent to the Crown, and his princi- pality is a peerage. Since the reign of Edward III. the eldest sons of the kings and queens of England have always been dukes of Cornwall by birth, and, with a few exceptions, princes of Wales by creation. Before that Edward I. had conferred the principality on his eldest son, afterwards Edward II., who was summoned to and sat in parliament as prince of Wales. But Edward the Black Prince was the original grantee of the principality as well as of the dukedom, under the special limitations which have continued in force to the present day. The entail of the former was " to him and his heirs the kings of England " and of the latter " to him and his heirs the first-begotten sons of the kings of England. " Hence when a prince of Wales and duke of Cornwall succeeds to the throne the principality in all cases merges at once in the Crown, and can have no separate existence again except under a fresh creation, while the dukedom, if he has a son, descends immediately to him, or remains in abeyance until he has a son if one is not already born. If, however, a prince of Wales and duke of Cornwall should die in the lifetime of the sovereign, leaving a son and heir, both dignities are extinguished, because his son, although he is his heir, is neither a king of England nor the first-begotten son of a king of England. But, if instead of a son he should leave a brother his heir, then — as was decided in the reign of James I. on the death of Henry, prince of Wales, whose heir was his brother Charles, duke of York — the dukedom of Cornwall would pass to him as the first-begotten son of the king of England then alive, the principality of Wales alone becoming merged in the Crown. It has thus occasionally happened that the dukes of Cornwall have not been princes of Wales, as Henry VI. and Edward VI., and that the princes

of Wales have not been dukes of Cornwall, as Richard II. and George III.

But even now the cadets of the reigning family can only by royal intervention legally be saved from merging, as of old, in the general untitled mass of the people. The children of the sovereign other than his eldest son, though by courtesy " princes " and " princesses, " need a royal warrant to raise them de jure above the common herd; and even then, though they be dubbed " Royal Highness " in their cradles, they remain " commoners " till raised to the peerage. In 1905 King Edward VII. established what appears to be a new precedent, by conferring the titles of "princess" and "highness" upon the daughters of the princess Louise, duchess of Fife, created " princess royal. "

This use of the word " prince " — which has in England so lofty a

connotation — to translate foreign titles of such varying impor- tance and significance naturally leads to a good deal of confusion in the public mind. It is not uncommon in English society to see, e.g. a Russian prince, who may be only the cadet of a family not included in the Almanack de Gotha, given precedence as such over the untitled members of a great English ducal family, and treated with some of that exaggerated deference paid to " royalty. " On the other hand, the insular complacency of many Englishmen is apt to regard all German princes with a certain contempt, whereas the title is in Germany sometimes associated with sovereign power, sometimes with vast territorial possessions, and always with high social position.

See, Du Cange, Glossarium, s.v. " Princeps," ed. G. A. L. Henschal (Niort, 1883); John Selden, Titles of Honour (London, 1672); Almanack de Gotha (1906) ; H. Schulze, Die Hausgesetze der regie- renden deutschen Fiirstenhauser (3 vols., Jena, 1 862-1 883); H. Rehm, Modernes Furstenrecht (Munich, 1904). (W. A. P.)

PRINCE EDWARD ISLAND, a province of the Dominion of Canada, lies between 45 58′ and 47° 7′ N. and 62 and 64 27′ W. The underlying geological formation is Permian, though outliers of Triassic rock occur. The coal seams supposed to underlie the Permian formation are apparently too deep down to be of practical value. The rocks consist of soft red micaceous sandstone and shales, with interstratified but irregular beds of brownish-red conglomerates containing pebbles of white quartz and other rocks. There are also beds of hard dark-red sandstone with the shales. Bands of moderately hard reddish-brown conglomerate, the pebbles being of red shale and containing white calcite, are seen at many points; and then greenish-grey irregular patches occur in the red beds, due to the bleaching out of the red colours by the action of the organic matter of plants. Fossil plants are abundant at many places. Beds of peat, dunes of drifted sand, alluvial clays and mussel mud occur in and near the creeks and bays.

Physical Features. — The island lies in a great semi-circulai bay of the Gulf of St Lawrence, which extends from Point Miscou in New Brunswick to Cape North in Cape Breton. From the mainland it is separated by Northumberland Strait, which varies from 9 to 30 miles in width. It is extremely irregular in shape, and deep inlets and tidal streams almost divide it into three approximately equal parts; from the head of Hillsborough river on the south to Savage Harbour on the north is only one and a half miles, while at high tide the distance between the heads of the streams which fall into Bedeque and Richmond Bays is even less. North of Summerside the land nowhere rises more than 175 ft. above sea-level; but between Summerside and Charlottetown, especially near north Wiltshire, is a ridge of hills, running from north to south and rising to a height of nearly 500 ft. From Charlottetown eastwards the land is low and level. The north

shore, facing the gulf, is a long series of beaches of fine sand, and is a favourite resort in summer. On the south, low cliffs of crumbling red sandstone face the strait. The climate is healthy, and though bracing, milder than that of the neighbour- ing mainland. Fogs are much less common than in either New Brunswick or Nova Scotia.

Area and Population. — The greatest length of the island is 145 m., its greatest breadth 34 m., its total area 2184 sq. m.

The population in iqoi was 103,259, having sunk from 109,078 in 1 89 1. It is thus much the most densely populated province in Canada, there being nearly fifty-two persons to the sq. m. Though very large families are not so common as in the province of Quebec, the agricultural character of the population makes the average number of persons to a family greater (5-51) than in any other province. As in all the maritime provinces, there is a steady immigration to the Canadian West and to the United States. The population is mainly of British descent, but a-lso comprises descendants of the French Acadians and of the American loyalists. About 200 Indians of the Mic-Mac tribe remain, and have slightly increased in numbers since 1891. In 1901 the origin of the people was: Scots, 41,753; English, 24,043; Irish, 21,992; French, 13,867; all other nationalities, 1604. The principal religious denominations and the number of their adherents were as follows: Church of Rome, 45,796; Presby- terians, 30,750; Methodists, 13,402; Anglican, 5976; Baptists, 5905. The Irish and French are almost entirely Roman Catholic, the Scots about two-thirds Presbyterian and one third Roman Catholic. Jurisdiction over the Catholics is held by the bishop of Charlottetown, and over the Anglicans by the bishop of Nova Scotia. The Presbyterians form part of the synod of the Maritime Provinces.

Administration, &c. — Five members of the House of Commons and four senators are sent to the federal legislature. At its entry into federation in 1873, the number of members was six, and the reduction to five in 1901 was bitterly denounced. The local government now consists of a lieutenant-governor and of a legislative assembly. This conducts not only the general affairs of the province, but most of those of the towns and villages; legal provision has, however, been made for the establishment of a municipal system, and Charlottetown and Summerside are incorporated municipalities, though with powers of self-govern- ment much more limited than those of any other incorporated Canadian towns. The provincial revenues, which tend to prove inadequate, are largely made up of the subsidy paid by the federal government, though there are numerous taxes,

which bear heavily on the small industrial population. But for the increase in 1907 of the federal subsidy, financial exigencies might have forced the adoption of direct taxation, in spite of its unpopularity among the farmers.

Education. — Primary education in the province has been given free since 1852. Since 1877 it has been under the control of a minister of education with a seat in the provincial cabinet. At Charlottetown is the Prince of Wales College, really a rather advanced secondary school, with which is affiliated the Normal School. St Dunstan's College, another advanced high school in Charlottetown, is under Roman Catholic control. Advanced university education is not given in the province. Attendance at the primary schools is by law compulsory, but the exigencies of a farming population and the lack of adequate means of enforcement render the law inoperative. The salaries of the teachers are, as a rule, low,' and the school buildings cheerless and ill-maintained.

Agriculture. — The soil, an open sandy loam, deep red in colour, which was slightly exhausted at the beginning of the century by repeated crops of cereals, has been renewed by the application of mussel mud dredged from the bays and tidal streams. All the staple crops are grown — especially oats, potatoes and turnips. Wheat is raised only for local consump- tion. Cattle and hogs flourish. In the last years of the 19th century the introduction of co-operation gave a great impetus to the manufacture of butter and cheese. The first cheese factory was opened in 1892, and the first creamery in 1894. Of over 15,000 farmers all, save about 900, own their own farms, and are in nearly all cases well-to-do. Large quantities of animal and vegetable food, amounting to about one-half of the total product, are exported, chiefly to Cape Breton, Newfoundland, and the New England states. Fruit is raised less extensively than in Nova Scotia, but enough is grown to supply the local market, and apples of good quality are exported.

Fisheries. — Though smaller in value than those of any other

sea-board province, the fisheries of Prince Edward Island are, in proportion to the total population, extremely productive. Of the catch of about £200,000, lobsters, most of which are canned, are worth about £90,000, and oysters £20,000, in the latter case about half the total value of the catch of the Dominion, which is compelled to import largely from the United States. There are signs of the approaching exhaustion of the oyster beds, but no adequate remedy or new source of supply has been found. Herring, cod, mackerel and smelts are also caught in large quantities in the coast waters.

Other Industries. — About one-third of the province is covered with birch,

beech, maple, pine, spruce, cedar and other woods, but though a little lumber is exported, the industry is declining. The building of wooden ships, a flourishing trade till about 1886, is now almost extinct. The packing of pork and of lobsters is actively pursued near Charlottetown, and small factories have been established for the manufacture of boots and shoes, tobacco, condensed milk, &c, but the great bulk of the manufactured goods used are imported from the other provinces.

Communications. — The Prince Edward Island branch of the Intercolonial railway, owned and worked by the federal govern- ment, runs from Souris in the east to Tignish in the north-west, with branches to Georgetown, Murray Harbour, Charlottetown and Cape Traverse. Good wagon roads intersect each other everywhere, and nearly all the villages and country districts are connected by telephone. During spring, summer and autumn Charlottetown has daily communication with Pictou in Nova Scotia and Shediac in New Brunswick, and a frequent service to other ports in Nova Scotia, Newfoundland and Massachusetts. The harbour of Charlottetown and the Northumberland Straits are closed by ice from about the middle of December to the beginning of April, after which there is a service by specially constructed ice-breaking boats between Georgetown and Pictou. The ice is often too thick to make a regular service possible, and the island has long agitated for federal construction of a railway tunnel between Cape Traverse in Prince Edward Island and the neighbouring shore of New Brunswick, 9 m. distant.

History. — Jacques Cartier sighted Prince Edward Island on his first voyage in June 1 534, but mistook it for part of the main- land. Succeeding voyagers discovered his mistake, and toward the end of the 16th century it was called Isle St Jean, which name it retained till 1798, when it was given its present name out of compliment to the duke of Kent, at that time commanding the British forces in North America. In 1603 Champlain took possession of it for France, and in 1663 it was granted by the company of New France to Captain Doublet, an officer in the navy whose failure to make permanent settlements soon brought about the loss of his grant. Little attention was paid to the island until after the Peace of Utrecht, when the French made efforts to colonize it. In 1 719 it was granted, en franc alien / noble, to the count of St Pierre, who tried to establish fisheries and a trading company. He spent large sums on his enterprise, but the scheme proved unsuccessful and his grant was revoked. In 1758, soon after the capture of Louisbourg, Isle St Jean was occupied by a British force under Lord Rollo (see Annual Register, 1758). Its population at this time numbered about 4000, under a military governor with his headquarters at Port la Joie (Charlottetown). After its final cession to Great Britain in 1763 it was placed under the administration of Nova Scotia, but later was made a separate government, its first parliament meeting in 1773.

In 1 764-1 765 it was surveyed, and most 01 the present names given; in 1767 it was divided into townships of about 20,000 acres each, grants of which were made to individuals with claims on the government. They were to pay a small sum as quit rents, and the conditions imposed provided for the establishment of churches and wharves and bona-fide settlement. On these terms practically the whole island was granted away in a single day. The grantees were in most cases mere speculators, and the lands fell into the hands of a large number of non-residents. A continual agitation against the absentees was kept up by the settlers, who rapidly increased in numbers. During the early

igth century many Scottish immigrants settled in the island. A commission appointed in i860 advised the compulsory purchase of the lands, and their sale in smaller holdings to genuine settlers, but a bill passed with this intent was disallowed by the imperial authorities.

In 1864 a conference to consider the question of maritime union met at Charlottetown. The visit of delegates from Canada widened it into a general conference on federation, from which sprang the Dominion of Canada. Prince Edward Island's local patriotism forced its representatives to withdraw from the later conferences, but the abrogation in 1866 by the United States of the Reciprocity Treaty of 1854, financial difficulties connected with the building of an island railway, and the offer of better terms by the Dominion government, brought it into federation in 1873. A bill on the lines of that formerly disallowed was soon afterwards passed, and the land difficulty was finally settled. Since then the main political issues have been the quarrel with the federal government over the construction of a tunnel and the control of the liquor traffic, which has been prohibited but by no means suppressed.

Authorities. — Sir J. W. Dawson, Acadian Geology (1891); Report of Dr R. W. Ells, Geological Survey (1882-1884); Report of R. Chalmers, Geological Survey (1894); Rev. G. Sutherland, Manual of History of Prince Edward Island (1861); D. Campbell, History of Prince Edward Island (1875); Special Reports on Educa- tional Subjects, vol. iv. (London, 1901); articles in J. C. Hopkins's Canada, an Encyclopaedia (Toronto, 1 898-1900). (W. L. G.)

PRINCES' ISLANDS (anc. Demonesi; Byzantine, Papadonisia; Turkish, Kizil Adalar, or " Red Islands," from the ruddy colour of the rocks), a cluster of nine islands in the Sea of Marmora, forming a caza of the

prefecture of Constantinople. They figure in Byzantine history chiefly as places of banishment. A convent in Prinkipo (now a mass of ruins at the spot called Kamares) was a place of exile for the empresses Irene, Euphrosyne, Zoe and Anna Dalassena. Antigone was the prison of the patriarch Methodius, and its chapel is said to have been built by the empress Theodora. In Khalki the monastery of the Theotokos (originally of St John), which since 1831 has been a Greek commercial school, was probably founded by John VI. or VII. Palaeologus, was rebuilt about 1680, and again in the 18th century by Alexander Ypsilanti, hospodar of Moldavia. Close beside it is the tomb of Edward Barton, second English ambassador to the Porte. Hagia Trias (a school of theology since 1844) was rebuilt by the patriarch Metrophanes. On Prote were the monasteries to which Bardanes (Philippicus), Michael I. Rhangabes, Romanus I., Lecapenus and Romanus IV. Diogenes were banished. The islands are a favourite summer resort; four are inhabited and noted for the mildness and salubrity of their climate. Prinkipo (Pilyusa), altitude 655 ft.; Khalki (Chalcitis; Turkish Heibeli), 445 ft.; Prote (Turkish Kinali), 375 ft.; and Antigone (Panormus; Turkish Burgaz Adasi), 500 ft. The buildings on all the islands were injured by the earthquake of 1894, especially the naval college, and monastery of St George on Khalki, and the monastery of Christ on Prinkipo. The population is about 10,500, half being Greek. Khalki contains an Ottoman naval school and Greek theological and commercial colleges.

See G. Schlumberger, Les lies des Princes (Paris, 1884); A. Grise- bach, Rumelien und Brussa (Gottingen, 1839).

PRINCETON, a city and the county-seat of Gibson county, Indiana, U.S.A., about 27 m. N. of Evansville. Pop. (1900), 6041, 628 being of negro descent and 198 foreign-born; (1910) 6443. It is served by the Evansville & Terre Haute and the Southern railways (the latter of which has shops here), and by the Evansville & Southern Indiana traction line (electric). It has a considerable trade in oil and coal and in the agricultural products of the surrounding region, and has various manufactures. Princeton was first settled in 18 14, and was chartered as a city in 1884.

PRINCETON, a borough of Mercer county, New Jersey, on Stony Brook, and the Delaware & Raritan canal, 49 m. S.W. of New York City. Pop. (1905) 6029; (1910) 5136. Princeton is served by the Pennsylvania railroad, and by two electric lines

to Trenton (10 m.), passing through Lawrenceville (in Lawrence township; until 1816 called Maidenhead; pop., 2522 in 1910), the seat of the Lawrenceville school (1882), for boys, which was endowed by the residuary legatees of John Cleve Green (1800- 1875), and is probably the

first endowed secondary school for boys in the Middle States.

Princeton is situated 210 ft. above sea-level, and the county to the east, north and west is rocky and hilly. The borough is the seat of Princeton University (q.v.), and of " The Theo- logical Seminary of the Presbyterian Church in the United States of America," commonly known as Princeton Theological Semi- nary, which was opened in 1812, and was chartered in 1824. The seminary was for one year under the sole care of Archibald Alexander (q.v.), and among its teachers and representative theologians have been Samuel Miller (1769-1850), who was professor of ecclesiastical history and church government here (1813-1849), Charles Hodge, Joseph Addison Alexander and James Waddel Alexander, William Henry Green, Archibald Alexander Hodge, Francis L. Patton,who became president in 1902 and Benjamin B. Warfield (b. 185 1), professor of didactic and polemic theology from 1887. Under such leaders Princeton theology has been distinctly conservative, supporting the old standards of the Westminster Confession and Catechisms. The seminary is well endowed, so that there is no charge for tuition or room rent ; among its principal benefactors were James Lenox (1800-1880), Robert Leighton Stuart (1806-1882), his widow and his brother Alexander (1810-1879), John Cleve Green, men- tioned above, and Mrs Mary J. Winthrop (d. 1902). It has a fine campus south-west of the business centre of the borough; in the Lenox Library and the Lenox Reference Library, built in 1843 an d 1879 respectively, and gifts of James Lenox, there were 82,200 bound volumes and 31,500 pamphlets in 1909; Stuart Hall (1876) contains lecture-rooms; Miller Chapel is the place of worship; and the three dormitories are Alexander Hall (the " Old Seminary "), first used for this purpose in 1817, Brown Hall, built in 1864-1865, and Hodge Hall (1893). In 1908- 1909 the faculty numbered 16 and the students 153, of whom 8 were fellows and 17 graduate students.

Princeton became in 1897 the home of Grover Cleveland, who died there; and from 1898 until his death it was the residence of Laurence Hutton (1843-1904), a well-known writer on the history of the stage. Besides its fine residences and buildings of the seminary and of the university, the only notable buildings are the handsome Princeton Inn, about midway between the campus of the university and that of the seminary, and " Mor- ven," the homestead of the Stocktons, built in the first decade of the 1 8th century. In the Princeton Cemetery are buried presidents and professors of the university.

The first settlers were the companions of Richard Stockton, the grandfather of Richard Stockton, signer of the Declaration of Independence. The removal hither in 1756 from Newark of the College of New Jersey, later Princeton University, gave the place its first educational prominence. At the

time of the War of Independence town and gown were both strongly patriotic. The first state legislature of New Jersey met here on the 27th of August 1776; and in Nassau Hall, the first of the college buildings, erected in 17 54-1 7 56, which was then the largest edifice in the colonies, the Continental Congress sat from the 30th of June to the 4th of November 1783, and on the 31st of October Congress received the news of the signature of the definitive treaty of peace with Great Britain. After the battle of Trenton Cornwallis's troops were hurried to that place, three regiments and three companies of light-horse being left at Prince- ton when the main body, on the 2nd of January 1777, passed through. Washington, unable to retreat or to meet the British attack, turned Cornwallis's left flank and advanced on the weak garrison at Princeton. On the 3rd a force under Gen. Hugh Mercer (c. 1720-1777), ordered to destroy the Stony Brook bridge, and so cut off escape to Trenton, met two of the three regiments,led by Lieut .-Colonel Charles Mawhood,near the bridge, and, though doing great execution with its rifles at a distance, was unable, being unequipped with bayonets, to hold its ground

In hand-to-hand fighting, and fled through an orchard, leaving Mercer there mortally wounded; he died on the 12th in a farm- house (still standing) on the battlefield. Washington's main army now came to the assistance of the retreating Americans, and forced the retreat of the other British regiments (the 55th and 40th) to Princeton, where they either surrendered or fled towards New Brunswick. The British losses were heavy and the Americans lost many officers. The bridge was destroyed by the American troops just before the approach of General Alexander Leslie (c. 1740-1794) with reinforcements from Corn- wallis. Washington's flank movement at Trenton and his engage- ment with the British at Princeton made necessary the withdrawal of the British from West Jersey. In the autumn of 1783 Wash- ington, summoned to Princeton by Congress, then in session there, made his headquarters at Rocky Hill, about 4 m. north of Princeton in Montgomery township, Somerset county, whence on the 2nd of November he issued his farewell address to the army; his headquarters is preserved as a museum. A battle monument in Princeton, designed by MacMonnies and paid for by the Federal Congress, the state of New Jersey and the borough of Princeton, has been projected.

See J. R. Williams, Handbook of Princeton (New York, 1905); J. F. Hageman, History of Princeton and its Institutions (2 vols., Philadelphia, 1879) ; W. S. Stryker, The Battles of Trenton and Prince- ton (Boston, 1898); and V. L. Collins, The Continental Congress at Princeton

(Princeton, 1908).

PRINCETON UNIVERSITY, an American institution of higher learning in Princeton, New Jersey, until 1896 called officially the college of New Jersey. Its campus consists of 539 acres comprised in three tracts of ground adjoining each other. The main campus, one of the most beautiful in the country, is on the south side of Nassau Street, the old country road between Philadelphia and New York, and is principally con- tained in a block of about 225 acres, which on its west side has an almost continuous row of English collegiate Gothic buildings: Blair Hall, Stafford Little Hall and the gymnasium.

Nassau Hall, which was built in 1756, nearly destroyed by fire in 1802, rebuilt in 1804, and damaged by fire in 1855, is a squarely built edifice in the Georgian style. Originally hous- ing the whole college, it is familiarly known as North College, in a quadrangle arrangement of which West College, built in 1836, is the only other remainder; the south side having been occupied since 1838 by Clio Hall and Whig Hall, the homes of the two literary societies, founded respectively in 1765 and 1769, and since 1893 housed in white marble buildings of classical type; and East College, having given place to the main building of the University Library (1897), in Oxford Gothic of Longmeadow stone, the gift of Mrs Percy Rivington Pyne. Besides West College, the dormitories are Reunion Hall (1870), commemo- rating the reconciliation of the Old and New schools of the Presbyterian Church; University Hall (1876), formerly an hotel and now housing on its lower floors the university dining balls for all freshmen and sophomores; Witherspoon Hall (1877), in Victorian Gothic of grey stone trimmed with brown; Edwards Hall (1880), a brown stone Gothic building; Albert B. Dod Hall (1890), a granite limestone-trimmed Italian building; David Brown Hall (1891), granite and Pompeian brick, in Florentine Renaissance; the Pyne Buildings (1896) in half-timbered Chester style; Blair Hall (1897), built in English Collegiate Gothic of white Germantown stone, on the south-western margin of the campus; the Stafford Little Hall (1899 and 1901), in the same style as Blair Hall, and joining it on the south; Seventy-nine Hall (1904), the gift of the class of 1879, another Tudor Gothic building of red brick trimmed with Indiana limestone; and Patton Hall (1906); Campbell Hall (1909), the gift of the class of 1877; and a new group of buildings, chiefly dormitories, oc- cupying the entire north-west corner of the main campus, front- ing on Nassau and University Place, three sections of which (two being the gift of Mrs Russell Sage) were completed in 1 9 10. These buildings are in the same architectural style and si the same materials as Blair and Little Halls. There is accommodation for about 90% of the undergraduates of the

university in the campus dormitories, including the new buildings.

The recitation halls are: Dickinson (1870; remodelled in 1876) and McCosh Hall (1907), for the academic department; and the school of science building (1873), a gift of John C. Green, on the north-east corner of the main block of the campus. The Halsted Observatory (1869) and the Observatory of In- struction (1878) are well known for the work done in them by the astronomer Charles Augustus Young (1834- 1908) ; among the laboratories are the biological (1887), the chemical (1891), the civil engineering (1904), the Palmer physical (1908), and, for natural science, Guyot Hall (1909), which also houses the natural science museum, including valuable fossils. There is a museum of historic art (1887) which includes the finds of the Princeton archaeological expedition to Syria, and in Nassau Hall there is a psychological laboratory. There are two auditoriums, the Marquand chapel (1881), the gift of Henry G. Marquand, and Alexander Hall (1892), used for commencement exercises. Also on the campus are the dean's house (1756), until 1878 the president's residence; Prospect (1849), bought by the college in 1878, which is the president's residence; the university offices (1803); and Dodge Hall (1900) and Murray Hall (1879), which are the home of the college Y.M.C.A., the Philadelphian Society, founded in 1825.

The university library is housed in a large building already described, built (1896) on to the Chancellor Green library building (1872), given by John C. Green in memory of his brother Henry Woodhull Green, chancellor of the state of New Jersey, and now the reading room and reference library. In 1910 the library had a collection of 257,800 volumes and about 58,000 unbound pamphlets. There are two athletic fields: one, the university, two blocks east of the main campus, and the other, the Brokaw field, in the south-west corner of the main campus; immediately north of the latter are the Brokaw Memorial gateway and building (1892), with a swimming pool, and the university gymnasium (1903). South-east of the Campus is Lake Carnegie, an artificial widening of Millstone River, the gift of Andrew Carnegie; it is used for boating.

A notable feature of the university is its upper-class club-houses. The upper-class clubs have in the social life of Princeton somewhat the place of the Greek letter societies elsewhere. There are no fraternities at Princeton: each entering student pledges himself to " have no connexion whatever with any secret society, nor be present at the meetings of any secret society " so long as he is a member of the university, " it being understood that this promise has no refer- ence to the American Whig and Cliosophic Societies." These two societies, the object of which is particularly to cultivate skill in debate and public speaking, are affiliated with the English department of the faculty.

A peculiarity of the university is its system of student government, which is

most markedly developed in the Princeton " honour system " in examinations and written recitations, under which every student signs a pledge on his paper that he has " neither given nor received assistance," and there is no faculty or monitorial watch over students in examinations; the system is administered by a student committee, to which any dishonesty in examinations is to be reported, and which then investigates the charge, and if it finds it true reports the offender to the faculty for dismissal.

The university in 1910 included an academic department, leading to the degree of A.B.,or Litt. B.;the John C. Green school of science (1873), offering courses leading to the degree of B.S. and C.E.;a school of electrical engineering; and a graduate depart- ment (1877J, with courses leading to master's and doctor's degrees. Entrance rea uirements are largely in accordance with the recommen- dations of the National Education Association and the college entrance examination board; students entering the academic department must offer Greek if they are candidates for the degree of A.B.; students (not offering Greek for entrance) who concentrate in mathematics or science in junior and senior year are candidates for the B.S. degree, and those who concentrate in other departments during those years, for the Litt. B. degree. The entrance require- ments for the B.S. and Litt. B. degree are the same, and they differ from those for the A.B. degree (and agree with those for the C.E. degree) in including more mathematics, i.e. solid geometry and plane trigonometry. The school of electrical engineering is graduate and professional in its scope. The graduate school (1871) is only slightly developed, and this development has been almost entirely since 1900; a bequest of more than $300,000 in 1906 provided for the John R. Thomson Graduate College; and the estate of Isaac Chauncey Wyman (d. 1910), of the class of 1848, valued at about

$3,000,000, was left to the university for the establishment of the graduate school.

A notable feature of the scheme of instruction is the preceptorial (or tutorial) system, introduced in 1905; it somewhat resembles Jowett's method at Balliol College, Oxford; the preceptors, usually young men (many of them domiciled in the dormitories), have " con- ferences " each with a certain number of students on prescribed reading, especially in the departments of philosophy, history and politics, art and archaeology, and the languages. The preceptorial system has been a great success, and seems to have given the univer- sity a greater intellectual vitality. In 1909-1910 the university faculty numbered 169, of whom 51 were preceptors. In the

same year there were 1400 students of whom 134 were in the graduate school, 13 in the school of electrical engineering, 521 in the A.B. course, 440 in the Litt.B. and B.S. courses, 203 in the C.E. course, and 89 not in regular courses.

The corporate title of the university is " The Trustees of Princeton University," and the university is governed by the trustees, of whom the governor of the state of New Jersey is ex officio president. The president of the university is president of the board in the absence of the governor. The Board consists of twenty-five " life trustees," a self-perpetuating body, two ex officio trustees, and (since 1900) five alumni trustees, elected by the graduates of the university for a five-year term, one each year.

The tuition fee is $160 a year in all undergraduate courses. There are many scholarships and prizes, a fund for the remission of tuition to students of insufficient means, and funds for the assistance of students for the ministry. In July 1909 the assets of the university were $4,749,482, of which $4,168,900 was invested for endowment; of the endowment $3,410,907 was special, $330,445 general, $60,000 historical, $122,643 was for scholarships and $244,905 was for pro- fessorships; and in this fiscal year the gifts for current expenses and special purposes amounted to $199,294 and the gifts for endowment to $1,508,283.

The university owes its origin to a movement set on foot by the Synod of Philadelphia in 1739 to establish in the Middle Colonies a college to rank with Harvard and Yale in New Eng- land and William and Mary in Virginia. Owing to dissension in the Church, no progress was made until 1746, when the plan was again broached by the synod of New York, recently formed by the secession of the presbytery of New York and the pres- bytery of New Brunswick, radical (New School) presbyteries of the Synod of Philadelphia. The synod of New York was led by Ebenezer Pemberton (1704-1779), a graduate of Harvard (1721), and Jonathan Dickinson (1688-1747), a graduate of Yale (1706). Together they had attempted to make peace between the conservatism of the presbytery of Philadelphia and the radicalism of the presbytery of New Brunswick. Most of the leaders of the presbytery of New Brunswick had been educated at the Log College, a school with restricted curriculum, situated about 20 m. N.N.E. of Philadelphia, but recently closed. The students of the Log College were almost without exception preparing for the Presbyterian ministry, and on the closing of the Log College, the opportunity was taken by the synod of New York to found a larger and better institution of higher learning, broader in scope and training, and to transfer to the new project the Log College interests. On October 22nd 1746, John Hamilton, acting governor of New Jersey, granted a charter for erecting a college in New Jersey. The college of New Jersey was opened in May 1747 at Elizabeth, New Jersey,

with the Rev. Jonathan Dickinson as president. Little was accomplished until 1748, when, on the 14th of September, a second charter was granted to the " trustees of the College of New Jersey," thirteen in number. The college under the ad- ministration of Jonathan Dickinson, held its exercises from the last of May 1747 to the 7th of October 1747, when Dickinson died. Upon the succession of Aaron Burr to the presidency, the school removed to Newark, where the first commencement was held in 1748 and where Burr began the work of organizing the college and its curriculum; but the situation was unsuit- able, and in 1752 the trustees voted to remove the college to Princeton, where land was given for the Campus by Nathaniel Fitz Randolph. While funds were being collected in Great Britain, work was begun in Princeton in 1754 on the first college build- ing, which, at Governor Belcher's request, was named Nassau Hall, in honour of King William. A year after the completion of this single college building and the removal of the students to Princeton, Burr died and was succeeded by his father-in-law,

Jonathan Edwards, who died after five weeks in office (1758). He was succeeded (1759-1761) by Samuel Davies, and Davies (in 1761-1766) by Samuel Finley (1715-1766). John Wither- spoon (q.v.) was president from 1768 until his death in 1794, and more than any of his predecessors influenced the college. The presidents immediately succeeding Witherspoon were: his son-in-law, Samuel Stanhope Smith (1750-1819), who resigned in 1812; Ashbel Green (1762-1848), who resigned in 1822; James Carnahan (177 5-1859), who held office for thirty-one years (1823-1854), and in whose presidency there was, in 1846-1852, a de- partment of law in the college; and John Maclean (1800-1886), who was president from 1854 to 1868. Up to the outbreak of the Civil War, the college was largely attended by Southerners, and the Civil War thus dealt it a doubly heavy blow, from which it began to recover under the long presidency (1868-18S8) of James McCosh, who, like his successor, Francis Landey Patton (q.v.), president from 1888 to 1902, greatly advanced the material welfare of the college. Fourteen new buildings were erected during Dr McCosh's administration, and the John C. Green School of Science was established in 1873 by the gift of John Cleve Green; and during Dr Patton's administration the en- rolment of students more than doubled, as did the number of members of the faculty. In October 1896, on the 150th anni- versary of its founding, the official name of the College of New- Jersey, long popularly displaced by Princeton, was dropped, and the corporation became " The Trustees of Princeton Uni- versity," although the institution did not become, in the usual American use of the term, a university, having no professional schools whatever, and only a small post graduate department. On Dr Patton's resignation in 1902 he was succeeded by Woodrow Wilson (q.v.), the first layman to become president, who

introduced the preceptorial system already described.

PRINCIPAL, a person or thing first, or chief in rank or im- portance, or, more widely, prominent, leading. The Lat. adj. principalis, first, chief, original, also princely, is formed from princeps, the first, chief, prince, from primus, first, and capere to hold. In Late Lat. principalis was used as a substitute for an overseer or superintendent, and also for the chief magistrate of a municipality (Symmachus, Ep. 9, 1). It is a common title for the head of educational institutions, universities, colleges and schools. It is thus used of the director, of some of the heads of newer universities in England, e.g. London and Bir- mingham, always so in Scotland, and frequently combined with the vice-chancellorship. At the university of Oxford the name occurs twice as the title of the head of a college, viz. of Brasenose and Jesus. It was always used of the heads of halls, of which St Edmund Hall alone remains. It is also the designation used of the head of the newer theological or denominational colleges, and also of the women's colleges. At Cambridge it does not occur. In law, it is used in distinction from " accessory," for the person who actually commits the crime, " principal in the first degree," or who is present, aiding and abetting at the commission of the crime," principal in the second degree;" and also for the person for whom another acts by his authority (see Principal and Agent below). Finally as a shortened form of " principal sum," " principal money," &c.,the term is used of the original sum lent or invested upon which interest is paid, and so, widely of any capital sum, as opposed to interest or income derived from it.

PRINCIPAL AND AGENT. In law an agent is a person authorized to do some act or acts in the name of another, who is called his principal. The law regulating the relations of principal and agent has its origin in the law of mandate among the Romans, and in England the spirit of that system of juris- prudence pervades this branch of the law. The Jaw of agency is thus almost alike throughout the whole British Empire, and a branch of the British commercial code, in which it is of great importance that different nations should understand each other's system, differs only slightly from the law of the rest of Europe.

In a general view of the law of agency it is necessary to have regard to the rights and duties of the principal, the agent, and the public. The agent should not do what he has no authority

for; yet if he be seen to have authority, those with whom he deals should

not be injured by secret and unusual conditions. The employer is bound by what his agent does in his name, but the public are not entitled to take advantage of obligations which are known to be unauthorized and unusual. The agent is entitled to demand performance by the principal of the obligations undertaken by him within the bounds of his commission, but he is not entitled to pledge him with a recklessness which he would certainly avoid in the management of his own affairs. It is in the regulation of these powers and corresponding checks in such a manner that the legal principle shall apply to daily practice, that the niceties of this branch of the law consist.

Agents are of different kinds, according to their stipulated or consuetudinary powers. The main restraint in the possible powers of an agent is in the old maxim, delegatus non potest delegare, designed to check the complexity that might be created by inquiries into repeatedly-deputed responsibility. The agent cannot delegate his commission or put another in his place; but in practice this principle is sometimes modified, for it so may arise from the nature of his office that he is to employ other persons for the accomplishment of certain objects. Thus, there is nothing to prevent a commercial agent from sending a por- tion of the goods entrusted by him to his own agent for disposal.

In the general case agency is constituted by the acceptance of the mandate or authority to act for the principal, and the evi- dence of this may be either verbal or in writing. The English statute of frauds requires an agent to have authority in writing for the purposes of its ist, 2nd and 3rd clauses relating to leases. " And it is a general rule, that an agent who has to execute a deed, or to take or give livery or seisin, must be appointed by deed for that purpose. Moreover, as a corporation aggregate can in general act only by deed, its agent must be so appointed, though it would seem that some trifling agencies, even for cor- porations, may be appointed without one." (Smith's Mercantile Law, B. I. ch. iv.). It is a general rule that those obligations which can only be undertaken by solemn formalities cannot be entered on by a delegate who has not received his authority in writing. But it is often constituted, at the same time that its extent is defined, by mere appointment to some known and recognised function — as where one is appointed agent for a banking establishment, factor for a merchant, broker, super- cargo, traveller, or attorney. In these cases, usage defines the powers granted to the agent; and the employer will not readily be subjected to obligations going beyond the usual functions of the office; nor will the public dealing with the agent be bound by private instructions inconsistent with its usual character. While, however, the public, ignorant of such secret limitations, are not bound to respect them, the agent himself is liable for the consequences of transgressing them. Agency may also be either created or enlarged by implication. What the agent has done with his principal's consent the public are justified in believing him authorized to continue

doing. Thus, as a familiar instance, the servant who has continued to purchase goods for his master at a particular shop on credit is presumed to retain authority and trust, and pledges his master's credit in further purchases, though he should, without the knowledge of the shopkeeper, apply the articles to his own uses. The law is ever jealous in admitting as accessories of a general appoint- ment to any particular agency the power to borrow money in the principal's name, to give his name to bill transactions, and to pledge him to guaranties; but all these acts may be author- ized by implication, or by being the continuation of a series of transactions, of the same kind and in the same line of business, to which the principal has given his sanction. Thus an employer may, by the previous sanction of such operations, be liable for the bills or notes drawn, indorsed and accepted by his clerk or other mandatary; nay, may be responsible for the obligations thus incurred after the mandatary's dismissal, if the party dealing with him knew that he was countenanced in such trans- actions, and had no reason to suppose that he was dismissed. In questions of this kind the distinction between a general and a special agent is important. A general agent is employed to

transact all his principal's business of a particular kind, at a certain place — as a factor to buy and sell; a broker to nego- tiate contracts of a particular kind ; an attorney to transact his legal business; a shipmaster to do all things relating to the employment of a ship. Such an agent's power to do every- thing usual in the line of business in which he is employed is not limited by any private restriction or order unknown to the party with whom he is dealing. On the contrary, it is incum- bent on the party dealing with a. particular agent, i.e. one specially employed in a single transaction, to ascertain the extent of his authority. The law applicable to a mercantile agent's power to pledge or otherwise dispose of the goods entrusted to him being in an unsatisfactory state, a statutory remedy was applied to it by an act of 1825 (6 Geo. IV. c. 94), amended in 1842 (s & 6 Vict. c. 39) and replaced by the Factors Act 1889.

The obligations of the principal are: to pay the agent's re- muneration, or, as it is often called, commission, the amount of which is fixed by contract or the usage of trade; to pay all advances made by the agent in the regular course of his em- ployment; and to honour the obligations lawfully undertaken for him. The agent is responsible for the possession of the proper skill and means for carrying out the functions which he undertakes. He must devote to the interests of his em- ployer such care and attention as a man of ordinary prudence bestows on his own — a duty capable of no more certain defini- tion, the application of it as a fixed rule being the function of a jury. He is bound to observe the strictest good faith; and the law even interposes to remove him from temptation to sacrifice his employer's interests to his own (see Com- mission: Secret). Thus, when he

is employed to buy, he must not be the seller. When an agent is employed to sell, he must not be the purchaser. He ought only to deal with persons in good credit, but he is not responsible for their absolute solvency unless he guarantee them. A mercantile agent guaranteeing the payments he treats for is said to hold a del credere com- mission.

See also Auctions and Auctioneers; Broker ;Factor; Guaran- tee, &c. ; also Smith's Mercantile Law (nth ed., 1905); Bowstead, On Agency (4th ed., 1909).

PRINGLE, SIR JOHN (1707-1782), British physician, was the younger son of Sir John Pringle, of Stitchel, Roxburghshire, and was born on the 10th of April 1707. He was educated at St Andrews, at Edinburgh, and at Leiden. He took the degree of doctor of physic at the last-named university, where he was an intimate friend of G. van Swieten and A. von Haller. He settled in Edinburgh at first as a physician, but after 1734 also acted as professor of moral philosophy in the university. In 1742 he became physician to the earl of Stair, then com- manding the British army in Flanders, and in 1744 was appointed by the duke of Cumberland physician-general to the forces in the Low Countries. In 1749, having settled in London, he was made physician in ordinary to the duke of Cumberland; and in 1752 he married a daughter of Dr William Oliver (1695- 1764) of Bath, the inventor of " Bath Oliver " biscuits. Sub- sequently he received other court appointments as physician, and in 1766 was made a baronet. His first book, Observations on the Nature and Cure of Hospital and Jayl Fevers, was pub- lished in 1750, and in the same year he contributed to the Philosophical Transactions of the Royal Society three papers on " Experiments on Septic and Antiseptic Substances," which gained him the Copley medal. Two years later he published his important work, Observations on the Diseases of the Army in Camp and Garrison, which entitles him to be regarded as the founder of modern military medicine. In November 1772 he was elected president of the Royal Society. In this capacity he delivered six " discourses," which were afterwards collected into a single volume (1783). After passing his seventieth year he resigned his presidency and removed to Edinburgh in 1780, but returned to London in September 1781, and died on the 1 8th of January following. There is a monument to him in Westminster Abbey, executed by Nollekens. /

A Life of Pringle by Andrew Kippis is prefixed to the volume containing the Six Discourses. The library of the College of Physi- cians of Edinburgh

possesses ten folio volumes of his unedited MSS. including an essay " On Air, Climate, Diet and Exercise." There are iloges on him by Vicq d'Azyr and Condorcet.

PRINGSHEIM, NATHANAEL (1823-1894), German botanist, was born at Wziesko in Silesia, on the 30th of November 1823. He studied at the universities of Breslau, Leipzig, and Berlin successively. He graduated in 1848 as doctor of philosophy with the thesis De forma et incremento stratorum crassiorum in plantarum celltda, and rapidly became a leader in the great botanical renaissance of the 19th century. His contributions to scientific algology were of striking interest. Pringsheim was among the very first to demonstrate the occurrence of a sexual process in this class of plants, and he drew from his observations weighty conclusions as to the nature of sexuality. Together with the French investigators G. Thuret and E. Bornet, Pringsheim ranks as the founder of our scientific knowledge of the algae. Among his researches in this field may be men- tioned those on Vaucheria (1855), the Oedogoniaceae (1855-1858), the Coleochaeteae (i860), Hydrodictyon (1861), and Pandorina (1869); the last-mentioned memoir bore the title Beobachtungen fiber die Paarung de Zoosporen. This was a discovery of fundamental importance; the conjugation of zoospores was regarded by Pringsheim, with good reason, as the primitive form of sexual reproduction. A work on the course of mor- phological differentiation in the Sphacelariaceae (1873), a family of marine algae, is of great interest, inasmuch as it treats of evolutionary questions; the author's point of view is that of Naegeli rather than Darwin. Closely connected with Pring- sheim's algological work was his long-continued investigation of the Saprolegniaceae, a family of algoid fungi, some of which have become notorious as the causes of disease in fish. Among his contributions to our knowledge of the higher plants, his exhaustive monograph on the curious genus of water-ferns, Savinia, deserves special mention. His career as a morphol- ogist culminated in 1876 with the publication of a memoir on the alternation of generations in thallophytes and mosses. From 1874 to the close of his life Pringsheim's activity was chiefly directed to physiological questions: he published, in a long series of memoirs, a theory of the carbon-assimilation of green plants, the central point of which is the conception of the chlorophyll-pigment as a screen, with the main function of protecting the protoplasm from light-rays which would neu- tralize its assimilative activity by stimulating too active re- spiration. This view has not been accepted as offering an ade- quate explanation of the phenomena. Pringsheim founded in 1858, and edited till his death, the classical Jahrbuch fur ■wissenschaftliche Botanik, which still bears his name. He was also founder, in 1882, and first president, of the German Botanical Society. His work was for the most part carried on in his private laboratory in Berlin; he only held a teaching post of

importance for four years, 1864-1868, when he was professor at Jena. In early life he was a keen politician on the Liberal side. He died in Berlin on the 6th of October 1894.

A fuller account of Pringsheim's career will be found in Nature, (1895) vol. li., and in the Berichte derdeutschen botanischen Gesellschaft, (1895) vol. xiii. The latter is by his friend and colleague, Ferdinand Cohn. (D. H. S.)

PRINSEP, JAMES (1799-1840), Anglo-Indian scholar and antiquary, was born on the 20th of August 1799. In 1819 he was given an appointment in the Calcutta mint, where he ultimately became assay-master, succeeding H. H. Wilson, whom he likewise succeeded as secretary of the Asiatic Society. Apart from architectural work (chiefly at Benares), his leisure was devoted to Indian inscriptions and numismatics, and he is remembered as the first to decipher and translate the rock edicts of Asoka. Returning to England in 1838 in broken health, he died in London on the 22nd of April 1840. Prinsep's Ghat, an archway on the bank of the Hugli, was erected to his memory by the citizens of Calcutta.

PRINSEP, VALENTINE CAMERON (1 838-1 904), English artist, was born on the 4th of February 1838. His father, Henry

Thoby Prinsep, who was for sixteen years a member of the Council of India, had settled at Little Holland House, which became a centre of artistic society. Henry Prinsep was an intimate friend of G. F. Watts, under whom his son first studied. Val Prinsep also worked in Paris in the atelier Gleyre; and " Taffy " in his friend Du Maurier's novel Trilby, is said to have been sketched from him. He was an intimate friend of Millais and of Burne -Jones, with whom he travelled in Italy. He had a share with Rossetti and others in the decoration of the hall of the Oxford Union. He first exhibited at the Royal Academy in 1862 with his " Bianca Capella," his first picture, which attracted marked notice, being a portrait (1866) of General Gordon in Chinese costume; the best of his later exhibits were " A Versailles," " The Emperor Theophilus chooses his Wife," " The Broken Idol " and " The Goose Girl." He was elected A.R.A. in 1879 and R.A. in 1894. In 1877 he went to India and painted a huge picture of the Delhi durbar, exhibited in 1880, and afterwards hung at Buckingham Palace. He married in 1884 Florence, daughter of the well-known col- lector, Frederick Leyland. Prinsep wrote two plays, Cousin Dick and Monsieur le Due, produced at the Court and the St James's theatres respectively; two novels; and Imperial India: an Artist's Journal (1879). He was an enthusiastic volunteer, and one of the founders of the Artists' Corps. He died on the nth of November 1904.

PRINT, the colloquial abbreviation used to describe printed cloths generally, though it is most commonly applied to the staple kinds of cotton goods. The word must be distinguished from " printer," which refers to the regular kinds of cotton cloths intended for printing. (See Textile Printing.)'

PRINTING (from Lat. imprimere, O. Fr. empreindre), the art or practice of transferring by pressure, letters, characters or designs upon paper or other impressible surfaces, usually by means of ink or oily pigment. As thus defined, it includes three entirely different processes: copperplate printing, lithographic or chemical stone-printing, and letterpress printing. The difference between the three lies in the nature or conformation of the surface which is covered with the pigment and afterwards gives a reproduction in reverse on the material impressed. For the nature and method of preparing these surfaces see respectively Engraving (and allied articles), Lithography and Typography. In copperplate printing the whole of the plate is first inked, the flat surface is then cleaned, leaving ink in the incisions or trenches cut by the engraver, so that, when dampened paper is laid over the plate and pressure is brought to bear, the paper sinks into the incisions and takes up the ink, which makes an impression in line or lines on the paper. In lithographic printing the surface of the stone, which is practi- cally level, is protected by dampening against taking the ink except where the design requires. In letterpress printing the printing surface is in relief, and alone receives the ink, the remainder being protected by its lower level. Before the inven- tion of typography, pages of books, or anything of a broadside nature, were printed from woodcuts, i.e. blocks cut with a knife on wood plankwise, as distinct from wood engravings which are cut with a burin on the end grain, a more modern innovation. These woodcuts, like the lithographic or engraved surface, served one definite purpose only, but in typography the types can be distributed and used again in other combinations.

The term " printing " is often used to include all the various processes that go to make the finished product; but in, this article it is properly confined to " press-work," i.e. to the work of the printing-press, by which the book, newspaper, or other printed article, when set up in type and ready as a surface to be actually impressed on the paper, is finally converted into the shape in which it is to be issued or published.

History of Printing-press.

Before dealing with modern machinery it will be necessary to consider the historical evolution of the printing-press, especi- ally since the middle of the 19th century, from which point printing machinery has developed in a most remarkable manner.

It is not clear how the first printers struck off their copies, but without doubt Gutenberg did use at an early period in his career a mechanical press of some kind, which was constructed of wood. In fact he could not have produced his famous forty-two line Bible without such aid.

The earliest picture of a press shows roughly the construction to have been that of an upright frame, the power exerted Wooden by a movable handle, placed in a screw which was Hand- tightened up to secure the requisite impression, and presses. wag i 00sene(j again after the impression was obtained. The type pages were placed on a flat bed of solid wood or stone, and it was quite a labour to run this bed into its proper position

at a smaller expenditure of labour, and it allowed of larger and heavier surfaces being printed. The chief points of the iron press consisted of an improved application of the power to the spindle. The main part of it was

Iron Hand- presses.

the upright frame or staple, of iron; the feet of this staple rested upon two pieces of substantial timber dove- tailed into a cross, which formed a base or foundation for the

Fig. 1. — Blaeu's Wooden Hand-press.

under the hanging but fixed horizontal plane, called the platen, which gave the necessary impress when screwed down by the aid of the movable bar. This labour had to be repeated in order to release the printed sheet and before another copy could be struck off. This same press, with a few modifications, was apparently still in general use till the early part of the 17th century, when Willem Janszon Blaeu (1571-1638) of Amsterdam, who was appointed map maker to the Dutch Republic in 1633, made some substantial improvements in it. Our first authority on printing, Joseph Moxon, in his Mechanick Exercises, as Applied to the Art of Printing (vol. i., 1683), says, " There are two sorts of presses in use, viz. the old fashion and the new fashion," and he gives credit to Blaeu for the invention of the new and decidedly improved press (fig. 1).

Blaeu's improvement consisted of putting the spindle of the screw through a square block which was guided in the wooden frame, and from this block the platen was suspended by wires or cords. This block gave a more rigid platen, and at the same time ensured a more equal motion to the screw when actuated by the bar-handle. He also invented a device which allowed

the bed on which the type pages were placed to run in and out more readily, thus reducing the great labour involved in that part of the work of the older form of press, and he also used a new kind of iron lever or handle to turn the screw which applied the necessary pressure. The value of these various improve- ments, which were in details rather than in principles, was speedily recognized, and the press was introduced into England and became known as the " new fashion."

From this it will be observed that in a general way there had only been two kinds of wooden presses in use for a period of no less than three hundred and fifty years, and when the work of some of the early printers is studied, it is marvellous how often good results were obtained from such crude appliances.

The iron press (fig. 2) invented by Charles, 3rd earl Stanhope (1753-1816), at the end of the 18th century was a decided advance on those made of wood. Greater power was obtained

■*The Stanhope Iron Hand-press.*

complete press to stand upon. The staple was united at the top and bottom, but the neck and body were left open, the former for the mechanism and the latter for the platen and the bed when run in preparatory to taking the impression. The upper part of the staple, called the nut, answered the same purpose as the head in the older kind of wooden press, and was in fact a box with a female screw in which the screw of the spindle worked. The lower portion of the neck was occupied by a piston and cup, in and on which the toe of the spindle worked. On the near side of the staple was a vertical pillar, termed the arbor, the lower end of which was inserted into the staple at the top of the shoulder — the upper end passing through a top-plate, which being screwed on to the upper part of the staple held it firmly. The extreme upper end of the arbor, which was hex- agonal, received a head, which was really a lever of some length; this head was connected by a coupling-bar to a similar lever or head, into which the upper end of the spindle was inserted. The bar by which the power was applied by the pressman was fixed into the arbor, and not into the spindle, so that the lever was the whole width of the press, instead of half, as in Blaeu's wooden press, and it was better placed for the application of the worker's strength. There was also another lever to the arbor head in addition to that of the spindle head; and lastly, the screw itself was so enlarged that it greatly increased the power. The platen was screwed on to the under surface of the spindle; the table or bed had slides underneath which moved in, and not on, ribs as in the older form of press, and was run in and out by means of strips of webbing fastened to each end and passed round a drum or wheel. As the platen was very heavy the operator was assisted in raising it from the type-forme by a balance weight suspended upon a hooked lever at the back of the press. This somewhat counterbalanced the weight of the platen, raised it after the impression had been taken, and brought the bar- handle back again to its original position, ready for another pull.

The Stanhope press, which is still in use, was soon followed by other hand-presses made of iron, with varying changes of details. The most successful of these were the Albion and Columbian presses, the former of English manufacture, and the latter invented (1816) by an American, George Clymer (1754-1834), of Philadelphia.

The Albion press (fig. 3), which was designed by Richard Whittaker Cope,

was afterwards much improved upon by John Hopkinson (1849-1898). It is still used where hand printing prevails, and it was this form of press which was employed by William Morris at his famous, but short-lived, Kelmscott Press,

m the production of many sumptuous books, the most celebrated of which was the Chaucer, a large folio volume, illustrated by Sir Edward Burne-Jones. The chief characteristics of the Albion are its lightness of build and its ease in running; the pull is short, the power great, and the means whereby it is attained so simple that the press does not readily get out of order. It is easily taken to pieces for cleaning, and readily re-erected. The power is obtained by pulling the bar-handle across, which causes

Fig. 3. — Payne & Sons' Albion Hand-press.

an inclined piece of wedge-shaped steel, called the chill, to become perpendicular; in so doing the platen is forced down, and the impression takes place at the moment the chill is brought into a vertical position. On the return of the bar the platen is raised by a spiral spring, placed in a box and fixed at the head of the press. The larger sizes of these presses usually print a sheet of double crown, measuring 30X20 in.

Although the Columbian is not so much in demand as the Albion, it is still employed for heavy hand-work because of its greater stability and power. This power is acquired by a very massive lever, moving on a pivot bolt in the top of the near side of the staple, and passing across the press to the further side of the frame, at which end the power is applied through the coup- ling-bar by a bar-handle working from the near side. The platen is attached to the centre of the lever by a square bar of iron, and its vertical descent is assured by two projecting guides, one from each cheek ; it is then raised from the type-forme, and the iron bar carried back by two levers — the one attached to and above the head and weighted with the eagle; the other behind the press, attached to the arm to which the coupling-bar is fixed, and which also has a weight at the end. The great power of this press adapts it to the working of large and solid formes in printing, but it is somewhat slower in action than the Albion press, which is both lighter in construction and quicker in working.

The average output of the modern hand-press, when all is made ready for running, is about two hundred and fifty impres- sions per hour. This number, it should be said, is the product of two men who work together as

” partners.” One inks the type-forme and keeps a sharp look-out for any inequality of inking, and sees generally that the work is being turned out in a workmanlike manner. The other lays on the sheet to certain marks, runs the carriage in under the platen, and pulls the bar- handle across to give the necessary impression. He then runs back the carriage and takes out the printed sheet, which he replaces by another sheet, and repeats the different operations for the next impression. During the interval between taking »ff the printed sheet and laying on the next one his partner inks

the type surface with a roller which carries just sufficient ink properly distributed to preserve uniformity of ” colour.”

Having dealt with hand-presses, we must now go back to the end of the 18th century, when the first experiments were made to devise some mechanical means of producing larger printed sheets, and at a quicker rate. In England the broad distinction between ” presses ” and ” machines ” is generally considered to rest in the fact that the former are worked by hand, and the latter by steam, gas or electricity; and the men who work by these two methods are called respectively ” pressmen ” and ” machine minders ” or ” machine managers.” But in America the terms ” presses ” and ” pressmen ” are universally applied to machines and the men who operate them. For the purposes of this article presses and machines are used as synonymous terms. Various schemes had been propounded with a view of increasing the output of the hand-press, and in 1790 William Nicholson (1753-1815) evolved his ideas on the The First subject, which were suggestions rather than definite Cylinder inventions. Nicholson was not a printer, but, as he Machine. was an author and editor, it is presumed that he had some knowledge of printing. His proposals were to print from type placed either on a flat bed or a cylinder, and the impression was to be given by another cylinder covered with some suitable material, the paper being fed in between the type and the impression cylinder, and the ink applied by rollers covered with cloth or leather, or both. While Nicholson’s schemes did not bear any practical result they certainly helped others later on. His suggestion to print from type made wedge-shaped (that is, smaller at the foot and wider at the top) to allow of its being so fixed on a cylinder that it would radiate from the centre and thus present an even printing surface, was adopted later by Applegath and others, and really was the first conception of printing on the rotary principle which has now been brought to such perfection.

It was left to Friedrich Konig (1774-1833), a German, to produce the first really practical printing machine. His inven- tion was to print type placed on a flat bed, the impression being given by a large cylinder, under which the type passed, but his inking appliances were not satisfactory. He induced the proprietor of The Times (London) to take two of these machines, and in

1814 that newspaper was printed with steam power at the rate of 1100 impressions per hour, a great advance on the number produced up to that time. Both Nicholson's and Konig's machines printed only one side at a time — the second or backing printing being a separate and distinct operation — but they really embodied the general principles on which all other machines have been constructed or modelled.

It will be understood that Nicholson's theories were to print both from the flat and from type arranged in circular or cylinder form. These two principles are defined as reciprocating, for the flat bed which travels backwards and forwards; and rotary, for that which continuously revolves or rotates. Konig's inven- tion was a reciprocating one.

Two other classes of presses of somewhat different design were largely in operation in the middle of the 19th century — the " double platen," which still printed only one side at each impression from each end, and the " perfecting machine," which was made with two large cylinders and printed from two type- formes placed on separate beds. Although the latter machine turned out sheets printed on both sides before it delivered them (hence its name), the second impression was still a distinct operation. The double platen press was somewhat Double analogous to the hand-press, both the type beds Platen and impressions being flat. A machine of this kind, Machine. if it printed a sheet of double demy, which measures 35X225 in., was about 13 ft. in length, and the platen itself, of very massive construction, was placed in the centre. This platen had a perpendicular motion, being guided in grooves and worked by a connecting rod fixed to a cross beam and crank, which acquired its motion from the main shaft. There were two type beds and two inking tables, which travelled backwards and forwards, and one platen only, situated in the middle of the machine,

which in turn gave the needful impression as the type-formes passed underneath. The sheets were laid or fed to certain marks between the frisket and tympan, and when these were closed together the carriage was propelled under the platen and the impression was given to that portion of the machine, while at the other end another sheet was being fed in ready to receive its impression in due course.

It was once thought that the finest work could not be produced by a cylinder impressing a surface in the progress of its recipro- cating motion, but that it was likely to give a slurred or blurred impression. This is why

machines of flat construction were so long employed for the best class of work. But cylinder presses are now made so truly turned, and geared to such nicety, that this idea no longer prevails. The cylinder press is able to produce generally quite as good work as the double platen, its speed is much greater, and it requires a smaller amount of power to drive it.

The perfecting machine has had a great vogue, and has been much improved from time to time, especially in America, though the two-revolution machine in recent years Machin'ef superseded it, whether temporarily or not being still uncertain. We shall deal with it more fully below in relation to the modern and more complicated class of machinery; and this also applies to the ordinary stop or single cylinder, and small platen machines, both of which have been in use many years, and are still in demand.

Before the general introduction of rotary machines which print from curved stereotype plates from an endless web or reel Type °f paper (see below), several other presses of a revol-

Revolvlag ving character were made, to some extent based on Machines. Nicholson's ideas. The first printing surface used was ordinary type, because the difficulty of curving the stereo- type plates had not been surmounted. This type was fixed, both in vertical and in perpendicular positions, upon a cylinder, round which rotated other cylinders, which held and compressed the sheets against the larger one, which also revolved and carried the printing surface. These machines were made to print several sheets at a time, and were called four-, six-, eight- or ten-feeders, according to the number of sheets fed in and printed. They necessitated a great deal of labour, because each feed required a separate layer-on and taker-off besides the superin- tending printer, and other hands to carry away the sheets as fast as they accumulated at the different taking-off boards. Besides, these sheets all had to be folded by hand. In this class of machine various improvements were made from time to time by different manufacturers, each profiting by the experiences of the others, and two kinds of such revolving presses may now be given as examples.

After many experiments Augustus Applegath (i 789-1871) in 1 848 constructed for The Times (London) . a machine which was an eight-feeder, built entirely on the cylindrical principle, the cylinders placed not in a horizontal but in a vertical position. The type was fixed on a large cylinder, and instead of the printing surface presenting a complete circle, the different columns were each arranged so as to form a polygon. Around this large type cylinder were eight smaller ones, all upright, for taking the impression for each of the eight sheets fed in separately, and rollers were so arranged as to apply the ink to the type as it passed alternately from one

impression cylinder to the other. The sheets were laid in from eight different feed-boards, placed horizontally, and they passed through tapes, when they were seized by another series of tapes and then turned sideways between their corresponding impression and type cylinder, thus obtaining sheets printed on one side only. The impression cylinder then delivered the sheets separately (still in a vertical position) into the hands of the boys employed as takers-off. The results from this press were, at the time, considered fairly satisfactory, the number of copies (about 8000) printed per hour from one type-forme having been materially increased by the employing of the eight different stations to feed the sheets in, all of which in turn were printed from the same single type surface.

XXII. 12

About 1845 Robert Hoe & Co. of New York, and subsequently of London, had constructed, to meet the increased demands of newspapers, the " Hoe Type Revolving Machine," one good point of which was an apparatus for securely fastening in the type on a large central cylinder fixed horizontally. This was accomplished by the construction of cast-iron beds, one for each separate page (not column, as in Applegath's machine). The column rules were made tapering towards the feet of the type, and the type was securely locked in on these beds so that it could be held firmly in the required position to form a complete circle, thus allowing the cylinder to revolve at a greater speed than Apple- gath's, which was polygonal. Around the large type cylinders were placed the smaller impression cylinders, the number of these being governed by the output required. Hoe's first presses were four-feeders, but as many as ten feeds were supplied, as in the case of the two presses built to replace the Applegath machine for The Times, each of which produced about 2000 impressions from each feed, making a total of 20,000 per hour, printed on one side, or from two machines 20,000 sheets printed on both sides. As will be observed, the only differences in principle between these two type revolving machines were in the positions of the respective cylinders, and the fixing of the type to form a printing surface.

It was Sir Rowland Hill who first suggested the possibilities of a press which should print both sides at once, from a roll or reel of paper. This was about 1825, but it was William A. Bullock (1813-1867) of Philadelphia who in 1865 invented the first machine to print from a continuous web of paper. This machine had two pairs of cylinders, that is, two type or stereotype cylinders, and two others which gave the impression as the web passed between. The second impression cylinder was made somewhat larger so as to give a greater tympan surface, to lessen the off-set from the side first printed. In his machine the stereo- type plates were not made to fill the whole periphery of the forme cylinders so as to allow of the sheets being cut before printing, a difficulty which the first machines did not satisfactorily

over- come. The sheets were severed by knives placed on the cylin- ders, and when cut were carried by grippers and tapes; and delivery was made by means of automatic metal fingers fixed upon endless belts at such distances apart as to seize each sheet in succession as it left the last printing cylinder. These presses were not at first reliable in working, especially in the cutting and delivery of the sheets after printing, but were finally so far improved that the Bullock press came into quite general use. The inventor was killed by being caught in the driving belt of one of his own presses.

Modern Presses.

The machines invented during the second half of the 19th century and still in general use, are best classified as follows: —

1. The iron hand-press, such as the Albion or the Columbian, used for the pulling of proofs, or for the printing of limited editions de luxe. ciassitlca-

2. Small platen machines (worked by foot or tioa of power) used for the printing of cards, circulars and Modern small jobbing or commercial work. Presses and

3. Single cylinder machines (in England generally ac nes ‘ called ” Wharf edales “), usually built on the ” stop ” cylinder principle, and printing one side of the sheet only.

4. Perfecting machines, usually with two cylinders, and prin- ting or ” perfecting ” both sides of a sheet before it leaves the machine, but with two distinct operations.

5. Two-revolution machines, which, although with but one cylinder, have largely superseded perfecting machines, as their output has been increased and the quality of their work compares favourably with that of the average two-cylinder.

6. Two-colour machines, usually made with one feed, that is, with only one cylinder, but with two printing surfaces, and two sets of inking apparatus one at each end of the machine. Occa- sionally these machines are made with two cylinders.

7. Rotary machines, printing from an endless web of paper from curved stereotype or electrotype plates, principally used

for newspaper or periodical work. They are made to print upon a single reel, or upon two, four, six or even eight reels, in both single or double widths, i.e. two or four pages wide.

The hand-press has already been sufficiently described, and we may proceed to deal with the other classes.

The small but useful platen machine (fig. 4) is very largely employed in those printing-houses that make commercial work Platen a s P ec i a "ty. The smaller machines can be worked Jobbing with the foot, but if the establishment is equipped with machines. P ow er it is customary to gear them for driving. The larger machines require power. As its name implies, the type bed and impression platen are both flat surfaces as in the hand-press, but as they are self-inking and are easily driven, the

average output is about 1000 copies per hour, and but one operator is required, whereas two men at a hand- press can produce only 250 copies in the same time. In design these platen presses usually consist of a square frame with a driving shaft fixed horizontally across the centre of it. This shaft is attached to a large fly-wheel which gives impetus to the press when started and assists in carrying over the impression when the platen is in contact with the print- ing surface. The type-forme is usually fixed in an almost vertical and stationary posi- tion, and it is the platen on which the sheet is laid which rises from the horizontal position to the vertical in order to give the necessary impact to produce a printed impression from the type-forme. Practically this platen is, as it were, hinged at the off side, nearest the type bed, and its rise and fall is effected by the use of two arms, one on each side of the platen, which derive an eccentric motion from cams geared in connexion with the shaft. When the sheet is printed and the platen falls back to the horizontal the operator removes it with one hand and with the other lays on a fresh sheet. Generally the larger of these machines will print a sheet up to 21 X 16 in.

The modern single or " stop " cylinder, quite different in construc- «' \y nar f e . tion from the old single cylinder machines, largely suc- date " ceeded the double platen machine. The principle of the

Machines. st0 P cylinder was really a French invention, but it has been more commonly adopted in Great Britain, where the machines are known as " Wharfedales " (fig. 5). They are much

Fig. 4-

-The Golding Jobber Platen Machine.

used for the printing of books and commercial work. The average

production is about 1000 copies per hour. The type bed travels with a reciprocating motion upon rollers or runners made of steel, the bed being driven by a simple crank motion, starting and stopping without much noise or vibration. All the running parts are made of hard steel. The cylinder is " stopped " by a cam motion while the bed is travelling backward, and during this interval the sheet to be printed is laid against the " marks," and the gripper closes on it before the cylinder is released, thus ensuring great accuracy of lay, and consequent good register. After the impression is made the sheet is seized by another set of fingers and is transferred to a second and smaller cylinder over the larger one, and this smaller cylinder or drum delivers the sheet to the "flyer," or delivery apparatus, which in turn deposits it upon the table. The inking arrangements are usually very good, for, by a system of racks and cogs which may be regulated to a nicety, the necessary distribution of ink and rolling of the printing surface runs in gear with the travelling type bed or coffin. All the accessories for inking are placed at the end of the machine, the ink itstlf being supplied from a ductor, which can be so regulated by the keys attached to it as to let out the precise amount of pigment required. The ink passes to a small solid metal roller, and is then conveyed by a vibrating roller made of composition to a larger and hollow metal cylinder or drum which distributes the ink for the first time. This revolves with the run of the machine and at the same time has a slight reciprocating action which helps the distribution. A second vibrating composition roller conveys the ink from this drum to the distributing table or ink slab, on which other rollers, called distributors, still further thin out the ink. As the type bed travels, larger composition rollers, called inkers, placed near the cylinder, adjusted to the requisite pressure on the type, pick up the necessary amount of ink for each impression and convey it to the type as it passes under them. Usually three or four such rollers are required to ink the forme.

The perfecting machine is so named because it produces sheets printed on both sides or, in technical language, " perfected." This

operation is performed by two distinct printings. This

Perfecting

class of machine has been in use a great many years, Machines. although both the stop-cylinder and the two-revolution press have to some extent superseded it. It is perhaps best adapted for the printing of newspapers or magazines having circulations that do not require rotary machines intended for long runs. Although some perfecting machines have been made with one cylinder only, which reverses itself on the old " tumbler " principle, they now are made with two cylinders, and it is with this class that we are particularly concerned. There are various makes of perfecting machines of

which the Dryden & Foord is shown in fig. 6; among the best recent typed is the Huber Perfecter.

Although the two-type beds have a reciprocating motion, as in the ordinary one-sided press, the two cylinders rotate towards each other. The frame of the machine, owing to the fact that it contains two carriages and a double inking apparatus, is long, the exact size depending on the size of the sheet to be printed. Close to the large cylinders are the inking rollers, which take the necessary amount of ink, each set from its own slab as it passes under, and these rollers convey the requisite ink to the printing surface as the forme-carriage runs under its own cylinder. The distinctive feature is the ingenious manner in which the sheets are printed first on one side, and then on the other. This is performed by carrying them over a series of smaller cylinders or drumslby means of tapes. The pile of sheets

Fig. 5. — Payne & Sons' Wharfedale Stop-Cylinder Machine.

to be fed in stands on a high board at one end. The sheet is laid to its mark and is conveyed round an entry drum; thence it is carried round the first impression cylinder, and under this, moving at the same speed as the cylinder, is the type bed containing the inner

of broad tapes which lie on the laying-on board and are fastened to a small drum underneath it. This drum has a series of small cogs which move the web or tapes in the same direction. The sheet is laid to a back mark on the tapes, and is propelled between two rollers

forme already inked. The paper then receives its impression on the first side. In the older type of machine it is next led up to the right- hand one of the two reversing drums, which are placed above the large printing cylinders, and over which it passes with the printed side downwards. It is then brought under the second or left-hand drum, and so on to the other large impression cylinder, with the blank side of the sheet exposed to the type of the outer forme on the table underneath. Thus it will be seen that the sheet is reversed in its travel between the first and second large cylinders which give the impression. The sheet is then finally run out and delivered in the space between the two large cylinders, and laid on the delivery board — usually with the aid of flyers. In the more recent type of

Fig. 6.— Dryden & Foord's Perfecting (two-cylinders) Machine.

direct into the machine. Another variety employs grippers some- what after

the manner of the ordinary single cylinder. The Anglo- French perfecting machine is one of that class. As a rule most double-cylinder presses produce on an average about iooo copies per hour, printed both sides.

*The two-revolution machine is another one-cylinder machine built on the reciprocating principle. Its speed is greater than the stop cylinder (it may be geared to produce from 1500 to _ 2000 copies per hour, printed one side only). The °" Miehle (fig. 7), which is of American design but now made *° yo >? loa also in Great Britain, is a good example of this kind of Macbines – machine and is much used, especially for illustrated work. It has*

perfecting machines the sheet is fed directly into grippers, change taking place when grippers on each cylinder meet, the outer forme grippers taking the sheet from the inner forme grippers.

This is a general description of the principles on which these machines are built, but, as in other classes, there are many variations in details. For example, there are the drop-bar, the web and the gripper methods of feeding these presses. In the first case a bar descends upon the paper after it is laid to point marks, and this bar, having a rotary motion, runs the sheet between a roller and a small drum into the machine. The web arrangement consists of a series

Fig. 7. — The Miehle Two-revolution Cylinder Machine.

the high over-feedboard, and the taking-off apparatus is automatic but on a different plan from that of the ordinary Wharfedale, the sheets being carried over tapes with the freshly-printed side upper- most, thus preventing smearing ; they are then carried on to the heap or pile by the frame or long arms placed at the end of the machine. A recent feature of this machine is the tandem equipment, whereby two, three or even four machines may be coupled together for colour work. Only one layer-on is required and register is obtained auto- matically throughout.

The principle of the two-revolution press is that the cylinder

always rotates in the same direction, and twice for each copy given, once for the actual impression, and again to allow of the return of the forme-carriage in its reciprocating action. This also allows time for the feeding in of the next sheet to be printed. Among other advantages claimed for this press one is that the movement which governs the action of the type bed in

reversing is so arranged that the strain which sometimes occurs in other reciprocating machines is considerably reduced; another is that the registering or correct backing of the pages on the second side in printing is uncommonly good; but this depends much upon the layer-on. In many of the old kinds of two- revolution machines, owing to the cylinder being geared separately from the type bed, it was apt to be occasionally thrown out, but in the Miehle, for instance, it is only out of gear in reversing, and in gear while printing. Great strength is imparted to the frame, and the type bed is particularly rigid. These points, together with a truly turned and polished cylinder, with carefully planned means of adjustment, much simplify the preparation of making-ready of any kind of type-forme or blocks for printing, which is carried out much in the same way as on the ordinary single cylinder, but in a more convenient manner. Many of these machines are made to print four double crowns, 60 X 40 in., or even larger.

continuously rotate, the web of paper travelling in and out, in a serpentine manner, between various cylinders of two characters — one (the type cylinders) carrying the surface to be impressed, usually curved stereotype plates, and the other (the impression cylinders) giving the desired impression. Such a press, if driven by electric power, is set in motion by merely pushing a button or small switch, a bell first giving warning of the press being about to move. The number of duplicate sets of stereotype plates to be worked from by these presses is determined by the size and number of the pages to be printed, and this in turn is regulated by the capacity of the machine.

As already explained, the forerunners of the rotary presses of the present day were the type-revolving printing-machines, and, whilst they were still being used, experiments were being made to cast curved stereotype plates which would facilitate and simplify the work of producing newspapers. This was successfully accomplished by the use of flexible paper matrices, from which metal plates could be cast in shaped moulds to any desired curve. These plates were then fixed on the beds of the Hoe type revolving machine, which were adapted to receive them instead of the movable type- formes previously used. This new method enabled the printers

The two-colour machine is generally a single cylinder (fig. 8) with one feed only, and the bed motion reciprocating. The two colours are printed each at one revolution from the two Mhi' ,r type-formes as they pass under the cylinder, which Machines. rota tes twice in its travel. A double inking apparatus is of course necessary, and the inking arrangements are placed at the two extreme ends of the machine. In comparison with the ordinary single cylinder the two-colour machine is built with a longer frame, as is necessary to allow the two type-formes to pass under the cylinder, both in

its travel forward and on its return. This cylinder on its return is stationary, in fact it might be called a double or rather an alternative stop-cylinder machine, with the ink- ing facilities arranged somewhat on the same plan as on either a two-feeder or a perfecting machine. These two-colour presses are intended only for long runs, short runs may be worked to advantage separately on the ordinary single-colour machine. Generally, with the exception just mentioned, the machine is much the same as the ordinary stop or Wharfedale.

Before leaving the subject of printing with the reciprocating bed- motion, it may be mentioned that although in all modern machines of that kind the printed sheet is self-delivered, the imprinted paper has generally been fed in by hand, and for some classes of work this is still done. But many automatic feeders have been invented from time to time, which for the many purposes for which they are suitable must be reckoned part of a modern printing establishment.

As distinct from flat bed printing with a reciprocating motion, printing on rotary principles is a most interesting study, and it is this department of printing mechanics which has mm developed so very much in recent years. It seems Machines. a i most as though this branch had reached its limit, and as though any further developments can only be a question of duplication of the existing facilities so as to print from a greater number of cylinders than, say, an octuple machine. This would be merely a matter of building a higher machine so as to take a larger number of reels arranged in decks. As the name implies, these presses are so constructed that both printing surfaces and paper

Fig. 8. — Payne & Sons' Two-colour Single Cylinder Machine.

to duplicate the type pages and to run several machines at the same time, thus producing copies with far greater rapidity. In some large offices as many as five machines were in constant use. About this period the English stamp duty on printed matter was repealed, and this materially aided the development of the newspaper press.

Subsequently the proprietors of The Times made various experi- ments with a view to making a rotary perfecting press, and as a result started the first one about 1868. It was somewhat similar in design to the Bullock press, so far as the printing apparatus was concerned, except that the cylinders were all of one size and placed one above the other. The sheets were severed after printing, brought up by tapes, and carried down to a sheet flyer, which moved backwards and forwards, and the sheets were alternately " flown " into the hands of two boys seated opposite each other on either side of the flyers. Hippolyte Marinoni (1823-1904), of Paris, also devised a

machine on a somewhat similar principle, making the impression and type cylinders of one size and placing them one over the other. About 1870 an English rotary machine called the " Victory " was invented by Messrs Duncan & Wilson. It printed from the web, and had a folder attached. An improved form of this machine is still in use. This machine had separate fly-boards for the delivery of the sheets. In 1871 Messrs Hoe & Co. again turned their atten- tion to the construction of a rotary perfecting press to print from the reel or continuous web of paper, and from stereotype plates fastened to the cylinder.

The rotary presses in use at the present time are indeed wonderful specimens of mechanical ingenuity, all the various operations of damping (when necessary), feeding, printing (both sides), cutting, folding, pasting, wrapping (when required) and counting being purely automatic. These machines are of various kinds, and are specially made to order so as to cope with the particular class of work in view. They may be built on the " deck " principle of two, three, four, or even more reels of paper, and either in single width (two pages wide), or double width (four pages wide). Single and two-reel machines are generally constructed on the " straight line " principle, i.e. arranged with the paper at one end of the machine.

and passing through the cylinders to the folder at the other end where the copies are delivered. Three- and four-reel machines have also been constructed on the same principle, but the more usual arrangement of the four-reel press is to place two reels at either end, with the folders and delivery boards in the centre. This makes it possible to operate them as independent machines, or to run in combination with each other.

When presses are made in double width a two-reel machine is known as a quadruple, a three-reel as a sextuple, and a four-reel as an octuple machine. Double sextuple and double octuple machines are made, having six and eight reels respectively. The quadruple machine is a favourite one and is perhaps most in demand for news- paper work. This press prints from two reels of the double width. The first reel is placed to the right of the machine near the floor, and the second at the back of the machine and at right angles to it. A quadruple machine will produce 48,000 copies per hour of four, six or eight pages ; and proportionately less of a greater number of pages ; all folded, counted and pasted if required. The four cylinders, which are on the right-hand side of the press, are respectively the

plates, four pages on each type cylinder, making a total of thirty-two pages

in all. Each press produces of that number of pages 50,000 copies per hour, printed both sides, cut, folded and gˆapfe counted off in quires complete; by increasing the sets of j} tarv stereotype pages the same machine will produce 100,000 Machlaes. copies per hour of sixteen pages, and by duplicating the folding and delivery apparatus, 200,000 copies of eight pages of the same size. This mammoth press measures 54 ft. in length, 19 ft. in height and 12 ft. across; its dead weight is about no tons, and roughly 100,000 different pieces of metal were used in its construc- tion. The rough cost of such a machine is probably about £18,000. Such a press requires two 55 h.p. motors, one at each end, to drive it. The press is practically four quadruple machines built together, each of which can be worked independently of the other. The paper is fed from reels placed at the two ends in decks, one above the other, each reel containing about five miles of paper, and weighing about fourteen hundredweight. The process of unwinding these long reels of paper in the course of printing takes only half an hour; they are arranged on a revolving stand so that directly they are

Fig. 9. — Hoe's Double Octuple Rotary Machine.

printing and impression cylinders — the two inside ones being those giving the impression, and the two outer ones bearing the printing surfaces. The inking arrangements are placed at the two extreme ends of these four drums or cylinders, thus being near the type surfaces in each case. As the paper is unwound from the reel below it travels between the first two cylinders when it is printed on the first side ; it then passes to the third and fourth cylinders, which give it the second backing side, thus " perfecting " the printed sheet. From this point the long sheet is carried overhead to the left-hand side of the machine, where it is cut longitudinally and divided, and then associated with the other web similarly printed by the other half of the press. They then descend into the two different folders, where they are folded and cut — the copies being discharged on to the delivery boards situated at the two sides of the left-hand portion of the machine, and each quire is counted or told off by being jogged forward. This description applies to one half of the machine only, for while this is in operation the same thing is being repeatedby the other half situated at the back.

Another machine, somewhat complex but quite complete in itself, is mat constructed by Messrs Robert Hoe & Co. in London from drawings and patterns sent over from New York, for weekly papers of large circulation. Double sets of plates are placed on the main machine, which is capable of taking twenty-four pages, but by using narrower rolls the number of pages may be reduced to either sixteen or twenty if a smaller paper is desired. In addition to the body of the paper it prints a cover, and is capable of producing 24,000 complete copies per hour, folded, insetted, cut, pasted and covered. That portion of the machine which prints the cover is fed

from a narrower reel of a different colour of paper from that used for the inside pages. The printing surface for one side of the cover is placed at one end of the cylinder and the reverse side is placed at the other end. This ingenious combination results in the printing of one cover for every copy of the paper.

The double octuple machines (fig. 9) erected by the same firm for the printing of Lloyd's Weekly News were probably, in 1908, the latest development in rotary printing. These presses print from eight different reels of the double width, four placed at each end of the machine, the delivery being in the centre, and from eight sets of

spent the stand is turned half way round, and four other full reels already in position are presented ready to be run into the press. This ingenious arrangement, whereby the reels can be changed in about three minutes, obviates the loss of time previously incurred by the press being kept standing while the empty spindles were removed and replaced with four full reels.

Having described some representative types of the different classes of printing-presses in use, we may now treat of the methods employed by the workmen in securing The Pre- the best results in printing. The real art of printing, paratlon or as far as presswork is concerned, lies in the careful Making- preparation of the printing surface for printing before S^™" running off any number of impressions. This preparation is technically called " making-ready," and is an operation requiring much time and care, especially in the case of illustrated work, where artistic appreciation and skill on the part of the workman is of great assistance in obtaining satisfactory and delicate results. Theoretically, if both type and press were new, little or no preparation should be necessary, but practical experience proves that this need of preparation has not yet been entirely obviated and still remains an important factor. Single proofs of type, stereotype, electrotype or blocks- of any description can often be struck off without making-ready with fairly good results, but if precision of " colour " (that is, inking) and uniformity of impression throughout a volume are desired, it is necessary to put the forme, whether type or blocks or both, into a proper condition before starting the printing of an edition, whatever its number. And this applies to all good work produced from whatever presses or machines other than those built on the rotary principle. In these, even if time permitted, little can be done in the way of making-ready; nor*

is it really necessary for newspapers, printed and read one day, and then generally thrown away the next. But for finely printed works this preparation is essential; the actual results vary with the operator, both as regards quality and, what is very important to the employer, in the length of time taken. Some men labour more at it than others, and it is considered that a press is only really paying while it is actually running.

The system of making-ready employed now is quite different from that in use when it was necessary to dampen paper before it could be satisfactorily printed. It was then customary to print with a good deal of packing, usually consisting of a thick blanket together with several thicknesses of paper, all of which intervened between the printing and the impression surface, whether the latter was flat or cylindrical. There was much in favour of this system, because a good firm impression could be obtained, and the " nutmeg-grater " effect on the reverse, when the impression was too heavy, could, after the sheets were dry, be removed by cold-pressing in a hydraulic press. It is still the best method for obtaining first-rate results in fine work, where hand-made or other rough paper is used. But the demand for cheap literature required quicker means of production, and the introduction of process blocks, especially those made by the half-tone process, necessitated the use of smooth paper and a faster drying ink, both of which are to be deplored, because to calender the paper to the degree requisite for this kind of printing practically means destroying its natural surface, and in rendering the ink quicker in drying the pigment undoubtedly suffers. On the other hand, there has been a compensating advantage in the fact that improved machinery has been demanded for this class of work, and the British manufacturer has been stimulated by the American manufacturers, who have taken the initiative in the change of methods in printing. Cylinders are now turned so truly and ground to such a nicety that very little packing is required between type and sheet to be impressed, so that a new system of making-ready, termed " hard-packing," has been resorted to. The fact that the iron impression cylinder was nearer the type forbade the large amount of soft-packing formerly used, besides which process blocks, whether line or half-tone, could not be rendered properly by a soft impression. Although less packing is necessary, greater care is required in preparing type or blocks for printing by this new method. The method in making-ready ordinary plain formes is as follows. The type-forme is placed on the coffin or bed of the press and fixed into its proper position — the precise position being regulated by the exact size of the sheet of paper on which the work is to be printed. The cylinder is first dressed with a fine and thin calico drawn tightly over and fastened securely, which serves as a base on which to fasten sheets. A sheet of some hard paper, such as manila, is then placed over it to form, as it were, a foundation.

The printer next proceeds to pull a sheet, without ink, to test the

impression. We take it that the machine has already been regulated by means of the impression screws at the respective ends of the cylin- der for all-round or average work, and that any inequality of impres- sion can be remedied by adding or taking away from the sheets on the cylinder. Now, supposing the forme to be dealt with consists of thirty-two pages to be printed on quad crown paper, measuring 40X30 in., on a suitable size of single cylinder machine of the Wharf edale class, it would be found, although both the machine and type were fairly new (that is, not much worn), that there was some amount of inequality in the impression given to the whole sheet. This is easily detected by examining the sheet the reversed side in a strong side-light. Although the greater part may be fairly even, some pages, or portions of pages, would show up too strongly, the impress almost cutting through the paper, while in other portions the impression would be so faint that it could hardly be seen. These differences of impression are called respectively " high " and " low." All these difficulties have to be rectified by the printer either over- laying or cutting away pieces in this first trial sheet. If the " set " of the cylinder is about correct, and the impression sheet has been taken with neither too many nor too few sheets on the cylinder, it will be a matter rather of overlaying, or " patching up," than of cutting away from this trial sheet. As soon as this first sheet has been levelled up it is fixed on to the cylinder to its exact position, so that it will register or correspond with the type when the press is running, and another trial sheet is struck off, which is treated pre- cisely in the same manner, and is then fastened up on the cylinder on top of the first sheet. It may even be necessary for fine printing to repeat this a third time, especially if the forme includes blocks of any kind. When this preparation is completed, the whole is covered up by a somewhat stouter sheet, which forms a protection- to the whole making-ready, but which can easily be lifted should it be necessary to give any finishing touches to it before beginning to run.

If the forme to be printed consists of both type and blocks mixed, a somewhat different treatment has to be employed in order to put the blocks into a relative position with the type for printing. This is done by the usual trial impression sheet, and, as blocks are found to vary much in height and are generally low as compared with type, this deficiency has to be remedied by underlaying the

blocks so that they are brought to the height of the type, or a shade higher. This is usually done by pasting layers of tnickish paper, or even thin cards, underneath the blocks. This must be carefully done so as to make them stand squarely and firmly on their base, in order that they may not rock and give a slur in printing. After underlaying, and to emphasize the respective degrees of light and shade in the illustrations, a separate and careful overlaying is re- quired for the blocks before anything is done to the

main iorme. This is particularly necessary if the blocks are woodcuts, or electrotypes of woodcuts, which require a different cutting of perhaps three different thicknesses, all on thin hard paper, to give their full effect. But with half-tone process illustrations very little overlaying is required, provided theblocks have been brought up to the proper height by underlaying in the first instance — the various tones being already in the block itself — and it is little more than a matter of sharp, hard impression to give full effect to these, if both paper and ink are suitable. For line process blocks a still different treatment in making-ready is desirable, so as to get rid of the hard edges which are nearly always found in this kind of block. Here too it is essential that the preliminary underlaying be done with extreme care if good work is desired. The originals and the engraver's proofs are of great assistance to the workman in bringing out the details of an illustra- tion when he is preparing it for printing. In rotary printing from the curved stereotype pTate and from the endless web of paper much can be done to assist the printer if good stereotype plates are supplied to him, and, if the forme contains any illustrations, both the artist and the engraver can help him if they keep in mind the particular character of illustration which they are preparing for the press. The artist can accentuate the high lights or solids in the original drawing or photograph, and the stereotyper can emphasize points in the picture by thickening the plate in the parts necessary to stand out.

The past generation has seen many improvements in printing machinery, all tending to an increased production, and generally to the betterment of the work turned out. This is particu- _ larly true of three-colour printing (see Process), which Re ˆ eatDe ' for commercial purposes has been brought to a high ve "P meats . degree of perfection. Only what may be fairly considered as representative presses have been dealt with in this article, but there are many others, some of which have been most ingeniously con- structed for special purposes. Process engraving has practically superseded wood engraving, and the new processes have brought new conditions, requiring a different making-ready, paper and ink. Some of these altered conditions are to be regretted. For instance, it is unfortunate that the quality and surface of papers have to be sacrificed to the demands for cheap literature, and this especially applies to illustrated work.

The introduction of the autoplate is of great advantage to those using rotary presses, because it allows the production of a large number of duplicate stereotype plates of satisfactory quality speedily. This is all important in a newspaper office, where the margin of time between the caseroom and machine department is usually so limited, for it permits several machines being quickly equipped with duplicate sets of the same pages.

Power is another matter that is changing fast. Electricity is supplanting both steam and gas, and is being installed in most large printing-houses, including newspaper offices. Suction gas is being tried in some offices as a supplanter of electricity and is said to be much cheaper as a power producer. The independent system of motors is generally adopted, because it is found more economical and better for driving purposes, besides dispensing with the overhead shafting and belting, always unsightly, and dangerous to the work- people. Speeds can be regulated to a nicety for each separate machine, and any machine can be set in motion by pressing a button. A printing-house of average size, which makes book printing a speciality, consists of many departments under the supreme control of a general manager. His deputy may be said to be _. the works manager, who is responsible for all work Man-

being produced in a proper manner by the different "Semeniot departments. The progress of the work is as follows. aPTtntitt Z m The MS., or " copy " as it is called, is handed, with all " ouie – instructions, to the overseer of the caseroom, who gives it out to the compositors in instalments as they finish the work already in hand. Formerly the greater bulk of composition was done on the piece-work system, but as machine composition has largely superseded hand labour for the more ordinary class of work, piece-work is declining, and there is a greater tendency to have the work done on " establish- ment " (" 'stab "), i.e. fixed weekly wages. When the copy is in type a proof is struck off and sent to the reading closet, where the corrector of the press (see Proof- Reading), with the aid of a reading-boy, will compare it with the original MS. or copy, and mark all errors on the proof, so that they may be amended by the compositor at his own cost before it is despatched to the author or customer, who in turn revises or corrects it for the general improvement of the work. The proof is then returned to the printer, and if these corrections are at all heavy, another proof, called the " revise," is submitted, together with the first marked one, so that the author may see that his emendations have been made. This may even be repeated, but when finally corrected the proof is marked " press "

and is sent to the printer with the necessary instructions as to printing. After another reading or revision in the reading closet it is sent to the compositors, who make the final corrections in the type and hand the forme to the printing department to deal with. It is this department which contributes most to the success of any printing firm, and it requires a really good man at its head. He must be a thoroughly practical printer familiar with the different kinds of printing machinery. To make the department

pay, the machines must be kept fully employed with the many classes of work that a large concern has to deal with; the wheels must be kept running as much as possible, and the time for making-ready curtailed as far as is consistent with the proper preparation of the forme. Here again it is most important that a sharp eye be kept on the materials used. Ink forms a large item in the total expenses of this department, besides which there are: oil for lubricating, turpentine and other solvents for cleaning, paper for proofs and making-ready, &c. When the work is printed it is handed to the warehousemen, who are responsible both for unprinted and printed paper. Lastly, the counting-house deals with all accounts, both departments' and customers'.

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PRIOR, MATTHEW (1664-1721), English poet and diploma- tist, was the son of a Nonconformist joiner at Wimborne-Minster, East Dorset, and was born on the 21st of July 1664. His father moved to London, and sent him to Westminster, under Dr Busby. At his father's death he left school, and fell to the care of his uncle, a vintner in Channel Row. Here Lord Dorset found him reading Horace, and set him to translate an ode. He acquitted himself so well that the earl offered to contribute to the continuance of his education at Westminster. One of his schoolfellows and friends was Charles Montagu, afterwards earl of Halifax. It was to avoid being separated from Montagu and his brother James that Prior accepted, against his patron's wish, a scholarship recently founded at St John's College. He took his B.A. degree in 1686, and two years later became a fellow. In collaboration with

Montagu he wrote in 1687 the City Mouse and Country Mouse, in ridicule of Dryden's Hind and Panther. It was an age when satirists were in request, and sure of patronage and promotion. The joint production made the fortune of both authors. Montagu was promoted at once, and Prior three years later was gazetted secretary to the embassy at the Hague. After four years of this employment he was appointed one of the gentlemen of the king's bedchamber. Apparently, also, he acted as one of the king's secretaries, and in 1697 he was secretary to the plenipotentiaries who concluded the peace of Ryswick. Prior's talent for affairs was doubted by Pope, who had no special means of judging, but it is not likely that King William would have employed in this important business a man who had not given proof of diplomatic skill and grasp of details. The poet's knowledge of French is specially mentioned among his qualifications, and this was recognized by his being sent in the following year to Paris in attendance on the English ambassador. At this period Prior could say with good reason that " he had commonly business enough upon his hands, and was only a poet by accident." To verse, however, which had laid the foundation of his fortunes, he still occasionally trusted as a means of maintaining his position. His occasional poems during this period include an elegy on Queen Mary in

1695; a satirical version of Boileau's Ode sur le prise de Namur (1695); some lines on William's escape from assassination in 1696; and a brief piece called The Secretary. After his return from France Prior became under-secretary of state and suc- ceeded Locke as a commissioner of trade. In 1701 he sat in parliament for East Grinstead. He had certainly been in William's confidence with regard to the Partition Treaty; but when Somers, Orford and Halifax were impeached for their share in it he voted on the Tory side, and immediately on Anne's accession he definitely allied himself with Harley and St John. Perhaps in consequence of this for nine years there is no mention of his name in connexion with any public transaction. But when the Tories came into power in 1710 Prior's diplomatic abilities were again called into action, and till the death of Anne he held a prominent place in all negotiations with the French court, sometimes as secret agent, sometimes in an equivocal position as ambassador's companion, sometimes as fully accredi- ted but very unpunctually paid ambassador. His share in negotiating the treaty of Utrecht, of which he is said to have disapproved, personally led to its popular nickname of " Matt's Peace." When the queen died and the Whigs regained power he was impeached by Sir Robert Walpole and kept in close custody for two years (1715-1717). In 1709 he had already pub' lished a collection of verse. During this imprisonment, main- taining his cheerful philosophy, he wrote his longest humorous poem, Alma; or, The Progress of the Mind. This, along with his most ambitious work, Salomon, and other Poems on several

Occasions, was published by subscription in 17 18. The sum received for this volume (4000 guineas), with a present of £4000 from Lord Harley, enabled him to live in comfort; but he did not long survive his enforced retirement from public life, although he bore his ups and downs with rare equanimity. He died at Wimpole, Cambridgeshire, a seat of the earl of Oxford, on the 18th of September 1721, and was buried in Westminster Abbey, where his monument may be seen in Poet's Corner. A History of his Own Time was issued by J. Bancks in 1740. The book pretended to be derived from Prior's papers, but it is doubtful how far it should be regarded as authentic.

Prior had very much the same easy, pleasure-loving disposition as Chaucer (with whose career his life offers a certain parallelism) , combined with a similar capacity for solid work. His poems show considerable variety, a pleasant scholarship and great executive skill. The most ambitious, i.e. Solomon, and the paraphrase of the Nut-Brown Maid, are the least successful. But Alma, an admitted imitation of Butler, is a delightful piece of wayward easy humour, full of witty turns and well- remembered allusions, and Prior's mastery of the octo-syllabic couplet is greater than that of Swift or Pope. His tales in rhyme, though often objectionable in their themes, are excellent specimens of narrative skill; and as an epigrammatist he is unrivalled in English. The majority of his love songs are frigid and academic, mere wax-flowers of Parnassus; but in familiar or playful efforts, of which the type are the admirable lines To a Child of Quality, he has still no rival. " Prior's" — says Thackeray, himself no mean proficient in this kind — " seem to me amongst the easiest, the richest, the most charmingly humorous of English lyrical poems. Horace is always in his mind, and his song and his philosophy, his good sense, his happy easy turns and melody, his loves and his Epicurianism, bear a great resemblance to that most delightful and accomplished master."

The largest collection of Prior's verses is that by R. Brimley Johnson in the " Aldine Poets " (2 vols., 1892). There is also a selec- tion in the " Parchment Library," with introduction and notes by Austin Dobson (1889). (A. D.)

PRIOR (from Lat. prior — former, and hence superior, through 0. Fr. priour), a title applied generally to certain monasˆ tic superiors, but also in the middle ages to other persons in authority. Under the Roman Empire the word prior is found signifying " ancestor." In the early middle ages it was com- monly applied to secular officials and magistrates, and it remained all though the middle ages as the title of certain officials in the

Italian city states. Noteworthy among these were the famous priores artis at Florence. These were appointed governors ,}f the Florentine republic when the Companies of the Arts seized the government in 1282.

The term prior was most commonly used to denote the superiors in a monastery, at first with an indefinite significance, but later, as monastic institutions crystallized, describing certain definite officials. In the Rule of St Benedict and other early rules (he titles praepositus and praelatus (see Prelate) are generally used, but prior is also found signifying in a general way the superiors and elders in a monastery. When used by St Benedict in the singular number it seems (according to the commentator Menard) to denote the abbot himself. At a later date in the order of St Benedict the title was applied to the monk next in authority to the abbot, though this usage was not adopted technically until the 13th century. In some monasteries several priors were to be found and generally at least two. Thus we find the terms prior, sub-prior, tertius prior, quartus prior, quinlus prior. The first prior was sometimes called prior major, sometimes prior claustralis. Occasionally both titles are found in one house, the latter ranking below the former. The first prior acted as vicar in all matters in the absence of the abbot, and was generally charged with the details of the discipline of the monastery. With the foundation of the order of Cluny in the 10th century there appeared the conventual prior who ruled as head of a monastery, but was subject in some degree to the archiabbas of the mother-house of Cluny. The Regular Canons later gave this title of prior to the heads of their houses, as did also the Carthusians and the Dominicans. It was in houses of these orders that the sub-prior became a regular official. Among the Dominicans the head of a province is known as the " prior provincial." In the order of St John of Jerusalem (q.v.) a priory was a group of commanderies ruled by a " grand prior."

The term prior was applied also in the middle ages in a very general manner. Thus there was the prior scholae or leader of the choir, prior scriniariorum, &c.

See Du Cange, Glossarium mediae el infimae latinitatis, new edition by L. Favre (Niort, 1883, &c.) ; Sir William Smith and S. Cheetham, edd. Dictionary of Christian Antiquities (1875-1880). (E. O'N.)

PRISCIAN [Priscianus Caesariensis], the celebrated Latin grammarian, lived about a.d. 500, i.e. somewhat before Justinian. This is shown by the facts that he addressed to Anastasius, emperor of the East (491-518), a laudatory poem, and that the MSS. of his Instituliones grammaticae contain a subscription to the effect that the work was copied (526, 527) by

Flavius Theodoras, a clerk in the imperial secretariat. Three minor treatises are dedicated to Symmachus (the father-in-law of Boetius). Cassiodorus, writing in the ninety-third year of his age (560? 573?), heads some extracts from Priscian with the statement that he taught at Constantinople in his (Cassiodorus's) time (Keil, Gr. Lat. vii. 207). His title Caesariensis points, according to Niebuhr and others, to Caesarea in Mauretania. Priscian 's teacher was Theoctistus, who also wrote an Institutio artis grammaticae. Priscian was quoted by several writers in Britain of the 8th century — Aldhelm, Bede, Alcuin — and was abridged or largely used in the next century by Hrabanus Maurus of Fulda and Servatus Lupus of Ferrieres. There is hardly a library in Europe that did not and does not contain a copy of his great work, and there are about a thousand MSS. of it. The greater part of these contain only books i.-xvi. (sometimes called Priscianus major); a few contain (with the three books Ad Symmachum) books xvii., xviii. {Priscianus minor); and a few contain both parts. The earliest MSS. are of the 9th century, though a few fragments are somewhat earlier. All are ultimately derived from the copy made by Theodoras. The first printed edition was in' 1470 at Venice.

The Institutiones grammaticae is a systematic exposition of Latin grammar, dedicated to Julian, consul and patrician, whom some have identified with the author of a well-known epitome of Justinian's Novellae, but the lawyer appears to be somewhat later than Priscian. It is divided into eighteen books,

of which the first sixteen deal mainly with sounds, word-forma- tion and inflexions; the last two, which form from a fourth to a third of the whole work, deal with syntax. Priscian informs us in his preface that he has translated into Latin such precepts of the Greeks Herodian and Apollonius as seemed suitable, and added to them from Latin grammarians. He has preserved to us numerous fragments which would otherwise have been lost, e.g. from Ennius, Pacuvius, Accius, Lucilius, Cato and Varro. But the authors whom he quotes most frequently are Virgil, and, next to him, Terence, Cicero, Plautus; then Lucan, Horace, Juvenal, Sallust, Statius, Ovid, Livy and Persius. His industry in collecting forms and examples is both great and methodical, His style is somewhat heavy, but sensible and clear; it is free, not of course from usages of Late Latin, but from anything that can be called barbarism. Its defects may be referred in the main to four heads. (1) Priscian avowedly treats Greek writers on (Greek) grammar as his supreme authorities; and bears too little in mind that each has a history of its own and is a law to itself. (2) There had been no scientific study of phonetics, and consequently the changes and combinations of languages are treated in a mechanical way: e.g. i passes into a, as genus, generis, generatum; into 0, as saxi, saxosus; q passes into s, as lorqueo, torsi, &c. (3) The resolution of a word into root or stem and

inflexional or derivative affixes was an idea wholly unknown, and the rules of formation are often based on unimportant phenomena; e.g. Venus, like other names ending in us, ought to have genitive Veni, but, as this might be taken for a verb, it has Veneris. Ador has no genitive because two rules conflict; for neuters in or have a short penult {e.g. aequor, aequoris), and adoro, from which it is derived, has a long penult. (4) The practical meaning of the inflexionsis not realized, and syntactical usages are treated as if they were arbitrary or accidental associa- tions. Thus, after laying down as a general rule for declinable words that, when they refer to one and the same person, they must have the same case, gender and number, Priscian adds that when there are transitive words we may use different numbers, as doceo discipulos, docemus discipulum. He often states a rule too broadly or narrowly, and then, as it were, gropes after restrictions and extensions.

His etymologies are of course sometimes very wild: e.g. caelebs from caelestium vitam ducens, b being put for consonantal u because a consonant cannot be put before another consonant; deterior from the verb detero, deteris; potior (adj.) from potior, potiris; arbor from robur; verbum from verberatus aeris, &c. Nor is he always right in Greek usages.

Priscian's three short treatises dedicated to Symmachus are on weights and measures, the metres of Terence, and some rhetorical elements (exercises translated from the Hpoyvixvaafiara of Hermogenes). He also wrote De nomine, pronomine, et verbo (an abridgment of part of his Institutiones) , and an interesting specimen of the school teaching of grammar in the shape of complete parsing by question and answer of the first twelve lines of the Aeneid {Partitiones xii. versuum Aeneidos principalium). The metre is discussed first, each verse is scanned, and each word thoroughly and instructively examined. A treatise on accents is ascribed to Priscian, but is rejected by modern writers on the ground of matter and language. He also wrote two poems, not in any way remarkable, viz. a panegyric on Anastasius in 3 1 2 hexameters with a short iambic introduction, and a faithful translation into 1087 hexameters of Dionysius's Periegesis or geographical survey of the world.

The best edition of the grammatical works is by Hertz and Keil, in Keil's Grammatici latini, vols, ii., iii. ; poems in E. Bahrens' Poetae latini minores, the " Periegesis " also, in C. W. Mtiller, Geographi graeci minores, vol. ii. See J. E. Sandys, History of Classical Scholarship (ed. 1906), pp. 272 sqq.

PRISCILLIAN (d. 385), Spanish theologian and the founder of a party which, in spite of severe persecution for heresy, continued to subsist in Spain and in Gaul until after the middle of the 6th century. He was a

wealthy layman who had devoted his life to a study of the occult sciences and the deeper problems of philosophy. He was largely a mystic and regarded the Christian

life as continual intercourse with God. His favourite idea is that which St Paul had expressed in the words ” Know ye not that ye are the temple of God?” and he argued that to make himself a fit habitation for the divine a man must, besides holding the Catholic faith and doing works of love, renounce marriage and earthly honour, and practise a hard asceticism. It was on the question of continence in, if not renunciation of, marriage, that he came into conflict with the authorities. Priscillian and his sympathizers, who were organized into bands of spiritales and abstinentes, like the Cathari of later days, indignantly refused the compromise which by this time the Church had established in the matter (see Marriage: Canon Law). This explains the charge of Manichaeism levelled against Priscillian (Jerome, for his talk of the Sordes nuptiarum, had been similarly accused, and to escape popular indignation had retired to Bethlehem), 1 and to this was added the accusation of magic and licentious orgies. Among the more prominent of Priscillian’s friends were two bishops, named Instantius and Salvianus, and Hyginus of Cordova also joined the party; but, through the exertions of Idacius of Emerita, the leading Priscillianists, who had failed to appear before the synod of Spanish and Aquitanian bishops to which they had been summoned, were excommuni- cated at Saragossa in October 380. Meanwhile, however, Priscillian was made bishop of Avila, and the orthodox party found it necessary to appeal to the emperor (Gratian), who issued an edict threatening the sectarian leaders with banishment. Priscillian, Instantius and Salvianus succeeded, however, in procuring the withdrawal of Gratian’s edict, and the attempted arrest of Ithacius of Ossonuba. On the murder of Gratian and accession of Maximus (383) Ithacius fled to Treves, and in conse- quence of his representations a synod was held (384) at Bordeaux, where Instantius was deposed. Priscillian appealed to the emperor, with the unexpected result that with six of his com- panions he was burned alive at Treves in 385. The first instance of the application of the Theodosian law against heretics had the approval of the synod which met at Treves in the same year, but Ambrose of Milan and Martin of Tours can claim the glory of having in some measure stayed the hand of persecution. The heresy, notwithstanding the severe measures taken against it, continued to spread in France as well as in Spain; in 412 Lazarus, bishop of Aix in Provence, and Herod, bishop of Aries, were expelled from their sees on a charge of Manichaeism. Proculus, the metropolitan of Marseilles, and the metropolitans of Vienne and

Narbonensis Secunda were also followers of the rigorous tradition for which Priscillian had died. Something was done for its repression by a synod held by Turibius of Astorga in 446, and by that of Toledo in 447; as an openly professed creed it wholly disappeared after the second synod of Braga in 563. " The official church," says F. C. Conybeare, " had to respect the ascetic spirit to the extent of enjoining celibacy upon its priests, and of recognizing, or rather immuring, such of the laity as desired to live out the old ascetic ideal. But the official teaching of Rome would not allow it to be the ideal and duty of every Christian. Priscillian perished for insisting that it was such; and seven centuries later the Church began to burn, the Cathari by thousands because they took a similar view of the Christian life."

The long prevalent estimation of Priscillian as a heretic and Manichaean rested upon Augustine, Turibius of Astorga, Leo the Great and Orosius, although at the Council of Toledo in 400, fifteen years after Priscillian's death, when his case was reviewed, the most serious charge that could be brought was the error of language involved in rendering kykvrtros by innascibilis. It was long thought that all the writings of the " heretic " himself had perished, but in 1885, G. Schepss discovered at Wurzburg eleven genuine tracts, since published in the Vienna Corpus. " They contain nothing that is not orthodox and commonplace,

1 Cf . the outbreak at Rome in 384 against the gymnosophists, emaciated monks who walked the streets and vehemently denounced marriage. The epistles of Pope Siricius (who wished to stand well with the people) are full of scorn for these ascetics, and the Leonine sacra me ntary contains prayers which severely denounce them.

nothing that Jerome might not have written," and go fai to justify the description of Priscillian as " the first martyr burned by a Spanish Inquisition."

See E. Ch. Babut, Priscillian et le Priscillianisme (Paris, 1909).

(A. J. G.)

PRISCUS, of Panium in Thrace, Greek sophist and historian, lived during the 5th century a.d. He accompanied Maximin, the ambassador of Theodosius the Younger, to the court of Attila (448). During the reign of Marcian (450-457) he also took part in missions to Arabia and the Egyptian Thebai'd. Priscus was the author of an historical work in eight books (Bvˆavrtvuci) ToTopta), probably from the accession of Attila to that of Zeno (433-474). Only fragments of the work remain, but the description of Attila and his court and the account of the reception of the Roman

ambassadors is a most valuable piece of con-ˆ temporary history. Priscus's style is pure, and his impartiality and trustworthiness entitle him to an honourable place among the writers of his time.

Fragments and life in C. W. Mtiller, Fragmenta historicorum graecorum, iv. 69-110; v. 24-26, ed. B. G. Niebuhr in Bonn, Corpus scriptorum hist, byzantinae (1829), vol. vi., and L. Dindorf in Historici graeci minores (1870), vol. i. For the embassy to Attila see Gibbon, Decline and Fall, ch. 34.

PRISCUS, a Greek Neoplatonist philosopher, of the school of Iamblichus and Aedesius. He died about the year 398 at the age of ninety. The emperor Julian frequently invited him to court on the strength of his reputation in connexion with theurgy. Eunapius says that he was a man of dignified and austere habit. Unlike Maximus, he used his influence over Julian with great moderation. He died during the Gothic invasion of Greece (a.d. 396-98). He is important partly as maintaining the best traditions of philosophy during a period when Neoplatonism as a whole was a parasite of imperial power, and partly as being a connecting link between Iamblichus and Plutarch of Athens.

See Zeller's Hist, of Greek Phil.

PRISHTINA, -Prichtina, or Pristina, the chief town of a sanjak in the vilayet of Kossovo, Albania, European Turkey; on a small tributary of the river Sitnitza, an affluent of the Ibar, and 3 m. E. of the Prishtina station on the Salonica-Mitrovitza railway. Pop. (1905), about 11,000. Prishtina is the seat of a governor-general and of a general of division, and possesses many mosques, a military hospital and a higher class school. The trade is considerable, the exports including chrome, wheat, maize, barley, skins, wine and timber from the magnificent beech forests in the sanjak. The plain of Kossovo (Kossovopolye, " Field of Blackbirds "), to the west, was the scene of the battle in which the Servian empire was destroyed by the Turks in 1389. To the south-east lies the partly ruined monastery of Grachanitza founded by King Milutin of Servia (1275-1321). Among the frescoes are a remarkable head of Christ in the dome, and portraits of the founder and his queen Simonida, daughter of Andronicus II. Palaeologus.

See G. M. M. Mackenzie and A. P. Irby, Travels in the Slavonic Provinces of Turkey (1877),

PRISM (Gr. xpitr/ia, properly a thing sawn, xptfeie, to saw), in geometry a solid enclosed by plane surfaces, two of which, termed the ends, are parallel, equal, similar and similarly situated polygons, and the faces connecting the ends are parallelo- grams, equal in number to the sides of

the polygon. If the faces be perpendicular to the ends the prism is a " right prism," and the faces are rectangles; otherwise the prism is " oblique." The axis is the line joining the centres of the ends. It may be generated by moving a plane (corresponding to an end or base) parallel to itself. A prismoid differs from a prism in having for its ends two dissimilar parallel figures. For illustrations see Crystallography, and for the mensuration see that article. In optics the word denotes a triangular prism, i.e. one having a triangle for base, used to decompose white light. (See Refraction and Dispersion.)

PRISON (derived through the Fr. from the Lat. prehensio, seizure), a place for the confinement or compulsory restraint of

persons after arrest or sentence by arbitrary authority or process of law.

The earliest object sought in imprisonment was to secure the person of the accused to ensure his appearance before his judges for trial, and after conviction to produce him Penalties. t0 ta ' ce ^' s punishment. They were applied to other uses less justifiable or defensible; they served to execute the will of the despotic master upon all who set them- selves in opposition to his authority, or were decreed, more or less wisely but still arbitrarily, by a government in the best interests of society, organized for the general good. Coercion and intimidation slowly came to be leading ideas, the infliction of a lesser penalty than the capital. The deprivation of liberty under irksome circumstances, rough lodging, hard fare and perpetual labour was after all a milder measure than death, although long years elapsed before the prison was so used. Penal codes depended rather upon shorter and more cruel methods; the scaffold was in constant use, with all manner of physical pain, torture before and after sentence, shameful exposure, hideous mutilation, exile, selling into bondage as slaves. Incarceration was no doubt practised by irresponsible masters, regardless of personal rights, callous to the sufferings of their victims, to which death by starvation or horrible neglect was a welcome relief. But consignment to a prison for length- ened periods was, as a penalty, of more recent introduction, and of still later date is the recognition of the duties incumbent upon the authority to use its powers mercifully by humane endeavours to reform and improve those on whom it laid hands.

The progress made can only be realized by considering what prisons once were. The shocking picture drawn by John Howard Howard's of the state of prisons at the latter end of the 18th Reforms la century will last for all

time. They were for the England. mos t p ar t pestiferous dens, overcrowded, dark, foully dirty, not only ill ventilated, but deprived altogether of fresh air. The wretched inmates were dependent for food upon the caprice of their gaolers or the charity of the benevolent; water was denied them except in the scantiest proportions; their only bedding was putrid straw. Every one in durance, whether tried or untried, was heavily ironed. All alike were subject to the rapacity of their gaolers and the extortions of their fellows. Gaol fees were levied ruthlessly—" garnish " also, the tax or contribution paid by each individual to a common fund to be spent by the whole body, generally in drink. Idleness, drunken- ness, vicious intercourse, sickness, starvation, squalor, cruelty, chains, awful oppression and everywhere culpable neglect — in these words may be summed up the state of the gaols at the time of Howard's visitation.

At this time prisons were primarily places of detention, not of punishment, peopled by accused persons, still innocent in the eyes of the law, and debtors guilty only of breaches of the financial rules of a commercial country, framed chiefly in the interest of the creditor. Freedom from arrest was guaranteed by Magna Carta, save on a criminal charge, yet thousands were committed to gaol on legal fictions and retained indefinitely for costs far in excess of the original debt. The impecunious were locked up and deprived of all hope of earning means to obtain enlargement; while their families and persons dependent on them shared their imprisonment and added to the overcrowding. The prisons were always full. Gaol deliveries were of rare occurrence, even when tardy trial ended in acquittal release was delayed until illegal charges in the way of fees had been satisfied. In the article Deportation it is shown how the discoveries in the southern seas led to the adoption of penal exile in prefer- ence to other suggested improvements in the English prison systems. The penitentiary scheme proposed by Howard was not, however, abandoned. It was revised and kept alive by Jeremy Bentham in his fanatical scheme for a " panopticon or inspection house," described as " a circular building, an iron cage, glazed, a glass lantern as large asRanelagh, with the cells on the outer circumference." His plan was to keep every inmate of every cell under constant close observation, and all were to be reformed by solitude and seclusion while constantly

employed in remunerative labour, in the profits of which they were to share. The scheme hung fire, owing, it was alleged, to the personal hostility of George III. to Bentham as an advanced radical. Lands were, however, purchased which were eventually taken over by the government and utilized for the erection of Millbank penitentiary, begun in 1813 and partially completed in 1816. It was now fully recognized that the reformation of prisoners could best be attempted by seclusion, " employment and religious instruction." Millbank, as a new and most

enlightened undertaking in prison affairs, was opened with much eclat. It was to be governed by a specially appointed committee of distinguished personages, the chairman being the Speaker of the House of Commons. The sum total expended upon the buildings amounted to half a million of money, and the yearly charges of the establishment were a heavy burden on the exchequer.

The erection of Millbank was a step in the right direction. The energy with which it was undertaken was the more remarkable because elsewhere throughout the United Kingdom the prisons, with few exceptions, remained deplorably bad. J. Neild, who in 181 2 followed in the footsteps of John Howard, found that the old conditions remained unchanged. " The great reformation produced by Howard," to use Neild's own words, " was merely temporary . . . prisons were relapsing into their former horrid state of privation, filthiness, severity and neglect." Yet the legislature was alive to the need for prison reform. Besides the building of Millbank it had promulgated many acts for the amelioration of prisoners. Gaol fees were once more distinctly abolished; the appointment of chaplains was insisted upon, and the erection of improved prison buildings was rendered imperative upon local authorities. But these, with other and much older acts, remained in abeyance. Thus an act which provided for the classification of prisoners had remained a dead letter; even the separation of the males from the females was not a universal rule. Roused by these crying evils, a small band of earnest men formed themselves into an association for the improvement of prison discipline. They perambulated the country inspecting the prisons; they issued lengthy interrogatories to prison officials; they published periodical reports giving the result of their inquiries, with their views on the true principles of prison management, and much sound advice, accompanied by elaborate plans on the subject of prison construction. The labours of this society brought out into strong relief the naked deformity of the bulk of the British gaols. Speaking of St Albans from his personal observation Mr (afterwards Sir T. F.) Buxton, a most active member of the society, said: " All were in ill health; almost all were in rags; almost all were filthy in the extreme. The state of the prison, the desperation of the prisoners, broadly hinted in their conversa- tion and plainly expressed in their conduct, the uproar of oaths, complaints and obscenity, the indescribable stench, presented together a concentration of the utmost misery and the utmost guilt." The reports of the society laid bare the existence of similar horrors in numbers of other gaols. Yet this was in 1 818, when the legislature was setting a praiseworthy example — when half a million had been spent in providing large airy cells for a thousand prisoners. Even in London itself, within easy reach of the palatial Millbank penitentiary, the chief prison of the city, Newgate, was in a disgraceful condition. This had been exposed by a parliamentary inquiry as far back

as 1814, but nothing had been done to remedy the evils laid bare. The state of the female side had already attracted the attention of that devoted woman, Mrs Fry, whose ministrations and wonderful success no doubt encouraged, if they did not bring about, the formation of the Prison Society. Mrs Fry went first to Newgate in 18 13, but only as a casual visitor. It was not until 1817 that she entered upon the noble work with which her name will ever be associated. She worked a miracle there in an incredibly short space of time. The ward into which she penetrated was like a den of wild beasts; it was filled with women unsexed, fighting, swearing, dancing, gaming, yelling and justly deserved its name of " hell above ground." Within a month it was transformed.

and presented, says an eyewitness, " a scene where stillness and propriety reigned." The wild beasts were tamed. Movements similar to that which Mrs Fry headed were soon set on foot both in England and on the Continent, and public attention was generally directed to the urgent necessity for prison reform.

Stimulated by the success achieved by Mrs Fry, the Prison Discipline Society continued its labours. Hostile critics were not wanting; many voices were raised in protest against the ultra-humanitarianism which sought to make gaols too comfort- able and tended to pamper criminals. But the society pursued its objects, undeterred by sarcasm. Many of these are now accepted as axioms in prison treatment; for instance, that female officers only should have charge of female prisoners, that prisoners of both sexes should be kept apart and constantly employed. Yet these principles were unacknowledged at that time and were first enunciated in acts such as the 4 Geo. IV. c. 65 and the 5 Geo. IV. c. 85 (1823-1824), the passing of which were mainly due to the strenuous exertions of the Prison Discipline Society. It was laid down in these that over and above safe custody it was essential to preserve health, improve morals, and enforce hard labour on all prisoners sentenced to it. Irons were strictly forbidden except in cases of " urgent and absolute necessity," and it was ruled that every prisoner should have a bed to himself — if possible a separate cell, the last being the first formal statement of a principle upon which all future prison discipline was to be based.

The importance of these acts cannot be over-estimated as supplying a legal standard of efficiency by which all prisons could be measured. Still the progress of improvement was extremely slow, and the managers of gaols still evaded or ignored the acts. Many local authorities grudged the mohey

to rebuild or enlarge their gaols; others varied much in their interpretation of the rules as to hard labour and the hours of employment. One great drawback to general reform was that a large number of small prisons lay beyond the reach of the law. Those under small jurisdictions in the boroughs and under the petty corporate bodies continued open to the strongest reprobation, and thus remained until they were swept away by the measure which brought about the reform of the municipal corporations in 1835. But by this time a still more determined effort had been made to establish some uniform and improved system of prison discipline. In 1 83 1 a select committee of the House of Commons went into the whole subject of secondary punishment and reported that, as the difficulties in the way of an effective classification of prisoners were insurmountable, they were strongly in favour of the confinement of prisoners in separate cells, recommending that the whole of the prisons should be altered accordingly and the expense borne by the public exchequer. There can be little doubt that this committee was greatly struck by the superior methods of prison discipline pursued in the United States. The best American prisons had recently been visited by two eminent Frenchmen, J. A. de Beaumont and A. de Tocqueville, who spoke of them in terms of the highest praise. It was with the object of appropriating what was best in the American system that Mr W. Crawford was despatched across the Atlantic on a special mission of inquiry. His exhaustive report, published in 1834, was a valuable contribution to the whole question of penal discipline. Another select committee, this time of the House of Lords, returned to the subject in 1835, and after a long investigation re-enunciated the theory that all prisoners should be kept separate from one another. It also urged in strong terms the necessity for one uniform system of treatment, more especially as regarded dietaries, labour and education, and strongly recommended the appointment of official inspectors to enforce obedience to the acts. These recommendations were eventually adopted and formed the basis of a new departure.

For fifty years transportation (see Deportation) had been in England the principal form of secondary punishment for crime. Primary or capital punishment still existed, but to a Progress. 8 reat ly modified extent. The pious Quakers of Penn- sylvania at the end of the 18th century had realized a deeper duty towards the offenders than their extinction,

and sought to amend and reform the living. The note struck first in the Walnut Street penitentiary began a new era in prison treatment, and the methods adopted were destined to extend over the whole world. This was the germ of the nearly universal principle of individual confinement, and the origin of what some advanced thinkers have denounced as the greatest crime of the present age, the invention of the separate cell. It was and still is held by many that the criminal may be best and most effectually weaned

from his evil ways by shutting him up for lengthy periods between four walls, and subjecting him, when most susceptible, to curative processes, to constant exhortation and searching introspection, changing his nature and restoring him to society a reformed man.

It must be at once admitted that the system of isolation has produced no remarkable results. Solitary confinement has neither conquered nor appreciably diminished crime, even where it has been applied with extreme care, as in Belgium, and more recently in France, where it obtains strict and unbroken for long terms of years. Cloistered seclusion is an artificial condition quite at variance with human instincts and habits, and the treatment, long continued, has proved injurious to health, inducing mental breakdown. A slow death may be defended indeed on moral grounds if regeneration has been com- passed, but it is only another form of capital punishment. Still the measures introduced in the United States and the action taken upon them fill a large page in prison history and must be recorded here.

Several states in the Union followed the lead of Pennsylvania. That of New York built the great Auburn penitentiary in 1816 to carry out the new principles. There every prisoner was kept continuously in complete isolation. He saw no one, spoke to no one, and did no work. Within a short period very deplorable results began to show themselves. Many prisoners became insane; health was generally impaired and life greatly endangered. Mr Crawford, whose mission to the United States has been already referred to, was in favour of solitary confinement, but he could not deny that several cases of suicide followed this isolation. Some relaxation of the disastrous severity seemed desirable, and out of this grew the second great system, which was presently introduced at Auburn and afterwards at the no less renowned prison of Sing Sing. It was called the silent system. While the prisoners were still separated at night or meals, they were suffered to labour in association, but under a rule of silence ruthlessly and rigorously maintained. The latter, entrusted to irresponsible subordinates, degenerated into a despotism which brought the system into great discredit. All discipline officers were permitted to wield the whip summarily and without the slightest check. Under such a system the most frightful excesses were possible and many cases of brutal cruelty were laid bare. Reviewing the merits and demerits of each system, Mr Crawford gave his adhesion to that of unvarying solitude as pursued in the Eastern penitentiary in Pennsylvania.

Mr Crawford came back from the United States an ardent champion of the solitary system. He saw, however, great difficulties in making this the universal rule, chief among which was the enormous expense of provid- separation, ing suitable prisons. Some modification of the rule of unbroken

solitude would be inevitable; but he strongly urged its adoption for certain classes, and he was equally convinced of the imperative necessity for giving every prisoner a separate sleeping cell. It is clear that the government endorsed Mr Crawford's views. Where it was possible they gave effect to them at once. At Millbank, with its spacious solitary cells, the rule of seclusion was more and more strictly enforced. Ere long permissive legislation strove to disseminate the new principles. In 1830 Lord John Russell had given it as his opinion that cellular separation was desirable in all prisons. But it was not until 1830 that an act was passed which laid it down that individuals might be confined separately in single cells. Even now the executive did not insist upon the con- struction of prisons on a new plan. It only set a good example

by undertaking the erection of one which should serve as a model for the whole country. In 1840 the first stone of Pentonville prison was laid, and after three years of considerable outlay, its cells, 520 in number, were occupied on the solitary, or more exactly the separate system — the latter being somewhat less rigorous and irksome in its restraints. To the credit of many local jurisdictions, they speedily followed the lead of the central authority. Within half a dozen years no fewer than fifty-four new prisons were built on the Pentonville plan, which now began to serve generally as a " model " for imitation, not in England alone, 'but all over the world. Sir Joshua Jebb, who presided over its erection, may fairly claim indeed to be the author and originator of modern prison architecture.

The building of Pentonville was epoch-making. The modern prison dates from it. The penal discipline of to-day, much modified and varied it is true, may be largely traced to it. The " cell " scheme of individual separation holds the ground, and countries which can afford the outlay have built or are building cellular prisons. France has made steady progress in this respect. Great additions have been made to La Sante prison in Paris, and a new prison on gigantic lines has been opened at Fresnes les Rungis, on the outskirt of the metropolis, to replace the obsolete Mazas, and to give cellular accommodation to the large numbers always on hand in Paris. Germany has embarked on penitentiary reforms with the provision of several new prisons; it is the same with the United States, Austria, Holland, Spain, Portugal, Denmark, Norway, Sweden. In Italy a com- prehensive scheme has been drawn up so that cellular imprison- ment may become a general rule. In Belgium, where penal administration has received the closest attention for a number of years, the regime of cellular imprisonment has been long carried to its farthest limits, and solitary confinement ranging

over ten years and in some cases much more has been strictly enforced. Of late years however a new school has arisen in Belgium which expresses strong doubts of the wisdom or efficacy of prolonged cellular confinement. In England, moreover, which, if not the first to adopt separation in principle, certainly gave the largest effect to it in practice, continuous cellular con- finement for short terms is ceasing to be the inevitable rule; and although it has been retained in cases of penal servitude for the first six months, it was in 1809 practically abandoned for lesser sentences, and all prisoners after the first month work together in association under surveillance. In July 19 10 the home secretary announced his intention to reduce it to one month in all cases, except those of recidivists (see Recidivism). The bias of modern practice, in short, is towards milder methods, not only in treatment, but in those anticipatory processes which may render imprisonment unnecessary.

To understand the existing British prison system it is necessary to consider its gradual growth and the steps taken to establish it. Its foundations were laid by Sir George Grey, The Moaern home secretary, when transportation ended rather British abruptly by the refusal of the chief colonies to System. continue to be the dumping ground for British convicts. Sir George Grey sought to deal with the difficulty as a whole, and to provide for all classes of criminals, the most heinous deserving severe correction and the minor offenders in the earliest stages of misconduct. For the first there was some urgency, the latter was still the business of the local jurisdictions. The system now introduced consisted of three principal parts: (1) of a limited period of separate confinement in a home prison or penitentiary, accompanied by industrial employment and moral training; (2) of hard labour at some public works prison either at home or abroad; and (3) of exile to a colony with a conditional pardon or ticket-of -leave (q.v.). No pains were spared to give effect to this plan. Pentonville was available for the first phase; Millbank was also pressed into the service, and accommodation was hired in some of the best provincial prisons, as at Wakefield and Leicester. Few facilities existed for carrying out the second stage, but they were speedily improvised. Although the hulks at home had been condemned, convict establishments in which these floating prisons still

formed the principal part were organized at Bermuda and Gibraltar. Neither of these was a conspicuous success; they were too remote for effective supervision; and although they lingered on for some years they were finally abolished. The chief efforts of the authorities were directed to the formation of public works prisons at home, and here the most satisfactory results were soon obtained. The construction of a harbour of refuge at Portland had been recommended in 1845; in 1847 an act was passed to facilitate the purchase of land there, and a sum of money was taken in the estimates for the erection of a prison which was begun next

year. At another point, Dartmoor, a prison already stood available, although it had not been occupied since the last war, when ten thousand French and American prisoners had been incarcerated in it. A little re-construction made Dartmoor into a modern gaol, and in the waste lands around there was ample labour for any number of convict hands. Dartmoor was opened in 1850; two years later a convict prison was established at Portsmouth in connexion with the dockyard, and another of the same class at Chatham in 1856. The third stage in Sir George Grey's scheme contemplated the enforced emigration of released convicts, whom the discipline of separation and public works was supposed to have purged and purified, and who would have better hopes of entering on a new career of honest industry in a new country than when thrown back among vicious associations at home. The theory was good, the practice impossible. No colony would receive these ticket-of-leave men. Van Diemen's Land positively refused to do so, even though this denial cut off the supply of labour, now urgently needed. The appearance of a convict ship at the Cape of Good Hope nearly produced a revolt. Although Earl Grey addressed a circular letter to all colonial governments offering them the questionable boon of transporta- tion, only one, the comparatively new colony of Western Australia, accepted. But this single receptacle could not absorb a tithe of the whole number of convicts awaiting exile. It became necessary therefore to find some other means for their disposal. Accordingly, in 1853 the first Penal Servitude Act was passed, substituting certain shorter sentences of penal servitude for transportation. It was only just to abbreviate the terms; under the old sentence the transportee knew that if well conducted he would spend the greater part of it in comparative freedom. But although sentences were shortened it was not thought safe to surrender all control over the released convict; and he was only granted a ticket-of-leave for the unexpired portion of his original sentence. No effective supervision was maintained over these convicts at large. They speedily relapsed into crime; their numbers, as the years passed, became so great and their depredations so serious, especially in garrotte robberies, that a cry of indignation was raised against the system, which led to its arraignment before a select committee of the House of Commons in 1863.

Meanwhile prison discipline in the elementary stage, as inflicted on lesser offenders, was continually discussed. The subject was referred to many committees for inquiry, and it was shown that there was a lamentable want of uniformity in the enforce- ment of legal penalties. The processes and treatment varied with the localities. Dietaries differed, here too ample, there meagre to starvation. The amount of exercise allowed varied greatly; there was no universal rule as to employment. In some prisons hard labour was insisted upon, and embraced tread- wheels or the newly-invented cranks; in some it did not exist at all. The cells inhabited by prisoners (and

separate cellular confinement was now very general) were of different dimensions — variously lighted, warmed and ventilated. The time spent in these cells was not invariably the same, and as yet no authoritative decision had been made between the solitary and silent systems. The first named had been tried at Pentonville, but the period had been greatly reduced. The duration had been at first fixed at eighteen months, but it was proved that the prisoners' minds had become enfeebled by this long isolation, and the period was limited to nine months. In many jurisdictions however the silent system, or that of associated

PRISON

labour in silence, was still preferred; and there might be prisons within a short distance of each other at which two entirely different systems of discipline were in force. . In 1849 Mr Charles Pearson, M.P., moved for a select committee to report upon the best means of securing some uniform system which should be at once punitive, reformatory and self-supporting. He urged that all existing plans were inefficacious, and he advocated a new scheme by which the labour of all prisoners should be applied to agriculture in district prisons. The result of a full inquiry was the reiteration of views already accepted in theory but not yet generally adopted in practice. Thirteen more years elapsed and still no such steps had been taken. A new committee sat in 1863, and in its report again remarked in no measured terms upon the many and wide differences that still existed in the gaols of Great Britain as regards construction, diet, labour and general discipline, " leading to an inequality, uncertainty and inefficiency of punishment productive of the most prejudicial results." Matters could only be mended by the exercise of legislative authority, and this came in the Prison Act of 1865, an act which consolidated all previous statutes on the subject of prison discipline, many of its provisions being still in force. Yet the years passed and uniformity was still far from secured; it was impossible indeed while prison administra- tion was still left to a number of local authorities, no two of which were often of the same mind. The legislature had tried its best, but had failed. It had exercised some supervision through its inspectors, had forbidden cells to be used until duly certified as fit, and had threatened to withhold exchequer contributions from prisons of which unfavourable reports were received. Such penalties had exercised no sufficient terrors. It began to be understood, moreover, that the prisons under local jurisdictions were not always conveniently and economic- ally situated. Crime, with the many facilities offered for rapid locomotion to those who committed it, had ceased to be merely local, and the whole state rather than individual communities ought to be taxed; prison charges should be borne by the public exchequer and not by local rates. These considerations gained strength and led at length to the introduction of the Prison Bill which became law in 1877, by which the control of all gaols

was vested in a body of prison commissioners appointed by and responsible to the home secretary. These commissioners had power to consolidate by closing superfluous prisons, to establish one system of discipline, and generally by watchful supervision, aided by the experience of specialists, to maintain that much- desired uniformity which had been so long and unsuccessfully sought. At the same time the co-operation of the local magistrates was invited so far as advice and assistance were concerned; but all real power and control has passed from their hands into that of the commissioners of prisons. The system established by the act of 1877 is that now in force.

As for penal servitude, the punishment reserved for the gravest offences, great changes had been introduced. We left this branch of the subject at a parliamentary inquiry. The verdict given was in the main satisfactory; but doubts were expressed as to the severity of the discipline inflicted, the principal features of which were moderate labour, ample diet and substantial gratuities. The first was far less than the work free men did for a livelihood, the second larger, the third excessive, so that convicts often left prisons with thirty, forty, .even eighty pounds in their pockets. Penal servitude, to use the words of the lord chief justice Sir Alexander Cockburn, one of the members of the committee, " was hardly calculated to pro- duce on the mind of the criminal that salutary dread of the recurrence of the punishment which may be the means of deterring him and, through his example, others from the commis- sion of crime." The chief recommendation put forward to mend the system comprised lengthening of all sentences, a diminution in the dietaries, the abolition of large gratuities, and, speaking broadly, a general tightening of the reins. The most notable change however was in regard to labour, the quantity and value of which was to be regulated in future by the so-called " mark-system." This plan had originated with Captain

Maconochie, at one um« superintendent in Norfolk Island, who had recommended that the punishment inflicted upon criminals should be measured, not by time, but by the amount of labour actually performed. In support of his theory he devised an ingenious system of recording the convicts' daily industry by marks, which on reaching a given total would entitle them to their release. This mark system had already been tried with good results in Ireland, where the Irish system, as it was called, introduced by Sir Walter Crofton, had attracted widespread attention. There had been a very marked diminu- tion in crime, attributable it was supposed to this system, which was in almost all respects the same as the English, although the Irish authorities had invented an " intermediate stage " in which convicts worked in a state of semi-freedom and thus practised the self-

reliance which in many produced reform. As a matter of fact the diminution in crime was traceable to general causes, such as a general exodus by emigration, the introduction of a poor law and an increase in the facilities for earning an honest livelihood. It may be added here that judged by later experience the Irish system had no transcendent merits, and it is now extinct. But we owe something to the Irish prac- tice which first popularized the idea of maintaining a strict supervision over convicts in a state of conditional release, and it reconciled us to a system which was long wrongfully stigmatized as espionage. The mark system, as recommended by the com- mittee of 1863 and as subsequently introduced, had however little in common with either Maconochie's or the Irish plan. It was similar in principle and that was all. According to the committee, every convict should have it in his power to earn a remission — in other words, to shorten his sentence by his in- dustry. This industry was to be measured by marks earned by hard labour at the public works, after a short probational term of close " separate " confinement. But the remission gained did not mean absolute release. All males were to be sent, during the latter part of their sentence, " without disguise to a thinly peopled colony," to work out their time and their own re- habilitation. The committee still clung to the old theory of transportation, and this in spite of the lively protests of some of its members. The one outlet remaining, however, that of Western Australia, was soon afterwards (1867) closed to con- vict emigrants; and this part of the committee's recommenda- tions became a dead letter. Not so the mark system, or the plan of earning remission by steady industry. This was carried out on a broad and intelligent basis by officials prompt to avail themselves of the advantages it offered. Thus in 1877-1878 efforts were made to minimize contamination by segregating the worst criminals and restricting conversation at exercise. A special class was formed in 1880, in which all convicts " not versed in crime," first offenders and comparatively innocent men, are now kept apart from the older and more hardened criminals. The committee last quoted gave it as their opinion that " penal servitude as at present administered is on the whole satisfactory; it is effective as a punishment and free from serious abuses … a sentence of penal servitude is now generally an object of dread to the criminal population." Since then, steps have been taken in the classification of convicts when undergoing sentence with a view to dealing more effectually with habitual criminals.

Having thus traced the history of secondary punishments and prison discipline in England, it will be well to de- Latest scribe the system now actually in force. This will Measures be best understood if we follow those who break ^^""f the law through all the stages from that of arrest, ofscipHae through conviction, to release, conditional or la England. complete.

After a short detention in a police cell, an offender, unless disposed of summarily, passes into one of His Majesty's prisons, there to await his trial at sessions or assizes. The period thus spent in the provinces will never exceed three months; in London, with the frequent sitting at Clerkenwell and of the Central Criminal Court, it is seldom more than one month. While awaiting trial the prisoner may wear his own clothes, provide

his own food, see and communicate with his friends and legal adviser so as to prepare fully for his defence. His fate after conviction depends on his sentence. If this be " imprison- ment," so called to distinguish it from " penal servitude," although both mean deprivation of liberty and are closely akin, it is undergone in one of the " local " prisons — the prisons till 1878 under local jurisdiction, but now entirely controlled by the state through the home secretary and the commissioners of prisons. The regime undergone is cellular; able-bodied pri- soners are kept in strict separation for at least a month, and during that time subjected to severe labour; although the term of first-class hard labour and of purely penal character no longer exists. The tread-wheel has also been abolished. A system of progressive stages based on the mark system has been adopted in the local prisons, and the prisoner's progress through each depends on his own industry and good conduct. During the first month he sleeps on a plank bed, a wooden frame raised from the floor, with bedding but without mattress. When he has earned the proper number of marks, which at the earliest cannot be until one month has elapsed, he passes into the second stage and is allowed better diet and a mattress twice a week. The third stage, at the end of the third month, gives him further privileges as regards diet and bed. The fourth stage concedes to the prisoner a mattress every night, and the privilege, if well conducted, to communicate by letter or through visits with his friends outside. These stages are applicable to females except as regards the plank bed; youths under sixteen and old men above sixty are also allowed mattresses. A small gratuity may be earned during the second and three following stages, amounting in the aggregate to ten shillings. The labour, too, may be industrial, and include instruction in tailoring, shoe-making, basket-making, bookbinding, printing, and many more handicrafts. Throughout the sentence the prisoner has the advantage of religious and moral instruction; he attends divine service regularly, and whatever his creed is visited by a chap- lain professing it, and receives educational assistance according to his needs. His physical welfare is watched over by competent medical men; close attention is paid to the sanitary condition of prisons; strict rules govern the size of cells, with their light- ing, warming and ventilation. Dietaries are everywhere the same; they are calculated

with great nicety according to the time of durance, and afford variety and ample nutrition without running into excess. In a word, as regards discipline, labour, treatment, exactly the same system obtains in the " local " prisons throughout the United Kingdom.

Where the sentence passes beyond two years it ceases to be styled imprisonment and becomes penal servitude, which may be inflicted for any period from three years to life. The prisoner becomes a convict and undergoes his penalty in one or more of the convict prisons. These are entirely under state management. A sentence of penal servitude as now admin- istered consists of three distinct periods or stages: (1) that of probation endured in separate confinement at a so-called " close " prison; (2) a period of labour in association at a public works prison; and (3) conditional release for the unexpired portion of the sentence upon licence or ticket-of-leave.

1. In the first stage, which was limited to six months, but which it is proposed to reduce to one month, the convict passes his whole time in his cell apart from other prisoners, engaged at some industrial employment. He exercises and goes to chapel daily in the society of others, but holds no communica- tion with them; his only intercourse with his fellow-creatures is when he is visited by the governor, chaplain, schoolmaster or trade instructor. This period of almost unbroken solitude is of a painful character, and its duration has therefore been wisely limited.

2. The second is a longer stage and endures for the whole or a greater part of the remainder of the sentence, its duration being governed by the power a convict holds in his own hands to earn a remission. It is now passed at a public works prison; either at Aylesbury (females), Borstal, Dartmoor, Park- hurst or Portland. While cellular separation, except at work,

at prayers or exercise, is strictly maintained, labour is in asso- ciation under the close and constant supervision of officials. Inter- communication no doubt takes place; men working together in quarry, brickfield or barrow-run, and out of earshot of their guardians, may and do converse at times. But the work is too arduous to allow of long and desultory conversation; the chance of contamination is now minimized by the careful separation of the less hardened from the old offenders. There is no reason to suppose that any great evils arise from this association, and without it the execution of the many important national public works which now attest its value would have been impossible. Among these may be mentioned the follow- ing: the quarrying of stone for the great Portland breakwater, nearly 2 m. in length and between 50 and 60 ft. deep in the sea, with the defensive works on the Verne, batteries, case- ments and barracks intended to render the island of Portland impregnable, and the

enlargement and extension of the dock- yards at Chatham and Portsmouth. At Borstal a line of forts intended to protect Chatham on the south and west have been erected by convicts; they have also built magazines at Chattenden on the left bank of the Medway. Besides this, convict labour has been usefully employed in the erection of prison buildings at new points or in extension of those at the old. In all cases the bricks have been made, the stone quarried and dressed, the timber sawn, the iron cast, forged and wrought by the prisoners. The great merit of this system is the skill acquired in handicrafts by so many otherwise idle and useless hands. Convict mechanics are rarely found ready made. It is a fact that a large percentage of the total number employed at trades learnt them in prison. These results are n

3. Having earned his remission the convict enters upon the third stage of his punishment. He is released, but only con- ditionally, on licence or ticket-of-leave. This permission to be at large may easily be forfeited by fresh breaches of the law. Stringent conditions are endorsed upon the licence and well known to every licence holder (see Ticket-of-Leave).

Further modifications have been introduced from time to time in the British penal system, tending mostly to milder discipline, more intelligent classification of prisoners and a certain amelioration of their lot. In its general outlines the system as set forth above has been maintained, but the depart- mental committee appointed in 1895 made some important recommendations which were presently adopted in part. The committee was dissatisfied with the moral results achieved and thought that more attention should be paid to reformatory processes. They believed that " few inmates left prison better than when they came in." Recommittals were frequent and recidivism on the increase. Imprisonment was not sufficiently deterrent to the habitual criminal class, and small attention was paid to the reclamation of less hardened offenders. The views of this committee were embodied in a Penal Servitude 1 bill which was long debated, but became law in 1898. It

emphasized the excellence of the system devised in 1879 for the segregation of the comparatively innocent from convicts hardened in crime. The system of the " star " class as originally estab- lished provided that the prisoner never previously convicted should be kept absolutely apart, at chapel, labour, exercise and in quarters, from his less fortunate fellows who had already been imprisoned. The rule was strictly enforced and with the most conspicuous results, so that little more than 1 % of " stars " have been re-

convicted when once more at large. The privilege of the " star " is only accorded after careful inquiry and reason- able proof that the individual has never before been sent to prison. Reference is made to the police at the time of con- viction, and the duty of looking into previous and present character is very strictly performed. The inquiry is continuous and may be prolonged into the sentence; then, if necessary, correction is applied. But as a matter of fact very few mistakes are made. It is obvious that wrongful admission into the " star " class might be fraught with mischievous consequences, and it is well known that a first sentence does not necessarily mean absolute unacquaintance with crime. For administrative convenience the " stars " — whose name comes from the scrap of crimson cloth worn on cap and jacket sleeve — have been generally concentrated at Portland, and employed in labours specially allotted to them, for the most part demanding a higher rate of intelligence than the general average shown by convicts. Moulders, blacksmiths, carpenters, tinsmiths, stonemasons, bookbinders, painters and various other trades and handicrafts are the peculiar province of the " stars."

The Prison Act of 1898 made some marked changes in penal discipline. One was the strict limitation of corporal punishment to offences of mutiny and gross personal violence to officers, where previously it might be inflicted for many forms of mis- conduct, and it can only now be adjudged under great restrictions. It was feared that the removal of this powerful deterrent would adversely affect discipline, but on the contrary, the yearly average of prison offences has diminished from 147 to 131 per thousand prisoners, and it has been felt by the authorities that the limita- tion was salutary and wise. Another change was the power given to courts of law to differentiate between offenders by ordering them one of three classes of treatment ranging from severe to less rigorous. The first of these divisions was akin to that of former first-class misdemeanants; the second division was allotted to persons guilty of trivial offences not amounting to moral depravity, the third division was apportioned to serious crime calling for severe repression, involving strict separation for the first twenty-eight days with " hard labour " (now an obso- lete expression, since all prison labour is nowadays accounted " hard "). The scheme was judicious, but courts have been slow to make use of its provisions. Yet a third improvement was permission conceded to prisoners locked up in default of pay- ment of fine, to obtain a reduction of time proportionate to part payment of the fine. The numbers under both categories are considerable, and taken together show a steady increase in the ten years from 1892 (when the acts first came into effect) to 1902, the figures being 33,802 in 1892 and 51,302 in 1902.

Imprisonment, albeit somewhat modified and diluted, con- tinues to be used as the chief penalty and most trusted panacea for all crime. The medicine is so simple in application and so easily available that it is served out

almost automatically and indifferently to every law-breaker; the pickpocket and the burglar are locked up next door to the clergyman at variance with his bishop; the weak-kneed and self-indulgent drunkard rubs shoulders with the political zealot who has endangered the peace of nations. There is an enormous mass of so-called crime in England which is not crime at all, and still is perpetually penalized by ar_ infliction of imprisonment for such short periods as to be perfectly futile. The bulk of the offences for which it is meted out are trivial and unimportant. Eighty-three per cent of the annual convictions, summarily and on indictment, followed by committal to gaol, are for misconduct that is dis- tinctly non-criminal, such as breaches of municipal by-laws and police regulations, drunkenness, gaming and offences under the

vagrancy acts. The leniency of the sentences indicates the com- paratively trifling character of the wrongdoing. Forty per cent, of the males and 39% of the females were sent to prison for periods of a week or less; on the other hand, no more than 4% were sentenced to six months and under, only 2 % were imprisoned for terms between six months and one year; and -75% to more than one year. The question will arise some day whether it is really necessary to maintain fifty-six local prisons, with all their elaborate paraphernalia, their imposing buildings and expensive staff, to maintain discipline in daily life and insist upon the proper observance of customs and usages, many of them of purely modern invention. Of course there is in most cases the alternative of a fine, the non-payment of which entails the imprisonment; yet a penalty imposed on the pocket is so clearly the proper retribution for such misdeeds that better methods should be devised for the collection of fines.

The chief aim of penal legislation should indeed be either to keep gaols empty or to use them only where distinct reduction in the number of offenders, whether by regeneration or by con- tinuous withdrawal from noxious activity, can be obtained. An axiom based upon this view has been formulated, and although paradoxical it may well be quoted here. The great aim and object of all penal processes, it has been said, should be the recognition of the general principle of dividing all offenders into two categories: (1) those who ought never to enter a gaol, and (2) those who ought never to be allowed to leave it. Praise- worthy efforts to compass the first end have been made in recent legislation. The First Offenders Act in 1887 had the effect of postponing sentence and sparing these offenders from incar- ceration subject to their good conduct. An average of about 4500 thus escaped imprisonment in the five years between 1893 and 1897, and an average of 5500 the five following years. The gain in this was great, seeing that no more than 6 to 8% were actually sent to gaol after the commission of a second offence, and that there was therefore a very distinct saving in expense of maintenance of prisoners incarcerated. The

value of this act is to be seen in its wide adoption. It is in force in some of the states of the American Union. It was adopted in France by the Berenger law of 1891, and in Belgium, where 14 % of sentences of imprisonment in one year and a-half were postponed. In some countries the concession has been accompanied by admonition. The Summary Jurisdiction Acts, by which large numbers of minor offenders were discharged on bail, or subjected to fines or very brief terms of imprisonment, have also tended to diminish the prison population enormously. The number annually discharged increased from 33,000 in 1893 to 51,302 in 1902. This excellent system has commended itself to many countries and it is now adopted by the bulk of governments and jurisdictions owing allegiance to the British Crown.

Two new systems of applying imprisonment have commended themselves to English administrators, and both have been effected by the Prevention of Crime Act 1908. The first is a new method for educating and reforming young offenders, already on the frontiers of habitual crime, no longer children, but at an age still susceptible of permanent improvement; the second is the legal acceptance of the principle of indefinite detention, the willingness to inflict an indeterminate sentence on those who have already forfeited the right to be at large.

Both these measures originated in the United States. The Borstal scheme of a juvenile-adult reformatory has been to some extent planned on the institutions of Elmira reformatory in the state of New York and of Concord in Massachusetts (see Juvenile Offenders). Side by side with the new processes introduced, the idea of the indeterminate sentence was started and put in practice, by which release was made to depend upon reasonable hope of amendment and sentences were prolonged until it was more or less certain that the treatment had resulted in cure.

Other measures are set forth in the new classification of convicts, prescribed by the secretary of state in the rules sub- mitted by him to the House of Commons in 1904. All convicts

are classed iD three categories, viz. (A) the Ordinary division; (B) the Habitual Offenders' division; and © the Long Sentence division.

The " A " or Ordinary division comprises all ordinary con- victs under old rules who are still separated into the three classes of " star," intermediate and recidivist, as provided by the act of 1898. The qualifications for each

class are clearly laid down. Only those never previously convicted, or known as of not habitually criminal or corrupt habits, are eligible for the " star " class. The intermediate class takes those not previously con- victed but deemed unsuitable as " stars " from antecedents and generally unsatisfactory character. The recidivist class is for those previously sentenced to penal servitude or whose record shows them to have been guilty of grave and persistent crime. . >,

These three classes begin with cellular confinement, but for varying periods; the first for three months, the second six months and the third for nine months, in all cases subject to a medical report upon mental and physical condition. Female convicts pass the first three months of their sentence in separate cells.

The " B " division indicates the worst penalties to be inflicted upon habitual criminals. There is no recognition whatever of the principle of the indeterminate sentence. The law merely prescribes the forfeiture of all remission. The convict is not eligible for release or licence, but when the time of conditional liberation would have formerly arrived the case is submitted to the authorities and dealt with on its merits. Early release depends upon the reports on industry and conduct, and the prospect of his keeping straight if set free. He may have to " do " his whole time but not an hour beyond it.

Certain privileges are conceded to the " B " division to com- pensate those in it for the loss of remission. They wear a special dress, a band of blue cloth on the left arm; they may earn an extra gratuity and spend a part of it in buying extra food or articles of comfort and relaxation; they may take their meals in association, converse at them or at exercise, but not at labour.

The " C " division has been designed for convicts serving long sentences, who have gained all possible privileges in the early years of sentence and have little or nothing to expect further until the last year of their sentence, when they may earn an additional gratuity. But after ten years they may enter the " C " division, earn a special gratuity therein, and enjoy the various privileges accorded to the " B " or habitual criminals' division with the additional advantage that there is no inter- ference with their remission.

Still milder and more humanitarian prison treatment was that put forward by the home secretary in 19 10 in his speech already referred to. In it he suggested that the following reforms should be carried out, some by administrative order and some by future legislation: (1) time for the payment of fines inflicted for minor offences; (2) disciplinary treatment outside prison for all offenders under 21 years of age; (3) punishment of

those guilty of offences not involving moral turpitude to be relieved of all degrading features; (4) the reduction of the period of solitary confinement to a maximum of one month; (5) and the abolition of the ticket-of -leave system. It was also proposed to give four lectures or concerts a year in convict prisons.

Prisons in other Countries. — The general progress made in prison treatment will be best realized by a brief survey of penal institutions in the principal countries of the world. It will be convenient to take them alphabetically.

1. Austria-Hungary. — The regime of cellular confinement has not been universally adopted ; only six prisons are built on that principle and no more than 15% of the whole number of prisoners can be subjected to the system. Cellular separation is not inflicted for long periods, the minimum being six months and the maximum three years. The bulk of the prisoners live and labour in common. A great feature has been the execution of public works by prisoners in a state of semi-liberty beyond prison walls — the practical adoption of the so-called " Irish " or. Intermediate prison — and good results are seen in road-making and the improvement of river courses.

2. Belgium. — This country has spared neither pains nor money in carrying out penal processes, and the Belgian prisons are examples of the cellular system prolonged to the utmost limits of human endurance. There is a nvnimum of ten years, but the individual may elect to continue in separation, or be transferred to partial association. A new school of Belgian criminologists has been headed by M. Prins, the chief of the prison department, who has protested that to hope the vicious, hardened offender, after a long detention, " surrounded with every attention, soaked with good counsel, will leave his cell regenerated," is a Utopian dream.

3. British Dominions beyond the Sea. — The principle of cellular separation was accepted as far back as 1836 and the model prison of Pentonville, opened in 1842, has since been copied throughout the civilized world. The cellular system has been adopted in all British colonies with various modifications, and prisons built on modern principles are to be found in Canada, Australia, New Zealand and the Cape of Good Hope. India retains association as the system most suitable for its criminal classes, with other methods generally abandoned in Great Britain, such as the employment of weil- conducted prisoners as auxiliaries in prison discipline and service; deportation is still the penalty for the worst offences and is carried out on a large scale and with satisfactory results in the Andaman Islands. In Egypt since the establishment of British control a very marked change has been introduced in prison affairs.

4. Denmark. — In Denmark all convicted prisoners pass through several stages, from cellular treatment to the intermediate prison and conditional liberty. Two new prisons on the latest model have been erected at Copenhagen, one for males and the other for females. The smaller gaols for short terms are mostly on the cellular plan.

5. France. — France has devoted very considerable attention to prison matters and is now practising the two extremes of treatment, the strict cellular isolation of the Belgian system and the penal exile or transportation which was long the English rule.

6. Germany. — The unified German Empire has not as yet adopted one system of prison treatment, and its various component kingdoms still retain independence in views and practice.

Baden has a well-known cellular prison at Bruchsal, but separation is not imposed for more than four years and associated labour is carried out in another quarter of the prison.

Bavaria has four cellular prisons, the chief being at Munich and Nuremberg, but the collective system also obtains.

Prussia having declared for the cellular system constructed the well-known Moabit prison in Berlin, also those of Ratibor in Silesia and of Herford in Westphalia, while those of Graudenz, Breslau, Werden and Cologne have been added since. The total number of separate cells to-day is 11,041 against 3247 in 1869. Two new cellular prisons, Luttringhausen and Saarbruck, have recently been added. Frankfurt has a good prison on the Pentonville (London) plan; so has Hamburg; and new buildings have been erected at Wohlan, Siegburg, Breslau and Munster. Separate cells in Prussia had increased in 1896 from 3247 to 6573. The cellular regime is applicable to prisoners between 18 and 30, and to first offenders of 50 years of age, the term being fixed by the governor of the gaol, but never exceeding three years.

Saxony established a penitentiary at Zwickau in 1850 and in its earlier management exhibited exaggerated kindness to its inmates. Both the cellular and the associated systems obtain.

Wiirttemberg has accepted the cellular system. There are prisons for females at Heilbronn, and for males at Ludwigsburg and Stuttgart ; in Wiirttemberg itself the regime is collective.

7. Holland has followed her nearest neighbour Belgium and has now at command separate cells sufficient to receive the whole number of her prison population. The system of unbroken seclusion, prolonged to five years, is

maintained with strictness.

8. Italy. — Although accepting the principle of cellular imprison- ment, Italy has not adopted it largely, partly from want of funds and not a little because the current of thought has set against it. The really penal establishments are 77 in number, the great ergaslolo of San Stefano being one. Agricultural labour for convicts has been tried in colonies of coatti (or those provisionally released) planted out in the islands of the Italian archipelago.

9. Norway.— The separation of Norway, as an independent state, from Sweden has produced no great change in its prison institutions, which still follow the lines of the neighbouring country.

10. Portugal. — There are three or more cellular prisons at Lisbon, Coimbra and Santarem, and the system of strict separation when first adopted in 1884 was expected both to amend and deter.

11. Sweden. — Prince Oscar of Sweden was one of the earliest adherents of cellular imprisonment, and at his urgent representation penitentiary reform was warmly espoused in 1 841. His influence is still felt, and the system in force in Norway and Sweden is progres- sive from strict separation to working outside the cell. Sweden, which adopted the cellular system in 1842, has now cells sufficient for prisoners sentenced to two years and less. There are three principal central prisons, one at Langholm near Stockholm, a second at Malmo and a third at Mya Varfet near Gothenburg.

12. United States. — The penal system of the United States varies between being the most advanced and the most backward in the civilized world. At one end of the scale are the numerous bad

county gaols and the horrors of the convict lease system in the southern states, now nearly extinct; at the other such modern and well-equipped reformatories as Elmira and Concord (see Juvenile Offenders). The worst feature is the indiscriminate association sometimes seen of all inmates, bond and free, the convicted and accused ; even witnesses against whom there is no shadow of a charge are sometimes imprisoned among felons. Nor is it only in distant corners of the great continent that this criticism applies, though constant improvements are removing the grounds for it. It is only a short time since the local gaol in the city of New York, " the Tombs," a house of detention for prisoners awaiting trial, was described in

an official report to the state legislature as " a disgrace. ... It is defective in every modern appliance. It is dark, damp and ill-ventilated . . . worst of all is the hideous system of keeping, two or three men in a cell ; . . . a means of indescribable torture to a decent man and a prolific source of vice and crime to a criminal. Such treatment of dogs would be gross cruelty." This building has, how- ever, now been pulled down, and a new and better one has taken its place. The administration of prisons rests mainly with the various state authorities, and there is no federal or general system which would introduce uniformity of treatment. The federal government has no influence or control except for offences against the federal laws, regulating coinage, postal service, the revenue andˆso forth. Prison management is essentially a local concern, but sorne general features are common to all states, such as the rule that while petty offenders and prisoners awaiting trial are under county and city jurisdiction, the state takes charge of all persons convicted of serious crimes. The state prisons receive by far the largest propor- tion of the criminal population, more than half the general total being imprisoned therein. Some of them are models of cleanliness and good order, built on the best and most imposing lines with large comfortable cells and an abundance of light and air. The earnest desire of most prison administration is to develop industrial training and trade profits side by side with mildness of treatment. The latter sometimes lapses into methods which are not usually thought compatible with prison discipline, such as the permission to play on musical instruments, the holding of concerts, the privilege of smoking and chewing tobacco, of receiving baskets of provisions, novels and newspapers from friends outside.

It is worthy of note that prison architecture in the United States misses many of the gloomy features common to such constructions. The newest prisons are generally lighter, more roomy, better venti- lated and on the whole more comfortable than even the best British prisons. In 1900 Sir E. Ruggles Brise, the English expert on prisons, declared that " the purity of the air and the cleanliness of the Ameri- can prisons are admirable, and under a very elaborate system of warming by hot air, a regular and uniform temperature is sustained throughout the year, which, considering the varying nature of the climate from extreme heat to cold many points below zero, is a considerable engineering triumph."

Prison Industries. — It is an axiom in prison science that enforced labour cannot easily be made productive. No doubt the problem has been in a measure solved in England by that useful incentive to industry, the mark system. But the more substantial returns cannot always be expected with the sedentary employments and single-handed effort inseparable from the regime of cellular imprison- ment. England for many years past, in adopting the principle of Public Works Prisons after a certain short period spent in separa- tion, has pronounced in favour of open-air employment in

association. Although the system still has many hostile critics its value cannot be contested. It has been said by a trustworthy authority, 1 " We are convinced also that severe labour on public works is most beneficial in teaching criminals habits of industry and training them to such employments as digging, road-making and brick-making — work of a kind which cannot be carried on in separate confinement." A good proof of the value of the system as remunerative and healthful, morally and physically, is seen in the growing desire of other coun- tries to follow our lead. Very similar operations have been carried out in Austria-Hungary, where large tracts of land have been brought into cultivation, and watercourses have been diverted successfully despite serious difficulties, climatic and physical; in Russia convict labour has been largely used in the construction of the Trans-siberian railway ; the military operations in the Sudan were greatly aided by convict labourers engaged in useful work at the base and all along the line ; Italy passed a law in 1904 enacting outdoor labour for the reclamation and draining of waste lands by prisoners under long sentence; and France, although much wedded to cellular imprison- ment, is beginning to favour extra-mural employment of prisoners under strict regulations. The subject was discussed at the Peniten- tiary Congress at Budapest in 1905, and a resolution passed recom- mending extra-mural employment for prisoners of rural origin, vagrants and drunkards, and those subject to tuberculous disease, " so largely the concomitant of cellular confinement."

Prison industries continue to be largely sedentary in character; they cover a wide range, although the conditions of life are for the most part artificial. Most trades and handicrafts are practised, such as shoemaking, tailoring, carpentry, the work of white- and

1 Report of the Royal Commission on Penal Servitude (1878-1879).

blacksmiths; skilful and intelligent workmen, such as the French and Japanese, find a wide outlet for their versatile and artistic talent. The well-known products, styled articles de Paris, prison-made, find a large sale, and many objects of high art, fine paintings, cloisonne enamels and gold lacquer are among the beautiful products from Japanese prisoners. The indoor manufactures followed in British prisons are not so varied as the foregoing and have been limited by the protests and objections raised by free or outside labour against alleged unfair competition. Accordingly, the production of goods has been largely curtailed for the open market and prison labour is restricted nowadays to supplying articles required for current use by public departments — such as the navy, army, post office and, of course, all prison establishments. Prison labour has found an outlet, therefore, in such work as service blanket making, hammock making, mail-bag making, the manufacture of cartridge cases, flags, chopping firewood for barracks and so on, having been diverted almost entirely from mat-

making, once an exclusive prison trade originally invented indeed by prison task-masters. The total annual value of the labour applied in English prisons has varied. In 1 896-1 897 the total accruing from manufactures, farm operations and the ordinary service of the prison was £213,812, the prison population in local and convict prisons being 17,614; in 1903-1904 the total amounted to £244,518, the prison population on the 31st of March 1904 being 21,117. The gross expenditure was £524,289 for 1896-1897, as against £615,656 for 1903-1904. Figures are not available for any exact comparison of outlay and return in other countries, but the earnings in European countries generally run to about half the expenditure. In the United States the policy varies between the two extremes of making prisoners self-supporting and of leaving them in idleness so that the whole weight of expense falls upon the state. In some states economic considerations have carried the day; in others the stringency of labour laws under the pressure of labour associations has paralysed all prison industry. In the first mentioned, the contract system, by which a contractor hires the prisoner's labour from the state, has proved very profitable, but at the sacrifice of discipline and neglect of reformatory processes upon the individual. This leasing-out system has been carried further in some of the southern states, and has produced the convict camps, which have been much criticized and condemned from the harshness of the discipline enforced, the many abuses that exist and the meagre results other than monetary that have been obtained.

The modern movement in favour of industrial employment combined with humane and intelligent considerations has swept away the more or less barbaric method of enforcing labour by auto- matic machinery such as the treadmill, crank and shot drill (see Treadmill).

Authorities. — John Howard, State of Prisons in England and Wales (1784); Cesare Lombroso, L'Uomo delinquente, &c. (1899); Beaumont and A. de Tocqueville, Systeme pSnitentiaire aux £tats~ Unis (1837); Crawford, Report on Penitentiaries (U.S.A., 1838); Maconochie, Prison Discipline (1856); Dr Guillaume, Progress of Prison Discipline in Switzerland (1872); Arthur Griffiths, Memorials of Millbank (1873), Chronicles of Newgate (1882) ; Armingol y Cornet, Prisons and Prison Discipline in Spain (1874); Stevens, Regime des etablissements penitentiaires en Belgique (1875); F. V. Holtzendorf and von Jagemann, Handbuch des Gefangniswesens (1877); Scaglia Beltrani, Reforma penitenzaria in Italia (1879); Sir Edmund F. Du Cane, Punishment and Prevention of Crime (1885) ; Braco, Estudos penitenciarios e criminaes (Lisbon, 1888); Garofalo, Studio sul delitto, sulle sui cause e sui mezzi di repressione (1890); Adolphe Guillot, Les Prisons de Paris (1890) ; Tallack, Preventive and Peno- logical Principles (1896) ; Salillas, Vida penal en Espana (Madrid).

(A. G.)

PRISONERS', BASE (Prisoners' Bars), an ancient game much affected by children. The players are divided into two sides, each standing within a base or home marked off at some distance apart. After preliminary songs and war-like challenges, a player on one side runs out and is pursued by one of " the enemy " ; if touched he becomes a prisoner of the side to which his captor belongs. If another player from the side of the pursued runs between him and his pursuer, the latter has to follow him, but the last to leave his base is privileged to touch any one of the enemy who left his base before him. The rules of the game are, however, traditional, and necessarily somewhat elastic. The end comes, of course, when all of one side have been captured by the other.

PRITCHARD, CHARLES (1808-1893), British astronomer, was born at . Alberbury, Shropshire, on the 29th of February 1808. At the age of eighteen he was enrolled as a sizar at St John's College, Cambridge, whence he graduated in 1830 as fourth wrangler. In 1832 he was elected fellow of his college, and in the following year he was ordained, and became head master of a private school at Stockwell. From 1834 to 1862 he was headmaster of Clapham grammar school. He then

retired to Freshwater, in the Isle of Wight, and took an active interest in the affairs of the Royal Astronomical Society, of which he became honorary secretary in 1862 and president in 1866. His career as a professional astronomer began in 1870, when he was elected Savilian professor of astronomy at Oxford. At his request the university determined to erect a fine equatorial telescope for the instruction of his class and for purposes of research, a scheme which, in consequence of Warren de la Rue's munificent gift of instruments from his private observatory at Cranford, expanded into the establishment of the new univer- sity observatory. By De la Rue's advice, Pritchard began his career there with a determination of the physical libration of the moon, or the nutation of its axis. In 1882 Pritchard com- menced a systematic study of stellar photometry. For this purpose he employed an instrument known as the " wedge photometer" (see Photometry, Celestial, and Mem. R.A.S. xlvii. 353), with which he measured the relative bright- ness of 2784 stars between the North Pole and about — io° declination. The results were published in 1885 in his Uranome- tria Nova Oxoniensis, and their importance was recognized by the bestowal in 1886 upon him, conjointly with Professor Pickering, of the Royal Astronomical Society's gold medal. He now resolved to try the

experiment of applying photography to the determination of stellar parallax. With the object of testing the capabilities of the method, he took for his first essay the well-known star 6r Cygni, and his results agreed so well with those previously attained that he undertook the systematic measurement of the parallaxes of second-magnitude stars, and published the outcome in the third and fourth volumes of the Publications of the Oxford University Observatory. Although some lurking errors impaired the authority of the concluded parallaxes this work ranks as a valuable contribution to astronomy, since it showed the possi- bility of employing photography in such delicate investigations. When the great scheme of an international survey of the heavens was projected, the zone between 25° and 31 north declination was allotted to him, and at the time of his death some progress had been made in recording its included stars. Pritchard became a fellow of New College, Oxford, in 1883, and an honorary fellow of St John's College, Cambridge, in 1886. He was elected a fellow of the Royal Society in 1840, and in 1892 was awarded one of the royal medals for his work on photometry and stellar parallax. He died on the 28th of May 1893.

See Proc. Roy. Soc. liv. 3; Month. Notices, Roy. Astr. Soc. liv. 198; W. E. Plummer, Observatory, xvi. 256 (portrait); Astr. and Astrophysics, xii. 592; J. Foster, Oxford Men and their Colleges, p. 206 ; Hist. Register of the Univ. of Oxford, p. 95 ; The Times (May 30, 1893); C. J. Robinson's Register of Merchant Taylors' School, ii. 210; Charles Pritchard, D.D., Memoirs of his Life, by Ada Pritchard (London, 1897).

PRITCHARD, HANNAH (1711-1768), English actress, whose name before her early marriage — to an actor — was Vaughan, first attracted attention as a singer at Bartholomew's Fair in 1733. She was soon playing a wide variety of parts, mostly comedy, at the Haymarket, Drury Lane and Covent Garden. When Garrick became patentee of Drury Lane in 1747 she joined his company and played with him for twenty years, her last appearance being as Lady Macbeth — one of her greatest r61es — in April 1768, a few months before her death. Her talents were highly thought of by the critics of the day. Her daughter, who had studied under Garrick, and whose beauty created a sensation when she made her debut (as " Miss Pritchard ") in October 1756, did not live up to the expectations then raised. She married in 1762 the actor John Palmer, retired from the stage at the same time as her mother, and after her husband's death married a political writer named Lloyd.

PRITTLEWELL, a residential parish in the borough of Southend-on-Sea, and in the S.E. parliamentary division of Essex, England; lying 15 m. inland (N.N.W.) from Southend, with a station on the Southend branch of the Great Eastern railway. The church of St Mary the Virgin has fine

Perpen- dicular work and traces of Norman work. There are fragments o{ a Cluniac priory of the 12th century. Pop. (iqoi), 27,245.

PRIVAS, a town of south-eastern France, capital of the depart- ment of Ardeche, 95 m. S. by W. of Lyons on a branch line of the railway from that city to Nimes. Pop. (1906), town, 3495; commune, 7000. Privas is situated near the Ouveze, here joined by the Mezayon and Chazalon. The town is the seat of a pre- fecture, a court of assizes and a tribunal of first instance. Other institutions are training colleges for both sexes, a communal college and a lunatic asylum for the departments of Ardeche and Drome. Silk-milling is carried on. The rearing of silk- worms and the cultivation of the mulberry are widespread industries. There are mines of iron ore in the vicinity. Trade is in silk, tanned leather, game, chestnuts and fruit preserves. Privas is first heard of in the 12 th century, as a possession of the counts of Valentinois, and subsequently became the seat of a separate barony. One of the strongholds of the Reformed Faith, it suffered terribly during the Wars of Religion. In- effectually besieged by the royal troops in 1574, it passed in 1619, by the marriage of the heiress of the barony, Paule de Chambaud, into the possession of the vicomte de Lestrange, a Roman Catholic noble. A general rising followed, and in 1629 it was besieged and taken by Louis XIII. It was reduced to ruins, and the king decreed that it should not be again inhabited; but in 1632, some of the townspeople having fought against Lestrange, who had joined Montmorency's rebellion, the inhabitants were allowed to return. Some ancient houses, which escaped the general destruction, are still standing.

PRIVATEER, an armed vessel belonging to a private owner, commissioned by a belligerent state to carry on operations of war. The commission is known as letters of marque. Accep- tance of such a commission by a British subject is forbidden by the Foreign Enlistment Act 1870. Privateering is now a matter of much less importance than it formerly was, owing to the terms of art. 1 of the Declaration of Paris, April 16, 1856, " Privateering is and remains abolished." The declaration binds only the powers who are signatories or who afterwards assented, and those only when engaged in war with one another. The United States and Spain have not acceded to it, but though it did not hold as between them in the war of 1898, they both observed it. Privateers stand in a position between that of a public ship of war and a merchant vessel, and the raising of merchant vessels to the status of warships has in recent wars given rise to so much difficulty in distinguishing between volun- teer war-ships and privateers that the subject was made one of those for settlement by the Second Hague Conference (1907). The rules adopted are as follows: —

1. A merchant-ship converted into a war-ship cannot have the rights and duties appertaining to vessels having that status unless it is placed under the

direct authority, immediate control and responsibility of the power the flag of which it flies.

2. Merchant-ships converted into war-ships must bear the external marks which distinguish the war-ships of their nation- ality.

3. The commander must be in the service of the state and duly commissioned by the proper authorities. His name must figure on the list of the officers of the fighting fleet.

4. The crew must be subject to military discipline.

5. Every merchant-ship converted into a war-ship is bound to observe in its operations the laws and customs of war.

6. A belligerent who converts a merchant-ship into a war- ship must, as soon as possible, announce such conversion in the list of its war-ships.

In connexion with the conversion of the " Peterburg " and " Smolensk " on the high seas during the Russo-Japanese War, and the ruse by which they came through the Bosporus and the Dardanelles, it was agreed, after a vain attempt to solve the question in a way satisfactory to all parties, that the subject of whether the conversion may take place upon the high seas should remain outside the scope of the convention. (T. Ba.)

PRIVET, in botany, the vernacular name of Ligustrum, l a. genus of Oleaceae, containing about thirty-five species, natives

1 Other vernacular names for the common species are prim, primurint, primwort and primrose.

of temperate and tropical Asia; only the common privet is a native of Europe. They are shrubs or low trees with evergreen or nearly evergreen opposite entire leaves, and dense clusters of small, white, tubular four-parted flowers, enclosing two stamens and succeeded by small, globular, usually black berries, each with a single pendulous seed. The best-known species is the common European privet, L. vulgare, which makes good hedges; L. ovalifolium (a native of Japan) thrives by the seaside and even in towns; there is a yellow-leaved variety (var. variegatum) , the leaves becoming white as they get older. L. lucidum (China) is taller and handsomer. There are numerous varieties of L. vulgare in cultivation; var. buxifolium has broader and more persistent leaves; var. fructu-luteum has

bright yellow fruit; var. pendulum has long weeping branches; and var. variegatum has the leaves variegated with bright yellow. L. japonicum, L. Massalon- gianum (Rhassia Hills) and other species are also cultivated. Mock-privet is Phillyrea, a member of the same order and a small genus of ornamental hardy evergreen shrubs, natives of the Mediterranean region and Asia Minor.

PRIVILEGE, in law, an immunity or exemption conferred by special grant in derogation c (common right. The term is derived from privilegium, a law specially passed in favour of or against a particular person. In Roman law the latter sense was the more common; in modern law the word bears only the former sense. Privilege in English law is either personal or real — that is to say, it is granted to a person, as a peer, or to a place, as a university. The most important instances at present existing in England are the privilege of parliament (see Parlia- ment), which proteˆs certain communications from being regarded as libellous (see Libel and Slander), and certain privileges enjoyed by the clergy and others, by which they are to some extent exempt from public duties, such as serving on juries. Privileged copyholds are those held by the custom of the manor and not by the will of the lord. There are certain debts in England, Scotland and the United States which are said to be privileged — that is, such debts as the executor must first apply the personal estate of the deceased, in payment, for example, of funeral expenses or servants' wages. In English law the term " preferred " rather than " privileged " is generally applied to such debts. There are certain deeds and summonses which are privileged in Scots law, the former because they require less solemnity than ordinary deeds, the latter because the ordinary induciae are shortened in their case (see Watson, Law Diet., s.v. " Privilege ").

In the United States the term privilege is of considerable political importance. By art. iv. § 2 of the constitution, " the citizens of each state shall be entitled to all privileges and im- munities of citizens in the several states." By art. xiv. § 1 of the amendments to the constitution (enacted July 28, 1868), " no state shall make or enforce any law which shall abridge the privileges or immunities of citizens of the United States." It will be noticed that the former applies to citizens of the states, the latter to citizens of the United States. " The intention of this clause (art. iv.) was to confer on the citizens of each state, if one may so say, a general citizenship, and to communicate all the privileges and immunities which the citizens of the same state would have been entitled to under the like circum- stances " (Story, Constitution of the United States, § 1806). The clauses have several times been the subject of judicial decision in the Supreme Court. With regard to art. iv., it was held that a state licence tax discriminating against commodities the production of other states was void as abridging the privi- leges and immunities of the citizens of such other

states (Ward v. Stale of Maryland, 12 Wallace's Reports, 418). With regard to art. xiv. 1, it was held that its main purpose was to protect from the hostile legislation of the states the privileges and immunities of citizens of the United States, looking more especi- ally to the then recent admission of negroes to political rights. Accordingly it was held that a grant of exclusive right or privi- lege of maintaining slaughter-houses for twenty-one years, imposing at the same time the duty of providing ample con-

veniences, was not unconstitutional, as it was only a police regulation for the health of the people (The Slaughter House Cases, 16 Wallace, 36). The same has been held of a refusal by a state to grant to a woman a licence to practise law (Bradwell v. The State, 16 Wallace, 130), of a state law confining the rights of suffrage to males (Minor v. Happersett, 21 Wallace, 162), and of a state law regulating the sale of intoxicating liquors (Barte meyer v. Iowa, 18 Wallace, 129). Suits to redress the depriva- tion of privilege secured by the constitution of the United States must be brought in a United States court. It is a crime to conspire to prevent the free exercise and enjoyment of any privilege, or to conspire to deprive any person of equal privileges and immunities, or under colour of law to subject any inhabitant of a state or territory to the deprivation of any privileges or immunities (Revised Statutes of United States, §§ 5507, 5510,

55ia)-

PRIVY COUNCIL. The origin of the privy council dates back substantially to the Norman period of English history. The commune concilium, the assembly, in theory, of all the tenants-in-chief of the Crown, had attached to and included in it a group of officers of state and of the royal household, who with a staff of clerks and secretaries carried on the executive, judicial and financial business of government. This group, of necessity permanent, it is suggested, formed the curia regis; and appears to have consisted of the chancellor, the chief justiciary (so long as the office lasted), the treasurer, the steward, the chamberlain, the marshal and the constable, together with the two archbishops and any other persons the king might choose to appoint. Their duties were to advise the king in matters of legislation and administration, to see justice done and generally to execute the royal will. Such a blend of advisory, executive and judicial power could exist only in a simple con- dition of affairs, and therefore it was to be expected that as government became more settled, and so more complicated, a separation of powers would inevitably follow. The change came quickly. Quite early finance was dealt with by a small section of the court convened at the exchequer chamber; this soon developed into a separate department controlled by the treasurer, managing the revenue and deciding all suits connected with its administration. A little later the court of king's bench and the court of common pleas grew into being, and by the end of the reign

of John these two courts were finally separated from one another and from the curia. The establishment of separate courts of justice, although relieving the curia of much of its work, did not deprive it of all judicial power. The king was the fountain of justice, and where redress could not be obtained in the ordinary way, either from the greatness of the disputants, through private oppression, or because no other means existed, resort still remained to the Crown, either in the first instance or when all other courses had failed the petitioner. Relieved of financial detail and the bulk of its judicial work, the curia continued to develop on the lines of an advisory and administrative council. Becoming prominent as a council of regency during the minority of Henry III., it quickly assumed definite form as the concilium regis. Under Edward I. " its members take an oath; they are sworn of the council — swearing to give good advice, to protect the king's interests, to do justice honestly, to take no gifts" (Maitland, Const. Hist. p. 01). At this period in addition to the great officers of state the judges and a number of bishops appear among the members. One of the most important duties of the council was to advise the Crown in matters of legislation. During the fourteenth and fifteenth centuries, ordinances in subordinate matters appear to have been made regularly by the king in council and accepted as legal by parliament and by the judges. In early parliamentary days it was also part of the council's duty to put into legis- lative form the petitions sent up by the Commons. Frequently the statute in its final form did not correspond with the petition, and the Commons were continually complaining of the council's unwarrantable interference. Eventually by the reign of Henry VII. the council had ceased to interfere, the petitions being drawn in the form of a bill, and enacted without alteration.

During the 14th century the toncilium regis had become definitely distinct as well from parliament as from the courts of law. Under Henry IV. in 1404 the council numbered nineteen — three bishops, nine peers and seven commoners. The members held office at the king's pleasure, they are sworn to give their best advice and are well paid for their work. They meet continually, though the king is often absent, but their proceed- ings are committed to writing. Maitland {Const. Hist. p. 199) sums up the work as follows: " The function of the Council is to advise the King upon every exercise of the royal power. Every sort of ordinance, licence, pardon, that the King can issue is brought before the Council. Sometimes Parliament trusts it with extraordinary powers of legislation and taxation; to raise loans and the like. It is to the advice of the Council that the King looks in all his financial difficulties." The powers of the council naturally varied with the character of the king. Quiescent and obedient under a strong king,

its influence was re-asserted under a weak one; and when infant kings sat on the throne, for all practical purposes it became the ruler of the land.

In spite of the existence of regular courts of law the council continually interfered with affairs of justice. Many attempts were made by it to set aside or to disregard the judgments of the ordinary courts, but by the beginning of the 15th century parliament had forcibly intervened, and the council gave in. Repeatedly statutes were passed during the reign of Edward

III. with a view to checking the council's original jurisdiction in criminal matters, but without effect, as in the reigns of Henry

IV. and his son the Commons are found still petitioning against the practice. Yet during the period under review parliament is continually enacting that certain offenders are to be punished by and at the discretion of the council. Evidently such a tribunal, quickly and informally constituted, bound by no legal rules and maxims, proved a useful engine for sharp and speedy punishment. In 1487 was passed an act (3 Hen. VII. c. 1) which is accounted the creator of the Court of Star Chamber. Perjury, riot, bribery of jurors and misconduct of officials had grown rife, and the act authorizes certain members of the council to call offenders before it, to examine them, and if satisfied of their guilt, to punish them. In later years a committee of the council appear to have sat and exercised a widely extended criminal jurisdiction, inflicting every kind of punishment short of the death penalty. This body became known as the Court of Star Chamber and remained in existence until its abolition by act of parliament in 1641.

During the 14th century many petitions relating to civil disputes were presented to the council and were frequently taken into consideration by it on the ground that extraordinary remedies were required, either from lack of legal form or owing to influential private oppression. Eventually where the courts could decide, it became the practice of the council not to interfere, but where no relief could be obtained the council passed the petition on to the chancellor. In course of time the petitions went direct to the chancellor, and in this manner the equity jurisdiction of the court of chancery was established. The act of 1641, which abolished the Court of Star Chamber, also formally forbade the council to meddle with civil causes.

During the Tudor period the council grew in importance; it became useful to the Crown as a vehicle for straining prerogative to the utmost. By the act 31 Hen. VIII. the king's procla- mation acquired the force of law, and for a short period the king in council had concurrent legislative power with parlia- ment. Henry's statute was repealed by 1 Edw. VI. c. 1 2 and the legislative supremacy of parliament re-established. In 1553 the council

numbered forty members— four bishops, fourteen peers and the rest commoners. The increase in tV? number of its mem- bers, the direct and often independent communication between the Crown and its secretaries, and the strong personality of the Tudor sovereigns quickly reacted on the work of the council. It had become too large for consultative purposes and the sovereign began a practice, which quickly grew, of consulting only its important members. In this way, within the council

itself, there appears a small inner ring— -a true privy council — thfr parent of the cabinet of later days.

The struggle of James I. and Charles I. for absolute power and finally the Rebellion, ended by leaving the council for the time being impotent. The act of 1641 had not only abolished its special criminal jurisdiction but forbade its interference in civil cases, while the growth of the Secretariat had gradually removed the bulk of its administrative powers. In the end there was little left for it but occasional meetings to give legal sanction to orders it had no concern with, and on the judicial side to act as a court of final resort in Admiralty matters and for all civil and criminal appeals from the courts of the Crown's dominions beyond the seas.

In the reign of Charles II. an attempt was made to revive the usefulness of the council. A scheme was prepared by Sir William Temple in 1679 and accepted by the king. A representative council of thirty members came into being and attempted to carry out the new scheme, but the king, after a short trial, held to his old opinion that the numbers of the council made it " unfit for the secrecy and despatch which are necessary in many great affairs." Once more the king returned to his confidential committee, his cabal, out of which the cabinet of the future grew. Under William III. faction flourished and made general agreement at the council board impossible. George I., ignorant of the English language, never appeared at its meetings, with the result that the direction of affairs passed into the hands of a committee of ministers — the cabinet.

Although the true privy council is the cabinet, the name is to-day given collectively to a large number of eminent people whose membership and position are titular only. All members of the cabinet if not already privy councillors become so on appointment to cabinet office. Occasionally, subordinate members of the ministry and some of its private supporters are made privy councillors as a special distinction. The lord chancellor, the lords of appeal in ordinary, the president of the probate division, the lord president of the court of session in Scotland, the lord justice clerk and the lord advocate of Scotland are always privy councillors, as are the archbishops of Canterbury and York and the bishop of London. In 1807 all the premiers of the self-governing colonies were made privy councillors. Of

recent years, retired ambassadors, judges, retired civil servants and persons distinguished in science, letters and arts have been appointed. The custom seems also to be growing of using the honour of privy councillor to reward political supporters who do not wish for hereditary titles. The collective title of the council is " the Lords and others of His Majesty's Most Honourable Privy Council." The members are addressed as " Right Honourable " and wear a state uniform. The appoint- ment is informal, the new privy councillor simply being invited by the king to take his seat at the board. He is then sworn in, and his name placed on the list. Office lasts for the life of the sovereign and six months after, but it is the modern custom for the new sovereign to renew the appointment.

Meetings of the whole council are held at the beginning of a new reign or when the reigning sovereign announces his or her marriage. The lord mayor of London is then summoned to attend. The whole council might also be summoned on other occasions of state and ceremony.

The formal meetings of the council are attended by the few councillors concerned with the orders to be issued. These are generally ministers or officials. The chief officer of the council is the lord president, now a cabinet minister of the highest rank, but without departmental duties. The office of clerk of the council dates from 1540 and his signature is necessary to authenticate all orders.

The administrative work of the council has always been done through committees, and during the last two centuries in spite of changed conditions this rule has been preserved in theory. The board of trade, the local government board, the education department and the board of agriculture were all committees of the council. Now, of course, these so-called committees are state departments presided over by ministers responsible to

parliament. The existing jurisdiction of the council , is both administrative and judicial.

Administrative. — This jurisdiction depends chiefly upon statutory authority, which practically makes of the privy council a subordinate legislature. It is found impossible for parliament to enact long and intricate measures dealing with departmental detail, hence a general measure is passed and the privy council is authorized under the act to draw up orders in council which of course have the full force of law. This power is exercised usually by committees to which matters are referred by the

Crown in council, the departments of state concerned settling the details. Other examples of administra- tive work are the universities committee, with temporary powers under the Universities Act (1877), and the committee of council for the consideration of charters of incorporation under the Municipal Corporations Act (1882), the latter a work of considerable difficulty and delicacy and usually carried out in close consultation with the local government board. Cases affecting the constitutional rights of the Channel Islands are referred to a committee for the affairs of Jersey and Guernsey. The committees report to the Crown in council, and their report is adopted and enforced by an order in council published in the Gazette. Among other acts conferring administra- tive powers on the privy council are the Pharmacy Act (1852), as amended by 31 & 32 Vict. c. 121, the Medical Act (1858), the Foreign Enlistment Act (1870), the Destructive Insects Act (1877), the Contagious Diseases (Animals) Act (1878), the Dentists Act (1878) the Veterinary Surgeons Act (1881).

Judicial. — By the 3 & 4 Will. IV. c. 41 a judicial committee of the council was constituted. It consists of all the members of the council holding or having held the office of lord president or lord chancellor or certain high judicial offices enumerated in the act. By the Appellate Jurisdiction Acts of 1876 and 1887 other high judicial offices are included. All the lords of appeal in ordinary are members of the committee. Under the act of 1833 the king may also appoint any other two persons, being councillors. By the acts of 1833 and 1887 two persons having been Indian or Colonial judges may be appointed, and such appointments carry an annual salary of £400. By an act of 1895 any of the chief justices of certain colo- nies who are also privy councillors may be appointed to the com- mittee, but not more than five such appointments may be made. Under this act certain colonial chief justices now sit. In appeals under the Clergy Discipline Acts three bishops sit as assessors. In colonial Admiralty appeals two nautical assessors attend. These assessors are merely technical advisers, and have no part in any decision. Appeals also lie from consular courts and prize courts. The decisions of ecclesiastical courts are subject to review by the committee, the sovereign being the " supreme governor " of the Church, but no appeal is competent where the case is one for the exercise of the bishop's discretion. In these ecclesiastical cases the committee does not profess to expound and settle doctrine with ecclesiastical authority: it merely interprets the laws of the Church. In matters relating to ritual history and precedents are taken into account. Appeals also lie from vice-admiralty courts abroad, the Channel Islands, the Isle of Man, India and all the colonies. _ As a rule they lie as of right when the value of the matter at issue is of a certain amount (the amount varying according to the appeal rules of the different foreign possessions) and in a few other cases. Recent

legislation, at the instance of the colonies, has to some extent further restricted the right to appeal. Appeals lie at the discretion of the committee on leave being obtained by petition for special (eave to appeal. All proceedings are by petition (see Petition) which is addressed to the Crown in council in the first instance. The judicial proceedings of the council are in reality conducted like an ordinary case in the courts of law. Counsel are heard, and the ordinary rules of law and legal practice followed, and costs taxed. Judgment is given by motion which takes the form of advice to the Crown, and whatever may have taken place privately in discus- sion between the members, outwardly the committee is unanimous. Within recent years it has been suggested that the appellate juris- diction of the House of Lords and the privy council should be coalesced, and thus constitute one final court of appeal for the whole empire. Besides tire appellate there exists in the sovereign in council an original jurisdiction in questions concerning ˆboundaries between dependencies, the extent of charters and the like. Until recently the council dealt with the petitions to extend the time patents were protected, but this work has now been given by statute to the controller-general of patents.

Ireland has its own privy council. The lord-lieutenant takes the place of the Crown. There is little real work and the distinction of membership is titular as in England. Scotland has had no privy council since the Act of Union which provided for one council for Great Britain. British colonies with parliamentary government have cabinets or committees of ministers, borrowed from the English model, but no privy council. In France, before the Revolution, the king had a council which bore some resemblance to the English type (see France: Law and Institutions). In Germany a " privy council " (Geheimes Rats-Kollegium, Geheimes Conseil, Staatsrat), which under the prince formed the supreme organ of government, formerly existed in the various states of the empire, and out of this the ministries developed in the 17th centurv. These

were originally committees of the council (Geheime Konferenz, Geheimes Kabinett, &c.) which, as in England, gradually absorbed its functions. In some of the German states, however, it still survives as the " council of state " (Staatsrat) and in Wurttemberg as " privy council " (Geheimer Rat). The title Wirklicher Geheimer Rat (real privy councillor), with the predicate Excellenz is given to the highest officials. That of Geheimer Rat simply is very generally, e.g. in Prussia, given to high officials, usually with the addition of the branch of the service to which they belong, e.g. Geheimer Finanzrat, Geheimer Justizrat. The title is also sometimes purely honorary, e.g. that of Geheimer Commerzienrat, bestowed on eminent men of business. (G. E.)*

PRIVY PURSE, is the amount set apart in the civil list (q.v.) for the private

and personal use of the sovereign in England. During the reign of Queen Victoria it was £60,000 a year, but on the accession of Edward VII. the amount was fixed at £110,000 a year, which was the amount paid to the last sovereign (William IV.) who had a queen consort. The official who is charged with all payments made by the sovereign for his private expenses or charities is termed the keeper of the privy purse. The department of the keeper of the privy purse to the sovereign, assumed its existing shape in the earlier part of the last century. Under Queen Victoria the offices of keeper of the privy purse and private secretary were combined. As now organized these branches of the royal household consist of the private secretary and the keeper of the privy purse, two assistant private secre- taries and keepers of the privy purse, and a secretary, assistant secretary and several clerks of the privy purse. These officials, though of the royal household, are not in the department of the lord steward or the lord chamberlain, but are of the king's personal staff.

PRIVY SEAL, a seal of the United Kingdom, next in impor- tance to the great seal, and occupying an intermediate position between it and the signet. The authority of the privy seal was principally of a two-fold nature. It was a warrant to the lord chancellor to affix the great seal to such patents, charters, &c, as must necessarily pass the great seal (more particularly letters patent (q.v.). It was also the authority required for the issue of money from the exchequer, and was appended to documents of minor importance which did not require the great seal. Previous to the Great Seal Act 1884, all letters patent conferring any dignity, office, monopoly, franchise or other privilege were always passed under the privy seal before passing under the great seal.

Lord Privy Seal is the title of the officer who had the custody of the privy seal. He was originally known as the " keeper of the privy seal." The importance of the office was due to the desire of the privy council and the parliament in the 14th and 15th centuries to place some check on the issue of public money, as well as to prevent the use of the great seal by the sovereign without any intermediary except the lord chancellor. The lord privy seal first appears as a minister of state in the reign of Edward III. Until 1537 he was always an ecclesiastic, but is now more usually a temporal lord. He is the fifth great officer of state, and takes rank next after the president of the council and before all dukes. See Anson, Law and Custom of the Constitution (1896). PRIZE, or Prize of War (Fr. prise, from prendre, to take), a vessel or cargo captured by a belligerent on the high seas; also the act of capture. Under Blockade, Contraband, and Neutrality will be found details of existing practice as regards infringements of international law which expose neutrality vessels and cargoes to capture and trial in a prize court. Under War will be found the application of international law in rela- tion to the private property of subjects and

citizens of belligerent states as between them. We treat here of the manner of dealing with prizes after they have been brought into the juris- diction of the prize court.

Under the law in force at the beginning of 1910 the subject was governed by the following English acts : the Naval Prize Act 1864 (27 & 28 Vict. c. 25); the Colonial Courts of Admiralty Act r8go (53 & 54 Vict. c. 27) ; the Supreme Court of Judicature Act 1891 (54 & 55 Vict. c. 53, s. 4), and the Prize Courts Act 1894 (J7 & 58 Vict c 39). A new Naval Prize Act was,

however, already in contemplation, repealing the acts of 1864 and 1894, consolidating and re-enacting their main provisions and making such statutory provisions as will permit of the ratification of a convention adopted at the second Hague Conference (1907) for the establishment of an International Prize Court.

The Convention referred to above contains an elaborate scheme of 50 articles setting out the constitution and procedure of the court. It begins with the following declaration of its objects: —

Animated by the desire to settle in an equitable manner the differences which sometimes arise in the course of a naval war in connexion with the decisions of national prize courts :

Considering that, if these courts are to continue to exercise their functions in the manner determined by national legislation, it is desirable that in certain cases an appeal should be provided under conditions conciliating, as far as possible, the public and private interests involved in matters of prize :

Whereas, moreover, the institution of an international court, whose jurisdiction and procedure would be carefully defined, has seemed to be the best method of attaining this object :

Convinced, finally, that in this manner the hardships consequent on naval war would be mitigated ; that, in particular, good relations will be more easily maintained between belligerents and neutrals, and peace better assured

It prescribes that the court shall be composed of fifteen mem- bers out of the whole panel (art. 14). Of these Great Britain, France, Germany, Austria-Hungary, Russia, Italy, the United States and Japan each appoint

one (art. 15). A schedule of the other powers is appended to the Convention, under which they take their turn to sit to the number of seven, making up together the prescribed fifteen. As composed under the first year's distribution, the other judges would be appointed by Argentina, Colombia, Spain, Greece, Norway, Holland and Turkey.

There are also full provisions as to the procedure and conduct of the proceedings in the court, but the only provisions of concern to general readers are those relating to international law, which are as follows: —

1. The validity of the capture of a merchant-ship or its cargo is decided before a prize court in accordance with the present conven- tion when neutral or enemy property is involved.

2. Jurisdiction in matters of prize is exercised in the first instance by the prize courts of the belligerent captor.

The judgments of these courts are pronounced in public or are officially notified to parties concerned who are neutrals or enemies.

3. The judgments of national prize courts may be brought before the international prize court : — •

i. When the judgment of the national prize courts affects the

property of a neutral power or individual ; ii. When the judgment affects enemy property and relates to : —

(a) Cargo on board a neutral ship;

(b) An enemy ship captured in the territorial waters of a

neutral power, when that power has not made the capture the subject of a diplomatic claim ;

(c) A claim based upon the allegation that the seizure has been

effected in violation, either of the provisions of a con- vention in force between the belligerent powers, or of an enactment issued by the belligerent captor. The appeal against the judgment of the national court can be

based on the ground that the judgment was wrong either in fact or

in law.

4. An appeal may be brought : —

i. By a neutral power, if the judgment of the national tribunals injuriously affects its property or the property of its nationals (art. 3 [(i.)]), or if the capture of an enemy vessel is alleged to have taken place in the territorial waters of that power (art. 3 (ii.) (&)) ;

ii. By a neutral individual, if the judgment of the National Court injuriously affects his property (art. 3 (i.)), subject, how- ever, to the reservation that the power to which he be- longs may forbid him to bring the case before the court, or may itself undertake the proceedings in his place ;

iii. By an individual subject or citizen of an enemy power, if the judgment of the national court injuriously affects his property in the cases referred to in art. 3 (ii.), except that mentioned in paragraph (b).

5. An appeal may also be brought on the same conditions as in the preceding article, by persons belonging either to neutral states or to the enemy, deriving their rights from and entitled to represent an individual qualified to appeal, and who have taken part in the proceedings before the national court. Persons so entitled may appeal separately to the extent of their interest.

The same rule applies in the case of persons belonging either to

neutral states or to the enemy who derive their rights from and are entitled to represent a neutral power whose property was the subject of the decision.

6. When, in accordance with the above art. 3, the inter- national court has jurisdiction, the national courts cannot deal with a case in more than two instances. The municipal law of the belligerent captor shall decide whether the case may be brought before the international court after judgment has been given in first instance or only after an appeal.

If the national courts fail to give judgment within two years from the date of capture, the case may be carried direct to the inter- national court.

7. If a question of law to be decided is covered by a treaty in force between the belligerent captor and a power which is itself or whose subject or citizen is a party to the proceedings, the court is governed by the provisions of the said treaty.

In the absence of such provisions, the court shall apply the rules of international law. If no generally recognized rule exists, the court shall give judgment in accordance with the general principles of justice and equity.

The above provisions apply equally to questions relating to the order and mode of proof.

If, in accordance with art. 3 (ii.) (c), the ground of appeal is the violation of an enactment issued by the belligerent captor, the court shall enforce the enactment.

The court may disregard failure to comply with the procedure laid down in the legislation of the belligerent captor, when it is of opinion that the consequences of complying therewith are unjust and inequitable.

8. If the court pronounces the capture of the vessel or cargo to be valid, they shall be disposed of in accordance with the laws of the belligerent captor.

If it pronounces the capture to be null, the court shall order restitution of the vessel or cargo, and shall fix, if there is occasion, the amount of the damages. If the vessel or cargo have been sold or destroyed, the court shall determine the compensation to be given to the owner on this account.

If the national prize court pronounced the capture to be null, the court can only be asked to decide as to the damages.

9. The contracting powers undertake to submit in good faith to the decisions of the international prize court, and to carry them out with the least possible delay.

The British delegates, in their report on the work of the Conference, wrote that it was to them a subject of satisfaction that they had been able to accomplish the task thus laid upon them, " not, indeed, in the form of an adaptation of the machinery of the existing court, but in the form of a new institution" ; and that the convention drawn appeared to them to be " a very noteworthy step in the history of law as the first attempt to constitute a really international court, and as the first device to produce uniformity in any branch of international law." Here, however, the delegates overstated the scope of the work done,, and in order to obtain that uniformity a further conference was held in London (Dec. 1908-Feb. 1909) " to arrive at an agreement as to what are the generally recognized rules of international law within the meaning of art. 7" of the Convention. The London Conference drew up a series of rules which it declared " correspond in substance with the generally recognized prin- ciples of international law " on Blockade {q.v.), Contraband of War (q.v.), Unneutral service, Destruction of Neutral Prizes, Transfer to a Neutral Flag, Enemy Character, Convoy {q.v.), Resistance to Search and Compensation. These rules, if ratified, will bind the international court.

The proposal to submit captures in war to a special inter- national jurisdiction has often been made, and in fact it suggests itself whenever

there are two opinions concerning the justice of a prize court's decision.

The Institute of International Law in 1887, after adopting a very full code of prize law, consisting of no fewer than 122 articles and covering every branch of the subject, forwarded them to the different European governments, with the expression of a wish that " in the future reform might take a still more complete shape by the institution of an international tribunal for trial of prize cases. "

The subject was brought up at the session in 1905 at Chris- tiania of the International Law Association. The discussion showed that there was much to be said on both sides. Mr Justice Phillimore inter alios seemed favourable to the insti- tution of an independent court of appeal only.

This was the position of the discussion at the opening of the

second Hague Conference in June 1907, when the British and German delegates announced that they had been instructed to present schemes for the establishment of an interna- tional court of appeal in matters of naval prize. Two projects were simultaneously presented on behalf of Great Britain and Germany.

The original English idea was to " secure the adaptation " of the machinery of the existing Hague Court to the purposes of an " International Tribunal of Appeal " from decisions of belligerent prize courts. The official instructions, published in the correspondence respecting the Second Conference 1 observed, in reference to the proposal, that the " judgments of the tribunal in such cases would probably prove the most rapid and efficient means which can, under existing conditions, be devised for giving form and authority to the canons of inter- national law in matters of prize." The instructions continue that the advantages would far outweigh any difficulty which might arise from the fact that some alterations in the municipal laws of this country, and probably also of other states, would be required, and that " H.M. Government considered that if the Hague Conference accomplished no other object than the con- stitution of such a tribunal, it would render an inestimable service to civilization and mankind."

The objection to the existing system is that the judge is ap- pointed by the belligerent state whose interest it is to condemn the capture; that his bias, if any, is against the neutral interest. But will there be no room in an international prize court for bias against the belligerent? " Representing as we do," said Mr Choate at the sitting of the nth of July, " a widely extended maritime nation, and a nation which hopes and confidently expects always in the future to be a neutral nation, we deem the establishment of an international court of prize by this Con- ference to be a matter of supreme importance." The converse may obviously be as important for a nation which, with its vast dependencies, cannot with equal confidence expect to remain a mere spectator among the rivalries of expanding states in different quarters of the globe. The interests of the civilized world in time of war are divisible into three groups, namely, the respective interests of the two belligerents, and the interest of the neutrals. In practice the interest of the neutrals is against the making of captures. Under the system hitherto prevailing it is the judge appointed by the captor who decides whether the capture was a legitimate one or not. It may be contended, however, that he hears the cause and gives his judg- ment in the face of the whole neutral world, at all times the larger part of civilized mankind, and one which has now infinitely greater facilities for making its

voice heard than it had a century earlier, when a powerful belligerent maritime state was, out of all proportion to any neutral combination, able to enforce its views as regards neutral property. (T. Ba.)

PRIZREN (also written Prisren, Prisrend, Prizrendi, Prezdra and Perzerin) , the capital of the sanjak of Prizren, in the vilayet of Kossovo, Albania, European Turkey; 65 m. E. by N. of Scutari, on the river Bistritza, a left-hand tributary of the White Drin. Pop. (1905), about 30,000, chiefly Mahommedan Albanians, with a minority of Roman Catholic Albanians, Serbs and Greeks. Prizren is beautifully situated 1424 ft. above sea-level, among the northern outliers of the Shar Planina. To the north-west a fertile and undulating plain, watered by the White Drin, extends as far as Ipek (42 m.). A good road con- nects Prizren with the Ferisovich station on the Salonica- Mitrovitza railway (37 m.). The city is the seat of a Roman Catholic archbishop, a Greek bishop, and a Servian theological seminary. Its chief buildings are the citadel and many mosques, one of which is an ancient Byzantine basilica, originally a

1 Prince von Billow was credited with suggesting in his corre- spondence on the question of the Bundesrath that a tribunal of arbitration should be instituted to deal with all questions of capture. At any rate, on the 19th of January 1900 he wrote that the German government had proposed that all the points then in dispute should be submitted to arbitration. The British government declared their concurrence in the institution of a tribunal to arbitrate upon claims for compensation.

Servian cathedral. In its bazaars an active trade in agricultural produce, glass, pottery, saddlery, and copper and iron ware is carried on; but the manufacture of fire-arms, for which Prizren was long famous throughout European Turkey, has suffered greatly from foreign competition.

Prizren has sometimes, though on doubtful evidence, been identified with the ancient Tharendus or Theranda. In the 1 2th century it was the residence of the kings of Servia, and the sanjak of Prizren forms part of the region still called Old Servia (Stara Srbiya) by the Slavs. From the 13th century to the 1 6th Prizren had a flourishing export trade with Ragusa, and it has always been one of the principal centres of commerce and industry in Albania.

PRJEVALSKY [Przhevalsky], NIKOLAI MIKHAILOVICH (1830-1888), Russian traveller, born at Kimbory, in the govern- ment of Smolensk, on the 31st of March 1839, was descended from a noble Cossack family. He was educated at the Smolensk gymnasium, and in 1855 entered an infantry regiment as a. subaltern. In November 1856 he became an officer, and four years later he entered the academy of the general staff. From

1864 to 1866 he taught geography at the military school at Warsaw, and in 1867 he was admitted to the general staff and sent to Irkutsk, where he started to explore the highlands on the banks of the Usuri, the great southern tributary of the Amur. This occupied him until 1869, when he published a book on the Usuri region, partly ethnographical in character. Between November 1870 and September 1873, accompanied by only three men and with ridiculously small pecuniary re- sources, he crossed the Gobi desert, reached Peking, and, pushing westwards and south-westwards, explored the Ordos and the Ala-shan, as well as the upper part of the Yangtsze-kiang. He also penetrated into Tibet, reaching the banks of the Di Chu river. By this remarkable journey he proved that, for resolute and enduring men, travelling in the Central Asian plateaus was easier than had been supposed. The Russian Geographical Society presented him with the great Constantine medal, and from all parts of Europe he received medals and honorary diplomas. The work in which he embodied his researches was immediately translated into all civilized languages, the English version, Mongolia, the Tangut Country, and the Solitudes of Northern Tibet (1876), being edited by Sir Henry Yule. On his second journey in 1877, while endeavouring to reach Lhasa through east Turkestan, he re-discovered the great lake Lop-nor (q.v.), which had not been visited by any European since Marco Polo. On his third expedition in 1879-1880 he penetrated, by Hami, the Tsai-dam and the great valley of the Tibetan river Kara-su, to Napchu, 170 m. from Lhasa, when he was turned back by order of the Dalai Lama. In 1883-1885 he undertook a fourth journey of exploration in the wild mountain regions between Mongolia and Tibet. On these four expeditions he made collections of plants and animals of inestimable value, including nearly twenty thousand zoological and sixteen thousand botanical specimens. Among other remarkable discoveries were those of the wild camel, ancestor of the domesticated species, and of the early type of horse, now known by his name (Equus prjewalskii). Prjevalsky's account of his second journey, From Kulja, across the Tian-Shan, to Lop-nor, was translated into English in 1879. In September 1888 he started on a fifth expedition, intending to reach Lhasa, but on the 1st of November he died at Karakol on Lake Issyk-kul. A monument was erected to his memory on the shores of the lake, and the Russian government changed the name of the town of Karakol to Przhevalsk {q.v.) in his honour.

PROA (Malay, prau), the general term in the Malay language for all vessels, from the sampan or canoe to the square-rigged kapal, but in western usage confined to the swift-sailing craft that the pirates of the Indian Ocean made familiar to sailors in eastern waters. The chief points which characterize these vessels are that while the weather-side is rounded the lee-side is flat from stem to stern, that both stem and stern are exactly

similar in shape, and that there is a small similarly shaped hull swung out from the side of the main hull on poles, which acts

as an outrigger and prevents the vessel heeling over. The main hull carries the mast rigging and an enormous triangular-shaped sail.

PROBABILISM (from Lat. probare, to test, approve), a term used both in theology and in philosophy with the general implication that in the absence of certainty probability is the best criterion. Thus it is applied in connexion with casuistry for the view that the layman in difficult matters of conscience may safely follow a doctrine inculcated by a recognized doctor of the church. This view was originated by the monk Molina (1528-1581), and has been widely employed by the Jesuits. In philosophy the term is applied to that practical doctrine which gives assistance in ordinary matters to one who is sceptical in respect of the possibility of real knowledge: it supposes that though knowledge is impossible a man may rely on strong beliefs in practical affairs. This view was held by the sceptics of the New Academy (see Scepticism and Carneades). Opposed to " probabilism" is " probabiliorism" (Lat. probabilior, more likely), which holds that when there is a preponderance of evidence on one side of a controversy that side is presumably right.

PROBABILITY (Lat. probabilis, probable or credible), a term which in general implies credibility short of certainty.

The mathematical theory of probabilities deals with certain phenomena which are employed to measure credibility. This Description measurement is well exemplified by games of chance. aadDMslon If a pack of cards is shuffled and a card dealt, the of the probability that the card will belong to a particular

' suit is measured by — we may say, is — the ratio 1 : 4,

or J; there being four suits to any one of them the card might have belonged. So the probability that an ace will be drawn is -5ˆ, as out of the 52 cards in the pack 4 are aces. So the probability that ace will turn up when a die is thrown is J. The probability that one or other of the two events, ace or deuce, will occur is J. If simultaneously a die is thrown and a card is dealt from a pack which has been shuffled, the probability that the double event will consist of two aces is 1X4 divided by 6X52, as the total number of double events formed by combining a face of a die with a face of a card is 6X52, and out of these 1X4 consist of two aces.

The data of probabilities are often prima facie at least of a type different from that which has been described. For example, the probability that a child about to be born will be a boy is about 0-51. This statement is founded solely on the observed fact that about 51 % of children born (alive, in European countries) prove to be boys. The probability is not, as in' the instance of dice and cards, measured by the proportion between a number of cases favourable to the event and a total number of possible cases. Those instances indeed also admit of the mea- surement based on observed frequency. Thus the number of times that a die turns up ace is found by observation to be about 16-6% of the number of throws; and similar statements are true of cards and coins. 1 The probabilities with which the calculus deals admit generally of being measured by the number of times that the event. is found by experience to occur, in pro- portion to the number of times that it might possibly occur.

The idea of a probable or expected number is not confined to the number of times that an event occurs; if the occurrence of the event is associated with a certain amount of money or any other measurable article there will be a probable or expected amount of that article. For instance, if a person throwing dice is to receive two shillings every time that six turns up, he may expect in a hundred throws to win about 2X16-6 (about 33-3) shillings. If he is to receive two shillings for every six and one shilling for every ace, his expectation will be 2Xi6-6+iXi6-6 (50) shillings. The expectation of lifetime is calculated on this principle. Of 1000 males aged ten say the probable number who will die in their next year is 490, in the following year 397, and so on; if we (roughly) estimate that those who die in the first year will have enjoyed one year of life after ten, those who die in the next year will have enjoyed two years of life, and so on ; 1 Cf . note to par. 5 below.

then the total number of years which the 1000 males 2 aged ten may be expected to live is

1 X 1000 + 2 X (1000-490) + 3 (1000-490-397) +. . . Space as well as time may be the subject of expectation. If drops of rain fall in the long run with equal frequency on one point — or rather on one small interval, say of a centimetre or two — on a band of finite length and negligible breadth, the distance which is to be expected between a point of impact in the upper half of the line and a point of impact in the lower half has a definite proportion to the length of the given line. 3

Expectation in the general sense may be considered as a kind of average. 4 The doctrine of averages and of the deviations therefrom technically called " errors " is distinguished from the other portion of the calculus by the peculiar difficulty of its method. The paths struck out by Laplace and

Gauss have hardly yet been completed and made quite secure. The doctrine is also distinguished by the importance of its applications. The theory of errors enables the physicist so to combine discre- pant observations as to obtain the best measurement. It may abridge the labour of the statistician by the use of samples. 6 It may assist the statistician in testing the validity of inductions. 6 It promises to be of special service to him in perfecting the logical method of concomitant variations; especially in investigating the laws of heredity. For instance the correlation between the height of parents and that of children is such that if we take a number of men all of the same height and observe the average height of their adult sons, the deviation of the latter average from the general average of adult males bears a definite propor- tion — about a half — to the similarly measured deviation of the height common to the fathers. The same kind and amount of correlation between parents and children with respect to many other attributes besides stature has been ascertained by Professor Karl Pearson and his collaborators. 7 The kinetics of free molecules (gases) forms another important branch of science which involves the theory of errors.

The description of the subject which has been given will explain the division which it is proposed to adopt. In Part I. probability and expectation will be considered apart from the peculiar difficulties incident to errors or deviation from averages. The first section of the first part will be devoted to a preliminary inquiry into the evidence of the primary data and axioms of the science. Freed from philosophical difficulties the mathematical calculation of probabilities will proceed in the second section. The analogous calculation of expectation will follow in the third section. The contents of the first three sections will be illustrated in the fourth by a class of examples dealing with space measurements — the so-called "local" or "geometrical" probabilities. Part II. is devoted to averages and the deviations therefrom, or more generally that grouping of statistics which may be called a law of frequency. Part II. is divided into two sections distinguished by differences in character and extent between the principal generalizations respecting laws of frequency.

Part I. — Probability and Expectation Section I. — First Principles.

1. As in other mathematical sciences, so in probabilities, or even more so, the philosophical foundations

2. (1) How the Measure of Probability is Ascertained. — The first question which arises under this head is: on what evidence are the facts obtained which are employed to measure probability ? A very generally accepted view is that which Laplace has thus expressed:

2 It is more usual to speak of the mean expectation, the average number of

years per head.

3 Below, par. 88.

- *For more exact definition see below, par. 95.*

6 See Bowley's Address to Section F. of the British Association

(1906).

• Edgeworth, " Methods of Statistics," Journal of the Statistical Society (Jubilee volume, 1885).

7 See Biometrika, vol. iii. " Inheritance of Mental Characters."

" The probability of an event is the ratio of the number of cases which favour it to the number of all the possible cases, when nothing leads us to believe that one of these cases ought to occur rather than the others; which renders them, for us, equally possible." 1 Against this view it is urged that merely psychological facts can at best afford a measure of belief, not of credibility. Accordingly, the ground of probability is sought in the observed fact of a class or " series " 2 such that if we take a great many members of the class, or terms of the series, the members thereof which belong to a certain assigned species compared with the total number taken tends to a certain fraction as a limit. Thus the series which consists of heads and tails obtained by tossing up a well-made coin is such that out of a large number of throws the proportion giving heads is nearly half.

3. These views are not so diametrically opposed as may at first appear. On the one hand, those who follow Laplace would of course admit that the presumption afforded by the " number of favourable cases " with respect to the probability of throwing either five or six with a die must be modified in accordance with actual experience such as that below cited 3 respecting particular dice that they turn up five or six rather oftener than once in three times. On the other hand, the series which is regarded as the empirical basis of pro- bability is not a simple matter of fact. There are implied conditions which are not satisfied by the sort of uniformity which ordinarily characterizes scientific laws ; which would not be satisfied for instance by the proportionate frequency of any one digit, e.g. 8, in the expan- sion of any vulgar fraction, though the expression may consist of a

circulating decimal with a very long period. 4

4. The type of the series is rather the frequency of the several digits in the expansion of an incommensurable constant such as 1/2, log 11, it, &c. 6 The observed fact that the digits occur with equal Frequency is fortified by the absence of a reason why one digit should occur oftener than another. 6

5. The most perfect types of probability appear to present the two aspects: proportion of favourable cases given a priori and fre- quency of occurrence observed a posteriori. When one of these attributes is not manifested it is often legitimate to infer its existence from the presence of the other. Given numerous batches of balls, each batch numbering say 100 and consisting partly of white and partly of black balls ; if the percentages of white balls presented by the set of batches averaged, and, as it were, hovered about some particular percentage, e.g. 50, though we knew as an independent datum, or by inspection of the given percentages, that the series was not obtained by simply extracting a hundred balls from a jar con- taining a melange of white and black balls, we, might still be justified in concluding that the observed phenomenon resulted from a system equivalent to a number of jars of various constitution, compounded in some complicated fashion. So Laplace may be justified in postu- lating behind frequencies embodied in vital statistics the existence of a " constitution " analogous to games of chance, " possibilities " or favourable cases which might conceivably be " developed " or discussed. 7 On the other hand, it is often legitimate to infer from the known proportion of favourable cases a corresponding frequency of occurrence. The cogency of the inference will vary according to the degree of experience. That one face of a die or a coin will turn up nearly as often as another might be affirmed with perfect confi- dence of the particular dice which Weldon threw some thousands of times, 8 or the coins with which Professor Pearson similarly operated. 9 It may be affirmed with much confidence of ordinary coins and dice without specific experience, and generally, where fairplay is presumed, of games of chance. This confidence is based not only on experiments like those tried by Buffon, Jevons and many others, 10 but also on a continuous, extensive, almost unconsciously registered experience in pari materia. It is this sort of experience which justj- fies our expectation that commonly in mathematical tables one digit will occur as often as another, that in a shower about as many drops

1 Laplace, Theorie analytique des probability, liv. II. ch. i. No. 1. Cf. Introduction, II' principe.

- *The term employed by Venn in his important Logic of Chance.*
- *Below, par. 119.*

- *E.g. xitt< ln tne expansion of which the digit 8 occurs once in ten times in seemingly random fashion (see Mess, of Maths. 1864, vol. 2, pp. 1 and 39).*

5 The type shows that the phenomena which are the object of probabilities do not constitute a distinct class of things. Occur- rences which perfectly conform to laws of nature and are capable of exact prediction yet in certain aspects present the appearance of chance. Cf. Edgeworth, " Law of Error," Cam. Phil. Trans., 1905, p. 128.

- *Cf. Venn. op. cit. ch. v. § 14; and v. Kries on the " Prinzip des mangelnden Grundes " in his Wahrscheinlichkeitsrechnurig, ch. i. § 4, tt passim.*

7 In a passage criticized unfavourably by Dr Venn, Logic of Chance, ch. iv. § 14.

8 Below, par. 115.

- *Chances of Death, i. 44.*

10 A summary of such experiments, comprising above 100,000 trials, is given by Professor Karl Pearson in his Chances of Death, i. 48.

will fall on one element of area as upon a neighbouring spot of equal size. Doubtless the presumption must be extended with caution to phenomena with which we are less familiar. For example, is a meteor equally likely to hit one square mile as another of the earth's surface ? We seem to descend in the scale of credibility from abso- lute certainty that alternative events occur with about equal fre- quency to absolute ignorance whether one occurs more frequently than the other. The empirical basis of probability may appear to become evanescent in a case like the following, which has been dis- cussed by many writers on Probabilities. 11 What is the probability of drawing a white ball from a box of which we only know that it contains balls both black and white and none of any other colour ? In this case, unlike the case of an urn containing a mixture of white and black balls in equal proportions, we have no reason to expect that if we go on drawing balls from the urn, replacing each ball after it has been drawn, that the series so presented will consist of black and white in about equal numbers. But there is ground for believing that in the long course of experiences in pari materia — other urns of similar constitution, other cases in which there is no reason to expect one alternative more than another — an event of one kind will occur about as often as one of another kind. A " cross-series " a is thus formed which seems to rest on as extensive if not so definite an empirical basis as the series which we began by

considering. Thus the so-called " intellectual probability " ls which it has been sought to separate from the material probability verified by fre- quency of occurrence, may still rest on a similar though less obvious ground of experience. This type of probability not verified by specific experience is presented in two particularly important classes.

6. Unverified Probabilities. — In applying the theory of errors to the art of measurement it is usual to assume that prior to observation one value of the quantity under measurement is as likely as another. " When the probability is unknown," says Laplace, 14 ." we may equally suppose it to have any value between zero and unit." The assumption is fundamentally similar whether the quantum is a ratio to be determined by the theorem of Bayes, 16 or an absolute quantity to be determined by the more general theory of error. Of this first principle it is well observed by Professor Karl Pearson 16 : " There is an element of human experience at the bottom of Laplace's assump- tion." Professor Pearson quotes with approbation 16 the following account of the matter: "The assumption that any probability-constant about which we know nothing in particular is as likely to have one value as another is grounded upon the rough but solid expe- rience that such constants do as a matter of fact as often have one value as another."

7. It may be objected, no doubt, that one value (of the object under measurement) is often known beforehand not to be as likely as another. The barometric height for instance is not equally likely to be 29 in. or to be 2 in. The reply is that the postulate is only required with respect to a small tract in a certain neighbour- hood, some 2 in. above and below 29J in. in the case of barometric pressure.

8. It is further objected that the assumption in question involves inconsistencies in cases like the following. Suppose observations are made on the length of a pendulum together with the time of its oscillation. As the time is proportional to the square root of the length, it follows that if the values of the length occur with equal frequency those of the time cannot do so; and, inversely, if the proposition is true of the times it cannot be true of the lengths. 18 One reply to this objection is afforded by the reply to the former one. For where, we are concerned only with a small tract of values ic will often happen that both the square and the square root and any ordin- ary function of a quantity which assumes equivalent values with equal probability will each present an approximately equal distribu- tion of probabilities. 19 It may further be replied that in general the reasoning does not require the a priori probabilities of the different values to be very nearly equal ; it suffices that they should not he very unequal ; M and this much seems to be given by experience.

9. Whenever we can justify Laplace's first principle 21 that " pro- bability

is the ratio of the number of favourable cases to the number of all possible cases " no additional difficulty is involved in his second

11 E.g. J. S. Mill, Logic, bk. III., ch. xviii. § 2.

12 Cf. Venn, Logic of Chance, ch. vi. § 24.

13 Boole, Trans. Roy. Soc. (1862), ix. 251.

14 Op. cit. Introduction.

15 Below, par. 130.

16 Grammar of Science, ed. 2, p. 146.

17 From the article by the present writer on the " Philosophy of Chance " in Mind, No. ix., in which some of the views here indicated are stated at greater length than is here possible.

18 Cf. v. Kries, op. cit. ch. ii.

19 On the principle of Taylor's theorem ; cf . Edgeworth, Phil. Mag. (1892), xxxiv. 431 seq.

20 Cf. J. S. Mill, in the passage referred to below, par. 13, on the use that may be made of an " antecedent probability," though " it would be impossible to estimate that probability with anything like numerical precision."

21 Op. cit. Introduction.

principle, of which the following may be taken as an equivalent. If we distribute the favourable cases into several groups the pro- bability of the event will be sum of the probabilities pertaining to each group. 1

10. Another important instance of unverified probabilities occurs when it is assumed without specific experience that one phenomenon is independent of another in such wise that the probability of a double event is equal to the product of the one event multiplied by the pro- bability of the other — as in the instance already given of two aces occurring. The assumption has been verified with respect to " runs " in some games of chance ; 2 but it is

*legitimately applied far beyond those instances. The proposition that very long runs of particular digits, e.g. of 7, may be expected in the development of a constant like it — e.g. a run of six consecutive sevens if the expansion of the constant was carried to a million places of decimals — may be given as an instance in which our conviction greatly transcends specific verification. In the calculation of probable, and improbable, errors, it 3 has to be assumed without specific verification that the observa- tions on which the calculation is based are independent of each other in the sense now under consideration. With these explanations we may accept Laplace's third principle " If the events are independent of each other the probability of their concurrence (I' existence de leur ensemble) is the product of their separate probabilities." **

1 1 . Interdependent Probabilities. — Among the principles of proba- bilities it is usual to enunciate, after Laplace, several other pro- positions. 6 But these may here be rapidly passed over as they do not seem to involve any additional philosophical difficulty.

12. It has been shown that when two events are independent of each other the product of their separate probabilities forms the probability of their concurrence. It follows that the probability of the double event divided by the probability of either, say the first, component gives the probability of the other, the second component event. Th; quotient, we might say, is the probability that when the first event has occurred, the second will occur. The proposition in this form is true also of events which are not independent of one another. Laplace exemplifies the composition of such interdepen- dent probabilities by the instance of three urns, A,B,C, about which it is known that two contain only white balls and one only black balls. 8 The probability of drawing a white ball from an assigned urn, say C, is f. The probability that, a white ball having been drawn from C, a ball drawn from B will be white, is §. Therefore the probability of the double event drawing a white ball from C and also from B is iXi, or . The question now arises. Supposing we know only the probability of the double event, which probability we will call [BC], and the probability of one of them, say © (but not, as in the case instanced, the mechanism of their interdependence); what can we infer about the probability [B] of the other event (an event such as in the above instance drawing a white ball from the urn B) — the separate probability irrespective of what has happened as to the urn C ? We cannot in general say that [B] = [BC] divided by © but rather that quotient Xk, where k is an unknown coefficient which may be either positive or negative. It might, however, be improper to treat k as zero on the ground that it is equally likely (in the long run of similar data) to be positive or negative. For given values of [BC] and ©, k has not this equiprobable character, since its positive and negative ranges are not in general equal; as appears from considering that [B] cannot be less than

[BC], nor greater than unity. 7

13. Probability of Causes and Future Effects. — The first principles which have been established afford an adequate ground for the reasoning which is described as deducing the probability of a cause from an observed event. 8 If with the poet 9 we may represent a perfect mixture by the waters of the Po in which the " two Doras " and other tributaries are indiscriminately commingled, there is no great difference in respect of definition and deduction between the probability that a certain particle of water should have emanated from a particular source, or should be discharged through a particular mouth of the river. " This principle," we may say with De Morgan, " of the retrospective or ' inverse ' probability is not essentially

1 Bertrand on " Probabilities composees," op. cit. art. 23.

2 In some of the- experiences referred to at par. 5.

*3 See below, pars. 132, 159. * Op. cit. Introduction.*

' There is a good statement of them in Boole's Laws of Thought, ch. xvi. § 7. Cf. De Morgan " Theory of Probabilities " (Encyc. Metrop.), §§ 12 seq.

6 Laplace, op. cit. Introduction, IV" Principe; cf. V Principe and liv., II. ch. i. § 1.

7 In such a case there seems to be a propriety in expressing the indeterminate element in our data, not as above, but as proposed by Boole in his remarkable Laws of Thought, ch. xvii., ch. xviii., § I (cf. Trans. Edin. Roy. Soc, (1857), vol. xxi. ; and Trans. Roy. Soc, 1862, vol. ix., vol. clii. pt. i. p. 251); the undetermined constant now representing the probability that if the event C does not occur the event B will. The values of this constant — in the absence of speci- fic data, arid where independence is not presumable — are, it should seem, equally distributed between the values o and I. Cf. as to Boole's Calculus, Mind, loc. cit., ix. 230 seq.

8 Laplace's Sixth Principle. 9 ˆManzoni.

different from the one first stated (Principle I.)." 10 Nor is a new first principle necessarily involved when after ascending from an effect to a cause we descend to a collateral effect. 11 It is true that in the investigation of causes it is often necessary to have recourse to the unverified species of probability. An intance has already been given of several approximately equiprobable causes, the several values of a quantity under measurement, from one of which the observed phenomena, the given set of observations, must have, so to speak, emanated. A simpler instance of two alternative causes occurs in the investigation which, J. S. Mill 12 has illustrated —

whether an event, such as a succession of aces, has been produced by a par- ticular cause, such as loading of the die, or by that mass of " fleeting causes " called chance. It is sufficient for the argument that the " a priori " probabilities of the alternatives should not be very unequal. 13

14. (2) Whether Credibility is Measurable. — The domain of probabili- ties according to some authorities does not extend much, if at all, beyond the objective phenomena which have been described in the preceding paragraphs. The claims of the science to measure the subjective quantity, degree of belief, are disallowed or minimized. Belief, it is objected, depends upon a complex of perceptions and emotions not amenable 14 to calculus. Moreover, belief is not credi- bility ; even if we do believe with more or less confidence in exact conformity with the measure of probability afforded by the calculus, ought we so to believe ? In reply it must be admitted that many of the beliefs on which we have to act are not of the kind for which the calculus prescribes. It was absurd of Craig 16 to attempt to evalu- ate the credibility of the Christian religion by mathematical calcula- tion. But there seem to be a number of simpler cases of which we may say with De Morgan 16 " that in the universal opinion of those who examine the subject, the state of mind to which a person ought to be able to bring himself " is in accordance with the regulation measure of probability. If in the ordeal to which Portia's suitors were subjected there had been a picture of her not in one only, but in two of the caskets, then — though the judgment of the principal parties might be distorted by emotion — the impartial spectator would normally expect with greater confidence than before that at any particular trial a casket containing the likeness of the lady would be chosen. So the indications of a thermometer may not correspond to the sensations of a fevered patient, but they serve to regulate the temperature of a public library so as to secure the com- fort of the majority. This view does not commit us to the quantita- tive precision of De Morgan that in a case such as above supposed we ought to " look three times as confidently upon the arrival as upon the non-arrival " of the event. 17 Two or three roughly dis- tinguished degrees of credibility — very probable, as probable as not, very improbable, practically impossible — ˆsuffice for the more important applications of the calculus. Such is the character of the judgments which the calculus enables us to form with respect to the occurrence of a certain difference between the real value of any quantity under measurement and the value assigned to it by the measurement. The confidence that the constants which we have determined are accurate within certain limits is a subjective feeling which cannot be dislodged from an important part of probabilities. 18 This sphere of subjective probability is widened by the latest develop- ments of the science 19 so far as they add to the number of constants for which it is important to determine the probable — and improbable — error. For instance, a

measure of the deviation of observations from an average or mean value was required by the older writers only as subordinate to the determination of the mean, but now this " standard deviation " (below, par. 98) is often treated as an entity for which it is important to discover the limits of error. 20 Some of the newer methods may also serve to countenance the measurement of subjective quantity, in so far as they successfully apply the calculus to quantities not admitting of a precise unit, such as colour

10 De Morgan, Theory of Probabilities, § 19; cf. Venn, Logic of Chance, ch. vii. § 9; Edgeworth, "On the Probable Errors of Frequency Constants," Journ. Stat. Soc. (1908), p. 653. The essential symmetry of the inverse and the direct methods is shown by an elegant proof which Professor Cook Wilson has given for the received rules of inverse probability (Nature, 1900, Dec. 13).

11 Laplace's Seventh Principle.

12 Logic, book III., ch. xviii. § 6.

13 Cf . above, par. 8 ; below, par. 46.

14 Cf. Venn, Logic of Chance, p. 126.

15 See the reference to Craig in Todhunter, History . . . of Probability.

16 Formal Logic, p. 173.

17 Ibid. Cf. " Theory of Probabilities " (Encyc. Metrop.), note to § 5, " Wherever the term greater or less can be applied there twice, thrice, &c, can be conceived, though not perhaps measured by us."

18 It is well remarked by Professor Irving Fisher (Capital and Income, 1907, ch. xvi.), that Bernoulli's theorem involves a " sub- jective " element a " psychological magnitude." The remark is applicable to the general theory of error of which the theorem of Bernoulli is a particular case (see below, pars. 103, 104).

19 In the hands of Professor Karl Pearson, Mr Sheppard and Mr Yule. Cf. par. 149, below.

20 Cf. Edgeworth, Journ. Stat. Soc. (Dec. IQ08V

of eye or curliness of hair. 1 A closer analogy is supplied by the older writers who boldly handle " moral " or subjective advantage, as will be shown under the next head.

r 5- (3) Axioms of Expectation. — Expectation so far as it involves probability presents the same philosophical questions. They occur chiefly in connexion with two principles analogous to and deducible from propositions which have been stated with respect to probabi- lity. 2 (i.) The expectation of the sum of two quantities subject to risk is the sum of the expectations of each, (ii.) The expectation of the product of two quantities subject to risk is the product of the expectations of each ; provided that the risks are independent. For example, let one of the fortuitously fluctuating quantities be the winnings of a player at a game in which he takes the amount A if he throws ace with a die (and nothing if he throws another face). Then the expectation of that quantity is JA ; or, in n trials (n being large), the player may expect to win about ra&A. Let the other fortuitously fluctuating quantity be winnings of a player at a game in which he takes the amount B when an ace of any suit is dealt from an ordinary pack of cards. The expectation of this quantity is iˆB ; or in n trials the player may expect to win about nˆ s B. Now suppose a compound trial at which one simultaneously throws a die and deals a card ; and let his winning at a compound trial be the sum of the amounts which he would have received for the die and the card respectively at a simple trial. In n such compound trials he may expect to win about nlA + nˆB, or the expectation of the winning at a compound trial is the sum of the separate expectations. Next suppose the winning at a compound trial to be the product of the two amounts which he would have received for the die and the card if played at a simple trial. It is zero unless the player obtains two aces. It is AXB when this double event occurs. But this double event occurs in the long run only once in 78 times. Accord- ingly the expectation of the winning at a compound trial at which the winning is the product of the winnings at two simple trials is the product of the separate expectations. What has been shown for two expectations of the simplest type, where o is the probability of an event which has been associated with a quantity a, may easily be extended to several expectations each of the type

aiai-)-a2a2-f-a3a3-r- . . .

where aˆa, is an expectation of the simplest type, above exemplified, or of the type ajaiXa202Xa3a 3 X … or a mixture of these types. For by the law which has been exemplified the sum of r expectations can always be reduced to the sum of r — i.and then the r — 1 to r— 2, and so on ; and the like is true of products.

16. It should be remarked that the proviso as to the independence of the

probabilities involved is required only by the second of the two fundamental propositions. It may be dispensed with by the first. Thus in the example of interdependent probabilities given by Laplace 3 — three urns about which it is known that two contain only black balls and one only white — if a person drawing a ball first from C and then from B is to receive x shillings every time he draws a white ball, from one or other of the urns, he may expect if he performs the compound operation n times to receive nX2X'ix shillings. But the expectation of the product of the number of shillings won by drawing a white ball from C and the number of shillings won by afterwards drawing a white ball from B is not »(|)V, but n\x 2 .

17. The first of the two principles is largely employed in the

*{)ractical applications of probabilities. The second principle is argely employed in the higher generalizations of the science * (the laws of error demonstrated in Part II.) ; the requisite independence of the involved probabilities being mostly of the unverified 5 species.*

18. Expectation of Utility. — A philosophical difficulty peculiar to expectation 6 arises when the quantity expected has not the objective character usually presupposed in the applications of mathematics. The most signal instance occurs when the expectation relates to an advantage, and that advantage is estimated subjectively by the amount of utility or satisfaction afforded to the possessor. Mathe- maticians have commonly adopted the assumption made by Daniel Bernoulli that a small increase in a person s material means or " physical fortune " causes an increase of satisfaction or " moral fortune," inversely proportional to the physical fortune; and accord- ingly that the moral fortune is equateable to the logarithm of the physical fortune. 7 The spirit in which this assumption should be employed is well expressed by Laplace when he says 8 that the expec-

1 Below, par. 152.

- *Consider the equivalent of Laplace's second principle given at par 9, above, and his third principle quoted at par. 10.*

' Above, par. 12.

4 In the more familiar form ; that (of two independently fluctuating quantities) the mean of the product is the product of the means (cf. Czuber, Theorie der Beobachtungsfehler, p. 133).

6 Above, par. 6.

6 These peculiarities afford some justification for Laplace's restric- tion of

the term expectation to " goods." As to the wider definition here adopted see below, par. 94 and par. 95, note.

7 Each fortune referred to is divided by a proper parameter. See below, par. 69

8 Op. cii. liv. II. ch. xiii. No. 41. Cf. liv. II. ch. i. No.2.

tation of subjective advantage {V espirance morale) " depends on a thousand variable circumstances which it is almost always impossible to define and still more to submit to calculation." " One cannot give a general rule for appreciating this relative value," yet the principle above stated in " applying to the commonest cases leads to results which are often useful."

19. In this spirit we may regard the logarithm in Bernoulli's (as in Malthus's) theory as representative of a more general relation. Thus generalized the principle has been accepted by economists and utilitarian philosophers whose judgment on the rela- tion between material goods and utility or satisfaction carries weight. Thus Professor Alfred Marshall writes: 9 " In accordance with a suggestion made by Daniel Bernoulli, we may perhaps suppose that the satisfaction which a person derives from his income may be regarded as beginning when he has enough to support life and after- wards as increasing by equal amounts with every equal successive percentage that is added to his income; and vice versa for loss of income." l0 The general principle is embodied in Bentham's utili- tarian reasoning which has been widely accepted. 11 The possibility of formulating the relation between feeling and its external cause is further supported by Fechner's investigations. This branch of Probabilities also obtains support from another part of the science, the calculation sanctioned by Laplace, of the disutility incident to error of measurement. a Altogether it seems impossible to deny that some simple mathematical operations prescribed by the calculus of probabilities are sometimes serviceably employed to estimate prospective benefit in the subjective sense of desirable feeling.

20. Single Cases and " Series." — Analogous to the question regard- ing the standard of belief which arose under a former head, a question regarding the standard of action arises under the head of expectation. The former question, it may be observed, arises chiefly with respect to events which are considered as singular, not forming part of a series. There is no doubt, there is a full belief, that if we go on tossing (unloaded) dice the event which consists of obtaining either a five or a six will occur in approximately 33-3% of the trials. The important question is what is or should be our state of mind with regard to the result of a trial which is sui generis and not to be repeated, like the choice of a casket in the Merchant

of Venice." A similar difficulty is presented by singular events, with respect to volition. Is the chance of one to a thousand of the prize £1000 at a lottery approximately equivalent to £1 in the eyes of a person who for once, and once only, has the offer of such a stake ? The question is separable from one with which it is often confounded, the one discussed in the last paragraph what is the " moral " value of the prize ? The person might be a millionaire for whom £1 and £1000 both belong to the category of small change. The stake and the prize might both be " moral." The better opinion seems that apart from a system of transactions like that in which an insurance company undertakes, or at least a " cross-series " u of the kind which seem largely to operate in ordinary life, expectations in which the risks are very different are no longer equateable. So De Morgan with regard to the " single case " (the solitary transaction in question) declares that the " mathematical expectation is not a sufficient approximation to the actual phenomenon of the mind when benefits depend upon very small probabilities; even when the fortune of the player forms no part of the consideration " 16 [without making allow- ance for the difference between " moral " and mathematical pro- babilities]. So Condorcet, " If one considers a single man and a single event there can be no kind of equality " 16 (between expecta- tions with very different risks). It is only for the long run — lorsqu'on embrasse la suite indifinie des evenements — that the rule is valid: To the same effect at greater length the logicians Dr Venn 17 and von Kries. 18 Some of the mathematical writers have much to learn from their logical critics 19 on this and other questions relating to first principles.

Section II. — Calculation of Probability. 21. Object of the Section. — In the following calculations the principal object is to ascertain the number of cases favourable to an event in proportion to the total number of possible cases. 80

9 Principles of Economics, book III., ch. vi. § 6, p. 209, ed. 4.

10 Cf. below, par. 71.

u Some further references bearing on the subject are given in a paper by the present writer on the " Pure Theory of Taxation," No. III. Economic Journ. (1897), vii. 550-551.

12 Below, par. 131.

13 Above, par. 14.

14 Above, par. 5.

15 Article on " Probabilities " (Encyc. Metrop.), § 40.

16 Essai (1785), pp. 142 et seq.

17 Logic of Chance, ch. vi. §§ 24-28.

a Wahrscheinlichkeitsrechnung, pp. 184 seq.

19 The relations of recent logicians to the older mathematical writers on Probabilities may be illustrated by the relations of modern " historical " economists to their more abstract predecessors.

20 Of the two properties which have been found to characterize probability (above, par. 5)— proportionate (1) number of (equally) favourable cases and (2) frequency of observed occurrence — ;the former especially pertain to the data and quaesita of this section.

[METHODS OF CALCULATION

" The difficulty consists in the enumeration of the cases," as Lagrange says. Sometimes summation is the only mathematical operation employed; but very commonly it is necessary to apply the theory of permutations and combinations involving multipli- cation. 1

22. Fundamental Theorem. — One of the simplest problems of this sort is one of the most important. Given a mUange of things con- sisting of two species, if n things are taken at random what is the probability that x out of these n things will be of a certain species ? For example, the melange might be a well-shuffled pack of cards, and the species black and red ; the quaesitum, what is the probability that if n cards are dealt, 5 of them will be black ? There are two varieties of the problem : either after each card is dealt it is returned to the pack, which is reshuffled, or all the n cards are dealt (as in ordinary games of cards) without replacement. The first variety of the problem deserves its place as being not only the simpler, but also the more important, of the two.

23. At the first deal there are 26 cases favourable to black, 26 to red. When two deals have been made (in the manner prescribed), out of 52 2 cases formed by combinations between a card turned up at the first deal and a card turned up at the second, 26X26 cases are combinations of two blacks, 26X26 are combinations of two reds, and the remainder 2(26X26) are made up of combinations between one black and one red; 26X26 cases of black at the first deal and red at the second, and 26X26 cases of red at the first and black at the second deal. The number of cases favourable to

each alternative is evidently given by the several terms in the expansion of (26-I-26) 2 . The corresponding probabilities are given by dividing each term by the total number of cases, viz. 52 2 . Similarly, when we go on to a third deal, the respective probabilities of the three possible cases, three blacks, two blacks and one red, two reds and one black, three blacks, are given by the successive terms in the binomial expansion of (26+26) 3 , and so on. The reasoning is quite general. Thus for the event which consists of dealing either clubs or spades (black) we might substitute an event of which the probability at a single trial is not 5, e.g. dealing hearts. Generally, if p and 1 —p are the respective probabilities of the event occurring or not occurring at a single trial, the respective probabilities that in n trials the event will occur n times, n— I times . . . twice, once or not at all, are given by the successive terms in the expansion of [p + (i — p)] n ; of which

expansion the general term is •

to!

p-(i-p)”-‘.

the ” Multinomial Theorem ‘■• gives the rule when there are more than two alternatives at each trial. For instance, if there are three alternatives, hearts, diamonds or a card belonging to a black suit, the probability that if n cards are dealt there will occur x hearts, t diamonds, and n—s — t cards which are either clubs or spades is*

n\ (i\ • / 1\ ‘ /i\ “- 8 –

sHl(n-s-t)l W W W

27. Applications of Fundamental Theorem. — The peculiar interest of the problem which is here placed first is that its solution represents a law of almost universal application : the law assigning the frequency with which different values assumed by a quantity, like most of the quantities with which statistics has to do, depends upon several independent agencies. It is remarkable that the problem in pro- babilities which historically was almost the first belongs to the kind which is first in interest. Of this character is a question which occupied Galileo and before him Cardan, and an even earlier writer : what are the chances that, when two or three dice are thrown, the sum of the points or pips turned up should amount to a certain number ? A particular case of this problem is presented by the old game of ” passedix ” : what is the probability that if three dice are thrown the sum of the pips should exceed ten ? 7 The answer is obtained by considering the number of combinations that are favour- able to each of the different

alternatives, 18 pips, 17, 16 …. II pips, which make up the event in question. Thus out of the total of 216 (6 3) combinations, one is favourable to 18, three to 17, and so on. There are twenty-five chances, as we may call the permutations, in favour of 12, twenty-seven in favour of II. 8 The sum of all these being 108, we have for the event in question 108/216, an even chance. More generally it may be inquired: what is the probability that, if n dice are thrown, the number of points turned up will be exactly x ? By an extension of the reasoning which was employed in the first problem it is seen that the required probability is that of which the index is x in the expansion of the expression

[©'©■ ©'©' ©• + ©•];

The calculation may be simplified by writing this expression in the form

xl(n-x)!

24. The probability may also be calculated as follows. Taking for example the case in which the event consists of dealing hearts; consider any particular arrangement of the » cards, of which x are hearts, e.g. the arrangement in which the x cards first dealt are hearts and the following n —s all belong to other suits. The probability of the first x cards being all hearts is (i) s ; the probability that none of the last (n—s) cards are hearts is (f)"""._ Hence the probability of that particular arrangement occurring is (i) ! (f)"~. But this arrangement is but one of many, e.g. that in which the x hearts are the last dealt, which are equally likely to occur. There are as many different arrangements of this type as there are combina- tions of n things taken together x times, that is nl/sKn— s)l The probability thus calculated agrees with the preceding result.*

25. It follows from the law of expansion for [p + (l — p)] n that as n is increased, the value of the fractions which form the terms at either extremity diminishes. When n becomes very large, the terms which are in the neighbourhood of the greatest term of the expansion overbalance the sum total of the remaining terms. 2 Thus in the example above given, if we go on and on dealing cards (with replacement) the ratio of the red cards dealt to all the cards dealt tends to become more and more nearly approximate to the limit J. These statements are comprised in the theorem known as James Bernoulli's. Stated in its simplest form — that " in the long run all events will tend to occur with a relative frequency proportional to their objective probabilities " 3 — this theorem has been regarded as tautological or circular. Yet the proofs of the theorem which have been given by great mathematicians may deserve attention as at least showing the consistency of first principles. 4 Moreover, as usually stated, James Bernoulli's imports something more than the first axiom of probabilities. 6

26. The generalization of the Binomial Theorem which is called

1 Cf. Bertrand's distinction between " Probability totales," and " Probability composees," Calcul des probability's, ch. ii. arts.

2 3. 2 4-

2 Cf. Todhunter, History . . . of Probability, p. 360, and other statements of James Bernoulli's Theorem, referred to in the index.

3 Venn, op. cit. p. 91.

4 Some of these proofs are adduced, and a new and elegant one added by Bertrand, op. cit. ch. v.

' When the degree in which a certain range of central terms tends to preponderate over the residue of the series is formulated with precision, as in the statement given by Todhunter (op. cit. p. 548) when he is interpreting Laplace, then James Bernoulli's theorem presents a particular case of the law of error — the case considered below in par. 103.

©•[■-OTt'-i]"

The successive terms of the expansion give the respective probabilities that the number in question should be », m+i … 6k comprising all the possible numbers among which x is presumably included (otherwise the answer is zero). Of course we are not limited to six alternatives; instead of a die we may have a teetotum with any number of sides. The series expressing the probabilities of the different sums can be written out in general terms, as Laplace and others have done ; but it seems to be of less interest than the approxi- mate formula which will be given later. 9

28. Variant of the Fundamental Theorem. — The second variety of our first problem may next be considered. Suppose that after each trial the card dealt (ball drawn, &c.) is not replaced in statu quo ante. For instance, if r cards are dealt in the ordinary way from a shuffled pack, what is the probability that x of them will be hearts (x

13. 12. • • • ji3-(x-i)| ■ 39.38. ■ • • (39-r-x-i)

52.51. •• • (52-(x-i)}. l52-xjl52-(x. + i)j • • • \52-(r-i))'

Now consider any other arrangement of the r cards, e.g. t of the x hearts to occur first and the remaining s — t last. The denominator in the above expression will remain the same ; and in the numerator only the order of the factors will be altered. The probability of the second arrangement is

therefore the same as that of the first ; and the probability that some one or other of the arrangements will occur is given by multiplying the probability of any one arrangement and the number of different arrangements, which, as in the simpler case of the problem, 10 is the same as the number of combinations formed by r things taken'together x times, that is r[image] (r — s) !. The formula thus obtained may be generalized by substituting n for

"See Chrystal, Algebra, ch. xxiii. § 12; or other textbook of algebra.

7 See Todhunter, History . . . of Probability, art. 8 ; Bertrand, Calcul des probability, p. vii., or the original documents.

8 As Galileo discerned. A friend of his had observed that 1 1 occurred 1080 times to 1000 times of 12.

9 The law of error given below, par. 104.

10 Above, par. 24.

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52, pn for 13, qn for 39 (where p + q = l; pn and qn are integers). A formula thus generalized is proposed by Professor Karl Pearson 1 as proper to represent the frequency with which different values are assumed by a quantity depending on causes which are not independent.

29. Miscellaneous Examples: Games of Chance. — The majority of the problems under this heading cannot, like the preceding two, be regarded as conducing directly to statistical methods which are required in investigating some parts of nature. They are at best elegant exercises in a kind of mathematical reasoning which is required in most of such methods. Games of chance present some of the best examples. We may begin with one of the oldest, the problem which the Chevalier de Mere put to Pascal when he ques- tioned : How many times must a pair of dice be thrown in order that it may be an even chance that double six — the event called sonnez — may occur at least once? 2 The answer may be obtained by finding a general expression for the probability that the event will occur at least once in n trials ; and then determining n so that this expres- sion = J. The probability of the event occurring is the difference between unity and the probability of its failing. Now the proba- bility of ' ' sonnez ' ' failing at a single throw (of two dice) is 25 There- fore the probability of its failing in n throws is (~%) • Whence we

obtain, to determine n, the equation 1

‘(MY

= }, which gives

n = 24-605 nearly.

30. In the preceding problem the quaesitum was (unity minus) the probability that out of all the possible events an assigned one (” sonnez “) should fail to occur in the course of n trials. In the following problem the quaesitum is the probability that out of all the possible events one or other should fail — that they should not all be represented in the course of n trials. A die being thrown n times, what is the probability that all three of the following events will not be represented (that one or other of the three will not occur at least once) ; viz. (a) either ace or deuce turning up, (6) either 3 or 4, (c) either 5 or 6. The number of cases in which one at least of these events fails to occur is equal to the number of cases in which (a) fails, plus the number in which (b) fails, plus the number in which (<;) fails, minus the number of cases in which two of the events fail concurrently (which cases without this subtraction would be counted twice). 3 Now the number of cases in which (a) fails to occur in the

course of the n trials is(-) of all the possible cases numbering 3”.

Like propositions are true of (b) and ©. The number of cases in

which both (a) and (b) fail is (-) of the total ; 4 and the like is true

of the cases in which both (a) and © fail and the cases in which both (6) and © fail. Accordingly the probability that one at least of the events will fail to occur in the course of n trials is

»©■-»©”•

31. One more step is required by the following problem: If n cards are dealt from a pack, each card after it has been dealt being returned to the pack, which is then reshuffled, what is the probability that one or other of the four suits will not be represented? The probability that hearts will fail to occur in the course of the n deals

is (3 1 ; and the like is true of the three other suits. From the sum

of these probabilities is to be subtracted the sum of the probabilities that there will be concurrent failures of any two suits ; but from this subtrahend are to be subtracted the proportional number of cases in which there are

concurrent failures of any three suits (otherwise cases such as that in which e.g. hearts, diamonds and clubs con- currently failed 6 would not be represented at all). Now the pro- bability of any assigned two suits failing is f -I ; the probability of

any assigned three suits failing is (-1 . Accordingly the required probability is

The analogy of the Binomial Theorem supplies the clue to the solu- tion of the general problem of which the following is an example.

1 Trans. Roy. Soc. (1895). See below, par. 165.

- *Todhunter, History . . . of Probability, and Bertrand, Calcul its probabilites, p. 9.*
- *All three events cannot fail.*

4 (e) occurring » times.

6 The reasoning may be illustrated by using the area of a circle to represent the frequency with which hearts fail, another (equal) circle for diamonds ; for the case in which both hearts and diamonds fail the area common to the circles interlapping, and so on.

If a die is thrown n times the probability that every face will have turned up at least once is 6

i-«®- + i5(J)— a o(|)- + i5(D—6(|)-.

32. If in the (first) problem stated in paragraph 31 the cards are dealt in the ordinary way (without replacement), we must substitute

22 33 39-(“-i).

for

the continued product

52‘5i ’” 52-(»-i)’

for

©’

*the continued product rr’TT ‘ ‘ ‘ rr — tz — ~1> and so on. 5 2 o l 5 2 v 1 *■)*

33. Still considering miscellaneous examples relating to games of chance let us inquire what is the probability that at whist each of the ; two parties should have two honours? 7 If the turned-up card is an honour, the probability that of the three other honours an assigned one is among the twenty-five which are in the hands of the dealer or his partner, while the remaining two honours are in*

25 26 25

the hands of the other party, is =7, — , -• But the assigned card*

a 1 5° 49 may with equal probability be any one of three honours; and accordingly the above written probability is to be multiplied by 3. If the turned-up card is not an honour then the probability that an assigned pair of honours is in the hands of the dealer or his partner, while the remaining two honours are in the hands of their adver-

. 2S 24 26 2^ .

saries, is r^ • r^ ■ — • -s ; this probability is to be multiplied by six, as

the assigned pair may be any of the six binary combinations formed by the four honours. Now the probability of the alternative first

considered — the turned-up card being an honour — is £-; and

Accordingly the required

probability is

*A. v 25_^.25 fo^ 252426 2^^*

13 6 51 50 49 T I3 51 50 49 48 833

34. The probability that each of the four players should have an honour may be calculated thus. 3 If the card turned up is an honour then ipso facto the dealer has one honour and the probability that the remaining players have each an assigned one of the three remaining

honours, is -rj • -2 • -2. Which probability is to be multiplied by 3 1,

as there are that number of ways in which the three cards may be assigned. If the card turned up is not an honour the probability

J-2 J-I Jl J2

that each player has an assigned honour is rf • -r: • — • rs- Which*

51 50 49 40

the

probability of the second alternative, ˆ

probability is to be multiplied by 4!. probability is

Accordingly the required

li ,1 -3 3 ” I 9 , I2-13 3 _ 6.13 3 13 3 ‘5i-50-49″ r i3 4 ‘48.5i.5o_49 5i-5°-49 (the chance not being affected by the character of the card turned up).

35. The probability of all the trumps being held by the dealer is

— . — . . -or — 4 , which being calculated by means of

51 50 41 40 52! B

tables for (logarithms of) factorials 9 or directly, 10 is 158,753,389,000.

36. There is a set of dominoes which goes from double blank to double nine (each domino presenting either a combination — which occurs only once — of two digits, or a repetition of the same digit). What is the probability that a domino drawn from the set will prove to be one assigned beforehand? The probability is the reciprocal of the number of dominoes: which is 10X9/2 (the number of com- binations of different digits) + 10 (the number of doubles) =55.

37. Choice and Chance. — When we leave the sphere of games of chance and frame questions relating to ordinary life there is a danger of assuming distributions of probability which are far from probable. For example, let this be the question. The House of Commons formerly consisting of 489 English members, 60 Scottish and 103 Irish, what was the probability that a committee of three members should represent the three nationalities? An assumption of indiffer- ence where it does not exist is involved in the answer that the required probability is the ratio of the number of favourable triplets, viz. 489 X 60 X 103 to the total number of triplets, viz. 652 X651 X 650X3! A similar absence of selection is postulated by the ordinary treatment of a question like the following. There being j candidates

• See Whitworth, Exercises in Choice and Chance, No. 502 (p. 125); referring to prop. xiv. of the same author’s Choice and Chance.

7 Cf. Whitworth, Choice and Chance, question 143, p. 183, ed. 4.

« Ibid.

3 There is such a table at the end of De Morgan's article in the Calculus of Probabilities in the Ency. Brit. " Pure Sciences," vol. ii.

10 Cancelling factors common to the numerator and denominator.

at an examination and r optional subjects from which each candidate chooses one (r>s), what is the probability that no two candidates should choose the same subject? If the candidates be arranged in any order, the probability that the second candidate should not choose the same subject as the first candidate is (re — i)/n. The pro- bability that the third candidate will not choose either of the two subjects taken by the aforesaid candidates is (re — 2)/re, and so on. Thus the required probability is

n(n — i) (n—2)...{n — (s—i)\/n 3 .

38. When as in these cases the interest of the problem lies chiefly in the application of the theory of combinations, or permutations, there is a propriety in Whitworth's enunciation of the questions under the head of choice rather than chance. It comes to the same whether we say that there are x ways in which an event may happen, or that the probability of its happening in an assigned one of those ways is i/x. For example, suppose that there are n couples waltzing at a ball; if the names of the men are arranged in alphabetical order, what is the probability that the names of their partners will also be in alphabetical order? The probability that the man who is first in alphabetical order should have for partner the lady who is first in that order is i/rc. The probability that the man who is second alphabetical order should have for partner the lady who is second in thatx>rder is i/(n-i), and so on. Therefore the required proba- bility is l/»!. Or it may be easier to say that the number of ways, each consisting of a set of couples in which the party can be arranged, is n!; of which only one is favourable.

39. The same principle governs the following question. For how many days can a family of 10 continue to sit down to dinner in a different order each day ; it not being indifferent who sits at the head of the table — what is the absolute, as well as the relative, position of the members? The number of

permutations, viz. 10!, is the answer. If we are to attend to the relative position only — as would be natural if the question related to 10 children turning round a fly- pole — the number of different arrangements would be only 9!

40. Method of Equations in Finite Differences. — The last question may serve to introduce a method which Laplace has applied with great eclat to problems in probabilities. Let y n be the number of ways in which n men can take their places at a round table, without respect to their absolute position; and consider how the number will be increased by introducing an additional man. From every particular arrangement of the original n men can now be obtained n different arrangements of the rc + 1 men (since the additional man may sit between any two of the party of n). Hence y„ + i=rey„, an equation of differences of which the solution is C (re — 1)! The con- stant may be determined by considering the case in which n is 2.

41. The following example is not quite so simple. If a coin is thrown n times, what is the chance that head occurs at least twice running? Calling each sequence of n throws a " case," consider the number of cases in which head never occurs twice running; let tin be this number, then 2″ — k„ must be the number of cases when head occurs at least twice successively. Consider the value of Wn+j; if the last or (re+2)th throw be tail, Un+t includes all the cases (ttn+i) of the n + i preceding throws which gave no succession of heads; and if the last be head the last but one must be tail, and these two may be preceded by any one of the u n favourable cases for the first n throws. Consequently,

«» + 2=«n+l+ Wo- lf o, (3 are the roots of the quadratic x 2 — x — 1=0, this equation gives l

w„ = Aa"+B/3"-

Here A and B are easily found from the conditions Wi = 2, % = 3; viz.

A— 2-,,B

a – 0′ /3 – o'

whence «.-! + » j i+IS±g» 5 + &c. } .

The probability that head never turns up twice running is found by dividing this by 2", the whole number of cases. This probability, of course, becomes smaller and smaller as the number of trials (re) is increased. This is a particular case of a more general problem solved by Laplace 2 as to the occurrence i times running of an event of which the probability at one trial is p.

42. In such problems where we now employ the calculus of finite difference Laplace employed his method of generating functions. A distinguished instance is afforded by the problem of points which was put by the Chevalier de Mere to Pascal and has exercised genera- tions of mathematicians. It is thus stated by Laplace. 3 Two players of equal skill have staked equal sums; the stakes to belong to the player who shall have won a certain number of games. Suppose they agree to leave off playing when one player, A, wants x " points " (games to be won) in order to complete the assigned number, while the second player wants x' points: how ought they

to divide the stakes? This is a question in Expectation, but its difficulty consists in determining the probability that one of the players, say A, shall win the stakes. Let that probability be y x ,x'. Then, after the next game, if A has won, the probability of his win- ning the stakes will be y x \,x'. But if A loses, B winning, the proba bility will be y x ,x'-i. But these alternatives are equally likely. Accordingly the probability of A winning the stakes may be written

iVx-i, x'+bW-i- This is the same probability as that which was before written y x ,x'. Equating the two expressions we have, for the function y, an equation of finite difference involving two variables, of which the solution is 4

.,!„< T 1 x 1 , x{x+i) 1 , , x(x+i) • ■ • (x+x f -2) 1) y~?~ 5 1 r ~"t — — a+ -I x.„ . . . <■„/, \ "^F=i i .

1 Cf . Boole's Finite Differences, ch. vii. § 5.

2 Op. cit. liv. II. ch. ii., No. 12.

3 Op. tit. liv. II. ch. ii., No. 8.

*1-2 ■ • • (x' — i) 2**

43. The problem of points is to be distinguished from another classical problem, relating to a contest in which the winner has not simply to win a certain number of games, but to win a certain number of counters from his opponent. 6 Space does not admit even the enunciation of other complicated problems to which Laplace has applied the method of generating functions.

44. Probability of Causes Deduced from Observed Events. — Problems relating to the probability of alternative causes, deduced from observed effects, are usually placed in the separate category of " inverse " probability, though, as above remarked, 6 they do not necessarily involve

different principles. The difference principally consists in the need of evidence, other than that which is afforded by the observed event, as to the probability of the alternative causes existing and operating. The following is an example free from the difficulty incident to unverified a priori probabilities, which commonly besets this kind of problem. A digit having been taken at random from, mathematical tables (or the expansion of an endless constant such as x) ; a second digit is obtained by taking from a random succession cf digits one that added to the first digit makes a sum greater than 9. Given a result thus formed, what are the respective probabilities that the second digit should have been o, 1, 2, ... 8 or 9? In the long run the first digit assumes with equal frequency the values o, I, 2 … 8, 9. Accordingly the second digit can never be o. There is only one chance of its being I , namely when the first digit is 9 If the second digit is 2, and the first either 8 or 9, the observed effect will be produced. And so on. If the second digit is 9, the effect may occur in nine ways. Accordingly in the long run of pairs thus formed it will occur that the cases or causes which are defined by the circumstances that the second digit is o, 1, 2, ... 8, 9, respectively, will occur with frequencies in the following ratios 0:1 : 2 … 8 : 9. The probability of the observed event having been caused by a particular (second) digit, e.g. 7, is

7/(0 + 1+2 + . . +9) =7/45.

45. The following example taken from Laplace ' is of a more familiar type. An urn is known to contain three balls made up of white and black balls in some unknown proportion. From this urn a ball is extracted m times (being each time replaced after extraction). If a white ball is drawn every time, what are the respective proba- bilities that the number of white balls in the urn are 3, 2, 1 or o? By parity of reasoning it appears that in the first case the result is certain, its probability 1, in the second case the probability of the observed event occurring is (I)™, in the third case that probability is (l) m , in the fourth case zero. Accordingly the respective inverse probabilities are in the ratios

1 :(!)" : a-) m :o; provided that (as in the preceding example, with respect to the second digits) the alternative causes, the four possible constitutions of the urn, are (a priori) equally probable. This is rather a bold assump- tion with respect to the contents of concrete urns 8 and similar group- ings; but with regard to things in general may perhaps be justified on the principle of cross-series. 9

46. Often in the investigation of causes we are not thrown back on unverified a priori probabilities. We have some specific evidence though of a very rough character. An example has been cited from Mill in a preceding paragraph. 10 Against the improbabilities cal- culated by the

methods of the present section there has often to be balanced an improbability evidenced by common sense, which does not admit of mathematical calculation. Bertrand u puts the follow- ing case. _ The manager of a gambling house has purchased a roulette table which is found to give red 5300 times, black 4700 times, out of 10,000 trials. The purchaser claims an indemnity from the maker. What can the calculus tell us as to the justice of the claim? Nothing

4 A clear and corrected version of Laplace's reasoning is given by Todhunter, History. . . of Probability , art. 973, p. 528, with reference to the more general cases in which the " skills " of each party — their chances of winning a single game — are not equal but respect- ively p and q (p--q = i). See also Czuber, Wahrscheinlichkeits- theorie, pp. 30 seq.

s See Todhunter, op. cit. art. 107, and other articles referring to duration of play. See also Boole, Finite Differences, ch. xiv., art. 7, ex, 6.

6 Above, par. 13. 7 Op. cit. liv. II. ch. i. No. 1.

8 Cf. Bertrand, op. cit. § 118. 9 Above, par. 5.

10 Par. 13. « Op. cit. § 134.

precise, yet something worth knowing. The a priori improbability of the maker's inaccuracy must be very great to overcome the im- probability of such an event occurring by chance if the machine is accurately made (accuracy being denned, say, by the condition that the ratio of red to [red f white] would prove to be in the in- definitely long run of trials between 0-499 and 0-501). The odds against the so denned event occurring are found to be some millions to one. 1

47. The difficulty recurs in more practical problems: for instance, certain symptoms having been observed, to find the probability that they are produced by a particular disease. Such concrete applica- tions of probabilities are often open to the sort of objections which have been urged against the classical use of the calculus to determine the probability that witnesses are true, or judges just.

48. Probability of Testimony. — The application of probabilities to testimony proceeds upon two assumptions: (1) that to each witness there

pertains a coefficient of probability representing the average frequency with which he speaks the truth or untruth, (2) that the statements of witnesses are independent in the sense proper to proba bilities. Thus if two witnesses concur in making a statement which must be either true or false, their agreement is a circumstance which is only to be accounted for by one of two alternatives: either that they are both speaking the truth, or both false. If the average truthfulness — the credibility — of one witness is p, that of the other p\ then the probabilities of the two alternative explanations are to each other in the ratio pp' : (1 —p) (1 —p') ; the probability that the statement is true is Pp'i{pp'h(l —p)(i—p')\ So far no account is taken of the a priori probability of the statement. This evidence may be treated as an independent witness. Thus, if a person whose credibility is p asserts that he has seen at whist a hand consisting entirely of trumps dealt from a well-shuffled pack of cards, there are two alternative explanations of his assertion, with probabilities in the ratio

£Xo-ooo,ooo,ooo,o063: (1 —p) X 0-999,999,999,993. The truthfulness of the witness must be very great to outweigh the a priori improbability of the fact. 2 These formulae are easily extended to the case of three or more witnesses. The probability of a statement made by three witnesses of respective credibilities P, P', P' is

PP'P",\PP'P' + {I -p) (I -p') (I -p")}. For r witnesses we have

Pi Pi- ■ -PrllPl t>2. ■ -Pr+(I -Pi) (I -pi) . . . (I -A)).

Dividing both the numerator and the denominator by p\pt . . .p„ we see that the probability of the statement increases with the number of the witnesses, provided that for every witness (1 —p)jp is a proper fraction, and accordingly p> J. As an example of several witnesses, let us inquire how many witnesses to a fact such as a hand at whist consisting entirely of trumps would be required in order to make it an even chance that the fact occurred, supposing the credibility of each witness to be ^. Let x be the required num- ber of witnesses. We have the 1/(1 -Mi) 1 0-000,000,000,006) = J, or * log = 12 '2. Whence, if x is 13, it is more than an even chance that the statement is true.*

49. When an event may occur in two or more ways equally probable a priori, the formulae show that the probability of the state- ment will depend on the credibility of the witnesses; and accordingly the explicit consideration of a priori probabilities may, as in our first instance, be omitted. One who reports the number of a ticket obtained at a lottery ordinarily makes a statement against which there is no a priori improbability ; but if the number is one which had

been predicted, there is an a priori improbability —that an assigned

ticket should be drawn out of a melange of n tickets. Similar reason- ing is applicable to the probability that the decisions of judgments, the verdict of juries, is right.

*50. The assumptions upon which all this reasonihg is based are open to serious criticisms. The postulated independence of wit- nesses and judges is frequently not realized. The revolutionary tribunal which condemned Condorcet was affected by an identity of illusions and passions which that mathematician had not taken into account when he calculated " that the probability of a decision being conformable to truth will increase indefinitely as the number of voters is increased." **

51. The use of coefficients based on the average truthfulness or justice of each witness and judge involves the neglect of par- ticulars which ought to influence our estimate of probability, such as the consistency of a witness's statements and the relation of the case to the interests, prejudices and capacities of the witness or the judge.' Thus even in so simple a case as the alleged occurrence of

1 By a calculation based on the fundamental theorem (above, par. 23; cf. below, par. 103).

1 But see below, par. 51.

- *Morgan Crofton, loc. cit. p. 778, par. 1.*

'Essai, p. 6 (there is postulated a proviso analogous to that which has been stated in par. 49 above, with reference to witnesses : that the probability of any one voter being right is> J).

"See Mill's forcible remarks 'on this use of probabilities, which

an extraordinary hand at whist, the " truthfulness " of the witness in the general sense of the term may not adequately represent his liability to have made a mistake about the shuffling. 6 A neglect of particulars, however, is sometimes practised with success in the applications of statistics (insurance, for instance). Perhaps there are broad results and general rules to which the mathematical theory may be applicable. Perhaps the laborious researches of Poisson on the " probability of judgments " are not, as they have been called by an eminent mathematician, absolument rien. 7 More than mathematical interest may attach to Laplace's investigation of a rule appropriate to cases like the following. An event (suppose the death of a certain person) must have proceeded from one of n causes A, B, C, &c, and a tribunal has to pronounce on which is the most probable. Professor

Morgan Crofton's original proof of Laplace's rule is here reproduced. 8

52. Let each member of the tribunal arrange the causes in the order of their probability according to his judgment, after weighing the evidence. To compare the presumption thus afforded by any one judge in favour of a specified cause with that afforded by the other judges, we must assign a value to the probability of the cause derived solely from its being, say, the rth on his list. As he is supposed to be unable to pronounce any closer to the truth than to say (suppose) H is more likely than D, D more likely than L, &c, the probability of any cause will be the average value of all those which that probability can have, given simply that it always occupies the same place on the list of the probabilities arranged in order of magnitude. As the sum of the n probabilities is always I, the question reduces to this: —

Any whole (such as the number 1) is divided at random into » parts, and the parts are arranged in the order of their magnitude — least, second, third, . . . greatest; this is repeated for the same whole a great number of times; required the mean value of the least, of the second, &c, parts, up to that of the greatest.

A P

Let the whole in question be represented by a line AB = a, and let it be divided at random into n parts by taking » — 1 points indiscriminately on it. Let the required mean values be

X10, X 2

N = o»-«. <•

The sum of the least parts, in every case, will be

S l = NXia = X 1 a". Let a small increment, B6 = 5a, be added on to the line AB at the end B; the increase in this sum is 5Si = »X 1 a n_1 Sa. But, in dividing the new line At, either the n — l points all fall on AB as before, or n— 2 fall on AB and 1 on Bb (the cases where 2 or more fall on Bb are so few we may neglect them). If all fall on AB, the least part is always the same as before except when it is the last, at the end B of the line, and then it is greater than before by &a; as it falls last in n _1 of the whole number of trials, the increase in Si is re _1 a" _I 5a. But if one point of division falls on Bb, the number of new cases introduced is (» — i)a"""" i Ja; but, the least part being now an infinitesimal, the sum Si is not affected; we have therefore &Si = ri\ia n ~ 1 8a = n~ 1 a n ~ 1 5a; ..X 1 =n 2 . To find X2, reasoning exactly in the same way, we find that where one point falls on Bb and n — 2 on AB, as the least part is infinitesimal, the second least

part is the least of the » — I parts made by the « — 2 points; consequently, if we put Xi' for the value of Xi when there are n — 1 parts only, instead of n, SS 3 =ffX 2 a»- 1 «a = »- a n-1 So-r-(«- l)a n_2 Xi'a5a, .:n\i = n~ l + (n — i)Xi'; but \ = (n — 1)-*; .'. nX 2 = n~ l + (n — 1) _1 . In the same way we can show generally that n\ = n~ l + (» — 1) XV-i ; and thus the required mean value of the rth part is*

X,a = an- 1 {»~ 1 +(»-i)^ + (»-2)- 1 + ■ -.■ (n-r+i)' 1 }.

he places among the " misapplications of the calculus which have made it the real opprobrium of mathematics " (Logic, Book III, ch. xviii. § 3). Cf. Bertrand, Calcul des probability's; Venn, Logic of Chance, ch. xvi. § 5-7; v. Kries, Princtpien der Wahrscheinlich- keitsrechnung, ch. ix., preface, § v., and ch. xiii. §§ 12, 13; Laplace's general reflections on this matter seem more valuable than his calculations: " Tant de passions et d'interfits particuliers y mfilent si souvent leur influence qu'il est impossible de soumettre au calcul cette probability," op. cit. Introduction (Des Choix et decisions des assemblSes).

6 As to the possibility of mistake in this respect, see Proctor, How to play Whist, p. 121.

7 Bertrand, loc. cit,

8 Loc- cit. I 43.

Thus each judge implicitly assigns the probabilities

1, 1 (I 4. L\ ,l(l+ l 4. L\ , n 2 ' n \n n — 1/ ' n \n "■" n — 1 ' n — 2/ '

to the causes as they stand on his list, beginning from the lowest. The values assigned for the probability of each alternative cause may be treated as so many equally authoritative observations representing a quantity which it is required to determine. Accord- ing to a general rule given below 1 the observations are to be added and divided by their number; but here if we are concerned only with the relative magnitudes of the probabilities in favour of each alternative it suffices to compare the sums of the observations. We thus arrive at Laplace's rule. Add the numbers found on the different lists for the cause A, for the cause B, and so on; that cause which has the greatest sum is the most probable.

53. Probability of Future Effects deduced from Causes. — Another class of problems which it is usual to place in a separate category are those which require that, having ascended from an observed event to probable causes, we should descend to the probability of collateral effects. But no new principle is involved in such problems. The reason may be illustrated by the following modifi- cation of the problem about digits which was above set 2 to illustrate the method of deducing the probability of alternative causes. What is the probability that if to the second digit which contributed to the effect there described there is added a third digit taken at random, the sum of the second and third will be greater than 10 (or any other assigned figure)? The probabilities — the a posteriori probabilities derived from the observed event (that the sum of the first and second digit exceeds 9) — each multiplied by 45, of the alternatives constituted by the different values o, I, 2, . . . 8, 9 of the second figure are written in the fiist of the subjoined rows.

0123456789 0012345678

o o 2 6 12 20 30 42 56 72 Below each of these probabilities is written the probability, X 10 that if the corresponding cause existed the effect under consideration would result. The product of the two probabilities pertaining to each alternative way of producing the event gives the probability of the event occurring in that way. The sum of these products which are written in the third row divided by 45X10, viz. t=f s , is the required probability. It may be expected that actual trial would verify this result.

54. " Rule of Succession." — One case of inferred future effects, sometimes called the " rule of succession," claims special notice as having been thought to furnish a test for the cogency of induction. A white ball has besn extracted (with replacement after extraction) n times from an immense number of black and white balls mixed in some unknown proportion; what is the probability that at the (n + i)th trial a white ball will be drawn? It is assumed that each constitution of the mttange 3 formed by the proportion of white balls (the probability of drawing a white ball), say p, is a priori as likely to have any one value as another of the series

Ap,2Ap,5Ap, . . . 1— 2Ap, i — Ap, 1. Whence a posteriori the probability of any particular value of p as the cause of the observed recurrence is p n l~Zp n , where p in the denominator receives every value from Apto I. The probability that this cause, if it exists, will produce the effect in question, the extraction of a white ball at the (n + l)th trial, is p. The probability of the event, obtained by summing the probabilities of all the different ways in which it may occur, is accordingly Xp n+l IXp n , where p both in the numerator and the denominator is to receive all possible values between a p and 1 . In the limit we have

j^dp/pfdp = (n + 1) / (» +2) .

In particular if n = i, the probability that an event which has been observed once will recur on a second trial is f. These results are perhaps not so absurd as they have seemed to some critics, when the principle of " cross-series ' 4 is taken into account. Among authorities who seem to attach importance to the rule of succession, in addition to the classical writers on Probabilities, may be men- tioned Lotze 6 and Karl Pearson. 6

Section III. — Calculation of Expectation. 55. Analogues of Preceding Problems. — -This section presents problems analogous to the preceding. If n balls are extracted

from an urn containing black and white balls mixed up in the proportions p: (l—p), each ball being replaced after extraction, the expected number of white balls in the set of n is by definition np. 7 ft may be instructive to verify the consistency of first prin- ciples by demonstrating this axiomatic proposition. 8 Consider the respective probabilities that in the series of n trials there will occur no white balls, exactly one white ball, exactly two white balls, and so on, as shown in the following scheme : —

No. of white)

balls

Corresponding)

probability.)

(i-£)"

w-

«!

(jl-2)l2!

2,

*(.I-P)"-*P**

P"

1 Below, pars. 135, 136. A difficulty raised by Cournot with respect to the determination of several quantities which are con- nected by an equation does not here arise. The system of values determined for the several causes fulfils by construction the con- dition that the sum of the values should be

equal to unity.

1 Above, par. 44.

- *It comes to the same to suppose the total number of balls in the mixture to be N; and to assume that the number of white balls is a priori equally likely to have any one of the values 1,2,. . . N-i, N.*

*4 Above, par. 5. * Logic, bk. ii. ch. ix. § 5.*

*• Grammar of Science, ch. iv. § 16. Cf. the article in Mind above referred to, ix. 234. *

To calculate the expectation of white balls it is proper to multiply 1 by the probability that exactly one white ball will occur, 2 by the probability of two white balls, and so on. We have thus for the required expectation

+ {n ^\ r ^ -p)-r + --- + »ir

*= np [(i~p)”- 1 + (.n-i)(.i-p)«-*p + .. .*

+ (n _ (^) – l)1 (i-P)”^ 1

ˆl

=np[(i-p)+p]*- 1 =np.

The expectation in the case where the balls are not replaced — riot similarly axiomatic— may be found by approximative formulae. 8

56. Games of Chance. — With reference to the topic which occurred next under the head of probabilities, a distinction must be drawn between the number of trials which make it an even chance that all the faces of a die will not have turned up at least once, and the number of trials which are made on an average before that event occurs. We may pass from the probability to expectation in such cases by means of the following theorem. If i is the number oi trials in which on an average success (such as turning up every face of a die at least once) is obtained, then s = i+fi+%+. . . ; Where f, denotes the probability of failing in the first r trials. For the required expectation is equal to I X probability of succeeding at the first trial + 2 X probability of succeeding at the second trial +&c. Now the probability of succeeding at the first trial is 1 — ii ; the probability of succeeding at the second trial (after failing at the first) is- /i(i— /»); the probability of succeeding at the third trial is similarly / 2 (i — / 8) ; and so on. Substituting these values for the expression for the expectation, we have the proposition which was to be proved. In the proposed problem

/-«®-‘ 5®-Xa6(j)-.5@-+6g-)

Assigning to n in each of these terms, every value from I to 00 we have 6-|/(l — 1). =3 > f° r the sum of the first set, with corre- sponding expressions for the sets formed from the following terms. Whence s = i +30-30 + 20- 1 #+f = 14-7. By parity of reasoning it is proved that on an average 7$H cards 10 must be dealt before at least one card of every suit has turned up. u

57. Dominoes are taken at random (with replacement after each extraction) from the set of the kind described in a preceding paragraph. 12 What is the difference (irrespectiye of sign) to be expected between the two numbers on each domino? The digit 9, according as it is combined with itself, or any smaller digit, gives the sum of differences

0+1 + 2+. .. + 9-

The digit 8 combined with itself or any smaller digit gives the sum of differences + 1+2+ ... +8 and so on. The sum of the differences is 2 Jr. r + i, where r has every integer value

from 1 to 9 inclusive, = ■ ‘ , , =165. And the number

*2*3*

of, the differences is 10 + 9 + 8 + . . . + 2 + 1 = 55. There- fore the required expectation is 165/55=3.

58. Digits taken at Random. — The last question is to be distin- guished from the following. What is the difference (irrespective of sign) between two digits, taken at random from mathematical tables, or the expansion of an endless constant like 7r? The com- binations of different digits will now occur twice as often as the repetitions of the same digit. The sum of the differences may now be obtained from the consideration that the sum of the positive differences must be equal to sum of the negative differences when the null differences are distributed equally between the positive and the negative set. The sum of the positive set is, a s before,

7 See the introductory remarks headed ” Descriptionand Division of the Subject.”

8 Cf . above, par. 25.

9 See Pearson, Phil. Trans. (1895), A.

10 Whitworth, Exercises, No. 502.

11 Ibid. No. 504, cf. above, par. 29. 4 u Ibid. par. 36.

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3»5

165. But the denominator of this numerator is not the same as before, but less by half the number of null differences, that is 5. We thus obtain for the required expectation 165/50 = 3 3.

59. A simple verification o f this prediction may thus be ob- tained. In a table of logarithms note any two digits so situated as to afford no presumption of close correlation; for instance, in the last place of the logarithm of 10009 the digit 7 and in the last place of the logarithm of 10019 the digit 4, and take the difference between these two, viz. 3, irrespective of sign. Proceed similarly with the similarly situated pair which form the last places of the logarithms of 10020 and 10039; for which the difference is I, and 50 on. The mean of the differences thus found ought to

be approxi- mately 3-3. Experimenting thus on the last digits of logarithms, in Hutton's tables extending to seven places, from the logarithm of 10009 to the logarithm of 10909, the writer has found for the mean of 250 differences, 3-2.

60. Points taken at Random. — By parity of reasoning it may be shown that if two different milestones are taken at random on a road n miles long (there being a stone at the starting-point) their average distance apart is J(»+2).

61. If instead of finite differences as in the last two problems the intervals between the numbers or degrees which may be selected are indefinitely small, we have the theorem that the mean distance between two points taken at random on a finite straight line is a third of the length of that straight line.

62. The fortuitous division of a straight line is happily employed by Professor Morgan Crofton to exhibit Laplace's method of deter- „ mining the worth of several candidates by combining Rules for t ˆ e votes of electors. There is a close relation between fifedto's ˆis method and the method above given for deter-

" ' mining the probabilities of several alternatives by combining the judgments of different judges. 1 But there is this difference — that the several estimates of worth, unlike those of probability, are not subject to the condition that their sum should be equal to a constant quantity (unity). The quaesita are now ex- pectations, not probabilities. Professor Morgan Crofton's version 2 of the argument is as follows. Suppose there are n candidates for an office ; each elector is to arrange them in what he believes to be the order of merit ; and we have first to find the numerical value of the, merit he thus implicitly attributes to each candidate. Fixing on some limit a as the maximum of merit, n arbitrary values less than a are taken and then arranged in order of magnitude— least, second, third, . . . greatest ; to find the mean value of each

Take a line AB = a, and set off n arbitrary lengths AX, AY, AZ . . . beginning at A; that is, n points are taken at random in AB„ Now the mean values of AZ, XY, YZ, . . . are all equal; for if a new point P be taken at random, it is equally likely to be 1st, 2nd, 3rd, &c, in order beginning from A, because out of rc+l points the chance of an assigned one being 1st is (w-|-l) -1 ;of its being 2nd (n + 1) -1 ; and so on. But the chance of P being 1st is equal to the mean value of AX divided by AB; of its being 2nd M(XY)-x-AB; and so on. Hence the mean value of AX is AB (n + i)-'; that of AY is 2AB (n + 1)- 1 ; and so on. Thus the mean merit assigned to the several candidates is

ain + i)- 1 , 2a(n + l)~ 1 , 3o(» + l) 1 . . .no(n)-l)" 1 .

Thus the relative merits may be estimated by writing under the names of the candidates the numbers 1, 2, 3, . . . n. The same being done by each elector, the probability will be in favour of the candidate who has the greatest sum.

Practically it is to be feared that this plan would not succeed, because, as Laplace observes, not only are electors swayed by many considerations independent of the merit of the candidates, but they would often place low down in their list any candidate whom they judged a formidable competitor to the one they preferred, thus giving an unfair advantage to candidates of mediocre merit.

63. This objection is less appropriate to competitive examinations, to which the method may seem applicable. But there is a more fundamental objection in this case, if not indeed in every case, to the reasoning on which the method rests: viz. that there is sup- posed an a priori distribution of values which is in general not supposable; viz. that the several estimates of worth, the marks given to different candidates by the same examiner, are likely to cover evenly the whole of the tract between the minimum and maximum, e.g. between o and 100. Experience, fortified by theory, shows that very generally such estimates are not thus indifferently disposed, but rather in an order which will presently be described as the normal law of error. 3 The theorem governing the case would therefore seem to be not that which is applied by Laplace and Morgan Crofton, but that which has been investigated by Karl Pearson, 4 a theorem which does not lend itself so readily to the purpose in hand. 6

1 Above, par. 52. 2 Loc. cit. § 45.

3 See Edgeworth, " Elements of Chance in Examinations," Journ. Stat. Soc. (1890). Cf. below, par. 124.

4 Biometrika, i. 390.

6 Moore, of Columbia University, New York, has attempted to

64. Expectation of Advantage.— The general examples of ex pectation which have been given may be supplemented by some appropriate to that special use of the term which Laplace has sanc- tioned when he considers the subject of expectation as a " good "; in particular money, or that for the sake of which money is desired, "moral " advantage, in more modern phrase utility or satisfaction.

65. Pecuniary Advantage. — The most important calculations of pecuniary expectation relate to annuities and insurance; based largely on life tables from which the expectation of life itself, as well as of money value at the end, or at any period, of life is predicted. The reader is referred to these heads for practical exemplifications of the calculus. It must suffice here to point out how the calcula- tions are facilitated by the adoption of a law of frequency, the Gompertz or the Gompertz-Makeham law, which on the one hand can hardly be ranked with hypotheses resting on a vera causa, yet on the other hand is not purely empirical, but is recommended, as germane to the subject-matter, by colourable suppositions. 6

66. There is space here only for one or two simple examples of money as the subject of expectation. Two persons A and B throw a die alternately, A beginning, with the understanding that the one who first throws an ace is to receive a prize of £1. What are their respective expectations? 7 The chance that the prize should be won at the first throw is |, the chance that it should be won at the second throw is f \ ; at the third throw (Jj) s J, at the fourth throw (J) 3 J, and so on. Accordingly the expectation of A

=£iXJ{i+(l) 2 +(f) 4 +.. .J;

expectation of B

-£iXH|i + «)»+(|)«+. • .1.

Thus A's expectation is to B's as 1 : f. But their expectations must together amount to £1. Therefore A's expectation is ^ of a pouud, B's ^ T .

67. There are n tickets in a bag, numbered i,.2, 3, . . . n. A man draws two tickets at once, and is to receive a number of sovereigns equal to the product of the numbers drawn. What is his expectation? 8 It is the number of pounds divided by an improper fraction of which the denominator is the number of possible products, \n(n — 1), and the numerator is the sum of all possible products = i{(I +2+3 . . . + n) 2 — (i 2 + 2 2 + . . . +n(. Whence the required number (of pounds) is found to be ^(»4-i) (31+2). The result may be contrasted with what it would be if the two tickets were not to be drawn at once, but the second after replacement of the first. On this supposition the expectation in respect of one of the tickets separately is 4(n-(i). Therefore, as the two events are now independent, the expectation of the pro duct, 9 being the product of the expectations, is j |(n + i)} 2 .

68. Peter throws three coins, Paul two. The one who obtains the greater number of heads wins £1. If the number of heads are equal, they play again, and so on, until one or other obtains a greater number of heads.

What are their respective expectations? 10 At the first trial there are three alternatives: (o) Peter obtains more heads than Paul, (ff) an equal number, (7) fewer. The cases in favour of a are (1) Peter obtains three heads, (2) Peter, two heads, while Paul one or none, (3) Peter one head, Paul none. The cases in favour of /3 are (1) two heads for both, or (2) one head, or (3) none, for both. The remaining case favours 7.' The probability of o is i +f}+li = i. The probability of is |i+fl+H=A- The probability of 7 is 1 — }jj =iV Alternative /S is to be split up into three a', /3', 7', of which the probabilities (when (3 has occurred) are as before, T \, ft, ˆ 6 . /3′ is similarly split up, and so on. Thus Peter's expectation is T j{i-r- A +(&) + • • •)£* =A£i- Paul's expectation is ˆ£1.*

An urn contains m balls marked 1, 2, 3, . . . m. Paul extracts successively the m balls, under an agreement to give Peter a shilling every time that a ball comes out in its proper order. What is Peter's expectation? The expectation with respect to any one

ball is — , and therefore the expectation with respect to all is

1 (shilling). 11

69. Advantage subjectively estimated. — Elaborate calculations are paradoxically employed by Laplace and other mathematicians to determine the expectation of subjective advantage in various cases of risk. The calculation is based on Daniel Bernoulli's formula which may be written thus: If x denote a man's physical fortune, and y the corresponding moral fortune

*y = k log (x/h), k, h being constants, x and y are always positive, and *> ft; for every*

trace Karl Pearson's theory in the statistics relating to th« efficiency of wages (Economic Journal, Dec. 1907; and Journ. Stat. Soc, Dec. 1907).

6 Cf. below, par. 169.

7 Whitworth, Choice and Chance, question 126.

8 Whitworth, Exercises, No. 567.

9 According to the principle above enounced, par. 15. 14 Bertrand, id. § 44, prob. xlvii. 11 Bertrandi id. § 39, prob. xliii. It is not to be objected that

the probabilities on which the several expectations are calculated are not independent (above, par. 16).

man must possess some fortune, or its equivalent, in order to live. To estimate now the value of a moral expectation. Suppose a person whose fortune is a to have the chance p of obtaining a sum a, q of obtaining /3, r of obtaining y, &c, and let

$p+q+r+ \ldots =1$, only one of the events being possible. Now his moral expectation from the first chance — that is, the increment of his moral fortune multiplied by the chance — is

pk\og 2-j-^-log |[=pk log (a+a)-pk log a.

Hence his whole moral expectation is J

$E^*=kp \log (a+a)+kq \log(a+p) +kr \log\{a+y) + \ldots$ — k log a; and, if Y stands for his moral fortune including this expectation, that is, k log (aj k) + E, we have

Y = kp \og(a+a)+kq log(a+(3) + . . . -k log h. To find X, the physical fortune corresponding to this moral one, we have Y = k log X — k log h.

Hence X = (a+a)P(a+0)

and X— a will be the actual or physical increase of fortune which is of the same value to him as his expectation, and which he may reasonably accept in lieu of it. The mathematical value of the same expectation is 2

pa+qP+ry+. . •

70. Gambling and Insurance. — These formulae are employed, often with the aid of refined mathematical theorems, to demonstrate received propositions of great practical importance: that in general gambling is disadvantageous, insurance beneficial, and that in speculative operations it is better to subdivide risks — not to " have all your eggs in one basket."

71. These propositions may be deduced by the use of a formula which perhaps keeps closer to the facts: viz. that utility or satis- faction is a function of material goods not definitely ascertainable, defined only by the conditions that the function continually in- creases with the increase of the variable, but at a continually decreasing rate (and some additional

postulate as to the lower limit of the variable), say y = "(x) is negative; and \//(x) is never less, x is always greater than zero. Suppose a gambler whose (physical) fortune is a, to have the chance p of obtaining a sum a and the chance q{ = I — p) of losing the sum 0. If the game is fair in the usual sense of the term pa = q{). Accordingly the prospective psychical advantage of the party is £(a + a) + g(a-/3) = N'(a + a)-r-#{a-(/ > / g)a}, say y a . When a is zero the expression reduces to the first state of the man, ˆ(a), say y«. To compare this state with what it becomes by the gambling transaction, let a receive continually small increments of Aa. When a is zero the first differential coefficient of (ya—y), viz. ' M'(a.) — p*

viz. p4i"{&)-—— ˆ"(a), is negative, since by hypothesis ˆ" is con- tinually negative. And as o continues to increase from zero,the second

P 2 P

differential coefficient of (ya — y), viz. ˆ"(a + a) + W"'(a + £a),

continues to be negative. Therefore the increments received by the first differential coefficient of (ya—y) are continually negative; and therefore (ya— y) is continually negative; ya

72. To show the advantage of insurance, let us suppose with Morgan Crofton 6 that a merchant, whose fortune is represented by 1, will realize a sum e if a certain vessel arrives safely. Let the probability of this be p. To make up exactly for the risk run by the insurance company, he should pay them a sum (i—p)t. If he does, his moral fortune becomes, according to the formula now proposed ˆ(1 + / > «), since his physical fortune is increased by the secured sum «, minus the payment (l—p)e; while if he does not insure it will be p4f(i + e) + (i — p)i//(i). We have then to compare +g (1). Now instead of exposing the lump sum e to a single risk, let him subdivide e into n equal parts, each exposed to an inde- pendent equal risk (q) of being lost. As n is made larger 6 it be- comes more and more nearly a certainty that he will realize pe out of the total e exposed to risk. Therefore his condition (in respect of the sort of advantage which is under consideration) will be approxi- mately T//(i + pe). Then we have to compare \f/ (i + pt), say yi, with pnf/(i--t)-{-qyj/ (1), say yi. By reasoning analogous to that which has been above employed — observing that (p—p 2) ˆ(l) is negative for all possible values of p — we conclude that yt*

73. The Petersburg Problem. — The doctrine of " moral fortune " was first formulated by Daniel Bernoulli 7 with reference to their celebrated " Petersburg Problem," which is thus stated by Tod- hunter 8 : " A throws a coin in the air: if head appears at the first throw he is to receive a shilling

from B, if head does not appear until the second throw he is to receive 2s., if head does not appear until the third throw he is to receive 4s., and so on, required the expectation of A." So many lessons are presented by this problem that there has been room for disputing what is the lesson. Laplace and other high authorities follow Daniel Bernoulli. Poisson finds the explanation in the fact that B could not be expected to pay up so large a sum. Whitworth, who regards the disadvantage of gambling as consisting mainly in the danger of becoming " cleaned out, ' 9 finds this moral in the Petersburg problem. All have not noticed what some regard as the principal lesson to be obtained from the paradox : viz. that a transaction which cannot be regarded as one of a series — at least a " cross-series " 10 — is not subject to the general rule for expectations of advantage whether material or moral. 11

Section IV '.—Geometrical Applications.

74. Under this head occur some interesting illustrations of principles employed in the preceding sections ; in particular of a priori probabilities and of the relation between probability and expectation.

75. Illustrations of a priori Probabilities. — The assumption 1 which has been made under preceding heads that the probability of certain alternatives is approximately equal appears to rest on evi- dence of much the same character as the assumption which is made under this head that one point in a line, plane or volume is as likely to occur as another, under certain circumstances. Thus consider the proposition : if a given area S is included within a given area A, the chance of a point P, taken at random on A, falling on S is S/A. In a great variety of circumstances such a size can be assigned to the spaces, and " taking at random " can be so defined that the proposition is more or less directly based on experience. The fact that the points of incidence are equally distributed in space is observed, or connected by inference with observation, in many cases, e.g. raindrops and molecules. There is a solid substratum of evidence for the premiss employed in the solution of problems like the following: On a chess-board, on which the side of every square is o, there is thrown a coin of diameter b(b

76. Random Lines. — Speculative difficulties recur when we have to define a straight line taken at random in a plane; for instance, in the following problem proposed by Buffon. 13

A floor is ruled with equidistant parallel lines; a rod, shorter than the distance between each pair, being thrown at random on the floor, to find the chance of its falling on one of the lines. The problem is usually solved as follows : —

Let x be the distance of the centre of the rod from the nearest line, 8 the inclination of the rod to a perpendicular to the parallels, 2a the common distance of the parallels, 2c the length of rod ; then, as all values of x and between their extreme limits are equally probable, the whole number of cases will be represented by

dxdd = m.

6 See above, par. 25 (James Bernoulli's theorem). "Specimen theoriae novae de mensura sortis (16), translated (into German) with notes by Pringsheim (1906).

8 Op. cit. art. 389.

9 Choice and Chance, pp. 211, 232. The danger of a party to a game of chance being ruined " (by losing more than his whole fortune), which forms a separate chapter in some treatises, is readily deducible from the theory of deviations from an average which will be stated in pt. ii.

10 Above, par. 5. n Above, par. 20.

12 Whitworth, Exercises, No. 500.

13 Cf . Morgan Crofton, loc. cit.

Now if the rod crosses one of the lines we must have c>x/cos 0; so that the favourable cases will be measured by

Of

J-v/2 JO

'c cos

dx = 2C.

by Legendre's theorem on rectification, N being the measure of the number of lines,

N

= \ 21, pda = l

Thus the probability required is /> = 2c/«i.

It may be asked — why should we take the centre of the rod as the point where distance from the nearest line has all its values equally probable? Why not one extremity of the line, or some other point suited to the circumstances of projection? Fortunately it makes no difference in the result to what point in the rod we assign this pre-eminence.

77. The legitimacy of the assumption obtains some verification from the success of a test suggested by Laplace. If a rod is actually thrown, as supposed in the problem, a great number of times, and the frequency with which it falls on one of the parallels is observed, that proportionate number thus found, say p, furnishes a value for the constant ir. For r ought to equal 2c/pa. The experiment has been made by Professor Wolf of Frankfort. Having thrown a needle of length 36 mm. on a plane ruled with parallel lines at a distance from each other of 45 mm. 5000 times, he observed that the needle crossed a parallel 2532 times. Whence the value of 7r is deduced 3-1596, with a probable error 1 =t -05.

78. More hesitation may be felt when we have to define a random chord of a circle, 2 for instance, with reference to the question, what is the probability that a chord taken at random will be greater than the side of an equilateral triangle? For some purposes it would no doubt be proper to assume that the chord is con- structed by taking any point on the circumference and joining it to another point on the circumference, the points from which one is taken at random being distributed at equal intervals around the circumference. On this understanding the probability in question would be J. But in other connexions, for instance, if the chord is obtained by the intersection with the circle of a rod thrown in random fashion, it seems preferable to consider the chord as a case of a straight line falling at random on a plane. Morgan Crofton 3 himself gives the following definition of such a line: If an infinite number of straight lines be drawn at random in a plane, there will be as many parallel to any given direction as to any other, all directions being equally probable; also those having any given direction will be disposed with equal frequency all over the plane. Hence, if a line be determined by the co-ordinates p, a, the perpendicular on it from a fixed origin O, and the inclination of that perpendicular to a fixed axis, then, if p, u be made to vary by equal infinitesimal increments, the series of lines so given will represent the entire series of random straight lines. Thus the number of lines for which p falls between p and p--dp, and a between 01 and w+dw, will be measured by dpdo>, and the integral ffdpdu, between any limits, measures the number of lines within those limits.

79. Authoritative and useful as this definition is, it is not en- tirely free from difficulty. It amounts to this, that if we write the equation of the random line

x cos a--y sin a—p = o, we ought to take o and p as those variables, of which, the equi- crescent values are equally probable — the equiprobable variables, as we may say. But might we not also write the equation in either of the following forms

(1) x/a+yfb — 1=0,

*(2) 0*4-631 — 1=0,*

and take a and b in either system as the equiprobable variables? To be sure, if the equal distribution of probabilities is extended to infinity we shall be landed in the absurdity that of the random lines passing through any point on the axis of y a proportion differ- ing infinitesimally from unity — 100% — are either (1) parallel or (2) perpendicular to the axis of x. But the admission of infinite values will render any scheme for the equal distribution of proba- bilities absurd. If Professor Crofton's constant p, for example, becomes infinite, the origin being thus placed at an infinite distance, all the random chords intersecting a finite circle would be parallel! 80. However this may be, Professor Crofton's conception has the distinction of leading to a series of interesting propositions, of which specimens are here subjoined. 4 The number of random lines which meet any closed convex contour of length L is measured by L. For, taking inside the contour, and integrating first for p, from o to p, the perpendicular on the tangent to the contour, we havefpdw; taking this through four right angles for u, we have

1 As recorded by Czuber, Geometrische Wahrscheinlichkeiten, p. 90.

2 Cf. Bertrand, Calcvl des probability, pp. 4 seq. The matter has been much discussed in the Educational Times. See Mathematical Questions . . . from the Educational Times [a reprint], xxix. 17-20, containing references to earlier discussions, e.g. x. 33 (by Woolhouse).

8 Loc. cit. § 75.

4 The whole of p. 787 of Morgan Crofton's article is often referred to, and parts of pp. 786, 788 are transferred here.

Fig. 1.

Thus, if a random line meet a given contour, of length L, the chance of its meeting another convex contour, of length /, internal to the former is p =

l/L. If the given contour be not convex, or not closed, N will evidently be the length of an endless string, drawn tight around the contour.

81. If a random line meet a closed convex contour of length L, the chance of it meeting another such contour, ex- ternal to the former, is p = (X— Y)/L, where X is the length of an endless band enveloping both contours, and crossing between them, and Y that of a band also enveloping both, but not crossing. _ This may be shown by means of Legen- dre's integral above; or as follows : —

Call, for shortness, N(A) the number of lines meeting an area A; N(A, A') the number which meet both A and A'; then (fig. 1) N(SROQPH) +N(S'Q'OR'P'H') = N(SROQPH+S'Q'OR'P'H')

+N(SROQPH, S'Q'OR'P'H'),

*since in the first member each line meeting both areas is counted twice. But the number of lines meeting the non-convex figure consisting of OQPHSR and OQ'S'H'P'R' is equal to the band Y, and the number meeting both these areas is identical with that of those meeting the given areas Q, Q' ; henc^, X = Y + N(0, a'). Thus the number meeting both the given ar^as is measured by X— Y. Hence the theorem follows. *

82. Two random chords cross a given convex boundary, of length L, and area Q; to find the chance that their intersection falls inside the boundary.

Consider the first chord in any position; let C be its length; considering it as a closed area, the chance of the second chord meeting it is 2C/L ; and the whole chance of its coordinates falling in dp, do> and of the second chord meeting it in that position is

2C dpda 2 „ , ,

]JdpT z l p

But the whole chance is the sum of these chances for all its positions; . • . prob. =2h~ Jl JfCdpda. Now, for a given value of w, the value of [Cdp is evidently the area U; then, taking to from ■ to o, we have*

required probability = 27r£)L -2 . The mean value of a chord drawn at random'across the boundary

M

JfCdpdu jjdpdu

= L'

83. A straight band of breadth c being'traced on a floor, and a circle of radius r thrown on it at random; to find the mean area of the band which is covered by the circle. (The cases are omitted where the circle falls outside the band.) 6

If S be the space covered, the chance of a random point on the circle falling on the band is £ = M(S)/»r 2 , this is the same as

5 This result also follows by considering that, if an infinite plane be covered by an infinity of lines drawn at random, it is evident that the number of these which meet a given finite straight line is proportional to its length, and is the same whatever be its position. Hence, if we take / the length of the line as the measure of this number, the number of random lines which cut any element ds of the contour is measured by ds, and the number which meet the con- tour is therefore measured by JL, half the length of the boundary. If we take 2/ as the measure for the line, the measure for the contour will be L, as above. Of course we have to remember that each line must meet the contour twice. It would be possible to rectify any closed curve by means of this principle. Suppose it traced on the surface of a circular disk, of circumference L, and the disk thrown a great number of times on a system of parallel lines, whose distance asunder equals the diameter, if we count the number of cases in which the closed curve meets one of the parallels, the ratio of this number to the whole number of trials will be ultimately the ratio of the circumference of the curve to that of the circle. [Morgan Crofton's note.]

6 Or the floor may be supposed painted with parallel bands, at a distance asunder equal to the diameter; so that the circle must fall on one.

Fig. 2.

if the circle were fixed, and the band thrown on it at random. Now let A (fig. 2) be a position of the random point; the favourable cases are when HK, the bisector of the band, meets a circle, centre A, radius \c\ and the whole number are when HK meets a circle, centre O, radius r--\c; hence the probability is

*2t • \c f_*

p 2*{r + \c) 2r + c

This is constant for all positions of A ; hence, equating these two values of p, the mean value required is M(S) = c(2r--c)~ 1 irr i .

The mean value of the portion of the circumference which falls on the band is the same fraction cj(2r+c) of the whole circumference.

If any convex area whose surface is 12 and circumference L be thrown on the band, instead of a circle, the mean area covered is

M(S)=irc(L+irc)- 1 n. For as before, fixing the random point at A, the chance of a random point in H falling on the band is p = 2ir . ic/L', where L' is the perimeter of a parallel curve to L, at a normal distance ic from it. Now

L' = L+27r.|c.

• M(S) _ T c

fl L+TC

84. Buffon's problem may be easily deduced in a similar manner. Thus, if 2r = length of line, = distance between the parallels, and we conceive a circle (fig. 3) of diameter a with its centre at the middle of the line, 1 rigidly attached to the latter, and thrown with it on the parallels, this circle must meet one of the parallels; if it be thrown an infinite number of times we shall thus have an infinite number of chords crossing it at random. Their number is measured by 2?r.ja, and the number which meet

2r is measured by 4r. Hence the chance that the line 2r meets one of the parallels is p = ˆrjira.

85. To investigate the probability that the inclination of the line joining any two points in a given convex area £2 shall lie within

given limits. We give here a method of reducing this question to calculation, for the sake of an integral to which it leads, and which is not easy to deduce otherwise.

First let one of the points A (fig. 4) be fixed; draw through it a chord PQ = C, at an inclination 6 to some fixed line; put AP = r, AQ = r'; then the number of cases for which the direction of the line joining A and B lies between and d --dd is measured by \{r 2 +r' 2)dd. Now let A range over the space between PQ and a parallel chord distant dp from it, the number of cases for which A lies in this space and the direction of AB from 8 to 6--

dB is (first consider- ing A to lie in the element drdp)

hdpdef (r+r'*)dr = iC*dpde.*

Let p be the perpendicular on C from a given origin O, and let u be the inclination of p (we may put da for d9), C will be a given function of p, a; and, integrating first for w constant, the whole number of cases for which u falls between given limits a',

Fig. 3.

i£' dufcidp;

Fig. 5.

Fig. 6.

the integral fC 3 dp being taken for all positions of C between two tangents to the boundary parallel to PQ. The question is thus reduced to the evaluation of this double integral, which, of course, is generally difficult enough; we may, however, deduce from it a remarkable result; for, if the integral iffCHpdw be extended to all possible positions of C, it gives the whole number of pairs of positions of the points A, B which lie inside the area; but this number is H 8 ; hence

JfCUpdw = $P,

the integration extending to all possible positions of the chord C, — its length being a given function of its co-ordinates p. u. 2

1 The line might be anywhere within the circle without altering the question.

- *This integral was given by Morgan Crofton in the Comptes rendus (1869), p. 1469. An analytical proof was given by Serret, Annates scient. de I'ecole normale (1869), p. 177.*

Cor. Hence if L, a be the perimeter and area of any closed convex contour, the mean value of the cube of a chord drawn across it at random

is 3fl 2 /L.

86. Let there be any two convex boun- daries (fig. 5) so related that a tangent at any point V to the inner cuts off a constant segment S from the outer (e.g. two concentric similar ellipses) ; let the annular area between them be called A ; from a ppint X taken at random on this annulus draw tangents XA, XB to the inner. The mean value of the arc AB, M(AB) =

LS/A, L being the whole length of the inner curve ABV.

The following lemma will first be proved : —

If there be any convex arc AB (fig. 6), and if Ni be (the measur of) the number of random lines which meet it once, N 2 the number which meet it twice,*

2 arc AB = Ni+2N 2 .

For draw the chord AB; the number of lines meeting the convex figure so formed is Ni +N2 = arc +chord (the perimeter) ; but N 1 = number of lines meeting the chord = 2 chord;

.'. 2 arc + Ni = 2N2 + 2N2, .'. 2 arc = N1+2N2.

Now fix the point X, in fig. 5, and draw XA, XB. If a random line cross the boundary L, and pi be the probability that it meets the arc AB once, p2 that it does so twice,

2AB/L = p 1 +2p 2 ; and if the point X range all over the annulus, and pi, p 2 are the same probabilities for all positions of X,

2M(AB)/L=A+2£2..

Let now IK (fig. 7) be any position of the random line; drawing tangents at I, K, _ FlG. 7-

it is easy to see that it will cut the arc AB twice when X is in the space marked a, and once when X is in either space marked /S; hence, for this position of the line, pi+2p2 = 2(a+())/A = 2S/A, which is constant; hence M(AB)/L = S/A.

Hence the mean value of the arc is the same fraction of the peri- meter that the constant area S is of the annulus.

If L be not related as above to the outer boundary, M(AB)/L = M(S)/A, M(S) being the mean area of the segment cut off by a tangent at a random point on the perimeter L.

The above result may be expressed as an integral. If s be the arc AB included by tangents from any point (x, y) on the annulus,

JJsdxdy = LS.

It has been shown {Phil. Trans., 1868, p. 191) that, if 9 be the angle between the tangents XA, XB,

Jfedxdy = tt (A -2S).

The mean value of the tangent XA or XB may be shown to be M(XA) = SP/2A, where P = perimeter of locus of centre of gravity of the segment S.

87. When we go on to species of three dimensions further specu- lative difficulties occur. How is a random line through a given point to be defined ? Since it is usual to define a vector by two angles (viz. the angle made with the axis X by a vector r in the plane XY, and 6 (or }»■ — 6) the angle made by the vector p with r in the plane containing both p and r and the axis Z) it seems natural to treat the angles and 6 as the equiprobable variables. In other words, if we take at random any meridian on the celestial globe and combine it with any right ascension the vector joining the centre to the point thus assigned is a random line. 3 It is possible that for some purposes this conception may be appropriate. For many purposes surely it is proper to assume a more symmetrical distribu- . tion of the terminal points on the surface of a sphere, a distribution such that each element of the surface shall contain an approxi- mately equal number of points. Such an assumption is usually made in the kinetic theory of molecules with respect to the direction of the line joining the centres of two colliding spheres in a " mole- cular chaos." 4 It is safe to say with Czuber, " No discussion can remove indeterminateness." Let us hope with him that " though this branch of probability can for the present claim only a theoretic interest, in the future it will perhaps also lead to practical results. " 6

88. Illustrations of probability and expectation. — The close relation between probability and expectation is well illustrated by geo- metrical examples. As above stated, when a given space 5 is included within a given space A, if p is the probability that a point

8 Cf. Bertrand, op. cit. § 135.

4 See e.g. Watson, Kinetic Theory of Gases, p. 2 ; Tait, Trans. Roy. Soc., Edin. (1888), xxxiii. 68.

5 Wahrscheinlichkeitstheorie, p. 64.

P, taken at random on A, falling on S, p — S/A. If now the space S be

variable, and M(S) be its mean value f> = M(S)/A. For, if we suppose S to have n equally probable values Si, S 2 , S» . . •, the chance of any one Si being taken, and of P falling On Si, is

£, =ra-iS,/A;

now the whole probability p = pi+p?+p3 + . . . , which leads at once to the above expression. The chance of two points falling on S is, in the same way,

£ = M(S 2)/A 2 , and so on.

In such a case, if the probability be known, the mean value follows, and vice versa. Thus, we might find the mean value of the nth power of the distance XY between two points taken at random in a line of length /, by considering the chance that, if n more points are so taken, they shall all fall between X and Y. This chance is

M(XY)"//» = 2(m + i)- 1 (»+2)- 1 ; for the chance that X shall be one of the extreme points, out of the whole (n+2), is 2(«+2) _1 ; and, if it is, the chance that the other extreme point is Y is (»+i) -1 . Therefore

M(XY)»=2i»(M + i)- 1 (»+2)- 1 . A line I is divided into n segments by n — I points taken at ran- dom ; to find the mean value of the product of the n segments. Let a, b, c, . . . be the segments in one particular case. If n new points are taken at random in the line, the chance that one falls on each segment is

1.2.3 . . . nabc . . . jl n ; hence the chance that this occurs, however the line is divided, is

n>/-»M(a6c . . .). Now the whole number of different orders in which the whole 2» — I points may occur is (2n — i)l; out of these the number in which one of the first series falls between every two of the second is easily found by the theory of permutations to be «!(» — 1)!. Hence the required mean value of the product is

M(abc.

■>~(2n-i)V■

89. Additional examples of the relation between probability and expectation appear in the following series of propositions : (1) If M be the mean value of any quantity depending on the positions of two points (e.g. their distance) which are taken, one in a space A, the other in a space B (external to A) ; and if M' be the same mean when both points are taken

indiscriminately in the whole space A + B; M„, Mj the same mean when both points are taken in A and both in B respectively ; then

(A+B) 2 M' = 2ABM+A 2 M„ + B 2 M ! ,.

If the space A = B, 4M'=2M + M„+M6; if, also, M„ = M 6 , then 2M' = M + M„.

(2) The mean distance of a point P within a given area from a fixed straight line (which does not meet the area) is evidently the distance of the centre of gravity G of the area from the line. Thus, if A, B are two fixed points on a line outside the area, the mean value of the area of the triangle APB=the triangle AGB. From this it will follow that, if X, Y, Z are three points taken at random in three given spaces on a plane (such that they cannot all be cut by any straight line), the mean value of the area of the triangle XYZ is the triangle GG'G", determined by the three centres cf gravity of the spaces.

(3) This proposition is of use in the solution of the following problem : —

Two points X, Y are taken at random within a triangle. What is the mean area M of the triangle XYC, formed by joining them with one of the angles of the triangle?

Bisect the triangle by the line CD; let Mi be the mean value when both points fall in the triangle ACD, and M 2 the value when one falls in ACD and the other in BCD; then 2M»=Mi + M2. But Mi = JM; and M 2 = GG'C, where G, G' are the centres of gravity of ACD, BCD; hence M 2 = | ABC, and M = j 4 ,ABC.

(4) From this mean value we pass to probabilities. The chance that a new point Z falls on the triangle XYC is £, ; and the chance that three points X, Y, Z taken at random form, with a vertex C, a re-entrant quadrilateral, is J.

90. The calculation of geometrical probability and expectation is much facilitated by the following general principle: If M be a mean value depending on the positions of n points falling on a space A; and if this space receive a small increment a, and M' be the same mean when the n points are taken on A-f-a, and M the same mean when one point falls on a and the remaining n — I on A; then, the sum of all the cases being M'(A +a)", and this sum consisting of the cases (1) when all the points are on A, (2) when one is on o the others on A (as we may neglect all where two or more fall on o), we have

M'(A+o)" = MA'+nMio"" 1 ; .\(M'-M)A = »A(M,-M),

*as M' nearly = M. For example, suppose two points X, Y are taken in a line of length I, to find the mean value M of (XY) n . If / receives an increment dl, IdM = 2dl(Mi — M). Now Mi here = the mean nth power of the distance of a single point taken at random in / from one extremity of I; and this is /"(n+l) * (as is shown by finding the chance of n other points falling on that dis- tance) ; hence*

ldM=2dl{l"(n + i)- 1 -M}; .■JdM+2Mdl = 2(n + i)-H< >dl. or l-Kd.MP = 2(n + i)-H"dl:

:. MP = 2(n+i yyio+W = 2l" +i l(n + 1) (» +2) +C ; .\N=2/»/(ff +i) (n+2), C being evidently o.

91. The corresponding principle for probabilities may thus be stated: If p is the probability of a certain condition being satisfied by the n points within A in art. 90, p' the same probability when they fall on the space A -fa, and p' the same when one point falls on a and the rest on A, then, since the numbers of favourable cases are respectively £'(A+a) n , pA", npiaA"' 1 , we find

(p'-p)A~na(pi~p).

Hence if p' = p then pi=p. For example, . if we have to find the chance of three points within a circle forming ah acute-angled triangle, by adding an infinitesimal concentric ring to the circle, we have evidently p'^p; hence the required chance is unaltered by assuming one of the three points taken on the circumference. Again, in finding the chance that four points within a triangle shall form a convex quadri- lateral; if we add to the triangle a small band between the base and a line parallel to it, the chance is clearly unaltered. Therefore we may take one of the points at random on the base (fig. 8), the others X, Y, Z within the triangle. Now the four lines from the vertex B to the four points are as likely to occur in any speci- fied order as any other. Hence it is an even chance that X, Y, Z fall on one of the triangles ABW, CBW, or that two fall on one of these triangles and the remaining one on the other. Hence the probability of a re-entrant quadrilateral is

hpi+hpt,

where pi = prob. (WXYZ re-entrant), X, Y, Z in one triangle;

pt— do., X in one triangle, Y in the

other, Z in either.

But pi = i. Now to find £ 2 ; the chance of Z falling within the triangle

WXY is the mean area of WXY divided by ABC. Now by par. 89, for any particular position of W, M(WXY) = WGG', where G, G' are the centres of gravity of ABW, CBW. It is easy to see that WGG' = JABC = i, putting ABC = i. Now if Z falls in CBW, the chance of WXYZ re-entrant is 2M(IYW), for Y is as likely to fall in WXZ as Z to fall in WXY; also if Z falls in ABW the chance of WXYZ re-entrant is 2M(IXW). Thus the whole chance is £ 2 = 2M(IYW + IXW) = |. Hence the proba- bility of a re-entrant quadrilateral is

1 i-H s —i

2 JTJ ■ 8 — 3′

That of its being convex is § .

92. From this probability we may pass to the mean value of the area XYZ, if M be this mean, and A the given area, the chance of a fourth point falling on the triangle is M/A; and the chance of a re-entrant quadrilateral is four times this, or 4M/A. This chance has just been shown to be f; and accordingly M = J J jA.

93. The preceding problem is a par- ticular case of a more general problem investigated by Sylvester. For another instance, let the given area A be a circle; within such three points are taken at random; 'and let M be the mean value of the triangle thus formed. Adding a concentric ring a, we have since of the circles, M' = M(A + a)/A.

AMa/A = 3 a(Mi-M); .\M = !Mi, where Mi is the value of M when one of the points is on the cir- cumference. Take O fixed ; we have to find the mean value of OXY (fig. 9). Taking (p, 6) (/, B') as coordinates of X, Y,

M l = (Tra?)-y r fpdpde//'p'dp'd8. (OXY). V M! = (irWY'-ffffW sin {8 - e') B p'dpdp'd6dd'

M'

Fig. 9. M as the areas

■-(■ifia^-KlfflrH'K sin {8-8')d8d9',

39°

PROBABILITY

[AVERAGE

putting r = OH, r' = OK; as r = 20 sin 9, r' = 2a sin 6',

M^tt^f-fof! sm ‘ e sin3ff ‘ sin W-o’Wto’-

_ 1 (20) 6 pi

Professor Sylvester has remarked that this double integral, by means of the theorem

*I ”) * /(. **y)dxdy** = **I ” J** f(a—y, a — x)dxdy,*

is easily shown to be identical with

2 jlf sinV sinV cos B’dBdB’ = i f * sin *6dB = §J^t|t|t-*

301T 407T 2

From this mean value we pass to the probability that four points within a circle shall form a re-entrant figure, viz.

A— 25-

94. The function of expectation in this class of problem appears to afford an additional justification of the position here assigned to this conception 1 as distinguished from an average in the more general sense which is proper to the following Part.

Part II. — Averages and Laws of Error

95. Averages. — An average may be defined as a quantity derived from a given set of quantities by a process such that, if the constituents become all equal, the average will coincide with the constituents, and the constituents not being equal, the average is greater than the least and less than the greatest of the constituents. For example, if Xi, X2, . . . x„ are the constituents, the following expressions form averages (called respect- ively the arithmetic, geometric and harmonic means) : —

*xi + x t -f . . . + *».*

(, X *2 X . . . X *n) J.*

■A(k+i+—^)-

The conditions of an average are likewise satisfied by innumer- able other symmetrical functions, for example: —

*! + *2 2 r ■ • ■ +x„ 2 \i*

P

The conception may be extended from symmetrical to unsym- metrical functions by supposing any one or more of the constitu- ents in the former to be repeated several times. Thus if in the first of the averages above instanced (the arithmetic mean) the constituent x r , occurs / times, the expression is to be modified by putting lx r for x r in the numerator, and in the denominator, for n, n-r-r-i. The definition of an average covers a still wider field. The process employed need not be a junction? One of the most important averages is formed by arranging the con- stituents in the order of magnitude and taking for the average a value which has as many constituents above it as below it, the median. The designation is also extended to that value about which the greatest number of the constituents cluster most closely, the " centre of greatest density," or (with reference to the geometrical representation of the grouping of the constitu- ents) the greatest ordinate, or, as recurring most frequently, the mode.' But to comply with the definition there must be added the condition that the mode does not occur at either extremity of the range between the greatest and the least of the constituents. There should be also in general added a definition of the process by which the mode is derived from the given constituents. 4 Perhaps this specification may be dispensed

1 See introductory remarks and note to par. 95.

2 A great variety of (functional) averages, including those which are best known, are comprehended in the following general form 4>~ l {M[4>(x \), (xi), . . . <£(„)][; ***where 4> is an arbitrary function, ~ 1 is inverse (such that < > "" 1 (4>(:x:)) = a0, M is any (functional) mean. When M denotes the arithmetic mean; if #()*** *= log * (c£ -1 (.x) s= «*) we have the geometric mean; if (ji(x)s^l/x, we have the harmonic mean. Of this whole class of averages it is true that the average of several averages is equal to the average of all their constituents.*

' This convenient term was introduced by Karl Pearson.

- *E.g. some specified method of smoothing the given statistics.*

with when the number of the constituents is indefinitely large. For then it may be presumed that any method of determining the mode will lead to the same result. This presumption pre- supposes that the constituents are quantities of the kind which form the sort of " series " which is proper to Probabilities. 5 A similar presupposition is to be made with respect to the con- stituents of the other averages, so far as they are objects of probabilities.

96. The Law of Error. — Of the propositions respecting average with which Probabilities is concerned the most important are those which deal with the

relation of the average to its con- stituents, and are commonly called " laws of error." Error is defined in popular dictionaries as " deviation from truth " ; and since truth commonly lies in a mean, while measurements are some too large and some too small, the term in scientific diction is extended to deviations of statistics from their average, even when that average — like the mean of human or barometric heights — does not stand for any real objective thing. A " law of error" is a relation between the extent of a deviation and the frequency with which it occurs: for instance, the proposition that if a digit is taken at random from mathematical tables, the difference between that figure and the mean of the whole series (indefinitely prolonged) of figures so obtained, namely, 4-5, will in the long run prove to be equally often = ± = 0-5, = t i-S, ± 2-S, = t 3-S, = t 4-S. 6 The assignment of frequency to discrete values — as o, 1, 2, &c, in the preceding example — is often replaced by a continuous curve with a corresponding equation. The distinc- tion of being the law of error is bestowed on a function which is applicable not merely to one sort of statistics — such as the digits above instanced — but to the great variety of miscellaneous groups, generally at least, if not universally. What form is most deserving of this distinction is not decided by uniform usage; different authorities do not attach the same weight to the different grounds on which the claim is based, namely the extent of cases to which the law may be applicable, the closeness of the application, and the presumption prior to specific experi- ence in favour of the law. The term " the law of error " is here employed to denote (1) a species to which the title belongs by universal usage, (2) a wider class in favour of which there is the same sort of a priori presumption as that which is held to justify the more familiar species. The law of error thus understood forms the subject of the first section below.

97. Laws of Frequency. — What other laws of error may require notice are included in the wider genus " laws of fre- quency," which forms the subject of the second section. Laws of frequency, so far as they belong to the domain of Probabilities, relate much to the same sort of grouped statistics as laws of error, but do not, like them, connote an explicit reference to an average. Thus the sequence of random digits above instanced as affording a law of error, considered without reference to the mean value, presents the law of frequency that one digit occurs as often as another (in the long run). Every law of error is a law of frequency; but the converse is not true. For example, it is a law of frequency — discovered by Professor Pareto 7 — that the number of incomes of different size (above a certain size) is approximately represented by the equation $y = A/x^{\circ}$, where x denotes the size of an income, y the number of incomes of that size. But whether this generalization can be construed as a law of error(in the sense here defined) depends on the nice inquiry whether the point from which the

frequency diminishes as the income x increases can be regarded as a " mode," y diminishing as x decreases from that point.

*6 See above, pt. i., pars. 3 and 4. Accordingly the expected value of the sum of n (similar) constituents (*i-t-*2-K • . + x») may be regarded as an average, the average value of nx, where Xr is any one of the constituents.*

6 See as to the fact and the evidence for it, Venn, Logic of Chance, 3rd ed., pp. in, 114. Cf. Ency. Brit., 8th ed., art "Probability," p. 592; Bertrand, op. cit., preface § ii. ; above, par. 59.

7 See his Cours d'economie politique, ii. 306. Cf. Bowley, Evidence before the Select Committee on Income Tax (1906, No. 365, Question 1 163 seq.); Benini, Metodologica statistica, p. 324, referred to in the Journ. Stat. Soc. (March, 1909).

LAWS OF ERROR]

PROBABILITY

39i

Section I. — The Law of Error. 98. (1) The Normal Law of Error.- — The simplest and best recog- nized statement of the law of error, often called the " normal law," is the equation

VlTC

*more conveniently written (i/Vtc) exp — (x—a) 2 /c i , where x is the magnitude of an observation or " statistic," z is the pro- portional frequency of observations measuring *, a is the arithmetic mean of the group (supposed indefinitely 1 multiplied) of similar statistics: c is a constant sometimes called the " modulus" 8 proper to the group; and the equation signifies that if any large number N of such a group is taken at random, the number of observations between x and x+ Ax is (approximately) equal to the right-hand side of the equation multiplied by Najc. A graphical representation of the corresponding curve — sometimes called the " probability-curve " — is here given (fig. 10), showing the general shape of the curve, and how its dimensions vary with the magnitude of the modulus c. The area being constant (viz. unity), the curve is furled up when c is small, spread out when c is large. There is added a table of integrals, corresponding; to areas subtended by the curve; in a form suited for calculations of probability, the variable, t, being the length of the abscissa referred to (divided by) the modulus. 3 It may be noted that the points of inflexion in the figure are each at a distance from the origin of 1/ V2 modulus, a distance equal to the square foot of the mean square of*

error — often called the " standard deviation." Another notable value of the abscissa is that which divides the area on either side of the origin into two equal parts; commonly called the " probable error." The value of t which corresponds to this point is o 4769. . . .

follows :

A priori proof.

+X

Fig. 10. 99. An a priori proof of this law was given by Herschel 4 as The probability of an error depends solely on its magni- tude and not on its direction;" positive and negative errors are equally probable. " Suppose a ball dropped from a given height with the intention that it should fall on a given mark," errors in all directions are equally probable, and errors in perpendicular directions are independent. Accord- ingly the required law, " which must necessarily be general and apply alike in all cases, since the causes of error are supposed alike unknown," 6 is for one dimension of the form tj > {x 2), for two dimen-

1 On this conception see below, par. 122.

2 E.g. in the article on " Probability " in the 9th ed. of the Ency. Brit. ; also by Airy and other authorities. Bravais, in his article Sur la probabilite des erreurs. ..." Memoires presentes par divers savants " (1846), p. 257, takes as the " modulus or parameter " the Inverse square of our c. Doubtless different parameters are suited to different purposes and contexts; c when we consult the common tables, and in connexion with the operator, as below, par. 160; k(= k c ') when we investigate the formation of the probability-curve out of independent elements (below, par. 104); A(= l/c 2) when we are concerned with weights or precisions (below, par. 134). If one form of the coefficient must be uniformly adhered to, probably,

5 Fuller tables are to be found in many accessible treatises. Burgess's tables in the Trans, of the Edin. Roy. Soc. for 1900 are carried to a high degree of accuracy. Thorndike, in his Mental and Social Measurements, gives, among other useful tables, one referred to the standard deviation as the argument. New tables of the probability integral are given by W. F. Sheppard, Biometrics, ii. 174 seq.

4 Edinburgh Review (1850), xcii. 19.

6 The italics are in the original. The passage continues: " And

sions (x? + f) ; and (« + y 2) = (**) X W ; a functional equation of*

which the solution is the function above written. A reason which satisfied Herschel is entitled to attention, especially if it is endorsed by Thomson and Tait. 6 But it must be confessed that the claim to universality is not, without some strain of inter pretation, 7 to be reconciled with common experience.

2 C T

*Table of the Values of the Integral I=-j— J e~**dx.*

T

I

T

I

T

I

T

I

O'OO

00000

•2

•22270

i-3

■93401

24

•99931

•01

•01 128

■3

■32863

1-4

95229

25

•99959

02

•02256

4

•42839

i-5

•966H

26

•99976

•03

•03384

5

■52050

16

•97635

27

■99986

04

•045 1 1

•6

•60386

17

98379

2-8

•99992

•05

•05637

•7

■67780

1-8

•98909

29

•99996

06

•06762

■8

•742IO

19

99279

30

•99998

07

•07886

9

■7969I

20

99532

00

I 00000

08

•09008

10

•8427O

21

•99702

09

•10128

1 1

■88020

2-2

•99814

•I

•I 1246

1-2

■9I°3I

2-3

•99886

100. There is, however, one class of phenomena to which Herschel's reasoning applies without reservation. In a " molecular chaos," such as the

received kinetic theory of gases postulates, if a molecule be placed at rest at a given point and the distance which it travels from that point in a given time, driven hither and thither by collid- ing molecules, is regarded as an " error," it may be presumed that errors in all directions are equally probable and errors in perpen- dicular directions are independent. It is remarkable that a similar presumption with respect to the velocities of the molecules was employed by Clerk Maxwell, in his first approach to the theory of molecular motion, to establish the law of error in that region.

101. The Laplace-Quetelet Hypotliesis. — That presumption has, indeed, not received general assent ; and the law of error appears to be better rested on a proof which was originated by Laplace. Accord- ing to this view, the normal law of error is a first approximation to the frequency with which different values are apt to be assumed by a variable magnitude dependent on a great number of inde- pendent variables, each of which assumes different values in random fashion over a limited range, according to a law of error, not in general the law, nor in general the same for each variable. The normal law prevails in nature because it often happens — in the world of atoms, in organic and in social life — that things depend on a number of independent agencies. Laplace, indeed, appears to have applied the mathematical principle on which this explana- tion depends only to examples (of the law of error) artificially generated by the process of taking averages. The merit of account- ing for the prevalence of the law in rerum natura belongs rather to Quetelet. He, however, employed too simple a formula 8 for the action of the causes. The hypothesis seems first to have been stated in all its generality both of mathematical theory and statistical exemplification by Glaisher. 9

*102. The validity of the explanation may best be tested by first (A) deducing the law of error from the condition of numerous independent causes; and (B) showing that the law is adequately fulfilled in a variety of concrete cases, in J?' Deauc- which the condition is probably present. The con- **"" trom dition may be supposed to be perfectly fulfilled in games \Z £\, of chance, or, more generally, sortitions, characterized by „ * ., the circumstance that we have a knowledge prior to «_. " specific experience of the proportion of what Laplace*

calls favourable cases 10 to all cases — a category which includes, for instance, the distribution of digits obtained by random extracts from mathematical tables, as well as the distribution of the numbers of points on dominoes.

103. The genesis of the law of error is most clearly illustrated by the simplest sort of " game," that in which the sortition is between two alternatives, heads or tails, hearts or not-hearts, or, gener- ally, success or

failure, the probability of a success being p and that of a failure q, where p + a = 1. The number of „ . such successes in the course of n trials may be con- chance" sidered as an aggregate made up of n independently varying; elements, each of which assumes the values o or 1 with respective frequency q and p. The frequency of each value of the

it is on this ignorance, and not on any peculiarity in cases, that the idea of probability in the abstract is formed." Cf. above, par. 6.

• Natural Philosophy, pt. i. art. 391. For other a priori proofs see Czuber, Theorie der Beobachtungsfehler, th. i.

7 Cf. note to par. 127.

8 He considered the effect as the sum of causes each of which obeys the simplest law of frequency, the symmetrical binomial.

9 Memoirs of Astronomical Society (1878), p. 105. Cf. Morgan Crofton, " On the Law cf Errors of Observation," Trans. Roy. Soc. (1870), vol. clx. pt. i. p. 178.

10 Above, par. 2.

aggregate is given by a corresponding term in the expansion of (?+£)t and by a well-known theorem 1 this term is approximately

*squal to l_*

*-v*l2npq*

where v is the number of integers

V v2npq

by which the term is distant from tip (or an integer close to np) ; provided that v is of (or <) the order V». Graphically, let the sortition made for each element be represented by the taking or not taking with respective frequency p and q a step of length i. If a body starting from zero takes successively n such steps, the point at which it will most probably come to a stop is at npi (measured from zero) ; the probability of its stopping at any neigh- bouring point within a range of ± 4ni is given by the above written

law of frequency, vi being the distance of the stopping- point from npi. Put vi — x and 2npqi i — c i ; then the probability may be written (i/Vic) exp — x 2 /c 2 .

104. It is a short step, but a difficult one, from this case, in which the element is binomial — heads or tails — to the general case, in which the element has several values, according to the law of frequency — consists, for instance, of the number of points pre- sented by a randomly-thrown die. According to the general theorem, if Q is the sum 2 of numerous elements, each of which assumes different magnitudes according to a law of frequency, s=/r(*)i the function / being in general different for differ- ent elements, the number of times that Q assumes magnitudes bet ween x and x +Ax in the course of N trials is NzAx, if z = (1/V2T&) exp — {x— ayj2k; where a is the sum of the arithmetic

means of all the elements, any one of which a, = jxf r (x)dx < the

square brackets denoting that the integrations extend between the extreme limits of the element's range, if the frequency-locus for each

element is continuous, it being understood that jfJxidx \ =l ' and k is the sum of the mean squares of error for each element, = 2 J at u -J-t)rff ' ^ tne f re(: l uenc y-l oc us for each element is con- tinuous, where a, is the arithmetic mean of one of the elements, and £ the deviation of any value assumed by that element from a, r 2 denoting summation over all the elements. When the frequency- locus for the element is not continuous, the integrations which give the arithmetic mean and mean square of error for the element must be replaced by summations. For example, in the case of the dice above instanced, the law of frequency for each element is that it assumes equally often each of the values 1, 2, 3, 4, 5, 6. Thus the arithmetic mean for each element is 3-5, and the mean square of error {(3-5 – i) 2 + (3-5 – 2) 2 + &c.j /6 = 2-916. Accordingly, the sum of the points obtained by tossing a large number, n, of dice at random will assume a particular value x with a frequency which is approximately ass igned by the equation

z = (i/V-5-83> *) exp-(s-3-5)y5-83"-. The rule equally applies to the case in which the elements are not similar; one might be the number of points on a die, another the number of points on a domino, and so [on. Graphically, each element is no longer represented by a step which is either null or i, but by a step which may be, with an assigned probability, one or other of several degrees between those limits, the law of frequency and the range of i being different for the different elements.*

105. Variant Proofs. — The evidence of these statements can only be

indicated here. All the proofs which have been offered involve some postulate as to the deviation of the elements from their respec- tive centres of gravity, their " errors:" If these errors extended to infinity, it might well happen that the law of error would not be fulfilled by a sum of such elements. 8 The necessary and sufficient postulate appears to be that the mean powers of deviation for the elements, the second (above written) and the similarly formed third, fourth, &c, powers (up to some assigned power), should be finite. 4

106. (1) The proof which seems to flow most directly from this postulate proceeds thus. It is deduced that the mean powers of deviation for the proposed representative curve, the law of error (up to a certain power), differ from the corresponding powers of the actual locus by quantities which are negligible when the number of the elements is large. 5 But loci which have their mean powers of deviation (up to some certain power) approximately equal may be considered as approximately coincident. 6

107. (2) The earliest and best-known proof is that which was

1 By the use of Stirling's and Bernoulli's theorems, Todhunter, History . . . of Probability.

2 The statement includes the case of a linear function, since an element multiplied by a constant is still an element.

3 E.g. if the frequency-locus of each element were i/x(i-(-a; 2), extending to infinity in both directions. But extension to infinity would not be fatal, if the form of the element's locus were normal.

4 For a fuller exposition and a justification of many of the state- ments which follow, see the writer's paper on " The Law of Error " in the Camb. Phil. Trans. (1905).

6 Loc. oil. pt. i. § 1.

- *On this criterion of coincidence see Karl Pearson's paper "On the Systematic Fitting of Curves," Biometrika, vols. i. and ii.*

originated by Laplace and generalized by Poisson.? Some idea of this celebrated theory may be obtained from the following free version, applied to a simple case. The case is that in which all the elements have one and the same locus of frequency, and that locus is symmetrical about the centre of gravity. Let the locus be repre- sented by the equation i) = { — i) ; the construction signifying that the probability of the element having a value £ (between say £ — JA£ and £ + ?A£) is

extreme limits, put x(a) for [S0(£)e ™ A£] where £ is an integer multiple of A£ (or Ax)=pAx, say. Form the mth power of xU).*

*The coefficient of e 1 ™ r * in (x(a)) m is the probability that the sum of the values of the m elements should be equal to rAx; a probability which is equal to Axy r , where y is the ordinate of the locus representing the frequency of the compound quantity (formed by the sum of the elements). Owing to the symmetry of the function the value of y r , will not be altered if we substitute*

fore' , e , nor if we substitute i{e ryl +

e), that is cos ar&x. Thus (x(a)) m becomes a sum of

terms of the form Axy r cos arAx, where y^ T = y+r. Now multiply (x(o)) m thus expressed by cos tAxa, where, t being an integer, tAx = x, the abscissa of the "error" the probability of whose occurrence is to be determined. The product will consist of a sum of terms of the form Axy r J(cos a(r+t)Ax+cos a{r — t)Ax). As every value oi r—t (except zero) is matched by a value equal in absolute magnitude, — r+t, and likewise every value of r+t is matched by value —r—t, the series takes the form AxjvS cos qaAx+Axy,, where a has all possible integer values from I to the largest value of \r\ % increased by |/|; and the term free from circular functions is the equivalent of Axy r cos a(r+t)Ax, when r=—t, together with Axy r cos a(r — t)Ax, when r= +l. Now sub- stitute for aA a new symbol /3; and integrate with respect to (3, the thus transformed (xW)"* cos tAxa between the limits /8 = o and |8 = jr. The integrals of all the terms which are of the form Anovcos g/3 will vanish, and there will be left surviving only irAxy,.*

We thus obtain, as equal to irAxy,, J ^{x OS/Ax)} ""cos t0dp. Now change the independent variable to a; then as df} = daAx, Axy t =AxL C 1rlAx da(x (a)) m cos tAxa.

IT J

*Replacing tAx by *, and dividing both sides by Ax, we have*

y x = J o 7r/AX So(X (a))'» cos ax.

Now expanding the cos ax which enters into the expression for x(o)> we obtain

x(a)=[S0(a)]-i[S^,(a)a 2]x 2 -|-l ! [S

Performing the summations indicated, we express x(<0 in terms of the

mean powers of deviation for an element. Whence x(«) m is expressible in terms of the mean powers of the compound locus. First and chief is the mean second power of deviation for the com- pound, which is the sum of the mean second powers of deviation for the elements, say k. It is found that the sought probability may be equated to

f.

t[Ax

dxe

-Wk

cos ax+

V- Jo <

where i 2 is the coefficient defined below. 9 Here ir/Ax may be replaced by «> , since the finite difference Ax is small with respect to unity when the number of the elements is large ; la and thus the integrals involved become equateable to known definite integrals. If it were allowable to neglect all the terms of the series but the first the

expression would reduce to-n — r\ e . the normal law of error.

V (2vk)

*But it is allowable to neglect the terms after the first, in a first approximation, for values of * not exceeding a certain range, the number of the elements being large, and if the postulate above enunciated is satisfied. 11 With these reservations it is proved that the sum of a number of similar and symmetrical elements conforms to the normal law of error. The proof is by parity extended to the case in which the elements have different but still symmetrical frequency functions ; and, by a bolder use of imaginary quantities, to the case of unsymmetrical functions.*

7 Laplace, Thiorie analytique des probabilites, bk. ii. ch. iv. ; Poisson, Recherches sur la probabilite des jugements. Good restate- ments of this proof are given by Todhunter, History . . Jof Probability art. 1004, and by Czuber, Theorie der Beobachtungsfehler, 'art. 38 and Th. 2, § 4.

8 The symbol || is used to denote absolute magnitude, abstraction being made of sign.

9 Below, pars. 159, 160. w Loc. cit. app. I. 11 Loc. cit. p. 53 and context.

108. (3) De Forest 1 has given a proof unencumbered by imagin- aries of what is the fundamental proposition in Laplace's theory that, if a polynomial of the form

Ao+A l2 +A 2 2 2 + . . . +A m z» be raised to the nth power and expanded in the form

B +B lZ B 2 2* . . . +B m „2™», then the magnitudes of the B's in the neighbourhood of their maxi- mum (say Bi) will be disposed in accordance with a " probability- curve," or normal law of error.

109. (4) Professor Morgan Crofton's original proof of the law of error is based on a datum obtained by observing the effect which the introduction of a new element produces on the frequency-locus for the aggregate of elements. It seems to be assumed, very properly, that the sought function involves as constants some at least of the mean powers of the aggregate, in particular the mean second power, say k. We may without loss of generality refer each of the elements (and accordingly the aggregate) to its respective centre of gravity. Then if y, =f(x), is the ordinate of the frequency-locus for the aggre- gate before taking in a new element, and y = dy the ordinate after that operation, by a well-known principle, 2 y + dy = [S m (£)f(x — £)A£], where i), = 4> m ({), is the frequency-locus for the new element, and the square brackets indicate that the summation is to extend over the whole range of values assumed by that element. Expanding in ascending powers of (each value of)£and neglecting powers above the second, as is found to be legitimate under the conditions specified, we have (since the first mean power of the element vanishes)

dy = i[S^

From the fundamental proposition that the mean square for the aggregate equals the sum of mean squares for the elements it follows that [SfVm^DA^] the mean second power of deviation for the with element is equal to dk, the addition to k the mean second power of deviation for the aggregate. There is thus obtained a partial differential equation of the second order

dy_ 1 (Py. /.-,

dk'^dk 2 v '

A subsidiary equation is (in effect) obtained by Professor Crofton from the property that if the unit according to which the axis of x is graduated is altered in any assigned ratio, there must be a corre- sponding alteration both of the ordinate expressing the frequency: of the aggregate and of the mean square of deviation for the aggrega- tion. By supposing the alteration indefinitely small he obtains a second partial differential equation, viz. (in the notation here adopted)

*> *£*#■*

O. (2)

*From these two equations, regard being had to certian other condi- tions of the problem, 3 it is deducible that y = Ce-*V*, where C is a constant of which the value is determined by the condition that*

/-

ydx ■■

1 10. (5) The condition on which Professor Crofton's proof is based may be called differential, as obtained from the introduction of a single new element. There is also an integral condition obtained from the introduction of a whole set of new elements. For let A be the sum of wii elements, fluctuating according to the sought law of error. Let B be the sum of another set of elements tth in number (mi and m both large). Then Q a quantity formed by adding to- gether each pair of concurrent values presented by A and B must also conform to the law of error, since Q is the sum of mi+nh elements. The general form which satisfies this condition of reproductivily is limited bv other conditions to the normal law of error. 4*

in. The list of variant proofs is not yet exhausted, 6 but enough has been said to establish the proposition that a sum of numerous elements of the kind described will fluctuate approximately according to the normal law of error.

*112. As the number of elements is increased, the constant above designated k continually increases ; so that the curve, representing the frequency of the compound magnitude spreads out v f?f ile * from its centre. It is otherwise if instead of the simple e Zf" sum we consider the linear function formed by adding the Function. m elements each mu i t ipHed by i/m. The "spread " of the average thus constituted will continually diminish as the number of the elements is increased; the sides closing in as the*

'The Analyst (Iowa), vols, v., vi., vii. passim; and especially vi. 142 seq., vii. 172 seq. ...

2 Morgan Crofton, loc. cit. p. 781, col. a. The principle has been used by the present writer in the Phil. Mag. (1883), xvi. 301.

3 For a criticism and extension of Crofton's proof see the already cited paper on "The Law of Error," Camb. Phil. Trans. (1905), pt. i. § 2. Space does not permit the reproduction of Crofton's proof as given in the 9th ed. of the Ency. Brit. (art. " Probability,"

I 48).

- *Loc. cit. pt. I. § 4; and app. 6. ' Loc. cit. p. 122 seq.*

Extension to

Non-linear Functions.

vertex rises up. The change in " spread " produced by the accession of new elements is illustrated by the transition from the high to the low curve, in fig. 10, in the case of a sum; in the case of an average (arithmetic mean) by the reverse relation.

113. The proposition which has been proved for linear functions may be extended to any other function of numerous variables, each representing the value assumed by an independently fluctuating element; if the function may be expanded in ascending powers of the variables, according to Taylor's theorem, and all the powers after the first may be neglected. The matter is not so simple as it is often represented, when the variable elements may assume large, perhaps infinite, values; but with the aid of the postulate above enunciated the difficulty can be overcome. 6

114. All the proofs which have been noticed have been extended to errors in two (or more) dimensions. 7 Let Q be the sum of a number of elements, each of which, being a function,, . . of two variables, x and y, assumes different pairs of 7. ens °" values according to a law of frequency \Zr-jAx, y), the ° ^°° functions being in general different for different elements. D y / nens/oas The frequency with which Q assumes values of the variables between * and + Ax and between y and y-- Ay is zAxAy, if _ I ov „ m{x- a y-2l(x – a)(q – b) + k(y – 6) 2*

Z ~2ˆkm-P CXP 2(km-P) •

*where, as in the simpler case, a = 'Za r , a r being the arithmetic mean of the values of * assumed in the long run by one of the elements, b is the corresponding sum for values of y, and*

- *= 2 _JJh – ar)Jr(x, y)dxdyj m = 2 [JJiy – hYf,{x, y)dxdyj I = 2*

[jZ/O* h)(y fc)/r(*, y)dxdyj ;

the summation extending over all the elements, and the integration between the extreme limits of each; supposing that the law of frequency for each element is contin- uous, otherwise summation is to be substituted for integration. For ex- ample, let each element be constituted as follows: Three coins having been tossed, the number of heads presented by the first and second coins together is put for x, the number of heads pre- sented by the second and third coins together is put for y. The law of fre- quency for the element is represented in fig. n, the integers outside denoting the values of x or y, the fractions in- side probabilites of particular values of x and y concurring.

If * is the distance from to I and from I to 2 on the abscissa, and V> the corresponding distance on the ordinate, the mean of the values of x for the element — Aa, as we may say, — is i, and the corresponding mean square of horizontal deviations is fi 2 . Likewise Ab = i'; Aw = Jt' 2 ; and Al = l(+iX+i'—iX — *') = \ii'. Accordingly, if « such elements are put together (if n steps of the kind which the diagram represents are taken), the frequency with which a particular pair of aggregates x and y will concur, with which a particular point on the plane of xy, namely, x = ri and y = n, will be reached, is given by the equation

supposing

2

i

i $ i t

i

t

z

Fig. 11.

1 /i?

(r — n) (/ — n)ii' + (r'

u)i> *Y

115. A verification is afforded by a set of statistics obtained with dice by Weldon, and here reproduced by his permission. A success is in this

experiment defined, not by obtaining a head when a coin is tossed, but by obtaining a face with more than three points on it when a die is tossed ; the probabilities of the two events are the same, or rather would be if coins and dice were perfectly symmetrical.' Professor Weldon virtually took six steps of the sort above described when, six painted dice having been thrown, he added the number of successes in that painted batch to the number of successes in another batch of six to form his x, and to the number of successes in a third batch of six to form his y. The result is represented in the annexed table, where each degree on the axis of x and y respectively corre- sponds to the i and V of the preceding paragraphs, and i— i' . The observed frequencies being represented by numerals, a general correspondence between the facts and the formula is apparent.

6 Loc. cit. pt. ii. § 7.

7 The second by Burbury, in Phil. Mag. (1894), xxxvii. 145; the third by its author in the Analyst for 1881 ; and the remainder by the present writer in Phil. Mag. (1896), xii. 247; and Camb: Phil. Trans. (1905), loc. cit.

8 Compare the formula for the simple case above, § 4.

9 On the irregularity of the dice with which Weldon experimented, see Pearson, Phil. Mag. (1900), p. 167.

The maximum frequency is, as it ought to be, at the point x = 6i, y = 6t'. The density is particularly great along a line through that point, making 45 ° with the axis of x; particularly small in the complementary direction. This also is as it ought to be. For if the centre is made the origin by substituting x for (x — a) and y for (y — b), and then new co-ordinates X and Y are taken, making an angle with x and y respectively, the curve which is traced on the plane of zX by its intersection with the surface is of the form

s = J exp-X 2 [& sin 2 0-2/ cos sin 6+m cos 2 B]l2{km-P),

a probability-curve which will be more or less spread out according as the factor k sin 2 — 2/. cos sin 6+m cos 2 is less or greater. Now this expression has a minimum or maximum when (k—m) sin 0—2/ cos 29=o; a minimum when {k — m) cos 20+2 /sin 20 is positive, and a maximum when that criterion is negative; that is, in the present case, where k=m, a minimum when 6 = \ir and a maximum when = f ?r.

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116. Characteristics of the Law of Error.' 1 — As may be presumed from the examples just given, in order that there should be some approximation to the normal law the number of elements need not be very great. A very tolerable imitation of the probability-curve has been obtained by superposing three elements, each obeying a law of frequency quite different from the normal one, 2 namely, that simple law according to which one value of a variable occurs as frequently as another between the limits within which the variation is confined (y = i/2a, between limits x— + a, x — — a). If the component elements obey unsymmetrical laws of frequency, the compound will indeed be to some extent unsymmetrical, unlike the " normal " probability-curve. But, as the number of the elements is increased, the portion of the compound curve in the neighbourhood of its centre of gravity tends to be rounded off into the normal shape. The portion of the compound curve which is sensibly identical with a curve of the " normal " family becomes greater the greater the number of independent elements ; caeteris paribus, and granted certain conditions as to the equality and the range of the elements. It will readily be granted that if one component predominates, it may unduly impress its own character on the compound. But it should be pointed out that the characteristic With which we are now

concerned is not average magnitude, but deviation from the average. The component elements may be very unequal in their contributions to the average magnitude of the compound without prejudice to its " normal " character, provided that the fluctuation of all or many of the elements is of one and the same order. The proof of the law requires that the contribution made by each element to the mean square of deviation for the compound, k, should be small, capable of being treated as differential with respect to k. It is not necessary that all these small quantities should be of the same order, but only that they should admit of being rearranged, by massing together those of a smaller order, as a numerous set of

1 Experiments in pari materia performed by A. D. Darbishire afford additional illustrations. See " Some Tables for illustrating Statistical Correlation," Mem. and Proc. Man. Lit., and Phil. Soc, vol. li. pt. iii.

2 Journ. Stat. Soc. (March 1900), p. 73, referring to Burton, Phil. Mag. (1883), xvi. 301.

independent elements in which no two or three stand out as sui generis in respect of the magnitude of their fluctuation. For example, if one element consist of the number of points on a domino (the sum of two digits taken at random), and other elements, each of either 1 or o according as heads or tails turn up when a coin is cast, the first element, having a mean square of deviation 16-5, will not be of the same order as the others, each having 0-25 for its mean square of deviation. But sixty-six of the latter taken together would con- stitute an independent element of the same order as the first one; and accordingly if there are several times sixty-six elements of the latter sort, along with one or two of the former sort, the conditions for the generation of the normal distribution will be satisfied. These propositions would evidently be unaffected by altering the average magnitude, without altering the deviation from the average, for any element, that is, by adding a greater or less fixed magnitude to each element. The propositions are adapted to the case in which the elements fluctuate according to a law of frequency other than the normal. For if they are already normal, the aforesaid conditions are unnecessary. The normal law will be obeyed by the sum of elements which each obey it, even though they are not numerous and not independent and not of the same order in respect of the extent of fluctuation. A similar distinction is to be drawn with respect to some further conditions which the reasoning requires. A limita- tion as to the range of the elements is not necessary when they are already normal, or even have a certain affinity to the normal curve. Very large values of the element are not excluded, provided they are sufficiently rare. What has been said of curves with special reference to one dimension is of course to be extended to the case of surfaces and many dimensions. In all cases the theorem that under the conditions stated the normal law of error will be

generated is to be distinguished from the hypothesis that the conditions are fairly well fulfilled in ordinary experience.

117. Having deduced the genesis of the law of error from ideal conditions such as are attributed to perfectly fair .„. „ .„ games of chance, we have next to inquire how far^' fJl ca ~ these conditions are realized and the law fulfilled in J°° j, e common experience. w '

118. Among important concrete cases errors of observation occupy a leading place. The theory is brought to bear on this case by the hypothesis that an error is the algebraic sum of „ numerous elements, each varying according to a law errors of frequency special to itself. This hypothesis involves proper. two assumptions: (1) that an error is dependent on numerous independent causes; (2) that the function expressing that dependence can be treated as a linear function, by expanding in terms of ascend- ing powers (of the elements) according to Taylor's theorem and neglecting higher powers, or otherwise. The first assumption seems, in Dr Glaisher's words, " most natural and true. In any observation where great care is taken, so that no large error can occur, we can see that its accuracy is influenced by a great number of circumstances which ultimately depend on independent causes: the state of the observer's eye and his physiological condition in general, the state of the atmosphere, of the different parts of the instrument, &c, evidently depend on a great number of causes, while each contributes to the actual error." 3 The second assumption seems to be frequently realized in nature. But the assumption is not always safe. For example, where the velocities of molecules are distributed according to the normal law of error, with zero as centre, the energies must be distributed according to a quite different law. This rationale is applicable not only to the fallible perceptions of the senses, but also to impressions into which a large ingredient of inference enters, such as estimates of a man's height or weight from his appearance, 4 and even higher acts of judgment. 5 Aiming at an object is an act similar to measuring an object, misses are produced by much the same variety of causes as mistakes; and, accordingly, it is found that shots aimed at the same bull's-eye are apt to be distributed according to the normal law, whether in two dimensions on a target or according to their horizontal deviations, as exhibited below (par._ 156). A residual class comprises miscellaneous statistics, physical as well as social, in which the normal law of error makes its appearance, presumably in consequence of the action „ . .

of numerous independent influences. Well-known l ™ lscel – instances are afforded by human heights and other statistics. bodily measurements, as tabulated by Quetelet 6 and others. 7 Professor Pearson has found that " the normal curve suffices to describe within the limits of random sampling the distri- bution of the chief characters in man." 8 The tendency of social

phenomena to conform to the normal law of frequency is well

3 Memoirs of Astronomical Society (1878), p. 105.

4 Journ. Stat. Soc. (1890), p. 462 seq.

5 E.g. the marking of the same work by different examiners. Ibid.

6 Lettres sur la theorie des probabilites and Physique sociale.

7 E.g. the measurements of Italian recruits, adduced in the Atlante statistico, published under the direction of the Ministero de Agricul- tura (Rome, 1882) ; and Weldon's measurements of crabs, Proc. Roy. Soc. liv. 321; discussed by Pearson in the Trans. Roy. Sot. (1894), vol. clxxxv. A.

8 Biometrika, iii. 395. Cf. ibid. p. 141.

A Variant Classifica- tion.

exemplified by A. L. Bowley's grouping of the wages paid to different classes. 1

119. The division of concrete errors which has been proposed is not to be confounded with another twofold classification, namely,

observations which stand for a real objective thing, and such statistics as are not thus representative of something outside themselves, groups of which the mean is called " subjective," This division would be neither clear nor useful. On the one hand so-called real means are often only approxi- mately equal to objective quantities. Thus the proportional frequency with which one face of a die — the six suppose — turns up is only approximately given by the objective fact that the six is one face of a nearly perfect cube. For a set of dice with which Weldon experimented, the average frequency of a throw, presenting either five or six points, proved to be not -3, but 0-3377. 2 The difference of this result from the regulation 0-3 is as unpredictable from objective data, prior to experiment, as any of the means called subjective or fictitious. So the mean of errors of observation often differs from the thing observed by a so-called "constant error." So shots may be constantly deflected from the bull's-eye by a steady wind or " drift."

120. On the other hand, statistics, not purporting to represent a real object, have more or less close relations to magnitudes which cannot be described as fictitious. Where the items averaged are ratios, e.g. the proportion of births or deaths to the total population in several districts or other sections, it sometimes happens that the distribution of the ratios exactly corresponds to that which is ob- tained in the simplest games of chance — " combinational " distribu- tion in the phrase of Lexis. 3 There is unmistakably suggested a sortition of the simplest type, with a real ascertainable relation between th» number of " favourable cases " and the total number of cases. The most remarkable example ot this property is presented by the proportion of male to female (or to total) births. Some other instances are given by Lexis 4 and Westergaard. 6 A similar correspondence between the actual and the " combinational " dis- tribution has been found by Bortkevitch 6 in the case of very small probabilities (in which case the law of error is no longer " normal "). And it is likely that some ratios — such as general death-rates — not presenting combinational distribution, might be broken up into subdivisions — such as death-rates for different occupations or age- periods — each distributed in that simple fashion.

121. Another sort of averages which it is difficult to class as sub- jective rather than objective occurs in some social statistics, under the designation of index-numbers. The percentage which repre- sents the change in the value of money between two epochs is seldom regarded as the mere average change in the price of several articles taken at random, but rather as the measure of something, e.g. the variation in the price of a given amount of commodities, or of a unit of commodity. 7 So something substantive appears to be de- signated by the volume of trade, or that of the consumption of the working classes, of which the growth is measured by appropriate index-numbers, s the former due to Bourne and Sir Robert Giffen, 9 the latter to George Wood. 10

122. But apart from these peculiarities, any set of statistics may be related to a certain quaesitum, very much as measurements are related to the object measured. That quaesitum is the limiting or ultimate mean to which the series of statistics, if indefinitely prolonged, would converge, the mean of the complete group; this conception of a limit applying to any frequency-constant, to " c," for instance, as well as " a " in the case of the normal curve. 11 The given statistics may be treated as samples from which to reason up to the true constant by that principle of the calculus which determines the comparative probability of different causes from which an observed event may have emanated. 12

123. Thus it appears that there is a characteristic more essential to the statistician than the existence of an objective quaesitum, namely, the use of

that method which is primarily, but not ex- clusively, proper to that sort of quaesitum — inverse probability. 13

Applica- tions of the Normal Law.

1 Wages in the United Kingdom in the Nineteenth Century; and art. " Wages " in the Ency. Brit., 10th ed., vol. xxxiii.

2 Phil. Mag. (1900), p. 168.

3 Cf. Journ. Stat. Soc, Jubilee No., p. 192.

4 Masscnerscheinungen.

6 Grundziige der Statistik. Cf. Bowley, Elements of Statistics, P- 302.

6 Das Gesetz der kleinen Zahlen.

7 See for other definitions Report of the British Association (1889), pp. 136 and 161, and compare Walsh's exhaustive Measurement of General Exchange- Value.

8 Cf. Bowley, Elements of Statistics, ch. ix.

9 Journ. Stat. Soc. (1874 and later). Parly. Papers [C. 2247] and [C. 3079].

10 " Working-Class Progress since i860," Journ. Stat. Soc. (1899), p. 639.

11 On this conception compare Venn, Logic of Chance, chs. iii. and iv., and Sheppard, Proc. Lond. Math. Soc, p. 363 seq.

12 Laplace's 6th principle, Theorie analytique, intro. x.

13 See above, pars. 13 and 14.

Without that delicate instrument the doctrine of error can seldom be fully utilized; but some of its uses may be indicated before the introduction of technical difficulties.

124 Having established the prevalence of the law of error, 14 we go on to its applications. The mere presumption that wherever three or four independent causes co-operate, the law of error tends to be set up, has a certain speculative interest. 15 The assumption of the law as a hypothesis is legiti- mate. • When the presumption is confirmed by specific experience this knowledge is apt to be turned to account. It is usefully applied to the practice of gunnery, 16 to determine the proportion of shots which under

assigned con- ditions may be expected to hit a zone of given size. The expendi- ture of ammunition required to hit an object can thence be inferred. Also the comparison between practice under different conditions is facilitated. In many kinds of examination it is found that the total marks given to different candidates for answers to the same set of questions range approximately in conformity with the law of error. It is understood that the civil service commissioners have founded on this fact some practical directions to examiners. Apart from such direct applications, it is a useful addition to our knowledge of a class that the measurable attributes of its members range in conformity with this general law. Something is added to the truth that " the days of a man are threescore and ten," if we may regard that epoch, or more exactly for England, 72, as " Nature's aim, the length of life for which she builds a man, the dispersion on each side of this point being . . . nearly normal." 17 So Herschel says: " An [a mere] average gives us no assurance that the future will be like the past. A [normal] mean may be reckoned on with the most complete confidence." 18 The existence of independent causes, 19 in- ferred from the fulfilment of the normal law, may be some guarantee of stability. In natural history especially have the conceptions supplied by the law of error been fruitful. Investigators are already on the track of this inquiry: if those members of a species whose size or other measurable attributes are above (or below) the average are preferred — by " natural " or some other kind of selection — as parents, how will the law of frequency as regards that attribute be modified in the next generation?

*125. A particularly perfect application of the normal law of error in more than one dimension is afforded by the movements of the molecules in a homogeneous gas. A general idea of the r61e played by probabilities in the explanation Normal Dis- of these movements may be obtained without entering ˆ ,"? ot into the more complicated and controverted parts of vj , *?; the subject, without going beyond the initial very Ve,ocit es ' abstract supposition of perfectly elastic equal spheres. For con- venience of enunciation we may confine ourselves to two dimen- sions. Let us imagine, then, an enormous billiard-table with perfectly elastic cushions and a frictionless cloth on which millions of perfectly elastic balls rush hither and thither at random — colliding with each other — a homogeneous chaos, with that sort of uniformity in the midst of diversity which is characteristic of probabilities. Upon this hypothesis, if we fix attention on any n balls taken at random — they need not be, according to some they ought not to be, contiguous — if n is very large, the average properties will be approxi- mately the same as those of the total mixture. In particular the average energy of the n balls may be equated to the average energy of the total number of balls, say T/N, if T is the total energy and N the total number of the balls. Now if we watch any one of the n specimen balls long enough for*

it to undergo a great number of collisions, we observe that either of its velocity-components, say that in the direction of x, viz. u, receives accessions from an immense number of independent causes in random fashion. We may presume, therefore, that these will be distributed (among the n balls) according to the law of error. The law will not be of the type which was first supposed, where the " spread " continually increases as the number of the elements is increased. 20 Nor will it be of the type which was afterwards mentioned 21 where the spread diminishes as the number of the elements is increased. The linear function by which the ele- ments are aggregated is here of an intermediate type ; such that the mean square of deviation corresponding to the velocity remains constant. The method of composition might be illustrated by the process of taking r digits at random from mathematical tables adding the differences between each digit and 4-5 the mean value of digits, and dividing the sum by Vr. Here are some figures obtained by taking at random batches of sixteen digits from the expansion of ir, subtracting 16 X 4"5 from the sum of each batch, and dividing the remainder by V 16: —

14 Cf. above, par. 102.

16 Cf. Galton's enthusiasm, Natural Inheritance, p. 66.

16 A lucid statement of the methods and results of probabilities applied to gunnery is given in the Official Text-book of Gunnery

(1902).

17 Venn, Journ. Stat. Soc. (1891), p. 443.

18 Ed. Rev. (1850), xcii. 23.

19 Cf. Galton, Phil. Mag. (1875), xlix. 44.

20 Above, par. 112.

21 Ibid.

+ I-25, +075, -i, -i, +5-5, -2-75, +0-75, -2, + 1-75. +3-25, +o-25, -275, -2-25, -0-5, +4-75. +0-25. If, instead of sixteen, a million digits went to each batch, the general character of the series would be much the

same; the aggregate figures would continue to hover about zero with a standard deviation of 8-25, a probable error of nearly 2. Here for instance are seven aggregates formed by recombining 252 out of the 256 digits above utilized into batches of 36 according to the prescribed rule: viz. subtracting 36X4-5 from the sum of each batch of 36 and dividing the remainder by V 36 : —

-o-5. +3‘3. +2-6, -o-6, +1-5, -2, +1. The illustration brings into view the circumstance that though the system of molecules may start with a distribution of velocities other than the normal, yet by repeated collisions the normal distribution will be superinduced. If both the velocities u and v are distributed according to the law of error for one dimension, we may presume that the joint values of u and v conform to the normal surface. Or we may reason directly that as the pair of velocities u and v is made up of a great number of elementary pairs (the co-ordinates in each of which need not, initially at least, be supposed uncorrelated) the law of frequency for concurrent values of u and v must be of the normal form which may be written x

ˆ = 2 V {km. 1 -r 2) ex P – [f ~ 2r jL + m] /z(l ” ˆ

It may be presumed that r, the coefficient of correlation, is zero, for, owing to the symmetry of the influences by which the molecular chaos is brought about, it is not to be supposed that there is any connexion or repugnance between one direction of u, say south to north, and one direction of v, say west to east. For a like reason k must be supposed equal to m. Thus the average velocity = 2k; which multiplied by m, the mass of a sphere, is to be equated to the average energy T/N. The reasoning may be extended with confi- dence to three dimensions, and with caution to contiguous molecules.

*126. Correlation cannot be ignored in another application of the many-dimensioned law of error, its use in biological inquiries to Normal investigate the relations between different generations. Correlation ** was f ° unci fy Galton that the heights and other • fti j ory measurable attributes of children of the same parents*

range about a mean which is not that of the parental heights, but nearer the average of the general population. The amount of this ” regression ” is simply proportional to the distance of the ” mid-parent’s ” height from the general average. This is a case of very general law which governs the relations not only between members of the same family, but also between members of the same organism, and generally between two (or more) coexistent or in any way co-ordinated observations, each belonging to a normal group. Let x and y be the measurements of a pair thus constituted.

Then 2 it may be expected that the conjunction of particular values for x and y will approximately obey the two-dimensioned normal law which "has been already exhibited (see par. 114).

127 . Regression-lines. — In the expression above given, put //V km = r, and the equation for the frequency of pairs having values of the attribute under measurement becomes

= 27rV£mvl-r 2eXp L k

("))» ..(<»)(y-ft) , {y-W

V k -Jm

+-

-]/ 2 (l-r 2).

This formula is of very general application. 3 If two sets of measure- ments were made on the height, or other measurable feature, of the proverbial " Goodwin Sands " and " Tenterden Steeple," and the first measurement of one set was coupled with the first of the other set, the second with the second, and so on, the pairs of magnitudes thus presented would doubtless vary according to the above-written law, only in that case r would presumably be zero ; the expression for 2 would reduce to the product of the two independent probabilities that particular values of x and y should concur. But slight inter- dependences between things supposed to be totally unconnected would often be discovered by this law of error in two or more dimen- sions. 4 It may be put in a more convenient form by substituting £ for (x-a)Hk and r\ for (y — b)Hm. The equation of the surface then becomes z = (1/2W1 — r 2) exp — — r 2). If the frequency of observations in the vicinity of a point is repre- sented by the number of dots in a small increment of area, when r = the dots will be distributed uniformly about the origin, the curves of equal probability will be circles. When r is different from zero

1 Above, par. 114, and below, par. 127.

2 Some plurality of independent causes is presumable.

3 Herschel's a priori proposition concerning the law of error in two dimensions (above, par. 99) might still be defended either as generally true, so many phenomena showing no trace of interdependence, or on the principle which justifies our putting | for a probability that is unknown (above, par. 6), or 5 for a decimal place that is neglected; correlation being equally likely to be positive or negative. The latter sort of explanation may

be offered for the less serious contrast between the a priori and the empirical proof of the law of error in one dimension (below, par. 158).

- *Cf. above, par. 115.*

the dots will be distributed so that the majority will be massed in two quadrants : in those for which £ and i\ are both positive or both negative when r is positive, in those for which £ and ij have opposite signs when r is negative. In the limiting case, when r = 1 the whole host will be massed along the line i} = |, every deviation £ being attended with an equal deviation i. In general, to any deviation of one of the variables {'there corresponds a set or " array ' ' (Pearson) of values of the other variable ; for which the frequency is given by substituting £' f or £ in the general equation. The section thus obtained proves to be a normal probability-curve with standard deviation V (1 — r 2). The most probable value of r\ corresponding to the assigned value of £ is r£'. The equation 77 — r£, or rather what it becomes when translated back to our original co-ordinates (y — 6)/

128. Analogous statements hold good for the case of three or more dimensions of error. 6 The normal law of error for any number of variables, Xi x s x 3 , may be put in the form 2 = (i(2Tr)n/2 V A) exp — where A is the determinant : —

1 r.i, r.q

each r, e.g. r 2 s (= r 3 2), is the coefficient of correlation between two of the variables, e.g. x 2 , x 3 ; Rn is the first minor of the deter- minant formed by omitting the first row and first column; R 22 is the first minor formed by omitting the second row and the second column, and so on; R12 (= R 2 i) is the first minor formed by omitting the first column and second row (or vice versa). The principle of correlation plays an important r61e in natural history. It has re- placed the notion that there is a simple proportion between the size of organs by the appropriate conception that there are simple proportions existing between the deviation from the average of one organ and the most probable value for the coexistent deviation of the other organ from its average. 7 Attributes favoured by " natural "or other selection are found to be correlated with other attributes which are not directly selected. The extent to which the attributes of an individual depend upon those of his ancestors as measured by corre- lation. 8 The principle is instrumental to most of the important " mathematical contributions " which Professor Pearson has made to the theory of evolution. 9 In social inquiries, also, the principle promises a rich harvest. Where numerous fluctuating causes go to produce a result like pauperism or immunity from small-pox, the ideal method of eliminating chance would

be to construct "regression-equations" of the following type: "Change % in pauperism [in the decade 1871-1881] in rural districts = — 27-07%, +0-299 (change % out-relief ratio), +0-271 (change % on proportion of old), + -064 (change % in population)." 10

*129. In order to determine the best values of the coefficients involved in the law of error, and to test the worth of „ _ the results obtained by using any values, recourse must t j " ˆ *~ be had to inverse probability. _ _ Constants by*

130. The simplest problem under this head is tne Inverse where the quaesitum is a single real object and ˆ e Method. data consist of a large number of observations,

Xi, X2, . . . x n , such that if the number were indefinitely increased, the completed series would form a normal probability-curve with the true point as its centre, and having a given modulus c. It is as if we had observed the position of the dints made by the fragments

5 Cf. note to par. 98, above.

6 Phil. Mag. (1892), p. 200 seq.; 1896, p. 211; Pearson, Trans. Roy. Soc. (1896), 187, p. 302; Burbury, Phil. Mag. (1894), p. 145.

7 Pearson, " On the Reconstruction of Prehistoric Races," Trans. Roy. Soc. (1898), A, p. 174 seq.; Proc. Roy. Soc. (1898), p. 418.

8 Pearson, "The Law of Ancestral Heredity," Trans. Roy. Soc; Proc. Roy. Soc. (1898).

9 Papers in the Royal Society since 1895.

10 An example instructively discussed by Yule, Journ. Stat. Soc.

(1899).

of an exploding shell so far as to know the distance of each mark measured (from an origin) along a right line, say the line of an extended fortification, and it was known that the shell was fired perpendicular to the fortification from a distant ridge parallel to the fortification, and that the shell was of a kind of which the fragments are scattered according to a normal law l with

*a known coefficient of dispersion; the question is at what position on the distant ridge was the enemy's gun probably placed ? By received principles the probability, say P, that the given set of observations should have resulted from measuring (or aiming at) an object of which the real position was between * and x + Ax is*

Ax J exp — 2 ;

/+00

Pdx

-00

(since the given set of observations must have resulted from some position on the axis of x). The value of x, from which the given set of observations most probably resulted, is obtained by making P a maximum. Putting dP/ dx = o, we have for the maximum (d 2 P/

z = (V«/Virc) exp — nix — x') 2 /c 2 . The reasoning is applicable without material modification to the case in which the data and the quaesiium are not absolute quantities, but proportions; for instance, given the percentage of white balls in several large batches drawn at random from an immense urn con- taining black and white balls, to find the percentage of white balls in the urn — the inverse problem associated with the name of Bayes.

131. Simple as this solution is, it is not the one which has most recommended itself to Laplace. He envisages the quaesiium not so much as that point which is most probably the real one, as that point which may most advantageously be put for the real one. In our illustration it is as if it were required to discover from a number of shot-marks not the point 2 which in the course of a long siege would be most frequently the position of the cannon which had scattered the observed fragments but the point which it would be best to treat as that position — to fire at, say, with a view of silencing the enemy's gun — having regard not so much to the fre- quency with which the direction adopted is right, as to the extent to which it is wrong in the long run. As the measure of the detri- ment of error, Laplace 3 takes "la valeur moyenne de l'erreur a craindre," the mean first power of the errors taken positively on each side of the real point. The mean spare of errors is proposed by Gauss as the criterion. 4 Any mean power indeed, the integral of any function which increases in absolute magnitude with the increase of its variable, taken as the measure of the detriment, will lead to the same conclusion, if the normal law prevails. 5

132. Yet another speculative difficulty occurs in the simplest, and recurs in

the more complicated inverse problem. In putting P as the probability, deduced from the observations that the real point for which they stand is x (between x and x + Ax), it is tacitly assumed that prior to observation one value of x is as probable as another. In our illustration it must be assumed that the enemy's gun was as likely to be at one point as another of (a certain tract of) the ridge from which it was fired. If, apart from the evidence of the shell-marks,' there was any reason for thinking that the gun was situated at one point rather than another, the formula would require to be modified. This a priori probability is sometimes grounded on our ignorance; according to another view, the procedure is justified by a rough general knowledge that over a tract of x for which P is sensible one value of x occurs about as often as another. 6

1 If normally in any direction indifferently according to the two- or three-dimensioned law of error, then normally in one dimension when collected and distributed in belts perpendicular to a horizontal right line, as in the example cited below, par. 155.

2 Or small interval (cf. preceding section).

3 " Toute erreur soit positive soit n6gative doit e"tre consideree comme un desavantage ou une perte reelle a un jeu quelconque," Theorie analytique, art. 20 seq., especially art. 25. As to which it is acutely remarked by Bravais (op. cit. p. 258), " Cette regie simple laisse a desirer une demonstration rigoureuse, car l'analogue du cas actuel avec celui des jeux de hasard est loin d'etre complete."

- *Theoria combinations, pt. i. § 6. Simon Newcomb is con- spicuous by walking in the way of Laplace and Gauss in his prefer- ence of the most advantageous to the most probable determinations. With Gauss he postulates that " the evil of an error is proportioned to the square of its magnitude " (American Journal of Mathematics, vol. viii. No. 4).*

6 As argued by the present writer, Camb. Phil. Trans. (1885), vol. xiv. pt. ii. o. 161. Cf. Glaisher, Mem. Astronom. Soc. xxxix.

108.

8 The view taken by the present writer on the " Philosophy of Chance," in Mind (1880; approved by Professor Pearson, Grammar

133. Subject to similar speculative difficulties, the solution which has been obtained may be extended to the analogous problem in which the quaesitum is not the real value of an observed magnitude, but the mean to which a series of statistics indefinitely prolonged converges. 7

134. Next, let the modulus, still supposed given, not be the same for all the observations, but C\ for Xi, e 2 for x 2 , &c. Then P becomes proportional to

exp – [(x – xOVci 2 + (x – x 2) 2 /c 2 2 + &c.]. And the value of x which is both the most probable and the " most advantageous" is (xi/ci 2 +x 2 /c2 2 -f&c.)/(i/ci 2 -|-i/(; 2 2 |&c.) ; each observation being weighted with the inverse Method of mean square of observations made under similar con- * ditions. 8 This is the rule prescribed by the " method Squares. of least squares "; but as the rule in this case has been deduced by genuine inverse probability, the problem does not exemplify what is most characteristic in that method, namely, that a rule deducible from the hypothesis that the errors of observations obey the normal law of error is employed in cases where the normal law is not known, or even is known not, to hold good. For example, let the curve of error for each observation be of the form of

■ z = [i/V («:)] X exp [— x 2 /c 2 — 2j(x/c — 2X 3 /3<: 3)], where j is a small fraction, so that 2 may equally well be equated to (i/V«;)[i — 2j(x/c — 2× 3 /3C 3)] exp — x 2 /c 2 , a law which is actually very prevalent. Then, according to the genuine inverse method, the most probable value of x is given by the quadratic equation

4-Iog P= o, where log P= const. – 2(x-x r) 2 /c r 2 – S2j'[(x-x r) 3 /c r 3 –

2(x — Xr) 3 /$Cr 3 \, S denoting summation over all the observations. According to the " method of least squares," the solution is the weighted arithmetic mean of the observations, the weight of any observation being inversely proportional to the corresponding mean square, i.e. c r 2 /2 (the terms of the integral which involve j vanishing), which would be the solution if the j's are all zero. We put for the solution of the given case what is known to be the solution of an essentially different case. How can this paradox be justified?

135. Many of the answers which have been given to this question seem to come to this. When the data are unmanageable, it is legiti- mate to attend to a part thereof, and to determine the most probable (or the " most advantageous ") value of the quaesitum, and the degree of its accuracy, from the selected portion of the data as if it formed the whole. This throwing overboard of part of the data in order to utilize the remainder has often to be resorted to in the rough course of applied probabilities. Thus an insurance office only takes account of the age and some other simple attributes of its customers, though a better bargain might be made in particular cases by taking into account all available details. The nature of

the method is particularly clear in the case where the given set of observations consists of several batches, the observations in any batch ranging under the same law of frequency with mean x r and mean square of error k r , the function and the constants different for different batches ; then if we confine our attention to those parts of the data which are of the type x' r and k T — ignoring what else may be given as to the laws of error — we may treat the x' r 's as so many observations, each ranging under the normal law of error with its coefficient of dispersion; and apply the rules proper to the normal law. Those rules applied to the data, considered as a set of deriva- tive observations each formed by a batch of the original observations) averaged, give as the most probable (and also the most advantageous combination of the observations the arithmetic mean weighted according to the inverse mean square pertaining to each observation, and for the law of the error to which the determination is liable the normal law with standard deviation 9 V (2k/n) — the very rules that are prescribed by the method of least squares.

136. The principle involved might be illustrated by the proposal to make the economy of datum a little less rigid: to utilize, not in- deed all, but a little more of our materials — not only the mean square of error for each batch, but also the mean cube of error. To begin with the simple case of a single homogenous batch: suppose that in our example the fragments of the shell are no longer scattered according to the normal law. By the method of least squares it would still be proper to put the arithmetic mean to the given observa- tions for the true point required, and to measure the accuracy of that determination by a probability-curve of which the modulus is V (2k), where k is the mean square of deviation (of fragments from their mean). If it is thought desirable to utilize more of the data there is available, the proposition that the arithmetic mean of a

of Science, 2nd ed. p. 146). See also " A priori Probabilities," Phil. Mag. (Sept. 1884),' and Camb. Phil. Trans. (1885), vol. xiv. pt. ii. p. 147 seq.

7 Above, pars. 6, 7.

8 The mean square f +M (x 2 /V«:) exp — x 2 /e 2 ix = c 2 /2.

9 The standard deviation pertaining to a set of (n/r) composite observations, each derived from the original n observations by averaging a batch thereof numbering r, is VWr)/V(nW; = V(W, when the given observations are all of the same weight; mutatis mutandis when the weights differ. . •

n Ynx 1 , • (x 2× 3 \ "I t , •.

= 7s ex P – [iF + 2nj {7 "3?) J = M ' m :

numerous set of observations, say x, Xi, . . . x n (taken as a sample from an indefinitely large group obeying any the same law of frequency) varies from set to set approximately according to the following law (to be established later)

n -7 = exp

We r

*where c 2 /2 the mean square of deviation, and j = the mean cube of deviation, and j/cz, say j, is small. Then, by abstrac- tion analogous to that which has just been attributed to the method of least squares, we may regard the datum as a single observation, the arithmetic mean (of a sample batch of obser- vations) subject to the law of error z = f{x). The most probable value of the quaesitum is therefore given by the equation f'(x—x') = o, where x' is the arithmetic mean of the given observations. From the resulting quadratic equation, putting * = *'+«, and recollecting that e is small we have e =]c. That is the correction due to the utilization of the mean cube of error. The most advan- tageous solution cannot now be determined, 1 /(x) being unsymmetri- cal, without assuming a particular form for the function of detriment. This method of least squares plus cubes may easily be extended to the case of several batches.*

137. This application of probabilities not to the actual data but to a selected part thereof, this economy of the inverse method, is widely practised in miscellaneous statistics, where the object is to determine whether the discrepancy between two sets of observation is accidental or significant of a real difference. 2 For instance, let the data be ages at death of individuals of two classes (e.g. temperate or not so, urban or rural, &c.) who have been under observation, since the age of, say, 20. Granted that the ages at death conform to Gompertz's law; the determination of the modal age at death, that age at which the proportion of the total observed dying (per unit of time) is a maximum for each class, would most perfectly be effected by the genuine inverse method. That method will also enable us to determine the probability that the two modes should have differed to the observed extent by mere accident. 3 According to the abridged method it suffices to proceed as if our data con- sisted of two observations x' and y', the average ages at death of the two classes, each averag e obeying the normal law of error , with respective moduli c t = V[(x' — x t) 2 + (x' — X2) 2 + &c.]2/n , c? = V [(/ — yif + (/ — J^) 2 + &c.)2jn, where x,, x 2 , &c, yi y it &c, are the respective sets of observed ages at death ; as follows from the law of error, whatever the law of distribution of the given observations. According to a well-known property of the normal law, the difference between the averages of re and re' observations re spectivel y will range under a probability-curve with modulus Vci 2 f C2 2 , say c. Whence for the probability that a difference as great as the observed one, say e, should have occurred by chance we have j[I— 0®], where t =e/c, and 8{x) is the integral 2/V v P(exp = Xijdx, given in many treatises.

138. This sort of abridgment may be extended to other kinds of average besides the arithmetic, in particular the median (that point Abridged wnlcn nas as many of the given observations above as Methods below it). By simple induction we know that the

median of a large sample of observations is a probable value for the true median; how probable is determined as follows from a selection of our data. First suppose that all the observa- tions are of the same weight. If x' were the true median, the probability that as many as \n f r of the observations should fall on either side of that point is given by the normal law for which the exponent is — 2r 2 /n. 4 This probability that the observed median will differ from the true one by a certain number of observations is connected with the probability that they will differ by a certain extent of the abscissa, by the proposition that the number of obser- vations contained between the true and apparent median is equal to the small difference between them multiplied by the density of observations at the median — in the case of normal and generally symmetrical curves the greatest ordinate. This is the second datum we require to select. In the case of the normal curve it may be calculated from the modulus itself,

determined by induction from a selection of data.- If the observations are not all of the same worth, weight may be assigned by counting one observation as if it occurred oftener than another. This is the essence of Laplace's Method of Situation. 5 '

1 The use of the cubes is also contrasted with that of the squares (only) in this respect : that it is no longer a matter of indifference how many of the original observations we assign to the batch of which the mean constitutes the single (compound) observation.

2 The object of the writer's paper on " Methods of Statistics " in the Jubilee number of the Journ. Stat. Soc. (1885).

3 See on the use of the inverse method to determine the mode of a group, the present writer's paper on " Probable Errors " in the Journ. Stat. Soc. (Sept. 1908).

4 Above, par. 103.

5 Theorie analytique, 2nd supp. p. 164. Mecanique celeste, bk. iii. art. 40; on which see the note in Bowdich's translation. The method may be extended to other percentiles. See Czuber, Beobachtungsfehler, §58. Ci.Phil. Mag. (1886), p. 375;and Sheppard,

Determin- ation of Frequency Constants.

139. In its simplest form, where all the given observations are ol equal weight, this method is of wide applicability. Compared with the genuine inverse method, it is always more convenient, seldom much less accurate, sometimes even more accurate. If the given observations obey the normal law, the precision of the median is less than the precision of the arithmetic mean by only some 25 % — a discrepancy not very serious where only a rough estimate of the worth of an average is required. If the observations do not obey the normal law — especially if the extremities are abnormally diver- gent — the precision of the median may be greater than that of the arithmetic mean. 6

140. Yet another instance of the contrast between genuine and abridged inversion is afforded by the problem to determine the modulus as well as the mean for a set of observations known to obey the normal law ; what the first problem 7 becomes when the coefficient of dispersion is not given. By inverse probability we ought in that case, in addition to the equation dP/dx = o, to put dP/dc = o. Whence c 2 = 2 [(' – xi) 2 + (' – x 2) 2 + &c. + (' – x») 2] in, and x' = (xi + x ? + &c. + x")/re. This solution differs from that which is often given in the_ textbooks 8 in that there, in the expression for f, (n — 1) occurs in the denominator instead of*

n. The difference is explained by the fact that the authorities referred to determine c, not by genuine inversion, but by ordinary induction, by a condition which certainly would be fulfilled in the long run, but does not express the whole_of our data; a condition in this respect like the equation of c to Vir(2e)/re, where e is the difference (taken positively, without regard to its sign) between any observation and the arithme- tic mean of all the observations. 9

141. Of course the determination of the most probable value is subject to the speculative difficulties proper to a priori probability: which are particularly striking in this case, as it appears equally natural to take as that constant, of which the values are a priori equally probable, £(=c 2 /2), or even 10 h{ = 1/c 2), the measure of weight, as in fact Laplace has done ; n yet no two of these assumptions can be exactly true. 12

*142. A more convenient determination is obtained from simple induction by equating the modulus to some datum of the observed group to which it would be equal if the group were complete — in particular to the distance from the median of some percentile (or point which marks off a certain percentage, e.g 25 of the given observations) multiplied by a factor corresponding to the percentile obtainable from a familiar table. Mr Sheppard has given an interest- ing proof 13 that we cannot by way of percentiles obtain such good 14 results for the frequency-constants as- by the use of " the average and average square " [the method prescribed by inverse probability^*

*143. The same philosophical subtleties, with greater mathematical complications, meet us when we pass on to the case of two or more quaesita. The problem under this head which mainly E . . . exercised the older writers was to determine a number of * n ' an ? ,ea unknown quantities, given a larger number, re, of equa /neasure ' tions involving them. ments.*

144. Supposing the true values approximately known, by substi- tuting the approximate values in the given equations and expanding according to Taylor's theorem, there will be obtained for the correc- tions, say x, y . . . , re linear equations of the form

(hx+biy =/i

a 2 x+hy— =/ 2 , where each a and J is a known coefficient, and each / is a fallible observation. Suppose that the error to which each is liable obeys the normal law, and that the modulus pertaining to each observation is the same — which latter condition can be secured by multiplying each equation by a proper factor — then if x' and y' are the true values of the quaesita, the frequency with which (aix' + 61/ — /0 assumes different

values is given by the equation z = l/(V ttc') exp — [aix + hy — /J 2 /ci 2 , where Ci is a constant which,

Trans. Roy. Soc. (1889), 192, p. 135, ante, where the error incident to this kind of determination is ascertained with much precision.

6 Cf. Phil. Mag. (1887), xxiv. 269 seq., where the median is pre- scribed in case of " discordant " (heterogeneous) observations. If the more drastic remedy of rejecting part of the data is resorted to Sheppard's method of performing that operation may be recom- mended (Proc.Lond. Math. Soc. vol. 31). He prescribes for cases to which the median may not be appropriate, namely, the determination of other frequency-constants besides the mean of the observations.

7 Above, par. 134.

8 E.g. Airy, Theory of Errors, art. 60.

9 It is a nice point that the expression for c 2 , which has (re — 1) instead of re for denominator, though not the more probable, may yet be the more advantageous (supposing that there were any sensible difference between the two). Cf. Camb. Phil. Trans. (1885), vol. xiv. pt. ii. p. 165 ; and " Probable Errors," Journ. Stat. Soc. (June 1908).

10 Above, par. 96, note.

11 Thiorie analytique, 2nd supp. ed. 1847, p. 578.

12 See the matter discussed in Camb. Phil. Trans., loc. cit.

13 Trans. Roy. Soc. (1899), A, cxcii. 135.

14 Good as tested by a comparison of the mean squares of errors in the frequency-constant determined by the compared methods.

Normal Correlation,

if not known beforehand, may be inferred, as in the simpler case, from a set of observations. Similar statements holding for the other equations, the probability that the given set of observations fi, / 2 , &c, should have resulted from a particular system of values for ***, y . . is J exp [(aix+piy***

— hY/ci +(a 2 x+b 2 y — /2) 2 /c s 2 +&c], where J is a -constant determined on the same principle as in the analogous simpler cases. 1 The condition that P should be a maximum gives as many linear equations for the determination of x' y' . . . as there are unknown quantities.

145. The solution proper to the case where the observations are known to arrange according to the normal law may be extended to numerous observations ranging under any law, on the principles which justify the use of the Method of Least Squares in the case of a single quaesilum.

146. As in that simple case, the principle of economy will now justify the use of the median, e.g. in the case of two quaesita, putting for the true values of x and y that point for which the sum of the perpendiculars let fall from it on each of a set of lines representing the given equations (properly weighted) is a minimum. 2

147. The older writers have expressed the error in the determina- tion of one of the variables without reference to the error in the

other. But the error of one variable may be regarded as correlated with that of another; that is, if the system x' , y' . . . forms the solution of the given equations, while x'+£, y'+v … is the real system, the (small) values of £, i;- • • • which will concur in the long run of systems from which the given set of observations result are normally correlated. From this point of view Bravais, in 1846, was led to several theorems which are applicable to the now more important case of correlation in which £ and i; are given (not in general small) deviations from the means of two or more.correlated members (organs or attributes) forming a normal group.

148. To determine the frequency-constants of such a group it is proper to proceed on the analogy of the simple case of one-dimen- sioned error. In the case of two dimensions, for instance, the probability pi that a given pair of observations (xi, yO should have resulted from a normal group of which the means are x' y' respectively, the standard deviations 01 and o- 2 and the coefficient of correlation r, may be written —

A.rAyA

dP dP dP dP dP

dx, dy, dcri, den, dr. The values of the arithmetic mean and of the standard deviation for each variable are what have been obtained in the simple case of one dimension. The value of r is 20c'— x T)(y' — y T)hiai.. 3 The probable error of the determination is assigned on the assumption that the errors to which it is liable are small. 4 Such coefficients have already been calculated for a great number of interesting

cases. For instance, the coefficient of correlation between the human stature and femur is 08, between the right and left femur is 0-96, between the statures of husbands and wives is 0-28. 5

149. This application of inverse probability to determine correla- tion-coefficients and the error to which the determination is liable has been largely employed by Professor Pearson and other recent writers. The use of the normal formula to measure the probable — and improbable — errors incident to such determinations is justified by reasoning akin to that which has been employed in the general proof of the law of error. 7 Professor Pearson has pointed out a circumstance which seems to be of great importance in the theory of evolution: that the errors incident to the determination of different frequency-coefficients are apt to be mutually correlated. Thus if a random selection be made from a certain population, the correlation-coefficient which fits the organs of that set is apt to differ from the coefficient proper to the complete group in the same sense as some other frequency-coefficients.

150. The last remark applies also to the determination of the coefficients, in particular those of correlation, by abridged methods, on principles explained with reference to the simple case ; for instance by the formula r = 27j/2£, where 2£ is the sum of (some or all) the

1 Above, par. 130.

2 See Phil. Mag. (1888), " On a New Method of Reducing Observations " ; where a comparison in respect of convenience and accuracy with the received method is attempted.

*3 Corresponding to the kHlm of pars. 14, 127 above. * Pearson, Trans. Roy. Soc., A, 191, p. 234.*

6 Pearson, Grammar of Science, 2nd ed. p. 402, 431.

6 Trans. Roy. Soc. (1898), A, vol. 191 ; Biometrika, ii. 273.

7 Above, par. 107. Compare the proof of the " Subsidiary Law of Error," as the law in this connexion may be called, in the paper on " Probable Errors," Joum. Stat. Soc. (June 1908).

positive (or the negative) deviations of the values for one organ or attribute measured by the modulus pertaining to that member, and 217 .is the sum of the values of the other member, which are associated with the constituents of Z{. This variety of this method is certainly much less troublesome, and is perhaps not much less accurate, than the method prescribed by genuine inversion.

151. A method of rejecting data analogous to the use of percentiles in one dimension is practised when, given the frequency of observa- tions for each increment of area, e.g. each Ax Ay, we utilize only the frequency for integral areas. Mr Sheppard has given an elegant solution of the problem: to find the correlation between two attributes, given the medians L, and M, of a normal group for each attribute and the distribution of the total group, as thus. 8

Below- L,

Above- L,

Below M,

P

R

Above M,

R

P

Fig. 12. If cos D is put for r, the coefficient of correlation, it is found that D=7rR/(P-|-R). For example, let the group of statistics relating to dice already "cited from Professor Weldon be arranged in four quadrants by a horizontal and a vertical line, each of which separates the total groups into two halves: lines of which equa- tions prove to be respectively y = 6-n and x=6-!56. For R we have I360'5, and for P 687-5 roughly. Whence D = irXo-66; r = cos o-66 Xi = — I nearly, as it ought ; the negative sign being required by the circumstance that the lower part of Mr Sheppard's diagram shown in fig. 12 corresponds to the upper part of Professor Weldon's diagram shown in par. 115.

152. Necessity rather than convenience is sometimes the motive for resort to percentiles. Professor Pearson has applied the median method to determine the correlation between husbands and wives in respect of the darkness of eye-colour, a character which does not admit of exact graduation: " our numbers merely refer to certain groupings, arranged, it is true, in increasing darkness of colour, but in no way corresponding to equal increases in colour-intensity." 10 From data of this sort, having ascertained the number of husbands with eye-colours above the median tint who marry wives with eye- colour above the median tint, Professor Pearson finds for r the coefficient of correlation +01. A general method for determining the frequency-constants when the data are, or are taken to be,

of the integral sort has been given by Professor Pearson. 11 Attention should also be called to Mr Yule's treatment of the problem by a sort of logical calculus on the lines of Boole and Jevons. 12

153. In the cases of correlation which have been so far considered, it has been presupposed that the things correlated range according to the normal law of error. But now, suppose the law

of distribution to be no longer normal : for instance, that Abnormal the dots on the plane of xy, n representing each a pair of t ' orre a " on – members, are no longer grouped in elliptic (or circular) rings of equal frequency, that the locus of the maximum y deviation, corresponding to an assigned x deviation, is no longer a right line. How is the interdependence of these deviations to be formulated? It is submitted that such data may be treated as if they were normal : by an extension of the Method of Least Squares, in two or more dimensions. 14 Thus when the amount of pauperism together with the amount of outdoor relief is plotted in several unions there is obtained a distribution far from normal. Nevertheless if the average pauperism and average outdoor relief are taken for aggregates — say quintettes or decades — of unions taken at random, it may be expected that these means will conform to the normal law, with coefficients obtained from the original data, according to the rule which is proper to the case of the normal law. 15 By obtaining averages conforming to the normal law, as by the simple application of the method of least squares, we should not indeed have utilized the whole of our data, but we shall put a part of it in a very useful

8 Trans. Roy. Soc. (1899), A, 192, p. 141.

9 Above, par. 115.

10 Grammar of Science, p. 432.

11 Trans. Roy. Soc, A, vol. 195. In this connexion reference should also be made to Pearson's theory of " Contingency " in his thirteenth contribution to the " Mathematical Theory of Evolution " (Drapers' Company Research Memoirs).

12 Trans. Roy. Soc. (1900), A, 194, p. 257; (1901), A, 197, P- °i-

13 Above, par. 127.

14 Above, par. 116.

15 If from the given set of n observations (each corresponding to a point on the plane xy) there is derived a set of njs observations each obtained by

averaging a batch numbering 5 of the original observation; the coefficient of correlation for the derived system Is the same as that which pertains to the original system. As to the standard deviation for the new system see note to par. 135.

shape. Although the regression-equations obtained would not accurately fit the original material, yet they would have a certain correspondence thereto. What sort of correspondence . may be illustrated by an example in games of chance, which Professor Weldon kindly supplied. Three half-dozen of dice having been

thrown, the number of dice with more than three points in that dozen which is made up of the first and the second half-dozen is taken for y, the number of sixes in the dozen made up to the first and the third half-dozen, is taken for x. Thus each twofold observation (xy) is the sum of six twofold elements, each of which is subject to a law of fre- quency represented in fig. 13; where 1 the figures outside denote the num- ber of successes of each kind, for the ordinate the number of dice with more than three points (out of a cast ria. 13- of two dice), for the co-ordinate the

number of sixes (out of a cast of two dice, one of which is common to the aforesaid cast) ; and the figures inside denote the comparative probabilities of each twofold value (e.g. the probability of obtain- ing in the first two cast dice each with more than three points, and in the second cast two sixes, is 1/72). Treating this law of fre- quency according to the rule which is proper to the normal law, we have (for the element) if the sides of the compartments each = i

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1

*7**

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72

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61

36

H

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8

36

135

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150

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21

5

2

1

7

74

195

260

179

112

35

5

1

6

90

248

254

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4

*most probable value of y ought to be 1. And in fact this expectation is verified, x and y being measured along lines drawn through the centre of the compartment, which ought to have the maximum of content, representing the concurrence of one dozen with two sixes and another dozen with six dice having each more than three points, the compartment which in fact contains 254 {almost the maximum content). In the absence of observations at *=— 31 or y = ± 6i, the regression-equations cannot be further verified. At least they have begun to be verified by batches composed of six elements, whereas they are not verifiable at all for the simple elements. The normal formula describes the given statistics as they behave, not when by themselves, but when massed in crowds: the regression- equation does not tell us that if x' is the magnitude of one member the most probable magnitude of the other member associated there- with is xx , but that if x' is the average of several samples of the first member, then xx' is the most probable average for the specimens of the other member associated with those samples. Mr Yule s proposal to construct regression-equations according to the normal rule " without troubling to investigate the normality of the distri- bution " * admits of this among other explanations. 3 Mr Yule s own view of the subject is well worthy of atte ntion.*

*‘Cf. above, par. 115. * Proc. Roy. Soc, vol. 6o, p. 477. » Below, par. 168.*

154. In the determination of the standard-deviation proper to the law of error (and other constants proper to other laws of frequency) it commonly happens that besides the inaccuracy, cf, eDDan /» s which has been estimated, due to the paucity of the Cor lL : tj ons data, there is an inaccuracy due to their discrete charac- ter: the circumstance that measurement, e.g. of human heights, are given in comparatively large units, e.g. inches, while the real objects are more perfectly graduated. Mr Sheppard has prescribed a remedy for this imperfection. For the standard deviation let M2 be the rough value obtained on the supposition that the observations are massed at intervals of unit length (not spread out continuously, as ideal measurements would be) ; then the proper value, the mean integral of deviation squared, say (jn) —fii — ˆh 2 , where h is the size of a unit, e.g. an inch. It is not to be objected to this correction that it becomes nugatory when it is less than the probable error to which the measurement is liable on account of the paucity of obser- vations. For, as the correction is always in one direction, that of subtraction, it tends in the long run to be advantageous even though masked in particular instances by larger fluctuating errors. 4

155. Professor Pearson has given a beautiful application of the theory of correlation to test the empirical evidence that a given group conforms to a proposed formula, e.g. the normal _ , law of error. 6 Hearsoa s

Supposing, the constants of the proposed function to

Criterion 0/

Empirical

Verification.

be known — in the case of the normal law the arith- metic mean and modulus — we could determine the ‘ position of any percentile, e.g. the median, say a. Now the pro- bability that if any sample numbering n were taken at random from the complete group, the median of the sample, a’, would lie at such a distance from a that there should be r observations between

rx

a and a’ is I V2/ir» exp — 2r 2 /». 6

If, then, any observed set has an excess which makes the above written integral very small, the set has probably not been formed by a random

selection from the supposed given complete group. To extend this method to the case of two, or generally n, percentiles, forming (n + I) compartments, it must be observed that the excesses say e and e', are not independent but correlated. To measure the probability of obtaining a pair of excesses respectively as large as e and e', we have now (corresponding to the extremity of the pro- bability-curve in the simple case) the solid content of a certain probability-surface outside the curve of equal probability which passes through the points on the plane xy assigned by e, e' (and the other data). This double, or in general multiple, integral, say P, is expressed by Professor Pearson with great elegance in terms of the quadratic factor, called by him x 2 > which forms the exponent of the expression for the probability that a particular system of the values of the correlated e, e', &c, should concur —

P = V 2/Tp-Wdx + yjf-e-W [f

+ — + ■ T i-3

+

i-3

• (» – 2) j

X

when n is odd; with an expression different in form, but nearly coincident in result, when re is even. The practical rule derived from this general theorem may thus be stated. Find from the given observations the probable values of the coefficients pertaining to the formula which is supposed to represent the observations. Calculate from the coefficients a certain number, say re, of percentiles ; thereby dividing the given set into re + 1 sections, any of which, according to calculation, ought to contain say m of the observations, while in fact it contains m'. Put e for m'—m; then x 2 =Se 2 /»j. Professor Pearson has given in an appended table the values of P corresponding to values of re + I up to 20, and values of x 2 up to 70. He does not conceal that there is some laxity involved in the circum- stance that the coefficients employed are not known exactly, only inferred with probability. 7

156. Here is one of Professor Pearson's illustrations. The table on next page gives the distribution of 1000 shots fired at a line in a target, the hits being arranged in belts drawn on the target parallel to the line. The " normal distribution " is obtained from a normal curve, of which the coefficients are determined from the observations. From the value of x 2 , viz. 45-8, and of (re+l), viz. 11, we deduce, with sufficient accuracy from

Professor Pearson's table, or more exactly from the formula on which the table is based, that P = -000,001,5 ' ' • "In other words, if shots are distributed on a target according to the normal law, then such a distribution as that cited could only be expected to occur on an average some 15 or 16 times in 10,000,000 times."

157. " Such a distribution " in this argument must be inter- preted as a distribution for which it is claimed that the The observations are all independent of each other. Suppose Criterion that there were only 500 independent observations, the Criticized. remainder being merely duplicates of these 500. Then in the above

- *Just as the removal of a tax tends to be in the long run beneficial to the consumer, though the benefit on any particular occasion may be masked by fluctuations of price due to other causes.*

6 Phil. Mag. (July, 1900). 6 As shown above, par. 103.

7 Loc. cit. p. 166.

table the columns for the normal distribution and for the discrepancy e should each be halved ; and accordingly the column for e 2 /m should be halved. Thus e 2 /m being reduo2d to 22-9, P as found from Pro- fessor Pearson's table is between 995 and 629. That is, such a distribution might be expected to occur once on an average some once or twice in a hundred times. If actual duplication of this sort is not common in statistics, 1 yet in all such applications of the

Belt.

Observed Frequency.

Normal Distribution.

e.

e/m.*

1 2 3 4 5 6

7 8

9 10 11

1

4 10

89

190

212

204

193

79

16

2

1

6

27

67

162

242

240

157

70

26

2

— 2

-17 +22 +28 -30 -36 +36 + 9

— 10

0-667 10-704 7-224 4-839 3-719 5400

8-255

I-I57

3-846

1000

1000

—

45-Sii

Pearsonian criterion — and in other calculations involving the num- ber of observations, in particular the determinations of probable error — a good margin is to be left for the possibility that the n observa- tions are not perfectly independent: e.g. the accidents of wind or nerve which affected one shot may have affected other shots immediately before or after.

158. (2) The Generalized Law of Error. — That the normal law of error should not be exactly fulfilled is not disconcerting to those who ground the law upon the plurality of independent causes. On that view the normal law would only be exact when the numbers of ele- ments from which it is generated is very great. In general, when that number is large, but not indefinitely great, 2 there is required a correction owing to one or other of the following imperfections: that the elements do not fluctuate according to the normal law of frequency; that their fluctuations are not independent of each other; that the function whereby they are aggregated is not linear. The correction is formed by a series of terms descending in the order of magnitude.

159. The first term of this series may be written

-2(&/c 3)[z/c-2× 3 /3c 3] ; where c'/2 is the mean square of deviation for the compound and also the sum of the mean squares of deviations for the component elements, ki is the mean cube of deviations for the ˆrrhirrf compound and the sum of the mean cubes for the com- " Th,ra ponents, and the elements are supposed to be such and so numerous that £i/c 3 is of the order i/V n. This second approximation, first given by Poisson, was rediscovered by De Forest. 3 The present writer has obtained it 4 by a variety of methods. By a further extension of these methods a third and

further approximations may be found. The corrected normal law is then of the form 5

*1 /..._ * 2 \ f. -i_ (x 2x s \ , ,., / 5*

Approxima- tions.

20 x 8 x«\ , , /, x 2 2 x*\ "1 ~T& + 9*

. x' 3 + I0 ˆ

where k = fej/c 3 , k 2 = fe/c 4 , k\ and c are defined as above, fo is the sum of the respective differences for each element between its mean fourth power of error and thrice its mean square of error, 6 and also the corresponding difference for the compound. The formula may be verified by the case of the binomial, considered as a simple case of the law of great numbers. Here

c 2 = 2npq, fej = npa {q—p), fe 2 = npq (1 — 6£g).'

1 It is frequent in the statistics of wages.

2 See on this subject, in addition to the paper on the " Law of Error " already cited (Camb. Phil. Trans., 1905), another paper by the present writer, on " The Generalized Law of Error," in the Journ. Stat. Soc. (September, 1906).

3 The Analyst (Iowa), vol. ix.

4 Phil. Mag (Feb.. 1896) and Camb. Phil. Trans. (1905).

5 The part of the third approximation affected with k 2 may be found by proceeding to another step in the method described {Phil. Mag., 1896, p. 96). The remaining part of the third approxima- tion is found by the same method (or the variant on p. 97) from the

dv 1 dˆy new partial differential equation 4- = — -j-4, where h, is the differ- ence between the actual mean fourth power of deviation and what it would be if the normal law held good. Further approximations may be obtained on the same principle.

*V« — 3/*i 2 in the notation which Professor Pearson has made familiar.*

' Cf. Pearson, Trans. Roy. Soc. (1895), A, clxxxvi. 347.

These values being substituted for the coefficients in the general formula, there results an expression which may be obtained directly by continuing 8

to expand the expression for a term of the binomial.

In virtue of the second approximation a set of observations is not to be excluded from the affinity to the normal curve because, like the curve of barometric heights, 9 it is slightly asymmetrical. In virtue of the third approximation it is not excluded because, like the group of shot-marks above examined, it is, though almost perfectly symmetrical, in other respects apparently somewhat abnormal.

160. If the third approximation is not satisfactory there is still available a fourth, or a still higher degree of approximation. 10 The general expression for y which (multiplied by Ax) „. _ represents the probability that an error will occur at a ADoroxIm' particular point (within a particular small interval) J^n. may be written*

- ki h(S

+».?©'-

*•+ <-> *tnM£)' +a –*

I e — x 2 J2k

' ' ' y °' k is the

where yo is (the normal error-function)-T7~r- <

mean square of deviation; k it ki,..., &c, are coefficients formed from the mean powers of deviation according to the rule that kt is the difference between the fth mean power as it actually is and what it would be if the (/- I)th approximation were perfectly correct. Thus h is the difference between the actual mean third power and what the third power, would be if the first approximation, the normal law, were perfectly correct, that is, the difference between the actual mean third power, often written M3, and zero, that is /i 3 . Similarly kt is the difference between the actual mean fourth power of deviation, say in, and what that mean power would be if the second approxima- tion were perfectly correct, viz. 3k 1 . Thus fe=M3 — 3^ 2 – The series ki, ks, k 6 , &c, k, k 2 , k4, &c, form each a succession of terms descend- ing in the order of magnitude, when each k, e.g. kt has been divided by the corresponding power, i.e. the power O+2) of the parameter or modulus c = V (.2k), which division is secured by the successive differ-

entiations of y 0l with which each k is associated, e.g. k t with

\dx)

Moreover, the first term of the odd series of fe's when divided by the proper power of the parameter, viz. c 8 is small in comparison with the first term of the even series, viz. k, properly referred — divided by c 2 (= 2k).

161. Whatever the degree of approximation employed, it is to be remembered that the law in general is only applicable to a certain range of the compound magnitude here represented by

the abscissa a:. 11 The curve of error, even when general- Character ized as here proposed, coincides only with the central °. .

portion— the body, as distinguished from the extremities t £jg° x "" — of the actual locus; a greater or less proportion.

162. The law thus generalized may be extended, with similar reservations, to two or more dimensions. For example, the second approximation in two dimensions may be written

I / . <2 3 Zo . ,

zo j, s,o k 3 + 32.1 k dtfdj + 3l ' 2 k 3xiy 2 + 0,3k dyj '• to Tw0 or

where z< > is (the normal error-function) Dlmen-

1 Bvrx (x 2 -2rxy+y i!) slons.

tt(i – I 2) exp – (1 – r 2) '

x and y are (as before) co-ordinates measured from the centre of gravity of the group as origin, each referred to (divided by) its proper modulus; r is the ordinary coefficient of regression; 3,0k is the mean value of the cubes x 3 , 2,1k is the mean value of the products x 2 y, and so on; all these k's being quantities of an order less than unity. This form lends itself readily to the determination of a second approxi- mation to the regression-curve, which is the locus of that y, which is the most probable value of the ordinate corresponding to an assigned value of x. Form the logarithm of the above-written ex- pression (for the frequency-surface) ; and differentiate that logarithm with respect to x. The required locus is given by equating this

8 Above, § 103, referring to Todhunter, History, art. 993. The third (or second additional term of) approximation for the binomial, given explicitly by Professor Pearson, Trans. Roy. Soc. (1895), A, footnote of p. 347, will be found to agree with the general formula above given, when it is observed that the correction affecting the absolute term, his yo, disappears in his formula by division.

9 Journ. Stat. Soc. (1899), P- 55°i referring to Pearson, Trans. Roy. Soc. (1898), A.

10 Practically no doubt the law is not available beyond the third or fourth approximation, for a reason given by Pearson, with refer- ence to his generalized probability-curve, that the probable error incident to the determination of the higher moments becomes very great.

11 This consideration does not present the determination of the true moments from the complete set of observations if homogeneous, according as the system of elements fulfils more or less perfectly certain conditions.

differential to zero (the second differential being always negative). The resulting equation is of the form

y — rx — T — ax 2 — 2/3xy — Yy 2 =o, where T, a, /3, 7 are all small, linear functions of the k's. As y is nearly equal to r x, it is legitimate to substitute r x for y, when y is multiplied by a small coefficient. The curve of regression thus reduces to a parabola with equation of the form

y— T = rx — qx 2 ; where q is a linear function of the third mean powers and moments of the given group.

163. Dissection of certain Heterogeneous Groups. — Under the head of law of error may be placed the case in which statistics relating to two (or more) different types, each separately con- forming to the normal law, are mixed together; for instance, the measurements of human heights in a country comprising two distinct races.

In this case the quaesita are the constants in a curve of the form :

y = a(i/V«i) exp-(x-a) 2 /ci s (3(i/V"«: 2) exp – (x – fc) 2 /c 2 2 , where o and /S are the proportionate sizes of the two groups (a/3 = l); a and b are the respective centres of gravity; and ci, c 2 the respective moduli. The data are measurements each of which relates to one or other of these component curves. A splendid solution of this difficult problem has been given by Professor Pearson. The five unknown quantities are connected by him with, the centre of gravity of the given observations, and the mean second, third, fourth and fifth powers of their deviations from that centre of gravity, by certain rational algebraic equations, which reduce

to an equation in one variable of the ninth dimension. In an example worked by Professor Pearson this fundamental equation had three possible roots, two of which gave very fair solutions of the problem, while the third suggested that there might be a negative solution, importing that the given system would be obtained by subtracting one of the normal groups from the other; but the coefficients for the negative solution proved to be imaginary. " In the case of crabs' foreheads, therefore, we cannot represent the frequency curve for their forehead length as the difference of two normal curves." In another case, which prima facie seemed normal, Professor Pearson found that " all nine roots of the fundamental nonic lead to imaginary solutions of the problem. The best and most accurate representation is the normal curve."

164. This laborious method of separation seems best suited to cases in which it is known beforehand that the statistics are a mix- ture of two normal groups, or at least this is strongly suggested by the two-headed character of the given group. Otherwise the less troublesome generalized law of error may be preferable, as it is appro- priate both to the mixture of two — not very widely different — normal groups, and also the other cases of composition. Even when a group of statistics can be broken up into two or three frequency curves of the normal — or not very abnormal — type, the group may yet be adequately represented by a single curve of the " generalized " type, provided that the heterogeneity is not very great, not great enough to prevent the constants ki, k 2 , k3, &c, from being small. Thus, suppose the given group to consist of two normal curves each having the same modulus c, and that the distance between the centres is considerable, so considerable as just to cause the central portion of the total group to become saddle-backed. This pheno- menon sets in when the distance between the centre of gravity of the system and the centre of either component = V \c} Even in this case k 2 is only— 0-125; ˆ4 is 0-25 (the odd k's are zero).

Section II. — Laws of Frequency.

165. A formula much more comprehensive than the corrected normal law is proposed by Professor Pearson under the The

. designation of the "generalized probability-curve." " Ueneral- The ground and scope of the new law cannot be better Izcd Proba- stated than in the words of the author: " The slope of bllity the normal curve is given by a relation the form Curve."

J_dy_ _x y dx~ d' The slope of the curve correlated to the skew binomial, as the normal curve to the symmetrical binomial, is given by a relation of the form

1 d y _ x

y dx~ Ci+C2ˆ Finally, the slope of the curve correlated to the hypergeometrical series (which expresses a probability distribution in which the contributory causes are not independent, and not equally likely to give equal deviations in excess and defect), as the above curves to their respective binomials, is given by a relation of the form

1 Cf. Journ. Stat. Soc. (1899), lxii. 131. A similar substitution of the generalized law of error may be recommended in preference to the method of translating a normal law of error (putting x=/(x), where x obeys the normal law of error) suggested by the present writer {Journ. Stat. Soc, 1898), and independently by Professor J. C. Kapteyn (Skew Frequency Curves, 1903).

I dy x

'y dx~ ~Ci+c 2 x:-f-CsX 2 ' This latter curve comprises the two others as special cases, and, so far as my investigations have yet gone, practically covers all homogeneous statistics that I have had to deal with. Something still more general may be conceivable, but I have found no necessity for it." 2 The " hypergeometrical series," it should be explained, had appeared as representative of the distribution of black balls, 3 in the following case. " Take n balls in a bag, of which pn are black and qn are white, and let r balls be drawn and the number of black be recorded. If v>pn, the range of black balls will lie between o and pn; the resulting frequency-polygon is given by a hypergeometrical series."

Further reasons in favour of his construction are given by Professor Pearson in a later paper. 4 " The immense majority, if not the total- ity, of frequency distributions in homogeneous material show, when the frequency is indefinitely increased, a tendency to give a smooth curve characterized by the following properties, (i.) The frequency starts from zero, increases slowly or rapidly to a maximum and then falls again to zero — probably at a quite different rate — as the charac- ter for which the frequency is measured is steadily increased. This is the almost universal unimodal distribution of the frequency of homogeneous series . . (ii.) In the next place there is generally contact of the frequency-curve at the extremities of the range. These characteristics at once suggest the following of frequency curve, if y&x measure the frequency falling between x andx+Sa;'. — dy _ y{x--a) dx F(x) Now let us assume that F (x) can be expanded by Maclaurin's theorem. Then our differential equation to the frequency will be

1 dy x-fa

y dx io+fri^+W-l- • • • Experience shows that the form (x) [" keeping 5 , 61, 6 2 , only "] suffices for certainly the great bulk of frequency distributions." 6

166. The " generalized probability-curve " presents two main forms 6 • —

y = ya(l+xlai)<" 1 {) X—xlat)"%

and y=yar

— v tan -1 * /a.

(1 +x 2 /a 2) ra "

When oi, o 2 , v are all finite and positive, the first form represents, in general, a skew curve, with limited range in both directions; in the particular case, when di=o 2 , a symmetrical curve, with range limited in both directions. If a 2 = a> , the curve reduces to

y = yo(2 +xla 1 <">iie-< > *) ; representing an asymmetrical binomial with v = 2/j 2 /^ 3 , and 2i=2/« 2 2 /m3 — om3/m 2 i v-i and nz, being respectively the mean second and mean third power of deviation measured from the centre of gravity. In the particular case, when m is small, this form reduces to what is above called the " quasi-normal " curve; and when fi, is zero, ai becoming infinite, to the simple normal curve. The pregnant general form yields two less familiar shapes apt to represent curves of the character shown in figs. 14 and 15— the one occurring in a

Fig. 14.

Fig. 15.

good number of instances, such as infant deaths, the values of houses, the number of petals in certain flowers ; the other less familiarily illustrated by Consumptivity and Cloudiness. 7 The second solution represents a skew curve with unlimited range in both directions. 8 Professor Pearson has successfully applied these formulae to a number of beautiful specimens culled in the most diverse fields of statis- tics. The flexibility with which the generalized probability-curve adapts itself to every variety of existing groups no doubt gives it a great advantage over the normal curve, even in its extended form. It is only in respect of a priori evidence that the latter can claim precedence. 9

167. Skew Correlation. — Professor Pearson has extended his

2 Trans. Roy. Soc. (1895), A, p. 381. 3 Ibid. p. 360.

4 " Mathematical Contributions to the Theory of Evolution " (Drapers' Company Research Memoirs, Biometric Series II.), xiv. 4.

6 p. 7, loc. cit. 6 Ibid. p. 367.

7 Pearson, loc. cit., p. 364, and Proc. Roy. Soc.

8 A lucid exposition of Professor Pearson's various methods is given by W. Palin Elderton in Frequency-curves and Correlation

(1906).

9 Journ. Stat. Soc. (1895), p. 506.

method to frequency -loci of two dimensions; 1 constructing for the curve of regression (as a substitute for the normal right line), in the case of " skew correlation," a parabola, 2 with constants based on the higher moments of the given group.

168. In this connexion reference may again be made to Mr Yule's method of treating skew surfaces as if they were normal. It is certainly remarkable that the correlation should be so well represented by a line — the property of a normal surface — in cases of which normality cannot be predicated: for instance, the statistics of the number of husbands (or wives) living at each age who have wives (or husbands) living at different ages. 3 It may be suggested that though in this case there is one dominant cause, the continual decrease of the population, inconsistent with the plurality of causes postulated for the law of error, yet there is a sufficient degree of accidental variation to realize one property at least of the normal locus.

169. There is possibly an extensive class of phenomena of which frequency depends largely on fortuitous causes, yet not Relati a s0 com pl ete ly as to present the genuine law of error. 4 between This mixed class of phenomena might be amenable Frequency to a kind of law of frequency that would be different aadfroba- f ronl) y e t have some affinity to, the law of error. biuty. ˆ,j ie ˆQybjg character may be taken as the definition of the laws proper to the present section. The definition of the class is more distinct than its extent. Consider for example the statistics which represent the numbers out of a million born that die in each year of age after thirty of forty — the latter part of the column in a life-table. These are well represented by a species of Professor Pearson's " generalized probability-curve," 5 his type iii. of the form

yo (1 + xjoy e

~yx

The statistics also lend themselves to the Gompertz-Makeham formula for

the number living at the age

The former law, the simplest species of the " generalized probability-curve," may well be attributed in part to the operation of a plexus of causes such as that which is apt to generate the law of error. In fact, a high authority, Professor Lexis, has seen in these statistics — or continental statistics in pari materia — a fulfilment of the normal law of error. 6 They at least fulfil tolerably the generalized law of error above described. But the Gompertz-Makeham formula is not thus to be accounted for; at least it is not thus that it was regarded by its discoverers. Gompertz justifies his law 7 by a " hypothetical deduction congruous with many natural effects," such as the exhaustion of air by a pump; and Makeham follows 8 in the same track of explanation by way of natural laws. Of course it is not denied that mortality is subject to accident. But the Gompertz-Makeham law purports to be fulfilled in spite of, not by reason of, fortuitous agencies. The formula is accounted for not by the interaction of fleeting causes which is characteristic of probability, but by causes of that ordinary kind of which the investigation constitutes the greater part of natural science. Laws of frequency thus conceived do not belong to the theory of Probabilities.

Authorities. — As a comprehensive and masterly treatment of the subject as a whole, in its philosophical as well as mathematical character, there is nothing similar or second to Laplace's Thkorie analytique des probabilites. But this " ne plus ultra of mathematical skill and power " as it is called by Herschel {Edinburgh Review, 1850) is not easy reading. Much of its difficulty is connected with the use of a mathematical method which is now almost superseded,

1 " Contributions," No xiv. (above cited).

2 Not the same parabola as that proposed at par. 162.

5 Census of England and Wales General Report (cod. 2174), p. 226. Cf. p. 70, as to the rationale of the phenomenon.

- *A good example of the suggested blend between law and chance is presented by an hypothesis which Benine (in a passage referred to above, par. 97) has proposed to account for Pareto's income-curve.*

6 " Contributions, No. ii., Phil. Trans. (1895), vol. 186, A. 8 Lexis, Massenerscheinungen, § 46. Cf. Venn, cited above, par. 124.

7 Phil. Trans. (1-25).

8 Assurance Magazine (1866), xi. 315.

‘ ‘ Generating Functions. ‘ ‘ Not all parts of the book are as rewarding as the Introduction (published separately as Essai philosophique des probabilites) and the fourth and subsequent chapters of the second book. Among numerous general treatises E. Czuber’s Wahrschein- lichkeitstheorie (1899) may be noticed as terse, lucid and abounding in references. Other authorities may be mentioned in relation to the different parts of the subject as above divided. First principles are discussed with remarkable acumen by J. Venn in Logic of Chance (1st ed., 1876, 3rd ed., 1888) and by J. v. Kries in Principien der Wahrscheinlichkeitsrechnung (1886). As a repertory of neat prob- lems involving the calculation of probability and expectation W. A. Whitworth’s Choice and Chance (5th ed., 1901), and DCC. Exercises . . . in Choice and Chance (1897) deserve mention. But this advantage is afforded in nearly as great perfection by more compre- hensive works. Bertrand’s Calcul des probabilites (1889) abounds in choice examples, while it excels in almost every other branch of the subject. Special mention is also deserved by H. Poincare’s Calcul des probability {lecons professes, i893~i894)._ On local or geometrical probability Professor Morgan Crofton is one of the highest authorities. His paper on ” Local Probability ” in Phil. Trans. (1868), and on ” Geometrical Theorems,” Proc. Lond. Math. Soc. (1887), viii., should be read in connexion with the section on ” Local Probability ” in his article on ” Probability ” in the 9th edition of the Ency. Brit., from which section several paragraphs have been transferred en bloc to the section on Geometrical Applications in the present article. The topic is treated ex- haustively by Czuber in Geometrische Wahrscheinlichkeiten und Mittelworten (1884). Czuber is also to be mentioned as the author of Theorie der Beobachtungsfehler, in which he has reproduced, often with improvement, or referred to, almost everything of importance in the work of his predecessors. A. L. Bowley’s Elements of Statistics, pt. 2 (2nd ed., 1902), forms an introduction to the law of error which leads the beginner easily, yet far. References to other writers are given in Section I. of Part II. above. A list of writings on the cognate topic, the method of least squares, has been given by Merriman (Con- necticut Trans, vol. iv.). On laws of frequency, as above defined, Professor Karl Pearson is the highest authority. His ” Contributions to the Mathematical Theory of Evolution,” of which twelve have appeared in the Trans. Roy. Soc. (1 894-1 903) and others are being published by the Drapers’ Company, teem with new theories in Probabilities. (F. Y. E. 9)

PROBATE, in English law, the ” proving ” (Lat. probalio) of a will. The early jurisdiction of the English ecclesiastical courts over the probate of wills of personality is discussed under Will. The Court of Probate Act 1857 transferred the juris- diction both voluntary and contentious of all ecclesiastical, royal peculiar, peculiar and manorial courts to the court of

probate thereby constituted, created a judge and registrars of that court, abolished the old exclusive rights in testamentary matters of the advocates of Doctors' Commons, and laid down rules of procedure. Contentious jurisdiction was given to county courts when the personal estate of the deceased was under £200 in value. The Judicature Act 1873 merged the old court of probate in the probate divorce and admiralty division of the High Court of Justice. The division now consists of the presi- dent and one other judge. The practice of the division is mainly regulated by the rules of the Supreme Court 1883. Appeals lie to the court of appeal and thence to the House of Lords. Probate may be taken out either in common or solemn form. In the former case, which is adopted when there is no dispute as to the validity of the will, the court simply recognizes the will propounded as the last will of the deceased. This formality is necessary to enable the executor to administer the estate of his testator. Probate in this form is granted simply as a ministerial act if the attestation clause declares that the formali- ties of the Wills Act have been complied with, or if other evidence to that effect is produced. Such grant is liable to revocation, but it is provided that any person dealing with an executor on the faith of a grant of probate in common form, shall not be prejudiced by its revocation. The executor may within thirty years be called upon to prove in solemn form, or a person whe doubts the validity of the will propounded may enter a caveat which prevents the executor proving for six months and the caveat may be renewed each six months. The executor may however take out a summons to get the caveat " subducted " 01 withdrawn, but if an appearance to the summons is entered 9 These initials do not apply to certain passages in the above article, namely, the greater part of paragraphs 41, 52, 62 and 72, and almost the whole of the 4th section of Part. I. (pars. 76-93), which have been adopted from the article " Probability " in the 9th edition of the Ency. Brit., written by Professor Morgan Crofton.

within six days to the summons the executor is then compelled to prove in solemn form. Probate in solemn form is a judgment of the court in favour of the will propounded, and is only revoc- able by the discovery of a later will. In order, therefore, to obtain such grant proceedings have to be taken by action, and witnesses produced in support of the will, and the action proceeds in the usual way.

The principal rules now obtaining as to probate are these. Probate, which since the Land Transfer Act 1897 must be taken out for wills of realty as well as wills of personalty, may be granted either in the principal or in a

district registry, and should be obtained within six months after the testator's death. When no executor is named the will is not now invalid, as was once the case, but administration cum testamento annexo is granted. The same course is pursued where the executor renounces or dies intestate before administering the estate of the deceased. After probate, the probate itself (as the official copy of the will is called) becomes evidence, the original will being deposited in the principal registry at Somerset House, London. On grant of probate, estate duty, denoted by a stamp on the affidavit sworn for that purpose, is payable. It varies according to the amount at which the estate of the deceased is fixed by the oath of the executor (see Estate Duty). The act of 1881 enables any officer of inland revenue to grant probate where the personal estate does not exceed £300.

Ireland. — In 1867 an act on lines similar to the English act was passed for Ireland and under the Irish Judicature Act of 1877 the then existing court of probate was merged in the High Court of Justice.

Scotland. — Confirmation includes both the probate and letters of administration of English procedure. Without confirmation by the court interference by the executor becomes a vitious intro- mission. Originally confirmation of testaments of movables fell, as in England, under the cognizance of the church courts. Such jurisdiction certainly existed at the time of regiam majestatem. This ecclesiastical right continued through the commissary court at Edinburgh (constituted by Queen Mary in 1563), and the local commissaries, until modern times when the jurisdiction of the courts was at first transferred and then abolished by a series of enactments from the Commissary Courts Act 1 823 to the Sheriff Courts Act 1876. The act of 1823 placed the commissary jurisdiction in the sheriff courts; by the act of 1876 the sheriffs sit as sheriffs in testamentary matters, no longer as commissaries. Confirmation of wills where the whole estate is under £300 is regulated by the Customs and Inland Revenue Act 1881 and other acts. An eik is an addition to a confirmation made on discovery of additional effects of the deceased after confirmation.

United States. — Probate is granted in some states by the ordinary chancery or common law courts, but more frequently by courts of special jurisdiction, such as the prerogative court in New Jersey, the surrogates' court in New York, the orphans' court in Pennsylvania.

" In a great majority of the states the original equitable juris- diction over administrations is in all ordinary cases — without any special circumstances such as fraud, or without any other equitable feature such as trust — either expressly or practically abrogated. The courts of equity, in the absence of such special circumstances or distinctively equitable features, either do not possess or will not exercise the jurisdiction, but leave

the whole matter of administra- tions to the special probate tribunals " . . .so that " unless the case involves some special feature or exceptional circumstances of themselves warranting the interference of equity, such as fraud, waste, and the like, or unless it is of such an essential nature that a " probate court is incompetent to give adequate relief, or is one of which the probate court having taken cognizance has completely miscarried and failed to do justice by its decree, the courts of equity will refuse to interpose and to exercise whatever dormant powers they may possess, but will leave the subject matter and the parties to the statutory forum which the legislature plainly regarded as sufficient and intended to be practically exclusive " (Rices Probate Law, pp. 4 and 5).

Probate courts are in most if not all the states courts of record, having a public seal and a clerk (or the judge has authority to act as clerk) ; they issue process and execute their decrees by appropriate officers in the same manner as the common law and chancery courts. They sit at stated terms. They have power to punish for contempt, and to compel obedience to their orders and decrees, and their judgments upon matters within their jurisdiction are enforced usually by the same means as common

law and chancery courts (Noemen's Law of Administration,

§ H5).

Jurisdiction as to wills and their probate as such is neither included in nor excepted out of the grant of judicial power to the courts of the United States (i.e. the Federal as distinguished from the state courts). So far as it is ex parte and merely administrative it is not conferred, and it cannot be exercised by them at all until in a case at law or in equity its exercise becomes necessary to settle a controversy by reason of the (diverse) citizenship of the parties. An action to set aside the probate of a will of real estate may be maintained in a Federal court when the parties on one side are citizens of a different state from the parties on the other side (Ellis v. Davis, 109 U.S. Reports, 485). Probate in solemn form, i.e. after due notice to all parties in interest is the almost universal form in use in the United States. One reason for this no doubt is that all documents affecting title to real estate must be recorded and probate in solemn form concludes all parties to the proceeding and thus tends to establish the title to all real estate passing under the will.

In the United States wills of real property must be separately proven in the proper probate court in each state in which the real property is situated, unless statute dispenses with separate probate (each state being " foreign " to every other for this purpose). Copies of such will and probate should be filed also in the office of the register of deeds of each county in the state in

which any real property belonging to the testator is situated.

In the state of New Jersey it has been held that an unprobated will is capable of conveying an interest in the property devised, and when a conveyance is made under a power in the will before probate a subsequent probate validates the conveyance (1906, Mackey v. Mackey, 63 Atl. Rep. 984).

In Illinois a court of equity has no inherent power to entertain a bill to contest a will (1906; O'Brien v. Bonfield, 220 111. Rep. 219).

In Missouri a foreign (New York) will of real estate in Missouri, probate of which was duly recorded in Missouri, cannot be collaterally attacked, and cannot be set aside by direct proceeding after being filed for record more than five years in Missouri (1907; Cohen v. Herbert, 104 So. W. Rep. 84).

PROBATION. The probation system, in penology, is an attempt to reform a prisoner outside prison, a special kind of warder — the probation officer — supervising the prisoner in the prisoner's own home. The state of Massachusetts in America was the first to attempt " probation," and at first (1878) in a tentative manner. As success crowned the efforts of the reformers the system was developed and applied to an increasing number of cases; and gradually other American states followed with some variations in their plans. The probation officers attend the court and the judge officially gives up the prisoner to the officer chosen to supervise him, generally explaining to the prisoner that, if he is not obedient to all the rules made for him by the officer, he will be returned to court and prison will be his fate. An officer generally has from sixty to eighty cases under his care. Women officers are in charge of women and boys and girls under eighteen. A probation officer has a special area of the town allotted to him and usually gets all prisoners from that area. He acquires an intimate knowledge of the physical, economic and social surroundings in which his prisoner lives. He is therefore well fitted to watch him and to help him to become once more a decent citizen. He gradually gives him back his liberty and removes restrictions until he is capable of living a decent life alone. The powers of the probation officer are necessarily very great. The prisoner continues his work as before, but the officer visits his factory or workshop and arranges to receive his wages each week, passing over the greater part of them to the wife to keep up the home, giving a very small sum to the prisoner for personal expenses, and retaining a small sum, which is paid back to the prisoner when he becomes a free man.

The advantages claimed for the probation system are these, that a number of independent well-paid probation officers, chosen for their knowledge of human nature and their skill in reforming it, can give personal attention to

individual cases; the stigma of prison is avoided, and while great care is taken that the prisoner shall be strictly controlled and effectively

restrained, his self-respect is carefully developed; the family- benefits, the home is not broken up, the wages still come in, and if the prisoner is a mother and a wife, it is, of course, most important that she should retain her place in the home; the prisoner does not ” lose his job ” nor his mechanical skill if he is a skilled workman. Lastly, the system is far cheaper than imprisonment. The prisoner keeps himself and his family, and one officer can attend to from 60 to 80 prisoners.

In the United Kingdom the probation system has been applied to young offenders by the Prevention of Crime Act 1908. That act empowered the prison commissioners to place offenders on licence from the Borstal Institution (see Juvenile Offenders) at any time after six months (in the case of a female, three months), if satisfied that there was a reasonable probability of their abstaining from crime and leading a useful and industrious life. The condition of their release is that they be placed under the supervision or authority of some society or person (named in the licence) willing to take charge of the case. This is, of course, only a limited application of the system of probation, for those detained in a Borstal Institution are offenders between the ages of sixteen and twenty-one who have been convicted of an indictable offence. It does not apply to those of full age, nor to those under twenty-one years of age who have been committed to prison for minor offences. It has been long held by English prison reformers that young persons under the age of twenty-one should not be committed to prison, unless for serious offences, but that they should be put under some system of probation. Legislation to this effect was foreshadowed by the home secretary in his speech on prison reform in the House of Commons on the 20th of July 1910.

PROBOSCIDEA (animals ” with a proboscis “), the scientific name of the group of mammals represented at the present day only by the two species of elephant. Although here regarded as a sub-order of Ungulata (?.».), the group is sometimes accorded the rank of an order by itself. 1 The existing elephants are widely sundered from all other living mammals, and for a long time palaeontology afforded but little clue as to their ancestry. Discoveries made during the first few years of the 20th century in the Lower Tertiary deposits of the Fayum district of Egypt have, however, brought to light the existence of several kinds of primitive proboscideans which serve to link the group with other ungulates, and likewise apparently

indicate affinity with the Sirenia.

The following are some of the leading characteristics of existing elephants. The combined upper lips and nose are produced into a long muscular, flexible and prehensile proboscis, or trunk, with the nostrils at its tip. The teeth consist of a pair of large upper permanently growing incisors or tusks ; and a set of cheek- teeth having their crowns composed of a series of tall transverse vertical plates gradually increasing in number from the first to the last of the series; and only portions of two of these teeth being in use at any one time. There are no clavicles; and the limbs are stout, with their component segments placed nearly in a vertical line, and the upper segment, especially in the hind- limb, the longest; the radius and ulna are distinct, the latter articulating extensively with the carpus; the fibula and tibia also distinct; the astragalus very flat on both surfaces; and both front and hind feet short, broad and massive, with five toes (though the outer pair may be more or less rudimentary), all encased in a common integument, though with distinct, broad, short hoofs; third digit the largest. Two anterior venae cavae entering the right auricle. Stomach simple. A capacious caecum. Testes permanently abdominal. Uterus bicornuate. Placenta deciduate and zonary. Teats two, pectoral.

In order to understand the peculiar nature of the dentition, it is

necessary to discuss to some extent those of the immediate ancestors

of the true elephants, such as the mastodons (see

Dentition. Mastodon). As regards the incisors, or tusks, which

1 Cuvier's order Pachydermata (Gr. 7raxfe, thick and Skppa, skin), containing the elephants, hippopotami, rhinoceros, swine, tapirs, hyraxes, &c, is now abandoned, its members now forming the orders Proboscidea and Hyracoidea and the sub-order Parisso- dactyla. A few Artiodactyla are also included.

project largely out of the mouth, and are of an elongated conical form and generally curved, these are composed mainly of solid dentine, the fine elastic quality and large mass of which renders it invaluable as " ivory " for commerce and the arts. A peculiarity of the dentine of the Proboscidea is that it shows, in transverse fractures or sections, fine lines proceeding in the arc of a circle from the centre

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Fig. 1. — Longitudinal Sections of the Crowns of Molar Teeth of various Proboscideans, showing stages in the gradual modification from the simple

to the complex form. The dentine is indicated by transverse lines, the cement by a dotted surface, and the enamel is black.

I, Mastodon americ anus; III, Elephas africanus;

II, Elephas {Stegodon) insignis; IV, Elephas primigenius.

to the circumference in opposite directions, and forming by their decussations curvilinear lozenges, as in the " engine-turning " of the case of a watch. The enamel-covering in existing species is confined to the extreme apex, and very soon wears off, but in some extinct species it forms persistent longitudinal bands of limited breadth. The tusks have small milk-predecessors, shed at an early age.

As regards the cheek-teeth, these are composed in the mastodons of a variable number of enamel-covered transverse ridges, often divided into inner and outer columns, which may partially alternate, and complicated by smaller additional columns; but in the unworn tooth they stand out freely on the surface of the crown, with deep valleys between (fig. 1, I). In the elephants the ridges are increased in number, and consequently become narrower from before back- wards, while they are greatly extended in vertical height. In order to give solidity to what would otherwise be a comb-like tooth, the whole structure is enveloped and united in a large mass of cement, which completely fills the valleys, and gives a general smooth appear- ance to the unworn tooth; but as the wear consequent upon the masticating process proceeds, the alternate layers of tissue of different hardness — cement, dentine and enamel — which are disclosed upon the surface form a fine and efficient grinding instru- ment. The intermediate stages between the molar of a modern elephant and that of a mastodon are so fully known that it is not possible to draw a definite line between the two types of tooth- structure (see fig. I, II, III, IV).

As regards the mode of succession, that of modern elephants is very peculiar. During the complete lifetime of the animal there are but six cheek-teeth, which it will be convenient to allude to as molars, on each side of each jaw, with occasionally a rudimentary one in front, completing the typical number of seven. The last three represent the molars of ordinary mammals, those in front are milk-molars, which are never replaced by permanent successors, the whole series gradually moving forwards in the jaw, and the teeth becoming worn away and their remnants cast out in front, while development of others proceeds behind. The individual- teeth are so large, and the processes of growth and destruction by wear take place so slowly, that not more than one, or portions of two, teeth are ever in place and in use on each side of each jaw at oijp time, and the whole series of changes coincides with the usual duration of the animal's life. On

the other hand, the earlier representations of the proboscidean series referred to below have the whole of the cheek-teeth in place and use at one time, and the milk-molars vertically displaced by premolars in the ordinary fashion. Among mastodons transitional forms occur in the mode of succession as well as in structure, many species showing a vertical displacement I of one or more of the milk-molars, and the same has been observed

in one extinct species of true elephant (Elephas planifrons) as regards some of these teeth.

Most proboscideans are animals of large dimensions, and some are the most colossal of land mammals. The head is of great proportionate size; and, as the brain-case increases but little in bulk Character during growth, while the exterior wall of the skull is isiics. required to be of great superficial extent to support

the trunk and the ponderous tusks, and to afford space for the attachment of muscles of sufficient size and strength to

an

(Flower's Osteology of Mammalia.)

Fig. 2. — Section of the Skull of the African Elephant {Elephas africanuˆ) taken to the left of the middle line, and including the vomer (Vo) and the mesethmoid (ME).

an, Anterior, pn, Posterior nasal aperture.

wield the skull thus heavily weighted, an extraordinary develop- ment of air-cells takes place in the cancellous tissue of nearly all the bones of the cranium. These cells are not only formed in the walls of the cranium proper, but are also largely developed in the nasal bones and upper part of the premaxillae and maxillae, the bones forming the palate and the basi-cranial axis, and even extend into the interior of the ossified mesethmoid and vomer. Where two originally distinct bones come into contact, the cells pass freely from one to the other, and almost all the sutures become obliterated in old animals. The intercellular lamellae in the great mass which surrounds the brain-cavity superiorly and laterally mostly radiate from the inner to the outer table, but in the other bones their direction is more irregular. Like the similar but less developed air- cells in the skulls of

many other mammals, they all communicate with the nasal passages, and they are entirely secondary to the original growth of the bones, their development having scarcely commenced in the new-born animal, and gradually enlarge as the growth of the creature proceeds. The nasal bones are very short, and the anterior nasal aperture situated high in the face. The zygomatic arch is slender and straight, the jugal bone being small, and forming only the middle part of the arch, the anterior part of which (unlike that of true Ungulates) is formed only by the maxilla. The maxillo-turbinals are rudimentary, the elongated proboscis supplying their place functionally in warming and clearing from dust the inspired air.

The neck is very short. The limbs, as already mentioned, are long and stout, and remarkable for the great length of the upper segment (especially the femur) as compared with the lower segment, as represented by the foot. It is owing to this and the vertical position of the femur that the knee-joint in the hind-leg is placed much lower, and is more conspicuous externally than in most quadrupedal mammals; and this having been erroneously compared with the hock-joint or ankle of the more ordinary ungulates, gave rise to the popular fallacy that the joints of the elephant's leg bend in a contrary direction to that of other mammals. There is no round ligament in the hip-joint, or third trochanter to the femur. The radius and ulna are distinct, though fixed in a crossed or prone position; and the fibula also is quite separated from the tibia. The feet are short and broad, the carpal and tarsal bones being very square, with flattened surfaces for articulation; the astragalus especially differs from that of the more typical ungulates in its flatness, in the absence of distinct pulley-like articular surface at either extremity, and in having no articular facet for the cuboid. The fibula articulates with the calcaneum, as in the artiodactyle sub-order of Ungulata. Of the five toes present on each foot, the middle one is somewhat the largest, while the lateral ones are the smallest, and generally lack (especially in the hind-foot) the complete number of phalanges. The terminal phalanges are all small, irregular in form, and late in ossification. The whole are encased in a common integument, with a flat, subcircular, truncated sole, the only external indication of the toes being the broad oval nails or hoofs arranged in a semicircle around the front edge of the

sole. The hind foot is smaller and narrower than the front. The liver is small and simple, and there is no gall-bladder. In form the brain resembles that of the lower orders of mammals in that the cerebellum is entirely behind and uncovered by the cerebrum, but the hemispheres of the latter are richly convoluted.

Elephants are exclusively vegetable-feeders, living chiefly on leaves and young branches of forest trees and various kinds of herbage, or roots, which they gather and convey to their mouth by a very mobile proboscis,

an organ which combines in a marvellous manner strength with dexterity of application, and is a necessary compensation for the shortness and inflexibility of the neck, as it is by this that many of the functions of the lips of other animals are performed. By its means elephants are enabled to drink without bending the head or limbs. The end of the trunk being dipped, for instance, into a stream or pool, a forcible inspiration fills the two capacious air-passages in its interior with water, which, on the tip of the trunk being turned upwards and inserted into the mouth, is ejected by a blowing action, and swallowed. Or if the animal wishes to refresh and cool its skin, it can throw the water in a copious stream over any part of its surface. Elephants can also throw dust and sand over their bodies by the same means and for the same purpose, and they have frequently been observed fanning themselves with boughs held in the trunk.

The following are the distinctive features of the genus Elephas, the type of the family Elephantidae : Dentition: i. £, c. %, m. | = 26. The incisors variable, but usually of very large size, especially in the male sex, directed somewhat outwards, and curved upwards, without enamel except on the apex before it is worn ; preceded by small milk-incisors. The molars succeed each other by horizontal replacement from before backwards, never more than one or part of two being in use on each side of each jaw at the same time; each composed of numerous flattened enamel-covered plates or ridges of dentine, projecting from a common many-rooted base, surrounded and united together by cement. The number of plates increases from the anterior to the posterior molar in regular succession, varying in the different species, but the third and fourth (or the last milk-molar and the first true molar), and these only, have the same number of ridges, which always exceeds five. Skull of adult very high and globular. Lower jaw ending in front in a deflected, spout-like symphysis. Vertebrae: C. 7, D. 19-21, L. 3-4, S. 4, C, 26-33.

The two existing species of elephant are the Indian or Asiatic (Elephas maximus), and the African (E. africanus), the distinctive characteristics of which are given under Elephant. See also Mammoth and Mastodon.

Extinct Proboscidea

Elephas. — The extinct representatives of the Proboscidea are of the greatest importance and interest, since they serve to connect the modern elephants with ungulates of more ordinary type. The Mammoth (Elephas primigenius) is treated in a separate article. Nearly allied is E. armeniacus of Asia Minor; but E. antiquus, of which the remains are abundant in many of the superficial formations of England and Europe generally, approximates in the structure of its molar teeth to the African elephant. It is represented in the Pleistocene of India by the closely allied or identical E.

namadicus. Affinity with the African species is strongly marked in the case of the dwarf elephants of Malta (E. melitensis) and Cyprus (E. Cypriotes) ; and the gigantic E. meridionalis, of the " forest-bed " of the east coast of England and the Upper Pliocene of the Val D'Arno, has likewise molars showing the broad lozenges of enamel- bordered dentine characteristic of the African type. These and other species indicate, however, that, so far as dental characters are concerned, generic separation of the African from the Asiatic elephant is impossible. In North America the mammoth occurs in the far north, E. columbi, more akin to E. antiquus chiefly in the Central United States, and E. imperator (allied to E. meridionalis) in the south. The oldest representatives of this group are E. hysudricus and E. planifrons of the Lower Pliocene of Northern India; the latter of which developed premolars vertically replacing the anterior teeth of the molar series.

From E. planifrons there is an almost complete transition to the ridge-toothed elephants, such as E. ganesa, E. insignis,

E. bombifrons and E. clifti, typically from the Lower Pliocene of India and Burma, but some of which extend eastwards to Java, Borneo, China and Japan. These constitute the group (or genus) Stegodon, and are characterized by the lowness of the crowns of the molar teeth, in which the tall plates of the more typical elephants are reduced to low ridges with more or less completely open valleys between them; the number of ridges in each tooth is always much lower than in the corresponding teeth of the typical elephants. Premolars, vertically replacing the anterior molars, were often developed. These stegodont elephants appear to have been confined to India and the countries farther east, and exhibit an almost complete transition, so far as dental characters are concerned, to the mastodons of the same region.

Mastodon. — The connexion between the stegodont elephants and the mastodons (see Mastodon) is formed by the Indian and Burmese Mastodon latidens and M. cautleyi. In fact the main distinction between these animals and the stegodont elephants is the smaller number of ridges in the third, fourth and fifth molars, which is usually four, and never exceeds five, whereas in the stegodonts it is at least six and the numbers are not the same in each of the three teeth. In the two species named the transverse ridges are more or less continuous. Many other species, such as the European M. arvernensis (see fig. 2 in art. Mastodon) and the Indian M. sivalensis, have, how- ever, the ridges broken up into columns, or cones, more or less alternately arranged, and thus blocking the intermediate

valleys. In these species, which are of Pliocene age, there are four ridges in molars 3, 4 and 5; but in the Pleistocene North American M. americanus (as well as in many other species) these are reduced to three in each of the aforesaid teeth. The lower jaw of the latter species frequently shows small tusks, which are, however, generally shed in mature age. Premolars, which vertically replace some of the anterior molars (milk-molars), are developed in many species, although not in M. americanus. Species of the genus are found over the greater part of the world, inclusive of Europe, Asia and North and South America; M. humboldti being the best known South American species. A single tooth referable to this or the next genus has been ob- tained from South Africa.

Tetrabelodon. — The more primitive mastodons constitute the genus Tetrabelodon, and are characterized by the presence of a pair of short chisel-shaped tusks in the lower jaw, which is prolonged into a trough-like chin for their support; tusks being also present in the upper jaw. These animals were pro- vided with a snout-like muzzle instead of a trunk (see Mastodon). Their birthplace was Africa; the Miocene European M. angus- tidens having been discovered in Egypt in strata overlying those from which were obtained the remains of the under-mentioned more primitive genera. Tetrabelodont mastodons were, how- ever, by no means confided to the Miocene, Tetrabelodon longiros- tris occurring in the Lower Pliocene of Europe, and T. pandionis in that of India. Most of these four-tusked mastodons were smaller animals than modern elephants.

Palaeomastodon. — No proboscidean earlier than Tetrabelodon occurs in Europe, but the group is represented in the Upper Eocene of Egypt by a smaller and more primitive type known as Palaeomastodon. This genus resembles Tetrabelodon in having four pairs of tusks, but differs in the less elephant-like skull, and the simpler character of the molar teeth, ot which five pairs were in use at one time, whereas in Tetrabelodon and Mastodon there were never more than two pairs and a portion of a third in simultaneous wear.

Moeritherium. — The earliest representative of the proboscidean stock at present known is Moeritherium, from the Middle Eocene of Egypt, which includes still smaller animals, whose relation- ship to Elephas would scarcely be realized were it not for the intermediate links. All six pairs of cheek-teeth (pm. 2-m. 3,

fig. 3) were in use at once, and there was a comparatively full series of teeth in the front of the jaws; while the premolars were preceded by milk-molars in the normal manner. Very significant is the enlargement of the second pair of incisors in each jaw, thereby foreshadowing the tusks of Tetrabelodon. There was, however, no lengthening of the chin, so that the

muzzle was

(From the Geological Magazine.)

Fig. 3. — Dentition of Moeritherium lyonsi.

A, Upper teeth.

B, Front of snout, showing the tusk-like second incisors.

C, Left ramus of mandible from outer side.

probably of normal proportions. This animal was not larger than a tapir.

Dinotherium. — The huge proboscidean from the Lower Pliocene and Middle Miocene strata of Europe and India, known as Dinotherium, indicates a type off the line of descent of the elephants. Upper tusks were apparently wanting, but the

Fig.

4-

-Skull of Dinotherium giganteum (Lower Pliocene. Eppelsheim, Hesse-Darmstadt).

lower jaws carried a pair of large tusks bent downwards in a peculiar manner (fig. 4). The cheek-teeth formed five pairs, all in use at one time, and premolars vertically replacing milk- molars in the ordinary fashion. The ridge-formula of the permanent teeth of the cheek series was 2.2.3.2.2.

Barytherium and Pyrotherium. — Very problematical are the

affinities of Barytherium of the Egyptian Eocene and Pyro- therium of the Lower Tertiaries of Patagonia; although it is possible that they may both be offshoots from the primitive proboscidean stock. Pyrotherium had a pair of upwardly directed tusks in the lower jaw. The cheek-teeth are five in number and carry transverse ridges similar to those on the molars of Dinotherium, although there are only two to each tooth. If really related to the Proboscidea, Pyrotherium may be derived from the African ancestral stock of that group which reached South America by way of a former land-connexion between that continent and Africa. So far as can be determined, Barytherium approximates in many respects to Dinotherium, but in others

seems to approach Uintatherium of the North American Tertiaries (see Amblypoda).

See C. W. Andrews, Descriptive Catalogue of the Tertiary Vertebrata of the Fayum, British Museum, 1906. (R. L.)*

PROBOSCIS, the trunk of an elephant (Gr. irpo&ocds, rrpo, before, fioaiceLv, to feed), the long flexible snout of the order of Mammalia called Proboscidea (q.v.), which embraces the elephant and its extinct allies the mammoths and mastodons. The term is also applied to the snout of the tapir and of the " kahan " or proboscis-monkey (Nasalis larvatus), and more particularly to the elongated parts of the mouth of various insectˆ, such as the rostrum or beak of a rhynchophorus beetle, the antlia of Lepidoptera, the sucking mouth of the house-fly, &c. Various worms possess a tubular structure which can be extended at the anterior portion of the body, and some gastropods a sucking tongue, to both of which the name " proboscis " is applied.

PROBOSCIS-MONKEY, a large, long-tailed, red Bornean species characterized by the extraordinary prolongation of the nose of the adult male, which hangs, however, down in front of the upper lip and does not stand straight out from the face in the manner commonly represented in pictures. From this feature the species, which is the only representative of its genus, derives its name of Nasalis larvatus. In females and young the nose is much less developed, with a tendency to turn upwards in the latter. This monkey is a leaf-eater, nearly allied to the langurs, as typified by the sacred ape of India. (See Primates.)

PROBUS, MARCUS AURELIUS, Roman emperor a.d. 276 to 282, was a native of Sirmium in Pannonia. At an early age he entered the army, where he distinguished himself under the emperors Valerian, Claudius and Aurelian. He was appointed governor of the East by the emperor Tacitus, at whose death he was immediately proclaimed his successor by the soldiers. Florianus, who had claimed to succeed his brother, was put to death by his own troops, and the senate eagerly ratified the choice of the army. The reign of Probus was mainly spent in successful wars by which he re-established the security of all the frontiers, the most important of these operations being directed to clearing Gaul of the Germans. Probus had also put down three usurpers, Saturninus, Proculus and Bonosus. One of his principles was never to allow the soldiers to be idle, and to employ them in time of peace on useful works, such as the planting of vineyards in Gaul, Pannonia and other districts. This increase of duties was naturally unpopular, and while the emperor was urging on the draining of the marshes of his native place he was attacked and slain by his own soldiers. Scarcely any emperor has left behind him so good a reputation; his death

was mourned alike by senate and people, and even the soldiers repented and raised a monument in his honour.

Life by Vopiscus; Zosimus i. 64; Zonaras xii. 29; Aurelius Victor, Caes. and Epit. 37 ; H. Schiller, Geschichte der romischen Kaiserzeit (1883), vol- i-; E. Lepaulle, Htude historique sur M. A. Probus d'apres la numismatique (1885); Pauly-Wissowa, Realency- clopddie, ii. 2516 (Henze).

PROBUS, MARCUS VALERIUS, of Berytus, Roman gram- marian and critic, flourished during the reign of Nero. He was a student rather than a teacher, and devoted himself to the criticism and elucidation of the texts of classical authors (especi- ally the most important Roman poets) by means of marginal

notes or by signs, after the manner of the Alexandrine gram- marians. In this way he treated Horace, Lucretius, Terence and Persius, the biography of the last-named being probably taken from Probus's introduction to his edition of the poet. With the exception of these texts, he published little, but his lectures were preserved in the notes taken by his pupils. Some of his criticisms on Virgil may be preserved in the commentary on the Bucolics and Georgics which goes under his name. We possess by him part of a treatise Be notis, probably an excerpt from a larger work. It contains a list of abbreviations used in official and historical writings (especially proper names), in laws, legal pleadings and edicts.

The following works have been wrongly attributed to him. (1) Catholica Probi, on the declension of nouns, the conjugation of verbs, and the rhythmic endings of sentences. This is now generally regarded as the work of the grammarian Marius Plotius Sacerdos (3rd century). (2) Instituta artium, on the eight parts of speech, also called Ars vaticana from its having been found in a Vatican MS. As mention is made in it of the baths of Diocletian, it cannot be earlier than the 4th century. It is possibly by a later Probus, whose existence is, however, problematical. (3) Appendix Probi, treating of the noun, the use of cases, rules of orthography (valuable in reference to the pronunciation of Latin at the time), and a table of Differentiae. As the author has evidently used the Instituta, it also must be assigned to a late date. (4) De nomine excerpta, a compilation from various grammatical works.

See J. Steup, De Probis grammaticis (1871); Teuffel-Schwabe, Hist, of Roman Literature (Eng. trans.), 301.

PROCEDURE (Fr. procedure, from Lat. procedere, to go for- ward) , in general, a method or course of action. In law, procedure may be defined as the mode in which the successive steps in litigation are taken. As a term in

English law it dates only from the passing of the Common Law Procedure Acts 1852-1860; it is usually coupled with, or more often replaced by, the word " practice." The procedure of the High Court of Justice in England is governed by the rules of the supreme court, which are published in the Annual Practice. Procedure has been defined (per Lush, L.J., Poyser v. Minors, L. R. 7 Q.B.D. 329), as " the mode of proceeding by which a legal right is enforced as distinguished from the law which gives or defines the right, and which by means of the proceeding the court is to administer; the machinery as distinguished from the product." T. E. Holland {Elements of Jurisprudence, 1906, p. 86) describes procedure, or " adjective " law, as that part of law which provides a method of aiding and protecting rights.

See the articles on the various branches of law, as Admiralty Jurisdiction, Criminal Law, Divorce, &c. ; also Action, Appeal, Evidence, Pleading, Summons, Trial, &c.

PROCESS, a general term now technically employed for the photo-mechanical processes by which illustrations are reproduced in printing. Until the last quarter of the 19th cen- tury reproductive processes, save as regards line reproduction, can hardly be said to have had an existence. Paintings, draw- ings, and engravings, which it was desired to put into form which by means of the printing-press could be multiplied indefinitely had to go through a process of interpretation by an engraver or draughtsman, who, on a metal plate, a block of wood or stone, gave a rendering of the original subject. The means at his disposal were lines and dots, which, varying in their thick- ness and proximity, expressed dark or light passages in the scheme of light and shade of the original. It will readily be understood how such interpretations would vary. An engraver with fine art instincts would produce a result as distinct in character as an engraving as was the original as a painting or drawing, and engravings were sought after as works of art, and treasured for their artistic qualities. But engraving of this kind took time. Years were devoted to the production of one steel- or copper- plate, while wood engravers who were artists could only work on a block when in the mood; and for that mood the publisher had to wait, and he grew impatient and was willing to accept rapid interpretation of originals by men who could produce them under other than artistic conditions. But the pain of the artist at the bad rendering of his original was often great, so that he, not less than the publisher, though for another reason, hailed

the attempts that were being made to reproduce his work mechanically

without the intervention of the translator or interpreter. The ideal of an artist would naturally be a repro- duction of his work in facsimile, which retained all, or as many as possible of, the individual characteristics of his work; and to give him this was the aim of the school of wood engravers which originated in the United States and made a last stand to maintain the position of their art in the field of book illustration. By a system of extremely fine work the American wood engravers were able to keep much closer to the tones of an original' than had previously been possible; but the result was obtained at the sacrifice of the artistic rendering of the best old engravings, and was so mechanical in its character that when it had to compete with a real mechanical process the engraving could not hold its ground, the enormous difference in the cost of production being a factor of sufficient importance in itself to make it im- possible for the engraving to retain the field. A similar develop- ment had been going on in the other branches of engraving. The line engraver and the etcher, to whom had been entrusted the interpreting of works of art first produced in other forms, found themselves faced by mechanical reproductions in plate form which, while preserving more of the character of the original work, were produced in much less time and at a greatly reduced cost. It has thus come about that the last quarter of the 19th century witnessed the dispossession of the hand engraver from the field of interpretative engraving, and the occupation of his position by the chemist and the mechanician.

The term " process," which has come to be applied to all photo-mechanical reproductions, is a somewhat unfortunate one, inasmuch as it is descriptive of nothing. From time to time various names have been given to its varying forms, indica- tive either of the name of the inventor or of some peculiarity of method. Zincography, gillotype, photogravure, heliogra- vure, heliotype, phototype, albertype, are illustrations of the kind of name given often to very slightly varying applications of the same principle, but usage has come to apply the term " process " to any printing surface that is produced by chemical and mechanical means. The whole of these processes may be arranged under three heads: (1) relief; (2) intaglio; (3) piano- graphic.

1. Relief Processes. — An engraving in relief is one in which the printing surface stands up above the surrounding ground. The history of the development of relief processes is really the history of photography (q.v .) ; for whilst attempts were made to obtain results without the aid of photography, by drawing upon plates with prepared chalk or ink, " rolling them up " with printer's ink and etching away the ground with acid, as in the case of zincography, the real progress of all process has been upon the lines of photography; and to Niepce and Daguerre may be attributed the origin of the modem mechanical and chemical processes.

Speaking broadly, all the modem " processes " are the out- come of a

discovery by Mungo Ponton that a preparation of albumen or other colloid substance and bichromate of potash could be hardened and rendered insoluble and nonabsorbent in water by exposure to light, and that as a photographic negative permitted the passage through it of light in varying degrees of intensity, so a film of the preparation placed under a negative was liable to be hardened and rendered insoluble in degrees varying with the intensity of the light affecting it. This dis- covery governs the production of process blocks or plates of all kinds.

The methods of reproduction of pure line work differ greatly from those for the reproduction of originals in tone. As the first necessity in securing a good result is the suit- Blocks. ability of the original to be reproduced, it is desirable to make clear the character of a good original. This should be of one tone or degree of colour all through. It may be all grey; it is better that it be all black. It may not be black in parts only and grey in others. The lines of an original may be of any variety of thickness. It is necessary, therefore, for the draughtsman to see that he works with a good black

ink, or ink that will tell as black when it is exposed to the photo- graphic plate. Inks of a warm tone — that is, inclining to red or orange — yield better results than cold inks which incline to blue.

Most prepared liquid inks have a tendency to lose their blackness by exposure to the atmosphere on the removal of the cork from the bottle. The ideal ink is one freshly ground from a dry cake of colour when beginning work. Indian ink is goodLif well ground and kept sufficiently thick to assure the necessary blackness. It has the advantage of not washing up when colour in washes is passed over it, but it must be used freshly ground. The addition of a little Indian yellow, burnt sienna or sepia, gives a warmth of tone to it and renders it photographically more active. Bourgeois ink, prepared by Bourgeois of Paris, appears to be prepared with the admixture of some warm colour with the black base. It is a good ink for the purpose, and is prepared both in solid and liquid form. Lampblack gives good black lines; so does ivory black, which is warmer in tone than lampblack. Higgins' Indian ink or American drawing ink is an American ink made in liquid form which has the reputation of not fading by exposure. Stephens's Ebony Stain is a fine black medium which does not clog the pen ; if it thickens and dries, it cracks off and does not corrode the pen.

Besides the pen a brush brought to a fine point is much pre- ferred by some artists, as it yields a line less monotonous than that given by a pen, though the brush cannot be used so freely. The paper used should be smooth and a& white as possible. A paper is made with a surface coating of white chalk, which admits of the use of a u scraper to remove lines or to break them up.

It is not possible to lay down a rule for the amount of reduction to be made when photographing for the reproduction; the finer the drawing the less should be the reduction made; but expe- rience is the only guide. Sometimes, where the lines are very fine and the drawing minute in character, an enlargement is desirable. Where drawings are reduced too much, there is a tendency for the spaces between the lines to fill up, and to give a coarse, heavy result. Faulty drawing is not lessened by reduction. On the contrary, the fault.becomes more evident, so it is desirable to make all necessary corrections in the drawing. The original drawing which has to be reproduced is photo- graphed to the size of the required block. The negative taken is absolutely dense except where the lines of the drawing have affected it, and these are absolutely clear, admitting the unre- stricted passage of light through them. A piece of planished copper or zinc is prepared or made sensitive to light by a pre- paration of albumen or gelatin and bichromate of potash spread upon its surface. The negative is laid upon the sensi- tized metal and placed in the light in the way an ordinary photo- graph is printed. The light passes through, the transparent lines of the negative and hardens the bichromated film beneath them. Both negative and plate are then taken into a darkened room, where the metal plate is rolled with an inked roller, placed in a bath of cold water and allowed to soak until the albumen and bichromate becomes so softened everywhere, except where the light has hardened them, that they all wash away, and nothing is left but the hardened lines. The lines are dusted with asphalt, which by heat is melted on to them, and makes a ground which resists the action of acid. A coat of varnish is put over the back and edges of the plate, to protect them from the acid also, and only the spaces between the lines on the surface are left free to its action. The plate is then placed in a bath of dilute nitric acid, which eats away the metal where- ever it is exposed; but it leaves the lines of the drawing, which are protected by the hardened film standing up above the eaten or etched surface; and these lines, which correspond to those of a wood engraving, are the printing surface of the plate. The plate is mounted on a wood or metal block, made type-high, and it can then be used along with type in the printing-press.

Various devices have been resorted to that effects of tone may be obtained by means of the simple line process. Grained papers with a surface of chalk, upon which are printed close-ruled lines crossing at right angles, or rows of dots give the papers a heavy, flat, " tone," upon which a drawing can be made in pencil, chalk or ink, and gradations of tone introduced by means of scrapers, which remove partially or entirely the black ruled lines or dots, leaving, if desired, high lights of pure white. A drawing on such

paper consists of lines or dots, a combination of the original lines or dots of the paper and those of the drawing itself, the scraper splitting up lines into dots or removing them altogether. The result is quite easily reproduced by the line process. Another method is by the use of what are known as Day's " shades," or shading mediums. They are transparent films of gelatin which have upon them lines or dots in varying combination in relief, so that they can be inked up by a roller. When placed over a drawing, their transparency enables the operator to see exactly what passage he is dealing with, and he can by means of a burnisher impress the lines or dots of the shade upon any passage of the drawing; these lines or dots then become part of the drawing; and are reproduced in the usual way.

Pencil or chalk drawings upon simple white-grained paper, where the pencil or chalk passing over the ruts or hollows in the paper makes a mark on the top of the grain only, are also reproducible by the line process, but such drawings are apt to be unequal in colour and difficult to deal with. The difficulty led to the invention of a process by Henry Matheson, who, not having the capital to work it, joined the late Mr Dawson, senior, whose sons continued to work the process with Matheson under the name of the Swelled Gelatin „ .. Process. It is based upon the fact that gelatin, sensi-

a'f ti tized with bichromate of potash, swells when placed in

-ˆ water, and swells in proportion to the amount of light

to which it has been exposed. A negative taken from a drawing which varies in tone, not being thoroughly black all through, varies in the quality of its transparent lines and dots; and when a piece of paper or glass coated with sensitized gelatin is exposed to the action of such a negative it is affected according to the amount of light the negative allows to pass. After making a print on such paper or glass, it is placed in a dish of water and the surface allowed to swell, which it does in varying degrees, the portion unaffected by the light absorbing most water and swelling most, the hardened lines of the drawing not swelling at all. This swelled print is then placed in a frame, and a preparation of plaster is poured upon it to make a mould of its surface. When this has set and the gelatin has been removed, this mould is filled with a preparation of wax, which sets in a few minutes sufficiently for it to be released from its plaster mould. Additional wax is built up when necessary upon the " whites," as they are technically called — that is, the passages which represent what will be the hollows in the block — so that these may be as deep as possible ; and this wax mould is electrotyped in copper. The lines and dots of this copper block, which when finished is backed up with metal and mounted, vary slightly in height, the result being that the slightly lower dots do not come so closely in contact with the inking roller or with the paper, and so produce when printed a

grey impression corresponding to the greyness of the original drawing.

The drawback to the use of the process is that it is about three times as costly as the ordinary process. It is a method much used for the reproduction of line and stipple engravings, where fine dots and lines are apt to be printed in delicate tones. The finest results by this method are producible, however, by omitting the plaster mould and wax-cast stages, and by coating the sensitized gelatin with plumbago or other impalpable metal preparation which will enable it to receive a copper deposit to qualify it to take its place in the electrotyper's bath, and so to get the needed thin coating of copper from the surface of the gelatin itself ; but this needs to be done with the greatest care, and is still more costly.

A non-photographic process of obtaining line blocks in relief has been for a long time successfully worked by Messrs Dawson. A _ , brass plate is coated with a film or ground of wax upon

2?f? ra which a tracing of the drawing to be reproduced may

**• be rubbed down. By means of an etching needle the*

lines of the drawings are incised upon the thin wax ground down to the surface of the brass plate. A pencil of wax and a pencil of hot metal are then used to produce a flow of melted wax which drops from the wax pencil upon the ridges of wax between the lines and builds them up until they are of sufficient height. The risk that this wax may run into the incised lines has to be carefully guarded against, but skilful treatment manages so that it stops at the edges and does not run over. In maps and diagrams where lettering or figures are necessary, type is impressed into the wax with a very neat and precise result. By this means a mould is formed, an electrotype from which gives a really good relief block which may be printed with type.

The invention of line processes only stimulated the efforts to find out some means whereby tones might be reproduced on

blocks or plates that could be printed along with Processes. l yP e m t ˆ le ordinary rapid printing-press. It is

only possible to approximate to the printing of a fiat or graduated tone by producing a broken or granulated surface which shall present a series of lines or dots that, when inked and impressed upon paper, shall by the variations of proximity and size give the impression of an unbroken tone. This necessitates the lines or dots being so small that the eye

shall not at a glance appreciate the broken-up character of the surface of

the block. Many efforts resulted in the production of what is known as the screen, which itself was only made possible by the invention of ruling machines of a delicacy previously unknown.

A screen is made by coating a sheet of glass — which must be flawless both as to body and surface — with a composition analogous to the ground used by an etcher to coat his plate before drawing upon it with his needle. The glass so coated is placed in an automatic ruling machine, of which the ruling point is a diamond, and which can be adjusted so as to rule any number of lines from 50 to 300 to the inch. The lines are ruled diagonally on the glass, and at mathematically equal distances from each other. The sheet of glass, after ruling, is treated with hydrofluoric acid, and the lines where the ground is cleared away by the diamond point are etched or bitten into it. The plate is cleaned up and an opaque dark pigment rubbed into the lines. Two such ruled sheets of glass are sealed together face to face with Canada balsam, with the diagonally ruled lines crossing each other at right angles, the result being a grating, or screen containing innumerable little squares of clear glass through which the light can pass, which it cannot do through the ruled lines, which are filled by the opaque pigment.

To produce a half-tone block from a picture, a black and white drawing in tone, or a photograph, a negative is exposed in the camera in the usual way, with this screen quite close to it but not in contact; and the subject is photographed on to the negative through the screen, and what is termed a " screen negative " is the result. It is a photograph of so much of the original as could affect the negative through the little clear squares of the screen, and represents the tones of it by in- numerable dots and lines, the size and proximity of which are regulated by the fineness or coarseness of the screen used.

In the early days zinc was the metal used for these half-tone blocks; but experience showed that though more difficult to etch to the necessary depth, the closer, denser texture of copper rendered plates of this metal much more suitable for the produc- tion of the best blocks, and zinc now is used only for inferior blocks. Whichever metal may be used, a sheet of it, most carefully planished, is sensitized with a coating of gelatin or fish-glue and bichromate of potash, dried and exposed under the screen negative to the action of light, as in the ordinary method of photographic printing. The action of the light hardens the gelatin film, the portion not so hardened being soluble by water. The plate with the gelatin picture in lines and dots is exposed to heat and the image is burnt in on the surface of the metal like an enamel, which enables the photo- graphic picture to resist the subsequent etching. The plate is placed in a bath of iron perchloride and etched until sufficient depth is obtained. Wherever the surface of the plate

is free from the lines and dots, it is bitten away by the perchloride, and the lines and dots are left in relief. This first biting in the bath produces a rather flat general impression of the original, and is termed " rough etching." To produce finer results, and to bring out the contrasts of black and white necessary to a good reproduction, the block has to go through processes of stopping out and rebiting similar to those of etching an intaglio plate. This " fine etching " calls for the artistic taste and judgment of the craftsman; and with a good photograph to work from the final quality of a block will depend largely upon its treat- ment by the fine etcher. A substitute for the acid bath has been found in an acid blast. The acid is driven in the form of a spray with some force on to the surface of the prepared plate, which it etches more rapidly and more effectively than the bath.

One risk to be guarded against is the underbiting of the lines and dots which form the printing surface. As soon as the acid has eaten its way downwards past the protecting surface film, it will attack the sides of the upstanding dots as well as the ground that supports them, with the result that they become weakened and rendered liable to break off in the process of printing, as well as to make the obtaining of electrotypes from the blocks a

matter of extreme difficulty, the underbitten points breaking or tearing away in the mould. To avoid this underbiting a fatty ground is laid over the surface of the block each time it is etched; by exposure to heat this ground is sufficiently melted to permit of its running down the sides of the upstanding points, and so giving them the required protection. The acid blast is less liable than the bath process to eat away the sides of the dots. This method of making tone relief blocks is most generally known as the " Meisenbach " process, from Meisenbach, of Munich, who was the first to make it commercially successful, but the history of its development is somewhat obscure. Fox Talbot as early as 1852 took out a patent for using a screen of crape or muslin; he also suggested dusting glass with a fine powder to produce a grain screen. All the early ruled screens were single line, and the credit is due of suggesting the shifting of the single line screen during the operation and, by reversing it, producing the effect of the double line, to Sir Joseph Swan, who patented the process in 1879. Meisenbach's patent for a similar method is dated 1882. The development of the screen was the important factor in the development of the process. The early screens were photographs of ruled plates and the great advance was made by Max Levy of Philadelphia, who made it possible by his ruling machines

to produce screens of a fineness and clearness not previously practicable. It was F. E. Ives who, in 1886, introduced ruled screens placed face to face and sealed up so as to produce cross-lined screens.

The chief objection to this process is its inability to reproduce the extremes of expression employed by the artist in black and white; actual white is impossible, and delicate tones, such as are characteristic of skies, are destroyed by the cross-bar lines of the screen, which cover down all light passages and rob the reproduction of that brilliancy which characterized wood engraving. It is true that the addition of hand engraving can be resorted to in the case of the process block, and lights and other varieties of tone and form introduced, but this can only be done on blocks of very fine texture, and the cost of reproduc- tion is greatly increased by the introduction of such handwork by the engraver.

The most important development of the half-tone process is in the direction of the reproduction of works in colour by means Three oi relief blocks. The theories of colour (q.v.) in Colour light and in pigments enter largely into this develop- Biocks. ment. White or solar light is composed of rays of light of three distinct colours, red, green and violet, which are called the primary or fundamental colours because by their combination in various proportions all other tones of colour are produced, but they cannot themselves be produced by any combination of other coloured rays. The theory of pigmental colour differs from this in that the primary or foundation colours from which all others are produced, while being themselves unproducible by any admixture, are blue, red and yellow, and while the combination of the red, green and violet of the scientist produces white, the combination of the primaries of pigments in their full strength produces black.

Colour is the result of the absorption and reflection of the rays of light which strike upon a body. The rays which are reflected are those which affect the vision and produce the sense of colour. Should the object absorb all the rays it appears black, should it absorb none but reflect all it is white, and between these two extremes lie an infinite variety of tones. Filters have been made which absorb and refuse passage to certain coloured rays, while permitting the passage of others, e.g. a photographic filter of a certain colour will absorb and stop the passage of red and green rays, while permitting the passage through it of the violet. It will then be perceived how, when a picture or other coloured object is placed before a camera, with one of these filters between it and the exposed negative, the rays of light of the colour which can pass through the filter to the negative will be the only ones which can affect it, and that it is possible in this way to secure on three separate negatives a record of the green, red and violet rays which are reflected from its coloured surface by any object placed before the

camera.

These records are coloured photographs; they are simply ordinary negatives, records of colour values which may be translated into colour by the use of coloured inks. The principle governing the process is analysis or separation followed by recombination. Positives are made from these colour records, from which by means of the rule screens already described half-tone process blocks are made which, when printed one over the other in coloured inks, combine again the colours which were separated by the filtering process and give approximately a reproduction of the original in its true colours. The colour used with each block must have a relation to the filter used in its production. It must represent a combination of the two colours stopped out by the filter when making the negative from which the block was made, that is to say, the colour used must be complementary to the colours stopped out. Certain subjects which are amenable to long exposures can be dealt with by what is known as the " direct process," whereby the screen negative and the colour record are made by one operation on the same plate. By this means six of the fifteen otherwise necessary operations are saved, but the method is not always practicable,

As far back as 1861 the suggestion was made at the Royal Institution by Clerk Maxwell to reproduce objects in their natural colours by superimposing the three primary colours. Later Baron Ransomut, of Vienna, Mr Collen, a gentleman who taught drawing to Queen Victoria, and two Frenchmen, MM. Chas. Cros and Ducos du Hauron, carried on the idea and made experiments with the aid of photography, which were still further developed in Germany by Professor Husnik, of Prague, Dr Vogel, of Berlin, and others; but it was in America that the first three-colour blocks for letterpress printing were made, F. E. Ives, at Philadelphia, being their maker in 1881.

This three-colour relief process has made great advances in recent years. The first great practical difficulty which had to be overcome was to produce three screen blocks which could be printed one over the other. Were the screens of each block used at the same angle, the lines and dots would print on the top of one another; but a great deal of the colour result depends upon a considerable proportion of each colour being on the white paper. Artists know well that much purer and more brilliant results are produced by placing touches of colour side by side than one over another; small patches of red and blue, placed side by side, yield to the eye a purple of much greater purity and beauty than the same touches of colour worked one over the other. Consequently it was found necessary to turn the screen at a different angle for each block, so that the lines should not fall on each other but should cross each other; but the risk of this is that, used at certain angles, the crossing of the screen lines will produce what is known as the

moire antique result. Vogel took out a patent in Great Britain for the process, and he therein stated that the screens should be used at certain stated angles. He also proposed to use single-line screens, similar to those used by F. E. Ives at Philadelphia, instead of cross-line; but it has since been found that the cross- or double- line screens can be used successfully; and that the angle at which they can be used is not a fixed one.

Filters are made in a dry or wet form. The dry filter is made by spreading a film of gelatin or collodion, tinted by an aniline colour, upon a piece of glass. The wet filter is a cell or trough made of two sheets of glass, sealed all round and filled with water tinted with an aniline dye or colour. The accuracy of the tint of the colour-filter may be tested by the spectroscope, or by an instrument invented by Sir William Abney, and known as the Abney colour sensitometer. This is a theoretical test. The practical test is by photographing through them patches of blue, red, and yellow. If, for example, the filter for blue records the full strength of blue with the full strength of the colour of the negative, while giving slight or no record at all of the red and yellow, it is practically a true filter. It is possible to treat the negatives themselves so as to render them more sensitive to the special colour they are intended to record. Indeed Dr Albert, of Munich, has produced a collodion emulsion which isso sensitized that the various colour sensations are directly obtained without the interposition of a colour filter. Different makes of plates demand different colour-filters. (For colour-filter making see Ives,

Photographic Journal, vol. xx. No. n). The preparation of these colour-filters calls for great perfection of quality in the materials em- ployed, and great accuracy in the using of them. The glass, whether for the dry or wet filter, must be absolutely flat as to its surface, and its two sides must be absolutely parallel. In the wet filter the glasses forming the sides of the cell or trough must be parallel to each other.

Coloured glass is sometimes used in combination with the tinted collodion, but there is no particular advantage in this, because two glasses are always used in the making of a filter, and each one may, if desired, be coated with different dyes and afterwards cemented together with Canada balsam.

The following dyes or their equivalents form a basis for nearly all three-colour filters : —

For the red printing negative „ blue „ „

„ yellow „

(Brilliant green. (Brilliant yellow. (Cochineal red. (Brilliant yellow. (Methyl violet J (Naphthol green.

The first dye named is the base colour in each case, the second is employed in small proportions to produce the required modification of tint.

The theory of the three-colour process is that the same three colours shall be used for the printing of every subject; and there is no doubt that if the filtration were perfect and the printing inks absolutely pure, the theory would work out fairly correctly in practice; but there is room for improvement in both these matters, and it is therefore often found desirable to print special subjects with special pigments, which makes it difficult to print several subjects together. Special care is called for on the part of the Need of Pf inter. There must be the most perfect register of Careful three subjects, otherwise a blurred effect results;

Printing. tnere .must be constant watchfulness to see that there is no excess of ink of any one colour, or the whole scheme of colour will be destroyed. This three-colour process has been a rather long time in establishing itself and nothing has so tended to retard it as bad printing. Good blocks have been obtainable, but in the hands of ordinary printers they have yielded but indifferent results. It is hardly to be expected that the untrained eye of the ordinary printer should be successful where the work requires the cultivated judgment of an artist. There is one other necessity for success in all tone relief work, and that is the use of the right quality of paper and ink. The blocks are so delicate they soon fill up if an excess of ink is used. Ink of a good quality can be used in much less quantity than common kinds, but it must be impressed upon paper that is sympathetic and will ” bear out ” the ink.

The best results can be obtained only with the use of what is known as ” coated ” paper. It is a paper which, after manufacture, is passed through a bath of a preparation of china clay, which by means of brushes is rubbed into the surface of the paper. When dry the surface takes a high polish, and is sensitive to the smallest amount of ink. The polish of this coated paper is objectionable to many readers of illustrated books, and the clay adds considerably to the weight. Paper makers are, however, supplying a dull-surfaced highly calendered rag paper which is very good for artistic and scientific illustrations and obviates both the glossy surface and the supposed lack of permanency of chromo paper.

2. Intaglio Processes. — An intaglio engraving is one in which the printing surface is sunk below the surrounding portions of the plate; the lines or dots — pressed, cut or bitten into the surface — holding the ink which is to "be impressed upon the paper when the original surface of the plate is wiped clean. The old- fashioned steel engraving may be taken as the type of an intaglio plate, in which the lines which printed were cut into the surface of the plate, instead of being left standing up in relief, as in the case of a wood engraving.

" Photogravure " is the name by which the many processes are generally known by means of which intaglio engravings are made mechanically, " heliogravure " being another name for the process, or special application of it. Photogravure repro- duces the tones of photographs or drawings, and gives the nearest approach to a facsimile reproduction that has yet been arrived at. Gelatin bichromatized is the medium by means of which the photogravure plate is produced; but as the screen is not used in ordinary work, it is necessary to produce an ink-holding grain in some way upon the plate. This is done by allowing a cloud of bitumen dust, raised inside a box, to settle upon the surface of a copper plate; it is fixed by heat, which, though insufficient to melt it, is enough to attach the fine grains to the

plate. Over this prepared surface is laid the film of bichroma- tized gelatin, upon which is printed the subject through a glass positive; the usual hardening process takes place by the action of light, followed by a washing out of the unhardened portions of the gelatin. The plate is exposed to the action of ferric chloride, which attacks it most strongly in the least exposed parts, but which cannot eat it away in broad flat masses of dark, even in the non-exposed portions, owing to the existence of the bitumen granulation, which ensures the keeping of a grained surface even in the darkest passages.

Photogravure is a costly process to employ for illustration. The plates have to be printed slowly, with much hand work, as in the case of etchings. It is the printing that makes its use expensive, rather than the making of the plates; and as each plate must be printed separately and on special paper, it cannot be employed with type, like relief blocks.

There is much uncertainty about the production of plates by the photogravure method; and although great improvements have been made in the process, it is often necessary to produce several plates before a satisfactory one is obtained. In all these reproductive processes the more artistic the workman the better the result; this is especially true of photogravure, in which the aim is to come very much nearer to the original work of the artist designer than in the less perfect processes.

The method of Rousillon, which was adopted by Goupil in the production of photogravure plates in the early days of the process, was to prepare the surface of the plate with a secret preparation of certain salts, which crystallized under the action of light, so that when exposed under the negative the surface was broken up by this crystallization more or less, according to the amount of light the negative permitted to reach it. The plate with its crystallized surface was then electrotyped, and the electrotype was the plate used for printing. It was a deposit process, as opposed to an etching process.

Photogravure plates are made also by the use of the giain screen, in which the reticulations of the screen take the place of the bitumen powder in producing a grain; it is the inversion of the method by means of which points and fines are produced in the relief block. It has not, however, come much into favour, probably owing to the greater coarseness of the grain and the consequent loss of softness in the tones. An application of this method has, however, been made in the development known as the Rembrandt intaglio process. It is a secret, process; but the secret lies more in the press by which Rembrandt the plates are printed than in the plates themselves, intaglio which are intaglio plates made with a very fine screen ftMess> and bent to a cylinder. The attempt to print photogravure plates by machinery was given up because the plates were so shallow they would not stand the wear and tear, and their life was too short and the results too indifferent; but the use of the grain screen renders possible stronger, deeper plates, that will stand harder wear. There is little doubt that the machine used is some form of the machine used to print wall-papers, in which there is a central cylinder engraved with the design, inked by rollers with which it comes in contact. The ink not only fills up the intaglio or sunk portion which has to print the design, but covers as well the whole surface of the plate. To clean this surface, leaving ink only in the sunk dots and lines, another metal cylinder is employed, ground and grooved somewhat like the shaft of the common steel of the dinner table used to sharpen knives, the grooved surface of which, passing over the engraved cylinder, scrapes clean its inked surface, leaving ink only in the sunk portions, which will, as the cylinder comes in contact with the paper, deposit itself and print the picture. The results produced by the Rembrandt intaglio process are softer and smoother than those given by photogravure, and they are free from the gritty qualities which occasionally characterize photo- gravure; but they lack the brilliancy and depth of the latter. The process on the whole is less costly to use, mainly because the printing is so much more rapid, and is turned out by a machine instead of by hand.

A method of printing intaglio plates made from a screen

PROCESS

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A. GALLIREX JOHNSTON!. B.

The Turaco of Ruwcnzori. Frnm a Ihaicing by Sir Barry Jokststen, from "The Uganda Protectorate." by Permission of Hutchinson

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SHOWING THE SEPARATE COLOURS EMPLOYED IN PHOTO-REPRODUCTION

BY THE THREE-COLOUR PROCESS

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A. GALLIREX JOHNSTONL

The Turaco of Ruwcnzuri.

From a Drawing by Sir Ilaˆry Johnston, fmut "The Uijsmtia Protectorate" by Permission of Hutchinson & Co.

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SHOWING THE SEPARATE COLOURS EMPLOYED IN PHOTO-REPRODUCTION

BY THE THREE-COLOUR PROCESS

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PROCESS

negative by the lithographic press was introduced and patented by Sir Joseph Swan and his son, Donald Cameron-Swan. The sunk surfaces are rendered receptive of lithographic ink while the surface of the plate itself is kept damp with water or glycerin and water, and remains clean and free from ink when the plate is rolled.

The monotype is not a new, but a revival of a somewhat old, method of reproducing on paper a painting by an artist. The Monotype, design is executed on a plate by means of brushes, fingers or other tools, with paint or printer's ink. On the completion of the painting, paper is laid upon it, and plate and paper are together passed through a press, when the ink or colour is transferred to the paper. One impression only is possible, hence the name of the process. A method has been devised by Sir Hubert von Herkomer for dusting the painting while still wet with a fine metallic powder, which gives a tooth to and renders the surface sympathetic to a copper deposit when it is placed in the galvanic bath, by which means an electro- type of the painting, with its varying relief surfaces, is obtained, and forms a plate from which numerous impressions can be taken.

The very large number of impressions it is often required to get from the etched surface of a block has made it necessary to devise Electro. means for preserving the original block, and to prepare . " and work from duplicates, which can be renewed when

" necessary. For this process the original is coated

with a film of the finest plumbago (black lead) powder before being placed face to face with a bed of soft fine wax, into which it is pressed. The plumbago prevents adhesion and facilitates the with- drawal of the block after contact with the wax. The wax mould which is thus obtained is suspended in a galvanic bath of sulphate of copper. On passing a current of electricity through the liquid to the mould, the copper at once begins to deposit itself in metallic form Jover the face of the wax mould, and in a short time the deposit becomes thick enough, either by itself or when backed up with other metal, to be used as a block in the place of the original. The very fine nature of process blocks, and the necessity of obtain- ing perfect impressions from them, has led to the introduction of gutta- percha instead of wax as the medium for making a mould, ft is melted and poured in a liquid state upon the block, and when cold can be removed without the risk attending the use of wax, which is apt to give way in the course of the separation of the block from the mould. Gutta-percha is much more tenacious, and being some- what flexible, does not break and tear, as wax is liable to do. The whole process requires the greatest care in its

manipulation.

Steel-facing is resorted to where long numbers have to be printed from photogravure plates. The finest film of steel is deposited by _. . an electric battery over the whole face of the plate,

facias which it hardens and protects. This steel face in time

‘ begins to wear, through the constant pressure and rubbing incidental to the process of printing, and the copper begins to show through it. As soon as this happens the plate is placed in an acid bath, in which the steel film disappears. The plate itself being still intact, can be re-steeled for further work.

*The changes which have taken place in the form of illustrations have necessarily been accompanied by changes in the machinery Cb re to k y w h’ c h they are printed. Almost all the changes Machinery anc * improvements have been initiated in the United States of America. The vital change made in the interest of process block-printing is what is technically known as ” hard packing.” Before the introduction of process blocks the ” blanket ” played an important part in all printing machines. It was a soft woollen sheet, which came between the plate or cylinder and the type and blocks, and modified the force of the contact between them. Owing to the increased fineness of the texture of the process block as compared with the wood engraving, it was found that the blanket was too coarse and soft a material, and that it interfered with the clearness and fineness of the printed result. Blankets of finer material were tried, with im-*

C roved results; but at last the blanket was entirely superseded y a glazed board, the machinery was more accurately con- structed, and the hard, finely-polished steel cylinder, without any intervening substance save the thin glazed board and the sheet of paper to be printed, was brought in contact with the type and blocks. The old soft blanket kept the cylinder or the flat press in contact with the type, in spite of the weak con- struction of ‘much printing machinery.’ The new method of work made no allowance for such construction; and the new machinery, to meet the new conditions, had to be very perfect in manufacture. About the old machines there was a lack of solidity, which allowed vibration. Modern work demands absolute rigidity in the machine; and a chief characteristic of the best modern printing machinery is strength and solidity, admitting of precision of impression. Another change has been in the nature and treatment of the printing paper.

Most elaborate methods were adopted for the moistening of the substance of paper before use. Most paper was printed on whilst damp, but damp

paper had to disappear with the soft blanket, and a clay-surfaced or highly-calendered paper was introduced with a glazed face in harmony with the polished steel cylinder which pressed it against the type and blocks. It is essential to this paper that it be dry when used ; to ensure the best results with it the paper should be kept some weeks or months before use, so that it may be absolutely dry, or seasoned. If printed on too soon, the clay surface tears away when in contact with the " tacky " ink; and instead of the ink being deposited on the paper, bits of the paper surface are left on the forme, and white spots appear in the impression. The bits of paper surface so deposited on the forme get inked as they pass under the rollers, and impress black spots on the sheets that come after. New and unseasoned paper accounts for much bad printing, and this form of badness is due to the change in material due to the necessities of modern process work.

3. Piano graphic processes are such as are printed from a flat surface neither raised above the surrounding ground like a wood engraving or type letter, nor sunk below the ground like an etch- ing or steel engraving. Lithography (q.v.) with its flat stone or plate may be taken as the type.

Woodbury type is a development rather than an invention by Walter Woodbury. By an old nature-printing process leaves and other things which lent themselves to the treatment were by extreme pressure forced into a flat surface of soft metal, and the mould so formed was used as a printing surface to reproduce the forms of the impressed object. Woodbury found that a film of bichromated gelatin exposed to the action of light under a negative and the unaffected parts washed away gave him a relief image which was so hardened by the action of light aided by other hardening agents, that it could with no injury to the film itself — which could be used many times to make fresh moulds — be forced by hydraulic pressure into a thin flat plate of lead or type metal, and that the mould so formed could be used in a similar way to the mould formed in the old nature printing process. But a Woodbury type print is rather a cast from the shallow mould than a print in the true sense. It is obtained by filling the mould with a warm solution of coloured gelatin and pressing on it a piece of hard surfaced paper. The pressure forces the solution away from the highest parts of this mould which come in actual contact with the paper, so that none of it is left between them and the surface of the paper which in these parts remains uncoloured. These are the high lights of the print. The pressure forces the colouring matter into the hollows of the mould, and this amount is graduated according to the depth of the hollows. The coloured gelatin gradually cools and hardens and adheres to the paper which on its removal from the mould retains a delicate cast of the impressed subject. The variety of light and shade is the result of the varying depth of the hollows and the consequent variation of the amount of colouring matter taken up by the impressed paper. The white paper is an important element

in the result, the light reflected from it through this coloured gelatin varying according to the thickness of the gelatin film. A drawback to the use of the Woodbury type for book illustration is that every print has to be trimmed and mounted, and of course it cannot be printed with type.

Stannotype is a variation upon Woodbury type. It is an attempt to do away with the need of the hydraulic press for the making of the mould. A film of bichromated gelatin is exposed to the action of light under a positive instead of a negative and the unaffected parts washed away, by which means a mould is obtained corresponding exactly to that obtained in metal by pressure from a film exposed to light under a negative. This mould was covered by a coating of tin foil to give it the necessary metal surface, and good results were obtained from it, but for some reason it has never come much into use.

Collotype or phototype is a process in which the film of isinglass, gelatin or gum, treated with bichromate of potash with the addir tion of alum or some other hardening substance, becomes an actual printing surface inked with an ordinary roller and printed by an ordinary machine. A strong tough film made up of a first coating of a simple gelatinous nature covered by a seconfl film of the sensitive bichromated gelatin is spread upon glass and allowed to dry. Exposed to light under a reversed negative

the unprotected parts are hardened in proportion to the amount of protection they receive from the negative. After exposure under the negative the back of the film is exposed to the action of sunlight through the glass at its back, so that the whole film may be rendered as hard and tough and durable as possible to stand the wear and tear of the process of printing. When in its place in the printing press the film must be kept moistened. The soft parts unacted upon by the light, but from which the bichromate has been since washed, will absorb moisture in pro- portion to the action the light has exercised upon it, the abso- lutely hard parts. refusing moisture altogether. The film may now be inked with an ordinary inking roller, the ink being freely taken up by the hard and unmoistened passages and by the partly hardened in proportion to the amount of moisture they are capable of absorbing; as in lithography, the constant moistening of the printing surface is a necessity. Collotype is largely used for postcards. It may be printed in a lithographic or ordinary vertical press of the letterpress printer. Admirable colour results are obtained by this process.

Heliotype is a variation of the method of producing the film which is first

spread as described upon waxed glass and then stripped from the glass when dry. After hardening the back of the film it is laid down upon a metal plate and firmly secured i to it by the use of an india-rubber cement. It is remarkable the admirable results that are obtainable by so delicate a process. The films have not a long life; a few hundreds only can be printed from each, but the renewal of the film is a simple matter. The result is very like a photograph. The use of heliotype is, however, practically obsolete.

Photolithography. — Zinc or aluminium plates are now fre- quently used instead of the more cumbrous stones for all so called lithographic printing. These plates have the same affinity for fat ink as stone, the method of dealing with them being practically the same as with stones, and the description may be taken as applying to both. The stone itself may be rendered sensitive by coating it with a thin film of bichromated gelatin, exposing it under a reversed negative of the required subject and treating the hardened film as it is treated in the case of collotype. A better plan is to render sensitive a sheet of unsized or transfer paper which is exposed under a negative, moistened, and rolled with transfer ink, which is of a specially fatty nature, and adheres only to the parts hardened by exposure which are unaffected by the moistening and remain dry. This inked sheet is laid upon the stone and the two together are subjected to great pressure, passing through a lithographic press. After further moistening the sheet of transfer paper is peeled off, the stone leaving the inked drawing behind it. The usual methods of lithography are then followed, the stone is treated with a preparation of acid and gum, kept moist and printed from in the ordinary lithographic method. Lithography of all kinds can only deal with lines or solid blocks. Tints present difficulties which are best dealt with by other methods of reproduction, but attempts have been made to obtain tints lithographically by breaking up the solid surfaces of the gelatin print with a grain before rolling it with ink and transferring it to the stone.

One of the most successful of such attempts is known as the Ink Photo process, which is more or less of a secret process worked by Messrs Sprague. None of them, however, yield so sound a result as a good drawing made in line, as the grain has a tendency to fill up. Transfers may also be made on to zinc : plates which will take the lithographic ink equally well with stones. The plates may be etched — as the inked surfaces resist the action of acid — and by this means a relief plate made, which when mounted on a block, type-high, may be printed typographi- cally. It is known in this form as zincography.

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PROCESS, in law, in the widest sense of the word, any means by which a court of justice gives effect to its authority. In the old practice of the English common law courts process was either original or judicial. Original process was a means of compelling a defendant to compliance with an original writ (see Writ). Judicial process was any compulsory proceeding rendered necessary after the appearance of the defendant. Process was also divided in civil matters into original, mesne and final. Original process in this sense was any means taken to compel the appearance of the defendant. A writ of

summons is now the universal means in the High Court of Justice. Mesne process was either any proceeding against the defendant taken between the beginning and the end of the action, such as to compel him to give bail, or was directed to persons not parties to the action, such as jurors or witnesses. Arrest on mesne process was abolished in England by the Debtors Act 1869. Final process is practically coexistent with execution. In criminal matters process only applies where the defendant does hot appear upon summons or otherwise. A warrant is now the usual form of such process.

Stet processus was a technical term used in old common law practice. It consisted of an-entry on the record by consent of the parties for a stay of proceedings. Since the Judicature Acts there has been no record, and the stet processus has disappeared with it.

In Scots law process is used in a much wider sense, almost equiva- lent to practice or procedure in English law. Where papers forming steps of a process are borrowed and not returned, the return of the borrowed process may be enforced by caption (attachment). The Scottish process is very much akin to the French dossier.

In the United States process is governed by numerous statutes, both of Congress and of the state legislatures. The law is founded upon the English common law.

PROCESSION 1 (M. Eng., processioun, Fr., procession, Lat., processio, from procedere, to go forth, advance, proceed), in general, an organized body of people advancing in a formal or ceremonial manner. This definition covers a wide variety of such progresses: the medieval pageants, of which the Lord

1 In classical Latin the word generally used for a procession was pompa, a formal march or progress of persons to some particular spot, to celebrate some event, or for some public or religious purpose. Processio is used by Cicero in the sense of " a marching forward, an advance," any public progress, such as the formal entrance of the consul upon his office (Du Cange, s.v. Processio), or the public appearance of the emperor. In Late Latin processio is generally used of a religious procession, the word having come to be used of I the body of persons advancing or proceeding.

Mayor's show in London is the most conspicuous survival; the processions connected with royal coronations and with court ceremonies generally; the processions of friendly societies, so popular in Great Britain and America;

processions organized as a demonstration of political or other opinions; processions forming part of the ceremonies of public worship. In a narrower sense of " going forth, proceeding," the term is used in the technical language of theology in the phrase " Procession of the Holy Ghost," expressing the relation of the Third Person in the Triune Godhead to the Father and the Son.

Processions have in all peoples and at all times been a natural form of public celebration, as forming an orderly and impressive Greek ana way in which a number of persons can take part in Roman Pro- some ceremony. They are included in the celebra- cessioas. ti ns of many religions, and in many countries, both in the East and West, they accompany such events as weddings and funerals. Religious and triumphal processions are abundantly illustrated by ancient monuments, e.g. the religious processions of Egypt, those illustrated by the rock-carvings of Boghaz-Keui (see Pteria), the many representations of pro- cessions in Greek art, culminating in the great Panathenaic procession of the Parthenon frieze, and Roman triumphal reliefs, such as those of the arch of Titus.

Processions played a prominent part in the great festivals of Greece, where they were always religious in character. The games were either opened or accompanied by more or less elaborate processions and sacrifices, while processions from the earliest times formed part of the worship of the old nature gods (e.g. those connected with the cult of Dionysus, &c), and later formed an essential part of the celebration of the great religious festivals (e.g. the processions of the Thesmophoria, and that of the Great Dionysia), and of the mysteries (e.g. the great pro- cession from Athens to Eleusis, in connexion with the Eleusinia) . Of the Roman processions, the most prominent was that of the Triumph, which had its origin in the return of the victorious army headed by the general, who proceeded in great pomp from the Campus to the Capitol to offer sacrifice, accompanied by the army, captives, spoils, the chief magistrate, priests bearing the images of the gods, amidst strewing of flowers, burning of incense and the like (Ovid, Trisl. iv. 2, 3 and 6). Connected with the triumph was the pompa circensis, or solemn procession which preceded the games in the circus ; it first came into use at the ludi romani, when the games were preceded by a great procession from the Capitol to the Circus. The praetor or consul who appeared in the pompa circensis wore the robes of a triumphing general (see Mommsen, Staatsrecht I. 397 for the connexion of the triumph with the ludi). Thus, when it became customary for the consul to celebrate games at the opening of the consular year, he came, under the empire, to appear in triumphal robes in the processus consularis, or procession of the consul to the Capitol to sacrifice to Jupiter. After the establishment of Christianity, the consular processions in Constantinople retained their religious character, now proceeding to St Sophia, where prayers and offerings were

made; but in Rome, where Christ- ianity was not so widely spread among the upper classes, the tendency was to convert the procession into a purely civil function, omitting the pagan rites and prayers, without substitu- ting Christian ones (Dahremberg and Saglio, s.v. " Consul "). Besides these public processions, there were others connected with the primitive worship of the country people, which remained unchanged, and were later to influence the worship of the Christ- ian Church. Such were those of the Ambarvalia, Robigalia, &c, which were essentially rustic festivals, lustrations of the fields, consisting in a procession round the spot to be purified, leading the sacrificial victims with prayers, hymns and cere- monies, in order to protect the young crops from evil influences. (See Preller, R8m. Mythologie, pp. 370-372.)

As to the antiquity of processions as part of the ritual of the Christian Church, there is no absolute proof of their existence before the 4th century, but as we know that in the catacombs stations were held at the tombs of the martyrs on the anni- versary of their death, for the celebration of the eucharist, it

is quite probable that the faithful proceeded to the appointed spot in some kind of procession, though there is no satisfactory evidence that this was the case. There are, indeed, processions early instances of the use of the word processio by in the Christian writers, but it does not in any case Christian appear to have the modern meaning "procession." cburch – Tertullian (2nd century) uses processio and procedere in the sense of " to go out, appear in public," 1 and, as applied to a church function, processio was first used in the same way as collecta, as the equivalent of the Greek auva&s, i.e. for the assembly of the people in the church (Du Cange, s.v.). In this sense it appears to be used by Pope Leo I. (Ep. IX. ad Diosc. episc. c. 445: " qui nostris processionibus et ordinationibus frequenter interfuit "), while in the version by Dionysius Exiguus of the 17th canon of the Council of Laodicaea awaˆeai, is translated by processionibus (Smith, Die. of Chr. Antiq. s.v. " Procession "). For the processions that formed part of the ritual of the eucharist, those of the introit, the gospel and the oblation, the earliest records date from the 6th century and even later (see Duchesne, Origines, 2nd ed., pp. 77, 154, 181; 78, 194), but they evidently were established at a much earlier date. As to public processions, these seem to have come into rapid vogue after the recognition of Christianity as the religion of the empire. Those at Jerusalem would seem to have been long established when described by the authoress of the Peregrinatio Silviae towards the end of the 4th century (see Palm Sunday, for the procession of palms) .

Very early were the processions accompanied by hymns and prayers, known as litaniae (Gr. XtraveTa, from \lttj, prayer), rogationes or

supplicationes (see Litany). It is to such a procession that reference appears to be D Wa "« s or made in a letter 2 of St Basil (c. 375), which would thus be the first recorded mention of a public Christian proces- sion. The first mention for the Western Church occurs in St Ambrose (c. 388, Ep. 40 § 16, Ad Theodos. " monachos . . . qui . . . psalmos canentes ex consuetudine usuque veteri pergebant ad celebritatem Machabaeorum martyrum "). In both these cases the litanies are stated to have been long in use. There is also mention of a procession accompanied by hymns, organized at Constantinople by St John Chrysostom (c. 390-400) in oppo- sition to a procession of Arians, in Sozomen, Hist. eccl. viii. 8. 3 In times of calamity litanies were held, in which the people walked in robes of penitence, fasting, barefooted, and, in later times, frequently dressed in black (litaniae nigrae). The cross was carried at the head of the procession and often the gospel and the relics of the saint were carried. Gregory of Tours gives numerous instances of such litanies in time of calamity; thus he describes (Vita S. Remig. I.) a procession of the clergy and people round the city, in which relics of St Remigius were carried and litanies chanted in order to avert the plague. So, too, Gregory the Great (Ep. xi. 57) writes to the Sicilian bishops to hold processions in order to prevent a threatened invasion of Sicily. A famous instance of these penitential litanies is the litania sepliformis ordered by Gregory the Great in the year 590, when Rome had been inundated and pestilence had followed.

1 See De praescr. adv. haer. C. xliii., " Ubi metus in Deum, ibi gravitas honesta . . . et subjectio religiosa, et apparitio devota, et processio modesta, et Ecclesia unita et Dei omnia," where it would seem to mean " a modest bearing in public; " also De cultu foem. ii., xi., " Vobis autem nulla procedendi caussa tetrica; aut im- becillus aliquis ex fratribus visitandus, aut sacrificium offertur, aut Dei verbum administratur," which shows that procedere was not used only of going to church. The passage ad uxorem, ii. 4, which is sometimes quoted to prove the existence of processions at this date, appears to use procedere in the same way as the above passages; "... si procedendum erit, nunquam magis familiae occupatio obveniat. Quis enim sinat conjugem suam visitandorum fratrum gratia vicatim aliena ac quidem pauperiora quaeque tuguria circuire? . . . quis denique solemnibus Paschae abnoctantem securus sus- tinebit? "

*2 Ep. 207 ad Neocaes: 'AW ovk rjv, i)Tl, ravra iiri rov neyakov Tpeyopiov. *AAX" ov8t at Airaveicu, as ii/iets vvv kircdeueTe k. t. X,*

3 Brawls having arisen with the Catholics, who began singing their hymns in opposition, the emperor prohibited the Arian meetings.

In this litany seven processions, of clergy, laymen, monks, nuns, matrons, the poor, and children respectively, starting from seven different churches, proceeding to hear mass at Sta Maria Maggiore (see Greg, of Tours, Hist. Fr. x. i , and Johann. Diac. Vita Greg. Magn. i. 42). This litany has often been confused with the litania major, introduced at Rome in 598 {vide supra), but is quite distinct from it. 1

Funeral processions, accompanied with singing and the carry- ing of lighted tapers, were very early customary (see Lights, Ceremonial Use or), and akin to these, also very early, were the processions connected with the translation of the relics of martyrs from their original burying place to the church where they were to be enshrined (see e.g. St Ambrose, Ep. 29 and St Augustine, De civitate Dei, xxii. 8 and Con}, viii. 7, for the finding and translation of the relics of Saints Gervasius and Protasius). From the time of the emperor Constantine I. these processions were of great magnificence. 2

Some liturgists maintain that the early Church in its proces- sions followed Old Testament precedents, quoting such cases OHgin of as the procession of the ark round the walls of Christian Jericho (Josh, vi.), the procession of David with the Processions. ar k (2 Sam. vi.), the processions of thanksgiving on the return from captivity, &c. The liturgy of the early Church as Duchesne shows (Origines, ch. i.) was influenced by that of the Jewish synagogue, but the theory that the Church adopted the Old Testament ritual is of quite late growth. What is certain is that certain festivals involving processions were adopted by the Christian Church from the pagan calendar of Rome. Here we need only mention the litaniae majores et mi- nores, which are stated by tlsener (" Alte Bittgange," in Zeller, Philosophische Aufsdtze, p. 278 seq.) to have been first instituted by Pope Liberius (352-366). It is generally acknowledged that they are the equivalent of the Christian Church of the Roman lustrations of the crops in spring, the Ambarvalia, &c. The litania major, or great procession on St Mark's day (April 25) is shown to coincide both in date and ritual with the Roman Robigalia, which took place ad. vii. Kal. Mai., and consisted in a procession leaving Rome by the Flaminian gate, and proceeding by way of the Milvian bridge to a- sanctuary at the 5th milestone of the Via Claudia, where the flamen quirinalis sacrificed a dog and a sheep to avert blight (robigo) from the crops (Fasti praenestini, C.T.L.T., p. 317). The litania major followed the same route as far as the Milvian bridge, when it turned off and returned to St Peter's, where mass was celebrated. This was already established as an annual festival by 598, as is shown by a document of Gregory the Great (Regist. ii.) which inculcates the duty of celebrating litaniam, quae major ab omnibus appellatur. The litaniae minores or

rogations, held on the three days preceding Ascension Day, were first introduced into Gaul by Bishop Mamertus of Vienne (c. 470), and made binding for all Gaul by the 1st Council of Orleans (511). The litaniae minores were also adopted for these three days in Rome by Leo III. (c. 800) . A description of the institution and character of the Ascensiontide rogations is given by Sidonius Apollinaris (Ep. v. 14). " The solemnity of these," he says, " was first established by Mamertus. Hitherto they had been erratic, lukewarm and poorly attended (vagae, tepentes, infrequentesque) ; those which he instituted were characterized by fasting, prayers, psalms and tears." In the Ambrosian rite the rogations take place after Ascensiontide, and in the Spanish on the Thursday to Saturday after Whitsuntide, and in November (Synod of Girona, 517).

1 Litanies, owing to the fact that they were sung in procession were in England sometimes themselves called " processions." Thus we read in the " Order of making Knights of the Bath for the coronation of Queen Elizabeth " : " the parson of the said church knelynge said the procession in Englysche and all that were there answered the parson " (B. M. Add. MSS. 4712, p. 51, printed in Anstis's Observations, p. 53).

2 See Martigny, Diet, des antiquitSs chr. s.v. " Processions," " Stations," " Translations " for details of processions under Constantine, and Du Cange, s.v. Processio for various processions in the middle ages.

It is impossible to describe in detail the vast development of processions during the middle ages. The most Processions important and characteristic of these still have a la tne place in the ritual of the Roman Catholic Church, ^"^n The rules governing them are laid down in the catholic Rituale Romanum (Tit. ix.), and they are classified Church. in the following way: —

(1) Processiones generates, in which the whole body of the clergy takes part. (2) Processiones ordinariae, on yearly festivals, such as the feast of the Purification of the Virgin (Candlemass, q.v.), the procession on Palm Sunday (q.v.), the Litaniae majores and minores, the feast of Corpus Christi (q.v.), and on other days, according to the custom of the churches. (3) Processiones extraordinariae, or processions ordered on special occasions, e.g. to pray for rain or fine weather, in time of storm, famine, plague, war, or, in quacunque tribulatione, processions of thanksgiving, translation of relics, the dedication of a church or cemetery. There are also processions of honour, for instance to meet a royal personage, or the bishop on his first entry into his diocese (Pontif. rom. iii.). Those taking part in processions are to walk bare-headed (weather permitting), two and two, in decent costume, and with reverent mien; clergy and laity, men and women, are to walk separately. The cross is carried at the head of the" procession,

and banners embroidered with sacred pictures in places where this is customary ; these banners must not be of military or triangular shape. Violet is the colour prescribed for processions, except on the Feast of Corpus Christi, or on a day when some other colour is prescribed. The officiating priest wears a cope, or at least a surplice with a violet stole, the other priests and clergy wear surplices.

Where the host is carried in procession it is covered always by a canopy, and accompanied by lights. At the litaniae majores and minores and other penitential processions, joyful hymns are not allowed, but the litanies are sung, and, if the length of the pro- cession requires, the penitential and gradual psalms.

As to the discipline regarding processions the bishop, according to the Council of Trent (Sess. 25 de reg. cap. 6) , appoints and regulates processions and public prayers outside the churches.

The observance or variation of the discipline belongs to the Congregation of Rites; in pontifical processions, which are regulated by {he masters of the ceremonies (magistri ceremoniarum ponlifi- calium), these points are decided by the chief cardinal deacon. As to processions within the churches, some difference of opinion having arisen as to the regulating authority, the Congregation of Rites has decided that the bishop must ask, though not necessarily follow, the advice of the chapter in their regulation.

Reformed Churches. — The Reformation abolished in all Protest- ant countries those processions associated with the doctrine of transubstantiation (Corpus Christi); " the Sacrament of the Lord's Supper," according to the 28th Article of Religion of the Church of England " was not by Christ's ordinance reserved, carried about, lifted up, or worshipped." It also abolished those associated with the cult of the Blessed Virgin and the saints. The stern simplicity of Calvinism, indeed, would not tolerate religious processions of any kind, and from the " Reformed " Churches they vanished altogether. The more conservative temper of the Anglican and Lutheran communions, however, suffered the retention of such processions as did not conflict with the reformed doctrines, though even in these Churches they met with opposition and tended after a while to fall into disuse.

The Lutheran practice has varied at different times and in different countries. Thus, according to the Wiirttemberg Kirchenordnung of 1553, a funeral procession was prescribed, the bier being followed by the congrega- church" tion singing hymns; the Brandenburg Kirchenord- nung (154°) directed a cross-bearer to precede the procession and lighted candles to be carried, and this was prescribed also by the Waldeck Kirchenordnung of

1556. At present funeral processions survive in general only in the country districts; the processional cross or crucifix is still carried. In some provinces also the Lutheran Church has retained the ancient rogation processions in the week before Whitsuntide and, in some cases, in the month of May or on special occasions (e.g. days of humiliation, Busstage), processions about the fields to ask a blessing on the crops. On these occasions the ancient litanies are still used.

In England " the perambulations of the circuits of the parishes . . . used heretofore in the days of rogations " were ordered to be observed by the Injunctions of Queen Elizabeth in 1559; and for these processions certain " psalms, prayers and homilies "

were prescribed. The Puritans, who aimed at setting up the Genevan model, objected; and the visitation articles of the bishops in Charles I.'s time make frequent inquisition Bagiand. ' nto t ˆ le ne g' ect of the clergy to obey the law in this matter. With " the profane, ungodly, presumptuous multitude " (to quote Baxter's Saint's Rest, 1650, pp. 344, 345), however, these " processions and perambulations " appear to have been very popular, though " only the traditions of their fathers." However this may be, the Commonwealth made an end of them, and they seem never to have been revived; Sparrow, in his Rationale upon the Book of Common Prayer (London, 1668), speaks of "the service formerly appointed in the Rogation days of Procession."

Among the processions that survived the Reformation in the English Church was that of the sovereign and the Knights of the Garter on St George's day. This was until Charles II. 's time a regular rogation, the choristers in surplices, the gentlemen of the royal chapel in copes, and the canons and other clergy in copes preceding the knights and singing the litany. In 1661, after the Restoration, by order of the sovereign and knights companions in chapter " that supplicational procession " was " converted into a hymn of thanksgiving." Akin to this procession also are the others connected with royal functions; coronations, funerals. These retained, and retain, many pre- Reformation features elsewhere fallen obsolete. Thus at the funeral of George II. (1760) the body was received at the door of the Abbey by the dean and prebendaries in their copes, attended by the choir, all carrying lighted tapers, who preceded it up the church, singing.

The only procession formerly prescribed in the Book of Common Prayer is that in the order of the burial of the dead, where the rubric directs that "

the priest and clerks meeting the corpse at the entrance of the churchyard, and going before it, either into the church, or towards the grave, shall say, or sing " certain verses of Scripture. Tapers seem to have been carried, not only at royal funerals, until well into the 18th century (see Lights, Ceremonial). Processions, with singing of the litany or of hymns, appear also to have been always usual on such occasions as the consecration of churches and churchyards and the solemn reception of a visiting bishop. Under the influence of the Catholic revival, associated with the Oxford Tractarians, processions have become increasingly popular in the English Church, pre-Reformation usages having in some churches been revived without any legal sanction. The most common forms, however, are the processional litanies, and the solemn entry of clergy and choir into the church, which on festivals is accom- panied by the singing of a processional hymn, their exit being similarly accompanied by the chanting of the Nunc Dimittis. In this connexion the use of the processional cross, banners and lights has been largely revived.

See the article " Bittgange," by M. Herold, in Herzog-Hauck, Realencyklopadie, iii. 248 (3rd ed., Leipzig, 1897) ; Wetzer und Welte, Kirchenlexikon, s.v. " Prozession, Bittgange Litanei " and Smith's Dictionary of Christian Antiquities s.v. " Procession." For the early ritual see Duchesne, Origines du culte Chretien (3rd ed., Paris, 1903). See also G. Catalani, Rituale romanum perpetuis commentariis exomatum (1760); N. Serarius, Sacri peripatetici de sacris ecclesiae catholicae processionibus (2 vols., Cologne, 1607) ; Jac. Gretser, De ecclesiae romanae processionibus (2 vols., Ingolstadt, 1606) ; Jac. Eveillon, De processionibus ecclesiae (Paris, 1641); Edw. Martene, De antiquis ecclesiae ritibus (3 vols., Antwerp, 1763), &c. For the past usage of the Church of England, Hierurgia anglicana, ed. Vernon Staley, p. ii pp. 3-22 (London, 1903).

PROCESSION PATH (Lat. ambitus templi) , the route taken by processions on solemn days in large churches — up the north aisle, round behind the high altar, down the south aisle, and then up the centre of the nave.

PROCES-VERBAL (Fr. prods, process, Late Lat. verbalis, from verbum, word), in French law, a detailed authenticated account drawn up by a magistrate, police officer, or other person having authority of acts or proceedings done in the exercise of his duty. In a criminal charge, a proces-verbal is a statement of the facts of the case. The term is also sometimes applied to the written minutes of a meeting or assembly, xxn. 14

PROCIDA (Gr. Ilpoxfrnj, Lat. Prochyta), an island off the coast of Campania, Italy, 2 m. S.W. of Capo Miseno, and 2 m. N.E. of Ischia on the west side of the Gulf of Naples, and about 12 m. S.W. of Naples. Pop. (1901), of the town, 2520; of the whole island, one commune, 14,440. It

is about 2 m. in length and of varying width, and, reckoning in the adjacent island of Vivara, is made up of four extinct craters, parts of the margins of all of which have been destroyed by the sea. The highest point of it is only 250 ft. above sea-level. It is very fertile, and the population is engaged in the cultivation of vines and fruit and in fishing. Procida, the only town, lies on the east side; its castle is now a prison. It also contains a royal palace. Classical authors explained the name of Procida either as an allusion to its having been detached from Ischia, or as being that of the nurse of Aeneas.

PROCLAMATION (Lat. proclamare, to make public by announcement), in English law, a formal announcement (royal proclamation), made under the great seal, of some matter which the king in council desires to make known to his subjects: e.g. the declaration of war, the statement of neutrality, the sum- moning or dissolution of parliament, or the bringing into opera- tion of the provisions of some statute the enforcement of which the legislature has left to the discretion of the king in council. Royal proclamations of this character, made in furtherance of the executive power of the Crown, are binding on the subject, " where they do not either contradict the old laws or tend to establish new ones, but only confine the execution of such laws as are already in being in such manner as the sovereign shall judge necessary " (Blackstone's Commentaries, ed. Stephen, ii. 528; Stephen's Commentaries, 14th ed. 1903, ii. 506, 507; Dicey, Law of the Constitution, 6th ed., 51). Royal proclamations, which, although not made in pursuance of the executive powers of the Crown, either Call upon the subject to fulfil some duty which he is by law bound to perform, or to abstain from any acts or conduct already prohibited by law, are lawful and right, and disobedience to them (while not of itself a misdemeanour) is an aggravation of the offence (see charge of Chief Justice Cockburn to the grand jury in R. v. Eyre (1867) and Case of Proclamations 1610, 12 Co. Rep. 74). The Crown has from time to time legislated by proclamation; and the Statute of Proclamations 1539 provided that proclamations made by the king with the assent of the council should have the force of statute law if they were not prejudicial to " any person's inheritance, offices, liberties, goods, chattels or life." But this enactment was repealed by an act of 1 547 ; and it is certain that a proclamation purporting to be made in the exercise of legisla- tive power by which the sovereign imposes a duty to which the subject is not by law liable, or prohibits under penalties what is not an offence at law, or adds fresh penalties to any offence, is of no effect unless itself issued in virtue of statutory authority (see also Order in Council). The Crown has power to legis- late by proclamation for a newly conquered country (Jenkyns, British Rule and Jurisdiction beyond the Seas); and this power was freely exercised in the Transvaal Colony during the Boer War of 1899-1902. In the British colonies, ordinances' are fre- quently brought

into force by proclamation; certain imperial acts do not take effect in a colony until there proclaimed (e.g. the Foreign Enlistment Act 1870); and proclamations are con- stantly issued in furtherance of executive acts. In many British protectorates the high commissioner or administrator is empowered to legislate by proclamation.

In the old system of real property law in England, fines, levied with " proclamations," i.e. with successive public announcements of the transaction in open court, barred the rights of strangers, as well as parties, in case they had not made claim to the property conveyed within five years thereafter (acts 1483- 1484 and 1488- 1489). These proclamations were originally made sixteen times, four times in the term in which the fine was levied, and four times in each of the three succeeding terms. Afterwards the number of proclamations was reduced to one in each of the four terms. The proclamations were endorsed on the back of the record. The system was abolished by the Fines and Recoveries Act 1833. (A. W. R.)

PROCLUS, or Proculus (a.d. 410-485), the chief representa- tive of the later Neoplatonists, was born at Constantinople, but

brought up at Xanthus in Lycia. Having studied grammar under Orion and philosophy under Olympiodorus the Peripa- tetic, at Alexandria, he proceeded to Athens. There he attended the lectures of the Neoplatonists Plutarch and Syrianus, and about 450 succeeded the latter in the chair of philosophy (hence his surname Diadochus, which, however, is referred by others to his being the " successor " of Plato). As an ardent upholder of the old pagan religion Proclus incurred the hatred of the Christians, and was obliged to take refuge in Asia Minor. After a year's absence he returned to Athens, where he remained until his death. His epitaph, written by himself, is to be found in Anthologia palatina, vii. 451. Although possessed of ample means, Proclus led a most temperate, even ascetic life, and employed his wealth in generous relief of the poor. He was supposed to hold communion with the gods, who endowed him with miraculous powers. He acted up to his famous saying that " the philosopher should be the hierophant of the whole world " by celebrating Egyptian and Chaldaean as well as Greek festivals, and on certain days performing sacred rites in honour of all the dead.

His great literary activity was chiefly devoted to the elucida- tion of the

writings of Plato. There are still extant commen- taries on the First Alcibiades, Parmenides, Republic, Timaeus and Cratylus. His views are more fully expounded in the nepi ttjs Kara ITKaTuva deoKoylas (In Platonis theologiam). The Sroix e "j< J "s OfoKayudi (Institutio theologica) contains a compendious account of the principles of Neoplatonism and the modifications introduced in it by Proclus himself. The pseudo- Aristotelian De causis is an Arabic extract from this work, ascribed to Alfarabius (d. 950), circulated in the west by means of a Latin translation (ed. O. Bardenhewer, Freiburg, 1882). It was answered by the Christian rhetorician Procopius of Gaza in a treatise which was deliberately appropriated without acknowledgment by Nicolaus of Methone, a Byzantine theologian of the 12th century (see W. Christ, Gesch. der griechischen Litteratur, 1898, § 692). Other philosophical works by Proclus are Stoix" 00 "? vo~Licri fj Hepl Kivrictccs (Institutio physica sive De motu, a compendium of the last five books of Aristotle's Hepl (frvoiKrjs ctKpodcrecos, De physica auscultatione) , and De providentia et falo, Decern dubitationes circa providentiam, De malorum subsistentia, known only by the Latin translation of William of Moerbeke (archbishop of Corinth, 1277-1281), who also translated the 2Toix e k°°'« deoKoyiid) into Latin. In addition to the epitaph already mentioned, Proclus was the author of hymns, seven of which have been preserved (to Helios, Aphrodite, the Muses, the Gods, the Lycian Aphrodite, Hecate and Janus, and Athena), and of an epigram in the Greek Antho- logy (Anlhol. pal. iii. 3, 166 in Didot edition.) His astronomical and mathematical writings include 'TiroTii/rcotrts tuv dorpo- voyxK&v imodeoeuv (Hypotyposis astronomicarum positionum, ed. C. Manitius, Leipzig, 1909); Hepl cr^cupas (De sphaera); Hapapa.v Eii/cAet5ov OTOixeiwv, a commentary on the first book of Euclid's Elements; a short treatise on the effect of eclipses (De ejfeclibus eclipsium, only in a Latin translation).*

His grammatical works are: a commentary on the Works and Days of Hesiod (incomplete) ; some scholia on Homer; an elemen- tary treatise on the epistolary style, Hepl «ri0ToXip;cuoi> x a P aKT VPos (Characteres epistolici), attributed in some MSS. to Libanius. The XpriffTOfiadLa ypap- fiaTLKij by a Proclus, who is identified by Suidas with the Neoplatonist, is probably the work of a grammarian of the 2nd or 3rd century, though Wilamowitz- Mollendorff (Philolog. Untersuch. vii.; supported by O. Immisch in Festschrift Th. Gomperz, pp. 237-274) agrees with Suidas. According to Suidas, he was also the author of 'E7rix« t pi7M ar " l1 7 Kara XptcrTtawv (Animadversiones duodeviginti in christianos) . This work, identified by W. Christ with the Institutio theologica, was answered by Joannes Philoponus (7th century) in his De aeternitate mundi. Some of his commentary on the Chal- daean oracles (Abyta XaXSaud) has been discovered in modern times.

There is no complete edition of the works of Proclus. The selection of V. Cousin (Paris, 1864) contains the treatises De provi- dentia et fato, Decern dubitationes, and De malorum subsistentia, the commentaries on the Alcibiades and Parmenides. The Institutio theologica has been edited by G. F. Creuzer in the Didot edition of Plotinus (Paris, 1 855); the In Platonis theologiam has not been reprinted since 161 8, when it was published by Aemilius Portus with a Latin translation. Most recent editions of individual works are : Commentaries on the Parmenides, French translation with notes by A. E. Chaignet (1900-1903); Republic, by W. Kroll (1899- 1901) ; Timaeus, by E. Diehl (1903-) ; Hymns, by E. Abel (1883) and A. Ludwich (1895); commentary on Euclid by G. Friedlein (1873); AoT'aXaX5aiVa,byA. Jahn (1891); Characteres epistolici, by

A. Westermann (1856), Scholia to Hesiod in E. Vollbehr's edition (1844). Thomas Taylor, the " Platonist," translated the com- mentaries on the Timaeus and Euclid, The Theology of Plato, the Elements of Theology, and the three Latin treatises.

On Proclus generally and his works see article in Suidas; Marinus, Vita Prodi; J. A. Fabricius, Bibliotheca graeca (ed. Harles), ix. 363-445; W. Christ, Ceschichte der griechischen Litteratur (1898), § 623; J. E. Sandys, Hist, of Classical Scholarship (1906), i. 372; J. B. Bury, Later Roman Empire (1889), i. 13, where Proclus is styled the "Hegel of Neoplatonism"; on his philosophy, T. Whittaker, The Neo-Platonists (1901), and Neoplatonism.

Extracts from the Xp-qaroiiaBla are preserved in Photius (Cod. 239), almost the only source of information regarding the epic cycle ; on the question of authorship, see Christ § 637, and Sandys, p. 379; also D.

B. Monro's appendix to his ed. of Homer's Odyssey, xiii.-xxiv. (1901).

PROCOPIUS, Byzantine historian, was born at Caesarea in Palestine towards the end of the 5th century a.d. He became a lawyer, probably at Constantinople, and was in 527 appointed secretary and legal adviser to Belisarius, who was proceeding to command the imperial army in the war against the Persians (De bello persico i. 12). When the Persian War was suspended and Belisarius was despatched against the Vandals of Africa in 533, Procopius again accompanied him, as he subsequently did in the war against the Ostrogoths of Italy, which began in 535. After the capture of Ravenna in 540 Procopius seems to have returned to Constantinople, since he minutely describes the great plague of 542 (op. cit. ii. 22). It does not appear whether he was with the Roman armies in the later stages of the Gothic War, when Belisarius and afterwards Narses fought against Totila in Italy; his narrative of these years is much less full and minute than that

of the earlier warfare. Of his subsequent fortunes we know nothing, except that he was living in 559. Whether he was the Procopius who was prefect of Constantinople in 562 (Theophanes, Chronographia, 201, 202), and was removed from office in the year following, cannot be determined. As the historian was evidently a person of note, who had obtained the rank of illustrius (Suidas), and from a passage in the Anecdota (12) seems to have risen to be a senator, there is no improbability in his having been raised to the high office of prefect.

Procopius's writings fall into three divisions : the Histories (Persian, Vandal and Gothic Wars), in eight books; the treatise on the Buildings of Justinian (De aedificiis), in six books; and the Unpublished Memoirs ('AveKSora, Historia arcana), so called because they were not published during the lifetime of the author.

The Histories are called by the author himself the Boohs about the Wars (ol vrtp tS>v TroXencov X670O. They consist of: (1) the Persian Wars, in two books, giving a narrative of the long struggle of the emperors Justin and Justinian against the Persian kings Kavadh and Chosroes Anushirvan down to 550; (2) the Vandal War, in two books, describing the conquest of the Vandal kingdom in Africa and the subsequent events there from 532 down to 546 (with a few words on later occurrences); (3) the Gothic War, in three books, narrating the war against the Ostrogoths in Sicily and Italy from 536 till 552. The eighth book contains a further summary of events down to 554. These eight books of Histories, although mainly occupied with military matters, contain notices of some of the more important domestic events, such as the Nika insurrection at Constantinople in 532, the plague in 542, the conspiracy of Artabenes in 548. They tell us, however, comparatively little about the civil adminis- tration of the empire, and nothing about legislation. On the other hand they are rich in geographical and ethnographical information.

PROCOPIUS OF GAZA— PROCTER, B. W.

As an historian Procopius is of quite unusual merit, when the generally low literary level of his age is considered. He is in- dustrious in collecting facts, careful and impartial in stating them; his judgment is sound, his reflections generally acute, his conceptions of the general march and movement of things not unworthy of the great events he has recorded. His descrip- tions, particularly of military operations, are clear, and his especial fondness for this part of the subject seldom leads him into unnecessary minuteness. The style, although marked by mannerisms, by occasional affectations and rhetorical devices, is on the whole direct and businesslike, nor is the Greek bad for the period in which he wrote. His models are Thucydides and Herodotus. The former he imitates in the maxims (yvcofiai) he throws in

and the speeches which he puts into the mouth of the chief actors; the latter in his frequent geographical digres- sions, in the personal anecdotes, in the tendency to collect and attach some credence to marvellous tales. The speeches are obviously composed by Procopius himself, rarely showing any dramatic variety in their language, but they seem sometimes to convey the substance of what was said; and even when this is not the case they frequently serve to bring out the points of a critical situation. Procopius is almost as much a geo- grapher as an historian, and his descriptions of the people and places he himself visited are generally careful and thorough. Although a warmly patriotic Roman, he does full justice to the merits of the barbarian enemies of the empire, particularly the Ostrogoths; although the subject of a despotic prince, he criticizes the civil and military administration of Justinian and his dealings with foreign peoples with a freedom which gives a favourable impression of the tolerance of the emperor. His chief defects are a somewhat pretentious and at the same time monotonous style, and a want of sympathy and intensity.

The De aedificiis contains an account of the chief public works executed during the reign of Justinian down to 558 (in which year it seems to have been composed), particularly churches, palaces, hospitals, fortresses, roads, bridges and other river works throughout the empire. All these are of course ascribed to the personal action of the monarch. If not written at the command of Justinian (as some have supposed), it is evidently grounded on official information, and is full of gross flattery of the emperor and of the (then deceased) empress. In point of style it is greatly inferior to the Histories — florid, pompous and affected, and at the same time tedious. Its chief value lies in the geographical notices which it contains.

The Anecdota (" Secret History") purports to be a supplement to the Histories, containing explanations and additions which the author could not insert in the latter work for fear of Justinian and Theodora. It is a furious invective against these sovereigns, their characters, personal conduct and government, with attacks on Belisarius and his wife Antonina, and on other noted officials in the civil and military services of the empire. Owing to the ferocity and brutality of the attacks upon Justinian, the authen- ticity of the Anecdota has often been called in question, but the claims of Procopius to the authorship are now generally recog- nized. In point of style, the Anecdota is inferior to the Histories, and has the air of being unfinished, or at least unrevised. Its merit lies in the furious earnestness with which it is written, which gives it a force and reality sometimes wanting in the more elaborate books written for publication. The history of Philip of Macedon by Theopompus probably furnished the author with a model.

The best complete edition of Procopius is by J. Haury (Teubner Series,

1905) ; the Gothic War has been edited by D. Comparetti (1895-1898), with an Italian translation. There are English translations of the History of the Wars, by H. Holcroft (1653) ; of the Anecdota (1674, anonymous); of the Buildings, by Aubrey Stewart (1888, in Palestine Pilgrims' Text Society). Chief authori- ties: F. Dahn, Procopius von Cdsarea (1865); W. S. Teuffel in Studien und Charakteristiken (2nd ed., 1889); L. Ranke, Welt- geschichte (1883), iv. 2. On the genuineness of the Anecdota cf. J. B. Bury (who agrees with Ranke in rejecting the authorship of Procopius) A History of the Later Roman Empire (1889), vol. i., and introd. to vol. i. (p. 57) and app.to vol. iv. of his edition of

Gibbon's Decline and Fall. For the literature of the subject generally, see C. Krumbacher, Geschichte der byzantinischen Litteratur (2nd ed., 1897).

PROCOPIUS OF GAZA (c. 465-528 a.d.), Christian sophist and rhetorician, one of the most important representatives of the famous school of his native place. Here he spent nearly the whole of his life teaching and writing, and took no part in the theological movements of his time. The little that is known of him is to be found in his letters and the encomium by his pupil and successor Choricius. He was the author of numerous rhetorical and theological works. Of the former, his panegyric on the emperor Anastasius alone is extant; the description of the church of St Sophia and the monody on its partial destruc- tion by an earthquake are spurious. His letters (162 in number), addressed to persons of rank, friends, and literary opponents, throw valuable light upon the condition of the sophistical rhetoric of the period and the character of the writer. The fragment of a polemical treatise against the Neoplatonist Proclus is now assigned to Nicolaus, archbishop of Methone in Pelo- ponnesus {fl. 12th century). Procopius's theological writings consist of commentaries on the Octateuch, the bocks of Kings and Chronicles, Isaiah, the Proverbs, the Song of Songs and Ecclesiastes. They are amongst the earliest examples of the " catenic " {catena, chain) form of commentary, consisting of a series of extracts from the fathers, arranged, with inde- pendent additions, to elucidate the portions of Scripture con- cerned. Photius {cod. 206), while blaming the diffuseness of these commentaries, praises the writer's learning and style, which, however, he considers too ornate for the purpose.

Complete editions of the works of Procopius in Migne, Patrologia graeca, lxxxvii; the letters also in Epistolographi graeci, ed. R. Hercher (1873); see also K. Seitz, Die Schule von Gaza (1892); D. Russos, Tpets TofaToi (Constantinople, 1893); L. Eisenhofer, Procopius von Gaza (1897) ! further bibliographical notices in C. Krumbacher, Geschichte der byzantinischen Litteratur (1897), and article by G. Kriiger in Herzog-

Hauck's Realencyclopadie fur protestantische Theologie (1905).

PROCRUSTES (Gr. for "the stretcher"), also called Poly- pemon or Damastes, in Greek legend, a robber dwelling in the neighbourhood of Eleusis, who was slain by Theseus. He had two bedsteads (according to some, only one), the one very long, the other very short. When a stranger claimed his hospitality, Procrustes compelled him, if he was tall, to lie down on the short bed, and then cut off his extremities to make him fit. If on the other hand he was short, he was placed on the long bedstead and his limbs pulled out until he died from exhaustion. The " bed of Procrustes " has become proverbial.

Diod. Sic. iv. 59; Hyginus, fab. 38; Plutarch, Theseus, n; Pausanias i. 38, 5.

PROCTER, BRYAN WALLER (1787-1874), English poet, was born at Leeds on the 21st of November 1787. He was educated at Harrow, where he had for contemporaries Lord Byron and Sir Robert Peel. On leaving school he was placed in the office of a solicitor at Calne, Wiltshire, remaining there until about 1807, when he returned to London to study law. By the death of his father in 181 6 he became possessed of a small property, and soon after entered into partnership with a solicitor; but in 1820 the partnership was dissolved, and he began to write under the pseudonym of " Barry Cornwall." After his marriage in 1824 to Miss Skepper, a daughter of Mrs Basil Montague, he eturned to his professional work as conveyancer, and was called to the bar in 183 1. In the following year he was appointed, metropoli- tan commissioner of lunacy — an appointment annually renewed until his election to the permanent commission constituted by the act of 1842. He resigned office in 1861. He died on the 5th of October 1874. Most of his verse was composed between 181 5, when he began to contribute to the Literary Gazette, and 1823, or at latest 1832.

His principal poetical works were : Dramatic Scenes and other Poems (1819), A Sicilian Story (1820), Mirandola, a tragedy performed at Covent Garden with Macready, Charles Kembie and Miss Foote in the leading parts (182 1), The Flood of Thessely (1823). and English Songs (1832). He was also the author of

Effigies poetica (1824), Life of Edmund Kean (1835), Essays and Tales in Prose (1851), Charles- Lamb; a Memoir (1866), and of memoirs of Ben

Jonson and Shakespeare for editions of their works. A posthumous autobiographical fragment with notes of his literary friends, of whom he had a wide range from Bowles to Browning, was published in 1877, with some additions by- Coventry Patmore. Charles Lamb gave the highest possible praise to his friend's Dramatic Sketches when he said that had he found them as anonymous manuscript in the Garrick collec- tion he would have had no hesitation about including them in his Dramatic Specimens. He was perhaps not an impartial critic. " Barry Cornwall's " genius cannot be said to have been entirely mimetic, but his works are full of subdued echoes. His songs have caught some notes from the Elizabethan and Cavalier lyrics, and blended them with others from the leading poets of his own time; and his dramatic fragments show a similar infusion of the early Victorian spirit into pre-Restoration forms and cadences. The results are somewhat heterogeneous, and lack the impress of a pervading and dominant personality to give them unity, but they abound in pleasant touches, with here and there the flash of a higher, though casual, inspiration.

His daughter, Adelaide Anne Procter (1825-1864), also a poet, was born on the 30th of October 1825. She began to con- tribute to Household Words in 1853. She adopted the name of " Mary Berwick," so that the editor, Charles Dickens, should not be prejudiced by his friendship for the Procters. Her principal work is Legends and Lyrics, of which a first series, published in 1858, ran through nine editions in seven years, while a second series issued in i860 met with a similar success. Her unambitious verses dealing with simple emotional themes in a simple manner have a charm which is scarcely explicable on the ground of high literary merit, but which is due rather to the fact that they are the cultured expression of an earnest and beneficent life. Among the best known of her poems are The Angel's Story, The Legend of Bregenz and The Legend of Provence. Many of her songs and hymns are very popular. Latterly she became a convert to Roman Catholicism, and her philanthropic zeal appears to have hastened her death, which took place on the 2nd of February

1864.

PROCTOR, ALEXANDER PHIMISTER (1862-), American sculptor and painter, was born in Ontario, Canada, on the 27th of September 1862. As a youth he lived at Denver, Colorado, spending much of his time in the Rocky Mountains, and his familiarity with the ways and habits of wild animals was supple- mented later by study in the Jardin des Plantes, Paris. He was a pupil at the National Academy of Design and later in the Art Students' League, in New York, and first attracted attention by his statues of wild animals at the Columbian Exposition, Chicago. In 1896 he won the Rinehart Scholarship, which enabled him to spend five years in Paris,

where he studied under Puech and J. A. Injalbert. Among his works of sculpture are: "Indian Warrior" (a small bronze); "Panthers," Prospect Park, Brooklyn, New York; " Quadriga," for United States Pavilion, Paris Exhibition (1900), and groupsin the City Park, Denver, and Zoological Park, New York. His pictures of wild animals, mainly in water colours, are also characteristic. He became a member of the Society of American Artists (1895), of the National Academy of Design (1904), of the American Water Color Society, and of the Architectural League, New York.

PROCTOR, RICHARD ANTHONY (1837-1888), British astro- nomer, was born at Chelsea on the 23rd of March 1837. He was a delicate child, and, his father dying in 1850, his mother attended herself to his education. On his health improving he was sent to King's College, London, from which he obtained a scholarship at St John's College, Cambridge. He graduated in i860 as 23rd wrangler. His marriage while still an undergraduate probably accounted for his low place in the tripos. He then read for the bar, but turned to astronomy and authorship instead, and in 1865 published an article on the " Colours of Double Stars " in the Cornhill Magazine. His first book — Saturn and his System — was published in the same year, at his

own expense. This work contains an elaborate account of the phenomena presented by the planet; but although favourably received by astronomers, it had no great sale. He intended to follow it up with similar treatises on Mars, Jupiter, sun, moon, comets and meteors, stars, and nebulae, and had in fact com- menced a monograph on Mars, when the failure of a New Zealand bank deprived him of an independence which would have enabled him to carry out his scheme without anxiety as to its commercial success or failure. Being thus obliged to depend upon his writings for the support of his family, and having learned by the fate of his Saturn that the general public are not attracted by works requiring arduous study, he cultivated a more popular style. He wrote for a number of periodicals; and although he has stated that he would at this time willingly have " turned to stone-breaking on the roads, or any other form of hard and honest but unscientific labour, if a modest competence had been offered " him in any such direction, he attained a high degree of popularity, and his numerous works had a wide influence in familiarizing the public with the main facts of astronomy. His earlier efforts were, however, not always successful. His Hand- book of the Stars (1866) was refused by Messrs Longmans and Messrs Macmillan, but being privately printed, it sold fairly well. For his Half-Hours with the Telescope (1868), which eventually reached a 20th edition, he received originally £25 from Messrs Hardwick. Although teaching was uncongenial to him he took pupils in mathematics, and held for a time the position of mathematical coach for Woolwich and Sandhurst.

*His literary standing meantime improved, and he became a regular contributor to The Intellectual Observer, Chambers's Journal and the Popular Science Review. In 1870 appeared his Other Worlds than Ours, in which he discussed the question of the plurality of worlds in the light of new facts. This was followed by a long series of popular treatises in rapid succession, amongst the more important of which are Light Science for Leisure Hours and The Sun (1871); The Orbs around Us and Essays on Astronomy (1872); The Expanse of Heaven, The Moon and The Borderland of Science (1873); The Universe and the Coming Transits and Transits of Venus (1874) ; Our Place among Infinities (1875); Myths and Marvels of Astronomy (1877); The Universe of Stars (1878) ; Flowers of the Sky (1879) ; The Peotry of Astronomy (1880); Easy Star Lessons and Familiar Science Studies (1882); Mysteries of Time and Space and The Great Pyramid (1883); The Universe of Suns (1884); The Seasons (1885); Other Suns than Ours and Half-Hours with the Stars (1887). In 1881 he founded Knowledge, a popular weekly magazine of science (converted into a monthly in 1885), which had a considerable circulation. In it he wrote on a great variety of subjects, including chess and whist. He was also the author of the articles on astronomy in the American Cyclopaedia and the ninth edition of the Encyclopaedia Brilannica, and was well known as a popular lecturer on astronomy in England, America and Australia. Elected a fellow of the Royal Astronomical Society in 1866, he became honorary secretary in 1872, and contributed eighty-three separate papers to its Monthly Notices. Of these the more noteworthy dealt with the distribution of stars, star- clusters and nebulae, and the construction of the sidereal universe. He was an expert in all that related to map-drawing, and published two star-atlases. A chart on an isographic projection, exhibiting * all the stars contained in the Bonn Durchmusterung, was designed to show the laws according to which the stars down to the 9-ioth magnitude are distributed over the northern heavens. His " Theoretical Considerations respecting the Corona " (Monthly Notices, xxxi. 184, 254) also deserve mention, as well as his discussions of the rotation of Mars, by which he deduced its period with a probable error of o s -005. He also vigorously criticized the official arrangements for observing the transits of Venus of 1874 and 1882. His largest and most ambitious work, Old and New Astronomy, unfortunately left unfinished at his death, was completed by A. Cowper Ranyard and published in 1892. He settled in America some time after his second marriage in 1881, and Cied at New York on the 12th of September 1888.*

See Monthly Notices, xlix. 164; Observatory, xi. 366; The Times, (Sept.

14, 1888); Knowledge (Oct. 1888, p. 265); Appleton's Annual Cyclopaedia, xiii. 707 ; Autobiographical Notes in New Science Review, i. 393.

PROCTOR, an English variant of the word procurator (q.v.); strictly, a person who takes charge or acts for another, and so approaching very nearly in meaning to " agent " (q.v.). The title is used in England in three principal senses.

1. A practitioner in the ecclesiastical and admiralty courts. A proctor in this sense is also a qualified person licensed by the archbishop of Canterbury to undertake duties such as are performed in other courts by solicitors, but this matter is now only of historical interest, since by the Judicature Acts 1873 and 1875 all the business formerly confined to proctors may be conducted by solicitors. The king s proctor is the proctor or solicitor representing the Crown in the courts of probate and divorce. In petitions of divorce or for declaration of nullity of marriage the king's proctor may, under direction of the attorney- general, and by leave of the court, intervene in the suit for the purpose of proving collusion between the parties. His power of intervening is limited, by the Matrimonial Causes Act i860, to cases of collusion only, but he may also, as one of the public, show cause against a decree nisi being made absolute (see Divorce). In the admiralty court a proctor or procurator was an officer who, in conjunction with the king's proctor, acted as the attorney or solicitor in all causes concerning the lord high admiral's affairs in the high court of admiralty and other courts. The king's proctor so acted in all causes concerning the king.

2. A representative of the clergy in convocation. A proctor in this sense represents either the chapter of a cathedral or the beneficed clergy of a diocese. In the province – of Canterbury two proctors represent the clergy of each diocese; in that of York there are two for each archdeaconry. In both alike each chapter is represented by one.

3. The name of certain important university officials. At Oxford the proctors (procuratores) , under the statutes, supervise the transaction of university business and appoint delegates to look after any particular affairs wherever these are not other- wise provided for by statute. They are ex officio members of all the important delegacies, except that of the University Press. They also act as the assessors of the chancellor or his commissary in particular matters dealt with in the university. They super- vise the voting at public meetings of the university and announce the results. They also have, according to the ancient statutes, the power of veto in convocation and congregation: no proposal can be passed into a statute or decree if twice vetoed by them. They are ex officio members of the

hebdomadal council, the governing council of the university, and they are the assessors of the vice-chancellor when he confers degrees. When a degree is to be granted they walk down the hall in which the ceremony is performed, nominally to ask for the approval of the masters, and it was formerly the custom for any tradesman, or any other person, who had a claim of debt against the postulant for a degree, to pluck the gown of the proctor as he passed and request settlement of the debt before the degree was granted. The proctors are also responsible for the good order of the university, and they are charged with the duty of inquiring into and reporting on any breaches of its statutes, customs or privileges. They are empowered to punish undergraduates, or graduates under the degree of Bachelor of Civil Law and Master of Arts, by fine or by confinement to their colleges or lodgings (familiarly known as " gating "). They have to draw up the list of candi- dates for examination, and have to be present at all examinations, to see that they are properly conducted. They are responsible for the good order of the streets at night, so far as members of the university are concerned. For this purpose more especially each of them is empowered, immediately on his election, to nominate two masters of at least three years' standing as pro- proctors. The proctors and pro-proctors take it in turn to perambulate the streets nightly, accompanied by two sworn constables, familiarly known as "bulldogs." The proctors are elected by the heads, fellows and resident members of convo- cation of each college in rotation. They are presented to the

vice-chancellor with much ceremony, part of which consists in taking over the insignia of their office — a copy of the statutes and a bunch of keys — from their predecessors.

At Cambridge the proctors are nominated annually by the colleges in rotation and elected (a formal proceeding) by the senate. They must have been three years members of the senate and have resided two years at the university. The two pro- proctors are not, as at Oxford, nominated by the proctors, but are also elected by the senate on the nomination of the colleges, each college having the right to nominate a pro-proctor the year next before that in which it nominates the proctor (Grace of February 26, 1863). Two additional pro-proctors are also elected by the senate each year, on the nomination of the vice- chancellor and proctors, to assist the latter in the maintenance of discipline (Grace of June 6, 1878).

The early history of the office at Cambridge is obscure, but it seems that the proctors have always represented the colleges in university proceedings. At present their functions are twofold (1) as taking part in all university ceremonials, (2) as enforcing discipline in the case of members of the university who are in statu pupillari (i.e. undergraduates and Bachelors of Arts and Law). (1) The proctors are not (as at Oxford) ex officio members

of the council of the senate or of other boards or syndicates, except those with which their duties are specially connected. But their presence is essential at all congregations of the senate, at which the senior proctor reads all the " graces " (already approved by the council of the senate) . If any grace is opposed by any member of the senate saying non placet the proctors take the votes of those present and announce the result. Graces are offered not only for making changes in university statutes and ordinances and for appointing examiners and the like, but also for granting degrees. When a degree is to be taken the college of the candidate presents a supplicat or petition for the degree, this petition is approved by the council of the senate, when they have satisfied themselves that the candidate has fulfilled the conditions, and is read at the congregation by the senior proctor: these supplicats axe practically never opposed, but graces for new statutes and ordinances are frequently opposed, and on very important occasions many hundreds of non-resident members of the senate come up to record their votes. (2) The proctors' powers as to discipline have a very long history. As far as concerns members of the university they have authority to impose certain fines for minor offences, such as not wearing academical dress on occasions when it is ordered, and also to order a man not to be out of his college after a certain hour for a certain number of days (" gating "). In the case of more serious offences the proctor generally reports the matter to the authorities of the offender's college to be dealt with by them, or as an ultimate resort brings the offender before the university court of discipline, which has power to rusticate or expel. The power of the proctors over persons who are not members of the university dated from charters granted by Eliza- beth and James I., which empowered the university authorities to search for undesirable characters, men and women, rogues, vagabonds, and other personas demalo suspectas , and punish them by imprisonment or banishment. In recent times this power was regularly exercised with respect to women of bad character. The proctors promenaded the streets attended by their servants (the bulldogs), who are always sworn in as special constables. If occasion arose the proctor could arrest a suspected woman and have her taken to the Spinning House (for which Hobson the carrier had left an endowment); the next day the woman was brought before the vice-chancellor, who had power to commit her to the Spinning House; as a general rule the sentence was not for a longer perior than three weeks. For this purpose the vice-chancellor sat in camera and the jurisdiction had nothing to do with that of the vice-chancellor's court. In 1898 attention was called to this procedure by the case of a girl named Daisy Hopkins, who was arrested and committed to the Spinning House. Application was made on her behalf to the Queen's Bench Divi- sion for a writ of habeas corpus, and when the application came on it appeared that there had been a technical irregularity (the

prisoner not having been formally charged when brought before the vice-chancellor) ; so the writ was granted and the prisoner released. She afterwards brought an action against the proctor, which failed. It was now decided to abolish the practice of hearing these cases in camera. The whole practice was, how- ever, objected to by the authorities of the town, and after conference an agreement was arrived at, the proctorial juris- diction over persons not members of the university being abolished (1904).

PROCURATION (Lat. procurare, to take care of), the action of taking care of, hence management, stewardship, agency. The word is applied to the authority or power delegated to a procurator, or agent, as well as to the exercise of such authority expressed frequently "by procuration" (per procurationem), or shortly per pro., or simply p.p. In ecclesiastical law, procuration is the providing necessaries for bishops and arch- deacons during their visitations of parochial churches in their dioceses. Procuration at first took the form of meat, drink, provender, and other accommodation, but it was gradually compounded for a certain sum of money. Procuration is merely an ecclesiastical due, and is suable only in a spiritual court. In those dioceses where the bishop's estates have vested in the ecclesiastical commissioners procurations are payable to the commissioners who, however, have abandoned their collection (Phillimore, Ecc. Law, 2nd ed., 1895, pp. 1051, 1060). Pro- curation is also used specifically for the negotiation of a loan by an agent for his client, whether by mortgage or otherwise, and the sum of money or commission paid for negotiating it is frequently termed procuration fee.

The English criminal law makes the . provision or attempted provision of any girl or woman under twenty-one years of age for the purpose of illicit intercourse an offence, known as procuration. (See Prostitution.)

PROCURATOR (Lat. procurare, to take care of), generally one who acts for another. With the Romans it was applied to a person who maintained or defended an action on behalf of another, thus performing the functions of a modern attorney. Roman families of importance employed an official correspond- ing to the modern steward and frequently called the procurator. Later the name was applied especially to certain imperial offi- cials in the provinces of the Roman Empire. With the estab- lishment of the imperial power under Augustus, the emperor took under his direct government those of which the condition or situation rendered a large military force necessary. Here certain officials, known as the procuratores Caesaris, took the place occupied by the quaestor in the senatorial

provinces. They were either equites or f reedmen of the Caesar and their office was concerned with the interests of the fiscus (the public property of the Caesar). They looked after the taxes and paid the troops. There were also officials bearing this title of procuratores Caesaris in the senatorial provinces. They collected certain dues of the fiscus which were independent of those paid to the aerarium (the property of the senate). This organization lasted with some modifications until the 3rd century. The procurator was an important official in the reorganized empire of Diocletian.

T^ie title remained all through the middle ages to describe very various officials. Thus it was sometimes applied to a regent acting for a king during his minority or absence; sometimes it appears as an alternative title to seneschal or dapijer. It preserved its legal significance in the title of procurator ani- marum, who acted as solicitor or proxy in the ecclesiastical courts, and was so called because these courts dealt with matters affecting the spiritual interests of the persons concerned. The economical significance remained in such titles as procurator anniversariorum, the exactor of dues for the celebration of anni- versaries; this office was assigned to laymen. The procurator draperii was entrusted with the administration of matters per- taining to the art of cloth-making. The procurator duplarum was the collector of fines in certain churches from absent canons, &c. The officials entrusted with the administration of the

goods of a church were called variously procurator ecclesiae, procurator parcitatis, procurator universitatis. Bishops and bishops-elect frequently described themselves by the title of procuratores ecclesiarum. The prior of a dependent religious house was sometimes styled procurator obedientiae. The official who represented the public interests in the courts of the inquisition was known as the procurator fidei. The administrator of the affairs of a large community was sometimes called the procurator syndicus, the administrator of goods left to the poor, procurator pauperum. In monasteries the economus was, and is, sometimes described as procurator. Thus the procurator has still the administration of material affairs in every Domini- can priory. Procurator di San Marco was a title of honour in the republic of Venice. There were nine official procurators and numerous distinguished persons bearing the honorary title.

The term procurator (Fr. procureur) is used in those countries whose codes are based on the Roman civil law for certain officials, having a representative character, in the courts of law. Thus under the ancien regime in France the procureurs du roi were the representative of the Crown in all causes (see France : Law and Institutions) ; and now the procureurs generaux, and under them the procureurs substituts, procureurs de la ripublique and procureurs still represent the ministire public in the courts.

In Scotland the procurator is a law agent who practises in an inferior court. A procurator in Scotland has been, since the Law Agents Acts 1873, exactly in the same legal position as other law agents. The procurator-fiscal is a local officer charged with the prosecution of crimes. He is appointed by the sheriff. He also performs the duties of an English coroner by holding inquiries into the circumstances of suspicious deaths. A common English form of procurator is proctor (q.v.).

See Sir William Smith, Dictionary of Greek and Roman Antiquities (3rd ed., 1890-1891), and Du Cange, Glossarium mediae et infimae latinitatis (new ed. by L. Favre, Niort, 1883). (E. O'N.)

*PRODICUS OF CEOS (b. c. 465 or 450 B.C.), a Greek humanist of the first period of the Sophistical movement, known as the " precursor of Socrates." He was still living in 399 B.C. He came to Athens as ambassador from Ceos, and became known as a speaker and a teacher. Like Protagoras, he pro- fessed to train his pupils for domestic and civic affairs; but it would appear that, while Protagoras's chief instruments of education were rhetoric and style, Prodicus made ethics prom- inent in his Curriculum. In ethics he was a pessimist. Though he discharged his civic duties in spite of a frail physique, he emphasized the sorrows of life; and yet he advocated no hope- less resignation, but rather the remedy of work, and took as his model Heracles, the embodiment of virile activity. The in- fluence of his views may be recognized as late as the Shepherd' of Hermas. His views on the origin of the belief in the gods is strikingly modern. First came those great powers which benefit mankind (comparing the worship of the Nile), and after these the deified men who have rendered services to humanity. But he was no atheist, for the pantheist Zeno spoke highly of him. Of his natural philosophy we know only the titles of his treatises On Nature and On the Nature of Man. His chief interest is that he sought to give precision to the use of words. Two of his discourses were specially famous; one, " On Propriety of Language," is repeatedly alluded to by Plato; the other, entitled *Qpai, contained the celebrated apologue of the Choice of Heracles, of which the Xenophontean Socrates (Mem. ii. 1, 21 seq.) gives a summary. Theramenes, Euripides and Isocrates are said to have been pupils or hearers of Prodicus. By his immediate successors he was variously estimated: Plato satirizes him in the early dialogues; Aristophanes in the TayriviaTcu calls him " a babbling brook "; Aeschines the Socratic condemns him as a sophist.*

See Spengel, Artium scriptores, pp. 45 sqq.; Welcker, "Prodikos der Vorganger des Sokrates," in Rheinisches Museum (1833), and in gleine Schriften, ii. 393; Hummel, De Prodico Sophista (Leiden, 1846); Cougny, De Prodico Ceio (Paris, 1858).

PRODIGY, an extraordinary or wonderful thing, person, event, &c; something which excites amazement and astonish- ment. The term has been particularly applied to children who display a precocious genius, especially in music. The German expression Wunderkind has of late been often adopted by those who have found the name " infant prodigy " too reminiscent of the " infant phenomenon " familiar to readers of Dickens. The Lat. prodigium, an omen, portent, and abnormal or monstrous event, is probably not to be derived from pro and dicere, to foretell, prophesy, but rather, on the analogy of adagium, adage, aphorism, from pro {prot before a vowel), and the root of aio, I say.

PRODUCTION (Lat. productionem, from producere, to pro- duce), in general, the act of producing, or bringing forth. Pro- duction, in contrast with distribution and consumption, is one of the great divisions which all treatises on economics make in dealing with the subject, and as such it is defined in every text- book and its elements and processes dealt with at length. J. R. McCulloch's definition may be given as one difficult to improve on: " by production, in the science of political economy, we are not to understand the production of matter, for that is the exclusive attribute of Omnipotence, but the production of utility, and consequently of exchangeable value, by appro- priating and modifying matter already in existence, so as to fit it to satisfy pur wants, and to contribute to our enjoyments." W. S. Jevons says, " production is one of the very few happily chosen terms which the economist possesses. Etymologically the term implies that we draw wealth forth, and this is the correct idea of production." Though the mere definition of " production " as the creation of utilities is apparently simple enough, the treatment of the subject has varied from time to time in proportion to the changes which economic science has itself undergone; it has been said that the theory of production is based on unalterable natural facts, but even this cannot be too absolutely stated, for the organization of production changes with social growth. Much discussion has, during the growth of the science of economics, centred round what is and what is not productive or unproductive, and as to the relative importance of the functions of production and distribution.

See E. Canaan's History of the Theories of Production and Distri- bution (1893), and the standard treatises on economics. Also the articles, Capital; Value; Wealth.

PROFANITY, irreverent or blasphemous language, swearing, by the use of words casting derision on sacred or divine things, especially the taking of

the name of God in vain (see Blasphemy; and Swearing). The word "profane," derived from Lat. profanum, outside the temple (fanum), hence opposed to sacrum or religiosum, in the sense of not sacred, common, is used in English not only as meaning irreverent, or blasphemous, but also in the senses of the original Latin, not initiated into sacred mysteries, hence, lay, secular, or as referring to subjects not connected with sacred or biblical matters, e.g. profane literature, history, &c.

PROFESSOR (the Latin noun formed from the verb profiteri, to declare publicly, to acknowledge, profess), a term now properly confined to a teacher of a special grade at a university. Its former significance of one who has made " profession " or open acknowledgment of religious belief, or, in particular, has made a promise binding the maker to a religious order, is now obsolete. The educational use is found in post-Augustan Latin, and profiteri is used by Pliny (Ep. ii. 18, 3, iv. n, 14), absolutely, in the sense of " to be a teacher," an extension of the classical use in the sense of to practise, profess a science or art, e.g. profiteri jus, medicinam, phUosophiam, &c. In the universities of the middle ages the conferring of a degree in any faculty or branch of learning meant the right or qualification to teach in that faculty, whence the terms magister, " master," and doctor for those on whom the degree had been granted. To these names must be added that of " professor." The " three titles of Master, Doctor, Professor, were in the middle ages absolutely synony- mous " (H. Rashdall, The Universities of Europe in the Middle Ages, 1895, i. 21). At Paris in the faculties of theology,

medicine and arts professor is more frequently used than doctor but less so than magister; at Bologna the teachers of law are known as professores or doctores (id.). From this position to that of the holder of an endowed " chair," the occupant of which is the principal public teacher of the particular faculty, the evolution was gradual. The first endowed professorship at Oxford was that of divinity, founded by the mother of Henry VII. in 1497 (? 1502) and named after her the " Margaret Professorship." The foundation of the regius professorship by Henry VIII. , in 1546 no doubt, as the New English Dictionary points out, tended to the general modern use of the word. Sub- ordinate public teachers in faculties or in subjects to which a professorial " chair " is attached, are known as " readers " or " lecturers," and these titles are also used for the principal public teachers in subjects which have not reached professorial rank.

PROFILE, an outline or contour drawing, particularly the drawing of the outline of the human face as seen from the side,, or in architecture the contour of a part of a building, of a moulding, &c, as shown by a vertical section. In fortification the " profile " of an earthwork is an outline of a transverse section and gives the relative thickness; so a work is said to be "

of strong " or " of weak " profile. The Fr. profit, formerly porfil, pourfil, Ital. profilo, proffilo, are formed from Lat. pro, and filare, to draw a line, Mum, thread.

The French pourfil also gave English " purfle," to embroider the edge of a fabric with gold or other thread; this was further corrupted to "purl," now often wrongly spelt "pearl," an inverted stitch in knitting.

PROFIT-SHARING {i.e. between employer and employed), a method of remunerating labour, under which the employees receive, in addition to ordinary wages, a share of the profit which the business realizes. The term is not infrequently used loosely to include many forms of addition to ordinary wages, such as bonus on output or quality, gain-sharing and product- bearing. Yet strictly, where an employee or a group works for a share of the product, or is paid so much in addition to ordinary wages in proportion as the product exceeds a certain quantity, or the quality exceeds a certain standard, in neither of these cases have we profit-sharing, for the net result of the business may be a large profit or a small one or a loss, and the employee's claim is unaffected. In the same way if a workman is employed on the basis that if in doing a particular job he saves something out of a stipulated time of labour, or a stipulated amount of materials, he shall receive in addition to ordinary wages a pro- portion of the value so saved, that is technically gain-sharing, not profit-sharing. Even where the bonus depends strictly on profit, it is not reckoned as profit-sharing, if it is confined to the leading employees.

An agreement is of the essence of the matter. It is not profit- sharing where an employer takes something from his profits at his own will and pleasure, and gives it to his employees. Strictly such gifts in cash are gratuities, while, when they take other forms, such as better houses, libraries, recreation rooms, provision for sickness and old age, all given at the will of the employer, we have paternalism. Such benefits thus taken ex- pressly from profits and varying more or less with the amount of profit certainly approach true profit-sharing: they are some- times called " indeterminate " profit-sharing. Though many of the above methods of remunerating, or benefiting, the employed are from time to time included under profit-sharing even by writers of repute, the strict sense of the term was defined by the international congress on profit-sharing in 1889 as " an agree- ment freely entered into by which the employed receives a share of profits determined in advance." It does not follow that the agreement must be actually enforceable at law; some employers to protect themselves from litigation stipulate that it shall not be.

Profit-sharing,, in the loose sense, must be of untold antiquity; the first great example of profit-sharing in the strict sense is that of the Parisian

house-painter, Edme-Jean Leclaire, " The Father of Profit-Sharing." In 1842 he was employing 300 men

on day wages. By greater zeal and intelligence and less waste, not necessarily by harder work, he reckoned they could save £3000 a year; and he made it their interest to do so by arranging that they should receive the greater part of the saving them- selves. This arrangement proved a very great success; the material gain to the men and the improvement in their morale were marked; and Leclaire, who began life with nothing and died worth £48,000, always maintained that, without the zeal drawn out in his men by profit-sharing, he never could have made so large a business or gained so much wealth. In 1008 the system was still in active operation in the firm. Its main features are as follows: after paying 5% interest on the capital, and small sums as wages of superintendence to the two manag- ing partners, the remaining profit is divided into four parts, one of which goes to the managing partners, one to the Mutual Aid Society, and the remaining half to the employees as a dividend on their ordinary wages, exclusive of piece-work and overtime, on which no dividend is paid. The Mutual Aid Society is a registered body, and is a limited partner in the firm, the liability of the two managing partners being unlimited and the control resting entirely in their hands. The benefits of the Mutual Aid Society, and of the profit-sharing generally, are enjoyed in the main by all the employees of the business, but certain advantages are confined to a limited number of permanent employees.

Leclaire's system attracted the marked interest of John Stuart Mill and other English economists, and in 1865-1867 a number of experiments in profit-sharing, or as it was then called, industrial partnership, were made in England, the most noted being that of Henry Briggs, Son & Co., at their collieries in Yorkshire. The main object in this case was to detach the workmen from the trade union and attach them to the firm. In other ways the experiment was very successful, and £40,000 was divided as bonus on wages in nine years, but the main object was not attained; and when the price of coal fell heavily after the inflation of 1873 Briggs's men joined the strike to resist a reduction of wages, and the experiment came to an end.

The present extent of profit-sharing, though in itself con- siderable, is but small in comparison with the vast extent of the world's commerce and industry, and except in one of its developments, co-partnership, it can hardly be said to be making progress. In 1006 there were in the United Kingdom and its colonies 65 ordinary firms practising profit-sharing in its

strictest sense, and 17 others known to have adopted and not known to have discontinued it, making 82 in all as against 92 in 1001, and 101 in 1894. On the other hand the number of employees had grown from 28,000 in 1894 to 48,000 in 1906. In addition about one-fourth of the workmen's co-operative societies in Great Britain (see Co-operation) practise profit-sharing with perhaps 30,000 employees.

In 1894 it was found that there were more profit-sharing firms in the British Empire than in any other country, and this is probably still true. The only rival is France, where, however, the term " participation aux b6nefices " is used in a wider sense. There are also important examples in Germany, the United States, Switzerland (where the state once applied the system in the postal service, and still does in the telegraphs), in Hol- land, in the socialist co-operative societies of Belgium, and elsewhere.

Profit-sharing has been quickly abandoned in many instances, for various reasons; there were no profits to divide; the small bonus given seemed to have no effect; the hope of detaching the men from their union, or contenting them with lower wages, was not realized; or the business passed into unsympathetic hands. On the other hand, one lasting success in such a matter proves more than many short experiments which failed; and profit-sharing has been splendidly successful where some high- minded man has breathed into it the spirit of partnership. Often it has been a step to actual partnership; the workman has not only received a share of profit, as added remuneration of his labour, but been led on to invest in the capital of the business, and as a shareholder, to take his share of the profits paid on

capital, as well as of responsibility, of loss if any, and of control. This system of profit-sharing plus shareholding is now known as co-partnership (see Co-operation), and is making undoubted progress. It is exemplified in nearly all profit-sharing co- operative societies, and in a growing number of businesses of non-co-operative origin which accumulate part or the whole of labour's profit in shares. In 1908, in the Familistere of Guise the whole capital of £200,000 belonged to the workers and a few retired workers, in Leclaire's old business the Mutual Aid Fund owned half, in the Laroche-Joubert paper-works the em- ployees owned more than two-thirds. In the South Metropolitan Gas Co. the employees owned £327,000 and elected three of the nine directors. It would seem to be in this direction, as a step to full partnership, that profit-sharing has a great future before it.

Bibliography. — A large number of works are noted in the International Co-operative Bibliography (London, 1906; International Co-operative Alliance). The following may be specially mentioned: Sedley Taylor, Profit-sharing between Capital and Labour (London, 1 884 ; New York, 1 886) ; N. P. Gilman, Profit-sharing between Employer and Employed (London and

New York, 1892); and N. P. Gilman, A Dividend to Labour (London and Boston, I900) ; Board of Trade Report by D. F. Schloss, on Profit-sharing (London, 1894; with yearly addenda in the Labour Gazette) ; D. F. Schloss, Methods of Industrial Remuneration (London, 1894) ; Victor Bohmert, Die Gewinn- betheiligung (Leipzig, 1878, and Dresden 1903); Publications of the SocUte" pour V etude de la participation (Paris, 1879 and onwards); Albert Trombert, Guide pratique de la participation (Paris, 1892) ; International Co-operative Alliance publications, especially Report of Fifth Congress (London, 1902) ; Labour Co-partnership Associa- tion Reports and Publications (London, 1883, and onwards).

(A. Wl.)*

PROGNATHISM (Gr. irpo, forward, and yvados, jaw), the term applied by ethnologists, with its opposite Ortho- gnathism {bpBbs, straight), to describe the varying degrees of projection of the upper jaw, which itself is determined by the angle made by the whole face with the brain-cap. Eury-gnathism (evpvs, wide), is the lateral projection of jawbones so characteristic of the MongOlic races. (See Craniometry.)

PROGNOSIS (Gr. irpoyvcaais, knowledge of recognition before- hand, from KporyvyviicKuv, to know beforehand, cf. " prognos tication," prediction), a term used in modern medicine, as it was in Greek, for an opinion, forecast or decision as to the probable course, duration and termination of a case of disease. It is to be distinguished from " diagnosis " (Gr. St-asyvucns, ti.ayvyvuio-K&.v to distinguish), the determination or identification of a dis- ease in a particular case from an investigation of its history and symptoms.

PROGRAMME, or Program, in its original use, following that of Gr. irpoypafifxa, a public notice (irpoypatpeu', to make public by writing), now chiefly in the sense of a printed notice containing the items of a musical concert, with the names of the pieces to be performed, the composers and the performers, or of a theatrical performance, with the characters, actors, scenes, &c. In a wider sense the word is used of a syllabus or scheme of study, order of proceedings or the like, or of a cata-logue or schedule containing the chief points in a course of action, and so, politically, in the sense of a list of the principal objects on which a party proposes to base its legislative course of action, as in the " Newcastle Programme " of 18-91, drawn up by the Liberal Federation. The. spelling " program," now general in America, was that first in use in England, and so continued till the French form " programme " was adopted at the beginning of the 19th century. The New English Dictionary considers the earlier and modern American spelling preferable, on the analogy of " diagram," " telegram," " cryptogram " and the like. Scott and Carlyle always used "

program."

PROGRAMME MUSIC, a musical nickname which has passed into academic currency, denoting instrumental music without words but descriptive of non-musical ideas. Musical sounds lend themselves to descriptive purposes with an ease which is often uncontrollable. A chromatic scale may suggest the whistling of the wind or the cries of cats; reiterated staccato notes may suggest many things, from raindrops to the cackling of hens. Again, though music cannot directly imitate anything

in nature except sounds, it has a range of contrast and a power of climax that is profoundly emotional in effect ; and the emotions it calls up may resemble those of some dramatic story, or those produced by the contemplation of nature. But chromatic scales, reiterated notes, emotional contrasts and climaxes, are also perfectly normal musical means of expression; and the attempts to read non-musical meanings into them are often merely annoying to composers who have thought only of the music. Some distinguished writers on music have found a difficulty in admitting the possibility of emotional contrasts and climaxes in an art without an external subject-matter. But it is impossible to study the history of music without coming to the conclusion that in all mature periods music has been self-sufficient to this extent, that, whatever stimulus it may receive from external ideas, and however much of these ideas it may have embodied in its structure, nothing has survived as a permanently intelligible classic that has not been musically coherent to a degree which seems to drive the subject-matter into the background, even in cases where that subject-matter is naturally present, as in songs, choral works and operas. In short, since sound as it occurs in nature is not sufficiently highly organized to form the raw material for art, there is no natural tendency in music to include, as a " subject, " any item conceivable apart from its artistic embodiment. Explicit programme music has thus never been a thing of cardinal importance, either in the transitional periods in which it has been most prominent, or in the permanent musical classics.

At the same time, artistic creation is not a thing that can be governed by any a priori metaphysical theory; and no great artist has been so ascetic as always to resist the inclination to act on the external ideas that impress him. No composer writes important music for the voice without words; for speech is too ancient a function of the human voice to be ousted by any a priori theory of art; and no really artistic composer, hand- ling a living art-form, has failed to be influenced, sooner or later, by the words which he

sets. It matters little if these words be in themselves very poor, for even false sentiment must make some appeal to true experience, and the great composers are quicker to seize the truth than to criticize its verbal presentation or to suspect insincerity. The earliest mature musical art was ; then, inevitably descriptive, since it was vocal. So incessant is the minute onomatopoeia of 1 6th-century music, both in the genuine form of sound-painting (Tonmalerei) and in the spurious forms to which composers were led by the appearance of notes on paper (e.g. quick notes representing " darkness " because they are printed black!) that there is hardly a page in the productions of the "golden age" of music which has not its literary aspect. Programme music, then, may be expected to derive many of its characteristics from ancient times; but it cannot properly be said to exist until the rise of instrumental music, for not until then could music be based upon external ideas that did not arise inevitably from the use of words or dramatic action.

The resources of the modern orchestra have enabled recent composers to attain a realism which makes that of earlier descriptive music appear ridiculous; but there is little to choose between classics and moderns in the intellectual childishness of such realism. Thunderstorms, bird-songs and pastoral effects galore have been imitated by musicians great and small from the days of the Fitzwilliam Virginal Book to those of the episode of the flock of sheep in Strauss's Don Quixote. And, while the progress in realism has been so immense that the only step which remains is to drive a real flock of sheep across the concert-platform, the musical progress implied thereby has been that from inexpensive to expensive rubbish. What is really important, in the programme music of Strauss no less than that of the classics, is the representation of characters and feelings. In this respect the classical record is of high interest, though the greatest composers have contributed but little to it. Thus the Bible Sonatas of J. Kuhnau (published in 1700) and Bach's early Capriccio on the Departure of a Beloved Brother, which is closely modelled on Kuhnau's programme music, show very

markedly the tendency on the one hand to illustrate characters and feelings, and on the other hand to extract from their pro- grammes every occasion for something that would be a piece of incidental music if the stories were presented as dramas. Thus, though Kuhnau in his naive explanatory preface to his first Bible sonata seems to be trying, like a child, to frighten him- self into a fit by describing the size and appearance of Goliath, in the music it is only le bravate of Goliath that are portrayed. Thus the best movement in the Goliath sonata is a figured chorale (Aus tiefer Noth schrei' ich zu Dir) representing the terror and prayers of the Israelites. And thus the subjects of the other sonatas (Saul cured by David's music; The Marriage of Jacob; Hezekiah; Gideon; and The Funeral of Jacob) are in various quaint ways musical because ethical; though Kuhnau's conceptions are far better than his execution. In the same way Bach makes his Capriccio descriptive of the feelings of the anxious and sorrowing friends of the departing brother, and his utmost realism takes the form of a lively fugue, very much in Kuhnau's best style, on the themes of the postilion's coachhorn and cracking whip. Even Buxtehude's musical illustrations of the " nature and characters of the planets " are probably not the absurdities they have been hastily taken for by writers to whom their title seems nonsensical; for Buxtehude would, of course, take an astrological rather than an astronomical view of the subject, and so the planets would represent temperaments, and their motions the music of the spheres.

Nearly all the harpsichord pieces of Couperin have fantastic titles, and a few of them are descriptive music. His greater contemporary and survivor, Rameau, was an opera composer of real importance, whose harpsichord music contains much that is ingeniously descriptive. La Poule, with its theme inscribed " co-co-co-co-co-co-cocodai, " is one of the best harpsichord pieces outside Bach, and is also one of the most minutely realistic compositions ever written. French music has always been remarkably dependent on external stimulus, and nearly all its classics are either programme music or operas. And the extent to which Rameau's jokes may be regarded as typically French is indicated by the fact that Haydn apologized for his imitation of frogs in The Seasons, saying that this " fran- zosische Quark " had been forced on him by a friend. But throughout the growth of the sonata style, not excepting Haydn's own early work, the tendency towards gratuitously descrip- tive music is very prominent; and the symphonies of Dit- tersdorf on the Metamorphoses of Ovid are excellent examples- of the way in which external ideas may suggest much that is valuable to a musician who struggles with new forms, while at the same time they may serve to distract attention from points in which his designs break down. (See Symphonic Poem.) Strict accuracy would forbid us to include in our survey such descriptive music as comes in operatic overtures

or other pieces in which the programme is really necessitated by the conditions of the art; but the line cannot be so drawn without cutting off much that is essential. From the time of Gluck onwards there was a natural and steady growth in the descriptive powers of operatic music, which could not fail to react upon purely in- strumental music; but of programme music for its own sake we may say there is no first-rate classic on a large scale before Beethoven, though Beethoven himself could no more surpass Haydn in illustrating an oratorio text (as in the magnificent opening of The Creation) than Haydn could surpass Handel.

I lozart's Musikalischer Spass is a solitary example of a special branch of descriptive music; a burlesque of incompetent per- formers and incompetent composers. The lifelike absurdity of the themes with their caricature of classical formulas; the inevitable processes by which the " howlers " in composition seem to arrive as by natural laws, further complicated by the equally natural laws of the howlers in performance; and the unfailing atmosphere of good nature with which Mozart satirizes, among other things, his own style; all combine to make this work very interesting on paper. The effect in performance is astonishing; so exactly, or rather so ideally, is the squalid effect of bad structure and performance kept at a

constant level of comic interest. (In the Leipzig edition of the parts of this work the modern editor has added a new and worthy act to Mozart's glorious farce by correcting and question- ing many of the mistakes!) Mozart's burlesque has remained unapproached, even in dramatic music. Compared with it, Wagner's portrait of Beckmesser in Die Meistersinger seems embittered in conception and disappointing in comic effect. Mendelssohn is said to have had a splendid faculty for ex- temporizing similar musical jokes. His Funeral March of Pyramus and Thisbe in the Midsummer Night's Dream, and Cornelius's operatic trio in which three persons conjugate the verb Ich sterbe den Tod des Verrdters, are among the few ex- amples of a burlesque in which there is enough musical sense to keep the joke alive. Such burlesques have their bearing on programme music, in so far as they involve the musical por- trayal of character and give opportunity for masterly studies of the psychology of failure. Their special resources thus play a large part in the recent development of the symphonic poem by Richard Strauss, whose instrumental works avowedly illustrate his cheerfully pessimistic views on art and life. But into the main classics of programme music this kind of characterization hardly enters at all.

Beethoven was three times moved to ascribe some of his pro- foundest music to an external source. In the first instance, that of the Eroica Symphony, he did not really produce anything that can fairly be called programme music. Napoleon, before he became emperor, was his ideal hero; and a triumphant symphony, on a gigantic scale and covering the widest range of emotion expressible by music, seemed to him a tribute due to the liberator of Europe; until the liberator became the tyrant. That the slow movement should be a funeral march was, in relation to the heroic tone of the work, as natural as that a symphony should have a slow movement at all. There is no reason in music why the idea of heroic death and mourning should be the end of the representation of heroic ideals. Hence it is unnecessary, though plausible, to hear, in the lively whisper- ing opening of the scherzo, the babel of the fickle crowd that soon forgets its hero; and the criticism which regards the finale as "an inappropriate concession to sonata form " may be dis- missed as merely unmusical without therefore being literary. Beethoven's next work inspired from without was the Pastoral Symphony: and there he records his theory of programme music on the title-page, by calling it " rather the expression of • feeling than tone-painting." There is not a bar of the Pastoral Symphony that would be otherwise if its " programme " had never been thought of either by Beethoven or by earlier com- posers. The nightingale, cuckoo and quail have exactly the same function in the coda of the slow movement as dozens of similar non-thematic episodes at the' close of other slow move- ments (e.g. in the violin sonata Op. 24, and the pianoforte sonata in D minor). The " merry meeting of country folk " is a subject that lends itself admirably to Beethoven's form of scherzo (q.v.) ; and the thunderstorm, which interrupts the last repetition of this scherzo, and forms an introduction to the finale, is none the less purely musical for being, like several of Beethoven's inven- tions, without any formal parallel in other works. Beethoven's Battle Symphony is a clever pot-boiler, which, like most musical representations of such noisy things as battles, may be disregarded in the study of serious programme music. His third great ex- ample is the sonata Les Adieux, I' absence ei le retour. Here, again, we have a monument of pure sonata form; and, what- ever light may be thrown upon the musical interpretation of the work by a knowledge of the relation between Beethoven and his friend and patron the Archduke Rudolph and the circum- stances of the archduke's departure from Vienna during the Napoleonic wars, far more light may be thrown upon Beethoven's feelings by the study of the music in itself. This ought ob- viously to be true of all successful programme music; the music ought to illustrate the programme, but we ought not to need to learn or guess at quantities of extraneous information in order to understand the music. No doubt much ingenuity may be spent in tracing external details (the end of the first move-

ment of Les Adieux has been compared to the departure of a coach) , but the real emotional basis is of a universal and musical kind. The same observations apply to the overtures to Coriolan, Egmont and Leonora; works in which the origin as music for the stage is so far from distracting Beethoven's attention from musical form that the overture which was at first most insepar- ably associated with the stage and most irregular in form {Leonora No. 2) took final shape as the most gigantic formal design ever embodied in a single movement {Leonora No. 3), and so proved to be too large for the final version of the opera for which it was first conceived. Beethoven's numerous recorded assertions, whether as to the " picture " he had in his mind whenever he composed, or as to the " meaning " of any particular composition, are not things on which it is safe to rely. Many of his friends, especially his first biographer, Schindler, irritated him into putting them off with any nonsense that came into his head. Composers who have much to express cannot spare time for expressing it in other terms than those of their own art.

Modern programme music shows many divergent tendencies, the least significant of which is the common habit of giving fan- tastic titles to pieces of instrumental music after they have been composed, as was the case with many of Schumann's pianoforte lyrics. Such a habit may conduce to the immediate popularity of the works, though it is apt to impose on their interpretation limits which might not quite satisfy the composer himself. But there is plenty of genuine programme music in Schumann's case, though, as with Beethoven, the musical sense throws far more light on the programme than the programme throws upon the music. Musical people may profitably study E. T. A. Hoff- mann and Jean Paul Richter in the light of Schumann's Novel- lettes and Kreisleriana; but if they do not already understand Schumann's music, Jean Paul and Hoffmann will help them only to talk about it. The popular love of fantastic titles for music affected even the most abstract and academic composers during the romantic period. No one wrote more programme music than Spohr; and, strange to say, while Spohr's programme constantly interfered with the externals of his form and ruined the latter part of his symphony Die Weihe der Tone, it did not in any way help to broaden his style. Mendelssohn's Scotch and Italian symphonies, and his Hebrides Overture, are cases rather of what may be called local colour than of programme music. His Reformation Symphony, which he himself regarded as a failure, and which was not published until after his death, is a composite production, artistically more successful, though less popular, than Spohr's Weihe der Tone. The overture to the Midsummer Night's Dream is a marvellous musical epitome of Shakespeare's play; and the one point which invites criticism, namely, the comparative slightness and conventionality of its second subject, may be defended as closely corresponding with Shakespeare's equally defensible

treatment of the two pairs of lovers.

The one composer of the mid-nineteenth century who really lived on programme music was Berlioz, but he shows a characteristic inability to make up his mind as to what he is doing at any given moment. Externals appeal to him with such overwhelming force that, with all the genuine power of his rhetoric, he often loses grasp of the situation he thinks he is portraying. The moonshine and the sentiment of the Scene d'amour, in his Romeo and Juliet symphony, is charming; and the agitated sighing episodes which occasion- ally interrupt its flow, though not musically convincing, are dramatically plain enough to anyone who has once read the balcony scene: but when Berlioz thinks of the nurse knocking or calling- at the door his mind is so possessed with the mere incident of the moment that he makes a realistic noise without interrupting the amorous duet. No idea of the emotional tension of the two lovers, of Juliet's artifices for gaining time, and of her agitation at the interruptions of the nurse, seems here to enter into Berlioz's head. Again, if the whole thing is to be expressed in instrumental music, why do I we have, before the scene begins, real voices of persons in various

degrees of conviviality returning home from the ball? The whole design is notoriously full of similar incongruities, of which these are the more significant for being the most plausible. There is hardly a single work of Berlioz, except the Harold symphony and the Symphonie fantastique, in which the determination to write programme music does not frequently yield to the impulse to make singers get up and explain in words what it is all about. The climax of absurdity is in the Symphonie funebre et triomphale, written for the inauguration of the Bastille Column, and scored for an enormous military band and chorus. The first movement is a funeral march, and is not only one of Berlioz's finest pieces, but probably the greatest work ever written for a military band. The Apotheose chorus is in the form of a triumphal march. Because the occasion was one on which there would be plenty of real speeches, Berlioz must needs write a connecting link called Oraison funebre, consisting of a sermon delivered by a solo trombone ; presumably for use in later performances. His naive Gasconade genius prefers this to the use of the chorus!

Current modern criticism demands plausibility, though it cares little for intellectual soundness: and while practically the whole of Liszt's work is professedly programme music (where it is not actually vocal) and, though there is much in it which is incomplete without external explanation, Liszt

is far too " modern " to betray himself into obvious confusion between different planes of musical realism. With all his unreality of style, Liszt's symphonic poems are remarkable steps towards the attainment of a kind of instrumental music which, whether its form is dictated by a programme or not, is at any rate not that of the classical symphony. The programmes of Liszt's works have not always, perhaps not often, produced a living musical form; a form, that is, in which the rhythms and proportions are neither stiff nor nebulous. Both in breadth of design and in organization and flow, the works of Richard Strauss are as great an advance on Liszt as they are more complex in musical, realistic and autobiographical content. Being, with the exception of the latest French orchestral developments, incomparably the most important works illustrating the present state of musical transition, they have given rise to endless discussions as to the legitimacy of programme music. Such discussions are mere windmill-tilting unless it is constantly borne in mind that no artist who has anything of his own to say will ever be prevented from saying it, in the best art-forms attain- able in his day, by any scruples as to whether the antecedents of his art-forms are legitimate or not. There is only one thing that is artistically legitimate, and that is a perfect work of art. And the only thing demonstrably prejudicial to such legitimacy in .a piece of programme music is that even the most cultured of musicians generally understand music better than they under-stand anything else, while the greatest musicians know more of their art than is dreamt of in general culture. (D. F. T.)

PROHIBITION (Lat. prohibere, to prevent), a term meaning the action of forbidding or preventing by an order, decree, &c. The word is particularly applied to the forbidding by law of the sale and manufacture of intoxicating liquors (see Liquor Laws and Temperance). In law, as defined by Blackstone, prohibition is " a writ directed to the judge and parties of a suit in any inferior court, commanding them to cease from the prosecution "thereof, upon a surmise either that the cause originally or some collateral matter arising therein does not belong to that jurisdiction, but to the cognizance of some other court." A writ of prohibition is a prerogative writ — that is to say, it does not issue as of course, but is granted only on proper grounds being shown. Before the Judicature Acts prohibition was granted by one of the superior courts at Westminster; it also issued in certain cases from the court of chancery. It is now granted by the High Court of Justice. Up to 1875 the high court of admiralty was for the purposes of prohibition an inferior court. But now by the Judicature Act 1873, s. 24, it is provided that no proceeding in the High Court of Justice or the court of appeal is to be restrained by prohibition, a stay of proceedings taking its place where necessary. The admiralty division being now one of the divisions of the High Court can therefore no longer

be restrained by prohibition. The courts to which it has most frequently

issued are the ecclesiastical courts, and county and other local courts, such as the lord mayor's court of London, the court of passage of the city of Liverpool and the court of record of the hundred of Salford. In the case of courts of quarter sessions, the same result is generally obtained by certiorari (see Writ). The extent to which the ecclesiastical courts were restrainable by prohibition led to continual disputes for centuries between the civil and the ecclesiastical authorities. Attempts were made at different times to define the scope of the writ, the most conspicuous instances being the statute Circumspecte Agatis, 13 Edw. I. st. 4; the Articuli cleri, 9 Edw. II. st. 1 ; and the later Articuli cleri of 3 Jac. I., consisting of the claims asserted by Archbishop Bancroft and the reply of the judges. The law seems to be undoubted that the spiritual court acting in spiritual matters pro salute animae cannot be restrained. The difficulties arise in the application of the principle to individual cases.

Prohibition lies either before or after judgment. In order that proceedings should be restrained after judgment it is neces- sary that want of jurisdiction in the inferior court should appear upon the face of the proceedings, that the party seeking the pro- hibition should have taken his objection in the inferior court, or that he was in ignorance of a material fact. A prohibition goes either for excess of jurisdiction, as if an ecclesiastical court were to try a claim by prescription to a pew, or for transgression of clear laws of procedure, as if such a court were to require two witnesses to prove a payment of tithes. It will not as a rule be awarded on a matter of practice. The remedy in such a case is appeal. Nor will it go, unless in exceptional cases, at the instance of a stranger to the suit. The procedure in prohibition is partly common law, partly statutory. Application for a prohibition is usually made ex parte to a judge in chambers on affidavit. The application may be granted or refused. If granted, a rule to show cause why a writ of prohibition should not issue goes to the inferior judge and the other party. In prohibition to courts other than county courts pleadings in prohibition may be ordered. These pleadings are as far as possible assimilated to pleadings in actions. They are rare in practice, and are only ordered in cases of great difficulty and importance.

Much learning on the subject of prohibition will be found in the opinion of Mr Justice Wills delivered to the House of Lords in The Mayor and Aldermen of London v. Cox (1867, L.R. 2 Eng. and Ir. Appeals, 239).

In Scots law prohibition is not used in the English sense. The same result is obtained by suspension or reduction. In the United States the Supreme Court has power to issue a prohibition to the district courts when proceeding as courts of admiralty and maritime jurisdiction. Most of the states have also their own law upon the subject, generally giving power to

the supreme judicial authority in the state to prohibit courts of inferior jurisdiction.

PROJECTION, in mathematics. If from a fixed point S in space lines or rays be drawn to different points A, B, C, ... in space, and if these rays are cut by a plane in points A', B', C, . . . the latter are called the projections of the given points on the plane. Instead of the plane another surface may be taken, and then the points are projected to that surface instead of to a plane. In this manner any figure, plane or in space of three dimensions, may be projected to any surface from any point which is called the centre of projection. If the figure projected is in three dimensions then this projection is the same as that used in what is generally known as perspective (q.v.).

In modern mathematics the word projection is often taken with a slightly different meaning, supposing that plane figures are projected into plane figures, but three-dimensional ones into three-dimensional figures. Projection in this sense, when treated by co-ordinate geometry, leads in its algebraical aspect to the theory of linear substitution and hence to the theory of invariants and co-variants (see Algebraic Forms).

In this article projection will be treated from a purely geo- metrical point of view. References like (G. § 87) relate to the article Geometry, § Projective, in vol. xi.

*§ i. Projection of Plane Figures. — Let us suppose we have in space two planes x and *■'. In the plane x a figure is given having known properties; then we have the problem to find its projection from some centre S to the plane x', and to deduce from the known properties of the given figure the properties of the new one.*

If a point A is given in the plane x we have to join it to the centre S and find the point A' where this ray SA cuts the plane 7r'; it is the projection of A. On the other hand if A' is given in the plane x', then A will be its projection in x. Hence if one figure in x' is the projection of another in x, then conversely the latter is also the projection of the former.

A point and its projection are therefore also called corresponding points, and similarly we speak of corresponding lines and curves, &c. § 2. We at once get the following properties : — The projection of a point is a point, and one point only. The projection of a line {straight line) is a line; for all points in a line are projected by rays which lie in the plane determined by S

and the line, and this plane cuts the plane x in a line which is the projection of the given line.

// a point lies in a line its projection lies in the projection of the line.

The projection of the line joining two points A, B is the line which joins the projections A', B' of the points A, B. For the projecting plane of the line AB contains the rays SA, SB which project the points A, B.

The projection of the point of intersection of two lines a, b is the point of intersection of the projections a', b' of those lines. Similarly we get— The projection of a curve is a curve.

The projections of the points of intersection of two curves are the points of intersection of the projections of the given curves.

If a line cuts a curve in n points, then the projection of the line cuts the projection of the curve in n points. Or — The order of a curve remains unaltered by projection. The projection of a tangent to a curve is a tangent to the projection of the curve. For the tangent is a line which has two coincident points in common with a curve.

The number of tangents that can be drawn from a point to a curve remains unaltered by projection. Or —

The class of a curve remains unaltered by projection. | 3. Two figures of which one is a projection of the other ob- tained in the manner described may be moved out of the position in which they are obtained. They are then still said to be one the projection of the other, or to be projective or homographic. But when they are in the position originally considered they are said to be in perspective position, or (shorter) to be perspective.

All the properties stated in §§ 1, 2 hold for figures which are projective, whether they are perspective or not. There are others which hold only for projective figures when they are in perspective position, which we shall now consider.

If two planes x and x' are perspective, then their line of inter-. section is called the axis of projection. Any point in this line' coincides with its projection. Hence —

All points in the axis are their own projections. Hence also — Every line meets its projection on the axis.

§ 4. The property that the lines joining corresponding points all pass through a common point, that any pair of corresponding points and the

centre are in a line, is also expressed by saying that the figures are co-linear or co-polar; and the fact that both figures have a line, the axis, in common on which corresponding lines meet is expressed by saying that the figures are co-axal.

The connexion between these properties has to be investigated. For this purpose we consider in the plane x a triangle ABC, and let the lines BC, CA, AB be denoted by o, b, c. The projection will consist of three points A', B', C and three lines a', b', c'. These have such a position that the lines AA', BB', CC meet in a point, viz. at S, and the points of intersection of a and a', b and b', c and c' lie on the axis (by § 2). The two triangles therefore are said to be both co-linear and co-axal. Of these properties either is a consequence of the other, as will now be proved.

// two triangles, whether in the same plane or not, are co-linear they are co-axal. Or — .

If the lines AA', BB', CC joining the vertices of two triangles meet in a point, then the intersections of the sides BC and B'C, CA and C'A', AB and A'B' are three points in a line. Conversely — // two triangles are co-axal they are co-linear. Or — // the intersection of the sides of two triangles ABC and A'B'C, viz. of BC and B'C, of CA and C'A', and of AB and A'B', lie in a line, then the lines AA', BB', and CC meet in a point.

Proof. — Let us first suppose the triangles to be in different places. By supposition the lines AA', BB', CC (fig. 1) meet in a point S. But three intersecting lines determine three planes, SCB, SCA and SAB. In the first lie the points B, C and also B', C. Hence the lines BC and B'C will intersect at some point P, because any two lines in the same plane intersect. Similarly CA and C'A' will intersect at some point Q, and AB and A'B' at some

Coint R. These points P, Q, R lie in the plane of the triangle ABC ecause they are points on the sides of this triangle, and similarly in the plane of the triangle A'B'C. Hence they lie in the intersection of two planes — that is, in a line. This line (PQR in fig. 1) is called

Fig. 1.

the axis of perspective or homology, and the intersection of AA', BB', CC , i.e. S in the figure, the centre of perspective.

Secondly, if the triangles ABC and A'B'C' lie both in the same plane the above proof does not hold. In this case we may con- sider the plane figure as the pro- jection of the figure in space of which we have just proved the theorem. Let ABC, A'B'C be the co-linear triangles with S as centre, so that AA', BB', CC meet at S. Take now any point in space, say your eye E, and

from it draw the rays projecting the figure. In the line ES take any point Si, and in EA, EB, EC take points Ai, Bj., Ci respec- tively, but so that Si, Ai, Bi, Q are not in a plane. In the plane ESA which projects the line S1A1 lie then the line SiAi and also EA'; these will therefore meet in a point A/, of which A' will be the projection. Similarly points Bi , C/ are found. Hence we have now in space two triangles A1B1C1 and Ai'Bi'C/ which are co-linear. They are therefore co- axal, that is, the points Pi, Qi, R lt where A1B1, &c, meet will lie in a line. Their projections therefore lie in a line. But these are the points P, Q, R, which were to be proved to lie in a line.

This proves the first part of the theorem. The second part or converse theorem is proved in exactly the same way. For another proof see (G. § 37).

§ 5. By aid of this theorem we can now prove a fundamental property of two projective planes.

Let s be the axis, S the centre, and let A, A' and B, B' be two pairs of corresponding points which we suppose fixed, and C, C any other pair of corresponding points. Then the triangles ABC and A'B'C' are co-axal, and they will remain co-axal if the one plane x' be turned relative to the other about the axis. They will therefore, by Desargue's theorem, remain co-linear, and the centre will be the point S', where AA' meets BB'. Hence the line joining any pair of corresponding points C, C will pass through the centre S'. The figures are therefore perspective. This will remain true if the planes are turned till they coincide, because Desargue's theorem remains true.

If two planes are perspective, then if the one plane be turned about the axis through any angle, especially if the one plane be turned till it coincides with the other, the two planes will remain perspective; corresponding lines will still meet on a line called the axis, and the lines joining corresponding points will still pass through a common centre S situated in the plane.

Whilst the one plane is turned this point S will move in a circle whose centre lies in the plane x, which is kept fixed, and whose plane is perpendicular to the axis.

The last part will be proved presently. As the plane x' may be turned about the axis in one or the opposite sense, there will be two perspective positions possible when the planes coincide.

§ 6. Let (fig. 2) x, x' be the planes intersecting in the axis s whilst S is the centre of projection. To project a point A in x we join A to S and see where this line cuts x'. This gives

the point A'. But if we draw through S any line parallel to x, then this line will cut x' in some point I', and if all lines through S be drawn which are parallel to x these will form a plane parallel to x which will cut the plane x' in a line V parallel to the axis s. If we say that a line parallel to a plane cuts the latter at an infinite distance, we may say that all points at an infinite distance in x are projected into points which lie in a straight line i ' , and conversely all points in the line are projected to an infinite distance in x, whilst all other points are projected to finite points. We say therefore that all points in the plane x at an infinite distance may be considered as lying in a straight line, because their projections lie in a line. Thus we are again led to consider points at infinity in a plane as lying in a line (cf. G. §§ 2-4). Similarly there is a line j in x which is projected to infinity in x'; this projection will be denoted by j' so that i and j' are lines at infinity.

§ 7. If we suppose through S a plane drawn perpendicular to

the axis s cutting it at T, and in this plane the two lines SI'

parallel to x and SJ parallel to x', then the lines through I' and J

Fig. 2.

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parallel to the axis will be the lines V and _;'. At the same time a parallelogram SJTI'S has been formed. If now the plane x' be turned about the axis, then the points I' and J will not move in their planes; hence the lengths TJ and TI', and therefore also SI' and SJ, will not change. If the plane x is kept fixed in space the point J will remain fixed, and S describes a circle about J as centre and with SJ as radius. This proves the last part of the theorem

in 5 5-

§ 8. The plane x' may be turned either in the sense indicated by the arrow at Z or in the opposite sense till x' falls into x. In the first case we get a figure like fig. 3 ; i' and j will be on the same side of the axis, and on this side will also lie the centre S ; and

5 T

1 T

T F

s"

t

r

-s

s

T

J

J

Fig._3.

Fig. 4.

then ST = SJ+SI' or SI' = JT, SJ=I'T. " In the second case (fig. 4) i' and j will be on opposite sides of the axis, and the centre S will lie between them in such a position that I'S=TJ and I'T = SJ. If I'S = SJ, the point S will lie on the axis.

It follows that any one of the four points S, T, J, I' is completely determined by the other three: if the axis, the centre, and one of the lines i' or j are given the other is determined ; the three lines s, i', j determine the centre; the centre and the lines i', j determine the axis.

§ 9. We shall now suppose that the two projective planes ir, x' are perspective and have been made to coincide.

// the centre, the axis, and either one pair of corresponding points on a line through the centre or one pair of corresponding lines meeting on the axis are given, then the whole projection is determined.

Proof. — If A and A' (fig. l) are given corresponding points, it has to be shown that we can find to every other point B the corre- sponding point B'. Join AB to cut the axis in R. Join RA'; then B' must lie on this line. But it must also lie on the line SB. Where both meet is B'. That the figures thus obtained are really projective can be seen by aid of the theorem of § 4. For, if for any point C the corresponding point C be found, then the triangles ABC and A'B'C are, by construction, co-linear, hence co-axal; and s will be the axis, because AB and AC meet their corresponding lines A'B' and A'C on it. BC and B'C therefore also meet on s.

If on the other hand a, a' are given corresponding lines, then any line through S will cut them in corresponding points A, A' which may be used as above.

§ 10. Rows and pencils which are projective or perspective have been considered in the article Geometry (G. §§ 12-40). All that has been said there holds, of course, here for any pair of correspond- ing rows or pencils. The centre of perspective for any pair of corresponding rows is at the centre of projection S, whilst the axis contains coincident corresponding elements. Corresponding pencils on the other hand have their axis of perspective on the axis of projection whilst the coincident rays pass through the centre.

We mention here a few of those properties which are independent of the perspective position: —

The correspondence between two projective rows or pencils is completely determined if to three elements in one the corresponding ones in the other are given. If for instance in two projective rows three pairs of corresponding points are given, then we can find to every other point in either the corresponding point (G. §§ 29-36). If A, B, C, D are four points in a row and A', B', C, D' the corre- sponding points, then their cross-ratios are equal (AB, CD) = (A'B', CD')— where (AB, CD) =AC/CB:AD/DB.

If in particular the point D be at infinity we have (AB, CD) = -AC/ CB=AC/BC. If therefore the points D and D' are both at infinity we have AC/BC = AD/BD, and the rows are similar (G. § 39). This can only happen in special cases. For the line joining corresponding points passes through the centre; the latter must therefore lie at infinity if D, D' are different points at infinity. But if D and D' coincide they must lie on the axis, that is, at the point at infinity of the axis unless the axis is altogether at infinity. Hence — In two perspective planes every row which is parallel to the axis is similar to its corresponding row, and in general no other row has this property.

But if the centre or the axis is at infinity then every row is similar to its corresponding row.

In either of these two cases the metrical properties are particu- larly simple. If the axis is at infinity the ratio of similitude is the same for all rows and the figures are similar. If the centre is at infinity we get parallel projection; and the ratio of similitude changes from row to row (see §§ 16, 17).

In both cases the mid-points of corresponding segments will be corresponding points.

§ 11. Involution. — If the planes of two projective figures coin- cide, then every point in their common plane has to be counted twice, once as a point A in the figure x, once as a point B' in the figure x'. The points A' and B corresponding to them will in general be different points; but it may happen that they coincide. Here a theorem holds similar to that about rows (G. §§ 76 seq.).

If two projective planes coincide, and if to one point in their common plane the same point corresponds, whether we consider the point as belonging to the first or to the second plane, then the same will happen for every other point — that is to say, to every point will correspond the same point in the first as in the second plane.

In this case the figures are said to be in involution. Proof. — Let (fig. 5) S be the centre, s the axis of projection, and let a point denoted by A in the

first plane and by B' in the second have the property that the points A' and B corresponding to them again coincide. Let C and D' be the names which some other point has in the two planes. If the line AC cuts the axis in X, then the point where the line XA' cuts SC will be the point C corresponding to C (§ 9). The line B'D' also cuts the axis in X, and therefore the point D corresponding to D' is the point where XB cuts SD'. But this is the same point as C Fig. 5.

This point C might also be got by drawing CB and joining its intersection Y with the axis to B'. Then C must be the point where B'Y meets SC. This figure, which now forms a complete quadrilateral, shows that in order to get involution the corresponding points A and A' have to be harmonic conjugates with regard to S and the point T where AA' cuts the axis.

If two perspective figures be in involution, two corresponding points are harmonic conjugates with regard to the centre and the point where the line joining them cuts the axis. Similarly —

Any two corresponding lines are harmonic conjugates with regard to the axis and the line from their point of intersection to the centre. Conversely —

// in two perspective planes one pair of corresponding points be harmonic conjugates with regard to the centre and the point where the line joining them cuts the axis, then every pair of corresponding points has this property and the planes are in involution.

§ 12. Projective Planes which are not in perspective position. — We return to the case that two planes x and x' are projective but not in perspective position, and state in some of the more important cases the conditions which determine the correspondence between them. Here it is of great advantage to start with another definition which, though at first it may seem to be of far greater generality, is in reality equivalent to the one given before.

We call two planes projective if to every point in one corresponds a point in the other, to every line a line, and to a point in a line a point in the corresponding line, in such a manner that the cross-ratio of four points in a line, or of four rays in a pencil, is equal to the cross-ratio of the corresponding points or rays.

The last part about the equality of cross-ratios can be proved to be a consequence of the first. As space does not allow us to give an exact proof for this we include it in the definition.

If one plane is actually projected to another we get a correspond- ence

which has the properties required in the new definition. This shows that a correspondence between two planes conform to this definition is possible. That it is also definite we have to show. It follows at once that —

Corresponding rows, and likewise corresponding pencils, are pro- jective in the old sense (G. §§ 25, 30). Further —

If two planes are projective to a third they are projective to each other. The correspondence between two projective planes x and x' is deter- mined if we have given either two rows u, v in x and the corresponding rows u , v' in x', the point where u and v meet corresponding to the points where u' and v' meet, or two pencils U, V in x and the corre- sponding pencils U', V in x\ the ray UV joining the centres of the pencils in x corresponding to the ray U'V.

It is sufficient to prove the first part. Let any line a cut u, v in the points A and B. To these will correspond points A' and B' in «' and v' which are known. To the line a corresponds then the line A'B'. Thus to every line in the one plane the corre- sponding line in the other can be found, hence also to every point the corresponding point.

§ 13. If the planes of two projective figures coincide, and if either four points, of which no three lie in a line, or else four lines, of which no three pass through a point, in the one coincide with their corre- sponding points, or lines, in the other, then every point and every line coincides with its corresponding point or line so that the figures are identical.

If the four points A, B, C, D coincide with their corresponding points, then every line joining two of these points will coincide with

its corresponding line. Thus the lines AB and CD, and therefore also their point of intersection E, will coincide with their corre- sponding elements. The row AB has thus three points A, B, E coincident with their corresponding points, and is therefore identical with it (§ 10). As there are six lines which join two and two of the four points A, B, C, D, there are six lines such that each point in either coincides with its corresponding point. Every other line will thus have the six points in which it cuts these, and therefore all points, coincident with their corresponding points. The proof of the second part is exactly the same. It follows —

§ 14. If two projective figures, which are not identical, lie in the same plane, then not more than three points which are not in a line, or three

lines which do not pass through a point, can be coincident with their corresponding points or lines.

If the figures are in perspective position, then they have in common one line, the axis, with all points in it, and one point, the centre, with all lines through it. No other point or line can there- fore coincide with its corresponding point or line without the figures becoming identical. It follows also that —

The correspondence between two projective planes is completely determined if there are given — either to four points in the one the corresponding four points in the other provided that no three of them lie in a line, or to any four lines the corresponding lines provided that no three of them pass through a point.

To show this we observe first that two planes ir, x' may be made projective in such a manner that four given points A, B, C, D in the one correspond to four given points A', B , C, D' in the other; for to the lines AB, CD will correspond the lines A'B' and CD', and to the intersection E of the former the point E' where the latter meec. The correspondence between these rows is therefore determined, as we know three pairs of corresponding points. But this determines a correspondence (by § 12). To prove that in this case and also in the case of § 12 there is but one correspondence possible, let us suppose there were two, or that we could have in the plane x' two figures which are each projective to the figure in x and which have each the points A'B'C'D' corresponding to the points ABCD in x. Then these two figures will themselves be projective and have four corresponding points coincident. They are therefore identical by § 13.

Two projective planes will be in perspective if one row coincides with its corresponding row. The line containing these rows will be the axis of projection.

As in this case every point on 5 coincides with its corresponding point, it follows that every row a meets its corresponding row a' on $ where corresponding points are united. The two rows a, a' are therefore perspective (G. § 30), and the lines' joining corre- sponding points will meet in a point S. If r be any one of these lines cutting a, a' in the points A and A' and the line s at K, then to the line AK corresponds A'K, or the ray r corresponds to itself. The points B, B' in which r cuts another pair b, V of corresponding rows must therefore be corresponding points. Hence the lines joining corresponding points in b and V also pass through S. Similarly all lines joining corresponding points in the two planes x and x' meet in S ; hence the planes are perspective. The following proposition is proved in a similar way: — Two projective planes will be in perspective position if one

pencil coincides with its corresponding one. The centre of these pencils will be the centre of perspective.

In this case the two planes must of course coincide, whilst in the first case this is not necessary.

*§ 15. We shall now show that two planes which are projective according to definition (§12) can be brought into perspective position, hence that the new definition is really equivalent to the old. We use the following property: If two coincident planes ir and x' are perspective with S as centre, then any two corresponding rows are also perspective with S as centre. This therefore is true for the row j and j' and for i and *', of which i and j' are the lines at infinity in the two planes. If now the plane x' be made to slide on x so that each line moves parallel to itself, then the point at infinity in each line, and hence the whole line at infinity in ir', remains fixed. So does the point at infinity on j, which thus remains coincident with its corresponding point on j , and therefore the rows j and j' remain perspective, that is to say the rays joining corresponding points in them meet at some point T. Similarly the lines joining corresponding points in i and V will meet in some point T . These two points T and T' originally coincided with each other and with S.*

Conversely, if two projective planes are placed one on the other, then as soon as the lines j and i are parallel the two points T and T' can be found by joining corresponding points in .7 and j', and also in i and V . If now a point at infinity is called A as a point in X and B' as a point in ir', then the point A' will lie on V and B on j, so that the line AA' passes through T' and BB' through T. These two lines are parallel. If then the plane ir' be moved parallel to itself till T' comes to T, then these two lines will coincide with each other, and with them will coincide the lines AB and A'B'. This line and similarly every line through T will thus now coin- cide with its corresponding line. The two planes are therefore according to the last theorem in § 14 in perspective position.

It will be noticed that the plane x' may be placed on x in two different ways, viz. if we have placed x' on x we may take it off and turn it over in space before we bring it back to x, so that what was its upper becomes now its lower face. For each of these positions we get one pair of centres T, T', and only one pair, because the above process must give every perspective position. It follows — In two projective planes there are in general two and only two pencils in either such that angles in one are equal to their correspond- ing angles in the other. If one of these pencils is made coincident with its corresponding one, then the planes will be perspective.

This agrees with the fact that two perspective planes in space can be made

coincident by turning one about their axis in two different ways (§ 8).

In the reasoning employed it is essential that the lines j and V are finite. If one lies at infinity, say j, then i and j coincide, hence their corresponding lines V and j' will coincide ; that is, V also lies at infinity, so that the lines at infinity in the two planes are corre- sponding lines. If the planes are now made coincident and per- spective, then it may happen that the lines at infinity correspond point for point, or can be made to do so by turning the one plane in itself. In this case the line at infinity is the axis, whilst the centre may be a finite point. This gives similar figures (see § 16). In the other case the line at infinity corresponds to itself without being the axis; the lines joining corresponding points therefore all coin- cide with it, and the centre S lies on it at infinity. The axis will be some finite line. This gives parallel projection (see § 17). For want of space we do not show how to find in these cases the per- spective position, but only remark that in the first case any pair of corresponding points in x and x' may be taken as the points T and T , whilst in the other case there is a pencil of parallels in x such that any one line of these can be made to coincide point for point with its corresponding line in x', and thus serve as the axis of projection. It will therefore be possible to get the planes in perspective position by first placing any point A' on its correspond- ing point A and then turning x' about this point till lines joining corresponding points are parallel.

§ 16. Similar Figures. — If the axis is at infinity every line is parallel to its corresponding line. Corresponding angles are there- fore equal. The figures are similar, and (§ 10) the ratio of simili- tude of any two corresponding rows is constant.

If similar figures are in perspective position they are said to be similarly situated, and the centre of projection is called the centre of similitude. To place two similar figures in this position, we observe that their lines at infinity will coincide as soon as both figures are put in the same plane, but the rows on them are not necessarily identical. They are projective, and hence in general not more than two points on one will coincide with their corresponding points in the other (G. § 34). To make them identical it is either sufficient to turn one figure in its plane till three lines in one are parallel to their corresponding lines in the other, or it is necessary before this can be done to turn the one plane over in space. It can be shown that in the former case all lines are, or no line is, parallel to its corresponding line, whilst in the second case there are two directions, at right angles to each other, which have the property that each line in either direction is parallel to its corresponding line. We also see that —

If in two similar figures three lines, of which no two are parallel, are parallel respectively to their corresponding lines, then every line has this

property and the two figures are similarly situated ; or

Two similar figures are similarly situated as soon as two corre- sponding triangles are so situated.

If two similar figures are perspective without being in the same plane, their planes must be parallel as the axis is at infinity. Hence — Any plane figure is projected from any centre to a parallel plane into a similar figure.

If two similar figures are similarly situated, then corresponding points may either be on the same or on different sides of the centre. If, besides, the ratio of similitude is unity, then corresponding points will be equidistant from the centre. In the first case there- fore the two figures will be identical. In the second case they will be identically equal but not coincident. They can be made to coincide by turning one in its plane through two right angles about the centre of similitude S. The figures are in involution, as is seen at once, and they are said to be symmetrical with regard to the point S as centre. If the two figures be considered as part of one, then this is said to have a centre. Thus regular polygons of an even number of sides and parallelograms have each a centre, which is a centre of symmetry.

§ 17 Parallel Projection. — If, instead of the axis, the centre be moved to infinity, all the projecting rays will be parallel, and we get what is called parallel projection. In this case the line at in- finity passes through the centre and therefore corresponds to itself — but not point for point as in the case of similar figures. To any

Eoint I at infinity corresponds therefore a point I' also at infinity ut different from the first. Hence to parallel lines meeting at I correspond parallel lines of another direction meeting at I . Further, in any two corresponding rows the two points at infinity are corresponding points; hence the rows are similar. This gives the principal properties of parallel projection: — To parallel lines correspond parallel lines ; or

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To a parallelogram corresponds a parallelogram. The correspondence of parallel projection is completely determined as soon as for any parallelogram in the one figure the corresponding parallelogram in the other has been selected, as follows from the general case in § 14. [Corresponding rows are similar (§ 10).]

The ratio of similitude for these rows changes with the direction : // a row is parallel to the axis, its corresponding row, which is also parallel to the axis, will be equal to it, because any two pairs AA' and BB' of corresponding points will form a parallelogram. Another important

property is the following: — The areas of corresponding figures have a constant ratio. We prove this first for parallelograms. Let ABCD and EFGH be

any two parallelograms in ir, A'B'C'D' and E'F'G'H' the corresponding parallelograms in ir'. Then to the parallelo- gram KLMN which lies (fig. 6) between the lines AB, CD and EF, GH will correspond a parallelogram K'L'M'N' formed in exactly the same manner. As ABCD and KLMN are between the same parallels

Fig. 6. their areas are as the bases. Hence- ABCD AB

A'B'C'D' KTM3f = KX' and similar 'y K'L'M'N' =

A'B'

K'L'

But AB/KL = A'B'/K'L', as the rows AB and A'B' are similar. Hence

ABCD KLMN . ., . EFG H KLMN

A'B'C'D' "K'L'M'N' and sltmlarl y E'F'G'H' "K'L'M'N'"

Hence also

ABCD

EFGH

A'B'C'D' "E'F'G'H'

This proves the theorem for parallelograms and also for their halves, that is, for any triangles. As polygons can be divided into triangles the truth of the theorem follows at once for them, and is extended (by the method of exhaustion) to areas bounded by curves by inscribing polygons in, and circumscribing polygons about, the curves.

Just as (G. § 8) a segment of a line is given a sense, so a sense may be given to an area. This is done as follows. If we go round the boundary of an area, the latter is either to the right or to the left. If we turn round and go in the opposite sense, then the area will be to the left if it was first to the right, and vice versa. If we give the boundary a definite sense, and go round in this sense, then the area is said to be either of the one or of the other sense according as the area is to the right or to the left. The area is generally said to be positive if it is to the left. The sense ot the boundary is indicated either by an arrowhead or by the order of the letters which

denote points in the boundary. Thus, if A, B, C be the vertices of a triangle, then ABC shall denote the area in magnitude and sense, the sense being fixed by going round the triangle in the order from A to B to C. It will then be seen that ABC and ACB denote the same area but with opposite sense, and generally ABC = BCA = CAB = – ACB = – BAC = – CBA; that is, an inter- change of two letters changes the sense. Also, if A and A' are two points on opposite sides of, and equidistant from, the line BC, then ABC = -A'BC.

Taking account of the sense, we may make the following state- ment •. —

If A, A' are two corresponding points, if the line AA' cuts the axis in B, and if C is any other point in the axis, then the triangles ABC and A'BC are corresponding, and

ABC _ AB _ AB . A'BC "A'B" BA" or The constant ratio of corresponding areas is equal and opposite to the ratio in which the axis divides the segment, joining two corre- sponding points.

§ 18. Several special cases of parallel projection are of interest. Orthographic Projection. — If the two planes x and ir' have a definite position in space, and if a figure in ir is projected to ir' by rays perpendicular to this plane, then the projection is said to be orthographic. If in this case the plane ir be turned till it coincides with 7r' so that the figures remain perspective, then the projecting rays will be perpendicular to the axis of projection, because any one of these rays is, and remains during the turning, perpendicular to the axis.

The constant ratio of the area of the projection to that of the original figure is, in this case, the cosine of the angle between the two planes r and t', as will be seen by projecting a rectangle which has its base in the axis. Orthographic projection is of constant use in geometrical drawing. Shear. — If the centre of projection be taken at infinity on the axis, then the projecting rays are parallel to the axis; hence corre- sponding points will be equidistant from the axis. In this case, therefore, areas of corresponding figures will be equal.

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If A, A' and B, B' (fig. 7) are two pairs of corresponding points on the same line, parallel to the axis, then, as corresponding seg- ments parallel to the axis are equal, it follows that AB = A'B', hence also AA' = BB'. If these points be joined to any point O on the axis, then AO and A'O will be corre- sponding lines; they will there- fore be cut by any line parallel to the axis in corresponding points. In the figure therefore C, C and also D, D' will

be pairs of corresponding points and CC = DD'. As the ratio CC'/AA' equals the ratio of the distances of C and A from the axis, therefore —

Two corresponding figures may be got one out of the other by moving all points in the one parallel to a fixed line, the axis, through distances which are proportional to their own distances from the axis. Points in a line remain hereby in a line.

Such a transformation of a plane figure is produced by a shearing stress in any section of a homogeneous elastic solid. Foi this reason Lord Kelvin gave it the name of shear.

A shear of a plane figure is determined if we are given the axis and the distance through which one point has been moved; for in this case the axis, the centre, and a pair of corresponding points are given.

I 19. Symmetry and Skew-Symmetry. — If the centre is not on the axis, and if corresponding points are at equal distances from it, they must be on opposite sides of it. The figures will be in involution (§ 11). In this case the direction of the projecting rays is said to be conjugate to the axis.

The conjugate direction may be perpendicular to the axis. If the line joining two corresponding points A, A' cuts the axis in B, then AB = BA . Therefore, if the plane be folded over along the axis, A will fall on A'. Hence by this folding over every point will coincide with its corresponding point. The figures therefore are identically equal or congruent, and in their original position they are symmetrical with regard to the axis, which itself is called an axis of symmetry. If the two figures are considered as one this one is said to be symmetrical with regard to an axis, and is said to have an axis of symmetry or simply an axis. Every diameter of a circle is thus an axis; also the median line of an isosceles triangle and the diagonals of a rhombus are axes of the figures to which they belong.

In the more general case where the projecting rays are not per- pendicular to the axis we have a kind of twisted symmetry which may be called skew-symmetry. It can be got from symmetry by giving the whole figure a shear. It will also be easily seen that we get skew-symmetry if we first form a shear to a given figure and then separate it from its shear by folding it over along the axis of the shear, which thereby becomes an axis of skew-symmetry.

Skew-symmetrical and therefore also symmetrical figures have the following properties: —

Corresponding areas are equal, but of opposite sense. Any two corresponding lines are harmonic conjugates with regard to the axis and a

lirie in the conjugate direction.

If the two figures be again considered as one whole, this is said to be skew-symmetrical and to have an axis of skew-symmetry. Thus the median line of any triangle is an axis of skew-symmetry, the side on which it stands having the conjugate direction, the other sides being conjugate lines. From this it follows, for in- stance, that the three median lines of a triangle meet in a point. For two median lines will be corresponding lines with regard to the third as axis, and must therefore meet on the axis.

An axis of skew-symmetry is generally called a diameter. Thus every diameter of a conic is an axis of skew-symmetry, the con- jugate direction being the direction of the chords which it bisects. § 20. We state a few properties of these figures useful in mechanics, but we omit the easy proofs: —

// a plane area has an axis of skew-symmetry, then the mass-centre (centre of mean distances or centre £>(inertia) lies on it.

If a figure undergoes a shear, the mass-centre of ifo. area remains the mass-centre ; and generally —

In parallel projection the mass-centres of corresponding areas (or of groups of points, but not of curves) are corresponding points.

The moment of inertia of a plane figure does not change if the figure undergoes a shear in the direction of the axis with regard to which the moment has been taken.

If a figure has an axis of skew-symmetry, then this axis andrthe conjugate direction are conjugate diameters of the momental ellipse for every point in the axis.

U a figure has an axis of symmetry, then this is an axis of the momental ellipse for every point in it.

The truth of the last propositions follows at once from the fact that the product of inertia for the lines in question vanishes.

It is of interest to notice how a great many propositions of Euclid are only special cases of projection. The theorems Euc. I. 35-41 about parallelograms or triangles on equal bases and between the same parallels are examples of shear, whilst I. 43 gives a case of

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skew-symmetry, hence of involution. Figures which are identi- cally equal are of course projective, and they are perspective when placed so that they have an axis or a centre of symmetry (cf . Henrici, Elementary Geometry, Congruent Figures). In this case again the relation is that of involution. The importance of treat- ing similar figures when in perspective position has long been recognized; we need only mention the well-known proposition about the centres of similitude of circles.

Applications to Conies.

§21. Any conic can be projected into any other conic. This may be done in such a manner that three points on one conic and the tangents at two of them are projected to three arbitrarily selected points and the tangents at two of them on the other.

If u and u' are any two conies, then we have to prove that we can project « in such a manner that five points on it will be projected to points on «'. As the projection is determined as soon as the projections of any four points or four lines are selected, we cannot project any five points of u to any five arbitrarily selected points on u'. But if A, B, C be any three points on u, and if the tangents at B and C meet at D, if further A', B', C are any three points on u', and if the tangents at B' and C' meet at D', then the plane of u may be projected to the plane of «' in such a manner that the points A, B, C, D are projected to A', B', C, D'. This determines the correspondence (§ 14). The conic u will be projected into a conic, the points A, B, C and the tangents BD and CD to the points A', B', C and the lines B'D' and C'D', which are tangents to u' at B' and C. The projection of u must therefore (G. § 52) coincide with «', because it is a conic which has three points and the tangents at two of them in common with u'.

Similarly we might have taken three tangents and the points of contact of two of them as corresponding to similar elements on the other.

If the one conic be a circle which cuts the line j, the projection will cut the line at infinity in two points; hence it will be a hyper- bola. Similarly, if the circle touches j, the projection will be a parabola; and, if the circle has no point in common with j, the projection will be an ellipse. These curves appear thus as sections of a circular cone, for in case that the two planes of projection are separated the rays projecting the circle form such a cone.

A ny conic may be projected into itself.

If we take any point S in the plane of a conic as centre, the polar of this point as axis of projection, and any two points in which a line through S

cuts the conic as corresponding points, then these will be harmonic conjugates with regard to the centre and the axis. We therefore have involution (§ 11), and every point is projected into its harmonic conjugate with regard to the centre and the axis — ■ hence every point A on the conic into that point A' on the conic in which the line SA' cuts the conic again, as follows from the harmonic properties of pole and polar (G. § 62 seq.).

Two conies which cut the line at infinity in the same two points are similar figures and similarly situated — the centre of similitude being in general some finite point.

To prove this, we take the line at infinity and the asymptotes of one as corresponding to the line at infinity and the asymptotes of the other, and besides a tangent to the first as corresponding to a parallel tangent to the other. The line at infinity will then correspond to itself point for point ; hence the figures will be similar and similarly situated.

§ 22. Areas of Parabolic Segments. — One parabola may always be considered as a parallel projection of another in such a manner that any two points A, B on the one correspond to any two points A', B' on the other; that is, the points A, B and the point at infinity on the one may be made to correspond respectively to the points A', B' and the point at infinity on the other, whilst the tangents at A and at infinity of the one correspond to the tangents at B' and at infinity of the other. This completely determines the correspondence, and it is parallel projection because the line at infinitv corresponds to the line at infinity. Let the tangents at A and B meet at C, and those at A', B' at C; then C, C f will correspond, and so will the triangles ABC and A'B'C as well as the parabolic segments cut off by the chords AB and A'B'. If (AB) denotes the area of the segment cut off by the chord AB we have therefore

(AB)/ABC = (A'B')/A'B'C ; or

The area of a segment of a parabola stands in a constant ratio to the area of the triangle formed by the chord of the segment and the tangents at the end points of the chord.

If then (fig. 8) we join the point C to the mid-point M of AB, then this line / will be bisected at D by the parabola (G. § 74), and the tangent at D will be parallel to AB. Let this tangent cut AC in E and CB in F, then by the last theorem Fl r 8 (AB) (AD) (BD)

MG. 8. ABC – ADE-BFD _m '

where m is some number to be determined. The figure gives (AB) = ABD

+(AD) + (BD).

Combining both equations, we have

ABD=m (ABC-ADE-BFD). But we have also ABD = a ABC, and ADE = BFD = | ABC; hence

i ABC=to (l-i-f) ABC, or r» = f. The area of a parabolic segment equals two-thirds of the area of the triangle formed by the chord and the tangents at the end points of the chord.

§ 23. Elliptic Areas. — To consider one ellipse a parallel projection of another we may establish the Correspondence as follows. If AC, BD are any pair of conjugate diameters of the one and A'C, B'D'. any pair of conjugate diameters of the other, then these may be made to correspond to each other, and the correspondence will be completely determined if the parallelogram formed by the tangents at A, B, C, D is made to correspond to that formed by the tangents at A', B', C, D' (§§ 17 and 21). As the projection of the first conic has the four points A', B', C, D' and the tangents at these points in common with the second, the two ellipses are pro- jected one into the other. Their areas will correspond, and so do those of the parallelograms ABCD and A'B'C'D'. Hence —

The area of an ellipse has a constant ratio to the area of any inscribed parallelogram whose diagonals are conjugate diameters, and also to every circumscribed parallelogram whose sides are parallel to conjugate diameters.

It follows at once that —

All parallelograms inscribed in an ellipse whose diagonals are conjugate diameters are equal in area ; and

All parallelograms circumscribed about an ellipse whose sides are parallel to conjugate diameters are equal in area.

If a, b axe the length of the semi-axes of the ellipse, then the area of the circumscribed parallelogram will be 40& and of the inscribed one 2ab.

For the circle of radius r the inscribed parallelogram becomes the square of area 2r 2 and the circle has the area r 2 ir; the constant ratio of an ellipse to the inscribed parallelogram has therefore also the value A 7r. Hence —

The area of an ellipse equals abw.

§ 24. Projective Properties. — The properties of the projection of a figure

depend partly on the relative position of the planes of the figures and the centre of projection, but principally on the properties of the given figure. Points in a line are projected into points in a line, harmonic points into harmonic points, a conic into a conic; but parallel lines are not projected into parallel lines nor right angles into right angles, neither are the projections of equal segments or angles again equal. There are then some pro perties which remain unaltered by projection, whilst others change. The former are called projective, or descriptive, the latter metrical properties of figures, because the latter all depend on measurement. To a triangle and its median lines correspond a triangle and three lines which meet in a point, but which as a rule are not median lines.

In this case, if we take the triangle together with the line at infinity, we get as the projection a triangle ABC, and some other line j which cuts the sides a, b, c of the triangle in the points Ai, Bi, Ci. If we now take on BC the harmonic conjugate A2 to Ai and similarly on CA and AB the harmonic conjugates to Bi and Ci respectively, then the lines AA 2 , BB 2 , CC 2 will be the projections of the median lines in the given figure. Hence these lines must meet in a point.

As the triangle and the fourth line we may take any four given lines, because any four lines may be projected into any four given lines (§ 14). This gives a theorem: —

// each vertex of a triangle be joined to that point in the opposite side which is, with regard to the vertices, the harmonic conjugate of the point in which the side is cut by a given line, then the three lines thus obtained meet in a point.

We get thus out of the special theorem about the median lines of a triangle a more general one. But before this could be done we had to add the line at infinity to the lines in the given figure.

In a similar manner a great many theorems relating to metrical properties can be generalized by taking the line at infinity or points at infinity as forming part of the original figure. Conversely special cases relating to measurement are obtained by projecting some line in a figure of known properties to infinity. This is true for all properties relating to parallel lines or to bisection of seg- ments, but not immediately for angles. It is, however, possible to establish for every metrical relation the corresponding projective property. To do this it is necessary to consider imaginary elements. These have originally been introduced into geometry by aid of co-ordinate geometry, where imaginary quantities constantly occur as roots of equations.

Their introduction into pure geometry is due principally to Poncelet, who by the publication of his great work Traite des Proprietes Projectives des Figures became the founder of projective geometry in its widest sense. Monge had considered parallel projection and had already distinguished between permanent and accidental properties of figures, the latter being those which de- pended merely on the accidental position of one part to another. Thus in projecting two circles which lie in different planes it

depends on the accidental position of the centre of projection whether the projections be two conies which do or do not meet. Poncelet introduced the principle of continuity in order to make theorems general and independent of those accidental positions which depend analytically on the fact that the equations used have real or imaginary roots. But the correctness of this principle remained without a proof. Von Staudt has, however, shown how it is possible to introduce imaginary elements by purely geometrical reasoning, and we shall now try to give the reader some idea of his theory.

§ 25. Imaginary Elements. — If a line cuts a curve and if the line be moved, turned for instance about a point in it, it may happen that two of the points of intersection approach each other till they coincide. The line then becomes a tangent. If the line is still further moved in the same manner it separates from the curve and two points of intersection are lost. Thus in considering the rela- tion of a line to a conic we have to distinguish three cases — the line cuts the conic in two points, touches it, or has no point in common with it. This is quite analogous to the fact that a quadratic equa- tion with one unknown quantity has either two, one, or no roots. But in algebra it has long been found convenient to express this differently by saying a quadratic equation has always two roots, but these may be either both real and different, or equal, or they may be imaginary. In geometry a similar mode of expressing the fact above stated is not less convenient.

We say therefore a line has always two points in common with a conic, but these are either distinct, or coincident, or invisible. The word imaginary is generally used instead of invisible; but, as the points have nothing to do with imagination, we prefer the word ” invisible ” recommended originally by Clifford.

Invisible points occur in pairs of conjugate points, for a line loses always two visible points of intersection with a curve simultane- ously. This is analogous to the fact that an algebraical equation with real coefficients has imaginary roots in pairs. Only one real line can be drawn through an invisible point, for two real lines meet in a real or visible point. The real

line through an invisible point contains also its conjugate.

Similarly there are invisible lines — tangents, for instance, from a point within a conic — which occur in pairs of conjugates, two conjugates having a real point in common.

The introduction of invisible points would be nothing but a play upon words unless there is a real geometrical property indicated which can be used in geometrical constructions — that it has a definite meaning, for instance, to say that two conies cut a line in the same two invisible points, or that we can draw one conic through three real points and the two invisible ones which another conic has in common with a line that does not actually cut it. We have in fact to give a geometrical definition of invisible points. This is done by aid of the theory of involution (G. § 76 seq.).

An involution of points on a line has (according to G. § 77 [2]) either two or one or no foci. Instead of this we now say it has always two foci which may be distinct, coincident or invisible. These foci are determined by the involution, but they also determine the involution. If the foci are real this follows from the fact that conjugate points are harmonic conjugates with regard to the foci. That it is also the case for invisible foci will presently appear. If we take this at present for granted we may replace a pair of real, coincident or invisible points by the involution of which they are the foci.

Now any two pairs of conjugate points determine an involution (G. § 77 161).

Hence any point-pair, whether real or invisible, is completely determined by any two pairs of conjugate points of the involution which has given the point-pair as foci and may therefore be replaced by them.

Two pairs of invisible points are thus said to be identical if, and only if, they are the foci of the same involution.

We know (G. § 82) that a conic determines on every line an in- volution in which conjugate points are conjugate poles with regard to the conic — that is, that either lies on the polar of the other. This holds whether the line cuts the conic or not. Furthermore, in the former case the points common to the line and the conic are the foci of the involution. Hence we now say that this is always the case, and that the invisible points common to a line and a conic are the invisible foci of the involution in question. If then we state the problem of drawing a conic which passes through two points given as the intersection of a conic and a line as that of drawing a conic which determines a given involution on the line, we have it in a form in which it is independent of the accidental circumstance of the intersections being real

or invisible. So is the solution of the problem, as we shall now show.

§ 26. We have seen (§ 21) that a conic may always be projected into itself by taking any point S as centre and its polar s as axis of projection, corresponding points being those in which a line through S cuts the conic. If then (fig. 9) A, A' and B, B' are pairs of corresponding points so that the lines AA' and BB' pass through S, then the lines AB and A'B', as corresponding lines, will meet at a point R on the axis, and the lines AB' and A'B will meet at another point R' on the axis. These points R, R' are conjugate points in the involution which the conic determines on the line s,

because the triangle RSR' is a polar triangle (G. § 62), so that R' lies on the polar of R.

This gives a simple means of determining for any point Q on the line s its conjugate point Q'. We take any two points A, A' on the conic which lie on a line through S, join Q to A by a line cutting the conic egain in C, and join C to A'. This line will cut J in the point Q' required.

To draw some conic which shall determine on a line s a given involution.

We have here to reconstruct the fig. 9, having given on the line s an involution. Let Q, Q' and R, R' (fig. 9) be two pairs of conjugate points in this involution. We take any point B and join it to R and R', and another point C to Q and Q'. Let BR and CQ meet at A, and BR' and CQ' at A'. If now a point P be moved along J its conjugate point P' will also move and the two points will describe projective rows The two rays AP and A'P' will

therefore describe projective pencils, and the intersection of corre- sponding rays will lie on a conic which passes through A, A', B and C. This conic determines on s the given involution.

Of these four points not only B and C but also the point A may be taken arbitrarily, for if A, B, C are given, the line AB will cut s in some point R. As the involution is supposed known, we can find the point R' conjugate to R, which we join to B. In the same way the line CA will cut s in some point Q. Its conjugate point Q' we join to C. The line CQ' will cut BR' in a point A', and then AA' will pass through the pole S (cf. fig. 9). We may now interchange A and B and find the point B'. Then BB' will also pass through S, which is thus found. At the same time five points A, B, C, A', B' on the conic have been found, so that the conic is completely known which determines on the line .s the given involution. Hence —

Through three points we can always draw one conic, and only one, which

determines on a given line a given involution, all the same whether the involution has real, coincident or invisible foci.

In the last case the theorem may now also be stated thus: — It is always possible to draw a conic which passes through three given real points and through two invisible points which any other conic has in common with a line.

§ 27. The above theory of invisible points gives rise to a great number of interesting consequences, of which we state a few. The theorem at the end of § 2 1 may now be stated : — Any two conies are similar and similarly situated if they cut the line at infinity in the same two points — real, coincident or invisible. It follows that

Any two parabolas are similar; and they are similarly situated as soon as their axes are parallel.

The involution which a circle determines at its centre is circular (G. § 79); that is, every line is perpendicular to its conjugate line. This will be cut by the line at infinity in an involution which has the following property: The lines which join any finite point to two conjugate points in the involution are at right angles to each other. Hence all circular involutions in a plane determine the same involution on the line at infinity. The latter is therefore called the circular involution on the line at infinity; and the involu- tion which a circle determines at its centre is called the circular involution at that point. All circles determine thus on the line at infinity the same involution ; in other words, they have the same two invisible points in common with the line at infinity.

Ail circles may be considered as passing through the same two points at infinity.

These points are called the circular points at infinity, and by Professor Cayley the absolute in the plane. They are the foci of the circular involution in the line at infinity.

Conversely — Every conic which passes through the circular points is a circle; because the involution at its centre is circular, hence conjugate diameters are at right angles, and this property only circles possess.

We now see why we can draw always one and only one circle through any three points; these three points together with the circular points at infinity are five points through which one conic only can be drawn.

Any two circles are similar and similarly situated because they have the same points at infinity (§21).

Any two concentric circles may be considered as having double contact at infinity, because the lines joining the common centre to the circular points at infinity are tangents to both circles at the circular points, as the line at infinity is the polar of the centre.

Any two lines at right angles to one another are harmonic conjugates with regard to the rays joining their intersection to the circular points, because these rays are the focal rays of the circular involution at the intersection of the given lines.

To bisect an angle with the vertex A means (G. § 23) to find two rays through A which are harmonic conjugates with regard to the

limits of the angle and perpendicular to each other. These rays are therefore harmonic with regard to the limits of the given angle and with regard to the rays through the circular points. Thus perpendicularity and bisection of an angle have been stated in a projective form.

It must not be forgotten that the circular points dc not exist at all ; but to introduce them gives us a short way of making a statement which would otherwise be long and cumbrous.

We can now generalize any theorem relating to metrical pro- perties. For instance, the simple fact that the chord of a circle is touched by a concentric circle at its mid point proves the theorem : — // two conies have double contact, then the points where any tangent to one of them cuts the other are harmonic with regard to the point of contact and the point where the tangent cuts the chord of contact.

(O. H.) PROKOP, the name of two of the most prominent Hussite generals

i. Peokop, surnamed ” Veliky ” (the great) or ” Holy ” (the bald), was a married utraquist priest who belonged to an eminent family of citizens of Prague. Though a priest and continuing to officiate as such, he became the most prominent leader of the advanced Hussite or Taborite forces during the latter part of the Hussite wars. He was not indeed the immediate successor of 2izka as leader of the Taborites, as has been fre- quently stated, but he commanded the forces of Tabor when they obtained their great victories over the Germans and Romanists at Usti nad Labam (Aussig) in 1426 and Domazlice (Tauss) in 143 1. He also acted as leader of the Taborites during their frequent incursions into Hungary and Germany, particularly when in 1429 a vast Bohemian army invaded

Saxony and the territory of Nuremberg. The Hussites, however, made no attempt permanently to conquer German territory, and on the 6th of February 1430 Prokop concluded at Kulmbach a treaty with Frederick of Brandenburg, burgrave of Nuremberg, by which the Hussites engaged themselves to leave Germany. When the Bohemians entered into negotiations with Sigismund and the Council of Basel and, after prolonged discussions, resolved to send an embassy to the council, Prokop the Great was the most prominent member of this embassy, which reached Basel on the 4th of January 1433. When the negotiations there for a time proved resultless Prokop with the other envoys returned to Bohemia, where new internal troubles broke out. A Taborite army led by Prokop the Great besieged Plzen, which was then in the hands of the Romanists. The discipline in the Hussite camp had, however, slackened in the course of prolonged warfare, and the Taborites encamped before Plzen revolted against Prokop, who therefore returned to Prague. Probably encouraged by these dissensions among the men of Tabor, the Bohemian nobility, both Romanist and utraquist, formed a league for the purpose of opposing democracy, which through the victories of Tabor had acquired great strength in the Bohemian towns. The struggle began at Prague. Aided by the nobles, the citizens of the old town took possession of the more democratic new town, which Prokop unsuccessfully attempted to defend. Prokop now called to his aid Prokop " the Lesser," who had succeeded him in the command of the Taborite army before Plzen. They jointly retreated eastward from Prague, and their forces, known as the army of the towns, met at Lipan, between Kourim and Kolin, the army of the nobles (May 30, 1434). The Taborites were decisively defeated, and Prokop the Great perished in this battle.

2. Prokop " the Lesser," or Prokupek (the Bohemian diminutive of the word Prokop) , was one of the greatest Hussite generals. Little is known of his early life. He took part in all the later campaigns of Prokop the Great in Germany, and suc- ceeded him as commander of the Taborite army that besieged Plzen. After the formation of the confederacy of the nobles he was recalled by Prokop the Great, with whom he shared the command of the army of the towns at the fateful battle of Lipan, in which he also perished.

See Count Lutzow, Bohemia: A Historical Sketch; Palacky, History of Bohemia; Toman, Husitske Valecnictvi (Hussite Warfare).

PROKOPOVICH, THEOFAN (1681-1736), Russian archbishop and statesman, one of the ablest coadjutors of Peter the Great, was sprung from a merchant family. He brilliantly distinguished

himself at the Orthodox academy of Kiev, subsequently com- pleting his education in Poland (for which purpose he turned Uniate), and at Rome in the College of the Propaganda. Primed with all the knowledge of the West,

he returned home to seek his fortune, and, as the Orthodox monk, became one of the pro- fessors at, and subsequently rector of, the academy of Kiev. He entirely reformed the teaching of theology there, substituting the historical method of the German theologians for the anti- quated Orthodox scholastic system. In 1709 Peter the Great, while passing through Kiev, was struck by the eloquence of Prokopovich in a sermon on " the most glorious victory," i.e. Poltava, and in 1716 summoned him to Petersburg. From henceforth it was Theofan's duty and pleasure to explain the new ideas and justify the most alarming innovations from the pulpit. So invaluable, indeed, did he become to the civil power, that, despite the determined opposition of the Russian clergy, who regarded " the Light of Kiev " as an interloper and semi-heretic, he was rapidly promoted, becoming, in 17 18, bishop of Pskov, and finally, in 1724, archbishop of Novgorod. As the author of " the spiritual regulation " for the reform of the Russian Church, Theofan must, indeed, be regarded as the creator of " the spiritual department " superseding the patri- archate, and better known by its later name of " the holy synod," of which he was made the vice-president. Penetrated by the conviction that ignorance was the worst of the inveterate evils of old Russia, a pitiless enemy of superstition of every sort', a reformer by nature, overflowing with energy and resource, and with a singularly lucid mind armed at all points by a far- reaching erudition, Prokopovich was the soul of the reforming party after the death of Peter the Great. To him also belongs the great merit of liberating Russian preaching from the fetters of Polish turgidity and affectation by introducing popular themes and a simple .style into Orthodox pulpit eloquence.

See I. Chistovitch, Theofan Prokopovich and his Times (Rus. ; Petersburg, 1868); P. Morozov, Theophan Prokopovich as a Writer (Rus.; Petersburg, 1880). (R. N. B.)

PROLEGOMENON (Gr. for " that which is said beforehand," ■wpoKkyav, to speak, say before), a preface or introduction to a book, especially a preliminary introductory essay to a learned work, or a treatise which serves as a general survey or intro- duction to the study of some subject or as a special survey of the subject. The word is more often used in the plural.

PROLETARIAT, or Proletariate, a term borrowed from the French and used collectively of those classes of a political community who depend for their livelihood on their daily labour, the wage-earning, operative class as opposed to the capital- owning class. It is of frequent use by those social reformers who base their theories on the supposed antagonism of capital and labour. The Latin proletarius, from which the word was formed, was the name given to the body of citizens possessed of no property and who therefore served the state with their children (proles, offspring). This division of the members of the state was traditionally ascribed to Servius

Tullius.

PROLOCUTOR, one who speaks for others (Lat. pro, for, and loqui, to speak) ; specifically the chairman of the lower house of convocation in the two provinces of the Church of England, who presides in that house and acts as representative and spokesman in the upper house. He is elected by the lower house, subject to the approval of the metropolitan. (See Convocation.)

PROLOGUE (from Gr. irpb, before, and X670S, a word), a prefatory piece of writing, usually composed to introduce a drama. The Greeks use a word irpoKoyos, which included the modern meaning of the prologue, but was of wider signifi- cance, embracing any kind of preface, like the Latin praefatio. In Attic Greek drama, a character in the play, very often a deity, stood forward or appeared from a machine before the action of the play began, and made from the empty stage such- statements as it was necessary that the audience should hear, in order that they might appreciate the ensuing drama. It was the early Greek custom to dilate in great detail on everything that had led up to the play, the latter being itself, as a rule,

merely the catastrophe which had inevitably to ensue on the facts related in the prologue. The importance, therefore, of the prologue in Greek drama was very great; it sometimes almost took the place of a romance, to which, or to an episode in which, the play itself succeeded. It is believed that the prologue in this form was practically the invention of Euripides, and with him as has been said, it takes the place of " an explanatory first act." This may help to modify the objection which criticism has often brought against the Greek prologue, as an impertinence, a useless growth prefixed to the play, and standing as a barrier between us and our enjoyment of it. The point precisely is that, to an Athenian audience, it was useful and pertinent, as supply- ing just what they needed to make the succeeding scenes in- telligible. But it is difficult to accept the view that Euripides invented the plan of producing a god out of a machine to justify the action of deity upon man, because it is plain that he himself disliked this interference of the supernatural and did not believe in it. He seems, in such a typical prologue as that to the Hippo- lytus, to be accepting a conventional formula, and employing it, almost perversely, as a medium for his ironic rationalism. Many of the existing Greek prologues may be later in date than the plays they illustrate, or may contain large interpolations. On the Latin stage the prologue was often more elaborate than it was in Athens, and in the careful composition of the poems which Plautus prefixes to his plays we see what importance he gave to this portion of the entertainment; sometimes, as in the preface to the Rudens, Plautus rises to the height of his genius in his

adroit and romantic prologues, usually placed in the mouths of persons who make no appearance in the play itself. Moliere revived the Plautian prologue in the' introduction to his Amphitryon. Racine introduced Piety as the speaker of a pro- logue which opened his choral tragedy of Esther. The tradition of the ancients vividly affected our own early dramatists. Not only were the mystery plays and miracles of the middle ages begun by a homily, but when the drama in its modern sense was inaugurated in the reign of Elizabeth, the prologue came with it, directly adapted from the practice, of Euripides and Terence. Sackville, Lord Buckhurst, prepared a sort of pro- logue in dumb show for his Gorbuduc of 1562; and he also wrote a famous Induction, which is, practically, a prologue, to a mis- cellany of short romantic epics by diverse hands. In the Eliza- bethan .drama the prologue was very far from being universally employed. In the plays of Shakespeare, for instance, it is an artifice which the poet very rarely introduced, although we find it in Henry V. and Romeo and Juliet. Sometimes the Eliza- bethan prologue was a highly elaborated poem; in 1603 a har- binger recited a sonnet on the stage, to prepare the audience for Heywood's A Woman Kill'd with Kindness. Often the prologue was a piece of blank verse, so obscure and complicated that it is difficult to know how its hearers contrived to follow it; such are the prologues of Chapman. Among Elizabethan prologues the most ingenious and interesting are those of Ben Jonson, who varied the form on every occasion. For instance, in The Poetaster (1602), Envy comes in " as Prologue," and speaks a long copy of heroics, only to be turned off the stage by an armed figure, who states that he is the real prologue, and proceeds to spout more verses. Jonson's introductions were often recited by the " stage-keeper," or manager. Beaumont and Fletcher seem to have almost wholly dispensed with pro- logues, and the form was far from being universal, until the Restoration, when it became de rigueur. The prologues of the last thirty years of the 17th century were always written in rhymed verse, and were generally spoken by a principal actor or actress in the ensuing piece. They were often, in the hands of competent poets, highly finished essays on social or literary topics. For instance, the famous prologue to Dryden's Aureng- zebe (1675) is really a brief treatise on fashions in versification. Throughout the 18th century the prologue continued to flourish, but went out of vogue in the early part of the 19th. See also Epilogue. (EG)

PROME, a district in the Pegu division of Lower Burma, with an area of 2915 sq. m. and a population (1901) of 365,804.

It occupies the whole breadth of the valley of the Irrawaddy, between Thayetmyo district on the north and Henzada and Tharrawaddy districts on the south, and originally extended as far as the frontier of Independent

Burma, but in 1870 Thayetmyo was formed into an independent jurisdiction. There are two mountain ranges in Prome, which form respectively the eastern and western boundaries. The Arakan Yomas extends along the whole of the western side, and that portion of the district lying on the right bank of the Irrawaddy is broken up by thickly wooded spurs running in a south-easterly direction, the space for cultivation being but limited and confined to the parts adjacent to the river. On the eastern side lies the Pegu Yomas, and north and north-east of the district its forest-covered spurs form numerous valleys and ravines, the torrents from which unite in one large stream called the Na-weng River. The most important of the plains lie in the south and south-west portions of Prome, and extend along the whole length of the railway that runs between the towns of Paungde and Prome; they are mostly under cultivation, and those in the south are watered by a series of streams forming the Myit-ma-kha or upper portion of the Hlaing. There are in addition large tracts of land covered by tree-jungle which are available for cultivation. The principal river is the Irrawaddy, which intersects the district from north to south; next in importance are the Tha-ni and its tributaries and the Na-weng system of rivers. In the hiUs near the capital the soil is of Tertiary formation, and in the plains it is an alluvial deposit. The climate is much drier than other districts in Lower Burma, the annual rainfall being about 48 in. The temperature ranges from about ioo° in June to 6o° in January. The staple crop is rice, but some cotton and tobacco are grown, while the custard apples are famous. Sericulture is extensively carried on by a special class. The forests yield teak and cutch, cotton and silk-weaving are important industries; there are also manufactures of ornamental boxes, coarse brown sugar and cutch.

The early history of the once flourishing kingdom of Prome, like that of the other states which now form portions of Burmaˆ is veiled in obscurity. After the conquest of Pegu in 1758 by Alompra, the founder of the last dynasty of Ava kings, Prome remained a portion of the Burman kingdom till the close of the second Burmese War in 1853, when the province of Pegu was annexed to British territory.

Prome, the chief town of the district, is situated on the left bank of the Irrawaddy, 161 m. N. of Rangoon, population (1901)

27,375-

To the south and south-east the town is closed in by low pagoda-topped hills, on one of which stands the conspicuous gilded Shwe Tsan-daw. The town was taken by the British in 1825 and again in 1852, on both occasions with hardly any opposition. In 1862 it was almost entirely destroyed by fire, and was afterwards relaid out in straight and broad

streets! It was erected into a municipality in 1874, and since then great improvements have been made, including waterworks. Its principal manufactures are silk cloths and lacquer ware. It is the terminus of a railway, from Rangoon, which runs through the district. The other chief towns in the district are Shwedaung (pop. 10,787) and Paungde (pop. 11,105).

PROMENADE, a walk taken for exercise or more especially for social amusement, hence a road, drive or other public place laid out for the purpose, a parade. The French word promenade was formerly pourmenade, and came from pourmener, promener, to take for a walk, Late Latin prominare, to drive an animal out to pasture, from pro, forward, minare, to drive on with cries and threats (minae). "Promenade concerts," so called from the fact that the audience are free to walk about or " promenade," were first introduced from Paris to London in 1838 under the name of " promenade concerts a la Musard," after the concerts given by the French musician and conductor, Philippe Musard (1 793-1 859) . They were given at the Lyceum Theatre (English Opera House).

PROMETHEUS, son of the Titan Iapetus by the sea nymph Clymene, the chief " culture hero," and, in some accounts, the

Demiurge of Greek mythical legend. As a culture-hero or in- ventor and teacher of the arts of life, he belongs to a wide and well-known category of imaginary beings. Thus Qat, Quah- teaht, Pundjel, Maui, Ioskeha, Cagn, Wainamoinen and an endless array of others represent the ideal and heroic first teachers of Melanesians, Ahts, Australians, Maoris, Algonkins, Bushmen and Finns. Among the lowest races the culture-hero commonly wears a bestial guise, is a spider (Melanesia), an eagle hawk (in some myths and south-east Australia), a coyote (north-west America), a dog or raven (Thlinkeet), a mantis insect (Bushman), and so forth, yet is endowed with human or even super-human qualities, and often shades off into a permanent and practically deathless god. Prometheus, on the other hand, is purely anthropomorphic. He is the friend and benefactor of mankind. He defends them against Zeus, who, in accordance with a widely diffused mythical theory, desires to destroy the human race and supplant them by a new and better species, or who simply revenges a trick in which men get the better of him. The pedigree and early exploits of Prometheus are given by Hesiod (Theog. 510- 616). On a certain occasion gods and men met at Mecone. The business of the assembly was to decide what portions of slain animals the gods should receive in sacrifice. On one side Prometheus

arranged the best parts of the ox covered with offal, on the other the bones covered with fat, as the meat was covered in Homeric sacrifices. Zeus was invited to make his choice, chose the fat, and found only bones beneath. A similar fable of an original choice, in which the chooser is beguiled by appear- ances, recurs in Africa and North America (see the caskets in the Merchant of Venice). The native tribes adapt the myth to explain the different modes of life among themselves and white men. In wrath at this trick, according to Hesiod, or in other versions for the purpose of exterminating the remnants of people who escaped the deluge of Deucalion, Zeus never bestowed, or later withdrew, the gift of fire. In his " philanthropic fashion," Prometheus stole fire, concealed in a hollow fennel stalk (Hesiod, Op. et Di.), and a fennel stalk is still used in the Greek islands as a means of carrying a light (cf. Pliny xiii. 22). According to some legends he gained the fire by holding a rod close to the sun. Probably the hollow fennel stalk in which fire was carried got its place in myth from the very fact of its common use.

We thus find Prometheus in the position of the fire-bringer, or fire-stealer, and so connected with a very wide cycle of similar mythical benefactors. Among the Murri of Gippsland, to begin with a backward people, the fire-stealer was a man, but he became a bird. Tow-e-ra, or fire, was in the possession of two women who hated the blacks. A man who loved men cajoled the women, stole fire when their backs were turned, and was metamorphosed into " a little bird with a red mark on its tail, which is the mark of fire." The fire-bringer in Brittany is the golden or fire-crested wren. Myths like this kill two birds with one stone, and at once account for the possession of fire by men and for the marking of certain animals regarded as fire-bringers. 1 In another Australian legend fire was stolen by the hawk from the bandicoot, and given to men. In yet another a man held his spear to the sun, and so got a light. A bird is fire-bringer in an Andaman island tale, and a ghost in another myth of the same island. 2 In New Zealand, Maui stole fire from Mauika, the lord of fire. He used a bird's inter- vention. Among the Ahts, in North America, 3 fire was stolen by animals from the cuttle-fish. Among the Thlinkeets, Yehl, the raven god, was the fire-stealer. Among the Cahrocs, the coyote steals fire from " two old women." Among the Aryans of India, Soma is stolen by birds, as water is among the Thlinkeets, and mead in the Edda. 4 Fire concealed himself, in the Veda, was dragged from his hiding place by Mataricvan, and was given to the priestly clan of Bhrigu. We also hear that Mataricvan " brought fire from afar " (R. V. iii. 9, 5), and that Bhrigu found fire lurking in the water (R. V. x. 46, 2). 6 In considering the whole question, one must beware of the

1 For these see Brough Smith with Howitt, Native Tribes of South- east Australia, Aborigines of Victoria; Kuhn, on bird fire-bringer in Isle of Man,

Vie Herabkunft des Feuers, p. 109; Van Gennep, Mythes et legendes d'Australie.

2 Journ. Anthrop. Inst. (Nov. 1884).

3 Sproat, Savage Life.

- *Bancroft, iii. 100; Aitareya brahmana, ii. 93, 203; Kuhn, op. cit.,*

6 Cf. Bergaigne, La Religion vidique, i. 52-56, and Kuhn's Herabkunft; and see the essays by Steinthal in appendix to English version, of Goldziher's Mythology among the Hebrews.

hasty analogical method of reasoning too common among mythologists. For example, when a bird is spoken of as the fire-bringer we need not necessarily conclude that, in each case, the bird means lightning. On the other hand, the myth often exists to explain the cause of the markings of certain actual species of birds. Again, because a hero is said to have stolen or brought fire, we need not regard that hero as the personification of fire, and explain all his myth as a fire-myth. The legend of Prometheus has too often been treated in this fashion, though he is really a culture hero, of whose exploits, such as making men of clay, fire-stealing is no more than a single example. This tendency to evolve the whole myth of Prometheus from a belief that he is personified fire, or the fire-god, has been intensified by Kuhn's ingenious and plausible etymology of the name npo/iij0eiis; The Greeks derived it from Trpoixrfiris, provident, and connected it with other such words as icpopvtfioiipm., ■Kpoixifina. They had also the proper name '~E,iri.p,rfitvs for the slow-witted brother of Prometheus who turned all the hero's wisdom to foolishness. Against these very natural etymologies the philologists support a theory that Prometheus is really a Greek form of pramantha (Skt.), the fire-stick of the Hindus. The process of etymological change, as given by Steinthal, was this. The boring of the Perpendicular in the horizontal fire- stick, whereby fire was kindled, was called manthana, from math, " I shake." The preposition pra was prefixed, and you get pramantha. But Mataricvan was feigned to have brought Agni, fire, and " the fetching of the god was designated by the same verb mathnami as the proper earthly boring " of the fire- stick. " Now this verb, especially when compounded with the preposition pra, gained the signification to tear off, snatch to oneself, rob." 6 Steinthal goes on: " Thus the fetching of Agni became a robbery of the fire, and the pramatha (fire-stick) a robber. The gods had intended, for some reason or other, to withhold fire from men; a benefactor of mankind stole it from the gods. This robbery was called pramatha; pramathyu-s is ' he who loves boring or robbery, a borer or robber.' From the latter words, according to the peculiarities of Greek phonology, is formed lipo/xridtv-s, Prometheus. He is therefore a fire-god,"

&c. Few things more ingenious than this have ever been done by philologists. It will be observed that " forgetfulness of the meaning of words " is made to account for the Greek belief that fire was stolen from the gods. To recapitulate the dpctrine more succinctly, men originally said, in Sanskrit (or some Aryan speech more ancient still), " fire is got by rubbing or boring;" nothing could have been more scientific and straightforward. They also said, " fire is brought by Mataricvan; " nothing could have been more in accordance with the mythopoeic mode of thought. Then the word which means " fetched " is confused with the word which means " bored," and gains the sense of " robbed." Lastly, fire is said (owing to this confusion) to have been stolen, and the term which meant the common savage fire-stick is by a process of delusion conceived to represent, not a stick, but a person, Prometheus, who stole fire. Thus then, according to the philologists, arose the myth that fire was stolen, a myth which, we presume, would not otherwise have occurred to Greeks. Now we have not to decide whether the Greeks were right in thinking that Prometheus only meant " the fore-sighted wise man," or whether the Germans know better, and are correct when they say the name merely meant " fire-stick." But we may, at least, point out that the myth of the stealing of fire and of the fire-stealer is current among races who are not Aryan, and never heard the word pramantha. We have shown that Thlinkeets, Ahts, Andaman Islanders, Australians, Maoris, South Sea Islanders, Cahrocs and others all believe fire was originally stolen. Is it credible that, in all their languages, the name of the fire-stick should have caused a confusion of thought which ultimately led to the belief that fire was obtained originally by larceny ? If such a coincidence appears incredible, we may doubt whether the belief that is common to Greeks and Cahrocs and Ahts was produced, in Greek minds by an etymo- logical confusion, in Australia, America and so forth by some 6 Cf. Kuhn, op. cit. pp. 16, 17.

other cause. What, then, is the origin of the widely-diffused myth that fire was stolen? We offer a purely conjectural suggestion. No race is found without fire, but even some civilized races have found the artificial reproduction of fire very tedious. Thus we read (Od. v. 488-493), " As when a man hath hidden away a brand in the black embers at an upland farm, one that hath no neighbour nigh, and so saveth the seed of fire that he may not have to seek a light otherwhere, even so did Odysseus cover him with the leaves." If, in the Homeric age, men found it so hard to get the seed of fire, what must the difficulty have been in the earliest dawn of the art of fire-making? Suppose, then, that the human groups of early savages are hostile. One group lets its fire go out, the next thing to do

would be to borrow a light from the neighbour, perhaps several miles off But if the neigh- bours are hostile the unlucky group is cut off from fire, igni inter- dicilur. The only way to get fire in such a case is to steal it. Men accustomed to such a precarious condition might readily believe that the first possessors of fire, wherever they were, set a high value on it, and refused to communicate it to others. Hence the belief that fire was originally stolen. This hypothesis at least explains all myths of fire-stealing by the natural needs, passions, and characters of men, " a jealous race," whereas the philological theory explains the Greek myth by an exceptional accident of changing language, and leaves the other widely diffused myths of fire-stealing in the dark. It would occupy too much space to discuss, in the ethnological method, the rest of the legend of Prometheus. Like the Australian Pundjel, and the Maori Tiki, he made men of clay. He it was who, when Zeus had changed his wife into a fly, and swallowed her, broke open the god's head and let out his daughter Athena. He aided Zeus in the struggle with the Titans. He was punished by him on some desolate hill (usually styled Caucasus) for fire-stealing, and was finally released by Heracles.

His career may be studied in Hesiod; in the splendid Prometheus vinctus of Aeschylus, with the scholia; in Heyne's Apollodorus; in the excursus (1) of Schiizius to the Aeschylean drama, and in the frequently quoted work of Kuhn. The essay of Steinthal may also be examined (Goldziher, Myth. Hebr., Eng. trans., p. 363-392), where the amused student will discover that " Moses is a Praman- thas," with much else that is as learned and convincing. See also Tylor's Early History of Man; Nesfield in Calcutta Review (January, April, 1884); and the article Fire. (A. L.)

PROMOTER, one who promotes (Lat. promovere, to move forward), advances or forwards any scheme, project or under- taking. The most general specific sense in which the word is now used is that of a person who takes the steps necessary to the incorporation of a joint-stock company (see Company) or to the passing of a private or local act of parliament. In legal history, a promoter was one who prosecuted offenders, originally as an officer of the Crown, later as a common informer; the term is still used thus of the prosecutor in a suit in an ecclesias- tical court.

PRONGBUCK, Pronghorn, or (in America) simply Antelope, the sole existing representative of a family (Antilocapridae) of hollow-horned ruminants in which the horn-sheaths are forked and annually shed and renewed. Standing about 3 ft. high at the shoulder and slightly more at the croup, the male prongbuck has the black horns rising vertically upwards immediately above the eyes. The general colour is bright sandy fawn, with much white on the face, three white bars on the throat and white under parts and buttocks. The white throat-bands are evidently protective; and

the long white hair on the buttocks can be erected and expanded into large chrysanthemum-like bunches as in Japanese deer; these being guides to the members of the herd when in flight. The tail is short; lateral hoofs are wanting; and the teeth are tall-crowned. Female prongbuck produce one or two young at a birth, and are either hornless or furnished with small and more or less rudimentary horns.

Prongbuck, of which two races, the typical Antilocapra americana and A. mexicana, are recognized by American naturalists, inhabit the open plains of the temperate districts of western North America, where they were formerly very abun- dant. Nowadays their numbers have become greatly diminished

and small and isolated bands represent the great herds of former years. Young prongbuck are very liable to be attacked by wolves; to protect them from these marauders the females first clear an area in the middle of a patch of cactus, by jumping on the plants with their sharp hoofs, and bring forth their offspring in the protected space. Certain extinct American ruminants, namely Cosoryx, Blastomeryx and Merycodus are believed to be in some way related to the prongbuck; but they have frontal appendages more like antlers than horns. In view of this presumed relation- ship it seems preferable to retain the family Antilocapridae rather than relegate it to the rank of a sub-family of Bovidae. (See Pecora.) (R. L.)*

PRONUNCIATION (Lat. pronuntiatio, from pronuntiare, proclaim, announce, pronounce), the action of pronouncing, the manner of uttering an articulate vocal sound (see Phonetics and Voice). The original sense of the Latin, a public declara- tion, is preserved in Spanish pronunciamiento, a manifesto or proclamation, especially as issued by a party of insurrection or revolution.

PRONY, GASPARD CLAIR FRANCOIS MARIE RICHE DE (1755ˆ1839), French engineer, was born at Chamelet, in the department of the Rhone, on the 22nd of July 1755, and was educated at the Ecole des Ponts et Chaussees. His Mimoire sur la poussee des voutes published in 1783, in defence of the principles of bridge construction introduced by his master J. R. Perronnet, attracted special attention. The laborious enter- prise of drawing up the famous Tables du Cadastre was entrusted to his direction in 1792, and in 1794 he was appointed professor of the mathematical sciences at the Ecole Polytechnique, becoming director at the Ecole des Ponts et Chaussees four years later. He was employed by Napoleon to superintend the engineering operations for protecting the province of Ferrara against the inundations of the Po and for draining and im- proving the Pontine Marshes. After the Restoration he was likewise engaged in regulating the course of the Rhone, and in several other important works.

He was made a baron in 1828, and a peer in 1835. He died at Asnieres (Seine) on the 29th of July 1839. For the " Prony Brake " see Dynamometer.

PROOF (in M. Eng. preove, proeve, preve, b°c, from O. Fr . prueve, proeve, &c, mod. preuve, Late. Lat. proba, probare, to prove, to test the goodness of anything, probus, good), a word of which the two main branches are derived from those of " to prove," viz. to show to be true, to test, to try. Of the first division the chief meanings are: that which establishes the truth of a fact or the belief in the truth, demonstration, for the nature of which see Logic. In law " proof " is the general term for the establishment of the material facts in issue in a particular case by proper legal means to the satisfaction of the court (see Evidence) ; specifically, documents so attested as to form legal evidence, written copies of what a witness is prepared to support on oath, and the evidence of any case in the court records are all termed " proofs." In Scots law the term is used of a trial before a judge alone as opposed to trial by jury. From the general sense of examination, trial or assay derived from " to prove," to test the quality of anything, " proof " is used of that which has succeeded in standing a trial or test; the commonest form in which this use appears is as a compound adjective, thus materials are said to be " waterproof," "armour-" "bullet-proof," and the like. The principal other uses are for a standard of strength for spirit (see Alcohol and Spirits) for a trial impression, in printing, on which corrections and additions can be made (see article Proof-Reading) and, in engraving and etching, for one of a limited number of impressions made before the ordinary issue is printed. In the earlier history of engraving a " proof " was an impression during the process of printing made for the artist's inspection, approval or correc- tion, whence its name. In the modern use of the term, where the impression has been taken before the inscription has been added to the plate, it is called a " proof before letter."

In bookbinding, some of the shorter or narrower leaves are left with rough edges, " uncropped," to show that the book has not been " cut," these are styled " proofs."

PROOF-READING, the art or business of correcting for the press the printed " proofs " of articles or books set in type before publication. The special business of a proof-reader, attached to a printing house, is to correct these proofs before they are shown to the author; he is an intermediary between the compositor and the author, and as such his functions may vary according to his capacities. Proof-reading as a dis- tinct

department in the work of a printing office does not date from the very earliest days of " the art preservative of all arts." The first products of the printing-press show abundant evidences of the' non-existence of any one specially charged with the duty of correcting the compositors' mistakes. How much conjectural emendation and consequent controversy would have been avoided if the First Folio Shakespeare had been more typographically correct! Sir Theodore Martin said that the typographical errors alone of that work had been computed to number nearly 20,000, which amounts to 2-25% of the total number of words in the volume. It was a usual practice in the 17th and 1 8th centuries for authors to send the proofs of their works round amongst their personal friends for correction; and in the univer- sities and colleges sheets of works passing through the press were frequently hung up in the quadrangles for public inspection and correction. With the growth of printing gradually came a demand for systematic proof-reading, and the leading printers engaged scholars and men of letters to read proofs for them. Among these may be mentioned Cruden, of Concordance fame (" Alexander the Corrector "), and William Julius Mickle, poet, and translator of Luiz de Camoens's Lusiads, who was a reader at the Clarendon Press. Goldsmith and Dr Johnson also are credited with having wielded the proof-reader's pen. Times, however, have changed since, as the elder D'Israeli wrote, " it became the glory of the learned to be correctors of the press to eminent printers," and to-day in every printing office the proof- reader is found — an unobtrusive functionary, known to publishers, authors, editors and journalists, but for the most part unknown to the general reading public; a functionary who yet does useful, often valuable, and always indispensable work. The influence of good proof-reading upon the character of book, newspaper and general printing is too often underrated. The celebrated old printing offices and the foremost of the modern ones owe their reputation for good workmanship largely to the excellence and thoroughness of the work done in their reading-rooms, for no perfection of paper, ink, machining or binding can atone for bad or slipshod typography.

The nature of the proof-reader's work, frequently monotonous and uninteresting, will be made clear by what follows. After the compositor (see Typography) has set up, by hand or type-setting machine, the " copy " supplied to him, a slip or page proof is pulled and sent with the manuscript to the proof- reader. The manuscript is then read aloud by a copy-holder, while the proof-reader carefully follows the text before him tetter by letter, marking on the margin of the proof all the mis- spellings, turned letters, " wrong fonts " (letters differing in size or style of face from those in the immediate context) and other errors, and seeing that the punctuation clearly defines the author's meaning. The copy-holder reads rapidly — indeed, an ordinary listener would imagine it to be impossible for the proof-

reader to understand him — and as the reader is obliged to keep pace, he goes through the proof again, without the aid of the copy-holder, in order to mark any errors that may have escaped him in the first rapid reading. The proof, called the " first proof," is then sent to the compositor to be corrected. When this has been done, a further proof is submitted to the reader, who, upon satisfying himself by careful revision that it is free from typographical mistakes, passes it as " clean." If the reader, when dealing with the first proof, notices any slips in grammar or errors of fact on the part of the writer, or is in doubt whether any particular word' in the manuscript has been correctly deciphered, he underlines the word or passage, and places " Qy." (query) in the margin. The proof is then despatched to the author or editor. On the return of the proof, after the writer's corrections and alterations have been carried

out, the type is made up into pages and sheets and another proof pulled. This passes into the hands of the press reader (as distinguished from the " first proof-reader "), who checks the headlines, page numbers, and sequence of chapters or sections, and observes that the pages are of uniform length and that a sufficient amount of margin is allowed, before finally reading through the text. When the press-reader's corrections have been effected, the work is ready for the printing machine or the stereotyping foundry.

The cost of proof-reading may be said to range from about 7§ to 20 % of the cost of composition, varying, of course, with the nature of the work.

Many prominent authors have expressed in warm terms their gratitude to the proof-reader for valuable assistance rendered by apt queries and pertinent suggestions. Two of these expressions of opinion may be given as typical, one from a novelist and one from a poet. Charles Dickens said: " I know from some slight practical experience what the duties of correctors of the press are, and how these duties are usually discharged. And I can testify, and do testify here, that they are not mechanical — that they are not mere matters of manipulation and routine; but that they require from those who perform them much natural intelligence, much super- added cultivation, considerable readiness of reference, quickness of resource, an excellent memory and a clear understanding. And I must gratefully acknowledge that I have never gone through the sheets of any book I have written without having had presented to me by the corrector of the press something I had overlooked — some slight inconsistency into which I had fallen — some little lapse I had made — in short, without having set down in black and white some unquestionable indication that I had been closely followed in my work by a patient and trained mind, and not merely by a skilful eye. In this declaration I have not the slightest doubt that the great body of my brother and sister writers would, as a plain act of justice,

heartily concur." Robert Browning thus corroborated Dickens: " I have had every opportunity of becoming acquainted with, and gratefully acknowledging, the extreme service rendered to me; and, if mine be no exceptional case, the qualifications of readers and correctors are important indeed." P. Larousse spoke of French proof-readers as his " collaborateurs les plus chers," and Hugo referred to them as those " modestes savants " so well able " lustrer les plumes du g6nie"; while the Academie Frangaise consulted them on points arising in the revision of the Academy's dictionary.

Though much good work is done by readers who have not been practical printers, yet the technical knowledge gained by working as a compositor is essential to the best ' proof-reading. The reader must possess a quick eye, alert to note every error or mechanical imperfection in the type, and must scrutinize closely every letter of every word, clause and sentence, while keeping a grasp of the sense of the matter he is dealing with. The more varied his information and the wider his knowledge, the better. Though his strict duty is merely to see that the author's copy is properly reproduced, he is always glad to give the author the benefit of the experience and knowledge he has acquired, and, as a consequence, he is constantly crossing the line which separates proof-reading from sub-editorial duties. From this last consideration has arisen the plea for the reader, on the daily press especially, being placed under the control of, and made responsible to, the editorial department rather than the head of the composing-room.

Proof-readers in Great Britain have a trade union, and many of them retain membership of the unions to which they belonged when working as compositors; and in some states of the American Union as well as in Scotland the compositors insist upon readers being also members of their society. The oldest English organization devoted entirely to the interests of proof-readers is the Association of Correc- tors of the Press, founded in 1854. The chief aim of the association is to give its members information as to vacant situations, so as to keep them in full employment; but it also assists members in distress from its benevolent fund, and provides pensions, as well as a sum of money at death. There is in France the Societe des correc- leurs des imprimeries de Paris. There are also proof-readers' societies in several American cities, many of whose members are women, for in the United States women bulk largely in the rank of proof-readers. There are very few women proof-readers in London. In Edinburgh, however, women form a considerable proportion of the proof-readers. (J-A. Bl. ; J. R.)*

PROPAGATION, the multiplication of a species by natural processes of reproduction (q.v.). The Latin propagare meant to fasten down {pro- and pangere, to fasten) layers, shoots or

slips (propagines) of plants for the purpose of reproduction, hence to generate, reproduce and generally to extend or increase. It is in this sense that " propagation " is used of the spreading or dissemination of doctrines, ideas, opinions, &c. The term "propaganda," often wrongly used as a plural word, means properly an organization or association for the spreading of particular beliefs or opinions, and is an adapta- tion of the name of that committee of cardinals in the Roman curia which supervises foreign missions, the full title being Congregatio de propaganda fide.

PROPELLANTS, a generic name for explosives used for propelling projectiles from guns and other firearms, in order to distinguish them from the more violent explosives used in shells, mines, &c, to produce a blasting effect. Some explosive substances can be used both as propellants and as bursters, as for example gunpowder, and some of the ingredients of a propellant may be similar, though differently proportioned and combined, to those of a " high explosive;" (For details see Explosives; Gunpowder; Cordite, &c.)

PROPERTIUS, SEXTUS {ft. 30-15 B.C.), the greatest of the elegiac poets of Rome, was born of a well-to-do Umbrian family at or near Asisium (Assisi), the birthplace also of the famous St Francis. We learn from Ovid that Propertius was his senior, but also his friend and companion; and that he was third in the sequence of elegiac poets, following Gallus, who was born in 69 B.C., and Tibullus, and immediately preceding Ovid himself, who was born in 43 B.C. We shall not then be far wrong in supposing that he was born about 50 B.C. His early life was full of misfortune. He lost his father prematurely; and after the battle of Philippi and the return of Octavian to Rome, Propertius, like Virgil and Horace, was deprived of his estate to provide land for the veterans, but, unlike them, he had no patrons at court, and he was reduced from opulence to comparative indigence. The widespread discontent which the confiscations caused provoked the insurrection generally known as the helium perusinum from its only important incident, the fierce and fatal resistance of Perugia, which deprived the poet of another of his relations, who was killed by brigands while making his escape from the lines of Octavian. The loss of his patrimony, however, thanks no doubt to his mother's providence, did not prevent Propertius from receiving a superior education. After, or it may be, during its completion he and she left Umbria for Rome; and there, about the year 34 B.C., he assumed the garb of manly freedom. He was urged to take up a pleader's profession; but, like Ovid, he found in letters and gallantry a more congenial pursuit. Soon afterwards he made the acquaint-

ance of Lycinna, about whom we know little beyond the fact that she subsequently excited the jealousy of Cynthia, and was subjected to all her powers of persecution (vexandi). This passing fancy was succeeded by a serious attachment, the object of which was the famous " Cynthia." Her real name was Hostia, and she was a native of Tibur. She was a courtesan of the superior class, somewhat older than Propertius, but, as it seems, a woman of singular beauty and varied accomplishments. Her own predilections led her to literature; and in her society Proper- tius found the intellectual sympathy and encouragement which were essential for the development of his powers. Her character, as depicted in the poems, is not an attractive one; but she seems to have entertained a genuine affection for her lover. The intimacy began in 28 and lasted till 23 B.C. These six years must not, however, be supposed to have been a period of un- broken felicity. Apart from minor disagreements an infidelity on Propertius's part excited the deepest resentment in Cynthia; and he was banished for a year. The quarrel was made up about the beginning of 25 B.C.; and soon after Propertius published his first book of poems and inscribed it with the name of his mistress. Its publication placed him in the first rank of con- temporary poets, and amongst other things procured him ad- mission to the literary circle of Maecenas. The intimacy was renewed; but the old enchantment was lost. Neither Cynthia nor Propertius was faithful to the other. The mutual ardour gradually cooled; motives of prudence and decorum urged the

discontinuance of the connexion; and disillusion changed in- sensibly to disgust. Although this separation might have been expected to be final, it is not certain that it was so. It is true that Cynthia, whose health appears to have been weak, does not seem to have survived the separation long. But a careful study of the seventh poem of the last book, in which Propertius gives an account of a dream of her which he had after her death, leads us to the belief that they were once more reconciled, and that in her last illness Cynthia left to her former lover the duty of carrying out her wishes with regard to the disposal of her effects and the arrangements of her funeral. Almost nothing is known of the subsequent history of the poet. He was alive in 16 B.C., as some allusions in the last book testify. And two passages in the letters of the younger Pliny mention a descen- dant of the poet, one Passennus Paullus. Now in 18 B.C. Augustus carried the Leges Juliae, which offered inducements to marriage and imposed disabilities upon the celibate. Proper- tius then may have been one of the first to comply with the new enactments. He would thus have married and had at least one child, from whom the contemporary of Pliny was descended. Propertius had a large number of friends and acquaintances, chiefly literary, belonging to the circle of Maecenas. Amongst these may be mentioned Virgil, the epic poet Ponticus, Bassus (probably the iambic poet

of the name), and at a later period Ovid. We hear nothing of Tibullus, nor of Horace, who also never mentions Propertius. This reciprocal silence is probably significant. In person Propertius was pale and thin, as was to be expected in one of a delicate and even sickly constitution. He was very careful about his personal appearance, and paid an almost foppish attention to dress and gait. He was of a some- what voluptuous and self-indulgent temperament, which shrank from danger and active exertion. He was anxiously sensitive about the opinion of others, eager for their sympathy and re- gard, and, in general, impressionable to their influence. His over-emotional nature passed rapidly from one phase of feeling to another; but the more melancholy moods predominated. A vein of sadness runs through his poems, sometimes breaking out into querulous exclamation, but more frequently venting itself in gloomy reflections and prognostications. He had fits of superstition which in healthier moments he despised.

The poems of Propertius, as they have come down to us, consist of four books containing 4046 lines of elegiac verse. The first book, or Cynthia, was published separately and early in the poet's literary life. It may be assigned to 25 B.C. The dates of the publication of the rest are uncertain, but none of them was published before 24 B.C., and the last not before 16 B.C. The unusual length of the second one (1402 lines) has led Lach-mann and other critics to suppose that it originally consisted of two books, and they have placed the beginning of the third book at ii. 10, a poem addressed to Augustus, thus making five books, and this arrangement has been accepted by several editors.

The subjects of the poems are threefold: (1) amatory and personal, mostly regarding Cynthia — seventy-two (sixty Cynthia elegies), of which the last book contains three; (2) political and social, on events of the day — thirteen, including three in the last book; (3) historical and antiquarian — six, of which five are in the last book.

The writings of Propertius are noted for their difficulty and their disorder. The workmanship is unequal, curtness alterna- ting with redundance, and carelessness with elaboration. A desultory sequence of ideas, an excessive vagueness and in- directness of expression, a peculiar and abnormal latinity, a constant tendency to exaggeration, and an immoderate indul-gence in learned and literary allusions — all these are obstacles lying in the way of a study of Propertius. But those who have the will and the patience to surmount them will find their trouble well repaid. For power and range of imagination, for freshness and vividness of conception, for truth and originality of presenta- tion, few Roman poets can compare with him when he is at his best. And this is when he is carried out of himself, when the discordant qualities of his genius are, so to say, fused together

by the electric spark of an immediate inspiration. His vanity and egotism are undeniable, but they are redeemed by his fancy and his humour.

Two of his merits seem to have impressed the ancients them- selves. The first is most obvious in the scenes of quiet descrip- tion and emotion in whose presentation he particularly excels. Softness of outline, warmth of colouring, a fine and almost voluptuous feeling for beauty of every kind, and a pleading and melancholy tenderness — such were the elements of the spell which he threw round the sympathies of his reader, and which his compatriots expressed by the vague but expressive word blanditia. His poetic facundia, or command of striking and appropriate language, is more noticeable still. Not only is his vocabulary very extensive, but his employment of it extra- ordinarily bold and unconventional. New settings of use, idiom and construction continually surprise us, and, in spite of occa- sional harshness, secure for his style an unusual freshness and freedom. His handling of the elegiac couplet, and especially of its second line, deserves especial recognition. It is vigorous, varied and even picturesque. In the matter of the rhythms, caesuras and elisions which it allows, the metrical treatment is much more severe than that of Catullus, whose elegiacs are comparatively rude and barbarous; but it is not bound hand and foot, like the Ovidian distich, in a formal and conventional system. An elaborate symmetry is observable in the con- struction of many of his elegies, and this has tempted critics to divide a number of them into strophes.

Propertius's poems bear evident marks of the study of his predecessors, both Greek and Latin, and of the influence of his contemporaries. He tells us himself that Callimachus and Philetas were his masters (iii. i, seq.), and that it was his ambition to be the Roman Callimachus (iv. i, 64). But, as Teufiel has said, his debt to these writers is chiefly a formal one. Even into his mythological learning he breathes a life to which these dry scholars are strangers. We can trace obligations to Meleager, Theocritus, Apollonius Rhodius and other Alexandrines, and amongst earlier writers to Homer, Pindar, Aeschylus and others. Propertius's influence upon his successors was considerable. There is hardly a page of Ovid which does not show obligations to his poems, while other writers made a more sparing use of his stories.

A just appreciation of the genius and the writings of Proper- tius is made sensibly more difficult by the condition in which his works have come down to us. Some poems have been lost; others are fragmentary; and many are

more or less disfigured by corruption and disarrangement. The manuscripts on which we have to rely are both late and deeply interpolated. Thus the restoration and interpretation of the poems is one of peculiar delicacy and difficulty.

On the Propertii see Mommsen in Hermes, iv. 370; Haupt, Opusc. i. 282. Inscriptions of Propertii have been found at Assisi. Pro- pertius's family was not " noble," ii. 34, 55, 6, and ii. 2MSS. Asis.), " the climbing walls of his town " (scandentes arces, scandens murus, iv. 1 , 65 and loc.cit.) , its nearness to Perugia, and its position close above the plain (i. 22, 9, 10) are decisive for Asisium as the birthplace of Propertius. Ovid thus assigns Propertius his place: successor fuit hie (Tibullus), tibi, Galle: Propertius Mi (Tibullo): Quartus ab his serie temporis ipse fui (Tr. iv. 10, 53, 54) (cf. ib., ii. 467). For Ovid's friendship with Propertius see below — iv. i, 121 seq. is the chief authority for the earlier events of his life, 127 seq. : "Ossaque legisti non ilia aetate legenda Patris et in tenues cogeris ipse Lares. Nam tibi cum multi versarent rura iuvenci Abstulit excultas pertica tristis opes." Elsewhere he says that he is " non ita dives " ii. 24, loc. cit.) and that he had " nulla domi fortuna relicta," ii. 34, loc. cit. His living on the Esquiline, iii. 23, 24, points to a competence. For the death of his kinsman, generally supposed to be the Gallus of i. 21, see i. 22, 5-8. Propertius's mother is mentioned more than once, in very affectionate terms in i., ii. 21. She was dead when iii. 13 (n) was written, i.e. six months after the publication of the first book. For the quality of Propertius's education, the poems themselves are the only, but a sufficient, testimony. For Lycinna see iii. 15, 3-10, 43. Cynthia (Hostia) was a native of Tibur (iv. 7, 85), and probably a \ grand-daughter (iii. 20, 8) of L. Hostius, who wrote a poem on the , Illyrian War of 178 B.C., of which some fragments are preserved. She was older than Propertius (ii. 18, 20). That she was a meretrix is clear from many indications — her special accomplishments, her

house in the Subura, the occurrence of scenes like those in i. 3, ii. 29, the fact that Propertius could not marry her, &c. For references to her beauty see ii. 2, 5 sqq. and 3, 9 sqq. ; ii. 13, 23, 24 ; to her poetry, ii. 3, 21 ; to other accomplishments, i. 2, 27 seq.; iii. 20, 7 seq. She was fickle (i. 15, ii. 6, &c), avaricious (ii. 16, n, 12), fond of finery (ii- 3, 15. 16), violent of temper (iii. 8; i. 4, 18 seq.). For the five years see iii. 25, 3, " quinque tibi potui servire fideliter annos "; and for the year of estrangement, iii. 16, 9, " peccaram semel, et totum sum pulsus in annum." The second separation is vouched for by the two last elegies of book iii. For the evidence which iv. 7 furnishes in favour of a reconciliation see Postgate {Prop. Introd. p. xxv. seq.); iv. 6 commemorates the celebration of the ludi quinquennales, in 16 B.C., and iv. II, 66 alludes to the consul- ship of P. Scipio in the same year. For Passennus Paullus (or as an Assisi inscription calls him C. Passennus

Sergius Paullus Proper- tius Blaesus), see Pliny (Ep. vi. 15), " municeps Properti atque etiam inter maiores Propertium numerat" ; (9, 22), " in litteris veteres aemulatur exprimit reddit: Propertium in primis a quo genus ducit, vera suboles eoque simillima illi in quo ille praecipuus, si elegos eius in manum sumpseris, leges opus tersum molle iucundum et plane in Properti domo scriptum." ii. 1 and iii. 9 are addressed to Maecenas, ii.,10 to Augustus. Virgil is spoken of in the highest terms in ii. 34, 61 seq. Other poems are addressed to Ponticus (i. 7, 9), Bassus (i. 4), Lynceus, a tragic poet (i. 19, ii. 34). In Ep. ii.

2, 87 seq., Horace has been thought to make a direct attack on Propertius. On Propertius's personal appearance, see i. I, 22, 5, 21. A likeness of him has possibly been preserved in a double Hermes in the Villa Albani and the Vatican, which represents a young beardless Roman, of a nervous and somewhat sickly appearance, together with a Greek poet (Visconti, Iconograph. romana, pi. 14,

3, 4). Ill health is proved by i. 15 and the frequent references to death and burial — i. 19, ii. I, 71 sqq., ii. 13, 17 sqq. For his care about dress and the like see ii. 4, 5, seq. For want of courage and energy see ii. 7, 14, ii. 19, 17-24; and for superstitious leanings, ii. 27, ii. 4, 15, iv. 5, 9 seq. The four-book numbering is now the current one and is adopted in this article though there is little doubt that there were originally four books besides the Cynthia. Few of the poems can be dated with certainty, but those that can, with the exception of iv. 6 and n, fall between the years 28 and 23 B.C. For ancient references to Propertius as a writer see Quint. x. I, 93 (where it is stated that some (not Quintilian) preferred him to Tibullus), Ov. A. A. iii. 333; Tr. iii. 465, v. 1, 17; Mart. xiv. 189, viii. 73; Pliny, loc. cit. above, Stat. Silv. i. 2, 253.

There is no existing MS. of Propertius older than the 12th century. Up till the publication of Bahrens's edition (1880), the oldest one, Neapolitanus (N., now at Wolfenbiittel) , was universally regarded as the best, and even now critics are found to maintain its paramount claims. But the more judicious admit the value of the four MSS. collated by Bahrens. Vossianus, c. 1300 (A); Laurentianus, end of 14th century (F); Ottoboniano-Vaticanus, 15th century (V); Daventriensis, 15th century (D), to which has to be added the Holkhamicus, 142 1 (L), collated by Postgate, Cambridge Philological Transactions (1894) vol. iv.

*The editio princeps of Propertius is that of 1472 (Venice). Among later editions we may mention the following, those with explanatory or critical notes being marked with an asterisk: *Scaliger (1577, &c), *Brouldiusius (2nd. ed., 1577), *Passeratius (1608, with index verborum), *Vulpir.o (1755, with index verborum), *P. Burmann (and Santen) (1780),*

**Lachmann (1816), *Hertzberg (1843-1845), L. Miiller (1870), Haupt-Vahlen (last ed., 1904), *Bahrens (1880), *A. Palmer (1.-80), *Postgate (1881), selections with introduction (text with critical notes in the Corpus poetarum latinorum, 1894, also issued separately), :;: Rothstcin (1898), *H. E. Butler (1905), indc:; verborum (to '.ic own te; i), J. S. Phillimore (1906), A. E. Housman (without publishing an edition) has done much to improve and explain, the poems. For further information we may refer to F. Plessis, Etudes critiques sur Properce et ses elegies (1886), and the sections on the poet in Teuffel's and Schanz's Histories of Roman Literature.*

The following translations into English verse are known : G. F. Nott (1782), bk. i. ; C. A. Alton, selections in his Specimens of the Classic Poets (1814), ii. 215 seq.; C. R. Moore (1870) ; J. Cranstoun (1875); F. A. Paley (1866), verse translations from bk. v. with notes; also a few translations by the poet Gray, vol. i. (Gosse, 1884); S. G. Tremenheere (1899), bk. i. Prose translations: P. J. F. Gantillon (with Nott's and Elton's versions, Bohn, 1848); J. S. Phillimore (1906). (J. P. P.)

PROPERTY, that which is peculiarly one's own, that which belongs to or is characteristic of an individual. The Latin pro- prietas (formed from proprius, one's own, possibly derived from prope, near) in post-Augustan times was extended to ownership and rights of possession. It is thus, in law, the generic term for rights of ownership and for things subject to the rights of ownership. It is " the most comprehensive of all terms which can be used, inasmuch as it is indicative and de- scriptive of every possible interest which the party can have " (see Langdale, M. R., in Jones v. Skinner, 1835, 5 L. J. Ch. 90).

In Roman law and in modern systems of law based on it, pro- perty is divided into " movables " and " immovables " ; in English law, on the other hand, the division is into personal property, including chattels real, and real property (see Personal Pro- perty and Real Property). Theatrical usage has given a specific meaning to the word, that of any article used on the stage during the performance of a play.

*PROPHET (irpo4>r)Tr)s) , a word taken from the vocabulary of ancient Greek religion, 1 which passed into the language of Christianity, and so into the modern tongues of Europe, because it was adopted by the Hellenistic Jews as the rendering of the Hebrew *>ii (ndbhi" pi., nebhllm). The word therefore as we use it is meant to convey an idea which belongs to Hebrew and not to Hellenic belief.*

That the word ndbhi", "prophet," originally signified one who speaks or announces the divine will, is rendered highly probable by a comparison of the Assyrian nabu, meaning (a) to " call " or " name," (b) " announce " (see Delitzsch, Hand- worterbuch sub voce). The Babylonian deity Nabu (in Old Testament Nebo) is a contraction from Na-bi-u, which thus corresponds closely with the Hebrew ndbhi" and originally signified the speaker or proclaimer of destiny. He was repre- sented as the writer of the tablets of destiny, and was therefore regarded as the interpreter of oracles (see Zimmern, K. A. T. 3 pp. 400, 404). Accordingly this derivation is preferable to that suggested by earlier Semitists from Gesenius to (in recent times) Kautzsch ("Religion of Israel," Hastings's Diet. Bible, extra vol., p. 652 footnote), and Cheyne (Ency. Bibl. col. 3853), which connects it with another verbal root naba, "bubble " or " gush." This Davidson (" Prophecy and Prophets," Hastings's Diet. Bible, p. 108 footnote) rightly rejects. While he connects it with the Arabic root naba' a," come into promin- ence " (conj. II. " announce,") he ends by ascribing to it an ultimate Babylonian origin. Zimmern (K.A.T. 3 p. 590) gives the name of a priest-official munambu (lit. " howler "), which is derived from a Piel of nabu, viz. nubbu (= numbu), " bawl " or " howl." A brief sketch will be given (1) of the history of Hebrew prophecy (in supplement to what has been already said in the article Hebrew Religion or is to be found in the articles devoted to individual prophets), and (2) of prophecy in the early Christian Church.

1. The Prophets of the Old Testament. — The author of 1 Sam. ix. 9 tells us that " beforetime in Israel, when a man went to inquire of God, thus he spake, Come and let us go to the seer; for he that is now called a prophet (ndbhi") was beforetime called a seer." This remark is probably a later gloss. Samuel was a "seer" (ver. n), or, as he is also called (ver. 6 seq.), a " man of God," that is one who stood in closer relations to God than ordinary men; " all that he said was sure to come to pass," so that he could be consulted with advantage even in private matters like the loss of the asses of Kish. The narrative of 1 Sam. ix. belongs, as Budde has demonstrated, to the older stratum of the narrative (called J) which

1 According to Plato (Timaeus, p. 72) the name ˆ0ˆ17×175 ought properly to be confined to the interpreters employed to put an intelligible sense on the dreams, visions, or enigmatic utterances of the frenzied juan- is. But in ordinary Greek usage the prophet of any god is in general any human instrument through whom the god declares himself; and the tendency was " to reserve the name for unconscious interpreters of the divine thought, and for the ministers of the oracles in general " (Bouch6-Leclercq, Hist, de la divination, 1880, ii. 11). This probably facilitated the adoption of the term by the Hellenists of Alexandria, for, when Philo distinguishes the prophet from the spurious diviner by saying that the latter applies his own inferences to omens and the like while the true prophet,

rapt in ecstasy, speaks nothing of his own, but simply repeats what is given to him by a revelation in which his reason has no part (ed. Mangey, ii. 321 seq., 343; cf. i. 510 seq.), he follows the prevalent notion of the later Jews, at least in so far as he makes the function of the prophet that of purely mechanical reproduction ; cf. John xi. 51, ana the whole view of revelation presupposed in the Apocalyptic literature. But in any case the Greek language hardly offered another word for an organ of revelation so colourless as irpi)Tris, while the condition of etymology among the ancients made it possible to interpret it as having a special reference to pre- diction (so Eusebius, Dem. Ev. v., deriving it from itpo4 > alvo >).

The Seer.

The Dervish.

includes ix., x. 1-16, xi. i-n, 15, xiii., xiv. 1-16 in which Samuel is a priest-seer of a provincial town, without the high functions of government as Shophet. We must not suppose that the word " prophet " had merely become more common in his time and supplanted an older synonym. This is clearly shown a few verses farther down, where we see that there were already in Samuel's time people known as nebhiim, but that they were not seers. The seer (rdeh) appears individually, and his function was probably not so much one of speech as of the routine of close ob- servation of the entrails of slaughtered victims, like the Assyrian barii (see Priest). It is in this way that the function of the seer is closely connected (as in the case of Balaam) with sacri- fices. With the prophets it is quite otherwise; they appear not individually but in bands; their prophesying is a united exercise accompanied by music, and seemingly dance-music; it is marked by strong excitement, which sometimes acts con- tagiously, and may be so powerful that he who is seized by it is unable to stand, 2 and, though this condition is regarded as pro- duced by a divine afflatus, it is matter of ironical comment when a prominent man like Saul is found to be thus affected. Samuel in his later days appears presiding over the exercises of a group of nebhiim at Ramah, where they seem to have had a sort of coenobium (Naioth), but he was not himself a ndbhi" — that name is never applied to him except in 1 Sam. iii. 21, where it is plainly used in the later sense for the idea which in Samuel's own time was expressed by " seer."

But again this special type of nebhiim seems to have been a new thing in Israel in the days of Samuel. Seers there had been of old as in other primitive nations; of the two Hebrew words literally corresponding to our seer, rdeh and hozeh, the second is found also in Arabic, and seems to belong to the primitive Semitic vocabulary. 3 But the enthusi- astic bands of prophets are nowhere mentioned before the time of Samuel; and in the whole previous history the word prophet occurs very rarely, never in the

very oldest narratives, and always in that sense which we know to be later than the age of Samuel, so that the use of the term is due to writers of the age of the kings, who spoke of ancient things in the language of their own day. The appearance of the nebhiim in the time of Samuel was, it would seem, as is explained in the article Hebrew Religion, one manifestation of the deep pulse of suppressed indignant patriotism which began to beat in the hearts of the nation in the age of Philistine oppression, and this fact explains the influence of the movement on Saul and the interest taken in it by Samuel.

It was perhaps only in time of war, when Israel felt himself to be fighting the battles of Yahweh, that the Hebrew was stirred to the depths of his nature by emotions of a religious colour. Thus the deeper feelings of religion were embodied in warlike patriotism, and these feelings the Philistine oppression had raised to extreme tension among all who loved liberty, while yet the want of a captain to lead forth the armies of Yahweh against his foemen deprived them of their natural outlet.

In its external features the new phenomenon was exceedingly like what is still seen in the East in every zikr of dervishes — the enthusiasm of the prophets expressed itself in no artificial form, but in a way natural to the Oriental temperament. Pro- cessions with pipe and hand-drum, such as that described in 1 Sam. x., were indeed a customary part of ordinary religious feasts; but there they were an outlet for natural merriment, here they have changed their character to express an emotion more sombre and more intense, by which the prophets, and often mere chance spectators too, were so overpowered that they

2 I Sam. x. 5 seq., xix. 20 seq. In the latter passage read " they saw the fervour of the prophets as they prophesied, &c." (see Hoffmann in Stade's Zeitschr. 1883, p. 89), after the Syriac.

3 Hoffmann, ut supra, p. 92 seq. Rdeh, however, occurs very rarely in early, i.e. pre-exilian, Hebrew, viz. in I Sam. ix. 9, Isa. xxx. 10. We have several in the late literature of Chronicles. Accordingly we lack the materials for determining the distinction which probably existed between the rdeh, the hozeh and the kosem. Cheyne, art. " Prophetic Literature " in Ency. Bib., col. 3858, appears to identify them.

seemed to lose their old personality and to be swayed by a supernatural influence. More than this hardly lies in the expression " a divine spirit " (dm'jn mi), which is used not only of the prophetic afflatus but of the evil frenzy that afflicted Saul's later days. The Hebrews had a less narrow conception of the spiritual than we are apt to read into their records.

To give a name to this new phenomenon the Israelites, it would seem, had to borrow a word from their Canaanite neigh- bours. At all events the word ndbhi" is neither part of the old Semitic vocabulary (in Arabic it is a late loan word) nor has it any etymology in Hebrew, the cognate words " to prophesy " and the like being derived from the noun in its technical sense. But we know that there were nebhlim among the Canaanites; the " prophets " of Baal appear in the history of Elijah as men who sought to attract their god by wild orgiastic rites. In fact the presence of an orgiastic character is as marked a feature in Canaanite religion as the absence of it is in the oldest religion of Israel; but the new Hebrew enthusiasts had at least an external resemblance to the devotees of the Canaanite sanctuaries and this would be enough to determine the choice of a name which in the first

instance seems hardly to have been a name of honour. In admitting 1 that the name was borrowed, we are not by any means shut up to suppose that the Hebrew nebhlim simply copied their Canaan- ite neighbours. The phenomenon is perfectly intelligible with- out any such hypothesis. A wave of intense religious feeling passes over the land and finds its expression, according to the ordinary law of oriental life, in the formation of a sort of enthusiastic religious order. The Nazarites and the Rechabites are parallel phenomena, though of vastly inferior historical importance.

It may be assumed that the name ndbhi", while it originated from Babylonian sources, reached Israel through Canaanite channels (cf. Kautzsch, " Religion of Israel," in Hastings's Diet. Bible extra vol., p. 653). Some support is given to this view by (a) the statement in 1 Kings xviii. 19 that four hundred prophets of Baal and Asherah sat at Jezebel's table; (b) the fact that Deborah, Samuel, Elijah, Elisha, Micaiah ben Imlah, the most notable of the earlier representatives of prophecy, belong to northern Israel, which was more subject to Canaanite- Phoenician influence.

It is certainly probable that the ndbhi" emerged by a process of continued development, of which the intermediate stages are lost, from the older rdeh, as the explanatory gloss in 1 Sam. ix. 9 evidently intimates. Samuel himself is called a rdeh. We may assume that like the practice of the soothsaying priest (the earlier type of priest) and of the kdsem (diviner), so the procedure of the rdeh was mechanical and magical in character. Clear indications of a primitive magical modus operandi appear as survivals in the narratives of the pre-exilian prophets. The wonder-working staff of Elisha (2 Kings iv. 29, 31) is one of these indications. There are likewise traces of survival in the exam- ples of " sympathetic magic " transformed into the acted parable of prophecy. Students of Tallquist's Maklu series of incanta- tion or of the surpu series edited by Zimmern (in his Beitrdge zur Kenntniss der Babylonischen Religion) will recollect the images over which the priest sorcerer recites his formulae. The accompanying actions (tying knots, &c.) which he performs are assumed to work themselves out on the enemy whose evil eye or sorcery is blasting the happiness of the suppliant (see Hastings's Did. Bible, " Magic," p. 209, where examples are cited). The signs or symbolic acts of the prophet probably originated in the actions of sympathetic magic. Thus in the vivid scene of 1 Kings xxii. 11 the iron horns of Zedekiah ben Kena'nah, and in 2 Kings xiii. 15-19 the magic of the arrow shot eastward and of the thrice stricken floor, are evident survivals of an older practice. The 1 If this account of the origin of the nebhlim is correct (cf. Kuenen, Prophets, Eng. trans., p. 554 seq.), the etymological sense of the word x'21 is comparatively unimportant. The root seems to mean " to start up," " to rise into prominence," and so " to become audible." This is based on the Arabic naba'a; see the remarks at the beginning of this article.

magical act passes into sign or symbol, not however without the accompanying conception that underlies it still persisting that a mysterious effectuating potency belongs to the symbolic act. The mystic power of a significant name Maker shdlai hash baz inscribed on a tablet and bestowed on a child (Isa. viii. 1-4, cf. xx. 2 sqq.), of the " thongs and bars " of Jer. xxvii. (in which contending prophets confront one another in a contest of symbols), of the linen girdle of ch. xiii. 1 sqq., and of the potter's vessel of xix. 1 sqq., are further illustrations of survivals from the old world of magic. The symbol gradually passes into mere metaphor, and we already begin to see this when we compare Ezekiel's oracles and those of the Deutero-Isaiah with the records of the words and deeds of earlier prophets.

The peculiar methods of the prophetic exercises described in 1 Sam. were of little consequence for the future development of prophecy. The heat of a first enthusiasm neces- prophetic sarily cooled when the political conditions that Societies produced it passed away; and, if the prophetic ""OUds. associations had done no more than organize a new form of spiritual excitement, they would have only added one to the many mechanical types of hysterical religion which are found all over the East. Their real importance was that they embodied an intenser vein Of feeling than was expressed in the ordinary feasts and sacrifices, and that the greater intensity was not artificial, but due to a revival of national sentiment. The worship of the local sanctuaries did nothing to promote the sense of the religious unity of Israel; Yahweh in the age of the Judges ran no small risk of being divided into a number of local Baals, givers of natural good things each to his own locality. The struggle for freedom called forth a deeper sense of the unity of the people of the one Yahweh, and in so doing raised religion to a loftier plane; for a faith which unites a nation is necessarily a higher moral force than one which only unites a township or a clan. The local worships, which subsisted unchanged during the greater part of the Hebrew kingship, gave no expression to this rise in the religious consciousness of the nation; on the contrary, we see from the prophetic books of the 8th century that they lagged more and more behind the progress of religious thought. But the prophetic societies were in their origin one symptom of that upheaval of national life of which the institution of the human sovereign reigning under the divine King was the chief fruit; they preserved the traditions of that great movement; they were, in however imperfect a way, an organ of national religious feeling, and could move forward with the movement of national life. And so, though we cannot follow the steps of the process, we are not surprised to learn that they soon had an established footing in Israel, and that the prophets came to be recognized as a standing sacred element in society. What was their precise place in Hebrew life we hardly know but they formed at least a religious class which in all its traditions repre- sented the new national and not the

old communal and particu- laristic life. One characteristic point which appears very early is that they felt themselves called upon to vindicate the laws of divine righteousness in national matters, and especially in the conduct of the kings, who were not answerable to human authority. The cases of Nathan and David in the matter of Uriah, of Elijah and Ahab after the judicial murder .of Naboth, will occur to everyone, and from the Hebrew standpoint the action of Gad in the matter of the census taken by David belongs to the same category. Such interventions with an Eastern king demanded great moral courage, for, though to some extent protected by their sacred character, the persons of the prophets were by no means legally inviolable (1 Kings xix. 2, xxii. 27; 2 Kings vi. 31). It is far from easy to determine how far the development of the class of prophets meant the absorption into it of the old seers. Probably both coexisted for some time. At all events we know from Isa. iii. 2, 3, that in Isaiah's time the kdsem still held an important place in society as well as the prophet and the magician. The functions of rdeh and ndbhi" may indeed at first have been mingled. The great prophecy of I Nathan (2 Sam. vii.) is of too disputed a date to be cited in

Nathan.

Elijah.

evidence, 1 but already in David's time we find that Gad the ndbhF is also the king's seer (2 Sam. xxiv. 11; cf. 1 Sam. xxii. 5), and by-and-by it comes to be clearly understood that the prophets are the appointed organ of Yahweh's communications with His people or His king. The rise of this function of the prophets is plainly parallel with the change which took place under the kings in the position of the priestly oracle; the Torah of the priests now dealt rather with permanent sacred ordinances than with the giving of new divine counsel for special occasions. Yahweh's ever-present kingship in Israel, which was the chief religious idea brought into prominence by the national revival, demanded a more continuous manifestation of His revealing spirit than was given either by the priestly lot or by the rise of occasional seers; and where could this be sought except among the prophets? It does not, of course, follow that everyone who had shared in the divine afflatus of prophetic enthusiasm gave forth oracles; but the prophets as a class stood nearer than other men to the mysterious workings of Yahweh, and it was in their circle that revelation seemed to have its natural home. A most instructive passage in this respect is 1 Kings xxii., where we find some four hundred pro- phets gathered together round

the king, and where it is clear that Jehoshaphat was equally convinced, on the one hand, that the word of Yahweh could be found among the prophets, and on the other that it was very probable that some, or even the mass of them, might be no better than liars. And here it is to be observed that Micaiah, who proved the true prophet, does not accuse the others of conscious imposture; he admits that they speak under the influence of a spirit proceeding from Yahweh, but it is a lying spirit sent to deceive. The sublime and solitary figure of Elijah, whom we are apt to take as the typical figure of a prophet in the old kingdom, has little in common with the picture even of the true prophet which we derive from 1 Kings xxii.; and when his history is carefully and critically read it is found to give no reason to think that he stood in any close relation to the prophetic societies of his time. He is a man of God, like Moses and Samuel, a man admitted to a strange and awful intimacy with the Most High, and like them he combines functions which in later times were distributed between prophet and priest. The fundamental idea that Yahweh guides His people by the word of revelation is older than the separation of special classes of theocratic organs; Moses, indeed, is not only prophet and priest, but judge and ruler. But, as the history goes on, the prophet stands out more and more as the typical organ of revelation, the type of the man who is Yahweh's intimate, sharing His secrets (Amos iii. 7; Jer. xxiii. 22), and ministering to Israel the gracious guidance which distinguishes it from all other nations (Amos ii. n; Hosea xii. 10, 13), and also the sentences of awful judgment by which Yahweh rebukes rebellion (Hos. vi. 5). The full development of this view seems to lie between the time of Elijah and that of Amos and Hosea — under the dynasty of Jehu, when prophecy, as represented by Elisha and Jonah, stood in the fullest harmony with the patriotic efforts of the age. This growth in the conception of the pro- phetic function is reflected in parts of the Pentateuch, which may be dated with probability as belonging to the period just named; the name of ndbhi is extended to the patriarchs as Yahweh's intimates (Gen. xx. 7), and Moses begins to be chiefly looked at as the greatest of prophets (Num. xi., xii.; Deut. xxxiy. 10), while Aaron and Miriam are also placed in the same class (Exod. xv. 20; Num. xii.), because they too are among the divinely favoured leaders of Israel (cf . Micah vi. 4) . 2*

1 Budde (Backer Samuelis, p. 233) assigns Nathan's speech (2 Sam. vii.) to a late E. writer in the 7th century. Perhaps we might assign it and Jer. xxiii. 5, 6, to the earlier part of Josiah's reign.

- *None of these passages belong to the very oldest thread of Pentateuchal story, and similarly Deborah is called prophetess only in the later account (Judg. iv. 4), not in the song (Judg. v.). It is characteristic that in Num. xi. the elders who receive a share in Moses' task also receive a share of his prophetic spirit (cf. the*

parallel 2 Kings ii. 9 seq.). In the older account (Exod. xviii.) this is not so. Again, Moses differs from all other prophets in that Yahweh speaks to him face to face, and he sees the similitude of Yahweh. This is in fact the difference between him and Elijah

Elisha, the successor of Elijah, stood in much closer relations to the prophetic societies than his great master had done. As a man of practical aims he required a circle through BUshtu which to work, and he found this among the prophets, or, as they are now called, the sons of the prophets. According to Semitic idiom " sons of the prophets " most naturally means " members of a prophetic corporation," 3 which may imply that under the headship of Elisha and the favour of the dynasty of Jehu, which owed much to Elisha and his party, the prophetic societies took a more regular form than before. The accounts we have certainly point in this direction, and it is characteristic that in 2 Kings iv. 42 first-fruits are paid to Elisha. But to an institution like prophecy national recognition, royal favour and fixed organization are dangerous gifts. It has always been the evil fate of the Hebrews to destroy their own highest ideals by attempting to translate them into set forms, and the ideal of a prophetic guidance of the nation of Yahweh could not have been more effectually neutralized than by committing its realization to the kind of state Church of professional prophets, " eating bread " by their trade (Amos vii. 12), 4 which claimed to inherit the traditions of Elijah and Elisha. The sons of the prophets appear to have been grouped round the leading sanctuaries, Gilgal, Bethel, and the like (cf. Hos. ix. 8), and to have stood in pretty close relation to the priesthood (Hos. iv. 5), though this comes out more clearly for the southern kingdom, where, down to the last days of Hebrew independence, the official prophets of Jerusalem were connected with the Temple and were under the authority of the chief priest (Jer. xxix. 26). Since the absorption of the aborigines in Israel Canaanite ideas had exercised great influence over the sanctuaries — so much so that the reforming prophets of the 8th century regarded the national religion as having become wholly heathenish; and this influence the ordinary prophets, whom a man like Micah regards as mere diviners, had certainly not escaped. They too were, at the beginning of the Assyrian period, not much more different from prophets of Baal than the priests were from priests of Baal. Their God had another name, but it was almost forgotten that He had a different character.

The rise and progress of the new school of prophecy, beginning with Amos and continued in the succession of canonical prophets, which broke through this religious stagnation, is ˆmos discussed in the article Hebrew Religion; for horn uad his Amos, and still more from Isaiah downwards, the Successors. prophets and their work made up the chief interest of Hebrew history. From this time, moreover, the prophets appear as authors; and

their books, preserved in the Old Testament, form the subject of special articles (Amos, Hosea, &c). A few observations of a general character will therefore suffice in this place.

Amos disclaimed all connexion with the mere professional prophets, and in this he was followed by his successors. Formerly the prophets of Yahweh had been all on the same side; their opponents were the prophets of Baal. But henceforth there were two parties among the prophets of Yahweh themselves, the new prophets accusing the old of imposture and disloyalty to Yahweh, and these retaliating with charge of disloyalty to Israel. We have learned to call the prophets of the new school " true " prophets and their adversaries " false "; and this is perfectly just if we take the appellations to mean that the true prophets maintained a higher, and therefore a truer, view of (cf. Exod. xxxiii. 8-11 with I Kings xix. 13), but not between him and the great prophets of the 8th century (Isa. vi. 5). That prophecy was generally given in visions, dreams and obscure sen- tences is true only of an early period. Amos still has frequent visions cf a more or less enigmatic character, as Micaiah had, but there is little trace of this in the great prophets after him. On the psychological reasons for this see W. R. Smith, Prophets of Israel (1882), p. 221 seq.

3 See G. Hoffmann, Kirchenversammlung zu Ephesus (1873), p. 89.

4 Those who consulted the old seers were expected to make a present, I Sam. ix. 7 (Arabic holwanu-'l-kahin; cf. Bokhari iv. 219). Similar presents were brought to the older prophets (1 Kings xiv. 3), and first-fruits were sometimes paid to a man of God ; but the successors of Amos share his contempt for those who traded on their oracles (Mic. iii. 5 seq.).

Yahweh's character, purpose and relation to His people. But the false prophets were by no means mere common impostors; they were the accredited exponents of the common orthodoxy of their day, for the prophets who opposed Jeremiah took their stand on the ground of the prophetic traditions of Isaiah, whose doctrine of the inviolability of Yahweh's seat on Zion was the starting-point of their opposition to Jeremiah's predictions of captivity. No doubt there were many conscious hypocrites and impostors among the professional prophets, as there always will be among the professional representatives of a religious standpoint which is intrinsically untenable, and yet has on its side the prestige of tradition and popular acceptance. But on the whole the false prophets deserve that name, not for their conscious impostures, but because they

were content to handle religious formulas, which they had learned by rote, as if they were intuitive principles, the fruit of direct spiritual experience, to enforce a conventional morality, shutting their eyes to glaring national sins, after the manner of professional orthodoxy, and, in brief, to treat the religious status quo as if it could be accepted without question as fully embodying the unchanging principles of all religion. The popular faith was full of heathenish super- stition strangely blended with the higher ideas which were the inheritance left to Israel by men like Moses and Elijah; but the common prophets accepted all alike, and combined heathen arts of divination and practices of mere physical enthu- siasm with a not altogether insincere pretension that through their professional oracles the ideal was being maintained of a continuous divine guidance of the people of Yahweh.

Amos and his successors accepted the old ideal of prophecy if they disowned the class which pretended to embody it. " The Lord Yahweh will do nothing, but He revealeth His secret to His servants the prophets." " By a prophet Yahweh brought Israel out of Egypt, and by a prophet " in each successive age Israel had been watched over and preserved. But in point of fact the function of the new prophecy was not to preserve but to destroy Israel, if Israel still meant the actual Hebrew nation, with its traditional national life. Till Amos (with the solitary exception of Micaiah ben Imlah, in i Kings xxii.) prophecy was optimist — even Elijah, if he denounced the destruction of a dynasty and the annihilation of all who had bowed the knee to Baal, never doubted of the future of the nation when only the faithful remained; but the new prophecy is pessimist— it knows that Israel is rotten to the core, and that the whole fabric of society must be dissolved before reconstruction is possible. And this it knows, not by a mere ethical judgment on the visible state of society, but because it has read Yahweh's secret written in the signs of the times and knows that He has condemned His people. To the mass these signs are unintelli- gible, because they deem it impossible that Yahweh should utterly cast off His chosen nation; but to those who know His absolute righteousness, and confront it with the people's sin, the impending approach of the Assyrian can have only one meaning and can point to only one issue, viz. the total ruin of the nation which has denied its divine head. It is sometimes proposed to view the canonical prophets as simple preachers of righteousness; their predictions of woe, we are told, are conditional, and tell what Israel must suffer if it does not repent. But this is an incomplete view; the peculiarity of their position is that they know that Israel as it exists is beyond repent- ance. Only, while they are hopeless about their nation they have absolute faith in Yahweh and His purpose. That cannot be frustrated, and, as it includes the choice of Israel as His people, it is certain that, though the present commonwealth must perish, a new and better Israel will rise from its grave. Not the

reformation but the resurrection of Israel is the goal of the prophets' hope (Hos. vi. i seq.).

This of course is only the broadest possible statement of a position which undergoes many modifications in the hands of individual seers, but on the whole governs all prophecy from Amos to Jeremiah. The position has, we see, two sides: on the Dne side the prophets are heralds of an inexorable judgment based on the demands of absolute righteousness; on the other

they represent an assured conviction of Yahweh's invincible and gracious love. The current theological formula for this two-sided position is that the prophets are at once preachers of the law and forerunners of the gospel; and, as it is generally assumed that they found the law already written, their originality and real importance is made to lie wholly in their evangelical function. But in reality as has been shown in the article on Hebrew Religion, the prophets are older than the law, and the part of their work which was really epoch-making for Israel is just the part which is usually passed over as unimportant. By emphasizing the purely moral character of Yahweh's demands from Israel, by teaching that the mere payment of service and worship at Yahweh's shrines did not entitle Israel's sins to be treated one whit more lightly than the sins of other nations, and by enforcing these doctrines through the conception that the approach of the all-destroying empire, before which Israel must fall equally with , all its neighbours, was the proof of Yahweh's impartial righteousness, they gave for the first time a really broad and fruitful conception of the moral government of the whole earth by the one true God. 1

It is impossible to read the books of the older prophets, and especially of their protagonist Amos, without seeing that the new thing which they are compelled to speak is not Yahweh's grace but His inexorable and righteous wrath. That that wrath must be followed by fresh mercies is not in itself a new thought, but only the necessary expression of the inherited conviction that Yahweh whom they preach as the judge of all the earth, is nevertheless, as past history has proved, the God who has chosen Israel as His people. That this is so appears most clearly in the fact that with Amos the prophecy of restoration appears only in a few verses at the end of his book, and in the still more instructive fact that neither he nor Hosea attempts to explain how the restoration which they accept as a postulate of faith is to be historically realized. 2 Recent critics, however, viz. Wellhausen, Nowack, Marti and Harper, as well as others, have denied the genuineness of the concluding verses in Amos, viz. ix. 8-15. To Hosea, at least in his later prophecies, the fate of Judah does not appear separable from that of the northern realm — when Israel and Ephraim fall by their iniquity Judah must fall with them (Hos. v. 5). Thus even on this side there is no real bridge over the chasm that separates the total ruin impending

over the Israel of the present from the glorious restoration of the Israel of the future. There is a unity in the divine purpose, of which judgment and mercy are the two poles, but there is as yet no conception of an historical continuity in the execution of that purpose, and therefore no foundation laid for the maintenance of a continuous community of faith in the impending fall of the nation.

From this we can see the enormous importance of the work of Isaiah as it has been exhibited in the article Hebrew Religion; his doctrine of the remnant, never lost to the nation in the worst times, never destroyed by the most fiery judgments, supplies the lacking element of continuity between the Israel of the present and of the future. Yahweh's kingdom cannot perish even for a time; nay, Isaiah argues that it must remain visible, and visible not merely in the circle of the like-minded whom he had gathered round him and who formed the first germ of the notion of the church, but in the political form of a kingdom also. Zion at least, the sacred hearth of Yahweh, the visible centre of His kingdom,

1 It must not be supposed that this conception necessarily came into force as soon as it was recognized that Yahweh was the creator of the universe. That the national or tribal god is the creator is an idea often found in very low religions. To us God's sovereignty oyer nature often seems the hardest thing to conceive ; but to primi- tive peoples who know nothing of laws of nature, His moral sover- eignty is a much more difficult conception. In the older literature of the Hebrews, the nearest approach to the thought of Amos and Hosea is not Gen. ii., iii., but Gen. xviii. 25.

2 Hosea ii. 14 seq., xi. 10 seq. are not solutions of this difficulty, as appears from their metaphorical form. They tell us that Yahweh will call His people and that they will answer; but this is only putting in another form the axiom that the gifts and calling of God are without repentance.

roust remain inviolable; it can never be delivered into the hands of the Assyrian. Thus, with Isaiah in the days of Sennacherib's invasion, the prophetic word became again, as it had been in the days of the Syrian wars, " the chariots and horsemen of Israel," the stay and strength of all patriotic hope.

Yet even at this crisis the resemblance between Isaiah and Elisha, between the new prophecy and the old, is more apparent than real. Elisha still stands firmly planted on the old national conception of the religion of

Yahweh; his ideals are such as do not he beyond the range of practical politics. In doing battle against the Tyrian Baal he is content with a reformation for which the whole nation can be heartily won, because it makes no radical change in their inherited faith and practices of worship. And in stimulating resistance to Syria he is still the prophet of the old " God of the hosts of Israel " — a God who works deliver- ance by the thews and sinews of His earthly warriors. But Isaiah's ideal of religion was one for which he himself demands as a preliminary condition an outpouring of Yahweh's spirit on king (Isa. xi. 2) and people (Isa. xxxii. 15), working an entire moral regeneration. And so too it is not through the material organization of the Judaean kingdom that Isaiah looks for deliverance from Assyria. He sees with absolute clearness the powerlessness of the little realm against that great empire: the Assyrian must fall, and fall before Jerusalem, that Yahweh alone may appear to all the earth as the one true God, while all the idols appear as vain to help their worshippers. These conceptions break through the old particularistic idea of Yahweh and His religion at every point. Zion is now not the centre of a mere national cult, but the centre of all true religion for the whole world; and more than once the prophet indicates not obscurely that the necessary issue of the great conflict between Yahweh and the gods of the heathen must be the conversion of all nations, the disappearance of every other religion before the faith of the God of Israel. The pre-exilian origin of Isa. ii. 2-4 which announces that all foreign nations shall stream towards the exalted mountain of Yahweh's temple is maintained by Duhm but is denied by many recent critics including Cornill. But this all-conquering religion is not the popular Yahweh worship; why then can the prophet still hold that the one true God is yet the God of Israel, and that the vindication of His Godhead involves the preservation of Israel? Not because His providence is confined to Israel — it embraces all nations; not because He shows any favouritism to Israel — He judges all nations by the same strict rule. If Israel alone among nations can meet the Assyrian with the boast " with us is God," the reason is that in Zion the true God is known 1 — not indeed to the mass, but to the prophet, and that the " holy seed " 2 or " remnant " (contained in the name Shear ydskubh) which forms the salt of the nation. The interpretation which Isaiah puts on this fact depends on the circumstance that at that date religion had never been conceived as a relation between God and individuals, or as a relation between God and a purely spiritual society, but always as a relation between a deity and some natural social group — a stock, a tribe, a nation. It was therefore only as the God of Israel that the true God could be known within Israel; and so on the one hand the little society of faith — which had not in reality the least tinge of political coherence — is thought of as yet forming the true kernel of the nation qua nation, while on the other hand the state of Judah profits by the prophetic religion inasmuch as the nation must be saved from

destruction in order that the prophetic faith — which is still bound up with the idea of the nation — may not be dissolved. This connexion of ideas was not of course explicitly before the prophet's mind, for the distinctive features of a national religion could not be formulated so long as no other kind of religion had ever been heard of. When we put down in black and white the explicit details of what is

1 We should be apt to say " the true idea of God," but that is a way of putting it which does not correspond with prophetic thought. To the prophets knowledge of God is concrete knowledge of the divine character as shown in acts — knowledge of a person, not of an idea.

2 The last clause of Isa. vi. 13, " a holy seed is its stock," is rejected by many critics (Duhm, Cheyne, Marti and others) as a later insertion. It is omitted in the Septuagint.

involved in Isaiah's conclusion of faith we see that it has no absolute validity. True religion can exist without having a particular nation as its subject as soon as the idea of a spiritual community of faith has been realized. But till this was realized Isaiah was right in teaching that the law of continuity demanded that the nation within which Yahweh had made Himself known to His spiritual prophets must be maintained as a nation for the sake of the glory of God and the preservation of the " remnant."

The withdrawal of Sennacherib's army, in which the doctrine of the inviolability of Zion received the most striking practical confirmation, was welcomed by Isaiah and his disciples as an earnest of the speedy inbringing of the new spiritual era. But these hopes were not fulfilled. The prophetic teaching had in- deed produced a profound effect; to the party of reaction, as the persecution under Manasseh shows, it seemed to threaten to subvert all society; and we can still measure the range and depth of its influence in the literary remains of the period from Isaiah to the captivity, which include Micah vi. 1-8, and that nobis essay to build a complete national code on the principle of love to God, righteousness, and humanity — the legislation of Deutero- nomy. Nay more, the reception of the book of Deuteronomy by king and people in the eighteenth year of Josiah shows what a hold the prophetic teaching had on the popular conscience. It was no small triumph that there was even a passing attempt to introduce such a code as the law of the land. • But it was one thing to touch the conscience of the nation and another to change its heart and renew its whole life. That no code could do, and, as every practical government must adapt itself to actualities and not to a purely ideal standard, it must have appeared at once that the attempt to govern by prophetic ideas was only sewing a new piece on an old garment. The immediate result of Josiah's reformation was the complete dissolution of any- thing that could be called a political party

of prophetic ideas; the priests and the ordinary prophets were satisfied with what had been accomplished; the old abuses began again, but the nation had received a reformed constitution and there was nothing more to be said.

Thus it was that, though beyond question there had been a real advance in the average ethical and spiritual ideas of the people since the time of Isaiah, Jeremiah found himself more isolated than Isaiah had ever been. Even in that earliest part of his book which is mainly a recapitulation of his experi- ences and work in the reign of Josiah, his tone is one of absolute hopelessness as to the future of the nation. But we should quite misunderstand this pessimism if we held it to mean that Jeremiah saw no signs of private morality and individual spiritual convictions among his people. To him as a prophet the question was whether Israel as a nation could be saved. In Isaiah's days the answer had been affirmative; there appeared to be at least a potentiality of national regeneration in the holy seed when once it should be cleansed from the chaff by a work of judgment. But, now a century of respite had been granted, the Chaldaeans were at the gates, and there was no sign of valid national repent- ance. The harvest was past, the season of ripe fruits was over, and still Israel was not saved (Jer. viii. 20). The time of respite had been wasted, all attempts at national reformation had failed; how should Yahweh spare a nation which had shown no tokens of fitness to discharge the vocation of Yahweh's people ? The question was not whether there was still a faithful remnant, but whether that remnant was able to save the state as a state, and this Jeremiah was forced to deny. Nay, every attempt at genuine amendment was frustrated by the dead weight of a powerful opposition, and when the first captivity came it was precisely the best elements of Judah that went into captivity and were scattered among the nations (xxiv. 5, xxiii. 2 seq.). And so the prophet was compelled to teach that the immediate future of Israel was a blank, that the state as a state was doomed. He did not even dare to intercede for such a nation (vii. 16); though Moses and Samuel stood pleading for it before Yahweh, He could not but cast it out of His sight (xv. 1). It was the death-struggle of the idea of a national religion (vi. 8) ;

the continuity of true faith refused to be longer bound up with the continuity of the nation. Still indeed the New-Testament idea of a purely spiritual kingdom of God, in this world but not of it, is beyond the prophet's horizon, and he can think of no other vindication of the divine purpose than that the true Israel shall be gathered again from its dispersion. But the

condition of this restoration is now changed. To gather the dispersed implies a call of God to individuals, and in the restored Israel the covenant of Yahweh shall not be merely with the nation but with man one by one, and " they shall no more teach everyone his neighbour saying, Know the Lord, for all shall know Me from the least of them even to the greatest of them " (xxxi. 33 seq.). In a word, when the nation is dissolved into its individual elements the continuity and ultimate victory of true faith depends on the relation of Yahweh to individual souls, out of which the new state shall be built up (Jer iii. 14).

Thus, for the first time in the world's history, the ultimate problem of faith is based on the relation of God to the individual believer; and this problem Jeremiah is compelled to face mainly in relation to his own personality, to assure himself that his own faith is a true possession and lifts him above all the calamities that assail him, in spite of the hopeless ruin of his nation. The struggle is a sore one; his very life is bitter to him; and yet he emerges victorious. To know that God is with him is enough though all else fail him. Now as soon as the relation of God to a single soul has thus been set free from all earthly conditions the work of prophecy is really complete, for what God has done for one soul He can do for all, but only by speaking to each believer as directly as He does to Jeremiah . Henceforth revelation is not a word to the nation spoken through an individual, but a word spoken to one which is equally valid for every one who receives it with like faith. The New Testament joins on not to the post-exile prophets, who are only faint echoes of earlier seers, but to Jeremiah's great idea of the new covenant in which God's law is written on the individual heart, and the community of faith is the fellowship of all to whom He has thus spoken. The prophets of the restoration are only the last waves beating on the shore after the storm which destroyed the old nation, but created in its room a fellowship of spiritual religion, had passed over; they resemble the old prophets in the same imperfect way in which the restored community of Jerusalem resembled a real nation. It was only in so far as the community of faith still possessed certain external features of nationality that post-exile prophecy was possible at all, and very soon the care of the national or quasi-national aspects of religion passed altogether out of their hands into those of the scribes, of whom Ezekiel was the first father, and whose Torah was not the living word of prophecy but the Pentateuchal code. From the time of Jeremiah downwards the perennial interest of Old-Testament thought lies in the working out of the problems of personal religion and of the idea of a spiritual fellowship of faith tran- scending all national limitation; and these are the motives not only of the lyrics of the Psalter but of the greater theodiceas of Isa. xl.-lxvi. and of the book of Job. The theodicea of the prophets is national; they see Yahweh's righteousness working itself out with unmistakable clearness in the present, and know

that all that He brings upon Israel is manifestly just; but from the days of Jeremiah 1 the fortunes of Israel as a nation are no longer the one thing which religion has to explain; the greater question arises of a theory of the divine purpose which shall justify the ways of God with individual men or with His "righteous servant" — that is, with the ideal community of true faith as distinct from the natural Israel.

It will be evident even from this rapid sketch, necessarily confined to a few of the most cardinal points, that Hebrew prophecy is not a thing that can be defined and reduced to a formula, but was a living institution which can only be under- stood by studying its growth and observing its connexion with the historical movements with which its various manifestations were bound up. Throughout the great age of prophecy the most obvious formal character that distinguished it was that the 1 One might say from the days of Habakkuk.

prophet did not speak in his own name but in the name of Yahweh. But the claim to speak in the name of God is one which has often been made — and made sincerely — by others than the prophets of Israel, and which is susceptible of a great variety of meanings, according to the idea of God and His relation to man which is presupposed. Every early religion seeks to realize such an intercourse with the object of worship as shall be two-sided; when the worshipper approaches the deity he desires to have an answer assuring him of acceptance and divine aid. The revelation thus looked for may be found in natural omens, in the priestly lot or some similar sacral oracle, or, finally, in the words of a seer who is held to be in closer contact with the deity than common men. Broadly speaking these methods of revelation are found in all ancient religions, but no other religion presents anything precisely analogous to prophecy. It is true that the prophets absorbed the old seers, and that the Israelites, as we see in ihe case of the asses of Kish, went to their seers on the same kind of occasions as sent heathen nations to seers or diviners. There is sufficient evidence that down to the last age of the Judaean monarchy practices not essentially different from divination were current in all classes of society, and were often in the hands of men who claimed to speak as prophets in the name of Yahweh. But the great prophets disallowed this claim, and the distinction which they draw between true prophecy and divination is recognized not only in the prophetical law of Deuteronomy but in earlier parts of the Pentateuch and historical books. " There is no augury in Jacob and no divination in Israel; in due time it is told to Jacob and to Israel what God doth work " (Num. xxiii. 23). The seer, in the sense in which all antiquity believed in seers, is simply a man. who sees what others cannot see, no matter whether the thing seen be of public or of mere private interest; but the prophet is an organ of Yahweh's kingship over His people — he sees and tells so much of the secret purpose of Yahweh as is needful for His people to know. We

have already seen how Amos and Hosea put this (supra, p. 201 1), and it does not appear that they were introducing a conception of prophecy formally novel — the new thing was their conception of Yahweh's purpose. And so too with the following great prophets; the important thing in their work was not their moral earnestness and not their specific predictions of future events, but the clear- ness of spiritual insight with which they read the spiritual significance of the signs of the time and interpreted the move- ments of history as proofs of Yahweh's actual moral sovereignty exercised over Israel. So long as the great problems of religion could be envisaged as problems of the relation of Yahweh to Israel as a nation the prophets continued to speak and to bring forth new truths; but the ultimate result was that it became apparent that the idea of moral government involved the destruc- tion of Israel, and then the function of prophecy was gone because it was essentially national in its objects. But meantime the relation of God to the prophet had acquired an independent significance; the inner life of Isaiah during the long years when his teaching seemed lost, or of Jeremiah through the whole course of his seemingly fruitless ministry, was rich in experiences of faith triumphing over temptations and trials, of personal converse with God sustaining the soul in the face of difficulties hopeless to the eye of sense, which formed the pattern of a new and higher stage of religion in which the relation of the individual soul to God should be set free from those limitations which had been imposed by the conception that the primary subject of religion is the nation. But the religion of the Old Testament did not become merely individualistic in becoming individual, and now the problem was to realize a new conception of the society of faith, the true Israel, the collective servant of Yahweh — in a word to form the idea of a spiritual commonwealth and to show how it was possible for faith to hold fast, in spite of all seeming contradiction, to the truth that Yahweh had chosen for himself a spiritual people, every member of which was in truth the object of His saving and unfailing love, and which should ultimately in very deed inherit that glory of which the carnal Israel was unworthy. This is the post-prophetic problem

which occupies the more profound of the later Old-Testament books, but first received its true solution in the gospel, when the last shreds of the old nationalism disappeared and the spiritual kingdom found its centre in the person of Christ.

Old-Testament prophecy therefore forms only one stage in a larger development, and its true significance and value can only be realized when it is looked at in this light. In this as in all other matters of transcendental

truth " wisdom is justified of her children"; the conclusive vindication of the prophets as true messengers of God is that their work forms an integral part in the progress oi spiritual religion, and there are many things in their teaching the profundity and importance of which are much clearer to us than they could possibly have been to their contemporaries, because they are mere flashes of spiritual insight lighting up for a moment some corner of a region on which the steady sun of the gospel had not yet risen.

A less complete but yet most powerful vindication of the spiritual prophets was furnished by the course and event of Israel's history. After the captivity it was no longer a question that the prophetic conception of Yahweh was the only possible one. Thenceforth the religion of Yahweh and the religion of the prophets are synonymous; no other reading of Israel's past was possible, and in fact the whole history of the Hebrews in Canaan, as it was finally shaped in the exile, is written from this point of view, and has come down to us, along with the remains of actual prophetic books, under the collective title of " The Prophets."

To some extent this historical vindication of the prophetic insight went on during the activity of the prophets themselves. From the time of Amos downwards the prophets spoke mainly at great historical crises, when events were moving fast and a few years were often sufficient to show that they were right and their opponents wrong in their reading of the signs of the times. And here the controversy did not turn on the exact fulfilment of detailed predictions; detailed prediction occupies a very secondary place in the writings of the prophets.

The prophets themselves required no historical verification of their word to assure them that it was indeed the word of God, nor do they for a moment admit that their contemporaries are entitled to treat its authority as unproved till such verification is offered. The word of God carries its own evidence with it in its searching force and fire: " Is not my word like as a fire, saith Yahweh, and like a hammer that breaketh the rock in pieces ? " (Jer. xxiii. 29). To the prophet himself it comes with imperious force: it constrains him to speak (Amos iii. 8), seizes him with a strong hand (Isa. viii. n), burns like a fire within his bones till it finds utterance (Jer. xx. 9) ; and it is this force of moral conviction which ought also to commend it to the con- science of his hearers. The word is true because it is worthy of the true God. When Deut. xviii. 21,22 seeks the legal criterion of true prophecy in the fulfilment of prediction, the writer is no doubt guided by the remembrance of the remarkable confir- mation which the doctrines of spiritual prophecy had received in history then recent, but his criterion would have appeared inadequate to the prophets themselves, and indeed this passage is one of the most striking proofs that to formulate the principles of prophetic religion in a legal code was an impossible task.

The mass of the nation, of course, was always much more struck by the "signs" and predictions of the prophets than by their spiritual ideas; we see how the idea of supernatural insight and power in everyday matters dominates the popular conception of Elijah and Elisha in the books of Kings. At a very early date the great prophets became a kind of saints or welts, and the respect paid to the tombs of the prophets, which ultimately took in almost every particular the place of the old local shrines (Matt, xxiii. 29; Jerome, Epit. Paulae, § 13; see Obadiah), can be traced back to the time before the exile. 1

The Hebrew prophet stands alone among divinely appointed

'See 2 Kings xxiii. 21, and also Deut. xxxiv. 6. So too all the old national heroes and heroines ultimately became prophets; in the case of Deborah there is even a fusion in local tradition between an old heroine and an historical seer.

and inspired men of any religion, though analogies in other religions present themselves. Ethical and religious teachers arose among other nations of antiquity whose precepts may well be compared with those of Hebrew prophecy. We might cite the maxims of Ani in the Egyptian papyrus Prisse (XHth dynasty). But these teachers did not succeed in accomplishing a task parallel to what the Hebrew prophets achieved, namely, the complete renewal and elevation of the Hebrew religion from a local and national into a universal and ethical religion. Yet instructive parallels may be found in ancient literatures. Thus the Vedic hymns are reputed to have no human authors. The names attached to them are those of the seers who " saw " them, to whom they were revealed. They are therefore merely the channels through which the divine word is communicated to man (Professor Rapson). The Rev. C. H.W.Johns {Interpreter, April 1906, " The Prophets of Babylonia ") thinks that longer dis- courses moral, and predictive, fully equal to those of the Hebrew prophets, existed in Babylonia as early as the 3rd millennium B.C. but were curtailed into the brief sentences of the omen tablets. " The so-called ' tablet of warning to kings against injustice ' gives a fair specimen of connected discourse, e.g. ' If a king hearken not to law, his people shall grow feeble and his land be ravaged. If he attend not to the justice of his land, Ea, the king of fates, shall distort his lot, &c.' " Further illustrations of ethical teaching may be found in the litany or confession of a penitent cited by Mr Johns in the same paper (p. 303).

It may be here stated that Winckler's conception of the Hebrew prophet Isaiah as the mouthpiece of the Assyrian court (K.A.T. 3 p. 172 sqq.) can be easily refuted by a reference to the Isaianic oracles. A theory that Jeremiah was similarly influenced from Babylonia might seem more

plausible, though equally baseless.

After the extinction of the prophetic voice, an ever-increasing weight was not unnaturally laid on the predictive element in their writings. Their creative religious ideas had become the common property of religious-minded Jews, at least in the some- what imperfect shape in which they were embodied in the law, and their work on this side was carried on by the great religious poets. But the restored community which was still making a sort of faint attempt to be a religious nation as well as a Church felt very painfully the want of a direct message from God in critical times such as the prophets of old had been wont to bring. And in this need men began to look at the prophetic books, mainly in the hope that there might be found in them predictions which still awaited fulfilment, and might be taken as referring to the latter days of Persian or Greek oppression. By ignoring the free poetical form of prophecy, and still more by ignoring the fact that the prophetic pictures of the ideal future of Israel could not be literally fulfilled after the fall of the ancient state had entirely changed the sphere in which the problems of true religion had to be worked out, it was possible to find a great mass of unfulfilled prophecy which might form the basis of eschato- logical constructions. All this was quite in the vein of later Judaism, and so at length the unfulfilled predictions of the pro- phets served as the raw material for the elaborate eschatology of the apocalypses (see Apocalyptic Literature). In spite of superficial resemblances, mainly due to the unavoidable influence of current exegetical methods, the conception of prophecy as fulfilled in Christ is fundamentally different from the Jewish apocalyptic view of unfulfilled prophecy. Not external details but the spiritual ideas of the prophets find their fulfilment in the new dispensation, and they do so under forms entirely diverse from those of the old national kingdom of Yahweh.

Literature. — In the ancient and medieval Church and in the dog- matic period of Protestantism there was little Or no attempt at historical study of prophecy, and the prophetical books were found instructive only through the application of allegorical or typical exegesis. For details the reader may refer to Diestel, Geschichte des Alten Testaments (Jena 1869), and for the final form of orthodox Protestant views to Witsius, De prophetis et prophetia. The growing sense of the insufficiency of this treatment towards the close of the period of dogmatism showed itself in various ways. On the one hand we have the revival of apocalyptic exegesis by Cocceius and his school,

which has continued to influence certain circles down to the present day, and has led to the most varied attempts to find in prophecy a history written before the event of all the chief vicissitudes of the Christian Church down to the end of the world. On the other hand Lowth's Lectures on Hebrew Poetry, and the same author's Commentary on Isaiah (1778), show the beginnings of a tendency to look mainly at the aesthetic aspects of the prophetical books, and to view the prophets as enlightened religious poets. This tendency culminates in Eichhorn, Die hebrdischen Propheten (1816). Neither of these methods could do much for the historical understanding of the phenomena of prophecy as a whole, and the more liberal students of the Old Testament were long blinded by the moralizing unhistorical rationalism which succeeded the old orthodoxy. The first requisite of real progress, after dogmatic prejudices had been broken through, was to get a living conception of the history in which the prophets moved ; and this again called for a revision of all traditional notions as to the age of the various parts of Hebrew literature — criticism of the sources of the history, among which the prophetical books themselves take the first place. In recent times therefore advance in the understanding of the prophets has moved on pari passu with the higher criticism, especially the criticism of the Pentateuch, and with the general study of Hebrew history; and most works on the subject prior to Ewald must be regarded as quite antiquated except for the light they cast on detailed points of exegesis. On the prophets and their works the reader would still do well to consult Ewald's Propheten des alten Bundes (1st ed., 1840-1841, 2nd ed., 1867-1868, Eng. trans., 1876-1877). The subject is treated in all works on Old Testament introduction (among which Kuenen's Onderzoek, vol. ii., claims the first place), and on Old-Testament theology (see especially Vatke, Religion des A.T., 1835). On the theology of the prophets there is a separate work by Duhm (Bonn, 1875), and Knobel's Prophetismus der Hebraer (1837), is a separate introduction to the prophetical books. Kuenen's Prophets and Prophecy in Israel (1875, Eng. trans. 1877) is in form mainly a criticism of the traditional view of prophecy, and should therefore be compared with his Onder- zoek and Godsdienst van Israel. Most English books on the subject are more theological than historical, but a sketch of Hebrew pro- phecy in connexion with the history down to the close of the 8th century is given by W. R. Smith, The Prophets of Israel (Edinburgh, 1882). The literature of the theological questions connected with prophecy is much too copious to be cited here; lists will be found in several of the books already referred to. Among more recent works and articles should be mentioned Briggs, Messianic Prophecy ; Giesebrecht, Die Berufsbegabung der alltestamentlichen Propheten; Volz, Die vorexilische Jahwe-Prophetie u. der Messias; Htihn, Die messianischen Weissagungen; R. Kittel, Prophetie u. Weissagung; Professor Kennett, Pre-exilic Prophets; W. H. Bennett, Post- exilic Prophets (T. and T. Clark); A. B. Davidson, "

Prophecy and Prophets," in Hastings's Diet. Bible; also " Prophetic Literature," by Cheyne and others in Ency. Bibl. (W. R. S. ; O. C. W.)

II. Prophets in the Primitive Church.— The appearance of prophets in the first Christian communities is one proof of the strength of faith and hope by which these bodies were animated. An old prophecy (Joel iii. 1) has foretold that in the Messianic age the Spirit of God would be poured out on every member of the religious community, and in point of fact it was the universal conviction of those who believed in Christ that they all possessed the Spirit of God. This Spirit, manifesting His presence in a variety of ways and through a variety of gifts, was to be the only ruling authority in the Church. He raised up for Himself particular individuals, into whose mouths He put the word of God, and these were at first regarded as the true leaders of the congregations. We find accordingly that there were prophets in the oldest church, that of Jerusalem (Acts. xi. 27, xv. 32), and again that there were " prophets and teachers" in the church at Antioch (Acts xiii. 1). These were not office-bearers chosen by the congregation, but preachers raised up by the Spirit and conferred as gifts on the Church. When Paul says (1 Cor. xii. 28; cf. Eph. iv. n), " God hath set some in the Church, first apostles, secondarily prophets, thirdly teachers," he points to a state of things which in his time prevailed in all the churches both of Jewish and heathen origin. We here learn from Paul that the prophets occupied the second position in point of dignity; and we see from another passage (1 Cor. xiv.) that they were distinguished from the teachers by their speaking under the influence of inspiration— not, however, like the " speakers in tongues," in unintelligible ejaculations and disconnected words, but in articulate, rational edifying speech. Until recently it was impossible to form any distinct idea of the Christian prophets in the post-apostolic age, not so much from rant of materials as because what evidence existed was not

sufficiently clear and connected. It was understood, indeed, that they had maintained their place in the churches till the end of the 2nd century, and that the great conflict with what is known as Montanism had first proved fatal to them; but a clear conception of their position and influence in the churches was not to be had. But the discovery, by Bryennios in 1873, of the ancient Christian work called AtSaxv T&vd&iSeKa wkoo-toXuv (published in 1883), has immensely extended the range of our knowledge, and has at the same time thrown a clear light on many notices in other sources which for want of proper interpretation had been previously neglected or incorrectly understood.

The most important facts known at present about the manner of life, the influence, and the history of the early Christian prophets are the following: (1) Until late in the 2nd century the prophets (or prophetesses) were regarded as an essential element in a Church possessing the Holy Ghost.

Their existence was believed in, and they did actually exist, not only in the catholic congregations — if the expression may be used — but also in the Marcionite Church and the Gnostic societies. Not a few Christian prophets aie known to us by name: as Agabus, Judas, and Silas in Jerusalem; Barnabas, Simon Niger, &c, in Antioch; in Asia Minor, the daughters of Philip, Quadratus, Ammia, Polycarp, Melito, Montanus, Maximilla and Priscilla; in Rome, Hermas; among the followers of Basilides, Barkabbas and Barkoph; in the community of Apelles, Philumene, &c. Lucian tells us that the impostor Peregrinus Proteus, in the time of Antoninus Pius, figured as a prophet in the Christian churches of Syria. (2) Till the middle of the 2nd century the prophets were the regular preachers of the churches, without being attached to any particular congregation. While the " apostles " (i.e. itinerating missionaries) were obliged to preach from place to place, the prophets were at liberty either, like the teachers, to settle in a certain church or to travel from one to another. (3) In the time of Paul the form of prophecy was reasoned exhort- ation in a state of inspiration; but very frequently the inspira- tion took the form of ecstasy — the prophet lost control of himself, so that he did not remember afterwards what he had said. In the Gentile-Christian churches, under the influence of pagan associations, ecstasy was the rule. (4) With regard to the matter of prophecy, it might embrace anything that was necessary or for the edification of the Church. The prophets not only consoled and exhorted by the recital of what God had done and by predictions of the future, but they uttered extempore thanks- givings in the congregational assemblies, and delivered special directions, which might extend to the most minute details, as, for example, the disposal of the church funds. (5) It was the duty of the prophets to follow in all respects the example of the Lord (ixtw tow rporovs rod Kvplov), and to put in practice what they preached. But an ascetic life was expected of them only when, like the apostles, they went about as missionaries, in which case the rules in Matt. x. applied to them. Whenever, on the contrary, they settled in a place they had a claim to a liberal maintenance at the hands of the congregation. The author of the AiSaxh even compares them to the High Priests of the Old Testament, and considers them entitled to the first fruits of the Levitical law. In reality, they might justly be com- pared to the priests in so far as they were the mouthpieces of the congregation in public thanksgiving. (6) Since prophets were regarded as a gift of God and as moved by the Holy Spirit, the individual congregation had no right of control over them. When anyone was approved as a prophet and exhibited the " conversation of the Lord," no one was permitted to put him to the test or to criticize him. The author of the Aidaxv goes so far as to assert that whoever does this is guilty of the sin against the Holy Ghost. (7) This unique position of the prophets could only be maintained so long as the original enthusiasm remained fresh and vigorous. From three quarters primitive Christian prophecy was exposed to

danger — first, from the permanent officials of the congregation, who, in the interests of order, peace and security could not but look with suspicion on the activity of excited prophets; second, from the prophets themselves, in so

far as an increasing number, of dishonest characters was found amongst them, whose object was to levy contributions on the churches; 1 third, from those prophets who were filled with the stern spirit of primitive Christianity and imposed on churches, now becoming assimilated to the world, obligations which these were neither able nor willing to fulfil. It is from this point of view that we must seek to understand the so-called Montanistic crisis. Even the author of the AiSaxv finds it necessary to defend the prophets who practised celibacy and strict asceticism against the depreciatory criticism of church members. In Asia Minor there was already in the year 160 a party, called by Epiphanius " Alogi," who rejected all Christian prophecy. On the other hand, it was also in Asia Minor that there appeared along with Montanus those energetic prophetesses who charged the churches and their bishops and deacons with becoming secularized, and endeavoured to prevent Christianity from being naturalized in the world, and to bring the churches once more under the exclusive guidance of the Spirit and His charismata. The critical situation thus arising spread in the course of a few decades over most of the provincial churches. The necessity of resisting the inexorable demands of the prophets led to the introduction of new rules for distinguishing true and false prophets. No prophet, it was declared, could speak in ecstasy, that was devilish ; further, only false prophets accepted gifts. Both canons were innovations, designed to strike a fatal blow at prophecy and the church organization re-established by the prophets in Asia — the bishops not being quite prepared to declare boldly that the Church had no further need of prophets. But the prophets would not have been suppressed by their new methods of judging them alone. A much more important circumstance was the rise of a new theory, according to which all divine revelations were summed up in the apostles or in their writings. It was now taught that prophecy in general was a peculiarity of the Old Testament (" lex et prophetae usque ad Johannem "); that in the new covenant God had spoken only through apostles; that the whole word of God so far as binding on the Church was contained in the apostolic record — the New Testament; 2 and that, consequently, the Church neither required nor could acknowledge new revelations, or even instructions, through prophets. The revolution which this theory gradually brought about is shown in the transformation of the religious, enthusiastic organization of the Church into a legal and political constitution. A great many things had

to be sacrificed to this, and amongst others the old prophets. The strictly enforced episcopal constitution, the creation of a clerical order, and the formation of the New Testament canon accomplished the overthrow of the prophets. Instead of the old formula," God continually confers on the church apostles, prophets, and teachers," the word now was: " The Church is founded in the (written) word of the pro- phets (i.e. the Old Testament prophets) and the apostles (viz. the twelve and Paul)." After the beginning of the 3rd century there were still no doubt men under the control of the hierarchy who experienced the prophetic ecstasy, or clerics like Cyprian who professed to have received special directions from God; but prophets by vocation no longer existed and these sporadic utterances were in no sense placed on a level with the contents of the sacred Scriptures.

See Hilgenfeld, Die Glossolalie in der alien Kirche (1850); Bttck- mann, " Tiber die Wunderkrafte bei den ersten Christen und ihr Erloschen," in the Ztschr. f. d. Ges. luther. Theol. u. Kirche (1878), pp. 216-255 (learned but utterly uncritical); Bonwetsch, "Die Prophetie im apostol. und nachapostol. Zeitalter," in the Ztschr. f. kirr.hl. Wissensch. u. kirchl. Leben (1884), pt. 8, p. 408 seq , pt. 9, p. 460 seq.; Harnack, Die Lehre der zwolf Apostel (1884), pp. 93-137; Haller, " Die Propheten der nachapostolischen Kirche," in the Theol. Studien aus Wilrttemberg (1888), p. 36 seq.; Nardin, " Essai sur les prophetes de l'eglise primitive," Thesis, (Paris, 1888) ; Weinel, " Die Wirkungen des Geistes und der Geister im nachapostolischen Zeitalter bis auf Irenaeus," (1899) ; Selwyn, " The Christian Prophets

1 See Lucian's story about Peregrinus, and that chapter of the AiSaxij where the author labours to establish criteria for distin- guishing false prophets from true.

2 The Apocalypse of John was received into it, not as the work pf a prophet but as that of an apostle.

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and the Prophetic Apocalypse " (1900) ; Bˆnazech, " Le Proph6tisme chrtkienne depuis les origines jusqu'au pasteur d'Hermas," Thesis, (Paris, 1901). (A. Ha.; A. C. McG.)

PROPIOLIC ACID, CHiC-CO-sH, acetylene mono-carboxylic acid, an unsaturated organic acid prepared by boiling acetylene dicarboxylic acid (obtained by the action of alcoholic potash on dibromsuccinic acid) or " its acid potassium salt with water (E. v. Bandrowski, Ber., 1880, 13, p. 2340). It forms silky crystals which melt at 6° C, and boil at about 144° C. with decomposition. It is soluble in water and possesses an odour

resembling that of acetic acid. Exposure to sunlight converts it into trimesic acid (benzene-i.3.5-tricarboxylic acid). Bromine converts it into dibromacrylic acid, and it gives with hydro- chloric acid /3-chloracrylic acid. It forms a characteristic explosive silver salt on the addition of ammoniacal silver nitrate to its aqueous solution, and an amorphous precipitate which explodes on warming with ammoniacal cuprous chloride. Its ethyl ester condenses with hydrazine to form pyrazolone (R; v. Rothenburg, Ber., 1893, 26, p. 1722). Phenylpropiolic acid, C6H 5 C:C-C0 2 H, formed by the action of alcoholic potash on cinnamic acid dibromide, C 6 H 5 CHBr-CHBr-C0 2 H, crystallizes in long needles or prisms which melt at i36-i37°C. Whenheated with water to 120 C. it yields phenyl acetylene C 6 H s -CjCH. Chromic acid oxidizes it to benzoic acid; zinc and acetic acid reduce it to cinnamic acid, C 6 H 5 -CH:CH-C0 2 H, whilst sodium amalgam reduces it to hydrpcinnamic acid, C 6 H S -CH2-C0 2 H. Ortho-nitro phenylpropiolic acid, N02-C 6 H 4 -C: C-C0 2 H, prepared by the action of alcoholic potash on ortho-nitrocinnamic acid dibromide (A. v. Baeyer, Ber., 1880, 13, p. 2258), crystallizes in needles which decompose when heated to 155-156° C. It is readily converted into indigo (q.v.) .

PROPYLAEA (Jlp&irvXov, Hpcnrvkaia) , the name given to a porch or gate-house, at the entrance of a sacred or other enclosure in Greece; such propylaea usually consisted, in their simplest form, of a porch supported by columns both without and within the actual gate. The name is especially given to the great entrance hall of the Acropolis at Athens, which was begun in 437 B.C. by Pericles, to take the place of an earlier gateway. Owing probably to political difficulties and to the outbreak of the Peloponnesian War, the building was never completed according to the original plans; but the portion that was built was among the chief glories of Athens, and afforded a model to many subsequent imitators. The architect was Mnesicles; the material Pentelic marble, with Eleusinian blackstone for dados and other details. The plan of the Propylaea consists of a large square hall, from which five steps lead up to a wall pierced by five gateways of graduated sizes, the central one giving passage to a road suitable for beasts or possibly for vehicles. On the inner side towards the Acropolis, this wall is faced with a portico of six Doric columns. At the other end of the great hall is a similar portico facing outwards; and between this and. the doors the hall is divided into three aisles by rows of Ionic columns. The western or outer front is flanked on each side by a projecting wing, with a row of three smaller Doric columns between Antae at right angles to the main portico. The north wing is completed by a square chamber which served as k picture gallery; but the south wing contains no corresponding chamber, and its plan has evidently been curtailed; its front projected beyond its covered area, and it is finished in

what was evidently a provisional way on the side of the bastion before the little temple of Victory (Nimj). From this and other indications Professor Dorpfeld has inferred that the original plan of Mnesicles was to complete the south wing on a plan symmetrical with that of the north wing, but opening by a portico on to the bastion to the west; and to add on the inner side of the Propylaea two great halls, faced by porticoes almost in a line with the main portico, but with smaller columns. It is probable that this larger plan had to be given up, because it would have interfered with sacred objects such as the precinct of Artemis Brauronia and the altar of Nike, and religious conservatism prevailed over the waning influence of Pericles. In addition to this, the un finished surface of the walls and the rough bosses left on many

of the blocks show that the building was never completed. The Propylaea were approached in Greek times by a zig-zag path, terraced along the rock; this was superseded in Roman times by a broad flight of steps. In medieval times the Propylaea served

THE PROPYLAEA

as designed by Mnesicles ~^~1

Scale of Feet o 10 20 30 40 50

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Pelamgic Wall—.

Building completed 5th. a\4 th. * “^—*

Century B.C. “™ WI

Building projected but never completed ?,»’„», Other Sf*.4 4th. Century i»or* ESS Boitian...EZ3*

after Dorpfcld

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(Redrawn from the Athemschc Mitteilungen by permission of the Kaiserlicbes Archaeologisches Institute

as the palace of the dukes of Athens; they were much damaged by the explosion of a powder magazine in 1656. The tower, of Frankish or Turkish date, that stood on the south wing, was pulled down in 1874.

See R. Bohn, Die Propylaeen der Akropolis zu Athen (Berlin, 1882); W. Dorpfeld, articles in Mittheilungen d. d. Inst. Athen. (1885) vol. x. (E. Gr.)

PROPYL ALCOHOLS (C 3 H 7 OH). Two compounds of this formula exist as explained in the article Alcohols. Normal propyl alcohol, CH3-CH 2 - CH 2 -OH, was obtained in 1853 by G. C. B. Chancel, by submitting fusel oil to fractional distillation. It may be prepared by any of the methods applicable to primary alcohols. It is an agreeable-smelling liquid; boiling at 97-4° C, and miscible with water in all proportions. It cannot be separated from water by fractional distillation, since it forms a mixture of constant boiling point (see Distillation). Oxidation con- verts it into propionic acid. It is distinguished from ethyl alcohol by its insolubility in a cold saturated calcium chloride solution.

Iso-propyl alcohol (CH 3) 2 CHOH, was obtained by M. P. E. Berthelot in 185s by heating the addition compound of propylene and sulphuric acid with water, and in 1862 by C. Friedel by the reduction of acetone. It is a colourless liquid boiling at 82-7° C.

PROROGATION, a postponement, specifically the termination without dissolution of a session of parliament by discontinuing the meetings until the next session. The Lat. prorogatio (from prorogate, to ask publicly) meant a prolongation or continuance of office or command, cf. prorogatio imperii (Liv. viii. 26), or a

putting off or deferring of an appointed time, cf . dies ad solvendum prorogare (Cic. Phil. ii. 10, 24). A prorogation of parliament affects both houses, and thus differs from an " adjournment," which does not terminate the session and is effected by each house separately by resolution. Further, at a prorogation, a bill which has not passed all of its stages must begin again ab initio in the next session, and all proceedings, except impeachments and appeals before the House of Lords, are quashed. A proroga- tion is effected by the sovereign in person, or by commission. If, at the demise of the Crown, parliament stands prorogued or adjourned, it is by 6 Anne c. 7 to sit and act at once; similarly the Crown must by proclamation order parliament to sit, if prorogued, when the militia is embodied or the reserves are called out.

PROSCENIUM (Gr. Trpooicqviov), that part of the stage in the ancient Greek theatre which lies in front of the

PROSE, a word supposed to be derived from the Lat. prorsus, direct or straight, and signifying the plain speech of mankind, when written, or rhetorically composed, without reference to the rules of verse. It has been usual to distinguish prose very definitely from poetry (q.v.), and this was an early opinion. Ronsard said that his training as a poet had proved to him that prose and poetry were " mortal enemies." But " poetry " is a more or less metaphysical term, which cannot be used without danger as a distinctive one in this sense. For instance, an ill- inspired work in rhyme, or even a well-written metrical composi- tion of a satirical or didactic kind, cannot be said to be poetry, and yet most certainly is not prose; it is a specimen of verse. On the other hand, a work of highly wrought and elaborately sustained non-metrical writing is often called a prose-poem. The fact that this phrase can be employed shows that the anti- thesis between prose and poetry is not complete, for no one, even in jest or hyperbole, speaks of a prose-verse.

Prose, therefore, is most safely defined as comprising all forms of careful literary expression which are not metrically versified, and hence the definition from prorsus, the notion being that all verse is in its nature so far artificial that it is subjected to definite and recognized rules, by which it is diverted out of the perfectly direct modes of speech. Prose, on the other hand, is straight and plain, not an artistic product, but used for stating precisely that which is true in reason or fact. The Latins called prose sermo pedestris, and later oratio soluta, thus showing their con- sciousness that it was not poetry, which soars on wings, and not verse, which is bound by the rules of prosodical confinement.

Prose, however, is not everything that is loosely said. It has its rules and requirements. In the earliest ages, no doubt, conversation did not exist. The rudest fragments of speech were sufficient to indicate the needs of the savage, and these blunt babblings were not prose. Later on some orator, dowered with a native persuasiveness, and desirous of making an effect upon his comrades, would link together some broken sentences, and in his heat produce with them something more coherent than a chain of ejaculations. So far as this was lucid and digni- fied, this would be the beginning of prose. It cannot be too often said that prose is the result of conversation, but it must at the same time be insisted upon that conversation itself is not necessarily, nor often, prose. Prose is not the negation of all laws of speech; it rejects merely those laws which depend upon metre. What the laws are upon which it does depend are not easy to enumerate or define. But this much is plain; as prose depends on the linking of successive sentences, the first require- ment of it is that these sentences should be so arranged as to ensure lucidity and directness. In prose, that the meaning should be given is the primal necessity. But as it is found that a dull and clumsy, and especially a monotonous arrangement, of sentences

is fatal to the attention of the listener or reader, it is

needful that to plainness should be added various attractions and ornaments. The sentences must be built up in a manner which displays variety and flexibility. It is highly desirable that there should be a harmony, and even a rhythm, in the progress of style, care being always taken that this rhythm and this harmony are not those of verse, or recognizably metrical. Again, the colour and form of adjectives, and their sufficient yet not excessive recurrence, is an important factor in the construction of prose. The omission of certain faults, too, is essential. In every language grammatical correctness is obligatory. Here we see a distinction between mere conversation, which is loose, fragmentary and often, even in the lips of highly educated persons, slightly ungrammatical ; and prose, which is bound to weed away whatever is slovenly and incorrect, and to watch very closely lest merely colloquial expressions, which cannot be defended, should slip into careful speech. What is required in good prose is a moderate and reasonable elevation without bombast or bathos. Not everything that is loosely said or vaguely thought is prose, and the celebrated phrase of M. Jourdain in Moliere's Bourgeois gentilhomme: " Par ma foi, il y a plus de quarante ans que je dis de la prose, sans que j'en susse rien," is not exactly true, although it is an amusing illustration of the truth, for all the little loose phrases which M. Jourdain had used in his life, though they were certainly not verse, were not prose either, whatever the schoolmaster might say. On the other hand, it seems that Earle goes too enthusiastically in the contrary direction when he says, " Poetry, which is the organ of Imagination, is futile without the support of Reason; Prose, which is the organ of Reason, has no vivacity or beauty or artistic value but with the favour and sympathy of the Imagination." It is better to hold to the simpler view that prose is literary expression not subjected to any species pf metrical law.

Greece. — The beginnings of ancient Greek prose are very obscure. It is highly probable that they took the form of inscriptions in temples and upon monuments, and gradually developed into historical and topographical records, preserving local memories, and giving form to local legends. It seems that it was in Ionia that the art of prose was first cultivated, and a history of Miletus, composed by the half-mythical Cadmus, is appealed to as the earliest monument of Greek prose. This, however, is lost, and so are all the other horoi of earliest times. We come down to something definite when we reach Hecataeus, the first geographer, and Herodorus, the first natural philosopher, of the Greeks; and, although the writings of these men

have disappeared, we know enough about them to see that by the 4th century B.C. the use of prose in its set modern sense had been established on a permanent basis. We even know what the character of the style of Hecataeus was, and that it was admired for its clearness, its grammatical purity, its agreeable individu- ality — qualities which have been valued in prose ever since. These writers were promptly succeeded by Hellanicus of Lesbos, who wrote many historical books which are lost, and by Hero- dotus of Halicarnassus, whose noble storehouse of chronicle and legend is the earliest monument of European prose which has come down to us. When once non-metrical language could be used with the mastery and freedom of Herodotus, it was plain that all departments of human knowledge were open to its exercise. But it is still in Ionia and the Asiatic islands that we find it cultivated by philosophers, critics and men of science. The earliest of these great masters of prose survive, not in their works, but in much later records of their opinions; in philosophy the actual writings of Thales, Anaximander, Pythagoras and Empedocles are lost, and it is more than possible that their cosmological rhapsodies were partly metrical, a mingling of ode with prose apophthegm. We come into clearer air when we cross the Aegean and reach the Athenian historians: Thucydides, whose priceless story of the Peloponnesian War has most fortu- nately come down to us; and Xenophon, who continued that chronicle in the spirit and under the influence of Thucydides, and who carried Greek prose to a great height of easy distinction. But it is with the practice of philosophy that prose in ancient Greece rises to its acme of ingenuity, flexibility and variety,

proving itself a vehicle for the finest human thought such as no later ingenuity of language has contrived to excel. The death of Socrates (399 B.C.) has been taken by scholars as the date when the philosophical writings of the Athenians reached their highest pitch of perfection in the art of Plato, who is the greatest prose writer of Greece, and, in the view of many who are well qualified to judge, of the world. In his celebrated dialogues — Crito, Gorgias, Phaedo, Phaedrus, the Symposium, most of all perhaps in the Republic — we see what splendour, what elasticity, what exactitude, this means of expression had in so short a time developed; how little there was for future prose-writers in any age to learn about their business. The rhetoricians were even more highly admired by the critics of antiquity than the philo- sophers, and it is probable that ancient opinion would have set Demosthenes higher than Plato as a composer of prose. But modern readers are no longer so much interested in the technique of rhetoric, and, although no less an authority than Professor Gilbert Murray has declared the essay-writing of the school of Isocrates to form " the final perfection of ancient prose," the works of the orators cease to move us with great enthusiasm. In Aristotle we see the conscious art of prose-writing

already subordinated to the preservation and explanation of facts, and after Aristotle's day there is little to record in a hasty outline of the progress of Greek prose.

Latin. — In spite of having the experience of the Greeks to guide them, the Romans obeyed the universal law of literary history by cultivating verse long before they essayed the writing of prose. But that the example of later Greece was closely followed in Rome is proved by the fact that the. earliest prose historians of whom we have definite knowledge, Q. F. Pictor and L. C. Alimentus, actually wrote in Greek. The earliest annalist who wrote in Latin was L. C. Hemina; the works of all these early historians are lost. A great deal of primitive Roman prose was occupied with jurisprudence and political oratory. By universal consent the first master of Latin prose was Cato, the loss of whose speeches and " Origines " is extremely to be deplored; we possess from his pen one practical treatise on agri- culture. In the next generation we are told that the literary perfection of oratory was carried to the highest point by Marcus Antonius and Lucius Licinius Crassus — " by a happy chance their styles were exactly complementary to one another, and to hear both in one day was the highest intellectual entertainment which Rome afforded." Unfortunately none but inconsiderable fragments survive to display to us the qualities of Roman prose in its golden age. Happily, however, those qualities were con- centrated in a man of the highest genius, whose best writings have come down to us; this is Cicero, whose prose exhibits the Latin language to no less advantage than Plato's does the Greek, From 70 to 60 B.C. Cicero's literary work lay mainly in the field of rhetoric; after his exile the splendour of his oratory declined, but he was occupied upon two treatises of extreme importance, the De oratore and the De republica, composed in 55 and 54-57 B.C. respectively; of the latter certain magnificent passages have been preserved. The beautiful essays of Cicero's old age are more completely known to us, and they comprise two of the masterpieces of the prose of the world, the De amicitia and De senectute (45 B.C.). It is to the collection of the wonderful private letters of Cicero, published some years after his death by Atticus and Tiro, that we owe our intimate knowledge of the age in which he lived, and these have ever since and in every language been held the models of epistolary prose. Of Cicero's greatest contemporary, Julius Caesar, much less has been preserved, and this is unfortunate because Roman critical opinion placed Caesar at the head of those who wrote Latin prose with purity and perfection. His letters, his grammars, his works of science, his speeches are lost, but we retain his famous Commentaries on the War in Gaul. Sallust followed Caesar as an historian, and Thucydides as a master of style. His use of prose, as we trace it in the Jugurtha and the Catilina, is hard, clear and polished. The chroniclers who succeeded Sallust neglected these qualities, and Latin

prose, as the Augustan age began, became more diffuse and more rhetorical.

But it was wielded in that age by one writer of the highest genius, the historian Titus Livius. He greatly enriched the tissue of Latin prose with ornament which hitherto had been confined to poetry; this enables him, in the course of his vast annals, " to advance without flagging through the long and intricate narrative where a simpler diction must necessarily have grown monotonous" (Mackail). The periodic structure of Latin prose, which had been developed by Cicero, was carried by Livy " to an even greater complexity." The style of Pollio, who wrote a History of the Civil Laws, was much admired, and the loss of this work must be deplored. A different species of prose, the plebius sermo, or colloquial speech of the poor, is partly preserved in the invaluable fragments of a Neronian writer, Petronius Arbiter. Of the Latin prose-writers of the silver age, the elder Pliny, Quintilian and Tacitus, who adorned the last years before the decay of classical Latin, nothing need here be said.

English. — It was long supposed that the conscious use of prose in the English language was a comparatively recent thing, dating back at farthest to the middle of the 16th century, and due directly to French influences. Earle was the first to show that this was not the case, and to assert that we " possess a longer pedigree of prose literature than any other country in Europe." Though this may be held to be a somewhat violent statement, the independence of English prose is a fact which rests on a firm basis. " The Code of Laws of King's Inn " dates from the 7th century, and there are various other legal documents which may be hardly literature in themselves, but which are worded in a way that seems to denote the existence of a literary tradition. After the Danish invasion, Latin ceased to be the universal language of the educated, and translations into the vernacular began to be required. In 887, Alfred, who had collected the principal scholars of England around him, wrote with their help, in English, his Hand-Book; this, probably the earliest specimen of finished English prose, is unhappily lost. Alfred's preface to the English version of the Cura pastoralis was in Latin; this translation was probably completed in 890. Later still Alfred produced various translations from Bede, Orosius, Boethius and other classics of the latest Latin, and, in 900, closing a translation from St Augustine, we read " Here end the sayings of King Alfred." The prose of Alfred is simple, straightforward and clear, without any pretension to elegance. He had no direct followers until the time of the monastic revival, when the first name of eminence which we encounter is

that of iElfric, who, about 997, began to translate, or rather to paraphrase, certain portions of the Bible. The prose of JEliric, however, though extremely interesting historically, has the fault that it presents too close a resemblance, in structure and movement, to the alliterative verse of the age. This is particu- larly true of his Homilies. A little later vigorous prose was put forth by Wulfstan, archbishop of York, who died in 1023. At the Norman Conquest, the progress of English prose was violently checked, and, as has been acutely said, it " was just kept alive, but only like a man in catalepsy." The Annals of Winchester, Worcester and Peterborough were carried on in English until 1154, when they were resumed in Latin; the chronicle which thus came to an end was the most important document in English prose written before the Norman Conquest. Except in a few remote monasteries, English now ceased to be used, even for religious purposes, and the literature became exclusively Latin or French. There was nothing in prose that was analogous to the revival of verse in the Ormulum or the metrical chronicles. All the pre-Norman practice in prose belongs to what used to be distinguished as Anglo-Saxon literature. The distinction has fallen into desuetude, as it has become more clearly perceived that there is no real break between the earlier and the later language. The Norman check, however, makes it fair to say that modern English prose begins with the Testament of Love of Thomas Usk, an imitation of the De consolalione of Boethius, which a certain London Lollard wrote in prison about 1584. About the same time were written a number of translations, The Tale of Melibee and The Parson's Sermon by Chaucer ; the treatises

of John of Trevisa, whose style in the Polychronicon has a good deal of vigour; and the three versions of the Travels of Jean a Barbe, formerly attributed to a fabulous " Sir John Mandeville." The composite text of these last-mentioned versions really forms the earliest specimen of purely secular prose which can be said to possess genuine literary value, but again the fact, which has only lately been ascertained, that " Sir John Mandeville " was not an original English writer robs it of much of its value. The anonymous compiler- translator can no longer be styled " the father of English prose." That name seems more properly to belong to John Wyclif, who, in the course of his fierce career as a controversialist, more and more completely abandoned Latin for English as the vehicle of his tracts. The earliest English Bible was begun by Nicholas Hereford, who had carried it up to Baruch, when he abruptly dropped it in June 1382. The completion of this great work is usually attributed, but on insufficient grounds, to Wyclif himself. A new version was almost immediately started by John Purvey, another Wyclifite, who completed it in 1388. We are still among translators, but towards the middle of the 14th century Englishmen began, somewhat timidly, to use prose as the vehicle for original work. Capgrave, an Augustinian friar, wrote a chronicle of English history down to 141 7;

Sir John Fortescue, the eminent constitu- tional jurist, produced about 1475 a book on The Governance of England; and Reginald Pecock, bishop of Chichester, attacked the Lollards in his Repressor of Over Much Blaming of the Clergy (1455), which was so caustic and scandalous that it cost him his diocese. The prose of Pecock is sometimes strangely modem, and to judge what the ordinary English prose familiarly in use in the 15th century was it is more useful to turn to The Paston Letters. The introduction of printing into England is coeval with a sudden development of English prose, a marvellous example of which is to be seen in Caxton's 1485 edition of Sir Thomas Malory's Morte d' Arthur, a compilation from French sources, in which the capacities of the English language for melody and noble sweetness were for the first time displayed, although much was yet lacking in strength and conciseness. Caxton himself, Lord Berners and Lord Rivers, added an element of literary merit to their useful translations. The earliest modern • historian was Robert Fabyan, whose posthumous Chronicles were printed in 1515. Edward Hall was a better writer, whose Noble Families of Lancaster and York had the honour of being studied by Shakespeare. With the advent of the Renaissance to England, prose was heightened and made more colloquial. Sir Thomas More's Richard III. was a work of considerable importance; his finer Utopia (1516) was unfortunately composed in Latin, which still held its own as a dangerous rival to the vernacular in prose. In his Governor (1531) Sir Thomas Elyot added moral philosophy to the gradually widening range of sub- jects which were thought proper for English prose. In the same year Tyndale began his famous version of the Bible, the story of which forms one of the most romantic episodes in the chronicles of literature; at Tyndale's death in 1536 the work was taken up by Miles Coverdale. The Sermons of Latimer (1549) introduced elements of humour, dash and vigour which had before been foreign to the stately but sluggish prose of England. The earliest biography, a book in many ways marvellously modern, was the Life of Cardinal Wolsey, by George Cavendish, written about 1557, but not printed (even in part) until 1641. In the closing scenes of this memorable book, which describe what Cavendish had personally experienced, we may say that the perfection of easy English style is reached for the first time. The prose of the middle of the 16th century — as we see it exempli- fied in the earliest English critic, Sir Thomas Wilson; the earliest English pedagogue, Roger Ascham; the distinguished humanist, Sir John Cheke — is clear, unadorned and firm, these Englishmen holding themselves bound to resist the influences coming to them from Italy and Spain, influences which were in favour of elaborate verbiage and tortured construction. Equal simplicity marked such writers as Foxe, Stow and Holinshed, who had definite information to purvey, and wished a straightforward prose in which to present it. But Hoby and North, who

translated Guevara, Castiglione and Amyot, brought with them not a few of the ingenious exotic graces of those originals, and pre- pared the way for the startling innovations of Lyly in his famous didactic romance of Euphues (1579). The extravagances and eccentricities of Lyly outdid those of his continental prototypes, and euphuism became a disturbing influence which, it may be, English prose has not, even to the present hour, entirely succeeded in throwing off. In spite of its overwhelming popularity, it was opposed in its own day, not merely by the stately sobriety of Hooker, in whom we see Latin models predominant, but by the sweetness of Sir Philip Sidney in his Arcadia. Raleigh wrote English prose that was perhaps more majestic than any which preceded it, but he revelled in length of sentence and in ponder- osity of phrase, so that it is probable that the vast prestige of The History of the World on the whole delayed the emancipation of English prose more than it furthered it. The direct influence of the euphuistic eccentricity was seen for some time in the work of poets like Lodge and Greene, and divines like Lancelot Andrewes; its indirect influence in the floweriness and violence of most careful prose down to the Restoration. Bacon, whose contempt of the vernacular is with difficulty to be excused, despaired too early of our national writing. Donne cultivated a rolling and sonorous majesty of style; and Burton could use English with humour and vivacity when he gave himself the chance, but his text is a prototype of the vicious abuse of quota- tion which was a crowning fault of prose in the early 17th century. In spite of the skill with which, during the civil wars and the Commonwealth, certain authors (such as Jeremy Taylor, Howell, Fuller, Milton, Izaak Walton) manipulated prose, and in spite of the extraordinary magnificence of the Ciceronian periods of Sir Thomas Browne, it was not until shortly before the Restoration that English prose reached its perfection. According to Dr Johnson, Sir William Temple (1628-1699) " was the first writer who gave cadence to English prose; before his time they were careless of arrangement, and did not mind whether a sentence ended with an important word or an insignificant word, or with what part of speech it concluded." The tendency was all in favour of brevity and crispness, and in particular of shorter sentences and easier constructions. Not a little of the majesty of the earlier age was lost; but for practical purposes, and in the hands of ordinary men, prose became a far more useful and businesslike implement than it had hitherto been. The short treatises of Halifax, if we compare them with similar writings of a generation earlier, display the complete change of style; or we may contrast the clear and sarcastic sentences of South with the undulating quaintness of Joseph Hall. The range of English speech was first compre- hended perhaps by Dryden, who combined dignity and even pomp of movement with an

ease and laxity at occasion which gave variety to prose, removed from it its stilted and too pre- latical elevation at inappropriate moments, and approximated it to the ordinary speech of cultivated persons. This then may be called the foundation of modern English prose, which has extended into no departments not recognized, at least in essence, by Bunyan, Dryden and Temple. The ensuing varieties of prose have been mainly matters of style. In the 18th century, for instance, there was a constant alternation between a quiet, rather cold elegance and precision of prose-writing, which was called the Addisonian manner, and a swelling, latinized style, full of large words and weighty periods, in which Johnson was the most famous but Gibbon perhaps the most characteristic proficient. But as far as grammatical arrangement and the rules of syntax are concerned, it cannot be said that English prose has altered essentially since about 1680. It is, however, to be noted that in the course of the 19th century the use of short sentences, and the habit of neglecting to group them into paragraphs, introduced a heresy not known before; and that, on the other hand, there has been a successful attempt made to restore the beauty and variety of early 17th-century diction, which had suffered a long decline from the Restoration onwards.

Icelandic. — The independent invention of prose by the exiled

aristocrats in the Heroic Age of Iceland is one of the most singular facts in literary history. It resulted from the fact that story-telling grew to be a recognized form of amusement in the isolated and refined life of an Icelandic household from the 9th to the nth century. Something of the same kind had existed in the courts of Norway before the exodus, but it was in Iceland that it was reduced to an art and reached perfection. It is remarkable how suddenly the saga, as a composition, became a finished work; it was written in a prose which immediately presented, in the best examples, " a considerable choice of words, a richness of alliteration and a delicate use of syntax " (Vigfusson). The deliberate composition of sagas began about the year 1030, and it is supposed that they began to be written down soon after 1100. It is distinctly recorded that Ari Frodi (1067-1148) was the first man in Iceland who wrote down stories in the Norse tongue. Many of Ari's books are lost, but enough survive to show what Icelandic prose was in the hands of its earliest artificer, and the impress of his rich and simple style is felt on all the succeeding masterpieces of the great age of Icelandic history and biography. But the Greater Sagas, as they are called, the anonymous stories which followed the work of Ari and were completed in the 13 th century, exhibit prose style in its most enchanting fullness, whether in the majesty of Njala, in the romantic art of Laxdaela, or in the hurrying garrulity of Eyrbyggia. There followed a vast abundance of sagas and saga- writers. The great historian, Sturla (1214-1284), is the latest of these classic writers of Iceland, and after his death there was a very rapid decline in the purity and dignity of the national prose. By the opening of

the 14th century the art of writing in the old noble language had become entirely lost, and it was not until the 17th century that it began to revive as an archaeological curiosity and a plaything for scholars. " For an Icelander of the present day to write modern history in saga style is a ludicrous absurdity," and the splendid living prose of the 12th century remains unrelated, a strange and unparalleled portent in the history of European literature. Of its beneficial effect on later Scandinavian, English and even Teutonic style there can be no question.

Spain. — In Castilian Spanish, as in the other languages of Europe, verse is already far advanced before we meet with any distinct traces of prose. A didactic treatise for use in the confessional is attributed to a monk of Navarre, writing in the 13th century. Between 1220 and 1250 a chronicle of Toledo was indited. But the earliest prose-writer of whom Spain can really boast is King Alphonso the Learned (1226-1284), in whose encyclopaedic treatises " Castilian makes its first great stride in the direction of exactitude and clearness " (Fitzmaurice- Kelly). Almost all the creditable prose of the end of the 13th century is attributed to Alphonso, who was helped by a sort of committee of subsidiary authors. The king's nephew, Juan Manuel (1 282-1347), author of the admirable Conde Lucanor, carried prose to a further point in delicacy and precision. The poet Ayala (1332-1407) was another gifted artificer of Spanish prose, which suffered a setback in the hands of his successors, Santillana and Mena. It rose once more in The Sea of Histories of Perez de Guzman (1378-1460), who has been compared to Plutarch and St Simon, and in whom the lucid and energetic purity of Castilian prose is for the first time seen in its perfection. • In the 15th century the shapeless novel of chivalry was predomi- nant, while in the age of Charles V. poetry altogether over-shadowed prose. The next great writer of prose whom we meet with is Guevara, who died in 1545, and whose Dial of Princes exercised an influence which was not confined to Spanish, and even extended to English prose (in North's well-known version). The historians of this period, prolix and discursive, were of less value. The earliest picaroon novel, Lazarillo de Tormes (1554), the authorship of which is unknown, introduced a new form and exhibited Castilian prose style in a much lighter aspect than it had hitherto worn. Still greater elegance is met with in the mystical and critical writings of Juan de Valdes and in those of Luis de Le6n; of the latter Mr Fitzmaurice-Kelly says that " his concise eloquence and his classical purity of expression rank

him among the best masters of Castilian prose." The instru- ment,

accordingly, was polished and sharpened for the finest uses, and was ready to the hand of the supreme magician Cervantes, whose Don Quixote was begun a few years (about 1501) after Los Nombres de Cristo of Luis de Leon had been published ˆ583); these dates are significant in the history of Spanish prose. The prose of Lope de Vega is stately and clear, but of course has little importance in comparison with the verse of his huge theatre. Quevedo's style had the faults which were now invading all European writing, of violent antithesis and obscure ingenuity; but his Visions (1627) occupy a prominent place in the history of Castilian prose. The latest struggles of a decadent critical conscience, battling against tortuousness and affectation, are seen in Gracian (1601-1658) and in Molinos (1627-1607), who vainly endeavoured to save classic prose out of the intellectual shipwreck of the 18th century. When Spanish prose revived in the 19th century, in the person of Larra (1809- 1837), the influence of French models was found to have deprived it of distinctly national character, while giving it a fresh fluidity and grace.

French. — There had long been a flourishing versified literature in the vernacular of France, before anyone thought of writing French prose. It was the desire to be exact in giving informa- tion, together with a reduced sense of the value of rhyme and rhythm, which led to a partial divergence from metre. The translator of the fabulous Chronicle of Turpin mentions that he writes in prose " because rhyme entails the addition of words which are not in the Latin." Thus about the year 1200 verse began to be abandoned by chroniclers who had some definite statements to impart, and who had no natural gifts as poets. They ceased to sing; they wrote, more or less easily, as those around them spoke. The earliest French prose was translated from the Latin, but Baldwin VI., who died in 1205, is said to have commissioned several scribes to compile in the vulgar tongue a history of the world. If this was ever written it is lost, but we possess a Book of Stories written about 1225 by a clerk at Lille, which may fairly be said to be the start-word of French prose history. When once, however, a taste for prose was admitted, the superiority of that medium over verse as material for exact history could not but be perceived, and prose soon became frequent. The earliest French prose-writer of genius was Geoffroy (or Jofroi) de Villehardouin, who put down memoirs of his life between r 1 98 and 1 207 ; he left his book, which is known as The Conquest of Constantinople, incomplete when he died in 1 2 13. In the history of prose, Villehardouin takes an eminent place. In his admirable style are seen many of the most precious elements of French prose, its lucidity, its force, its sobriety and its charm of address. He had been trained as an orator, and it was his merit that, as M. Langlois has said, he was content to write as he had learned to speak. Villehardouin was closely followed by other admirable writers of memoirs, by Robert of Clari, by Henri of

Valenciennes, by the anonymous chronicler of B6thune, to whom we owe the famous description of the battle of Bouvines, and by the Minstrel of Reims. The last-named finished his Recits in 1 260. These works in the new easy manner of writing were found to be as elegant and as vivacious as any preserved by the old rhetorical art of verse. They led the way -directly to the eminent writer who was the earliest historian of modern Europe, to Jean de Joinville, who finished his Histoire de St Louis in 1309. A century later Froissart left his famous Chroniques unfinished in 1404, and again a hundred years passed before Philippe de Commines dropped the thread of his Memoires in 1511. These are the three most illustrious names in the chronicle of French medieval prose, in whom the various characteristics of the nation are separately developed. It must be noted that these three are simply the most eminent figures in a great cloud of prose-writers, who preserved with more or less vivacity the features of French life in the later middle ages, and helped to facilitate the use of the central national language. In the 15th century, moreover, Antoine de la Salle deserves mention as practically the earliest of French novelists, and one whose skill in the manipulation of

language was long in waiting for a rival among his successors. But with the Renaissance came the infusion into France of the spirit of antiquity, and in Rabelais there was revealed an author of the very highest genius who at once defended the integrity of French syntax and enriched its vocabulary with an infinite multitude of forms. The year 1532, in which the first brief sketch of Gargantua appeared, was critical in French literature; for more than twenty years afterwards the structure of the great Pantagruelist romance was still being builded. Meanwhile in 1 549 had appeared the Defense et illustration de la langue fran- c,aise of Joachim du Bellay, in which the foundations of the learned and brilliant literary criticism of France were firmly laid. The liberation of the language proceeded simultaneously in all directions. In 1539 it was officially decreed that all judicial acts were thenceforward to be written in vernacular prose, " en langage maternal francais et non autrement." Calvin led the theologians, and his precise, transparent and sober prose, curiously deficient in colour, gave the model to a long line of sober rhetoricians. It is in the pages of Calvin that we meet for the first time with a simple French prose style, which is easily intelligible by the reader of to-day. There is some affectation of an ornamented pedantry in St Francois de Sales, some return to the form and spirit of medieval French in Mon- taigne; so that the prose of these great writers may easily seem to us more antiquated than that of Calvin. Yet the Institution belongs at latest to 1560, and the immortal Essais at earliest to 1580. We are approaching the moment when there should be nothing left for French prose to learn, and when development should merely take forms of personal brilliancy and initiative of enterprise on lines

already clearly laid down. But we pause at Brantome, in whom the broad practice of French as Froissart and the medieval chroniclers had used it was combined with the modern passion for minute detail and the close observation of the picturesque. Here the habit of memoir-writing in French prose first becomes a passion. With the beginning of the 17th century there sprang up almost an infatuation for making prose uniformly dignified and noble, for draping it in solemn robes, for avoiding all turns of speech which could remind the reader of the " barbarous " origins of the language; the earliest examples of this subjection of eloquence to purely aristocratic forms have been traced back to the Servitude volontaire of Montaigne's friend, La Boetie (1530-1563). In the pursuit of this dignity of speech the prose writers of the 16th century ventured to borrow not words merely but grammatical terms and peculiarities of syntax from the ancient literatures of Greece and Rome. The genius of France, however, and the necessity of remaining intelligible checked excess in this tendency, and after a few wild experiments the general result was discovered to be the widening of the capacities of the language, but at the temporary expense of some of the idiomatic richness of the old French form. In the 1 7th century a great stimulus was given to easy prose by the writers of romances, led by d'Urf6, and by the writers of letters, led by Balzac. In the hands of these authors French prose lost its heaviness and its solemnity; it became an instrument fit to record the sentiments of social life in an elegant balance of phrases; here was first discovered what Voltaire calls the nombre et harmonie de la prose. French style became capable of more than this, it achieved the noblest and the subtlest expressions of human and divine philosophy, when it was used by Descartes and by Pascal to interpret their majestic thoughts to the world. At this moment of national development, in 1637, the French Academy was founded, for the distinct purpose of purifying, embellishing and enlarging the French language; and in process of time, out of the midst of the academy, and as a primary result of its labours, arose the extremely important Remarques (1647) of Vaugelas, a work of grave authority, which was the earliest elaborate treatise on the science of prose in any language. Antiquated as the method of Vaugelas now seems, and little regarded in detail by modern writers, it may be said that his famous book is still the basis of all authority on the subject of French prose. In common with his colleagues of the hour, Vaugelas strove to lay down laws by which harmony of structure,

a graceful sobriety, lucidity and exactitude of expression, could be secured to every practised French writer. He was not accepted as an infallible lawgiver, even in his own age; he was immediately exposed to the searching

criticism of La Mothe le Vayer, who, however, was radically at one with him regarding the basis of his definition. The great demerit of the early academicians was that they knew little and cared less about the forms of medieval French. They thrust everything aside which they regarded as barbarous, and the work of the 19th century was to recover from a past behind Rabelais elements of great value which the 17th had arbitrarily rejected as "incorrect." In the succeeding centuries there has been a vast extension of the practice of French prose into every conceivable department of experience and observation, but in spite of all neologisms, and in spite of the waves of preciosity which have periodically swept over the French language in the three hundred years which divide the age of Somaize from that of Mallarme, the treatise of Vaugelas remains the final code in which the laws that govern French prose are preserved.

Italy. — The case of prose in the Italian language has this unique feature that, instead of gathering form obscurely and slowly, it came into sudden existence at the will of one of the greatest of writers. Latin had almost universally been used in Italy until the close of the 13th century, when Dante created a vernacular prose in the non-metrical part of his famous Vita Nuova, written about 1 293. For a long time the prose of Dante stood practically alone, and Petrarch actually affected to despise the works which his great predecessor had written in the vulgar tongue. But about 1348 Boccaccio started the composition of his Decameron, which gave classic form to the prose romance of Italy. There had been stories in the vernacular before, and Boccaccio himself had written the Filocopo and the Amalo, but the Decameron marked the lines upon which easy and graceful Italian prose was to move for the future. It should have been greatly to the advantage of Italy over the other countries of Europe, that in the hands of Dante and Boccaccio prose was born full-grown, and had not to pass through the tedious periods of uncertain development which awaited it in England, France and Spain. After this brilliant beginning, however, there was a decline in the 15th century, the writers of the next age lacking the courage to be independent of antiquity. There was a return to Latin phraseology which made many works almost maca- ronic in character; the famous Hypnerotomachia of Colonna is an instance of this. Something of the purity of Italian prose as Boccaccio had left it was recovered by Sannazaro in his Arcadia (1489) a pseudo-classical pastoral romance, the form of which was widely imitated throughout Europe; even Sannazaro, however, did not see how needful it was to cast off Latin construc- tions. At length a pair of historians, Machiavelli and Guicciar- dini, succeeded in releasing prose from the yoke of Rome, and in writing undiluted Tuscan. In the 16th century the prose writers of Italy became extremely prolific, with Pietro Bembo at their head. The novelists were now prominent, but, although they take a foremost place in the history of Italian literature,

there was little art in their employment of language. Many of them were born out of Tuscany, and, like Bandello, never learned the exact rules of pure Italian prose. Since the 16th century Italian would seem to have undergone no radical changes as a language, and its prose has been stationary in form. At the close of the 19th century a new school of writers, with Gabriele d'Annunzio at its head, created a demand for a new prose, but it is significant that the remedy suggested by these innovators was neither more nor less than a return to the proce- dure of Boccaccio and Machiavelli, who remain the types of ease and dignity in Italian prose.

German. — The earliest coherent attempts at the creation of German prose belong to the age of Charlemagne, and the first example usually quoted is the Sfrassburger Eidschwiire of 842. For all literary purposes, however, metrical language was used exclusively during the mittelhochdeutsch period, which lasted until the end of the 13th century. What little prose there was, was limited to jurisprudence and theology. David of Augsburg,

who died in 1272, is named as the earliest preacher in the ver- nacular, but only one of his sermons has come down to us. More important was Berthold " the Sweet " (1220-1272), whose sermons were discovered by Neander and published in 1824. Historical prose began with the Saxon Chronicle of 1 248. There was little to record in the next two centuries, until prose was revived by Geiler von Kaisersburg (1445-15 10) in his sermons. About the same time translations were made of the Decameron and of other Italian collections of novels. The development of prose in Germany is, however, negligible until we reach the Reformation, and it is Luther's Bible (New Testament, 1522), on which all classic German prose is based. This movement is due to Luther alone, since the other protagonists of reform wrote mainly in Latin. Johann Fischart composed important secular books in the vernacular, in particular the Bienenkorb (1579) and an imitation of Gargantua (1575), which is the earliest German novel. But nearly a century passes before we reach another prose work of real importance in the German vernacular, this being the curious picaresque romance of Simplicissimus (1669) of Grimmelshausen. But the neglect of prose by the German nation was still general, and is exemplified in the way by which men of the stamp of Leibnitz wrote in Latin and even in French, rather than in their own " barbarous " tongue. What Luther had done at the beginning of the 16th century was, however, completed and confirmed in the middle of the 18th by Lessing, who must be considered as the creator of modern German prose. The critical period in this revival was 1764 to 1768, which saw the production of Laocoon and the Hamburgische Dramaturgic We pass on presently to Jean Paul Richter, and so to Goethe, in whose majestic hands German prose became the organ of thought and eloquence which it has been ever since.

Authorities. — John Earle, English Prose (London, 1890); C. Favre de Vaugelas, Remarques sur la langue francaise (Paris, 1647). Nouvelles' remarques (Paris, 1690); T. Mundt, Kunst der deutschen Prosa (Berlin, 1837); J. W. Mackail, Latin Literature (London, 1895); James Fitzmaurice-Kelly, History 0/ Spanish Literature (London, 1898); G. Vigfusson, various Prolegomena. (E.G.)

PROSECUTION, the procedure by which the law is put in motion to bring an accused person to trial (see Criminal Law; Indictment; Summary Jurisdiction, and Trial). In theory in the United Kingdom the king is in all criminal offences the prosecutor, because such offences are said to be against his peace, his crown and dignity, but in practice such prosecutions are ordinarily undertaken by the individuals who have suffered from the crime. This is a different procedure from that pre- vailing in Scotland, European continental countries and the United States, in all of which a public department or officer undertakes the prosecution of offences. A step towards public prosecution was taken in England by the Prosecution of Offences Act (1879), under which an officer called the " Director of Public Prosecutions " was appointed; in 1884 the Prosecution of Offences Act of that year revoked the appointment made under the act of 1879, and constituted the solicitor to the Treasury Director of Public Prosecutions. The Prosecution of Offences Act (1908) separated the two offices again, making the public prosecutor independent of the treasury, but putting him under the control of the Home Office. The duty of the public prose- cutor is to institute, undertake or carry on criminal proceedings in any court and to give advice and assistance to persons con- cerned in such proceedings. The appointment of such an officer, according to the act of 1908, does not preclude any person from instituting or carrying on criminal proceedings, but the public prosecutor may at any stage undertake the conduct of these proceedings if he thinks fit (s. 2, par. 3). .

A person to be qualified for the post of public prosecutor must be a barrister or solicitor of not less than ten years' standing, and an assistant public prosecutor, who may be appointed under the act of 1908 and who is empowered to do any act or thing which the public prosecutor is required or authorized to do, must be a barrister or solicitor of not less than seven years' standing. See also Lord Advocate.

PROSELYTE (Gr. Trpo^Xvros), strictly one that has arrived (= Lat. advena), a stranger or sojourner, a term now prac- tically restricted to converts from one religion to another. It

was originally so used of converts to Judaism, but any one who sets out to convert others to his own opinions is said to " proselytize." The word is commonly used in the Alexandrian Greek translation of the Old Testament (Septuagint) for the Hebrew word (ger) which is derived from a root (gur) denoting to sojourn. The English versions often render the word by "stranger;" but though distinguished from the home-born "ezrah (= one rising from the soil), the person denominated ger became the equal of the native Israelite, and, when the meaning of ger passed from a mainly civil to a religious connotation, enjoyed many rights. Like the Arabic/or (which is philologically cognate to ger), the ger attached himself as a client to an indi- vidual or as a protected settler to the community. He shared in the Sabbath rest (Exod. xx. 10), and was liable to the same duties and privileges as Israel (see references in Oxford Gesenius, p. 158). The Hebrew word later came to mean what we now understand by proselyte, a term which appears in the sense of convert to Judaism in the New Testament (Matt, xxiii. 15; Acts ii. 10).

The Rabbinic law recognized two classes: (a) the full proselyte, the stranger of righteousness (gersedeq), who was admitted after circumcision, baptism and the offering of a sacrifice (after the destruction of the Temple the first two ceremonies were alone possible); and (b) the limited proselyte, the resident alien (ger toshab) or proselyte of the gate (ger ha-sha'ar), who, without accepting Judaism, renounced idolatry and accepted Jewish jurisdiction, thereby acquiring limited citizenship in Palestine. Some authorities think that the " God-fearers " of some of the Psalms and of the New Testament were these limited proselytes. The Hebrew and Greek terms, however, lost the connotation of a change of residence, and both ger and " proselyte " came to apply to a convert without regard to his nationality.

At various periods there were proselytes to Judaism. The Maccabaeans used compulsion in some cases, but Judaism in the Diaspora was a missionary religion in the less militant sense. Heathens felt in the religion of Israel an escape from their growing scepticism, and a solution to the problem of life. Josephus testifies that there was much proselytism in Rome (Against Apion, ii. 39), and several Latin writers confirm this (Cicero, Pro Flacco, § 28; Juvenal xiv. 96; cf. Reinach, Textes d'auteurs grecs et romains relatifs au Judaisme (1895). The well-known reference in Matt. xxv. 15 supports the view that proselytes were actively sought by the Pharisees, and the famous Didache was probably in the first instance a manual for instructing proselytes in the principles of Judaism. There were, however, varying opinions as to the value to the Jewish body of these accessions. Some rabbis interpreted Israel's dispersion as divinely designed for the very purpose of proselytizing (Pesahim 876.). In the Diaspora admission of con- verts may have been made easy, circumcision being sometimes omitted, but the conditions became gradually more severe, until

they reached their present form. It is thought that the Hadrianic persecution led to this change. The Jews seem to have suffered during the war from the treachery of half-hearted friends. Again, many who had become converts to Judaism afterwards joined the new Christian communities. Moreover, in the middle ages, it was not lawful for the Jews to admit proselytes. Various church councils prohibited it, and the Code of Alfonso X. (1261) made conversion to the synagogue a capital crime. (In 1222 a Christian deacon was executed at Oxford for his apostasy to Judaism : Matthew Paris, ed. Luard, iii. 71.) Again, the pragmatic theory of Judaism, enunciated in Talmudic times, and raised almost to the dignity of a dogma by Maimonides (On Repentance, iii. 5, &c), was that Judaism was not necessary for salvation, for " the pious of all nations have a share in the world to come " (Tosephta, Sanh. xiii. 2). If to these causes be added a certain exclusiveness, which refused to meet a would-be convert more than half-way, we find no difficulty in accounting for the reluctance which the medieval and modern syn- agogue has felt on the subject. Yet willing proselytes to Judaism are still freely received, provided that their bona fides are proven. In some reformed congregations in America proselytes are admitted without circumcision, and a similar policy is proposed (not yet adopted) by the Jewish Religious Union in London, though the male children of proselytes are to be required to undergo the rite. In 1896 the central conference of American Rabbis formulated as a proselyte Confession of faith these five principles: (i) God the Only One; (2) Man His Image; (3) Immortality of the Soul; (4) Retribution ; and (5) Israel's Mission. Most cases of conversion to Judaism at the present time are for purposes of marriage, and female proselytes are more numerous than male. Female proselytes are admitted after the total immersion in a ritual bath, though in some Reformed congregations this rite is omitted. Proselytes are

still not allowed, in Orthodox circles, to become the wives of reputed descendants of the priestly families, but otherwise marriage with proselytes is altogether equal to marriage between born Jews.

See Schurer, Geschichte des jiidischen Volkes, ed. 3, iii. 102-135, Bertholet, Die Stellung der Israeliten und der Juden zu den Fremden, 179-349; articles in Ency. Bib., Hastings's Diet. Bib. and the Jewish Ency. For the Jewish law of the admission of proselytes, see Shulhan 'Aruch, Yore Deah, § 268. (I. A.)

PROSERPINE (Proserpina), the Latin form of Persephone, 1 a Greek goddess, daughter of Zeus and the earth-goddess Demeter. In Greek mythology Demeter and Proserpine were closely associated, being known together as the two goddesses, the venerable or august goddesses, sometimes as the great goddesses. Proserpine herself was commonly known as the daughter (Core), sometimes as the first-born. As she was gathering flowers

with her playmates in a meadow, the earth opened and Pluto, god of the dead, appeared and carried her off to be his queen in the world below. 2 This legend was localized in various places, as at Eleusis, Lerna, and " that fair field of Enna " in Sicily. Torch in hand, her sorrowing mother sought her through the wide world, and finding her not she forbade the earth to put forth its increase. So all that year not a blade of corn grew on the earth, and men would have died of hunger if Zeus had not persuaded Pluto to let Proserpine go. But before he let her go Pluto made her eat the seed of a pomegranate, and thus she could not stay away from him for ever. 3 So it was arranged that she should spend two-thirds (according to later authors, one-half) of every year with her mother and the heavenly gods, and should pass the rest of the year with Pluto beneath the earth. 4 There can be little doubt that this is a mythological expression for the growth of vegetation in spring and its disappearance in autumn. Accord- ing to Theopompus there was a Western people who actually called the spring Proserpine. As wife of Pluto, she sent spectres, ruled the ghosts, and carried into effect the curses of men. The lake of Avernus, as an entrance to the infernal regions, was sacred to her. From the head of a dying person Proserpine was supposed to cut a lock of hair which had been kept sacred and unshorn through life. 5 She was sometimes identified with Hecate. On the other hand in her character of goddess of the spring she was honoured with flower-festivals in Sicily and at Hipponium in Italy. Sicily was a favourite haunt of the two

1 Some, however, regard Proserpina as a native Latin form, not borrowed from the Greek, and connected with proserpere, meaning the goddess who aided the germination of the seed.

2 The story is reminiscent of the old form of marriage by capture.

3 The idea that persons who have made their way to the abode of the dead can return to the upper world if they have not tasted the food of the dead appears elsewhere, as in New Zealand (R. Taylor, New Zealand, pp. 233, 271).

4 Hymn to Demeter; Ovid, Fasti, iv. 419; Metam. V. 385.

5 Aen., iv. 698 seq. It appears to have been a Greek custom to cut a lock of hair from a dead man's head, and hang it outside of the house door, in token that there was a corpse in the house. At least this seems a fair inference from Eurip. Ale., 75, 76, 101-104. The lock so cut may have been that which was kept sacred to the gods and unshorn (Etym. Mag., s.v. A7r«rKoAuwjeeos). For examples of hair dedicated to gods, see II. xxiii. 141 seq.; Plut., Thes. 5; Paus. viii. 20, 3. In Tibet a lama (priest) is called in to cut off some hairs from the head of a dying person, in order that his

soul may escape through the top of his head, which is deemed an essential condition of a good transmigration (Horace de la Penna, in Bogle and Manning's Travels in Tibet, ed. C. R. Markham, 1876). We can hardly doubt that the intention of the Graeco-Roman custom was similar. In modern Greece the god of death, Charos, is supposed to draw the soul out of the body, and if a man resists the Aracho- bites believe that Charos slits open his breast (B. Schmidt, Volks- leben der Neugriechen, 1871, p. 228). There are other instances of incisions made in the body of a dying person to allow his soul to escape(cf. A. Bastian, Der Mensch in der Geschichte, i860, ii. 342). The custom probably dates from the times when death in battle was the usual death. In the legend of Nisus and Scylla there is a trace of the custom which was still observed in classical times in the sacrifice of animals. The practice of cutting off the hair of the dead prevailed in India, though it does not appear in the Vedas (Monier-Williams, Religious Thought and Life in India, p. 281). We are reminded of the practice of the Pawnees and other North-American Indians, who shaved the head with the exception of one lock (the scalp-lock), which was removed by a victorious enemy (Catlin, North American Indians, ii. 24). The Sandwich Islanders also cut a lock from a slain foe (W. Ellis, Polynesian Researches, 1834, iv. 159).*

goddesses, and ancient tradition affirmed that the whole island was sacred to them. The Sicilians claimed to be the first on whom Demeter had bestowed the gift of corn, and hence they honoured the two goddesses with many festivals. They celebrated the festival of Demeter when the corn began to shoot, and the descent of Proserpine when it was ripe. At Cyare, a fountain near Syracuse which Pluto made to spring up when he carried off his bride, the Syracusans held an annual festival iri the course of which bulls were sacrificed by being drowned in the water. At Cyzicus also, in Asia Minor, bulls were sacrificed to Proserpine. Demeter and Proserpine were worshipped to- gether by the Athenians at the greater and less Eleusinian festivals, held in autumn and spring respectively. In the Eleusinian mysteries Proserpine no doubt played an important part. One Greek, writer, Achemachus, identified Proserpine with the Egyptian Isis. 1 At Rome Proserpine was associated with Ceres (the Roman representative of Demeter) in the festival of the Cerealia (April 12 to 19), she was represented as the wife of Dis Pater (the Roman Pluto), and was sometimes identified with the native Latin goddess Libera. The pomegranate was Proserpine's symbol, and the pigeon and cock were sacred to her. Her votaries abstained from the flesh of domestic fowls, fish, beans, pomegranates and apples. In works of art she appears with a cornucopia or

with ears of corn and a cock. 2 The regular form of her name in Greek was Persephone, but various other forms occur: Phersephone, Persephassa, Phersephassa, Pherre- phatta, &c, to explain which different etymologies were in- vented. Corresponding to Proserpine as goddess of the dead is the old Norse goddess Hel (Gothic Halja), whom Saxo Gram- maticus calls Proserpine.

See L. Preller, Demeter und Persephone (1837); R. Foerster, Der Raub und die Riickkehr der Persephone (1874) ; A. Zimmermann, De Proserpinae raptu et reditu (1882) ; J. A. Overbeck, •" Demeter and Kore " in Griechische Kunstmythologie, ii. (1878). (J. G. Fr. ; X.)

PROSKUROV, or Ploskurov, a town of Russia, in the govern- ment of Podolia, situated on the railway from Odessa to Lem- berg, 62 m. N.W. of Zhmerinka junction. Pop. (1897), 22,915, more than one-half being Jews. It is poorly built, mostly of wood, on a low marshy plain surrounded by hills, at the conflu- ence of the Ploskaya with the Bug. Its old castle has been destroyed, the site being occupied by a Roman Catholic church. The Orthodox Greek cathedral (1839) contains a very ancient and highly venerated image of the Virgin. The manufactures include oil-works and potteries; the Jewish merchants carry on an active export trade in corn and sugar, while the imports consist of salt and manufactured wares. Agriculture and market-gardening are the chief occupations of the Little-Russian inhabitants.

PROSODY (Gr. irpoa-cˆia), the art of versification (see Verse), including as its three divisions accent, breathing and quantity. Prosody is the mode in which the discipline is deter- mined by which successive syllables are so arranged as to form verse. The Latin name for it was accentus.

PROSPECTUS (Lat. for view, look-out, prospect, from prospicere, to look forward), a written or printed preliminary announcement of some undertaking, giving the scheme or plan, the principal features, &c. In law, the term is specifically applied to the invitation issued to the public by a company to subscribe for shares in the enterprise for which the company is formed (see Company).

PROSPER OF AQUITAINE, or Prosper Tiro (c. 390-c. 465), Christian writer and disciple of St Augustine, was a native of Aquitaine, and seems to have been educated at Marseilles. In 431 he appeared in Rome to interview Pope Celestine regard- ing the teachings of St Augustine and then all traces of him are lost until 440, the first year of the pontificate of Leo I., who had been in Gaul and thus probably had met Prosper. In any case Prosper was soon in Rome, attached to the pope in some secretarial or notarial capacity. Gennadius (De script, eccl. 85)*

1 Others regarded her as originally a moon-goddess. ‘ As the wife of Hades she was represented with the insignia of royalty and a torch.”

mentions a rumour that Prosper dictated the famous letters of Leo I. against Eutyches. The date of his death is not known, but his chronicle goes as far as 455, and the fact that Ammianus Marcellinus mentions him under the year 463 seems to indicate that his death was shortly after that date. Prosper was a lay- man, but he threw himself with ardour into the religious con- troversies of his day, defending Augustine and propagating orthodoxy. The Pelagians were attacked in a glowing polemical poem of about 1000 lines, Adversus ingratos, written ■about 430. The theme, dogma quod. . . pestifero vomuit coluber sermone Britannus, is relieved by a treatment not lacking in liveliness and in classical measures. After Augustine’s death he wrote three series of Augustinian defences, especially against Vincent of Lerins (Pro Augustino responsiones) . His chief work was against Cassian’s Collatio, his Be gratia dei ut liber arbitrio (432). He also induced Pope Celestine to publish an Epistola ad epis- copos GaUorum against Cassian. He had earlier opened a correspondence with Augustine, along with his friends Tyro and Hilarius, and although he did not meet him personally his enthusiasm for the great theologian led him to make an abridg- ment of his commentary on the Psalms, as well as a collection of sentences from his works — probably the first dogmatic com- pilation of that class in which Peter Lombard’s Liber senten- tiarum is the best-known example. He also put into elegiac metre, in 106 epigrams, some of Augustine’s theological dicta.

Far more important historically than these is Prosper’s Epiloma chronicon. It is a careless compilation from St Jerome in the earlier part, and from other writers in the later, but the lack of other sources makes it very valuable for the period from 425 to 45s, which is drawn from Prosper’s personal experience. There were five different editions, the last of them dating from 455, after the death of Valentinian. For a long time the Chronicon imperiale was also attributed to Prosper Tiro, but without the slightest justification. It is entirely independent of the real Prosper, and in parts even shows Pelagian tendencies and sympathies.

The Chronicon has been edited by T. Mommsen in the Chronica minora of the Monumenta Germaniae historica (1892). The com- plete works are in Migne’s Patrologia latina. Tome 51. See L. Valentine, St. Prosper a’ Aquitaine (Paris, 1900), where a complete list of previous writings on Prosper is to be found; also A. Potthast, Bibliotheca historica (1896).

PROSSNITZ (Czech Prostejov), a town of Austria, in Moravia, 50 m. N.E. of Briinn by rail. Pop. (1900), 24,054, mostly Czech. It is situated in the fertile plain of the Hanna, and is the principal commercial centre for the

sale of the various produce of the region. It has important textile, malt and sugar indus- tries, distilling, brewing and milling, manufactures of agricultural implements and lucifer matches. Prossnitz is a town of ancient origin, and in the 16th century was one of the chief seats of the Moravian Brethren.

PROSTITUTION (from Lat. prostituere, to expose publicly), a word which may best be defined as promiscuous unchastity for gain. In German law it is described as Gewerbsmassige Unzucht. It has always been distinguished in law and custom from concu- binage, which is an inferior state of marriage, and from adultery and other irregular sexual relations, in which the motive is passion. Prostitution has existed in all civilized countries from the earliest times, and has always been subject to regulation by law or by custom. In Christian countries attempts have repeatedly been made to suppress it, but without success. Its ultimate basis lies in the two most elementary attributes of living things, namely, the will to live and the instinct of repro- duction. The one represents the interest of the individual, the other that of the race; and the essential character of prostitu- tion is that it utilizes the latter to satisfy the former, whereas in true sexual passion, as Schopenhauer has pointed out, the advantage of the individual is subordinated to the needs of the race. In practical language, prostitution offers, through abuse of the sexual instinct, a means of livelihood which a certain proportion of women prefer to other means. It is often assumed by philanthropic moralists that no other means are open to them. That may be so in cases in which deception or constraint

has been used, and adverse circumstances — such as lack of friends and a harsh social code — close the door to other occupa- tions; but to suppose that such cases account for prostitution is to misapprehend the problem. The detailed investigations of various observers and the experience of rescue societies prove that the great majority of prostitutes prefer that means of liveli- hood to others entailing regular work, discipline and self-control. When they really cease to prefer the life, they leave it volun- tarily. 1 Otherwise there is extreme difficulty in reclaiming even the few who will consent to try, and permanent success is only attained with a small proportion of them. The earliest attempt at reclamation met with the same result. It was carried out by the Roman empress Theodora, wife of Justinian, herself a prostitute in early life. She established a home for 500 women on the Bosporus, but after a time they could not bear the restraint; some threw themselves into the sea, and eventually the scheme was abandoned. The preference is due to several causes, of which indolence is

the chief. Prostitutes are drawn mainly from the lower classes; the life offers them an escape from the toil which would otherwise be their lot. Women who present themselves to the police for inscription on the continent of Europe frequently give as their reason for embracing the life, that they do not intend to work any more. Other causes are love of excitement and dislike of restraint. The same qualities make the criminal and the wastrel. In addition, a large propor- tion have the sexual appetite developed in an abnormal degree. Of 3505 women interrogated by M. Buls in Brussels, 11 18 admitted le gout pour I'homme. The foregoing are primary causes. External conditions which foster any of these tenden- cies, or destroy the self-respect and sense of modesty which are their natural antidotes, are secondary causes of prostitution. The more important are: (1) difficulty of finding employment; (2) excessively laborious and ill-paid work; (3) harsh treat- ment of girls at home; (4) promiscuous and indecent mode of living among the overcrowded poor; (5) the aggregation of people together in large communities and factories, whereby the young are brought into constant contact with demoralized companions; (6) the example of luxury, self-indulgence and loose manners set by the wealthier classes; (7) demoralizing literature and amusements; (8) the arts of profligate men and their agents. Alcohol is often an aid to prostitution, but it can hardly be called a cause, for the practice flourishes even more in the most abstemious than in the most drunken countries. These observations apply to the West. In Oriental countries girls are commonly born into or brought up to the trade, and in that case have no choice.

Among the ancient nations of the East, with the exception of the Jews, prostitution appears to have been connected with religious worship, and to have been not merely tolerated but encouraged. From the Mosaic ordi- nances and the narrative of the Old Testament it is clear that the separation of the Jews as the chosen people, and the main- tenance of their faith, were always felt by Moses and by the later prophets to be chiefly endangered by the vicious attractions of the religious rites practised around them. The code of sexual morality laid down in the Book of Leviticus is prefaced by the injunction not to do after the doings of the land of Egypt, nor after the doings of the land of Canaan, where all the abominations forbidden to the Jews were practised; and whenever the Israelites lapsed from their faith and " went a-whoring after strange gods," the transgression was always associated with licentious conduct. In Egypt, Phoenicia, Assyria, Chaldea, Canaan and Persia, the worship of Isis, Moloch, Baal, Astarte, Mylitta and other deities consisted of the most extravagant sensual orgies, and the temples were merely centres of vice. In Babylon some degree of prosti- tution appears to have been even compulsory and imposed upon all women in honour of the goddess Mylitta. In India the ancient connexion between religion and prostitution still sur- 1 The number of those who do so

is considerable. In Copenhagen, from 1871 to 1896, 33% of the registered prostitutes were removed from the register by marriage and by returning to their friends. Many women resort to prostitution occasionally in alternation with work.

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vives ; but that is not the case in China, a most licentious country, and, considering the antiquity of its civilization, and its conser- vatism, we may perhaps conclude that it formed an exception in this respect among the ancient nations. Among the Jews, who stood apart from the surrounding peoples, the object of the Mosaic law was clearly to preserve the purity of the race and the religion. Prostitution 'in itself was not forbidden, but it was to be confined to foreign women. Jewish fathers were forbidden to turn their daughters into prostitutes (Lev. xix. 20), and the daughters of Israel were forbidden to become prostitutes (Deut. xxiii. 17), but no penalty was attached to disobedience, except in the case of a priest's daughter, who was to be burnt (Lev. xxi. 9). This distinction is significant of the attitude of Moses, because the heathen " priestesses " were nothing but prostitutes. Similarly, he forbade groves, a common adjunct of heathen temples and a convenient cover for debauchery. Again, his purpose is shown by the severe penalties imposed on adultery (death) and on unchastity in a betrothed damsel (death by stoning), as contrasted with the mild prohibition of prostitution. So long as it did not touch the race or the religion, he tolerated it; and even this degree of disapproval was not maintained, for Jephthah was the son of a harlot 2 (Judg. xi. 1). There is abundant evidence in the Old Testament that prostitu- tion prevailed extensively in Palestine, even in the earlier and more puritan days. The women were forbidden Jerusalem and places of worship; they infested the waysides, and there is some evidence of a distinctive dress or bearing, which was a marked feature of the trade among the Greeks and Romans. In the later period of aggrandisement that increase of licentious indulgence which Moses had foreseen took place, associated with infidelity. The people plunged into debauchery, the invariable sign of national decadence, which has always accompanied over-prosperity and security, and has always heralded national destruction. Before leaving the Jews, it may be noted as an interesting fact that the remarkable series of ordinances laid down by Moses in the interest of public health contains unmis- takable recognition of venereal disease and its contagious character (Lev. xv.).

Passing on to the ancient Greeks, we find prostitution treated at Athens on a new principle. The regulations of Solon were designed to preserve public order and decency. He established houses of prostitution (dicteria), which were a state monopoly and confined to certain quarters. The dicteriades were forbidden the superior parts of the town, and were placed under

various disabilities. They were compelled to wear a distinctive dress, and, so far from being connected with religion, they were not allowed to take part in religious services. These laws do not seem to have been carried out at all effectually, and were

2 Neither " harlot " nor " whore " is the Anglo-Saxon for a prosti- tute, for which the word is miltestre (so in Matt. xxi. 31). " Whore " came into English from Scandinavian sources. It was not spelled with the initial w till the beginning of the 16th century. The earlier forms are hore or hoore. The word appears in many Teutonic lan- guages, Dan. hore, Swed. hora, Du. hoer, Ger. Hure. The ultimate origin has been taken to be the root meaning " to love," seen in Lat. cams, dear. In its earliest usages the word means " adulterer " or " adulteress." It is frequent in the early version of the Bible in the sense of prostitute. " Harlot," possibly, as the New English Dictionary points out, as a less offensive word, is frequent in 16th- century versions.

The word " harlot " first appears without its "present application and usually of men, in the sense ot rogue, vagabond, sometimes even with no evil significance at all, much as we use " fellow." Thus in the prologue to the Canterbury Tales, 647, where the " Somonour " is called a " gentil harlot and a kynde." The word came from Fr. arlot, masculine, arlotte, feminine. Du Cange (Glossa- rium) defines med. Lat. arlotus, as Helluo, ventri deditus, and gives the Fr. arlot as an equivalent, with the meaning homo nihili, fripon, coquin. The Catholicon anglicum (1483) defines " harlott " as joculator, joculatrix, histrio, histrix, connecting the word with the wandering players, actors, jugglers, of the day. The ultimate origin of the Romanic word is unknown. Skeat connects it with the Teutonic word, which appears in Ger. kerl, Eng. " churl," which means " man," " fellow." Like " bigot " (q.v.), the word has been fancifully derived from the name of a person, viz. Arietta or Arlotta, the mother of William the Conqueror (William Lambarde, 1536-1601, Perambulation of Kent, pub. 1576).

presently relaxed. After the Persian wars more stringent regulations were again introduced. The dicteriades were placed under police control, and were liable to prosecution for various offences, such as ruining youths, committing sacrilege and treason against the state. It is clear, however, that as time went on the Athenian authorities experienced the difficulties encountered by modern administrations in carrying out state regulation. There were grades of prostitution, socially though not legally recognized, and women of a superior order were too powerful for the law, which failed to maintain the ban against them. The Greek hetaerae, who were

prostitutes, not " mistresses," and the most gifted and brilliant members of their class known to history, wielded great and open influence. The test case of Phryne, in which the stern attitude previously maintained by the Areopagus broke down, established their triumph over the law, deprived virtuous women of their sole advantage, and opened the door to general laxity. In later times any one could set up a diclerion on payment of the tax. In other Greek cities extreme licence prevailed. At Corinth, which was famous for sensual practices, a temple, with a huge staff of common prostitutes for attendants, was established in honour of Aphrodite and for the accommodation of the sailors frequenting the port. The worship of this goddess became generally debased into an excuse for sexual excesses.

The Romans united the Jewish pride of race with the Greek regard for public decency, and in addition upheld a standard of austerity all their own. In early days female virtue was highly honoured and strenuously maintained among them, of which the institution of the vestal virgins was a visible sign. Their attitude towards prostitution differed, accordingly, from that of other ancient nations. Among them, alone, it was considered disgraceful to a man to frequent the company of prostitutes; and this traditional standard of social conduct, which markedly distinguished them from the Greeks, retained sufficient force down to the later days of the Republic to furnish Cicero with a weapon of rhetorical attack against his political opponents, whom he denounced as scortatores. Prostitution was more severely regulated by them than by any other ancient race. They introduced the system of police registration, which is the leading feature of administration in most European countries to-day. From the earliest days of the Republic prostitutes were required to register at the aediles' office, where licences were issued to them on payment of a tax. They were placed under stringent control, had to wear a distinctive dress, dye their hair or wear yellow wigs, and were subject to various civil disabilities; but the severest feature of the system was that, once registered, their names were never erased, and consequently remained for ever under an indelible stain. As in our times, registration became ineffective, and neither law nor tradition could check the demoralizing influence of ease and luxury when once external conquest left the Romans free to devote their energies to the pursuit of pleasure. An attempt was made, by the enactment of severer laws against prostitution, to stem the rising tide of immorality, which threatened to taint the best blood in Rome with the basest elements in the later days of the Republic. Citizens were prohibited from marrying the descend- ants or relatives of prostitutes, daughters of equestrians were forbidden to become prostitutes, and married women who did so were liable to penalties. More stringent regulations were also imposed on prostitutes themselves, in addition to the old disabilities and police system, which remained in force. If these laws had any effect at all, it was to promote the general prevalence

of immorality; they certainly did not diminish prostitution. The profligacy of imperial Rome has never been surpassed for gross and obscene sensuality.

The greatest change introduced by Christianity with regard to prostitution was the adoption of a more charitable attitude towards these social and legal outcasts. The Roman state tax, which had descended to the emperors and had been further regulated under Caligula, was partly given up in the 4th century by Theodosius, on the representations of Florentius, a wealthy patrician, who offered to make good the loss of revenue out of his

own pocket. It was fully and finally abolished by Anastasius I. in the next century, and the old registers were destroyed. Then some of the civil disabilities of prostitutes were removed by Justinian in the 6th century. Gibbon, who never gave credit for a good motive when a base one could be found, attributes Justinian's action solely to his desire to marry Theodora, whose life had been notorious; and no doubt she influenced him in the matter, but it is permissible to assume a good motive. Even Gibbon is constrained to admit her virtue after marriage, and to give her credit for " the most benevolent institution " of Justinian's reign, the rescue home for fallen women in Con- stantinople, which was at any rate disinterested. Though it did not succeed, it marks a turning-point in the treatment of a class which had never met with public sympathy before. At the same time procuration and connivance " were severely punished, which is in keeping with the Christian attitude. The early Christian Church laid great stress on chastity, which probably suggested to its Roman persecutors the horrible punishment of forcibly prostituting Christian maidens. Such malignity enhanced the glory of martyrdom without shaking the constancy of its victims; and the triumph of purity in an age of unbounded licence was conspicuously recognized by Alaric, the Gothic conqueror, who gave strict orders in the sack of Rome that the virtue of Christian women was to be respected. The church, however, was not severe upon prostitutes, to whom the altar was open upon repentance, and some of the fathers ex- plicity recognized their trade as a necessary evil. Among them was St Augustine, a man of the world, who saw that its sup- pression would stimulate more destructive forms of immorality. Gradually charity degenerated into patronage. Rome, con- quered spiritually by Christianity and materially by the northern barbarians, sapped the virtue of both. Before the middle ages the institutions and ministers of the Church became a by-word for vice. Charlemagne made an effort to suppress the prevailing disorder, but his private life was licentious, and his capitularies, which ordained the scourging of prostitutes and panders, were not inspired by any regard for morality. A period of reform followed. The rise of chivalry, with its lofty idealiza- tion of women, and the wave of Christian fervour connected with the Crusades, inspired a vigorous and high-minded cam- paign against an

all-prevalent evil. The Church became ex- ceedingly active in prevention and rescue work, and was assisted by a devout and zealous laity. Rescue missions were organized, convents were founded everywhere for the reception of penitents, and dowries were subscribed to procure them husbands. Fulke de Neuilly was a conspicuous figure in this work. He held mis- sions, preached, and collected large sums for marriage dowries. Pope Innocent III. (1108-1216) pronounced it a praiseworthy act to marry a prostitute; and Gregory IX., a few years later, wrote to Germany that brothel-keepers were not to prevent prostitutes from attending missions, and that clergy and laity who drew profit from prostitution were banned. " Urge bache- lors," he wrote, " to marry repentant girls, or induce the latter to enter the cloister." In spite of such efforts, and of occasional spasms of severity by individual rulers, prostitution flourished everywhere throughout the middle ages. It was not merely tolerated, but licensed and regulated by law. In London there was a row of " bordells " (brothels) or " stews " in the Borough near London Bridge. They were originally licensed by the bishops of Winchester, according to John Noorthouck, and subsequently sanctioned by parliament. Stow quotes the regu- lations enacted in the year 1161, during the reign of Henry II. These were rather protective than repressive, as they settled the rent which women had to pay for the rooms, and forbade their compulsory detention. The act was afterwards confirmed in the reigns of Edward III. and Richard II. In 1383 the bordells belonged to William Walworth, lord mayor of London, who farmed them out, probably on behalf of the Corporation, according to analogy in other parts of Europe. They were closed in 1506, but reopened until 1546, when they were abolished by Henry VIII. In London we get the earliest known regulations directed against the spread of venereal

disease. The act of 1161 forbade the bordell-keepers to have women suffering from the "perilous infirmity of burning"; and by an order of 1430 they were forbidden to admit men suffering from an infirmiias nefanda. Probably it was by virtue of this order that in 1439 two keepers were condemned to eleven days' imprisonment and banishment from the city. In 1473, again, it is recorded that bawds and strumpets were severely handled by Lord Mayor Hampton.

Elsewhere in Europe much the same state of things prevailed during the same period. Prostitution was both protected and regulated, and in many places it constituted a source of public revenue. In France prostitutes were distinguished by a badge, and forbidden to wear jewels and fine stuffs and to frequent certain parts of the town. Public brothels on a large scale were

established at Toulouse, Avignon and Montpellier. At Toulouse the profits were shared between the city and the university; at Montpellier and Avignon the trade was a municipal monopoly, and farmed out to individuals; at Avignon, where the estab- lishment was kept up during the whole period of the popes' residence, the inmates were subjected to a weekly examination. In 1254 Louis IX. issued an edict exiling prostitutes and brothel- keepers; but it was repealed two years later, though in this and the succeeding century procuration was punished with extreme severity. In some parts of France prostitutes paid a tax to the seigneur. In Germany, according to Fiducin, the public pro- tection of Lust-Dirnen was a regular thing in all the large towns during the middle ages. " Frauenhauser," similar to those in London and in France, existed in many places. They are mentioned in Hamburg in 1292; and from later records it appears that they were built by the corporation, which farmed them. So also in Ulm, where special regulations were issued in 1430. We find them existing at Regensburg in 1306, at Zurich in 1314, at Basel in 1356 and Vienna in 1384. According to Henne-am- Rhyn, admission to these houses was forbidden to married men, clergy and Jews, and on Sundays and saints' days they were closed. The laws of the emperoi Frederick II. in the 13th century contain some curious provisions. Any one convicted of a criminal assault on a prostitute against her will was liable to be beheaded; if she made a false accusation she was subject to the same penalty. Any one not going to the assistance of a woman calling for help was liable to a heavy fine. In these ordinances the influence of chivalry may be detected. At the same time prostitutes were forbidden to live among respectable women or go to the baths with them. Hospitality to important guests included placing the public Frauenhauser at their dis- posal. So King (afterwards Emperor) Sigismund was treated at Bern in 1414 and at Ulm in 1434, so much to his satisfaction that he publicly complimented his hosts on it. Besides the municipal Frauenhauser, there were " Winkelhauser," which were regarded as irregular competitors. In 1492 the licensed women of Nuremberg complained to the mayor of this unfair competition, and in 1508 they received his permission to storm the obnoxious Winkelhaus, which they actually did. In Italy and Spain the system appears to have been very much the same. At Bologna prostitutes had to wear a distinctive dress, in Venice they were forbidden to frequent the wine-shop, and in Ravenna they were compelled to leave a neighbourhood on the complaint of other residents. At Naples a court of prostitutes was established, having jurisdiction over everything connected with prostitution. It led to great abuses, was reformed in 1589, and abolished about a century later.

Such was the state of things in the middle ages. In the 15th and 16th centuries a great change took place. It was due to two very different causes : (1) fear of disease; (2) the Reformation. With regard to the first, there

can be little doubt that both the slighter and graver forms of venereal disease existed in very remote times, but until the 15th century they attracted com- paratively little attention. The constitutional character of syphilis was certainly not understood — which is by no means surprising, since its pathology has only recently been elucidated (see Venereal Diseases) — but one would still have expected to find more notice taken of it by historical, moral and medical

writers in classical and medieval times. Nor is it possible to explain their reticence by prudery, in view of the unbounded literary licence permitted in those ages. One can only conclude that the evil was less widely spread or less virulent than it after- wards became. At the end of the 15th century it attracted so much notice that it was supposed to have originated then de novo, or to have been brought from the West Indies by Columbus — both untenable hypotheses; and, as usual, each country accused some other of bringing the contagion within its borders. To speculate on the cause of this increased prevalence would be idle; it is enough to note the fact and its consequences. It was immediately followed by the Reformation, and the two together led to a general campaign against the system of licensed prostitution. The last Frauenhaus was closed in Ulm in 1531, in Basel in 1534 and in Nuremberg in 1562. In London, as already noted, the bordells were abolished in 1546. In Paris an ordinance was issued in 1560 prohibiting these establish- ments, and later all prostitutes were required to leave the city within twenty-four hours. These instances will suffice to show the general character of the movement. Nor were municipal brothels ever tolerated again. It is observed by Henne-am-Rhyn — no friend of toleration — that their suppression was followed by the appearance of the crime of infanticide, by the establishment of hospitals for foundlings and for syphilis. This suggests an indictment against humanity which is hardly justified by the facts. Infanticide was no new thing, and foundling hospitals date from the beginning of the 13th century. Their marked increase and the establishment of syphilitic hospitals came a century later than the Reformation campaign against the Frauenhauser. The suppression of the latter did not affect the prevalence of prostitution. In the 17th century another spasm of severity occurred. In 1635 an edict was issued in Paris con- demning men concerned in the traffic to the galleys for life; women and girls to be whipped, shaved and banished for life, without formal trial. These ordinances were modified by Louis XIV. in 1684. The Puritan enactments in England were equally savage. Fornication was punishable by three months' imprison- ment, followed by bail for good behaviour. Bawds were con- demned to be whipped, pilloried, branded and imprisoned for three years; the punishment for a second offence was death. In Hamburg all brothels were pulled down and the women ex- pelled from the town. If these measures had any effect, it was speedily lost in a greater reaction ;

but they have some historical interest, as the present system was gradually evolved from them. It would be tedious and unprofitable to follow all the steps, the shifts and turns of policy, adopted in different countries during the 18th century for the suppression or control of an incurable evil. They involve no new principle, and merely represent phases in the evolution of the more settled and more systematic procedure in force at the present time. Its chief feature, as compared with the past, is the establishment of an organized police force, to which the control of prostitution is entrusted, coupled with a general determination to put the sub- ject out of sight and ignore it as far as possible. The procedure on the continent of Europe is virtually a return to the old Roman system of registration and supervision, except that there is no state tax, and names can be removed from the register. The objects are the same, namely, public order and decency, with one important addition, which has given rise to much con- troversy. This is the protection of health. From what- has gone before, the reader will have gathered that it is not, as fre- quently supposed, a new thing. Already in the middle ages the question occupied the attention of parliament in England, and a weekly examination of public women by the barber (the surgeon of that time) was instituted at Avignon. The practice was adopted in Spain from about 1 500, and later in many other places. But the abolition of licensed brothels, and the con- sequent growth of private prostitution, rendered it a dead letter. To meet the difficulty, registration was devised. It was first suggested in France in 1765, but was not adopted until 1778. The present regulations in France are based on the ordinances of that year and of 1780 which in their turn were borrowed from

those of the 16th and 17th centuries, previously mentioned. The theory of the modern attitude towards prostitution is clearly laid down by successive ordinances issued in Berlin. Those of 1700 stated that " this traffic is not permitted, but merely tolerated "; the more precise ones of 1792 pronounced the toleration of prostitution a necessary evil, " to avoid greater disorders which are not to be restrained by any law or authority, and which take their rise from an inextinguishable natural appetite "; and the regulations of 1850 and 1876 are headed: " Polizeiliche Vorschriften zur Sicherung der Gesundheit, der offentlichen Ordnung und des offentlichen Anstandes. " This embraces the whole theory of present administration, and if Gesundlieit be omitted, is not less applicable to the United King- dom than to the continent. The last attempt to suppress pro- stitution in Germany is worth noting, as it occurred so late as 1845. Registration was stopped and the tolerated houses were closed in Berlin, Halle and Cologne. The attempt was a com- plete failure, and it was

abandoned in 1851 in favour of the previous system.

We proceed to state the present condition of the law in France, Germany, Austria and the United Kingdom.

France. — The French criminal law takes no cognizance of prostitution. The subject was omitted from the penal code drawn up by the first Republic, and was never laws. restored, although many attempts were made to

introduce legislation, on account of the great dis- order which arose. Procuration is to a certain extent a criminal offence. Paragraph 334 of the code forbids the exciting, favour- ing or facilitating habitually the debauch of girls or boys under twenty-one years of age; the penalty is imprisonment for six months to two years, and a fine of 50 to 500 francs. If the offence is committed by parents, guardians or other persons in a tutelary position, imprisonment is from two to five years, and the fine 300 to 1000 francs. The regulation of prostitution rests on the law of 1 790, which entrusted the preservation of public tran- quillity to the administrative authorities; these are in Paris the prefect of police, and in other communes the mayor. The Parisian regulations have been built up by the decrees of succes- sive prefects. They are based on those of 1778, which fell into abeyance at the Revolution, were reintroduced in 1816, amended in 1823, and made more complete in 1830 and 1841. Those adopted in other towns do not differ in any essential particular. The more important points are: (1) registration of prostitutes, which is either voluntary, or compulsory after repeated arrest;

(2) recognized brothels, which are of two classes — maisons de tolerance (residential) and maisons de passe (houses of call);

(3) medical examination, which is weekly at the maisons de tolerance, while other registered prostitutes must present them- selves fortnightly at the dispensary; (4) hospital treatment of those found diseased; (5) rules with regard to solicitation, the frequenting of public places, &c. A small fee is paid for ex- amination. The penalty for infraction of regulations is imprison- ment; offences are divided into two classes: (1) slight, (2) grave, and the term of imprisonment varies accordingly from fourteen days to one year. Names may be erased from the register on the following grounds: (1) marriage, (2) organic disease such as to render the calling impossible, (3) return to relations and proof of good behaviour. The whole procedure appears to rest on grounds of doubtful legality. Prostitution never comes before the courts which alone can try offences and pronounce sentence. The police have no power to do so, yet they both try and sentence these women. That is to say, the whole system depends on their doing, by some verbal quibble, what they have no power to do. The question came before

the court of Reims in 1876, in the case of two women who refused to submit to medical examination, and the judge decided in their favour. He was dismissed in consequence, which does not make the situation more satisfactory.

Germany. — The German law is more explicit and more logical. Prostitution is not forbidden, but by paragraph 361 of the Imperial Code women are liable to arrest for practising prosti- tution without being under police control, and for contravening

regulations after they have been placed under such control. This brings the traffic completely under the police, and gives legal sanction to their regulations. These vary to same extent in different places, but their general tenor is the same. They include compulsory registration and weekly or semi-weekly medical examination, together with rules, for the most part ex- tremely strict, with regard to public demeanour and conditions of life. In Hamburg, for instance, prostitutes are confined to certain streets or houses, forbidden to share lodgings with persons not registered, to have female servants under twenty-five years of age, to keep children after school age, to admit young men under twenty, to make a noise or quarrel, to attract attention in any way, to go out between two and five in summer, to frequent certain parts of the town, or public balls, or superior seats in the theatre, to remain out after n p.m. (Regulations of 1886). On proved reclamation, supervision may be relaxed or names struck off the register. Generally, the women are com- pelled to contribute a fixed sum to a sick fund, for defraying the cost of medical examination; and in some places also to a journey fund, which is applied to sending strangers to their homes. Brothels are absolutely illegal throughout Germany. Paragraph 180 of the Imperial Code (1876) made Kuppelei a penal offence. Kuppelei is defined as promoting prostitution, either by procuration or by providing facilities of any kind. There is (1) ordinary Kuppelei, or simply assisting prostitution for gain, and (2) aggravated Kuppelei, which includes false pre- tences and procuration by parents, guardians, teachers, &c. The penalty for the former is a short term of imprisonment and police supervision; for the latter, penal servitude up to five years. It is obvious that if this law were strictly enforced, it would amount to suppression, for every householder or house-owner who harboured a prostitute would be liable to prose- cution. Its actual interpretation, however, is very elastic. A law passed in Prussia in 1900 has for its object the reclamation of the young. Girls under eighteen may be placed under con- trol until they are twenty-one.

Austria. — The Austrian law goes farther than the German, and is still more inconsistent with the existing practice. By paragraph 5 of the Criminal Act of 1885 prostitution is actually forbidden, but permission is given to the police to tolerate it under conditions, and to prescribe

regulations according to circumstances. Power to punish is also given to the police. Only certain cases of prostitution are liable to criminal prosecution, namely, when continued after police punishment, with disregard of regulations, when practised by persons suffering from venereal disease, and when accompanied by public scandal. Seduction of the young is punishable by imprisonment, eight days to six months; living on the prostitution of others, by eight days to three months. Kuppelei is a penal offence. Simple Kuppelei include (1) harbouring prostitutes for the purpose of pursuing their trade, (2) procuration, (3) having any con- nexion with the traffic — penalty, three to six months' imprison- ment; qualified Kuppelei is (1) procuration of innocent persons (equivalent to use of false pretences), (2) procuration by parents, guardians, &c. — penalty, one to five years. The police regula- tions and procedure are similar to those in Germany, but less strict. In all these countries a special service of police is employed.

Great Britain. — The English law differs markedly from the foregoing. It regards prostitution solely as a public nuisance, and dates from the middle of the 18th century. The principal act (25 Geo. II.) was passed in 1755, making perpetual a previous act of 1752. It is entitled " An act for encouraging prosecutions against persons keeping bawdy-houses," and provides that two ratepayers, on giving notice to a constable, may go with him before a justice and obtain an order for proceeding against the persons in question. A further act was passed in 1763, fixing the penalties, and a third in 1818 (58 Geo. III.), enabling the overseers of the parish to take the requisite proceedings. Thus machinery was provided for dealing with brothels, but it was left to the public to put it in motion. The Vagrancy Act of 1824 enables the police to proceed against " common prostitutes

for behaving in a riotous or indecent manner," and also forbids indecent literature. This was strengthened by a special act (1839) applying to London only, for the prevention of " loitering for the purpose of prostitution or solicitation, to the annoyance of passengers or inhabitants." Other large towns have since obtained private acts for the same purpose. The penalties are fines and short terms of imprisonment. In 1847 an act was passed making it an offence for publicans to allow " common prostitutes to assemble and continue " in licensed premises. The Licensing Act of 1872 contains a provision to the same effect. The previous law for dealing with brothels by indict- ment was strengthened by the Criminal Law Amendment Act of 1885, which renders " any person who keeps, manages or acts or assists in the management of a brothel," and any owner or occupier who knowingly permits the same, liable to summary conviction under the

Summary Jurisdiction Act; penalties for first offence, a fine up to £20, or imprisonment up to three months, increased for second offence to £40 and four months respectively. The same act also strengthened the law, which had previously been very weak, for the protection of the young and the prevention of procuration. It makes the procuration or attempted procuration of any girl or woman " to become a common prostitute " a misdemeanour punishable by two years' imprisonment, and places the following offences on the same footing: procuring defilement by threats, fraud or drugs; com- pulsory detention for defilement or in a brothel; procuring the defilement of girls under twenty-one; inducing them to leave the kingdom or to leave home and go to a brothel, with intent. The defilement of girls under sixteen and over thirteen years of age is also a misdemeanour, and subject to the same penalty; the defilement of girls under thirteen is felony, punishable by penal servitude from five years up to a life-sentence. Owners or occupiers of premises conniving at these offences are equally liable.

No account of the law in the United Kingdom would be complete without some reference to the partial adoption of the system of examination as employed elsewhere in Europe in 1864-1883. In 1864 a Contagious Diseases Prevention Act was passed providing for the compulsory medical examination of prostitutes, and detention in hospital of those found diseased, in the following garrison towns: Portsmouth, Plymouth, Woolwich, Chatham, Sheerness, Aldershot, Colchester, Shorn- cliffe, the Curragh, Cork and Queenstown. The legal machinery was a justices' order granted on sworn information that the woman named was a common prostitute. " The Act having proved very inefficacious " (judge advocate-general in House of Commons, April 1883), it was amended in 1866 and extended to Windsor. Two years later an important memorial was drawn up by the royal colleges of physicians and surgeons in favour

of the acts and their extended application, and in 1869 they were further amended and applied to Canterbury, Dover, Gravesend, Maidstone, Southampton and Winchester — eighteen places in all. A popular agitation, based on humanitarian and moral grounds, and continuously carried on against the measure led to the appointment of a royal commission in 1871 and a select committee in 1879. The direct evidence was strongly in favour of the acts, alike with regard to the diminution of disease among the troops in the protected towns, the absence of complaints and the good effect on public order, to which clergymen and other residents testified. The majority of the committee reported accordingly after three years' inquiry; but in 1883 the House of Commons passed a resolution, by 182 to no votes, condemning the compulsory examination of women. As this would have entailed refusal to vote the money required to carry on the system, it was immediately dropped, and the officers of the metropolitan police to whom its execution had been entrusted were recalled. In 1886 the C. D. Acts were repealed.

In India the system was introduced for military cantonments in 1865, partially suspended at the end of 1884, and stopped in 1888 on account of the action of the House of Commons. A new Cantonment Act was applied in 1889, and an amending act

in 1893, by which the compulsory or periodical examination of women was prohibited. In consequence of the enormous increase of syphilis which followed, a new order was made in 1897, which gave power (1) to call on persons suffering from a contagious disease to attend the dispensary, (2) to remove brothels, (3) to prevent the residence or loitering of prostitutes near

cantonments.

The foregoing summary of existing laws and regulations sufficiently indicates the present methods of dealing with pro- stitution. All Western nations broadly follow one or other of the systems described, though the local regulations may vary somewhat in minor details.

The French system of recognized houses, with registration, police des mceurs, &c, obtains in Belgium, Russia, Hungary, Spain and Portugal; Italy adopted it in 1855, but conditions abandoned it in 1888 for a modified system; in the actually Dutch towns maisons de tolerance are permitted exls tiag. with or without a service des mceurs; Norway has aban- doned registration, except in Bergen and Trondhjem, but otherwise Scandinavia rather follows the German principle of non-recognition, with more or less vigorous policing; of the Swiss cantons, some have the French, others the German system; while the United States and the British self-governing colonies incline more to the English model of comparative freedom, without a moral police or one possessing arbitrary executive powers independent of the courts of justice. All the systems have their defects; all fail to fulfil their purpose in the great cities. The most modest aim is to preserve public order and propriety. This object is better secured on the continent of Europe than elsewhere, but at the cost of submitting to an arbitrary police rule, intolerable to a free people. There appears to be less prostitution, both visible and actual, in Italy than in other countries. Under the English system the streets can be, and sometimes are, kept orderly in provincial towns by an energetic police; but in London the mass of prostitution is so great that the police seem totally unable to cope with it. Important thoroughfares and centres are frequented by large numbers of prostitutes in broad daylight, and choked by them at night. The law with regard to loitering is a dead letter, for these women do nothing but loiter. Flagrant solicitation is to some extent repressed, but for the most part the police content themselves with preventing positive tumults, and do not always succeed in that. On the other hand the less obvious but more pernicious nuisance of the brothel prevails to a far greater extent on the continent of Europe. Under the French system it is, of course, encouraged, in preference to " surreptitious " pro- stitution; but under the German it is forbidden. The facts here afford a proof of the impotence of the law no less striking than the condition of the London streets. By the German and Austrian criminal law, quoted above, brothels are prohibited, yet they abound in both countries. In Austria they are recognized, and perhaps the logic of the law is saved by permissive police clauses. In Germany it is not so. Paragraph 180 absolutely disposes of the question, and in Berlin it is acted on. Elsewhere brothels not only existed, but were recognized by authority for years after the passing of the laws against Kuppelei. It was not until 1886 and 1889 that they were nominally abolished in Hamburg and Saxony

respectively. Yet they still exist in most or all of the large towns, with the knowledge and consent, if not with the permission, of the police. In some they are even authorized. Berlin, which is more severely policed than any town outside Russia, is an exception. There brothels are not openly winked at, but the police have to deal annually with 16,000 or 17,000 charges of Kuppelei, and the number remains very constant, from which it may be inferred that the law, even when logically and energetically carried out, is quite ineffective. The European system of registration is still more delusive. In Russia, where the authorities have the means of knowing the movements and habits of every individual, it may be possible to compel the registration of the majority of prostitutes, but in other countries it is impossible. The police everywhere com- plain of the amount of " clandestine " prostitution, which they

cannot control, and which tends always to increase, under the system, while the roll of inscribed women dwindles. The numbers alone are sufficient to prove the failure of the procedure; for in- stance, 311 and 270 in Dresden and Munich respectively (Zehnder 189 1), both capital towns and cities of pleasure containing over 300,000 inhabitants. Cologne,, with only half the population, had double the number on the register at the same time. In Paris, which may be called the headquarters of Western vice, the disproportion between registered and clandestine prostitu- tion has reduced the whole system to an absurdity. The number of women on the roll is not a tenth of the estimated number of prostitutes; nor is Berlin, with about 3000 on the register, any better off. In Bordeaux, Brest, Lille, Lyons and Marseilles the same process is going on (Reuss). It follows that the pro- tection of health, which is the object aimed at by registration, is delusive in an equal degree. There are no means of ascer- taining the amount of venereal disease existing in any town or country, except in Norway, and consequently, no data for com- paring one period or one place with another; but we know that all forms of such disease are still very prevalent in all large European towns, in spite of the system. The only exact figures available are the military returns, which are of some value. It is in garrison towns of moderate size that compulsory regis- tration is likely to be most efficiently carried out and to pro- duce the most decided results, because the women with whom soldiers consort are by their character and habits least able to elude the vigilance of the police. The following table gives the proportion of admissions to hospital from all forms of venereal disease in the German, French, Austrian and British forces for twenty years from 1876. It may be added that the pro- portion in the Russian army is almost identical with the French, while the Italian figures are slightly higher than

the Austrian. It is therefore unnecessary to give them: —

Admissions per 1000 in European Armies.

Year.

German.

French.

Austrian.

British ‘ (Home).

British (India).

1876

28-8

57-o

65-8

146-5

203-5

1877

30-0

57-8

669

153-2

224-4

1878

360

59-7

75-4

175-5

291-6

1879

38-5

03-7

81 – 4

179-5

253-3

1880

34-9

65-8

75-7

245-9

249-0

1881

39;2

6o-6

79-0

245-5

259-6

1882

41-0

62-0

73-7

246-0

265-5

1883

38-2

58-9

73-3

260-0

271-3

1884

34-5

52-1

73-5

270-7

293-5

1885

32-6

50-7

69-0

275-4

342-6

1886

29-7

49-6

65-8

267-1

385-8

1887

28-6

51-6

64-4

252-9

361-4

1888

26-3

46-7

65-4

224-5

372-2

1889

26-7

45-8

65-3

2I2-I

481-5

1890

26-7

43-8

65-4

212-4

5°3-6

1891

27-2

43-7

63-7

197-4

400-7

1892

27-9

44-0

6i-6

201-2

409-9

1893

—

42-8

64-5

194-6

466-0

1894

—

40-9

64-8

182-4

5”-4

.895

—

—

173-8

522-3

The most striking thing in this table is the enormous difference between the continental and the British figures. To make the comparison more complete, we will add the following, which gives the average admissions per 1000 for the three years 1890-189 2: —

German.

French.

Rus- sian.

Aus- trian.

Italian.

U.S.A.

British (Home).

British (India).

Dutch (Indies).

27-2

43 6*

43-0

63-5

7i-3

77-4

203-6

438-0

455-6

It is clear at once that troops in the East stand upon an entirely different footing from those in the West, the Dutch figures being even higher than the British; we may therefore put them aside for the moment. Comparing the rest, we notice that not only are the British figures enormously higher than the other European, but the latter also show very large discrepancies; and since all the foreign troops are under the same protective system, we may conclude that other factors must be taken into account. The

discipline maintained, the character of the soldiers themselves, and the procedure with regard to admission into hospital, no doubt all affect the returns. Further, a sort of epidemic rise and fall is to be noted. All the returns given in the first table show a simultaneous rise for several years, beginning with 1876; and having reached a maximum, each shows a progressive fall, likewise lasting over several years. This points to another disturbing factor. It is convincingly shown by the figures for the protected districts in the United Kingdom before, during, and after the period of protection. In 1864 — that is, just before the first Contagious Diseases Act came into operation — the proportional figure was 260; ten years later it had fallen to 126; but in 1883 it had risen again to 234, in spite of the pro- tection. Then, protection being removed, it rose to 276, but afterwards fell again progressively to 191 in 1895, without any protection. It is therefore evident that in interpreting the statistics allowance must be made for large fluctuations due to causes quite independent of the protective system. The margin of difference, however^ between the British and European re- turns is so large that, when all allowances have been made, it is impossible to doubt that a considerable degree of real protection is afforded to soldiers by the system. This conclusion is con- firmed by the comparatively high returns for the army of the United States, and still more

by the Indian statistics. They rose gradually, it is true, during the cantonment system, but when that was dropped disease increased with shocking rapidity. Between 1887 and 1895 the admissions for primary syphilis rose from 75-5 to 174-1 per 1000, and those for secondary syphilis from 29-4 to 84-9.

The broad conclusion is that under special conditions, and when rigidly enforced, registration and medical examination do to a considerable extent fulfil the purpose of protecting health. Their failure to do so among the population at large and under the ordinary conditions of life is not surprising when we regard the amount of venereal disease which still occurs even among soldiers protected by the most rigorous measures and under the most favourable conditions.

*A general view of the whole subject suggests no pleasant or hopeful conclusions. Prostitution appears to be inseparable from human society in large communities. In different countries and ages it has in turn been patronized and prohibited, ignored and recognized, tolerated and condemned, regulated and let alone, flaunted and concealed. Christianity, the greatest moral force in the history of mankind, has repeatedly and syste- matically attacked it with a scourge in one hand and balm in the other; but the effect has been trifling or transient. Nor have all the social and administrative resources of modern civi- lization availed to exercise an effective control. The elementary laws on which prostitution rests are stronger than the artificial codes imposed by moral teaching, conventional standards or legislatures; and attempts at repression only lead to a change of form, not of substance. It survives all treatment; and though it may coexist with national vigour, its extravagant development is one of the signs of a rotten and decaying civili- zation. In Western communities the traffic is not carried on so openly as in the East, nor is it exploited for purposes of public revenue, as among the ancients and in the middle ages; a veil of reticence and secrecy, for the most part of a transparently flimsy character, is thrown over it; but whatever is gained in public decency is counterbalanced by other attendant evils. Two, in particular, are fostered by the policing of prostitutes. One is the system of blackmail levied by the executive. The scandal has been most notorious in the United States, but it exists everywhere, and is a constant source of profound cor- ruption. The other is the growth of the most degraded class that ever disgraced the name of man — the creatures who live upon the earnings of individual prostitutes, with whom they cohabit. They are called souteneurs in France, louis *in Germany, cadets in New York, and by various slang names in Great Britain. They are all criminals. They flourish chiefly on the continent of Europe, where they exist in large and ever-increasing numbers; but they find their way everywhere, and are a dangerous*

menace to society. They are not altogether new. The Eliza- bethan drama is full of references to men who took toll of prostitutes in return for protective services in the old days of persecution; but they have been greatly fostered by the modern system, under which women find it necessary or convenient to have the cover of a man, who can pass for a husband and baffle the police. Thus the law is evaded on the one hand by the cor- ruption of those who administer it, and on the other by the appear- ance of a class of criminal idlers more degraded than any other— both greater evils than the traffic which the law is intended, but fails, to control. There are no data for comparing the extent of profligacy at present existing in Western communities with that in other countries or in former times, but the unmentionable facts which come constantly to the knowledge of the police des mmurs, and less frequently to the ears of doctors, and lawyers, leave no doubt that in intensity of vice the great centres of modern civilization have nothing whatever to learn from Corinth, imperial Rome, ancient Egypt or modern China. The classical obscenities dug up and relegated to museums are far surpassed by the photographic abominations prepared to- day in Paris or in Amsterdam. The gross perversion and abuse of the sexual instinct implied by these excesses may be a passing phase, but it is a phase which has always marked the decadence of great nations. It is undoubtedly accompanied by a general tendency towards increase of the volume of prostitution. Im- provement in the conditions of life among the poor ought to tend in the opposite direction, by removing one of the most potent causes of the traffic, but it is more than counterbalanced by the rising standard of luxury and comfort which accompanies it, by the aggregation of the people more and more into great cities, and by their craving for amusement. The growth of prosti- tution has already left its marks on the marriage- and birth- rates of the most highly civilized Western communities.

In 1900 the Prussian Government made an attempt, with the co-operation of the medical corporations, to ascertain the amount of venereal disease prevalent in the kingdom. Circular questions were addressed to all members of the medical profession requesting them to report the number of patients suffering from those disorders in their practice at the date of the 1st of April. Answers were sent in by 63%, and the aggregate number of patients was 40,902. From this datum it is calculated that the number of persons attacked in the course of a year is at the very least 500,000 in Prussia alone (vide Hygienisch-e Rundschau, April 1902).

Authorities. — W. F. Amos, State Regulation of Vice; Committee of Fifteen (New York), The Social Evil (1902) ; Conference Internationale (Brussels,

1899), Comptes rendus; Fiaux, La Prostitution en Belgique; Gibbon, Decline and Fall of the Roman Empire; Henne-am-Rhyn, Die Gebrechen der Sitten-polizei; Parent-Duchatelet, De la prostitu- tion dans la ville de Paris; Reuss, La Prostitution; Von Raumer, Geschichte der Hohenstaufen ; Sanger, History of Prostitution ; Schlegel, Histoire de la prostitution en Chine; Schrank, Die Prostitution in Wien; Sturmer, Die Prostitution in Russland; Tarnowsky, La Prostitution; Zehnder, Die Gefahren der Prostitution. (A. Sl.)

PROSTYLE (Gr. irpo, before, and orDXos, a column), in architecture, a portico in which the columns project from the building to which it is attached.

PROTAGORAS (c. 481-41 1 B.C.), Greek philosopher, was born at Abdera. He is known as the first of the Sophists' {q.v.), i.e. he was the first to teach for payment. It is said that he received nearly £400 from a single pupil. He learned philosophy in the Ionian school, and was perhaps a pupil of Democritus, though this is doubtful on chronological grounds. He was an older contemporary of Socrates. He was so highly esteemed by Pericles that he was entrusted with the task of framing laws for the new colony of Thurii (Plut. Pericles, 36). At the age of seventy, having been accused by Pythodorus, and convicted of atheism, Protagoras fled from Athens, and on his way to Sicily was lost at sea. According to Plato (Prot., 318 E), he en- deavoured to communicate " prudence " (eufSouXia) to his pupils, " which should fit them to manage their households, and to take part by word and deed in civic affairs." The education which he provided consisted of rhetoric, grammar, style and the interpretation of the poets. His formal lectures were supplemented by discussions amongst his pupils. He left behind him several treatises, of which only a few fragments have

survived. In Truth, by way of justifying his rejection of philo- sophy or science, he maintained that " man is the measure of all things — of what is, that it is, and of what is not, that it is not." Besides Truth, and the book Of the Gods which caused his condemnation at Athens, Diogenes Laertius attributes to him treatises on political, ethical, educational and rhetorical subjects. Protagoras was the first to systematize grammar, dis- tinguishing the parts of speech, the tenses and the moods.

Authorities. — Diog. Laert., ix. 8, &c. ; the very different repre- sentations in Plato's Protagoras and Theaetetus; |the fragments in Johannes Frei, Quaestiones Protagoreae (Bonn, 184.5), an d A. J. Vitringa, Disquisitio de Protagorae vita et Philosophia (Groningen, 1852) ; for the Thurian legislation, M. H. E. Meier, Opuscula, i. 222, and Gomperz in Franz Hoffmann's Beitrdge zur Gesch. des griech. und rom. Rechts (1870). On Protagoras' philosophy see the histories of philosophy, e.g. Gomperz, Greek

Thinkers (Eng. trans., 1901) i. 438-475 and 586-592, Zeller, Ueberweg, Erdmann, and works quoted under Sophists.

PROTECTION, in economics a system of commercial policy and a body of doctrine, which in their modern forms are the outgrowth of the commercial and industrial development of the 19th century. The common definition of protection as a policy is the attempt to develop a manufacturing industry by a system of discriminating duties upon manufactured goods imported from foreign countries. But this is far too narrow a definition to suit the modern use of the term, though the notion of discriminating tariffs is common and, we may say, basal to all definitions. Protection as a policy includes not only dis- criminating tariffs, but also a large number of other features supplementary to this fundamental one and designed to em- phasize its purpose. Thus a scheme of bounties and premiums, of rebates and drawbacks, is everywhere considered an essential element of the protective system. Nor is it any longer limited to the encouragement of manufactures, but includes as well the protection of agriculture, forestry, mining, fishing, shipping, &c. In short, one cannot give a comprehensive and satisfactory definition of protection to-day without giving it a much wider scope than that of a system of protective duties upon manu- facturing industry.

Many of its advocates claim, and with some show of reason, that the term protection, as now used to describe the com- mercial policy of a nation, should be so defined as to v include all the means by which a country undertakes p^f, to secure through the positive efforts of the govern- ment the complete industrial and commercial development of all its resources and of all its parts. As its object is thus comprehensive, its justification is to be found in a series of arguments based upon political, economic, and social consider- ations. From this point of view the protective policy embraces not merely the system of discriminating import duties in favour of home products — industrial, agricultural and mining, with which the policy began in the United States, for example — but, also the system of bounties offered for the introduction and establishment of new industries; the policy of restricted immi- gration of the less desirable classes of labourers, combined with the positive inducements to the skilled labour of other countries' to transfer itself to the one in question; the system of dis- criminating or prohibitive tonnage duties, known as Navigation Acts; the system of developing foreign markets by an active policy directed towards securing advantages for home products in foreign countries — in a word, all those pecuniary or other sacrifices which a country may make in order to develop its material resources and establish, develop and foster industry and commerce. In this wide sense the comprehensive policy adopted by the United States, for example, includes the making., of a careful geological and botanical survey of the whole country in order to discover and open up the vast natural wealth of its domain in its mines, forests and fields; the

establishment of ex- periment stations to test the usefulness of new crops or means of making old crops more valuable; the stocking of its rivers with fish and the afforesting of its mountains; the introduction of new or more valuable breeds of livestock; the building of rail- ways and canals, and the offering of inducements to private parties to undertake similar enterprises; the deepening of its

rivers and harbours, &c; and, finally, the development, at public expense, of a scheme of technical and commercial edu- cation — lower and higher — adapted to discover and train all the talent in the community available for developing the in- dustry and commerce of the country.

If such an account of the features of a protective policy is objected to on the ground that free trade countries like Great Britain have also adopted some of them, it may be replied that in so far as they have done so they have adopted the principle of protection, namely, that government shall adopt a positive policy looking towards the development, by government aid if necessary, of new branches of commerce and industry and the firmer establishment of old branches. It may further be pointed out that the countries which have adopted the protective policy most fully — the United States, France, Germany and Russia — have most consistently followed out the policy here indicated and in all these countries it has been the so-called protectionist party which has identified itself most fully with the compre- hensive policy here suggested.

As a doctrine, protection is the set of principles by which this policy of government aid to industry is justified, and these principles have been elaborated hand in hand with Doctrine. tne development of the so-called protective policy sometimes outrunning its actual application and advocating its further extension, more often lagging behind and seeking for means of explaining and defending what had already been done. The present development of the system and theory of protection is a result of the growing predominance of capitalism in modern society, combined with the tendency of modern politics towards the organization and development of great national states, with the resulting desire to secure their industrial as well as their political independence. It has been further favoured in certain ways by the fact that the financial needs of modern states require a resort to indirect taxation, thus making it easier for the capitalistic forces to exploit the tax system for their own benefit; while the wars of the 19th century have favoured in many ways the tendency towards the adoption of special means, like high discriminating duties, to accomplish this end. Hand

in hand with this has gone a steady tendency to see in the state a powerful means of pro- moting the development of trade and industry, and a growing disbelief in the more extreme forms of the free trade doctrine, such as the type known as the Manchester School, the theory of the laissez faire, laissez passer school of economics and politics. Protection, both as a doctrine and policy, can be best under- stood by examining the course of its development in those countries adopting it most consistently. Germany and the United States offer the two striking examples of great modern nations adopting a system of protection and developing under its influence. They may in a certain sense serve as types of the kind of state which in the 19th century accepted and de- fended, in its politics at any rate, the so-called protective system. In both cases the high protective system was associated with the development of nationality, of industry, of capitalism, and of a financial system which favoured the growth of certain elements of the protective policy.

The protective system in the United States began with the adoption of the Constitution in 1789, and found its first formal defence in the celebrated report of Alexander Hamil- ton on manufactures. The argument and the movement were largely academic. As there was no strong manufacturing interest in existence, so there was no organized capitalistic effort to secure manipulation of the tariff duties in the interest of special industries. There was general agreement, however, that it would be desirable to develop a manufacturing industry in the colonies if it were practicable. A high degree of natural protection was already afforded by the cost of transportation. It was felt, therefore, that a small duty on manufactures would probably serve the purpose, since the development of the manufactures would favour the production of raw material, which would therefore need no special en- couragement. It was also felt that a small duty, continued for

a few years, would result in the establishment of the industry on such a firm basis that all duties might be abolished. The introduction of this form of protection, i.e. discriminating duties upon imported goods, was greatly assisted, if not originally caused, by the fact that the new government needed money which could most easily be obtained by customs duties. Thus all those parties which were opposed to direct taxes joined their efforts with those interested in securing protective duties, in order to commit the government to the policy of basing its revenue system on a tariff on imports. To these considerations must be added the further one that the country had just thrown off political dependence on Europe, and felt that it must now become industrially independent also, if it were to be a great nation. These influences, then, namely, firstly, the desire of the statesmen of the time to create a revenue system for the Federal government which

would make it absolutely independent of the states; secondly; the wish to develop an industry which would serve the needs of the new country while it promoted its complete independence of the Old World, conspired to commit the Federal government from the beginning to a policy of protection based upon a system of discriminating duties. At the same time a system of discriminating tonnage dues and prohibitory regu- lations relating to foreign shipping in the coasting trade was adopted to promote and foster the shipping interest.

Industry and commerce began to thrive as never before, largely because of the absolute free trade which the Constitution had secured among the states of the Union. The long struggle between France and Great Britain, extending from 1806 to 181 2, for the possession of the commerce and the trade of the world, combined with the retaliatory measures of the American government itself, practically destroyed American commerce for a time, and finally led to the British-American War of 1812, which closed in 1815. The financial system of the Federal government during this war was based on getting the largest returns from the customs, so that the duties were screwed up still higher. The ten years period of non-intercourse, while it had seriously injured American commerce, had fostered the growth of American manufacturing; and when the close of the War of 181 2 brought with it an enormous influx of foreign goods,, particularly from the plethoric warehouses and factories of England, it looked for a time as though the new American indus- tries were destined to vanish as rapidly as they had grown up. And now for the first time appeared a strong, well-developed, capitalistic party, which was, in spite of some drawbacks, destined to grow until it became one of the most characteristic features of the politics of the republic.

The manufacturers of the country determined the tariff policy of the country, and with few reverses pursued a steadily ad- vancing course of victory down to the close of the 19th century. They secured the maintenance of high duties at the close of the war of r8i2, and managed to increase them steadily until the reaction of 1830-1833, when they were forced to content them- selves with a lower rate, which continued, with a slight inter- ruption in 1842-1846, until the outbreak of the Civil War in 1861. This was an opportunity which they knew how to utilize to the greatest advantage. During the war, when the government was forced to exploit every possible source of revenue, the pro- tectionist party knew how to turn the necessities of the govern- ment to its advantage. The rate of duties was pressed ever higher; and when the war closed, and the taxes could again be lowered, the protectionist managers knew how to lower or remit altogether the non-protective duties, and thus keep high, and even advance to a still higher point, the duties which protected them from foreign competition.

In the meantime the country was turning from agriculture to manufactures at an unprecedented rate. The manufactur- ing party was becoming ever stronger and more aggressive. As it had also been the national party, it profited by the enormous development of the nationalist sentiment during and after the war. It now became patriotic to favour the development of a national industry. It was treason to advocate free trade — that had been the policy of the slave-holders' party, and the Slave-

holders' Rebellion, as the Civil War was called, had drawn its strength largely from the free-trade sentiment. The policy of the protectionist party had expanded with the growth of the country and the necessity of coming to terms with the antagonistic elements. Thus at first the platform of the protectionists had been one of reasonably low duties on manufactured commodities, low duties on half-manufactured and no duties at all on raw material. But as the country advanced, and it was seen how the interests of manufacturing had been quickened by the policy of discrimination, those engaged in producing raw materials and half-manufactured commodities demanded that they too should be considered. As this concession had to be made by the manu- facturers, they were compelled to justify it by other arguments than those used at first. The infant-industry argument gave place to the proposition, that as long as the prices of raw materials and labour were higher in America than abroad, it would be necessary to maintain countervailing duties at least equal to this difference, in order to protect American industry. One branch after another of manufacturing or agriculture was included and given the benefit of protection. In order to have satisfactory theoretical basis for such a policy, the theory was advanced that foreign trade was a necessary evil, to be diminished as much as possible. The ideas were advanced and spread throughout the country: that the home market should be reserved for home products; that the labourers should be protected against the influx of foreign cheap labour (Chinese Exclusion Acts; restrictive immigration laws); that prices should be kept high, so as to enable employers to pay high wages; that shipping should be encouraged by subsidies, the sugar industries by bounties; that the nation should become ever more independent of foreign nations for all its industrial products, and capable of holding its own against the world in industry as well as in arms.

The protective party has been the national party during a time when the greatest question before the American people was whether it was to be one nation, or two, or twenty, and it naturally profited by the inevitable victory of nationalism; it has always stood for honest payment of national and

state debts, if not in the standard according to which they were contracted, in a still better one, and it has profited naturally by this attitude in a country where the development of trade and industry was rapidly and steadily towards a capitalistic state of society in which such policy is favoured; it has stood for a vigorous and active independence in the field of world politics, and it has naturally profited by this fact in a country which was rapidly forging ahead to take its place among the greatest of existing nations, and with an ever-increasing self-consciousness was ready to assert itself among the nations of the world; it has stood for free labour against slave labour, and consequently profited here again in a country whose greatest conflict turned upon the question whether the system of slave labour should be extended or not; it has stood for high wages for American labourers, and in words at any rate has advocated a policy directed to protecting them against competition with the " pauper labour " of the Old World. It has stood for government activity in the direction of developing railways and canals; of estab- lishing education upon national lines, making it free, in all grades from the kindergarten to the university, to all citizens of the republic, and it has profited by this association in a country where all influences were telling in favour of this tendency. In short, whatever one may think, of the wisdom or folly of trying to develop national industry by a system of discriminating duties, the protective party as such in the United States has been on the progressive side of so many of the deep questions of national importance that it has obtained and kept the allegiance of thousands of men who would have been glad to see a change, or indeed a reversal, in the tariff policy of the party. The history of the tariff policy in Germany had been very similar to that of the United States. Beginning with the es- Germany. tablishment of absolute free trade among the various German states in the earlier customs union, it ex- tended this policy, by the establishment of the North German

Confederation and the new German Empire, to all the states now included in the federation. The long-wished-for political union meant political independence, and when political independence was once achieved, industrial and commercial independence were next desired. Within the empire itself it was necessary, if the new organization were to be strong and vigorous, that the central government should become independent of the individual states; and this could be best effected by giving it a revenue system based upon import duties, which in the long run has enabled the central government to subsidize the state governments, and thus bring them still further under its influence. To develop this system the political support of some strong party was needed. This party was found in the protectionist elements, which have thus again become the national party in a state which was being rapidly nationalized; the industrial party in a society which was rapidly passing from the agricultural to the industrial condition;

the capitalistic party in a society which was rapidly becoming capitalistic in all its tendencies. It stooc 1 r or industrial and commercial, as well as political, independence of other countries, and thus satisfied the longing for national unity and independence of a people which had suffered for centuries from disunion and dependence.

These two examples may serve' to explain how the two most powerful industrial nations next to Great Britain became and remained highly protectionist in sentiment and in action, and how they both opened the 20th century with a more openly declared and a more fully developed system of protection than ever before.

Protection as a theory or doctrine is to a certain extent an outgrowth or modification of the old doctrines of mercantilism. In its modern form, however, it dates really from Modern the celebrated report on manufactures made by Advocates Alexander Hamilton when secretary of the U.S. and Critics. Treasury in the year 1701. The views there advanced have been further developed by Friedrich List and Henry C. Carey, and have in later years been carried along somewhat different lines to their logical conclusions by Simon N. Patten and George Gunton. Starting from an argument in favour of temporary duties on manufactured goods imported from abroad until such time as the infant industry might take firm root, the development proceeded through List, who favoured the main-tenance of such duties until the country had passed into the manufacturing stage as a whole, and then through Carey to Patten and Gunton, who maintain that a protective policy, extended to cover agriculture, trade and mining, should be pre- served as the permanent policy of the country until the entire world is one nation, or all nations have reached the same level of political, economic and Social efficiency. The protective policy, which a century ago was to be, in the view of its advocates, temporary and partial, has become to-day, in the arguments of its apologists, permanent and comprehensive. We must content ourselves here with a brief statement of the arguments of the leading and most successful defenders of modern protectionism.

Alexander Hamilton, at that time secretary of the treasury, submitted his celebrated report on manufactures to the Congress of the United States on the 5th of December 1791. It Hamilton is in a certain sense the first formulation of the modern doctrine of protection, and all later developments start from it as a basis. It is a positive argument directed to proving that the existence of manufacturing is necessary to the highest development of a nation, and that it may be wisely promoted by various means, of which the most important is a system of discriminating duties upon foreign imports. Among the objects to be attained by the development of a flourishing manufacturing industry are mentioned: (1) Independence

of foreign nations for military and other essential supplies. (2) A positive aug- mentation of the produce and revenue of society, growing out of (a) division of labour, (6) extensive use of machinery, (c) additional employment to classes of the community not ordinarily engaged in business. (3) An increase in the immigration of skilled labourers from foreign countries. (4) A greater scope for the diversity

of talents and dispositions which discriminate men from each other. (5) A more ample and various field for enterprise. (6) In many cases a new, and in all a more certain and steady demand for the surplus produce of the soil. (7) A more lucrative and prosperous trade than if the country were solely agricultural. Among the feasible means of promoting the development of such an industry he mentions the following: (1) Protective duties, or duties on foreign articles which are the rivals of the domestic ones, to be encouraged. (2) Prohibition of rival articles or duties equivalent to prohibition. (3) Prohibition of the exportation of the materials of manufactures. (4) Pecuniary bounties. (5) Premiums. (6) Exemption of the materials of manufactures from duty. (7) Drawbacks of the duties which are imposed on the materials of manufactures. (8) The encourage- ment of new inventions and discoveries at home, and the intro- duction into the United States of such as may have been made in other countries; particularly those which relate to machinery. (9) Judicious regulations for the inspection of manufactured commodities. (10) The facilitating of the pecuniary remittances from place to place.

The above suggestions contain the outline of a comprehensive scheme for developing the manufacturing resources of the country, and the United States has subsequently adopted, in one form or another, almost all of these propositions. Hamilton considered that the duties, &c, would not have to be very high or very long continued in order to accomplish their legitimate ends, after which they would become unnecessary, and would naturally be abolished. He conceded that, generally speaking, import duties were taxes on the customer, and therefore burdens — but burdens which might well be temporarily borne for the sake of the ultimate advantage arising from cheaper goods and diversi fied industries. He emphasized also the advantage of a home market for agricultural products, and seemed to think that the United States had to pay the cost of transportation both on the agricultural products it exported and the manufactured goods it imported. This report remained the armoury from which the protectionists drew their weapons of offence and defence for two generations, and it has not yet ceased to be the centre around which the theoretical contest is

waged even to-day in Germany and France as well as in the United States.

The next great theorist in this field was the German, Friedrich List, who, while an exile in the United States, became imbued with protectionist ideas, and after doing substantial service for them in the country of his adoption, returned to Germany to do battle for them there. He published his National System of Political Economy in Germany in the year 1841. It had great and immediate success, and has exercised a wide influence in Europe on theoretical discussion as well as on practi- cal politics. List, like Hamilton, looked on protection as a temporary system designed to facilitate the passage of a country from an agricultural to a manufacturing state. He accepted free trade as generally and permanently true, but suited for actual adoption only in that cosmopolitan era towards which the world is progressing. But in order to prepare for this cos- mopolitan period it is first necessary for each nation to develop its own resources in a complete and harmonious manner. A comprehensive group of national economies is the fundamental condition of a desirable world economy; otherwise there would be a predominance of one or of a few nations, which would of itself constitute an imperfect civilization. Protection is a means of educating a nation, of advancing it from a lower to a higher state. He admits that it may involve a loss, but only in the sense that money expended for an education or an educational system is a loss, or that money spent for seed corn is a loss. To the cosmopolitan system of Adam Smith, List opposes the national system as a preliminary and necessary stage. He favours the imposition of duties as the most efficient means of effecting the protection which he has in mind. Agriculture will be sufficiently protected by the constant demand for its products. The essence of his larger work is contained in a pamphlet pub- lished in Philadelphia in 1827, entitled Outlines of American Political Economy. It is, in fact, a series of letters advocating

List.

the further development of the protective system already adopted in the United States.

The third great name in the history of protection is that of Henry C.Carey, an American, in some ways the most distinguished and most influential of the followers of Hamilton and Carey: List. He was at first a strong free trader, then a Pattea. protectionist who believed in protection as a preparation for free trade, and finally an uncompromising advocate of protection in all circumstances and for all nations. In him and in Simon M. Patten, the last, and in many respects the ablest, of the apologists for protection, we have the theoretical development corresponding to the practical outcome of protection as a com- prehensive all-embracing scheme

extending protection to all branches of industry alike — agriculture, manufacturing and mining — and aiming to be permanent in its form and policy. As Patten expresses it: " Protection now changes from a tem- porary expedient to gain specific ends (such as the establishment of manufactures), to a consistent endeavour to keep society dynamic and progressive. Protection has become part of a fixed national policy to increase the value of labour with the increase of productive power, and to aid in the spread of know- ledge and skill, and in the adjustment of a people to its environ- ment." The object of protection has now become, in the view of the theoretical American protectionist, not an approximation to European industrial conditions, but as great a differentiation from them as possible. Carey's works were translated into the leading European languages, and contributed doubtless to the spread of protectionist ideas, though the extreme form in which his views were expressed, and the rambling illogical method of exposition, repelled many who might otherwise have been attracted by the course of his thought.

Economists of other schools, with the exception of the more rigid British free traders, have allowed a relative validity to the doctrines of List; and even among older British economists, Mill and some of his disciples conceded the logical possibility of quickening the development of an industry by import duties in such a way as to result in more good than harm, though they have hardly been willing to acknowledge that it is practically possible. The modern historical school of political economists have generally admitted the reasonableness of protective policies at certain times and places, though usually finding the justifica- tion in political and social considerations rather than in economic. And while the British objections to protectionism in any form have been widely upheld by the more conservative economists in England, the new political school of " tariff-reform and colonial preference " has found strong support at the hands of such British authorities on economics as Professors Cunningham, Ashley and Hewins, or the authors of Compatriots' Club Essays 1906 (J. L. Garvin and others), whose advocacy of a national policy recalls the work of Hamilton and List. (E. J. J.)

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PROTECTOR, a Latin word (formed from protegere, to cover in front) adopted into English. In post-classical Latin the protectores were the body-guards of the emperors, and of the Praetorian prefects until, under Constantine the Great (306-337), they ceased to exercise military functions. The protectores, with the domestici, continued to form the body-guard and household troops of the emperor. They were veterans selected from the legions, and were capable of being appointed to high commands. In the Roman curia the protectores regnorum are cardinals who take charge of the affairs of the " province " to which they are named which come before the Sacred College, and to present them for consideration. In England " protector " was used first for the regent during a minority (e.g.

the Protector Somerset, and then by Oliver Cromwell when he assumed the government in 1653). The name thus acquired a revolutionary significance, and has not since been officially used in England. In Spanish America the bishops were officially protectors of the Indians. The title is convenient for a ruler who wishes to exercise control outside the limits of his direct sovereignty. Thus Napoleon called himself protector of the Confederation of the Rhine. The kings of France, and the governments which have arisen out of the Revolution, were protectors of the Latin Christians in the Turkish Empire, while the tsars of Russia have claimed the same position towards the Orthodox Christians.

See App. B. to vol. ii. of Bury's edition of the Decline and Fall (London, 1896); Du Cange, Glossarium lat.; Sorel, L' Europe et la revolution francaise, vol. vii. (Paris, 1904).

PROTECTORATE, in international law, now a common term to describe the relation between two states, one of which exer- cises control, great or small, direct or indirect, over the other. It is significant of the rare use of the term until recent times that the word does not occur in Sir G. C. Lewis's book on The Government of Dependencies. Yet the relation is very ancient. There have always been states which dominated their neigh- bours, but which did not think fit to annex them formally. It has always been, politic for powerful states to facilitate and hide schemes of aggrandizement under euphemistic expressions; to cloak subjection or dependence by describing it in words in- offensive or strictly applicable to other relations. A common problem has been how to reduce a state to submission or sub- ordination while ostensibly preserving its independence or exist- ence; to obtain power while escaping responsibility and the expenditure attending the establishment of a regular adminis- tration. Engelhardt (Les Proteclorats anciens et modernes) and other writers on the subject have collected a large number of instances in antiquity in which a true protectorate existed, even though the name was not used. Thus the Hegemony of Athens as it existed about 467 B.C.,. was a form of protectorate; though the subject states were termed allies, the so-called " allies " in all important legal matters had to resort to Athens (Meyer, Geschichte des Alterthums, vol. iii. § 274).

In dealing with dependent nations Rome used terms which veiled subjection (Gairal, Les Proteclorats internationaux, p. 26). Thus the relationship of subject or dependent cities to the dominant power was described as that of clientes to the patronus (Marquardt, Romische Staatsverwaltung, 2nd ed., vol. i. p. 80) . Such cities might also be described as civitates foederatae or civitates liberae. Another expression of the same fact was that certain communities had come under the power of the Roman people; in deditionem or in fidem populi romani venire (Marquardt, Romische

Staatsverwaltung, i. 73, 81). The king- doms of Numidia, Macedonia, Syria and Pergamum were ex- amples of protected states, their rulers being termed inservientes.

The Romans drew a distinction between foedera aequa and foedera iniqua. The latter created a form of protectorate, But the protected state remained free. This is explained in a passage of the Digest 49. 15. 7: " Liber autem populus est is, qui nullius alterius populi potestati est subjectus, sive is foedera- tus est; item sive aequo foedere in amicitiam venit, sive foedere comprehensum est, ut is populus alterius populi majestatem comiter conservaret. Hoc enim adjicitur, ut intelligatur alterum populum superiorem esse: non ut intelligatur alterum non esse liberum " (Marquardt, Romische Staatsverwaltung, 2nd ed., vol. i. p. 46, Mommsen, Romisches Staatsrecht, vol. iii. pt. 1, p. 645, and the instances collected by Pufendorf, 8 c. 9. 4).

In medieval times this relation existed, and the term " pro- tection " was in use. But the relation of subordination of one state to another was generally expressed in terms of feudal law. One state was deemed the vassal of another; the ruler of one did homage to the ruler of another. In his book De la Ripub- lique Bodin treats of ceux qui sont en protection (1. c. 7), or, as the Latin text has it, de patrocinio et clientela. In Bodin's view such states retain their sovereignty (1. c. 8). Discussing the question whether a prince who becomes a cliens of another loses his majestas, he concludes that, unlike the true vassal, the cliens is not deprived of sovereignty: " Nihilominus in foederibus et pacis actionibus, quae inter principes aut populos societate et amicitia conjunctissimos sancientur; earn vim habet ut nee alter alteri pareat, nee imperet: sed ut alter alterius majes- tatem observare, sine ulla majestatis minutione teneatur. Itaque jus illud clientelare seu protectionis omnium maximum ac pulcherrimum inter principes censetur " (1 c. 7). Elsewhere Bodin remarks, " le mot de protection est special et n'emporte aucune subjection de celuy qui est en protection." He dis- tinguishes the relation of seigneur and vassal from that of protecteur and adherent. As to whether the protected state or prince is sovereign, he remarks, " je tiens qu'il demeure soverain, et n'est point subject." He makes clear this conception of protection by adding " Fadvoue ou adherent doit estre exempte de la puissance du protecteur s'il contrevient aux traictes de protection. Voila done la plus grande seurete de la protection, e'est empescher s'il est possible que les protecteurs ne soyent saisis des fortresses " &c. (p. 549, ed. 1580). Sometimes letters of protection were granted by a prince to a weak state, as e.g. by Louis XIII. in 1641 to the prince of Monaco (Gairal, p. 81).

Reverting to the distinction in Roman law, Grotius and Pufendorf, with many others, treat protection as an instance of unequal treaties; that is, "

when either the promises are unequal, or when either of the parties is obliged to harder conditions " (D 'e jure belli et pacis, 1 c. 13. 21; De jure naturae, 8. c. g).

The following are some definitions of " protectorate ": " Piincipis privilegium, quo ne alicui vis inferatur, cavetur, eumque in pro- tectionem suscipit." Du Cange: " La situation d'un ^_ etat a l'egard d'un autre moins puissant auquel il a fpL, " promis son appui d'une maniere permanent " (Gairal, * . ec ~ p. 52) ; a definition applicable only to certain simple or e * forms of this relation. " Pour le protege, une condition de mi-souverainet6 substitute a la pleine ind6pendance que comporte le regime de simple protection " (p. 58). " La situation respective de deux etats de puissance inegale, dont l'un contracte l'obligation per- manente de dfifendre l'autre, et en outre de le diriger " (p. 62). " Unter einem Protektorat versteht man ein Schutzverhaltniss zwischen zwei Staaten des Inhalts dass der eine Staat, der Oberstaat oder schutzherrliche Staat, zum dauernden Schutze des anderen Staates — des Schutzstaates oder Unterstaates — verpflichtet ist; wofilr ihm ein mehr oder weniger weitgehender Einfluss auf die auswartigen Angelegenheiten desselben und theilweise auch auf dessen innere Verhaltnisse eingeraiimt ist " (von Stengel, Die deutschen Schutzgebiete, 11). " Das Verhaltniss von zwei (oder mehreren) Staaten, das in materieller Beziehung auf dem dauernden Bediirfniss des Schutzes eines schwacheren Staates durch einen starkeren beruht " (Ullmann, s. 26).*

" The one common element in Protectorates is the prohibition of all foreign relations except those permitted by the protecting state. What the idea of a protectorate excludes, and the idea of annexation, on the other hand, would include, is that absolute ownership which was signified by the word dominium in Roman law, and which, though not quite satisfactorily, is sometimes described as ' territorial sovereignty.' The protected country remains, in regard to the protecting state, a foreign country; and

this being so, the inhabitants of the protectorate, whether native- born or immigrant settlers, do not by virtue of the relationship between the protecting and the protected state become subjects of the protecting state " (Lord Justice Kennedy, Rex v. Crewe, 1910, 79, L.J., p. 802). " The mark of a protected state or people, whether civilized or uncivilized, is that it cannot maintain political intercourse with foreign powers except through or by permission of the protecting state " (Hall, Foreign Jurisdiction of the British Crown, p. 218). " A British protectorate is a country which is not

within British dominions, but as regards its foreign relations is under the exclusive control of the King, so that its government cannot hold direct communication with any other foreign power, nor a foreign power with that Government " (Jenkyns, British Rule and Jurisdiction "beyond the Seas, p. 165; Reinsch, Colonial Govern- ment, p. 109; Payne, Colonies and Colonial Federations, p. 194).

The term is used very loosely. Often it designates a relation which it is deemed politic to leave indefinite: a state desires to obtain the reality of conquest without the responsibilities attaching thereto. Protectorate may mean no more than what it says: " One state agrees to protect or guarantee the safety of another." The term is also employed to describe any relation of a political superior to an inferior state. It is also used as the equivalent of suzerainty. As appears from the article Suzerainty, the terms are distinguishable. But both imply a desire to carry out changes without friction and not to break up ancient forms; both proceed on the plan of securing to the stronger state the substance of power while allowing the weaker state a semblance of its old constitution. It is a form ofempire or state building which appears when a power- ful, expanding state comes in contact with feebler political organi- zations, or when a state falls into decay, and disintegration sets in. The creation of a protectorate is convenient for the superior and the inferior; it relieves the former from the full responsibilities incident to annexation; it spares to some extent the feelings of the latter.

Certain protectorates originate in treaties; others have been imposed by force. Some are accompanied by occupation, in which case it is difficult to distinguish them from annexation. Thus the treaty of May 1881, art. 2, between France and Tunis, provides for the occupation of strategical points by the protecting state (A. Devaulx, Les Protectorats de la France, p. 21).

The establishment of a protectorate may be akin to a guar- antee. Generally, however, the former implies a closer relation than a guarantee; and the two relations may be widely different, as may be seen by comparing tieaties of guarantee with the treaty establishing the protectorate of Tunis.

Strictly speaking, a protectorate cannot exist over a domain uninhabited or ruled by no organized state; in such cases the elements of the true protectorates are wanting. But the distinction is not adhered to. The difficulty of defining the relations between the protected and the protecting states is greater, because a protectorate may imply a condition of transi- tion: a contractual or limited relation of state to state, more or less rapidly changing into true union.

It has been the policy of the British government in India to establish on the frontiers, as elsewhere, protectorates. The political advantages of the system are pointed out in Sir A. Lyall's Rise and Expansion of the British Dominion in India. It is a system " whereby the great conquering or commercial peoples masked, so to speak, their irresistible advance"; it was much practised by the Romans in Africa and tectorates.' Asia; it has been chiefly applied in modern times in India (p. 326). The Indian states are some- times described as " Feudatory States," sometimes " Indepen- dent and Protected States ". (Twiss), sometimes " Mediatized States " (Chesney), sometimes " Half-Sovereign, " sometimes as in a position of " subordinate alliance " (Lord Salisbury, Parliamentary Papers, 1897 [c. 8700]. § 27). The Inter- pretation Act, 1889 (52 & S3 Vic. c. 63, s. 18), refers to the Indian native princes as under the " suzerainty " of the British Crown. These states are really sui generis,&nd their precise position can be understood only by a private examination of the treaties affecting them. The following are the chief points as to which Indian states are subject to English law: (1) the governor- general is empowered to make laws for servants of the British government and European and native Indian subjects of his majesty; (2) British laws are in force in certain parts of the native states e.g. in cantonments; (3) native princes have adopted certain British laws, e.g. the Indian Penal Code; (4) they have no ex- ternal relations with foreign states; (5) the king is the donor of honours; (6) acts of parliament affect them indirectly by

directly affecting the British agent; (7) they receive advice, which may be akin to commands. (See also Ilbert's Govern- ment of India, 2nd ed. p. 140).

Among the chief British protectorates are: The African groups, consisting of the western group — -Gambia; Sierra Leone; Ashanti (northern territory) ; Northern Nigeria ; Southern Nigeria (with which is amalgamated Lagos). The southern group — Bechuanaland ; Southern Rhodesia; Swaziland. The central group — North-east Rhodesia and North-west Rhodesia ; Nyasaland. The eastern group — British East Africa; Uganda; Zanzibar and Pemba (sometimes described as " a sphere of influence ") ; Somaliland; and the Sudan.

There is a group of protectorates near Aden, including the island of Sokotra. There are also the Bahrein Islands in the Persian Gulf. Jurisdiction over these protectorates is, generally speak- Existiar ing, exercised under orders in council made under the ~ . f Foreign Jurisdiction Act 1890 (Burge's Colonial and t ora tes Foreign Law, 2nd ed., p. 320). There is also the Malay _ group, consisting of the Malay States in the Borneo peninsula and in Borneo, the protectorates of North Borneo, Brunei and Sarawak. Protectorates also exist in the Western Pacific group of

islands (including the Friendly Islands, the Ellice and Gilbert group, and the British Solomon Islands).

There is the interesting case of Papua (formerly British New Guinea), over which a protectorate was established in 1884, but which became in 1906 a territory of the Australian Commonwealth. There are also dependencies, or protectorates, attached to India, Baluchistan, Sikkim and Andaman Islands.

France possesses several protectorates, of which the chief are Tunis, Annam and Tongking. Her policy has been until lately to transform them into French territory. Such change has taken place as to Tahiti and Madagascar, and such in effect is the posi- tion of the Indo-China protectorates (Devaulx, Les Protectorats de la France-, Report by Mr Lister, Pari. Papers 1908, Cd. 3883).

The chief German protectorates are South-west Africa, Togoland and Cameroon, German East Africa, Kaiser Wilhelm Land, Bismarck Archipelago, Solomon Islands, and Kiaochow — under lease from China — (Zeitschrift fur Kolonialrecht, 1907, p. 311). Russia has the protectorates of Khiva and Bokhara ; and China exercises or claims rights as protector of certain dependencies.

There are two principal classes of protectorates; the first being those exercised generally by treaty over civilized countries. Of the first, the chief are: (a) that of Cracow, which was re- cognized by the Treaty of Vienna as an independent state, and placed under the protection of Russia: it was incorpor- ated with Austria in 1846; (b) Andorra, protected by Spain and France as successors of the counts of Foix (See Andorra); (c) the Ionian Islands, placed under the protection of Great Britain by the Treaty of Paris of 181 5. 1

The second class of protectorates consists of those exer- cised by one civilized state over an uncivilized people, some- times called a " Colonial Protectorate " or " pseudo-protec- torate," and usually the preparatory step to annexation. These have become common, especially in Africa, since 1878. The second class may be subdivided into two groups: (a) protectorates exercised over countries with organized govern- ments and under recognized sovereigns, such as the Malay States; and (b) those exercised over countries possessing no stable or definite governments and rulers. The territories of chartered companies, when not within the dominion of the protecting state, may also for some purposes be regarded as, protectorates.

Attempts have been made to define the reciprocal rights and duties of

protecting and protected states. Sometimes the treaty creating the relation defines the obliga- _ . tions. Thus in the treaty with respect to Sarawak Duties of the latter is described as an " independent state Protecting under the protection of Great Britain." " Such ana protection shall confer no right on his Majesty's suus government to interfere with the internal ad- ministration of that state further than is herein provided." The British consular officers are to receive exequaturs in the name of the government of Sarawak. Foreign relations are to be conducted by that government, and the raja cannot cede or alienate any part of the territory without the consent of the British government (Hertslet, 18. 227). In the treaty creating a protectorate over the territories of the king and chief of Opopo (Hertslet, 17. 130) the sovereign undertakes to extend to them, and to the territory under their authority and jurisdiction, his favour and protection. They promise not to

enter into " any correspondence, agreement or treaty with any foreign nation or power, except with the knowledge and sanction of his Majesty's government." Some treaties establishing protectorates provide for direct interference with internal affairs; for example, the treaty of 1847 creating a French pro- tectorate over Tahiti, and that of 1883 as to Tunis. Sometimes the Oberstaat — to use a convenient expression — is content to insist upon the presence of a resident, who guides the policy of the native ruler. In the case of protectorates over uncivilized countries it is usual to stipulate against alienation of territory without consent of the Oberstaat.

The legal position of protectorates is still somewhat unde- termined; there are an old view and also a new view of their nature. The relation may be one of international ates and ˆ aw > two states having entered into obligations inter- by treaty. Or the relation may be one of public

national j aw . one f two s tates has become subordinate to, and incorporated with, the other. The general rule is that the protected state does not cease to be a sovereign state, if such was its previous status. Its head is still entitled to the immunities and dignity of a sovereign ruler. Further, the establishment of a protectorate does not necessarily rescind treaties made between the protected state and other states, at all events when it is not in reality conquest or cession, or when any modification would be to the injury of third parties (Pari. Papers, Madagascar, 1897 [c. 8700]; Trione, 187). Nor does the new relation make any change as to the nationality of the subjects of the two states, though in some countries facilities are afforded to the subjects of the Unterstaat to transfer their

allegiance; and they owe a certain ill-defined degree of obedience to the protecting state. Nor, speaking generally, does the terri- tory of the protected state become part of the territory of the Oberstaat; in this respect is it unlike a colony, which may be regarded as an extension or outlying province of the country. At the same time, the question whether a particular protec- torate forms part of the " dominion " or " territory " of the Crown for any purposes or within the meaning of any statute cannot be regarded as wholly free from doubt; its terms and intention must be examined. In Rex v. Crewe (1919, 79, L. J. 874) the Court of Appeal decided that the Bechuanaland Pro- tectorate was not part of the dominion of the Crown, but was foreign territory. Several writers propose this distinction — the protected country is to be considered a part of the territory as to certain important sovereign rights, and as to other matters not. In one view, for the purpose of municipal law, the terri- tory of a protectorate is not, but for the purposes of international law is, within the territory of the protecting state. In another view, such territory is foreign only in the sense that it is not within the purview of the majority of statutes (see Hall's International Law, 6th ed., 126, Heilborn, 535; Tupper's Indian Protectorates, 336; Laband, 2, § 70).

The older view of the position of a protectorate according to international law is contained in the decision of Dr Lushington in the case of the " Leucade " (8 S.T., N.s., 432), to the effect that, the declaration of war by Great Britain against Russia notwith- standing, the Ionian Islands, which were then under the protectorate of Great Britain, remained neutral. The king of Great Britain had the right of declaring peace and war. " Such a right is insepara- ble from protection." But the Ionian states did not become neces- sarily enemies of the state with which Great Britain was at war. According to one view, the protected state is implicated in the wars to which the protecting state is a party only when the latter has acquired a right of military occupation over the territory of the former. " Cette solution a 6t6 reconnue par la France en 1870, a propos de la guerre contre l'Allemagne pour les iles Taiti alors soumises a notre protectorat; elle s'imposerait pour la Tunisie, 1′ Annam et Tonkin, et pour le Cambodge, ou les traites nous conferent le droit d'occupation militaire " (M. Despagnet). In the event of hostilities between the protecting and protected states, such hostilities would be regarded not as of the nature of an insurrection, but as a regular war (Trione, 149).

By the General Act of the Berlin Conference it was agreed that the acquisition of a protectorate should be notified to the signa- tories to the agreement (art. 34), and it has been the practice to give such notice. It was proposed by some of the powers

represented that effective occupation should be a condition to the creation

of a protectorate on the coast of Africa. But this was opposed by England,' and was not adopted (Laband, ii. 680). Many writers adhere to the doctrine that there is no impair- ment of sovereignty of the weaker state by the establishment of a protectorate. They also allege that it is res inter alios acta, an arrangement which concerns only parties to it. But the trend of recent policy and purport of much recent legislation are against this view. The distinct tendency, especially as to protectorates over uncivilized countries, is to treat, for purposes of international law, the territory of a protectorate as if it belonged to the protecting state. If France, for example, per- mitted in Tunis or other protectorates operations of an unfriendly character to any power, the injured power would no doubt look to France for redress. This view would probably be strongly pressed in the case of protectorates over countries having no well-defined or stable government. The prpbability is that in such cases governments and courts applying international law would probably be guided not by technical facts — such, to take the case of British possessions, as the fact that an order in council permitted appeals to the Judicial Committee — but would look to the facts of the case. " Any state which undertakes to protect another assumes towards the rest of the world responsi- bility for its good behaviour — the more complete protection the more extensive the responsibility — and this responsibility involves a .duty to interfere if need be " (Coolidge, United States as a World Power," p. 167; and to the same effect Liszt, Volker- recht, p. 31; and Zorn, Volkerrecht, p. 45). The tendency is for protecting states to assert jurisdiction over foreigners within the territories of the protected states (Westlake, 187; Jenkyns, p. 176; Ilbert, 2nd ed., 393, 434). Mr Hall remarks (International Law, 6th ed., p. 126 n.) that " all the states represented at the Berlin Conference of 1884-1885, with the exception of Great Britain, maintained that the normal jurisdiction of a protector- ate includes the right of administering justice over the subjects of other civilized states." The General Act contemplated measures which are scarcely compatible with the exemption of European traders and adventurers from the local civilized jurisdiction. He points out that Great Britain — which until lately took the view that a protected state possesses only dele- gated powers, and that an Eastern state cannot grant jurisdiction over persons who are neither its own subjects nor subjects of the country to which the powers are delegated — had by the Pacific Order in Council of 1893 and the South African Orders in Council of 1 891-1894 asserted jurisdiction over natives and foreign subjects. " The Orders show a gradual increase of the assump- tion of internal sovereignty" (Jenkyns, 193). A similar process is observable in the German protectorates, which are treated for some purposes as " inland," and not foreign territory (Der . koloniale Inlands- und Auslands-begriff, Zeitschrift fiir Kolo- nialrecht, 1907, p. 311). The fact is that in the case of pro- tectorates over uncivilized or semi-civilized countries a develop- ment is inevitable: control quickly hardens

into conquest, and international law more and more takes note of this fact.

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Authorities. — Bodin, Les Six livres de la Republique (Lyons, 1580); De republica libri sex (Paris, 1586); Stengel, Die Staats- und volkerrechtliche Stellung der deutschen Colonien (1886) ; Heim- burger, Der Erwerb der Gebietshoheit (1888); D'Orgeyal, Les Pro- tector ats allemands; annates de I'&cole des Sciences Politiques (1890); Wilhelm, Theorie juridique des protectorats (1890); Despagnet, Essai sur les protectorats (1896) ; Heilborn, Das volkerrechtliche Protectorat (1891); Hall, The Foreign Jurisdiction of the British Crown (1894); Stengel, Die deutschen Schutzgebiete (1895); Gairal, Les Protectorats internationaux ; Ieze, Etude theorique, &c, sur I' occupation, &c. (1896); Trione, Gli stati civili nei loro rapporti giuridici cot popoli barbari e semibarbari (1889); Ilbert, The Government of India (1898) ; Jenkyns, British Rule and. Jurisdiction beyond the Seas (1902) ; Laband, Das Staatsrecht des deutschen Reiches (1876-1882), Revue de droit international, civilises, et barbares, xvii. 1, xviii. 188; Stengel, Die Rechtsverhdltnisse der deutschen Schutzgebiete (1901); Devaulx, Les Protectorats de la France (1903) article " Protectorates" in the Encyclopaedia of the Laws of England, 2nd ed., vol. xi. ; Baty, International Law (1909) ; Ullmann, Volkerrecht, § 26 (1908) ; Rex v. Crewe (1910) 79, L.J. 874; Von Stengel in Zeitschrift fiir Kolo- nialrecht (1909), p. 258; Sir W. Lee-Warner, Protected States of India (1910). (J. M.)

PROTEOMYXA, a name given by E. Ray Lankester (Ency. Brit., 9th ed., 1885, art. " Protozoa, ") to a group of Protozoa Sarcodina. The group was really recognized as distinct by Cienkowski and by Zopf , receiving the name of Monadinea from

1, Vampyrella spirogyrae, Cienk., amoeba phase penetrating a cell of Spirogyra b, by a process of its protoplasm c, and taking up the substance of the Spirogyra cell, some of which is seen within the Vampyrella a.

2, Large individual of Vampyrella, showing pseudopodia e, and food particles a. The nucleus (though present) is not shown in this drawing.

3, Cyst phase of Vampyrella. The contents of the cyst have divided into four equal parts, of which three are visible. One is commencing to break its way tlirough the cyst-wall /; a, food particles.

4, Archerina boltoni, Lankester, showing lobose and filamentous

protoplasm, and three groups of chlorophyll corpuscles. The pro- toplasm g is engulphing a Bacterium i.

5, Cyst phase of Archerina: a, spinous cyst- wall ; b, green-coloured contents.

6, Chlorophyll corpuscle of Archerina showing tetraschistic division.

7, Actinophryd form of Archerina: b, chlorophyll corpuscles.

8, Protogenes primordialis, Haeckel (Amoeba porrecta, M. Schultze), from Schultze's figure.

the former; but as this name had been usually applied to Flagel- lates and even the zoospores are not always provided with flagella, Lankester 's name has become more suitable, and has been adopted by Delage and Herouard (1896) and by Hartog (1906). The group entered to a considerable extent into the

" Monera " of Haeckel, supposed (erroneously in most if not all species adequately studied) to possess no nucleus in the proto- plasm. The following are the characteristics of the group. Pseudopods usually granular, fine flexible, tapering generally, not freely branching; reproducing sometimes by simple fission, but more frequently by multiple fission in a brood-cyst whose walls may be multiple. Plasmodium formation occasional, but never leading to the formation of a massive fructification: other syngamic processes unknown, and probably non-existent. Encystment, or at least a resting stage at full growth, is very characteristic, and frequently an excretion of granules takes place into the first-formed cyst, whereupon a second inner cyst is formed which may be followed by a third. These brood-cysts, in which multiple fission takes place, may be of two kinds, ordinary and resting, the latter being distinguished by a firm, and usually ornamented and cuticularized cell-wall, and only producing its zoospores after an interval. Besides, an indi- vidual at any age may under unfavourable conditions surround itself with a " hypnocyst," to pass the time until matters are more suitable to active life, when it emerges unchanged.

From the initial character of the brood-cell on leaving the sporo- cyst the dividing character of the two orders is taken.

1. Zoosporeae, Zopf. The brood-cells leave the cyst as " Monads " (with one or two flagella). Genera: Pseudospora, Cienk. ; Protomonas, Cienk.; Diplophysalis , Zopf.; Gymnococcus, Z.; Aphelidium, Z.; Pseudosporidium, Z. ; Plasmodiophora, Woronin ; Tetramyxa, Goebel.

2. Azoosporeae, Zopf. Genera : Endyonema, Z. ; Vampyrella, Cienk. (figs. I, 2, 3) ; Leptophrys, Hertw. and Less. ; Bursulla, Sorokin; Protogenes, Haeck. (fig. 8) ; A rcherina. Lank. (figs. 4-7) ; Serosporidium, L. Pfeiffer; Lymphosporidium, Calkins.

Many of the species are endoparasites in living cells, mostly of Algae or Fungi, but not exclusively. At least two species of Pseu- dospora have been taken for reproductive stages in the life history of their hosts — whence indeed the generic name. Plasmodiophora brassicae gives rise to the disease known as " Hanburies " or " fingers and toes" in Cruciferae; Lymphosporidium causes a virulent epidemic among the American brook-trout, Sahelinus fontinalis. Archerina boltoni is remarkable for containing a pair of chlorophyll corpuscles in each cell; no nucleus has been made out, but the chlorophyll bodies divide previous to fission. It is a fresh-water form. The cells of this species form loose aggregates or filoplasmodia, like those of Mikrogromia (Foraminifera, q.v.) or Leydenia (Labyrinthuloidea, q.v.), &c.

Vampyrella (figs. 1-3) and Enteromyxa also form a compact Plasmodium which separates into i-nucleate cells, which then encyst and divide into a brood of four.

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(M. Ha.)

PROTESILAUS, in Greek legend, son of Iphiclus, and husband of Laodameia. In command of the Greek contingent from Phylace in Thessaly, he was the first to spring ashore on Trojan soil, although he knew it meant instant death. His wife be- sought the gods below that he might be permitted to return to earth for the space of three hours. Her prayer was granted, and on the expiration of the time allotted she returned with him to the nether world. According to Hyginus (Fab. 103, 104), Laodameia made a waxen image of her husband. A slave, having detected her in the act of embracing it and supposing it to be a lover, informed her father, who ordered her to burn the image; whereupon she threw herself with it into the flames. In another account (Conon, Narrationes, 13) Protesilaus survived the fall of Troy and carried off Aethilla, the sister of Priam. During a halt on the peninsula of Pallene, Aethilla and the other captive women set fire to the

ships. Protesilaus, unable to continue his voyage, remained and built the city of Scione. His tomb and temple were to be seen near Eleus in the Thracian Chersonese. Nymphs had planted elm-trees, facing towards Troy, which withered away as soon as they had grown high enough to see the captured city. Protesilaus was the subject of a tragedy by Euripides, of which some fragments remain.

Iliad, ii. 698 ; Lucian, Dial mort. xxiii. 1 ; Ovid, Heroides, xiii. ; Philostratus, Heroica, iii.

PROTESTANT, the generic name for an adherent of those Churches which base their teaching on the principles of the Reformation (q.v.). The name is derived from the formal Protestatio handed in by the evangelical states of the empire, including some of the more important princes and 14 imperial cities, against the recess of the diet of Spires (1529), which decreed that the religious status quo was to be preserved, that no innova- tions were to be introduced in those states which had not hither- to made them, and that the mass was everywhere to be tolerated. The name Protestant seems to have been first applied to the protesting princes by their opponents, and it soon came to be used indiscriminately of all the adherents of the reformed religion. Its use appears to have spread more rapidly outside Germany than in Germany itself, one cause of its popularity being that it was negative and colourless, and could thus be applied by adherents of the " old religion " to those of the " new religion," without giving offence, on occasions when it was expedient to avoid abusive language. The designation was moreover grate- ful to the Reformers as connoting a certain boldness of attitude; and Professor Kattenbusch (Herzog-Hauck, Realencyklopadie, 3rd ed., xvi. p. 136, 15) points out with great truth how, from this point of view, the name " Protestantism " has survived as embodying for many the conception of liberty, of the right of private judgment, of toleration for every progressive idea in religion, as opposed to the Roman Catholic principles of authority and tradition; so that many even of those who do not ' : profess and call themselves Christians " yet glory in the name of " Protestant."

As the designation of a Church, " Protestant " was unknown during the Reformation period and for a long while after. In Germany the Reformers called themselves usually evangelici, and avoided special designations for their communities, which they conceived only as part of the true Catholic Church; " Cal- vinists," " Lutherans," " Zwinglians " were, in the main, terms of abuse intended to stamp them as followers of one ov other heretical leader, like Arians or Hussites. It was not until the period of the

Thirty Years' War that the two main schools of . the reformed or evangelical Churches marked their definitive separation: the Calvinists describing themselves as the "Re- formed Church," the Lutherans as the " Lutheran Church." In France, in England, in Holland the evangelicals continued to describe their churches as ecclesiae reformatae, without the arriere pensee which in Germany had confined the designation " Reformed " to the followers of a particular church order and doctrine. As to the word " Protestant," it was never applied to the Church of England or to any other, save unofficially and in the wide sense above indicated, until the style "Protestant Episcopal Church " (see below) was assumed by the Anglican communion in the United States. Even in the Bill of Rights the phrase " Protestant religion " occurs, but not " Protestant Church," and it was reserved for the Liberal government, in the original draft (afterwards changed) of the Accession Declara- tion Bill introduced in 1010, to suggest " Protestant Reformed Church of England " as a new title for the Established Church. The style " Protestant " had, however, during the 19th cen- tury assumed a variety of new shades of meaning which neces- sarily made its particular application a somewhat hazardous proceeding. In Germany it had, for a while, been assumed by the Lutherans as against the Calvinists, and when in 181 7 King Frederick William III. of Prussia forcibly amalgamated the Lutheran and Reformed Churches in the new " Evangelical Church " its public use was forbidden in the Prussian dominions. It survived, however, in spite of royal decrees, but in an altered sense. It became — to quote Professor Kattenbusch — the " secular " designation of the adherents of the Reformation, the shibboleth of the " liberal " ecclesiastical and theological tendencies. Finally, in opposition to the ultramontane move- ment in the Roman Catholic Church, it came once more into fashion in something of its original sense among the evangelicals. In the Church of England, on the other hand, the name " Protestant " has, under the influence of the High Church reaction, been repudiated by an increasingly large number of

the clergy and laity, and is even sometimes used by them in a derogatory sense as applied to their fellow churchmen who still uphold in their integrity the principles of the Reformation. Among the latter, on the other hand, " Protestantism " is used as exclusive of a good many of the doctrines and practices which in the Lutheran Church were at one time " Protestant " as opposed to " Reformed," e.g. the doctrine of the real Presence, auricular confession, the use of ceremonial lights and vestments. By many churchmen, too, the name of " Protestant " is accepted in what they take to be the old sense as implying repudiation of the claims of Rome, but as not necessarily involving a denial of " Catholic " doctrine or any confusion of the Church of England with non-episcopal churches at home or abroad.

In contradistinction to all these somewhat refined meanings, the term "

Protestant " is in common parlance applied to all Christians who do not belong to the Roman Catholic Church, or to one or other of the ancient Churches of the East.

PROTESTANTENVEREIN is the name of a society in Germany the general object of which is to promote the union (Verein) and progress of the various established Protestant Churches of the country in harmony with the advance of culture and on the basis of Christianity. It was founded at Frankfort-on-the- Main in 1863 by a number of distinguished clergymen and lay- men of liberal tendencies, representing the freer parties of the Lutheran and Reformed Churches of the various German states, amongst whom were the statesmen Bluntschli and Von Bennigsen and the professors R. Rothe, H. Ewald, D. Schenkel, A. Hilgenfeld and F. Hitzig. The more special objects of the association are the following: the development of the Churches on the basis of a representative parochial and synodal system of government in which the laity shall enjoy their full rights; the promotion of a federation of all the Churches in one national Church ; resistance to all hierarchical tendencies both within and without the Protestant Churches; the promotion of Christian toleration and mutual respect amongst the various confessions; the rousing and nurture of the Christian life and of all Christian works necessary for the moral strength and prosperity of the nation. These objects include opposition to the claims of Rome and to autocratic interference with the Church on the part of either political or ecclesiastical authorities, efforts to induce the laity to claim and exercise their privileges as members of the Church, the assertion of the right of the clergy, laity and both lay and clerical professors to search for and proclaim freely the truth in independence of the creeds and the letter of Scripture. Membership in the association is open to all Germans who are Protestants and declare their willingness to co-operate in pro- moting its objects. The means used to promote these objects are mainly (1) the formation of local branch associations through- out the country, the duty of which is by lectures, meetings and the distribution of suitable literature to make known and advocate its principles, and (2) the holding of great annual or biennial meetings of the whole association, at which its objects and principles are expounded and applied to the circumstances of the Church at the moment. The " theses " accepted by the general meetings of the association as the result of the discus- sions on the papers read indicate the theological position of its members. The following may serve as illustrations : —

The creeds of the Protestant Church shut the doors on the past only, but open them for advance in the future; it is immoral and contrary to true Protestantism to require subscription to them. The limits of the freedom of teaching are not prescribed by the letter of Scripture, but a fundamental requirement of Protestantism is free inquiry in and about the Scriptures. The attempt to limit the freedom of theological inquiry and teaching in the

universities is a violation of the vital principle of Protestantism. Only such concep- tions of the person of Jesus can satisfy the religious necessities of this age as fully recognize the idea of his humanity and place in history. The higher reason only has unconditional authority, and the Bible must justify itself before its tribunal; we find the history of divine revelation and its fulfilment in the Bible alone, and reason bids us regard the Bible as the only authority and canon in matters of religious belief.

The formation of the association at once provoked fierce and determined opposition on the part of the orthodox sections

of the Church, particularly in Berlin. Attempts more or less | successful have been made from the first to exclude clergymen and professors identified with it from the pulpits and chairs of Berlin and elsewhere, though membership in it involves no legal disqualification for either. One of the objects of the association was to some extent obtained by their organization of the Prussian Church when Dr Falk was cultus minister, on the basis of paro- chial and synodal representation, which came into full operation in 1879. But the election for the general synod turned out very unfavourable to the liberal party, and the large orthodox majority endeavoured to use their power against the principles and the members of the association. In 1882 the position of the associa- tion was rendered still more difficult by the agitation in Berlin of Dr Kalthoff and other members of it in favour of a "people's church " on purely dissenting and extremely advanced theologi- cal principles. This difficulty has continued, and the extreme rationalist position taken up by some leaders has alienated the sympathy not only of the obscurantists but of those who were prepared to go some distance in the direction of a liberal theology. There are now about 25,000 members in the 20 branches of the Verein.

See D. Schenkel, Der deutsche Protestantenverein und seine Bedeu- tung fur die Gegenwart (Wiesbaden, 1868, 2nd ed. 1871) ; Der deutsche Protestantenverein in seinen Statuten und den Thesen seiner Haupt- versammlungen 1865-1882 (Berlin, 1883) ; P- Wehlhorn in Herzog-Hauck's Realencyk. fur prot. Theol. u. Kirche; H. Weinel, " Religious Life and Thought in Germany To-day," Hibbert Journal (July 1909).

PROTESTANT EPISCOPAL CHURCH, in the United States, a part of the Anglican Communion, organized after the War of Independence by the scattered parishes of the Church of Eng- land which survived the war. It inherits from the Church of England, with which it is in communion, its

liturgy, polity and spiritual traditions, though it has entire independence in legislation. While the clergy of both Churches are cordially received in their respective countries, there is no formal con- nexion between them except in fellowship and in advisory council as at the Lambeth Conference. The Church in the United States is therefore an independent national Church which has adapted itself to the conditions of American life.

With many likenesses, the Protestant Episcopal Church is different from the Church of England in its organization and representative form of government. It has the three orders of bishops, priests and deacons, and uses an almost identical liturgy; but it is a democratic institution in which the laity have practically as much power as the clergy, and they are represented in all legislative bodies. The constitution of the Church follows in many particulars the constitution of the United States. As the separate states of the Union are made up of different town- ships, so the diocese is composed of separate parishes; and as the nation is a union of the states, so the Church is a union of the dioceses. The American plan of representative government is consistently adhered to. The Church in America is thus a part of the Catholic Church of Christ, with its roots deep in the past and yet a living body with a life of its own, standing for the truth of the Christian religion in the great Republic. It is now firmly established in every state and Territory of the United States, and in all the dependencies, with also vigorous missions in foreign lands.

Services of the Church of England were held by the chaplains of exploring expeditions in various parts of North America before a settlement was established: on Hudson Bay, in 1578, and on the shores of the Pacific with Drake in 1579; but the first permanent foothold of the Church was in Jamestown, Virginia, in 1607, when a colony was founded and a church built. This fact is recognized in the proposed preamble to the constitution, in which it is stated that this American Church was " first planted in Virginia in the year of Our Lord' 1607, by representatives of the ancient Church of England. " Parishes were later founded in Maryland in 1676; in Massachu- setts in 1686; in New York about 1693; in Connecticut in 1706; and in the other colonies during the 17th and 18th centuries. The growth of these colonial churches was largely promoted by the Society for the Propagation of the Gospel in Foreign Parts,

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founded in 1701, through the efforts of the Rev. Thomas Bray, a missionary in Maryland. These churches scattered throughout the different colonies up to the American War of Independence were missions of the Church of England. They were under the jurisdiction of the Bishop of London, there being no bishop in America. The Bishop of London

superintended these distant parishes by means of commissaries. Many of the clergy came from England; and when young men in America desired to be ordained, it was necessary for them to go to England for this purpose. The Church during the colonial period was incomplete in organization, and without the power of expansion. It was confined principally to the more settled parts of the country, though it had extended itself into all the colonies. During this period a few educational institutions were founded: the College of William and Mary in 1693, in Virginia; the Public Academy of Philadelphia, in 1749, now the university of Pennsylvania; and King's College, in 1754, in New York, now Columbia Univer- sity. The clergy also frequently taught in parochial schools, and trained boys and girls in their homes.

When the war broke out and independence was declared, a number of the clergy went back to England, leaving their parishes vacant, but many, especially in the southern states, remained and upheld the American cause. A large majority of the laymen were patriots. Two-thirds of the signers of the Declaration of Independence were Episcopalians. The churches, having their support largely withdrawn by the Venerable Society, became very weak. In Massachusetts during the war only two churches were kept open.

After the war it was very soon recognized that if the Church was to survive, there must be organization and co-operation among the fragments left. Rev. William White (1 748-1836) of Philadelphia, who had been chaplain of the Continental Congress, was a leader in the plan of organization. Rev. Samuel Seabury (1729-1796) of Connecticut was also an important factor in continuing the life of the Church. He was elected bishop by the clergy of Connecticut, and after being refused in England, was consecrated bishop of Connecticut by the Scotch non-juror bishops in Aberdeen on the 14th of November 1784. Later, William White of Pennsylvania and Samuel Provoost (1742-1815) of New York were consecrated bishops in the chapel at Lambeth Palace on the 4th of February 1787, by the arch- bishops of Canterbury and York and others. Rev. James Madison (1740-1812) of Virginia was also consecrated bishop in England, on the 19th of September 1790. An important meeting or general convention of laymen, clergy and bishops was held in 1784, and another in 1789, for the purpose of consolida- ting and uniting the Church. Certain fundamental principles were adopted which were the basis of organization: that the Episcopal Church be independent of all foreign authority; that it have full and exclusive power to regulate the concerns of its own communion; that the doctrines be maintained as in the Church of England; that bishops, priests and deacons be required; that the canons and laws be made by a more representative body of clergy and laity conjointly. At the general convention of 1789 a constitution and canons were finally adopted, and the book of Common Prayer was set forth. The Church thus being fully

organized, it was prepared to develop and extend. There was a long period, however, when little was done save retain what had already been gained. Owing in a measure to the popular prejudice against anything that savoured of England, and to the difficulty of adapting the newly formed institution to the conditions of American life, the Church hardly held its own from 1789 to 181 1. The general convention of 181 1 was attended by only five clergymen and four laymen more than that of 1789. The Church in Virginia especially suffered a decline, but in the North it maintained itself. After 181 r a new spirit manifested itself in the consecration of three important men to the episcopate. John Henry Hobart, a man of great zeal and devotion, became bishop of New York in 1811; Alexander Viets Griswold (1766-1843), a man of piety and force, became bishop of the eastern diocese of New England in 1811; and Richard Channing Moore (1762-1841), a

strong preacher and vigorous personality, was consecrated bishop of Virginia in 1814. Both Hobart and Moore became interested in theological education; and their efforts to train clergymen resulted in the establishment of the General Theo- logical Seminary in New York in 1819, and the Theological Seminary in Virginia, opened in Alexandria in 1824. The Churchman's Magazine was started. Another evidence of expansion was the consecration in 181 9 of Philander Chase (1775-1852), who became pioneer bishop of the West, first in Ohio where he laid the foundations (1824) of the " Theological Seminary of the Protestant Episcopal Church in the Diocese of Ohio," afterward called Kenyon College, at Gambier, and then in Illinois where he organized a church and founded Jubilee College. The Domestic and Foreign Missionary Society was started in 1821. This centralized the mission work, and became the great agency in the growth and extension of the Church. Bishop Jackson Kemper (1789-1870) in the North-west, and Bishop James Hervey Otey (1800-1863) in the South-west, did important pioneer work.

The period between 1835 and 1865 was characterized by further expansion of the episcopate and the formation of new dioceses. Bishop William Ingraham Kip (1811-1893) went to the miners of California in 1853. The dioceses of Oregon and Iowa were founded in 1854; and Bishop Henry Benjamin Whipple (1822-1901) was sent to Minnesota in 1859. The Church found its way into Indiana, Texas, Arkansas, Florida, Nebraska and Colorado. In 1835 there were 763 clergymen; in 1850 the number had increased to 1558; and even in 1865 there were 2450. The number of communicants also grew from 1835, when there were 36,000;

to 1850, when there were 80,000; and to 1865, when there were 150,000. During this period some beautiful church buildings were erected, notably Trinity church and Grace church, New York. The services were richer; stained glass was used; stalls for the clergy and choir were introduced, and the lectern was substituted for the old-time reading-desk. Other educational institutions were founded: Nashotah, Wiscon- sin, in 1842; Bexley Hall at Gambier in 1839; Racine College, at Racine, Wisconsin; and Griswold College in Iowa.

When the Civil War broke out in 1861 the Church in the South met and formed a separate organization called " The Protestant Episcopal Church in the Confederate States," but the Church in the North did not recognize the secession; at the meeting of the general convention in New York in 1862, the roll of the Southern dioceses was called, and though absent, they were still considered a part of the Church in the United States. This brotherliness was an important factor in bringing about a complete union between the Northern and Southern Churches after the Civil War; so the Church in the Confederate States had but a temporary existence.

Since the Civil War the Church has grown with the expansion of national life. It has become strong in great centres, and has reached out into every part of the United States and its depen- dencies, and has maintained missionary stations in foreign lands. There are bishops and missionary dioceses in Alaska, Hawaii, the Philippine Islands, Porto Rico and Cuba; two bishops in China and two in Japan; and bishops in Liberia, Haiti, and Brazil.

Institutions of learning, schools, colleges and theological semi- naries, have been founded. Prominent among the schools are St Paul's, at Concord, New Hampshire; St Mark's, at Southboro, Massa- chusetts; Groton School, at Groton, Massachusetts; St Mary's, at Garden City, Long Island; St Agnes's, at Albany, New York; St Mary's, at Burlington, New Jersey ; the Cathedral School, at Wash- ington D.C.; and St. George's School, at Newport, Rhode Island. In addition to the colleges already referred to, there should be in- cluded: Trinity College, at Hartford, Connecticut; St Stephen's, at Annandale, New York; the University of the South, at Sewanee, Tennessee; and Hobart College, at Geneva, New York. The theo- logical seminaries, besides the general seminary in New York and the Virginia Seminary, are: the Divinity School, in Philadelphia; the Berkeley Divinity School, at Middletown, Connecticut; the Seabury Divinity School, at Faribault, Minnesota; Western Theological Seminary, in Chicago; Nashotah House, at Nashotah, Wisconsin; Bexley Hall, Gambier, Ohio; the Church Divinity School of the Paci- fic, San Mateo, California; and the Episcopal Theological School in Cambridge, Massachusetts.

Cathedrals have been built or were in process of construction in 1910 in many cities. Among them are: All Saints Cathedral, Milwaukee; the Cathedral of AH Saints, Albany; the Cathedral of the Incarnation, Garden City, Long Island; the Cathedral Church of St Luke, Portland, Maine; St John the Divine, New York; and also those in Dallas, Texas, Washington, D.C., Davenport, Iowa, and Cleveland, Ohio.

The institutional life of the Church is constantly increasing. Among the numerous organizations founded for distinct purposes are: the Woman's Auxiliary to the Board of Missions; the American Church Building Fund Commission ; the American Church Missionary Society; the General Clergy Relief Fund; the Assyrian Mission Committee ; the American Church Institute for Negroes ; the Brother- hood of St Andrew ; the Girls' Friendly Society ; the Church Students' Missionary Association; the Church Laymen's Union; the Seabury Society of New York; the Church Mission to Deaf Mutes; the Con- ference of Church Workers among the Colored People; the Society for the Increase of the Ministry; the Church Association for the Advancement of the Interests of Labor; the Church Temperance Society ; the Church Unity Society ; the Confraternity of the Blessed Sacrament; the Guild of the Holy Cross; the Guild of St Barnabas for Nurses; the Church Congress in the United States. In addition there are Sunday School commissions and institutes in almost every diocese. Among the religious orders may be mentioned the Society of Mission Priests of St John the Evangelist; the Order of the Holy Cross: the Community of St Mary; the Sisterhood of St Margaret; the All Saints Sisters of the Poor; the Sisterhood of St John Baptist; and others. There are also training schools for deaconesses, including the New York Training School for Deaconesses; and the Church Training and Deaconess House of the Diocese of Pennsylvania.

The Protestant Episcopal Church in the United States is governed according to the constitutions and canons adopted in 1789, and from time to time amended by the General Govern- Convention, which meets every three years. The meat. General Convention consists of the House of Bishops, having as members all the bishops of the Church, and a House of Depu- ties, composed of four presbyters and four laymen elected by each diocese in union with the Convention; also one clerical and one lay deputy from each missionary district within the boundaries of the United States, and one clerical and one lay deputy chosen by the Convocation of the American Churches in Europe. The voting is by both houses acting separately and concurring. In the House of Deputies the vote is taken by orders, the clerical and lay deputies voting separately; and they must concur for a resolution to pass. This representa- tive body legislates for the whole Church. Each diocese also has its own constitution and canons, by which it regulates its internal affairs, having also an annual diocesan convention, in

which the clergy and laity are represented. A bishop is elected by the diocese, subject to confirmation by a majority of the bishops and standing committees of the different dioceses. Missionary bishops are elected by the House of Bishops and confirmed by the House of Deputies if the General Convention is in session; if not in session, by a majority of the standing committees. The presiding bishop of the Church was the senior bishop in order of consecration, until 1910, when an amendment to the constitution was adopted providing for his election by the General Convention. A special feature of the government of the Church is the power given to the laymen. In the parishes they elect their own clergyman; and they have votes in the diocesan convention and in the General Convention, and are thus an integral part of the legislative machinery of the Church.

The worship of the Church is conducted in accordance with the Book of Common Prayer, set forth in 1 789, but changed from time to time as need has arisen. The preface states that " this Church is far from intending to depart from the Church of England in any essential part of doctrine, discipline or worship, or further than local circumstances require." This principle guided the Church in the early days, and continues in force. However, changes have been made in the direction of omission and addition. The Athanasian Creed is omitted, as well as all reference to the king and royal family. The Commination Service has been dropped. In the Te Deum, in place of " Thou didst not abhor the Virgin's womb," is substituted " Thou didst humble Thyself to be born of a Virgin." Many verbal

changes have been made. " Our Father which art in Heaven " is changed to " Who art in Heaven "; " Them that trespass " is changed to " Those who trespass." The Ornaments Rubric and the Black Rubric are omitted. The Communion Office is more like the Scottish office, having the Oblation and Invocation. Instead of the Commandments may be said our Lord's summary of the law. Special prayers and thanksgiving have been added, to be used upon several occasions. A form of the consecration of a church has been introduced, as well as an office for the institution of a minister and an office for the visitation of prisoners. The last revision of the American Prayer Book was in 1892; gospels for the Festival of the Transfiguration and for the early celebration of the Holy Communion on Christmas Day and Easter Day were added; and a greater flexibility in the use of the Prayer Book was permitted.

The statistics as reported by the General Convention of 1907 are as follows

: the whole number of clergy, 5329 ; deacons ordained, 483 ; priests ordained, 471; candidates for holy orders, 469 ; postulants, 323 ; lay readers, 2464; baptisms, 197,203; persons confirmed, 158,931; communicants, 871,862 ; Sunday School officers and teachers, 47,871 ; pupils, 446,367; parishes and missions, 7615; church edifices, 7028; rectories, 2530; church hospitals, 72; orphan asylums, 57; homes, 84; academic institutions, 22; collegiate, 17; theological, 23; other institutions, 79; total contributions for all purposes, $52,257,519; episcopal fund, $3,499,838; hospitals and other institutions,

$17,509,085.

Authorities. — J. S. M. Anderson, History of the Church of England in the Colonies (3 vols., 2nd ed., London, 1856); Leighton Coleman, The Church in America (New York, 1895) ; A. L. Cross, The Anglican Episcopate and the American Colonies (New York, 1902) ; H. W. Foote, Annals of King's Chapel (2 vols., Boston, 1882-1887); George Hodges, Three Hundred Years of the Episcopal Church in America (Philadelphia, 1906); W. S. Perry, History of the American Episcopal Church, 1587-1883, with Monographs (2 vols., Boston, 1885); W. S. Perry, Historical Collections Relating to the Episcopal Colonial Church, covering Virginia, Pennsylvania, Massachusetts, Maryland and Delaware (4 vols., Hartford, 1870) ; S. D. McConnell, History of the American Episcopal Church (New York, 1890); D. D. Addison, The Episcopalians (New York, 1902) ; C. C. Tiffany, A History of the Protestant Episcopal Church (New York, 1905). (D. D. A.)

PROTEUS, in Greek mythology, a prophetic old man of the sea. According to Homer, his resting-place was the island of Pharos, near the mouth of the Nile; in Virgil his home is the island of Carpathus, between Crete and Rhodes. He knew all things past, present and future, but was loth to tell what he knew. Those who would consult him had first to surprise and bind him during his noonday slumber in a cave by the sea, where he was wont to pass the heat of the day surrounded by his seals. Even when caught he would try to escape by assuming all sorts of shapes: now he was a lion, now a serpent, a leopard, a boar, a tree, fire, water. But if his captor held him fast the god at last returned to his proper shape, gave the wished-for answer, and then plunged into the sea. He was subject to Poseidon, and acted as shepherd to his " flocks." In post-Homeric times the story ran that Proteus was the son of Poseidon and a king of Egypt, to whose court Helen was taken by Hermes after she had been carried off, Paris being accompanied to' Troy by a phantom substituted for her. This is the story followed by Herodotus (ii. 112, 118), who got it from Egyptian priests, and by Euripides in the Helena. From his power of assuming what- ever shape he pleased Proteus came to be regarded, especially by the Orphic mystics, as a symbol of the original matter from which the world was created.

Rather he is typical of the ever-changing aspect of the sea (Homer, Odyssey, iv. 351; Virgil, Georgics, iv. 386).

PROTEUS (Proteus anguinus), in zoology, a blind perenni- branchiate tailed Batrachian, inhabiting the subterranean waters of the limestone caves to the east of the Adriatic from Carniola to Herzegovina. It was long supposed to be the sole representative of the Batrachians in the cave fauna, but other examples have been added in recent years. It is a small eel-like animal, with minute limbs, the anterior of which are tridactyle, the posterior didactyle, with a strongly compressed tail, a narrow head, with flat truncate snout, minute rudimentary eyes hidden under the skin, which is usually colourless, or rather flesh-coloured, with the short, plume-like external gills blood-

red; the jaws and palate are toothed. This extraordinary Batrachian has been found in a great number of different caves, but rather sporadically, and it is believed' that its real home is in deeper subterranean waters, whence it is expelled at times of floods. It is often kept in aquariums, where it may turi> almost black, and has bred in captivity. Proteus forms with Necturus (Menobranchus) the family Proteidae. The second genus, which is widely distributed in eastern North America, is more generalized in its structure, having better developed limbs, with four digits, and is adapted to live in the light. But the two are closely allied, and Necturus gives us a very exact idea of what sort of a type Proteus must be derived from.

In 1896 a Proteus-like Batrachian was discovered in Texas during the operation of boiing an artesian well 188 ft. deep, when it was shot out with a number of remarkable and unknown Crustaceans. Typhlomolge rathbuni (see fig.), as this creature was called, agrees with Proteus in the shape of the head, in the absence of functional eyes, in the presence of external gills, and in the unpigmented skin. It differs in the very short body and the long slender limbs with four to five digits. It was first placed in the same family as Proteus, but the anatomical investigations of Ellen J. Emerson have led this author to believe that the real affinities are with the larval form of the lungless salamander Spelerpes, not with Necturus and Proteus. Whilst Proteus has lungs in addition to the gills, Typhlomolge lacks the lungs, and with them the trachea and larnyx. It is therefore probable that Typhlomolge is a permanent larva derived from Spelerpes, whilst we are quite unable to assign any direct ancestor to Necturus.*

Another blind Urodele has recently been described as Typhlotriton spelaeus, from caves in the Mississippi Valley. It has neither gills nor lungs in the adult, and is found under rocks in or out of the water. It is not allied to Proteus. The eyes are apparently normal in the larva, but in the adult they have undergone marked degeneration.

See P. Configliachi and M. Rusconi, Del Proteo anguino (Pavia, 1819), 4; J. de Bedriaga, Lurchfauna Europas (1897), ii. 28; E. Zeller, Uber die Fortpflanzung des Proteus anguinus., Jahresb. ver. Nat. Wiirttemb. (1889), p. 131 ; L. Steineger, " New Genus and Species of Blind Cave Salamanders from North America," P. U.S. Nat. Mus. (1892), xv. 115; idem, " New Genus and Species of Blind, Tailed Batrachians from the Subterranean Waters of Texas," op. cit. (1896), xviii. 619; Ellen J. Emerson, "General Anatomy of Typhlomolge rathbuni," P. Boston Soc. N.H. (1905), xxxii. 43.

PROTHESIS (Gr. wpbdecns, a setting forth, from irporidtvai, to set forward or before), in the liturgy of the Orthodox Eastern Church, the name given to the act of " setting forth " the oblation, i.e. the arranging of the bread on the paten, the signing of the cross (o(bpayi£eiv) on the bread with the sacred spear, the mixing of the chalice, and the veiling of the paten and chalice (see F. E. Brightman, Liturgies Eastern and Western, 1896). The term is also used, architecturally, for the place in which this ceremony takes place, a chamber on the north side of the central apse in a Greek church, with a small table. During the reign of Justin II. (565-574) this chamber was located in an apse, and another apse was added on the south side for the diaconicon (

Typhlomolge rathbuni.

central apse leads direct to the diaconicon, but never to the prothesis.

PROTISTA, a name invented by Ernst Haeckel (Generelle Morphologie der Organismen, 1866) to denote a group of organisms supposed to be intermediate between the animal and vegetable kingdoms. As knowledge advanced the precise limits of the group shifted, and Haeckel himself, in successive publications, placed different sets of organisms within it, at one time proposing to include all unicellular animals and plants, making it a third kingdom equivalent to the animal and vegetable kingdoms. Partly because the term represented an interpretation rather than an objective set of facts, the word Protista has not been generally accepted for use in classification, and, whilst recogniz- ing that the limits of the animal and plant kingdoms are not sharply denned, modern systematists refrain from associating these doubtfully placed organisms simply because of the dubiety of their position. (See Protozoa.)

PROTOCOL (Fr. protocole, Late Lat. protocollum, from Gr. 7rpcoros, first,

and koXK&v, to glue, i.e. originally the first sheet of a papyrus roll) , in diplomacy, the name given to a variety of written instruments. The protocollum was under the late Roman Empire a volume of leaves, bound together with glue, in which public acts were recorded, so as to guard against fraud or error on the part of those responsible for preparing them; and in later usage it came to be applied to the original drafts of such acts. Thus, too, the word prothocollare was devised for the process of drawing up public acts in authentic form (Du Cange, Glos- sariumlat. s.v. Protocollum). The use of the word protocollum for the introductory and other formulae in the medieval diploma (see Diplomatic) thus explains itself as implying a recorded usage in such matters.

In the language of modern diplomacy the name of " protocol " is given to the minutes (proces-verbaux) of the several sittings of a conference or congress; these, though signed by the pleni- potentiaries present, have only the force of verbal engagements (see Congress). The name of "protocols" is also given to certain diplomatic instruments in which, without the form of a treaty or convention being adopted, are recorded the principles or the matters of detail on which an agreement has been reached, e.g. making special arrangements for carrying out the objects of previous treaties, defining these objects more clearly, interpre- ting the exact sense of a doubtful clause in a treaty (protocoles interpretatifs) and the like. Thus the famous Troppau protocol, which annunciated the right and duty of the European powers to intervene in the internal affairs of a state threatened with revolution, was from the point of view of its signatories merely a logical application of the principles contained in the treaty of the 20th of November 181 5 (see Troppau). Occasionally also an agreement between two or more powers takes the form of a protocol, rather than a treaty, when the intention is to proclaim a community of views or aims without binding them to eventual common action in support of those views or aims; thus the settlement of the question of the Danish succession was recognized by the powers in conference at London, by the protocol of 1852 (see Schleswig-Holstein Question).

Finally, " the protocol " {protocole diplomatique, protocole de chancellerie) is the body of ceremonial rules to be observed in all written or personal official .intercourse between the heads of different states or their ministers. Thus the protocol lays down in great detail the styles and titles to be given to states, their heads, and their public ministers, and the honours to be paid to them ; it also indicates the forms and customary courtesies to be observed in all international acts. " It is," says M. Pradier- Fodere, " the code of international politeness."

See P. Pradier-Fodere, Cours de droit diplomatique (Paris, 1899), ii. 499-

PROTOGENES, a Greek painter, born in Caunus, on the coast of Caria, but resident in Rhodes during the latter half of the 4th century B.C. He was celebrated for the minute and laborious finish which he bestowed on his pictures, both in drawing and in colour. Apelles, his great rival, standing astonished in presence of one of these works, could only console himself by

saying that it was wanting in charm. On one picture, the " Ialysus," he spent seven years; on another, the " Satyr," he worked continuously during the siege of Rhodes by Demetrius Poliorcetes (305-304 B.C.) notwithstanding that the garden in which he painted was in the middle of the enemy's camp. Demetrius, unsolicited, took measures for his safety; more than that, when told that the " Ialysus " just mentioned was in a part of the town exposed to assault, Demetrius changed his plan of opera- tions. Ialysus was a local hero,the founder of the town of the same name in the island of Rhodes, and probably he was represented as a huntsman. This picture was still in Rhodes in the time of Cicero, but was afterwards removed to Rome, where it perished in the burning of the Temple of Peace. The picture painted during the siege of Rhodes consisted of a satyr leaning idly against a pillar on which was a figure of a partridge, so life-like that ordinary spectators saw nothing but it. Enraged on this account, the painter wiped out the partridge. The " Satyr " must have been one of his last works. He would then be about seventy years of age, and had enjoyed for about twenty years a reputation next only to that of Apelles, his friend and bene- factor. Both were finished colourists so far as the fresco- painting of their day permitted, and both were laborious in the practice of drawing, doubtless with the view to obtaining bold effects of perspective as well as fineness of outline. It was an illustration of this practice when Apelles, finding in the house of Protogenes a large panel ready prepared for a picture, drew upon it with a brush a very fine line which he said would tell sufficiently who had called. Protogenes on his return home took a brush with a different colour and drew a still finer line along that of Apelles dividing it in two. Apelles called again; and, thus challenged, drew with a third colour another line within that of Protogenes, who then admitted himself surpassed. This panel was seen by Pliny (N.H. xxxv. 83) in Rome, where it was much admired, and where it perished by fire. In the gallery of the Propylaea at Athens was to be seen a panel by Protogenes. The subject consisted of two figures representing personifica- tions of the coast of Attica, Paralus and Hammonias. For the council chamber at Athens he painted figures of the Thesmo- thetae, but in what form or character is not known. Probably these works were executed in Athens, and it may have been then that he met Aristotle, who recommended him to take for subjects the deeds of Alexander the Great. In his " Alexander and Pan " he may have followed that advice in the idealizing spirit to which he was accustomed. To this spirit must be traced also his " Cydippe " and "

Tlepolemus," legendary personages of Rhodes. Among his portraits are mentioned those of the mother of Aristotle, Philiscus the tragic poet, and King Antigonus. But Protogenes was also a sculptor to some extent, and made several bronze statues of athletes, armed figures, huntsmen and persons in the act of offering sacrifices.

PROTOGENES (E. Haeckel), a little-known genus of Forami- nifera (q.v.), marine organisms, forming a naked flat disk with numerous long radiating pseudopodia: nucleus and contractile vacuole not seen, and reproduction unknown.

PROTOMYXA (E. Haeckel), a genus of Foraminifera (q.v.), marine organisms, of orange colour, naked and reproducing in a broad-cyst which liberates i-flagellate zoospores.

PROTOPLASM, the name given in modern biology to a sub- stance composing, wholly or in part, all living cells, tissues or organisms of any kind, and hence regarded as the primary living substance, the physical and material basis of life. The term " protoplasma," from xpcoros, first, and 7rXdcr/io, formed substance, was coined by the botanist Hugo von Mohl, in 1846, for the " tough, slimy, granular, semi-fluid " constituent of plant cells, which he distinguished from the cell- wall, nucleus and cell-sap. This was not, however, the first recognition of the true living substance as such, since this step had been achieved in 1835 by the French naturalist F. Dujardin, who in his studies on Foraminifera had proposed the term " sarcode " for the living material of their bodies in the following words: " Je propose de nommer ainsi ce que d'autres observa- teurs ont appele une ge! 6e vivante, cette substance glutineuse,

diaphane, insoluble dans l'eau, se contractant en masses globu- leuses, s'attachant aux aiguilles de dissection, et se laissant etirer comme du mucus, enfin se trouvant dans tous les animaux inferieurs interposee aux autres elements de structure." To the French naturalist belongs, therefore, the real credit of the discovery of protoplasm, or rather, to be more accurate, of the first recognition of its true nature as the material basis of vital phenomena. Neither Dujardin nor von Mohl, however, had any conception of the universal occurrence and fundamental similarity of protoplasm in all living things, whether animal or vegetable, and it was not till 1861 that the identity of animal sarcode and vegetable protoplasm was proclaimed by Max Schultze, whose name stands out as the framer, if not the founder, of the modern notions concerning the nature of the living sub-

stance. From this time onwards the term " protoplasm " was used for the living substance of all classes of organisms, although it would have been more in accordance with the custom of priority in nomenclature to have made use of Dujardin's term " sarcode."

A living organism, of any kind whatsoever, may be regarded as composed of (1) protoplasm, (2) substances or structures pro- duced by the protoplasm, either by differentiation or modifica- tion of the protoplasm itself, or by the excretory or secretory activity of the living substance. The protoplasm of a given organism may be in a single individual mass, or may be aggre- gated into a number of masses or units, discontinuous but not disconnected, termed cells (see Cytology). Thus living organ- isms may be distinguished, in a general way, as unicellular or multicellular. An instance of a unicellular organism is well seen in an Amoeba, or in one of the Foraminif era, classic examples for the study of undifferentiated protoplasm, which here com- poses the greater part of the body, while products of the forma- tive activity of the protoplasm are seen in the external shell and in various internal granules and structures. As an example of a multicellular organism we may take the human body, built up of an immense number of living cells which produce, singly or in co-operation, a variety of substances and structures, each contributing to the functions of the body. This, without attemp- ting to enter into details, the horny epidermis covering the body, the hairs, nails, teeth, skeleton, connective tissue, &c, are all of them products formed by the metabolic activity of the living substance and existing in intimate connexion with it, though not themselves to be regarded as living. In addition to meta- bolic products of this kind, special modifications of the living substance itself are connected with specializations or exaggera- tions, as it were, of a particular vital function; such are the contractile substance of muscular tissue, and the various mechan- isms seen in nervous and sensory tissue. It is necessary, there- fore, in a living body of any kind, to distinguish clearly between simple protoplasm, its differentiations and its products.

Protoplasm from whatever source, whether studied in a cell of the human body, in an Amoeba or Foraminifer, or in a veget- able organism, is essentially uniform and similar in appearance and properties. Its appearance, graphically described by Dujardin in the passage quoted above, is that of a greyish, viscid, slimy, semi-transparent and semi-fluid substance. Its pro- perties are those of living things generally, and the most salient and obvious manifestation of life is the power of automatic movement exhibited by living protoplasm. When free and not limited by firm envelopes, the movements take the character known generally as amoeboid, well shown in the common Amoeba or in the white corpuscles of the blood. When confined by rigid envelopes, as in plant-cells, the protoplasm exhibits streaming movements of various kinds. Even more

essentially characteristic of the living matter than the power of movement is the property of metabolism — that is to say, the capacity of assimilating substances different from itself, of building them up into its own substance (anabolism), and of again decomposing these complex molecules into simpler ones (katabolism) with production of energy in the form of heat, movement and electri- cal phenomena. An important part of the metabolic process is respiration, i.e. the absorption of oxygen from the surrounding

medium and oxidation of carbon atoms to form carbonic acid gas and other simple chemical compounds; in ordinary plant and animal protoplasm the process of respiration seems to be of universal occurrence, but some Bacteria constitute apparently an exception to the rule. Metabolism results not only in the generation of energy, but also, if anabolism be in excess of katabolism, in increase of bulk, and consequent growth and reproduction.

Living protoplasm is, therefore, considered from a chemical standpoint, in a state of continual flux and instability, and it follows that if protoplasm be a definite chemical substance or mixture of substances (see below), a given sample of protoplasm cannot be pure, or at least cannot remain so for any length of time so long as its power of metabolism is being exerted, but will contain particles either about to be built up by anabolism into its substance, or resulting from katabolic disintegration of its complex molecules. Hence it is convenient to distinguish the living substance from its metaplastic products of anabolism and katabolism. Such products are to be recognized invariably in protoplasm and take the form generally of granules and vacuoles. Granules vary in size from very minute to relatively large, coarse grains of matter, usually of a firm and solid nature. To the presence of innumerable granules is due the greyish, semi-transparent appearance of protoplasm, which in parts free from granules appears hyaline and transparent. Different samples of protoplasm may vary greatly in the number and coarseness of the granulations. Vacuoles are fluid drops of more watery consistence, which, when relatively small, assume a spherical form, as the result of surface tension acting upon a drop of fluid suspended in another fluid. When vacuoles are numerous and large, however, they may assume various forms from mutual pressure, like air-bubbles in a foam. A good example of frothy protoplasm, due to the presence of numerous vacuoles, is seen in the common " sun-animalcule " (Actinosphaerium) . Or when the cell is confined by an envelope, and becomes very vacuolated, the vacuoles may become confluent to form a cell- sap contained in a protoplasmic lining or " primordial utricle," and traversed by strands of protoplasm, as in the ordinary cells of plant-tissues. In many unicellular organisms, so-called contractile vacuoles are continually being formed as an act of excretion and expelled from the body when they reach a certain size.

While the majority of protoplasmic granules are probably to be regarded as metaplastic in nature, there is one class of granulations of which this is certainly not true, namely the grains of chromatin, so named from their peculiar affinity for certain dyes, such as carmine, logwood and various aniline stains. These grains may occur as chromidia, scattered through the protoplasm, or they may be concentrated at one or more spots to form a definite nucleus or nuclei, which may or may not be limited from the remaining protoplasm by a definite mem- brane, and may undergo further differentiations of structure which cannot be considered further here (see Cytology) . The protoplasm of an ordinary cell is thus specialized into nucleus and cytoplasm. It was formerly thought that the most primitive forms of life, the Monera of E. Haeckel, consisted of pure protoplasm without a nucleus. It must be borne in mind, however, that chromatin can be present without being con- centrated to form a definite nucleus, and that with imperfect technique the chromatin may easily escape observation. It seems justifiable at present to believe, until the contrary has been proved, that all organisms, however primitive, contain chromatin in some form: first, because this substance has always been found when suitable methods for its detection have been employed; secondly, because it has been shown experi- mentally, by cutting up small organisms, such as Amoeba, that enucleated fragments of protoplasm are unable to maintain their continued existence as living bodies; and, thirdly, because modern research has shown the chromatin to be of very great, perhaps fundamental, importance in regulating the vital pro- cesses of the cell and so determining the specific characters of the organism, a property which enables the chromatin to act

as the vehicle of heredity 'and to transmit the characters of parent to offspring. In the present state of our knowledge, therefore, the peculiar chromatin-granules must be regarded as an integral part, perhaps even the most essentially and primarily important portion, of the living substance. At the same time it must be borne in mind that the term " chromatin " does not denote a definite chemical substance, to be recognized universally by hard and fast chemical tests. The chromatin of different organisms or cells may behave quite differently in relation to stains or other reactions ; and if it be true that it is the chromatin which determines the nature and activities of the cell, it follows that no two cells which differ from one another in any way can have their chromatin exactly similar. The conception of chrom- atin is one based upon its relations to the vital activities and life cycle, as a whole, of the organism or cell, and not upon any definable material, that is chemical and physical, properties.

The importance of protoplasm, as the physical and material basis of life, has caused it to be the subject in recent years of much minute and laborious research. It seems obvious that matter so peculiarly endowed must possess a complexity of structure and organization far exceeding that which at first sight meets the eye. Some biologists have attacked the problem of the ultimate constitution of protoplasm from a purely theoretical standpoint, and have framed hypotheses of an ultramicroscopic constitution sufficient, in their opinion, to explain, or at least to throw light upon, the vital activities of the living substance. Others, proceeding by more empirical methods, have attempted to lay bare the structure of protoplasm by means of the refinements of modern microscopical technique, or to solve the question of its constitution by means of chemical and physiological investigation. Hence a convenient distinction, not always easy, however, to maintain in practice, is drawn between speculative and empirical theories of protoplasm.

i. Speculative theories have come with the greatest frequency from those who have attempted to find a material explanation for the phenomena of heredity (q.v.). As instances may be mentioned more particularly the " gemmules " of Darwin, the " pangenes " of de Vries, the " plastidules " of Haeckel, and the " biophores " of Weismann. These theories have been ably brought together and discussed by Delage, who has included them all under the term " micromerism," since they agree, in the assumption that the living substance contains, or consists of, a vast number of excessively minute particles — i. e. aggregates or combinations of molecules, which give to the protoplasm its specific properties and tendencies (" idioplasm " of Nageli). In other cases the assumption of invisible protoplasmic units has been inspired by a desire either to explain the general vital and assimilative powers of protoplasm, as, for example, the " micellae " of Nageli and the " plasomes " of Wiesner, or to elucidate the mechanism of some one function, such as the " inotagmas " cf Engelmann, assumed to be the agents of contractility. In general, it may be said of all these speculations either that they can only be extended to all vital phenomena by the help of so many subordinate hypotheses and assumptions that they become unworkable and unintelligible, or that they only carry the difficulties a step further back, and really explain nothing. Thus it is postulated for Wiesner's hypothetical plasomes that they possess the power of assimilation, growth and reproduction by division; in other words, that they are endowed with just those properties which constitute the unexplained mystery of living matter.

2. Empirical theories of protoplasm differ according as their authors seek to find one universal type of structure or constitu- tion common to all conditions or differentiations of the living substance, or, on the contrary,, are of opinion that it may vary fundamentally in different places or at

different times. From these two points of view protoplasm may be regarded either as monomorphic or polymorphic (Fischer). The microscopical investigation of protoplasm reveals at the first glance a viscid, slimy or mucilaginous substance, in which is embedded an immense number of granules, for the most part very tiny. Very rarely are these granules absent, and then only from a portion

of the protoplasm, and only temporarily. Hence many authori- ties have regarded the minute granules — the " microsomes " of Hanstein — as themselves the ultimate living units of proto- plasm, in opposition to those who would regard them merely as " metaplastic " substances, i.e. as the heterogeneous by- products of metabolism and vital activity. The granular theory, as this conception of the living substance is called, has received its extreme elaboration at the hands of Altmann, whose stand- point may be taken as typical of this class of theories. After demonstrating the universal occurrence of granules in protoplasm, Altmann has compared each individual granule to a free-living bacterium, and thus regards a cell as a colony of minute organisms, namely the granules or bioblasts, as he has termed them, living embedded in a common matrix, like a zoogloea colony of bacteria. Of this theory it may be remarked, firstly, that it brings us no nearer to an explanation of vital phenomena than do the plasomes of Wiesner; secondly, that to consider bacteria as equivalent, not to cells, but to cell granules, is to assume for this class of organisms a position with regard to the cell theory which is, to say the least, doubtful; and, thirdly, that the observations of the vast majority of competent microscopists furnish abundant support for the statement that granules of protoplasm do not lie free in a structureless matrix, but are embedded in the substance of a minute and delicate framework or morphoplasm, which in its turn is bathed by a watery fluid or enchylema permeating the whole substance. The upholders of the granular theory deny the existence of the framework, or explain it as due to an arrangement of the granules, or as an optical effect produced by the matrix between the granules. Amongst those, on the other hand, who assert the existence of a framework distinct from granules and enchylema, the utmost diversity of opinion prevails with regard to the true structural relations of these three parts and the role played by each in the exercise of vital functions. Some have regarded the framework as made up of a tangle of separate fibrillae {filar theory) — a view more especially connected with the name of Flemming — but most are agreed that it represents the appearance of a reticulum or network with excessively fine meshes, usually from 3 to 1 ju in diameter. The reticulum carries the granules at its nodal points, and is bathed everywhere by the enchylema. Even with so much in common, however, opinions are still greatly at variance. In the first place, the majority of observers interpret the reticulum as the expression of an actual spongy framework, a network of minute

fibrillae ramifying in all planes. While, however, Heitzmann, following the speculations of Briicke, considered the framework itself to be actively contractile and the seat of all protoplasmic movement, an opposite point of view is represented by the writings of Leydig, Schafer and others, who regard the reticulum merely as a kind of supporting frame- work or spongioplasm, in which is lodged the enchylema or hyaloplasm, considered to be itself the primary motile and living substance. Biitschli, on the other hand, has pointed out the grave difficulties that attend the interpretation of the reticulum as a fibrillar framework, in view of the distinctly fluid consistence of, at any rate, most samples of protoplasm. For if the sub- stance of the framework be assumed to be of a firm, solid nature, then the protoplasm as a whole could not behave as a fluid, any more than could a sponge soaked in water. On the other hand, the hypothesis of a fluid fibrillar framework leads to a physical impossibility, since one liquid cannot be permanently suspended in another in the form of a network. Biitschli therefore interprets the universally present reticulum as a meshwork of minute lamellae, forming a honeycombed or alveolar structure, similar to the arrangement of fluid lamellae in a fine foam or lather, in which the interstices are filled, not with air but with another fluid; in other words, the structure of protoplasm is that of an exceedingly fine emulsion of two liquids not miscible with one another.

It may be claimed for the alveolar theory of Biitschli that it throws

light upon many known facts relating to protoplasm. It interprets

the reticulum as the optical section of a minute foam-like structure,

and permits the formation of protoplasmic striations and of apparent

1 fibrillae as the result of linear or radiating dispositions of the alveolar

framework; it reconciles with the laws of physics the combination of a framework with a fluid or semi-fluid aggregate condition, while variations in the fluidity of the framework are compatible with a stiffening of the protoplasm almost to the pitch of rigidity, as seen, for example, in nervous tissue; and, finally, it explains many charac- teristic structural peculiarities of protoplasm, such as the superficial layer of radiately arranged alveoli, the spherical form of vacuoles, the continuous wall or pellicle which limits both the vacuoles and the protoplasm as a whole, and many other points not intelligible on the theory of a sponge-like structure. Butschli has succeeded, moreover, in producing artificial foams of minute structure,

which not only mimic the appearance of protoplasm, but can be made to exhibit streaming and amoeboid movements very similar to those of simple protoplasmic organisms. Incidentally these experiments have shown that many of the apparent granulations and " micro- somes " are an optical effect produced by the nodes of the minute framework. In his most recent works Butschli has extended his theory of alveolar structure to many other substances, and has tried to prove that it is a universal characteristic of colloid bodies, a view strongly combated, however, by Fischer. While it cannot be claimed that Biitschli's theory furnishes in any way a complete 'explanation of life, leaving untouched, as it does, the fundamental question of assimilation and metabolism, he at least draws attention to a very important class of facts, which, if demonstrated to be of universal occurrence, must be reckoned with in future treatment of the protoplasm question, and would form an indispensable preliminary to aH speculations upon the mechanism of the living substance.

In opposition to the above-mentioned monomorphic theories of protoplasm, all of which agree in assuming the existence of some fundamental type of structure in all living substance, attempts have been made at various times to show that the structural appearances seen in protoplasm are in reality artificial products, due to precipitation or coagulation caused by reagents used in the study or preparation of living objects. These views have been developed by Fischer, who by experimenting upon various proteids with histological fixatives, has shown that it is possible to produce in them a granular, reticular or alveolar structure, according to treatment, and, further, that granules so produced may be differentially stained according to their size and absorptive powers. Fischer therefore suggests that many structural appearances seen in protoplasm may be purely artificial, but does not extend this view to all such structures, which would indeed be impossible, in view of the frequency with which reticular or alveolar structures have been observed during life. He suggests, however, that such structures may be temporary results of vital precipitation of proteids within the organism, and that protoplasm may have at different times a granular reticular or alveolar structure, or may be homogeneous. Fischer's conception of living protoplasm is therefore that of a polymorphic substance, and a similar view is held at the present time by Flemming, Wilson and others. Strassburger also regards protoplasm as composed of two portions: a motile kinoplasm which is fibrillar, and a nutritive trophoplasm which is alveolar, in structure.

The chemical investigation of protoplasm labours at the outset under the disadvantage that it cannot deal with- the living substance as a whole, since no analysis can be performed upon it without destroying the life. Protoplasm consists, to the extent of about 60% of its total mass, of a mixture of various nucleo- proteids — that is to say, of those substances

which, in molecular structure and chemical composition, are the most complex bodies known. In association with them are always found varying amounts of fats, carbohydrates, and other bodies, and such compounds are always present in the living substance to a greater or less degree as products of both upward and down- ward metabolism. Protoplasm also contains a large but variable percentage of water, the amount of which present in any given case affects largely its fluid or viscid aggregate condition. Especial interest attaches to the remarkable class of bodies known as ferments or enzymes, which when prepared and isolated from the living body are capable of effecting in other substances chemical changes of a kind regarded as specifically vital. It is from their study, and from that of the complex proteids found in the living body, that the greatest advances towards an explanation of the properties of living matter may be expected at the present time.

The question may be raised how far it is probable that there is one universal living substance which could conceivably be isolated or prepared in a pure state, and which would then exhibit the phenomena characteristic of vital activity. It is sufficiently obvious, in the first place, that protoplasm, as we know it, exhibits infinite diversity of character, and that no two samples of protoplasm are absolutely similar in all respects. Chemical differences must be assumed to exist not only between the vital fabrics of allied species of organisms, but even between those of individuals of the same species. Kassowitz regards this variability as compatible with the assumption of a gigantic protoplasmic molecule in which endless variations arise by changes in the combinations of a vast number of atoms and atom complexes. It is difficult to conceive, however, of any single substance, however complex in its chemical constitu- tion, which could perform all the functions of life. To postulate a universal living substance is to proceed along a path which leads inevitably to the assumption of biophores, plastidules or other similar units, since the ultimate living particles must then be imagined as endowed at the outset with many, if not all, of the fundamental properties and characteristic actions of living bodies. Such a conception has as its logical result a vitalistic standpoint, which may or may not embody the correct mental attitude with regard to the study of life, but which at any rate tends to check any further advance towards an explanation or analysis of elementary vital phenomena. We may rather, with Kolliker, Verworn and others, ascribe the activities of protoplasm to the mutual interaction of many substances, no single one of which can be considered as living in itself, but only in so far as it forms an indispensable consti- tuent of a living body. From this point of view life is to be regarded, not as the property of a single definite substance, but as the ex- pression of the ever-changing relations existing between the many substances which make up the complex and variable congeries known to us as protoplasm.

Authorities. — For exhaustive historical summaries of the proto- plasm question, with full bibliographical references, the reader may be referred to the following works, especially the first five : Butschli, Investigations on Microscopic Foams and Protoplasm (London, 1894); Untersuchungen iiber Strukturen (Leipzig, 1898); " Meine Ansicht iiber die Struktur des Protoplasmas und einige ihrer Kritiker," Arch. f. Entwickelungsmechanik d. Org. (1901); xi. 499-584, pi. xx. ; Delage, La Structure du protoplasme et les theories sur I here'dite' (Paris, 1895) ; Wilson, The Cell (2nd ed., London, 1900) ; Fischer, Fixirung, Fdrbung, und Bau des Protoplasmas (Leipzig, 1899); Kassowitz, Allgemeine Biologie (Vienna, 1899) ; G. Mann, Protoplasm, its Definition, Chemistry and Structure (Oxford, 1906), p. 59.

(E. A. M.) PROTOZOA (Gr. irp&ros, first, and %Qov, living thing), the name given by modern zoologists to the animalcules, for the most part microscopic, which were termed by the older natural- ists Infusoria, from the manner in which they appear in infusions containing decaying animal and vegetable matter. The name Infusoria is now, however, restricted to one of the four classes which comprise the Protozoa proper. The name Protozoa was coined as far back as 1820 as an equivalent for the German word Urthiere, meaning animals of primitive or archaic nature, the forms of animal life which may be supposed to have been the first that appeared upon our globe. The great naturalist C. T. von Siebold was, however, the first to give a scientific definition to the group. Von Siebold pointed out that in the Protozoa the individual was always a single vital unit or cell, in contrast with the higher division of the animal kingdom, the Metazoa, in which the body is generally, though not universally, regarded as composed of many such units. To put the matter briefly and somewhat technically: the Protozoa are unicellular animals, the Metazoa multicellular animals; in the Protozoa the cell is complete in itself, both morphologically and physiologically, and is capable of maintaining a separate and independent exist- ence in suitable surroundings, like any other organism; in the Metazoa the cells are differentiated for the performance of dis- tinct functions and combined together to form the various tissues of which the body is built up, and the individual cells of the Metazoan body are not capable of maintaining a separate existence apart from their fellows. This is the sense in which the term Protozoa is used by zoologists, whereby certain forms of animal life, which were formerly ranked as Protozoa, such as sponges and rotifers, are now definitely excluded from the group and classed as Metazoa.

The animal kingdom may be divided, therefore, into two sub-kingdoms, the Protozoa and the Metazoa, the first-named characterized by their essentially unicellular nature. This is a criterion by which it is easy to define the Protozoa from a purely

zoological standpoint, but which becomes less satisfactory when we take into consideration the whole range of microscopic unicellular organisms. Besides the true Protozoa, which, ex hypothesi, are organisms of animal nature, there are many other organisms of equally simple organization, including the Bacteria and the unicellular plants. The Bacteria stand sharply apart from the other forms of life, not only, in many cases, by their divergent methods of metabolism, but by morphological characteristics, such as the definite body-form limited by a distinct envelope, the absence of organs for locomotion other than the peculiar flagella, and, above all, by the lack of any differentiation of the body-protoplasm into nucleus and cyto- plasm, as in all true cells of either animal or vegetable nature. On the other hand, to separate by hard-and-fast definitions the unicellular plants from the unicellular animals is not only difficult but practically impossible. The essential difference between plant and animal is a physiological one, a difference in the method of nutrition. A typical green plant is able to live independently of other organisms and to build up its substance from simple gases in the air and inorganic salts in the soil or water, provided that certain conditions of light and moisture be present in its environment; this is the so-called holophytic method of nutrition. A typical animal, on the other hand, while practically independent of sunlight, is not able to exist apart from other living organisms, since it is not able to build up its substance from simple chemical constituents like a plant, but must be supplied with ready-made proteids in its food, for which it requires other organisms, either plants or animals; this is the so-called holozoic method of nutrition. Intermediate between these two habits of life is the so-called saprophytic habit, exemplified by the fungi amongst plants; in this method of nutrition the organism cannot build up its substance entirely from inorganic substances, but absorbs the organic substances present in solutions containing organic salts or decaying animal or vegetable matter.

If we regard the organisms termed collectively Protozoa from the point of view of their methods of nutrition (considering for the present only free-living, non-parasitic forms), we find in one class, the Flagellata, examples of the three methods men- tioned above, the holozoic, holophytic and saprophytic habit of life, not only in species closely allied to each other, but even combined in one and the same species at different periods of its life or in different surroundings. An individual of a given species may contain chlorophyll, with which it decomposes carbonic acid gas in the sunlight, like a plant, while possessing a definite mouth-aperture, by means of which it can ingest solid food, like an animal. Such instances show clearly that in the simplest forms of life the difference between plant and animal is but a

difference of habit and of mode of nutrition, to which the organism is not at first irrevocably committed, and which are not at first accompanied by distinctive morphological characteristics. Only when the organism becomes specialized for one or the other mode of life exclusively does it acquire such definite morphological characters that the difference between plant and animal can be used for the purpose of a natural classification, as in the higher forms of life. In the lowest forms it is not possible to base natural subdivisions on their vegetable or animal nature. For this reason it has been proposed by E. Haeckel to unite all the primitive forms of life in which the body is morphologically equivalent to a single cell into one group, the Protista, irrespective of their animal or vegetable nature. In this method of dealing with the problem the Protista are regarded as a distinct kingdom {Reich), more or less inter- mediate between, but distinct from, the animal and vegetable kingdoms, and representing the ancestral stock from which both animals and plants have sprung. Many authorities have followed Haeckel's lead in the matter, and the science of Pro- tistology or Protistenkunde has already a special journal devoted to the publication of researches upon it. But though it may be more scientific, from a theoretical point of view, to group all these primitive organisms together in the way suggested by Haeckel, in practice it is inconvenient, on account of the

vast number of forms of life to be comprised as Protista, their diversity in habit of life and organization, and, above all, the difference in the technical methods required for their study, which becomes too complicated for a single worker. Hence Protistology becomes split up in practice by its own mass into three sciences: the Bacteria are the objects of the science of bacteriology; botanists deal with the unicellular plants; and the zoologists with those Protista which are more distinctly animal in their characters.

Hence the Protozoa are to be regarded as a convenient rather than a natural group, and may be characterized generally as follows : Organisms in which the individual is a single cell, that is to say, consists of a single undivided mass of protoplasm which is capable of independent existence in a suitable environment; if many such individuals be combined together to form a colony, as frequently occurs, there is no differentiation of the individuals except for reproductive purposes, and never for tissue-formation as in the Metazoa. The body always contains chromatin or nuclear substance, which may be disposed in various ways, but usually forms one or more concentrated masses termed nuclei, which can be distinguished sharply from the general body- protoplasm or cytoplasm. The protoplasmic body may be naked at the surface, or may be limited and enclosed by a distinct envelope or cell-membrane, which is not usually of the nature of cellulose, except in holophytic forms. Organs serving for locomotion and for the capture and assimilation of solid food are usually present, but may be wanting altogether when the mode of nutrition is other than holozoic;

chlorophyll, on the other hand, is only found as a constituent of the body-substance in the holophytic Flagellata. 1 To these characters it may be added that reproduction is effected by some form of fission, 01 division of the body into smaller portions, and that in the vast majority of Protozoa, if not in all, a process of conjugation or syngamy occurs at some period in the life-cycle, the essential feature of the process being fusion of nuclear matter from distinct individuals. The foregoing definition does not distinguish the Protozoa sharply from the primitive forms of plant-life, with which, as stated above, they are connected by many transitions; but the differentiation of the body-substance into nucleus and cytoplasm separates them at once from the Bacteria, in which the chromatin is distributed evenly through the body- protoplasm.

Protozoa and Disease. — The study of the Protozoa has ac- quired great practical importance from the fact that many of them live as parasites of other animals, and as such may be the cause of dangerous diseases and epidemics in the higher forms of animal life and in man (see Parasitic Diseases). Examples of parasitic forms are to be found in all the four classes into which, as will be stated below, the Protozoa are divided, and one class, the Sporozoa, is composed entirely of endoparasitic forms. Hence Protozoology, as it is termed, is rapidly assuming an importance in medical and veterinary science almost equal to that of bacteriology, although the recognition of Protozoa as agents in the production of disease is hardly older than a decade. The most striking instances of Protozoa well established as pathogenic agents are the malarial parasites, the species of Piroplasma causing haemoglobinuria of cattle and other animals, the trypanosomes causing tsetse-fly disease, surra, sleeping sickness, and other maladies, the species of Leishmania causing kala azar and oriental sore, and the Amoeba responsible for the so-called amoebic dysentery. Other diseases referred, but as yet doubtfully, to the agency of Protozoa are syphilis, small- pox, hydrophobia, yellow fever, and even cancer.

It is only possible here to discuss briefly in a general way the relations of these parasites to their hosts. When two organisms stand habitually in the relation of host and parasite, an equi- librium tends to become established gradually between them, so

1 Many Protozoa contain symbiotic green organisms, so-called zoochlorellae or zooxanthellae, in their body-protoplasm ; for instance, Radiolaria, and Ciliata such as Paramecium bursaria, &c. This condition must be carefully distinguished from chlorophyll occurring as a cell-constituent.

that a condition is brought about in which, after many genera- tions, the host becomes " tolerant " of the parasite, and the parasite is not lethal to the host, though perhaps capable of setting up considerable disturbance in its vital functions. Many animals are found to contain almost constantly certain internal parasites without being, apparently, in the least affected by them; and it should be borne in mind that in most cases it is not to the interest of the parasite to destroy the host or to over- tax its resources. But when the parasite is transferred naturally or artificially to a species or race of host which does not ordinarily harbour it, and which therefore has not acquired powers of resisting its attacks, the parasites may be most deadly in their effects. Thus the white traveller in the tropics is exposed to far greater dangers from the indigenous disease-producing organisms than are the natives of those climes.

In some cases two organisms have become mutually adapted to each other as host and parasite to such an extent that the parasite is not capable of flourishing in any other host. An instance of this is Trypanosoma lewisi of the rat, which cannot live in an"y other species of animal but a rat, and which is not as a rule lethal to a rat, at least not to one otherwise healthy. Contrasting in an instructive manner with this species is Trypano- soma brucii, which occurs as a natural parasite of buffaloes and other big game in Africa, and is, apparently, harmless to them, but which is capable of being transferred to other animals by inoculation. The transference may take place naturally, by the bite of a tsetse-fly, or may be effected artificially; in either case T. brucii is extremely lethal to certain animals, such as imported cattle, horses and dogs, or to rats and guinea-pigs. Other animals, however, may be quite "repellent" 1 to this parasite, that is to say, if it be inoculated into their blood it dies out without producing ill effects, just as T. lewisi does when injected into an animal other than a rat. Thus it is seen that T. brucii, when introduced into the blood of an animal which is specifically or racially distinct from its natural hosts in the region where it is indigenous, is either unable to maintain itself in its new host, or flourishes in it to such an extent as to be the cause of its death.

We may assume, therefore, at least as a working hypothesis, that a lethal parasite is one that is new to its host, and that a harmless parasite is one long established. Since all parasites must have been new to their proper hosts at some period, recent or remote, in the history of the species, it would follow that the first commencement of parasitism would be in almost all cases a life and death struggle, as it were, between the two organisms concerned, and it is quite conceivable that the host might succumb in the struggle and so be exterminated. Ray Lankester has suggested that the extinction of many species of animals in the past may have been due, in

some cases, to their having been attacked by a species of parasite to which they did not succeed in becoming adapted, and by which they became, in consequence, exterminated entirely.

Organization of the Protozoa. — The body-form may be constant or inconstant in the Protozoa, according as the body-substance is or is not limited at the surface by a firm envelope or cuticle. When the surface of the protoplasm is naked, as in the common amoeba and allied organisms, the movements of the animal bring about continual changes of form. The protoplasm flows out at any point into processes termed pseudopodia, which are being continually retracted and formed anew. Such movements are known as amoeboid, and may be seen in the cells of Metazoa as well as in Protozoa. The pseudopodia serve both for locomo- tion and for the capture of food. If equally developed on all sides of the body, the animal as a whole remains stationary, but if formed more on one side than the other, the mass of the body shifts its position in that direction, but the movement of transla- tion is generally slow. If the animal remains perfectly quiescent and inactive, the laws of surface-tension acting upon the semi- fluid protoplasmic body cause it to assume a simple spherical

1 The use of the terms " tolerant " and " repellent " is taken from the excellent article on " Sleeping Sickness," by E. Ray Lankester, in the Quarterly Review (July 1904), No. 399. pp. 113-138. xxii. 16

form, which is also the type of body-form generally characteristic of Protozoa of floating habit (Radiolaria, Heliozoa, &c).

In the majority of Protozoa, however, the protoplasm is limited at the surface by a firm membrane or cuticle, and in consequence the body has a definite form, which varies greatly in different species, according to the habit of life. As a general rule those forms that are fixed and sedentary in habit tend towards a radially symmetrical structure; those that are free-swimming approach to an ovoid form, with the longest axis of the body placed in the direction of movement; and those that creep upon a firm substratum have the lower side of the body flattened, so that dorsal and ventral surfaces can be distinguished; it is very rare, however, to find a bilaterally symmetrical type of body-structure amongst these organisms. In some cases the cuticle may be too thin to check completely the changes of form due to the movements of the underlying protoplasm; instances of this are seen amongst the so-called " metabolic " Flagellata, in which the body exhibits continually changes of form, termed by Lankester " euglenoid " movements, due to the activity of the superficial contractile layer of the body manifesting itself in ring-like contractions passing down the body in a manner similar to the peristaltic movements of the intestine.

The body-substance of the Protozoa is protoplasm, or, as it was originahy termed by Dujardin, sarcode, which is finely alveolar in structure, the diameter of the alveoli varying generally between § and 1 p. At the surface of the body the alveoli may take on a definite honeycomb-like arrangement, forming a special " alveolar layer " which in optical section appears radially striated. Besides the minute proto- plasmic alveoli, the protoplasm often shows a coarse vacuola- tion throughout the whole or a part of its substance, giving the body a frothy structure. When such vacuoles are present they must be carefully distinguished from the contractile vacuoles and food- vacuoles described below; from the former they differ by their non-contractile nature, and from the latter by not containing food-substances.

In many Protozoa and especially in those forms in which there is no cuticle, the body may be supported by a skeleton. The material of the skeleton differs greatly in different cases, and may be wholly of an organic nature, or may be impregnated with, or almost entirely composed of, inorganic mineral salts, in which case the skeletal substance is usually either silica or carbonate of lime. From the morphological point of view the skeletons of Protozoa may be divided into two principal classes, according as they are formed internal to, or external to, the body in each case. Instances of internal skeletons are best seen in the spherical floating forms comprised in the orders Radiolaria and Heliozoa; such skeletons usually take the form of spicules, radiating from the centre to the circumference, and often further strengthened by the for- mation of tangential bars, producing by their union a lattice-work, which in species of relatively large size may be formed periodically at the surface as the animal grows so that the entire skeleton takes the form of concentric hollow spheres held together by radiating beams. The architec- tural types of these skeletons show, however, an almost infinite diversity, and cannot be summarized briefly. External skeletons have usually the form of a shell or house, into which the body can be retracted for protection, and from which the protoplasm can issue forth during the animal's phases of activity. Shells of this kind, which must be carefully distinguished from cuticles or other membranes that invest the body closely, are well seen in the order Foraminifera; in the simplest cases they are monaxon in architecture, that is to say, with one principal axis round which the shell is radially symmetrical, and at one pole is a large aperture through which the protoplasm can creep out. In addition to the principal aperture, the shell may or may not be pierced all over by numerous fine pores, through which also the protoplasm can pass out. For further details concerning these shells and their very numerous varieties of structure the reader is referred to the article Foraminifera.

PROTOZOA

The protoplasmic body of the Protozoa is frequently differ- entiated into two zones or regions: a more external, termed the ectoplasm or ectosarc, and a more internal, termed the endo- plasm or endosarc. The ectosarc is distinguished by being more clear and hyaline in appearance, and more tough and viscid in consistence; the endoplasm, on the other hand, is more granular and opaque, and of a more fluid nature. The ecto- plasm is the protective layer of the body, and is also the portion most concerned in movement, in excretion, and perhaps also in sensation and in functions similar to those performed by the nervous systems of higher animals. The endoplasm, on the other hand, is the chief seat of digestive and reproductive functions.

As the protective layer of the body, the ectoplasm forms the envelopes or membranes which invest the surface of the body, and which are differentiations of the outermost layer of the ectoplasm. Thus in most Flagellata the ectoplasm is represented only by the more or less firm outer covering or periplast. Even when such envelopes are absent, however, the ectoplasm can still be seen to exert a protective function; as, for instance, in those Myxosporidia which are parasitic in the gall-bladders or urinary bladders of their hosts, and which can resist the action of the juices in which they live so long as the ectoplasm is intact, but succumb to the action of the medium if the ectoplasm be injured. In many Infusoria the ectoplasm contains special organs of offence termed trichocysts, each a minute ovoid body from which, on stimulation, a thread is shot out, in a manner similar to the nematocysts of Coelenterata. Similar organs are seen also in the spores of Myxosporidia, as the so-called polar capsules; but in this case the organs are not specially ectoplasmic, and appear to serve for adhesion and attachment, rather than for offence.

The connexion of the ectoplasm with movement is seen in the simplest forms, such as Amoeba, by the fact that all pseudopodia arise from it in the first instance. In forms with a definite cuticle, on the other hand, the ectoplasm usually contains contractile fibres or myonemes, forming, as it were, the muscular system of the organism. The dependence of the motility of the animal upon the development of the ectoplasm is well seen in Gregarines, in which other organs of locomotion are absent; in forms endowed with active powers of locomotion a distinct ectoplasmic layer is present below the cuticle; in those Gregarines incapable of active movement, on the other hand, the ectoplasm is absent or scarcely recognizable.

From the ectoplasm arise the special organs of locomotion, which, when present, take the form of pseudopodia, flagella or cilia. Pseudopodia, as

already explained, are temporary proto- plasmic organs which can be extruded or retracted at any point; they fall naturally into two principal types, between which, however, transitions are to be found: first, slender, filamentous or filosc pseudopodia, composed of ectoplasm alone, which may remain separate from one another, or may anastomose to form networks, and are then termed reliculose; secondly, thick, blunt, so-called lobose pseudopodia, which are composed of ectoplasm with a core of endoplasm, and never form networks. In forms showing active locomotor powers the pseudopodia are usually more lobose in type; filose pseudopodia, on the other hand, are more adapted for the function of capturing food.

Flagella are long, slender, vibratile filaments, generally few in number when present, and usually placed at the pole of the body which is anterior in progression. Each flagellum performs peculiar lashing movements which cause the body, if free, to be dragged along after the flagellum in jerks or leaps; if, however, the body be fixed, the action of the flagellum or flagella causes a current towards it, by which means the animal obtains its food-supply. A flagellum which is anterior in movement has been distinguished by Lankester by the convenient term tractellum; sometimes, however, the flagellum is posterior in movement and acts as a propeller, like the tail of a fish ; for this type Lankester has proposed the term pulsellum. The flagellum appears to arise in all cases from a distinct basal granule, and in some cases, as in the genus Trypanosoma, there is a portion

of the nuclear apparatus set apart as a distinct kinetic nucleus, with the function, apparently, of governing the activities of the flagellum.

Cilia are minute, hair-like extensions of the ectoplasm, which pierce the cuticle and form typically a furry covering to the body. Though perhaps primitively derived from flagella, cilia, in their usual form, are distinguished from flagella by being of smaller size, by being present, as a rule, in much greater numbers, and above all by the character of their movements. In the place of the complicated lashing movements of the flagella, each cilium performs a simple stroke in one direction, becoming first bowed on one side, by an act of contraction, and then straightened out again when relaxed. The movements of the cilia are co- ordinated and they act in concert, though not absolutely in unison, each one contracting just before or after its neighbour, so that waves of movement pass over a ciliated surface in a given direction, similar to what may be seen in a cornfield when the wind is blowing over it. Primitively coating the whole surface of the body evenly, the 'cilia may become modified and specialized in various ways, which cannot be described in detail here (see Infusoria).

Besides the organs of locomotion already mentioned, there may be present

so-called undulating membranes, in the form of thin sheets of ectoplasm which are capable of performing sinuous, undulating movements by their inherent contractility. In some cases distinct contractile threads or myonemes have been described in these membranes. Undulating membranes appear to be formed either by the fusion together of a row of cilia, side by side,, or by the attachment of a flagellum to the body by means of an ectoplasmic web, in which case the flagel- lum forms the free edge of the membrane, as in the genus Trypanosoma.

Returning to the ectoplasm, the excretory function exerted by this layer is seen by the formation in it of the peculiar con- tractile vacuoles found in most free-living Protozoa. A con- tractile vacuole is a spherical drop of watery fluid which makes its appearance periodically at some particular spot near the surface of the animal's body, or, if more than one such vacuole is present, at several definite and constant places. Each vacuole grows to a certain size, and when it has reached the limit of its growth it discharges its contents to the exterior by a sudden and rapid contraction. There is, apparently, in most if not in all cases, a definite pore through which the contractile vacuole empties itself to the exterior. On account of the relatively large size which the contractile vacuole attains it bulges inwards beyond the limits of the ectoplasm and comes to lie chiefly in the endoplasm, to which it is sometimes, but erroneously, ascribed. In the most highly differentiated Protozoa, for instance, the Ciliata, the ectoplasm contains an apparatus of excretory channels, situated in its deeper layers, and forming as it were a drainage-system, from which the contractile vacuoles are fed. The fluid discharged by the contractile vacuoles appears to be chiefly water which has been absorbed at the surface of the protoplasmic body, and which has filtered through the protoplasm, taking up the soluble waste nitrogenous products of the metabolism and the gaseous products of respiration; hence the contractile vacuoles may be compared in a general way to the urinary and respiratory organs of the Metazoa.

One of the first consequences of the parasitic habit of life is the disappearance of the contractile vacuoles, which are hardly ever found in truly parasitic Protozoa, that is to say, in forms which live in the interior of other animals and nourish them- selves at their expense. They are also very frequently absent in marine forms.

Mechanisms of a nervous nature are very seldom found in Protozoa, but in some Ciliata special tactile bristles are found, and it is possible that flagella, and perhaps even pseudopodia, may be sometimes tactile rather than locomotor in function. Pigment-spots, apparently sensitive to light, may also occur in some Flagellata.

The endoplasm, as already stated, is the chief seat of nutritive and reproductive processes. In many Flagellata the ectoplasm

is represented only by the thin envelope or periplast, so that the whole body is practically endoplasm. When the two layers are well differentiated the endoplasm is more fluid and coarsely granular, and contains various organs, chief amongst them in importance being the nucleus, which must be considered specially and may be put aside for the present.

In considering the functions of ingestion and assimilation of food a distinction must be drawn between those Protozoa which absorb solid food-particles, that is to say, which are holozoic in habit, and those which, being holophytic, saprophytic or parasitic in habit, absorb their nourishment in a state of solution. Only in holozoic forms is a special apparatus found for ingestion or digestion of food; in all other forms nutriment is absorbed by osmosis through the body-wall, presumably at any point of the surface. In holozoic forms we must distinguish further those in which the protoplasm is naked at the surface from those in which the body is clothed by a firm cuticle or cell- membrane. In naked forms food-particles are taken in at any point of the body-surface, either by means of the pseudopodia, or by the action of flagella causing them to impinge upon the surface of the body. In either case the food is absorbed by the protoplasm simply flowing round it and engulfing it, and the food passes into the interior of the body in a tiny droplet of water forming what is termed a food-vacuole. Into the food-vacuole the surrounding protoplasm secretes digestive enzymes, so that each such vacuole represents a minute digestive cavity, in which the food is slowly digested, rendered soluble, and absorbed by the surrounding protoplasm. The insoluble residue of the food is finally rejected by expelling the food-vacuole and its contents from the surface of the body at any convenient point.

The simple process of food-absorption described above for the more primitive naked forms is necessarily modified in detail, though not in principle, in corticate Protozoa, that is to say, in forms provided with a cuticle. In the first place, it becomes necessary to have a special aperture for the ingestion of food, a cell-mouth or cytostome. Primitively the cytostome is a simple pore or interruption of the cuticle, but in forms more highly evolved the aperture is prolonged inwards in the form of a tube lined by ectosarc and cuticle, forming a gullet or oesophagus which ends in the endoplasm. Food-particles are forced by the action of cilia or flagella down the oesophagus and collect at the bottom of it in a droplet of water which,

after reaching a certain size, passes into the endoplasm as a food- vacuole in which the food is digested. For rejection of the insoluble residue of the food- vacuoles, a special pore or cell-anus (cytopyge) may be present. In the Ciliata there is often a distinct anal tube visible at all times, but as a rule the anus is only visible at the moment that faecal matter is being ejected from it, though fine sections show that the pore is a constant one. In the higher Flagellata, on the other hand, the oesophageal ingrowth forms commonly a sort of cloacal cavity, into which the contractile vacuole or vacuoles discharge themselves, and into which also the food-vacuoles evacuate their residues.

Besides the food-vacuoles already described, and the nuclear apparatus presently to be dealt with, the endoplasm may contain various metaplastic products, that is to say, bodies to be regarded as stages in the upward or downward metabolism of the proto-. plasmic substance. Such substances may take the form of coarse granules of various kinds, crystals, vacuoles or droplets of fatty or oily nature, pigment-grains, and other bodies. In the holophytic Flagellata the endoplasm contains also various organs proper to the vegetable cell, such as chlorophyll-bodies (chromatophores), pyrenoids, grains of a starchy nature (par- amylum), and so forth, which need not be described here in detail.

The nucleus in Protozoa is usually a compact, fairly con- spicuous structure, composed of chromatin combined in various ways with an achromatic substance or substances. Sometimes the chromatin is distributed in smaller masses through the nucleus, producing a granular type of nucleus; more often the chromatin is more or less concentrated in a central mass forming a so-called

karyosome, consisting of an achromatic plastinoid substance impregnated with chromatin. If the karyosome is large and there is very little chromatin between it and the nuclear membrane, the nucleus is of the type termed vesicular. A nuclear membrane is not, however, always present, and true nucleoli, of the type found in the nuclei of metazoan cells, are not found in Protozoa.

A given individual may have more than one nucleus, and the number present may amount to many thousands, as in the Plasmodia of Mycetozoa. In such cases the nuclei may be all of one kind, that is to say, not markedly different in size, struc- ture or function, so far as can be seen; or there may be a pro- nounced morphological differentiation of the nuclei correlated with a difference of function. Thus in the class Infusoria two nuclei are found in each individual; a macronucleus which is somatic in function, that is to say, which regulates the meta- bolism and vital processes of the body generally, and the micro- nucleus, which is generative

in function, that is to say, which remains in reserve during the ordinary, " vegetative " life of the organism and becomes active during the act of syngamy, after which the effete macronucleus is absorbed or cast out and a new somatic nucleus is formed from portions of the micronuclei which have undergone fusion in the sexual act. Thus the micro- nucleus of the Infusoria can be compared in a general way with the germ-plasm of the Metazoa, like which it remains inactive until the sexual union. On the other hand, in some Flagellata a differentiation of the nucleus of quite a different type is seen, a smaller, kinetic nucleus being separated off from the larger, trophic or principal nucleus. The kinetic nucleus has the function, apparently, of controlling the locomotor apparatus, so that the specialization of these two nuclei is of a kind quite different from that seen in the Infusoria.

Besides the nuclear substance which is concentrated to form the principal nucleus or nuclei, there may be present also extranuclear granules of chromatin, so-called chromidia, scattered! throughout the whole or some part of the protoplasmic body. Chromidia may be normally present in addition to the principal nucleus, or may be formed from the principal nucleus during certain phases of the life-cycle. In some cases the entire nucleus may become resolved temporarily into chromidia, from which a new nucleus may be formed again later by condensation and concentration of the scattered granules. When the chromidia are numerous and closely packed they may form a so-called chromidial network {Chromidial-Netz). Recent observations ort the reproduction of some Sarcodina have shown that the chromidia may possess great importance in the life-cycle as representing generative chromatin which, like the micronuefeus of the Infusoria mentioned above, remains in reserve until, by the process of syngamy, the nuclear apparatus is renewed;; while the principal nuclei represent, like the macronuclei, somatic or vegetative chromatin which becomes effete and is cast off or absorbed when syngamy takes place. These questions will be discussed further below.

It was formerly supposed that the lowest Protozoa were entirely without a nucleus, and on this supposition E. Haeckel attempted to establish a class named by him Monera, defined as Protozoa consisting of protoplasm alone, in which a nucleus was not differentiated. To this class were referred various organisms whose alleged archaic nature was expressed by such names as Protogenes primordialis, organisms which, like so many other of the primitive forms of animal life described by Haeckel, have been seen by that naturalist alone up to the present. In all Protozoa that have been examined by modern methods a nucleus in some form has been demonstrated to exist, and it must be supposed, until proof to the contrary be forthcoming, that in the case of the so-called Monera either the nucleus was overlooked owing to defective technique, or it had been temporarily resolved into chromidia.

The nuclear apparatus may be supplemented by other bodies of which the nature is not always clear. Such is the so- called " Nebenkern " of Par amoeba eilhardi, apparently of the nature of a centrosome. Sometimes the karyosome acts like a.

centrosome during the division of the nucleus, and sometimes true centrosomes are present, Flagella also commonly arise from basal granules of a centrosomic nature, blepharoplasts in the correct sense of the term; 1 these blepharoplasts are always in connexion with the nucleus, or with the kinetic nucleus if there is one distinct from the trophic nucleus, as in the genus Trypanosoma and allied forms.

Reproduction of the Protozoa. — The mode of reproduction in these organisms is the same as that of the cell generally, and takes always the form of fission of some kind; that is to say, of division of the body into smaller portions, each of which repre- sents a young individual. The division of the body is preceded by that of the nucleus, if single, or of each nucleus in] the cases where there are two different nuclei; if, however, more than one nucleus of the same kind be present, the nuclei may be simply shared amongst the daughter-individuals, this mode of division being known as plasmotomy. Other organs of the body may either, like the nucleus, undergo fission, or may be formed afresh in the daughter-individuals.

The division of the nucleus in Protozoa may take place by the direct method or by means of mitosis. Direct division, without mitosis, is of very common occurrence; the division may be simple or multiple, that is to say, into only two parts, or into a number of fragments formed simultaneously. An extreme case of multiple fission is seen in the formation of the microgametes of Coccidium schubergi, where the nucleus breaks up into a great number of chromidia, which become concentrated in patches to form the several daughter-nuclei. In some cases, on the other hand, multiple daughter-nuclei are formed by rapidly repeated simple division of the parent nucleus. The mode of division may be different in different nuclei of the same individual; thus in the Infusoria the macronucleus divides by direct division, the micronucleus by mitosis.

The mitosis of the Protozoa is far from being of the uniform stereotyped pattern seen in the Metazoa, but, as might have been expected, often shows a much simpler and more primitive condition. Centrosomes are often absent, and their place may be taken, as stated above, by other bodies. The

nuclear membrane may be retained throughout the mitosis. Definite chromosomes can, as a rule, be made out, but the chromosomes are often very numerous and minute, without definite form, and divide irregularly. Much remains to be done in studying the mitosis of the Protozoa, but it is probable that wider knowledge will show many conditions intermediate between direct division and perfect mitosis.

The simplest method of fission in Protozoa is that termed binary, where the body divides into two halves, which may be equal and similar, so that the result is two sister-individuals impossible to distinguish as parent and offspring. In many cases of binary fission, however, the resulting daughter-individuals may be markedly unequal in size, so that one may be distinguished as the parent, the other as the offspring. If the daughter-individual be relatively very small, and formed in a more or less imperfect condition at first, the process is termed gemmation or budding. The buds formed in this way may be either external, formed on the surface of the body, or internal, that is, formed in special internal cavities, from which the offspring are later set free, as in many Acinetaria. Gemmation may be correlated with multiple nuclear fission in such a way that buds are formed over the whole body surface of the organism, which thereby under- goes a process of simultaneous multiple fission into numerous daughter-individuals. Rapid multiple fission of this kind is termed sporulation, and is a form of reproduction which is of common occurrence, especially in parasitic forms. Usually^ the central portion of the parent body remains over as a residual body (Restkorper) , but sometimes the parent organism is entirely resolved into the daughter-individuals, which are termed spores

1 The kinetic nucleus of Trypanosoma is sometimes, but in the writer's opinion wrongly, named centrosome or blepharoplast ; the bodies to which cytologists give these names are achromatic bodies ; the kinetic nucleus is a true chromatic nucleus. The question of the centrosome in Protozoa is discussed by R. Goldschmidt and M. Popoff.

in a general way, but can be given special names in special cases (see Gregarines, Coccidia, &c).

Life-cycles of the Protozoa. — It is probable that in all Protozoa, as in the Metazoa, the life-history takes its course in a series of recurrent cycles of greater or less extent, a fixed point, as it were, in the cycle being marked by the act of syngamy or conju- gation, which represents, apparently, a process for recuperation of the waning vital powers of the organism. It is true that in many types of Protozoa syngamy is not known as yet to occur. but in all species which have been thoroughly investigated syngamy in some form has been observed, and there is nothing to lead to the belief that the sexual process is not of universal occurrence in the Protozoa.

The life-cycle of a given species may be very simple or it may be extremely complex, the organism occurring under many different forms at different phases or periods of its development. The polymorphism of the Protozoa is best considered under three categories, according to the three main causes to which it is due, namely, first, polymorphism due to adaptation to different con- ditions of existence; secondly, polymorphism due to differences of size and structure during growth ; thirdly, polymorphism due to the differentiation of individuals in connexion with the process of syngamy or sexual conjugation.

i. Polymorphism in Relation to Life-conditions. — As a protec- tion against unfavourable conditions, or for other reasons, most Protozoa have the power of passing into a resting condition, during which the vital functions may be wholly or in part suspended. In the resting phase the animal usually becomes enveloped in a resistant membrane or cyst secreted by it, and is then said to be encysted. The formation of a cyst may be a response to conditions of various kinds. Very commonly it is formed to protect the organism against a change of medium, as in the case of freshwater forms liable to desiccation, or of para- sites about to pass out of the bodies of their hosts. In other cases the organism passes into the resting state in order to absorb ingested nutriment or in order to enter upon reproductive phases.

As a preparation for encystment, organs of locomotion, if present, are retracted or cast off; contractile vacuoles cease to be formed; and the food-vacuoles disappear, usually by digestion of their contents and rejection of the waste residue. The body becomes rounded off and more or less spherical in form, and the protoplasm becomes denser, that is, less fluid and more opaque, but at the same time of diminished specific gravity, by loss of water. The cyst is then secreted at the surface as a layer of varying thickness and toughness. In the encysted condition many Protozoa are capable of being transported by the wind : a fact which explains their appearance in infusions and liquids exposed to the air. In favourable conditions the cysts germinate, that is to say, the envelope is dissolved and the contained organ- ism or organisms are set free to enter upon the strenuous life once more.

In the Mycetozoa, organisms adapted to a semi-terrestrial life in moist surroundings, the protoplasm is capable, when desiccated, of passing into a tough condition resembling sealing- wax, which, when moistened, assumes again its normal appear- ance and active condition.

Resting phases, analogous to encystment, are seen in the spores of various forms, especially those of parasitic habit, which are commonly enclosed in tough, resistant envelopes or sporocysts, and enveloped as a protection against change of medium or of host. Within the sporocyst multiplication of

the sporoplasm may take place to form more or fewer sporozoites. The sporocysts usually show definite symmetry and structure, infinitely variable in different species. In a suitable medium the spores germinate by rupture of the sporocysts and escape of the contents.

2. Polymorphism in Relation to Growth and Development. — In many species of Protozoa there is hardly any difference to be observed between different individuals during their active phases except in size. Those individuals about to multiply by fission are slightly above the normal in dimensions: op the

other hand, those resulting from recent fission will be smaller than the average; and such differences are, it need hardly be said, more pronounced when the fission is of the unequal binary type, or in cases of gemmation or multiple fission. In cases also where a given strain of a species is becoming senile, it is sometimes observed that the individuals are markedly undersized on the average.

On the other hand, it is often the case that the young indi- viduals resulting from a recent act of multiplication may differ from adult individuals of the species, not merely in size, but in structural characters, to such an extent that their relationship to the adult forms could not be determined by simple inspection without other evidence. This is especially true of those species in which multiplication by sporulation occurs, giving rise to numerous small spores which may at first be in a resting condi- tion, enveloped in protective sporocysts, but which sooner or later become free, motile individuals known technically as swarm- spores. Thus in many Sarcodina the adult is a large amoeboid organism which produces by sporulation a great number of relatively minute swarm-spores. These may be either, as in the common Amoeba proteus, amoeboid organisms, so-called amoebulae or pseudopodiospores, or, as in the Foraminifera and Radiolaria, flagellated organisms, so-called flagellulae or flagelli- spores. Sometimes, as in many Mycetozoa, amoeboid and flagellated phases may succeed each ether rapidly in the develop- ment of the swarm-spores. The familiar Noctiluca miliaris is another instance of a species which produces by sporulation numerous tiny swarm-spores quite different from the parent form in their characters. Such instances could be multiplied indefinitely amongst the Protozoa.

When the young individuals differ greatly from the adults in structure and appearance they may be regarded as larval forms, and it is interesting to

note that such forms appear to be just as much recapitulative, in the phylogenetic sense, as are the larvae of many Metazoa. A striking instance is that of the Acinetaria, in which the swarm-spores produced by gemmation are ciliated, and thus betray affinities with the Ciliata which could hardly be suspected from a study of the adult forms alone. Similarly, in the genus Trypanosoma, the young forms often show a Herpelomonas-like structure which is probably of phyletic significance. The swarm-spores of Sarcodina and of Noctiluca mentioned above can, perhaps, be regarded in the same light. On the other hand, many larval forms cannot be considered as exhibiting recapitulative char- acters, but merely as adaptations to environment or other special life-conditions. This is especially true, as in Metazoa, of parasitic forms, subject as they are to great vicissitudes, to cope with which the most finely adjusted adaptations are necessary on the part of the organism.

3. Polymorphism in Relation to Sex. — In all Protozoa of which the life-cycle has been made known in its entire course, a process of syngamy or sexual union has been found to occur. There are still many forms in which syngamy remains to be discovered: this is true even of some groups of considerable extent. It is quite possible, therefore, that Protozoa exist in which syngamy does not occur. In view, however, of the widespread occurrence of sexual processes amongst unicellular organisms, both of animal and vegetable nature, and the fact that extended observation continually brings to light new instances of this kind, it is safer, in cases amongst the Protozoa in which syngamy is not known to occur, to explain its apparent absence by the imperfections of the present state of our know-ledge, than to suppose that in such forms sexual phenomena are entirely lacking in the life-cycle. 1

The process of r>yngamy, though greatly diversified in different forms, consists essentially of one and the same process in all cases; namely, the fusion of nuclear matter from two distinct individuals. Plus Qa change, plus e'est la mtme chose 1 Hence true syngamy may be distinguished as karyogamy from the process of plastogamy, or fusion of the protoplasmic bodies,

1 It will be shown below, however, that in some species syngamy may perhaps be secondarily in abevance.

of frequent occurrence in many forms of Protozoa. The individuals whose nuclei undergo fusion are termed gametes. They may be in no way different from each other or from ordinary individuals of the species, or, on the other hand, they may be highly differentiated in size, form and structure. The two gametes may undergo complete fusion into one body, thus giving rise to an individual termed generally a zygote or copula, but which may

bear special names in special cases (e.g. vermicule or ookinete of the malarial parasites, &c); such a process is termed sometimes copulation. On the other hand, the bodies of the two gametes may remain distinct, and portions of the nucleus of each be exchanged between them; to this condition the term conjugation is sometimes specially applied. The act of syngamy may be performed in the free condition, or in the resting state, within a cyst.

The significance of syngamy has been much discussed, and it is very difficult to make positive statements upon this point. By comparing the life-cycles of different forms it is found that syngamy sometimes precedes, sometimes follows, a period of great reproductive activity on the part of the organism. Thus in such a form as Noctiluca, syngamy between two full-grown individuals is followed by rapid sporulation and the production of a swarm of young individuals; on the other hand, in Forami- nifera and Radiolaria, rapid sporulation of adult individuals produces a numerous progeny of young forms which may go through the process of syngamy and produce zygotes that simply grow into the adult form. Comparing these two types of develop- ment, instances of which might be greatly multiplied, it is seen that in one case syngamy follows a period of growth and precedes a period of proliferation in the life-cycle, and that in the other case exactly the reverse is true. Hence it follows that syngamy must not be regarded as in any way specially connected with reproduction, but must be considered in its relation to the life- cycle as a whole, and in those instances in which syngamy is followed by increased reproductive activity the explanation must be sought in the general physiological effects of the sexual process upon the vital powers of the organism.

In the Metazoa the sexual process is always related to the production of a new individual, that is to say, of a multicellular organism for which there is no analogy amongst the Protozoa, although an approach to the Metazoan condition is seen in colony -forming Flagellata, such as Volvox and its allies. The reproduction of Protozoa is analogous to the ordinary process of cell-division and multiplication which is going on at all times in the bodies of the Metazoa, arid which can be observed in the pro- duction of the gametes; that is to say, in the period of the life- cycle immediately preceding the sexual process in the Metazoa, just as much as in the developmental phases which follow syn- gamy and result in the building up of a new Metazoan individual. Hence, so far as the Protozoa are concerned, the phrase " sexual reproduction " is an incongruous combination of words; repro- duction and sex are two distinct things, not necessarily related or in any direct causal connexion; and in order to arrive at any theory of sex it is necessary first of all to clear away all misconceptions or preconceived notions arising from analogies with the multicellular Metazoan individual.

Many observations indicate that the vital powers of the Protozoa become gradually weakened, and the individual tends to become senile and effete, unless the process of syngamy intervenes. The immediate result of the sexual union is a renewal of the vitality, a rejuvenescence, which manifests itself in enhanced powers of metabolism, growth and reproduction. These facts have been most studied in the Ciliata. It is observed that if these organisms be prevented from conjugating with others of their kind they become senile and finally die off. It has been found by G. N. Calkins, however, that if the senile individuals be given a change of medium and nourishment, their vigour may be renewed and their life prolonged for a time, though not indefinitely; there comes a period when artificial methods fail and only the natural process of syngamy can enable them to prolong their existence. The results obtained by Calkins are of great interest, as indicating that under special conditions

of the environment the necessity for the sexual process may be diminished and the event may be deferred for a long time, if not indefinitely. Hence it is quite possible that in many Proto- zoa the process of syngamy may be in abeyance, just as there are plants which can be propagated indefinitely by suckers or cuttings without ever setting seed; and it is possible that the inoculative or artificial transmission of parasitic Protozoa from one host to another, as in the case of pathogenic trypanosomes, without any apparent diminution in their vital powers, is an instance of this kind.

As a general rule, in order that syngamy may be attended by beneficial results to the organism, it is necessary that the two conjugating individuals should be from different strains, that is to say, they should not be nearly related by descent and parentage. Thus F. Schaudinn found that in order to observe the sexual union of the gametes of Foraminifera it was necessary to bring together gametes of distinct parentage. On the other hand it has been observed that in many Protozoa, especially in parasitic forms, syngamy takes place between individuals of common parentage. Thus in Amoeba coli, according to F. Schaudinn, a single individual becomes encysted and its nucleus divides into two; after each nucleus has undergone certain maturative changes they give rise to pronuclei which conjugate and initiate a new developmental cycle. Syngamy between sister individuals, or autogamy, as it has been termed, is not, however, confined to parasitic Protozoa; it has been observed in Actino- sphaerium by R. Hertwig. The benefit to the organism, if any, arising from autogamy can only be supposed to result from the rearrangement and reconstitution of the nuclear apparatus. The frequent occurrence of autogamy suggests that in many

Protozoa the nature of the environment diminishes the impor- tance of the sexual process, at. least so far as the mixture of nuclear material from distinct sources is concerned; and, since autogamy is most common in parasitic forms, this result may, in the light of G. N. Calkins's experiments, be ascribed in great part to the frequent changes of environment and nutrition to which parasitic forms, above all, are subject.

True syngamy consists, as has been said, of nuclear fusion or karyogamy. It rarely, if ever, happens, however, that such fusion takes place without the conjugating nuclei having under- gone some process of reduction by elimination of a portion of the nuclear substance, in a manner analogous to the maturation of the germ-cells in the Metazoa. The chromatin thus eliminated may be cast out from the body of the organism as one or more so-called polar bodies; or may be absorbed in the cytoplasm; or may remain in the cytoplasm and be left over in the residual protoplasm in cases where syngamy is followed by a process of rapid multiplication by sporulation; but in all cases the chroma- tin removed from the nucleus is rejected in some way or other and plays no part in the subsequent development of the organism. The nuclei of the gametes which have completed this process of epuration nucUaire are then ripe for syngamic fusion and are termed pronuclei; the union of two pronuclei produces a single nucleus termed a synkaryon.

It is certain that in many, if not in all, cases the nuclear substance that is rejected as a preliminary to syngamy consists of somatic or vegetative chromatin; that is to say, of chromatin that has been functional in regulating the ordinary vital func- tions, metabolism, growth, reproduction, &c, during previous generations, and has become effete; while on the other hand the chromatin that persists to form the pronuclei is generative chromatin which has remained in reserve for the sexual act and has retained its peculiar powers and properties unimpaired. The truth of this explanation is extremely obvious in such forms as the Infusoria, where somatic and generative chromatin are concentrated into two distinct and entirely separate nuclei. In some Rhizopoda also the body contains one or more principal nuclei and a mass of chromidia, and it has been observed that as a preparation for syngamy the principal nuclei are eliminated and the pronuclei are formed from the chromidia; in such cases, therefore, it is reasonable to regard the principal nuclei as repre- senting somatic chromatin, the chromidia as generative chroma-

tin. In other cases, however, for example Actinosphaerium, the chromidia must be interpreted, from their behaviour, as somatic chromatin, and the principal nuclei as generative chromatin; hence R. Goldschmidt has proposed the special term sporetia for those chromidia which represent reserve generative chromatin. In the majority of Protozoa, however, the

nuclear substance is not differentiated in such a way that it can be distinguished by any visible peculiarities into somatic and generative chromatin.

The process of reduction is not limited, apparently, to the elimination of somatic chromatin, but a portion of the generative chromatin is also cast off. Thus in the Infusoria not only the somatic macronucleus, but also a considerable portion of the generative micronucleus, is absorbed at each act of conjugation. The elimination of generative chromatin is perhaps of importance as a factor in heredity and the production of variations, or possibly for sex determination, as will be discussed below; it is difficult to suggest any other explanations for it, unless it be supposed that during the exercise of ordinary vital functions a portion of the generative chromatin be rendered effete as well as the somatic chromatin.

From the considerations set forth in the foregoing paragraphs it must be supposed that the synkaryon, the fusion-product of the two pronuclei in syngamy, consists at first purely of genera- tive chromatin, which must speedily become differentiated into the regulative somatic chromatin of the ensuing generations and the generative chromatin held in reserve for the next act of syngamy. Such a differentiation can be actually observed in the Infusoria, where immediately after conjugation the synkaryon divides into one or more pairs of nuclei, each pair becoming the two unequally sized nuclei of an ordinary individual, sometimes with, even at this stage, an apparently wanton elimination of nuclear substance. Thus the somatic and generative chromatin of the Protozoa offer a certain analogy with the soma and germ- plasm of Metazoa; but in making such comparisons the dis- tinction between a physiological analogy and a morphological homology should be borne clearly in mind.

It has been stated above that the two gametes of a given species of Protozoa may be perfectly similar and indistinguish- able, or may be very different one from the other. The condition with similar gametes is termed isogamy, that with differentiated gametes anisogamy. Every transition can be found from complete isogamy and pronounced anisogamy in the Protozoa; in tracing, however, the evolution of specialized gametes it must be remembered that we are dealing only with visible morphological differences mainly of an adaptive nature, without prejudice to the question of the possible existence of a funda- mental sexual antithesis in all gametes, present even when not perceptible. The sex philosopher 0. Weininger has urged that sex is a fundamental attribute of living things, and that the living substance, protoplasm, consists of arrhenoplasm and thelyplasm united in varying proportions. Certain observations of F. Schaudinn tend to support this view; in Trypanosoma noctuae, for example, Schaudinn found that the process of reduction in one gamete took an opposite course to that

which it took in the other gamete. In one gamete certain portions of the nucleus were retained and certain other portions rejected ; in the maturation of the other gamete the portions rejected and the portions retained were the reverse. Hence Schaudinn was led to regard the indifferent individuals as essentially herma- phrodite in nature, and therefore capable of giving rise to gametes of either order by elimination of one or the other set of sexual elements; a theory which throws further light on the elimination of generative chromatin mentioned above. It is possible, therefore, that the gametes of Protozoa may possess sexual characters intrinsically different even when perfectly similar so far as can be perceived. It is very probable, for instance, that the isogamy in Gregarines is a state of things derived secondarily from a primitive condition of anisogamy (see Gregarines).

The simplest possible condition of the gametes is seen in the free-swimming Ciliata, forms which in other respects are the

most highly organized of Protozoa; here the individuals which conjugate are only distinguished from ordinary individuals of the species by the fact that their nuclei have undergone very complicated processes of reduction and nuclear elimination. In these forms there is also no difference between young and adult individuals, beyond scarcely perceptible differences of size between individuals about to divide and those that are the products of recent division, so that these species are practically monomorphic in the active condition. In forms, however, which, like Vorticella, are of sessile habit, small free-swimming individuals are liberated which seek out and conjugate with the ordinary sessile individuals. Here we have an instance of a morphological differentiation of the gametes which is clearly adaptive to the life-conditions of the species. In other Protozoa there may be, as already stated, differences, more or less pro- nounced, between young and adult individuals, and syngamy may take place either between young individuals (microgamy) or between adults (macrogamy); the gametes may be in either case ordinary individuals of the species, not specially differen- tiated in any way, or on the other hand they maybe differentiated from ordinary individuals, while still similar and isogamic amongst themselves; or, finally, they may be anisogamic; that is to say, differentiated into two distinct types. Thus in the Radiolaria, for example, an adult individual breaks up by a process of sporulation into numerous minute flagellated swarm- spores; these may be all of one kind, termed isospores, which develop directly without undergoing syngamy; or they may be of two kinds, termed anisospores, both different in their character from the isospores,

and incapable of development without syngamy.

When the gametes are differentiated the divergence between them almost always follows parallel paths. One gamete is distinguished by its smaller size, its greater activity, and its comparative poverty in granules of reserve food-material; hence it is termed the microgamete. The other gamete is distinguished by its greater bulk, its pronounced sluggishness and inertness, and its tendency to form and store up in the cytoplasm reserve nutriment of one kind or another; hence it is termed the macro- gamete, or, as some prefer to write it, the megagamete (better megadogamete). When these differences are very pronounced, as, for instance, in the Coccidia and other Sporozoa, a condi- tion is reached which is practically indistinguishable from that seen in the sperm and ova of the Metazoa. Hence the micro-gamete is generally regarded as male, the macrogamete as female; and these terms may be conveniently used, although they do not in themselves imply more than would the words positive and negative, or any other pair of terms expressive of a fundamental contrast. The microgamete may become reduced to a mere thread of chromatin, which may possess one or two flagella for purposes of locomotion, as in Coccidia, &c, or may move by serpentine movements of the whole body, which re- sembles in its entirety a flagellum, and is often wrongly so termed. In contrast with the microgamete, its correlative, the macro- gamete, tends to become a bulky, inert body, often with great resemblance to an ovum, its cytoplasm dense and granular, packed with reserve food-materials as an egg contains yolk, and without organs of locomotion or capacity for movement of any kind. Hence the macrogamete is the passive element in syngamy, which requires to be sought out and " fertilized "■ by the active microgamete, a division of labour perfectly ana- logous to that seen in the male and female gametes of Metazoa. In those cases where syngamy takes place by interchange of nuclear substance between two gametes which remain separate from one another, as in the Infusoria, each gamete forms two pronuclei, which are , distinguished by their behaviour as the active and passive pronuclei respectively. The active pronucleus of each gamete passes over into the body of the other and fuses with its passive pronucleus to form a synkaryon. A similar method of procedure occurs also in Amoeba coli, according to F. Schaudinn.

When gametes are not very highly specialized they may still retain the power of multiplication by division possessed by

ordinary individuals, so long as they have not undergone the process of nuclear reduction preliminary to syngamy. If, however, the gametes are highly specialized they may forfeit the power of multiplication. In this respect the microgametes are worse off than the other sex; on account of the great reduction of the body-protoplasm, and the entire absence of any

reserve materials, they must either fulfil their destiny as gametes or die off. The macrogametes, on the other hand, with their great reserves of cytoplasm and nutriment, are more hardy than any other forms of the species, and are able to maintain their existence in periods of famine and starvation when all other forms are killed off. Moreover they may regain the power of multiplication by a process of parthenogenesis, a term originally applied in the Metazoa to cases where a germ-cell of definitely female character, that is to say an ovum, acquires the power of reproduction without fertilization by syngamy. A macro- gamete multiplying by parthenogenesis first goes through certain nuclear changes whereby it is set back, as it were, from the female to the indifferent condition, and it is then able to multiply by fission like any ordinary, non-sexual individual of the species. Parthenogenesis has been described by F. Schaudinn in the malarial parasites and in Trypanosoma noctuae. In both cases the female forms are able to persist under adverse conditions after all other forms have perished, and then by parthenogenesis they may multiply when conditions are more favourable, overrun the host again, and cause a relapse of the disease of which they are the cause. S. v. Prowazek has described in Herpetomonas muscae-domesticae an analogous process of multiplication on the part of male individuals, and has coined the term etheogenesis for this process, but the statement needs confirmation, and as a general rule the microgamete is quite incapable of independent reproduction under any circumstances.

It is often found that not only are the gametes differentiated, but that their immediate progenitors may also exhibit characters which mark them off from the ordinary "or indifferent individuals of the species. In such cases the parent-forms of the gametes are termed gametocytes, and they may differ amongst them- selves in characters which render it possible to distinguish those destined to produce microgametes from those which will produce the other sex. The parent-individuals of the microgametes, or microgametocytes, are distinguished as a general rule by clearer protoplasm, free from coarse granulations, and a larger nucleus, more rich in chromatin. The macrogametocytes, on the other hand, usually have coarsely granular cytoplasm, rich in reserve food-stuffs, and a relatively small nucleus. The gametocytes produce the gametes by methods that vary according to the degree of specialization of the gametes. In isogamous forms, of which good examples are furnished by many Gregarines (q.v.), the gametes are produced by a process of sporulation on the part of the gametocytes, a certain amount of residual protoplasm being left over. In forms with pronounced anisogamy, for instance, Coccidia or Haemosporidia, the microgametes are produced by sporulation in which almost the whole mass of the body of the gametocyte may be left over as residual protoplasm, together with some portion of the nucleus; in the other

sex, however, the process of sporulation may be altogether in abeyance, and the macrogametocyte becomes simply converted into the macro-gamete after going through a process of nuclear reduction.

The gametocytes may, however, possess the power of multi- plication without change of character for many generations; or, to put the matter in other words, the sexual differentiation may be apparent not merely in the generation immediately preceding the gametes, but in many generations prior to this. Thus a given species may consist of three different types of adult individuals, male, female and indifferent, each multiplying in its own line. Complicated alternations of generations are the result, and if at the same time there is a well-marked differ- ence between young and adult forms of the species the height of polymorphism is reached. Very commonly a double series of generations occurs, the non-sexual or indifferent forms multiply- ing apart from the sexually differentiated individuals and the generations immediately descended from them; in such cases the

series of non-sexual generations is termed schizogony, the series of sexual generations gametpgony or sporogony. Schizogony and sporogony. usually occur as adaptations to, or at least in relation with, distinct conditions of life. Thus in parasitic forms, as well illustrated by the Coccidia, the organisms multiply by schizogony when overrunning the host, that is to say, when nutriment is abundant; sporogony begins as a preparation for passing into the outer world, in order to infect new hosts. In the Haemo- sporidia, in which transmission from one vertebrate host to another is effected by means of blood-sucking ectoparasites (Diptera, ticks, leeches, &c), the schizogony goes on in the vertebrate host, the sporogony in the invertebrate host. In free-living, non-parasitic forms, schizogony may go on under ordinary conditions, while sporogony supervenes as a preparation for a marked change in the life-conditions; for instance, a change of medium, or at the approach of winter. It is interesting to note that, as a general rule, the differentiation of sexual forms seems to be a preliminary to the production of more resistant forms capable of braving adverse conditions or violent changes in the conditions of life; a phenomenon which is in support of the hypothesis that syngamy has a strengthening effect on the vitality of the species.

Classification of the Protozoa.

Various attempts have been made to separate the Protozoa into two primary subdivisions. E. Ray Lankester divided them into two main groups,

the Gymnomyxa, with naked protoplasm and indefinite form, and the Corticata, with the protoplasm limited by a firm membrane, and consequently with a definite body-form. In many of the corticate groups, however, there must be placed amoeboid, non-corticate forms, such as Mastig- amoeba amongst the Flagellata, or the malarial parasites amongst the Sporozoa. Hence if Lankester's classification be used, it must be without a hard and fast verbal definition. F. Doflein, on the other hand, has divided the Protozoa into Plasmodroma, with organs of locomotion derived from protoplasmic processes, i.e. pseudopodia or flagella, and Ciliophora, with locomotion by cilia. It may be doubted, however, if the distinction between flagella and cilia is so fundamental and sharply defined as this mode of classification would imply, W. H. Jackson has proposed to unite the forms bearing flagella and cilia into one section, Plegepoda, and distinguishes two other sections, Rhizopoda (= Sarcodina) and Endoparasita (= Sporozoa).

Four main groups of Protozoa, of the rank of classes, are universally recognized, however they may be combined into larger categories; these are the Sarcodina, Mastigophora, Sporozoa and Infusoria.

The Sarcodina are characterized by the body being composed of naked protoplasm, not covered by any limiting cuticle, although in many cases a house or shell is secreted into which the protoplasm can be partly or entirely withdrawn. No special organs of locomotion, either flagella or cilia, are ever present in the adult, and locomotion and capture of food are effected in the manner named amoeboid, by more or less temporary extrusions or outflow of the protoplasm which are termed pseudopodia, as in Amoeba.

The Mastigophora are so named because organs of locomotion are always present in the adult in the form of one or more flagella, each flagellum (Gr. nacm%, whip) a delicate, thread-like extension of the protoplasm, endowed with a special contractility which enables it to perform lashing, whip-like movements. The body protoplasm is sometimes naked, in which case it may be amoeboid, but is more usually limited by a cuticle, varying in thickness in different types.

The Sporozoa, with the exception of a few forms of dubious position, are exclusively internal parasites of Metazoa, absorbing their food from the internal juices and secretions of their hosts, and never exhibiting in their trophic phases any organs of loco- motion or for the ingestion and digestion of solid food. The body-protoplasm may be naked and amoeboid or limited by a cuticle. The reproduction is specialized in correlation with the parasitic habit, and results typically in the formation of a

number of minute germs or spores, by which the infection of fresh hosts is effected. It must not be supposed, however, that spore-formation is confined to this class of Protozoa.

The Infusoria, a name originally of much wider application, is now restricted to denote those Protozoa in which locomotion or capture of food is effected by means of special organs termed cilia, minute hair-like contractile extensions of the protoplasm differing from flagella not only in their usually smaller size and greater number, but also in the mode of contraction and move- ment. The cilia may be present throughout life or only in an early stage of the individual. The body is always limited by a cuticle and the nucleus seems to be invariably double, being divided into two parts specialized in function and differing in size, termed respectively macronucleus and micronucleus.

Comparing these four subdivisions with one another, it may be said at once that the Sporozoa and Infusoria are highly specialized classes, each well marked off from the other sub- divisions. The Sarcodina and Mastigophora, on the other hand, include the most primitive types of Protozoa and are delimited from one another by a somewhat arbitrary character, the presence or absence of a flagellum in the adult. Thus Mastigamoeba is a form which unites the characters of the Sarcodina and Mastigophora, having an amoeboid body which bears a flagellum, and it is classed among the Mastigophora merely because the flagellum is retained throughout life; if the flagellum were absent in the adult condition it would be placed among the Sarcodina, many of which have flagella in their young stages but lack them when adult. Hence Butschli considered the Rhizomastigina (i.e. Mastigamoeba and its allies) as the most primitive group of Protozoa, representing the common ancestral form of all the classes; and on this view the flagellated young stages of many Sarcodina would represent recapitulative larval stages.

Biitschli's theory of Protozoan phylogeny implies that a flagellum is an organ of most primitive nature, possessed perhaps by the earliest forms of life; and it must be remembered that flagella are borne by many Bacteria. On the other hand, one would imagine, from general considerations, that living beings possessing a flagellum would have been preceded in evolution by others that did not bear so definite an organ. The flagellum itself is generally regarded as a vibratile process or extension of the protoplasm, comparable in its nature to a slender pseudo- podium endowed with peculiar powers of movement. More knowledge with regard to the nature and formation of the flagellum is needed in order to decide this point, and particularly with regard to the question whether the flagella of Bacteria are of the same nature as those of Protozoa.

It has been much debated whether the earliest forms of life were of the nature of plants or animals. Many authors consider the question settled beyond all debate by a process of trenchant deductive reasoning. It is argued that animals require other organisms for their nutriment, and that plants, that is to say green plants, do not; therefore plants must have preceded animals. On the other hand, the morphologist will urge that green plants derive their peculiar powers of metabolism from (he possession of very definite cell-organs, namely chromato- phores containing chlorophyll; and will argue that living things without such organs must have preceded in evolution those possessing them. The whole dispute is based on the assumption that plant and animal represent the two fundamental modes of metabolism; whereas the study of the Bacteria shows the possibility of many other modes of life. Many Bacteria exhibit processes of metabolism totally different from those generally laid down in textbooks as characteristic of living matter; some are killed by free oxygen; others can absorb free nitrogen, and various other " abnormal " properties are manifested by them. Hence the primitive organisms may have been neither plant nor animal in their nature, but may have possessed, like the Bacteria at present, many different' methods of metabolism from which plant and animal are two divergent paths of evolution.

The origin of life is veiled in a mist which biological knowledge

in its present state is unable to dispel; and speculations with regard to the nature of the earliest form of life are as yet premature and futile.

The following references are either general treatises on the Protozoa, or memoirs dealing with special points in a general manner.

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PROUDHON, PIERRE JOSEPH (1809-1865), French socialist and political writer, was born on the 15th of January 1809 at Besancon, France, the native place also of the socialist Fourier. His origin was of the humblest, his father being a brewer's cooper; and the boy herded cows and followed other simple pursuits of a like nature. But he was not entirely self-educated; at sixteen he entered the college of his native place, though his family was so poor that he could not procure the necessary books, and had to borrow them from his mates in order to copy the lessons. At nineteen he became a working compositor; afterwards he rose to be a corrector for the press, reading proofs of ecclesiastical works, and thereby acquiring a very competent knowledge of theology. In this way also he came to learn Hebrew, and to compare it with Greek, Latin and French; and it was the first proof of his intellectual audacity that on the strength of this he wrote an Essai de grammaire ginerale. As Proudhon knew nothing whatever of the true principles of philology, his treatise was of no value. In 1838 he obtained the pension Suard, a bursary of 1500 francs a year for three years, for the encouragement of young men of promise, which was in the gift of the academy of Besancon.

In 1839 he wrote a treatise L'Utilitedela calibration dudimanche which contained the germs of his revolutionary ideas. About this time he went to Paris, where he lived a poor, ascetic and studious life — making acquaintance, however, with the socialistic ideas which were then fomenting in the capital. In 1840 he published his first work Qu'est-ce que la propriety? His famous answer to this question, " La propriete, c'est le vol " (property is theft), naturally did not please the academy of Besancon,

and there was some talk of withdrawing his pension; but he held it for the regular period. For his third memoir on property, which took the shape of a letter to the Fourierist, M. Considerant, he was tried at Besancon but was acquitted. In 1846 he pub- lished his greatest work, the Systeme des contradictions Scono- miques ou philosophie de la misbre. For some time Proudhon carried on a small printing establishment at Besancon, but without success; afterwards he became connected as a kind of manager with a commercial firm at Lyons. In 1847 he left this employment, and finally settled in Paris, where he was now

becoming celebrated as a leader of innovation. He regretted the sudden outbreak of the revolution of February (1848), because it found the social reformers unprepared. But he threw himself with ardour into the conflict of opinion, and soon gained a national notoriety. He was the moving spirit of the ReprS- sentant du peuple and other journals, in which the most advanced theories were advocated in the strongest language; and as member of assembly for the Seine department he brought forward his celebrated proposal of exacting an impost of one- third on interest and rent, which of course was rejected. His attempt to found a bank which should operate by granting gratuitous credit was also a complete failure; of the five million francs which he required only seventeen thousand were offered. The violence of his utterances led to an imprisonment at Paris for three years, during which he married a young working woman. As Proudhon aimed at economic rather than political innovation, he had no special quarrel with the second empire, and he lived in comparative quiet under it till the publication of his work , De la Justice dans la revolution et dans VSglise, (1858) in which he attacked the Church and other existing institutions with unusual fury. This time he fled to Brussels to escape imprison- ment. On his return to France his health broke down, though he continued to write. He died at Passy on the 16th of January

1865.

Personally Proudhon was one of the most remarkable figures of modern France. His life was marked by the severest sim- plicity and even Puritanism; he was affectionate in his domestic relations, a most loyal friend, and strictly upright in conduct. He was strongly opposed to the prevailing French socialism of his time because of its utopianism and immorality; and, though he uttered all manner of wild paradox and vehement invective against the dominant ideas and institutions, he was remarkably free from feelings of personal hate. In all that he said and did he was the son of the people, who had not been broken to the usual social and academic discipline; hence his roughness, his one-sidedness, and his exaggerations; but he is always vigorous, and often brilliant and original.

It would of course be impossible to reduce the ideas of such an irregular thinker to systematic form. In later years Proudhon himself confessed that " the great part of his publications formed only a work of dissection and ventilation, so to speak, by means of which he slowly makes his way towards a superior conception of political and economic laws." Yet the groundwork of his teaching is clear and firm; no one could insist with greater emphasis on the demonstrative character of economic principles as understood by himself. He strongly believed in the absolute truth of a few moral ideas, with which it was the aim of his teach- ing to mould and suffuse political economy. Of these funda- mental ideas, justice, liberty and equality were the chief. What he desiderated, for instance, in an ideal society was the most perfect equality of remuneration. It was his principle that service pays service, that a day's labour balances a day's labour — in other words, that the duration of labour is the just measure of value. He did not shrink from any of the consequences of this theory, for he would give the same remuneration to the worst mason as to a Phidias; but he looks forward also to a period in human development when the present inequality in the talent and capacity of men would be reduced to an inappreciable minimum. From the great principle of service as the equivalent of service is derived his axiom that property is the right of aubaine. The aubain was a stranger not naturalized; and the right of aubaine was the right in virtue of which the sovereign, from the earliest monarchy, claimed the goods of such a stranger who had died in his territory. 1 Property is a right of the same nature, with a like power of appropriation in the form of rent, interest, &c. It reaps without labour, consumes without producing, and enjoys without exertion. Proudhon's aim, therefore, was to realize a science of society resting on principles of justice, liberty and equality thus understood; " a science absolute, rigorous, based on the nature of man and of his faculties,

1 The droit d' aubaine -was abolished in 1790, revived by Napoleon, and ended in 1819.

and on their mutual relations; a science which we have not to invent, but to discover." But he saw clearly that such ideas with their necessary accompaniments could only be realized through a long and laborious process of social transformation. He strongly detested the prurient immorality of the schools of Saint-Simon and Fourier. He attacked them not less bitterly for thinking that society could be changed off-hand by a ready- made and complete scheme of reform. It was " the most accursed lie," he said, " that could be offered to mankind." In social change he*

distinguishes between the transition and the perfection or achievement. With regard to the transition he advocated the progressive abolition of the right of aubaine, by reducing interest, rent, &c. For the goal he professed only to give the general principles; he had no ready-made scheme, no Utopia. The positive organization of the new society in its details was a labour that would require fifty Montesquieus. The organization he desired was one on collective principles, a free association which would take account of the division of labour, and which would maintain the personality both of the man and the citizen. With his strong and fervid feeling for human dignity and liberty, Proudhon could not have tolerated any theory of social change that did not give full scope for the free development of man. Connected with this was his famous paradox of anarchy, as the goal of the free development of society, by which he meant that through the ethical progress of men government should become unnecessary. " Government of man by man in every form," he says, " is oppression. The highest perfection of society is found in the union of order and anarchy." Proudhon, indeed, was the first to use the word anarchy, not in its revolutionary sense, as we understand it now, but as he himself says, to express the highest perfection of social organization.

Proudhon's theory of property as the right of aubaine is substantially the same as the theory of capital held by Marx and most of the later socialists. Marx, however, always greatly detested Proudhon and his doctrines, and attacked him violently in his Misere de la philosophic Property and capital are defined and treated by Proudhon as the power of exploiting the labour of other men, of claiming the results of labour without giving an equivalent. Proudhon's famous paradox, " La propriete, c'est le vol," is merely a trenchant expression of this general principle. As slavery is assassination inasmuch as it destroys all that is valuable and desirable in human personality, so property is theft inasmuch as it appropriates the value produced by the labour of others without rendering an equivalent. For property Proudhon would substitute individual possession, the right of occupation being equal for all men.

A complete edition of Proudhon's works, including his posthumous writings, was published at Paris (1875). See also P. J. Proudhon, sa vie et sa correspondance, by Sainte-Eeuve (Paris, 1875) ; BeaucheYy, Hconomie sociale de P. J. Proudhon (Lille, 1867) ; Spoil, P. J. Proud-hon,ctudebiographique(Pans,l86y); Marchegay /Silhouette de Proudhon (Paris, 1868); Putlitz, P. J. Proudhon, sein Leben und seine positiven Ideen (Berlin, 1881); Diehl, P. J. Proudhon, seine Lehre und sein LebenQena, 1888-1889); Mulberger, Studien uber Proudhon(Stuttga.rt, 1 891); Desjardins, P. J. Proudhon, sa vie, ses ceuvres et sa doctrine (Paris, 1896); Mulberger, P. J. Proudhon (Stuttgart, 1899).

PROUST, ANTONIN (1832-1905), French journalist and politician, was born at Niort on the 15th of March 1832. He founded in 1864 an anti-imperial journal, La Semaine hebdomadaire which appeared at Brussels. He was war correspondent to Le Temps in the early days of the Franco-German War, but after Sedan he returned to Paris, where he became secretary to Gambetta and superintended the refugees in Paris. He entered the Chamber as deputy for his native town in 1876, taking his seat on the left. In Gambetta's cabinet (1881-1882) he was minister of the fine arts, and in the Chamber of Deputies he was regularly commissioned to draw up the budget for the fine arts, after the separate department had ceased to exist. Prosecuted in connexion with the Panama scandals, he was acquitted in 1893. From this time he lived in the closest retirement. On the 20th of March 1905 he shot himself in the head, dying of the wound two days later.

PROUST, JOSEPH LOUIS (1754-1826), French chemist, was born on the 26th of September 1754 at Angers, where his father was an apothecary. After beginning the study of chemistry in his father's shop he came to Paris and gained the appointment of apothecary in chief to the Salpetriere, also lecturing on chemistry at the musee of the aeronaut J. F. Pilatre de Rozier, whom he accompanied in a balloon ascent in 1 784. Next, at the instance of Charles IV., he went to Spain, where he taught chemistry first at the artillery school of Segovia, and then at Salamanca, finally becoming in 1789 director of the royal laboratory at Madrid. In 1808 he lost both his position and his money by the fall of his patron, and retired first to Craon in Mayenne and then to Angers, where he died on the 5th of July 1826. His name 'is best known in connexion with a long controversy with C. L. Berthollet. The latter chemist was led by his doctrine of mass-action to deny that, substances always combine in constant and definite proportions.. Proust, on the other hand, maintained that compounds always contain definite quantities of their con- stituent elements, and that in cases where two or more elements unite to form more than one compound, the proportions in which they are present vary per saltum, not gradually. In 1799 he proved that carbonate of copper, whether natural or artificial, always has the same composition, and later he showed that the two oxides of tin and the two sulphides of iron always contain the same relative weights of their components and that no intermediate indeterminate compounds exist. His analytical skill enabled him to demonstrate the inaccuracy of the researches by which Berthollet attempted to support the opposite view, and to show among other things that some of the compounds which Berthollet treated as oxides were in reality hydrates containing chemically combined water, and the upshot was that by 1808 he had fully vindicated his position. Proust also investigated the varieties of sugar that occur in sweet vegetable juices, distinguishing three kinds, and he showed

that the sugar in grapes, of which he announced the existence to his classes at Madrid in 1799, is identical with that obtained from honey by the Russian chemist J. T. Lowitz (1757-1804).

Besides papers in scientific periodicals he published Indagaciones sobre el estanada de cobre, la vajilla de estano y el vidriado (1803); Mimoire sur le sucre de raisins (1808); Recueil des memoir es relatifs a la poudre a canon (1815) ; and Essai sur une- des causes qui peuvent amener la formation du calcul (1824).

PROUSTITE, a mineral consisting of silver sulpharsenite, Ag_3AsS_3, known also as light red silver ore, and an important source of the metal. It is closely allied to the corresponding sulphantimonite, pyrargyrite, from which it was distinguished by the chemical analyses of J. L. Proust in 1804, after whom the mineral received its name. Many of the characters being so similar to those of pyrargyrite (q.v.) they are mentioned under that species. The prismatic crystals are often terminated by the scalenohedron {201} and the obtuse rhombohedron {no}, thus resembling calcite (dog-tooth-spar) in habit. The colour is scarlet-vermilion and the lustre adamantine; crystals are trans- parent and very brilliant, but on exposure to light they soon become dull black and opaque. The streak is scarlet, the hardness 25, and the specific gravity 5-57. The mode of occur- rence is the same as that of pyrargyrite, and the two minerals are sometimes found together. Magnificent groups of large crystals have been found at Chanarcillo in Chile; other localities which have yielded fine specimens are Freiberg and Marienberg in Saxony, Joachimsthal in Bohemia and Markirch in Alsace. (L. J. S.)

PROUT, SAMUEL (1783-1852), English water-colour painter, was born at Plymouth on the 17th of September 1783. He spent whole summer days, in company with the ill-fated Havdon, in drawing the quiet cottages, rustic bridges and romantic water- mills of the beautiful valleys of Devon. He even made a journey through Cornwall to try his hand in furnishing sketches for Britton's Beauties of England. On his removal in 1803 to London, which became his headquarters after 1812, a new scene of activity opened up before Prout. He now endeavoured to

correct and improve his style by the study of the works of the rising school of landscape. To gain a living he painted marine pieces for Palser the printseller, received pupils, and published many drawing books for learners. He was likewise one of the first who turned to account in his profession the newly-invented art of lithography. It was not however until about 18 18 that Prout discovered his proper sphere. Happening at that time to make his first visit to the Continent, and to study the quaint streets and market-places of continental cities, he suddenly found himself in a new and enchanting province of art. All his faculties, having found their congenial element, sprung into unwonted power and activity. His eye readily caught the pictur- esque features of the architecture, and his hand recorded them with unsurpassed felicity and fine selection of line. The com- position of his drawings was exquisitely natural; their colour exhibited " the truest and happiest association in sun and shade"; the picturesque remnants of ancient architecture were rendered with the happiest breadth and largeness, with the heartiest perception and enjoyment of their time-worn ruggedness; and the solemnity of great cathedrals was brought out with striking effect. At the time of his death, on the 10th of February 1852, there was scarcely a nook in France, Germany, Italy and the Netherlands where his quiet, benevolent, observant face had not been seen searching for antique gables and sculptured pieces of stone. In Venice especially there was hardly a pillar which his eye had not lovingly studied and his pencil had not dexterously copied.

See a memoir of Prout, by John Ruskin, in Art Journal for 1849, and the same author's Notes on the Fine Art Society's Loan Collection of Drawings by Samuel Prout and William Hunt (1879-1880).

PROUT, WILLIAM (1785-1850), English chemist and physi- cian, was born at Horton, Gloucestershire, on the 15th of January 1785, and died in London on the 9th of April 1850. His life was spent as a practising

physician in London, but he also occupied himself with chemical research. He was an active worker in physiological chemistry, and carried out many analyses of the products of living organisms, among them being one of the gastric juice which, at the end of 1823, resulted in the notable discovery that the acid contents of the stomach contain hydro- chloric acid which is separable by distillation. In 1815 he published anonymously in the Annals of Philosophy a paper " On the relation between the specific gravities of bodies in their gaseous state and the weights of their atoms," in which he calculated that the atomic weights of a number of the elements are multiples of that of hydrogen; and in a second paper pub- lished in the same periodical the following year he suggested that the xpcorTj vKrj of the ancients is realized in hydrogen, from which the other elements are formed by some process of condensation or grouping. This view, generally known as " Prout's hypothesis," at least had the merit of stimulating inquiry, and many of the most careful determinations of atomic weights undertaken since its promulgation have been provoked by the desire to test its validity.

PROVENCAL LANGUAGE. The name Provencal is used to comprehend all the varieties of Romanic speech formerly spoken and written, and still generally used by country people in the south of France. The geographical limits of this infinitely varied idiom cannot be defined with precision, because it is conterminous on the north, south and east with idioms of the same family, with which almost at every point it blends by insensible gradations. Roughly speaking it may be said to be contained between the Atlantic on the west, the Pyrenees and Mediterranean on the south, and the Alps on the east, and to be bounded on the north by a line proceeding from the Gironde to the Alps, and passing through the departments of Gironde, Dordogne, Haute Vienne, Creuse, Allier, Loire, Rhone, Isere and Savoie. These limits are to some extent conventional. True, they are fixed in accordance with the mean of linguistic char- acters; but it is self-evident that according to the importance attached to one character or another they may be determined differently.

1. Different Names. — Though the name Provencal is generally

adopted to designate the Romanic idiom of this region, it must not be supposed that this name has been imposed by general consensus, or that it rests upon any very firm historical basis. In the southern part of Gaul, Romanic developed itself, so to say, in the natural state of language. Contrary to what took place in other Romanic countries, no local variety here raised itself to the rank of the literary idiom par excellence. While in Italy the Florentine, in France the French dialect proper (that is to say, the dialect of the lie de France), succeeded little by little in monopolizing literary use, to the exclusion of the other dialects, we do not find that either the Marseillais or the Toulousain idiom was ever spoken or written outside

of Marseilles or Toulouse. In consequence of this circumstance, no name originally designating the language of a town or of a small district came to be employed to designate the language of the whole of southern France; and on the other hand the geogra- phical region described above, having never had any special name, was not able to give one to the idiom.

In the middle ages the idiom was spoken of under various appellations: Romans or lenga romana was that most generally used. The name was employed by the authors of the Leys d 'amors, a treatise on grammar, poetry and rhetoric, composed at Toulouse in the 14th century. But while it is capable of being applied and in fact, has been applied, to each of the Romanic languages individually, the term is too general to be retained in a particular case; though it was revived in the beginning of the 19th century by Raynouard, the author of the Lexique roman. Roman or langue romane is no longer in use among scholars to design the Romanic language of the south of France. In the 13th century a poet born in Catalonia, on the southern slope of the Pyrenees, Raimon Vidal of Besalu, introduced the name of Limousin language, probably on account of the great reputation of some Limousin troubadours; but he took care to define the expression, which he extended beyond its original meaning, by saying that in speaking of Limousin he must be understood to include Saintonge, Quercy, Auvergne, &c. (Rasos de trobar, ed. Stengel, p. 70). This expression found favour in Spain, and especially in Catalonia, where the little treatise of Raimon Vidal was extensively read. The most ancient lyric poetry of the Catalans (13th and 14th centuries), composed on the model of the poetry of the troubadours, was often styled in Spain poesia lemosina, and in the same country lengua lemosina, long designated at once the Provencal and the old literary Catalan. The name Provencal as applied to language is hardly met with in the middle ages, except in the restricted sense of the language of Provence proper, i.e. of the region lying south of Dauphine on the eastern side of the Rhone. Raimon Feraut, who composed about 1300, a versified life of St Honorat, uses it, but he was himself a native of Provence. We can also cite the title of a grammar, the Donatz proensals, by Hugh Faidit (about 1250); but this work was composed in north Italy, and we may con- ceive that the Italians living next to Provence employed the name Provencal somewhat vaguely without inquiring into the geographical limits of the idiom so called. In fact, the name Provencal became traditional in Italy, and in the beginning of the 1 6th century Bembo could write, " Era per tutto il Ponente la favella Provenzale, ne tempi ne quali ella fiori, in prezzo et in istima molta, et tra tutti gli altri idiomi di quelle parti, di gran lunga primiera. Conciosiacosa che ciascuno, o Francese, o Fiamingo, o Guascone, o Borgognone, o altramente di quelle nationi che egli si fosse, il quale bene scrivere e special- mente verseggiar volesse, quantunque egli Provenzale non fosse, lo faceva Provenzalmente " (Prose,

ed. 1529, fol. viii.). 1 This passage, in which the primacy of the Provencal tongue is manifestly exaggerated, is interesting as showing the name Provencal employed, though with little precision, in the sense in which we now apply it.

1 " The Provencal speech in the times in which it nourished was prized and held in great esteem all over the West, and among all the other idioms of that region was by far the foremost; so that every one, whether Frenchman, Fleming, Gascon, Burgundian, or of what nation soever, who wished to write and versify well, although he was not a Provencal, did it in the Provencal language."

Another designation, which is supported by the great authority of Dante, is that of lingua d'oco (langue d'oc). In his treatise, De vulgari eloquio (bk. i. chs. viii. and ix.), Dante divides the languages of Latin origin into three idioms, which he characterizes by the affirmative particles used in each, oc. oil, si; " nam alii oc, alii oil, alii si, afnrmando loquuntur, ut puta Hispani, Franci, et Latini." As is seen, he attributes the affirmation oc to the Spaniards, which is of course erroneous; but there is no doubt that to the Spaniards he joined more correctly the inhabitants of southern France, for in the Vita nuova, ch. xxv., and in the Convivio, I. x., he speaks of the lingua d'oco as having been long celebrated for its poets, which can apply only to the language of the troubadours. The name langue d'oc occurs also as early as the end of the 13th century, in public acts, but with a different sense, that of the province of Languedoc, as constituted after the union of the county of Toulouse to the French king's dominion in 1 271. In the royal acts of the end of the 13th and of the 14th century partes linguae occitanae ox pays de langue d'oc designates the union of the five seneschalates of Perigueux, Carcassone, Beaucaire, Toulouse and Rodez; that is to say, the province of Languedoc, such as it existed till 1790. Some scholars, following the example of Dante, still actually use the term langue d'oc in opposition to langue d'oui; but these names have the inconvenience that they take such a secondary fact as the form of the affirmative particle as an essential character. Moreover, it can hardly help to distinguish the other Romanic languages, as langue de si would cause a confusion between Italian and Spanish. Provencal, without being entirely satis- factory, since in principle it applies solely to the language of Provence, is, notwithstanding, the least objectionable name that can be adopted. In addition to its being in some sort conse- crated by the use made of it by the Italians, who were the first after the Renaissance to study the works of the troubadours, it must not be forgotten that, just as the Roman provincia, in

which the name originated, extended across the south of Gaul from the Alps to Toulouse and the Pyrenees, so still in the middle ages provincia, provinciales, were understood in a very wide sense to designate not only Provence strictly so called, i.e. the present departments of Alpes Maritimes, Basses Alpes, Var, Bouches du Rhone, but also a very considerable part of Languedoc and the adjacent countries. Thus in the 12th century the chronicler Albert of Aix-la-Chapelle (Albertus Aquensis) places the town of Puy (Ha'ute Loire) in Provincia.

2. General Characters of the Language in its Ancient State. — The Provencal language, within the limits above indicated, cannot be said to have any general characters really peculiar to it. Such of its characters as are found in all the varieties of the language are met with also in neighbouring idioms; such as are not found elsewhere are not general characters, that is to say, are manifested only in certain varieties of Provencal. In reality " Provencal language " does not designate, properly speaking, a linguistic unity; it is merely a geographical expression.

Tonic or Accented Vowels. — Latin a is preserved in an open syllable a m a r e, amar, a m a t u m, amat, as well as in a closed syllable c a r n e m, earn. This character is common also to the Romanic of Spain and Italy; but it is one of the best distinguishing marks between Provengal and French, for, to the north, this a, when in an open syllable, does not pass beyond a line which would run approximately through Blaye, Coutras (Gironde), Riberac, Nontron (Dordogne), Bellac (Haute Vienne), Boussac (Creuse), Montlugon, Gannat (Allier), Montbrison (Loire). Starting eastward from Lyons or thereabouts, there appears a notable linguistic fact which is observable in varied proportions in the departments of Ain, Isere and Savoie, and in Romanic Switzerland. This is, that accented Latin a in an open syllable, when preceded by a mouillure or palatalization (whatever the origin of this), becomes e\ on the contrary, when there is no mouillure, it remains a. Thus we find in the Meditations of Marguerite d'Oingt (Lyons, c. 1300) ensennier, deleitier, as against desirrar, recontar, regardar. Of these two endings, the former, -ter, is that which is found regularly in French, the second that which is regular in Pr. Pure Pr. would have -ar in both cases (ensenhar, deleitar, desirrar. &c.) ; Fr. would have -ier (enseignier, delitier) and er (desirer). G. I. Ascoli has given the name of Franco bromnqal (franco-provenzale) to the varieties of Romanic in which we rind this duality of treatment in Latin a, according as it was or was

not preceded by a palatalized sound. Lat. e, 1 become close e (Ital. e chiuso ; Fr. e) : h a b e r e, aver, credit, ere, m e(n)s e m, mes, f 1 d e m, fe, p 1 1 u m, pel. This character is not only common to Italian and Spanish, but also extends over the French domain on its western side as far as Britanny. Certain exceptions noticed in French do not occur in Pr. : thus

mercedem, c e r a, p r(e h)e- (n)s um, venenum, which give in Fr. merci, cire, pris, venin, where we should have expected mercei, ceire, preis, venein, give regularly in Pr. merce, cera, pres, vere. Lat. e preserves, as in Italy, the sound of open e (Ital. e aperto) : pedem, pe, levat, leva, 1 e p o r e m, lebre. In certain determinate cases, this e, from about the 13th century onwards, may diphthongize to ie: ego, eu, then ieu, h e r i, er, ier, f e r i o, fer, fier. Lat. t is preserved, as in all the Romanic languages: a m I c u m, ami, r I p a, riba. Lat. % is treated like i long when it precedes (with hiatus) another vowel: plum, p 5 a, piu, pia, via, via, 1 i g a t, lia. Lat. 0, u result in one and the. same sound, that of Ital. u, Fr. ou (Eng 00) The same pheno- menon takes place in the north of Italy and in the Romanic of Switzerland. This sound, which is styled by the Donat Proensal the o estreit (close 0), is usually symbolized in the early texts by simple 0, and is thus confounded in spelling, though not in pronun- ciation, with the open (0 larc of the Donat Proensal), which comes from Lat. 0. Lat. u becomes il (i.e. Fr. «), as all over France, and also in part of north Italy: mflrum, mur (= miir), durum, dur (= diir). Lat. au is rigorously preserved over the whole extent of the Pr. domain : a u r u m, aur, a 1 a u d a, alauza, pauperem, paubre. At present the preservation of Lat. au does not extend much outside the Prov. domain; it is, however, found in certain parts of the Ladina zone in Switzerland (upper Rhine valley), and in Friuli, and it is to be supposed to have been once general over the whole of that zone. It is attested as late as the 16th century in the Vaudois valleys of Piedmont, and there are also examples of it in old Catalan. Elsewhere the diphthong has regularly become open (a u r u m, Ital. and Span, oro. Fr. or, &c).

*Atonic Vowels. — The atonic vowels (i.e. vowels of the unaccented syllables) which precede the accented syllable present no very characteristic phenomenon ; but it is otherwise with those that follow the accented syllable, the post-tonic vowels. The Pr. is one of the Romanic idioms which, like the French, but unlike the Castilian and many dialects of Italy, admit of only one syllable after the accent. But the rules are not quite the same as in French, and in some exceptional cases real proparoxytones seem to have been preserved by ancient documents. In French the only vowel which can stand after the accented syllable is " e feminine," otherwise called " e mute." In Prov. a and e are the most frequent vowels in this position, but * and o also occur. In French the first of the two post- tonic vowels of a Latin proparoxytone always disappears ; in Prov. it tends to be preserved, when followed by one of the consonants n, r, I, d: t e-r m i n u m, te-rmen, h o-m i n e m, o-men, a-n g e 1 u m, a-ngel, s e-c a 1 e m, se-guel, c r e-s c e r e, crei-sser, t e – p idum, te-be. We have some instances of two syllables being retained after the tonic in the extreme south and south-east : dime-negue (dies dominica), cano-negue (canonic us), mo-negue, mo-nega (m o n a c u s, m o n a c a), ma-nega (m a n i c a, a handle), ca-nebe (cannabis), later*

dimergue, canorgue, morgue, morga, marga, carbe; however, when such apparently proparoxytonic forms appear in poetry, the ending -egue, -ega, -ebe counts only as one syllable, from which it appears that the copyist, not the author, is responsible for them. Again, names of places ending in -anicus, -onicus, as Colonicus, De-Athatianicus, Dominitianicus, &c, now Colorgues, Dassargues, Domessargues, in department Gard, appear in the 12th and 13th centuries as Colonegues, Dazanegues, Domensanegues. Moreover Prov. presents in certain words coming from Latin propar-oxytones the trace of forms which (like Italian) admitted two atonic vowels after the accented syllable: thus we have porte-que and po-rgue (poTticum), Fabre-ga, a place name, and fa-rga (fa-brica), perte-ga and pe-rga (pe-rtica), feme-na and fe-mna (f e-m i n a). We have also lagre-ma (1 a-c r y m a), but a form accented like Fr. larme does not exist. There seems to be no doubt that these forms, in which a displacement of the Latin accent is observed, were at an earlier period pronounced as proparoxytones (po-rtegue, fa .brega, pe.rtega e-mena, la-grema).

Consonants. — The boundary usually recognized between Prov. and French is founded upon linguistic characters furnished by the vowels, especially a; if it had been determined by. characters fur- nished by the consonants, the line of demarcation would have to be drawn farther south, because the consonantal system which is regarded as proper to French really extends in its main features over the northern zone of the Provencal region as defined above. As with the vowels, only a few of the salient facts can here be indicated. C initial, or second consonant of a group, before a (c a b.a llum.mercatu m), preserves its Latin sound (= k) in the greater part of the Prov. region. But in the northern zone it takes the sound of tch (Eng. ch in chin) as in Old French, and this sound is still pretty well preserved, although there is here and there a ten- dency to the present sound of ch in Fr. (— sh Eng.). The place names Castellum, Castanetum, Casale give Chastel. Chastanet, Chazal, in Dordogne, Haute Vienne, Correze, Puy de D6me, Cantal, Haute Loire, the north of Lozere, of Ardfiche, oi

Drome, of Isere, and of Hautes Alpes, and Castel, Castanet, Cazal, farther to the south. Analogously, g initial, or second consonant of a group, followed by a, becomes j (i.e. dzh = 0. Fr. and Eng. j in jam) in the same zone ; Garrica is Jarrija, Jarria in Dordogne, Correze, Cantal, Haute Loire, Isere, and Garriga farther south. Between two vowels I becomes d; edat, emperador, nodal, amada aetatem, imperatorem, natal e, amata). This was also the case in 0. Fr. until about the ioth or nth century (honurede, efnperedur, lavadures, &c, in the Life of St Alexis). But in the northern zone this d, representing a Latin t, fell away as early as in French. In an I

*ith-century text from the environs of Valence we read muraor, coroaa (*muratorem, corrogata), Fr. corvee (P. Meyer, Recueil d'anciens textes, Provengal section, No. 40). In the south, Latin d between two vowels was preserved almost everywhere until about the middle of the 12th century, when it became 2 (as in Fr. and Ertg. zero) : cruzel, azorar, auzir, vezer (crudelem, adorare, audire, videre). In the 14th and 15th centuries this 2, like every 2 or s soft of whatever origin, was liable to become r (lingual, not uvular) : aurir, veren (audire, v i d e n t e m). In Beam and Gascony d remained; but in the northern zone Latin d, instead of changing into 2, r, disappeared as in French and quite as early. The poem of Boethius, of which the MS. is of the nth century, shows in this respect great hesitation: e.g. d preserved in chaden, credet, tradar, veder (c a d e n t e m, *c r e d e- d it, *t r a d a r e, videre); d fallen away in creessen, feeltat, traazo, veUt, fiar (*c redessent, fidelitatem, *t r a- dationem, *v i d u t u m, p. pie. of v i d e r e, f i d a r e). One of the most general facts in Pr. is the habit of rejecting Latin final t, of which examples to any number are presented by the verbs. In French this t was formerly retained when it followed a vowel which remained, aimet, entret (a m a t, i n t r a t), and still remains (in writing at least) when, in Latin, it follows a consonant, aimenl, fait, vil (a m a n t, f a c i t, *f a c t, v i v i t, *v i v t) ; but in Pr. the t is dropped in all cases, even in the most ancient texts: aman, fai, viu. Yet in the northern zone we find the t retained in the 3rd per. pi. of verbs, -ant, -ont (Lat. -a n t, -u n t). H has gone completely (or at least only appears through orthographic tradition, and very intermittently, (h)erba, (h)onor, (h)umil, &c), not only in words of Latin origin, which is the case in Old French, but even in Teutonic words (anta, ardit, arenc, ausberc, elm, Fr. honte, hardi, hareng, haubert, heaume, with h aspirated). By this feature, the northern limits of which are not yet well determined, the Provencal attaches itself to the Romanic of the southern countries. N final, or standing in Latin between two vowels of which the second is to be dropped, disappears in the whole central part of the Pr. domain: gran gra, ben be, en e, ven ve, fin ft, un u (g r a n u m, be n e, in, v e n i t, f i n e m, u n u m). The forms with n belong to the eastern part (left of the Rhone), the western part (Gascony, but not Beam), and the region of the Pyrenees. It is possible that this loss of n went along with a lengthening of final vowel ; at least, in Bearnese when the n falls away the vowel is doubled: caperaa, besii, boo (capellanum, vicinum, bonu m), &c.*

These are the most important characteristics of the consonants in relation to the extent of space over which they prevail. Others, which appear only within a more limited area, are perhaps more curious on account of their strangeness. It will suffice to mention a few which belong to the district bounded on the west and south by the Atlantic, the Basque provinces and the Pyrenees, and which extends northward and eastward towards the

Garonne and its affluents, as far as the Gironde. (This includes Beam, Bigorre and Gascony;) Here the sound v no longer exists, being replaced generally by 6; between two vowels, in Gascony, by u with the sound of English w. Initial r assumes a prosthetic a: arram, arre, Arrobert (r a m u m, r e m, R o b e r t u m). LI between two vowels becomes r: aperar, caperan, or (Beam) caperaa, bera, era (a p e 1- 1 a r e, capellanum, b e 1 1 a, ilia). On the contrary, at the end of words (viz. in Romanic) 11 becomes g or t, d; the former change seems to belong rather to Hautes and Basses Pyrenees, Landes, the latter to Gironde, Lot et Garonne, Gers: eg, ed, et (ille), arrasteg, -ed, -et(r a s t e 1 1 u m), casteg, -ed, -et (c a s t e 1 1 u m), capdeg, -ed, -et (c a p i t e 1 1 u m), whence Fr. cadet (in 16th century capdet, originally a Gascon word). For further details upon the consonants in this region of south-west France see Romania, iii. 435-43 8 , v. 368-369.

Flexion. — Old Provencal has, like Old French, a declension con- sisting of two cases for each number, derived from the Latin nomina- tive and accusative. In certain respects this declension is more in conformity with etymology in Provencal than in Old French, having been less influenced by analogy. The following are the types of this declension, taking them in the order of the Latin declensions.

(1) Words in -a coming from Latin 1st decl , increased by certain words coming from Latin neuter plurals treated in Prov. as feminine singulars; one form only for each number: sing, causa, pi. causas.

(2) Words of the Latin 2nd decl., with a few from the 4th ; two forms for each number: sing, subject cavals (cab all us), object caval (c a b a 1 1 u m) ; pi. subject caval (c a b a 1 1 i), object cavals (c a- b a 1 1 o s. (3) Words of Latin 3rd decl. Here there are three Latin types to be considered. The first type presents the same theme and the same accentuation in all the cases, e.g. c a n i s. The second

presents the same accentuation in the nominative singular and in the other cases, but the theme differs: c o-m e s, c o-m item. In the third type the accentuation changes: p e c c a-t o r, p e c c a- t 6-r e m. The first type is naturally confounded with nouns of the 2nd decl.: sing. subj. cans or cas, obj. can or ca. The second and third types are sometimes followed in their original variety; thus corns answers to co-mes, and co-mte to c o-m i t e m. But it has often happened that already in vulgar Latin the theme of the nominative singular had been refashioned after the theme of the oblique cases. They said in the nom. sing, heredis, parentis, p r i n c i p i s, for h eres, parens, princeps. Consequently the difference both of theme and of

accentuation which existed in Latin between nominative and accusative has disappeared in Pr. This reconstruction of the nominative singular after the theme of the other cases takes place in all Latin words in -as (except abbas), in those in -io, in the greater part of those in or, at least in all those which have an abstract meaning. Thus we obtain bontatz (b o n i t a t i s for b o n i t a s) and bontat (b o n i t a t e m),ciutatz (c i v i- t a t i s for c i v i t a s) and ciutat (c i v i t a t e m), amors (amoris for amor) and amor (a m o r e m). All present participles in the subject case singular are formed in this way upon refashioned Latin nominatives: amans (a m a n t i s for a m a n s), amant (a m a n- t e m). It is to be remarked that in regard to feminine nouns Pr. is more etymological than French. In the latter feminine nouns have generally only one form for each number: bonte for the subj. as well as for the obj. case, and not bontes and bonte; in Pr. on the contrary bontatz and bontat. Still, in a large number of nouns the original difference of accentuation between the nominative singular and the other cases has been maintained, whence there result two very distinct forms for the subjunctive and objective cases. Of these words it is impossible to give a full list here ; we confine ourselves to the exhibi- tion of a few types, remarking that these words are above all such as designate persons: a-bas aba-t, pa-stre pasto-r, sor soro-r, cantai-re cantado-r (cantator, -ore m), emperai-re emperad-or, bar baro-, compa-nh companho-, lai-re lairo- (latro, -o n e m). To this class belong various proper names: E-ble Eblo-, Gui Guio-, Uc Vgo-. A few have even come from the 2nd decl., thus Pei-res Peiro-, Pons Ponso-, Ca-rles, Carlo, the vulgar Latin types being P e t r u s, -6 n e m, Pontius, -o n e m, C a r o 1 u s, -o n e m., (On this peculiarity of the vulgar Latin declension, see Philipon, in Romania, xxxi. 213-228.) We may mention also geographical adjectives, such as Bret Breto-, Bergo-nhz Bergonho- , Gasc Gasco-, &c. The plural of the 3rd decl. is like that of the second : subj. aba-t, soro-r, cantado-r, emperado-r, baro-, companho-, lairo- ; obj. aba-tz, soro-rs, cantado-rs, emperado-rs, baro-s, companho-s, lairo-s, as if the Latin nominative pi. had been abbati, sorori, cantator i, &c. It is barely possible that such forms actually existed in vulgar Latin; no trace of them, however, is found in the texts, save in the glosses of Cassel (8th century), s a p i e n t i for sapientes, and in a great many ancient charters p a r e n t o- r u m, which implies a nominative p a r e n t i. The words of the 4th and 5th declensions present no points requiring mention here.

This declension of two cases is a notable character of the whole Romanic of Gaul, north as well as south, i.e. French as well as Provencal. It must be noted, however, that in the south-west it existed only in a very restricted measure. In the old texts of Gascony it is no longer general in the 13th century. In Beam it appears to have been completely unknown, the nouns and adjectives having only one form, usually that of the objective case. In

Catalan poetry its application is often laid down in the 13th century, but as the charters and documents free from literary influence show no trace of it, its introduction into the poetry of this country may be assumed to be an artificial fact. In the region where it is best observed, i.e. in the centre and north of the Provencal territory, it tends to disappear from ordinary use already in the 13th century. The poet-grammarian Raimon Vidal of Besalu, who flourished about the middle of the century, points out in various troubadours transgressions of the rules of declension, and recognizes that in colloquial speech they are no longer observed. The general tendency was to retain only a single form, that of the objective case. For certain words, however, it was the subjunctive form which sur- vived. Thus in modern Pr. the words in the ending -ai-re (answering to Lat. -a t o r) are as frequent as those in adou (repr. – a t o r e m). But there is a slight difference of meaning between these two suffixes.

Adjectives, generally speaking, agree in flexion with the nouns. But there is one fact particular to adjectives and past participles which is observed with more or less regularity in certain 12th and 13th-century texts. There is a tendency to mark more clearly than in the substantives the flexion of the subj. pi., chiefly when the adjec- tive or participle is employed predicatively. This is marked by the addition of an i, placed, according to the district, either after the final consonant, or else after the last vowel so as to form a diphthong with it. The following are examples from an ancient translation of the New Testament (MS. in library of the Palais Saint-Pierre, Lyons, end of 13th century) ; " Die a vos que no siatz consirosi " (ne solliciti sitis, Matt. vi. 25) ; " que siatz visti d'els " (ut videamini ab eis, Matt. vi. 1) ; " e davant los reis els princeps seretz menadi " (et ad praesides et ad reges ducemini, Matt. x. 18). In charters of

the 12th and 13th centuries we find in the subj. case pi., and especially in this predicative use, pagaig, certifiaih, acossailhaih, representing pagati, certificati, adconsiliati.

A similar peculiarity is noticeable also in masculine substantives, but appears only in a very limited number of texts; so auzil, auzelh [Lat. a v i c e 1 1 i] (see A. Thomas, in Romania, xxxiv. 353).

It is in the verbs that the individuality of the different Romanic idioms manifests itself most distinctly. At a very early date the etymological data were crossed, in various directions and divers manners according to the country, by analogical tendencies. The local varieties became little by little

so numerous in the Romanic conjugation that it is not easy to discover any very characteristic features observed over a territory so vast as that of which the limits have been indicated at the commencement of this article. The following are, however, a few.

*The infinitives are in -ar, -er, -re, -ir, corresponding to the Lat. -are, -ere, -ere, -ire, respectively; as in the whole Romanic domain, the conjugation in -ar is the most numerous. The table of verbs, which forms part of the Pr. grammar called the Donatz Proensals (13th century), contains 473 verbs in -ar, 101 in -er and -re, 115 in -ir. In the ar conjugation we remark one verb from another conjugation: far (cf. Ital. fare) from f a c e r e. The con jugations in -er and -re encroach each upon the territory of the other. The three Lat. verbs cadere, caper e, sapere have become -er verbs (caze-r, cabe-r, sabe-r) as in Fr. cheoir, -cevoir (recevoir), savoir; and several other verbs waver between the two: crede-r, creer, and crei-re (credere), quere-r and que-rre (q u a e- rere). This fluctuation is most frequent in the case of verbs which belonged originally to the -ere conjugation: arde-r and a-rdre, plaze-r and plai-re, taze-r and tai-re (a r d e r e, p 1 a c e r e, t ace re). Next to the -ar conjugation, that in -ir is the one which has preserved most formative power. As in the other Romanic languages, it has welcomed a large number of German verbs, and has attracted several verbs which etymologically ought to have belonged to the conjugations in -er and -re: emplir im-plere), jauzir (g a u d e r e) , cosir (consuere), erebir (e r i – p e r e) , fugir (fugere), seguir (*sequere = sequi) also segre.*

Except in the -ar conjugation, the ending of the infinitive does not determine in a regular manner the mode of forming the different tenses. The present participles are divided into two series: those in -an (oh), sing.) for the first conj., those in -en for the others. In this the Pr. distinguishes itself very clearly from the French, in which all present participles have -ant. There is also in Pr. a participial form or verbal adjective which is not met with in any other Romanic language, except Rumanian, where, moreover, it is employed in a different sense; this is a form in -do-r, -doi-ra, which supposes a Latin type -torius, or-tiirius; the sense is that of a future participle, active for the intransitive verbs, passive for the transitive: endevenido-r, -doi-ra, "that is to happen"; fazedo-r, -doi-ra, " that is to be done "; punido-r, -doi-ra, " to be punished." In conjugation properly so called we may remark the almost com- plete disappearance of the Lat. preterite in avi, of which traces are found only in texts written in the neighbourhood of the French speaking region, and in Beam. In return, a preterite which seems to have been suggested by the Latin dedi, steti, has increased and become the type of the tense almost everywhere in the -ar conjugation, and in many verbs in -er and re: amei, ame-st, ame-t, ame-m, ame-tz, ame-ron. In French there is a form like this, or at least having the same origin, only in a small number of verbs, none of which belong to the

first conjugation, and in these only in the 3rd pers. sing, and pi. (perdiet, perdierent; entendiet, entendierent, &c). It is well known that reduplicated preterites had greatly multiplied in vulgar Latin : there have been recovered such forms as a s c e n- diderat, ostendedit, pandiderunt, adtendedit incendiderat, &c. (see Schuchardt, Vokalismus des Vulgar- lateins, i. 35, iii. 10; cf. Romania, ii. 477). But, in order to explain the Pr. form -ei, -est, -et (with open e) , we must suppose a termination not in – 1 d i or – e d i, but in – e-d i. In the western region the 3rd

f>ers. sing, is generally in -ec, probably by analogy with preterites ike bee, crec, dec, sec, formed after the Latin type in – u i. Another notable peculiarity, of which Old French shows only rare traces, in texts of a very remote period, is the preservation of a preterite in -ara or -era, derived from the Latin pluperfect, ama-ra or ame-ra, " I loved." The former, which is rare, comes directly from Lat. a m a r a m , the latter has been influenced by the ordinary preterite in -ei. This preterite is used with the sense of a simple past, not of a pluperfect, and consequently is an exact doublet of the ordinary preterite, which explains how it was at length eliminated almost everywhere by the latter, of which it was a mere synonym. But it remained in general use with the sense of a past conditional: ama-ra or ame-ra, " I should have loved," fora, " I should have been."

3. Modern Provencal. — In consequence of political circum- stances the Provencal ceased to be used for administrative as well as literary purposes about the 15th century, in some places a little sooner, in others later (notably in Beam, where it con- tinued to be written as the language of ordinary use till the 17th, and even in some places till the 18th century) . The poems in local

dialect composed and printed in the 16th century, and on to our own day, have no link with the literature of the preceding period. Reduced to the condition of a patois, or popular dialect simply, the idiom experienced somewhat rapid modifications. Any one who should compare the poems of Goudelin of Toulouse (1579-1649) with those of a Toulousain troubadour of the 13th century would be astonished at the changes which the language has undergone. Yet this impression would probably be exag- gerated. In order to make a rigorously accurate comparison of the language at the two epochs, it would have to be written in the two cases with the same orthographic system, which it is not. The first writers of Provencal, about the 10th and nth century, applied to the language the Latin orthography, pre- serving to each letter, as far as possible, the value given to it in the contemporary pronunciation of Latin. To express certain sounds which did

not exist in Latin, or which were not there clearly enough noted, there were introduced little by little, and without regular system, various conventional sym- bolizations such as Ih and nh to symbolize the sound of I and n mouillees. From this method of proceeding there resulted an orthographic system somewhat wanting in fixity, but which from its very instability lent itself fairly well to the variations which the pronunciation underwent in time and locality. But, the tradition having been interrupted about the 15th century, those who afterwards by way of pastime attempted composition in the patois formed, each for himself apart, an orthography of which many elements were borrowed from French usage. It is evident that differences already considerable must be exaggerated by the use of two very distinct orthographical systems. Nevertheless, even if we get quit of the illusion which makes us at first sight suppose differences of sound where there are merely different ways of spelling the same sound, we find that between the 14th and 16th centuries the language underwent everywhere, Beam excepted, great modifications both in vocabulary and grammar. The Provencal literature having gradually died out during the 14th century, the vocabu- lary lost rapidly the greater part of the terms expressing general ideas or abstract conceptions. To supply the place of these, the authors who have written in the patois of the south during the last few centuries have been obliged to borrow from French, modifying at the same time their form, a multitude of vocables which naturally have remained for the most part unintelligible to people who know only the patois. In this case the adoption of foreign words was excusable; but it did not stop here. Little by little, as primary instruction (now compulsory) was diffused, and introduced, first in the towns and afterwards in the villages, certain knowledge of French, words purely French, have been introduced into use in place of the corresponding dialect words. Thus, one hears constantly in Provence pe-ro, mi-ro, fre-ro, forms adapted from French, instead of paire, maire, fraire, cacha {catsha- =Fr. cacher) instead of escoundre, &c.

In the phonology, the modifications are of the natural order, and so have nothing revolutionary. The language has developed locally tendencies which certainly already existed during the flourishing period, although the ancient orthography did not recognize them. Of the vowels, a tonic is generally preserved ; an in an open syllable becomes (open) in part of the departments of Aveyron, Lot, Dordogne, Correze, Cantal and south of Haute Loire : gro (g r a- n u m), mo (manum), po (p a n e m). This nasalized a must have had a particular sound already in O. Pr., for it is qualified in the Donatz Proensals (ed. Stengel, p. 49) as a estreit (= close or narrow a). A feature almost general is the passage of post-tonic a into 0: terro, amavo, amado (terra, amab.it, am at a). In many places, particularly in the east, examples of this change occur as early as the end of the 15th century. But even yet there are a few cantons, notably

Montpellier and its neighbourhood, and also Nice, where the ancient post-tonic a is preserved. It is remarkable that the Latin diphthong au, which had become simple o in almost all Romanic lands at the date of the most ancient texts, is to this day preserved with a very distinct diphthongal sound everywhere in the south of France.

In the morphology, the leading feature of modern Provengal is the ever greater simplification of grammatical forms. Not only have the two forms (nominative and objective) in each number, in nouns and adjectives, been reduced to one — this reduction manifested itself in ordinary use already in the 14th century — but in many places there no longer remains any distinction between the singular and

the plural. In a great part of the south ieu (e g o) does duty as an objective, me or mi being very restricted in use. In part of Dr6me it is the other way, mi being substituted in the nominative for ieu, which it has completely displaced. It is perhaps in conjugation that the greatest changes from the older form of the language are seen. Analogy, basing itself upon one or another much used form, has acted with immense force, tending to make general in the whole conjugation, without any regard to the original classes to which the various verbs belonged, certain terminations, chiefly those which were accented, and thus appeared to the popular instinct to have more significance. The result, if the tendency were carried the full length, would be the reduction of all the three conjugations to one. Perhaps before this point is reached the patois of the south will themselves have disappeared. As the endless modifications which the language undergoes, in vocabulary and grammar alike, develop themselves in different directions, and each over an area differently circumscribed, the general aspect of the language becomes more and more confused, without the possibility of grouping the endless varieties within dialectal divisions, there being hardly any case in which a certain number of phonetic or morphological facts present themselves within the same geographical limits. The custom has been adopted of roughly designating these varieties by the name of the ancient provinces in which they appear. Limousin (divided into High and Low Limousin), Marchese, Auvergnese, Gascon, Bearnese, Rouergat, Languedocian, Provencal, &c. ; but these divisions, though convenient in use, correspond to no actualities. Nimes and Montpellier are in Languedoc, and Aries and Tarascon are in Provence ; nevertheless the dialect of Nimes resembles that of Aries and Tarascon more than that of Montpellier. I

Texts.— For the history of the Provencal in all its varieties there are many more materials than for any other Romanic language, not excepting even Italian or French. The literary texts go back to the loth or nth century (see

below). For phonetic purposes many of these texts are of secondary value, because the MSS. in which they have reached us, and several of which, especially for the poetry of the troubadours, are of Italian origin, have altered the original forms to an extent which it is not easy to determine; but we possess a countless number of charters, coutumes, regulations, accounts, registers of taxation, which are worthy of absolute confidence — first, because these documents are in most cases original, and, secondly, because, none of the dialectical varieties having raised itself to the rank of the literary language, as happened in France with the central (Parisian) variety and in Italy with the Florentine, writers never had the temptation to abandon their own idiom for another. For a selection of that kind of documents see P. Meyer, Documents linguistiques du midi de la France (vol. i., 1909, in 8vo, containing the documents of Ain, Basses Alpes, Hautes Alpes, Alpes Maritimes). It is proper to add that Provencal possesses two ancient grammars of the 13th century (the earliest compiled for any Romanic idiom) — the Donatz proensals and Razos de trobar (see below, Provencal Literature). Although very short, especially the second, which is a collection of detached observations, they furnish valuable data. The 14th-century Leys d'amors presents the lan- guage in a somewhat artificial state — the written rather than the spoken language.

Bibliography: j. Ancient Condition. — There does not exist any comprehensive work upon the Provencal whence to obtain a precise idea of the history of the language at its different epochs. Diez's Grammatik der romanischen Sprachen is still the groundwork. It gives, especially in the 3rd ed. (1869-1872), the last revised by the author, the results of extensive researches conveniently arranged. But Diez had only a slender knowledge of the language in its present state, and in his time phonology had made little progress. The French translation of MM. G. Paris, A. Brachet and Morel-Fatio (Paris, 1873-1876) was to be completed by a supplementary volume, but this expedient had to be abandoned, it having been recognized that what was wanted was not a supplement but a general recast. Meyer-Liibke's Grammatik der romanischen Sprachen (Leipzig, 1890-1899; Fr. trans., with indexes, 1890-1906), though repre- senting a more advanced state of Romance philology, is marred by an unusual number of inaccuracies, and is of little use for the study of Provencal. The " Recherches philologiques sur la langue romane," and " Resume de la grammaire romane," published by Raynouard at the beginning of vol. i. of his Lexique roman (1838), are entirely out of date. The " Tableau sommaire des flexions provencales," published by K. Bartsch, in the Chrestomathie proven- cale, though much improved in later editions, is incomplete and often erroneous. Better is the introduzione grammaticale to V. Crescini's Manualetto provenzale (2nd ed., 1905). Grandgent's Outline of the Phonology and Morphology of Old Provencal (Boston, 1905) is also

to be recommended. But the actual state of our knowledge of ancient Provencal must be sought in a great number of scattered dissertations or monographs, which will be found especially in the Romania, the_ Revue de la societe pour V etude des langues romanes, and other periodicals, to which may be added some academic disser- tations published mainly in Germany, and the special studies upon the language of particular texts prefixed to editions of these. As to dictionaries, the Lexique roman, ou diclionnaire de la langue des troubadours, by Raynouard (6 vols. 8vo, Paris, 1 836-1 844), can always be used with advantage. It has been largely supplemented

by Professor E. Levy in his Provenzalisches Supplement-Worterbuch (5 vols., Leipzig, 1892-1910, stops actually at letter P). The numer- ous special vocabularies appended by editors to texts published by them cannot be neglected. These yield a considerable number of words, either wanting or wrongly explained in the Lexique roman. 2. Modern Form. — The most useful grammatical works (all done with insufficient knowledge of phonology, and under the precon- ceived idea that there exist dialects with definite circumscription) are J. B. Andrews, Essai de grammaire du dialecte mentonais [Men- tone] (Nice, 1878), see also his " Phonetique mentonaise," in Romania, xii. 394 ; Cantagrel, " Notes sur l'orthographie et la pronon- ciation languedocienne," prefixed to La Canson de la Lauseto, by A. Mir (Montpellier, 1876); Chabaneau, Grammaire limousine (Paris, 1876), referring especially to the variety of Nontron, in the north of Perigord (Dordogne) ; Constans, Essai sur I'histoire du sous- dialectedu Rouergue (Montpellier and Paris, 1880); Lespy, Grammaire bearnaise (2nd ed., Paris, 1880) ; A. Luchaire, Etudes sur les idiomes pyreneens de la region francaise (Paris, 1879); Moutier, Grammaire dauphinoise, dialecte de la vallee de la Drome (Montelimar, 1882) ; Ruben, " Etude sur le patois du Haut Limousin," prefixed to Poems by J. Foucaud, in ,the Limousin patois (Limoges, 1866). Far superior in every respect are Alfred Dauzat's essays on the language of North Auvergne: Phonetique historique du patois de Vinzelles (Paris, 1897), Morphologie du patois de Vinzelles (Paris, 1900), Geographie phonetique d'une region de la Basse Auvergne (Paris, 1906). As to dictionaries, we may mention, among others, Andrews, Vocabulaire francais-mentonais (Nice, 1877); Azais, Dictionnaire des idiomes romans du midi de la France (3 vols. 8vo, Montpellier, 1877) , taking for its basis the dialect of Beziers ; Chabrand and De Rochas d'Aiglun, Patois des Alpes Cottiennes et en particulier du Queyras (Grenoble and Paris, 1877) ; Couzinie, Dictionnaire de la langue romane-castraise (Castres, 1 850); Garcin, Nouveau diction- naire provencal-franc,ais (2 vols., Draguignan, 1841): Honnorat, Dictionnaire provencal-francaise (2 vols. 4to, Digne, 1846-1847), De Sauvages,

Dictionnaire languedocien-francais (new ed., 2 vols., Alais, 1820) ; Vayssier, Dictionnaire patois-francais du departement de I'Aveyron (Rodez, 1879). F. Mistral's Tresor dou Felibrige, ou dictionnaire provencal-francais (2 vols. 4to, 1880-1888) is the most complete of all. This dictionary takes as its basis the variety of Maillane (in the north of Bouches-du-Rh6ne), the author's native district, but gives, as far as possible, all the forms used in the south of France. It is by far the best of all the dictionaries of the southern dialects which have yet been published, and, to a great extent, will enable the student to dispense with all the others. (P. M.)

PROVENCAL LITERATURE. Provencal literature is much more easily defined than the language in which it is expressed. Starting in the nth and 12th centuries in several centres it thence gradually spiead out, first over the greater portion, though not the whole of southern France, and then into the north of Italy and Spain. It never felt the influence of the neigh- bouring literatures. At the time of its highest development (12th century) the art of composing in the vulgar tongue' did not exist, or was only beginning to exist, to the south of the Alps and the Pyrenees. In the north, in the country of French speech, vernacular poetry was in full bloom; but between the districts in which it had developed — Champagne, lie de France, Picardy and Normandy — and the region in which Provencal literature had sprung up, there seems to have been an inter- mediate zone formed by Burgundy, Bourbonnais, Berry, Touraine and Anjou which, far on in the middle ages, appears to have remained almost barren of vernacular literature. In ' its rise Provencal literature stands completely by itself, and in its development it long continued to be absolutely original. It presents at several points genuine analogies with the sister- literature of northern France; but these analogies are due principally to certain primary elements common to both and only in a slight degree to mutual reaction.

It must be inquired, however, what amount of originality could belong to any, even the most original, Romantic literature in the middle ages. In all Romanic countries compositions in the vernacular began to appear while the custom of writing in Latin was still preserved by uninterrupted tradition. Even during the most barbarous periods, when intellectual life was at its lowest, it was in Latin that sermons, lives of saints more or less apocryphal, accounts of miracles designed to attract pilgrims to certain shrines, monastic annals, legal documents, and contracts of all kinds were composed. When learning began to revive, as was the case in northern and central France under the influence of Charlemagne and later in the nth century, it was Latin literature which naturally received increased attention, and the Latin language was more then ever employed

in writing. Slowly and gradually the Romanic languages, especially those of France, came to occupy part of the ground formerly occupied by Latin, but even after the middle ages had passed away the parent tongue retained no small portions of its original empire. Consequently Romanic literatures in general (and this is especially true of Provencal, as it does not extend beyond the medieval period) afford only an incomplete representation of the intellectual development of each country. Those literatures even which are most truly national, as having been subjected to no external influence, are only to a limited extent capable of teaching us what the nation was. They were, in short, created in the interests of the illiterate part of the people, and to a considerable degree by men themselves almost devoid of literary learning. But that does not make them less interesting.

Origin. — It was in the nth century, and at several places in the extensive territory whose limits have been described in the foregoing account of the Provengal language, that Provencal literature first made its appearance. It took pretic form; and its oldest monuments show a relative perfection and a variety from which it may be concluded that poetry had already received a considerable development. The oldest poetic text, of which the date and origin are not surely determined, is said to be a Provencal burden (Fr. refrain) attached to a Latin poem which has been published (Zeitschriftfiir deutsche Philologie, 1881, p. 335) from a Vatican MS., written, it is asserted, in the 10th century. But it is useless to linger over these few words, the text of which seems corrupt, or at least has not yet been satisfactorily interpreted. The honour of being the oldest literary monument of the Provengal language must be assigned to a fragment of two hundred and fifty-seven decasyllabic verses preserved in an Orleans MS. and frequently edited and annotated since it was first printed by Raynouard in 181 7 in his Choix des poesies originates des troubadours. The writing of the MS. is of the first half of the nth century. The peculiari- ties of the language point to the north of the Provencal region, probably Limousin or Marche. It is the beginning of a poem in which the unknown author, taking Boethius's treatise De con- solatione philosophiae as the groundwork of his composition, adopts and develops its ideas and gives them a Christian colouring of which there is no trace in the original. Thus from some verses in which Boethius contrasts his happy youth with his afflicted old age he draws a lengthy homily on the necessity of laying up from early years a treasure of good works. The poem is consequently a didactic piece composed by a " clerk " knowing Latin. He doubtless preferred the poetic form to prose because his illiterate contemporaries were accustomed to poetry in the vulgar tongue, and because this form was better adapted to recitation; and thus his work, while a product of erudition in as far as it was an adaptation of a Latin treatise, shows that at the time when it was

composed a vernacular , poetry was in existence. A little later, at the close of the same century, we have the poems of William IX., count of Poitiers, dul'2 of Guienne. They consist of eleven very diverse strophic pieces, and were consequently meant to be sung. Several are love songs; one relates a bonne fortune in very gross terms; and the most important of all — the only one which can be approximately dated, being composed at the time when William was setting out for Spain to fight the Saracens (about n 19) — expresses in touching and often noble words the writer's regret for the frivolity of his past life and the apprehensions which oppressed him as he bade farewell, perhaps for ever, to his country and his young son. We also know from Ordericus Vitalis that William IX. had composed various poems on the incidents of his ill-fated expedition to the Holy Land in 1101. And it must further be mentioned that in one of his pieces {Ben voil que sapchon li plusor) he makes a very clear allusion to a kind of poetry which we know only by the specimens of later date, the partimen, or, as it is called in France, the jeu parti. William IX. was born in 1071 and died in 11 27. There is no doubt that the most prolific period of his literary activity was his youth. On the other hand there is no reason to believe that he

created the type of poetry of which he is to us the oldest represen- tative. It is easy to understand how his high social rank saved some of his productions from oblivion whilst the poems of his predecessors and contemporaries disappeared with the genera- tions who heard and sang them; and in the contrast in form and subject between the Boethius poem and the stanzas of William IX. we find evidence that by the 11 century Provencal poetry was being rapidly developed in various directions. Whence came this poetry? How and by whose work was it formed? That it has no connexion whatever with Latin poetry is generally admitted. There is absolutely nothing in common either in form or ideas between the last productions of classical Latinity, as they appear in Sidonius Apollinaris or Fortunatus, and the first poetic compositions in Romanic. The view which seems to meet with general acceptance, though it has not been distinctly formulated by any one, is that Romanic poetry sprang out of a popular poetry quietly holding its place from the Roman times, no specimen of which has survived — just as the Romanic languages are only continuations with local modifications of vulgar Latin. There are both truth and error in this opinion. The question is really a very complex one. First as to the form Romanic versification, as it appears in the Boethius poem and the verses of William IX., and a little farther north in the poem of the Passion and the Life of St Lcger (10th or nth century), has with all its variety some' general and permanent characteristics; it is rhymed, and it is composed of a definite number of syllables certain of which have the syllabic accent. This form has evident affinity with the rhythmic Latin versification, of which specimens exist from the close of the Roman Empire

in ecclesiastical poetry. The exact type of Romanic verse is not found, however, in this ecclesiastical Latin poetry; the latter was not popular. How- ever, it may be assumed that there was a popular variety of rhythmic poetry from which Romanic verse is derived.

Again, as regards the substance, the poetic material, we find nothing in the earliest Provencal which is strictly popular. The extremely personal compositions of William IX. have nothing in common with folk-lore. They are subjective poetry addressed to a very limited and probably rather aristocratic audience. The same may be said of the Boethius poem, though it belongs to the quite different species of edifying literature; at any rate it is not popular poetry. Vernacular compositions seem to have been at first produced for the amusement, or in the case of religious poetry, for the edification, of that part of lay society which had leisure and lands, and reckoned intellectual pastime among the good things of life. Gradually this class, intelligent, but with no Latin education, enlarged the circle of its ideas. In the 12th century, and still more in the 13th, historical works and popular treatises on contemporary science were composed for its use in the only language it understood; and vernacular literature continued gradually to develop partly on original lines and partly by borrowing from the literature of the " clerks. " But in the nth century vernacular poetry was still rather limited, and has hardly any higher object than the amusement or the edification of the upper classes. An aristocratic poetry, such as it appears in the oldest Provencal compositions, cannot be the production of shepherds and husbandmen; and there is no probability that it was invented or even very notably improved by William IX.

From what class of persons then did it proceed? Latin chroniclers of the middle ages mention as joculares, joculatores, men of a class not very .highly esteemed whose profession con- sisted in amusing their audience either by what we still call jugglers' tricks, by exhibiting performing animals, or by recita- tion and song. They are called joglars in Provencal, jouglers or jougleors in French. A certain Barnaldus, styled joglarius, appears as witness in 1058 to a charter of the chartulary of St Victor at Marseilles. In 1106 the act of foundation of a salva terra in Rouergue specifies that neither knight nor man-at- arms nor joculator is to reside in the village about to be created. These individuals— successors of the mimi and the thymelici of antiquity, who were professional amusers of the public — were

the first authors of poetry in the vernacular both in the south and in the

north of France. To the upper classes who welcomed them to their castles they supplied that sort of entertainment now sought at the theatre or in books of light literature. There were certain of them who, leaving buffoonery to the ruder and less intelligent members of the profession, devoted themselves to the composition of pieces intended for singing, and conse- quently in verse. In the north, where manners were not so refined and where the taste for warlike adventure prevailed, the jongleurs produced chansons de geste full of tales of battle and combat. In the courts of the southern nobles, where wealth was more abundant and a life of ease and pleasure was consequently indulged in, they produced love songs. There is probably a large amount of truth in the remark made by Dante in ch. xxv. of his Vita nuova, that the first to compose in the vulgar tongue did so because he wished to be understood by a lady who would have found it difficult to follow Latin verses. 1 And in fact there are love songs among the pieces by William of Poitiers; and the same type preponderates among the compositions of the troubadours who came immediately after him. But it is worthy of note that in all this vast body of love poetry there is no epithalamium nor any address to a marriageable lady. The social conditions of the south of France in the feudal period explain in great measure the powerful development of this kind of poetry, and also its peculiar characteristics — the profound respect, the extreme deference of the poet towards the lady whom he addresses. Rich heiresses were married young, often when hardly out of their girlhood, and most frequently without their fancy being consulted. But they seem after marriage to have enjoyed great liberty. Eager for pleasure and greedy of praise, the fair ladies of the castle became the natural patronesses of the mesnie or household of men-at-arms and jongleurs whom their husbands maintained in their castles. Songs of love addressed to them soon became an accepted and almost conventional form of literature; and, as in social position the authors were generally far below those to whom they directed their amorous plaints, this kind of poetry was always distinguished by great reserve and an essentially respectful style. From the beginning the sentiments, real or assumed, of the poets are expressed in such a refined and guarded style that some historians, over-estimating the virtue of the ladies of that time, have been misled to the belief that the love of the troubadour for the mistress of his thoughts was generally platonic and conventional.

The conditions under which Romanic poetry arose in the south of France being thus determined as accurately as the scarcity of documents allows, we now proceed to give a survey of the various forms of Provengal literature, chronological order being followed in each division. By this arrangement the wealth of each form will be better displayed; and, as it is rare in the south of France for the same person to distinguish himself in

more than one of them, there will be generally no occasion to introduce the same author in different sections.

Poetry of the Troubadours. — Though he was certainly not the creator of the lyric poetry of southern France, William, count of Poitiers, by personally cultivating it gave it a position of honour, and indirectly contributed in a very powerful degree to ensure its development and preservation. Shortly after him centres of poetic activity make their appearance in various places — first in Limousin and Gascony. In the former province lived a viscount of Ventadour, Eble, who during the second part of William of Poitiers's life seems to have been brought into relation with him, and according to a contemporary historian, Geffrei, prior of Vigeois, erat valde gratiosus in cantilenis. We possess none of his compositions; but under his influence Bernart of Ventadour was trained to poetry, who, though only the son of one of the serving-men of the castle, managed to gain the love of the lady of Ventadour, and when on the discovery of their amour he had to depart elsewhere, received a gracious

1 " E lo primo che comencio a dire sicome poeta volgare si mosse peroche voile fare intendere le sue parole a donna alia quale era malagevole ad intendere i versi latini."

welcome from Eleanor of Guienne, consort (from 1152) of Henry II. of England. Of Bernart's compositions we possess about fifty songs of elegant simplicity, some of which may be taken as the most perfect specimens of love poetry Provencal literature has ever produced. Bernart must therefore have been in repute before the middle of the 12th century; and his poetic career extended well on towards its close. At the same period, or probably a little earlier, flourished Cercamon, a poet certainly inferior to Bernart, to judge by the few pieces he has left us, but nevertheless of genuine importance among the troubadours both because of his early date and because definite information regarding him has been preserved. He was a Gascon, and composed, says his old biographer, " pastorals " according to the ancient custom {pastor elas a la uzansa antiga). This is the record of the appearance in the south of France of a poetic form which ultimately acquired large development. The period at which Cercamon lived is determined by a piece where he alludes very clearly to the approaching marriage of the king of France, Louis VII., with Eleanor of Guienne (1137). Among the earliest troubadours may also be reckoned Marca-brun, a pupil of Cercamon's, from whose pen we have about forty pieces, those which can be approximately dated ranging from 1135 to 1148 or thereabout. This poet has great origin- ality of thought and style. His songs, several of which are historical, are free from the commonplaces of their class, and contain curious strictures on the corruptions of the time.

We cannot here do more than enumerate the leading trouba- dours and briefly indicate in what conditions their poetry was developed and through what circumstances it fell into decay and finally disappeared: Peter of Auvergne (Peire d'Alvernha), who in certain respects must be classed with Marcabrun; Arnaut Daniel, remarkable for his complicated versification, the inventor of the sestina, a poetic form for which Dante and Petrarch express an admiration difficult for us to understand; Arnaut of Mareuil, who, while less famous than Arnaut Daniel, certainly surpasses him in elegant simplicity of form and delicacy of sentiment; Bertran de Born, now the most generally known of all the troubadours on account of the part he is said to have played both by his sword and his sirventescs in the struggle between Henry II. of England and his rebel sons, though the importance of his part in the events of the time seems to have been greatly exaggerated; Peire Vidal of Toulouse, a poet of varied inspiration who grew rich with gifts bestowed on him by the greatest nobles of his time; Guiraut de Borneil, lo maestre dels trobadors, and at any rate master in the art of the so-called " close " style (trobar clus), though he has also left us some songs of charming simplicity; Gaucelm Faidit, from whom we have a touching lament (planh) on the death of Richard Cceur de Lion; Folquet of Marseilles, the most powerful thinker among the poets of the south, who from being a troubadour became first a monk, then an abbot, and finally bishop of Toulouse (d. 1231).

It is not without interest to discover from what class of society the troubadours came. Many of them, there is no doubt, had a very humble origin. Bernart of Ventadour's father was a servant, Peire Vidal's a maker of furred garments, Perdigon's a fisher. Others belonged to the bourgeoisie: Peire d'Alvernha, for example, Peire Raimon of Toulouse, Elias Fonsalada. More rarely we see traders' sons becoming trouba- dours; this was the case with Folquet of Marseilles and Aimeric de Pegulhan. A great many were clerics, or at least studied for the Church, for instance, Arnaut of Mareuil, Hugh of Saint Circq (Uc de Saint Circ), Aimeric de Belenoi, Hugh Brunet, Peire Cardinal; some had even taken orders: the monk of Montaudon, the monk Gaubert of Puicibot. Ecclesiastical authority did not always tolerate this breach of discipline. Gui d'Uissel, canon and troubadour, was obliged by the injunction of the pontifical legate to give up his song-making. One point is particularly striking, the number of nobles (usually poor knights whose incomes were insufficient to support their rank) who became troubadours, or even, by an inferior descent, jongleurs: Raimon de Miraval, Pons de Capdoill, Guillem Azemar, Cadenet, Peirol, Raimbaut de Vacqueiras, and many more.

There is no doubt they betook themselves to poetry not merely for their own pleasure, but for the sake of the gifts to be obtained from the nobles whose courts they frequented. A very different position was occupied by such important persons as William of Poitiers, Raimbaut of Orange, the viscount of Saint Antonin, William of Berga and Blacatz, who made poetry for their own amusement, but contributed not a little, by thus becoming troubadours, to raise the profession.

The profession itself was entirely dependent on the existence and - prosperity of the feudal courts. The troubadours could hardly expect to obtain a livelihood from any other quarter than the generosity of the great. It will consequently be well to mention the more important at least of those princes who are known to have been patrons and some of them practisers of the poetic art. They are arranged approximately in geographical order, and after each are inserted the names of those troubadours with whom they were connected.

France. — Eleanor of Guienne, Bernart de Ventadour (Venta- dorn); Henry Curtmantle, son of Henry II. of England, Bertran de Born (?); Richard Cceur de Lion, Arnaut Daniel, Peire Vidal, Folquet of Marseilles, Gaucelm Faidit; Ermengarde of Narbonne (1143-1192), Bernart de Ventadour, Peire Rogier, Peire d'Alvernha; Raimon V., count of Toulouse (1143-1194), Bernart de Ventadour, Peire Rogier, Peire Raimon, Hugh Brunet, Peire Vidal, Folquet of Marseilles, Bernart de Durfort; Raimon VI., count of Toulouse (1 194-1222), Raimon de Miraval, Aimeric de Pegulhan, Aimeric de Belenoi, Ademar lo Negre; Alphonse II., count of Provence (1185-1209), Elias de Barjols; Raimon Berenger IV., count of Provence (1209-1245), Sordel; Barral, viscount of Marseilles (d. c. 1 192), Peire Vidal, Folquet de Marseilles; William VIII., lord of Montpellier (1172-1204), Peire Raimon, Arnaut de Mareuil, Folquet de Marseilles, Guiraut de Calanson, Aimeric de Sarlat; Robert, dauphin of Auvergne (1169- 1234), Peirol, Perdigon, Pierre de Maensac, Gaucelm Faidit; Guillaume du Baus, prince of Orange (1182-1218), Raimbaut de Vacqueiras, Perdigon; Savaric de Mauleon (1200-1230), Gaucelm de Puicibot, Hugh de Saint Circq; Blacatz, a Provencal noble (i20O?-i236), Cadenet, Joan d'Aubusson, Sordel, Guillem Figueira; Henry I., count of Rodez (1208-1222?), Hugh de Saint Circq; perhaps Hugh IV., count of Rodez (I222?-I274) and Henry II., count of Rodez (1274-1302), Guiraut Riquier, Folquet de Lunel, Serveri de Girone, Bertran Carbonel; Nunyo Sanchez, count of Roussillon (d. 1241), Aimeric de Belenoi; Bernard IV., count of Astarac (1249-1291), Guiraut Riquier, Amanieu de Sescas.

Spain. — Alphonse II., king of Aragon (1162-1196), Peire Rogier, Peire Raimon, Peire Vidal, Cadenet, Guiraut de Cabreira, Elias de Barjols, the monk of Montaudon, Hugh Brunet; Peter II., king of Aragon (1196-1213),

Raimon de Miraval, Aimeric de Pegulhan, Perdigon, Ademar lo Negre, Hugh of Saint Circq; James I., king of Aragon (1213-1276), Peire Cardinal, Bernart Sicart de Maruejols, Guiraut Riquier, At de Mons; Peter III., king of Aragon (1276- 1285), Paulet of Marseilles, Guiraut Riquier, Serveri de Girone; Alphonso IX., king of Leon (1138-1214), Peire Rogier, Guiraut de Borneil, Aimeric de Pegulhan, Hugh de Saint Circq; Alphonso X., king of Castile (1252-1284), Bertran de Lamanon, Bonifaci Calvo, Guiraut Riquier, Folquet de Lunel, Arnaut Plages, Bertran Carbonel.

Italy. — Boniface II , marquis of Montferrat (1 192-1207), Peire Vidal, Raimbaut de Vacqueiras, Elias Cairel, Gaucelm Faidit (?) ; Frederick II., emperor (1215-1250), Jean d'Aubusson, Aimeric de Pegulhan, Guillem Figueira; Azzo VI., marquis of Este (1196- 12 12), Aimeric de" Pegulhan, Rambertin de Buvalelli; Azzo VIII. , marquis of Este (1215-1264), Aimeric de Pegulhan.

The first thing that strikes one in this list is that, while the troubadours find protectors in Spain and Italy, they do not seem to have been welcomed in French-speaking countries. This, however, must not be taken too absolutely. Provencal poetry was appreciated in the north of France. There is reason to believe that when Constance, daughter of one of the counts of Aries, was married in 998 to Robert, king of France, she brought along with her Provencal jongleurs. Poems by trouba- dours are quoted in the French romances of the beginning of the 13th century; some of them are transcribed in the old collections of French songs, and the preacher Robert de Sorbon informs us in a curious passage that one day a jongleur sang a poem by Folquet of Marseilles at the court of the king of France. But in any case it is easy to understand that, the countries of the langue d'oui having a full developed literature of their own suited to the taste of the people, the troubadours generally

preferred to go to regions where they had less to fear in the way of competition.

The decline and fall of troubadour poetry was mainly due to political causes. When about the beginning of the 13th century the Albigensian War had ruined a large number of the nobles and reduced to lasting poverty a part of the south of France, the profession of troubadour ceased to be lucrative. It was then that many of those poets went to spend their last days in the north of Spain and Italy, where Provencal poetry had for more than one generation been highly esteemed. Following their example, other poets who were not natives of the south of France began to compose in Provencal, and this fashion continued till, about the middle of the 13th century, they gradually abandoned the foreign tongue in northern Italy, and somewhat later in Catalonia, and took to singing the same airs in the

local dialects. About the same time in the Provencal region the flame of poetry had died out save in a few places — Narbonne, Rodez, Foix and Astarac — where it kept burning feebly for a little longer. In the 14th century composition in the language of the country was still practised; but the productions of this period are mainly works for instruction and edification, translations from Latin or sometimes even from French, with an occasional romance. As for the poetry of the troubadours, it was dead for ever.

Form. — Originally the poems of the troubadours were intended , to be sung. The poet usually composed the music as well as the words; and in several cases he owed his fame more to his musical than to his literary ability. Two manuscripts preserve specimens of the music of the troubadours, but, though the subject has been recently investigated, we are hardly able to form a clear opinion of the originality and of the merits of these musical compositions. The following are the principal poetic forms which the troubadours employed. The oldest and most usual generic term is vers, by which is understood any composition intended to be sung, no matter what the subject. At the close of the 12th century it be- came customary to call all verse treating of love canso — the name vers being then more generally reserved for poems ori other themes. The sirventesc differs from the vers and the canso only by its sub- ject, being for the most part devoted to moral and political topics. Peire Cardinal is celebrated for the sirventescs he composed against the clergy of his time. The political poems of Bertran de Born are sirventescs. There is reason to believe that originally this word meant simply a poem composed by a sirvent (Lat. serviens) or man- at-arms. The sirventesc is very frequently composed in the form, sometimes even with rhymes, of a love song having acquired some popularity, so that it might be sung to the same air. The tenson is a debate between two interlocutors, each of whom has a stanza in turn. The partimen (Fr. jeu parti) is also a poetic debate, but it differs from the tension in so far that the range of debate is limited. In the first stanza one of the partners proposes two alternatives; the other partner chooses one of them and defends it, the opposite side remaining to be defended by the original pro- pounder. Often in a final couplet a judge or arbiter is appointed to decide between the parties. This poetic game is mentioned by William, count of Poitiers, at the end of the nth century. The pastoreta, afterwards pastorela, is in general an account of the love adventures of a knight with a shepherdess. All these classes have one form capable of endless variations : five or more stanzas and one or two envois. The dansa and balada, intended to mark the time in dancing, are pieces with a refrain. The alba, which has also a refrain, is, as the name indicates, a waking or morning song at the dawning of the day. All those classes are in stanzas. The descort is not thus divided, and consequently it must be set to

music right through. Its name is derived from the fact that, its component parts not being equal, there is a kind of " discord " between them. It is generally reserved for themes of love. Other kinds of lyric poems, sometimes with nothing new about them except the name, were developed in the south of France; but those here mentioned are the more important.

Narrative Poetry. — Although the strictly lyric poetry of the troubadours forms the most original part of Provencal literature, it must not be supposed that the remainder is of trifling impor- tance. Narrative poetry, especially, received in the south of France a great development, and, thanks to recent discoveries, a consider- able body of it has already become known. Several classes must be distinguished: the chanson de geste, legendary or apparently historical, the romance of adventure and the novel. Northern France remains emphatically the native country of the chanson de geste; but, although in the south different social conditions, a more delicate taste, and a higher state of civilization prevented a similar profusion of tales of war and heroic deeds, Provencal literature has some highly important specimens of this class. The first place belongs to Girart de Roussillon, a poem of ten thousand verses, which relates the struggles of Charles Martel with his powerful

vassal the Burgundian Gerard of Roussillon. It is a literary pro- duction of rare excellence and of exceptional interest for the history of civilization in the nth and 1 2th centuries. Girart de Roussillon belongs only within certain limits to the literature of southern France. The recension which we possess appears to have been made on the borders of Limousin and Poitou ; but it is clearly no more than a recast of an older poem no longer extant, probably either of French or at least Burgundian origin. To Limousin also seems to belong the poem of Aigar and Maurin (end of the 12th century), of which we have unfortunately only a fragment so short that the subject cannot be clearly made out. Of less heroic charac- ter is the poem of Daurel and Beton (first half of the 13th century), connected with the cycle of Charlemagne, but by the romantic character of the events more like a regular romance of adventure. We cannot, however, form a complete judgment in regard to it, as the only MS. in which it has been preserved is defective at the close, and that to an amount there is no means of ascertaining. Midway between legend and history may be classified the Provencal Chanson of Antioch, a mere fragment of which, 700 verses in extent, has been recovered in Madrid and published in Archives de VOrient latin, vol. ii. This poem, which seems to have been composed by a certain Gregoire Bechada, mentioned in a 12th- century chronicle and written in

Limousin (see G. Paris, in Romania, xxii. 358), is one of the sources of the Spanish compilation La gran conquista de Ultramar. To history proper belongs the Chanson of the crusade against the Albigensians, which, in its present state, is composed of two poems one tacked to the other: the first, con- taining the events from the beginning of the crusade till 12 13, is the work of a cleric named William of Tudela, a moderate supporter of the crusaders; the second, from 1213 to 1218, is by a vehement opponent of the enterprise. The language and style of the two parts are no less different than the opinions. Finally, about 1280, Guillaume Anelier, a native of Toulouse, composed, in the chanson de geste form, a poem on the war carried on in Navarre by the French in 1276 and 1277. It is an historical work of little literary merit. AH these poems are in the form of chansons de geste, viz. in stanzas of indefinite length, with a single rhyme. Gerard of Roussillon, Aigar and Maurin and Daurel and Beton are in verses of ten, the others in verses of twelve syllables. The peculiarity of the versification in Gerard is that the pause in the line occurs after the sixth syllable, and not, as is usual, after the fourth. Like the chanson de geste, the romance of adventure is but slightly represented in the south; but it is to be borne in mind that many works of this class must have perished, as is rendered evident by the mere fact that, with few exceptions, the narrative poems which have come down to us are each known by a single manuscript only. We possess but three Provencal romances of adventure: Jaufre (composed in the middle of the 13th century and dedicated to a king of Aragon, possibly James I.), Blandin of Cornwall and Guillem de la Barra. The first two are connected with the Arthurian cycle: Jaufre is an elegant and ingenious work; Blandin of Cornwall the dullest and most insipid one can well imagine. The romance of Guillem de la Barra tells a strange story also found in Boccaccio's Decameron (2nd Day, viii.). It is rather a poor poem; but as a contribution to literary history it has the advantage of being dated. It was finished in 1318, and is dedicated to a noble of Languedoc called Sicart de Montaut. Connected with the romance of ad- venture is the novel (in Provencal novas, always in the plural), which is originally an account of an event " newly " happened. The novel must have been at first in the south what, as we see by the Decameron, it was in Italy, a society pastime — the wits in turn relating anecdotes, true or imaginary, which they think likely to amuse their auditors. But before long this kind of production was treated in verse, the form adopted being that of the romances of adventure — octosyllabic verses rhyming in pairs. Some of those novels which have come down to us may be ranked with the most graceful works in Provencal literature; two are from the pen of the Catalan author Raimon Vidal de Besaltl. One, the Castia-gilos (the Chastisement of the Jealous Man), is a treatment, not easily matched for elegance, of a frequently-handled theme — the story of the husband who, in order to entrap his wife, takes the disguise of the lover whom she is expecting and receives with satisfaction

blows intended, as he thinks, for him whose part he is playing; the other, The Judgment of Love, is the recital of a question of the law of love, departing considerably from the subjects usually treated in the novels. Mention may also be made of the novel of The Parrot by Arnaut de Carcassonne, in which the principal character is a parrot of great eloquence and ability, who succeeds marvel- lously in securing the success of the amorous enterprises of his master. Novels came to be extended to the proportions of a long romance. Flamenca, which belongs to the novel type, has still over eight thousand verses, though the only MS. of it has lost some leaves both at the beginning and at the end. This poem, composed in all probability in 1234, is the story of a lady who by very in-

fenious devices, not unlike those employed in the Miles gloriosus of 'lautus, succeeds in eluding the vigilance of her jealous husband. No analysis can be given here of a work the action of which is highly complicated; suffice it to remark that there is no book in medieval literature which betokens so much quickness of intellect and is so instructive in regard to the manners and usages of polite

society in the 13th century. We know that novels were in great favour in the south of France, although the specimens preserved are not very numerous. Statements made by Francesco da Bar- berino (early part of 14th century), and recently brought to light, give us a glimpse of several works of this class which have been lost. From the south of France the novel spread into Catalonia, where we find in the 14th century a number of novels in verse very similar to the Provencal ones, and into Italy, where in general the prose form has been adopted.

Didactic and Religious Poetry. — Compositions intended for instruction, correction and edification were very numerous in the south of France as well as elsewhere, and, in spite of the enormous losses sustained by Provencal literature, much of this kind still remains. But it is seldom that such works have much originality or literary value. Originality was naturally absent, as the aim of the writers was mainly to bring the teachings contained in Latin works within the reach of lay hearers or readers. Literary value was not of course excluded by the lack of originality, but by an unfortunate chance the greater part of those who sought to instruct or edify, and attempted to substitute moral works for secular productions in favour with the people, were, with a few exceptions,

Eersons of limited ability. It would be out of question to enumerate ere all the didactic treatises, all the lives of saints, all the treatises of popular theology and morals, all the books of devotion, all the pious canticles, composed in Provencal verse during the middle ages; still some of these poems may be singled out. Daude de Prades (early 13th century), a canon

of Maguelone, and at the same time a troubadour, has left a poem, the Auzels cassadors, which is one of the best sources for the study of falconry. Raimon d'Avig- non, otherwise unknown, translated in verses, about the year 1200, Rogier of Parme's " Surgery " (Romania, x. 63 and 496). We may mention also a poem on astrology by a certain G. (Guil- hem?), and another, anonymous, on geomancy, both written about the end of the 13th century (Romania, xxvi. 825). As to moral compositions, we have to recall the Boethius poem (unfortunately a mere fragment) already mentioned as one of the oldest documents of the language, and really a remarkable work; and to notice an early (12th century?) metrical translation of the famous Disticha de moribus of Dionysius Cato (Romania, xxv. 98, and xxix. 445). More original are some compositions of an educational character known under the name of ensenhamenz, and, in some respects, comparable to the English nurture-books. The most interesting are those of Garin le Brun (12th century), Arnaut de Mareuil, Arnaut Guilhem de Marsan, Amanieu de Sescas. Their general object is the education of ladies of rank. Of metrical lives of saints we possess about a dozen (see Histoire litteraire de la France, vol. xxxii.), among which two or three deserve a particular atten- tion: the Life of Sancta Fides, recently discovered and printed Romania, xxxi.), written early in the 12th century; the Life of St Enimia (13th century), by Bertran of Marseilles, and that of St Honorat of Lerins by Raimon Feraud (about 1300), which is dis- tinguished by variety and elegance of versification, but it is almost entirely a translation from Latin. Lives of saints (St Andrew, St Thomas the Apostle, St John the Evangelist) form a part of a poem, strictly didactic, which stands out by reason of its great extent (nearly thirty-five thousand verses) and the somewhat original conception of its scheme — the Breviari d'amor, a vast encyclopaedia, on a theological basis, composed by the Minorite friar Matfre Ermengaut of Beziers between 1288 and 1300 or thereabout.

Drama. — The dramatic literature of southern France belongs entirely to the religious class, and shows little originality. It consists of mysteries and miracle plays seldom exceeding two or three thousand lines, which never developed into the enormous dramas of northern France, whose acting required several consecu- tive days. Comic plays, so plentiful in medieval French literature (farces, sotties), do not seem to have found favour in the south. Specimens which we possess of Provencal drama are comparatively few; but researches in local archives, especially in old account books, have brought to light a considerable number of entries concerning the acting, at public expense, of religious plays, called, in Latin documents, ludus, historia, moralitas, most of which seem to be irretrievably lost. As all the Provencal plays, sometimes mere fragments, which have escaped destruction, are preserved in about a dozen manuscripts, unearthed within the last forty or fifty years, there is hope that new texts of that sort may

some day be published. Generally those plays belong to the 15th century or to the 16th. Still, a few are more ancient and may be ascribed to the 14th century or even to the end of the 13th. The oldest appears to be the Mystery of St Agnes (edited by Bartsch, 1869), written in Aries. Somewhat more recent, but not later than the beginning of the 14th century, is a Passion of Christ (not yet printed) and a mystery of the Marriage of the Virgin, which is partly adapted from a French poem of the 13th century, (see Romania xvi. 71). A manuscript, discovered in private archives (printed by Jeanroy and Teulie, 1893), contains not less than sixteen short mysteries, three founded on the Old Testament, thirteen on the New. They were written in Rouer- gue and are partly imitated from French mysteries. At Manosque (Basses Alpes) was found a fragment of a Ludus sancti Jacohi, inserted in a register of notarial deeds (printed by C. Arnaud.

Marseilles, 1 858). The region comprised between the Rhone and the Var seems to have been particularly fond of representations of this sort, to judge by the entries in the local records (see Romania xxvii. 400). At the close of the 15th and the beginning of the 16th centuries many mysteries were played in that part of Dauphine which corresponds to the present department of Hautes-Alpes. Five mysteries of this district, composed and played somewhere about 1500 (the mysteries of St Eustace, of St Andrew, of St Pons, of SS Peter and Paul and of St Anthony of Vienne) , have come down to us, and have been edited by Abb6 Fazy (1883), the four others by Canon P. Guillaume (1883-1888). The influence of the con- temporary French sacred drama may to some extent be traced in them.

Prose. — Prose composition in the south of France belongs to a comparatively late stage of literary development; and the same remark applies to the other Romanic countries, particularly to northern France, where prose hardly comes into fashion till the beginning of the 13th century, the prose of the preceding century being little else than translations of the books of the Bible (especially the Psalter).

As early as the 12th century we find in Languedoc sermons, whose importance is more linguistic than literary (Sermons du XII" Steele en vieux provencal, ed. by F. Armitage, Heilbronn, 1884). About the same time, in Limousin, were translated chapters xiii.xvii. of St John's Gospel (Bartsch, Chrestomathie provencale). Various translations of the New Testament and of some parts of the Old have been done in Languedoc and Provence during the 13th and 14th centuries (see S. Berger, " Les Bibles provencales et vaudoises," Romania xviii. 353; and " Nouvelles recherches sur les Bibles

provencales et catalanes," ibid. xix. 505). The Pro vencal prose rendering of some lives of saints made in the early part of the 13th century (Revue des langues romanes, 1890) is more interesting from a purely linguistic than from a literary point of view. To the 13th century belong certain lives of the troubadours intended to be prefixed to, and to explain, their poems. Many of them were written before 1250, when the first anthologies of troubadour poetry were compiled; and some are the work of the trou- badour Hugh of Saint Circq. Some were composed in the north of Italy, at a time when the troubadours found more favour east of the Alps, than in their own country. Considered as historical documents these biographies are of a very doubtful value. Most of them are mere works of fiction, written by men who had no data except such informations as they derived from the songs they had to explain and which they often misunderstood. To the same period must be assigned Las Razos de trobar of the troubadour Raimon Vidal de Besalii (an elegant little treatise touching on various points of grammar and the poetic art), and also the Donatz proensals of Hugh Faidit, a writer otherwise unknown, who drew up his purely grammatical work at the request of two natives of northern Italy. A remarkable work, both in style and thought, is the Life of St Douceline, who died in 1274, near Marseilles, and founded an order of Beguines. In the 14th century compositions in prose grew more numerous. Some rare local chronicles may be mentioned, the most interesting being that of Mascaro, which contains the annals of the town of Beziers from 1338 to 1390. Theological treatises and pious legends translated from Latin and French also increase in number. The leading prose-work of this period is the treatise on grammar, poetry and rhetoric known by the name of Leys d'amors. It was composed in Toulouse, shortly before '35°i by a group of scholars, and was intended to fix the rules of the language with a view to the promotion of a poetical renais- sance. For this purpose an academy was founded which awarded prizes in the shape of flowers to the best compositions in verse. We still possess the collection of the pieces crowned by this academy during the 14th century, and a large part of the 15th (Flors del gay saber). Unfortunately they are rather academic than poetic. The Leys d'amors, which was to be the starting-point and rule of the new poetry, is the best production of this abortive renais- sance. The decay of Provencal literature, caused by political circumstances, arrived too soon to allow of a full development of prose. This accounts, in some measure for the complete absence of historical compositions. There is nothing to compare- with Villehardouin or Joinville in northern France, or with Ramon Muntaner in Catalonia. The 14th and 15th centuries were in no respect a prosperous period for literature in the south of France. In the 15th century people began to write French both in verse and prose; and from that time Provencal literature became a thing of the past. From the 16th century such poetry as is written in the vernacular of southern France

(Auger Gaillard, La Bellaudiera, Goudelin, d' Astros, &c), is entirely dependent on French influence. The connexion with ancient Provencal literature is entirely broken. Bibliography. — Fauriel, Histoire de la poisie provencale (Paris, 1846, 3 vols. 8vo), is quite antiquated. Not only are three-fourths of the works in Provencal poetry ignored, but the very idea of the book is vitiated by the author's system (now abandoned), based on the supposition that in the south of France there was an immense epic literature. The articles on the troubadours in the Histoire litteraire de la France, by Gingueni 1 , E. David, &c, must be con- sulted with extreme caution F. Diez's Die Poesie der Troubadours (Zwickau, 1827, 8vo; new ed by Bartsch, 1883) and his Leben und

Werke der Troubadours (Zwickau, 1829, 8vo; new ed. by Bartsch, 1882) are of great excellence for the time at which they appeared. A. Restori's Lelleralura provenzale (Milan, Hoepli, 1891), though very short and not free from oversights, gives a generally correct view of the subject. For the history of Provengal literature in Spain, see Mila y Fontanals, De los Trovadores en EspaHa (Barcelona, 1861, 8vo); for Italy, Cavedoni, Ricerche storiche intorno ai trovatori provenzali (Modena, 1844, 8vo); A. Thomas, Francesco Barberino et la litterature provencale en Italie (Paris, 1883, 8vo); O. Schultz, " Die Lebensverhaltnisse der italienischen Trobadors," in Zeits. fur romanische Philologie (1883). For the bibliography consult especially Bartsch, Grundriss zur Geschichte der provenzalischen Literatur (ElberfelrL 1872, 8vo). For texts the reader maybe re- ferred to Raynouard, Choix de poesies originates des Troubadours (1816-1821, 6 vols. 8vo), and Lexique roman, ou diet, de la langue des troubadours, of which vol. i. (1838) is entirely taken up with texts; and Rochegude, Parnasse occitanien (Toulouse, 1819, 8vo). All the pieces published by Raynouard and Rochegude have been reprinted without amendment by Mahn, Die Werke der Troubadours in provenz. Sprache (Berlin, 8vo, vol. i. 1846, ii. 1 855-1 864, iii. 1880; vol. iv. contains an edition of the troubadour Guiraut Riquier, 1853). The same editor's Gedichte der Troubadours (Berlin, 1856-1873) is a collection conspicuous for its want of order and of accuracy (see Romania iii. 303). Among editions of individual troubadours may be mentioned: Peire Vidal' s Lieder, by Karl Bartsch (Berlin, 1857, i2mo.) ; Les Derniers troubadours de la Provence, by Paul Meyer (Paris, 1 87 1 , 8vo) ; Der Troubadour Jaufre Rudel, sein Leben und seine Werke, by A. Stimming (Kiel, 1873, 8vo) ; Bertran de Born, sein Leben und seine Werke, by A. Stimming (Halle, 1879, 8vo; revised and abridged edition, Halle, 1892) ; another edition, by A. Thomas (Toulouse, 1888, 8vo) ; Guilhem Figueira, ein provenzalischer Troubadour, by E. Levy (Berlin, 1880, 8vo) ; Das Leben und die Lieder des Troubadours Peire Rogier, by Carl Appel (Berlin, 1882, 8vo) ; La vita e le opere del trovatore Arnaldo Daniello, by U. A. Canello (Halle, 1883, 8vo);

O. Schultz, Die Briefe des Trobadors Raimbaut de Vaqueiras an Bonifaz I., Markgrafen von Monferrat (Halle a. S., 1893); Italian edition (Florence, 1898).; Cesare de Lollis, Vita e poesie di Sordello di Goito (Halle a. S., 1896); J. Coulet, Le Troubadour Guilhem Montan- hagol (Toulouse, 1898) ; R. Zenker, Die Lieder von Peires von Auvergne (Erlangen, 1900); J. J. Salverda De Grove, Le Troubadour Bertran d'Aiamanon (Toulouse, 1902); G. Bertoni, I Trovatori minori di Geneva (Dresden, 1903), and Rambertino Buvalelli, trovatore bolognase (Dresden, 1908, 8vo); A. Jeanroy, "Les Poesies de Gavandan " in Romania, vol. xxxiv. (Paris, 1905). Concerning the music of the Troubadors, see J. B. Beck, Die Melodien der Troubadours (Strasburgh, 1908). Among editions of Provencal works of a miscellaneous kind are: Bartsch, Denkmaler der provenzalischen Literatur (Stuttgart, 1856, 8vo) ; H. Suchier, Denkmaler der provenz. Literatur und Sprache, vol. i. 8vo (Halle, 1883); Paul Meyer, La Chanson de la croisade contre les Albigeois (2 vols. 8vo, Paris, 1875-1879) ; idem, Daurel et Beton, chanson de geste provencale (Paris, 1880, 8vo) ; idem, Le Roman de Flamenca (Paris, 1865, 8vo ; 2nd ed., 1 901) ; idem., Guillaume de la Barre, roman d'aventures par Arnaut Vidal de Castelnaudari (Paris, 1895, 8vo) ; E. Stengel, Die beiden dltesten provenzal. Grammatiken, Lo Donatz proensals und Las Razos de trobar (Marburg, 1878, 8vo); Le Brevairi d'amor de Matfre Ermen- gaud, published by the Archaeological Society of Beziers (2 vols. 8vo, Beziers, 1862-1880); A. L. Sardou, La Vida de Sant Honorat, Ugende en vers provencaux par Raymond Feraud (Nice, 1875, 8vo); Noulet and Chabaneau, Deux manuscrits provengaux du XIV' siecle (Montpellier, 1888, 8vo) ; Albanes, La Vie de Sainte Douceline (Marseilles, 1879, 8vo). Documents and dissertations on various points of Prcvencal literature will be found in almost all the volumes of Romania (Paris, in progress since 1872, 8vo), and the Revue des langues romanes (Montpellier, in progress since 1870, 8vo). See also the other journals devoted in Germany and Italy to the Romanic languages, passim. (P. M.)

Modern Provencal Literature. 1 — Literature in the south of France never died out entirely. Indeed, we have a link which, though too much importance may easily be attached to it, yet undoubtedly connects the products of the troubadours with the Provencal poetry of the present day. The Academy of Toulouse, founded in 1324, was flourishing in the 14th century, and, after many vicissitudes, is flourishing still. [The poets crowned by this body between 1324 and 1498 stand in the same relation to the troubadours as the Meistcrsinger do to the Minnesdnger: academic correctness takes the place of inspiration. The institution flourished, even to the extent of establishing branches in Catalonia and Majorca; and in 1484, when its prosperity was threatened, a semi-fabulous person, Clemence Isaure, is said to have brought about a revival by instituting fresh prizes.

The town of Toulouse never ceased to supply funds

1 In accordance with general usage, we are . employing the term Provengal for the whole of the south of France, save where special reservation is made.

of some kind. In 1513 French poems were first admitted in the competitions, and under Louis XIV. (from 1679) these were alone held eligible. This unfair arrangement, by which some of the leading poets of northern France profited, held good till 1893, when the town very properly transferred its patronage to a new Escolo moundino, 1 but very soon restored its support to the older institution, on learning that Provencal poetry was again to be encouraged.] In the two centuries that followed the glorious medieval period we have a succession of works, chiefly of a didactic and edifying character, which scarcely belong to the realm of literature proper, but at least served to keep alive some kind of literary tradition. This dreary interval was relieved by a number of religious mystery plays, which, though dull to us, probably gave keen enjoy- ment to the people, and represent a more popular genre; the latest that have come down to us may be placed between the years 1430-1515. Not only did the literature deteriorate during this period, but dialects took the place of the uniform literary language employed by the troubadours, while the spoken tongue yielded more and more to French. In 1539 Francois I. forbade the use of Provencal in official documents — a fact that is worthy of note only as being significant in itself, not as an important factor in the decadence of Provengal letters.

On the contrary, just about this time there are signs of a revival. In 1565 the Gascon, Pey de Garros, translated the Psalms into his dialect, and two years later published a volume of poems. His love for his native tongue is genuine, and his command over it considerable; he deplores its neglect, and urges others to follow his example. Auger Gaillard {c. 1 530-1 595) does infinitely less credit to his province: the popularity of his light pieces was probably due to their obscenity. More in the spirit of Garros is the charming trilingual Salut composed by the famous du Bartas in honour of a visit of Marguerite de Valois to Nerac (1579): three nymphs dispute as to whether she should be welcomed in Latin, French, or Gascon, and the last, of course, wins the day. Provence proper gave birth to a poet of consider- able importance in Louis Bellaud de la Bellaudiere (1532-1588), of Grasse, who, after studying at Aix, enlisted in the royal armies, and was made a prisoner at Moulins in 1572. During his cap- tivity he wrote poems

inspired by real love of liberty and of his native country {Don- Don internal, 1584 or 1585). At Aix Bellaud subsequently became the centre of a literary circle which included most of the local celebrities; all of these paid their tribute to the poet's memory in the edition of his works published by his uncle, Pierre Paul, himself the author of pieces of small value, included in the same volume {Lous Passatens, obros et rimos, &c, Marseilles, 1595). Even when Bellaud is wholly frivolous, and intent on worldly pleasures only, his work has interest as reflecting the merry, careless life of the time.

A writer very popular in Provence for the light-hearted productions of his youth was Claude Brueys (1570-1650), remarkable chiefly for comedies that deal largely with duped husbands {Jardin deys musos provensalos, not published till 1628). There is a certain charm, too, in the comedies of Claude's disciple, Gaspard Zerbin {La Perlo deys musos et coumedies prouvensalos, 1655); and those critics who have read the plays of Jean de Cabanes (1653-17 12) and of Seguin (of Tarascon, c. 1640), still in MS., speak highly of them. The most consistently popular form of poetry in the south of France was always the no'el. There has been no limit to the production of these; but very rarely does the author deserve special mention. An exception must be made in the case of Nicholas Saboly (1614-1675), who produced the best pieces of this class, both as regards beauty of language and the devotion they breathe. They have deservedly maintained their popularity to the present day. In Languedoc four poets have been cited as the best of the age — Goudelin, Michel, Sage and Bonnet. Thisiscertainlysointhecase of Pierre Goudelin (province Goudouli, 1579-1649), of Toulouse, the most distinguished name in south French literature

1 Moundino, i.e. of Toulouse ; a common designation, derived from Raymond, the familiar name of the counts of Toulouse.

between the period of the troubadours and that of Jasmin. He had a good classical education, traces of which appeaV in all his poetry, his language and his manner being always admir- able, even where his matter is lacking in depth. He is often called " the Malherbe of the South," but resembles that writer only in form: his poetry, taken as a whole, has far more sap. Goudelin essayed and was successful in almost every short genre {Lou Ramelet Moundi, 161 7, republished with additions till 1678), the piece of his which is most generally admired being the stanzas to Henri IV., though others will prefer him in his gayer moods. He enjoyed enormous popularity (extending to Spain and Italy), but never prostituted his art to cheap effects. His influence, especially but not exclusively in Provence, has been deep and lasting. The fame of Jean Michel, of Nimes, rests on the Embarras de lafoire de Beaucaire, a poem of astonish- ing vigour, but

deficient in taste. Daniel Sage, of Montpellier {Las Foulies, 1650), was a man of loose morals, which are reflected in nearly all his works: his moments of genuine inspira- tion from other causes are rare. More worthy of being bracketed with Goudelin is the avocat Bonnet, author of the best among the open air plays that were annually performed at Beziers on Ascension Day: a number of these (dated 1616-1657) were subsequently collected, but none can compare with the opening one, Bonnet's Jugement de Paris. Another very charming poet is Nicolas Fizes, of Frontignan, whose vaudeville, the Opera de Frontignan (1670), dealing with a slight love intrigue, and an idyllic poem on the fountain of Frontignan, show a real poetic gift. A number of Toulouse poets, mostly lauriats of the Academy, may be termed followers of Goudelin: of these Francois Boudet deserves mention, who composed an ode, Le Trinfe del Moundi (1678), in honour of his native dialect. The classical revival that may be noted about this time is also gener- ally ascribed to Goudelin's influence. Its most distinguished representative was Jean de Vales, of Montech, who made excellent translations from Virgil and Persius, and wrote a brilliant burlesque of the former in the manner of Scarron {Virgile deguisat, 1648; only four books published). He also composed a pastoral idyll, which, though too long and inclined to obscenity, contains much tender description. The greatest of the pastoral poets was Francois de Cortete (1571-1655), of Prades, whose comedies, Ramounet and Miramoundo (published, unfortunately with alterations, by his son in 1684), are written with such true feeling and in so pure a style that they can be read with real pleasure. A comedy of his dealing with Sancho Panza in the palace of the Duke has been edited. It is difficult to understand the enormous popularity of Daubasse (1664- 1727), of Quercy, who belonged to the working classes; he was patronized by the nobility in exchange for panegyrics. Gascony produced two typical works in the 17th century: Ader's Centil- homme gascoun (1610) and Dastros's Trinfe de la langue gascoune (1642). The former depicts a regular boasting Gascon who distinguishes himself in everything; while the latter is a plea in favour of the Gascon tongue, inspired by a genuine love of country. Gabriel Bedout {Parterre gasooun, 1642) is chiefly noted for his amorous solitari, called forth by the sufferings he endured from a hardhearted mistress. Louis Baron (b. 161 2), living peacefully in his native village of Pouyloubrin, celebrated it with great tenderness.

In the 1 8th century the number of authors is much larger, but the bulk of good work produced is not equally great in proportion. The priests are mainly responsible for the literary output of Languedoc. Claude Peyrot (1 709-1 795) one of them, celebrates his county with true rural spirit in the Printemps rouergat and Quartre sosous. But the chief of the band is the Abbe Favre (1727-1783), the prior of Celleneuve, whose Sermoun de moussu sistre, delivered by a drunken priest against intemper- ance, is a

masterpiece. He also wrote a successful mock-heroic poem {Siege de Caderousse) travesties of Homer and Virgil, a prose novel depicting the country manners of the time {Histoire de Jean I'ont pris), and two comedies, which likewise give a vivid picture of the village life he knew so well. Two genuine poets are the brothers Rigaud of Montpellier: Auguste's (1760-1835)

description of a vintage is deservedly famous; and Cyrille (1750- 1824) produced an equally delightful poem in the Amours de Mounpeie. Pierre Hellies of Toulouse (d. 1724) a poet of the people, whose vicious life finds an echo in his works, has a certain rude charm, at times distantly recalling Villon. In the Province Toussaint Gros (1 698-1 748), of Lyons, holds undisputed sway. His style and language are admirable, but unfortunately he wasted his gifts largely on trivial pieces aV occa- sion. Coye's (1711-1777) comedy, the Fiance pare, is bright and still popular, while Germain's description of a visit paid by the ancient gods to Marseilles {La Bourrido dei Dious, 1760) has considerable humour. In Gascony the greatest poet is Cyrien Despourrins (1698-1755), whose pastoral idylls and mournful chansons, which he himself set to music, are imbued with tenderness and charm (most ot them were collected at Pau, in 1828).

The Revolution produced a large body of literature, but nothing of lasting interest. However, it gave an impetus to thought in the south of France, as elsewhere; and there, as elsewhere, it called forth a spirit of independence that was all in favour of a literary revival. Scholars of the stamp of Raynouard (1761-1863), of Aix, occupied themselves with the brilliant literary traditions of the middle ages; newspapers sprang up (the Provencal Bouil-Abaisso, started by Desanat, and the bilingual Lou Tambourin et le menestrel, edited by Bellot, both in,i84i); poets banded together and collected their pieces in volume form (thus, the nine troubaire who published Lou Bouquet prouvenqaou in 1823). Much has been written about the precurseurs de Felibrige, and critics are sorely at variance as to the writers that most deserve this appellation. We shall not go far wrong if we include in the list Hyacinthe Morel (1756-1829), of Avignon, whose collection of poems, Lou Saboulet, has been republished by Mistral; Louis Aubanel (1758- 1842), of Nimes, the successful translator of Anacreon's Odes; Auguste Tandon, " the troubadour of Montpellier," who wrote Fables, contes et autres pieces en vers (1800); Fabre d'Olivet (1767-1825), the versatile litterateur who in 1803 published Le Troubadour: Poesies occitaniques , which, in order to secure their success, he gave out as the work of some medieval poet Diou- loufet (1771-1840),

who wrote a didactic poem, in the manner of Virgil, relating to silkworm-breeding {Lets magnans) ; Jacques Azais (1778-1856), author of satires, fables, &c; D'Astros (1780- 1863), a writer of fables in Lafontaine's manner; Castil-Blaze (1784-1857), who found time, amidst his musical pursuits, to compose Provencal poems, intended to be set to music; the Marquis de Fare-Alais (1791-1846), author of some light satirical tales (Las Castagnados). While these writers were all more or less academic, and appealed to the cultured few, four poets of the people addressed a far wider public: Verdie (1779-1820), of Bordeaux, who wrote comic and satirical pieces; Jean Reboul (1796-1864), the baker of Nimes, who never surpassed his first effort, L'Ange et I' enfant (1828) ; Victor Gelu (1806-1885), relentless and brutal, but undeniably powerful of his kind (Fenian et Grouman ; dix chansons provenqales, 1840); and, greatest of them all, the true and acknowledged forerunner of the felibres, Jacques Jasmin (1798-1864), the hairdresser of Agen, whose poems, both lyrical and narrative, continue to find favour with men of the highest culture and literary attainments, as with the villagers for whom they were primarily intended.*

While much of this literature was still in the making, an event took place which was destined to eclipse in importance any that had gone before. In 1845 Joseph Roumanille (1818-1891), a gardener's son, of Saint-Remy (Bouches-du-Rh6ne), became usher in a small school at Avignon, which was attended by Frederic Mistral (q.v.) , a native of the same district, then fifteen years of age. The former, feeling the germs of poetry within him, had composed some pieces in French; but, finding that his old mother could not understand them, he was greatly distressed,

1 One of his chief titles to fame is that, together with Alphonse Dumas, he drew the attention of Lamartine to Mistral's Mirhio. Roumanille and Mistral showed their gratitude by republishing the best pieces of these two pricurseurs, together with those 01 Castil-Blaze and others, in Un Liame de Rasin (1865).

and determined thenceforth to write in his native dialect only. These poems revealed a new world to young Mistral, and spurred him on to the resolve that became the one purpose of his life — de remettre en lumiere et conscience de sa gloire cette noble race qu'en plein '89 Mirabeau nomme encore la nation provencale. There is no doubt that Mistral's is the more puissant personality, and that his finest work towers above that of his fellows; but in studying the Provencal renaissance, Roumanille's great claims should not be overlooked, and they have never been put forward with more force than by Mistral himself (in the preface to his Isclos d'oro). Roumanille's secular verse cannot fail to appeal to every lover of pure and sincere poetry (Li Margaritedo, 1836-1847; Li Sounjarello, 1852; Li Flour

de Sauvi, 1850- 1859, &c), his noels are second only to those of Saboly, his prose works (such as Lou mege de Cucugnan, 1863) sparkling with delightful humour. He it was who in 1852 collected and published Li Prouvengalo, an anthology in which all the names yet to become famous, and most of those famous already (such as Jasmin), are represented. In 1853 he was one of the enthu- siastic circle that had gathered round J. B. Gaut at Aix, and whose literary output is contained in the Roumavagi dei Trou- baire and in the shortlived journal Lou gay saber (1854). At the same time the first attempt at regulating the orthography of Provencal was made by him (in the introduction to his play, La Part dou bon Dieu, 1853). And in 1854 he was one of the seven poets who, on the 21st of May, foregathered at the castle of Fonts6gugne, near Avignon, and founded the Felibrige. [The etymology of this word has given rise to much speculation: the one thing certain about the word is that Mistral came across it in an old Provencal poem, which tells how the Virgin meets Jesus in the Temple, among the seven filibres of the law. The outlines of the constitution, as finally settled in 1876, are as follows: The region of the Felibrige is divided into four manten- enqo (Provence, Languedoc, Aquitaine and Catalonia 2). At the head of all is a consistori of fifty (called majourau) , presided over by the Capoulie, who is chief of the entire Felibrige. The head of each mantenenco is called sendi (who is at the same time a majourau) ; and at the head of each " school " (as the sub-divisions of the mantenenqo are called) is a cabiscdu. The ordinary members, unlimited in number, are manteneire. Annual meetings and fites are organized. The most widely read of the Felibrige publications is the Armana prouvenQau, which has appeared annually since 1855, maintaining all the while its original scope and purpose; and though unpretentious in form, it contains much of the best work of the school. 3] The other six were Mistral, Aubanel, A.Mathieu (a schoolfellow of Mistral's at Avignon), E. Garcin, A. Tavan and P. Giera (owner of the castle). Of these, Theodore Aubanel (1829-1886, of Avignon, son of a printer and following the same calling) has alone proved himself worthy to rank with Mistral and Roumanille. " Zani," the girl of his youthful and passionate love, took the veil; and this event cast a shadow over his whole life, and determined the character of all his poetry (Lou miougrano entre-duberto, i860; Li Fiho d' Avignoun, 1883). His is, without a doubt, the deepest nature and temperament among the felibres, and his lyrics are the most poignant. He has a keen sense of physical beauty in woman, and his verse is replete with suppressed passion, but he never sinks to sensuality. His powerful love drama Lou pau dou peccat was received with enthusiasm at Montpellier in 1878, and successfully produced (some years later in Arene's version) by Antoine at his Theatre Libre — no mean criterion. It is the only play of real consequence that the school has yet produced.

We need not do more than glance at the work of the fourth of the group of poets who alone, amidst the numerous writers of lyrics and other works that attain a high level of excellence.

2 One of the most pleasing features of the movement is the spirit of fraternity maintained by the felibres with the poets and literary men of northern France, Spain, Italy, Rumania, Germany and other countries.

3 In common with so many other productions of the Felibrige, this Almanac is published by the firm J. Roumanille, Libraire- Editour, Avignon.

appear to us to have so far secured permanent fame by the magni- tude of their achievement. Felix Gras (1844-1801) settled at Avignon in his youth. His rustic epic, Li Carbounie (1876) is full of elemental passion and abounds in fine descriptions of scenery, but it lacks proportion. The heroic geste of Toloza (1882), in which Simon de Montfort's invasion of the south is depicted with unbounded vigour and intensity, shows a great advance in art. Li Roumancero provencal (1887) is a collection of poems instinct with Provencal lore, and in Li Papalino (1891) we have some charming prose tales that bring to life again the Avignon of the popes. Finally, the poet gave us three tales dealing with the period of the Revolution (Li Rouge dou miejour, &c); their realism and literary art called forth general admiration. 1

A few lines must suffice for some of the general aspects of the movement. It goes without saying that all is not perfect harmony; but, on the whole, the differences are differences of detail only, not of principle. While Mistral and many of the best felibres employ the dialect of the Bouches-du-Rhone, others, who have since seceded as the Felibrige latin (headed by Roque-Ferrier), prefer to use the dialect of Montpellier, owing to its central position. A third class favour the dialect of Limousin, as having been the literary vehicle of the troubadours; but their claim is of the slenderest, for the felibres are in no sense of the word the direct successors of the troubadours. Nearly all the leaders of the Felibrige are Legitimists and Catholics, their faith being the simple faith of the people, undisturbed by philosophic doubts. There are exceptions, however, chief among them the Protestant Gras, whose Toloza clearly reflects his sympathy with the Albigenses. Yet this did not stand in the way of his election as Capoulie — a proof, if proof were needed, that literary merit outweighs all other considerations in this artistic body of men. Finally, it may be noted that the felibres have often been accused of lack of patriotism towards northern

France, of schemes of decentralization, and other heresies; but none of these charges holds good. The spirit of the movement, as represented by its leaders, has never been expressed with greater terseness, force and truth than in the three verses set by Felix Gras at the head of his Carbounie: " I love my village more than thy village; I love my Provence more than thy province; I love France more than all."

Authorities. — Las Joyas del gay saber, edited by Noulet (vol. iv. of Gatien-Arnoult's Monumens de la litterature romane, &c, Tou- louse, 1849); Noulet, Essai sur Vhistoire litteraire des patois du midi de la France aux .XVI' et XVII e siecles (Paris, 1859) and . . . au XVIII' Steele (Paris, 1877); Gaut, " Etude sur la litterature et la poesie provencales " (Memoires de Vacademie des sciences, &c, d'Aix, tome ix. pp. 247-344, Aix, 1867); Mary-Lafon, Histoire litteraire du midi de la France (Paris, 1882); Restori, Letleratura provenzale, pp. 200-214 (Milano, 1891); Marieton's articles on Provencal and Felibrige in the Grande encyclopedie ; Donnadieu, Les Precurseurs des felibres 1800-1855 ; (Paris, 1888) ; Jourdanne, Hi- stoire du Felibrige, 1854-1896 (Avignon, 1897); Hennion, Les Fleurs felibresques (Paris, 1883); Portal, La letteratura provenzale moderna (Palermo, 1893); Koschwitz, Ueber die provenzalischen Feliber und ihre Vorgdnger (Berlin, 1894); Marieton, La Terre provencale (Paris, 1894). (H. O.)

PROVENCE (Provincia, Proenza), a province in the south-east of ancient France, bounded on the N. by the Dauphine, on the E. by the Rhone and Languedoc, on the W. by the Alps and Italy, and on the S. by the Mediterranean. The coast, originally inhabited by Ligurians, was from an early date the home of some Phoenician merchants. About 600 B.C., according to tradition, some traders from Phocaea founded the Greek colony of Massalia (Marseilles) and the colonists had great difficulty in resisting the Cavares and the Salyes, i.e. the Ligurian peoples in the vicinity. Other colonies in the neighbourhood, such as Antibes, Agde, Nice, originated in this settlement. During the wars which followed, the inhabitants of Massalia asked assistance from the Romans, who thus made their first entry into Gaul (125 B.C.), and, after a campaign which lasted several years under the

1 Gras was Capoulie from 1891 till 1901, succeeding his brother- in-law, Roumanille, who held the office from 1888 till 1891. The first Capoulie was, of course, Mistral (1876-1888). Gras's suc- cessor was Pierre Devoluy, of Die (appointed in April 1901).

direction of the pro-consul C. Sextius Calvinus, conquered the territories between the Alps, the sea and the Rhone (with the province of Narbonne on the right bank of this river). These lands formed the Provincia romana,

and the name was retained by Provence. The town of Aix (Aquae Sextiae)vi&s founded to form the capital of this conquered land. In consequence of the conquest of Gaul by Caesar (50 B.C.) and the administrative reforms introduced by Augustus, the territory of the former Pro- vincia was divided into the new provinces of Narbonensis II., of the Maritime Alps and of Viennois, but it still remained an important centre of Roman learning and civilization. Mar- seilles, which for some time had a prosperous Greek school, and also Aix now became of secondary importance, and Aries was made the chief town of the province, becoming after the capture of Treves by the barbarians (a.d. 418) the capital of Gaul. Christianity spread fairly early into Provence, although the legend that this country was evangelized by Mary Magdalene and some of the apostles cannot be traced farther back than the 1 2 th century. Trophimus established a church at Aries in the 3rd century, and during the two centuries which followed bishoprics were founded in all the cities of Provence.

At the beginning of the 5th century, Provence was attacked by the Visigoths. In 425 the Visigothic king Theodoric I. was defeated by Aetius under the walls of Aries, but the part taken by the Goths in the election of the emperor Avitus did not put a stop to their attacks (450). In 480 Aries was captured by Euric I., and the southern part of Provence, i.e. the country south of the Durance, thus came definitely under Visigothic rule. The more northern cities, such as Orange, Apt, Trois- Chateaux, &c, were again joined to the kingdom of Burgundy. Towards 510 Visigothic Provence was ceded to Theodoric, king of the Italian Ostrogoths, by Alaric II. as a mark of his gratitude for the support given to him during the war against the Franks. In addition to this, about 523, the Ostrogoths took advantage of the wars between the Franks and the Burgundians to extend their lands in the north as far as Gap and Embrun. Vitiges, king of the Ostrogoths, ceded Provence to the kings of the Franks about 537, when it was divided in a peculiar manner: the northern cities and those on the coast (Aries, Marseilles, Toulon, Antibes, Nice) were given back to Burgundy, whilst a narrow strip of territory with Avignon, Apt, Cavaillon, Riez, &c, extending from the west to the east as far as the Alps, was added to the kingdom of Austrasia. and from that time followed the fortunes of Auvergne, which, as is known, was generally dependent on Austrasia. Provence was united under one ruler during the reigns of Clotaire II. and Dagobert I., but at the death of the latter in 639 was divided again, only to be reunited under the successors of Dagobert II. (679). At this period the name of Provence was restricted to the southern cities, which had passed from the Gothic to the Frankish rule; it did not regain its original signification and denote the country extending as far as Lyonnais till the end of the 8th and the beginning of the 9th centuries.

At the beginning of the 8th century, some Arabs from Spain, who had crossed the Pyrenees and settled down in Septimania, attacked Provence, in 735 took the town of Aries and in 737 captured Avignon, thus becoming masters of one part of the country. Charles Martel who had already made two expeditions against them, in 736 and 737, with the help of the Lombards of Italy, succeeded in 739 in expelling them, and brought the country definitely under Frankish rule. Austrasian counts were given authority in the cities, and under Charlemagne and Louis the Pious the history of Provence became incorporated with that of the rest of the empire. At the time of the partition of Verdun (843) Provence fell to the share of the emperor Lothair I., who joined it to the duchy of Lyons in 855 to form a kingdom for his youngest son, Charles. On the death of the latter in 863 his inheritance was divided between his two brothers, when Lothair II., king of Lorraine, received the northern part, Lyon- nais and Viennois, and to the other, the emperor Louis II., king of Italy, was given Provence. At his death in 875 Provence passed into the hands of Charles the Bald, and he entrusted

the government to his brother-in-law, Duke Boso, who, taking advantage of the struggles between the Frankish princes which followed the death of Charles the Bald, reconstituted the former kingdom of Charles, the son of Lothair, and in 879 was acknow- ledged as its sovereign at Mantaille in Viennois. This is the kingdom of Provence (Provence, Viennois, Lyonnais and Vivarais), sometimes, but improperly, called Cisjuran Burgundy. Boso died in 887, having succeeded in maintaining his indepen- dence against the united Frankish princes. His widow Ermen- garde, daughter of Louis II., with the assistance of the emperor Arnulf, had her son Louis acknowledged king at an assembly held at Valence in 890. Louis attempted to seize the crown of Italy in 900, and in 901 was even crowned emperor at Rome by Pope Benedict IV. ; but in 905 he was surprised at Verona by his rival Berengar, who captured him, put out his eyes, and forced him to give up Italy and return to Provence; he lived here till his death in 928, leaving an illegitimate son, Charles Constan- tine. The principal figure in the country at this time was Hugo (Hugues) " of Aries," count, or duke, of Viennois and marquis of Provence, who had been king of Italy since 926. In order to retain possession of this country, he gave the kingdom of Louis the Blind to Rudolph II., king of Burgundy (?.».), and thus the kingdom of Burgundy extended from the source of the Aar to the Mediterranean. But the sovereignty of Rudolph II. and his successors, Conrad (937-993) and Rudolph III. (993-1032), over Provence was almost purely nominal, and things were in much the same condition when, on the death of Rudolph III.,

the kingdom of Burgundy passed into the hands of the German kings, who now bore the title of kings of Aries, but very rarely exercised their authority in the country.

At the beginning of the 10th century Provence was in a state of complete disorganization, a result of the invasions of the Sara- cens, who, coming from Spain, took up their quarters in the neighbourhood of Fraxinetum (La Garde-Freinet in the depart- ment of Var) and ravaged the country pitilessly, the Christians being unable to oust them from their strongholds. All the real power was in the hands of the counts of the country. It is probable that from the 9th century several of the Provencal countships were united under one count, and that the count of Aries had the title of duke, or marquis, and exercised authority over the others. In the middle of the 10th century the count- ship of Provence was in the hands of a certain Boso, of unknown origin, who left it to his two sons William and Roubaud (Rotbold). These two profited by the commotion caused by the capture of the famous abbot of Cluny, St Maiolus (Mayeul), in 973, who had fallen into the hands of the Saracens, and marched against the Mussulmans, definitely expelling them from Fraxinetum. About the same period the marquisate seems to have been re-established in favour of Count William, who died in 993, and from that time the descendants of the two brothers, without making any partition, ruled over the different countships of Provence, only one of them, however, bearing the title of marquis. The counts of Provence had, from about the middle of the nth century, a tendency to add the name of their usual residence after their title, and thus the lordships, known later under the names of the countships of Aries (or more properly Provence), of Nice, and of Venaissin, grew up. Roubaud had one son named William, who died without children, about 1043, and one daughter, Emma, who married William, count of Toulouse, by whom she had a son, Pons (1030-1063), the father of Raymund of Saint-Gilles (1063-1105). William also had a son of the same name. This William II. had three sons by his wife Gerberge — Fulk, Geoffrey and William. The last- mentioned had a son, William Bertrand (1 044-1067), whose daughter Adelaide married, first, Ermengaud, count of Urgel, and then Raimbaud of Nice. Geoffrey was the father of Ger- berge, who married Gilbert, count of Gevaudan, and he had a daughter Douce, who in in 2 married Raymund-Berenger, count of Barcelona; by this marriage, Provence, in the correct sense of the word, passed over to the house of Barcelona. At the beginning of the 12th century the various marriages of the Provencal heiresses, of whom mention has just been made, led

to the land being divided up among the different branches of the ancient countly family (1105, 1125 and 1149), and thus the countships of Provence, Venaissin and Forcalquier were definitely formed.

Under the command of Raymund of Saint-Gilles the Proven- cals took an important part in the first crusade, and the use of the term " Provencal" to denote the inhabitants of southern France, their language and their literature, seems to date from this period.

The history of the princes of the house of Barcelona, Raymund- Berenger I. (1113-1131), Raymund-Berenger II. (1131-1144) and Raymund-Berenger III. (1144-1166), is full of accounts of their struggles with the powerful feudal house of Baux, which had extensive property in Provence; in 11 46 one of the representa- tives of this house, Raymund, obtained from the emperor the investiture, though only in theory, of the whole countship of Provence. After the death of Raymund-Berenger III., who was killed at the siege of Nice (1166), his cousin Alphonso II., king of Aragon, claimed his inheritance and took the title of the count of Provence. But his succession was disputed by the count of Toulouse, Raymund V., a marriage having been previously arranged between Raymund-Berenger's daughter and his son, and he himself hastening to marry the widow Richilde, niece of the emperor Frederick I. The majority of the lay and ecclesiastical lords of Provence recognized Alphonso, who in 1 1 76 signed a treaty with his competitor, by which Raymund V. gave up his rights to the king of Aragon in consideration of a sum of money. Alphonso was represented in Provence by his brothers Raymund-Berenger and Sancho in turn, and in 1193 by his son Alphonso, who succeeded him. This Alphonso gave Aragon and Catalonia to his brother Peter (Pedro), and kept only Provence for himself, but on the death of his father-in-law, Count William II., in 1208, whose son had been disinherited, he added to it the county of Forcalquier. He was able to protect Provence from the consequences of the war of the Albigenses, and it was not until after his death (1209), 'during the minority of his son Raymund-Berenger IV., who succeeded him under the regency of his uncle, Peter of Aragon, and later of his. mother Gersende, that Provence was involved in the struggle of the count of Toulouse against Simon de Montfort, when the part played by the city of Avignon in the Albigensian movement finally led to Louis VIII. 's expedition against the town. William of Baux took advantage of the troubles caused by Raymund-Berenger's minority to have the kingdom of Aries conferred upon himself by Frederick II.; this led, however, to no practical result. Raymund-Berenger had also to fight against Raymund VII., count of Toulouse, the emperor having ceded to this latter in 1230 the countship of Forcalquier, and showed another mark of his favour in 1238, when, in consequence of some difficulties with the city of Aries, Raymund-Berenger drove the imperial vicar from the town. The intervention of St Louis, who in 1234 had married Margaret, the eldest daughter of the count of Provence (the second, Eleanor, married Henry III. of England in 1236), put an end to the designs of the count of Toulouse. Raymund-Berenger died in 1245, leaving

a will by which he named as his heiress his fourth daughter, Beatrice, who shortly afterwards, in 1246, married the celebrated Charles of Anjou (see Charles I., king of Naples), brother of the king of France. After her death, in 1267, Charles still maintained his rights in Provence. The countship of Venaissin was left to him by his sister-in-law, Jeanne, countes? of Toulouse, but in 1272 King Philip the Bold took possession of it, giving it up in 1274 to Pope Gregory X., who had claimed it for the Roman Church in pursuance of the treaty of 1229 between Raymund VII. of Toulouse and St Louis. Almost all the time and energy of Charles of Anjou were taken up with expeditions and wars concerning the kingdom of Naples, which he had gained by his victories over Manfred and Conradin in 1266 and 1268. His government of Provence was marked by his struggles with the towns. The movement which resulted in the emancipation of these had its origin fairly far back. In the first part of the 12th century the towns of Provence, no

doubt following the example of those in Italy, began to form municipal administrations and consulates, independent of the viscounts, who in theory represented the authority of the count in the towns. This movement was occasionally interrupted by home disturbances, such as struggles against the civil and ecclesiastical authorities; nevertheless Marseilles, Aries, Tarascon, Avignon (whose consulate laws date from the 12th century), Brignoles and Grasse were self-governing and elected their magistrates, sometimes negotiating with the count, as a power with a power, and concluding political or commercial treaties without consulting him. The city of Nice, which was joined to Provence in n 76, had retained its freedom. This state of affairs was in direct opposition to the authoritative government of Charles of Anjou, who tried to bring back the most indepen- dent of these towns under his sway. In 1251 he seized Aries and Avignon and placed them under a viguier (vicar) nominated by himself. In 1257 Marseilles was also subdued, and ministers nominated by the court performed their duties side by side with the municipal officials.

The successors of Charles of Anjou also showed great interest in maintaining their rights over the kingdom of Naples, and only occasionally do they appear in the history of Provence. Charles II. (1 285-1309), after failing in several attacks on the house of Aragon in southern Italy, lived in the country during the latter years of his reign as duke, and tried to reform some of the abuses which had grown up in the administration of justice and finance. Robert of Calabria (1309-1343), his son and successor, was forced to sustain a long siege in Genoa, whither he had been called by the Ghibelline party: a siege which cost a large number of lives to the Provencal

navy. Robert was succeeded by his granddaughter Joanna, widow of Andrew of Hungary, who sold her rights over the city of Avignon to Pope Clement VI. in 1348, in order to raise funds to enable her to continue the struggle against the house of Aragon in her Nea- politan states. The political situation of the country was not much changed by Charles IV. 's residence in Provence, nor by the empty ceremony of his coronation as king of Aries (1365). Charles IV. gave up his rights, or his claims, to Louis, duke of Anjou, brother of Charles V., but the expedition which this prince made to take possession of Provence only resulted in the seizure of Tarascon, and failed before Aries (1368). Joanna had nominated as her heir Charles of Anjou-Gravina, duke of Duras, who had married her niece Margaret, but to provide herself with a protector from Louis of Hungary, who accused her of murdering her first husband Andrew and wished to dispute her right to the kingdom of Naples, she married again and became the wife of Otto of Brunswick. Charles of Duras, discontented with this marriage, took part against her, and she in her turn disinherited him and named Louis of Anjou as her eventual successor (1380). The duke of Anjou took posses- sion of Provence, whilst Charles of Duras made the queen prisoner at Naples and gave orders for her to be put to death (1382). Louis of Anjou also made an expedition to Naples, but did not arrive till after her death, and he died in 1384. His son Louis II. (1384-1417) banished the viscount of Turenne from Provence, because he had taken advantage of his sove- reign's absence to ravage the country. He did not live in Provence till the last years of his life; in 1415 he established a parlement. The following year the country was devastated by a terrible plague. The wars carried on by his successor Louis III. (1417-34) against the kings of Aragon, his rivals at Naples, were the cause of the complete ruin of Marseilles by the Aragonese fleet. The town, however, regained its former state comparatively quickly. Although Louis III. had centred almost all his attention on the expeditions in Italy, he managed to secure the lands belonging to the house of Baux on the death of the last of the family, the Baroness Alix (1426). Rene, duke of Lorraine (q.v.), Louis's brother and successor, after an unsuccessful attack on Naples (1460-1461), went to live on his property in France, and after 147 1 was principally in Provence, where he built the castle of Tarascon and interested himself in art, literature, and pastoral amusements. He left his territories

(Anjou, Lorraine, Provence) to his nephew Charles, count of Maine, by his will in 1474. Louis XL, king of France, protested at first in the name of the rights of the Crown, and even seized Rene's duchies. In consequence, however, of an interview between Rene and the king at Lyons, the former obtained a withdrawal of the seizure and ended his • days peacefully in Provence (1480). The rights of his successor, Charles, were disputed by Rene II., duke of Lorraine, but, with the support of Louis XL, his attack on

Provence was defeated. On the other hand, Louis had corrupted some of Charles's advisers, especially Palamede de Forbin, with the result that, at Charles's death in 1482, he left Provence to the king of France in his will. Rene of Lorraine protested in vain; Louis claimed the possession of the disputed territory, but Provence was not definitely annexed to France till 1486, under Charles VIII., and even then it preserved a certain individuality. In laws relating to this country the sovereigns added to their title of king of France " and count of Provence and of Forcalquier," and Provence always preserved a separate administrative organization.

In the 1 6th century Provence took part in a war between France and the imperialists. The constable de Bourbon, who had received the investiture of Provence from the emperor Charles V., crossed the Var in 1524 with an army, but was defeated at Marseilles. The expedition under Charles V. and the duke of Savoy in 1536 had no more definite result than the coronation of the emperor at Aix as king of Aries. About the same time the first signs of the Reformation became evident in Provence, at first in the country of the ancient Vaudois at Cabrieres and at Merindol in the county of Venaissin. A sen- tence passed in 1540 by the parlement of Provence against these heretics was carried out with great severity in 1545 by the president d'Oppede aiid the baron de la Garde, who burned the villages and massacred the inhabitants. Protestantism did not take a great hold on Provence, but drew a fair number of followers from the ranks of the lesser nobles, who, with Paul de Mauvans at their head, began the struggle against the Catholics under the comte de Carces. Charles IX.'s journey in Provence in 1567, followed by the establishment in the parlement at Aix of a court (chambre) in which Catholics and Protestants had an equal number of seats, led to a momentary cessation of hostilities. These were resumed between the Carcistes (Roman Catholics) and Razats (Protestants), and again interrupted by the peace of 1576, which gave some guarantees to the Protestants, with La Seyne as a place of security, and also by the plague of 1579, which affected the whole country. The league, on the other hand, made rapid progress in Provence under the direction of the comte de Sault and Hubert de la Garde, seigneur of Vins, and the governors of fipernon and La Valette vainly tried to pacify the country. La Valette and the political party or Bigarrats were finally more or less reconciled to the Protestants, and, at the time of the death of Henry III., the struggle was no more than a question of district politics. Weakened by the division between the comtesse de Sault and the young comte de Carces, the league applied to the duke of Savoy, who was besieging Marseilles. Carces and the other heads of the league submitted one after the other to the new governor Lesdiguieres, who was succeeded by the duke of Guise in 1595, and in 1596 the religious wars in Provence were definitely ended by the capitulation of Marseilles.

During the reign of Henry IV. the country was comparatively peaceful; but under Richelieu the restriction of local freedom and the creation of new offices led to the insurrection of the Cascaveous (small bells, a name derived from their rallying sign), which Conde came to suppress in 1630-1631. At the time of the Fronde additional taxes were levied by the parle- ment at Aix, and the struggle began between the Canivels (Mazarins) and the Sabreurs (prince's party), who captured the governor, the comte d'Alais, for a short time. The duke of Mercoeur calmed the country down. Louis XIV.'s tour in Provence (1660) was marked by an insurrection at Marseilles, which brought about the abolition of the last remaining muni- cipal liberties of the town. Provence was severely tried by the

imperialist invasions of 1 706 and 1 746, and the great plague of 1720. Towards the end of the ancien regime the movement which resulted in the revolution of 1789 made itself felt in Pro- vence, and was most apparent in the double election at Aixand at Marseilles of Mirabeau as deputy for the states-general.

Provence, with its own special language and its law so closely related to Roman law, has always been quite separate from the other French provinces. Theoretically it retained its provincial estates, the origin of which has been traced tc the assemblages of the 12th century. They met annually, and included repre- sentatives of three orders: for the clergy, the archbishop of Aix, president ex officio of the estates, the other bishops of Provence, the abbots of St Victor at Marseilles, of Montmajour and of Thoronet; for the nobility, all the men of noble birth (gentilhommes) until 1623, when this privilege was restricted to actual holders of fiefs; for the third, the members of the twenty- two chief towns of the vigueries l and fifteen other privileged places, among which were Aries and Marseilles. There were theoretically no taxes, but only supplies given freely by the estates and assessed by them. However, this assembly did not meet after 1639. The administrative divisions of Provence were constantly changing. In 1307 Charles II. divided it into two senechaussees, Aix and Forcalquier, comprising twenty-two vigueries. At the end of the ancien regime the government (gouvernement) of Provence, which corresponded to the genSralite of Aix, was made up of eight senechaussees, those of Lower Provence — Aix, Aries, Marseilles, Brignoles, Hyeres, Grasse, Draguignan, Toulon; and four of Upper Provence — Digne, Sisteron, Forcalquier, Castellane. From a judicial point of view the parlement of Aix had replaced the former conseil eminent or cour souveraine. There was a chambre des comptes at Aix, and also a cour des aides. A decree, dated the 22nd of December 1789, divided Provence

into the three departments of Bouche du Rhone, Basses-Alpes and Var, and in 1793 Vaucluse, the former county (comtat) of Venaissin, which belonged to the pope, was added to these. The boundaries of the department of Var were modified in i860 after the annexa- tion, when the department of the Alpes Maritimes was formed.

Authorities. — There is no good general history of Provence. For a complete work consult the ancient works of H. Bouche, Chorographie et histoire chronologique de Provence (2 vols, in fol., Aix, 1664) ; Papon, Histoire generate de Provence (4 vols, in 4to, Paris, 1 777-1 786); L. M6ry, Histoire de Provence (3 vols, in 8vo, Marseilles, 1830-1837). For special periods of history see F. Kiener, Verfassungsgeschichte der Provence, 510-1200 (8vo, Leipzig, 1900); R. Poupardin, Le Royaume de Provence sous les Carolingiens (in 8vo, Paris, 1901); G. de Manteyer, La Provence du i" & xii' siecle (in 8vo, Paris, 1907) ; Lambert, Essai sur le rtgime municipal et I'affranchissement des communes en Provence (in 8vo, Toulon, 1882); Les Guerres religieuses en Provence (2 vols, in 8vo, 1870); Cabasson, Essai historique sur le parlement de Provence (3 vols, in 8vo, Aix, 1826). (R. Po.)

PROVERB (Lat. proverbium, from pro, forth, publicly, verbum, word; the Greek equivalent is irapoiixia, from7rapa, alongside, and olfios, way, road, i.e. a wayside saying; Ger. Sprichwort), a form of folk-literature, or its later imitation, expressing, in the form of a simple, homely sentence, a pungent criticism of life. Many definitions have been attempted of a " proverb," of which none has met with universal acceptance. J. Howell's (d. 1666) three essentials, " shortness, sense and salt," omit the chief characteristic, popularity or general acceptance, and the definition of Erasmus — Celebre dictum scita quapiam novitate insigne — suits a good proverb rather than proverbs in general. Lord Russell's " The wisdom of many and the wit of one " is familiar.

For a general survey of the subject of proverbs, Archbishop Trench's Proverbs and their Lessons (new ed., 1905, by A. Smythe- Palmer, with additions and notes) is useful; it contains a fairly comprehensive bibliography, ancient and modern. Bohn's Hand- book of Proverbs, and Polyglot of Foreign Proverbs (1857), based on

'The viguerie was the jurisdiction of a viguier, i.e. "vicar," a name given at various times and places in the south of France to very different feudal officials. The viguerie in the 17th and 18th centuries as an administrative subdivision in Provence corresponded to the privdte elsewhere.

the collections of John Ray (1670) and David Ferguson (1641), are very full. V. Stuckey Lean's Collectanea (5 vols.) 1902 is a storehouse of

English proverbs, classified in various ways; Notes and Queries, 9th series (1898), vol. ii., contains a bibliography of English works. The principal foreign works are G. Strafforello, La Sapienza del mondo (3 vols., 1883) and Reinsberg and Durings- feld, Die Sprichwbrter der germanischen und romanischen Sprachen (2 vols., 1872-1875). There are many popular handbooks giving full collections of proverbs, English and foreign.

PROVERBS, BOOK OF (Heb. Mishle Shelomoh, " Proverbs of

Solomon," abridged by the later Jews to Mishle; Septuagint, irapoi/jiai or II. 2aX.; Lat. Vulg. Parabolae sal. and Liber prover- biorum), one of the Wisdom books of the Old Testament (see Wisdom Literature) and the principal representative in the Old Testament of gnomic thought. This sort of thought, which appears very early in Egypt (2000 B.C. or earlier), and relatively early among the Greeks (in the sayings of Thales and Solon as reported by Diogenes Laertius), was of late growth among the Hebrews. Doubtless they, like other peoples, had their simple proverbs, embodying their general observations of life; a couple of these have been preserved in the Old Testament: " Is Saul also among the Prophets?" (1 Sam. x. 12); " The fathers eat sour grapes, and the children's teeth are set on edge " (Jer. xxxi. 29; Ezek. xviii. 2). It is possible that Solomon uttered or col- lected a number of such sayings, based in part on observation of the habits of beasts and plants (1 Kings iv. 32 seq. [Heb.v. 12 seq.]; cf. Jotham's apologue, Judg. ix. 8 sqq., and Samson's riddle, Judg. xiv. 14). The Hebrew word mashal, commonly rendered " proverb," is a general term for didactic and elegiac poetry (as distinguished from the descriptive and the liturgical), its form being that of the couplet with parallelism of clauses; in the Old Testament it signifies a folk-saying (Ezek. xii. 22, xviii. 2), an allegory (Ezek. xvii. 2), an enigmatical saying (Ezek. xxi. 5), a byword (Jer. xxiv. 9; Deut.xxviii. 37), a taunting speech (Isa. xiv. 4; Hab. ii. 6), a lament (Mic. ii. 4), a visional or apocalyptic discourse (Num. xxiii. 7; xxiv. 15), a didactic discourse (Ps. xlix., lxxviii.), an argument or plea (Job xxix. 1). In the book of Proverbs it is either an aphorism (x.-xxii.) or a discourse (i.-ix., xxiii. 29-35, xxvii. 32-27).

The uses of the term being so various, its special signification in any case must be determined by the character of the passage in which it occurs; and an examination of the contents of Proverbs shows that the thought of the book differs widely from that of the literature prior to the 5th century B.C. The book appears on its face to be a compilation, various authors being mentioned'in the titles: Solomon in x. 1 and xxv. 1; the " sages " in xxii. 17 and xxiv. 23; Agur in xxx. 2; the mother of King Lemuel in xxxi. 2; xxxi. 10-31 and, probably, xxx. 5-33 are anonymous; the ascription in i. 1 to Solomon may refer to i.-ix or to the whole book. Apart from the titles (which are not authoritative) the difference of style in the various sections

indicates difference of authorship. There is, indeed, a certain unity of thought in the book; throughout it inculcates cardinal social virtues, such as industry, thrift, discretion, truthfulness, honesty, chastity, and in general it assumes wisdom to be the guiding principle of life. But the sections differ in form and tone. While chs. x.-xxix. and part of xxx. consist of aphorisms chs. i.ix., xxxi. are composed of more or less elaborate dis courses. In the aphoristic sections also there is variety; there are couplets (x. i.-xxii. 16; xxv.-xxix.), quatrains (xxii.-xxiv.) and tetrads and other numerical arrangements (xxx. 7-33). Compilatory character is indicated by repetitions; there are identical lines (x. 1 and xxix. 3; xi. 14 and xxiv. 6; xiii. 9 and xxiv. 20; xiv. 1 and xxiv. 3; xv. 18 and xxix. 22; xvii. 3 and xxvii. 2i;xix. 13 and xxvii. 15; xx. 22 and xxiv. 29; xxiv. 23 and xxviii. 21) and identical couplets (xviii. 8 and xxvi. 22; xix. 1 and xxvii. 6; xix. 24 and xxvi. 15; xx. 16 and xxvii. 13; xxi. 9 and xxv. 34; xxii. 3 and xxvii. 12).

The dates of the various parts of the book must be determined by the character of the contents, there being no decisive external data. The fact that it stands in the third division of the Hebrew Canon, the Writings or Hagiographa, along with such late works as Job, Psalms, Chronicles, Daniel, Ecclesiastes and

Esther, must be allowed weight; the presumption is that the arrangers of the Canonical books regarded it as being in general later than the Prophetical books. No help can be got from the titles. Examination of titles in the Prophets and the Psalms (to say nothing of Ecclesiastes and Wisdom of Solomon) makes it evident that these have been added by late editors who were governed by vague traditions or fanciful associations or caprice, and there is no reason to suppose the titles in Proverbs to be exceptions to the general rule. The ascription of parts of Proverbs to Solomon (i. i, x. i, xxv. i) means nothing for us except that there was a disposition among the later Jews to refer their books to great names of the past, Enoch, Daniel, Job, Moses, David, Solomon, Ezra; as also, outside of Jewry, works were ascribed to Homer, Plato, Aristotle, Tacitus and others that were not composed by these authors. The supposi- tion of a Solomonic authorship for Proverbs is excluded by the whole colouring of the book, in which monotheism and mono- gamy are assumed, without discussion, to be generally accepted, while in Solomon's time and by Solomon's self the worship of many gods and the taking of more than one wife were freely practised, without rebuke from priest or prophet. The high ethical conception of the kingly office in Proverbs is out of keeping with the

despotic character of Solomon's government. It is supposed, indeed, by some modern writers that the notice in xxv. i (" These are proverbs of Solomon, that the men of Hezekiah king of Judah transcribed ") is too circumstantial to be merely a late tradition or scribal guess. But similarly definite titles are prefixed elsewhere, for example, to Ps. li.lx., where they cannot possibly be correct. Hezekiah's time may have been selected by the author of the title (or by the tradition which he represents) as being the next great literary period in Judah after Solomon, the time of Micah and Isaiah, or the selec tion may have been suggested by the military glory of the period (the repulse of the Assyrian army) and by the fame of Hezekiah as a pious monarch and a vigorous reformer of the national religion. But to regard Hezekiah as a Jewish Pisistratus is to ascribe to the time a literary spirit of which the extant documents give no hint ; the literature of the age was wholly occupied with the past history, the religious conditions and the political fortunes of the nation, subjects alien to the book of Proverbs.

The objections to the Solomonic age as the time of origination of the book apply also to the period extending from Solomon through the 6th century. But there are considerations that lead us to put its origin still later. One of these is the non- national character of the thought. The historical and propheti- cal books and the Pentateuch are wholly concerned with the nation. For them Israel is the centre of the world, the point around which all other things revolve — every other people derives its claim to consideration from its relation to Israel — the only subject deserving attention is the extent of the Jewish nation's obedience or disobedience to its divinely given law, on which depends its prosperity or its adversity. In Proverbs there is a notable absence of this point of view. The name Israel and the terms temple, prophet, priest, covenant, do not occur in the book. The " vision " (that is, prophetic vision) in the Hebrew text of xxix. 18 (" Where there is no vision, people throw off restraint ") is an error of text. No writer who was acquainted with Hebrew history could suppose that there was any relation between the national morality and the abundance of prophetic visions; the period in which such visions were most numerous is precisely that in which the corruption of morals is painted by the prophets in the darkest colours and, on the other hand, the people are said (in Pss. xliv. and lxxiv.) to have been obedient at a time when there was no prophet. Moreover, this reading supplies no antithesis in the couplet, the second line of which is: " But he who obeys instruction (or law), happy is he "; we should expect the first line to read: "Where there is no guidance people throw off restraint," as in xi. 14: " Where there is no guidance, a people falls, but in the multitude of counsellors there is safety." Prophets play so great a part in the early history that the ignoring of them here is significant. The deca- dence of prophecy is indicated in two passages that belong

probably to the Greek period: in Zech. xiii. 2 sqq. prophecy is identified with the " unclean spirit," the pretender to visions is threatened with death by his parents, and, so great is the general contempt for the class, protests that he is no prophet but a tiller of the ground, accounting for the wounds on his person (such as these charlatans used to inflict on themselves) by declaring that they were received in the house of his friends (that is, apparently, in a drunken quarrel) ; from a very different point of view Joel ii. 28 seq. (Heb. iii. 1 seq.) predicts that in the latter times (in the ideal restoration of the people) all persons, free and bond, male and female, shall have the spirit of prophecy — that is, the old order shall be set aside and a new religious constitution established. Proverbs belongs to the time when prophecy, as a helpful institution, had disappeared, and wisdom had taken its place. So also the term law had here taken on a new meaning. It is no longer the law of Moses or that of the prophetic revelation — it is the standard of rightdoing resident in every man's mind, the creation of wise reflection; such a con- ception lies outside the point of view that forms the very sub- stance of Hebrew thought in the period prior to the 5th century. It is true that the nationalistic tinge is found in late writings (Chronicles, Psalms), and that its absence, therefore, is not merely a matter of date; but it is hardly conceivable that an author of any time before the 5th century could have ignored the nationalistic point of view so completely as Proverbs does.

Another noteworthy feature of the book is the picture it gives of social life. The organization of the family is treated much more fully than in the Law and the Prophets, and has a more modern aspect. In Deut. xxi. 18 sqq. (of the 7th century) a disobedient son, complained of by his parents, is to be stoned to death by the men of the city; in Proverbs (xiii. 24, xxii. 15, xxiii. 13 seq., xxix. 15, 17) a bad child is to be chastised, and much is said of the training of children by instruction. The impression made by a number of passages (i. 8, xxiii. 22 al.) is that a regular system of family education existed, more definitely ethical than that indicated in Deut. vi. 7, which merely enjoins teaching children the details of the national law. In addition to this parental instruction we find hints of a sort of academic training, particularly in chs. i.ix., in which the sage appears to address a circle of youths. If we may credit the Talmudic tract Pirke Aboth (ch. i.), Jewish academies under the charge of great teachers existed early in the 2nd century B.C., and the beginnings of such institutions may go back a century; they would probably be suggested by the Greek schools of philosophy, which early sprang up in Western Asia and Egypt under Alex ander's successors.

Monogamy, as is remarked above, is assumed in Proverbs to be the recognized custom. Polygamy was legal and usual in the 7th century (Deut. xxi. 15) and the 6th (Lev. xviii. 17, 18), and doubtless continued to be

practised some time after by the Jews, though on this point we have no definite information; Herod, who was a despot, and was not a Jew, cannot be taken as an illustration of Jewish custom; the obscure passage, Mai. ii. 10 sqq. (450-400 B.C.) may have monogamy in mind, but its position on this point is not clear. What is certain is that the definite assumption of monogamy is found only in such late books as Ben-Sira (Ecclesiasticus), Tobit and Judith. In regard to punishment for the violation of a husband's rights Proverbs shows a marked advance on the old usage. The Pentateuchal law (Lev. xx. 10) prescribes death as the punishment for adul- tery; Proverbs (v., vi. 27 sqq., vii.) treats the offence as a sin against the offender himself, an act of suicidal folly, the punish- ment coming sometimes from the jealous husband, but chiefly in the way of the physical depravation and social ignominy that befall the adulterer. This change of punishment imports not a falling off in the moral standard but rather the conviction that a crime of this sort is best dealt with by public opinion; in any case it means a change in the constitution of society.

The experiences described in Proverbs belong especially to city life. Something is said here and there bearing on agricul- tural pursuits, and there is a paragraph (xxvii. 23 sqq.) — a little treatise it may be called — enjoining on the landowner the

necessity of paying special attention to his cattle, large and small; these, says the writer, are the real sources of wealth to the rural landowner. Possibly he means to insist on the advan- tages of country life over life in the city; if this be so, the para- graph bears witness to the prominence of the latter. Whether or not this is his design, advice to cattle-owners is natural in a manual of conduct. The Jews were mainly country-folk from the time of their settlement in Canaan to their final expulsion from the land by Titus and Hadrian, and the soil of Israelitish Palestine was better adapted to the raising of sheep and oxen than to the production of grain. Doubtless much attention was paid to this industry, but the composition of a little book on the subject, indicating a scientific interest in boviculture, points to a comparatively late period; the Greek and Roman works of this sort, by Aristotle, Theophrastus, Virgil and others, were late. This little treatise stands almost alone in Proverbs; the great mass of its aphorisms relate to vices and faults which, though possible in any tolerably well-organized community, were specially prominent in the cities in which the Jews dwelt after the conquests of Alexander. They are malicious gossip, greed of money, giving security, nocturnal robbery, murder, unchastity. Much space is given to the last-named vice through- out the book, and

especially in chs. i. and ix. — obviously it is regarded as a notorious social evil. Comparatively little is said of it in the Pentateuch and the prophetical and historical books. That there were harlots and adulteresses in Israel from an early time is shown by such passages as Judg. xi. i (Jephthah's mother), i Kings iii. 16 (the judgment of Solomon), Hos. iii. i. (Hosea's wife), by the denunciations of the crime and the laws against it, and by the employment of the terms harlotry and adultery as designations of religious unfaithfulness. Yet, apart from the references to cultic prostitution (which was adopted by the Israelites from the Canaanites), the mention of the vice in ques- tion is not frequent; in a polygamous society and in a country without great cities it was not likely to grow to great proportions. The case was different when the Jews were dispersed through the new Greek kingdoms, and lived in cities like Jerusalem and Alexandria, centres of wealth and luxury, inhabited by mixed populations; this form of debauchery then became commoner and better organized. Hetairae flocked to the cities. Naukratis in the Egyptian Delta was famous under the Ptolemies for its brilliant venal women. The temptations of Alexandria and the loose morals of the time (latter part of the 3rd century) are illus- trated by the story told by Josephus (Ant. xii. 4, 6) of Joseph the son of Tobias. The picture of society given in Ben-Sira (ix. 3-9, xix. 2, xxiii. 16-26, xxv. 16-26, xxvi. 8-12, xlii. 9-14), based on life in Jerusalem and Alexandria in the 2nd and 3rd centuries B.C. agrees in substance with the descriptions of the Book of Proverbs. The tone of these descriptions throughout the book, but particularly in chs. i.-ix., is modern. A point of interest is that the exhortations to chastity are addressed to men only; the man is regarded as the victim, the woman as the temptress — women are never warned against men or against the general seductions of society. This silence may be due in part to a current opinion that women were more hedged in and guarded by social arrangements and less exposed to temptation than men; but it is chiefly the result of the fact that the Old Testament (like most ancient and modern works on practical ethics) addresses itself almost exclusively to men (certain classes of women are denounced in Amos iv. 1-3; Isa. iii. 16-iv. 1; Ezek. xiii. 17-23); the moral independence of women is not distinctly recognized. In this regard Ecclesiasticus agrees with Proverbs — it has no word of advice for women. The temptress in Proverbs appears to be a married woman; she is certainly such in chs. vi. and vii., and probably also throughout the book. The term " strange woman " (ii. 16 al.) means not a foreigner, but one who is alien to the man's family circle, the wife of an- other man. Such women may sometimes have been foreigners, but the sage's concern is with the man's violation of the marriage obligation, be the woman Jew or Gentile. In the earlier time marriages between Jewish men and Canaanite women seem to have been not uncommon; whether (outside of Herod's family)

there were marriages with foreigners in the Greek period we have no means of determining.

Proverbs is remarkable for the attention it gives to kings. The prophets have nothing to say of them as a class. One passage in the Pentateuch (Deut. xvii. 15-20) prescribes that the Israelite king shall be the opposite of Solomon — he shall not accumulate horses, wives, silver and gold, and shall study the law. In the Psalter he is considered merely as a servant of Yahweh. Proverbs treats the king, in a quite modern way, as a member of society. He is described ideally as ruling by the might of wisdom (viii. 15, 16), and as controlled in his administration by truth, kindness and justice (xx. 8, 26, 28) — the wicked ruler who oppresses the poor is condemned as not reaching the ideal standard (xxviii. 3, 5, 16). Three manuals of conduct are devoted to him (xvi. 107-15, xxv. 2-7, xxxi. 2-9). His power is recognized — he is the source of life and death (xvi. 14, 15) — but he is treated as a human being who must be governed by the ordinary laws of right. It is especially illustrative of the times that instruction in table manners is offered to the guests of kings — they must be modest in their bearing, not putting them- selves forward (xxv. 6, 7; cf. Luke xiv. 8, n), and they must control their appetites (xxiii. 1, 2). The reference here must be to the numerous non- Jewish kings of the Greek period, and perhaps also to the Maccabean princes; the manners of the time are set forth in Josephus's account of Ptolemy's dinner, at which the Jew Hyrcanus was a guest (Ant. xii. 4, 9). The mingling of despotism and good-natured familiarity there described (and the spirit is doubtless correctly given by Josephus, whether or not his details are historical) agrees with the picture in Proverbs.

Finally, a late date for Proverbs is indicated by what may be called its philosophical element — a feature that it has in com- mon with the other Wisdom books (see Wisdom Literature). This element is recognizable throughout the book, but is most distinct in chs. i.-ix., in which wisdom is personified as the power regulating the affairs of human life (iii. 13-18, viii. 1-21). The portraiture approaches hypostatization in the cosmogonic ode (viii. 22-31), especially if the first line of v. 30 be rendered: " I was at his side as a master- workman "; but the Hebrew word (amon) rendered " master- workman " is of doubtful meaning, and the connexion rather calls for some such sense as " nursling, ward "; Yahweh himself is represented as the architect, and wisdom, the first of his works, is his companion, sporting in his presence like a beloved child. . The whole passage (vv. 22-31) was early employed by Christian theologians (Irenaeus, Athanasius, Augustine and others) in the controversies respect- ing the nature of the Second Person of the Trinity', particularly in connexion with the idea of eternal generation; the argument turned in part on the question whether the verb in v. 22 was to be translated by " created " or by " possessed." Ecclesiasticus

xxiv. and Wisdom of Solomon vii. should be compared with the Proverbs ode. In the remainder of the book (chs. x.xxxi.) ” wisdom ” is sometimes common sense or sagacity, sometimes the reflective habit of mind and largeness of outlook, sometimes the recognition of the ideal standard of living. Contrasted with the wise are fools, and on these the sages vent their scorn abun dantly (xii. 15, 16, xvii. 12, xviii. 6, 7, xxiii. 9 al.); xxvi. 1,3-12 is a ” book of fools.” The conception of the good 1 life is that of philosophically ordered rectitude. The religious element is prominent in x. i-xxii. 16, but it is blended with the reflective. The philosophy of the book is practical, not speculative.

Comparison of Proverbs with Ecclesiasticus, Ecclesiastes and Wisdom of Solomon shows that it belongs, in its main features, in the same category as these. Its thought, differing so widely from that of the prophets and the Pentateuch, is most naturally referred to the period when the Jews came into intimate intel- lectual contact with the non-Semitic world, and particularly with the Greeks (philosophical influence is not to be looked for from Persia) .

While the general period in which the book belongs may thus be determined with fair probability, it is less easy to fix the dates of its several parts. The earliest of the groups of which the book

is composed seems to be x. iˆxxii. 16, xxv.-xxix. which consists of simple aphorisms relating to everyday affairs. This group, however, is itself composite; we may distinguish a collection of antithetic couplets (x.-xv. and most of xxviii., xxix), and one made up of comparisons and single sentences (xvi.’ 1 — xxii. 16, xxv.-xxvii., and some verses in xxviii., xxix). Of these two the first, on account of its simpler form, appears to be the earlier, though they cannot stand far apart in time; and by combining them an editor formed the section as we now have it. These may have been severally made from current collections, a number of which were probably in existence. A general preface exhorting the pupil to give heed to the instruction of the sages (xxii. 17-21), introduces a group of quatrains in two sub-groups (xxii. 22 — xxiv. 22 and xxiv. 23-34) characterized by a wide range of thought and by ethical depth. Probably later than these are the elaborate discourses of i.-ix. (excluding vi. 1-5, 6~i 1, 12-19 and ix. 7-12, misplaced paragraphs) contain- ing praise of ideal wisdom and warnings against unchastity. Chs. xxx., xxxi., made up of various pieces, form a sort of appen- dix to the book; some of the pieces are artificial in form (xxx. 1 1-3 1), one is a full picture of a good housewife’s home life

(xxxi. 10-31), two are ascribed to the unknown persons Agur (xxx. 2-4) and King Lemuel's mother (xxxi. 2-9). Agur's dictum is one of pious agnosticism directed, apparently, against certain theologians who talked as if they were well acquainted with the ways of God. Agur's word, breathing the spirit of scepticism, falls into the category represented by Ecclesiastes, and we may probably set the year 200 (or possibly 150) B.C. as the lower limit of the Book of Proverbs; allowing a century for the collection and combination of the various parts, we shall have the year 300 B.C. as the date of its earliest section. Some of the material may have existed in aphoristic form before, but the composition of the present book may be put approximately in the century 300-200 B.C. Even its simplest maxims have a certain academic form.

In its general ethical code Proverbs represents the best stan- dard of the times ; the sages are at one with the more enlightened moralists of the Western world. All the ordinary social virtues such as truthfulness, honesty, kindness, chastity are emphasized and a great stress is laid on care for the poor (a social necessity at a tine when there were no well organized public charities). But Proverbs seems not to go the length of identifying righteous- ness with almsgiving, as is done in Dan. iv. 27 (24), Matt. v. 1, and substantially in Ecclus. iii. 30, xxix. 12 and Tobit iv. 10, xii. 9; in x. 2, " righteousness delivers from death," the word " righteousness " is probably to be taken in its ordinary ethical sense. The above-named virtues are all recognized in the earlier Hebrew writings, the prophets and the law, but in certain points Proverbs goes beyond these, notably in its prohibition of exultation over a fallen enemy (xxiv. 17) and of retaliation for injury received (xxiv. 29), and in its inculcation of kindness to enemies (xxv. 21). The injunction in Lev. xix. 18, "Thou shalt love thy neighbour as thyself," refers only to Israelite fellow-citizens, not to enemies (cf. the interpretation given in Matt. v. 43), and the command in Exod. xxiii. 4 seq., to care for one's enemy's ox or ass likewise refers to Israelites; Proverbs con- ceives the principle in a higher way and extends it beyond the limits of the nation. Slavery is recognized as a lawful institu- tion, but little is said of it. There is no suggestion of moral training of the slave; he is to be taught not by words (xxix. 19) but by the rod, like the child (v. 15), and it is intimated (». 21) that it is a mistake to bring up a servant delicately. This was doubtless the general view of the time; Ben-Sira frankly regards the servant as a chattel (Ecclus, xxxiii. 24-31). Proverbs greatly disapproves of the elevation of slaves to the position of rulers (xix. 10) — an occurrence not uncommon in those days. The estimate of woman as wife and mother, and especially as housewife, is high (xviii. 22, xix. 14, xxxi. 10-31). In vi. 20 the mother is spoken of, along with the father, as teacher of the children, and it is assumed, therefore, that she is competent; but nothing is said of the education of women— in xxxi. 26 the " wisdom "

of the good wife (not " virtuous

woman ") is good sense, practical sagacity in housekeeping. The equality of all men as creatures of God, silently assumed in the earlier literature, is definitely expressed in Proverbs (xxii. 2, cf. Job xxxiv. 19, Ecclus. xi. 14). Humility, as the opposite of insolent pride, is recognized as a virtue (xviii. 12, cf. xvi. 18) — it is a modest estimate of one's worth, refusal to claim too great honour for one's self. In general it is the simple homely virtues that are enjoined on men in Proverbs — there is no mention of courage, fortitude, intellectual truthfulness, and no recognition of beauty as an element of life; the ethical type is Semitic, not Hellenic, and the sages emphasize only those qualities that seemed to them to be most effective in the struggle of life; their insistence on the practical, not the heroic, side of character is perhaps in part the consequence of the position of the Jewish people at that time, as also the silence respecting international ethics belongs to the thought of the times. The ground of moral judgments in the book is both external (the law of God) and internal (the conscience of man) ; these two are fused into one, and both go back ultimately to current customs and ideas. The motive assigned for right doing is individualistic utilitarian — the advantage accruing to the man either through the laws of society or through the rewards dispensed by God. This motive, which is the one assumed throughout the Old Testament, is effective for the mass of men, and becomes ethi- cally high when the advantage had in view is of an elevated moral character. Proverbs does not offer the good of society as an aim of action, though it takes for granted that good conduct will promote the happiness of all. Assuming human freedom it at the same time assumes that the ills of life may be overcome by a wise employment of man's resources, and it silently regards universal happiness on earth as the goal of human development. Its religious scheme is the simplest form of theism; religion is reverence for God and obedience to His laws. Though the sages doubtless recognized the temple-cult as of divine appoint- ment and obligatory, they lay no stress upon it; for them the essence of religion is something else; right living, they say (xxi. 3), is more acceptable to God than sacrifice, and sacrifice without ethical feeling is abominable to Him (xv. 8). Subordinate supernatural beings (angels and demons), though of course accepted as real, are ignored as having no importance for life. There is no reference or allusion to national Messianic hopes (certainly none in xvi. 10-15); neither the political situation in the 3rd century B.C., nor the sages' point of view was friendly to such hopes. The view of the future life is the old Hebrew one: death is practically the end-all, Sheol is the negation of happy activity, and from it no one returns; in v. 23, vii. 27, ix. 18, x. 2, the reference is to premature death on earth. The aim of the sages is to make earthly life strong and happy. They lay no claim to divine inspiration — they speak simply as ordinary human thinkers, though they are

convinced that they have eternal truth.

The reception of Proverbs into the Hebrew. Canon was for a time opposed on the ground of a supposed contradiction between two aphorisms (xxvi. 4, 5,) and (vii. 7, 20) of too highly coloured descriptions {Shabbath, 30b, Aboth Nathan, cap. i.); these difficul- ties were got over, and the book was finally declared canonical. . It is quoted over twenty times in the New Testament, and has always been highly valued as a manual of conduct.

Of the ancient versions the Septuagint is the only one that is . of great service for the criticism of the Hebrew text of Proverbs. The Latin, the Peshitta Syriac and the Targum occasionally offer suggestions; the Hexaplar Syriac and the Coptic are of value for the determination of the text of the Septuagint.

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PROVIDENCE, the second largest city of New England, capital of Rhode Island, U.S.A., the county-seat of Providence county, and a port of entry, situated at the head of Providence river (the N. arm of Narragansett Bay) and at the influx of the Seekonk (or Blackstone), Moshassuck and Woonasquatucket rivers, about 35 m. from the Atlantic ocean, 45 m. by rail S.S.W. of Boston, and 188 m. E.N.E. of New York. Pop. (1890), 132,146; (1900), 175,597; (1905, state census), 198,635, of whom 65,746 were foreign-born, including 17,155 Irish, 12,114 Italians, 9795 English, 4221 English Canadians, 4005 French Canadians, 3685 Russians, 3347 Swedes, 2211 Germans, 2173 Portuguese (including some Bravas from the Cape Verde Islands), and 1930 Scotsmen. The figure for 1910 was 224,326. Providence is served by the New York, New Haven & Hartford railway and by steam- boat lines to Newport, New York, Philadelphia, Baltimore and Norfolk. It extends over an area of more than 18 sq. m., and is irregularly laid out. The Seekonk and Providence rivers mark the eastern boundary, the Providence and Moshassuck rivers divide the middle and northern portion of the city into the east and west sides, and the Woonasquatucket river divides the wesf side into the northern and southern parts. The west side is a level or gently rolling plain only a few feet above the sea, but on the eastern side are a plateau and hills rising to a maxi- mum height of about 200 ft. The larger and newer portion of the business district is along the western bank of the Providence, and some of the best business houses are on made land. The part of the city which has most historic interest is on the east side, where are the most attractive residences. Most of the manufactories are along the banks of the Woonasquatucket and Moshassuck. The names of streets — Pound, Sovereign, Shilling, Dollar, Doubloon, Benevolent, Benefit, Hope, Friend- ship, Peace, &c, reflect the early commercial importance of the city and its strong Quaker element.

The principal building is the large State House, completed in 1902, of Georgia marble and white granite, surmounted by a central dome of marble, 235 ft. high, and standing on a rise of ground (Capitol Hill) about 7 m. north by west of the steamboat landing at the head of Providence river; in the state chamber is a full length portrait of George Washington by Gilbert Stuart. The old State House on Benefit Street, on the east side, is now used as the 6th district (Providence and North Provi- dence) court-house. Near the centre of the city (in Exchange Place) is the city-hall (1878), a handsome structure of granite; on its facade is a medallion of Roger Williams. Across Exchange Place from the city-hall is the Federal Building (1908), which houses the post-office, custom-house, U.S. courts, &c. The county court-house (1877) is the only other prominent govern- ment building. The Arcade (1828), 225 ft. long, with six massive Ionic columns at each entrance, the Butler Exchange, and a few other fine buildings fronting on Westminster Street are among the more prominent business buildings. In Cranston Street, between Waterloo and Dexter, is an Armory, with the largest hall in New England. A handsome public library building, opened in 1900, lying between Fountain, Greene and Washington

Streets, houses a good collection of 140,000 vols, (in 1909); other libraries are the State Library (30,000 volumes), the State Law Lifcrary (50,000 volumes) in the Providence county court- house, the Providence Athenaeum (the Providence Library, established in 1753, united in 1836 with the Providence Athe- naeum, established in 1831; in 1909 it had 73,000 volumes), the library of the Rhode Island Historical Society (established 1822; with 30,000 volumes and 50,000 pamphlets in 1909), and the libraries of Brown University. The meeting-house of the First Baptist Church, founded by Roger Williams, the oldest organization of this sect in the United States, was built in 1775 and was designed to resemble St Martin's-in-the-Fields, London. Its bell still rings the curfew at nine o'clock every evening; and the commencements of Brown University are held here. The Friends' meeting-house, another interesting old building, was erected in 1759. The Beneficent Church (Congre- gational, 1 809-1 8 10) is in the Colonial style, with a rounded dome. The Church of the Blessed Sacrament (Roman Catholic), in Academy Street, was designed by John La Farge. The Roman Catholic Cathedral of SS. Peter and Paul (1878) is of brown stone and has excellent interior decorations. Providence is the see of a Protestant Episcopal bishop. In Cathedral Square is a statue (1889) by Henry Hudson Kitson of Thomas A. Doyle, mayor of the city (1864-1869, 1870-1881, and from 1884 until his death in 1886). There is an equestrian statue (1887) by Launt Thompson of General A. E. Burnside in City Hall Park. In front of the post-office are two allegorical groups (" Provi- dence " and " the United States ") by J. Massey Rhind. In Columbus Park is a replica of Bartholdi's " Columbus," which was cast in silver by Providence metal

workers for the Colum- bian Exposition in Chicago. Other statues are Hippolyte Hubert's Ebenezer Knight Dexter (erected 1894), George Thomas Brewster's bronze " Genius of Religious Liberty " on the dome of the State House, Franklin Simmons's Roger Williams (1877) in Roger Williams Park, a Hellenic bronze " Pancratiast " (1900, presented to the city by Paul Bajnotti of Turin) also in Roger Williams Park, and a Hellenistic statue of Augustus on the campus of Brown University. Two fountains also are worth mention: the Bajnotti Memorial Fountain in City Hall Park, a memorial to the wife of Paul Bajnotti, representing " The Struggle of Life " and designed by Enid Yandell; and the Elisha Dyer Memorial Fountain, a bronze athlete, by H. H. Kitson. There are art collections in Brown University and in the Ann- mary Brown Memorial (given to the city as a memorial to his wife, a daughter of Nicholas Brown, by Rush C. Hawkins, b. 183 1). Among interesting old houses of the 18th century are the Admiral Hopkins House, in Hopkins Park, the Stephen Hopkins House (1742; 9 Hopkins St.), the John Carter Brown House (1791; 357 Benefit St.), and the John Brown House (1786; 52 Power St.). There are many colonial houses, red brick with marble trimmings, set well back from the street, with an occa- sional walled garden. There are many musical societies in Providence, including the Chopin Club (1879), the Arion Club (1880), the Einklang Singing Society (1890; German), the Verdandi Swedish Singing Society (1894), and the Providence Musical Association (1904). Other clubs are the Brown Union, University Club, a cricket and a polo club, golf clubs, yacht clubs and canoe clubs, the Handicraft Club, the Providence Art Club, the Hope Club and the Deutsche Gesellschaft.

Under the municipal park commissioners there are 33 public parks with a total area of 644-38 acres, and the city supports' summer playgrounds; the state board of metropolitan park commissioners controls a large park system in the metropolitan park district, and a system of boulevards, connecting the several parks and other public reservations; there are nine metropolitan reservations, containing 677 acres, the largest being Lincoln Woods, of 460 acres, 4 m. north of the State House. Other metropolitan reservations are: Woonasquatucket Reservation (53 acres; i\ m. west of the State House) ; Edgewood Beach (25 m. south of the State House) ; and the Ten Mile River Reservation (100 acres; 4! m. north-east of the State House) on both sides of Ten Mile River. The finest municipal reservation is Roger

Williams Park (432 acres, of which 140 are water), with 9 m. of drives and boulevards, in the southern part of the city, 23 m. from the State

House. It was a part of the original tract ceded to Roger Williams by Miantonomo; 107 acres were a farm which Betsy Williams (d. 187 1), a lineal descendant of Roger Williams, left to the city by will. In the park are a chain of lakes with a shore front of i\ m., a boat-house, a casino, a speedway and athletic grounds, a municipal natural history museum, and the Betsy Williams Cottage (1775). Other municipal parks are: Neutaconkanut (405 acres; 25 m. west of the State House) on high land commanding a view to the east and south; Davis Park (383 acres) with amusement grounds; Blackstone Park (43 acres, \ m. east of the State House) along the Seekonk river; Hopkins Park (f m. north of the State House), comprising the estate of Esek Hopkins (1718-1802), commander of the American Navy in the War of Independence, with a historical museum in the Admiral Hopkins House; and City Hall Park. Blackstone Boulevard is if m. long; and Pleasant Valley Parkway is ij m. long. Enclosed by a railing near the eastern end of Power Street, on the bank of the Seekonk, is What Cheer Slate 1 Rock, according to tradition the first landing place of Roger Williams. In the North Burial Ground are the remains of Stephen Hopkins (1 707-1 785), a citizen of Providence, a delegate to the Albany convention of 1754, a colonial governor of Rhode Island (1755- i757> 1758-1762, 1763-1765, and 1767-1768), a member of the Continental Congress in 17 74-1 780 and a signer of the Declara- tion of Independence; of William Barton (1748-1831), who in the War of Independence captured General Richard Prescott near Newport on the 10th of July 1777; of Francis Wayland; and of Nicholas Brown, who was a patron of Brown University and one of the founders of the Providence Athenaeum and of the Butler Hospital for the Insane.

On the steep slope of College Hill (or Prospect Hill) in the east side near the business district, is Brown University (1764) — one of the eight colleges in the United States founded before 1776 — closely connected with the history of Providence, Rhode Island, and the Baptist Church in America. It has an undergraduate department for men, with courses, largely elective, leading to the degrees of A.B. and Ph.B., and courses, almost wholly pre-scribed, in civil, mechanical and electrical engineering. It includes, besides " The Women's College in Brown University," a separate college for women, and a graduate department open to both men and women. The campus is shaded by some fine old elms and is surrounded by an iron fence with beautiful memorial gates. In 1910 there were twenty-two buildings, including the following: University Hall (erected in 1770 and used during the War of Independence as barracks and hospital by American and French soldiers) ; Sayles Memorial Hall (1881), containing the chapel, lecture halls and seminary rooms; three library buildings, the John Hay Library (which occupies the site of the old President's House), the old University Library (1878) and the John Carter Brown Library (1904); the Ladd

Astronomical Observatory, with a 12-in. equatorial and much other valuable equipment; Rhode Island Hall (1840), containing a biological laboratory and a natural history museum; Manning Hall (1834), containing an art museum; Wilson Hall (1891), con- taining a physical and a psychological laboratory; Rogers Hall (1862), a chemical laboratory; an engineering building (1903); the Lyman gymnasium (1891) and Colgate Hoyt swimming pool (1904); an administration building (1902); the Sayles gymna- sium (1906) for women; Rockefeller Hall (1903), occupied by the Brown Union, a students' organization and the Young Men's Christian Association; the residence halls: University Hall (1770, remodelled 1883), Hope College (1822 and 1891), Slater Hall (1879), Maxcy Hall (1895), and Caswell Hall (1903) ; and the Carrie (clock) Tower, erected in 1904 by Paul Bajnotti, of Turin, Italy, as a memorial to his wife, Carrie Mathilde Brown, of Providence. Besides the general library, containing (1909) about 164,000 volumes, the university owns the separately housed John Carter Brown Library of 20,000 volumes, one of

1 So called because Roger Williams was greeted here by Indians, who said ".What cheer, Netop ?" (" Netop " meaning friend).

the best collections in the world of material on early American history (especially of books printed before 1800), which, with an endowment of $500,000, was presented to the university in 1901 in accordance with the will of John Nicholas Brown, the son of John Carter Brown (1797-1874) a prominent Providence merchant, who began the collection. In 1909 the university had an endowment fund of $3,416,744, 90 instructors and 993 students, of whom 88 were graduates; of the undergraduates 179 were enrolled in the Women's College. The charter of the institution requires that it shall be governed by a board of thirty- six trustees, of whom twenty-two shall be Baptists, five Friends, four Congregationalists, and five Episcopalians, and by twelve fellows (including the president) of whom eight (including the president) shall be Baptists, " and the rest indifferently of any or all denominations." At the time it was framed the charter was considered extraordinarily liberal. Only two pro- visions are included regarding the character of instruction to be offered: first that " the public teaching shall in general respect the sciences," and second, that " into this liberal and catholic institution shall never be admitted any religious tests, but on the contrary all the members hereof shall forever enjoy full, free, absolute and uninterrupted liberty of conscience." The government has always been largely non- sectarian in spirit, and a movement was on foot in 1910 to abolish the denominational requirements for trustees and fellows.

Brown University, the first institution for higher education established by

American Baptists, was incorporated in 1764, and although still under its original charter was known for the first forty years as Rhode Island College. The Latin or preparatory school was opened at Warren in 1764 and the college was started there in 1766, but in 1770 the institution was removed to Provi. dence. Although its work was interrupted by the War of Inde- pendence, the institution was reopened in 1782 and ten years later it began to receive aid from Nicholas Brown (1769-1841), a wealthy merchant who graduated from the Rhode Island College in 1786; it was named in his honour in 1804, and up to the time of his death his gifts amounted to about $160,000. Dr Francis! Wayland, the most eminent of its presidents, began his adminis- tration in 1827 and in twenty-eight years of service as its head he established the elective system and greatly raised the standard of scholarship. Brown actually became a university under Elisha Benjamin Andrews, who was president in 1889-1898, who developed the graduate school and undergraduate instruction in history and social and political science, and who was succeeded in 1899 by William Herbert Perry Faunce (b. 1859), who graduated at Brown in 1880. In 1900 and 1901 more than $2,000,000 was added to the endowment of the university. The Women's College was founded in 1891, and in 1897 it was accepted by the corporation as a department of the university. Among distinguished alumni of Brown are Henry Wheaton (1785-1848), John Hay, Richard Olney, James Burrill Angell (b. 1829) Adoniram Judson, William Learned Marcy, Wilbur Fisk, Horace Mann, Samuel Gridley Howe, Barnas Sears, Edwards Amasa Park, Samuel Sullivan Cox, George Park Fisher, George Dana Boardman, Alexander Lyman Holley, and Albert Harkness.

In Providence are the Rhode Island Normal School (in the north part of the city, in Gaspee St.; established in 1854; discon- tinued in 1857; re-established in 1871), which has a fine building (1898), the Rhode Island Institute for the Deaf (1876), and the Rhode Island School of Design (1877; partially supported by the state, since 1882, and by the city), affiliated with Brown University. The following secondary schools are in the city: four high schools, one of which is technical, La Salle Academy (1871; Roman Catholic, under the Brothers of the Christian Schools), Saint Xavier's Academy (Roman Catholic), the Academy of the Sacred Heart (Roman Catholic), Moses Brown School (Friends; at Portsmouth in 1 784-1 7S8; re-estab- lished in Providence in 18 14), the Brown school for boys (non- sectarian) , Fielden-Chace school for girls (non-sectarian), and the Lincoln School (non-sectarian). The public school system has benefited by the presence of Brown University, whose faculty has been largely represented on the school committee; by an agreement with the university its professor of the theory and practice of education is director of the training department in the high schools, and there are other schemes of

co-operation. Transition classes between the kindergarten and primary were

long peculiar to the Providence public schools. In 1908 a ” Sunshine School ” was established, with sun and fresh-air treatment for invalid pupils.

The Providence Journal (Independent, daily, 1829), the most important newspaper published in the state, and the Evening Bulletin (Independent, 1863) are controlled by the same com- pany.

The charitable institutions include the Rhode Island Hospital (1863, private), the Prisoners’ Aid Association (1872), the Providence Rescue Home and Mission (1896), the Bethany Home of Rhode Island (1892), a temporary home for women; the House of the Good Shepherd (1904), the Lying-in Hospital (1884), Saint Joseph’s Hospital (1892; Sisters of St Francis), two dispensaries, a City Hospital for the Treatment of Contagious Diseases (1909) en Capitol Hill ; the Butler Hospital for the Insane, which is one of the oldest institutions of its kind in the country, was established by a be- quest of $30,000 left in 1 841 by Nicholas Brown,’ and has about 120 acres of beautiful grounds on the western bank of the Seekonk; the Dexter Asylum for the Poor (endowed with the Dexter Fund and limited to those who have a legal settlement in Providence, i.e. have paid taxes on $200 worth of property for five years; and hence a charity of little practical use) ; a home for aged men (1875), a home for aged women (1856), St Elizabeth’s Home (1882, Protestant Episcopal) for incurable and convalescent women ; a home for aged coloured women (1890), five temporary homes, the Rhode Island Catholic Orphan Asylum (1851, Sisters of Mercy), St Vincent de Paul’s Infant Asylum (1892, Sisters of Divine Providence), St Mary’s Orphanage (1873, Protestant Episcopal), the State Home and School (1885) for indigent and neglected children, Providence Children’s Friend Society (1835), other homes’ for children, day nurseries, and the Providence Society for organizing charity (1892). Jewish charities are prominent. The St Vincent de Paul Society is the organized charity of the Roman Catholic churches.*

The harbour of Providence and its approaches have been much improved since the middle of the 19th century by the Federal and state governments. Between 1853 and 1873 the low-water depth of the channel was increased from 4! ft. to 12 ft., at a cost of $59,000; from 1878 to 1895 the depth of the channel was further increased to 25 ft., and anchorage basins were created with a minimum depth of 20 ft. for a width of 600 ft., with a

minimum depth of 18 ft. for a width of 725 ft., with a minimum depth of 12 ft. for a width of 940 ft., and with a minimum depth of 6 ft. for a width of 1060 ft. Between 1896 and 1906 the channel from Sassafras Point to the ocean was widened to 400 ft. and by 1909 the anchorage area, having a depth of 25 ft., was further increased to about 288 acres. Between 1867 and 1909 the channel of the Seekonk. river was dredged to a depth of 16 ft. as far as Pawtucket at the head of navigation. In 1908 the commerce, largely coastwise, of Providence Harbor, amounted to 3,379,594 tons, chiefly coal, general merchandise and fish, valued at $93,309,495. In 1909 the value of the foreign imports, chiefly salt from Turks Island and lumber from Nova Scotia, amounted to $1,893,551, and the value of the exports to $12,517. Of greater importance to Providence than its commerce are its manufactures, the value of which in 1905 was $91,980,963, or 16-9% more than in 1900. Its factory products were valued at 45-5% of the state's total; its wage earners were 40-9% of the state's total; and nearly one-half of the worsted goods and more than one-fourth of all the textiles made in the state were manufactured here, as were four-fifths of the rubber and elastic goods, nine-tenths of the foundry and machine-shop products, and all the gold and silver refined, not from the ore. The Gorham Company engage here in the manufacture of gold, silver and bronze works of art; the American Screw Company, the Brown & Sharpe Manufacturing Company, and the Nicholson File Company have factories here; and here the famous Corliss engines were first made about 1847. In 1905 Rhode Island ranked first among the states and Territories of the Union in the value of jewelry manufactured and more than 99% of this was made in Providence, which produced 26-9% (by value) of all the jewelry made in the United States. The value of the jewelry made in Providence in 1905 was $14,317,050, being 15-6% of the value of the city's entire factory product. Closely allied with this manufacture were the reducing and refining of gold and silver sweepings, &c. (none from ore), with a product value in 1905 of $4,260,698, and silversmithing and the manufacture of silver-ware with products in 1905 valued at

$5!3 2 3) 2 64- Actually the largest industry in 1905 was the manufacture of worsted goods, valued at $21,020,892. Other important manufactures are foundry and machine-shop products (1905, $9,358,687), woollen goods ($2,080,658), cotton goods ($1,025,264) and cotton small wares ($1,967,298), dyeing and finishing textiles ($2,254,074), rubber and elastic goods ($2,167,983), and malt liquors ($1,427,246).

Providence is governed under a city charter of 1832, subse- quently amended. A town meeting is still held annually for the administration of the fund (referred to above) called the Dexter donation. Under the city charter only citizens who pay a tax on $134 worth of real property or $200 worth of personal property may vote for members of the city council.

Until 1842 there was the further requirements that every voter should be the eldest son of a freeholder. The city council is composed of: a board of aldermen, one from each of the ten wards, which may redistrict the city every five years, and until 1895 a"cted as a returning board, and which is presided over by the mayor; and a common council of four members from each ward, elected in open ward-meeting by the qualified freeholders of the ward. Elections are annual. The aldermen and common council meet together to organize and to elect municipal officers, not other- wise provided for. The greater size of the common council gives it the power in joint sessions; and although the vote of the city for mayor is normally Democratic, the vote of the qualified freeholders (which is only about 40% of the total vote) for common-councilmen and aldermen is always Republican.

The two houses acted before 1895 as a board of registration; the council now chooses a board of three members with a term of three years. The city council and a school committee of 33 members (3 ex officio; 30 elected by wards, one each year from each ward for a three-year term) control the public schools. The mayor has had the veto power only since 1854; and until 1866 his veto could be overridden by a majority vote; a three- fifths vote of each chamber is now necessary. The mayor was at the head of the police department until 1901, when a commis- sion of three was created; until 1906 these police commissioners were appointed by the governor of the state, but they are now chosen by the mayor with the approval of the board of alder- men. In the same way the mayor appoints a commissioner of public works for a term of three years. The three commissioners of the fire department and the three members of the board for the assessment of taxes are chosen by the city council. The city treasurer (since 1858) and the overseer of the poor and the harbour-master (since 1866) are elected by popular vote. The municipality owns and operates the waterworks and there are municipal bath-houses.

Providence was founded in 1636 by Roger Williams, an exile from Massachusetts, and its early history is closely bound up with the early history of Rhode Island, it being one of the four towns out of which this commonwealth was formed. Having agreed with Canonicus and Miantonomo, the Narraganset sachems, for the purchase of a considerable tract of land, Wil- liams built his house about 50 ft. east of what is now North Main Street and nearly opposite the confluence of the Moshassuck and Woonasquatucket rivers, and he named the place Providence in recognition of his divine guidance hither. He and a few companions who had accompanied him into exile immediately established a town government with monthly town meetings, and in the next year, 1637, after the arrival of a few more settlers, a plantation covenant was adopted which laid the basis of the future commonwealth on a new principle — the

complete separa- tion of religious and civil affairs. In 1644 Williams secured a charter uniting Providence, Aquidneck (Portsmouth), and New-port, as " The Incorporation of Providence Plantations in the Narraganset Bay in New England"; these three towns (and Warwick) organized in Providence in May 1647 under this government. The charter of the 24th of November 1663, to the Governor and Company of the English Colony of Rhode Island and Providence Plantations, perpetuated the name Providence Plantations, which still remains a part of the legal 1 title of the state. Providence was incorporated as a town by

the Colonial Assembly in 1649; in 1730-1731, when the area of Providence was 370 sq. m., Scituate (including Foster), Glocester (including Burrillville), and Smithfield (including North Smith- field and Lincoln) were set off; in the next thirty years the area of the township was reduced to si sq. m. by the separation of Cranston, Johnston and North Providence, parts of which have been re-annexed since i860. Providence was chartered as a city in 1832. During King Philip's War, in 1676, the town was attacked by Indians and the northern half was burned. In June 1772, a British schooner, the " Gaspee," while chasing a Providence packet-boat ran aground at what has since become known as Gaspee Point, whereupon its capture was planned by John Brown (1736-1828), a Providence merchant, and the plan — including the burning of the vessel — was carried out under the command of Abraham Whipple (1733-1819). During the war much privateering was carried on from Providence. The British occupation of Newport during the War of Independence caused the transfer of the important foreign commerce of that city to Providence, but as a consequence of their superior railway facilities most of this went to New York and Boston before the middle of the 19th century. In September 181 5 Providence was visited by a gale which did about $1,000,000 damage to its shipping and other property. In 1830 Providence had ceased to be a great port and had begun to be a textile manufacturing place. Until 1900 Providence was one of the two capitals of the state, Newport being the other; since 1900 it has been the sole capital.

See H. C. Dorr, " The Planting and Growth of Providence," in the Rhode Island Historical Tracts (Providence, 1882) ; W. A. Greene and others, The Providence Plantations for Two Hundred and Fifty Years (Providence, 1886); W. R. Staples, Annals of the Town of Providence (Providence, 1843); W. B. Weeden, "Providence, the Colony of Hope," in L. P. Powell's Historic Towns of New England (New York, 1898); H. K. Stokes, "

Finances and Administration of Providence " (Baltimore, 1903) in Johns Hopkins University Studies in Historical and Political Science; and William Kirk and others, A Modern City: Providence, Rhode Island, and Its Activities (Chicago,

1909).

PROVINCE (Lat. provincia; perhaps a contraction of provi- dentia), a term originally applied, in ancient Rome, to the depart- ment or sphere of duty assigned to one of the higher magistrates, the consuls and praetors. 1 When, with the spread of the Roman arms, the government of conquered countries grew to be one of the most important duties of the higher magistrates, the term province, from designating the government of a con- quered country as one particular duty of a Roman magistrate, came to be used generally as a designation of the country itself. Thus in later days it was applied to analogous territorial sub- divisions of a country, as opposed to the centre of government; and apart from any territorial signification, the term is used generally for a sphere of duty.

It is to the older sense of the term as a subject territory lying outside of Italy and governed by Roman magistrates that the following historical remarks apply: —

As distinguished from Italy, the provinces paid tribute to Rome, for, at least from the time of the Gracchi, it was a recognized constitutional principle that the provinces were the estates of the Roman people and were to be managed for its benefit. Under the republic the constitution of a province was drawn up by the victorious Roman general assisted by ten commissioners appointed by the senate from its own body, and the province was henceforth governed on the lines laid down in this constitu- tion or charter {lex provinciae). For administrative purposes the province was divided into districts, each with its capital, the magistrates and council of which were responsible for the col- lection of the district taxes. For judicial purposes the province was divided into circuits (conventus) , and in the chief town of each circuit the governor of the province regularly held assizes.

1 Only those magistrates who had imperium (military power) had a province. When the province of a quaestor is mentioned it refers to the province of the consul or praetor to whom the quaestor is subordinate. In familiar language any business was called a province.

Cities taken by the sword were destroyed, and their lands were turned into

Roman domains and were let out by the censors at Rome to private persons, who undertook to pay a certain pro- portion of the produce. Royal domains, such as those of Syracuse, Macedonia, Pergamum, Bithynia and Cyrene were also confiscated. On the other hand communities which surrendered without offering an obstinate resistance were usually allowed to retain their personal freedom and private property, and their chief town was left in the enjoyment of its territory and civil rights; but all the lands were subjected to a tax, consisting either of a payment in kind (vectigal) or of a fixed sum of money (tributum, stipendium), and in some cases a custom-duty (por- torium) was levied. It is to this latter class of communities (the civitates vectigales or stipendiariae) that the large majority of the provincial states belonged. In a better position were those states whose freedom was guaranteed by Rome on the ground of old alliances or special loyalty. Their freedom was recognized either by a treaty or by a decree of the Roman people or senate. As a decree of the people or senate could at any time be recalled, the position of the free states without a treaty was more pre- carious than that of the treaty states {civitates foederatae) . The latter, though not allowed to meddle in foreign politics, enjoyed a certain amount of internal freedom, retained their lands, paid no taxes, and were bound to render those services only which were expressly stipulated for in the original' treaty, such as furnishing ships and troops, supplying corn at a certain price and receiving Roman officials and soldiers en route. Amongst these treaty states were Massilia (Marseilles), Athens, Rhodes and Tyre. The privileges of the free but not treaty states were somewhat similar, but, as stated, more precarious. All political distinctions, save that between slave and freeman, disappeared when Caracalla bestowed the Roman franchise on the whole empire.

Provincial Diets. — Apart from the government by Roman officials, every province appears to have had, at least under the empire, a provincial assembly or Diet of its own {concilium or commune), and these Diets are interesting as the first attempts at representative assemblies. The Diet met annually, and was composed of deputies {legati), from the provincial districts. It arranged for the celebration of religious rites and games, especially (under the empire) for the worship of the emperor, the neglect of which was severely punished. The actual celebration was under the conduct of the high priest of the province, a person of much dignity and importance, perhaps the forerunner of the Christian bishop. The Diet also decreed the erection of statues and monuments; it passed votes of thanks to the outgoing governor, or forwarded complaints against him to Rome; and it had the right of sending embassies direct to the senate or the emperor.

The Provincial Governor. — The provinces were administered by governors sent direct from Rome, who held office for a year. From the formation of the first provinces in 227 B.C. down to the time of Sulla (82 B.C.) the

governors were praetors (see Praetor) ; from the time of Sulla to that of Augustus the praetors remained in Rome during their year of office, and at the end of it assumed the government of a province with the title of propraetor. This applies, however, only to provinces which were in a settled state and could consequently be administered without a large military force. A province which was the seat of war, or was at least in a disturbed state, was committed to the care either of one of the consuls for the year or of a commander specially appointed for the purpose with the title of proconsul, who might be one of the consuls of the pre- ceding or of a previous year, or else a former praetor, or even, in rare cases, a private individual who had held neither consulship nor praetorship. Thus the distinction between consular (or pro- consular) and praetorial (or propraetorial) provinces varied from year to year with the military exigencies of different parts of the empire. At the close of the republic, however, we find even such a peaceful province as Asia administered by a proconsul. In the earlier period of the republic the senate either before or after the elections determined which provinces were to be governed by con- suls and which by praetors, and after their election the consuls arranged between themselves by lot or otherwise which of the provinces nominated by the senate each should have, and similarly with the praetors. But in order to guard against partiality the Sempronian law of 123 B.C. provided that the senate should yearly nominate the two consular provinces before the election of the

consuls, and that the consuls should after their election but before their entry on office arrange between themselves which of the two provinces each should have. The Pompeian law of 53 B.C. enacted that no one should hold the governorship of a province till at least five years after his consulship or praetorship. This law was re- pealed by Caesar after the battle of Pharsalia, but was re-enacted under Augustus; it severed the connexion which had previously existed between an urban magistracy and the governorship of a province, and turned the latter, from the mere prolongation of a Roman magistracy, into an independent office. Like magistracies at Rome a provincial governorship was regularly held for one year ; but, unlike them, it could be prolonged, formerly by a vote of the people, later by a decree of the senate. The Julian law of Caesar (46 B.C.) enacted that the governorship of a consular province should be held for two, that of a praetorian province for one-year. The necessary supplies of men and money were voted to the governor by the senate. His staff consisted of one or more lieutenants (legati), a quaestor (q.v.) and numerous subordinates. The lieu- tenants were nominated by the senate

from men of senatorial rank; if they proved incompetent, the governor dismissed them; if they showed ability, he entrusted thern with military or judicial functions. Besides these the governor took with him from Rome a number of young men of the upper classes to assist him in the government. These were known as the companions (comites) or suite of the governor, sometimes, but incorrectly, as the praetorian cohort (see Praetorians). These members of his suite were chosen by the governor himself, who was responsible for them, but they were maintained at the expense of the state, and under the empire received regular pay. In addition there was a crowd of beadles, clerks, couriers, criers, doctors, dragomans, &c, not to speak of f reedmen and slaves for the personal service of the governor. Under the republic the governor was not allowed to take his wife with him to his province ; under the empire he might do so, but he was answer- able for her conduct. Before setting out for his province the governor, clad in the purple military robe of his office, offered sacri- fice on the Capitol; then immediately after receiving the imperium or military command he marched out of the city (for the imperium could only be exercised outside of Rome and was forfeited by staying in the city) , .preceded by his sergeants (lictores) , and accom- panied by his suite. He was bound to travel direct to his pro- vince; the means of transport were supplied partly by the state, partly by the provinces through which he travelled. His year of office began from the day he set foot in his province, but the time of arrival varied with the length and difficulty of the route. In the hands of the governor all powers military and civil were united. He commanded all the troops in the province, and had power to raise levies of Roman citizens as well as of provincials, and to make requisitions of war material. He possessed both criminal and civil jurisdiction; as criminal judge he had the power of life and death, and from his sentence none but Roman citizens could appeal ; as ‘ civil judge he was guided partly by the charter of the province (lex provincial) , partly by the edict which it was customary for him to issue before his entrance on office (compare Praetor), partly by the original laws of the country so far as their validity was acknow- ledged by the charter or by the governor’s own edict. Under the empire Gaius wrote a commentary on the provincial edict, and it is usually supposed that this was a general edict drawn up for use in all the provinces and superseding all separate edicts for the different provinces. Mommsen, however, is of opinion that Gaius only commented on the edict of a particular province.

Condition of the Provinces under the Republic. — Under the republic the Roman people regarded the provinces as so many estates from which they were to derive revenue. The weal or woe of the pro- vincials was of no moment, but the development of the material resources of the provinces was of great moment. Hence agriculture and commerce were encouraged, settlements were made, roads and aqueducts were constructed; in short, the

Roman aimed at exploit- ing his empire by a system of prudent economy as far as possible removed from the blind rapacity which has turned the empire of the Turk from a garden into a wilderness. But the Roman governors were too apt to look on their provinces as their own peculiar prey; they had usually bought their way to office at vast expense, and they now sought in the provinces the means of reimbursing themselves for the expenditure they had incurred at Rome. The annual change of governor was thus a frightful calamity to the provincials, for every year brought a repetition of the same extravagant de- mands to be met by the same or, as the province became exhausted, still heavier sacrifices. Redress was to be had originally by a com- plaint to the senate; after 149 B.C. there was a regular court estab- lished at Rome for the trial of cases of extortion (repetundae) by provincial governors. But, even when after much trouble and expense the provincials had arraigned their oppressor, it was difficult to secure his condemnation at the hands of juries composed (as they usually were) of men who had a fellow-feeling for the offender because they had themselves committed or hoped for means of committing similar offences. Besides the governor, two classes of harpies joined in wringing the uttermost farthing from the unhappy provincials. These were the publicani or farmers of the taxes, and the money-lenders (negotiatores) , who supplied a temporary accommodation at ruinous rates of interest. Both these

classes were recruited from the ranks of the Roman knights, and, since from the legislation of Gaius Gracchus (122 B.C.) the juries were drawn at first exclusively and after Sulla's time (81 B.C.) partially from the knightly order, 1 the provincial governor could not check the excesses of those blood-suckers without risking a condemnation at the hands of their brethren. Accordingly he gener- ally made common cause with them, backing their exactions when needful by military force.

The Provinces under the Empire. — Under the empire the pro- vinces fared much better. The monarchy tended to obliterate the distinction between Romans and provincials by reducing both to a common level of subjection to the emperor, who meted out equal justice to all his subjects. The first centuries of the Christian era were probably for some of the countries included in the Roman Empire the happiest of their history; Gibbon indeed fixed on the period from the death of Domitian to the accession of Commodus (96-180 a.d.) as the happiest age of the world.

Augustus, in 27 B.C., divided the provinces into imperial and senatorial. Those which, from their proximity to the frontier or the turbulence of their population, required the presence of an army were placed under the direct control of the emperor; those which needed no troops were left to be administered by the senate. (1) The senatorial provinces were ruled by an

annual governor as under the republic. Of these provinces Augustus ordained that Africa and Asia should be consular, the rest praetorian ; but all the governors of the senatorial provinces were now called pro- consuls. Their powers and dignities were much the same as they had been under the republic, except that they had now no troops, or only a handful to maintain order. (2) The imperial provinces were governed by imperial lieutenants (legati Caesaris), who were nominated by the emperor and held office at his pleasure; all of them had the power of the sword (jus gladii). For the adminis- tration of the finances these lieutenants had procurators under them, while the governors of the senatorial provinces continued to have quaestors as under the republic. Another class of imperial provinces consisted of those which from the physical nature of the country (as the Alpine districts) or the backward state of civiliza- tion (as Mauretania and Thrace) or the stubborn character of the people (as Judaea and Egypt) were not adapted to receive a regular provincial constitution. These were regarded as domains of the emperor, and were managed by a procurator (in the case of Egypt by a praefect, see Praefect) nominated by and responsible to the emperor.

Under the empire all provincial governors received a fixed salary. Complaints against them were brought before the senate, and the accusers were allowed a senator to act as their advocate. The lengthened periods during which the governors, at least in the imperial provinces, held office, together with the oversight exercised by the emperor, alleviated materially the position of the provincials under the empire. In order to keep himself well informed of what was passing in the empire, Augustus established a post whereby official despatches were forwarded by couriers and official persons were conveyed by coaches. The post, however, was only for the use of the government; no private person was allowed, unless by an exceptional concession, to avail himself of it. (J. G. Fr.; X.)

Authorities. — The most exhaustive account of the Roman provinces and their administration will be found in Marquardt, Rbmische Staatsverwaltung (1881), vol. i. See also W. T. Arnold, Roman Provincial Administration (1879); Mommsen, Roman Pro- vinces under the Empire (1884); C. Halgan, V Administration des provinces senatoriales sous V empire, with full bibliography of the subject; and T. M. Taylor, Constitutional and Political History of Rome (1899).

PROVINCETOWN, a township at the N. end of Cape Cod, in Barnstable county, Massachusetts, U.S.A. Pop. (1890), 4642; (1900), 4247; (1910 U.S. census) 4369. Area about 95 sq. m. The township is served by the New York, New Haven & Hart- ford railway, and by a steamship line to Boston. The harbour, which is important as a harbour of refuge, is protected on the east by land, and the Federal government has strengthened

this protection by dikes and groins and other sand-catching devices; it has five lighthouses. There is a magnificent beach stretching 30 m. from Provincetown village to Eastham. The village is a summer resort. Through many generations the inhabitants have gained their living chiefly from the sea; the township's fisheries, however, have greatly decreased in importance (the invested capital diminishing 67-1% in 1885-1895). The prosperity it retains is not a little due to Portuguese from the Cape Verde Islands and the Azores, and to British Americans. Proyincetown village was long second only to Gloucester in the cod fisheries, which low prices and the introduction of larger vessels and correspondingly costlier fittings have greatly

1 Sulla excluded the equites from the list ; the lex Aurelia (70) reinstated them.

handicapped. Whaling retains a remnant of its old importance, and there are also mackerel and shore fisheries, oil-works, cold storage establishments for preserving fish for food and bait, and canning works for herring. The first settlement here was made about 1680; it became a " district " or precinct of Truro in 1714, and was established as a township with its present name in 1727. Provincetown harbour was possibly visited by Gaspar Cortereal in 1501; Gosnold explored it and its vicinity in 1602, and John Smith was here in 1614. It was in this harbour that the " May-flower " compact (see Massachusetts) was drawn up and signed by the Pilgrims before they proceeded to Plymouth, in 1620; here John Carver was chosen the first governor of Plymouth Colony, and Provincetown was the first landing place (on Satur- day the nth [o.s.] of November) of the Pilgrims in the New World. A memorial of the " compact," of polished Acton granite, 6 ft. high, with two bronze tablets, was erected before the town-hall by the Old Colony Commission, and on High Pole Hill on the 20th of August 1907 the cornerstone of a second memorial (completed in 1909, dedicated Aug. 5, 1910), a granite tower, 252 ft. high, was laid, addresses being delivered by President Roosevelt, James Bryce and H. C. Lodge. In Pro- vincetown harbour, on the 1st of January 1862, James M. Mason and John Slidell, the envoys of the Confederate States to Great Britain and France respectively, who had been taken by a Federal vessel from the British ship " Trent," were restored by the Federal authorities to H.B.M.S. " Rinaldo," after their detention in Fort Warren in Boston harbour.

PROVINS, a town of northern France, capital of an arron- dissement of the

department of Seine-et-Marne, at the junction of the Durtain with the Voulzie (an affluent of the Seine), 59 m. E.S.E. of Paris by rail. Pop. (1906), 7546. The town enjoys a certain reputation for its mineral waters (which contain iron, lime, and carbonic acid, and are used for bathing and drinking), and is also known from its trade in roses, but it derives a higher interest from numerous remains of its medieval prosperity. Provins is divided into two quarters — the ville-haute and the less ancient ville-basse — which in the 13th century were surrounded by fortifications. There still remains a great part of these fortifications, which made a circuit of about 4 m., strengthened at intervals by towers, generally round, and now, being bordered with fine trees, form the principal promenade of the to wn . The large tower situated within this line, and variously known as the king's, Caesar's or the prisoners' tower, is one of the most curious of the 12th century keeps now extant. The base is surrounded by a thick mound of masonry added by the English in the 15th century when they were masters of the town. The tower serves as belfry to the church of St Quiriace, which dates its foundation from the 12th century. These two buildings in the ville-haute rise picturesquely from the crest of a steep wooded hill above the ville-basse. The church preserves among its treasures the pontifical ornaments of St Edmund of Canterbury (d. 1242). The interior is plain, but very beautifully proportioned. The appearance of the exterior suffers from an inappropriate dome erected above the crossing. The palace of the counts of Champagne, some fragments of which also belong to the 12th century, is occupied by the communal college. The old tithe-barn is a building of the 13th century with two fine vaulted chambers, one of which is below ground. The church of St Ayoul dates from the 12th to the 1 6th centuries, the transept being the oldest part; it is in a state of great dilapidation, and the choir is used as a storehouse. St Croix belongs partially to the 13th century. Extensive cellars, used as warehouses in the middle ages, extend beneath portions of the town. On Mont Ste Catherine, opposite Provins, the general hospital occupies the site of an old convent of St Clare, of which there remains a cloister of the 14th century. The sub-prefecture, tribunals of first instance and of commerce are among the public institutions. There is an active trade in grain, livestock and wool, and the industries include flour- milling, nursery-gardening, brickmaking, and the manufac- ture of porcelain, pianos, gas and petrol engines, agricultural implements and sugar.

Provins began to figure in history in the 9th century. Passing from the counts of Vermandois to the counts of Champagne, it rapidly attained a high degree of prosperity. Cloth and leather were its staple manufactures, and its fairs, attended by traders from all parts of Europe, were of as much account as those of Beaucaire, while its money had currency throughout Europe. In the 13th century the population of the town is said to have

reached 60,000; but the plague of 1348 and the famine of 1349 proved disastrous. The Hundred Years' War, during which Provins was captured and recaptured, completed the ruin of the town. During the religious wars it sided with the Catholic party and the League, and Henry IV. obtained possession of it in 1592 only after thirteen days' siege.

See Felix Bourquelot, Histoire de Provins (2 vols., Provins,

1 839-1 840).

PROVISION (Lat. provisio), a term meaning strictly the act of providing, or anything provided, especially in respect of food (provisions) or other necessaries. In constitutional law it signifies the act by which an ecclesiastical office or benefice is conferred by a person having competent authority for the purpose; and the word is specially used of appointments made by the pope in derogation of the rights of ecclesiastical patrons. Innocent III. (1198-1216) seems to have been the first pope who directed prelates to collate his nominees to canonries and other benefices, but it was during the pontificate of Innocent IV. (1243-12 54) that the practice first assumed alarming propor- tions. Vigorous protests were then made in England and France against the large number of papal provisions in favour of non- resident Italian clerks. These protests were not without effect for a while; but the popes, finding it impossible to carry on the work of government without this means of rewarding their servants, soon began to show little regard to national protests. The English parliament held at Carlisle in 1307 petitioned the king for a remedy against this abuse, but though he promised redress nothing was done. Meanwhile the popes had been asserting claims to appoint bishops in certain events on their own initiative, and at last Clement V. (1305-1313) reserved to himself the right of appointment in all cases. After his time there is scarcely an instance of an English bishop being elected in accordance with the older procedure by the cathedral chapter. If an election were made the pope usually either overrode it by another appointment or, ignoring the election, appointed the elected clerk by a bull of provision. The Hundred Years' War caused an outburst of indignation against the use of papal pro- visions, whether to the canonries and collative offices or to bishoprics. The popes had taken up their residence at Avignon and had become mere creatures of the kings of France. The English nobility and gentry were bitter at seeing vast sums of money pass out of the country into the hands of their enemies. To remedy the evil the first Statute of Provisors was enacted in 135 1. It declared that the free elections of bishops and other dignitaries should take place in accordance with the ancient practice; that bishops and ecclesiastics should have free presenta- tions to benefices and offices in their gift; that in the event of any provision being made by the pope the king should have the same right of collation as his progenitors had before they granted free

election; and similarly where the pope provided to a benefice or office in the gift of secular or regular clergy the king was to have the collation for that occasion. Provisors who interfered with the rights of the king or patron were liable to arrest and imprisonment on conviction. The act was supplemented in J 353 by the first Statute of Praemunire, by which appeals outside the realm were prohibited and persons who offended were made liable to outlawry. This legislation against papal provisions was anti-clerical rather than anti-papal. There are no signs that it was promoted by the English clergy, who seem to have accepted the claim of the popes to control their patronage. In spite of the statutes the popes still continued, as the papal registers show, to make provisions to English benefices and offices, and it is evident that the statutes were not enforced. The Statute of Provisors was confirmed by a second statute in 1364, but this again seems to have had little effect. Attempts were made to

establish a concordat on the subject between the king and pope; its terms, however, were all in favour of the latter. At last, in 1389, a third Statute of Provisors was enacted which provided that the statute of 1351 should be firmly holden for ever and " put in due execution from time to time in all manner of points." The new statute was carried into effect as regards canonries and benefices; but, until the Reformation, bishops were nominally appointed by a papal bull of provision. The person appointed, however, was usually nominated by the king, and the bull was not issued without his consent.

Authorities. — Statutes of the Realm ; Calendar of Papal Registers ; J. Le Neve, Fasti ecclesiae anglicanae ; Rolls of Parliament; F. W. Maitland, Canon Law in the Church of England; W. Stubbs, Con- stitutional History of England; Anglia sacra. (G. J. T.)

PROVISIONAL ORDER, a method of procedure followed by several government departments in England, authorizing action on the part of local authorities under various acts of parliament. Procedure by provisional order is a substitute for the more expensive course of private bill legislation; it is usually employed for such purposes as alteration of areas, compulsory purchase of land, building of light railways, &c. A preliminary local inquiry is first held in public by an inspector of the department to whom application has been made to issue it. Upon the report of the inspector and other information the department decides whether or not to issue the order. The order when issued has no force until it is confirmed by parliament. For this purpose it is included with other orders in a confirming bill, introduced

by the minister at the head of the department concerned. In both houses of parliament all provisional order bills are referred to examiners for compliance with standing orders. In the House of Lords, if a provisional order bill is opposed, it is referred to a select committee and then to a committee of the whole house; if not opposed, it goes, after second reading, to a committee of the whole house, and in both cases then proceeds as a public bill. In the House of Commons, the bill goes after second reading to the committee of selection or to the general committee on railway and canal bills; if unopposed it is treated as an unopposed private bill; if opposed it goes to a private bill committee, which hears evidence for and against.

PROVO, a city and the county-seat of Utah county, Utah, U.S.A., on the Provo river, 3 m. E. of Utah Lake, and about 45 m. S. by E. of Salt Lake City. Pop. (1890), 5159; (1900), 6185 (1176 foreign-born); (1910) 8925. Provo is served by the Rio Grande Western and the San Pedro, Los Angeles & Salt Lake railways. It is situated at an altitude of about 4530 ft., in a region of fine scenery, Provo Canon, Bridal Veil Falls and Utah Lake being of especial interest. The city has a general hospital and is the seat of the state mental hospital and of Brigham Young University (a Mormon institution), founded by Brigham Young in 1875, opened as an academy in 1876, and in- corporated in 1896; it comprises a college and high commercial, music, arts and trades, agricultural and preparatory schools. Provo has various manufactures, including woollen goods, lime, pottery and bricks, and the city is a shipping point for a fertile agricultural and fruit-producing region. Within a radius of forty or fifty miles of Provo are a number of important mines. Provo was settled in 1849 and was chartered as a city in 1851.

PROVOST (through O. Fr. prevost, mod. prevdt, Lat. prae- positus, set over, from praeponere, to place in front) , a title attached to various ecclesiastical and secular offices. In ecclesiastical usage the word praepositus was at first applied by the Church fathers to any ecclesiastical ruler or dignitary. It early, how- ever, gained a more specific sense as applied to the official next in dignity to the abbot of a monastery, or to the superior of a single cell. Thus in the rule of St Benedict the provost {prae- positus) is the superior of the monastery immediately subordinate to the abbot, the dean {decanus) being associated with him. From the Benedictine rule this arrangement was taken over by Chrodegang of Metz when he introduced the monastic organiza- tion of cathedral chapters. In these the provostship (prae- positura) was normally held by the archdeacon, while the office of dean fell to the archpriest. In many cathedrals the temporal

duties of the archdeacons made it impossible for them to fulfil those of the provostship, and the headship of the chapter thus fell to the dean. In

England the title ” provost ” has thus everywhere given way to that of ” dean “; in Germany, on the Other hand, ” Probst ” is still the style of the heads of certain chapters. The title has also been preserved in certain dioceses of the German Evangelical Church as the equivalent of Superin- tendent, and both the Roman Catholic and Protestant chaplains- general of the forces have sometimes, e.g. in Prussia, the title Feldprobst. The Tieads of Augustinian and Dominican friaries are termed ” provost or prior ” {praepositus vel prior), those of Cistercian monasteries ” provost or warden” {praepositus vel custos). Finally the name praepositus was sometimes used for the secular advocatus of a monastery. With the ecclesiastical use of the title is connected its English application to the heads of certain colleges; ” proVost ” is still the style of the principals of Queen’s, Oriel and Worcester Colleges at Oxford, of King’s College at Cambridge, of Trinity College at Dublin and of Eton College. 1

As a secular title praepositus is also very old; we need only instance the praepositus sacri cubiculi of the late Roman Empire, and the praepositus palatii of the Carolingian court. The impor- tant developments of the title in France are dealt with below. From France the title found its way into Scotland, where it survives in the style (provost) of the principal magistrates of the royal boroughs (” lord provost ” in Edinburgh, Glasgow, Aberdeen, Perth and Dundee), and into England, where it is applied to certain officers charged with the maintenance of military discipline. A provost-marshal is an officer of the army appointed when troops are on service abroad for the prompt repression of all offences. He may at any time arrest and detain for trial persons subject to military law committing offences, and may also carry into execution any punishments to be in- flicted in pursuance of a court martial (Army Act 1881, § 74). A provost- sergeant is an officer responsible for the maintenance of order when soldiers are in the United Kingdom. A provost- sergeant may be either garrison or regimental, and he has under his superintendence the garrison or regimental police.

(W. A. P.)

The Provost in France. — The word prevdt (provost) in old French law had many applications. In conformity with its etymology {praepositus) it could be applied to any person placed at the head of a branch Of the public service, a position which, according to the old principles, habitually carried with it a right of jurisdiction. It is thus that there was at Paris the ” pro- vost of Paris,” who was a royal judge, and the ” provost of the merchants ” {prevdt des marchands), the head of the Paris municipality. 2 There were besides — to mention only the prin- cipal provosts — the ” provosts of the marshals of France ” (prtvdls des marechaux de France), of whom more below; the ” provost of the royal palace ” {prevdt de I’hdtel du roi) or ”

grand provost of France " {grand prevdt de France), and the " provost general " {prevdt general) or "grand provost of the mint" {grand prevdt des monnaies). But the most important and best known provosts, who formed part of a general and comprehensive organization, were the " royal provosts " {prevdts royaux), the lower category of the royal judges. It must be borne in mind, however, that the magistrates belonging to the inferior category of royal judges {juges subalternes) had different designations in many parts of France. In Normandy and Burgundy they were called chdtelains, and elsewhere — especially in the south — viguiers. These were titles which had established themselves in the great fiefs before their reunion with the Crown and had survived this. The royal provosts, on the other hand, were a creation of the Capetian monarchy.

The date of this creation is uncertain, but was without doubt some time in the nth century. The provosts replaced the viscounts wherever the viscounty had not become a fief, and

1 Where, however, the head-master, though technically sub- ordinate to the provost, is the effective head'of the school.

2 Thus in a register of the Ch&telet of Paris in the 14th century, we read: " k Paris est la prevdte de Paris et celle des marchands."

it is possible that in creating them the Crown was imitating the ecclesiastical organization in which the provost figured, notably in the chapters. The royal provosts had at first a double character. In the first place they fulfilled all the functions which answered locally to the royal power. They collected all the revenues of the domain and all the taxes and dues payable to the king within the limits of their jurisdiction. Doubtless, too, they had certain military functions, being charged with the duty of calling out certain contingents for the royal service; there survived until the end of the ancien regime certain military provosts prevots d'Spee (provosts of the sword) who were re- placed in the administration of justice by a lieutenant. Finally, the provosts administered justice, though certainly their com- petence in this matter was restricted. They had no jurisdiction over noblemen, or over feudal tenants {hommes defief) ,who claimed the jurisdiction of the court of their over-lord, where they were judged by their peers — the other vassals of the same lord. Neither had they jurisdiction over the open country, the plat pays, where this belonged to local seigneurs; and even in the towns over which they were set their jurisdiction was often limited by that of the municipal courts established for the benefit of the

burgesses. The second characteristic of the old provosts was that their office was farmed for a limited time to the highest bidder. It was simply an application of the system of farming the taxes. The provost thus received the speculative right to collect the revenues of the royal domain in the district under his jurisdiction; this was his principal concern, and his judicial functions were merely accessory. By these short appointments the Crown guaranteed itself against another danger: the possible conversion by the functionary of the function into a property. Very early, however, certain provostships were bestowed en garde, i.e. the provost had to account to the king for all he collected. The prevotes en Jerme were naturally a source of abuses and oppression, the former seeking to make the mpst of the concession he had bought. Naturally, too, the people complained. From Joinville we learn how under St Louis the provostship of Paris became a prevdte en garde. At the death of Louis XL the prevStes en jerme were still numerous and provoked a remonstrance from the States-general of 1484. Their suppression was promised by Charles VIII. in 1493, but they are again referred to in the grande ordonnance of 1498. They disappeared in the 16th century, by which time the provosts become regular officials, their office being purchasable.

Other transformations had previously taken place. The creation of the royal baillis reduced the provosts to a subaltern rank. Each bailli had in his district a certain number of pro- vosts, who became his inferiors in the official hierarchy. When appeals were instituted (and this was one of the earliest instances of their introduction) the provost, the sphere of whose competency was limited, was subject to an appeal to the bailli, though his judgment had hitherto been without appeal. Moreover, in the 14th century they had ceased to collect the revenues of the royal domain, except where the prevdte was en jerme, and royal collectors (receveurs royaux) had been appointed for this purpose. The summoning of the feudal contingents, the ban and arriere-ban, had passed into the hands of the baillis. Thus the provosts were left for their sole function as inferior judges for non-nobles, the appeals from their sentences going to the baillis, who also had jurisdiction in the first instance over actions brought against nobles and in cases reserved for the crown judges (cas royaux). This corresponded to a principle which had also applied in the chief feudal courts in the 13th and 14th centuries, where a distinction was made between judicial acts which could be per- formed en preAiote, and those which had to be performed in a solemn assize (assise); this did not, however, always imply the existence of a superior and an inferior official, a provost and a bailli.

The provost in the exercise of his legal functions sat alone as judge, and he alone exercised the judicial authority at his tri- bunal; but he had to consult with certain lawyers (avocats or procureurs) chosen by himself, whom, to use the technical phrase, he "summoned to his council" (appelait

a son conseil). In 1578 official counsellors (conseillers-magislrats) were created, but

were suppressed by the ordonnance of Blois of 1579. The office was restored in 1609 by a simple decree of the royal council, but it was opposed by the parlements, and it seems to have been conferred in but few cases.

The " provosts of the marshals of France," mentioned above, were non-legal officials (officiers de la robe courte) forming part of the body of the marechaussee which was under the ancien regime what the gendarmerie was after the Revolution. Their original function was to judge offences committed by persons following the army, but in the course of the 14th and 15th centuries they acquired the right of judging certain crimes and misdemeanours, by whom- soever committed. They became stationary, with fixed spheres of authority, and the offences falling within their competency came to be called cas prevdtaux. These were, the worst crimes of violence, and all crimes and misdemeanours committed by old offenders (repris de justice), who were familiarly known as the gibier des prevots des marechaux (gaol-birds). Theirs was really a kind of military jurisdiction, from which there was no appeal; but the provost was bound to associate with himself a certain number of ordinary judges or graduates in law. The provost of the marshals did not himself judge what was a cas prevdtal; this had in each case to be decided by the nearest bailliage or presidial court. The presidial judges also dealt with cas prevdtaux in concurrence with the provosts of the marshals. (J. P. E.)-

PROW, the fore-part of a ship, the stem and its surrounding parts, hence used like " keel," by metonymy, of the ship itself. It was in old naval parlance applied to the battery of guns placed in the fore gun-deck. The Fr. proue and cognate forms (Ital. prua, Port, and Span, proa, of which the English is an adapta- tion) represent Lat. prora, itself adapted from Gr. irpcjipa, formed from7rp6, before, in front. From this word must be distinguished an obsolete " prow," brave, valiant, now only surviving in "prowess," and representing O. Fr. prou, mod. preux, from the first part of Lat. prodesse, to be profitable; the same source gives " proud."

PROXY (short for " procuracy "), a term denoting either (1) a person who is authorized to starid in place of another, (2) the legal instrument by which the authority is conferred. Proxies are now principally employed for certain voting purposes. A proxy may in law be either general or special. A general proxy authorizes the person to whom it is entrusted to exercise a general discretion throughout the matter in hand, while a special proxy limits the authority to some special proposal or resolution. Formerly a peer could give his vote in the British parliament by proxy, by getting another

peer to vote for him in his absence, temporal peers only being privileged to vote for temporal, and spiritual peers for spiritual. This voting by proxy in the House of Lords was an ancient custom, often abused. In Charles II, 's reign the duke of Buckingham used to bring twenty proxies in his pocket, and the result was that it was ordered that no peer should bring more than two. In 1830 to 1867 inclusive proxies were only called seventy-three times; and on the 31st of March 1868, on the recommendation of a committee, a new standing order was adopted by which the practice of calling for proxies on a division was discontinued. In English bankruptcy pro- ceedings creditors may vote by proxy, and every instrument of proxy, which may be either general or special, is issued either by the official receiver or trustee. Under the Bankruptcy Act of 1869 very great abuses of the system of proxies arose (see Bankruptcy), and were investigated by a select committee of the House of Commons. The committee recommended the abolition of general proxies; and though their recommendation was not carried out, the Bankruptcy Acts of 1883 and 1890 put considerable restrictions on the use of general proxies. A share- holder in a limited liability company may vote by proxy, and regulations to that effect prescribing the requirements, are usually embodied in the articles of association. A proxy to vote at a meeting must, by the Stamp Act 1870, bear a penny stamp. In the United States, proxies are further used for voting purposes in political conventions.

In the early practice of the admiralty courts in England a

proxy was the authority by which the proctor or advocate appeared for either party to a suit. In the ecclesiastical courts a proxy is the warrant empowering a proctor to act for the party to a suit. Two proxies are usually executed, one authorizing the proctor to institute, the other to withdraw, proceedings. They are signed by the parties, attested by two witnesses, and deposited in the registry of the court (Phillimore, Ecclesiastical Law). In the convocations of the Church of England those who are absent are allowed to vote by proxy. " Proxies," or " pro- curations," were also by the canon law certain sums of money paid yearly by parish priests to the bishops or archdeacon ratione visitationis; originally the visitor demanded a proportion of meat and drink for his refreshment, and afterwards this was turned into a money " procuration " — ad procurandum cibum et potum. Marriage by proxy or deputy was a custom recognized either for reasons of state or ceremonial.

PRUDENTIUS, AURELIUS CLEMENS (348-c. 410), the most remarkable

of the earlier Christian poets in the West, was prob- ably born at Tarraco, though Saragossa and Calagurris have also been claimed as his birthplace. The meagre autobiographical preface, which he affixed to the complete edition of his works when he was fifty-seven years old, makes it clear that he received a liberal education — being of noble family — practised as a lawyer and entered official life, and finally held some high office under Theodosius. At the age of fifty-seven he retired to a monastery, but died shortly afterwards.

Bentley calls Prudentius " the Horace and Virgil of the Christians," but his diction is stilted and his metre often faulty. The list of his works given in the preface mentions the hymns, poems against the Priscillianists and against Symmachus and Peristephanon. The Diptychon ox Dittochaeon is not mentioned. The twelve hymns of the Cathemerinon liber (" Daily Round ") consist of six for daily use, five for festivals, and one intended for every hour of the day. Prudentius shows Ambrose as his master here, but gives to Ambrose's mystic symbolism much clearer expression. The Apotheosis and Hamartigenia are polemic, the first against the disclaimers of the divinity of Christ, the latter against the gnostic dualism of Marcion and his followers. In them Tertullian is the source of inspiration. Of more historical interest are the two books Contra Symmachum, of 658 and 1 13 1 hexameter verses respectively, the first attacking the pagan gods, the second directed against the petition of Symmachus to the emperor for the restoration of the altar and statue of Victory which Gratian had cast down. The Peri- stephanon consists of fourteen hymns to martyrs. These were mostly Spanish, but some were suggested to Prudentius by sacred images in churches or by the inscriptions of Damasus. This book, with the Cathemerinon liber and the Psychomachia, was among the most widely read books of the middle ages. Its influence on the iconography of medieval art was great. The Psychomachia is aesthetically inferior, but had the greatest in- fluence of all of Prudentius's writings. In it he depicts the struggle of Christendom with paganism under the allegory of a struggle between the Christian virtues and the pagan vices. The Dittochaeon is a series of quatrains, probably intended to explain forty-nine pictures of a basilica. The work is more interesting for archaeology than for literature.

Prudentius's works were published by Giselin'at Antwerp in 1 564, and by F. Arevalo at Rome in 1 788, with complete commentary. This last is the edition reprinted in J. P. Migne's Patrologia Latino, vols, lix.-lx. (Paris, 1847). More recent editions are by Obbarius (Tubingen, 1845) and A. Dressel (Leipzig, 1886), while a critical edition has been undertaken by J. Bergmann.

See also J. Bergmann, Lexicon prudentianum, fasc. i. [a-adscendo] (Upsala, 1894); M. Schanz, Gesch. d. rom. Lit. (Munich, 1904); A. Ebert,

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PRUD'HON, PIERRE (1758-1823), French painter, born at Cluny on the 4th of April 1758, was the third son of a mason. The monks of the abbey undertook his education, and by the aid of the bishop of Macon he was placed with Devosges, director of the art school at Dijon. In 1778 Prud'hon went to Paris armed with a letter to Wille, the celebrated engraver, and three years later he obtained the triennial prize of the states of Burgundy, which enabled him to go to Rome, where he became intimate with Canova. He returned to Paris in 1787, and led for some time a precarious existence. The illustrations which he executed for the Daphnis and Chloe published by Didot brought him into notice, and his reputation was extended by the success of his decorations in the H6tel de Landry (now Rothschild) , his ceiling painting of " Truth and Wisdom " for Ver- sailles (Louvre), and of " Diana and Jupiter " for the Gallery of Antiquities in the Louvre. In 1808 he exhibited " Crime pursued by Vengeance and Justice " (Louvre, engraved by Royer which had been commissioned for the assize courts, and " Psyche carried off by Zephyrs " (engraved by Massard). These two remarkable compositions brought Prud'hon the Legion of Honour; and in 1816 he entered the Institute. Easy as to fortune, and consoled for the misery of his marriage by the devoted care of his excellent and charming pupil, Mile Mayer, Prud'hon's situation seemed enviable; but Mile Mayer's tragical suicide on the 26th of May 182 1 brought ruin to his home, and two years later (Feb. 16, 1823) Prud'hon fol- lowed her to the grave. Mile Mayer (1778-1821) was his ablest pupil. Her " Abandoned Mother " and " Happy Mother " are in the Louvre.

Voiart ,' ' Notice historique de la vie et oeuvres de P. Prud'hon, ' ' in A rch. de Vart franqais; Qu. de Quincy, Discours prononce sur la tombe de Prud'hon, Fev. 1823; Eugene Delacroix, Rev. des deux monies, 1846; Charles Blanc, Hist, des peintres francais.

PRUNE (adapted in various forms, e.g. prunne, proyne, &c, from Fr. prune, Med. Lat. pruna, Lat. prunum, Gr. irpovvov, earlier irpoviwov, plum), the name generally given to the fruit of various species of plums, dried, and used either stewed as a dish or plain as a dessert fruit. The finest dessert prunes, known as " French plums," are produced from the St Julien

plum-tree and are dried and exported from the valley of the Loire in France. California now produces a fine quality of " prune." In scientific nomenclature, Prunus is the name of a genus of rosaceous trees, the type of the tribe pruneae, of which the plum, apricot, peach, cherry, &c, are species (see further under Plum). From this word must be distinguished " to prune," (1) to cut or trim superfluous growth from a shrub or tree in order to encourage fresh growth and bring into regular form, &c, and (2) to trim or dress the feathers with the bill, used of a bird " preening " itself. In the first sense the word is an adaptation (16th century) of the Old French proigner, the second sense appears in the end of the 14th century but is not found in French.

PRURITUS, an ailment characterized by intense itching of the surface of the body. It may occur in connexion with other morbid conditions, such as jaundice, diabetes, digestive dis- orders, &c, or as the result of the irritation produced by skin parasites. The most serious form is pruritus senilis, which affects old persons, and is often a cause of great suffering, depriving the patient of sleep. In such cases it is probably due to atrophic changes in the skin. No eruption is visible, except such marks as are produced by scratching. The treatment consists in the removal of any apparent cause, and measures to strengthen the system, such as the use of quinine, iron, &c. Soothing lotions composed of solutions of alkalis conjoined with chloral, opium, hydrocyanic acid, &c, may be applied to the affected skin at bedtime.

PRUSSIA (Ger. Preussen; Lat. Borussia), a kingdom of Germany, and the largest, most populous and most important state of the German Empire. (For map see Germany.) It is bounded on the N. by the Baltic, Mecklenburg, Denmark and the North Sea, on the E. by Russia, on the S. by Austria, the kingdom of Saxony, the Thuringian states, Bavaria and

Hesse-Darmstadt, on the W. by Alsace-Lorraine, Luxemburg, Belgium and the Netherlands. Its frontiers have a circuit of about 4750 m., and with the exception of the enclaves Oldenburg, Mecklenburg, Brunswick and other small German states, and certain small appurtenances, such as HohenzoUern, in the south of Wurttemberg, it forms a tolerably compact mass of territory, and occupies almost the whole of northern Germany. Its longest axis is from S.W. to N.E. With the exception of the sea on the north and the mountain-barrier on the south-east, the frontiers are political rather than geographical. The total area of the monarchy is 134,622 sq. m. and comprises almost two-thirds of the entire extent of the German Empire.

Its kernel is the mark of Brandenburg, round which the rest of the state has been gradually built up.

Physical Features. — Fully three-fifths of Prussia belong to the great north European plain and may be generally characterized as lowlands. The plain is much wider on the east, where only the southern margin of Prussia is mountainous, than on the west, where the Hanoverian hills approach to within less than 100 m. of the sea. A line drawn from Düsseldorf through Halle to Breslau would, roughly speaking, divide the flat part of the country from the hilly districts. In the south-east Prussia is separated from Austria and Bohemia by the Sudetic chain, which begins at the valley of the Oder and extends thence towards the north-west. This chain includes the Riesen Gebirge, with the highest mountain in Prussia (Schneekoppe), and subsides gradually in the hills of Lusatia. The Harz Mountains, however, beyond the Saxon plain, follow the same general direction and may be regarded as a de- tached continuation of the systemi To the south of the Harz the Prussian frontier intersects the northern part of the Thuringian Forest, which is also prolonged towards the north-west by the Weser Gebirge and the Teutoburger Wald. The south-west of Prussia is occupied by the plateau of the lower Rhine, including on the left bank the Hunsruck and the Eifel, and on the right the Taunus, the Westerwald and the Sauerland. Between the lower Rhenish and Thuringian systems are interposed the Vogelsberg, the Rhon, and other hills belonging to the Triassic system of the upper Rhine. The Silesian Mountains are composed chiefly of granite, gneiss and schists, while the Harz and the lower Rhenish plateau are mainly of Devonian and Silurian formation. To the north of the Sauerland is the important carboniferous system of the Ruhr, and there are also extensive coalfields in Silesia. With the exception of the Danube Prussia is traversed by all the chief rivers of Germany, comprising almost the entire course of the Oder and the Weser. Nearly the whole of the German coast-line belongs to Prussia, and it possesses all the important seaports (see also Germany) except Hamburg, Bremen and Liibeck.

Climate. — The climate of Prussia may be described as moderate, and is generally healthy. The greatest extremes of temperature are found between the east and west, the mean annual temperature in the bleak and exposed provinces of the north-east being about 44 F., while that of the sheltered valley of the Rhine is 6° higher. In winter the respective means are 26 and 35 ; in summer the difference is not above 2° to 4 . In Prussia as a whole the ther- mometer ranges from 100° to 130°, but these extremes are rarely reached. The average annual rainfall is about 21 in.; it is highest in the hilly district on the west (34 in.) and on the north-west coast (30 to 32 in.), and lowest (16 in.) in the inland parts of the eastern provinces.

Population. — The following schedule shows the area and popula- tion of

the whole kingdom and of each of its fourteen provinces on the 1st of December 1900, and the 31st of December 1905.

Provinces.

Area in Eng. sq. m.

Pop., 1900.

Pop., 1905.

East Prussia

West Prussia

Berlin ….

Brandenburg

Pomerania

Silesia ….

Posen ….

Saxony ….

Schleswig-Holstein 1 .

Hanover

Westphalia

Hesse Nassau

Rhineland

HohenzoUern

14,284

9,859

29

15,382

11,620

15,568

11,186

9,751

7,338

14,870

7,803

6,062

10,423 441

1,996,626 1,563,658 1,888,848 3,108,554 1,634,832 4,668,857

1,887,275 2,832,616 1,387,968

2,590,939 3,187,777 1,897,981 5,759,798 66,780

2,030,176 1,641,746 2,040,148

3,531,906

1,684,326 4,942,611

1,986,637

2,979,221

1,504,248

2,759,544 3,618,090 2,070,052

6,436,337 68,282

134,616

34,472,509

37,293,324

Including Heligoland.

The increase of population proceeds most rapidly, as would be expected, in Berlin, and next follow Westphalia, the Rhineland, Brandenburg and

Saxony, while it is weakest in HohenzoUern, Pomerania and East Prussia. The population is densest in the mining and manufacturing district of the Rhine, which is closely followed by the coal regions of Silesia and parts of Saxony and West- phalia. Both the birth-rate and the death-rate show a tendency to diminish. (For statistical tables under this head, see Germany.) In Prussia, the annual increase in the urban population is about seven times as great as that in the rural communities. In 1905 Prussia contained twenty-two towns each with upwards of 100,000 inhabitants. The annual rate of suicide in Prussia is high, and among German states is only exceeded in the kingdom of Saxony. Divided according to nationalities (by speech), the population of Prussia includes roughly 31,000,000 Germans, over 3,000,000 Poles (in the eastern provinces), 107,000 Lithuanians (in the north- east), 137,000 Danes (in Schleswig-Holstein), 65,000 Wends (in Brandenburg and Silesia), 25,000 Czechs (in Silesia) and 78,000 Walloons (near the Belgian frontier). In the rural districts of Posen and in parts of Silesia the Poles form the predominant element of the population.

Communication. — With most internal means of communication Prussia is well provided. Hardly any of its excellent highroads existed in the time of Frederick the Great, and many of them date from the Napoleonic era. The first Prussian railway was laid in 1838, but the railway system did not receive its full development until the events of 1866 removed the obstacles placed in the way by Hanover. Most of the lines were laid by private companies, and the government confined itself to establishing lines in districts not likely to attract private capital. In 1879, however, a measure was passed authorizing the acquisition by the state of the private railways, and in 1884 nine-tenths of the 13,800 m. of railway in Prussia were in the hands of government. The proportion of railway mileage in Prussia (5 m. per 10,000 inhabitants) is nearly as high as in Great Britain, but the traffic is much less. Between 1880 and 1886 the state-owned lines of railway increased by 9240 m., the increase being principally due to the policy of buying up private lines; and since 1886 there has been a further increase. In 1903 the state lines amounted to a total of 18,520 m., and the private lines to 1248 m. The former total includes lines in Hesse-Darm- stadt, the railways of this grand duchy having been incorporated with the Prussian railways in 1896. The building of the railways in Prussia has in almost every case been influenced by military requirements; and this applies also to the making of private lines. The most important trunk line of Prussia is that which enters the western frontier at Herbesthal, and runs through Cologne, Diisseldorf, Hanover, Berlin, Dirschau and Konigsberg, and leaves the eastern boundary at Eydtkuhnen for St Petersburg. Generally speaking, the principal lines of the country either radiate from Berlin or run alongside the frontiers and boundaries. To the former category belong the lines which connect the capital with Hamburg and Kiel, with Stettin, with Danzig and

Konigsberg, with Posen and Breslau (dividing at Frankfort-on-Oder), with Dresden, with Leipzig and Bavaria, with Frankfort-on-Main via Halle and Erfurt, with Coblenz via Cassel, and with Cologne via Magdeburg and Brunswick. The second category embraces lines from Hamburg to Stettin, from Stettin to Posen and Breslau, and from Breslau to Halle ; the ring is again taken up at Frankfort- on-Main, and continues up the Rhine (on both banks) to Cologne, and thence through Minister and Bremen to Hamburg. Besides these there are two other important lines, one connecting Hamburg with Frankfort-on-Main via Hanover and Cassel, the other linking Hanover with Halle.

Prussia possesses also an extensive system of natural and artificial waterways. In the period 1880-1893 the Prussian Government spent no less than £11,677,750 upon the maintenance and con- struction of locks, canals, canal buildings, bridges, roadways, &c. Besides this there was a special vote of £6,197,600 for the construc- tion of the Dortmund-Ems Canal and the improvement of the navigation of the Oder, Vistula, Spree and other waterways in Brandenburg. The most important of the canals are the North Sea and Baltic Canal (officially the Kaiser Wilhelm Canal), the Elbe-Trave Canal (to give Liibeck access to the Elbe), and the Dortmund-Ems Canal, and its continuation, the Dortmund-Rhine Canal (see further, Germany). The largest ship-owning ports are Flensburg, Stettin, Kiel, Rostock and Danzig; and Geestemiinde owns the largest deep-sea fishing fleet.

Agriculture. — Of the total area of cultivable land in the German Empire fully 66% belongs to Prussia. About 29% of the soil of Prussia consists of good loam or clay, 32 % is mediocre or of loam and sand mixed, 31% is predominantly sandy, and 6% is occupied by bogs and marshes. The north-eastern provinces contain a high proportion of poor soil, and in the north-west occur large tracts of heath and moor. The reclaimed marshlands in both districts, as well as the soil in the neighbourhood of the rivers, are usually very fertile, and tracts of fruitful ground are found in the valleys of the Rhine and its affluents and in the plain around Magdeburg, the so-called Bohrde. The most fertile Prussian province is Saxony, while the least productive are East and West

Prussia. The principal crop in Prussia is rye, of which the ordinary bread of the country is made; it grows in all parts of the kingdom, especially in the north and east, and occupies about one-fourth of the whole tilled surface. Oats occupy an area equal to about half that devoted to rye, and are also

grown most extensively in the north-eastern districts. Wheat, which is chiefly cultivated in the south and west, does not cover more than a fourth as much ground as rye. Barley is most largely grown in Saxony and Silesia. Other grain crops are spelt (chiefly on the Rhine), buckwheat (Hanover and Schleswig-Holstein) and millet; maize is grown for fodder in some districts. The produce of grain does not cover the consumption and is supplemented by imports of rye and other cereals from Russia and Holland. Potatoes, used both as food and for the distillation of spirits, are cultivated over nearly as large an area as rye and are especially predominant in the eastern provinces. The common beet is extensively grown for the production of sugar in the provinces of Saxony, Hanover, Silesia, Pomerania and Bran- denburg. Flax and hemp occupy considerable areas in East Prussia, Silesia and Hanover, while hops are raised chiefly in Posen and Saxony. The cultivation of rape-seed for oil has fallen off since the use of petroleum has become general. The tobacco of Silesia, Brandenburg, Hanover and the Rhine province is inferior to that of Germany; the annual value of Prussian-grown tobacco is about £500,000, or one-fourth of the total produce of the empire. Of the total cultivated area less than 5 % is divided into farms of less than 5 acres each, about 33% amongst farms ranging from 5 to 50 acres, 32-01 % amongst farms ranging from 50 to 250 acres, and the rest amongst farms exceeding 250 acres. The provinces in which large estates (up to 2500 acres and more) are the rule, are Pomerania, Posen, Silesia, East Prussia, Brandenburg, West Prussia and Saxony, in the order named. The estates of the old landed gentry {RittergiUer) of Prussia, taking the estates above 500 acres each, aggregate in all some 13,400,000 acres. Small estates (peasant holdings) prevail principally in the Rhine province, Hesse-Nassau and Westphalia, and to some extent also in Hanover, Silesia and Saxony, but large peasant holdings (50 to 250 acres) exist only in Schleswig-Holstein, Hanover, East Prussia, Westphalia, Saxony and Brandenburg. Notwithstanding the continuous decline in prices, and other drawbacks from which agriculture has suffered throughout Europe, the Prussian farmers have on the whole fairly well maintained their position, owing mainly to the fact that they have been both eager and skilful in availing themselves of the oppor- tunities offered by the progress of agricultural knowledge. One of the latest departures in this field has been the establishment of central stations for the distribution of electric power to the estates in its neighbourhood, the power to be used for driving both fixed and movable machinery (mills, chaff-cutters, threshing-machines, ploughs, &c). for lighting buildings and houses, for cooking and heating, and on large estates for giving signals and conveying orders. The cultivation of the beetroot for sugar has had a far- reaching effect upon Prussian agriculture, especially in the pro- vinces of Saxony, Silesia, Posen, Hanover, West Prussia, Pomerania, Brandenburg, the Rhine province, and other parts of the kingdom, where the beetroot is extensively

cultivated. Owing to the deep cultivation of the soil and the incessant hoeing which the beet crop requires, the three or four crops which follow it are invariably good, and the liability to failure of the immediately succeeding crop is reduced to a minimum. Moreover, the fiscal policy of the Prussian government has been of first-rate assistance to the Prussian farmer. Hand in hand with the cultivation of the beetroot has gone the cultivation of barley and chicory, crops of scarcely inferior value from the cultivator's point of view. Barley is grown on more than 11 j million acres. Th<" Prussian province of Saxony produces one-half of the total quantity of chicory yielded every year through- out the empire; the principal centres for its manufacture in Prussia are Magdeburg, Berlin and Breslau.

Livestock. — The province of East Prussia, with the principal government stud of Trakehnen, is the headquarters of horse- rearing, and contains the greatest number of horses both relatively and absolutely. The horses bred there are generally suitable for the lighter kind of work only, and are in great request for military purposes. Horses of a stouter type are bred in Schleswig-Holstein and on the Rhine, but heavy draught horses have to be imported from France, Holland, Belgium and Denmark. The best cattle are reared in the maritime provinces, whence, as from the marshy lowlands of Hanover, they are exported in large numbers to England.

In the matter of freights the government renders material assist- ance to the Prussian farmer. As the state owns the railways, it carries agricultural produce, especially such as is destined for ex- port, at lower preferential rates.

Foreste.— Prussia contains a greater proportion of woodland (23) than any other large country in the south or west of Europe (France 17, Italy 12%, Great Britain 3%), though not so large a proportion as Russia, Austria' and some of the minor German states. The most extensive forests are in East and West Prussia, Silesia, and Brandenburg, where coniferous trees prevail, and in the Rhenish and Hessian districts, where oaks and beeches are the most prominent growths. The north-west is almost entirely desti- tute of timber, and peat is there used universally as fuel. The

government forests cover about 6,000,000 acres, or upwards of one- fourth of the whole, and are admirably managed, bringing in an annual revenue of ii millions sterling. The state also controls the management of forests in private possession, and exerts itself to secure the planting of waste lands.

Viticulture. — The principal wine-growing districts of Prussia are the Rheingau and the Rhine provinces, though wine is also pro- duced in Silesia, Westphalia and a few other districts. The valleys of the Nahe, Saar, Moselle and Ahr all produce excellent wine. The Prussian state owns

several vineyards in the Rhine district. German vine-growers have suffered, in common with vine-growers in other countries of Europe, from the Oidium tuckeri and the Phylloxera,ˆ and the government has spent large sums of money in endeavouring to arrest the ravages caused.

Fisheries. — The fisheries on the Baltic Sea and its haffs, and on the North Sea, are important. In the former the take consists mainly of herrings, flat fish, salmon, mackerel and eels, while the chief objects of the latter are cod and oysters. Inland fishery has been encouraged by the foundation of numerous piscicultural establishments and by the enactment of close-time laws. Carp, perch, pike and salmon, the last-named especially in the Rhine, are the principal varieties; sturgeon are taken in the Elbe and Oder, and the lakes of East Prussia swarm with bream and lampreys. Game of various kinds abounds in different parts of Prussia, and the lakes are frequented by large flocks of waterfowl.

Mining and Metal Industries. — Prussia is the largest producer of coal, zinc, salt, lead and copper amongst the states of the German Empire, though in respect of iron she comes second to Alsace- Lorraine. Of the aggregate German output of coal Prussia supplies over 93%, viz. the huge total of 101,966,158 tons, valued at £43,912,500 in 1900, as compared with some 47,000,000 tons in 1882, representing an increase of about 117%, and of this the province of Westphalia produces the largest quantity. Next comes the Rhine province, that is, the Saar, Aachen, Dusseldorf and Roer coal-fields; then Silesia. An extremely important r61e is played in the coal industry of Prussia by the Rhenish-Westphalian Coal Syndicate, which has its headquarters at Essen, and which from the bulk of its output (about 40% of the total German output) has succeeded in regulating the production and price of the coalfields generally. Out of a total output of lignite for the entire German Empire of 40,498,019 tons in 1900, Prussia yielded no less than 84%, or a total of 34,007,542 tons, valued at £4,012,900, showing an annual increase of over 24 million tons and of 3! millions sterling since 1882. Almost all the zinc produced in Germany comes out of the Silesian mines. The chief iron-producing regions are the Rhine province, Westphalia, Hesse-Nassau and Silesia. But in the production of lead and manganese Prussia enjoys almost an unchallenged monopoly. Salt is mined principally in the province of Saxony (Stassfurt, Aschersleben, Erfurt, Halle, Merseburg, Sangerhausen), the kali salts near Magdeburg and Glauber salts in the Rhine province and Hesse-Nassau. Iron is worked principally in the districts of Arnsberg, Dusseldorf, Oppeln in Silesia, Treves and Coblenz, and zinc for the most part near Oppeln in Silesia; lead and silver near Aachen, Oppeln and Wiesbaden, and sulphuric acid in all the mining districts, as well as near Potsdam, Breslau, Magdeburg and Merseburg. Petroleum is extracted to a limited extent at a couple of places in the province of Hanover. Down to 1899, in which year

the monopoly was bought out by the Prussian government, 150 to 250 tons of amber were mined in East Prussia. A little is also collected on the coast near Pillau.

Industrial Development. — During the last quarter of the 19th century Prussia developed into a great manufacturing country. Among the causes which have been mainly instrumental in fostering the industrial development in Prussia are the fostering care of the government (at once energetic, comprehensive and watchful), co-operation and organization, which has been immensely facili- tated by the habits of prompt obedience and order learnt in the course of the military training; the generally high intellectual level and technical and artistic skill of the workmen, due in part to the enforcement of sound elementary education and in part to the excellent technical high schools, .trades " continuation schools," and hosts of special schools in which the arts and crafts are thorough- ly and systematically taught; the use made of scientific discoveries and the power of taking advantage of scientific progress generally; the national aptitude for giving conscientious attention to minutiae, and for thoroughness and mastery of detail; the extensive employ- ment of commercial travellers, having command of languages, in all parts of the world ; and an earnest desire to find out and meet the wants and tastes of customers. Moreover, the social and economic conditions of the people have been in their favour. Wages have on the whole been lower than, for example, in England, though since 1896 they have shown a strong upward tendency, and the standard of comfort, and even in many cases the standard of living, has been lower. Litigation, too, is more expeditious and less costly. But the Prussian manufacturer has derived no small measure of advantage from the fact that he came into the field somewhat later than his foreign rivals. He has been enabled to utilize their experience, to profit from their drawbacks, faults and deficiencies, and to make a clean start in the light of this valuable acquired knowledge. His interests have also been materially

promoted by the commercial and fiscal policies of his government. The chief industrial districts are, of course, those which yield coal, with, in addition, the great cities — Berlin, Magdeburg, Hanover, Breslau, Gorlitz, Stettin, Essen, Dortmund, Elberfeld-Barrnen, Diisseldorf, Cologne, Aix-la-Chapelle, Crefeld, Halle, Hanover, Frankfort-on-Main, Saarbriicken, Hochst, Solingen, Remscheid, Hagen, Konigsberg, Danzig and many others. The iron and metal industries, especially the making of machinery, electrical plant, tramway plant, and the production of articles in wrought copper and brass, rank in the forefront. In these branches Berlin, and more

lately its suburbs, as well as Magdeburg and Cologne, have played an active role, though the old centres of the metallurgical and iron and steel industries in the Rhine province and West- phalia have also expanded in an extraordinary degree. The growth of the chemical industries, which are essentially a German speciality, must also be mentioned in the front rank. The branches in which this supremacy stands unrivalled are those which produce aniline dyes, artificial indigo, illuminants (acetylene gas, Welsbach mantles, &c), explosives, various chemical salts, pharmaceutical prepara- tions, cellulose, glycerine, artificial (chemical) manures, and per- fumes. 1 A third branch of industry in which German genius has won triumphs of the highest kind is shipbuilding.

Constitution. — The present constitution of Prussia was framed by the government of King Frederick William IV., with the co- operation of a constituent assembly, and was proclaimed on the 31st of January 1850. It consists of an hereditary monarchy with two houses of parliament and was subsequently modified by various enactments, notably that of the 12th of October 1854, reconstituting the upper chamber. The constitution affirms the legal equality of all citizens in the eye of the law, provides for universal military service, and guarantees the personal liberty of the subject, the security of property, immunity from domiciliary visits, the in- violability of letters, toleration of religious sects, freedom of the press, the right of association and public meetings, and liberty of migration.

The monarchy is hereditary in the male line of the house of Hohenzollern, and follows the custom of primogeniture. The king alone exercises the executive power, has the supreme command of the army, and is head of the Church, but shares the legislative power with his parliament. He appoints and discharges the minis- ters and other officials of the Crown, summons and dissolves parlia- ment, possesses the right of pardon and mitigation of punishment, declares war and concludes peace, confers orders and titles and conducts the foreign policy of the country, though this prerogative has now, constitutionally speaking, passed from the king of Prussia to the German emperor. He is held to be irresponsible for his public actions, and his decrees require the countersign of a minister, whose responsibility, however, is not very clearly defined. The national tradition and feeling lend the Crown considerable power not formulated in the constitution, and the king is permitted to bring his personal influence to bear upon parliament in a way quite at variance with the English conception of a constitutional monarch. The annual civil list of the king of Prussia amounts to £770,554.

The legislative assembly or Landtag, consists of two chambers, which are convoked annually at the same time but meet separately. The right of proposing new measures belongs equally to the king and each of the chambers, but the consent of all three is necessary before a measure can

pass into law. The chambers have control of the finances and possess the right of voting or refusing taxes. Financial questions are first discussed in the lower house, and the upper house can accept or reject the annual budget only en bloc. All measures are passed by an absolute majority, but those affect- ing the constitution must be submitted to a second vote after an interval of at least twenty-one days. Members may not be called to account for their parliamentary utterances except by the chamber in which they sit. No one may at the same time be a member of both chambers. The ministers of the Crown have access to both chambers and may speak at any time, but they do not vote unless they are actually members. The sittings of both chambers are public.

The general scheme of government, though constitutional, is not exactly " parliamentary " in the English sense of the word, as the ministers are independent of party and need not necessarily represent the opinions of the parliamentary majority. The Herren- haus, or house of peers, contains two classes of members, the heredit- ary and non-hereditary. The former consists of the adult princes of the house of Hohenzollern, the mediatized princes and counts of the old imperial nobility, and the heads of the great territorial nobility. The non-hereditary members are chosen for life by the king from the ranks of the rich landowners, manufacturers and men of general eminence, and representatives " presented " for the king's approval by the landowners of the eight old provinces, by the larger towns and by the universities. Every member of the Herrenhaus must be specially summoned by the king. The Abge- ordnetenhaus or chamber of deputies, consists of 433 members, elected

1 See Dr Frederick Rose, Chemical Instruction and Chemical Industries in Germany (1901-1902), being Nos. 561 and 573 of the " Miscellaneous Series of British Diplomatic and Consular Reports."

for periods of five years by indirect suffrage, exercised by all male citizens who have reached the age of twenty-five and have not forfeited their communal rights. The original electors are arranged in three classes, according to the rate of taxes paid by them, in such a way that the gross amount of taxation is equal in each class. The country is accordingly divided into electoral districts, with the electors grouped in three categories, each of which selects a Wahlmann or electoral proxy, who exercises the direct suffrage. Members of the lower house must be thirty years old and in full possession of their civic rights. They receive a daily allowance {Diaten) of fifteen shillings during the sitting of the house, and travel- ling expenses.

The king exercises his executive functions through an irre- sponsible Staatsrat, or privy council, revived in 1884 after thirty years of inactivity, and by a nominally responsible cabinet or council of ministers {Staats-

Ministerium). The latter consists of the president and minister of foreign affairs, and ministers of war, justice, finance, the interior, public worship and instruction, in- dustry and commerce, public works and agriculture, domains and forests. Ministers conduct the affairs of their special departments independently, but meet in council for the discussion of general questions. They represent the executive in the houses of parliament and introduce the measures proposed by the Crown, but do not need to belong to either chamber. The affairs of the royal household and privy purse are entrusted to a special minister, who is not a member of the cabinet.

The Prussian governmental system is somewhat complicated by its relation to that of the empire. The king of Prussia is at the same time German emperor, and his prime minister is also the imperial chancellor. The ministries of war and foreign affairs practically coincide with those of the empire, and the custom-dues and the postal and telegraph service have also been transferred to the imperial government. Prussia has only seventeen votes in the federal council, or less than a third of the total number, but its influence is practically assured by the fact that the small northern states almost invariably vote with it. To the Reichstag Prussia sends more than half the members. The double parliamentary system works in some respects inconveniently, as the Reichstag and Prussian Landtag are often in session at the same time, and many persons are members of both. Where imperial and Prussian legislation come into conflict the latter must give way.

Local Government. — For administrative purposes Prussia is divided into fourteen Provinzen or provinces, Regierungsbezirke or governmental departments, Stadtkreise or urban districts (circles), and Landkreise or rural districts. The city of Berlin and the dis- trict of Hohenzollern form provinces by themselves. Recent legislation has aimed at the encouragement of local government and the decentralization of administrative authority by admitting lay or popularly elected members to a share in the administration alongside of the government officials. Certain branches of adminis- tration, such as the care of roads and the poor, have been handed over entirely to local authorities, while a share is allowed them in all. In the province the government is represented by the Ober- prdsident, whose jurisdiction extends over all matters affecting more than one department. He is assisted by a council (Provinzial- rat) consisting, bes'des himself as chairman, of one member appointed by government and five members elected by the provincial committee (Provinzialausschuss). The latter forms the permanent executive of the provincial diet (Provinzial-Landtag), which consists of deputies elected by the kreise or circles, and forms the chief provincial organ of local government. The Regierungs- bezirk is solely a government division and is only indirectly repre- sented in the scheme of local administration. The government authorities are the Regierungs-Prasident,

who is at the head of the general internal administration of the department, and the Regie- rung or government board, which supervises ecclesiastical and educational affairs and exercises the function of the state in regard to the direct taxes and the domains and forests. The depart- mental president is also assisted by a Bezirksrat or district council, consisting of one official member and four others selected from in- habitants of the department by the provincial committee. Each Landkreis has a Landrat, an office which existed in the mark of Brandenburg as early as the 16th century. He is aided by the Kreissausschuss, or executive committee of the Kreistag (the diet of the circle). The Landkreise include towns having less than 25,000 inhabitants, rural communes (Landgemeinden) and manors (Gutsbezirke) . Stadtkreise are towns with more than 25,000 in- habitants; they have each a town council (Stadtverordnetenver- sammlung) elected on a three-class property suffrage. The practical executive is entrusted to the magistracy (Magistrat), which usually consists of a burgomaster, a deputy burgomaster (both paid officials), several unpaid members, and, where necessary, a few other paid members. The unpaid members hold office for six«years; the paid member? are elected for twelve years, and their election requires ratification from the state.

Justice. — Down to the 1st of January 1900 (when the German civil code — Biirgerliches Gesetzbuch — was introduced) a threefold system of civil law had prevailed in Prussia, viz. the common law of Prussia (Landrecht), codified in 1794, in eastern and central

Prussia, the German common law (Gemeines deutsches Recht) in Schleswig-Holstein, Hanover, and parts of the Rhine provinces, and the Code Napoleon generally on the Rhine and in Alsace-Lorraine. The burgerliches Gesetzbuch has now put an end to the former anom- alies. The criminal law was unified by the penal code {Strafgesetz- buch) of 1 87 1 and the military penal code (militdr. Straf gesetzbuch) of 1872. A new penal code, promulgated in 1850, did away with the old patrimonial or seigniorial jurisdiction, and the administra- tion of justice is now wholly in the hands of government. The courts of lowest instance are the Amtsgerichte, in which sits a single judge, accompanied in penal cases by two Schoffen or lay assessors (a kind of jurymen, who vote with the judge). Cases of more importance are decided by the Landgerichte or county courts, in which the usual number of judges is three, while in important criminal cases a jury of twelve persons is generally empanelled. From the Land- gerichte appeals may be made to the Oberlandesgerichte or provincial courts. The Oberlandesgerkht at Berlin is named the Kammer-

gericht and forms the final instance for summary convictions in Prussia, while all other cases may be taken to the supreme imperial court at Leipzig. The judges (Richter) are appointed and paid by the state, and hold office for life. After finishing his university career the student of law who wishes to become a judge or to practise as qualified counsel (Rechtsanwalt, barrister and solicitor in one) passes a government examination and becomes a Referendarius. He then spends at least four years in the practical work of his profession, after which he passes a second examination, and, if he has chosen the bench instead of the bar, becomes an Assessor and is eligible for the position of judge. A lawyer who has passed the necessary examinations may at any time quit the bar for the bench, and a judge is also at liberty to resign his position and enter upon private practice. In all criminal cases the prosecution is under- taken by government, which acts through Staatsanwalte, or directors of prosecutions, in the pay of the state.

Army. — The military organization of the monarchy dates from 1 814 and provides that every man capable of bearing arms shall serve in the army for a certain number of years. The peace strength of the Prussian contingent of the imperial German army consisted, in 1905, of 20,646 officers (including surgeons), 448,365 men and 82,786 horses. There were also 2196 farriers and shoesmiths. (For Navy, see Germany).

Religion. — The centre of the kingdom is solidly Protestant, the proportion of Roman Catholics increasing towards east and west and reaching its maximum on the Rhine and in the Slavonic provinces. East Prussia, however, with the exception of Ermeland, is Protestant. The Roman Catholics greatly outnumber the Protestants in the Rhine provinces (3 to 1), Posen, Silesia and West Prussia. All religious bodies are granted freedom of worship, and civil rights are not conditional upon religious confession.

The Evangelical or Protestant State Church of Prussia consists as it now stands of a union of the Lutherans and Calvinists, effected under royal pressure in 1 81 7. According to the king this was not a fusion of two faiths but an external union for mutual admission to the Eucharist and for the convenience of using the same liturgy, prepared under the royal superintendence. Those who were unable from conscientious scruples to join the union became Separatist or Old Lutherans and Old Calvinists, but their numbers were and are insignificant. The king is " summus episcopus " or supreme pontiff of the Church, and is represented in the exercise of his ecclesiastical functions by the minister of public worship and instruction. The highest authority for the ordinary management of the Church is the Oberkirchenrat or supreme church council at Berlin, which acts through provincial consistories and superintendents appointed by the Crown. Recent

legislation has made an effort to encourage self-government and give a congregational character to the Church by the granting of a presbyterial constitution, with parish, diocesan, provincial and general synods. The clergy are appointed by the Crown, by the consistories, by private or municipal patronage, or by congregational election.

The hierarchy of the Roman Catholic Church in Prussia consists of two archbishops (Cologne, Gnesen-Posen) and ten bishops. The prince-bishop of Breslau and the bishops of Ermeland, Hildesheim and Osnabruck are directly under the pope, and the bishoprics of Fulda and Limburg are in the archiepiscopal diocese of Freiburg in Baden. The higher ecclesiastics receive payment from the state, and the annual appropriation appearing in the budget for the Roman Catholic Church is as high as that made for the State Church. All the Roman Catholic religious orders in Prussia have been suppressed except those occupied with attendance on the sick.

The relations of the state with the dissenting Christian sects, such as the Baptists, Mennonites and Moravian Brethren, are practically confined to granting them charters of incorporation which ensure \hem toleration. The Mennonites were formerly allowed to pay an extra tax in lieu of military service, which is inconsistent with their belief, but this privilege has been withdrawn. The Old Catholics number about 30,000, but do not seem to be increasing.

The Jews belong mainly to the urban population and form 20 to V>% of the inhabitants in some of the towns in the Slavonic

provinces. (For more exact details of the various religious creeds, see Germany.)

Education. — In Prussia education is compulsory, and the general levet attained is very high. Every town or community must main- tain a school, supported by local rates and under the supervision of the state. By the constitution of 1850, all persons are permitted to instruct, or to found teaching establishments, provided the^can produce to the authorities satisfactory proofs of their moral, scientific and technical qualifications. Both public and private educational establishments are under the surveillance of the minister of public instruction, and all public teachers are regarded as servants of the state {Staatsbeamte). No compulsion exists in reference to a higher educational institution than primary schools. All children must attend school from their sixth to' their fourteenth year. At the head of the administration stands the minister of public in- struction and ecclesiastical affairs, to whom also the universities are directly subordinated. The higher (secondary) schools are supervised by provincial Schulcollegia or school boards, appointed by government, while the management of the elementary and private schools falls within the jurisdiction of the ordinary Regie- rungen or civil government. This is carried out through qualified school inspectors, frequently chosen from among the clergy.

The expenses of the primary schools (Volksschulen) are borne by the communes (Gemeinden), aided when necessary by subsidies from the state. The subjects of instruction are theology, reading, writing, spelling, arithmetic, the elements of geometry, history, geography and natural science, singing, drawing, sewing and gymnastics. All fees in the elementary schools are abolished. The number of illiterate recruits among those called upon each year to serve in the army affords a good test of the universality of elementary education. In 1899 the proportion of Analphabeti, or men unable to read or write, among the recruits levied was only 0-12%. The teachers for the elementary schools are trained in normal seminaries or

colleges established and supervised by the state, and much has been done of late years to improve their position. In most of the larger towns the elementary schools are supplemented by middle schools (Burgerschulen, Stadtschulen) , which carry on the pupil to a somewhat more advanced stage, and are partly intended to draw off the unsuitable elements from the higher schools.

The secondary schools of Prussia may be roughly divided into classical and modern, though there are comparatively few in which Latin is quite omitted. The classical schools proper consist of Gymnasia and Progymnasia, the latter being simply gymnasia wanting the higher classes. In these boys are prepared for the universities and the learned professions, and the full course lasts for nine years. In the modern schools, which are divided in the same way into Realgymnasia and Real-pro gymnasia, and also have a nine years' course, Latin is taught, but not Greek, and greater stress is laid upon modern languages, mathematics and natural science. The three lower classes are practically identical with those of the gymnasia, while in the upper classes the thoroughness of training is assimilated as closely as possible to that of the classical schools, though the subjects are somewhat altered. Ranking with the realgymnasia are the Oberrealschulen, which differ only in the fact that Latin is entirely omitted, and the time thus gained devoted to modern languages. The Hohere (or upper) Burgerschulen, in which the course is six years, rank with the middle schools above mentioned, and are intended mainly for those boys who wish to enter business life immediately on leaving school. All these secondary schools possess the right of granting certificates entitling the holders, who must have attained a certain standing in the school, to serve in the army as one-year volunteers. The gymnasial " certificate of ripeness" (Maturitatszeugniss), indicating that the holder has passed satisfaetorily through the highest class, enables'a student to enroll himself in any faculty at the university, but that of the realgymnasium qualifies only for the general or " philosophical " faculty, and does not open the way to medicine, the Church or the bar. Considerable efforts are, however, now being made to have the realgymnasium certificate recognized as a sufficient qualification for the study of medicine at least. At any of these schools a thoroughly good education may be obtained at a cost seldom exceeding, in the highest classes, £5 per annum. The teachers are men of scholarship and ability, who have passed stringent government examinations and been submitted to a year of probation. The great majority of the secondary schools have been established and endowed by municipal corporations.

Prussia possesses ten of the twenty German universities (not including the lyceum at Braunsberg and the Roman Catholic seminary at Munster). The largest Prussian university is that of Berlin, while Breslau, Bonn, Gottingen and Halle are the next in size. The oldest is the university of Greifswald,

founded in 1456. Like the schools the universities are state institutions, and the pro- fessors are appointed and paid by government, which also makes liberal annual grants for apparatus and equipment. The full obligatory course of study extends over three, and in the case of medicine, four years. It is, however, not unusual for non-medical students also to spend four years at the university, and there is an agitation to make this compulsory. Students qualifying for

a Prussian government appointment are required to spend at least three terms or half-years (Semester) at a Prussian university.

Ranking with the universities are the large technical high schools at Berlin, Hanover, Aix-la-Chapelle and Danzig, the mining acad- emies of Berlin and Klausthal, and the academies of forestry at Eberswalde and Miinden; the agricultural high schools of Berlin and Poppelsdorf (Bonn) and the two veterinary high schools of Berlin and Hanover. Music is taught at several conservatoria, . the best known of which are at Berlin and Frankfort-on-Main.

The science and art of Prussia find their most conspicuous external expression in the academies of science and art at Berlin, both founded by Frederick I.; and each town of any size throughout the kingdom has its antiquarian, artistic and scientific societies. Recognized schools of painting exist at Berlin and Diisseldorf, and both these towns, as well as Cassel, contain excellent picture galleries. The scientific and archaeological collections of Berlin are also of great importance. Besides the university collections, there are numerous large public libraries, the chief of which is the royal library at Berlin (1,000,000 volumes).

Finance. — As in all civilized countries, the national accounts of Prussia expand by leaps and bounds, and they do this in spite of the advantage which the state derives from the possession of valuable revenue-yielding properties. Of these the most important are the railways. Next in point of revenue come the mines and salines. Then follow the state forests and the landed domains, though the income from this source is rapidly decreasing as agri- culture declines. For 1905-1906 the public revenue and expendi- ture were estimated at £135,914,080. The principal sources of revenue are the railways, £81,268,493; domains and forests, £5,982,911; state lottery, £4,840,665; mines, &c, £10,585,875; direct taxes (principally income-tax), £11,505,365; indirect taxes, £4,789,965; administrative receipts, £8,410,684; and from the general financial control, £8,356,636. The chief

items of the expenditure consist of payments for religion and education, £8,201,632; for justice, £6,260,330; working expenses, including £50,280,525 for working the state railways, £69,626,542; interest, &c, on public debt, £12,375,380; the ministry of finance, £6,585,722, and the ministry of the interior, £4,313,780. The public debt grew from £64,363,000 in 1872 to £360,447,654 in 1905. The greater part of this debt has been incurred in the purchase of the state railways.

See Jahrbuch fur die amtlidie Statistik des preussischen Stoats, the Statistisches Jahrbuch fiir das deutsche Reich, and other publi- cations of the statistical offices of Prussia and Germany. Good general accounts of the natural, social and political features of the country are given in Eiselen's Der preussische Staat (Berlin, 1862) and in Daniel's Handbuch der Geographie (several editions). The Prussian constitution and administrative system are concisely described in the Handbuch der Verfassung und Verwaltung in Preussen, by Graf Hue' de Grais, and are treated at length in Von Ronne's Staatsrecht der preussischen Monarchic (4th ed., 1881-1884), and in Arndt, Verfassungs-Urkunde fiir den preussischen Staat (Berlin, 1900). In addition, see Landeskunde Preussens (Berlin, 1901), edited by Beuermann. Various volumes of Forschungen zur deut- schen Landes- und Volkskunde, edited by Kirchhoff; British Diplomatic and Consular Reports; and James Baker, Report on Technical and Commercial Education in East Prussia, &c. (London,

1900).

History. — The name of Prussia is derived from the dukedom of Prussia (the present province of East Prussia), which was raised into a kingdom by the emperor in favour of Frederick III., elector of Brandenburg, on the 18th of January 1701. The title "king of Prussia" 1 applied at the outset only to Prussia proper, which formed no part of the Empire; in respect of his other dominions the king continued to bear titles (margrave, duke, &c.) which implied feudal subordination to the emperor. The extension of the style " kingdom of Prussia " so as to cover the whole of the territories, by whatever title held, of the electors of Brandenburg, was not, however, an empty assumption, but symbolized a new fact of first-class historic importance: the rise in Germany and in Europe of a new great power. The consolidation of this power had been the work of the Great Elector, the work of whose reign (1640-1688) laid the foundations of the modern Prussian state (see Frederick William I., elector of Brandenburg, and Brandenburg: History).

The Great Elector's son Elector Frederick III. was an osten- tatious and somewhat frivolous prince, who hazarded the acquisitions of his father by looking on his position as assured

1 Strictly speaking, the title assumed was " king in Prussia " (Konig in Preussen), this apparently being meant to indicate that there was still a Prussia (West Prussia) of which he was not king, though it has also been otherwise explained.

and by aiming rather at external tokens of his dignity than at a further consolidation of the basis on which it rested. The Brandenburg troops fought in the war of the second coalition against Louis XIV. and in that of i 688 i7i3. " the Spanish Succession; but neither the peace of Ryswick (1697) nor that of Utrecht (1713) brought the country any very tangible advantage. Brandenburg soldiers also helped the emperor in his wars with the Turks, and it was Frederick's action in covering the Dutch frontier with 6000 troops which left William of Orange free scope in his expedition to England. The most notable incident in Frederick's reign was, however, his acquisition of the title of king of Prussia, which had long formed the principal object of his policy. The emperor's consent was finally purchased by the promise of a contingent of 8000 men to aid him in the War of the Spanish Succession, and on the 18th of January 1701 Frederick crowned himself at Konigsberg with accompanying ceremonies of somewhat inflated grandeur. Elector Frederick III. of Brandenburg became henceforth King Frederick I. of Prussia. 2 Superficial as this incident may at first sight appear, it added considerably to the moral and politi cal momentum of the country, if only by giving to the subjects of the Prussian crown a common name, and its advantages were reaped by Frederick's two vigorous successors. About the same time (1697) the elector of Saxony also acquired the kingly dignity by his election to the throne of Poland, but in doing so he had to become a Roman Catholic, and thus left the Hohen-zollerns without a rival among the Protestant dynasties of Germany. Frederick was extravagant; but he also did much for the intellectual life of the country, patronizing learned men, and founding the university of Halle (1694) and at Berlin the Academy of Arts (1699) and the Academy of Sciences (1700). Moreover, even under this improvident king the territory of Prussia increased. From Saxony the king bought the heredit- ary advocateship (Erbvogtei) of the Reichsstift of Quedlinburg, as well as the imperial city of Nordhausen, the bailiwick of Petersberg and the countship of Tecklenburg, while in 1702 from William III. of Orange he inherited Lingen, Mors and Neunbufg.

The court of Vienna consoled itself for the growing power of Prussia under the Great Elector by the reflection that it was probably temporary and 'due mainly to the vigorous individu- ality of that prince. The events of Frederick I.'s reign seemed to justify this view. At his accession Prussia might fairly claim to rank as the second state of Germany, but before the death of Frederick, Bavaria, Saxony and Hanover all raised themselves to at least a level with Prussia. Frederick's preoccupation in the western wars

had allowed Sweden to reassert her pre-eminence in northern Europe, and it was Russia, and not Prussia, that now impeded her progress. The internal soundness of the country had also suffered: the finances were in a state of com- plete disorganization, and the burden of taxation was almost insupportable. If Frederick's son and successor had not been a man of vigorous character the downhill progress might have continued until it had removed Prussia altogether from the list of important states.

The accession, on the 25th of February 1713, of Frederick William I. produced at once a complete change of system. The new king, whose literary education had been Frederick neglected, shared none of his father's artistic tastes wmiami., and had a complete contempt for. the trappings of l7,3 – ,74 °- royalty. On the other hand, he possessed administrative talents of no mean order and was singularly painstaking, indus- trious and determined in carrying out his plans. By carefully husbanding his finances Frederick William filled his treasury and was able to keep on foot one of the largest and best disciplined armies in Europe, thereby securing for Prussia an influence in European councils altogether disproportionate to its size and population. In internal management he made Prussia the model

2 By the treaty of Utrecht, to which King Frederick William I. acceded on the 15th of May 1713, Prussia received upper Gelderiand in exchange for the principality of Orange, and the king's title was acknowledged by the European powers.

state of Europe, though his administration was of a purely arbitrary type, in which the estates were never consulted and his ministers were merely clerks to register his decrees. His first act was to reform the expensive institutions of the court; and the annual allowance for the salaries and pensions of the chief court officials and civil servants was at once reduced from 276,000 to 55, 000 thalers. The peace of Utrecht (1713) left Frederick William free to turn his attention to the northern war then raging between Sweden on the one side and Russia, Poland, and Denmark on the other. Though at first disposed to be friendly to Sweden, he was forced by circumstances to take up arms against it. In September 17 13 Stettin was captured by the allies and handed over to the custody of Frederick William, who paid the expenses of the siege and undertook to retain possession of the town until the end of the war. But Charles XII. refused to recognize this arrangement and returned from his exile in Turkey to demand the immediate restitution of the town. With this demand the king of Prussia naturally declined to comply, unless the money he had advanced was

reimbursed; and the upshot was the outbreak of the only war in which Frederick William ever engaged. The struggle was of short duration, and was practically ended in 1715 by the capture of Stralsund by the united Prussians, Saxons and Danes under the command of the king of Prussia. The Swedes were driven from Pome- rania, and at the peace of 1720 Frederick William received the greater part of Swedish Pomerania, including the important sea- port of Stettin. Sweden now disappeared from the ranks of the Great Powers, and Prussia was left without a rival in northern Germany.

A detailed history of Frederick William's reign would necessitate the recital of a long and tedious series of diplomatic proceedings, centring in the question of the succession to the duchies of Julich and Berg. The treaty of Wusterhausen be- tween Austria and Prussia was concluded in 1726, and was con- firmed with some modifications by the treaty of Berlin in 1728. Frederick William engaged to recognize the Pragmatic Sanction, while the emperor on his side undertook to support Prussia's claims to Julich and Berg. The policy of the latter, however, was far from straightforward, as he had already entered into a similar compact with the count palatine of Sulzbach, who was a Roman Catholic and therefore a more sympathetic ally. Frederick William's intervention in the matter of the suc- cession to the throne of Poland, rendered vacant by the death of Augustus II. in 1733, proved barren of advantage to Prussia and failed to secure the hoped-for reversion of the duchy of Courland. A Prussian contingent took part none the less in the ensuing war between Austria and France, but Austria concluded peace in 1735 without consulting her ally. In 1737 the king withstood the pressure brought to bear upon him by England, France, Holland and Austria to induce him to submit to their settlement of the Julich-Berg question; and in 1739, convinced at least of the confirmed duplicity of the emperor, he turned to his hereditary enemy for help and concluded a defensive alliance with France. The rivalry between Austria and Prussia had begun, which for the rest of the century formed the pivot on which the politics of Europe mainly turned.

If the external history of Frederick William's reign is not especially glorious, and if in diplomacy he was worsted by the emperor, the country at least enjoyed the benefits of a twenty-five Prussia years' peace and efficient government. During this reign the revenues of Prussia were doubled, and the king left at his death an accumulated treasure of 9,000,000 thalers and an army of 85,000 men. Though not rank- ing higher than twelfth among the European states in extent and population, Prussia occupied the fourth place in point of military power. The king himself took the greatest interest in the management of his army, in which the discipline was of the strictest; and he carried the habits of the military martinet into all depart- ments of the administration. His chief innovation

was the abolition of the distinction between the military and the civil funds, and the assignment of the entire financial management of the country to a general directory of finance, war and domains. The directory was instructed to pay for everything out of a common fund, and so to regulate the expenditure that there should invariably be a surplus at the end of the year. As the army absorbed five-sevenths of the revenue, the civil administration had to be conducted with

under Frederick William I.

the greatest economy. The king himself set the example of the frugality which he expected from his officials, and contented himself with a civil list of 52,000 thalers (£7800). The domains were now managed so as to yield a greater income than ever before, and im- portant reforms were made in the system of taxation. By the sub- stitution of a payment in money for the obsolete military tenure the nobles were deprived of their practical exemption from taxation, and they were also required to pay taxes for all the peasant holdings they had absorbed. Attempts were made to better the condition of the peasants, and the worst features of villeinage were abolished in the Crown domains. The military system of cantonment, according to which each regiment was allotted a district in which to recruit, was of constitutional as well as military importance, since it brought the peasants into direct contact with the royal officials. The col- lection of the taxes of the peasantry was removed from the hands of the landowners. The duties of the state officials were laid down with great detail, and their performance was exacted with great severity. Justice seems to have been administered in an upright manner, though the frequent and often arbitrary infliction of the penalty of death by the king strikes us with astonishment. The agricultural and industrial interests of the country were fostered with great zeal. The most important industrial undertaking was the introduction of the manufacture of woollen cloth, the royal factory at Berlin supplying uniforms for the entire army. The commercial regulations, conceived in a spirit of rigid protection, were less successful. In the ecclesiastical sphere the king was able to secure toleration for the Protestants in other parts of Germany by reprisals on his own Roman Catholic subjects, and he also gave welcome to numerous Protestant refugees, including 18,000 exiled peasants from Salzburg (1732). He has the credit of founding the common-school system of Prussia and of making elementary educa- tion compulsory.

On the 31st of May 1740 Frederick William died, and was succeeded by his son as Frederick II., known in history as Frederick the Great. The young king at once Frederick resolved to use the well-filled treasury and well- u., 1740- disciplined army left to him by his father for the 1T86 ‘ purpose of increasing the position of Prussia in Europe. The death of the emperor

Charles VI., the last of the male line of the house of Habsburg, on the 20th of October 1740, gave him his opportunity, by raising the question of Maria Theresa's right to succeed under the Pragmatic Sanction (see Charles VI., emperor; Maria Theresa; Austria-Hungary: History). Austrian duplicity in the matter of Julich gave him a colourable pretext for his hostile attitude in reviving the long dormant claims of Prussia to the Silesian duchies. Within a year of his accession he had embarked on the Silesian War, and this was closely followed by the second, which ended in 1745, leaving Frederick in undisputed possession of almost the whole of Silesia, with the frontier that still exists. East Friesland, the Prussian claim to which dated from the time of the Great Elector, was absorbed in 1744 on the death without issue of the last duke. The two Silesian Wars completely exhausted the stores left by Frederick William, both of grenadiers and thalers, and Frederick gladly welcomed the interval of peace to amass new treasures and allow his subjects time to recover from their exertions. When the Seven Years' War broke out in 1756 he had an army of 1 50,000 men at his command, representing about one-seventh of the available male population of his little kingdom. He had also a fund of 11,000,000 thalers in his treasury, though this would have gone but a small way had he not been assisted by the subsidies of England and able to make the fertile plains of Saxony his chief basis of supply. (See Seven Years' War.)

Though without gain in extent or population, Prussia emerged from the war as an undoubted power of the first rank, and hence- forth completely eclipsed Saxony, Bavaria and Hanover,

Prussia under

*while it was plain that Austria would no longer stand without a rival for the hegemony of the German f^rfe/**// Empire. The glorious victories over the French and Russians also awakened a spirit of German patriotism that had hitherto been almost unknown. But the price paid for these results was enormous. Of the 850,000 soldiers who, as is estimated, perished during the war about 180,000 fell in the service of Prussia, and the gross population of the kingdom had decreased in seven years to the extent of half a million souls. The misery and poverty indirectly attendant on the war were incalculable. The development of the country was thrown back for many years, which were almost a repetition of the period succeeding the Thirty Years' War. But while nearly a century elapsed before the traces of that struggle I disappeared, Frederick repaired most of the ravages of the Seven*

Years' War in a tenth of the time. By great dexterity in the manage- ment of his finances he had kept clear of debt, and was soon able to advance large sums to the most impoverished districts. Foreign colonists were invited to repeople the deserted villages; taxes were in several instances remitted for a series of years; the horses of the army were employed in farm labour; and individual effort in every department was liberally supported by the government. By 1770 nearly all the ruined villages had been rebuilt; the ground was again under cultivation; order had been restored; the vacant offices had been filled; and the debased currency had been called in. Throughout the kingdom agriculture was encouraged by the drainage of marshy districts; industry was extended by the introduction of new manufactures, by bounties and by monopolies; and commerce was fostered by measures of protection. Frederick's methods of administration did not greatly differ from those of his predecessor, though the unrelenting severity of Frederick William was relaxed and the peculiarities of his system toned down. Frederick's own personal supervision extended to every department, and his idea of his position and duties made him his own first minister in the widest and most exacting sense of the term. His efforts to improve the administration and the bureaucracy were unceasing, and he suc- ceeded in training a body of admirable public servants. One of his most sweeping reforms was in the department of law, where, with the able aid of the jurist Samuel von Cocceji (1679-1755), he carried out a complete revolution in procedure and personnel. One of the king's first acts was to abolish legal torture, and he rarely sanctioned capital punishment except in cases of murder. The application of the privilegium de non appellando (1746) freed Prussia from all relations with the imperial courts and paved the way for a codification of the common law of the land, which was begun under Frederick but not completed till the end of the century. In matters of religion Frederick not only exercised the greatest toleration, remarking that each of his subjects might go to heaven after his own fashion, but distinctly disclaimed the connexion of the state with any one confession. Equal liberty was granted in speaking and writing. Though his finances did not allow him to do much directly for education, his example and his patronage of men of letters exercised a most salutary effect. The old system of rigid social privilege was, however, still maintained, and unsur- mountable barriers separated the noble from the citizen and the citizen from the peasant. The paramount defect of Frederick's administration, as future events proved, was the neglect of any effort to encourage independence and power of self-government among the people. Every measure emanated from the king himself, and the country learned to rely on him alone for help in every emergency.

In 1772 Prussia and Austria, in order to prevent an over- weening growth of Russia, joined in the first partition of Poland. Frederick's share consisted

of West Prussia and the Netze district, which filled up the gap between the great mass of his territories and the isolated district of East Prussia. It had also this advantage over later acquisitions at Poland's expense, that it was a thoroughly German land, having formed part of the colonizations of the Teutonic Order. In 1778 Prussia found herself once more in opposition to Austria on the question of the Bavarian succession, but the difficulty was adjusted without much bloodshed (see Potato War). The same question elicited the last action of importance in which Frederick en- gaged — the formation of a " Fiirstenbund," or league of Ger- man princes under Prussian supremacy, to resist the encroach- ments of Austria. The importance of this union was soon obscured by the momentous events of the French Revolution, but it was a significant foreshadowing of the duel of Austria and Prussia for the pre-eminence in Germany. Frederick died on the 17th of August 1786, having increased his territories to an area of 75,0°° sq. m., with a population of five and a half millions. The revenue also had immensely increased and now amounted to about twenty million thalers annually, of which, however, thirteen were spent on the army. The treasury contained a fund of sixty million thalers, and the country was free of debt. (See Frederick II., King or Prussia.)

A continuation of the personal despotism under which Prussia had now existed for seventy years, as well as of its dispropor- Frederick tionate influence in Europe, would have required a William 11., ruler with something of the iron will and ability of IT86-1797. Frederick the Great. Unfortunately Frederick's nephew and successor, Frederick William II., had neither the energy nor the insight that his position demanded. He was too undecided to adhere to the vigorous external policy of his predecessor, nor did he on the other hand make any attempt

to meet the growing discontent by an internal movement of liberal reform. The rule of absolutism continued, though the power now lay more in the hands of a " camarilla " or cabinet than in those of the monarch; and the statesmen who now came to the front were singularly short-sighted and inefficient. The freedom of religion and the press left by Frederick the Great was abrogated in 1788 by royal ordinance. In 1787 the army engaged in an expensive and useless campaign against Holland. The abandonment of Frederick's policy was shown in a tendency to follow the lead of Austria, which culminated in an alliance with that power against revo- lutionary France. But in 1795 Prussia, suspicious of the Polish plans of Russia and Austria, concluded the separate peace of Basel, almost the only redeeming feature of which was the stipulation that all north German states beyond a certain line of demarcation should participate in its benefits. This practically divided Germany into two camps and inflicted a severe blow on the imperial system. The indifference with which Prussia relinquished to France German lands on the left bank of the Rhine, compared with her

eagerness to increase her Slavonic territories on the east, was certainly one of the great blunders of the reign. Prussia's share in the second and third partitions of Poland (1783 and 1795) nearly doubled her extent, but added little or nothing to her real power. The twelve years following the peace of Basel form one of the most sombre periods of the history of Prussia. Her prestige was lost by her persistent and ill-timed neutrality in the struggle with France; the old virtues of economy, order and justice disappeared from the bureaucracy; the army was gradually losing its excellence and was weakened rather than strengthened by the hordes of dis- affected Polish recruits; the treasury was exhausted and a large debt incurred; the newly awakened feeling of German patriotism had died away, especially among the upper classes. (See Frederick William II., King of Prussia.)

Frederick William III. possessed many virtues that did him credit in his private capacity, but he lacked the vigour that was at this juncture imperatively required from a ruler Frederick of Prussia, while he was unfortunately surrounded William ill., by counsellors who had as little conception as h.ixa- l79T ~ 1840 ' self of Prussia's proper role. Not even the high-handed occupation of Hanover by the French in 1803 could arouse him; and the last shred of self-respect seemed to have been parted with in 1805 when Prussia consented to receive Hanover, the property of its ally England, from the hands of France. The formation of the Confederation of the Rhine in 1806 and the intelligence that France had agreed to restore Hanover to England at last convinced Frederick William of what he had to fear from Napoleon; while Napoleon on his side, being now free of his other antagonists, jv a „ j e0D . was only too glad of an opportunity to destroy his tool. Prussia declared war on the 9th of October 1806; and the short campaign that ensued showed that the army of Frederick the Great had lost its virtue, and that Prussia, single-handed, was no match for the great French commander. On the 14th of October the Prussian armies were overthrown at Jena and Auerstadt, and a total collapse set in. Disgraceful capitulations of troops and fortresses without a struggle followed one another in rapid succession; the court fled to East Prussia; and Napoleon entered Berlin in triumph. At the Peace of Tilsit (July 9, 1807) Frederick William lost half his kingdom, including all that had been acquired at the second and third partitions of Poland and the whole of the territory west of the Elbe. An enormous war indemnity was also demanded, and the Prussian fortresses were occupied by the French until this should be paid.

The next half-dozen years form a period of the greatest sig- nificance in the history of Prussia, embracing, as they do, the turning-point in the moral regeneration of the country. The disasters of 1806 elicited a strong spirit of patriotism, which was fanned by the exertions of the " Tugendbund," or

League of Virtue, and by the writings of men like Fichte and Arndt. The credit of the reformation belongs mainly to the great minister Stein, and in the second place to the chancellor Hardenberg.

The condition on which Stein based his acceptance of office was itself of immense importance; he insisted that the system of governing through irresponsible cabinet coun- teforms. c iU° rs > which had gradually become customary, should cease, and that the responsible ministers of departments should be at once the confidential advisers and the executive agents of the king. Stein's edict of 1807 abolished serfdom and obliterated the legal distinction of classes by establishing freedom of exchange in land and free choice of occupation. 1 The " Stadteordnung " of 1808 reformed the municipalities and granted them important rights of self-govern- ment. His administrative reforms amounted to a complete reconstruction of the ministerial departments and the machinery of provincial government, and practically established the system now in force. In 1810 Hardenberg, with a precipitancy which Stein would scarcely have approved, continued the reform in the condition of the peasants by making them absolute owners of part of their holdings, the landlords obtaining the rest as an indemnity for their lost dues. 2 The army was also reorganized by Scharnhorst and Gneisenau, while the condition imposed by Napoleon that it should not exceed 42,000 men was practically evaded by replacing each body of men by another as soon as it was fairly versed in military exercises. The educational reforms of Wilhelm von Humboldt established the school system of Prussia on its present basis, and the university of Berlin was founded in 1809 (see Stein, H. F. C. Freiherr von; Harden- berg, K. A. von).

Frederick William hesitated to take part in the Austrian rising in 1809, but his opportunity came in 1813, when Napoleon fled from Russia. General York, commander of the corps that Prussia had been obliged to contribute to the French expedi- tion, anticipated the formal declaration of war by joining the Russians with his troops on his own responsibility (Dec. 30, 1812). On the outbreak of the war the people rose en masse and with the utmost enthusiasm. A treaty of alliance between Russia and Prussia was concluded at Kalisch, and Austria, after some hesitation, also joined the league against Napoleon. In the struggle that followed (see Napoleonic Campaigns) Prussia played one of the most prominent parts, and her general Bliicher was the driving force of the allied armies. Between 1813 and the battle of Waterloo Prussia lost 140,000 men, and strained her financial resources to the utmost. As compensation she received at the

Congress of Vienna to™”” t ˆ le nortnern hˆf of Saxony, her old possessions west of the Elbe, Swedish Pomerania, the duchies of Berg and Julich, and other districts in Westphalia and on the Rhine. The acquisitions of the last partition of Poland, with the exception of the grand-duchy of Posen, were resigned to Russia; Friesland went to Hanover, and Bavaria was allowed to retain Baireuth and Ansbach, which had come into her hands in 1806. This arrangement of the map did not wholly restore Prussia to its former extent, as its area was now only 108,000 sq, m. compared with 122,000 sq. m. at the beginning of 1806, but the substitution of German for Slav territory and the shifting of the centre of gravity towards the west more than made up for any slight loss in size. Hanover still formed a huge wedge splitting Prussia completely in two, and the western frontier was very ragged. Prussia's position required caution, but forced upon it a national German policy; and the situation of the new lands was vastly more effectual in determining the future leader of Germany than was Austria's aggrandisement in Italy. The task that confronted Frederick William III. in 1815 — that of welding together the heterogeneous elements assembled under „ . his crown by the great congress — was one that would

*toerI81S h ave taxed the statesmanship of a stronger man than he. a * The population of Prussia had been more than doubled,*

and contained, besides 2,000,000 Slavs, people of every German

1 Previous to this measure the distinction between " noble," " burgher," and " peasant " land and occupations was strictly ob- served, and no transition of property or employment from one class to another was possible,

- *The patrimonial jurisdiction of the landowners was not taken away till 1848.*

race; and, as an additional problem, the annexation of the Rhine provinces had raised the number of Roman Catholic subjects of the most Protestant of the German monarchies to some two-fifths of the whole. On the 3rd of June 18 14 the king had issued a cabinet order promising on his return to give a decision as to a n n esii of national constitution, and this promise had been „ ,,. repeated in proclamations at Danzig and Posen (May .. ° 1815) and in the patent addressed to the new Saxon _ oa ' provinces on the 22nd of May : in addition to the provincial estates there was to be a national Diet for the whole country. When, however, the work of drawing up the constitution was put in hand, it soon became clear that it would meet with extraordinary diffi- culties. Liberalism was as yet a force only in the professional classes; the provinces, proud of their traditions, were loth to be merged in a common organization (Pomeranians and Silesians are

described in contemporary documents as ” nations “); above all, there was the fundamental antagonism, by no means extinct even now, between the old eastern provinces, with their strong feudal spirit, and the new western provinces, in which the ideas of the Revolution had gained a permanent ascendancy; and of all these conflicting tendencies, one only was organized into a compact body of opinion: the ultra-conservative feudal landowners (Junker) of the mark of Brandenburg, ” heartless, wooden, half -educated people,” as Stein called them, ” fit only to be turned into corporals or calculating machines,” but for all that the very backbone of the traditional Prussian monarchy.

In spite of all the king would probably have granted a constitution, but for the ilKtimed alarums and excursions of the Liberal Turn- vereine and Burschenschaften. The trials and humilia- p an .Q erman tions he had passed through during the revolutionary , <„.#_«„_ epoch had left him in a condition of nervous appre- n eactio „' hension, which the Wartburg festival of October 181 8 y„Prt»ss/a (Kamptz's Police Laws, an uhlan's stays and a corporal's cane — symbols of Prussian methods — had been committed to the flames) and the murder of Kotzebue turned into reactionary panic. Metternich, who had never ceased to warn the king of the peril to the Prussian monarchy which would result from a central repre- sentative system, seized the opportunity; under his influence in October 1819, Frederick William by signing the Carlsbad Decrees (q.v.) definitely committed himself to the Austrian system of " stability." It was not, however, till the nth of June 1821 that the king finally decided to postpone the constitution, and to summon a commission to organize a system of provincial estates, which were created by royal patent on the 5th of June 1823. For the rest, the question of a constitution was not again raised during the king's reign, and for years the Prussian police engaged in the con- genial task of " demagogue hunting " (Demagogenhetzerei) , popular heroes like Jahn and Arndt being haled to prison on frivolous charges, and even Gneisenau and Scharnhorst surrounded with spies.

Meanwhile, by an ordinance of the 20th of April 1814 the kingdom had been divided into eight provinces, each province into govern- ment districts (Regierungsbezirke) , and these again Admlnlstra- into ” circles ” administered by a Landrat (landr atliche .. „ Kreise). At the head of each Regierungsbezirk was a eaa i za ° loa government board responsible to the Oberprdsident, g who was responsible in his turn to the ministry under the chan- cellor. On the 20th of March 1817 was created a council of state (Staatsrat) consisting of the royal princes, high officials and a certain number of members nominated by the king, whose function was to supervise the administration and discuss projects of legislation. Its immediate tasks were to bring the new provinces into harmony with the Prussian system and to set order into the disorganized finances. Both

problems were solved in a manner that did credit to the Prussian bureaucracy. By 1820, in spite of the damage caused by the war and of the exhaustion of the country, the financial situation was satisfactory, the king having contributed to this result by surrendering the Crown domains to the state, reserving only a charge of 2,500,000 thalers, the so-called Kron-ftdeikommissfonds. The reconciliation of the new provinces to the new order was a matter of even more difficulty, notably _. .. in the case of the population of the Rhine districts, j,^*,™ which had been accustomed to the easy-going methods and light taxation of the ecclesiastical princes. They were, however, to a certain extent reconciled by the wise liberality which left to them many of their peculiar institutions, e.g. the Code Napoleon in the Rhine provinces. Most burdensome of all was the law of the 3rd of September 1 814 introducing universal military service and organizing the Landwehr; but it was precisely this which was to be the strongest factor in welding Prussia together and making her supreme in Germany.*

Of all the reforms the most far-reaching was the creation, on the 1st of January 1834, of the famous customs union or The toll- Zollverein, which was to become the material basis vere fc, of Prussia's influence in Germany. (For details see Germany: History, xi, 865.)

In educational matters also the government achieved results of lasting value. The university of Bonn was founded, the others were reorganized; numerous Gymnasien were built and above all

elementary education was made universal and compulsory. Less happy was Frederick William's attempt to adjust the religious differences of his subjects with the corporal's cane. Education j n 1 g 1 j i t h e tercentenary of the Reformation, a royal fj", M decree announced that henceforth Lutherans and Re-

KeJJglon. f orme j were to U nite in one " Evangelical Church," the public use of the name " Protestant " being officially forbidden. The so-called Old Lutherans, who refused to conform, were forbidden to found a separate community, and refractory pastors were dragooned and imprisoned. A quarrel also broke out with the Roman Catholic Church on the question of " mixed marriages," which culminated in 1837 in the imprisonment of Baron Droste zu Vischering (q.v.), archbishop of Cologne, and of the archbishop of Posen.

In foreign politics, too, Prussia played but a secondary r61e after 1815.

The king either attended, or was represented at, the various congresses up to that of Verona in 1822, but his sole idea was to support the views of Metternich, and later, those of the emperor Nicholas I. of Russia. (See Europe: History.)

Frederick William III. died on the 7th of June 1840. In spite of his faults, he had accomplished great things for Prussia, and his kindness of heart, his devotion to duty and the memory of his sufferings maintained his personal popularity to the last (see Frederick William III., King of Prussia). Of his son Frederick and successor, Frederick William IV., great things wwiam iv„ were expected, since his talents were undeniable 1840-1861. anc j jj g j ia(j g a j ne d as cro wn prince a reputation for Liberalism. One of his first acts was to liberate Jahn and the imprisoned archbishops, to reinstate Arndt in office and to issue a general amnesty (Aug. 10, 1840). Five years later he allowed the Old Lutherans liberty to set up a Church of their own. But in spite of these promising beginnings, it was soon clear that the king was wholly out of touch with the ideas of modern Liberalism. In spite of the warnings of the emperor Nicholas I. and of Metternich, he sought to satisfy the cry for a constitution by issuing on the 13th of February 1847 a patent summoning the "united Diet" for Prussia — that is to say, a mere " concentration " of the provincial Diets. The story of the contest that followed between the Crown and the people is outlined elsewhere (see Germany). It is only necessary to give here some account of the constitutional development in Prussia itself.

The most important landmark in this respect was the law promulgated after the dissolution of the lower house of the „ . revolutionary National Assembly on the 27th of Law of 1849 April 1849. This law, which was only slightly modified and Consth by the electoral reform law of 1910, divided the parlia- ««? " ° f nientary electors into three classes, their voting power being determined by property qualifications or by official and professional position. In the elections that followed, the disgusted democrats took no part, with the result that the chambers that met on the 7th of August 1849 were strongly Conservative and made no difficulty about revising the demo- cratic constitution of 1848 in accordance with the royal wishes. The constitution, thus amended, was proclaimed on the 31st of January 1851, and has remained substantially that of Prussia ever since. Its immediate effect was an extraordinary series of reactionary measures, e.g. the restoration of the old manorial courts and of the provincial estates (1850). The actual con- stitution of the parliament as consisting of a House of Lords (Herrenhaus) and House of Delegates (Abgeordnetenhaus) was fixed in 1854, and in this assembly the dominant element con- tinued to be that of the Prussian Junkertum or squirearchy, which supported the king and his government in all their reactionary efforts.

So far as the internal history of Prussia is concerned, little was altered by the substitution of William as regent for his brother, now hopelessly mad, in 1858. The new 1861-1888'. ru l er 7 who became king in 1861, shared to the full his predecessor's views as to the divine right of the Prussian crown. He was prepared to accept the established constitutional forms, but he was not prepared to sacrifice to them what he firmly believed to be the divinely appointed mission of Prussia in Germany. Bismarck, who became prime minister in 1862, fully shared his master's views. He realized,

what the lower house did not, that the German question could only be settled as the result of a trial of strength between Prussia and Austria and that therefore it was necessary for Prussia to spend money on armaments; and, since he could not give his real reasons to the parliament and the parliament refused to accept the reasons he did give, he raised the necessary funds in defiance of the votes of the House of Delegates. The result justified him in the eyes of the Prussian people. Bis- marck's policy, culminating in the war of 1866, left Prussia the undisputed mistress of Germany (see Schleswig-Holstein Question; and Germany: History). By the Treaty of Prague (Aug. 23, 1866) Prussia acquired Hanover, Hesse-Cassel, Hesse-Nassau, Frankfort and the duchies of Schleswig- Holstein and Lauenburg; her territory had been Treaty at increased by one-fifth and became for the first time Prague, satisfactorily rounded off and compacted; by the l866 ' acquisition of the Elbe duchies, too, she laid the foundations of her future sea-power. In 187 1 as the result of the German victory over France the king of Prussia became German Emperor.

; From 1867 onward Prussia has had from the point of view of international politics no existence apart from the North German Federation and the German Empire; and even in internal affairs her preponderance and influence V™! in Germany have been overwhelming. For all practi- the German cal purposes the German Empire has been Prussia Empire. and, however much the still surviving particularist feeling of the lesser states has resented the process, the " Prussification," in greater or less degree, of all Germany was inevitable from the moment that the great imperial departments— army, customs, posts, railways — were placed under Prussian authority or con- formed to the Prussian model. With this particular expansion of Prussia, however, we are not concerned, but solely with the internal development of the Prussian kingdom itself. The main tasks that lay before the government after 1870 were the assimilation of the new provinces, the reorganization of the administration, the economic development of the country, the settle- ment of the questions arising out of the attitude of the ?™?, " Roman Catholics on the one hand and the Social Demo- Pr ° ,™J crats on the other. On the whole the new German a ' ter,S7U – provinces accepted their fate with equanimity, though in Hanover especially the deposed dynasty continued to command a con- siderable

following of which the ablest spokesman was Windthorst (q.v.). Since the dispossessed princes refused to resign their claims, the large sum of money which had been assigned to them by the Prussian parliament was, so early as March 1868, seques- trated, and, under the name of the Guelph Fund {Welfenfonds), formed a secret service supply highly convenient for Bismarck's purposes. More difficult was the task, rashly undertaken by the government, of germanizing the Danish parts of Schleswig-Holstein arid the Polish districts in the eastern provinces, a task which after thirty years of effort shows but very small results (see Schleswig- Holstein Question, ad fin.; and_ Posen). _

Closely connected with the Polish question was the quarrel with the Roman Catholic Church, known as the Kulturkampf, of which Prussia was the focus (see Germany: History, xi. _ 880 seq.). The anti- Vatican policy, associated f eK ««"^ especially with the name of the minister Falk, necessi- """P 1, tated an alliance of the government with the Liberals, and this led to a policy of at least administrative reform. The present administrative system {Kreisordnung) of Prussia was introduced in 1872 for certain provinces, but not extended to the whole kingdom until 1888, when it was applied to Posen. The Liberalism of the Prussian parliament was, however, of a very lukewarm temper; and when in 1 878-1 879 Bismarck decided to reverse the fiscal policy of the country and to pass repressive legislation against the Social Democrats, tofloenceo/ the Liberals were not strong enough to offer an effective ˆ c a resistance. In 1879 the moderate Liberal ministry D e ' a ˆL"? y! resigned, and was succeeded by a Conservative cabinet, in which the most conspicuous figure was Robert von Putt- kammer (q.v.). Henceforth the government depended for parliamentary support; on a union of the National Liberals and Conservatives or of the Conservatives and Ultramontanes. An eventual understanding with the Holy See was inevitable, though the Kulturkampf was not actually settled until 1888, when the Prussian government, assisted by the diplomatic „ attitude of Pope Leo XIII., came to terms with Rome. Jfjˆu sm Meanwhile in 1879 the era of Bismarck's experiments in state socialism had begun by the purchase by the state of three of the great railways, thus laying the foundation of the present system of state railways in Prussia.*

On the 9th of March 1888 William I. died. His successor,

Frederick

111.. 1888.

Frederick III., only lived till the 15th of June, the sole important act of his reign being the dismissal of Puttkammer. Under his successor William II. the development of Prussian affairs continued on the lines laid down under William I., the main difference being that, after the fall of Bismarck (March 20, 1890), the old antagonism between the unrepresented masses and the government tended to William it., change into one between these masses and the 1888. Crown. For while in the unreformed parliament

the squirearchy was still disproportionately represented, 1 Socialism — denounced by the king-emperor as treason FranchUe against himself and the country — spread rapidly Reform. among the unrepresented population. Discontent grew apace, and the trouble culminated in 1908 and 1909. In 1906 a bill raising the number of members of the Diet from 433 Growth of t° 443 an< l effecting an unimportant redistribution Social of seats had been passed, but a Radical amendment Democracy. j n f avour { di re ct and universal suffrage and the secret ballot had been rejected by a large majority. In 1907 the elections for the Reichstag resulted in a remarkable defeat of the Socialist forces, and this had its effect in Prussia also. In 1908 a resolution in favour of universal suffrage was again brought forward. It was opposed by Prince Btilow, the German chancellor, and was rejected by a large majority. Riots followed in Berlin and demonstrations in favour of reform throughout the country, and at the new elections in June seven Socialist members were returned — a portentous phenomenon under the actual franchise. In the session of 1909 the reform resolution was again brought forward, and again thrown out by the Conservative majority.

Demonstrations and collisions with the police followed in most of the large Prussian towns, and in October four of the Socialist members returned in 1908 who had been unseated on technical grounds were re-elected. It became clear to the government that some sop must be thrown to popular opinion, and accordingly in the speech from the throne delivered on the nth of January 19 10 the king-emperor announced a measure of franchise reform. The agitation, however, continued, and the terms of the bill when it was introduced by Herr von Beth- mann-Hollweg on the 10th of February were not such as to conciliate opposition. The chancellor and minister-president adhered to the principles enunciated by his predecessor; 2 the bill retained the triple class division of voters, public of 1910 voting and plural votes; the voting, however, was to be direct and certain changes were suggested giving less to the moneyed interest and more to the professional classes. A furious agitation at once arose all over the country, culminating in a series of Socialist demonstrations on the 14th in Berlin and elsewhere; owing to the elaborate police precautions there was, however, no serious disturbance; but on the evening of the 18th there was street fighting between rioters and police in Frankfort. Meanwhile, on the 13th, the bill

had been referred to a committee of the Diet. No party was satisfied with it; the Berlin municipality petitioned for its entire rejection; but its fate was ultimately determined by an agreement between the representatives of the Conservative and Catholic Centre parties on the committee, "the latter agreeing to support the retention of indirect voting on condition of the former declaring in favour of the secret ballot (Feb. 22). In this sense the committee ultimately reported, in spite of the government's efforts to retain public voting and to concede direct election, and on the 14th of March the bill in this shape passed its second reading. On the 16th the third reading was carried, all the parties except the Conservatives and the Centre voting against it; Herr von Bethmann-Hollweg accepted the bill on behalf of the govern- ment, merely reserving the right to amend it in matters of

1 Prince Schonaich-Carolath pointed out in 1908 that 314,000 Socialist voters were entirely unrepresented, while 324,000 Con- servative voters returned 143 members, and that the propertied and agrarian section of the community returned over 300 members, the remainder only some 130 (Annual Register, 1908, p. 280).

' His speech is reported in The Times of the I Ith of February

1910.

detail. Demonstrations and riots in various centres showed how far this result was from satisfying the popular demands.

Thus Prussia retained, in contradistinction to the South German states, its traditional character, as a land ruled from above, the monarchy and the bureaucracy basing their authority not on the will of the people, but partly on divine right and partly on the middle-class terror of the social revolution, while as its ultimate sanction there remained the tremendous power of the king of Prussia as supreme "war lord" of Germany. It remained to be seen how long these conditions could last in a country which, during the tremendous material expansion of the period following the war, had developed an immense industrial population which saw, or thought it saw, its interests sacrificed to the agricultural classes, with their traditional feudalism and inherited loyalty to the Prussian system.

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general works may be mentioned Ranke, Zwolf Bucher preussischer Gesch., 5 vols, to 1745 (2nd ed., Leipzig, 1878); Droysen, Gesch. der preussischen Politik, 5 parts in 15 vols, to 1756 (Berlin and Leipzig, 1855-1885); H. G. Prutz, Preussische Geschichte, 4 vols, to 1888 (Stuttgart, 1900-1902) ; and for constitutional history, C. Bornhak, Preussische Staats- und Rechts geschichte (Berlin, 1903), Of the many works devoted to special periods Treitschke's Deutsche Geschichte im 19. Jahrhundert (Leipzig, 1 879-1 894), in spite of its strong Prussian' bias, is especially valuable for the period up to 1848, when it breaks off. 'See also the lists of books attached to the biographies of the various Prussian kings and statesmen.

PRUSSIA, in the original and narrower sense of the word, a territory of Germany, in the kingdom of Prussia, stretching along the Baltic coast for about 220 m., and occupying an area of 24,083 sq. m. The eastern part of this territory formed the duchy of Prussia, which was conquered and colonized by the Teutonic Order and was acquired by the elector of Brandenburg in 1618, furnishing his successor with his regal title in 1701. The western part, which had been severed from the eastern half and assigned to Poland in 1466, was not annexed to Prussia until the partition of Poland in 1772, while the towns of Danzig and Thorn remained Polish down to 1793. The two districts were united in 1824 to form a single province. But, as might have been expected, the union did not work well, and it was dissolved in 1878, its place being taken by the modern provinces of East and West Prussia. (See East Prussia and West Prussia.)

PRUSSIC ACID, or Hydrocyanic Acid, HCN, an organic acid first prepared in 1782-1783 by C. Scheele and subsequently examined by J. Gay-Lussac. It is present in varying amounts in certain plants, being a product of the hydrolysis of the cyano- genetic glucosides, e.g. amygdalin (q.v.). It may be prepared by heating a mixture of cyanogen and hydrogen to soo°-55o° C. (M. Berthelot, Ann. chim. phys., 1879 (5), 18, p. 380); by passing induction sparks through a mixture of acetylene and nitrogen; by the dry distillation of ammonium formate; by the decomposition of the simple cyanides with mineral acids; and by distilling potassium ferrocyanide with dilute sulphuric acid (F. Wohler, Ann., 1850, 73, p. 219), the anhydrous acid being obtained by fractional distillation of the aqueous distillate, special precautions being necessary owing to the excessively poisonous nature of the free acid:

K 4 Fe(NC)6-t-3H 2 S0 4 = 2K,,S04 + FeS04 + 6HCN.

The free acid is a colourless liquid with a smell resembling bitter almonds; it boils at 26-1° C, and may be solidified, in which condition it melts at -14 C. It burns with a blue flame, and is readily soluble in water, but the solution is unstable and decomposes on standing, giving amorphous

insoluble substances, and ammonium formate, oxalic acid, &c. An aqueous solution of hydrogen peroxide converts it into oxamide, (CONH 2) 2 , and reduction by zinc and hydrochloric acid gives methylamine. The anhydrous acid combines with hydrochloric, hydrobromic and hydriodic acids to form crystalline addition products, which

are decomposed by water w^h the formation of the corre- sponding ammonium salt and formic acid. It combines with aldehydes and ketones to form the nitriles of oxy-acids, for example, CH 3 CHO + HCN = CH 3 CH(OH)(CN). It is a very weak monobasic acid, and the aqueous solution has a very low electric conductivity.

Cyanides. — The salts of this acid, known as cyanides, may be prepared by the action of cyanogen or of gaseous hydro- cyanic acid on a metal; by heating the carbonates or hydro- oxides of the alkali metals in a current of hydrocyanic acid; by heating alkaline carbonates with carbon in the presence of free nitrogen: BaCC>3 + 4C + N 2 = Ba(NC) 2 + 3CO; by ignition of nitrogenous organic substances in the presence of alkaline carbonates or hydroxides; or by processes of double decom- position. The alkali and alkaline earth cyanides are soluble in water and in alcohol, and their aqueous solution, owing to hydrolytic dissociation, possesses an alkaline character. When heated in contact with air they undergo a certain amount of oxidation, being converted to some extent into the corresponding cyanate. The cyanides of other metals are decomposed by heat, frequently with liberation of cyanogen. The cyanides are usually reducing agents. Those of the heavy metals are mostly insoluble in water, but are soluble in a solution of potassium cyanide, forming more or less stable double salts, for example KAg(NC)2, KAu(NC) 2 . Lead cyanide, Pb(NC) 2 , however, does not form such a salt, and is insoluble in potassium cyanide solution.

Ammonium cyanide, NH4NC, a white solid found to some slight extent in illuminating gas, is easily soluble in water and alcohol, and is very poisonous. Its vapour is inflammable. It is obtained by passing ammonia gas over hot coal; by subliming a mixture of ammonium chloride and potassium cyanide; by passing a mixture of ammonia gas and chloroform vapour through a red hot tube ; and by heating a mixture of ammonia and carbon monoxide: CO + 2NH3 = NH 4 NC + H 2 0. Barium cyanide, Ba(NC) 2 , pre- pared by the action of potassium cyanide on baryta, or by passing air over a heated mixture of barium carbonate and coal, is a white solid, which when heated with water to 300° C. loses the whole of its nitrogen in the form of ammonia. Mercuric cyanide, Hg(NC) 2 , is a

sparingly soluble salt formed by dissolving precipitated mercuric oxide in' hydrocyanic acid, or by boiling potassium ferrocyanide with mercuric sulphate and water: 2K4Fe(NC) 6 +3HgS0 4 = 3Hg(NC) 2 | 3K2S04-t-K 2 Fe[Fe(NC) 6]. Its aqueous solution is not an electrolyte, and consequently does not give the reactions of the mercury and cyanogen ions. When heated it yields mercury, cyanogen and para- cyanogen. Silver cyanide, AgNC, is formed as a white precipitate by adding potassium cyanide to silver nitrate solution; or better, by adding silver nitrate to potassium silver cyanide, KAg(NC) 2 , this double cyanide being obtained by the addition of one molecular proportion of potassium cyanide to one molecular proportion of silver nitrate, the white precipitate so formed being then dissolved by adding a second equivalent of potassium cyanide. On con- centration the double salt separates as hexagonal tables. Dilute mineral acids decompose it with the formation of insoluble silver cyanide and hydrocyanic acid: KNC-AgNC+HN0 3 = HCN + KN03+AgNC. A boiling solution of potassium chloride with the double cyanide gives silver chloride and potassium cyanide.

Potassium cyanide, KNC, and sodium cyanide,ˆ NaNC, are two of the most important of the salts of hydrocyanic acid, the former being manufactured in large quantities for consumption in the extraction of gold (q.v.). Potassium cyanide may be obtained by fusing potassium ferrocyanide either alone — K4Fe(NC) 6 =4KNC + FeC 2 + N 2 — or with potassium carbonate [V. Alder, English patent 1353 (1900)]; in the latter case the chief reaction probably is: K,Fe(NC) 6 + K ? C0 3 = 4KNC +2KOCN + CO-r-Fe; more potas- sium ferrocyanide is occasionally added in small quantities, in order to decompose the cyanate formed ; 2KOCN-t-2K4Fe(NC)o = 10KNC + 2FeO + 4C f 2N 2 ; 2FeO + 2C = 2CO + 2Fe. The re action is accompanied by much frothing, and the whole is filtered when in a state of tranquil fusion. Rossler and Hasslacher prepare the double potassium sodium cyanide by fusing potassium ferro- cyanide with sodium, the product of fusion being extracted with water and the solution evaporated: K4Fe(NC) 6 + 2Na = Fe + 4KNC-2NaNC. This process gives a product free from cyanate, which was always formed in the older fusion processes.

Many other processes have been devised. D. T. Playfair [Eng. pat. 7764 (1890)] decomposes sulphocyanides by fusing with zinc: the zinc is heated with a small quantity of carbon and when com- pletely fused potassium sulphocyanide is added, the mass being well stirred and heated untilf it thickens and begins to turn red ; finally it is allowed to cool out of contact with air, lixiviated with water, the solution decanted, and evaporated to a paste in vacuo. The potassium sulphocyanide is obtained from ammonium sulpho- cyanide, which is formed by washing crude coal gas with water

containing suspended sulphur. Various processes involving the use of atmospheric nitrogen have been devised, but in most cases they do not yield good results. More successful results are obtained by the use of ammonia. The Stassfurter Chem. Fabrik [Eng. pat. 9350-2 (1900)] pass ammonia over a mixture of alkali or alkaline carbonate and charcoal, first at a dull red heat and then at a bright red heat : KHO + NH 3 + C = KNC + H 2 + H 2 . H. Y. Castner [Fr. pat. 242938 (1894)] passes anhydrous ammonia over heated sodium to form sodamide, which is then brought in a molten con- dition into contact with carbon: NaNH 2 +C = NaNC+H 2 . The Deutsche Gold und Silber Scheide Anstalt [Eng. pat. 3328, 3329 (1901)] prepare sodium cyanamide by melting sodium with carbons or some hydrocarbon, and passing ammonia over the melt at from 400 -6oo° C. The temperature is then raised to 7oo°-8oo° C, and the sodium cyanamide in contact with the residual carbon forms sodium cyanide. H. W. Crowther and E. C. Rossiter (Journ. Soc. Chem. Ind., 1893, 13, p. 887) digest carbon bisulphide with ammonia and lime in quantities slightly in excess of those demanded by the following equation: 2CS 2 + 2NH, + 2Ca(OH) 2 = Ca(SCN) 2 + Ca(SH) 2 +4H 2 0; the product is then treated with a current of carbon dioxide, calcium carbonate being precipitated, su'phuretted hydrogen escaping, and calcium sulphocyanide remaining in solution. The sulphocyanide is converted into the potassium salt by adding potassium sulphate, and finally desulphurized by lead, zinc, or iron. Potassium cyanide is an excessively poisonous, colourless, de- liquescent solid ; it is readily soluble in water, but almost insoluble in absolute alcohol. It is stable in dry air, but is easily oxidized when fused, in which condition it is a powerful reducing agent. It dissolves gold (q.v.) in the presence of water and atmospheric oxygen. It is also largely used by the jeweler, electroplater and photographer.

Double Cyanides. — The double cyanides formed by the solu- tion of the cyanide of a heavy metal in a solution of potassium cyanide are decomposed by mineral acids with liberation of hydro- cyanic acid and formation of the cyanide of the heavy metal. Besides these, other double cyanides are known which do not suffer such decomposition, the heavy metal present being combined with the cyanogen radical in the form of a complexion. The most important members of these classes are the ferro- and ferri-cyanides and the nitroprussides.

Potassium ferrocyanide, K4Fe(NC) 6 , (yellow prussiate of potash), was first obtained by decomposing Prussian blue with caustic potash : F ei [Fe(NC),], + 12KHO = 3K4Fe(NC). + 4Fe(OH), ; _ it may be also obtained by warming a solution of ferrous sulphate with an excess of potassium cyanide: FeS04+6KNC = K4Fe(NC)e-(- K2SO4. The older processes for the commercial preparation of this salt, which were based on the ignition of nitrogenous substances with an alkaline carbonate and

carbon, have almost all been aban- doned, since it is more profitable to prepare the salt from the by- products obtained in the manufacture of illuminating gas. W. Fowlis [Eng. pat. 9474 (1892)] passes the gas (after freeing it from ammonia) through a solution of potassium carbonate containing ferric oxide or ferrous carbonate (actually ferrous sulphate and potassium carbonate) in suspension; the sulphuretted hydrogen in the gas probably converts the iron salts into ferrous sulphide .which then, in the presence of the hydrocyanic acid in the gas, and the alkaline carbonate, forms the ferrocyanide, thus: FeS+6HCN-f- 2K 2 C0 3 = K4Fe(NC) 6 + H 2 S + 2C0 2 + 2H 2 0. The salt is re- covered by crystallization. The process is not very efficient, since the solutions are too dilute and large quantities of liquid have to be handled. A large quantity of the salt is now prepared from the " spent oxide " of the gas works, the cyanogen compounds formed in the manufacture of the gas combining with the ferric oxide in the purifiers to form insoluble iron ferrocyanides. The soluble salts are removed by lixiviation, and the residue is boiled with lime to form the soluble calcium ferrocyanide, which is finally converted into the potassium salt by potassium chloride or carbonate.

The salt crystallizes in large yellow plates, containing three molecules of water of crystallization. It is soluble in water, but insoluble in alcohol. It is not poisonous. When fused with potassium carbonate it yields potassium cyanide; warmed with dilute sulphuric acid it yields hydrocyanic acid, but with concen- trated sulphuric acid it yields carbon monoxide: 6H 2 + I<4Fe(NC) 6 + 6H 2 SOi = 2K 2 S0 4 + FeS0 4 + 3(NH 4) 2 S0 1 + 6CO. Oxidizing agents (CI, Br, H 2 2 , &c.) convert it into potassium ferricyanide (see below), a similar result being attained by the electrolysis of its aqueous solution: 2K4Fe(NC)o + 2H 2 = 2KOH + Hs + 2K 3 Fe(NC) 6 . Potassium ferrocyanide may be estimated quantitatively in acid solution by oxidation to ferri- cyanide by potassium permanganate (in absence of other reduc- ing agents): sK4Fe(NC)6 + KMn0 4 + 4H 2 S0 4 = 5K s Fe(NC) 6 + 3K 2 S0 4 +MnS04+4H 2 0.

Hydroferrocyanic acid, H4Fe(NC)e, is best obtained by decom- posing the lead salt with sulphuretted hydrogen under water, or by passing hydrochloric acid gas into a concentrated ether solution of the potassium salt. In the latter case the precipitate is dissolved in water, reprecipitated by ether, and washed with ether-alcohol.

PRUSSIC ACID

It is a tetrabasic acid, of markedly acid character, and readily decomposes carbonates and acetates. It dissolves unchanged in concentrated sulphuric

acid, and oxidizes readily in moist air, forming Prussian blue.

Prussian blue, Fe7(NC)i 8 or Fe 4 [Fe(NC) 6] 3 , ferric ferrocyanide, was discovered in 1 710 by a German manufacturer named Diesbach, who obtained it by the action of fused alkali and iron salts on nitro- genous organic matter (e.g. blood). It is now prepared from the calcium ferrocyanide formed in gas purifiers (see above) by decom- position with ferrous sulphate. J. Bueb (Congress of German Gas Industries, March 1900) brings gas (free from tar) into intimate contact with a saturated solution of ferrous sulphate, when a " cyanogen mud " is obtained. This is heated to boiling, and the residue after filtration contains about 30 % of Prussian blue. On the small scale it may be prepared by adding an acid solution of a ferrous salt to a solution of potassium ferrocyanide. The grey precipitate first formed is allowed to stand for some hours, well washed, and then oxidised by a warm solution of ferric chloride : 6K 2 Fe[Fe(NC) 6] + 3O _= Fe,(NC), 8 + 3K 4 Fe(NC) 6 + Fe 2 3 ; It is a dark blue powder with a marked coppery lustre. It is insoluble in water and is not decomposed by acids.

Soluble Prussian blue, K 2 Fe2[Fe(NC)«]2, potassium ferric ferro- cyanide, is formed when a solution of potassium ferrocyanide is added to an insufficiency of a solution of a ferric salt (1), or when potassium ferricyanide is added to a ferrous salt (2) :

(1) 2K 4 Fe(NC) 6 +2FeCl 3 = 6KC1 + K 2 Fe 2 [Fe(NC) 6 l 2

(2) 2 K 3 Fe(NC)6 + 2FeCl 2 = 4KCI + K 2 Fe 2 [Fe(NC)e] 2 .

It is soluble in water, but is insoluble in salt solutions.

Potassium ferricyanide, K 3 Fe(NC)6, red prussiate of potash, is obtained by oxidizing potassium ferrocyanide with chlorine, bromine, &c, 2K 4 Fe(NC) 6 + Cl 2 = 2K 3 Fe(NC) 6 + 2KCI. G. Kassner (Ckem. Zeit., 1889, 13, p. 1701; 17, p. 1712) adds calcium plumbate to a solution of potassium ferrocyanide and passes carbon dioxide through the mixture: 2K4Fe(NC)6+Ca 2 Pb04+4C0 2 = 2K 3 Fe(NC)« + K 2 C0 3 + PbC0 3 +2CaC0 3 . The mixture of calcium and lead carbonates is filtered off and roasted at a low red heat in order to regenerate the calcium plumbate. It crystallizes in dark red monoclinic prisms which are readily soluble in water. The solution decomposes on standing, and in the presence of an alkali acts as an oxidizing agent: 2K 3 Fe(NC)6+2KHO=2K 4 Fe(NC)6+H 2 0+0. With silver nitrate it gives an orange red precipitate of silver ferricyanide, Ag 3 Fe(NC) 6 . With a pure ferric salt it only gives a brown coloration. It can be estimated quantitatively by mixing a dilute solution with potassium iodide and hydrochloric acid in excess, adding

excess of zinc sulphate, neutralizing the excess of free acid with sodium bicarbonate, and determining the amount of free iodine by a standard solution of sodium thiosulphate. The zinc sulphate is added in order to remove the ferrocyanide formed as an insoluble zinc salt: 2K 3 Fe(NC) 6 +2KI =2K 4 Fe(NC) 6 +I 2 . As an alternative method it may be decomposed by hydrogen peroxide in alkaline solution and the amount of evolved oxygen measured : 2K 3 Fe(NC) 6 + 2KHO + H 2 2 = 2K 4 Fe(NC) 6 + 2H 2 + 2 .

Turnbull's blue, Fes(NC)i 2 or Fe 3 [Fe(NC)e] 2 , ferrous ferricyanide, is best obtained by adding a hot solution of potassium ferricyanide to a ferrous salt, and allowing the mixture to stand some time in the presence of an iron salt : 2K 3 Fe(NC)6+3FeS0 4 — Fe 3 [Fe(NC)«] s + 3K 2 S0 4 . It is insoluble in dilute acids.

Hydroferricyanic acid, H 3 Fe(NC)6, obtained by adding concen- trated hydrochloric acid to a cold saturated solution of potassium ferricyanide, crystallizes in brown needles, and is easily decomposed.

Nitroprussides. — The nitroprussides are salts of the type M 2 Fe(NC) 6 -NO. The free acid forms dark red deliquescent crystals and is obtained by decomposing the silver salt with, hydrochloric acid, or the barium salt with dilute sulphuric acid.

Sodium nitroprusside, Na 2 Fe(NC)sN02H 2 0, is the commonest salt. It is prepared by oxidizing potassium ferrocyanide with a diluted nitric acid. The solution is evaporated, separated from potassium nitrate, the free acid neutralized with soda, and the solution concentrated. It crystallizes in dark red prisms which are readily soluble in water; it is a valuable reagent for the detection of sulphur, this element when in the form of an alkaline sulphide giving a characteristic purple blue coloration with the nitro-prusside. The potassium salt may be prepared by adding potassium cyanide to ferrous sulphate solution, the brown precipitate so formed being then heated with potassium nitrite :

5 KNC + 2 FeS0 4 = 2 K 2 S0 4 + KFe 2 (NC) 6 , 2 KFe 2 (NC) 5 + 2 KN0 2 = 2 FeO + 2 K 2 Fe(NC) 5 -N0.

Other complex cyanides are known which may be regarded as derived from the acids H 2 X(CN) 4 , X=ˆNi, Pd, Pt; H 4 X(CN) 6 , X = Fe, Co, Ru; H 3 X(CN) 6 , X = Fe, Co, Rh; and H 2 R(CN) 6 (see Abegg, Anorganischen Chemie).

Organic Cyanides or Nitriles. — Hydrocyanic acid forms two series of derivatives by the exchange of its hydrogen atom for alkyl or aryl groups;

namely the nitriles, of type R-CN, and the isonitriles, of type R-NC. The latter compounds may be

considered as derivatives of the«p.s yet unknown isohydrocyanic acidHNC. W

Nitriles. — These substances were first isolated in 1834 by J. Pelouze (Ann., 1834, IO > P- 249). They may be prepared by heating the alkyl iodides with potassium cyanide ; by heating sulphuric acid esters with potassium cyanide; by distilling the acid-amides with phosphorus pentoxide; and by distilling amines (containing more than five atoms of carbon) with bromine and potash (A. W. Hofmann), for example

C 7 Hi S CH 2 NH 2 ˆC 7 Hi5CH 2 NBr 2 C7H 3 6CN. In addition to these methods, the nitriles of the aromatic series may be prepared by distilling the aromatic acids with potassium sulphocyanide : C 6 H 5 C0 2 H + KCNS = HCNS + C 6 H 6 C0 2 K, C 6 H 6 C0 2 H + HCNS = C6H 6 CN + H 2 S + C0 2 ; from the primary aromatic amines by converting them into diazonium salts, which are then decomposed by boiling with potassium cyanide and copper sulphate; by fusing the potassium salts of the sulphonic acids with potassium cyanide; by leading cyanogen gas into a boiling hydro carbon in the presence of aluminium chloride (A. Desgrex, Bull. soc. chim., 1895, (3) 13, p. 735) ; and from the syn-aldoximes by the action of acetyl chloride or acetic anhydride.

They are mostly colourless liquids which boil without decom- position, or solids of low melting point. The lower members of the series are somewhat soluble in water. They behave in most respects as unsaturated compounds; they combine with hydrogen to form amines ; with water to form acidamides ; with sulphuretted hydrogen to form thio-amides; with alcohols, in the presence of acids, to form imido-ethers R-C(:NH)-OR 1 ; with ammonia and primary amines to form amidines R-C(:NH)-NH 2 ; and with hydroxylamine to form amidoximes, R-C(:NOH)-NH 2 . When heated with sodium they frequently polymerize. Heated with acids or alkalis they hydrolyse to acids: RCN + HC1 + 2H 2 = R-COOH + NH 4 C1. This reaction shows that the alkyl or aryl group is attached to the carbon atom in the nitrile.

Acetonitrile boils at 8i-6° C, and is readily miscible with water. Propionitrile boils at 97 C; it is somewhat easily soluble in water, but is thrown out of solution by calcium chloride. It was obtained by E. Frankland C. C. Graham (Journ. Chem. Soc., 1880, 37, p. 740) by the action of cyanogen gas on zinc ethyl. Allyl cyanide boils at 119 C. Benzonitrile boils at 190-6° C. When solidified it melts at— 17° C. It is easily soluble in alcohol and ether.

The Isonitriles (isocyanides or carbylamines) were first prepared in 1866 by A. Gautier (Ann., 1869, 151, p. 239) by the action of alkyl iodides on silver cyanide, and the distillation of the resulting compound with potassium cyanide in concentrated aqueous solution : RI->R-Ag(NC) 2 ->R-NC+KAg(NC) 2 . They may also be ob- tained by distilling a primary amine with alcoholic potash and chloroform: R-NH 2 + CHC1 3 + 3KH0 = 3KC1 + 3H 2 6 + R-NC (A. W. Hofmann, Ann., 1868, 146, p. 107). They are colourless liquids, readily soluble in alcohol and in ether, but insoluble in water. They possess an exceedingly unpleasant smell and are poisonous. They boil at temperatures somewhat lower than those of the corresponding nitriles; and .are stable towards alkalis, but in the presence of mineral acids they readily hydrolyse, forming primary amines and formic acid: RNC-r-2H 2 = RNH 2 -f-H 2 COs. This reaction shows that the alkyl or aryj group is linked to the nitrogen atom. The carbon atom in the isonitriles is assumed by J. U. Nef to be divalent, since these substances readily form addition compounds, such addition taking place on the carbon atom, as is shown by the products of hydrolysis; for example with ethyl carbylamine :—

C 2 H 6 NC + CH 3 C0Cl-> C 2 H 6 NC(C0CH 3)C1->HC1 + C 2 H 6 NH. + CH 3 C0-C0 2 H. This view was confirmed by J. Wade (Journ. Chem. Soc, 1902, 81, P- 1596) who showed that the products obtained by the action of alkyl iodides on the isonitriles in alcoholic solution at 100° C. yield amine hydroidides and formic acid when hydrolysed. Such a reaction can only take place if the addition of the alkyl group takes place on the nitrogen atom of the isonitrile, from which it follows that the nitrogen atom must be trivalent and consequently the carbon atom divalent. The reactions may probably be represented as follows : —

C 2 H6NC+C 2 H5l+4C 2 H60H=C 2 H5NH 2 -HH-HC0 2 C 2 H5+2(C 2 H 6) 2 0, C 2 H 5 NC(+C 2 H 5 I)-ˆC 2 H 6 N(C 2 H5-I)C(-(-3C 2 H60H)

->(C 2 H 6) 2 NH-HI-|- H-C0 2 C 2 H 6 + (C 2 H 5) 2 0.

The isonitriles dissolve silver cyanide readily, forming a soluble silver salt (cf. KNC). At 200° C. the isonitriles are converted into nitriles.

Constitution of Metallic Cyanides. — Considerable discussion has taken place as to the structure of the metallic cyanides, since potassium cyanide and silver cyanide react with alkyl iodides to form nitriles and isonitriles respectively, thus apparently pointing to the fact that these two compounds possess the formulae KCN and AgNC. The metallic cyanides are analogous to the alkyl isocyanides, since they form soluble double silver salts, and the fact that ethyl ferrocyanide on distillation yields ethyl isocyanide also

points to their isocyanide structure. J. Wade (loc. cit.) explains

the formation of nitriles from potassium cyanide, and of isonitriles from silver cyanide by the assumption that unstable addition products are formed, the nature of which depends on the relative state of unsaturation of the carbon and nitrogen atoms under the varying conditions : —

KNCˆKN:C(:C 2 H 6 I)-»KI+C 2 H 5 CN, AgNC-ˆAgN(:C 2 H 6 I)CˆAgI +C 2 H 6 NC; that is, when the metal is highly electro-positive the carbon atom is the more unsaturated, the addition takes place on the carbon atom, and nitriles are produced. The same type of reaction occurs when the metal is relatively electro-positive to the added radical, for example, with ethyl isocyanide and acetyl chloride (see above) ; com- pare also AgNC ->AgN(:Cl-COCH ?)C ->AgCl+CH 3 COCN. On the other hand, when there is but little electro-chemical difference between the radical of the cyanide and that of the reacting compound then the nitrogen atom is the more unsaturated element and iso- nitriles are produced. This explanation also accounts for the formation of nitriles by the diazo reaction, thus : —

C,H s N 2 Cl+CuNC-»CuN:C-Cl-N 2 -C,H 6 -»CuCl + N :c-N 2 -C6H 6 H>C 6 H 6 CN-r-N 2 . Detection. — The metallic cyanides may be detected by adding ferrous sulphate, ferric chloride, and hydrochloric acid to their solution, when a precipitate of. Prussian blue is produced; if the original solution contains free acid it must be neutralized by caustic potash before the reagents are added. As an alternative test the cyanide may be decomposed by dilute hydrochloric acid, and the liberated hydrocyanic acid absorbed in a little yellow ammonium sulphide. The excess of reagent is removed by evaporation and a small quantity of a ferric salt added, when a deep red colour is produced. Silver nitrate gives a white precipitate with cyanides, soluble in excess of potassium cyanide. The amount of hydrocyanic acid in a solution may be determined by adding excess of caustic potash and a small quantity of an alkaline chloride, and running into the dilute solution standard silver nitrate until a faint per- manent turbidity (of silver chloride) is produced, that is, until the reaction, 2KNC +AgNO» = KAg(NC) 2 +KNOj, is completed.

See R. Robine and M. Lengler, The Cyanide Industry, 1906 (Eng. trans, by J. A. Le Clerc) ; W. Bertelsmann, Die Technologie der Cyanverbindungen, 1906.

Pharmacology, Therapeutics and Toxicology of Hydrocyanic Acid. — The

pharmacopoeial preparations of this acid are a 2% solution, which is given in doses of from two to six minims, the tinctura chloroformi et morphinae composila, which contains a half-minim of this solution in each ten minims, and the aqua laurocerasi, which owes its virtues to the presence of this acid, and is of inconstant strength, besides being superfluous. The acid is also the active ingredient of the preparations of Virginian Prune, to which the same strictures apply.

The simple cyanides share the properties of the acid, except those of platinum and iron. With these exceptions, the simple cyanides are readily decomposed even by carbonic acid, free prussic acid being liberated. The double cyanides are innocuous. Hydrocyanic acid is a protoplasmic poison, directly lethal to all living tissues, whether in a plant or an animal. It is by no means the most powerful poison known, for such an alkaloid as pseud-aconitine, which is lethal in dose of about 1/200 of a grain, is some hundreds of times more toxic, but prussic acid is by far the most rapid poison known, a single inhalation of it producing absolutely instantaneous death. The acid is capable of passing through the unbroken skin, where-upon it instantly paralyses the sensory nerves. It is very rapidly absorbed from raw surfaces and may thereby cause fatal conse- quences. It is naturally an antiseptic.

The therapeutic applications of the drug are based entirely upon its anaesthetic or anodyne power. A lotion containing ten minims of the dilute acid to an ounce of water and glycerin will relieve itching due to any cause; and is useful in some forms of neuralgia. It must never be employed when the skin is abraded. The diluted acid is used internally to relieve vomiting or gastric pain. It is also added to cough mixtures, when the cough is of the dry, painful kind, which serves no purpose, as nothing is expectorated. Such a cough is relieved by the sedative action on the central nervous system.

Toxicology. — Instantaneous death results from taking the pure acid. The diluted form, in toxic quantities, will cause symptoms usually within a few seconds. The patient is quite unconscious, the eyes are motionless, the pupils dilated, the skin cold and moist, the limbs relaxed, the pulse is slow and barely perceptible, the respirations very slow and convulsive. Post mortem, the body is livid, and the blood very dark. There may be an odour of prussic acid, but this soon disappears.

Treatment is only rarely of use, owing to the rapidity of the toxic action. The patient who survives half-an-hour will probably recover, as the volatile acid is rapidly excreted by the lungs. The drug kills by paralysing the nervous arrangements of the heart and respiration. The appropriate drug is therefore atropine, which stimulates the respiration and prevents the

paralysis of the heart.

One-fiftieth of a grain must be immediately injected subcutaneously. The stomach must be washed out and large doses of emetics given as soon as possible. Every second is of consequence. Ammonia should be given by inhalation, and artificial respiration must never be forgotten, as by it the paralysed breathing may be compensated for and the poison excreted. The use of chemical antidotes, such as iron salts, is futile, as the drug has escaped into the blood from the stomach long before they can be administered.

PRUTZ, HANS (1843-), German historian, son of Robert Eduard Prutz (1816-1872), the essayist and historian; was born at Jena on the 20th of May 1843, am A was educated at the univer- sities of Jena and Berlin. In 1865 appeared his monograph on Henry the Lion, duke of Saxony and Bavaria, which was fol- lowed by three volumes on the emperor Frederick Barbarossa {Kaiser Friedrich I., Danzig, 1871-1874). Meanwhile from 1863 to 1873 he was teaching in secondary schools. In 1874 he received a government commission to undertake explorations in Syria, particularly at Tyre, and as a result he published in 1876 Aus Phonicien, a collection of historical and geographical sketches. In the same year appeared his first work on the Crusades, Quellenbeitrdge zur Geschichte der Kreuzztige, and a series of monographs on the same subject culminated in 1883 in the notable Kultur geschichte der Kreuzztige. Then turning to a wider theme Prutz contributed to Oncken's university history the two volumes on the political history of Europe during the middle ages (Staatengeschichte des Abendlandes im Mittelalter, Berlin, 1885-1887). In 1888 he reverted to a subject which he had touched upon in his Geheimlehre und Geheimstatuten des Tempelherrenordens (Danzig, 1879), and wrote the history of the rise and fall of the Templars (Entwickelung und Untergang des Tempelherrenordens), which is noticed in the article Templars. His Preussische Geschichte (4 vols., Stuttgart, 1 899-1 902), which is perhaps his most notable work, is an attempt to apply scientific rather than patriotic canons to a subject which has been mainly in the hands of historians with a patriotic bias. He also wrote Aus des Grossen Kurjursten letzlen Jahren (Berlin, 1897) and Bismarcks Bildung, ihre Quellen und ihre Ausserungen (Berlin, 1904). In 1902 Prutz resigned the chair of history in the university of Konigsberg, which he had held since 1877, and took up his residence at Munich.

PRUTZ, ROBERT EDUARD (1816-1872), German poet and prose writer, was born at Stettin on the 30th of May 1816. He studied philology, philosophy and history at Berlin, Breslau and Halle, and in the last-named became associated, after taking his degree, with Arnold Ruge in the publication of the Hallesche JahrbUcher. Subjected on account of his

advanced political views to police surveillance, he removed to Jena, where, on the strength of an excellent monograph, Der Gottinger Dichterbund (1841), he hoped to obtain an academic appointment. He was, however, expelled from the town for offending against the press laws, and it was not until 1846 that he received per- mission to lecture in Berlin. From 1849 to 1859 he was extra- ordinary professor of literature at Halle, but retired in 1859 to Stettin, where he died on the 21st of June 1872.

Prutz belonged to the group of political poets who dominated German literature between 1841 and 1848; his poems are more conspicuous for their liberal tendency than their poetry. Among them may be mentioned Ein Mdrchen (1841); Gedichte (1841); Aus der Heimat (1858) ; Neue Gedichte (i860) ; Herbstrosen (1865) ; Buck der Liebe (1869). Among his novels are noteworthy > Das Enge\chen (185 1) and Der Musikantenturm (1855). Much more important are his contributions to literary history and criticism; Vorlesungen tiber die Geschichte des deutschen Theaters (1847); Ludwig Holberg (1857); Die deutsche Literatur der Gegen- wart (1859), and Menschen und Biicher (1862). Prutz also wrote some dramas of little merit.

See R. von Gottschall, in Unsere Zeit (1872).

PRYNNE, WILLIAM (1600-1669), English parliamentarian, son of Thomas Prynne by Marie Sherston, was born at Swains- wick near Bath in 1600. He was educated at Bath Grammar School, matriculated at Oriel College, Oxford, in 1618, obtained his B.A. in 162T, was admitted a student of Lincoln's Inn the same year, and was called to the Bar in 1628. He was Puritan

to the core, with a tenacious memory, a strength of will bordering upon obstinacy, and a want of sympathy with human nature. His first book, The Perpetuity of a Regenerate Man's Estate (1627), defended one of the main Calvinistic positions, and The Unloveliness of Love-locks and Health's Sickness (1628) attacked prevailing fashions without any sense of proportion, treating follies on the same footing as scandalous vices.

In 1629 Prynne came forward as the assailant of Arminianism in doctrine and of ceremonialism in practice, and thus drew down upon himself the anger of Laud. Histrio-mastix, published in 1633, was a violent attack upon stage plays in general, in which the author pointed out that kings and emperors who had favoured the drama had been carried off by violent

deaths, which assertion might easily be interpreted as a warning to the king, and applied a disgraceful epithet to actresses, which, as Henrietta Maria was taking part in the rehearsal of a ballet, was supposed to apply to the queen. After a year's imprisonment in the Tower Prynne was sentenced by the star chamber on the 17th of February 1634 to be imprisoned for life, and also to be fined £5000, expelled from Lincoln's Inn, rendered incapable of returning to his profession, degraded from his degree in the university of Oxford, and set in the pillory, where he was to lose both his ears. The latter portion of the sentence was carried out on the 7th of May, and the rest of his punishment inflicted except the exaction of the fine. There is no reason to suppose that his punishment was unpopular. In 1637 he was once more in the star chamber, together with Bastwick and Burton. In A Divine Tragedy lately acted he had attacked the Declaration of Sports, and in News from Ipswich he had assailed Wren and the bishops generally. On the 30th of June a fresh sentence, that had been delivered on the 14th, was executed. The stumps of Prynne's ears were shorn off in the pillory, arid he was branded on the cheeks with the letters S.L., meaning " seditious libeller," which Prynne, however, interpreted as " stigmata laudis." He was removed to Carnarvon Castle, and thence to Mont Orgueil Castle in Jersey, where he occupied himself in writing against popery.

Immediately upon the meeting of the Long Parliament in 1640 Prynne was liberated. On the 28th of November he entered London in triumph, and on the 2nd of March 1641, reparation was voted by the Commons, at the expense of his persecutors. Prynne now attacked the bishops and the Roman Catholics and defended the taking up of arms by the parliament. The words " Touch not- mine anointed," he declared in the Vindication of Psalm cv. ver. 15 (1642), only commanded kings not to oppress their subjects. In 1643 he took an active part in the proceedings against Nathaniel Fiennes for the surrender of Bristol, and showed a vindictive energy in the prosecution of Archbishop Laud. He manipulated the evidence against him, and having been entrusted with the search of Laud's papers, he published a garbled edition of the archbishop's private " Diary," entitled A Breviate of the Life of Archbishop Laud. He also published Hidden Works of Darkness brought to Light in order to prejudice the archbishop's case, and after his execu- tion, Canterbury's Doom … an unfinished account of the trial commissioned by the House of Commons. Prynne sup- ported a national, church controlled by the state, and issued a series of tracts against independency, including in his attacks Henry Burton his former fellow sufferer in the pillory, John Lilburne and John Goodwin [e.g. Independence Examined (1644); 'Brief Animadversions on Mr John Goodwin's Theo- machia (1644), &c.]. He denounced Milton's Divorce at Pleasure, was answered in the Colasterion, and contemptuously referred to in the sonnet " On the Forcers of Conscience." He also opposed violently

the Presbyterian system, and denied the right of any Church to excommunicate except by leave of the state [e.g. Four Short Questions (1645); A Vindication of Pour Serious Questions (1645)]. He was throughout an enemy of individual freedom in religion.

Prynne took the side of the parliament against the army in 1647, supported the cause of the eleven impeached members, and visited the university of Oxford as one of the parliamentary

commissioners. On the 7th of November 1648 Prynne was returned as member for Newport in Cornwall. He at once took part against those who called for the execution of Charles, and on the 6th of December delivered a speech of enormous length in favour of conciliating the king. The result was his inclusion in " Pride's Purge " on the morning of the 6th, when, having resisted to military violence, he was imprisoned. After recover- ing his liberty Prynne retired to Swainswick. On the 7th of June 1649 he was assessed to the monthly contribution laid on the country by parliament. He not only refused to pay, but published A Legal Vindication of the Liberties of England, arguing that no tax could be raised without the consent of the two houses. In the same year he began a long account of ancient parliaments, intended to reflect on the one in existence, and in June 1650 he was imprisoned in Dunster Castle, afterwards at Taunton, and in June 1651 at Pendennis Castle. He was at last offered his discharge on giving a bond of £1000 to do nothing to the prejudice of the commonwealth. This he refused, and an unconditional order for his release was given on the 18th of February 1653. After his release Prynne further expressed his feelings in defence of advowsons and patrons, an attack on the Quakers (1655), and in a pamphlet against the admission of the Jews to England (.4 Short Demurrer to the Jews) issued in 1656. On the occasion of the offer of the crown to Cromwell he issued King Richard the Third Revived (1657), and on the creation of the new House of Lords A Plea for the Lotds

(1658).

On the restoration of the Rump Parliament by the army of the 7th of May 1659 fourteen of the secluded members, with Prynne among them, claimed admittance. The claim was refused, but on the 9th, through the inadvertence of the door- keepers, Prynne, Annesly and Hungerford succeeded in taking their seats. When they were observed the house purposely adjourned for dinner. In the afternoon the doors were found guarded; the secluded members were not permitted to pass, and a vote was at once taken that they should not again be allowed to enter the house. Wrathful at the failure of his protest and at the continuance of the republican government, Prynne attacked his adversaries fiercely in print. In

England's Confusion, pub- lished on the 30th of May 1659, in the True and Full Narrative, and in The Brief Necessary Vindication, he gave long accounts of the attempt to enter the house and of his ejection, while in the Curtaine Drawne he held up the claims of the Rump to derision. In Shuffling, Cutting and Dealing, 26th of May, he rejoiced at the quarrels which he saw arising, for " if you all complain I hope I shall win at last." Concordia discors pointed out the absurdity of the constant tendency to multiply oaths, while " remonstrances," " narratives," " queries," " prescriptions," " vindications," " declarations " and " statements " were scattered broadcast. Upon the cry of the " good old cause " he is especially sarcastic and severe in The True Good Old Cause Rightly Stated and other pamphlets. Loyalty Banished explains itself. His activity and fearlessness in attacking those in power during this eventful year were remarkable, and an ironical petition was circulated in Westminster Hall and the London streets complaining of his indefatigable scribbling. On the 27th of December Prynne made another fruitless attempt to take his seat. In obedience to the popular voice, however, on the 21st of February 1660, the ejected members of 1648, led in triumph by Prynne, wearing a basket-hilt sword, re-entered the house. He supported the Restoration in this parliament, and in the Convention Parliament, which met on the 25th of April 1660, and in which he sat for Bath, he urged severe measures against the regicides, and the exclusion of several individuals from the Act of Indemnity. He was foremost in support of the claims of the Presbyterians and against the bishops; advocated the indis- criminate infliction of penalties, and demanded that the officials of the commonwealth should be compelled to refund their salaries. He was nominated a commissioner for disbanding the army, and was appointed keeper of the records in the Tower, a post in which he performed useful services.

Prynne was again returned as member for Bath on the 8th of

May 1 66 1, in spite of the vehement efforts of the Royalists headed by Sir T. Bridge. This parliament was bent upon the humiliation of the Presbyterians, and Prynne appears in his familiar character of protester. On the 18th of this month he moved that the Engagement, with the Solemn League and Cove- nant, should be burned by the hangman. About the same time he published a pamphlet advocating the reform of the Prayer Book, while a tract issued on the 1 5th of July, Sundry reasons against the new intended Bill for governing and reforming Corpora- tions, was declared illegal, false, scandalous and seditious; Prynne being censured, and only escaping punishment by sub- mission. The continued attacks upon the

Presbyterians led him to publish his Short, Sober, Pacific Examination of Exuber- ances in the Common Prayer, as well as the Apology for Tender Consciences touching Not Bowing at the Name of Jesus. In 1662 there appeared also the Brevia parliamentaria rediviva, possibly a portion of the Brief Register of Parliamentary Writs, of which the fourth and concluding volume was published in 1664. During 1663 he served constantly on committees, and was chairman of the committee of supply in July, and again in April 1664.

In the third session Prynne was once more, on the 13th of May 1664, censured for altering the draft of a bill relating to public-houses after commitment, but the house again, upon his submission remitted the offence, and he again appears on the com- mittee of privileges in November and afterwards. In 1665 and 1666 he published the second and first volumes respectively of the Exact Chronological Vindication and Historical Demonstration of the supreme ecclesiastical jurisdiction exercised by the English kings from the original planting of Christianity to the death of Richard I. In the latter year especially he was very busy with his pen against the Jesuits. In January 1667 he was one of three appointed to manage the evidence at the hearing of the impeach- ment of Lord Mordaunt, and in November of the same year spoke in defence of Clarendon, so far as the sale of Dunkirk was con- cerned, and opposed his banishment, and this appears to have been the last time that he addressed the house. In 1668 was published his Aurum reginae or Records concerning Queen-gold, the Brief Animadversions on Coke's Institutes in 1669, and the History of King John, Henry III. and Edward I., in which the power of the Crown over ecclesiastics was maintained, in 1670. The date of the Abridgment of the Records of the Tower of London, published 1689, is doubtful, though the preface is dated 1656- 1657. Prynne died unmarried, in his lodgings at Lincoln's Inn, on the 24th of October 1669, and was buried in the walk under the chapel there. He left one portion of his books to Lincoln's Inn and another to Oriel College. His works number about 200 and occupy, together with the replies which they excited, twenty-four columns in the catalogue of the British Museum. Lists of them are given in Wood's Alhenae Oxonienses (ed. P. Bliss), vol. iii., and in Documents relating to the Proceedings against William Prynne.

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PRYOR, ROGER ATKINSON (1828-), American jurist and politician, was born near Petersburg, Virginia, on the 19th of July 1828. He graduated at Hampden-Sidney College in 1845 and at the law school of the university of Virginia in 1848, and in 1849 was admitted to the bar, but devoted himself for some years to journalism. He served as a Democrat in the National House of Representatives from December 1859 to March 1861, and was re-elected for the succeeding term, but owing to the secession of Virginia did not take his seat. He served in the provisional Confederate congress (1861) and also in the first regular congress (1862) of the Confederate constitution. He entered the Confederate army as a colonel, became a brigadier- general (April 16, 1862), and took part in the battles of Williams- burg, Seven Pines, second Bull Run and Antietam. Owing to a

disagreement with President Davis he resigned his commission in 1863, but entered General Fitzhugh Lee's cavalry as a private in August of that year. He was taken prisoner on the 28th of November 1864, but was released on parole by order of the president. In 1865 he removed to New York City, where he practised law. He was judge of the New York court of common pleas in 1890-1894, and of the New York supreme court in 1894- 1899. His wife, Sara Agnes (Rice) Pryor (b. 1830), published The Mother of Washington and her Times (1903), Reminiscences of Peace and War (1904), The Birth of the Nation (1907), and My Day: Reminiscences of a Long Life (1909).

PRYTANEUM and PRYTANIS (Gr. root %po, first or chief).

1. In general in ancient Greece, each state, city or village pos- sessed its own central hearth and sacred fire, representing the unity and vitality of the community. The fire (cf . at Rome the fire in the temple of Vesta) was kept alight continuously, tended by the king or members of his family (cf. at Rome the vestal virgins, originally perhaps the daughters of the king). The building in which this fire was kept was the Prytaneum, and the chieftain (the king or pry tanis) probably made it his residence. The word Prytanis (plur. Prytaneis) is generally applied specially to those who, after the abolition of absolute monarchy, held the chief office in the state. Rulers of this name are found at Rhodes as late as the 1st century B.C. The Prytaneum was regarded as the religious and political centre of the community and was thus the nucleus of all government, and the official " home " of the whole people. When members of the state went forth to found a new colony they took with them a brand from the Prytaneum altar to kindle the new fire in the colony; 1 the fatherless daughters of Aristides, who were regarded as children of the state at Athens, were married from the Prytaneum as from their home; Thucydides informs us (ii. 15) that in the Synoecism of Theseus (see Athens) the Prytaneaof all the separate communities were joined in the central Prytaneum of Athens as a symbol of

the union; foreign ambassadors and citizens who had deserved especially well of the state were entertained in the Prytaneum as public guests. In Achaea, this central haH was called the Lei'ton (town-hall), and a similar building is known to have existed at Elis. This site of the Prytaneum at Athens cannot be definitely fixed; it is generally supposed that in the course of time several buildings bore the name. The Prytaneum, mentioned by Pausanias, and probably the original centre of the ancient city, was situated somewhere east of the northern cliff of the Acropolis. Hence the frequent confusion with the Tholos which was near the council chamber and was the residence of the Prytaneis (see below) of the council. Curtius places the original Prytaneum south of the Acropolis in the Old Agora, speaks of a second identical with the Tholos in the Cerameicus, and regards that of Pausanius as a building of Roman times (Stadl- geschichte, p. 302). Wachsmuth holds the former view and regards the Tholos as merely a dining-room for the Prytaneis in the old democratic period. Many authorities hold that the original Prytaneum of the Cecropian city must have been on the Acropolis. From Aristotle's Constitution of Athens (ch. 3) we know that the Prytaneum was the official residence of the Archons, but, when the new Agora was constructed (by Peisistratus ?), they took their meals in the Thesmotheteum for the sake of convenience. There was also a court of justice called the court of the Prytaneum; all that is known of this court is that it tried murderers who could not be found, and inanimate objects which had caused death. Judging from its rather fanciful functions and from its name, it is probably a relic of the pre-historic jurisdiction of the patriarch-king.

2. For the Prytaneis of the Boule and of the Naucraries, see Botjle and Naucrary.

3. Prytaneia were court-fees paid when the prosecutor was claiming a part of the penalty which the defendant would be called upon to pay if he lost.

4. Prytanis was also the name of a legendary king of Sparta of the Eurypontid or Proclid line. He was the son ot Eurypon and fourth in descent from Procles.

1 Cf. Indian tribes of North America.

Bibliography.— On the Prytaneum as the centre of an ancient state see article Fire, and references in a paper {s.v.) by Frazer (Journal of Philology, l88g, xiv. 28). For the site of the Athenian P. see E. Curtius,

Attische Studien, and an article by Scholl (Hermes, v. 340) ; also general histories of Greece.

PRZEMYSL, a town of Austria, in Galicia, 60 m. W. of Lemberg by rail. Pop. (1900), 46,295, mostly Polish. It is situated on the river San and is one of the strongest fortresses in Galicia. Przemysl is the seat of a Roman Catholic and of a Greek uniat bishop, and has a Roman Catholic cathedral, begun in 1460. The industries comprise the manufacture of machinery, liqueurs and spodium or tutty, the refining of naphtha, corn-milling and the sawing of timber. The trade is chiefly in timber, corn, leather and linen. On the hill above the town are the ruins of an old castle, said to have been founded by Casimir the Great.

Przemysl, one of the oldest towns in Galicia, claims to have been founded in the 8th century, and was at one time capital of a large independent principality. Casimir the Great and other Polish princes endowed it with privileges similar to those of Cracow, and it attained a high degree of prosperity. In the 17th century its importance was destroyed by inroads of Tatars, Cossacks and Swedes.

PRZHEVALSK, formerly Karakol (renamed in 1889), a town of Russian Turkestan, in the province of Semiryechensk, 8 m. S.E. of Lake Issyk-kul. Nikolai Przhevalsky (Przevalsky q.v.), the Russian explorer in Central Asia, died here in 1889, and a monument has been erected to his memory. It is a growing town, and had in 1897 a population of 7985.

PSALM (from the Gr. word ˆdXXeie, to play the harp), the name used to designate the religious poems of the Hebrews, which are contained in the Psalter (see Psalms, Book of). Modern collections of religious poetry sometimes bear the title of Psalms and Hymns, but these are always more or less directly connected with the actual Psalms of David. Longfellow wrote " A Psalm of Life " (1839), which was an intimate confession of the religious aspirations of the author. The Psaumes of Clement Marot (1538) were curious adaptations of Hebrew ideas to French forms of the epigram and the madrigal. But it is doubtful whether the psalm, as distinguished from the Hebrew Psalter, can be said to have any independent existence. It is loosely used to describe any exalted strain of devotional melody. (See also Hymns.)

PSALMANAZAR, GEORGE (c. 1679-1763), French adventurer, was born about 1679, probably in Languedoc. According to his own account he was sent in his seventh year to a free school taught by two Franciscan monks, after which he was educated in a Jesuit college "in an archiepiscopal city." On leaving college he became a private tutor. He assumed personations in order to obtain money, his first being that of a pilgrim to Rome. Afterwards

he travelled through Germany, Brabant and Flanders in the character of a Japanese convert. At Liege he enlisted in the Dutch service, shortly after which he posed as an uncon- verted Japanese. At Sluys he made the acquaintance of a Scottish chaplain, by whom he was brought over to England and introduced to the bishop of London. Having undergone conversion to Christianity, he was employed by the bishop to translate the Church catechism into what was supposed to be the Japanese language. In 1704 he published a fictitious Historical and Geographical Description of Formosa, and was shortly after- wards sent to Oxford. In 1707 he published Dialogue between a Japanese and a Formosan. There also appeared, without date, An Inquiry into the Objections against George P Salmanazar of Formosa,' with George Psalmanazar's Answer. His pretensions were from the beginning doubted by many, and when exposure was inevitable he made a full confession. Throughout the rest of his life he exhibited, according to Dr Samuel Johnson, as reported by Mrs Piozzi, " a piety, penitence, and virtue exceeding almost what we read as wonderful in the lives of the saints." Psalmanazar published Essays on Scriptural Subjects (1753), contributed various articles to the Ancient Universal History, and completed Palmer's History of Printing. He died in London on the 3rd of May 1763. His memoirs appeared in 1764 under the title, Memoirs of . . . commonly known by the name of George

Psalmanazar, but do not disclose his real name or the place of his birth.

PSALMS, BOOK OF, or Psalter, the first book of the Hagio- grapha in the Hebrew Bible.

Title and Traditional Authorship. — The Hebrew title of the book is o'kin, t&hillim, or 0'% "i?e "the book of hymns," 01 rather "songs of praise." 1 The singular 'ijra i s properly the infinitive or nomen verbi of ˆn, a verb employed in the technical language of the Temple service for the execution of a jubilant song of praise to the accompaniment of music and the blare of the priestly trumpets (1 Chron. xvi. 4 seq., xxv. 3; 2 Chron. v. 1 2 seq.) . The name is not therefore equally applicable to all psalms, and in the later Jewish ritual the synonym Hallel specially designates two series of psalms, cxiii.-cxviii. and cxlvi.-cl., of which the former was sung at the three great feasts — the encaenia, and the new moon, and the latter at the daily morning prayer. That the whole book is named " praises " is clearly due to the fact that it was the manual of the Temple service of song, in which praise was the leading feature. But for an individual psalm the usual name is liDjP (in the Bible only in titles of psalms) , which is applicable to any piece designed to be sung to a musical accompaniment. Of this word ˆaXjuos, " psalm," is a translation, and in the Greek Bible the whole book is called i/'aX/ioi or ipaXrripiov. 2 The title i/'aX/xoi or j3t/3X6s ipaKyjuv is used in the New Testament (Luke xx. 42, xxiv. 44; Acts i. 20),

but in Heb. iv. 7 we find another title, namely " David." Hippolytus tells us that in his time most Christians said " the Psalms of David," and believed the whole book to be his; but this title and belief are both of Jewish origin, for in 2 Mace. ii. 13 ra toO AantS means the Psalter, and the title of the apocryphal " Psalter of Solomon " implies that the previously existing Psalter was ascribed to David. Jewish tradition does not make David the author of all the psalms; but as he was regarded as the founder and legislator of the Temple psalmody (1 Chron., ut supra; Ezra iii. 10; Neh. xii. 36, 45 seq.; Ecclus. xlvii. 8 seq.), so also he was held to have completed and arranged the whole book, though according to Talmudic tradition 3 he incorporated psalms by ten other authors, Adam, Melchizedek, Abraham, Moses, Heman, Jeduthun, Asaph, and the three sons of Korah. With this it agrees that the titles of the psalms name no one later than Solomon, and even he is not recognized as a psalmodist by the most ancient tradition, that of the LXX., which omits him from the title of Ps. exxvii. and makes Ps. lxxii. be written not by him but of him. The details of the tradition of authorship show considerable variation; according to the Talmudic view Adam is author of the Sabbath psalm, xcii., and Melchizedek of Ps. ex., while Abraham is identified with Ethan the Ezrahite (Ps. Ixxxix.). But, according to older Jewish tradition attested by Origen, 4 Ps. xcii. is by Moses, to whom are assigned Ps. xc.c. inclusive, according to a general rule that all anonymous pieces are by the same hand with the nearest preceding psalm whose author is named; and Ps. ex., which by its title is Davidic, seems to have been given to Melchi zedek to avoid the dilemma of Matt. xxii. 41 seq. Origen's rule accounts for all the psalms except i. and ii., which were sometimes reckoned as one poem (Acts xiii. 33 in the Western text; Origen; B. Berakhoth, f. 9b.), and appear to have been ascribed to David (Acts iv. 25).

The opinion of Jerome (Praef. in ps. heb.) and other Christian writers that the collector of the Psalter was Ezra does not seem to rest on Jewish tradition.

Nature and Origin of the Collection. — Whatever may be the value of the titles to individual psalms, there can be no question that the tradition that the Psalter was collected by David is not historical;

1 Hippol., ed. Lag., p. 188; Euseb. H.E. vi. 25, 2; Epiph. Mens et Pond. § 23 ; Jerome's preface to Psalt. juxta Hebraeos.

2 Similarly in the Syriac Bible the title is mazmore. _

3 The passages are collected in Kimhi's preface to his commentary on the Psalms, ed. Schiller-Szinessy, Cambridge (1883).

4 Opp. ii. 514 seq., ed. Rue; cf. Hippol. ut supra; Jerome, Ep. cxl. (ed. Cypr.), and Praef. in Mai.

for no one doubts that some of the psalms date from after the Baby- lonian exile. The truth that underlies the tradition is that the collection is essentially the hymn-book of the second Temple, 1 and it was therefore ascribed to David, because it was assumed, as we see clearly from Chronicles, that the order of worship in the second temple was the same as in the first, and had David as its father: as Moses completed the law of Israel for all time before the people entered Canaan, so David completed the theory and contents of the Temple psalmody before the Temple itself was built. When we thus understand its origin, the tradition becomes really instructive, and may be translated into a statement which throws light on a number of points connected with the book, namely, that the Psalter was (finally, at least) collected with a liturgical purpose. Thus, though the psalms represent a great range of individual religious experience, they avoid such situations and expressions as are too unique to be used in acts of public devotion. Many of the psalms are doxologies or the like, expressly written for the Temple; others are made up of extracts from older poems in a way perfectly natural in a hymn-book, but otherwise hardly intelligible. Such ancient hymns as Exod. xv. I sqq., Judges v., I Sam. ii. I sqq., are not included in the collection, though motives from them are embodied in more modern psalms : the interest of the collector, we see, was not historical but liturgical.

The question now arises: Was the collection a single act or is the Psalter made up of several older collections ? And here we have first to observe that in the Hebrew text the Psalter is divided into five books, each of which closes with a doxology. The scheme of the whole is as follows : —

Book I., Ps. i.-xli. ; all these are ascribed to David except i., ii., x. (which is really part of ix.), xxxiii. (ascribed to David in LXX.) ; doxology, xli. 13. Book II., Ps. xlii.-lxxii. : of these xlii.-xlix. are ascribed to the Korahites (xliii. being part of xlii.), 1. to Asaph, H.-lxxi. to David (except lxvi., lxvii., lxxi. anonymous; in LXX. the last two bear David's name), lxxii. to Solomon; doxology, lxxii. 18, 19 followed by the subscription "The prayers of David the son of Jesse are ended." Book III., Ps. Ixxiii.lxxxix. ; here lxxiii. lxxxiii. bear the name of Asaph, lxxxiv., lxxxv., lxxxvii., lxxxviii. that of the Korahites, lxxxvi. of David, lxxxviii. of Heman, lxxxix. of Ethan; doxology, lxxxix. 52. Book IV., Ps. xc.-cvi. : all are anonymous

except xc. (Moses), ci., ciii. (David), — LXX. gives also civ. to David; here the doxology is peculiar, " Blessed be Jehovah God of Israel from everlasting and to everlasting. And let all the people say Amen, Hallelujah." Book V., Ps. cvii.-cl. : of these cviii.-cx., cxxii., cxxiv., cxxxi., cxxxiii., cxxxviii.-cxlv. are ascribed to David and cxxvii. to Solomon, and cxx.-cxxxiv. are pilgrimage psalms, LXX. varies considerably from the Hebrew as to the psalms to be ascribed to David; the book closes with a group of doxological psalms.

The division into five books was known to Hippolytus, but a closer examination of the doxologies shows that it does not represent the original scheme of the Psalter; for, while the doxologies to the first three books are no part of the psalms to which they are attached, but really mark the end of a book in a pious fashion not uncommon in Eastern literature, that to book IV., with its rubric addressed to the people, plainly belongs to the psalm, or rather to its liturgical execu- tion, and does not therefore really mark the close of a collection once separate. In point of fact books IV. and V. have so many common characters that there is every reason to regard them as a single great group. Again, the main part of books II. and III. (Ps. xlii.lxxxiii.) is distinguished from the rest of the Psalter by habitually avoiding the name Jehovah (the Lord) and using Elohim (God) instead, even in cases like Ps. 1. 7, where " I am Jehovah thy God " of Exod. xx. 2 is quoted but changed very awkwardly to " I am God thy God." This is not due to the authors of the individual psalms, but to an editor; for Ps. liii. is only another recension of Ps. xiv., and Ps. lxx. repeats part of Ps. xl., and here Jehovah is six times changed to Elohim, while the opposite change happens but once. The Elohim psalms, then, have undergone a common editorial treatment, dis tinguishing them from the rest of the Psalter. And they make up the mass of books II. and III., the remaining psalms, lxxxiv.-lxxxix., appearing to be a sort of appendix. But when we look at the Elohim psalms more nearly, -we see that they contain two distinct elements, Davidic psalms and psalms ascribed to the Levitical choirs (sons of Korah, Asaph). The Davidic collection as we have it splits the Levitical psalms into two groups and actually divides the Asaphic Ps. 1. from the main Asaphic collection, lxxiii.-lxxxiii. This order can hardly be original, especially as the Davidic Elohim psalms have a separate subscription (Ps. lxxii. 20). But if we remove them we get a continuous body of Levitical Elohim psalms, or rather two collections, the first Korahitic and the second Asaphic, to which there have been added by way of appendix by a non-Elohistic editor a supplementary group of Korahite psalms and one psalm (certainly late) ascribed to David. The formation of books IV. and V. is cer- tainly later than the Elohistic redaction of books II. and III., for Ps. cviii. is made up of two Elohim psalms (lvii. 7-11, lx. 5-12) in the Elohistic form, though the last two books of the Psalter are generally

1 This must be understood of the whole collection as completed, not of all its component parts. (R. H. K.)

Jehovistic. We can thus distinguish the following steps in the redaction: (a) the formation of a Davidic collection (book I.) with a closing doxology; (b) a second Davidic collection (li.lxxii.) with doxology and subscription; (c) a twofold Levitical collection (xlii. xlix.; 1., lxxiii.-lxxxiii.); {£) an Elohistic redaction and combination of (b) and © ; (e) the addition of a non-Elohistic supplement to (d) with a doxology; (/) a collection later than (d), consisting of books IV. and V. And finally the anonymous psalms i., ii., which as. anonymous were hardly an original part of book I., may have been prefixed after the whole Psalter was completed. We see, too, that it is only in the latest collection (books IV., V.) that anonymity is the rule, and titles, especially titles with names, occur only sporadically. Elsewhere the titles run in series and correspond to the limits of older collections.

Date of the Collection. — An inferior limit for the final collection is given by the Septuagint translation. But this translation was not written all at once, and its history is obscure; we only know from the prologue to Ecclesiasticus that the Hagiographa, and doubtless therefore the Psalter, were read in Greek in Egypt about 130 B.C. or somewhat later. 1 And the Greek Psalter, though it contains one apocryphal psalm at the close, is essentially the same as the Hebrew ; there is nothing to suggest that the Greek was first translated from a less complete Psalter and afterwards extended to agree with the extant Hebrew. It is therefore reasonable to hold that the Hebrew Psalter was completed and recognized as an authoritative collection long enough before 130 B.C. to allow of its passing to the Greek-speaking Jews in Alexandria. Beyond this the external evidence for the completion of the collection does not carry us.

(W. R. S.) ;

But there is absolutely no necessity for supposing that when the grandson of Ben Sira reached Egypt the Psalter had been translated into Greek for any considerable time. Indeed it is at least equally probable that it was the recent translation of some of the poetical books of the Old Testament which fired him with a desire to translate his grandfather's book, and perhaps add the work of a member of the family to the Bible of the Egyptian Jews. It appears indeed from 1 Chron. xvi., 2 Chron. vi. 41, 42, that various psalms belonging to books IV. and V. were current in the time of the Chronicler. Unfortunately however it is im- possible to date the book of Chronicles with certainty. The argument that the Chronicler must have been contemporary with the last persons named in his book is by no means convincing and on the other hand his account of the Temple services, in which he seems to be describing the Temple of his own days, harmonizes

far better with a date at the end of the third, or even in the second, century B.C. than with the close of the Persian or the beginning of the Greek period. For the impression which we get from Nehemiah's memoirs is that in his days the community at Jerusalem was in the main poverty-stricken, while Malachi's exhortations to the people to pay their dues to the priests implies that in the middle of the fifth century B.C. the Temple was by no means wealthy. But in the comparative peace and freedom of the 3rd century B.C. the condition of Jerusalem was greatly ameliorated. Wealth accumulated to such a degree that Simon the son of Oniah was enabled practically to rebuild the Temple, and to maintain its services with a grandeur of ritual which they had probably never known before. It must be admitted that the gorgeousness of ritual described by the Chronicler is far more in harmony with the days of Simon than with any previous post-exilic period. How late the Chronicler wrote cannot perhaps be determined; but it is, at all events, impossible to prove that the author of Ecclesiasticus was acquainted with his work. Ben Sira indeed in his list of worthies mentions Zerubbabel, Joshua and Nehemiah ; but Zerubbabel and Joshua he must have known from the books of Haggai and Zechariah, and he may well have been acquainted with that document relating to Nehemiah which the Chronicler incorporated with his book. Ben Sira's omission of the name of Ezra rather militates against the supposition that he had the Chronicler's book before him when he wrote. The conflict between Saduceeism and the sopherim was hardly so intense in his days as to warrant the supposition that he omitted the name of Ezra intentionally. Moreover, it is not certain that the psalms that the Chronicler quotes (xcvi., cv., cvi., exxxii.)

1 The text of the passage is obscure and in part corrupt, but the Latin " cum multum temporis ibi fuissem " probably expresses the author's meaning. A friend has written to the author that for avyxpovlaas we ought perhaps to read avxvbv kyxpovlaaz.

already existed in their place in our Psalter, or that Ps. cvi. even existed in its present form.

Other evidence of date is to be found in the Levitical psalms of the Elohistic collection. These, as we have seen, form two groups, referred to the sons of Korah and to Asaph. In Nehe- miah xii. 46 Asaph is taken to be a contemporary of David and chief of the singers of his time, and in 1 Chron. xxv. 1 seq. one of the three chief singers belonging to the three great Levitical houses. But the older history knows nothing of an individual Asaph; in Ezra ii. 41 the gild of singers as a whole is called Bne Asaph, as

it was apparently in the time of Nehemiah (Neh. xi. 22, Heb.). 1 The singers or Asaphites are at this time still distinguished from the Levites; the oldest attempt to incorporate them with that tribe appears in Exod. vi. 24, where Abiasaph — that is, the eponym of the gild of Asaphites — is made one of the three sons of Korah. But when singers and Levites were fused the Asaphites ceased to be the only singers, and ultimately, as we see in Chronicles, they were distinguished from the Korah- ites and reckoned to Gershom (1 Chron. vi.), while the head of the Korahites is Heman, as in the title of Ps. lxxxviii. It is only in the appendix to the Elohistic psalm-book that we find Heman and Ethan side by side with Asaph, as in the Chronicles; but this does not necessarily prove that the body of the collection originated when there were only two gilds of singers.

But here it becomes necessary to ask what is the precise meaning which we are to assign to the phrases, " to David," " to Asaph," " to the sons of Korah." We certainly need not suppose that the Davidic, Asaphic and Korahite psalms severally once existed as separate books, for, if this had been the case, it is probable that the ascription would not have been prefixed to each_ separate psalm, but rather to the head of each collection (cf. Prov. i. 1, x. 1., xxv. 1), together with some such note at the end as is found in Job. xxxi. 40, Ps. lxxii. 20; moreover we should be compelled to assent to the view expressed in the Oxford Dictionary that those psalms which have the heading PSO?ˆ (A. V. "to " — R. V. " for "— " the chief Musician ") also originally formed a separate collection. But against this explanation of the heading osi? 1 ? there is an almost insuperable objection; for, since both the first and second books contain psalms with this ˆheading, it is clear that, the " Chief Musician's — or Director's — Psalter " must have been in existence before either of these books; in which case, apart from the difficulty of the antiquity which we should be compelled to assign to this earliest Psalter, it is impossible to understand on what principle the first book of Psalms was formed. If the compiler of the first book aimed simply at making a collection of Davidic psalms from a major Psalter com- piled by the " Director," why should he have deliberately rejected a number of Davidic psalms'(Ps. Ii. sqq.) which, ex hypothesi, lay before him in this Psalter? It is surely as difficult to suppose that the Davidic psalms of the first book are a selection made from a greater collection of such psalms contained in the " Director's Psalter." as it is to imagine that St Mark's Gospel is an abridgment of St Matthew's. It is true that the preposition " to " (h) may denote authorship, as it does apparently in Isaiah xxxviii. 9, Hab. iii. I, but it certainly has a much wider meaning; and indeed in some cases the idea of authorship is out of the question, for the psalms ascribed to the Korahites can scarcely have been supposed to be the joint composition of that body. Moreover, it is very doubtful whether the word CflHP can be translated " Director." In 1

Chron. xv. 21 the verb of which crsje is the participle is used of the duty which was discharged by Mattithiah, Eliphelehu, Mikneiah, Obed-edom, Jeiel and Azaziah (and perhaps, if verse 20 is to be takenin close connexion with verse 21, by Zecharaiah, Aziel, Shemiramoth, Jeiel, Unni, Eliab, Maaseiah and Benaiah also) on one definite occasion. Unfortunately the exact nature of these men's per- formances is not quite clear, for it is said to have been connected with " harps set to the sheminith," or according to another inter- pretation, with " harps over the tenors." But whatever the obscure expression n , ::2!f ; m l 7y may mean, Tfth cannot here mean to " direct," for a choir with six " directors " would have been a veritable bear- garden. Obviously the word Vxh must refer to something in the music; and inasmuch as the cymbals were for the purpose of produc- ing a volume of sound (Wiˆh) , it is reasonable to suppose that the

musicians with treble lutes and with harps an octave lower (or with lutes and harps over the sopranos and tenors respectively) were to lead the singers in giving out the melody. If this explanation be correct — and it certainly accords best with the meaning of 0Mˆ> in 1 Chron. xv. 21 — the owp will be that part of the orchestra which played the melody to be sung, virtually corresponding, mutatis mutandis, to what we now call the choir organ, and we need not com- plicate the compilation of the Psalter by postulating an altogether unnecessary " Director's Psalter." Now we have seen that the ˆ prefixed to rnp 'ji cannot refer to authorship ; we seem therefore shut up to one of two alternatives, either the psalms inscribed 'j? i> nip belonged to the repertoire of the Korahites, or they were intended to be sung in the Korahite style. It is indeed possible that, each division of the Levitical singers had its own collection ; but this is hardly probable unless we are to suppose that they never officiated simultaneously, in which case we should certainly have expected that the psalm quoted by the Chronicler (1 Chron. xvi.) would be included in the Asaphic collection. But there is no difficulty in supposing that each division of the Levitical musicians had its own traditional music, certain instruments being peculiar to the one and certain to the other, in which case the assignment of a psalm to the Asaphites or Korahites will merely denote the sort of music to which it is set. In like manner it is not improbable that ~rn\ meant originally " to be sung in the Davidic mode "; 2 that is, perhaps, " with harp accompaniment " (cf. 1 Sam. xvi. 16), or, since the Chronicler ascribes to David the initiation of the Temple music, " in the oldest traditional mode." Under such circumstances, however, a confusion would easily arise between the composer of the tune and the author ; and when once the idea had arisen that David was the author of psalms, it would be natural to endeavour to dis- cover in the story of his life suitable occasions for their composition. The interpretation of the titles here suggested removes an objec- tion brought against the assumption of a Maccabaean date for certain psalms,

*which lays stress on the fact that some of them, e.g. Ps. xliv., are written in a time of the deepest dejection, and yet are psalms of the Temple choirs; whereas, when the Temple was re-opened for worship, after its profanation by Antiochus, the Jews were victorious, and a much more joyful tone was appropriate. For if the titles rn'p 'jaS, *]s^, &c, do not denote that the psalms so inscribed were collected by the Temple choirs, there is no evidence that these psalms were originally sung in the Temple. The earlier collections of psalms may well have been used first in synagogues, and only adapted to the Temple worship when they had become part of the devotional life of the people. It is noteworthy that the psalms quoted by the Chronicler belong to the last collection, books IV. and V., which, as a whole, is far more suitable for liturgical use.*

Since, then, the existence of separate books of psalms anterior to the present divisions of the Psalter is very doubtful, we must look for other evidences of date. Now, both the Korahite and Asaphic groups of psalms are remarkable that they hardly contain any recog- nition of present sin on the part of the community of Jewish faith — though they do confess the sin of Israel in the past — but are exercised with the observation that prosperity does not follow righteousness either in the case of the individual (xlix., lxxiii.) or in that of the nation, which suffers notwithstanding its loyalty to God, or even on account thereof (xliv., lxxix.). Now the rise of ithe problems of individual faith is the mark of the age that followed Jeremiah, while the confident assertion of national righteousness under mis- fortune is a characteristic mark of pious Judaism after Ezra, in the period of the law but not earlier. Malachi, Ezra and Nehemiah, like Haggai and Zechariah, are still very far from holding that the sin of Israel lies all in the past. Again, a considerable number of these psalms (xliv., lxxiv., lxxix., lxxx.) point to an historical situa- tion which can be very definitely realized. They are post-exilic in their whole tone and belong to a time when prophecy had ceased and the synagogue worship was fully established (lxxiv. 8, 9). But the Jews are no longer the obedient slaves of the oppressing power; there has been a national rising and armies have gone forth to battle. Yet God has not gone forth with them : the heathen have been victorious, blood has flowed like water round Jerusalem, the Temple has been defiled, and these disasters assume the character of a religious persecution. These details would fit the time of religious persecution under Antiochus, to which indeed Ps. lxxiv. is referred (as a prophecy) in 1 Mace. vii. 16. It is contended by those who, like the late Professor W. Robertson Smith, are opposed to the dating of any psalms of the second collection in the Maccabaean period, that, since they are post-exilic, there is one and only one time in the Persian period to which they can be referred, viz. that of the great civil wars under Artaxerxes III. Ochus (middle of 4th

1 The threefold division of the singers appears in the same list according to the Hebrew text of verse 17, but the occurrence of Jeduthun as a proper name instead of a musical note is suspicious, and makes the text of LXX. preferable. The first clear trace of the triple choir is therefore in Neh. xii. 24.

2 Some confirmation of this explanation of the titles may be found in the fact that in place of pnrvˆ (Ps. xxxix. 1) we find in lxii. I, lxxvii. 1, pnnj-Sy, the latter expression being apparently an abbre- viation of pnn; Vip-ˆy.

century, B.C.)- But there is no evidence that the Jews were involved in these; for the account which Josephus gives of Bagoses' oppres- sion of the Jews represents the trouble as having arisen originally from internal dissensions, and does not hint at anything of the nature of a rebellion against Persia. Moreover the statement of Eusebius (Chron. anno 1658 Abr.) that Artaxerxes Ochus in the course of his campaign against Egypt transported a detachment of Jews to Hyrc&nia does not prove that Judaea as a whole had revolted. There is nothing even to connect these Jews with Palestine; they may have formed a part of the very considerable Jewish community which we know to have been settled in Egypt as early as the 5th century B.C. On the other hand, it is extremely improbable that the Jews of Judaea, whom Nehemiah had entirely detached from their immediate neighbours, would have taken part in any general rising against Persia. Between them and the Samaritans on the north and the Edomites on the south there was the most implacable hostility, which would probably be sufficient in itself to keep them from joining in the revolts in which other parts of Syria were involved.. Moreover, even if the Jews had revolted, it cannot fairly be main- tained that such a revolt must necessarily have had a religious character. Even Josephus does not say that the Persians tried to interfere with the Jews in the exercise of their religion; and nothing less than this would satisfy the language of Ps. xliv. 22: " Yea, for vhy sake are we killed all the day long," &c. On the other hand, not only is the atmosphere of the second collection of psalms as a whole the atmosphere of godly Judaism in the 2nd century B.C., but it may fairly be claimed that this collection contains many psalms which may naturally be interpreted in the light of the history of that period, of which no satisfactory explanation (in their details) can be given if they are assigned to any other time. Thus, for example, Ps. xliv., with its description of the sufferings of the righteous for God's sake, would be perfectly appropriate in the mouth of one of the " godly " (Hasidim) about 167 B.C. Ps. xlv., though the unsoundness of the text in certain parts makes it difficult to speak with certainty, would suit

the marriage of Alexander Balas at Ptole- mais in 150 B.C., at which the high priest Jonathan was present as an honoured guest In this connexion verse 10 is particularly appropriate as addressed to an Egyptian princess whose forefathers, though their rule had not on the whole been tyrannical, had been regarded by the Jews as heathen oppressors. Again, Ps. lx., with its ideal description of Jehovah's kingdom as including Gilead, Samaria, Moab, Edom and Philistia, though the ideal was not realized till the days of John Hyrcanus, would be quite appropriate in the mouth of a Maccabaean patriot. The author of Ps. lxviii. would seem to have been inspired by the sight or the description of the never-to-be-forgotten procession of the victorious Maccabees in 164 B.C. to rededicate the desecrated Temple. Hence the taunt to Bashan, the stronghold of the Seleucid government; hence the men- tion of Judah and Benjamin with the two Galilaean tribes Zebulon and Naphtali (as in Isaiah ix. I — a passage which on independent grounds has been assigned to the time of Simon Maccabaeus), while schismatic Samaria is completely ignored. The historical back-ground of Ps. lxxix. is apparently the same as that of Ps. xliv. Again, Ps. lxxxvii. would seem to date from a time when the Jews, having won freedom to worship God, were able to look forward to the conversion of their former oppressors (cf. Isaiah xi., xix.). That this psalm was composed at least as late as the 3rd century B.C. is made probable by the name here given to Egypt, Rahab. Having regard to Job. ix. 13, xxvi. 12, Isaiah li. 9, there can be little doubt that Rahab is the (? Palestinian) name of Tiamat the dragon of the abyss, the natural symbol of the power of darkness, or of the kingdom of the world as opposed to the kingdom of the people of the saints of the Most High God. It is extremely improbable that such a name was applied to Egypt simply because Egypt possessed the crocodile. The origin of its application must be sought in a time when Egypt was regarded as hostile to the people of the Lord — that is to say, during the Ptolemaic rule over Palestine. These considerations, in addition to numerous phrases and expressions which cannot here be noticed, of which the full force can only be felt by those who have specially studied the Maccabaean period and those other portions of the Old Testament, such as Zechariah ix.-xiv., which may plausibly be assigned to it, make it almost certain that the second collection of psalms was made not earlier than the time of Jonathan or even of Simon.

Now books IV. and V. are, as we have seen, later than the Elohistic redaction of books II. and III., so that the collection of the last part of the Psalter must, if our argument up to this point is sound, fall within the second half of the 2nd century B.C. And here it is to be noted that though no part of the Psalter shows clearer marks of a liturgical purpose, we find that in books IV. and V. the musical titles have entirely disappeared. This does not necessarily prove that " the technical terms of the Temple music

had gone out of use, presumably because they were already become unintelligible, as they were when the Septuagint version was made " ; for it does not follow that technical musical terms which had originated in the Temple at Jerusalem and were intelligible in Palestine would have been understood in Egypt. The absence of the musical titles, however, may be taken as an indication that the last collection of psalms was formed in a different place from that in which the earlier

collections had arisen ; and if, as seems probable, we may identify this place with the Temple at Jerusalem, the absence of musical titles is easily explained, for the number of skilled musicians who there ministered, and who would, of course, possess the tradition of the various modes and tones, would make precise musical directions superfluous. On the other hand, in a collection intended for syna- gogue use — and the second collection of psalms is as a whole far more suitable to a synagogue than to the Temple — where there would not be a large choir and orchestra of skilled musicians, it would obviously be desirable to state whether the psalm was to be sung to a Davidic, Asaphic or Korahite tone, or to give the name of a melody appro- priate to it. Again, the general tone of large parts of this collection is much more cheerful than that of the Elohistic psalm-book. It begins with a psalm (xc.) ascribed in the title to Moses, and seemingly designed to express feelings appropriate to a situation analogous to that of the Israelites when, after the weary march through the wilder- ness, they stood on the borders of the promised land. It looks back on a time of great trouble and forward to a brighter future. In some of the following psalms there are still references to deeds of oppression and violence, but more generally Israel appears as happy under the law. The problems of divine justice are no longer burning questions, the righteousness of God is seen in the peaceful felicity of the pious (xci., xcii., &c). Israel, indeed, is still scattered and not triumphant over the heathen, but even in the dispersion the Jews are under a mild rule (cvi. 46), and the commercial activity of the nation has begun to develop beyond the seas (cvii. 26 seq.). But some of the psalms refer to a time of struggle and victory. In Ps. cxviii. Israel, led by the house of Aaron — this is a notable point — has emerged triumphant from a desperate conflict, and celebrates at the Temple a great day of rejoicing for the unhoped-for victory: in Ps. cxlix. the saints are pictured with the praises of God in their throat and a sharp sword in their hands to take vengeance on the heathen, to bind their kings and nobles, and exercise against them the judgment written in prophecy. Such an enthusiasm of militant piety, plainly based on actual successes of Israel and the house of Aaron, can only be referred to the first victories of the Maccabees, culminating in the purification of the Temple in 164 B.C. This restoration of the worship of the national sanctuary, under circumstances that inspired religious feelings very different from those of any other generation since the

return from Babylon, might most naturally be followed by an extension of the Temple psalmody ; it certainly was followed by some liturgical innovations, for the solemn service of dedication on the 25th day of Chisleu was made the pattern of a new annual feast (that mentioned in John x. 22). In later times the psalms for the encaenia or feast of dedica- tion embraced Ps. xxx. and the hallel Ps. cxiii.-cxviii. ; and though Ps. xxx. may have been adapted from a collection already existing, there is every reason to think that the hallel, which especially in its closing part contains allusions that fit no other time so well, was first arranged for the same ceremony. The course of the subsequent history makes it very intelligible that the Psalter was finally closed, as we have seen from the date of the Greek version that it must have been, within a few years at most after this great event. 1 From the time of Hyrcanus downwards the ideal of the princely high priests became more and more divergent from the ideal of the pious in Israel, and in the Psalter of Solomon we see religious poetry turned against the lords of the Temple and its w-orship.

All this does not, of course, imply that there are not in books IV. and V. any pieces older than the completion of books II. and III., for the composition of a poem and its acceptance as part of the Leviti- cal liturgy are not necessarily coincident in date, except in psalms written with a direct liturgical purpose. In the fifteen " songs of degrees " (Ps. cxx.-cxxxiv.) we have a case in point. According to the Mishna (Middoth. ii. 5) and other Jewish traditions, these psalms were sung by the Levites at the Feast of Tabernacles on the fifteen steps or degrees that led from the women's to the men's court. But when we look at the psalms themselves we see that they must originally have been a hymn-book, not for the Levites, but for the laity who came up to Jerusalem at the great pilgrimage feasts, and who themselves remembered, or their fathers had told them, the days when, as we see in Ps. xlii., it was impossible to make pilgrimage to Zion. They are hymns of the laity, describing with much beauty and depth of feeling the emotions of the pilgrim when his feet stood within the gates of Jerusalem, when he looked forth on the encircling hills, when he felt how good it was to be camping side by side with his brethren on the slopes of Zion (cxxxiii.), when a sense of Jehovah's forgiving grace and the certainty of the redemption of Israel triumphed over all the evils of the present and filled his soul with humble and patient hope.

The titles which ascribe four of the pilgrimage songs to David and one to Solomon are lacking in the true LXX., and inconsistent with the contents of the psalms. Better attested, because found in the LXX. as well as in the Hebrew, and therefore probably as old as the collection itself, are the name of Moses in Ps. xc. and that of David in Ps. ci., cii., cviii.-cx., cxxxviii.-cxlv. But where did the last collectors of the psalms find such very ancient pieces which had

1 Possibly under Simon ; compare the other hallel (Ps. cxlvi.-cl. with I Mace. xiii. 50 seq.

been passed by all previous collectors, and what criterion was there to establish their genuineness? No canon of literary criticism can treat as valuable external evidence an attestation which first appears so many centuries after the supposed date of the poems, especially when it is confronted by facts so conclusive as that Ps. cviii. is made up of extracts from Ps. lvii. and lx. and that Ps. cxxxix. is marked by its language as one of the latest pieces in the book. The only possible question for the critic is whether the ascription of these psalms to David was due to the idea that he was the psalmist par excellence} to whom any poem of unknown origin was naturally ascribed, or whether we have in some at least of these titles an ex- ample of the habit so common in later Jewish literature of writing in the name of ancient worthies. In the case of Ps. xc. it can hardly be doubted that this is the real explanation, and the same account must be given of the title in Ps. cxlv., if, as seems probable, it is meant to cover the whole of the great hallel or tehilla (Ps. cxlv.-cl.), which must, from the allusions in Ps. cxlix., as well as from its place, be almost if not quite the latest thing in the Psalter.

For the later stages of the history of the Psalter we have, as we have seen, a fair amount of evidence pointing to conclusions of a pretty definite kind. We have still to consider the two great groups of psalms ascribed to David in books I. and II. We have en- deavoured to show that the ascription " to David " in these groups did not originally denote authorship by David, and that, notwith- standing the subscription of Ps. lxxii., which may well be a later note, there is no necessity to suppose an original collection of Davidic psalms from which excerpts were made. It is, however, probable that the title soon came to be understood of David's authorship, with the result that further notes were added indicating the situation in David's life to which the psalms appeared to be appropriate. It is certainly not impossible that the two groups of " Davidic " psalms once formed separate collections independently compiled, and that the subscription to Ps. lxxii. originally stood at the end of the second collection; for in book I. every psalm, except the intro- ductory poems i. and ii. and the late Ps. xxxiii., which may have been added as a liturgical sequel to Ps. xxxii., bears the title " of David," and in like manner the group Ps. Ii.— lxxii., though it con- tains a few anonymous pieces and one psalm which is either " of," or rather, according to the oldest tradition, " for Solomon," is composed of " Davidic " psalms. It would seem also that the collectors of books I. -III. know of no Davidic

psalms outside of these two collections, for Ps. lxxxvi. in the appendix to the Elohistic collection is merely a cento of quotations from Davidic pieces with a verse or two from Exodus and Jeremiah. Now that the ascription " to David " was understood of David's authorship before the time of the LXX. is clear from such titles as that of Ps. xviii., for example, but there is no evidence that in early times David was regarded as the author of any of the psalms. Even the Chronicler, though he regarded David as the great founder of the Temple music, does not quote any psalm as composed by him, and the Chronicler's omission of 2 Sam. xxii.-xxiii. 7 makes it probable that this section has been inserted in the book of Samuel since he wrote. If, as is possible, Ecclus. xlvii. 8 is a reminiscence of Ps. ix. 2 and Ps. xviii. 2, we should indeed naturally infer that these two psalms were regarded by Ben Sira as the work of David ; but this would prove nothing as to the date of the collection in which we now have them. It may fairly be contended therefore that the tradition that David is the author of the psalms which are assigned to him in books I. and II. comes to us from a period later than that in which the Chronicler wrote. And it is not too much to say that that view — which to some extent appears in the historical psalms of the Ehohistic Psalter — implies absolute incapacity to understand the difference between old Israel and later Judaism, and makes almost anything possible in the way of the ascription of comparatively modern pieces to ancient authors. In any case the titles are manifestly the product of the same uncritical spirit as we have just been speaking of, for not only are many of the titles certainly wrong, but they are wrong in such a way as to prove that they date from an age to which David was merely the abstract psalmist and which had no idea whatever of the historical conditions of his age. For example, Ps. xx. xxi. are not spoken by a king but addressed to a king by his people; Ps. v. xxvii. allude to the Temple (which did not exist in David's time) and the author of the latter psalm desires to live there continually. Even in the older Davidic psalm-book there is a whole series of hymns in which the writer identifies himself with the poor and needy, the righteous people of God suffering in silence at the hands of the wicked, without other hope than patiently to wait for the interposition of Jehovah (Ps. xii., xxv., xxxvii., xxxviii., &c). Nothing can be further removed than this from any possible situation in the life of the David of the books of Samuel, and the case is still worse in the second Davidic collection, especially where we have in the titles definite notes as to the historical occasion on which the poems are supposed to have been written. To refer Ps. Hi. to Doeg, Ps. liv. to the Ziph- ites, Ps. lix. to David when watched in his house by Saul, implies an absolute lack of the very elements of historical judgment. Even the bare names of the- old history were no longer correctly known

1 The explanation of inS suggested above offers another alter- native.— R.-

when Abimelech (the Philistine king in the stories of Abraham and Isaac) could be substituted in the title of Ps. xxxiv. for Achish, king of Gath. In a word, the ascription of these two collections to David has none of the characters of a genuine historical tradition.

At the same time it is clear that the two collections do not stand on quite the same footing. The second collection of " Davidic " psalms, as well as the Korahite and Asaphic psalms, have been sub- jected to an Elohistic redaction, for which we must find a reason if the history of the Psalter is to be written. An explanation that naturally suggests itself is that, at the time when books II. and III. (with the exception of the appendix, Ps. Ixxxiv.lxxxix.) were collected, it was already the custom, from motives of reverence, to abstain from pronouncing the Tetragrammaton. Upon this sup position it might be explained that book I. was collected before this scruple arose, and books IV. and V. when the custom had arisen of substituting in reading the word Adonai. But, as we have seen, it is impossible to separate the contents of the Elohistic books from those of the last collection. Both include psalms which are most naturally understood as referring to the persecution of Antiochus Epiphanes and to the Maccabaean victories, and cannot therefore be separated by a long interval of time. Moreover the scruple as to the pro- nunciation of the Tetragrammaton seems to have arisen earlier, as in the LXX. version of the Pentateuch w.t is represented by Kvpws. And further, if the Elohistic redaction was due merely to a desire to avoid pronouncing the divine name, why was not the presumably earlier collection of psalms in book I. subjected to a similar redaction? It is therefore difficult to suppose that the Jewish Church as a whole passed through a stage in which it was felt desirable to substitute D'n^g in writing for n;rr. There is, however, no difficulty in supposing that such a thing was done in some sections of the Jewish Church, and it is probable that we must look for an explanation of the peculiarity not to the time but to the place where the second collec- tion was formed. Now it must be frankly admitted that the earlier books of psalms exhibit no particular suitability for the Temple services. It is only in the last collection, books IV. and V., that we find any number of psalms appropriate to such a ritual as that of the Temple, and it is difficult to resist the conviction that the earlier collections were made for use, not in the Temple at Jerusalem but in some synagogue or synagogues. Thus, for example, the numerous psalms in which the poets, though speaking perhaps, not as in- dividuals but as members of a class, describe themselves as poor and afflicted at the hands of certain ungodly men, who appear to be Jews, can hardly have been originally collected by the Temple choirs. For since the ministers of the Temple at Jerusalem were the aristo- cracy of the land, and were often, as we know both from the book of Malachi and from the history of the Maccabees, the chief

offenders, it is extremely unlikely that they collected for the official services of the Temple compositions directed against themselves. It is also remarkable that hymns such as Exodus xv., which would be specially suitable to the Temple, find no place in the Psalter. More- over, in Ps. xl., we have the striking assertion, which surely did not originate in the Temple, that God has no delight in sacrifice and offerings. On the other hand, the first collection of " Davidic " psalms taken as a whole would be perfectly appropriate in the worship of a Judaean community of ffasidim in the Maccabaean period. We have, unfortunately, no information as to the origin of synagogues, but their existence in pre-Maccabaean times may be inferred not only from the statement in Ps. lxxiv. 8, but also from the fact that there must have been some rallying points for the religion of the Hasidim : besides that supplied by occasional visits or pilgrimages to Jerusalem, We need not suppose that congregations gathered together to worship away from Jerusalem, especially in times of distress, would necessarily sing the religious poems which they had collected, though it is by no means improbable that they would do so. At any rate, Ps. cxxxvii. 4 may fairly be taken as evidence that those heathen among whom the Jews dwelt " in a strange land " had heard and admired the " songs of Zion." Certainly in happier times, when the worst period of storm and stress was over, there would be a desire to enliven the services with music, which would naturally be borrowed from the traditional music of the great national sanctuary.

In thus assigning the first collection of psalms to some Judaean community of Hasidim in the earlier Maccabaean period we need not conclude that all the psalms contained in this collection were first composed at this time. Although there is no psalm which can be shown with any probability to be pre-exilic, it is not impossible that there are some which date from as early a time as the age of Zerubbabel, by whose appointment national hopes were raised to so high a pitch. Thus, for example, Ps. xviii., xx., xxi., which in some respects recall the language of the song ascribed to Hannah in I Sam. ii., may possibly, like that song, be referred to this period. It must, however, be admitted that as a whole the psalms of the first collection are more suitable to a later date. Ps. viii., which is almost certainly quoted in Job. vii. 17, need not have been composed long before the book in which it is quoted: the references to the " godly " and to their persecutions at the hands of wicked men, who seem to be Jews, recall the Maccabaean age ; in Ps. xxii. the speaker, who is not an individual but speaks in the name of a community, bears a remark- able resemblance to the " suffering servant " of Isaiah Hi. 13-liii.

and of this last passage it may be said that all the translatable portions of it can be naturally explained, if it refers to the time when the resistance of the Hastdim, whom the Sadducees had despised and shunned, had won freedom for Israel as a whole, and at no other known period; the fragment, Ps. xxiv. 7-10, is most easily understood of the time when the Lord who had shown Himself strong and mighty by His victories over the heathen returned in triumph to His Temple in 164 B.C. — in the days of Zerubbabel or of Nehemiah Jehovah had not recently shown Himself " mighty in battle."

In the light of these circumstances — and space here forbids more than the scantiest reference — we may reasonably suppose that the first book, with the exception of Ps. i., ii. and possibly xxxiii., is a collection of psalms in the shape which it assumed in a Judaean synagogue in the earlier days of the Maccabaean victories.

We have already noticed the difficulty of supposing that the Elohistic Psalter was compiled in a place where a Jehovistic Psalter was already in use. It is therefore probable that the second collec- tion of psalms (books II. and III.), containing as it does an Elohistic recension of a psalm occurring in book I. in a Jehovistic form, must have been compiled for use in some other district. Since the last collection (books IV. and V.) which may reasonably be assigned to the Temple at Jerusalem uses freely the name m.T, it may be in- ferred that the district where an objection was felt to writing the Tetragrammaton was some distance from Jerusalem, and probably not in such close touch with it as most of the country districts of Judaea would be. Such a district we may find in southern Galilee, " the land of Zebulon and the land of Naphtali," apparently the only portion of Palestine north of Samaria where the worshippers of Jehovah existed in any considerable numbers. It is at least remark- able that the names Zebulon and Naphtali in Isaiah ix. I (a passage which, as has been already noted, is probably Maccabaean) denote the region which had felt the brunt of the persecution of the heathen, while in Ps. lxviii. 27 (a poem of which every translatable verse is explicable if it refers to the great procession at the rededication of the Temple in 164 B.C.) the same two tribes are joined with Judah and Benjamin (sc. Judaea) as celebrating the Lord's victory. The dissenting inhabitants of Samaria are naturally absent from such a festival. It is not improbable that the Elohistic redaction of the second collection of psalms is due not so much to any Jewish scruples about writing the Tetragrammaton as to the fear that it might fall into the hands of the heathen who were trying to destroy the Hebrew Scriptures, and might thus be desecrated (cf. I Mace. 1.

56. 57)- ,

We may thus suppose that about the time of Jonathan the Macca- baean High Priest (if our explanation of Ps. xlv. is correct), at all events not earlier than 150 B.C., a south Galilaean synagogue made a collection of the various religious poems current among its members. Perhaps those which were to be sung according to the old Davidic mode formed the nucleus of the collection, and to these were added other poems to be sung according to the more intricate Korahite and Asaphic modes. The appendix to this collection (Ps. lxxxiv.-lxxxix.) being non-Elohistic presumably was collected else- where. It is possible that these last-mentioned psalms were originally an appendix to the Judaean collection and have been removed from their original place to after the other Levitical psalms.

In books IV. and V. we have a collection probably made originally for use in the Temple, consisting in the main of recent hymns, but embodying, at least to some extent, older traditional hymns of the Temple. On this hypothesis we are able to explain the presence of certain poetical pieces both in the book of Chronicles and in the Psalter. We need not suppose that the Chronicler quotes from the Psalter or vice versa, the matter which they have in common being probably derived from certain traditional songs current among the Levitical singers. Since this last collection includes a psalm (ex.) which can scarcely refer to any one earlier than Simon the Maccabee, and cannot well be later than his time, we are justified in assigning the compilation of this collection to about the year 140 B.C. But by this time a great change had taken place in the aims and aspira- tions of the Jews. The earlier Maccabaean policy of concentration had given place to one of expansion. The Jews in Jerusalem could not ignore the Jews of Galilee or even of the Dispersion. The hymns which had brought comfort to the faithful in the time of their distress had become an integral part of their religion which could not be given up. Jerusalem was now the religious metropolis of a great nation, and accordingly it was felt desirable that the hymn-books of the several parts of the nation should be combined into a hymn-book for the whole. The synagogue collections, since they contained psalms which at this time were probably considered to be the work of David, were placed first, and the Temple collection added to them. There was then prefixed to the whole collection a hymn (Ps. ii.) describing the hoped-for greatness of Simon's kingdom, and finally Pharisaic sentiment prefaced the whole by a psalm in praise of the law. In the final compilation, or perhaps in a subsequent redaction, some alterations were made in the original order, some notes were added describing the circumstances in which various psalms had been composed, and lastly, in order to assimilate the outward form of the Psalter to that of the Pentateuch, the three collections were divided into five books. The final redaction is probably to be dated between the years 140 and 130 B.C.

Musical Execution and Place of the Psalms in the Temple Service. — The

musical notes found in the titles of the psalms and occasionally also in the text (Selah, 1 Higgaion) are so obscure that it seems unnecessary to enter here upon the various conjectures that have been made about them. The clearest point is that a number of the psalms were originally at least set to melodies named after songs, 2 and that one of these songs beginning rmvrrhs (Al-tashith in E. V., Ps. lvii. seq.), may be probably identified with the vintage song, Isa. lxv. 8. The original music of the psalms was therefore apparently based on popular melodies. A good deal is said about the musical services of the Levites in Chronicles, both in the account given of David's ordinances and in the descriptions of particular festival occasions. But unfortunately it has not been found possible to get from these accounts any clear picture of the ritual of any certainty as to the technical terms used. In Egypt by the translators of the Septuagint these terms were not understood.

The music of the temple attracted the attention of Theo- phrastus (ap. Porph. De abst. ii. 26), who was perhaps the first of the Greeks to make observations on the Jews. His descrip- tion of the Temple ritual is not strictly accurate, but he speaks of the worshippers as passing the night in gazing at the stars and calling on God in prayer; his words, if they do not exactly fit anything in the later ritual, are well fitted to illustrate the original liturgical use of Ps. viii., exxxiv. Some of the Jewish traditions as to the use of particular psalms have been already cited; it may be added that the Mishna (Tarnid) assigns to the service of the continual burnt-offerings the following weekly cycle of psalms. — (1) xxiv., (2) xlviii., (3) lxxxii., (4) xciv., (5) Ixxxi., (6) xciii., (Sabbath) xcii., as in the title. Many other details are given in the treatise Soflrim, but these for the most part refer primarily to the synagogue service after the destruction of the Temple. For details on the liturgical use of the Psalter in Christendom the reader may refer to Smith's Diet. Chr. Ant., s.v. " Psalmody."

Ancient Versions. — (ˆ4) The oldest version, the LXX., follows a text generally closely corresponding to the Massoretic Hebrew, the main variations being in the titles and in the addition (lacking in some MSS.) of an apocryphal psalm ascribed to David when he fought with Goliath. Ps. ix. and x. are rightly taken as one psalm, but conversely Ps. cxlvii. is divided into two. The LXX. text has many " daughters," of which may be noticed (a) the Memphitic (ed. Lagarde, 1875); (b) the old Latin, which as revised by Jerome in 383 after the current Greek text forms the Psalterium romanum, long read in the Roman Church and still used in St Peter's; (c) various Arabic versions, including that printed in the polyglots of Le Jay and Walton, and two others of the four exhibited together in Lagarde's Psalterium, Job, Proverbia, arabice, 1876; on the relations and history of these versions see G. Hoffmann, in Jenaer Literature., 1876, art. 539; the fourth of Lagarde's versions is from the Peshito. The Hexaplar text of the

LXX., as reduced by Origen into greater conformity with the Hebrew by the aid of subsequent Greek versions, was further the mother (d) of the Psalterium gallicanum — that is, of Jerome's second revision of the Psalter (385) by the aid of the Hexaplar text; this edition became current in Gaul and ultimately was taken into the Vulgate; (e) of the Syro- Hexaplar version (published by Bugati, 1820, and in facsimile from the famous Ambrosian MS. by Ceriani, Milan, 1874). (B) The Christian Aramaic version or Peshito (P'shltta) is largely influenced by the LXX., compare Baethgen, Untersuchungen iiber die Psalmen nach der Peschita, Kiel, 1878 (unfinished).

1 Of the various explanations that have been given of Selah the only one which possesses any probability is that given independently by Baethgen and others, viz. that it is a mispronunciation of an original nVjj = ˆAXXe. The word, which was probably derived from some Greek bandmaster, was presumably an instruction for a musical interlude. The LXX. translators who render it by iiiuj/dKua though not recognizing the derivation of the word, knew its meaning. — R. H. K.

2 Compare the similar way of citing melodies with the prep, 'al or 'at kala, &c, in Syriac (Land, Anecd. iv. ; Ephr. syr. hymni, ed. Lamy).

This version has peculiar titles taken from Eusebius and Theodore of Mopsuestia (see Nestle, in Theol. Literaturz., 1876, p. 283). (C) The Jewish Aramaic version or Targum is probably a late work. 1 The most convenient edition is in Lagarde, Hagiographa chaldaice, 1873. (D) The best of all the old versions is that made by Jerome after the Hebrew in 405. It did not, however, obtain ecclesiastical currency — the old versions holding their ground, just as English churchmen still read the Psalms in the version of the " Great Bible " printed in their Prayer Book. This important version was first published in a good text by Lagarde, Psalterium juxta hebr.aeos hieronymi (Leipzig, 1874).

Exegetical Works. — While some works of patristic writers are still of value for text criticism and for the history of early exegetical tradition, the treatment of the Psalms by ancient and medieval Christian writers is as a whole such as to throw light on the ideas of the commentators and their times rather than on the sense of a text which most of them knew only through translations. For the Psalms, as for the other books of the Old Testament, the scholars of the period of the revival of Hebrew studies about the time of the Reformation were mainly dependent on the ancient versions

and on the Jewish scholars of the middle ages. In the latter class ICimhi stands pre-eminent ; to the editions of his commentary on the Psalms enumerated in the article Kimhi must now be added the admirable edition of Dr Schiller-Szinessy (Cambridge, 1883), containing, un- fortunately, only the first book of his longer commentary. Among the works of older Christian scholars since the revival of letters, the commentary of Calvin (1557) full of religious insight and sound thought — and the laborious work of M. Geier (1668, 1681 et saepius) may still be consulted with advantage, but for most purposes Rosenmuller's Scholia in Psalms (2nd ed., 1831-1822) supersedes the necessity of frequent reference to the predecessors of that industrious compiler. Of more recent works the freshest and most indispensable are Ewald's, in the first two half-volumes of his Dichter des alien Bundes (2nd ed., Gtittingen, 1866; Eng. trans., 1880), and Olshausen's (1853). To these may be added (excluding general commentaries on the Old Testament) the two acute but wayward commentaries of Hitzig (1836, 1 863-1865), that of Delitzsch (1859-1860, then in shorter form in several editions since 1867 ; Eng. trans., 187 1), and that of Hupfeld (2nd ed. by Riehm, 1867, 2 vols.). The last-named work, though lacking in original power and clearness of judgment, is extremely convenient and useful, and has had an influence perhaps dispropor- tionate to its real exegetical merits. The question of the text was first properly raised by Olshausen, and has since received special attention from, among others, Lagarde (Prophetae chald., 1872, p. 46 seq.), Dyserinck (in the " scholia " to his Dutch translation of the Psalms, Theol. Tijdschr., 1878, p. 279 seq.), and Bickell (Carmina V. T. metrice, &c, Innsbruck, 1882), whose critical services are not to be judged merely by the measure of assent which his metrical theories may command. In English we have, among others, the useful work of Perowne (5th ed., 1883), that of Lowe and Jennings, (2nd ed., 1885), and the valuable translation of Cheyne (1884). The mass of literature on the Psalms is so enormous that no full list even of recent commentaries can be here attempted, much less an enumeration of treatises on individual psalms and special critical questions. For the latter Kuenen's Onderzoek, vol. iii., is, up to its date (1865), the most complete, and the new edition now in prepara- tion will doubtless prove the standard work of reference. As regards the dates and historical interpretation of the Psalms, all older discussions, even those of Ewald, are in great measure anti- quated by recent progress in Pentateuch criticism and the history of the canon, and an entirely fresh treatment of the Psalter by a sober critical commentator is urgently needed.

The bibliography up to this point is taken from the article Psalms by the late Professor W. Robertson Smith (Ency. Brit., 1886), large portions of which are incorporated in the present article. It was the belief of Professor Robertson Smith that the second (Elohistic) collection of psalms originated

in a time of persecution earlier than the time of Antiochus Epiphanes which he referred to the reign of ArtaxerxesIII. Ochus. This theory, which he set forth with all his accustomed learning and force, is still accepted in many quarters, many other passages of the Oid Testament being likewise assigned to the same date. In the judgment of the present writer however, the results of Old Testament study (particularly in the Prophets) since Professor Robertson Smith's death have shown that this theory is untenable. Notwithstanding his reverence, therefore, for the great scholar with whose name it is associated, and to whose memory he would pay both grateful and humble tribute, he has ventured to omit or rewrite alˆ those portions of the original article which he considers no longer tenable, while retaining every word which is still valuable.

Of the works on the Psalms which have appeared since the first publication of Professor W. Robertson Smith's article the following may be specially noticed: Cheyne, The Book of Psalms (1888), The

1 It contains, however, elements which are as early as the time of the New Testament. Cf. Ps. lxviii. 18 with Ephes. iv. 8.

Origin of the Psalter, Bampton Lectures (1891), and the article Psalms (in Ency. Bib., 1902); Bickell, Die Dichtungen der Hebrder (3 der Psalter, 1883), from a revised and metrically arranged text; Baethgen, in Nowack's Hand-Komm. (1892); Wellhausen, in Sacred Books of the Old Test. (Eng. trans, by Furness, J. Taylor and Paterson, 1898); Duhm, in Marti's Kurzer Hand-Comm. (1899); Kirkpatrick, in Cambridge Bible for Schools (1893-1895) ; W. T. Davison, in Hastings's Diet. Bible (1902) ; Driver, The Parallel Psalter (1904) ; C. A. and E. G. Briggs, " Critical and Exegetical Commentary on the Psalms," vol. i. (1906), vol. ii. (1907), in International Critical Com- mentary. (R. H. K.)

PSALTERY, Psalterion, or Sawtrie (Fr. psalterion, salteire; Ger. Psalterium; Ital. salterio, istrumento di porco), an ancient stringed instrument twanged by fingers or plectrum, and men- tioned many times in the English Bible; a favourite instrument also during the middle ages in England, France and Italy. It is exceedingly doubtful whether the word was ever applied during the classic Greek period to any individual instrument; there is, moreover, no trace in the monuments of that time of the psalterion in any of the forms in which it afterwards became known during the middle ages. It is also puzzling to find no fewer than four different instruments translated psalterion in the Septuagint, i.e. Nebel, Psanterin, Ugab (organ) and Toph (Job xxi. 12). On the other hand the Aramaic word Pisantir or Psanterin (Dan. iii. 5, 10, 15) generally translated psalterion, and by some scholars claimed, as a loan word from the Greek, corresponds to the Santir, a stringed instrument represented on Assyrian monu- ments of the 8th

century B.C. (when as yet the word had not been used in Greek for a musical instrument) and still in use in Persia at the present day by the same name. The instrument itself, moreover, a dulcimer, which in its earlier forms differed from the psalterion mainly in that its strings were struck by curved sticks instead of being plucked, must in the absence of contrary evidence be considered as the prototype of the medieval psalterion or psaltery. Early medieval writers generally connect the psalterium and the cithara, probably because the strings of both were set in vibration in the same manner, by plucking or twanging.

The medieval psaltery consisted of a shallow box-soundchest over which strings varying in number were stretched, being fastened at one side to pegs and at the other to wrest pins. In the early rectangular form the strings, numbering 10 or 12, were, as in the cithara, of uniform length, the pitch being varied by the thickness and tension of the strings. When the triangular form succeeded the rectangular, the stringing was that of the harp, pitch being dependent on the length. The trapeze form, clearly borrowed from the oriental Kanon, and the curious Italian istrumento di porco, were the latest types to survive. In these later forms the vibrating length of the strings was regulated by means of two wooden bridges, converging as the strings became snorter. The psaltery was held in an upright position against the chest of the performer, until, owing to the increasing number of strings, it grew too cumbersome, and was placed flat on a table or on the knee. The German zither is the sole European survivor of the medieval psaltery. (K. S.)

PSAMMETICHUS (Egypt. Psammetk), the name of three kings of the Saite, XXVIth Dynasty, called by Herodotus respectively Psammetichus, Psammis and Psammenitus. The first of these is generally considered to be the founder of the dynasty; Manetho, however, carries it back through three or four predecessors who ruled at Sais as petty kings under the XXVth, Ethiopian, Dynasty. The name is frankly written so as to mean " the man of tnethek," i.e. " mixed drink," whether as a tippler or as a vendor of strong drink. The Egyptian scribes do not conceal the opprobrious elements, but it has been suggested that the name may be due to false etymology of a foreign name (though all the names throughout the dynasty appear to be Egyptian), or that Methek may have been an un- known deity. The story in Herodotus of the Dodecarchy and the rise of Psammetichus is fanciful. It is known from cuneiform texts that twenty local princelings were appointed by Esarhaddon and confirmed by Assur-bani-pal to govern Egypt. Niku (Necho) , father of Psammetichus, was the chief of these kinglets, but they seem to have been quite unable to hold the Egyptians to the hated Assyrians against the more sympathetic Ethiopian. The labyrinth built by a king of the XHth Dynasty is ascribed by Herodotus to the Dodecarchy, or rule of 12, which must

represent this combination of rulers. If the dynasties were numbered thus before Manetho, the numeral may be the cause of Herodotus's confusion. After his father's death Psammetichus I. (664-610 B.C.) was able to defy the Assyrians and the Ethiopians, and during a long reign marked by intimate relations with the Greeks restored the prosperity of Egypt. The short reign of the second Psammetichus (504-589 B.C.) is noteworthy for the graffiti of his Greek, Phoenician and Carian mercenaries at Abu Simbel (g.v.). The third of the name was the unfortunate prince whose reign terminated after six months in the Persian conquest of Egypt (525 B.C.). It has been conjectured that the family of the Psammetichi was of Libyan origin; on the other hand, some would recognize negro features in a portrait of Psam- metichus I., which might connect him with the Ethiopian rulers. See above, Egypt : History; on the name, F. LI. Griffith, Catalogue of the Rylands demotic papyri; the portrait, H. Schafer in Zeitschrift fiir aegyptische Sprache, xxxiii. 116. (F. Ll. G.)

PSELLUS (Gr. ˆeXXos), the name of several Byzantine writers, of whom the following may be mentioned: —

1. Michael Psellus the elder, a native of Andros and a pupil of Photius, who flourished in the second half of the 9th century. His study of the Alexandrine theology, as well as of profane literature, brought him under the suspicions of the ortho- dox, and a former pupil of his, by name Constantine, accused him in an elegiac poem of having abandoned Christianity. In order to perfect his knowledge of Christian doctrine, Psellus had recourse to the instructions of Photius, and then replied to his adversary in a long iambic poem, in which he maintained his orthodoxy. None of his works has been preserved.

2. Michael Constantine Psellus the younger, born in 1018 (probably at Nicomedia; according to some, at Constantinople) of a consular and patrician family. He studied at Athens and Constantinople, where he became intimate with John Xiphilinus. Under Constantine Monomachus (1042-1054) he became one of the most influential men in the empire. As professor of philo- sophy at the newly founded academy of Constantinople he revived the cult of Plato at a time when Aristotle held the field; this, together with his admiration for the old pagan glories of Hellas, aroused suspicions as to his orthodoxy. At the height of his success as a teacher he was recalled to court, where he became state secretary and vestarch, with the honorary title of "Twcltos t&v 03v (prince of philosophers). Follow- ing the example of his friend Xiphilinus he entered the monastery of Olympus

(near Prusa in Bithynia), where he assumed the name of Michael. But, finding the life little to his taste, he resumed his public career. Under Isaac Comnenus and Constantine Ducas he exercised great influence, and was prime minister during the regency of Eu'docia and the reign of his pupil Michael Parapinaces (1071-1078). It is probable that he died soon after the fall of Parapinaces.

Living during the most melancholy period of Byzantine history, Psellus exhibited the worst faults of his age. He was servile and unscrupulous, weak, fond of intrigue, intolerably vain and ambitious. But as a literary man his intellect was of the highest order. In the extent of his knowledge, in keenness of observation, in variety of style, in his literary output, he has been compared to Voltaire; but it is perhaps as the forerunner of the great Renaissance Platonists that he will be chiefly remembered. His works embraced politics, astronomy, medicine, music, theology, jurisprudence, physics, grammar and history.

Of his works, which are very numerous, many have not yet been printed. We may mention: Chronographia (from 976-1077), which in spite of its bias in favour of the Ducases is a valuable history of his time, chiefly on domestic affairs; three Epitaphioi or funeral orations over the patriarchs Cerularius, Lichudes and Xiphilinus. His letters (nearly 500 in number) are also full of details of the period. A complete list of his works is given in Fabricius, Bibliotheca graeca, x. 41 ; the most important have been published by C. Sathas in his MtatuuiuKii fti{i\Lo6r)KT), iv, v. On Psellus himself see Leo AUatius, De Psellis et eorum scriptis (1634); E. Egger in Dictionnaire des sciences philosophiques (1875); A. Rambaud in Revue historique (1877); P. V. Bezobrazov, Michel Psellos (1890; in Russian); C. Neumann, Die Weltstellung des byzantinischen Reiches vor den Krcuzziigen (1894) ; C. Krumbacher, Geschichte der byzantinischen Literatur (1897) ; J. E. Sandys, Hist, of Classical Scholarship (1906), i. 411.

PSEUDO-DIPTERAL (Gr. ˆevSifr, false, Sis, double, and irrepbv, a wing), the term given to a dipteral temple, i.e. in which there are two rows of columns round the naos, the inner row of which has been omitted to give more space for the processions or for shelter (see Temple).

PSEUDONYM (Gr. \ptvocbvvfios, having a false name, \pev8ris, false and ovofia, name), a false or invented name, particularly the fictitious name under which an author produces his work in order to conceal his identity. The same end is gained by publication without any name, i.e. anonymously (Gr. avoivvnos, without a name). The body of works thus pro- duced either without the author's name or under a fictitious name is known as anonymous and pseudonymous literature, and many books have been published affording a key to the identity of the various writers, forming an

important section of bibliography. Though Fredericus Geisler published a short treatise on the subject entitled Larva detracta, &c, in 1669, the chief early work was that of Vincent Placcius (1642-1699) whose Theatrum anonymorum et pseudonymorum was published in 1708, edited by L. F. Vischer with a preface and life by J. A. Fabricius; supplements were published in 171 1 and in 1740. The next important work, only a fragment of the purposed scheme, was that of Adrien Baillet (q.v..), under the title of Auteurs deguisis sous les noms Strangers, &c. (1690). Antoine Alexandre Barbier (q.v.) published his standard work Dictionnaire des ouvrages anonymes et pseudonymes in 1806-1809 (2nd ed., 1822-1827). This was followed by the Supercheries lilteraires devoilees of J. M. Querard (q.v.). The third edition of Barbier's work, embodying Querard and much new matter, was published in 1872-1879. This was edited by P. Gustave Brunet, who published a supple- ment in 1889. Other works in French are those of C. Jolliet, Les Pseudonymes du jour (1867 and 1884), and F. Drujon, Livres dclef(i8&8). Of German works in this sphere of bibliography the Index pseudonymorum, W orterbuch der Pseudonymen of Emil Weller appeared in 1856, of which several supplements were published later. The most monumental of all works are the Deutsches Anonymen-Lexikon, 1501-1850, by M. Holzmann and H. Bohatta (1902-1907), supplement, 185ˆ1908 ˆ909), and the Deutsches Pseudonymen-Lexikon, by the same authors (1 906) . See also F. Sintenis, Die Pseudonyme der neueren deutschen Litter alur (1899), and the supplementary volume (1909), to Meyers's Konversations-Lexikon (6th ed.). The chief Italian work is the Dizionario di opere anonime e pseudonime di scrittori italiani, by G. Melzi (1848-1859), with supplement by G. Passano (1887). The Dutch Vermomde en nadmlooze schrijvers . . . der Nederl. en Vlaamschen letteren, by J. I. van Doorninck (1883-1885), was a second edition of an earlier work. The Academy of Upsala is publishing, under the editorship of L. Bygden, a Swedish dictionary Svenskt anonym och pseudonym lexikon (1898), &c. England was late in entering the field. The first work actually published was the Handbook of Fictitious Names, by R. Thomas (Oiphar Hamst) (1868) . Samuel Halkett, and the successor to his compilations, John Laing, both died before their work was published; edited and revised by Miss C. Laing it appeared in 1882-1888 in 4 vols, as the Dictionary of the Anonymous and Pseudonymous Literature of Great Britain, by S. Halkett and J. Laing. This remains the standard work on the subject in English. Other works are W. Cushing, Initials and Pseudonyms (American and English from the beginning of the 18th century) ; 2nd series (1886, 1888), and Anonyms (1890); F. Marchmont, A Concise Handbook of Literature issued under Pseudonyms or Initials (1896); see also especially W. P. Courtney, The Secrets of our National Literature (1908), the first chapter of which contains a sketch of the history of the subject, to which the above account is mainly due. The anonymous and pseudo- nymous

Latin literature of the middle ages has been treated in modern times by A. Franklin, Dictionnaire des noms, b˚c, latins 1100-1530 (1875), and A. G. Little, Initia operum latinorum saec. 13-15 (1904).

PSEUDO-PERIPTERAL (Gr. ˆevSris, false, irepl, round, ■KTtpbv, a wing), a term in architecture given to a temple in which the columns surrounding the naos have had walls built

between them, so that they become engaged columns, as in the great temple at Agrigentum. In Roman temples, in order to increase the size of the cella, the columns on either side and at the rear became engaged columns, the portico only having isolated columns. (See Temple.)

PSEUDOPOD, Pseudopoditjm, the name given to an ex- tension of -the naked protoplasm of certain Protozoa, notably the Sarcodina (q.v.), for crawling or creeping or for the prehension of food, but not for active swimming (see also Amoeba).

PSILOMELANE, a mineral consisting of hydrous manganese oxide with variable amounts of barium, potassium, &c. It is sometimes considered to be a hydrous manganese manganate, but of doubtful composition. The amount of manganese present corresponds to 70-80% of manganous oxide with 10-15% ˚f " available " oxygen. The mineral is amorphous and occurs as botryoidal and stalactitic masses with a smooth shining surface and submetallic lustre. The name has reference to this char- acteristic appearance, being from the Greek \f/i\6s (naked, smooth) and ixk\as (black); a Latinized form is calvonigrite, and a German name with the same meaning is Schwarzer Glaskopf. Psilomelane is readily distinguished from other hydrous manga- nese oxides (manganite and wad) by its greater hardness (H. = 5ˆ) ; the sp. gr. varies from 3-7 to 4-7. The streak is brownish- black and the fracture smooth. Owing to its amorphous nature, the mineral often contains admixed impurities, such as iron hydrates. It is soluble in hydrochloric acid with evolution of chlorine. It is a common and important ore of manganese, occurring under the same conditions and having the same com- mercial applications as pyrolusite {q.v.). It is found at many localities; amongst those which have yielded typical botryoidal specimens may be mentioned the Restormel iron mine at Lostwithiel in Cornwall, Brendon Hill in Somerset, Hoy in the, Orkneys, Sayn near Coblenz, and Crimora in Augusta county, Virginia. With pyrolusite it is extensively mined in Vermont, Virginia, Arkansas and Nova Scotia.

PSKOV, a government of the lake-region of north-west Russia, which extends from Lake Peipus to the source of the west Dvina, having the governments of St Petersburg and Novgorod on the N., Tver and Smolensk on the E., Vitebsk on the S. and Livonia on the W. It has an area of 17,064 sq. m. In the south-east it extends partly over the Alaun or Vorobiovy heights, which stretch west into Vitebsk and send to the north a series of irregular ranges which occupy the north-western parts of Pskov. A depression 120 m. long and 35 m. broad, drained by the Lovat and the Polista, occupies the interval between these two hilly tracts; it is covered with forests and marshes, the only tracts suitable for human occupation being narrow strips of land along the banks of the rivers, or between the marshes, and no communication is possible except along the watercourses.

With the exception of the south-eastern corner, where Carboni- feious rocks crop out, nearly the whole of the government consists of Devonian strata of great thickness, with deposits of gypsum and white sandstone, the latter extensively quarried for building purposes. The bottom moraine of the Scandinavian and Finnish ice-sheet formerly extended over the whole of this region, and has left behind it numerous ridges {kames or eskers), the upper parts consisting of Glacial sands and post-Glacial clays, sands and peat-bogs. The soil is thus not only infertile, but also badly drained, and only those parts of the territory which are covered with thicker strata of post-Glacial deposits are suitable for agriculture.

The rivers are numerous and belong to three separate basins — to Lakes Peipus and Pskov the rivers in the north-west, to Lake Ilmen those in the middle, and to that of the Dvina the rivers in the south-east. A great number of small streams pour into Lake Pskov, the chief being the Velikaya. The Lovat and the Shelon, belonging to the basin of Lake Ilmen, are both navigable; while the west Dvina flows for 100 m. on the south border of the government or within it, and is used only for floating timber. There are no fewer than 850 lakes in Pskov, with a total area of 391 sq. m. The largest is Lake Pskov, which is 50 m. long and 13 broad, covers 300 sq. m. and has a depth of 3 to 18 ft.; it is

connected by a channel, 40 m. long and 3 to 10 wide, with Lake Peipus. The marshes on the banks of the Polista are nearly 1250 sq..m. in extent. Forests occupy nearly one-third (32%) of the entire area, and in some districts (Kholm, Toropets, Porkhov) as much as two-thirds of the surface. Large pine forests are met with in the north: in other parts the birch and the aspen prevail ; but almost one-quarter of the forest area is overgrown with brushwood.

The climate is very moist and changeable. The average temperature is 41° F. (17-1° in January and 64-8° in July). The population of the government

numbered 1,135,639 in 1897, when there were 584,931 women, and the urban population only 72,623. The estimated population in 1906 was 1,275,300. With the exception of 25,460 Fsthonians (1897), the inhabitants are almost entirely Great Russians. They belong mainly to the Orthodox Greek Church, but the official number of Noncon- formists, 32,066, is far below the mark. There are also about 1 2 ,000 Lutherans and 4000 Roman Catholics. The government is divided into eight districts, the chief towns of which, with their populations in 1897, are Pskov {q.v.), Kholm (5899), Novo- rzhev (2973), Opochka (5658), Ostrov (6252), Porkhov (5573), Toropets (7489) and Velikiye Luki (8481). Between 1875 an d 1896 the peasantry increased their landed possessions by 91%, and the merchants bought considerable areas from the nobles, who altogether sold 43% of their estates. Although the soil is far from fertile, no less than 30% of the total area is under crops and 12% under meadows. The crops principally cultivated are rye, oats, barley, pease, potatoes, flax (for which the govern- ment is famous) and hemp. Grain has to be imported, but oats are exported. Owing to the efforts of the zemstvos, there has been a notable improvement in agriculture, especially in dairy-farming. Fishing in Lake Pskov and the smaller lakes is a source of income. The manufacture of wooden wares for local needs, ship-building, the timber trade, and the weaving of linen and woollens for local requirements are additional sources of income. Flax, flour, tobacco factories, saw-mills, distilleries and breweries are the principal industrial establishments. The population engage also in the preparation of lime, in stone-quarrying, and in the transport of merchandise. (P. A. K.; J. T. Be.)

PSKOV, in German, Pleskau, a town of Russia, capital of the government of the same name and an archiepiscopal see of the Orthodox Greek Church, situated on both banks of the Velikaya River, 9 m. S.E. from Lake Pskov and 170 m. by rail S.W. of St Petersburg. Pop. (1897), 30,424. The chief part of the town, with its kremlin on a hill, occupies the right bank of the river, to which the ruins of its old walls (built in 1266) descend; the Zapskovye stretches along the same bank of the Velikaya below its confluence with the Pskova; and the Zavelichye occupies the left bank of the Velikaya — all three keeping their old historical names. The cathedral in the kremlin has been four times rebuilt since the 12th century, the present edifice dating from 1691-1699, and contains some very old shrines, as also the graves of the bishops of Pskov and of several Pskov princes, including those of Dovmont (d. 1299), and Vsevolod (d. 1138). The church of Dmitriy Solunskiy dates originally from the 12th century; there are others belonging to the 14th and 15th. The Spaso-Mirozhskiy monastery, founded in irs6, and restored in 1890-1903, has many remarkable antiquities. The ruins of numerous rich and populous monasteries in or near the town attest its former wealth and greatness. The

present town is ill-built, chiefly of wood, and shows traces of decay. It has a cadets' school, a normal school for teachers, and a few lower technical schools, an archaeological museum (1903) and some scientific societies. The private collections (coins, antiquities, art works, &c.) of Messrs Pushkin and Sudhov are two of the most remarkable in Russia. The manu- factures are unimportant. Since the completion of the St Petersburg and Warsaw railway the trade of Pskov has increased. Pskov has regular steam communication with Dorpat.

History. — Pskov, formerly the sister republic of Novgorod, and one of the oldest cities of Russia, maintained its indepen- dence and its free institutions until the 16th century, being thus

the last to be brought under the rule of Moscow. It already existed in the time of Rurik (9th century) ; and Nestor mentions under the year 914 that Olga, wife of Igor, prince of Novgorod, was brought from Pleskov {i.e. Pskov). The Velikaya valley and river were from a remote antiquity a channel for the trade of the south of Europe with the Baltic coast. Pskov being an important strategic point, its possession was obstinately dis- puted between the Russians and the Germans and Lithuanians throughout the nth and 12th centuries. At that time the place had its own independent institutions; but it became in the 1 2th century a prigorod of the Novgorod republic — that is a city having its own free institutions, but included in certain respects within the jurisdiction of the metropolis, and compelled in time of war to march against the common enemy. Pskov had, however, its own prince {defensor municipii); and in the second half of the 13th century Prince (Timotheus) Dovmont fortified it so strongly that the town asserted its independence of Novgorod, with which, in 1348, it concluded a treaty wherein the two republics were recognized as equals. Its rule extended over the territory which now forms the districts of Pskov, Ostrov, Opochka, and Gdov (farther north on the east side of Lake Peipus). The vyeche or council of Pskov was sovereign, the councils of the subordinate towns being supreme in their own municipal affairs. The council was supreme in all affairs of general interest, as well as a supreme court of justice, and the princes were elected by it; these last had to defend the city and levied the taxes, which were assessed by twelve citizens. But while Novgorod constantly showed a tendency to become an oligarchy of the wealthier merchants, Pskov figured as a republic in which the influence of the poorer classes prevailed. Its trading associations, supported by those of the working classes, checked the influence of the wealthier merchants.

This struggle continued throughout the 14th and 15th cen- turies. Nothwithstanding these conflicts Pskov was a very wealthy city. Its strong walls, its forty large and wealthy churches, built during this period, its numerous monasteries, and its extensive trade, bear testimony to the wealth of the inhabitants, who then numbered about 60,000. As early as the 13th century Pskov was an important station for the trade between Novgorod and Riga. A century later it became a member of the Hanseatic League. Its merchants and trading associations had factories at Narva, Reval and Riga, and ex- ported flax, corn, tallow, skins, tar, pitch, honey, and timber for ship-building. Silks, woollen stuffs, and all kinds of manu- factured wares were brought back in exchange. In 1399 the prince of Moscow claimed the privilege of confirming the elected prince of Pskov in his rights; and though, fifty years later, Pskov and Novgorod concluded defensive treaties against Moscow, the poorer classes continued to seek at Moscow a protection against the richer citizens. After the fall of Nov- gorod (1475) Pskov was taken (1510) by Basil Ivanovich, prince of Moscow, and a voyvode or deputy was nominated to govern the city. Moscow, at the end of the 17th century, abolished the last vestiges of self-government at Pskov, which thence- forward fell into rapid decay. Near this city the Teutonic knights inflicted a severe defeat upon the Russians in 1502. Pskov became a stronghold of Russia against Poland, and was besieged (1581) for seven months by Stephen Bathory during the LivonianWar, and in 1615 by Gustavus Adolphusof Sweden. Under Peter the Great it became a fortified camp.

(P. A. K. ; J. T. Be.)

PSORIASIS, a skin affection characterized by the occurrence of flat dry patches of varying size covered with silvery white scales. Next to eczema and ringworm it is one of the most commonly found skin diseases. It occurs frequently during infancy and early adult life, and rarely begins after the age of fifty. Though a parasitic origin has been suggested, no bac- teriological factor has yet been found, and it has been demon- strated that psoriasis may follow on nervous shock, gout, mental emotion and insufficient nourishment. It may also follow an attack of scarlet fever or erysipelas. The site of the disease may be determined by an abrasion or other injury of the skin,

or even an irritation caused by friction of the clothing. The favourite starting point of the lesion is either the elbows or the fronts of the knees. It is nearly always symmetrical in its distribution, and spreads over the trunk and the extensor surfaces of the limbs, in contrast to eczema, which selects the flexor surfaces. The hairy scalp may also be affected. The eruption generally first shows itself as one or more papules, at first red and spreading, and later white from the formation of scales and red at the

spreading margin, where it is surrounded by a hyperaemic zone. On removing the scales is seen a smooth hyperaemic zone dotted with red spots. The patches spread centrifugally and may remain stationary for a long time or coalesce with other patches and cover large areas of skin. In some cases involution of the central portion accompanies the spreading of the patch, and large concentric rings are formed. The lesions may persist for years, or spontaneously disappear, leaving behind a slight brown stain. The symptoms are usually slight and there is little or no irritation or itching, and no pain except in a form which is associated with osteo-arthritis. The disease, though of noted chronicity, is subject to sudden ex-acerbations, and may reappear at intervals after it has com- pletely disappeared. It has little or no effect upon the general health. Several forms have been described, viz. the simple uncomplicated, the nervous, the osteo-arthritic, and the seborrhoeic. Varieties have also been named according to the character of the patches, such as psoriasis punctata, guttata, circinata or nummularis, or when large areas are involved and the skin is harsh, dry and cracked, it is known as psoriasis inveterata. The pathological changes taking place in the skin have been described as an inflammation of the papillae and corium, with a down-growth of the stratum mucosum between the papillae and an increase of the horny layer (keratosis). This latter, however, has been said to be due to the formation in it of tiny dry abscesses. The silvery appearance of the scales is due to the inclusion of air globules within them. The treatment is hygienic, constitutional and local. The clothing must be regulated so as to prevent undue perspiration or irritation or chafing of the skin. The most effective local application is chrysarobin used as an ointment. A bath of hot water and soap should first be given, or an alkaline bath, in order to remove all the scales; the ointment is then applied, but must be used over a small area at a time, as it is apt to set up dermatitis. Tarry applications, such as unguentum picis liquidae, creosote ointment or liquor carbonis detergens, are also useful; and radio-therapy has caused a rapid removal of the lesions, but neither it nor the ointment has prevented subsequent recur- rence. In chronic cases the sulphur-water baths of Harrogate, Aix-les-Bains and Aachen have been successful. The internal administration of small doses of vinum antimoniale, in acute cases, or of arsenic (in gradually increasing doses of the liquor arsenicalis) in chronic cases, is undoubtedly beneficial.

PSOROSPERMIASIS, the medical term for a disease caused by the animal parasites known as psorosperms or gregarinidae, found in the liver, kidneys and ureters.

PSYCHE {foxy), i n Greek mythology, the personification of the human soul. The story of the love of Eros (Cupid) for Psyche is a philosophical allegory, founded upon the Platonic conception of the soul. In this connexion Psyche was repre- sented in Greek and Graeco-Roman art as a

tender maiden, with bird's or butterfly's wings, or simply as a butterfly. Sometimes she is pursued and tormented by Eros, sometimes she revenges herself upon him, sometimes she embraces him in fondest affection. The tale of Cupid and Psyche, in the Metamorphoses of Apuleius, has nothing in common with this conception but the name. In it Psyche, the youngest daughter of a king, arouses the jealousy of Venus, who orders Cupid to inspire her with love for the most despicable of men. Cupid, however, falls in love with her himself, and carries her off to a secluded spot, where he visits her by night, unseen and unrecognized by her. Persuaded by her sisters that her companion is a hideous monster, and forgetful of his warning, she lights a lamp to look upon him while he is asleep; in her ecstasy at his beauty

she lets fall a drop of burning oil upon the face of Cupid, who awakes and disappears. Wandering over the earth in search of him, Psyche falls into the hands of Venus, who forces her to undertake the most difficult tasks. The last and most dangerous of these is to fetch from the world below the box containing the ointment of beauty. She secures the box, but on her way back opens it and is stupefied by the vapour. She is only restored to her senses by contact with the arrow of Cupid, at whose entreaty Jupiter makes her immortal and bestows her in marriage upon her lover. The meaning of the allegory is obvious. Psyche, as the personification of the soul, is only permitted to enjoy her happiness so long as she abstains from ill-advised curiosity. The desire to pry into its nature brings suffering upon her; but in the end, purified by what she has undergone, she is restored to her former condition of bliss by the mighty power of love.

On this story see L. Friedlander, " Ueber das Marchen von Amor und Psyche " (in Darstellungen aus der Sittengeschichte Roms, 1888, vol. i. ; for a treatment of the Greek conception, see E. Rohde, Psyche, 1894). For Psyche in art see A. Conze, De Psyches imagi- nibus quibusdam (1855); Max Collignon, Essai sur les monuments grecs et romains relatifs au mythe de Psyche (1877).

PSYCHICAL RESEARCH, a term which may be defined, partially, as an examination into the amount of truth contained in world-wide superstitions. Thus when Saul disguised himself before his seance with the witch of Endor, and when Croesus scientifically tested the oracles of Greece (finding clairvoyance or lucidite in the Delphic Pythoness), Saul and Croesus were psychical researchers. A more systematic student was the Neoplatonist philosopher Porphyry. In his letter to Anebo, answered in Ilept

fivarripLciiv by Iamblichus (?) we find Porphyry concerned with the usual alleged phenomena — prophecy; the power of walking through fire unharmed; the movements of inanimate objects, untouched; the "levitation" of "mediums"; apparitions of spirits, their replies to questions, the falsehood of those replies; and so forth. Similar phenomena fill the lives of the saints and the records of witch trials. Apparitions, especially of the dying or the dead; the stereotyped disturb- ances in haunted houses; and the miraculous healing of diseases, are current in classical and medieval records. The exhibition of remote or even future events, to gazers in mirrors, crystals, vessels full of water, or drops of ink or blood, is equally notorious in classical, Oriental, medieval and modern litera- ture; while the whole range of these phenomena is found in Chinese, Japanese, Hindu, ancient American, Red Indian and savage belief.

At various periods, and in proportion to the scientific methods of the ages, attempts have been made to examine these things scientifically. St Augustine wrote on the whole topic with remarkable acuteness and considerable scepticism; his treat- ment of miracles of healing is especially noteworthy. After Petrus Thyraeus (1546-1601), S. J. Wierus, Ludwig Lavater (1527-1586), and other authors of the 16th century, came the labours of Glanvill, Henry More, Richard Baxter, Boyle, Cotton Mather, and others in England and America, during and after the Restoration. Attempts were made to get first-hand evidences and Glanvill investigated the knocking drummer of Tedworth in situ (1663). The disturbances in the house of the Wesleys at Ep worth (17 16 and later) were famous, and have copious contemporary record. David Hume believed himself to have settled questions which, when revived by the case of Sweden- borg and the experiments of Mesmer and his pupils, puzzled and interested Kant. The influence of Mesmer has never died out; the fact of "animal magnetism" (with such examples as the" divining rod," and the phenomena in general) was accepted in his manner, and explained, by Hegel. The researches of Braid (e. 1840- 18 50) gave a new name, " hypnotism," to what had been called "mesmerism" or "animal magnetism"; a name conveying no theory of " magnetic " or other " fluids." " Mesmerism " implies a theory of " emanations " from the operator to the patient ; " hypnotism " implies no such hypo- thesis. In the middle of the 19th century Dr Gregory and Dr Mayo published their entertaining but unsystematic works,

Animal Magnetism and The Truths in Popular Superstitions respectively. Esdaile and Elliotson were practical pioneers in the medical use of induced sleep or somnambulism. For their ideas and experiments The Zoist may be consulted. The epidemic of " spiritualism " and of " turning tables " then invaded Europe from America, and was discussed by Dr Car- penter, Faraday, Gasparin, De Morgan and many others. The adventures of Daniel Dunglas Home excited all Europe, and his effects were studied by Sir

William Crookes with especial attention. Home disappeared after a lawsuit; his successes remain an unsolved enigma. Believers explained them by the agency of the spirits of the dead, the old savage theory. He had many followers, most of whom, if not all, were detected in vulgar impostures. Of the books of this period those of Mr Richard Dale Owen (1810-1890) are the most curious, but exact method was still to seek.

In 1882 the Society for Psychical Research, under the presi- dency of Henry Sidgwick, professor of moral philosophy in the university of Cambridge, was founded expressly for the purpose of introducing scientific method into the study of the " debateable phenomena." Other early members were Edmund Gurney, F. W. H. Myers, Andrew Lang, Professor Barrett, Mrs Sidgwick, F. Podmore, Lord Tennyson, Lord Rayleigh and Professor Adams; while among presidents were Professor Balfour Stewart, A. J. Balfour, Professor William James of Harvard and Sir William Crookes. The society has published many volumes of Proceedings. In France and in Germany and Italy many men of distinguished scientific position have examined the Italian " medium " Eusapia Palladino, and have contributed experiments, chiefly in the field of hypnotism and " telepathy." Hypnotism has been introduced into official experimental psychology and medicine with some success.

It is plain that the range of psychical research is almost unlimited. It impinges on anthropology (with its study of the savage theory of spirits — animism — and of diabolical possession), and on the usual province of psychology, in the problems of the hallucinations both of morbid patients and of people in normal mental health. The whole topic of the unconscious or subconscious self is made matter not of mere metaphysical speculation (as by Kant and Hamilton), but of exact observa- tion, and, by aid of hypnotism and automatism, of direct experiment. The six original committees of the society undertook the following themes: —

1. An examination of the nature and extent of any influence

which may be exerted by one mind upon another, apart from any generally recognized mode of perception.

2. The study of hypnotism and the forms of so-called mesmeric

trance, clairvoyance and other allied phenomena.

3. A critical revision of Reichenbach's researches into certain

organizations called " sensitive."

4. A careful investigation of any reports, resting on strong

testimony, regarding apparitions at the moment of death or otherwise, or regarding disturbances in houses reputed to be haunted.

5. An inquiry into the various physical phenomena commonly

called spiritualistic, with an attempt to discover their causes and general laws.

6. The collection and collation of existing materials bearing

on the history of these subjects. To these themes we might now add the study of "crystal- gazing," and of the hallucinatory visions which a fair percentage of people observe when staring into any clear deep, usually a glass ball; but ink (with some experimenters) does as well, or a glass water-jug. Of these themes, the third has practically led to nothing. The experiments of Reichenbach on the per- ception of flames issuing from magnets have not been verified. The collection of historical examples, again (6), has not been much pursued by the society, except in Mr Gurney's studies of witchcraft in Phantasms of the Living, by himself, Mr Podmore and Mr Myers. On the other hand, a vast number of experi- ments were made in " thought transference." (1) Diagrams drawn by A were reproduced by B; cards thought of, numbers

and so forth were also reproduced in conditions that appeared to make the normal transference of the idea by sound, sight or touch impossible, and to put chance coincidence out of court. In one or two instances collusion was detected ingeniously. In others two explanatory theories have been broached. People may accidentally coincide in their choice of diagrams, or the " unconscious whispering " of a person fixing his mind hard on a number, card or what not may be heard or seen. But coin- cidence in diagrams does not apply when a ship, dumb-bells, a candlestick or a cat is drawn by both experimenters; nor can " unconscious whispering " be heard or seen when the experi- menters are in different rooms. On the whole, the inquirers convinced themselves that one mind or brain may influence another mind or brain through no recognized channel of sense. This is, of course, an old idea (see Walton's Life of Donne, and his theory of the appsarance of Mrs Donne, with a dead baby, to Dr Donne in Paris). The method of communication remains a problem. Are there " brain waves," analogous to the X-rays, from brain to recipient brain, or does mind touch mind in some unheard-of way? The former appears to be the hypothesis preferred by Sir William Crookes and Professor Flournoy {Des Indes a la

planete Mars, pp. 363-365). On this showing there is nothing " supranormal " in " telepathy," as it is called. The latter theory of " a purely spiritual communication " is argued for by Mr Myers {Proceedings of the Society for Psychical Research, xv. 407-410). If we accept telepathy as experi- mentally demonstrated, and regard it as a physical process, we reduce (4), " apparitions at the moment of death or other- wise," to a normal though not very usual fact. Everyone would admit this in the case of mere empty hallucinations. A, in Paisley, sees P, in London, present in his room. P is neither dying nor in any other crisis, and A is, as both continue to be, in his normal health. Such experiences are by no means very uncommon, when there is nothing to suggest that P has exercised any telepathic influence on A. On the other hand, in Phantasms of the Living, and in the report on the Census of Hallucinations {Proceedings, vol. x.), the society has published large numbers of " coincidental " hallucinations, the appearance of P to A coinciding with the death or other crisis of the distant P. That such " wraiths " do occur is the popular and savage belief . But, it may be urged, many hallucinations occur and many deaths. People only remember the hallucinations which happened, or were made by erroneous reckoning to seem to happen, coin- cidentally with the decease of the person seen. This is not quite true, for a hallucination so vivid as to betaken for a real person and addressed as such is not easily forgotten by a sober citizen, even if " nothing happened " afterwards. None the less, the coincidental hallucinations have certainly a better chance of being remembered, while fancy is apt to exaggerate the closeness of the coincidence. Nothing can demonstrate that coincidences between death and hallucination occur more frequently than by the doctrine of chance they ought to do, except a census of the whole population. In the present indifference of govern- ment to psychical science no party is likely to institute such a census, and even if it were done, the frivolity of mankind would throw doubt on the statistics. It would be necessary to cross-examine each " percipient," and to ask for documentary or other corroborative evidence in each case.

The Society for Psychical Research collected statistics in proportion to its resources. More than 17,000 answers were received to questions rather widely circulated. The affirmative respondents were examined closely, their mental and physical health and circumstances inquired into, and collectors of evidence were especially enjoined to avoid selecting persons known to be likely to return affirmative replies. There were 80 cases at first hand in which the death of the person seen coincided, within twelve hours, with the visual hallucination of his or her presence, out of 352 instances of such hallucinations. By way of arriving at the true proportions, the hallucinations which coincided with nothing were multiplied by four. In this way allowance was made for obliviousness of non-coincidental

hallucinations. The verdict of the committee was that, on the xxn. 18

evidence before them, hallucinations coincided with deaths in a ratio of 440 times more than was to be expected by the law of probabilities. The committee came to the conclusion that a relation of cause and effect does exist between the death of A and the vision of A beheld by P. The hallucination is apparently caused from without by some unexplained action of the mind or brain of A on the brain or mind of P. This effect is also traced, where death does not occur, for example, in the many instances of false " arrivals." A is on his way to X, or is dream- ing that he is on his way, and is seen at X by P, or by P, Q and R, as may happen. These cases are common, and were explained in Celtic philosophy by the theory of the " Co- Walker," a kind of " astral body." The facts are accounted for in the same way by Scandinavian popular philosophy. Possibly in many instances such hallucinations are the result of expectancy in the beholder. Yet if we go out to shoot or fish, excepting to encounter grouse or salmon, we do not usually see grouse or salmon if they are not there ! Where the arrival is not expected, this explanation fails. In "second sight," even among savages, these occurrences are not infrequent, and doubtless admit of an explanation by telepathy. In two instances, known at first hand to the present writer, persons dreamed, at a. distance, that they entered their own homes. In one the person was seen, in the other distinctly heard, by the inmates of his or her house. In several of these examples knocks are heard, as in spiritualist seances. In fact, if we accept the evidence, living but remote persons may, unconsciously, produce effects of sounds and of phantasms exactly like those which popular belief ascribes to the spirits of the dead.

If we admit the evidence, of which a great body exists, and if we attribute the phenomena to telepathy, curious inferences may be drawn. Thus if the phenomena are such as only the spirits of the dead could be credited with producing — if the dead were frequently recognized by various good witnesses — • it would follow (on the hypothesis of telepathy) that telepathy is not a physical process caused by material waves or rays from living brain to brain, the dead having no brains in working order. On the other hand, if living brains may thus affect each other, a subjective hallucination experienced by the living A may conceivably be " wired on" to the living P. Thus A, in a given house, may have a mere subjective hallucination of the presence of the dead B, and may, unconsciously, infect with that hallu- cination other persons who come to the house. Thus once admit that any living brain may infect any other, and it becomes practically impossible for a spirit of the dead to prove his identity. Any information which he may give in any way must either be known to living people, however remote, or unknown. If known to a living person, he may, unconsciously, " wire it on " to the seer. If wholly unknown to everybody,

the veracity of the information cannot be demonstrated, except later, if it refers to the unknown future. Thus the theory of telepathy, with a little good will, puts the existence and activity of the souls of the dead beyond possibility of proof.

These remarks apply to the researches of the society into alleged isolated phantasms of the dead, and into " haunted houses." As to the former cases, it is admitted on all hands that sane and sober people may have subjective hallucinations of the presence of living friends, not dying or in any other crisis. Obviously then, the appearance of a dead person may equally be an empty hallucination. Thus, a member of the House of Commons, standing at the entrance of a certain committee-room, saw another member, of peculiar aspect and gait, pass him and enter the room, his favourite haunt. Several hours passed before the percipient suddenly recollected that the other member had been dead for some months. Even superstition cannot argue that this appearance was a ghost. In the same way Hawthorne, the celebrated novelist, frequently, he has written, saw a dead club-man in his club. But suppose, for the sake of argument, that at intervals members of the house kept seeing such appear- ances of dead members of parliament, and suppose that they had never seen the prototypes in their lifetime, but yet correctly described them: then it might be said that their hallucinations

had merely been " wired on " from the brain of some living member of parliament who knew the deceased.

Thus telepathy cuts two ways. It is, if accepted, a singular discovery, but it throws an enormous burden of proof on a " ghost " who wants to establish his identity. In the same way telepathy cuts at the root of " clairvoyance," or lucid view of events remote in space or distant in time. The vision may have been " wired on " telepathically by a living person who knew the remote event. The " supranormal " can only be proved if the information conveyed by the hallucination is verified in the future, or is proved by the finding of documents . not known to exist at the time of the hallucination, but after- wards discovered. A curious possible instance was the dis- covery in 1856 of a MS. inventory of the jewels of Mary Stuart (1566), verifying in some degree a clairvoyant vision about the jewels published some years earlier (see " Queen Mary's Jewels " in the writer's Book of Dreams and Ghosts). For the same reasons the information nominally given by " spirits " of the dead through the mouth or by the automatic writing of Mrs Piper

(Boston, U.S.) and other mediums may be explained by tele- pathy from the living who know the facts. This theory was rejected, for example, in the case of Mrs Piper, by Myers and Dr Richard Hodgson, who devoted much time to the examina- tion of the lady (see Proceedings, vols, vi., viii., xiii., xiv., with criticisms by Mrs Sidgwick and the present writer in vol. xv. pt. xxxvi). In the late Dr Hodgson's opinion, the dead do communicate through the automatic writing or speaking of Mrs Piper. The published evidence (much is unpublished) does not seem to justify the conclusion, which is not accepted by Mrs Piper herself! Dr J. H. Hyslop has published enormous and minute reports on Mrs Piper, convincing to himself but not to most readers.

This leads us to the chief field of research in " automatisms," or actions of the subconscious or " subliminal " self. The proto- type of such things is found in the performances of natural somnambulists, who in all ages have seemed to exhibit faculties beyond their power when in a normal condition. The experi- ments of Mesmer, and of those who followed in his track, down to the psychologists of to-day, proved (what had long been known to savages and conjurers) that a state of somnambulism could be induced from without. Moreover, it is proved that certain persons can, as it were, hypnotize themselves, even unwittingly, and pass into trance. In these secondary conditions of trance, such persons are not only amenable to " suggestion, " but occasionally evolve what are called secondary personalities: they speak in voices not their own, and exhibit traits of character not theirs, but in harmony with the impersonation. The popular, savage and ancient theory of these phenomena was that the people thus affected were inspired by a god or spirit, or " possessed " by a demon or a dead man. Science now regards the gods or demons or spirits as mere exhibi- tions of the secondary personality, which wakens when the normal personality slumbers. The knowledge and faculties of the secondary personality, far exceeding those exhibited in the normal state, are explained to a great extent by the patient's command, when in the secondary state, of resources latent in the memory. The same explanation is offered for other pheno- mena, like those of automatic writing, knocking out answers by tilting tables, or discovering objects by aid of the " divining rod." The muscular actions that tilt the table, or wag the rod, or direct the pencil or planchette, are unconsciously made, and reveal the latent stores of subconscious knowledge, so that a man writes or knocks out information which he possessed, but did not suspect himself of possessing. These processes were familiar to the Neoplatonists, and in one form or other are practised by Chinese, Tibetans, Negroes, Malayans and Melan- esians. A similar kind of automatism is revealed in the inspira- tions of genius, which often astonish the author or artist himself. An interesting example has been studied by Myers in the feats of arithmetic recorded about " calculating

boys," who are usually unconscious of their methods. The whole of this vast field of the unconscious, or subconscious, or subliminal self has

been especially examined by Myers, and by such psychologists as Ribot, Janet, Richet, Flournoy and many others.

The general result is a normal explanation, not yet complete, of the phenomena hitherto attributed to witchcraft, inspiration, possession, and so forth. Probably the devils, saints, angels and spirits who have communicated with witches, living saints, demoniacs and visionaries are mere hallucinatory reflections from the subconscious self, endowed with its store of latent memories and strangely acute percipient faculties. Thus a curious chapter of human history is at last within possible reach of explanation. Men regard phenomena as " supranormal " or " supernatural," or reject them altogether, till their modus is explained. But it would not be candid to say that the explana- tion is complete, or nearly complete. The nature of the hyp- notic trance itself remains a matter of dispute. The knowledge automatically revealed can by no means always be accounted for, either by latent memory or by the sharpening of the normal faculties of perception, while the limits of telepathy (if it be accepted) are vaguely conjectured. Even the results of simple experiments in " crystal-gazing " are often very perplexing. Further experiment may reveal some normal explanation, while scepticism (which seldom takes the trouble to examine the alleged facts with any care) can always repose on a theory of malobservation and imposture. These, of course, are verae causae, while in this, as in all provinces of human evidence, bad memories and unconscious errors distort the testimony. Psychical research encourages, or ought to encourage, the cool impartiality in examining, collecting and recording facts, which is usually absent, in greater or less degree, from the work even of eminent historians. Men of equal honesty and acuteness may believe or disbelieve in the innocence of Mary Queen of Scots, or in the " spirits " which control Mrs Piper. As to alleged " physical phenomena " of unknown cause, one, the power of passing without lesion with naked feet over fire, has recently been attested by numerous competent observers and experimenters in the ritual of Fijians and other South Sea Islanders, Japanese, Bulgarians, natives of southern India and other races. (The evidence has been collected by the present writer in Proceedings S.P. R. vol. xv. pt. xxxvi. pp. 2-15. Compare a case examined and explained more or less by S. P. Langley, Nature, August 22, 1901.) The much more famous tales of movements of objects untouched have been carefully examined, and perhaps in no instance have professional per- formers proved innocent of fraud. Yet the best known living medium, Eusapia Palladino, though exposed at Cambridge, has been rehabilitated, after later experiments, in the opinion of many distinguished Continental observers, who entirely disbelieve in the old theory, the action of " spirits," and venture no other

hypothesis.

The results of psychical research, after several years of work, are not really less than could be expected from toil in a field so difficult. The theory of alternating, or secondary, personalities is the key, as we have said, to a strange chapter in " the history of human error." The provisional hypothesis of telepathy puts a meaning into the innumerable tales of " wraiths " and of " second sight." It is never waste of time to investigate the area of human faculty; and practical results, in the medical treatment of abnormal intellectual conditions, have already been obtained. The conduct of our witch-burning ancestors now becomes intelligible, a step on the way to being pardonable. With their methods and inherited prejudices they could scarcely have reasoned otherwise than they did in certain cases of hysteria and autohypnotization. Many " miracles " of healing and of " stigmatization " become credible when verified in modern experience and explained by "suggestion"; though to "ex- plain the explanation " is a task for the future. Such as it is, the theory was accepted by St Francis de Sales in the case of St Theresa. Results of wider range and of more momentous interest may yet be obtained. The science of electrical pheno- mena was not developed in a quarter of a century, and it would be premature to ask more from psychical research than it has achieved in a short period. The subject is not readily capable

of exact experiment, human faculty being, as it were, capricious, when compared with ordinary physical processes. Imposture, conscious or unconscious, is also an element of difficulty. But already phenomena which are copiously reported throughout the whole course of history have been proved to possess an actual basis in fact, have been classified, and to some extent have been explained. Even if no light is ever to be cast on spiritual problems, at least the field of psychology has been extended.

The literature of psychical research is already considerable, and a complete bibliography would occupy much space. Readers who care to pursue the study will find their best guide in the Proceedings of the Society {or Psychical Research, which contains a catalogue of the society's collection, including the Gurney Library (hypnotism), with reviews of modern books in many languages — French, German, Italian, Russian— as they appear. Among modern English books may be recommended Phantasms of the Living, by Gurney, Podmore and Myers ; Studies in Psychical Research, by

Podmore, with his Apparitions and Thought-Transference; and Principles of Psychology, by Professor William James, of Harvard. The historical side of the subject, especially as regards the beliefs of savages and of classical antiquity, may be studied in E. B. Tylor's Primitive Culture (under " Animism "), in Myers's Classical Essays (under " Greek Oracles "), and A. Lang's Cock Lane and Common Sense, and Making of Religion. Myers's work, Human Personality, contains vast collections of facts, with a provisional theory. Myers's regretted death prevented him from finally revising his book, which contains certain inconsistencies. It is plain that he tended more and more to the belief in the " invasion " and " possession " of living human organisms by spirits of the dead. The same tendency marks an article on " Psychical Research," by Sir Oliver Lodge, in Harper's Magazine (August 1908). Other students can find, in the evidence cited, no warrant for this return to the " palaeolithic psychology " of " invasion " and " possession." Th. Flournoy's Des Indes a la planet Mars is a penetrating study of pseudo-spiritual " messages." A criticism making against the notion of telepathy may be found in Herr Parish's Hallucinations and Illusions (Eng. trans.). Some errors and confusions in this work (due in part to the expansion of the original text) are noted in A. Lang's Making of Religion, appendix A. Such topics as Telepathy, Crystal-Gazing, Hypnotism, Second Sight, the Poltergeist, &c, are dealt with under separate articles in this work. (A. L.)*

PSYCHOLOGY (tpvxh, the mind or soul, and X670S, theory), the science of mind, which can only be more strictly denned by an analysis of what " mind " means.

1. In the several natural sciences the scope and subject-matter

of each are so evident that little preliminary discussion is called

for. But with psychology, however much it is freed The Science . . .

ofMind." lrom metaphysics, this is different. It is indeed

ordinarily assumed that its subject-matter can be at once defined. " It is what you can perceive by consciousness or reflection or the internal sense, " says one, " just as the subject- matter of optics is what you can perceive by sight." Or, " psychology is the science of the phenomena of mind," we are told again, " and is thus marked off from the physical sciences, which treat only of the phenomena of matter." But, whereas nothing is simpler than to distinguish between seeing and hear- ing, or between the phenomena of heat and the phenomena of gravitation, a very little reflection may convince us that we cannot in the same fashion distinguish internal from external sense, or make clear to ourselves what we mean by

phenomena of mind as distinct from phenomena of matter.

To every sense there corresponds a sense-organ; the several senses are distinct and independent, so that no one sense can add Internal and' or a '*- er the materials of another: the possession External °^ ^ ve senses – e S furnishing no data as to the character of a possible sixth. Moreover, sense-impressions are passively received and occur in the first instance without regard to the feeling or volition of the recipient and without any manner of relation to the " contents of consciousness " at the moment. Now such a description will apply but very partially to the so-called " internal sense." For we do not by means of it passively receive impressions differing from all previous presenta- tions, as the sensations of colour for one " couched " differ from all he has experienced before: the new facts consist rather in the recognition of certain relations among pre-existing presentations, i.e. are due to our mental activity and not to a special mode of what has been called our sensitivity. For when we taste we cannot hear that we taste, when we see we cannot smell that we see; but when we taste we may be conscious that we taste, when we hear we may be conscious that we hear. Moreover, the facts so ascertained are never independent of feeling and volition and of the contents of*

consciousness at the time, as true sensations are. Also if we consult the physiologist we learn that there is no evidence of any organ or " centre " that could be regarded as the " physical basis " of this inner sense ; and, if self-consciousness alone is temporarily in abey- ance and a man merely " beside himself," such state of delirium has little analogy to the functional blindness or deafness that constitutes the temporary suspension of sight or hearing.

To the concept of an internal perception or observation the preceding objections do not necessarily apply — that is to say, this concept may be so defined that they need not. But then in propor- tion as we escape the change of assuming a special sense which furnishes the material for such perception or observation, in that same proportion are we compelled to seek for some other mode of distinguishing its subject-matter. For, so far as the mere mental activity of perceiving or observing is concerned, it is not easy to see any essential difference in the process whether what is observed be psychical or physical. It is quite true that the so-called psycho- logical observation is more difficult, because the facts observed are often less definite and less persistent, and admit less of actual isolation than physical facts do; but the process of recognizing similarities or differences, the dangers of mal-observation or non- observation, are not materially altered on that account. It may be further allowed that there is one difficulty peculiarly felt in psychological observation, the one most inaccurately expressed by saying that here the observer and the observed are one. But

this difficulty is surely in the first instance due to the very obvious fact that our powers of attention are limited, so that we cannot alter the distribution of attention at any moment without altering the contents of consciousness at that moment. Accordingly, where there are no other ways of surmounting this difficulty, the psycho- logical observer must either trust to representations at a later time, or he must acquire the power of taking momentary glances at the psychological aspects of the phase of consciousness in question. And this one with any aptitude for such studies can do with so slight a diversion of attention as not to disturb very seriously either the given state or that which immediately succeeds it. But very similar difficulties have to be similarly met by physical observers in certain special cases, as, e.g. in observing and registering the phe- nomena of solar eclipse ; and similar aptitudes in the distribution of attention have to be acquired, say, by extempore orators or skilful surgeons. Just as little, then, as there is anything that we can with propriety call an inner sense, just so little can we find in the process of inner perception any satisfactory characteristic of the subject- matter of psychology. The question still is: What is it that is perceived or observed ? and the readiest answer of course is: Internal experience as distinguished from external, whatj takes place in the mind as distinct from what takes place without.

*This answer, it must be at once allowed, is adequate for most purposes, and a great deal of excellent psychological work has been done without ever calling it in question. But the distinction between internal and external experience is not one that can be drawn from the standpoint of psychology, at least not at the outset. From this standpoint it appears to be either (1) inaccurate or (2) not extra-psychological. As to (1), the boundary between the internal and the external was, no doubt, originally the surface of the body, with'*which the subject or self was identified ; and in this sense the terms are of course correctly used. For a thing may, in the same sense of the word, be in one space and therefore not in — i.e. out of — another; but we express no intelligible relation if we speak of two things as being one in a given room and the other in last week. Any one is at liberty to say if he choose that a certain thing is "in his mind "; but if in this way he distinguishes it from something else not in his mind, then to be intelligible this must imply one of two statements — either that the something else is actually or possibly in some other mind, or, his own mind being alone considered, that at the time the something else does not exist at all. Yet, evident as it seems that the correlatives in and not-in must apply to the same category, whether space, time, presentation (or non-presenta- tion) to a given subject, and so forth, we still' find psychologists more or less consciously confused between " internal," meaning " presented " in the psychological sense, and " external," meaning not " not-presented " but corporeal or oftener extra-corporeal. But (2), when used to distinguish*

between presentations (some of which, or some relations of which with respect to others, are called " internal," and others or other relations, " external "), these terms are at all events accurate; only then they cease to mark off the psychological from the extra-psychological, inasmuch as psychology has to analyse this distinction and to exhibit the steps by which it has come about. But we have still to examine whether the distinc- tion of phenomena of Matter and phenomena of Mind furnishes a better dividing line than the distinction of internal and external.

A phenomenon, as commonly understood, is what is manifest, sensible, evident, the implication being that there are eyes to see, ears to hear, and so forth — in other words, that there is „ . . presentation to a subject ; and wherever there is presenta- ea a . tion to a subject it will be allowed that we are in t \ ie " laienal – domain of psychology. But in talking of physical phenomena we, in a way, abstract from this fact of presentation. Though consciousness should cease, the physicist would consider the sum

total of objects to remain the same: the orange would still be round, yellow and fragrant as before. For the physicist — whether aware of it or not — has taken up a position which for the present may be described by saying that phenomenon with him means appearance or manifestation, or — as we had better say — object, not for a concrete individual, but rather for what Kant called Bewusstsein iiberhaupt, or, as some render it, the objective conscious- ness, i.e. for an imaginary subject freed from all the limitations of actual subjects save that of depending on " sensibility " for the material of experience. However, this is not all, for, as we shall see presently, the psychologist also occupies this position; at least if he does not his is not a true science. But, further, the physicist leaves out of sight altogether the facts of attention, feeling, and so forth, all of which actual presentation entails. From the psycho- logical point of view, on the other hand, the removal of the subject removes not only all such facts as attention and feeling, but all presentation or possibility of presentation whatever. Surely, then, to call a certain object, when we abstract from its presentation, a material phenomenon, and to call the actual presentation of this object a mental phenomenon, is a clumsy and confusing way of representing the difference between the two points of view. For the terms " material " and " mental " seem to imply that the two so-called phenomena have nothing in common, whereas the same object is involved in both, while the term " phenomenon " implies that the point of view is in each

case the same, when in truth what is emphasized by the one the other ignores.

2. Paradoxical though it may be, we must then conclude that psychology cannot be denned by reference to a special subject- Standpoiat matter as such concrete sciences, for example, as of Psycho- mineralogy and botany can be; and, since it deals in logy. some sort with the whole of experience, it is obviously

not an abstract science in any ordinary sense of that term. To be characterized at all, therefore, apart from metaphysical assump- tions, it must be characterized by the standpoint from which this experience is viewed. It is by way of expressing this that widely different schools of psychology define it as subjective, all other positive sciences being distinguished as objective. But this seems scarcely more than a first approximation to the truth, and, as we have seen incidentally, is apt to be misleading. The distinction rather is that the standpoint of psychology is what is sometimes termed " individualistic," that of the so-called object-sciences beiAg " universalistic," both alike being objective in the sense of being true for all, consisting of what Kant would call judgments of experience. For psychology is not a biography in any sense, still less a biography dealing with idiosyncrasies, and in an idiom having an interest and a meaning for one subject only, and incommunicable to any other. Locke, Berkeley and Hume have been severely handled because they regarded the critical investigation of knowledge as a psychological problem, and set to work to study the individual mind simply for the sake of this problem. But none the less their standpoint was the proper one for the science of psychology itself; and, however surely their philosophy was foredoomed to a collapse, there is no denying a steady psychological advance as we pass from Locke to Hume and his modern representatives. By " idea " Locke tells us he means " Whatsoever is the object of the understanding when a man thinks " (i.e. is conscious), and having, as it were, shut himself within such a circle of ideas he finds himself powerless to explain his knowledge of a world that is assumed to be independent of it; but he is able to give a very good account of some of these ideas themselves. He cannot justify his belief in" the world of things whence certain of his simple ideas " were conveyed " any more than Robinson Crusoe could have explored the continents whose products were drifted to his desert island, though he might perhaps survey the island itself well enough. Berkeley accordingly, as Professor Fraser happily puts it, abolished Locke's hypothetical outer circle. Thereby he made the psychological standpoint clearer than ever — hence the truth of Hume's remark, that Berkeley's argu- ments " admit of no answer "; at the same time the epistemo- logical problem was as hopeless as before — hence again the truth of Hume's remark that those arguments " produced no con- viction."

Of all the facts with which he deals, the psychologist may truly say that their esse is percipi, inasmuch as all his facts are facts of presentation, are ideas in Locke's sense, or objects which imply a subject. Before we became conscious there was no world for us; should our consciousness cease, the world for us

ceases too ; had we been born blind, the world would for us have had no colour; if deaf, it would have had no sounds; if idiotic, it would have had no meaning. Psychology, then, never transcends the limits of the individual. But now, though this Berkeleyan standpoint is the standpoint of psychology, psychology is not pledged to the method employed by Berkeley and by Locke. Psychology may be individualistic without being confined exclusively to the introspective method. There is nothing to hinder the psychologist from employing materials furnished by his observations of other men, of infants, of the lower animals, or of the insane; nothing to hinder him taking counsel with the philologist or even the physiologist, provided always he can show the psychological bearings of those facts which are not directly psychological. The standpoint of psychology is individualistic; by whatever methods, from whatever sources its facts are ascertained, they must — to have a psychological im- port — be regarded as having place in, or as being part of, some one's consciousness or experience. In this sense, i.e. as presented to an individual, " the whole choir of heaven and furniture of earth " may belong to psychology, but otherwise they are psychological nonentities. In defining psychology, however, the propriety of avoiding the terms mind or soul, which it implies, is widely acknowledged; mind because of the disastrous dualism of mind and matter, soul because of its metaphysical associations. Hence F. A. Lange's famous mot : modern psychology is Psychologie ohne Seele. But consciousness, which is the most frequent substitute, is continually confused with self- consciousness, and so is apt to involve undue stress on the subjective as opposed to the objective, as well as to emphasize the cognitive as against the conative factors. Experience, it is maintained, is a more fundamental and less ambiguous term. Psychology then is the science of individual experience. The problem of psychology, in dealing with this complex subject- matter, is in general — first, to ascertain its ultimate constituents, and, secondly, to determine and explain the laws of their interaction.

General Analysis.

3. In seeking to make a first general analysis of experience, we must start from individual human experience, for this alone is what we immediately know. From this standpoint we must endeavour to determine the " irreducible minimum " involved, so that our concept may apply to all lower forms of experi- ence as well. Etymologically experience connotes practical

ac- quaintance, efficiency and skill as the result of trial — usually repeated trial — and effort. Many recent writers on comparative psychology propose to make evidence of experience in this sense the criterion of psychical life. The ox knoweth his owner and the ass his master's crib, and so would pass muster; but the ant and the bee, who are said to learn nothing, would, in spite of their marvellous instinctive skill, be regarded as mere auto- mata in Descartes's sense. That this criterion is decisive on the positive side will hardly be denied; the question how far it is available negatively we must examine later on. But it will be well first briefly to note some of the implications of this positive criterion: Experience is the process of becoming expert by experi- ment. The chief implication, no doubt, is that which in psycho- logical language we express as the duality of subject and object. Looking at this relation as the comparative psychologist has to do, we find that it tallies in the main with the biological relation of organism and environment. The individuality of the organ- ism corresponds to, though it is not necessarily identical with, the psychological subject, while to the environment and its changes corresponds the objective continuum or totum objectivum as we shall call it. This correspondence further helps us to see still more clearly the error of regarding individual experience as wholly subjective, and at the same time helps us to find some measure of truth in the nai've realism of Common Sense. As these points have an important bearing on the connexion of psychology and epistemology, we may attempt to elucidate them more fully.

Though it would be unwarrantable to resolve a thing, as some have done, into a mere meeting-point of relations, yet it is

perhaps as great a mistake to assume that it can be anything deter- minate in itself apart from all relations to other things. By the physicist this mistake can hardly be made: for him action and reaction are strictly correlative: a material system can do no work on itself. For the biologist, again, organism and environ- ment are invariably complementary. But in psychology, when presentations are regarded as subjective modifications, we have this mistaken isolation in a glaring form, and all the hopeless difficulties of what is called " subjective idealism " are the result. Subjective modifications no doubt are always one constituent of individual experience, but always as correlative to objective modifications or change in the objective continuum. If experi- ence were throughout subjective, not merely would the term subjective itself be meaningless, not merely would the

concep- tion of the objective never arise, but the entirely impersonal and intransitive process that remained, though it might be described as absolute becoming, could not be called even solipsism, least of all real experience. Common Sense, then, is right in positing, wherever experience is inferred, (i) a factor answering to what we know as self, and (2) another factor answering to what each of us knows as the world. It is further right in regarding the world which each one immediately knows as a coloured, sounding, tangible world, more exactly as a world of sensible qualities. The assumption of na'ive realism, that the world as each one knows it exists as such independently of him, is questionable. But this assumption goes beyond individual experience, and does not, indeed could not, arise at this standpoint.

Answering to the individuality and unity of the subjective factor, there is a corresponding unity and individuality of the objective. Every Ego has its correlative Non-Ego, whence in the end such familiar saying as quol homines tot sententiae and the like. The doctrine of Leibnitz, that " each monad is a living mirror. . . representative of the universe according to its point of view," will, With obvious reservations, occur to many as illustrative here. In particular, Leibnitz emphasized one point on which psychology will do well to insist. " Since the world is a plenum," he begins, " all things are connected together and everybody acts upon every other, more or less, according to their distance, and is affected by their reaction; hence each monad is a living mirror," 1 &c. Subject and Object, or (as it will be clearer in this connexion to say) Ego and Non-Ego, are then not merely logically a universe, but actually the universe, so that, as Leibnitz put it, " He who sees all could read in each what is happening everywhere " (Monadology, § 61). Though every individual experience is unique, yet the more Egoi is similar to Ego 2 the more their complementaries Non-Egoi, Non- Ego 2 are likewise similar; much as two perspective projections are more similar the more adjacent their points of sight, and more similar as regards a given position the greater its distance from both points. No doubt we must also make a very exten- sive use of the hypothesis of subconsciousness, just as Leibnitz did, before we can say that the universe is the objective factor in each and every individual's experience. But we shall have in any case to allow that, besides the strictly limited " content " rising above the threshold of consciousness, there is an indefinite extension of the presentational continuum beyond it. And the Leibnitzian Monadology helps us also to clear up a certain con- fusion that besets terms such as " content of consciousness," or " finite centre of experience " — a barbarous but intelligible phrase that has recently appeared — the confusion, that is, with a mosaic of mutually exclusive areas, or with a scheme of mutu- ally exclusive logical compartments. Consciousnesses, though in one respect mutually exclusive, do not limit each other in this

fashion. For there is a sense in which all individual experiences are absolutely the same, though relatively different as to their point of view, i.e. as to the manner in which for each the same absolute whole is sundered into subjective and objective factors.

This way of looking at the facts of mind helps, again, to dispel the obscurity investing such terms as subjective, inter subjective, 1 Principles of Nature and Grace, § 3.

transsubjective and objective, as these occur in psychological or epistemological discussions. For the psychologist must main- tain that no experience is merely subjective: it is only epistemo- logists (notably Kant) who so describe individual experience, because objects experienced in their concrete particularity per- tain, like so many idiosyncrasies, to the individual alone. In contrast with this, epistemologists then describe universal experience — the objects in which are the same for every experient — as objective experience par excellence. And so has arisen the time-honoured opposition of Sense-knowledge and Thought- knowledge: so too has arisen the dualism of Empiricism and Rationalism, which Kant sought to surmount by logical analysis. It is in the endeavour to supplement this analysis by a psycho- logical genesis that the terms intersubjective and transsubjective prove useful. The problem for psychology is to ascertain the successive stages in the advance from the one form of experience or knowledge to the other. " When ten men look at the sun or the moon," said Reid, " they all see the same individual object." But according to Hamilton this statement is not " philosophically correct . . . the truth is that each of these persons sees a different object. ... It is not by perception but by a process of reasoning that we connect the objects of sense with existences beyond the sphere of immediate knowledge." 2 Now it is to this " beyond " that the term transsubjective is applied, and the question before us is: How do individual subjects thus get beyond the immanence or immediacy with which all experience begins? By a " process of reasoning," it is said. But it is at least true in fact, whether necessarily true or not, that such reasoning is the result of social intercourse. Further, it will be generally allowed that Kant's Analytik, before referred to, has made plain the insufficiency of merely formal reasoning to yield the categories of Substance, Cause and End, by which we pass from mere perceptual experience to that wider experience which transcends it. And psychology, again, may claim to have shown that in fact these categories are the result of that reflective self-consciousness to which social intercourse first gives rise.

But such intercourse, it has been urged, presupposes the common ground between subject and subject which it is meant to explain. How, it is asked, if every subject is confined to his own unique experience, does this intersubjective intercourse ever arise ? If no progress towards intellective

synthesis were possible before inter- subjective intercourse began, such intercourse, as presupposing something more than immediate sense-knowledge, obviously never could begin. 3 Let us illustrate by an analogy which Leibnitz's association of experience with a " point of view " at once suggests. If it were possible for the terrestrial astronomer to obtain observations of the heavens from astronomers in the neighbouring stars, he would be able to map in three dimensions constellations which now he can only represent in two. But unless he had ascertained unaided the heliocentric parallax of these neighbouring stars, he would have no means of distinguishing them as near from the distant myriads besides, or of understanding the data he might receive ; and unless he had first of all determined the still humbler geocentric parallax of our sun, those heliocentric parallaxes would have been unattainable. So in like manner we may say " intersubjective parallax " presupposes what we may call " subjective parallax," and even this the psychological duality of object and subject. But such subjective parallax or acquaintance with other like selves is the direct outcome of the extended range in time which memory proper secures; and when in this way self has become an object, resembling objects become other selves or " ejects," to adopt with slight modification a term originated by the late W. K. Clifford. We may be quite sure that his faithful dog is as little of a solipsist as the noble savage whom he accompanies. Indeed, the rudiments of the social factor are, if we may judge by biological evidence, to be found very early. Sexual union in the physiological sense occurs in all but the lowest Metazoa, pairing and courtship are frequent among insects, while " among the cold-blooded fishes the battle of the stickleback with his rivals, his captivating manoeuvres to lead the female to the nest which he has built, his mad dance of passion around her, and his subsequent jealous guarding of the nest, have often been observed and admired." 4 Among birds and mammals

2 Lectures on Metaphysics, ii. 153.

3 And it is precisely for want of this mediation that Kant's " two stems of human knowledge, which perhaps may spring from a common but to us unknown root," leave epistemology still more or less hampered with the old dualism of sense and understanding.

1 Evolution of Sex, by Geddes and Thomson, 1st ed. p. 265.

we find not merely that these psychological aspects of sexual life are greatly extended, but we find also prolonged education of off- spring by parents and imitation of the parents by offspring. Even language, or, at any rate " the linguistic impulse," is not wholly absent among brutes. 1 Thus as the sensori-motor adjustments of the organism to its environment generally advance in complexity and range, there is a concomitant advance in the variety and intimacy of its relations specially with individuals of its kind. It is therefore reasonable to assume no discontinuity between phases of experience that for the individual are merely objective and phases that are also ejective as well ; and once the ejective level is attained, some interchange of experience is possible. So disappears the great gulf fixed betwixt subjective or individual and intersubjective or universal experience by rival systems in philosophy.

4. From this preliminary epistemological discussion we may pass on to the psychological analysis of experience itself. As to this, there is in the main substantial agreement; the ele- mentary facts of mind cannot be expressed in less than three propositions — " I feel somehow," " I know something," " I do something." But here at once there arises an important ques- tion, viz. What after all are we to understand by the subject of these propositions? The proposition "I feel somehow " is not equivalent to " I know that I feel somehow." To identify the two would be to confound consciousness with self-conscious- ness. We are no more confined to our own immediate observa- tions here than elsewhere; but the point is that, whether seeking to analyse one's own consciousness or to infer that of a lobster, whether discussing the association of ideas or the expression of emotions, there is always an individual self or " subject " in question. It is not enough to talk of feelings or volitions: what we mean is that some individual — man or worm — feels, strives, acts, thus or thus. Obvious as this may seem, it has been frequently either forgotten or gainsaid. It has been forgotten among details or through the assumption of a medley of faculties, each treated as an individual in turn, and among which the real individual was lost. Or it has been gainsaid, because to admit that all psychological facts pertain to an experiencing subject or experient seemed to imply that they pertained to a particular spiritual substance, which was simple, indestructible, and so forth; and it was manifestly desirable to exclude such assumptions from psychology as a science aiming only at a systematic exposition of what can be known and verified by observation. But, however, ' much assailed or

disowned, the concept of a " mind " or conscious Bxo. ° r subject is to be found implicitly or explicitly in all

psychological writers whatever — not more in Berke- ley, who accepts it as a fact, than in Hume, who treats it as a fiction. This being so, we are far more likely to reach the truth eventually if we openly acknowledge this

inexpugnable assump- tion, if such it prove, instead of resorting to all sorts of devious periphrases to hide it. Now wherever the word Subject, or its derivatives, occurs in psychology we might substitute the word Ego and analogous derivatives, did such exist. But Subject is almost always the preferable term; its impersonal form is an advantage, and it readily recalls its modern correlative Object. Moreover, Ego has two senses, distinguished by Kant as pure and empirical, the latter of which was, of course, an object, the Me known, while the former was subject always, the I know- ing. By pure Ego or Subject it is proposed to denote here the simple fact that everything experienced is referred to a Self experiencing. This psychological concept of a self or subject, then, is after all by no means identical with the metaphysical concepts of a soul or mind-atom, or of mind-stuff not atomic; it may be kept as free from metaphysical implications as the concept of the biological individual or organism with which it is so intimately connected.

The attempt, indeed, has frequently been made to resolve the former into the latter, and so to find in mind only such an indi- /4ttemp individuality. But such procedure owes all its plausi-

bility to the fact that it leaves out of sight the dif- ference between the biological and the psychological standpoints. All that the biologist means by a dog is " the sum of the phenomena

1 Gf. Darwin, Descent of Man, i. 56.

which make up its corporeal existence." 2 And, inasmuch as its presentation to any one in particular is a point of no import- ance, the fact of presentation at all may be very well dropped out of account. Let us now turn to psychology: Why should we not here follow Huxley and take " the word ' soul ' simply as a name for the series of mental phenomena which make up an indi- vidual mind " ? 3 Surely the moment we try distinctly to under- stand this question we realize that the cases are different. " Series of mental phenomena " for whom ? For any passer-by such as might take stock of our biological dog ? No, obviously only for that individual mind itself; yet that is supposed to be made up of, to be nothing different from, the series of phenomena. Are we, then, (1) quoting J. S. Mill's words, " to accept the paradox that something which ex hypothesi is but a series of feelings, can be aware of itself as a series " ? 4 Or (2) shall we say that the several parts of the series are mutually phenomenal, much as A may look at B, who was just now looking at A ? Or (3) finally, shall we say that a large part of the so-called series, in fact every term but one, is phenomenal for the rest — for that one ?

As to the first, paradox is too mild a word for it ; even contradiction will hardly suffice. It is as impossible to express " being aware of " by one term as it is to express an equation or any other relation by one term : what knows can no more be identical with what is known than a weight with what it weighs. If a series of feelings is what is known or presented, then what knows, what it is presented to, cannot be that series of feelings, and this without regard to the point Mill mentions, viz. that the infinitely greater part of the series is either past or future. The question is not in the first instance one of time or substance at all, but simply turns upon the fact that knowledge or consciousness is unmeaning except as it implies some- thing knowing or conscious of something. But it may be replied: Granted that the formula for consciousness is something doing some- thing, to put it generally; still, if the two somethings are the same when I touch myself or when I see myself, why may not agent and patient be the same when the action is knowing or being aware of; why may I not know myself— in fact, do I not know myself ? Cer- tainly not; agent and patient never are the same in the same act; such terms as self-caused, self-moved, self-known, et id genus omne, either connote the incomprehensible or are abbreviated expressions — as, e.g. touching oneself when one's right hand touches one's left.

And so we come to the alternative: As one hand washes the other, may not different members of the series of feelings be subject and object in turn ? Compare, for example, the state of mind of a man succumbing to

temptation (as he pictures himself enjoying the coveted good and impatiently repudiates scruples of conscience or dictates of prudence) with his state when, filled with remorse, he sides with conscience and condemns this " former self "■ — the " better self " having meanwhile become supreme. Here the cluster of presentations and their associated sentiments and motives, which together played the r61e of self in the first situation, have; — only momentarily it may be true, but still have — for the time the place of not-self; and under abnormal circumstances this partial alternation may become complete alienation, as in what is called " double consciousness." Or again, the development of self-consciousness might be loosely described as taking the subject or self of one stage as an object in the next— self being, e.g. first identified with the body and afterwards distinguished from it. But all this, however true, is beside the mark; and it is really a very serious misnomer to speak, as e.g. Herbert Spencer does, of the development of self- consciousness as a " differentiation of subject and object." It is, if anything, a differentiation of object and object, i.e. in plainer words, it is a differentiation among presentations — a differentiation every step of which implies just that relation to a subject which it is supposed to supersede.

There still remains the alternative, expressed in the words of J. S. Mill, viz. " the alternative of believing that the Mind or Ego is some- thing different from any series of feelings or possibilities of them." To admit this, of course, is to admit the necessity of distinguishing between Mind or Ego, meaning the unity or continuity of conscious- ness as a complex of presentations, and Mind or Ego as the subject to which this complex is presented. In dealing with the body from the ordinary biological standpoint no such necessity arises. But, whereas there the individual organism is spoken of unequivocally, in psychology, on the other hand, the individual mind may mean either (i.) the series of feelings or " mental phenomena ' above referred to; or (ii.) the subject of these feelings for whom they are phenomena; or (iii.) the subject of these feelings or phenomena plus the series of feelings or phenomena themselves, the two being in that relation to each other in which alone the one is subject and the other a series of feelings, phenomena or objects. It is in this last sense that Mind is used in empirical psychology. 6 Its exclusive use in the first sense is favoured only by those who shrink from the speculative associations connected with its exclusive use in the

2 T. H.'Huxley, Hume, " English Men of Letters Series," (1879), p. 171.

3 Huxley, op. cit. p. 172.

- *Examination of Sir W. Hamilton's Philosophy, ch. xii. fin. 6 A meaning better expressed, as said above, by experience.*

second. But psychology is not called upon to transcend the relation of subject to object or, as we may call it, the fact of presentation. On the other hand, as has been said, the attempt to ignore one term of the relation is hopeless; and equally hopeless, even futile, is the attempt, by means of phrases such as consciousness or the unity of consciousness, to dispense with the recognition of a conscious subject.

5. We might now proceed to inquire more closely into the character and relations of the three invariable constituents of psychical life which are broadly distinguished as cognitions, feelings and conations. But we should be at once confronted by a doctrine which, strictly taken, amounts almost to a denial of this tripartite classification of the facts of mind — the doctrine, viz. that feeling alone is primordial and invariably present wherever there is consciousness at all. Every living creature, it is said, feels, though it may never do any more; only the higher animals, and these only after a time, learn to discriminate and identify and to act with a purpose. This doctrine, as might be expected, derives its plausibility partly from the vagueness of psychological terminology, and partly from the intimate connexion that undoubtedly exists between feeling and cognition on the one hand and feeling and volition on the other. As to the meaning of the term, it is plain that further definition is requisite for a word that may mean (a) a touch, as feeling of roughness; (b) an organic sensation, as feeling of hunger; (c) an emotipn, as feeling of anger; (d) feeling proper, as pleasure or pain. But, even taking feeling in the last, its stricter sense, it has been maintained that all the more complex forms of consciousness are resolvable into, or at least have been developed from, feelings of pleasure and pain. The only proof of such position, since we cannot directly observe the beginnings of conscious life, must consist of considerations such as the following. So far as we can judge, we find feeling everywhere; but, as we work downwards from higher to lower forms of life, the possible variety and the definiteness of sense-impressions both steadily diminish. Moreover, we can directly observe in our own organic sensations, which seem to come nearest to the whole content of primitive or infantile experience, an almost entire absence of any assignable quale. Finally, in our sense- experience generally, we find the element of feeling at a maximum in the lower senses and the cognitive element at a maximum in the higher. But the so-called intellectual senses are the most used, and use (we know) blunts feeling and

favours intellection, as we see in chemists, who sort the most filthy mixtures by smell and taste without discomfort. If, then, feeling predominates more and more as we approach the beginning of conscious life, may we not conclude that it is its only essential constituent ? On the contrary, such a conclusion would be rash in the extreme. Two lines, e.g. may get nearer and nearer and yet will never meet, if the rate of approach is simply proportional to the dis- tance. A triangle may be diminished indefinitely, and yet we cannot infer that it becomes eventually all angles, though the angles get no less and the sides do. Before, then, we decide whether pleasure or pain alone can ever constitute a complete experience, it may be well to inquire into the connexion between feeling and cognition, on the one hand, and between feeling and conation on the other, so far as we can now observe. And this is an inquiry which will help us towards an answer to our main question, namely, that concerning the nature and connexions of what are commonly regarded as the three ultimate facts of mind.

Broadly speaking, in any state of mind that we can directly observe, what we find is (1) that we are aware of a certain change Relation of in our sensations, thoughts or circumstances, (2) c ee "«5"° ˆ at we are pl ease< i or pained with the change, and aadCooa- (3) tnat we act accordingly. We never find that tioa. feeling directly alters — i.e. without the intervention

of the action of which it prompts — either our sensations or situation, but that regularly these latter with remarkable prompt- ness and certainty alter it. We have not first a change of feeling, and then a change in our sensations, perceptions and ideas; but, these changing, change of feeling follows. In short, feeling appears to be an effect, which therefore cannot exist without

its cause, though in different circumstances the same immediate cause may produce a different amount or even a different state of feeling. Turning from what we may call the receptive phase of an experience to the active or appetitive phase, we find in like manner that feeling is certainly not— in such cases as we can clearly observe — the whole of what we experience at any moment. True, in common speech we talk of liking pleasure and disliking pain; but this is either tautology, equivalent to saying we are pleased when we are pleased and pained when we are pained; or else it is an allowable abbreviation, and means that we like pleasurable objects and dislike painful objects, as when we say we like feeling warm and dislike feeling hungry. But feeling warm or feeling hungry, we must remember, is not pure feeling in the stricter sense of the word. Within the limits of our observation, then, we find that feeling accompanies some more or less definite presentation which for the sake of it becomes the object of appetite or aversion; in other words, feeling implies a relation to a pleasurable or

painful presentation or situation, that, as cause of feeling or as end of the action to which feeling prompts, is doubly distinguished from it. Thus the very facts that lead us to distinguish feeling from cognition and conation make against the hypothesis that consciousness can ever be all feeling.

But, as already said, the plausibility of this hypothesis is in good part due to a laxity in the use of terms. Most psycholo- gists before Kant, and some even to the present day, Feeling and speak of pleasure and pain as sensations. But it is Sensation plain that pleasure and pain are not simple ideas, distinct. as Locke called them, in the sense in which touches and tastes are — that is to say, they are never like these localized or projected, nor are they elaborated in conjunction with other sensations and movements into percepts or intuitions of the external. This confusion of feeling with sensations is largely consequent on the use of one word pain both for certain organic sensations and for the purely subjective state of being pained. But such pains not only are always more or less definitely localized — which of itself is so far cognition, they are also distinguished as shooting, burning, gnawing, &c, all which symp- toms indicate a certain objective quality. Accordingly psycholo- gists have been driven by one means or another to recognize two " aspects " (Bain), or "properties " (Wundt), in what they call a sensation, the one a " sensible or intellectual " or " qualita- tive," the other an "affective" or "emotive," aspect or property. The term " aspect " is figurative and obviously inaccurate; even to describe pleasure and pain as properties of sensation is a matter open to much question. But the point which at present concerns us is simply that when feeling is said to be the primordial element in consciousness more is usually included under feeling than pure pleasure and pain, viz. some character- istic or quality by which one pleasurable or painful sensation is distinguishable from another. No doubt, as we go downwards in the chain of life the qualitative or objective elements in the so-called sensations become less and less definite; and at the same time organisms with well-developed sense-organs give place to others without any clearly differentiated organs at all. But there is no ground for supposing even the amoeba itself to be affected in all respects the same whether by changes Of tempera- ture or of pressure or by changes in its internal fluids, albeit all of these changes will further or hinder its life and so presumably be in some sort pleasurable or painful. On the whole, then, there are grounds for saying that the endeavour to represent all the various facts of consciousness as evolved out of feeling is due to a hasty striving after simplicity, and has been favoured by the ambiguity of the term feeling itself. If by feeling we mean a certain subjective state varying continuously in intensity and passing from time to time from its positive phase (pleasure) to its negative phase (pain), then this purely pathic state implies an agreeing or disagreeing something which psychologically determines it. If, on the other

hand, we let feeling stand for both this state and the cause of it, then, perhaps, a succession I of such " feelings " may make up a consciousness; but then we I are including two of our elementary facts under the name of one

of them. The simplest form of psychical life, therefore, involves not only a subject feeling but a subject having qualitatively distinguish- able presentations which are the occasion of its feeling.

6. We may now try to ascertain what is meant by cognition as an essential element in this life, or, more exactly, what we are to understand by the term presentation. It was an

A presentation has then a twofold relation — first, directly to the subject, and, secondly, to other presentations. The former relation answers to the fact that a presentation is attended to, that the subject is more or less conscious of it: it is " in his mind" or presented. As presented to a subject a presentation might with advantage be called an object, or perhaps a psychical object, to distinguish it from what are called objects apart from presentation, i.e. conceived as independent of any particular subject. Locke, as we have seen, did so call it; still, to avoid possible confusion, it may turn out best to dispense with the frequent use of object in this sense. But on one account, at least, it is desirable not to lose sight altogether of this, which is after all the stricter as well as the older signification of object, namely, because it enables us to express definitely, without implicating any ontological theory, what we have so far seen reason to think is the fundamental fact in experience. Instead of depending mainly on that vague and treacherous word " con- sciousness," or committing ourselves to the position that ideas are modifications of a certain mental substance or identical with the subject to whom they are presented, we may leave all this on one side, and say that ideas are objects, and the relation of objects to subjects — that whereby the one is object and the other subject — is presentation; and it is because only objects sustain this relation that they may be spoken of simply as presentations. On the side of the subject this relation implies what, for want of a better word, may be called attention, extending the denota- tion of this term so as to include even what we ordinarily call inattention. Attention so used will thus cover part of what is meant by consciousness — so much of it, that is, as answers to being mentally active, active enough at least to " receive impressions." Attention

on the side of the subject implies intensity on the side of the object: we might indeed almost call intensity the matter of a presentation, without which it is a nonentity. 1

The inter-objective relations of presentations, on which Continuity their second characteristic, that of revivability and at Con- associability depends, though of the first import- sclousness. ance ; n themselves, hardly call for examination in a general analysis like the present. But there is one point

1 Cf . Kant's Principle of the Anticipations of Perception: "In all phenomena the real, which is the object of sensation, has intensive magnitude."

Attention.

still more fundamental that we cannot wholly pass by: it is — in part at any rate — what is commonly termed the unity or continuity of consciousness. From the physical standpoint and in ordinary life we can talk of objects that are isolated and independent and in all respects distinct individuals. The screech of the owl, for example, has physically nothing to do with the brightness of the moon: either may come or go without changing the order of things to which the other belongs. But psychologically, for the individual percipient, they are parts of one whole; the more his attention is given to the one the more it is taken from the other. Also the actual recurrence of the one will afterwards entail the re-presentation of the other also. Not only are they still parts of one whole, but such distinctness as they have at present is the result of a gradual differentiation.

It is quite impossible for us now to imagine the effects of years of experience removed, or to picture the character of our infantile presentations before our interests had led us habitually to concentrate attention on some and to ignore others. In place of the many things which we can now see and hear, not merely would there then be a confused presentation of the whole field of vision and of a mass of undistinguished sounds, but even the difference between sights and sounds themselves would be without its present distinctness. Thus the further we go back the nearer we approach to a total presentation having the character of one general continuum in which differences are latent. There is, then, in psychology, as in biology, what may be called a principle of "progressive differentiation or specialization"; 2 and this, as well as the facts of reproduction and association, forcibly suggests the conception of a certain objective continuum forming the background or basis to the several relatively dis-tinct presentations that are elaborated out of it — the equiva- lent, in fact, of that unity and continuity of consciousness which has been supposed to

supersede the need for a conscious subject.

There is one class of objects of special interest even in a general survey, viz. movements or motor presentations. These, like sensory presentations, admit of association and reproduction, and seem to attain to such distinctness sentat i on s. as they possess in adult human experience by. a gradual differentiation out of an original diffused mobility which is little besides emotional expression. Of this, however, more presently. It is primarily to such dependence upon feeling that movements owe their distinctive character, the possession, that is, under normal circumstances, of definite and assignable psychical antecedents, in contrast to sensory presentations, which are devoid of them. We cannot psychologically explain the order in which particular sights and sounds occur; but the movements that follow them, on the other hand, can be ade- quately explained only by psychology. The twilight that sends the hens to roost sets the fox to prowl, and the lion's roar which gathers the jackals scatters the sheep. Such diversity in the movements, although the sensory selection. presentations are similar, is due, in fact, to what we might call the principle of " subjective or hedonic selection " — that, out of all the manifold changes of sensory presentation which a given individual experiences, only a few are the occasion of such decided feeling as to become objects of possible appetite or aversion. It is thus by means of movements that we are more than the creatures of circumstances and that we can with propriety talk of subjective selection. The represen- tation of what interests us comes then to be associated with the representation of such movements as will secure its realization, so that — although no concentration of attention will secure the requisite intensity to a pleasurable object present only in idea — we can by what is strangely like a con- centration of attention convert the idea of a movement into the fact, and by means of the movement attain the coveted reality.

2 The biological principle referred to is that known as von Baer's law, viz. " that the progress of development is from the general to the special."

Conation.

7. And this has brought us round naturally to the third of the commonly accepted constituents of experience. What is conation, or rather conative action? For there are two ques- tions often more or less confused, the

question of motive or spring of action, as it is sometimes called — why is there action at all? and the question of means — how do definite actions come about? The former question relates primarily to the connexion of conation and feeling. It is only the latter question that we now raise. In ordinary voluntary movement we have first of all an idea or re-presentation of the movement, and last of all the actual movement itself — a new presentation which may for the present be described as the filling out of the re-presentation, which thereby attains that intensity, distinctness and embodiment we call reality. How does this change come about? The attempt has often been made to explain it by a reference to the more uniform, and apparently simpler, case of reflex action, including under this term what are called sensori-motor and ideo-motor actions. In all these the movement seems to be the result of a mere trans- ference of intensity from the associated sensation or idea that sets on the movement. But when by some chance or mischance the same sensory presentation excites two or more nascent motor changes that conflict, a temporary block is said to occur; and, when at length one of these nascent motor changes finally prevails, then, it is said, " there is constituted a state of consciousness which displays what we term volition." 1 But this assumption that sensory and motor ideas are associated before volition, and that volition begins where automatic or reflex action ends, is due to that inveterate habit of confound- ing the psychical and the physical which is the bane of modern psychology. How did these particular sensory and motor presentations ever come to be associated? The only psycho- logical evidence we have of any very intimate connexion between sensory and motor representations is that furnished by our acquired dexterities, i.e. by such movement as Hartley 2 styled " secondarily automatic." But then all these have been preceded by volition: as Herbert Spencer says, " the child learning to walk wills each movement before making it." Surely, then, a psychologist should take this as his typical case and prefer to assume that all automatic actions that come within his ken at all are in this sense secondarily automatic, i.e. to say that either in the experience of the individual or of his ancestors, volition or something analogous to it, preceded habit. But, if we are thus compelled by a sound method to regard sensori-motor actions as degraded or mechanical forms of voluntary actions, instead of regarding voluntary actions as gradually differentiated out of something physical, we have not to ask: What happens when one of two alternative movements is executed? but the more general question: What happens when any movement is made in consequence of feeling? It is obvious that on this view the simplest definitely purposive movement must have been preceded by some movement simpler still. For any distinct movement purposely made presupposes the ideal presentation, before the actual realization, of the move- ment. But such ideal presentation, being a re-presentation, equally presupposes a previous actual movement of which it is the so-called mental residuum.

There is then, it would seem, but one way left, viz. to regard those movements which are immediately expressive of pleasure or pain as primordial, and to regard the so-called voluntary movements as elaborated out of these. The vague and diffusive character of these primitive emotional manifestations is really a point in favour of this position. For such " diffusion " is evidence of an underlying continuity of motor presentations parallel to that already discussed in connexion with sensory presentations, a continuity which, in each case, becomes differentiated in the course of experience into comparatively distinct and discrete movements and sensations respectively. 3

1 Compare' Spencer's Principles of Psychology, i. §§ 217, 8.

2 D. Hartley, Observations on Man (6th ed., 1834), pp. 66 sqq.

3 It may be well to call to mind here that Alexander Bain also regarded emotional expression as a possible commencement of action,

But whereas we can only infer, and that in a very roundabout fashion, that our sensations are not absolutely distinct but are parts of one massive sensation, as it were, we are still liable under the influence of strong emotion directly to experience the corre- sponding continuity in the case of movement. Such motor- continuum we may suppose is the psychical counterpart of that permanent readiness to act, or rather that continual nascent acting, which among the older physiologists was spoken of as " tonic action." This " skeletal tone," as it is now called, is found to disappear more or less completely from a limb when its sensory nerves are divided. " In the absence of the usual stream of afferent impulses passing into it, the spinal cord ceases to send forth the influences which maintain the tone." 4 And a like intimate dependence, we have every reason to believe, obtains throughout between sensation and movement. We cannot imagine the beginning of life but only life begun. The simplest picture, then, which we can form of a concrete state of mind is not one in which there are movements before there are any sensations or sensations before there are any movements, but one in which change of sensation is followed by change of movement, the link between the two being a change of feeling.

Having thus simplified the question, we may now ask again: How is this change of movement through feeling brought about? The answer, as already hinted, appears to be: Dependence By a change of attention. We learn from such of Action of observations as psychologists describe under the Peelit >g' head of fascination, imitation, hypnotism, &c, that the mere concentration of attention upon a movement is often enough to bring the movement to pass. But, of course, in such cases neither emotion nor volition is necessarily implied; but none the less they show the close

connexion that exists between attention and movement. Everybody, too, must often have observed how the execution of any but mechanical movements arrests attention to thoughts or sensations, and how, vice versa, a striking impression or thought interrupts him in the performance of skilled movements. Let us suppose, then, that we have at any given moment a certain distribution of attention between sensory and motor presenta- tions; a change in that distribution then will mean a change in the intensity of some of all of these. But, in the case of motor presentations, change of intensity means change of movement. Such changes are, however, quite minimal in amount so long as the given presentations are not conspicu- ously agreeable or disagreeable. So soon as they are, however, there is evidence of a most intimate connexion between feeling and attention; but it is hardly possible adequately to exhibit this evidence without first attempting to ascertain the charac- teristics of the presentations, or groups of presentations, that are respectively pleasurable and painful, and this must occupy us later on.

8. We are now at the end of our analysis, and the results may perhaps be most conveniently summarized by first throwing them into a tabular form and then appending a Primordial few remarks by way of indicating the main purport Fads of of the table. Taking no account of the specific Mi ""- difference between one concrete state of mind and another, and supposing that we are dealing with presentations

but only to reject it in favour of his own peculiar doctrine of " spon- taneity," which, however, is open to the objection that it makes movement precede feeling instead of following it — an objection that would be serious even if the arguments advanced to support his hypothesis were as cogent as only Bain supposed them to be. Against the position maintained above he objects that " the emo- tional wave almost invariably affects a whole group of movements," and therefore does not furnish the " isolated promptings that are desiderated in the case of the will " {Mental and Moral Science, p. 323). But to make this objection is to let heredity count for noth- ing. In fact, wherever a variety of isolated movements is physically possible there also we always find corresponding instincts, " that untaught ability to perform actions," to use Bain's own language, which a minimum of practice suffices to perfect. But then these suggest gradual ancestral acquisition. 4 Foster, Text-Book of Physiology, § 597.

in their simplest form, i.e. as sensations and movements, we have : —

‘(r) non- voluntarily attend-” ing to changes in the sensory-continuum j 1 [Cognition]

A SUBJECT

= Presentation of sensory

(2) being, in consequence, either pleased or pained ; [Feeling]

and (3) by voluntary atten-“l tion or ” innervation ” | producing changes in the motor-continuum. ‘J [Conation]

= Presentation of motor

‘OBJECTS.

Of the three phases or functions, thus analytically distinguish- able, but not really separable, the first and the third correspond in the main with the receptive and active states or powers of the older psychologists. The second, being more difficult to isolate, was long overlooked; or, at all events, its essential characteristics were not distinctly marked, so that it was confounded either with (1) which is its cause, or with (3), its effect. But perhaps the most important of all psychological distinctions is that which traverses both the old bipartite and the prevailing tripartite analysis, viz. that between the subject on the one hand, as acting and feeling, and the objects of this activity on the other. With this distinction clearly before us, instead of crediting the sub- ject with an indefinite number of faculties or capacities, we must seek to explain not only reproduction, association, &c, but all varieties of thinking and acting, by the laws pertaining to ideas or presentations, leaving to the subject only the one power of variously distributing that attention upon which the intensity of a presentation in part depends. What we call activity in the narrower sense (as e.g. purposive movement and intellection) is but a special form of this single subjective activity, although a very important one.

According to this view, then, presentations, attention, feeling, are not to be regarded as three co-ordinate genera, each of which is a complete ” state of mind or consciousness,” i.e. as being all alike included under this one supreme category. There is, as Berkeley long ago urged, no resemblance between activity and an idea ; nor is it easy to see anything common to pure feeling and an idea, unless it be that both possess intensity. Classifica- tion seems, in fact, to be here out of place. Instead, therefore, of the one summum genus, state of mind or consciousness, with its three co-ordinate subdivisions — cognition, emotion, conation — our analysis seems to lead

us to recognize three distinct and irreducible components — attention, feeling, and objects or presentations — as together, in a certain connexion, constituting one concrete state of mind or psychosis. Of such concrete states of mind or psychoses we may then say — so far agreeing with the older, bipartite psychology — that there are two forms, corresponding to the two ways in which attention may be determined and the two classes of objects attended to in each, viz. (1) the sensory or receptive attitude, when attention is non-voluntarily determined, i.e. where feeling follows the act of attention; and (2) the motor or active attitude, where feel- ing precedes the act of attention, which is thus determined voluntarily.

Attention.

9. Instead of a congeries of faculties we have assumed a single subjective activity and have proposed to call this attention. Some further explication of this position seems to be desirable. We start with the duality of subject and object as fundamental. We say of man, mouse, or monkey that it feels, perceives, remembers, infers, strives, and so forth. Leaving aside the first term, it is obvious that all the rest imply both an activity and an object. Is it possible to resolve these instances into a form in which the assumed diversity of the act will appear as a diver- sity of the object? At first sight it looks rather as if the kind

1 To cover more complex cases we might here add the words " or trains of ideas."

of activity might vary while the object remained the same; that e.g. we perceived an object and later on remembered or desired it. It would then be most natural to refer these several activities to corresponding faculties of perception, memory and desire. This, indeed, is the view embodied in common speech, and for practical purposes it is doubtless the simplest and the best. Nevertheless, a more thorough analysis shows that when the supposed faculty is different the object is never entirely and in all respects the same. Thus in perception, e.g. we deal with " impressions " or primary presentations, and in memory and imagination with " ideas " (in the later sense) or secondary presentations. In desire the want of the object gives it an entirely different setting, adding a new characteristic, that of value or worth, so that its acquisition becomes the end of a series of efforts or movements. The older psychology, by its accept- ance of the Cartesian doctrine that all the facts of immediate experience are to be interpreted as subjective modifications, failed to distinguish adequately between the subject as active and the objects of its activity. Hence the tendency to rest content with the popular distinction of various faculties in spite of the underlying sameness implied in the common application of " conscious " to them all. In fact, Locke's definition of idea (in the older and wider sense)

as the immediate object of con- sciousness or thinking was censured by Reid as " the greatest blemish in the Essay on Human Understanding." But, accepting this definition as implied in the duality of subject and object, and accepting too the underlying sameness which the active form "conscious" undeniably implies, we have simply to ask: " Which is the better term to denote this common element — consciousness or attention?"

Consciousness, as the vaguest, most protean and most treach- erous of psychological terms, will hardly serve our purpose. Attention, on the other hand, has an invariable active sense, and there is an appropriate verb, to attend. But many things, it may be said, are presented while few are attended to; if atten- tion is to be made coextensive with the activity implied in consciousness, will not the vital distinction between attention and inattention be lost? In fact, however, this distinction implies a covert comparison, not an absolute contrast. In everyday life we recognize many degrees of attention, ranging from an extreme of intense concentration to one of complete remission, as Locke long ago pointed out. 2 Between these extremes there is perfect continuity, and not a difference of kind; to apply the one term attention to the whole range is very like applying the one term magnitude to large and small quantities alike.

But it is not enough to show that when we commonly talk of different faculties we also find psychological differences of object, and to assert that if there is one common factor in all psychical activity this factor is attention. To make our position secure it is needful to show directly that all the various faculties with which a subject can be credited are resolvable into attention and various classes or relations or states of presentations that are attended to. How far this is possible remains to be seen as we proceed. In the case of the so-called " intellectual powers " the position is generally conceded, but so far as the voluntary or active powers are concerned it is as generally denied. Now, in so far as volition implies not merely action, overt or intended, but also motives, in so far also it must be acknowledged it contains a factor not resolvable into attention to motor presenta- tions. This further factor, which has been called " the volitional character of feeling," we here leave aside. Apart from this direct spring of action, then, the question is whether the active process itself differs from the cognitive or receptive process

2 " That there are ideas, some or other, always present in the mind of a waking man, every one's experience convinces him ; though the mind employs itself about them with several degrees of attention. Sometimes the mind fixes itself with such intention . . . that it shuts out all other thoughts and takes no notice of the ordinary impressions made on the senses; . . .at other times it barely observes the train of ideas . . . without directing and pursuing any of them; and at other times it lets them pass almost quite

unregarded as faint shadows I that make no impression ” (Essay, ii. 19, §§ 3, 4).

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save in being attention to a special class of objects. First of all, it is noteworthy that both have the same characteristics. Thus, what Hamilton called ” the law of limitation ” holds of each alike and of either with respect to the other; and it holds too not only of the number of presentations but also of the intensity. We can be absorbed in action just as much as in perception or thought; also, as already said, movements, unless they are mechanical, inhibit ideas; and vice versa, ideas, other than associated trains, arrest movements. Intoxication, hypno- tism or insanity, rest or exhaustion, tell on apperception as well as on innervation. The control of thoughts, equally with the control of movements, requires effort; and as there is a strain peculiar to intently listening or gazing, which is known to have a muscular concomitant, so too there is a strain characteristic of recollection and visualization, which may quite well turn out to be muscular too. When movements have to be associated, the same continuous attention is called for as is found requisite in associating sensory impressions; and, when such associations have become very intimate, dissociation is about equally difficult in both cases.

There is one striking fact that brings to light the essential sameness of apperception and innervation, cited by Wundt for this very purpose. In so-called ” reaction-time ” experi- ments it is found, when the impression to be registered follows on a premonitory signal after a certain brief interval, that then the reaction (registering the impression) is often instantaneous; the reaction-time, in other words, is nil. In such a case the subject is aware not of three separate events, (i) the perception of the impression; (2) the reaction; (3) the perception of this; but the fact of the impression is realized and the registering movement is actualized at once and together 1 the subject is conscious of one act of attention and one only.

Theory of Presentations.

10. We come now to the exposition of the objects of attention or consciousness, i.e. to what we may call the objective or presentational factor of psychical life. The treatment of this will fall naturally into two divisions. In the first we shall have to deal with its general characteristics and with the fundamental processes which all presentation involves. In view

of its general and more or less hypothetical character we may call it the theory of presentation. We can then pass on to the special forms of presentations, known as sensations, percepts, images, &c, and to the special processes to which these forms lead up.

This exposition will be simplified if we start with a supposition that will enable us to leave aside, at least for the present, the Assumption difficult question of heredity. We know that in of a Psycho- the course of each individual's life there is more logical or i ess f progressive differentiation or development.

n v ua . Ynrther, it is believed that there has existed a series of sentient individuals beginning with the lowest form of life and advancing continuously up to man. Some traces of the advance already made may be reproduced in the growth of each human being now, but for the most part such traces have been obliterated. What was experience in the past has become instinct in the present. The descendant has no consciousness of his ancestor's failures when performing by " an untaught ability " what they slowly and perhaps painfully acquired. But, if we are to attempt to follow the genesis of mind from its earliest dawn, it is the primary experience rather than the eventual instinct that we have first of all to keep in view. To this end, then, it is proposed to assume that we are dealing with one individual who has continuously advanced from the begin- ning of psychical life, and not with a series of individuals of whom all save the first inherited certain capacities from their progenitors. The life-history of such an imaginary individual, that is to say, would correspond with all that was new in the experience of a certain typical series of individuals each of whom advanced a certain stage in mental differentiation. On the other hand, from this history would be omitted that inherited reproduction of the net results, so to say, of ancestral experience, that innate tradition by which alone, under the actual conditions

sentation- Continuum.

sensations consisting

of existence, progress is possible. The process of thus reproduc- ing the old might differ as widely from that of producing the new as electrotyping does from engraving. However, the point is that as psychologists we know nothing directly about it ; neither can we distinguish precisely at any link in the chain of life what is old and inherited — original in the sense of Locke and Leibnitz — from what is new or acquired — original in the modern sense. But we are bound as a matter of method to suppose all com- plexity and differentiation among presentations to have been originated, i.e. experimentally acquired, at some time or other. So long, then, as we are

concerned primarily with the progress of this differentiation we may disregard the fact that it has not actually been, as it were, the product of one hand dealing with one tabula rasa to use Locke's — originally Aristotle's — figure, but of many hands, each of which, starting with a reproduction of what had been wrought on the preceding tabulae, put in more or fewer new touches before devising the whole to a successor who would proceed in like manner.

n. What is implied in this process of differentiation and what is it that becomes differentiated ? — these are the questions to which we must now attend. Psychologists have The Pre- usually represented mental advance as consisting fundamentally in the combination and recombina- tion of various elementary units, the so-called and primitive movements: in other words, as in a species of " mental chemistry. " If we are to resort to physical analogies at all — a matter of very doubtful pro- priety — we shall find in the growth of a seed or an embryo far better illustrations of the unfolding of the contents of con- sciousness than in the building up of molecules: the process seems much more a segmentation of what is originally continuous than an aggregation of elements at first independent and distinct. Comparing higher minds or stages of mental development with lower — by what means such comparison is possible we need not now consider — we find in the higher conspicuous differences between presentations which in the lower are indistinguishable or absent altogether. The worm is aware only of the difference between light and dark. The steel-worker sees half a dozen tints where others see only a uniform glow. To the child, it is said, all faces are alike; and throughout life we are apt to note the general, the points of resemblance, before the special, the points of difference. But even when most definite, what we call a presentation is still part of a larger whole. It is not separated from other presentations, whether simultaneous or successive, by something which is not of the nature of presenta- tion, as one island is separated from another by the intervening sea, or one note in a melody from the next by an interval of silence. In our search for a theory of presentations, then, it is from this " continuity of consciousness " that we must take our start. Working backwards from this as we find it now, we are led alike by particular facts and general considerations to the conception of a totum objectivum or objective continuum which is gradually differentiated, thereby giving rise to what we call distinct presentations, just as some particular presentation, clear as a whole, as Leibnitz would say, becomes with mental growth a complex of distinguishable parts. Of the very begin- ning of this continuum we can say nothing; absolute beginnings are beyond the pale of science. Experience advances as this continuum is differentiated, every differentiation being a change of presentation. Hence the commonplace of psychologists — We are only conscious as we are conscious of change.

But ” change of consciousness” is too loose an expression to take the place of the unwieldy phrase differentiation of a presentation-continuum, to which we have been n ra a U aWU- driven. For not only does the term ” consciousness ” terentiation confuse what exactness requires us to keep distinct, an ofPresen- activity and its object, but also the term “change” ‘”°”” fails to express the characteristics which distinguish new presentations from other changes. Differentiation implies that the simple becomes complex or the complex more complex; it implies also that this increased complexity is due to the per- sistence of former changes; we may even say such persistence is*

essential to the very idea of development or growth. In trying, then, to conceive our psychological individual in the earliest stages of development we must not picture him as experiencing a succession of absolutely new sensations, which, coming out of nothingness, admit of being strung upon the ” thread of consciousness” like beads picked up’at random, or cemented into a mass like the bits of stick and sand with which the young caddis covers its nakedness. The notion, which Kant has done much to encourage, that psychical life begins with a confused manifold of sensations — devoid not only of logical but even of psychological unity — is one that becomes more inconceivable the more closely we consider it. An absolutely new presentation, having no sort of connexion with former presentations till the subject has synthesized it with them, is a conception for which it would be hard to find a warrant either by direct observation, by inference from biology, or in considerations of an a priori kind. At any given moment we have a certain whole of presentations, a ” field of consciousness, ” psychologically one and continuous; at the next we have not an entirely new field but a partial change within this field. Many who would allow this in the case of representations, i.e. where idea succeeds idea by the workings of association, would demur to it in the case of primary presentations or sensations. ” For, ” they would say, ” may not silence be broken by a clap of thunder, and have not the blind been made to see? ” To urge such objections is to miss the drift of our discussion, and to answer them may serve to make it clearer. Where silence can be broken there are representations of preceding sounds and in all probability even subjective presentations of sound as well; silence as experienced by one who has heard is very different from the silence of Con- dillac’s statue before it had ever heard. The question is rather whether such a conception as that of Condillac’s is possible; supposing a sound to be, qualitatively, entirely

distinct from a smell, could a field of consciousness consisting of smells be followed at once by one in which sounds had part? And, as regards the blind coming to see, we must remember not only that the blind have eyes but that they are descended from ancestors who could see. What nascent presentations of sight are thus involved it would be hard to say; and the problem of heredity is one that we have for the present left aside.

The view here taken is (i) that at its first appearance in psychical life a new sensation or so-called elementary presenta- tion is really a partial modification of some pre-existing presenta- tion which thereby becomes as a whole more complex than it was before; and (2) that this complexity and differentiation of parts never become a plurality of discontinuous presentations, having a distinctness and individuality such as the atoms or ele- mentary particles of the physical world are supposed to have. Beginners in psychology, and some who are not beginners, are apt to be led astray by expositions which set out from the sensations of the special senses, as if these furnished us with the type of an elementary presentation. The fact is we never experience a mere sensation of colour, sound, touch, and the like; and what the young student mistakes for such is really a perception, a sensory presentation combined with various sensory and motor presentations and with representations — and having thus a definiteness and completeness only possible to complex pre- sentations. Moreover, if we could attend to a pure sensation of sound or colour by itself, there is much to justify the suspicion that even this is complex and not simple, and owes to such com- plexity its clearly marked specific quality. In certain of our vaguest and most diffused organic sensations there is probably a much nearer approach to the character of the really primitive presentations.

In such sensations we can distinguish three variations, viz. variations of quality, of intensity, and of what Bain called Diffusion massiveness, or, as we shall say, extensity. This and last characteristic, which everybody knows who

Restriction, knows the difference between the ache of a big bruise and the ache of a little one, between total and partial immersion in a bath, is, as we shall see later on, an essential element in our perception of space. But it is certainly

not the whole of it, for in this experience of massive sensation alone it is impossible to find other elements which an analysis of spatial intuition unmistakably yields. Extensity and exten- sion, then, are not to be confounded. Now, we find, even at our level of mental evolution, that an increase in the intensity of a sensation is apt to entail an increase in its extensity too. In like manner we observe a greater extent of movement in

emo- tional expression when the intensity of the emotion increases. Even the higher region of imagination is no exception, as is shown by the whirl and confusion of ideas incident to delirium, and, indeed, to all strong excitement. But this " diffusion " or " radiation, " as it has been called, diminishes as we pass from the class of organic sensations to the sensations of the five senses, from movements expressive of feeling to movements definitely purposive, and from the tumult of ideas excited by passion to the steadier sequences determined by efforts to think. Increased differentiation seems, then, to be intimately connected with increased " restriction." Probably there may be found certain initial differentiations which for psychology are ultimate facts that it cannot explain. As already said, the very beginning of experience is beyond us, though it is our business — working from within — to push back our analysis as far as we can. But some differentiations being given, then it may be safely said that, in accordance with what we have called the principle of subjective selection (see §6), attention would be voluntarily concentrated upon certain of these and upon the voluntary movements specially connected with them. To such subjectively initiated modifications of the presentation-continuum, moreover, we may reasonably suppose "restriction" to be in large measure due. But increased restriction would render further differentiation of the given whole of presentation possible, and so the two processes might supplement each other. These processes have now proceeded so far that at the level of human consciousness we find it hard to form any tolerably clear conception of a field of consciousness in which an intense sensation, no matter what, might — so to say — diffuse over the whole. Colours, e.g. are with us so distinct from sounds that — except as regards the excitement of attention or the drain upon it — there is nothing in the intensest colour to affect the simultaneous presentation of a sound. But at the beginning whatever we regard as the earliest differentiation of sound might have been incopresentable with the earliest differentiation of colour, if sufficiently diffused, much as a field of sight all blue is now incopresentable with one all red. Or, if the stimuli appropriate to both were active together, the resulting sensation might have been not a blending of two qualities, as purple is said to be a blending of red and violet, but rather a neutral sensation without the specific qualities of either. Now, on the other hand, colours and sounds are necessarily so far localized that we are directly aware that the eye is concerned with the one and the ear with the other. This brings to our notice a fact so ridiculously obvious inco- that it has never been deemed worthy of mention, present- although it has undeniably important bearings — ability. the fact, viz. that certain sensations or movements are an absolute bar to the simultaneous presentation of other sensa- tions or movements. We cannot see an orange as at once yellow and green, though we can feel it at once as both smooth and cool; we cannot open and close the same hand at the same moment, but we can open one

hand while closing the other. Such incopresentability or contrariety is thus more than mere difference, and occurs only between presentations belonging to the same sense or to the same group of movements. Strictly speaking, it does not always occur even then; for red and yellow, hot and cold, are presentable together provided they have certain other differences which we shall meet again presently as differences of " local sign. "

12. In the preceding paragraphs we have had occasion to distinguish between the presentation-continuum or whole field of consciousness, as we may for the present call it, and those several differentiations within this field ness- which are ordinarily spoken of as presentations, and to which — now that their true character as parts is clear —

we too may confine the term. But it will be well in the next place, before inquiring more closely into their characteristics, to consider for a moment that persistence of preceding modifica- tions which the principle of progressive differentiation implies. This persistence is best spoken of as retentiveness. It is often confused with memory, though this is something much more complex and special; for in memory there is necessarily some contrast of past and present, whereas here there is simply the persistence of the old. But what is it that persists ? On our theory we must answer, the continuum as differentiated, not the particular differentiation as an isolated unit. If psychologists have erred in regarding the presentations of one moment as merely a plurality of units, they have erred in like manner concerning the so-called residua of such presentations. As we see a certain colour or a certain object again and again, we do not go on accumulating images or representations of it, which are somewhere crowded together like shades on the banks of the Styx; nor is such colour, or whatever it be, the same at the hundredth time of presentation as at the first, as the hundredth impression of a seal on wax would be. There is no such lifeless fixity in mind. The explanations of perception most in vogue are far too mechanical and, so to say, atomistic; but we must fall back upon the unity and continuity of our presentation- continuum if we are to get a better. Suppose that in the course of a few minutes we take half a dozen glances at a strange and curious flower. We have not as many complex presentations which we might symbolize as Fi, F2,.... Fe- But rather, at first only the general outline is noted, next the disposition of petals, stamens, &c, then the attachment of the anthers, position of the ovary, and so on; that is to say, symbolizing the whole flower as [p'(ab) s' {c d) o' (fg)], we first

apprehend say [p'. . s' ..0'}, then \p' (ab) s'..o'.], or [p' (a..) s' (c.)o' (/..)], and so forth. It is because the traits first attended to persist that the later form an addition to them till the complex is at length complete. There is nothing in this instance properly answering to what are known as the reproduction and association of ideas; in the last and complete apprehension as much as in the first vague and inchoate one the flower is there as a primary presenta- tion. There is a limit, of course, to such a procedure, but the instance taken, we may safely say, is not such as to exceed the bounds of a simultaneous field of consciousness. Assuming then that such increase of differentiation through the persistence of preceding differentiations holds of the presentation-continuum as a whole, we conclude that, in those circumstances in which we now have a specific sensation of, say, red or sweet, there would be for some more primitive experience nothing but a vague, almost organic, sensation, which, however, would persist, so that on a repetition of the circumstances it could be again further differentiated. The earlier differentiations, in short, do not disappear like the waves of yesterday in the calm of to- day, nor yet last on like old scars beside new ones; but rather the two are blended and combined, so that the whole field of consciousness, like a continually growing picture, increases indefinitely in complexity of pattern.

13. Assimilation. — This process, in which later differentiations blend with and thereby further restrict and specialize what is retained of earlier and less definite presentations, is thus a further implication of the principle of the progressive development of the presentational continuum. When not ignored altogether this further process has been commonly regarded as merely a simple form of " association," its peculiarity being, as it was supposed, that the presentations associated — though numerically distinct — were in quality perfectly identical. In point of fact, both these assumptions seem to be erroneous arid due to the so-called psychologist's fallacy. 1 For the experiencing subject there is apparently at this stage — as we have already urged — neither the numerical distinctness nor the qualitative identity which the words " past impression (Ai) " and " present impression (A2) " suggest. Still the connexion between this process of mere blending or fusion, which we shall call assimilation, and the process of association proper is so close, and the detailed analysis called for so complex, that we must needs defer further discussion till we come to treat of association as a whole (cf. below, § 24). It may then be possible to show that we have here to do with a process

1 As, e.g. in interpreting the conduct of children as if they were already " grown-up " persons; cf. J. Ward, II. of Spec. Phily. (1882), pp. 369 fin. 374; James, Prin. of Psychy. (1890), i. 196.

much simpler and more fundamental than association. But it is at least

clear at once that if the term association is to be correctly used it will imply that the presentations associated are from the first distinct, are attended to as distinct, are associated solely in conse- quence of such attention, and remain to the last distinguishable.

In view of the intimate connexion between differentiation, reten- tiveness and assimilation it will sometimes be convenient to refer to all three together as constituting what we may call the plasticity of the presentational continuum.

14. This will be the most convenient place to take note of certain psychological doctrines which, though differ- ing in some material respects, are usually included under the term Law of Relativity.

a. Hobbes's Sentire semper idem et non sentire ad idem recidunt is often cited as one of the first formulations of this law; and if we take it to apply to the whole field of consciousness it becomes at once true and trite: a field of consciousness unaltered either by change of impression or of idea would certainly be a blank and a contradiction. Understood in this sense the Law of Relativity amounts to what Hamilton called the Law of Variety : " that we are conscious only as we are conscious of difference." 2 But, though consciousness involves change, it is still possible that particular presentations in the field of consciousness may continue unchanged indefinitely. When it is said that " a constant impression is the same as a blank," what is meant turns out to be something not psychological at all, as, e.g., our insen- sibility to the motion of the earth or to the pressure of the air — cases in which there is obviously no presentation, nor even any evidence of nervous change. Or else this paradox proves to be but an awkward way of expressing what we may call accommoda- tion, whether physiological or psychological. Thus the skin soon adapts itself to certain seasonal alterations of temperature, so that heat or cold ceases to be felt: the sensation ceases because the nervous change, its proximate physical counterpart, has ceased. Again, there is what James Mill calls " an acquired incapacity of attention," such that a constant noise, for example, in which we have no interest, is soon inaudible. In such a case of psychological accommodation we should expect also to find on the physiological side some form of central reflection or isola- tion more or less complete. As a rule, no doubt, impressions do not continue constant for more than a very short time; still there are sad instances enough in the history of disease, bodily and mental, to show that such a thing can quite well happen, and that such constant impressions (and " fixed ideas," which are in effect tantamount to them), instead of becoming blanks, may dominate the entire consciousness, colouring or bewildering everything.

b. From the fact that the field of consciousness is continually changing it

has been supposed to follow, not only that a constant presentation is impossible, but — as a further consequence — that every presentation is essentially nothing but a transition or difference. " All feeling," says Bain, the leading exponent of this view, " is two-sided. . . . We may attend more to one member of the couple than to the other. . . . We are more conscious of heat when passing to a higher temperature, and of cold when passing to a lower. The state we have passed to is our explicit consciousness, the state we have passed from is our implicit consciousness." But the transition need not be from heat to cold, or vice versa: it can equally well take place from a neutral state, which is indeed the normal state, of neither heat nor cold; a new-born mammal, e.g. must experience cold, having never experienced heat. Again, suppose a sailor becalmed gazing for a whole moaning upon a stretch of sea and sky, what sensations are implicit here ? Shall we say yellow as the greatest contrast to blue, or darkness as the contrary of light, or both ? What, again, is the implicit consciousness when the explicit is sweet ; is it bitter or sour, and from what is the transition in such a case ? For one thing it seems clear that the transition of attention from one pre- sentation to another and the differences between the presenta- tions themselves are distinct facts. It is strange that the psychologist who has laid such stress on neutral states of surprise

2 The Works of Thos. Reid, supplementary note, p. 932.

as being akin to feeling and so distinct from special presentations, should in any way confound the two. The mistake is perhaps accounted for by the fact that Bain, in common with the rest of his school, nowhere distinguishes between attention and the presentations that are attended to. If " change of impression " and being conscious or mentally alive are the same thing, it is then manifestly tautologous to say that one is the indispensable condition of the other. If they are not the same thing, then the succession of shocks or surprises cannot wholly determine the impressions which successively determine them.

But we have still to consider whether the impressions them- selves are nothing but differences or contrasts. " We do not know any one thing of itself but only the difference between it and another thing," said Bain. But it is plain we cannot speak of contrast or difference between two states or things as a contrast or difference, if the states or things are not themselves presented; the so-called contrast or difference would then be itself a single

presentation, and its supposed ” relativity ” but an inference. Difference is not more necessary to the presentation of two objects than two objects to the presentation of difference. And, what is more, a difference between presentation is not at all the same thing as the presentation of that difference. The former must precede the latter; the latter, which requires active com- parison, need not follow. There is an ambiguity in the words ” know,” ” knowledge,” which Bain seems not to have con- sidered: ” to know ” may mean either to perceive or apprehend, or it may mean to understand or comprehend. 1 Knowledge in the first sense is only what we shall have presently to discuss as the recognition or assimilation of an impression (see below, § 18); knowledge in the latter sense is the result of intellectual comparison and is embodied in a proposition. Thus a blind man who cannot know light in the first sense can know about light in the second if he studies a treatise on optics. Now in simple perception or recognition we cannot with any exactness say that two things are perceived: straight is a thing, i.e. a definite object presented; not so not-straight, which answers to no definite object at all. Only when we rise to intellectual know- ledge is it true to say: ” No one could understand the meaning of a straight line without being shown a line not straight, a bent or crooked line.” 2 Two distinct presentations are necessary to the comparison that is here implied; but we must first re- cognize our objects before we can compare them, and this further step we may never take. We need, then, to distinguish between the comparativity of intellectual knowledge, which we must admit — for it rests at bottom on a purely analytical proposition — and the ” differential theory of presentations,” which, however plausible at first sight, must be wrong somewhere, since it com- mits us to absurdities. Thus, if we cannot have a presentation X but only the presentation of the difference between Y and Z, it would seem that in like manner we cannot have the presen- tation of Y or Z, nor therefore of their difference X, till we have had the presentation of A and B say, which differ by Y, and of C and D, which we may suppose differ by Z.

The lurking error in this doctrine, that all presentations are but differences, may perhaps emerge if we examine more closely what may be meant by difference. We may speak of (a) dif- ferences in intensity between sensations supposed to be qualita- tively identical, as e.g. between the taste of strong and weak tea; or of (b) differences in quality between presentations of the same sense, as e.g. between red and green; or of © differences between presentations of distinct senses, as e.g. between blue and bitter. Now as regards (a) and (b), it will be found that the difference between two intensities of the same quality, or between two qualities of the same order, may be itself a distinct pre-

1 Other languages give more prominence to this distinction ; compare yvuwai and tiSicai, noscere and scire, kennen and wissen, connailre and

savoir. On this subject there are some acute remarks in a little-known book, the Exploratio philosophica, of Professor J. Grote. Hobbes, too, was well awake to this difference, as e.g. when he says, " There are two kinds of knowledge; the one, sense or know- ledge original and remembrance of the same; the other, science or knowledge of the truth of propositions, derived from understanding."

' Bain, Logic, i. 3.

sentation, that is to say, in passing from a load of 10 lb to one of 20 lb, for example, or from the sound of a note to that of its octave, it is possible to experience the change continuously, and to estimate it as one might the distance between two places on the same road. But nothing of this kind holds of ©. 3 In pass- ing from the scent of a rose to the sound of a gong or a sting from a bee we have no such means of bringing the two into relation — scarcely more than we might have of measuring the length of a journey made partly on the com- mon earth and partly through the looking-glass. In ©, then, we have only a diversity of presentations, but not a special presentation of difference; and we only have more than this in (a) or (b) provided the selected presentations occur together. We say that we know the difference between a sound and a taste; but what we mean is simply that we know what it is to pass from attending to the one to attending to the other. It is simply an experience of change. Change, however, im- plies continuity, and there is continuity here in the movement of attention and the affective state consequent on that, but not directly in the qualities themselves.

c. If red follows green we may be aware of a greater difference than we could if red followed orange; and we should ordinarily call a 10 lb load heavy after one of 5 lb and light after one of 20 lb. Facts like these it is which make the differential theory of presentations plausible. On the strength of such facts Wundt has formulated a law of relativity, free, apparently, from the objections just urged against Bain's doctrine. It runs thus: " Our sensations afford no absolute but only a relative measure of external impressions. The intensities of stimuli, the pitch of tones, the qualities of light, we apprehend (empfinden) in general only according to their mutual relation, not according to any unalterably fixed unit given along with or before the impression itself." 4

But if true this law would make it quite immaterial what the impressions themselves were: provided the relation continued the same, the sensation would be the same too, just as the ratio of 2 to 1 is the same whether our unit be miles or millimetres. In the case of intensities, e.g. there is a minimum sensibile and a maximum sensibile. The existence of such extremes is alone sufficient to turn the flank of the thoroughgoing

relativists; but there are instances enough of intermediate intensities that are directly recognized. A letter-sorter, for example, who iden- tifies an ounce or two ounces with remarkable exactness iden- tifies each for itself and not the first as half the second; of an ounce and a half or of three ounces he may have a compara- tively vague idea. And so generally within certain limits of error, indirectly ascertained, we can identify intensities, each for itself, neither referring to a common standard nor to one that varies from time to time — to any intensity, that is to say, chat chances to be simultaneously presented; just as an enlisting sergeant will recognize a man fit for the Guards without a yard measure and whether the man's comrades are tall or short. As regards the qualities of sensations the outlook of the relativists is, if anything, worse. In what is called Meyer's experiment (described under Vision) what appears greenish on a red ground will appear of an orange tint on a ground of blue; but this contrast is only possible within certain very narrow limits. In fact, the phenomena of colour-contrast, so far from proving, distinctly disprove that we apprehend the qualities of light only according to their mutual relation. In the case of tones it is very questionable whether such contrasts exist at all. Summing up on the particular doctrine of relativity of which Wundt is the most distinguished adherent, the truth seems to be that, in some cases where two presentations whose difference is itself present- able occur in close connexion, this difference — as we indirectly learn — exerts a certain bias on the assimilation or identification

3 Common language seems to recognize some connexion even here or we should not speak of harsh tastes and harsh sounds, or of dull sounds and dull colours and so forth. All this is, however, super- added to the sensation, probably on the ground of similarities in the accompanying organic sensations.

4 Physiologische Psychologie, 1st ed., p. 421 ; the doctrine reappears in later editions, but no equally general statement of it is given.

of one or both of the presentations. There is no " unalterably fixed unit " certainly, but, on the other hand, " the mutual relations of impressions " are not everything.

15. The term "field of consciousness " has occurred sundry times in the course of this exposition: it is one of several em- ■fubcoa- ployed in

describing what have been incidentally sciousness. re f erre(j t as ” degrees or grades of consciousness ” — a difficult and perplexing topic that we must now endeavour further to elucidate. Sailors steering by night are said to look at the pole-star, ” the cynosure of every eye,” but this does not prevent them from seeing the rest of the starry vault. At a conversazione we may listen to some one speaker while still hearing the murmur of other voices, and while listening we may also see the speaker and thereby identify him the better. What in these instances is looked at or listened to has been called the ” focus ” of consciousness, the rest of what is heard or seen or otherwise presented being called the ” field ” within which attention is thus concentrated or brought to a point. Of these objects beyond the focus we have then only a lower degree of consciousness, and the more ” distant ” they are from the centre of interest the fainter and obscurer they are supposed to be or to become. Now, it is obvious that the continuity here implied, if strictly taken, logically commits us to a field of con- sciousness extending with ever diminishing intensity ad in- definitum. But we have next to notice certain new features that have led psychologists to give to the term field of con- sciousness a more restricted meaning. A meteor flashing across the sky would certainly divert the helmsman’s attention, and for the nonce he would look at that and not at the star in the Little Bear’s tail; a voice at our elbow accosting us, we should turn to the new speaker and listen to him, still hearing it may be, but no longer ” following,” the discourse thus for us interrupted. In these cases a change in the field of con- sciousness brings about a non-voluntary change in the focus. But it only does so provided it is sufficiently intense and abrupt, and the more attention is already concentrated the less effective a given disturbance will be. A whole swarm of meteors might have streaked the sky unheeded while Ulysses, life in hand, steered between Scylla and Charybdis, just as all the din of the siege failed to distract Archimedes bent over his figures in the sand. On the other hand, we can voluntarily transfer the focus of consciousness to any object within the field, provided again this is sufficiently differentiated from the rest. But, more than that, we can not only of our own motion turn to lock at or to listen to what we have only seen or heard, but not noticed before; we can also look out or listen for something not as yet distinguish- able, perhaps not as yet existing at all. And here again the con- centration of attention may be maximal, as when a shipwrecked crew scan the horizon for a sail, or a beleaguered troop hearken for the oncoming of rescue. Now, such anticipated presentations as soon as they are clearly discernible have already a certain finite intensity, and so they are said to have passed over ” the threshold ” — to use Herbart’s now classic phrase — and to have entered the field of consciousness. Afterwards any further increase in their intensity is certainly gradual; are we then to suppose that before this their intensity changed instantly from zero to a finite quantity and not rather that there was an

ultra- liminal or subliminal phrase where too it only changed continuously? The latter alternative constitutes the hypothesis of subconsciousness.

According to this hypothesis the total field with which we began is divided into two parts by what Fechner emphatically called "the fact of the threshold," and the term field of con- sciousness is henceforth restricted to that part within which the focus of consciousness always lies, the outlying part being the region of subconsciousness. Difficulties now begin to be apparent. The intensity or vivacity of a presentation within the field of consciousness depends partly on what we may call its inherent or absolute intensity, partly on the attention that it receives; but this does not hold of presentations in subcon- sciousness. These sub-presentations, as we ought perhaps to call them, cannot be severally and selectively attended to,

cannot be singled out as direct objects of experience. Many psy- chologists have accordingly maintained not only that they cannot with propriety be called presentations, but that they have no strictly psychical existence at all. This, however, is too extreme a view. If nothing of a presentational character can exist save in the field of consciousness as thus circumscribed by a definite boundary or threshold, a breach of continuity is implied such as we nowhere else experience: even the field of sight, from which the metaphor of a field of consciousness is derived, has no such definite margin. The threshold then is not com- parable to a mathematical line on opposite sides of which there is an intensive discontinuity. This has been amply proved by the psychophysical investigations of Fechner and others. We listen, say, to a certain sound as it steadily diminishes; at length we cease to hear it. Again, we listen for this same sound as it steadily increases and presently just barely hear it. In general it is found that its intensity in the former case is less than it is in the latter, and there is also in both cases a certain margin of doubt between clear presence and clear absence; the presentation seems to flicker in and out, now there and now gone. Further, in comparing differences in sensations — of weight, brightness, temperature, &c. — we may fail wholly to detect the difference between a and b, b and c, and yet the difference between a and c may be clearly perceived. We have thus to recognize the existence of a difference between sensa- tions, although there is no so-called " sensation of difference." But if this much continuity must be admitted we can hardly fail to admit more. If differences of presentation exist within the field of consciousness beyond the outermost verge of the " threshold of difference," we cannot consistently deny the existence of any presentations at all beyond the threshold of consciousness. Since the field of consciousness varies greatly and often suddenly with the amount and distribution of attention, we must, as already said, either recognize such subconscious presentations or suppose that clearly differentiated presenta- tions, presentations that is to

say of finite intensity, pass abruptly into or out of existence with every such variation of the field.

The hypothesis of subconsciousness, then, is in the rnain nothing more than the application to the facts of presentation of the law of continuity, its introduction into psychology being due to Leibnitz, who first formulated that law. Half the diffi- culties in the way of its acceptance are due to our faulty ter- minology. With Leibnitz consciousness was not coextensive with all psychical life, but only with certain higher phases of Jt. 1 Of late, however, the tendency has been to make con- sciousness cover all stages of mental development, and all grades of presentation, so that a presentation of which there is no con- sciousness resolves itself into the manifest contradiction of an unpresented presentation — a contradiction not involved in Leibnitz's " unapperceived perception." But such is not the meaning intended when it is said, for example, that a soldier in battle is often unconscious of his wounds or a scholar unconscious at any one time of most of the knowledge " hidden in the obscure recesses of his mind." There would be no point in saying a subject is not conscious of what is not presented at all; but to say that what is presented lacks the intensity requisite, in the given distribution of attention to change that distribution appreciably is pertinent enough. Subconscious presentations may tell on conscious life — as sunshine or mist tells on a landscape, or the underlying writing on a palimpsest — although lacking either the intensity or the individual distinctness requisite to make them definite features. Even if there were no facts to warrant

1 The following brief passage from his Principes de la nature et de la grace (§ 4) shows his meaning: " II est bon de faire distinction entre la Perception, qui est l'<5tat interieur de la Monade representant les choses externes, et V Apperception, qui est la Conscience, ou la connaissance reflexive de cet 6tat interieur, laquelle n'est point donnˆe a toutes les toes, ni loujours a la mime dme. Et c'est faute de cette distinction que les Cartesiens ont manque, en comptant pour rien les perceptions dont on ne s'appercoit pas, comme le peuple compte pour rien les corps insensibles (Op. Phil. Erdmann's ed., P- 715)-

this concept of an ultra-liminal presentation of impressions it might still claim an a priori justification.

The subconscious presentation of ideas as distinct from im- pressions calls, however, for some special consideration. As we can turn our attention to the sensory threshold “i °“id as an < ˆ awa ' t tne entrance of an expected impression, ' so we may await the emergence of a "memory- image "; and again the threshold turns out to be not a mathe- matically exact boundary but a region of varying depth. 1 What we are trying to recollect seems first to waver, now at the tip of our tongue and the next moment completely gone, then per- haps a moment afterwards rising into clear consciousness. Sometimes when asked, say, for the name of a certain college contemporary we reply: I cannot tell, but I should know the name if I heard it. We are aware that we could " recognize," though we cannot " reproduce. " At other times we are con- fident that even recognition is no longer possible, and still if we met the man himself in the old scenes and heard his voice his name might yet recur. Nevertheless, it may be urged, it is surely incredible that all the incidents of a long lifetime and all the items of knowledge of a well-stored mind that may possibly recur — " the infinitely greater part of our spiritual treasures," as Hamilton says — are severally retained and continuously pre- sented in the form and order in which they were originally experienced or acquired. This, however, is not implied. Images in contrast to impressions have always a certain generality. The same image may figure in very various connexions, as may the same letter, for example, in many words, the same word in many sentences. We cannot measure the literature of a language by its vocabulary, nor may we equate the extent of our " spiritual treasures " when these are successively unfolded with the psychical apparatus, so to say, in which they are subconsciously involved. 2 Take the first book of the Aeneid, which, as Macaulay would say, every schoolboy knows: as subconsciously involved, when the boy is not thinking of it, his knowledge is more com- parable to a concordance than to the text itself, which never- theless can be reproduced from it. In the text Aeneas occurs many times, in the concordance as a heading but once. But give him the cue Aeneas scopulum, and the boy reels off from the 180th line; or Praecirpue pins Aeneas, and he starts with the 220th. But ask him for the 580th line; he is probably helpless, while a dunce with the book in his hand can read it off at once. Say instead Et pater Aeneas, and the boy can straightway com- plete the line while the dunce is now helpless. So though its explicit revival is successional, occurs, so to say, in single file, a whole scheme in which many ideas are involved may rise towards the threshold together. When our schoolboy, for example, turns from classics to geography, the mention of Atlas, which might then have recalled a Titan, now leads him to think only of his book of maps. And there is a like sudden shifting of the substratum of our thoughts, when, taking up the morning paper, we glance first at the foreign telegrams, then at the money market, and then at the doings of our political friends. Yet more remote than all, obscurer but more per- vasive, like the clouds of cherubs or imps vaguely

limned in medieval pictures, are the indefinite constituents of our emotional atmosphere, " gay motes that people the sunbeams " of our cheerfulness and make all couleur de rose, or " horrid shapes and sights unholy " that overcast the outlook when we " have the blues." And as attention relaxes, these advance into the foreground and become more or less palpable hopes or fears.

1 Herbart and Fechner describe subconscious presentations gener- ally as existing below the threshold. On the other hand, we have spoken of subconscious sensations as existing beyond it. In view of the important differences between the two forms of presentations primary and secondary, this distinction of ultra-liminal and sub- liminal seems convenient and justifiable.

2 This doctrine of the involution and evolution of ideas we owe to Leibnitz. Herbart attempted in a very arbitrary and a priori fashion to develop it into a physical statics and dynamics with the result — usual to extreme views — that later psychologists neglected it altogether. There are now signs of a fresh reaction, and we shall continually come across evidence of the wide range and great import- ance of the doctrine as we proceed.

Because of the manifold forms into which they may evolve, subconscious images, while still involved, are sometimes called ” psychical ” or more definitely ” presentational dispositions.” The word disposition means primarily an arrangement, as when we talk of the disposition of troops in a battle or of cards in a game; the disposita, that is to say, are always something actual. Which of several potential dispositions they will actually assume will depend upon circumstances, but at least, as Leibnitz long ago maintained, ” les puissances veritables ne sont jamais des simples possibilites.” What is requisite to the realization of a given potentiality is sometimes a condition to be added, sometimes it is one to be taken away. A locomotive with the fire out has no tendency to move, but with steam up it is only hindered from moving by the closure of the throttle-valve or the friction of the brake. Now presentational dispositions we assume to be of the latter sort. They are processes or functions more or less inhibited, and the inhibition is determined by their relation to other psychical processes or functions. The analysis and genesis of these presentational interactions will occupy us at length by and by; it may then be possible to explain the gradual involution of what was successively unfolded in ex- plicit consciousness into those combinations which Herbart called ” apperception-masses,” combinations devoid of the con- crete hints of date and place which are essential to memory. Meanwhile the evidence adduced — decidedly cogent though admittedly indirect — together with the difficulties besetting the extreme view that beyond or below the threshold of con- sciousness there is nothing presentational, seems clearly to justify the

hypothesis of subconsciousness. At the same time the principle of continuity, everywhere of fundamental im- portance when we are dealing with reality, forbids the attempt arbitrarily to assign any limits to the subconscious.

Many psychologists have proposed to explain subconscious retention by habit. But it is obvious that habit itself implies retention and is practically synonymous with disposition; it must therefore presuppose disposita if we are to escape the absurdities of puissances ou facultes nues, with which in this very connexion Leibnitz twitted Locke. Yet, obvious as all this may be, it is frequently ignored even by those who are fond of exposing the pretended explanations of the " faculty-psycho- logists " and quoting Moliere to confute them. Thus we find J. S. Mill arguing: " I have the power to walk across the room though I am sitting in my chair.; but we should hardly call this power a latent act of walking." 3 Nor should we call it a power at all if Mill had been paralysed, or if, instead of sitting in his chair, he had been lying in his cradle. What we want is the simplest psychological description of the situation after the power has been acquired by practice and is still retained. In such a case we can be conscious of the " idea " of the move- ment without the movement actually ensuing; yet only in such wise that the idea is more apt to pass over into action the in- tenser it is, and often actually passes over in spite of us. Surely there must be some functional activity answering to this con- scious presentation; why may not a much less amount of it be conceived possible in subconscious presentation?

Sensation, Movement and the External World. 16. On the view of experience here maintained, we are bound to challenge the description of sensations 4 as due to physical stimuli — widely current though it is — as one that is psychologically inappropriate. The „ e " °" ° following definition, given by Bain, may be taken as a type: " By sensations, in the strict meaning, we under- stand the mental impressions, feelings or states of consciousness following on the action of external things on some part of the body, called on that account sensitive." 5 It is true, no doubt, that what the psychologist calls sensibility has as its invariable concomitant what physiologists call sensibility,

3 Examination of Sir W. Hamilton's Philosophy, 3rd ed., p. 329.

4 For a detailed account of the various sensations and perceptions pertaining to the several senses the reader is referred to the articles Vision; Hearing; Touch; Taste; Smell, &c

6 Senses and Intellect, 4th ed. (1894), p. 101.

or what the more careful of them call irritability; and, true again, that this irritability is invariably preceded by a physical process called stimulation. But it may be urged, why not recognize a connexion that actually obtains, since otherwise sensation must remain unexplained ? Well, in the first place, such " psychophysical " connexion is not a psychological explanation: it cannot be turned directly to account in psychology, either analytic or genetic. Next the psychological fact called sensation always is, and at bottom always must be, independently ascertained; for the physiological " neurosis " or irritation has not necessarily a concomitant " psychosis " or sensation and, strictly dealt with, affords no hint of such. Finally, this inexplicability of sensation is a psychological fact of the utmost moment: it answers to what we call reality in the primary sense of the term. The psycho- physicist, in setting out to explain sensation, has — unawares to himself — left this fundamental reality behind him. For it belongs essentially to individual experience, and this — in as- suming the physical standpoint — he has of course transcended. Nevertheless the mistake of method that here reveals itself was perhaps inevitable, for the facts of another's sense-organs and their physical excitants must have obtruded themselves on observation long before the reflective attitude was advanced enough to make strictly psychological analysis possible. The psychophysical standpoint, that is to say, was attained before the purely psychological; and the consequent bias is only now in process of correction. A series of physical processes, first without and then within the organism — ethereal or aerial vibrations, neural and cerebral excitations — was the starting-point. What comes first, immediately, and alone, in the indi- vidual's experience, and is there simply and positively real, was then misinterpreted as subjective modification, mental impression, species sensibiles, or the like. For from the days of Democritus to our own the same crude metaphor has pre- vailed without essential variation. And here the saying holds: Vestigia nulla retrorsum. Into the man's head the whole world goes, including the head itself. Such thoroughgoing " introjection " affords no ground for subsequent " projection." Thus the endeavour to explain sensation overreaches itself: the external object or thing that was supposed to cause sensations and to be therefore distinct from them, was in the end wholly resolved into these and regarded as built out of them by asso- ciation (Mill) or by apperceptive synthesis (Kant). But no " mental chemistry," no initial alchemy of " forms," can generate objective reality from feelings or sense-impressions as psychophysically defined. 1 A's experience as it is for B is not real but inferential; and if the grounds of the inference, which are the

only realities for B, are to be regarded as the causes of which A's experiences are merely the effects, then the two experiences are on a wholly different footing. When A treats B in the same fashion we get the world in duplicate: (1) as original and out- side, i.e. as cause, and (2) as copied within each percipient's head, i.e. as effect. But when B interprets his own experience as he had interpreted A's we seem to have lost the real world altogether. In presence of this dilemma, the philosophers of our time, as already said, are feeling it needful to revise their psychology. The question of method is vital. If the psycho- physical standpoint were the more fundamental, psychology would be based on physiology, and the old definition of sensation might stand. If, on the other hand, it is the exclusive business of psychology to analyse and trace the development of individual experience as it is for the experiencing individual, then — however much neurological evidence may be employed as a means of ascertaining psychological facts — the facts them- selves must be scrupulously divested of all physical implications, the psychophysical method takes a secondary place, and the objective reality of " sensory " presentations stands unim- peached.

The duality of subject and object in experience compels us also to object to the description of sensations as " states of conscious-

1 Nothing shows this more plainly than the newly-coined term epiphenomenon now applied in this connexion

ness." Since it is the subject, not the object that is conscious, the term state of consciousness implies strictly a subjective reference; and so it is only applicable to sensations, if they are regarded as subjective modifications, either affective or active. The former would identify sensation with feeling, and this — for reasons already given — we must disallow. But it is true that a sensation, like other presentations, implies the subjective activity we call attention; it is not, however, a modification or state of this activity, but the object of it This relation is expressed in German by means of the distinc- tion generally of Vorstellen and Vorstellung and in the present case of Empfinden and Empfindung; and German psychology has gained in clearness in consequence. The distinction of conception and concept (conceit) is to be found in older English writers and was revived by Sir W. Hamilton, who suggested also the analogous distinction of perception and percept. It would be a great gain if there were a corresponding pair of terms to distinguish between " the sensing act " and the object " sensed," as some have been driven to say. Reception and recept at once occur and seem unex- ceptionable — apart, of course, from their novelty. 2 At any rate, if we are to rest content with our present untechnical terminology we must understand sensations to mean objective changes as they first break in upon the experience of our psychological individual ; in this respect Locke's term

" impression " has a certain appropriateness.

What we ordinarily call a single sensation has not only a characteristic quality but it is also quantitatively determined in respect of intensity, protensity (or duration) and extensity. A plurality of properties, it may be said, straightway implies complexity of some sort. This is obvious and un-character- deniable; psychological — as distinct from psychical 3 isticsof — analysis of simple sensations is possible, and the Seasatl < >n. description just given is reached by means of it. Such analysis, however, presupposes the comparison of many sensations; but to the complexity it discloses there is no answering plurality discernible in the immediate experience of a single sensa- tion. To make this clearer let us start from a case in which such plurality can be directly verified. In a handful of rose petals we are aware at once of a definite colour, a definite odour and a definite " feel." Here there is a plurality (a+b+c), any part of which can be withdrawn from our immediate experi- ence without prejudice to the rest, for we can close the eyes, hold the nose, or drop the petals on the table. Let us now turn to the colour alone; this we say has a certain quality, in- tensity, extensity, &c. But not only have we not one sense for quality, another for intensity, &c, but we cannot reduce the intensity to zero and yet have the quality remaining; nor can we suppress the quality and still retain the extensity. In this case then what we have is not a plurality of presentations (a+b +c), but a single presentation having a plurality of attributes (a b c) so related that the absence of any one annihilates the whole. But though, as already said, such single presentation gives, as it stands, no evidence of this plurality, yet it is to be remembered that in actual experience we do not deal with sensations in isolation; here, accordingly, we find evidence in plenty to justify our psychological analysis. In innumerable cases we experience varieties of intensity with little or no ap- parent change of quality, as happens, for example, when a sounding pitch-pipe is moved towards or away from the ear; and continuous changes of quality without any change of in- tensity, as happens when the pipe is shortened or lengthened without any alteration of position. We may have tactual or visual sensations which vary greatly in extensity without any striking change of quality, and we may have such sensations in every possible variety of quality without any changes of extensity.

The numerous and striking diversities among our present sensations are obviously not primordial; what account then can we give of their gradual differentiation ? Some psycho- logists have assumed the existence of absolute " units of

2 Reception does not in English suggest the taking back of the Latin recipere; it expresses only th.e comparative passivity of sense. In contrast to percipere (to take entire possession of) it implies the absence of that

assimilation which is essential to perception ; and finally it contrasts appropriately with retention.

3 This distinction, though continually overlooked, is vitally impor- tant. By psychological analysis we mean such analysis as the psychological observer can reflectively make, by psychical analysis only such analysis as is possible in the immediate experience of the subject observed.

sensibility," all identically the same, and explain the unlike- nesses in our existing sensations as resulting " from unlike Differentia- modes of integration of these absolute units." 1 Hon of The sole evidence on which they rely is physiological, Sensation. t jj e supposed existence of a single nerve shock or neural tremor. It is true that in an extirpated nerve what is known as the " negative variation " is approximately such an isolated event of uniform quality. But the same cannot be said of what happens during the stimulation of a nerve in situ with its peripheral and central connexions still intact. The only evidence apparently to which we can safely appeal in this inquiry is that furnished by biology. Protoplasm, the so- called " physical basis of life," is amenable to stimulation by every form of physical agency — mechanical, chemical, thermal, photical, electrical — with the single exception of magnetism; and in keeping with this it is found that unicellular organisms respond; and respond in ways more or less peculiar, to each of these possible modes of excitation. Since, so far as is known, there is no morphological separation of function in these lowest forms of life, it is reasonably assumed that the single cell acts the part of " universal sense-organ," and that the advance to such complete differentiation of sense-organs as we find among the higher vertebrates has been a gradual advance. Numerous facts can now be adduced of the occurrence of " transitional " or " alternating " sense-organs among the lower forms of multi- cellular animals; organs, that is to say, which are normally responsive to two or more kinds of stimulus, and thus hold an intermediate position between the universal sense-organ of the Protozoa and the special sense-organ of the Mammalia. For example, a group of cells which would behave towards all stimuli impartially were they independent unicellular organ- isms become, as an organ in a multicellular organism, amenable only to mechanical or only to chemical stimuli, — become, that is to say, an organ of touch and of hearing, or an organ of taste and also of smell; until, finally, when differentiation is suffi- ciently advanced, the group ends by becoming exclusively the organ of one specified sense, touch or hearing

in the one case, taste or smell in the other. 2 Of course the imperfectly special- ized sensations, say of the leech, and still more the wholly unspecialized sensations of the amoeba, cannot be regarded as blends of some or all of those which we are said to receive through our five senses. We must rather suppose that sen- sations at the outset corresponded very closely with the general vital action of stimuli as distinct from their action on specially differentiated sensory apparatus. Even now we are still aware of the general effects of light, heat, fresh air, food, &c, as in- vigorating or depressing quite apart from their specific qualities. Hence the frequent use of the term general or common sen- sibility (coenesthesis). But, though less definitely discriminated, the earlier, and what we call the lower, sensations are not any less concrete than the later and higher. They have been called general rather than specific, not because psychologically they lack any essential characteristic of sensation which those ac- quired later possess, but simply because physiologically they are not, like these, correlated to special sense-organs.

But, short of resolving such sensations into combinations of one primordial modification of consciousness, if we could Complexity conceive such, there are many interesting facts of which point clearly to a complexity that we can

Sensations, seldom directly detect. Several of pur supposed sensations of taste, e.g., are complicated with sensations of touch and smell: thus the pungency of pepper and the dryness of wine are tactual sensations, and their spicy flavours are really smells. How largely smells mingle with what we ordinarily take to be simply tastes is best brought home to us by a severe cold in the head, as this temporarily prevents the access of exhalations to the olfactory surfaces. The difference between the smooth feel of a polished surface and the roughness of one that is

1 Cf. G. H. Lewes, Problems of Life and Mind (1879), v °l- ”'• pp. 250 sqq.; H. Spencer, Principles of Psychology, vol. i. § 60.

2 Cf. W. A. Nagel, ” Die Phylogenese specifischer Sinnesorgane,” Bibliotheca zoologica (1894), pp. 1-42.

unpolished, though to direct introspection an irresolvable differ- ence of quality, is probably due to the fact that several nerve- terminations are excited in each case: where the sensation is one of smoothness all are stimulated equally; where it is one of roughness the ridges compress the nerve-ends more, and the hollows compress them less, than the level parts do. The most striking instance in point, however, is furnished by the differences in musical sounds, to which the name timbre is given. To the inattentive or uninstructed ear notes or ” compound tones ” appear to be

only qualitatively diverse and not to be com- plexes of simple tones. Yet it is possible with attention and practice to distinguish these partial tones in a note produced on one instrument, a horn, say, and to recognize that they are different from those of the same note produced on a different instrument, for example, a violin.

In like manner many persons believe that they can discriminate in certain colours, hence called "mixed," the elementary colours of which they are held to be composed; red and yellow, for example, in orange, or blue and red in violet. But in so thinking they appear to be misled, partly by the resemblance that certainly exists between orange and red, on the one hand, and orange and yellow on the other, the two colours between which in the colour spectrum it invariably stands; and partly by the knowledge that, as a pigment, orange is obtainable by the mixture of red and yellow pigments; and so in the other cases. As we shall see later, however (§ 39), in this particular case of sensory continua, resemblance is no proof of complexity. Were it otherwise we should have to conclude that a given tone, since this also resembles the two between which it is intermediate, ought to be a blend of both ; whereas, in point of fact, the tone d — though as regards pitch it has a certain resemblance to c and e, its neighbours on either side — differs widely from the chord c-e, which is made up of these. In all cases in which the psychical complexity of a sensation is beyond dispute the partial sensations are distin- guished by discernible differences of extensity, and usually of inten- sity as well. Thus, if the skin be touched by the point of a hot or cold bradawl the temperature sensation has not the punctual character of the touch but seems rather to surround this as a sort of penumbra. Similarly, the ground-tone of a clang-complex has not only a greater intensity but also a greater extensity than any of the over- tones. 3 There is also in such cases a certain rivalry or antago- nism between the complex as an unanalysed whole and the complex as analysed, and even between the several partial sensations after such analysis. In the absence of such direct evidence it is unwarrant- able to infer psychical complexity from complexity in the physical stimuli, even when this is really present. In the case of pigment mixture, however, there is no such physical complexity as is vulgarly supposed. And it is worth noting that white light is physically the most complex of all, whereas the answering sensation is not only simple but probably the most primitive of all visual sensations.

Every sensation within the fields of consciousness has sen- sibly some continuous duration and seems sensibly to admit of some continuous variation in intensity and ex- tensity. But whether this quantitative continuity continuity' of presentational change is more than apparent has been questioned. Sensations of almost liminal intensity are found to fluctuate every few seconds, and, as already remarked, when the threshold of intensity is actually reached, they seem intermittently to appear and

disappear, a fact which Hume long ago did not fail to notice. The results of numerous experi- ments, however, justify the conclusion that these variations are due primarily to oscillation of attention, and furnish so far no ground for the assumption that even the liminal sensation is discontinuous. But again we can only detect a difference of intensity when this is of finite amount and bears a certain constant ratio to the initial intensity with which it is compared — a fact commonly known as Weber's Law. But this imper- fection in our power of discrimination is no proof that our sen- sations vary discontinuously; and not only is there no positive evidence in favour of such discontinuity, but it is altogether improbable on general grounds. Lastly, there is always more or less distinctness in the several nerve-endings as well as isolation of the nerve-fibres themselves. The skin, for example, when carefully explored, turns out to be a complex mosaic of so-called " spots," severally responding to stimulation by sen- sations of pressure, heat, cold and pain. But from this to argue that the extensity of a sensation is really a mere aggre- gate without any continuity is on a par with calling a lake a 3 Cf. Stumpf, Tonpsychologie, ii. 58 seq.

collection of pools because it is fed by separate streams. If it could be shown that in the brain as a whole there is no func- tional continuity a formidable psychophysical problem would no doubt arise.

As regards the quality of sensations — the primitive sensation of sight appears to consist only of the single quality we call

" light," a quality which ranges in intensity from Sensations. a dazzling brightness that becomes painful and

blinding down to a zero of complete darkness ; a limit which, however, is never completely attained, since the retina is always more or less internally stimulated — hence what is called the eye's own light (Eigenlicht) . The first responses to light-stimulation seem to be very much on a par with our own to diffused heat or cold; some organisms seek the light and others shun it. As little as our temperature-sense yields us a perception of form does the light-sense at this level yield any. Not until the stage of visual spatial perception is reached and some discrimination of form is possible, do black and white attain the meaning they now have for us. An object can be visually perceived only when its colour or shade differs from that of the surrounding field; so far black as a " secondary quality " is on a par with

colour, that is to say, when we are talking of things it may be called a quality. But there is still an important difference; in a light field many colours or shades may be distinguished, but in a dark field none. Though it is correct to speak of perceiving a black object, must we not then maintain that — so far as it is really black 1 — the object yields us directly no sensation? Similarly, the piper is said to " feel " the holes in his whistle when actually he only touches the solid metal in which they are pierced; or the soldier is said to hear the tattoo, though he has no auditory sensation of the silence intervening between successive taps on the drum. And it has yet to be shown that there is any more justification for speaking of visual sensations without luminosity. Meanwhile we must maintain that in absolute darkness we do not see black, since we do not see at all. No doubt we are prone to identify the two concepts darkness and blackness, for what we may call their sensory content is the same, viz. the absence of visual sensation.

Whereas in nature the only diffused light we need consider is that emitted by the sun, the rays transmitted by the things about us vary in physical quality and in their effects upon protoplasm. As soon, therefore, as visual forms can be distinguished, a differentiation among light-sensations becomes obviously advantageous. The first colours to be differentiated were probably yellow and blue, or perhaps it would be truer to say " warm " colour and " cold " colour, upon which there followed a further differentiation of the warm colour into red and green. 2 It is interesting to note that all possible sensa- tions of colour constitute a specific continuum. We may represent it by a sphere, in which (a) the maximum of luminosity is at one pole and the minimum at the other; (b) the series of colours proper (red to violet and through purple back to red), constituting a closed line, are located round the equator or in zones parallel to it, according to shade ; and © the amount of saturation (or absence of white) for any given zone of illumination increases with distance from the axis.

In dealing with the quality of auditory sensations we have to distinguish between the simple sensations called tones and the sensation-complexes, either clangs or noises, which result from their combination. Simple tones also constitute a qualitative con- tinuum, but it has only one dimension, their so-called " pitch "; this may be represented by a straight line ranging between two more or less indefinite extremes. If intensity, that is to say loudness, is taken into account, we have of course a continuum of two dimensions. The tone-continuum is also universally regarded as steadily diminishing in massiveness or extensity as the pitch rises. And, in fact, as we approach the lower

1 As a matter of fact there are no objects absolutely black, none that are devoid of all lustre and completely absorbent of light. But this does not

affect the argument.

s It is assumed that the physiological differentiation of the retina has advanced from the centre.where vision is most distinct, towards the margin where it is least so; and it is found that stimulation of the margin yields none but achromatic sensations, stimulation of a certain intermediate zone only sensations of yellow or blue, and central stimulation alone sensations of every hue. Further, total colour-blindness is extremely rare, whereas red-green colour-blind- ness is comparatively common.

limit, the so-called deep or grave tones become less " even," till at length distinct, more or less pervasive, tremors are felt rather than heard as distinct impulses on the ear-drum. The so-called high or acute tones again, as we approach their limit, are accompanied by tactual, often more or less painful, sensations, as if the ear were pierced by a fine needle. This connexion of auditory with tactual sensations confirms the independent evidence of biology pointing to an original differentiation of sound from touch. The special characteristics of tone-com- plexes, whether clangs or noises, are due to the remarkable analytic power which belongs to the sense of hearing. Two colours cannot be simultaneously presented unless they are differently localized, but several tones may form one complex whole within which they, as " partial " tones, are distinguish- able, though spatially undifferentiated.

Unlike the higher senses of sight and hearing, the lower senses of touch, taste, smell, &c, do not constitute qualitative con- tinua. Temperatures may indeed be represented as ranging in opposite directions, i.e. through heat or through cold, between a zero of no sensation and the organic sensations due to the destructive action of both extremes, heat and cold alike. But the continuity in this case is intensive rather than qualita- tive. Tastes fall into the four isolated qualities known as sweet, sour, bitter, saline; but smells hardly admit of classification at all. Sensations of touch and sight have in a pre-eminent degree a certain peculiar continuity which differentiations of extensity entail, and which we shall have presently to consider further under the title of local signs. The various sensations classed together as organic, hunger, thirst, physical pain, &c, are left to the physiologist to describe.

Our motor presentations contrast with the sensory by their want of striking qualitative differences. They are divided into two groups: (a) motor presentations proper and movements, (b) auxilio-motor of kinaesthetic presentations. The former answer to our " feelings of muscular effort " or " feelings of innervation." The latter are those presentations due to the straining of tendons, stretching and flexing of the skin, and the like, by which the healthy man knows that his efforts to move are followed by

movement, and so knows the position of his body and limbs. It is owing to the absence of these presentations that the anaesthetic patient cannot directly tell whether his efforts are -effectual or not, nor in what position his limbs have been placed by movements from without. Thus under normal circumstances motor presentations are always accompanied by auxilio-motor; but in disease and in passive movements they are separated and their distinctness thus made manifest. Originally we may suppose kinaesthetic pre- sentations to have formed one imperfectly differentiated continuum, but now, as with sensations, they have become a collection of special continua, viz. the groups of movements possible to each limb and certain combinations of these movements.

But whereas kinaesthetic presentations were commonly allowed to be purely sensory, the concomitants of centripetal excitations — ■ hence the older name of " muscular or sixth sense " applied to them by Sir Charles Bell, Weber, Sir William Hamilton and others — concerning motor presentations proper, a very different view, first tentatively advanced by the great physiologist Johannes Muller, and adopted by Helmholtz, Wundt, and especially by Bain, long prevailed. It is, however, now generally discredited, if not com- pletely overthrown. 3 According to this view, " the characteristic feeling of exerted force " must be regarded, Bain maintained, " not as arising from an inward transmission . . . but as the concomitant of the outgoing current by which the muscles are stimulated to act " (op. cit. p. 79). The necessity for this assumption has certainly not been established on physiological grounds, nor apparently did Bain rely primarily on these; for at the very outset of his discussion we find him saying " that action is a more intimate and inseparable property of our constitution than any of our sensations, and enters as a component part into every one of our senses " (op. cit. p. 59). But this important psychological truth is affirmed as strenuously by some, at any rate (e.g. Professor James) of Bain's opponents as it was by Bain himself. Unhappily many, under the same psychophysical

3 Cf. Bastian, The Brain as an Organ of Mind (1880), pp. 691 sqq.; Ferrier, The Functions of the Brain (1886), 2nd ed. pp. 382 sqq.; James, Principles of Psychology (1890), cb xxvi.

bias and so induced, like the upholders of this innervation theory, to look for evidence of subjective activity in the wrong place, have been led to

doubt or to deny the reality of this activity altogether. In fact, this theory, while it lasted, tended to sustain an undue separa- tion of so-called " sensory " from so-called " motor " presentations, as if living experience were literally an alternation of two independent states, one wholly passive and the other wholly active, corresponding to the anatomical distinction of organs of sense and organs of move- ment. The subject of experience or Ego does not pass to and fro between a sensorium commune or intelligence department and a motorium commune or executive, is not in successive intervals receptive and active, still less always passive, but rather always actively en rapport with an active Non-Ego, commonly called the External World.

Perception.

17. In treating apart of the differentiation of our sensory and motor continua, as resulting merely in a number of dis- Mental Sya- tinguishable sensations and movements, we have thesis or been compelled by the exigencies of exposition integration. to i eave ou t of sight another process which really advances pari passu with this differentiation, viz. the integration or synthesis of these proximately elementary presentations into those complex presentations which are called percepts, intuitions, sensori-motor reactions and the like. It is, of course, not to be supposed that in the evolution of mind any creature attained to such variety of dis- tinct sensations and movements as a human being possesses without making even the first step towards building up this material into the most rudimentary knowledge and action. On the contrary, there is every reason to think, as has been said already incidentally, that further differentiation was helped by previous integration, that perception prepared the way for distincter sensations, and purposive action for more various movements. This process of synthesis, which is in the truest sense a psychical process, deserves some general consideration before we proceed to the several complexes that result from it. Most complexes, certainly the most important, are conse- quences of that principle of subjective selection whereby in- teresting sensations lead through the intervention of feeling to movements; and the movements that turn out to subserve such interest come to have a share in it. In this way — which we need not stay to examine more closely now — it happens that a certain sensation, comparatively intense, and a certain move- ment, definite enough to control that sensation, engage atten- tion, to the more or less complete exclusion of the other less intense sensations and more diffused movements that accompany them. Apart from this intervention of controlling movements, the presentation-continuum, however much differentiated, would remain for all purposes of knowledge little better than the dis-connected manifold for which Kant took it. At the same time it is to be remembered that the subject obtains command of particular movements out

of all the mass involved in emotional expression only because such movements prove on occurrence adapted to control certain sensations. A long process, in which natural selection probably played the chief part at the outset — subjective selection becoming more prominent as the process advanced — must have been necessary to secure as much purposive movement as even a worm displays. We must look to subjective interest to explain, so far as psychological ex- planation is possible, those syntheses of motor and sensory presentations which we call spatial perception and the in- tuitions of material things. For example, some of the earliest lessons of this kind seem to be acquired as we may presently see, in the process of exploring the body by means of the limbs, — a process for which grounds in subjective interest can obviously never be wanting.

Perception sometimes means only the recognition of a sen- sation or movement as distinct from its original presentation, thus implying the more or less definite revival Perception. °^ cer tain residua of past experience which re- sembled the present. More frequently it is used as the equivalent of what has been otherwise called the " localization and projection " of sensations — that is to say, of sensations apprehended either as affections of some part of

our own body regarded as extended or as states of some foreign body beyond it. According to a former usage, strictly taken, there might be perception without any spatial presentation at all; a sensation that had been attended to a few times might be perceived as familiar. According to the latter, an entirely new sensation, provided it were complicated with motor experiences in the way required for its localization or pro- jection, would be perceived. But as a matter of fact actual per- ception probably invariably includes both cases: impressions which we recognize we also localize or project, and impressions which are localized or projected are never entirely new — they are, at least, perceived as sounds or colours or aches, &c. It will, however, frequently happen that we are specially concerned with only one side of the whole process, as is the case with a tea- taster or a colour-mixer on the one hand, or, on the other, with the patient who is perplexed to decide whether what he sees and hears is " subjective," or whether it is " real." But there is still a distinction called for: perception as we now know it in- volves not only recognition (or assimilation) and localization, or " spatial reference," as it is not very happily termed, but it usually involves " objective reference " as well. We may perceive sound or light without any presentation of that which sounds or shines; but none the less we do not regard such sound or light as merely the object of our attention, as having only immanent existence, but as the quality or .change or state of a thing, an object distinct not only from the subject attending but from all presentations whatever to which it attends. Here again the actual separation is impossible, because this factor in perception has been so intertwined throughout our mental development with the other two. Still a careful psychological analysis will show that such " reification," as we might almost call it, has depended on special circumstances, which we can at any rate conceive absent. These special circumstances are briefly the constant conjunctions and successions of impressions, for which psychology can give no reason, and the constant move- ments to which they prompt. Thus we receive together, e.g. those impressions we now recognize as severally the scent, colour, and " feel " of the rose we pluck and handle. We might call each a " percept," and the whole a " complex percept." But there is more in such a complex than a sum of partial per- cepts; there is the apprehension or intuition of the rose as a thing having this scent, colour and texture. We have, then, under perception to consider (a) the recognition and (b) the localization of impressions, and © the intuition of things.

18. The range of the terms recognition or assimilation of impressions is wide: between the simplest mental process they may be supposed to denote and the most complex Asslmila- there is a great difference. The penguin that tion of watched unmoved the first landing of man upon its impressions. lonely rock becomes as wild and wary as more civilized fowl after two or

three visits from its molester: it then recognizes that featherless biped. His friends at home also recognize him though altered by years of peril and exposure. In the latter case some trick of voice or manner, some " strik- ing" feature, calls up and sustains a crowd of memories of the traveller in the past — events leading on to the present scene. The two recognitions are widely different, and it is from states of mind more like the latter than the former that psychologists have usually drawn their description of perception. At the outset, they say, we have a primary presentation or impression P, and after sundry repetitions there remains a mass or a series of P residua, P1P2P3 ■ ■ • ', perception ensues when, sooner or later, P n " calls up " and associates itself with these repre- sentations or ideas. Much of our later perception, and especially when we are at all interested, awakens, no doubt, both distinct memories and distinct expectations; but, since these imply previous perceptions, it is obvious that the earliest form of re- cognition, or, as we might better call it, assimilation, must be free from such complications, can have nothing in it answering to the overt judgment, P n is a P. Assimilation involves re- tentiveness and differentiation, as we have seen, and prepares the way for re-presentation; but in itself there is no confronting

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the new with the old, no determination of likeness, and no sub- sequent classification. The pure sensation we may regard as a psychological myth; and the simple image, or such sensation revived, seems equally mythical, as we may see later on. The nth sensation is not like the first: it is a change in a presen- tation-continuum that has itself been changed by those pre- ceding; and it cannot with any propriety be said to reproduce these past sensations, for they never had the individuality which such reproduction implies. Nor does it associate with images like itself, since where there is association there must first have been distinctness, and what can be associated can also, for some good time at least, be dissociated.

19. To treat of the localization of impressions is really to give an account of the steps by which the psychological Localization individual comes to a knowledge of space. At oflmpres- the outset of such an inquiry it seems desirable first slous. f a n to make plain what lies within our purview,

and what does not, lest we disturb the peace of those who, con- founding philosophy and psychology, are ever eager to fight for or against the a priori character of this element of knowledge. That space is a priori in the

epistemological sense it is no con- cern of the psychologist either to assert or to deny. Psycho- logically a priori or original in such sense that it has been either actually or potentially an element in all presentation from the very beginning it certainly is not. It will help to make this matter clearer if we distinguish what philosophers frequently confuse, viz. the concrete spatial experiences, constituting actual localization for the individual, and the abstract con- cept of space, generalized from what is found to be common in such experiences. A gannet's mind " possessed of " a philoso- pher, if such a conceit may be allowed, would certainly afford its tenant very different spatial experiences from those he might share if he took up his quarters in a mole. So, any one who has revisited in after years a place from which he had been absent since childhood knows how largely a " personal equa- tion," as it were, enters into his spatial perceptions. Or the same truth may be brought home to him if, walking with a friend more athletic than himself, they come upon a ditch, which both know to be twelve feet wide, but which the one feels he can clear by a jump and the other feels he cannot. In the concrete " up " is much more than a different direction from " along." The hen-harrier, which cannot soar, is indifferent to a quarry a hundred feet above it — to which the peregrine, built for soaring, would at once give chase — but is on the alert as soon as it de- scries prey of the same apparent magnitude, but upon the ground. Similarly, in the concrete, the body is the origin or datum to which all positions are referred, and such positions differ not merely quantitatively but qualitatively. Moreover, our various bodily movements and their combinations constitute a net- work of co-ordinates, qualitatively distinguishable but geo- metrically, so to put it, both redundant and incomplete. It is a long way from these facts of perception, which the brutes share with us, to that scientific concept of space as having three dimensions and no qualitative differences which we have elaborated by the aid of thought and language, and which reason may see to be the logical presupposition of what in the order of mental development has chronologically preceded it. That the experience of space is not psychologically original seems obvious — quite apart from any successful explanation of its origin— from the mere consideration of its complexity. Thus we must have a plurality of objects — A out of B, B beside C, distant from D, and so on; and these relations of externality, juxtapo- sition, and size or distance imply further specialization; for with a mere plurality of objects we have not straightway spatial differences. Juxtaposition, e.g. is only possible when the related objects form a continuum; but, again, not any continuity is extensive. Now how has this complexity come about?

The first condition of spatial experience seems to lie in what has been noted above (§ 11) as the extensity of sensation. This much . we may allow is original ; for the longer we reflect the more clearly we see that no

combination or association of sensations varying only in intensity and

Extensity.

quality, not even if motor presentations are added, will account for this space-element in our perceptions. A series of touches a, b, c, d may be combined with a series of move- ments mi, fth, tn s , mi, both series may be reversed; and finally the touches may be presented simultaneously. In this way we can attain the knowledge of the coexistence of objects that have a certain quasi-distance between them, and such experience is an important element in our perception of space; but it is not the whole of it. For, as has been already remarked by critics of the associationist psychology, we have an experience very similar to this in singing and hearing musical notes or the chromatic scale. The most elaborate attempt to get extensity out of succession and coexistence is that of Herbert Spencer. He has done, perhaps, all that can be done, and only to make it the more plain that the entire procedure is a xxxrepov irpbrepov. We do not first experience a succession of touches or of retinal excitations by means of movements, and then, when these impressions are simultaneously presented, regard them as extensive, because they are associated with or symbolize the original series of movements; but, before and apart from movement altogether, we experience that massiveness or extensity of impressions in which movements enable us to find positions, and also to measure. 1 But it will be objected, perhaps not with- out impatience, that this amounts to the monstrous absurdity of making the contents of consciousness extended. The edge of this objection will best be turned by rendering the concept of extensity more precise. Thus, suppose a postage stamp pasted on the back of the hand; we have in consequence a certain sen- sation. If another be added beside it, the new experience would not be adequately described by merely saying we have a greater quantity of sensation, for intensity involves quantity, and increased intensity is not what is meant. For a sensa- tion of a certain intensity, say a sensation of red, cannot be changed into one having two qualities, red and blue, leaving the intensity unchanged; but with extensity this change is pos- sible. For one of the postage stamps a piece of wet cloth of the same size might be substituted and the massiveness of the compound sensation remain very much the same. Intensity belongs to what may be called graded quantity: it admits of increment or decrement, but is not a sum of parts. Extensity, on the other hand, does imply plurality: we might call it latent or merged plurality or a " ground " of plurality, inasmuch as to say that a single presentation has massiveness is to say that a portion of the presentation-continuum at the moment undifferentiated is capable of differentiation.

Attributing this property of extensity to the presentation- continuum as a whole, we may call the relation of any particular sensation to this larger

whole its local sign, and can see that, so long as the extensity of a presentation admits of diminution without the presentation becoming nil such presen- tation either has or may have two or more local signs — its parts, taken separately, though identical in quality and intensity, having a different relation to the whole. Such difference of relation must be regarded fundamentally as a ground or possi- bility of distinctness of sign — whether as being the ground or possibility of different complexes or otherwise — rather than as being from the beginning such an overt difference as the term " local sign," when used by Lotze, is meant to imply. 2 From

1 We are ever in danger of exaggerating the competence of a new discovery; and the associationists seem to have fallen into this mistake, not only in the use they have made of the concept of asso- ciation in psychology in general, but in the stress they have laid upon the fact of movement when explaining our space-perceptions in particular. Indeed, both ideas have here conspired against them — association in keeping up the notion that we have only to deal with a plurality of discrete impressions, and movement in keeping to the front the idea of sequence. Mill's Examination of Hamilton (3rd ed., p. 266 seq.) surely ought to convince us that, unless we are prepared to say, as Mill seems to do, " that the idea of space is at bottom one of time " (p. 276), we must admit the inadequacy of our experience of movement to explain the origin of it.

2 To illustrate what is meant by different complexes it will be enough to refer to the psychological implications of the fact that scarcely two portions of the sensitive surface of the human body are anatomically alike. Not only in the distribution and character of

this point of view we may say that more partial presentations are concerned in the sensation corresponding to two stamps than in that corresponding to one. The fact that these partial presentations, though identical in quality and intensity, on the one hand are not wholly identical, and on the other are presented only as a quantity and not as a plurality, is explained by the distinctness along with the continuity of their local signs. Assuming that to every distinguishable part of the body there corresponds a local sign, we may allow that at any moment only a certain portion of this continuum is definitely within the field of consciousness; but no one will

maintain that a part of one hand is ever felt as continuous with part of the other or with part of the face. Local signs have thus an invariable relation to each other: two continuous signs are not one day coincident and the next widely separate. 1 This last fact is only implied in the mere massiveness of a sensation in so far as this admits of differentiation into local signs. We have, then, when the differ- entiation is accomplished, a plurality of presentations constitut- ing an extensive continuum, presented simultaneously, and having certain fixed and invariable relations to each other. Of such experience the typical case is that of passive touch, though the other senses exemplify it. It must be allowed that' our concept of space in like manner involves a fixed continuity of positions; but then it involves, further, the possibility of move- ment. Now in the continuum of local signs there is nothing whatever of this; we might call this continuum an implicit plenum. It only becomes the presentation of oscupied space after its several local signs are complicated in an orderly way with active touches, when in fact we have experienced the contrast of movements with contact and movements without, i.e. in vacuo. It is quite true that we cannot now think of this plenum except as a space, because we cannot divest ourselves of these motor experiences by which we have explored it. We can, how- ever, form some idea of the difference between the perception of space and this one element in the perception by contrasting massive internal sensations with massive superficial ones, or the general sensation of the body as " an animated organism " with our perception of it as extended. Or we may express the difference by remarking that extension implies the distinction of here and there, while extensity rather suggests ubiquity.

It must seem strange, if this conception of extensity is essential to a psychological theory of space, that it has escaped notice so long. The reason may be that in investigations into the origin of our knowledge of space it was always the concept of space and not our concrete space percepts that came up for examination. Now in space as we conceive it one position is distinguishable from another solely by its co-ordinates, i.e. by the magnitude and signs of certain lines and angles, as referred to a certain datum, position or origin; ■ and these elements our motor experiences seem fully to explain. But on reflection we ought, surely, to be puzzled by the question, how these coexistent positions could be known before those movements were made which constitute them different positions. The link we thus suspect to be missing is supplied by the more concrete experiences we obtain from our own body, in which two positions have a qualitative difference or " local colour " independently of move- ment. True, such positions would not be known as spatial without movement; but neither would the movement be known as spatial had those positions no other difference than such as

Positional signs.

the nerve-endings but in the variety of the underlying parts — in one place bone, in another fatty tissue, in others tendons or muscles variously arranged — we find ample ground for diversity in " the local colouring " of sensations. And comparative zoology helps us to see how such diversity has been developed as external impressions and the answering movements have gradually differentiated an organism originally almost homogeneous and symmetrical. Between one point and another on the surface of a sphere there is no ground of difference ; but this is no longer true if the sphere revolves round a fixed axis, still less if it also runs in one direction along its axis.

1 The improvements in the sensibility of our " spatial sense " con- sequent on practice, its variations under the action of drugs, &c, are obviously no real contradiction to this ; on the contrary, such facts are all in favour of making extensity a distinct factor in our space experience and one more fundamental than that of movement.

arises from movement. In a balloon drifting steadily in a fog we should have no more experience of change of position than if it hung becalmed and still.

We may now consider the part which movement plays in elaborating the presentations of this dimensionless continuum into percepts of space. In so doing we must bear in mind that while this continuum implies the incopresentability of two impressions having the same local sign, it allows not only of the presentation of sensations of varying massiveness, but also of a sensation involving the whole continuum simultaneously, as in Bain's classic example of the warm bath. As regards the motor element itself, the first point of importance is the incopre- sentability and invariability of a successive series of auxilio- motor or kinaesthetic presentations, Pi, P 2 , P3, P4. Pi cannot be presented along with P 2 , and from P4 it is impos- sible to reach Pi again save through P 3 and P 2 . Such a series, taken alone, could afford us, it is evident, nothing but the knowledge of an invariable sequence of impressions which it was in our own power to produce. Calling the series of P's " positional signs," the contrast between them and local signs is obvious. Both are invariable, but succession character- izes the one, simultaneity the other; the one yields potential position without place, the other potential place (twos) without position; hence we call them both merely signs. 2 But in the course of the movements necessary to the exploration of the body — probably our earliest lesson in spatial perception — these positional signs receive a new significance from the active and passive touches that accompany them, just as they impart to these last a significance they could never have alone.

It is only in the resulting complex that we have the presenta- tions of actual

position and of spatial magnitude. For space, though conceived as a coexistent continuum, excludes the notion of omnipresence or ubiquity; two positions l d and l r must coexist, but they are not strictly distinct positions so long as we conceive ourselves present in the same sense in both. But, if F d and F g are, e.g. two impressions produced by compass points touching two different spots as l d and l s on the hand or arm, and we place a finger upon l d and move it to l e , experiencing thereby the series P,, Pi, P3, P4, this series constitutes l d and /, into positions and also invests F d and F r with a relation not of mere distinct- ness as roiroi but of definite distance. The resulting complex perhaps admits of symbolization as follows: —

F«F !l Fc/ ; ‘ < iF < .F/F ! ,Fi l F i

*Tttt PipiptP**

Here the first line represents a portion of the tactual continuum, F d and F r being distinct ” feels,” if we may so say, or passive touches presented along with the fainter sensations of the con- tinuum as a whole, which the general ” body-sense ” involves; T stands for the active touch of the exploring finger and Pi for the corresponding kinaesthetic sensation regarded as ” posi- tional sign “; the rest of the succession, as not actually present at this stage but capable of revival from past explorations, is sym- bolized by the ttt and pipspt.

When the series of movements is accompanied by active touches without passive there arises the distinction between one’s own body and foreign bodies; when the initial movement of a series is accompanied by both active and passive touches, the final movement by active touches only, and the intermediate movements are unaccompanied by either, we get the further presentation of empty space lying between us and them — but only when by frequent experience of contacts along with those intermediate movements we have come to know all movement as not only succession but change of position. Thus active touches come at length to be projected, passive touches alone being localized in the stricter sense. But in actual fact, of course, the localization of one impression is not perfected before that of another is begun, and we must take care lest our necessarily meagre exposition give rise to the -mistaken notion

2 Thus a place may be known topographically without its position being known geographically, and vice versa.

that localizing an impression consists wholly and solely in performing or imaging the particular movements necessary to add active touches to a group of passive impressions. That this cannot suffice is evident merely from the consideration that a single position out of relation to all other positions is a contra- diction. Localization, though it depends on many special experiences of the kind described, is not like an artificial product which is completed a part at a time, but is essentially a growth, its several constituents advancing together in definiteness and interconnexion. So far has this development advanced that we do not even imagine the special movements which the localization of an impression implies, that is to say, they are no longer dis- tinctly represented as they would be if we definitely intended to make them: the past experiences are " retained," but too much blended in the mere perception to be appropriately spoken of as remembered or imaged.

A propos of this almost instinctive character of even our earliest spatial percepts it will be appropriate to animadvert on a misleading implication in the current use of such terms as " localization," " projection," " bodily reference," " spatial reference " and the like. The implication is that external space, or the body as extended, is in some sort presented or supposed apart from the localization, projection or reference of impressions to such space. That it may be possible to put a book in its place on a shelf there must be (i) the book, and (2), distinct and apart from it, the place on the shelf. But in the evolution of our spatial experience impressions and positions are not thus presented apart. We can have, or at least we can suppose, an impression which is recognized without being localized as has been already said ; but if it is localized this means that a more complex presentation is formed by the addition of new elements, not that a second distinct object is presented and some indescribable connexion established between the impression and it, still less that the impression is referred to something not strictly presented at all. The truth is that the body as extended is from the psychological point of view not perceived at all apart from localized impressions. In like manner impressions projected (or the absence of impressions projected) constitute all that is perceived as the occupied (or unoccupied) space beyond. It is not till a much later stage, after many varying experiences of different impressions similarly localized or projected, that even the mere materials are present for the formation of such an abstract concept of space as " spatial reference " implies. 1 Psychologists, being themselves at this later stage, are apt to commit the oversight of introducing it into the earlier stage which they have to expound.

20. In a complex percept, such as that of an orange or a piece of wax, may be distinguished the following points concerning which psychology may be expected to give an Things. account : (a) the object's reality, (b) its solidity

or occu- pation of space, (c) its unity and complexity, (d) its per- manence, or rather its continuity in time and (e) its substantiality and the connexion of its attributes and powers. Though, in fact, these items are most intimately blended, our exposition will be clearer if we consider each for a moment apart.

a. The terms actuality and reality have each more than one meaning. Thus what is real, in the sense of material, is opposed to what is mental; as the existent or actual it is Reality " °PP° se d to the non-existent ; and again, what is actual is distinguished from what is possible or necessary. But here both terms, with a certain shade of difference, in so far as actual is more appropriate to movements and events, are used, in antithesis to whatever is ideal or represented, for what is sense-given or presented. This seems at least their primary psychological meaning; and it is the one most in vogue in Eng- lish philosophy at any rate, over-tinged as that is with psycho- logy. 2 Any examination of this characteristic will be best deferred till we come to deal with ideation generally (see § 21 below). Meanwhile it may suffice to remark that reality or actuality is not a single distinct element added to the others which enter into the complex presentation we call a thing,*

1 Cf. on this point Poincare\ La Science et I'hypothese, pp. 74 sqq.

2 Thus Locke says, "Our simple ideas [i.e. presentations or impressions, as we should now say] are all real. . .and not fictions at pleasure; for the mind . . . can make to itself no simple idea more than what it has received " (Essay, ii. 30, 2). And Berkeley says, " The ideas imprinted on the senses by the Author of Nature are called real things; and those excited in the imagination, being less regular, vivid and constant, are more properly termed ideas or images of things, which they copy or represent " (Prin. of Hum. Know., pt. i. §33).

as colour or solidity may be. Neither is it a special relation among these elements, like that of substance and attribute, for example. In these respects the real and the ideal, the actual and the possible, are alike; all the elements or qualities within the complex, and all the relations of those elements to each other, are the same in the rose represented as in the presented rose. The difference turns not upon what these elements are, regarded as qualities or relations presented or represented, but upon whatever it is that distinguishes the presentation from the representation of any given qualities or relations. Now this dis- tinction, as we shall see, depends partly upon the relation of such complex presentation to other presentations in consciousness with it, partly upon its relation as a presentation to the subject whose presentation it is. In this respect we find a difference, not only between the simple qualities, such as cold, hard, red and sweet in strawberry ice, e.g. as presented and as represented, but also,

though less conspicuously, in the spatial, and even the temporal, relations which enter into our intuition as distinct from our imagination of it. So then, reality or actuality is not strictly an item by itself, but a characteristic of all the items that follow.

b. In the so-called physical solidity or impenetrability of things our properly motor presentations or " feelings of effort or innervation " come specially into play. They

are not entirely absent in those movements of ^^ e exploration by which we attain a knowledge of space; but it is when these movements are definitely resisted, ' or are only possible by increased effort, that we reach the full meaning of body as that which occupies space. Heat and cold, light and sound, the natural man regards as real, and by and by perhaps as due to the powers of things known or unknown, but not as themselves things. At the outset things are all corporeal like his own body, the first and archetypal thing, that is to say: things are intuited only when touch is accompanied by pressure; and, though at a later stage passive touch without pressure may suffice, this is only because pressures depending on a subjective initiative, i.e. on voluntary muscular exertion, have been previously ex- perienced. It is of more than psychological interest to remark how the primordial factor in materiality is thus due to the pro- jection of a subjectively determined reaction to that action of a not-self of which sense-impressions consist — an action of the not-self which, of course, is not known as such till this pro- jection of the subjective reaction has taken place. Still we must remember that accompanying sense-impressions are a condition of its projection: muscular effort without simultaneous sensa- tions of contact would not yield the distinct presentation of something resistant occupying the space into which we have moved and would move again. Nay more, it is in the highest degree an essential circumstance in this experience that muscular effort, though subjectively initiated, is still only possible when there is contact with something that, as it seems, is making an effort the counterpart of our own. But this something is so far no more than thing-stuff; without the elements next to be considered our psychological individual would fall short of the complete intuition of distinct things.

c. The remaining important factors in the psychological constitution of things might be described in general terms as the time-relations of their components. Such rela- tions are themselves in no way psychologically i^ter- Col Jl Ie " jt mined; impressions recur with a certain order or want

of order quite independently of the subject's interest or of any psychological principles of synthesis or association whatever. It is essential that impressions should recur, and recur as they have previously occurred, if

knowledge is ever to begin; out of a continual chaos of sensation, all matter and no form, such as some philosophers describe, nothing but chaos could result. But a flux of impressions having this real or sense-given order will not suffice; there must be also attention to and retention of the order, and these indispensable processes at least are psychological.

But for its familiarity we should marvel at the fact that out of the variety of impressions simultaneously presented we do

not instantly group together all the sounds and all the colours, all the touches and all the smells; but, dividing what is given together, single out a certain sound or smell as belonging together with a certain colour and feel, similarly singled out from the rest, to what we call one thing. We might wonder, too — those at least who have made so much of association by similarity ought to wonder — that, say, the white of snow calls up directly, not other shades of white or other colours, but the expectation of cold or of powdery softness. The first step in this process has been the simultaneous projection into the same occupied space of the several impressions which we thus come to regard as the qualities of the body filling it. Yet such simul- taneous and coincident projection would avail but little unless the constituent impressions were again and again repeated in like order so as to prompt anew the same grouping, and unless, further, this constancy in the one group was present along with changes in other groups and in the general field. There is nothing in its first experience to tell the infant that the song of the bird does not inhere in the hawthorn whence the notes pro- ceed, but that the fragrance of the mayflower does. It is only where a group, as a whole, has been found to change its position relatively to other groups, and — apart from casual relations — to be independent of changes of position among them, that such complexes can become distinct unities and yield a world of things. Again, because things are so often a world within themselves, their several parts or members not only having distinguishing qualities but moving and changing with more or less independence of the rest, it comes about that what is from one point of view one thing becomes from another point of view several — like a tree with its separable branches and fruits, for example. Wherein then, more precisely, does the unity of a thing consist? This question, so far as it here admits of answer, carries us over to temporal continuity.

d. Amidst all the change above described there is one thing comparatively

fixed: our own body is both constant as a group and a constant item in every field of groups; and not Coatimtlt on ly so i DUt ˆ i s beyond all other things an object ‘ of continual and peculiar interest, inasmuch as our earliest pleasures and pains depend solely upon it and what affects it. The body becomes, in fact, the earliest form of self, the first datum for our later conceptions of permanence and individuality. A continuity like that of self is then transferred to other bodies which resemble our own, so far as our direct experience goes, in passing continuously from place to place and undergoing only partial and gradual changes of form and quality. As we have existed — or, more exactly, as the body has been continuously presented — during the interval between two encounters with some other recognized body, so this is regarded as having continuously existed during its absence from us. However permanent we suppose the conscious subject to be, it is hard to see how, without the continuous presentation to if of such a group as the bodily self, we should ever be prompted to resolve the discontinuous presentations of external things into a continuity of existence. It might be said: Since the second presentation of a particular group would, by the mere workings of psychical laws, coalesce with the image of the first, this coalescence would suffice to ” generate ” the concept . of continued existence. But such assimilation is only the ground of an intellectual identification and furnishes no motive, one way or the other, for real identification: between a second presentation of A and the presentation at different times of two A’s there is so far no difference. Real identity no more involves exact similarity than exact similarity involves sameness of things; on the contrary, we are wont to find the same thing alter with time, so that exact similarity after an interval, so far from suggesting one thing, is often the surest proof that there are two concerned. Of such real identity, then, it would seem we must have direct experience; and we have it in the continuous presentation of the bodily self; apart from this it could not be ” generated ” by association among changing presentations. Other bodies being in the first instance personified, that then is regarded as one thing — from whatever point of view

we look at it, whether as part of a larger thing or as itself com- pounded of such parts — which has had one beginning in time. But what is it that has thus a beginning and continues indefinitely? This leads to our last point.

e. So far we have been concerned only with the combination of sensory and motor presentations into groups and with the differentiation of group from group; the relations to each other of the constituents of each group still £ lt for the most part remain. To these relations in the main must be referred the correlative concepts of substance and attribute, the distinction in substances of qualities and powers, of primary qualities and secondary, and the like. 1

Of all the constituents of things only one is universally present, that above described as physical solidity, which presents itself according to circumstances as impenetrability, resistance or weight. Things differing in temperature, colour, taste and smell agree in resisting compression, in filling space. Because of this quality we regard the wind as a thing, though it has neither shape nor colour, while a shadow, though it has both but not resistance, is the very type of nothingness. This constituent is invariable, while other qualities are either absent or change — form altering, colour disappearing with light, sound and smells intermitting. Many of the other qualities — colour, temperature, sound, smell — increase in intensity if we advance till we touch a body occupying space; with the same movement too its visual magnitude varies. At the moment of contact an unvarying tactual magnitude is ascertained, while the other qualities and the visual magnitude reach a fixed maximum; then first it becomes possible by effort to change or attempt to change the position and form of what we apprehend. This tangible plenum we thenceforth regard as the seat and source of all the qualities we project into it. In other words, that which occupies space is psychologically the substantial; the other real constituents are but its properties or attributes, the marks or manifestations which lead us to expect its presence.

Imagination or Ideation?

21. Before the intuition of things has reached a stage so com- plete and definite as that just described, imagination or ideation as distinct from perception has well begun. In passing to the consideration of this higher form of J^d^easT mental life we must endeavour first of all analytically to distinguish the two as precisely as may be and then to trace the gradual development of the higher.*

To begin, it is very questionable whether Hume was right in applying Locke's distinction of simple and complex to ideas in the narrower sense as well as to impressions. " That idea of red," says Hume, " which we form in the dark and that impression which strikes our eyes in the sunshine differ only in degree, not in nature." 3 But what he seems to have overlooked is that, whereas we may have a mere sensation red, we can only have an image or representation of a red thing or a red form, i.e of red in some way ideally projected' or intuited. In other words, there are no ideas — though there are concepts — answering to simple or isolated impressions. The synthesis which has taken place in the evolution of the percept can dhly partially fail in the idea, and never so far as to leave us with a chaotic " manifold " of mere sensational remnants. On the contrary, we find that in " constructive imagination " a new kind of effort is often requisite in order partially to dissociate these representational complexes as a preliminary to new combinations. But it is doubtful whether the results of such an analysis

are ever the ultimate elements of the percept, that is, merely isolated impressions in a fainter form. We may now try to ascertain further the characteristic marks which distinguish what is imaged from what is perceived.

1 The distinction between the thing and its properties is one that might be more fully treated under the head of " Thought and Con- ception." Still, inasmuch as the material warrant for these concepts is contained more or less implicity in our percepts, some considera- tion of it is in place here.

2 Ideation — " a word of my own coining," says James Mill.

3 Treatise of Human Nature, bk. i. pt. i. I I.

The most obvious difference is that which Hume called " the force or liveliness " of primary presentations as compared Character- with secondary presentations. But what exactly istks 0/ are we to understand by this somewhat figurative ideas. language ? A simple difference of intensity cannot be all that is meant, for — though we may be momentarily confused — we can perfectly well distinguish the faintest impression from an image; moreover, we can reproduce such faintest impressions in idea. The whole subject of the intensity of representations awaits investigation. Between moonlight and sunlight or between midday and dawn we can discriminate many grades of intensity; but it does not appear that there is any corresponding variation of intensity between them when they are not seen but imagined. Many persons suppose they can imagine a waxing or a waning sound or the gradual abate- ment of an intense pain; but what really happens in such cases is probably not a rise and fall in the intensity of a single repre- sentation, but a change in the complex represented. In the primary presentation there has been a change of quality along with change of intensity, and not only so, but most frequently a change in the muscular adaptations of the sense-organs too, to say nothing of organic sensations accompanying these changes. A representation of some or all of these attendants is perhaps what takes place when variations of intensity are supposed to be reproduced. Again, hallucinations are often described as abnormally intense images which simply, by reason of their intensity, are mistaken for percepts. But such statement, though supported by very high authority, is almost certainly false, and would probably never have been made if physiological and epistemological considerations had been

excluded as they ought to have been. Hallucinations, when carefully examined, seem just as much as percepts to contain among their constituents some primary presentation — either a so-called subjective sensation of sight and hearing or some organic sensation due to deranged circulation or secretion. Intensity alone, then, will not suffice to discriminate between impressions and images.

What we may call superior steadiness is perhaps a more constant and not less striking characteristic of percepts. Ideas are not only in a continual flux, but even when we attempt forcibly to detain one it varies continually in clearness and com- pleteness, reminding one of nothing so much as of the illuminated devices made of gas jets, common at fetes, when the wind sweeps across them, momentarily obliterating one part and at the same time intensifying another. There is not this perpetual flow and flicker in what we perceive. The impressions entering consciousness at any one moment are psychologically independent of each other; they are equally independent of the impressions and images presented the moment before — independent, i.e. as regards their order and character, not, of course, as regards the share of attention they secure. Attention to be concentrated in one direction must be withdrawn from another, and images may absorb it to the exclusion of impressions as readily as a first impression to the exclusion of a second. But, when attention is secured, a faint impression has a fixity and definite- ness lacking in the case of even vivid ideas. One ground for this definiteness and independence lies in the localization or projection which accompanies all perception. But why, if so, it might be asked, do. we not confound percept and image when what we imagine is imagined as definitely localized and projected ? Because we have a contrary percept to give the image the lie; where this fails, as in dreams, or where, as in hallucination, the image obtains in other ways the fixity characteristic of im- pressions, such confusion does in fact result. But in normal waking fife we have the whole presentation-continuum, as it were, occupied and in operation: we are distinctly conscious of being embodied and having our senses about us.

But how is this contrariety between impression and image possible ? With eyes wide open, and while clearly aware of the actual field of sight and its filling, one can recall or imagine a wholly different scene: lying warm in bed one can imagine one- self out walking in the cold. It is useless to say the times are different, that what is perceived is present and what is imaged

is past or future. 1 The images, it is true, have certain temporal marks — of which more presently — by which they may be referred to what is past or future; but as imaged they are present, and, as we have just observed, are regarded as actual whenever there are no correcting impressions. We cannot at once see the sky red and blue; how is it we can imagine it the one

while perceiving it to be the other? When we attempt to make the field of sight at once red and blue, as in looking through red glass with one eye and through blue glass with the other, either the colours merge and we see a purple sky or we see the sky first of the one colour and then of the other in irregular alternation. That this does not happen between impression and image shows that, whatever their connexion, images as a whole are distinct from the presenta- tion-continuum and cannot with strict propriety be spoken of as revived or reproduced impressions. This difference is manifest in another respect, viz. when we compare the effects of diffusion in the two cases. An increase in the intensity of a sensation of touch entails an increase in the extensity; an increase of muscular innervation entails irradiation to adjacent muscles; but when a particular idea becomes clearer and more distinct, there rises into consciousness an associated idea qualitatively related probably to impressions of quite another class, as when the smell of tar calls up memories of the sea-beach and fishing- boats. Since images are thus distinct from impressions, and yet so far continuous with each other as to form a train in itself un- broken, we should be justified, if it were convenient, in speaking of images as changes in a new continuum; and later on we may see that this is convenient.

Impressions then — unlike ideas — have no associates to whose presence their own is accommodated and on whose intensity their own depends. Each bids independently for attention, so that often a state of distraction ensues, such as the train of ideas left to itself never occasions. The better to hear we listen; the better to see we look; to smell better we dilate the nostrils and sniff; and so with all the special senses: each sensory impression sets up nascent movements for its better reception. 2 In like manner there is also a characteristic adjustment for images which can be distinguished from sensory adjustments almost as readily as these are distinguished from each other. We become most aware of this as, mutatis mutandis, we do of them, when we voluntarily concentrate attention upon particular ideas instead of remaining mere passive spectators, as it were, of the general procession. To this ideational adjustment may be referred most of the strain and ” head-splitting ” connected with recol- lecting, reflecting and all that people call headwork; and the ” absent look ” of one intently thinking or absorbed in reverie seems directly due to the absence of sensory adjustment that accompanies the concentration of attention upon ideas.

22. But, distinct as they are, impressions and images are still closely connected. In the first place, there are two or three well-marked intermediate stages, so that, though we connexion cannot directly observe it, we seem justified in assum- of Impres- ing a steady transition from the one to the other. As s/ons aad the first of such intermediate stages, it is usual to m ges ‘ reckon what are often, and — so far as psychology goes — inaccurately, styled after-images. They would be better de- scribed as after-

sensations, inasmuch as they are due either (1) to the persistence of the original peripheral excitation after the stimulus is withdrawn, or (2) to the effects of the exhaustion or the repair that immediately follows this excitation. In the former case they are qualitatively identical with the original sensation and are called " positive," in the latter they are complementary to it and are called "negative " (see Vision). These last, then, of which we have clear instances only in connexion with sight, are obviously in no

1 Moreover, as we shall see, the distinction between present and past or future psychologically presupposes the contrast of impression and image.

2 Organic sensations, though distinguishable from images by their definite though often anatomically inaccurate localization, furnish no clear evidence of such adaptations. But in another respect they are still more clearly marked off from images, viz. by the pleasure or pain they directly occasion.

sort re -presentations of the original impression, but a sequent presentation of diametrically opposite quality; while positive after-sensations are, psychologically regarded, nothing but the original sensations in a state of evanescence. It is this continuance and gradual waning after the physical stimulus has completely ceased that give after-sensations their chief title to a place in the transition from impression to image. There is, however, another point: after-sensations are less affected by movement than impressions are. If we turn away our eyes we cease to see the flame at which we have been looking, but the after-image remains still projected before us and continues localized in the dark field of sight, even if we close our eyes altogether. This fact that movements do not suppress them, and the fact that yet we are distinctly aware of our sense-organs being concerned in their presentation, serve to mark off after-sensations as intermediate between primary and secondary presentations. The after-sensation is in reality more elementary than either the preceding percept or its image. In both these, in the case of sight, objects appear in space of three dimensions, i.e. with all the marks of solidity and perspective; 1 but the so-called after-image lacks all these.

Still further removed from normal sensations {i.e. sensations determined by the stimuli appropriate to the sense-organ) are the "recurrent sensations "

often unnoticed but probably expe- rienced more or less frequently by everybody — cases, that is, in which sights or sounds, usually such as at the time were engrossing and impressive, suddenly reappear several hours or even days after the physical stimuli, as well as their effects on the terminal sense-organ, seem entirely to have ceased. Thus workers with the microscope often see objects which they have examined during the day stand out. clearly before them in the dark; it was indeed precisely such an experience that led the anatomist Henie first to call attention to these facts. But he and others have wrongly referred them to what he called a " sense-memory "; all that we know is against the supposition that the eye or the ear has any power to retain and reproduce percepts. " Recurrent sensations " have all the marks of per- cepts which after-sensations lack; they only differ from what are more strictly called " hallucinations " in being independent of all subjective suggestion determined by emotion or mental derangement.

In what Fechner has called the " memory after-image " or the primary memory-image, as it is better termed, we have the image proper in its earliest form. As an instance of what is meant may be cited the familiar experience that a knock at the door, the hour struck on the clock, the face of a friend whom we have passed unnoticed, may sometimes be recognized a few minutes later by means of the persisting image, although — apparently — the actual impression was entirely disregarded. But in vision the primary memory-image can always be obtained, and is obtained to most advantage, by looking intently at some object for an instant and then closing the eyes or turning them away. The image of the object will appear for a moment very vividly and distinctly, and can be so recovered several times in succes- sion by an effort of attention. Such reinstatement is materially helped by rapidly opening and closing the eyes, or by suddenly moving them in any way. In this respect a primary memory- image resembles an after-sensation, which can be repeatedly revived in this manner when it would otherwise have disappeared. This seems to show that the primary memory-image in such cases

1 The following scant quotation from Fechner, one of the best observers in this department, must suffice in illustration. " Lying awake in the early morning after daybreak, with my eyes motionless though open, there usually appears, when I chance to close them for a moment, the black after-image of the white bed immediately before me and the white after-image of the black stove-pipe some distance away against the opposite wall. . . . Both [after images] appear as if they were in juxtaposition in the same plane; and, though — when my eyes are open — I seem to see the white bed in its entire length, the after-image — when my eyes are shut — presents instead only a narrow black stripe owing to the fact that the bed is seen considerably foreshortened. But the memory-image on the other hand

com- pletely reproduces the pictorial illusion as it appears when the eyes are opep" (ElemenU der Psvchophysik, ii. 473).

owes its vivacity in part to a positive after-sensation; at any rate it proves that it is in some way still sense-sustained. But in other respects the two are very different: the after-sensation is necessarily presented if the intensity of the original excitation suffices for its production, and cannot be presented otherwise, however much we attend. Moreover, the after-sensation is only for a moment positive, and then passes into the negative or complementary phase, when, so far from even contributing towards the continuance of the original percept, it directly hinders it. Primary memory-images on the other hand, and indeed all images, depend mainly upon the attention given to the impression; provided that was sufficient, the faintest impression may be long retained, and without it very intense ones will soon leave no trace. The primary memory-image retains so much of its original definiteness and intensity as to make it possible with great accuracy to compare two physical phenomena, one of which is in this way " remembered " while the other is really present. For the most part this is indeed a more accurate procedure than that of dealing with both together, but it is only possible for a very short time. From Weber's experiments with weights and lines 2 it would appear that even after 10 seconds a considerable waning has taken place, and after 100 seconds all that is dis- tinctive of the primary image has probably ceased.

On the whole, then, it appears that the ordinary memory- image is a joint effect; it is not the mere residuum of changes in the presentation-continuum, but an effect of these only when there has been some concentration of attention upon them. It has the form of a percept, but is not constituted of revived impressions, for the essential marks of impressions are absent; there is no localization in, or projection into, external space, neither is there the motor adaptation, nor the tone of feeling, incident to the reception of impressions. Ideas do not reproduce the intensity of these original constituents, but only their quality and complication. What we call the vividness of an idea is of the nature of intensity, but it is an intensity very partially and indirectly determined by that of the original impression; it depends much more upon the state of what we shall call the memory-continuum and the attention the idea receives. The range of vividness in ideas is probably compara- tively small; what are called variations in vividness are often really variations in distinctness and completeness. 3 Where we have great intensity, as in hallucinations, primary presentations may be reasonably supposed to enter into the complex.

It is manifest that the memory-continuum has been in some- way formed out of or differentiated from the presentation- continuum by the movements

of attention, but the precise con- nexion of the two continua is still very difficult to determine. We see perhaps the first distinct step of this evolution in the primary memory-image: here there has been no cessation in presentation, and yet the characteristic marks of the impression are gone, so much so, indeed, that superposition without " fusion " with an exactly similar impression is possible. We have now to inquire into the genesis and development of ideation.

Genesis and Development of Ideation. 23. We find ourselves sometimes engrossed in present percep- tions, as when tracing, for example, the meanderings of an ant; at other times we may be equally absorbed in reminiscences; or, again, in pure reverie and " castle-building." Here are three well-marked forms of conscious life: the first being concerned with what is, the second with what has been, and the third with the merely possible. Again, the first involves definite spatial and temporal order, though the temporal order, as just said, is in the main restricted to the " sensible present "; the second involves only definite time-order; and the last neither in a defi- nite way. Thus, analytically regarded, perception, memory, imagination, show a steady advance. In infancy the first

2 Vie Lehre vom Tastsinne, &c, pp. 86 seq.

3 As we have seen that there is a steady transition from percept to image, so, if space allowed, the study of hallucinations might make clear an opposite and abnormal process — the passage, that is to say, of images into percepts, for such, to all intents and purposes, are hallucinations of perception, psychologically regarded.

predominates, while senility lapses back to the second; in the third, where similarities suggest themselves and the contrast of actual and possible is explicit, we have at length the groundwork of logical comparison. Nevertheless, since imagination plays a conspicuous part in child life before much personal reminiscence appears, it would seem probable that ideas do not first arise as definite memory-images or reminiscences. On the other hand, in the so-called homing instincts of the lower animals we have evidence of isolated " memories " of a simpler form than ours.

The subject is as difficult as it is interesting and important, and we can hardly hope at present for a final solution. One chief obstacle, as is so often the case in psychology, lies in the unsettled connotation of such leading

terms as memory, association and idea. Even what is most fundamental of all, that " plasticity " which we have analysed into retentiveness, differentiation and integration, is sometimes described as if it already involved memory-ideas and their association. Ideas, that is to say, are identified with mere " residua " of former " impressions," and yet at the same time are spoken of as " copies " of these: which is much like saying the even- ing twilight is a replica of the noonday glare as well as its parting gleam. Again, the continuous differentiation and redintegration of the presentational continuum which mark the progress of perceptual experience are resolved into an original multiplicity of presenta- tional atoms which are associated by " adhesion " of the contiguous. Yet before the differentiation there was no plurality, and after the integration there is only a complex unity, comparable perhaps with another organic whole, but certainly not with a mosaic stuck together with cement. This mistaken identification by the Associa- tionist psychology of later processes with simpler and earlier ones, by which they are only partially explained, has not only obscured the science with inappropriate concepts but has prevented the ques- tion on which we are entering — that concerning the genesis and development of ideas — from being ever effectually raised. The dis- cussion of this question will incidentally yield the best refutation of those views.

Experience, we say, is the acquisition of practical acquaintance and efficiency as the result of repeated opportunity and effort. This means that strangeness on the cognitive side gives place to familiarity, and that on the active side clumsiness is superseded by skill. But though analytically distinct, the two sides are, as we have already insisted, actually inseparable: to the uninterest- ing we are indifferent, and what does not call for active response is ignored. If the original presentations whether sensory or motor, be A, B, C, we find then that they gradually acquire a new character, become, let us say, At, Bt, Ct, 7 representing the eventual familiarity or facility, as the case may be. We find, again, a certain sameness in this character, however various the presentations to which it pertains, a sameness which points to the presence of subjective constituents, and to these we may assign the " feelings " that enter into accommodation and adjustment. This factor is important as evidence of a subjective co-operation which may enable us to dispense with the mutual " adhesions " and " attractions" among presentations, on which the Associa- tionists rely. But it is obvious that there must be an objective factor as well; and it is this objective factor in the process giving rise to 7 that now primarily concerns us. We have described that process as assimilation or immediate recognition: the older psychology described it as association of the completely similar, or as automatic association. That the two views have some- thing in common is shown by the juxtaposition of " automatic " and

” immediate,” ” similarity ” and ” assimilation.” To pre- pare the way for further discussion, let us first ascertain these points of agreement. ” When I look at the full moon,” said Bain, ” I am instantly impressed with the state arising from all my former impressions of her disc added together.” This we may symbolize in the usual fashion as A + a, • • • + a 3 + a 2 + «i. Now, it will be granted (1) that the present occurrence (full moon) has been preceded by a series of like occurrences, enumer-” able as 1, 2, 3, • • • n; (2) that the present experience (At) is what it is in consequence of the preceding experiences of these occurrences; and (3) that it ” arises instantly ” as the joint result of such preceding experiences. But it is denied (1) that this present experience is the mere sum, or even the mere ” fusion,” of the experiences preceding it; (2) that they were qualitatively identical; (3) that they persist severally unaltered, in such wise that experience ” drags at each remove a lengthening chain ”

of them. In the case of dexterities, where 7 answers to facility, it is obvious that there is no such series of identicals (ai, c 2 , ■ • • a„) at all. From the first rude beginning — say the school- boy’s pothooks — up to the finished performance of the adept there is continuous approximation: awkward and bungling attempts, passing gradually into the bold strokes of mastery. Nor is the case essentially different in cognition where 7 answers to familiarity; if we attend, as it is plain we ought, not to the physical fact cognized, but to the individual’s perception of it. This, too, is an acquisition, has entailed activity, and is marked by gradual approximation towards clearness and distinctness. The successive experiences of n identical occurrences does not then result in an accumulation of n identical residua. The ineptness of the atomistic psychology with its “physical ” and ” chemical ” analysis is nowhere more apparent than here. Considering the intimate relation of life and mind, and the strong physiological bias shown by the Associationists from Hartley onwards, it is surely extraordinary how completely they have failed to appreciate the light-bearing significance of such concepts as function and development. Facility and faculty (or function) are much the same, both etymologically and actually. As the perfected structure is not so many rudimentary structures “added together,” but something that supersedes them com- pletely, must we not say the same of the perfected function? The less fit is not embodied in the fittest that finally survives. Development implies change of form in a continuous whole: every growth into means an equal growth out of: thus one cannot find the caterpillar in the butterfly. Between organic development and mental development there is then more than an analogy.

But though assimilation cannot be analysed into a series of identical ideas {a u a 2 , ■ ■ • a n), either “added together” or ” instantaneously fused,” yet it does result in an a which may provisionally be called an idea. Such idea is, however, neither a memory-idea in the proper sense nor an idea

within the meaning of the term implied in imagination or ideation. For it is devoid of the temporal signs 1 indicated by the subscript numerals in ai, a 2 , • • ■, and it does not yet admit of reproduction as part of an ideational continuum, one, that is, divested of the character- istics belonging to the actual and sensibly present. It is, so to say, embryonic, something additional to the mere sensation assimilated, and yet something less than a " free or independent idea." It is, as it has been happily called, 2 a tied (gebundene) or implicit idea. We have clear evidence of the sense-bound stage of this immature " idea " in the so-called " memory after- ■ image " (cf. § 22). There is, however, nothing in this of memory, save as the term is loosely used for mere retentiveness; and after- percept would therefore be a less objectionable name for it. This after-percept is entirely sense-sustained and admits of no ideal recall, though — in minds sufficiently advanced — it may persist for a few moments, and so form the basis of such compari- son with a second sensation, as we find in the experiments of Weber, Fechner and others. 3 At a still lower level, or in actual perception, we cannot assume even this amount of partial independence, though continuity clearly points to something beyond the bare sensation, which is a pure abstraction, as we may presently see.

It is saying too little to maintain, as some do, that this " some- thing " is subconscious, on the ground that it is not discoverable by direct analysis. Yet it is saying too much, regardless of this defect, to describe a percept as a presentative-representative

1 On this term cf. below, §§ 24, 28.

2 Cf. Drobisch, Empirische Psychologie (1842), § 31; Hoffding, " Ueber Wiederkennen, Association und psychische Activitat," in Vierteljahrsschr. f. wissenschaftl. Philosophie, Bd. xiii. and xiv. To Hoffding we are also indebted for the term Bekanntheitsqualitat, which has suggested the 7 character used above. Cf. also Ward, " Assimilation and Association," Mind (1894-1895).

3 Recent experiments, however, seem to prove that the after- percept is not the sole factor, and often is not a factor at all in such successive comparison (so-called) ; but that what is now termed " the absolute impression " may supplement it or even replace it altogether. As to what is meant by absolute impression, cf. § H. c.

complex, if representation is to imply the presence of a free or independent idea. To call this " something " a tied or nascent idea on the ground of its possible later development into an independent representation seems, then, nearest the truth. The same meaning is sometimes expressed in a wholly different and designedly para- doxical way, by saying that all cognition (perception) is recognition. This statement has been met by elaborate expositions of the differ- ence between knowing and knowing again, the irrelevance of which any lexicon would show; and, further, by the demand : How on such a view is a first cognition possible, or how is an indefinite regress of assimilation to be avoided? We may confidently reply that it cannot be avoided : an absolute beginning of experience, whether phylogenetically or ontogenetically, is beyond us. Assimilation means further assimilation; in this sense all cognition is further cognition, and a bare sensation is, as said, an abstraction representing a limit to which we can never regress.

We find evidence, again, of ideas in the making in what Lewes called preperception. Of this instances in plenty are furnished by everyday illusions, as when a scarecrow is hailed by the travel- ler who mistakes it for a husbandman, or when what is taken for an orange proves to be but an imitation in wax. In reality all complex percepts involve preperception; and, so far, it must be allowed that such percepts are directly analysable into presentative-representative complexes. Nevertheless, the repre- sentative element is not yet, and may never become, an idea proper. The sight of ice yields a forefeel of its coldness, the smell of baked meats a foretaste of their savour. Such pre- percepts differ from free ideas just as after-percepts do: they are still sense-bound and sense-sustained. Nor can this complica- tion be with any propriety identified either with the association pertaining to memory or with that specially pertaining to idea- tion; though, no doubt, the two processes — complication and association — are genetically continuous, as are their respective constituents, nascent and free ideas. 1 The whole course of perceptual integration being determined and sustained by subjective interest, involves from the outset, as we have seen, concurrent conative impulses; and thus the same assimilation that results in familiarity and preperception on the subjec- tive side results in facility and purpose on the conative. Knowing immediately what to do is here the best evidence of knowing what there is to do with; the moth that flies into the candle has assuredly no preperception of it, and does not act with purpose. Bearing this in mind, we may now see one way, and probably the earliest, in which tied ideas become free.

The contrast between the actual and the possible constitutes, as we have seen, the main difference beween experience at the perceptual and experience at the ideational stage. A subject confined to the former level knows not yet this difference. Such knowledge is attained, not through any

quasi-mechanical inter- action of presentations, but usually through bitter experience. The chapter of accidents is the Bible of fools, it has been said; but we are all novices at first, and get wisdom chiefly by the method of trial and failure. Things are not always different in what to us are their essential properties, but they so differ from time to time. Resemblances are frequent enough to give us familiarity and confidence; yet uniformity is flecked by diversity, and thwarted intentions disclose possibilities for which we were not prepared. What was taken for sugar turns out to be salt; what was seized as booty proves to be bait. We catch many Tatars, and so learn wariness in a rough school. In such wise preperceptions displaced by the actual fact yield the " what " severed from the " that," the " ideal " freed at length from the exclusive hold of the real. In a new situation after such adven- ■ tures the attitude assumed — if, for brevity, we describe it in terms of our own still more advanced experience — is of this sort: " It may be a weasel, if so, I back; it may be a rabbit, if it is, I spring." Instead of unquestioned preperception that "makes

1 Hence the earlier process has been named " impressional association " (Stout, Analytic Psychology, 1896, ii. pp. 27-29), and again " animal association " (Thorndike, Animal Intelligence, an Experimental Study of the Associative Processes in Animals, 1898, pp. 71, 87, and passim). But it seems preferable to confine the term " association " to the later process, in which alone the component presentations have that amount of distinctness and individuality which the term properly connotes.

the mouth water," we have the alternative possibilities presem. as " free ideas," and action is in suspense, the alternative courses, that is to say, again present only in idea. It is easy to see how in such situations one free idea, a " what " sundered from its " that," will tend to loosen the sensory ties of alternative, still implicit ideas. On the cognitive side, from immediate assimil- ation an advance is made towards mediate cognition, towards comparison; on the active side there is advance from impulsive action towards deliberate action. 2

We conclude, then, that implicit ideas — the products of assimilation, and integrated as such in complex percepts and the motor co-ordinations to which they lead — are more likely to emerge as free ideas the more this perceptual complexity increases. Perception in the lower animals, who give no signs of either memory or ideation, has apparently no such complexity. A fish, for example, can feel, smell, taste, see, and even hear, but we cannot assume solely on that account that it has any percepts to which its five senses contribute, as they do to our percept, say, of an orange or a peppermint. Taking voluntary movements as the index of psychical life, it would seem that the fish's move- ments are instigated and guided by its senses, not collectively but separately. Thus a dog-fish, according to

Steiner, seeks its food exclusively by scent; so that when its olfactory bulbs are severed, or the fore-brain, in which they end, isdestroyed, it ceases to feed spontaneously. The carp, on the other hand, appears to search for its food wholly under the guidance of sight, and continues to do so just as well when the fore-brain is removed, the mid-brain, whence the optic nerves spring, seeming to be the chief seat of what intelligence it has. 3 Again, Bateson observes: " There can be no doubt that soles also perceive objects approaching them, for they bury themselves if a stroke at them is made with a landing-net; yet they have no recognition of a worm hanging by a thread immediately over their heads, and will not take it even if it touch them, but continue to feel for it aimlessly on the bottom of the tank, being aware of its presence by the sense of smell." 4 To this inability to combine simple percepts into one complex percept of a single object or situation we may reasonably attribute the fish's lack of true ideas, and consequent lack of sagacity. The sagacity even of the higher animals does not amount to " general intelligence," such as enables a child " to put two and two together," as we say, whatever " two and two " may stand for. So far as life consists of a series of definite situations and definite acts, so far the things done or dealt with together, the contents of the several foci or concentrations of attention, form so many integrated and comparatively isolated wholes. Round the more compli- cated of these, and closely connected with them, free ideas arise as sporadic groups, making possible those "lucid intervals," those fitful gleams of intelligence in the very heat of action, which occasionally interrupt the prevailing irrationality of the brutes. And as we cannot credit even the higher animals with general trains of ideas, just as little can we credit them with a continuous memory: indeed, it is questionable how far memory of the past, as past, belongs to them at all. For they live entirely in an up-stream, expectant attitude, and it is in this aspect that " free ideas " arise when they arise at all. We cannot imagine a dog regretting, like one of Punch's heroes, that he " did not have another slice of that mutton." 6

The free idea (a) then at its first emergence has neither an assignable position in a continuous memory-record, as a\ or a 2 , nor has it a definite relation as a " generic idea " to possible specializations such as a' or a". These further developments bring us to the general consideration of mental association.

2 Some light is perhaps here thrown on the reciprocal relation of " association by contrast " and " association by similarity " as severally the differentiation of partial similars and the integration of partial dissimilars.

3 J. Steiner, Die Functionen des Centralnervensytems u.s.w., 2te Abth. Die Fische (1888), pp. 50, 126, 19 seq., 101.

4 W. Bateson, "The Sense-Organs and Perceptions of Fishes," Journ. Marine Biol. Assoc. (1890), p. 239.

6 Cf. Stout, Manual of Psychology (1899), vol. ii. ch. i. ; also F. H. Bradley, " Memory and Inference," Mind (1899), pp. 145 sqq. ; and especially Thorndike, Animal Intelligence, cited above.

Funda- mental.

Mental Association and the Memory-Continuum. 24. Great confusion has been occasioned, as we have seen incidentally, by the lax use of the term " association," and this confusion has been increased by a further laxity in by Similar- tne use °f the term "association by similarity." Uy not In so far as the similarity amounts to identity, as in assimilation, we have a process which is more fundamental than association by contiguity, but then it is not a process of association. And when the reviving presentation is only partially similar to the presentation revived, the nature of the association does not appear to differ from that operative when one " contiguous " presentation revives another. In the one case we have, say, a b x recalling a b y , and in the other a b c recalling d e f. Now anybody who will reflect must surely see that the similarity between a b x and a b y, as distinct from the identity of their partial constituent a b, cannot be the means of recall; for this similarity is nothing but the state of mind — to be studied presently — which results when a b x and a b y, having been recalled are in consciousness together and then compared. But if a b, having concurred with y before and being now present in a b x, again revives y, the association, so far as that goes, is manifestly one of contiguity, albeit as soon as the revival is complete, the state of mind immediately incident may be what Bain loved to style " the flash of similarity." So far as the mere revival itself goes, there is no more similarity in this case than there is when a b c revives d ef. For the very a b c that now operates as the reviving presentation was obviously never in time contiguous with the d e f that is revived; if all traces of previous experiences of a b c were obliterated there would be no revival. In other words, the a b c now present must be " automatically associated," or, as we prefer to say, must be assimilated to those residua of a b c which were " con- tiguous " with d e f, before the representation of this can occur. And this, and nothing more than this, we have seen, is all the " similarity " that could be at work when a b x " brought up " a b y.

On the whole, then, we may assume that the only principle of association we have to examine is the so-called association by

„ .. .. contiguity, which, as ordinarilv formulated, runs: Contiguity . . ˆ. , . 1”. 1 • •

Inexplicable. Any presentations whatever, which are in conscious- ness together or in close succession, cohere in such a way that when one recurs it tends to revive the rest, such ten- dency increasing with the frequency of the conjunction. It has been often contended that any investigation into the nature of association must be fruitless. 1 But, if association is thus a first principle, it ought at least to admit of such a statement as shall remove the necessity for inquiry. So long, however, as we are asked to conceive presentations originally distinct and isolated becoming eventually linked together, we shall naturally feel the need of some explanation of the process, for neither the isolation nor the links are clear — not the isolation, for we can only conceive two presentations separated by other presentations intervening; nor the links, unless these are also presentations, and then the difficulty recurs. But, if for contiguity we substitute continuity and regard the associated presentations as parts of a new continuum, the only important inquiry is how this new whole was first of all integrated.

To ascertain this point we must examine each of the two leading divisions of contiguous association — that of simultaneous Formation presentations and that of presentations occurring ot Memory- in close succession. The last, being the clearer, may Continuum. \ te t a k e n first. In a series of associated presentations A B C D E, such as the movements made in writing, the words of a poem learned by heart, or the simple letters of the alphabet themselves, we find that each member recalls its successor but not its predecessor. Familiar as this fact is, it is not perhaps easy to explain it satisfactorily. Since C is associated both with B and D, and apparently as intimately with the one as with the other, why does it revive the later only and not the earlier? B recalls C; why does not C recall B? We have seen that any

1 So Hume, Treatise of Human Nature, pt. i. § 4 (Green and Grose’s ed., p. 321); also Lotze, Metaphysik, 1st ed., p. 526.

reproduction at all of B, C or D depends primarily upon its having been the object of special attention, so as to occupy at least momentarily the focus of consciousness. Now we can in the first instance only surmise that the order in which they are reproduced is determined by the order in which they were thus attended to when first presented. The next question is whether the association of objects simultaneously presented can be resolved into an association of objects successively attended to. Whenever we try to

recall a scene we saw but for a moment there are always a few traits that recur, the rest being blurred and vague, instead of the whole being revived in equal distinctness or indistinctness. On seeing the same scene a second time our attention is apt to be caught by something unnoticed before, as this has the advantage of novelty; and so on, till we have " Hved ourselves into " the whole, which may then admit of simultaneous recall. Bain, who is rightly held to have given the best exposition of the laws of association, admits something very like this in saying that " coexistence is an artificial growth formed from a certain peculiar class of mental successions." But, while it is easy to think of instances in which the associated objects were attended to successively, and we are all perfectly aware that the surest — not to say the only — way to fix the association of a number of objects is by thus concentrating attention on each in turn, it seems hardly possible to mention a case in which attention to the associated objects could not have been successive. In fact, an aggregate of objects on which attention could be focused at once would be already associated.

The exclusively successional character of contiguous association has recently been denied, and its exclusively simultaneous character maintained instead. It is at once obvious that this opposition of succession and simultaneity cannot be pressed so as to exclude dura- tion altogether and reduce the whole process to an instantaneous event. Nor is there any ground for saying that there is a fixed and even distribution of attention to whatever is simultaneously presented: facts all point the other way. Still, though we cannot exclude the notion of process from consciousness, we may say that presentations attended to together become pro tanto a new whole, are synthesized or complicated. Such primary synthesis leads not to an association of ideas, but rather to the formation of one percept, which may be- come eventually a free idea. The disconcerted preperception which sets this free may likewise liberate a similar or contrasting idea, but it will not resolve either complex into the several " ideas of its sensory or motor constituents, with which only the psychologist is familiar. The actual recurrence of some of these constituents may again reinstate the rest, not, however, as memories or as " thoughts," but only as tied ideas in a renewed perception.

Again, it has become usual to distinguish the association of contiguous experiences and the so-called association of similars or opposites as respectively external and internal forms of association. The new terminology is illuminating: the substitution of forms for laws marks the abandonment of the old notion that association was by " adhesion " of the contiguous and " attraction " of the similar. We are thus left to find the cause of association in interested attention; and that, we may safely say, is an adequate, and appar- ently the sole adequate, cause for the two commonly recognized forms of external association, the so-called

simultaneous and the successive. But these two are certainly not co-ordinate; and if our analysis be sound, the former — for which we would retain the Herbartian term complication — yields us not members of an associa- tion but a member for association. So far, then, we should have but one form of association, that of the successive contents of focalized attention: and but one result, the representation or memory-con- tinuum, 2 in contrast to the primary- or presentation-continuum, whence its constituents arise. Turning now to the distinction of external and internal, it at once strikes the unprejudiced mind that " internal association " is something of an anomaly, since the very notion of association implies externality. Also, on closer inspection what we find is not an association of similars or opposites as such, but — something quite distinct — a similarity or contrast of associates; of ideas, that is to say, which are contiguous members of the memory (or experience) continuum, or of ideas which have become contiguous through its reduplication.

The only case, then, that now remains to be considered is that — to take it in its simplest form — of two primary presenta- tions A and X, parts of different special continua or distinct — • i.e. non-adjacent — parts of the same, and occupying the focus of consciousness in immediate succession. This constitutes

2 Experience-continuum would perhaps be a better name, since it is only a preliminary to a true memory record, as we shall presently

their integration; for the result of this occupation may be regarded as a new continuum in which A and X become adjacent parts. For it is characteristic of a continuum that an increase in the intensity of any part leads to the intenser presentation of adjacent parts; and in this sense A and X, which were not originally continuous, have come to be so. We have here, then, some justification for the term secondary- or memory- continuum when applied to this continuous series of representa- tions to distinguish it from the primary or presentation- continuum from which its constituents are derived. The most important peculiarity of this continuum, therefore, is that it is a series of representations integrated by means of the movements of attention out of the differentiations of the primary or presenta- tion-continuum, or rather out of so much of these differentia- tions as pertain to what we know as the primary memory-image. These movements of attention, if the phrase may be allowed, come in the end to depend mainly

upon interest, but at first appear to be determined entirely by mere intensity. 1 To them it is proposed to look for that continuity which images lose in so far as they part with the local signs they had as percepts and cease to be either localized or projected. Inasmuch as it is assumed that these movements form the connexion between one representation and another in the memory-train, they may be called " temporal signs." 2 The evidence for their existence can be more conveniently adduced presently; it must suffice to remark here that it consists almost wholly of facts connected with voluntary attention and the voluntary control of the flow of ideas, so that temporal signs, unlike local signs, are funda- mentally motor and not sensory. And, unlike impressions, representations can have each but a single sign, 3 the continuum of which, in contrast to that of local signs, is not rounded and complete, but continuously advancing. But in saying this we are assuming for a moment that the memory-continuum forms a perfectly single and unbroken train. If it ever actually were such, then, in the absence of any repetition of old impressions and apart from voluntary interference with the train, conscious- ness, till it ceased entirely, would consist of a fixed and mechanical round of images. Some approximation to such a state is often found in uncultured persons who lead uneventful lives, and still more in idiots, who can scarcely think at all.

25. In actual fact, however, the memory-train is liable to change in two respects, which considerably modify its structure, viz. (1) through the evanescence of some parts, and (2) through the partial recurrence of like impressions, which produces reduplications of varying amount and extent in other parts. As regards the first, we may infer that the waning or sinking towards the threshold of consciousness which we can observe Formation in the primary mental image continues in sub- of ideational consciousness after the threshold is past. For the Continuum. i on g e r the time that elapses before their revival the fainter, the less distinct, and the less complete are the images when revived, and the more slowly they rise. All the elements of a complex are not equally revivable, as we have seen already: tastes, smells and organic sensations, though powerful as im- pressions to revive other images, have little capacity for ideal

1 This connexion of association with continuous movements of attention makes it easier to understand the difficulty above referred to, viz. that in a series A B C D . . . B revives C but not A, and so on — a difficulty that the analogy of adhesiveness or links leaves unac- countable. To ignore the part played by attention in association, to represent the memory-continuum as due solely to the concurrence of presentations, is perhaps the chief defecCof the associationist psychology, both English and German. Spencer's endeavour to show " that psychical life is distinguished from physical life by consisting of successive changes only instead of successive and simultaneous changes " (Principles of Psychology, pt. iv. ch. ii., in

particular pp. 403, 406) is really nothing but so much testimony to the work of attention in forming the memory-continuum, especially when, as there is good reason to do, we reject his assumption that this growing seriality is physically determined.

2 A term borrowed from Lotze (Metaphysik, 1st ed., p. 295), but the present writer is alone responsible for the sense here given 60 it and the hypothesis in which it is used.

3 Apart, that is to say, of course, from the reduplications of the memory-train spoken of below.

reproduction themselves, while muscular movements, though perhaps of all presentations the most readily revived, do not so readily revive other presentations. Idiosyncrasies are, however, frequent; thus we find one person has an exceptional memory for sounds, another for colours, another for forms. Still it is in general true that the most intense, the most impressive, and the most interesting presentations persist the longest. But the evanescence, which is in all cases comparatively rapid at first, deepens sooner or later into real or apparent oblivion. In this manner it comes about that parts of the memory-continuum lose all distinctness of feature and, being without nbiMscemx recognizable content, shrivel up to a dim and meagre representation of life that has lapsed — a representation that just suffices, for example, to show us that " our earliest recollections " are not of our first experiences, or to save them from being not only isolated but discontinuous. Such discontinuity can, of course, never be absolute; we must have something represented even to mark the gap. Oblivion and the absence of all representa- tion are thus the same, and the absence of all representation cannot psychologically constitute a break. The terms " evolu- tion " and " involution " have in this respect been happily applied to the rising and falling of representations. When we recall a particular period of our past life, or what has long ceased to be a familiar scene, events and features gradually unfold and, as it were, spread out as we keep on attending. A precisely opposite process may then be supposed to take place when they are left in undisturbed forgetfulness; this process is called obliviscence.

More important changes are produced by the repetition of parts of the memory-train. The effect of this is not merely to prevent the evanescence of the particular image Repetition or series of images, but by partial and more or less frequent reduplications of the memory-train or " thread " upon itself to convert it into a partially new continuum, which we might perhaps call the ideational continuum or "tissue." 4 The reduplicated portions of the train are strengthened, while at the points of divergence it becomes comparatively weakened, and this apart from the effects of obliviscence.

One who had seen the king but once would scarcely be likely to think of him without finding the attendant circumstances recur as well; this could not happen after seeing him in a hundred different scenes. The central representation of the whole complex would have become more distinct, whereas the several „ diverging lines would tend to dissipate attention and, images. by involving opposing representations, to neutralize each other, so that probably no definite background would be re- instated. Even this central representation would be more or less generalized. It has been often remarked that one's most familiar friends are apt to be mentally pictured less concretely and vividly than persons seen more seldom and then in similar attitudes and moods; in the former case a " generic image " has grown out of such more specific representations as the latter affords. Still further removed from memory-images are the images that result from such familiar percepts as those of horses, houses, trees, &c.

Thus as the joint effect of obliviscence and reduplication we .are provided with trains of ideas distinct from the memory- thread and thereby with the material, already more or less organized, for intellectual and volitional / Hea" ° manipulation. We do not experience the flow of ideas — save very momentarily and occasionally — altogether undisturbed; even in dreams and reverie it is continually interrupted and diverted. Nevertheless it is not difficult to ascertain that, so far as it is left to itself, it takes a very different course from that which we should have to retrace if bent on reminiscence and able to recollect perfectly. The readi- ness and steadiness of this flow are shown by the extremely small effort necessary in order to follow it. Nevertheless from its very nature it is liable, though not to positive breaches*

4 This contrast of thread and tissue is suggested, of course, by Herbart's terms Reihe and Gewebe. It is justified by the fact that memory proper follows the single line of temporal continuity, while ideation furnishes the basis for manifold logical connexions.

of continuity from its own working, yet to occasional blocks or impediments to the smooth succession of images at points where reduplications diverge, and either permanently or at the particular time neutralize each other. 1

The flow of ideas is, however, exposed to positive interruptions

from -two distinct sides — by the intrusion of new presentations and

of voluntary interference. The only result of such

Conflict of i n t errU pti ons which we need here consider is the conflict

Presents- j presentations that may ensue. Herbart and his

oas ‘ followers have gone so far as to elaborate a complete

system of psychical statics and dynamics, based on the concep- tion of presentations as, forces and on certain more or less improbable assumptions as to the modes in which such forces interact. Since our power of attention is limited, it continually ■happens that attention is drawn off by new presentations at the expense of old ones. But, even if we regard this non-voluntary redistribution of attention as implying a struggle between presenta- tions, still such conflict to secure a place in consciousness is very different from a conflict between presentations that are already there. Either may be experienced to any degree possible without the other appearing at all; thus, absorbed in watching a starry sky, one might be unaware of the chilliness of the air, though recognizing at once, as soon as the cold is felt, that, so far from being incom- patible, the clearness and the coldness are causally connected. This difference between a conflict of presentations to enter the field of consciousness — if we allow for a moment the propriety of the expression — and that opposition or incompatibility between presenta- tions which is only possible when they are in consciousness has been strangely confused by the Herbartians. In the former the intensity of the presentation is primarily alone of account; in the latter, on the contrary, quality and content are mainly concerned. Only the last requires any notice here, since such opposition arises when the ideational continuum is interrupted in the ways just mentioned, and apparently arises in no other way. Certainly there is no such opposition between primary presentations : there we have the law of incopresentability preventing the presentation of opposites with the same local sign ; and their presentation with different local signs involves, on this level at all events, no conflict. But what has never been presented could hardly be represented, if the ideational process were undisturbed: even in our dreams white negroes or round squares, for instance, never appear. In fact, absurd and bizarre as dream-imagery is, it never at any moment entails overt contradictions, though contradiction may be implicit.

But between ideas and percepts actual incompatibility is frequent. In the perplexity of Isaac, e.g. — ” The voice is Jacob’s voice, but the hands are the hands of Esau ” — we have such a case in a familiar form. There is here not merely mental arrest but actual conflict: the voice perceived identifies Jacob, at the same time the hands identify Esau. The images of Esau and Jacob by themselves are different, but do not conflict; neither is

there any strain, quite the contrary, in recognizing a person partly like Jacob and partly like Esau. For there is no direct incompatibility between smooth and rough, so long as one pertains only to voice and the other only to hands, but the same hands and voice cannot be both smooth and rough. Similar incompatibilities may arise without the intrusion of percepts, as when, in trying to guess a riddle or to solve a problem, or generally to eliminate intellectual differences, we have images which in themselves are only logically opposite, psychologically opposed, or in conflict, because each strives to enter the same com- plex. In all such conflicts alike we find, in fact, a relation of presenta- tions the exact converse] of that which constitutes similarity. In the latter we have two complete presentations, a b x and a b y, as similar, each including the common part a b ; in the former we have two partial presentations, x and y, as contraries, each excluding the other from the incomplete a b — . And this a b, it is to be noted, is not more essential to the similarity than to the conflict. But in the one case it is a generic image (and can logically be predicated of two subjects) ; in the other it is a partially determined individual

(and cannot be subject to opposing predicates). Except as thus supplementing a b, x and y do not conflict ; black and white are not incompatible save as attributes of the same thing. The possibility of most of these conflicts — -of all, indeed, that have any logical interest — lies in that reduplication of the memory-continuum which gives rise to these new complexes, generic images or general ideas.

Reminiscence and Expectation: Temporal Perception.

26. Having thus attempted to ascertain the formation of the ideational continuum out of the memory-train, the question arises: How now are we to distinguish between imagining and remembering, and again, between imagining and expecting?

1 It is a mark of the looseness of much of our psychological termin- ology that facts of this kind are commonly described as cases of association. Dr Bain calls them " obstructive association," which is about on a par with " progress backwards " ; Mr Sully's " divergent association " is better. But it is plain that what we really have is an arrest or inhibition consequent on association, and nothing that is either itself association or that leads to association.

It is plainly absurd to make the difference depend on the presence of belief in memory and expectation and on its absence in mere imagination; for the belief itself depends on this difference instead of constituting it. One real and obvious distinction, however, which Hume pointed out as regards memory, is the fixed order and position of the ideas of what is remembered

or expected as contrasted with " the liberty " of the imagination to transpose and change its ideas. This order and ˆ(Memory position in the case of memory are, of course, norm- ally those of the original impressions, but it seems rather naive of Hume to tell us that memory " is tied down to these without any power of variation," while imagination has liberty to trans- pose as it pleases, as if the originals sat to memory for their portraits, while to imagination they were but studies. Such correspondence being out of the question — as Hume takes care to state as soon as it suits him — all we have, so far, is this fixity and definiteness as contrasted with the kaleidoscopic instability of ideation. In this respect what is remembered or expected resembles what is perceived: the grouping not only does not change capriciously and spontaneously, but resists any mental efforts to change it. But, provided these characteristics are there, we should be apt to believe that we are remembering, just as, mutatis mutandis, with like characteristics we might believe that we were perceiving: hallucination is possible in either case.

This fixity of order and position is, however, not sufficient to constitute a typical reminiscence where the term is exactly used. But remembering is often regarded as equivalent to knowing and recognizing, as when on revisiting some once familiar place one remarks, "How well I remember it!" What is meant is that the place is recognized, and that its recognition awakens memories. Memory includes recognition; recognition as such does not include memory. In human consciousness, as we directly observe it, there is, perhaps, no pure recognition: here the new presentation in not only assimilated to the old, but the former framing of circumstance is reinstated, and so perforce distinguished from the present. It may be there is no warrant for supposing that such redintegration of a preceding field is ever absolutely nil, still we are justified in regarding it as extremely vague and meagre, both where mental evolution is but slightly advanced and where frequent repetition in varying and irrelevant circumstances has produced a blurred and neutral zone. The last is the case with a great part of our knowledge; the writer happens to know that bos is the Latin for " ox " and bufo the Latin for " toad," and may be said to remember both items of knowledge, if "remember" is only to be synonymous with " retain." But if he came across bos in reading he would think of an ox and nothing more; bufo would immediately call up not only " toad " but Virgil's Georgics, the only place in which he has seen the word, and which he never read but once. In the former there is so far nothing but recognition (which, however, of course rests upon retentiveness) ; in the latter there is also remembrance of the time and circumstances in which that piece of knowledge was acquired. Of course in so far as we are aware that we recognize we also think that remembrance is at any rate possible, since what we know we must previously have learned — recog- nition excluding novelty. But the

point here urged is that there is an actual reminiscence only when the recognition is accom- panied by a reinstatement of portions of the memory-train continuous with the previous presentation of what is now recog- nized. Summarily stated, we may say that between knowing and remembering on the one hand and imagining on the other the difference primarily turns on the fixity and completeness of the grouping in the former; in the latter there is a shifting play of images more or less " generic," reminding one of " dissolving views." Hence the first two approximate in character to per- ception, and are rightly called recognitions. Between them, again, the difference turns primarily on the presence or absence of temporal signs. In what is remembered these are still intact enough to ensure a localization in the past of what is recognized; in what is known merely such localization is prevented, eithef because of the obliviscence of temporal connexions or because

the reduplications of the memory-train that have consolidated the central group have entailed their suppression. There is further the difference first mentioned, which is often only a difference of degree, viz. that reminiscences have more circum- stantiality, so to say, than mere recognitions have: more of the collateral constituents of the original concrete field of conscious- ness are reinstated. But of the two characteristics of memory proper — (a) concreteness or circumstantiality, and (b) localization in the past — the latter is the more essential. It sometimes happens that we have the one with little or nothing of the other. For example, we may have but a faint and meagre representation of a scene, yet if it falls into and retains a fixed place in the memory train we have no doubt that some such experience was once actually ours. On the other hand, as in certain so-called illusions of memory, we may suddenly find ourselves reminded by what is happening at the moment of a preceding experience exactly like it — rsome even feel that they know from what is thus recalled what will happen next; and yet, because we are wholly unable to assign such representation a place in the past, instead of a belief that it happened, there arises a most distressing sense of bewilderment, as if one were haunted and had lost one's personal bearings. 1 It has been held by some psychologists 2 that memory proper includes the representation of one's past self as agent or patient in the event or situation recalled. And this is true as regards all but the earliest human experience, at any rate; still, whereas it is easy to see that memory is essential to any development of self consciousness, the converse is not at all clear, and would involve us

in a needless circle.

27. Intimately connected with memory is expectation. We may as the result of reasoning conclude that a certain event e ect ti a w ˆ happen; we may also, in like manner, conclude ‘ that a certain other event has happened. But as we should not call the latter memory, so it is desirable to distinguish such indirect anticipation as the former from that expectation which is directly due to the interaction of ideas. Any man knows that he will die, and may make a variety of arrangements in anticipation of death, but he cannot with propriety be said to be expecting it unless he has actually present to his mind a series of ideas ending in that of death, such series being due to previous associations, and unless, further, this series owes its representation at this moment to the actual recurrence of some experience to which that series succeeded before. And as familiarity with an object or event in very various settings may be a bar to recollection, so it may be to expectation: the average Englishman, e.g. is continually surprised without his umbrella, though only too familiar with rain, since in our climate one not specially attentive to the weather obtains no clear representation of its successive phases. But after a series of events A B C D E . . . has been once experienced we instinctively expect the recurrence of B C . . . on the recurrence of A, i.e. provided the memory-train continues so far intact. Such expectation, at first perhaps slight — a mere tendency easily overborne — becomes strengthened by every repetition of the series in the old order, till eventually, if often fulfilled and never falsified, it becomes certain and, as we commonly say, irresistible. To have a clear case of expectation, then, it is not necessary that we should distinctly remember any previous experience like it, but only that we should have actually present some earlier member of a series which has been firmly associated by such previous experiences, the remaining members, or at least the next, if they continue serial, being revived through that which is once again realized. This expectation may be instantly checked by reflection, just as it may, of course, be disappointed in fact; but these are matters which do not concern the inquiry as to the nature of expectation while expectation lasts.

We shall continue this inquiry to most advantage by widening it into an examination of the distinction of present, past and future. To a being whose presentations never passed through

1 Any full discussion of paramnesia, as these very interesting states of mind are called, belongs to mental pathology.

- *As, e.g. James Mill (Analysis of the Human Mind, ch. x.), who treats this difficult subject with great acuteness and thoroughness.*

the transitions which ours undergo — first divested of the strength and

vividness of impressions, again reinvested with them and brought back from the faint world of ideas Present, — the sharp contrasts of " now " and " then," and Past ' a "d all the manifold emotions they occasion, would be Future – quite unknown. Even we, so far as we confine our activity and attention to ideas are almost without them. Time-order, suc- cession, antecedence, and consequence, of course, there might be still, but in that sense of events as " past and gone for ever," which is one of the melancholy factors in our life; and in the obligation to wait and work in hope or dread to what is " still to come " there is much more than time-order. It is to presenta- tions in their primary stage, to impressions, that we owe what real difference we find between now and then, whether prospective or retrospective, as it is to them also that we directly owe our sense of the real, of what is and exists as opposed to the non-existent that is not. But the present alone and life in a succession of presents, or, in other words, continuous occupation with impres- sions, give us no knowledge of the present as present. This we first obtain when our present consciousness consists partly of memories or partly of expectations as well. An event expected differs from a like event remembered chiefly in two ways — in its relation to present impressions and images and in the active attitude to which it leads. The diverse feelings that accompany our intuitions of time and contribute so largely to their colouring are mainly consequences of these differences. Let us take a series of simple and familiar events A B C D E, representing ideas by small letters, and perceptions by capitals whenever it is necessary to distinguish them. Such series may be present in consciousness in such wise that abed are imaged while E is perceived anew, i.e. the whole symbolized as proposed would be a bed E; such would be, e.g. the state of a dog that had just finished his daily meal. Again, there may be a fresh impression of A which revives b c d e; we should have then (1) A bed e — the state of our dog when he next day gets sight of the dish in which his food is brought to him. A little later we may have (2) abCde. Here a b are either after-sensations or primary memory-images, or have at any rate the increased intensity due to recent impression; but this increased intensity will be rapidly on the wane even while C lasts, and a b will pale still further when C gives place to D, and we have (3) a b c D e. But, returning to (2), we should find d e to be increasing in intensity and definite- ness, as compared with their state in (1), now that C, instead of A, is the present impression. For, when A occupied this position, not only was e raised less prominently above the threshold of consciousness by reason of its greater distance from A in the memory-continuum, but, owing to the reduplications of this continuum, more lines of possible revival were opened up, to be successively negatived as B succeeded to A and C to E; even dogs know that " there is many a slip 'twixt the cup and the lip." But, where A B C D E is a series of percepts such as we have here supposed — and a series of simpler states would hardly afford much ground for the

distinctions of past, present and future — there would be a varying amount of active adjustment of sense- organs and other movements supplementary to full sensation. In (2), the point at which we have a b C d e, for instance, such adjustments and movements as were appropriate to b would cease as B lapsed and be replaced by those appropriate to C. Again, as C succeeded to B, and d in consequence increased in intensity and definiteness, the movements adapted to the reception of D would become nascent, and so on. Thus, psycho- logically regarded, the distinction of past and future and what we might call the oneness of direction of time depend, as just described, (1) upon the continuous sinking of the primary memory-images on the one side, and the continuous rising of the ordinary images on the other side, of that member of a series of percepts then repeating which is actual at the moment; and (2) on the prevenient adjustments of attention, to which such words as " expect," " await," " anticipate," all testify by their etymology. These conditions in turn will be found to depend upon all that is implied in the formation of the memory-train and upon that recurrence of like series of impressions which we

Succession.

attribute to the " uniformity of nature. " If we never had the same series of impressions twice, knowledge of time would be impossible, as indeed would knowledge of any sort.

28. Time is often figuratively represented as a line, and we may perhaps utilize this figure to make clear the relation of our perception of time to what we call time itself. The present, though conceived as a point or instant of time, is still such that we actually can and do in that moment attend to a plurality of presentations to which we might other- wise have attended to severally in successive moments. Grant- ing this implication of simultaneity and succession, we may, if we represent succession as a line, represent simultaneity as a second line at right angles to the first; pure time — or time-length without time-breadth, we may say — is a mere abstraction. Now it is with the former line that we have to do in treating of time as it is (or as we conceive it), and with the latter in treating of our perception of time, where, just as in a perspective represen- tation of distance, we are confined to lines in a plane at right angles to the actual line of depth. In a succession of events A B C D E . . . the presence of B means the absence of A and of C, but the presentation of this succession involves the simulta-

neous presence, in some mode or other, of two or more of the presentations A B C D. In our temporal perception, then, all that corresponds to the differences of past, present and future is presented simultaneously. To this fact the name of " specious present" or " psychical present " has been given. What we have is not a moving point or moment of objective time, but rather a moving line, the contents of which, continuously changing, simultaneously represent a portion of the line of objec- tive succession, viz. the immediate past as still present in primary memory-images, and the immediate future as anticipated in prepercepts and nascent acts. 1 This truism — or paradox — that all we know of succession is but an interpretation of what is really simultaneous or coexistent, we may then concisely express by saying that we are aware of time only through time-perspec- tive, and experience shows that it is a long step from a succession of presentations to such presentation of succession. The first condition of such presentation is that we should have represented together presentations that were in the first instance attended to successively, and this we have both in the persistence of primary memory-images and in the simultaneous reproduction of longer or shorter portions of the memory-train. In a series thus secured there may be time-marks, though no time, and by these marks the series will be distinguished from other simul- taneous series. To ask which is first among a number of simul- taneous presentations is unmeaning; one might be logically prior to another, but in time they are together and priority, is excluded. Nevertheless after each distinct representation a, b, c, d there probably follows, as we have supposed, some trace of that movement of attention of which we are aware in passing from one presentation to another. In our present reminiscences we have, it must be allowed, little direct proof of this inter- position, though there is strong indirect evidence of it in the tendency of the flow to follow the order in which the presen- tations were first attended to. With the movements themselves we are familiar enough, though the residua of such move- ments are not ordinarily conspicuous. These residua, then, are our temporal signs, and, together with the representations connected by them, constitute the memory-continuum. But temporal signs alone will not furnish all the pictorial exactness of the time-perspective. They give us only a fixed series; but the working of obliviscence, by insuring a progressive variation in intensity and distinctness as we pass from one member of the series to the other, yields the effect which we call time-distance. By themselves such variations would leave us liable to confound more vivid representations in the distance with fainter ones nearer the present, but from this mistake the temporal signs save us; and, as a matter of fact, where the memory-train is imperfect such mistakes continually occur. On the other hand, where these variations are slight and imperceptible, though the memory-

1 Cf. W. James, Principles of Psychology, i. 629 sqq. ;L. W. Stern, "

Psychische Prasenzzeit," Z. f. Psych., (1897), xiii. 325 sqq. xxn. iq

continuum preserves the order of events intact, we have still no such distinct appreciation of comparative distance in time as we have nearer the present where these perspective effects are considerable.

29. When in retrospect we note that a particular presentation X has had a place in the field of consciousness, while certain other presentations, A B C D . . ., have succeeded each other, then we may be said in observing this relation of the two to perceive the duration of X. And it is in this way that we do subjectively estimate longer periods of time. But first, it is evident that we cannot apply this method to indefinitely short periods without passing beyond the region of distinct presentation; and, since the knowledge of duration implies a relation between distinguishable presentations ABC D and X, the case is one in which the hypothesis of subconsciousness can hardly help any but those who confound the fact of time with the knowledge of it. 'Secondly, if we are to compare different durations at all, it is not enough that one of them should last out a series A B C D, and another a series L M N O; we also want some sort of common measure of those series. Locke was awake to this point, though he expresses himself vaguely (Essay, ii. 14, §§ 9-12). He speaks of our ideas succeeding each other " at certain distances not much unlike the images in the inside of a lantern turned round by the heat of a candle, " and " guesses " that " this appearance of theirs in train varies not very much in a waking man." Now what is this " distance " that separates A from B, B from C, and so on, and what means have we of knowing that it is tolerably constant in waking life ? It is probably that the residuum of which we have called a temporal sign; or, in other words, it is the movement of attention from A to B. But we must endeavour here to get a more exact notion of this movement. Everybody knows what it is to be distracted by a rapid succession of varied impressions, and equally what it is to be wearied by the slow and monotonous recurrence of the same impressions. Now these " feelings " of distraction and tedium owe their characteristic qualities to movements of atten- tion. In the first, attention is kept incessantly on the move; before it is accommodated to A, it is disturbed by the sudden- ness, intensity, or novelty of B; in the second, it is kept all but stationary by the repeated presentation of the same impression. Such excess and defect of surprises make one realize a fact which in ordinary life is so obscure as to escape notice. But recent experiments have set this fact in a more striking light, and made clear what Locke had dimly before his mind in talking of a certain distance between the presentations of a waking man. In estimating very short periods of time, of a second or less — indicated say by the beats of a metronome — it is found that there is a certain period for which the mean of a number of estimates is correct, while shorter periods are on the whole over-estimated, and longer periods under-estimated. This we may

perhaps take to be evidence of the time occupied in accommodating or fixing atten- tion. Whether the " point of indifference " is determined by the rate of usual bodily movement, as Spencer asserts and Wundt conjectures, or conversely, is a question we need not discuss just now. But, though the fixation of attention does of course really occupy time, it is probably not in the first instance perceived as time, i.e. as continuous " protensity, " to use a term of Hamil- ton's, but as intensity. Thus, if this supposition be true, there is an element in our concrete time-perception which has no place in our abstract conception of time. In time conceived as physical there is no trace of intensity; in time psychically experienced duration is primarily an intensive magnitude, witness the comparison of times when we are " bored " with others when we are amused. It must have struck every one as strange who has reflected upon it that a period of time which seems long in retrospect — such as an eventful excursion — should have appeared short in passing; while a period, on the contrary, which in memory has dwindled to a wretched span seemed everlasting till it was gone. But, if we consider that in retrospect length of time is represented primarily and chiefly by impressions that have sur- vived, we have an explanation of one-half; and in the intensity of the movements of attention we shall perhaps find an explanation

of the other. What tells in retrospect is the series a b c d e, &c. ; what tells in the wearisome present is the intervening hhh, &c. , or rather the original accommodation of which these temporal signs are the residuum. For, as we have seen elsewhere, the intensity of a presentation does not persist, so that in memory the residuum of the most intense feeling of tedium may only be so many t's in a memory-continuum whose surviving members are few and uninteresting. But in the actual experience, say, of a wearisome sermon, when the expectation of release is continu- ally balked and attention forced back upon a monotonous dribble of platitudes, the one impressive fact is the hearer's impatience. On the other hand, so long as we are entertained, at tention is never involuntary, and there is no continually deferred expectation. Just as we are said to walk with least effort when our pace accords with the rate of swing of our legs regarded as pendulums, so in pastimes impressions succeed each other at the rate at which attention can be most easily accommodated, and are such that we attend willingly. 1 We are absorbed in the present without being unwillingly confined to it; not only is there no motive for retrospect or expectation, but there is no feeling that the present endures. Each impression lasts as long as it is interesting, but does not continue to monopolize the focus of consciousness till attention to it is fatiguing, because uninter- esting. In such facts, then, we seem to have proof that our perception of duration rests ultimately upon quasi-motor acts of varying intensity, the duration of which we do not directly experience as duration at all. They do endure and their intensity is a function of their duration; but the intensity is all that we directly perceive. In other words, it is here con- tended that what Locke called an instant or moment — " the time of one idea in our minds without the succession of another, of one wherein therefore we perceive no succession at all " — is psychologically not " a part in duration " in that sense in which, as he says, " we cannot conceive any duration without succession " (Essay, ii. 16, 12).

But, if our experience of time depends primarily upon acts of attention to a succession of distinct objects, it would seem that Is time time, subjectively regarded, must be discrete and not

Discrete or continuous. This, which is the view steadily main- CoaUnuous? . ta ' n ˆ Dv tne psychologists of Herbart's school, was implied if not stated by Locke, Berkeley and Hume. Locke hopelessly confuses time as perceived and time as con- ceived, and can only save himself from pressing objections by the retort, "It is very common to observe intelligible discourses spoiled by too much subtlety in nice divisions." But Berkeley and Hume, with the mathematical discoveries of Newton and Leibnitz before them, could only protest that there was nothing answering to mathematical continuity in our experience. And, whereas Locke had tried to combine with his general

psychological account the inconsistent position that " none of the distinct ideas we have of either [space or time] is without all manner of composition," Berkeley declares, " For my own part, whenever I attempt to frame a simple idea of time, abstracted from the succession of ideas in my mind, which flows uniformly and is participated by all beings, I am lost and embrangled in inextricable difficulties. I have no notion of it at all, only I hear others say it is infinitely divisible, and speak of it in such a manner as leads me to harbour odd thoughts of my existence. . . . Time therefore being nothing, abstracted from the succession of ideas in our minds, it follows that the duration of any finite spirit must be estimated by the number of ideas or actions succeeding each other in that same spirit or mind " {Principles of Knowledge, i. § 98).. Hume, again, is at still greater pains to show that " the idea which we form of any- finite quality is not infinitely divisible, but that by proper distinctions and separations we may run this idea up to inferior ones, which will be perfectly simple and indivisible . . . that the imagination reaches a minimum, and may raise up to itself an idea of which it cannot conceive any subdivision, and which cannot be diminished without a total annihilation " (Human Nature, pt. ii. § I, Green's ed., pp. 334 seq.).

At first blush we are perhaps disposed to accept this account of our time-perception, as Wundt, e.g. does, and to regard the attri- bution of continuity as wholly the result of after-reflection. 2 But it may be doubted if this is really an exact analysis of the case.

1 To this rate the " indifference point " mentioned above is obviously related. It has also been called " adequate time " or " optional time." It is, however, a tempo that varies with the subject-matter attended to; when effective attention is more difficult the tempo is slower than it is when to attend is easy.

2 Cf. Wundt, Logik, i. 432.

Granted that the impressions to which we chiefly attend are distinct and discontinuous in their occupation of the focus of consciousness, and that, so far, the most vivid element in our time-experience is discrete; granted further that in recollection and expectation such objects are still distinct — all which seems to imply that time is a mere plurality — yet there is more behind. The whole field of conscious- ness is not occupied by distinct objects, neither are the changes in this field discontinuous. The experimental facts above-mentioned illustrate the transition from a succession the members of which are distinctly attended to to one in which they are indistinctly attended to, i.e. are not discontinuous enough to be separately distinguished. Attention does not move by hops from one definite spot to another, but, as Wundt himself allows, by alternate diffusion and

concentra- tion, like the foot of a snail, which never leaves the surface it is traversing. We have a clear presentation discerned as A or B when attention is gathered up; and, when attention spreads out, we have confused presentations not admitting of recognition. But, though not recognizable, such confused presentations are represented, and so serve to bridge over the comparatively empty interval during which attention is unfocused. Thus our perception of a period of time is not comparable to so many terms in a series of finite units any more than it is to a series of infinitesimals. When attention is concentrated in expectation of some single impression, then, no doubt, it is brought to a very fine point (" zugespitzt," as Herbart would say) ; and a succession of such impressions would be repre- sented as relatively discrete compared with the representation of the scenery of a day-dream. But absolutely discrete it is not and cannot be. In this respect the truth is rather with Herbert Spencer, who, treating of this subject from another point of view, remarks, " When the facts are contemplated objectively, it becomes manifest that, though the changes constituting intelligence approach to a single succession, they do not absolutely form one " (Psychology, i.' § 180).

On the whole, then, we may conclude that our concrete time- experiences are due to the simultaneous representation of a series of definite presentations both accompanied and separated by more or fewer indefinite presentations more or less confused ; that, further, the definite presentations have certain marks or temporal signs due to the movements of attention ; that the rate of these movements or accommodations is approximately constant ; and that each movement itself is primarily experienced as an intensity.

Experimental Investigations concerning Memory and Association.

30. Of the vast mass of experimental work 'undertaken in recent years, that relating to memory and association is probably the most important. A brief account of some of it is therefore offered at this point, by way of illustrating the character of the " new psychology."

The learning and retaining of a stanza of poetry, say, is obviously a function of many variables, such as the mode of presentation (whether the words are heard only, or heard and seen, or both heard, seen and spoken aloud), the length, familiarity with the words and ideas used, the number of repetitions, the attention given, &c. Familiarity of course implies previous learning and retaining; the first essential, there- fore, in any attempt to study these processes from the beginning, is the exclusion of this factor. Accordingly Ebbinghaus, the pioneer in experiments of this kind, 3 devised the new material, which is now regularly employed, namely, closed monosyllables, not themselves words, and strung together promiscuously

into lines of fixed length so as never to form words: bam, rit, por, sig, nef, gud, &c, is an instance of such " senseless verses." With very slight attention most persons would be able to reproduce three or four such syllables on a single reading or hearing; and by greater concentration six or seven might be so reproduced. This maximum, called sometimes the " span of prehension," has been repeatedly made the subject of special inquiry. In idiots it is found, as might be expected, remarkably low; in school children it increases rapidly between the ages of eight and fourteen, and then remains almost stationary, individual differences being small compared with the striking differences that appear when longer lines make repetitions necessary. 4 This comparatively constant span of prehension is doubtless

3 H. Ebbinghaus, " Ueber das Gedachtniss: Untersuchungen zur experimentellen Psychologie " (1885).

4 Cf. J. Jacobs and F. Galton on the " Span of Prehension," Mind, (1887), pp. 75 sqq. ; Bourdon, " Influence de l'age sur la mˆmoire immediate," Rev. phil. (1894) xxxviii., 148 sqq.

closely connected with certain other psychical constants, such as the duration of the psychical present and of the primary memory- image, the tempo of movements of attention (§§ 28, 29), &c. There are isolated investigations of these several conditions, but the subject as a whole still awaits systematic treatment. 1 That it is not wanting in interest is evident when we consider that if our span of prehension were enlarged, a corresponding increase in the variety and range of metre and rhyme in poetry, of " phrase " in music, and of evolution in the dance would be possible. The limits at present imposed on these and like complexities find their ultimate explanation in the constants just mentioned.

With lines of greater length than seven syllables some repeti- tion is requisite before they can be said correctly: the number of such repetitions was found by Ebbinghaus to increase very rapidly with the number of syllables to be learnt. In his own case, for lines of 12, 16, 24, 36 syllables the repetitions necessary were on the average 16-6, 30, 44, 55 respectively. Thus for a line exceeding in length that of the span of prehension only about five times, he required fifty-five times as many repetitions, if we may call the single presentation of the syllables a " repeti- tion." Substituting poetry for gibberish of equal amount, Ebbinghaus found that one-tenth the

number of repetitions suf- ficed; the enormous saving thus effected showing how numerous and intimate are the ready-made associations that " rhyme and reason " involve. But at one and the same time to memorize five verses even of sense requires more than five times as many repetitions as the memorizing of one. Two or three lines of inquiry here present themselves, e.g. (1) as to the comparative value of successive repetitions when several are taken together; (2) as to retention after an interval, as (a) a function of the number of repetitions previously made, and as (b) a function of the time; (3) as to the respective effects of more or less cumu- lating, or more or less distributing, the repetitions, on the number of these required.

1. It is at once obvious that beyond a certain point exhaustion of attention renders further repetition for a time futile; thus Ebbinghaus found 64 repetitions at one sitting of six 16-syllable nonsense verses, a task lasting some three-quarters of an hour, " was apt to bring on asthenia, a sort of epileptic aura, and the like ! " But keeping well within this heroic limit, a certain " law of diminishing return," to use an economic analogy, discloses itself. Thus taking a line of 10 syllables, the number of syllables reproduced correctly and in their proper order, after 1, 3, 6, o and 12 " repetitions," were 2-2, 2-5, 2-8, 3-4, 3-9 respec- tively, as the averages of a series of experiments with each of eight persons. 2 " The first repetition is undoubtedly the best," assuming, of course, that the subjects start with their attention fully concentrated. Some persons naturally do this, many do not; the experimenter has therefore to take special precautions to secure uniformity in this respect.

2. (a) On relearning a line after an interval of twenty-four hours there was in Ebbinghaus's case an average saving of one repetition for every three made the day before. A line of 16 syllables, for example, required some 30 repetitions, and could then be said off correctly. If only 8 repetitions were taken at first, the line being " underlearnt," it probably appeared quite strange the next day, yet the proportional saving was no less; on the other hand, if an additional 30 repetitions followed immedi- ately on the first, the line being " doubly learnt," in spite of the

1 Cf. Dietze, " Untersuchungen uber den Umfang des Bewusst- seins u.s.w.," Phil. Studien (1885), pp. 362 sqq. ; L. W. Stern, " Psy- chische Prasenzzeit," Ztschr. f. Psychologie (1897), xiii. 325 sqq.; Daniels, " Memory After-image and Attention," Am. Jour, of Psychology (1893), vi. 558 sqq.

2 W. G. Smith, " The Place of Repetition in Memory," Psycho- logical Rev. (1896), pp. 20 sqq. The figures given are unquestionably low, partly, as the writer pointe out, in consequence of the method employed, but partly, as his detailed tables show, in consequence of the lax attention of three out

of his eight subjects._ Objections have been taken to the plan of this investigation, but it is doubtful if they invalidate the result here mentioned. Cf. Jost, " Die Associations- festigkeit in ihrer Abhangigkeit von der Vertheilung der Wiederho- lungen," Ztschr. f. Psychologie, xiv. 455 sqq.

familiarity next day apparent, the proportional saving was no greater. The absolute saving would, of course, be less. We are so far led to infer that the stronger associations effected by many repetitions at one time fall off more rapidly than weaker associations effected by fewer repetitions in the same way. Herbart in his " psychical dynamics " — influenced probably by physical analogies — conjectured that the " sinking " or " inhibition " of presentations generally was proportional to their intensity: the less there was to sink, the slower the sinking became. Recent experiments certainly point in this direction. (b) As to retention as a function of the time — we all know that memories fade with time, but not at what precise rate. Ebbing- haus, by a series of prolonged experiments, ascertained the rate to be proportional to the logarithm of the time — a result already implied in that connecting retention and intensity; albeit in inquiries of this kind independent confirmation is always of value.

3. Had the proportional saving just described held good indefinitely, some 100 repetitions of the 16 syllables at one time should have dispensed with any further repetition twenty-four hours afterwards; whereas, in fact, this result seemed never attainable. Beyond a certain degree of accumulation, an ever- diminishing return was manifest, and that apparently short of the stage at which exhaustion of attention began to be felt. But, contrariwise, when the repetitions were distributed over several days, an ever-increasing efficiency was then the result. Thus, for Ebbinghaus, 38 repetitions spread over three days were as effective as 68 taken together. The results of careful experi- ments by Jost with two different subjects, using G. E. Miiller's " method of telling " (to be described later on), are still more conclusive. Comparing 8 repetitions on three successive days with 4 repetitions on six, and 2 on twelve, the efficiencies, tested twenty-four hours later, were respectively as 11-5, 35, and 54; and probably, as Jost surmises, the effect of the maximum distribution — single " repetition " on twenty-four successive days — would have been more advantageous still, securing in fact the superiority of a first impression (cf. 1, above) on every occasion. This result again, is in part explained by the law of sinking already found. For if the sinking were simply pro- portional to the time, or were independent of the intensity, there would so far be no reason why one mode of distributing a given number of repetitions should be more economical than another. There is, however, another reason for this superiority, less clearly implied, to which we shall come presently.

Invariably, and almost of necessity, a more or less complex rhythmical

articulation becomes apparent as the syllables are repeated, even when — as in the improved methods of G. E. Miiller and his collaborateurs — they are presented singly and at regular intervals. A series of twelve syllables, for example, would be connected into six trochees, with a caesura in the middle of the verse; while in each half of it the first and last accented syllables would be specially emphasized; thus:

bam fis I lup tol | gen ker || dub naf | &c. In trying to suppress this tendency and to repeat the syllables in a monotonous, staccato fashion, just as they were presented, the tempo, though really unchanged, seemed to be distinctly quickened, a consequence, doubtless, of the greater effort involved. Moreover, the attempt, which was seldom successful, about doubled the number of repetitions required for learning off, thereby showing how much is gained by this psychical organization of disconnected material. But the gain thus ensured was manifest in other ways. Each foot, whether dissyllabic or trisyllabic, became a new complex unit, the elements to be connected by successive association being thereby reduced to a half or a third, and the whole line seemingly shortened. The varied intonation, again, helped to fix the place of each foot in the verse, thus further facilitating the mind's survey of the whole. Such a transformation can hardly be accounted for so long as retention and association are regarded as merely mechanical and passive processes.

Psychical rhythm, upon which we here touch, has also been experimentally investigated at great length, alike in its physiological

psychological and aesthetical aspects. The topic is far too intricate and unsettled for discussion here, yet two or three points may be noted in passing. We are not specially concerned with objective rhythms, recurring series of impressions — that is to say, in which there are actually periodic variations of intensity, interval and the like. What is remarkable is that even a perfectly regular succession of sounds (or touches), qualitatively and quantitatively all alike, a series therefore devoid of all objective rhythm, is nevertheless apprehended as rhythmically grouped, provided the rate lies between the limits of about 0-8″ and 0-14". The slower of these rates leads to simple groups of two, replaced by groups of four or eight as the rate increases; groups of three and six also occur, though less frequently. The average duration of the groups, whether these are large or small, is comparatively constant, measuring rather more than one second.

The subject usually keeps time by taps, nods or other accompanying movements; the pulse and respiration are also implicated. These organic rhythms have even been regarded as the prime source of all psychical rhythm and of its manifold aesthetic effects. Some connexion there is unquestionably. As the decimal system corresponds to our possession of ten fingers, and our move- ments to the structure of our limbs, so here we may assume that physiological processes fix the limits within which psychical rhythm is possible, but yet may be as little an adequate cause of it or its developments as fingers are of arithmetic, or legs of an Irish jig. In motor rhythms, such as the last, the initiative is obviously psychical, and the respiratory and other periodic organic processes simply follow suit. And even sensory rhythms can often be varied at the subject's own choice, or on the suggestion of another; and then again the breathing is altered in consequence. Familiar instances of such procedure are to be found in the " tunes " so readily attri- buted to the puff of a locomotive, to the churning of a steamer's screw, and the like. Psychical rhythm, then, we may conclude, is due to attention or apperception, but the conditions determining it are many, and their relations very complex. If the presentations to be " rhythmized " (the rhythmizomenon, as the Germans say) succeed each other slowly, the length (or shall we say the breadth?) of the "psychical present" tells one way: the first impression is below the threshold when the third appears. If they arrive rapidly, their intensity and duration and the span of prehension tell another way; for it is essential that they retain their individual distinctness and only so many can be grasped at once. But if the series continue long enough, or be frequently experienced, sub-groups may be treated as individuals; and indeed till some facility is acquired, the subject attending is aware of no rhythm. In the act of attention itself there are phases, in so far as expectation involves preadjustmerit to what is coming: usually the first members of a tact are predominant, and the rhythm tends to "fall"; several alternations of accent within a complex rhythmic whole are of course still compatible with this. But it is important to note that, whether simple or complex, the rhythm is an intuited unity as truly as a geometrical figure may be. Unlike a geometrical figure, however, it rarely or never has symmetry. We cannot reverse a tune and obtain an effect comparable with that obtained by reprinting the score backwards in line with the original. We now pass to a question in which the psychological bearing of this fact becomes apparent. 1

But first a new method of dealing with memory-problems must be mentioned, in which the connexion between rhythmizing and memorizing has been turned to account by the Gottingen psycholo- gists. The method of Ebbinghaus consisted in ascertaining the repetitions saved in consequence of previous repetitions, when the verse was relearnt some fixed time later.

Hence this method is called the learning method or the method of saving. When, a given time after a certain number of repetitions (say) in trochaic measure, the subject is confronted with one of the accented syllables and asked to name the unaccented syllable that belongs to it, he will answer sometimes rightly, sometimes wrongly, and sometimes be unable to answer at all. This, the new, method is therefore named Trejfer-methode, the method of " shots," or, let us say, the telling method. It enables the experimenter to obtain far more insight into details than was possible before, for the " misses " as well as the " hits " are instructive. Moreover, by measuring the time of each answer- (Trefferzeit) and comparing these times together, much can be learnt; in stronger or recent associations, for example, the answers being quicker than in weaker or older ones.

Does association work forwards only or backwards also, as the middle link of a chain, when lifted, raises the contiguous links on either side of it? This is certainly not the case when the forward direction makes sense, but with nonsense verses, if the mechanical analogy is a sound one, such reversal is to be expected. For here there are none of the " obstructing associations " which

1 The following are among the more important papers on rhythm: T. L. Bolton, " Rhythm," Am. Joum. of Psychology (1894), pp. 145 sqq.; E. E. Meumann, " Untersuchungen z. Psychologies Aesthetik des Rhythmus," Phil. Studien (1894), x. 249 sqq., 393 sqq.; M. K. Smith, " Rhythmus und Arbeit," Phil Studien (1900), xvi. 71 sqq. 197 sqq.; Arbeit und Rhythmus (1899), by K. Bucher, a well-known economist, bringing out the teleological aspects of rhythm.

" rhyme and reason " imply. In learning a verse backwards Ebbinghaus found a saving of 12-4 % of the time originally taken up in learning it forwards. A saving almost as great (10-4 %) was effected by relearning a like verse forwards, but skipping one syllable: the order of syllables, that is to say, being 1, 3, 5, . . . 15, 2, 4, . . . 16. Even when learning backwards and skipping one syllable, Ebbinghaus found a saving of 5 %. But the number of his experiments (four) was too few to give this result much value, as he fully admits. These experiments as a whole, then, might incline us to suppose that association does work in both directions, though the connexions backwards are considerably weaker. But if so the associations both ways should be alike at least in form — continuous, that is to say, backwards, d c b a, as well as forwards, abed. The facts at present available are, however, against this. In two or three hundred, experiments by Miiller and Pilzecker, verses of twelve syllables were repeated a set number of times in anapaestic measure — accented, that is to say, on the 3rd, 6th, 9th and 12th. After a fixed interval the subject, confronted with one of the accented syllables, mentioned any of the other syllables which he

called to mind. Now the cases in which the syllable immediately preceding was revived were only about half as frequent as those in which the syllable next but one preceding was revived; the time of telling (Trefferzeit) for the latter was also shorter. This result is incompatible with the theory of continuous backward association, but it is readily explained by the fact that the group of three syllables had become one complex whole, and it shows that the tendency to reinstate the initial member of the group is stronger than that to reinstate the middle. The saving effected in Ebbinghaus's experiment is also thus explained. 2

A somewhat paradoxical situation is brought to light when the method of saving and the method of telling are used together. In the experiments by Jost, mentioned above, the series of verses were repeated thirty times; after an interval of twenty-four hours one series was tested by the first method and the other by the second. Two new series were then taken: the first repeated four times, and after an interval of a minute tested by the first method; the other was then repeated in like manner, and tested after the same interval by the second method. The old series was found (by the method of saving) to require on an average 5-85 repetitions for relearning, and the new 9-6; yet on the method of telling, the new series yielded 2-7 " hits," with an average time of about if second for each, while the old yielded only 9 " hits," with an average time of 45 seconds for each. Thus one may be able to reproduce relatively little of a given subject matter, and yet require only a few repetitions in order to learn it off anew; on the other hand, one may know relatively much, and still find many more repetitions requisite for such complete learning. The " age " of the associations is then important. Other things being equal, we may conclude that each fresh repetition effects more for old associations than for recent ones. It might be supposed that the strength of the old associations was more uniform and on the average greater than the strength of the new; so that while none of the old were far below the threshold, few, if any, were above it; whereas more of the new might be above the threshold though the majority had lapsed entirely. And the latter would certainly be the case if the subject of experiment tried to make sure of a few " hits," and paid no atten- tion to the rest of the series. Due care was, however, taken that the ends of the experiment should not in this way be defeated. Also, there is ample evidence to show that the supposed greater uniformity in strength of old associations is not, in fact, the rule. We seem left, then, to conjecture that the difference is the effect of the process of assimilation working subconsciously — that psychical aspect of nervous growth which Professor James has aptly characterized by saying that " we learn to skate in summer and to swim in winter." It continually happens that we can recognize connexions that we are quite unable to reproduce. To the diminished " strength " of an association, as tested by the

2 There are still other forms of what seems at first sight to be regressive association, but none that do not admit of explanation without this assumption.

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method of telling, there may then quite well be an equivalent set-off in more developed assimilation. As a seed germinates it has less latent energy, but this is replaced by growth in root and stem: similar relations may obtain when an old association is said merely to lose " strength." On the other hand — within the range of the primary memory-image — we can often reproduce what after a longer interval we should fail to recognize. We seem warranted, then, in concluding that this conception of " associa- tion-strength," so freely used by G. E. Miiller and his co-workers, requires more analysis than it has yet received. The two factors which their methods disclose in it appear to confirm the distinc- tion we have already made between impressions and free ideas. They help us also to understand, further, the superiority of dis- tributed over cumulated repetition, of " inwardly digesting " over " cram."

Feeling. 31. Such summary survey as these limits allow of the more elementary facts of cognition is here at an end; so far the most conspicuous factors at work have been those of what might be termed the ideational mechanism. In the higher processes of thought we have to take more account of mental activity and of the part played by language. But it seems preferable, before entering upon this, to explore also the emotional and active constituents of mind in their more elementary phases.

In our preliminary survey we have seen that psychical life consists in the main of a continuous alternation of predominantly receptive and predominantly reactive consciousness. In its earliest form experience is simply an interplay of alternations of sensation and movement. At a later stage we find that in the receptive phase ideation is added to sensation; and that in the active phase thought and fancy, or the voluntary manipulation and control of the idea- tional trains, are added to the voluntary manipulation and control of the muscles. At this higher level also it is possible that either form of receptive consciousness may lead to either form of active : sensations may lead to thought rather than to action in the restricted sense, and ideas apart from sensations may prompt to muscular exertion. There is a further complication still: not only may either sensations or ideas lead to either muscular or mental movements, but

movements themselves, whether of mind or limb, may as mere presentations determine other movements of either kind. In this respect, however, movements and thoughts either in themselves or through their sensational and ideational accompaniments may be regarded as pertaining to the receptive side of consciousness. With these provisos, then, the. broad generalization may hold that re- ceptive states lead through feeling to active states, and that presen- tations that give neither pleasure nor pain meet with no responsive action. But first the objection must be met that presentations that are in themselves purely indifferent lead continually to very energetic action, often the promptest and most definite action. To this there are two answers. First, on the higher levels of psychical life presentations in themselves indifferent are often indirectly inter- esting as signs of, or as means to, other presentations that are more directly interesting. It is enough for the present, therefore, if it be admitted that all such indifferent presentations are without effect as often as they are not instrumental in furthering the realiza- tion of some desirable end. Secondly, a large class of movements, such as those called sensori-motor and ideo-motor, are initiated by presentations that are frequently, it must be allowed, neither pleasurable nor painful. In all such cases, however, there is probably only an apparent exception to the principle of subjective selection. They may all be regarded as instances of another im- portant psychological principle which we shall have to deal with more fully by and by, viz. that voluntary actions, and especially those that either only avert pain or are merely subsidiary to pleasure- giving actions, tend at length, as the effect of habit in the individual and of heredity in the race, to become " secondarily automatic," as it has been called. Such mechanical or instinctive dexterities make possible a more efficient use of present energies in securing pleasurable and interesting experiences, and, like the rings of former growths in a tree, afford a basis for further advance, as old interests pall and new ones present themselves. Here, again, it suffices for our present purpose if it be granted that there is a fair presumption in favour of supposing all such movements to have been originally initiated by feeling, as certainly very many of them were.

Of the feeling itself that intervenes between these sensory and motor presentations there is but little to be said. The chief points have been already insisted upon, viz. that it is not itself a presentation, but a purely subjective state, at once the effect of a change in receptive consciousness and the cause of a change in motor consciousness; hence its continual confusion either with the movements, whether ideational or muscular, that are its

expression, or with the sensations or ideas that are its cause. For feeling as such is, so to put it, matter of being rather than of direct knowledge; and all that we know about it we know from its antecedents or consequents in

presentation.

Pure feeling, then, ranging solely between the opposite extremes of pleasure and pain, we are naturally led to inquire whether there is any corresponding contrast in the causes of feeling on the one hand, and on the other p ee i in „ in its manifestations and effects. To begin with the first question, which we may thus formulate: What, if any, are the invariable differences characteristic of the presentations or states of mind we respectively like and dislike; or, taking account of the diverse sources of feeling — sensuous, aesthetic, intellectual, active — is there anything that we can predicate alike of all that are pleasurable and deny of all that are painful, and vice versa? It is at once evident that at least in presen- tations objectively regarded no such common characters will be found; if we find them anywhere it must be in some relation to the conscious subject i.e. in the fact of presentation itself. There is one important truth concerning pleasures and pains that may occur at once as an answer to our inquiry, and that is often advanced as such, viz. that whatever is pleasurable tends to further and perfect life, and whatever is painful to disturb or destroy it. The many seeming exceptions to this law of self-conservation, as it has been called, probably all admit of explanation in conformity with it, so as to leave its substantial truth unimpeached. 1 But this law, however stated, is too teleological to serve as a purely psychological principle, and, as generally formulated and, illustrated, it takes account of matters quite outside the psychologist's ken. We are not now concerned to know why a bitter taste e.g. is painful or the gratification of an appetite pleasant, but what marks distinctive of all painful presentations the one has and the other lacks. From a biological standpoint it may be true enough that the final cause of sexual and parental feelings is the perpetuation of the species; but this does not help us to ascertain what common character they have as actual sources of feeling for the individual. From the biologi- cal standpoint again, even the senile decadence and death of the individual may be shown to be advantageous to the race; but it would certainly be odd to describe this as advantageous to the individual; so different are the two points of view. What we are in search of, although a generalization, has reference to some- thing much more concrete than concepts like race or life, and does not require us to go beyond the consciousness of the moment to such ulterior facts as they imply.

Were it possible it would be quite unnecessary to examine in detail every variety of pleasurable and painful consciousness in connexion with a general inquiry of this sort. It will be best to enumerate at the outset the only cases that specially call for investigation. Feeling may arise mainly from (a) single sen- sations or movements, including in these what recent psycholo- gists call their tone; or it may be chiefly determined by (b) some combination or arrangement of these primary presentations — hence what

might be styled the lower aesthetic feelings. We have thus among primary presentations a more material and a more formal cause or ground of feeling. The mere representation of these sources of feeling involves nothing of moment: the idea of a bright colour or a bitter taste has not definiteness or intensity enough to produce feeling; and the ideal presentation of a harmonious arrangement of sounds or colours does not in itself differ essentially as regards the feeling it occasions from the actual presentation. When we advance to the level at which there occur ideas more complex and more highly representative — or re-representative, as Mr Spencer would say — than any we have yet considered we can again distinguish between material and formal grounds of feeling. To the first we might refer, e.g. (c) the egoistic, sympathetic, and religious feelings; this class will probably Tequire but brief notice. The second, con- sisting of (d) the intellectual and (e) the higher aesthetic feelings, is psychologically more important. There is a special class of

1 See Spencer, Data of Ethics, chs. i.-iv. ; G. H. Schneider, Freud und Leid des Metischengeschlechts, ch. i.

feelings, which might be distinguished from all the preceding as reflex, since they arise from the memory or expectation of feelings but in fact these are largely involved in all the higher feelings, and this brief reference to them will suffice: of such hope, fear, regret are examples.

a. The quality and intensity as well as the duration and frequency of a sensation or movement all have to do with Sensations determining to what feeling it gives rise. It will and Move- be best to leave the last two out of account for a time. meats. Apart from these, the pleasantness or painfulness of a movement appears to depend solely upon its intensity, that is to say, upon the amount of effort necessary to effect it, in such wise that a certain amount of exertion is agreeable and any excess disagreeable. Some sensations also, such as those of light and sound, are agreeable if not too intense, their pleasantness increasing with their intensity up to a certain point, on nearing which the feeling rapidly changes and becomes disagreeable or even painful. Other sensations, as bitter tastes, e.g. are naturally unpleasant, however faint — though we must allow the possibility of an acquired liking for moderately bitter or pungent flavours. But in every case such sensations produce unmistakable manifestations of disgust, if at all intense. Sweet tastes, on the other hand, however intense, are

pleasant to an unspoiled palate, though apt before long to become mawkish, like " sweetest honey, loathsome in his own deliciousness," as confectioners' apprentices are said soon to find. The painfulness of all painful sensations or movements increases with their intensity without any assignable maximum being reached.

A comparison of examples of this kind, which it would be tedious to describe more fully and which are indeed too familiar to need much description, seems to show (i) that, so far as feeling is determined by the intensity of a presentation, there is pleasure so long as attention can be adapted or accommodated to the presentation, and pain so soon as the intensity is too great for this; and (2) that, so far as feeling is determined by the quality of a presentation, those that are pleasurable enlarge the field of consciousness and introduce or agreeably increase in intensity certain organic sensations, while those that are painful contract the field of consciousness and introduce or disagreeably increase in intensity certain organic sensations. There are certain other hedonic effects due to quality, the examination of which we must for the present defer. Meanwhile as to the first point it may be suggested, as at any rate a working hypothesis, that in itself any and every simple sensation or movement is pleasurable if there is attention forthcoming adequate to its intensity. In the earliest and simplest phases of life, in which the presentation-continuum is but little differentiated, it is reasonable to suppose that variation in the intensity of presentation preponderates over changes in the quality of presentation, and that to the same extent feeling is determined by the former and not by the latter. And, whereas this dependence on intensity is invariable, there is no ground for supposing the quality of any primary presen- tation, when not of excessive intensity, to be invariably dis- agreeable; the changes above-mentioned in the hedonic effects of bitter tastes, sweet tastes, or the like tend rather to prove the contrary. This brings us to the second point, and it requires some elucidation. We need here to call to mind the continuity of our presentations and especially the existence of a background of organic sensations or somatic consciousness, as it is variously termed. By the time that qualitatively distinct presentations have been differentiated from this common basis it becomes possible for any of these, without having the intensity requisite to affect feeling directly, to change it indirectly by means of the systemic sensations accompanying them, or, in other words, by their tone. The physiological concomitants of these changes of somatic tone are largely reflex movements or equivalents of movements, such as alterations in circulatory, respiratory and excretory processes. Such movements are psychologically movements no longer, and are rightly regarded as pertaining wholly to the sensory division of presentations. But originally it may have been otherwise. To us now, these organic reflexes seem but part and parcel of the special sensation whose tone they

form, and which they accompany even when that sensation, so far as its mere intensity goes, might be deemed indifferent. But perhaps at first the special qualities that are now throughout unpleasant may have been always presented with an excessive intensity that would be painful on this score alone, and the reflexes that at present pertain to them may then have been psychologically the expression of this pain. 1 At any rate it is manifestly unfair to refuse either to seek out the primitive effects of the sensations in question and allow for the workings of heredity, or to reckon this accompanying systemic feeling as part of them. The latter seems the readier and perhaps, too, the preferable course. A word will now suffice to explain what is meant by enlarging and contracting the field of consciousness and agreeably increasing or decreasing certain elements therein.

The difference in point is manifest on comparing the flow of spirits, buoyancy and animation which result from a certain duration of pleasurable sensations with the lowness or depression of spirits, the gloom and heaviness of heart, apt to ensue from prolonged physical pain. Common language, in fact, leaves us no choice but to describe these contrasted states by figures which clearly imply that they differ in the range and variety of the presentations that make up consciousness, and in the quickness with which these succeed each other. 2 It is not merely that in hilarity as contrasted with dejection the train of ideas takes a wider sweep and shows greater liveliness, but as it were at the back of this, on the lower level of purely sensory experience, certain organic sensations which are ordinarily indifferent acquire a gentle intensity, which seems by flowing over to quicken and expand the ideational stream as we see, for instance, in the effects of mountain air and sushine. Or, on the other hand, these sensations become so violently intense as to drain off and ingulf all available energy in one monotonous corroding care, an oppressive weight which leaves no place for free movement, no life or leisure to respond to what are wont to be pleasurable solicitations. 3

As regards the duration and the frequency of presentation, it is in general true that the hedonic effect soon attains its maxi- mum, and then, if pleasant, rapidly declines, or even changes to its opposite. Pains in like manner decline, but more slowly and without in the same sense changing to pleasures. The like holds of too frequent repetition. Physiological explanation of these facts, good as far as it goes, is, of course, at once forth- coming: sensibility is blunted, time is required for restoration, and so forth; but at least we want the psychological equivalent of all this. In one respect we find nothing materially new; so

1 In the lowly organisms that absorb food directly through the skin such bitter juices as exist naturally might at once produce very violent effects — comparable, say, to scalding; and the reflexes then established may have

been continued by natural selection so as to save from poisoning the higher organisms, whose absorbent surfaces are internal and only guarded in this way by the organ of taste. Some light is thrown on questions of this kind by the very interesting experiments of Dr Romanes; for a general account of these see his Jelly-fish, Star-fish, and Sea-urchins, ch. ix.

2 This is one among many cases in which the study of a vocabulary is full of instruction to the psychologist. The reader who will be at the trouble to compare the parallel columns under the heading "Passive Affections," in Roget's Thesaurus of English Words and, Phrases, will find ample proof both of this general statement and of what is said above in the text.

3 Observation and experiment show that the physical signs of pain in the higher animals consist in such changes as a lowered and weaker pulse, reduction of the surface temperature, quickened respiration, dilatation of the iris, and the like. And so far as can be ascertained these effects are not altogether the emotional reaction to pain but in large measure its actual accompaniments, the physical side of what we have called its tone. The following is a good descrip- tion of these general characteristics of feeling: " En mime temps, il se fait une serie de mouvements generaux de flexion, comme si l'animal voulait se rendre plus petit, et offrir moins de surface a la douleur. II est interessant de remarquer que, pour l'homme comme pour tous les animaux, on retrouve ces mimes mouvements generaux de flexion et d'extension repondant aux sentiments differents de plaisir et de la douleur. Le piaisir repond a un mouvement d'epa- nouissement, de dilatation, d'extension. Au contraire, dans la douleur, on se rapetisse, on se referme sur soi; c'est un mouvement general de flexion " (C. Richet, L' Homme et V Intelligence: la douleur, P- 9)-

and of Movements.

far as continued presentation entails diminished intensity we have nothing but diminished feeling as a consequence; so far as its continued presentation entails satiety the train of agreeable accompaniments ceases in which the pleasurable tone consisted. But in another way long duration and frequent repetition produce indirectly certain characteristic effects on feeling in consequence of habituation and accommodation. We may get used to a painful presentation in such wise that we cease to be conscious of it as positively disagreeable, though its cessation is at once a source of

*pleasure; in like manner we come to require things simply because it is painful to be without them, although their possession has long ceased to be a ground of positive enjoyment. This loss (or gain) consequent on accommodation * has a most important effect in changing the sources of feeling: it helps to transfer attention from mere sensations to what we may distinguish as interests.*

b. Certain sensations or movements not separately unpleasant become so when presented together or in immediate succession; Combina- anc ˆ contrariwise, some combinations of sensations tions of or of movements may be such as to afford pleasure Sensations distinct from, and often greater than, any that they separately yield. Here again we find that in some cases the effect seems mainly to depend on intensity, in others mainly on quality, (i.) As instances of the former may be mentioned the pleasurableness of a rhythmic succession of sounds or movements, of symmetrical forms and curved outlines, of gentle crescendos and diminuendos in sound, and of gradual variations of shade in colour, and the painfulness of flickering lights, ” beats ” in musical notes, false time, false steps, false quantities, and the like. In all these, whenever the result is pleasurable, attention can be readily accommodated — is, so to say, economically meted out; and, whenever the result is painful, attention is surprised, balked, wasted. Thus we can make more movements and with less expenditure of energy when they are rhythmic than when they are not, as the perform- ances of a ball-room or of troops marching to music amply testify. Of this economy we have also a striking proof in the ease with which rhythmic language is retained, (ii.) As instances of the latter may be cited those arrangements of musical tones and of colours that are called harmonious or the opposite. Harmony, however, must be taken to have a different meaning in the two cases. When two or three tones harmonize there results, as is well known, a distinct pleasure over and above any pleasure due to the tones themselves. On the other hand, tones that are discordant are unpleasant in spite of any pleasantness they may have singly. Besides the negative condition of absence of beats, a musical interval to be pleasant must fulfil certain positive conditions, sufficiently expressed for our purpose by saying that two tones are pleasant when they give rise to few combination-tones, and when among these there are several that coincide, and that they are unpleasant when they give rise to many combination-tones, and when among these there are few or none that coincide. Too many tones together prevent any from being distinct. But where tones coincide the number of tones actually present is less than the number of possible tones, and there is a proportionate simplification, so to put it: more is commanded and with less effort. An ingenious writer 2 on harmony, in fact, compares the confusion of a discord to that of ” trying to reckon up a sum in one’s head and failing because the numbers are too

high." A different explanation must be given of the so-called harmonies of colour. The pleasur- able effect of graduations of colour or shade — to which, as Ruskin tells us, the rose owes its victorious beauty when com- pared with other flowers — has been already mentioned: it is rather a quantitative than a qualitative effect. What we are

1 It has been definitely formulated, but in physiological language, by Bain as the Law of Novelty: " No second occurrence of any great shock or stimulus, whether pleasure, pain, or mere excite- ment, is ever fully equal to the first, notwithstanding that full time has been given for the nerves to recover from their exhaustion " {Mind and Body, p. 51). Cf. also his Emotions and Will, 3rd ed., p. 83.

2 Preyer, Akustische Untersuchungen, p. 59

now concerned with are the pleasurable or painful combinations of different ungraduated colours. A comparison of these seems to justify the general statement that those colours yield good combinations that are far apart in the colour circle, while those near together are apt to be discordant. The explanation given, viz. that the one arrangement secures and the other prevents perfect retinal activity, seems on the whole satisfactory — especially if we acknowledge the tendency of all recent investi- gations and distinguish sensibility to colour and sensibility to mere light as both psychologically and physiologically two separate facts. Thus, when red and green are juxtaposed, the red increases the saturation of the green and the green that of the red, so that both colours are heightened in brilliance. But such an effect is only pleasing to the child and the savage; for civilized men the contrast is excessive, and colours less completely opposed, as red and blue, are preferred, each being a rest from the other, so that as the eye wanders to and fro over their border different elements are active by turns. Red and orange, again, are bad, in that both exhaust in a similar manner and leave the remaining factors out of play.

c. The more or less spontaneous workings of imagination, as well as that direct control of this working necessary to thinking in the stricter sense, are always productive of pain or pleasure in varying degrees. Though the ex- 4,

d. Closely related to these formal intellectual feelings are certain of the higher aesthetic feelings. A reference to some Higher of the commonplaces of aesthetical writers may be Aesthetic sufficient briefly to exhibit the

leading characteristics Feelings. f th ese feelings. There is a wide agreement among men in general as to what is beautiful and what is not, and it is the business of a treatise on empirical aesthetics from an analysis of these matters of fact to generalize the principles of taste — to do, in fact, for one source of pleasure and pain what we are here attempting in a meagre fashion for all. And these principles are the more important in their bearing upon the larger psychological question, because among aesthetic effects are reckoned only such as are pleasing or otherwise in themselves, apart from all recognition of utility, of possession, or of ulterior gratification of any kind whatever. Thus, if it should be objected that the intellectual satisfaction of consistency is really due to its utility, to the fact that what is incompatible and incompre- hensible is of no avail for practical guidance, at least this objec- tion will not hold against the aesthetic principle of unity in variety. In accordance with this primary maxim of art criticism, at the one extreme art productions are condemned for monotony, as incapable of sustaining interest because " empty," " bald " and " poor "; at the other extreme they are condemned as too incoherent and disconnected to furnish a centre of interest. And those are held as so far praiseworthy in which a variety of elements, be they movements, forms, colours or incidents, instead of conflicting, all unite to enhance each other and to form not merely a mass but a whole. Another principle that serves to throw light on our inquiry is that which has been called the principle of economy, 1 viz. that an effect is pleasing in proportion as it is attained by little effort and simple means. The brothers Weber in their classic work on human locomotion discovered that those movements that are aesthetically beautiful are also physiologically correct; grace and ease, in fact, are well- nigh synonymous, as Herbert Spencer points out, and illustrates by apt instances of graceful attitudes, motions and forms. The same writer, 2 again, in seeking for a more general law underlying the current maxims of writers on composition and rhetoric is led to a special formulation of this principle as applied to style, viz. that " economy of the recipient's attention is the secret of effect."

Perhaps of all aesthetical principles the most wide-reaching, as well as practically the most important, is that which explains aesthetic effects by association. Thus, to take one example where so many are possible, the croaking of frogs and the mono- tonous ditty of the cuckoo owe their pleasantness, not directly to what they are in themselves, but entirely to their intimate association with spring-time and its gladness. At first it might seem, therefore, that in this principle there is nothing fresh that is relevant to our present inquiry, since a pleasure that is only due to association at once carries back the question to its sources; so that in asking why the spring, for example, is pleasant we should be returning to old ground. But this is not altogether true ; aesthetic effects call up not merely ideas but ideals. A great work of art improves upon the real in two respects: it

intensifies and it transfigures. It is for art to gather into one focus, cleared from dross and commonplace, the genial memories of a life- time, the instinctive memories of a race; and, where theory can only classify and arrange what it receives, art — in a measure free from " the literal unities of time and place " — creates and glorifies. Still art eschews the abstract and speculative; however plastic in its hands, the material wrought is always that of sense. We have already noticed more than once the power which primary presentations have to sustain vivid re-presentations, and the, bearing of this on the aesthetic effects of works of art must be straightway obvious. The notes and colours, rhymes and rhythms, forms and movements, which produce the lower aesthetic feelings also serve as the means of bringing into view,

1 Cf. Fechner, Vorschule der Aesthetik, ii. 263. Fechner's full style for it is " Princip der okonomischen Verwendung der Mittel oder des kleinsten Kraftmasses."

2 Essays, Scientific, Political and Speculative, vol. ii., Ess. I. and VIII.

and maintaining at a higher level of vividness, a wider range and flow of pleasing ideas than we can ordinarily command.

When we reach the level at which there is distinct self- consciousness (cf. § 44), we have an important class of feelings determined by the relation of the presenta- Egoistic, ana tion of self to the other contents of consciousness. Socialistic And as the knowledge of other selves advances pari Feelings. passu with that of one's own self, so along with the egoistic feelings appear certain social or altruistic feelings. The two have much in common; in pride and shame, for example, account is taken of the estimate other persons form of us and of our regard for them; while, on the other hand, when we admire or despise, congratulate or pity another, we have always present to our mind a more or less definite concep- tion of self in like circumstances. It will therefore amply serve all the ends of our present inquiry if we briefly survey the leading characteristics of some contrasted egoistic feel- ings, such as self-complacency and disappointment. When a man is pleased with himself, his achievements, possessions or circumstances, such pleasure is the result of a comparison of his present position in this respect with some former position or with the position of someone else. Without descending to details, we may say that two prospects are before him, and the larger and fairer is recognized as his own. Under disappointment or reverse the same two pictures may be present to his mind, but accompanied by the certainty that the better is not his or is his no more. So far, then, it might be said the contents of his consciousness are in each case the same, the whole difference lying in the different relationship to self. But this makes all the difference even to the contents of

his consciousness, as we shall at once see if we consider its active side. Even the idlest and most thoughtless mind teems with intentions and expecta- tions, and in its prosperity, like the fool in the parable, thinks to pull down its barns and build greater, to take its ease, eat, drink and be merry. The support of all this pleasing show and these far-reaching aims is, not the bare knowledge of what abundance 'will do, but the reflection — These many goods are mine. In mind alone final causes have a place, and the end can produce the beginning; the prospect of a summer makes the present into spring. But action is paralysed or impossible when the means evade us. In so far as a man's life consists in the abundance of the things he possesseth, we see then why it dwindles with these. The like holds where self-complacency or displicency rests on a sense of personal worth or on the honour or affection of others.

32. We are now at the end of our survey of certain typical pleasurable and painful states. The answer to our inquiry which it seems to suggest is that there is pleasure in proportion as a maximum of attention is effectively J^afJ^ exercised, and pain in proportion as such effective attention is frustrated by distractions, shocks, or incomplete and faulty adaptations, or fails of exercise, owing to the narrow- ness of the field of consciousness and the slowness and smallness of its changes. Something must be said in explication of this formula, and certain objections that might be made to it must be considered. First of all it implies that feeling is determined partly by quantitative, or, as we might say, material conditions, and partly by conditions that are formal or qualitative. As regards the former, both the intensity or concentration of atten- tion and its diffusion or the extent of the field of consciousness have to be taken into account. Attention, whatever else it is, is a limited quantity —

Pluribus intentus minor est ad singula sensus — to quote Hamilton's pet adage. Moreover, as we have seen, attention requires time. If, then, attention be distributed over too wide a field, there is a corresponding loss of intensity, and so of distinctness: we tend towards a succession of indis- tinguishables — indistinguishable, therefore, from no succession. We must not have more presentations in the field of conscious- ness than will allow of some concentration of attention: a maximum diffusion will not do. A maximum concentration, in like manner — even if there were no other objection to it —

would seem to conflict with the general conditions of conscious- ness, inasmuch a§ a single simple presentation, however intense, would admit of no differentiation, and any complex presentation is in some sort a plurality. The most effective attention, then, as regards its quantitative conditions, must lie somewhere between the two zeros of complete indifference and complete absorption. If there be an excess of diffusion, effective atten- tion will increase up to a certain point as concentration increases, but beyond that point will decrease if this intensification con- tinues to increase; and vice versa, if there be an excess of con- centration. But, inasmuch as these quantitative conditions involve a plurality of distinguishable presentations or changes in consciousness, the way is open for formal conditions as well. Since different presentations consort differently when above the threshold of consciousness together, one field may be wider and yet as intense as another, or intenser and yet as wide, owing to a more advantageous arrangement of its constituents. 1

The doctrine here developed, viz., that feeling depends on efficiency, is in the main as old as Aristotle; all that has been

done is to give it a more accurately psychological Pleasures. expression, and to free it from the implications of

the faculty theory, in which form it was expounded by Hamilton. Of possible objections there are at least two that we must anticipate, and the consideration of which will help to make the general view clearer. First, it may be urged that, according to this view, it ought to be one con- tinuous pain to fall asleep, since in this state consciousness is rapidly restricted both as to intensity and range. This state- ment is entirely true as regards the intensity and substantially true as regards the range, at least of the higher consciousness: certain massive and agreeable organic sensations pertain to falling asleep, but the variety of presentations at all events grows less. But then the capacity to attend is also rapidly declining; even a slight intruding sensation entails an acute sense of strain in one sense, in place of the massive pleasure of repose through- out; and any voluntary concentration either in order to move or to think involves a like organic conflict, futile effort, and arrest of balmy ease. There is as regards the more definite constituents of the field of consciousness a close resemblance between natural sleepiness and the state of monotonous humdrum we call tedium or ennui; and yet the very same excitement that would relieve the one by dissipating the weariness of inaction would disturb the other by renewing the weariness of action: the one is com- mensurate with the resources of the moment, the other is not. Thus the maximum of effective attention in question is, as Aristotle would say, a maximum " relative to us." It is possible, therefore, that a change from a wider to a narrower field of consciousness may be a pleasurable change, if attention is more effectively

engaged. Strictly speaking, however, the so-called negative pleasures of rest do not consist in a mere narrowing of the field of consciousness so much as in a change in the amount of concentration. Massive organic sensations connected with restoration take the place of the comparatively acute sensations of jaded powers forced to work. We have, then, in all cases to bear in mind this subjective relativity of all pleasurable or painful states of consciousness.

1 As it is impossible to say that any distinguishable presentation is absolutely simple," the hypothesis of subconsciousness would leave us free to assume that any pleasantness or unpleasantness that cannot be explained on the score of intensity is due to some obscure harmony or discord, compatibility or incompatibility, of elements not separately discernible. But this, though tempting, is not really a very scientific procedure. If a particular presentation is pleasur- able or painful in such wise as to lead to a redistribution of attention, it is reasonable to look for an explanation primarily in its connexion with the rest of the field of consciousness. Moreover, it is obvious — since what takes place in subconsciousness can only be explained in analogy with what takes place in consciousness — that, if we have an inexplicable in the one, we must have a corresponding inex- plicable in the other. If the feeling produced by what comports itself as a simple presentation cannot be explained by what is in consciousness, we should be forced to admit that some presentations are unpleasant simply because they are unpleasant — an inexplica- bility which the hypothesis of subconsciousness might push farther back but would not remove.

33. But there is still another and more serious difficulty to face. It has long been a burning question with theoretical moralists whether pleasures differ only quantita- Do Pleasures tively or differ qualitatively as well, whether psycho- Differ Quail- logical analysis will justify the common distinction teHve i>' ? of higher and lower pleasures or force us to recognize nothing but differences of degree, of duration, and so forth — as expounded, e.g. by Bentham, whose cynical mot, " pushpin is as good as poetry provided it be as pleasant," was long a stumbling block in the way of utilitarianism. The entire issue here is confused by an ambiguity in terms that has been already noticed: pleasure and pleasures have not the same connotation. By a pleasure or pleasures we mean some assign- able presentation or presentations experienced as pleasant — i.e. as affording pleasure; by pleasure simply is meant this subjective state of feeling itself. The former, like other objects of know- ledge, admit of classification and comparison: we may dis- tinguish them as coarse or as noble, or, if we will, as cheap and wholesome. But while the causes of feeling are manifold, the feeling itself is a subjective state, varying only in intensity and duration. The best evidence of this lies in the general character of the actions that ensue

through feeling — the matter which has next to engage us. Whatever be the variety in the sources of pleasure, whatever be the moral or conventional estimate of their worthiness, if a given state of consciousness is pleasant we seek so far to retain it, if painful to be rid of it: we prefer greater pleasure before less, less pain before greater. This is, in fact, the whole meaning of preference as a psychological terrrl. Wisdom and folly each prefer the course which the other rejects. Both courses cannot, indeed, be objectively preferable; that, however, is not a matter for psychology. But as soon as reflection begins, exceptions to this primary principle of action seem to arise continually, even though we regard the individual as a law to himself. Such exceptions, however, we may presently find to be apparent only. At any rate the principle is obviously true before reflection begins — true so long as we are dealing with actually present sources of feeling, and not with their, re-presentations. But to admit this is psychologically to admit everything, at least if experience is to be genetically explained. Assuming then that we start with only quantitative variations of feeling, we have to attempt to explain the development of formal and qualitative differences in the character given to the grounds of feeling. But, if aversions and pursuits result from incommensurable states of pain and pleasure, there seems no other way of saving the unity and continuity of the subject except by speculative assumption — the doctrine known as the freedom of the will in its extremest form. The one position involves the other, and the more scientific course is to avoid both as far as we can.

The question, then, is : How, if action depends in the last resort on a merely quantitative difference, could it ever come about that what we call the higher sources of feeling should supersede the lower? If it is only quantity that turns the scales, where does quality come in, for we cannot say, e.g. that the astronomer experiences a greater thrill of delight when a new planet rewards his search than the hungry savage in finding a clump of pig-nuts? Tempora mutanlur nos et mutamur in Mis contains the answer in brief. We shall understand this answer better if we look at a parallel case, or what is really our own from another point of view. We distinguish between higher and lower forms of life: we might say there is. more life in a large oyster than in a small one, other things being equal, but we should regard a crab as possessing not necessarily more life — as measured by waste of tissue — but certainly as manifesting life in a higher form. How, in the evolution of the animal kingdom, do we suppose this advance to have been made? The tendency at any one moment is simply towards more life, simply towards growth; but this process of self-conservation imperceptibly but steadily modifies the self that is conserved. The creature is bent only on filling its skin; but in doing this as easily as may be it gets a better skin to fill, and accordingly seeks to fill it differently. Though cabbage and honey are what

they were before, they have changed relatively to the grub now it has become a butterfly. So, while we are all along preferring a more pleasurable state of consciousness before a less, the content of our consciousness is continually changing; the greater pleasure still outweighs the less, but the pleasures to be weighed are either wholly different, or at least are the same for us no more. What we require then, is not that the higher pleasures shall always afford greater pleasure than the lower did. but that to advance to the level of life on which pleasure is derived from higher objects shall on the whole be more pleasur- able and less painful than to remain behind. And this condition seems provided in the fact of accommodation above referred to and in the important fact that attention can be more effec- tively expended by what we may therefore call improvements in the form of the field of consciousness. But when all is said and done a certain repugnance is apt to arise against any associa- tion of the differences between the higher and lower feelings with differences of quantity. Yet such repugnance is but another outcome of the common mistake of supposing that the real is obtained by pulling to pieces rather than by building up. No logical analysis — nay, further, no logical synthesis — is adequate to the fullness of things. For the rest, such aversion is wholly emotional, and has no more an intellectual element in it than has the disgust we feel on first witnessing anatomical dissections. 1

Emotion and Emotional Expression. 34. We now pass from the causes of feeling to its effects. We have assumed (§ 7) that the simplest and earliest of these effects are to be found in the various bodily move- Feeiiag. ments commonly described as the expression or manifestation of emotion. But in a notorious article, entitled "What is an Emotion?" Professor James 2 attempted to turn this, the common-sense position, upside down. Before proceeding we must, therefore, examine his alternative theory: " Common sense says: we lose our for- tune, are sorry and weep; we meet a bear, are frightened and run; we are insulted by a rival, are angry and strike." But, Professor James continues, " the hypothesis here to be defended says that this order of sequence is incorrect: that the one mental state is not immediately induced by the other, that the bodily manifestations must first be interposed between, and that the more rational statement is that we feel sorry because we cry, angry because we strike, afraid because we tremble, and not that we cry, strike or tremble because we are sorry, angry or fearful, as the case may be." In a word, whereas it is commonly supposed that the emotion precedes and produces the expression, it seems here to be

maintained that the expres- sion precedes and produces the emotion. But the sequence denied in the first case is a psychological sequence, the sequence maintained in the second is a physiological sequence. The subject's experiences of the bodily expressions is here the emotion, and these are physically, not psychically, determined. " They are sensational processes," says Professor James; " processes due to inward currents set up by physical happen- ings."

The new theory is, then, in part psychological, in part psycho- physical. As to the first part, which the author calls " the vital point of the whole theory," it consists mainly in exposing the ambiguity of the phrase " bodily expression of an emotion " — a phrase which is liable to mislead us into fancying that

1 " To look at anything in its elements makes it appear inferior to what it seems as a whole. Resolve the statue or the building into stone and the laws of proportion, and no worthy causes of the former beautiful result seem now left behind. So, also, resolve a virtuous act into the passions and some quantitative law, and it seems to be rather destroyed than analysed, though after all what was there else it could be resolved into? " Sir A. Grant, Aristotle's Ethics, Essay IV., " The Doctrine of the Mean," i. 210 (2nd ed.).

2 Mind (1884), ix. 188 sqq.; and, again, Principles of Psychology, ch. xxv. Very similar views were advanced independently and almost at the same time by the Danish physiologist C. Lange; hence the name James-Lange theory, by which their views are commonly known. Of Lange's work a German translation was published in 1887.

emotion, like thought, may be antecedent to, or independent of, any expression or utterance. My fear or anger may chance to be expressive to another, but they are of necessity impressive to me. " A disembodied human emotion is a sheer nonentity." In so far as I have a certain emotion, in so far I have " the feelings of its bodily symptoms." This is true, not to say trite; but how do these symptoms arise? With this question we pass to the psychophysical side of the theory, and here it be- comes perplexing, and is itself perplexed; for to this question it is driven to return two distinct and divergent answers. First, we are told that it is not the emotion that gives rise to the bodily expression, but that, on the contrary, " the bodily changes follow directly the perception of the existing fact," it being beyond doubt " that objects do excite bodily changes by a preorganised mechanism." Again: '" Each emotion is," for Professor James, ." a resultant of a sum of elements, and each element is caused by a physiological process of a sort already well known. The elements are all organic changes, and each of them is the reflex effect of the existing object." The old attempts at classification and description being contemptu- ously dismissed as belonging

only to " the lowest stage of science," we are informed that now we step from a superficial to a deep order of inquiry. " The questions now are causal: ' Just what changes does this object and what changes does that object excite?' and ' How come they to excite these particular changes, and not others?'" But we have not had to wait for the James-Lange theory to raise these questions, and surely there are none that bring out its defects more glaringly. "Objects " that determine bodily changes by means of preorganized mechanism and without psychical interposition might fairly be taken to be physical objects; and indeed the whole process is expressly described as reflex. But only very slovenly physiologists talk of "objects" exciting reflexes: it is inexact even to say that sensations do so. All that reflex action requires is a stimulus. " The essence of a reflex action," says Foster, " consists in the transmutation, by means of the irritable protoplasm of a nerve-cell, of afferent into efferent impulses." Let Professor James be confronted first by a chained bear and next by a bear at large: to the one object he presents a bun, and to the other a clean pair of heels ; or let him first be thrilled by a Beethoven symphony and then by a Raphael Madonna. Will he now undertake to account, in terms of stimuli and their reflex effects, for the very different results of the similar " causes " in the one case, or for the similar results of the very different " causes " in the other? Such a challenge would certainly be declined, and Professor James would remind us that in his nomenclature " it is the total situation on which the reaction of the subject is made." 3 But there is just a world of difference between " object " = stimulus transformed by preorganised mechanism into an efferent discharge, and " object " = total situation to which the subject reacts. The attempt to explain emotion causally on the lines of the former meaning lands us in the conscious automaton theory, with which we must deal presently: this Professor James rejects. The latter meaning, on the other hand, involves the recognition of the subject's attitude as essential to the reaction, and of this as determined by pleasure, pain or by some " interest " resting ultimately on these. Such, with scarcely an exception, has always been, and still remains, the analysis of emotion in vogue among psychologists. It brings to the fore a new category, that of worth or value, one wholly extraneous to the physio- logist's domain, and repugnant to the mechanical analogies which are there in place. No doubt such a concept is attained only by reflexion, but the experiences from which it is drawn, the affective states and the conative tendencies of the subject experiencing, must have preceded. From this central stand- point alone the objective situation has a worth which explains the subject's attitude, and here alone can we find the clue which

3 " Physical Basis of Emotion," Psychological Review (1894), p. 518. In this reply to criticisms Professor James is supposed to have modified his views : it would be nearer the truth to say that he has made admissions

incompatible with them.

will enable us to answer the questions of cause that Professor James propounds.

The experimental investigations of Mosso, Fere\ Lehmann, and others have shown that the vaso-motor and such like bodily changes as are prominent in emotional excitement are present also to some extent in all forms of conscious activity. The more un- wonted and interesting the situation, the more diffused movements predominate over movements that are purposive; the further assimilation, both on the cognitive and the reactive side, has ad- vanced, the more diffusion is replaced by restriction and adapta- tion. But we are not warranted in separating these factors of voluntary activity into distinct processes, as the physiologist, for example, separates the functions of striped and unstriped muscle. Unless we are prepared to treat all activity as reflex — as the physiologist may quite well do, if he keep strictly to his own point of view — it does not seem possible to regard emotional expression as so much organic sensation with which purposive movement has nothing to do. No doubt this connexion of vegetal and animal functions remains one of the obscurest in all psycho-biology, though its teleological fitness is obvious enough.

Nevertheless, Professor James's main position is that an emotion is but a sum of organic sensations; and in order to establish this he is led to the second and very different statement which we have now to examine. Here, so far from suggesting inquiries as to the " objects " that excite emotion, his point is to maintain that in so far as the bodily cause is set up, be the means what they may, in so far the emotion is present. 1 And here, at length, the con- tention is explicit : Emotions are a certain complex of organic sensations, and such complexes are emotions: the two are not merely coexistent, they are identical. The exciting object is thus, after all, physiological; that is to say, it is whatever stimulus sets up the sensations. It cannot be psychological, " the total situation for the reacting subject," for in this sense the emotion, it is main- tained, may be " objectless." In support of his position Professor James first of all cites pathological cases of such objectless emotion. He next follows up these with accounts of other cases in which emotional apathy seemed to keep pace with sensory anaesthesia, arguing that, according to his theory, a subject absolutely anaesthetic should also be incapable of emotion, although " emotion-

inspiring objects might evoke the usual bodily expression from him." Whether any testimony from lunatics, hypnotics and other minds diseased could suffice to establish this novel doctrine is questionable : that the evidence so far adduced is insufficient, Professor James himself seems to allow. There are some four or five of the apathetic cases altogether: three of them are regarded by the mental patho- logists who describe them as adverse to Professor James's theory. 2 Of the fourth case, reported by a pathologist on Professor James's side, the latter himself candidly observes, " We must remember that the patient's inemotivity may have been a co-ordinate result with the anaesthesia of his neural lesions, and not the anaesthesia's mere effect." This missing link in the argument is supplied by the experiments of Professor Sherrington, 3 and these show conclusively that normal emotional states are possible along with complete visceral anaesthesia. As to emotional excitement induced by intoxi- cation or disease, and so far groundless, the most that can safely be said is that the object may be vague, ill-defined and shifting, but not that it is absent altogether. States of physical exaltation, depression or irritability readily arouse by association appropriate troupes of imagery: only when they fail of this are we entitled to say that there is no object, and then we must add that there is also no emotion.

Emotional and Conative Action. 35. As in dealing with the causes of feeling, so we may now in like manner proceed to inquire whether in its manifesta- tions or effects there is any contrast corresponding to the opposing extremes of pleasure and pain. We have already seen reasons for dismissing reflex movements or movements not determined by feeling as psychologically secondary, the effects of habit and heredity, and for regarding those diffusive movements that are immediately expressive of feeling as primordial — such movements as are strictly purposive being gradually selected or elaborated from them. But some dis- tinction is called for among the various movements expressive of emotion; for there is more in these than the direct effect of feeling regarded as merely pleasure or pain. It has been usual with psychologists to confound emotions with feeling, because intense feeling is essential to emotion. But, strictly

1 Text-Book of Psychology (1890), p. 383.

2 G. H. J. Berkley, " Two Cases of General Cutaneous and Sensory Anaesthesia without marked Psychical Implications," Brain (1891), xiv. 441 sqq.

3 " Experiments on the Value of Vascular and Visceral Factors for the Genesis of Emotion," Proc. Roy. Soc. (1900), lxvi. 390 sqq.; and Nature, lxii. 328 sqq.

speaking, a state of emotion is a complete state of mind, a psychosis, and not a psychical element, if we may so say. Thus in anger we have over and above pain a more or less definite object as its cause, and a certain characteristic reactive display — frowns, compressed lips, erect head, clenched fists, in a word, the combative attitude — as its effect, and similarly of other emotions; so that generally in the particular movements indicative of particular emotions the primary and primitive effects of feeling are overlaid by what Darwin has called service- able associated habits. The purposive actions of an earlier stage of development become, though somewhat atrophied as it were, the emotive outlet of a later stage: in the circum- stances in which our ancestors worried their enemies we only show our teeth. We must, therefore, leave aside the more complex emotional manifestations and look only to the simplest effects of pleasure and of pain, if we are to discover any funda- mental contrast between them. 4

Joy finds expression in dancing, clapping the hands and meaningless laughter, and these actions are not only pleasurable in themselves but such as increase the existing pleasure. Attention is not drafted off or diverted; ˆxpresshin. but rather the available resources seem reinforced, so that the old expenditure is supported as well as the new. To the pleasure on the receptive side is added pleasure on the active side. The violent contortions due to pain, on the other hand, are painful in themselves, though less intense than the pains from which they withdraw attention; they are but counter-irritants that arrest or inhibit still more painful thoughts or sensations. Thus, according to Darwin, " sailors who are to be flogged sometimes take a piece of lead into their mouths in order to bite it with their utmost force, and thus to bear the pain." When in this way we take account of the immediate effects as well as of the causes of feeling, we find it still more strikingly true that only in pleasurable states is there an efficient expenditure of attention. It is needless now to dwell upon this point, although any earlier mention of it would hardly have been in place. But we should fail to realize the contrast between the motor effects of pleasure and of pain if we merely regarded them as cases of diffusion. The intenser the feeling the intenser the reaction, no doubt, whether it be smiles or tears, jumping for joy, or writhing in agony; but in the move- ments consequent on pleasure the diffusion is the result of mere exuberance, an overflow of good spirits, as we sometimes say, and these movements, as already remarked, are always com- paratively purposeless or playful. Even the earliest expressions of pain, on the contrary, seem but so many efforts to escape from the cause of it; in them there is at least the blind purpose to flee from a definite ill, but in pleasure only the enjoyment of present fortune.

From Plato downwards psychologists and moralists have been fond of discussing the relation of pleasure and pain. It has been maintained that

pain is the first and more fundamental fact, and pleasure nothing but relief from pain; and, again, on the other side, that pleasure is prior and positive, and pain only the negation of pleasure. So far as the mere change goes, it is obviously true that the diminution of pain is pro tanto pleasant, and the diminu- tion of pleasure pro tanto unpleasant; and if relativity had the unlimited range sometimes assigned to it this would be all we could say. But we must sooner or later recognize the existence of a comparatively fixed neutral state, deviations from which, of comparatively short duration and of sufficient intensity, consti- tute distinct states of pleasure or pain. Such states, if not of liminal intensity, may then be further diminished without reversing

*_ * Of the three principles Darwin advances in explanation of emo- tional expression that which he places last — perhaps because it admits of less definite illustration — seems both psychologically and physiologically more fundamental than the more striking principle of serviceable associated habits which he places first; indeed the following, which is his statement of it, implies as much: " Certain actions which we recognize as expressive of certain states of mind are the direct result of the constitution of the nervous system, and have been from the first independent of the will, and to a large extent of habit " (Expression of the Emotions, p. 66). It is in illustration of this principle too that Darwin describes the movements expressive of joy and grief, emotions which in some form or other are surely the most primitive of any.*

their pleasurable or painful character. The turning-point here implied may, of coupe, gradually change too — as a result, in fact, of the law of acconimodation. Thus a long run of pleasure would raise " the hedonistic zero," while — to the small extent to which accommodation fto pain is possible— a continuance of pain would lower it. But such admission makes no material difference where the actual feeling of the moment is alone concerned and retrospect out of the question. On the whole it seems, therefore, most reason- able to regard pleasure and pain as emerging out of a neutral state, which is prior to and distinct from both — not a state of absolute indifference, but of simple contentment, marked by no special active display. But it is by reference to such state of equilibrium or iraBla that we see most clearly the superior volitional efficacy of pain upon which pessimists love to descant. " Nobody," says Von Hartmann, " who had to choose between no taste at all for ten minutes or five minutes of a pleasant

taste and then five minutes of an unpleasant taste, would prefer the last " Most men and all the lower animals are content " to let well alone."

To ascertain the origin and progress of purposive action it seems, then, that we must look to the effects of pain rather than to those of pleasure. It is true that psy- AcUoa. e chologists not infrequently describe the earliest purposive movements as appetitive; or at least they treat appetitive and aversive movements as co-ordinate and equally primitive, pleasures being supposed to lead to actions for their continuance as much as pains to actions for their removal. No doubt, as soon as the connexion between a pleasur- able sensation and the appropriate action is completely established, as in the case of imbibing food, the whole process is then self-sustaining till satiety begins. But the point is that such facility was first acquired under the teaching of pain — the pain of unsatisfied hunger. The term " appetite " is apt both by its etymology and its later associations to be misleading. What are properly called the " instinctive " appetites are — when regarded from their active side — movements determined by some existing uneasy sensation. So far as their earliest mani- festation in a particular individual is concerned, this urgency seems almost entirely of the nature of a wj a tergo; and the movements are only more definite than those simply expressive of pain because of inherited pre-adaptation, on. which account, of course, they are called " instinctive." But what one inherits another must have acquired, and we have agreed here to leave heredity on one side and consider only the original evolution.

But if none but psychological causes were at work this evolu- tion would be very long and in its early stages very uncertain. At first, when only random movements ensue, we may fairly suppose both that the chance of at once making a happy hit would be small and that the number of chances, the space for repentance, would also be small. Under such circumstances natural selection would have to do almost everything and subjective selection almost nothing. So far as natural selection worked, we should have, not the individual subject making a series of tries and perfecting itself by practice, as in learning to dance or swim, but we should have those individuals whose structure happened to vary for the better surviving, increasing and displacing the rest. How much natural selection, apparently unaided, can accomplish in the way of complicated adjust- ment we see in the adaptation of the form and colour of plants and animals to their environment. Both factors, in reality, operate at once, and it would be hard to fix a limit to either, though to our minds natural selection seems to lose in compara- tive importance as we advance towards the higher stages of life.

But psychologically we have primarily to consider subjective selection, i.e. first of all, the association of particular movements with particular

sensations through the mediation of feeling. The sensations here concerned are mainly painful excitations from the environment, the recurring pains of innutrition, weariness, &c, and pleasurable sensations due to the satisfaction of these organic wants — pleasures which, although not a mere " filling-up," as Plato at one time contended, are still preceded by pain, but imply over and above the removal of this a certain surplus of positive good. There seem only a few points to notice, (a) When the movements that ensue through pleasure are themselves pleasurable there is ordinarily no ground for

singling out any one; such movements simply enhance the general enjoyment, which is complete in itself and so far contains no hint of anything beyond, (b) Should one of these spontaneous movements of pleasure chance to cause pain, no doubt such movement is speedily arrested. Probably the most immediate connexion possible between feeling and purposive action is that in which a painful movement leads through pain to its own suppression. But such connexion is not very fruitful of consequences, inasmuch as it only secures what we may call internal training and does little to extend the relation of the individual to its environment, (c) Out of the irregular, often conflicting movements which indirectly relieve pain some one may chance to remove the cause of it altogether. Upon this movement, the last of a tentative series, attention, released from the pain, is concentrated; and in this way the evil and the remedy become so far associated that on a recurrence of the former the many diffused movements become less, and the one purposive movement more, pronounced; the one effectual way is at length established and the others, which were but palliatives, disappear, (d) When things have advanced so far that some one definite movement is definitely represented along with the painful sensation it remedies, it is not long before a still further advance is possible and we have preventive movements. Thanks to the orderliness of things, dangers have their premonitions. After a time, therefore, the occurrence of some signal sensation revives the image of the harm that has previously followed in its wake, and a movement — either like the first, or another that has to be selected from the random tries of fear — occurs in time to avert the impending ill. (e) In like manner, provided the cravings of appetite are felt, any signs of the presence of pleasur- able objects prompt to movements for their enjoyment or appropriation. In these last cases we have action determined by percepts. The cases in which the subject is incited to action by ideas as distinct from percept require a more detailed con- sideration; such are the facts mainly covered by the term " desire."

By the time that ideas are sufficiently self-sustaining to form trains that are not wholly shaped by the circumstances of the present, entirely new possibilities of action are _ opened up. We can desire to live again through

experiences of which there is nothing actually present to remind us, and we can desire a new experience which as yet we only imagine. We often, no doubt, apply the term to the simpler states mentioned under («) in the last paragraph: the fox in the fable is said to have desired the grapes he vilified because out of his reach. Again, at the other extreme it is usual to speak of a desire for honour, or for wealth, and the like; but such are not so much single states of mind as inclina- tions or habitual desires. Moreover, abstractions of this kind belong to a more advanced stage of development than that at which desire begins, and of necessity imply more complicated grounds of action than we can at present examine. The essen- tial characteristics of desire will be more apparent if we suppose a case somewhere between these extremes. A busy man reads a novel at the close of the day, and finds himself led off by a reference to angling or tropical scenery to picture himself with his rods packed en route for Scotland, or booked by the next steamer for the fairyland of the West Indies. Presently, while the ideas of Jamaica or fishing are at least as vividly imagined as before, the fancied preparations receive a rude shock as the thought of his work recurs. Some such case we may take as typical and attempt to analyse it.

First of all it is obviously true, at least of such more concrete desires, that what awakens desire at one time fails to do so at another, and that we are often so absorbed or content with the present as not to be amenable to (new) desires at all. A given x or y cannot, then, be called desirable per se, it is only desir- able by relation to the contents of consciousness at the moment. Of what nature is this relation? (i) At the level of psychical life that we have now reached very close and complete con- nexions have been formed between ideas and the movements necessary for their realization, so that when the idea is vividly

present these movements are apt to be nascent. This associa- tion is the result of subjective selection — i.e. of feeling — but being once established, it persists like other associations indepen- dently of it. (2) Those movements are especially apt to become nascent which have not been recently executed, which are therefore fresh and accompanied by the organic sensations of freshness, but also those which are frequently executed, and so from habit readily aroused. The latter fact, which chiefly concerns habitual desires, may be left aside for a time. (3) At times, then, when there is a lack of present interests, or when these have begun to wane,

or when there is positive pain, atten- tion is ready to fasten on any new suggestion that calls for more activity, requires a change of active attitude, or promises relief. Such spontaneous concentration of attention ensures greater vividness to the new idea, whatever it be, and to its belongings. In some cases this greater vividness may suffice. This is most likely to happen when the new idea affords intellectual occupation, and this is at the time congenial, or with indolent and imaginative persons who prefer dreaming to doing. (4) But when the new idea does not lead off the pent-up stream of action by opening out fresh channels, when, instead of this, it is one that keeps them intent upon itself in an attitude comparable to expectation, then we have desire. In such a state the intensity of the re-presentation is not adequate to the intensity of the incipient actions it has aroused. This is most obvious when the latter are directed towards sensations or percepts, and the former remains only an idea. If it were possible by concentrating attention to convert ideas into percepts, there would be an end of most desires: "if wishes were horses beggars would ride." (5) But our voluntary power over movements is in general of this kind: here the fiat may become fact. When we cannot hear we can at least listen, and, though there be nothing to fill them, we can at least hold out our hands. It would seem, then, that the source of desire lies essentially in this excess of the active reaction above the intensity of the re-presentation (the one constituting the " im- pulse," the other the " object " of desire, or the desideratum), and that this disparity rests ultimately on the fact that move- ments have, and sensations have not, a subjective initiative. (6) The impulse or striving to act will, as already hinted, be stronger the greater the available energy, the fewer the present outlets, and, habits apart, the fresher the new opening for activity. (7) Finally, it is to be noted that, when such inchoate action can be at once consummated, desire ends where it begins: to constitute a definite state of desire there must be not only an obstacle to the realization of the desideratum — if this were all we should rather call the state one of wishing— but an obstacle to its realization by means of the actions its representation has aroused.

However the desire may have been called forth, its intensity is primarily identical with the strength of this impulse to action, Relation of an d has no definite or constant relation to the amount Desire to of pleasure that may result from its satisfaction. Feeling. jjjg feeling directly consequent on desire as a state of want and restraint is one of pain, and the reaction which this pain sets up may either suppress the desire or prompt to efforts to avoid or overcome the obstacles in its way. To inquire into these alternatives would lead us into the higher phases of voluntary action; but we must first consider the relation of desire to feeling more closely.

Instances are by no means wanting of very imperious desires accompanied by the clear knowledge that their gratification will be positively distasteful.

1 On the other hand it is possible to recollect or picture circumstances known or believed to be intensely pleasurable without any desire for them being awakened at all: we can regret or admire without desiring. Yet there are many psychologists who maintain that desire is excited only by the prospect of the pleasure that may arise through its gratification, and that the strength of the desire is proportional to the intensity of the pleasure thus anticipated.

1 As such an instance may be cited Plato's story of Leontius, the son of Aglaeon, in Rep. iv. 439ˆ71.

Quidquid petitur petitur sub specie boni is their main formula. The plausibility of this doctrine rests partly upon a seemingly imperfect analysis of what strictly pertains to desire and partly on the fact that it is substantially true both of what we may call " presentation-prompted " action, which belongs to an earlier stage than desire, and of the more or less rational action that comes later. In the very moment of enjoyment it may be fairly supposed that action is sustained solely by the pleasure received and is proportional to the intensity of that pleasure. But there is here no re-presentation and no seeking; the con- ditions essential to desire, therefore, do not apply. Again, in rational action, where both are present, it may be true — to quote the words of an able advocate of the view here controverted — that " our character as rational beings is to desire everything exactly according to its pleasure value." 2 But consider what such conceptions as the good, pleasure value and rational action involve. Here we have foresight and calculation, regard for self as an object of permanent interest — Butler's cool self-love; but desire as such is blind, without either the present certainty of sense or the assured prevision of reason. Pleasure in the past, no doubt, has usually brought about the association between the representation of the desired object and the movement for its realization; but neither the recollec- tion of this pleasure nor its anticipation is necessary to desire, and even when present they do not determine what urgency it will have. The best proof of this lies in certain habitual desires. Pleasures are diminished by repetition, whilst habits are strengthened by it; if the intensity of desire, therefore, were proportioned to the " pleasure value " of its gratification, the desire for renewed gratification should diminish as this pleasure grows less; but, if the present pain of restraint from actum determines the intensity of desire, this should increase as the action becomes habitual. And observation seems to show that, unless prudence suggests the forcible suppression of such belated desires or the active energies themselves fail, they do in fact become more imperious, although less productive of positive pleasure, as time goes on.

In this there is, of course, no exception to the general principle that action is consequent on feeling — a greater pleasure being preferred before a less,

a less pain before a greater; for, though the feeling that follows upon its satisfaction be less or even change entirely, still the pain of the unsatisfied desire increases as the desire hardens into habit. It is also a point in favour of the position here taken that appetites, which may be compared to inherited desires, certainly prompt to action by present pain rather than by prospective pleasure.

Intellection.

36. Desire naturally prompts to the search for the means to its satisfaction and frequently to a mental rehearsal of various possible courses of action, their advantages and disadvantages. Thus, by the time the ideational continuum has become — mainly by the comparatively passive working of association — sufficiently developed to furnish free ideas as thinking material, motives are forthcoming for thinking to begin. It is obviously impos- sible to assign any precise time for this advance; like all others, it is gradual. Fitfully, in strange circumstances and under strong excitement, the lower animals give unmistakable signs that they can understand and reason. But thought as a per- manent activity may be fairly said to originate in and even to depend upon the acquisition of speech. This indispensable instrument, which more than anything else enables our pyscho- logical individual to advance to the distinctly human or rational stage, consists of gestures and vocal utterances, which were originally — and, indeed, are still to a large extent — emotional expressions. 3 Our space will only allow us to note in what

2 Bain, Emotions and Will, 3rd ed., p. 438.

3 It must be noted that, though we still retain our psychological standpoint, the higher development of the individual is only possible through intercourse with other individuals, that is to say, through society. Without language we should be mutually exclusive an<5 impenetrable, like so many physical atoms; with it each several mind may transcend its own limits and share the minds of others. As a

way language when it already exists, is instrumental in the development as distinct from the communication of thought. But first of all, what in general is thinking, of which language is the instrument?

In entering upon this inquiry we are really passing one of the hardest and

fastest lines of the old psychology — that between sense and understanding. So lQng as it was the fashion Distinction ˆ Q assume a multiplicity of faculties the need was less between f e [t f Qr a c j ear exposition of their connexion. A man Sense and j lac j gˆggg anc j intellect much as he had eyes and ears;

standing.

the heterogeneity in the one case was no more puzzling than in the other. But for psychologists who do not cut

the knot in this fashion it is confessedly a hard matter to explain the relation of the two. The contrast of receptivity and activity hardly avails, for all presentation involves activity and essentially the same activity, that of attention. Nor can we well maintain that the presentations attended to differ in kind, albeit such a view has been held from Plato downwards. Nihil est in intellectu quod non fuerit prius in sensu: the blind and deaf are necessarily without some concepts that we possess. If pure being is pure nothing, pure thought is equally empty. Thought consists of a certain elaboration of sensory and motor presentations and has no content apart from these. We cannot even say that the forms of this elaboration are psychologically a priori; on the contrary, what is epistemologically the most fundamental is the last to be psychologically realized. This is not only true as a fact ; it is also true of necessity, in so far as the formation of more concrete concepts is an essential preliminary to the formation of others more abstract — those most abstract, like the Kantian categories, &c, being thus the last of all to be thought out or understood. And though this formative work is substantially voluntary, yet, if we enter upon it, the form at each step is determined by the so-called matter, and not by us; in this respect ” the spontaneity of thought ” is not really freer than the receptivity of sense. 1 It is sometimes said that thought is synthetic, and this is true; but imagination is synthetic also; and the processes which yield the ideational train are the only processes at work in intellectual synthesis. Moreover, it would be arbitrary to say at what point the mere generic image ceases and the true concept begins — so continuous are the two. No wonder, therefore, that English psychology has been prone to regard thought as only a special kind of perception — perceiving the agreement or disagreement of ideas — and the ideas themselves as mainly the products of associa- tion. Yet this is much like confounding observation with experi- ment or invention — the act of a cave-man in betaking himself to a drifting tree with that of Noah in building himself an ark. In reverie, and even in understanding the communications of others, we are comparatively passive spectators of ideational movements, non-voluntarily determined. But in thinking or ” intellection,” as it has been conveniently termed, there is always a search for something more or less vaguely conceived, for a clue

which will be known when it occurs by seeming to satisfy certain conditions. Thinking may be broadly described as solving a problem — finding an AX that is B. In so doing we start from a comparatively fixed central idea or intuition and work along the several diverging lines of ideas associated with it — hence far the aptest and in fact the oldest description of thought is that it is discursive. Emotional excitement — and at the outset the natural man does not think much in cold blood — quickens the flow of ideas: what seems relevant is at once contemplated more closely, while what seems irrelevant awakens little interest and receives little attention. At first the control acquired is but very imperfect; the actual course of thought of even a disciplined mind falls far short of the clearness, distinctness, and coherence of the logician's ideal. Familiar associations are apt to hurry attention away from the proper topic, so that thought

herd of individuals mankind would have a natural history as other animals have; but personality can only emerge out of intercourse with persons, and of such intercourse language is the means. But important as is this addition of a transparent and responsive world of minds to the dead opaqueness of external things, the development of our psychological individual still remains a purely individual development. The only new point is — and it is of the highest importance to keep it in sight — that the materials of this develop- ment no longer consist exclusively of presentations elaborated by a single mind in accordance with psychical laws. Nevertheless that combination of individual experiences which converts subjective idiosyncrasy and isolation into the objectivity and solidarity of Universal Mind only affects the individual in accordance with psychical laws, and we have no need therefore to overstep our proper domain in studying the advance from the non-rational phase to the phase of reason.

1 Locke, so often misrepresented, expressed this truth according to his lights in the following: " The earth will not appear painted with flowers nor the fields covered with verdure whenever we have a mind to it. . . . Just thus is it with our understanding: all that is volun- tary in our knowledge is the employing or withholding any of our faculties from this or that sort of objects and a more or less accurate survey of them " (Essay, iv. 13, 2).

becomes not only discursive but wandering; in place of concepts of fixed and crystalline completeness, such as logic describes, we may find a congeries of ideas but imperfectly compacted into one . generic idea, subject to continual transformation and implicating much that is irrelevant and confusing.

Thus, while it is possible for thought to begin without language, just as arts may begin without tools, yet language enables us to carry the same process enormously farther. In the first place it gives us an increased command of

jˆanguaˆ. even such comparatively concrete generic images as can be formed without it. The name of a thing or action becomes, for one who knows the name, as much an objective mark or attribute as any quality whatever can be. The form and colour of what we call an " orange " are perhaps even more intimately combined with the sound and utterance of this word than with the taste and fragance which we regard as strictly essential to the thing. But, whereas its essential attributes often evade us, we can always command its nominal attribute, in so far as this depends upon movements of articulation. By uttering the name (dr hearing it uttered) we have secured to us, in a greater or less degree, that superior vividness and definiteness that pertain to images reinstated by impressions: our idea approximates to the fixity and independence of a percept (cf. § 21 above). With young children and uncultured minds — who, by the way, not uncommonly " think aloud " — the gain in this respect is probably more striking than those not confined to their mother-tongue or those used to an analyti- cal handling of language at all realize. 2 When things are thus made ours by receiving names from us and we can freely manipu- late them in idea, it becomes easier mentally to bring together facts that logically belong together, and so to classify and generalize. For names set us free from the cumbersome tangi- bility and particularity of perception, which is confined to just what is presented here and now. But as ideas increase in gener- ality they diminish in definiteness and unity; they not only become less pictorial and more schematic, but they become vague and unsteady as well, because formed from a number of concrete images only related as regards one or two constituents, and not assimilated as the several images of the same thing may be. The mental picture answering to the word " horse " has, so to say, body enough to remain a steady object when under atten- tion from time to time; but that answering to the word " ani- mal " is perhaps scarcely twice alike. The relations of things could thus never be readily recalled or steadily controlled if the names of those relations, which as words always remain concrete, did not give us a definite hold upon them — mAe them compre- hensible. Once these " airy nothings " have a name, we reap again the advantages a concrete constituent affords: by its means that which is relevant becomes more closely associated, and that which is irrelevant — abstracted from — falls off. When what answers to the logical connotation or meaning of a concept is in this way linked with the name, it is no longer necessary that such " matter or content " should be distinctly present in con- sciousness. It takes time for an image to raise its associates above the threshold; and, when all are there, there is more demand upon attention in proportion. There is thus a manifest economy in what Leibnitz happily styled " symbolic," in contrast to " intuitive " thinking. Our power of efficient attention is limited, and with words for counters we can, as Leibnitz remarks, readily perform operations involving very complex presentations, and wait till these

operations are con- cluded before realizing and spreading out the net result in sterling coin.

But this simile must not mislead us. In actual thinking there never is any complete separation between the symbol and the ideas symbolized: the movements of the one are never entirely suspended till those of the ideation other are complete. " Thus," says Hume, " if, instead of saying, that in war the weaker have always recourse*

2 Ruskin, in his Fors clavigera, relates that the sight of the word " crocodile " used to frighten him when a child so much that he could not feel at ease again till he had turned over the page on which it occurred.

to negotiation, we should say, that they have always recourse to conquest, the custom which we have acquired of attributing certain relations to ideas still follows the words and makes us immediately perceive the absurdity of that proposi- tion." 1 How intimately the two are connected is shown by the surprises that give what point there is to puns, and by the small confusion that results from the existence of homonymous terms. The question thus arises — What are the properly ideational elements concerned in thought? Over this question psychologists long waged fight as either nominalists or con- ceptualists. The former maintain that what is imaged in connexion with a general concept, such as triangle, is some individual triangle " taken in a certain light," 2 while the latter maintain that an " abstract idea " is formed embodying such constituents of the several particulars as the concept connotes, but dissociated from the specific or accidental variations that distinguish one particular from another. 'As often happens in such controversies, each side saw the weak point in the other. The nominalists easily showed that there was no distinct abstract idea representable apart from particulars; and the conceptualists could as easily show that a particular presentation " considered in a certain light " is no longer merely a particular presentation nor yet a mere crowd of presentations. The very thing to ascertain is what this consideration in a certain light implies. Perhaps a speedier end might have been put to this controversy if either party had been driven to define more exactly what was to be understood by image or idea. Such ideas as are possible to us apart from abstraction are, as we have seen, revived percepts, not revived sensations, are complex total re-presenta- tions made up of partial re-presentations, which may figure in other totals (cf. § 21).

Reproductive imagination is so far but a faint rehearsal of actual percepts, and constructive imagination but a faint anticipation of possible percepts. In either case we are busied with elementary presentations compli- cated or synthesized to what are tantamount to intuitions, in so far as the forms of intuition remain in the idea, though the fact, as tested by movement, &c, is absent. The several partial re-presentations, however, which make up an idea might also be called ideas, not merely in the wide sense in which every mental object may be so called, but also in the narrower sense as secondary presentations, i.e. as distinguished from primary presentations or impressions. But such isolated images of an impression, even if possible, would no more be intuitions than the mere impression itself would be one: taken alone the one would be as free of space and time as is the other. Till it is settled, therefore, whether the ideational elements concerned in conception are intuitive complexes or something answering to the ultimate elements of these, nothing further can be done.

In the case of what are specially called " concrete " as distinct from " abstract " .concepts — if this rough-and-ready, but unscientific, distinction may be allowed — the idea answering to the concept differs little from an intuition, and we have already remarked that the generic image (Gemeinbild of German psychologists) constitutes the connecting link between imagina- tion and conception. But even concerning these it is useless to ask what does one imagine in thinking, e.g. of triangle or man or colour. We never — except for the sake of this very inquiry — – attempt to fix our minds in this manner upon some isolated concept; in actual thinking ideas are not in consciousness alone and disjointedly, but as part of a context. When the idea " man" is present, it is present in some proposition or question, as — • Man is the paragon of animals; In man there is nothing great but mind; and so on. It is quite clear that in understanding or mentally verifying such statements very different constituents out of the whole complex " man " are prominent in each. Fur- ther, what is present to consciousness when a general term is understood will differ, not only with a different context, but also the longer we dwell upon it: we may either analyse its connota-

1 Treatise of Human Nature (Green and Grose's ed.), pt. i. § vii. p. 331.

2 Cf. Berkeley, Principles of Human Knowledge, Introd. § 16, Hume, op. cit. § 7.

tion or muster its denotation, as the context or the cast of our minds may determine. Thus what is relevant is alone prominent, and the more summary the attention we bestow the less the full extent and intent of the concept are displayed. To the nom- inalist's objection, that it is impossible to imagine a man without imagining him as either tall or short, young or

old, dark or light, and so forth, the conceptualist might reply that at all events percepts may be clear without being distinct, that we can recognize a tree without recognizing what kind of tree it is, and that, moreover, the objection proves too much: for, if our image is to answer exactly to fact, we must represent not only a tall or a short man, but a man of definite stature — one not merely either light or dark, but of a certain precise complexion. But the true answer rather is that in conceiving as such we do not necessarily imagine a man or a tree at all, any more than — if such an illustration may serve — in writing the equation to the parabola we necessarily draw a parabola as well.

The individuality of a concept is thus not to be confounded with the sensible concreteness of an intuition either distinct or indis- tinct, and " the pains and skill " which Locke felt were required in order to frame what he called an abstract idea are not comparable to the pains and skill that may be necessary to discriminate or decipher what is faint or fleeting. The material " framed " consists no doubt of ideas, if by this is meant that in thinking we work ultimately with the ideational continuum, but what results is never a mere intuitive complex nor yet a mere group of such. The concept or " abstract idea " only emerges when a certain intelligible relation is established among the members of such a group; and the very same intuition may furnish the material for different concepts as often as a different geistiges Band is drawn between them. The stuff of this bond, as we have seen, is the word, and this brings into the foreground of consciousness when necessary those elements — whether they form an intuition or not — which are relevant to the concept. Conception, then, is not identical with imagination, although the two terms are still often, and were once generally, regarded as synonymous. The same ultimate materials occur in each; but in the one they start with and retain a sensible form, in the other they are elaborated into the form which is called " intelligible."

37. The distinctive character of this intellectual synthesis

lies, we have seen, in the fact that it is determined entirely

by what is synthesized, whether that be the elemen- _ .

tary constituents of intuitions or general relations character

of whatever kind among these. It differs, therefore, and Growth

in being selective from the synthesis of association, oflnteiiec-

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which rests upon contiguity and unites together

whatever occurs together. It differs also from any synthesis, though equally voluntary in its initiation, which is determined by ajmrely subjective preference, since intellection depends upon objective relations alone. Owing to the influence of logic, which has long been in a much more forward state than psychology, it has been usual to resolve intellection into comparison, abstrac- tion, and classification, after this fashion: ABCM and ABCN are compared, their differences M and N left out of sight, and the class notion ABC formed including both; the same process repeated with ABC and ABD yields a higher class notion AB; and so on. But our ideational continuum is not a mere string of ideas of concrete things, least of all such concrete things as this view implies. Not till our daily life resembles that of a museum porter receiving specimens will our higher mental activity be comparable to that of the savant who sorts such specimens into cases and compartments. What we perceive is a world of things in continual motion, waxing, waning, the centres of manifold changes, affecting us and apparently affected by each other, amenable to our action and, as it seems, con- tinually interacting among themselves. Even the individual thing, as our analysis of perception has attempted to show, is not a mere sum of properties which can be taken to pieces and distributed like type, but a whole combined of parts very variously related. To understand intellection we must look at its actual development under the impetus of practical needs,

rather than to logical ideals of what it ought to be. Like other forms of purposive activity, thinking is primarily undertaken as a means to an end, and especially the end of economy. It is often easier and always quicker to manipulate ideas than to manipulate real things; to the common mind the thoughtful man is one who " uses his head to save his heels." In all the arts of life, in the growth of language and institutions, in scientific explanation, and even in the speculations of philosophy, we may remark a steady simplification in the steps to a given end or conclusion, or — what is for our present inquiry the same thing — the attainment of better results with the same means. The earliest machines are the most cumbrous and clumsy, the earliest speculations the most fanciful and anthropomorphic. Gradually imitation yields to invention, the natural fallacy of post hoc, ergo propter hoc to methodical induction, till what is essential and effective is realized and appreciated and what is accidental and inert is discarded and falls out of sight. In this way man advances in the construction of a complete mental clue or master key to the intricacies of the real world, but this key is still

the counterpart of the world it enables us to control and explain. To describe the process .by which such insight is attained as a mere matter of abstraction deserves the stigma of " soulless blunder " which Hegel applied to it. Of course if attention is concentrated on X it must pro tanto be abstracted from Y, and such command of attention may require " some pains and skill." But to see in this invariable accompaniment of thinking its essential feature is much like the schoolboy's saying that engraving consists in cutting fine shavings out of a hard block. The great thing is to find out what are the light-bearing and fruit-bearing combinations. Moreover, thinking does not begin with a conscious abstraction of attention from recognized differences in the way logicians describe. The actual process of generalization, for the most part at all events, is much simpler. The same name is applied to different things or events because only their more salient features are perceived at all. Their differences, so far from being consciously and with effort left out of account, often cannot be observed when attention is directed to them: to the inexperienced all is gold that glitters. Thus, and as an instance of the principle of progressive differentiation already noted (§6) ,we find genera recognized before species, and the species obtained by adding on differences, not the genus by abstracting from them. Of course such vague and indefinite concepts are not at first logically general: they only become so when certain common elements are consciously noted as pertaining to presentations in other respects qualitatively different, as well as numerically distinct. But actually thinking starts from such more potential generality as is secured by the association of a generic image with a name. So far the material of thought is always general— is freed, that is, from the local and temporal and other defining marks of percepts.

38. The process of thinking itself is psychologically much better described as (1) an analysis and (2) a re-synthesis of this material already furnished by the ideational trains. The logical resolution of thought into hierarchies of concepts arranged like Porphyry's tree, into judgments uniting such concepts by means of a logical copula, &c, is the outcome of later reflection — mainly for technical purposes — upon thought as a completed product, and entirely presupposes all that psychology has to explain. The logical theory of the formation of concepts by generalization (or abstraction) and by determination (or concretion) — i.e. by the removal or addition of defining marks — assumes the previous existence of the very things to be formed, for these marks or attributes — X's and Y's, A's and B's— are themselves already concepts. Moreover, the act of generalizing or determining is really an act of judgment, so that the logician's account of conception presupposes judgment, while at the same time his account of judgment presupposes conception. But this is no evil; for logic does not essay to exhibit the actual genesis of thought but only an ideal for future

thinking. Psychologically, however — that is to say, chronologically — the judgment is

Thought as Analytic

first. The growing mind, we may suppose, passes beyond simple perception when some striking peculiarity in what is at the moment perceived is a bar to its recognition. The stalking hunter is not instantly recognized as the destroying biped, because he crawls on all fours; or the scarecrow looks like him, and yet not like him, for, though it stands on two legs, it never moves. There is thus no immediate assimilation; recognition under such circumstances is in itself a judgment, involving an analysis more or less explicit. But of more account is the further judgment to which it leads, that which connects the new fact with the generic idea. Though actually complex, generic images are not explicitly known as complexes when they first enter into judgments; as the subjects of such judgments they are but starting-points for predication — It crawls; It does not move; and the like. Such impersonal judgments, according to most philo- logists, are in fact the earliest; and we may reasonably suppose that by means of them our generic images have been partially analysed, and have attained to something of the distinctness and constancy of logical concepts. But the analysis is rarely complete: a certain confused and fluctuating residuum remains behind. The psychological concept merges at sundry points into those cognate with it— in other words, the continuity of the underlying memory-train still operates; only the ideal concept of logic is in all respects totus, teres, atque rotundus. Evidence of this, if it seem to any to require proof, is obtain- able on all sides, and, if we could recover the first vestiges of thinking, would doubtless be more abundant still.

*But, if we agree that it is through acts of judgment which suc- cessively resolve composite presentations into elements that con- cepts first arise, it is still very necessary to inquire more carefully what these elements are. On the one side we ^?**f have seen logicians comparing them to so many letters, ~™ s ~* and on the other psychologists enumerating the several Ps y cl,0l0 xy- sensible properties of gold or wax — their colour, weight, texture, &c. — as instances of such elements. In this way formal logic and sen- sationalist psychology have been but blind leaders of the blind. Language, which has enabled thought to advance to the level at which reflection about thought can begin, is now an obstacle in the way of a thorough analysis of it. A child or savage would speak only of " red " and " hot," but we of " redness " and " heat." They would probably say, " Swallows come when the days are lengthening and snipe when they are shortening " ; we say, ' ' Swal- lows are spring and snipe are winter migrants." Instead of " The sun shines and plants grow," we should say, " Sunlight is the cause of vegetation." In short, there is a tendency to resolve all concepts into substantive concepts; and the reason of this is not far to seek. Whether the subject or starting-point of our discursive thinking be actually what we perceive as a thing, or whether it be a quality, an action, an effectuation (i.e. a transitive action), a concrete spatial or temporal relation, or finally, a resemblance or difference in these or in other respects, it becomes by the very fact of being the central object of thought pro tanto a unity, and all that can be affirmed Con- cerning it may so far be regarded as its property or attribute. It is, as we have seen, the characteristic of every completed concept to be a fixed and independent whole, as it were, crystallized out of the still-fluent matrix of ideas. Moreover, the earliest objects of thought and the earliest concepts must naturally be those of the things that live and move about us ; hence, then— to seek no deeper reason for the present — this natural tendency, which language by providing distinct names powerfully seconds, to reify or personify not only things but every element and relation of things which we can single out, or, in other words, to concrete our abstracts. 1 It is when things have reached this stage that logic begins. But ordinary, so-called formal, logic, which intends to concern itself not with thinking but only with the most general structure of thought, is debarred from recognizing any difference between concepts that does not affect their relations as terms in a pro- position. As a consequence it drifts inevitably into that compart- mental logic or logic of extension which knows nothing of categories or predicables, but only of the one relation of whole and part qualitatively considered. It thus pushes this reduction to a com- mon denomination to the utmost: its terms, grammatically re- garded, are always names and symbolize classes or compartments of things. From this point of view all disparity among concepts, save that of contradictory exclusion, and all*

connexion, save that of partial coincidence, are at an end.

Of a piece with this are the logical formula for a simple judgment, X is Y, and the corresponding definitions of judgment as the com- parison of two concepts and the recognition of their agreement or

1 See Wundt, Logik, i. 107 seq., where this process is happily styled " die kategoriale Verschiebung der Begriffe."

disagreement. 1 It certainly is possible to represent every judg- ment as a comparison, although the term is strictly adequate only to judgments of one kind and affords but a very artificial descrip- tion of others. But for a logic mainly concerned with inference — i.e. with explicating what is implicated in any given statements concerning classes — there is nothing more to be done than to ascertain agreements or disagreements ; and the existence of these, if not necessarily, is at least most evidently represented by spatial relations. Such representation obviously implies a single ground of comparison only and therefore leaves no room for differences of category. The resolution of all concepts into class concepts and that of all judgments into comparisons thus go together. On this view if a concept is complex it can only be so as a class combination ; and, if the mode of its synthesis could be taken account of at all, this could only be by treating it too as an element in the combination like the rest: iron is a substance, &c, virtue a quality, &c, distance a relation, &c, and so on. There is much of directly psychological interest in this thoroughgoing reduction of thought to a form which makes its consistency and logical concatenation conspicuously evident. But of the so-called matter of thought it tells us nothing. And, as said, there are many forms in that- matter of at least equal moment, both for psychology and for epistemology : these formal logic has tended to keep out of sight.

It has generally been under the bias of such a formal or com-

fmtational logic that psychologists, and especially English psycho- ogists, have entered upon the study of mind. They have brought with them an analytic scheme which affords a ready place for sensa- tions or " simple ideas " as the elements of thought, but none for any differences in the combinations of these elements. Sensations being in their very nature concrete, all generality becomes an affair of names; and, as Sigwart has acutely remarked, sensationalism and nominalism always go together.

History would have borne him out if he had added that a purely formal logic tends in like manner to be nominalistic.

If we are still to speak of the elements of thought, we must extend this term so as to include not only the sensory elements we are said to receive but three distinct ways in Synthesis. wn i cn tms P ure matter is combined: (i) the forms of intuition— Time and Space 2 ; (2) the real categories — Substance, Attribute, State, Act, Effect, End or Purpose, &c. — the exact determination of which is not here in place; and (3) certain formal (logical and mathematical) categories — as Unity, Difference, Identity, Likeness. These cannot be obtained by such a process of abstraction and generalization as logicians and psychologists alike have been wont to describe. They are not primarily concepts more general than all others in the sense in which animal is more general than man, but rather distinct methods of relating or synthesizing presentations. Kant, though he accepted almost unquestioned the logic and psychology current in his day, has yet been the occasion, in spite of himself, of materially advancing both, and chiefly by the distinction he was led to make between formal and trans-cendental logic. In his exposition of the latter he brings to light the difference between the " functions of the understand- ing " in synthesizing — or, as we might say, organizing — percepts into concepts and the merely analytic subsumption of abc and abd under ah — a, b, c and d being what they may. Unlike other concepts, categories as such do not in the first instance signify objects of thought, however general, but these functions of the understanding in constituting objects. In fine, they all imply some special process, and the general characteristic of the resulting products is what we have first of all to note

Objects of Higher Order: their Analysis and Genesis. 39. By transposing a tune from one key to another we may obtain two entirely diverse aggregates of notes, and yet the melody may remain unchanged. On the other hand, by varying the order of the notes two distinct tunes taay result from the same collection of tones. Sense furnishes merely the parts: whence, then, this identity of the whole in spite of their diversity, this diversity of the whole in spite of their identity? From the sameness or difference of the several "intervals," it is replied. But the answer is insufficient; for the tune is a unity, not a mere series, and, further, with every interval the same problem recurs. 1 Cf. Hamilton: "To judge {kplvuv, judicare) is to recognize the relation of congruence or of confliction in which two concepts, two individual things, or a concept and an individual, compared together, stand to each other " (Lectures on Logic, i. 225).

- *As to these it must suffice to refer to what has Deen alreadv said ; cf. § 1 1 and § 28.*

For the interval, too, is a whole, though a simpler one: it does not necessarily change with a change of its constituents, nor remain the same as long as their distance is unaltered. Feelings and " associations," again, cannot account for the result, inasmuch as such accompaniments are not invariably present: moreover, they obviously presuppose the melody instead of producing it. Of such complex wholes or combinations — as distinct from mere aggregates or collections — there are many forms; as, for example, geometrical figures and patterns, motions and other changes, numbers, logical connexions, &c. In view of this variety it seems to strike the unprejudiced as wild to expect that " the progress of psychophysics " may disclose an explanation of such combina- tions conforming to the old scholastic maxim, Nihil est in intel- lectu quod nonfuerit prius in sensu. Yet hopes of such a generatio aequivoca are entertained! 8 Meanwhile the " old psychology," at any rate, is content to regard such complex wholes as new presentations, the products, that is to say, not of a quasi- mechanical interaction of their constituents, but of intellectual synthesis.

What is here said of the combinations whereby the items of an aggregate are construed as parts of a whole holds equally of the comparisons whereby such items are related, as like or unlike, compatible or incompatible. Before either combination or comparison is possible, such items or particulars must be "given." But it is conceivable that they should be given and no intellectual synthesis ensue; such a consciousness has been happily named anoetic. 1 Whether or no it actually exists is another matter: it is a conceivable limit, and has the theoretical usefulness of limiting conceptions generally. But relative anoesis suffices here. Suppose, then, we have: (a) item, a sound; item, ditto; item, ditto; or (b) item, blue; item, green. The sensationalist, from Hume onwards, has complained that he does not find in the one case a further item: total three; nor in the other a further item: unlikeness. After vainly seeking the living whole among the dead particulars, he next surmises that they generate it by their conjoint action! But whence this notion of "action"; and how, if such disjecta membra suffice, do they so often fail of their effect, so that we cannot " see the wood for the trees "? Combinations and comparisons then, we conclude, are not given, but " grounded " on what is given, and is thus their fundamentum. Hence Meinong, who has studied the psychology of intellection with especial care, has called the new presentations, due to this process of " grounding " (Fundiren), " objects of a higher order," or ideal objects. 5 They have validity in respect of the particulars on which they are grounded, but not reality as data existing for perception alongside of such particulars.

The reader will here be reminded of Hume's distinction between knowledge and probability. His four philosophical relations, " which, depending solely upon ideas, can be the objects of know- ledge and certainty —

resemblance, continuity, degrees in quality and proportions in quantity or number " — are objects of higher order and ideal. " The other three, which depend not upon the idea, and may be absent or present even while that remains the same " — namely, identity, the situations in time and place, and causation — are thus obviously not the result of grounding or noesis merely, are not ideal but empirical, and have, that is to say, existential import. In fact, the second of these, the situations, though they imply synthesis in the wider sense in which all complex perception does, do not involve intellectual synthesis at all: are neither ideal combinations nor ideal relations. And since such temporal and spatial situations enter into both the other two — numerical identity and causation — the mixed, a posteriori character of these is obvious. Whatever be the defects of Hume's psychology, his classification of relations is so far sound, and its epistemological importance can hardly be overrated. It is accordingly to be regretted that the one vague term " relation " does not allow us to make these distinctions more precise. The German language, with the two terms Verhaltniss and Beziehung, can do more.

3 Cf. e.g. F. Schumann, " Zur Psychologie der Zeitanschauung," Ztschr. f. Psychologie, xvii. 130, 136.

- *G. F. Stout, Analytic Psychology, k 50 seq.*

*6 A. Meinong, " Ueher G< *genstande h6herer Ordnung u.s.w.," Ztschr. f. Psychologie (1899), xxi. 182 sqq. Special mention must be made of an earlier paper by C. v. Ehrenfels (" Ueber Gestaltquali- tateV Vlerteljahrsschr.f. ivissensch. Philosophie, 1890, pp. 249 sqq.), round which the whole subsequent discussion of this topic centres, f Cf., too, Stout, op. cit. bk. i. ch. iii.*

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It will be convenient at this point to digress somewhat for a moment to consider a question of some psychological interest. When we say that two " contents " are similar, and when too they admit of analysis, we can, if need be, enumerate certain elements as the ground of their partial likeness, and certain others as the ground of their partial diversity. We may further say that, ab- stracting from these last, we can regard the points of resemblance as constituting a general class to which the two contents belong as specific instances. But how is either comparison or abstraction possible when the two resembling contents appear as simple, and so far

unanalysable? Instances, of course, are familiar to every one : thus we call red and orange colours, and say they resemble each other more than do red and blue. In presence of this question logicians and psychologists are apt to be at loggerheads. The logician maintains that abstraction and resemblance (as distinct from qualitative identity) imply complexity; and surely here he cannot be gainsaid. Yet there are the facts: reds and blues of sorts and a whole scale of degrees of likeness and unlikeness; but no constituent parts, no assignable marks of identity or diversity, are forthcoming, such as we find when we class sugar and salt together as solid or soluble, and pronounce them like in colour and unlike in taste. Here the logician's symbols a + b + c, a--b--d, have their counterparts: there — for the percipient's consciousness at all events — they have not. We cannot " consider and attend to either the sameness or the differences in " red and blue, as we can to the like or the unlike properties in salt and sugar. None the less it would be hasty to conclude that colours or any given sensations are simple. We are often struck by the likeness of complex wholes — two faces, say — long before we can discern the exact points of resemblance. Still, so long as there is no perceptible complexity in the individual presentations there can be no analysis of them, and, therefore, neither abstraction nor comparison based upon it. Can we find elsewhere the complexity that generalization and comparison invariably imply? Though colour may be regarded as a general term applicable alike to red, green and blue, just as animal is a general term applicable alike to bird, beast and fish, it is a mistake to infer that the processes are the same because of this similarity in their products. We seem bound to distinguish between consciously logical or " noetic " processes and processes that are unconsciously logical or " hyponoetic," as we may perhaps call them. In the former the subjective aspect is left aside; in the latter it cannot be. The only common mark we can psychologi- cally assign to colours is that they are all seen, and to tones — as the element of notes and noises — that they are all heard. So often as we talk of tasting tastes, smelling smells, feeling touches, language leads us to bear witness to this fact. When the sunset red changes to the twilight grey, I still see; but when the thunder follows the lightning there is a double change, though not an absolute one : from seeing I pass to hearing, but I am sentient still. And if progressive differentiation be the order of experience then the " universal " sentience precedes the differentiations seeing, hearing, &c, and, again, the " universal " colour the differentiations, red, green, blue, &c. Such " first universals," then, are not reached by abstrac- tion, but are given in the fundamental continuity of experience, and their subsequent differentiation admits neither of definition nor the classification applicable to discrete complexes, which are the material of logical comparison only. When red is pronounced liker or nearer to yellow than it is to green, this is because a smaller change is experienced in the transition from red to yellow than in that from red to

green, and because in the latter yellow is reached and passed before green appears. 1 Proximity and resemblance are, then, so far one and the same; also both are equally relative, admit of the same indefinite gradation, and have the same limit in zero, regarded either as coincidence or identity. The conception of " distance between " answers, then, to what we have called a hyponoetic relation, and this is plainly distinct from the analysis of discrete complexes, with which, as said, noetic comparison is alone concerned : the one implies and the other excludes the notion of continuity and change — a fact which helps still further to distinguish the two.

Categories.

40. We come now to deal with the categories in more detail. To begin with what are par excellence formal categories, Formal an< i among these with that which is the most funda- Categorles: mental and formal of all — How do we come by the Unity. conception of unity? " Amongst all the ideas we have," says Locke, " as there is none suggested to the mind by more ways, so there is none more simple than that of unity, or one. It has no shadow of variety or composition in it ; every object our senses are employed about, every idea in our under- standings, every thought of our minds, brings this idea along with it." 2 But to assign a sensible origin to unity is certainly

1 Assuming, of course, that the change is the simplest or directest possible, i.e. a change of " colour proper " without change of saturation.

2 Essay concerning Human Understanding, II. xvi. § 1.

a mistake — one of a class of mistakes already more than one? referred to, which consist in transferring to the data, of sense all that is implied in the language necessarily used in speaking of them. The term " a sensation " no doubt carries along with it the idea of unity, but the bare sensation as received brings along with it nothing but itself. And, if we consider sensory consciousness merely, we do not receive a sensation, and then another sensation, and so on seriatim; but we have always a continuous diversity of sensations even when these are qualitatively sharply differentiated. Moreover, if unity were an impression of sense and passively received, it would, in common with other impressions, be unamenable to change. We cannot see red as blue, but we can resolve many (parts) into one (whole), and vice versa. 3 Unity, then, is the result of an act the occasions for which, no doubt, are at first non- voluntarily determined; but the act is still as distinct from them as is attention from the objects attended to. It is to that movement of attention already described in dealing with ideation (§ 24) that we must look as the source of this category. This same movement, in like manner, yields us temporal signs; and the complex unity formed by a combination of these is what we call number. When there is little or no

difference between the field and the focus of attention, unifying is an impossibility, whatever the impressions received may be. On the other hand, as voluntary acts of concentration become more frequent and distinct the variegated continuum of sense is shaped into intui- tions of definite things and events. Also, as soon as words facilitate the control of ideas, it becomes possible to single out special aspects and relations of things as the subjects or starting- points of our discursive thinking. Thus the forms of unity are manifold: every act of intuition or thought, whatever else it is, is an act of unifying.

It is obvious that the whole field of consciousness at any moment can never be actually embraced as one. What is unified becomes thereby the focus of consciousness and so leaves an outlying field; so far unity may be held to imply plurality. But it cannot with propriety be said that in a simple act of atten- tion the field of consciousness is analysed into two distinct parts, i.e. two unities — this (now attended to) and the other or the rest (abstracted from). For the not-this is but the rest of a con- tinuum and not itself a whole; it is left out but not determined, as the bounding space is left out when a figure is drawn. To know two unities we must connect both together; and herein comes to light the difference between the unity which is the form of the concept or subject of discourse and the Unity of a judgment. The latter is of necessity complex; the former may or may not be. But in any case the complexity of the two is different. If the subject of thought is not only clear but distinct — i.e. not merely defined as a whole but having its constituents like- wise more or less defined — such distinctness is due to previous judgments. At any future time these may of course be repeated; such are the analytical or explicative judgments of logic. As the mere subject of discourse it is, however, a single unity simul- taneously apprehended; the relation ascertained between it and its predicate constitutes the unity of judgment, a unity which is comprehended only when its parts are successively apprehended.

But, though a judgment is always a complex unity, the extent of this complexity seems at first sight to vary as the form of synthesis varies. Formal logic, as we have seen, Lawot by throwing the form of synthesis into the predicate Dichotomy has no difficulty in reducing every judgment to an or Duallt y- S is P. But, if we at all regard the matter thought, it is certain, for example, that " It is an explosion " is less complex than " The enemy explodes the mine." The first answers one question; the second answers three. But as regards the more complex judgment both the process of ascertaining the fact and the language in which it is expressed show that the three elements concerned in it are not synthesized at once.

3 " We may regard one of the words here printed as one, in that by a definite act we unite a plurality of letters in our image and separate it from

its neighbours : we may also regard the one word as many when we attend to the transition from one letter to another and mark each step ” (Sigwart, Logic, ii. § 66).

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PSYCHOLOGY

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Suppose we start from the explosion — and changes or move- ments are not only apt to attract attention first, but, when recog- nized as events and not as abstracts personified, they call for some supplementing beyond themselves — then in this case we may search for the agent at work or for the object affected, but not for both at once. Moreover, if we find either, a complete judgment at once ensues: ” The enemy explodes,” or ” The mine is exploded.” The original judgment is really due to a synthesis of these two. But, when the results of former judgments are in this manner taken up into a new judgment, a certain ” condensation of thought ” ensues. Of this condensation the grammatical structure of language is evidence, though logical manipulation — with great pains — obliterates it. Thus our more complex judgment would take the form — ” The enemy is now mine-exploding ” or ” The mine is enemy-exploded,” according as one or other of the simpler judgments was made first. An examination of other cases would in like manner tend to show that intellectual synthesis is always — in itself and apart from implications — a binary synthesis. Wundt, to whom belongs the merit of first explicitly stating this ” law of dichotomy or duality ” ‘ as the cardinal principle of discursive thinking, contrasts it with synthesis by mere association. This, as running on continuously, he represents thus — A — B — C — D — . . . ; the synthesis of thought, on the other hand, he symbolizes by forms such as the following: —

AB; AB CD; AB

‘DE

&c.

Thus, Socrates is a philosopher; the philosopher Socrates dis- covered a method; the philosopher Socrates discovered the dialectical method; &c. The point is that the one thing attended to in an intellective act is the synthesis of two ideas, and of two ideas only, because, as only one movement of attention is possible at a time, only two ideas at a time can be synthesized. In that merely associative synthesis by which the memory-continuum is produced attention moves from A to B and thence to C without any relation between A and B being attended to at all, although

they must have relations, that of sequence e.g. at least.

" Difference," says Hume, " I consider rather as a negation of relation than anything real or positive. Difference is of two Difference kinds, as opposed either to identity or resemblance. and The first is called a difference of number, the other

Likeness. ■ oi £; MC f » The trut h seems ra ther to be that differ- ence in Hume's sense of numerical difference 2 is so far an element in all relations as all imply distinct correlatives. To this extent even identity — or at least the recognition of it — rests on differ- ence, that form of difference, viz. which is essential to plurality. But absolute difference (i.e. diversity) of kind may be considered tantamount not, indeed, to the negation, but at least to the absence of all formal relation. That this absolute difference — or disparateness, as we may call it — affords no ground for rela- tions becomes evident when we consider (i) that, if we had only a plurality of absolutely different presentations, we should have no consciousness at all (cf. § n); and (2) that we never compare — although we distinguish — presentations which seem absolutely or totally disparate, as e.g. a thunderclap and the taste of sugar, or the notion of free trade and that of the Greek accusative. All actual comparison of what is qualitatively different rests upon at least partial likeness. This being under- stood, it is noteworthy that the recognition of unlikeness is, if anything, more " real or positive " than that of likeness, and is certainly the simpler of the two. In the comparison of sensible impressions — as of two colours, two sounds, the lengths or the directions of two lines, &c. — we find it easier in some cases to have the two impressions that are compared presented together, in others to have first one presented and then the other. But, either way, the essential matter is to secure the most effective presentation of their difference, which in every case is something 1 Wundt, Logik; eine Untersuchung der Principien der Erkenntniss (2nd ed., 1893), •• 59 sc tQ-

1 Hume's numerical difference, that is to say, is really distinctness, not quantitative difference.

*positive and, like any other impression, may vary in amount from bare perceptibility to the extremest distance that the continuum to which it belongs will admit. Where no difference or distance at all is perceptible there we say there is likeness or equality. Is the only outcome, then, that when we pass from ab to ac there is a change in consciousness, and that when ab persists there is none? To say this is to take no account of the operations (we may symbolize them as ac—*ab:c, ab — >ab:o) by which the difference or the equality results. The change of presentation © and absence of change (o) are not here what they are as merely passive occurrences, so to put it. This is evident from the fact that in the former*

there is positive presentation and in the latter no presentation at all. The relation of unlikeness, then, is distinguished from the mere " position " or fact of change by (1) the voluntary concentration of attention upon ab and ac with a view to the detection of this change as their difference, and by (2) the act, relating them through it, in that they are judged unlike to that extent. The type of comparison is such superposition of geometrical lines or figures (as, e.g. in Euclid I. iv.) : if they coincide we have concrete equality; if they do not their difference is a line or figure. All sensible comparisons conform essentially to this type. In comparing two shades we place them side by side, and passing from one to the other seek to determine not the absolute shade of the second but its shade relative to the first — in other words, we look out for contrast. We do not say of one " It is dark," for in the scale 01 shades it may be light, but " It is darker "; or vice versa. Where there is no distance or contrast we simply have not two impressions, and, as said — if we consider the difference by itself — no impression at all. Two coincident triangles must be perceived as one. The distinction between the one triangle thus formed by two coinciding and the single triangle rests upon something extraneous to this bare presentation of a triangle that is one and the same in both cases. The marks of this numerical distinctness may be various: they may be different temporal signs, as in reduplications of the memory-continuum; or they may be constituents peculiar to each, from which attention is for the moment abstracted, any one of which suffices to give the common or identical constituent a new setting. In general, it may be said (1) that the numerical distinctness of the related terms is secured in the absence of all qualitative difference solely by the intellectual act which has so unified each as to retain what may serve as an individual mark; and (2) that they become related as " like " either in virtue of the active adjustment to a change of impression which their partial assimilation defeats, or in virtue of an anticipated continuance of the impression which this assimilation confirms.

It is in keeping with this analysis that we say in common speech that two things in any respect similar are so far the same. This ambiguity in the word " same," whereby it means either individual identity or indistinguishable resemblance has been often noticed, and from a logical or objective point of view justly complained of as " engendering fallacies in otherwise enlightened understandings." But appar- ently no one has inquired into its psychological basis, although more than one writer has admitted that the ambiguity is one "in itself not always to be avoided." 3 It is not enough to trace the confusion to the existence of common names and to cite the forgotten controversies of scholastic realism. We are not now concerned with the conformity of thought to things or with logical analysis, but with the analysis of a psycho- logical process. The tendency to treat presentations as if they were copies of things — the objective bias, as we

may call it- is the one grand obstacle to psychological observation. Some only realize with an effort that the idea of extension is not extended; no wonder, then, if it should seem " unnatural " to maintain that the idea of two like things does not consist of two like ideas. But, assuming that both meanings of identity have a psychological justification, it will be. well to distinguish

8 Cf. J. S. Mill, Logic, bk. i. ch. iii. § n, and Examination of Hamilton, 3rd ed., ch. xiv. p. 306, note; also Meinong, " Hume- Studien " II., Wiener Sitzungsberichte (Phil. Hist. CI.), ci. 709.

them and to examine their connexion. Perhaps we might term the one " material identity " and the other " individual identity " — following the analogy of expressions such as " different things but all made of the same stuff," " the same person but entirely changed." Thus there is unity and plurality concerned in both, and herein identity or sameness differs from singularity or mere oneness, which so far entails no rela- tion. But the unity and the plurality are different in each, and each is in some sort the converse of the other. In the one, two different individuals partially coincide; in the other, one individual is partially different; the unity in the one case is an individual presentation, in the other is the presentation of an individual.

In material identity the unity is that of a single presentation, whether simple or complex, which enters as a common con- stituent into two or more others. It may be possible, Identity. °f course, to individualize it, but as it emerges in a comparison it is a single presentation and nothing more. On account of this absence of individual marks this single presentation is what logicians call " abstract "; but this is not psychologically essential. It may be a generic image which has resulted from the neutralization of individual marks, but it may equally well be a simple presentation, like red, to which such marks never belonged. We come here from a new side upon a truth which has been already expounded at length, viz. that presentations are not given to us as individuals but as changes in a continuum. Time and space — the instruments, as it were, of individualization, which are presupposed in the objective sciences — are psychologically later than this mere differentiation.

*The many vexed questions that arise concerning individual identity are metaphysical rather than psychological. But it will serve to bring out the difference between the identity. * w0 f° rm s of identity to note that an identification cannot be established solely by qualitative compari- son; an alibi or a breach of temporal continuity will turn the flank of the strongest argument from resemblance. Moreover, resemblance itself may be fatal to identification when the law of being is change.*

41. As regards the real categories, it may be said generally that these owe their origin in large measure to the anthropo- morphic or mythical tendency of human thought — Categories. T ° ofxoiov t<$ 6/wtoj yivkoniodoj.. Into the forma- tion of these conceptions two very distinct factors enter — (1) the facts of what in the stricter sense we call " self- consciousness," and (2) certain spatial and temporal relations among our presentations themselves. On the one hand, it has to be noted that these spatial and temporal relations are but the occasion or motive — and ultimately perhaps, we may say, the warrant — for the analogical attribution to things of selfness, efficiency and design, but are not directly the source of the forms of thought that thus arise. On the other hand, it is to be noted also that such forms, although they have an independent source, would never apart from suitable material come into actual existence. If the followers of Hume err in their exclusive reliance upon " associations naturally and even necessarily generated by the order of our sensations " (J. S. Mill), the disciple of Kant errs also who relies exclusively on " the synthetic unity of apperception." The truth is that we are on the verge of error in thus sharply distinguishing the two at all; if we do so moment- arily for the purpose of exposition it behoves us here again to remember that mind grows and is not made. The use of terms like " innate," " a priori," " necessary," " formal," &c, without further qualification leads only too easily to the mistaken notion that all the mental facts so named are alike underived and original, independent not only of experience but of each other; whereas but for the forms of intuition the forms of thought would be impossible — that is to say, we should never have a self conscious ness at all if we had not previously learnt to distinguish occupied and unoccupied space, past and present in time, and the like. But, again, it is equally true that, if we could not feel and move as well as receive impressions, and if experience did not repeat

itself, we should never attain even to this level of spatial and temporal intuition. Kant shows a very lame and halting recognition of this dependence of the higher forms on the lower both in his schematism of the categories, and again in correcting in his Analytic the opposition of sense and understanding as respectively receptive and active with which he set out in his Aesthetic. Still, although what are called the subjective and objective factors of real knowledge advance together, the former is in a sense always a step ahead. We find again without us the permanence,

individuality, efficiency, and adaptation we have found first of all within (cf. § 20, b and d). But such primitive imputation of personality, though it facilitates a first understanding, soon proves itself faulty and begets the contra- dictions which have been one chief motive to philosophy. We smile at the savage who thinks a magnet must need food or the child who is puzzled that the horses in a picture remain for ever still; but few consider that underlying all common-sense thinking there lurks the same natural precipitancy. We attribute to extended things a unity which we know only as the unity of an unextended subject; we attribute to changes among these extended things what we know only when we act and suffer ourselves; and we attribute further to them in their changes a striving for ends which we know only because we feel. In asking what they are, how they act, and why they are thus ahd thus, we assimilate them to ourselves, in spite of the differences which lead us by-and-by to see a gulf between mind and matter. Such instinctive analogies have, like other analogies, to be confirmed, refuted, or modified by further knowledge, i.e. by the very insight into things which these analogies have themselves made possible. That in their first form they were mythical, and that they could never have been at all unless originated in this way, are considerations that make no difference to their validity — assuming, that is, that they admit, now or hereafter, of a logical transformation which renders them objectively valid. This legitimation is, of course, the business of philosophy; we are concerned only with the psychological analysis and origin of the conceptions themselves.

42. As it must here suffice to examine one of these categories; let us take that which is the most important and central of the three, viz. causality or the relation of cause and effect, c as that will necessarily throw some light upon the con- aus y ‘ stitution of the others. To begin, we must distinguish three things, which, though very different, are very liable to be confused. (1) Perceiving in a definite case, e.g. that on the sun shining a stone becomes warm, we may say the sun makes the stone warm. This is a concrete instance of predicating the causal relation. In this there is, explicitly at all events, no statement of a general law or axiom, such as we have when we say (2) ” Every event must have a cause ” — a statement commonly known as the principle of causality. This again is distinct from what is on all hands allowed to be an empirical generalization, viz. (3) that such and such particular causes have invariably such and such particular effects. With these last psychology is not directly concerned at all: it has only to analyse and trace to its origin the bare conception of causation as expressed in (1) and involved in both these generalizations. Whether only some events have causes, as the notion of chance implies, whether all causes are uniform in their action or some capricious and arbitrary, as the unreflecting suppose — all this is beside the question for us.

One point in the analysis of the causal relation Hume may be said to have settled once for all : it does not rest upon or contain any immediate intuition of a causal nexus. The two relations that Hume allowed to be perceived (or " presumed to exist "), viz. con- tiguity in space of the objects causally related and priority in time of the cause before the effect, are the only relations directly dis- cernible. We say indeed " The sun warms the stone " as readily as we say " The sun rises and sets," as if both were matters of direct observation then and there. But that this is not so is evident from the fact that only in some cases when one change follows upon another do we regard it as following from the other: casual coin- cidence is at least as common as causal connexion. Whence the difference, then, if not from perception? Hume's answer, 1 repeated in the main by English psychologists since, is, as all the world knows, that the difference is the result of association, that when a change o in an object A has been frequently observed to precede a change in another object B, this repetition determines the mind to a transition from the one to the other. It is this

1 Treatise of Human Nature, pt. iii. § xiv., " of the idea of necessary connexion."

determination, which could not be present at first, that constitutes "the third relation betwixt these objects." This " internal im- pression " generated by association is then projected; "for 'tis a common observation that the mind has a great propensity to spread itself on external objects."

The subjective origin and the after-projection we must admit, but all else in Hume's famous doctrine seems glaringly at variance with facts. In one respect it proves too much, for not all constant sequences are regarded as causal, as according to his analysis they ought to be; again, in another respect it proves too little, for causal connexion is continually predicated on a first occurrence. The natural man has always distinguished between causes and signs or portents; but there is nothing to show that he produced an effect many times before regarding himself as the cause of it. J. S. Mill has indeed obviated the first objection epistemologically by adding to constant conjunction the further characteristic of " uncon- ditionally." But this is a conception that cannot be psychologi- cally explained from Hume's premisses, unless perhaps by resolving it into the qualification that the invariability must be complete and not partial, whereupon the second objection applies. " Uncondi- tional " is a word for which we can find no

meaning as long as we confine our attention to temporal succession. It will not do to say both that an invariable succession generates the idea, and that such invariable succession must be not only invariable but also uncondi- tional in order to generate it. We may here turn the master against the disciple: "the same principle," says Hume, "cannot be both the cause and the effect of another, and this is perhaps the only proposition concerning that relation which is either intuitively or demonstratively certain " (op. cit. p. 391). Unconditionality is then part of the causal relation and yet not the product of invariable repetition.

Perhaps the source of this element in the relation will become clear if we examine more closely the so-called " internal impression " of the mind, which according to Hume constitutes the whole of our idea of power or efficacy. To illustrate the nature of this impression Hume cites the instant passage of the imagination to a particular idea on hearing the word commonly annexed to it, when " 'twill scarce be possible for the mind by its utmost efforts to prevent that transition " (op. cit. p. 393). It is this determination, then, which is felt internally, not perceived externally, that we mis- takenly transfer to objects and regard as an intelligible connexion between them. But, if Hume admits this, must he not admit more? Can it be pretended that it is through the workings of association among our ideas that we first feel a determination which our utmost efforts can scarce resist, or that we feel such determination under no other circumstances? If it be allowed that the natural man is irresistibly determined to imagine an apple when he hears its name or .to expect thunder when he sees lightning, must it not also be allowed that he is irresistibly determined much earlier and in a much more impressive way when overmastered by the elements or by his enemies? But, further, such instances bring to light what Hume's " determination " also implies, viz. its necessary correla- tive, effort or action. Even irresistible association can only be known as such by efforts to resist it. Hume allows this when he says that his principles of association "are not infallible causes; for one may fix his attention during some time on any one object without looking farther " (op. cit. p. 393). But the fact is, we know both what it is to act and what it is to suffer, to go where we would and to be carried where we would not, quite apart from the work- ings of association. And, had Hume not confused the two different inquiries, that concerning the origin of the idea of causation and that concerning the ground of causal inference or law of causation, it could never have occurred to him to offer such an analysis of the former as he does.

Keeping to the»former and simpler question, it would seem that when in ordinary thinking we say A causes this or that in B we project or analogically attribute to A what ive experience in acting, and to B what we experience in being acted on ; and the structure of language shows that

such projection was made long before it was suspected that what A once did and B once suffered will be done and suffered in the same circumstances again. The occasions suitable for this projection are determined by the temporal and spatial relations of the objects concerned, which relations are matter of intuition. These are of no very special interest from a psychological point of view, but the subjective elements we shall do well to consider further. First of all, we must note the distinction of immanent action and transuent action; the former is what we call action simply, and implies only a single thing, the agent ; the latter, which we might with advantage call effectuation, implies two things, a patient as well as an agent. In scientific language the agent in an intransitive act is called a causa immanens and so distinguished from the agent in effectuation or causa transiens. Common thought, however, does not regard mere action as caused at all ; and we shall find it, in fact, impossible to resolve action into effectuation. But, since the things with which we ordinarily deal are complex, have many parts, properties, members, phases, and in consequence of the analytic procedure of thought, there ensues, indeed, a con- tinual shifting of the point of view from which we regard any given thing, so that what is in one aspect one' thing is in another many

(cf. § 20). So it comes about that, when regarding himself as one, the natural man speaks of himself as walking, shouting, &c. ; but, when distinguishing between himself and his members, he speaks of raising his voice, moving his legs, and so forth. Thus no sooner do we resolve any given action into an effectuation, by analytically dis- tinguishing within the original agent an agent and a patient, than a new action appears. Action is thus a simpler notion than causa- tion and inexplicable by means of it. It is certainly no easy problem in philosophy to determine where the resolution of the complex is to cease, at what point we must stop, because in the presence of an individual thing and a simple activity. At any rate, we reach such a point psychologically in the conscious subject, and that energy in consciousness we call attention. If this be allowed, Hume's critique of the notion of efficacy is really wide of the mark. " Some," l he says, " have asserted that we feel an energy or power in our own mind; and that, having in this manner acquir'd the idea of power, we transfer that quality to matter, where we are not able immediately to discover it. . . . But to convince us how fallacious this reasoning is, we need only consider that the will, being here consider'd as a cause, has no more a discoverable con- nexion with its effects than any material cause has with its proper effect. . . .The effect is there [too] distinguishable and separable from the cause, and could not be foreseen without the experience of their constant conjunction " (op. cit. p. 455). This is logical analysis, not psychological; the point is that the will is not considered as a cause and distinguished from its effects, nor in fact considered at all. It is not a case of sequence between two separable

impressions; for we cannot really make the indefinite regress that such logical distinctions as that between the conscious subject and its acts implies. Moreover, our activity as such is not directly presented at all: we are, being active; and further than this psychological analysis will not go. 2 There are, as we have seen, two ways in which this activity is manifested, the receptive or passive and the motor or active in the stricter sense — (cf. § 8) and our experience of these we project in predicating the causal relation. But two halves do not make a whole ; so we have no complete experience of effectua- tion, for the simple reason that we cannot be two things at once. We are guided in piecing it together by the temporal and spatial relations of the things concerned. Hence, perhaps, some of the antinomies that beset this concept. In its earliest form, then, the so-called necessary connexion of cause and effect is perhaps nothing more than that of physical constraint. To this, no doubt, is added the strength of expectation — as Hume supposed — when the same effect has been found invariably to follow the same cause. Finally, when upon the basis of such associated uniformities of sequence a definite intellectual elaboration of such material ensues, the logical necessity of reason and consequent finds a place, and so far as deduction is applicable cause and reason become interchange- able ideas.

Belief.

43. The mention of logical necessity brings us to a new topic, viz. the " objectivity " of thought and cognition generally. The psychological treatment of this topic is tantamount to an inquiry into the characteristics of the states of mind we call certainty, doubt, belief — all of which centre round the one fact of evidence. Between the certainty that a proposition is true and the certainty that it is not there may intervene many grades of uncertainty. We may know that A is sometimes B, or sometimes not; or that some at least of the conditions of B are present or absent; or the presentation of A may be too confused for distinct analysis. This is the region of probability, possibility, more or less obscurity. Leaving this aside, it will be enough to notice those cases in which certainty may be complete. With that certainty which is absolutely objective, i.e. with knowledge, psychology has no direct concern; it is for logic to furnish the criteria by which knowledge is ascertained.

Emotion and desire are frequent indirect causes of subjective certainty, in so far as they determine the constituents and the

1 Hume here has Locke and Berkeley specially in view. Locke as a patient and acute inquirer was incomparably better as a psychologist than a man addicted to literary foppery like Hume, for all his genius, could possibly be. On the particular question, see Locke, Essay, bk. ii. c. 21, §§ 3-5.

2 In an article (Mind, 1886, p. 317) Mr F. H. Bradley created some stir by declaring that " the present use of these phrases [active energy] is little better than a scandal and a main obstacle in the path of English psychology." In Mind for 1902 and 1903 he has made important contributions towards clearing up the supposed confusion, and the subject is still being debated. But the main contention of the text, that activity is for psychology at all events ultimate and unanalysable, seems still to await refutation. A brief notice of some of the diverse views obtaining will be found in an address, " The Problems of General Psychology," by J. Ward Philosophical Review (1904), pp. 608 sqq.

grouping of the field of consciousness at the moment — " pack the jury " or " suborn the witnesses," as it were. But the ground of certainty is in all cases some quality or some relation of these presentations inter se. In a sense, therefore, the ground of all certainty is objective — in the sense, that is, of being something at least directly and immediately determined for the subject and not by it. Where certainty is mediate, one judgment is often spoken of as the ground of another; but a syllogism is still psychologically a single, though not a simple, judgment, and the certainty of it as a whole is immediate. Between the judgment A is B and the question Is A B? the difference is not one of content nor scarcely one of form: it is a difference which depends upon the effect of the proposition on the subject judging, (i.) We have this effect before us most clearly if we consider what is by common consent regarded as the type of certainty and evidence, the certainty of present sense-impressions whence it is said, " Seeing is believing." The evident is here the actual, and the " feeling or consciousness " of certainty is in this case nothing but the sense of being taken fast hold of and forced to apprehend what is there, (ii.) The like is true of memory and expectation: in these also there is a sense of being tied down to what is given, whereas in mere imagination, however lively, this non- voluntary determination is absent (cf. § 26). Hume saw this at times clearly enough, as, e.g. when he says, " An idea assented to feels different from a fictitious idea that the fancy alone presents to us." But unfortunately he not only made this difference a mere difference of intensity, but spoke of belief itself as " an operation of the mind " or " manner of conception that bestowed on our ideas this additional force or vivacity." 1 In short, Hume confounded one of the indirect causes of belief with the ground of it, and again, in describing this ground committed the varepov irpbrepov of making the mind determine the ideas instead of the ideas determine the mind, (iii.)

In speaking of intellection he is clearer: " The answer is easy with regard to propositions that are prov'd by intuition or demonstration. In that case the person who assents not only conceives the ideas according to the proposition, but is neces- sarily determin'd to conceive them in that particular manner " (op. cit. p. 395). It has been often urged — as by J. S. Mill, for example — that belief is something " ultimate and primordial." No doubt it is; but so is the distinction between activity and passivity, and it is not here maintained that certainty can be analysed into something simpler, but only that it is identical with what is of the nature of passivity — objective determination. As Bain put it, " The leading fact in belief … is our primitive credulity. We begin by believing everything; whatever is is true" (Emotions and Will, 3d ed., p. 511). But the point is that in this primitive state there is no act answering to " believe " distinct from the non-voluntary attention answering to " per- ceive," and no reflection such as a modal term like " true " implies. With eyes open in the broad day no man says, " I am certain there is light "; he simply sees. He may by-and-by come absolutely to disbelieve much that he sees — e.g. that things are nearer when viewed through a telescope — just as he will come to disbelieve his dreams, though while they last he is certain in these too. The consistency we find it possible to establish among certain of our ideas becomes an ideal, to which we expect to find all our experience conform. Still the intuitive evidence of logical and mathematical axioms is psychologically but a new form of the actual; we are only certain that two and two make four and we are not less certain that we see things nearer through a telescope.

Presentation of Self, Self-Consciousness and Conduct. 44. The concept of self we have just seen underlying and to a great extent shaping the rest of our intellectual furniture; on this account it is at once desirable and difficult to analyse it and ascertain the conditions of its development. In attempt- ing this we must carefully distinguish between the bare presenta- tion of self and that reference of other presentations to it which is often called specially self -consciousness, " inner sense," or 1 Treatise of Human Nature, Green and Grose's ed., i. 396.

internal perception. Concerning all presentations whatever — that of self no less than the rest — it is possible to reflect, " This presentation is mine; it is my object; I am the subject attending to it." The presentation of self, then, is one presentation among others, the result, like them, of the differentiation of the original continuum. But it is obvious that this presentation must be in existence first before other presentations can be related to it. On the other hand, it is only in and by means of such relations that the concept of self is completed. We begin, therefore, with self simply as an object, and end with the concept of that object as the subject or " myself " that knows itself. The self has, first of all (a) a unique interest and

(b) a certain inwardness, (c) it is an individual that (d) persists, (e) is active, and finally (/) knows itself. These several characteristics of self are inti- mately involved; so far as they appear at all they advance in definiteness from the lowest level of mere sentience to those moments of highest self-consciousness in which conscience approves or condemns volition.

The earliest and to the last the most important element in self — what we might perhaps term its root or material element — is that variously styled the organic sensations — vital sense, coenaesthesis, or somatic consciousness. This largely ~ ^™ determines the tone of the special sensations and enters, toe Body. though little suspected, into all our higher feelings. If, as some- times happens in serious nervous affections, the whole body or any part of it should lose common sensibility, the whole body or that part is at once regarded as strange and even as hostile. In some forms of hypochondria, in which this extreme somatic insensibility and absence of zest leave the intellect and memory unaffected, the individual doubts his own existence or denies it altogether. Ribot cites the case of such a patient, who, declaring that he had been dead for two years, thus expressed his perplexity: — " J'existe, mais en dehors de la vie reelle, materielle, et, malgre moi, rien ne m'ayant donne la mort. Tout est mecanique chez moi et se fait inconsciem- ment." 2 It is not because they accompany physiological functions essential to the efficiency of the organism as an organism, but simply because they are the most immediate and most constant sources of feeling, that these massive but ill-defined organic sensa- tions are from the first the objects of the directest and most unre- flecting interest. Other objects have at the outset but a mediate interest through subjective selection in relation to these, and never become so instictively and inseparably identified with self, never have the same inwardness. This brings us to a new point. As soon as definite perception begins, the body as an extended thing is distinguished from other bodies, and such organic sensations as can be localized at all are localized within it. At the same time the actions of other bodies upon it are accompanied by pleasures and pains, while their action upon each other is not. The body also is the only thing directly set in motion by the reactions of these feelings, the purpose of such movements being to bring near to it the things for which there is appetite and to remove it from those towards which there is aversion. It is thus not merely the type of occupied space and the centre from which all positions are reckoned, but it affords us an unfailing and ever-present intuition of the actu- ally felt and living self, to which all other things are external, more or less distant, and at times absent altogether. The body then first of all gives to self a certain measure of individuality, permanence and inwardness.*

But with the development of ideation there arises within this what we may

call an inner zone of self, having still more unity and permanence. We have at this stage not only an intuition of the bodily self doing or suffering ‘ aaerSe ”’ here and now, but also memories of what it has been and done under varied circumstances in the past. External impressions have by this time lost in novelty and become less absorbing, while the train of ideas, largely increased in number, distinctness and mobility, diverts attention and often shuts out the things of sense altogether. In all such reminiscence or reverie a generic image of self is the centre, and every new image as it arises derives all its interest from relation to this; and so apart from bodily appetites new desires may be quickened and old emotions stirred again when all that is actually present is dull and unexciting. But desires and emotions, it must be remembered, though awakened by what is only imaginary, invariably entail actual organic perturbations, and with these the generic image of self comes to be intimately united. Hence arises a contrast between the inner self, which the natural man locates in his breast or pf)v, the chief seat of these emotional disturbances, and the whole visible and tangible body be- sides. Although from their nature they do not admit of much ideal representation, yet, when actually present, these organic sensations exert a powerful and often irresistible influence over other ideas; they have each their appropriate train, and so heighten in the very

2 ” Bases affectives de la personnalite ” in Revue philosophique, xviii. 149.

complex and loosely compacted idea of self those traits they originally wrought into it, suppressing to an equal extent all the rest. Normally there is a certain equilibrium to which they return, and which, we may suppose, determines the so-called temperament, naturel or disposition, thus securing some tolerable uniformity and continuity in the presentation of self. But even within the limits of sanity great and sudden changes of mood are possible, as, e.g. in hysterical persons or those of a ” mercurial temperament,” or among the lower animals at the onset of parental or migratory instincts. Beyond those limits — as the concomitant apparently of serious visceral derangements or the altered nutrition of parts of the nervous system itself — complete “alienation” may ensue. A new self may arise, not only distinct from the old and devoid of all save the most elementary knowledge and skill that the old possessed, but diametrically opposed to it in tastes and disposition — obscenity, it may be, taking the place of modesty and cupidity or cowardice succeeding to generosity or

courage. The most convincing illus- trations of the psychological growth and structure of the presenta- tion of self on the lower levels of sensation and ideation are furnished by these melancholy spectacles of minds diseased ; but it is impossible to refer to them in detail here. 1

Passing to the higher level of intellection, we come at length upon the concept which every intelligent being more or less dis- Setfasa tinctly forms of himself as a person, M. or N., having Person such and such a character, tastes and convictions, such and such a history, and such and such an aim in life. The main instrument in the formation of this concept, as of others, is language, and especially the social intercourse that language makes possible. Up to this point the presentation of self has shaped that of not-self, — that is to say, external things have been com- prehended by the projection of its characteristics. But now the order is in a sense reversed : the individual advances to a fuller self-knowledge by comparing the self within with what is first dis- cernible in other persons without. So far avant I'homme est la societe; it is through the " us " that we learn of the " me " (cf. § 36, note 1). Collective action for common ends is of the essence of society, and in taking counsel together for the good of his tribe each one learns also to take counsel with himself for his own good on the whole; with the idea of the common weal arises the idea of happiness as distinct from momentary gratification. The extra-regarding impulses are now confronted by a reasonable self-love, and in the deliberations that thus ensue activity attains to its highest forms — those of thought and volition. In the first we have a distinctly active manipulation of ideas as compared with the more passive spectacle of memory and imagination. Thereby emerges a contrast between the thinker and these objects of his thought, including among them the mere generic image of self, from which is now formed this concept of self as a person. A similar, even sharper, contrast also accompanies the exercise of what is very misleadingly termed " self-control," i.e. control by this personal self of " the various natural affections " — to use Butler's phrase — which often hinder it as external objects hindered them. It is doubtful whether the reasoning, regulating self is commonly regarded as definitely local- ized. The effort of thinking and concentrating attention upon ideas is no doubt referred to the brain, but this is only compar- able with the localization of other efforts in the limbs; when we think we commonly feel also, and the emotional basis is of all the most subjective and inalienable. If we speak of this latest phase of self as par excellence " the inner self," such language is then mainly figurative, inasmuch as the contrasts just described are contrasts into which spatial relations do not enter.

45. The term " reflection," or internal perception is applied to that state of mind in which some particular presentation or group of presentations (x or y) is not simply in the field of scio'usaess. consciousness but there as

consciously related to self, which is also presented at the same time. Self here may be symbolized by M, to emphasize the fact that it is in like manner an object in the field of consciousness. The relation of the two is commonly expressed by saying, " This (x or y) is my (M's) percept, idea or volition; I (M) it is that perceive, think, will it." Self-consciousness, in the narrowest sense, as when we say " I know myself, I am conscious that I am," &c, is but a special, though the most important, instance of this internal perception: here self (M) is presented in relation to self (with a difference, M') ; the subject itself — at least, so we say — is or appears as its own object.

It has been often maintained that the difference between consciousness and reflection is not a real difference, that to know and to know that you know are " the same thing considered in

1 This subject has a very wide literature. The following are specially interesting: Ribot, Les Maladies de la personnalite (3rd ed., 1889) ; Boris Sidis and S. P. Goodhart, Multiple Personality (1905) ; Morton Prince, The Dissociation of a Personality (1906).

different aspects." 2 But different aspects of the same thing are not the same thing, for psychology at least. Not only is it not the same thing to feel and to know that you feel; but it might even be held to be a different thing still to know that you feel and to know that you know that you feel — such being the difference perhaps between ordinary reflection and psychological introspection. 3 The difficulty of apprehending these facts and keeping them distinct seems obviously due to the necessary presence of the earlier along with the later; that is to say, we can never know that we feel without feeling. But the converse need not be true. How distinct the two states are is shown in one way by their notorious incompatibility, the direct conse- quence of the limitation of attention: whatever we have to do that is not altogether mechanical is ill done unless we lose our- selves in the doing of it. This mutual exclusiveness receives a further explanation from the fact so often used to discredit psychology, viz. that the so-called introspection, and indeed all reflection, are really retrospective. It is not while we are angry or lost in reverie that we take note of such states, but afterwards, or by momentary side glances intercepting the main interest, if this be not too absorbing.

But we require an exacter analysis of the essential fact in this retrospect — the relation of the presentation x or y to that of self or M. What we have to deal with, it will be observed, is, implicitly at least, a judgment. First of all, then, it is noteworthy that we are never prompted to such judgments by everyday occurrences or acts of routine, but only by matters of interest, and, as said, gener- ally when these are over or have ceased to be all-

engrossing. Now in such cases it will be found that some effect of the preceding state of objective absorption persists, like wounds received in battle, unnoticed till the fight is over — such e.g. as the weariness of muscular exertion or of long concentration of attention; some pleasurable or painful after-sensation passively experienced, or an emotional wave subsiding but not yet spent; " the jar of interrupted expectation," or the relief of sudden attainment after arduous striving, making prominent the contrast of contentment and want in that particular; or, finally, the quiet retrospect and mental rumination in which we note what time has wrought upon us and either regret or approve what we were and did. All such presenta- tions are of the class out of which, as we have seen, the presentation of self is built up, and so form in each case the concrete bond con- necting the generic image of self with its object. In this way and in this respect each is a concrete instance of what we call a state, act, affection, &c, and the judgments in which such relations to the standing presentation of self are recognized are the original and the type of all real predications. The opportunities for re- flection are at first few, the materials being as it were thrust upon attention, and the resulting " percepts " are but vague. By the time, however, that a clear concept of self has been attained the exigencies of life make it a frequent object of contemplation, and as the abstract of a series of instances of such definite self-con- sciousness we reach the purely formal notion of a subject or pure ego. For empirical psychology this notion is ultimate; its specula- tive treatment falls altogether — usually under the heading^' rational psychology " — to metaphysics.

46. The growth of intellection and self-consciousness reacts powerfully upon the emotional and active side of mind. To de- scribe the various sources of feeling and of desire that c . . thus arise — aesthetic, social and religious sentiments, pride, ambition, selfishness, sympathy, &c. — is beyond the scope of systematic psychology, and certainly quite beyond the limits of an article like the present. But at least a general resume of the characteristics of activity on this highest or rational level is indispensable. If we are to gain any oversight in a matter of such complexity it is of the first importance to keep steadily in view, as a fundamental principle, that as the causes of feeling become more complex, internal, and representative the con- sequent actions change in like manner. We have noted this

2 So — misled possibly by the confusions incident to a special faculty of reflection, which they controvert — James Mill, Analysis, i. 224 seq. (corrected, however, by both his editors, pp. 227 and 230), and also Hamilton, Led. i. 192.

3 It has been thought a fatal objection to this view that it implies the possibility of an indefinite regress; but why should it not? We reach the limit of our experience in reflection, or at most in deliberate introspection,

just as in space of three dimensions we reach the limit of our experience in another respect. But there is no absurdity in supposing a consciousness more evolved and explicit than our self-consciousness, and advancing on it as it advances on that of the unreflecting brutes.

connexion already in the case of the emergence of desires, and seen that desire in prompting to the search for' means to its end is the primum movens of intellection (cf. § 35). But intellect does much more than devise and contrive in unquestioning subservience to the impulse of the moment, like some demon of Eastern fable; even the brutes, whose cunning is on the whole of this sort, are not without traces of self-control. As motives conflict and the evils of hasty action recur to mind, deliberation succeeds to mere invention and design, In moments of leisure, the more imperious cravings being stilled, besides the rehearsal of failures or successes in the past, come longer and longer flights of imagination into the future. Both furnish material for intellectual rumination, and so we have at length (1) concepts of general and distant ends, as wealth, power, knowledge, and —self-consciousness having arisen — that concept also of the happiness or perfection of self, and (2) maxims or practical generalizations as to the best means to these ends. Instead of actions determined by the vis a tergo of blind passion we have conduct shaped by what is literally prudence or foresight, the pursuit of ends that are not esteemed desirable till they are judged to be good. The good, it is truly urged, is not to be identified with the pleasant, for the one implies a standard and a judgment, and the other nothing but a bare fact of feeling; thus the good is often not pleasant and the pleasant not good; in talking of the good, in short, we are passing out of the region of nature into that of character. It is so, and yet this progress is itself so far natural as to admit of psychological explication. As already urged (§ 34), the causes of feeling change as the con- stituents of consciousness change; also they depend more upon the form of that consciousness as this increases in complexity. When we can deliberately range to and fro in time and circum- stances, the good that is not directly pleasant may indeed be preferred to what is only pleasant while attention is confined to the seen and sensible; but then the choice of such good is itself pleasant — pleasanter than its rejection would have been.

The mention of deliberation brings us to the perennial problem of " the freedom of the will." But to talk of will is to lapse into _ . the confusions of the old faculty — psychology. As

freedom. Locke long ago urged: "The question is not proper, whether the will be free, but whether a man be free." l In the absence of external constraint, when a man does what he likes, we say he is "externally free"; but he may still be the slave of every momentary impulse, and then it is said that he is not " internally " free. The existence and nature of this internal freedom is the problem. But if such freedom is held to imply a certain sovereignty or autonomy of self over against momentary propensions and blind desires, there can obviously be no question of its existence till the level of self-consciousness is reached and maxims or principles of action are possible. The young child, the brute and the imbecile, even when they do as they like, have not this freedom, though they may be said to act spontaneously A resolutely virtuous man will have more of this freedom than the man of good moral disposition who often succumbs to temptation; but it is equally true that the hardened sinner has more of it than one still deterred in his evil ways by scruples of conscience. A man is internally free, then, whenever the ends he pursues have his whole-hearted approval, whether he say with Milton's Satan, " Evil be thou my good," or with Jesus, " Thy will be done." But this freedom is always within our experience a relative freedom; hence at a later time we often declare that in some past act of choice we were not our true selves, not really free. But what is this true self more than our ideal ? Or perhaps we prefer to say that we were free and could have acted otherwise; and no doubt we might, if the place of the purely formal and abstract concept of self had been occupied by some other phase of that empirical self which is continuously, but at no one moment completely, presented. It must then be admitted that psychological analysis in this case is not only actually imperfect, but must always remain so — so long, at any rate, as all that we discern by reflection is less than all we are. But this admission does not commit us to allowing the possible existence of a liberum arbitrium tndifferentiae, sometimes called "absolute indeterminism " ; for that would seem to differ in no respect from absolute chance or caprice. On the other hand, the rigidly determinist position can only be psychologically justified by ignoring the activity of the experiencing subject altogether. At bottom it treats the analysis of conduct as if it were a dynamical problem pure and simple. But motives are never merely so many quantitative forces playing upon something inert, or interacting entirely by themselves. At the level of self-consciousness especi-

1 Essay concerning Human Understanding, II. xxi. §§ 16 sqq.

ally motives are reasons and reason is itself a motive. In the blind struggle of so-called " self -regarding " impulses might is the only right; but in the light of principles or practical maxims right is the only might. 2 This superiority in position of principles is only explicable by reference to the inhibitory power of attention, which alone makes deliberation possible and

is essentially voluntary; that is, subjectively determined. But no, it may be objected, deliberation in such cases is just the result of painful experiences of the evil of hasty action, and only ensues when this motive is strong enough to restrain the impulse that would otherwise prevail. Even if this be granted, it does not prove that the subject's action is determined for and not by him; it merely states the obvious fact that prudence and self-control are gradually acquired. Authori- tative principles of action, such as self-love and conscience, are no more psychologically on a par with appetites and desires than thought and reason are on a par with the association of ideas.

Relation of Body and Mind. 47. The question of subjective initiative leads us naturally to that concerning the connexion of mind and organism, to which we now proceed. In development and efficiency, in „ „

the intensity and complexity of their processes, mind and brain keep invariably and exactly in line together. Striking and impressive instances of this correspondence are to be found in comparative psychology, and especially in mental pathology; but it is needless here to enlarge on a point which in the main is beyond dispute. In this correspondence lay the plausibility of the old materialism. But a closer scrutiny dis- closes an equally impressive disparity: we reject materialism, accordingly, while still maintaining this psychoneural parallelism to be a well-established fact. From this we must distinguish a second sense of parallelism founded on the disparity just men- tioned as pertaining to the psychical and neural correlates. We may call this physiologico-psychological, or, more briefly, methodo- logical, parallelism. It disclaims as illogical the attempt to penetrate to psychical facts from the standpoint of physiology, so persistently and confidently pursued by the old materialists. It also forbids the psychologist to piece out his own shortcomings with tags borrowed from the physiologist. The concepts of the two sciences are to be kept distinct, as the facts themselves to which they relate are distinct. Confusion is inevitable if the psychologist, for example, talks of his volition as the cause of his arm moving, when by arm movement he means the process described by the physiologist in terms of efferent excitations, muscular flexions, and so forth; or if the physiologist speaks of a sensation of red as produced by retinal stimulation due to light- waves of a certain length, when by sensation he means what he immediately experiences on looking at a field poppy. This methodological convention, as we may call it, implies a more stringent interpretation of causation than that expounded by J. S. Mill and his contemporaries. It does not, however, forbid psychological inferences on the basis of physiological facts, nor vice versa. But in spite of this distinctness of the facts, and of the standpoints from which they are respectively studied, their causal relation cannot be simply ignored: it is, however, a problem that pertains strictly to the higher standpoint of

philosophy. There have been in all four different theories of this relation within modern times: (1) that of mutual interaction — the common-sense view — very inconsistently maintained by Des- cartes; (2) the " occasionalism " substituted for this by Geulincx and the later Cartesians; (3) the pre-established harmony of Leibnitz; and (4) the monism of Spinoza, which reduced matter and mind to parallel attributes of the One Substance. The last of these — severed, however, from Spinoza's metaphysics — is still perhaps the prevailing theory, and to it the term psychophysical parallelism most properly applies. For whereas the parallelism first mentioned states a real correspondence between psychical processes and neural processes, but leaves open the question of a possible interaction between matter and mind, modern psychophysical parallelism is a pure hypothesis concerning the relation of psychical facts to physical theories, on the ground of which — as we shall presently see — any interaction between matter and mind is expressly denied.

2 The right is only relative, of course, when the maxims are " hypothetical " — to use Kant's phrase, — but it is absolute when the maxim is " categorical."

But in the exposition of this hypothesis these two meanings of parallelism are frequently confused or interchanged. The same term " body " is applied both to an aggregate of matter and to the living organism. Now life must be regarded as either inherent in matter, or as the result simply of a particular material configuration, or as physically inexplicable. But, for the present at all events, it cannot be explained physically ; nor are we even within measurable distance of such an explanation: so much is beyond cavil. Yet the hypothesis of psychophysical parallelism confines us to one or other of the former alternatives: at the same time its unwarrantable identification with psychoneural parallelism — where we find a real correspondence between mind and organism — tends to conceal the gravity of such assumptions. The standpoint of physiology, there- fore, must be described not as identical with that of physics, but as intermediate between it and the standpoint of psychology. If the fact of life could be reduced to physical terms, physiology then, no doubt, would have to fall into line with physics, much as chemistry, for example, may have had to do. On the other hand, till a physical explanation of life is forthcoming, physiology belongs, with psycho- logy, to the biological group of sciences, and cannot divest itself completely of the teleological concepts essential to them, not a vestige of

which belongs to bare physics. It is just because of this commu- nity in their concepts that there actually is a certain " point to point" correspondence or parallelism between the psychical and the neural : as an organ a neuron is a unit; physically regarded, it ceases to be one. Yet this illicit identification of organism and material body is thought to be legitimate, inasmuch as physiological processes are found to rest invariably on a physical basis : and inasmuch as, though methodo- logical parallelism forbids the physiologist to identify psychosis with neurosis, no limits can be imposed on his efforts to ascertain the mechanism of the neurosis itself. But if this be granted, is not psychophysical parallelism justified, in principle at all events? By no means : as little, for example, as an explanation of the mechanism of a locomotive would justify us in ascribing its origin, its mainten- ance or its guidance to the machine itself. When life and mind are ex- plained by their mechanism the physicist may summon the biologist, as Mephistopheles did Faust, " Her zu mir ": then, but not before.

A favourite mode of stating psychophysical parallelism is that known as the Double Aspect Theory. In this, besides "Double the unjustified identification of the first and third Aspect" meanings, we find also an equally unjustified inter- Tbeoiy. pretation of parallelism in the second sense. All that methodology prescribes is that psychologists and neuro- logists — and, we may add, that physicists too — shall severally, as " specialists," mind their own business. Again, all that the first two jointly ascertain is simply the fact of correspondence: the explanation of it is still to seek. Two propositions are now advanced which are held to meet this need. First— and negatively — the connexion, it is said, is not causal; mind does not act on body, nor body- on mind: the changes on each side form two independent series, each " going along by itself." In other words, the series themselves are said to exemplify what methodology enjoins on the sciences that investigate them — they mind their own business and never intrude into each other's domains. Nevertheless their interaction is not prima facie contradictory or absurd, and ordinary thought, as we have seen, assumes that it exists. What evidence, then, is there for denying it absolutely? Empirical evidence for such a universal negative there can hardly be; it must be established therefore — if established at all — on a priori grounds. Meanwhile two facts, already noticed, make seriously against it. On the psychical side sensations point to an intrusion of some sort, and are not psychically explicable (cf. § 16), and the like — for the present at all events — must be said of the fact of life on the physical side. Apart from all this, it seems plain that methodological parallelism, so far from justifying the denial of interaction, simply precludes its discussion on the dualistic level to which that parallelism is confined. The gulf implied is indeed not absolute — of so much, parallelism in the first sense assures us — but those who are forced to keep to their own side of it obviously are

not the people to settle how it is crossed. We are aware that the dualism is not absolute, it is replied: it is only phenomenal, and the two series of phenomena are conditioned by an underlying unity of substance. Such is the second, and positive, proposition of the theory. Again asking for evidence, we are told that this underlying unity is unknown — in fact, unknowable. This unknowable substance is assumed, then, simply because — the •impossibility of causal connexion being taken as established — no other alternative remains. The nega-

tive proposition is thus the foundation of the theory, and without it this agnostic monism becomes entirely arbitrary. We have, therefore, to continue our search for the grounds on which the possibility of interaction is denied. But it will be worth while first to examine certain ambiguities besetting the positive statement.

Difference of aspect may result solely from difference of stand- point, or it may be due to difference in the reality itself. The circle, seen as concave from within and as convex from without, is an ancient instance of the first still in great favour; the pillar that was cloud and darkness to the Egyptians, but light to the children of Israel, may serve to exemplify the second. The former we may call the phenomenal, and the latter the ontal, meaning of " aspect." With these two very different meanings our theory plays fast and loose, as suits its own convenience. To do this is easy— in so far as the reality is unknown and un- knowable; and necessary — since in the end, the reality, however unknowable, must somehow include both the phenomenal aspects and all that pertains to them, and so far therefore be known. In dealing with " aspect " in the first sense, the one question to be raised concerns the nature and relation of the respective standpoints. To one belongs what we know as in- dividual experience, and this is essentially concrete, immediate, and qualitatively diverse; to the other belongs an abstract, conceptual scheme, wholly quantitative, familiarly known as the mechanical theory. Between these there is plainly no such co-ordination as the inept comparison with the inside and the outside of a circle implies. 1 Neither is there, on the other hand, the same complete opposition; for the entire mechanical theory is based upon individual experience as enlarged and developed by inter-subjective intercourse. Both the sense knowledge of the one and the thought-knowledge of the other relate to the one objective factor involved in both. So far, then, there is fundamentally only one standpoint — that of the sub- jective factor to the objective factor, which is immediately perceived in the one and mediately conceived in the other. The question here raised is thus primarily epistemological, but it is a question, as we have seen, in which psychology is intimately concerned. " Aspect " in the second sense is inde- pendent of standpoints. We have here to deal with attributes of the one reality, more or less in Spinoza's sense: this reality itself, as possessed of disparate attributes, is so far dual, and the question*

of causal connexion between these attributes is not escaped. For to know that a thing has invariably two distinct attributes does not enable us to determine straightway how the changes or " modes " of the one are connected with those of the other, (i) The same attribute might be always the initiating or independent variant, and then would come the question of finding out which of the two it was; or (2) it might be that now one, now the other, took the lead, the grounds of this alternation being then the topic for inquiry; or, finally, (3) it might be, as our theory assumes, that there was but a single series of double changes. The questions here raised are philosophical questions, but again they are questions in which psychology is intimately concerned. Our examination thus yields two results: first, there is fundamentally only a single standpoint — that of ex- perience, now at the perceptual, now at the conceptual, level; and secondly, the distinction of aspects is not merely pheno- menal, but pertains " somehow " to reality. The question is how; and this leads us to resume our inquiry into the grounds on which interaction is denied.

These grounds neither pertain to psychology nor to physiology. In spite of the outstanding difficulties connected with sensation and life, which these sciences severally raise, such denial is upheld

1 In fact, if there were, since it is only as we contemplate finite portions of the circle that the distinction of concave and convex is present, the nearer we approximated to its elements the more this difference of aspect would disappear. If on the physical side we called these elements atoms, there would be an answering element of " mind-stuff " on the psychical; and there would be no more unity and no other diversity in a given man's mind than in his brain regarded as a complex of primordial atoms. Wild as all this seems, yet views of the kind have been seriously put forward more than once as the logical outcome of psychophysical parallelism.

mainly on the strength of an interpretation of the principle known as the conservation of energy — an interpretation of it, however, which many of the ablest physicists disallow. The energy of the physical world, it is maintained, is a strictly in- variable amount; matter, therefore, cannot act on mind, for such action would entail a decrease, nor can mind act on matter, since that would entail an increase, of this energy. In other words, the material world is held to be a "closed system"; and as all the changes within it are mass-motions, there can be none which are not the effect and

equivalent of antecedent mass- motions. But now this statement must be established on physical grounds: to assume it otherwise would be openly to beg the very question at issue. For if mind does act on matter, the physical mechanism is subject to changes from without, and so often its motions are not due to antecedent motions; and this — the common-sense view — cannot, of course, be summarily dismissed as impossible or absurd. Now, energy is essentially a metrical notion, and its conservation in finite and isolated material systems has been ascertained by careful quantitative experiments. To say that the energy of the material universe is constant is only a way of expressing the generalization of this result — is tantamount, in other words, to saying that it holds of all finite isolated systems. The whole universe _ may perhaps be called isolated, but we do not know that it is finite. We cannot, therefore, apply metrical concepts to it; and consequently we cannot interpret the conservation of energy as meaning that the physical part of it is a closed system. But if not a closed system, then the energy of a given group of bodies may be increased or decreased without interaction between that group and other bodies — may be increased or decreased by psychophysical interaction, that is to say. And, moreover, such psychophysical interaction would not invalidate the con- servation of energy, rightly understood; for that merely means that the energy of a group of bodies can be altered only from without, and this might happen whenever such interaction occurred. 1 We seem, therefore, justified for the present in re- jecting psychophysical parallelism as one of the three possible modes of relating mind and matter regarded as attributes of the real. Not only are there psychological as well as biological objections which it has not yet overcome, but there are so far no physical grounds in its favour.

At this point we may again for a moment turn aside to consider a modified form of the doctrine — the so-called Conscious Auto- " Conscious maton Theory, an attempt to blend the old Cartesian Auto- views concerning the minds of man and brute.

matoa " According to Huxley, 2 the best known modern Theory. exponent of this theory, "our mental conditions are simply the symbols in consciousness of the changes that take place automatically in the organism." This conscious- ness is supposed " to be related to the mechanism of the body simply as a collateral product of its working, and to be as completely without any power of modifying that working as the steam-whistle … is without influence upon the locomotive's machinery": thus "the feeling we call volition is not the cause of a voluntary act, but the symbol of that state of the brain which is the immediate cause of that act." In other words, physical changes are held to be independent of psychical, whereas psychical changes are de- clared to be their " collateral products." They are called collateral products, or " epiphenomena," to obviate the

charge of materialism, and to conform to the interpretation of the conservation of energy that we have just discussed. Such a theory is, strictly speaking, one of parallelism no longer: rather it adopts, instead, the first of the two possibilities we have noted above as opposed to parallelism. According to it, matter is the initiating or independent variant, on whose changes mind simply follows suit. It is open to two fatal objections. First, it is methodologically unsound : its psychology is physiological in the

1 The possibility is enough : we cannot tell what actually happens, and do not, therefore, know how far the direction of matter by mind calls for a modification or limitation of physical hypotheses. Cf. Ward, Naturalism and Agnosticism (3rd ed., 1906), ii. 73-86.

2 Essay on " Anima) Automatism," Collected Essays, vol. i.

bad sense. It regards all states of consciousness as passive, i.e. as ultimately either " feelings " or " reflexes." Volitional activity is declared illusory; and if this be true, intellectual activity must be illusory too. But to detect illusion requires experience of reality — we only know the sham by knowing the genuine first; and even passive states could not be experienced as such save by contrast with states that are active. To the physical side, then, we naturally turn for this knowledge which we are told is not to be found on the psychical; and we do so the more readily as, according to the present theory, the physical holds the primary place. But we turn in vain; for matter is inert, and its energy only " works " by taking the line of least resistance, like water running down hill. Moreover, such activity as we are in search of could only be found here in case the physical mechanism showed signs of being intelligently directed, and that would also be evidence that psychical activity is not illusory. Is, then, the physical side after all primary? No, we reply: the assumption is epistemologically unsound. This is our second objection. The order implied in the distinc- tion of physical phenomena and psychical ˆphenomena is contrary to all experience and indefensible. A physical pheno- menon is either actually perceived or possibly perceptible; other- wise it is devoid of empirical reality altogether. But objects of perception are so far psychical; that is, they belong to im- mediate or individual experience. Therefore we cannot regard them as independent of this experience, nor this as their collateral product, i.e. as epiphenomenal. Again, the phenomenality sup- posed to be common to both involves, as we have already seen, a fundamental identity in the standpoint of each: they belong to the same continuous experience at different levels. And lastly, their abstract, merely quantitative, character shows that it is the concepts of physics, and not the facts of immediate experience, that are symbolic, and so to say epithetic. The attempt — either empirically or speculatively — to outflank mind by way of matter is an absurdity on a par with getting into a basket in the hope of being able to

carry oneself.

These epistemological considerations may help us to deal with the prime and ultimate argument for strict parallelism. When all is said and done, it is urged, still the interaction of mind and matter remains inconceivable. But this is hardly a sufficient reason for denying what is prima facie a fact. Occasionalists, from Geulincx to Lotze, have acknowledged the same obscurity in all cases of transeunt action. Yet they did not venture to deny that sensations were interruptions in the psychical series, the " occasions " for which were only to be found in the physical; nor that purposive movements were interruptions in the physical series, the " occasions " for which were only to be found in the psychical. And surely such a position is more in harmony with experience than that of the parallelists, who maintain that each series " goes along of itself " — a statement which, as we have repeatedly urged, contradicts psychology and assumes the physi- cal " explanation " of life. Whereas occasionalism leaves the question of ultimate means to be dealt with by a metaphysics which will respect the facts, 3 parallelism forecloses it on the basis of a ready-made metaphysics — modern naturalism, that is to say — in which psychology as an independent science is entirely ignored. Starting with a dualism as absolute as that of Descartes — but replacing his two substances by one, enjoying the otium cum dignitate of the Unknowable — starting, too, from the physical side, no wonder such a philosophy finds that what is for us the most familiar and of the supremest interest, the concrete world of sense and striving, is for it the altogether inconceivable, the supreme " world riddle." And yet if the naturalist could deign to listen to the plainest teachings of psychology and of epistemo- logy, the riddle would seem no longer insoluble, for his phenomenal dualism and his agnostic monism would alike disappear. The material mechanism which he calls Nature would rank not as the profoundest reality there is to know: it would rather become — what indeed "machine" primarily connotes — an instrument- ality subservient to the " occasions " of the living world of ends; and so regarded, it would cease to be merely calculable, and 3 Cf. Lotze, Metaphysik, § 61 fin.

would be found intelligible as well. Psychophysical parallelism, then, we conclude, is not a philosophically tenable position; and — pending the metaphysical discussion as to the ultimate nature of interaction generally — we have to rest content with the second of the three possible modes of connexion above defined, as occasionalism formulates it. According to this,

the two series, the psychical and the physical, are not independent and " closed " against each other; but in certain circumstances — e.g. in perception — physical changes are the occasion of psychical, and in certain circumstances — e.g. in purposive movements — psychical changes are the occasion of physical: the one change not being explicable from its psychical antecedents, nor the other from its physical.

Into the metaphysical discussion we cannot, of course, enter here. It must suffice to say that it will not be conducted on the lines of our present inquiry: it will not start from a dualism of matter and mind, either regarded as substances or as pheno- mena. Its problem will rather be the interaction of subject and object — a duality in the unity of experience, which by no means coincides with the dualism of matter and mind, neurosis and psychosis, and the like.

Comparative Psychology 48. Psychoneural parallelism is no doubt a well established generalization; nevertheless, concerning its exact range and its precise meaning there are differences of opinion. It is applicable, every one will allow, so soon as there is evidence of experiences individually acquired (cf . § 3) ; and from such point onwards, in ascending any biological phylum, we find that the psychical and neural aspects differentiate and develop together. But how when we descend? Interpreting the neural correlate physiologically, and not morphologically, as referring primarily to function and not to structure, we find that even in unicellular organisms it is still present as irritability and conductivity (leading to contraction, secretion, &c). But as at higher levels psychosis is correlative to neurosis, the principle of continuity would seem to justify us in assuming a like correspondence here. Moreover, " learning by experience," the comparative psychologist's criterion, obviously presupposes some antecedent and underlying process, of which it is the differentiation and development. And our general analysis of mind, if correct, enables us to describe this process — " the irreducible psychical minimum," of which we are here in search. We have such complete psychosis — and it is the simplest we know — in the emotional or diffused movements that follow immediately upon sensation; and these are so far purposive — though not intentional — that they tend to heighten or retain what is pleasurable, and to alleviate or remove what is painful. Given that plasticity, wlagh is the/- ˆpsychological presupposition of all acquisition, then learning by experience is a possible development from such a primitive stage.

But though every psychosis have its concomitant neurosis, it is uncertain how far the converse holds good. The action of the heart, for example, depends upon neuroses of which we have now no direct consciousness. Facts of this kind have led to three hypotheses concerning the lowest forms of life, differing more or less from that just proposed, (i.) Perfectibility and

instinct are found, it is said, to be in inverse ratio. Hence in the lowest forms of life there is no " learning by experience," because a stationary state of complete adjustment to environment has been already attained, and all reactions have therefore become "secondarily automatic": consciousness, having served its pur- pose, lias disappeared. To such a very Buddhistic psychology it may be objected: (1) that even organic reflexes tell upon the so- called vital sense or coenaesthesis, and so far — the irreducible minimum being still intact — do not preclude all possibility of learning, should occasion arise; and (2) that the psychical life, even of a Protozoan, does not, according to the best evidence, show any such mechanical finality as is here supposed. 1 (ii.) According to the second view, which is advocated by Herbert Spencer, the behaviour of the lower organisms is wholly made 1 Cf. H. S. Jennings, Behaviour of the Lower Organisms (1906).

up of such reflexes, supposed to be devoid of all psychical con- comitants; but consciousness — so far from having disappeared — first comes upon the scene at the opportune moment when the increasing complexity of the mechanism calls for its guidance. Psychologically this hypothesis is less defensible than the last, and it has already been dealt with at some length (cf. § 7). It not only assumes, as that does, far more uniformity in the interaction of organism and environment than the facts warrant, but in regarding life as prior to mind, and as the means of its evolution, it burdens science with two insoluble problems instead of one. For even if it were possible chemically to build up protoplasm, we should still be as far from organisms as a heap of bricks are from putting themselves together as a house, (iii.) The last view we have to notice is essentially an extension of the preceding, and is chiefly interesting as a reductio ad absurdum of that. The physics of colloidal substances — at present wanting, but confidently expected " in the near future " by certain biologists — is the key which is to unlock the mysteries of protoplasm. Certain organisms, regarded as varieties of such a substance, react positively to a given physical property of the environment, and others negatively: thus a moth flies towards the light, and a centipede runs from it — the one is positively, the other negatively, " heliotropic " ; the radicle of a seed, growing downwards, is, positively, the plumule, growing up- wards, is, negatively, " geotropic." Instincts are but complexes of such tropisms, and owe their character entirely to the sym- metrical form and definite structure of the colloidal substance. Now if it facilitate the work of the biologist to say that when what we ordinarily regard as a hungry caterpillar climbs to the tip of a branch it is forced so to do by positive heliotropism ; that then positive chemiotropism sets up mastication of the young buds; and that, lastly, " we can imagine this process lead- ing to the destruction of the substances in the skin of the animal that are sensitive to light, and upon which the

heliotropism depended," so leaving it free to crawl downwards and come in contact with the new buds which have in the meantime unfolded 2 — if such language serve' any useful purpose, all well and good; only it must be applied to the hungry man too: in short, all behaviour must be described in the same terms. For the champion of colloids to betake himself to consciousness as he approaches the higher forms of life is as much a breach of methodological parallelism as it is for the psychologist to fall back upon protoplasm as he approaches the lower. But to suppose that psychical processes first appear in the complicated form of association of ideas — which learning by experience is taken to imply — and at the same time to assume that such experience, even when it appears, is " ultimately due to the motions of colloidal substances," these are incongruous absurd- ities which only the grossest ignorance would be bold enough to maintain.

Concluding, as we have done, that mind and matter — as we may provisionally call them — do really interact, we naturally infer that organic structures are not the result solely of material processes, but involve the co-operation of mental direction and selection: in other words, we are led to regard structure as partly shaped and perfected by function, rather than function as solely determined by structure, itself mechanically evolved. And such a view is justified by the fact that mechanical evolution is primarily a process of " degradation " rather than development, a case of facilis descensus contrasting with the upward struggle of life per aspera ad astra. Still, the notion of fife or mind as formative and directive has its difficulties. In the first place, we have no experience of mind organizing matter — no experience of the actual process, that is to say — however sure we may feel of the fact. 3 Hence the occasionalism to which here, at any rate, science is confined. But even so, the difficulty is not wholly removed. In the handicrafts whence we derive the conception

2 Cf . J. Loeb, Comparative Psychology (1901), pp. 188 sqq. — an interesting book, full of psychological crudities.

5 But, of course, a thoroughgoing spiritualism ought to explain the very existence of matter as really the appearance or manifesta- tion of mind.

of organs the artificer handles, but does not literally order, his tools — as if they too were intelligent. The conscious direction of such movements is doubtless facilitated by the fact that many of the complex co-ordinations actually involved in them are carried out automatically, thanks to structural modifications, either inherited or acquired. And, regarding life

phylogeneti- cally, we can imagine this process carried back indefinitely. Indeed, if it be illogical to talk of mechanisms evolving them- selves and giving rise to the beings whose ends they serve, we have no choice but to accept this dualism of mind-shaping and matter inert. No choice, that is, unless we can establish the primacy of the psychological standpoint. Here we have duality but not dualism, and the object is not inert, i.e. is not matter. But still there remain two difficulties — possibly resolvable into one — the plasticity already referred to as involved in all biological development and hereditary transmission; as to these, psychology is almost wholly in the dark. 1

Authorities. — Historical: There are few good works on the his- tory of psychology ; the only one in English, R. Blakey, History of the Philosophy of Mind from the Earliest Period to the Present Time (London, 1848), is poor. F. A. Carus's Geschichte der Psychologie (Leipzig, 1808) is at least useful for reference. A work bearing the same title by H. Siebeck (the first part consisting of two divisions — (i.) Die Psychologie von Aristoteles, (ii.) Die Psychologie von Aristoteles bis zu Thomas von Aquino (Gotha, 1880 and 1884) is thoroughly and carefully done. Siebeck has also contributed a series of articles, " Zur Psychologie der Scholastik," to the Archiv f. d. Gesch. d. Philos. (vols, i.iii.). Die Philosophie in ihrer Geschichte (I. Psycho logie), by Professor Harms (Berlin, 1878), is also good. T. A. Ribot's La Psychologie anglaise contemporaine (3rd ed., 1892) and La Psycho- logie allemande contemporaine (2nd ed., 1885) are lucid and concise in style, though the latter work in places is superficial and inaccurate. Of Max Dessoir's Geschichte der neueren deutschen Psychologie the section dealing with the 17th-century writers prior to Kant went into a second edition in 1897; 't contains a useful collection of material. From Les Origines de la psychologie contemporaine (2nd ed., 1908), by the neo-Thomist scholar Mgr. D. Mercier, much may be learnt, though its purpose is not primarily historical.

Positive: The recent output of systematic works on psychology has been voluminous. Among the most important of these may be mentioned J. Sully's The Human Mind (2 vols., 1892) ; W. James, Principles of Psychology (2 vols., 1890) ; G.' F. Stout, Analytic Psych- ology (2 vols., 1896); A Manual of Psychology (2nd. ed., 1901); H. Hoffding, Outlines of Psychology (1891 ; translated from the Danish) ; G. T. Ladd, Psychology, Descriptive and Explanatory (1894); W. Wundt, Grundriss der Psychologie (4th ed., 1901, translated); F. Jodl, Lehrbuch der Psychologie (2 vols., 2nd ed., 1902). Dealing mainly with experimental psychology are: Kiilpe, Grundriss der Psychologie auf experimenteller Grundlage dargestellt (1893 ; translated) ; Ebbinghaus, Grundziige der Psychologie (3rd ed., 1908), Bd. I.; and E. B. Titchener, Experimental Psychology : a Manual of Laboratory Practice (2 vols., 1901) ; C. S. Myers, Experimental Psychology (1908).

Of the older more advanced textbooks Professor Volkmann's Lehrbuch der Psychologie (2 vols., 3rd ed., 1885; edited by Cornelius) is written in the main from a Herbartian standpoint. To the honoured name of Lotze belongs a distinguished place in any enu- meration of modern productions in philosophy; his Medicinische Psychologie (Gottingen, 1852) is still valuable. A large part of his Mikrokosmos (3 vols., 3rd ed., 1876-1880; trans, into English, 2 vols., 1885) and one book of his Metaphysik (2nd ed., 1884; also trans, into English) are, however, devoted to psychology. The doctrine of evolution has been as fruitful in this study as in other sciences that deal with life. In this respect Herbert Spencer's Principles of Psychology (2 vols., 3rd ed., 1881) and Data 0} Ethics (1879) occupy a foremost place. Dr Alexander Bain's standard volumes, The Senses and the Intellect (4th ed., 1894) and The Emotions and the Will (3rd ed., 1875), contain a good deal of " physiological psychology," but no adequate recognition of the importance of the modern theory of development. Wundt's Physiologische Psychologie (3 vols., 6th ed., 1908 seq.) is indispensable to the student of this subject.

Specially interesting as treating psychological problems on new lines are La Psychologie des idees-forces, by A. Fouillee (2 vols., 1893) — perhaps the best French contribution to recent psychology; its cardinal point is the fundamentally dynamical character of the psychical. R. Avenarius, Kritik der reinen Erfahrung (2 vols., 1888-1890; 2nd ed., 1908), is an attempt, on the model of Kirchhoff and Mach's treatment of physics, to describe experience, taking the relation of the central nervous system to the environment as starting- point. Its strange and forbidding terminology prevented the timely recognition of its merits; but since the author s death in 1896 — from overwork and disappointment — quite a literature has grown up,

1 On the subject of comparative psychology generally, see Animal Behaviour (1900), by Professor C. Lloyd Morgan; L. T. Hobhouse, Mind in Evolution (1901).

partly expository, partly controversial, devoted to this latest critique. H. Cornelius, Psychologie als Erfahrungswissenschajl (1897), rather epistemological than psychological, claims affinity with the critiques of Kant and Avenarius. In J. Rehmke's Lehr- buch der allgemeinen Psychologie (and ed., 1905) — a psychology with a soul, and claiming to be philosophy as well — the problems of perception and of psychoneural interaction are discussed at length. F. Brentano, Psychologie vom empirischen Standpunkte (1874), vo '- '•> treats presentations and judgments as fundamentally distinct, feeling and willing, on the other hand, as fundamentally one. ■ His' influence on Austrian psychologists has been considerable, and is more or less apparent in the following: K. Twardowski,

Zur Lehre vom Inhalt und Gegenstand der Vorstellungen (1894) ; A. Meinong, Psychologisch-ethische Untersuchungen zur Werththeorie (1894), a "d also numerous important papers; v. Ehrenfels, System der Werth-theorie (2 vols., 1897-1898); A. Hofler, Psychologie (1897).

Important as treating of particular topics are C. Stumpf, Ton- psychologie (2 vols., 1883-1890) ; A. Lehmann, Die Hauptgesetze des menschlichen Gefiihlsleben (trans, from the Danish; 1892); various monographs by T. A. Ribot on diseases of memory, will, personality, on the psychology of attention, of the emotions, of general ideas, &c, all translated into English; J. M. Baldwin, Social and Ethical Inter- pretations in Mental Development (1897); W. Wundt, V olkerpsycho- logie (3 vols., 1900) ; W. McDougall, An Introduction to Social Psychology (1908).

There are several periodicals devoted exclusively to psychology, the chief being the American Journal of Psychology; the Psychological Review ; Zeitschrift fur Psychologie und Physiologie der Sinnesorgane ; L' Annie psychologique; the British Journal of Psychology; and Archiv filr die gesammte Psychologie. (J. W.)*

PSYCHOPHYSICS (from Gr. 1ˆx17, soul, <£ixus, nature), a department of psychology which deals with the physiological aspects of mental phenomena, and in particular investigates the quantitative relations between stimuli and the resultant sensations. Following the introspective school of which the, last leader was Alexander Bain, the tendency of psychological investigation, in the hands of Fechner, Helmholtz, Wundt, Munsterberg, was predominantly psychophysical, and psycho- logical study, especially in Germany, where the first fully- equipped laboratory was set up in Leipzig (1879) by Wundt, and in America became largely a matter of experiment and apparatus. Such apparatus has been devised for optical, acoustical, haptical (Gr. airruv, touch), taste and smell experi-ments. Haptical apparatus includes the kinesimeter (for cuta- neous sensation), the thermaesthesiometer (for heat and cold sensa- tion), the aigometer or algesimeter (for pain sensations), the aeslhesiometer {e.g. those of Jastrow and Munsterberg). Among important apparatus for measuring the time relations of mental processes are the d'Arsonval chronometer, which marks hundredths of a second, and the Hipp chronoscope y in which the stimulus andˆ the clock are electrically connected.

For authorities see Baldwin's Diet, of Philos. and Psych, s.v. " Laboratory," and the latest psychological textbooks.

PTARMIGAN (Lagopus mutus or alpinus), a gallinaceous bird akin to the grouse (q.v.). The word in Gaelic is tarmachan, which appears from the

end of the 16th century in many forms, such as tormican, tarmichen, and even " termagant."

PTERIA (mod. Boghaz Keui), the ancient capital of the " White Syrians " of Cappadocia, which Croesus of Lydia is stated by Herodotus to have taken, enslaved and ruined, after he had declared war on the rising power of Persia and crossed the Halys (after the middle of the 6th century B.C.). Thereafter be fought a drawn battle near the city, and retired again across the river to his ultimate defeat and doom. Pteria is mentioned by no other ancient authority, but it is of great interest if, as seems highly probable, (1) its " White Syrian " inhabitants were what we call " Hittites " (q.v.), or at least, participants in the " Hittite civilization "; (2) its remains are to be seen in the immense prehistoric city and remarkable rock-sculptures near Boghaz Keui in Cappadocia, about 100 m. east of Angora and beyond the Kkil Irmak (Halys). This is the chief " Hittite " site in Asia Minor, far superior in extent to either Euyuk or Giaur Kalesi, which seem to have been its dependencies, and a centre from which roads, marked by the occurrence of " Hittite " monuments, radiate towards Syria and the Aegean. Sir W. M. Ramsay has shown with great probability that it was the importance of Pteria and its bridge over the Halys which

diverted the Persian " royal road " far to the north of its natural line. This road, in fact, followed an earlier main track whose ultimate objective had been different.

The remains of Boghaz Keui are indubitably pre-Persian and pre- Greek. They consist of a large fortified city on a steep slope enclosed by two deep ravines, and falling to northward over 800 ft. from summit to base. The acropolis was strengthened with a circle of stone redoubts, between which led very narrow gateways, and with internal redoubts as well. Just inside what seems to have been its principal entrance is a rock face inscribed with nine lines of " Hittite " characters, greatly perished (Nishan Tash), and a similar inscription, equally illegible, can be detected on a neighbouring rock. Below the acropolis on the north-east is a residential quarter, containing large ruins of what seems to have been a palace or temple built round a central court. The whole site is surrounded by a strong wall, 14 ft. thick, with towers about 100 ft. apart. The monument, however, which earliest rendered Boghaz Keui famous is the sculptured rock grotto, 1 m. to the east, called Yasili Kaya. Here two hypaethral galleries are adorned with reliefs in panels, the larger gallery showing two processions, which, starting on both walls from the entrance, meet at the head of the grotto. On

the left wall are 45 figures, headed by a gigantic male figure, erect on the bent necks of two men. On the right wall he is opposed by a female of almost equal stature standing on a leopard or lioness, and followed by a young male with battle-axe, erect on a similar beast. Behind these are some 20 figures of mitred priests, &c. There can be no doubt that the female is the great Nature goddess of western Asia, attended by her spontaneously-generated son, with whose help she creates the world (see Great Mother of the Gods). Priests or minor divinities follow them. The other procession, according to the analogy of other monuments, should be composed of mortals bearing sacra and headed by their king, who makes offering or dedicates his city to, or engages in some mystic union with, the goddess. The figure following him seems to be that of his high priest. " Hittite " symbols are carved above many of the figures. Besides the proces- sions there are five independent reliefs in the small gallery and its approach, one repeating the figure of the high priest.

In 1906, as the result of the discovery of cuneiform tablets at Boghaz Keui by E. Chantre in 1890, a concession for the excavation of the site was obtained by the Berlin Oriental Society, and H. Winckler was sent to make a preliminary examination. He found a number of tablets in two languages, Babylonian and local, the latter being that of the Arzawa letters found at Tell el-Amarna. Among them was a cuneiform copy of the treaty made by Rameses II. in his 20th year with the king of the Kheta, and inscribed on a wall at Karnak. In 1907 Winckler returned with O. Puchstein and others and made regular excavations, laying bare much of the fortifications and two temples, and finding inscribed monuments and many more tablets. From those written in Babylonian Winckler has established the fact that Boghaz Keui was the capital of a powerful Hatti dynasty from the middle of the 16th century B.C. to at least 1200 B.C. He claims further that its ancient name was Hatti. At the height of its power it ruled all Asia Minor down to the Aegean and northern Syria to the headwaters of the Orontes, and was also overlord of the Mitanni and the Amurri (Amarru) in Mesopotamia. It had continual relation on terms of equality with Egypt and Babylonia. The four kings of the Kheta, alluded to by name in Egyptian texts, have been identified with kings of Boghaz Keui. The decline of Hatti power began with the expansion of Assyria after uoo B.C. and Cappadocia seems to have been inferior to Phrygia after the rise of the Midaean dynasty in the 9th and 8th centuries. It should be added that the identification of Boghaz Keui with the Pteria of Heroditus has not yet been confirmed, and the latter name has been claimed for a primitive site at Ak-alan near Samsun by Th. Makridi Bey, as the result of his excavations for the Constantinople Museum in 1907 (see Hittites).

Authorities. — C.Ritter, Erdkunde, xviii ; C.Texier, Descr. del'Asie Mineure (i., 1843); J. Hamilton, Researches, &c. (1842); H. Barth, Reise von

Trapezunt, &c. (Ergdnz. Petermann's Geog. Mith.; i860); G. Perrot and E. Guillaume, Expl. arch, de la Galatie (1862-1872); K. Humann and O. Puchstein, Reisen in Kleinasien u. Nordsyrien (1890); Murray's Guide to Asia Minor (1894); G. Perrot and C. Chipiez, Hist, de I'art (1886) vol. iv. ; Lord Warkworth, Notes of a Diary, &c. (1898); E. Chantre, Mission en Cappadocie (1898). (For recent excavations see Hittites.) (D. G. H.)

PTERIDOPHYTA (Gr. 7TT«ptj, fern, and vr6v plant), or as they are frequently called, the Vascular Cryptogams, the third of the large subdivisions of the vegetable kingdom. The Ferns form the great majority of existing Pteridophytes; the importance and interest of the other groups, of which the Club-mosses and Horsetails are the most familiar examples, depend largely on the fact that they are the surviving representatives of large families of plants which flourished in earlier geological periods. (See Palaeobotamy.)

The relation which exists between the two alternating stages

or generations, which together constitute the cohiplete life-cycle of all plants higher than the Thallophyta, is perhaps the most natural characteristic of the Pteridophyta. From the , germinated spore of a fern plant, which must not be OTy '

confused with the " seed " of seed-bearing plants, a small, flat, green organism is developed; this is the prothallus (gametophyte, sexual generation; fig. 7). As the result of fertilization of an ovum produced by this, the fern plant (sporophyte, asexual generation) originates; from it spores are ultimately set free, with the germination of which the life-history again commences. The point common to all Pteridophyta is that from the first the gametophyte is an independent organism, while the sporophyte, though in the first stages of its development it obtains nutriment from the prothallus, becomes physiologically independent when its root develops. This independence of the two genera- tions for the greater part of their lives distinguishes this group

Fig. 1. — Diagrammatic sketches of prothalli of-

o, Equisetum.

b, Lycopodium cernuum.

c, L. phlegmaria.

d, L. clavatum.

Selaginella. /, Botrychium virginianum. g, Helminthostachys. h, A Fern.

Salvinia.

on the one hand from the Bryophyta (in which the sporophyte is throughout its life attached to the gametophyte), and on the other hand from the Gymnosperms and Angiosperms (in which the more or less reduced gametophyte remains enclosed within the tissues of the sporophyte). The gametophyte, which is usually dorsiventral, though in some cases radially symmetrical (fig. 1, 6), is a small thallus attached to the soil by rhizoids. In structure it is equally simple, being composed of parenchyma- tous tissue without any clearly marked conducting system. Usually it grows exposed to the light and contains chlorophyll, but subterranean saprophytic prothalli also occur in the Lyco- podiaceae and Ophioglossaceae (fig. x,c,d,f,g). In the hetero- sporous forms the gametophyte is more or less reduced (fig. i, e, i). The reproductive organs ultimately produced on the same or on different individuals are of two kinds, the antheridia and archegonia; the origin of both is from single superficial cells of the prothallus. The antheridium (fig. 8) at maturity consists of a layer of cells forming the wall which encloses a group of small cells; from each of the latter a single motile spermatozoid originates. The archegonium (fig. 9) consists of a more or less projecting neck and the venter, which is usually enclosed by the tissue of the prothallus. A central series of cells can be distin- guished in it, the lowest of which is the ovum; above this come

the ventral canal cell and one or more canal cells. When the archegonium has opened by the separation of the terminal cells of the neck, the disintegration of the canal cells leaves a tubular passage, at the base of which is the ovum (fig. g, b). Down this

Fig. 2. — Diagrammatic sketches of spore-producing members of — u, Equisetum. d, Ophioglossum. g, Nephrodium.

b, Lycopodium. e, Kaulfussia. h, Salvinia.

c, Psilotum. /, Angiopteris.

(All except d represent vertical sections of sporangiophore or sorus.)

canal the spermatozoid, which in the Ferns has been shown to be attracted by reason of its positive irritability to malic acid, passes and fuses with the ovum. After fertilization the latter surrounds itself with a cell-wall and develops into the sporo- phyte. The early segmentation of the embryo

differs in the several groups, but usually the first leaf or leaves, the apex of the stem and the first root are differentiated early, while a special absorbent organ (the foot) maintains for some time the physio- logical connexion between the sporophyte and the prothallus. The sporophyte is always highly organized both as regards form and structure. Root, stem and leaf can be distinguished even in the simplest forms, and the plant is traversed by a well- developed vascular system. The reproductive organs of the sporophyte are the sporangia, within which the spores are produced; the sporangia are often borne on or in relation to leaves, which may be more or less distinct from the foliage leaves in form and structure (cf. fig. 2). The cells of the wall of the sporangium are usually so constructed as to determine the dehiscence of the sporangium and the liberation of its spores. The spores produced in each sporangium vary from very many to a single one in the case of some heterosporous forms. These latter bear spores of two kinds, microspores and megaspores, in separate sporangia. From the microspore an extremely reduced male prothallus and from the megaspore the female prothallus, develops (cf. fig. 1, e). The spores of the homosporous Vascular Cryptogams are usually of small size; the prothalli produced from them usually bear both antheridiaandarchegonia, though under special conditions an imperfect sexual differen- tiation may result. The complete life-history, with its regular alternation of gametophyte and sporophyte, is now known in all except a few rare genera of recent Pteridophyta, and will be described in connexion with the several groups. A cytological difference of great importance between the two generations can only be mentioned in passing. The nuclei of the cells of the sexual generation possess a definite number of chromosomes and this number is also characteristic of the sexual cells. On fertilization the number is doubled and all the cells of the spore- bearing generation have the double number. On the formation

of the spores a reduction to the number characteristic of the gametophyte takes place.

The systematic arrangement of the Vascular Cryptogams for the purposes of identification and description necessarily remains unchanged, while the comparative morpho- logy is being more fully worked out. But modifica- ˆuon'.' tions in the order of placing the natural groups are of importance in expressing the results of such investigations. Such a scheme may be placed here in a tabular form before entering on the consideration of the life-history, natural history, morphology, and classification of the several groups: —

Pteridophyta.

\ Equisetaceae. { Calamariaceae.

I. Equisetales

II. Sphenophyllales

III. PSILOTALES .

IV. Lycopodiales

V. Ophioglossales .

J Sphenophyllaceae. \ Cheirostrobaceae. Psilotaceae.

{Lycopodiaceae. Selaginellaceae. Lepidodendraceae. Isoetaceae. Ophioglossaceae.

‘ Marattiaceae.

Osmundaceae.

Schizaeaceae.

Gleicheniaceae.

Filicaceae . < Matoniaceae.

VI. Filicales … -J Loxsomaceae.

Hymenophyllaceae.

Cyatheaceae.

Polypodiaceae.

Hydropterideae \ SMniaceae. I (Marsihaceae.

These main subdivisions are of unequal size and importance. The Sphenophyllales are only known in a fossil state, while the Equisetales, Lycopodiales and Filicales include both living and extinct representatives. _ The small groups of recent plants forming the Psilotales and Ophioglossales are given independence in this scheme of classification owing to their exact affinities with the other phyla being at present doubtful.

I. Equisetales. — The plants of the single living genus Equisetum, which vary in height from a few inches to 40 ft., have subterranean rhizomes, from which the erect shoots arise. The habit of the plant depends on the degree of branching rather than upon the foliage. The internodes are elongated and hollow. The leaves are borne in whorls, those of each whorl cohering, except at their extreme tips, to form a sheath. The leaves of successive whorls alternate with one another, and this applies also to the branches which arise in the axil of the leaf sheath. In most species many of

these buds, which alternate with the leaves, remain dormant, but in others the aerial shoots are copiously and repeatedly branched. In some species branches of the rhizome with tuberous internodes are formed, which serve as a means of vegetative reproduction. The roots which arise from the base of the lateral buds remain undeveloped on the aerial stem. The vascular bundles equal in number the leaf-teeth from which they enter the stem and form a single ring. Each bundle runs downwards through one internode and then divides into two branches which insert themselves on the alter- nating bundles entering at this node. The young stems, and the older stems of certain species, are clearly monostelic; but in other species an inner and outer endodermis may be present, or an endodermal layer surrounds each bundle. The vascular bundles themselves are collateral, the xylem consisting of the protoxylem, towards the centre of the stem, and two groups of xylem, between which the phloem is situated; the protoxylem elements soon break down, giving rise to the carinal canal. Only the median or carinal strand of xylem is common to stem and leaf; the lateral cauline strands possibly represent the remains of a centripetally developed mass of primary xylem. There is no secondary thickening except at the node in E. maximum, where some short tracheides, arranged in radial rows, arise from a cambium. The stems, the surface of which exhibits a number of ridges with intervening furrows, perform the greater part of the work of assimilation. The chlorophyll-containing tissue reaches the surface at the sides and base of the furrows,

where stomata of peculiar form occur in the epidermis, while subepidermal strands of sclerenchyma occupy the ridges. In the cortical tissue beneath each furrow a wide intercellular space is present running the length of the internode, and called the

B P ˆ

(C, D, E from Strasburger's Lehrbuch der Botanik, by permission of Gustav Fischer.) Fig. 3. — Equisetum maximum.

A, Longitudinal section of the rhizome, including a node and portions of the adjoining internodes; k, septum between the two internodal cavities, hh; gg, vascular bundles; /, vallecular canal; 5, leaf-sheath.

B, Transverse section of the rhizome; g, vascular bundle ; J, valle- cular canal.

C, Fertile shoot showing two leaf-sheaths and the terminal strobilus.

D, E, Sporophylls bearing sporangia, which in E have opened.

vallecular canal. The central cylinder of the root, in which there are several xylem and phloem strands, has around it a two-layered endodermis, the inner layer of which appears to take the place of a pericycle. The sporangia are borne upon lateral outgrowths of the axis (the sporangiophores), which arise in whorls and are associated in definite strobili or cones (fig. 3, C); at the base of the cone an outgrowth of the axis like a rudimentary leaf sheath (the annulus) is present. Each sporangiophore (fig. 3 D) consists of a stalk expanding into a peltate disk of hexagonal outline; from the inner surface of the latter six to nine large sporangia hang parallel with the stalk. The single vascular bundle supplies a branch to the base of each sporangium. The latter arises from a number of superficial cells, the cells destined to form the spores being derived from a single one of these. A tapetal layer is derived from the cells surrounding the sporogenous group, and the arrest of a number of the spore-mother-cells further contributes to the nourishment of the remainder, each of which gives rise to four spores. The outermost layer of the cell-wall of the ripe spore splits along spiral lines, giving rise to the elaters; these two long strips of wall, attached by their middle points to the spore, tend to straighten out in dry, and close round the spore in damp air. They thus assist in the opening of the sporangium, which takes place by a slit on its inner face. Further, several spores will be likely to germinate together owing to their elaters becoming entangled; a fact of some importance, since the antheridia and archegonia, though occurring sometimes on the same prothallus, are more often borne on separate individuals. The prothalli contain abundant chlorophyll, and are dorsiventral. Those that bear the antheridia are the smaller, and are either filamen- tous, or flattened, and irregularly lobed. The antheridia are

deeply sunk in the tissue; the spermatozoids consist of a spiral of two or three coils, the numerous cilia being attached to the pointed anterior end. The female prothalli, which are sometimes branched, consist of a thick cushion bearing thin, erect lobes, at the base of which the archegonia are situated. The necks of the latter are short, the central series of cells consisting of ovum, ventral canal cell and one or two canal cells. The half of the embryo directed towards the archegonial neck gives rise to the apex of the stem and a sheath of three leaves, the other half to the small foot and the primary root. The first shoots are of limited growth, being replaced by lateral branches, which gradually acquire the number of leaf-teeth characteristic of the species.

Fossil species, some of which attained a great size, are known, to which the name Equisetites is given, since they appear to be closely allied to the existing forms. Two other extinct genera, Phyllotheca and Schizoneura, may be mentioned here. Abnormal specimens of Equisetum in which the

strobilus is interrupted by whorls of leaves are of interest for comparison with the fructification of Phyllotheca. The most important and best known of the extinct Equisetales are, however, the Calamites (see Palaeobotany : Palaeozoic). In the primary structure of the stem the Calamites present many points of resemblance to Equisetum, but secondary thickening went on in both stem and root. These plants, which appear to have grown in swampy soil, thus attained the dimensions of considerable trees. The leaves, which were of simple form (except in Archaeocalamites, where they forked), were inserted in whorls at the nodes; they were either free from one another or cohered by their bases into a sheath. Thf branches alternated in position with the leaves, and sprang from just above the insertion of the latter. Some of the branches terminated in cones, which present a general similarity to those of Equisetum. This similarity is closest in Archaeocalamites, an ancient type found in Upper Devonian rocks; in this the strobilus consists of peltate sporangiophores inserted in whorls on the axis. In the other Calamarian strobili known the whorls of sporangiophores are separated by whorls of bracts. In some the sporangiophores stood midway between the sterile whorls, while in others they approached the whorl above or below. There is a close resemblance between these sporangiophores and those of Equisetum, but as a rule only four sporangia were borne on each. Some Calamites were hetero- sporous, sporangia with microspores and megaspores being found in the same cone.

Our knowledge of the extinct Equisetales, full as it is with respect to certain types, does not suffice for a strictly phylogenetic classifica- tion of the group. The usual subdivision is into Equisetaceae including Equisetum and Equisetites (with which Phyllotheca and Schizoneura may be provisionally associated), and Calamariaceae, including Calamites and Archaeocalamites.

II. Sphenophyllales. — The two very distinct genera Sphenophyllum and Cheirostrobus, included in this group, are known only from the Palaeozoic rocks. Though the high specialization of this ancient group of plants renders the deter- mination of their natural affinities difficult, indications are afforded by anatomy and the morphology of the strobilus.

In general appearance the species of Sphenophyllum (the remains of Cheirostrobus known do not allow of any idea of its habit being formed) present some resemblances to the Equisetales. The long, sparingly branched stem bore at the somewhat swollen nodes whorls of six to eighteen wedge-shaped or linear leaves, which did not alter- nate in successive whorls. Both the broader and narrower leaves may be more or less deeply divided, and both forms may occur on the same shoot. From the relation of the thickness of the stem to its length it may be inferred that the shoots of Sphenophyllum derived support from adjoining plants. Without entering

into detail regard- ing the anatomy, it may be stated that secondary thickening took place in both genera. The single stele in the stem consisted of the phloem surrounding a solid central strand of xylem, the groups of protoxylem being situated at the projecting angles. In Spheno- phyllum, in which the transverse section of the xylem is triangular, there were three or six protoxylem groups ; in Cheirostrobus they were more numerous. The anatomy of the stem is thus very unlike that characteristic of the Equisetales, and presents essential points of resemblance to the Lycopodiales and especially to the Psilotales. The general morphology of the cones, on the other hand, suggests some affinity with the Equisetales. The cone of Sphenophyllum consisted of an axis bearing at the nodes whorls of bracts, united below into a sheath. The overlapping bracts afforded protection to the sporangia, which were borne on sporangiophores springing from the upper' surface of tha coherent bracts near their origin from the axis; two sporangiophores usually arose from each bract, and sometimes adhered to its upper surface for some distance. Each bent round at the upper end, and bore one or two sporangia on the side turned towards the axis. The mature sporangium had a wall of a single layer of cells, which were larger towards the

base, where they continued into the epidermis of the sporangiophore. In Sphenophyllum fertile both the ventral lobes of the sporophyll (corresponding to the sporangiophores in other species) and the dorsal lobes, which in other species are sterile, were developed as peltate sporangiophores. In other species of Sphenophyllum, which are known only as impressions, single sporangia, or groups of four, appear to have been inserted directly on the upper surface of the bracts. In Cheirostrobus a similar relation of sporangiophores to bracts existed, but here each bract was divided into three segments. From each segment, near its base, a stalked peltate sporangiophore arose; this bore four sporangia, which hung parallel to the stalk. That these three sterile segments, with their sporangiophores, are together comparable to one of the bracts of Sphenophyllum, with its sporangiophores, is shown by the vascular supply in each case being derived from a single leaf-trace. So far as is at present known, the Sphenophyllales were homosporous. The differences between the two genera described above are sufficiently marked to justify the division of the Sphenophyllales into the two orders Sphenophyllaceae and Cheirostrobaceae. A consideration of the characters of both shows that the Psilotales are the nearest living representatives of the Sphenophyllales, while resemblances suggesting actual relation- ship exist between this group and the Equisetales and Lycopodiales. It has been suggested that the

Sphenophyllales may have sprung from a very old stock which existed prior to the divergence of the latter groups. So long, however, as our knowledge of these phyla is confined, as at present, to specialized forms, the nature of the relationship between them must remain to some extent hypothetical.

III. Psilotales. — The two genera Psilotum and Tmesipteris, which are provisionally isolated in this group, have usually been classed with the Lycopodiales. Recent work both on their anatomy and on the morphology and structure of their spsre- producing organs has however tended to show that their peculiarities can be best understood in the light of our kno.wledge of the Sphenophyllales. Some authorities place them in this group and there is much to be said in support of the close rela- tionship implied. The Psilotaceae, however, differ from the Sphenophyllales in a number of definite features, such as the arrangement of the leaves singly and not in whorls, and the mode of branching. These differences and our comparatively im- perfect knowledge of the Sphenophyllaceous plants which most closely resemble the Psilotaceae appear to justify the provisional isolation of the latter as a distinct group, showing affinities with both the Sphenophyllales and Lycopodiales. In both Psilotum and Tmesipteris the functions of the root-system, which is com- pletely absent, are performed by leafless rhizomes bearing absorbent hairs and inhabited by an endophytic fungus. Psilo- tum lives epiphytically or in soil rich in humus, while Tmesipteris is epiphytic (and, it has been suggested, partially parasitic) upon stems of tree ferns: the former has small scale-like leaves; those of the latter are of considerable size. The stem is mono- stelic, the piotoxylem groups being towards the periphery of the xylem, the development of which is thus centiipetal; the centre of the stele is occupied by sclerenchymatous tissue. The leaves, which bear the sporangia, are dichotomous, and do not form definite cones, but alternate in irregular zones with the foliage leaves. The sporophylls may exceptionally undergo further dichotomies and bear more numerous synangia. The sporangia of the Psilotaceae are associated in synangia, which occupy the same position relatively to the sporophyll, as the single sporangium of Lycopodium or the group of sporangia in Spenophyllum majus. The careful study of the development of the synangium of Tmesipteris, which consists of two loculi, and of Psilotum, which consists of three, has shown that their structure can be explained as originating by the septation of a single sporangium resembling that of Lycopodium. Other views of the nature of the Psilotaceous synangium are, however, possible, and indeed the existence of both simple and complicated sporangiophores in the Sphenophyllaceae leaves the question open as to whether the synangium in existing Psilotaceae is a relatively simple type of sporangiophore which has persisted unaltered or is the result of reduction from a more elaborate structure. There is some reason to believe that the prothallus of Psilotum

resmbles some Lycopodium prothalli, but conclu- sive evidence is wanting; that of Tmesipteris is unknown.

IV. Lycopodiales. — The living representatives of this group are of small size compared with the related plants which lived in Palaeozoic times. A large proportion of the living species are

tropical, though others' have a wide distribution. As general characteristics of the Lycopodiales, the simple form of the leaves, which are generally of small size, and the situation of the sporangia on the upper surface of the sporophylls, which are often associated in cones, close to their insertion on the axis, may be mentioned; there aie both homosporous and heterosporous forms, the prothalli exhibiting corresponding differences. A number of species of Lycopodium are epiphytic and those of Isoetes live submerged in water. Vegetative reproduction is effected in various ways: by the separation of the branches of a creeping stem in some Lycopodia, the persis- tence through the winter of the apex of the shoot in L. inundatum, and by the formation of leafy bulbils on the aerial stem of L. Selago and others. A highly specialized means of vegetative reproduction is seen in the tubers of Phylloglossum and the embryos of some Lycopods. The modifications shown by the gametophyte of Lycopodium will be described below. All such special relations of the plant to its environment, which might be expected in the few forms of a large group which has per- sisted beyond the others, are less marked in the genus Selaginella. It would appear as if the latter was more suited to the conditions of the existing flora, and many of the specific forms within it may rather be regarded as recently evolved than as simply persistent.

Lycopodiaceae. — This order contains the two genera Phylloglossum and Lycopodium ; the former has a single species, confined to Australia, Tasmania and New Zealand, while nearly one hundred species of Lycopodium are known. Erect and creeping terrestrial plants and

(From Strasburger's Lehrbttch der Botanik.)

Fig. 4. — Lycopodium clavatum.

A, Old prothallus.

B, Prothallus bearing young sporophyte.

G, Portion of a mature plant showing the creeping habit, the adventitious roots and the specialized erect branches bearing the strobili or cones.

H, Sporophyll bearing the single sporangium on its upper surface.

/, Spore, highly magnified.

pendulous epiphytes occur in the latter genus. The simple leaves, which are of small size and do not possess a ligule, are arranged spirally around the branched stem in the majority of the species. The roots of the erect forms often grow downwards in the cortex of the stem to reach the soil. The anatomy of Lycopodium presents considerable variety in detail, but the stem is always monostelic and the development of the xylem centripetal, the protoxylems being situated at the periphery of the stele; pericycle and endo- dermis surround the stele, and the wide cortex may be more or less

sclerenchymatous. The central cylinder of the root often shows a striking resemblance to that of the stern. The Lycopodiaceae are homosporous. The spores are formed in sporangia of considerable size, situated on the upper surface and near the base of the sporophylls. The latter may differ from the foliage leaves and be arranged in definite cones, or the two may be similar and occupy alternate zones of a shoot with continued growth; sometimes rudiments of sporangia are found at the bases of the leaves (fig. 4). In the development of the sporangium the sporogenous tissue is derived from a number of superficial cells by divisions parallel to the surface. The tapetum is derived from the layer of cells surrounding the sporo- genous group. Short trabeculae of sterile tissue have been found to project into the cavity of the sporangium of some species. The spores, when liberated by the dehiscence of the sporangium, give rise to the prothallus, which is now, owing mainly to the investiga- tions of Treub and Bruchmann, known in a number of tropical and temperate species. In habit and mode of life of the prothallus these present striking differences, which may be correlated with the situations inhabited by the sporophyte, and are perhaps to be regarded as adaptations which have enabled the species to survive. Thus in L. cernuum and others the prothallus is green and grows on the surface of the soil (fig. 1, b) ; in the species living on the moors it is subterranean and saprophytic, though sometimes capable of developing chlorophyll when exposed to light (fig. I, d) ; while in L. Phlegmaria and other epiphytic forms the prothallus consists of fine branches growing saprophytically in rotting wood (fig. I, c). A comparison of these various types would appear to indicate that the primitive form of prothallus in the genus was radially symmetri- cal and contained chlorophyll. The prothalli of L. cernuum come nearest to this; in them the meristem forms a zone slightly below the summit, which may bear a number of green lobes. The different forms of the prothallus found in L. Selago give an idea of how the more extremely modified types could be derived from such a prothal- lus as that of L.

cernuum. All the saprophytic prothalli contain an endophytic fungus in definite layers of their tissue. The antheri- dia and archegonia are produced above the meristematic zone, and are more or less sunk in the tissues of the prothallus. The most important difference in the sexual organs concerns the length of the archegonial neck; this is shortest and has only a single canal cell in L. cernuum, while in L. complanatum it is longer than in any other Vascular Cryptogam, and contains a number of canal cells. The spermatozoids are biciliate. The embryo in L. cernuum and other forms with superficial green prothalli is attached to the prothallus by a small foot, and develops at first as a tuberous body (the proto- corm) bearing'rhizoids ; this forms a number of simple leaves, and upon it the apex of the shoot arises later. In the saprophytic forms the protocorm is absent, and in some of them the foot is of large size (fig. 4, B). When new individuals of species which possess a proto- corm arise vegetatively from the leaves or roots of young plants, the protocorm appears in the young sporophyte. This fact leads to the consideration of Phylloglossum, which resembles the embryo of Lycopodium cernuum in so many respects that it has been spoken of as a permanently em- bryonic form of Lycopod : it is in some respects the simplest existing Pterido- phyte. Its prothallus resembles that of L. cernuum, but wants the crown of assimi- lating lobes. The plant is reproduced by tubers, which resemble the protocorm in bearing first a number of protophylls and later the upright shoot with its single terminal strobilus. The sporangia agree with those of Lycopodium in structure and position.

Selaginellaceae. — The single genus of this order {Selaginella) contains between three and four hundred species. There is considerable diversity among them as regards external form, the majority having , dorsiventral aerial shoots with dimorphic leaves (fig. 5, A), while in others the shoots are radially symmetrical and the leaves alike. The stem contains one, two or several steles; in one species the stele is tubular. The phloem completely surrounds the

xylem, which usually develops from two

(From Strasburger's Lthrbuch protroxylem groups. In the aerial stem

da Boianik.) f t h e British species (S. spinosa) the

Fig. 5. — Selaginella. radial stele has a number of protoxylem

A, S. helvetica (nat. size), groups arranged round the periphery,

B, S. denticulata, young much as in Lepidodendron. The cells of plant attached to the the endodermis are developed as trabe- megaspore (enlarged), culae, which traverse the continuous

air-space surrounding each stele. The simple, uni-nerved leaves have a ligule near the base; the base of the ligule is somewhat sharply marked off from the other tissues of the leaf. In some species a depression of the leaf-surface encloses the ligule, regarding the function of which little is known. The roots, the stele of which is monarch, may arise directly from xxil. vo

the stem, or are borne on rhizophores, which spring from the shoot at the point of branching, and root on reaching the soil. In structure they resemble the roots, but their morphological nature is uncertain. The sporophylls are arranged radially in the cones, which are terminal on the branches. A single sporangium is borne on the axis just above the insertion of each sporophyll. Selaginella is heterosporous, the megasporangia being often found towards the base of the cone. The development of the micro- and mega- sporangia is the same up to the stage of isolation of the spore mother-cells. The sporogenous tissue, which is referable to several archesporial cells, is surrounded by a tapetum, mostly derived from the sporogenous group. In the microsporangium all the mother-cells undergo the tetrad division, giving rise to the numerous microspores. In the megasporangium, on the other hand, the four megaspores, which arise from a single mother-cell, are nourished at the expense of the other sporogenous cells and of the tapetum. On germination the microspores give rise to a reduced prothallus, consisting of the small cell first cut off and a wall of cells enclosing two to four central ones; from these latter the biciliate spermatozoids originate. The megaspore becomes filled with the female prothallus, the formation of cell-walls commencing at the pointed end of the spore, where from the first the nuclei are more numerous, and later extending to the base. The surface of the prothallus, which is exposed when the thick wall of the spore is ruptured, may produce a few rhizoids; upon it the archegonia, con- sisting of a short neck and the central series of ovum, ventral canal cell and canal cell, arise (fig. I, e). After fertilization the embryo forms a short suspensor; the apex of the stem, with a leaf on each

side of it, is first distinguishable; at the base of this is the foot; while the root arises on the farther side of the latter. Thus the position of the root in Selaginella is different from what obtains in the other Vascular Cryptogams. A point of interest in this heterosporous genus is that the formation of the prothallus may commence before the megaspore is liberated from the sporangium.

Lepidodendraceae. — This order includes only extinct forms, the best known of which are the plants placed in the genera Lepido- dendron and Sigillaria. These plants, a fuller description of which must be sought in ths article Palaeobotany : Palaeozoic, under- went secondary increase in thickness and attained the size of large trees; the aerial stem was more or less branched dichotomously. The leaves, which were of simple form and provided with a ligule, were, as the leaf-scars on the stem show, variously arranged. In Sigillaria the latter form vertical rows, while in Lepidodendron the arrangement is a complicated spiral. The stem had a single stele, the primary xylem of which was polyarch and centripetally developed. The upright stems were attached to the soil by a number of dichotomously branched members (Stigmaria), which, whatever their morphological nature may be, appear to have per- formed the function of roots: they bore numerous cylindrical appen- dages, which penetrated the soil on all sides. The cones, which in some instances at least were heterosporous, presented a general resemblance to those of Lycopodium and Selaginella, a single sporan- gium being situated on the upper surface of each sporophyll. The cavities of the large sporangia were sometimes traversed by trabe- culae of sterile tissue resembling those found in Isoetes. In some of the heterosporous forms (Lepidocarpon, Miadesmia) the sporangia were sometimes surrounded by an integument; and since only a single megaspore attained maturity, the structure of the mega- sporangium suggests a comparison with an ovule.

Isoetaceae. — The single genus (Isoetes) contains about fifty, mostly aquatic, species, though a few are amphibious or terrestrial. The plants present considerable uniformity in general habit, consisting of a short, unbranched stem, bearing the closely-crowded awl-shaped leaves, which in the larger species attain the length of a foot. Each leaf bears a ligule resembling that of Selaginella in structure and position. The stem is monostelic, the centre of the stele being occupied by a mass of short tracheides; but little can be said as to the primary structure of the central cylinder, which appears to be reduced. A meristematic zone forms a short distance outside the xylem, from which secondary tissue is developed both internally and externally; that to the inside contains both xylem and phloem elements. By the unequal development of the secondary cortex the stem becomes two- or three-lobed; the roots, which branch dichotomously, spring from the furrows between the lobes. The leaves have a single main

bundle, and in the mesophyll are four longitudinal series of large intercellular spaces separated by trans- verse diaphragms. The sporangia, which are situated singly on the adaxial surface of the leaves, between their insertion on the stem and the ligule, arise from a considerable number of epidermal cells. The cells composing the young sporangium are at first similar, but ultimately become differentiated into sterile trabeculae, which may stretch from the inner to the outer wall, and the mother-cells of the spores. The latter are more numerous in the microsporangium than in the megasporangium. The tapetal layer is partly formed from the sporangial wall and partly as a layer covering the trabeculae. The spores, which are set free by the rotting of the sporangial wall, germinate much as in the case of Selaginella, though the similarity may be a case of independent resemblance. Important points of difference are found in the multiciliate spermatozoids, and in the embryo, which has no suspensor.

PTERIDOPHYTA

The several orders of Lycopodiales described above, while presenting a number of features in common, are distinctly isolated from one another. A natural classification of such specialized plants can only be obtained when the extinct forms are more fully known. What is known at present, while it does not indicate the phylogeny of the Lycopodiales, at least shows that such living orders as Lycopodiaceae and Selaginel- laceae cannot be regarded as forming a linear series. The difficulty is increased when it is borne in mind that the small surviving forms probably have a long geological history, and may have coexisted with the Lepidodendraceae. For these reasons no attempt has been made to arrange the orders in larger divi- sions, since such a division as that of the ligulate and eligulate forms, while convenient for practical purposes, may not express the phylogeny of the group. The Psilotaceae, formerly in- cluded in the Lycopodiales, have been described separately owing to their resemblance to the Sphenophyllales. It remains to be mentioned that the Isoetaceae have been regarded as more nearly allied to the Filicales than to the former, near which they are here placed.

V. Ophioglossales. — The peculiarities of this small order of Pteridophyta render their systematic position a matter of doubt, especially in the absence of evidence as to their geological history, and justify their separation for the present from the other main natural groups. In the three genera, Ophioglossum, Botrychium and Helminthostachys , there is an underground rhizome, from which one leaf or a few leaves with sheathing bases are

produced annually; the roots arise in more or less definite relation to the insertion of the leaves. The latter are simple, or irregularly lobed in Ophioglossum, more or less compoundly pinnate in Botrychium and palmately pinnate in Helminthostachys. The fertile branch or branches are situated on the adaxial surface of the leaves, and may be simple, as in Ophioglossum (fig. 2, d), or more or less compound, the degree of branching in the sterile and fertile segments exhibiting a general parallelism. The stem is monostelic, the arrangement of the xylem and phloem being collateral. The endodermis and pericycle surround the whole stele in Botrychium and Helminthostachys; in Ophioglossum each bundle has a separate sheath. Well- marked secondary thickening occurs in Botrychium. In the roots of Ophioglossum and' Botrychium and in the first formed roots of Helminthostachys an endophytic fungus is present, forming a mycorhiza — the stele in the larger roots has the usual radial arrangement of xylem and phloem; monarch roots occur in Ophioglossum. The morphology of the fertile spike is a disputed question, upon the answer to which the systematic position of the Ophioglossaceae largely rests. The spike is most simple in Ophioglossum, where it bears on each side a row of large sporangia, which hardly project from the surface, the vascular bundles occupying a central position. In the young spike, which arises when the leaf is still very small, a band of tissue derived from superficial cells is distinguishable along either side; this sporangiogenic band gives rise to the sporo- genous groups, the sterile septa between them, and the outer walls of the sporangia. The spike of Helminthostachys corre- sponds to that of Ophioglossum, but in it the sporangia are borne on two lateral rows of branched sporangiophores. The sporangia themselves resemble those of Botrychium, which project from the ultimate subdivisions of the branched spike; each is developed from a number of cells, the sporogenous tissue arising from a single cell. Two diverse views of the morphology of the fertile spike in these plants have been entertained. The older view was that it was a fertile segment of the leaf; and though its ventral position presents a difficulty, this must be regarded as a possible explanation; the occasional occurrence of sporangia on the lamina in Botrychium has been regarded as supporting it. On the other hand, the spike has been ex- plained as due to the elaboration of a single sporangium occupying a similar position with regard to the leaf as in the Lycopodiales, and evidence of considerable weight has been brought forward in support of this interpretation. The im- portant bearing of this question on the relationship of the

Ophioglossaceae to the phyla of the Filicales and Lycopodiales will be obvious.

The position of the fertile spike in relation to the leaf corresponds to that of the synangium or sporangiophores in the Psilotales and Sphenophyllales. The Ophioglossaceae are homosporous, and the prothalli, which are known

in species of all three genera, are sub- terranean and saprophytic (fig. I, /, g). The prothallus of O. pedunculosum, as observed by Mettenius, subsequently reached the surface and produced green lobes ; those of the other species known are wholly saprophytic, and contain an endophytic fungus. Those of Ophioglossum are cylindrical, while the dorsiventral prothallus of Botrychium bears the sexual organs on the upper surface. They present a general, but probably homoplastic, resemblance to the saprophytic prothalli of certain Lycopodia. Important points of difference exist, however, in the apical position of the meristem of the Ophioglossaceous prothalli, in the presence of a basal cell to the archegonium, and in the multiciliate spermatozoids. In these respects, in the megaphyllous habit and in certain anatomical features, the Ophioglossaceae approach the Filicales. Some species of Botrychium have recently been found to have embryos provided with a suspensor. The position of the Ophioglossaceae can at present only be regarded as an open question, in considering which the possible antiquity of the group must be borne in mind.

VI. Filicales. — This group of Pteridophyta differs from the others in being well represented in our present flora by forms, many of which can be regarded not as archaic types which have persisted to the present day, but as having been evolved in comparatively recent periods. The Ferns exhibit a wide range in size from the minute epiphytic Hymenophyllaceae, with leaves barely a centimetre in length, to gigantic tree-ferns 80 ft. or more in height. A general characteristic of their habit is the large size of the leaves, which are often highly compound, relatively to the stem. Some ferns have a longer or shorter erect stem often clothed by the persistent bases of the leaves; in others the stem creeps on the surface of the substratum or is subterranean. Its surface is clothed with filamentous or scaly hairs (paleae), which protect the growing point; and adventi- tious roots spring from it. The position of the branches varies in the group; they are only exceptionally axillary (Hymenophyl- laceae, Botryopterideae). The anatomy of the stele in the stem exhibits on the whole a progression from a solid protostele through a tubular solenostele to one or more circles of separate steles derived by the breaking up of the solenostele. The leaf-traces usually interrupt the continuity of the stele of the axis on their departure. The sporangia are borne in groups (sori) on the under surface of the leaves; some- times the fertile leaves differ more or less from the purely vegetative ones. The form of the sorus and the structure of the sporangium are of great systematic importance. The sorus is frequently pro- tected by an outgrowth from the surface or margin of the leaf called the indusium. Heterospory is only known in the Hydro- pterideae. The prothallus developed from the spore is green and in most cases dorsiventral, bearing the archegonia and antheridia on the under surface.

Some of the more striking adaptive modifications in the gametophyte and sporophyte, and certain effects of al- tered external conditions which have been ascertained experimentally, may be briefly mentioned. The dorsiventrality of the prothallus has been shown to depend mainly on the illumination, the filamentous form being retained in feeble

light ; a similar result is obtained when the (From strasburger's Lehr- prothalli are cultivated in water. These facts may have a bearing on the filamen- tous prothalli of some Hymenophyllaceae. The reproduction of the prothallus by

gemmae in species of Trichomanes, Vittaria and Monogramme is another interesting adaptation; the prothallus of Gymnogrammt

buck der Botanik.}

Fig. 6.-Scolopendrium vulgar e.

PTERIDOPHYTA

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leptophylla is perennial, the sporophyte being annually borne on it. The phenomena of apogamy and apospory which have now been observed in a number of Ferns, may be mentioned here. In the former the prothallus produces one or more fern-plants vegetatively, the projection which develops into the sporophyte in many cases occupying the position of an archegonium. In some apogamous Ferns sporangia may occur on the prothallus and the vegetative organs of the sporophyte may also occur singly. In apospory the converse phenomenon- is seen, the gametophyte springing vegetatively from the sporangium, re- ceptacle of the sorus, or leaf-margin of the fern-plant. In a number of cases, though not in all, apospory appears to be correlated with a failure of the sporangia to develop.

pores derived from stomata occur in the epidermis. The sori are borne on the under surface of the pinnae, usually in a single row on either side of the midrib, but in Kaulfussia dotted over the expanded lamina. The large sporangia, each of which originates from a number of superficial cells, are here incompletely separated from one another and arranged in a single circle forming a synangium. The

Strasburger's Lehrbuch der Botanik.)

Mature antheridium. Empty antheridium;

{From Strasburger's Lehrbuch der Botanik.)

Fig. 7. — Nephrodium filix-mas.

A, Prothallus viewed from the lower surface; ar, archegonia; an, antheridia; rh, rhizoids (much enlarged).

B, Prothallus bearing a young fern plant; b, first leaf; w, primary root.

The adaptations in the vegetative organs of the sporophyte are similar to those in the Flowering Plants. Thus there are a few

Ferns which climb, others are water plants, while many, es- pecially those which live as epiphytes, are more or less xero- phytic. Some of the epiphytic forms {Poly podium quercifolium, Platycerium) have strongly di- morphic leaves, the sterile leaves serving in some cases to catch falling debris, and thus to provide the plant with soil. Lastly, the symbiotic relation between the plant and ants is found in Ferns, the rhizome of Polypodmm car- Fig. S. —Polypodium vulgare. nosum containing cavities in- habited by these insects. The existence of these myrmecophilous prothallial cell; 1, 2, cells of Ferns suggests a possible explana- antheridial walls; 3. cap cell. tion of the nec taries on the leaves C, D , Spermatozoids. q{ sQme Qther spedeSj such as the

Common Bracken. The main existing groups of the Filicaceae may now be briefly described, with special reference to the characters of gametophyte and sporophyte, which have been found of value in determining

affinities.

Marattiaceae. — These are ferns of considerable size, the large leaves of which are borne on a short, erect, swollen stem (Angiopteris, Marattia), or arise from a more or less horizontal rhizome {Danaea, Kaulfussia). The leaves, at the base of which are two large stipule- like outgrowths, have a thick leaf-stalk, and are simple or simply pinnate in Danaea, pinnate in Archangiopteris, bi- to tri-pinnate in Marattia and Angiopteris, and digitately lobed in Kaulfussia. The stem, from the ground tissue of which sclerenchyma is absent, has a complicated system of steles arranged in concentric circles; the thick roots, the central cylinders of which have several alter- nating groups of xylem and phloem, arise in relation to these. The pinnae, except in a few filmy forms, are thick; in Kaulfussia large

(From Strasburger's Lehrbuch der Botanik.)

Fig. 9. — Polypodium vulgare.

A, Unopened archegonium; 0, ovum; k", ventral canal cell; k', neck-canal-cell.

B, Mature opened archegonium.

association is closest in Danaea, where the individual sporangia of the elongated sorus, which is sunk in a depression of the leaf, open by pores; in Marattia and Kaulfussia (fig. 2, e) they dehisce by slits on the inner face; while in Angiopteris (fig. 2, /) they are almost free from one another. The spores produce a green prothallus of large size, the sexual organs of which hardly project from the surface. The cotyledon and stem grow up vertically through the prothallus, the root turning downwards into the soil.

Osmundaceae. — The two genera of this group, Osmunda and Todea, have thick erect stems, covered with the closely crowded leaf bases. The stem is monostelic, the vascular tissues being separated into curved groups comparable with collateral vascular bundles, which surround the pith. The somewhat thick roots are diarch. The leaves are large and pinnate ; their lamina is usually thick, though filmy species of Todea occur. The leaf-base shows indica- tions of stipular outgrowths. In Todea the sori, each of which consists of a single circle of bulky sporangia, are borne on the under surface of the pinnae. In Osmunda the region of the leaf which bears the sporangia has its lamina little developed ; the leaf thus bears sterile and fertile pinnae, or, as in 0. cinnamomea, sterile and fertile leaves may be present. The sporangia originate from single cells, though surrounding cells may contribute to the formation of the stalk. The latter is thick and short, and the wall of the sporangium, which opens by a median slit, has a group of thick-walled cells at the summit, forming the annulus. The prothalli are similar to those of the other Filicaceae, but more massive ; the same may be said of the archegonia and antheridia, which, however, project more than in the preceding group.

Schizaeaceae. — The anatomy of the stem differs in the four recent genera of this order, and presents a series possibly illustrating the origin of a number of concentric steles from a solid stele, the inter- mediate step being represented by those forms in which the central cylinder is tubular. The sporangia are borne singly or in sori of cwo or three on the margin or under surface of leaves, the fertile pinnae of which differ more or less from the sterile segments. The sporangium is of considerable size, and dehisces by a median slit, the annulus being a more or less definitely limited horizontal ring of cells near the apex. The prothallus and sexual organs may resemble those of the Polypodiaceae ; in Aneimia and Mohria the prothallus, though flattened, is not bilaterally symmetrical, the growing point being on one side; a filamentous type of prothallus is known in Schizaea.

Gleicheniaceae. — These forms have a horizontal rhizome, from which simply pinnate leaves arise in Platyzoma, while Gleichenia bears compound pinnate leaves with continued apical growth. The rhizome usually has a solid central cylinder in Gleichenia, while that of Platyzoma is tubular. The sporangia arise simultaneously in the sorus, which is borne on the under surface of the ordinary pinna; in those species with large sporangia the latter form a single circle, in others sporangia may also arise from the central part of the receptacle. The annulus is horizontal and the dehiscence median. The prothalli, while resembling those of the Polypodiaceae, have points of similarity with those of the preceding groups.

Matoniaceae. — This contains the single genus Matonia, two species of which are known from the eastern tropics. They are of special interest, since they have been shown to be the surviving forms of a group species which have been identified from Jurassic and Cretaceous rocks. The living species have a long rhizome, from the upper surface of which the large leaves arise; these are branched in a pedate manner, each branch being pinnate. The structure of the rhizome is complicated, a transverse section showing that the centre may be occupied by a solid stele, outside of which are two tubular steles. The sori are borne on the under surface of the pinnae,

each consisting of a single series of large sporangia covered by a coriaceous indusium, which is attached to the central part of the receptacle. The sporangium, which corresponds on the whole to that of the Gleicheniaceae, has a somewhat oblique annulus ; the dehiscence also is not truly median. The gametophyte is unknown.

Loxsomaceae. — The single genus Loxsoma has a tubular stele in its rhizome, which bears leaves resembling those of some Davallias. The elongated receptacle of the marginal sori is surrounded by a basal cup-shaped indusium. The sporangia, which arise in basipetal succession on the receptacle, dehisce by a median slit, though the annulus is somewhat oblique; they have resemblances to the Gleich- eniaceae. When mature, the sporangia are raised above the margin of the indusium by the elongation of the receptacle, thus facilitating the dispersion of the spores. The gametophyte is unknown.

Hymenophyllaceae. — This group, which contains the two genera Hymenophyllum and Trichomanes, is characterized by the prevalent ” filmy ” texture of the leaves. Many of the species inhabit situations in

which the air is constantly moist, especially in the tropics; some are terrestrial; others, some of which are very minute, are epiphytic on tree-stems. A single solid central cylinder is found in the rhizome. The sori, which are marginal, have a long receptacle, bearing the sporangia in basipetal succession, and are surrounded by a cup-shaped indusium. The sporangia present a considerable range in size, the largest being found in species of Hymenophyllum, the smallest in Trichomanes. Each has an almost horizontal annulus resembling that of Gleichenia, but the dehiscence is lateral. The gametophyte in Hymenophyllum is flat and variously lobed; that of Trichomanes may be similar, but in other species is filamentous. The archegonia and antheridia present points of similarity to those of the Gleicheniaceae.

Cyatheaceae. — This order includes the majority of existing tree- ferns, as well as some of smaller size. The stem has a ring of flattened steles. The sorus has a somewhat elongated receptacle, on which the sporangia arise basipetally; the indusium may be cup-shaped, bivalve or wanting. The dehiscence of the sporangium is almost transverse, as in the Polypodiaceae, but the annulus is slightly oblique. The prothalli correspond to those of the next group.

Polypodiaceae. — This group, which contains the remaining ferns, includes a number of distinct lines of descent and will doubtless require subdivision as our knowledge of the morphology of the genera classed in it becomes extended. Space will not allow of an account of the progress already made in this direction. The stem in the more primitive forms has a tubular stele (solenostele) ; for the most part two to many steles, arranged in a ring (dictyostele). In a number of genera, which there is reason to regard as relatively primitive, the sporangia show the same regular basipetal succession as in some of the preceding groups ; in the great majority, however, the succes- sion is not regular, but those of various ages are intermixed in the sorus (fig. 2, g). The sporangia dehisce by a transverse slit, the annulus being truly vertical or, in some of the genera in which they are regularly arranged, very slightly oblique. The structure of the prothallus and sexual organs will be evident from figs. 7, 8 and 9; some of the more interesting modifications have been referred to above.

Our knowledge of the extinct Filicales cannot be readily summarized, since it is in a transition state, owing to the recent evidence which has shown that many of the fern-like plants of the Palaeozoic period belonged to a group of seed-bearing plants derived from a filicineous ancestry. There is, however, abundant evidence that the Ferns were represented in the most ancient floras known, though they were not such a dominant group as has hitherto been supposed. The best known of these ancient Ferns belong to the Botryopterideae; the characters of this group point to its having been the

starting-point of several series of existing Ferns (see Palaeobotany: Palaeozoic).

A consideration of the Filicaceae as arranged above will show that the several sub-orders may in general terms be said to form a series between those in which the sorus consists of a single circle of bulky sporangia and those Polypodiaceae in which the numerous small sporangia appear to be grouped without order in the sorus. When the survey is extended to the extinct Ferns of which the fructification is known, many of those from the more ancient rocks are found to group themselves with the exist- ing sub-orders with large sporangia, such as the Marattiaceae, Gleicheniaceae and Schizaeaceae; the Polypodiaceae, on the other hand, do not appear until much later. The extinct forms cannot be dealt with in detail here; but it may be pointed out that their order of appearance affords a certain amount of direct evidence that the existing Ferns with a single circle of large sporangia in the sorus are relatively primitive. The series which can be constructed from a study of the sorus is in general supported by the anatomy of the sporophyte, and by the

structure and sexual organs of the gametophyte. A more detailed investigation of all the characters of the Ferns will be needed before the course of evolution thus broadly indicated can be traced, but the results obtained afford a deeper insight into the general method of progression and the selective factors in the process. On the ground mainly of an examination of the sorus and sporangium, Bower has shown that the Filicaceae may be divided into three groups — the Simplices, Gradatae and Mixtae — in which the sporangia arise simultaneously, in basipetal succession, or irregularly in the sorus respectively. The first includes the Marattiaceae, Osmundaceae, Schizaeaceae, Gleicheni- aceae and Matoniaceae; the second the Loxsomaceae, Hymeno- phyllaceae, Cyatheaceae and the Dennstaedtineae (a group including species placed in the Synopsis Filicum in Dicksonia and Dwvailia) ; while the remaining Polypodiaceae constitute the Mixtae. The change from the one type of sorus to the other may have taken place in several different lines of descent, some of which have been traced. A consideration of the biology of the sorus gives an insight into the advantages obtained by the one type over the preceding, as regards protection, spore pro- duction and the dispersal of the spores, and thus indicates the way in which natural selection may have acted. The differences in the form and mode of dehiscence of the sporangia (those of the Simplices having median dehiscence and a horizontal annulus, those of the Gradatae a more or less oblique position of the annulus and of the plane of dehiscence, while in the Mixtae the annulus is vertical and the dehiscence transverse) stand in rela- tion to the position of the sporangia in the sorus relatively to one another. The application of the important criteria which Bower has thus pointed out to the construction of a strictly

phylogenetic classification of the Filicaceae cannot be made until the anatomy, the sexual generation and the palaeobotanical evidence have been further examined from this point of view. Though on this account and because the subdivisions Simplices, Gradatae and Mixtae do not correspond to definite phylogenetic groups, they have not been used in classifying the Ferns above; they are of great importance as an advance towards a natural classification.

Hydroptekideae. — Two very distinct orders of hetero- sporous Filicales, the Salviniaceae and the Marsiliaceae, are in- cluded in this group. The difficulty of determining their exact relationship to the other orders of Ferns is increased by the more or less completely aquatic habit of the plants and the modifica- tions and reductions in structure associated with this. The absence of an annulus from their indehiscent sporangia makes it impossible to compare them with the other Ferns in respect of this important character. It has been suggested with con- siderable probability that the Marsiliaceae- are allied to the Schizaeaceae, while the Salviniaceae may possibly be related t& the Hymenophyllaceae or to some other family of the Gradatae. Space will only permit of a brief general account of the more obvious features of the several genera, the structure and life- history of which are known in great detail. Unlike as they are in many respects, the two orders agree in being heterosporous. The microspores on germination produce a small, greatly reduced male prothallus bearing one or two antheridia which give rise to a number of spirally coiled, multiciliate spermatozoids. The single large megaspore contained in each megasporangium pro- duces a small prothallus, which bears one or a few archegonia; these are exposed on the surface of the prothallus at the summit of the germinated megaspore (fig. 1, i).

1. The Salviniaceae include the two genera Salvinia (fig. 10) and Azolla. The small dorsi ventral plants are in both cases floating aquatics. Azolla has roots depending from the lower surface of the stem into the water, while these organs are completely wanting in Salvinia, their place being taken functionally by highly divided leaves borne on the ventral surface of the stem. Nostoc colonies are constantly present in a special cavity of the dorsal lobe of the leaf in Azolla. The sporangia in both genera are associated in sori enclosed by indusia springing from the base of the receptacle. In Salvinia (fig. 2, h) the sori are borne towards the base of the submerged leaves, in Azolla on the reduced ventral lobe of the leaf. Theyconsfst either of microsporangia or megasporangia, which are arranged in basipetal succession on the receptacle. In the megasorus of Azolla

there is only the one terminal, functional sporangium. The micro- spores are united by means of hardened protoplasm into one or more masfes, while the solitary megaspores have a more or less complicated episporium.

After Bischoff from Strasburger's Lekrbuch der Botanik.)

Fig. 10. — Salvinia natans. A, From the side. B, From above.

2. The Marsiliaceae also include two genera, Marsilia and Pilularia, the latter of which is found in Britain. The plants grow as a rule in marshy places, though some species of Marsilia are xerophytic. The creeping stem produces roots from the ventral surface and leaves from the dorsal surface ; the leaves when young are circinately coiled. The leaves are simple and linear in Pilularia, but in Marsilia bear a pinnate four-lobed lamina. The highly specialized sporocarps are borne on the basal portions of the leaves, as a rule singly, but in some species of Marsilia in numbers. The development of the sporocarp shows that it corresponds to a pinna, although when mature it may appear to occupy a ventral position in relation to the vegetative portion of the leaf. It has a complicated structure in both genera; in Pilularia its shape is nearly spherical, while in Marsilia it is elon- gated and bean-shaped. The sori are developed in depressions and are thus protected within the resistent outer wall of the sporocarp. There are usually four sori in Pilularia, while in Marsilia they form two longitudinal rows. Each sorus includes both microsporangia, with numerous spores, and megasporangia, each of which contains a single megaspore with a complicated wall. Enclosed within the sporocarp they can endure a period of drought, but on the return of moist conditions are extruded from the sporocarp by the swelling of a special mucilaginous tissue and the spores become free. The development of the prothalli is in general similar to that of the Sal viniaceae, though the resemblance may be homoplastic. The stem in the less reduced forms is solenostelic with sclerenchymatous ground tissue occupying the centre of the stele.

In the absence of direct evidence from Palaeobotany, and bearing in mind the modifications associated with adaptation to an aquatic life in other plants, the recognition of any more definite affinity for these heterosporous ferns than that indicated above appears to be inadvisable. Further evidence is necessary before they can be removed from such a position of convenience as is assigned to them here and placed in proper relation to the series of the Filicaceae.

The several phyla of Pteridophyta having now been briefly described, their relationship to one another remains for con- sideration. The available

evidence does not suffice to solve this question, although certain indications exist. In the earliest land vegetations of which we have any sufficient record specialized forms of Equisetales, Lycopodiales, Sphenophyllales and Filicales existed, so that we are reduced to hypotheses founded on the careful comparison of the recent and extinct members of these groups. In this connexion it may be pointed out that the fuller study of the extinct forms has as yet been of most use in emphasizing the difficulty of the questions at issue. It has thus led to a condition of uncertainty as regards the relationship of the great groups of Vascular Cryptogams, in which, however, lies the hope of an ultimate approach to a satisfactory solution. The study of the Sphenophyllales, how- ever, as has been pointed out above, appears to indicate that the Equisetales and Lycopodiales may be traced back to a com- mon ancestry. As to the relationship of the Filicales to the other phyla, evidence from extinct plants appears to be wanting.

Phylogeay.

If, as has been suggested by Bower, the strobiloid types are relatively primitive, the large-leaved Pteridophyta must be supposed to have arisen early from such forms. The question cannot be discussed fully here, but enough has been said above to show that in the light of our present knowledge the main phyla of the Vascular Cryptogams cannot be placed in any serial relationship to one another.

It may even be regarded as an open question whether some of them may not have arisen independently and represent parallel lines of evolution from Bryophytic or Algal forms. This leads us to consider the question whether any indications exist as to the manner in which the Pteridophyta arose. It will be evident that no direct record of this evolution can be expected, and recourse must be had to hypotheses founded on the indirect evidence available. There appears to be no reason to doubt that the sexual generation is homologous with the thallus of a Liverwort, or of such an Alga as Coleochaete. It is with regard to the origin of the spore-bearing generation of the Pteridophyta that differences of opinion exist. This, though at first depen- dent on the prothallus, soon becomes independent. It may be regarded as derived from a wholly dependent sporogonium not unlike that of some of the simpler Bryophyta; the latter are assumed to have arisen from primitive Algal forms, in which, as the first step in the interpolation of the second generation in the life cycle, the fertilized ovum gave rise to a group of swarm spores, each of which developed into a new sexual plant. On this view the origin of the sporophyte is looked for in the gradual development of sterile tissue in the generation arising from the fertilized ovum, and a consequent postponement of spore-forma- tion. Certain green Algae (e.g. Oedogonium, Coleochaete), the Bryophyta, and the simpler Pteridophyta, such as Phyllo- glossum, have been regarded as

illustrating the method of progression, though there is no reason to regard the existing forms as constituting an actual series. For a discussion of this view, which regards the alternation of generations in Pteridophytes as antithetic and the two generations as not homologous with one another, reference may be made to the works of Celakovsky and Bower. Although the anti- thetic theory is supported by many facts regarding the life- history and structure of the group of plants under consideration, it is quite possible that a stage in which the sporophyte was wholly dependent on the gametophyte may never have been passed through in their evolution. The spore-bearing genera- tion may throughout its phylogenetic history have been inde- pendent at one part of its life, and have been derived by modification of individuals homologous with those of the sexual generation, and not by the progressive sterilization of a structure the whole of which was originally devoted to asexual reproduc- tion. A number of facts regarding the Algae, and also those relating to such deviations from the normal life cycle as apogamy or apospory, may be regarded as lending support to this view, which, in contrast to the theory of antithetic alternation, has been called that of homologous alternation. Without entering further into the discussion of these alternative theories, for which the literature of the subject must be consulted, it may be pointed out that on the latter view the strobiloid forms of Pteridophyta would not necessarily be regarded as primitive relatively to the large-leaved forms, and also that the early stages of the origin of the sporophyte in the two cases may have pro- ceeded on different lines.

Another question of great interest, which can only be touched upon here and may fitly close the consideration of this division of the Vegetable Kingdom, concerns the evidence as to the derivation of higher groups from the Pteridophyta. The most important positive evidence on this point indicates that the most ancient Gymnosperms were derived from the Filicales rather than from any other phylum of the Vascular Cryptogams. Extinct forms are known intermediate between the Ferns and the Cycads, and a number of these have been shown to bear seeds and must be classed as Pteridospermae. These forms will, however, be found discussed in the articles treating of extinct plants and the Gymnosperms, but their recognition will serve

to emphasize, in conclusion, the important position the Pterido- phyta hold with regard to the existing flora.

Cultivation. — Numerous species of ferns, both temperate and tropical, are

cultivated as valued ornamental plants. Species of the other groups are occasionally grown for scientific purposes in the larger botanic gardens, but their cultivation, which often presents special difficulties, need not be referred to here. While a number of ferns can be multiplied vegetatively, by buds formed on the leaves and in other ways, the regular mode of propagation is by sowing the spores shed from the ripe sporangia. The spores should be thinly sprinkled on the surface of the soil in well-drained pots, which should stand in saucers filled with water and be covered with glass plates. After the prothalli have attained some size and bear sexual organs the pots should be occasionally sunk in water so as to flood the prothalli for a few minutes and facilitate fertilization. The young plants developed on the prothalli should be carefully pricked out into other pans and later transferred to 3-in. pots. When the pots are fairly filled with roots the plants may be shifted into larger ones. The best time for a general repotting of ferns is in spring, just before growth commences. Those with creeping rhizomes can be propagated by dividing these into well-rooted portions, and, if a number of crowns is formed, they can be divided at that season. In most cases this can be performed with little risk, but the Gleichenias, for example, must only be cut into large portions, as small divisions of the rhizomes are almost certain to die; in such cases, however, the points of the rhizomes can be led over and layered into small pots, several in succession, and allowed to remain unsevered from the parent plant until they become well rooted. In potting the well-established plants, and all those of considerable size, the soil should be used in a rough turfy state, not sifted but broken, and one-sixth of broken crocks or charcoal and as much sand as will insure free percolation should be mixed with it.

The stove ferns require a day temperature of 65° to 75 , but do not thrive in an excessively high or close dry atmosphere. They require only such shade as will shut out the direct rays of the sun, and, though abundant moisture must be supplied, the atmosphere should not be loaded with it. The water used should always be at or near the temperature of the house in which the plants are growing. Some ferns, as the different kinds of Gymnogrammae and Cheilanthes, prefer a drier atmosphere than others, and the former do not well bear a lower winter temperature than about 60° by night. Most other stove ferns, if dormant, will bear a temperature as low as 55° by night and 60 ° by day from November to February. About the end of the latter month the whole collection should be turned out of the pots and redrained or repotted into larger pots as required. This should take place before growth has commenced. Towards the end of March the night temperature may be raised to 6o°, and the day temperature to 70° or 75 , the plants being shaded in bright weather. Such ferns as Gymnogrammas, which have their surface covered with golden or silver powder, and certain species of scaly- surfaced Cheilanthes and

Nothochlaena, as they cannot bear to have their fronds wetted, should never be syringed; but most other ferns may have a moderate sprinkling occasionally (not necessarily daily) and as the season advances sufficient air and light must be admitted. Authorities. — Scott, Structural Botany: Flowerless Plants (London, 1896), Studies in Fossil Botany (Edinburgh, 1900) ; Camp- bell, Mosses and Ferns (London, 1895);* Engler and Prantl, Die naturlichen Pflanzenfamilien (Theil i. Abth. 4.; Leipzig, 1 898-1902); Bower, The Origin of a Land Flora (London, 1908) ; Goebel, Organo- graphy of Plants (Oxford, 1905) ; Hooker and Baker, Synopsis Filicum (London, 1874); Baker, Fern Allies (London, 1887); Christ, Die Fankrduter der Erde (Jena, 1897) ; Seward, Fossil Botany, vol. i. (Cambridge, 1898). In those works marked with an asterisk copious references to the recent literature of the subject will be found.*

(W. H. L.)

PTEROBRANCHIA, a zoological group established by Ray Lankester in 1877. It contained at that time the single genus Rhabdopleura, a minute animal dredged by Sars off the Lofoten Islands, and by Norman off the Shetlands. Rhabdopleura was at first regarded as an aberrant Polyzoon, but with the publica- tion of the Challenger Report (Cephalodiscus) in 1887, it became clear that Cephalodiscus, the second genus now included in the order, had affinities in the direction of the Enteropneusta. The connexion of the Pterobranchia with the Polyzoa is in the highest degree questionable.

Rhabdopleura is no doubt of world-wide distribution, since it has been recorded in various localities from Greenland to South Australia, usually in water of not less than forty fathoms. Cephalodiscus, which for many years was known solely as the result of a single dredging by the " Challenger " from 245 fathoms in the Straits of Magellan, has recently been found in entirely different parts of the world, as for instance between Japan and Korea at 100 fathoms, at about half that depth off the south-east coast of Celebes, and between tide-marks on the coast of Borneo.

It appears to be common in the neighbourhood of Cape Town,

while the recent Antarctic expeditions have shown that it occurs in various localities from the Falkland Islands to the Antarctic circle. No less than twelve species, referred to three sub-genera {Demiothecia, Idiothecia, Orthoecus), have now been described; but it is at present uncertain whether more than a single species of Rhabdopleura is valid, although several specific names have been suggested for specimens from different localities.

Both genera are characterized by their habit of secreting a tubular

gelatinoid investment, the "coenoecium," composed of a number of superposed lamellae, doubtless the result of its intermittent secretion, mainly though perhaps not exclusively, by the proboscides of the zooids. In Rhabdopleura each zooid forms its own delicate tube composed of a characteristic series of distinct rings. In Cephalodiscus the coenoecium is more massive, and may contain a continuous irregular cavity in which the zooids live {Demiothecia), or may be secreted in such a way that each zooid has its own independent tube {Idiothecia, Orthoecus).

The zooids are a modification of the type of structure known in Balanoglossus, from which they differ principally in the follow- ing respects: (i.) The alimentary canal, instead of being straight, has a U-shaped flexure, the dorsal line between the mouth and the anus being short, (ii.) The proboscis (fig. I, b), known as the " buccal shield," is a large organ, strongly flattened in an

(From a drawing by Professor Mcintosh.)

Fig. 1. — Zooid of Cephalodiscus dodecalophus. a, a, Buds. d, Arms and tentacles.

b, Proboscis. e, Ventral edge of proboscis.

c, Stalk. J, Its dorsal edge.

antero-posterior direction, its ventral lobe usually concealing the mouth, (iii.) The collar is produced dorsally into arms (one pair in Rhabdopleura, four to eight pairs in Cephalodiscus), each of which bears numerous ciliated tentacles, the organs by which the microscopic food-particles are conveyed to the mouth, (iv.) The third division of the body, the metasome, is prolonged ventrally into a relatively enormous outgrowth containing the loop of the alimentary canal, beyond which projects a stalk (fig. 1, c), of a length varying with the state of contraction and perhaps with the species, (v.) The stalk gives rise to buds, by which the colonial habit is acquired. While in Rhabdopleura the buds remain in organic continuity with the parent, in Cephalodiscus they become free at an early stage, and the coenoecium accordingly contains a number of separate individuals. In the living Cephalodiscus a zooid can crawl by means of its proboscis over the gelatinous processes of the outer side of the coenoecium, a position which it can assume owing to the very great extensibility of the stalk, the proximal suctorial end of which remains attached to the inner surface of some part of the coenoecium (Andersson, 1907).

In correspondence with the fundamental constitution of the zooid, each of the three segments has its own body-cavity separated from the others. The

main proboscis-cavity (fig. 2, b.c. 1) is unpaired, and opens to the exterior by the two proboscis pores (p.p.). It contains a closed vesicle regarded by Schepotieff as a right proboscis- cavity and in any case representing the pericardium of Balanoglossus, the glomerulus of which is also probably represented. The collar- cavity {b.c. 1) is paired, although its ventral mesentery is not complete. It extends into the arms, which originate in the bud (fig. I) as dorsal outgrowths of the collar. The ventral and lateral parts of the anterior

margin of the collar constitute the so-called operculum {op.) a structure which not only acts as a lower lip, but must be important in separating the food-current produced by the cilia of the tentacles from the external apertures of the collar-canals and gill-slits The collar-canals (fig. 3, c.p.) are a pair of ovoid organs which open from the collar-cavity to the exterior, their external pores lying immedi- ately behind the base of the operculum.

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(After Harmer.)

Fig. 2.— Median (sagittal) section of Cephalodiscus dodecalophus.

Anus.

Body-cavity of proboscis.

Of collar.

Of metasome.

Intestine.

Mouth.

Notochord.

Central nervous system.

Oesophagus.

op., Operculum, or ventral lip.

ov., Ovary. ovd., Oviduct.

ph., Pharynx. p.p., Proboscispore.

p.s., Proboscis. St., Stomach. stk., Stalk.

a, b.cK, b.c\, b.c\, int., m., nch., n.s., oes.,

While it is not improbable that the collar-pores and the proboscis- pores may evacuate excretory substances, there can be little doubt that their primary function is to regulate the turgidity of the seg- ment to which they respectively belong. A pair of gill-slits U'g. 3, g.s.), which do not occur in Rhabdopleura, open immediately behind the collar-pores. It is probable that they serve to strain off the superfluous water which is introduced into the mouth during the process of feeding. An anterior median diverticulum of the pharynx (fig. 2, nch.), growing forwards in the septum between the proboscis-cavity and the collar-cavities, and supported dorsally by the median mesentery of the collar, is the representative of the so-called notochord or stomochord of Balanoglossus; and it the view that this organ is really a notochord is well founded it may be regarded as the homologue of the anterior end of the vertebrate notochord.

The metasome contains nearly the whole of the alimentary canal, in which pharynx (fig. 2, ph.), oesophagus (oes.), stomach (st.) and intestine (int.) may be distinguished. The remarkable position ot the anus (a) on the dorsal side has already been alluded to 1 he metasomatic cavities are divided by dorsal (fig. 3, d.mes) and ventral mesenteries, the latter following the outer curvature of the loop of the alimentary canal. The most conspicuous blood vessel possessed by Cephalodiscus is the dorsal vessel (d.b.v.). A ventral vessel occurs on the anterior side of the metasome and forms a loop extending down the entire length of the stalk, while a " heart " projects into the cavity of the pericardium, probably connected on the ventral side of the notochord with the ventral vessel, and on its dorsal side with the dorsal vessel. At their opposite ends the dorsal and ventral vessels are probably connected with one another by means of a splanchnic sinus surrounding the stomach. The original specimen of C. dodecalophus contained exclusively female zooids, in which a single pair of ovaries (figs. 2, 3, ov.) lie in the meta- somatic cavities, and open to the exterior dorsally by short, highly

pigmented oviducts (fig. 2, ovd.). In C. nigrescens and in some other species a zooid may contain a pair of ovaries, a pair of testes or an ovary and a testis, although the males, females and herma- phrodites do not

differ from one another in external characters, in L. sibogae (Celebes) the single colony known is of the male sex 1 he reproductive individuals have undergone an extraordinary simplification of the organs concerned with the collection and diges- tion of food. Thus the & arms are reduced to a single pair and possess no tenta- cles, there is no definite operculum, and the alimen- tary canalis vestigial. The testes, which correspond in position with the ovaries of a female Cephalodiscus, constitute the greater part of the animal. Associated with these males are neuter zooids, which usually pos- sess _ no functional repro- ductive organs, but have in other respects the struc- ture of an ordinary female Cephalodiscus. It appears probable that there is a vascular connexion be- tween these and the male individuals, which thus de- rive their nutriment from the neuters. The reproduc- tive organs of Rhabdopleura have but seldom been ob- served. They resemble –—• .o- ~~^~n "a..ovc™ cu me those of Cephalodiscus in ' on § ax i s °f Cephalodiscus dodecalophus structure and in position, (morphologically a frontal section), except that in each sex the bx > Body cavity of metasome. TnrT/h hengt ^' Collar-canal, above which is (^L ♦■ a 1 ^° dy ° my seen the operculum. (Schepotieff, 1906). d . h .v., Dorsal blood-vessel. The eggs of Cephalodiscus d.mes.,Dor sa [mesentery.

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(After Masterman.)

Fig. 3. — Section transverse to the

possess a large amount of

Proboscis.

Gill-slit.

Intestine.

Left collar-cavity.

Mouth.

Ovary.

Vacuolated tissue of pharyngeal wall, the so-called " pleuro- chords "of Masterman.

Right collar-cavity.

yolk, and it is practically .7 certain that there is no %nt pelagic larval

form. The l c c ‘ embryos are hatched in an ˆ, ‘ ” early stage, but their meta- ov ' morphosis has not been pi c \ observed. The early de- ‘ velo.pment appears to re- semble that of the large- rcc yolked species of Bala- ‘ ” noglossus. In the bud- development, the three-segmented condition is extremely conspicu- ous, and a striking feature is the great relative size of the proboscis (hg. 1). A considerable part of the alimentary canal is said to be derived from the ectoderm in the buds of both Cephalodiscus and Rhabdopleura. Schepotieff (1907) states that in the young buds ot the latter the central part of the alimentary canal is developed from cells which are apparently not of ectodermic origin.

The affinity of the Pterobranchia to the Enteropneusta may be regarded as definitely established. Considering the wide differences between the two groups in the size and external characters, and in the mode of life, including the mode of feeding, it is indeed surprising that in every important organ the two groups should show a fundamental morphological identity. Their relations to Phoronis are doubtful (see Phoeonidea). The question of their affinity to other divisions of the animal kingdom depends principally on the views which are held with regard to the relationships of the Enteropneusta and Phoronidea respectively. The suggestion has been made by Allmann and recently upheld by Schepotieff that Rhabdopleura is related to some of the Graptolites.

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PTERODACTYLES (Gr. for wing-fingers), an extinct order of flying reptiles, variously known as Pterosauria (Gr. for wing-lizards) or Ornithosauria (Gr. for bird-lizards), whose remains occur in all Mesozoic formations from the Lower Lias to the Upper Cretaceous inclusive. Their bones are of very light, though strong construction, and hollow like those of flying

Rhamphorhynchus phyllurus: restoration by O. C. Marsh, showing extent of Hying membranes.— Upper Jurassic (Lithographic stone); Bavaria.

birds, with well-fitting articulations, quite different from those of ordinary reptiles. The head is large and remarkably bird- like in shape, while it is fixed on the neck at the same angle as in birds. The brain is small, but resembles that of birds in its general conformation. The trunk is relatively small, with few slender ribs and a keeled breastbone (sternum). The fore-limbs are always a pair of wings, the fifth digit or "little " finger being enormously elongated for the support of a smooth flying membrane (seen in specimens from the lithographic stone of Bavaria). The wings are thus constructed on the same plan as those of a bat, but instead of four fingers, only one is elongated to bear the membrane. The hind-limbs are comparatively feeble, and must have been of very little use for walking.

The remains of pterodactyles are found chiefly in marine deposits, so that these reptiles must have frequented the coast- lines. They probably fed partly on fish, partly on insects; but no traces of food have hitherto been observed within the fossil skeletons. The oldest satisfactorily known member of the group is Dimorphodon from the Lower Lias of Dorsetshire. The typical species has a skull about 20 centim. in length, with huge teeth in front, smaller teeth behind: its tail is much elongated and slender. Equally fine skeletons of Campylognaihus have been found in the Upper Lias of Wurttemberg. Other long-tailed pterodactyles occur well preserved in the Upper Jurassic (lithographic stone) of Bavaria and Wurttemberg, which is so fine-grained as to show impressions of the wing-membrane. In Rhamphorhynchus there is also a rhomboidal expansion of membrane at the end of the tail. The short-tailed Pterodactylus itself, sometimes no larger than a sparrow, is also found in the same formation. It was originally described by Collini in 1784 as an unknown sea-animal, and its

true nature was first deter- mined by Cuvier in 1809, when he named it " Pterodactyle." The Pterosaurians of the Cretaceous period, just before their extinction both in Europe and in North America, were of enormous size, and some became toothless. A pair of wings of the toothless Pteranodon from the Chalk of Kansas, now in the British Museum, measures about five and a half metres in span. Fragments of equally large pterodactyles with teeth are found in the English Chalk.

See H. G. Seeley, The Ornithosauria (Cambridge, 1870) and Dragons of the Air (London, 1901) ; S. W. Williston, piper in Kansas University Quarterly (1897), vi. 35; G. F. Eaton, papers in Amer. Journ. Science (1903-1904), 4th series, vols, xvi., xvii.

(A. S. Wo.)

PTERON (Gr. wrepov, a wing), an architectural term used by Pliny for the peristyle of the tomb of Mausolus, which was raised on a lofty podium, and so differed from an ordinary peristyle raised only on a stylobate, as in Greek temples, or on a low podium, as in Roman temples.

PTOLEMAEUS, of Alexandria, surnamed Chennus, Greek grammarian during the reigns of Trajan and Hadrian. According to Suidas, he was the author of an historical drama named Sphinx, of an epic, Anthomeros, in 24 books (both lost) and a Strange History. The last is probably identical with the work of which an abridgment has been preserved in Photius (cod. 190). It contains a medley of all sorts of legends and fables belonging to both the mythological and historical periods. It is probable that Chennus was also the author of a lost treatise on the life and works of Aristotle, ascribed to " Ptolemaeus " in an Arabic list of his works, taken from a Syriac version of the Greek original (A. Baum- stark, Aristoteles bei den Syrern vom v.-viii. Jahrh., Leipzig, 1900).

See editions of Photius's abridgment by J. Roulez (1834); and in A. Westermann, Mythographi graeci (1843); R. Hercher, Uber die Glaubwilrdiekeil der neuen Geschichte des Ptolemdus Chennus (Leipzig, 1856) ; J. E. Sandys, Hist, of Classical Scholarship (2nd ed., 1906).

PTOLEMIES, a dynasty of Macedonian kings who ruled in Egypt from 323 to 30 B.C.

The founder, Ptolemy (JlroXfuaios) , son of Lagus, a Macedonian nobleman of Eordaea, was one of Alexander the Great's most trusted generals, and among the seven " body-guards " attached to his person. He plays a principal part in the later campaigns of Alexander in Afghanistan and India. At the Susa marriage festival in 324 Alexander caused him to

marry the Persian princess Artacama; but there is no further mention of this Asiatic bride in the history of Ptolemy. When Alexander died in 323 the resettlement of the empire at Babylon is said to have been made at Ptolemy's instigation. At any rate he was now appointed satrap of Egypt under the nominal kings Philip Arrhidaeus and the young Alexander. He at once took a high hand in the province by killing Cleomenes, the financial controller appointed by Alexander the Great; he also subju- gated Cyrenaica. He contrived to get possession of Alexander's body which was to be interred with great pomp by the imperial government and placed it temporarily in Memphis. This act led to an open rupture between Ptolemy and the imperial regent Perdiccas. But Perdiccas perished in the attempt to invade Egypt (321). In the long wars between the different Macedonian chiefs which followed, Ptolemy's first object is to hold his posi- tion in Egypt securely, and secondly to possess the Cyrenaica, Cyprus and Palestine (Coele-Syria). His first occupation of Palestine was in 318, and he established at the same time a protectorate over the petty kings of Cyprus. When Antigonus, master of Asia in 315, showed dangerous ambitions, Ptolemy joined the coalition against him, and, on the outbreak of war, evacuated Palestine. In Cyprus he fought the partisans of Antigonus and reconquered the island (313). A revolt of Cyrene was crushed in the same year. In 312 Ptolemy, with Seleucus, the fugitive satrap of Babylonia, invaded ■ Palestine and beat Demetrius, the son of Antigonus, in the great battle of Gaza. Again he occupied Palestine, and again a few months later, after Demetrius had won a battle over his general and Antigonus' entered Syria in force, he evacuated it. In 311 a peace was concluded between the combatants, soon after which the surviving king Alexander was murdered in Macedonia, leaving the satrap of Egypt absolutely his own master. The peace did not last long, and in 309 Ptolemy commanded a fleet in person which detached the coast towns of Lycia and Caria from Anti- gonus and crossed to Greece, where Ptolemy took possession of Corinth, Sicyon and Megara (308). In 306 a great fleet under Demetrius attacked Cyprus, and Ptolemy's brother, Menelaus. was defeated and captured in the decisive battle of Salamis. The complete loss of Cyprus followed. Antigonus and Demetrius

now assumed the title of kings; Ptolemy, as well as Cassander, Lysimachus and Seleucus, answered this challenge by doing the same. In the winter (306-5) Antigonus tried to follow up the victory of Cyprus by invading Egypt, but here Ptolemy was strong, and held the frontier successfully against him. Ptolemy led no further expedition against Antigonus overseas. To the Rhodians, besieged by Demetrius (305-4), he sent such help as won

him divine honours in Rhodes and the surname of Soter (" saviour "). When the coalition was renewed against Anti- gonus in 302, Ptolemy joined it, and invaded Palestine a third time, whilst Antigonus was engaged with Lysimachus in Asia Minor. On a report that Antigonus had won a decisive victory, for a third time he evacuated the country. But when news came that Antigonus had been defeated and slain at Ipsus (301) by Lysimachus and Seleucus, Ptolemy occupied Palestine for the fourth time. The other members of the coalition had assigned Palestine to Seleucus after what they regarded as Ptolemy's desertion, and for the next hundred years the question of its ownership becomes the standing ground of enmity between the Seleucid and Ptolemaic dynasties. Henceforth, Ptolemy seems to have mingled as little as possible in the broils of Asia Minor and Greece; his possessions in Greece he did not retain, but Cyprus he reconquered in 295-4. Cyrene, after a series of rebellions, was finally subjugated about 300 and placed under his stepson Magas (Beloch, Griech. Gesch. III. [ii.], p. 134 seq.). In 285 he abdicated in favour of one of his younger sons by Berenice (q.v.), who bore his father's name of Ptolemy; his eldest (legitimate) son, Ptolemy Ceraunus, whose mother, Eurydice, the daughter of Antipater, had been repudiated, fled to the court of Lysimachus. Ptolemy I. Soter died in 283 at the age of 84. Shrewd and cautious, he had a compact and well-ordered realm to show at the end of fifty years of wars. His name for bonhomie and liberality attached the floating soldier-class of Macedonians and Greeks to his service. Nor did he neglect conciliation of the natives. He was a ready patron of letters, and the great library, which was Alexandria's glory, owed to him its inception. He wrote himself a history of Alexander's campaigns, distinguished by its straightforward honesty and sobriety.

Ptolemy II. Philadelphus (309-246), was of a delicate constitu- tion, no Macedonian warrior-chief of the old style. His brother Ptolemy Ceraunus found compensation by becoming king in Macedonia in 281, and perished in the Gallic invasion of 280-79 (see Brennus). Ptolemy II. maintained a splendid court in Alexandria. Not that Egypt held aloof from wars. Magas of Cyrene opened war on his half-brother (274), and Antiochus I., the son of Seleucus, desiring Palestine, attacked soon after. Two or three years of war left Egypt the dominant naval power of the eastern Mediterranean; the Ptolemaic sphere of power extended over the Cyclades to Samothrace, and the harbours and coast towns of Cilicia Trachea (" Rough Cilicia "), Pam- phylia, Lycia and Caria were largely in Ptolemy's hands (Theoc. Idyll, xvii. 86 seq.). The victory won by Antigonus, king of Macedonia, over his fleet at Cos (between 258-56; see Beloch, III. [ii.], p. 428 seq.) did not long interrupt his command of the Aegean. In a second war with the Seleucid kingdom, under Antiochus II. (after 260), Ptolemy sustained losses on the sea- board of Asia Minor and agreed to a peace by which Antiochus

married his daughter Berenice (250?). Ptolemy's first wife, Arsinoe (I.), daughter of Lysimachus, was the mother of his legitimate children. After her repudiation he married, probably for political reasons, his full-sister Arsinoe (II.), the widow of Lysimachus, by an Egyptian custom abhorrent to Greek morality. The material and literary splendour of the Alexandrian court was at its height under Ptolemy II. Pomps and gay religions flourished. Ptolemy deified his parents as the 6(ol a8t\(j>oi, and his sister-wife, after her death (270), as Phila- delphus. This surname was used in later generations to distin- guish Ptolemy II. himself, but properly it belongs to Arsinog only, not to the king. Callimachus, made keeper of the library, Theocritus, and a host of lesser poets, glorified the Ptolemaic family. Ptolemy himself was eager to increase the library and

to patronize scientific research. He had the strange beasts of far- off lands sent to Alexandria. But, an enthusiast for Hellenic culture, he seems to have shown but little interest in the native religion. The tradition which connects the Septuagint trans- lation of the Old Testament into Greek with his name is not historical. Ptolemy had many brilliant mistresses, and his court, magnificent and dissolute, intellectual and artificial, has been justly compared with the Versailles of Louis XIV.

Ptolemy III. Euergetes I. (reigned 246-221), son of Ptolemy II. and Arsinoe I. At the beginning of his reign he reunited the Cyrenaiica to Egypt by marrying Berenice the daughter and successor of Magas (who had died about 2 50) . At the same time he was obliged to open war on the Seleucid kingdom, where Antiochus II. was dead and his sister Berenice had been mur- dered, together with her infant son, by Antiochus's former wife, Laodice, who claimed the kingdom for her son Seleucus II. Ptolemy marched triumphantly into the heart of the Seleucid realm, as far at any rate as Babylonia, and received the formal submission of the provinces of Iran, while his fleets in the Aegean recovered what his father had lost upon the seaboard, and made fresh conquests as far as Thrace. This moment marks the zenith of the Ptolemaic power. After Ptolemy returned home, indeed, Seleucus regained northern Syria and the eastern provinces, but the naval predominance of Egypt in the Aegean remained, although there are traces of its being replaced locally, towards the end of Euergetes' reign, by that of Macedonia — in Amorgos, Naxos, Syros, Nisyros, Cos and parts of Crete (see Beloch, III. [ii.], p. 463). After his final peace with Seleucus, Ptolemy no longer engaged actively in war, although his forces might occasionally mingle in the broils of Asia Minor, and he supported the enemies of Macedonia in Greece. It seems probable that his internal policy differed from his father's in patronizing the native religion more liberally; he has left larger traces at any rate among the monuments that are known to-day.

Ptolemy IV. Philopator (reigned 221-204), son of the pre- ceding, was a wretched debauchee under whom the decline of the Ptolemaic kingdom began. His reign was inaugurated by the murder of his mother, and he was always under the dominion of favourites, male and female, who indulged his vices and con- ducted the government as they pleased. Self-interest led his ministers to make serious preparations to meet the attacks of Antiochus III. (the Great) on Palestine, and the great Egyptian victory of Raphia (217), at which Ptolemy himself was present, secured the province till the next reign. The arming of Egyp- tians in this campaign had a disturbing effect upon the native population of Egypt, so that rebellions were continuous for the next thirty years. Philopator was devoted to orgiastic forms of religion and literary dilettantism. He built a temple to Homer and composed a tragedy, to which his vile favourite Agathocles added a commentary. He married (about 215) his sister Arsinoe" (III.), but continued. to be ruled by his mistress Agathoclea, sister of Agathocles.

Ptolemy V. Epiphanes reigned 204-181), son of Philopator and Arsinoe, was not more than five years old when he came to the throne, and under a series of regents the kingdom was paralysed. Antiochus III. and Philip V. of Macedonia made a compact to divide the Ptolemaic possessions overseas. Philip seized several islands and places in Caria and Thrace, whilst the battle of Panium (198) definitely transferred Palestine from the Ptolemies to the Seleucids. Antiochus after this concluded peace, giving his own daughter Cleopatra to Epiphanes to wife (193-192). Nevertheless, when war broke out between Antiochus and Rome Egypt ranged itself with the latter power. Epiphanes in manhood was chiefly remarkable as a passionate sportsman; he excelled in athletic exercises and the chase. Great cruelty and perfidy were displayed in the suppression of the native rebellion, and some accounts represent him as personally tyrannical.*

The elder of his two sons, Ptolemy VI. Philometor (181-145), succeeded as an infant under the regency of his mother Cleo- patra. Her death was followed by a rupture between the Ptolemaic and Seleucid courts, on the old question of Palestine.

Antiochus IV. Epiphanes invaded Egypt (170) and captured Philometor.

The Alexandrians then put his younger brother Ptolemy VII. Euergetes II. (afterwards nicknamed Physkon, on account of his bloated appearance) upon the throne. Antiochus professed to support Philometor, but, when he withdrew, the brothers agreed to be joint-kings with their sister Cleopatra

as queen and wife of Philometor. Antiochus again invaded Egypt (168), but was compelled by the Roman intervention to retire. • The double kingship led to quarrels between the two brothers in which fresh appeals were continually made to Rome. In 163 the Cyrenaica was assigned under Roman arbitration to Euer- getes as a separate kingdom. As he coveted Cyprus as well, the feud still went on, Rome, continuing to interfere diplomatically but not effectively. In 154 Euergetes invaded Cyprus but was defeated and captured by Philometor. He found his brother, however, willing to pardon and was allowed to return as king to Cyrene. In 152 Philometor joined the coalition against the Seleucid king Demetrius I. and was the main agent in his de- struction. The protege of the coalition, Alexander Balas, married Philometor's daughter Cleopatra (Thea), and reigned in Syria in practical subservience to him. But in 147 Philometor broke with him and transferred his support, together with the person of Cleopatra, to Demetrius II., the young son of Demetrius I. He himself at Antioch was entreated by the people to assume the Seleucid diadem, but he declined and installed Demetrius as king. In 145 in the battle on the Oenoparas near Antioch, in which Alexander Balas was finally defeated, Philometor received a mortal wound. Philometor was perhaps the best of the Ptolemies. Kindly and reasonable, his good nature seems sometimes to have verged on indolence, but he at any rate took personal part, and that bravely and successfully, in war.

Philometor's infant son, Ptolemy Philopator Neos (P) 1 , was proclaimed king in Alexandria under the regency of his mother Cleopatra. Euergetes however, swooping from Cyrene, seized the throne and married Cleopatra, making away with his nephew. He has left an odious picture of himself in the historians — a man untouched by benefits or natural affection, delighting in deeds of blood, his body as loathsome in its blown corpulence as his soul. Something must be allowed for fhe rhetorical habit of our authorities, but that Euergetes was ready enough to shed blood when policy required seems true. He soon found a more agreeable wife than Cleopatra in her daughter Cleopatra, and thenceforth antagonism between the two queens, the " sister "

and the " wife," was chronic. In 130-1 Cleopatra succeeded in driving Euergetes for a time to Cyprus, when he revenged himself by murdering the son whom she had borne him (surnamed Memphites). Massacres inflicted upon the Alexandrians and the expulsion of the representatives of Hellenic culture are laid to his charge. On the other hand, the monument and papyri show him a liberal patron of the native religion and a considerable administrator. In fact, while hated by the Greeks, he seems to have had the steady support of the native population. But there are also records which show him, not as an enemy, but a friend, like his ancestors, to Greek culture. He himself published the fruit of his studies and travels in a voluminous collection of notebooks, in which he showed a lively eye for the oddities of his fellow kings. The old Ptolemaic realm was never again a unity after the death of Euergetes II. By his will he left the Cyrenaica as a separate kingdom to his illegitimate son Ptolemy Apion (116-96), whilst Egypt and Cyprus were bequeathed to Cleopatra (Kokke) and whichever of his two sons by her, Ptolemy VIII. Soter II. (nicknamed Lathyros) and Ptolemy IX. Alexander I., she might choose as her associate. The result was, of course, a long period of domestic strife. From 116 to 108 Soter reigned with his mother, and at enmity with her, in Egypt, whilst her favourite son, Alexander, ruled Cyprus. Cleopatra compelled Soter to divorce his sister-wife Cleopatra and marry

another sister, Selene. Cleopatra plunged into the broils of

1 Or, according to another view, Eupator. On the obscure ques- tions raised by these two surnames, see L. Pareti, Ricerche sui Tolemei Eupatore e Neo. Filopatore (Turin, 1908).

the Seleucid house in Syria and perished, In 108 Cleopatra Kokke called Alexander to Egypt, and Soter flying to Cyprus took his brother's place and held the island against his mother's forces. The attempts which Soter and Cleopatra respectively made in 104-3 to obtain a predominance in Palestine came to nothing. Alexander now shook off his mother's yoke and married Soter's daughter Berenice. Cleopatra Kokke died in 101 and from then till 89 Alexander reigned alone in Egypt. In 89 he was expelled by a popular uprising and perished the following year in a sea-fight with the Alexandrian ships off Cyprus. Soter was recalled (88) and reigned over Egypt and Cyprus, now reunited, in association with his daughter Berenice. This, his second, reign in Egypt (88-80), was marked by a native rebellion which issued in the destruction of Thebes. On his death Berenice assumed the government, but the son of Alexander I., Ptolemy X. Alexander II., entering Alexandria under Roman patronage, married, and within twenty days assassinated, his elderly cousin and stepmother. He was at once killed by the enraged people and with him the Ptolemaic family in the legiti- mate male line became extinct. Ptolemy Apion meanwhile, dying in 96, had bequeathed the Cyrenaica to Rome. The Alexandrian people now chose an illegitimate son of Soter II. to be their king, Ptolemy XL Philopator Philadelphus Neos Dionysus, nicknamed Auletes, the flute-player (80-51), setting his brother as king in Cyprus. The rights of these kings were doubtful, not only because of their illegitimate birth, but because it was claimed in Rome that Alexander II. had be- queathed his kingdom to the Roman people. Two Seleucid princes, children of Soter's sister Selene, appeared in Rome in 73 to urge their claim to the Ptolemaic throne. Ptolemy Auletes was thus obliged to spend his reign in buying the support of the men in power in Rome. Cyprus was annexed by Rome in 58, its king committing suicide. From 58 to 55 Auletes was in exile, driven out by popular hatred, and worked by bribery and murder in Rome to get himself restored to Roman power. His daughter Berenice meanwhile reigned in Alexandria, a husband being found for her in the Pontic prince Archelaus. In 55 Auletes was restored by the proconsul of Syria, Aulus Gabinius. He killed Berenice and, dying in 51, bequeathed the kingdom to his eldest son, aged ten years, who was to take as wife his sister Cleopatra, aged seventeen. In the reign of Ptolemy XII. Philopator (51-47) and Cleopatra Philopator, Egyptian history coalesces with the general history of the Roman world, owing to the murder of Pompey off Pelusium in 48 and the Alexandrine War of Julius Caesar (48-47). In that war the young king perished arid a still younger brother, Ptolemy XIII. Philopatorˆ was

associated with Cleopatra till 44, when he died, probably by Cleopatra's contriving. From then till her death in 30, her son, born in 47, and asserted by Cleopatra to be the child of Julius Caesar, was associated officially with her as Ptolemy XIV. Philopator Philometor Caesar; he was known popularly as Caesarion. (For the incidents of Cleopatra's reign see Cleopatra, Arsinoe.) After her death in 30 and Caesarion's murder Egypt was made a Roman province. Cleopatra's daughter by Antony (Cleopatra Selene) was married in 25 to Juba II. of Mauretania. Their son Ptolemy, who succeeded his father (a.d. 23-40), left no issue. 2

See Mahaffy, The Empire of the Ptolemies (1895) and Egypt under the Ptolemaic Dynasty (1899) ; Strack, Die Dynastie der Ptolemaer (1897); Bouche-Leclercq, Histoire des hagid.es (1904, 1907); Meyer, Das Heerwesen der Ptolemaer und Romer (Leipzig, 1900).

(E. R. B.)

PTOLEMY (Claudius Ptolemaeus), the celebrated mathema- tician, astronomer and geographer, was a native of Egypt, but there is an uncertainty as to the place of his birth. Some ancient manuscripts of his works describe him as of Pelusium, but Theodorus Meliteniota, a Greek writer on astronomy of the

2 The Ptolemies were not in antiquity distinguished by the ordinal numbers affixed to their names by modern scholars and represented according to. the usual convention by Roman 'figures. This is merely done for our convenience. In the case of the later Ptolemies different systems of notation prevail according as the problematic Eupatpr and Philopator Neos are reckoned in or not.

1 2th century, says that he was born at Ptolemais Hermii, a Grecian city of the Thebaid. It is certain that he observed at Alexandria during the reigns of Hadrian and Antoninus Pius, and that he survived Antoninus. Olympiodorus, a philosopher of the Neoplatonic school who lived in the reign of the emperor Justinian, relates in his scholia on the Phaedo of Plato that Ptolemy devoted his life to astronomy and lived for forty years in the so-called Hrepa rod ~Kavcofiov, probably elevated terraces of the temple of Serapis at Canopus near Alexandria, where they raised pillars with the results of his astronomical discoveries engraved upon them. This statement is probably correct; we have indeed the direct evidence of Ptolemy himself

that he made astronomical observations during a long series of years; his first recorded observation was made in the eleventh year of Had- rian, 127 a.d., 1 and his last in the fourteenth year of Antoninus, 151 a.d. Ptolemy, moreover, says, " We make our observations in the parallel of Alexandria." St Isidore of Seville asserts that he was of the royal race of the Ptolemies, and even calls him king of Alexandria; this assertion has been followed by others, but there is no ground for their opinion. Indeed Fabricius shows by numerous instances that the name Ptolemy was common in Egypt. Weidler, from whom this is taken, also tells us that according to Arabian tradition Ptolemy lived to the age of seventy-eight years; from the same source some description of his personal appearance has been handed down, which is generally considered as not trustworthy, but which may be seen in Weidler, Historia astronomiae, p. 177, or in the preface to Halma's edition of the Almagest, p. 61.

Mathematics. ' Ptolemy's work as a geographer is discussed below, and an account of the discoveries in astronomy of Hipparchus and Ptolemy is given in the article Astronomy: History. Their contributions to pure mathematics, however, require to be noticed here. Of these the chief is the foundation of trigonometry, plane and spherical, including the formation of a table of chords, which served the same purpose as our table of sines. This branch of mathematics was created by Hippar- chus for the use of astronomers, and its exposition was given by Ptolemy in a form so perfect that for 1400 years it was not surpassed. In this respect it may be compared with the doctrine as to the motion of the heavenly bodies so well known as the Ptolemaic system, which was paramount for about the same period of time. There is, however, this difference, that, whereas the Ptolemaic system was then overthrown, the theorems of Hipparchus and Ptolemy, on the other hand, will be, as Delambre says, for ever the basis of trigonometry. The astronomical and trigonometrical systems are contained in the great work of Ptolemy, 'H p.aJdT)p.a.TiKT) owa£is, or, as Fabricius after Syncellus writes it, Meyakri

We proceed now to consider the trigonometrical work of Hippar- chus and Ptolemy. In the ninth chapter of the first book of the Almagest Ptolemy shows how to form a table of chords. He sup- poses the circumference divided into 360 equal parts (i-MwaTa), and then bisects each of these parts. Further, he divides the diameter into 120 equal parts, and then for the subdivisions of these he employs the sexagesimal method as most convenient in practice, i.e. he divides each of the sixty parts of the radius into sixty equal parts, and each of these parts he further subdivides into sixty equal parts. In the Latin translation these subdivisions become " partes minutae primae " and " partes minutae secundae," whenc e our " minutes "

1 Weidler and Halma give the ninth year; in the account of the eclipse of the moon in that year Ptolemy, however, does not say, as in other similar cases, he had observed, but it had been observed (Almagest, iv. 9).

and " seconds " have arisen. It must not be supposed, however, that these sexagesimal divisions are due to Ptolemy ; they must have been familiar to his predecessors, and were handed down from the Chaldaeans. Nor did the formation of the table of chords originate with Ptolemy ; indeed, Theon of Alexandria, the father of Hypatia, ■who lived in the reign of Theodosius, in his commentary on the Almagest says expressly that Hipparchus had already given the doc- trine of chords inscribed in a circle in twelve books, and that Mene- laus had done the same in six books, but, he continues, every one must be astonished at the ease with which Ptolemy, by means of a few simple theorems, has found their values ; hence it is inferred that the method of calculation in the Almagest is Ptolemy's own.

As starting-point the values of certain chords in terms of the diameter were already known, or could be easily found by means of the Elements of Euclid. Thus the side of the hexagon, or the chord of 60°, is equal to the radius, and therefore contains sixty parts. The side of the decagon, or the chord of 36 , is the greater segment of the radius cut in extreme and mean ratio, and therefore contains approximately 37″ 4′ 55″ parts, of which the diameter contains 120 parts. Further, the square on the side of the regular pentagon is equal to the sum of the squares on the sides of the regular hexagon and of the regular decagon, all being inscribed in the same circle (Eucl. XIII. 10); the chord of 72 can therefore be calculated, and contains approximately 70″ 32′ 3". In like manner, the square on the chord of 90°, which is the side of the inscribed square, is twice the square on the radius; and the square on the chord of 120 , or the side of the equilateral triangle, is three times the square on the radius; these chords can thus be calculated approximately. Further, from the values of all these chords we can calculate at once the chords of the arcs which are their supplements.

This being laid down, we now proceed to give Ptolemy's exposition of the mode of obtaining his table of chords, which is a piece of geometry of great elegance, and is indeed, as De Morgan says, " one of the most beautiful in the Greek writers."

He takes as basis and sets forth as a lemma the well-known theorem, which is called after him, concerning a quadrilateral inscribed in a circle: The rectangle under the diagonals is equal to the sum of the rectangles under the opposite sides. By means of this theorem the chord of the sum or the difference of- two arcs whose chords are given can be easily found, for we have only to draw a diameter from the common vertex of the two arcs the chord of whose sum or difference is required, and complete the

quadrilateral; in one case a diagonal, in the other one of the sides is a diameter of the circle. The relations thus obtained are equivalent to the funda- mental formulae of our trigonometry —

sin (A + B) = sin A cos B + cos A sin B, sin (A — B) = sin A cos B — cos A sin B, which can therefore be established in this simple way.

Ptolemy then gives a geometrical construction for finding the chord of half an arc from the chord of the arc itself. By means of the foregoing theorems, since we know the chords of 72° and of 6o°, we can find the chord of 12°; we can then find the chords of 6°, 3 , i|° and three-fourths of 1°, and lastly, the chords of 4i°, 7i°, 9°, 10J , &c. — all those arcs, namely, as Ptolemy says, which being doubled are divisible by 3. Performing the calculations, he finds that the chord of I5 contains approximately i p 34′ 55”, and the chord of three-fourths of 1° contains o p 47′ 8”. A table of chords of arcs increasing by 1 J° can thus be formed ; but this is not sufficient for Ptolemy’s purpose, which was to frame a table of chords increas- ing by half a degree. This could be effected if he knew the chord of one-half of i°; but, since this chord cannot be found geometrically from the chord of li°, inasmuch as that would come to the trisection of an angle, he proceeds to seek in the first place the chord of i°, which he finds approximately by means of a lemma of great elegance, due probably to Apollonius. It is as follows : If two unequal chords be inscribed in a circle, the greater will be to the less in a less ratio than the arc described on the greater will be to the arc described on the less. Having proved this theorem, he proceeds to employ it in order to find approximately the chord of 1 °, which he does in the following manner —

chord 60′ < 60 chord 45′ 45′

i.e. < 4, /. chord i° < 4 choi-d 45';

3 3

again —

? hord 90′ < 22 ig < 3 ... chord !« > 2 chord ,_

chord 60′ 60 2 3

For brevity we use a modern notation. It has been shown that the chord of 45′ is o p 47′ 8″ q.p., and the chord of 90′ is i” 34′ 15″ q.p. ; hence it follows that approximately

chord 1° < i p 2' 50" 40'" and > i» 2′ 50”. Since these values agree as far as the seconds, Ptolemy takes l p 2′ 50 as the approximate value of the*

chord of 1°. The chord of i° being thus known, he finds the chord of one-half Of a degree, the approxi- mate value of which is o p 31′ 25”, and he is at once in a position to complete his table of chords for arcs increasing by half a degree. Ptolemy then gives his table of chords, which is arranged in three columns; in the first he has entered the arcs, increasing by half-degrees, from o° to 180°; in the second he gives the values of the

chords of these arcs in parts of which the diameter contains 120, the subdivisions being sexagesimal ; and in the third he has inserted the thirtieth parts of the differences of these chords for each half- degree, in order that the chords of the intermediate arcs, which do not occur in the table, may be calculated, it being assumed that the increment of the chords of arcs within the table for each interval of 30′ is proportional to the increment of the arc. 1

Trigonometry, we have seen, was created by Hipparchus for the use of astronomers. Now, since spherical trigonometry is directly applicable to astronomy, it is not surprising that its development was prior to that of plane trigonometry. It is the subject-matter of the eleventh chapter of the Almagest, whilst the solution of plane triangles is not treated separately in that work.

To resolve a plane triangle the Greeks supposed it to be inscribed in a circle; they must therefore have known the theorem — which is the basis of this branch of trigonometry: The sides of a triangle are proportional to the chords of the double arcs which measure the angles opposite to those s’ides. In the case of a right-angled triangle this theorem, together with Eucl. I. 32 and 47, gives the complete solution. Other triangles were resolved into right-angled triangles by drawing the perpendicular from a vertex on the opposite side. In one place (Aim. vi. ch. 7; i. 422, ed. Halma) Ptolemy solves a triangle in which the three sides are given by finding the segments of a side made by the perpendicular on it from the opposite vertex. It should be noticed also that the eleventh chapter of the first book of the Almagest contains incidentally some theorems and problems in plane trigonometry. The problems which are met with correspond to the following: Divide a given arc into two parts so that the chords of the doubles of those arcs shall have a given ratio ; the same problem for external section. Lastly, it may be mentioned that Ptolemy (Aim. vi. ch. 7; i. 421, ed. Halma) takes 3″ 8′ 30’,

3 “” 60 3600*

= 3-1416, as the value of the ratio of the circum-

ference to the diameter of a circle, and adds that, as had been shown by Archimedes, it lies between 3ˆ and 3fJ.

The foundation of spherical trigonometry is laid in chapter xi. on a few simple and useful lemmas. The starting-point is the well- known theorem of plane geometry concerning the segments of the sides of a triangle made by a transversal: The segments of any side are in a ratio compounded of the ratios of the segments of the other two sides. This theorem, as well as that concerning the inscribed quadrilateral, was called after Ptolemy — naturally, indeed, since no reference to its source occurs in the Almagest. This error was corrected by Mersenne, who showed that it was known to Menelaus, an astronomer and geometer who lived in the reign of the emperor Trajan. The theorem now bears the name of Menelaus, though most probably it came down from Hipparchus; Chasles, indeed, thinks that Hipparchus deduced the property of the spherical triangle from that of the plane triangle, but throws the origin of the latter farther back and attributes it to Euclid, suggesting that it was given in his Porisms? Carnot made this theorem the basis of his theory of transversals in his essay on that subject. It should be noticed that the theorem is not given in the Almagest in the general manner stated above ; Ptolemy considers two cases only of the theo- rem, and Theon, in his commentary on the Almagest, has added two more cases. The proofs, however, are general. Ptolemy then lays down two lemmas : If the chord of an arc of a circle be cut in any ratio and a diameter be drawn through the point of section, the diameter will cut the arc into two parts the chords of whose doubles are in the same ratio as the segments of the chord; and a similar theorem in the case when the chord is cut externally in any ratio. By means of these two lemmas Ptolemy deduces in an ingenious manner — easy to follow, but difficult to discover — from the theorem of Menelaus for a plane triangle the corresponding theorem for a spherical triangle: If the sides of a spherical triangle be cut by an arc of a great circle, the chords of the doubles of the segments of any one side will be to each other in a ratio compounded of the ratios of the chords of the doubles of the segments of the other two sides. Here, too, the theorem is not stated generally; two cases only are considered, corresponding to the two cases given in piano. Theon has added two cases. The proofs are general. By means of this theorem four of Napier’s formulae for the solution of right-angled spherical triangles can be easily established. Ptolemy does not give them, but in each case when required applies the theorem of Mene- laus for spherics directly. This greatly increases the length of his demonstrations, which the modern reader finds still more cumbrous, inasmuch as in each case it was necessary to express the relation in terms

of chords— the equivalents of sines — only, cosines and tangents being of later invention.

Such, then, was the trigonometry of the Greeks. Mathe- matics, indeed, has ever been, as it were, the handmaid of astronomy, and many important methods of the former arose

1 Ideler has examined the degree of accuracy of the numbers in these tables and finds that they are correct to five places of decimals.

s On the theorem of Menelaus and the rule of six quantities, see Chasles, Apercu historique sur I'or + gine et developpement des methodes en geometrie, note vi. p. 291.

from the needs of the latter. Moreover, by the foundation of trigonometry, astronomy attained its final general constitution, in which calculations took the place of diagrams, as these latter had been at an earlier period substituted for mechanical apparatus in solving the ordinary problems. 3 Further, we find in the application of trigonometry to astronomy frequent ex- amples and even a systematic use of the method of approxima- tions — the basis, in fact, of all application of mathematics to practical questions. There was a disinclination on the part of the Greek geometer to be satisfied with a mere approximation, were it ever so close; and the unscientific agrimensor shirked the labour involved in acquiring the knowledge which was indispensable for learning trigonometrical calculations. Thus the development of the calculus of approximations fell to the lot of the astronomer, who was both scientific and practical. 4

We now proceed to notice briefly the contents of the Almagest. It is divided into thirteen books. The first book, which may be regarded as introductory to the whole work, opens with a short preface, in which Ptolemy, after some observations on the distinc- tion between theory and practice, gives Aristotle's division of the sciences and remarks on the certainty of mathematical knowledge, " inasmuch as the demonstrations in it proceed by the incontro- vertible ways of arithmetic and geometry." He concludes his preface with the statement that he will make use of the discoveries of his predecessors, and relate briefly all that has been sufficiently explained by the ancients, but that he will treat with more care arid develop- ment whatever has not been well understood or fully treated. Ptolemy unfortunately does not always bear this in mind, and it is sometimes difficult to distinguish what is due to him from that which he has borrowed from his predecessors.

Ptolemy then, in the first chapter, presupposing some preliminary notions on the part of the reader, announces that he will treat in order — what is

the relation of the earth to the heavens, what is the position of the oblique circle (the ecliptic), and the situation cf the inhabited parts of the earth; that he will point out the differences of climates; that he will then pass on to the consideration of the motion of the sun and moon, without which one cannot have a just theory of the stars; lastly, that he will consider the sphere of the fixed stars and then the theory of the five stars called "planets." All these things — i.e. the phenomena of the heavenly bodies — he says he will endeavour to explain in taking for principle that which is evident, real and certain, in resting everywhere on the surest observations and applying geometrical methods. He then enters on a summary exposition of the general principles on which his Syntaxis is based, and adduces arguments to show that the heaven is of a spherical form and that it moves after the manner of a sphere, that the earth also is of a form which is sensibly spherical, that the earth is in the centre of the heavens, that it is but a point in com- parison with the distances of the stars, and that it has not any motion of translation. With respect to the revolution of the earth round its axis, which he says some have held, Ptolemy, while admitting that this supposition renders the explanation of the phenomena of the heavens much more simple, yet regards it as altogether ridiculous. Lastly, he lays down that there are two principal and different motions in the heavens — one by which all the stars are carried from east to west uniformly about the poles of the equator; the other, which is peculiar to some of the stars, is in a contrary direction to the former motion and takes place round different poles. These preliminary notions, which are all older than Ptolemy, form the subjects of the second and following chapters. He next proceeds to the construction of his table of chords, of which we have given an account, and which is indispensable to practical astronomy. The employment of this table presupposes the evaluation of the obliquity of the ecliptic, the knowledge of which is indeed the foundation of all astronomical science. Ptolemy in the next chapter indicates two means of determining this angle by observation, describes the instruments he employed for that purpose, and finds the same value which had already been found by Eratosthenes and used by Hipparchus. This " is followed by spherical geometry and trigonometry enough for the determination of the connexion between the sun's right ascension, declination and longitude, and for the formation of a table of declinations to each degree of longitude. Delambre says he found both this and the table of chords very exact." 6

In book ii., after some remarks on the situation of the habitable parts of the earth, Ptolemy proceeds to make deductions from the principles established in the preceding book, which he does by means of the theorem of Menelaus. The length of the longest day being given, he shows how to determine the arcs of the horizon intercepted between the equator and the ecliptic — the amplitude of the eastern point of the ecliptic at the solstice— for different

8 Comte, Systeme de politique positive, iii. 324. 4 Cantor, Vorlesungen iiber Geschichte der Mathematik, p. 356. ‘ De Morgan, in Smith’s Dictionary of Greek and Roman Biography, s.v. ” Ptolemaeus, Claudius.”

degrees of obliquity of the sphere; hence he finds the height of the pole and reciprocally. From the same data he shows how to find at what places and times the sun becomes vertical and how to calculate the ratios of gnomons to their equinoctial and solstitial shadows at noon and conversely, pointing out, however, that the latter method is wanting in precision. All these matters he con- siders fully and works out in detail for the parallel of Rhodes. Theon gives us three reasons for the selection of that parallel by Ptolemy: the first is that the height of the pole at Rhodes is 36 , a whole number, whereas at Alexandria he believed it to be 30° 58’; the second is that Hipparchus had made at Rhodes many observa- tions ; the third is that the climate of Rhodes holds the mean place of the seven climates subsequently described. Delambre suspects a fourth reason, which he thinks is the true one, that Ptolemy had taken his examples from the works of Hipparchus, who observed at Rhodes and had made these calculations for the place where he lived. In chapter vi. Ptolemy gives an exposition of the most important properties of each parallel, commencing with the equator, which he considers as the southern limit of the habitable quarter of the earth. For each parallel or climate, which is determined by the length of the longest day, he gives the latitude, a principal place on the parallel, and the lengths of the shadows of the gnomon at the solstices and equinox. In the next chapter he enters into particulars and inquires what are the arcs of the equator which cross the horizon at the same time as given arcs of the ecliptic, or, which comes to the same thing, the time which a given arc of the ecliptic takes to cross the horizon of a given place. He arrives at a formula for calculating ascensional differences and gives tables of ascensions arranged by 10° of longitude for the different climates from the equator to that where the longest day is seventeen hours. He then shows the use of these tables in the investigation of the length of the day for a given climate, of the manner of reducing temporal 1 to equinoctial hours and vice versa, and of the nonagesimal point and the point of orientation of the ecliptic. In the following chapters of this book he determines the angles formed by the intersections of the ecliptic — first with the meridian, then with the horizon, and lastly with the vertical circle — and concludes by giving tables of the angles and arcs formed by the intersection of these circles, for the seven climates, from the parallel of Meroe (thirteen hours)

to that of the mouth of the Borysthenes (sixteen hours). These tables, he adds, should be completed by the situation of the chief towns in all countries according to their latitudes and longitudes; this he promises to do in a separate treatise and has in fact done in his Geography.

Book iii. treats of the motion of the sun and of the length of the year. In order to understand the difficulties of this question Ptolemy says one should read the books of the ancients, and especi- ally those of Hipparchus, whom he praises " as a lover of labour and a lover of truth " (kvbpi i \oTrbvt$ rt by.ov ko.1 tptXaXiflti). He begins by telling us how Hipparchus was led to discover the preces- sion of the equinoxes; he relates the observations by which Hippar- chus verified the eccentricity of the solar orbit imperfectly known to his Chaldaean predecessors, and gives the hypothesis of the eccentric by which he explained the inequality of the sun's motion. Ptolemy concludes this book by giving a clear exposition of the circumstances on which the equation of time depends. Ptolemy, moreover, applies Apollonius's hypothesis of the epicycle to explain the inequality of the sun's motion, and shows that it leads to the same results as the hypothesis of the eccentric. He prefers the latter hypothesis as more simple, requiring only one and not two motions, and as equally fit to clear up the difficulties. In the second chapter there are some general remarks to which attention should be directed. We find the principle laid down that for the explanation of phenomena one should adopt the simplest hypothesis that it is possible to establish, provided that it is not contradicted by the observations in any important respect. 2 This fine principle, which is of universal application, may, we think — regard being paid to its place in the Almagest— be justly attributed to Hipparchus. It is the first law of the " philosophia prima " of Comte. 3 We find in the same page another principle, or rather practical injunction, that in investiga tions founded on observations where great delicacy is required we should select those made at considerable intervals of time in order that the errors arising from the imperfection which is inherent in all observations, even in those made with the greatest care, may be lessened by being distributed over a large number of years. In the same chapter we find also the principle laid down that the object of mathematicians ought to be to represent all the celestial phenomena by uniform and circular motions. This principle is stated by Ptolemy in the manner which is unfortunately too common with him — that is to say, he does not give the least indication whence he derived it. We know, however, from Simplicius, on the authority of Sosigenes, 4 that Plato is said to have proposed the following

1 Koiputoi, temporal or variable. These hours varied in length with the seasons ; they were used in ancient times and arose from the division of the natural day (from sunrise to sunset) into twelve parts.

8 Aim. ed. Halma, i. 159.

3 Systeme de politique positive, iv. 173.

- *This Sosigenes, as Th. H. Martin has shown, was not the astro- nomer of that name who was a contemporary of Julius Caesar, but a Peripatetic philosopher who lived at the end of the 2nd century.*

problem to astronomers: "What regular and determined motions being assumed would fully account for the phenomena of the motions of the planetary bodies ? " We know, too, from the same source that Eudemus says in the second book of his History of Astronomy that " Eudoxus of Cnidus was the first of the Greeks to take in hand hypothesis of this kind," 6 that he was in fact the first Greek astro- nomer who proposed a geometrical hypothesis for explaining the periodic motions of the planets — the famous system of concentric spheres. It thus appears that the principle laid down here by Ptolemy can be traced to Eudoxus and Plato ; and it is probable that they derived it from the same source, namely, Archytas and the Pythagoreans. We have indeed the direct testimony of Geminus of Rhodes that the Pythagoreans endeavoured to explain the phenomena of the heavens by uniform and circular motions. 6 _

Books iv., v. are devoted to the motions of the moon, which are very complicated; the moon in fact, though the nearest to us of all the heavenly bodies, has always been the one which has given the greatest trouble to astronomers. 7 Book iv., in which Ptolemy follows Hipparchus, treats of the first and principal inequality of the moon, which quite corresponds to the inequality of the sun treated of in the third book. As to the observations which should be employed for the investigation of the motion of the moon, Ptolemy tells us that lunar eclipses should be preferred, inasmuch as they give the moon's place without any error on the score of parallax. The first thing to be determined is the time of the moon's revolution; Hipparchus, by comparing the observations of the Chaldaeans with his own, discovered that the shortest period in which the lunar eclipses return in the same order was 126,007 days and I hour. In this period he finds 4267 lunations, 4573 restitutions of anomaly and 4612 tropical revolutions of the moon less 7 J° q.p. ; this quantity (7i°) is also wanting to complete the 345 revolutions which the sun makes in the same time with respect to the fixed stars. He con- cluded from this that the lunar month contains 29 days and 31′ 50″ 8‴ 20⁗ of a day, very nearly, or 29 days 12 hours 44′ 3″ 20". These results are of the highest importance. In order to explain this inequality, or the equation of the centre, Ptolemy makes use of the hypothesis of an epicycle, which he prefers to that of the eccentric. The fifth book commences with the description of the astrolabe of Hipparchus, which Ptolemy made use of in following up the observa- tions of that astronomer,

and by means of which he made his most important discovery, that of the second inequality in the moon's motion, now known by the name of the " evection." In order to explain this inequality he supposed the moon to move on an epicycle, which was carried by an eccentric whose centre turned about the earth in a direction contrary to that of the motion of the epicycle. Thisi is the first instance in which we find the two hypotheses of eccentric and epicycle combined. The fifth book treats also of the parallaxes of the sun and moon, and gives a description of an instrument— called later by Theon the " parallactic rods " — devised by Ptolemy for observing meridian altitudes with greater accuracy.

The subject of parallaxes is continued in the sixth book of the Almagest, and the method of calculating eclipses is there given. The author says nothing in it which was not known before his time.

Books vii., viii. treat of the fixed stars. Ptolemy verified the fixity of their relative positions and confirmed the observations of Hipparchus with regard to their motion in longitude, or the preces- sion of the equinoxes. The seventh book concludes with the cata- logue of the stars of the northern hemisphere, in which are entered their longitudes, latitudes and magnitudes, arranged according to their constellations; and the eighth book commences with a similar catalogue of the stars in the constellations of the southern hemi- sphere. This catalogue has been the subject of keen controversy amongst modern astronomers. Some, as Flamsteed and Lalande, maintain that it was the same catalogue which Hipparchus had drawn up 265 years before Ptolemy, whereas others, of whom Laplace is one, think that it is the work of Ptolemy himself. The probability is that in the main the catalogue is really that of Hipparchus altered to suit Ptolemy's own time, but that in making the changes which were necessary a wrong precession was assumed. This is Delambre 's opinion; he says, " Whoever may have been the true author, the catalogue is unique, and does not suit the age when Ptolemy lived; by subtracting 2° 40′ from all the longitudes it would suit the age of Hipparchus; this is all that is certain." 8 It has been remarked that Ptolemy, living at Alexandria, at which city the altitude of the pole is 5 less than at Rhodes, where Hipparchus observed, could have seen stars which are not visible at Rhodes: none of these stars, however, are in Ptolemy's catalogue. The eighth book contains, moreover, a descri ption of the milky way and the manner

6 Brandis, Schol. in Aristot. edidit acad. reg. borussica (Berlin, 1836), p. 498.

6 Eiaayoiy/) els to aiv6iia > a, c. i. in Halma's edition of the works of Ptolemy, vol. iii. (" Introduction aux phe^nomenes celestes, traduite du grec de Geminus," p. 9), Paris, 1819.

7 This has been noticed by Pliny, who says, ” Multiformi haec (luna) ambage torsit ingenia contemplantium, et proximum ignorari maxime sidus indignantium ” {N.H., ii. 9).

8 Delambre, Histoire de Vastronomie ancienne, ii. 264.

of constructing a celestial globe; it also treats of the configuration of the stars, first with regard to the sun, moon and planets, and then with regard to the horizon, and likewise of the different aspects of the stars and of their rising, culmination and setting simultaneously with the sun.

The remainder of the work is devoted to the planets. The ninth book commences with what concerns them all in general. The planets are much nearer to the earth than the fixed stars and more distant than the moon. Saturn is the most distant of all, then Jupiter and then Mars. These three planets are at a greater distance from the earth than the sun. 1 So far all astronomers are agreed. This is not the case, he says, with respect to the two remaining planets, Mercury and Venus, which the old astronomers placed between the sun and earth, whereas more recent writers 2 have placed them beyond the sun, because they were never seen on the sun. s He shows that this reasoning is not sound, for they might be nearer to us than the sun and not in the same plane, and conse- quently never seen on the sun. He decides in favour of the former opinion, which was indeed that of most mathematicians. The ground of the arrangement of the planets in order of distance was the relative length of their periodic times; the greater the circle, the greater, it was thought, would be the time required for its description. Hence we see the origin of the difficulty and the difference of opinion as to the arrangement of the sun, Mercury and Venus, since the times in which, as seen from the earth, they appear to compkte the circuit of the zodiac are nearly the same — a year. 4 Delambre thinks it strange that Ptolemy did not see that these contrary opinions could be reconciled by supposing that the two planets moved in epicycles about the sun; this would be stranger still, he adds, if it is true that this idea, which is older than Ptolemy, since it is referred to by Cicero, 5 had been that of the Egyptians. 6 It may be added, as strangest of all, that this doctrine was held by Theon of Smyrna, 7 who was a contemporary of Ptolemy or somewhat senior to him. From this system to that of Tycho Brahe there is, as Delambre observes, only a single step.

We have seen that the problem which presented itself to the astronomers of the Alexandrian epoch was the following: it was required to find such a system of equable circular motions as would represent the inequalities in the apparent motions of the sun, the moon and the planets. Ptolemy now takes up this question for the planets; he says that " this perfection is of the essence of celestial things, which admit of neither disorder nor inequality," that this planetary theory is one of extreme difficulty, and that no one had yet completely succeeded in it. He adds that it was owing to these difficulties that Hipparchus — who loved truth above all things, and who, moreover, had not received from his predecessors observations either so numerous or so precise as those that he has left — had succeeded, as far as possible, in representing the motions of the sun and moon by circles, but had not even commenced the theory of the five planets. He was content, Ptolemy continues, to arrange the observations which had been made on them in a methodic order and to show thence that the phenomena did not agree with the hypotheses of mathematicians at that time. He showed that in fact each planet had two inequalities, which are different for each, that the retro- gradations are also different, whilst other astronomers admitted only single inequality and the same retrogradation ; he showed further that their motions cannot be explained by eccentrics nor by epi- cycles carried along concentrics, but that it was necessary to com- bine both hypotheses. After these preliminary notions he gives from Hipparchus the periodic motions of the five planets, together with the shortest times of restitutions, in which, moreover, he has made some slight corrections. He then gives tables of the mean motions in longitude and of anomaly of each of the five planets, 8

1 This is true of their mean distances ; but we know that Mars at opposition is nearer to us than the sun.

2 Eratosthenes, for example, as we learn from Theon of Smyrna. 'Transits of Mercury and Venus over the sun's disk, therefore,

had not been observed.

4 This was known to Eudoxus. Sir George Cornewall Lewis (An Historical Survey of the Astronomy of the Ancients, p. 155), confusing the geocentric revolutions assigned by Eudoxus to these two planets with the heliocentric revolutions in the Copernican system, which are of course quite different, says that " the error with respect to Mercury and Venus is considerable " ; this, however, is an error not of Eudoxus but of Cornewall Lewis, as Schiaparelli has remarked.

5 " Hunc [solem] ut comites consequuntur Veneris alter, alter Mercurii cursus " (Somnium Scipionis, De rep. vi. 17). This hypothesis is alluded to

by Pliny, N.H. ii. 17, and is more explicitly stated by Vitruvius, Arch. ix. 4.

6 Macrobius, Commentat ius ex Cicerone in somnium Scipionis, i.

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7 Theon (Smyrnaeus Platonicus), Liber de aslronomia, ed. Th. H. Martin (Paris, 1849), pp. 174, 294, 296. Martin thinks that Theon, the mathematician, four of whose observations are used by Ptolemy (Aim. ii. 176, 193, 194, 195, 196, ed. Halma), is not the same as Theon of Smyrna, on the ground chiefly that the latter was not an observer.

8 Delambre compares these mean motions with those of our modern tables and finds them tolerably correct. By " motion in

and shows how the motions in longitude of the planets can be represented in a general manner by means of the hypothesis of the eccentric combined with that of the epicycle. He next applies his theory to each planet and concludes the ninth book by the explana- tion of the various phenomena of the planet Mercury. In the tenth and eleventh books he treats, in like manner, of the various phe- nomena of the planets Venus, Mars, Jupiter and Saturn.

Book xii. treats of the stationary and retrograde appearances of each of the planets and of the greatest elongations of Mercury and Venus. The author tells us that some mathematicians, and amongst them Apollonius of Perga, employed the hypothesis of the epicycle to explain the stations and retrogradations of the planets. Ptolemy goes into this theory, but does not change in the least the theorems of Apollonius ; he only promises simpler and clearer demonstrations of them. Delambre remarks that those of Apollonius must have been very obscure, since, in order to make the demonstrations in the Almagest intelligible, he (Delambre) was obliged to recast them. This statement of Ptolemy is important, as it shows that the mathe- matical theory of the planetary motions was in a tolerably forward state long before his time. Finally, book xiii. treats of the motions of the planets in latitude, also of the inclinations of their orbits and of the magnitude of these inclinations.

Ptolemy concludes his great work by saying that he has included in it everything of practical utility which in his judgment should find a place in a treatise on astronomy at the time it was written, with relation as well to discoveries as to methods. His work was justly called by him MaOrjfianKri uivraˆis, for it was in fact the mathematical form of the work which caused it to-be preferred to all others which treated of the same science, but not by " the sure methods of geometry and calculation." Accordingly, it soon

spread from Alexandria to all places where astronomy was cultivated ; numerous copies were made of it, and it became the object of serious study on the part of both teachers and pupils. Amongst its numerous commentators may be mentioned Pappus and Theon of Alexandria in the 4th century and Proclus in the 5th. It was translated into Latin by Boetius, but this translation has not come down to us. The Syntaxis was translated into Arabic at Bagdad by order of the enlightened caliph Al-Mamun, who was himself an astronomer, about 827 a.d., and the Arabic translation was revised in the follow- ing century by Tobit ben Korra. The Almagest was translated from the Arabic into Latin by Gerard of Cremona (q.v.). In the 15th century it was translated from a Greek manuscript in the Vatican by George of Trebizond. In the same century an epitome of the Almagest was commenced by Purbach (d. 1461) and completed by his pupil and successor in the professorship of astronomy in the university of Vienna, Regiomontanus. The earliest edition of this epitome is that of Venice (1496), and this was the first appearance of the Almagest in print. The first complete edition of the Almagest is that of P. Liechtenstein (Venice, 1515) — a Latin version from the Arabic. The Latin translation of George of Trebizond was first printed in 1528, at Venice. The Greek text, which was not known in Europe until the 15th century, was first published in the 16th by Simon Grynaeus, who was also the first editor of the Greek text of Euclid, at Basel (1538). This edition was from a manuscript in the library of Nuremberg — where it is no longer to be found — ■ which had been presented by Regiomontanus, to whom it was given by Cardinal Bessarion.

Other works of Ptolemy, which we now proceed to notice very briefly, are as follow. (1) av, On the Apparitions of the Fixed Stars and a Collection of Prognostics. It is a calendar of a kind common amongst the Greeks under the name of Trapairqyua, or a collection of the risings and settings of the stars in the morning or evening twilight, which were so many visible signs of the seasons, with prognostics of the principal changes of temperature with relation to each climate, after the observations of the best meteorologists, as, for example, Meton, Democritus, Eudoxus, Hipparchus, &c. Ptolemy, in order to make his Parapegma useful to all the Greeks scattered over the enlightened world of his time, gives the apparitions of the stars not for one parallel only but for each of the five parallels in which the length of the longest day varies from 13J hours to 15-J hours — that is, from the latitude of Syene to that of the middle of the Euxine. This work was printed by Petavius in his Uranologium (Paris, 1630), and by Halma in his edition of the works of Ptolemy, vol. iii. (Paris, 1819). (2) 'Tirodkueis ruiv irKavoiˆkvuv ft T&v obpavioiv kvkKojv Kivrjueis , On the Planetary Hypothesis. This is a summary of a portion of the Alma- gest, and contains a brief statement of the principal hypotheses for the explanation of the motions of the heavenly bodies. It was first published

(Gr., Lat.) by Bainbridge, the Savilian professor of astronomy at Oxford, with the Sphere of Proclus and the Koctln' /WiXetfiv (London, 1620), and afterwards by Halma, vol. iv. (Paris, 1820). (3) Kaviiv PaaiXti&v, A Table of Reigns. This is a chrono- logical table of Assyrian, Persian, Greek and Roman sovereigns, with the length of their reigns, from Nabonasar to Antoninus Pius. This table (cf. G. Syncellus, Chronogr. ed. Dind. i. 388 seq.) was printed by Scaliger, Calvisius, Petavius, Bainbridge and by Halma,

longitude " must be understood the motion of the centre of the epicycle about the eccentric, and by " anomaly " the motion of the star on its epicycle.

vol. iii. (Paris, 1819). (4) 'kppoviK&v j8t/3Xio 7'. This Treatise on Music was published in Greek and Latin by Wallis at Oxford (1682). It was afterwards reprinted with Porphyry's commentary in the third volume of Wallis's works (Oxford, 1699). (5) TeTpd|8i/3Xos a-wi-aˆis, Tetrabiblon or Quadripartitum. This work is astrological, as is also the small collection of aphorisms, called Kapw6s or Centi- loguium, by which it is followed. It is doubtful whether these works are genuine, but the doubt merely arises from the feeling that they are unworthy of Ptolemy. They were both published in Greek and Latin by Camerarius (Nuremberg, 1535), and by Melanchthon (Basel, 1553). (6) De analemmate. The original of this work of Ptolemy is lost. It was translated from the Arabic and published by Commandine (Rome, 1562). The Analemma is the description of the sphere on a plane. We find in it the sections of the different circles, as the diurnal parallels, and everything which can facilitate the intelligence of gnomonics. This description is made by perpen- diculars let fall on the plane; whence it has been called by the moderns " orthographic projection." (7) Planisphaerium, The Planisphere. The Greek text of this work also is lost, and we have only a Latin translation of it from the Arabic. The " planisphere " is a projection of the sphere on the equator, the eye being at the pole — in fact what is now called " stereographic " projection. The best edition of this work is that of Commandine (Venice, 1558). (8) Optics. This work is known to us only by imperfect manuscripts in Paris and Oxford, which are Latin translations from the Arabic. The Optics consists of five books, of which the fifth presents most interest: it treats of the refraction of luminous rays in their passage through media of different densities, and also of astronomical refractions, on which subject

the theory is more complete than that of any astronomer before the time of Cassini. De Morgan doubts whether this work is genuine on account of the absence of allusion to the Almagest or to the subject of refraction in the Almagest itself; but his chief reason for doubting its authenticity is that the author of the Optics was a poor geometer. (G. J. A.)

The publication of a new edition of Ptolemy's works under the title, Claudii Ptolemaei opera quae exstant omnia, was recently undertaken at Leipzig. The first volume (in two parts, 1898, 1903) contains the Greek text of the Almagest edited by J. L. Heiberg. Consult also J. E. Mcntucla, Histoire des mathematiques, i. 293; J. B. J. Delambre, Connaissance des temps (1816); and Histoire de I'astronomie ancienne, vol. 2; J. J. A. Caussin, Nouvelles memoires de Vacad. des inscriptions, t. vi. ; P. Tannery, Recherches sur I'histoire de I'astronomie ancienne, ch. vi.-xv. ; Narrieu, History of Astronomy (1833); Fabricius, Bibliotheca graeca, ed. Harles, vol. 5; Halma's 1813-1816 edition of his Almagest (Greek with French translation); A. Berry, A Short History of Astronomy, pp. 62-73; British Museum Catalogue.

Geography.

Ptolemy is hardly less celebrated as a geographer than as an astronomer, and his Geographike syntaxis exercised as great an influence on geographical progress (especially during the period of the Classical Renaissance) , as did his Almagest on astronomical. This exceptional position was largely due to its scientific form, which rendered it convenient and easy of reference; but, apart from this, it was really the most considerable attempt of the ancient world to place the study of geography on a scientific basis. The astronomer Hipparchus had indeed pointed out, three centuries before Ptolemy, that the only way to construct a trustworthy map of the inhabited world would be by observa- tions of the latitude and longitude of all the principal points on its surface. But the materials for such a map were almost wholly wanting, and, though Hipparchus made some approach to a correct division of the known world into zones of latitude, " climates " or klimata, as he termed them, trustworthy observa- tions of latitude were then very few, while the means of deter- mining longitudes hardly existed. Hence probably it arose that no attempt was made to follow up the suggestion of Hipparchus until Marinus of Tyre, who lived shortly before Ptolemy, and whose work is known to us only through the latter. Marinus' scientific materials being inadequate, he contented himself mostly with determinations derived from itineraries and other rough methods, such as are still employed where more accurate means of determination are not available. The greater part of Marinus' treatise was occupied with the discussion of his authorities, and it is impossible, in the absence of the original work, to decide how far his results attained a

scientific form. But Ptolemy himself considered them, on the whole, so satisfac- tory that he made his predecessor's work the basis of his own in regard to all the Mediterranean countries, that is, in regard to almost all those regions of which he had definite knowledge. In the more remote regions of the world, Ptolemy availed himself of

Marinus' information, but with reserve, and himself explains the reasons that induced him sometimes to depart from his predecessor's conclusions. It is unjust to term Ptolemy a plagiarist from Marinus, as he himself fully acknowledges his obligations to that writer, from whom he derived the whole mass of his materials, which he undertook to arrange and present to his readers in a scientific form. It is this form, unique among those ancient geographical treatises which have survived, that constitutes one great merit of Ptolemy's work. At the same time it shows the increased knowledge of Asia and Africa acquired since Strabo and Pliny.

1. Mathematical Geography.— As an astronomer, Ptolemy was of course better qualified to explain the mathematical conditions of the earth and its relations to the celestial bodies than most preceding geographers. His general views had much in common with those of Eratosthenes and Strabo. Thu=, i»ˆ assumed that the earth was a globe, the surface of which was divided by certain great circles — the equator and the tropics — parallel to one another, dividing the earth into five zones, the relations of which with astronomical phenomena were of course clear to his mind as a matter of theory, though in regard to the regions bordering on the equator, as well as to those adjoining the polar circle, he could have had no confirmation of his conclusions from actual observation. He adopted also from Hipparchus the division of the equatorial circle into 360 parts (degrees, as they were subsequently called, though the word does not occur in this sense in Ptolemy), and supposed other circles to be drawn through this, from the equator to the pole, to which he gavf the name of meridians. He thus, like modern geographers, conceived the whole surface of the earth as covered with a network of parallels of latitude and meridians of longitude, terms which he himself was the first extant writer'to employ in this technical sense. Within the network thus constructed it was his task to place the outline of the world, so far as known to him.

But at the very outset of his attempt he fell into an error vitiating; all his conclusions. Eratosthenes (276-196 B.C.) was the first who had attempted scientifically to determine the earth's circumference, and his result of 250,000 (or 252,500) stadia, i.e. 25,000 (25,200) geographical miles, was generally adopted by subsequent geo- graphers, including Strabo. Poseidonius, however (c. 135-50 B.C.), reduced this to 180,000, and the latter computation was inexplicably adopted by Marinus and Ptolemy. This error made every degree of latitude or longitude (measured at the equator)

equal to only 500 stadia (50 geographical miles), instead of its true equivalent of 600 stadia. The mistake would have been somewhat neutralized had there existed a sufficient number of points of which the position was fixed by observation; but we learn from Ptolemy himself that such observations for latitude were very few, while the means of determining longitudes were almost wholly wanting. 1 Hence the posi- tions laid down by him were, with few exceptions, the result of computations from itineraries and the statements of travellers, liable to much greater error in ancient times than at the present day, from the want of any accurate mode of observing bearings, of measuring time (by portable instruments), or of estimating distances at sea, except by the rough estimate of the time employed in sailing from point to point. Even the use of the log was unknown to the ancients. But, great as were the errors resulting from such imperfect means of calculation, they were increased by the permanent error arising from Ptolemy's system of graduation. Thus if he con- cluded (from itineraries) that two places were 5000 stadia distant, he would place them io° apart, and thus in fact separate them by 6000 stadia.

Another source of permanent error (though of less importance), which affected all his longitudes, arose from his prime meridian. Here also he followed Marinus, who, supposing that the Fortunate Islands (vaguely answering to our Canaries plus the Madeira group) lay farther west than any part of Europe or Africa, had taken the meridian through the (supposed) outermost of this group as his prime meridian, from whence he calculated his longitudes eastwards to the Indian Ocean. But as both Marinus and Ptolemy had no exact knowledge of the islands in question the line thus assumed was purely imaginary, drawn through the supposed position of an island which they placed 2\° (instead of 9 20') west of the Sacred Promontory (i.e. Cape St Vincent, regarded by Marinus and Ptolemy, as by previous geographers, as the westernmost point of Europe). Hence all Ptolemy's longitudes, reckoned eastwards, were about 7° less than they would have been if really measured from the meridian of Ferro, which continued so long in use. This error was the more unfortunate as the longitude was really calculated, not from this imaginary line, but from Alexandria, westwards as well as eastwards (as Ptolemy himself has done in his eighth book), and afterwards reversed, so as to suit the supposed method of computation.

1 Hipparchus pointed out the mode of determining longitudes by observations of eclipses, but the instance to which he referred (of the celebrated eclipse before the battle of Arbela, which was also seen at Carthage) was a mere matter of popular observation, of no scien- tific value. Yet Ptolemy seems to have known of no other.

The equator was in like manner placed by Ptolemy at a consider- able distance from its true geographical position. The place of the equinoctial line was well known to him as a matter of theory, but as no observations could have been made in those regions he could only calculate its place from that of the tropic, which he supposed to pass through Syene. And as he here, as elsewhere, reckoned a degree of latitude as equivalent to 500 stadia, he inevi- tably made the interval between the tropic and the equator too small by one-sixth ; and the place of the former being fixed by obser- vation, he necessarily carried up the supposed place of the equator too high by more than 230 geographical miles. But as he had practically no geographical acquaintance with the equinoctial regions this error was of little importance.

With Marinus and Ptolemy, as with preceding Greek geographers, the mpsj important line for practical purposes was the parallel of 36 ft-, which, passing through the Straits of Gibraltar, Rhodes Island and the Gulf of Issus, and thus dividing the Mediterranean (as Dicaearchus and his successors usually regarded it) into two, was continued in theory along the chain of Mt Taurus till it joined the mountains north of India; thence to the Eastern Ocean it was regarded as constituting the dividing line of the inhabited world, along which the length of the latter must be measured. But so inaccurate were the observations and so imperfect the materials at command, even in regard to the best known regions, that Ptolemy, following Marinus, describes this parallel as passing through Caralis in Sardinia and Lilybaeum in Sicily, the one being really in 39 ° 12′ lat., the other in 37 ° 50’. Still more strangely he places Carthage 1 ° 20′ south of the dividing parallel, while it really lies nearly 1 ° north of it.

The problem that had especially attracted the attention of geographers from Dicaearchus to Ptolemy was to determine the length and breadth of the inhabited world. This question had been fully discussed by Marinus, who had arrived at conclusions widely different from his predecessors. Towards the north, indeed, there was no great difference of opinion, the latitude of Thule being gen- erally recognized as that of the highest northern land, and this was placed both by Marinus and Ptolemy in 63 N., not far beyond the true position of the Shetland Islands, which had come to be generally identified with the mysterious Thule of Pytheas. The western extremity, as already mentioned, had been in like manner determined by the prime meridian drawn through the supposed position of the outermost of the Fortunate Islands. But towards the south and east Marinus gave an enormous extension to Africa and Asia, beyond what had been known to or suspected by earlier geographers, and, though Ptolemy reduced Marinus' calculations, he retained an exaggerated estimate of their results.

The additions thus made to the estimated dimensions of the known world were indeed in both directions based upon a real extension of knowledge, derived from recent information ; but the original statements were so perverted by misinterpretation as to give results (in map-construction) differing widely from the truth. The southern limit of the world had been fixed by Eratosthenes and even by Strabo at the parallel which passed through the eastern extremity of Africa (Cape Guardafui), the Cinnamon Region (Somali- land) and the country of the Sembritae (Sennaar). This parallel, which would correspond nearly to that of 10° of true latitude, they supposed to be situated at a distance of 3400 stadia (340 geographical miles) from that of Meroe (the position of which was pretty accu- rately known) and 13,400 to the south of Alexandria; while they conceived it as passing eastward through Taprobane (Ceylon, often Ceylon plus Sumatra?), universally recognized as the southernmost land of Asia. Both these geographers were ignorant of the vast extension of Africa to the south of this line and even of the equator, and conceived it as trending away west from the Cinnamon Land and then north-west to the Straits of Gibraltar. Marinus had, however, learned from itineraries both by land and sea the fact of this extension, of which he had conceived so exaggerated an idea that even after Ptolemy had reduced it by more than half it was still much in excess of the truth. The eastern coast of Africa was indeed tolerably well known, being frequented by Greek and Roman traders, as far as a place called Rhapta (opposite to Zanzi- bar?), placed by Ptolemy not far from 7 S. To this he added a bay extending to Cape Prasum (Delgado?), which he placed in I5j°S. At the same time he assumed the position in about the same parallel of a region called Agisymba, inhabited by Ethiopians and abounding in rhinoceroses, which was supposed to have been discovered by a Roman general, Julius Maternus, whose itinerary was employed by

Marinus. Taking, therefore, this parallel as the limit of knowledge to the south, while he retained that of Thule to the north, Ptolemy assigned to the inhabited world a breadth of nearly 80°, instead of less than 60 °, as in Eratosthenes and Strabo.

It had been a common belief among Greek geographers, from the earliest attempts at scientific geography, not only that the length of the inhabited world greatly exceeded its breadth, but that it was more than twice as great, an unfounded assumption to which their successors seem to have felt themselves bound to conform. Thus Marinus, while extending his Africa unduly southward, exag- gerated Asia still more grossly eastward. Here also he really possessed a great advance in knowledge over all his predecessors, the silk trade with China having led to an acquaintance, though of

a vague and general kind, with regions east of the Pamir and Tian Shan, the limits of Asia as previously known to the Greeks. Marinus had learned that traders proceeding eastward from the Stone Tower (near the Pamir?) to Sera, the capital of the Seres (inland China?), occupied seven months on the journey; thence he calculated that the distance between the two points was 36,200 stadia or 3620 geographical miles. Ptolemy, while he points out the erroneous mode of computation on which this conclusion was founded, could not correct it by any real authority, and hence reduced it sum- marily by one half. He therefore placed Sera (Singanfu?), the easternmost point on his map of Asia, 45J from the Stone Tower, which again he fixed, on the authority of itineraries cited by Marinus, at 24,000 stadia or 60° of longitude from the Euphrates, reckoning in both cases a degree of longitude (in this latitude) as equivalent to 400 stadia. Both distances were greatly in excess, independently of error arising from graduation. The distances west of the Euphrates were of course comparatively well known, nor did Ptolemy's calculation of the length of the Mediterranean differ very materially from those of previous Greek geographers, though still greatly exceeding the truth, after allowing for the permanent error of graduation. This last, it must be remembered, would be cumu- lative, the longitudes being computed from a fixed point in the west, instead of being reckoned east and west from Alexandria, which was undoubtedly the mode in which they were really calculated. These causes of error combined to make Ptolemy allow 180° long., or 12 hours' interval, between the Fortunate Islands meridian and Sera (really about 130°).

But in thus estimating the length and breadth of the known world, Ptolemy attached a very different sense to these terms from that which they had generally borne. Most earlier Greek geographers and " cosmographers " supposed the inhabited world to be surrounded on all sides by sea, and to form a vast island in the midst of a circumfluous ocean. This notion

(perhaps derived from the Homeric " ocean stream," and certainly not based upon direct observation) was nevertheless in accordance with truth, great as was the misconception involved of the continents included. But Ptolemy in this respect went back to Hipparchus, and assumed that the land extended indefinitely north in the case of eastern Europe, east, south-east and north in that of Asia, and south, south-west and south-east in that of Africa. His boundary line was in each of these cases an arbitrary limit, beyond which Jay the Unknown Land, as he calls it. But in Africa he was not content with this extension southward; he also prolonged the continent eastward from its southernmost known point, so as to form a connexion with south-east Asia, the extent and position of which he wholly misconceived.

In this last case Marinus derived from the voyages of recent navigators in the Indian seas a knowledge of extensive lands hitherto unknown to the Helleno-Roman world, and Ptolemy acquired more information in this quarter. But he formed a false conception of the bearings of the coasts thus made known, and of the position of the lands to which they belonged, and, instead of carrying the line of coast northwards from the Golden Chersonese (Malay Peninsula) to the Land of the Sinae (sea-coast China), he brought it down again towards the south after forming a great bay, so that he placed Cattigara — the principal emporium in this part of Asia, and the farthest point known to him — on a supposed coast of unknown extent, but with a direction from north to south, and facing west. The hypothesis that this land was continuous with southernmost Africa, so as to enclose the Indian Ocean as one vast lake, though a mere assumption, is stated by him as definitely as if based upon positive information. It must be noticed that Ptolemy's extension of Asia eastwards, so as to diminish by 50 of longitude the interval between easternmost Asia and westernmost Europe, fostered Columbus' belief that it was possible to reach the former from the latter by direct navigation, crossing the Atlantic.

Ptolemy's errors respecting distant regions are one thing; it is another thing to discover, in regard to the Mediterranean basin, the striking imperfections of his geographical knowledge. Here he had indeed some well-established data for latitudes. That of Massilia had been determined, within a few miles, by Pytheas, and those of Rome, Alexandria and Rhodes were approximately known, all having been observation-centres for distinguished astronomers. The fortunate accident that Rhodes lay on the same parallel with the Straits of Gibraltar enabled Ptolemy to connect the two ends of the Inland Sea on the famous parallel of 36 N. Unfortunately Ptolemy, like his predecessors, supposed its course to lie almost uniformly through the open sea, ignoring the great projection of Africa towards the north from Carthage westward. The erroneous position assigned to Carthage being supposed to rest upon astronomical observation, doubtless determined that

of all North Africa. Thus Ptolemy's Mediterranean, from Massilia to the opposite point of Africa, had a width of over li c of latitude (really 6£°). He was still more at a loss in respect of longitudes, for which he had no trustworthy observations; yet he came nearer the truth than previous geographers, all of whom had greatly exaggerated the length of the Inland Sea. Their calculations, like those of Marinus and Ptolemy, could only be founded on the imper- fect estimates of mariners; and Ptolemy, in translating these I conclusions into scientific form, vitiated his results by his system of

graduation, Thus while Marinus calculated 24,800 stadia as the length of the Mediterranean from the Straits to the Gulf of Issus, this was stated by Ptolemy at 62 °, or about 20 too much. Even after correcting the error due to his computation of 500 stadia to a degree, there remains an excess of nearly 500 geographical miles.

Another error which disfigured the eastern portion of Ptolemy's Mediterranean map was the position of Byzantium, which Ptolemy (misled by Hipparchus) placed in the same latitude with Massilia, thus carrying it up more than 2° above its true position. This pushed the whole Euxine — with whose general form and dimensions he was fairly well acquainted — too far north by the same amount ; besides this he enormously exaggerated the extent of the Palus Maeotis (the Sea of Azov), which he also represented as having its direction from south to north ; by the combined effect of these two errors he carried up its northern extremity (with the Tanais estuary and city) as high as 54 30′ (the true south shore of the Baltic). Ptolemy, however, was the first writer of antiquity who showed some conception of the relations between the Tanais or Don (usually considered by the ancients as the boundary between Europe and Asia) and the Rha or Volga, which he correctly described as flowing into the Caspian. He was also the first geographer after Alexander to return to the correct view (found in Herodotus and Aristotle) that the Caspian was an inland sea, without communication with the ocean.

As to north Europe, Ptolemy's views were vague and imperfect. He had indeed more acquaintance with the British Islands than any previous geographer, and showed a remarkable knowledge of certain British coast-lines. But he (1) placed Ireland (Ivernia) farther north than any part of Wales, and (2) twisted round the whole of Scotland, so as to make its

length from west to east and to place the northern extremities of Britain and Ireland almost on the same parallel. These errors are probably connected and are naturally accompanied by the placing of Thule, the Orkneys (Orcades) and the Hebrides (Ebudae) indiscriminately on the left or north of Caledonia. Here he was perhaps embarrassed by adopting Marinus' conclusion that Thule lay in 63° N., while regarding it, like earlier geographers, as the northernmost of all lands. Ptolemy also supposed the northern coast of Germany, beyond the Cimbric Chersonese (Denmark), to be the southern shore of the Northern Ocean, with a general direction from west to east. Of the almost wholly landlocked Baltic he was entirely ignorant, as well as of the Scandinavian Peninsula; his Scandia is an island smaller than Corsica, lying in the true position of southern central Sweden. Some way east of the Vistula, Ptolemy, however, makes the Sarmatian coast trend north, to the parallel of Thule ; nor did he conceive this as an actual limit, but believed the Unknown Land to extend indefinitely in this direc- tion as also to the north of Asiatic Scythia.

As to the latter region, vague and erroneous as were his views concerning this enormous tract from Sarmatia to China, they show an advance on those of earlier geographers. Ptolemy was the first who had anything like a clear idea of the great north-and-south dividing range of Central Asia (the Pamir and Tian Shan), which he called Imaus, placing it nearly 40° too far east, and making it divide Scythia into two portions (Within Imaus and Beyond Imaus), somewhat corresponding to Russian and Chinese Central Asia. Ptolemy also applies the term Imaus to a section of the backbone range which in his system crosses Asia from west to east. This section lies east of the Indian Caucasus, and forms an angle with the other Imaus running north.

On the southern shores of Asia Ptolemy's geography is especially faulty, though he shows a greatly increased general knowledge of these regions. For more than a century the commercial relations between western India and Alexandria, the chief eastern emporium of the Roman Empire, had become more important and intimate than ever before. The tract called the Periplus of the Erythraean Sea, about a.d. 80, contains sailing directions for merchants from the Red Sea to the Indus and Malabar, and even indicates that the coast from Barygaza (Baroch) had a general southward direction down to and far beyond Cape Komari (Comorin), which, taken together with its account of the shore-line as far as the Ganges, affords some suggestions at least of a peninsular character for south India. But Ptolemy, following Marinus, not only gives to the Indian coasts, from Indus to Ganges, an undue extension in longitude, but practi- cally denies anything of an Indian peninsula, placing capes Komaria and Kory (his southernmost points in India) only 4° S. of Barygaza, the real interval being over 800 geographical miles, or, according to Ptolemy's system of

graduation, 16° of latitude. This error, distor- ting the whole appearance of south Asia, is associated with another as great, but of opposite tendency, in regard to Taprobane (in which ancient ideas of Ceylon and Sumatra are confusedly mingled). The size of this was exaggerated by most earlier Greek geographers; but Ptolemy extended it through 15 of latitude and 12 of longitude, so as to make it about fourteen times as large as the reality, and bring down its southern extremity more than 2° south of the equator.

Similar distortions in regions beyond the Ganges, concerning which Ptolemy is our only ancient authority, are less surprising. Between the date of the Periplus and that of Marinus it seems probable that Greek mariners had not only crossed the Gangetic gulf and visited the land on the opposite side, which they called the

Golden Chersonese, but pushed considerably farther east, to Catti- gara. But these commercial voyagers either brought back inaccu- rate notions, or Ptolemy's preconceptions destroyed the value of the new information, for nowhere does he distort the truth more wildly. After passing the Gjeat Gulf, beyond the Golden Cher- sonese, he makes the coast trend southward, and thus places Catti- gara (perhaps one of the south China ports) 8j° south of the equator. In this he was perhaps influenced by his notion of a junction of Asia and Africa in a terra incognita south of the Indian Ocean.

In regard to West Africa, we may notice that he conceives this coast as running almost due north and south to io° N., and then (after forming a great bay) as bending away to the unknown south- west. Though the Fortunate Islands were so important to his system as his prime meridian, he was entirely misinformed about them, and extended the group through more than 5° of latitude, so as to bring down the most southerly of them to the real parallel of the Cape Verde Islands.

In regard to the mathematical construction or projection of his maps, not only was Ptolemy greatly in advance of all his predeces- sors, but his theoretical skill was altogether beyond the nature of the materials to which he applied it. The methods by which he obviated the difficulty of transferring the delineation of different countries from the spherical surface of the globe to the plane surface of an ordinary map differed little from those in use at the present day, and the errors arising from this cause (apart from those produced by his fundamental error of graduation) were really of little conse- quence compared with the defective character of his information and the want of anything approaching to a survey of the countries delineated. He himself was well aware of his deficiencies in this respect, and, while giving full directions for the scientific construction of a general map, he contents himself, for the special maps of different countries, with the simple method employed by Marinus of drawing the

parallels of latitude and meridians of longitude as straight lines, assuming in each case the proportion between the two, as it really stood with respect to some one parallel towards the middle of the map, and neglecting the inclinations of the meridians to one another. Such a course, as he himself repeatedly affirms, will not make any material difference within the limits of each special map.

Ptolemy especially devoted himself to the mathematical branch of his subject, and the arrangement of his work, in which his results are presented in a tabular form, instead of being at once embodied in a map, was undoubtedly designed to enable the student to construct his maps for himself. This purpose it has abundantly served, and there is little doubt that we owe to the peculiar form thus given to his results their transmission in a comparatively perfect condition to the present day. Unfortunately the specious appear- ance of these results has led to the belief that what was stated in so scientific a form must necessarily be based upon scientific observa- tions. Though Ptolemy himself has distinctly pointed out in his first book the defective nature of his materials, and the true character of the data furnished by his tables, few readers studied this portion of his work, and his statements were generally received with un- doubting faith. It is only in modern times that his apparently scientific work has been shown to be in most cases a specious edifice resting upon no adequate foundations.

There can be no doubt that the work of Ptolemy was from the time of its first publication accompanied with maps, which are regularly referred to in the eighth book. But how far those which are now extant represent the original series is a disputed point. In two of the most ancient MSS. it is expressly stated that the maps which accompany them are the work of one Agathodaemon of Alexandria, who " drew them according to the eight books of Claudius Ptolemy." This expression might equally apply to the work of a contemporary draughtsman under the eyes of Ptolemy himself, or to that of a skilful geographer at a later period, and nothing is known from any other source concerning this Agatho- daemon. The attempt to identify him with a grammarian of the same name who lived in the 5th century is wholly without founda- tion. But it appears, on the whole, most probable that the maps appended to the MSS. still extant have been transmitted by unin- terrupted tradition from the time of Ptolemy.

2 . Progress of Geographical Knowledge in Certain Special Regions. — Ptolemy records, after Marinus, the penetration of Roman expedi- tions to the land of the Ethiopians and to Agisymba, clearly some region of the Sudan beyond the Sahara desert, perhaps the basin of Lake Chad. But while this name was the only recorded result of these expeditions, Ptolemy also gives much other information con- cerning the interior of North Africa

(whence derived we know not) to which nothing similar is found in any earlier writer. Unfortu- nately this new information was of so crude a character, and is presented in so embarrassing a form, as to perplex rather than assist. Thus Ptolemy's statements concerning the rivers Gir and Nigir, and the lakes and mountains with which they were connected, have baffled successive generations of interpreters. It may safely be said that they present no resemblance to the real features of the country as now known, and cannot be reconciled with them except by arbitrary conjecture.

As to the Nile, both Greeks and Romans had long endeavoured to discover the sources of this river, and an expedition sent out for that purpose by the emperor Nero had undoubtedly penetrated as far

as the marshes of the White Nile in about 9° N. Ptolemy's statement that the Nile derived its waters from two streams which rose in two lakes a little south of the equator was nearer the truth than any of the theories concocted in modern times before the discovery of the Victoria and Albert Nyanza. 4 n connexion with this subject he introduces a range of mountains running from east to west, which he calls the Mountains of the Moon, and which, however little understood by Ptolemy, may be considered to represent in a measure the fact of the alpine highlands now known to exist in the neighbour- hood of the Nyanzas and in British and German East Africa (Ruwen- zori, Kenya, Kilimanjaro, &c).

In Asia, as in Africa, Ptolemy had obtained, as we have seen, a vague, sometimes valuable, often misleading, half-knowledge of extensive regions, hitherto unknown to the Mediterranean world, and especially of Chinese Asia and its capital of Sera (Singanfu). North of the route leading to this far eastern land (supposed by Ptolemy to be nearly coincident with the parallel of 40°) lay a vast region of which apparently he knew nothing, but which he vaguely assumed to extend indefinitely northwards as far as the limits of the Unknown Land. The Jaxartes, which since Alexander had been the boundary of Greek geography in this direction, was still the northern limit of all that was really known of Central Asia. Beyond that Ptolemy places many tribes, to which he could assign no definite locality, and mountain ranges which he could only place at hap- hazard. As to south-east Asia, in spite of his misplacement of Cattigara and the Sinae or Thinae, we must recognize in the latter name a form of China; from the Sinae being placed immediately south of the Seres, it is possible that Ptolemy was aware of the connexion between the two — the Chinese coast known only by maritime voyages, and inland China, known only by

continental trade.

As to Mediterranean countries, we have seen that Ptolemy professed (in the main) to follow Marinus; the latter, in turn, largely depended on Timosthenes of Rhodes (ft. c. 260 B.C.), the admiral of Ptolemy Philadelphus, as to coasts and maritime distances. Claudius Ptolemy, however, introduced many changes in Marinus' results, some of which he has pointed out though there are doubtless many others which we have no means of detecting. For the interior of the different countries Roman roads and itineraries must have furnished both Marinus and Ptolemy with a mass of valuable materials. But neither seems to have taken full advantage of these ; and the tables of the Alexandrian geographer abound with mistakes — even in countries so well known as Gaul and Spain — which might easily have been obviated by a more judicious use of such Roman authorities.

In spite of the merits of Ptolemy's geographical work it cannot be regarded as a complete or satisfactory treatise upon the subject. It was the work of an astronomer rather than a geographer. Not only did its plan exclude all description of the countries with which it dealt, their climate, natural productions, inhabitants and peculiar features, but even its physical geography proper is treated in an irregular and perfunctory manner. While Strabo was fully alive to the importance of the rivers and mountain chains which (in his own phrase) " geographize " a country, Ptolemy deals with this part of his subject in so careless a manner as to be often worse than useless. In Gaul, for instance, the few notices he gives of the rivers that play so important a part in its geography are disfigured by some astound- ing errors; while he does not notice any of the great tributaries of the Rhine, though mentioning an obscure streamlet, otherwise unknown, because it happened to be the boundary between two Roman provinces.

Bibliography. — Ptolemy's Geographia was printed for the first time in a Latin translation, accompanied with maps, in 1462(7), and numerous other editions followed in the latter part of the 15th and earlier half of the 16th centuries, but the Greek text did not make its appearance till 1533, when it was published at Basel in quarto, edited by Erasmus. All these early editions, however, swarm with textual errors, and are critically worthless. The same may be said of the edition of P. Bertius (Gr. and Lat., Leiden, 1618, typ. Elzevir), which was long the standard library edition. It contains a new set of maps drawn by Mercator, as well as a fresh series (not intended to illustrate Ptolemy) by Ortelius,.the Roman Itiner- aries, including the Tabula peutingeriana, and much other miscel- laneous matter. The first attempt at a really critical edition was made by F. G. Wilberg, and C. H. F. Grashof (4to, Essen, 1838^ 1845), but this only covered the first six books of the entire eight. The edition of C. F. A. Nobbe

(3 vols., i8mo., Leipzig, 1843), presents the best Greek text of the whole work, and has a useful index. The best edition, so far as completed, is that published in A. F. Didot's Bibliotheca graecorum scriptorum (Claudii Ptolemaei geographia; 2 vols., Paris, 1883 and 1901), originally edited by Carl Miiller and continued by C. T. Fischer, with a Latin translation and a copious commentary, geographical as well as critical. See also. F. C. L. Sickler, Claudii Ptolemaei Germania (Hesse Cassel, 1833); W. D. Cooley, Claudius Ptolemy and the Nile (London, 1 854) ; J. W. McCrindle, Ancient India described by Ptolemy (Bombay, 1885), reprinted from Indian Antiquary (1884); Henry Bradley, " Ptolemy's Geography of the British Isles," in Archaeologia, vol. xlviii. (1885) ;T. G. Rylands, Geography of Ptolemy Elucidated (Dublin, 1893) ; and a Polish study of Ptolemy's Germany and Sarmatia, in

the Historical-Philosophical Series (2) of the Cracow University (1902), vol. xvi. (E. H. B.;C. R. B.)

PTOMAINE POISONING (Gr. VT&fia, corpse), a phrase now popularized in the sense of a certain class of food-poisoning. The word "ptomaine" was invented by the Italian chemist Selmi for the basic substances produced in putrefaction. They belong to several classes of chemical compounds. (See Medical Jurisprudence.)

PUBERTY (Lat. puberlas, from pubes, puber, mature, adult), that period of life at which the generative organs in both sexes become functionally active (see Reproductive System). In northern countries males enter upon sexual maturity between fourteen and sixteen, sometimes not much before the eighteenth year, females between twelve and fourteen. In tropical climates puberty is much earlier. In English common law the age of puberty is conclusively presumed to be fourteen in the male and twelve in the female. Puberty is of much ethnological interest, as being the occasion among many races for feasts and religious ceremonies. In Rome a feast was given to the family and friends: the hair of boys was cut short, a lock being thrown into the fire in honour of Apollo, and one into water as an offering to Neptune. Girls offered their dolls to Venus, and the bulla — a little locket of gold worn round children's necks, often by boys as well as girls — was taken off and dedicated in the case of the former to Hercules or the household lares, in the case of the latter to Juno. The attainment of puberty is celebrated by savages with ceremonies some of which seem to be directly associated with totemism. The Australian rites of initiation include the raising of those scars on the bodies of clansmen or clanswomen which serve as tribal badges or actually depict the totem. Among many savage peoples lads at puberty undergo a pretence of being killed and brought to life again.

PUBLICANI, literally men employed " in connexion with the revenue,"

(publicum, from populus, people), or possibly " in the public service," the name given in ancient Rome to a body of men who either hired state property or monopolies for a certain period, during which they could farm such property to their own profit, or bought of the state for a fixed sum the right to farm for a term of years the taxes due to the treasury from the public land in Italy (see Agrarian Laws) or the land held by Roman subjects in the provinces. In very early times the senate entrusted to officials appointed for the purpose the control of the sale of salt (Livy ii. 9); and it was a natural development from this that the state, instead of appointing officials to manage its monopolies, should let out those monopolies to individuals. A regular system was soon established by which the censor, who held office every fifth year, placed all the sources of public revenue in the hands of certain individuals or companies, who on payment of a fixed sum into the treasury, or on giving adequate security for such payment, received the right to make what profit they could out of the revenues during the five years that should elapse before the next censorship. The assignment was made to the highest bidder at a public auction held by the censor. The same system was applied to the public works, the publicanus (or company) in this case being paid a certain sum, in return for which he took entire charge of a certain department of the public works, and winning his appointment by making the lowest tender. That this system was well established at the time of the Second Punic War is assumed in Livy's account of the various offers made by the wealthier class of citizens to relieve the exhausted treasury after the battle of Cannae. On the one hand we have companies offering a price for branches of the revenue which was calculated rather to meet the needs of the state than to ensure any profit for themselves (Livy xxiii. 49). On the other hand individuals are represented as undertaking the management of public works on the understanding that they will expect no payment until the conclusion of the war (ibid, xxiv. 18).

In very early times the publicani may have been men closely connected with the government. But since wealth was a neces- sary qualification for the post, and wealth at Rome became more and more confined to the commercial class, the toublicani became

identical with the leading representatives of the class of capital- ists and traders. This class was always distinct at Rome from the hereditary nobilty which monopolized the government of the state, and members of the senatorial class were excluded from it by definite enactment (see Senate). Although common interest was strong enough to secure for the government

in time of external danger the loyal support of the commercial class, yet after the close of the great wars a market hostility grew up between it and the government.

The extension of the Roman system of tax-farming to the provinces did not at first increase the importance of the publicani in Italy, for in the earlier provinces, in which the collection of the revenues was put up to auction in the province itself, the publicani were generally natives. But C. Gracchus, who carried a law that the taxes of the new province of Asia should be put up to auction by the censor in Rome, gave to the Roman capital- ists an opportunity of greatly extending their financial operations and thus in a short time of securing important political powers. It was in their capacity of publicani in the wealthiest provinces that the capitalist or equestrian judices (see Eqdites) became a menace to the provincial governors who represented the sena- torial power. Cicero often applies the name publicani to the whole order; and on the various occasions when the demands of the equestrian party determined the policy of the state we can clearly trace the interests of the publicani, who were involved in an infinite number of commercial and financial transactions in the provinces, as the motive of its action. Thus the cruel fate of the Roman business men in Cirta led the capitalist class to force the Jugurthine War upon the senate in 112 B.C.; the dis- organization of Asiatic commerce by the pirates led the same party to support the proposal to confer extraordinary powers on Pompey in 67 B.C.; and the rigour of the senate in opposing any relaxation of the burdensome contract made by the tax-farmers of Asia in 60 b.c. led to that estrangement between the senate and the capitalist class which enabled the democratic party to work its will and pave the way for the principate.

The companies of publicani continued some of their operations in the provinces under the early principate, but they lost many of their opportunities of oppression and embezzlement. We hear of a vigorous attempt made by Nero to suppress their unjust exactions, and they appear to have been kept under much closer supervision.

The term publicanus was applied at this time, and probably earlier, to the subordinate officials employed by the companies of publicani for the actual collection of the revenue, and thus acquired the general sense of " tax-collector," even in provinces where the system of tax-farming by contract with societies of publicani was not in existence. (A. M. Cl.)

PUBLIC HEALTH, LAW OF. State medicine as an organized department of administration is entirely of modern growth. By the common law of England the only remedy for any act or omission dangerous to health was an action for damages or an indictment for nuisance. The indictment for nuisance still lies for many offences which are now punishable in a

summary manner under the powers of modern legislation. But for a long time it was the only, not as now a concurrent, remedy. At a comparatively early date statutes were passed dealing with matters for which the common law had provided too cumbrous a remedy, while the plague called forth the act of 1 Jac. I. c. 31 (1603), which made it a capital offence for an infected person to go abroad after being commanded by the proper authority to keep his house. The act for the rebuilding of London after the great fire, 19 Car. II. c. 3 (1668), contained various provisions as to the height of houses, breadth of streets, construction of sewers and prohibition of noisome trades. Numerous local acts gave the authorities of the more important towns power over the public health. But it was not until 1848 that a general Public Health Act, embracing the whole of England (except the Metropolis), was passed. The Public Health Act 1848 created a general board of health as the supreme authority in sanitary matters, but greater local sanitary control was given by an act of 1858. The local government board, the present central authority, was

created by an act of 1871. Numerous acts dealing with public health were passed from 1849 to 1874; and the law was digested into the Public Health Act 1875, as amended by the Local Government Act 1894 and other acts.

The tendency of English sanitary legislation has been to place local sanitary regulations in the hands of the local authorities, subject to general superintendence by a government department. The jurisdiction of a local authority is both preventive and remedial. The matters falling under it are very numerous, but the more im- portant will be found in the article England: Local Government. The act of 1875 was followed by the Public Health Acts Amend- ment Act 1890, the Public Health Act 1896 and the Public Health Acts Amendment Act 1907. The first of these statutes confers enlarged powers on such local authorities as choose to adopt it — the right of adoption being general in the case of urban authorities, and in that of rural authorities limited to certain specified pro- visions unless extended by the local government board. The Public Health Acts 1896 and 1904 abolished the old system of quarantine (q.v.), and empowered the local government board to make regulations as to the landing or embarking of infected persons from ships, British or foreign; while the act of 1907 enabled local authorities to adopt many of the useful clauses intro- duced into private bills from time to time, relating not only to sanitary provisions, but to streets and buildings, milk, &c. supply, recreation grounds, sky-signs, &c.

Elaborate provision has been made for the notification of infec- tious diseases by the Infectious Diseases (Notification) Acts 1889 and 1899. The former statute was originally adoptive only, but it has now been extended by the latter to every district in England or Wales — in London notification

has been compulsory since 1 89 1. Reference should be made also to the following statutes: the Infectious Disease (Prevention) Act 1890 provides for the inspection of dairies, and the cleansing and disinfecting of premises, and under the Public Health (Ports) Act 1896 the local government board may by order assign to any port sanitary authority powers or duties arising under this statute. The scope of the Baths and Washhouses Acts 1846 to 1882 sufficiently appears from the title. The Isolation' Hospitals Act 1893 enables county councils to promote the establishment of hospitals for the reception of patients suffering from infectious diseases; the Cleansing of Persons Act 1897 enables local authorities to permit persons who apply to them, on the ground that they are infested with vermin, to have the gratuitous use of cleansing apparatus; and the Vaccination Acts of 1898 and 1907 profoundly modified the law as to vaccination by giving a discretion to magistrates. See too, among other acts, those of 1881 (alkali works), 1882 (fruit pickers), 1883 (epidemics), 188Q (cholera), 1904 (shop hours), 1905 (medical inspection of aliens) and numerous others.

In addition to these statutes, account has to be taken of a large body of legislation which relates indirectly to the law of public health, or at least comes well within its range of operation. It deals with a very great variety of subjects, and only the slightest sketch of its results need be given here. (For factories and work- shops, see Labour Legislation, and for merchant shipping, see Seamen.) The Coal Mines Regulation Act 1896 aims at the pre- vention of accidents due to inflammable gas and coal-dust in coal mines. The Cotton Cloth Factories Acts 1889 and 1897 enable the home secretary to make regulations for health in cotton mills. The Rivers Pollution Prevention (Borders Councils) Act i3q8 enables joint committees of English and Scottish county councils of counties on both sides of the Border to exercise the powers of the Rivers Pollution Prevention Act 1876, in relation to any river or tributary which is partly in England and partly in Scotland— an expression including the Tweed. The Notification of Births Act 1907 and the Children Act 1908 (see Children: Law relating to) have given great protection to infant life. Lastly, reference may be made to the Contagious Diseases (Animals) Act 1894, which consolidated the law on this subject.

London. — Down to the year 1 891 London was governed in matters of public health by a series of special statutes (especially the Metropolitan Police Acts), and by provisions in the general statutes. The law as to the Metropolis was consolidated, and is now regulated by the Public Health (London) Act 1 891. The sanitary authorities for the execution of the act were the com- missioners of sewers for the City of London, the vestries of the larger and the district boards of some of the smaller parishes, and varying authorities for Woolwich and some other places. Under the London Government Act 1899, the powers of each existing vestry and district board

are transferred to the council of the borough comprising the area within the jurisdiction of such vestry and district board; and the borough councils take over certain of the powers of the county council {e.g. as to dairies, milk, slaughter- houses and offensive businesses) and exercise concurrent jurisdiction with it in other matters. Provision is made for the appointment of medical officers of health and sanitary inspectors. The medical officer is for some purposes placed on the footing of a district poor- law medical officer, and he cannot be removed without the consent of the local government board. In its structure and substance

the Public Health (London) Act 1891, which consists of 144 sections, closely resembles the general acts (see London, § iv.).

The law of public health in London is also affected by a number of later statutes relating to the Metropolis alone, such as the London Building Acts 1894 and 1898, the Baths and Washhouses Act 1896, the Canals Protection (London) Act 1898, &c.

Scotland. — Sanitary legislation occurs as early as the reign of Alexander III. The Statuta Gilde, c. 19, forbade the deposit of dung or ashes in the street, market, or on the banks of the Tweed at Berwick, under a penalty of eight shillings. At a later date the act of 1540, c. 20, enacted that no flesh was to be slain in Edinburgh on the east side of the Leith Wynd; that of 1621, c. 29, fixed the locality of fleshers and candlemakers. The various statutes re- lating to public health in Scotland are now consolidated and amended by the Public Health (Scotland) Act 1897, which, together with the Infectious Diseases Notification Act 1889 and the Burgh Police (Scotland) Act 1892, constitute the statutory law of Scottish sanitary administration. The central authority is the local government board for Scotland. The local authorities are — (i.) in burghs under the Burgh Police (Scotland) Act 1892, the town council or burgh commissioners; (ii.) in other burghs, the town council or board of police; (iii.) in districts where the county is divided into districts, the district committee; (iv.) in counties not so divided, the county council. The substantive provisions are similar to those of the English acts.

Ireland. — Several acts of the Irish parliament dealt with specific nuisances, e.g. 5 Geo. III. c. 15, forbidding the laying of filth in the streets of cities or county towns, and making regulations as to sweeping and scavenging. There were also numerous private acts dealing with water-supply and the obstruction of watercourses. In 1878 the existing legislation

was consolidated by the Public Health (Ireland) Act 1878, a close copy of the English act of 1875. Most of the English acts apply to Ireland with modifications and adaptations.

United Suites. — After the Civil War boards of health were estab- lished in the chief cities. Public health is under the control of the local authorities to a greater extent than in England. By the Act of Congress of the 25th of February 1799 officers of the United States are bound to observe the health laws of the states. A national board of health was created by the act of the 3rd of March 1879, c. 202; and it was succeeded by the Public Health and Marine Hospital Service, whose chief officer is the surgeon-general and which has jurisdiction in quarantine and in epidemics of a peculiarly dangerous nature.

Authorities. — English: Glen, Public Health Acts, 13th edition (London, 1906) ; Lumley, Public Health Acts, 7th edition (London, 1908); Redlich and Hirst, Local Government (1904); Hunter, Open Spaces (London, 1896) ; Hunt, London Local Government (London, 1897); Hunt, London Government Act i8qq (London, 1899); Macmorran, Lushington and Naldrett, London Government Act 1899 (London, 1899); Shaw's Vaccination Manual (London, 1899); Macmorran, Public Health (London) Act 1891 (2nd ed., 19 10) ; Encyclopaedia of Local Government Law (by various authors), begun in 1905; Annual Report of Local Government Board; Annual Volume of Statutory Rules and Orders. Scottish: Macdougall and Murray, Handbook of Public Health (Edinburgh). Irish: Vanston, Public Health in Ireland (Dublin, 1892) ; Vanston's Public Health Supplement (Dublin, 1897). American: Bouvier, Law Diet., ed. Rawle (London and Boston, 1897).

PUBLIC HOUSE, in its genera^ English acceptation, a house in respect of which a licence has been obtained for the con- sumption of intoxicating liquors. Public houses are frequently distinguished as "tied" and "free." A tied house is one rented from a person or firm from whom the tenant is compelled to purchase liquors or other commodities to be consumed therein. A free house has no such covenant. The keepers of public houses (" publicans " or " licensed victuallers ") are subject, in the conduct of their business, to a number of restrictions laid down by various acts of parliament; while, in order to ply their trade, they require a justices' licence and an excise licence. (See Liquor Laws; Temperance.)

By the Parliamentary Elections Act (1853) a public house must not be used for elections, meetings or committee rooms. By the Payment of Wages in Public Houses Prohibition Act (1883) it is illegal to pay wages to any workman in a public house, except such wages as are paid by the resident owner or occupier. By the Sheriffs Act (1887) when a debtor is arrested he

must not be taken to a public house without his free consent, nor must he be charged with any sum for liquor or food, except what he freely asks for.

PUBLILIUS (less correctly Publius) SYRUS, a Latin writer of mimes, flourished in the 1st century B.C. He was a native of Syria and was brought as a slave to Italy, but by his wit and

talent he won the favour of his master, who freed and educated him. His mimes, in which he acted himself, had a great success in the provincial towns of Italy and at the games given by Caesar in 46 B.C. Publilius was perhaps even more famous as an improvisatore, and received from Caesar himself the prize in a contest in which he vanquished all his competitors, includ- ing the celebrated Decimus Laberius. All that remains of his works is a collection of Sentences (Sententiae) , a series of moral maxims in iambic and trochaic verse. This collection must have been made at a very early date, since it was known to Aulus Gellius in the 2nd century a.d. Each maxim is comprised in a single verse, and the verses are arranged in alphabetical order according to their initial letters. In course of time the collection was interpolated with sentences drawn from other writers, especially from apocryphal writings of Seneca; the number of genuine verses is about 700. They include many pithy sayings, such as the famous " judex damnatur ubi nocens absolvitur " (adopted as its motto by the Edinburgh Review).

The best texts of the Sentences are those of E. Wolfflin (1869) A. Spengel (1874) and W. Meyer (1880), with complete critical apparatus and index verborum ; recent editions with notes by O. Friedrich (1880), R. A. H. Bickford-Smith (1895), with full bibliography; see also W. Meyer, Die Sammlungen der Spruchverse des Publilius Syrus (1877), an important work.

PUBLISHING. In the technical sense, publishing is the business of producing and placing upon the market printed copies of the work of an author (see Book). Before the inven- tion of printing the actual maker of a manuscript was to a great extent his own publisher and his own bookseller. Increase of facilities for the production of copies led to a steady though slow differentiation of functions. The author was the first factor to be isolated and confined to a well-marked province, yet we may find upon the title-page of some old books an intimation that they might be purchased either at the shop of the bookseller who published them or at the lodgings of the author.

The separation of publishing from bookselling came later (see Bookselling). Booksellers were the first publishers of printed books, as they had previously been the agents for the production and exchange of authentic

manuscript copies; and as they are quite competent to make contracts with paper- makers, printers and bookbinders, there is no particular reason why they should not be publishers still, except the tendency of every composite business to break up, as it expands, into specialized departments. That tendency may be seen at work in the publishing business itself. When publishers had con- quered their own province, and had confined booksellers to bookselling, they held in their own hands the entire business of distribution to the trade. But a class of wholesale booksellers has grown up, and although important retail booksellers in London continue to deal directly with the publishers, the retail booksellers throughout the country draw their supplies quite largely from the wholesale agents.

The intellectual movement which was largely responsible for the French Revolution, and the general stir and upheaval which followed that portentous cataclysm, precipitated the separation of production from distribution in the book trade, by the mere expansion of the demand for books. That separation was practically complete at the beginning of the 19th century, although it would not be difficult to find survivals of the old order of things at a much later date. The old bookseller- publishers were very useful men in their time. They met pretty fairly the actual needs of the public; and as regards the author, they took the place of the private patron upon whom he was previously dependent. No doubt the author had much to endure at their hands, still, they did undoubtedly improve his status by introducing him to public patronage and placing him upon a sounder economic basis. If in the earlier days, they were less than liberal in their terms, it may be remem- bered that their own business was not very extensive or very remunerative. They were not equipped either with brains or with capital to extend that business in answer to the growing I demand for books. By the daily routine of their shops they

were tied down to narrow views, and their timidity is charac- teristically shown by the fact that to publish a book of any importance required the co-operation of a number of book- sellers who shared the expenses and the profits.

Enterprise could not be expected from a committee of that kind and of that composition; hence there was not merely- an opportunity, but a clamorous demand for men of larger ideas and wider outiook to undertake the proper business of publishing, unhampered by the narrowing influences of retail trade.

Besides unconsciously improving the position of authors by enabling them to appeal to the public instead of to patrons, whom Johnson classed with other evils in the line " toil, envy, want, the patron and the gaol, " the bookseller-publishers gave them, or many of them, steady employment as literary assistants and advisers.

As the demand for books increased, these worthy tradesmen felt with growing acuteness their own want of literary ability and of education. They called in men of letters to supply their own deficiencies. No doubt they expected the lowest kind of hack work from their assistants, no doubt the pay was poor, no doubt they trampled upon the sensibilities of the man of letters, and no doubt he irritated them by his unbusinesslike habits. Still, the association was useful to both parties; and indeed, one may lay down many books at the present day with a sigh of regret that the writers had never been compelled to go through an apprenticeship of the kind.

The emergence of the publishers as a separate class was accompanied by differentiation of the functions of their literary assistants. The routine drudgery which men of education and ability formerly had to undergo fell to a class now known as " proof readers, " who are on the watch for typographical errors, grammatical slips, ambiguities of expression, obvious lapses of memory and oversights of all kinds. Men of letters became " publishers' readers, " and their duty was to appraise the worth of the manuscripts submitted, and to advise their employers as to the value of the matter, the originality of the treatment, and the excellence of the style. Their advice was also sought upon literary projects that may have suggested themselves to the publishers, and novel suggestions emanating from themselves were welcomed. Men of letters in positions of that kind could obviously exercise very considerable influence over the proceed- ings of the publishing firms to which they were attached, and many an unknown writer has owed the acceptance of his work to the sympathetic insight of the publishers' reader.

The man of letters as publisher's reader is, however, a trans- itory phenomenon in the evolution of the publishing business. His primary function is to tell the publisher what is intrinsically good, but probably he has always to some extent discharged the secondary function of advising the publisher as to what it would pay to publish. The qualities which make a man a sound critic of intrinsic worth are quite different from those that make him a good judge of what the public will buy. When books were comparatively few, and when the reading public was comparatively small, select and disposed to give consider- able attention to the few books it read, the critical faculty was of more importance than the business one. But when the output of books became large, and when, as the consequence of educa- tional changes, tlje reading public became numerous, uncritical and

hurried and superficial in its reading, the importance of the critical faculty in the publisher's reader dwindled, while the faculty of gauging the public mind and guessing what would sell became increasingly valuable. The publisher's literary adviser belongs to the period when the publishing business had expanded sufficiently to compel the publisher to look for skilled assistance in working more or less upon the older traditions. But when, as is now the case, expansion has gone so far as to swamp the older traditions, and to make publishing a purely commercial affair, the literary reader gives place to the man of business with aptitude for estimating how many copies of a given book can be sold. This is practically recognized by at least one London publisher, who in recent years paid no salary to his reader, but gave him a small commission upon every copy

that was sold of any book the publication of which he had recommended. Nothing could more plainly indicate that literary faculty is not wanted, and that the reader's function is to judge, not literary value, but commercial utility.

The market is flooded with books badly written, badly constructed, as poor in matter as in style, hastily flung together, and outrageously padded to suit conventional relations between size and price. They are books which no man of literary taste or judgment could ever recommend for publication on their merits, but they are published, just as crackers are at Christmas, on a calculation that a certain number will find buyers. Even if the publisher sees no prospect of an adequate sale, he pub- lishes the books all the same, upon terms which ensure to him a manufacturing profit and throw the risk of loss upon other shoulders.

There is no reproach, stated or implied, to the publisher. He is merely a man of his age carrying on his business upon terms which the age prescribes through a number of concurrent causes. Any reproach that may fall upon him he invites by sometimes giving himself the airs of one belonging to an earlier age, and claiming credit for acting upon principles that are obsolete.

An author, even if he be an immortal genius, is, from the economic point of view, a producer of raw material. A publisher, however eminent, is from the same point of view a middleman who works up the author's raw material into a saleable form and places it upon. the market. The relationship between the two is one that occurs with great frequency in business, always giving rise to efforts by each party to adjust the division of profits for his own advantage. If there be anything peculiar to the publishing business it is that the party who in that business most successfully adjusts matters for his own advantage is liable to be charged by the other with some form of moral obliquity. The diatribes of authors against

publishers are familiar to every one; and publishers on their side have some hard things to say about authors, though their sentiments are less piquantly and less publicly expressed. The publisher is usually a more or less capable man of business, while the author is generally — though there are very notable exceptions — quite ignorant of business and apparently incapable of learning the rudiments. It neces- sarily follows that the author, left to himself, accepts agreements and signs contracts which are much less favourable than they need be to his acquisition of a due share of the profits jointly made by himself and the publisher. What makes his position still worse is the circumstance that each author fights for his own hand, whereas the publishers, although in competition with one another, are also to some extent in combination.

In these circumstances it occurred to Sir Walter Besant and some others that a remedy for this inferiority in position might be found in a combination of authors for mutual help and protection. After a troublesome period of incubation the Society of Authors was established in London in 1883, with Lord Tennyson as its first president, and with a goodly list of 35 vice-presidents. It offered useful assistance to authors igno- rant of business in the way of examining contracts, checking publishers' accounts, revising their sometimes too liberal esti- mates of costs of production, and giving advice as to the publishers to be applied to or avoided in any given case. It has no doubt been of great service in checking the abuses of the publishing trade and in compelling the less scrupulous among the publishers to conform more or less exactly to the practice of the more honourable. On general questions such as that of copyright it serves to focus the opinions of authors, though here it champions their interests against the public rather than against the publishers. But the society has never been an effective com- bination of authors; and indeed the obstacles, material and moral, to such a combination are so great as to render complete success extremely improbable. Nothing could better illustrate this difficulty than the fact that, concurrently with the Society of Authors, a totally different machinery for the furtherance of the interests of authors came into existence. The " literary agent " made his appearance about 1880. He is supposed to be an

expert in all matters pertaining to publishing and to the book market. He takes the author's business affairs entirely into his hands; utilizes the competition among publishers to sell the author's work to the highest bidder; checks accounts, estimates and sales; keeps the author's accounts for him; and charges a commission upon the proceeds. Here we have the author fighting as of old for his own hand. The only difference is that he

does his fighting by proxy, hiring a stronger man than himself to deal the blows on his account. There is no question whatever of solidarity with his fellow-authors, and the whole system is a direct negation of the principle upon which the Society of Authors was founded.

On the other hand, both publishers and booksellers have long had the disposition, and to some extent the ability, to co-operate, and the efforts of both sets of men have unfortunately been in the direction of maintaining, if not raising, the price of books to the public. Since the formation of the Publishers' Association in 1 896 the publishing trade has been strongly organized on the trade-union pattern, and its operations have been assisted by the less powerful Booksellers' Association. Books, like many other articles, are sold by the makers at list prices, and the retailer's profit is furnished by discounts off these prices. Under such a system competition among retailers takes the form of the sacrifice by the more enterprising of a portion of their dis- count. They prefer a large sale at a low profit to a small sale at a high profit. It is always the desire of the less enterprising to put an end to this competition by artificial regulations compelling all to sell at the same price.

Many attempts have been made to destroy freedom of dealing in books. In July 1850 twelve hundred booksellers within 12 m. of the London General Post Office signed a stringent agreement not to sell below a certain price. This agreement was broken almost immediately. Another attempt was made in 1852; but at a meeting of distinguished men of letters resolutions were adopted declaring that the principles of the Booksellers' Association of that period were opposed to free trade, and were tyrannical and vexatious in their operations. The Times took an active part in defending and enforcing the conclusions which they sanctioned. The question was eventually referred to a commission, consisting of Lord Campbell, Dean Milman and George Grote,which decided that the regulations were unreasonable and inexpedient, and contrary to the freedom which ought to prevail in commercial transactions. An attempt was also made in 1869 to impose restrictions upon the retail bookseller; but that also failed, mainly by reason of the ineffective organization which the publishers then had at command.

Feeling their hands greatly strengthened by the establishment of their Association, the publishers were emboldened to make another effort to put an end to reductions in the selling price of books. After much discussion between authors, publishers and booksellers, a new scheme was launched on the 1st of January 1900. Books began to be issued at net prices, from which no bookseller was permitted to make any deduction whatever. This decree was enforced by the refusal of all the publishers included in the Association to supply books to any bookseller who should dare to infringe it

in the case of a book published by any one of them. In other words, a bookseller offending against one publisher was boycotted by all. Thus, what is known as the " net system" depended absolutely upon the close trade union into which the publishers had organized themselves. The Booksellers' Association signed an agreement to charge the full published price for every net book, but that body had no real power to impose its will upon recalcitrant booksellers. Its assent to the terms of the publishers merely relieved them of the fear of active opposition on the part of the wholesale booksellers and the large retail booksellers, mainly located in London.

All books were not issued at net prices even in 1910, though the practice had extended enormously since it began in 1900. But the principle was applied all round. In the case of such books as six-shilling novels the discount price of four shillings and sixpence was treated as the net price, and the usual penalty

was inflicted upon those who dared to sell at any lower price, at all events within twelve months of the date of publication.

Owing to the fact that the net system was gradually intro- duced, net books and discount books being issued side by side with discount books in the majority, the full effect of the innova- tion was not immediately apparent. But the establishment of TheTimes Book Club in 1905 brought the system to the test. That Club aimed at giving to the readers of The Times a much more prompt and copious supply of new books than could be obtained from the circulating libraries. The scheme was at first very favourably received by the publishers, who saw in it the promise of largely increased orders for their goods. They obtained these orders, but then something else happened which they had not foreseen. Of the books they issued the vast majority were of only ephemeral interest. For a few weeks, sometimes only for a few days, everybody wanted to glance at them, and then the public interest dwindled and died. As the copies ceased to be in demand for circulation the Book Club naturally tried to take advantage of the buying demand, which always exists, though it is always repressed by the very high prices charged by publishers in Great Britain. The Book Club sold its surplus copies at reduced prices, and was obliged to do so, since otherwise it would have been swamped with waste paper. But the authors and publishers now rose in arms. Forgetting that they had been paid the full trade price for every copy, they said that the Book Club was spoiling the market, and that a wholesale buyer had no right to sell at the best price he could get. Hence arose what came to be known as the Book War, between The Times and the associated publishers and booksellers, the publishers withdrawing their advertisements from The Times and doing their best to refuse books to the Book Club. The conflict made a considerable commotion, and the arguments on both sides were hotly con- tested. It did not, however, alter

the fact that the public will not pay high prices for books having no permanent value.

The Booksellers' Association, dominated by the large book- sellers in London and a few great towns, made common cause with the Publishers' Association. Their interests were not affected by the net system, and they saw in the Book Club an energetic competitor. The small booksellers up and down the country are injuriously affected, because it is more difficult than ever for them to stock books on which there is a very small margin of profit, and the sale of which they cannot any longer push by the offer of a discount. Formerly, if a book did not sell at the full price, they could sacrifice their profit and even part of what they paid for it, thus saving at least part of their invested capital. Now if a book does not sell at the net price they have to keep it so long that it is probably unsaleable at any price and forms a dead loss. Hence they cannot afford to stock books at all, and that channel of distribution is blocked.

The cast-iron retail price is economically wrong. A book- seller with a large turn-over in the midst of a dense population can afford to sell at a small profit. He finds his reward in increased sales. His action is good for the public, for the author, and for the publisher himself, were he enlightened enough to see it. But a small bookseller in a remote country town cannot afford to sell at an equally low profit, because he has not access to a public large enough to yield correspondinglyincreased sales. Yet both are arbitrarily compelled to sell ojily at a uniform price fixed by the publisher. What makes the matter worse is that there is no cast-iron wholesale price. The small book- seller has to pay more for his books than the large one who buys in dozens of copies. Carriage on his small parcels often eats up what profit is left to him. As he is not allowed to have books " on sale or return," he has no chance whatever; and as a distributing agency the small bookseller has become negligible.

It is not a necessary consequence of the net system that new books should cost the public more than before. If it has become the practice to sell a ten-shilling book for seven shillings and sixpence, and if that practice be thought objectionable, the obvious remedy, supposing publishers to have no other end in view, is to publish the book at the price for which it is sold. But the net system has been used to enforce the sale of the book

at the published price and nothing less, which obviously amounts to compelling the public to pay more than before for the book. Again, if the

object were to benefit the retail bookseller by reliev- ing the pressure of competition, it is plain that after abolishing discounts the publishers would charge the same wholesale prices as before to the booksellers. But, on the contrary, they have so adjusted their prices that the retailer gets no more profit upon a book sold net than he formerly obtained from a book of the same published price after allowing a discount. Thus the object and result of the net system is to increase the profits of the publishers at the expense of the public. This has been accomplished at a time when paper is cheaper than at any previous period, and when machinery has reduced the cost of composition, printing and binding to an almost equal extent. It is a remarkable illustration of the power of combination among quasi-monopolists to raise the price of their commodities even in the face of a falling market.

The Book War came to an end in 1008; but though the pub- lishers and booksellers appeared in the result to have brought the Book Club within terms which were satisfactory to them, the whole situation had really been changed. The public for the first time had been educated. Public attention had been forcibly directed to the fact that there is no reason in the nature of things why the price of books should increase, but on the con- trary, every reason why they should be cheaper than at any previous period. A certain mystery which had hung over the publishing trade was effectually dispelled. The man in the street learned that books priced to him at six shillings can be produced by the joint labours of the paper maker, the printer, and the bookbinder for about sixpence, and that in many cases the author gets little or nothing out of the difference. There followed a quickening of the public demand for literature at reasonable prices, and enterprising people were found to meet the demand. A vast quantity of good literature, much better than nine-tenths of what is written to-day, has been brought within reach of persons of the smallest incomes. Hundreds of standard works have appeared in convenient and readable editions at a shilling, at sevenpence and even sixpence per volume. These cheap editions have an enormous sale, not only because they are low in price, but because they have permanent value. For the cost of a novel which he will never look at twice, and which perhaps was hardly worth reading once, a man may obtain half a dozen books that have stood the test of time, and that will become the valued companions of his leisure. He gets them too in a form suited not only to his purse, but to the limited storage accommodation at the disposal of the mass of modern readers, who can neither buy nor house the stately editions that adorn the libraries of the wealthy. Thus, in respect of the large class of books read for recreation, we have reached the paradoxical position that cheapness and excellence go hand-in-hand; and that the disparaging adjective frequently linked with " cheap" is more properly associated with dear and pretentious.

Nor does the counter movement stop even here. There is a growing tendency to bring out books of current production in cheap editions, and also to publish the original edition at prices which must give a painful shock to the authors of the net system. Cheap magazines, and the feuilletons which newspapers are adopting from French practice, make considerable inroads upon the province of the six-shilling novel; and as regards more serious books the newspapers now give an amount of information about their contents which goes far to console the public for the prohibitive prices of the books themselves. These move- ments are developing and will continue to develop, seriously interfering vvith the plans of those who devised the net system. The combing tˆon publishers have never understood that, apart from the very small percentage of works which make real addi- tions to the sum of knowledge or of genuine literary achievement, the reading of the books they turn out is a pastime, which has to compete in public favour with a great variety of other pastimes. They have chosen to make their form of recreation extremely expensive, with the double result that the public turn to others,

and that even their own is increasingly supplied by cheaper agencies.

There are certain classes of books which must always bs relatively expensive, because they appeal only to students of some particular branch of science or of art or of literature, whose number is not great. But these are books of enduring value. Their price is justified not only by their prolonged service, but by the erudition or the exceptional qualities which go to the writing of them, as well as by the frequently excep- tional cost of producing them. But as regards the vast output of books which merely amuse an idle hour, the existence of a large body of readers is the only excuse for their appearance, and if they cannot be produced at a low price ensuring an exten- sive sale they ought not to be produced at all. Thus there is more than a mere money question involved in the contention about price. An artificial system of prices leads to the printing of a vast quantity of trash, which demoralizes the reading public and is a serious obstacle to the success of the better books. Such a system operates, in fact, as a protective duty in favour of mediocrity and even of something worse. It is no defence of such a system that it panders to the vanity of incompetent scribblers, and enables publishers to make money by soiling paper that had better have been kept clean.

A rational system of prices would automatically solve some of the difficulties of the book-world. If a book is selling by tens of thousands of copies, as every book printed for pastime ought to do, it would not matter at what price any large buyer chose to resell his purchases. They would only be a drop in the bucket, and all the contention about second-hand prices would disappear. Then there is the troublesome system of ”

remainders," that is to say; the unsaleable copies of thousands of books published every year. The editions are small enough — probably not more than one thousand copies — yet, in spite of circulating libraries, a third or a half of that modest number remains in the ware- houses of the publishers. Sometimes they are sold for about the cost of their flimsy covers; sometimes they simply go to be reduced to their original pulp at the paper mills. If a book has any sale justifying its production, there will be no question of remainders, supposing its supply to have been regulated by the most ordinary prudence. The sale of such a book never stops dead, and any small surplus of copies can always be got rid of at a small reduction in price.

Towards the end of the 19th century came a large influx into England of American literature, especially fiction. Not only was there a growing appreciation of many American writers, but the attractive " get-up " of American books made its influ- ence felt upon the British market. Some of the American methods of distribution were also introduced into Great Britain, but at first with only partial success. The most successful effort was the sale of important expensive works through the medium of newspapers. Canvassing, which was a common method of distributing books in the United States, met with little support in the United Kingdom, although about the middle of the 19th century a large trade was done through .England and Scotland by canvassers, who sold in numbers and parts such works as Family Bibles, Daily Devotions, Lives of Christ and Foxe's Book of Martyrs.

The methods of publishing in America are similar to those adopted in Great Britain, but the discount to the booksellers is generally given pro rata according to the number purchased. It is, however, in respect of the means of distribution that the systems of the two countries differ most. In America the general stores to a large extent take the place of the English bookseller, and by their energy and extensive advertising a wider public is served. In the distribu- tion of fiction the American plan of " booming " a book by copious advertising, although expensive, is often the means of inducing a large sale, and of bringing an author's name before the public. In 1901 the net system, as adopted in Great Britain, was partially introduced into America.

The continental methods of publishing and distributing, especi- ally in Germany, differ, in many respects very materially, from those of Great Britain. In even the smallest German towns there is a bookseller who receives on sale, immediately upon publication, a supply of such new books as he or the publisher may think suitable to his class of book-buyers. The bookseller submits these books

to his customers, and by this method most books issued are at once placed at the disposal of any buyer interested in the particular subject. The large sums spent in other countries upon advertise- ments are thus saved. At the book fairs held in Leipzig at Easter and Michaelmas the accounts for books sent on sale are made up and paid. In France all books have to be licensed before publica- tion, but the methods of publication differ little from those of other continental countries, in all of which book prices are much lower than in England.

PUCCINI, GIACOMO (1858-), Italian operatic composer, was born at Lucca, of a family already distinguished in music; his great-great-grandfather Giacomo, great-grandfather Antonio, grandfather Domenico, and father Michele, being all well known in the art. He was educated at the Milan Conservatoire, and in 1884 his opera Le Villi was performed at the Teatro del Verme. In 1889 his Edgar was performed at La Scala, and in 1893 his Manon Lescaut in Turin. But it was the production of La Boheme in Turin in 1896 that made him famous, and this opera had a great success everywhere. Tosca followed in 1900, and in 1904 Madama Butterfly confirmed the highest opinions of his talent.

PUCHTA, GEORG FRIEDRICH (1 798-1846), German jurist, born at Kadolzburg in Bavaria on the 31st of August 1798, came of an old Bohemian Protestant family which had immi- grated into Germany to avoid religious persecution. His father, Wolfgang Heinrich Puchta (1769- 1 84 5), a legal writer and district judge, imbued his son with legal conceptions and princi- ples. From i8utoi8i6 young Puchta attended the gymnasium at Nuremberg, where he acquired a taste for Hegelianism. In 1816 he went to the university of Erlangen, where, in addition to being initiated by his father into legal practice, he fell under the influence of the writings of Savigny and Niebuhr. Taking his doctor's degree at Erlangen, he established himself here in 1820 as privatdozent, and in 1823 was made professor extraordinary of law. In 1828 he was appointed ordinary professor of Roman law at Munich. In 1835 he was appointed to the chair of Roman and ecclesiastical law at Marburg, but he left this for Leipzig in 1837, and in 1842 he succeeded Savigny at Berlin. In 1845 Puchta was made a member of the council of state (Staatsrat) and of the legislative commission (Gesetz- gebungskommission). He died at Berlin on the 8th of January 1846. His chief merit as a jurist lay in breaking with past unscientific methods in the teaching of Roman law and in making its spirit intelligible to students. Among his writings must be especially mentioned Lehrbuch der Pandekten (Leipzig, 1838, and many later editions), in which

he elucidated the dog- matic essence of Roman law in a manner never before attempted ; and the Kursus der Institutionen (Leipzig, 1841-1847, and later editions) , which gives a clear picture of the organic development of law among the Romans. Among his other writings are Das Gewohnheitsrecht (Erlangen, 1828-183 7); and Einleitung in das Recht der Kirche (Leipzig, 1840).

Puchta's Kleine zivilistische Schriften (posthumously published in 1851 by Professor A. A. Friedrich Rudorn), is a collection of thirty- eight masterly essays on various branches of Roman law, and the preface contains a. sympathetic biographical sketch of the jurist. See also Zeher, Uber die von Puchta der Darsiellung des romischen Rechts zu Grunde gelegten rechtsphilosophischen Ansichten (1853).

PUCKLER-MUSKAU, HERMANN LUDWIG HEINRICH,

FtJRST Von (1785-1871), German author, was born at Muskau in Lusatia on the 30th of October 1785. He served for some time in the bodyguard at Dresden, and afterwards travelled in France and Italy. In 181 1, after the death of his father, he inherited the barony of Muskau and a considerable fortune. As an officer under the duke of Saxe- Weimar he distinguished himself in the war of liberation and was made military and civil governor of Bruges. After the war he retired from the army and visited England, where he remained about a year. In 1822, in compensation for certain privileges which he resigned, he was raised to the rank of Fiirst by the king of Prussia. Some years earlier he had married the Grafin von Pappenheim, daughter of Fiirst von Hardenberg; in 1826 the marriage was legally dissolved though the parties did not separate. He again visited England and travelled in America and Asia Minor, living after his

return at Muskau, which he spent much time in cultivating and improving. In 1845 he sold this estate to Prince Frederick of the Netherlands, and, although he afterwards lived from time to time at various places in Germany and Italy, his principal residence was his seat, Schloss Branitz near Kottbus, where he laid out splendid gardens as he had already done at Muskau. In 1863 he was made an hereditary member of the Prussian Herrenhaus, and in 1866 he attended the Prussian general staff in the war with Austria. He died at Branitz on the 4th of February 1871, and, in accordance with instructions in his will, his body was cremated. As a writer of books of travel he held a high position, his power of observation being keen and his style lucid and animated. His first work was Brief e eines V erstorbenen (4 vols., 1830-183 1), in which he expressed many independent judgments about England and other countries he had visited and about prominent persons whom he had met. Among his later books of travel were Semilassos vorletzter Weltgang (3 vols.,

i&35),SemilassoinAfrika (5 vols., 1836), AusMehemed-Alis Reich (3 vols., 1844) and Die Riickkehr (3 vols., 1846-1848). He was also the author of Andeutungen uber Landschaftsgdrtnerei (1834).

See Ludmilla Assing, Piickler-Muskaus Briefwechsel und Tage- bucher (9 vols., 1 873-1 876); Fiirst Hermann von Piickler- Muskau (1873); and Petzold, Fiirst Hermann von Piickler-Muskau in seiner Bedeutung fur die bildende Gartenkunst (1874).

PUDDING, a term, now of rather wide application, for a dish consisting of boiled flour enclosing or containing meat, vegetables or fruit, or of batter, rice, sago or other farinaceous foods boiled or baked with milk and eggs. Properly a pudding should be one boiled in a cloth or bag. There are countless varieties, of which the most familiar are the Christmas plum-pudding, the Yorkshire pudding and the suet pudding. The word was originally and is still so used in Scotland for the entrails of the pig or other animal stuffed with meat, minced, flavoured and mixed with oatmeal and boiled. The etymology is obscure. The French boudin occurs in the Scottish original sense at the same time as poding (13th century) in English. Boudin has been connected with Italian boldone and Latin botulus, sausage, but the origins of these words are quite doubtful. Attempts have been made to find the origin in a stem pud-, to swell, cf. " podgy," L. Ger. Pudde-wurst, black-pudding, &c.

PUDSEY, a municipal borough in the Pudsey parliamentary division of the West Riding of Yorkshire, England, 6 m. W. by S. of Leeds, on the Great Northern railway. Pop. (1891), 13,444; (1901), 14,907. The principal buildings are the church of St Lawrence in Gothic style, erected in 1821, and the mechanics' institute, a fine building, comprising class-rooms, a library, a public hall and a lecture hall. A public park was opened in 1889. The town has an important woollen trade and possesses dyeing and fulling mills. Part of the parish, Tyersall, is in the borough of Bradford. Pudsey is mentioned in Domesday. It was sold by Edward II. to the Calverley family, from which it passed to an ancestor of the Milners. The town was incorporated in 1899, and the corporation consists of a mayor, 6 aldermen and 18 councillors. Area, 2399 acres.

PUDUKKOTTAI, a state of southern India, in subordination to Madras, lying between the British districts of Tanjore and Madura. Area, 1100 sq. m. Pop. (1901), 380,440, showing an increase of 2% in the decade. The state consists mainly of an undulating plain, nowhere of great fertility and in many parts barren; it is interspersed with rocky hills, especially in the south- west. Granite and laterite are quarried, red ochre is worked, and silk and cotton fabrics, bell-metal vessels and perfumes are among the principal manufactures. There is also some export trade in groundnuts and tanning

bark. The chief, whose title is tondaman, is of the Kalian or robber caste. His ancestors received a grant of territory for loyal services to the British during the wars in the Carnatic at the end of the 18th century. Estimated gross revenue, £80,000; no tribute. The state has for some years past been well administered under a council, with a representative assembly. The town of Pudukkottai had a population in 1901 of 20,347. It is well laid out, and contains several fine new buildings.

PUEBLA, a state of Mexico, occupying the south-east angle of the great central plateau, or that part of it known as the Anahuac table-land. It is bounded N. and E. by the state of Vera Cruz, S. by the states of Oaxaca and Guerrero, and W. by the states of Morelos, Mexico, Tlaxcala and Hidalgo. Area, 12,204 sq. m. Pop. (1900), 1,021,133, largely civilized Indians. Lofty mountains overlook the plateau from the north-east and west, three of the highest peaks, Orizaba, Popocatepetl and Ixtaccihuatl rising above the permanent snow-line, while another, Malinche, lifts its isolated mass nearly to that limit. In the south the table-land breaks away and long fertile valleys lead downward toward the warm southern plains. The central table-land forms part of the watershed between the eastern and western drainage systems, some of the streams in the north and south-east emptying into the Gulf of Mexico, while the Atoyac, which has its source in Tlaxcala, crosses the state and discharges into the Pacific through the Mescala. Puebla has a temperate, healthful climate, one of the best in Mexico. The soil is generally fertile and the rainfall abundant. Agriculture is the principal industry. The Mexican, Interoceanic and Mexican Southern railways cross the state and afford ample transportation facilities.

PUEBLA (full tide La Puebla de los Angeles, and more recently, Puebla de Zaragoza), a city of Mexico and capital of the state of the same name, on the banks of the Atoyac river, 60 m. S.E. of the city of Mexico, with which it is connected by two lines of railway. Pop. (1900), 93,152, including a large percentage of Indians. Its railway connexions put it in daily communication with the national capital, Vera Cruz, Pachuca, Oaxaca, and the terminal ports of the Tehuantepec railway — Coatzacoalcos and Salina Cruz. The city is built on a broad healthy plain, about 7200 ft. above sea-level. It is well provided with street railways, electric and gas illumination, water and drainage. The great Doric cathedral, about 165X320 ft., is perhaps the finest ecclesi- astical building in Latin America. It was begun about 1552, but not completed until 1649. Among other churches, famous for their lavish decorations, are those of San Jose, San Cristobal, Santa Catarina and San Domingo. The " Teatro Principal," built

in 1790, is said to be the oldest existing theatre on the con- tinent. There are two other theatres, and an immense bull-ring. Among the more conspicuous public buildings are the palace of justice, the building of the state legislature, a school of medicine to which is attached the Palafoxiana Library of over 100,000 volumes, an academy of fine arts, and the national college. At Fort Guadalupe, near the city, there are several hot sulphur springs, which are used for medicinal baths. Puebla is one of the busiest manufacturing cities in Mexico, and among its products are cotton and woollen textiles, soap, glass, straw hats, pottery and leather goods. There are also some large foundries.

Puebla was founded in 1532 by Sebastian Ramirez de Fuenleal, archbishop of Santo Domingo, and the celebrated Franciscan friar Toribio Motolinia. In 1 5 50 it became the see of the bishopric originally created in 1526 at Tlaxcala. The appellation " de los Angeles," which is now practically dropped, originated in a popular belief that during the building of the cathedral two angels every night added as much to the height of the walls as the workmen had completed on the preceding day. Its present title was given in honour of General Ignacio Zaragoza (1829- 1862), who successfully defended the city against the first French attack in 1862. It was captured in the following year by the French, and then by the Mexicans under Porfirio Diaz in 1867. In the war between Mexico and the United States it was captured by General Winfield Scott and was his headquarters from June to August 1847.

PUEBLO, a city and the county-seat of Pueblb county, the second largest city of Colorado, U.S.A., and one of the most important industrial centres west of the Missouri river, situated on the Arkansas river, about 120 m. S. by E. of Denver. Pop. (1890), 24,558; (1900), 28,157, of whom 4705 were foreign-born, 1250 being Austrian, 587 German, 529 Italian, 415 Irish, 391 Swedish, 385 English and 341 English Canadian; (1910, census), 44,395. It is served by five great continental railway

systems — the Denver & Rio Grande, the Atchison, Topeka & Santa F6, the Missouri Pacific, the Chicago, Rock Island & Pacific and the Colorado & Southern, giving it altogether a dozen outlets. It lies about 4680 ft. above the sea, in a valley at the junction of the prairies with the foothills of the Rockies, on both banks of the Arkansas river, near its confluence with Fountain Creek; the city has an exceptionally good climate and attracts many winter visitors. There are a state insane asylum and four hospitals, of which the Minnequa Hospital (for the employes of the Colorado Fuel & Iron Co.) and St Mary's Hospital are the most notable. Among the public buildings are the McClelland public library (1891) and the court-house, the latter of white stone quarried in the vicinity. The Mineral Palace (1891), having a roof formed of twenty-eight domes, in the northern part

of the city, contains a collection of the minerals of the state. Pueblo is chiefly an industrial city, and is often called the Steel City, or the Pittsburg of the West. Cheap fuel is furnished by the excellent coal of Canyon City (about 30 m. west), Walsenburg (about 40 m. south-west) and Trinidad (about 75 m. south) . Petroleum deposits in the immediate vicinity are of grow- ing importance. Fluxing material is only about 50 m. away, around Cripple Creek. The rich river valley yields abundant crops of alfalfa, sugar beets, cantaloupes, apples and peaches, and the dry lands behind its shores prove fertile under irrigation or under the Campbell system of dry farming; on the plains livestock interests are important. In 1905 Pueblo's total factory products were valued, at $2,197,293 (an increase of 52-6% since 1900); if the output of the great smelting and refining establishments just outside the city limits had been included, the value would have been considerably larger. Pueblo is the greatest smelting centre west of the Missouri and probably the greatest in the United States. The bulk of the steel rails used on western railways are from the mills of the Pueblo district.

Pueblo was originally a Mexican settlement. A considerable body of Mormons settled here temporarily on their way to Utah in 1846-1847, and a trading post was established in 1850; but the site, owing principally to Indian troubles, had been practically abandoned before 1858, when another settlement was made on the Fontaine qui Bouille, or Fountain Creek. Two years later Pueblo was surveyed and platted. The first railway — the Denver & Rio Grande — came through in 1872. Pueblo was char- tered as a city in 1870, and again, with an enlarged area, in 1887.

PUEBLO INDIANS, the Spanish name {pueblo = village) for the town-building tribes of American Indians of the Keresan, Shoshonean, Tanoan and Zuftian stocks, whose representatives are now practically confined to New Mexico and Arizona. For- merly they had a far greater range. They were alike in their sedentary agricultural characteristics, and had not the warlike disposition of the Plains Indians. Their modern history begins with their discovery in 1539 by Father Marcos de Niza. In the following year they were subdued by Francisco Vasquez de Coronado. Two years later they made a successful revolt, but in 1586 they had again to submit. In 1680 they once more rebelled, but by 1692 they were finally conquered. Their houses are communal, generally but one structure for the whole village. These houses are sometimes built of stone, but oftener of adobe, several storeys high, each storey receding from the one below. The common plan is a hollow square or curved figure, though in some cases the form of a pyramid is followed. A feature of each town is the underground chamber used for tribal ceremonies. Many of the towns are built on high table-lands inaccessible except by steep trails. The Pueblos are a short, sturdy type of American Indians, very active, but mild-mannered and much darker than

those of the plains. They are farmers and herdsmen, and are skilful in basket-work, weaving, pottery and carving. They are notable for their highly developed cere- monial customs, and their blankets and earthenware are decorated with religious symbolism.

PUELCHE, a tribe of South-American Indians of Araucanian stock. Their home is the Pampas region of southern Argentina around the Colorado river. They are chiefly nomadic, breeding cattle and horses, and lead a wild, lawless life.

PUENTEAREAS, a town of north-western Spain in the province of Pontevedra; on the Tuy-Santiago de Compostella railway and on the river Tea, a right-hand tributary of the Mino. Pop. (1900), 13,452. Puenteareas is the chief town of a fertile hilly region, which produces wine, grain and fruit, and contains many cattle farms. The industries of the town itself are porcelain manufactures, tanning and distilling. Close by are the ruins of the castle of Sobroso, which played an important part in the medieval civil wars.

PUENTE GENIL, or Ptjente Jenil, a town of southern Spain, in the province of Cordova; on the right bank of the river Genii or Jenil, a tributary of the Guadalquivir. Pop. (1900), 12,956. Puente Genii is on the Cordova-Malaga railway, and is the starting-point of the line to Linares. A bridge across the Genii, from which the name of the town is derived, joins the lower part of Puente Genii with the higher, which is built on rising ground extending to the olive groves above. There are several convents, schools for primary and higher education, hospitals, a municipal library and a theatre. The principal industry is the manu- facture of olive oil. There are also flour-mills and linen factories. The alhondiga or permanent market is always well stocked with grain, vegetables and livestock.

PUERPERAL FEVER (Lat. puerpera, from puer, child, and parcre, to bring forth) , the name given to the varieties of general infection, long regarded as a specific disease (" child-bed fever," " lying-in fever "), to which women are subject after parturition, owing to the genital tract being peculiarly expos&d, in septic surroundings, to the invasion of pathogenic bacteria (see Sepsis). Owing largely to the labours of I. P. Semmelweiss (q.v.) the grave mortality formerly attending this condition has been enormously reduced; and the necessity of rigid cleanliness in the treatment of lying-in cases is fully recognized. When unhappily this is not the case, and infection takes place, its complications must be treated according to the

circumstances, antiseptic douching being employed, or preferably curetting the endometrium with a sharp curette and swabbing with disinfectant solution. In definitely septicaemic cases antistreptococcic serum may be useful.

PUERTO CABELLO, a city and port of Venezuela, in the state of Carabobo, 20 m. N. by W. of Valencia, the capital of the state. Pop. (1891), 10,145. Puerto Cabello has railway connexions with Valencia and Caracas. It stands on a small peninsula which partly shelters a large bay, called " Golfo Triste," by the early Spanish navigators. After La Guayra the harbour is the principal port of Venezuela, and it is provided with mole, wharves, railway communication with the interior, and other facilities for the handling of merchandise and produce. The town and harbour were strongly fortified in colonial times, but the port defences were greatly damaged in 1902 in a bombard- ment by some German vessels of the allied blockading fleet. Among the exports are coffee, cacao, dyewoods, hides, skins, and copper ores. Puerto Cabello suffered much in the War of Independence, changing hands several times and remaining in the possession of Spain down to 1823.

PUERTO CORTES (Cortez or Caballos), a seaport on the Atlantic coast of Honduras; in 15° 51′ N. and 87° 56′ W., at the northern terminus of the transcontinental railway from Fonseca Bay, and near the mouth of the river Chamalecon. Pop. (1905), about 2500. The harbour, an inlet of the Gulf of Honduras, is deep, spacious and secure, and there is a railway pier at which vessels can load and discharge. The exports include bananas, coffee, cabinet woods, rubber, sarsaparilla, livestock, deerskins and gold. The harbour was discovered in 1527 by Gonzalo d'Avila, and the town was founded a few years later by order of Hernando Cortes, from whom it derives its name.

PUERTO DE SANTA MARIA, a seaport of southern Spain, in the province of Cadiz, on the right bank of the river Guadalete, with a station on the railway from Cadiz to Seville. Pop. (1900), 20,120. Puerto de Santa Maria, commonly called " El Puerto," is probably the Menesthei Tortus of Ptolemy. Its most important industry is the wine trade; there are also glass,

liqueur, alcohol, starch and soap manufactures. The principal buildings are a Moorish citadel, a Gothic church founded in the 13th century, a Jesuit college, and a bull- ring which accommodates 12,000 spectators. The town is noted for its bull-fights, that given here in honour of Wellington being the subject of the considerably idealized description in Byron's Childe Harold, j

PUERTO PRiNCIPE (officially, Camaguey), a city and the capital of the province of Camaguey in east-central Cuba, about 528 m. E.S.E. of

Havana. Pop. (1899), 25,102; (1907), 29,616. In addition to the axis-railway of the island, which connects it with Havana and Santiago, the city has connexion by a branch line with Nuevitas. Puerto Principe lies on a broad plain about equally distant from the north and south coasts of the island, and between two small rivers, the Tinima and Hatibonica. In appearance it is one of the most ancient of Cuban towns. Many of the churches, convents and other ecclesiastical establish- ments were built in the second half of the 18th century, some in the first half; and some parts of the original cathedral of 16 17 have probably survived later alterations and additions. Some of the bridges, too, built in the 18th century, are picturesque. The city hall was begun in 1733. There is a provincial institute for secondary education. The city is the seat of a court of appeal. Puerto Principe is connected by railway, 47 m. long, with its port, Nuevitas (pop. in 1907, 4386), which is on the north side of the island and has a spacious land-locked bay of good depth, approached through a break in the off-lying coral keys and a narrow canyon entrance. About 50 m. south of Puerto Principe is Santa Cruz del Sur (pop. in 1907, 1640) on the south coast. Cabinet woods, fruit, tobacco, sugar, wax, honey and cattle products are the leading exports. In 15 14 Diego Velasquez founded, on Nuevitas Bay (then known as the Puerto del Principe) , a settlement that was moved in 151 5 or 15 16 to the site of the present city of Puerto Principe (or Santa Maria del Puerto del Principe). From very early times the surrounding plains were given over to horse and cattle-raising. As early as the beginning of the 17th century Havana depended on this supply to furnish the fleets of royal ships which monopolized trade between Spain and America. From very early times, too, a prosperous clan- destine trade was maintained with Providence, the Bahamas, and especially with Curacoa and Jamaica (after its capture by the English in 1655). After the capital, Puerto Principe was the richest prize of the island when it was captured and plundered in 1668 by a force of Frenchmen and Englishmen under Henry Morgan, the buccaneer. In the 18th century land grants and illicit trade led to serious disturbances. In 1775 Nuevitas was resettled, and in 1780 was made a legal (kabilitado) port. After the cession of Santo Domingo to France in 1800, the Real Audiencia, the supreme court of the Spanish West Indies, was removed to Puerto Principe. A superior audiencia was created for Havana in 1838, but the older court continued to exist throughout the Spanish period. Puerto Principe boasts of being the most Creole of Cuban cities. It was prominent in the war of 1868-78 and in the disaffection preceding and following it.

PUERTO REAL, a seaport of southern Spain, in the province of Cadiz; on the north shore of the inner arm of the Bay of Cadiz and on the Seville-Cadiz railway. Pop. (1900), 10,535. Puerto Real (Port Royal) is the Partus Gaditanus of the Romans, and is probably the most ancient trading-

station on the Bay of Cadiz. It owes its modern name to the fact that it was rebuilt in 1488 by Ferdinand and Isabella. The port has good quays, a dry dock of the Spanish Transatlantic Company, connected with their important works, and safe anchorage close to the wharves for the largest steamers. The town has fine squares, and broad, well-built streets, a handsome town-hall, many schools, a bull- ring, several convents, and a 16th-century Gothic parish church, with three naves and a remarkable atrium. There is an active trade in wine and oils; other industries are the construction and repairing of ships, and the production of salt.

PUFENDORF, SAMUEL (1632-1694), German jurist, was born at Chemnitz, Saxony, on the 8th of January 1632. His father was a Lutheran pastor, and he himself was destined for the ministry. Educated at Grimma, he was sent to study theology

at the university of Leipzig. Its narrow and dogmatic teaching was profoundly repugnant to him, and he soon abandoned it for the study of public law. He went so far as to quit Leipzig altogether, and betook himself to Jena, where he formed an intimate friendship with Erhard Weigel the mathematician, whose influence helped to develop his remarkable independence of character. Pufendorf quitted Jena in 1637 and became a tutor in the family of Petrus Julius Coyet, one of the resident ministers of Charles Gustavus, king of Sweden, at Copenhagen. At this time Charles Gustavus was endeavouring to impose upon Denmark a burdensome alliance, and in the middle of the negotiations he brutally opened hostilities. The anger of the Danes was turned against the envoys of the Swedish sovereign; Coyet, it is true, succeeded in escaping, but the second minister, Steno Bjelke, and the whole suite were arrested and thrown into prison. Pufendorf shared this misfortune, and was subjected to a strict captivity of eight months' duration. He occupied himself during this time in meditating upon what he had read in the works of Grotius and Hobbes. He mentally constructed a system of universal law; and, when, at the end of his captivity, he accompanied his pupils, the sons of Coyet, to the university of Leiden, he was enabled to publish, in 1661, the fruits of his reflections under the title of Elementa juris prudentiae universalis, libri duo. The work was dedicated to Charles Louis, elector pala- tine, who created for Pufendorf at Heidelberg a new chair, that of the law of nature and nations, the first of the kind in the world. In 1667 he wrote, with the assent of the elector palatine, a tract, De statu imperii gsrtnanici, liber unus. Published under the cover of a pseudonym at Geneva in 1667, it was supposed to be addressed by a gentleman of Verona, Severinus de Monzambano, to his

brother Laelius. The pamphlet made a great sensation. Its author directly arraigned the organization of the Holy Roman Empire and exposed its feebleness, denounced in no measured terms the faults of the house of Austria, and attacked with remarkable vigour the politics of the ecclesiastical princes. Before Pufendorf, Philipp Bogislaw von Chemnitz, publicist and soldier, had written, under the pseudonym of " Hippolytus a Lapide," De ralione status in imperio nostra romano-germanico. Inimical, like Pufendorf, to the house of Austria, Chemnitz had gone so far as to make an appeal to France and Sweden. Pufendorf, on the contrary, rejected all idea of foreign inter- vention, and advocated that of national initiative. In 1670 Pufendorf was called to the university of Lund. His sojourn there was fruitful. In 1672 appeared the De jure naturae el gentium, libri octo, and in 1675 a resume of it under the title of De officio hominis el civis.

In the De jure naturae et gentium Pufendorf took up in great measure the theories of Grotius and sought to complete them by means of the doctrines of Hobbes and of his own ideas. His first important point was that natural law does not extend beyond the limits of this life and that it confines itself to regulating external acts. He combated Hobbes's conception of the state of nature and concluded that the state of nature is not one of war but of peace. But this peace is feeble and insecure, and if something else does not come to its aid it can do very little for the preservation of mankind. As regards public law Pufendorf, while recognizing in the state (civitas) a moral person (persona moralis), teaches that the will of the state is but the sum of the individual wills that constitute it, and that this association explains the state. In this a priori conception, in which he scarcely gives proof of historical insight, he shows himself as one of the precursors of J. J. Rousseau and of the Contrat social, Pufendorf powerfully defends the idea that international law is not restricted to Christendom, but con- stitutes a common bond between all nations because all nations form part of humanity.

In 1677 Pufendorf was called to Stockholm as historiographer- royal. To this new period belong Einleitung zur Historie der vornekmsten Reiche und Staaten, also the Commentarium de rebus suecicis, libri XXVI., ab expeditions Gustavi Adolphi regis in Germaniam ad abdicationem usque Christinae and De rebus a Carolo Gustavo gestis. In his historical works Pufendorf is hopelessly dry; but he professes a great respect for truth and generally draws from archives. In his De habitu religionis christianae ad vitam civilem he traces the limits between ecclesi- astical and civil power. This work propounded for the first

time the so-called " collegial " theory of church government (Kollegialsystem) , which, developed later by the learned Lutheran

theologian Christoph Mathaus Pfaff (1686-1760), formed the basis of the relations of church and state in Germany and more especially in Prussia.

This theory makes a fundamental distinction between the supreme jurisdiction in ecclesiastical matters (Kirchenhoheit or jus circa sacra), which it conceives as inherent in the power of the state in respect of every religious communion, and the ecclesiastical power [Kirchengewalt or jus in sacra) inherent in the church, but in some cases vested in the state by tacit or expressed consent of the ecclesiastical body. The theory was of importance because, by distinguishing church from state while preserving the essential supremacy of the latter, it prepared the way for the principle of toleration. It was put into practice to a certain extent in Prussia in the 18th century; but it was not till the political changes of the 19th century led to a great mixture of confessions under the various state governments that it found universal acceptance in Germany. The theory, of course, has found no acceptance in the Roman Catholic Church, but it none the less made it possible for the Protestant governments to make a working compromise with Rome in respect of the Catholic Church established in their states.

In 1688 Pufendorf was called to the service of Frederick William, elector of Brandenburg. He accepted the call, but he had no sooner arrived than the elector died. His son Frederick III. fulfilled the promises of his father; and Pufendorf, historio- grapher and privy councillor, was instructed to write a history of the Elector Frederick William (De rebus gestis Frederici Wilhelmi Magni). The king of Sweden did not on this account cease to testify his goodwill towards Pufendorf, and in 1694 he created him a baron. In the same year, on the 26th of October, Pufendorf died at Berlin and was buried in the church of St Nicholas, where an inscription to his memory is still to be seen.

Pufendorf was at once philosopher, lawyer, economist, historian and statesman. His influence was considerable, and he has left a profound impression on thought, and not on that of Germany alone. But the value of his work was much under-estimated by posterity. Much of the responsibility for this injustice rested with Leibnitz, who would never recognize the incontestable greatness of one who was constantly his adversary, and whom he dismissed as " vir parum jurisconsultus et minime philosophus." It was on the subject of the pamphlet of Severinus de Monzam- bano that their quarrel began. The conservative and timid Leibnitz was beaten on the battlefield of politics and public law, and the aggressive spirit of Pufendorf aggravated yet more the dispute, and so widened the division. From that time the two writers could never meet on a common subject without attacking each other.

See H. von Treitschke, " Samuel von Pufendorf," Preussische Jahrbiicher (1875), xxxv. 614, and xxxvi. 61; Bluntschli, Deutsches Staats- Wbrterbuch, viii. 424, and Geschichte des allgemeinen Stajts- rechts und der Politik, p. 108; Lorimer, The Institutes of the Law of Nations, i. 74; Droysen, " Zur Kritik Pufendorfs," in his Abhand- lungen zur neueren Geschichte; Roscher, Geschichte der Nalional- Oekonomik in Deutschland, p. 304; Franklin, Das deutsche Reich nach Severinus von Monzambano.

PUFF-BALL, in botany, the common name for a genus of fungi (known botanically as Lycoperdon) , and so called because of the cloud of brown dust-like spores which are emitted when the mature plant bursts. They are common in meadows and woods and on heaths or lawns, and when young resemble white balls, sometimes with a short stalk, and are fleshy in texture. If cut across in this state, they show a compact rind enclosing a loose tissue, in the interspaces of which the spores are developed; as the fungus matures it changes to yellowish-brown and brown and when ripe the rind tears at the apex and the spores escape through the aperture when any pressure is applied to the ball. When white and fleshy the fungus is edible. The" fibrous mass which remains after the spores have escaped has been used for tinder or as a styptic for wounds. The giant puff-ball, Lycoperdon giganteum, reaches a foot or more in diameter.

PUFF-BIRD, the name first given, according to W. Swainson (Zool. Illustrations, 1st series, vol. ii., text to pi. 99), by English residents in Brazil to a group of birds now placed in the sub- family Bucconinae, which with the Galbulinae or jacamars form

the family Galbulidae of Coraciiform birds standing between the trogons (q.v.) and barbets, for a long time confounded, under the general name of barbets, with the Capitonidae of modern systematists. Each group has formed the subject of an elabo- rate monograph — the Capitonidae being treated by C. H. T. and G. F. L. Marshall (London, 1870-187 1), and the Bucconidae by P. L. Sclater (London, 1879-1882). The Bucconinae are zygodactylous birds confined to the neotropical region, in the middle parts of which, and especially in its sub-Andean sub- region, they are, as regards species, abundant; while only two seem to reach Guatemala and but one Paraguay. As with most South American birds, the habits and natural history of the Bucconidae have been but little studied, and of only one species, which happens to belong to a rather abnormal genus, has the nidification been described. This is the Chelidoptera tenebrosa, which is said to breed in holes in banks, and to lay white eggs much like those of the

kingfisher and consequently those of the jacamars. From his own observation Swainson writes (loc. cit.) that puff -birds are very grotesque in appearance. They will sit nearly motionless for hours on the dead bough of a tree, and while so sitting " the disproportionate size of the head is rendered more conspicuous by the bird raising its feathers so as to appear not unlike a puff-ball. . . . When frightened their form is suddenly changed by the feathers lying quite flat." They are very confiding birds and will often station themselves a few yards only from a window. The Bucconidae almost without exception are very plainly-coloured, and the majority have a spotted or mottled plumage suggestive of immaturity. The first puff-bird known to Europeans seems to have been that described by G. de L. Marcgrav, under the name of " tamatia," by which it is said to have been called in Brazil, and there is good reason to think that his description and figure — the last, comic as it is in outline and expression, having been copied by F. Willughby and many of the older authors — apply to the Bucco maculatus of modern ornithology — a bird placed by M. J. Brisson (Ornithologie, iv. 524) among the kingfishers. But if so, Marcgrav described and figured the same species twice, since his " Matuitui " is also Brisson's " Martin-pescheur tachele du Bresil."

P. L. Sclater divides the family into, 7 genera, of which Bucco is the largest and contains 20 species. The others are Mala- coptila and Monacha, each with 7, Nonnula with 5, Chelidoptera with 2, and Micromonacha and Hapaloptila with 1 species each. The most showy puff-birds are those of the genus Monacha, with an inky-black plumage, usually diversified by white about the head, and a red or yellow bill.

PUFFIN, the common English name of a sea-bird, the Fra- tercula arctica of most ornithologists, known however on various parts of the British coasts as the bottlenose, coulterneb, pope, sea- parrot and tammy-norie, to say nothing of other still more local designations, some (as marrott and willock) shared also with allied species of Alcidae, to which family it belongs. Of old time puffins were a valuable commodity to the owners of their breeding-places, for the young were taken from the holes in which they were hatched, and " being exceeding fat," as Carew wrote in 1602 (Survey of Cornwall, fol. 35), were " kept salted, and reputed for fish, as coming neerest thereto in their taste." In 1345, according to a document from which an extract is given in Heath's Islands of Scilly (p. 190), those islands were held of the Crown at a yearly rent of 300 puffins 1 or 6s. 8d., being one-sixth of their estimated annual value. A few years later (1484), either through the birds having grown scarcer or money cheaper, only 50 puffins are said (op. cit. p. 196) to have been

1 There cannot be much doubt that the name puffin given to these young birds, salted and dried, was applied on account of their downy clothing, for

an English informant of Gesner's de- scribed one to him (Hist, avium, p. no) as wanting true feathers, and being covered only with a sort of woolly black plumage. It is right, however, to state that Caius express'y declares (Rarior. animal, libellus, fol. 21) that the name is derived " a naturali voce pupin." Skeat states that the word is a diminutive, which favours the view that it was originally used as a name for these young birds. The parents were probably known by one or other of their many local appellations.

demanded. It is stated by both Gesner and Caius that they were allowed to be eaten in Lent. Ligon, who in 1673 published a History of the Island of Barbadoes, speaks (p. 37) of the ill taste of puffins " which we have from the isles of Scilly," and adds " this kind of food is only for servants." Puffins used to resort in vast numbers to certain stations on the coast, and are still plentiful on some, reaching them in spring with remarkable punctuality on a certain day, which naturally varies with the locality, and after passing the summer there leaving their homes with similar precision. They differ from most other Alcidae in laying their single egg (which is white with a few grey markings when first produced, but speedily begrimed by the soil) in a shal- low burrow, which they either dig for themselves or appropriate from a rabbit, for on most of their haunts rabbits have been introduced. Their plumage is of a glossy black above — the cheeks grey, encircled by a black band — and pure white beneath ; their feet are of a bright reddish orange, but the most remark- able feature of these birds, and one that gives them a very comical expression, is their huge bill. This is very deep and laterally flattened, so as indeed to resemble a coulter, as one of the bird's common names expresses; but moreover it is parti-coloured — blue, yellow and red — curiously grooved and still more curiously embossed in places, that is to say during the breeding- season, when the birds are most frequently seen. But it had long been known to some observers that such puffins as occa- sionally occur in winter (most often washed up on the shore and dead) presented a beak very different in shape and size, and to account for the difference was a standing puzzle. Many years ago Bingley (North Wales, i. 354) stated that puffins " are said to change their bills annually." The remark seems to have been generally overlooked; but it has proved to be very near the truth, for after investigations carefully pursued during some years by Dr Bureau of Nantes he was in 1877 enabled to show (Bull. Soc. Zool. France, ii. 377~399) 2 that the puffin's bill undergoes what may be called an annual moult, some of its most remarkable appendages, as well as certain horny out- growths above and beneath the eyes, dropping off at the end of the breeding season, and being reproduced the following year. Not long after the same naturalist announced (op. cit.) iv. 1-68) that he had followed the similar changes which, he found to take place, not only in other species of puffins, as the Fratercula corniculata and F. cirrhata of the Northern Pacific, but in

several birds of the kindred genera Ceratorhina and Simorhynachus inhabiting the same waters. The name puffin has also been given in books to one of the shearwaters which belong to the sub-family Procellariina of the Petrels (q.v), and its latinized form Puffinus is still used in that sense in scien- tific nomenclature. This fact seems to have arisen from a mistake of Ray's who, seeing in Tradescant's Museum and that of the Royal Society some young shearwaters from the Isle of Man, prepared in like manner to young puffins, thought they were the birds mentioned by Gesner as the remarks inserted in Willughby's Ornithologia (p. 251) prove; for the specimens de- scribed by Ray were as clearly shearwaters as Gesner's were puffins.

PUGACHEV, EMEL'YAN IVANOVICH (? 1741-1775), Rus- sian pretender, the date of whose birth is uncertain, was the son of a small Cossack landowner. He married a Cossack girl Sofia Nedyuzheva, in 1758, and the same year was sent with his fellow Cossacks to Prussia, under the lead of Count Zachary Chernuishev. In the first Turkish War (1 769-74) of Catherine II. Pugachev, now a Cossack ensign, served under Count Peter Panin and was present at the siege of Bender. Invalided home, he led for the next few years a wandering life; was more than once arrested and imprisoned as a deserter; and finally, after frequenting the monasteries of the " Old Believers," who exercised considerable influence over him, suddenly proclaimed himself (1773) to be Peter III. The story of Pugachev's strong resemblance to the murdered emperor is a later legend. Pugachev dubbed himself Peter III. the better to attract to his standard all those (and they were many) who attributed their misery to ! See Zoologist for 1878, pp. 233-240.

the government of Catherine II., for Peter III. was generally remembered as the determined opponent of Catherine. As a matter of fact Pugachev and his followers were hostile to every form of settled government. The one thought of the destitute thousands who joined the new Peter was to sweep away utterly the intolerably oppressive upper-classes. Pugachev's story was that he and his principal adherents had escaped from the clutches of Catherine, and were resolved to redress the griev- ances of the people, give absolute liberty to the Cossacks, and put Catherine herself away in a monastery. He held a sort of mimic court at which one Cossack impersonated Nikita Panin, another Zachary Chernuishev, and so on. The Russian government at first made light of the rising. At the beginning of October 1773 it was simply regarded as a nuisance, and 500 roubles was considered a sufficient reward for the head of the troublesome Cossack. At

the end of November 28,000 roubles were promised to whomsoever should bring him in alive or dead. Even then, however, Catherine, in her correspondence with Voltaire, affected to treat " I' affaire du Marquis de Pugachev "as a mere joke, but by the beginning of 1774 the joke had developed into a very serious danger. All the forts on the Volga and Ural were now in the hands of the rebels; the Bashkirs had joined them; and the governor of Moscow reported great restlessness among the population of central Russia. Shortly afterwards Pugachev captured Kazan, reduced most of the churches and monasteries there to ashes, and massacred all who refused to join him. General Peter Panin, the conqueror of Bender, was thereupon sent against the rebels with a large army, but difficulty of transport, lack of discipline, and the gross insubordination of his ill- paid soldiers paralysed all his efforts for months, while the in- numerable and ubiquitous bands of Pugachev were victorious in nearly every engagement. Not till August 1774 did General Mikhelson inflict a crushing defeat upon the rebels near Tsar- itsyn, when they lost ten thousand in killed and prisoners. Panin's savage reprisals, after the capture of Penza, completed their discomfiture. Pugachev was delivered up by his own Cossacks on attempting to fly to the Urals (Sept. 14), and was executed at Moscow on the nth of January 1775.

See N. Dubrovin, Pugachev and his Associates (Rus. ; Petersburg, 1884); Catherine II., Political Correspondence (Rus. Fr. Ger. ; Petersburg, 1885, &c); S. I. Gnyedich, Emilian Pugachev (Rus.; Petersburg, 1902). (R. N. B.)

PUGET, PIERRE (1622-1694), French painter, sculptor, architect and engineer, was born at Marseilles on the 31st of "October 1622. At the age of fourteen he carved the ornaments of the galleys built in the port of his native city, and at sixteen the decoration and construction of a ship were entrusted to him. Soon after he went to Italy on foot, and was well received at Rome by Pietro di Cortona, who employed him on the ceilings of the Barberini Palace and on those of the Pitti at Florence. In 1643 he returned to Marseilles, where he painted portraits and carved the colossal figure-heads of men-of-war. After a second journey to Italy in 1646 he painted also a great number of pictures for Aix, Toulon, Cuers and La Ciotat, and sculptured a large marble group of the Virgin and Child for the church of Lorgues. His caryatides for the balcony of the H6tel de Ville of Toulon were executed between 1655 and 1657. N. Fouquet employed Puget to sculpture a Hercules for his chateau in Vaux. The artist's desire to paint gradually subsided before his passion for sculpture, and a serious illness in 1665 brought Puget a prohibition from the doctors which caused him wholly to put aside the brush. The fall of Fouquet in 1660 found Puget at Genoa. Here he executed for Sublet des Noyers his French Hercules (Louvre), the statues of St Sebastian and of Alexandre Sauli in the church of Carignano (c. 1664), and much other work. The Doria family gave him

a church to build; the senate proposed that he should paint their council chamber. But Colbert bade Puget return to France, and in 1669 he again took up his old work in the dockyards of Toulon. The arsenal which he had there undertaken to construct under the orders of the duke of Beaufort was destroyed by fire, and Puget, disheartened, took leave of Toulon. In 1685 he went

back to Marseilles, where he continued the long series of works of sculpture on which he had been employed by Colbert. His statue of Milo (Louvre) had been completed in 1682, Perseus and Andromeda (Louvre) in 1684; and Alexander and Dio- genes (bas-relief, Louvre) in 1685, but, in spite of the personal favour which he enjoyed, Puget, on coming to Paris in 1688 to push forward the execution of an equestrian statue of Louis XIV., found court intrigues too much for him. He was forced to abandon his project and retire to Marseilles, where he remained till his death on the 2nd of December 1694. His last work, a bas-relief of the Plague of Milan, which remained unfinished, was placed in the council chamber of the town hall of his native city.

In spite of Puget's visits to Paris and Rome his work never lost its local character: his Hercules is fresh from the galleys of Toulon; his saints and virgins are men and women who speak Provencal. His best work, the St Sebastian at Genoa, though a little heavy in parts, shows admirable energy and life, as well as great skill in contrasting the decorative accessories with the simple surface of the nude. There is in the museum of Aix in Provence the bust of a long-haired young man in pseudo- classical costume which is believed to be a portrait of Louis XIV. made by Puget at the time of the king's visit in 1660.

See Leon Lagrange, Pierre Puget (Paris, 1868, with a catalogue of works) ; Charles Ginoux, Annates de la vie de P. Puget (Paris, 1894) ; Philippe Auquier, Pierre Puget . . . biographie critique (Paris, 1903).

PUGILISM (from Lat. pugil, boxer, Gr. ir6|, with clenched fist), the practice or sport of fighting with the fists. The first mention of such fighting in literature is found in the 23rd book of the Iliad, and shows that in Homer's time the art was already highly developed. The occasion was the games at the funeral of Patroclus, the champions engaged being Epeus, the builder of the wooden horse, and Euryalus. Each combatant seems to have been naked except for a belt, and to have worn the cestus. The fight ends with the defeat of Euryalus. According to Virgil (Aeneid, v.) similar games took place within the walls of Troy at the funeral of Hector, the principal boxers being Dares, the winner, and the gigantic Butex, a pupil of Amycus, Paris, the Trojan champion, abstaining from the contests. Further on we find the account of the games on the occasion of the funeral of Anchises, in

the course of which Dares, the Trojan, receiving no answer to his challenge from the Sicilians, who stood aghast at his mighty proportions, claims the prize; but, just as it is about to be awarded him, Entellus, an aged but huge and sinewy Sicilian, arises and casts into the arena as a sign of his acceptance of the combat the massive cesti, all stained with blood and brains, which he has inherited from King Eryx, his master in the art of boxing. The Trojans are now appalled in their turn, and Dares, aghast at the fearful implements, re- fused the battle, which, however, is at length begun after Aeneas has furnished the heroes with equally matched cesti. For some time the young and lusty Dares circles about his gigantic but old and stiff opponent, upon whom he rains a torrent of blows which are avoided by the clever guarding and dodging of the Sicilian hero. At last Entellus, having got his opponent into a favourable position, raises his tremendous right hand on high and aims a terrible blow at the Trojan's head; but the wary Dares deftly steps aside, and Entellus, missing his adversary altogether, falls headlong by the impetus of his own blow, with a crash like that of a falling pine. Shouts of mingled exultation and dismay break from the multitude, and the friends of the aged Sicilian rush forward to raise their fallen champion and bear him from the arena; but, greatly to the astonishment of all, Entellus motions them away and returns to the fight more keenly than before. The old man's blood is stirred, and he attacks his youthful enemy with such furious and headlong rushes, buffeting him grievously with both hands, that Aeneas puts an end to the battle, though barely in time to save the discomfited Trojan from being beaten into insensibility.

Although fist-fighting was supposed by the Greeks of the classic period to have been a feature of the mythological games at Olympia, it was not actually introduced into the historical

Olympic contests until the 23rd Olympiad after the re-estab- lishment of the famous games by Iphitus (about 880 B.C.). Onomastos was the . first Olympic victor. In heroic times the boxers are supposed to have worn the fcoˆta, or belt, but in the Greek games the contestants, except for the cestus, fought entirely naked, since the custom had been introduced in the 1 5th Olympiad, and was copied by the contestants at the Pythian, Nemean, Isthmian and Panathenaic games (see Games, Classical). At Olympia the boxers were rubbed with oil to make them supple and limit the flow of perspiration, a pre- caution the more necessary as the Olympic games were held during the hottest part of the year. The cesti, of which there were several varieties, were bound on the boxers' hands and wrists by attendants

or teachers acting as seconds. On account cf the weight of the gloves worn, the style of boxing differed from that now in vogue (see Boxing), the modern straight-from-the- shoulder blow having been little used. Both Homer and Virgil speak of " falling blows," and this was the common method of attack, consisting more in swinging and hammering than in punching. The statue of a Greek boxer in the Louvre shows the right foot forward, the left hand raised as if to ward off a blow from above, and the right hand held opposite the breast, the whole attitude more resembling that of a warrior with sword and shield than of a modern boxer. The pugilists of Rome, who were in many cases Greeks and employed Greek methods, exaggerated the brutality of the fist-fight to please the Roman taste, and the sanguinary contest between Dares and Entellus, described above, although in some respects an anachronism as an account of a pugilistic battle in primitive times, was doubt- less an exact portrayal of the encounters to be seen in Virgil's day in the circuses of Rome. Nevertheless it must not be under- stood that the boxing matches at the Greek games were not themselves severe to the point of brutality, in spite of the fact that style and grace of movement were sedulously taught by the masters of the time. The Greek champions trained for months before the games, but encounters between athletes armed with such terrible weapons as the loaded cestus were bound to result in very serious bruises and even disfigurement. Pluck was as highly thought of as at the present day, and it was related of a certain Eurydamas that, when his teeth were battered in, he swallowed them rather than show that he was hurt, whereupon his antagonist, in despair at seeing his most furious blows devoid of effect, gave up the battle. As, on account of the swinging style of blows, the ears were particu- larly liable to injury ear-protectors (d/j < £wTiSes) were generally used in practice, though not in serious combats. The so- called " pancratist's ear," swollen and mis-shapen, was a char- acteristic feature of the Greek boxer. The satirists of the time flung their grim jests at the champion bruisers. Lucilius writ- ing of a Greek boxer of Etruria (Anthologia epigrammatum graecorum), says, " Aulos, the pugilist, consecrates to the God of Pisa all the bones of his cranium, gathering up one by one. Let him but return alive from the Nemean Games, O mighty Jupiter, and he will also offer thee, without doubt, the vertebrae of his neck, which is all he has left ! "

The rules of Greek boxing were strict. No wrestling, grap- pling, kicking nor biting were allowed, and the contest ended when one combatant owned himself beaten. On this account pugilism and the pancratium (see below) were forbidden by Lycurgus, lest the Spartans should become accustomed to an acknowledgment of defeat (Plutarch, Lycurgus). In spite of the terrible injuries which often resulted from these con- tests it was strictly forbidden to kill an adversary, on pain of losing the prize. Rhodes, Aegina, Arcadia and Elis produced most of the Olympic victors in boxing, which

was considered as an excellent training for war. According to Lucan (Attach. 3) Solon recommended it for pedagogic purposes, and the contest with the sphairai, or studded cesti, was added by Plato to his list of warlike exercises as being the nearest approach to actual battle.

The Greek athletic contest called pancratium (way Kpariov, complete, or all-round, contest), which was introduced into

the Olympic games in the 38th Olympiad, was a combination of boxing and wrestling in which the contestants, who fought naked, not wearing even the cestus, were allowed to employ any means except biting to wring from each other the acknowledgment of defeat. Boxing, wrestling, kicking, dislocation of joints, breaking of bones, pulling of hair and strangling were freely indulged in. The fight began with sparring for openings and was continued on the ground when the contestants fell. Many pancratists excelled in obtaining quick holds of their opponents' fingers, which they crushed and dislocated so completely that all effective opposition ceased. Sudden attacks resulting in the dislocation of an arm or leg were also taught, reminding one of the Japanese jiu-jitsu. The pancratium was considered by the Greeks the greatest of all athletic contests and, needless to say, only the most powerful athletes attempted it. It. became popular in Rome during the Empire and remained so until the time of Justinian.

Diagoras of Rhodes, his three sons and many grandsons, who were sung by Pindar (Olymp. 7), were the most celebrated of the Olympic boxing champions. One of the sons, Dorieus, was three times victorious at Olympia in the pancratium, and during his career won eight Olympian, eight Isthmian, seven Nemean and one of the Pythian prizes. Many famous champions also came from the Greek colonies, like the Locrian Euthymus, who con- quered three times at Olympia. Another celebrated fighter and wrestler was Milo of Crotona (520 B.C.).

Boxing was evidently in vogue in very ancient times in Italy, imported, in all probability, from Greece, for Livy (i. 35) relates that, at the first celebration of the great Roman games (ludi, romani magnique varie appellati) by Tarquinius Priscus (6th century B.C.), boxers were brought from outlying pro- vinces; and there was an old tradition that a school of pugilism flourished in Etruria in heroic times. During the republic' boxing was cultivated is a gentlemanly exercise, and we find Cato the Elder giving his son instruction in the art (Plutarchˆ Cato Major). Tacitus (Ann. xvi. 3) says that the emperor Caligula imported the best Campanian and African pugilists for the gladiatorial games, and Strabo (iii. 3) records that the Lusitanians and also the Indians, who gave virgins as prizes, boxed. The art remained popular in Italy down to a late peri6d of the Empire.

From the fall of the Roman Empire to the beginning of the 10th century pugilism seems to have been unknown among civilized nations with the single exception of the English.

The first references to boxing in England as a regular sport' occur towards the end of the 17th century, but little mention is made of it before the time of George I., when " prize-fighters " engaged in public encounters for money, with the backsword, falchion, foil, quarter-staff and single-stick, and, to a less extent, with bare fists, the last gradually gaining in popularity with the decline of fencing. The most celebrated of these fighters and the one who is generally considered to have been the first champion of England, fighting with the bare fists, was James Figg, who was supreme from 1719 to 1730. Figg was succeeded by Pipes and Gretting, both of whom made way in 1734 for Jack Broughton, who built the amphitheatre for public dis^ plays near Tottenham Court Road and who was undisputed champion until 1750. Broughton seems to have been a man of intelligence, and to him is ascribed the scientific development of the art of boxing. During his time the sport became truly national and the prize-fighter the companion of the greatest in the land. Among Broughton's successors were Slack, " Big Ben " Brain, Daniel Mendoza (a Jew who flourished about 1790 and was the proprietor of the Lyceum in the Strand), J. Jackson, Tom Cribb, Jem Belcher, Pearce (called the " Game Chicken"), and John Gully, who afterwards represented Ponte- fract in Parliament.

To Broughton is ascribed the invention of boxing-gloves for use in practice. All prize-fights, however, took place with bare knuckles in roped-off spaces called rings, usually in the open air. Pugilists toughened their hands by " pickling " them in a powerful astringent solution. A fight ended when one

of the " bruisers," as they were called, was unable to " come to the scratch," i.e. the middle of the ring, at the call of the referee at the beginning of a new round. Each round ended when one fighter fell or was knocked or thrown to the ground, but a pugilist " going down to avoid punishment," i.e. without being struck by the opponent, was liable to forfeit the fight. Wrestling played an important role in the old prize-ring, and a favourite method of weakening an adversary was to throw him heavily and then fall upon him, seemingly by accident, as the manoeuvre, if done intentionally, was foul. The fight- ing was of the roughest description, low tricks of all kinds being practised when the referee's attention was diverted, gouging out an adversary's eye being by no means unknown. Until 1795 pugilists wore long hair, but during a fight in that year Jackson caught

Mendoza by his long locks and held him down helpless while he hit him. This was adjudged fair by the referee, with the result that prize-fighters have ever since cropped their head. Nevertheless there were rules which no fighter dared to overstep, such as those against kicking, hitting below the belt, and striking a man when he had fallen.

From the time of Cribb the English champions were Tom Spring (1824), Jem Ward (1825), Jem Burke (1833), W.Thomp- son, called " Bendigo" (1830-1845), Ben Caunt (1841), W. Perry, the " Tipton Slasher " (1850), Harry Broome (1851), Tom Sayers (1857-1860), Jem Mace (1 861-1863), Tom King (1863), and again Mace, until 1872.

In America boxing began to be popular about the beginning of the 19th century. The first recognized national champion was Tom Hyer (1841-1848), who was followed by James Ambrose (born in Ireland), called " Yankee Sullivan "; John Morrissey (afterwards elected to the United States Congress); John C. Heenan; Tom Allen (of England); Jem Mace (of England); J. Kilrain; John L. Sullivan (1880-1891); J. J. Corbett (1892- 1897); Robert Fitzsimmons (1897-1900) (born in Cornwall); James J. Jeffries. The defeat of the last named by the negro Jack Johnson in 19 10 caused a great sensation.

What is still the most celebrated prize-fight of modern times took place at Farnborough in April i860, between Tom Sayers and the huge youthful American pugilist J. C. Heenan, the " Benicia Boy," who had been defeated in America by Morris- sey, but had succeeded to the championship upon the latter's retirement. The English champion was a much smaller and lighter man than his challenger, a fact which increased the popular interest in the fight. ■ Although the local English authorities endeavoured to prevent it taking place, Heenan complaining that he had " been chased out of eight counties," the ring at Farnborough was surrounded by a company containing representatives of the highest classes, and the exaggerated statement was made that '" Parliament had been emptied to patronize a prize-fight." The battle lasted for 2 hours and 20 minutes, during which Heenan, owing to his superi- ority in weight and reach, seemed to have the advantage, although nearly blinded by Sayers's hard straight punches. During one of the opening rounds a tendon in Sayers's right forearm was ruptured in guarding, and he fought the rest of the battle with a pluck which roused the enthusiasm of the spectators. Heenan had neglected to harden bis hands properly, with the result that they soon swelled to unnatural proportions, rendering his blows no more effective than if he had worn boxing-gloves. Nevertheless towards the close of the fight Heenan repeatedly threw Sayers violently, and held him on the ropes enclosing the ring, which, just as the police interfered, were cut by persons who asserted that Heenan was on the point of strangling Sayers. In spite of the indecisive

outcome of the battle both fighters claimed the victory, but the match was officially adjudged a draw. This was the last great prize-fight with bare fists on English soil, as public opinion was aroused, and orders were given to the police thenceforth to regard prize- fights as illegal, as tending to a " breach of the peace." Several surreptitious prize-fights did indeed occur within a few years after the Sayers-Heenan battle; but more than once, notably in the fight between Heenan and Tom King, one of the participants

was " doctored," i.e. drugged, and this lack of fairplay, added to the brutality of fist-fights, gave the death-blow to pugilism of the old kind. In its place came fighting and boxing with padded gloves, small ones weighing about 4 oz. being used by professionals, while amateurs, who boxed and sparred rather than fought (see Boxing), made use of larger and softer gloves.

An added impetus was given to boxing as well as pugilism in 1 866 by the founding of the " Amateur Athletic Club " by John C. Chambers, who, assisted by the marquess of Queensberry, drew up the code of rules for competitions still in vogue and called after that nobleman, who, in 1867, presented cups for the amateur championships at the different weights. These rules prohibit all rough and unfair fighting, as well as wrestling, and divide a match into rounds of three (or two) minutes each, with half a minute rest between the rounds. It is a matter of agreement in professional battles whether in " breaking away " after a clinch blows may be struck or not. When a contestant is knocked down (a man on one knee is technically down) he is allowed ten seconds, usually counted aloud by the referee, in which to rise and renew the fight. Should he be unable to do so he is " counted out " and loses the match.

See Fistiana (London, 1868); American Fistiana (New York, 1876); Egan, Boxiana (London, 1818-1824); Fencing, Boxing and Wrestling, in the Badminton Library (London, 1889) ; R. G. A. Winn, Boxing, Isthmian Library (London, 1897).

PUGIN, AUGUSTUS WELBY NORTHMORE (1812-1852), English architect, son of Augustus Charles Pugin (1762-1832), a Frenchman by birth who settled in London as an architectural draughtsman and had several pupils who rose to fame, was born in Store Street, Bedford Square, on the 1st of March 181 2. After an education at Christ's Hospital he entered his father's office, where he displayed a remarkable talent for drawing. His father was for many years engaged in preparing a large series of works on the Gothic buildings of England, almost, if not quite, the first illustrated with accurate drawings of medieval buildings; and the son's early youth was mostly occupied in making minute measured drawings for these books. In this way his enthusiasm for Gothic art was first aroused. All

through his fife, both in England and during many visits to Germany and France, he continued to make great numbers of drawings and sketches, in pen and ink or with sepia monochrome, per- fect in their delicacy and precision of touch, and masterpieces of skilful treatment of light and shade. At first he acted as assistant in his father's work, and his own independent efforts to obtain business were not very successful. In 1827 he was employed to design furniture in a medieval style for Windsor Castle; and in 183 1 — the year he married his first wife, Ann Garnett, who died in childbirth a year later — he designed scenery for the new opera of Kenilwortk at Her Majesty's theatre. But he got into money difficulties, and soon after his marriage he was imprisoned for debt. When he came out he again incurred serious losses over an attempt to start a shop for supplying architectural accessories of his own designing, which he had to give up. But after his second marriage in 1833 to Louisa Burton (d. 1844), and his reception into the Roman Catholic Church shortly afterwards, he began to obtain more steady architectural practice and by degrees he acquired the reputation which has made his name stand foremost among those responsible for the English Gothic revival (see Archi- tecture: Modern: "The Gothic Revival"). No man had so thoroughly mastered the principles of the Gothic style in its various stages, both in its leading lines and in the minutest details of its mouldings and carved enrichments. In 1837-1843 he assisted Sir Charles Barry by working out the details of the designs for the new Houses of Parliament at Westminster; and though his exact share in the designs was subsequently the subject of bitter controversy after both he and Barry were dead, there is no doubt that, while he was working as Barry's paid clerk, a great deal in the excellence of the details was due to him and to his training of the masons and carvers. His conversion to Roman Catholicism, while part and parcel of his

devotion to Gothic art, naturally brought him employment as an architect mainly from Roman Catholics; and many of his executed works suffered from the fact that his designs were not fully carried out, owing to a desire to save money or to spend it so as to make the greatest possible display. For this reason his genius is often more fairly displayed by his drawings than by the buildings themselves. In almost every case his design was seriously injured, both by cutting down its carefully considered proportions and by introducing shams (above all things hateful to Pugin), such as plaster groining and even cast-iron carving. The cathedral of St George at Southwark, and even the church in Farm Street, Berkeley Square, London, are melancholy instances of this. Thus his life was a series of disappoint- ments; no pecuniary success compensated him for the de- struction of his

best designs, as in him the man of business was thoroughly subordinate to the artist. He himself used to say that the only church he had ever executed with unalloyed satisfaction was the one at Ramsgate, which he not only designed but paid for. Pugin was very bread in his love for the medieval styles, but on the whole preferred what is really the most suited to modern requirements, namely the Perpendicular of the 15th century, and this he employed in its simpler domestic form with much success both in his own house at Ramsgate and in the stately Adare Hall in Ireland built for Lord Dunraven. The cathedral of Killarney and the chapel of the Benedictine monastery of Douai were perhaps the ecclesiastic buildings which were carried out with least deviation from Pugin's original conception.

Apart from his work as an architect, his life presents little of detail to record. In 1836 he published his Contrasts; or a Parallel between the Architecture of the 15th and igth centuries, in which he seriously criticized the architecture of Protestantism. His other principal publications were True Principles of Christian Architecture (1841); Glossary of Ecclesiastical Ornament (1844); and Treatise on Chancel Screens and Rood Lofts (1851). He was a skilful etcher, and illustrated in this way a number of his works, which were written with much eloquence, great antiquarian knowledge and considerable humour. This last gift is exemplified in a series of etched plates in his Contrasts; on one side is some noble structure of the middle ages, and on the other an example of the same building as erected in the 19th century. In 1849 he married a third wife, daughter of Thomas Knill. Early in 1852 he was attacked by insanity, and he died on the 14th of September that year. His eldest son by his second wife, Edward Welby Pugin (1834-1875), was also an accomplished architect, who carried on his father's work.

See B. Ferrez, Recollections of A. W. Pugin and his Father (London,

1861).

PUISNE (from O. Fr. puisne, modern pulni, later born, in- ferior; Lat. postea, afterwards, and natus, born), a term in law meaning " inferior in rank." It is pronounced " puny," and the word, so spelt, has become an ordinary adjective meaning weak or undersized. The judges and barons of the common law courts at Westminster, other than those having a distinct title, were called puisne. By the Supreme Court of Judicature Act 1877, a " puisne judge " is denned as a judge of the High Court other than the lord chancellor, the lord chief justice of England, the master of the rolls, the lord chief justice of the common pleas, and the lord chief baron, and their successors respectively.

PUJAH, or Pooja, the Hindu ceremonies in idol-worship. Colloquially the

word has come to be applied by Anglo-Indians to any kind of rite; thus " pujah of the flag " is the sepoy term for trooping of the colours.

PUKET (also known by the Chinese name Tongkah), the first Siamese port on the west coast of the Malay Peninsula, situated on the eastern side of the island of Junk Ceylon (Malay, " Ujong Salang") in 7° 50′ N. and 98 24′ E. It is the headquarters of the high commissioner of the Siamese administrative division of the same name, and has a population of about 30,000, of which more than a third is Chinese. Beneath the town and around it lie deposits of tin ore which have been worked by Chinese from ancient times> and the extraction of which still furnishes

occupation for the majority of the inhabitants. In 1907, dredging for tin in the harbour was undertaken by a European company. Puket has been a resort of European merchants since the 16th century. During the ancient wars between Siam and Burma it was more than once attacked by the latter, but was relieved by forces from Nakhon Sri Tammarat (Ligore) on the mainland. The Siamese mining department has a branch at Puket under control of European officers.

PULASKI, CASIMIR, Count (1 748-1 779), Polish soldier, was born in Podolia in 1748, and took a prominent share, under his father Count Joseph Pulaski, in the formation of the con- federation of Bar and in the military operations which followed, becoming ultimately commander-in-chief of the Polish patriot forces. Driven into exile about 1772, Pulaski went to America and joined the army of Washington in 1777. He distinguished himself at once in the battle of Brandywine, was made a brigadier-general and chief of cavalry by Congress, and fought at Germantown, and in the battles of the winter 1777-78, after which he raised a mixed corps called the Pulaski legion. At the head of this force he won further distinction in the southern theatre of war, and successfully defended Charleston in May 1779. He was mortally wounded soon afterwards at the un- successful attack on Savannah (Oct. 9) and died two days later on board ship. Congress voted a monument to his memory; and though this vote has never been carried into execution, Lafayette laid the corner-stone of a monument in Savannah in 1824, and this was completed in 1855.

PULCI, LUIGI (1431-1487), Italian poet, was born at Florence, of a well-connected family. His elder brother Luca (d. 1470) was also a poet, author of Pistole, Driadeo d'amore, and Ciriffo Calvaneo. Luigi was patronized by Cosimo, Piero, and Lorenzo de' Medici, and was the author of various works in poetry and prose. He is famous, however, as the first to bring artistic romance into Italian literature in his heroic poem Morgante Maggiore (Venice, 1481), an epic of a giant converted to Christianity, who

accompanies Orlando (Roland) . (See Italian Literature.)

PULGAR, HERNANDO DE (1436-c 1492), Spanish prose- writer, was bom at Pulgar (near Toledo) in 1436 and was educated at the court of John II. Henry IV. made him one of his secretaries, and under Isabella he became councillor of state, was charged with a mission to France, and in 1482 was appointed historiographer-royal. He is said to have died in 1492. His Crdnica de los Reyes Catfilicos, wrongly ascribed in the first edition (1565) to Antonio de Lebrija, is often inaccurate and always obsequious; but the record is not without value as regards events within the author's personal experience. Pulgar's Claros Varones de Castilla (i486), an account of celebrities at the court of Henry IV., is interesting in matter and style. He compiled a commentary (1485?) on the Coplas de Mingo Revulgo. His Letters, written to various persons of eminence, were first published in 1485-1486.

PULICAT, a town of British India, in Chingleput district, Madras, 25 m. N. of Madras city. Pop. (1901), 5448. TheDutch built a fort here as early as 1609, and it was for a long time their chief settlement on the Coromandel coast. Repeatedly captured, it did not finally become British until 1825. It gives its name to the Pulicat lake, a shallow lagoon stretching for about 37 m. along the coast. The seaward side is formed by the island of Sriharikot, which supplies firewood to Madras city.

PULKOVO, or Pulkowa, a village of Russia, in the govern- ment of St Petersburg, 10 m. S. of the city of St Petersburg. Pop. 2000. It contains the Pulkovo observatory, on a hill 248 ft. high, in 59° 46′ 18″ N. and 30 19′ 40″ E. It was built in 1833-1839.

PULLEY, a wheel, either fixed to a turning axle or carried freely on a stationary one, the periphery of which is adapted to receive some form of wrapping connector. A pulley carried on a rotating shaft and connected to another pulley on a second shaft by an endless band consisting of a flat belt, rope, chain or similar connector serves for the transmission of power from the one shaft- to the other and is known as a driving pulley;

PULLEY

64.1

while combinations of pulleys or " sheaves," mounted in fixed or movable frames or " blocks," constitute mechanisms used to facilitate the raising of heavy weights. The word appears in Mid. Eng. as pulley or polley (late), also as poleyne (Prompt. Parvul.). The first forms seem to be from the O. Fr. poulie, which itself is regarded as coming from the O. Eng. pullean, to

pull. The Low Lat. forms polea, polegia, whence Span, polea and Ital. poleggia, are apparently from the Fr. poulie. The earliest form, poleyne, is represented in Fr. by poulain, literally a colt, Low Lat. pullanus, pullus, the young of any animal, the root of which is seen in English " foal." Poulain was used of a rope to let casks down into a cellar or to raise heavy weights. The use of the name of an animal for a mechanical device is not uncommon, cf. " crane," or " easel," from Du. exel, literally " little ass."

Driving pulleys are usually constructed of cast iron, and are of circular form, having a central nave by which they are secured to the shaft by keys or other fastenings, and straight or curved arms connecting the nave to the rim, which latter is of a form adapted to the connector. Pulleys are usually cast in one piece, and the proportions of the various parts are designed to resist the unknown stresses due to contraction of the casting in cooling, in addition to the stresses to which pulleys are sub- jected in use. The rim is slightly wider than the belt, and is of such a section as will suffice to resist the stress due to the pull of the belt, which is commonly taken as 80 lb per inch of width for single belting and 140 lb per inch of width for double belting. The rim is also subject to a centrifugal tension of amount wv 2 jg pounds per square inch of section, where w is the weight in pounds of a length of one foot of the pulley rim one square inch in section, and v is the velocity of the rim in feet per second. This stress amounts to 1043 lb per square inch, if the velocity is 100 ft. per second. The combination of these stresses generally limits the rim velocity of cast-iron pulleys to 80 or 100 ft. per second. The dimensions of the nave depend to a large extent on the method of keying or otherwise securing the pulley to the shaft. The number of the arms is arbitrary, and they may be curved to diminish the liability to fracture from contraction in the cooling of the cast iron, but in other respects are preferably straight, since they are then lighter and stronger. The arms are ellip- tical in cross-section, diminishing from the nave to the rim, and are usually designed as equally loaded cantilevers, fixed at the nave and free at the rim. These assumptions are probably not nearly correct, and, as the stresses caused by the cooling of the casting are unknown, it is necessary to choose a low working stress of about one ton per square inch. The statical experi- ments of C. H. Benjamin (American Machinist, 1898) on cast- iron pulleys loaded by a belt to imitate the conditions in practice led him to the conclusion that the rim is usually not sufficiently rigid to load the arms equally, and that the ends of the arms are subjected to bending movements of opposite sign, that at the nave being almost invariably the greater.

Pulleys are also built up of wrought iron and steel, and can then be constructed entirely free from internal stress; they are thus much lighter and stronger, and are not liable to fly to pieces

like cast iron if they break. Fig. 1 shows a built-up pulley having a cast-iron nave A, straight wrought-iron arms B, screwed therein and connected to a steel plate-rim C by riveted ends, and also by screwed flanges D riveted on each side to the rim. The pulley is in halves to facilitate fixing, and when in place the sections C are joined by plates E, bolted or riveted to the rim.

_ ., _ „ The two halves of the nave

-Built-up Pulley. are secured by bolts Qr rivets

passing through the flanges F, and the pulley is connected to the xxn. 21

Fig. 1.

shaft by a sunk key or by conical keys driven in between the shaft and the boss, which latter is bored to suit. A modified form of this arrangement of cone keys is shown in the figure, in which a screwed conical bush M, divided into several parts longitu- dinally, is clamped round the shaft, and screwed into the corre- sponding part of the nave until the grip is sufficient. The parts of the bush are glued to a sheet of emery paper, so that its rough side may give a better grip on the shaft.

Pulleys are also made of paper, wood and other materials. Wooden pulleys are preferably made of maple, the rim being formed of small sections morticed, pinned and glued together, with the grain set in such directions that any warping of the material will leave the cylindrical form practically unaltered. Wooden pulleys are generally made in two halves, bolted to- gether at the rim and nave, and are provided with wooden, spokes dovetailed into the rim and secured by keys. The pulley is secured to the shaft by conical keys, to give a frictional grip on both the shaft and the pulley; these keys may have their exterior surfaces eccentric to the shaft, with corresponding recesses in the nave, so that the pulley and keys virtually form one piece.

If the centre of gravity of a pulley is on the axis of rotation, and the whole mass is distributed so that the axis of inertia coincides with the axis of rotation, there can be no unbalanced force or unbalanced couple as the pulley revolves. The mag- nitude of the unbalanced force, for a mass of w pounds at a radius of r feet and a velocity of v feet per second, is expressed by •ur&lgr lb; and, since the force varies as the square of the velocity, it is necessary carefully to balance a pulley running at a high speed to prevent injurious vibrations. This can be accomplished by attaching balance-weights to the pulley until it will remain stationary in all positions, when its shaft rests on two horizontal knife-edges in the same horizontal plane, or, preferably, the pulley and shaft may be supported on bearings resting on

springs, and balanced by attached masses until there is no perceptible vibration of the springs at the highest speed of rotation.

The rims of pulleys, round which fiat bands are wrapped, may be truly cylindrical, in which case the belt will run in- differently at any part of the pulley, or the rim may be swelled towards the centre, when the central line of the band will tend to run in the diametral plane of the pulley. This self-guiding property may be explained by the tendency which a flat band has, when running upon a conical pulley in a direction normal to its axis, to describe a spiral path as it wraps on to the surface because of the lateral stiffness of the material; the advancing side therefore tends to rise towards the highest part of the cone. If two cones are placed back to back the belt tends to rise to the ridge and stay there. In practice the pulley rim is curved to a radius of from three to five times its breadth, and this not only guides the belt, but allows the line of direction of the advancing side to deviate to a small extent, depending on the elasticity of the material.

Parallel shafts may be driven by flexible bands or connectors passing over pulleys, the central planes of which coincide, without any guiding arrangements for the belting. The shafts revolve in the same or opposite directions, according as the belt is open or crossed. Means of changing the relative speeds of rotation are furnished by pulleys of continuously varying diameter, or by speed cones (see Mechanics: Applied). A common arrangement for driving a lathe spindle, in either direction at several definite speeds, is to provide a counter- shaft on which are mounted two fixed pulleys and two loose pulleys to accommodate two driving belts from the main shaft, one of which is open and the other crossed. The belts are moved laterally by the forks of a striking gear pressing on the advancing sides of the belts, and the pulleys are arranged so that the belts either wrap round the loose pulleys, or can be shifted so that one wraps round a fixed pulley, while the other still re- mains on its loose pulley. Motion in either direction is thereby obtained, and a considerable variation in the speed of rotation can be obtained by providing a cone pulley on the counter- shaft, which drives the cone pulley secured to the lathe

spindle by a separate band. The dimensions of the pulleys are generally so arranged that the return motion of the lathe spindle is faster than the forward motion. An alternative arrangement consists in providing two loose pulleys on the counter-shaft, driven by open and crossed belts respectively,

and arranging two clutches on the shaft, so that by the movement of a sliding block, controlled by hand, one or other of the clutches can be put in gear.

The proportions of cone pulleys for open or crossed belts may be determined by considering the expression for the half length (/) of a belt wrapping round pulleys of radius fi and r% respectively, and with centres distant c apart. The value of / may be easily shown to be (n+“2)ir/ 2 + (“i =t “2)ii+c cos a, where the positive sign is to be taken for a crossed belt and the negative sign for an open belt. In determining the dimensions of corresponding drums of cone pulleys it is evident that for a crossed belt the sum of the radii of each pair remains a constant, since the angle a is constant, while for an open belt a is variable and the values .of the radii are then obtained by solving the equations

T\ = l/w— c(a sin a + cos a) + \c sin a,

rj. = //■— c(a sin a + cos_a) — \c sin a.*

The value of a is in general small, and an approximate solution

may be obtained by substituting two or three terms of the expansions

for sin a and cos a. This, however, leads to a troublesome numerical

solution. An accurate geometrical solution by C. Culmann gives

A J B

/a

*/y. \ *

M

**

Fig. 2. the linear equivalents of the above equations in the following manner. A rectangle ABCD (fig. 2), with side AB=ir c\i and AD=e, is constructed, and the quadrant AEF is drawn with centre D and radius DA. F B is the evolute of this circle, and for any radius DE at an angle a and corresponding tangent EG termin- ated by the evolute, the perpendicular distance of G from the line AD is c(cos a-f-a sin a). If now a line be drawn from A to the bisector H of the side BC, it will meet the vertical through G in I and IT=c(cos a+a sin a)/x. A circular arc, centre D and radius c/2, meets D E in K, and the perpendicular KL gives Jc sin a. This distance is

marked off from the point I in each direction, whereby the points M and N are obtained, the distance apart of which represents the value n — r 2 . If now the value 1]t = 0] be marked off, and a horizontal line be drawn through the point O, the line OM represents n--r^. Repeating this construction for all values of a between o° and 90 , we obtain a curve BPC, which can be used for determining the ratios of corresponding drums of cone pulleys or of conical drums for open belts. The curve BPC is generally used with the abscissae spaced more con- veniently for practical applications, and a modification of the diagram by J. F. Klein (Journ. Franklin Inst., vol. lxxix.) is often used instead.

When pulleys are mounted on shafts which are parallel to one another, the band will retain its position, provided that its cen- tral line advances towards each pulley in the diametral plane of this latter. This condition is fulfilled in the example shown by fig. 3, in which the central planes of each pulley pass through the points of delivery of the other pulley for the given direction of motion. If the motion is reversed the condition is no longer satisfied and the belt will leave the pulleys. In more compli- cated cases guide pulleys must be used. . In the most general case for inclined pulleys, any two points may be chosen on the line

Fig. 3.

of intersection of the diametral planes, and tangents drawn to the pitch circles of the pulleys. Guide pulleys are set with their diametral planes in the planes containing corresponding pairs of tangents, and a continuous belt wrapped round these pulleys in due order can then be run in either direction.

The rims of pulleys for hemp or other ropes or cords are grooved, and the sides are usually either inclined at 45° or curved to give a sharper angle at the outside than at the bottom of the groove; in the latter case, as the rope wears it engages in a groove of greater angle and less effective grip. Wire ropes are injured by the lateral crushing of the material, and in this case the grooves are wide enough to allow the rope to rest on the rounded bottom, which is lined with leather or wood to diminish the wear and increase the friction. In English prac- tice there are as many separate endless ropes as there are pairs of grooves in the two pulleys to be connected, but in cases of American practice the rope is continuously wound round the two pulleys, and the free end passes over a pulley mounted on a movable weighted carriage to adjust the tension. It is of con- siderable importance that the effective radius of action of the rope remain constant throughout each pulley, otherwise the wear on the rope becomes very great and its life is diminished. The grooves must be turned exactly alike, and the rope must be of the same diameter throughout to diminish

slip.

Pulleys may be detachably connected to a shaft by friction clutches, so that they may be thrown in and out of engagement at will. The section, fig. 4, shows a clutch for a rope-driven pulley A, which runs freely on a bush B on the shaft, and is provided with an enlarged cylindrical nave or clutch box C. A split ring D, carried by the clutch and turning with it, can be thrust against the clutch box by right- and left-handed screws E, so that a sufficient grip is obtained to cause the clutch and the pulley to turn as one piece. The engagement of the pulley and clutch is determined by a „

hand-controlled block F sliding 4-

on the shaft, the movement of which is communicated to the right- and left-handed screw shafts by links G connected to the levers H.

The resistance to slipping of a flat belt on a pulley may be obtained by considering the equilibrium of a small arc of the pulley surface subtending an angle dd at the centre, and having tensions T and T+dT at its extremities. Neglecting quantities of the second order, the pressure on the pulley is Tdd, and the friction is //TdB where m is the coefficient of friction between the belt and the pulley. We have therefore dT=nTd$ and dT/T = ndd. Integrating the expression for an angle of wrapping 0, we obtain the relation log e T1/T2 = /id, where Ti and T 2 are the end tensions. For leather belts on cast-iron pulleys the value of /* may be taken as 0-4, giving a ratio of the tensions on the tight and slack sides of Ti/T2 = 3-5I4, when the angle of wrapping is. 180 . For ropes in the grooves of cast-iron pulleys, where is the inclination of the sides of the grooves, the value of the normal pressure is increased in the ratio of cosec \4> = 1. A usual value of n for hemp ropes on cast-iron pulleys is 0-3, and the exponential log ratio is therefore o-37r cosec \<$> when 6 =x. At high speeds the centrifugal tension of the belt or rope, of amount wv 2 /g, may be considerable, and must be subtracted from the end tensions.

Pulley Blocks. — Frames or blocks containing pulleys or sheaves are used in combination for lifting heavy weights. There are usually two blocks, of which one A (fig. 5) is fixed, and the other B is movable, and a rope or chain, with one end secured to one of the blocks at C, passes round the sheaves in a continuous coil, leaving a free end D at which the effort is applied. In the arrangement shown there are three equal sheaves in each block, and each set turns on a pin secured in the framing. The load, supported by the lower hook, is raised by hauling on the free end and, neglecting any slight obliquity of the plies of rope, the free end moves six times as fast

///////,,'/,,,///»

as the lower block carrying the weight, and in the absence of friction and other resistances the mechanical advantage will be in the same ratio of the effort to the resistance. In practice the full advantage of this or any other similar combination is not realized, because of the friction of the sheaves against the pin or shaft, and more important still is the stiffness of the rope, which requires work to be done upon it to bend it round the sheave and straighten it again. The effect of pin friction is equivalent to diminishing the radius of the effort and increasing that of the resistance.

For a single pulley of diameter D, turning on a fixed pin of diameter d, the relation of the effort E to the load W, where / is the coefficient of friction, is expressed by E/W = (D+/d)/(D— jd) = 1+2/d/D approximately. The resistance of the rope to bending causes an additional resistance, which experiment shows can be expressed in'the form W

E'/R=(i-6-M/R)/(i+o). . (1)

If the load is self-sustaining E' is zero or negative, and hence i + M/Rmust be equal to or greater than unity, and therefore it is impossible for the ratio of R/E to rise to a greater value than (1— a)/2, and hence at least half the effort is wasted if the tackle

Fig. 6. — Weston Differential Fig. 7. — Moore and Head

Pulley Block. Pulley Block,

has the valuable property of sustaining a load when the effort is removed. If, however, an artificial resistance can be introduced, to come into action only when the effort is removed, it is possible to obtain a. tackle of greater efficiency. As an example we may take the case where a brake is provided offering a resistance, c R, proportional to the load sustained, and where the values a and b are small compared with unity. Equation (1) becomes E/R = (i-6-c-M/R)/(l-o), and hence b+c+M/K is equal to

or greater than unity when the load is self-sustained, and we thus obtain a relation between R and E in the form I —a/2 — c, which shows to a first approximation, that as c approaches unity a high efficiency is obtainable, while the self-sustaining power of the tackle is retained. In order to obtain a greater ratio of R to E, without using a large number ct sheaves, various

arrangements are used, of which the Weston differential pulley block is a typical example. The upper block carries a pair of chain pulleys A (fig. 6), secured together and of slightly different effective diameters D and d. An endless chain B, passing through guides C and D, encircles these pulleys and the single loose pulley E of the lower block, as indicated. With this arrangement a single revolution of the upper sheave causes the endless chain to wind up the chain on one side by an amount ?rD, and to unwind an amount vd on the other side, and in conse- quence the lower sheave is raised by ir(D — d)/2. Hence, neglect- ing friction, E7rD = iR7r(D-d), i.e. E = iR(i-d/D). The value d/D usually lies between the limits 10/11 and 15/16, and, if a greater difference of E from R is required, a further mechanical advantage can be obtained by employing a separate hand-wheel and chain, or by forming the upper sheave with an annular spur-wheel gearing with a pinion driven by a hand-wheel and chain, as in the Tangye form of Weston pulley-block. The efficiency of the Weston pulley-block is less than 50 %, and it does not therefore overhaul. An objection to this form of block is the great length of the endless chain, which may drag on the ground and pick up dirt and grit, and thereby interfere with the smooth working of the mechanism. Other forms, which do not require so lengthy a chain, sometimes employ an epicyclic train to obtain the reduced velocity of the load. The Moore and Head block has two equal chain-wheels A, B, fig. 7, loosely mounted on an axle C, and pro- vided with annular toothed gear-wheels which usually differ by one tooth. A spur pinion D, gearing with both wheels, is carried loosely upon an eccentric E forming part of the central pin, so that when this latter is turned by the hand-wheel F and chain G the axis of the pinion describes a circle the diameter of which equals the throw of the eccentric, and a small relative motion of the two sheaves takes place, depending on the number of the teeth of the annular wheels. The motion obtained is divided between the two vertical parts of the chain H, which is wrapped round each sheave in opposite directions, with a free loop I between, while the ends are attached to the lifting hook. This form is self-sustaining at all loads.

In order to obtain a ■ self-sustaining pulley tackle, which will have an efficiency of more than 50%, various arrangements are adopted, which during lifting auto- matically throw out of action a brake and cause it to come into action again when the effort is removed. A worm-gear tackle of this description is shown in fig. 8, in which a worm A, operated by a hand-wheel B and chain C, drives the worm-wheel D, thereby coiling up a chain E, one end F of which is secured to the upper block, and the other end hangs loose- ly, after passing round the sprocket- wheel. The worm is of great pitch, so that if the effort were removed the weight would descend, did not the axial end thrust of the worm shaft ‘ throw into action a friction brake H, the resistance of which prevents motion downwards. In the brake

shown, the cone I is pressed against a corresponding recess in the ratchet-wheel J, which latter turns loosely in the casing and is provided with a pawl not shown in the figure; this pawl allows freedom of motion when the load is being raised. The f ac- tional grip between the two surfaces prevents return motion of the worm shaft and the load remains suspended, but it may be lowered by turning the hand-wheel so as to overcome the friction brake. Various other arrange- ments of friction brakes have been devised to give a resistance propor- tional to the load.

Blocks, for lifting very heavy weights, are sometimes provided with an electric motor for driving the worm. The worm-wheel shaft then sometimes carries a spur-pinion gear- ing with a spur-wheel on the lifting shaft, whereby a much greater mechanical advantage is obtained with a small loss by friction of the spur gearing.

References. — W. J. M. Rankine, Machinery and Millwork and Applied Mechanics; W. C. Unwin, Machine Design; Ad. Ernst.

Fig. 8. — Worm-gear Pulley Block with Automatic Brake.

Die Hebezeuge; A. Ritter, Lehrbuch der technischen Mechanik; J. Weisbach and G. Herrmann, The Mechanics of Hoisting Machinery; F. Reuleaux, Der Constructeur ; A. B. W. Kennedy, Mechanics, of Machinery; J. Perry, Applied Mechanics; W. E. Dalby, Balancing of Engines. (E. G. C.)

PULLMAN) formerly a town of Cook county, Illinois, U.S.A., and now a part of the city of Chicago. Here are the works of the Pullman Palace Car Company, steel forging plants, and other factories. The place was founded in 1880 by George Mortimer Pullman (1831-1897), the inventor of the Pullman sleeping car, and the founder (1867) of the Pullman Palace Car Company, who attempted to make it a " model town." Even the public works were the property of the Pullman Com- pany and were managed as a business investment. Popular discontent with the conditions led to the annexation of Pullman to Chicago in 1889, but until 1910 the corporation held most of the property. In June and July 1894 a bitter railway strike developed from a controversy between employed and employers in the Pullman works. (See Chicago and Illinois: History.) PULPIT (from Lat. pulpitum, a staging, platform: equiva- lents are Fr. chaire d'iglise, Ital. pulpito, Ger. Kanzel), a raised platform with enclosed front, whence sermons, homilies, &c, were delivered. Pulpits were probably derived in their modern form from the ambones in the early Christian Church (see

Ambo). There are many old pulpits of stone, though the majority are of wood. Those in churches are generally hexagonal or octa- gonal; and some stand on stone bases, and others on slender wooden stems, like columns. The designs vary accordingly to the periods in which they were erected, having panelling, tracing, cuspings, crockets, and other ornaments then in use. Some are extremely rich, and ornamented with colour and gilding. A few also have fine canopies or sounding-boards. Their usual place is in the nave, mostly on the north side, against the second pier from the chancel arch. Pulpits for addressing the people in the open air were common in the medieval period, and stood near a road or cross. Thus there was one at Spital Fields, and one at St Paul's, London. External pulpits still remain at Magdalen College, Oxford, and at Shrews- bury. Pulpits, or rather places for reading during the meals of the monks, are found in the refectories at Chester, Beaulieu, Shrewsbury, &c, in England; and at St Martin des Champs, St Germain des Pres, &c, in Paris; also in the cloisters at St Die and St Lo. Shortly after the Reformation the canons ordered pulpits to be erected in all churches where there were none before. It is supposed that to this circumstance we owe many of the time of Elizabeth and James. Many of them are very beautifully and elaborately carved, and are evidently of Flemish workmanship. The pulpits in the Mahommedan mosques, which are known as " mimbars " are quite different in, form, being usually canopied and approached by a straight flight of steps. These have a doorway at the foot, with an enriched lintel and boldly moulded head; the whole of the work to this and to the stairs, parapet and pulpit itself being of wood, richly inlaid, and often in part gorgeously painted and gilt.

PULQUE, or Pulque Fuerte, the national beverage of the Mexican natives. It is prepared by fermenting the juice of a number of species of the agave (agava potatorum, americana, &c). The cultivation of the agave for purposes of pulque manufacture constitutes a considerable local industry, the capital invested running into several millions sterling. The juice obtained by tapping the agave is termed aguamiel. A quantity of this is allowed to ferment naturally for about ten days, and the product so obtained is termed madre pulque (mother of pulque). A small quantity of this is added to fresh aguamiel, and thereby a rapid fermentation is induced, the pulque being ready for consumption within a day or two. It has a somewhat heavy flavour, resembling sour milk, but it is much esteemed by the natives on account of its cooling, and according to them wholesome and nutritious, properties.

PULSE. (1) (O. Fr. pols, Lat. puis, pultis, Gr. it6Xtos, a porridge of beans, peas, &c), in botany, a collective term for

beans, peas, and other members of the order Leguminosae (q.v.), which is characterized by having a legume or pod for the fruit. (2) (M. Eng. pous,

pouce, O. Fr. pous, mod. pousse, Lat. pulsus, sc. venarum, the beating of the veins, pellere, to drive, beat), throbbing or beating; in physiology the rhythmical beating due to the changes of blood-tension in the arteries consequent on the contractions of their elastic tissues (see Vascular System).

PULSZKY, FERENCZ AUREL (1814-1897), Hungarian politician and author, was born on the 17th of September 1814 at Eperjes. After studying law and philosophy at the high schools of his native town and Miskolcz, he travelled abroad. England particularly attracted him, and his fascinating book, Aus dem Tagebach eines in Grossbritannien reisenden Ungarns (Pesth, 1837), gained for him the membership of the Hungarian Academy. Elected to the Reichstag of 1840, he was in 1848 appointed to a financial post in the Hungarian government, and was transferred in like capacity to Vienna under Esterhazy. Sus- pected of intriguing with the revolutionists, Pulszk'y fled to Budapest to avoid arrest. Here he became an active: member of the committee of national defence, and when obliged to fly the country he joined Kossuth in England and with him made a tour in the United States of America. In collaboration with his wife he wrote a narrative of this voyage, entitled White, Red, Black (3 vols., London, 1853). He was condemned to death (1852) in contumaciam by a council of war. In; i860 he went to Italy, took part in Garibaldi's expedition to Aspromonte (1862), and was interned as a prisoner of war in Naples. Amnestied by the emperor of Austria in 1866, he returned home and re-entered public life; was from 1867-1876, and again in 1884, a member of the Hungarian Diet, joining the Deak party. In addition to his political activity, he was president of the literary section of the Hungarian Academy, and director of the National Museum at Budapest, where he became distinguished for his archaeological researches. He employed his great influence to promote both art and science and Liberal views in his native country. He died on the 9th of September 1897. Among his writings are Die Jacobiner in Ungarn (Leipzig, 1851) and Eletem is Korom (Pest, 1880), and many treatises on Hungarian questions in the publications of the Academy of Pest.

Some Reminiscences of Kossuth and Pulszky were published by F. W. Newman in 1888.

PULTUSK, a town of Russian Poland, in the government of Warsaw, 33 m. N. of the city of Warsaw, on the right bank of the Narew. Pop. (1897), 15,878. The town was almost entirely destroyed by fire in 1875. It is now well built, and had before the fire a palace (1319) which was formerly a residence of the bishops of Plock. The industries include woollen, linen and hosiery mills, copper works and potteries. In 1703 Charles XII. of Sweden defeated and captured the greater part of a Saxon army near this town,

and in the same locality the French defeated the Russians in December 1806. The town was founded as early as 956.

PUMA, a name, probably of native origin, introduced into European literature by the early Spanish writers on South America (as Garcilaso de la Vega and Hernandez) for one of the largest cats (Felis concolor) of the New World. It is generally called " couguar " by the French, " leon " by the Spanish Americans, and " panther " by the Anglo-American hunters of the United States (see Carnivora). Though often spoken of as the American lion, chiefly on account of its colour, it rather resembles the leopard of the Old World in size and habits: usually measuring from nose to root of tail about 40 in., the tail being rather more than half that length. The head is small compared with that of other cats and has no mane. The ears are large and rounded. The tail is cylindrical, with stjme bushy elongation of the hairs near the end, but not forming a distinct tuft. The general colour of the upper parts and sides of the adult is a tawny yellowish brown, sometimes having a grey or silvery shade, but in some cases dark or inclining to red; and upon these and other differences, which are probably

constant locally, a number of sub-species have been named. The lower parts, inner surface of the limbs, throat, chin and upper Up are dirty white; the outside of the ears, particularly at their base, and a patch on each side of the muzzle black; the end of the tail dusky. The young are, when first born, spotted with dusky brown and the tail ringed. These markings generally fade, and quite disappear before the animal becomes full grown.

The puma has an exceedingly wide range of geographical distribution, extending over a hundred degrees of latitude, from Canada in the north to Patagonia in the south, and formerly was generally diffused in suitable localities from the Atlantic to the Pacific Ocean, but the advances of civilization have curtailed the extent of the districts which it inhabits. In

The Puma (Felis concolor).

Central America it is still common in the dense forests which clothe the mountain ranges as high as 8000 or 9000 ft. above the sea level. Though an expert climber, it is by no means confined to wooded districts, being frequently found in scrub and reeds along the banks of rivers, and even in the open pampas and prairies. Its habits much resemble those of the rest of the group to which it belongs; and, like the leopard, when it happens to come within reach of an abundant and easy prey, as the sheep or calves of

an outlying farming station, it kills far more than it can eat, either for the sake of the blood only or to gratify its propensity for destruction. It rarely attacks man, and when pursued escapes if possible by ascending trees. Several instances have occurred of pumas becoming tame in captivity. Edmund Kean, the actor, had one which followed him about like a dog. When caressed pumas purr like domestic cats.

PUMICE (Lat. putnex, spumex, spuma, froth), a very porous, froth-like, volcanic glass. It is an igneous rock which was almost completely liquid at the moment of effusion and was so rapidly cooled that there was no time for it to crystallize. When it solidified the vapours dissolved in it were suddenly released and the whole mass swelled up into a froth which immediately consolidated. Had it cooled under more pressure it would have formed a solid glass or obsidian (q.v.) ; in fact if we take fragments of obsidian and heat them in a crucible till they fuse they will suddenly change to pumice when their dissolved gases are set free. Hence it can be understood that pumice is found only in recent volcanic countries. Artificial substances resembling pumice can be produced by blowing steam through molten glass or slag, and when a mass of slag is suddenly cooled by being tipped into the sea (as is the case at the blast furnaces of Whitehaven in Cumberland) it swells up into a pumiceous form so light and full of vesicles that it will float on water. Any type of lava, if the conditions are favourable, may assume the pumiceous state; but basalts and andesites

do not so often occur in this form as do trachytes and rhyolites. Pumices are most abundant and most typically developed from acid rocks; for which reason they usually accompany obsidians, in fact in Lipari and elsewhere the base of a lava flow may be black obsidian while the upper portion is a snow white pumice.

Small crystals of various minerals occur in many pumices; the commonest are felspar, augite, hornblende and zircon. If they are abundant they greatly diminish the economic value of the rock, as they are hard and wear down more slowly than the glassy material; consequently they produce scratches. The cavities of pumice are sometimes rounded, but may also be elongated or tubular owing to the flowing movement of the solidifying lava. The glass itself forms threads, fibres and thin partitions between the vesicles. Rhyolite and trachyte pumices are white, contain 60 to 75% of silica and the specific gravity of the glass is 2ˆ3 to 2-4; andesite pumices are often yellow or brown; while pumiceous basalts, such as occur in the Sandwich Islands, are pitch black when perfectly fresh.

Good pumice is found in Iceland, Hungary, Nevada, Teneriffe, New Zealand, Pantellaria and the Lipari Islands. The last-named are the chief sources of pumice for the arts and manufactures. At Campo Bianco in

Lipari there is an extinct volcanic cone with a breached crater from which a dark stream of obsidian has flowed. For industrial purposes the best varieties are obtained from Monte Pelato and Monte Chirica. The pumice is extracted by means of shafts and tunnels driven through the soft incoherent stone. It is brought out in blocks of irregular shape and size and is trimmed into slabs and graded into several qualities before it is exported to Canneto, which is the centre of the pumice trade. The workmen say that the good pumice occurs in beds or veins, which are probably lava flows and are separated by valueless rock or by obsidian. The value depends entirely on the regularity, size and shape of the steam cavities and on the absence of minute crystals. From time immemorial the extraction and sale of pumice have been one of the principal sources of wealth to the inhabitants of this island. An inferior pumice, known in Lipari as Alessandrina, is used for smooth ing oilcloth. Though all the Aeolian Isles are volcanic no pumice is exported from any of the others. In Iceland, Teneriffe and Hungary pumice also occurs, but not in sufficient quantity or of such quality as to render it worth working on a large scale. It is estimated that in Lipari there are 170 pumice quarries (or mines) giving employment to 1200 persons and producing 6000 tons of pumice per annum. The price varies with the quality: from 3 lire per 100 kilogrammes for the commonest sorts to 200 of 300 lire for the best pieces, the average being about 15 lire. Much pumice is also used nowadays in the form of a fine powder, pro- duced by crushing the rock, and forms an ingredient of: metal polishes and some kinds of soap. It is often confounded with diatom earth or tripoli powder, but can easily be recognized by the aid of the microscope or by simple chemical tests.*

Among the older volcanic rocks pumice occurs, but usually has its cavities filled up by deposits of secondary minerals introduced by percolating water; hence it is of no value for industrial pur^ poses. Pumice, in minute fragments, has been shown to have an exceedingly wide distribution over the earth's surface at the present day. It occurs in all the deposits which cover the floor of the deepest portion of the oceans, and is especially abundant in the abysmal red clay. In some measure this pumice has been derived from submarine volcanic eruptions, but its presence is also accounted for by the fact that pumice will float on water for months, and is thus distributed over the sea by winds and currents. After a long time it becomes waterlogged and sinks to the bottom, where it gradually disintegrates and is incorporated in the muds and Oozes which are gathering there. After the great eruption of Krakatoa in 1883 banks of pumice covered the surface of the sea for many miles and rose in some cases for four or five ft. above the water level. In addition to this much finely broken pumice was thrown into the air to a great height and was borne away by the winds, ultimately settling down in the most distant parts

of the continents and oceans. (J. S. F.)

PUMP, 1 a machine which drives a liquid from one point to another, generally at different levels, the latter being usually the higher; an air-pump is an appliance for exhausting or

1 The word appears apparently first in English in the Promp- torium Parvulorum,. c. 1440, of a ship's pump Qiaurilorium) , in Dutch {pompe), a little later, dialectically, of a conduit pipe for water, but in the sense of a means of raising water it does not occur in Dutch or Ger. before the 16th century. The Fr. pompe is derived from Teut. The Ger. variant of Pumpe is Plumpe, which is gener- ally taken as being an echoic word, imitating the sound of the plunger, but the primary notion seems to be that of a pipe or tube. Cf. Ital. term, tromba,_ i.e. trumpet, pipe (see the note on the word in the New English Dictionary).

D

Fig. 1.

removing the air or other gas from a vessel, whilst a compression pump compresses the air. The simplest forms of pumps em- ployed for forcing liquids are " plunger pumps," consisting essentially of a piston moving in a cylinder, provided with inlet and outlet pipes, together with certain valves. The disposition of these valves divides this type of pump into suction pumps and force pumps.

Fig. 1 shows the arrangement in a suction pump. A is the cylinder within which the piston B is moved up and down by the rod C. D is the inlet pipe (the lower extremity of which . _ is placed beneath the surface of the liquid to be

- J removed), and G is the outlet pipe. E is a valve

**S_ . in the inlet pipe opening into the cylinder ; and*

the piston is perforated by one or more holes, each fitted with valves opening outwards on its upper surface. On raising the piston, the valve F remains closed and a vacuum tends to be created in the cylinder, but the pressure of the atmosphere forces the liquid up the tube D and it raises the valve E and passes into the cylinder. On reversing the motion the valve E closes and the liquid is forced through the valve F to the upper part of the

cylinder. On again raising the piston, more liquid enters the lower part of the cylinder, whilst the previously raised liquid is ejected from the delivery pipe. Obviously the action is intermittent. Moreover, the height of the lift is conditioned by the atmospheric pressure, for this is the driving force; and since this equals 34 ft. of water, the lift cannot be theoretically more than this distance when water is being pumped. In practice it may be considerably less, owing to leakage at the valves and between the piston and cylinder.

In the force pump (fig. 2) there is no such limitation to the lift. In this case the piston is solid, and the outlet pipe, G which is

placed at the bottom of the cylinder, has a valve F opening outwards, the inlet pipe and valve are the same as before. On raising the piston the liquid rises in the cylinder, the valve E opening and F remaining shut. On reversing the motion the valve E closes and the liquid is driven past the valve F. On again raising the piston the valve E opens admitting more liquid whilst F re- mains closed. It is seen that the action is intermittent, liquid only being discharged during a down stroke, but since the driving force is that which is supplied to the _ piston rod, the lift is only con-

**" IG – 2- ditioned by the power available and*

by the strength of the pump. A continuous supply can be obtained by leading the delivery pipe into the base of an air chamber H, which is fitted with a discharge pipe J of such a diameter that the liquid cannot escape from it as fast as it is pumped in during a down stroke. The air inside is compressed in consequence and during an upstroke of the piston this air tends to regain its original volume and so expels the water, thus bringing about a continuous supply. For a description of modern pumps, see Hydraulics.

Air-pumps. — Pumps for evacuating vessels may be divided into three classes: (1) mechanical, (2) mercurial, and (3) jet pumps; the last named are treated in Hydraulics. ' The invention of the mechanical air-pump is generally attributed to Otto von Guericke, consul of Magdeburg, who exhibited his instrument in 1654; it was first described in 1657 by Gaspar Schott, "professor of mathematics at Wurttemberg, in his Mechanica hydraulico-pneumalica, and afterwards (in 1672) by Guericke in his Experimenta nova Magdeburgica de vacus spatia. It consisted of a spherical glass vessel opening below by means of a stop-cock and narrow nozzle into the cylinder of an " exhausting syringe," which inclined upwards from the extremity of the nozzle. The cylinder, in which a well-fitting piston worked, was provided at its lower end with two valves. One of these opened from the nozzle into the cylinder, the other from the cylinder into the outside air.

During the down-stroke of the piston the former was pressed home, so that no air entered the nozzle and vessel, while the latter was forced open by the air which so escaped from the cylinder. During the return- stroke the latter was kept closed in virtue of the partial vacuum formed within the cylinder, while at the same time the former

Ji,

was forced open by the pressure of the denser air in the vessel and nozzle. Thus, at every complete stroke of the piston, the air in the vessel or receiver was diminished by that fraction of itself which is expressed by the ratio of the volume of the avail- able cylindrical space above the outward opening valve to the whole volume of receiver, nozzle and cylinder. The action is essentially that of the common suction pump. The construction was subsequently improved by many experimenters, notably by Boyle, Hawksbee, Smeaton and others; and more recently two pump barrels were employed, so obtaining the same degree of exhaustion much more rapidly. This type of pump is, however, not very efficient, for there is not only leakage about the valves and between the piston and cylinder, but at a certain degree of exhaust the air within the vessel is insufficient to raise the inlet valve; this last defect has been met in some measure by using an extension of the piston to open and close the valve.

The so-called oil air-pumps are much more efficient ; the valve difficulty is avoided, and the risk of leakage minimized; whilst in addition there is no air clearance between the piston and the base of the cylinder as in the older mechanical forms. The Fleuss pump may be taken as an example. The piston, provided with a valve opening upwards, is packed in the cylinder by a leather cup which is securely pressed against the sides of the cylinder by the atmospheric pressure. The piston rod passes through a valve in the upper part of the cylinder which is held to its seat by a spring. The inlet pipe enters an elliptical vessel which communicates with the cylinder a little way up from its base, whilst at the base there is a relief tube leading into the elliptical vessel already mentioned. Oil is placed both above the upper valve seating, and also in the cylinder up to the height of the lower edge of the inlet pipe. The action is as follows: On raising the piston it cuts off communication with the inlet pipe and then compresses the air above, forcing it through the upper valve and oil into the atmosphere. Some of the oil is also driven out, but as the valve does not close until the piston has descended a short distance, a certain amount of oil returns. On lowering the piston its valve opens and air passes in from the vessel to be exhausted; this is further rarefied on the next stroke and so on. The Max Kohl pumps are based on the same principle, but are constructed with more elaborate detail, leading to a greater efficiency, an exhaust of 0-0008 mm. being claimed as readily obtainable.

The invention of the barometer and Torricelli's explanation of the vacuity above the mercury column placed before the members of the Florentine academy a ready method of obtaining vacua; for to exhaust a vessel it was only necessary to join, by means of a tube provided with stop- cocks, the vessel to a barometer tube, fill the compound vessel with mercury and then to invert it in a basin containing this liquid, whereupon the mercury column fell, leaving a Torricellian vacuum in the vessel, which could be removed after shutting off the stop-cocks. This was the only method known until the invention of the mechanical air-pumps; it was subsequently employed by Count Rumford, and as late as 1845, Edward A. King patented filament electric lamps exhausted by the same methods. Although modern mercurial pumps have assumed a multiplicity of forms, their actions can be reduced to two principles, one statical, the other hydrodynamical — at the same time instruments have been devised utilizing both these principles.

Statical Pumps. — The earliest mercurial pump, devised by Swedenborg and described in his Miscellanea observata circa res naturales (1722), was statical in action, consisting essentially in replacing the solid piston of the mechanical pump by a column of mercury, which by being alternately raised and lowered gradually exhausted a vessel. A more complicated pump, but of much the same principle, was devised in 1784 by Joseph Baader, to be improved by C. F. Hindenburg in 1787, by A. N. Edelcrantz in 1804 and by J. H. Patten in 1824; whilst in 1881 Rankine Kennedy resuscitated the idea for the purpose of exhausting filament electric lamps. The pump devised by

Fig. 3.

H. Geissler of Bonn, and first described in 1858 by W. H. Theo. Meyer in a pamphlet Ueber das geschichtele electrische Licht surpassed all previous forms in both simplicity and efficiency.

The general scheme of Geisler's pump is shown in fig. 3. A and B are pear-shaped glass vessels connected by a long narrow india-rubber tube, which must be sufficiently strong" in the body (or strengthened by a linen coating) to stand an outward pressure of 1 to 1 j atmospheres. A terminates below in a narrow vertical tube c which is a few inches longer than the height of the baro- meter, and to the lower end of this tube the india-rubber tube is attached which con- nects A with B. At the upper end of A is a glass two-way stop-cock, by turning which the vessel A can either be made to com- municate with the vessel to be exhausted, or with the atmosphere, or can be

shut off from both when the cock holds an inter- mediate position. The apparatus, after having been carefully cleaned and dried, is charged with pure and dry mercury which must next be worked backwards and for- wards between A and B to remove all the air-bells. The air is then driven out of A by lifting B to a sufficient level, turning the cock Geisler s Air-Pump. so as j communicate with the atmosphere and letting the mercury flow into A until it gets to the other side of the stop-cock, which is then placed in the intermediate posi- tion. Supposing the vessel to be exhausted to have already been securely connected to the pump, we now lower the reservoir B so as to reduce the pressure in A sufficiently below the tension in the gas to be sucked in, and, by turning the cock so as to connect A with the vessels to be exhausted, cause the gas to expand into and almost fill A. The cock is now shut against both communications, the reservoir lifted, the gas contents of A discharged and so on, until, when after an exhaustion mercury is let into A, the metal strikes against the top without inter- position of a gas-bell. In a well-made apparatus the pressure in the exhausted vessel is now reduced to ˆ or ˆ of a milli- metre, or even less. An absolute vacuum cannot be produced on account of the unavoidable air-film between the mercury and the walls of the apparatus.

As it takes a height of about 30 in. of mercury to balance the pres- sure of the atmosphere, a Geisler pump necessarily is a somewhat long-legged and unwieldy instrument ; in addition, the long tube is liable to breakage. It can be considerably shortened, the two vessels A and B brought more closely together, and the somewhat objectionable india-rubber tube be dispensed with, if we connect the air-space in B with an ordinary air pump, and by means of it do the greater part of the sucking and the whole of the lifting work. An instrument thus modified was constructed by Poggen- dorff in 1865.

Even a Geisler's stop-cock requires to be lubricated to be abso- lutely gas-tight, and this occasionally proves a nuisance. Hence a number of attempts have been made to do without stop-cocks altogether. In the pump generally attributed to Topler, but which was previously devised by J. Mile of Warsaw in 1828, who termed it a " hydrostatic air-pump without cylinders, taps, lids or stoppers," this is attained by using, both for the inlet and the outlet, vertical capillary glass tubes, soldered, the former to somewhere near the bottom, the latter to the top of the vessel. These tubes, being more than 30 in. high, obviously act as efficient mercury-traps; but the already considerable height of the pump is thus multiplied by two. This consideration led Alexander Mitscherlich, F. Neisen and others to introduce glass valves in lieu of stop-cocks. A pump similar to Topler's construction was devised by Mendeleeff , and the original device has been much improved by Wiedemann, Bessel- Hagen and others.

The best -known pump of this type was invented in 1865 by H. Sprengel, although the idea had been previously conceived The by Magnus and Buff. The instrument, in its original

Dynamic (simplest) form (fig. 4), consists of a vertical capillary Pump. glass tube a of about 1 mm. bore, provided with a lateral branch b near its upper end, which latter, by an india-rubber joint governable by a screw-clamp, communicates with a funnel. The lower end is bent into the shape of a

Fig. 4. Sprengel's Air-Pump.

hook, and dips into a pneumatic trough. The vessel to

be exhausted is attached to b, and, in

order to extract its gas contents, a

properly regulated stream of mercury

is allowed to fall through the vertical

tube. Every drop of mercury, as it

enters from the funnel, entirely closes

the narrow tube like a piston, and in

going past the place where the side

tube enters entraps a portion of air and

carries it down to the trough, where it

can be collected. If the vertical tube,

measuring from the point where the

branch comes in, is a few inches greater

than the height of the barometer,

and the glass and mercury are per- fectly clean, the apparatus slowly but

surely produces an almost absolute vacuum.

The great advantages of Sprengel's pump lie in the simplicity of its construc- tion and in the readiness with which it adapts itself to the

collecting of the gas. It did excellent service in the hands of Graham for the extraction of gases occluded in metals. Many improvements upon the original construction have been proposed.

Many other devices have been introduced for facilitating the production of vacua. For example Raps in 1893 described an automatic arrangement to be used in connexion with a Topler pump; whilst in 1893 Schulze-Berge devised a rotary form. For the description of these forms see Winkelmann, Handbuch der Physik (1906), i. 1316. The history of mercurial pumps is treated by S. P. Thompson, The Development of the Mercurial Air Pump (1888). For the production of high vacua, see Vacuum Tube; Liquid Gases.

PUMPKIN, the fruit of the gourd Cucurbita Pepo, well-known in English cottage gardens, and largely cultivated in continental Europe and North America. The pumpkin varies much in form, being sometimes nearly globular, but more generally oblong or ovoid in shape; the rind is smooth and very variable in colour. It is a useful plant to the American backwoods farmer, yielding, both in the ripe and unripe condition, a valuable fodder for his cattle and pigs, being frequently planted at intervals among the maize that constitutes his chief crop. The larger kinds acquire a weight of 40 to 80 lb but smaller varieties are in more esteem for garden culture. When ripe, the pumpkin is boiled or baked, or made into various kinds of pie, alone or mixed with other fruit; while small and green it may be eaten like the vegetable marrow. The name squash is applied in America to this and other species of the genus Cucurbita. The name is adapted from an American Indian word (see L. H. Bailey, Cyclopaedia of A merican Horticulture, where is a fuller account of the squashes) . Summer squashes are mostly varieties of C. Pepo; winter squashes are either C. maxima or C. moschata, chiefly the former. The varieties of pumpkins and squashes are numerous and of great variety in size and shape; it is difficult to keep them pure if various kinds are grown together, but the true squashes (C. maxima) do not hybridize with the true pumpkin species. If carefully handled to avoid cracking of the skin, and kept dry and fairly warm, winter squashes may be kept for months.

PUN, a play upon words, particularly the use of a word in two or more different applications or of two or more words similar in sound but with different meanings by which a humorous or ludicrous effect is produced; thus Charles I.'s Court Jester is said to have made the punning grace " great praise be to God and little Laud to the devil " for which the archbishop dismissed him from his service. Another famous pun was that upon The Beggar's Opera, which " made Gay rich and Rich gay." Thomas Hood was the king of pun-makers. " They went and told the sexton, and the sexton toll'd the bell " (" Sally Brown ") is one example among the innumerable puns with which his poems are filled. The derivation of the

word is not known. It first appears in the second half of the 17th century. Skeat

(Etym. Did., 1898) identifies it with an obsolete and dialectal variant of " pound," to beat in the sense of " to pound words, to beat them into new senses, to hammer at forced similes " The New English Dictionary considers it was probably one of the shortened words, like " mob," " cit," &c, which were common in slang after the Restoration. In R. L'Estrange, Counsellor Manners's Last Legacy (1676), " pun " is found with punnet, pundigrion and quibble, " of which fifteen will not make up one single jest." Possibly these may be all referred to " punctilio " (It. puntiglio, dim. of punto, point, Lat. punctum), a small, fine point, a cavil or quibble. No historical connexion, however, has been found between the words.

PUNCH, the abbreviated form of Punchinello (Ital. Policinella, Pulcinella) , the most popular of the puppets or marionettes (q.v.), and the chief figure in the " Punch and Judy " show. It is of Italian origin, though its history is by no means free from obscurity. The earlier etymologists sought to trace the name to various mythical individuals, by whom, it was alleged, the type was first furnished. F. Galiani adopts the theory which derives it from the name of Puccio d'Aniello, a vintager of Acerra near Naples, who 1 , having by his wit and grotesque appearance vanquished some strolling comedians in their own sphere, was induced to join the troop, and whose place, by reason of his popularity, was supplied after his death by a masked actor who imitated his dress and manner. The claims of other individuals — Paolo Cinella, Polliceno, and Pulcinella, a Nea- politan dealer in fowls — have also found supporters, and the derivation of the name and character from some old mystery repre- senting Pontius (O. Eng. Pownce; Fr. Ponce) Pilate and Judas, or the Jews, was formerly popular. It has even been suggested that the title is a modification of iro\i> KU>eo> (I move much) as expressive of the restlessness which is characteristic of the puppet; and the assumption that the character was invariably of diminutive size has given rise to its reference to the word pottice, the thumb (cf. Ddumling, Tom Thumb). The most plausible theory, however, regards the name in its Italian form as a diminutive of pulcino, leva., pulcina, a chicken. It is some- times stated that, in consequence of the habit of using the word "chicken" as a term of endearment, it came to mean " a little child," and hence "a puppet" (W. Skeat). But this again involves the assumption that the application of the name to the character was in some measure determined by the size of the puppets, whereas it would appear to have been transferred from the comic stage to the puppet show and the

Pulcinella of the stage was not necessarily a dwarf. The choice, therefore, seems to lie between the theory of Quadrio, that it was applied on account of the resemblance of the hooked nose to a beak, and that of J. Baretti, which ascribes its employment to the nasal squeak and timorous impotence of the original character. With respect to the development of the modern type, it has been assumed that the whole family of Italian maschere (Arlecchino, Brighella, and the like) are modified survivals of the principal Oscan characters of the Atellanae, and that Punchinello is the representative of Maccus, the fool or clown. In proof of this it is urged that Acerra, the supposed residence of Puccio d'Aniello and the traditional source of the character, is in the neighbour- hood of Aversa, the old Atella; and reference is also made to a bronze statue of Maccus, discovered at Rome in 1727, an engrav- ing of which has been preserved in Ficoroni's Le Maschere sceniche e le figure comiche d'antichi Romani. But the resemblance of the statue to the puppet is scarcely to be termed a striking one, and the large nose and deformed figure are some- what hazardous ground on which to base a theory — especially in view of the fact that such points of likeness as there are. in it to the northern Punch are not to be found in the Neapolitan Pulcinella. It is possible that some relic of the old Ludi Osci, transmitted through the Vice of the mystery plays, is to be found in the character; but any direct descent from the Maccus of the Atellanae seems precluded by the fact that, while there are traces of the gradual development of the northern Punch from the Neapolitan Pulcinella, the latter with its grey hat, white smock and trousers, masked face, and undistorted body is widely

different from its alleged prototype. It seems necessary, therefore, to regard the Pulcinella as in large part a distinct creation of comparatively modern date. Prior to the 17th century there is no indication in the Italian burlesque poets of the existence of Pulcinella, though L. A. Riccoboni places the creation of the part before 1600.

Andrea Perrucci (1699) and Gimma assert with some show of authority that Silvio Fiorillo, a comedian named after his principal part Captain Matamoros (the Italian Miles Gloriosus) , invented the Neapolitan Pulcinella. It was afterwards improved by Andrea Calcese, surnamed Ciuccio, who died of the plague in 1656, and who, according to Gimma, imitated in the character the peasants of Acerra. This would place the origin of the Italian Pulcinella somewhere about the commencement of the 17th century, the original character appearing to have been that of a country clown, hook-nosed, shrill-voiced, cowardly, boastful and often stupid, yet given at times to knavish tricks and shrewd sayings. In thorough accordance with this date, we find that the earliest known appearance of Polichinelie in France is at the beginning of the reign of Louis XIV., in the show of the puppet-playing dentist Jean Brioche. It might have been

expected that the shrewder and wittier side of the character would most commend itself to the French mind, and there is good reason to believe that the Polichinelie of Brioche was neither a blunderer nor a fool. The puppet was almost imme- diately seized upon as the medium of political satire of the kind exemplified in the Letter of Polichinelie to Cardinal Mazarin (1649), an d it is described in the Combat dt Cyrano de Bergerac, as a " petit Esope de bois, remuant, tournant, virant, dansant, riant, parlant, petant " and as " cet .hetdroclite marmouset, disons mieux, ce drolifique bossu." In this there appears signs of transformation, whether the importation to France took place before or after the alleged improvements of Calcese. The hunchback had been long associated in France with wit and laughter, and there are, therefore, some grounds for C. Magnin's theory that the northern Punch is of French origin, a Gallic type under an Italian name, though there does not seem to be sufficient reason for adopting his suggestion that Polichinelie was a burlesque portrait of Bearnais. The date of its intro- duction into England has been disputed, J. Payne Collier being of opinion that Punch and King William came together, a second theory suggesting an earlier origin with the Huguenot refugees. In view of its popularity in France prior to the Restoration, however, it would be strange if its migration had been so long delayed, and it is more than probable that it crossed the channel in the wake of the Royalists. Apart from the general references by S. Pepys (1662) and by J. Evelyn (1667) to an Italian puppet-show at Covent Garden, the former makes mention (1669) of some poor people who called their fat child Punch, " that word being become a word of common use for all that is thick and short." An allusion to " Punchinellos " is also to be found in Butler's satire on English imitation of the French, and Aubrey speaks of " a Punchinello holding a dial " as one of the ornaments of Sir Samuel Lely's house at Whitehall. But, though the puppet did not travel in the train of William of Orange, allusions to it became far more frequent after the Revolution of 1688, and the skill of the Dutch in their treatment of puppet mechanism may have enhanced its attract- iveness. In 1703 it was introduced at Bartholomew Fair into a puppet play of the creation of the world; in 1709 (Taller, No. 16) it was to be found in a representation of the Deluge, though in a different part from that of the Momus Polichinelie of Alexis Piron's Arlequin- Deucalion (1722); and in 1710 {Spectator, No. 14) it is mentioned as a leading figure in Powell's puppet-show at Covent Garden. The alleged satire on Robert Walpole, entitled A Second Tale of a Tub, or the History of Robert Powel, the Puppet-Showman (1715), furnishes some details of Punch performances, and has an interesting frontis- piece representing Powell with Punch and his wife. The Judy (or Joan, as she appears to have been sometimes called) is not of a specially grotesque order, but the Punch is easily recogniz- able in all but the features, which are of the normal puppet type.

Other allusions are to be found in Gay's Shepherd's Week — Saturday (17 14) and Swift's Dialogue between Mad Mullinix and Timothy (1728). The older Punchinello was far less restricted in his actions and circumstances than his modern successor. He fought with allegorical figures representing want and weari- ness as well as with his wife and with the police, was on intimate terms with the patriarchs and the seven champions of Christen- dom, sat on the lap of the queen of Sheba, had kings and dukes for his companions, and cheated the Inquisition as well as the common hangman. Powell seems to have introduced a trained pig which danced a minuet with Punch, and the French (among whom Punch is now usually styled Guignol, originally a puppet hailing from Lyons) having occasionally employed a cat in the place of the dog Toby, whose origin is somewhat uncertain. A typical version of the modern play, with illustrations, was published by Payne Collier and Cruikshank in 1828 (3rd ed., 1844). (R- M. W.)

PUNCH. (1) To pierce, perforate, make a hole or stamp a mark, &c, with a tool known as a " puncheon " or " punch." The verb is derived from the substantive; the original is Lat. punclio, a pricking, from pungere, to prick. This gave Ital. punzone, O. Fr. poinson, mod. poitiQon. Both these French forms mean also a cask, from which the English "puncheon," a liquid measure varying in capacity from 72 to 120 gallons is taken. This is probably the same word as that for the tool, and refers to a mark or sign stamped or " punched " on the cask. The origin may therefore be paralleled by the explanation of " hogshead " as referring to a mark of an " oxhead " branded on the measure. (2) To beat or hit, especially in such collo- quialisms, as " to punch one's head." This is not the same word as (1) but is a shortened form of " punish," from Lat. punire, of which the ultimate origin is poena, penalty, from which is derived " pain." (3) The name of a drink, composed of spirits, water, sliced lemons or limes, or lemon-juice, together with sugar and spice, and served hot. According to the spirit with which it is made, it is known as brandy, whisky, rum punch, &c. Milk- punch is made of milk and spirit, bottled and served cold. The word is the English representative of the Hindostani panch, five (from the number of ingredients), and was introduced from the East.

PUNCTUATION (Lat. punctum, a point), the theory or art of " pointing " a literary composition so as to divide it properly into sentences and portions of sentences, which the " points " are used to mark at their close, with a view to precision in the meaning of a continuous set of written words, by the indication of what would be pauses or changes of expression if they were spoken. The uses of the chief " points " are explained as fol- lows in

the " Rules for Compositors " at the Oxford University Press, compiled by Mr Horace Hart, the university printer: —

The "full stop" or "period" (.) marks the end of a sentence. The "colon" (:) — Greek kwKov, a limb — is at the transition point of the sentence. The " semicolon " (;) separates different statements. The " comma " (,) — Gr. Kowxa, from wktuv, i.e. a piece cut off — separates clauses, phrases and particles. (The terms " period " — Greek ireploSos — " colon," " comma," now identified in punctuation with the signs here given, were borrowed from the Greek grammarians, who originally described either the whole sentence or a longer or shorter part of it respectively in this way.) Among other signs, the " dash " (—) marks abruptness or irregularity. The " exclamation " (!) marks surprise. The " interrogation " or " query " (?) asks a question. The apostrophe ('') marks elisions or the possessive case. " Quotes," quotation-marks or " inverted commas " (" ") define quoted words. Irregularities or interpolations in a sentence are marked by various forms of bracket ( ) or paren- thesis. Literary usage and the practice of printing-houses vary, however, so much that it is impossible to define exactly and shortly the part played by some of these points in a reasonable system of punctuation. The Oxford Rules already mentioned, which deal also with spelling and other pitfalls in literary composition and printing, carry the authority of such experts as Dr J. A. H. Murray and Dr Henry Bradley; and the art of

punctuation may be studied also in such works as H. Beadnell's Spelling and Punctuation, P. Allardyce's Stops: or how to punc- tuate, T. L. de Vinne's Correct Composition, and T. Lefevre's Guide pratique du compositeur. The acceptance of a conven- tional system of modern punctuation is mainly due to the invention of printing, and to the ingenuity and care of individual typographers. In the earlier forms of writing the letters ran on continuously in lines; it was only by degrees that actual words were divided from one another by spacing within the line; then later came the distribution of words into sentences by means of points, and the introduction by Aldus Manutius in the 16th century of a regular system for these. The chief signs were inherited by the printers from the dots of the Greek grammarians, but often with altered meanings; thus the Greek interrogation mark (;) becomes the modern semicolon. (See Palaeography and Typography.)

PUNDIT (Hindi pandit; Skr. pandita), a learned man, a teacher, particularly one skilled in Sanskrit and Hindu law, religion and philosophy. Before the institution of the High Courts in 1862, the Supreme Court of India had a law officer styled the Pundit of the Supreme Court, who advised the English judges on points of Hindu law. The term is frequently applied, somewhat derisively, or humorously, to learned persons, to those

who claim by long official or other experience to lay down the law or dictate principles of conduct.

PUNIC WARS, a name specially appropriated to the wars between Rome and Carthage in the 3rd and 2nd centuries B.C. The origin of these conflicts is to be sought in the position which Rome acquired about 275 B.C. as suzerain and protector of all Italy. Her new obligation to safeguard the peninsula against foreign interference made it necessary that she should not allow the neighbouring island of Sicily to fall into the hands of a strong and expansive power. Carthage, on the other hand, had long been anxious to conquer Sicily and so to complete the chain of island posts by which she ' controlled the western Mediterranean.

First Punic War (264-241 B.C. 1). — The proximate cause of the first outbreak was a crisis in the city of Messana, commanding the straits between Italy and Sicily. A band of Campanian mercenaries, which had forcibly esablished itself within the town and was being hard pressed in 264 by Hiero II. of Syracuse, applied for help both to Rome and Carthage and thus brought a force from either power upon the scene. The Carthaginians, arriving first, occupied Messana and effected a reconciliation with Hiero. The Roman commander nevertheless persisted in throwing troops into the city, and by seizing the person of the Carthaginian admiral during a parley induced him to withdraw his garrison. The Romans thus won an important strategic post, but their aggression was met by a declaration of war from Carthage and Syracuse.

Operations began with a joint attack upon Messana, which the Romans easily repelled. In 263 they advanced with a considerable force into Hiero's territory and induced him to seek peace and alliance with them. Having thus secured their foothold on the island they set themselves to wrest it completely from Carthage. In 262 they besieged and captured the enemy's base at Agrigentum, and proved that Punic mercenary troops could not stand before the infantry of the legions. But they made little impression upon the Carthaginian fortresses in the west of the island and upon the towns of the interior which mostly sided against them. Thus in the following campaigns their army was practically brought to a standstill.

In 260 the war entered upon a new phase. Convinced that they could gain no serious advantage so long as the Carthaginians controlled the sea and communicated freely with their island possessions, the Romans built their first large fleet of standard battleships. At Mylae, off the north Sicilian coast, their admiral C. Duilius defeated a Carthaginian squadron of superior manoeuvring capacity by a novel application of grappling and

l The chronology here given is the traditional one, but recent researches

tend to show that many events hav been antedated by one year.*

boarding tactics. This victory left Rome free to land a force on Corsica and expel the Carthaginians (259), but did not suffice to loosen their grasp on Sicily.

After two more years of desultory warfare the Romans de- cided to carry the war into the enemy's home territory. A large armament sailed out in 256, repelled a vigorous attack by the entire Carthaginian fleet off Cape Ecnomus (near Agrigen- tum) and established a fortified camp on African soil at Clypea. The Carthaginians, whose citizen levy was utterly disorganized, could neither keep the field against the invaders nor prevent their subjects from revolting. A single campaign compelled them to sue for peace, but the terms which the Roman com- mander Atilius Regulus offered were intolerably harsh. Accord- ingly they equipped a new army in which, by the advice of a Greek captain of mercenaries named Xanthippus, cavalry and elephants formed the strongest arm. In 255, under Xanthippus's command, they offered battle to Regulus, who had taken up position with an inadequate force near Tunes, outmanoeuvred him and destroyed the bulk of his army. A second Roman armament, which subsequently reached Africa after defeating the full Carthaginian fleet off Cape Hermaeum, did not venture to reopen the campaign, but withdrew all the remaining troops. The Romans now directed their efforts once more against Sicily. In 254 they carried the important fortress of Panormus (Palermo) by an attack from the sea; but when Carthage threw reinforcements into the island the war again came to a standstill. In 251 at last the Roman general L. Metellus brought about a pitched battle near Panormus in which the enemy's force was effectively crippled. This victory was followed by an investment of the chief Punic base at Lilybaeum by land and sea. The besiegers met with a gallant resistance, and in 249 were com- pelled to withdraw by the loss of their fleet in a surprise attack upon the neighbouring harbour of Drepanum (Trapani), in which the admiral Claudius Pulcher was repulsed with a loss of 93 ships. Meanwhile other losses in storms on the high seas so reduced the Roman fleet that the attack upon Sicily had to be suspended. At the same time the Carthaginians, who felt no less severely the financial strain of the prolonged struggle and had a war in Africa on their hands, reduced their armaments and made no attempt to deliver a counter-attack. The only noteworthy feature of the ensuing campaigns is the skilful guerilla war waged by a new Carthaginian commander, Hamilcar Barca, from his strong positions' on Mt Ercte (247-244) and Mt Eryx (244-242) in Western Sicily, by which he effectually screened Lilybaeum from the Roman land army.

In 242 Rome resumed operations on sea. By a magnificent effort on the part of private citizens a fleet of 200 warships was equipped and sent out to renew the blockade of Lilybaeum. The Carthaginians hastily collected a relief force, but in a battle fought off the Aegates or Aegusae islands (west of Drepana) their fleet was caught at a disadvantage and mostly sunk or captured (March 10, 241). This victory, by giving the Romans undisputed command of the sea, rendered certain the ulti- mate fall of the Punic

strongholds in Sicily. The Carthaginians accordingly opened negotiations and consented to a peace by which they ceded Sicily and the Lipari Islands to Rome and paid an indemnity of 3200 talents (about £800,000).

The Interval between the First and Second Wars (241-218 B.C.). — The loss of naval supremacy not only deprived Carthage of her predominance in the western Mediterranean, but exposed her oversea empire to disintegration under renewed attacks by Rome. The temper of the Roman people was soon made manifest during a conflict which broke out between the Cartha- ginians and their discontented mercenaries. Italian traders were allowed to traffic in munitions of war with the mutineers, and a gross breach of the treaty was perpetrated when a Roman force was sent to occupy Sardinia, whose insurgent garrison had offered to surrender the island (239). To the remonstrances of Carthage the Romans replied with a direct declaration of war, and only withheld their attack upon the formal cession of Sardinia and Corsica and the payment of a further indemnity.

From this episode it became clear that Rome intended to

use her victory to the utmost. To avoid complete humiliation Carthage had no resource but to humiliate her adversary. The recent complications of foreign and internal strife had indeed so weakened the Punic power that the prospect of renewing the war under favourable circumstances seemed remote enough. But the scheme of preparing for a fresh conflict found a worthy champion in Hamilcar Barca, who sought to compensate for the loss of Sicily by acquiring a dominion in Spain where Carthage might gain new wealth and form a fresh base of operations against Rome. Invested with an unrestricted foreign command, he spent the rest of his life in founding a Spanish empire (236-228). His work was continued by his son-in-law Hasdrubal and his son Hannibal, who was placed at the head of the army in 220. These conquests aroused the suspicions of Rome, which in a treaty with Hasdrubal confined the Carthaginians to the south of the Ebro, and also guaranteed the independence of Saguntum, a town on the east coast which pretended to a Greek origin. In 219 Hannibal laid siege to Saguntum and carried the town in spite of a stubborn defence. It has always been a debateable point whether his attack contravened the new treaty. The Romans certainly took this view and sent to Carthage to demand Hannibal's surrender. But his defiant policy was too popular to be disavowed; the Carthaginian council upheld Hannibal's action, and drew upon itself an immediate declaration of war.

Second Punic War (218-201 B.C.) : a. The "Hannibalic " War.— It seemed as though the superiority of the Romans at sea must enable them to choose the field of battle. They decided to embark one army for Spain and another for Sicily and Africa. But before their preparations were complete

Hannibal began that series of operations by which he dictated the course of the war for the greater part of its duration. Realizing that so long as Rome commanded the resources of an undivided Italian confederacy no foreign attack could beat her down beyond recovery, he conceived the plan of cutting off her supply of strength at the source by carrying the war into Italy and causing a disruption of the League. His chances of ever reaching Italy seemed small, for the sea was guarded by the Roman fleets and the land route was long and arduous. But the very boldness of his enterprise contributed to its success; after a six months' march through Spain and Gaul and over the Alps, which the Romans were nowhere in time to oppose, Hannibal arrived in the plain of the Po with 20,000 foot and 6000 horse, the pick of his African and Spanish levies (autumn 218: for details see Hannibal).

His further advance was here disputed by some Roman troops which had been recalled from the Spanish expedition. But the superiority of the Carthaginian cavalry and the spread of insurrection among the Gaulish inhabitants forced the defenders to fall back upon the Apennines. At the end of the year the Roman army was reinforced by the division from Sicily and led out to battle on the banks of the Trebia. Hannibal, by superior tactics, repelled the assailants with heavy loss, and thus made his position in north Italy secure.

In 217 the campaign opened in Etruria, into which the invading army, largely reinforced by Gauls, penetrated by an unguarded pass. A rash pursuit by the Roman field force led to its being entrapped on the shore of Lake Trasimene and destroyed with a loss of 40,000 men. This catastrophe left Rome completely uncovered; but Hannibal, having resolved not to attafck the capital before he could collect a more overwhelming force, directed his march towards the south of Italy, where he hoped to stir up the peoples who had formerly been Rome's most stubborn enemies. The natives, however, were everywhere slow to join the Carthaginians, and a new Roman army under the dictator Q. Fabius Maximus (" Cunctator "), which, without ever daring to close with Hannibal, persistently dogged his steps on his forays through Apulia and Campania, prevented his acquiring a permanent base of operations.

The eventful campaign of 216 was begun by a new aggressive move on the part of Rome. An exceptionally strong field army, estimated at 85,000 men, was sent forth in order to crush the Carthaginians in open battle. On a level plain near Cannae in

Apulia, which Hannibal had chosen for his battle-ground, the Roman legions delivered their attack. Hannibal deliberately allowed his centre to be driven in by their superior numbers, while Hasdrubal's cavalry wheeled round so as to take the enemy in flank and rear. The Romans, surrounded on all sides and so cramped that their superior numbers aggravated their plight, were practically annihilated, and the loss of citizens was perhaps greater than in any other defeat that befel the Republic. The moral effect of the battle was no less momentous. The south Italian nations at last found courage to secede from Rome, the leaders of the movement being the people of Capua, the second greatest town of Italy. Reinforcements were sent from Carthage, and several neutral powers prepared to throw their weight into the scale on Hannibal's behalf. At first sight it seems strange that the battle of Cannae did not decide the war. But the resources of Rome, though terribly reduced in respect both of men and of money, were not yet exhausted. In north and central Italy the insurrection spread but little, and could be sufficiently guarded against with small detachments. In the south the Greek towns of the coast remained loyal, and the numerous Latin colonies continued to render important service by interrupting free communication between the rebels and detaining part of their forces. In Rome itself the quarrels between the nobles and commons, which had previously unsettled her policy, gave way to a unanimity unparalleled in the annals of the Republic. The guidance of operations was henceforth left to the senate, which by maintaining a firm and persistent policy until the conflict was brought to a successful end earned its greatest title to fame.

The subsequent campaigns of the Italian War assume a new character. Though the Romans contrived at times to raise 200,000 men, they could only spare a moderate force for field operations. Their generals, among whom the veterans Fabius and M. Claudius Marcellus frequently held the most important commands, rarely ventured to engage Hannibal in the open, and contented themselves with observing him or skirmishing against his detachments. Hannibal, whose recent accessions of strength were largely discounted by the necessity of assigning troops to protect his new allies or secure their wavering loyalty, was still too weak to undertake a vigorous offensive. In the ensuing years the war resolved itself into a multiplicity of minor engagements which need not be followed out in detail. In 216 and 215 the chief seat of war was Campania, where Hannibal vainly attempted to establish himself on the coast and experienced a severe repulse at Nola. In 214 the main Cartha- ginian force was transferred to Apulia in hopes of capturing Tarentum. Though Croton and Locri on the Calabrian coast had fallen into his hands, Hannibal still lacked a suitable harbour by which he might have secured his oversea communications. For two years he watched in vain for an opportunity of surprising the town, while the Romans narrowed down the sphere of re- volt in Campania and

defeated other Carthaginian commanders. In 212 the greater part of Tarentum and other cities of the southern seaboard at last came into Hannibal's power. But in the same year the Romans found themselves strong enough to place Capua under blockade. They severely defeated a Carthaginian relief force, and could not be permanently dislodged even by Hannibal himself. In 211 Hannibal made a last effort to relieve his allies by a feint upon Rome itself, but the besiegers re- fused to be drawn away from their entrenchments, and even- tually Capua was starved into surrender. Its fall was a sign that no power could in the long run uphold a rival Italian coalition against Rome. After a year of desultory fighting the Romans in 209 gained a further important success by recovering Tarentum. Though Hannibal from time to time still won isolated engagements, yet slowly but surely he was being driven back into the extreme south of the peninsula.

In 207 the arrival of a fresh invading force produced a new crisis. Hasdrubal, who in 209-208 had marched overland from Spain, appeared in north Italy with a force scarcely inferior to the army which his brother had brought in 218. After levying contingents of Gauls and Ligurians he marched down the east

coast with the object of joining hands with his brother in central Italy for a direct attack upon Rome. By this time the drain of men and money was telling so severely upon her confederacy that some of her most loyal allies protested their inability to render further help. Yet by a supreme effort the Romans raised their war establishment to the highest total yet attained and sent a strong field army against either Carthaginian leader. The danger to Rome was chiefly averted by the prompt insight and enterprise of the consul C. Nero, who commanded the main army in the south. Having discovered that Hannibal would not advance beyond Apulia until his brother had established communications with him, Nero slipped away with part of his troops and arrived in time to reinforce his colleague Livius, whose force had recently got into touch with Hasdrubal near Sena Gallica (Sinigaglia). The combined Roman army frus- trated an attempt of Hasdrubal to elude it and forced him to fight on the banks of the Metaurus. The battle was evenly contested until Nero by a dexterous flanking movement cut the enemy's retreat. Hasdrubal himself fell and the bulk of his army was destroyed.

The campaign of 207 decided the war in Italy. Though Hannibal still maintained himself for some years in Calabria, this was chiefly due to the exhaustion of Rome after the pro- digious strain of past years and the consequent reduction of her armaments. In 203 Italy was finally cleared of Carthaginian troops. Hannibal, in accordance with orders from home, sailed back to Africa, and another expedition under his brother Mago,

*which had sailed to Liguria in 205 and endeavoured to rouse the slumbering discontent in Cisalpine Gaul and Etruria, was driven back on the coast and withdrawn about the same time. b. The Subsidiary Campaigns. — Concurrently with the great struggle in Italy the Second Punic War was fought out on several other fields. It will suffice merely to allude to the First Mace- donian War (214-205) which King Philip V. commenced when the Roman power seemed to be breaking up after Cannae. The diversions which *Roman diplomacy provided for Philip in Greece and the maintenance of a patrol squadron in the Adriatic prevented any effective co-operation on his part with Hannibal.*

In view of the complete stagnation of agriculture in Italy the Romans had to look to Sardinia and Sicily for their food supply. Sardinia was attacked by a Carthaginian armament in 215, but a small Roman force sufficed aaa siclly. to repel the invasion. In Sicily a more serious conflict broke out. Some isolated attacks by Punic squadrons were easily frustrated by the strong Roman fleet. But in 215 internal complications arose. The death of Hiero II., Rome's steadfast friend, left the kingdom of Syracuse to his inexpe- rienced grandson Hieronymus. Flattered by the promises of Carthaginian emissaries the young prince abruptly broke with the Romans, but before hostilities commenced he was assas- sinated. The Syracusan people now repudiated the monarchy and resumed their republican constitution, but they were misled by false threats of terrible punishment at the hands of Rome to play into the hands of the Carthaginians. The attacks of a Roman army and fleet under Marcellus which speedily ap- peared before the town were completely baffled by the mechanical contrivances of the Syracusan mathematician Archimedes (213). Meantime the revolt against Rome spread in the interior, and a Carthaginian fleet established itself in the towns of the south coast. In 212 Marcellus at last broke through the defence of Syracuse and in spite of the arrival of a Carthaginian relief force mastered the town by slow degrees. A guerilla warfare succeeded in which the Carthaginians maintained the upper hand until in 210 they lost their base at Agrigentum. Thereupon they were rapidly dislodged from their remaining positions, and by the end of the year Sicily was wholly under the power of Rome. The conflict in Spain was second in importance to the Italian War alone. From this country the Carthaginians drew large supplies of troops and money which might serve to c„./-

reinforce Hannibal; hence it was in the interest of the Romans to challenge their enemy within his Spanish domain.

Though the force which Rome at first spared for this war was small in numbers and rested entirely upon its own resources, the generals Publius and Gnaeus Scipio by skilful strategy and diplomacy not only won over the peoples north of the Ebro and defeated the Carthaginian leader Hasdrubal Barca in his attempts to restore communication with Italy, but carried their arms along the east coast into the heart of the enemy's domain. But eventually their successes were nullified by a rash advance. Deserted by their native contingents and cut off by Carthaginian cavalry, among which the Numidian prince Massinissa rendered conspicuous service, the Roman generals were slain and their troops were destroyed in detail (212 or 211).

Disturbances in Africa prevented the Punic commanders from reaping the full fruit of their success. Before long the fall of Capua enabled Rome to transfer troops from Italy to Spain, and in 209 the best Roman general of the day, the young son and namesake of the recently slain P. Scipio, was placed in command. The new leader signalized his arrival by a bold and successful coup-de-main upon the great arsenal of Carthago Nova. Though he failed to prevent Hasdrubal Barca from march- ing away to Italy, Scipio profited by his departure to push back the remaining hostile forces the more rapidly. A last effort by the Carthaginians to retrieve their losses with a fresh army was frustrated by a great victory at Ilipa (near Corduba), and by the end of 206 they were completely driven out of the peninsula.

In 205 Scipio, who had returned to Rome to hold the consul- ship, proposed to follow up his victories by an attack upon the home territory of Carthage. Though the presence in Africa. °^ Hannibal in Italy at first deterred the senate from sanctioning this policy, the general popularity of the scheme overbore all resistance. Scipio was granted a force which he organized and supplemented in Sicily, and in 204 sailed across to Africa. He was here met by a combined levy of Carthage and King Syphax of Numidia, and for a time penned to the shore near Utica. But inthe winter he extricated himself by a surprise attack upon the enemy's camp, which resulted in the total loss of the allied force by sword or flame. In the campaign of 203 a new Carthaginian force was destroyed by Scipio on the Great Plains not far from Utica, their ally Syphax was captured, and the renegade Massinissa (q.v.) rein- stated in the kingdom from which Syphax had recently expelled him. These disasters induced the Carthaginians to sue for peace, but before the very moderate terms which Scipio offered could be definitely accepted a sudden reversal of opinion caused them to recall Hannibal's army for a final trial of war, and to break off negotiations. In 202 Hannibal assumed command of a composite force of citizen and mercenary levies stiffened with a corps of his veteran Italian troops. After an abortive con- ference with Scipio he prepared for a decisive battle at Zama (an inland site not yet identified with certainty). Scipio's force was smaller in numbers, but well trained throughout and greatly superior in

cavalry. His infantry, after evading an. attack by the Carthaginian elephants, cut through the first two lines of the enemy, but was unable to break the reserve corps of veterans. The battle was ultimately decided by the cavalry of the Romans and their new ally Massinissa, which by a manoeuvre recalling the tactics of Cannae took Hannibal's line in the rear and com- pletely destroyed it. The Carthaginians having thus lost their last army again applied for peace and accepted the terms which Scipio offered. They were compelled to cede Spain and the Mediterranean islands still in their hands, to surrender their war- ships, to pay an indemnity of 10,000 talents (about £2,400,000) within fifty years and to forfeit their independence in affairs of war and foreign policy.

The Second Punic War, by far the greatest struggle in which either power engaged, had thus ended in the complete triumph of Rome. This triumph is not to be explained in the main by any faultiness in the Carthaginians' method of attack. The history of the First Punic War, and that of the Second outside of Italy, prove that the Romans were irresistible on neutral or Carthaginian ground. Carthage could only hope to win by

invading Italy and using the enemy's home resources against him. The failure of Hannibal's brilliant endeavour to realize these conditions was not due to any strategical mistakes on his part. It was caused by the indomitable strength of will of the Romans, whose character during this period appears at its best, and to the compactness of their Italian confederacy, which no shock of defeat or strain of war could entirely disintegrate. It is this spectacle of individual genius overborne by corporate and persevering effort which lends to the Second Punic War its peculiar interest.

The Third Punic War (149-146 B.C.) — The political power of Carthage henceforth remained quite insignificant, but its commerce and material resources revived in the 2nd century with such rapidity as to excite the . jealousy of the growing mercantile population of Rome and the alarm of its more timid statesmen. Under the influence of these feelings the conviction — sedulously fostered by Cato the Elder, the Censor — that " Carthage must be destroyed " overbore the scruples of more clear-sighted statesmen. A casus belli was readily found in a formal breach of the treaty, committed by the Carthaginians in 154, when they resisted Massinissa's aggressions by force of arms. A Roman army was despatched to Africa, and although the Carthaginians consented to make reparation by giving hostages and surrendering their arms, they were goaded into revolt by the further stipulation that they must emigrate to some inland site where they would be debarred from commerce. By a desperate effort they created a new war equipment and prepared their city for a siege (149). The Roman attack for two years completely miscarried, until in 147 the command was given to a

young officer who had distinguished himself in the early operations of the war — Scipio Aemilianus, the adoptive grandson of the former conqueror of Carthage. Scipio made the blockade stringent by walling off the isthmus on which the town lay and by cutting off its sources of supplies from oversea. His main attack was delivered on the harbour side, where he effected an entrance in the face of a determined and ingenious resistance. The struggle did not cease until he had carried house by house the streets that led up to the citadel. Of a population probably exceeding half a million only 50,000 remained at the final surrender. The survivors were sold into slavery ; the city was razed to the ground and its site con- demned by solemn imprecations to He desolate for ever. The territory of Carthage, which had recently been much narrowed by Massinissa's encroachments, was converted into a Roman province under the name of " Africa."

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PUNISHMENT (from Lat. punire, to punish, from poena, punishment, Gr. iroivfi), the infliction of some kind of pain 'or loss upon a person for a misdeed, i.e. the transgression of a law or command. Punishment may take forms varying from capital punishment, flogging and mutilation of the body to imprison- ment, fines, and even deferred sentences which come into opera- tion only if an offence is repeated within a specified time. The progress of civilization has resulted in a vast change alike in the theory and in the method of punishment. In primitive society punishment was left to the individuals wronged or their families, and was vindictive or retributive: in quantity and quality it would bear no special relation to the character or gravity of the offence. Gradually there would arise the idea of proportionate punishment, of which the characteristic type is the lex talionis, 1 " an eye for an eye." The second stage was punishment by

individuals under the control of the state, or community; in the third stage, with the growth of law, the state took over the primitive function and provided itself with the machinery of " justice " for the maintenance of public order. Henceforward crimes are against the state, and the exaction of punishment by the wronged individual is illegal (cf . Lynch Law) . Even at this stage the vindictive or retributive character of punishment remains, but gradually, and specially after the humanist movement under thinkers like Beccaria and Jeremy Bentham, new theories begin to emerge. Two chief trains of thought have combined in the condemnation of primitive theory and practice. On the one hand the retribu- tive principle itself has been very largely superseded by the protective and the reformative; on the other punishments involving bodily pain have become objectionable to the general sense of society. Consequently corporal and even capital punishment occupy a far less prominent position, and tend everywhere to disappear. It began to be recognized also that stereotyped punishments, such as belong to penal codes, fail to take due account of the particular condition of an offence and the character and circumstances of the offender. A fixed fine, for example, operates very unequally on rich and poor.

Modern theories date from the 18th century, when the humani- tarian movement began to teach the dignity of the individual and to emphasize his rationality and responsibility. The result was the reduction of punishment both in quantity and in severity, the improvement of the prison system, and the first attempts to study the psychology of crime and to distinguish between classes of criminals with a view to their improvement (see Crime; Prison; Children's Courts; Juvenile Offenders). These latter problems are the province of criminal anthropology and criminal sociology, sciences so called because they view crime as the outcome of anthropological and social conditions. The man who breaks the law is himself a product of social evolution and cannot be regarded as solely responsible for his disposition to transgress. Habitual crime is thus to be treated as a disease. Punishment can, therefore, be justified only in so far as it (1) protects society by removing temporarily or

1 Talio, in juridical Latin, the abstract noun from talis, such, 2 This idea combined with the retributive is found as early as alike, hence "retaliation." See Exod. xxi. 24; Lev. xxiv. 20; Deut. xix. 20, "And those which remain shall hear and fear, and Deut. xix. 21. 1 shall henceforth commit no more any such evil."

permanently one who has injured it, or acting as a deterrent, 2 or (2) aims at the moral regeneration of the criminal. Thus the retributive theory of punishment with its criterion of justice as an end in itself gives place to a theory which regards punishment solely as a means to an end, utilitarian or

moral, according as the common advantage or the good of the criminal is sought.

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PUNJAB, a province of British India, so named from the " five rivers " by which it is watered: the Jhelum, Chenab, Ravi, Beas and Sutlej, all tributaries of the Indus. Geographic- ally the Punjab is the triangular tract of country of 'which the Indus and the Sutlej to their confluence form the two sides, the base being the lower Himalaya hills between those two rivers; but the British province now includes a large tract outside those boundaries. Along the northern border Himalayan ranges divide it from Kashmir and Tibet. On the west it is separated from the North- West Frontier province by the Indus, until that river reaches the border of Dera Ghazi Khan district, which is divided from Baluchistan by the Suliman range. To the south lie Sind and Rajputana, while on the east the rivers Jumna and Tons separate it from the United Provinces.

The Punjab includes two classes of territory, that belonging

to the British Crown, and that in possession of 34 feudatory

chiefs, almost all of whom pay tribute. The total area

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of the province is 133,741 sq. m., of which 97,209 sq. m. DMsloas%

are British territory and the remainder belongs to native states. The British territory is divided into 29 districts, grouped under the five divisions of Delhi, Lahore, Jullundur, Rawalpindi and Multan; while the native states vary in size from Bahawalpur, with an area of 15,000 sq. m., to the tiny state of Darkoti, with an area of 8 sq. m. and a total popula- tion of 518 souls. They maybe grouped under three main heads: the Phulkian states of Patiala, Jind and Nabha and the Sikh state of Kapurthala, occupying the centre of the eastern plains; the Mahommedan state of Bahawalpur between the Sutlej and the Rajputana desert; and the hill states, among the Punjab Himalayas held by ancient Rajput families, including Chamba, Mandi, Suket, Sirmur and the Simla states.

Physical Features. — The mountain regions of the Punjab fall under four separate groups. To the north-east of the pro- vince lies the Himalayan

system, with the fringing range of the Siwaliks at its foot. In the south-eastern corner the Aravalli system sends out insignificant outliers, which run across Gurgaon. and Delhi districts and strike the Jumna at Delhi. The lower portion of the western frontier is constituted by the great Suliman chain ; while the north-western districts of the province are traversed by the hill system known as the Salt range. The mountain system of the Himalayas, so far as it concerns the Punjab, consists primarily of three great ranges running in a generally north-westerly direction from the head-waters of the Sutlej to the Indus: the western Himalayas or Zanskar or Bara Lacha range, the mid-Himalayas or Pir Panjal range, and the outer or sub-Himalayas. From these three great ranges spring numerous minor ranges, as ribs from a backbone, the whole forming a confused system of mountain chains and valleys, the breadth of which is some 90 m. at its eastern extremity from Lahul to the Siwaliks of Hoshiarpur, and some 150 m. measured at its western extremity across Kashmir.

The " five rivers " of the Punjab are each of large volume; but, on account of the great width of sandy channel in their passage through the plains, their changing courses, and shifting shoals, they are of no value for steam aj vers , navigation, though they all support a considerable boat-traffic. Of recent years most of them have been utilized for purposes of irrigation, and have turned the sandy desert of

the Punjab into one of the great wheat fields of the British Empire.

While the general name Punjab is applied to the whole country of the " five rivers," there are distinct names for each of the doabs (do, two; ab, water) or tracts between two adjoining rivers. The country between the Sutlej and the Beas is called the Jullundur Doab; it includes the districts of Jullundur and Hoshiarpur. The long strip between the Beas and the Ravi, containing the greater part of Gurdaspur, Amritsar, Lahore, Montgomery, and Multan districts, is called the Bari Doab. Rechna Doab is the tract between the Ravi and the Chenab, embracing Sialkot and Gujranwala districts, with the trans-Ravi portions of the districts of the Bari Doab. Chaj or Jech is the doab between the Chenab and the Jhelum (Gujrat and Shahpur districts and part of Jhang), and Sind Sagar is the name of the large doab between the Jhelum and the Indus, including Rawalpindi, Jhelum and Muzaffargarh dis- tricts, with parts of Shahpur, Bannu and Dera Ismail Khan. The higher and dryer parts of the doabs are called bar. They are waste, but not barren, scantily covered with low shrubs, and capable, when watered, of being well cultivated. The bar is the great camel-grazing land. Large areas

of Muzaffargarh and Multan districts are thai, barren tracts of shifting sand. The middle part of the Bari Doab, in Amritsar district, bears the distinctive name of Manjha (middle) as the centre and headquarters of the Sikh nation, containing their two sacred tanks of Amritsar and Taran Taran. The Malwa Sikhs, again, are those of the cis-Sutlej country.

South of the Himalayas stretch the great plains, which constitute by far the larger proportion of the province. With

the exception of the Himalayan and Salt range Plains tracts the Punjab presents, from the Jumna on the

east to the Sulimans in the west, one vast level, unbroken save by the wide eroded channels within which the great rivers ever shift their beds, by the insignificant spurs of the Aravalli range in the south-eastern corner, and the low hills of Chiniot and Kirana in Jhang. The whole of these vast plains is of alluvial formation. Stones are unknown save at the immediate foot of the hills; micaceous river sand is to be found everywhere at varying depths; and the only mineral is nodular accretions of limestone, called kankar, which is used for the construction of roads. The soil is a singularly uniform loam, the quality being determined by the greater or smaller proportion of sand present. In the local hollows and drainage lines the constant deposit of argillaceous particles has produced a stiff tenacious soil, especially adapted to rice cultivation, while in the beds of the great rivers, and on the wind-fretted water-sheds pure sand is commonly found. Where neither sand nor the saline efflorescence called reh is present, the soil is uniformly fertile, if only the rainfall be sufficient or means of irrigation be available. Throughout the greater part of the western plains, however, the insufficiency of rainfall is a permanent condition; and until recently the uniform aspect of the country was that of wide steppes of intrinsically fertile soil, useful, however, only as grazing grounds for herds of camels or cattle.

The Punjab may be divided into four great natural divisions: the Himalayan tract, the submontane tract, the eastern and western plains and the Salt range tract, which have characteristics widely different from each other. The Himalayan tract, which includes the Punjab hill states, consists of 20,000 sq. m. of sparsely inhabited mountain, with tiny hamlets perched on the hill-sides or nestling in the valleys. The people consist chiefly of Rajputs, Kanets, Ghiraths, Brahmans and Dagis or menials. The eastern and western plains, which are divided from each other by a line passing through Lahore, are dissimilar in character. The eastern are arable plains of moderate rainfall and almost without rivers, except along their northern and eastern edges. They are inhabited by the Hindu races of India, and contain the great cities of Delhi, Amritsar and Lahore. They formed, until

the recent spread of irrigation, the most fertile, wealthy and populous portion of the province. The western plains, except where canal irrigation has been introduced, consist of arid pastures with scanty rainfall, traversed by the five great rivers, of which the broad valleys alone are cultivable. They are inhabited largely

Natural Divisions.

by Mahommedan tribes, and it is in this tract that irrigation has worked such great changes. The Chenab and Jhelum Canal colonies are already pronounced successes, and it is hoped that in process of time the Lower Bari Doab and the Sind-Sagar Doab will be similarly fertilized. The submontane tract, skirting the foot of the hills, has an area of 10,000 sq. m., consisting of some of the most fertile and thickly populated portions of the province. Its popula- tion comes midway between the peoples of the hills and of the plains in race, religion and language, Mahommedanism being less prevalent, Hindi more generally spoken, and Rajputs and hill menials more common than in the plains. The Gujars form a special feature of this zone. Its only large town is Sialkot. The Salt range tract includes the districts of Rawalpindi and Jhelum and a small portion of Shahpur district, and consists of some 9000 sq. m. of broken and confused country.

Geology. — By far the greater part of the Punjab is covered by alluvial and wind-blown deposits of the plain of the Indus. The Salt range hills form a plateau with a steeply scarped face to the south, along which there is an axis of abrupt folding, accompanied by faulting. The rocks found in the Salt range belong to the Cambrian, Carboniferous, Permian, Triassic and Jurassic systems, while Tertiary beds cover the plateau behind. The extensive and valuable deposits of salt, from which the range takes its name, occur near the base of the Cambrian beds. Gypsum, kieserite and other salts are also found. Between the Cambrian and the Carboni- ferous beds there is an unconformity, which, however, is not very strongly marked, in spite of the lapse of time which it indicates. At the bottom of the Carboniferous series there is usually a boulder bed, the boulders in which have been brought from a distance and are scratched and striated as if by ice. It is generally admitted that this deposit, together with contemporaneous boulder beds in the peninsula of India, in Australia and in South Africa, indicate a southern glacial period in late Carboniferous times. Above the sandstone series at the base of which the boulder bed lies, come the Productus and Ceratite limestones. The former is believed to belong to the Upper Carboniferous and Permian, the latter to the Trias. Jurassic beds are found only in the western portion of the range.

Climate. — Owing to its sub-tropical position, scanty rainfall and cloudless skies, and the wide expanse of untilled plains, the climate of the Punjab

presents greater extremes of both heat and cold than any other part of India. From the middle of April to the middle of September it is extremely hot, while from the begin- ning of October to the end of March there is a magnificent cool season, resembling that of the Riviera, with warm bright days and cool nights. Frosts are frequent in January. In the first three months of the hot season, from April till the end of June, a dry heat is experienced, with a temperature rising to 120° F. in the shade. At the end of June the monsoon arrives, the rains break, and though the heat is less intense the air is moist, and from the middle of August the temperature gradually falls. This is the most unhealthy period of the year, being exceedingly malarious. The Punjab enjoys two 'well-marked seasons of rain- fall; the monsoon period, lasting from the middle of June till the end of September, on which the autumn crops and spring sowings depend ; and the winter rains, which fall early in January, and though often insignificant in amount materially affect the prosperity of the spring harvest. Excepting in the Himalayas the rainfall is greatest in the east of the province, as the Bombay monsoon is exhausted in its passage over the great plains of Sind and Raj- putana, while the west winds from Baluchistan pass over an arid tract and leave such moisture as they may have collected on the western slopes of the Suliman range; so that the Punjab depends for its rain very largely on the south-east winds from the Bay of Bengal. The submontane tract has an annual average of 36 to 32 in., the eastern plains vary from 20 to 14 in., and the western plains from 10 to 5 in.

Minerals. — Besides rock-salt, the mineral products of the Punjab are not many. Limestone, good for building, is obtained at Chiniot on the Chenab and at a few other places. There are ex- tensive alum-beds at Kalabagh on the Indus. A small quantity of coal is found in the Salt range in disconnected beds, the Dandot colliery in the Jhelum district being worked by the North- Western railway. Petroleum is found in small quantities at a number of places in Rawalpindi, being gathered from the surface of pools or collected in shallow pits. In almost all parts of the Punjab there is kankar, rough nodular limestone, commonly found in thick beds, a few feet below the surface of the ground, used for road metal and burned for lime.

Agriculture. — As in other parts of India, there are commonly two harvests in the year. The spring crops are wheat, barley, gram, various vegetables, oil-seeds, tobacco and a little poppy; the autumn crops are rice, millets, maize, pulses, cotton, indigo and sugar-cane. Wheat has become the most important export of the province. In the spring of 1906 an aiea of _8J million acres was harvested, producing 3J million tons. Tea ia cultivated in Kangra district. Flax has been produced successfully, but the cultivation has not been extended. Hops have been grown ex- perimentally, for the Murree brewery, on neighbouring hills; the

cultivation in Kashmir has been more encouraging. Potatoes are grown extensively on cleared areas on the hills. The Punjab produces freely many of the Indian fruits. Grapes are grown in many of the Himalayan valleys where the rain is not excessive; but they are inferior to those brought from Kabul.

Forests. — The forest area of the Punjab consists of 9278 sq. m., of which 1916 sq. m. are reserved and 4909 sq. m. protected. The wasteful destruction of trees is checked in the hill forests rented from native states by the British government. The principal reserved forests are the deodar (Cedrus Deodara) and chil (Pinus longifolia) tracts in the hills, the plantations of shisham (Dalbergia Sissu) and sal (Shorea robusta) in the plains, and the fuel rakhs or preserves (Acacia, Prosopis, &c).

Manufactures. — Most of the native manufactures of the Punjab are those common to other parts of India, such as the ordinary cotton fabrics, plain woollen blankets, unglazed pottery, ropes and cord, grass matting, paper, leather-work, brass vessels, simple agricultural implements and the tools used in trades. Other manu- factures, not so general, yet not peculiar to the Punjab, are woollen fabrics, carpets and shawls, silk cloths and embroidery, jewelry and ornamental metal-work, wood and ivory carving, turned and lacquered woodwork, glazed pottery, arms and armour and musical instruments. But some of these classes of manufacture are repre- sented by work of special kinds or special excellence in particular parts of the Punjab, notably the silk fabrics of Multan and Bahawal- pur; the carpets of Lahore and Amritsar; the kashi or glazed tile- work (an ancient art still practised in a few places) ; koft-kari, inlaid metal-work (gold wire on steel), chiefly made at Gujrat and Sialkot ; shawls and other fine woollen fabrics, made by Kashmiri work-people at Ludhiana and Nurpur, as well as in Kashmir; silk embroidery for shawls, scarfs and turbans, at Delhi, Lahore and Multan; embroidery on cloth for elephant-trappings, bed and table covers, &c, at Lahore and Multan; enamelled ornaments, in Kangra and Multan; quill embroidery on leather, in Kangra and Simla; lacquered woodwork, at Pak Pattan. Cotton-weaving gives employment to about a million persons, but the most flourish- ing industry is the woollen factories of Amritsar, Gurdaspur and elsewhere. Injur)' has been done to some of the native arts of the Punjab, as of other parts of India, by unwise copying of European patterns. The Lahore School of Art attempts to correct this and promote the study and execution of native forms and designs. The Lahore Museum contains illustrations of the arts and manu- factures, as well as raw products, of the Punjab; and also a large collection of the

sculptures, mostly Buddhist, and many of Greek workmanship, found in the north-west of the province.

Trade. — The trade of the Punjab is almost wholly dependent upon agriculture. In a normal year the principal feature of the trade is the movement of wheat to Karachi, which is the chief port for the province. But in a bad season, when the rains fail, this movement is at once checked, the wheat is held up in reserve and an eastward movement in cheaper grains begins. In 1904 32J million maunds of wheat were exported, but 1905 was 3 bad season and the amount fell to 21 million maunds. The other chief articles of export are pulse and raw cotton. The chief imports are European cotton and woollen piece-goods and yarn, Indian piece-goods, sugar, metals and jute goods. The through trade in the main staples of grain and piece-goods is in the hands of large European and native firms. In addition to the foreign trade there is a considerable provincial trade with the United Provinces, and a trans-frontier trade with Kashmir, Ladakh, Yarkand and Tibet on the north, and with Afghanistan on the west.

Irrigation. — Irrigation for large areas is from canals and from reservoirs, and for smaller areas from wells. The canals are of two kmds: those carrying a permanent stream throughout the year, and those which fill only on the periodical rising of the rivers, the latter being known as " inundation canals." There are only a few parts of the country presenting facilities for forming reservoirs, by closing the narrow outlets of small valleys and storing the ac- cumulated rainfall. The old canals made by the Mahommedan rulers, of which the principal are Feroz's Canal from the Jumna and the Hasli Canal from the Ravi, have been improved or re-constructed by the British government. The principal new canals are the Sirhind, drawn from the Sutlej near Rupar, which irrigates parts of the native states of Patiala, Nabha and Jhind, as well as British territory; the Bari Doab Canal from the Ravi; the Chenab Canal from the Chenab, irrigating the prosperous Chenab colony; and the Jhelum Canal irrigating the Jhelum colony. The total area irrigated by the canals of the province in 1905-1906 was 6,914,500 acres, the eight major works, the Western Jumna, Bari Doab, Sirhind, Lower Chenab, Lower Jhelum, Upper Sutlej, Sidhnai and Indus accounting for all but 751,000 acres. The ravages of the boll-worm in the cotton crop made 1906 an unfavourable year; but in spite of that the Lower Chenab Canal paid nearly 21 % on the capital invested, the Bari Doab 11 % and the Western Jumna nearly 10%.

Railways. — The Punjab is well supplied with railways, which have their central terminus at Delhi. One main line of the North- western runs from Umballa through Lahore and Rawalpindi towards Peshawar; another main line runs from Lahore to Multan,

and thence to the sea at Karachi; while a third runs along the left bank of the Indus, from Attock southwards. From Delhi to Umballa there are two lines, one of the North- Western through Meerut and Saharanpur in the United Provinces, and a more direct one, which is continued to Kalka, at the foot of the hills, whence a further continuation to Simla has been opened. The south-east of the province is served by two branches of the Rajputana system, which have their termini at Delhi and Ferozepore; and also by the Southern Punjab, which runs from Delhi to Bahawalpur.

Population. — The total population of the Punjab (including native states) according to the census of 1901 was 24,754,737, showing an increase of 6-4% in the decade. The Jats, who number some five millions, form the backbone of the cultivating community. Large numbers of them have become Sikhs or Mahommedans in the tracts where those religions predomi- nate. The Rajputs, with a total of over a million and three-quarters, comprise tribes of different religions, races and social systems. By religion they are mostly Mahommedan, only about one-fourth being Hindus, while a very few are Sikhs. By race they include the ancient ruling tribes of the Jumna valley, the Tomar and Chauhan, which gave Delhi its most famous Hindu dynasties; the Bhattis of the south and centre, which have migrated from Bikanir and Jeysulmere into their present seats; the Sials of Jhang; and the Punwars of the south-west. In the northern or submontane districts the Rajputs also represent the old ruling tribes, such as the Chibbs of Gujrat, the Janjuas of the Salt range and others, while in Kangra district they preserve a very old type of Hindu aristo- cracy. The Gujars are an important agricultural and pastoral tribe. They are most numerous in the eastern half of the province and in the districts of the extreme north-west, especi- ally in Gujrat, to which they have given their name. Baluchis and Pathans are strongly represented in the south-west. The distinctive religion of the Punjab is Sikhism (q.v.), though Sikhs form only 8-5% of the total population. Of the rest, Mahom- medans are more numerous than Hindus.

Language. — Of the 24,754,737 people in the Punjab about 18,000,000 speak the provincial language, Punjabi, which varies in character in different parts of the province. About 4,000,000 speak Hindustani (see Hindostani) , this number including those whose ordinary vernacular is Hindi, but who understand and are gradually adopting the more comprehensive Hindustani. These two languages are the most generally used throughout the province, but not equally in all parts. The other languages in use are more or less local. The hill dialects, known as Pahari, are akin to the language spoken in Rajputana; and so also is the speech of the Gujars. Hindustani is the language of the law courts and of all ordinary officials and other communications with chiefs and people.

Administration. — The administration is conducted by a lieutenant-governor, who is appointed by the governor-general, subject to the approval of the Crown. Two commissioners take the place of the board of revenue in most other provinces. A survival of the " non-regulation " system is to be found in the title of deputy-commissioner for the district officer elsewhere called collector. The highest judicial authority is styled the chief court, consisting of five judges, which corresponds to the high court elsewhere. A legislative council, first created in 1897, was enlarged in 1909 to 26 members, of whom ten are officials and five are elected. The province is distributed into five divisions or commissionerships. Most of the commissioners also exercise political functions over the native states within their jurisdiction.

Education. — The Punjab University, which was founded in 1882, differs from other Indian universities in being more than a merely examining body. It is responsible for the management of the Oriental College at Lahore, and takes a part in the improve- ment of vernacular literature. It also conducts Oriental exami- nations side by side with those in English, and has been the first to introduce a series of examinations in science from matricula- tion to the degree, as well as a final school examination in clerical and commercial subjects. The higher and special educational institutions are the Lahore Government College, the Cambridge

University Mission College at Delhi, the Medical School and the Mayo School of Art at Lahore; and the Punjab Chiefs' College, also at Lahore.

History. — For the early history of the Punjab from the Aryan immigration to the fall of the Mogul dynasty see India: History. It deserves, however, to be noted here that from the time of Alexander onwards Greek settlers remained in the Punjab, and that Greek artists gave their services for Buddhist work and introduced features of their own into Indian architecture. Besides the bases and capitals of large Greek columns at Shah- deri (Taxila) and elsewhere, numerous sculptures of Greek work-manship have been found at various places. These are single statues (probably portraits), also figures of Buddha, and repre- sentations of scenes in his legendary history, and other subjects. They are obtained from ruins of monasteries and other buildings, from mounds and the remains of villages or monumental topes. Of Buddhist buildings now remaining the most conspicuous as well as distinctive in character are the topes (stupa), in shape a plain hemisphere, raised on a platform of two or more stages. One of the largest of these is at Manikiala, 14 m. east of Rawalpindi. These

Buddhist buildings and sculptures are all probably the work of the two centuries before and the three or four after the beginning of the Christian era. The character of the sculptures is now well known from the specimens in the India Museum, South Kensington, and both originals and casts of others in the Lahore Museum. Unfortunately they have no names or inscriptions, which give so much value to the sculptures of the Bharhut tope.

The several bodies of settlers in the Punjab from the earliest times have formed groups of families or clans (not identical with Indian castes, but in many cases joining them), which have generally preserved distinct characteristics and followed certain classes of occupation in particular parts of the country. Some of the existing tribes in the Punjab are believed to be traceable to the early Aryan settlers, as the Bhatti tribe, whose special region is Bhattiana south of the Sutlej, and who have also in the village of Pindi Bhattian a record of their early occupation of a tract of country on the left bank of the Chenab, west of Lahore. The Dogras, another Aryan clan, belong to a tract of the lower hills between the Chenab and the Ravi. Others similarly have their special ancient localities. To the earlier settlers — the dark race (Dasyu) whom the Aryans found in the country, and who are commonly spoken of as aborigines — belonged, as is supposed, the old tribe called Takka, whose name is found in Taksha-sila or Taxila. And from the later foreigners again, the Indo-Scythians, are probably descended the great Jat tribe of cultivators, also the Gujars and others.

It was during the events which brought Baber, the first of the Mogul dynasty, to the throne, that the sect of the Sikhs was founded by Nanak ; and it was under the persecution of Aurangzeb that they were raised into a nation of warriors by Govind Singh, the tenth and last of the gurus. For their tenets and history see Sikhism.

The break-up of the Mogul Empire in the 18th century allowed the Sikhs to establish themselves, as a loosely organized commu- nity of marauders, in the eastern plains of the Punjab, on both banks of the Sutlej. Here, after long internecine warfare, one of their chieftains succeeded in enforcing his authority over the rest. This was Ranjit Singh, the " Lion of the Punjab," born in 1780, who acquired possession of Lahore as his capital in 1799. Ranjit was a man of strong will and immense energy, of no educa- tion but of great acuteness in obtaining the knowledge that would be of use to him. When he endeavoured to include the Sikh states south of the Sutlej within his jurisdiction, the heads of these states — chiefs of Sirhind and Malwa, as they were called — sought and obtained in 1808 the protection of the British, whose territories had now extended to their neighbourhood. The British were at this time desirous of alliance with Lahore as well as with Kabul, for protection against supposed French designs on India. A British

envoy, Charles Metcalfe, was received by Ranjit at Kasur in 1809 and the alliance was formed. Ranjit steadily strengthened himself and extended his dominions.

In 1809 he got possession of Kangra, which the Nepalese were besieging. In 1813 he acquired the fort of Attock on the other side of the Punjab; and in the same year he obtained from Shah Shuja, now a refugee in Lahore, what he coveted as much as territory, the celebrated Koh-i-nor diamond, which had been carried off by Nadir Shah from Delhi. In 1818, after some failures in previous years, he captured Multan. Kashmir, which had successfully opposed him several times, was annexed the following year, and likewise the southern part of the country between the Indus and the hills. The Peshawar valley he succeeded in adding four years later, but he found it best to leave an Afghan governor in charge of that troublesome district. These trans-Indus and Qther outlying tracts were left very much to themselves, and only received a military visit when revenue was wanted. Peshawar was never really ruled till Avitabile was sent there in later years. When he was gradually raising his large and powerful army Ranjit received into his service certain French and other officers, who drilled his troops and greatly improved his artillery. Whilst he relied on these foreigners for military and sometimes also for administrative services, he drew around him a body of native ministers of great ability, of whom the brothers Gulab Singh and Dhian Singh of Jammu were the most influential.

Ranjit always maintained friendly relations with the British government, and just before his death gave tacit approval to the scheme for placing Shah Shuja on the throne of Kabul. His death in 1839 was followed by six years of internal anarchy, princes and ministers being murdered in quick succession, while all real power passed to the army of 90,000 trained troops. At last this army, unpaid and unmanageable, demanded to be led into British territory, and had their way. They crossed the Sutlej in December 1845. The battles of Moodkee, Ferozeshah and Aliwal were followed by the rout of the Sikh army at Sobraon on the 10th of February 1846, when they were driven back into the Sutlej with heavy loss, and the British army advanced to Lahore. Of the Sikh guns 256 fell into the hands of the British in these actions on the Sutlej. A treaty was made at Lahore on the 9th of March with the chiefs and ministry who were to hold the government on behalf of the young maharaja, Duleep Singh. By this treaty the Jullundur Doab and the hill district of Kangra were ceded to the British, also the possessions of the maharaja on the left bank of the Sutlej. In addition the British demanded a money payment of £1,300,000. The services of Gulab Singh, raja of Jammu, to the Lahore state, in procuring the restoration of friendly relations with the British, were specially recognized. His independent sovereignty in such lands as might be made over to him was granted. The Sikh government, unable to pay the whole of

the money demand, further ceded, as equivalent for £1,000,000, the hill country between the Beas and the Indus, including Kashmir and Hazara. Gulab Singh was prepared to give the amount in place of which Kashmir was to have become British, and by a separate treaty with him, on the 16th of March 1846, this was arranged. At the urgent request of the durbar a British force was left at Lahore for the protection of the maharaja and the preservation of peace. To restore order and introduce a settled administration a British resident was appointed, who was to guide and control the council of regency, and assistants to the resident were stationed in different parts of the country.

Peace was not long preserved. The governor of Multan, Diwan Mulraj, desired to resign. Two British officers sent by the resident to take over charge of the fort were murdered, on the 19th of April 1848, and their escort went over to the diwan. Another of the assistants to the resident, Lieutenant Herbert Edwardes, then in the Derajat, west of the Indus, on hearing of their fate, collected a force with which to attack the Multan army while the insurrection was yet local. This he did with signal success. But Multan could not fall before such means as he possessed. The movement spread, the operations widened, and the Sikh and British forces were in the field again. Multan was taken. The severe battle of Chillianwalla on the 13th of January 1849 left the Sikhs as persistent as after the two terrible

days of Ferozeshah in the previous campaign. And it needed the crushing defeat of Gujrat, on the 21st of February 1849, t0 bring the war to a conclusion, and this time to give the Punjab to England. It was annexed on the 2nd of April 1849.

For the government of the new province, including the Jullundur Doab, previously annexed, and the cis-Sutlej states, a board of administration was appointed consisting of three members. In place of this board a chief commissioner was appointed in 1853, aided by a judicial commissioner and a financial commissioner. British troops, European and native, of the regular army were stationed at the chief cities and other places east of the Indus and at Peshawar. For the rest of the trans-Indus territory a special body of native troops, called the Punjab frontier force, was raised and placed under the orders of the chief commissioner. During the Mutiny of 1857 the Punjab, under Sir John Lawrence as chief commissioner, was able to send important aid to the force engaged in the siege of Delhi, while suppressing the disturbances which arose, and meeting the dangers which

threatened, within the Punjab itself. In 1858 the Delhi territory, as it was called, west of the Jumna, was transferred from the North-Western Provinces to the Punjab. The enlarged province was raised in rank, and on the 1st of January 1859 the chief commissioner became lieutenant-governor. In 1 901 the frontier districts beyond the Indus were severed from the Punjab and made into a separate province called the North-West Frontier province.

See J. D. Cunningham, History of the Sikhs (1849); S. S. Thor- burn, The Punjab in Peace and War (1904) ; Sir Lepel Griffin, Ranjit Singh (" Rulers of India" series, 1892); P. Gough and A. Innes, The Sikhs and our Sikh Wars (1897); Professor Rait, Life of Lord Gough (1903); Mahomet Latif, History of the Punjab (Calcutta, 1891); and Punjab Gazetteer (2 vols., Calcutta, 1908).

PUNKAH (Hindostani pankha), strictly a fan. In its original sense the punkah is a portable fan, made from the leaf of the palmyra; but the word has come to be used in a special sense by Anglo-Indians for a large swinging fan, fixed to the ceiling, and pulled by a coolie during the hot weather. The date of this invention is not known, but it was familiar to the Arabs as early as the 8th century, though it does not seem to have come into common use in India before the end of the 18th century. Of recent years it has largely been supplanted by the electric fan in barracks and other large buildings.

PUNSHON, WILLIAM MORLEY (1824-1881), English Non- conformist divine, was born at Doncaster, Yorkshire, on the 29th of May 1824. He was educated in his native town, and, after spending a few years in business, at the Wesleyan College, Richmond. In 1845 he received his first appointment, at Marden, Kent, and soon became famous as a preacher. After serving the usual period of probation he was ordained at Man-chester in 1849 an d for the next nineteen years travelled in several circuits, including some of the London ones (1858-1864). In 1868 he went to Chicago as the representative of the Wesleyan Methodist conference, and settling in Canada did much to advance the cause of his denomination. His preaching and lecturing drew great crowds both in the Dominion and in the United States, and he was five times president of the Canadian conference. He returned to England in 1873, was elected president of conference 1874, and in 1875 one of the missionary secretaries. He published several volumes of sermons, and a book of verse entitled Sabbath Chimes (1867, new edition 1880). PUNT (from Lat. ponto, pontoon; connected with pons, bridge), a flat-bottomed boat, used for shallow waters, and propelled by a pole, by paddles, or occasionally by sails. Formerly the word was applied to many such flat boats used for ferries, barges, lighters, &c, but it is now generally confined to a light flat boat very long in proportion to its width,

with square ends, both at stem and bow, slightly narrowing from the centre, and propelled by pushing against the bottom of the river or other water by a long pole. Such boats are much used for sport or pleasure on rivers with shallow and hard gravelly beds; a small punt with a mounted duck gun and propelled by paddles or short oars is used for wild-fowling. A professional punting

championship of England was instituted in 1876, and an amateur championship in 1886. Etymologically considered, "punt" certainly was adapted from ponto, a word used by Caesar (Bell, civ. p. iii. 22) of a light vessel for transport in Gaul. Later (as by Gallius and Ausonius) it was also applied to a floating-raft used as a bridge, a pontoon, and so connected with pons, bridge.

There are two other words which must be distinguished from the above. One means, in Rugby football, to catch the ball in the hands, drop and kick it before it reaches the ground, as distinguished from a " drop-kick," where the kick is given half-volley, as it reaches the ground. This word is probably cognate with " bunt," a dialect word meaning to push, and both represent nasalized forms of the onomatopoeic " put " or " but." The second, in the substantive " punter," used in the general sense of a gambler or better, originally referred to one who at card games such as basset, baccarat, &c, stakes against the bank. Both " punt " and " punter " are to be referred to Fr. ponter, and ponte, which is usually taken as an adapta- tion of Span, punto, a point.

PUNTARENAS, or Ptjnta Arenas, a seaport and capital of the district (comarca) of Puntarenas, Costa Rica; on the Gulf of Nicoya, an inlet of the Pacific Ocean, and at the western terminus of the interoceanic railway from Limon. Pop. (1904), 3569. Puntarenas is the principal harbour of Costa Rica on the Pacific, and a port of call for the United States liners which ply between San Francisco and Panama. It has an iron pier and ample warehouse accommodation for its large and growing export trade in coffee and bananas. The district of Puntarenas comprises the entire littoral from Burica Point to the Rio de las Lajas, an affluent of the Gulf of Nicoya.

PUPIL (Lat. pupillus, orphan, minor, dim. of pupus, boy, allied to puer, from root pu- or peu-, to beget, cf. "pupa," Lat. for " doll," the name given to the stage intervening between the larval and imaginal stages in certain insects), properly a word taken from Roman law for one below the age of puberty (im- pubes), and not under patria poteslas, who was under the protec- tion of a tutor, a ward or minor (see Infant; and Roman Law). The term was thus taken by the Civil Law and Scots Law for a person of either sex under the age of puberty in the care of a guardian. Apart from these

technical meanings the word is generally used of one who is undergoing instruction or education by a teacher. In education the term " pupil-teacher " is applied to one who, while still receiving education, is engaged in teaching in elementary schools. The system was introduced into England from Holland about 1840. At first the education which the pupil-teachers received was given at the schools to which they were attached. During the last quarter of the 19th century was developed a system of " pupil-teacher centres " where training and education was given. In 1907 was introduced " bursaries," as an alternative; these enable those intending to become teachers to continue their education at training colleges or selected schools as " student teachers." (See Education.)

A special use of the Lat. feminine diminutive pupilla has been adopted in English and other languages for the central orifice in the iris of the eye, the pupil. The origin of the sense may be found in the parallel use in early English of " baby," referring to small images seen reflected in that part of the eye (see Eye and Vision).

PURBECKIAN, in geology, the highest and youngest member of the Jurassic system of rocks. The name is derived from the district known as the Isle of Purbeck in Dorsetshire where the strata are splendidly exposed in the cliffs west of Swanage. The rocks include clays, shales and marls with marly, tufaceous and shelly limestones and occasional oolitic and sandy strata. Nodules of chert are present in some of the limestones. The Purbeck beds follow the line of the Jurassic outcrop from Dorsetshire, through the Vale of Wardour, Swindon, Garsington, Brill and Aylesbury; they have been proved by borings to lie beneath younger rocks in Sussex; in Lincolnshire they are represented in part by the Spilsby Sands, and in Yorkshire by portions of the Speeton Clay. The thickness of the series in Wiltshire is 80 to 90 ft., but in Dorsetshire it reaches nearly 400 ft. In most places the Purbeckian rests conformably upon

the Portland beds and it is conformably overlaid by the Wealden formations; but there are in some districts distinct indications that the Portland rocks were uplifted and worn to some extent prior to the deposition of the Purbeck beds. The Purbeckian in England is divisible into three subdivisions, viz. Upper, Middle and Lower. The Upper Purbeck comprises 50-60 ft. of fresh-water clays and shales with limestones, the " Purbeck marble " and Unio-bed, in the lower part. The Middle division (50-150 ft.), mainly thin limestones with shaly partings, contains the principal building stones of the Swanage district; near the base of this

subdivision there is a 5-in. bed from which an interesting suite of mammalian remains has been obtained; in this portion of the Purbeck series there are some marine bands. The Lower Purbeck (95-160 ft.) consists of fresh-water and terrestrial deposits, marls, and limestones with several fossil soils known as " dirt beds." This division is very extensively exposed on the Isle of Portland, where many of the individual beds are known by distinctive names. The chief building stones of Upway belong to this part of the Purbeckian.

No zonal fossil has been recognized for the British Purbeckian strata, but the horizon is approximately equivalent to that of Peri- sphinctes transitorius of the European continent. The Purbeckian equivalents of Spilsby and Speeton are in the zone of Belemnites lateralis. Other marine fossils are Hemicidaris purbeckensis and Ostrea distorta, the latter being abundant in the ' Cinder bed " of the Middle Purbeck. The fresh-water mollusca include Viviparus (Paludina), Planorbis, Melanopsis, Unio, Cyrena. A large number of insect genera has been found in the Middle and Lower Purbeck beds. Dinosaurs (Iguanodon, Echinodon), crocodiles (Goniopholis, Petrosuchus), Cimoliosaurus, the plesiosaurs and the chelonians (Chelone, Plcurosternum) , are representative reptiles. The mammals, mostly determined from lower jaws, found in the beds mentioned above include Plagiaulax, Amblotherium, Stylodon, Triconodon, Spalacotherium and several others. The isopod crustacean Archeon- iscus Brodei is very common in the Purbeck of the Vale of Wardour. The silicified stumps and trunks of cycads and coniferous trees, often surrounded by great masses of calcareous concretions (Burrs), are very noticeable in the dirt beds of Portland and near Lulworth. Chara is found in the fresh-water cherts of the Middle Purbeck.

Many geologists have ranged the Purbeck beds with the overlying Wealden formation on account of the similarity of their fresh-water faunas; but the marine fossils, including the fishes, ally the Purbeck more closely with the Upper Jurassic rocks of other parts, and it may be regarded as the equivalent of the Upper Volgian of Russia. The Purbeckian is present in the neighbourhood of Boulogne; in Charente it is represented by thin limestones with Cyrena and by gypsiferous marls; in north-west Germany three subdivisions are recognized, in descending order Purbeck Kalk, Serpulit and Milnder Mergel.

The building stones of the Purbeck beds have already been men- tioned ; the Purbeck or Paludina marble, a grey or greenish limestone full of shells, was formerly extensively employed in cathedrals and churches. Stone tiles or " slatts " were once used locally for roofing from the Lower Purbeck of Portland, Swanage and Swindon. Gypsum was formerly worked from the Lower Purbeck at Swanage.

See Jurassic ; also The Jurassic Rocks of Great Britain (1895), vol. v. and " The Geology of the Isle of Purbeck and Weymouth," Memoirs of the Geol. Survey (1898).

PURCELL, HENRY (1658-1695), English musical composer, was born in 1658 in St Ann's Lane, Old Pye Street, Westminster. His father, Henry Purcell (or Pursell), was a gentleman of the chapel-royal, and in that capacity sang at the coronation of Charles II.; he had three sons, Edward, Henry and Daniel — the last of whom (d. 17 17) was also a prolific composer. After his father's death in 1664 young Henry Purcell was placed under the guardianship of his uncle, Thomas Purcell (d. 1682), a man of extraordinary probity and kindness. Through the interest of this affectionate guardian, who was himself a gentleman of His Majesty's chapel, Henry was admitted to the chapel-royal as a chorister, and studied first under Captain Henry Cooke (d. 1672), " master of the children," and afterwards under Pelham Humfrey (1647-1674), his successor, a pupil of Lully. He is said to have composed well at nine years old; but the earliest work that can be certainly identified as his is an ode for the king's birthday, written in 1670. (The dates for his compo- sitions are often uncertain, though recent research has done much to fix them more authoritatively.) After Humfrey's death he continued his studies under Dr John Blow. In 1676 he was appointed copyist at Westminster Abbey — not organist, as has

sometimes been erroneously stated — and in the same year he composed the music to Dryden's Aurenge-Zebe, and Shadwell's Epsom Wells and The Libertine. 1 These were followed in 1677 by the music to Mrs Behn's tragedy, Abdelazor, and in 1678 by an overture and masque for Shadwell's new version of Shake- speare's Timon of Athens. The excellence of these compositions is proved by the fact that they contain songs and choruses which never fail to please, even at the present day. The masque in Timon of Athens is a masterpiece, and the chorus " In these delightful pleasant groves " in The Libertine is constantly sung with applause by English choral societies. In 1679 he wrote some songs for Playford's Choice Ayres, Songs and Dialogues, and also an anthem, the name of which is not known, for the chapel-royal. From a letter written by Thomas Purcell, and still extant, we learn that this anthem was composed for the exceptionally fine voice of the Rev. John Gostling, then at Canterbury, but afterwards a gentleman of His Majesty's chapel. Purcell wrote several anthems at different times for this extra- ordinary voice, a basso profundo, the compass of which is known to have comprised at least two full octaves, from D below the stave to D above it. The dates of very few of these sacred compositions are known; but one, " They that go down to the sea in ships," though certainly not written until some time after this period, will be best mentioned here. In thankfulness for a providential escape of the king from

shipwreck Gostling, who had been of the royal party, put together some verses from the Psalms in the form of an anthem, and requested Purcell to set them to music. The work is a very fine one but very difficult, and contains a passage which traverses the full extent of Gostling's voice, beginning on the upper D and descending two octaves to the lower.

In 1680 Dr Blow, who had been appointed organist of West- minster Abbey in 1669, resigned his office in favour of his pupil; and Purcell, at the age of twenty-two, was placed in one of the most honourable positions an English artist could occupy. He now devoted himself almost entirely to the composition of sacred music, and for six years entirely severed his connexion with the theatre. But during the early part of the year, and in all probability before entering upon the duties of his new office, he had produced two important works for the stage, the music for Lee's Theodosius and D'Urfey's Virtuous Wife. The composition of his opera Dido and Aeneas, which forms a very important landmark in the history of English dramatic music (see Opera), has been attributed to this period, though its earliest production has been shown by Mr W. Barclay Squire to have been between 1688 and 1690. It was written to a libretto furnished by Nahum Tate, at the request of Josiah Priest, a professor of dancing, who also kept a boarding-school for young gentlewomen, first in Leicester Fields and afterwards at Chelsea. It is a musical drama in the strictest sense of the term, a genuine opera, in which the action is entirely carried on in recitative, without a word of spoken dialogue from beginning to end; and the music is of the most genial character — a veritable inspiration, overflowing with spontaneous melody, and in every respect immensely in advance of its age. It never found its way to the theatre, though it appears to have been very popular among private circles. It is believed to have been extensively copied, but one song only was printed by PurcelPs widow in Orpheus Britannicus, and the complete work remained in manuscript until 1840, when it was printed by the Musical Antiquarian Society, under the editorship of Sir George Macfarren.

In 1682 Purcell was appointed organist of the chapel-royal, vice Edmund Lowe deceased, an office which he was able to hold conjointly with his appointment at Westminster Abbey. He had recently married, his eldest son being born in this year. His first printed composition, Twelve Sonatas, was published in 1683. For some years after this his pen was busily employed in the production of sacred music, odes addressed to the king and royal family, and other similar works. In 1685 he wrote two

1 The Libertine was suggested by Tirso de Molina's tale, El Bur- lador de Sevilla, afterwards dramatically treated by MoliSre and chosen by Da Ponte as the foundation of Mozart's Don Giovanni.

of his finest anthems, ” I was glad ” and ” My heart is inditing,” for the coronation of James II. In 1687 he resumed his con- nexion with the theatre by furnishing the music for Dryden’s tragedy, Tyrannic Love. In this year also Purcell composed a march and quick-step, which became so popular that Lord Wharton adapted the latter to the fatal verses of Lillibulero; and in or before January 1688 he composed his anthem ” Blessed are they that fear the Lord,” by express command of the king. A few months later he wrote the music for D’Urfey’s play, The Fool’s Preferment. In 1690 he wrote the songs for Dryden’s version of Shakespeare’s Tempest, including ” Full fathom five ” and ” Come unto these Yellow Sands,” and the music for Betterton’s adaptation of Fletcher and Massinger’s Prophetess (afterwards called Dioclesian) and Dryden’s Amphitryon; and in 1691 he produced his dramatic masterpiece, King Arthur, also written by Dryden, and first published by the Musical Antiquarian Society in 1843. In 1692 he composed songs and music for The Fairy Queen (an adaptation of Shakespeare’s Midsummer Night’s Dream), the score of which (discovered in 1 901) was edited in 1903 for the Purcell Society by J. S. Shedlock.

But Purcell’s greatest work is undoubtedly his Te Deum and Jubilate, written for St Cecilia’s Day, 1694, the first English Te Deum ever composed with orchestral accompaniments. In this he pressed forward so far in advance of the age that the work was annually performed at St Paul’s Cathedral till 1712, after which it was performed alternately with Handel’s Utrecht Te Deum and Jubliate until 1743, when it finally gave place to Handel’s Dettingen Te Deum. Purcell did not long survive the production of this great work. He composed an anthem for Queen Mary’s funeral, and two elegies. He died at his house in Dean’s Yard, Westminster, on the 21st of November 1695, and was buried under the organ in Westminster Abbey. He left a widow and three children, three having predeceased him. His widow died in 1706. She published a number of his works, including the now famous collection called Orpheus Britannicus (two books, 1698, 1702).

Besides the operas already mentioned, Purcell wrote Don Quixote, Bonduca, The Indian Queen and others, a vast quantity of sacred music, and numerous odes, cantatas and other miscellaneous pieces. (See the list in Grove’s Dictionary of Music.)

A Purcell Club was founded in London in 1836 for promoting the performance of his music, but was dissolved in 1863. In 1876 a Purcell

Society was founded, which has done excellent work in publishing new editions of his works.

PURCHAS, SAMUEL (is7s?-i626), English compiler of works on travel and discovery, was born at Thaxted, Essex, and graduated at St John's College, Cambridge, in 1600; later he became B.D., with which degree he was admitted at Oxford in 161 5. In 1604 he was presented by James I. to the vicarage of Eastwood, Essex, and in 1614 became chaplain to Archbishop Abbot and rector of St Martin's, Ludgate, London. He had previously spent much time in London on his geographical work. In 1 613 he published Purchas, his Pilgrimage; or, Relations of the World and the Religions observed in all Ages (4th ed. much enlarged, 1626); in 1619 Purchas, his Pilgrim. Microcosmus, or the histories of Man. Relating the wonders of his Generation, vanities in his Degeneration, Necessity of his Regeneration; and in 1625 Hakluytus Posthumus or Purchas his Pilgrimes, contayning a History of the World in Sea Voyages and Lande Travells, by Englishmen and others (4 vols.). This continuation of Hakluyt's Principal Navigations was partly based onMSS. left by Hakluyt. The fourth edition of the Pilgrimage is usually catalogued as vol. v. of the Pilgrimes, but the two works are essentially distinct. Purchas died in September or October 1626, according to some in a debtors' prison. None of his works was reprinted till the Glasgow reissue of the Pilgrimes in 1905-1907. As an editor and compiler Purchas was often injudicious, careless and even unfaithful; but his collections contain much of value, and are frequently the only sources of information upon important questions affecting the history of exploration.

PURCHASE, in its common sense, that which is acquired by the payment of money or its equivalent. The original

meaning of the word (O. Fr. pourchacier, pourchasser, &c, popular, Lat. pro-capliare) was to pursue eagerly, hence to acquire. Thus " purchase " was early used by the lawyers {e.g. Britton, in 1292) for the acquirement of property by other means than inheritance or mere act of law, including acquirement by escheat, prescription, occupancy, alienation and forfeiture; more generally, purchase in law means acquisition of land by bargain or sale, according to the law of " vendor and purchaser " (see Conveyancing) . A later development of meaning is found in the use of the word for a mechanical contrivance by which power can be excited or applied, a hold or fulcrum. This first appears (16th century) in the nautical use of the verb, to haul up a rope or cable by some mechanical device, the root idea being apparently to " gain " advantage over the rope bit by bit.

PURDAH (Pers. parda), the curtain which screens women from the sight of men in Eastern countries; a purdah-nashin is a woman who sits behind the

curtain. The term has passed into common Anglo-Indian usage, and to " lift the purdah " means to reveal a secret.

PURGATORY (Late Lat. purgatorium, from pur gar e, to purge), according to Roman Catholic faith, a state of suffering after death in which the souls of those who die in venial sin, and of those who still owe some debt of temporal punishment for mortal sin, are rendered fit to enter heaven. It is believed that such souls continue to be members of the Church of Christ; that they are helped by the suffrages of the living — that is, by prayers, alms and other good works, and more especially by the sacrifice of the Mass; and that, although delayed until "the last farthing is paid," their salvation is assured. Catholics support this doctrine chiefly by reference to the Jewish belief in the efficacy of prayer for the dead (2 Mace. xii. 42 seq.), the tradition of the early Christians, and the authority of the Church.

Irenaeus regards as heretical the opinion that the souls of the departed pass immediately into glory ; Tertullian, Cyprian, the Acts of St Perpetua, Clement of Alexandria, Cyril of Jerusalem, Basil, Gregory of Nyassa, Ambrose, Chrysostom and Jerome, all speak of prayer for the dead and seem to imply belief in a purgatory, but their view seems to have been affected by the pre-Christian doctrine of Hades or Sheol. Some of the Greeks, notably Origen, teach that even the perfect must go through fire in the next world. Augustine writes (De VIII. Dulcitii quaes tionibus) that "it is not incredible " that imperfect souls will be " saved by some purgatorial fire," to which they will be subjected for varying lengths of time according to their needs; but in other passages he expresses conflicting opin- ions {De civitate, xx. 25, xxi. 13, 26; Enchiridion, 69). Gregory the Great was the first to formulate the doctrine in express terms, " de quibusdam levibus culpis esse ante judicium purgatorius ignis credendus est " {Dial. iv. 39). Thenceforth it became part of the theology of the Western Church, and was definitely affirmed at the councils of Lyons (1274), Florence (1439) and Trent. Concerning the word purgatory, Innocent IV. writes: " Forasmuch as (the Greeks) say that this place of purification is not indicated by their doctors by an appropriate and accurate word, we will, in accordance with the tradition and authority of the holy fathers, that henceforth it be called purgatorium, for in this temporary fire are cleansed not deadly capital sins, which must be remitted by penance, but those lesser venial sins which, if not removed in life, afflict men after death."

Many points about purgatory, on which the Church has no definition, have been subjects of much speculation among Catholics. , Purgatory, for example, is usually thought of as having some position in space, and as being distinct from heaven and hell; but any theory as to its exact latitude and longitude, such as underlies Dante's description, must be regarded as imaginative. Most theologians since Thomas Aquinas and Bonaventura

have taught that the souls in purgatory are tormented by material fire, but the Greeks have never accepted this opinion. It must be inferred from the whole practice of indulgences as at present authorized that the pains of purgatory are measurable by years and days; but here also everything is indefinite. The Council of Trent, while it commands all bishops to teach " the sound doctrine of purgatory handed down by the venerable fathers and sacred councils," bids them exclude from popular addresses all the " more difficult and subtle questions relating to the subject which do not tend to edification."

The Eastern Church affirms belief in an intermediate state after death, but the belief is otherwise as vague as the expressions

of the pre-Nicene fathers on the subject. An authoritative statement of the present Eastern doctrine is to be found in the Longer Catechism of the Orthodox Church (Q. 376) : —

" Such souls as have departed with faith but without having had time to bring forth fruits meet for repentance may be aided towards the attainment of a blessed resurrection by prayers offered in their behalf, especially such as are offered in union with the oblation of the bloodless sacrifice of the Body and Blood of Christ, and by works of mercy done in faith for their memory."

The efficacy of prayers for the dead, and indirectly the doctrine of purgatory, were denied by early Gnostic sects, by Aerius in the 4th century, and by the Waldenses, Cathari, Albigenses and Lollards in the middle ages. Protestants, with the exception of a small minority in the Anglican communion, unanimously reject the doctrine of purgatory, and affirm that " the souls of believers are at their death made perfect in holiness and do immediately pass into glory." Rejection of an inter- mediate state after death follows the Protestant idea of justifica- tion by faith as logically as the doctrine of purgatory results from the Catholic idea of justification by works.

An analogy to purgatory can be traced in most religions. Thus the fundamental ideas of a middle state after death and of a purification preparatory to perfect blessedness are met with in Zoroaster, who takes souls through twelve stages before they are sufficiently purified to enter heaven; and the Stoics conceived of a middle place of enlightenment which they called hinrvpucns.

The principal authoritative statements of the Catholic Church on the doctrine of purgatory were made at the Council of Florence (Decret. unionis), and at that of Trent (Sess. vi. can. 30; Sess. xxii., c. 2, can. 3; Sess. xxv.). See H. J. D. Denziger's Enchiridion; J. Bautz, Das Fegfeuer (Mainz, 1883); and L. Redner, Das Fegfeuer (Regensburg, 1856). A very elaborate treatise from the Catholic standpoint is that of Cardinal Bellarmine, De purgatorio. The subject is discussed, moreover, in all major works on dogmatic theology. There is a representative Catholic statement by Hense in the Kirchenlexikon under the title " Fegfeuer," 2nd ed., vol. 4, col. 1284-1296; and a corresponding Protestant presentation by Rud. Hoffmann in Hauck's Realencyklopadie, 3rd ed. vol. v. pp. 788- 792. (C. H. HA.)

PURI, or Jagannath, a town and district of British India, in the Orissa division of Bengal. The town is on the sea-coast, and has a railway station. Pop. (1001), 49,334, including an exceptional number of pilgrims. As containing the world- famous shrine of Jagannath (see Juggernaut), Puri is perhaps the most frequented of all Hindu places of pilgrimage. Sanita- tion is effected by the Puri Lodging-House Act, which provides for the appointment of a special health officer, and for the licensing of lodging-houses both in the town and along the pilgrims' route.

The District of Puri has an area of 2499 sq. m. The popula- tion in 1901 was 1,017,284, showing an increase of 7-6% in the decade. For the most part the country is flat, the only mountains being a low range which, rising in the west, runs south-east in an irregular line towards the Chilka lake and forms a water-parting between the district and the valley of the Mahanadi. The middle and eastern divisions of the district, forming the south-western part of the Mahanadi delta, consist entirely of alluvial plains, watered by a network of channels through which the most southerly branch of that river, the Koyakhai, finds its way into the sea. The other rivers are the Bhargavi, the Daya and the Nun, all of which flow into the Chilka lake and are navigable by large boats during the rainy season, when the waters come down in tremendous floods, bursting the banks and carrying everything before them. The Chilka lake is one of the largest in India; its length is 44 m., and its breadth in some parts 20 m. It is separated from the sea only by a narrow strip of sand. The lake is saline and everywhere very shallow, its mean depth ranging from 3 to 5 ft. Puri district is rich in historical remains, from the primitive rock-hewn caves of Buddhism — the earliest relics of Indian architecture — to the medieval sun temple at Kanarak and the shrine of Jagannath. The annual rainfall averages 58 in.

Puri first came under British administration in 1803. The only political events in its history since that date have been the rebellion of the maharaja of Khurda in 1804 and the rising of the paiks or peasant militia in 181

7-18. In the Orissa famine of 1866 more than one-third of the population of Puri is said to have perished. The district suffered from drought in 1897. It is served by the East Coast railway, which was opened

throughout from Calcutta to Madras in 1801, with a branch to Puri town.

See Puri District Gazetteer (Calcutta, 1908).

PURIFICATION, in the study of comparative religion, may be defined as the expulsion or elimination by ritual actions and ceremonies from an individual or a community, a place or a dwelling, of the contagion of a taboo (q.v.) or ritual pollution, which is often conceived of as due to the presence of or haunting by an unclean spirit, and having for its effect disease, pain and death. In the higher religions the idea of purification has slowly developed into that of ethical liberation from sin and guilt. This development involves a distinction between the outward act and the inner act or motive, which we do not find even in the relatively advanced codes of the ancient Jews or of the Athenians of the 5th century B.C., for in both of these the taboo or guilt of homicide was the same whether accidentally or wilfully committed. It is part of this development that contrition, remorse and repentance come to be recognized, together with merely ritual acts, such as baptism and sacra- mental meals, as a condition of regaining the lost purity or status. The ethical ideal of atonement and purity of heart is at last attained when, as in the Society of Friends, all ritual acts are abandoned as indifferent to moral progress. The dross of the primitive taboo still encumbers the conscience in churches which insist on outward ritual performances as an element in holiness or moral perfection and purity. The tendency of civilization is more and more to antiquate them as obstacles rather than aids to the formation of character.

In most primitive societies the chief sources of ritual pollution are birth, death, bloodshed, blood, especially menstruous blood. Numberless other things are or have been taboo among different peoples, such as trees, colours, foods and drinks, persons, places, seasons. Persons and things brought even involuntarily into con- tact or association with these are tabooed, and only recover their normal condition by some rite of purification or catharsis. Such rites operate by the transference elsewhere of the stain or impurity contracted. Very generally the impurity is due to the haunting by an unclean spirit or ghost, who must be driven off by exorcists invoking the name of a more powerful and clean spirit, which usually enters the thing or person possessed in place of the unclean. On this side rites of purification may become rites of consecration. In lower civilizations disease and madness are held to be caused by evil spirits which are similarly expelled ; and on this side purificatory rites develop into the medical art. It must be borne in mind that a drug was originally not a

substance succeeding by dint of its chemical properties and physical reactions on our bodies, but a talisman or charm taken internally and succeeding by reason of its magical properties.

Among the methods of purification used widely among different races and in various religions, the following may be enumerated, though the list might be indefinitely extended.

1. Piacular sacrifices, often recurring annually, intended to renew the life of the god in the worshippers. " Without shedding of blood there is no remission of sins " (Heb. ix. 22).

2. Vicarious sacrifice, whereby the guilt of an individual or of a clan is transferred into an animal, like the Jewish scapegoat, which is forthwith destroyed or sent over the frontier.

3. Washing or sprinkling with water, as a rule previously blessed or exorcised ; or with the water of separation (i.e. water mixed with ashes of a red heifer).

4. Washing with gomez, or urine of the sacred cow.

5. Anointing with holy oil.

6. Smearing with the blood, e.g. of the passover lamb or of a pig; or by actual baptism with the blood of an ox as in the Taurobolium (see Mithras).

7. Fumigation with smoke of incense used at sacrifices, the incense itself being the gum of a holy tree and gathered with magical precau- tions.

8. Rubbing with sulphur or other lyes. Use of hellebore, hyssop, &c.

9. Burning with fire objects in which the impurity has been confined.

10. Sprinkling with water in which the cross has been washed (used for flocks and fields in Armenia).

1 1 . Evil spirits are expelled by invocation of the name of a being more powerful than they, and by the introduction of a clean spirit.

12. By fasting.

13. In the old Parsee religion the drugs or demons which infect a corpse can be driven off by the look of certain kinds of dogs.

14. An impure contagion may be removable together with hair, nails or bits

of clothing. Hence the use of the tonsure and the custom of shaving the head in vows.

15. Houses may be purged of evil spirits by sweeping them out with a broom, or by many of the cathartic media above enumerated for purification of the person.

16. By use of salt.

17. By celibacy, virginity and abstention from sexual intercourse.

18. By confession or expulsion of the evil in speech.

19. By spitting and blowing the nose in order to evacuate devils harbouring in the head and throat.

20. By spittle, as in the baptismal rite of the Latins.

21. By passing between fires or jumping through fire.

22. By sitting or standing on or wearing the fleece of a holy animal.

23. By beating and stinging with ants, by branding, tattooing, knocking out of teeth.

24. By circumcision and other more serious mutilations. In many of these rites the old man contaminated in some way is

put off and the mystic is reborn. This idea of rebirth is especially prominent in the blood-bath of the Taurobolium (No. 6) and in Christian baptism (q.v.) ; also in the initiatory rites of various savages who even make a pretence of killing their boys and bringing them back to life again. (F. C. C.)

PURIM, a Jewish festival held on the 14th and 15th of Adar, the last month of the Jewish calendar. According to Jewish tradition it is held in celebration of the deliverance of the Jews from the massacre plotted against them by their enemy Haman in the time of Artaxerxes, who fixed upon the former date by casting "lots" (= Hebrew loan-word Purim). It is preceded by a fast on the 13th day of Adar, known as the Fast of Esther, based upon Esther iv. 16.

Purim is the carnival of the Jewish year. 'Friends exchange gifts, and thus

occasion is taken to relieve the necessities of the poor in the most considerate manner under the guise of gifts. The children masquerade, and their parents are enjoined to drink wine until they cannot distinguish between blessing Mordecai and cursing Haman. The Megillah or Roll of Esther is read both at home and in the synagogue, and wherever, during the reading, the name of Haman is mentioned, it is accompanied with tramping the feet. In former times Haman was burnt in eftigy, holding on to a ring and swinging from one side of the fire • to the other (see L. Ginzberg, Geonica, 1909, pp. 1, 419; Davidson, Parody, pp. 21-22). This custom, which is still observed among the Jews of Caucasia (Tchorni, Sepher ha-Masaoth, pp. 191-192), is very ancient, as it is mentioned in the Talmud (Sanhedrin 64). From the 17th century onward Purim plays were performed mostly by the children, who improvised a dramatic version of the story of Esther. This grew to be the characteristic folk- drama of the ghetto, and has not died out in eastern Europe to the present day.

Much ingenuity has been spent upon the name and origin of the feast. As regards the name, we may dismiss at once the suggestions of J. Fuerst (Kanon des Allen Testaments) that it is derived from the Persian bahar, " spring," and of Hitzig (Geschichte Israels), who derives it from the modern Arabic Phur, " the New Year." These conjectures were made in the pre-scientific era of philology. Scarcely more is to be said in favour of the suggestion made by Von Hammer; but better known in connexion with the name of Lagarde, who connects the name Purim with the old Zoroastrian festival of the dead, entitled Farwardigan. Lagarde, who is followed by Renan, connects this form with the LXX. variant of the Hebrew (Qpovpal) ; but there is absolutely nothing about Purim which suggests any relation with a festival of the dead. Graetz's sugges- tion (Monats. Jud. xxxv. 10 seq.) that it is derived from the Hebrew purah, meaning wine-press (Is. lxiii. 3), obviously fails to connect a spring festival of joyousness with the autumn vine harvest. Zimmern (ZATW xl. 157 seq.) connects Purim with the puchru or assembly of the gods, which forms part of the Babylonian New Year festival Zagmuku, but the inserted guttural is against the identification.

The most plausible etymology connects the name with the Assyrian puru, either in the sense of " turn " of office at the begin- ning of the New Year or in that of " pebble " used for votes or lots, as with the Greek \pHs. It is a curious coincidence, to say the least, that Dieulafoy found among the ruins of the Memnonium at Susa (the ancient Shushan, given as the scene of the events narrated in the Book of Esther) a quadrangular prism bearing different numbers on its four faces. This etymological connexion, suggested by Jensen (Kostnologie, 84), brings the festival of Purim into close relation with the Babylonian New Year festival known as Zagmuku, in which one of the most prominent ceremonials was the celebration of the assembly of the

gods under the presidency of Marduk (Merodach) for the purpose of determining the fates of the New Year. Meissner (ZDMG, i. 296 seq.) and others have suggested that the drunkenness

and masquerading current at the period of Purim are directly derived from the general period of licence allowed at the Sacaea festival of the Babylonian New Year. Even the fact that this latter was celebrated on the first of Nisan, or a fortnight after the Jewish date for Purim, is confirmed by the Book of Esther itself, which states that " In the first month, which is the month Nisan, they cast Pur, that is, the lot, before Haman " (Esther iii. 7-ix. 26). The change of date may have been made in order not to conflict with the Passover on the 15th of Nisan. The connexion that has been suggested between the names of Mordecai and Esther and those of the Assyrian deities Marduk and Ishtar would be a further strong confirmation of the proposed etymology and derivation of the feast (see Esther). Going still further, J. G. Frazer connects Purim with the whole series of spring festivals current in western Asia, in which the old god of vegetation was put to death and a new human representative of him elected and allowed to have royal and divine rights, so as to pro- mote the coming harvest (Golden Bough, 2nd. ed., vol. iii. p. 154 seq.). The death of the god, he suggests, is represented by the Fast of Esther on the 13th of Adar, the day before Purim, while the rejoicing on Purim itself, and the licence accompanying it, recall the union of the god and goddess of vegetation, of which he sees traces in the relations of Mordecai and Esther. There may possibly be " sur- vivals " of the influence of some such celebrations both on the Book of Esther and on the ceremonies of Purim, but there is absolutely no evidence that the Jews took over the interpretation of these festivals with their celebration. Nor is there any record of royal privileges attaching to any person at the period of Purim such as occurs in the festivals with which it is supposed to be connected by Frazer. His further suggestion, therefore, that the ironical crowning of Jesus with the crown of thorns and the inscription over the Cross, together with the selection of Barabbas, had anything to do with the feast of Purim, must be rejected. The connexion of the Passion with the Passover rather than Purim would alone be sufficient to nullify the suggestion. However, it is practically certain, both from the etymology of the word Purim and from the resemblance of the festivals, that the feast, as represented in the Book of Esther, was borrowed from the Persians, who themselves appeared to have adapted it from the Babylonians. This is confirmed by the fact that the Book of Esther contains several Persian words and shows throughout a familiarity with Persian conditions. This renders it impossible to accept Haupt's suggestion that Purim is connected with the celebration of Nicanor's Day, to celebrate the triumph of Judas Maccabaeus over the Syrian general Nicanor at Adasa (161 b.c.) on the 13th of Adar, since this is the date of the Fast of Esther, and, besides, the

Second Book of Maccabees, which refers to Nicanor's Day, speaks of it as the day before Mordecai's Day (2 Mace. xvi. 36). If, as seems probable, the earlier Greek version of the Book of Esther was made about 179 B.C. (Swete, Introduction of the Old Testament in Greek, p. 25), this suggestion of the connexion of Purim with the Maccabean period made by Haupt and, before him, by Willrich, falls to the ground.

At the same time it is difficult to understand why Jews in Palestine and Egypt should have accepted a purely Persian or Babylonian festival long after they had ceased to be connected with the Persian Empire. One can understand its adoption during, or soon after, the reign of Cyrus, whose policy was so favourable to the Jews, and it might easily have become as popular among them as Christmas tends to become among modern Jews. When the exiles returned from Babylon they probably brought back with them the practice of keeping the festival.

The date at which the feast of Purim was first adopted by the Jews from their Persian neighbours would be definitely deter- mined if we knew the date of the Book of Esther. The festival is first mentioned in 2 Mace. xv. 36, and from that time onwards has formed one of the most popular festivals of the Jewish calendar. It became customary to burn an effigy of Haman at the conclusion of the feast, and this was regarded as in some ways an attack on Christianity and was therefore forbidden by the Theodosian code, XVI. viii. 18. This prohibition may have been due to the fact mentioned by Socrates (Hist, eccles. vii.) that, in 416 a.d., the Jews of Inmester, a town in Syria, ill- treated a Christian child during some Purim pranks and caused his death. It has even been suggested that this gave rise to the myth of the blood accusation in which Jews are alleged to sacri- fice a Christian child at Passover; but this is unlikely, since it has never been suggested that this crime was committed in connexion with Purim. But Jewish sources of the 10th century state that the custom of burning an effigy of Haman was still kept up at that time (L. Ginzberg, Geonica, ii.), and this is confirmed by Albiruni (Chronology, tr. Sachau, 273) and Makrizi, and indeed the custom was carried on down to the present century by Jewish children, who treated Haman as a sort of Guy Fawkes. Frazer suggests (loc. cit. 172) that this is a survival

of the burning of the man-god, like Hercules or Sandan, who again represented the old spirit of vegetation which was dying away in spring to revive with the new vegetation. The earliest mention, however, of this burning of Haman in effigy cannot be traced back earlier than the Talmud

in the 5th century.

In connexion with Purim many quaint customs were intro- duced by the Jews of later times. All means are adapted to increase the hilarity of the two days, which are filled with feasting, dancing, singing and making merry generally. In Germany it was even customary for men to dress up as women, and women as men, against the command of Deut. xxii. 5. In Frankfort the women were allowed to open their lattice windows in the synagogue in honour of the deliverance brought about by Esther. Execration of Haman, as the typical persecutor of the Jews, took various forms. In Germany wooden mallets were used in the synagogue to beat the benches when Haman's name was read out from the scroll of Esther, and during the festivities these mallets were sometimes used on the heads of the by- standers. Cakes were made of a certain shape to be eaten by the children, which were called, in Germany, Hamantaschen (Haman-pockets) and Hamanohren (Haman-ears), and in Italy, Orecchie d'Aman. In Italy a puppet representing Haman was set up on high amidst shouts of vengeance and blowing of trumpets. In Caucasus the women made a wooden, block to represent Haman, which, on being discovered by the men on their return to the synagogue, was thrown into the fire. Besides gifts to friends, parents made Purim gifts to their children, especially in the form of Purim cakes. To preside over these festivities it was customary to have a master of the ceremonies, who was called king in Provence, somewhat after the manner of the Feast of Fools. In later days the same function was performed by the Purim Rabbi, who often indulged in parodies of the ritual.

With Purim is connected the only trace of a true folk-drama among Jews. The first Spanish drama written by Jews was , entitled " Esther," by Solomon Usque and Lazaro Gratiano, published in 1567; and there is another entitled " Comedia famosa de Aman y Mordechay," produced anonymously in Leiden in 1699. Among the German Jews Purim-Spiele were frequent and can be traced back to the 16th century, where there is reference to their being regularly performed at Tannhausen. The earliest one of these printed was entitled " Ahaswerosh- Spiel," appeared at Frankfort in 1708, and was reprinted by Schudt in Juedische Merck-Wuerdigkeiten, ii. 314 seq. These were followed by a large number of similar reproductions, none of any great merit, but often showing ingenuity in parodying more serious portions of the Jewish ritual (Davidson, Parody, pp. 27, 50, 199-203).

Besides the general festival of Purim, various communities of Jews have instituted special local Purims to commemorate occasions when they have been saved from disaster. Thus the Jews of Cairo celebrated Purim on the 28th of Adar in memory of their being miraculously saved from the persecution of Ahmed Pasha in 1524. The Jews of Frankfort celebrate their

special Purim on the 20th of Adar because of their deliverance from persecution by Fettmilch in 1616. The Jews of Algiers similarly celebrated the repulse of the emperor Charles V. in 1541, by which they escaped coming once more into the yoke of the Spaniards. Similar occasions for rejoicing were introduced by individuals into their families to celebrate their escape from danger. Thus Abraham Danzig celebrated in this manner his escape from the results of an explosion of a powder magazine at Wilna in 1804. Rabbi Enoch Altschul of Prague recorded his own escape on the 22nd of Tebet 1623 in a special roll or megillah, which was to be read by his family on that date with rejoicing similar to the general Purim. David Brandeis of Jung-Bunzlau in Bohemia was saved from an accusation of

poisoning on the 10th of Adar 1731, and instituted a similar family Purim celebration in consequence.

See Biblical Dictionaries of Hastings and Cheyne, s.v. ; Jew. Ency., s.v. "Purim"; "Purim Plays," "Purims, Special"; W. Erbt, Die Purimsage (Berlin, 1900); Abrahams, Jewish Life in

the Middle Ages; Lagarde, Purim, ein Beitrag zur Geschichte der Religion (Gottingen, 1885); Steinschneider, Purim und Parodie (Berlin ; 1902) ; P. Haupt, Purim (Leipzig, 1906) ; Davidson, Parody in Jewish Literature, pp. 21, 27, 30, 135-9 (New York, 1908).

a- ja.)

PURIN, C5H4N4, in chemistry, the name given by Emil Fischer to the parent substance of a large group of compounds, the more important of which are sarcine, xanthine, uric acid, adenine, paraxanthine, guanine, theophylline, theobromine and caffeine. Its formula is shown in the , \i\T = = ptr(fi 'i inset, the positions taken by sub- (2)HC(OONH

_C-N> CH W

(4) (9)

Purin

Nch.

stituent atoms or groups being num- bered as shown. E. Fischer (Ber., 31, (3)N — C— N/ p. 2564) obtained it in 1898 by reduc ing 2-6-di-iodo purin, obtained from 2-6-8 trichlor purin (see below sub Uric acid), hydriodic acid and phosphonium iodide at o°, with zinc dust and water, the zinc double salt so obtained being decomposed by sulphuretted hydrogen, the precipitated zinc sulphide filtered off and the solution concentrated. It

has also been synthesized by O. Isay (Ber., 1906, 39, p. 25c) from 5-nitro-uracil. This substance with phosphorus oxychloride gives 2-4-dichlor-5-nitro pyrimidine, which with ammonia gives 4-amino-2-chlor-5-nitro pyrimidine; by reducing this compound with hydriodic acid and phos-phonium iodide, 4- 5-diamino-pyrimidine is obtained, which with formic acid furnishes purin; thus: —

NH-CH N:CH N-.CH N:CH N:CH

COC-N0 2 -ˆClCC-N0 2 -ˆClCC-N0 2 ->HCCNH 2 ->HCCNH

NhIcO N-'CCI N-C-NH 2 N-C-NH 2 U-X>

Purin crystallizes in microscopic needles, which melt at 2r6° C. It possesses the properties of both an acid and a base. It is characterized by its ready solubility in water and by its stability towards oxidizing agents.

Oxypurins. — Sarcine or hypoxanthine, C5H4N4O, is 6-oxypurin. It is found in many animal liquids and organs and in the seeds of many plants, and was discovered by J. Scherer in milk {Ann. 1850, 73, p. 328) and by A. Strecker in muscle. It crystallizes in needles which decompose at 150 C. It was synthesized by E. Fischer (Ber., 1897, 30, p. 2228) by heating 2-6-8-trichlorpurin with aqueous caustic potash, and reducing the dichlorhypoxanthine so obtained by hydriodic acid. Its aqueous solution shows acid properties, decompos- ing carbonates. It also forms a hydrochloride, C 6 H4N40-H0-H 2 0. When oxidized by hydrochloric acid and potassium chlorate it yields alloxan and urea, whilst with potassium permanganate it gives oxalic acid.

3-Methylhypoxanthine was synthesized by W. Traube and F. Winter (Arch. Pharm., 1906, 244, p. 11), whilst 8-oxypurin was obtained by E. Fischer and L. Ach in 1897 (Ber., 30, p. 2213), and by O. Isay (Ber., 1906, 39, p. 251).

Xanthine, C6H4N40 2 , or 2-6-dioxypurin, was discovered in 1817 by Marcet in a urinary calculus; it also occurs in various animal organs (the liver, pancreas and muscular tissue), in urine, and in beetroot juice. It may be prepared by boiling nuclein with water (A. Kossel, Zeit. physiol. Chem., 1880, 4, p. 290); by the decomposi- tion of guanine with nitrous acid (A. Strecker, Ann., 1858, 108, p. 1 4 1) ; and by heating the f ormyl derivative of 4- 5-diamino-2 • 6-dioxy- pyrimidine to 120° C. (W. Traube, Ber., 1900, 33, p. 3035). This pyrimidine is prepared from cyanacetyl urea, which on treatment with a concentrated solution of sodium hydroxide is converted into 4-amino-2-6-dioxypyrimidine. The isonitroso derivative of this compound is then reduced by ammonium sulphide to 4'5-diamino- 2-6-

dioxypyrimidine, the formyl derivative of which, on heating passes into xanthine.

COCH2 COCH 2 CO-C:NOH CO-C-NH 2 CO-CNH

II II M I II -10. >CH.

NHCN-ˆNHC:NH-}NHC:NHˆNHC-NH 2 ->NH C— Nˆ CONH 2 CO-NH CO-NH CO-NH CO— NH

It decomposes when heated, giving ammonia, carbon dioxide and hydrocyanic acid. It possesses both acid and basic properties. When heated with concentrated hydrochloric acid to 220° C, it decomposes into carbon dioxide, ammonia, glycine and formic acid. Potassium chlorate and hydrochloric acid oxidize it to alloxan and urea. Methylation of its lead salt gives theobromine.

The isomeric 6-8-dioxypurin was prepared by E. Fischer and L. Ach (loc. cit).

i-Methylxanthine was found in urine by M. Kriiger and G. Salomon (Zeit. physiol. Chem., 1897, 24, p. 364) ; ymethylxanthine was obtained by E. Fischer and F. Ach (Ber., 1898, 30, 1980) from 3-methyl uric

PURIN

acid; and 7-methylxanthine or heteroxanthine, which is found in human urine, may be obtained from theobromine (E. Fischer, Ber., ‘ 8 97. 3°. P- 2400; see also ibid., 1898, 31, p. 117).

Theophylline, C 6 (CH 3) 2 H 2 2 N4, or l-3-dimethyl-2-6-dioxypurin, was isolated by A, Kossel from tea-leaves (Ber., 1888, 21, p. 2164). It was synthesized by E. Fischer and L. Ach {Ber., 1895, 28, p. 3135) from i-3-dimethyl uric acid, which on treatment with phosphorus pentachloride yields chlortheophylline, from which theophylline is obtained by reduction with hydriodic acid. W. Traube (Ber., 1900, 33.. P- 3°35) formed the nitroso derivative of iminodimethyl barbi- turic acid (obtained by the action of phosphorus oxychloride on cyanacetic acid and dimethyl urea), and reduced it by ammo- nium sulphide to l-3-dimethyl-4-5-diamino-2-6-dioxypyrimidine, the formyl derivative of which, when heated to 250 C, loses the elements of water and yields theophylline (cf. Xanthine). It behaves as a weak base. When oxidized by potassium chlorate and hydro-chloric acid it yields dimethylalloxan. Its silver salt on methylation yields caffeine.

The isomeric Paraxanthine, or l7-dimethyl-2-6-dioxypurin, occurs in urine.

It has been obtained from theobromine (E. Fischer, Ber., 1897, 30, p. 2400); from 17-dimethyl uric acid (E. Fischer and H. Clemm, Ber., 1898, 31, p. 2622); and from 8-chlorcaffeine (E Fischer, Ber., 1906, 39, p. 423). On methylation it yields caffeine.

A third isomer Theobromine, or 37-dimethyl-2-6-dioxypurin, is found in the cocoa-bean (from Theobroma cacao) and in the kola-nut. It is obtained by methylating xanthine, or from 3-7-dimethyl uric acid (E. Fischer, Ber., 1897, 30, p. 1839). This acid, by the action of phosphorus oxychloride and pentachloride, is converted into 37-dimethyl-6-chlor-2-8-dioxypurin, which with ammonia gives the corresponding amino compound. This substance with phos- phorus oxychloride yields 37-dimethyl-6-amino-2-oxy-8-chlorpurin, which on reduction with hydriodic acid leads to 37-dimethyl-6- amino-2-oxypurin, from which theobromine is obtained by the action of nitrous acid. It is also obtained by W. Traube's method (Ber., 1900, 33, p. 3047) from cyanacetyl methyl urea, which gives 3-methyl-4-5-diamino-2-6-dioxypyrimidine, whose formyl deriva- tive yields 3-methylxanthine, from which theobromine is obtained by methylation. It crystallizes in anhydrous needles which sublime at 290-295° C. It behaves as a weak base. Potassium chlorate and hydrochloric acid oxidize it to methyl alloxan and methyl urea, chromic acid mixture oxidizes it to carbon dioxide, methylamine and methylparabanic acid. When boiled with baryta it yields carbon dioxide, ammonia, methylamine, formic acid and sarcosine. Methy- lation of its silver salt yields caffeine.

Caffeine, C 6 H(CH 3) 3 N 4 2 , is l-37-trimethyl-2-6-dioxypurin. For its general properties and method of extraction see Caffeine. It may be synthesized by methylating chlortheophylline and re- ducing the resulting product (E. Fischer and L. Ach, Ber., 1895, 28, P-.3 X 35); by the action of phosphorus oxychloride on tetramethyl uric acid, the resulting chlorcaffeine being reduced (Ber., 1897, 30 p. 3010); from dimethylalloxan (Ber., 1897, 30, p. 564)- from 3-methyl uric acid (Ber., 1898, 31, p. 1980), and from l-3-dimethyl- 4-5-diamino-2-6-dioxypynmidine (W. Traube, Ber., 1900, 33, p. 3042)- The three latter methods may be outlined as follows. Di- methylalloxan (I.) condenses with methylamine in the presence of sulphurous acid to form an addition product (II.), which on hydrolysis yields i-37-tnmethyl uramil; this substance gives with potassium cyanate, I -37-tnmethyl pseudo-uric acid (III.), which on dehydration yields I -37-tnmethyl uric acid (hydroxycaffeine) ; this substance with phosphorus pentachloride gives chlorcaffeine, which yields caffeine (IV.) on reduction: —

H3CNCO HaC-N-CO H 3 C-N-CO H 3 C-N-CO

OC CO-> OC CH.NHCH 3 -OC CH-n/^ OC (W

I I \CO-NH 2 I I >CH

*3 C-N-CO H 3 C-N-C-N-^*

(HI.) (IV.)

3-Methyl uric acid (I.) (H. Hill, Ber., 1876, 9, p. 370) by the action of phosphorus oxychloride is converted into 3-methyl-2-6-dioxy-8- chlorpurin (3-methyl-chlorxanthine) (II.), which, on treatment with methyl iodide in alkaline solution, eives rh1nrthpr.hrr,m;no CTTI -i fro lat

663

-NHCH

H 3 C-N-CO HaC-N-CO]

(I.) (II.)

11 1" """"""•""" = / \ ll Ji »mu, 011 treatment witn ... ,■ »«""" < = •" alkaline solution, gives chlortheobromine (III.), >m which chlorcaffeine (IV.) can be obtained by further methy lon : — '

HN'-CO CO C-NH.

HN-CO I

CH

CH3N-CO lu c-iSH v -> OC C-NHv -» OC C-N/ 0113 -> OC C-N' /

HN-CO

oc'

(I.)

(II.)

(III.)

CH 3 "i-CCl

(IV).

Dimethyl-diamino-dioxypyrimidine (see Theophyllin above) yields a formyl derivative which on treatment with sodium ethylate furnishes a sodium salt. This salt heated for some hours with methyl iodide yields caffeine.

The constitution of caffeine was settled by E. Fischer (Ann., I882, 215, p. 253). Earlier investigations had shown that oxidation with nitric acid gave dimethylparabanic acid or cholesterophane J. btenhouse, Ann., 1843, 45, p. 366) ; that chlorine water oxidized

it to amalic acid or tetramethyl alloxantin (Fr. Rochleder, Ann 1849, 71 p. 1), and that hydrolysis with baryta gave caffeidine (A. Strecker, Ann., 1862, 123, p. 360), which could be further hydro- /?? e c 1° , sarcoslne ‘ methylamine, formic acid and carbon dioxide (O. Schultzen, Zeit. f. Chemie, 1867, p. 614). Fischer confirmed these results and showed further that oxidation with chlorine water gave monomethyl urea and dimethyl alloxan, pointing to the pres- ence of three methyl groups in the molecule. Further, on bromi- nation, a brom-derivative is obtained which on treatment with alcoholic potash yields ethoxy-caffeine, which readily hydrolyses to hydroxy-caffeine. This substance behaves as an unsaturated com- pound and combines with a molecule of bromine to form a derivative which on treatment with alcoholic potash yields diethoxy-hydroxy-caffeine. Diethoxy-hydroxycaffeine on hydrolysis with concen- trated hydrochloric acid yields apocaffeine, C 7 H 7 N 3 O s , and hypo- caffeine, C 6 H 7 N 3 3 :

C 8 H 9 (OC 2 H 6) 2 (OH)N 4 2

<N-C (I.)

H s

JiCrH 7 N s 05+CH3NH2+2C 2 H 5 OH K6H 7 N 3 3 +C02+CH 3 NH 2 +2C 2 H 5 OH. Apocaffeine when boiled with water loses carbon dioxide and yields caffuncacid, C 6 H 9 N 3 04, which on hydrolysis with basic lead acetate is converted into mesoxalic acid, methylamine and monomethyl urea Reduction of caff uric acid yields hydrocaffuric acid, C 8 H 9 N 2 3 which readily hydrolyses to methyl hydantoin. Consequently hydrocaffuric and caffuric acids, apocaffeine and caffeine must contain the grouping (I.). Hypocaffeine on hydrolysis loses carbon dioxide and gives caffolin, C 6 H 9 N 3 2 , which on oxidation with alkaline potassium femcyanide yields monomethyl urea and methyl oxamic acid, whilst if oxidized by alkaline potassium permanganate it yields dimethyl oxamide. Hence caffolin contains the grouping (II.), and in consequence of its close relationship to hydrocaffuric acid is to be written as (III.). It follows that the caffeine molecule must be written as (IV.), a result confirmed by the later synthesis of caffeine itself from dimethyl alloxan (see above).

9 Hs CH 3 CH S H 3 C CO-NCH 3

•N-C-C .N-C /N-CHOH .N-C to

\n-6nCH°\N:CNH.CH 8 > CH \ N -C • N-CH 3 < n -) (HI.) (IV.)

The above decomposition products of caffeine probably possess the following constitutions : —

CH3-NC(C0 2 H)OCO CH 3 NCHOCO H 3 CNC (OH) (C0 2 H) H 3 CNCHOH 0C I I °? i col col

N:C— NCH 3 N:t- N-CH 3 N.C-NHCH 3 N-C-NHCH,

Apocaffeine. Hypocaffeine. Caffuric acid. Caffolin/

Uric acid, CjHiN^,, or 2-6-8-trioxypurin, was discovered in 1776 in urinary calculi by Scheele. It is found in the juice of the muscles, in blood, in urine, in the excrement of serpents and birds and in guano. The determination of the constitution and of the relation of uric acid to the other members of the group has been a process of gradual growth. G. Brugnatelli ((Zornale di fisica chemtca, &c, di Brugnatelli, 1818, n, pp. 38, 117) obtained alloxan and W. Prout (Phil. Trans., 1818, p. 420) obtained ammonium purpurate from uric acid, but the first elaborate investigation on the acid was by J. v. Liebig and F. Wohler (Ann., 1838, 26 p 241) who obtained from it allantoin, alloxantin, dialuric acid, parabanic acid, oxalunc acid, mesoxalic acid, &c. Further examination of the group was undertaken by A. Schlieper (Ann., 1845, 5s p 2 <;6- 56, p. 1), who obtained hydurilic acid and dilituric acid, and 'by A v' Baeyer (Ann 1863, 127, pp. 1, 199; 1864, 130, p. 129; 131, p . 291)' who showed that uric acid and many of its derivatives may be looked on as derivatives of barbituric acid. In 1875 L. Medicus (Ann i875. 1.75. P- 230) proposed the formula (I.) for the acid, whilst R. Fittig m 1877 (Traite de chim. org., p. 324 [1878]) suggested the formula (II.) ; subsequent investigations of R. Behrend and HN-CO HN-C NH

(I.) OC C-NH V (II.) OC I I >C0

■•C-NH/

■COCO NH

HN-C-NH/ HN-C

of E. Fischer showed the first formula to be correct. The first synthases of uric acid are due to J. Horbaczewski (Monats., 1882 P'n 79 6 ‘, I ° 85 ‘ P- 356) ‘ wh ? obtained very poor yields. These were followed by the more satisfactory, methods of R. Behrend and O. Roosen (Ann., 1888 251 p.

235) of E. Fischer and L. Ach (Ber., 1895, 28 p. 2473) and of W. Traube (Ber., 1900, 33, p. 303O. Hor- baczewski obtained the acid by heating urea with ammo-acetic acid (glycine) to 200-230 C, and by fusing urea with trichlorlac- tamide. In Behrend's method acetoacetic ester and urea (I.) are condensed and the resulting /3-uramidocrotonic ester (II.) on hydro- lysis gives methyl uracil (III.), which on treatment with concentrated nitric acid yields nitro-uracil carboxylic acid (IV.). This acid when boiled with water loses carbon dioxide, forming nitro-uracil uin A •/"• reduction gives amido-uracil (VI.) and oxy-uracH (VII). Oxidation of oxy-uracil with bromine water leads to dioxy- uraal (VIII.), which when heated with urea and concentrated sulphuric acid yields uric acid (IX.) : —

HsC-C-OH H 2 N-CO H s C-C-NH-CO-NH 2 H 3 C-C-NH— CO

CH-C0 2 C 2 H 6 + H 2 ft-> CH-C0 2 C 2 H 5 ~> CH-CO-NH

(i.) (id 4(in.)

HC-NH-CO HC-NH-CO H0 2 C-C-NH-CO

H 2 N-C-CO-NHˆ-0 2 N-C-CO-NHˆ 2 N-C-CO-NH

4, (vi.) (v.) (iv.)

HC-NH-CO HO-C-NH-CO .NH-C-NH-CO

+ 11 I -> II I ->CO< || |

HO-C-CO-NH HO-C-CO-NH x NH-C-CO-NH

(VII.) (VIII.) (IX.)

E. Fischer dehydrated pseudo-uric acid (formed from potassium cyanate and uramil) by heating it with anhydrous oxalic acid to 185 C, or with a large excess of 20% hydrochloric acid (Ber., 1897, 30, p. 560), and so obtained uric acid. This method is quite general. W. Traube condenses the sulphate of 4 • 5-diamino-2 ■ 6-dioxy- pyrimidine (I.) (see Xanthine, above) with chlorcarbonic ester. The resulting urethane (II.) when heated to 180-190 C loses a molecule of alcohol, giving uric acid (III.).

HN-CO-C-NH 2 HN-CO-C-NHC0 2 C 2 H 5 HN-CO-C-NH

I II -ˆ I II -» I II > co

OC-NH-C-NH 2 OC-NH-C-NH 7

(II.) (HI.)

OC-NHC-NH 2

(I.)

Uric acid is a white, microcrystalline powder. It is odourless and tasteless, and is insoluble in most reagents. Its solubility in water is increased by the presence of various inorganic salts, such as sodium phosphate, sodium acetate, borax, and particularly by lithium carbonate. It dissolves completely in concentrated sul- phuric acid, but is reprecipitated on the addition of water. It behaves as a weak dibasic acid. It is decomposed by heat into ammonia, urea, cyanuric acid and carbon dioxide. On fusion with caustic alkalis it yields alkaline cyanide, cyanate, oxalate and carbonate. It may be recognized by means of the " murexide " reaction, which consists in evaporating the acid to dryness with nitric acid, when a yellowish residue is obtained which becomes purple-red if moistened with ammonia. On the quantitative estimation of uric acid see F. W. Tunnicliffe (Chem. Centralb., 1897, 11, p. 987; E. H. Bartley, ibid., p. 644 and F. G. Hopkins, Chem. News, 1892, 66, p. 106).

Methyl Uric Acids. — i-Methyl uric acid was prepared by E. Fischer and H. Clemm (Ber., 1897, 30, p. 3091) from monomethyl alloxan and ammonium sulphite, which condense together to form i-methyluramil. This, with potassium cyanate, gives i-methyl- 41ˆ-uric acid, which on dehydration gives i-methyl uric acid. 3- or a-Methyl uric acid was prepared by Hill (Ber., 1876, 9i P- 37°) by heating acid lead urate with methyl iodide. It is best obtained by heating 3-methyl chlorxanthine with hydrochloric acid to 125 C. (E. Fischer, Ber., 1898, 31, p. 1984). 7- or 7-Methyl uric acid is prepared by heating 7-methyl-2 • 6 ■ 8-trichlorpurin (which results from phosphorus pentachloride and theobromine) with hydrochloric acid to 130° C, or by the condensation of alloxan with methylamine in the presence of sulphur dioxide (E. Fischer, Ber., 1897, 30, p. 563; cf. i-methyl uric acid). It is the most soluble in water of the methyl uric acids. 9- or /3-Methyl uric acid was obtained by E. Fischer (Ber., 1884, 17, pp. 332, 1777) by heating normal lead urate with methyl iodide to ioo° C. The product so obtained was converted by the action of phosphorus oxychloride and pentachloride into 9-methyl-8-oxy-2 • 6-dichlorpurin, and this when heated with hydrochloric acid to 140 C. gave the required methyl uric acid. It is distinguished from 3-methyl uric acid by its much smaller solubility in water and by the greater stability of its ammo- nium salt. A fifth isomer, 5-methyl uric acid, has been described by \V. v. Loeben (Ann., 1897, 298, p. 181) who obtained it by con- densing

acetoacetic ester and monomethyl urea according to Beh- rend's method. The constitution of this acid is not definitely known.

I '3 or 7-Dimethyl uric acid is obtained by converting dimethyl alloxan into dimethyluramil, which with potassium cyanate gives dimethyl-i/'-uric acid; this acid is then dehydrated (E. Fischer, Ber., 1895, 28, p. 2475; 1897, 30, p. 560). i-7-Dimethyl uric acid is similarly obtained by starting with monomethyl alloxan and methyl- amine (E. Fischer and H. Clemm, Ber., 1897, 30, p. 3095).

i-9-Dimethyl uric acid is obtained from 9-methyl-8-oxy-2 • 6- dichlorpurin (see g-Methyl uric acid above). By successive treat- ment with ammonia and nitrous acid this is converted into 9-methyl- 6 • 8-dioxy-2-chlorpurin, which on condensation with formaldehyde in alkaline solution yields 9-methyl-7-oxymethyl-6 ■ 8-dioxy-2-chlor- purin. Methylation of this latter compound introduces a methyl group into position I, and the dimethyl compound so formed on dilution with water and the simultaneous action of superheated steam yields i-9-dimethyl-6 • 8-dioxy-2-chlorpurin, from which l-9-dimethyl uric acid is obtained by hydrolysis with concentrated hydrochloric acid at 100 C. (E. Fischer, and F. Ach Ber., 1899, 32, P-257). 3-7 or 5-Dimethyl uric acid is prepared by methylating 7-methyl uric acid (E. Fischer, Ber., 1897, 30, p. 564) or by heating bromtheobromine with alkalis (Ber., 1895, 28, p. 2482). 3-9-Dime- thyl uric acid is prepared by heating neutral lead urate with methyl iodide (H. B. Hill and C. F. Mabery,/lmer. Chem. Journ., 1880-1881,2,

308) and by methylating 3-methyl uric acid (E. Fischer, Ber., 1899, 32, p. .269). 7-9 or /3-Dimethyl uric acid is prepared by heat- ing 7'9-dimethyl-8-oxy-2-6-dichlorpurin with hydrochloric acid to 130° C.

i-3-7-Trimethyl uric acid or hydroxycaffeine, may be prepared from caffeine, or by direct methylation of uric acid at 0° C. (E. Fischer). i-3-9-Trimethyl uric acid is prepared by methylating i-3-dimethyl uric acid (E. Fischer and L. Ach, Ber., 1895, 28, p. 2478). i-7-9-Trimethyl uric acid is prepared by methylating 9-methyl-6-8-dioxy-2-chlorpurin (see i-p-dimethyl uric acid, above) and heating the resulting trimethyl dioxychlorpurin with concen- trated hydrochloric acid to IIO-115 C. (E. Fischer and F. Ach, Ber., 1899, 32, p. 256).

Tetramethyl uric acid was first prepared (Ber., 1884, 17, p. 1784) by methylating 3-7-9-trimethyl uric acid. It may also be obtained by methylating uric acid and the other methyl uric acids. It has a neutral reaction.

Aminopurins. — Adenine is 6-aminopurin. It has been found in ox

pancreas and also in tea. It is prepared by heating 2-6-8- trichlorpurin with ammonia, and reducing the resulting 6-amino- 2-8-dichlorpurin with hydriodic acid; or by heating 8-oxy-2-6- dichlorpurin (from uric acid and phosphorus oxychloride) with alcoholic ammonia to obtain 8-oxy-2-chlor-6-aminopurin, which with phosphorus oxychloride at 140° C, gives 6-amino-2-8-dichlor- purin. Reduction of this compound with hydriodic acid yields adenine (E. Fischer, Ber., 1897, 30, p. 2238; 1898, 31, p. 104). It crystallizes from water in leaflets which contain three molecules of water of crystallization. The anhydrous base melts at 360-365° C. Nitrous acid converts it into hypoxanthine; whilst hydrochloric acid at 180-200° C. decomposes it completely into ammonia, carbon dioxide, formic acid and glycocoll (A. Kossel, Ber., 1890, 23, p. 225; 1893, 26, p. 1914).

Isoadenine or 2-aminopunn, is obtained from 2-4-dichlor-5-nitro-pyrimidine (see Purin, above) by heating it with ammonia, when 2-4-diamino-5-nitropyrimidine is formed. Reduction of this compound by means of stannous chloride and hydrochloric acid gives 2-4'5-triaminopyrimidine which readily condenses with formic acid to isoadenine (O. Isay, Ber., 1906, 39, p. 250). It has also been obtained by J. Tafel and B. Ach (Ber., 1901, 34, p. 1 177) by the electrolytic reduction of guanine to desoxyguanine, the acetate of which is warmed with bromine and subsequently oxidized. 9-Methyl adenine was first obtained by I. Kriiger (Zeit.f. physiol. Chem., 1894, 18, p. 434) by methylating adenine, and has been synthesized by E. Fischer (Ber., 1898, 31, p. 104) from 9-methyl-2-6-dichlor-8-oxypurin. For 7-methyl adenine see E. Fischer, Ber., 1898, 31, p. 104.

Guanine, or 2-amino-6-oxypurin, is found in the pancreas of various animals and also very abundantly in guano, from which it was first extracted by B. Unger (Ann., 1844, 51, p. 395; 1846, 58, p. 18). It has been obtained synthetically from 6-oxy-2-8-dichlorpurin (E. Fischer, Ber., 1897, 30, p. 2252) by heating it with alcoholic ammonia to 150° C. and reducing the resulting 6-oxy-2-amino-8- chlorpurin with hydriodic acid. W. Traube (Ber., 1900, 33, p. 1371) condensed cyanacetic ester with guanidine and the resulting com- pound (I.) with caustic soda gives 2-4-diamino-6-oxypyrimidine (II.). This substance yields an isonitroso-derivative which on reduc- tion with ammonium sulphide gives 2-4-5-triamino-6-oxypyrimidine (III.), from which guanine (IV.) is obtained by heating with concen- trated formic acid : —

HN-CO N:C-OH N:C-OH HN-CO

HN:CCH 2 ->H 2 N-C CH ->H 2 N-C C-NH 2 ->H 2 N-CC-NR

II II II II II II II >CH

H 2 NCN N-C-NH 2 N-C-NH 2 N-C-Nˆ

(I.) (II.) (III.) (IV.)

It may also be obtained as follows [E. Merck, German Patents 158591 (1903); 162336 (1904)!. Dicyandiamide (I.) condenses with cyanacetic ester to form 2-eyanamino-4-amino-6-oxypyrimidine (II.). This yields an isonitroso-derivative which on reduction gives 2-cyanamino-4-5-diamino-6-oxypyrimidine (III.). This compound when boiled with a 90% solution of formic acid gives guanine formate : —

NH N-C-NHj N-C-NH 2

CN-NH-C -> CN-NH-C CH -$> CN-NH-C C-NH 2 NH 2 N:C-OH N:C-OH

(I.) (II.) . ("I-)

It is an amorphous powder, insoluble in water, alcohol and ether, and has both acid and basic properties. Nitrous acid converts it into xanthine. When oxidized by hydrochloric acid and potassium chlorate it yields guanidine, parabanic acid and carbon dioxide.

6-Amino-2-oxypurin, an isomer of guanine, is prepared by heat- ing dichloradenine or 6-amino-2-6-8-trichlorpurin, obtained from 2-6-8 trichlorpurin and ammonia (Fischer, Ber., 1897, 30, p. 2239) with sodium ethylate to 130° C. and reducing the resulting 6-amino-2- ethoxy-8-chlorpurin with hydriodic acid (E. Fischer, Ber., 1897, 30, p. 2245). 6-Amino-8-oxypurin, another isomer of guanine, is prepared by heating 8-oxy-2 -6-dichlorpurin with alcoholic ammonia and reducing the resulting amino-oxy-chlor compound with hydri- odic acid (E. Fischer, loc. cit.).

7-Methyl guanine is obtained from 7-methyl-6-oxy-2-chlorpurin (see above) by the action of aqueous ammonia at 150 C. It also results instead of the expected 7-methyl-2-oxy-6-aminopurin, when 7-methyl-6-amino-2-chlorpurin is treated with dilute alkalis (E. Fischer, Ber., 1898, 31, p. 542), owing to ring splitting in the i-6-position, followed by eliminating of halogen acid.

Thiopurins. — W. Traube (Ann., 1904, 331, pp. 66 seq.) has obtained many compounds of the purin group by using thiourea, which is condensed with cyanacetic ester, &c, to form thiopyrimidines. These in turn yield

thiopurins, which on oxidation with dilute nitric acid are converted into purin compounds, thus: —

H 2 N C0 2 R HN-CO HN-CO

SC + CHj

I

-»

—>

SCC-NH 2

i

HN-CO >SC C-NH

I II >CH. HN-C-N ”

SCCH 2

II H 2 N CN HN-C:NH HNC-NH 2

Various thiopurins have been obtained by E. Fischer (Ber.,

1S98, 31, p. 431), principally by acting with potassium

sulphydrate on chlorinated purin compounds.

2-6-8-Trithiopurin is obtained from the corresponding trichlor- purin and potassium sulphydrate. It forms a light yellow mass which carbonizes on heating. It is almost insoluble in water and alcohol; but readily dissolves in dilute solutions of the caustic alkalis and of ammonia.

Much work has been done by J. Tafel (Ber., 1900, seq.) on the electrolytic reduction of the members of the purin group. The substance to be reduced is dissolved in a 50-75 % solution of sul- phuric acid and placed in a porous cell containing a lead cathode, the whole being then placed in a 20-60% solution of sulphuric acid in the anode cell. It is found that xanthine and its homologues take up four atoms of hydrogen per molecule and give rise to the so-called desoxy-compounds, which are stronger bases than the original substances. Uric acid takes up six hydrogen atoms per molecule and gives purone, CsHsNiOj, and it is apparently the oxygen atom attached to the carbon atom number 6 which is replaced by hydrogen, since when purone is heated with baryta, two molecules of carbon dioxide

are liberated for one of purone. Consequently purone must contain two urea residues, which necessi- tates the presence of the > CO groups in positions 2 and 8. (F. G. P.)*

PURITANISM (Lat. puritas, purity), the name given — originally perhaps in a hostile sense on the analogy of Catharism (see Cathars) — to the movement for greater strictness of life and simplicity in worship which grew up in the Church of England in the 16th century among those who thought that there had not been a sufficient divergence from the Roman Church, and which ultimately led to the rise of a number of separatist denomina- tions. Thomas Fuller (Church History) traces the earliest use of the term "Puritan" 101564. The terms " Precisian," " Puritan," " Presbyterian," were all used by Archbishop Parker in his letters about this time as nicknames for the same party, and ten years later the name was in common use.

See England, Church of; Congregationalism; Presby- terianism, &c. ; also D. Neal, History of the Puritans (ed.Toulmin, 5 vols., 1822); E. Dowden, Puritan and Anglican (1901); J. Heron, A Short History of Puritanism (1908).

PURLIEU, a word used of the outlying parts of a place or district, sometimes in a derogatory sense. It was a term of the old English forest law (q.v.), and meant, as denned by Manwood (Treatise of the Forest Laws), "a certain territory of ground adjoining unto the forest,. . .which. . .was once forest-land and afterwards disafforested by the perambulations made for the severing of the new forests from the old." The owner of free- lands in the purlieu to the yearly value of forty shillings was known as a " purlieu-man " or " purley-man." There seems no doubt that "purlieu" or "purley" represents the Anglo- French purale, puralee (O. Fr. pouraler, puraler, to go through, Lat. perambulare), a legal term meaning properly a perambula- tion to determine the boundaries of a manor, parish, &c.

PURLIN, a term in architecture for the longitudinal timbers of a roof, which are carried by the principal rafters and the end walls and support the common rafters.

PURNEA or Purniah, a town and district of British India, in the Bhagalpur division of Bengal. The town is on the left bank of the little river Saura, with a railway station. Pop. (1 90 1) , 1 4 ,007 . It has a bad reputation for fever.

*The District of Purnea has an area of 4994 sq. m. and a population (1901) of 1,874,794, showing a decrease of 3*6%*

in the decade. The district extends from the Ganges north- wards to the frontier of Nepal. It is a level, depressed tract of country, consisting for the most part of a rich, loamy soil of alluvial formation. It is traversed by several rivers flowing from the Himalayas, which afford great advantages of irrigation and water-carriage; in the west the soil is thickly covered with sand deposited by changes in the course of the Kusi. Among other rivers are the Mahananda and the Panar. Under Mahom- medan rule Purnea was an outlying province, yielding little revenue and often in a state of anarchy. Its local governor raised a rebellion against Suraj-ud-daula in 1757, after the capture of Calcutta. The principal crops are rice, pulses and oilseeds. The cultivation of indigo is declining, but that of jute is extending. The district is traversed by branches of the Eastern Bengal railway, which join the Bengal and North- western railway at Katihar.

PURPLE, a colour-name, now given to a shade varying between crimson and violet. Formerly it was used, as the origin of the name shows, of the deep crimson colour called in Latin purpura, purpureus and in Greek iropcfrvpa, Topvpeos (from Topiipeiv, to grow dark, especially used of the sea). This was properly the name of the shellfish (Purpura, Murex) which yielded the famous Tyrian dye, the particular mark of the dress of emperors, kings, chief magistrates and other dignitaries, whence " the purple " still signifies the rank of emperors or kings.

The title of porphyrogenitus (Gr. 7rop0upo7ewi)Tos) was borne particularly by Constantine VII., Byzantine emperor, but was also used generally of those born of the Byzantine imperial family. This title, generally translated " born in the purple," either refers to the purple robes in which the imperial children were wrapped at birth, or to a chamber or part of the imperial palace, called the Porpkyra (?r6p(J)Dpa) , where the births took place. Whether this Porphyra signified a chamber with purple hangings or lined with porphyry is not known (see Selden, Titles of Honour, ed. 1672, p. 60 seq.).

PURPURA, in pathology, a general term for the symptom of purple-coloured spots upon the surface of the body, due to extravasations of blood in the skin, accompanied occasionally with haemorrhages from mucous membranes. The varieties of purpura may be conveniently divided as follows: (a) toxic, following the administration of certain drugs, notably copaiba, quinine, ergot, belladonna and the iodides; also following snake-bite; (b) cachectic, seen in persons suffering from such diseases as tuberculosis, heart disease, cancer, Bright's disease, jaundice, as well as from certain of the infectious fevers, extravasations of the kind above mentioned being not infrequently present; (c) neurotic; (d) arthritic, which includes the form known as " Purpura simplex," in which there may or may not be articular pain, and the complaint is usually ushered in by

lassitude and feverishness, followed by the appearance on the surface of the body of the characteristic spots in the form of small red points scattered over the skin of the limbs and trunk. The spots are not raised above the surface, and they do not disappear on pressure. Their colour soon becomes deep purple or nearly black; but after a few days they undergo the changes which are observed in the case of an ordinary bruise, passing to a green and yellow hue and finally disappearing. When of minute size they are termed "petechiae" or "stigmata," when somewhat larger " vibices," and when in patches of considerable size " ecchymoses." They may come out in fresh crops over a lengthened period.

Purpura rheumatica (Schonlein's disease) is a remarkable variety characterized by sore throat, fever and articular pains accompanied by purpuric spots and associated with urticaria and Occasionally with definite nodular infiltrations. This is by many Writers con- sidered to be a separate disease, but it is usually regarded as of rheumatic origin.

Purpura haemorrhagica (acute haemorrhagic purpura) is a more serious form, in which, in addition to the phenomena already men- tioned as affecting the skin, there is a tendency to the occurrence of haemorrhage from mucous surfaces, especially from the nose, but also from the mouth, lungs, stomach, bowels, kidneys, &c, sometimes in large and dangerous amount. Great physical prostra- tion is apt to attend this form of the disease, and a fatal result some- times follows the successive haemorrhages, or is suddenly precipitated by the occurrence of an extravasation of blood into the brain.

The treatment will bear reference to any causes which may be discovered as associated with the onset of the disease, such as unfavourable hygienic conditions, and nutritive defects should be rectified by suitable diet. The various preparations of iron seem to be the best medicinal remedies in this ailment, while more direct astringents, such as gallic acid, ergot of rye, turpentine or acetate of lead, will in addition be called for in severe cases and especially when haemorrhage occurs. Sir A. Wright considers that in all cases of purpura the coagulation- time of the blood should be estimated. In such cases the time taken for clotting may be increased to three time,s as long as that taken by normal blood. He therefore advises calcium chloride in order to increase coagulability. In severe haemor- rhages, adrenalin is often useful.*

PURRAH, Purroh, or Poro, a secret society of Sierra Leone, West Africa.

Only males are admitted to its ranks, but two other affiliated and secret associations exist, the Yassi and the Bundu, the first of which is nominally reserved for females, but members of the Purrah are admitted to certain ceremonies. All the female members of the Yassi must be also members of the Bundu, which is strictly reserved to women. Of the three, the Purrah is by far the most important. The entire native population is governed by its code of laws. It primarily represents a type of freemasonry, a "friendly " society to which even infants are temporarily admitted, the ceremony in their case consisting merely of carrying them into the Purrah " bush" and out again. But this side of the Purrah is merged in its larger objects as represented by its two great aspects, the religious and the civil. Under the former, boys join it at puberty, while under the latter it is practically the native governing body, making laws, deciding on war and peace, &c.

The Purrah has its special ritual and language, tattooing and symbols, but details are unknown, as the oath of secrecy is always kept. It meets usually in the dry season, between the months of October and May. The rendezvous is in " the bush," an enclosure, separated into apartments by mats and roofed only by the over- hanging trees, serving as a club-house. There are three grades, the first for chiefs and " big men," the second for fetish-priests and the third for the crowd. The ceremonies of the Purrah are presided over by the Purrah " devil," a man in fetish dress, who addresses the meeting through a long tube of wood.

The Purrah can place its taboo on anything or anybody; and as no native would venture to'defy its order, much trouble has been caused where the taboo has been laid upon crops. In 1897 the British or local government was compelled to pass a special ordinance absolutely forbidding the imposition of the taboo on all indigenous products. Of the affiliated societies the Yassi appears to some extent to be an association for providing men and women, who believe themselves ill through "fetish," with medical treatment, on payment of certain fees. The women's Bundu is in many ways a replica of the men's Purrah, though without political power.

See T. J. Alldridge, The Sherbro and its Hinterland (1901).

PURSE (Late Lat. bursa, adapted from Gr. fivpaa, hide, skin; possibly O. Eng. pusa, bag, has influenced the change from b to p), a small bag for holding money, originally a leather pouch tied at the mouth, but now of various shapes. The great seal of England is borne by the purse-bearer in a purse, usually styled " burse," decorated with the arms of the kingdom, the " burse" being thus one of the insignia of office of the lord chancellor of England. The " privy purse" is the amount of public money set apart in the civil list for the private and personal use of the sovereign (see Privy Purse).

PURSER, the old name for the paymaster of the British and American navies still used in merchant vessels of to-day. In the British navy he was appointed by a warrant from the admiralty and was paid partly by salary and partly by a percentage (10%) on the value of unexpended stores.

PURSLANE, the common name for a small fleshy annual with prostrate stems, entire leaves and small yellow flowers, known botanically as Portulaca oleracea. It is a native of India, which was introduced into Europe as a salad plant, and in some countries has spread so as to become a noxious weed. In certain

parts of the United States the evil qualities of " pussly" have become proverbial. Its juice is refreshing and is used in tropical countries as a refrigerant in fever. Some of the species of the same genus, such as P. grandiflora and its varieties, are grown in gardens on rock-work owing to the great beauty and deep colouring of their flowers, the short duration of individual blossoms being compensated for by the abundance with which they are produced.

PURSUIVANT (0. Fr. porsivant, poursivant, mod. poursuivant, strictly an attendant, from poursuivre, to follow), the name of a member of the third and lowest rank of heraldic officers, formerly an attendant on the heralds. There are four pursuivants in the English Heralds' College, Rouge Croix, Bluemantle, Rouge Dragon and Portcullis; three in the Court of Lyon King of Arms (Scotland), Carrick, Unicorn and March; and four in the court of Ulster King of Arms (Ireland) , Athlone and three St Patrick pursuivants. (See Herald and Heraldry.)

PURULIA, a town of British India, headquarters of Manbhum district in Bengal, on the Sini-Asansol branch of the Bengal- Nagpur railway. Pop. (1901), 17,291. It is a growing centre of trade.

PURVEYANCE (Lat. providere, to provide), in England in former times the right of the sovereign when travelling through the country to receive food and drink and maintenance generally from his subjects for himself and his retinue. The custom dates from Anglo-Saxon times and is analogous to the right of fodrum, or annona militaris, exercised by the Frankish kings. Although in early times purveyance was reasonable and necessary, enabling the king to make journeys for the purpose of administering justice and discharging the other duties of government, it was liable to grave abuses, and under the later Plantagenet kings it became very oppressive. Provision for the royal needs was interpreted in the widest possible sense, and the right was exercised, not only on behalf of the king, but on behalf of his relatives. Besides victuals it included the compulsory use of horses and carts and even the enforcement of personal labour. Not infrequently no

payment was made; when it was it often took the form of tallies, which gave the recipient the right to deduct the amount from any taxes he might have to pay in the future. Purveyors were appointed to requisition goods, and they also fixed the price. The abuses of purveyance, which appear to have reached their climax during the reign of Edward I., frequently provoked legislation. Chapter xxviii. of Magna Carta is directed against them, while further attempts to curb them were made in the Statute of Westminster of 1275 and in the Articuli super cartas of 1300. Purveyance was entirely forbidden by the ordinance of 131 1, but in spite of all prohibitions its evils grew and flourished. During the reign of Edward III. ten statutes were directed against it, and by a law of 1362 it was restricted to the personal wants of the king and queen; at the same time the hated name of purveyor was changed to that of buyer, and ready money was ordered to be paid for the articles taken. From this time little was heard about the evils of purveyance until 1604, when the House of Commons petitioned James I., giving some striking illustrations of its hardships. It was asserted that when the royal officials required 200 carts they ordered 800 or 900 to be brought, in order that they might obtain bribes from the owners. Bacon called purveyance " the most common and general abuse of all others in the kingdom." Twice James entered into negotiations with his parliament for commuting his crown rights, of which purveyance was one, for an annual payment, but no arrangement was reached. In 1660, however, the right of purveyance, which had fallen into disuse with the execution of Charles I., was surren- dered by Charles II. in return for the grant of an excise on beer and liquors. The custom was exercised by almost all European sovereigns, and in France at least was as oppressive as in England. The word purveyor now means merely a vendor, generally a vendor of food and drink.

See W. Stubbs, Constitutional History of England (1896), vol. ii. ; H. Hallam, Constitutional History of England (1863); and S. R. Gardiner, History of England (1905), vol. i.

PUSA, a village of British India, in Darbhanga district, Bengal, near the right bank of the Burhi Gandak River; pop. (1901), 4570. It was acquired as a government estate in 1796, and was long used as a stud dep6t and afterwards as a tobacco farm. In 1904 it was selected as the site of a college and laboratory for agricultural research.

PUSEY, EDWARD BOUVERIE (1800-1S82), English divine, was born at Pusey near Oxford on the 22nd of August 1800. His father was Philip

Bouverie (d. 1828), a younger son of Jacob Bouverie, 1st Viscount Folkestone, and took the name of Pusey on succeeding to the manorial estates at that place. After having been at Eton, he became a commoner of Christ Church, Oxford, and was elected in 1824 to a fellowship at Oriel. He thus became a member of a society which already contained some of the ablest of his contemporaries — among them J. H. Newman and John Keble. Between 1825 and 1827 he studied Oriental languages and German theology at Gottingen. His first work, published in 1828, as an answer to Hugh James Rose's Cambridge lectures on rationalist tendencies in German theology, showed a good deal of sympathy with the German " pietists," who had striven to deliver Protestantism from its decadence; this sympathy was misunderstood, and Pusey was himself accused of holding rationalist views.

In the same year (1828) the duke of Wellington appointed him to the regius professorship of Hebrew with the attached canonry of Christ Church. The misunderstanding of his position led to the publication in 1830 of a second part of Pusey's Historical Enquiry, in which he denied the charge of rationalism. But in the years which immediately followed the current of his thoughts began to set in another direction. The revolt against individualism had begun, and he was attracted to its standard. By the end of 1833 he showed a disposition to make common cause with those who had already begun to issue the Tracts for the Times. " He was not, however, fully associated in the move- ment till 1835 and 1836, when he published his tract on baptism and started the Library of the Fathers " (Newman's Apologia, p. 136). He became a close student of the fathers and of that school of Anglican divines who had continued, or revived, in the 17th century the main traditions of pre-Reformation teaching. A sermon which he preached before the university in 1843, The Holy Eucharist a Comfort to the Penitent, so startled the authorities by the re-statement of doctrines which, though well known to ecclesiastical antiquaries, had faded from the common view, that by the exercise of an authority which, however legitimate, was almost obsolete, he was suspended for two years from the function of preaching. The immediate effect of his suspension was the sale of 18,000 copies of the condemned sermon; its permanent effect was to make Pusey for the next quarter of a century the most influential person in the Anglican Church, for it was one of the causes which led Newman to sever himself from that communion. The movement, in the actual origination of which he had had no share, came to bear his name: it was popularly known as Puseyism (sometimes as Newmania) and its adherents as Puseyites. His activity, both public and private, as leader of the movement was enormous. He was not only on the stage but also behind the scenes of every important controversy, whether theological or academical. In the Gorham controversy of 1850, in the question of Oxford reform in

1854, in the prosecution of some of the writers of Essays and Reviews, especially of Benjamin Jowett, in 1863, in the question as to the ref&rm of the marriage laws from 1849 to the end of his life, in the Farrar controversy as to the meaning of everlasting punish- ment in 1877, he was always-busy with articles, letters, treatises and sermons. The occasions on which, in his turn, he preached before his university were all memorable; and some of the sermons were manifestoes which mark distinct stages in the history of the High Church party of which he was the leader. The practice of confession in the Church of England practically dates from his two sermons on The Entire Absolution of the Penitent, in 1846, in which the revival of high sacramental doctrine is complemented by the advocacy of a revival of the penitential system which medieval theologians had appended to

it. The sermon on The Presence of Christ in the Holy Eucharist, in 1853, first formulated the doctrine round which almost all the subsequent theology of his followers revolved, and which revolutionized the practices of Anglican worship. Of his larger works the most important are his two books on the Eucharist — The Doctrine of the Re „ Presence (1855) and The Real Presence . . .the Doctrine of ft , English Church (1857) ; Daniel the Prophet in which he endeavours to maintain the traditional date of that book; The Minor Prophets, with Commentary, his chief contribu- tion to the study of which he was the professor; and the Eirenicon, in which he endeavoured to find a basis of union between the Church of England and the Church of Rome.

In private life Pusey's habits were simple almost to austerity. He had few personal friends, and rarely mingled in general society; though bitter to opponents, he was gentle to those who knew him, and his munificent charities gave him a warm place in the hearts of many to whom he was personally unknown. In his domestic life he had some severe trials; his wife died, after eleven years of married life, in 1839; his only son, who was a scholar like-minded with himself, who had shared many of his literary labours, and who had edited an excellent edition of St Cyril's commentary on the minor prophets, died in 1880, after many years of suffering. From that time Pusey was seen by only a few persons. His strength gradually declined, and he died on the 16th of September 1882, after a short illness. He was buried at Oxford in the cathedral of which he had been for fifty-four years a canon. In his memory his friends purchased his library, and bought for it a house in Oxford, known as the Pusey House, which they endowed with sufficient funds to maintain three librarians, who were charged with the duty of endeavouring to perpetuate in the university the memory of the principles which he taught.

Pusey is chiefly remembered as the eponymous representative

of the earlier phase of a movement which carried with it no small part of the religious life of England in the latter half of the 19th century. His own chief characteristic was an almost unbounded

capacity for taking pains. His chief influence was that of a preacher and a spiritual adviser. As a preacher he lacked all the graces of oratory, but compelled attention by his searching and practical earnestness. His correspondence as a spiritual adviser was enormous; his deserved reputation for piety and for solidity of character made him the chosen confessor to whom large numbers of men and women unburdened their doubts and their sins. But if he be estimated apart from his position as the head of a great party, it must be considered that he was more a theological antiquary than a theologian. Pusey in fact was left behind by his followers even in his lifetime. His revival of the doctrine of the Real Presence, coinciding as it did with the revival of a taste for medieval art, naturally led to a revival of the pre-Reformation ceremonial of worship. With this revival of ceremonial Pusey had little sympathy: he at first protested against it (in a university sermon in 1859) ; and, though he came to defend those who were accused of breaking the law in their practice of it, he did so on the express ground that their practice was alien to his own. But this revival of ceremonial in its various degrees became the chief external characteristic of the new movement; and "Ritualist" thrust "Puseyite" aside as the designation of those who hold the doctrines for which he mainly contended. On the other hand, the pivot of his teaching was the appeal to primitive antiquity; and in this respect he

helped to start inquiry which has since gone far beyond the

materials which were open to one of his generation.

See J. Rigg, Character and Life-Work of Dr Pusey (1883); B. W. Savile, Dr Pusey, an Historic Sketch, with Some Account of the Oxford Movement (1883), and especially the Life by Canon Liddon, completed by J. C. Johnston and R. J. Wilson (5 vols., 1893-1899), Newman's Apologia, and other literature of the Oxford Movement.

Pusey's elder brother, Philip Pusey (1799-1855), was a member of parliament and a friend and follower of Sir Robert Peel. He was one of the founders of the Royal Agricultural Society, and was chairman of the implement department of the great exhibition of i85r. He was a fellow

of the Royal Society, a writer on varied topics to the r eviews and the author of the hymn " Lord of our Life and God jf our , Salvation."

PUSHBALL, a game played by two sides on a field usually 140 yds. long and 50 yds. wide, with a ball 6 ft. in diameter and 50 lb in weight. The sides usually number eleven each, there being five forwards, two left-wings, two right-wings and two goal-keepers. The goals consist of two upright posts 18 ft. high and 20 ft. apart with a crossbar 7 ft. from the ground. The game lasts for two periods with an intermission. Pushing the ball under the bar counts 5 points; lifting or throwing it over the bar counts 8. A touchdown behind goal for safety counts 2 to the attacking side. The game was invented by M. G. Crane, of Newton, Massachusetts, in 1894, and was taken up at Harvard University the next year, but has never attained any considerable vogue. In Great Britain the first regular game was played at the Crystal Palace in 1902 by teams of eight. The English rules are somewhat different from those obtaining in the United States. Pushball on horseback was introduced in 1902 at Durland's Riding Academy in New York, and has been played in England at the Military Tournament.

PUSHKAR, a town of British India, in Ajmere district, Rajputana, 7 m. N. of Ajmere town. Pop. (1901), 3831. It derives its name from a small lake among the hills, 2389 ft. above the sea, in which Brahma is once said to have bathed as a pen- ance. It contains one- of the very few temples, in all India, dedicated to Brahma. At the annual celebration (Oct.-Nov.) about 100,000 pilgrims come to bathe in the lake.

PUSHKIN, ALEXANDER (1790-1837), Russian poet, was born at

Moscow, on the 7th of June 1799. He belonged to an ancient family of boyars; his maternal great-grandfather, a favourite negro ennobled by Peter the Great, bequeathed to him curly hair and a somewhat darker complexion than falls to the lot of the ordinary Russian. In 181 1 the future poet entered the newly founded lyceum of Tsarskoe Selo, situated near St Petersburg. On quitting the lyceum in 181 7 he was attached to the ministry of foreign affairs, and in this year he began the composition of his Ruslan and Ly'udmila, a poem which was completed in 1820. Meanwhile Pushkin mixed in all the gayest society of the capital, and it seemed as if he would turn out a mere man of fashion instead of a poet. But a very daring Ode to Liberty written by him had been circulated in manuscript in St Petersburg. This production having been brought to the notice of the governor, the young author only escaped a journey to Siberia by accepting an official position at Kishinev in Bess- arabia, in southern Russia. If we follow the chronological order of his poems, we can trace the enthusiasm with which he greeted the ever-changing prospects of the sea and the regions of the Danube and the Crimea.

At this time Pushkin was, or affected to be, overpowered by the Byronic " Weltschmerz." Having visited the baths of the Caucasus for the re-establishment of his health in 1822, he felt the inspiration of its magnificent scenery, and composed The Prisoner of the Caucasus, narrating the story of the love of a Circassian girl for a youthful Russian officer. This was followed by the Fountain of Bakhchisarai, which tells of the detention of a young Polish captive, a Countess Potocka, in the palace of the khans of the Crimea. About the same time he composed some interesting lines on Ovid, whose place of banishment, Tomi, was not far distant. To this period belongs also the Ode to Napoleon, which is inferior to the fine poems of Byron and Manzoni, or indeed of Lermontov, on the same subject. In the Lay concern- ing the Wise Oleg we see how the influence of Karamzin's History had led the Russians to take a greater interest in the early records of their country. The next long poem was the Gipsies (Tzuigani), an Oriental tale of love and vengeance, in which Pushkin has admirably delineated these nomads, whose strange mode of life fascinated him. During his stay in southern Russia he allowed himself to get mixed up with the secret societies then rife throughout the country. He also became embroiled with his chief, Count Vorontzov, who sent him to report upon the damages which had been committed by locusts

in the southern part of Bessarabia. Pushkin took this as a premeditated insult, and sent in his resignation; and Count Vorontzov in his official report requested the government to remove the poet, " as he was surrounded by a society of political and literary fanatics, whose praises might turn his head and make him believe that he was a great writer, whereas he was only a feeble imitator of Lord Byron, an original not much

to be com- mended." The poet quitted Odessa in 1824, and on leaving wrote a fine Ode to the Sea. Before the close of the year he had returned to his father's seat at Mikhailovskoe, near Pskov; where he soon involved himself in trouble on all sides. In his retirement he devoted a great deal of time to the study of the old Russian popular poetry, the builinas, of which he became a great admirer. Recollections of Byron and Andre Chenier gave the inspiration to some fine lines consecrated to the latter, in which Pushkin appeared more conservative than was his wont, and wrote in a spirit antagonistic to the French Revolution. In 1825 he published his tragedy Boris Godunov, a bold effort to imitate the style of Shakespeare. Up to this time the tradi- tions of the Russian stage, such as it was, had been French.

In 1825 the conspiracy of the Dekabrists broke out. Many of the conspirators were personal friends of Pushkin, especially Kuchelbecker and Pustchin. The poet himself was to a certain extent compromised, but he succeeded in getting to his house at Mikhailovskoe and burning all the papers which might have been prejudicial to him. Through influential friends he suc- ceeded in making his peace with the emperor, to whom he was presented at Moscow soon after his coronation. The story goes that Nicholas said to Count Bludov on the same evening, " I have just been conversing with the most witty man in Russia." In 1828 appeared Poltava, a spirited narrative poem, in which the expedition of Charles XII. against Peter and the treachery of the hetman Mazeppa were described. In 1829 Pushkin again visited the Caucasus, on this occasion accompanying the expedition of Prince Paskevich. He wrote a pleasing account of the tour; many of the short lyrical pieces suggested by the scenery and associations of his visit are delightful, especially the lines on the Don and the Caucasus. In 1831 Pushkin married Natalia Goncharov, and in the following year was again attached to the ministry of foreign affairs, with a salary of 5000 roubles. He now busied himself with an historical account of the revolt of the Cossack Pugachev, who almost overthrew the empire of Catherine and was executed at Moscow in the latter part of the 1 8th century. While engaged upon this he wrote The Captain's Daughter, one of the best of his prose works. In 1832 was completed the poem Eugene Onyegin, in which the author modelled his style upon the lighter sketches of Byron in the Italian manner. Yet no one can accuse Pushkin of want of nationalism in this poem: it is Russian in every fibre.

In 1837 the poet, who had been long growing in literary reputation, fell mortally wounded in a duel with Baron George Heckeren d'Anthes, the adopted son of the Dutch minister then resident at the court of St Petersburg. D'Anthes, a vain and frivolous young man, had married a sister of the poet's wife. Notwithstanding this he aroused Pushkin's jealousy by some attentions which he paid Natalia; but the grounds for the poet's anger, it must be confessed, do not appear very great. Pushkin died, after

two days' suffering, on the afternoon of Friday the 10th of February. D'Anthes was tried. by court-martial and expelled the country. In 1880 a statue of the poet was erected at the Tver Barrier at Moscow, and fetes were held in his honour, on which occasion many interesting memorials of him were exhibited to his admiring countrymen and a few foreigners who had congregated for the festivities. Pushkin left four children; his widow was afterwards married to an officer in the army, named Lanskoi; she died in 1863.

Pushkin's poetical tales are spirited and full of dramatic power. The influence of Byron is undoubtedly seen, in them, but they are not imitations, still less is anything in them plagi- arized. Boris Godunov is a fine tragedy; on the whole Eugene Onyegin must be considered Pushkin's masterpiece. Here we have a great variety of styles — satire, pathos and humour mixed

together. The character-painting is good, and the descriptions of scenery introduced faithful to nature. The poem in many places reminds us of Byron, who himself in his mixture of the pathetic and the humorous was a disciple of the Italian school. Pushkin also wrote a great many lyrical pieces. Interspersed among the poet's minor works will be found many epigrams, but some of the best composed by him were not so fortunate as to pass the censorship, and must be read in a supplementary volume published at Berlin. As a prose writer Pushkin has considerable merits. Besides his History of the Revolt of Puga- chev, which is perhaps too much of a compilation, he published a small volume of tales under the 110m de plume of Ivan Byelkin. These all show considerable dramatic power: the best are The Captain's Daughter, a tale of the times of Catherine II.; The Undertaker, a very ghostly story, which will remind the English reader of some of the tales of Edgar Poe; The Pistol Shot; and The Queen of Spades.

The academy of St Petersburg has recently issued a complete edition of the works of Pushkin, including his letters. See the bibliography in the editions of Gennadi (7 vols., St Petersburg, 1861) and Annenkov (6 vols., St Petersburg, 1855). (W. R. M.)

PUSHTU, the language of the Pathan races of Afghanistan and the North-West Frontier province of India. It belongs to the Iranian group of the Indo-European languages, but pos- sesses many Panjabi words. In Afghanistan it is the dominant language, but is not spoken west of the Helmund. In India it has two main dialects, the northern, hard or Pukhtu, and the southern,

soft or Pushtu. The dividing line of the two dialects runs eastwards from Thai through the Kohat district almost to the Indus, but it then turns northwards, as the speech of the Akhora Khattaks belongs to the Pushtu or southern dialect. Thus Pukhtu is spoken in Bajour, Swat and Buner, and by the Yusufzais, Bangash, Orakzais, Afridis and Mohmands; while Pushtu is spoken by the Waziris, Khattaks, Marwats and various minor tribes in the south. The language division corresponds roughly with the tribal system of the Pathans, who are aristo- cratic in the north and democratic in the south. The classical dialect of Pukhtu is that of the Yusufzais, in which the earliest works in the language were composed. The Orakzai dialect differs from that of the Afridis, in that it is broader but less guttural and spoken more rapidly. The standard dialect is that of Peshawar. The literature is richest in poetry, Abdur Rahman, of the 1 7th century, being the best-known poet. Pushtu was spoken in the North-West Frontier province in 1901 by 1,142,011 persons, or 54% of the population.

See Grierson, Linguistic Survey of India; Roos-Keppel, Manual of Pushtu (1901) ; Lorimer, Grammar of Waziri Pushtu (1902).

PUTEAUX, a north-western suburb of Paris, on the left bank of the Seine, 45 m. from the centre of the city. Pop. (1906), 28,718. Puteaux has a church of the 16th century with good stained glass windows. There is a fort on the Seine.

PUTEOLI (mod. Pozzuoli, q.v.), an ancient town of Campania, Italy, on the northern shore of the Bay of Puteoli, a portion of the Bay of Naples, from which it is 6 m. W. The statement made by Stephanus of Byzantium and Jerome, that the city was founded under the name of Dicaearchia by a colony of Samians about 520 b.c, is probably correct, for, though in the territory of Cumae, it does not appear to have been occupied previous to 520, Misenum having been the original port of Cumae. On the other hand, Cumae probably extended her supremacy over it not long after. Its history in the Samnite period is unknown; but the coins of Fistelia (or Fistlus in Oscan) probably belong to Puteoli, as Mommsen thought. Nor do we know anything of its history between 334 (when it probably became a civitas sine suffragio under Roman domination, shortly afterwards receiving, in 318, a praefectus iure dicundo) and 215, when the Romans introduced a garrison of 6000 men to protect the town from Hannibal, who besieged it in vain for three days in 214. In 194 a Roman colony of 300 men was established. The lex parieti faciundo, an interesting inscription of 105 B.C. relating to some building works in front of the temple of Serapis, shows that Puteoli had

considerable administrative independence, including the right to date such a public document by the names of its own magis- trates. Sulla retired to

Puteoli after his resignation of the dictatorship in 79, and ten days before his death reconciled the disputes of the citizens by giving them a constitution. Cicero had a house in Puteoli itself, and a villa on the edge of the Lucrine lake (which, though nearer to Puteoli, was in the terri- tory of Cumae), and many prominent men of the republic possessed country houses in the neighbourhood of Puteoli (see Baiae; Avernus Lacus; Lucrinus Lacus; Misenum). In the Civil War it sided with Pompey, and later on with Brutus and Cassius. Nero admitted the old inhabitants to the privileges of the colony, thus uniting in one the two previously distinct communities. In 61 St Paul landed here, and spent seven days before leaving for Rome (Acts xxviii. 13). Vespasian, as a reward for its having taken his part, gave the town part of the territory of Capua, and installed more colonists there — whence it took the title Colonia Flavia, which it retained till the end of the empire.

The remains of Hadrian, who died at the neighbouring town of Baiae, were buried at Puteoli, and Antoninus Pius, besides erecting a temple to his memory on the site of Cicero's villa, instituted sacred games to be held in the city every five years. Commodus held the title of duumvir quinquennalis. It was mainly, however, as a great commercial port that Puteoli was famous in ancient times. It joined with Naples to erect one of the finest porticoes of Constantinople at the time of its construc- tion. A letter of Symmachus gives us interesting details as to public corn distributions of the 4th century, throwing some light on the population. Like Ostia, Puteoli was considered a special port of Rome, and, on account of the safety and convenience of its harbour, it was preferred to Ostia for the landing of the more costly and delicate wares. As at Ostia, the various gilds were of considerable importance, but we find no centonarii or fabri, perhaps owing to its relations with the East, where these popular gilds were prohibited. Puteoli was preferred to Naples, (a) as being in Roman territory, (b) because the customs duty was only leviable once, not twice as it would have been at Naples — once by the local authorities, and once by the Roman authorities on entrance into Roman territory. 1 It exported iron from Elba, mosaics, pottery, manufactured locally with earth from Ischia (which was in considerable demand until 1883), sulphur (which indeed was extracted in the neighbourhood until the 18th cen- tury), probably alum (which is still worked), perfumes, pozzolana earth (taking its name from the place), cretaceous earth for mixing with grain (alica) from the Leucogaean hills, glass cups engraved with views of Puteoli, mineral dyes (the blue invented by one Vestorius is mentioned by Vitruvius and the purple of Puteoli by Pliny, as being of special excellence), &c, but not agricultural products, except certain brands of Campanian wine; but its imports were considerably greater. During the Punic Wars it was still a naval port, but in the latter part of the 2nd century B.C. it became the

greatest commercial harbour of Italy and we find Lucilius about 125 B.C. placing it next in importance to Delos, then the greatest harbour of the ancient world. We note a little later the existence of merchants of Puteoli in the East. Under the empire we find Eastern cults taking root here sooner than in Rome. The construction of the harbour of Claudius at the mouth of the Tiber adversely affected Puteoli. Nero's scheme for the construction of a canal from Lake Avernus to Ostia would have restored the balance in its favour (though it certainly could not have been continuous all the way to Rome with the means of engineering then available) .

The corn supply of Rome came partly through Puteoli, partly through Ostia. Seneca (Epist. 77) describes the joy of the inhabitants in the spring when the fleet of corn vessels from Alexandria was seen approaching, and Statius tells us that the crew of the ship which arrived first made libations to Minerva 1 A mass of pottery debris found in 1875 gave important information as to the local manufacture. Some fragments came from Arretium, others, not quite so good, were of local work, but of the same style.

when passing the promontory which bore her name (the Punta Campanella at Sorrento). It is uncertain what official had the charge of the corn supply at Puteoli under the Republic, but in the time of Antoninus Pius we find an Aug{usti) dis(pensator) a frumento Puteolis et Ostis dependent no doubt on a procurator annonae of the two ports.

Claudius established here, as at Ostia, a cohort of vigiles as a fire-brigade. Brundusium was similarly protected. There was also a station of the imperial post, sailors of the imperial fleet at Misenum being apparently employed as couriers. The artificial mole was probably of earlier date than the reign of Augustus (possibly 2nd century B.C.) ; and by that time at any rate there were docks large enough to contain the vessels employed in bringing the obelisks from Egypt. Remains of the piles of the mole still exist, and are popularly known as Caligula's Bridge, from the mistaken idea that they belong to the temporary structure which that emperor flung across the bay from the mole at Puteoli to the shore at Baiae. Inscriptions record repairs to the breakwater by Antoninus Pius in 139 in fulfilment of a promise made by Hadrian before his death. Alaric (410), Genseric (455) and Totila (545) successively laid Puteoli in ruins. The restoration effected by the Byzantines was partial and short- lived.

The original town of Puteoli was situated on the narrow hill of the Castello. Scanty traces of fortifications of the Roman period seem to have come to

light in recent tunnelling operations. The streets of the old town probably, as at Naples, preserve the ancient align- ment. There are also traces of the division of the lands in the immediate vicinity of the town into squares by parallel paths (decumani and cardines) at regular intervals of imˆ Roman feet, postulating as the basis of the division a square with a side of 10,000 Roman feet, divided into 81 smaller squares — an arrangement which could not have existed at Puteoli, and must have arisen elsewhere. It is remarkable as being contrary to Roman surveyors' practice, according to which the basis of division is the intersection at right angles of the cardo and decumanus, which would give an even (not an odd) number of smaller squares. The size of the ancient town at its largest can be roughly fixed by its tombs. Inscriptions show that it was divided into regiones. The market hall (macelhim) (compare the similar buildings at Pompeii and elsewhere), generally known as the temple of Serapis, from a statue of that deity found there, was excavated in 1750. It consisted of a rectangular court surrounded by chambers on the outside and with a colonnade of thirty-six columns of cipollino (Carystian) marble and grey granite. The three columns still standing, some 39 ft. high, belong to a fagade of four still higher columns erected in front of the absidal cella or sanctuary, with three niches for statues — no doubt of the protecting deities. The borings of marine shellfish visible in these columns between 11 and 19 ft. from the ground, and the various levels of pavement in the macellum help to indicate, according to Günther's researches (Archaeologia, lvii. 499; Earth Movements in the Bay of Naples, 1903), that the level of the shore fell very slightly during the Roman period, when it was some 20 ft. higher than at present ; that it fell more rapidly during the middle ages, was then raised again early in the 16th century (before the upheaval of the Monte Nuovo in 1538) and has since been sinking gradually. In the centre was a round colonnade with sixteen columns of Numidian mar- ble (giallo antico) now in the theatre of the palace at Caserta. Dubois (op. cit., 286 sqq.) reproduces important drawings and a description made by the architect Caristie in 1820. The well-preserved amphi- theatre, the subterranean parts of which below the arena are intact, with a main passage down the centre, a curved passage all round with holes for trap doors in its roof, and numerous small chambers, also with trap doors in their vaulted roofs for admitting the wild beasts, whose cages were on the other side of the curved passage, to the arena, are especially interesting. There were also arrangements for flooding the arena, but these can only have been in use before the construction of the greater part of the subterranean portion with its cages, &c. The whole amphitheatre measures 489 by 381 ft., and the arena 245 by 138 ft. Of the upper portion the interior is well preserved, but very little of the external arcades remains. It was not constructed before the reign of Vespasian, for inscriptions record that it was built by the Colonia Flavia. There was, however, an amphitheatre in the reign of Nero, who

himself fought in games given there, and the glass cup of Odemira shows two. A ruin still exists which may be doubtfully attributed to the latter (Dubois, p. 192). Remains of thermae also exist in various places, the mineral springs having been much used in Roman times. The cathedral of S. Proculus (containing the tomb of the musician Pergolesi, d. 1736) is built into a temple of Augustus, erected by L. Calpurnius, 6 columns of which, with their Corinthian capitals, still exist. Other ruins — of a circus, of tombs, &c, exist, and there are also considerable remains of villas in the neighbourhood.

Puteoli was supplied with water by two- aqueducts, both subter-

ranean, one of which, bringing water from springs in the immediate neighbourhood, is still in use, while the other is a branch of the Serino aqueduct, which was probably taken to Misenum by Agrippa. Several remains of reservoirs exist; one very large one is now called Piscina di Cardito.

Among the inscriptions one of the most interesting is the letter of the Tyrian merchants resident at Puteoli to the senate of Tyre, written in 174, asking the latter to undertake the payment of the rent of their factory, and the reply of the senate promising to do so. (This is the interpretation adopted by Dubois, pp. 86,92, following Dittenberger.) We find other Eastern merchants resident here — merchants from Heliopolis, Berytus (Beirut), Nabataea, Palestine, and from Asia Minor, Greece, &c. We find far less trace of commer- cial relations with the West, though there was considerable importa- tion of commodities from southern Spain — wine, oil, metals, salt fish, &c, while a good deal of pottery was exported to Spain and southern Gaul. We find ; indeed, two cases of men who held muni- cipal honours at Puteoli and in the Rhone valley. Puteoli was reached direct by a road from Capua traversing the hills to the north by a cutting (the Montagna Spaccata), which went on to Neapolis, and by the Via Domitiana from Rome and Cumae. There was also a short cut from Puteoli to Neapolis by the tunnel of Pausilipon, made under Augustus. It is not possible to trace the episcopal see of Puteoli with any certainty further back than the beginning of the 4th century. In 305, S. Januarius (S. Gennaro, the patron saint of Naples), bishop of Beneventum, S. Proculus, patron of Puteoli, and others, suffered martyrdom at Puteoli.

See the careful study by C. Dubois, Pouzzoles antique (Paris, 1907) (Bibliotheque des ecoles frangaises dAthenes et de Rome, fasc. 98).

(T. As.)

PUTLITZ, GUSTAV HEINRICH GANS, Edler ztj (1821- 1890), German

author, was born at Retzien near Perleberg in West Prignitz, on the 20th of March 1821. He studied law at Berlin and Heidelberg, and was attached to the provincial government at Magdeburg from 1846-1848. In 1853 he married Grafin Elisabeth von Konigsmark, and lived on his estate until 1863, when he became director of the Court theatre at Schwerin. This post he left in 1867, was for a short time chamberlain to the crown prince of Prussia, afterwards the emperor Frederick, and from 1873 to 1889 successfully directed the Court theatre at Karlsruhe. He died at Retzien on the 5th. of September 1890. Putlitz made his debut as a writer with a volume of romantic stories, Was sich der Wald erzaklt (1850), which attained great popularity (fifty editions) and found many imitators; but he was most successful in his comedies, notably Badekuren (1859); Das Herz vergessen (1853); and Spielt nicht mit dent Feuerl (1887), while of his narratives Die Alpenbraut (1870) and Wal- purgis (1870) are distinguished by refined terseness of style and delicacy of portraiture.

A selection of his works, Ausgewdhlte Werhe, was published in 6_vols. in Berlin (1872-1877), and a supplementary volume in 1888; his comedies, Lustspiele, appeared in two series of 4 vols, each (1851-1860 and 1869-1872). See E. zu Putlitz, Gustav zu Putlitz. Ein Lebensbild aus Brief en (3 vols., 1 894-1 895).

PUTNAM, ISRAEL (1718-1790), American soldier, was born in Salem Village (now Danvers), Massachussetts, on the 7th of January 1718. His first American ancestor (of the same family as George Puttenham), came from Aston Abbotts, Bucks, and was one of the first settlers of Salem Village. In 1740 he removed to a farm in the present townships of Pomfret and Brooklyn, Connecticut. Here in the winter of 1 742-1 743 he went down into a wolf den (still shown in Pomfret) and at close quarters killed a huge wolf. Putnam took an active part in the French and Indian War, enlisting as a private in 1755 and rising to the rank of major in March 1758. He was conspicuous for personal courage and for skill in Indian warfare, and was the hero of numerous exploits. In 1764, during Pontiac's conspiracy, he commanded the Connecticut troops (five companies) in the ex- pedition under Colonel John Bradstreet for the relief of Detroit. He was a prominent member of the Sons of Liberty and a leader in the opposition to the Stamp Act; was elected to the general assembly of Connecticut in 1766 and 1767; and increased his political influence by opening a tavern, " The General Wolfe," in Brooklyn, Conn. In August 1774, as chairman of the committee of correspondence for Brooklyn parish, he went with the committee's message and contributions to the Boston Patriots; and in October became lieutenant-colonel of the nth regiment of Connecticut militia. News of the fighting at

Lexington and Concord reached him while he was ploughing on his farm ; he instantly left the plough in the furrow and hastened to Cambridge; and he was later made second brigadier of the Connecticut forces. He was with the force, commanded by Colonel William Prescott, which on the night of the 16th of June fortified Breed's Hill, and on the next day he took a conspicuous part in resisting the British attack 1 (see Bunker Hill). Soon afterward, on his own authority, he occupied Prospect Hill, an important point for the siege of Boston, in which he commanded the centre (two brigades) of the American army at Cambridge. After the evacuation of Boston he was in command of New York City till Washington's arrival (April 13, 1776), and then was put in general charge of the city's fortifications. Immedi- ately before the battle of Long Island he succeeded General John Sullivan in command of the troops on Brooklyn Heights, and in the battle of Long Island (of Aug. 27) he was in immediate command of the American side. In the retreat from New York City he commanded one of the three grand divisions, and took part in the battle of Harlem Heights (September 16). His attempt to close the Hudson by sinking vessels in the channel was unsuccessful. In December he was ordered to Philadelphia to superintend the fortification of the city, was stationed at Prince- ton, New Jersey, from January to May 1777, and in May took command of the Hudson Highlands at Peekskill, which with Forts Montgomery and Clinton he abandoned in October, being out-manoeuvred by the British, and having been weakened by Washington's repeated demands for reinforcements. In the spring of 1778 he was superseded by General Alexander McDougall, but in April a court of inquiry acquitted him of " any fault, misconduct or negligence " in connexion with the loss of Forts Montgomery and Clinton. After a few months' recruiting service in Connecticut he returned to the main army at White Plains. In the winter of 1778-1779 he commanded the troops quartered near Redding, Conn., where Putnam Memorial Park now is. 2 In May he took command of the right wing on the west side oi!the Hudson. An attack of paralysis in December 1779 terminated his active service in the war. He spent his last yeajiisioril his farm in Brooklyn, Conn., where he died on the 29th of ,M ˆfj J790. A bronze equestrian statue by Karl Gerhardt, ove;/ V sarcophagus, was erected at Brooklyn, Conn., by the stfltffi Si j888, and there is another statue (1874) in Bushnell Park, Hartford, by J. Q. A. Ward.

Puitjjjam was a brave, intrepid and very industrious soldier rather than a great general, but his fame in the Indian wars, his personal courage, his bluff heartiness and his good-fellowship made him an idol of the rank and file; and he is one of the popular heroes in American history. He seems to have taken no part in the political manceuvrings and cabals which busied many of the officers of the American army.

See W. F. Livingston, Israel Putnam, Pioneer, Ranger and Major- General (New York, 1901) in the " American Men of Energy " series; I. N. Tarbox, Life of Israel Putnam (Boston, 1876) ; and Essay on the Life of the Honorable Major-Ceneral Israel Putnam (Hartford, 1788; enlarged ed., Boston, 1818), by David Humphreys, for a time Putnam's aide-de-camp.

PUTNAM, RUFUS (1738-1824), American soldier and pioneer, was born in Sutton, Massachusetts, on the 9th of April 1738 (O.S.). His grandfather was a half brother to Israel Putnam's father. He served in the French and Indian War in 1757-60; was a millwright in New Braintree in 1761-1768, during which time he studied surveying; and from 1769 until the War of Independence was a farmer and surveyor. In 1773, with Israel

1 So loose was the army's organization that it is impossible to settle the question whether Putnam or Prescott was in command at Bunker Hill. Apparently their authority did not clash and was practically independent. See Justin Winsor in his Narrative and Critical History, vi. 190-191 (reprinted in Livingston's Israel Putnam, as app. ii.).

2 On the 26th of February 1779, with a small outpost, he was surprised near Greenwich by a superior force under General William Tryon. He ordered a retreat, started to Stamford for reinforce- ments and, being closely pursued by several dragoons, is said to have ridden down a steep hill (marked in 1900 with a granite monument), and thus escaped. From Stamford he hastened back with rein- forcements and took thirty-eight prisoners from Tryon.

Putnam and two others, he visited West Florida to examine lands which, it was expected, were to be granted to the provincial troops for their services against the French and Indians, and which he charted (see Mississippi). He became lieutenant- colonel in one of the first regiments raised after the battle of Lexington, and served before Boston; in March 1776 he was made chief engineer of the works at New York; in August he was appointed engineer with the rank of colonel; and when Congress did not act on his plan (submitted in Oct. 1776) for the establishment of a distinct engineer corps he resigned (Dec. 1776), and in 1777 served in the northern army under Major-General Horatio Gates, commanding two regiments in the second battle of Saratoga. In 1778 he laid out fortifications, including Fort Putnam, at West Point, and in 1779 he served under Major- General Anthony Wayne after the capture of Stony Point. For the remainder of the war he saw little active service. In January 1783 he was commissioned brigadier-general. After the war he returned to Rutland, Mass., where he had bought a confiscated farm in 1780. In March 1786 he founded, with other officers of the War of Independence, the Ohio Company of Associates for the purchase and settlement of Western lands. In November 1787, after

Congress had made its grant to the Ohio Company, he was appointed by the company superintendent of its proposed settlement on the Ohio, and in 1788 he led the small party which founded Marietta, Ohio. He was a judge of the court of the North- West Territory in 1 790-1 796; was a briga- dier-general in the army and a commissioner to treat with the Indians in 1 792-1 793; was surveyor-general of the United States in 1 796-1803; and in 1802 was a member of the Ohio state consti- tutional convention. He died, in Marietta, on the 4th of May 1824. He has been called " The Father of Ohio," and he contri- buted greatly toward the material building up of the North- West Territory.

See John W. Campbell, Biographical Sketches (Columbus, Ohio, 1838); Sidney Crawford, " Rufus Putnam, and his Pioneer Life in the North-West, " vol. xii., new series, pp. 431-454, Proceedings of the American Antiquarian Society (Worcester, 1899), and Rowena Buell (ed.), The Memoirs of Rufus Putnam (Boston, 1903), in which his autobiography, his journal and other papers, now in the library of Marietta College, are reprinted. His Journal, 1757-1760, dealing with his experiences in the French and Indian War, was edited with notes by E. C. Dawes (Albany, New York, 1886).

PUTNAM, a city and the county-seat of- Windham county, Connecticut, U.S.A., in the township of Putnam, on the Quine- baug river, at the mouth of the Mill river, in the N.E. part of the state, about 6 m. from the Rhode Island boundary and about 75 m. from that of Massachusetts. Pop. (1900), of the town- ship (including the city), 7348; of the city, 6667 (2012 being foreign born) 5(1910) 6637. Putnam is at the intersection of two branches of the New York, New Haven & Hartford railway, and is connected by electric line with Worcester, Norwich and Providence. The city is the seat of two Roman Catholic insti- tutions, St Mary's Convent and Notre Dame Academy, and has a public library and an endowed hospital. The Quinebaug and Mill rivers provide excellent water-power. The township (named in honour of General Israel Putnam) was incorporated in 1855, and the city was chartered in 1895.

PUTTEE, or Puttie, the name, adapted from the Hindi pattl, bandage (Skr. patta, strip of cloth), for a covering for the lower part of the leg from the ankle to the knee, consisting of a long narrow piece of cloth wound tightly and spirally round the leg, and serving both as a support and protection, worn especially by riders, and taking the place of the leather or cloth gaiter. It has been adopted as part of the uniform of the mounted soldier in the British army.

PUTTENHAM, GEORGE (d. 1590), the reputed author of The Arte of English Poesie (1589). The book was entered at Stationers' Hall in 1588,

and published in the following year with a dedicatory letter to Lord Burghley written by the printer Richard Field, who professed ignorance of the writer's name and position. There is no contemporary evidence for the authorship, and the name of Puttenham is first definitely associated with it in the Hypercritica of Edmund Bolton, published in 1722, but

written in the beginning of the 17th century, perhaps as early as 1605. The writer of the Arte of English Poesie supplies certain biographical details. He was educated at Oxford, and at the age of eighteen he addressed an eclogue entitled Elpine to Edward VI. In his youth he had visited Spain, France and Italy, and was better acquainted with foreign courts than with his own. In 1579 he presented to Queen Elizabeth his Partheniades (printed in a collection of MSS. Ballads by F. J. Furnivall), and he wrote the treatise in question especially for the delectation of the queen and her ladies. He mentions nine other works of his, none of which are extant. There is no direct evidence beyond Bolton's ascription to identify the author with George or Richard Puttenham, the sons of Robert Puttenham and his wife Margaret, the sister of Sir Thomas Elyot, who dedicated his treatise on the Education or Bringing up of Children to her for the benefit of her sons. Both made unhappy marriages, were constantly engaged in litigation, and were frequently in disgrace. Richard was in prison when the book was licensed to be printed, and when he made his will in 1597 he was in the Queen's Bench Prison. He was buried, according to John Payne Collier, at St Clement Danes, London, on the 2nd of July 1601. George Puttenham is said to have been implicated in a plot against Lord Burghley in 1570. and in December 1578 was imprisoned. In 1585 he received reparation from the privy council for alleged wrongs suffered at the hands of his relations. His will is dated the 1st of September 1590. Richard Puttenham is known to have spent much of his time abroad, whereas there is no evidence that George ever left England. This agrees better with the writer's account of himself; but if the statement that he addressed Elpine to Edward VI. when he was eighteen years of age be taken to imply that the production of this work fell within that king's reign, the date of the author's birth cannot be placed anterior to 1529. At the date (1546) of his inheritance of his grandfather, Sir Thomas Elyot's estates, Richard Puttenham was proved in an inquisition held at Newmarket to have been twenty-six years old.

Whoever the author may have been, there is no doubt about the importance of the work, which is the most systematic and comprehensive, treatise of the time on its subject. It is " con- trived into three bookes: the first of poets and poesies, the second of proportion, the third of ornament." The first

section contains a general history of the art of poetry, and a discussion of the various forms of poetry; the second treats of prosody, dealing in turn with the measures in use in English verse, the caesura, punctuation, rhyme, accent, cadence, " proportion in figure," which the author illustrates by geometrical diagrams, and the proposed innovations of English quantitative verse; the section on ornament deals with style, the distinctions between written and spoken language, the figures of speech; and the author closes with lengthy observations on good manners. It is interest- ing to note that in his remarks on language he deprecates the use of archaisms, and although he allows that the purer Saxon speech is spoken beyond the Trent, he advises the English writer to take as his model the usual speech of the court, of London and the home counties.

Many later " poetics " are indebted to this book. The original edition is very rare. Professor Edward Arber's reprint (1869) contains a clear summary of the various documents with regard to the authorship of this treatise. The history of the Puttenhams is discussed in H. H. S. Croft's edition of Elyot's Boke called the Cover- nour. A careful investigation brought him to the conclusion that the evidence was in favour of Richard. There are other modern editions of the book, notably one in J. Haslewood's Ancient Critical Essays (1811-1815).

PUTTING THE SHOT (or Weight), a form of athletic sports (?.».). It is the only weight event now remaining in the champion- ship programme which requires a " put " as distinct from a throw, a put being a fair and square push straight from the shoulder, quite distinct from throwing or bowling, which are not allowed in putting the shot. The exercise originated in Great Britain, where, before the formation of the Amateur Athletic Association, the shot (a round weight of 16 lb) was put from a joist about 6 ft. long with a run of 7 ft., the distance being measured

from the impression made by the falling missile to the point on the joist, or a line continuing it, opposite the impression. Hence the putter failed to get the full benefit of any put save a perfectly straight one. The present British rule is that the put shall be made from a 7-ft. square, and the distance taken from the first pitch of the shot to the front line of the square or that line produced, as by the old method. In America the put is made from a 7-ft. circle, and the distance measured from the pitch to the nearest point of the circle, which has a raised edge in front to prevent overstepping and consequent fouls. Individual putters have slight variations of method, but the following description is substantially good for all. The putter stands in the back part of the square or circle with his weight entirely upon his right leg, which is bent. The body is inclined slightly backward, the left arm stretched out in front as a balance, and the right hand, the shot resting in the palm, is ˆheld against, or an inch or two from, the neck below and

behind the right ear. From this position a hop forward is made with the right leg, the foot landing in the middle of the square and the balance being preserved, so that the right shoulder is kept well back. Then, letting the right leg bend well down, the athlete springs up with a rapid twist of the body, so that the right shoulder is brought forward, and the right arm is thrust forward with all possible force, the secret being to throw all the weight and power of the body and arm into the put at the very moment of delivery. Mere brute strength and weight have less to do with successful shot-putting than in hammer-throwing or throwing the 56-Ib weight, and on this account some comparatively light men have repeatedly beaten larger and taller putters. Thus G. R. Gray, a Canadian by birth, who for many years held the world's record of 47 ft. for the 16-lb shot, was a smaller and less powerful man than several whom he defeated; and another champion of light weight was W. F. Robertson of Scotland, who weighed only 150 lb. Among the best putters of earlier times were E. J. Bor, London Athletic Club, who made a put of 42 ft. 5 in. in 1872; W. Y: Winthrop and G. Ross. The talent of Irish athletes both in Great : Britain and America for weight putting and throwing is remarkable, among the most famous of Irish putters being W. J. 3iI'.f'Bairy and Denis Hogan, the latter of whom won the amateur chaiB j&ri- ship in seven consecutive years from 1893, and again iri itp< eu 'piA 1905. The record in 1910 for the 16-lb shot was 51 ft./ rijajfe-a.t San Francisco in 1909 by R. Rose. gK .An:.

■ *PUTTKAMMER, ROBERT VON (1828-1900), Prussians 88*fts- man, was born at Frankfort-on-the-Oder on the 5th of May "¥828. His father, Eugen von Puttkammer, Oberprdsident of Posen, belonged to a widely extended noble family, of which Bismarck's wife and Robert von Puttkammer's own wife were also members. Robert von Puttkammer, after a short course of law, began his official career in 1850 as Auskultator in the courts at Danzig, but in 1852 entered the civil service, receiving after his promotion to the rank of Assessor in 1854 a post in the railway department of the ministry for trade and industry. In 1859 he became a member of the presidial council (Oberprdsidialrat) at Coblenz, capital of the Prussian Rhine province, and from i860 to 1866 was Landrat at Demmin in Pomerania. During the war with Austria he acted as civil commissary in Moravia. From 1867 . to 187 1 he was a councillor in the chancery of the North German Confederation. In 1871 he was appointed president of the governmental district of Gumbinnen in East Prussia, in 1875 district president {Bezirksprdsident) in Lorraine, and in 1877 Oberprdsident in Silesia. From 1874 onward he was frequently elected to the Reichstag and the Prussian Chamber of Deputies, in which he attached himself to the German Conservative party. Puttkammer was the chosen instrument of the Clerical Conserva- tive policy initiated by Bismarck when the Socialist peril made it expedient to conciliate the Catholic Centre. As*

Oberprdsident of Silesia he had already done much to mitigate the rigour of the application of the " May Laws," and as minister of public worship and of the interior he continued this policy. He is also remem bered as the author of the ordinance of the 21st of January 1880 on the simplification of German orthography. This was at first vigorously opposed, not least by Bismarck himself; but its*

convenience soon became evident, it was increasingly put into practice, and was so well based that later reformers have only needed to follow the lines laid down by Puttkammer. As minister of the interior Puttkammer's activities were less com- mendable. His reactionary conservative temper was in complete harmony with the views of Bismarck and the emperor William, and with their powerful support he attempted, in defiance of modern democratic principles and even of the spirit of the constitution, to re-establish the old Prussian system of rigid discipline from above. He was above all concerned to nip in the bud any tendencies in the bureaucracy to revolt, and it was on his initiative that, on the 4th of January 1882, a royal ordinance laid it down as the duty of all officials to give the govern- ment their unconditional support at political elections. Similarly though he carried out many useful administrative reforms, in a vain effort to combat Social Democracy he seriously interfered with the liberty of public meeting and attempted the forcible suppression of strike movements. This " Puttkammer regime " was intensely unpopular; it was attacked in the Reichstag not only by Radicals like Richter and Rickert, but by National Liberals like Bennigsen, and when the emperor Frederick III., whose Liberal tendencies were notorious, succeeded to the throne, it was clear that it could not last. In spite of Bismarck's support Puttkammer was forced to resign on the 8th of June 1888. Under William II., however, whose principles were those of his grandfather, Puttkammer was largely rehabilitated. On the 1st of January 1880 he received the Order of the Black Eagle. He was appointed a secular canon (Domherr) of Merseburg, and in 1891 became Oberprasident of Prussian Pomerania. In this office, which he held till 1899, he did very useful work in collaboration with the provincial estates. He died on his property at Karzm m Pomerania on the 15th of March 1900. (J. Hn.)

PUTTY, originally tin oxide in a state of fine division used for polishing glass, granite, &c, now known as "putty powder " or " polisher's putty " (from O. Fr. polie, a potful, hence brass, tin, pewter, &c., calcined in a pot). More commonly the term is applied to a kind of cement composed of fine powdered chalk intimately mixed with linseed oil,, either boiled or

raw, to the consistency of a tough dough. It is principally used by glaziers for bedding and fixing sheets of glass in windows and other frames, and by joiners and painters for filling up nail-holes and other inequalities in the surface of woodwork. The oxida- tion of the oil gradually hardens the putty into a very dense adherent mass, but when it is required to dry quickly, boiled oil and sometimes litharge and other driers are used. The word is also used of a fine lime cement employed by masons.

PUVIS DE CHAVANNES, PIERRE CfidLE (1824-1898), French painter, was born at Lyons on the 14th of December 1824. His father was a mining engineer, the descendant of an old family of Burgundy. Pierre Puvis was educated at the Lyons College and at the Lycee Henri IV. in Paris, and was intended to follow his father's profession when a serious illness interrupted his studies. A journey to Italy opened his mind to fresh ideas, and on his return to France he announced his intention of becoming a painter, and went to study first under Henri Scheffer, and then under Couture. On leaving this master in 1852 he established himself in a studio in the Place Pigalle (which he did not give up till 1897), and there organized a sort of academy for a group of fellow students who wished to work from the living model. Puvis first exhibited in the Salon of" 1850 a " Pieta," and in the same year he painted " Mademoiselle de Sombreuil Drinking a Glass of Blood to Save her Father," and " Jean Cavalier by his Mother's Deathbed," besides an " Ecce Homo," now in the church of Champagnat (Sa6ne-et-Loire). In 1852 and in the two follow- ing years Puvis's pictures were rejected by the Salon, and were sent to a private exhibition in the Galeries Bonne Nouvelle. The public laughed at his work as loudly as at that of Courbet, but the young painter was none the less warmly defended by Theophile Gautier and Theodore de Banville. For nine years Pi^'s was excluded from the Salons. In 1857 he had painted " Martyrdom of St Sebastian," " Meditation," " Village Firemen," " Julie," " Herodias," and " Saint Camilla " —

compositions showing a great variety of impulse, still undecided in style and reflecting the influence of the Italian masters as well as of Delacroix and Couture. In 1859 Puvis reappeared in the Salon with the " Return from Hunting " (now in the Marseilles Gallery). But not till he produced " Peace " and " War " did he really impress his critics, inaugurating a vast series of decorative paintings. For these two works a second- class medal was awarded to him, and the state offered to purchase the " Peace." Puvis, not choosing to part the pair, made a gift of " War " to the state. He then set to work again, and in

1864 exhibited " Autumn " and " Sleep," but found no pur- chasers. One of these pictures is now in the Lyons Museum, and the other at Lille. " Peace " and " War " were placed in the great gallery of the museum at

Amiens, where Puvis completed their effect by painting four panels — a " Standard- Bearer, " " Woman Weeping over the Ruins of her Home," a " Reaper," and a " Woman Spinning." These works were so much admired that further decorations were ordered for the same building, and the artist presented to the city of Amiens " Labour " and " Repose," for which the municipality could not afford to pay. At their request Puvis undertook another work, intended for the upper landing of the staircase, and in

1865 a composition entitled " Ave Picardia Nutrix," allegorical of the fertility of the province, was added to the collection. In 1879 the city wished to complete the decoration of the building, and the painter, again at his own expense, executed the cartoon of " Ludus pro patria," exhibited in the Salon of 1881 and purchased by the state, which at the same time gave him a commission for the finished work. While toiling at these large works, Puvis de Chavannes rested himself by painting easel pictures. To the salon of 1870 he had sent a picture called " Harvest;" the " Beheading of John the Baptist " figured in the Great Exhibition of 1889; then followed " Hope " (1872), the "Family of Fisher-Folk" (1875), and "Women on the Sea-shore " (1879). But these canvases, however interesting, are not to be named by the side of his grand decorative works. Two paintings in the Palais Longchamp at Marseilles, ordered in 1867, represent " Marseilles as a Greek Colony " and " Marseilles, the Emporium of the East." After these, Puvis executed for the town-hall of Poitiers two decorative paintings of historical subjects: " Radegund," and " Charles Martel." The Pantheon in Paris also possesses a decorative work of great interest by this painter: " The Life of Saint Genevieve," treated in three panels. In 1876 the Department of Fine Arts in Paris gave the artist a commission to paint " Saint Genevieve giving Food to Paris " and " Saint Genevieve watching over Sleeping Paris," in which he gave to the saint the features of Princess Cantacuzene, his wife, who died not long before he did. At the time of his death — on the 24th of October 1898 — the work was almost finished. After completing the first paintings in the Pantheon, which occupied him for three years and eight months, Puvis de Chavannes undertook to paint the staircase leading to the gallery of fine arts in the Lyons Museum, and took for his subjects the " Vision of the Antique," a procession of youths on horseback, which a female figure standing on a knoll points out to Pheidias; the "Sacred Grove"; and two allegorical figures of "The Rhone " and " The Sa6ne." It was in the same moo,d of inspiration by the antique that he painted the hemicycle at the Sorbonne, an allegory of " Science, Art, and Letters," a work of great extent, for which he was paid 35,000 francs (£1400). At the Hotel de Ville in Paris, again, Puvis decorated the grand staircase and the first reception-room. These works employed him from 1889 till 1893. In the reception-room he painted two panels, " Winter " and " Summer "; the mural paintings on the staircase, which had

previously been placed in the hands of Baudry and of Delaunay, are devoted to the glory of the attri- butes of the city of Paris. On the ceiling we see Victor Hugo offering his lyre to the city of Paris. The pictures in the Rouen Museum (1890-1892) show a different vein, and the artist's power of conceiving and setting forth a plastic scheme enabling him to decorate a public building with beautiful human figures and the finest lines of landscape. We see here toilers raising a

colossal monolith, part of some ancient monument, to add it to other architectural pieces; then the busy scene of a pottery; and finally artists painting in the open air. Puvis, as a rule, adhered to the presentment of the nude or of the lightest drapery; here, however, in response to some critical remarks, he has clad his figures exclusively in modern dress. After prolonged negotia- tions, begun so early as in 1891, with the trustees of the Boston Library, U.S.A., Puvis de Chavannes accepted a commission to paint nine large panels for that building, to be inserted in separate compartments, three facing the door, three to the right and three to the left. These pictures, begun in 1895, were finished in 1898. In these works of his latest period Puvis de Chavannes soars boldly above realistic vision. In the figures which people the walls with poetic images he endeavours to achieve originality of the embodying forms, and at the same time a plastic expression of ideas born of a mind whose conceptions grew ever loftier, while yet the artist would not abandon the severe study of nature. Such works as the great paintings at Amiens, Rouen, Marseilles, the Pantheon, the Sorbonne, and the H6tel de Ville are among the most important productions of French art in the 19th century. Puvis de Chavannes was president of the National Society of Fine Arts (the New Salon). His principal pupils and followers are Ary Renan (d. 1900), Baudouin, J. F. Auburtin and Cottet. See A. Michel, " Exposition de M. Puvis de Chavannes," Gazette des beaux-arts (1888); Marius Vachon, Puvis de Chavannes (1900); J. Buisson, " Puvis de Chavannes, Souvenirs Intimes," Gazette des beaux-arts (1899). (H. Fr.)

PUY, a geological term used locally in Auvergne for a volcanic hill. Most of the puys of central France are small cinder-cones, with or without associated lava, whilst others are domes of trachytic rock, like the domite of the Puy-de-D6me. The puys may be scattered as isolated hills, or, as is more usual, clustered together, sometimes in lines. The chain of puys in central France probably became extinct in late prehistoric time. Other volcanic hills more or less like those of Auvergne are also known to geologists as puys; examples may be found in the Eifel and in the small

cones on the Bay of Naples, whilst the relics of denuded puys are numerous in the Swabian Alps of Wiirttemberg, as pointed out by W. Branco. Sir A. Geikie has shown that the puy type of eruption was common in the British area in Carboniferous and Permian times, as abundantly attested in central Scotland by remains of the old volcanoes, now generally reduced by denudation to the mere neck, or volcanic vent, filled with tuff and agglomerate, or plugged with lava.

See Sir A. Geikie, Ancient Volcanoes of Great Britain (1897). PUY-DE-DdME, a department of central France, four-fifths of which belonged to Basse-Auvergne, one sixth to Bourbonnais, and the remainder to Forez (Lyonnais). Area, 3094 sq. m. Pop. (1906), 535,419. It is bounded N. by Allier, E. by Loire, S. by Haute-Loire and Cantal, and W. by Correze and Creuse. The highest point of the department, the Puy de Sancy (6188 ft.), is also the most elevated peak of central France; it commands the group of the volcanic Monts Dore, so remarkable for their rocky corries, their erosion valleys, their trap dykes and orgues of basalt, their lakes sleeping in the depths of ancient craters or confined in the valleys by streams of lava, and their wide plains of pasture-land. The Puy de Sancy, forming part of the watershed, gives rise on its northern slope to the Dordogne, and on the east to the Couze, a sub-tributary of the Loire, through the Allier. The Monts Dore are joined to the mountains of Cantal by the non-volcanic group of the Cezallier, of which the highest peak, the Luguet (5102 ft.), rises on the confines of Puy- de-D6me and Cantal. On the north the Monts Dore are con- tinued by a plateau of a mean height of from 3000 to 3500 ft., upon which are seen sixty cones raised by volcanic outbursts in former times. These are the Monts D6me, which extend from south to north as far as Riom, the most remarkable being the Puy-de-D6me (4800 ft.), from which the department takes its name, and the Puy-de-Pariou, the latter having a crater more than 300 ft. in depth. A meteorological observatory occupies the sum- mit of the Puy-de-D&me, which was once crowned by a Roman temple, the ruins of which still exist. To the east of the depart-

ment, along the confines of Loire, are the Monts du Forez, rising to 5380 ft. and continued north by the Bois Noirs. Between these mountains and the Dome extends the fertile plain of Limagne. The drainage of Puy-de-D6me is divided between the Loire, by its affluents the Allier and the Cher, and the Gironde, by the Dordogne. The Allier traverses the department from south to north, receiving on its right the Dore, which falls into the Allier at the northern boundary and lowest level of the department (879 ft.) ; on its left are the Alagnon from the Cantal, the two Couzes from the Luguet and the Monts Dore, and the Sioule, the most important of all, which drains the north-west slopes of the Monts Dore and Dome, and joins the Allier beyond the limits of the department. The Cher forms for a short space the boundary between the departments of Puy-de-D6me and Creuse, close to

that of Allier. The Dordogne, while still scarcely formed, flows past Mont-Dore-les-Bains and La Bourboule and is lost in a deep valley which divides this department from that of Correze. None of these streams is navigable, but boats can be used on the Allier during floods. The climate of Puy-de-D6me is usually very severe, owing to its high level and its distance from the sea; the mildest air is found in the northern valleys, where the elevation is least. During summer the hills about Clermont-Ferrand, exposed to the sun, become all the hotter because their black volcanic soil absorbs its rays. On the average 25 or 26 in. of rain fall in the year; in the Limagne around which the mountains arrest the clouds rainfall is less. Never- theless the soil of this plain, consisting of alluvial deposits of volcanic origin, and watered by torrents and streams from the mountains, makes it one of the richest regions of France. In the highest altitudes the rainfall attains 64 in.

About two-thirds of the inhabitants of Puy-de-DSme are engaged in agriculture. The Limagne yields a variety of products and the vine flourishes on its hill-sides. The high mountains provide pasture for large flocks of cows and sheep, and cheese-making is an industry of much importance. The intermediate region is cultivated chiefly for cereals, the chief of which are rye, wheat, oats and barley. Pota- toes are largely grown, and, to a less extent, peas, beans, beetroot and colza. The Limagne produces fruits of all kinds — apricots, cherries, pears, walnuts and apples, from which considerable quantities of cider are made. The department possesses considerable mineral wealth. There are important coal-mines at Brassac on the Allier, on the borders of Haute-Loire, at St Eloy near the department of Allier, and at Bourg-Lastic on the borders of Correze. Peat, asphalt, bituminous schists, antimony, mispickel and argentiferous lead are also worked. Of the last named there are mines and fcundries at Pontgibaud on the Sioule. Amethysts and other rare minerals are found and there are numerous stone-quarries. The watering-places of Mont Dore, Royat and La Bourboule receive separate notice. The springs of St Nectaire, containing sodium and iron chlorides and bicarbonates, are efficacious in liver complaints, rheumatism and gravel. The waters of Chateauneuf (on the Sioule), also known to the Romans, contain iron bicarbonates and are resorted to for skin diseases. Those of Chatelguyon, like the waters of Carlsbad and Marienbad, are used for disorders of the digestive organs, congestions of the liver, rheumatism, &c. There are many other mineral springs of varied character. Manufactures are for the most part grouped around Thiers, which produces a large amount of cheap cutlery, paper and leather, and Clermont-Ferrand, the capital. The depart- ment contains factories for lace and braid (in the mountains), for buntings and camlets and wool, cotton and hemp mills. There are wool-carding works and factories for linens, cloths and counter- panes, also silk-mills, tanneries, manufactories for chamois and other leathers, for caoutchouc (Clermont-

Ferrand), sugar- works, manu- factures of edible pastes with a reputation as high as those of Italy, and manufactures of fruit-preserves. The department exports grain, fruits, cattle, wines, cheese, wood, mineral waters, cutlery, &c. It is served by the Orleans and Paris-Lyon railway companies. Many thousands of the inhabitants, belonging chiefly to the district of Ambert, leave it during winter and find work elsewhere as navvies, chimney-sweeps, pit-sawyers, &c. The department comprises 5 arrondissements — Clermont-Ferrand, Ambert, Issoire, Riom, Thiers — 50 cantons and 471 communes. It is included in the bishopric and academie (educational division) of Clermont-Ferrand and the region of the XIII. army corps, of which the headquarters are in the same town ; the appeal court is at Riom.

The more noteworthy places in the department are Clermont- Ferrand, Issoire, Thiers, Riom, Ambert, Mont-Dore-les-Bains, La Bourboule and Royat (all separately noticed). Near Cler- mont-Ferrand is Mont Gergovie (see Gergovia) the scene of the victory of Vercingetorix over Julius Caesar. Other places of

interest are Billom, Chamalieres, Courpiere, Orcival, St Nectaire and St Saturnin, which possess churches in the Romanesque style of Auvergne. There are ruined feudal strongholds of great interest at Murols and Tournoel (near Volvic). Vic-le-Comte has a sainte-chapelle which is a beautiful example of the tran- sition from Gothic to Renaissance architecture, and Aigueperse has a Gothic church of the 13th to the 15th century. Near Pontgibaud are the ruins (13th century) of the Carthusian abbey of Port St Marie.

PUYLAURENS, ANTOINE DE LAAGE, Due de (d. 1635), French courtier, was born of an old Languedoc family. Attached to the household of Gaston, duke of Orleans, brother of Louis XIII., he gained a complete ascendancy over the weak prince by pandering to his pleasures, and became his adviser in the intrigues against Cardinal Richelieu. It was Puylaurens who arranged the escape of Gaston to Brussels in 1632 after the capture of Henri, due de Montmorency, and then negotiated his return with Richelieu, on condition that he should be reconciled to the king. As a reward Richelieu gave him Aiguillon, erected into a duchy. But he plunged into new intrigues, and was imprisoned first in the Louvre in 1635, then in Vincennes, where he died the same year.

PUZZLE, a perplexing question, particularly a mechanical toy or other

device involving some constructional problem, to be solved by the exercise of patience or ingenuity. Some of the oldest mechanical puzzles are those of the Chinese, one of the most familiar being that known as the tangram {chi ch'iao Cue), which consists of a square of wood or other material cut into live triangles, of different sizes, a small square and a lozenge, which can be so placed as to form over 300 different figures. This puzzle is sometimes made of ivory carved with the delicate workmanship for which the Chinese craftsmen are renowned, and is enclosed in a carved box. Another well-known puzzle is known as the " Chinese rings," consisting of a series of rings running linked together on a bar, the problem being to take them off the bar and replace them. The commonest of all puzzles are coloured maps, pictures (" jig-saw ") or designs, dissected into numerous variously shaped pieces, to be fitted together to form the complete design. A great number of puzzles are based on mathematical principles, such as the " fifteen puzzle," the " railway shunting puzzle," and the like.

See W. W. Rouse Ball, Mathematical Recreations and Amusements

(1892).

The etymology of the word " puzzle " is disputed. It has been usual to consider that the verb, which appears first at the end of the 16th century, is derived from the substantive, and that- this is an aphetic form of " apposal " or " opposal " i.e. opposi- tion, hence a question for solution, cf. Lydgate, Fall of Princes, quoted by Skeat (Etym. Diet. 1 898) . The New English Dictionary, however, takes it as ciear from the chronological evidence and sense-development that the substantive is derived from the verb, which, in its earliest examples, means to put in embarrassing material circumstances, to bewilder, to perplex. This seems against making " to puzzle " a derivative of " to pose," i.e. " oppose," to examine by putting questions. Some connexion may be found with a much earlier word " poselet," confused, bewildered, which does not occur later than the end of the 14th century.

PWLLHELI ("salt pit," or "pool"), a municipal and con- tributory parliamentary borough (Carnarvon district), seaport and market-town of Carnarvonshire, North Wales, 20 m. S. of Carnarvon and 270 m. from London by rail. Pop. (1901), 3675. It is on the north side of Cardigan Bay, on the shore of Tre- madoc Bay, with a sandy beach 4 m. in length and good bathing. It is the terminus of the Cambrian railway (the London & North- Western railway being 4 m. distant at Afonwen junction). Pwllheli commands a good' view of Merionethshire and of the Snowdon range, with the entire sweep of Cardigan Bay, Carreg yr ymbill (gimlet stone) at the mouth of the harbour, Abersoch and St Tudwal's Islands. Many hundred acres of land have been reclaimed from the sea here and

along the coast of the bay; there are costly embankments and good harbourage. The coast

is locally noted for fisheries (especially of lobsters and oysters) and some ship-building is carried on. Pwllheli was incorporated by Edward the Black Prince. At Nevin (Nefyn), 6 m. distant, Edward I. held a tournament or revel, in 1284, on a magnificent scale, to commemorate his conquest of Wales.

PYANEPSIA, or Pyanopsia (from Gr. irvavos = Kuaynos, bean, and '&f/ eiv, to boil), an ancient festival in honour of Apollo, held at Athens on the 7th of the month Pyanepsion (October). A hodge-podge of pulse was prepared and offered to Apollo (in his capacity as sun god and ripener of fruits) and the Horae, as the first-fruits of the autumn harvest. Another offering on this occasion was the eiresione. This was a branch of olive or laurel, bound with purple or white wool, round which were hung various fruits of the season, pastries, and small jars of honey, oil and wine. It was intended as a thank-offering for blessings received, and at the same time as a prayer for similar blessings and protection against evil in future; hence, it was called a " suppliant " branch (iKerqpia). The name is generally derived from eipos (wool) in reference to the woollen bands, but some connect it with eipeiv (to speak), the eiresione being regarded as the " spokesman " of the suppliants. It was carried in procession by a boy whose parents were both alive to the temple of Apollo, where it was suspended on the gate. The doors of private houses were similarly adorned. The branch was allowed to hang for a year, when it was replaced by a new one, since by that time it was supposed to have lost its virtue. During the procession a chant (also called eiresione) was sung, the text of which has been preserved in Plutarch {Theseus, 22): — " Eiresione carries figs and rich cakes ;

Honey and oil in a jar to anoint the limbs;

And pure wine, that she may be drunken and go to sleep."

The semi-personification of eiresione will be noticed; and, accord- ing to Mannhardt, the branch " embodies the tree-spirit conceived as the spirit of vegetation in general, whose vivifying and fructify- ing influence is thus brought to bear upon the corn in particular." Aetiologists connected both offerings with the Cretan expedi- tion of Theseus, who, when- driven ashore at Delos, vowed a thank-offering to Apollo if he slew the Minotaur, which after- wards took the form of the eiresione and Pyanopsia. To explain the origin of the hodge-podge, it was said that his comrades on landing in Attica gathered up the scraps of their provisions that remained and prepared a meal from them.

See W. Mannhardt, Wald- und Feldkulte (1905), ii. 214, for an exhaustive account of the eiresione and its analogies; J. G. Frazer, The Golden Bough (1900), i. 190; J. E. Harrison, Prolegomena to Greek Religion (1908), ch. 3; L. R. Farnell, Cults of the Greek States (1907), iv. 286.

PYAPON, a town and district of Lower Burma. The town is situated on a river of the same name, one of the numerous mouths of the Irrawaddy, about 12 m. from the sea. Pop. (1901), 5883. The district, which was only formed in 1903, lies within the delta of the Irrawaddy. It is a vast plain, inter- sected by tidal creeks and subject to inundation at high spring tides. The swampy jungle is being rapidly reclaimed for rice cultivation, which is the sole crop. Area, 2137 sq. m.; pop. (1901), 226,443, showing an increase of 63% in the decade.

PYAT, FELIX (1810-1889), French Socialist, was born at Vierzon (Cher) on the 4th of October 1810, the son of a Legitimist lawyer. Called to the bar in Paris in 1831, he threw his whole energies into journalism. The violent personalities of a pan> phlet entitled Marie Joseph Chenier el le prince des critiques (1844), in reply to Jules Janin, brought him a six months' sojourn in La Pelagie, in the cell just quitted by Lamennais. He worked with other dramatists in a long series of plays, with an interval of six years on the National, until the revolution of 1848. George Sand, whom he had introduced in 1830 to the staff of the Figaro, now asked Ledru-Rollin to make him commis- sary-general of the Cher. After three months' tenure of this office he was returned by the department to the Constituent Assembly, where he voted with the Mountain, and brought forward the celebrated motion for the abolition of the presidential office. About this time he fought a duel with Proudhon, who

had called him the " aristocrat of the democracy." He joined Ledru-Rollin in the attempt of the 13th of June 1849, after which he sought refuge in Switzerland, Belgium, and finally in England. For a glorification of regicide on the occasion of the Orsini attempt against Napoleon III. he was brought before an English court, but acquitted, and the general amnesty of 1869 permitted his return to France, but further outbursts against the authorities, followed by prosecution, compelled him to return to England. The revolution of the 4th of September brought him back to Paris, and it was he who in his paper Le Combat displayed a black-edged announcement of the pourparlers for the surrender of Metz. After the insurrection of the 31st of October he was imprisonedfor a short time. In January 1871, Le Combat was suppressed, only to be followed by an equally virulent Vengeur. Elected

to the National Assembly, he retired from Bordeaux with Henri Rochefort and others until such time as the "parricidal" vote for peace should be annulled. He returned to Paris to join the committee of public safety, and, in Hanotaux's words, was the time ulceree of the Commune, but was blamed for the loss of the fort of Issy. He was superseded there by Delescluze, but he continued to direct the violent acts of the Commune, the overthrow of the Vendome column, the 'destruc- tion of Thiers's residence and of the expiatory chapel built to the memory of Louis XVI. He escaped the vengeance of the Versailles government, crossed the frontier in safety, and, though he had been condemned to death in his absence in 1873, the general amnesty of July 1880 permitted his return to Paris. He was returned to the Chamber of Deputies for the department of Bouches-du-Rhone in March 1888 and took his seat on the extreme Left, but died at Saint-Gratien on the 3rd of August

1889.

PYATIGORSK, a town and watering-place of Russian Caucasia, in the province of Terek, 141 m. by rail N.W. of Vladikavkaz. Pop. (1882), 13,670; (1897), 18,638. It owes its origin to its mineral waters, which have long been known to the inhabitants of Caucasia. The sulphur springs, about fifteen in number, come from a great depth, and vary in temperature from 75 to 96° F.; they are used both for drinking and for bathing. The first buildings were erected in 181 2, and in 1830 the name of Pyatigorsk (" town of the five mountains ") was given to the new settlement. Its subsequent rapid increase was greatly stimulated by the completion of the railway connexion with Rostov-on-the-Don. The town is charmingly situated on a small plateau, 1680 ft. above sea-level, at the foot of the Beshtau, Mashuk and three other outliers of the Caucasus range, which protect it on the north. The snow-covered summits of the Elbruz are visible to the south. The most noteworthy features are a cathedral, a monument to the poet M. Y. Lermontov (r8r4-i84i), and a hydropathic.

PYCNOGONIDA, or Pantopoda, marine Arachnida (q.v.) remarkable for the reduction of the opisthosoma or abdomen to an insignificant tubercular or rod-like process (whence their trivial name of " nobody crabs "), and for the development of the oral region into a relatively immense suctorial proboscis. They form a compact group, differing from all the other orders of Arachnida in certain structural characters of such morpho- logical importance that it is impossible to affiliate them closely with any group of that class. For instance, in all typical exist- ing Arachnida the ganglionic centres which innervate the ambu- latory appendages are coalesced to form a single nervous mass, whereas in the Pycnogonida the ganglia supplying these limbs retain their original distinctness. More important still is the circumstance that in the Pycnogonida there may be as many as seven pairs

of leg-like limbs behind the mouth; but in the typical Arachnida there are never more than five such pairs. Curiously enough, too, although the number of these appendages, in all the orders of typical Arachnida is, with the exception of some degenerate Acari, a quite constant character, the number in the Pycnogonida is very variable. In most cases there are four pairs of ambulatory limbs, but in two antarctic genera, namely Pentanymphon, belonging to the family Nymphonidae and Decalopoda, probably belonging to the Colossendeidoe, they

are increased to five pairs. In front of these four or five pairs of ambulatory limbs there may be two pairs of longish post-oral limbs, called respectively the ovigerous legs and the palpi; but these may be totally absent. Finally, the single pair of pre-oral appendages may be well developed, three-jointed and chelate, or reduced in size and complexity, or altogether suppressed.

Fig. 1. — Male of Pycnogonum littorale, M tiller.

a, Parts of mouth forming a c, c, Thoracic segments.

beak. d, Rudimentary abdomen.

b, Cephalic area. e, Eyes.

Fig. 2 . — The same ; under size. a, a, Ovigerous legs.

As examples of this class exhibiting extremes of variation in the development and reduction of the appendages may be cited Decalopoda, which has the full complement of eight pairs of appendages, and the female of Pycnogonum littorale, in which all the appendages are aborted save four pairs of ambulatory limbs.

All the principal organs of the body are concentrated in that part which bears the appendages. The generative glands are lodged on each side, sending prolongations into the appendages, and their ducts open upon the second segments of more or fewer of them. The alimentary canal, beginning with the mouth at the extremity of the proboscis and terminating with the anus at the extremity of the tail-like opisthosoma, also sends long saccular prolongations into the limbs. Food is imbibed by means of the suctorial pharynx lodgec in the proboscis, the sucking action being effected by means of muscles radiating from the wall of the pharynx to that of the inner surface of the exoskeleton of the proboscis. The circulatory system, where it has been observed, consists of a heart formed of about three chambers communicating with each other. In each chamber there is a pair of orifices for the entry of the blood ; and the fluid is expelled through an orifice at the anterior extremity of the first chamber. No organs of respiration are known, the integument being the medium for the oxygenation of the blood.

The sexes are distinct, but commonly there is little external difference between the males and the females. Sometimes the female is considerably the larger of the two; and frequently the ovigerous legs are less well developed than in the male. Sometimes indeed these limbs are entirely wanting in the female, whereas this is never the case in the male. Finally, in the females the generative orifices are much more conspicuous than in the males, and the fourth joint of the legs is often swollen. The invariable presence of the ovigerous appendages in the males is correlated with the habit practised by this sex of carrying the fecundated eggs. The eggs are usually aggregated in two spherical masses round the middle of each of the ovigerous legs; sometimes, however, there are two such masses oil

each leg, or as many as four or five, whereas occasionally there is but one on the right or left side. More rarely, as in some species cf Pallene, there are few very large eggs attached separately to the legs, or the eggs may be carried in a single mass attached to the underside of the body, as in some species of Pycnogonum. Cases have been recorded of the females carrying their own eggs, as has been observed in a specimen of Nymphon brevicaudatum, but this seems to be a rare phenomenon.

The newly-hatched young frequently differs greatly from the adult. The body, which is oval, subquadrate and unsegmented, has the proboscis well developed, but bears only three pairs of appen- dages ; those of the first pair are large, three jointed and chelate, the basal segment containing a large so-called byssus gland, the duct of which opens at the tip of a spiniform or setiform process; these appendages are the mandibles of the adult. The appendages of the next two pairs are simple and small, and are generally held to be the palpi and ovigerous legs. This first larval stage, sometimes called the protonymphon, may be free living or may be retained within the egg-shell. In the second stage, which may also be con- tained in the egg, two or three of the remaining pairs of appendages have appeared, those representing the first pair of ambulatory limbs of the adult being as a rule better developed than the next. In the third stage the fourth pair of ambulatory limbs and the abdomen of the adult have begun to develop and gradually in- crease in size until the adult form is attained. But even within the limits of a single genus, e.g. Nymphon, the stage at which the young emerges from the egg is subject to considerable specific variation.

Pycnogonida vary greatly in size, the span of legs when ex- tended ranging from about 2 in. in Pycnogonum littorale to 2 ft. in Colossendeis gigas. They are wholly marine and occur at depths varying from only a few

fathoms to over 2500 fathoms. One of the best known British species is Pycnogonum littorale, a stoutly built form with only four pairs of appendages in the female. It occurs between tide marks on British coasts, but recedes to considerable depths, and on the Atlantic coast of America has been dredged at a depth of 430 fathoms. It is also wide-ranging, and has been recorded even from the coast of Chile. As a rule, but by no means an invariable rule, deep-water species have smoother bodies and much longer and thinner legs than shallow-water forms. The latter also commonly have four distinct eyes, whereas the former met with at a depth of over 400 fathoms not uncommonly have the eyes obsolete. There are many exceptions, however, to these rules. The habits of all Pycnogonida appear to be very similar. They are not swimmers, but crawl slowly over the bottom of the sea or amongst the fronds of seaweed, and they have been met with in polar, temperate and tropical seas. (R. I. P.)

PYCNOSTYLE (Gr. ttvkvos, close, compact, and otOXos, column), the architectural term given by Vitruvius to the inter- columniation of the columns of a temple, when this was equal to 1 1 diameters.

PYE, HENRY JAMES (1745-1813), English poet laureate, was born in London on the 20th of February 1745, and educated at Magdalen College, Oxford. His father, a Berkshire land- owner, died in 1766, leaving him a legacy of debt amounting to £50,000, and the burning of his home at Great Faringdon further increased his difficulties. In 1784 he was elected M.P. for Berkshire. He was obliged to sell the paternal estate, and, retiring from Parliament in 1790, became a police magistrate for Westminster. Although he had no command of language and was destitute of poetic feeling, his ambition was to obtain recognition as a poet, and he published many volumes of verse. Of all he wrote his prose Summary of the Duties of a Justice of the Peace out of Sessions (1808) is most worthy of record. He was made poet laureate in 1790, perhaps as a reward for his faithful support of Pitt in the House of Commons. The appointment was looked on as ridiculous, and his birthday odes were a con- tinual source of contempt. His most elaborate poem was an epic, Alfred (1801). He was the first poet laureate to receive a fixed salary of £27 instead of the historic tierce of Canary wine. He died at Pinner, Middlesex, on the nth of August 1813.

PYGMALION, in Greek mythology, son of Cilix, and grandson of Agenor, king of Cyprus. He fell in love with an ivory statue he had made; Aphrodite granted life to the image, and Pygmalion mar/ied the miraculously-born virgin (Ovid, Metatn. x. 243). There is no ancient authority for the introduction of the name

Galatea into the story. Pygmalion is also the name given in Virgil (Aeneid, i, 347) to a king of Tyre, who murdered Sychaeus. the husband of his

sister Dido.

PYGMY, or Pigmy (Gr. 7riry/icuos, from irvynr], a Greek measure of length corresponding to " the distance between the elbow and knuckles " of a man of average size), a term for a diminutive human being. We owe the word to Homer, who in the Iliad (iii. 6) uses it to describe a race of tiny folk dwelling in a far southern land, whither the cranes fly when inclement winters and piercing frosts visit the northern shores. Fierce battles were often mentioned by later writers as occurring between the pygmies and cranes, and were even represented on their vases. On these the pygmies were depicted as dwarfs with large heads, negro features, close, curly hair, and sometimes armed with lances. Aristotle firmly believed in the existence of these pygmies, whom he characterized as a race of men of small stature inhabiting the marshes of upper Egypt towards the sources of the Nile. That their existence was a matter of common knowledge and speculation is indicated by the fact that Philostratus describes the sleeping Hercules beset by swarms of pygmies. Herodotus (ii. 32), relying apparently on authentic information, describes graphically how a party of five Nasamon- ians, while journeying through the African desert, came at last to a plain where fruit-trees grew. While gathering the fruit they were seized by some dwarfish men of strange speech, who led them across forest marshes to a town, where dwelt people of a similar appearance, and near which a great river flowed from west to east containing crocodiles. This river was probably the Niger, and the people referred to were no doubt the ancestors of the existing pygmies of equatorial Africa. Representations of these pygmies have been found sculptured on the tombs at Sakkarah, which are referred to the Vth Dynasty of Egypt, 3366 B.C. The pygmies depicted in bas-relief on these tombs faithfully reproduce the racial characteristics of the present race of pygmies inhabiting the Ituri and Semliki forests. They no doubt served in the households of the Egyptian kings, and figured both in Egyptian and Roman triumphs.

Various writers have localized pygmies in different portions of the earth's surface. Pliny makes mention of dwarfed races in both Asia and Africa. Reference is made to the Catizi dwarfs in Thrace, and to a similar race dwelling in Caria. Ctesias, a century after Herodotus, wrote of a race of pygmies in the heart of India, describing them as black and ugly, and only two pygmai in height. The Chinese author, Chao Fu-Kua, in the beginning of the 13th century, described a tribe of black pygmies dwelling in the Philippine Islands; in the depth of the valleys there lived, he said, a tribe of men called Hai-tan, small in size, with round, yellow eyes, curly hair, and with the teeth showing through their lips. These were no doubt the ancestors of the present Aetas. Relics of a pygmy race are supposed to exist now in Sicily and Sardinia, i.e. along the high road between Pleistocene Africa and Europe. Near Schaffhausen, Dr Kollman found skeletal remains of small

human beings, which have been regarded by some authorities as belonging to the European pygmies of the Neolithic period. Some anthropologists of authority,' indeed — in spite of the absence of definite data in support of such a view — believe that a dwarf negroid race at one time existed in northern Europe, and may have given rise to the traditional tales of elves, goblins, gnomes and fairies.

At the present time the existing pygmy races may be sub- divided into two main groups or sub-races: (a) the African pygmies (Negrilloes), (b) the Asiatic pygmies (Negritoes).

a. The African pygmies are dispersed over a large zone extending right across equatorial Africa, from Uganda to the Gaboon, the width of this zone being about six degrees, i.e. three degrees north and south of the equator. In Uganda they are now principally confined to a belt of forest lying to the east and west of the Semliki River, though many centuries ago these forest dwarfs must have been the principal inhabitants of the whole of the Uganda Pro- tectorate. They are much more abundant in the forests of the Belgian Congo, being found as far south as the range of the Angola, and to the north and north-west as far as the Bahr-el-Ghazal and the German Cameroons. They are also found in the interior of the French Congo and in the Gaboon. They comprise the Akkas

(Tiky-Tiky) of the upper Nile, and of the Niam-Niam country; the Wambutti (Mbuti, Mambute, Bambute) of the great Ituri forest, and the Balua (Watwa) living to the south of the great curve of the Congo river. In the vast forest tract lying between the region of the great lakes and the Atlantic Ocean there are other scattered tribes of pygmies differing in no essential particulars from these, and severally known as Ariffi (of the Momfu country) ; Obongo, Wochua, Akua, Achango (of the French Congo), Ba-Bengaye (of Sanga), Boyaeli and Bayago (of the Cameroons). Negrilloes have also been noted outside these limits, e.g. in the basin of the upper Kasai, as far east as Lake Tanganyika, and even to the north ot Lakes Stefanie and Rudolf in British East Africa. There has been considerable mixture of the Negrilloes with the neighbouring Bantu peoples, e.g. Adumas, &c.

b. The distribution of the Asiatic pygmies is mainly Oceanic. The following are the three principal tribes. (1) The Aetas (Philip- pine Islands). The name " Aetas " is derived from the Malay word hitam, meaning black. These little folk dwell in small groups in the interior of Luzon Island, and

are to be met with also in the islands of Mindoro, Panay and Negros, and in the north-east of Mindanoa. The total number of Philippine Negritoes is about 20,000. (2) The Andamanese (Andaman Islands). These live in isolated groups of fifty to eighty persons. They appear to be dying out, and in 1891 numbered less than 4000. The term Mincopis has sometimes been applied to these Negritoes. (3) The Sakai (interior of the Malay Peninsula). Some of these Malay Negritoes are also known as Semangs, Menik, Sen-oi and Jembe. They live for the most part in small groups of from two to three families. In the Ulu-Papung district alone the pure Negritoes in 1890 num- bered over 5000. There is much mixture, however, with the sur- rounding Malay population. Thus the Mintra and Jakhuns are Sakai-Malay cross- breeds. In Malacca the Pangyans of Kelantan and Petani and the neighbouring Tumiors are pure Negritoes, while the Belendas are probably cross-breeds. Some anthro- pologists believe that the Sakas of the islands on the north-east coast of Sumatra are also derived from Negritoes.

A group of Negritoes — the Karons — has also been discovered in a small area in the north-west coast of New Guinea. 1 Here also there are Negrito- Papuan cross-breeds. There is much diver- sity of opinion as to whether the recently extinct Kalangs of Java — in some respects the most ape-like of all human beings — did or did not belong to the true Negrito race.

There seems little doubt that at one time the Negrito element was fairly widespread throughout Malaysia, though there is no positive evidence in support of de Quatrefages's contention that the Negrito race once inhabited a vast domain in Indo-oceanic Asia, extending from New Guinea up to the Persian Gulf, and from the Malay Archipelago to Japan. The Malay Peninsula, and possibly some parts of India, are the only portions of the Asiatic mainland where traces of a distinct negroid substratum have been discovered.

A passing reference may here be made to the Bushmen of South Africa, whose average height (4 ft. 8 in.) approximates to that of the true pygmies. Some authorities believe that there is a distinct ethnical relationship between the Negrilloes and the Bushmen, though in many respects the forest pygmies seem more closely allied to the West African Bantu negroes than to the Bushmen- Hottentot group. Professor Elliot-Smith is, indeed, of opinion the pygmies of Central Africa are essentially dwarfed negroes. Schweinfurth, who rediscovered the Akka pygmies of equatorial Africa, believed that they and the Bushmen of South Africa were the remnants of the aboriginal population of the continent, now becoming extinct. The Bushmen have totally different character- istics from the true pygmies. The steatopygia, the dolichocephalic cranium, the lozenge-shaped face with its deep wrinkles, the high protruding cheek-bones, the narrow oblique eyes, the peculiar speech with its marvellous " clicks," the fawn-yellow skin, the

absence of downy hair on the body, and other characteristics of the Bushmen, sharply differentiate them from the true forest pygmies.

Consideration of the distribution and general characteristics of the existing pygmy races — Negrilloes and Negritoes — has induced many anthropologists to conclude that we are dealing with the but little modified descendants of an extremely ancient race— the ancestors possibly of all the negro tribes. Sir W. H. Flower himself, as far back as 1880, stated that he was inclined to regard the Negritoes as representing an infantile, undeveloped, or primitive form of the type from which the African negroes on the one hand, and the Asiatic Melanesians on the other, with all their various modifications, may have sprung. If this view be correct, it seems probable that the members of the pygmy races are the existing human beings which most closely resemble primitive man. On the other hand, there are those who regard

1 In The Times of June 3, 1910, was reported a discovery, made by an expedition organized by the British Ornithologists' Union, of a tribe of pygmy people (probably Negritoes) in the great snow mountains of Dutch New Guinea, at an altitude of about 2000 ft. The average height of these pygmies is about 4 ft. 3 in.

the pygmies as a retrograde and degenerative type of the negro race and therefore of comparatively recent growth. Though the balance of evidence seems in favour of the former hypothesis, the question must still be regarded as sub judice. The first hypothesis would certainly go far to explain the present distri- bution of the pygmy races. If we regard, as many authorities do, the Indo-African continent, submerged in comparatively^ recent geological times by the waters of the Indian Ocean, as being the original home of primitive man, then it is easy to under- stand how he migrated from the subsiding Indo-African continent westward into the heart of Africa, and eastward to the Malay Peninsula by way of the Eastern Archipelago, at that time forming part of the mainland. Those members of the primitive race who migrated westward are supposed to have spread over the larger portion of the continent of Africa. They appear to have divided off into two main branches, the Negrillo pygmies of central Africa and the Bushmen of the southern portion of the continent. These two sub-races appear to have been the abori- ginal inhabitants of the country, though their direct descendants have now been driven into the great forest fastnesses by the more powerful Bantu races which sprang from the parent stem at a later date. A. H. Keane, who considers the recently extinct Kalang pygmies as the aborigines of Java, thinks it probable that this island was the first region reached by primitive man and his Miocene precursor during the eastward migration from the subsiding Indo-African continent.

General Characters of the Pygmy Races. — As regards stature, the smallest are the African Negrilloes, their average height being 1-38 m. (4ˆ ft.). One of the six Mambute Negrilloes brought to England by Colonel Harrison in 1906 measured just over 3I ft. Individuals not exceeding 3 ft. are met with, though the midgets of one or two pygmai in height, whose existence is indicated in the early Greek writings, must be relegated to the realm of mythology.

The Philippine Aetas measure 1-47 m., while the average height of the Sakai and Andamanese is I -49 m.

The present writer estimated the weight of six adult Mambute pygmies (four males and two females) from the Ituri forest, and Found the average weight to be seventy-seven pounds. Two of these, one man and one woman, each weighed only fifty-three pounds. _ All the pure pygmy tribes — whether Negrilloes or Negritoes —in addition to their small size have certain, well-marked characters in common. The most notable of these are crisp, closely-curled hair, flattened nose, broad at the base, deeply depressed at the root and with exaggerated development of the alae nasi, long upper lip with the mucous membrane moderately everted, large ape-like mouth, receding chin, pronounced prognathism, abundant fine woolly hair on the body, brachycephalic cranium, proportionately long arms and short legs, and a general simian appearance.

The colour of the skin shows considerable variation. The pure- blooded African Akkas are of a peculiar dirty reddish-yellow colour, the Mambute pygmies of the Ituri forest have a skin of a deep chocolate-brown hue, while that of the Oceanic Negritoes is of a dark brown or blackish colour, differing but little from that of the surrounding Papuans and Melanesians. The eyes of the pygmies are often large and staring, giving a characteristic " wild appearance."

The abdomen is protuberant in the case of the African pygmies, but not so in the case of the Oceanic Negritoes. The mid-point of the body is above the umbilicus, instead of being below as in the case of Europeans and Asiatics. There is no definite steato- pygia, though in a few individual cases among the black Negrillo women the buttocks attain considerable dimensions.

The feet are large and turned slightly inwards, while the toes are relatively longer than those of Europeans. In some there is a tendency for the four smaller toes to diverge from the great toe. Being wonderfully adroit clipibers, they sometimes make use of their feet by grasping branches between the great toe and the rest of the toes.

Their clothing is chiefly conspicuous by its absence. The African pygmies go

about, for the most part, quite naked, except for the occasional presence of a small covering over the pudenda, the men wearing a small piece of deer-skin, and the women one or two bunches of green leaves, which they renew daily. The resemblance to the traditional fig-leaf covering is obvious. The Andamanese wear practically no clothing. The Karons of New Guinea wear a few strips of bark dangling from a string round the loins. The Negrilloes seldom, if ever, tattoo their body. They are fond of beads and other articles of adornment; the upper lips are often pierced with holes, through which quills are thrust. They cut their short curly hair into all sorts of fantastic patterns, and often twist some of it into peaks into which they plait feathers.

Pygmy dwellings are extremely primitive structures. In A/rica they are simply arbours constructed of bent interlaced branches and plantain leaves, about 7 ft. in diameter and 4 ft. high, with a

small hole near the bottom, through which the pygmy crawls on all fours. Ten or twelve of these arbours constitute a village. These arbours are only temporary habitations, as the pygmies are always moving on to different portions of the forest in pursuit of game. The Philippine Aetas show the same nomadic tend- encies. The dwellings of the Malay Semangs are. mere lean-to's, constructed of matted palm-leaves, while the Karons of New Guinea live in wretched hovels of foliage and branches, and in some districts have no habitations whatever.

The pygmies are seldom if ever tillers of the soil. The African forest dwarfs live mainly on the flesh of birds, deer and other animals, which they shoot with bows and arrows. They eat white ants, bee grubs and the larvae of beetles, also honey, wild beans and mushrooms. They are fond of fruits, particularly bananas, which they obtain from their bigger neighbours by barter or by plunder. They eat the vegetables raw, while the meat is broiled in the ashes of the fire until quite dry. Their utensils consist solely of a few clay cooking-pots and gourds for water. There is no record of cannibalism among the pygmy races. The six Mambute pygmies brought to England in 1906 soon became acclimatized. They took most kindly to European diet and clothing. At the expiry of eighteen months they went back to the Ituri forest much improved in health, having each gained on an average t)J lb in weight.

They are most daring hunters, and marvellously skilful archers. Though of small size they are well made and agile, and are able to dart in and out

with the greatest of ease amongst the tall tangled vegetation of the tropical woodlands. The Batwa, from the south of the Congo, successfully attack elephants, shooting them with their tiny poisoned arrows. The poison is obtained from the juice of certain plants, and also from decaying animal matter derived from the putrefaction of ants. The Andaman pygmies live ex- clusively by hunting and fishing.

The African pygmies marry at a very early age, often when only nine or ten years old. Marriage is simply a question of the pur- chase of the girl from her father; the purchase-price being from ten to fifteen arrows, occasionally supplemented, in the case of a desirable wife,, by one or two spears or some tobacco. A man may have as many wives as he can afford to buy. A mother gives birth to her offspring in the forest, severing the navel-cord with her teeth, and burying the placenta in the ground. The families are usually small, rarely exceeding three in number. There is great rejoicing when a boy is born, while the unlucky girl baby is beaten by her father with plantain leaves. The boys are often circumcised. There is great affection between the husband and the wife and be- tween the parents and the children. The duration of life is short in the equatorial forests, death usually taking place before the age of forty. The dead are buried in graves, the chief's wives being sometimes killed and buried along with him.

The African pygmies have little if any belief in life after death. They say death is the end of everything. They have a vague belief in " Oudah," a sort of pygmy devil, who is responsible for sudden death and such-like calamities. There is no trace of spirit or ancestor worship. The Andaman Islanders have a vague belief in a sort of god — " Piiluga " — an invisible being who lives in a large stone house in the sky, and who made all things. They also believe in an evil one, to whom they attribute sickness and death. There is no hereditary chief. In many cases a group of pygmies simply cluster round a skilful hunter. In the case of the Mambute pygmies, a chief is succeeded, not by his son, but by his best friend. There are no governmental laws. Murder in the Ituri forest is punished by the next-of-kin lying in wait for the culprit and killing him.*

The Negrilloes are fond of music and have numerous folk-songs. They also twang on stringed bows, and beat drums made of hollowed- out tree trunks covered in at the ends with antelope skin. They are also great dancers, keeping perfect time to the beating of the drums their bodies going through the most extraordinary contor- tions. They all dance together in a long line, which twists about like a snake.

The forest dwarfs have some idea of drawing, each arrow shaft having its distinctive carving. The Andamanese display a consider- able degree of intelligence. The Karons of New Guinea, on the other hand, seem to be of a

low type of intelligence.

The Negrilloes have acquired a great reputation among the neigh- bouring tribes for their knowledge of poisons and their antidotes. Their treatment of all pains and inflammations consists in linear scarification of the skin of the affected part. They invariably use sharpened arrow-heads for this purpose.

Close observation has convinced the present writer that the African pygmies are endowed with a high degree of intelligence. Sir Harry Johnston believes them to be the intellectual superiors of the big negroes. They exhibit vivacity and adroitness, quick- ness in picking up information and languages, and surprising readiness in grasping the salient points of a subject. They are wonderful mimics, and have a marked sense of humour, making witty remarks which set the others off into peals of laughter. They are as a rule bright and cheerful in disposition, will sometimes fly into sudden fits of ill temper and as quickly recover their good humour. They are cleanly in their habits, have a natural sense of

modesty and refinement, and punctiliously observe the ordinary decencies of life.

The pygmies of the Malay Peninsula have a perfectly distinct language of their own. A glossary and grammar with phonetic rules of the Sen-oi dialect has been published, showing no con- nexion with any other known language.

The African pygmies, for the most part, speak a more or less corrupt form of the language of the adjacent negro tribes, e.g. Keswahili, Bantu, Momfu. They have some words, however, peculiar to themselves, which may be the fragments of their own original language. (R. M. L.)

PYLE, HOWARD (1853-), American artist and writer, was born at Wilmington, Delaware, on the 5th of March 1853. He was a pupil of the Art Students' League, New York, and first attracted attention by his line drawings after the manner of Albrecht Diirer. His brilliant work as an illustrator made him one of the foremost of American artists, his drawings to illustrate American colonial life, particularly in New England and New Amsterdam, being especially noteworthy; and he published a number of books of fiction, written and illustrated by himself. He also became prominent in decorative painting, his works including " The Battle of Nashville " for the capitol at St Paul, Minnesota, and " The Landing of Carteret " for the Essex county court house, Newark, New Jersey. At his home in Wilmington, Delaware, he established a school of art, instruction being gratuitous, and many successful American illustrators were educated

there. In 1907 Howard Pyle was elected a member of the National Academy of Design.

PYLOME, in Zoology, the name given to the principal opening (or openings) of the shell (theca, test) of such Protozoa as possess one. (See Foraminifera, Radiolaria.)

PYLOS (mod. Navarino), in ancient geography a town and bay on the west coast of Messenia, noted chiefly for the part it played in the Peloponnesian War. The bay, roughly semi- circular in shape, is protected by the island of Sphacteria (mod. Sphagia), over 2§ m. long from N. to S., and is entered by two channels, that on the S., some 1,400 yds. wide, and that on the N., 220 yds. wide and now almost silted up. To the north lies an extensive shallow basin, called the lagoon of Osman Aga, originally part of the great harbour but now cut off from it by a narrow sandbank. North of Sphagia is the rocky headland of Pylos or Coryphasium, called in modern times Palaeo-Navarino or Palaeokastro, from the Venetian ruins on its summit. Originally an island, this headland was in classical times, as now, connected by a narrow bar with the lower promontory of Hagios Nikolaos on the north ; it is now united to the mainland also by the sandbar already mentioned. Most scholars, ancient and modern, have identified this with the Homeric Pylos, the home of Neleus and Nestor,and a cave on the north slope of Coryphasium is pointed out as that in which Hermes hid the stolen cattle of Apollo. But this view presents considerable difficulties, and Strabo (viii. 348 sqq.) argued that the Pylos of Nestor must be the place of that name in Triphylia. After the Dorian migration Pylos declined, and it is referred to by Thucydides (iv. 3) as a deserted headland in 425 B.C. In May of that year, the seventh of the Peloponnesian War, the Athenians sent an expedition to Sicily under command of Eurymedon and Sophocles. With them was the general, Demosthenes, who landed at Coryphasium with a body of Athenian troops and hastily fortified it. The Spartans, who were then invading Attica, withdrew their forces and attacked them vigorously by sea. and land, but were re- pulsed, and the Athenians were enabled by the arrival and victory of their fleet to blockade on the island of Sphacteria a body of 420 Spartiates with their attendant helots. A truce was concluded, but peace negotiations were defeated by Cleon (q.v.), who was himself appointed to conduct operations with Demos- thenes. A large body of light troops was landed and drove the Spartans from their encampment by a well in the middle of the island to its northern extremity. Their heroic resistance was overcome by a rear attack directed by a Messenian, who led a body of men by a difficult path along the cliffs on the east, and the 292 Spartan survivors laid down their arms 72 days after the beginning of the blockade. Their surrender made a deep im- pression on the whole Greek world, which had learned to regard

a Spartan surrender as inconceivable, and to Sparta their loss was so serious that the Athenians might have concluded the war on very favourable terms had they so wished. Though Pylos should have been ceded to Sparta under the terms of the peace of Nicias (421 B.C.) it was retained by the Athenians until the Spartans recaptured it early in 409 B.C. (Diodorus xiii. 64).

In the middle ages the name Pylos was replaced by that of Avarino ('Afiapivos) or Navarino, derived from a body of Avars who settled there; the current derivation from the Navar- rese Company, who entered Greece in 1381 and built a castle at this spot, cannot now be maintained (Eng. Hist. Review, xx. 307, xxi. 106; Hermathena, xxxi. 430 sqq.). From 1498 to 1821 Navar- ino was in the hands of the Turks, save at two periods when it was held by the Venetians, who named it Zonklon. In 182 1 the Greeks captured the town, situated near the southern extremity of the bay, but in 1825 they had to retire before Ibrahim Pasha. On the 20th of October 1827, however, his fleet of 82 vessels was annihilated in the Bay of Navarino by 26 British, French and Russian ships under Admiral Codrington (see Navarino, the Battle of).

See W. M. Leake, Travels in the Morea, i. 398 sqq. (London, 1830), and Peloponnesiaca, 190 sqq. (London, 1846); E. Curtius, Pelopon- nesos, ii. 173 sqq. (Gotha, 1852); C. Bursian, Geographievon Griechen- land, ii. 175 sqq. (Leipzig, 1868); Pausanias iv. 36, and the com- mentary in J. G. Frazer, Pausanias 's Description of Greece, iii. 456 sqq., v. 608 sqq. (London, 1898) ; W. G. Clark, Peloponnesus, 214 sqq. (London, 1858); \V. Vischer, Erinnerungen und Eindriicke aits Griechenland, 431 sqq. (Basel, 1857); G. Grote, History of Greece, pt. ii. ch. 52; G. Busolt, Griechische Geschichte, iii. 1086 sqq.; F. M. Cornford, Thucydides mythistoricus, 82 sqq. (London, 1907). The operations at Pylos, described by Thucydides iv. 2-41, have been discussed on the basis of personal observation by Dr G. B. Grundy (Journal of Hellenic Studies, xvi. 1 sqq. ; Classical Review, x. 371 sqq., xi. 155 sqq., 448; J.H.S., xviii. 232 sqq.) and Professor R. M. Burrows (J.H.S., xvi. 55 sqq.; C.R. xi. I sqq.; J.H.S., xviii. 147 sqq., 345 sqq.; C.R. xix. 129 sqq.). Though differing on many points, they agree in thinking (1) that the island of Sphagia is the ancient Sphacteria, Palaeokastro the ancient Coryphasium or Pylos; (2) that in 425 B.C. the lagoon of Osman Aga was navigable and communicated by a navigable channel with the Bay of Navar- ino; (3) that Thucydides, if the MS. reading is correct, under- estimates the length of the island, which he gives as 15 stades instead of 24 (nearly 3 m.), and also the breadth of the

southern channel between it and the mainland. Cf. J.H.S., xx. 14 sqq., xxvii. 274 sqq., and Frazer's summary (op. cit. v. 608 sqq.). (M. N. T.)

PYM, JOHN (1584-1643), English statesman, was the son and heir of Alexander Pym, of Brymore, Somersetshire, a member of an ancient family which had held this seat in direct male descent from the time of Henry III. He matriculated as a com- moner at Broadgates Hall (now Pembroke College), Oxford, in 1599, and entered the Middle Temple in 1602. He acquired a sound knowledge of the law, and became receiver-general of the king's revenue for Wilts., thus gaining a valuable insight into business and finance. He was returned to parliament as member for Calne in i6i4and again in 1621. He at once became conspicuous in the struggle between Crown and parliament. To the committee appointed to consider the state of religion he made his first great speech on the 28th of November 162 1. He held fast to the Elizabethan principle that the Roman Catholics should be subjected to disabilities, not because of their religion, but because of their politics. He, therefore, moved that a special commission for the suppression of recusancy should be appointed, and that an association, after the model of those formed under Elizabeth, should be entered into for defence of the king's person and for the execution of the laws concerning religion. Pym supported Sir Edward Coke in the remonstrance on the prevailing discontents, and was a chief promoter of the petition which incurred James's violent displeasure, and of the Commons' answer defending their privileges, which was after- wards torn from the records by the king's own hand. On the dissolution of parliament which immediately followed, Pym, with other "ill-tempered spirits," was arrested in January 1622, and was confined first to his house in London, and then to Brymore. He associated himself with the party of Francis, 4th earl of Bedford, was returned for Tavistock in 1624, and represented this borough in all the ensuing parliaments. He

supported Eliot in urging war against Spain for the defence of Protestantism and the Palatinate, and showed throughout his career, as far as his attention was ever directed to foreign policy, a steady inclination in favour of France.

In the parliament of 1625 he continued his campaign against the Roman Catholics, and drew up with Sir Edwin Sandys the articles against them, and the petition to the king for the direct execution of the penal laws. In the parliament of 1626 he was the chief mover, in April, in the prosecution of Richard Montagu, who had advocated Romish doctrines. On the 8th of May he was manager of Buckingham's impeachment, when it was his special duty to press articles ix., x., xi., relating to the improper distribution of rewards and honours. In the third parliament of Charles I., in 1628, Pym overruled Eliot in de- ciding that Buckingham's impeachment should

now be sub- ordinated to the struggle on general grievances. He zealously pushed on the Petition of Right, resisting on the 20th of May the clause added by the Lords to safeguard the king's " sove- reign power," declaring that " he knew not what it was." On the 9th of June he carried up to the Lords the impeachment of Roger Manwaring, and delivered a famous speech in which he expounded the fundamental principles which guided his policy.

" Histories," he said, " are full of the calamities of whole states and nations …. [when] one part seeks to uphold the old form of government and the other part to introduce a new . . . But it is equally true that time must needs bring about some alterations. . . . Those things only are eternal which are con- stant and uniform. Therefore it is observed by the best writers on this subject, that those commonwealths have been most durable and perpetual which have often reformed and recompensed them- selves according to their first institution and ordinance."

On the nth of June he joined in the attack upon Buckingham, whom he regarded as the " cause of all these grievances." On the 27th of January 1629 he was reporter of the committee on religion, and declared that convocation was dependent upon parliament. He again, in February 1629, differed from Eliot, who treated the dispute about tonnage and poundage as a point of privilege, declaring that " the liberties of this house are in- ferior to the liberties of the kingdom," and desiring to deal with it on higher ground as a breach of law and the constitution. He .took no part in the subsequent disturbance in the house, and his name is not mentioned as actively resisting Charles's arbi- trary government during the eleven years which followed the dissolution. At this period the state of public affairs may well have appalled the most hopeful and the most patriotic, but there seems no sufficient authority for the belief that Pym, with Hampden and Cromwell, actually embarked for New England and were prevented from sailing by orders from the govern- ment. An allusion, however, to a similar plan formed " by some very considerable personages," " diverted by a miraculous providence," is made in a sermon by Thomas Cave in 1642. Pym himself was directly interested in the colonies, being patentee of Connecticut and Providence, and of the latter company also treasurer, and there can be little doubt that like other leaders of the opposition during this period, he regarded America as a possible refuge.

On the assembly of the Short Parliament on the 13th of April 1640, Pym was the acknowledged leader. " Whilst men gazed upon each other," says Clarendon (Hist. ii. 68), " looking who should begin (much the greater part having never before sat in parliament), Mr Pym, a man of good reputation . . . who had been as long in these assemblies as any man there living, broke the ice." On the 17th of April he made a great speech of nearly two

hours, in which he enumerated the national grievances, deplored almost in the words of Bacon " the interruption of that sweete communion which ought to be betwixt the king and his people in matters of grant and supply," pointed out the practical injury inflicted on commerce and every sort of enter- prise including colonial expansion by illegal and arbitrary tax- ation, and concluded by asking the Lords to join in finding out causes and remedies. His words made a deep impression. On the 27th of April he resisted the grant of supply, and when the Lords passed a resolution that supply should precede the

discussion of grievances, Pym, as manager of the Commons, on the ist of May, read them a severe lecture on the breach of privilege they had committed. Finally, on the 4th, it was resolved that Pym should next day petition the king to make terms with the Scots, to avoid which Charles summarily dissolved the parliament.

All the energies of Pym were now concentrated on obliging Charles to summon another parliament. He was the author of the petition of the twelve peers to the king for redress of grievances and for calling a new parliament, by the wide distribution of which an appeal was made to the nation, and he was the pro- moter of the petition signed by 10,000 citizens of London. In company with Hampden he rode through the provinces, rousing and organizing public opinion. Meanwhile Charles's attempt to implicate Pym in treasonable communications with the Scots, though there is little doubt that they existed, met with complete failure. Thus, when the king was forced to call the Long Parliament on the 3rd of November, Pym was its acknowledged author and leader. His great work was now, as he conceived it, to save the national liberties and the national religion. Clarendon (Hist. iii. 2) records some " sharp discourse " of Pym with himself at this time, " that they had now an opportunity to make their country happy by removing all grievances and pulling up the causes by the roots, if all men would do their duties." He had seen Vane's notes of Strafford's speeches at the council when he had advised the subduing of " this kingdom " by the Irish army, and on the 7th of November, after declaring to the house the dangerous designs then on foot, Pym moved for a sub-committee to examine into Strafford's conduct in Ireland. The latter's sudden arrival at London on the oth with the intention of instantly impeaching the popular leaders of treason was met by Pym with corresponding quickness and resolution. On the nth, after a debate of four hours in the Commons, by his directions with locked doors, he carried up Strafford's impeachment to the Lords, and by this great stroke rendered

him at once powerless.

On the 16th of December he moved the impeachment of Laud, whom he joined with Strafford as conspiring to subvert the government of the kingdom, and carried up the articles to the Lords on the 26th of February 1641. He was the chief pro- moter of the case against Strafford, while the attempts of the queen to gain him over were without result, and on the 28th of January 1641 he brought up to the Lords the list of charges. On the 23rd of March he opened the case, when he argued that to attempt to subvert the laws of the kingdom was high treason, and delivered a violent denunciation against the fallen minister, attributing to him systematic cruelty, avarice and corruption. He soon afterwards heard of the army plot, and the necessity of destroying Strafford became more apparent. He now dis- closed Vane's notes. To the attainder, which was at this stage resolved upon, he was opposed (since he clung to the more judi- cial procedure by impeachment), but when overruled he sup- ported it, at the same time procuring that the legal arguments should not be interrupted. He delivered his final speech on the 13th of April, a great oratorical performance, when he again appealed to the Elizabethan political faith and to that of Bacon, who had so severely censured any action which divided the king from the nation. The man who violated this union was guilty of the blackest treason. " Shall it be treason," he asked. " to embase the King's coin though but a piece … of sixpence . . . and not to embase the spirits of his subjects; to set a stamp and character of servitude upon them ? " Towards the end of his tremendous indictment of Strafford, Pym broke down, fumbled among his papers, and lost the thread of his argument. But his temporary failure did not diminish the force and effect of his words, all the more impressive because actually spoken in the presence of the sovereign. " I believe," wrote Baillie (Letters, i. 348) " the king never heard a lecture of so free language against that his idolized prerogative."

Attempts were now once more made to gain over Pym to the administration. He had two interviews with the king, but without result, and Charles again determined to resort to

force. On the 2nd of May he endeavoured to get possession of the Tower. On the 3rd the Protestation, on Pym's. motioh, was taken by the Commons within closed doors, and afterwards circulated in the country, and on the 5th Pym disclosed the army plot. These incidents decided the struggle and Strafford's fate. The Lords immediately passed the attainder, together with the bill for making parliaments indissoluble without their own consent. Soon afterwards were swept away those institutions of Tudor growth which had become the chief in- struments of oppression, the council of the North, the court of high commission, and the star chamber, while the Crown aban- doned the claim to levy customs without consent of parliament. Meanwhile

Pym had also taken the lead in the religious con- troversy. During the dispute between the two houses on this question on the 8th and 9th of February 1641, while supporting the London petition for the abolition of the bishops, he had declared his opinion that " it was not the intention of the House to abolish episcopacy or the Book of Common Prayer, but to reform both wherein offence was given to the people." This, no doubt, expressed his real intentions and policy. When, however, it became clear that the bishops were merely the nominees of the king to carry out " innovations in religion " and preach arbitrary government, Pym was easily persuaded to support their abolition, and voted in opposition to the moderate party for the Root and Branch Bill of May 1641, and again for taking away their votes in October. But in his " Vindication," published in March 1643, he especially states that his action with regard to the bishops in " no way concluded me guilty of revolt from the orthodox doctrine of the Church of England." .

The first act in the great political struggle had ended in the complete triumph of Pym. His chief care now was to defend the parliament from violence, since this was the only method of retaliation left a the king's disposal. Through the medium of the countess of Carlisle, Charles's plans were regularly dis- closed to Pym. In June he heard of the second army plot, and on the 22nd he carried up the ten propositions to the Lords, requesting their concurrence in effecting the disbandment of the armies and the removal of evil counsellors. After Charles's departure for Scotland, Pym served on the committee for defence, appointed on the 14th of August, and was chairman of the committee which sat during the recess from the 9th of September to the 20th of October to watch the progress of affairs and com- municate with Scotland. On the latter day letters arrived from Hampden, who had accompanied Charles, with news of the " incident," and immediate measures were taken to guard the parliament, by bringing up the train-bands. On the 30th Pym revealed his knowledge of the second army plot. On the ist of November came news of the Ulster insurrection, which created a serious difficulty for the parliament, when it was finally declared, at Pym's instance, that if the king did not change his advisers parliament would provide for the needs of Ireland in- dependently. On the 22nd of November Pym made a great speech on the Grand Remonstrance, of which he was the chief promoter, when he referred to plots " very near the king, all driven home to the court and popish party."*

Charles returned on the 25th. He immediately substituted a force commanded by Dorset for the guard already placed at Westminster, but was compelled to withdraw it, and on Pym's motion the house appointed its own watch. Everything now pointed to the advent of a frightful catastrophe. Charles appointed Lunsford to the Tower, rejected the Grand Remon- strance and the Impressment Bill, and began to assemble an armed

force. In consequence Pym urged, but unsuccessfully, on the 30th of December the summoning of the train -bands to guard the parliament, and moved the impeachment of the bishops, who had declared the proceedings of the parliament to be sinful and illegal. At the critical moment, however, Charles wavered. He renewed his offer to Pym of the exchequer on the ist of January 1642, and this meeting with a refusal, or again drawing back himself, he determined on the impeachment of the five members on the 3rd of January. The latter had been

forewarned of the -king's plans, and when on the 5th he entered the House of Commons with an armed band to seize them, they had removed themselves in safety (see Lenthal, William). Charles's first look on entering was for his great opponent, and he was greatly disconcerted at not finding him in his usual place. To his question " Is Mr Pym here ? " there was no answer, and nothing remained but to retreat with his mission completely unachieved.

The second act in the great national drama had thus, as the first, ended in a victory for Pym. On the nth, with the other members, he was escorted in triumph back to Westminster, and while the other four stood uncovered, Pym returned thanks from his place to the citizens. On the 25th of January he delivered a great speech to the Lords on the perils attending the kingdom, and referring to their hesitation on the subject of the militia, declared that he should be sorry that history should have to relate that the House of Peers had had no part in the preservation of the state in the present extremity of danger. The Commons ordered his speech to be printed, and it provided the chief material for the paper war between Charles and the parliament which now followed. Still en- deavouring to avoid a complete breach of constitutional forms, Pym caused to be added to the resolution of the Commons on the 20th of May 1642, which declared that " the king intends to make war against the parliament," the words " seduced by wicked counsel."

When war broke out, Pym remained at headquarters in control of the parliament and executive, and on the 4th of July was appointed to the committee of safety which directed the movements of the parliamentary forces. His attitude was firm but moderate. He opposed the attempt to prevent Colepepper giving the king's message to the house on the 27th of August. On the 20th of October, upon Charles refusing to accept the petition of the parliament and advancing towards London, Pym proposed the parliamentary covenant, and that those who refused it should be " cast

out of the Hcuse." He succeeded in over- coming the opposition in the city to the heavy taxation now im- posed. On the 10th of November, after Edgehill, he spoke in support of the negotiations for peace, at the same time warning the citizens that " to have printed liberties and not to have liberty in truth and realities is but to mock the kingdom." In Feb- ruary 1643 he still showed an inclination for peace, and during the negotiation of the treaty at Oxford supported the disband- ment of the armies. When it was evident that peace would not be secured, he proposed in order to carry on the war an excise, hitherto unknown in England, which met with the same violent hostility afterwards aroused by Walpole's scheme. In March he published a " Declaration, and Vindication " of his public conduct, in which he threw the whole blame of the appeal to arms on the opposite party, and expressed his fidelity to the Church and constitution. In May he entered, together with the other leaders, into resultless negotiations with the queen, and on the 23rd he took up her impeachment to the Lords. In June he reported on Waller's plot, which exposed the insincerity of Charles's negotiations, and on the 26th of June wrote a " sharp letter " to Essex on his inaction. In July, after the defeat at Adwalton Moor, he prevented the house from again initiating negotiations for peace, which he declared " full of hazard and full of danger," and on the 3rd of August, after having visited Essex at Kingston, persuaded him to separate himself from the peace propositions of the Lords and to march to relieve Gloucester. He thus incurred the hatred of the peace party, and on the 9th of August a mob of women surrounded the house calling for Pym's destruction, and were not dispersed without some bloodshed.

Pym had already, on the 3rd of January, proposed to the house an alliance with the Scots, and the Royalist victories now induced parliament to consent to what had before been re- jected. The establishment of Presbyterianism was accepted by Pym as a disagreeable necessity, and he was one of the first to take the covenant on the 25th of September. This alliance, which was afterwards destined to have so decisive an influence

on the military campaign, and was the first occasion on which the two nations had united in public action, closes Pym's great career. He was made master of the ordnance on the 8th of November, but died on the 8th of December at Derby House, where he resided. On the 1 5th of December he received a public funeral in Westminster Abbey, whence his body was ejected at the Restoration. A sum of £10,000 was voted by the par- liament to pay Pym's debts and provide for his family. About 1614 Pym married Anne Hooke, or Hooker (d. 1620), by whom he had five children, including two sons, Alexander, who died unmarried, and Charles, who was created a baronet; this title, together with Pym's male line, became extinct in the person of Pym's grandson Charles in 1688, Brymore then passing to his sister Mary, wife of Sir Thomas Hales, Bart.

Pym had little of the Puritan in his character or demeanour. His good humour, humanity and cheerfulness in all circum- stances, "his pleasant countenance and sweet behaviour," were marked characteristics; the aspersions, however, on his morals, as well as the accusations of bribery, are completely unsubstantiated and discredited. His death came as an irre- parable loss to the parliamentary cause. " Since Pym died," writes Baillie (Letters, ii. 216), "not a state head among them; many very good and able spirits, but not any of so great and comprehensive a braine as to manage the multitude of weightie affaires as lyes on them." He was one of the greatest leaders that the House of Commons has produced, a most capable man of business, and indefatigable in assiduous attention to its details. He possessed great tact in infl lencing the conduct of the house and in removing personal jealousies on critical occasions, and he excelled as a party leader in choosing and directing the course of policy, and in keeping his followers united and organized in its prosecution, as well as in stimulating and guiding popular opinion outside in its support. The frequent appeals to the nation by protestations, oaths of association and popular peti- tions, were a very striking feature in Pym's policy, one of the chief sources of his strength, and new in English history. We may indeed perhaps see in these and in the canvassing of con- stituencies conducted by Pym and Hampden the beginnings of party government. His eloquence lay rather in the clear- ness of his expression and in the depth and solidity of his ideas than in the more showy arts of oratory. Much of his success as a leader was the result of the confidence inspired by his high character, his well-tried courage and resolution at critical moments, his skill and vigilance in unmasking and frustrating the designs of the opposite faction. But Pym was not only great as a party leader; he had the real instinct of construction, the true test of the statesman. This construction, he believed, in the spirit of genuine conservatism, must always be progress along the lines of natural development, and not by the methods of revolutionary or extraneous innovation. It was Pym's chief charge against Charles, Strafford and Laud that they had arrested this progress, and were thus leading the nation to ruin and dissolution. Such was the theory and conviction, inherited from Bacon and passed on to Halifax and Burke, which underlay and inspired Pym's policy.

The article on Pym by S. R. Gardiner, in the Diet. Nat. Biog. with its references to authorities, must be supplemented by the same author's Hist, of England and of the Civil War. Pym's life has also been written at length by J. Forster in Lardner's Cabinet Cyclopaedia, Eminent British Statesmen, vol. iii., and by Wood in Ath, oxon. iii. 72, who adds a list of Pym's printed speeches. His character, drawn by Clarendon, Hist. iii. 30 and vii. 409, is inaccurate and obviously prejudiced. See also J. Forster's Grand Re- monstrance, Arrest of the Five Members, Life of Sir J. Eliot; Verney's

Notes of the Long Parliament; Whitelocke's Memorials, (needing corroboration of other authorities); R. Baillie's Letters; Eng. Hist. Rev. xvii. 736; Rushworth's Collections; Thomason Tracts, E 153

(10), 63 (8), 172 (14), 164 (3), 200 (13) (26) (37) (49) (65), 199 (24) (49),

78 (13); Somers Tracts iv. 217, 355, 461, 466; Affaniae and Death's Sermon, by C. Fitzgeffrey; Add. MSS. Brit. Mus. 14,827; 11,692; Lords and Commons Journals. There are a large number of refer- ences to Pym in Calendars of State Papers Dom. 1619-1643, and Colonial Series 1 574-1 660, and in the Hist. MSS. Comm. Series; but the supposed notebook of Pym mentioned in Rep. x. app. vi. 82, has been shown by Gardiner to be that of another person (Eng. Hist. Rev., Jan. 1895, p. 105). (P. C. Y.)

PYRAMID

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PYRAMID, the name for a class of buildings, first taken from a part of the structure, 1 and mistakenly applied to the whole of it by the Greeks, which has now so far acquired a more definite meaning in its geometrical sense that it is desirable to employ it in that sense alone. A pyramid therefore should be under- stood as meaning a building bounded by a polygonal base and plane triangular sides which meet in an apex. 2 Such a form of architecture is only known in Middle Egypt, and there only during the period from the IVth to the Xllth Dynasty (before 3000 B.C.) — having square bases and angles of about 50 . In other countries various modifications of the tumulus, barrow or burial-heap have arisen which have come near to this type; but these when formed of earth are usually circular, or if square have a flat top, and when built of stone are always in steps or terraces. The imitations of the true Egyptian pyramid at Thebes, Meroe and elsewhere are puny hybrids, being merely chambers with a pyramidal outside and porticos attached; and the structures found at Cenchreae, or the monument of Caius Sestius at Rome, are isolated and barren trials of a type which never could be revived: it had run its course in a country and a civilization to which alone it was suitable.

The origin of the pyramid type has been entirely explained by the discovery of the various stages of development of the tomb. In prehistoric times a square chamber was sunk in the ground, the dead placed in it, and a roof of poles and brushwood overlaid with sand covered the top. The 1st Dynasty kings developed a wooden lining to the chamber; then a wooden chamber free-standing in the pit, with a beam roof, then a stairway at the side to descend; then a pile of earth held in by a dwarf wall over it. By the

Illrd Dynasty this dwarf wall had expanded into a solid mass of brickwork, about 280 by 150 ft. and 33 ft. high. This was the mastaba type of tomb, with a long sloping passage descending to the chamber far below it. This pile of brickwork was then copied in stonework early in the Illrd Dynasty (Saqqara). It was then enlarged by repeated heightening and successive coats of masonry. And lastly a smooth casing was put over the whole, and the first pyramid appeared (Medum).

It is certain that the pyramids were each begun with a definite design for their size and arrangement; at least this is plainly seen in the two largest, where continuous accretion (such as Lepsius and his followers propound) would be most likely to be met with. On looking at any section of these build- ings it will be seen how impossible it would have been for the passages to have belonged to a smaller structure (Petrie, 165). The supposition that the designs were enlarged so long as the builder's life permitted was drawn from the compound mas- tabas of Saqqara and Medum; these are, however, quite dis- tinct architecturally from true pyramids, and appear to have been enlarged at long intervals, being elaborately finished with fine casing at the close of each addition.

Around many of the pyramids peribolus walls may be seen, and it is probable that some enclosure originally existed around each of them. At the pyramids of Gizeh the temples attached to these mausolea may be still seen. As in the private tomb, the false door which represented the exit of the deceased person from this world, and towards which the offerings were made, was always on the west wall in the chamber, so the pyramid was placed on the west of the temple in which the deceased king was worshipped. The temple being entered from the east (as in the Jewish temples), the worshippers faced the west, looking towards the pyramid in which the king was buried. Priests of the various pyramids are continually mentioned during the old kingdom, and the religious endowments of many of the priesthoods of the early kings were revived under the Egyptian renaissance of the XXVIth Dynasty and continued during Ptolemaic times. A list of the hieroglyphic names of nineteen

1 The vertical height was named by the Egyptians pir-em-us (see E. Revillout, Rev. £.g., 2nd year, 305-309), hence the Greek form pyramis, pi. pyramides (Herod.), used unaltered in the English of Sandys (1615), from which the singular pyramid was formed.

2 For figures of geometrical pyramids see Crystallography, and for their mensuration see Mensuration.

of the pyramids which have been found mentioned on monu- ments (mostly in tombs of the priests) is given in Liebleih's Chronology, p. 32. The

pyramid was never a family monu- ment, but belonged — like all other Egyptian tombs — to one person, members of the royal family having sometimes lesser pyramids adjoining the king's (as at Khufu's); the essential idea of the sole use of a tomb was so strong that the hill of Gizeh is riddled with deep tomb-shafts for separate burials, often running side by side 60 or 80 ft. deep, with only a thin wall of rock between; and in one place a previous shaft has been partially blocked with masonry, so that a later shaft could be cut partly into it, macled with it like a twin-crystal.

The usual construction of pyramids is a mass of masonry composed of horizontal layers of rough-hewn blocks, with a small amount of mortar; and this mass in the later forms became more and more rubbly, until in the Vlth Dynasty it was merely a cellular system of retaining walls of rough stones and mud, filled up with loose chips, and in the Xllth Dynasty the bulk was of mud bricks. Whatever was the hidden material, how- ever, there was always on the outside a casing of fine stone, elaborately finished, and very well jointed; and the inner cham- bers were of similarly good work. Indeed the construction was in all cases so far sound that, had it not been for the spite of enemies and the greed of later builders, it is probable that every pyramid would have been standing in good order at this day. The casings Were not a mere " veneer " or " film," as they have been called, but were of massive blocks, usually greater in thickness than in height, and in some cases (as at South Dahshur) reminding the observer of horizontal leaves with sloping edges.

Inside of each pyramid, always low down, and usually be- low the ground level, was built a sepulchral chamber; this was reached in all cases by a passage from the north, sometimes beginning in the pyramid face, sometimes descending into the rock on which the pyramid was built in front of the north side. This chamber, if not cut in the rock altogether (as in Menkaura's), or a pit in the rock roofed with stone (as in Khafra's), was built between two immense walls which served for the east and west sides, and between which the north and south sides and roofing stood merely in contact, but unbonded. The gable roofing of the chambers was formed by great sloping cantilevers of stone, projecting from the north and south walls, on which they rested without pressing on each other along the central ridge; thus there was no thrust, nor were there any forces to disturb the building; and it was only after the most brutal treatment, by which these great masses of stone were cracked asunder, that the principle of thrust came into play, though it had been pro- vided for in the sloping form of the roof, so as to delay so long as possible the collapse of the chamber. This is best seen in the pyramid of Pepi (Petrie), opened from the top right through the roof. See also the Abusir pyramids (Howard Vyse) and the king's and queen's chambers of the great pyramid (Howard Vyse, Piazzi Smyth, Petrie). The roofing is sometimes, per- haps usually, of more than

one layer; in Pepi's pyramid it is of three layers of stone beams, each deeper than their breadth, resting one on another, the thirty stones weighing more than 30 tons each. In the king's chamber (Gizeh) successive hori- zontal roofs were interposed between the chamber and the final gable roof, and such may have been the case at Abu Roash (Howard Vyse).

The passages which led into the central chambers have usually some lesser chamber in their course, and are blocked once or oftener with massive stone portcullises. In all cases some part, and generally the greater' part, of the passages slopes down- wards, usually, at an angle of about 26°, or 1 in 2. These pas- sages appear to have been closed externally with stone doors turning on a horizontal pivot, as may be seen at South Dahshur, and as is described by Strabo and others (Petrie) . This suggests that the interiors of the pyramids were accessible to the priests, probably for making offerings; the fact of many of them having been forcibly entered otherwise does not show that no practic- able entrance existed, but merely that it was unknown, as,

for instance, in the pyramids of Khufu and Khafra, both of | which were regularly entered in classical times, but were forced by the ignorant Arabs.

The pyramids of nearly all the kings of the IVth, Vth and Vlth Dynasties are mentioned in inscriptions, and also a few of later times. The first which can be definitely attributed is that of Khufu (or Cheops), called " the glorious," the great pyramid of

A A Original Mastaba.

Scale 1 inch to 100 ruj.

Fig. i. — Pyramid of Medum (Meidoun).

Gizeh. Dad-ef-ra, who appears next to Khufu in the lists, had his pyramid at Abu Roash. Khafra rested in the pyramid now known as the second pyramid of Gizeh. Menkaura's pyramid was called

Of the architectural peculiarities of some particular pyramids some notice must now be given. The pyramid of Medum (figs. I, 2) was the first true pyramid. It was begun as a mastaba, AA, like other such tombs, such as that of King Neter-khet at Beyt Khalaf. This mastaba was then enlarged by heightening it and adding a coating, and this process, repeated seven times, resulted in a high stepped mass of masonry. Such had been made before, at

the step pyramid of Saqqara ; but for the first time it was now covered with one uniform slope of masonry from base to top, and a pyramid was the result. The chamber is peculiar for being entered by a vertical shaft in the floor. The great pyramid (fig. 3) of Gizeh (Khufu's) is very different in its internal arrangements from any other known. The pyramid covers upwards of 13 acres, and is about 150 ft. higher than St Paul's Cathedral. As compared with St Peter's, Rome, it covers an area which is as 29 to 11, or nearly three times as much, and it is 50 ft. higher. The greater number of passages and chambers, the high finish of parts of the work, and the accuracy of construction all distinguish it. The chamber which is most normal in its situation is the subterranean chamber; but this is quite unfinished, hardly more than begun. The upper chambers, called the " king's " and " queen's," were completely hidden, the ascending passage to them having been closed by plug- ging blocks, which concealed the point where it branched upwards out of the roof of the long descending passage. Another passage, which in its turn branches from the ascending passage to the queen's chamber, was also completely blocked up. The object of having two highly-finished chambers in the mass may have been to receive the king and his co-regent (of whom there is some historical evidence) and there is very credible testimony to a sarcophagus having existed in the queen's chamber, as well as in the king's chamber. On the details of construction in the great pyramid it is needless to enter here; but it may be stated that the accuracy of work is such that the four sides of the base have only a mean error of six-tenths of an inch in length and 12 seconds in angle from a perfect square. 1

Fig. 2. — Pyramid of Medum.

" the upper," being at the highest level on the hill of Gizeh. The lesser pyramids of Gizeh, near the great and third pyramids, belong respectively to the families of Khufu and Khafra (Howard Vyse). The pyramid of Aseskaf, called " the cool," is unknown, so also is that of Userkaf of the Vth Dynasty, called the " holiest of buildings." Sahura's pyramid, the north one of Abusir, was named " the rising soul," much as Neferarkara's at Abusir was named " of the soul." Raenuser's pyramid, " the firmest of buildings," is the middle pyramid of Abusir. The pyramid of Menkauhor, called " the most divine building," is somewhere at Saqqara. Assa's pyramid is unidentified; it was "the beautiful." Unas not only built the mastaba Farun, long supposed to be his pyramid, but had 'a pyra- mid called "the most beautiful of buildings" at Saqqafa, ; which was opened in 188 1 (see Recueil des travaux, by M. Masperel Hi., for those opened at Saqqara). In the Vlth Dynasty the !' pyramid of souls," built by Ati (Rauserka), is unknown. That of Teta.j.j the most stable of buildings," was opened at Saqqara in i8'8l ii as Svell as that of Pepi (Rameri), " the firm and beautiful." The pyrarnids of Rameren, "the beautiful rising," and of*

Neferarkarai " the firm life, " are unknown. Haremsaf's pyramid was opened; at. Saqqara in 1881. Of the last two kings of the Vlth Dynasty, we know of no pyramids. In the Vllth or Vlllth Dynasty most probably the brick pyramids of Dahshur were erected. In the Xlth Dynasty the pyramid, " the most glorious building," of Mentuhotep II. is at Deir el Bahri, and the mud pyramid of one of the Antef kings is known at Thebes. In the Xllth Dynasty the pyramids, the " lofty and beautiful " of Amenemhat I. and " the bright " of Usertesen II., are known in inscriptions, while the pyramid of Senusert I. is at Lisht, that of Senusert II. is at Illahun, that of Senusert III. at Dahshur

(N. brick), and the brick pyramid at Howara is of Amenemhat III.,

who built the adjoining temple.

The second pyramid of Gizeh, that of Khafra, has two separate entrances (one in the side, the other in the pavement} and two

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From Vyse's Pyramids of Ghizeh.

Fig. 3. — Section of Great Pyramid.

1 With respect to the construction of this and other pyramids, see Howard Vyse; on measurements of the inside of the great pyramid and descriptions, see Piazzi Smyth ; and on measurements in general mechanical means, and theories, see Petrie.

chambers (one roofed with slabs, the other all rock-hewn), these chambers, however, do not run into the masonry, the whole bulk of which is solid so far as is known. This pyramid has a part of the original casing on the top; and it is also interesting as having the workmen's barracks still remaining at a short distance on the west side, long chambers capable of housing about 4000 men. The great bulk of the rubbish from the work is laid on the south side, forming a flat terrace level with the base, and covering a steep rock escarpment which existed there. The waste heaps from the great pyramid were similarly tipped out over the cliff on its northern side. Thus the rubbish added to the broad platform which set off the appearance of the pyramids; and it has remained undisturbed in all ages, as there was nothing to be got out of it. The third pyramid, that of Menkaura, was cased around the base with red granite for the sixteen lowest courses. The design

of it has been enlarged at one bound from a small pyramid (such as those of the family of Khufu) to one eight times the size, as it is at present, the passages needed therefore to be altered. But there is no sign of gradual steps of enlargement : the change was sudden, from a comparatively small design to a large one. The basalt sarcophagus of this pyramid was ornamented with the panel decoration found on early tombs, unlike the granite sarcophagi of the two previous pyramids, which are plain. Unhappily it was lost at sea in 1838.

An additional interest belongs to the third pyramid (of Menkaura) owing to its chamber being ceiled with a pointed arch (fig. 4).

But it is not a true arch, the stones being merely cantilevers opposite to each other, with the underside cut to the above form (see fig. 5).

*Farther south are the pyra- mids of Abusir, described in the work of Colonel Howard Vyse, and since excavated by the Ger- mans. Next come those of Saqqara. The construction of the step-pyramid or cumulat- ive mastaba has been noticed above; its passages are very peculiar and intricate, winding around the principal chamber, which is in the centre, cut in the rock, very high, and with a tomb- chamber built in the bottom of it, which is closed with a great plug of red granite, a circular stopper fitting into a neck in the chamber roof. A doorway faced with glazed tiles bearing the name of King Neter-khet of the Illrd Dynasty existed here; the tiles were taken to Berlin by Lepsius. The other pyramids of Saqqara are those of Unas, Pepi, Haremsaf, &c. They are distin- guished by the introduction of very long religious texts, covering the whole inside of the chambers and passages; these are carefully carved in small hiero- glyphics, painted bright green, in the white limestone. Beyond these come the pyramids of Dahshur, which are in a simple and massive style, much like those of Gizeh. The north pyramid of Dahshur has chambers roofed like the gallery in the great pyramid by successive overlappings of stone, the roof *i * ” ”” rising to a great height, with no less than eleven projections on each side. The south From Vyse. pyramid of Dahshur has still the greater part*

Fig. 5. — Section of its casing remaining, and is remarkable for of Sepulchral Cham- being built at two different angles, the lower ber, Third Pyramid, part being at the usual pyramid angle, while the upper part is but 43 . This pyramid is also remarkable for having a western passage to the chambers, which was carefully closed up. Beyond the Memphitic group are the scattered pyramids of Lisht (Senusert I.), Illahun (Senusert II.), and Howara (Amenemhat III.), and the earliest pyramid of Medum (Sneferu). Illahun is built with a framework of stone filled up with mud bricks,_ and Howara is built entirely of mud bricks, though cased with fine stone like the other pyramids.

The dimensions of the pyramids that are accurately known are in inches: —

From Vyse. Fig. 4. — Sepulchral Chamber, Third Pyramid.

The first two closely agree to the proportion of 7 high on 1 1 base, approximately the ratio of a radius to its circle. And on dividing the base at Medum by 11 the modulus is 515-64, and the base of Khufu -5-1 1 is 824-44. These moduli are 25 cubits of 20-625 ar "d 40 cubits of 20-611; so it appears that the form was of the same type; but with moduli of 25 and 40 cubits respectively.

Beyond these already described there are no true pyramids, but we will briefly notice those later forms derived from the pyramid. At Thebes some small pyramids belong to the kings of the XI th Dynasty ; the tomb-chamber is in the rock below. The size is under 50 ft. square. These are not oriented, and have a horizontal entrance, quite unlike the narrow pipe-like passages sloping down into the regular pyramids (see Mariette, in Bib. arch, trans, iv. 193). In Ethiopia, at Gebel Barkal, are other so-called pyramids of a very late date. They nearly all have porches ; their simplicity is lost amid very dubious decorations ; and they are not oriented. They are all very acute, and have flat tops as if to support some ornament. The sizes are but small, varying from 23 to 88 ft. square at Gebel Barkal and 17 to 63 ft. square at Meroe. The interior is solid throughout, the windows which appear on the sides being useless architectural members (see Hoskin's Ethiopia, 148, &c). The structures sometimes called pyramids at Biahmu in the Fayum have no possible claim to such a name; they were two great enclosed courts with sloping sides, in the centres of which were two seated statues raised on pedestals high enough to be seen over the walls of the courts. This form would appear like a pyramid with a statue on the top ; and a rather similar case in early construction is shown on the sculptures of the old kingdom. Obelisks then were single monuments (not in pairs) and stood in the midst of a great courtyard with sides sloping like a mastaba; such open courtyards on a small scale are found in the mastabas at Gizeh, and are probably copied from the domestic architecture of the time.

On the vexed question of inscriptions on the pyramids it will suffice to say that not one fragment of early inscription is known on the casing of any pyramid, either in situ or broken in pieces. Large quantities of travellers' " graffiti " doubtless existed, and some have been found on the casing of the great pyramid ; these probably gave rise to the accounts of inscriptions, which are expressly said to have been in many different languages.

The mechanical means employed by the pyramid-builders have been partly

ascertained. The hard stones, granite, diorite and basalt were in all fine work sawn into shape by bronze saws set with jewels (either corundum or diamond), hollows were made (as in sarcophagi) by tubular drilling with tools like our modern diamond rock-drills (which are but reinvented from ancient sources, see Engineering, xxxvii. 282). The details of the questions of transport and management of the large stones remain still to be explained.

See Colonel Howard Vyse, Operations at the Pyramids (1840); Professor C. Piazzi Smyth, Life and Work at the Great Pyramid (1867) ; W. M. Flinders Petrie, Pyramids and Temples of Gizeh, (1883).

(W. M. F. P.)

PYRAMIDION (diminutive of "pyramid"), an architectural term for the copper-gilt casing covering the apex of an obelisk, and generally extended to its upper termination of pyramidical

form. .

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PYRAMUS AND THISBE, the hero and heroine of a Baby- lonian love-story told by Ovid (Metam. iv. 55-465)- Their parents refused to consent to their union, and the lovers used to converse through a chink in the wall separating their houses. At last they resolved to flee together, and agreed to meet under a mulberry tree near the tomb of Ninus. Thisbe was the first to arrive, but, terrified by the roar of a lion, took to flight. In her haste she dropped her veil, which the lion tore to pieces with jaws stained with the blood of an ox. Pyramus, believing that she had been devoured by the lion, stabbed himself. Thisbe returned to the rendezvous, and finding her lover mortally wounded, put an end to her own life. From that time the fruit of the mulberry, previously white, was always black.

See G. Hart, Die Urspryng und Verbreitung der Pyramus- und- Thisbesage (1889-1892).

PYRARGYRITE, a

Ag 3 SbS3, known also source of the metal.

Place.

King.

Date B.C.

Base.

Error.

Angle.

Height.

Azimuth.

Medum . Gizeh

Dahshur S. . Dahshur Small .

Sneferu Khufu Khafra Menkaura

?

■ >

4750 4700 4600 4550

?

?

56820 9068-8 8474-9 4153-6 7459-0

2064-6

6-2

•65

1-5 3-0

3-7

I-T

51° 52′ 51° 52′ 53° 10′ 51° 10′ $43° 5’f >55° 1′ 5

44 34′

3619 5776 5664 2581 4134 2034

24′25″W.

3′43″W.

5′ 26″ W. 14′ 3”E.

9’i2”W.

16′ 12″ W.

mineral consisting^ silver sulphantimonite, as dark red silver ore, an important It is closely allied to, and isomorphous with, the corresponding sulpharsenite known as proustite (q.v.) or light red silver ore. ” Ruby silver ” or red silver ore (German Rotgultigerz) was men- tioned by G. Agricola in 1546, but the two species so closely resemble one another that they were not completely distinguished until chemical analyses of both were made by J. L. Proust in 1804.

Both crystallize in the ditrigonal pyramidal (hemimorphic-hemi- l hedral) class of the rhombohedral system, possessing the same degree of symmetry as tourmaline. Crystals are perfectly developed and are Usually prismatic in habit ; they are frequently attached at one end, the hemimorphic character being then evident by the fact that the oblique striations on the prism faces are directed towards one end only of the crystal. Twinning according to several laws is not uncommon. The angles are nearly the same in the two species; the rhombohedral angle rr’ being 71° 22′ in pyrargyrite and 72 12′ in proustite. The hexagonal prisms of pyrargyrite are usually terminated by a low hexagonal pyramid (310) or by a drusy basal plane. The colour of pyrargyrite is usually greyish-black and the lustre metallic-adamantine ; large crystals are opaque, but small ones and thin splinters are deep ruby-red by transmitted light, hence the name, from Gr. ttvp (fire) and apyvpos (silver) , given by E. F. Glocker in 1 83 1. The streak is purplish-red, thus differing markedly from the scarlet streak of proustite and affording a ready means of distinguishing the two minerals. The hardness is 2§, and the specific gravity 5-85: the refractive indices and birefringence are very high, 01 = 3-084, e = 2-88l. There is no very distinct cleavage and the fracture is conchoidal. The mineral occurs in metalliferous veins with calcite, argentiferous galena, native silver, native arsenic, &c. The best crystallized specimens are from St Andreasberg in the Harz, Freiberg in Saxony, and Guanajuato in Mexico. It is not uncommon in many silver mines in the United States, but rarely as distinct crystals; and it has been found in some Cornish mines.

Although the ” red silver ores ” afford a good example of iso- morphism,

they rarely form mixtures; pyrargyrite rarely contains as much as 3 % of arsenic replacing antimony, and the same is true of antimony in proustite. Dimorphous with pyrargyrite and proustite respectively are the rare monoclinic species pyrostilpnite or fireblende (Ag 3 SbS 3) and xanthoconite (Ag 3 AsS 3) : these four minerals thus form an isodimorphous group. (L. J. S.)

PYRAZINES, Piazines, or Paradiazines, in organic chem- istry, a group of compounds containing a ring system composed of 4 carbon atoms and 2 nitrogen atoms, the nitrogen atoms being in the para position: The di- and tri-methyl derivatives are found in the fusel oil obtained by fermentation of beet- root sugar (E. C. Morin, Comptes rendus, 1888, 106, p. 360). They were first prepared synthetically by reducing the iso- nitrosoketones. They may also be prepared by the inner con- densation of a-aminoaldehydes or a-aminoketones in the presence of a mild oxidizing agent, such as mercuric chloride or copper sulphate in boiling alkaline solution (L. Wolff, Ber., 1893, 26, p. 1830; S. Gabriel, ibid. p. 2207); and by the action of ammonia on a-halogen ketonic compounds (W. Staedel and L. Rugheimer, Ber., 1876, 9, p. 563; V. Meyer and E. Braun, Ber., 1888, 21, p. 19). They are also formed when grape sugar is heated with ammonia or when glycerin is heated with ammonium chloride and ammonium phosphate (C. Stoehr, Journ. prakt.Chem., 1895 (2), 51, p. 450; 1896 (2), 54, p. 481). They are feeble basic compounds which distil unchanged. They are mostly soluble in water and somewhat hygroscopic in char- acter. Their salts are easily dissociated. They form char- acteristic compounds with mercuric and auric chlorides. Their alkyl derivatives readily oxidize to pyrazine carboxylic acids.

Pyrazine, CiHiN^, crystallizes from water in prisms, which have a heliotrope odour. It melts at 55° C. and boils at 115 C. It may also be obtained by elimination of carbon dioxide from the pyrazine dicarboxylic acid formed when quinoxaline is oxidized with alkaline potassium permanganate (S. Gabriel). 2-5—Dimeth.ylpyra.zine, or ketine, C(H 2 (CH 3) 2 N 2 , is obtained by reducing isonitrosoacetone, or by heating glycerin with ammonium chloride and ammonium phosphate. It boils at 153 C.

*Two classes of dihydropyrazines are known, namely the 1-4 and 2-3-dihydro-compounds, corresponding to the formulae II. and III., pyrazine being I.: — **

HC-N-CH HC-NH-CH HC-N-CH 2 H 2 C-NH-CH 2

HC-N-CH HC-NH-CH HC-N-CH 2 H 2 C-NH-CH 2

I (Pyrazine) II (i-4dihydro) III (2-3 dihydro) IV (Piperazine).

Those of the former type are obtained by condensing a-bromketones with primary amines (A. T. Mason, Journ. Chem. Soc, 1893, 63, p. J 355) ; t ne latter type result on condensing alkylene diamines with a-diketones. The 2-3 derivatives are somewhat unstable compounds, since on heating they readily give up two hydrogen atoms. Tetra- hydropyrazines of the 1-2-3-4 type have also been obtained (L. Garzini, Ber., 1 891, 24, 956 R). Hexahydropyrazine or piperazine (formula IV. above), also known as diethylene diamine, may be prepared by reducing pyrazine, or, better, by combining aniline and ethylene bromide to form diphenyl diethylene diamine, the dinitroso compound of which hydrolyses topara-dinitrosophenol and pipera-

zine. It is a strong base, melting at 104° and boiling at I45°-I46°. It is used in medicine on account of the high solubility of its salt with uric acid.

PYRAZOLES, in organic chemistry, a series of heterocyclic

compounds containing a five-membered ring consisting of three

carbon atoms united to two nitrogen atoms, CH:CH.

\vju/, n thus: the derivatives are orientated from the n/ imino group, the second position being at the

other nitrogen atom. Pyrazole, C3H4N2, was obtained by E. Buchner {Ber., 1889, 22, p. 2165) by heating pyrazole 3.4.5.-tricarboxylic acid; and by L. Balbiano {Ber., 1890, 23, p. 1103), who condensed epichlorhydrin with hydrazine hydrate in the presence of zinc chloride:

C 3 H 6 OCl+2N 2 H4 = C 3 H4N 2 4-N 2 H 4 HCl-r-H 2 0-r-H 2 . It may also be prepared by the union of diazomethane with acetylene (H. v. Pechmann, Ber., 1897, 31, p. 2950), and by warming the acetal of propargyl aldehyde with an aqueous solution of hydrazine sulphate {Ber., 1903, 36, p. 3662). It crystallizes in colourless needles, is very stable and behaves as a weak base. It does not combine with the alkyl iodides. Ammoniacal silver nitrate gives a precipitate of pyrazole silver. The homologues of pyrazole may be obtained by digesting /3- diketones or /3-keto-aldehydes with phenylhydrazine ; by heating the phenylhydrazones of some monoketones with acetip anhydride; by elimination of hydrogen from pyrazolines, and by distilling pyrazolones and pyrazolidones over zinc dust. They are all weak bases, which combine directly with the alkyl iodides and form double salts with mercuric and platinic chlorides. On oxidation with potassium permanganate the C-alkyl-derivatives give carboxylic acids, whilst the iV-phenyl derivatives frequently split off the phenyl group

(especially if it be amidated) and have it replaced by hydrogen. On reduction, the pyrazoles with a free :NH group are scarcely affected, whilst the iv-phenyl derivatives give pyrazo- lines, or by the use of very strong reducing agents the ring is ruptured and trimethylenediamine derivatives are formed. They yield substitution derivatives with the halogens, bromine being the most effective. The chloro-derivatives are most readily prepared from the pyrazolones by the action of phosphorus oxychloride.

The pyrazole carboxylic acids may also be obtained by con- densing /§-diketone or oxymethylene ketone carboxylic esters with hydrazines, or the diazo fatty esters with acetylene dicarboxylic esters: N 2 CH-C0 2 R + C 2 (C0 2 R) 2 = C 3 HN 2 (C0 2 R) 3 [3-4-5]; by heating /S-diketones and diazo-acetic ester with sodium hydroxide (A. Klages, Ber., 1903, 36, p. 1128), and from the diazo-anhydrides of (3-diketones or /S-ketonic acids. These acids all split C0 2 readily when heated, most easily from the carboxyl group in position 3, and with most difficulty from the group in position 4.

The dihydropyrazoles or pyrazolines are less stable than the pyra- zoles and are more like unsaturated compounds. They may be obtained by the reduction of pyrazoles (especially iV-phenyl deriva- tives) with sodium in alcoholic solution ; by condensing diazo-acetic ester or diazomethane with ethylenic compounds (fumaric ester, &c.) (E. Buchner, Ber., 1890, 23, p. 703; Ann., 1895, 284, p. 212; H. v. Pechmann, Ber., 1894, 2 7> P- '891), and by rearrangement of the hydrazones of a-olefine aldehydes or ketones on warming or on distillation. They are weak bases which are only soluble in con- centrated acids. On reduction they yield pyrazolidines, or the ring is broken; and when oxidized they form blue or red colouring matters. The carboxylic acids show a remarkable behaviour on heating, the nitrogen is entirely eliminated, and trimethylene car- boxylic acids are obtained (see Polymethylenes). Pyrazoline is a colourless liquid which boils at 144° C. It may be prepared by the action of diazomethane on ethylene (E. Azzarello, Gazz., 1906, 36, (i.), p. 628).

The pyrazolones (ketodihydropyrazoles) , first prepared by L. Knorr in 1883, result from the elimination of the elements of alcohol from the hydrazones of /3-ketonic acids ; or on the oxidation of the pyrazolidones with ferric chloride. Three types are possible with the formulae:

H 2 C-CO v

I ,NH

HC-.N/ HC-NH'

Pyrazolone-5 Antipyrine type Pyrazolone-3

They form salts with both acids and bases, and yield benzylidine and isonitroso derivatives. Pyrazolone is obtained by the condensation of hydrazine with formylacetic ester. It is a colourless crystalline solid which melts at 164 C. l-Phenyl-ymethylpyrazolone-z is antipyrine (q.v.). The isomeric l-phenyl-ˆ-methylpyrazolone-T, is formed by condensing aceto-acetic ester with acetophenylhydrazine in the presence of phosphorus oxychloride, or by the action of ferric chloride on the corresponding pyrazolidone, which is produced by condensing phenylhydrazine with a /3-halogen butyric acid. When methylated it yields isoantipyrine, an isomer of antipyrine, which is more poisonous.

HCCO v

JJ ˆ NH HC-NH/

HC:CH

oc-nh/

The pyrazolidines are tetrahydropyrazoles. The N-phenyl derivative, from sodium phenylhydrazine and trimethylene bromide, is an oil which readily oxidizes to phenylpyrazoline on exposure. The corresponding keto-derivatives, or pyrazolidones , are produced by the action of hydrazines on the /3-haloid acids or o/3-olefine dicarboxylic acids. Isomeric compounds may arise here when phenylhydrazine is used, the keto-group taking either the 3 or 5 position; thus with /3-iodopropionic acid l-phenylpyrazolidone-5 is formed, whilst potassium jS-iodopropionate gives the 3-compound. Isomers of this type may be distinguished by the fact that the pyrazolidone-5 compounds are basic, whilst the 3-compounds are acidic. The simplest member of the series, pyrazolidone-5, is a liquid which is formed by the action of hydrazine on acrylic acid. The 3-5-pyrazolidones are the cyclic hydrazides of the malonic acid series.

Thiopyrazoles have been obtained by A. Michaelis {Ann., 1904, 331. P-. 197; Ber., 1904, 37, p. 2774) by the action of an aqueous or alcoholic solution of the methyl chloride or iodide of phenylmethyl- chlorpyrazole on a solution of an alkaline hydrosulphide into which carbon bisulphide has been passed ; or by the action of sodium thio- sulphate on antipyrine hydrochloride or a similar compound. The simplest member of the group is probably to be represented as

H 2 C— CS-

= N>

N-C 6 H 6 .

*HCiCCSH)^*

CH 3 -C = N/ CH 3 -C

PYRENE, Ci 6 H 10 , a hydrocarbon found together with chrysene in the last portion of the coal tar distillate, and also in " Stupp " fat.

The crude solid product from the tar distillate is digested with carbon bisulphide to dissolve the pyrene, the solution filtered and the solvent evaporated. The residue is dissolved in alcohol and to the cold saturated solution a cold alcoholic solution of picric acid is added. The picrate so formed is then decomposed by ammonia. On its separation from " Stupp " fat see E. Bamberger and M. Philip, Ann., 1887, 240, p. 161. It crystallizes in monociinic tables which melt at 148-149 C. Chromic acid oxidizes it to pyrene quinone, CuHaOj, and pyrenic acid, Ci 6 Hi 8 6 . The picrate, which is easily soluble in benzene, crystallizes in long red needles melting at 222 . When heated with hydriodic acid and phosphorus to 200 C. it yields a hexahydride. It has been obtained synthetically by M. Freund and H. Michaels {Ber., 1897, 30, p. 1383) by distilling thebenol over zinc dust in a stream of hydrogen, or by the action of hydriodic acid and phosphorus at 220° C. on thebenol.

PYRENEES [Span. Pirinios, Fr. Pyrinies], a range of moun- tains in south-west Europe, separating the Iberian Peninsula from France, and extending for about 240 m., from the Bay of Biscay to Cape Creus, or, if only the main crest of the range be considered, to Cape Cerbere, on the Mediterranean Sea. For the most part the main crest constitutes the Franco-Spanish frontier; the principal exception to this rule is formed by the valley of Aran, which belongs orographically to France but politically to Spain. The Pyrenees are conventionally divided into

English Miles 9 10 y 40

J O/igocene A Eocene

r "I Cretaceous

J Jurassic

J Triassie

u Permian

i Devonian

Walker

Silurian to Cambrian

Crystalline Recks Igneous Rocks

three sections, the central, the Atlantic or western, and the eastern. The central Pyrenees extend eastward from the Port de Canfranc to the valley of Aran, and include the highest summits of the whole chain, Aneto or Pic de Nethou (11,168 ft.), in the Maladetta ridge, Posets (11,047 ft.), and Mont Perdu or Monte Perdido (10,997 ft.). In the Atlantic Pyrenees the average altitude gradually diminishes westward; while in the eastern Pyrenees, with the exception of one break at the eastern

extremity of the Pyrenees Ariegeoises, the mean elevation is maintained with remarkable uniformity, till at last a rather sudden decline occurs in the portion of the chain known as the Alberes. This threefold division is only valid so far as the elevation of the Pyrenean chain is concerned, and does not accurately represent its geological structure or general con- figuration. The careful examination of the chain by members of the English and French Alpine Clubs has since 1880 consider- ably modified the views held with respect to its general char- acter; the southern versant, formerly regarded as inferior in area, has been proved to be the more important of the two. It has been recognized, as shown in the maps of MM. Schrader, de St Sand and Wallon, that, taken as a whole, the range must be regarded, not as formed on the analogy of a fern-frond or fish-bone, with thˆ, lateral ridges running down to the two op- posite plains, but rather as a swelling of the earth's crust, the culminating portion of which is composed of a series of primi- tive chains, which do not coincide with the watershed, but cross it obliquely, as if the ground had experienced a sidewise thrust at the time when the earth's crust was ridged up into the long chain under the influence of contraction. Both the orderly arrangement of these diagonal chains and the agreement which exists between the tectonic and geological phenomena are well shown in the geological and hypsometrical maps published in the Annuaire du Club Alpin jrancais for 1891 and 1892 by MM. Schrader and de Margerie. The primitive formations of the range, of which little beyond the French portions had previously been studied, are shown to be almost all continued diagonally on the Spanish side, and the central ridge thus pre- sents the appearance of a series of wrinkles with an inclination (from north-west to south-east) greater than that of the chain as a whole. Other less pronounced wrinkles run from south- west to north-east

and intersect the former series at certain points, so that it is by alternate digressions from one to the other series that the irregular crest of the Pyrenees acquires its general direction. Far from having impressed its own direction on the orientation of the chain at large, this crest is merely the resultant of secondary agencies by which the primitive mass has been eroded and lessened in bulk, and though its import- ance from a hydrographic point of view is still considerable, its geological significance is practically nil.

Geology— The Pyrenees are divided by E. de Margerie and F. Schrader into a number of longitudinal zones. The central zone consists of Primary rocks, together with great masses of granite. It forms most of the higher summits, but west of the Pic d'Anie it disappears beneath an unconformable covering of Cretaceous deposits. On the French side the central zone is followed by (1) the zone of Ariege, consisting of Lower Cretaceous and Jurassic beds, together with granitic masses; (2) the zone of the Petites Pyrenees, Upper Cretaceous and Eocene; and (3) the zone of the Corbieres, consisting of Eocene and Primary rocks. On the Spanish side, from north to south, are (1) the zone of Mont Perdu, Upper Cretaceous and Eocene; (2) the zone of Aragon, Eocene; and (3) the zone of the Sierras, Trias, Cretaceous and Eocene. In France the zones are clearly defined only in the eastern part of the chain, while towards the west they merge into one another. In Spain, on the other hand, it is in the central part of the chain that the zones are most distinct. Although the number of zones recognized is the same on the two flanks, they do not correspond. The zone of the Corbieres has no equivalent in Spain, while in France there is no definite zone of Eocene like that of Aragon. The zone of the Petites Pyrenees, however, is clearly homologous with that of the Sierras. On the northern side granitic masses occur in the zone of Ariege amongst the Jurassic and Lower Cretaceous beds. On the southern side they are not found except in the axial zone, and the Jurassic and Lower Cre- taceous deposits are reduced to a narrow band. In spite of these differences between the two flanks, the structure is to some extent symmetrical. On the north the greater number of the overfolds lean towards the north, while on the south they lean towards the south. Thus the chain shows the typical fan-structure which has long been recognized in the western Alps.

Since the publication of the maps by de Margerie and Schrader it has been shown that the phenomena of " recouvrement " play almost as large a part in the Pyrenees as in the Alps themselves. Large masses of rock have been brought upon nearly horizontal faults (thrust-planes) over the edges of either beds with which they originally had no connexion. In the region of Salies-du-Salat, for example, patches of Trias lie discordantly upon the edges of the Cretaceous and Tertiary beds. Several other similar cases

have been described ; but denudation has been carried further than in the western Alps, and accordingly the masses overlying the thrust-planes have been more completely removed (g.w.).

The earth movements which raised the Pyrenees appear to have begun in the Eocene period, but it was in Oligocene times that the principal folding took place. The Pyrenees are therefore contem- poraneous with the Alps; but they appear to have escaped the Miocene disturbances which affected the latter.

The arrangement of the Pyrenees in chains gently inclined near the centre but longitudinal everywhere else, is illustrated by the courses of the streams which flow down towards Spain. On the French side most of the longitudinal valleys have disappeared; and this is why the range has so long been described as sending out transverse spurs, the more important slope remaining unknown. It is, however, still possible to distinguish some traces of this forma- tion towards the east, where atmospheric denudation has been less active. On the south the principal streams, after cutting their way through the highest zone at right angles to the general direction of the range, become involved half-way to the fiains in great longi- tudinal folds, from which they make their escape only after traversing long distances without finding an outlet.

The importance shown to attach to the Spanish versant has greatly modified the values formerly assigned to the area and mean elevation of the Pyrenees. Instead of the 13,440 sq. m. formerly put down for the total, M. Schrader found the area to be 21,044 sq. m. Of this total 6390 sq. m. fall to the northern slope and 14,654 sq. m., i.e. more than double, to the southern, the difference being mainly due to the zone of plateaux and sierras. The mean elevation, estimated by Elie de Beaumont at 1500 metres (4900 ft.), has been sensibly diminished by the addition of that zone to the system, and it must now be placed at only 1200 metres (3930 ft.) for the range as a whole; so important a part is played by the above-mentioned plateaux of small elevation in a chain whose highest summit reaches 11,168 ft., while the passes show a greater altitude than those of the Alps.

Four conspicuous features of Pyrenean scenery are the ab- sence of great lakes, such as fill the lateral valleys of the Alps; the rarity and great elevation of passes; the large number of the mountain torrents locally called gaves, which often form lofty waterfalls, surpassed in Europe only by those of Scandinavia; and .the frequency with which the upper end of a valley assumes the form of a semicircle of precipitous cliffs, locally called a cirque. The highest waterfall is that of Gavarnie (1515 ft.), at the head of the Gave de Pau; the Cirque de Gavarnie, in the same valley, is perhaps the

most famous example of the cirque formation. Not only is there a total lack of those passes, so common in the Alps, which lead across the great mountain chains at a far lower level than that of the neighbouring peaks, but between the two extremities of the range, where the principal highroads and the only railways run between France and Spain, there are only two passes practicable for carriages — the Col de la Perche, between the valley of the Tet and the valley of the Segre, and the Col de Somport or Pot de Canfranc, on the old Rr>man road from Saragossa to Oloron.

Projects for further railway construction, including the build- ing of tunnels on a vast scale, have been approved by the French and Spanish governments (see Spain: Communications) .

The metallic ores of the Pyrenees are not in general of much importance, though there are considerable iron mines at Vic de Sos in Ariege and at the foot of Canigou in Pyrenees-Orien- tales. Coal deposits capable of being profitably worked are situated chiefly on the Spanish slopes but the French side has numerous beds of lignite. Mineral springs are abundant and very remarkable, and specially noteworthy are the hot springs, in which the Alps, on the contrary, are very deficient. The hot springs, among which those of Bagneres de Luchon and Eaux-Chaudes may be mentioned, are sulphurous and mostly situated high, near the contact of the granite with the stratified rocks. The lower springs, such as those of Bagneres de Bigorre (Hautes- Pyrenees) , Rennes (Aude) and Campagne (Aude), are mostly selenitic and not very warm .

The amount of the precipitation, including rain and snow, is much greater in the western than in the eastern Pyrenees, which leads to a marked contrast between these sections of the chain in more than one respect. In the first place, the eastern Pyrenees are without glaciers, the quantity of snow falling there being insufficient to lead to their development. The glaciers are confined to the northern slopes of the central Pyrenees, and do not descend, like those of the Alps, far down in the valleys,

but have their greatest length in the direction of the mountain- chain. They form, in fact, a narrow zone near the crest of the highest mountains. Here, as in the other great mountain ranges of central Europe, there are evidences of a much wider extension of the glaciers during the Ice age. The case of the glacier in the valley of Argeles in the department of Hautes-Pyrenees is the best-known instance. The snow-line varies in different parts of the Pyrenees from 8800 to 9200 ft. above sea-level.

A still more marked effect of the preponderance of rainfall in the western half of the chain is seen in the aspect of the vegetation. The lower mountains in the extreme west are very well wooded, but the extent of

forest declines eastwards, and the eastern Pyrenees are peculiarly wild and naked, all the more since it is in this part of the chain that granitic masses prevail. There is a change, moreover, in the composition of the flora in passing from west to east. In the west the flora, at least in the north, resembles that of central Europe, while in the east it is distinctly Mediterranean in character, though the differ- ence of latitude is only about i°, on both sides of the chain from the centre whence the Cobieres stretch north-eastwards towards the central plateau of France. The Pyrenees are rela- tively as rich in endemic species as the Alps, and among the most remarkable instances of that endemism is the occurrence of the sole European species of Dioscorea (yam), the D. pyre- naica, on a single high station in the central Pyrenees, and that of the monotypic genus Xatardia, only on a high alpine pass between the Val d'Eynes and Catalonia. The genus most abundantly represented in the range is that of the saxifrages, several species of which are here endemic.

In their fauna also the Pyrenees present some striking in- stances of endemism. There is a distinct species of ibex (Capra pyrenaica) confined to the range, while the Pyrenean desman or water-mole (Mygale pyrenaica) is found only in some of the streams of the northern slopes of these mountains, the only other member of this genus being confined to the rivers of south- ern Russia. Among the other peculiarities of the Pyrenean fauna are blind insects in the caverns of Ariege, the principal genera of which are Anophthaltnus and Adelops.

The ethnology, folk-lore, institutions and history of the Pyrenean region form an interesting study: see Andorra; Aragon; Basques; Bearn; Catalonia; Navarre.

See H. Beraldi, Cent ans aux Pyrenees (1901), Les Sierras, cent ans aprbs Ramond (1902), Apres cent ans. Les Pics d'Europe (1903), and Les Pyrenees orientates et V Ariege (1904); P. Joanne, Pyrenees (1905) ; H. Belloc, The Pyrenees (1909) ; for geology, in addition to the papers cited above, A. Bresson, Etudes sur les formations des Hautes et Basses Pyrenees (Paris, Ministere des Travaux Publics, 1903) ; L. Carez, La Geologic des Pyrenees francaises (Paris, M in. des Tr. P., 1903, &c); J. Roussel, Tableau stratigraphique des Pyrenees (Paris, Min. des Tr. P., 1904); and for climate and flora T. Cook, Handbook to the Health Resorts on the Pyrenees, &c. (1905), and J. Bentham, Catalogue des plantes indigenes des Pyrenees et de Bas- Languedoc (1826).

PYRlSNERS-ORIENTALES, a department of south-western France, bordering on the Mediterranean and the Spanish frontier, formed in 1790 of the old province of Roussillon and of small portions of Languedoc. The population, which in- cludes many Spaniards, numbered 213,171 in 1906.

Area, 1599 sq. m.

The department is bounded N. by Ariege and Aude, E. by the Mediterranean, S. by Catalonia and W. by the republic of Andorra. Its borders are marked by mountain peaks, on the north by the Corbieres, on the north-west and south-west by the eastern Pyrenees, on the extreme south-east by the Alberes, which end in the sea at Cape Cerbera. Spurs of these ranges project into the department, covering its whole surface, with the exception of the alluvial plain of Roussillon, which extends inland from the sea-coast. Deep and sheltered bays in the vicinity of Cape Cerbera are succeeded farther north by flat sandy beaches, along which lie lagoons separated from the sea by belts of sand. The lagoon of St Nazaire is 2780 acres in extent, and that of Leucate on the borders of Aude is 19,300 acres. Mont Canigou (9137 ft.), though surpassed in height by the Carlitte Peak (9583 ft.), is the most remarkable mountain in the eastern Pyrenees, since it stands out to almost its full height above the plain, and exhibits with great distinctness the succession of zones of vegetation. From the base to a height of 1400 ft. are found the orange, the aloe, the oleander, the pomegranate

and the olive; the vine grows to the height of 1800 ft.; next come the chestnut (2625 ft.), the rhododendron (from 4330 to 8330 ft.), pine (6400), and birch (6560); while stunted junipers grow to the summit.

The drainage of the department is shared by the Tet and the Tech, which rise in the Pyrenees, and the Agly, which rises in the Corbieres. All three flow eastwards into the Mediterranean. The Aude, the Ariege (an affluent of the Garonne) and the Segre (an affluent of the Ebro) also take their rise within the department and include a small part of it in their respective basins. The Tet rises at the foot of the Carlitte Peak and descends rapidly into a very narrow valley before it debouches at Hie (between Prades and Perpignan) upon the plain of Roussillon, where it flows over a wide pebbly bed and supplies numerous canals for irrigation. It is nowhere navigable, and its supply of water varies much with the seasons, all the more that it is not fed by any glacier. The Agly, which soon after its rise traverses the magnificent gorge of St Antoine de Galamus and, nearing its mouth, passes Rivesaltes (famous for its wines), serves almost exclusively for irrigation. The Tech, which after the Tet is the most important river of the department, flows through Vallespir (vallis aspera,) which, notwithstanding its name, is a green valley, clothed with wood and alive with industry; in its course the river passes Prats de Mollo and Arles-sur-Tech,

before reaching Amelie-les-Bains and Ceret. In the lowlands the climate is that of the Mediterranean, characterized by mild winters, dry summers and short and sudden rain-storms. Am61ie-les-Bains is much frequented on account of its mild climate and sheltered position. The thermometer ranges from 85 to 95 F. in summer, and in winter only occasionally falls as low as 26° or 27°. The mean amount of the rainfall is 27 in. on the coast, but increases towards the hills. The most common wind is the tramontane from N.N.W., as violent as the mistral of Provence and extremely parching. The marinada blows from the S.S.E.

The cultivated land in Pyrenees-Orientales is devoted to wine-growing, market-gardening and fruit culture, the pro- duction of cereals being comparatively unimportant. The main source of wealth to the department is its wine, of which some kinds are strongly alcoholic and others are in request as liqueur wines (Rivesaltes, Banyuls). The cultivation of early vegetables (artichokes, asparagus, tomatoes, green peas), which is specially flourishing in the irrigated lowlands, and fruit-growing (peaches, apricots, plums, pears, quinces, pome- granates, almonds, apples, cherries, walnuts, chestnuts), which is chiefly carried on in the river valleys, yield abundant returns. The woods produce timber for the cabinet-maker, cork, and bark for tanning. Large flocks of sheep feed in the pastures of the Pyrenees and Corbieres; the keeping of silkworms and bees is also profitable. In iron Pyrenees-Orientales is one of the richest departments in France, the greater part of the ore being transported to the interior. Lignite and various kinds of stone are worked. The mineral waters are much resorted to. Amelie-les-Bains has hot springs, chalybeate or sulphurous. In the arrondissement of Ceret there are also the establishments of La-Preste-les-Bains, near Prats de Mollo, with hot sulphurous springs, and of Le Boulou, the Vichy of the Pyrenees. Near Prades are the hot sulphurous springs of Molitg, and a little north of Mont Canigou are the hot springs of Vernet, containing sodium and sulphur. In the valley of the Tet the sulphurous and alkaline springs of Thues reach a temperature of 172° F. The baths of Les Escaldas, near Montlouis, are hot, sulphurous and alkaline. There are oil-works and sawmills, and the manufactures of the department include the making of whip- handles, corks, cigarette paper, barrels, bricks, woollen and other cloths, and espadrilles (a kind of shoe made of coarse cloth with esparto soles). Of the ports of the department Port Vendres alone has any importance. Imports include timber, Spanish and Algerian wine, cereals, coal; among the exports are wine, timber, vegetables, fruit, honey, oil and manu- factured articles. The department is served by the Southern railway. The chief route across the Pyrenees is from Perpignan by way of Montlouis, a fortified place, to Puigcerda, in the Spanish province of Gerona, through the pass of La Perche, skirting in the French department an enclave of Spanish terri- tory. Three other roads run from Perpignan to Figueras

through the passes of Perthus (defended by the fort of Belle- garde), Banyuls and Balistres, the last-named being traversed by a railway. The chief towns of the three arrondissements are Perpignan, Ceret and Prades: there are 17 cantons and

232 communes. The department constitutes the diocese of Perpignan, and is attached to the appeal court and the academy of Montpellier and to the region of the XVI. army corps, of which Perpignan is the headquarters.

Perpignan, the capital town and a fortress of the first class, Amelie-les-Bains and Elne are the more noteworthy places, and are treated separately. Rivesaltes (5448) is the most populous town after Perpignan. Other places may be men- tioned. Planes has a curious church, triangular in shape, and of uncertain date. Popular tradition ascribes to it a Moslem origin. The church and cloister at Arles-sur-Tech are also of the 1 2th century. Boule-d'Amont has a Romanesque church which once belonged to the Augustine abbey of Serrabona. It is peculiar in that its aisles open out into lateral porches, instead of communicating with tne nave. The church of Casteil, which is of the 1 ith century, is a relic of the ancient abbey of St Martin de Canigou. At St Michel-de-Guxa, near Prades, are fine ruins of a Benedictine abbey. The hamlet of Fontromeu, near Odeillo, has a chapel with a statue of the Virgin, which is visited by numerous pilgrims.

PYRETHRUM. The pyrethrum or " feverfew " (nat. ord. Compositae), now regarded as a section of the genus Chrysan- themum, flowers in the early summer months, and is remark- able for its neat habit and the great variety of character and colour which it presents. The type form is the Caucasian species P. roseunt of botanists, hardy perennial, with finely cut leaves^ aWd large flower heads, having a ray of deep rose- colouredKKjgutttt florets surrounding the yellow centre or disk. They bloom during the months of May and June, as well as later, and ar&]al ! #a'ys inost welcome ornaments for the flower borders, and us#*M©r'cu t ttiiig for decorative purposes. There are now many a exceQeftt' v Varielies, both single and double-flowered, in cuMvaiionV 1 ^; ' u,,; "■-'>■'*

*The pyre|nrurn grows best in soil of a loamy texture ; this should be Well fflanu'red' and deeply trenched up before planting, and shouldlBe' mti-fehe'd iffi the spring by a surface dressing of half-decayed • manure,;! Tfcej plants may be increased by division, the side shoots bejngjtjakeniQffijear.lyi in. spring rather than in autumn, with a portion of"; roots ' .artachedj. _) Plants disturbed in autumn frequently die during 1 'th8 .Winter'! = "Tney may be placed either in separate beds or ftf ¥He'**fHixeti flo^ei**'boWer as may be required. In beds they can bei'supj^emeiiteidi aa >ihe season passes on by the intermixture of later b{<}omingfSjuJgject^ such as gladioli. Slugs are often destruc- tive, tathg j young\sjhoo,ts, but may be*

checked by a few sprinklings of soot or linie.'" Seeds Should be sown in spring in a cold frame, and the jˆuh'#"pˆa > nts ji shoTuKt'be put out into beds when large enough, andJ'Should fldwier. ;.the • (following May. New varieties are being ccˆpanˆyrjiˆtrqd.uˆedˆ ;thp, reader is referred to the catalogues of nurseijyinettjtorˆ named ; jcinds. The powdered root of P. roseum and other species' is 'usea ,i'n the manufacture of insect powders. P. parthˆnifilikm ! V&t'. 'dWeM is the " golden-feather " of gardens, so much ettrflfoiylˆd as.' an edging to flower-beds. P. parthenium, pellitory or " fˆyairifes,,;" .was formerly used in medicine. Its double-flowered form is well worth growing. P. uliginosum is the." great ox-eye daisy " that flowers in September and October.

PYRGI (mod!: $, SfevefeS) an ancient town of Etruria, Italy, on the south-wˆt ! cˆiˆtˆ.c| ; 'jtj. W.N.W. of Caere. The name is Greek (irbpyoi,, iftw«rs);-and the place of considerable antiquity. Remains of its defensive walls exist in polygonal blocks of limestone and sandstone, neatly jointed. They enclosed a rectangular area some 200 yds. in width and at least 220 yds. in length. The south-west extremity has probably been destroyed by the sea. It contained a rich temple of Leucothea, the foundation of which was ascribed to the Pelasgi. It was plundered by Dionysius in 384 B.C.* Later it became dependent on Caere, though it is not probable that it was originally merely the harbour of Caere; Alsium (q.v.) is a good deal nearer (5 m. south). The Romans planted a colony here, which is first mentioned in 191 B.C. Later still it supplied fish to the capital, and became a favourite summer resort, as did also Punicum (S. Marinella) 5 m. to the north-west, where are many remains of villas. Both were stations on the coast road (Via Aurelia).*

See H. Dennis, Cities and Cemeteries of Etruria, i. 289. (London, 1883). (T. As.)

PYRGOS, a town of Greece, in the province of Elis and Achaea, 43 m. S.S.W. of Patras. It is the third town in importance in the Peloponnesus, and is connected with its harbour, Katakolon, 75 m. distant, and also with Patras and Olympia, by rail. It has frequently been injured by earth-quakes. Pop. (1907)1 1 3, 6 9°-

PYRIDINE, C5H5N, an organic base, discovered by T. Ander- son (Trans. Roy. Soc. Edin., 1851, 20, p. 251) in bone oil. It is also found among the distillation products of bituminous coal, lignite, and various shales, and has been detected in fusel oil and crude petroleum. It is a decomposition

product of various alkaloids (nicotine, sparteine, cinchonine, &c), being formed when they are strongly heated either alone or with zinc dust. It may be synthetically prepared by distilling allyl ethylamine over heated lead oxide (W. Konigs, Ber., 1879, 12, p. 2341) by passing a mixture of acetylene and hydrocyanic acid through a red-hot tube (W. Ramsay, Ber., 1877, 10, p. 736); by heating pyrrol with sodium methylate and methylene iodide to 200 C. (M. Dennstedt and J. Zimmermann, Ber., 1885, 18, p. 3316); by heating isoamyl nitrate with phosphorus pentoxide (E. T. Chapman and M. H. Smith, Ann., 1868, Suppl. 6, p. 329); and by heating piperidine in acetic acid solution with silver acetate (J. Tafel, Ber., 1892, 25, p. 1619). The amount of pyridine produced in most of these processes is very small, and the best source for its preparation is the " light-oil " fraction of the coal-tar distillate. The basic constituents are removed by dilute sulphuric acid, the acid layer removed, and the bases liberated by alkali, separated, dried, and fractionally distilled.

Pyridine is a colourless liquid of a distinctly unpleasant, penetrating odour. It boils at 114-5° C, and is miscible w,ith water in all proportions. It is a tertiary base, and combines readily with the alkyl halides to form pyridinium salts. Nascent hydrogen reduces it to piperidine, C 5 H n N (see below), whilst hydriodic acid above 300° C. reduces it to »-pentane (A. W. Hofmann, Ber., 1883, 16, p. 59°)- It is a very stable compound, chromic and nitric acids being without action upon it, whilst the halogens only yield substitution derivatives with difficulty. It reacts with sulphuric acid only at high temperatures, yielding a sulphonic acid. It forms addition compounds with mercuric and auric chlorides. On the constitution of the pyridine nucleus, see Korner, Gior. deW acad. di Palermo, 1869, and C. Riedel, Ber., 1883, 16, p. 1609. As regards the isomerism of the pyridine substitution products, three mono-derivatives are known, the different positions being indicated by the Greek letters a, f3 and 7, as shown in the inset formula. This formula also allows of the existence of six di-derivatives, six tri-derivatives, three tetra- and one penta- derivative, when the substituent groups are identi- cal; all of which are in agreement with known facts.

\«/

The three monochlorpyridines are known, the a and 7 compounds resulting from the action of phosphorus pentachloride on the corre- sponding oxypyridines, and the j3 compound from the action of chloroform on potassium pyrrol. a-Aminopyridine, Csˆ N-NHˆ is formed by heating 5-aminopyridine-2-carboxylic acid. It is a crystalline solid which melts at 56° C. and boils at 204° C. It can only be diazotized in the presence of concentrated sulphuric acid, and even then the free diazonium sulphate is

not stable, readily passing in the presence of water to o-oxypyridine. fi-Aminopyridine is obtained by heating /3-pyridyl urethane with fuming hydrochloric acid until no more carbon dioxide is liberated (T. Curtius and E. Mohr, Ber., 1898, 31, p. 2493), or by the action of bromine and caustic soda on the amide of nicotinic acid (F. Pollak, Monats., 1895, 16, p. 54). It melts at 64° C. and boils at 250-252° C. The aminopyridines are readily soluble in water, and resemble the aliphatic amines in their general chemical properties.

The oxypyridines may be prepared by distilling the corresponding oxypyridine carboxylic acids with lime, or by fusing the pyridine carboxylic acids with caustic potash. The mono-oxypyridines are easily soluble in ~water and possess only feeble basic properties. The (3 compound is hydroxylic in character, whilst the a and 7 deriva- tives behave frequently as if they possess the tautomeric keto- structure, yielding according to the conditions of the experiment either N- or O-ethers (H. v. Pechmann, Ber., 1895, 28, p.. 1624), thus corresponding to the formulae —

CH HC/\CH

A,

HC\/C-OH

N o-oxypyridine

CH HC/%CH

I! !l

HC\/CO

NH o-pyridone

COH HC/\CH

HO\/CH 7-oxypyridine

CO HCˆCH

HC\/CH

NH

7-pyridone

The homologues of pyridine may be synthesized in various ways. One of

the most important is the so-called " collidine " synthesis of A. Hantzsch (Ann., 1882, 215, p. 1; Ber., 1882, 15, p. 2914) which consists in the condensation of two molecules of aceto-acetic ester with one of an aldehyde and one of ammonia : —

R0 2 C-CH 2 , R'-CHO ,CH 2 -CO s R CH.CO + NH, + CO-CHa "

R0 2 C-CCHR'- C-COjR ' CH S C-NH-C-CH,

The resulting dihydro-compound is then oxidized with nitrous acid, the ester hydrolysed and the resulting acid heated with lime; carbon dioxide is eliminated and a trisubstituted pyridine of the type P H pepu \ is obtained. The reaction is apparently a

R.r/ \m general one for all aldehydes. On the course

\ rtr /-vc-tr \/ of the reaction see also C. Beyer, Ber., 1891, <~ri.v-(.i~n s j 24, p. 1662, andE. Knoevenagel, Ber., 1898,

31, p. 738. In this reaction the proportions of aldehyde and aceto- acetic ester may be interchanged and 07 disubstituted pyridines are then obtained. Of the other methods for preparing pyridine homologues mention may be made of the discovery by A. Ladenburg that the pyridinium alkyl iodides rearrange themselves when strongly heated and yield o and 7 alkyl pyridines (Ber., 1883, 16, p. 1410 seq. ; Ann., 1888, 247, p. 1). S. Ruhemann prepared 7-substituted dioxy- pyridines by condensing alkyl-dicarboxy-glutaconic esters with ammonia.

/d'ap\ r.r*T> r>tr I r*r\ r> '\ .R O2OC :CR'CHC02R . H C:CR"CH*

(K 02C) 2 CCK-LH(.L02K) 2 — OCNHCO "'HO C:N COH

M. Scholtz (Ber., 1895, 28, p. 1726) prepared aa- methylphenyl- pyridine by distilling cinnamenylidene acetoxime,

CH.CH :CH-CH :CH-C(:NOH)CH 3 = c,H b -C-N H .C-CH 3 + H2 °

The 1-5 diketones of the type inset, when heated with ammonia, also

yield pyridine derivatives. Alkyl pyridines

— COv /CO— are also obtained by heating aldehyde

J>C:CH-CH^ ammonias alone or with aldehydes and

V XX) — ketones (A. v. Baeyer, Ann., 1870, 155,

pp. 281, 294; J. Plochl, Ber., 1887, 20,

P- 722).

The subjoined table shows the chief homologues of pyridine: —

-co/

Name.

Formula.

Picolines

*Lutidine**

Collidines

C 6 H4(CH,)N

Position of Sub- stituent.

C 6 H 4 (C S H 6)N

C 6 H S (CH 3) 2 N C 6 H4(C,H T)N

C 6 H 3 (CH 3)(C 2 H 6)N C 6 H 2 (CH 3) 3 N

7

a, ft 7,

aa', 07, ajS'

10′ , 07-

Remarks.

a'a, 7|3,

a7, a/3′

07a'

a7/3′

Liquid, b.p. 129°. Oxi- dizes to picolinic acid. Condenses readily with aldehydes.

Liquid, b.p. 143°. Oxi- dizes to nicotinic acid. Does not condense with aldehydes.

Liquid, b.p. 144-145 .

Three isomers. All liquids. The /3 com- pound is a decompo- sition product of cinchonine, quinine, strychnine and bru- cine.

Five isomers. All liquids.

Liquids. The o com- pound is a decomposi- tionproductof Conine. Both contain the nor- mal propyl group.

Containing the isopro- pyl group.

Liquids.

Liquid, b.p. Prepared Hantzsch

Found in coal-tar.

171-172°. by the synthesis.

Pyridine carboxylic acids are usually prepared by oxidizing the homologues of the base; they also result as decomposition products I of various alkaloids. The more important are shown in the table.

PYRIMIDINES

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Position

Name.

Formula.

of Sub- stituent.

Remarks.

Picolinic

C 6 H4(C0 2 H)N

a

M.p. 137 . Easily solu- ble in water. Yellow

acid.

coloration wtith

FeSC>4. Position of

carboxyl group deter-

mined by synthesis

from o-naphthyl-

amine (Z. Skraup and

A. Cobenzl, Monats.,

1883, 4, p. 436). M.p. 228-229 . An oxi-

Nicotinic

C t H < (C0 2 H)N

acid.

dation product of nicotine, hydrastine and berberine. Con- stitution determined by synthesis from /S-naphthylamine (Skraup).

Quinolinic

C 6 H,(C0 2 H) 2 N

off

M.p. 192-195° with de-

acid.

composition into nico- tinic acid. Formed by oxidation of quinoline.

Cincho-

C 6 H 3 (C0 2 H) 2 N

Py

M.p. 258-259°. Formed

meronic

by oxidation of quin-

acid.

ine, cinchonine, and of isoquinoline.

a-Carbo-

C 6 H 2 (CO s H) 3 N

affy

M.p. 249-250°. Crystal-

cincho-

lizes with iiH 2 0. An

meronic

oxidation product of

acid.

cinchonine, quinine and papaverine.

Berbero-

C 6 H 2 (C0 2 H) 3 N

07/S'

M.p. 243°. An oxida-

nic

tion product of ber-

acid.

berine. Gives a red coloration with FeSC>4. Boiling with glacial acetic acid gives cinchomeronic

acid.

compounds. At 125-130" C. the compound C 6 H 6 C-C1:N(CH 2)6-Ci is obtained; this with water yields benzoylamidochloramylamine C 6 H 6 CONH6Cl, which when heated with hydrochloric acid tc 170-180° C.

furnishes e-chloramylamine, NH 2 (CH 2) 5 C1. a-Propyl- piperidine is the alkaloid conine (a.v.).

PYRIMIDINES, Metadiazines or Miazines, in organii chemistry, a series of heterocyclic compounds containing a rinj complex, composed of four carbon atoms and two nitrogen atoms the nitrogen atoms being in the meta-position. The oxyderiva tives of the tetrahydro- and hexahydro-pyrimidines are tht uracils and the ureides of malonic acid (see Purin). The purins themselves may be considered as a combination of the pyri- midine and glyoxaline ring systems. For formulae see below; the numbers about the first ring explain the orientation of pyrimidine derivatives.

The pyrimidines may be obtained by condensing i-3-di- ketones with the amidines (A. Pinner, Bar., 1893, 26, p. 2125).

CH s -CO , NH 2 -C-C e H 6 _.CH3-C:N= =C-C 6 H5.

CH 2 -CO(CH 3) "+" HN "" CH:C(CH 3)-N*

Trigonelline, C7H7NO5, the methyl betaine of nicotinic acid, was discovered in 1885 by E. Jahns (Ber., 1885, 18, p. 2518), and is found in the seeds of Trigonella and Strophanthus hispidus. It is very soluble in water. With baryta it yields methylamine, and when heated with concentrated hydrochloric acid to 260° C. it yields methyl chloride and nicotinic acid. It was synthesized by A. Hantzsch (Ber., 1886, 19, p. 31) by condensing methyl iodide and potassium nicotinate at 150 C. the resulting iodide being then decomposed by moist silver oxide. A. Pictet (Ber., 1897, 30, p. 21 17) obtained it by oxidizing nicotine methyl hydroxide with potassium permanganate. Apophyllenic acid, CgHrNCvrˆO, the methvl betaine of cinchomeronic acid, was synthesized by W. Roser (Ann., 1886, 234, p. 118).

Piperidine or hexa-hydropyridine, C 6 HnN, was first obtained in 1848 by distilling piperine with lime. It is formed in the hydrolysis of piperine by alcoholic potash, by the reduction of trimethylene cyanide (A. Ladenburg) and by the action of alkalis on «-chloramyl- amine, C1(CH 2) 5 -NH 2 (S. Gabriel, Ber., 1892, 25, p. 421). It is also produced in the electrolytic oxidation of iV-nitroso piperidine in sulphuric acid solution (F. B. Ahrens, Ber., 1898, 31, p. 2275). It is a liquid which boils at 105-106° C, and possesses an ammoniacal smell. It is readily soluble in water, alcohol and ether, and is a very powerful base. It is oxidized to pyridine by heating with con- centrated sulphuric acid to 300° C, or with nitrobenzene to 250° C, or with silver acetate to 180° C. Being an imide it readily yields a nitroso derivative, and iV-alky! and acidyl derivatives. The piperi- dine ring is easily split. When heated with fuming hydriodic acid to 300° C. it yields

normal pentane and ammonia, and hydrogen peroxide oxidizes it to glutarimide and to a piperidinium oxide or oxime (R. Wolffenstein, Ber., 1904, 37, p. 3228). A. W. Hofmann (Ber., 1881, 14, p. 660), by a process of exhaustive methylation and distillation, obtained the unsaturated hydrocarbon piperylene, CH 2 :CH-CH 2 CH : CH 2 ,from piperidine (see also A. Ladenburg, Ann., 1894, 279, p. 344). GHnN(+CH 3 I) -> C 5 H,oN(CH 3) 2 I (+AgOH) -> C 6 H 10 N(CH 3) 2 -OH

(distil) I C s H 3 X(CH 3) 3 OH<-(-l-AgOH)C 6 H 9 N(CH 3) 3 I<-(4CH 3 I)C 6 H 9 N(CH 3) 2

(distil) 4, C 4 H, + N(CH 3) s +H 2

J. v. Braun (Ber., 1901, 37, p. 2915) showed that benzoyl piperi- dine, when heated with phosphorus pentachloride to 200° C. in sealed tubes, yields benzonitrile, and pentamethylene dichloride, thus leading to a simple method of preparing pentamethylene

The)3-ketonic esters under like treatment yield oxypyrimidines, whilst if cyanacetic ester be employed then amino-oxypyrimi- dines are obtained. By using urea, guanidine, thiourea and related compounds instead of amidines, one obtains the uracils. The cyanalkines (aminopyrimidines) were first ob- tained, although their constitution was not definitely known, by E. Frankland and H. Kolbe (Ann. 1848, 65, p. 269) by heating the nitriles of acids with metallic sodium or with sodium ethy- late between 130° C. and 180° C.

3CH 3 CN = C 4 HN 2 (CH 3) 2 -NH 2 [2-4-6]. Pyrimidine, C4H 4 N 2 , itself is a water-soluble base which melts at 21° C. and possesses a narcotic smell. Its methyl derivatives yield the corresponding carboxylic acids when oxidized by potassium permanganate. The amino derivatives are stable bases which readily yield substitution derivatives when acted upon by the halogen elements. Cyanmethine, CeHsNs (dimethyl-aminopyrimi- dine — 2‘4-6), melts at i8o-i8i°C. The simple oxypyrimidines are obtained by the action of nitrous acid on the amino derivatives, or by heating these latter with concentrated hydrochloric acid to 180° C. They show both basic and phenolic properties and are indifferent to the action of reducing agents. Acid oxidizing agents, however, completely destroy them. By the action of phosphorus pentachloride, the hydroxyl group is replaced by chlorine.

Hydropyrimidines. — The dihydro derivatives are most probably those compounds which are formed in the condensation of acidyl derivatives of acetone, with urea, guanidine, &c. Tetrahydropyrimi- dines are obtained by the action of amidines on trimethylene bro- mide:

Br(CH 2),Br + C,H 6 C(:NH)-NHj = 2HBr + C4H 7 N 2 (C,Hj)[2]. The 2-6-diketo-tetrahydropyrimidines or uracils may be considered as the ureides of |8-aldehydo, and /3-ketonic acids. Uracil and its homologues may be obtained in many cases from the hydrouracils by the action of bromine, and subsequent elimination of the elements of hydrobromic acid; or by the condensation of aceto-acetic ester and related substances with urea, thiourea, guanidine, &c. Uracilˆ C4H40 2 N 2 , crystallizes in colourless needles, is soluble in hot water and melts with decomposition at 335° C. Hydrouracil, C4H 6 2 N 2 , is obtained by the action of bromine and caustic alkalis on succin- amide (H. Weidel and E. Roithner, Monats., 1896, 17, p. 172) ; by the fusion of |3-aminopropionic acid with urea; by the electrolytic reduction of barbituric acid (J. Tafel, Ber., 1900, 33, p. 3385), and by the condensation of acrylic acid with urea at 210-220° C. (E. Fischer, Ber., 1901, 34, p. 3759). It crystallizes in needles and is soluble in water. It melts at 275° C. -Methyluracil, C5H e 2 N 2 , has long been known, having first been synthesized by R. Behrend (see Purin). It crystallizes in needles which melt at 320° C. and is soluble in caustic alkalis. On oxidation with potassium permangan- ate it is converted into acetyl urea, together with other products. $-Methyluracil (Thymin) is obtained from the corresponding methyl bromhydrouracil (E. Fischer) ; or from 2-4-6-trichlor-5-methylpyrimi- dine by the action of sodium methylate. This yields a 2‘4-dime- thoxy-5-methyl-6-chlorpyrimidine, which on reduction and subsequent treatment with hydrochloric acid is converted into thymin (O. Gerngross, Ber., 1905, 38, p. 3394). For methods of preparation and properties of numerous other pyrimidine com- pounds see T. B. Johnson, Journ. Biol. Chem., 1906, &c. ; Amer. Chem. Journ., 1906, &c; W. Traube, Ber., 1900, &c. ; O. Isay, ibid., 1906, 39. P- 251-

N:C(CH 3)-N NH-CO-NH

NH 2 C:CH-C-CH 3 CH:CH-CO

N:CH-N. CH:CH-CH

6 .5. 4

Pyrimidine

Cyanmethine

Uracil

PYRITES, a term applied to iron disulphide when crystallized in the cubic system, but used also in a general sense to designate a group of metallic sulphides of which this mineral is the most characteristic example. When employed as a group-name the constituent species are distinguished by prefixes: thus the type is called iron pyrites, whilst other species are known as copper pyrites, arsenical pyrites, &c. The original word pyrites (from Gr. irOp, fire) had reference to the fact that sparks might be elicited on striking the mineral violently, as with flint, so that Trvpirris \Ldos meant a stone which struck fire. Hence the name seems to have been applied also to flint, and perhaps to emery and other hard stones. Nodules of pyrites have been found in prehistoric barrows and elsewhere under conditions suggesting their use as a primitive means of pro- ducing fire. Even in late historic time it was employed in some of the old wheel-lock guns. Iron-pyrites was formerly called marcasite, a word variously written marcasin, marchasite, marchesite, marquesite, &c. The two names are now ap- plied to distinct mineral species. The compound FeS 2 is dimorphous, and the modern practice is to distinguish the cubic forms as pyrites and the orthorhombic as marcasite (q.v.). Sometimes, however, the term pyrites is loosely applied to both species, and the cubic pyrites is then differentiated by the name " pyrite " — a form which brings the last syllable into harmony with the spelling of the names of most minerals.

Iron pyrites, or pyrite, belongs crystallographically to the parallel- faced hemihedral class of the cubic system. Its common forms are

Fig. 1.

Fig.

Fig. 3.

the cube, the octahedron, and the pentagonal dodecahedron. Fig. 1 shows P the cube (iooj, d the octahedron {11 1), and e the pentagonal dodecahedron ir I210J. In fig. 2 x (210) and |m} are associated with /the dyakis-dodecahedron tt J321J; whilst rig. 3 shows a combination of ir J210} and ir (421 j. The faces of the cube are sometimes striated parallel to the edges between P and e (fig. 1), the striae on each face being therefore at right angles to those of the adjoining faces, and indicating an oscilla- tory combination of the cube and penta- gonal dodecahedron. Fig. 4 illustrates a characteristic twin, formed by two inter- penetrating pentagonal dodecahedra. Such supplementary twins, known in Germany as " twins of the Iron Cross," are commonly

Fig. 4. brown by superficial conversion into limonite.

Pyrites presents a conchoidal fracture, and a very indistinct cubic cleavage. Its hardness is about 6, and its specific gravity 4-9 to 5-2, being rather more than that of marcasite. Moreover, the colour of pyrites is pale brass-yellow, whilst that of marcasite when untar- nished may be almost tin-white. From copper-pyrites (chalco- pyrite) iron-pyrites is distinguished by its superior hardness and by its paler colour. On exposure to meteoric influences pyrites com- monly becomes brown, by formation of ferric hydrate or limonite, whence the change is called " limonitization." Such a change is very common on the outcrop of mineral veins, forming what miners call " gozzan." Another kind of alteration which pyrites may suffer has been termed " vitriolization," since the products are ferrous sulphate, with free sulphuric acid and sometimes a basic ferric sulphate. It is often said that this saline change is more character- istic of marcasite than of pyrite, but according to H. N. Stokes this statement is incorrect. Contrary, too, to popular belief, he has found a fibrous structure more common in pyrite than in marcasite. In some cases the two forms of iron disulphide occur in intimate associa- tion and are difficult to distinguish.

According to the formula FeS2, pyrites contains theoretically 4667 % of iron and 53-33 of sulphur. Practically, however, it frequently contains other metals, such as copper, cobalt and nickel. Gold is often present, and in many gold-mining districts the precious metal is obtained mainly from auriferous pyrites. As pyrites, from its brass-yellow colour, is sometimes mistaken for gold, it has beer, vulgarly called " fool's gold." Traces of thallium, which are present in some pyrites, may be detected in the flues of the furnaces where the metal is roasted. Arsenic is an impurity which may be of

serious consequence in some of the purposes to which pyrites fs applied. The presence of copper, nickel and arsenic is possibly due in many cases to traces of kindred minerals, like chalcopyrite, pentlandite and mispickel.

Pyrites is a mineral of very wide distribution, occurring under varied conditions and probably originating in various way. It is common in, mineral-veins, usually associated with quartz, and is often known to miners as " mundic." It occurs crystallized, commonly in cubes, in schistose and slaty rocks, and less abundantly in the younger sedimentary deposits. In coal it not infrequently forms bands and nodules known as " brasses," and may also be finely disseminated through the coal as "black pyrites"; but much of the so-called pyrites of coal is really marcasite. Films of pyrites sometimes coat the joint-planes of coal. It is believed that the bluish colour of many clays and limestones is referable to the presence of finely divided pyrites, and it is known that certain deposits of blue mud now forming around continental shores owe their colour, in part, to disseminated iron sulphide. PyritouS shales have been largely used in the manufacture of*

alum, and are therefore known as " alum-shales." Many fossils are mineralized with pyrites, which has evidently been reduced by the action of decomposing organic matter on a solution of ferrous sulphate, or perhaps less directly on ferrous carbonate dissolved in water containing carbonic acid, in the presence of certain sulphates. A similar action probably explains the origin of pyrites and marcasite in coal and lignite, in clay and shales, and in limestone like chalk.

Pyrites is largely worked for sake of the sulphur which it contains, and in many cases it has displaced brimstone in the manufacture of sulphuric acid. For this purpose its value depends on the proportion of sulphur present. Pyrites low in sulphur is incapable of sustaining its own combustion without the aid of an external source of heat, and 45 % of sulphur is, for economic reasons, usually regarded as the lowest admis- sible for sulphuric acid manufacture. It is also important for this purpose that the ore should be as free as possible from arsenic (see Sulphuric Acid).

An extremely important variety of pyrites is that which is more or less cupriferous, and is commonly known commercially as " copper-pyrites " {q.v.), though distinct mineralogically from that mineral. It consists, indeed, mainly of iron-pyrites, with a notable but variable proportion of copper, sometimes with silver and gold, and not infrequently associated with lead and zinc sulphides. The copper probably exists as dissemi- nated chalcopyrite. Deposits of such cupriferous pyrites are widely distributed and are often of great magnitude. They are generally of lenticular form, and usually occur in or near the contact of eruptive rocks with schists or slates; the presence of the igneous rock being probably connected genetically with their origin. Among the best-known deposits of this character are those in the Huelva district, in the south-west of Spain, including the mines of Rio Tinto, Tharsis, Calafias, &c; with those of San Domingos in Portugal. At Rio Tinto the ore is divided into three classes: —

(1) The poorest, containing an average of about i\% of copper, which is treated locally by leaching with water and liquor containing ferric sulphate, whereby the copper is dissolved out and afterwards precipitated by pig-iron, whilst the residue is exported as ordinary iron-pyrites. (2) Export ore, with from 2 to 5 % of copper, in which the sulphur, copper and precious metals are utilized, and the residual iron oxide then sold as " purple ore " for use in iron manufacture. (3) Smelting ore, which averages about 6 % of copper, and is treated metallurgically as described under Copper.

The world's annual production of iron-pyrites is about 1,700,000 tons. The largest producer is Spain, with upwards of 350,000 tons, including the cupriferous pyrites. France yields about 300,000 tons, largely from the Sain Bel mines, department of the Rh6ne. Then follows Portugal, with its

important output of cupreous pyrites. In the United States the production of pyrites now reaches more than 200,000 tons per annum. The state of Virginia is the chief producer, followed successively by Georgia, North Carolina, Colorado, Massachu- setts, California, Missouri, New York, &c. From Indiana and

Ohio a quantity of pyrites is obtained as a by-product in coal- mining. Newfoundland yields cupreous pyrites, worked at Pilley's Island, whilst the nickeliferous pyrites of Sudbury in Ontario is partly magnetic (see Pyrrhotite). Magnetic pyrites of commercial importance occurs also in Virginia and Tennessee. The United Kingdom yields but little pyrites, the annual output being not more than about 10,000 tons. Large quantities of " sulphur ore " were, however, formerly worked in the Vale of Avoca, Co. Wicklow, Ireland. Finely crystallized specimens of pyrite are obtained from many other localities, especially from Cornwall, Elba and Traversella, near Ivrea, in Piedmont.

See, for the early history of pyrites, J. F. Henckel's Pyritologia, oder Kieshistorie (Leipzig, 1725) ; of which an English translation appeared in 1757, entitled Pyritologia; or a History of the Pyrites, the Principal Body in the Mineral Kingdom. For a modern description of the deposit of pyrites of economic importance reference may be made to A Treatise on Ore Deposits, by J. A. Phillips (2nd ed. by H. Louis, 1896). For chemical means of distinguishing pyrite from marcasite consult H. N. Stokes, " On Pyrite and Marcasite," Bull. U. S. Geol. Sun. No. 186 (1901). (F. W. R.)*

PYRITZ, a town of Germany, in the Prussian province of Pomerania, 16 m. S.W. of Stargard by the railway to Custrin. Pop. (1905), 8600. It is still surrounded by walls with towers, and has two Evangelical churches. There are small manu- factures of machinery, bricks and sugar. Excellent wheat is grown in the vicinity, while another industry is the breeding of cattle. Near the town is a fountain, erected to mark the spring in which Otto, bishop of Bamberg, baptized the first Pomeranian converts to Christianity in 11 24. Pyritz became a town in 11 50.

PYROCATECHIN, or Pyrocatechol, ortho-dioxybenzene, C 6 H 4 (OH)2, first prepared in 1839 by H. Reinsch on distilling catechin (the juice of Mimosa catechu); occurs free in kino and in beechwood tar; its sulphonic acid is present in the urine of the horse and man. It results in the alkaline fusion of many resins, and may be prepared by fusing ortho-phenolsulphonic acid, o-chlorphenol, o-bromphenol, and o-

phenoldisulphonic acid with potash, or, better, by heating its methyl ether, guaiacol, C6H 4 (OH)(OCH 3), a constituent of beechwood tar, with hydriodic acid.

Pyrocatechin crystallizes in white rhombic prisms, which melt at 104° and boil at 245°; it is readily soluble in water, alcohol and ether. Ferric chloride gives a green coloration with the aqueous solution, whilst the alkaline solution rapidly changes to a green and finally to a black colour on exposure to the air. It reduces silver solutions in the cold and alkaline copper on heating.

Guaiacol may be obtained directly from beechwood tar, from pyrocatechin by methylation with potash and potassium methyl sulphate at 180°, or from anisol by nitration, reduction of the ortho-nitroanisol to amino-anisol, which is then diazotized and boiled with water. It melts at 28° and boils at 250°. It is employed in medicine as an expectorant. The dimethyl ether or veratrol is also used in medicine. Many other pyrocatechin derivatives have been suggested for therapeutic application. Guaiacol carbonate is known as duotal, the phosphate as phosphatol, the phosphite as guaiaco-phosphal ; phosphotal is a mixture of the phosphites of creosote phenols. The valerianic ester of guaiacol is known as geosote, the benzoic as benzosol, the salicylic as guaiacolsalol, while the glycerin ether appears as guaiamar.

Pyrocatechin readily condenses to form heterocyclic compounds; cyclic esters are formed by phosphorus trichloride and oxychloride, carbonyl chloride, sulphuryl chloride, &c. ; whilst ortho-phenylene- diamine, o-aminophenol, and o-aminothiophenol give phenazine, phenoxazine and thiodiphenylamine.

PYROGALLOL, or Pyrogallic Acid, a trioxybenzene, C 6 H 3 (0H) 3 (1 : 2 : 3), prepared by Scheele in 1786 by heating gallic acid, C 6 H 2 (OH) 3 C02H. It is also obtained by heating para-chlorphenoldisulphonic acid with potassium hydroxide.

It forms white plates, melting at 132°, readily soluble in water, and subliming without decomposition. It is an energetic reducing agent, a property utilized in its application in gas analysis to absorb oxygen, and in photography (q.v.) as a developer. The aqueous solution is turned bluish black by ferrous sulphate containing a ferric salt. It does not combine with hydroxylamine, as does the isomeric phloroglucin which yields a trioxime(see Polymethylenes). Pyrogallol dimethyl ether is found in beechwood tar. Pyrogallol has antiseptic properties and is employed medicinally in the treat- ment of psoriasis. Eugallol, or monacetyl pyrogallol and lenigallel, or triacetyl pyrogallol, are also used.

PYROLUSITE, a mineral consisting essentially of manganese dioxide (Mn0 2), of importance as an ore of manganese. It is a soft, black, amorphous mineral, often with a granular, fibrous or columnar structure, and sometimes forming reniform crusts. It has a metallic lustre, and a black or bluish-black streak, and readily soils the fingers. The specific gravity is about 4-8.

Supposed crystals of pyrolusite have been proved to be pseudo- morphs after manganite; in fact the mineral often results by the dehydration and oxidation of manganite (Mn 2 03.H 2 0), and for this reason it frequently contains a little water. True crystals of manganese dioxide are referred to the rare species polianite: they are tetragonal and isomorphous with cassiterite. Pyrolusite is an alteration product of other manganese minerals — manganite, rhodochrosite, rhodonite, &c. It occurs as irregular masses and nodules in the residual clayey materials resulting from the decom- position of various rocks, for example, limestone. That it is readily deposited from solution is shown by the frequent occurrence of black dendritic markings in the crevices of rocks, excellent examples of which are seen in mocha stone (q.v.) and in the lithographic stone of Solenhofen in Bavaria. It is deposited from the waters of some springs, and manganiferous nodules are dredged from the floor of the deep sea.

As an ore it is extensively mined at Ilmenau and several other places in Thuringia, at Vorderehrensdorf near Prossnitz in Moravia, Platten in Bohemia, in North Wales, at several places in the United States (Vermont, Virginia, Arkansas, &c), Nova Scotia and Brazil. Pyrolusite, together with the rather less important ore, psilomelane, has various economic applications. It is extensively used for the manufacture of spiegeleisen and ferromanganese, and of various alloys, such as manganese-bronze. As an oxidizing agent it is used in the preparation of chlorine and disinfectants (permanganates), and for decolorizing glass: when mixed with molten glass it oxidizes the ferrous iron to ferric iron, and so dis- charges the green and brown tints, hence the name pyrolusite, from Gr. tvp (fire) and Xieiv (to wash). As a colouring material, it is used in calico printing and dyeing; for imparting violet, amber and black colours to glass, pottery and bricks; and in the manufacture of green and violet paints. (L. J. S.)

PYROMETER (Gr. irvp, fire, ykrpov, a measure), an instru- ment for measuring high temperatures. The term was first used by Musschenbroek to denote an instrument wherein the expansion of a metal rod measured the temperature. Dis- continuous thermoscopes, depending on the fusion of a metal or salt, are also employed. Prinsep prepared a series of alloys of silver and gold, and of gold and platinum, whose melting points, as determined by accurate instruments, covered a range of temperature from 954° to 1775°, at intervals of from 25° to 30 . By placing ingots in a

furnace and observing which one melted a fair idea of the temperature was obtained. Carnelley and Williams employed certain salts of known melting point; whilst the Seger's cones, employed in porcelain manufacture, depend on the fusion of small cones made of clay. (See Ther- mometry for scientific forms.)

PYROMORPHITE, a mineral species composed of lead chloro- phosphate (PbCl)Pb4(P0 4) s , sometimes occurring in sufficient abundance to be mined as an ore of lead.

Crystals are common, and have the form of a hexagonal prism terminated by the basal planes, sometimes combined with narrow faces of a hexagonal pyramid. Crystals with a barrel-like curvature are not uncommon. Globular and reniform masses are also found. As proved by the etched figures on the faces, crystals possess the same parallel-faced hemihedrism as apatite, with which mineral pyromorphite and also mimetite are isomorphous. Between pyro- morphite and the corresponding chloro-arsenate (mimetite, (q.v.) the resemblance in external characters is so close that, as a rule, it is only possible to distinguish between them by chemical tests: and they were formerly confused under the names " green lead ore " and " brown lead ore " (German, Griinbleierz and Braunbleierz) . The phosphate was first distinguished chemically by M. H. Klaproth, in 1784, and it was named pyromorphite by J. F. L. Hausmann in 1813, being so named from the Gr. irCp (fire) and M°P0n (form), because when a fragment of the mineral is fused the globule assumes a faceted form on solidifying. The colour of the mineral is usually some bright shade of green, yellow or brown, and the lustre is resinous. The hardness is 3J and the specific gravity 6-5-7-1. Owing to isomorphous replacement of the phosphorus by arsenic there may be aˆ gradual passage from pyromorphite to mimetite. Varieties containing calcium isomorphously replacing lead a/e lower in :densitV (;(specific gravity 5 , 9-6 , 5) and usually lighter in colour; they bear the names " polysphaerite " (because of the globular form), '" miesite " from Mies in Bohemia, " nussierite " from NuSsiere near Beaujeu, Rh6ne, France, and " cherokine" from Cherokee county in Georgia.

ˆ94-

PYRONES

Pyromorphite has resulted from the alteration of galena in the oxidized portions of metalliferous veins, and is frequently met with in the upper levels of lead mines. Finely crystallized specimens have been found at Braubach and Ems in Nassau, Wheal Alfred in Cornwall, Roughten Gill in Cumberland, Leadhills in Scotland, Phoenixville in Pennsylvania, Huelgoat in Finistere, Brittany, &c. At the last-named locality, as well as at Wheal

Hope, near Truro in Cornwall, there were formerly found curious pseudomorphs of galena after pyromorphite, known as " blue lead ore."

(L. J. S.)

PYRONES, in chemistry, a group of heterocyclic compounds, containing a six-membered ring composed of five carbon atoms and one oxygen atom. Two types are known, namely, the a-pyrones, which may be regarded as the lactones of 5-oxydio- lefine carboxylic acids, and the 7-pyrones, which may be regarded as anhydrides of diolefine dioxyketones: —

,CH :CH

:CK

(7)HC/~"""">0 (4)OC/ "'~">0(i)

C CH-CO' XTˆCH'

(18) (a) (5) (6)

a-Pyrone. 7-Pyrone.

As a class, the pyrones are rather unstable compounds, the ring

being readily broken. When digested with ammonia, the oxygen

atom is replaced by the imino (:NH) group, and pyridones or

oxypyridines are formed.

a-Pyrones. — The coumalic compounds belong to this series, and were first obtained by A. Hantzsch in 1884 {Ann. 222, p. 1) and H. v. Pechmann (Ber., 1884, 17, p. 936).

a-Pyrone or coumalin, C5H4O2, is obtained by distilling the mercury salt of coumalic acid (from malic acid and sulphuric acid) in a current of hydrogen. It is an oily liquid which boils at 206-209 C, and with alkalis it gives formyl crotonic acid, HCXOCH :CH-CH 2 -CHO. a'y-Dimethyl-a-pyrone or mesitene lactone, C 7 H 8 2 , is obtained from iso-dehydracetic acid (from aceto-acetic ester and sulphuric acid). Phenylcoumalin or a'-phenyl-a-pyrone, C 6 H 3 (C6H 5)0 2 , is found in coto-bark. When heated with alkalis it yields benzoic acid and acetophenone ; reduction by hydriodic acid gives 8-phenyl valeric acid, and when heated with ammonium acetate and ammonia it yields phenylpyridone. It forms an addition product with phenol and with aniline; the latter gives diphenylpyridone when boiled with concentrated hydrochloric acid.

Paracotoin, Cj S H 8 04, which also occurs in coto-rind, appears to be a bisoxymethylene phenylpyrone, C 6 H 3 2 -C 6 H 3 (CH 2 2).

Various pyronones (keto-dihydropyrones) derived from the compound having formula I. (below) are known, the most important of which is dehydracetic acid, CgHgO, first obtained by Geuther (Jena'sche Zeit, 1866, p. 8). It may be prepared by distilling aceto- acetic ester alone, by heating it with acetic anhydride to 200 C. or by heating acetyl chloride with pyridine to 200-220 C. J. N. Collie regards it as having formula II., whilst Feist (Ann. 1890, 257, p. 253) favours formula III.*

OCCH:CH OC-CH:C-CH 2 -CO-CH 3 OC-CH:C-CH„

H 2 C-CO-0 H 2 C-CO-0 CH 3 CO-HC-CO-0

(I.) . (II.) (III.)

It crystallizes in tables which melt at 108-109 C, and is a weak acid. Alcoholic potash converts it into aceto-acetic ester, and with concentrated aqueous caustic potash it is completely decomposed into acetone, acetic acid and carbon monoxide.

y-Pyrones. — Many of these compounds are found as natur- ally occurring substances: thus chelidonic acid is found in Chelidonium majus and meconic acid in opium, and the more complex flavone and flavonol derivatives are also found in various plants. The 7-pyrones may be synthesized by elimi- nating water from the 1-3-5 triketones: —

,CH 2 CO-C0 2 R .CH:C— C0 2 R

OC< -^ OC< >0

x CH 2 -CO-C0 2 R x CH:ClC0 2 R

Acetone dioxalic ester. — > Chelidonic ester.

y-Pyrone or pyrocomane, C 6 H 4 2 , melting at 32° C. and boiling at 210-215 C, is obtained by eliminating carbon dioxide from chelidonic acid (obtained as above), or from comanic acid, obtained by heating chelidonic acid. aa'-Dimethyl-y-pyrone, C 6 H 2 (CH 3) 2 2 , is obtained by the action of hydriodic acid on the ester of the corre- sponding acid (Feist, Ann., 1890, 257, p. 272); by the action of carbonyl chloride on the copper derivative of acetoacetic ester, and by the action of concentrated hydrochloric acid on dehydracetic acid. It forms a barium salt which with an acid yields diacetyl acetone. The most striking property of this compound is that it forms salts with mineral acids (J. N. Collie and Tickle,

Journ. Chem. Soc, ,1899, p. 710). For example, hydrochloric acid adds on at the oxygen atom, since the salts so formed are relatively unstable and undergo complete hydrolysis in dilute aqueous solution. The oxygen

atom is probably tetravalent, and the salts are to be regarded as oxonium salts (see Oxygen). Collie {Journ. Chem. Soc, 1904, 85, p. 971) is of the opinion that both oxygen atoms are to be regarded as tetravalent in these salts and gives the second formula below for the molecule : —

HC-CO-CH HC C = CH

HsC-C-O-C-CH, || Cl-O-H I

j^-j H 3 C-C — 0 = C-CH 3

Meconic acid, or oxypyrone tricarboxylic acid (3-2-6) CsH0 2 (OH)(C0 2 H) 2 , found in opium, crystallizes in prisms and gives a characteristic deep red colour with ferric chloride. On heating to 200° it gives comenic acid, C 5 H 2 2 (OH)(C0 2 H), and on distillation pyromeconic acid or /3-oxypyrone. On comenic acid see A. Peratoner, Gazz., 1906, 36 (i.), p. I.

The tetrahydfo-7-pyrones may be obtained by the condensation of aldehydes with acetone-dicarboxylic ester in the presence of hydrochloric acid.

Benzopyrones.

Compounds of this type are known in both the a and 7 series, the former including the coumarins {q.v.) and isocou- marins, and the latter a number of naturally occurring dyestuffs which may be considered as derivatives of flavone (see under).

The isocoumarins (annexed formula) may be prepared by the action of acid chlorides or anhydrides on orthocyanbenzyl cyanide (Ber., 1892, 25, p. 3563) ; by the molecular rearrange- ment of the benzal or alkylidene phthalides (S. « /CH Gabriel, Ber., 1885, 18, p. 2443; 1887, 20, p. 2363), / N/ and by the action of manganese dioxide and hydrochloric acid on ^-naphthoquinone.*

The parent substance of the 7-group, namely 1 ,. .

benzo-y-pyrone (chromone), was obtained in 1900 N/ > CO' by S. Ruhemann (Journ. Chem. Soc, 77, p. 1179) Isocoumarin. by heating its carboxylic acid (formed by the action of concentrated sulphuric acid on phenoxyfumaric acid) in vacuo. It crystallizes in colourless needles, and its solution in concentrated sulphuric acid is yellow with a blue fluorescence.

The naturally occurring compounds, chrysin, galanzin, quercetin, apigenine, &c, are considered to be derivatives of flavone (or flavonol), which is a phenyl-2-benzo-7-pyrone (S. Kostanecki, Ber., 1898-1906). Flavone and flavonol possess the following con- stitutions, the positions of the substituents being indicated by the numbers: —

CH

I

o

4 O

YY V /~

J I CH V

*\ /x co /a **

Flavone.

/v

o

\/

CO'

C-OHˆ" Flavonol.

"

V

Flavone, Ci 6 Hio0 2 , is obtained by the action of potassium hydroxide on the acetyl derivative of benzylidene-ortho-oxyacetophenone. It forms colourless needles, which dissolve in concentrated sulphuric acid with a yellow colour and show a faint blue fluorescence. On fusion with caustic alkalis it yields salicylic acid, acetophenone, ortho-oxyacetophenone and benzoic acid, the latter two products being also formed by its hydrolysis, with sodium ethylate. Chrysin or I -3-dioxyflavone, C15H10O4, is a yellow dye, which may be obtained from the buds of different varieties of the poplar. On hydrolysis it yields phloroglucin and benzoic and acetic acids. It has been synthesized by heating trimethoxy benzoyl acetophenone (from ethyl benzoate and phloracetophenone trimethyl ether) with hydriodic acid,

and also by the action of hydriodic acid on 2-4-dibrom-i-3-dimethoxyflavonone. Galanzinˆ or a-i‘3-trioxy- flavone or i-3-dioxyflavonol, Ci 6 Hio0 6 , crystallizes in yellow needles. It has been synthesized from hydroxydimethoxy-chalkone, C 6 H 6 -CH:CH-CO[i]-C 6 H 2 (OH)(OCH 3) 2 [2-4-6-], the resulting r3-di- methoxy-flavanone compound yielding a nitroso-compound from which galanzin is obtained by the action of concentrated hydriodic acid. Apigenine or i‘3-4’-trioxyflavone, CuHioOe, found in woad and in parsley, crystallizes in pale yellow needles. On fusion at moderate temperatures with caustic alkalis it gives phloroglucin and para-oxyacetophenone, whilst at higher temperatures it yields protocatechuic and para-oxybenzoic acids and phloroglucin. It is obtained synthetically by brominating r3-4’-tnmethoxyflavonone, the resulting tribromo-compound by the consecutive reactions of alcoholic potash and hydriodic acid yielding apigenine. Kaempferol or i-3-4’trioxyflavonol, Ci 6 Hio0 6 , is found in the blossoms of Del phinium consolida and D. zazil. It is obtained by the action of hydriodic acid on kaempherid, and crystallizes in yellowish needles, which on fusion with caustic alkalis give para-oxybenzoic acid and phloroglucin. It is obtained synthetically from hydroxy-trimethoxy- chalkone,CH 3 O4-C 6 H4[i]-CH:CH-C0-[i]C 6 H 2 (0H)(OCH 3) 2 [2-4-6]by a method similar to that used for galanzin. Kaempferid occurs together with galanzin and alpinin in galganta root. It crystallizes in pale yellow needles, which dissolve in the caustic alkalis with an intense yellow colour, and in concentrated sulphuric acid with a

yellow colour and blue fluorescence. Fisetin or 3-3’-4’trioxyflavonol, CuH I0 Oe, occurs in the wood of Quebracho Colorado, and can be obtained by heating fustic with dilute acids. It crystallizes in pale yellow needles. In dilute alcoholic alkalis it shows a dark green fluores cence. On fusion with caustic alkalis it yields phloroglucin, resorcin and protocatechuic acid, whilst if air be passed through its alcoholic solution it yields protocatechuic acid and resorcin. It is obtained synthetically from 2-oxy-3-4-dimethoxy-4-ethoxy-chalkone. The various steps in this synthesis are shown below, since the method employed is applicable to other members of the group. C 2 H 5 CK

>C 6 H 3 – COCH3+OHO C6H 3 (OCH 3) 2 -> HO/

C z H 5 0

>C 6 H 3 COCH:CHC 6 H 3 (OCH 3) 2

HO/

I

C 2 H;

C 2 H s O”

\/\co/

i

•CH-CoHstOCHaJaˆ-CjHsq C:NOH

:o/’

CH-C 6 H 3 (OCH 3) 2 ■CH 2

as/

CHC 6 H s (OCH 3) 2 CO

**

co/

CC„H 3 (OH) 2 COH

This structure of the fisetin molecule was confirmed by Herzig (Monats., 1891, 12, p. 177), who showed that the tetraethyl ether of fisetin on hydrolysis with alcoholic potash gave diethylproto- catechuic acid and diethylfisetol, the latter on oxidation yielding ethyl-/3-resorcylic acid, which had been previously obtained by oxidizing resacetophenone ethyl ether. Luteolin or i-3‘3’-4’tetroxy flavone, Ci 5 Hio0 6 , is found in the weld obtained from Reseda luteola. It crystallizes in small yellow needles, which dissolve in solutions of the caustic alkalis with a bright yellow colour. On fusion with caustic alkalis it yields phloroglucin and protocatechuic acid. It is obtained synthetically from i‘3-3’-4’-tetramethoxy-flavanone by bromination, the tribromo-compound being decomposed by the successive use of alcoholic potash and concentrated hydriodic acid. Quercetin or i-3-3’-4’tetroxyflavonol, C16H10O7, is a decomposition product of quercitrin rind, and is found in many plants. It is obtained by the hydrolysis of quercitrin with dilute sulphuric acid. It is a pale yellow crystalline powder. Alcohol hydrolyses it to protocatechuic acid and phloroglucin. It is prepared synthetic ally from 2-hydroxy-3-4-4’-6’-tetramethoxy-chalkone. Rhamnetin, C, 5 H 9 6 -OCH 3 , the monomethyl ether, is a pale yellow powder. Rhamnazin, Ci5H s 6 (OCH 3) 2 , the

dimethyl ether, crystallizes in yellow needles. Morin or i-3-2'-4'tetroxyflavonol, Cj E Hio0 7 , occurs in the wood of Autscorpis integrifolia, and crystallizes in long yellow needles, which on fusion with caustic alkali decompose into phloro glucin, resorcin and oxalic acid. On reduction with sodium amalgam in alkaline solution it yields phloroglucin and /3-resorcylic acid. It yields a tetramethyl ether and a penta-acetate. It has been synthesized from i-3-2'-4'tetramethoxy fiayanone by con verting this into its isonitroso compound, which yields morin trimethyl ether on hydrolysis by sulphuric acid. Myricetin or I- 3'3'-4 '5'-penta-oxy flavonol, CuHioOg, found in the rind of Myrica nagi and also in Sicilian sumach, crystallizes in yellow needles which dissolve with a green colour in dilute alkalis. On fusion with caustic alkalis it yields gallic acid and phloroglucin.

The parent substance of the group, namely chroman (annexed

formula), was obtained by J. v. Braun and A.

•CH 2 -CH 2 Steindorff in 1905 (Ber., 38, p. 850) by diazotizing

CeH) < ˆ I . ortho-amino-7-chlorpropylbenzene and heating

\ O — CH 2 the resulting chlorpropylphenol with a caustic

alkali. It is a colourless oil which boils at 214-

215° C. and possesses a characteristic peppermint odour.

For the dibenzo-pyrones see Xanthone.

PYROPE (pronounced pirop), a deep red variety of garnet, named from the Gr. irvponrbs (fiery) in allusion to its colour. It is used, like almandine (q.v.), as a gem-stone, but may be dis- tinguished by the absence of any tinge of violet in its colour and by its lower specific gravity (3-7 or 3-8, while that of alman- dine is 4-1 to 4-3). The typical colour of pyrope is blood-red, though sometimes a trace of orange gives rise to a hyacinthine hue: occasionally the mineral becomes nearly black, as seen in the pyrope of Arendal in Norway. Crystals are rare, but cubic forms have been observed. Pyrope may be regarded as a magnesium-aluminium garnet (see Garnet), but it usually contains more or less calcium, iron, manganese and chromium; and the rich colour of the mineral seems due to the presence of some of the last three metals, though their exact condition in the mineral has not been determined.

Pyrope generally occurs in grains embedded in peridotites (olivine rocks) or in serpentine resulting from their alteration, or it is found

as loose grains in detritus due to the disintegration of the matrix. The grains may be surrounded by a chloritic rind, or by a crust ol a fibrous mineral called by A. Schrauf kelyphite (from the Gr, Kc\utf>os, a nut-shell), which seems in some cases to be an amphibole. In the serpentine of Zoblitz and of Greifendorf near Leipzig, in Saxony, pyrope is characteristically developed; and the Saxon garnets, found loose in gravels, were referred to by G. Agricola as far back as 1546. Several localities in Bohemia are famous for yielding pyrope, and from its characteristic occurrence here it is often known, even when found elsewhere, as Bohemian garnet. The garnet-bearing district is a tract of about 70 square kilometres in the north of Bohemia, the chief locality being Meronitz near Bilin. It is notable that the pyrope is found at Meronitz in a clayey calcareous tufa or conglomerate, with opal and serpentine, products of the decomposition of a peridotite. It occurs also in sands and gravels near Chrastian, Lobositz, Triblitz, Podseditz, Chodolitz, and at several other localities in the Mittel Gebirge, between Teplitz and Leitmeritz. It is believed that the original pyrope-bearing rocks resulted from the eruptive activity which gave rise to Lin- horka Hill, near Starrey. The garnets in the detritus are accom- panied by zircon, spinel, corundum, cyanite, tourmaline, olivine, &c. Though generally very small, they are abundant, and are used not only as ornamental stones, but as a counterpoise in delicate weighing and as an abrasive agent. To obtain the stones the detritus is washed, and the garnets picked out by hand and then sized through sieves. The pyrope is generally rose-cut or step-cut, and often mounted with a foil. Beads are faceted all over. Some pyrope is cut en cabochon, forming, like almandine, carbuncle, and if very dark the stone is hollowed at the back so as to form a " garnet- shell." The industry of cutting Bohemian garnets is centred in Turnau on the Iser, near Reichenberg; but there are also works at other localities. Large stones are very rare, but a Bohemian pyrope as large as a hen's egg is preserved in the Imperial treasury at Vienna ; and another the size of a pigeon's egg in the Grtine Gewolbe of Dresden.

Pyrope occurs in many localities in the western part of the United States, especially in Colorado, Arizona and New Mexico, where it is often called " ruby." It is found loose in sand accompanied by olivine, and has resulted from the alteration of a peridotite. The Navajo Indians of New Mexico collect the garnet from the sands of the ant-hills and scorpion-holes. Very fine pyrope occurs in the diamond-fields of South Africa, having been derived from olivine-bearing rocks. It occurs in the blue-ground and in the detritus of the river-diggings. The Cape garnets have usually a rich colour, but some stones incline to an orange hue. The finest pyrope is often cut as a brilliant, and passes under the misleading name of " Cape ruby." A pyrope-bearing rock, rather like that of South Africa, occurs in Elliott county, Kentucky, U.S.A. ; it is notable, too, that pyrope is found near Elie in Fife,

in Scotland, where it occurs in volcanic agglomerates and in basaltic dikes. Sir A. Geikie has pointed out the suggestive resemblance of the occurrence there to that in South Africa.

See " Bohemian Garnets," by G. F. Kunz, Trans. Amer. Inst. Mining Eng. (1893), xxi. 241; and " Die bohmischen Granatlager- statten," by Dr Hans Oehmichen, Zeit. f. prakt. Geol. (1900), viii. I. Both papers contain bibliographical lists. (F. W. R.)*

PYROPHORUS (Gr. irvp, fire, cbipew, to bear), a substance which spontaneously inflames on contact with the air. One of the earliest known is that of Homberg, prepared by heating a mixture of alum and finely divided carbon to redness in a closed tube. On opening the tube and emptying out the black residue (consisting of potassium sulphide, aluminium sulphate and carbon) it promptly catches fire. Many readily oxidizable substances, especially when very finely divided, have the same property. Metallic iron and cobalt, when prepared under certain conditions, are pyrophoric, as is also ferrous oxide. Spontaneously inflammable liquids are also known, e.g. certain alkyl metallic compounds, phosphorus dihydride, &c.

PYROPHYLLITE, a mineral species belonging to the clay family, and composed of hydrous aluminium silicate HA1 (SiOa) 2 . It occurs in two more or less distinct varieties, namely, as crystalline folia and as compact masses; distinct crystals are not known.

The folia have a pronounced pearly lustre, owing to the presence of a perfect cleavage parallel to their surfaces: they are flexible but not elastic, and are usually arranged radially in fan-like or spherical groups. This variety, when heated before the blowpipe, exfoliates and swells up to many times its original volume, hence the name pyrophyllite, from the Greek irvp (fire) and i>X\ov (a leaf), given by R. Hermann in 1829. The colour of both varieties is white, pale green, greyish or yellowish; they are very soft (H. = i-2) and are greasy to the touch. The specific gravity is 2 -8-2 '9. The two varieties are thus very similar respectively to talc (q.v.) and its compact variety steatite, which is, however, a hydrous magnesium

silicate. The compact variety of pyrophyllite is used for slate pencils and tailors' chalk (" French chalk "), and is carved by the Chinese into small images and ornaments of various kinds. Other soft compact minerals (steatite and pinite) used for these Chinese carvings are included with

pyrophyllite under the terms agalmato- lite and pagodite.

Pyrophyllite occurs in schistose rocks, often associated with cyanite, of which it is an alteration product. Pale green foliated masses, very like talc in appearance, are found at Beresovsk near Ekaterinburg in the Urals, and at Zermatt in Switzerland. The most extensive deposits are in the Deep river region of North Carolina, where the compact variety is mined, and in South Carolina and Georgia.

PYROXENE, an important group of rock-forming minerals, very similar in chemical composition and general characters to the amphiboles (q.v.). Although crystallizing in three differ- ent systems, they all possess distinct prismatic cleavages, the angles between which are about 87 (the cleavage angle in the amphiboles being 56°). They are metasilicates, but, as shown in the following table, the composition varies widely in the different species, with corresponding differences in the various physical characters. The name pyroxene was originally given by R. J. Haiiy in 1796 to the black crystals of augite found in the lavas of Vesuvius and Etna: he derived the name from the Greek irvp (fire) and %evos (a stranger), because he thought that the crystals had been accidentally caught up by the lavas which contained them. As a matter of fact, the pyroxenes are, next to the felspars, the commonest constituents of igneous rocks of almost all kinds, being especially characteristic of those of basic composition. An igneous rock composed almost wholly of pyroxene is known as a pyroxenite. Besides being minerals of primary origin in igneous rocks, the pyroxenes are also of frequent occurrence in metamorphic rocks, for example, in crystalline limestones, being then of secondary origin.

At the present day the name pyroxene is used as a group name for all the minerals enumerated below, though sometimes it is also applied as a specific name to include the monoclinic members diopside, hedenbergite, schefferite and augite. Orthorhombic Series.

Enstatite MgSiOs.

Bronzite (Mg,Fe)Si0 3 .

Hypersthene (Fe,Mg)SiC > 3.

Monoclinic Series.

Diopside CaMg(Si0 3)2-

Hedenbergite CaFe(Si0 3) 2 .

Schefferite (Ca,Mg)(Fe,Mn)(Si0 3) 2 .

, . CCa(Mg,Fe)(Si0 3) 2 with

Au & lte I (Mg,Fe)(Al,Fe) 2 Si0 6 .

Acmite NaFe 7 “;Si0 3) 2 .

Spodumene LiAl(Si0 3) 2 .

Jadeite NaAl(Si0 3) 2 .

Wollastonite CaSiOs.

Pectolite HNaCa 2 (Si0 3) 3 .

Rosenbuschite Na 2 Ca 3 [(Si,Zr,Ti)0 3]4-

Anorthic Series.

Rhodonite MnSi0 3 .

Babingtonite (Ca,Fe,Mn)Si0 3 -Fe 2 ”’(Si0 3) 3 .

Hiortdahlite (Ca,Na) 2 F[(Si,Zr)0 2].

For details respecting the special characters and modes of occur- rence of most of these species reference may be made to the respec- tive headings: others not so treated are briefly mentioned below. Hedenbergite, or calcium iron pyroxene, is a black mineral closely allied to diopside (q.v.) and, owing to the isomorphous replacement of iron by magnesium, there is no sharp line of division between them. Schefferite, or manganese pyroxene, is a brown mineral found in the manganese mines of Sweden. Pectolite is a secondary mineral occurring as white masses with a radially fibrous structure in the veins and cavities of basic igneous rocks. Babingtonite is found as small black crystals on felspar in the granite of Baveno in Italy, and in the Haytor iron mine in Devonshire. Rosenbuschite, hiortdahlite, and some other rare members containing zirconium and fluorine, occur as accessory constituents in the nepheline- syenite of southern Norway.

PYROXENITE, a rock consisting essentially of minerals of the pyrpxene group, such as augite and diallage, hypersthene, bronzite or enstatite. Names have been given to members of this group according to their component minerals, e.g. pyroxenite (augite), diallagite (diallage), hypersthenite (hypersthene), bronzitites (bronzite), websterite (diallage and hypersthene). Closely allied to this group are the hornblendites, consisting

essentially of hornblende. The term perknite (Gr. 7repw6s, dark) has also been used to designate the whole series.

They are essentially of igneous origin, though some pyroxenites are included in the metamorphic complex of the Lewisian of Scotland; those pyroxene rocks which result from the contact alteration of impure limestones are described as pyroxene horn- felses (calc-silicate hornfelses). The pyroxenites are closely allied to the gabbros and norites, from which they differ by the absence of felspar, and to the peridotites, which are distinguished from them by containing olivine. This connexion is indicated also by their mode of occurrence, for they usually accompany masses of gabbro and peridotite and seldom are found by themselves. They are strictly plutonic and often very coarse-grained, containing indi- vidual crystals which may be several inches in length. The principal accessory minerals, in addition to olivine and felspar, are chromite and spinels, garnet, iron oxides, rutile, scapolite. They frequently occur in the form of dikes or segregations in gabbro and peridotite : e.g. in Shetland, Cortlandt on the Hudson river, North Carolina (websterite), Baltimore, New Zealand, and in Saxony. The com- ponent minerals often have a close resemblance to those of the surrounding rock. By decomposition the rocks consisting of pyroxene pass into serpentines, which sometimes preserve the original structures of the primary minerals, such as the lamination of hypersthene and the rectangular cleavage of augite. Under pressure-metamorphism hornblende is developed and various types of amphibolite and hornblende-schist are produced. Occa- sionally rocks rich in pyroxene are found as basic facies of nepheline syenite; a good example is provided by the melanite pyroxenites associated with borolanite {q.v.) at Ledbeg in Sutherlandshire.

(J. S. F.) PYRRHO OF ELIS (c. 360-270 B.C.), a Greek sceptic philo- sopher and founder of the school known as Pyrrhonism. Diogenes Laertius (ix. 61), quoting from Apollodorus, says that he was at first a painter, and that pictures by him were in exist- ence in the gymnasium at Elis. Later he was diverted to philosophy by the works of Democritus, and became acquainted with the Megarian dialectic through Bryson, pupil of Stilpo. With Anaxarchus, he went to the East in the train of Alexander, and studied in India under the Gymnosophists (q.v.) and under the Magi in Persia. From the Oriental philosophy he seems to have adopted a life of solitude. Returning to Elis, he lived in poor circumstances, but highly honoured by the Elians and also by the Athenians, who gave him the rights of citizenship. His doctrines are known mainly through the satiric writings (StXXot) of his pupil Timon of Phlius (the Sillographer) . The main principle of his thought is expressed in the word acatalepsia, which implies the impossibility of knowing things in their own nature. Against every statement the contradictory may be advanced with equal reason (iaoadevela tuiv \6yicv). Secondly, it is necessary in view of this fact to preserve an attitude of intellectual suspense (e7roxi7) , or, as Timon

expressed it, ov8iv fiaWov (i.e. no assertion more valid than another). The same idea is expressed also by the terms appepla (equili- brium) and acfracla (refusal to speak, non-committal silence). Thirdly, these results are applied to life in general. Pyrrho concludes that, since nothing can be known, the only proper attitude is imperturbability (ataraxia). The impossibility of knowledge, even in regard to our own ignorance or doubt, should induce the wise "man to withdraw into himself, avoiding the stress and emotion which belong to the contest of vain imaginings. This drastic scepticism is the first and the most thorough exposition of agnosticism in the history of thought. Its ethical results may be compared with the ideal tranquillity of the Stoics and the Epicureans. (For its relation to the New Academy and to scepticism in general see Scepticism and Megarian School of Philosophy.)

See histories of philosophy by Zeller, Erdmann, Ueberweg; Ritter and Preller, § 364; Waddington, Pyrrhon et le pyrrhonisme (1877); Zimmermann, Darstellung d. pyrrh. Phil. (1841) and Ueber Ursprung und Bedeutung d. pyrrh. Phil. (1843) ; Wachsmuth, De Timone Phliasio (1859).

PYRRHOTITE, a mineral species consisting of iron sulphide and crystallizing in the hexagonal system. The formula is Fe n S m+ i where n may vary from 5 to 16; usually it is Fe7 S 8 or Fe n S12, the latter being also the composition of the artificially prepared compound. Small amounts of nickel and cobalt are often present.

Crystals have the form of hexagonal plates bounded at their edges b> faces cf a hexagonal prism and pyramids, which are deeply striated horizontally. More frequently, however, the mineral is massive, with a laminar or granular structure. The colour is bronze- yellow and the lustre metallic; the streak is greyish-black. The hardness is 4 and the specific gravity 4 58-4-64. The mineral is magnetic, sometimes with polarity, and it is therefore often called " magnetic pyrites."

Pyrrhotite occurs in metalliferous veins, and as grains and plates disseminated through various rocks. In the gabbros and norites of Norway and Sweden it has been concentrated by magmatic differentiation at the margins of the igneous masses. Large bodies of massive pyrrhotite occur at Bodenmais in Bavaria and in Wheal Jane near Truro in Cornwall. Crystallized specimens are from the metalliferous veins at Morro Velho in Brazil, Kongsberg in Norway, and Andreasberg in the Harz. Crystals of

pyrrhotite have also been observed in meteoric stones; but iron sulphide appears more commonly in meteorites, especially in meteoric irons, as troilite (FeS), which, if really distinct from pyrrhotite, has not been met with in terrestrial rocks. (L. J. S.)

PYRRHUS {c. 318-272 B.C.), king of Epirus, son of Aeacides, and a member of the royal family of the Molossians. He claimed descent from Pyrrhus, the son of Achilles, and was also connected with the royal family of Macedonia through Olympias, the mother of Alexander the Great. When a mere lad he became king of the wild mountain tribes of Epirus, and learned the art of war in the school of Demetrius Poliorcetes and his father Antigonus. He fought by their side at the battle of Ipsus (301) in Phrygia, in which they were decisively defeated by the combined armies of Seleucus Nicator and Lysimachus. Soon afterwards he was sent to the court of Ptolemy of Egypt at Alexandria as a pledge for the faithful carrying out of a treaty of alliance between his brother-in-law Demetrius and Ptolemy. Through Ptolemy, whose step-daughter Antigone he married, Pyrrhus was enabled to establish himself firmly on the throne of Epirus, and became a formidable opponent to Demetrius, who was now king of Macedonia and the leading man in the Greek world. He defeated one of Demetrius's generals in Aetolia, invaded Macedonia, and forced Demetrius to conclude a truce with him. For about seven months Pyrrhus was in possession of a large part of Macedonia, Demetrius finding it convenient to make this surrender on condition that Pyrrhus did not meddle with the affairs of Peloponnesus. But in 286 he was defeated by Lysimachus at Edessa, driven out of Mace- donia, and compelled to fall back on his little kingdom of Epirus. In 281 came the great opportunity of his life. An embassy was sent to him from the Greek city Tarentum in southern Italy with a request for aid against Rome, whose hostility the Tarentines had recklessly provoked. After some hesitation on the part of the Tarentines, Pyrrhus's conditions were accepted, and a treaty was concluded. His general Milo crossed with a body of troops and occupied the citadel. Pyrrhus soon followed with a miscellaneous force of about 25,000 men (partly furnished by Ptolemy Ceraunus of Macedonia) and some elephants. The Tarentines and Italian Greeks shrank, however, from anything like serious effort, and resented his calling upon them for men and money. Rome meantime levied a special war contribution, called on her subjects and allies for their full contingent of troops, and posted strong garrisons in all towns of doubtful fidelity. She was now the dominant power in Italy, but her position was critical, as in the north she had had trouble with the Etruscans and the Gauls, while in the south the Lucanians and the Bruttians were making common cause with Tarentum and the Greek cities. For the first time in history Greeks and Romans met in battle at Heraclea near the shores of the Gulf of Tarentum, and the cavalry and elephants of Pyrrhus secured for him a complete*

victory over the consul M. Valerius Laevinus, though at so heavy a cost as to convince him of the great uncertainty of final success (hence is derived the phrase of a Pyrrhic victory). Although he now had the Samnites as well as the Lucanians and the Bruttians and all the Greek cities of southern Italy with him, he found every city closed against him as he advanced on Rome through Latium. The peace negotiations, carried on by the skilful diplomatist Cineas, the minister of Pyrrhus, led to no result; the senate seemed inclined to come to terms, but

the fiery and patriotic eloquence of the aged and blind Appius Claudius (the censor) carried the day. Cineas was ordered to leave the city at once and to tell his master that Rome could not negotiate so long as foreign troops remained on the soil of Italy. In the second year of the war (279), Pyrrhus again defeated a Roman army at Asculum (mod. Ascoli) in Apulia, but Rome still had armies in the field and her Italian confederation was not broken up. For a while he quitted Italy for Sicily, at the invitation of the Syracusans, with the idea of making himself the head of the Sicilian Greeks and driving the Cartha- ginians out of the island. In his military operations he was on the whole successful; and Rome and Carthage, in face of the common danger, concluded an offensive and defensive alliance against him. He passed three years in Sicily, but offended the Greek cities, which he governed in the fashion of a despot. Finding that he could no longer hold Sicily in face of the ill feeling thus aroused, and reproached by the Samnites for having deserted them, he decided to return to Italy. On the voyage he was attacked by the Carthaginians and lost several vessels. When he reached Italy, the Tarentines and the other Greek cities, having lost confidence in him, refused to supply him with men or money. Thoroughly disheartened, he made one more effort and engaged a Roman army at Beneventum (275) in the Samnite country, but his arrangements miscarried, and he was defeated with the loss of his camp and the greater part of his army. Nothing remained but to go back to Greece. He left a garrison in Tarentum and returned the following year to his home in Epirus after a six years' absence. The brief remainder of his life was passed in camps and battles, without any glorious result. He gained a victory on Macedonian soil over Antigonus Gonatas, king of Macedonia, whose troops hailed him as king. In 273 he was invited into Peloponnesus by Cleonymus to settle by force of arms a dispute about the royal succession at Sparta. He besieged the city, but was repulsed with great loss. Next, at the invitation of a political faction, he went to Argos, where, during a fight by night in the streets, he was struck on the head by a huge tile. He fell from his horse, and was put to death by one of the soldiers of Antigonus.

Pyrrhus was a brilliant and dashing soldier, but he was aptly compared to a gambler who made many good throws with the dice, but could not make

proper use of them in the game. He obtained no lasting results, and was never more than a captain of mercenaries, yet there was something chivalrous about him which seems to have made him a general favourite. After his death Macedonia had, for a time at least, nothing to fear, and the liberty of Greece was quite at the mercy of that power, Pyrrhus wrote a history of the art of war, which is praised by Cicero, and quoted by Dionysius of Halicarnassus and Plutarch.

The chief ancient authority for the life of Pyrrhus is Plutarch; see also Polybius xviii. 11, and elsewhere; Dion. Halic. xviii. I, xix. 6-9; Pausanias i. 13; Justin xviii. I, 2, xxiii. 3, xxv. 4, 5. Modern monographs by G. F. Hertzberg, " Rom und Konig Pyrrhus ' ' (popular: in O. Jager's Darstellungen aus der romischen Geschichte, 1870); R. von Scala, Der Pyrrhische Krieg (1884), with map of Roman garrison system in 281; R. Schubert, Geschichte des Pyrrhus (1894), with full list of authorities; also Rome: History, " The Republic."

PYRROL, C4H5N or C 4 H4-NH, an organic base found in coal- tar and Dippel's oil. It may be synthetically prepared by the dry distillation of ammonium mucate, or, better, by heating it with glycerin to 180-200 C. (H. Schwanert, Ann., i860, 116, p. 257); by passing the vapour of diethylamine through a red- hot tube; by distilling succinimide with zinc dust (C. A. Bell, Ber., 1880, 13, p. 877); by distilling calcium pyroglutaminate: H0 2 CCH-CH 2 -CH 2 -C0 2 H = C4H4NH-I-CO2+2H2O (L. Haitinger, Monats., 1882, 3, p. 228); and by boiling succinic dialdehyde .with ammonia and glacial acetic acid (C. Harries, Ber., 1901, 34, p. 1497). It is a feebly basic, colourless liquid which boils at 130 C, and possesses a smell resembling that of chloroform. It is slightly soluble in water, and turns brown on exposure to air. It has to some extent the character of a secondary amine; the hydrogen of the imino group can be replaced by potassium. It is resinified by the action of con- centrated mineral acids. On warming solutions of pyrrol in

dilute acid, ammonia is evolved, and an amorphous powder of variable composition, known as pyrrol-red, separates out. The pyrrol ring is easily broken, e.g. hydroxylamine gives the dioxime of succinic aldehyde. Pyrrol is readily converted into pyridine derivatives by acting with bromoform, chloroform, or methylene iodide on its potassium salt, /3-brom-and /3-chlor- pyridine being obtained with the first two compounds, and pyridine itself with the last. Iodine in alkaline solution converts pyrrol into iodol (tetra-iodopyrrol), crystallizing in yellowish- brown needles, which

decompose on heating. It may also be prepared by heating tetra-brom- or tetra-chlorpyrrol with potas- sium iodide in alcoholic solution (German patent, 38423, 1886). It is used as an antiseptic.

Zinc dust and hydrochloric acid reduce pyrrol to pyrrolin (dihydro-pyrrol), C

CH 2 CBr(C0 2 H) 2 CH 2 CH 2 Br

CH 2 -(CONH 2) ;

CH 2

N

-CH 2 /

*NH-**

CH 2 'CH(C0 2 H

CH 2

Nnh.

CH 2 / Numerous substitution derivatives of pyrrol are known. The iV-derivatives are prepared by the action of alkyl halides and acid chlorides on potassium pyrrol. The C-derivatives have been prepared in various ways. L. Knorr, by the action of ammonia on aceto-acetic ester, obtained /3-imidobutyric ester, which with nitrous acid yields a-isonitroso-/3-imidobutyric ester, CH 3 -C(:NH)-C(:N-OH)-C0 2 C 2 H 6 . Reduction of this ester leads to the formation of ammonia, hydroxylamine, and dimethyl pyrrol dicarboxylic ester,

/C(CH 3) : C-C0 2 R HN< I

\C(C0 2 R) :C-CH 3 . He also found that diaceto succinic ester reacts with compounds of the type NH 2 R(R = H, CH 3 , OH, NHC«H 6 , &c.) to form pyrrol derivatives : —

CH 3 -COCHC0 2 R ,C(CH 3):CC0 2 R

NH 2 R+ I -> RN< I

CH 3 COCH-C0 2 R \C(CH 3):C-C0 2 R

By using compounds of the type NH 2 R and acetophenone aceto- acetic ester C 6 H 5 COCH 2 CH (COCH 3)-C0 2 R,C. Paal obtained similar results. For the benzo-pyrrols see Indole.

PYRUVIC ACID, or Pyroracemic Acid, CH3COCO2H, an organic acid first obtained by J. Berzelius by the dry distillation of tartaric or racemic acids (Pogg. Ann., 1835, 36, p. 1). It may be prepared by boiling a-dichlorpropionic acid with silver oxide; by the hydrolysis of acetyl cyanide with hydrochloric acid (J. Claisen and J. Shadwell, Ber., 1878. 11, pp. 620, 1563); and by warming oxalacetic ester with a 10% solution of sulphuric acid. It is usually made by distilling tartaric acid with potassium bisulphate at about 200-250° C, the crude product being after- wards fractionated. It is a liquid which boils at about 165° C. (with partial decomposition) ; it may be solidified, and when pure melts at 13-6° C. (L.

Simon Bull. Soc. Chim., 1895 [3], 13, p. 335). It is readily soluble in water, alcohol and ether. It reduces ammoniacal silver solutions. When heated with hydrochloric acid to 100° C. it yields carbon dioxide and pyrotartaric acid, C 6 H 8 04, and when warmed with dilute sulphuric acid to 150° C. it gives carbon dioxide and acetaldehyde. Sodium amalgam or zinc and hydrochloric acid reduce it to lactic acid, whilst hydriodic acid gives propionic acid. It readily condenses with aromatic hydrocarbons in the presence of sulphuric acid. It is somewhat readily oxidized; nitric acid gives carbonic and oxalic acids, and chromic acid, carbonic and acetic acids. It forms a well-crystallized hydrazone with phenylhydrazine; and a-nitroso

propionic acid with hydroxylamine. It is monobasic and yields salts which only crystallize with great difficulty; when liberated from these salts by a mineral acid it forms a syrupy non- volatile mass. In aqueous solution it gives a red colour with ferric chloride. It shows characteristic ketone reactions, yielding a bisulphite compound and combining' with hydro-cyanic acid to form the nitrile of a-oxyisosuccinic acid. When warmed with baryta water it gives uvitic acid.

Pyruvic nitrile, or acetyl cyanide, CH 3 COCN, may be prepared by the action of silver cyanide on acetyl chloride ; or of acetyl chloride on nitrosoacetone (L. Claisen and O. Manasse, Ber., .1887, 20, p. 2196). It is a liquid which boils at 93 C. and with caustic alkalis polymerizes to diacetyldicyanide.

PYTHAGORAS (6th century B.C.), Greek philosopher, was, in all probability, a native of Samos or one of the neighbouring islands (others say a Tyrrhenian, a Syrian or a Tyrian), and the first part of his life may therefore be said to belong to that Ionian seaboard which had already witnessed the first development of philosophic thought in Greece (see Ionian School). The exact year of his birth has been variously placed between 586 and 569 B.C., but 582 may be taken as the most probable date. He was a pupil of Pherecydes (q.v.), and later of Hermodamas (Diog. Laert. viii. 2). He left in Ionia the reputation of a learned and universally informed man. " Of all men Pythagoras, the son of Mnesarchus, was the most assiduous inquirer," says Heracleitus, and then proceeds in his contemptuous fashion to brand his predecessor's wisdom as only eclectically compiled information or polymathy (TokvpaOiq) . This accumulated wisdom, as well as most of the tenets of the Pythagorean school, was attributed in antiquity to the extensive travels of Py- thagoras, which brought him in contact (so it was said) not only with the Egyptians, the Phoenicians, the Chaldaeans, the Jews and the Arabians, but also with the Druids of Gaul, the Persian Magi and the Brahmans. But these tales represent only the tendency of a later age to connect the beginnings of Greek speculation with the hoary religions

and priesthoods of the East. There is no intrinsic improbability, however, in the statement of Isocrates (Laud. Busir. 28, p. 227 Steph.) that Pythagoras visited Egypt and other countries of the Mediterranean, for travel was one of the few ways of gathering knowledge. Some of the accounts (e.g. Callimachus) represent Pythagoras as deriving much of his mathematical knowledge from Egyptian sources, but, however it may have been with the practical beginnings of geometrical knowledge, the scientific development of mathematical principles can be shown to be an independent product of Greek genius, Some of the rules of the Pythago- rean ritual have their Egyptian parallels, as Herodotus points out, but it does not necessarily follow that they were borrowed from that quarter, and he is certainly wrong in tracing the doctrine of metempsychosis (q.v.) to Egypt.

The historically important part of his career begins with his migration to Crotona, one of the Dorian colonies in the south of Italy, about the year 529. According to tradition, he was driven from Samos by the tyranny of Polycrates. At Crotona Pythagoras speedily became the centre of a widespread and influential organization, which seems to have resembled a religious brotherhood or an association for the moral reforma- tion of society much more than a philosophic school. Py- thagoras appears, indeed, in all the accounts more as a moral reformer than as a speculative thinker or scientific teacher; and the doctrine of the school which is most clearly traceable to Pythagoras himself in the ethico-mystical doctrine of transmigra- tion. The Pythagorean brotherhood had its rise in the wave of religious revival which swept over Hellas in the 6th century B.C., and it had much in common with the Orphic communities which sought by rites and abstinences to purify the believer's soul and enable it to escape from " the wheel of birth." Its aims were undoubtedly those of a religious order rather than a political league. But a private religious organization of this description had no place in the traditions of Greek life, and could only main- tain itself by establishing " the rule of the saints " on a political basis. The Pythagoreans appear to have established their supremacy for a time over a considerable part of Magna Graecia,

but this entanglement with politics led in the end to the dis- memberment and suppression of the society. The authorities differ hopelessly in chronology, but according to the balance of evidence the first reaction against the Pythagoreans took place in the lifetime of Pythagoras after the victory gained by Crotona over Sybaris in 510. Dissensions seem to have arisen about the allotment of the conquered territory, and an adverse party was formed in Crotona under the leadership of Cylon. This was probably

the cause of Pythagoras's withdrawal to Metapontum, which an almost unanimous tradition assigns as the place of his death in the end of the 6th or the beginning of the 5th century. The order appears to have continued powerful in Magna Graecia till the middle of the 5th century, when it was violently trampled out. The meeting-houses of the Pythago- reans were everywhere sacked and burned; mention is made in particular of " the house of Milo " in Crotona, where fifty or sixty leading Pythagoreans were surprised and slain.

The persecution to which the brotherhood was subjected throughout Magna Graecia was the immediate cause of the spread of the Pythagorean philosophy in Greece proper. Philo- laus, who resided at Thebes in the end of the 5th century (cf. Plato, Phaedo, 61 D), was the author of the first written exposi- tion of the system. Lysis, the instructor of Epaminondas, was another of these refugees. This Theban Pythagoreanism had an important influence upon Plato's thought, and Philolaus had also disciples in the stricter sense. But as a philosophic school Pythagoreanism became extinct in Greece about the middle of the 4th century. In Italy— where, after a temporary suppression, it attained a new importance in the person of Archytas of Tarentum — the school finally disappeared about the same time.

Aristotle in his accounts of Pythagorean doctrines never refers to Pythagoras but always with a studied vagueness to " the Pytha- goreans" (oi naXovitovot. Tlvdaybptwi). Nevertheless, certain doctrines may be traced to the founder's teaching. Foremost among these is the theory of the immortality and transmigration of the soul (see Metempsychosis). Pythagoras's teaching on this point is connected by one of the most trustworthy authorities with the doc- trine of the kinship of all living beings; and in the light of anthro- pological research it is easy to recognize the close relationship of the two beliefs. The Pythagorean rule of abstinence from flesh is thus, in its origin, a taboo resting upon the blood-brotherhood of men and beasts; and the same line of thought shows a number of the Pythagorean rules of life which we find embedded in the different traditions to be genuine taboos belonging to a similar level of primitive thought. The moral and religious application which Pythagoras gave to thˆ doctrine of transmigration continued to be the teaching of the school. The view of the body {oS>na) as the tomb (afina) of the soul, and the account of philosophy in the Phaedo as a meditation of death, are expressly connected by Plato with the teaching of Philolaus; and the strain of asceticism and other worldliness which meets us here and elsewhere in Plato is usually traced to Pythagorean influence. Plato's mythical descriptions of a future life of retribution and purificatory wandering can also be shown to reproduce Pythagorean teaching, though the sub- stance of them may have been drawn from a common source in the Mysteries.

The scientific doctrines of the Pythagorean school have no apparent connexion with the religious mysticism of the society or their rules of living. They have their origin in the same dis- interested desire of knowledge which gave rise to the other philo- sophical schools of Greece, and the idea of " philosophy " or the "theoretic life" as a method of emancipation from the evils of man's present state of existence, though a genuine Pythagorean conception, is clearly an afterthought. The discourses and specu- lations of the Pythagoreans all connect themselves with the idea of number, and the school holds an important place in the history of mathematical and astronomical science. An unimpeached tradition carries back the Pythagorean theory of numbers to the teaching of the founder himself. Working on hints contained in the oldest traditions, recent investigators have shown that the dis- coveries attributed to Pythagoras connect themselves with a primi- tive numerical symbolism, according to which numbers were repre- sented by dots arranged in symmetrical patterns, such as are still to be seen in the marking of dice or dominoes. Each pattern of units becomes on this plan a fresh unit. The " holy tetractys," by which the later Pythagoreans used to swear, was a figure of

this kind • • representing the number 10 as the triangle of 4,

and showing at a glance that 1 + 2 + 3-1-4 = 10. The sums of the series of any successive numbers may be graphically

represented in a similar way, and are hence spoken of as " triangular numbers," while the sums of the series of successive odd numbers are called " square numbers," and those of successive even numbers "oblong numbers"; thus 3 and 5 added to the unit give a figure

of this description

while 4 and 6, added to 2, are thus

represented j ■ ■ I • I ■ Such a method of representing number

in areas leads naturally to problems of a geometrical nature, and as the practical use of the right-angled triangle was already familiar in the arts and crafts, there is no reason to dispute the well-established tradition which assigns to Pythagoras the discovery of the pro- position that in such a triangle the square on the hypotenuse is equal to the sum of the squares on the other two sides. And it is probably also correct to attribute to him the discovery of the harmonic intervals which underlie the production of musical sounds. Impressed by this reduction of musical sounds to numbers and by the presence of numerical relations in every department of phenomena, Pythagoras and his early followers enunciated the doctrine

that " all things are numbers." Numbers seemed to them, as Aristotle put it, to be the first things in the whole of nature, and they supposed the elements of numbers to be the elements of all things, and the whole heaven to be a musical scale and a number (Mela. A. 986a). Numbers, in other words, were conceived at that early stage of thought not as relations or qualities predicable of things, but as themselves constituting the substance or essence of the phenomena — the rational reality to which the appearances of sense are reducible.

But the development of these ideas into a comprehensive meta- physical system was no doubt the work of Philolaus in the latter part of the 5th century. His formulation of the theory implies a knowledge of the teaching of Parmenides and Empedocles, and had itself in turn a great influence upon Plato. The " elements of numbers," of which Aristotle speaks in the passage quoted above, were, according to the Pythagoreans, the Odd and the Even, which they identified with the Limit and the Unlimited; and Aristotle distinctly says that they did not treat these as " priorities of certain other substances" such as fire, water or anything else of that sort, but that the unlimited itself and the one were the reality of the things of which they were predicated, and that is why they said that number was " the reality of everything " (Meta. A. 587). Numbers, therefore, are spatially conceived, " one " being identified with the point in the sense of a unit having position and magnitude. From combinations of such units the higher numbers and geometrical figures arise — " two " being identified with the line, " three " with the surface, and " four " with the solid — and the Pythagoreans proceeded to explain the elements of Empedocles as built up out of geometrical figures in the manner followed by Plato in the Timaeus. The identification of the numerical opposites, the Odd and the Even, with the Limit and the Unlimited— otherwise diffi- cult to explain — may perhaps be understood, as Burnet suggests, by reference to the arrangement of the units or "terms" (fywi) in patterns. "When the odd is divided into two equal parts," he quotes from Stobaeus, "a unit is left over in the middle; but when the even is so divided, an empty_ field is left over, without a master and without a number, showing that it is defective and incomplete." The idea of opposites, derived, perhaps, originally from Heracleitus, was developed by the Pythagoreans in a list of ten fundamental oppositions, bearing a certain resemblance to the tables of categories framed by later philosophers, but in its arbitrary mingling of mathematical, physical and ethical contrasts character- istic of the uncritical beginnings of speculative thought: (1) limited and unlimited, (2) odd and even, (3)one and many,(4)right and left, (5) male and female, (6) rest and motion, (7) straight and curved, (8) light and darkness, (9) good and evil, (10) square and oblong. To the Pythagoreans, as to Heracleitus, the universe was in a sense the realized union of these

opposites, but interpretations of Py- thagoreanism which represent the whole system as founded on the opposition of unity and duality, and proceed to identify this with the opposition of form and matter, of _ divine activity and passive material, betray on the surface their post-Platonic origin. Still more is this the case when in Neoplatonic fashion they go on to derive this original opposition from the supreme unity or God. The further speculations of the Pythagoreans on the subject of number rest mainly on analogies, which often become capricious and tend to lose themselves at last in a barren symbolism. "Seven" is called irapBevos and 'Adiivri, because within the decade it has neither factors nor product. " Five," on the other hand, signifies marriage, because it is the union of the first masculine with the first feminine number (3+2, unity being considered as a number apart). The thought already becomes more fanciful when " one " is identified with reason, because it is unchange- able ; " two " with opinion, because it is unlimited and indeterminate ; " four " with justice, because it is the first square number, the product of equals.

The astronomy of the Pythagoreans was their most notable contribution to scientific thought, and its importance lies in the fact that they were the first to conceive the earth as a globe,

self-supported in empty space, revolving with the other planets round a central luminary. They thus anticipated the heliocentric theory, and Copernicus has left it on record that the Pythagorean doctrine of the planetary movement of the earth gave him the first hint of its true hypothesis. The Pythagoreans did not, however, put the sun in the centre of the system. That place was filled by the central fire to which they gave the names of Hestia, the hearth of the universe, the watch-tower of Zeus, and other mythological expres- sions. It had then been recently discovered that the moon shone by reflected light, and the Pythagoreans (adapting a theory of Empedocles), explained the light of the sun also as due to' reflection from the central fire. Round this fire revolve ten bodies, first the Antichthon or counter-earth, then the earth, followed in order by the moon, the sun, the five then known planets and the heaven of the fixed stars. The central fire and the counter-earth are invisible to us because the side of the' earth on which we live is always turned away from them, and our light and heat come to us, as already stated, by reflection from the sun. When the earth is on the same side of the central fire as the sun, the side of the earth on which we live is turned towards the sun and we have day; when the earth and the sun are on opposite sides of the central fire we are turned away from the sun and it is night. The distance of the revolving orbs from the

central fire was determined according to simple numerical relations, and the Pythagoreans combined their astronomical and their musical discoveries in the famous doctrine of " the harmony of the spheres." The velocities of the bodies depend upon their distances from the centre, the slower and nearer bodies giving out a deep note and the swifter a high note, the concert of the whole yielding the cosmic octave. The reason why we do not hear this music is that we are like men in a smith's forge, who cease to be aware of a sound which they constantly hear and are never in a position to contrast with silence.

Authorities. — Zeller's account of Pythagoreanism in his Philo- sophic der Griechen gives a full account of the sources, with critical references in the notes to the numerous monographs on the subject, but the labour and ingenuity of more recent scholars has succeeded in clearing up a number of points since he wrote. Diels, Doxo- graphi graeci (1879), and Die Fragmente der Vorsokratiker, vol. i. (2nd ed., 1906). Gomperz, Greek Thinkers, vol. i., and especially Burnet's Early Greek Philosophy (2nd ed., 1908), give the results of the latest investigations. Tannery's Science hellene; Milhaud's La- Science grecque and Philosophes geometres; Cantor's History of Mathematics; and Gow's Short History of Greek Mathematics, refer to the mathematical and physical doctrines of the school.

(A. S. P.-P.)

Pythagorean Geometry As the introduction of geometry into Greece is by common consent attributed to Thales, so all are agreed that to Pythago- ras is due the honour of having raised mathematics to the rank of a science. We know that the early Pythagoreans published nothing, and that, moreover, they referred all their discoveries back to their master (see Philolaus). Hence it is not possible to separate his work from that of his early disciples, and we must therefore treat the geometry of the early Pythagorean school as a whole. We know that Pythago- ras made numbers the basis of his philosophical system, as well physical as metaphysical, and that he united the study of geometry with that of arithmetic.

*The following statements have been handed down to us. (a) Aristotle {Meta. i. 5, 985) says " the Pythagoreans first applied themselves to mathematics, a science which they improved; and, penetrated with it, they fancied that the principles of mathematics were the principles of all things." (b) Eudemus informs us that " Pythagoras changed geometry into the form of a liberal science, regarding its principles in a purely abstract manner, and investi- gated its theorems from the immaterial and intellectual point of view (ACXws *al voepfis)." 1 © Diogenes Laertius (viii. 11) relates that " it was Pythagoras who carried geometry to perfection, after Moeris 2 had first found out the principles of the elements of that science, as Anticlides*

tells us in the second book of his History of Alexander; and the part of the science to which Py- thagoras applied himself above all others was arithmetic." id) According to Aristoxenus, the musician, Pythagoras seems to have esteemed arithmetic above everything, and to have advanced it by diverting it from the service of commerce and by likening all things to numbers. 3 (e) Diogenes Laertius (viii. 13) reports on the same authority that Pythagoras was the first person who introduced measures and weights among the Greeks. (/) He discovered the numerical relations of the musical scale (Diog.

1 Proclus Diadochus, In primum Euclidis elementorum libriim commentarii, ed. Friedlein, p. 65.

2 Moeris was a king of Egypt who, Herodotus tells us, lived 900 years before his visit to that country.

- *Aristox. Fragm. ap. Stob. Eclog. Phys. i. 2, 6.*

Laert. viii. 11). (g) Proclus 4 says that " the word 'mathematics' originated with the Pythagoreans." ih) We learn also from the same authority 6 that the Pythagoreans made a fourfold division of mathematical science, attributing one of its parts to the " how many " (to irbaov) and the other to the " how much " (to TrrjhiKov) ; and they assigned to each of these parts a twofold division. They said that discrete quantity or the " how many " is either absolute or relative, and that continued quantity or the " how much " is, either stable or in motion. Hence they laid down that arithmetic contemplates that discrete quantity which subsists by itself, but music that which is related to another; and that geometry considers continued quantity so far as it is immovable, but that astronomy (17 o-ˆaipiKij) contemplates continued quantity so far as it is of a self-motive nature. (2) Diogenes Laertius (viii. 25) states, on the authority of Favorinus, that Pythagoras " employed defini- tions in the mathematical subjects to which he applied himself."

The following notices of the geometrical work of Pythagoras and the early Pythagoreans are also preserved. (1) The Pythagoreans define a point as " unity having position " (Procl. pp. cit. p. 95). (2) They considered a point as analogous to the monad, a line to the dyad, a superficies to the triad, and a body to the tetrad (ibid. P- 97)- (3) They showed that the plane around a point is com- pletely filled by six equilateral triangles, four squares, or three regular hexagons (ibid. p. 305). (4) Eudemus ascribes to them the discovery of the theorem that the interior angles of a triangle are equal to two right angles, and gives their proof, which was sub- stantially the same as that in Euclid I. 32 6 (ibid. p. 379). (5) Proclus informs us in his commentary on Euclid I. 44 that Eudemus says that the problems

concerning the application of areas — where the term "application" is not to be taken in its restricted sense (irapaiSoXij) , in which it is used in this proposition, but also in its wider signifi- cation, embracing iurep/3oXi7 and ZWtupis, in which it is used in Book VI. Props. 28, 29 — are old, and inventions of the Pythago- reans 7 (ibid. p. 419). (6) This is confirmed by Plutarch, 8 who says, after Apollodorus, that Pythagoras sacrificed an ox on finding the geometrical diagram, either the one relating to the hypotenuse, viz. that the square on it is equal to the sum of the squares on the sides, or that relating to the problem concerning the application of an area. 9 (7) Plutarch 10 also ascribes to Pythagoras the solution of the problem, To construct a figure equal to one and similar to another given figure. (8) Eudemus states that Pythagoras dis- covered the construction of the regular solids (Procl. op. cit. P- 65). (9) Hippasus, the Pythagorean, is said to have perished in the sea on account of his impiety, inasmuch as he boasted that he first divulged the knowledge of the sphere with the twelve pentagons (the inscribed ordinate dodecahedron) : Hippasus as- sumed the glory of the discovery to himself, whereas everything belonged to Him — " for thus they designate Pythagoras, and do not call him by name." 11 (10) The triple interwoven triangle or pentagram — star-shaped regular pentagon — was used as a symbol or sign of recognition by the Pythagoreans and was called by them " health " (iryieia). 12 (11) The discovery of the law of the three

4 Procl. op. cit. p. 45.

5 Op. cit. p. 35.

6 We learn from a fragment of Geminus, which has been handed down by Eutocius in his commentary on the Conies of Apollonius (Apoll. Conica, ed. Halleius, p. 9), that the ancient geometers observed two right angles in each species of triangle, in the equi- lateral first, then in the isosceles, and lastly in the scalene, whereas later writers proved the theorem generally thus — " The three internal angles of every triangle are equal to two right angles."

7 The words of Proclus are interesting. " According to Eudemus the inventions respecting the application, excess and defect of areas are ancient, and are due to the Pythagoreans. Moderns, borrowing these names, transferred them to the so-called conic lines, the para- bola, the hyperbola, the ellipse, as the older school, in their nomen- clature concerning the description of areas in piano on a finite right line, regarded the terms thus : An area is said to be applied (irapa- flaXkeiv) to a given right line when an area equal in content to some given one is described thereon; but when the base of the area is greater than the given line, then the area is said to be in excess (i>irtp(}a\ui>) ; but when the base is less,

so that some part of the given line lies without the described area, then the area is said to be in defect (eXXeiireii'). Euclid uses in this way in his sixth book the terms excess and defect. . . . The term application (xapa/3o.XXe«'), which we owe to the Pythagoreans, has this signification."

8 Non posse suaviter vivi sec. Epicurum, c. xi.

9 Etre irpol3\7]fia irepi tov x u, P UiU T V TrapafiohTJs. Some authors, rendering the last five words " concerning the area of the parabola," have ascribed to Pythagoras the quadrature of the parabola, which was one of the great discoveries of Archimedes.*

10 Symp. viii., Quaest. 2, c. 4.

11 Iamblichus, De vit. Pyth. c. 18, § 88.

12 Lucian, Pro lapsu in salut. § 5 ; also schol. on Aristoph. Nub. 611. That the Pythagoreans used such symbols we learn from Iamblichus (De vit. Pyth. c. 33, §§ 237 and 238). This figure is referred to Pythagoras himself, and in the middle ages was called Pylhagorae figura; even so late as Paracelsus it was regarded by

*squares (Euclid I. 47), commonly called the " theorem of Pythago- ras," is attributed to him by many authorities, of whom the oldest is Vitruvius. 1 (12) One of the methods of finding right-angled triangles whose sides can be expressed in numbers (Pythagorean triangles) — that setting out from the odd numbers — is referred to Pythagoras by Heron of Alexandria and Proclus. 2 (13) The discovery of irrational quantities is ascribed to Pythagoras by Eudemus (Procl. op. cit. p. 65). (14) The three proportions — arith- metical, geometrical and harmonica! — were known to Pythagoras. 3 (15) Iamblichus * says, "Formerly, in the time of Pythagoras and the mathematicians under him, there were three means only — the arithmetical, the geometrical and the third in order, which was known by the name sub-contrary (iirepavria) , but which Archytas and Hippasus designated the harmonical, since it appeared to include the ratios concerning harmony and melody." (16) The so-called most perfect or musical proportion, e.g. 6 : 8 : :9 : 12, which comprehends in it all the former ratios, according to Iamblichus, 6 is said to be an invention of the Babylonians and to have been first brought into Greece by Pythagoras. (17) Arith- metical progressions were treated by the Pythagoreans, and it appears from a passage in Lucian that Pythagoras himself had considered*

the special case of triangular numbers: Pythagoras asks some one, "How do you count?" He replies, "One, two, three, four." Pythagoras, interrupting, says, " Do you see? what you take to be four, that is ten and a perfect triangle and our oath. ' 6 (18) The odd numbers were called by the Pythagoreans "gnomons," 7 and were regarded as generating, inasmuch as by the addition of successive gnomons — consisting each of an odd number of unit squares — to the original square unit or monad the square form was preserved. (19) In like manner, if the simplest oblong (er«po^/ces) , consisting- of two unit squares or monads in juxtaposition, be taken and four unit squares be placed about it after the manner of a gnomon, and then in like manner six, eight . . . unit squares be placed in succession, the oblong form will be preserved. (20) Another of his doctrines was, that of all solid figures the sphere was the most beautiful, and of all plane figures the circle. 8 (21) According to Iamblichus the Pythagoreans are said to have found the quadrature of the circle. 9

him as a symbol of health. It is said to have obtained its special name from the letters v, y t, (= «), o having been written at its prominent vertices.

1 De arch. ix. ; Praef. 5, 6, 7. Amongst other authorities are Diogenes Laertius (viii. 11), Proclus (op. cit., p. 426), and Plutarch (ut supra, 6). Plutarch, however, attributes to the Egyptians the knowledge of this theorem in the particular case where the sides are 3, 4, and 5 (De Is. et Osir. c. 56).

2 Heron Alex. Geom. et stereom. rel., ed. F. Hultsch, pp. 56, 146; Procl. op. cit. p. 428. The method of Pythagoras is as follows: he took an odd number as the lesser side; then, having squared this number and diminished the square by unity, he took half the remainder as the greater side, and by adding unity to this number he obtained the hypotenuse, e.g. 3, 4, 5; 5, 12, 13.

J Nicom. Ger. Jntrod. Ar. c. xxii.

4 In Nicomacki arithmeticam, ed. S. Tennulius, p. 141.

5 Op. cit. p. 168. As an example of this proportion Nicomachus and, after him, Iamblichus give the numbers 6, 8, 9, 12, the har- monical and arithmetical means between two numbers forming a geo- metric proportion with the numbers themselves (a:— jrx : : °~^;b) .

Iamblichus further relates (loc. cit.) that many Pythagoreans made use of this proportion, as Aristaeus of Crotona, Timaeus of Locri, Philolaus and Archytas of Tarentum and many others, and after them Plato in his Timaeus (see Nicom. Inst, arithm., ed. Ast, p. 153, and Animadversiones,

pp. 327-329; and Iambi, op. cit. p. 172 seq.).

e Blwv irpavis, 4, i. 317, ed. C. Jacobitz.

7 Tviifiwv means that by which anything is known or " criterion "; its oldest concrete signification seems to be the carpenter's square {norma) by which a right angle is known. Hence it came to denote a perpendicular, of which, indeed, it was the archaic name (Proclus, op. cit. p. 283). Gnomon is also an instrument for measuring altitudes, by means of which the meridian can be found; it denotes, further, the index or style of a sundial, the shadow of which points out the hours. In geometry it means the square or rectangle about the diagonal of a square or rectangle, together with the two complements, on account of the resemblance of the figure to a carpenter's square; and then, more generally, the similar figure with regard to any parallelogram, as defined by Euclid II. def. 2. Again, in a still more general signification, it means the figure which, being added to any figure, preserves the original form. See Heron, Definitiones (59). When gnomons are added successively in this manner to a square monad, the first gnomon may be regarded as that consisting of three square monads, and is indeed the con- stituent of a simple Greek fret; the second of five square monads, &c. ; hence we have the gnomonic numbers.

8 Diag. Laert. De vit Pyth. viii. 19.

9 Simplicius, In Aristoielis physicorum Kbros quattuor priores commentaria, ed. H. Diels, p. 60.

On examining the purely geometrical work of Pythagoras and his early disciples, as given in the preceding extracts, we observe that it is much concerned with the geometry of areas, and we are indeed struck with its Egyptian character. This appears in the theorem (3) concerning the filling up a plane with regular figures — for floors or walls covered with tiles of various colours were common in Egypt; in the construction of the regular solids (8), for some of them are found in Egyptian architecture; in the problems con- cerning the application of areas (5) ; and lastly, in the theorem of Pythagoras (11), coupled with his rule for the construction of right- angled triangles in numbers (12). We learn from Plutarch that the Egyptians were acquainted with the geometrical fact that a triangle whose sides contain three, four and five parts is right- angled, and that the square of the greatest side is equal to the squares of the sides containing the right angle. It is probable too that this theorem was known to them in the simple case where the right-angled triangle is isosceles, inasmuch as it would be at once suggested by the contemplation of a floor covered with square tiles — the square on the diagonal and the sum of the squares on the sides contain each four of the right-angled triangles into which one of the squares is

divided by its diagonal. It is easy now to see how the problem to construct a square which shall be equal to the sum of two squares could, in some cases, be solved numerically. From the observation of a chequered board it would be perceived that the element in the successive formation of squares is the gnomon or carpenter's square. Each gnomon consists of an odd number of squares, and the successive gnomons correspond to the successive odd numbers, and include, therefore, all odd squares. Suppose, now, two squares are given, one consisting of sixteen and the other of nine unit squares, and that it is proposed to form from them another square. It is evident that the square consisting of nine unit squares can take the form of the fourth gnomon, which, being placed round the former square, will generate a new square containing twenty-five unit squares. Similarly it may have been observed that the twelfth gnomon, consisting of twenty-five unit squares, could be transformed into a square each of whose sides contains five units, and thus it may have been seen conversely that the latter square, by taking the gnomonic or generating form with respect to the square on twelve units as base, would produce the square of thirteen units, and so on. This method required only to be generalized in order to enable Pythagoras to arrive at his rule for finding right-angled triangles whose sides can be expressed in numbers, which, we are told, sets out from the odd numbers. The nth square together with the nth gnomon forms the (n-f-i)th square; if the nth gnomon contains m 2 unit squares, tit being an odd number, we have 2n--i =m 2 ,. \n = J(m 2 — 1), which gives the rule of Pythagoras.

The general proof of Euclid I. 47 is attributed to Pythagoras, but we have the express statement of Proclus {op. cit. p. 426) that this theorem was not proved in the first instance as it is in the Elements. The following simple and natural way of arriving at the theorem is suggested by Bretschneider after Camerer. 10 A square can be dissected into the sum of two squares and two equal rectangles, as in Euclid II. 4; these two rectangles can, by draw- ing their diagonals, be decomposed into four equal right-angled triangles, the sum of the sides of each being equal to the side of the square; again, these four right-angled triangles can be placed so that a vertex of each shall be in one of the corners of the square in such a way that a greater and less side are in continuation. The original square is thus dissected into the four triangles as before and the figure within, which is the square on the hypotenuse. This square, therefore, must be equal to the sum of the squares on the sides of the right-angled triangle.

It is well known that the Pythagoreans were much occupied with the construction of regular polygons and solids, which in their cosmology played an essential part as the fundamental forms of the elements of the universe. We can trace the origin of these mathematical speculations in the theorem (3) that " the plane around a point is completely filled by six equilateral triangles, four squares, or three regular hexagons." Plato also

makes the Pythagorean Timaeus explain — " Each straight-lined figure con- sists of triangles, but all triangles can be dissected into rectangular ones which are either isosceles or scalene. Among the latter the most beautiful is that out of the doubling of which an equilateral arises, or in which the square of the greater perpendicular is three times that of the smaller, or in which the smaller perpendicular is half the hypotenuse. But two or four right-angled isosceles triangles, properly put together, form the square; two or six of the most beautiful scalene right-angled triangles form the equi- lateral triangle; and out of these two figures arise the solids which correspond with the four elements of the real world, the tetra- hedron, octahedron, icosahedron and the cube " u (Timaeus, 53, 54, 55). The construction of the regular solids is distinctly ascribed to Pythagoras himself by Eudemus (8). Of these five

10 See Bretsch. Die Geom. vor Euklides, p. 82 ; Camerer, Euclidis elem. i. 444, and the references given there.

11 The dodecahedron was assigned to the fifth element, quinta pars, aether, or, as some think, to the universe. (See Philolaus.)

solids three — the tetrahedron, the cube and the octahedron — were known to the Egyptians and are to be found in their architecture. Let us now examine what is required for the construction of the other two solids — the icosahedron and the dodecahedron. In the formation of the tetrahedron three, and in that of the octahedron four, equal equilateral triangles had been placed with a common vertex and adjacent sides coincident; and it was known that if six such triangles were placed round a common vertex with their adjacent sides coincident, they would lie in a plane, and that, therefore, no solid could be formed in that manner from them. It remained, then, to try whether five such equilateral triangles could be placed at a common vertex in like manner; on trial it would be found that they could be so placed, and that their bases would form a regular pentagon. The existence of a regular pentagon would thus become known. It was also known from the formation of the cube that three squares could be placed in a similar way with a common vertex; and that, further, if three equal and regular hexagons were placed round a point as common vertex with adjacent sides coincident, they would form a plane. It re- mained in this case, too, only to try whether three equal regular pentagons could be placed with a common vertex and in a similar way; this on trial would be found possible and would lead to the construction of the regular dodecahedron, which was the regular solid last arrived at.

We see that the construction of the regular pentagon is required for the formation of each of these two regular solids, and that, therefore, it must have been a discovery of Pythagoras. If we examine now what knowledge of geometry was required for the solution of this problem, we shall see that it depends on Euclid IV. 10, which is reduced to Euclid II. II, which problem is reduced to the following: To produce a given straight line so that the rect- angle under the whole line thus produced and the produced part shall be equal to the square on the given line, or, in the language of the ancients, To apply to a given straight line a rectangle which shall be equal to a given area — in this case the square on the given line — and which shall be excessive by a square. Now it is to be observed that the problem is solved in this manner by Euclid (VI. 30, 1st method), and that we know on the authority of Eudemus that the problems concerning the application of areas and their excess and defect are old, and inventions of the Pythagoreans (5). Hence the statements of Iamblichus concerning Hippasus (9) — • that he divulged the sphere with the twelve pentagons — and of Lucian and the scholiast on Aristophanes (10) — that the pentagram was used as a symbol of recognition amongst the Pythagoreans — become of greater importance.

Further, the discovery of irrational magnitudes is ascribed to Pythagoras by Eudemus (13), and this discovery has been ever regarded as one of the greatest of antiquity. It is commonly assumed that Pythagoras was led to this theory from the considera- tion of the isosceles right-angled triangle. It seems to the present writer, however, more probable that the discovery of incommensu- rable magnitudes was rather owing to the problem: To cut a line in extreme and mean ratio. From the solution of this problem it follows at once that, if on the greater segment of a line so cut a part be taken equal to the less, the greater segment, regarded as a new line, will be cut in a similar manner; and this process can be continued without end. On the other hand, if a similar method be adopted in the case of any two lines which can be re- presented numerically, the process would end. Hence would arise the distinction between commensurable and incommensurable quantities. A reference to Euclid X. 2 will show that the method above is the one used to prove that two magnitudes are incommensu- rable; and in Euclid X. 3 it will be seen that the greatest common measure of two commensurable magnitudes is found by this process of continued subtraction. It seems probable that Pythagoras, to whom is attributed one of the rules for representing the sides of right-angled triangles in numbers, tried to find the sides of an isosceles right-angled triangle numerically, and that, failing in the attempt, he suspected that the hypotenuse and a side had no common measure. He may have demonstrated the incommensu- rability of the side of a square and its diagonal. The nature of the old proof — which consisted of a reductio ad absurdum, show- ing that, if the diagonal

be commensurable with the side, it would follow that the same number would be odd and even' — makes it more probable, however, that this was accomplished by his successors. The existence of the irrational as well as that of the regular dodecahedron appears to have been regarded by the school as one of their chief discoveries, and to have been preserved as a secret; it is remarkable, too, that a story similar to that told by Iamblichus of Hippasus is narrated of the person who first published the idea of the irrational, viz. that he suffered shipwreck, &c. 2

Eudemus ascribes the problems concerning the application of figures to the Pythagoreans. The simplest cases of the problems,

1 For this proof, see Euclid X. 117; see also Aristot. Analyt. Pr. i. c. 23 and c. 44.

2 Knoche, Untersuchungen iiber die neuaufgefundenen Sckolien des Proklus Diadochus zu Euclids Elementen, pp. 20 and 23 CHerford,

1865).

Euclid VI. 28, 29 — those, viz. in which the given parallelogram is a square — correspond to the problem: To cut a given straight line internally or externally so that the rectangle under the seg- ments shall be equal to a given rectilineal figure. The solution of this problem — in which the solution of a quadratic equation is implicitly contained — depends on the problem, Euclid II. 14, and the theorems, Euclid II. 5 and 6, together with the thedrem of Pythagoras. It is probable that the finding of a mean proportional between two given lines, or the construction of a square which shall be equal to a given rectangle, is due to Pythagoras himself. The solution of the more general problem, Euclid VI. 25, is also attributed to him by Plutarch (7). The solution of this problem depends on that of the particular case and on the application of areas; it requires, moreover, a knowledge of the theorems: Similar rectilineal figures are to each other as the squares on their homo logous sides (Euclid VI. 20) ; and, If three lines are in geometrical proportion, the first is to the third as the square on the first is to the square on the second. Now Hippocrates of Chios, about 440 B.C., who was instructed in geometry by the Pythagoreans, possessed this knowledge. We are justified, therefore, in ascrib- ing the solution of the general problem, if not (with Plutarch) to Pythagoras, at least to his early successors.

The theorem that similar polygons are to each other in the duplicate ratio of their homologous sides involves a first sketch, at least, of the doctrine of proportion and the similarity of figures. 3 That we owe the foundation and development of the doctrine of proportion to Pythagoras and his school is

confirmed by the testi- mony of Nicomachus (14) and Iamblichus (15 and 16). From these passages it appears that the early Pythagoreans were acquainted not only with the arithmetical and geometrical means between two magnitudes, but also with their harmonical mean, which was then called " subcontrary." The Pythagoreans were much occupied with the representation of numbers by geometrical figures. These speculations originated with Pythagoras, who was acquainted with the summation of the natural numbers, the odd numbers and the even numbers, all of which are capable of geometrical representa- tion. See the passage in Lucian (17) and the rule for finding Pythagorean triangles (12) and the observations thereon supra. On the other hand, there is no evidence to support the statement of Montucla that Pythagoras laid the foundation of the doctrine of isoperimetry, by proving that of all figures having the same perimeter the circle is. the greatest, and that of all solids having the same surface the sphere is the greatest. We must also deny to Pythagoras and his school a knowledge of the conic sections, and in particular of the quadrature of the parabola, attributed to him by some authors; and we have noticed the misconception which gave rise to this erroneous inference.

Certain conclusions may be drawn from the foregoing examina- tion of the mathematical work of Pythagoras and his school, which enable us to form an estimate of the state of geometry about 480 B.C. First, as to matter. It forms the bulk of the first two books of Euclid, and includes a sketch of the doctrine of proportion — which was probably limited to commensurable magnitudes — together with some of the contents of the sixth book. It contains, too, the discovery of the irrational (0X0701') and the construction of the regular solids, the latter requiring the description of certain regular polygons — the foundation, in fact, of the fourth book of Euclid. Secondly, as to form. The Pythagoreans first severed geometry from the needs of practical life, and treated it as a liberal science, giving definitions and introducing the manner of proof which has ever since been in use. Further, they distinguished between discrete and con- tinuous quantities, and regarded geometry as a branch of mathe- matics, of which they made the fourfold division that lasted to the middle ages — the quadrivium (fourfold way to knowledge) of Boetius and the scholastic philosophy. And it may be observed that the name of " mathematics," as well as that of " philo- sophy," is ascribed to them. Thirdly, as to method. One chief characteristic of the mathematical work of Pythagoras was the

3 It is agreed on all hands that these two theories were treated at length by Pythagoras and his school. It is almost certain, however, that the theorems arrived at were proved for commensu- rable magnitudes only, and were assumed to hold good for all. The Pythagoreans themselves seem to have been aware that their proofs were not rigorous, and were open to serious objection ; in this we may have the explanation of the secrecy which was

attached by them to the idea of the incommensurable and to the pentagram which involved, and indeed represented, that idea. Now it is remark- able that the doctrine of proportion is twice treated in the Elements of Euclid — first, in a general manner, so as to include incommensu- rables, in book v., which tradition ascribes to Eudoxus, and theh arithmetically in book vii., which, as Hankel has supposed, con- tains the treatment of the subject by the older Pythagoreans.

combination of arithmetic with geometry. The notions of an equation and a proportion — which are common to both, and contain the first germ of algebra — were introduced among the Greeks by Thales. These notions, especially the latter, were elaborated by Pythagoras and his school, so that they reached the rank of a true scientific method in their theory of proportion. To Pythagoras, then, is due the honour of having supplied a method which is common to all branches of mathematics, and in this respect he is fully comparable to Descartes, to whom we owe the decisive combination of algebra with geometry.

See G. J. Allman, Greek Geometry from Thales to Euclid (Cambridge, 1889) ; M. Cantor, Vorlesungen uber Geschichte der Malhemalik (Leipzig, 1894); James Gow, Short History of Greek Mathematics (Cambridge, 1884). (G. J. A.)

PYTHAGORAS, of Rhegium, a noted Greek sculptor of the 5th century B.C., a contemporary of Myron and Polyclitus, and their rival in making statues of athletes. He was born at Samos and migrated in his youth to Rhegium in Italy. He made a statue of Philoctetes notable for the physical expression of pain, an Apollo shooting the Python at Delphi, and a man singing to the lyre. He is said to have introduced improve- ments in the rendering of muscles, veins and hair.

PYTHEAS, of Marseilles (Massilia), a celebrated Greek navi- gator and geographer, from whom the Greeks apparently derived their earliest definite information concerning western Europe, and especially the British Islands. He was probably contem- porary with Alexander the Great; he certainly wrote before Dicaearchus, a pupil of Aristotle who died about 285 B.C. His work is lost, and we are left almost wholly in the dark as to its form and character, but the various titles under which it is quoted (e.g. Tijs irepiodos, or Td xepi rod 'QKeavov) point to a geographical treatise, in which Pytheas had embodied the results of his observations, rather than to a continuous narrative of his voyage.

Some modern writers have supposed Pytheas to have been sent out, at

public expense, in command of an expedition organ- ized by the republic of Massilia; but there is no ancient authority for this, and Polybius, who had unquestionably seen the original work, expressly states that he had undertaken the voyage in a private capacity and with limited means. All that we know concerning the voyage of Pytheas (apart from detached notices) is contained in a brief passage of Polybius, cited by Strabo, in which he tells us that Pytheas, according to his own statement, had not only visited Britain, but had personally explored a large part of it (" travelled all over it on foot," according to one read- ing of the text in Strabo, bk. iv. ch. i.), and estimated its circumference at more than 40,000 stadia (4000 geographical miles) . To this he added the account of Thule (which he placed six days' voyage north of Britain) and the adjoining regions, in which there was no longer any distinction between air, earth and sea, but a kind of mixture of all three, resembling the gela- tinous mollusc known as pidmo marinus, which rendered all navigation and progress in any other mode alike impossible. This substance Pytheas had himself seen, according to Strabo (bk. iv. ch. i.), but the other phenomena he described only from hearsay. After this he visited " the whole of the coasts of Europe " (i.e. those bordering on the ocean) as far as the Tanais (Strabo, bk. ii. ch. iv. § 1). This last sentence has led some modern writers to suppose that he made two different voyages; but this is improbable; the expressions of Polybius imply that his ex- plorations in both directions, first towards the north and after- wards towards the east, formed part of the same voyage.

The countries visited, and to a certain extent explored, by Pytheas, were previously unknown to the Greeks — except, perhaps, by vague accounts received through the Phoenicians — and were not visited by any subsequent authority during more than two centuries. Hence some of the later Greek geographers altogether disregarded his statements, and treated his voyage as a fiction. Eratosthenes, indeed (276-196 B.C.), attached great value to his authority as to Britain and Spain, though doubting some of his statements; but Polybius (c. 204-122 B.C.) considered the whole work of Pytheas a tissue of fables, like that of Euhemerus concerning Panchaea; and even Strabo, in whose time the western regions of Europe were comparatively well known, adopted to a great extent the view of Polybius.

In modern times a critical examination has arrived at a more favourable judgment, and though Gossellin in his Recherches sur la geographie des anciens (iv. 168-180) and Sir G. C. Lewis in his History of Ancient Astronomy (pp. 466-481) revived the sceptical view, the tendency of modern critics has been rather to exaggerate than to depreciate the value of what was really added by Pytheas to knowledge. Our information concerning him is so imperfect, and the scanty notices preserved to us from

his work are so meagre and discordant, that it is difficult to arrive at anything like a sound conclusion. It may, however, be considered as fairly established that Pytheas made a voyage round the western coasts of Europe, proceeding from Gades, the great Phoenician emporium, and probably the farthest point familiar to the Greeks, round Spain and Gaul to the British Islands, and that he followed the eastern coast of Britain for a considerable distance to the north, obtaining in- formation as to its farther extension in that direction which led him greatly to exaggerate its size. At the same time he heard vaguely of the existence of a large island to the north of it — probably derived from the fact of the Orkneys and Shetlands being really found in that position — to which he gave the name of Thule.

The most important statement made by Pytheas in regard to Thule was that connected with the astronomical phenomena affect- ing the duration of day and night therein. Unfortunately the re- ports transmitted to us differ so widely that it is almost impossible to determine what Pytheas himself stated. It is, however, probable that the version given in one passage by Pliny (H.N. iv. 16, 104) correctly represents his authority. According to this, the days at the summer solstice were twenty-four hours in length, and con- versely at the winter solstice the nights were of equal duration. Of course this would be true had Thule been situated under the Arctic Circle, which Pytheas evidently considered it to be, and his skill as an astronomer would lead him to accept as a fact what he knew must be true at some point as a voyager proceeded onwards towards the north.

Still more difficult is it to determine the extent and character of Pytheas's explorations towards the east. The statement that he proceeded along the coasts of Europe " from Gades to the Tanais ' ' is evidently based upon the supposition that this would be a simple and direct course along the northern shores of Germany and Scythia — Polybius himself, in common with the other Greek geographers till a much later period, being ignorant of the projection of the Danish or Cimbric peninsula, and the circumnavigation that it involved — of all which no trace is found in the extant notices of Pytheas. Notwithstanding this, some modern writers have sup- posed him to have entered the Baltic and penetrated as far as the Vistula (his Tanais). The only foundation for this is to be found in the fact that in a passage cited by Pliny (H. N. xxxvii. 2, 35) Pytheas is represented as stating that amber was brought from an island called Abalus, distant a day's voyage from the land of the Guttones, a German nation who dwelt on an estuary of the ocean called Meritonomus, 6000 stadia in extent. It was a production thrown up by the waves of the sea, and was used by the inhabitants to burn instead of wood. It has been conjectured that the " estuary " here mentioned refers to the Baltic, the existence of which as a separate sea was unknown to all ancient geographers; but the obscure manner in which it is indicated, as well as the

inaccuracy of the statements concerning the place from whence the amber was actually derived, both point to the sort of hearsay accounts which Pytheas might readily have picked up on the shores of the German Ocean, without proceeding farther than the mouth of the Ems, Weser or Elbe, which last is supposed by Ukert to have been the limit of his voyage in this direction. It must be observed also that amber is found in Friesland and on the west coast of Schleswig, as well as in the Baltic, though not in equal abundance.

As to the Cassiterides, or Tin Islands, the exploration of which would naturally be one of the chief objects of Pytheas, he seems to have furnished Timaeus, who wrote less than a century after him, with details upon the same, especially in regard to the commercial centre of Iktis (St Michael's Mount in Cornwall ?), which are pre- served by Diodorus. The trade with these regions was probably at this period in Phoenician hands, but we know that at a later time a considerable portion of the supply was carried overland through Gaul to Massilia.

Pytheas certainly had one merit which distinguished him from almost all his contemporaries — he was a good astronomer, and was one of the first who made observations for the deter- mination of latitudes, among others that of his native place Massilia, which he fixed with remarkable accuracy; his result, which was within a few miles of the truth, was adopted by Ptolemy, and became the basis of the Ptolemaic map of the western Mediter- ranean. His calculations of the length of the longest day at four different points in the neighbourhood of Britain are probably based on native reports. If these figures (16, 17, 18 and 19 hours) are to be pressed, they would refer to, say, Ushant (48 N.), Flam- borough Head (54), Tarbet Ness in Ross (58°) and the northern- most Shetlands (61°). Pytheas was also the first among the Greeks who arrived at any correct notion of the tides, and not only indicated their connexion with the moon, but pointed out their periodical fluctuations in accordance with the phases of that luminary. Other observations concerning the manners and customs of the inhabitants

of remote northern regions prove that he had himself really visited them. Among these are the gradual disappearance of various kinds of grain as one advanced towards the north; the use of fermented liquors made from corn and honey; and the habit of threshing out their corn in large covered barns, instead of on open threshing-floors as in Greece and Italy, on account of the want of sun and abundance of rain. Pytheas's notice of the

depth of the Bay of Biscay, of the length of the projection of Brittany, of Ushant under the name of Uxisama, and of three promontories of Britain, two of which seem to correspond to Land's End (Belerion), and North Foreland (Kantion), must not be forgotten.

The fragments of Pytheas have been collected by Arvedson (Upsala, 1824), and by Fuhr {De Pythea massiliensi, Darmstadt, 1835). Of the numerous treatises and dissertations on the subject, see Ukert, " Bemerkungen iiber Pytheas," in vol. i. of his Geog. d. Griechen u. Romer, pp. 298-309, which contains an excellent summary of all that is known concerning Pytheas; Sir George C. Lewis, Historical Survey of the Astronomy of the Ancients, pp. 466- 480 (London, 1862); Sir Edward H. Bunbury, History of Ancient Geography, vol. i. ch. xv. § 2 (London, 1883) ; C. I. Elton, Origins of English History, ci. especially app. i. pp. 400, &c. (London, 1882); Hugo Berger, Geschichte der wissenschaftlichen Erdkunde der Griechen, pt. 3 (2nd ed., Leipzig, 1903). A very elaborate investigation of the whole subject will be found in Mullenhoff, Deutsche Alterthumskunde, i. 211-497 (Berlin, 1870). See also Sir Clements Markham's paper, " Pytheas, the Discoverer of Britain," in the Geographical Journal (June 1893); and H. F. Tozer, History of Ancient Geography, pp. 152-164 (Cambridge, 1897). (E. H. B.;C. R. B.)

PYTHIS, or Pythius, one of the most noted Greek architects of the later age. He cultivated the Ionic style, in which he constructed the temple of Athena at Priene. The dedicatory inscription, which is in the British Museum, records that the founder was Alexander the Great. Pythis also made a great marble quadriga which surmounted the Mausoleum.

PYTHON, in Greek mythology, son of Gaea, an enormous serpent, said to have been produced from the mud after the flood of Deucalion. Its haunt was a cavern near Mt Par- nassus. Four days after its birth it was slain by Apollo (Apol- lodorus i. 4), who was hence surnamed Pythius. According to Ephorus (in Strabo ix. 646), Python, surnamed Dracon (serpent), was a brigand near Delphi. The python in reality represents the pestilential vapours rising from stagnant lakes and pools, which are dispersed by Apollo and his arrows — that is, the shafts of the sun. The old derivation (Homeric Hymn to Apollo, 371), according to which Delphi was originally called Pytho, because the slain serpent was left there to " rot " (irWiadcu) , points to this explanation.

See C. Pascal, Studii di antichitd, e mitologia (1896).

PYTHON, a genus of very large snakes of the family Boidae (see Snakes) inhabiting the tropical parts of Africa, Asia and

Australia. They differ from' the true boas .(q.v.), with which they are often con- founded by carrying a few teeth in the premaxilla, by the double row of subcaudal shields and by the posses- sion of a pair of supraorbital Fig. I. — Head of Boa canina. bones Most of them have

pits in some of the upper and lower labial shields.

Python reticulatus is the commonest species in Indo-China and the Malay Islands; four upper labial shields on either side are pitted. It is, next to the Anaconda, one oi the largest of all snakes, some specimens being known which measured about 30 ft. in length. P. molurus, scarcely smaller, is the python or rock-snake of India and Ceylon. The African species are much smaller, up to 15 ft. in length, e.g. P. sebae of tropical and southern Africa and the beautiful P. regius of West Africa. P. spilotes is the " carpet- snake " of Australia and New Guinea. A small relative of pythons is Loxocemus bicolor of South Mexico, the only New World example.

The giant pythons could no doubt overpower and kill by constriction almost any large mammal, since such snakes weigh

many hundredweights and possess terrific strength, but the width of their mouth — although marvellously distensible — has, of course, a limit, and this is probably drawn at the size of a goat. Before a python swallows such large prey, its bones are crushed and the body is mangled into the shape of a sausage. The snake begins with the head, and a great quantity of saliva is discharged over the body of the victim as it is hooked into the throat by the alternately right and FlG – 2— Head of Python reticulatus. left forward motions of the distended well-toothed jaws. If for any reason a snake should disgorge its prey, this will be found smothered with slime. Hence the fable that they cover it with saliva before deglutition.

Most pythons are rather ill-tempered, differing in this respect from the boas. They are chiefly arboreal, and prefer localities

Fig. 3. — Python reticulatus (India).

in the vicinity of water to which mammals and birds, their usual prey, resort. They move, climb and swim with equal facility. The female collects her eggs, sometimes as many as one hundred, into a heap, round which she coils herself, covering them so that her head rests in the centre on the top. In this position the snake remains without food throughout the whole period of incubation, or rather keeping guard, for about two months. (H. F. G.)

PYX (Gr. miˆis, a box or chest), a term for various forms of receptacle. In ecclesiastical usage it is the sacred vase or taber- nacle in which the Host is

reserved. In the English Mint the pyx is the chest in which are placed one coin from every 15ft) of newly coined gold and one from every 60 lb of newly coined silver to await the " trial of the pyx " (see Mint) . This chest was formerly kept in the Chapel of the Pyx in Westminster Abbey.

a the letter which immediately succeeds P in the alphabet of Latin and the modern languages of western Europe. It represents the Koppa of the earliest Greek alphabets surviving in that form of the Ionic alphabet, which ultimately superseded all others, merely as the numerical symbol for 90. In the Phoenician alphabet a sibilant Zade (Tzaddi) stands between q and p. Hence Q is the nineteenth letter in the Phoenician alphabet, the eighteenth in the Greek numerical alphabet, which alone contains it, the sixteenth (owing to the omission of 8 and £) in the Latin, and (from the addition of J) the seventeenth in the English alphabet. Its earliest form is a rough ellipse transfixed by an upright line, 9. In various Semitic alphabets this has been altered out of recognition, apparently from the writing of the symbol in cursive handwriting without lifting the pen. As a result forms like ˆ j> f> ˆ are developed. In Greece the head of the symbol is generally circular, and only in a few early inscriptions is the upright carried through the circle,) is a lip sound, the points of production are nearly as far separate as they can be. There is thus a tendency to assimilation, and instead of a guttural followed by a labial semi-vowel, a new labial consonant p is produced. In Greek this is common when the combination is followed by the vowel o, as in irS}, toi, &c, from the same stem as the Latin quo, qui, &c. This, however, is not found in all dialects alike (see Greek Language) . In other languages, like Oscan and Umbrian which are closely akin to Latin, or the Welsh branch of the Celtic languages, p occurs regularly without regard to the nature of the vowel following. Thus, corresponding to the Latin quattuor, we find the Oscan petora, the Gaulish petor-ritum, " four-wheeler," the Welsh pedwar, " four," &c, while the Irish celhir, " four," corresponds more closely to the Latin. (P. Gi.)

*QARAITES, or Karaites, a Jewish sect of the middle ages, claiming to be distinguished by adherence to Scripture as con- trasted with oral tradition, whence the name (from tr\p qara, to read, as if " readers," scripturarii; sometimes also ktjj? *jj " children of the Text " as read). They have frequently been identified with the Sadducees or with the Samaritans, with neither of whom have they any historical connexion or much spiritual affinity. The schism arose at Bagdad about the middle of the 8th century, when the hereditary claims of Anan, a learned Talmudist, to the office of Resh Galutha were set aside by the Gaonim (heads of rabbinical schools)*

at Sura and Pumbeditha, because he was believed to undervalue the author- ity of the Talmud. Anan, nevertheless, allowed himself to be proclaimed Exilarch by his followers, a step construed into treason by the Mahommedan government. He was sentenced to death, but his life was saved by his fellow prisoner, Abu Hanifa, the founder of the great school of Moslem theology and jurisprudence. Ultimately he and his followers were permitted to migrate to Palestine. They ereCfed a synagogue in Jerusalem xxii. 23

which continued to be maintained until the time of the Crusades. From this centre the sect diffused itself thinly over Syria, spread into Egypt, and ultimately reached S.E. Europe.

Anan, who is said to have died in a.d. 765, was the author of a commentary on the Pentateuch and other works in Talmudic Hebrew and Arabic. Most of these are lost, and we are thus left chiefly dependent on the hostile indications of opponents. His code was recovered in Egypt by the Qaraite Moses b. Elijah Bashya2i (1544-157 2). Fragments were published by Harkavy (Voskhod 1897-1898). It is clear that Anan, although theoretically antagonistic to rabbinic methods, was in the end compelled to incline towards them. Considerable influence, too, was exercised on his theology by Abu Hanifa. In general we know that he showed great bitterness against the Talmud and its upholders (the " Rabbanites ") for their modification of the written law by arbitrary additions and subtractions, but there is nothing to indicate that he himself had the insight or the fervour by which he could have become the pioneer of a really great reformation. The questions appear to have turned entirely on points of minute detail. Several of them related to the regulation of the calendar, the new moon, for example, being fixed by the Qaraites by direct observation, not by astronomical calculation, and the intercalary year also being determined empirically; others related to paschal and pentecostal ritual, such as the precise hour for killing the lamb or for burning its remains. The differences which affected social life most deeply were those relating to Sabbath observance and the forbidden degrees of marriage, the Qaraites not recognizing any distinction between relationships of consanguinity and those of affinity, while in their zeal to avoid all risk of infringement of the sacred- ness of the day of rest they prohibited the burning of any light at all in their houses from sunset to sunset.

Of late years much Qaraite literature has been published. The most valuable contribution to learning made by it is in the direction of Hebrew philology and the natural exegesis of the scriptural text. Little information as to the Qaraites can be derived from their liturgies; they differ fundamentally from those used by Rabbanites in being composed almost entirely of scriptural versicles and in containing practically no Piyyutim

(liturgical poems). The controversies as to the rule of faith which so deeply divided the Christian Church in the 16th century gave to this obscure sect an illusory and passing importance, the Catholics frequently hurling the epithet Karaei, in token of contempt, at the Protestants, who in their turn willingly accepted it as sufficiently descriptive of their attitude towards Scripture. The Qaraites never have been numerous; in 1904 their total number was estimated at 12,000, 10,000 being found in Russia: the present community in Jerusalem numbers only a few families. They occur in Constantinople and else- where in Turkey, and in Egypt, but are chiefly met with in southern Russia, and especially in the Crimean districts of Eupatoria, Theodosia and Sevastopol. Here their historical capital and chief synagogue was formerly the " Jews' Castle " (Tshujut-Kale) , near Bakh-chisarai. The place is now deserted ; its cemetery was the seat of Firkowitsch's notorious forgeries (inscriptions of 1st century), by which he sought to establish a fabulous antiquity for his sect. According to Strack {A. Firkowilsch u. seine Entdeckungen, 1876) the oldest tombstones do not go back beyond the 14th century. The modern Qaraites are generally well spoken of for their honesty, perseverance and simple habits of life; they are gradually approximating to the Rabbanites, with whom, in some places, they are on terms of social intimacy. The Russian government exempts the Qaraites from the restrictions to which the rest of the Jews are subject; this circumstance is probably due to the insignificance of the Qaraites numerically.

Among the older authorities may be mentioned Morinus, Exercit. Bibl. lib. ii. ex. 7 (1669) ; and Triglandius. Diatribe de Secta Karaeorum

(1703). See Gratz, Gesch. der Juden, especially in vol. v. (1806), with the additions and corrections of Harkavy in the Hebrew translation; and Furst, Gesch. des Karderthums (1865); S. Pinsker, Liqqu(e Qadmoniyyot : articles by A. Harkavy and by S. Poznanski in the Jewish Quarterly Review {e.g. x. 238-276, and vols, xviii.-xx.). See also Jewish Encyclopedia, s.v. " Anan," " Karaites," &c.

(I. A.) QARO (or Caro), JOSEPH BEN EPHRAIM (1488-1575), codifier of Jewish law, whose code is still authoritative with the mass of Jews, was born in 1488. As a child he shared in the expulsion from Spain (1492), and like most prominent Jews of the period was forced to migrate from place to place. In 1535 he settled in Safed, Palestine, where he spent the rest of his life. Safed was then the headquarters of Jewish mysticism. Qaro was himself a mystic, for the tribulations of the time turned many men's

minds towards Messianic hopes; nor was he by any means the only great Jewish legalist who was also a mystic. Mysticism in such minds did not take the form of a revolt against authority, but was rather the spiritual flower of pietism than an expression of antinomianism. It is, however, as a legalist that Qaro is best known. In learning and critical power he was second only to Maimonides in the realm of Jewish law. He was the author of two great works, the second of which, though inferior as an intellectual feat, has surpassed the first in popu- larity. This was inevitable, for the earlier and greater book was designed exclusively for specialists. It was in the form of a commentary (entitled Beth Yoseph) on the Turim (see 'Asher Ben Yehiel). In this commentary Qaro shows an astounding mastery over the Talmud and the legalistic literature of the middle ages. He felt called upon to systematize the laws and customs of Judaism in face of the disintegration caused by the Spanish expulsion. But the Beth Yoseph is by no means systematic.

Qaro's real aim was effected by his second work, the Shulhan 'Arukh (" Table Prepared "). Finished in 1555, this code was published in four parts in 1565. The work was not accepted without protest and criticism, but after the lapse of a century, and in consequence of certain revisions and amplifications, it became the almost unquestioned authority of the whole Jewish world. Its influence was to some extent evil. It "put Judaism into a strait-jacket." Independence of judgment was inhibited, and the code stood in the way of progressive adaptation of Jewish life to the life of Europe. It included trivialities by the side of great principles, and retained elements from the past which deserved to fall into oblivion. But its good effects far outweighed the bad. It was a bond of union, a bar to latitudin- arianism, an accessible guide to ritual, ethics and law. Above all, it gave a new lease of life to the great theory which identified life with religion. It sanctified the home, it dignified common pursuits. When, however, the era of reform dawned in the 19th century, the new Judaism found itself impelled to assume an attitude of hostility to Qaro's code.

See Graetz, Geschichte der Juden, vol. ix. (English trans, vol. iv.); Ginzberg, in Jewish Encyclopedia, arts. " Caro "and " Codification " ; Schechter, Studies in Judaism, second series, pp. 202 seq. (I. A.)

QUACK, one who pretends to knowledge of which he is ignorant, a charlatan, particularly a medical impostor. The word is a shortened form of " quacksalver " (Du. kwaksalver) , in which form it is common in the 17th century, "salver" meaning " healer," while " quack " (Du. kwakken) is merely an applica- tion of the onomatopoeic word applied to the sounds made by a duck, i.e. gabble or gibberish. In English law, to call a medical practitioner a " quack " is actionable per se without proof of special damage (Allen v. Eaton (1630), 1 Roll. Abs. 54). The often-quoted legal

definition of a " quack " is " a boastful pretender to medical skill," but a " quack " may have great skill, and it is the claim to cure by remedies which he knows have no efficacy which makes him a " quack " (see Dakhyl v. Labouchere, The Times, 29th of July 1904, and 5th and 9th of November 1907).

QUADRATRIX (from Lat. quadrator, squarer), in mathe- matics, a curve having ordinates which are a measure of the area (or quadrature) of another curve. The two most famous curves

Fig. 1.

of this class are those of Dinostratus and E. W. Tschirnhausen, which are both related to the circle.

The quadratrix of Dinostratus was well known to the ancient Greek geometers, and is mentioned by Proclus, who ascribes the invention of the curve to a contemporary of Socrates, probably Hippias of Elis. Dinostratus, a Greek geometer and disciple of Plato, discussed the curve, and showed how it effected a mechanical solution of squaring the' circle. Pappus, in his Collections, treats of its history, and gives two methods by which it can be generated . (1) Let a spiral line be drawn on a right circular cylinder; a screw surface is then obtained by drawing lines from every point of this spiral perpendicular to its axis. The orthogonal projection of a section of this surface by a plane containing one of the perpendiculars and inclined to the axis is the quadratrix. (2) A right cylinder having for its base an Archimedean spiral is intersected by a right circular cone which has the generating line of the cylinder passing through the initial point of the spiral for its axis. From every point of the curve of intersection, perpendiculars are drawn to the axis. Any plane section of the screw (plectoidal of Pappus) surface so obtained is the quadratrix. Another construction is shown in fig. 1. ABC is a quadrant in which the line AB and the arc AC are divided into the same number of equal parts. Radii are drawn from the centre of the quadrant to the points of division of the arc, and these radii are intersected by the lines drawn parallel to BC and through the corresponding points on the radius AB. The locus of these intersections is the quadratrix. A mechanical construction is as follows: Let AMP be a semicircle with centre O (fig. 2). Let PQ be the ordinate of the point P on the circle, and let M be another point on the circle so related to P that the ordinate PQ moves from A to O in the same time as the vector OM describes a quadrant. Then the locus of the intersection of PQ and OM is the quad- ratrix of Dinostratus.

The cartesian equation to

the curve is y = x cot — . which

J 2a

shows that the curve is sym- metrical about the axis of y, and that it consists of a central

portion flanked by infinite p IG . 2.

*branches (fig. 2). The asym- ptotes are x= *=2na, » being an integer. The intercept on the axis of y is 2a/x; therefore, if it were possible to accurately construct the curve, the quadrature of the circle would be effected. The curve also permits the solution of the problems of duplicating a cube (q.v.) and trisecting an angle.*

The quadratrix of Tschirnhausen is constructed by dividing the arc and radius of a quadrant in the same number of equal parts as before. The mutual intersections of the lines drawn from the points of division of the arc parallel to AB, and the lines drawn parallel to BC through the points of division of AB, are points on the quadratrix (fig. 3). The cartesian equation is y — a cos irxJ2a. The curve is periodic, and cuts the axis of x at the points x= ==(2«-i)a, n being an integer; the maximum values of y are *=a. Its properties are similar to those of the quadratrix of Dinostratus.*

QUADRATURE (from Lat. quadratura, a making square), in astronomy, that aspect of a heavenly body in which it makes a right angle with the direction of the sun; applied especially to the apparent position of a planet, or of the moon at first and last quarters. In mathematics, quadrature is the determination of a square equal to the area of a curve or other figure.

QUADRIGA, the ancient four-horsed chariot (Lat. quadrigae, contracted from quadrijugae) , which was regarded as one of the seven sacred features in Rome. It was chiefly used as the triumphal car of generals or emperors. The earliest example mentioned is that which was modelled in terra-cotta and raised on the pediment of the temple of Jupiter Capitolinus. In later time it formed the chief decorative feature which crowned the triumphal arches, and there are numerous representations of it on coins.

QUADRILATERAL, in geometry, a figure enclosed by four straight lines. It is also a military term applied to a combina- tion of four fortresses mutually supporting one another. The fortresses of Namur, Liege, Maastricht, and Louvain, and also those of Silistria, Rustchuk, Shumla, and Varna, were so called. But the most famous quadrilateral was that of the four fortified towns of north Italy — Mantua, Peschiera, Verona, and Legnago,

Fig. 3.

the two former of which are situated on the Mincio and the two latter on the Adige. The real value of the quadrilateral, which gave Austria such a firm hold on Lombardy, lay in the great natural strength of Mantua and in the readiness with which troops and supplies could be poured into Verona from the north. QUADRILLE, the name of a game of cards and of a dance. The game, played by four persons with a pack of forty cards, was a variation of the Spanish game of ombre (q.v.) and super- seded it in popularity about 1725, to give way in turn to whist. The dance is of French origin and is usually danced by four couples in square. In the 18th century the contredanse was introduced into the ballet, and groups of four, eight or twelve dancers dressed alike performed different figures; these were first called quadrilles des contredanses, later shortened to quadrilles. The dance became popular outside the ballet, and its figures, five in number, with a finale, bore the names of the different contre- danses, Le Pantalon, I'EIS, La Poule, La Trenilz, La Pastotlrelle. The dance was introduced into England in 181 5. The word in both its applications comes through Ital. quadriglio or Span. cuadrilla from Lat. quadra, a square, four-sided figure (qualtuor, four).

QUADROON (a corruption of quarter von, Span, cuarleron, from cuarlo, Lat. quarlus, fourth), strictly a person having one- fourth negro blood, the offspring of a mulatto and a white. The children of a mulatto and a negro are called in America zambos or sambos (possibly from Span, zambro, Lat. scambus, bow- legged), and the use of Sambo as a proper name for a black servant may have thus originated.

QUAESTOR (from Lat. quaero, investigate), a Roman magistrate whose functions, at least in the later times of the republic, were mainly financial, though he was originally con- cerned chiefly with criminal jurisdiction. The origin of the quaestorship is obscure, but it was probably instituted simul- taneously with the consulship in 509 B.C. l The number of the quaestors was originally two, but this was successively increased to four (in 421 B.C.), eight (in 267 or 241 B.C.), and by Sulla (in 81 B.C.) to twenty. Julius Caesar raised the number to forty (in 45 B.C.), but Augustus reduced it again to twenty, which remained the regular number under the empire. The original quaestors were afterwards distinguished by the title of urban quaestors (quaestores urbani). When the number was raised from two to four in 421 B.C. the office was thrown open to the plebeians. It was the lowest of the great offices of state and hence it was regularly the first

sought by aspirants to a political career (cursus honorum). Towards the close of the republic, if not earlier, the successful candidate was bound to have com- pleted his thirtieth year before he entered on office, but Augustus lowered the age to twenty-five. Originally the quaestors seem to have been nominated by the consuls, but later, perhaps from the fall of the decemvirs (449 B.C.), they were elected by the people assembled in tribes (comitia tributa) under the presidency of a consul or another of the higher magistrates. The quaestors held office for one year, but, like the consuls and praetors, they were often continued in office with the title of proquaestor. Indeed it was a rule that the quaestor attached to a higher magistrate should hold office as long as his superior; hence, when a consul regularly presided over the city for one year, and afterwards as proconsul governed a province for another year, his quaestor also regularly held office for two years. Before the election of the quaestors the senate decided the duties to be undertaken by them, and after election these duties were distributed amongst the new quaestors either by lot or by the choice of the higher magistrates to whom quaestors were assigned. A peculiar burden laid on the quaestors, not as an official duty, but rather as a sort of fee exacted from all who entered on the political career, was the paving of the high roads, for which Claudius substituted the exhibition of gladiatorial games.

1 Plutarch (Popl. 12) states that the office was instituted by the first consul. Tacitus, on the other hand (Ann. xi. 22), says that it dated from the time of the kings, but his ground is merely that they were mentioned in the Lex Curiata of the consul Brutus, which Tacitus assumes to have been identical with that of the kings.

Various classes of quaestors may be distinguished according to the duties they had respectively to discharge.

1. The Urban Quaestors. — Originally the duties of the quaestors, like those of the consuls, were undefined; the consuls were the superior magistrates of the republic, the quaestors their assistants. From a very early time, however, the quaestors possessed criminal jurisdiction. In the code of the Twelve Tables they are designated quaestores parricidii, "inquisitors of parricide or murder"; 2 and perhaps originally this was their full title, which was afterwards abbreviated into quaestors when their functions as criminal judges fell into the background. In addition to parricide or murder we can hardly doubt that all other crimes fell within the jurisdiction of the quaestors; political crimes only seem to have been excepted. The criminal jurisdiction of the quaestors appears only to have terminated when towards the close of the republic trial by permanent courts (quaesliones perpetuae) was extended to criminal cases. 3

The quaestors had also charge of the public treasury (aerarium) in the temple of Saturn, and this was in the later times of the republic their most important function. They kept the keys of the treasury and had charge of its contents, including not only coin and bullion but also the military standards and a large number of public documents, which in later times comprised all the laws as well as the decrees of the senate. Their functions as keepers of the treasury were withdrawn from the urban quaestors by Augustus and transferred to other magistrates, but the office itself continued to exist into the 3rd century, though as to the nature of the duties attached to it we have little or no information.

2. The Military Quaestors. — These were instituted in 421 B.C., when two new quaestors were added to the original two. They never had a distinctive appellation like that of the urban quaestors, from whom, however, they were clearly distinguished by the fact that, while the urban quaestors did not stand in a special relation of subordination to any particular magistrate, a non-urban quaestor was regularly assigned as an indispensable assistant or adjutant to every general in command, whose name or title the quaestor usually added to his own. 4 Originally they were the adjutants of the consuls only, afterwards of the provincial praetors, and still later of the proconsuls and propraetors. The dictator alone among military commanders had no quaestor, because a quaestor would have been a limitation to his powers. The governor of Sicily had two quaestors; all other governors and commanders had but one. Between the quaestor and his superior a close personal relation, analogous to that between a son and his father, existed, and was not severed when their official connexion ceased. Not till the close of the republic do cases occur of a quaestor being sent to a province invested with praetorial and even consular powers; in one case at least the quaestor so sent had a second quaestor placed under him. The duties of the military quaestor, like those of the treasury quaestor, were primarily financial. Moneys due to a provincial governor from the state treasury were often, perhaps regularly, received and disbursed by the quaestor; the magazines seem to have been under his charge; he coined money, on which not un- frequently his name appears alone. The booty taken in wa was not necessarily under the control of the quaestor, but was dealt with, especially in later times, by inferior officers called praefecti fabrum. But, though his duties were primarily financial, the quaestor was after all the chief assistant or adjutant of his superior in command, and as such he was invested with a certain degree of military power; under the republic his military rank was superior to that of the legates, though under the empire this relation was reversed. When the general left his province before the arrival of his successor he usually committed it to the care of his quaestor, and, if he died or was incapacitated from naming his successor, the quaestor acted as his representative. Unlike the urban quaestor, the*

military quaestor possessed not a criminal but a civil jurisdic- tion corresponding to that of the aediles at Rome.

3. The Italian Quaestors. — The subjugation of Italy occasioned the institution (in 267 B.C.) of four new quaestors, who appear to have been called quaestores classici because they were originally intended to superintend the building of the fleet (classis); their functions, however, are very imperfectly known. Though no doubt intended to assist the consuls, they were not subordinated (like the military quaestors) to a special consul. They were stationed at Ostia, at Cales in Campania, and in Gaul about the Padus (Po). The station of the fourth is not mentioned; perhaps it was Lily- baeum in Sicily.

5 The etymology and original meaning of parriciiium are doubtful. In the latter part of the word we have, of course, the same root as in caedere, " to kill," but whether or not the former part is from pater, " a father," or from the same root that we have in per-peram, per-jurium, is a moot point. Mommsen takes the latter view.

3 It is often supposed that the quaestores parricidii were an old magistracy quite distinct from the ordinary quaestors. For the identification of the two, see Mommsen, Rbmisches Staatsrecht, ii. pt. 1, p. 506.

4 Thus Cicero speaks of the provincia consularis of the quaestor, I and we find quaestor Cn. Pompei, &c.

Literature. — For a fuller treatment of all these points see Momm- sen, Staatsrecht, ii. p. 523 foil.; for the existence of the quaestor- ship under the monarchy, and a different view of the second station of the Italian quaestors, see A. H. J. Greenidge, Roman Public Life, pp. 63, 215.

QUAGGA, or Couagga, an animal of the genus Equus (see Horse), nearly allied to Burchell's zebra, formerly met with in vast herds on the great plains of South Africa between the Cape Colony and the Vaal river, but now completely extinct. Gener- ally speaking, the colour of the head, neck, and upper-parts of the body was reddish-brown, irregularly banded and marked with dark brown stripes, stronger on the head and neck and gradually becoming fainter until lost behind the shoulder. There is a broad dark median dorsal stripe. The under surface of the body, the legs, and tail are nearly white, without stripes. The crest is very high, surmounted by a standing mane, banded

alternately brown and white. It is, however, not improbable that there were two or more local races, for which separate names have been proposed. Though never really domesticated, quaggas have occasionally been trained to harness. The accompanying illustration is reduced from a painting made from one of two which were driven in Hyde Park by Mr. Sheriff Parkins in the early part of the 19th century. The name is an imitation of the shrill barking neigh of the animal, " oug-ga, oug-ga," the last syllable very much prolonged; it is also commonly applied to the bonnte-quagga, or Burchell's zebra (see Horse and Zebra).

QUAGMIRE, a bog or marsh, a piece of ground so saturated with water that it cannot support any weight. The word is composed of " quag " or " quake " (O.E. cwacian; cf. " quaver," " quiver ") and " mire, " mud (Icel. myri, Swed. myr).

Skeat suggests that quag may be connected with the root seen in " quick," and quotes (Eiym. Diet. 1898) Piers Plowman, c.ˆ xxi. 64, of an earthquake, the earth " quook as it quyke were," i.e. shook as if it were alive.

QUAICH, or Quaigh, a form of Scottish drinking vessel. The word is an adaptation of the Gaelic cuach, cup, bowl; cf. Welsh cawg, and is usually referred to the Gr. kovkos, Kafka, through Lat. caucus. In the 18th century it is sometimes spelled " quaff," and a connexion has been suggested with " quaff," to drink with a large or at a single draught; the New English Dictionary, however, considers this doubtful. The " quaich " was doubtless inspired by the low silver bowls with two flat handles, frequently used as bleeding vessels in England and Holland in the 17th century. The earliest quaichs were made of a solid block of wood, or of small staves of wood, often of different colours, supported by hoops, like barrels. They are generally fitted with two, and, more rarely, three short pro- jecting handles. In addition to wood, they are made of stone, brass, pewter, horn, and of silver. The latter were often engraved with lines and bands in imitation of the staves and hoops of the wooden quaichs. The origin of these vessels in Scotland is

traced to the Highlands; it was not until the end of the 17th century that they became popular in such large centres as Edinburgh and Glasgow. The silversmiths of such local gilds as Inverness and Perth frequently mounted them in silver, as may be seen from the hall-marks on the existing examples. They are found, of silver and pewter, in use as communion cups in various parts of Scotland; four, with the Edinburgh hall- mark for 1722, belong to Ayr parish church; and a large one with the same hall-mark for

1663-1684 is used as an alms-dish at Alvah, Banffshire. The loving cup at Donaldson's hospital, Edinburgh, is a large silver xmaich, with the Edinburgh stamp for 1724, which belonged to the founder of that hospital. The finest collection of these vessels is in the possession of the marquess of Breadalbane. (E. A. J.)

QUAIL (O. Fr. Quaille, Mod. Fr. Cattle, Ital. Quaglia, Low Lat. Quaquila, Du. Kwakkel and Kwartel, Ger. Wachtel, Dan. Vagtel), a well-known bird throughout almost all countries of Europe, Asia and Africa — in modern ornithology the Colurnix communis or C. dactylisonans. This last epithet was given from the peculiar three-syllabled call-note of the cock, which has been grotesquely rendered in several European languages, and in some parts of Great Britain the species is popularly known by the nickname of " wet-my-lips " or " wet-my-feet." The quail varies some- what in colour, and the variation is rather individual than attributable to local causes; but generally the plumage may be described as reddish-brown above, almost each feather being transversely patched with dark brown interrupted by a longi- tudinal stripe of light buff; the head is dark brown above, with three longitudinal streaks of ochreous-white; the sides of the breast and flanks are reddish-brown, distinctly striped with ochreous-white; the rest of the lower parts are pale buff, clouded with a darker shade, and passing into white on the belly. The cock, besides being generally brighter in tint, not unfrequently has the chin and a double-throat band of reddish or blackish-brown, which marks are wanting in the hen, whose breast is usually spotted. Quails breed on the ground, and lay from nine to fifteen eggs of a yellowish-white, blotched and spotted with dark brown. Though essentially migratory by nature, not a few quails pass the winter in the northern hemi- sphere and even in Britain, and many more in southern Europe. In March and April they cross the Mediterranean from the south on the way to their breeding homes in large bands, but these are said to be as nothing compared with the enormous flights that emigrate from Europe towards the end of September. During both migrations immense numbers are netted for the market, since they are almost universally esteemed as delicate meat. The flesh of quails caught in spring commonly proves dry and indifferent, but that of those taken in autumn, especially when they have been kept long enough to grow fat, as they quickly do, is excellent. In no part of the British islands at present do quails exist in sufficient numbers to be the especial object of sport. In old days they were taken in England in a net, attracted thereto by means of a quail-call — a simple instrument, 1 the use of which is now wholly neglected — on which their notes are easily imitated. In South Africa and India allied species, C. delegorguii and C. coromandelica, the latter known as the Rain-Quail, respectively occur, as well as the commoner one, which in Australia and Tasmania is wholly replaced by C. pectoralis, the Stubble-Quail of the colonists. In New

Zealand another species, C. novae-zelandiae, was formerly very abundant in some districts. Some fifteen or perhaps more species of quails, inhabiting the Indian and Australian regions, have been separated, perhaps unnecessarily, to form the genera Synoecus, Perdicula, Excalphatoria, and so forth.

America has some fifty or sixty species of birds which are commonly deemed quails, though by some authors placed in a distinct family or sub-family Odontophorinae. 2 The best

1 One is figured in Rowley's Ornithological Miscellany (ii. p. 363).

2 They form the subject of a monograph in folio by J. Gould, published between 1844 and 1850. See also S. D. Judd, Bulletin 21 of U.S. Dept. of Agriculture (1905) ; D. G. Elliot, Game Birds of North America (1897).

known is the Virginian Quail, or Colin, as it is sometimes called — that being, according to Hernandez, its old Mexican name. It is the Ortyx (or Colinus) virginianus of modern ornithology, and has a wide distribution in North America, being called "part- ridge " in the Southern states, and elsewhere being known by the nickname of "Bob-White," aptly bestowed upon it from a call-note of the cock. Many unsuccessful attempts have been made to introduce this bird to England (as indeed similar trials have been made in the United States with quails from Europe). The beautiful tufted Quail of California, Lophortyx calif ornica, has also been tried at large in Europe without success; but it is well established as an aviary bird. A few of the American Quails or Colins roost in trees.

Interesting from many points of view as is the group of birds last mentioned, there is another which, containing a score of species (or perhaps more) often termed Quails or Button-Quails, is of still greater importance in the eyes of the systematise This is that comprehended by the genus Tumix, or Hemipodius of some authors, the anatomical structure of which removes it far from the genera Cotumix, Ortyx, and their allies, and even from any of the normal Gallinae. T. H. Huxley regarded it as the representative of a generalized stock from which the Charadriomorphae and Alectoromorphae, to say nothing of other groups, have sprung. The button-quails are now placed as a separate sub-order, Turnices, of the order Gattiformes (see Bird). One species, T. sylvalica, inhabits Barbary and southern Spain, and under the name of Andalucian Hemipode has been included (though on evidence not wholly satisfactory) among British

birds as a reputed straggler. The rest are natives of various parts of the Ethiopian, Indian and Australian regions. It is characteristic of the genus Tumix to want the hind toe; but the African Ortyxelus and the Australian Pedio- nomus, which have been referred to its neighbourhood, have four toes on each foot. (A. N.)

QUAIN, SIR RICHARD, Bart. (1816-1898), Irish physician, was born at Mallow-on-the-Blackwater, Co. Cork, on the 30th of October 1816. He received his early education at Cloyne, and was then apprenticed to a surgeon-apothecary in Limerick. In 1837 he entered University College, London, where he graduated with high honours as M.B. in 1840, and as M.D. (gold medal) in 1842. Six years later he was chosen an assistant-physician to the Brompton Hospital for Diseases of the Chest, and with that institution he retained his connexion until his death, first as full (1855) and subsequently as consulting physician (1875). He became a fellow of the Royal College of Physicians in 1851, and filled almost every post of honour it could offer except the presidency, in the contest for which he was beaten by Sir Andrew Clark in 1888. He became physician-extraordinary to Queen Victoria in 1890, and was created a baronet in the following year. He died in London on the 13th of March 1898. Quain, who was elected a fellow of the Royal Society in 1871, was the author of several memoirs, dealing for the most part with disorders of the heart, but his name will be best remembered by the Dictionary of Medicine, the preparation of which occupied him from 1875 to 1882 (2nd edition, 1894; 3rd, 1902). He sat on the Royal Commission on Rinderpest (cattle plague) in 1865. He was a cousin of Jones Quain (1796-1865), the author of Qtiain's Elements of Anatomy, and of Richard Quain (1800-1887), who was president of the Royal College of Surgeons in 1868, and left £75,000 to University College, London, with which the Quain professorships of botany, English language and literature, law, and physics were endowed. A half-brother of the last two, Sir John Richard Quain (1816-1876), was appointed a judge of the Queen's Bench in 1871.

QUAINT (O. Fr. cointe, from Lat. cognilus, known, probably influenced by association with Lat. comptus, neat), an adjective meaning unusual or fanciful, often applied to things with a sense of old-fashioned charm or prettiness. " Queer," which has much the same meaning, is of doubtful etymology, but is generally taken as adapted from Ger. quer, crooked.

QUAKERS, originally a cant name applied in derision to the members of the Society of Friends, but now used without any

contemptuous significance. It was said to have originated in the saying of Justice Bennet at Derby in 1650, " Tremble (or quake) at the word of the Lord," but it is now certain that it was used as early as 1647, and arose

from the physical mani- festations of religious emotion characteristic of many of the early Friends. (See Friends, Society or.)

QUANTUM MERUIT (Lat. for "as much as he has de- served "), in the law of contract, originally a form of action on the case, grounded on a promise to pay the plaintiff for work done as much as it was worth. It has been abolished as a special form of action, but the term is still in use where, in cases of special contract, there has been a breach amounting to a dis- charge by one party before the other party has done all that he was bound to do. In such a case the plaintiff sues for a quantum meruit or the value of so much as he has done.

QUARANTINE (Fr. quarantaine, a period of forty days 2), a term originally applied to the old sanitary preventive system of detention of ships and men, • unlading of cargo in lazarets, fumigation of susceptible articles, &c, which was practised at seaports on account of the plague, in connexion with the Leva,ntine trade. It is now a thing of the past in the United Kingdom and in the majority of other states. But, in common usage, the same word is applied to the sanitary rules and regula- tions which are the modern substitutes for quarantine.

The plague was the only disease for which quarantine was practised (not to mention the earlier isolation of lepers, and the attempts to check the invasion of syphilis in northern Europe about 1490) down to the advent of yellow fever in Spain at the beginning of the 19th century, and the arrival of Asiatic cholera in 1 83 1. Venice took the lead in measures to check the spread of plague, having appointed three guardians of the public health in the first years of the Black Death (1348). The next record of preventive measures comes from Reggio in Modena in 1374. The first lazaret was founded by Venice in 1403, on a small island adjoining the city; in 1467 Genoa followed the example of Venice; and in 1476 the old leper hospital of Marseilles was converted into a plague hospital — the great lazaret of that city, perhaps the most complete of its kind, having been founded in 1526 on the island of Pomegue. The practice at all the Mediterranean lazarets was not different from the English procedure in the Levantine and North-African trade. On the approach of cholera in 183 1 some new lazarets were set up at western ports, notably a very extensive establishment near Bordeaux, afterwards turned to another use.

The plague had disappeared from England, never to return, for more than thirty years before the practice of quarantine against it was definitely established by an act of Parliament of Queen Anne's reign (17 10). The first act was called for, owing to an alarm lest plague should be imported from Poland and the Baltic; the second act of 17 21 was due to the disastrous pre- valence of plague at Marseilles and other places in

Provence; it was renewed in 1733 owing to a fresh outbreak of the malady on the continent of Europe, and again in 1743 owing to the disastrous epidemic at Messina. In 1752 a rigorous quarantine clause was introduced into an act regulating the Levantine trade; and various arbitrary orders were issued during the next twenty years to meet the supposed aanger of infection from the Baltic. Although no plague cases ever came to England all those years, the restrictions on traffic became more amd more stringent (following the movements of medical dogma), and in 1788 a very oppressive Quarantine Act was passed, with provisions affecting cargoes in particular. The first year of the 19th century marked the turning-point in quarantine legislation; a parliamentary committee sat on the practice, and a more' reasonable act arose on their report. In 1805 there was another new act, and in 1823-24 again an elaborate inquiry followed by an act making the quarantine only at discretion of the privy council, and at the same time recognizing yellow fever " or other highly infectious disorder " as calling for quarantine measures along

1 The strict sense of the term is also preserved in the " widows' quarantine," the right of a widow to remain in the principal house belonging to her husband for forty days after his death.

with plague. The steady approach of cholera in 183 1 was the last occasion in England of a thoroughgoing resort to quarantine restrictions. The pestilence invaded every country of Europe despite all efforts to keep it out. In England the experiment of hermetically sealing the ports was not seriously tried when cholera returned in 1849, ˆ53 an d 1865-66. In 1847 the privy council ordered all arrivals with clean bills from the Black Sea and the Levant to be admitted to free pratique, provided there had been no case of plague during the voyage; and therewith the last remnant of the once formidable quarantine practice against plague may be said to have disappeared.

For a number of years after the passing of the first Quarantine Act (17 10) the protective practices in England were of the most haphazard and arbitrary kind. In 1721 two vessels laden with cotton goods, &c, from Cyprus, then a seat of plague, were ordered to be burned with their cargoes, the owners receiving £23,935 as indemnity. By the clause in the Levant Trade Act of 1752 vessels for the United Kingdom with a foul bill (i.e. coming from a country where plague existed) had to repair to the lazarets of Malta, Venice, Messina, Leghorn, Genoa or Marseilles, to perform their quarantine or to have their cargoes " sufficiently opened and

aired." Since 1741 Stangate Creek (on the Medway) had been made the quarantine station at home; but it would appear from the above clause that it was available only for vessels with clean bills. In 1755 lazarets in the form of floating hulks were established in England for the first time, the cleansing of cargo (particularly by exposure to dews) having been done previously on the ship's deck. There was no medical inspection employed, but the whole routine left to the officers of customs and quarantine. In 1780, when plague was in Poland, even vessels with grain from the Baltic had to lie forty days in quarantine, and unpack and air the sacks; but owing to remonstrances, which came chiefly from Edinburgh and Leith, grain was from that date declared to be a " non- susceptible article." About 1788 an order of council required every ship liable to quarantine, in case of meeting any vessel at sea, or within four leagues of the coast of Great Britain or Ireland, to hoist a yellow flag in the daytime and show a light at the maintopmast head at night, under a penalty of £200. After 1800, ships from plague-countries (or with foul bills) were enabled to perform their quarantine on arrival in the Medway instead of taking a Mediterranean port on the way for that purpose; and about the same time an extensive lazaret was built on Chetney Hill near Chatham at an expense of £170,000, which was almost at once condemned owing to its marshy foundations, and the materials sold for £15,000. The use of floating hulks as lazarets continued as before. In 1800 two ships with hides from Mogador (Morocco) were ordered to be sunk with their cargoes at the Nore, the owners receiving £15,000. About this period it was merchandise that was chiefly suspected: there was a long schedule of " susceptible articles," and these were first exposed on the ship's deck for twenty-one days or less (six days for each instalment of the cargo), and then transported to the lazaret, where they were opened and aired forty days more. The whole detention of the vessel was from sixty to sixty-five days, including the time for reshipment of her cargo. Pilots had to pass fifteen days on board a " convalescent ship." The expenses may be estimated from one or two examples. In 1820 the " Asia," 763 tons, arrived in the Medway with a foul bill from Alexandria, laden with linseed; her freight was £1475 and her quarantine dues £610. The same year the " Pilato," 495 tons, making the same voyage, paid £200 quarantine dues on a freight of £1060. In 1823 the expenses of the quarantine service (at various ports) were £26,090, and the dues paid by shipping (nearly all with clean bills) £22,000. A return for the United Kingdom and colonies in 1849 showed, among other details, that the expenses of the lazaret at Malta for ten years from 1839 to 1848 had been £53,553. From 1846 onwards the establishments in the United Kingdom were gradually reduced, while- the last vestige of the British quarantine law was removed by the Public Health Act 1896, which repealed the Quarantine

Act 1825 (with dependent clauses of other acts), and transferred

from the privy council to the Local Government Board the powers to deal with ships arriving infected with yellow fever or plague, the powers to deal with cholera ships having been already transferred by the Public Health Act of 1875.

The existing British regulations are those of 9th November 1896; they apply to yellow fever, plague and cholera. Officers of the Customs, as well as of Coast Guard and Board of Trade (for signalling) , are empowered to take the initial steps. They certify in writing the master of a supposed infected ship, and detain the vessel pro- visionally for not more than twelve hours, giving notice meanwhile to the port sanitary authority. The medical officer of the port boards the ship and examines every person in it. Every person found infected is certified of the fact, removed to a hospital pro- vided (if his condition allow), and kept under the orders of the medical officer. If the sick cannot be removed, the vessel remains under his orders. Every person suspected (owing to his or her immediate attendance on the sick) may be detained on board forty-eight hours, or removed to the hospital for a like period. All others are free to land on giving the addresses of their destina- tions to be sent to the respective local authorities, so that the dispersed passengers and crew may be kept individually under observation for a few days. The ship is disinfected, dead bodies buried at sea, infected clothing, bedding, &c, destroyed or disinfected, and bilge-water and water-ballast (subject to exceptions) pumped out at a suitable distance before the ship enters a dock or basin. Mails are subject to no detention. A stricken ship within 3 miles of the shore must fly at the main a yellow and black flag borne quarterly from sunrise to sunset.

International Conventions. — Since 1852 several conferences have been held between delegates of the Powers, with a view to uniform action in keeping out infection from the East and pre- venting its spread within Europe; all but that of 1897 were occupied with cholera. No result came of those at Paris 1852, Constantinople 1866, Vienna 1874, and Rome 1885, but each of the subsequent ones has been followed by an international convention on the part of nearly one-half of the Powers repre- sented. The general effect has been an abandonment of the high quarantine doctrine of " constructive infection " of a ship as coming from a scheduled port, and an approximation to the principles advocated by Great Britain for many years. The principal States which retain the old system are Spain, Portugal, Turkey, Greece and Russia (the British possessions Gibraltar, Malta and Cyprus being under the same influence). The aim of each international sanitary convention has been to bind the Powers to a uniform minimum of preventive action, with further restrictions permissible to individual States. The minimum is now very nearly the same as the British practice, which

has been in turn adapted to continental opinion in the matter of the importation of rags.

The Venice convention of 1892 was on cholera by the Suez Canal route; that of Dresden, 1893, on cholera within European countries; that of Paris, 1894, on cholera by the pilgrim traffic; and that of Venice, in 1897, was in connexion with the outbreak of plague in the East, and the conference met to settle on an international basis the steps to be taken to prevent, if possible, its spread into Europe.

One of the first points to be dealt with in 1897 was to settle the incubation period for this disease, and the period to be adopted for administrative purposes. It was admitted that the incubation period was, as a rule, a comparatively short one, namely, of some three or four days. After much discussion ten days was accepted by a very large majority. The- principle of notification was unanimously adopted. Each Government is to notify to other Governments the existence of plague within their several jurisdictions, and at the same time state the measures of prevention which are being carried out to prevent its diffusion. The area deemed to be infected is limited to the actual district or village where the disease prevails, and no locality is deemed to be infected merely because of the importation into it of a few cases of plague while there has been no diffusion of the malady. As regards the precau- tions to be taken on land frontiers, it was decided that during the prevalence of plague every country had the inherent right to close its land frontiers against traffic. As regards the Red Sea, it was decided after discussion that a healthy vessel may pass through the Suez Canal, and continue its voyage m the Mediterranean during the period of incubation of the disease the prevention of which is in question. It was also agreed that vessels passing through the Canal in quarantine might, subject to the use of the electric light, coal in quarantine at Port Said by night as well as by day, and that passengers might embark in quarantine at that port. Infected vessels, if these carry a doctor and are provided with a disinfecting stove, have a right to navigate the Canal in quarantine, subject only to the landing of those who are suffering from plague, and of

such persons as have been in actual contact with the sick or with infected articles, together with the disinfection of the infected compartment of the vessel. Passing on to the conclusions dealing with regulations to be imposed " in Europe," the following are the chief points to be noted : — As regards measures to be adopted at ports of arrival, the conclusions of the Dresden convention were as far as practicable adhered to. In the case of healthy

vessels, i.e. those on board of which there is no illness, though they have sailed from an infected port, it was decided that they should at once have free pratique, but at the option of the local authority certain measures of disinfection of soiled articles may be required. For suspected vessels, viz. those on board of which there has been plague, but no fresh case within twelve days, some limited processes of disinfection, &c, as denned, having been complied with, it is recommended that the crew and passengers should be subject to surveillance for a period of ten days from the date of the arrival of the vessel. In the case of infected vessels, viz. those on which plague is actually present, or on which that disease has occurred ten days before arrival, the sick are to be landed and isolated, and the remainder of those on board are to be subjected, at the discretion of the local authority, to " observation " or " surveillance " for a period not exceeding ten days from the date of the occurrence of the last case of plague. In this convention the terms " observation " and "surveillance" are for the first time clearly defined; the definition as to the latter stating that under that system passengers are not to be isolated, but are to be allowed at once to proceed to their homes, where they can remain under medical supervision so long as may be deemed necessary by the local authority. The results of this conference indicated a great advance on the part of the nationalities represented towards a liberal and truly scientific conception of the means to be adopted by their respective Govern- ments for the prevention and control of infective diseases.

Literature. — A quarantine committee of the Social Science Association collected, in 1860-61, valuable consular returns on the practice of quarantine in all parts of the world; these were edited by Milroy and ordered to be printed (with the report and summary) as three parliamentary papers communicated to the board of trade. The third paper (6th August 1861, No. 544) contains, in an appendix, an Historical Sketch of Quarantine Legislation and Practice in Great Britain, by Dr Milroy. Russell's Treatise of the Plague (4to, London, 1791) contains " remarks on quarantines, lazarettoes, &c," and an account of the mode of " shutting up " practised by households in Aleppo on the outbreak of plague in the town. The inexpediency of quarantine in the United Kingdom is discussed by John Simon in the eighth Report of the Medical Officer of the Privy Council for 1865, p. 35, and also in Report (Medical) of Local Government Board, xxiv. 1892-93.

QUARE IMPEDIT, in English law, a form of action by which the right of presentation to a benefice is tried. It is so called from the words of the writ formerly in use, which directed the sheriff to command the person disturbing the possession to permit the plaintiff to present a fit person, or to show cause " why he hinders " the plaintiff in his right. The action was one of the few real actions preserved by the Real Property Limitation Act 1833,

and survived up to i860. The effect of the Common Law Procedure Act' i860, § 26, was to assimilate proceedings in quare impedit as far as possible to those in an ordinary action. It is now usually brought against a bishop to try the legality of his refusal to institute a particular clerk. The bishop must fully state upon the pleadings the grounds on which he refuses. Quare impedit is peculiarly the remedy of the patron; the remedy of the clerk is the proceeding called duplex querela in the ecclesiastical court. The action is not barred till the expiration of sixty years, or of three successive incumbencies adverse to the plaintiff's right, whichever period be the longer (Real Property Limitation Act, 1833, § 29). Where the patron of a benefice is a Roman Catholic, one of the universities presents in his place (1689, 1 Will. & Mary, sess. 1, c. 29). By 13 Anne c. 13 (17 14), during the pendency of a quare impedit to which either of the universities is a party in right of the patron being a Roman Catholic, the court has power to administer an oath for the discovery of any secret trust, and to order the cestui que trust to repeat and subscribe a declaration against transubstantiation. In Scotland the effect of a quare impedit is attained by action of declarator. In the United States, owing to the difference of ecclesiastical organization, the action is unknown.

QUARITCH, BERNARD (1819-1899), English bookseller and collector, was born at Worbis, Germany, on the 23rd of April 1819. After being apprenticed to a bookseller, he went to London in 1842, and was employed by Bohn the publisher. In

1847 he started a bookseller's business off Leicester Square, becoming naturalized as a British subject. In 1848 he started to issue a monthly Catalogue of Foreign and English Books. About 1858 he began to purchase rare books, one of the earliest of such purchases being a copy of the Mazarine Bible, and within a period of forty years he possessed six separate copies of this rare and valuable edition. In i860 he removed to Piccadilly. In 1873 he published the Bibliotheca Xylographica, Typographica et Palaeographica, a remarkable catalogue of early productions of the printing press of all countries. He became a regular buyer at all the principal book-sales of Europe and America, and from time to time published a variety of other catalogues of old books. Amongst these may be mentioned the Supple- mental Catalogue (1877), and in 1880 an immense catalogue of considerably over 2000 pages. The last complete catalogue of his stock was published in 1887-88 under the title General Catalogue of Old Books and Manuscripts, in seven volumes, increased with subsequent supplements to twelve. All these catalogues are of considerable bibliographical value. By this time Quaritch had developed the largest trade in old books in the world. Among the books that he published was Fitz-Gerald's Omar Khayy&m, and he was the ˆagent for the pub- lications of the British Museum and the Society of Antiquaries. He died at Hampstead

on the 17th of December 1899, leaving his business to his son.

QUARLES, FRANCIS (1592-1644), English poet, was born at Romford, Essex, and baptized there on the 8th of May 1592. His father, James Quarles, held several places under Elizabeth, and traced his ancestry to a family settled in England before the Conquest. He was entered at Christ's College, Cambridge, in 1608, and subsequently at Lincoln's Inn. He was made cup- bearer to the Princess Elizabeth, Electress Palatine, in 1613, remaining abroad for some years; and before 1629 he was appointed secretary to Ussher, the primate of Ireland. About 1633 he returned to England, and spent the next two years in the preparation of his Emblems. In 1639 he was made city chronologer, a post in which Ben Jonson and Thomas Middleton had preceded him. At the outbreak of the Civil War he took the Royalist side, drawing up three pamphlets in 1644 i n support of the king's cause. It is said that his house was searched and his papers destroyed by the Parliamentarians in consequence of these publications. He died on the 8th of September in that year.

Quarles married in 1618 Ursula Woodgate, by whom he had eighteen children. His son, John Quarles (1624-1665), was exiled to Flanders for his Royalist sympathies and was the author of Fons Lachrymarum (1648) and other poems.

The work by which Quarles is best known, the Emblems, was originally published in 1635, with grotesque illustrations engraved by William Marshall and others. The forty-five prints in the last three books are borrowed from the Pia Desideria (Antwerp, 1624) of Herman Hugo. Each " emblem " consists of a paraphrase from a passage of Scripture, expressed in ornate and metaphorical language, followed by passages from the Christian Fathers, and concluding with an epigram of four lines. The Emblems was immensely popular with the vulgar, but the critics of the 17th and 18th centuries had no mercy on Quarles. Sir John Suckling in his Sessions of the Poets dis- respectfully alluded to him as he " that makes God speak so big in's poetry." Pope in the Dunciad spoke of the Emblems,

" Where the pictures for the page atone And Quarles is saved by beauties not his own."

The works of Quarles include : A Feast for Wormes. Set forth in a Poeme of the History of Jonah (1620), which contains other scriptural paraphrases, besides the one that furnishes the title; Hadassa; or the History of Queene Ester (1621); Job Militant, with Meditations Divine and MoraU (1624) ; Sions Elegies, wept by Jeremie the Prophet (1624); Sions Sonets sung by Solomon the King (1624), a paraphrase of the Canticles; The Historie of Samson (1631) ; Alphabet of Elegies upon . . . Dr Aylmer

(1625); Argalus and Parthenia (1629), the subject of which is borrowed from Sir Philip Sidney's Arcadia; four books of Divine Fancies digested into Epigrams, Meditations and Observations (1632) ; a reissue of his scriptural paraphrases and the Alphabet of Elegies as Divine Poems (1633); Hieroglyphikes

of the Life of Man (1638) ; Enchyridion, containing Institutions Divine and Moral (1640-41), a collection of four " centuries " of miscellaneous aphorisms; Observations concerning Princes and States upon Peace and Warre (1642), and Boanerges and Barnabas — Wine and Oyle for . . . afflicted Soules (1644-46), both of which are collec- tions of miscellaneous reflections; three violent Royalist tracts (1644), The Loyall Convert, The Whipper Whipt, and The New Distemper, reissued in one volume in 1645 wn; h the title of The Profest Royalist; his quarrell with the Times, and some elegies. Solomon's Recantation . . . (1645) contains a memoir by his widow. Other posthumous works are The Shepheards' Oracles (1646), a second part of Boanerges and Barnabas (1646), a broadside entitled A Direfull Anathema against Peace-haters (1647), and an interlude, The Virgin Widow (1649).

An edition of the Emblems (Edinburgh, 1857) was embellished with new illustrations by C. H. Bennett and W. A. Rogers These are reproduced in the complete edition (1874) of Quarles included in the " Chertsey Worthies Library " by Dr A. B Grosart, who provides an introductory memoir and an appreciation which greatly overestimates Quarles's value as a poet.

QUARREL. (1) (Through Fr. querelle from Lat. querela, complaint), originally a complaint against a person, particularly a legal accusation or charge, hence a ground or cause for com- plaint or anger, or, more generally, an outbreak of anger or violent dispute. (2)ˆThrough O. Fr. quarrel or quarel, from med. Lat. quadrettus, diminutive of quadrus, square), a heavy short bolt or arrow with a square head, used in a cross-bow or arbalest. In architecture this term (and also the doublet " quarry ") is applied to any square-shaped opening, in the Beauchamp Roll to the quatrefoils in Perpendicular windows, sometimes to squares of paving, but most commonly to fhe lozenge-shaped pieces of glass in lead casements (see Glass, Stained).

QUARRY. (1) (Through Fr. from med. Lat. quareia for quadraria; quadrare, to square or hew stone), a place from which stones are dug, the term being usually confined to a place where such operation is carried on

in the open air, as opposed to a " mine " (see Quarrying). (2) (Through O. Fr. cuiree, cuir, skin", leather, Lat. corium; cf. mod. Fr. curie, spoils) , properly certain parts of a deer or other beast of chase given as a reward to the hounds and placed upon the hide of the animal, also parts of a bird given similarly to a hawk or falcon. The word is thus applied to the animal hunted or the bird killed by the hawk, and generally to any object of the chase.

QUARRYING, the art of winning or obtaining from the earth's crust the various kinds of stone used in construction, the operation being, in most cases, conducted in open workings.

According to their composition, building stones are broadly classed as granites, sandstones, limestones and slates. Under the first of these heads is included a number of crystalline rock species, such as granite, syenite, gneiss, &c, which to the geologist are quite distinct, but which in commerce are all spoken Kinds of of as granite. They are chiefly composed of one or stone more minerals of the felspar group mingled with

quarried. one or m0 re of the micas or with hornblende, and usually contain quartz. Sandstones are chiefly composed of fragments of quartz cemented into solid rock by silica and oxide of iron. Of these there are many varieties, including flagstone used for foot-pavements. Limestones consist princi- pally of carbonate of lime. Their chief variations are the crystalline form known as marble and the deposit from mineral springs known as Mexican onyx. Slates are mudstones or shales hardened by heat and pressure, and rendered fissile by the latter agent. Chemically they consist chiefly of hydrous silicate of alumina. Theoretically, granites are massive, and have no bedding or stratification like sandstones and limestones; but all rock masses are usually found to be more or less shattered by movements of the earth's crust which occur as a result of its constant readjustment to the cooling and shrinking interior, so that the rocks are divided by cracks or fissures, which are commonly known as joints. In the massive granites these joints, which usually occur in two or more planes at right angles to one another, are of the greatest importance to the quarryman, as they enable him to separate masses of stone with approxi- mately parallel faces. In gneisses the parallel arrangement of the minerals usually coincides with a direction of easy cleavage,

known to quarrymen as the "rift"; at right angles to this direction is usually one less easy parting, known as the " grain." Sandstones and limestones are stratified rocks which have been formed as sediments in bodies of water; and whether their beds are found in the normal position of horizontality, or whether they have been tilted and folded by earth movements, the direction of easiest separation is coincident with the

original planes of sedimentation and parallel to them. This is therefore called the " rift, " while the " grain " is at right angles to it. In gneisses, sandstones and limestones joints also occur; and while frequently convenient for the division of the beds into masses of useful size, they may be a detriment, as when they occur so close together as to fall within the limits of a block available for commercial purposes. In commerce the various kinds of building stone are usually designated by the name of the locality or region in which the quarry is situated. In the case of the more important varieties this geographic name usually conveys to the architect or builder full information concerning the colour, texture and other properties of the material. For example, the names Hallowell or Quincy granite, Medina or Berea sandstone, and Vermont or Tennessee marble, convey in the United States full information to those interested.

The methods of quarrying vary with the composition and hardness of the rocks, their structure, cleavage, and other physical properties; also with the position and charac- ter of the deposits or rock-masses. The general pur- M ˆ h ˆf S ed pose of the work is to separate the material from its bed in masses of form and size adapted to the intended use. Cutting the stone to accurate dimensions, dressing, rubbing and polishing are subsequent operations not involved in quarrying.

The practice of quarrying consists in uncovering a sufficient surface of the rock by removing superficial soil, sand or clay, or by sinking a shaft or slope, and then with proper tools and, when necessary, with explosives, detaching blocks of form and size adapted to the purpose in view. Frequently the outer portion of the rock has been affected by the action of the weather and other atmospheric agencies, so that it has become dis- coloured or softened by decay. This weathered material must be removed before stone can be obtained for use.

A quarry should, if possible, be opened on a hillside, for in this case it is usually much easier to dispose of the water which necessarily collects in any deep excavation, and which, if drainage by gravity is not afforded, must be removed by pump- ing, at considerable expense. As it is generally most convenient to operate on a vertical face of rock, the preliminary work of opening a quarry is usually directed toward the production of this result; but its accomplishment involves the waste of a certain amount of stone, which must be broken into irregular and useless pieces. The separation of blocks of building stone is effected ordinarily by drilling holes along the outlines of the block to be removed, and then, by exploding blasting-powder in the holes, or by driving wedges into them, exerting sufficient force to overcome the cohesion of the rock and rend it asunder. In many quarries it is found most convenient to separate a large mass and afterwards divide it into blocks of the required size. When the rock is stratified, or has an easily

determined " rift," the holes are drilled at right angles to the plane of separation. When there is no stratification or " rift," or these natural planes of separation are too far apart, or when the position of the joints is not advantageous, a row of horizontal holes must be drilled into the face or " breast " of the quarry, along which separation is effected by the use of wedges. Of late at certain American quarries, in a granite which has no rift or direction of ready cleavage, compressed air has been brought into service to effect the separation of extensive layers. A hole is drilled as deep as the desired thickness of the layer to be separated, and a small charge of dynamite is exploded at the bottom of it. This develops a cavity in which a small charge of powder is next exploded, producing a crack or crevice parallel to the surface of the rock. A pipe for conveying compressed air is now sealed into the opening, and gradually increasing pressure is introduced. This results in the gradual extension of the crevice developed by

the explosion of the powder. In the absence of compressed air, water under pressure may be used and also small powder charges exploded at intervals of a few days. In thinly bedded sandstones, where vertical joints are frequent, it is often possible to separate the desired slabs and flagstones with crowbars and wedges, without drilling or the use of explosives. When blasting is necessary, some form of gunpowder is generally used, rather than a violent explosive like dynamite, in order to avoid shatter- ing the rock. This, however, applies only to dimension stone. When the production of broken stone for road-making, concrete, or similar purposes is the sole end in view, violent explosives are preferred. In limestones and marbles and in the softer sand- stones, channelling machines, driven by steam, are employed, by which vertical or oblique grooves or channels can be cut with great rapidity to a depth of several feet. A level bed of rock is cleared, and on this are laid rails, along which the machine moves. After the channels are cut, a row of holes is bored perpendicular to the former at the desired distance below the surface of the bed, and by driving wedges into these the required blocks are separated.

When the beds of stone to be quarried are thin, and when to remove the whole of the overlying mass of earth or rock would be too expensive, it is found convenient to treat the stone quarry as if it were a mine, and to rely upon methods similar to those practised in mining. A horizontal bed of rock is usually opened at its outcrop on some hillside, or if this is impracticable, as shaft or slope is excavated to reach it. If dimension stone is required, a deep horizontal groove is cut near the top or the bottom of the bed. The quarry face is then divided into blocks by saw-cuts, channels, or rows of*

drill-holes, and the blocks are separated by wedging or blasting. As the excavation or stoping progresses, portions of the rock are left in place as pillars to support the roof. At many localities in Europe where roofing slate is quarried, it is found in beds dipping more or less from the horizontal. These deposits are worked by stopes which follow the inclination of the bed, from which, at convenient intervals, levels are driven across, to take advantage of the cleavage of the slate. As in other subterranean quarries, pillars of rock are left to support the roof, since artificial supports would be more expensive. At some of the marble quarries in Vermont, U.S.A., where the strata are very nearly vertical, the beds are worked to a great depth with a comparatively small surface opening.

See G. P. Merrill, Stones for Building and Decoration (New York, 1898); C. Le X. Foster, A Text-Book of Ore and Stone Mining (London and Philadelphia, 1894); O. Herrman, Steinbruchindustrie und Steinbruchgeologie (Berlin, 1899). (F. J. H. M .)

QUARTER (through Fr. from Lat. quartarius, fourth part), a word with many applications of its original meaning, namely, one of the four divisions of anything; thus as a measure of weight a quarter equals 28 lb, one-fourth of the hundredweight of 112 lb; as a measure of capacity for grain it equals 8 bushels; similarly in liquid measure the shorter form "quart "is a quarter of a gallon = 2 pints, so " quartern " is a quarter of a pint (a gill) , or. as a measure for bread, 4 lb. " Quarter " is also used of the fourth part of the moon's monthly revolution, and of a fourth part of the legal year, marked off by the " quarter-days " (see below). For the division of the heraldic shield into four " quarters " and the use of the term " quartering," the marshal- ling of several coats on one shield, see Heraldry. From the four principal points of the compass and the corresponding division of the horizon, &c, the word is used generally of direction or situation, and hence of a district in a town, &c, especially when assigned to or occupied by a particular class. It has thus become the usual term applied to stations, buildings, lodgings, &c, in the regular occupation of military troops (sec Barracks, Camp, and Cantonments).

There are many technical uses of the word, in which the original meaning has been lost or obscured; thus in carpentry and architecture it is applied to the main upright posts in framing, sometimes called "studs"; the filling in quarters were formerly named "prick posts"; in farriery, to one side

of the " coffin " of a horse's foot; in bootmaking, to the side piece of leather reaching from the vamp to the heel. The " quarter " of a ship is the after part of her side from the main- chains to the stern (see Quarterdeck).

There has been much discussion as to the origin of the use of the word "

quarter " in the sense of mercy, clemency, the sparing of the life of a beaten enemy and the acceptance of his surrender. The same use is found in Fr. quartier. Cotgrave explains this word as " faire war, wherein souldiers are taken prisoners and ransomed at a certaine rate." The real origin cannot be, as has often been repeated, following De Brieux (Origines de plusieurs J "aeons de parler, 1672), that it was due to a supposed agreement between the Dutch and Spaniards for ransoming officers and men at one quarter of their pay. The true source is either the assignment of " quarters," i.e. lodgings, to captured prisoners whose lives were spared, or the use of the word, now obsolete, for relations with or conduct towards another, often in the sense of fair treatment ; thus in Bacon's Essay on Cunning, " two, that were competitors, . . . kept good quarter between themselves."

Quarter days are the days that begin each quarter of the year. In England they are the 25th of March (Lady Day), the 24th of June (Midsummer Day), the 29th of September (Michaelmas Day) and the 25th of December (Christmas Day). They are the days on which it is usually contracted that rents should be paid and houses or lands entered upon or quitted. In Scotland there are two legal terms, the 15th of May (Whitsunday) and the nth of November (Martinmas) ; these, together with the two conventional terms, 2nd of February (Candlemas) and the 1st of August (Lammas), make up the Scottish quarter days. In the Scottish burghs, however, the removal terms are the 28th of May and the 28th of November. In the United States the quarter days are, in law, the 1st of January, April, July and October.

QUARTERDECK, the after part of the upper deck of a ship. In former times the upper deck of a line-of-battle ship or frigate ended at the mainmast, and was connected with the forecastle by two narrow passages, or gangways running along the sides. The quarterdeck is the residence and symbol of authority in a warship. The starboard, or right side looking forward, is reserved to the senior officer. A sailor who had a complaint to make was said to come to the mainmast, because he placed himself at the forward end of the quarterdeck near the mast. According to the ancient custom of the sea, the quarterdeck is to be saluted by all who come upon it, and the salute is returned by all officers present.

QUARTER SESSIONS, COURT OF, in English law, the name for the justices of the peace of any county, riding, parts, division or liberty of a county, or of any county of a city or county of a town, in general or quarter sessions assembled; it includes the court of the recorder of a municipal borough having a separate court of quarter sessions. The word " general " in this context is contrasted with " special " or " petty." The court is a local court of record having a limited criminal jurisdiction, and also to

some extent civil jurisdiction. As a court of record it has, in addition to its other jurisdiction, power to punish summarily without the assistance of a jury contempts committed in its presence, such as insults to the justices or disturbance of its proceedings. At the present time the whole of England and Wales is within the local jurisdiction of some court of quarter sessions. But the history of the court in counties is quite distinct from its history in boroughs.

Counties. — As regards counties the court originated in statutes of 1326, 1344 and 1360, which provided for justices in counties, and the commission of the peace. The court derived its name from the direction in a statute of 1388 that the " justices shall keep their sessions in every quarter of the year at the least." By a statute of 1414 they were directed to make their sessions four times in the year: that is to say, in the first week after the feasts of St Michael, the Epiphany, the clause of Easter and the translation of St Thomas the Martyr, and more often if need be. 1 These dates have only been slightly varied, first in 1814 in consequence of the adoption of the Gregorian calendar, later in 1830 by specifying the first week after the nth of October, 28th of December, 31st of March and 24th of June respectively, instead of the church feasts; and in 1894 by

1 An earlier statute not repealed (36 Edw. III. c. 12) fixes the third and fourth sessions differently, viz. second week of mid-Lent, and between Whit Sunday and Midsummer Day

giving the justices a limited power of fixing their sessions so as not to clash with the assizes. It will be seen that the statutes do not limit the justices to four sessions a year: and they are free to sit oftener by adjournment of the quarterly sessions to another time, and even to another place, in their county, or to hold additional sessions. All the sessions thus held are " general," though not all may be " quarter " sessions. The Assizes and Quarter Sessions Act 1908 gave the useful power of dispensing with the holding of quarter sessions if there is no business to transact.

Constitution of the Court. — Such a court sits for every judicial county in England, and is composed of two or more of the justices in the commission of the peace for the county, including ex officio justices. The quorum of the court is fixed by the commission of the peace at two. At one time certain specified justices described as of the quorum must be present, but under the present commission there are no such persons. In certain counties more than one commission of the peace is issued, e.g. for the three ridings of

Yorkshire (N. E. and W.) and the liberty of Ripon, the three parts of Lincolnshire (Lindsey, Kesteven and Holland), the isle of Ely and the rest of Cambridgeshire, the soke of Peterborough, and the rest of Northamptonshire. 1 In all counties, &c, except that of London, the justices in the commission elect a chairman and vice- chairman, neither of them necessarily a lawyer, to preside at the sittings of the court. In the county of London there are a paid chairman and deputy chairman, who must be barristers of at least ten years' standing, and are appointed by the crown. There is special legislation as to quarter sessions in the county palatine of Lancaster; and in the Salford Hundred of that county there is a paid chairman. There is also special legislation as to Kent, and arrangements have been made by which in Sussex and Suffolk the quarter sessions for the east and west divisions are virtually distinct courts. Under the Quarter Sessions Act 1858 the court may sit in two divisions of at least two justices at the same time and place, but not simultaneously in separate parts of the same county .except under statutory authority as in London.

The court may sit while the assizes for the county are being held, but usually refrains from doing so because of the inconvenience which would be occasioned, and adjusts its sittings so as to avoid clashing with the assizes. The chief officer of the court is the clerk of the peace, who acts as clerk to the court, records its proceedings, calls and swears the juries, draws many of the indictments, receives the bills returned by the grand jury, arraigns the prisoners and taxes the costs. In a county he is appointed by a standing joint-com- mittee of the quarter sessions and the county council, and has charge of, and responsibility for, the records and documents of the county subject to the directions of the custos rotulorum or the quarter sessions or the county council (Local Govt. Act 1888, s. 83).

Boroughs. — The jurisdiction of the court of quarter sessions of a borough does not depend upon the commission of the peace, but upon the Municipal Corporations Act 1882. Many boroughs have a separate commission of the peace (which does not contain the words of the county commission giving jurisdiction to try indictments), but have not received the grant of a separate court of quarter sessions: and such boroughs are within the jurisdiction of the court of quarter sessions for the county within which the borough lies. Before the Municipal Corporations Act 1835, many boroughs had criminal jurisdiction under their charters. Under that act and the act of 1882 a grant of quarter sessions to a city or borough is made by the crown in council on petition of the town council. The recorder, a barrister of not less than five years' standing appointed by the crown, is sole judge of the court, though the mayor can adjourn it in the absence of the recorder; he has a discretion to fix his own dates for the holding of the court, so long as he holds it once in every quarter of a year; and it may be held more frequently if he think fit, or a secretary of state so directs; he has no power

to allow, apportion, make or levy a borough rate or to grant a licence for the sale of excisable liquors by retail; a deputy may be appointed by the recorder, or in the event of his being unable to make the appointment by a secretary of state. Subject to these qualifications the court has the same jurisdiction as county quarter sessions.

The city of London is not subject to the Municipal Corpora- tions Act 1882, and its court of quarter sessions is created by the city charters, and is held be'fore the mayor and aldermen with

1 In the soke of Peterborough commissions of oyer and terminer, and gaol delivery, as well as a commission of the peace, are issued.

the recorder. It does not now sit to try indictments, which all go to the Central Criminal Court.

There is special legislation as to quarter sessions in the Cinque Ports. In a borough the clerk of the peace is appointed by the town council and holds office during good behaviour (Municipal Corporations Act 1882, s. 164).

Criminal Jurisdiction, Original. — Courts of quarter sessions in counties and boroughs have both original and appellate jurisdic- tion depending on the commission of the peace and on legislation beginning in 1344. This jurisdiction is derived in counties from the commission of the peace, which directs the justices " to inquire the truth more fully by the oath of good and lawful men of the county, by whom the truth of the matter shall be better known of all manner of crimes, trespasses, and all and singular other offences of which the justices of our peace may or ought lawfully to inquire," " and to hear and determine all and singular the crimes, trespasses and offences aforesaid " " according to the laws and statutes of our realm." " Provided always that if a case of difficulty upon the determination of any of the premises before you shall happen to arise then let judgment in no wise be given " " unless in the presence of one of the justices of assize for the county." This proviso has been read as requiring the justices to reserve the graver felonies for trial at the assizes, or to transmit to assizes indictments found at quarter sessions which raised difficult questions. Quarter sessions never dealt with forgery or perjury, but at one time assumed juris- diction over almost every other form of crime. By the Quarter Sessions Act 1842 and subsequent legislation, they are forbidden to try the following offences: treason or misprision of treason; murder, capital felony or any felony (except burglary) which is punishable on a first conviction by penal servitude for life; offences against the king's title, prerogative, person or government, or against either House of parliament; offences against the Official Secrets Act 1889; offences subject to the penalties of praemunire ; blasphemy and offences against religion,

and composing or publish- ing blasphemous, seditious or defamatory libels ; administer- ing and taking unlawful oaths; perjury and subordination and making or suborning another to make a false oath, declarations or affirmations punishable as perjury or as a misdemeanour; abduction of women and girls and offences under the Criminal Law Amendment Act 1885; bigamy and offences against the laws of marriage; concealment of birth; bribery and corruption at elections or of agents or public officials (but they can try offences against the Public Bodies Corrupt Practices Act 1889); setting fire to crops, woods and heaths ; stealing or destroying certain classes of documents ; offences against the factor sections (ss. 75-85) of the Larceny Act as amended by the Larceny Act 1901 ; and conspiracies to commit offences which the court could not try if committed by one person. Trials before the court with a jury are governed by the same pro- cedure as trials on indictment in a court of assize. Under the Vagrancy Act 1823 and amending acts, they have special powers of sentencing incorrigible rogues sent to them by courts of summary jurisdiction, and under the act of 1360 and the commission of the peace they can, but now rarely do, exercise an original and sum- mary jurisdiction as to articles of the peace (see Recognizance). They have power to estreat recognizances entered into before themselves or before courts of summary jurisdiction and returned to them for record or forfeiture, but by the Summary Jurisdiction Act 1879 the exercise of the latter power has been rendered unnecessary.

Appellate. — An appeal lies to quarter sessions from convictions by a court of summary jurisdiction only where such an appeal is expressly given by statute. The number of statutes giving such right of appeal is very great!. The appellate jurisdiction has been considerably increased by the Summary Jurisdiction Act 1879, which allows (s. 19) an appeal (with certain exceptions) from every conviction or order of a court of summary jurisdiction inflicting imprisonment without the option of a fine. The appeal may be brought in accordance with the act giving the appeal or the Summary Jurisdiction Acts. Most of the special procedure in statutes giving the right to appeal has been swept away by the Summary Jurisdiction Act 1884.

Civil Jurisdiction, Original. — Originally the county justices were confined to the exercise in or out of sessions of the powers given by the commission of the peace and of certain statutory duties as to rioters, &c. Under the Tudors and Stuarts the justices acting under the supervision of the Privy Council and the court of king's bench gradually became the rulers of the county in administrative and social as well as judicial matters (F. W. Maitland, Justice and Police, 1885, p. 80). The process by which thi§,result was attained is traced in Webb's English Local Government (1907, vol. i.). The effect of the change was the supersession by nominees of the crown of the common law authorities and officers of county,

hundred and township. But the change extended only to a small extent to municipal boroughs. By legislation in and since 1888 most of the administrative powers and duties of justices in general and quarter sessions have been transferred to the incorporated and elective councils of counties, boroughs and urban and rural districts. But the justices still possess certain original", civil or quasi-civil

jurisdiction with respect to the extinction of licences to sell intoxi- cants, and jointly with the county councils over the county police, and as to closing highways, and also powers as to fixing the petty sessional divisions of their county.

Appellate. — Theoretically quarter sessions have original jurisdiction in any matter as to which two justices have jurisdiction, unless the statute giving the jurisdiction gives an appeal to quarter sessions as a result of this rule. Most of the civil jurisdiction of quarter sessions is now appellate, i.e. with reference to orders made by justices out of quarter sessions as to the settlement and removal of paupers, or under the Highway, Licensing and Bastardy Acts, or as to appeals against assessments or rating. The procedure as to each form of appeal depends partly on the statute by which it is given and partly on the general provisions of the Summary Jurisdiction Acts 1879 and 1884. In substance their only original jurisdiction in civil or quasi-civil matters is now in cases of apprentice- ship (5 Eliz. c. 4) and articles of the peace (1 Edw. III. st. 2, c. 16). Appeal from Quarter Sessions. — There is no appeal properly so called from quarter sessions to the High Court either on facts or law. But decisions on law may be reviewed by the High Court (king's bench division) by means of certiorari, mandamus or pro- hibition; convictions on indictment before courts of quarter sessions are within the provisions of the Criminal Appeal Act 1907 (see Appeal), except convictions on indictments for obstruction or non-repair of a public bridge, highway or river, from which an appeal lies to the court of appeal in the same way as in the case of civil actions tried at assizes. Quarter sessions have also power to reserve a special case for the High Court on conviction or indictment (Crown Cases Act 1848), and also in other cases to consult the High Court by special case stated under the commission or under the Quarter Sessions Act 1849. Questions of law alone can be referred by special case, and there is no means of compelling the court to state a case. The procedure as to cases not within the acts of 1848, 1849 and 1907 is regulated by the Crown Office Rules of 1906, and s. 2 of the Judicature Act 1894, which gives the High Court certain powers of drawing inferences of fact from the evidence taken in the court below.

Scotland. — Justices of the peace were established in Scotland by act of 1587, c. 82, and quarter sessions by act of 1661, c. 338 (l2mo edition, c. 38), which directs that the justices of peace in each respective shire shall meet and convene together four times in the year, on the first Tuesday of March, May and August, and the last Tuesday of October, to administer justice to the people on things that are within their jurisdiction, and punish the guilty for faults and crimes done and committed in the preceding quarter. The obsolete details in this act were repealed in 1906, but the power of requiring law burrows, i.e. sureties to keep the peace, is preserved. By the Union with Scotland Amendment Act 1707 provision was made for appointing justices of the peace in shires, stewartries and burghs in Scotland: and the justices to be appointed are given authority to exercise whatever doth appertain to the office and court of a justice of peace by virtue of the laws and acts of parlia- ment made in England before the Union in relation to and for the preservation of the public peace. " Provided that in the sessions of the peace the methods of trial and judgments shall be according to the law of Scotland." The quarter sessions do not sit for the trial of indictments, but have powers of reviewing the decisions of justices in petty sessions (see Summary Jurisdiction). This power extends, inter alia, to revenue cases and cases under the Pawnbrokers Acts. Their jurisdiction as to the grant and refusal of liquor licences was taken away by the Licensing Scotland Act 1903, but they still have appellate jurisdiction as to offences under the" Licensing Acts, ss. 101-103. An appeal lies to the Circuit Court of Justiciary unless the statute under which they act otherwise provides. In criminal matters their functions are not considerable, most of the work done by justices in England being in Scotland dealt with by the sheriff or his substitutes, or by stipendiaries in the great cities. Their decisions in criminal cases are reviewable by the Court of Justiciary and in revenue cases by the court of exchequer. Their original jurisdiction is very limited and almost wholly civil. Thus they have power to divide a county and to make rules for the purposes of the Justices of the Peace Small Debts Acts 1825 and 1849.

Ireland. — In I risff municipal boroughs a court of quarter sessions may be granted and a recorder appointed under an act of 1840. In the case of Dublin, Cork, Belfast, Londonderry and Galway, the office of recorder may be united with that of chairman of quarter sessions for the adjoining county. The general criminal jurisdiction of the quarter sessions has the same origin and is on the same lines as in England; but the limitations imposed as to offences which may be tried are not so narrow as in England. The sessions, &c, are regulated in the main by an act of 1851. The appellate juris- diction rests on different statutes from those applicable to England, but is on the same lines (see 14 & 15 Vict. c. 93 ; 40 & 41 Vict. c. 56). In Ireland quarter sessions courts are held before a salaried

officer once styled the assistant barrister and now chairman, who is usually also judge of a civil bill court (the Irish county court), or recorder of a neighbouring city or borough. The appointment and tenure of office of the chairman is regulated by statutes datirg from 185 1

to 1889. The jurisdiction of the court is not limited by the Quarter Sessions Act 1842.

India. — In India courts of record were established in Madras and Bombay, originally styled mayors' courts and subsequently made recorders' courts, with a jurisdiction corresponding as to criminal matters to that of a borough court of quarter sessions in England. Throughout India there are under the Criminal Procedure Code of 1898 courts of sessions in each province for the purpose of criminal jurisdiction, which take the place of assizes and quarter sessions in England. They are under the supervision of the High Courts; but can try and sentence for any crime, subject as to sentences of death to confirmation by the High Court.

Canada. — In Canada courts of general quarter sessions exist in some provinces, e.g. Quebec. In New Brunswick they are replaced by the county court. Their jurisdiction to try indictable offences is defined by Part 42 of the Criminal Code 1892.

Australia. — In Queensland the place of quarter sessions is taken by the district courts, which have a criminal jurisdiction substantially the same as that of the English court of quarter sessions (31 Vict. No. 30, s. 117). In New South Wales quarter sessions continue. In Victoria a court of general sessions has been created by statute with powers closely resembling those of the English court of quarter sessions {re Dunn, 1906, Victoria State Rep. 493).

United States. — Courts of quarter sessions exist in many of the states; their jurisdiction is determined by state legislation, and extends as a rule only to the less grave crimes. They are in most, if not all, states held before professional judges. (W. F. C.)

QUARTER-STAFF, a staff of wood from 6 to 9 ft. in length, used as a means of attack and defence; originally no doubt it was the cudgel or sapling with which many heroes are described by early writers as being armed. The quarter-staff attained great popularity in England in the middle ages. It was usually made of oak, the ends often shod with iron, and it was held with both hands, the right hand grasping it one quarter of the distance from the lower end (whence the name) and the left at about the middle.

Egerton Castle {Schools and Masters of Fence) says that the staff was the "

foil," or practice-substitute for the long sword, or two-hander. In earlier times it may also have been used as a practice weapon for the spear and bill. In the prints illustrative of the life of Richard Beauchamp, earl of Warwick (1382-1439), reproduced in Joseph Strutt's Manners, Customs, Arms, Habits, b°c. of the Inhabitants of England, may be seen a combat between two knights after they have splintered their lances and dismounted, in which both are fighting with pointed staves about as long as a quarter-staff and held in the same manner. In the 1 7th century the staff was still popular in England.

At the present time the quarter-staff is used to a limited extent in military circles as a school for bayonet play. It is somewhat lighter than the old weapon, being usually made of bamboo and about 8 ft. long. Sabre-masks, gloves, padded jackets and shin-guards are worn. Another kind of staff, called by Captain A. Hutton {Cold Steel) the Great Stick, about 5 ft. long and made of stout rattan, is used in the French and Italian armies in general gymnastic exercises and as a school for bayonet play. The Italian method rather resembles that of the old two-handed sword, while the French approaches more closely to English quarter-staff play.

See Quarter-Staff, -by T. A. McCarthy (London, 1883) ; Broadsword and Singlestick, by R. G. Allanson-Winn and C. Phillips-Wolley (London, 1898).

QUARTO, a shortened form of Lat. in quarto, " in a fourth," i.e. of a sheet of paper, applied to a size of paper, and to a size of a printed volume. Paper is in quarto when a whole single sheet is folded twice so as to form four leaves; a book is technically termed of " quarto " size when made up of sheets. folded twice.

QUARTZ, a widely distributed mineral species, consisting of silicon dioxide, or silica (S1O2). It is the commonest of minerals, and is met with in a great variety of forms and with very diverse modes of occurrence. The various forms of silica have attracted attention from the earliest times, and the water-clear crystallized variety was known to the Greeks as Kptio-raXXos (clear ice), being supposed by them to have been formed from water by the intense cold of the Alps; hence the name " crystal," or more commonly rock-crystal, applied to this variety. The name quartz is an old German word of uncertain origin: it was used by G. Agricola : a 1529.

Quartz is a mineral which is put to many uses. Several of the varieties are

cut into gems and ornaments, balance weights, pivot supports for delicate instruments, agate mortars, &c; or used for engraving, for instance, cameos and the elaborately carved crystal vases of ancient and medieval times. Clear transparent rock-crystal is used for optical purposes and spectacle lenses. Fused quartz has recently been used for the construction of lenses and laboratory vessels, or it may be drawn out into the finest elastic fibres and used for suspending mirrors, &c, in physical apparatus. For striking fire, flint is used even to the present day. Buhrstone, a cellular variety of chalcedonic quartz from the Tertiary strata of the Paris basin, is largely used for millstones. Quartz is a valuable grinding and polishing material, and is used for making sand- paper and scouring-soap. It is also largely used in the manufacture of glass and porcelain, " silver sand " being a pure quartz sand.

Quartz crystallizes in the trapezohedral-hemihedral class of the rhombohedral division of the hexagonal system. Crystals of this class possess neither planes nor centre of symmetry, but only axes of symmetry: perpendicular to the principal triad axis there are three uniterminal dyad axes of symmetry. Usually, however, this lower degree of symmetry is not indicated by the faces developed on the crystals. The majority of crystals of quartz are bounded only by the faces of a hexagonal prism m\2il\ and a hexagonal bipyramid (fig. i), though sometimes the prism is absent (fig. 2). Frequently the faces are of different sizes (fig. 3) : mis-shapen crystals

Fig. 1.

Fig. 2.

Fig. 3.

are common and sometimes very puzzling, but they can always be orientated by the aid of the very characteristic striations on the prism faces, which serve also to distinguish quartz from other minerals of similar appearance. These striations (fig. 3) are horizontal in direction, being parallel to the edges of intersection between the prism and pyramid faces, and are due to the frequent oscillatory combination of these faces. The apparent hexagonal bipyramid is really a combination of two rhombohedra, the direct rhombohedron rjiooj and the inverse rhombohedron 2(221). The faces of these two rhombohedra exhibit differences in surface characters, those of r being usually brighter in lustre than those of z; further, the former often predominate in size (figs. 4 and 5), and the latter may sometimes be completely absent. When both the prism and the rhombohedron z are absent, the crystals resemble cubes in appearance, since the angles between the faces of the rhombohedron are 85 46'. The additional faces s and x (figs. 4 and 5), which indicate the true

degree of symmetry of quartz, are of comparatively rare occurrence except on crystals from certain localities. The six small faces 5(412) situated on alternate corners at each end of the crystal, are called the " rhomb " faces, because of their shape; if extended they would give a trigonal bipyramid. The " trapezohedral," or " plagihedral," faces XJ412) belong to a trigonal trapezohedron. The two crystals shown in figs. 4 and 5 are

Fig. 4.

Fig.

enantiomorphous, i.e. they are non-superposable, one being the mirror reflection of the other: they are left-handed and right-handed crystals respectively. The faces 5 are striated parallel to their edge

of intersection with r; this serves to distinguish r and z, and thus, in the absence of x faces, to distinguish left- or right-handed crystals. Numerous other faces have been observed on crystals of quartz, but they are of rare occurrence. The basal plane, so common on calcite and many other rhombohedral minerals, is of the greatest rarity in quartz, and when present only appears as a small rough face formed by the corrosion of the crystal. Faces of prisms other than m are also small and of exceptional occurrence.

Twinned crystals of quartz are extremely common, but are complex in character and can only be deciphered when the faces 5 and x are present, which is not often the case. Usually they are interpenetra- tion twins with the principal axis as twin-axis; the prism planes of the two individuals coincide, and the faces r and z also fall into the same plane. Such twins may therefore be mistaken for simple crystals unless they are attentively studied; but the twinning is often made evident by the presence of irregularly bounded areas of the duller z faces coinciding with the brighter r faces. In a rarer type of twinning, in which the twin-plane is (52T) (a plane truncating the edge between r and z), the two individuals are united in juxta- position with their principal axis nearly at right angles (84 33')- A few magnificent specimens of rock-crystal twinned according to this law have been found at La Gardette in Isere, and in Japan they are somewhat abundant.

The pyro-electric characters of quartz are closely connected with its peculiar type of symmetry and especially with the three uniterminal dyad axes. A crystal becomes positively and negatively electrified in alternate prism edges when its temperature changes.ˆ A similar distribution of electric charges is produced when a crystal is subjected to pressure; quartz being thus also piezo-electric. Etched figures, both natural and artificial (in the

latter case produced by the action of hydrofluoric acid), on the faces of the crystals are in accordance with the symmetry, and may serve to distinguish left- and right- handed crystals.

In its optical characters, quartz is also of interest, since it is one of the two minerals (cinnabar being the other) which are circularly polarizing. This phenomenon is connected with the symmetry of the crystals, and is also shown by the crystals of certain other substances in which there are neither planes nor centre of symmetry. A ray of plane-polarized light traversing a right-handed crystal of quartz in the direction of the triad axis has its plane of polarization rotated to the right, while a left-handed crystal rotates it to the left. A section I mm. thick, cut perpendicular to the principal axis of a quartz crystal, rotates the plane of yellow (D) light through 22 , and of blue (G) light through 43 . Such a section when examined in the polariscope shows an interference figure with a coloured centre, there being no black cross inside the innermost ring (this is not shown in very thin sections). Superimposed sections of right- and left-handed quartz, as may sometimes be present in sections of twinned crystals, exhibit Airy's spirals in the polariscope. The indices of refraction of quartz for yellow (D) light are w = 1-5442 and e = 1-5533; the optic sign is therefore positive.

Quartz has a hardness of 7 (being chosen as No. 7 on Mohs'_ scale), and it cannot be scratched with a knife; its specific gravity is 2-65. There is no distinct cleavage; though an imperfect cleavage may sometimes be developed parallel to the faces of the rhombohedron r by plunging a heated crystal into cold water. The glassy conchoidal fracture is a characteristic feature of the crystallized mineral. A peculiar rippled or " thumb-marked " fracture is sometimes to be seen, especially in amethyst (g.».), and is due to repeated inter- growths of right- and left-handed material. The mineral is a non-conductor of electricity; it is unattacked by acids with the exception of hydrofluoric acid, and is only slightly dissolved by solutions of caustic alkalis. It is infusible before the gas blowpipe, but in the oxyhydrogen flame fuses to a clear colourless glass, which has a hardness of 5 and specific gravity 2-2.

Many peculiarities of the growth of crystals are well illustrated by the mineral quartz. Thus in "ghost quartz," in which one crystal is seen inside another, the stages of growth are marked out by thin layers of enclosed material. In " capped quartz " these layers are thicker, and the successive shells of the crystal may be easily separated. " Sceptre quartz," in which a short thick crystal is mounted on the end of a long slender prism, indicates a change in the conditions of growth. Crystals with a helical twist are not uncommon. Enclosures of other minerals (rutile, chlorite, haematite, gothite, actinolite, asbestos and many others) are extremely Frequent in crystals of quartz. Cavities, either rounded or with the same shape ("

negative crystals “) as the surrounding crystal, are also common; they are often of minute size and present in vast numbers. Usually these cavities contain a liquid (water, a saline solution, carbon dioxide or petroleum) and a movable bubble of gas. The presence of these enclosed impurities impairs the transparency of crystals. Crystals of quartz are usually attached at one end to their rocky matrix, but sometimes, especially when embedded in a soft matrix of clay, gypsum or salt, they may be bounded on all sides by crystal faces (fig. 1). In size they vary between wide limits, from minute sparkling points encrusting rock surfaces and often so thickly clustered together as to produce a drusy effect, to large single crystals measuring a yard in length and diameter and weighing half a ton.

The characters as given above apply more particularly to crystals •of quartz, but in the various massive and compact varieties the material may be quite different in general appearance. Thus in the microcrystalline chalcedony (q.v.) the lustre is waxy, the fracture fibrous to even, and the external form botryoidal or stalactitic: flint and chert are compact and have a splintery fracture: jasper (q.v.) is a compact variety intermixed with much iron oxide, and clay and has a dull and even fracture. Further, these varieties may be of almost any colour, whereas transparent crystals have only a limited range of colour, being either colourless (rock-crystal), violet (amethyst), brown (smoky quartz) or yellow (citrine).

Quartz occurs as a primary and essential constituent of igneous rocks of acidic composition such as granite, quartz-porphyry and rhyolite, being embedded in these either as irregularly shaped masses or as porphyritic crystals. In pegmatite (graphic granite) and granophyre it often forms a regular intergrowth with felspar. It is also a common constituent, as irregular grains, in many gneisses and crystalline schists, a quartz-schist being composed largely^ of quartz. By the weathering of silicates, silica passes into solution and quartz is deposited as a secondary product in the cavities of basic igneous rocks, and in fact in the crevices and along the joints of rocks of almost all kinds. Extensive veins of quartz are especially frequent in schistose rocks. Vein-quartz, often of economic import- ance as a matrix of gold, may, however, in some cases have been of igneous origin. In mineral veins and lodes crystallized quartz is usually the most abundant gangue mineral; the crystals are often arranged perpendicular to the walls of the ‘ode, giving rise to a ” comby ” structure. In limestones of various kinds it occurs as nodules and bands of chert and flint, being in this case of organic origin. Quartz being a mineral very resistant to weathering agencies, it forms the bulk of sands and sandstones; and when the sand

grains are cemented together by a later deposit of secondary quartz a rock known as quartzite results. Pseudomorphous quartz, i.e. quartz replacing other minerals, is of frequent occurrence, ami as a petrifying material replacing organic remains it is often met with. As a deposit from hot springs, quartz is much less common than opal. Crystals of quartz may be readily prepared artificially by a number of methods; for example, by heating glass or gelatinous silica with water under pressure.

For particulars respecting the special characters, modes of occur- rence and localities of the more important varieties of quartz, reference may be made to the following articles : Agate, Amethyst,

AvENTURINE, BLOODSTONE, CAIRNGORM, CaRNELIAN, Cat's-EYE,

Chalcedony, Chrysoprase, Flint, Hei.iotropeJasper, Mocha- Stone, Onyx, Rock-Crystal, Sard, Sardonyx. For other forms of silica see Opal and Tridymite. (L. J. S.)

QUARTZITE, in petrology, a sandstone which by the deposit of crystalline quartz between its grains has been com- pacted into a solid quartz rock. As distinguished from sand- stones, quartzites are free from pores and have a smooth fracture, since when struck with the hammer they break through the sand grains, while in sandstones the fracture passes through the cementing material and the rounded faces of the grains are exposed, giving the broken surface a rough or granular appear- ance. The conversion of sandstone into quartzite is sometimes the work of percolating water under ordinary conditions. In the Reading beds of England, which are for the most part loose sands, there are often many large blocks of quartzite which weather out and are exposed at the surface, being known as grey-wethers. The silicification of these rocks must have taken place at no great depth and under ordinary pressures. Most quartzites, however, are found among ancient rocks, such as the Cambrian or Pre-Cambrian. Instances are the Lickey quartzite of Shropshire, the Holyhead quartzite of Anglesey, the Durness quartzite of Sutherlandshire, the Banff- shire and Perthshire quartzites and the Cherbourg quartzite. As these rocks lie in regions where there has been a considerable amount of metamorphism we may infer that (in addition to time and pressure) folding and rise of temperature favour the production of rocks of this type.

A normal quartzite has in microscopic section its clastic structure well preserved; the rounded sand grains are seen with patches of new quartz in the interspaces, and the latter is often deposited in crystalline continuity, so that the optical properties of the grains are similar to those of the material which surrounds them : a line, of iron oxides or other impurities often indicates the boundary of the original sand grain. As might be expected,

however, many of the oldest quartzites have been crushed by folding movements and the quartz consists in large part of a mosaic of small crystalline fragments of irregular shape with interlocking margins; these are called " sheared quartzites," and when they contain white mica in parallel crystalline flakes they become more fissile and pass into quartz-schists. Where sandstones are baked by intrusive

granite or diabase they are often converted into pure quartzite, the heat evidently occasioning the deposit of interstitial quartz.

The commonest minerals in quartzite, in addition to quartz, are felspar (microcline, orthoclase, oligoclase), white mica, chlorite, iron oxides, rutile, zircon and tourmaline. Except felspar they are usually present only in small quantity; the less frequent accessories include hornblende, sillimanite, garnet, biotite, graphite, magnetite and epidote. In colour quartzites are often snowy white; they frequently have a fine angular jointing and break up into rubble under the action of frost. Quartzites are too hard and splintery to be used as building stones to any large extent : they furnish a thin and very barren soil, and because they weather slowly tend to project as hills or mountain masses. They are rarely fossiliferous (e.g. Gorran in Cornwall), though many of them contain worm casts which may be dragged out into long sinuous markings when the rock is much folded (Durness quartzite). Although much used as road stones, being very hard, they are readily crushed to powder unless well embedded in the road surface; the Cherbourg and Emborough (near Bristol) stones are employed for this purpose. Quartzite blocks may be used in tube mills for crushing and grinding ores, cements, &c. ; rarely they have been adopted as a substitute for flint by Palaeolithic man for the fabrication of weapons and tools. (J. S. F.)

QUARTZ-PORPHYRY, in petrology, the name given to a group of hemi-crystalline acid rocks containing porphyritic crystals of quartz in a more fine-grained matrix which is usually of micro-crystalline or felsitic structure. In the hand specimens the quartz appears as small rounded, clear, greyish, vitreous blebs, which are crystals (double hexagonal pyramids) with their edges and corners rounded by resorption or corrosion. Under the microscope they are often seen to contain rounded enclosures of the ground-mass or fluid cavities, which are frequently negative crystals with regular outlines resembling those of perfect quartz crystals. Many of the latter contain liquid carbonic acid and a bubble of gas which may exhibit vibratile motion under high magnifying powers. In addition to quartz there are usually phenocrysts of felspar, mostly orthoclase, though a varying amount of plagioclase is often present. The felspars are usually full and cloudy from the formation of secondary kaolin and muscovite throughout their substance. Their crystals are larger than those of quartz

and sometimes attain a length of two inches. Not uncommonly scales of biotite are visible in the specimens, being hexagonal plates, which may be weathered into a mixture of chlorite and epidote. Other porphyritic minerals are few, but hornblende, augite and bronzite are sometimes found, and garnet, cordierite and muscovite may also occur. The garnets are small, of rounded shape and red or brownish colour; in some cases they appear to have been corroded or absorbed. Cordierite forms six-sided prisms with flat ends; these divide, between crossed nicols, into six triangular areas radiating from a centre, as the crystals, which belong to the rhombic system, are not simple but consist of three twins interpenetrating and crossing. In the vast majority of cases the cordierite has weathered to an aggregate of scaly chlorite and muscovite; this is known as pinite and is of dark green colour and very soft. The quartz-porphyries or elvans which occur as dikes in Cornwall and Devon frequently contain this mineral. The augite and horn- blende of these rocks are in most cases green, and are frequently decomposed into chlorite, but even then can usually be identified by their shape. A colourless rhombic pyroxene (enstatite or bronzite) occurs in a limited number of the rocks of this group and readily weathers to bastite. Apatite, magnetite, and zircon, all in small but frequently perfect crystals, are almost universal minerals of the quartz-porphyries.

The ground-mass is finely crystalline and to the unaided eye has usually a dull aspect resembling common earthenware; it is grey, green, reddish or white. Often it is streaked or banded by fluxion during cooling, but as a rule these rocks are not vesicular. Two main types may be recognized by means of the microscope — the felsitic and the microcrystalline. In the former the ingredients are so fine-grained that in the thinnest slices they cannot be deter- mined by means of the microscope. Some of these rocks show perlitic or spherulitic structure, and such rocks were probably originally glassy (obsidians or pitchstones) , but by lapse of time and processes of alteration have slowly passed into very finely crystal- line state. This change is called devitrification; it is common in glasses, as these are essentially unstable. A large number of the finer quartz-porphyries are also in some degree silicified oi

impregnated by quartz, chalcedony and opal, derived from the silica set free by decomposition (kaolinization) of the original felspar. This re-deposited silica forms veins and patches of indefinite shape or may bodily replace a considerable area of the rock by metasomatic substitution. The opal is amorphous, the chalcedony finely crystalline and often arranged in

spherulitic growths which yield an excellent black cross in polarized light. The microcrystalline ground-masses are those which can be resolved into their component minerals in thin slices by use of the microscope. They prove to consist essentially of quartz and felspars, which are often in grains of quite irregular shape (microgranitic). In other cases these two minerals are in graphic intergrowth, often forming radiate growths of spherulites consisting of fibres of extreme tenuity; this type is known as granophyric. There is another group in which the matrix contains small rounded or shapeless patches of quartz in which many rectangular felspars are embedded ; this structure is called micropoikilitic, and though often primary is sometimes developed by secondary changes which involve the deposit of new quartz in the ground-mass. As a whole those quartz-porphyries which have microcrystalline ground-masses are rocks of intrusive origin. Elvan is a name given locally to the quartz-porphyries which occur as dikes in Cornwall; in many of them the matrix contains scales of colourless muscovite or minute needles of blue tourmaline. Fluorite and kaolin appear also in these rocks, and the whole of these minerals are due to pneumatolytic action by vapours permeating the porphyry after it had consolidated but probably before it had entirely cooled.

Many ancient rhyolitic quartz-porphyries show on their weathered surfaces numerous globular projections. They may be several inches in diameter, and vary from this size down to a minute fraction of an inch. When struck with a hammer they may detach readily from the matrix as if their margins were defined by a fissure. If they are broken across their inner portions are often seen to be filled with secondary quartz, chalcedony or agate: some of them have a central cavity, often with deposits of quartz crystals; they also frequently exhibit a succession of rounded cracks or dark lines occupied by secondary products. Rocks having these struc- tures are common in N. Wales and Cumberland; they occur also in Jersey, the Vosges and Hungary. It has been proposed to call them pyromerides. Much discussion has taken place regarding the origin of these spheroids, but it is generally admitted that most of them were originally spherulites, and that they have suffered extensive changes through decomposition and silicification.

Many of the older quartz-porphyries which occur in Palaeozoic and Pre-Cambrian rocks have been affected by earth movements and have experienced crushing and shearing. In this way they become schistose, and from their felspar minute plates of sericitic white mica are developed, giving the rock in some cases very much of the appearance of mica-schists. If there have been no pheno- crysts in the original rock, very perfect mica-schists may be produced, which can hardly be distinguished from sedimentary schists, though chemically somewhat different on account of the larger amounts of alkalis which igneous rocks contain. When

phenocrysts were present they often remain, though rounded and dragged apart while the matrix flows around them. The glassy or felsitic enclosures in the quartz are then very suggestive of an igneous origin for the rock. Such porphyry-schists have been called porphyroids or porphyroid-schists, and in America the name aporhyolite has been used for them. They are well known in some parts of the Alps, Westphalia, Charnwood (England), and Pennsylvania. The hdlleflintas of Sweden are also in part acid igneous rocks with a well-banded schistose or granulitic texture.

The quartz-porphyries are distinguished from the rhyolites by being either intrusive rocks or Palaeozoic lava's. All Tertiary acid lavas are included under rhyolites. The intrusive quartz- porphyries are equally well described as granite-porphyries. The palaeozoic effusive quartz-porphyries (or acid lavas) would be called rhyolites by many English petrologists, who regard geological age as of no importance in petrological classifications. But the name quartz-porphyry, though somewhat ambiguous, is so expressive and so firmly established by long-continued use that it cannot be discarded, especially as a descriptive name for the use of field geologists. (J. S. F.)

QUASSIA, the generic name given by Linnaeus to a small tree of Surinam in honour of the negro Quassi or Coissi, who em- ployed the intensely bitter bark of the tree (Quassia amara) as a remedy for fever. The original quassia was officially recognized in the London Pharmacopoeia of 1788. In 1809 it was replaced by the bitter wood or bitter ash of Jamaica, Picraena excelsa, which was found to possess similar properties and could be obtained in pieces of much larger size. Since that date this wood has continued in use in Britain under the name of quassia to the exclusion of the Surinam quassia, which, however, is still employed in France and Germany. Picraena excelsa is a tree 50 to 60 ft. in height, and resembles the common ash in appearance. It has large compound leaves composed of four

or five pairs, with a terminal odd one, of short-stalked, oblong, blunt, leathery leaflets, and inconspicuous green flowers. The fruit consists of black shining drupes about the size of a pea. It is found also in other West Indian islands, as Antigua and St Vincent. Quassia amara is a shrub or small tree belonging to the same natural order as Picraena, viz. Simarubaceae, but is readily distinguished by its large handsome red flowers arranged in terminal clusters. It is a native of Panama, Venezuela, Guiana and northern Brazil. Jamaica quassia is imported into England in logs several feet in length and often nearly one foot in thickness, consisting of pieces of the trunk and larger branches. The thin greyish bark is usually removed. The wood is nearly white, or of a yellowish tint, but sometimes exhibits blackish markings due to the mycelium of a fungus, The wood has a pure bitter taste, and is without odour or aroma. It is usually to be met

with in the form of turnings or raspings, the former being obtained in the maufacture of the " bitter cups " which are made of this wood. The chief constituent is a bitter neutral principle known as quassin. It exists in the wood to the extent of about fo%. It forms crystalline needles soluble in alkalis, chloroform and 200 parts of water. There is also present a volatile oil. The wood con tains no tannin, and for this reason quassia, like chiretta and calumba, may be preserved with iron. The infusion is useful as a bitter tonic — a group of substances of which calumba is the type — and is also a very efficient anthelmintic for the threadworm (Oxyuris vermicularis) . It is tfted by brewers as a substitute for hops.

QUATERNARY, in geology, the time – division which embraces the Pleistocence and Holocene epochs, i.e. the later portion of the Cainozoic era, equivalent to the " Post-Pliocene " or " Post-Tertiary " of certain writers. The term was proposed by J. Desnoyers in 1829 to cover those formations which were formed just anterior to the present. There are other ways of regarding the Quaternary time. Sir A. Geikie (Text Book of Geology, 4th ed., 1903) divides it into an upper, post-glacial or Human period, and a lower, Pleistocene or Glacial period; but he subdivides the former into an Historic and a Prehistoric epoch, a scheme presenting difficulties, for the Palaeolithic or lower stage of prehistoric time cannot really be separated from the Pleistocene (q.v.). E. Kayser (Formationskunde, 3rd. ed., 1906), who is in agreement with the definition accepted above, employs a nomenclature which is rarely adopted by British geologists; he divides the Quartat formation (Quartar) into a younger, modern epoch, the Alluvium, and an older epoch, the Pleistocene or Diluvium (= Glacial) . A. de Lapparent, on the other hand (Traite de geologie, 5th ed., 1906), treats the Era moderne or Quaternaire as a great time division equivalent in value to the Tertiary, Secondary, &c, which is so far represented only by a first epoch, the Pleistocene.

QUATERNIONS, in mathematics. The word " quaternion " properly means "a set of four." In employing such a word to denote a new mathematical method, Sir W. R. Hamilton was probably influenced by the recollection of its Greek equivalent, the Pythagorean Tetractys (Terpa/crw, the number four), the mystic source of all things. Quaternions (as a mathematical method) is an extension, or improvement, of Cartesian geometry, in which the artifices of co-ordinate axes, Sic, are got rid of, all directions in space being treated on precisely the same terms. It is therefore, except in some of its degraded forms, possessed of the perfect isotropy of Euclidian space. From the purely geometrical point of view, a quaternion may be regarded as the quotient of two directed lines in space — or, what comes to the same thing, as the factor, or operator, which changes one directed line into another. Its analytical definition will appear later.

History. — The evolution of quaternions belongs in part to each of two weighty branches of mathematical history — the interpretation of the imaginary (or impossible) quantity of common algebra, and the Cartesian application of algebra to geometry. Sir W. R. Hamilton was led to his great invention by keeping geometrical applications constantly before him I while he endeavoured to give a real significance to V – i- We will

therefore confine ourselves, so far as his predecessors are con- cerned, to attempts at interpretation which had geometrical applications in view.

One geometrical interpretation of the negative sign of algebra was early seen to be mere reversal of direction along a line. Thus, when an image is formed by a plane mirror, the distance of any point in it from the mirror is simply the negative of that of the corresponding point of the object. Or if motion in one direction along a line be treated as positive, motion in the opposite direction along the same line is negative. In the case of time, measured from the Christian era, this distinction is at once given. by the letters a.d. or B.C., prefixed to the date. And to find the position, in time, of one event relatively to another, we have only to subtract the date of the second (taking account of its sign) from that of the first. Thus 1 to find the interval between the battles of Marathon (4Q0 B.C.) and Waterloo (a.d. 181 5) we have

+ 1 8 1 5 – (– 490) =2305 years. And it is obvious that the same process applies in all cases in which we deal with quantities which may be regarded as of one directed dimension only, such as distances along a line, rotations about an axis, &c. But it is essential to notice that this is by no means necessarily true of operators. To turn a line through a certain angle in a given plane, a certain operator is required; but when we wish to turn it through an equal negative angle we must not, in general, employ the negative of the former operator. For the negative of the operator which turns a line through a given angle in a given plane will in all cases produce the negative of the original result, which is not the result of the reverse operator, unless the angle involved be an odd multiple of a right angle. This is, of course, on the usual assumption that the sign of a product is changed when that of any one of its factors is changed, — which merely means that-i is commutative with all other quantities.

John Wallis seems to have been the first to push this idea further. In his Treatise of Algebra (1685) he distinctly proposes to construct the imaginary roots of a quadratic equation by going out of the line on which

the roots, if real, would have been constructed.

*In 1804 the Abbe Buee (Phil. Trans., 1806), apparently without any knowledge of Wallis's work, developed this idea so far as to make it useful in geometrical applications. He gave, in fact, the theory of what in Hamilton's system is called Com- position of Vectors in one plane — i.e. the combination, by + and — , of complanar directed lines. His constructions are based on the idea that the imaginaries = ± = V — 1 represent a unit line, and its reverse, perpendicular to the line on which the real units = *= 1 are measured. In this sense the imaginary expression a + b V — 1 is constructed by measuring a length a along the fundamental line (for real quantities), and from its extremity a line of length b in some direction perpendicular to the funda- mental line. But he did not attack the question of the repre- sentation of products or quotients of directed lines. The step he took is really nothing more than the kinematical principle of the composition of linear velocities, but expressed in terms of the algebraic imaginary.*

In 1806 (the year of publication of Buee's paper) Jean Robert Argand published a pamphlet 2 in which precisely the same ideas are developed, but to a considerably greater extent. For an interpretation is assigned to the product of two directed lines in one plane, when each is expressed as the sum of a real and an imaginary part. This product is interpreted as another directed line, forming the fourth term of a proportion, of which the first

1 Strictly speaking, this illustration of Tait's is in error by unity because in our calendar there is no year denominated zero. Thus the interval between June the first of 1 B.C. and June the first of I a.d. is one year, and not two years as the text implies. (A.McA.)

2 Essai sur une mamere He representer les Quantites Imaginaires dans les Constructions Geometnnues. A second edition was published by J. Houel (Paris, 1874). There is added an important Appendix, consisting of the papers from Gergonne's Annates which are referred to in the text above. Almost nothing can, it seems, be learned of Argand's private life, except that in all probability he was born at Geneva in 1768.

term is the real (positive) unit-line, and the other two are the factor-lines. Argand's work remained unnoticed until the question was again raised in Gergonne's Annates, 1813, by J. F. Franjais. This writer stated that he had found the germ of his remarks among the papers of his deceased brother, and that they had come from Legendre, who had himself received them from some one unnamed. This led to a letter from Argand, in which he stated his communications with Legendre, and gave a risume of the contents of his pamphlet. In a further communication to the Annates,

Argand pushed on the applica- tions of his theory. He has given by means of it a simple proof of the existence of n roots, and no more, in every rational algebraic equation of the «th order with real coefficients. About 1828 John Warren (1796-1852) in England, and C. V. Mourey in France, independently of one another and of Argand, reinvented these modes of interpretation; and still later, in the writings of Cauchy, Gauss and others, the properties of the expression a + b V — 1 were developed into the immense and most important subject now called the theory of complex numbers (see Number). From the more purely symbolical view it was developed by Peacock, De Morgan, &c, as double algebra.

Argand's method may be put, for reference, in the following form. The directed line whose length is o, and which makes an angle with the real (positive) unit line, is expressed by a (cos 0-f-i sin 0), where i is regarded as + V — 1. The sum of two such lines (formed by adding together the real and the imaginary parts of two such expressions) can, of course, be expressed as a third directed line) — the diagonal of the parallelogram of which they are conterminous sides. The product, P, of two such lines is, as we have seen, given by I:a(cos0-Hsin0) : : a'(cos0'+i sin 0'): P,

or P=aa'[cos (0+0') + isin (0+0')}.

Its length is, therefore, the product of the lengths of the factors, and its inclination to the real unit is the sum of those of the factors. If we write the expressions for the two lines in the form A+Bi, A' + B'i, the product is AA'-BB'+tfAB'+BA'); and the fact that the length of the product line is the product of those of the factors is seen in the form

(A 2 +B 2)(A' 2 +B' 2) = (AA'-BB') 2 +(AB'+BA') 2 . In the modern theory of complex numbers this is expressed by saying that the Norm of a product is equal to the product of the norms of the factors.

Argand's attempts to extend his method to space generally were fruitless. The reasons will be obvious later; but we mention them just now because they called forth from F. J. Servois (Gergonne's Annates, 1813) a very remarkable comment, in which was contained the only yet discovered trace of an anticipation of the method of Hamilton. Argand had been led to deny that such an expression as i» could be expressed in the form A+Bi, — although, as is well known, Euler showed that one of its values is a real quantity, the exponential function of — 7r/2. Servois says, with reference to the general representa tion of a directed line in space: — ;

" L'analogie semblerait exiger que le trin&me fut de la forme p cos a +g cos /3+r cos y; a, (3, 7 6tant les angles d'une droite avec trois axes rectangulaires ; et qu'on eut

{p cos a + a cos + r cos 7) (p' cos a + q' cos £ + r' cos 7) = cos 2 a +cos 2 /3+cos 2 7 = 1. Les valeurs de p, a, r, p', q,' r', qui satisferaient a cette condition seraient absurdes; mais seraient-elles imaginaires, reductibles k la forme generate A+BV-i ? Voila une question d'analyse fort singuliere que je soumets a vos lumieres. La simple proposition que je. vous en fais suffit pour vous faire voir que je ne crois point que toute fonction analytique non reˆelle soit vraiment reductible a la forme A+B V —I."

As will be seen later, the fundamental i, j, k of quarternions, with their reciprocals, furnish a set of six quantities which satisfy the conditions imposed by Servois. And it is quite certain that they cannot be represented by ordinary imaginaries. Something far more closely analogous to quaternions than anything in Argand's work ought to have been suggested by De Moivre's theorem (1730). Instead of regarding, as Buee and Argand had done, the expression a(cos d + i sin 6) as a directed line, let us suppose it to represent the operator which, when applied to any line in the plane in which 6 is measured, turns it in that plane through the angle 6, and at the same time increases its length in the ratio a : 1. From the new point of view we see at once, as it were, why it is true that (cos + i sin 0) m = cos mS + i sin mS.

For this equation merely states that m turnings of a line through successive equal angles, in one plane, give the same result as a single turning through m times the common angle. To make this process applicable to any plane in space, it is clear that we must have a special value of i for each such plane. In other words, a unit line, drawn in any direction whatever, must have — i for its square. In such a system there will be no line in space specially distinguished as the real unit line: all will be alike imaginary, or rather alike real. We may state, in passing, that every quaternion can be represented as a (cos 8+ ir sin 8), — where a is a real number, 8 a real angle, and it a directed unit line whose square is — i. Hamilton took this grand step, but, as we have already said, without any help from the previous work of De Moivre. The course of his investigations is minutely described in the preface to his first great work (Lectures on Quaternions, 1853) on the subject. Hamilton, like most of the many inquirers who endeavoured to give a real interpretation to the imaginary of common algebra, found that at least two kinds, orders or ranks of quantities were necessary for the purpose. But, instead of dealing with points on a line, and then wandering out at right angles to it, as Buee and Argand had done, he chose to look on algebra as the science of " pure time," 1 and to investigate the properties of " sets " of time-steps. In its essential nature a set is a

linear function of any number of " distinct " units of the same species. Hence the simplest form of a set is a " couple "; and it was to the possible laws of combination of couples that Hamilton first directed his attention. It is obvious that the way in which the two separate time-steps are involved in the couple will determine these laws of combination. But Hamilton's special object required that these laws should be such as to lead to certain assumed results; and he therefore commenced by assuming these, and from the assumption determined how the separate time-steps must be involved in the couple. It we use Roman letters for mere numbers, capitals for instants of time, Greek letters for time-steps, and a parenthesis to denote a couple, the laws assumed by Hamilton as the basis of a system were as follows: —

*(B lt B 2) – (A, A 2) = (B, – A,, B 2 – A 2) = (a, 0) ; (a, b) (o, 0) = (aa-b0, ba+a/S).**

To show how we give, by such assumptions, a real interpreta- tion to the ordinary algebraic imaginary, take the simple case a = o, b= 1, and the second of the above formulae gives

(O, I)(a,j8) = (-/S,a). Multiply once more by the number-couple (o, 1), and we have (0,I)(0, l)(a,/3) = (0, l)(-/3,a) = (a,/S) = (-I,0)(a,/3) = -(a,/3).

Thus the number-couple (o, 1), when twice applied to a step-couple, simply changes its sign. That we have here a perfectly real and intelligible interpretation of the ordinary algebraic imaginary is easily seen by an illustration, even if it be a somewhat extravagant one. Some Eastern potentate, possessed of absolute power, covets the vast possessions of his vizier and of his barber. He determines to rob them both (an operation which may be very satisfactorily expressed by — 1); but, being a wag, he chooses his own way of doing it. He degrades his vizier to the office of barber, taking all his goods in the process; and makes the barber his vizier. Next day he repeats the operation. Each of the victims has been restored to his former rank, but the operator — 1 has been applied to both.

Hamilton, still keeping prominently before him as his great object the invention of a method applicable to space of three dimensions, proceeded to study the properties of triplets of the form x+iy+jz, by which he proposed to represent the directed line in space whose projections on the co-ordinate axes are x, y, 2. The composition of two such lines by the algebraic

1 Theory of Conjugate Functions, or Algebraic Couples, with a Pre- liminary and Elementary Essay on Algebra as the Science of Pure Time, read in 1833 and 1835, and published in Trans. R. I. A. xvii. ii. (1835).

‘ Compare these with the long-subsequent ideas of Grassmann.

addition of their several projections agreed with the assumption of Buee and Argand for the case of coplanar lines. But, assuming the distributive principle, the product of two lines appeared to give the expression

xx’ —yy’—zz’ +i(yx’ --xy’) +j(xz’+zx’) +ij(yz’ +2/). For the square of j, like that of i, was assumed to be negative unity. But the interpretation of ij presented a difficulty — in fact the main difficulty of the whole investigation — and it is specially interesting to see how Hamilton attacked it. He saw that he could get a hint from the simpler case, already thoroughly discussed, provided the two factor lines were in one plane through the real unit line. This requires merely that

y : z : : y’ : 2′ ; oryz’— 23/ =0;

but then the product should be of the same form as the separate factors. Thus, in this special case, the term in ij ought to vanish. But the numerical factor appears to be yz’+zy’, while it is the quantity yz’—zy’ which really vanishes. Hence Hamil- ton was at first inclined to think that ij must be treated as nil. But he soon saw that ” a less harsh supposition ” would suit the simple case. For his speculations on sets had already familiarized him with the idea that multiplication might in certain cases not be commutative; so that, as the last term in the above product is made up of the two separate terms ijyz’ and jizy’, the term would vanish of itself when the factor- lines are coplanar provided ij= —ji, for it would then assume the form ij(yz’ —zy’). He had now the following expression for the product of any two directed lines: —

xx’— yy’— zz’--i(yx’+ xy’) +j(xz’ --zx’) +ij(yz’ — zy’). But his result had to be submitted to another test, the Law of the Norms. As soon as he found, by trial, that this law was satisfied, he took the final step. ” This led me,” he says, ” to conceive that perhaps, instead of seeking to confine ourselves to triplets, ... we ought to regard these as only imperfect forms of Quaternions, . . . and that thus my old conception of sets might receive a new and useful application.” In a very short time he settled his fundamental assumptions. He had now three distinct space-units, i, j, k; and the following conditions regulated their combination by multiplication: —

t 2 = j 2 = k 2 =—i, ij= —ji = k, jk = — kj = i, hi = —ik =j. z
And now the product of two quaternions could be at once expressed as a third quaternion, thus —

(a+ib+jc+kd)(a’+ib’+jc’+kd’)=A+iB+jC+kD, where

A = aa' — bb' —cc'—dd',

B=ab'+ba'+cd'-dc',

C=ac'--ca'--db' — bd',

D = ad'+da'--bc'—cb'.

Hamilton at once found that the Law of the Norms holds, — not being aware that Euler had long before decomposed the product of two sums of four squares into this very set of four squares. And now a directed line in space came to be repre- sented as ix--jy--kz, while the product of two lines is the quaternion

— (xx'+ yy'+zz') +i(yz' —zy') +j(zx'—xz') +k(xy' —yx'). To any one acquainted, even to a slight extent, with the ele- ments of Cartesian geometry of three dimensions, a glance at the extremely suggestive constituents of this expression shows how justly Hamilton was entitled to say: " When the con- ception . . . had been so far unfolded and fixed in my mind, I felt that the new instrument for applying calculation to geo- metry, for which I had so long sought, was now, at least in part, attained." The date of this memorable discovery is October 16,

1843.

*Suppose, for simplicity, the factor-lines to be each of unit length. Then *, y, z, x', y', z' express their direction-cosines. Also, if 8 be the angle between them, and x", y", z" the direction-cosines of a line perpendicular to each of them, we have xx' -{-yy' --zz' = cos 8, yz' —zy" =x" sin 8, &c, so that the product of two unit lines is now expressed as —cos8 + (ix" +jy" --kz") sin 8. Thus, when the factors*

3 It will be easy to see that, instead of the last three of these, we may write the single one ijk = — 1.

are parallel, or = o, the product, which is now the square of any (unit) line is — 1. And when the two factor lines are at right angles to one another, or = 71-/2, the product is simply ix"+jy"--kz", the unit line perpendicular to both. Hence, and in this lies the main element of the symmetry and simplicity of the quaternion calculus, all systems of three mutually rectangular unit lines in space have the same properties as the fundamental system i, j, k. In other words, if the system (considered as

rigid) be made to turn about till the first factor coincides with i and the second with j, the pro- duct will coincide with k. This fundamental system, therefore, becomes unnecessary; and the quaternion method, in every case, takes its reference lines solely from the problem to which it is applied. It has therefore, as it were, a unique internal character of its own.

Hamilton, having gone thus far, proceeded to evolve these results from a characteristic train of a priori or metaphysical reasoning.

Let it be supposed that the product of two directed lines is some- thing which has quantity; i.e. it may be halved, or doubled, for instance. Also let us assume {a) space to have the same properties in all directions, and make the convention (b) that to change the sign of any one factor changes the sign of a product. Then the product of two lines which have the same direction cannot be, even in part, a directed quantity. For, if the directed part have the same direction as the factors, (V) shows that it will be reversed by re- versing either, and therefore will recover its original direction when both are reversed. But this would obviously be inconsistent with (a). If it be perpendicular to the factor lines, (a) shows that it must have simultaneously every such direction. Hence it must be a mere number.

Again, the product of two lines at right angles to one another cannot, even in part, be a number. For the reversal of either factor must, by (b), change its sign. But, if we look at the two factors in their new position by the light of (a), we see that the sign must not change. But there is nothing to prevent its being represented by a directed line if, as further applications of (a) and (b) show we must do, we take it perpendicular to each of the factor lines. Hamilton seems never to have been quite satisfied with the apparent heterogeneity of a quaternion, depending as it does on a numerical and a directed part. He indulged in a great deal of speculation as to the existence of an extra-spatial unit, which was to furnish the raison d'etre of the numerical part, and render the quaternion homogeneous as well as linear. But for this we must refer to his own works.

Hamilton was not the only worker at the theory of sets. The year after the first publication of the quaternion method, there appeared a work of great originality, by Grassmann, 1 in which results closely analogous to some of those of Hamilton were given. In particular, two species of multiplication (" inner " and " outer ") of directed lines in one plane were given. The results of these two kinds of multiplication correspond respec- tively to the numerical and the directed parts of Hamilton's quaternion product. But Grassmann distinctly states in his preface that he had not had leisure to extend his method to angles in space. Hamilton and Grassmann, while their earlier work had much in common, had very different objects in view. Hamilton had geometrical application as his main object; when he realized the quaternion system, he felt that his object was gained, and thenceforth confined himself to the development of his method. Grassmann's object seems to have been, all along, of a much more ambitious character, viz. to discover, if possible, a system or systems in which every conceivable mode of dealing with sets should be included. That he made very great advances towards the attainment of this object all will allow; that his method, even as completed in 1862, fully attains it is not so certain. But his claims, however great they may be, can in no way conflict with those of Hamilton, whose mode of multiplying couples (in which the " inner " and " outer " multiplication are essentially involved) was produced in 1833, and whose quaternion system was completed and published before Grassmann had elaborated for press even the rudimentary portions of his own system, in which the veritable difficulty of the whole subject, the application to angles in space, had not even been attacked. Grassmann made in 1854 a somewhat savage onslaught on Cauchy and De St Venant, the former of whom had invented, while the latter had exemplified in applica tion, the system of " clefs algebriques," which is almost precisely

1 Die Ausdehnungslehre, Leipsic, 1844; 2nd ed., vollstandig und in strenger Form bearbeitet, Berlin, 1862. See also the collected works of Mobius, and

those of Clifford, for a general explanation of Grassmann's method.

that of Grassmann. But it is to be observed that Grassmann, though he virtually accused Cauchy of plagiarism, does not appear to have preferred any such charge against Hamilton. He does not allude to Hamilton in the second edition of his work. But in 1877, in the Mathematische Annalen, xii., he gave a paper " On the Place of Quaternions in the Ausdehnungslehre," in which he condemns, as far as he can, the nomen- clature and methods of Hamilton.

There are many other systems, based on various principles, which have been given for application to geometry of directed lines, but those which deal with products of lines are all of such complexity as to be practically useless in application. Others, such as the Barycentrische Calciil of Mobius, and the Methode des equipollences of Bellavitis, give elegant modes of treating space problems, so long as we confine ourselves to projective geometry and matters of that order; but they are limited in their field, and therefore need not be discussed here. More general systems, having close analogies to quaternions, have been given since Hamilton's discovery was published. As instances we may take Goodwin's and O'Brien's papers in the Cambridge Philosophical Transactions for 1849. (See also Algebra : special kinds.)

Relations to other Branches of Science. — The above narrative shows how close is the connexion between quaternions and the ordinary Cartesian space-geometry. Were this all, the gain by their introduction would consist mainly in a clearer insight into the mechanism of co-ordinate systems, rectangular or not — a very important addition to theory, but little advance so far as practical application is concerned. But, as yet, we have not taken advantage of the perfect symmetry of the method. When that is done, the full value of Hamilton's grand step becomes evident, and the gain is quite as extensive from the practical as from the theoretical point of view. Hamilton, in fact, remarks, 2 " I regard it as an inelegance and imperfection in this calculus, or rather in the state to which it has hitherto been unfolded, whenever it becomes, or seems to become, necessary to have recourse … to the resources of ordinary algebra, for the solution of equations in quaternions." This refers to the use of the x, y, z co-ordinates, — associated, of course, with i,j, k. But when, instead of the highly artificial expression ix+jy--kz, to denote a finite directed line, we employ a single letter, a (Hamilton uses the Greek alphabet for this purpose), and find that we are permitted to deal with it exactly as we should have dealt with the more complex expression, the immense gain is at least in part obvious. Any quaternion may now be expressed in numerous simple forms. Thus we may regard it as the sum of a number and a line, a+a, or as the product, /3y, or the quotient, Se- 1 , of two directed lines, &c, while, in

many cases, we may represent it, so far as it is required, by a single letter such as q, r, &c.

Perhaps to the student there is no part of elementary mathe- matics so repulsive as is spherical trigonometry. Also, every- thing relating to change of systems of axes, as for instance in the kinematics of a rigid system, where we have constantly to consider one set of rotations with regard to axes fixed in space, and another set with regard to axes fixed in the system, is a matter of troublesome complexity by the usual methods. But every quaternion formula is a proposition in spherical (sometimes degrading to plane) trigonometry, and has the full advantage of the symmetry of the method. And one of Hamilton's earliest advances in the study of his system (an advance independently made, only a few months later, by Arthur Cayley) was the interpretation of the singular operator q( )q- 1 , where q is a quaternion. Applied to any directed line, this operator at once turns it, conically, through a definite angle, about a definite axis. Thus rotation is now expressed in symbols at least as simply as it can be exhibited by means of a model. Had quaternions effected nothing more than this, they would still have inaugurated one of the most necessary, and apparently impracticable, of reforms.

The physical properties of a heterogeneous body (provided

they vary continuously from point to point) are known to depend,

in the neighbourhood of any one point of the body, on a quadric

function of the co-ordinates with reference to that point. The

2 Lectures on Quaternions, § 513.

same is true of physical quantities such as potential, temperature, &c, throughout small regions in which their variations are continuous; and also, without restriction of dimensions, of moments of inertia, &c. Hence, in addition to its geometrical applications to surfaces of the second order, the theory of quadric functions of position is of fundamental importance in physics. Here the symmetry points at once to the selection of the three principal axes as the directions for i, j, k; and it would appear at first sight as if quaternions could not simplify, though they might improve in elegance, the solution of questions of this kind. But it is not so. Even in Hamilton's earlier work it was shown that all such questions were reducible to the solution of linear equations in quaternions; and he proved that this,

in turn, depended on the determination of a certain operator, which could be represented for purposes of calculation by a single symbol. The method is essentially the same as that developed, under the name of " matrices," by Cayley in 1858; but it has the peculiar advantage of the simplicity which is the natural consequence of entire freedom from conventional reference lines.

Sufficient has already been said to show the close connexion between quaternions and the theory of numbers. But one most important connexion with modern physics must be pointed out. In the theory of surfaces, in hydrokinetics, heat-con- duction, potentials, &c, we constantly meet with what is called

d? d % d 2 " Laplace's operator," viz. j~~i + yi + -7-5. We know that this

is an invariant; i.e. it is independent of the particular directions chosen for the rectangular co-ordinate axes. Here, then, is a case specially adapted to the isotropy of the quaternion system;

d d d

*and Hamilton easily saw that the expression *T"+.7j _ + ^7"*

could be, like ix+jy+kz, effectively expressed by a single letter. He chose for this purpose V. And we now see that the square of V is the negative of Laplace's operator; while V itself, when applied to any numerical quantity conceived as having a definite value at each point of space, gives the direction and the rate of most rapid change of that quantity. Thus, applied to a potential, it gives the direction and magnitude of the force; to a distribution of temperature in a conducting solid, it gives (when multiplied by the conductivity) the flux of heat, &c.

No better testimony to the value of the quaternion method could be desired than the constant use made of its notation by mathe- maticians like Clifford (in his Kinematic) and by physicists like Clerk- Maxwell (in his Electricity and Magnetism). Neither of these men professed to employ the calculus itself, but they recognized fully the extraordinary clearness of insight which is gained even by merely translating the unwieldy Cartesian expressions met with in hydrokinetics and in electrodynamics into the pregnant language of quaternions. (P. G. T.)

Supplementary Considerations. — There are three fairly well- marked stages of development in quaternions as a geometrical method. (1) Generation of the concept through imaginaries and development into a method applicable to Euclidean geometry. This was the work of Hamilton

himself, and the above account (contributed to the 9th ed. of the Ency. Brit, by Professor P. G. Tait, who was Hamilton's pupil and after him the leading exponent of the subject) is a brief resume" of this first, and by far the most important and most difficult, of the three stages. (2) Physical applications. Tait himself may be regarded as the chief contributor to this stage. (3) Geometrical applications, different in kind from, though more or less allied to, those in connexion with which the method was originated. These last include (a) C. J. Joly's projective geometrical applica- tions starting from the interpretation of the quaternion as a point-symbol; 1 these applications may be said to require no addition to the quaternion algebra; (b) W. K. Clifford's bi- quaternions and G. Combebiac's tri-quaternions, which require the addition of quasi-scalars, independent of one another and of true scalars, and analogous to true scalars. As an algebraic

1 It appears from Joly's and Macfarlane's references that J. B. Shaw, in America, independently of Joly, has interpreted the quaternion as a point-symbol.

method quaternions have from the beginning received much attention from mathematicians. An attempt has recently been made under the name of multenions to systematize this algebra. We select for description stage (3) above, as the most char- acteristic development of quaternions in recent years. For (3) (a) we are constrained to refer the reader to Joly's own Manual of Quaternions (1905).

The impulse of W. K. Clifford in his paper of 1873 (" Pre- liminary Sketch of Bi-Quaternions," Mathematical Papers, p. 181) seems to have come from Sir R. S. Ball's paper on the Theory of Screws, published in 1872. Clifford makes use of a quasi-scalar co, commutative with quaternions, and such that if p,q,&c, are quaternions, when p--wq = p' '+coo/ ', then necessarily P = P'i 1~

Combebiac is not content with getting rid of the origin in these limited circumstances. The fundamental geometrical conceptions are the point, line and plane. Lines and com- plexes thereof are sufficiently treated as rotors and motors, but points and planes cannot be so treated. He glances at Grassmann's methods, but is repelled because he is seeking a unifying principle, and he finds that Grassmann offers him not one but many principles. He arrives at the Iri-quaternion as the suitable fundamental concept.

We believe that this tri-quaternion solution of the very interesting problem proposed by Combebiac is the best one. But the first thing that strikes one is that it seems unduly complicated. A point and a plane fix a line or axis, viz. that of the perpendicular from point to plane, and therefore a calculus

*of points and planes is ipso facto a calculus of lines also. To fix a weighted point and a weighted plane in Euclidean space we require 8 scalars, and not the 12 scalars of a tri-quaternion. We should expect some species of bi-quaternion to suffice. And this is the case. Let rj, co be two quasi-scalars such that i? 2 =i7, coij=co, ijco=co 2 = o. Then the bi- quaternion 175 + cor suffices. The plane is of vector magni- tude %Vq, its equation is %Spq=Sr, and its expression is the bi-quaternion Vg + coSy; the point is of scalar magnitude $Sq, and its position vector is /3, where %VPq=Xr (or what is the same, (3=[Vr--q.Vr. j -1]/), and its expression is TjSg+coVr. (Note that the % here occurring is only required to ensure harmony with tri-quaternions of which our present bi- quaternions, as also octonions, are particular cases.) The point whose position vector is Vrqr 1 is on the axis and may be called the centre of the bi-quaternion; it is the centre of a sphere of radius Srg -1 with reference to which the point and plane are in the proper quaternion sense polar reciprocals, that is, the position vector of the point relative to the centre is Srq' 1 . Vq/Sq, and that of the foot of perpendicular from centre on plane is Srq~ l . Sq/Vq, the product being the (radius) 2 , that is (Srq' 1) 2 . The axis of the member *Q+x'Q' of the second-order complex Q, Q' (where Q=rjq+ior, Q'=r]q'+oir' and x, x' are scalars) is parallel to a fixed plane and intersects a fixed transversal, viz. the line parallel to q'q- 1 which intersects the axes of Q and Q' ; the plane of the member contains a fixed line; the centre is on a fixed ellipse which*

intersects the transversal; the axis is on a fixed ruled surface [to which the plane of the ellipse is a tangent plane, the ellipse being the section of the ruled surface by the plane; the ruled surface is a cylindroid deformed by a simple shear parallel to the transversal. In the third-order complex the centre locus becomes a finite closed quartic surface, with three (one always real) intersecting nodal axes, every plane section of which is a trinodal quartic. The chief defect of the geometrical properties of these bi-quaternions is that the ordinary algebraic scalar finds no place among them, and in consequence Q _1 is meaningless.

Putting 1 — 77= § we get Combebiac's tri-quaternion under the form Q= ˆp+riq+ur. This has a reciprocal Q~ 1= %p~~ l = yq~ x —wp~ l rq~ l , and a conjugate KQ (such that K[QQ'] = KQ'KQ, K[KQ] = Q) given by KQˆKg+ˆKˆ+wKr; the product QQ' of Q and Q' is tpp'+yqq'+uipr'+rq'); the quasi-vector §(1 — K)Q is Combebiac's linear element and may be regarded as a point on a line; the quasi scalar (in a different sense from the rest of this article) K I +K)Q is Combebiac's scalar (Sp+Sq)-- Combebiac's plane. Combebiac does not use K; and in

place of £, 7/ he uses /i=rj — £, so that /j?= i,o)yu = — nu> = co, co 2 = o. Combebiac's tri-quaternion may be regarded from many simplifying points of view. Thus, in place of his general tri-quaternion we might deal with products of an odd number of point-plane-scalars (of form y.q--u>r) which are themselves point-plane-scalars; and products of an even number which are octonions; the quotient of two point-plane-scalars would be an octonion, of two octonions an octonion, of an octonion by a point-plane-scalar or the inverse a point-plane-scalar. Again a unit point n may be regarded as by multiplication changing (a) from octonion to point-plane-scalar, (b) from point-plane-scalar to octonion, (c) from plane-scalar to linear element, (d) from linear element to plane-scalar.

If .Q=£p+nq+ur and we put Q=(i+ˆw/)(££-hl?)X (i-f-fco/) -1 we find that the quaternion t must be 2f®/f(q—p), where f® = rq—Kpr. The point p=V(may be called the centre of Q and the length St may be called the radius. If Q and Q' are commutative, that is, if QQ' = Q'Q, then Q and Q' have the same centre and the same radius. Thus Q_1 , Q< Q 2 , Q 3 , • • • have a common centre and common radius. Q and KQ have a common centre and equal and opposite radii; that is, the t of KQ is the negative conjugate of that of Q. When Su = o, (i-f4coz<) ( ) (i+fco«)~ l is an operator which shifts (without further change) the tri-quaternion operand an amount given by u in direction and distance.

Bibliography. — In 1904 Alexander Macfarlane published a Bibliography of Quaternions and allied systems of Mathematics for the International Association for promoting the study of Quaternions and allied systems of Mathematics (Dublin University Press) ; the pamphlet contains 86 pages. In 1899 and 1901 Sir W. R. Hamilton's classical Elements of Quaternions of 1866 was republished under C. J. Joly's editorship, in two volumes (London). Joly adds valuable notes and thirteen important appendices. In 1890 the 3rd edition of P. G. Tait's Elementary Treatise on Quaternions appeared (Cambridge). In 1905 C. J. Joly published his Manual of Quaternions (London) ; the valuable contents of this are doubled by copious so-called examples; every earnest student should take these as part of the main treatise. The above three treatises may be regarded as the great storehouses; the handling of the subject is very different in the three. The following should also be mentioned: A. McAulay, Octonions, a development of Clifford's Bi-quaternions (Cambridge, 1898); G Combebiac, Calcul des triquaternions (Paris, 1902); Don Francisco Perez de Mufioz, Jntroduccion al estudio del cdlculo de Cuaterniones y otras Algebras especiales (Madrid, 1905); A. McAulay, Algebra after Hamilton, or Multenions (Edinburgh, 1908). (A. McA.)

QUATORZAIN (from Fr. qualorze, fourteen), the term used in English literature, as opposed to " sonnet," for a poem in fourteen rhymed iambic

lines closing (as a sonnet strictly never does) with a couplet. The distinction was long neglected, because the English poets of the 16th century had failed to apprehend the true form of the sonnet, and called Petrarch's and other Italian poets' sonnets quatorzains, and their own incorrect quatorzains sonnets. Almost all the so-called sonnets of the Elizabethan cycles, including those of Shakespeare,

Sidney, Spenser and Daniel, are really quatorzains. They consist of three quatrains of alternate rhyme, not repeated in the successive quatrains, and the whole closes with a couplet. A more perfect example of the form could hardly be found than the following, published by Michael Drayton in 1602:- Dear. why should you commend me to my rest,

When now the night doth summon all to sleep? Methinks this time becometh lovers best ,

Night was ordained together friends to keep. How happy are all other living things

Which though the day conjoin by several flight, The quiet evening yet together brings.

And each returns unto his love at night, O thou that art so courteous unto all,

Why should'st thou, Night, abuse me only thus, That every creature to his kind dost call,

And yet 'tis thou dost only sever us? Well could I wish it Would be ever day, If, when night comes, you bid me go away.

Donne, and afterwards Milton, fought against the facility and incorrectness of this form of metre and adopted the Italian form of sonnet. During the 19th century, most poets of distinction prided themselves on following the strict Petrarchan model of the sonnet, and particularly in avoiding the final couplet. In his most mature period, however, Keats returned to the quatorzain, perhaps in emulation with Shakespeare; and some of his examples, such as " When I have fears," " Standing aloof in giant ignorance," and " Bright Star," are the most beautiful in modern literature. The " Fancy in Nubibus," written by S. T. Coleridge in 1819, also deserves notice as a quatorzain of peculiar beauty.

QUATRAIN, sometimes spelt Quartain (from Fr. quatre, four), a piece of verse complete in four rhymed lines. The length or measure of the verse is immaterial, but they must be bound together by a rhyme-arrangement. This form has always been popular for use in the composition of epigrams, on

account of its brevity and neatness, and may be considered as a modification of the Greek or Latin epigram at its concisest.
QUATREFAGES DE BREAU, JEAN LOUIS ARMAND DE (1810-1892), French naturalist, was born at Berthezene, near Vallerangue (Gard), on the 10th of February 1810, the son of a Protestant farmer. He studiad medicine at Strassburg, where he took the double- degree of M;D. and D.Sc, one of his theses being a Theorie d'un coup de canon (November 1829); next year he published a book, Sur les aerolithes, and in 1832 a treatise on L' Extroversion de la vessie. Removing to Toulouse, he practised medicine for a short time, and contributed various memoirs to the local Journal de midecine and to the Annates des sciences naturelles (1834-36). But being unable to con- tinue his researches in the provinces, he resigned the chair of zoology to which he had been appointed, and in 1839 settled in Paris, where he found in H. Milne-Edwards a patron and a friend. Elected professor of natural history at the Lycee Napoleon in 1850, he became a member of the Academy of Sciences in 1852, and in 1855 was called to the chair of anthro- pology and ethnography at the Musee d'histoire naturelle. Other distinctions followed rapidly, and continued to the end of his otherwise uneventful career, the more important being honorary member of the Royal Society of London (June 1879), member of the Institute and of the Academie de medecine, and commander of the Legion of Honour (1881). He died in Paris on the 12th of January 1892. He was an accurate observer and unwearied collector of zoological materials, gifted with remarkable descriniiive power, and possessed of a clear, vigorous style, but = fcnewhat deficient in deep philosophic insight. Hence his serious studies on the anatomical characters of the lower and higher organisms, man included, will retain their value, while many of his theories and generalizations, especially in the department of ethnology, are already forgotten.

The work of de Quatrefages ranged over the whole field of zoology from the annelids and other low organisms to the anthropoids and man. Of his numerous essays in scientific periodicals, the. more important were: Considerations sur les caracteres zoolqgiques des rongeurs (1840); " De l'organisation des animaux sans vertebres des C6tes de la Manche " (Ann. Sc. Nat., 1844); " Recherches sur

le systeme nerveux, l'embryogˆnie, les organs des sens, et la circulation des annelides " (Ibid., 1844-50); " Sur les affinites et les analogies des lorabrics et des sangsues " (Ibid.) ; " Sur l'histoire naturelle des tarets " (Ibid., 1848-49). Then there is the vast series issued under the general title

of " £tudes sur les types inferieurs de l'embranchement des anneles," and the results of several scientific expeditions to the Atlantic and Mediterranean coastlands, Italy and Sicily, forming a series of articles in the Revue des deux mondes, or embodied in the Souvenirs d'un naturaliste (2 vols., 1854). These were followed in quick succession by the Physiologie comparee, metamorphoses de I'homme et des animaux (1862); Les Polynesiens et leurs migrations (1866); Histoire naturelle des anneles marins et de Veau douce (2 vols., 1866) ; La Rochelle et ses environs (1866); Rapport sur les progres de V anthro- pologic (1867); Ch. Darwin et ses precurseurs francais (1870), a study of evolution in which the writer takes somewhat the same attitude as A. R. Wallace, combating the Darwinian doctrine in its application to man; La Race prussienne (1871); Crania Ethnica, jointly with Dr Hamy (2 vols., with 100 plates, 1875-82), a classical work based on French and foreign anthropological data, analogous to the Crania Britannica of Thurnam and Davis, and to S. G. Mor- ton's Crania Americana and Crania Aegyptiaca; L'Esphce humaine (1877); Nouvelles Etudes sur la distribution geographique des negritos (1882); Hommes fossiles et hommes sauvages (1884); and Histoire generate des races humaines (2 vols., 1886-89), the first volume being introductory, while the second attempts a complete classification of mankind.

QUATREFOIL, in Gothic architecture, the piercing of tracery in a window or balustrade with small semicircular openings known as " foils "; the intersection of these foils is termed the cusp.

QUATREMERE, ETIENNE MARC (1782-1857), French Orientalist, the son of a Parisian merchant, was born in Paris on the 1 2th of July 1782. Employed in 1807 in the manuscript department of the imperial library, he passed to the chair of Greek in Rouen in 1809, entered the Academy of Inscriptions in 181 5, taught Hebrew and Aramaic in the College de France from 1819, and finally in 1827 became professor of Persian in the School of Living Oriental Languages.

Quatremere's, first work was Recherches . . . sur la laneue et la litlerature de I'Egypte (1808), showing that the language of ancient Egypt must be sought in Coptic. His translation of Makrizi's Arabic history of the Mameluke sultans (2 vols., 1837-41) shows his erudition at the best. He published among other works Memoires sur les Nabateens (1835); a translation of Rashid al-DIn's Hist, des Mongols de la Perse (1836); MSm. gSog. et hist, sur l'£gypte (1810); the text of Ibn Khaldun's Prolegomena; and a vast number of useful memoirs in the Journal asiatique. His numerous reviews in the Journal des savants should also be mentioned. Quatremere made great lexicographic collections in Oriental languages, fragments of which appear in the notes to his various works. His MS.

material for Syriac has been utilized in Payne Smith's Thesaurus; of the slips he collected for a projected Arabic, Persian and Turkish lexicon some account is given in the preface to Dozy, Supp. aux dictt. arabes. They are now in the Munich library.

A biographical notice by M. Barthelemy Sainte-Hilaire is prefixed to Quatremere's Melanges d'histoire et de philologie orientate (1861).

QUAY, MATTHEW STANLEY (1833-1904), American poli- tical " boss," was born in Dillsburg, York county, Pennsyl- vania, on the 30th of September 1833. He graduated at Jefferson College (now Washington and Jefferson College) in 1850 and was admitted to the bar in 1854. He served in various capacities in the Civil War, and in 1865-1867 was a member of the state House of Representatives, becoming secretary of the commonwealth in 1873-1878 and again in 1879-1882, recorder of Philadelphia in 1878-1879, and state treasurer in 1886-1887. He was chairman of the Republican national executive campaign committee in 1888, and was a member of the United States Senate in 1887-1899 and again in 1901-1904. For nearly twenty years he dominated the government of Pennsylvania, and also played a very prominent part in national affairs. In 1899 he was brought to trial on a charge of misappropriating state funds, and, although he was acquitted, the feeling among the reform element in his own party was so bitter against him that the legislature was dead- locked and his re-election was postponed for two years. He died on the 28th of May 1904.

QUAY, a wharf or landing-place for the loading and unloading »f water-borne cargo. The word, now pronounced like " key,"

takes the form of Fr. quai, older cay or caye, cf. Spanish cayo, a bar, barrier or reef. The earlier form in English is " kay," and it was so pronounced. " Key " was also earlier pro- nounced " kay," and the change in pronunciation in the one was followed also in the other. In spelling also the word was assimilated to " key," in the sense of a reef, or, especially, of the low range of reefs or islets on the coasts of Spanish America, e.g. on the coast of Florida, the chain of islets known as'Florida Keys.

QUEBEC, a province of the Dominion of Canada, bounded S. by New Brunswick and the United States, W. by Ontario, N. by the district of Ungava, and E. by the gulf of St Lawrence and the strip of eastern Labrador which belongs to Newfoundland. If Ungava be considered as added to the province of Quebec, Hudson Strait is the northern boundary. The province includes the island of Anticosti, the Bird Islands and the Magdalen Islands, in the gulf of St Lawrence. The western boundary, separating Quebec from Ontario, extends through Point au Baudet on the

river St Lawrence to Point Fortune on the Ottawa river, from which place the boundary follows the Ottawa to Lake Temiscaming. From the north end of this latter lake it runs due north to Hudson Bay. The province of Quebec thus extends from Blanc Sablon, a fishing harbour at the western end of the Strait of Belle Isle (which separates Canada from Newfoundland) in 59° 7′ W. to Lake Temiscaming in 79 40′ W., a distance of about 1350 miles. The area of the province is 351,873 sq. m. The general direction of the province is north-east and south-west, following the course of its chief physical feature, the river St Lawrence. Speaking generally, it may be said that the province of Quebec comprises the hydro- graphical basin of the river St Lawrence as far west as the intersection of the parallel of 45° N. with the latter. The St Lawrence flows near the southern edge of its basin, only some 50,000 sq. m. of the area of the province lying south of the river. The province of Quebec falls into three main physiographical divisions, viz.: (1) the Laurentian Highlands, (2) the Valley of the St Lawrence, and (3) the Notre Dame Mountains and the rolling country lying to the south-east of this range.

(1) The Laurentian Highlands are sometimes referred to as the " Laurentian Mountains," as they appear to constitute a mountain range when viewed from the gulf or the river St Lawrence. This portion of the province, however, is really a plateau having an elevation of 1000 to 2000 ft. above sea level, but this plateau north of latitude 55 ° falls away to lower levels toward Hudson Bay and Hudson Strait. Along the extreme eastern border of these Laurentian Highlands on the coast of Labrador, however, the country rises to much greater altitudes, forming an extremely rugged district which attains in places an elevation of 6000 ft. above sea-level. This plateau forms what is known as the Laurentian peneplain and is hummocky in character, the surface, however, being but slightly accentuated and the sky line seen from the higher points in the area being nearly level. It is densely wooded and everywhere abounds in lakes, great and small, lying either in basins etched in the rock surface by glacial action or else bounded by the irregularly distributed drift which more or less completely covers the surface of the underlying rocks. From these lakes issue very numerous streams tributary to the larger rivers. These lakes and rivers form so continuous a series of waterways that a traveller who knows their courses, and the portages connecting them, can traverse this immense tract of country in any direction by canoe. These streams also, cascading down from the elevated surface of the plateau to sea-level, afford immense water power, which is used to an increasing extent as the methods of long-distance electrical transmission of power become more and more perfect. These waters are, moreover, clear and pure, and the country is one in which malaria and similar diseases are unknown. Some of the rivers draining the Laurentian country run in very deep, high- walled valleys or

fjords cut in the solid rock; a number of which, comparable in character although perhaps not in depth to those of Norway and Greenland, pass outward from the central portion of the peneplain north, east and south. As an example of such fjords in the province of Quebec, those occupied by the waters of the Hamilton, Mingan and Saguenay rivers may be cited as well as that, now partially silted up, which is occupied by Lake Temis- caming and the Mattawa river. The walls of solid gneiss between which the Saguenay flows are in places from 1500 to 1800 ft. in height, while the waters of the river in places reach a depth of 1400 ft.

Thi9 Laurentian country in the province of Quebec and its continuation into the adjacent province contain the chief timber

supplies of the Dominion, supplies which with a little husbanding on the part of the government could be made to afford a bountiful supply of timber for all future generations. The country also contains valuable mineral deposits, and is the great home of the fur-bearing animals of the Dominion. While, however, along the southern border it supports a considerable agricultural popula- tion, the Laurentian country cannot be considered as one which in respect to its agricultural capabilities can ever take rank with the southern portions of eastern Canada or with the great plains and British Columbia which lie to the west.

(2) That portion of the lowlands of the St Lawrence valley which belongs to the province of Quebec forms a wedge-shaped area extending along the river from a short distance below the city of Quebec to the western border of the province. It is throughout a practically level plain of very fertile land, on which are situated the chief towns and cities of the province, and on it also are settled the majority of the rural population. These lowlands are bounded on the north by the Laurentian plateau, and on the south by the Notre Dame Mountains, which physical features gradually converge, the latter mountains reaching the shore of the river St Lawrence a short distance to the east of the city of Quebec. The plain in this way gradually narrows on going to the north-east, and is finally closed off in that direction. It was a portion of this plain that was first occupied by the early French settlers. Much of its surface, as has been said, is absolutely level, and it nowhere exceeds an elevation of a few hundred feet. Its uniform expanse, however, is broken by a line of eight isolated hills composed of rocks of igneous origin, being a series of eroded remnants of ancient volcanoes which now rise abruptly from the plain and constitute the most striking features of the landscape. They are known as the Monte- regian

Hills and rise to elevations of 560 ft. to 1600 ft. above sea- level. From the summit of Mount Royal, at the foot of which lies the city of Montreal, all the other Monteregian Hills are plainly visible, and the margin of the Laurentian Highlands may be seen bounding the horizon some 30 m. to the north, while south- ward the Green Mountains, and the Adirondacks in the state of New York, are distinctly visible on a clear day.

(3) The Notre Dame Mountains and the Eastern Townships. The Appalachian Mountain range, passing out of the state of Vermont, where it is known as the Green Mountains, crosses into the province of Quebec between Lake Champlain and Lake Memphremagog, and becoming lower and less rugged continues in a north-easterly direction to a point about 30 m. south of the city of Quebec. Thence it pursues its course, following the general trend of the river St Lawrence at a varying distance from its southern margin, and reaches the latter river near Metis. From the border to this point the range is known as the Notre Dame Mountains. The highest peak in the Notre Dame Mountains is Sutton Mountain — 3100 ft. Continuing on to the north-east it develops into the high land of the Gaspe Peninsula, of which the most elevated portion constitutes the Shickshock Mountains, the higher summits of which rise to elevations of 3000 to 4000 ft. above sea-level. The whole central area of the Gaspe Peninsula is a forest-clad wilderness.

To the south-east of the Notre Dame Mountains is an undulating country known as the " Eastern Townships." These hills, as mentioned above, are lower and less rugged than the Green Moun- tains, the general elevation of the country being from 500 to 1000 ft. above sea-level. There are a number of large and fine lakes in this district, among which may be mentioned lakes Metapedia, Temiscouata, Memphremagog, Aylmer, St Francis and Megantic.

In the belt of the Notre Dame Mountains the country is not in the strict sense of the term a mountainous one, but rather a rolling country containing much good farming and pasture land, while the Eastern Townships is a fine agricultural country, em- bracing some of the best farming and grazing land in the Dominion. This latter district was originally settled by Loyalists from the United States at the time of the revolt of the colonies, but is now being gradually occupied by French Canadians from the more northern portions of the province, the younger generation of English- speaking Canadians preferring to take up land and settle in Ontario or the western provinces of Manitoba, Saskatchewan, Alberta and British Columbia.

The whole country is exceptionally well watered and abounds in numerous large rivers, bays and lakes. The principal river is the St Lawrence, which

flows through the entire length of the province. A short distance above Montreal it receives from the north-west the Ottawa, a large and beautiful river over 600 m. in length with many tributaries, among which the most important are the Gatineau, the Lievre, the North, the Rouge and the Kinojevis. The St Lawrence is navigable for large ocean steamships as far as Montreal, beyond which place navigation is interrupted by rapids. The St Maurice rises in Lake Oskelaneo, flowing into the St Lawrence at Three Rivers, and is over 400 m. long. It has many tributaries, and drains an area of 21,000 sq. m. Twenty-four miles above Three

Rivers on the St Maurice are the falls of Shawinigan, 150 ft. high, from which a large amount of electrical power is obtained, a portion of which is used in the production of aluminium, while several thousand horse-power are transmitted to the city of Montreal. The Batiscan river enters the St Lawrence at Batiscan. The Jacques Carrier, the Ste Anne and the Mont-morency are northern tributaries of the St Lawrence. The Montmorency is famous for its falls, situated about 8 m. from Quebec city, and 250 ft. high. These beautiful falls, however, have in recent years been greatly reduced in volume, the water being largely employed for the development of electricity, and also for the supply of power to a large cotton-mill in the vicinity. Near these falls is Haldimand House, once the residence of the duke of Kent, father of Queen Victoria. The Saguenay rises in Lake St John and discharges into the St Lawrence at Tadousac after a course of 100 m. On the south side of the St Lawrence is the Richelieu river, which rises in Lake Champlain and enters the St Lawrence at Sorel on Lake St Peter. Champlain sailed up this river in 1609. Other important streams are the St Francis, rising in Lake Memphremagog; the Chaudiere, rising in Lake Megantic, with its beautiful falls 125 ft. high about 10 m. above Quebec; the Chateauguay, Yamaska, Etchemin, du Loup, Assomption and Becancour. Among the largest lakes in the province are Lake St John, which has an area of 360 sq. m.; Lake Temiscaming, having an area of 126 sq. m. ; Lake Matapedia, Lake Megantic and Lake Memphremagog.

The largest islands in the province of Quebec are: Anticosti, now used as a game preserve; Bonaventure, an important fishing station to the east of Gaspe; and the Magdalen Islands, situated in the gulf of St Lawrence about 50 m. north of Prince Edward Island.

Geology and Minerals. — Beginning with the oldest rocks, the more northern part of the province of Quebec is underlain by the Laurentian system of Sir William Logan. This includes a great series of very highly altered sediments, largely limestones, known as the Grenville series, which is penetrated by great intrusions of anorthosite, &c, and is invaded by and rests upon enormous bathyliths of granite, which are sometimes referred to as the " Fundamental Gneiss." The Grenville series is best developed along

the southern margin of the Laurentian Highlands between Three Rivers and the Georgian Bay. Two of the great anorthosite intrusions occur on the margin of the Laurentian country to the north of Montreal and about Lake St John. The Laurentian system is succeeded to the south by the Potsdam sandstone, probably equivalent to. the Upper Cambrian of Britain. On this rests a dolomitic limestone — the Calciferous formation — and on this the great and highly fossiliferous limestones known as the Chazy and Trenton formations. These limestones afford the best building stone of the province, while the Potsdam sandstone is also frequently employed for building purposes. Above the Trenton is the Utica shale, rich in graptolites and trilobites. This is succeeded by the Hudson River group composed largely of sandstones and calcareous beds. These constitute the complete Ordovician succession. Upper Silurian and Devonian beds, the latter holding fossil plants and fishes, occur in the south-east portion of the province, while on the shore of Chaleur Bay these are succeeded by the lowest beds of the Carboniferous. No coal occurs in the province of Quebec. In the region of the Notre Dame Mountains and the Eastern Town- ships there are great intercalations of ancient volcanic rocks and many important mineral deposits. Among these may be men- tioned gold, copper, asbestos and chromic iron ore; also serpentine, marble and roofing slates. The asbestos deposits are the most extensive and most productive in the world, the chief centre of asbestos mining being at Thetford Mines. A large part of the country, more especially on the lower levels, is covered with Pleistocene deposits of the so-called Glacial age. Till or boulder clay is usually at the base of these deposits. On this rests a finer stratified blue clay, in some places rich in fossil shells and known as the Leda clay. It affords a good material for the manufacture of bricks and tiles. Above the Leda clay are sands and gravels known as the Saxicava sand. This is also stratified and frequently contains an abundance of fossils. These stratified clays and sands are due to a re-sorting of the boulder clay by the action of water, and imply a submergence at the close of the Glacial period with a subsequent elevation. In certain alluvial deposits in the vicinity of the St Maurice river there occur deposits of bog iron ore which have been worked for many years.

Climate. — The climate of Quebec is variable. In the winter the cold is generally steady and the atmosphere clear and bracing. About Montreal snow lies on the ground from the end of November

until the following April, affording good sleighing for four months in the year. The inhabitants enjoy with zest and spirit all the out- door sports

common in the country, such as skating, curling, tobog- ganing, snowshoeing, ski-ing and sliding. The snowfall is heavy, and though the winds are often sharp they are not often raw or damp, nor is there any fog. The summer is warm and pleasant. The extreme heat is indicated at 90° F. The finest season of the year is the autumn, which lasts about six or eight weeks. The following is a table of temperatures as recorded by the meteorological stations at certain points in the province ; —

Table showing Normal Temperature, Precipitation &fc, at various Stations in the Province of C

Average

Lati-

Longi-

Alti-

Mean Temperature

Precipi-

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Sum-

tation .

Winter.

Year.

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Feet.

Inches.

Anticosti, W.

Pt. .

49° 52′

64° 32′

15

55° 8′

i 4 ° 2′

3 5°

4′

35′ 89

Bird Islands

47° 5i’

61° 8′

125

55° 4′

20° 7′

38°

2′

28-76

Chicoutimi

. .

48° 2 5′

71° 5′

150

61° 7′

6° 1′

3 5°

3′

iQ‘38

Quebec

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46° 48′

7i° 13′

296

63° 6′

12° 3′

38°

4′

41-98

Brome

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45° 10′

7 2° 36′

678

63° 6′

14° 8′ I40″

2′

35 35

Montreal .

.

45° 30′

73° 35′

187

66° 0′ 57° 8′

15° 6′ 42°

0′

39′ 24

Cape Magdalen

49° 16′

6 5 ° 20′

93

13° 9′ 37°

1′

3l‘55

The normal percentage of bright sunshine at Montreal is 41 and at Quebec 39, a higher average than northern Europe. (F. D. A.)

Area and Population. — The boundaries of Quebec have been more than once enlarged since 1867. By the extension given to them in 1898, the province, has an area of 351,873 sq. m., of which 341,756 sq. m. are land and 10,117 s q- m – are water. This estimate includes the islands of Orleans, Anticosti, and the Magdalen group, but not the gulf of St Lawrence or the territorial seas. In 1961 the population was 1,648,898, 992,667 being classed as rural and 656,231 as urban. Since 1891 the rural population has increased but little, but there has been a growth of about 1 1 % in the population of the towns and cities. No province has taken so small a share in the development of the West. True to his ancestral instincts, the French-Canadian remains close to the place of his birth. If he emigrates, it is to the neighbouring cities of New England or to the eastern districts of the province of Ontario. On the other hand, in the rural parts of the province, the French are driving out the English- speaking settlers, especially in the south-western counties, settled by Loyalists at the close of the War of American Indepen- dence, and known as the Eastern Townships. Nearly 98% of the population are Canadian-born. Of these over 80% are of French descent; of the remainder about 7% -are English,

7% Irish and 4% Scots. Save to the city of Montreal there is little immigration; but so prolific are the French that the population of the province increases as fast as that of the rest of the Dominion, in which to the natural increase is added a large immigration. The census gives the number of the average family as 5-36, but families with twelve and eighteen children are not uncommon. The English-speaking population is almost wholly confined to the towns, especially Montreal, in which city it controls the chief shipping and commercial interests. Of the original inhabitants about 8000 Indians remain, chiefly on reserves in the neighbourhood of Montreal and Quebec. Though quite peaceful, they are on the whole less civilized than those of eastern and southern Ontario. The capital is Quebec, with a population of about 70,000, which increases but slowly. The largest city is Montreal, the commercial and shipping centre of the Dominion, at the head of ocean steamship navigation, with a population of about 350,000. Other cities are Hull (practically a suburb of Ottawa; pop. in 1901, 13,993); Sher- brooke (11,765); Three Rivers (9981); Levis (7783).

The French, Irish and Indians are almost entirely of the Roman Catholic faith; a majority of the English are Anglican, with some Methodists; the Scots are Presbyterian. The Roman Catholic Church enjoys extensive rights and privileges, and nowhere in the world is devotion to that faith more wide- spread or more unquestioning.

Administration.— As in all the provinces, the executive power is nominally vested in a lieutenant-governor, appointed for five years by the federal government, and assisted by an executive

council (or cabinet) who have seats in, and are responsible to, the local legislature. In reality the lieutenant-governor is a figure-head, and power is in the hands of the legislature, which consists of two houses, a Legislative Council, appointed nomin- ally by the lieutenant-governor, really by the premier, and an Assembly, chosen by what is practically manhood suffrage. Either French or English may be used in addressing either house. The municipalities have large powers of local government, which are used with more or less efficiency, the predatory tendencies of the ward-politician being sometimes apparent, though of late years an improvement has been effected. The finances of the province are drawn from the same sources as those of Ontario (q.v.). Their administration has not been so economical as in the sister province, and there is a net provincial debt of over £4,000,000.

Education. — In primary education Quebec is still behind the other provinces, but great progress has been made since Federa- tion; illiteracy is decreasing, and 80% of the population over five years of age can read and

write. The Council of Public Instruction is divided into two committees of equal number, a Catholic and a Protestant, and all ratepayers are allowed to state whether they prefer their taxes to go to the Protestant or to the Catholic school. Both religious bodies have combined to carry out this system with very little friction or proselytizing. The Catholic schools are controlled by the clergy, the episcopate forming, ex officio, one-half of the Catholic section of the council. In the cities of Quebec and Montreal the schools are efficient and the teachers well paid; but in the rural districts the schools, especially those of the Catholics, are often inadequate, the buildings being poor, and the teachers receiving a mere pittance, in some cases less than £20 per antium. Over 95 % of the teachers in the primary schools are women. The great majority of the schools are controlled by the council, but there are also a number of independent schools, primary and secondary, usually under religious control; of these the so-called " Colleges Classiques," supported by the Catholic Church, are the most im- portant. The chief universities are McGill (undenominational), at Montreal (founded 1820), and Laval (Roman Catholic) (founded 1852), with its headquarters at Quebec, and with a large branch at Montreal. (See Montreal and Quebec City). There is also a small Anglican university, that of Bishop's College, Lennoxville (founded 1853), m connexion with which is Bishop's College school, on the model of the public schools of England. To McGill is affiliated a well-equipped Agricultural College established at Ste Anne de Bellevue by Sir William Macdonald (b. 1832), at a cost of over £2,000,000; and to Laval an Agricultural School at Oka, founded in 1893 by the Trappist Fathers. There are numerous normal and model schools, the most important being that of Ste Anne de Bellevue in connexion with Macdonald College.

Agriculture. — The French Canadian is a thrifty though somewhat unprogressive farmer, and loves the land with an even greater attachment than do the peasants of old France. Till recently his agriculture was of a very domestic character. He grew enough wheat to grind into flour, and enough oats to feed his horses; raised sheep whose wool his wife spun into rough cloth in the winter even- ings ; and even grew his own tobacco. Now his horizon is widening, and his imports and exports are increasing. The general climatic conditions are much the same as in Ontario, and the crops are similar. All the chief cereals are successfully cultivated, oats being the chief crop. The wise care of both federal and provincial governments has fostered the dairy farming of the province. In 1906 over £4,200,000 of cheese was produced, and over £5,200,000 of butter. Most of the butter is made in well-equipped creameries, in the number of which Quebec exceeds any other province; in exports of cheese she equals Ontario. In the production of fruit she ranks second to Ontario, Nova Scotia coming third. Perhaps the most typical Canadian industry, the making of syrup and sugar

from the sap of the maple tree as it rises in the spring, centres in this province. Over two-thirds of the tobacco grown in the Dominion is raised in Quebec, about 10,000 acres being under cultivation. At first of a coarse character, it is improving in quality. The total annual value of the agricultural produce of the province is about £18,000,000, about half that of Ontario. Several agricultural and dairy schools are supported or assisted by the provincial govern- ment, and much good is being done by the Agricultural College at Ste Anne de Bellevue.

The province still possesses large areas of crown land, which is sold at a nominal price to bona fide settlers. In the northern part of the province new and fertile areas have been opened up by the Grand Trunk Pacific railway.

Forests. — Next to agriculture in importance are the various industries which depend on the products of the forest. Over 150,000 sq. m. of forest land are still uncleared, chiefly in the northern part of the province, though the best timber is said to grow south of the watershed. In the north, pine, spruce, and fir predominate, and, farther south, the maple; spruce, lime (linden, bass-wood,

Tilia Americana) and poplar, are used extensively in the making of paper pulp. The annual value of the wood cut in the province is about £4,000,000, rather less than that of Ontario, and not quite two-fifths that of the whole Dominion. An export duty is levied on all pulp wood exported.

Fur and Fish. — The value of the annual catch of fish is estimated at {450,000, most of which consists of the product of the cod and herring fisheries in the gulf of St Lawrence. From Isle Verte eastward almost all the settlers along the coast depend largely on the produce of this industry. It is carried on mainly in small boats, which put out in the morning and return at nightfall, few large vessels being employed. Throughout the province are numerous trout-streams, and many of the northern lakes are well supplied with trout, bass and pike. In Lake St John is caught the celebrated winninish, a land-locked salmon growing to the size of six or eight pounds, and well known to anglers. Moose, deer, bear and other animals provide excellent shooting in the Laurentian mountains, and in the wooded districts of the north.

Manufactures. — In manufactures Quebec ranks second among the provinces, Ontario coming first. The largest Canadian manu- facturing town is Montreal, where most of the industries are controlled by the

English-speaking minority. No other part of the Dominion is so rich in water power, which is provided to a limitless extent by the falls of the rivers Montmorenci, St Maurice (Shawinigan Falls), Ste Anne, the rapids on the St Lawrence and the Richelieu, and many others. Tanning, and the making of paper pulp and of furniture, prosper on account of the great forests of the province. The French-Canadian workman is hardy and intelligent, and Quebec may yet become the manufacturing centre of the Dominion, though as yet higher wages are -paid in the American cities across the border, and thousands of French-speaking workmen are employed in the factories of Lowell and other American border towns.

Communications . — The rivers were long the chief roads, by water in summer, over the ice in winter; but though the St Lawrence is still the main artery of the province, the bulk of travel and of transport is now done by rail. The first railway in Canada was built in 1830 to carry stone from the wharves to aid in the con- struction of the citadel of Quebec. The first passenger railway was built in 1836, between Laprairie on the St Lawrence river and St John's on the Richelieu. There is now good railway communica- tion between all the chief points, and branch lines are opening up new areas to settlement. While a few main roads are kept in good conditio'n, those in the country parts are very indifferent.

Bibliography. — The various departments of the provincial government publish annual reports on a great variety of subjects. The annual Canada Year Book, published by the Federal Govern- ment, gives much information in a tabular form. Interesting articles are contained in J. Castell Hopkins, Canada; an Encyclopaedia (Toronto, 1898-1900). The legal enactments in which the municipal system is embodied are found in the Revised Statutes of the pro- vince (Acts 4178-4640). On education and religion A. Siegfried, he Canada; les deux races (1905; translated into English under the title of The Race Question in Canada, 1906), is well-informed and impartial. (W. L. G.)

QUEBEC, the capital of the Canadian province of the same name, situated on the north bank of the river St Lawrence, at its junction with the St Charles, about 300 m. from the gulf of St Lawrence and 180 m. by river N.E. of Montreal, in 71° 12′ 19"- 5 W. and 46 48′ 17"- 3 N. The origin of the name Quebec has been much disputed, but it is apparently the Algonkian word for a strait, or sudden narrowing, the river at its junction with the St Charles being about 2500 yds. wide, but narrowing opposite Cape Diamond to 13 14.

Quebec is built on the northern extremity of an elevated tableland which forms the left bank of the St Lawrence for a distance of 8 m. The highest part of the headland is Cape Diamond, 333 ft. above the level of the water,

and crowned by the citadel; towards the St Lawrence it presents a bold and precipitous front, while on the landward side and towards the St Charles the declivity is more sloping and gradual. The harbour of Quebec is spacious and deep enough to hold the largest ships, and, with the Louise basin and Lome graving-dock, — the latter on the opposite shore at Levis, — forms one of the best harbours in America. It is usually open from the end of April to the middle of December, being closed by ice during the winter. The Louise basin consists of twin wet- docks and tidal harbours, with areas of 40 and 20 acres respectively, and a minimum depth of 26 ft. The harbour is protected towards the north-east by the island of Orleans, on either side of which there is an approach, though that to the north of the island is used only by small vessels. The spring tides rise and fall about 18 ft. Quebec is divided into

upper and lower town, — access to the former being obtained by steep and winding streets, by several flights of narrow steps, or by an elevator. Much of the lower town still recalls the older portions of such French provincial towns as Rouen or St Malo. The streets, with one or two exceptions, are narrow and irregular; but it remains the principal business quarter of the city. In the upper town, where the streets are wider and well paved, are the better class of dwelling-houses and public buildings, most of the churches, the public walks and gardens, and many of the retail shops. To the west are the suburbs of St John and St Roch. The latter occupies the lower plain, and is of some commercial importance; the former is on the same level as the upper town. Seuth-west of St John stretch the historic Plains of Abraham. On this battleground stands a simple column 40 ft. high, marking the spot where General Wolfe fell. It was erected in 1849 by the British army in Canada, to replace a monument erected in 1832 by the governor-general, Lord Aylmer, which had been broken and defaced by ruffians. Till 1908 the Plains were also disfigured by a gaol and a rifle factory, but these have been removed, and the battleground converted into a public park. In the governor's garden, which overlooks the St Lawrence, is a monument 65 ft. in height, erected in 1828 under the administration of Lord Dalhousie, dedicated to the memory of Wolfe and Montcalm. An iron pillar surmounted by a bronze statue, the gift of Prince Jerome Napoleon, stands on the Ste Foy road, and was erected in 1855-60 to commemorate the achievements of the British and French troops in the brilliant but fruitless French victory of April 28, 1760. The chief point of interest in the upper town is Dufferin Terrace, a magnificent promenade overlooking the St Lawrence, 1400 ft. long and 200 ft. above the level of the river. Part of this terrace occupies the site of the old Chateau St Louis, which was destroyed by fire in 1834. At the eastern end of the terrace stands a fine statue of Champlain, erected in 1898. Near by, and conspicuous from the river, is the Hotel Frontenac, erected by the Canadian Pacific railway on

the model of an old French chateau. Nothing remains of the fortifications erected under the French regime. The present walls and the citadel, which covers an area of about 40 acres, were built in 1823-32 at a cost of over £7,000,000. Since then, several of the gates have been destroyed, and others rebuilt, but in other respects the walls are practically intact, and, though obsolete as fortifications, add greatly to the picturesque beauty of the city. Between 1865 and 1871 three forts were built on the L6vis side of the river, but were neither manned nor armed. Quebec's natural position still makes it one of great military strength, though depending on naval control of the sea and of the gulf of St Lawrence.

Besides numerous Protestant churches, including a small Anglican cathedral, there is a Jewish synagogue; but the bulk of the population is Roman Catholic. The cathedral, founded in 1647, and enlarged at intervals, is a large but not very striking building in the upper town. It contains some good oil paintings and some much-prized relics, but is rather garish in its ornamentation. Of the numerous other churches, the most interesting is Notre Dame des Victoires, in the lower town, erected in 1688, and named in honour of the defeat of Phips in 1690 and the shipwreck of Sir Hovenden Walker in 1 71 1. Laval University, which derives its name from Francois de Montmorency Laval, the first bishop of Quebec, who founded in 1663 a seminary for the training of priests, is under strict Roman Catholic control. It was instituted in 1852 by a royal charter from Queen Victoria and in 1876 received a charter from Pope Pius IX. The building is large and spacious, and the university includes faculties of theology, law, medicine and arts, a library of 125,000 volumes, a museum and a picture gallery. A large branch of the university has been established at Montreal, and has often, but vainly, sought permission to become an independent Catholic university. In connexion with Laval are the grand seminary founded in 1663, where theology is taught, and the minor seminary for literature and

philosophy. Other Roman Catholic institutions are Laval Normal and Model School, the Ursuline Convent, the Convent of the Good Shepherd and several nunneries. The convent and church of the Ursulines, founded in 1641, contains nearly 100 nuns and lay sisters, and nearly 600 pupils. It possesses some excellent paintings and a number of relics, among which is the skull of the French general, Montcalm. Morrin College, founded in 1859 by Dr Morrin, was for some years an efficient college in arts and theology, under Presbyterian control, but is now defunct. High schools for boys and girls and numerous academies are supported by the Protestants,

under the dual system of education in the province. The Literary and Historical Society — the oldest chartered institution of the kind in Canada, founded by Lord Dalhousie in 1824 — the Canadian Institute, the Geographical Society, the Young Men's Christian Association, the Advocates' Library and the Parliamentary Library, have valuable collections of books, the latter contain- ing 70,000 volumes, and numerous MSS. chiefly relating to the. early history of the province. The principal benevolent in- stitutions are the marine hospital, the Hotel Dieu, founded in 1639 by the duchess of Aiguillon, the general hospital (1693), the Jeffrey Hale Hospital, and the lunatic asylum at Beauport controlled by the Grey Nuns (sisters of charity). The pro- vincial parliament buildings, erected in 1878-92, are situated in extensive grounds on Grande Allee. The main building is quadrangular in form, and is ornamented with numerous statues. The seat of the lieutenant-governor is at Spencerwood, a pleasant country estate outside the city. Other prominent buildings are the palace of the Roman Catholic Archbishop, which adjoins Laval University, the court house, post office, custom house, city hall (1890-95) and masonic hall. Quebec is well lighted with gas and electric light, and has a system of electric tramcars, a plentiful supply of power being obtained from the Montmorency Falls (268 ft. in height), 6 m. N.E. The climate is severe, but bracing, the mean temperature in winter being 10°, in summer 68°, and the mean of the year 39°. The main lines of the Grand Trunk, Canadian Pacific and Inter- colonial railways are on the south bank of the St Lawrence, but branch lines connect the city with Montreal, and it is the headquarters of the Quebec and Lake St John, and various smaller railways. Steam ferries connect the city with Levis on the opposite bank, but the project of a bridge, though of great importance to the city, has been in various ways delayed. In August 1907 the portion completed fell into the St Lawrence. The city returns three members to the Canadian House of Commons, and three to the Provincial House of Assembly. It is governed by a mayor and council of aldermen, who hold office for two years, and are usually re-elected, one mayor having held office for eleven successive years. Quebec is the seat of a Roman Catholic archbishop and of an Anglican bishop. Economically, Quebec was long the chief port of Canada. A series of strikes almost ruined its export trade, and numerous severe fires, of which that of 1845 was the chief, also lessened its importance. For many years the export trade passed almost entirely to Montreal, but the increasing size of sea- going vessels makes navigation above Quebec more and more difficult, especially for fast passenger steamships, and for such vessels Quebec is again becoming the terminus. Quebec's staple export is timber, the greater portion of which comes from the Ottawa and St Maurice districts. Formerly the rafts floating down the river were collected in the coves which extend along both sides of the river, above the city, and were fastened by booms along the banks. Now much of the timber is sent by rail.

On the right bank of the stream, not far from Quebec, are extensive sawmills. Deals and square timber form the bulk of the export, but some furniture is also sent, and an increasing quantity of wheat is shipped. The building of wooden ships was formerly one of the chief industries of Quebec. The principal manufactures are iron castings, machinery, cutlery, nails, leather,- rifles, gunpowder, musical instruments, boots and shoes, paper, india-rubber goods, ropes, tobacco, steel. The population increases but slowly, having risen from

59,699 in 1871 to 68,840 in 1901; of these over 60,000 are French and Roman Catholic.

The first known white man to visit Quebec was Jacques Cartier, the French navigator, in 1535, who found on the site a large Indian village, called Stadacona. In July 1608 the present city was founded, and named by Champlain. Its growth was slow, and in 1629 it had but two permanently settled families, with a shifting population of monks, officials and fur traders. In that year it was captured by the English under Sir David Kirke (1597-1656; see H. Kirke, The First English Conquest of Canada, London, 1871, reprinted 1908), but in 1632 it was restored to the French by the treaty of St Germain-en-Laye. In 1663 the colony of New France was created a royal province, and Quebec became the capital. In 1690 Sir William Phips, governor of Massachusetts, attempted to reconquer it with a fleet and army fitted out by New England, but was defeated by the French governor, Frontenac. In 1 71 1 a great British expedition sent against it undei Sir Hoven- den Walker was shipwrecked in the gulf of St Lawrence, and the French held possession till 1759 (see below), when it was captured by the British troops on the 18th of September, five days after the battle of the Plains of Abraham; it was finally ceded to Great Britain by the treaty of Paris in 1763. In 1775 the American generals Montgomery and Benedict Arnold attacked the city, but Montgomery was killed (December 31, 1775) and Arnold was compelled to retreat in the following spring.

In 1763-1841, in 1851-55, and in 1859-65 Quebec was the capital of Canada, and it is still its most historic and picturesque city.

See Quebec under Two Flags, by A. G. Doughty and N. E. Dionne (Quebec, 1903). Canada, an Encyclopaedia, by J. C. Hopkins (Toronto, 1898-1900), has a good account (vol. v. pp. 241-248).

(W. L. G.)

Wolfe's Quebec Expedition, 1759- — Both in itself and also as the central incident of the British conquest of Canada, the taking of Quebec is one of the epics of modern military history. The American campaigns of the Seven

Years' War, hitherto somewhat spasmodic, were, after Amherst's capture of Louis- burg in 1758, co-ordinated and directed to a common end by that general, under whom James Wolfe, a young major-general of thirty-three years of age, was to command an expedition against Quebec from the lower St Lawrence, while Amherst himself led a force from New England by Lake Champlain on Montreal. Wolfe's column consisted of about 7000 troops, and was convoyed by a powerful fleet under Admiral Saunders. The expedition sailed 300 m. up the St Lawrence, disembarked on the Isle of Orleans and encamped facing the city. The defenders were commanded by Montcalm, a soldier whose character and abilities, like Wolfe's, need no comment here. The French were superior in numbers, though a con- siderable part of their force was irregular; but they had the defender's difficult task of being strong everywhere. Wolfe began the attack by seizing Point Levis, and thence bombarding Quebec. This, however, affected the main defences of the upper city but little, and they were moreover protected from closer attack by the St Lawrence and the St Charles. The third side of the triangle was the "plains of Abraham," to which it was thought there was no' approach from the river. After wasting some weeks, therefore, Wolfe decided to cross the St Lawrence 7 m. below Quebec and to fight his way to the city by the St Charles side. But Montcalm's fortified posts spread out from Quebec through Beauport as far as the Montmorency, and this formidable obstacle checked the English advance at the outset. No artifice could lure the defenders away, and at last Wolfe attacked the line of the Montmorency and was repulsed with heavy loss (July 31). Wolfe's fragile health gave way under the disappointment, and despondency set in in the English camp. But as soon as the young leader had recovered a little, he summoned his brigadiers and worked out a plan for attacking by the upper waters and the heights of Abraham. Access to the heights could be obtained, it was

found, by a tiny cove (Wolfe's cove), from which a steep footpath led to the summit. It was no place for artillery, and even for infantry the climb was long and exhausting, but the attempt was made. Considered as a way of taking Quebec, it was in the last degree a forlorn hope, but Wolfe, as a true soldier, felt the imperative necessity of preventing his opponent from sending reinforcements to the force opposing Amherst, and staked everything upon achieving this at least. " Happy if our efforts here," as he wrote, " can contribute to the success of His Majesty's arms in any other part of America." What with losses in action and by sickness, and detachments to guard the camps and batteries, only 3600 men could be spared for the attempt. These embarked on the warships on the evening of

September 12, and sailed up stream. The watchful Montcalm sent a detachment to observe their movements, but the ships proceeded to a point well above the cove, luring the detachment out of the way. Then at 1 a.m. Wolfe, with half his force, dropped down stream in the boats of the squadron and landed. The path was guarded by a redoubt, but the light infantry which led the advance scarcely attempted to follow it, scrambling up the hillside wherever they could find a foothold. The garrison of the redoubt, startled by the unfore- seen attack, abandoned the work, and by daylight Wolfe had assembled his 3600 men on the plains above the city. Mont- calm meanwhile had been held in check by a demonstration of part of the fleet under Admiral Saunders on Beauport, but at last, realizing that the real attack was coming from the other flank, he hurried all the troops he could collect over the St Charles and drew them up on the plain, with their backs to the walls of the upper town. He took the offensive at once. He had plenty of militiamen and irregulars, and these rapidly drove the British light infantry on to their main body, which was threatened on both flanks. On so small a battlefield, the troops in Wolfe's line of battle quickly became aware that the enemy was attacking in superior force. But their leader steadied them by his personal example, and when the French came within close range one " perfect volley " from the whole line decided the battle. Then as the French stopped, with great gaps in their lines, Wolfe led on his men to complete the victory. He received two painful wounds and then a shot through the breast. His last order, one rare indeed in the annals of 18th-century fighting, was to send a force to the St Charles bridge to cut off the retreat of the French. Montcalm too was mortally wounded, and died next day. On the 18th of September Quebec surrendered.

' QUEBEC ACT, the title usually given to a bill introduced into the House of Lords on May 2, 1774, entitled " An Act for making more Effectual Provision for the Government of the Province of Quebec, in North America." It passed the House of Lords on May 17, was discussed in the Commons from May 26 to June 13, and finally passed with some amend- ments. These were accepted by the Lords, in spite of the opposition of Lord Chatham, and the bill received the royal assent on June 22. The debates in the House of Commons are not found in the Parliamentary History, but were published separately by J. Wright in 1839. The speech of Lord Chatham is given in the Chatham Correspondence (iv. 351-353).

By this act the boundaries of the Canadian province of Quebec were extended so as to include much of the country between the Ohio and the Mississippi. The French inhabitants of the province were granted the liberty to profess " the religion of the Church of Rome"; the French civil law was established, though in criminal law the English code was introduced. Government was vested in a governor and council, a representative assembly not being granted till the Constitutional Act of 1701.

The granting of part of the Western territory to Quebec, and the recognition of the Roman Catholic religion, greatly angered the American colonies. On the other hand, it did much to keep the French Canadians from joining the Americans in the coming struggle. The act is still looked back to by the French in Canada as their great charter of liberty.

QUEDLINBURG, a town of Germany in the Prussian province of Saxony, situated on the Bode, near the N.W. base of the Harz Mountains, 12 miles S.E. by rail from Halberstadt on the line Magdeburg- Thale. Pop. (1905) 24,798, almost all Protestants. It consists of the old town, which is still partly surrounded by a turreted wall, the new town and four suburbs. On the west it is commanded by the castle, formerly the residence of the abbesses of Quedlinburg, connected with which is the interesting Schlosskirche, which was dedicated in 1129 and completely restored in 1862-82. The German king, Henry the Fowler, his wife Matilda, and Aurora, countess of Konigsmark, the mistress of Augustus the Strong, are buried in the Schlosskirche. There are many interesting articles in the treasury. The Gothic town hall, a 14th-century building, restored and enlarged in 1900, contains a collection of antiquities, and near it stands a stone figure of Roland. The town also possesses a gymnasium founded in 1540 and now containing the abbey library and a municipal museum. It has a fine memorial of the war of 1870-71. Quedlinburg is famous for its nurseries and market gardens, and exports vegetable and flower seeds to all parts of Europe and America. Its chief manufactures are iron goods, machinery and cloth, and it has a trade in grain and cattle. Near the town is the church of St Wipertus, which dates from the 12th century, and has a crypt of the 10th century.

Quedlinburg was founded as a fortress by Henry the Fowler about 922, its early name being Quitlingen. Soon it became a favourite residence of the Saxon emperors and was the scene of several diets. It afterwards joined the Hanseatic League. The abbey of Quedlinburg was planned by Henry the Fowler, although its actual foundation is due to his son Otto the Great. It was a house for the daughters of noble Saxon families and was richly endowed, owning at one time a territory about 40 sq. m. in area. The abbesses, who were frequently members of the imperial house, the second of them being Otto's daughter Matilda, ranked among the princes of the empire, and had no ecclesiastical superior except the pope. The town at first strove vigorously to maintain its independence of them, and to this end invoked the aid of the bishop of Halberstadt. In 1477, however, the abbess Hedwig, aided by her brothers, Ernest and Albert of Saxony, compelled the bishop to with- draw, and for the next 200 years both town and abbey were under the protection of the elector of Saxony. In 1539 the townsmen accepted the reformed doctrines and the abbey was converted into a Protestant sisterhood. In 1697 the elector of Saxony sold his rights over

Quedlinburg to the elector of Brandenburg for 240,000 thalers. The abbesses, however, retained certain rights of jurisdiction, and disputes between them and the Prussian government were frequent until the secularization of the abbey in 1803. The last abbess was Sophia Albertina (d. 1829), sister of King Charles XIII. of Sweden. After forming for a few years part of the kingdom of Westphalia, the abbey lands were incorporated with Prussia in 1815.

See the Urkundenbuch der Stadt Quedlinburg, edited by Janicke (Halle, 1873-82); Ranke and Kugler, Beschreibung und Geschichte der Schlosskirche zu Quedlinburg (Berlin, 1838); Lorenz, Alt- Qued- linburg, 1485-1698 (Halle, 1900) ; and Huchs, Fiihrer durch Quedlin- burg. For the history of the abbey see Fritsch, Geschichte des Reichsstifts und der Stadt Quedlinburg (Quedlinburg, 1828).

*QUEEN (O.E. cwen, wife, related to "quean," O.E. cwene, a hussy; cf. Gr. 71*17: from root gan-, to produce; cf. genus, " kin," &c), the title of the consort or wife of a king (" queen consort"), or of a woman who is herself the sovereign ruler of a state (" queen regnant") ; the widow of a former reigning sovereign is a " queen dowager," and, when the mother of the reigning sovereign, a " queen mother."*

For the position of the queen in English constitutional law see Consort, and for her household see Household, Royal.

QUEEN ANNE'S BOUNTY, the name applied to a perpetual fund of first-fruits and tenths granted by a charter of Queen Anne, and confirmed by statute in 1703 (2 & 3 Anne, c. n), for the augmentation of the livings of the poorer Anglican

clergy. First-fruits (annates) and tenths (decimae) formed originally part of the revenue paid by the clergy to the papal exchequer. The former consist of the first whole year's profit of all spiritual preferments, the latter of one-tenth of their annual profits after the first year. In accordance with the provisions of two acts (5 & 6 Anne, c. 24, and 6 Anne, c. 27) about 3900 poor livings under the annual value of £50 were discharged from first-fruits and tenths. The income derived from first-fruits and tenths was annexed to the revenue of the crown in 1535 (26 Hen. VIII. c. 3), and so continued until 1703. Since that date there has been a large mass of legisla- tion dealing with Queen Anne's Bounty, the effect of which will be found set forth in a Report of a Joint Select Committee on the Queen Anne's Bounty

Board, 1900. The governors consist of the archbishops and bishops, some of the principal officers of the government, and the chief legal and judicial authorities. The augmentation proceeds on the principle of assisting the smallest benefices first. All the cures not exceeding £10 per annum must have received £200 before the governors can proceed to assist those not exceeding £20 per annum. In order to encourage benefactions, the governors may give £200 to cures not exceeding £45 a year, where any person will give the same or a greater sum. The average income from first-fruits and tenths is a little more than fi6,ooo a year. In 1906 the trust funds in the hands of he governors amounted to £7,023,000. The grants in 1906 imounted to £28,607, the benefactions to £29,888. The accounts are laid annually before the king in council and the houses of parliament. The duties of the governors are not confined to the augmentation of benefices. They may in addition lend money for the repair and rebuilding of residences and for the execution of works required by the Ecclesiastical Dilapidations Acts, and may receive and apply compensation money in respect of the enfranchisement of copyholds on any benefice. The governors are unpaid; the treasurer and secretary receives a salary of £1000 a year. He is appointed by patent under the great seal, and holds office during the pleasure of the crown.

QUEENBOROUGH, a municipal borough in the Faversham parliamentary division of Kent, England, in the Isle of Sheppey, close to the junction of the Swale and Medway, 2 m. S. of Sheerness on the South-Eastern & Chatham railway. Pop. (1901) 1544. The prosperity of the town has been revived in modern times by the establishment by the railway company of a branch line from Sittingbourne in connexion with a service of mail and passenger steamers to Flushing (Holland), which run twice daily. The first copperas factory in England was established at Queenborough in 1579, by Matthias Falconer, of Brabant. In 1890 Portland cement works were built, and there is a large trade in timber. The town is governed by a mayor, 4 aldermen and 1 2 councillors. Area, 302 acres.

A fortress, called Sheppey Castle, is said to have existed from an early period for guarding the passage of the Swale river. Queenborough Castle was built about 1361 by Edward III., who named the town after Queen Philippa and made it a free borough, with a governing body of a mayor and two bailiffs. Charters were granted by subsequent sovereigns down to Charles I., who reincorporated the town under the title of the mayor, jurats, bailiffs and burgesses of Queenborough. The castle never had any military history, and having been seized by parliament together with the other royal possessions, and being considered of insufficient importance for repair, was demolished during the Commonwealth. The borough subsequently decreased in importance. The chief part of the population were employed in the oyster fishery. The town was first represented in

parliament by two members in 1572; it lost its franchise by the Reform Act of 1832.

QUEEN CHARLOTTE ISLANDS, a compact group lying off the northern part of the coast of British Columbia, and forming part of that province of Canada. Geologically the group is composed mainly of Triassic, Cretaceous and Tertiary strata, penetrated by intrusive rocks. It occupies a position similar

to that held by Vancouver Island farther to the south, in regard to the mainland coast and its immediately adjacent islands, but is separated by a somewhat wider sea from the coast. It was named by Captain Dixon, who visited the islands in the " Queen Charlotte" in 1787. Although the islands promise to become important, because of their excellent harbours, the discovery of good seams of bituminous coal (beside the anthracite already known), their abundant timber of certain kinds and their prolific fisheries, but little settlement has taken place. The wonderfully productive halibut fisheries of Hecate Strait, which separates these islands from the mainland and its adjacent islands, have attracted the attention of fishing companies, and great quantities of this fish are taken regularly and shipped across the continent in cold storage. The natives, the Haida people, constitute' with little doubt the finest race, and that most advanced in the arts, of the entire west coast of North America. They had developed in its highest degree the peculiar conventional art of the north-west coast Indians, which is found in decreasing importance among the Tsimshians on the west, the Tlingit on the north and the Kwakiutl and other tribes farther south on the Pacific coast. The carved totem posts of the Haida, standing in front of the heavily framed houses, or at a little distance from them, represent the coats of arms of the respective families of the tribes and generally exhibit designs treated in a bold and original manner, highly conventionalized but always recognizable in their purport by any one familiar with the distinctive marks of the animal forms portrayed. These primitive monuments are, however, rapidly falling to decay, and the people who erected them are becoming reduced in number and spirit. The native population of the islands is less than 700. (F. D. A.)

QUEENSBERRY, EARLS, MARQUESSES AND DUKES OF. The Queensberry title, one of the many with which the Scottish house of Douglas is associated, originated in the creation of Sir William Douglas (d. 1640) as earl of Queensberry in 1633. He was the eldest son of Sir James Douglas of Drumlanrig (d. 1616). His grandson William, the 3rd earl (1637-1695), was created marquess of Queensberry in 1682 and duke of Queensberry in 1684; he was lord justice general and an extraordinary lord of session. He was also lord high treasurer of Scotland, and served James II. as lord high commissioner to the parliament of 1685, but in 1686

he was deprived of his offices. He had assented to the accession of William and Mary and had again enjoyed the royal favour before he died on the 28th of March 1695. His son James Douglas, the 2nd duke (1662-1711), was born at Sanquhar Castle on the 18th of September 1662, and was educated at the university of Glasgow, afterwards spending some time in foreign travel. At the Revolution of 1688 he sided with William of Orange and was made a privy councillor; after he had become duke of Queensberry in 1695 he was appointed an extraordinary lord of session and keeper of the privy seal. He was the royal commissioner to the famous Scottish parliament which met in 1700, and just after the accession of Anne in 1702 he was made one of the secretaries of state for Scotland. In the latter part of 1703 he came under a temporary cloud through his connexion with the Jacobite intriguer, Simon Fraser, Lord Lovat, who had utilized Queensberry's jealousy of the duke of Atholl to obtain a commission from him to get evidence in France which would impli- cate Atholl. The plot was betrayed by Robert Ferguson, and Queensberry was deprived of his offices. However, in 1705 he was restored and in 1706 he was again commissioner to the Scottish parliament; in this capacity he showed great ability in carrying through the treaty for the union of the two crowns, which, chiefly owing to his influence and skill, was completed in 1707. For this he was very unpopular in Scotland, but he received a pension of £3000 a year. In 1708 he was created duke of Dover and marquess of Beverley, and he obtained a special remainder by which his titles were to pass to his second surviving son Charles, and not to his eldest son James, who was an idiot. In February 1709 he was appointed third secretary of state, and he died on the 6th of July 17 n.

Charles Douglas, the 3rd duke (1698-1778), who had been created earl of Solway in 1706, was lord justice general from 1763 until his death in October 1778. In 1720 he married Catherine, daughter of Henry Hyde, 4th earl of Clarendon; this lady, a famous beauty, although very eccentric, was the friend of many of the wits and writers of her day, notably of Gay, Swift and Walpole. She died on the 17th of July 1777. Their two sons predeceased the duke, and when he died his British titles, including the dukedom of Dover, became extinct, but the Scottish titles passed to his cousin, William, 3rd earl of March (1724-1810).

This William Douglas, who now became the 4th duke of Queensberry, is best known by his soubriquet of " Old Q." On the turf he was one of the most prominent figures of his time, and his escapades and extravagances were notorious. From 1766 to 1776 he was vice-admiral of Scotland, and

in 1760 he was made a lord of the bedchamber by George III.; but later he was an associate of the prince of Wales, being removed from his office in the royal household in 1789. A generous patron of the stage and of art, he was to the end of his life a " noble sportsman" of the dissolute type, and his degeneracy was the theme both of Wordsworth and of Burns. He died unmarried, but not without children, in London on the 23rd of December 18 10. The dukedom of Queensberry and some of his other titles, together with his fine seat Drumlanrig Castle, now passed to Henry Scott, 3rd duke of Buccleuch, in whose family they still remain; but the marquessate of Queensberry descended to Sir Charles Douglas (1777-1837), the representative of another branch of the Douglas family, who became the 5th marquess.

John Sholto Douglas, 8th marquess of Queensberry (1844-1900), son of Archibald William, the 7th marquess (1818-1858), became a well-known patron of sport and particu- larly of pugilism. He helped to found the Amateur Athletic Club in i860, and the new rules for prize-fighting, drawn up in 1867, were called after him the " Queensberry Rules." He married the daughter of Alfred Montgomery, and was succeeded by his son, Percy Sholto, 9th marquess (b. 1868).

QUEENSCLIFF, a town of Grant county, Victoria, Australia, 68 m. by land and 32 by sea S.W. by S. of Melbourne. Pop. (1901) 2025. It lies on Shortlands Bluff, a small peninsula connected with the mainland by the Narrows, a contracted strip of land some 400 yds. broad. Queenscliff is a favourite watering-place, having a fine pier and excellent and safe sea-bathing. It is also a pilot station; and the quarantine station for vessels entering Port Phillip is near the town.

QUEENS'S COUNTY, a county of Ireland, in the province of Leinster, bounded N.W. and N. by King's County, E. by Kildare, S. by Carlow and Kilkenny, and W. by Tipperary; area, 424,723 acres, or about 664 sq. m. The surface is for the most part level or gently undulating, but in the north-west rises into the elevations of the Slieve Bloom Mountains, the highest summit being Arderin, 1733 ft. In the central part of the county there is a large extent of bog. The south-east portion is included in the Leinster coalfield. Nearly the whole of the county is drained either by the Barrow, which has its source in the Slieve Bloom Mountains, and forms at various points the boundary with King's County, Kildare and Carlow, or by the Nore, which enters the county from Tipperary near Borris-in-Ossory, and flows east and then south till it reaches Kilkenny. The lakes are few and small, the largest being Lough Anaghmore on the north-western boundary. The Grand Canal enters the county at Portarlington, and runs southwards to the Barrow in Kildare, a branch passing west- wards 12 miles to Mountmellick.

The limestone plain prevails in this county, but the high coalfield, shared with Kilkenny and Carlow, rises from it in the south; while the Slieve Bloom Mountains, a round-backed Old Red Sandstone mass with Silurian inliers, dominate the lowland west of Maryborough. The limestone itself produces a range of hills near Stradbally, on which the fortress of Duna-mase stands conspicuously. Esker-gravels provide sandy soils

in many places. Clay-ironstone was formerly raised in con- nexion with the anthracite from the coalfield.

The climate is dry and healthy. Originally a great extent of the surface was occupied with bog, but by draining much of it has been converted into good land. For the most part it is very fertile except in the hilly districts towards the north, and there is some remarkably rich land in the south-east. The acreage under pasture is not quite twice that of tillage. Dairy- farming is extensively practised. Agriculture forms the chief occupation, but the manufacture of woollen and cotton goods is carried on to a small extent. The main line of the Great Southern & Western railway traverses the county from N.E. to S.W. by way of Portarlington J and Maryborough; from the latter town branches run N. to Mountmellick and S. to Waterford, and from Ballybrophy a line runs W. to Birr (Parsonstown) and to Limerick.

The population (63,855 in 1891; 57,417 in 1901) decreases in excess of the average of the Irish counties, and emigration is considerable. Of the total about 88% are Roman Catholic, and almost the whole is rural. Maryborough (the county town, pop. 2957), Mountmellick (2407) and Mountrath (1304), with Portarlington ˆ943, partly in King's County), are the principal towns. The county is divided into eleven baronies. Ecclesiastically it is in the Protestant dioceses of Dublin, Killaloe and Ossory, and in the Roman Catholic dio- ceses of Kildare and Leighlin, Ossory and Killaloe. Assizes are held at Maryborough, and quarter sessions at Abbeyleix, Borris-in-Ossory, Graigue (a suburb of Carlow), Maryborough, Mountmellick and Stradbally. The county is divided into the Leix and Ossory parliamentary divisions. To the Irish parlia- ment two members were returned for the county and two each for the boroughs of Ballinakill, Maryborough and Portarlington.

The territory now included in Queen's County covered the districts of Leix, Slewmargy, Irry and part of Glenmaliry, until in 1556 it was made shire ground under the name of Queen's County, in honour of Queen Mary, the place chosen for the county town being named Maryborough. Three miles south of Stradbally is Dun of Clopook, an ancient dun or fort occupying the whole extent of the hill. Aghaboe, where there are the ruins of the abbey, was formerly the seat of the bishopric of Ossory. There are no remains of

the abbey of Timahoe founded by St Mochua in the 6th century, but in the neighbourhood there is a fine round tower, 96 ft. high. Abbeyleix, a small market town south of Maryborough, had a famous Cistercian foundation of the 12 th century. The church of Killeshin, in the S.E. of the county, exhibits fine carving of the Norman period. Among the principal old castles are the ruined fortress of the O'Mores occupying the precipitous rock of Dunamase, 3 m. E. of Maryborough, Borris-in-Ossory on the Nore, and Lea Castle on the Barrow, near Portarlington, erected by the Fitzgeralds about 1260, burnt by Edward Bruce in 13 15, again rebuilt, and in 1650 laid in ruins by the soldiers of Cromwell. .

QUEENSFERRY, a royal and police burgh of Linlithgow- shire, Scotland. Pop. (1901) 1850. It is situated on the S. side of the Firth of Forth, 9 m. by road N.W. of Edin- burgh and about 1 m. from Dalmeny station on the North British railway, and is sometimes called South Queensferry, to distinguish it from the Queensferry on the opposite shore. Of old it was the ferry giving access to Dunfermline and other places on the north side of the firth, its use in this respect by Margaret, the queen of Malcolm Canmore, originating its name; just as Port Edgar, 5 m. W., was named after her brother, Edgar Atheling. The Hawes Inn, which figures in Scott's Antiquary, was the terminus of the run from Edinburgh in the coaching days. Queensferry became a burgh of royalty in 1363, a royal burgh in 1639 and a police burgh in 1882, and belongs to the Stirling district group of parliamentary burghs (with Stirling, Culross, Dunfermline and Inverkeithing) . The principal structures include, besides the small parish church of Dalmeny (the best example of pure Norman in Scotland), the Countess of Rosebery Memorial Hall (erected in 1893 by the earl of Rosebery), a library and reading-room, and a public

hall which also does duty as a town hall. A Carmelite friary was converted into an Episcopal chapel in 1890. There is a large oil-works in the parish. Dalmeny House, the seat of the earl of Rosebery, lies in beautifully wooded grounds about 2 m. E. of the ferry. In the park, on the seashore facing Drum Sands, stands Barnbougle Castle, a building of unknown age which became the seat of the Mowbrays in the 12th century. After passing into the hands of the earls of Haddington, it was purchased in 1662 by Sir Archibald Primrose, an ancestor of the earl of Rosebery. The castle was thoroughly restored in 1880. Dundas Castle, 15 m. S. of Queensferry, was a seat of the Dundases from 1124 to 1875, was besieged in 1449, received a visit from Cromwell in 165 1 and was partly rebuilt about 1850. Hopetoun House, nearly 3 m. W. of the ferry, was begun about 1696 from

the plans of Sir William Bruce of Kinross and completed by Robert Adam. It is the seat of the marquess of Linlithgow. Abercorn, a little to the west, gave the title of duke to a branch of the Hamiltons. It was the site of an ancient monastery, and from 681 to 685 the see of the earliest bishopric in Scotland.

QUEENSLAND, a state of the Australian commonwealth, occupying the whole of the north-eastern portion of the Australian continent, and comprising also the islands in Torres Strait. (For map, see Australia.) It lies between io° and 29 S., and is bounded on the N. by Torres Strait and the Gulf of Carpentaria, on the W. by South Australia and the Northern Territory, on the S. by New South Wales and on the E. by the Pacific Ocean. It has an area of 668,497 sc l- m > a coast line of 3000, is 1250 m. long and 950 m. wide at its widest part. With so extensive a seaboard Queensland is well favoured with ports on the Pacific side. Moreton Bay receives the Brisbane river, on whose banks Brisbane, the capital, stands. Maryborough port is on the Mary, which flows into Wide Bay; Bundaberg, on the Burnett; Gladstone, on Port Curtis; Rock- hampton, up the Fitzroy (Keppel Bay); Mackay, on the Pioneer; Bowen, on Port Denison; Townsville, on Cleveland Bay. Cairns and Port Douglas are near Trinity Bay; Card- well is on Rockingham Bay; Cooktown, on the Endeavour; Thursday Island port, near Cape York; and Normanton and Burketown near the Gulf of Carpentaria. The quiet Inner Passage, between the shore of the Great Barrier Reef, 1200 m. long, favours the north-eastern Queensland ports. Brisbane was founded in 1826, but colonization was restricted until 1842, when the Moreton Bay district of New South Wales was thrown open to settlers. It was named " Queensland " on its separation from the mother colony in 1859. A broad plateau, from 2000 to 5000 ft. in height, extends from north to south, at from 20 to 100 m. from the coast, forming the Main Range. The Coast Range is less elevated. A plateau goes westward from the Great Dividing Range, throwing most of its waters northward to the gulf. The Main Range sends numerous but short streams to the Pacific, and a few long ones south-westward, lost in earth or shallow lakes, unless feeding the river Darling. Going northward, the leading rivers, in order, are the Logan, Brisbane, Mary, Burnett, Fitzroy, Burdekin, Herbert, Johnstone and Endeavour. The Fitzroy receives the Mackenzie and Dawson; the Burdekin is supplied by the Cape, Belyando and Suttor. The chief gulf streams are the Mitchell, Flinders, Leichhardt and Albert. The great dry western plains have the Barcoo, Diamantina, Georgina, Warrego, Maranoa and Condamine. (T. A. C.)

Geology. — Queensland consists geologically of three areas. The eastern division of the state, including all the Cape York Peninsula and the mountainous areas behind the coast, is occupied by the Queensland Highlands, which are built up of a foundation of Archean and contorted

Lower Palaeozoic rocks, upon which rest some sheets of comparatively horizontal Upper Palaeozoic and Mesozoic rocks. The rocks of the Highlands sink to the west below the Western Plains, which consist in the main of a sheet of Cretaceous clays, capped by isolated ridges and peaks of Desert Sandstone. In the far west the plains end against the foot of an Archean tableland, which is the north-eastern projection of the Western Plateau of Australia.

The oldest rocks in Queensland are gneisses and schists, which

appear to underlie the whole of the state. They were originally regarded as metamorphosed Silurian rocks, which had been converted into gneiss, mica-schists and hornblende-schists. Their Silurian age was affirmed owing to their lithological resemblance to rocks in Victoria, which were then regarded as Silurian, but have since been shown to be Archean. The gneisses and schists occupy the Barklay Tableland, the Cloncurry Goldfield and the rocks of the Mackinlay district in the west of the state. The second chief Archean area is around Charters Towers and the Cape Goldfieid ; it includes quartzites, conglomerates arid slates, striking from north-west to south-east. The third Archean area occupies the Gilbert, Woolgar and Etheridge Goldfields, and is composed of schists trending from west to east, and with dikes of diorite and quartz-porphyry. Smaller Archean outcrops occur south of Bowen in the Clarke Range and on the Peak Downs. To the Archean series doubtless belong some of the many granitic massifs, including those of Charters Towers, Ravenswood and Croydon; but some of the granitic rocks are of Lower Carboniferous age, and some are apparently Mesozoic.

The Lower Palaeozoic sedimentary rocks are widely distributed, but owing to the rarity of fossils they are not well known. In the south-west of Queensland there are some Ordovician rocks, the eastern continuation of those in the Macdonnell Ranges. Silurian limestones occur in the mining field of Chillagoe and at Mount Wyatt. The Upper Palaeozoic systems are well developed, even when many of the schists, which have been included in the Devonian, are eliminated. The Middle Devonian is represented by the Burdekin limestones, which contain a rich fossil fauna corresponding to the Bucban and Bindi limestones of Victoria. The Middle Devonian limestones occur on the Marble and Hunter Islands in the Northumberland Archipelago. The Devonian rocks in the Pentland and Gilbert district are estimated by Jack to be over 20,000 ft. in thickness; but they probably include some Lower Palaeozoic beds.

The Queensland Carboniferous system is divided into five series — the Gympie, Star and the three divisions of the Bowen beds. The lowest series is the Gympie, which occurs between Brisbane and Maryborough. It consists

of shales and sandstones, and is traversed by dikes of diorite, which often contain pyrites and gold. The age of these gold-bearing rocks is proved by the presence of such fossils as Productus cora and Protoretepora ampla. The Gympie series is well developed in the districts of Burnett, Broad Sound Bay and Wide Bay, along the coast from Port Curtis to the south of Cape Palmerston. The Gympie beds are greatly contorted; and those of the Star series are regarded as younger, because they are less disturbed. They are best known in the basins of the Great and Little Star rivers, tributaries of the Upper Burdekin. They are best developed on the Belyando river and in the Drummond Range, where the shales and sandstones yield abundant fossil fish; on the Star river the shales contain Lepidodendron. The Bowen beds are divided into three series which represent the upper part of the Carboniferous. The Lower Bowen series consists of agglomerates and altered rocks exposed in the Toussaint Range; farther south, the Lower Bowen beds consist of grits, sandstones and shales, which have been altered by some granitic intrusions. The Middle Bowen series contains beds with Productus cora and Glossopteris. The Upper Bowen beds contain coal seams, abundant remains of Glossopteris and one marine band. They form the centre of the basin of the Bowen coalfield; while the Middle Bowen beds outcrop in a band around it. The Upper Bowen beds occur also at Townsville and Cooktown in Northern Queensland.

The rocks of the Mesozoic group may be divided into two divisions, of which the lower includes terrestrial deposits containing coal seams; the upper is mainly a marine formation, but it terminates with a further development of terrestrial deposits. The Lower Mesozoic division includes the Burrum and Ipswich series. The Burrum series occurs along the eastern coast from Laguna Bay, through Wide Bay and Maryborough, to Blackwater Creek; and it extends inland for about 30 m., where it is faulted against the Gympie beds. The western edge of the Burrum beds are de- scribed as highly altered in places, by contact with granites. The Ipswich series occupies 12,000 sq. m. in the south-eastern corner of Queensland, and is the northern continuation of the Upper Clarence series of New South Wales. It contains coal seams which have been worked, though the coal is of inferior value to that of the Carboniferous of New South Wales. One seam, on Stewarts Creek, near Rockhampton, is 26 ft. thick. Interbedded basalts occur in the Ipswich beds, forming the scarp of the Toowoomba Range. The Burrum and Ipswich beds have been included in the Trias and the Jurassic, or in both systems as the Trias-Jura, but according to A. C. Seward their characteristic fossil, Taeniopteris daintreei, is of Lower Oolitic age.

The Cretaceous system is represented by a lower group of marine clays forming the Rolling Downs formation. They are said to rest conformably upon the Ipswich beds, and some of the fossils found in these beds were

first described as Upper Oolitic. The affinities of the fauna are in part with Lower Cretaceous and in part with the Cenomanian; so both these series may be represented. The Roll- ing Downs formation consists in the main of clays, forming the

Impermeable cover over the subterranean stores of water, which maintain the flowing wells of central Australia. The Rolling Downs formation underlies the whole of the Western Plains of Queensland, from the foot of the Queensland Highlands, westward to the Barklay Tableland ; and it extends from the Gulf of Carpentaria on the north, across the state into South Australia and New South Wales. The Desert Sandstone overlies the Rolling Downs formation. Its age is shown to be Upper Cretaceous by some marine fossils from Maryborough and Croydon, which are said to be from rocks inter- bedded in it. In the interior, the Desert Sandstone is entirely of terrestrial and lacustrine origin, and the only fossils are obscure plant remains and the silicified trunks of trees. Glossopteris has been collected on Betts Creek from a rock identified as Desert Sand- stone, which is said to overlie the Rolling Downs formation ; but there is probably some mistake in the stratigraphy, as Glossopteris is only found in Coal Measures which are clearly of Palaeozoic age. If it had survived into the Cretaceous, some specimens of it would doubtless have been obtained from the coal seams of the Lower Mesozoic. The Desert Sandstone once covered nearly three-quarters of Queensland, having a wider range than the Rolling Downs formation. It was formed partly on land, partly in fresh- water lakes and partly in arms of the sea, as at Croydon and Mary- borough. There is no trace of volcanic rocks in this period, and the vitreous surface of the Desert Sandstone is due to the deposition of efflorescent chert. The Desert Sandstone formation has now been weathered into isolated plateaus and tent-shaped hills.

The Cainozoic group includes many volcanic rocks, mainly sheets of basalt, as at Townsville and Hughenden. Near Herberton, between the head of the Burdekin and the Einasleigh River, the basalts occupy 2000 sq. m. of country. Their age appears to be Oligocene, as they probably correspond with the oldest Cainozoic basalts of Victoria. Volcanic rocks of a later period occur north of Cooktown, and in the Einasleigh River, where the eruptive centres are recognizable; and a series of hot springs, some of which are described as geysers, represent the last stage of volcanic activity. The most important Cainozoic sedimentary rocks are the bone breccias, made up of bones of extinct marsupials, such as Diprotodon, Thylacoleo and giant Kangaroos. They appear to have been bogged in the mud by drying

water holes, during droughts. The bones also occur in beds of gravel and sand, and they have been found in places covered by 18S ft. of overlying deposits. Caves occur in the limestones, and on their floors there are beds yielding bones of marsupials and extinct birds; but no well authenticated case of the ancient remains of man has yet been established.

The chief mineral product of Queensland is gold, found in veins in Archean, Palaeozoic and Lower Mesozoic rocks. The most famous gold mines are Mount Morgan, now changing into a copper mine, Charters Towers and Gympie. Tin is found in the fields of Herberton, Cooktown and Stannary Hills. Copper occurs near Herberton, Chillagoe and Mungana, coal in southern Queensland in the Upper Carboniferous and Lower Mesozoic deposits.

A full account of the geology of Queensland up to 1892 is given in Jack and Etheridge's Geology of Queensland. The tectonic geology of the coast-line has been described by E. C. Andrews, and the general geology is described in the numerous valuable publica- tions of the Geological Survey of Queensland. A summary of the mineral resources was issued by the Queensland government in 1901. Information regarding the artesian water supply is given in the Annual Reports of the Queensland Hydraulic Engineer.

(J. W. G.) Flora. — The Queensland flora comprehends most of the forms peculiar to Australia, with the addition of about five hundred species belonging to the Indian and Malayan regions. There are no mountain ranges of sufficient altitude to make any appreciable change in the plant-life. Bellenden Ker, the highest mountain in tropical Australia, has a height of only 5200 ft., and the plants growing upon its summit, as well as on the highest parts of the neighbouring mountains, are for the most part similar to those on the low lands in the southern parts of the state, and the plants which may be considered as peculiar to these heights are few in number of species. They consist of a Leptospermum and a (?) Myrtus, which attain a height of about 30 or 40 ft., and have widespreading, densely leaved heads. The most attractive of the tall shrubs are Dracophyllum Sayeri, of which there are two forms, Rhododendron Lochae and Orites fragrans. A few orchids of small growth are met with, but the only large species known to inhabit these localities is the normal form of Dendrobium speciosum. These high spots have a few ferns peculiar to them, and of others it is the only known Australian habitat; for instance, the pretty white- fronded Java Bristle-fern (Trichontanes pallidum) has only so far in Australia been met on the south peak of Bellenden Ker; here also Todea Fraseri may be seen with trunks 2 to 3 ft. high. The sides of these mountains are clothed by a dense forest scrub growth, some of the trees being very tall, but diminishing in height towards the summits. Palms and fern-trees are plentiful, but the

greatest variety are met with at about 4000 ft. altitude. So far this is the only known habitat of that beautiful fern-tree Alsophila Rebeccae var. commutata, peculiar for the wig-like growth at the summit of

its stem, which is formed by the metamorphosed lower pinnae and pinnules.

The Myrtaceous genus Eucalyptus, of which sixty species are found, furnishes the greater part of what is designated " Hard- woods," the kinds being variously termed " Box," ' Gum," " Iron- bark," " Bloodwood," " Tallow-wood," " Stringy-bark," &c. These are mostly trees of large size. Other large trees of the order which supply hard, durable timber are the broad-leaved tea- tree {Melaleuca leucadendron and others), " Swamp Mahogany " {Tristania suaveolens) , " Brisbane Box " (7". conferta), " Turpentine " (Syncarpid laurifolia), " Peebeen " {S. Hillii), " Penda " (Xantho- stemon oppositifolius) . These are most generally cut at sawmills. Other orders, however, furnish equally serviceable, large-sized timber, particularly the following: — " Sour Plum " (Owenia venosa, Meliaceae), " Red Cedar " {Cedrela Toona), " Crow's Ash" {Flindersia australis, Meliaceae), " Burdekin Plum " {Pleiogynium Solandri, Anacardiaceae) ; " Bean-tree " {Castanospermum australe, Legumin- osae), " Johnstone River Teak " (Afzelia australis, Leguminosae), " Ringy Rosewood " {Acacia glaucescens, Leguminosae), " Black Walnut " {Cryptocarya Palmerstoni, Laurineae), " Hill's Teak " {Dissiliaria baloghioides). Many trees yield wood particularly adapted for carving and engraving, such as the " Native Pome- granate " {Capparis nobilis), the " Native Orange " {Citrus australis), " Sour Plum " {Owenia acidula), " Ivorywood " {Siphono- don australe). Coachbuilders and wheelwrights use the wood of many myrtaceous trees and several others, with Flindersias (Meliaceae), whilst tool-handles are also formed from these and other trees. There is also a large variety of woods suited for cabinet- making and building. A large number furnish tannin barks, gums, &c. The tannin barks are mostly derived from various kinds of acacia. Three spice barks, locally known as sassafras, are employed for flavouring — in the northern parts, Daphnandra aromahca, a Monimiaceous tree, and Cinnamomum Tamala; and in the southern parts Cinnamomum Oliveri. Many indigenous plants are used in domestic medicines, and several are recognized in the Pharma- copaeia, such as Eucalypts, Cinnamomums, Sideroxylons, Alstonias, Duboisias and Pipers.

With regard to fodder-plants, no country is better furnished; there are many herbs and a large number of salt bushes and other shrubs, which form excellent auxiliaries to the food supply for stock. It is, however, to the grasses that the excellence of the pastures is mainly due. On the extensive plains where the best species abound may be seen a large number of the

genus Panicum, of which the following are looked upon with the greatest favour: — " Vandyke grass," a form of P. flavidum, " Cockatoo grass " (P. semialatum), on the roots of which a species of cockatoo, in some parts of North Queensland, feeds; "Barley grass" (P. decompositutn and P. distachyum) ; "Blue grass" {Andropogon sericeus, A. perjusus, A. refractus, and A. erianthoides) ; " Russell River grass " (Paspalum

falmarra, nearly allied to the South American species P. paniculalum, \ minutiflorum, and P. brevifolium, Agropyrum scabrum) ; " Tall Oat grass " {Anthistiria avenacea) ; " Landsborough grass " {Anthis- tiria membranacea) ; Danthonia racemosa, D. pilosa, D. pallida, and D. semiannularis ; Sporobolus Benthami, an excellent species found near the Diamantina and Georgina rivers, and 5. actinocladus ; Stipa aristiglumis, Leptochloa chinensis, Microlaena stipoides; " Early spring grass " {Eriochloa punctata), with the following "Love grasses": — Eragrostis Brownii, E. chaetophylla, E. pilosa and E. tenella. The " Mitchell grasses " {Astrebla pectinata) and its varieties, viz. the Wheat {triticoides) , the weeping {elymoides) and the curly {curvifolia) , are those that have the most extra- ordinary vitality, but some stockholders consider that the "Sugar grass " or " Brown Top " {Pollinia fulva) surpasses them in its quickness of bursting into leaf with the first showers of rain.

Amongst the fruits are Antidesma Bunius, A. Dallachyanum, A. erostre, A. Ghaesembilla, and A. parvifolium, called cherries or currants according to the size of the fruit they bear, the jelly made from the fruit of some species being in nowise inferior to that made from the European red currant. The Kumquat or lime of Southern Downs country {Atalantia glauca) makes a peculiarly nice-flavoured preserve. Of the allied genus Citrus two species are met with in the south, C. australis, which has a round fruit I to 2 in. in diameter; the other, C. australasica, with long finger-like fruits 3 or more inches long and about I in. in diameter; of this a red variety (C. inodora), which is only met with in the tropics, bears a fruit often 2 \ in. long by i| in diameter. All these fruits are juicy, and of an agreeably sharp, acid flavour. " Davidson's Plum " {Davidsonia pruriens) is a fruit with a sharply acid, rich, plum-coloured juice, sometimes attaining the size of a goose's egg. Of the genus Eugenia, over thirty are indigenous, and fully one-third produce more or less useful fruits. One Fig {Ficus gracilipes) produces a fruit used for jam and jelly. Two Garcinias are recorded as indigenous, but of one only {G. Mestoni) is the fruit known. It is of a depressed globular form, sometimes 3 in. in diameter, very juicy, and of a pleasant flavour. Leptomeria acida, one of the very early fruits used by Australian colonists, is met with in some localities. The "Finger Berry" or "Native Loquat " {Rhodomyrtus macrocarpa) makes a good jam, but is in bad repute for use in the raw state, perhaps owing to a peculiar fungus at

times found to infest the berries. The Queensland Raspberry (Rubus rosaefolius) is widely spread and commonly used, but the fruit is rather insipid. The representatives of the genus Vitis all belong to the sub-genus Cissus ; several of them, although somewhat acrid, are useful for jam and jelly : probably the best for the purpose is one met with near the Walsh River, V. Gardineri, which is said to bear bunches from I lb to 2 ft in weight, the berries being large and of pleasant flavour. A large number of nut-like fruits are used by the aborigines for food, but the only one used by the white population is the fruit of Macadamia ternifolia, the Queensland nut.

The foliage of many plants yields by distillation essential oils, particularly Eucalypts, Backhousias and other Myrtaceous plants, as well as ,ome belonging to Rutaceae and Labiatae, especially the genus Mentha. Apart from plants of economic value, there is a profusion of ornamental plants, shrubs, trees and parasites. Of ferns, one-half of the kinds met with in Australia are found in Queensland as well as in the other states, one-fourth in Queensland alone, the remaining fourth belonging to the other states, but not to Queensland. The indigenous ferns equal in number those of New Zealand, and are three times the number of those of Great Britain. Fauna. — The land fauna of Queensland is essentially one with that of the entire continent. But the geographical position of the state, which exposes it to the climatic and transporting influences of the intertropical Pacific, has to a notable extent impressed on its fauna characters of its own. It has thus been made the headquarters of Australian bird-life on land and fish-life at sea, the moisture of its coastal regions and the warmth of its tidai waters being eminently favourable to that wealth of insect and other low types of life which determines the multiplication of the higher. The quadrupeds of Queensland are of the ordinary Australian type already described. Of the predominant class, the marsupials, one of the most interesting forms is the Tree- Kangaroo (Dendrolagus), as, apart from the habit of climbing trees, which is shared to some extent by the Rock-Wallabies, they afford a proof of the one-time continuity of the fauna with that of the islands to the north, when land communication still existed between the two areas. Of these curious animals, two species at least are known. As to the rest of the marsupials, there is of course a general resemblance to those of the continent as a whole, but this is accom- panied by much evolution of forms, especially among the smaller sorts, recognized by differences which are occasionally sufficient to mark off distinct generic, or even more differentiated groups. The larger Kangaroos are pretty conservative in character every- where, while the common Wallabies, the Rock- Wallabies

and the Kangaroo-Rats exhibit a greater tendency to differ from their southern and western kindred. The Koala, or native Bear, is almost absolutely invariable, a sign of the antiquity of the race. The Opossums and the so-called Flying-Opossums are not many in spacies, and are dwarfed descendants from a more flourishing ancestry. The Bandicoot family (Peramclidae) is fairly represented ; it includes the rabbit-bandicoot, which crosses in its eastern range the western border of the country. Carnivorous marsupials of destructive powers are few; the largest of them, the spotted-tailed native cat (Dasyurus maculatus) , is the most troublesome. Superior in size to the domestic cat, this pretender to the rank of cat is able to devastate a whole hen-roost in a single night, and is even said by the aboriginals to attack their infants. With the exception of a smaller species of the same kind, and a brush-tailed ally very much smaller, but yet able to kill a fowl with a single bite, the rest (marsupial mice) are but partly carnivorous, chiefly insectivorous, and therefore useful. This fauna is now fortunately deprived of the Thylacinus (Native Tiger) and Sarcophilus (Native Devil), which have been driven by physical changes southwards to Tasmania, and, it was thought until lately, of the Wombats, but a new species of these inoffensive burrowers has recently been discovered within the southern borders of the state. One other peculiarity in the form of a marsupial mammal is the little Musk-Rat (Hypsiprymnus), inhabiting those northern scrubs which are so prolific in other animal forms foreign to the rest of Australia, and seem to have received some of their denizens from the Malay Archipelago and some from the Papuan Islands. The remarkable deposits of fossil bones, extending -in patches throughout the length of the country, are sufficient proof that in former times a much larger number of animals were supported by it than are now to be found within its borders. Queensland has only one native carnivorous beast, the dingo, not a marsupial. Rats and mice of native origin are in considerable variety; among them are the Jumping Rats (Hapolotis) , Jerboa-like little animals, which are seldom seen. The bats are of several species; the most notorious of them are the great fruit-bats, or flying-foxes, which the fruit grower could well enough spare. The Sirenian mammal, the dugong, haunts nearly the whols of the coast-line. The Echidna, a porcupine ant-eater, and the playtpus are met with in the south. Batrachians are limited to the frogs and their nearest allies — that is, to the tailless division of the order, the tailed batrachians (newts, &c.) being, as far as is known at present, entirely absent. The greater part of the frogs are arboreal in habit, the most familiar being the large Green Tree Frog. The exuberance and diversity of their food have doubtless been the cause of their differentiation into many distinct species, which

enables them to play a very useful part in checking the undue, increase of noxious insects. Snakes, on the other hand, are in too great variety for

human interests, as they live very largely pninsect- feeders. The great majority belong to the venomous Colubridae, but fortunately the kinds of which the bite is more or. less deadly are not numerous, and snake-bite is one of the rarest causes of death. Those with the worst reputation are the Black Snake and the Orange-bellied Black Snake (P seudechis) , the Brown Snake (Diemansia), the Keeled Snake (Tropidechis), and the Death Adder (Acanthopis). The principal non- venomous species are the Pythons or constricting snakes, e.g. the common Carpet Snake (Morelia), the long lithe Tree Snake (Dendrophis) and the Fresh-water Snake (Tropidonotus). The Black-headed Rock Snake' (Aspidiotes), one of the Pythons, is said to reach the length of from 20 to 25 ft., but to be perfectly inoffensive. Several kinds of marine snakes occur on the coasts, and all are to be accounted dangerous. Of reptiles, the most numerous group by far is that of the lizards, which have among them representatives of each of the leading families of the class except the Chameleons. Tortoises are exemplified by many forms in the fresh waters; on the coasts by the leather-back, the edible turtle and the tortoise-shell turtle. Queensland waters are not at present infested by any species of alligator, though in times past one of large size was a scourge on the borders of the then inland sea. The crocodilian of its coasts is the crocodile of the Indian Seas, which ranges over the whole of the western tropical Pacific, and wanders south into Queensland waters as. far: as Keppel Bay. In the fresh-water pools of the northern tableland is found a small and harmless crocodile (Philas) of a very uncommon form. The avifauna is to the naturalist exceedingly attractive, for it is full of surprises and interesting lines of research, while to the artist it is a storehouse of form and colour. Where flowering and honey- yielding trees prevail, a profusion of birds seek their food either on the insects attracted by the honey, or, if so fitted, on the honey itself. Accordingly, the most striking feature of the bird-life, amid the forests of eucalypts and acacias, is its richness in honey-eaters and insect destroyers. The former, however, taken as a whole, are not a natural group, but include a family of perching birds and a portion of the parroquet family, both furnished with brush tongues adapted to the extraction of honey. A second characteristic is the great development of that quaint company, the bower birds, among them the regent bird, satin bird, cat birds, &c, constructors of the elaborate playgrounds which have excited so much attention. A third is the presence in one small part of the territory of a cassowary,, and on its seaboard of three kinds of rifle birds, both extensions southwards of the tropical families of cassowaries and paradise birds. In the same region of prolific vegetation the handsome fruit-pigeons are also outliers of a large family of such pigeons spread through the Papuan jungles. There is one species of lyre- bird found in the southern highlands; the giant kingfisher, a laughing jackass, is found in the same region. The Scrub-turkey (Catheturus) heaps its mound of rotting debris to

ferment in the shade of the jungles and give warmth to its eggs; the Scrub-hen (Megapodius) piles up sand on the beach for the sun to furnish the necessary temperature. The comparative paucity of birds of prey (Falconidae) , and the almost total absence of rasorial game- and poultry-birds, may be noted. Birds pursued for sport or profit, however, are not wanting. The Emu and the Bustard or Plain Turkey afford sport in the open country, Quail and Snipe in or near the timber, while rivers and lakes still unvisited by the gun are covered with Ducks and Geese, Swans and Pelicans. It has been said that Australia has no migratory birds : this is an error, founded upon an undue restriction of the term migratory. Several species could be mentioned which are truly migratory in Queensland, as the Drongo-shrike, Bee-eater, Dollar-bird, &c. On the land surface, among 1 its lowly organized products, interest centres in the multitudinous forms of insect-life, of which, excepting the Butterflies and Moths (Lepidoptera) and Beetles (Coleoptera), comparatively little is known at present. Insects inimical to man, with the exception, in some localities, of ants, flies and mosquitoes, are inconsiderable in number, and possess few hurtful properties. Centipedes, scorpions and leeches are less troublesome than in most other tropical regions. Spiders present themselves in astonishing variety, but only one kind, a small black spider with red spots (Lathrodectus) , is malignant. Among the larger insects proper, the great-winged Phasmas, the Skeleton or Stick-insects, the Leaf-insects, and the splendid Swallow- tailed Butterflies are especially notable. Many of the Beetles are remarkable for size or brilliancy of colour.

Fishes and Fisheries. — The class fishes is extraordinarily profuse in diversified forms, the coral reefs being the grazing- and hunting- grounds of hosts of gorgeously decorated fish, chiefly of the Wrasse family; these, however, are almost equalled in beauty by the Chaetodons, Gurnards, &c, of other habitats. Among the Perches are the enormous Groper, which may attain the weight of 4 cwt., the Murray Cod, and the Giant Perch, both excellent food-fish of about 70 ft in weight. Sharks of many species abound. A survival from the Mesozoic period is the Ceratodus or Burnett Salmon,, which, formerly inhabiting the headwaters of the Murray, still breeds in two of the smaller rivers north of the Bunya Range. This fish possesses a rudimentary lung in addition to ordinary gills. The

barrier reefs are thickets of corals of the most varied forms, in life glowing with colour, in death shrubs of snowy purity. Among the shell-fish conspicuous for beauty or rarity are the exquisitely delicate paper nautilus and Venus comb {Murex tenuispina), the orange and other valuable

cowries, and the gigantic clam-shell, which may require a ship's tackle to lift it from its bed. The fishery of the trepang, beche-de-mer or sea slug employs a considerable number of boats about the coral reefs. Boiled, smoke-dried and packed in bags, the trepang sells for exportation to China, though its agreeable and most nourishing soup is relished by Australian invalids. One species of this sea slug — the teat-fish — fetches as much as £240 per ton. The pearl fishery is a prosperous and progressive one in or near Torres Straits. A licence is paid, and the traffic is under government supervision. Thursday Island is the chief seat of this industry. The shells are procured by diving, and fetch from £120 to £200 a ton. Mother-of-pearl and tortoise-shell constitute important exports of the colony, capable of great expansion. Oysters are as fine flavoured as they are abundant. Turtles are caught to the northward. Of the fish which frequent the coast, one of the best known varieties is the sea mullet (Mugilidae), large shoals of which strike the Australian coast 100 m. south of Sydney, and travel northwards, arriving on the southern coast-line of Queensland in the months of April and May, crossing bars and ascending rivers on the appearance of south-easterly weather. These magnificent fish often attain a weight of from 10 lb to 12 lb. Small schools of bream succeed the mullet, and are followed in September and October by the poombah or tailor-fish, a fish of exceptional flavour, and much esteemed by epicures. These are succeeded by jewfish, specimens of which caught in southern waters have been known to exceed a weight of 50 lb, whiting, garfish and flatheads, while flounders, black and tongue soles are occasionally caught by seine or hauling nets. White and black trevally, groper and rock cod, and a variety of bonito identical with the tunny of the Mediterranean Sea are also frequently met with. Several species of the tassel fish (Poly- nemus macrocohoir) , from which isinglass is procured, have been taken by fishermen. King-fish, batfish, gurnards and eels of many varieties are also common. Schnapper, bream, rock cod, parrot-fish and groper are caught by hook and line in from 10 to 30 fathoms of water off the rocky headlands of the southern coast. Sardines, whitebait and sprats make their appearance in large shoals on the coast at intervals. The barramundi (Osteoglossum leichardti), which occurs in the Dawson and western waters, is found also on the "east coast, and is one of the most esteemed fresh-water fish in Queensland. Dugong, which formerly were found in herds along the northern coast and as far south as Moreton Bay, are caught in set nets of 36 in. mesh, 100 fathoms in length. Different varieties of turtle are plentiful, the green edible turtle being caught by large set nets, and preserved and tinned for export. In Torres Strait and the northern coast the hawksbill turtle, yielding the valuable tortoise-shell of commerce, is said to be captured in a peculiar manner, the sucking-fish or remora (Echeneis naucrates) being utilized by the islanders for that purpose. The remora is carried alive in the bottom of the canoe, a long thin line being attached to

the fish's tail and another usually to the gill. On a turtle being sighted and approached to within the length of the line, the sucking- fish is thrown towards it, and immediately it swims to and attaches itself by its singular head sucker to the under surface of the turtle, which if of moderate size is easily pulled into the canoe.

Amongst the Crustacea may be enumerated the gigantic clams which are found on the reefs of the Inner Route. Occasionally some are met with weighing nearly half a ton, embedded in coral. Fresh-water clams are found in the rivers in the northern districts. The edible oyster (Ostrea graminifora) has been largely cultivated in southern Queensland. Amongst other Crustacea, the squat lobster (Themis orientalis) is, with giant prawns and quampi, or small golden-lipped pearl shell, obtained by trawling in the southern waters. Many varieties of crabs are also found on reefs and fore-shores at low tide; prawns and shrimps are caught, dried, and form an article for export to China ; mussels, pinna or razor-shell cockles, and eugaries (a species of small shell-fish) are also abundant.

Climate. — As one-half of Queensland lies within the tropics the climate is naturally warm, though the temperature has a daily range less than that of other countries under the same isothermal lines. This circumstance is due to the sea breezes, which blow with great regularity. The hot winds which prevail during the summer in some of the other states are unknown in Queensland. Of course, in a territory of such large extent there are many varieties of climate, and the heat is greater along the coast than on the elevated lands of the interior. In the northern parts of the state the high temperature is trying to persons of European descent. The mean temperature at Brisbane during December, January and February is about 76 , while during June, July and August it averages about 6o°. In towns farther north, however, the average is higher. Winter in Rockhampton, for - nstance, averages nearly 65°, while the summer average rises almost to 85 . At Townsville and Normanton the average is higher still. The average rainfall is high, especially along the northern coast, where it ranges from 60 to 70 in. per annum. At Brisbane 50-01 in. is the average of 35 years, and

even on the plains of the interior from 20 to 30 in. usually fall every year. West of the coast range the air is dry and hot, and in summer the thermometer rises frequently to 106 in the shade. The monsoons play an important part in cooling the atmosphere near the coast, and are very regular in the north. The winter climate is perfection, especially in the north, but frosts are frequent and regular west of the coast range. Ice is commonly seen at Herberton, 17 S., during winter, and on the Darling Downs frosts are of nightly occurrence.

Population. — The population of Queensland in 1905 was estimated at 528,048 — 290,206 males and 237,842 females, the density of population per sq. m. being about 0.79. In 1861, that is, two years after the separation from New South Wales, the population of the colony stood at 34,400; in 1871 it had reached 125,100; in 1881, 227,000; in 1891, 410,300, and at the census of 1901, 498,129. The policy of assisted immigration contributed greatly to Queensland's progress, and people of foreign descent are proportionately more numerous than in any of the other states, though they only amount to 8-71% of the total population. At the census of 1901 there were 13,166 Germans, 3161 Danes, 2142 Scandinavians, and among coloured aliens 8587 Chinese, 2269 Japanese, 939 Hindoos and Cingalese, 9327 Pacific Islanders, and 1787 other races, making a total of 22,909 coloured aliens. It is estimated that the total aboriginal population of Queensland is about

25,000.

The births in 1905 were 13,626, of which 950 were illegitimate, and the deaths 5503, the respective rates per thousand of the population being 25-92 and 10-47. The decline in the birth rate will be gathered from the following table : —

tj ■ j Birth Rate per 1000

r, – , Birth Rate per 1000 Period. of Popu i ation .

1 enoa.

of Population.

1861-65

• 43-07

1886-90 . . 38-81

1866-70

• 43-91

1891-95 • • 35-15

1871-75

. 40-81

1896-1900 . . 30-40

1876-80

. 36-72

1901-05 . . 26-60

1881-85

• 36-37

The death rate shows a remarkable diminution: in 1861-65 it averaged 21-06 per 1000; in 1871-75, 17-94; m 1881-85, 19-10; and in 1891-95, 12-82. The marriage rate in 1905 was 6-04 per 1000, being an increase on the figures for 1904 of 95.

The chief cities and towns, with their population in 1905, are: — ■ Brisbane, 128,000; Rockhampton, 15,461; Gympie, 13,200; Maryborough, 12,000; Townsville, 10,950; Toowoomba, 10,700; Ipswich, 8637; Mount Morgan, 8836; Charters Towers, 6000; Bundaberg, 5000.

Administration. — As one of the Commonwealth states Queensland returns six senators and nine representatives to the federal parliament. The state parliament consists of a legislative council of 37 members nominated for life, and a legislative assembly of 72 members, who each receive £300 per annum for their services. For purposes of local govern- ment the state in 1905 was divided into 46 municipalities and 125 shires. The boroughs control 354 sq. m. and the shires 667,898 sq. m.; the revenue and expenditure of the former in 1905 being respectively £312,510 and £321,645, and of the latter £190,837 and £180,457. Revenue is mainly derived from rates levied on the capital value of assessed properties, which amounted for the whole state to £42,358,173, representing an annual value of £2,647,400. All improvements are exempt from assessment, and much of the revenue is expended in road-making and the building of bridges. Rates are supple- mented by an endowment from the central government.

Education. — Public education is free, unsectarian and compulsory. State or provisional schools are formed wherever an average attendance of twelve children can be got. Theoretically the school age is from six to twelve years, but in practice compulsory attendance is seldom if ever enforced in certain parts, owing mainly to the difficulty of providing suitable schools within reasonable access. In 1905 there were 1044 state schools, with 2382 teachers and 88,903 scholars. Of private schools the number in 1905 was 171, with 739 teachers and 14,891 pupils. Exclusive of coloured aliens almost the whole adult population can read and write. In 1905 the sum spent on education was £281,575. Ten grammar schools are

endowed by the state. By a system of competitive scholarships the government gives free education in grammar schools to scholars in state schools, and also three-yearly exhibitions to universities to students who pass an examination of a high standard. State aid is also rendered to schools of art, schools of design, free libraries and technical schools.

73ˆ

QUEENSLAND

4,047,850

32

6

11

13.245.150

58

7

2

29.457.134

73

12

5

39,338,427

76

8

6

39,068,827

74

6

There is no state church. Amongst the different denomina- tions the Church of England, at the date of the last census, numbered 37-5 % of the population, the Roman Catholic 24-5%, the Presbyterians 11-7, the Methodists 9-5, the Baptists 2-6o, the Jews 0-2, other Christian bodies 12-3, Pagans and Mahom- medans, 4-43.

Finance. — For the year ending June 1905, the receipts amounted

to £3,595.399. equal to £6, 17s. iod. per inhabitant. The chief

items of revenue were: taxation, £454,574; crown lands, £623,416;

railways, £1,409,414; balance refunded by the federal government,

£752,532. The expenditure for that year was £3,581,403, equal to

£6, 17s. 4d. per inhabitant; the chief items being: — interest on

public debt, £1,547,091; railways, £812,931; education, £322,496;

charitable institutions, £135,338. The public debt of the state

at the end of 1905 was £39,068,827, or £74, 6s. 3d. per inhabitant;

the bulk of this sum, £23,567,554, having been expended on railways.

The following shows the growth of the public indebtedness: —

Year. Total Debt. Debt per Inhabitant.

1861 …. £70,000 £209

1871

1881

1891

1901

1905

Defence. — The Commonwealth defence forces in Queensland had an actual strength at the end of 1905 of 7212 men, comprising a permanent force of 258, 2486 militia, 959 cadets and 3189 riflemen. Mining. — In Mount Morgan Queensland possesses one of the chief gold mines of the

world, and this mine is also one of the leading copper mines of the Commonwealth. In 1905 the value of the mineral production of the state was £3,726,275, being an excess over that of the previous year of £22,034, the highest in the history of the state. This advance was due, not to any improvement in the gold yield, which, latterly, has receded from the high level of former years, but to the increased output of the industrial metals. The value of the minerals, other than gold, won during 1905 amounted to £1,208,980, almost one-third of the total value of the year's mineral production, in which gold represented £2,517,295; silver, £69,176; copper, £503,547; tin, £297,454, an d coal, £i55.477-

Agriculture. — The total area under cultivation in Queensland in 1905 was 622,987 acres, the principal crops being: — wheat, 119,356 acres; maize, 113,720 acres; hay, 37,425 acres; green forage, 66,183 acres; potatoes, 7170 acres; barley, 5201 acres. Sugar-cane cultiva- tion is important. The progress of the industry may be gauged from the following figures: — area under cane in 1864, 94 acres; 1871, 9581 acres; 1881, 28,026 acres; 1891, 50,948 acres; 1901, 112,031 acres; 1905, 134,107 acres. The greater part of the field work on the Queensland plantations was long performed by coloured labour, chiefly South Sea islanders. In 1901, however, the federal parlia- ment passed an act under the provisions of which a limited number of Pacific islanders were allowed to enter Australia up to the 31st of March 1904, but after that date their coming was to be pro- hibited. All agreements for the employment of these Kanakas were to terminate on the 31st of December 1906, after which date all Pacific islanders were to be deported. Fruit cultivation has attained considerable importance. In 1905, 2044 acres were under vines; 6198 under bananas; 1845 under pineapples; 3078 under oranges; 374 under mangoes; 173 under strawberries; 537 under apples. The soil and climate of Queensland are admirably fitted for the production of excellent cotton, but this promise has not been realized. In 1871 the export of this staple was over 2,600,000 lb, valued at £79,000; the production gradually diminished and in 1898 absolutely ceased. The year 1902 saw a revival when 8 acres were planted; and in 1905 171 acres were devoted to cotton- growing. While the area set apart for tobacco cultivation continues to increase, the yield in 1905 being 10,230 cwt. (cured leaf) from 933 acres, the production of coffee dropped from 132,554 lb in 1904 to 82,230 lb in 1905.

Stock-raising is, however, the principal industry of the country. At the close of 1905 the numbers of the principal kinds of stock depastured were: cattle, 2,963,695; sheep, 12,535,231; horses, 430,565; swine, 164,087. The cattle industry has been greatly affected by the ravages of the cattle tick and by a succession of disastrous seasons, and the number in the state in 1905 was con- siderably less than half the number mustered in 1894. As the state is very lightly stocked a few good seasons will serve to bring the

number of cattle up to the previous greatest record. The sheep industry in Queensland though of less importance than the cattle, is still considerable, and of the six states of Australia, Queensland ranks second in the number which it depastures. The sheep depastured in 1905 were some nine millions less than in 1892. The weight of wool exported in 1905 was 53,072,727 lb; in 1892, however, the export was over 105 millions. Good progress has been made in dairying, the production of butter in 1905 being 20,320,000 lb; of cheese, 2,682,089 lb; of bacon and ham, 10,500,335 lb. It is estimated that the annual value of the pastoral and dairying industry of Queensland is about £8,224,000. The export of live cattle in 1905 amounted in value to £1,500,855; of fresh and pre- served meat, £707,345; of wool, £2,280,924; of tallow, £183,372 —

in 1894 the tallow export was nearly 30,000 tons, valued at £596,000.

Manufactures. — Queensland is not populous enough to have manufactures on a large scale, nevertheless there are 21,705 persons employed in the 1911 establishments of the state. The majority of these persons are engaged in the preparation of natural products for export, such as sugar, preserved meats and the like, or in industries arising out of the domestic requirements of the popula- tion. The horse power employed in 1905 was 28,009; tne value of plant and machinery was £3,988,056; and of land and premises £2,709,951 ; while the value of the output stood at £8,130,480.

Commerce. — The shipping entering Queensland ports in 1905 had a tonnage of 1,067,741 as compared with 468,607 in 1890. The imports in 1905 were £6,699,345, which is much less than the average of Australia, but nearly all the Queensland importations are for home consumption, whereas New South Wales, Victoria and South Australia have a large re-export trade. In 1861 the imports were valued at £968,000, or £31 per inhabitant; in 1871, £1.563,000, or £13 per inhabitant; in 1881, £4,064,000, or £18, 6s. per inhabitant; in 1891, £5,079,000, or £12, 13s. per inhabitant; in 1900, £7,184,112, or £14, 13s. 3d. per inhabitant. The disparity between the capitation figures of various years is due chiefly to two causes: the irregularity of the state borrowings, and the manner in which private capital has been sent from England and from the Australian states for investment in Queensland, both the borrowings and the investments appearing in the imports. The important bearing of these two items on the Queensland import trade may be gathered from the fact that, since 1863, there has been an inflow of capital into the state at the irate of about one million and a quarter sterling per annum. The exports from Queensland in 1905 were valued at £11,939,594, which is equal to the very high average of £22, 14s. 3d. per head; nearly the whole amount represents goods and produce of local origin. Going back to 1 861 the

amount of exports at the various decennial periods was: —

Year. Value of Total Exports. Exports per Head.

1861 …. £709.599 £22 14 8

1871 …. 2,760,045 22 18 8

1881 …. 3.540,366 15- 18 6

1891 . . . . 8,305,387 20 13 6

1901

9,249,366

is 5 10

Brisbane is the chief seat of trade, but this port does not hold so predominating a position as do the chief cities of the other states in regard to their minor ports. In 1905 the trade at the seven principal seaports of Queensland was : —

Port.

Imports.

Exports.

Brisbane

• £4.104.574

£3.524.939

Rockhampton

437,068

1,708,489

Townsville .

671,853

1,838,055

Bundaberg .

121,567

498,381

Maryborough

157,023

248,706

Mackay

80,468

499.034

Cairns

184,716

873.370

Railways. — Up to 1905 the state had expended £21,683,355 upon the construction and equipment of railways. The mileage open for traffic at the end of that year was 31 13; there were also 268 m. of privately owned railways. Railway construction in the state commenced in 1864, some five years after the introduction of re- sponsible government. Progress during the early years was very slow; in 1871 only 218 m. had been constructed and in 1881 only 800 m. ; between 1881 and 1891 railway construction was pushed on rapidly, an average of 152 m. a year being opened between those dates. In 1891 the length open for traffic was 2320 m., and in 1901 2801 m. The state railways in 1905 earned £1,483,535 and the working expenses were £851,627, leaving the net earnings £631,908, which is equal to 2-91% upon the capital expended. As the rate of interest paid on the outstanding loans of the Queens- land government is 3-94, there is an actual loss to the state of 0-30%. This loss, however, is more than counterbalanced by the advan- tages resulting from the construction of the railways.

Posts and Telegraphs. — There were 1360 post offices in the state in 1905; telegraph stations numbered 515, and there were 19 tele- phone exchanges. The revenue from these three services in 1 905 was respectively £233,523, £88,285 and £31,765— a total of £353.573. as against an expenditure of £415,420.

Banking. — The liabilities of the eleven banks trading in the state in 1905 totalled £13,770,865, and the assets £16,362,292. The deposits amounted to £13,217,084. The banks held coin and bullion to the value of £1,897,576. In the Government Savings Bank there was a sum of £3,992,758 to the credit of 84,163 depositors. The deposits in all banks amounted, therefore, to £17,209,842, which represents £32, us. iod. per head of population.

Authorities. — Statistical Register of Queensland (annual) ; Queens- landOfficial YearBook (1901) \Reports of the Government Statistician; H. Russell, Genesis of Queensland (Sydney, 1888); T. Weedon, Queensland Past and Present (Brisbane, 1897); T. A. Coghlan, Australia and New Zealand (Sydney, 1904); F. M. Bailey, Notes on the Flora at Queensland. (T. A. C.)

QUEENSLAND

History

The Portuguese may have known the northern shore nearly a century before Torres, in 1605, sailed through the strait since called after him, or before the Dutch landed in the Gulf of Carpentaria. Captain Cook passed along the eastern coast in 1770, taking possession of the country as New South Wales. Flinders visited Moreton Bay in 1802. Oxley was on the Brisbane in 1823, and Allan Cunningham on Darling Downs in 1827. Sir T. L. Mitchell in 1846-47 made known the Maranoa, Warrego, and Barcoo districts. Leichhardt in 1845-47 tra- versed the coast country, going round the gulf to Port Essington, but was lost in his third great journey. Kennedy followed down the Barcoo, but was killed by the blacks while exploring York Peninsula. Burke and Wills crossed western Queens- land in i860. Landesborough, Walker, M'Kinlay, Hann, Jack, Hodgkinson and Favence continued the researches. Squatters and miners opened new regions. Before its separa- tion in 1859 the country was known as the Moreton Bay district of New South Wales. A desire to form fresh penal depots led to the discovery of Brisbane river in December 1823, and the proclamation of a penal settlement there in August 1826. The convict population was gradually withdrawn again to Sydney, and in 1842 the place was declared open to free persons only. The first land sale in Brisbane was on August 9, 1843. An attempt was made in 1846, under the colonial ministry of Gladstone, to establish at Gladstone on Port Curtis the colony of North Australia for ticket-of-leave men from Britain and Van Diemen's Land. Earl Grey, when secretary for the Colonies, under strong colonial appeals arrested this policy, and broke up the convict settlement. In 1841 there were 176 males and 24 females; in 1844, 540 in all; in 1846, 1867. In 1834 the governor and the English rulers thought it necessary to abandon Moreton Bay altogether, but the order was withheld. The first stock belonged wholly to] the colonial Government, but flocks and herds of settlers came on the Darling Downs in 1 84 1. In 1844 there were 17 squatting stations round Moreton Bay and 26 in Darling Downs, having 13,295 cattle and 184,651 sheep. In 1849 there were 2812 horses, 72,096 cattle, and 1,077,983 sheep. But there were few persons in Brisbane and Ipswich. The Rev. Dr Lang then began his agitation in England on behalf of this northern district.

Some settlers, who sought a separation from New South Wales, offered to accept British convicts if the ministry granted independence. In answer to their memorial a shipload of ticket-of-leave men was sent in 1850. In spite of the objection of Sydney, the Moreton Bay district was separated from New South Wales by an Order in Council of 13th May 1859, and pro- claimed the colony of Queensland. The population was then about 20,000,

and the revenue £6475.

The constitution, which was based upon the New South Wales Act of 1853, provided for 16 electoral districts, with a representation of 26 members. A Legislative Council was also formed, to which the governor of New South Wales, Sir William Denison, appointed 5 members, to hold office for four years, and Sir George Ferguson Bowen, the first governor of the new colony, 8 life members. Robert (afterwards Sir Robert) George Wyridham Herbert was the first premier and colonial secretary, and held office until 1866. Of the 39 repre- sentatives in the first Parliament, 20 were pastoralists; the others may be roughly classed as barristers, solicitors, and merchants. The pastoralists were the pioneers of settlement in the colony; those best known were the Archers of Gracemere, the Bells of Jimboor, the Gores of Yandilla, the Bigges of Mount Brisbane, Mr (afterwards Sir) Arthur Hodgson, Robert Ramsay, Gordon Sandeman, and Messrs Kent and Wienholt. The white population at the end of 1859 was 25,788, and the exports were valued at £500,000.

Herbert's Administration, 18 59-1 866. — The first Parliament

»vas opened on May 29, i860. The providing of revenue and

the establishment of immigration were the chief matters for

consideration. The treasury was practically emDty, but Sir

xxii. 24

Saul Samuel, treasurer of New South Wales, took a broad and generous view of the situation, and rendered financial aid, whilst in 1861 the first Government loan of £123,800 was authorized, the money being appropriated to public works and European immigration. Labour was so scarce that as early as 1851 the squatters had imported Chinese; various schemes for the introduction of coolies on a large scale were now mooted, but public opinion was decidedly against any increase in the number of coloured aliens then in the colony. In 1859 the educational system was a mixed national and denominational one; there were 10 schools of the latter class, 1 of the former, and 30 private schools. In i860 a Board of General Education was established, which extinguished the denominational system and placed the schools under State control. In the same year State aid to religion was abolished. The governor, in opening Parliament in 1863, pronounced decisively against the reintroduction of convicts. In that year Queensland boldly grappled with the extension of colonizing, and a settle ment was established at the northerly point of Cape York pen- insula by Mr Jardine. During the following two years ports were opened along the coast,

and pastoral occupation spread far into the northern and western interiors. The first sod of the first railway, from Ipswich to the Darling Downs, was turned on 15th February 1864. On February 1, 1866, Mr Herbert retired, and Mr Macalister became premier and Mr Mackenzie colonial secretary. In the following July the failure of the Overend and Gurney and Agra banks, in the latter of which the Government had public moneys, caused the collapse of a loan which was being negotiated in London. A panic followed: the Government could not pay the railway contractors, and the navvies employed by them started for Brisbane, threatening to hang the ministers and loot the town. On arrival, however, they were easily headed off to a reserve. By this time the treasury was empty, general insolvency pre- vailed, and the community appeared to be wrecked. Treasury bills to the amount of £300,000 were issued, and the governor in council was authorized to legalize treasury notes, when necessary, as currency, payable in gold on demand, to tide over the crisis. Prior to this, however, the treasurer took preliminary steps to issue £300,000 " Legal Tender Notes " — inconvertible " greenbacks " — but Sir George Bowen informed the premier that he should veto such a scheme, and suggested the issue of treasury bills. Mr Macalister thereupon resigned, and Mr Herbert, who had made arrangements to proceed to England (where subsequently he became permanent secretary of the Colonial Office), took office again to help the colony through the difficulty. His second ministry lasted for eighteen days, and, having passed the Treasury Bills Act, he retired from the public life of Queensland. The only determined opposition the Herbert ministry met with was from the towns- people's representatives, whose contention was that the squatters dipped too deeply into the public purse for public works ex- penditure; but an important factor in the early parliamentary days was the opposition between the Brisbane and Ipswich parties in the House, the latter town aspiring to be the capital of the colony.

The Discovery of the Goldfields, 1866-1879. — Macalister returned to power in August 1866, and dealt so vigorously with the after-effects of the financial crisis that by the end of 1867 affairs had approached their normal condition. A new era was now opened for Queensland by the discovery of gold. The Gympie field was discovered by Nash in 1867, and a big " rush " resulted. In 1872 Hugh Mosman discovered Charters Towers, the premier goldfield of the colony; and Hann, the rich Palmer diggings. Other important discoveries were also made, and Queensland has ever since been a gold-producing colony. Mining is the foundation upon which much of the progress of the colony has been built, and the legislation and records show continuous traces of the influence of the gold-getter. In 1873 John Murtagh Macrossan, a digger, was returned to Parliament expressly as a mining representative; and other men of a different stamp from the representatives of the squatters and townspeople, who had

hitherto composed the House, now began to enter public life. From 1870 to 1879 progress was satisfactory, trade interests were prosperous, and in this decade the foundations of the public and social structure of Queensland were laid. Agriculture was extended, and sugar-growing took the place of cotton cultivation. (The first crop of sugar was grown by the Hon. Louis Hope at Cleveland, about 1862.) Hitherto politics had been non-partisan, and legislation was chiefly of a domestic character. From the time of Herbert's departure until the appearance of Thomas Mcllwraith and Samuel Walker Griffith, the two master-spirits of Queensland parliamentary life, the political history of the colony was composed of short-lived administrations, with Messrs Macalister, Mackenzie, Palmer, Lilley, George Thorn and John Douglas (afterwards Government Resident at Thursday Island) as premiers. Arthur Hunter Palmer (whose administration, from 1870 to 1874, had the longest life), a New South Wales squatter, entered the Queens- land Parliament in 1866. He was one of the most popular of Queensland's parliamentary leaders, and has left the impress of his labours on the public works, and educational and defence force systems of the colony. In 1870 Queensland was dis- appointed in her ambition of becoming the connecting-point for Australia with the European and Eastern cable systems. A company — the British Australian Telegraph Company — was formed in London to connect Australia by cable with Singapore. The plan provided for a land line from the Queensland telegraphs at Burketown to Port Darwin, in the Northern Territory, where the cable was to be landed. Writing on 25th January 1870, the Telegraph Construction and Maintenance Company officially informed the governor of Queensland that it had received a contract from the British Australian Telegraph Company to construct " cables and land lines, to be laid between Singapore and Burketown, in North Australia." The Construction Com- pany deputed Commander Noel Osborn to negotiate with the Governments of South Australia and Queensland in reference to the land line; but on arrival in Adelaide he accepted the offer of the South Australian Government to construct and maintain a telegraph line right across the continent from Port Darwin to Adelaide, and Queensland was informed that the original plan had been abandoned. Although the company was thus saved the expense of making and maintaining the Port Darwin-Burke- town line, it was regarded as having broken faith with Queens- land, which had specially pushed on her telegraph system to connect with the proposed line. In consequence of this incident Queenslanders have not always had the facilities for cheap cabling to Europe enjoyed by the other colonies,

though the subsequent owners of the cable, the Eastern Companies, were in no way responsible for the act of their predecessors.

A resolution in favour of the payment of members was carried in 1871. In 1872 the first Agent-General in London, Richard Daintree, was appointed. The same year the Railways Act Amendment Act was passed, authorizing the construction of railways by private enterprise, land being offered as com- pensation for the outlay. Electoral representation was increased to forty-two members. In January 1874 Palmer resigned, and Macalister came into power for two years, the most import- ant measure of his Government being the State Education Act of 1875, on which the present educational system is based. Both Messrs Mcllwraith and Griffith were members of the Macalister ministry, but the former resigned in October 1874, owing to a difference of opinion as to a proposed land-grant railway from Dalby to Norman ton. In 1878 Mr (afterwards .Sir) James Francis Garrick first became a cabinet minister, joining the Douglas ministry as secretary for public works and mines.

Active Politics, i8jg-i8go. — On 21st January 1879 the first Mcllwraith administration came into power, and an import- ant extension of local government was one of the early measures passed, divisional boards being formed to take charge of public works in districts not included in municipalities. In the following session, 1880, the Opposition, led by Mr Griffith, bitterly opposed the Government proposals on Kanaka labour,

land-grant railways, and a European mail service via Torres Straits. The Government, however, concluded an agreement with the British India Steam Navigation Company for a monthly mail service between Brisbane and London for an annual subsidy of £55,000. The Railway Companies Preliminary Act, giving the governor in council power to treat with persons willing to construct railways in return for grants of 8000 acres of land for each mile of rails laid, was also passed. This measure was generally unpopular, and no railways were built under its provisions. During the session Mr Griffith impeached the premier in connexion with contracts for the purchase of 15,000 tons of steel railway metals, and their carriage to the colony, made in London whilst Mcllwraith was there in January 1880. A select committee in the colony, and afterwards a Royal Commission in London, subsequently reported in the premier's favour. The discovery of the celebrated Mount Morgan gold mine, and the initiation of artesian well-boring by R. L. Jack, Government geologist, took place in 188 1. In 1883 a great drought prevailed, and the compulsory stoppage of public works demoralized the labour market. Early in the year information reached the colony that Germany proposed to annex a portion of New Guinea, which, together with other islands in the Papuan Gulf, was becoming of great strategic value to Australia; and the premier, fearing that it would thus be

lost to the empire, instructed Mr H. M. Chester, police magistrate at Thursday Island, to proceed to Port Moresby and take possession of the unappropriated portion of the island in the name of the crown. This act was afterwards — to the indignation of Australia — repudiated by Lord Derby; and, eventually, under the Berlin Treaty of 1886, England and Germany entered into joint- possession of that part of New Guinea lying east of 141° E. In July Sir Thomas Mcllwraith (created K.C.M.G. in 1882) was defeated by 27 votes to 16 on a proposal to arrange for the construction of a land-grant railway from Charleville to the Gulf of Carpentaria. The general elections which followed were fought mainly on the questions of coloured labour for the sugar plantations and land-grant railways. The Government was defeated, and Griffith formed his first administration. Later in the year the premier drafted the Federal Council Act at Sydney, and through his efforts Queensland eventually joined the Federal Council of Australasia. In 1884 a ten-million Loan Act was passed, intended to secure continuity in borrowing for railway construction, but many of the lines specified were unsurveyed. According to the view now generally held in Queensland, this loan seriously hampered the colony in after years. In 1887 the number of seats in the Assembly was increased to 72 (the present number), and several reforms were effected in the public service, notably the establishment of the department of agriculture. At the general elections in 1888 Sir Thomas Mcllwraith was returned for North Brisbane, defeat- ing Sir Samuel Griffith (who had been created K.C.M.G. in 1886) by a large majority, and resumed office as premier and leader of the " National Party." Ill-health, however, soon compelled him to leave the colony, and he was succeeded by Boyd Dunlop Morehead. Sir Thomas Mcllwraith's inflexible nature was evidenced all through his public life. On the death of Sir Anthony Musgrave in Brisbane in 1888, he maintained that the Government should be consulted as to the appointment of the new governor. Lord Knutsford declined to accept this view, and appointed Sir Henry Blake. The premier formally protested, and a deadlock ensued, which was only removed by the resigna- tion of the governor-designate. In 1889 payment of members at the rate of £300 a year, plus is. 6d. per mile travelling expenses, was established. In 1890 a financial crisis arose. Sir Thomas Mcllwraith had returned to the colony and dissociated himself from the ministry. He conferred on the situation with Sir Samuel Griffith, and a want-of-confidence motion was nearly carried. Morehead resigned, and a coalition ministry, with Griffith as premier, chief secretary and attorney-general, and Mcllwraith as treasurer, was formed. An agitation for the separation of Queensland into two or three separate colonies — mentioned as early as 1866 — was very marked during this

period. It took formidable shape at Townsville in 1882, the chief argument in its favour being that the north and central districts did not get a fair share of the public expenditure. Delegates were sent to London on several occasions to interview the Colonial Secretary, but success did not attend these direct appeals. Sir Samuel Griffith's Decentralization Bill of 1890, which proposed to erect separate legislatures in the three divisions with powers of local government, was a blow to separationists, and the agitation gradually disappeared.

The Labour Party in Politics, i8go~igoo. — The decade from 1890 to 1900 was chiefly notable, apart from the accomplish- ment of Federation, for the rise of the Labour party as a power in politics and the gradual disappearance of the squatter as a dominant factor. In 1890 the old opponents, Sir Samuel Griffith and Sir Thomas Mcllwraith, were still working side by side. The revenue for the year fell short of the estimates by half a million sterling, and a heavy accumulated deficit had to be grappled with by Parliament. Sir Thomas Mcllwraith, the treasurer, proposed a dividend tax and other imposts, which were agreed to, and a Treasury Bills Act authorizing an issue of £500,000 was also passed. A Constitution Act establishing triennial Parliaments, in place of quinquennial, which had hitherto existed, also went through. In August the great maritime strike spread to Brisbane, and crippled trade and commerce for several months. In 1891 a loan for £2,500,000, which was issued in London under the auspices of the Bank of England, failed. Sir Thomas Mcllwraith reflected strongly in Parliament on the conduct of the Bank of England, and the governor of the bank wrote to Sir James Garrick, the agent-general, protesting against Sir Thomas Mcllwraith's statements, and breaking off relations with the colony; but mutual explanations afterwards healed the breach.

Litigation was initiated by the London board of the Queens- land Investment and Land Mortgage Company against the Queensland directors, on the ground that they had made advances without taking adequate security. The case was tried by the chief justice, Sir Charles Lilley, in 1891 and 1892, the defendants being Sir Thomas Mcllwraith, Sir Arthur Palmer, then president of the Legislative Council, and Messrs F^ H. Hart and E. R. Drury. The judge submitted 143 questions to the jury, and though these were answered generally in favour of the defendants, judgment was entered largely for the plaintiffs. On appeal, heard before a specially constituted court, presided over by the late Sir William Windeyer of New South Wales, this judgment was reversed, with costs. Lack of employment and a disastrous strike of bush workers para- lysed the colony in this year. The strike began in January at Logan Downs station, where 200 shearers refused to sign the Pastoralists' Convention agreement. This strike was remark- able for the determined and aggressive attitude of the men, and the

firm, though conciliatory, manner in which it was handled by Mr (afterwards Sir) Horace Tozer, the colonial secretary, who had to provide military forces and artillery to hold the strikers in check. The trouble lasted many months; and after it was over a farcically planned plot to seize the central district and proclaim a republic was revealed in the Brisbane Courier. As an outcome of this strike, " New Australia " — a settlement on communistic lines — was founded in Paraguay (q.v.). The year 1892 was one of gloom and depression: want of money interfered with public works, and the impending stoppage of Kanaka labour and the low price of sugar almost ruined the planters. Sir Samuel Griffith then announced his conversion to the policy of continuing Kanaka labour for the sugar plantations, and also of land-grant railways. An act was passed authorizing agreements with companies for the extension of the trunk lines on this principle; but the measure was unpopular, and no transactions under the act are recorded. Financial depression reached its height in 1893: the salaries of ministers and civil servants were reduced, and drastic retrenchments were made in every department. In February, 107 in. of rain fell at the head of the Brisbane

river, and enormous losses were caused by the resulting floods; several vessels, including the Queensland Government gunboat Paluma, were washed into the Brisbane Botanic Gardens, and left high and dry when the waters subsided. A second flood followed and caused further losses. Rockhampton, Bowen, Townsville, and other places also suffered severely from floods. On 13th March Sir Samuel Griffith was gazetted chief justice, and on the 27th Mr (afterwards Sir) Hugh M. Nelson became premier and treasurer, and Sir Thomas Mcllwraith chief secretary and secretary for railways. Parlia- ment was dissolved on 3rd April, and after the general elections the ministry returned with 38 supporters, against Labour, 16, and Opposition and Independent, 18. During the month several financial institutions suspended payment, and on 15th May the Queensland National Bank closed its doors. Parliament was hurriedly summoned to deal with the financial crisis and the question of the Government funds held by the Queensland National Bank. Treasury notes, issued against coin held by the treasurer, were made legal tender throughout the colony; an issue of £1,000,000 treasury bills to retire the treasury notes was authorized, and a series of acts dealing with the suspended banks were passed. To assist the un- employed, labour and co-operative communities were started, but proved failures. An impetus was given to the sugar industry by the Sugar Works Guarantee Act, which authorized the treasurer to guarantee debentures issued by companies for the erection of sugar mills and plant. In 1894 little legisla- tion was achieved, the policy of the Government being directed towards national rehabilitation. In 1895 Sir Thomas Mcllwraith left the colony for London, where he died on 17th July 1900. At the

general election of 1896 the Labour party slightly improved its position. In that year a committee of investiga- tion reported a heavy deficit in the affairs of the Queensland National Bank, and made certain recommendations. In 1897 the bank was reconstructed a second time upon terms very favourable to the institution. An act was passed granting powers to a company to construct a railway from the rich mining district of Chillagoe to the terminus of the Cairns railway at Mareeba; at the end of fifty years the State was to have the right to acquire the line. In April 1898 the Queensland-born statesman, T. J. Byrnes, whose early death in the following September was lamented throughout Australia, succeeded Sir Hugh Nelson as premier. On 24th October the trial of the three ex-directors of the Queensland National Bank, Messrs F. H. Hart, B. D. Morehead and A. B. Webster, was commenced. The prosecution was instituted by the Government, on the advice of three barristers to whom the report of the committee of investigation into the affairs of the bank, which sat in 1897, was submitted. After a trial lasting 12 days, a verdict of "Not guilty" was returned. Proposals for the acquisition of 250,000 acres of land in New Guinea, made by a syndicate of London capitalists, were provisionally agreed to, but were eventually rejected, owing to a popular outcry raised in the colony and in New South Wales and Victoria. In 1896 the first of a series of factory acts was passed, and in 1907 Wages Boards were established for fixing the statutory minimum rate of wages. (See Australia.)

Federation was a burning question in the neighbouring colonies during the year, but Queenslanders generally took little interest in the movement, and the colony was not repre- sented at the Federal Convention at Melbourne when the Commonwealth Bill was passed. In 1899 Mr (afterwards Sir J. R.) Dickson, who had succeeded Byrnes as premier, was enlisted on the side of the " Billites," and in June of that year an Enabling Bill was passed. In September the Referendum supported the act by the narrow majority of 7492 votes on a poll of 69,484. Towards the end of the second session the ministry narrowly escaped defeat, on the Railway Standing Committees Bill, and resigned. Mr Dawson, leader of the Labour Opposition, then formed a ministry, and held office from 1st December to 7th December 1899. He was then defeated on a motion by R. Philp, and resigned, and Philp

became premier, and was in power when Queensland joined the Commonwealth. The year was shadowed by the con- tinuance of a terrible drought, which towards the end of 1900 became so aggravated that the revenue began to fall off, owing to decreased receipts from railways and

land. In that year Philp's chief policy was the passing of legislation to permit of the construction of railways by private enterprise. The Labour party offered vigorous opposition; but notwithstanding this a certain amount of progress was made. The Government appointed Dr Maxwell, an American sugar expert, to super- intend the sugar industry in the colony; a State school of mines was established at Charters Towers; and the compulsory clauses of the Education Act were put in force for the first time. Another act of importance was the establish- ment of a Government land bank. A powerful agitation for the extension or renewal of the leases of pastoral lands was raised, but no legislation resulted. A suggestion that Sir Samuel Griffith should retire from the chief justiceship, on a pension of £1750 a year (to be reduced by any emoluments received), to enable him to enter Federal politics, fell through. Some important discoveries of coal were made during the year, and dredging the northern rivers for gold became an established industry. J. R. Dickson represented the colony in London at the conference of Federal delegates in 1900, when the final details of the Commonwealth were settled. Early in 1901 he was created K.C.M.G., but died somewhat suddenly, at Sydney, on 9th January of that year, shortly after he had been made a member of the first Federal ministry.

Alien Immigration. — The working classes of Queensland have always objected to the presence of coloured aliens, and successive Governments have legislated against indiscriminate immigration into the colony. In 1876 Governor Cairns reserved an act imposing certain disabilities upon Chinese working on goldfields. In that year a poll tax of £10 was imposed upon Chinese arriving. In 1884 another principle was adopted: masters of ships were only allowed to carry to Queensland ports one Chinese for every 50 registered tons, and the poll tax was increased to £30. In 1888 Queensland took the lead in summoning an intercolonial conference on Chinese immigration, the outcome of which was the adoption of uniform legislation : in the Queensland Act passed that year the main provision was that only one Chinese for every 500 registered tons should be permitted to be carried to the colony from Chinese ports. The poll tax was then abolished. This act was also reserved, but received the Royal Assent on 5th February 1890, after slight modification had been made.

Treaty arrangements with Japan had been carried through by the Imperial Government, at the initiation of Queensland, under which the Japanese Government undertook to prevent the emigra- tion of coolies to the colony; and a Pearl Shell Fisheries Act was passed in 1895 placing restrictions upon the acquisition of vested interests in the industry by Japanese and other aliens. At Federa- tion eight acts — two Imperial and six local — regulated the importa- tion of Kanakas from the South Seas: that of 1880 was the basis of the system under which Kanakas were recruited in the

islands, brought to the colony in schooners, employed there, and returned to their homes at the end of their three years' engagements. The 1884 act confined Kanakas to field work. In December 1884 a Royal Commission was appointed, consisting of Messrs W. Kinnaird Rose, J. F. Buckland, and Hugh M. Milman, to report upon the system of recruiting Kanakas. Following the report of the Com- mission, which was in effect that many islanders had been recruited " by force and fraud," Sir Samuel Griffith, then premier, introduced the important Pacific Island Labourers Amendment Act of 1885, which stopped the importation of Kanakas after 1890. It was — and is — an article of faith with the working classes that white labour could be utilized for sugar cultivation. Yet from the passing of the act the sugar industry began to decay, no fresh capital was put into it, plantations dwindled down in value 50 to 75%, mills were closed, and the magnificent industry threatened to die out. Sir Samuel Griffith, being converted by these signs of the times from his position that sugar could flourish in the colony without coloured labour, issued on 12th February 1892 his " Manifesto to the People of Queensland," in which he acknowledged that to prevent the collapse of sugar-growing it was necessary to resume the immigration of Polynesians. This manifesto was the forerunner of the 1892 act, which reintroduced Kanaka labour. Since this time there has been no further State legislation on the subject, but the Federal Parliament has dealt with the matter (see above).

Land Legislation. — In Queensland's early days, with the pre- dominance of the squatting class, the lands Were freely leased in large blocks for sheep and cattle grazing. The squatter furnished 50% of the public revenue with his rents, and opened up

the great interior by his pioneering enterprise. As, however, population increased, the necessity for the agriculturist arose, and it became requisite to legislate in the interests of the small holder. Successive Queensland Governments have had some of their hardest work in adapting their land legislation to the needs of the community, recent policy being to reduce large estates and place the cultivator on the soil. At separation from New South Wales the holding of land was regulated by Orders in Council, under an Imperial act of 1846: untransferable leases of "runs" for fourteen years were issued, the minimum size of the run was measured in sheep-carrying capacity — 4000 sheep being the least number, and £10 the minimum rent. The lessee was able to buy up his holding in blocks of 160 acres at a time, £1 per acre being the minimum price, and was entitled to a renewal of his lease at its expiry. The minimum lease principle shut out the small agriculturist. The first leading acts passed by Queensland were the Crown Lands Alienation Act of 1868, dealing with the settled districts, and the Pastoral Leases Act of 1869, dealing with the unsettled districts — these divisions were fixed by the first-named measure. The " resumption "

principle was introduced by the 1868 act: lands in the settled districts were resumed after twelve months from the passing of the measure, and lessees were granted leases of half of their holdings for ten years; the other moiety was thrown open for settlement. The 1869 act granted new leases for twenty-one years at practically the same low rentals, but 10 % was added to the rent after each period of seven years; the area of a run was fixed at from 25 to 100 sq. m. This act greatly pleased the squatters. In 1884 the Dutton Act was passed. Its importance lies in its dealings with the 1869 act leases: on their expiry the State resumed from one-quarter to one-half of the area as crown lands, which were thrown open to selectors, and new leases of from ten to fifteen years were granted for the balance. Grazing farms (20,000 acres) and agricultural farms (1280 acres) were established. This measure was very unpopular with the squatters. With the act of 1897 it forms the basis of the existing land regulations of Queensland. Under the 1897 act the passing of the land into the hands of agriculturists was further marked by the creation of agricultural homesteads (160, 320, or 640 acres), grazing homesteads (20,000 acres), scrub selections (10,000 acres), and unconditional selections (1280 acres). Some of these classes of selections could be purchased right out, and all were leased at extremely moderate rates. Sales of country lands were established. Two measures were passed, in 1894 an d 1897 — the Agricultural Lands Purchases Acts — under which the State was authorized to purchase suitable estates of specially fertile land already alienated, to be cut up and thrown open as agricultural farms. These measures confirmed Queensland's determination to encourage agriculture. Owing to the expiration of pastoral leases and the fact that no legislation existed for their renewal for a term long enough to encourage the investment of capital, a formidable agitation prevailed in the colony, the lessees bitterly complaining of the uncertainty of their tenure. The British Australasia/i Society was formed in Great Britain, to protect the interests of British capital invested in the pastoral industry in Queensland. In 1900, out of the total Queensland area of 427,838,080 acres, no less than 411,793,786 acres remained in the hands of the State unalienated. (J. T. Cr.)

QUEENSTOWN, a town of the Cape province, South Africa, in the upper valley of the Great Kei river, 155 m. by rail N.W. of East London. Pop. (1904) 9616, of whom 4157 were white. Founded in 1853 and named after Queen Victoria, it was laid out in an unusual form. From each angle of a central hexagonal-shaped open space there runs one of the main thoroughfares. This "arrangement was adopted to facilitate defence in case of an attack by Kaffirs, Queenstown at the time of its foundation being a border settlement. Up to 1868 the burghers held their lands on a military tenure. It contains several fine buildings, including the town hall, court-house and public offices and the Anglican church of St Michael. Many of

the streets are lined with oaks and blue gums. Situated on the Karroo, at an elevation of 3500 ft., between the Stormberg and Amatola Mountains, it is the centre of a wheat and sheep-rearing district, and is a busy commercial town. The climate is healthy, and Queenstown has a reputa- tion as a sanatorium.

QUEENSTOWN, a town of Montagu county, Tasmania, on the Queen river, 23 m. by rail by Strahan, and 353 m. W. of Hobart. It is the centre of the Mount Lyell mining district and has numerous smelting works, brick-works, and sawmills. The county is mountainous and finely wooded. Pop. (1901) 5051; of the district, 10,451.

QUEENSTOWN (formerly Cove of Cork), a seaport, watering- place, and naval station of county Cork, Ireland, picturesquely situated on the south side of Great Island, on the slope of an

eminence rising abruptly above Cork Harbour. Pop. (1901) 7909. It is 12 m. E.S.E. of Cork and 177 m. S.W. of Dublin by the Great Southern & Western railway. It consists chiefly of terraces rising one above another with wide streets and handsome houses. On account of the mildness of the climate it is frequented by visitors both in summer and winter. Previous to the American War, Cove of Cork was a small fishing village, but it subsequently increased rapidly. It received its present name on the occasion of the visit in 1849 of Queen Victoria, being her first landing-place in Ireland. The town is governed by an urban district council. The harbour, which is defended by the Carlisle and Camden Forts at its entrance, and by Fort Westmoreland on Spike Island, can shelter a large fleet. Spike, Rocky and), Haulbowline islands are used in the formation of a government dockyard, which with the adjoining victualling yard covers an area of 55 acres. There is an enclosed basin 9 acres in extent, with 32 ft. 8 in. depth over the sill at high- water spring tides; and a dry dock at its southern end has a length of 408 ft. on the blocks. Queenstown is a port of call for American mail steamers, and the mails are transmitted overland by express trains; it is also a port of embarkation for colonial troops, and a government emigration station. The admiral's flagship is stationed here. The oldest yacht club in the United Kingdom, the Royal Cork (founded in 1720 as the Cork Harbour Water Club), has its headquarters here, with a club-house, and holds an annual regatta. Among the principal buildings are the modern Catholic cathedral of St Colman for the diocese of Cloyne, designed by A. W. Pugin, and the Protestant Episcopal church for the united parishes of Clonmel and Temple Robin. A fine promenade, over a

mile in length, connects Queenstown with Rushbrook, a favourite watering-place. The picturesque shores of the harbour are dotted with country residences and village-resorts, suc-h as Crosshaven and Church Bay.

QUELPART (Chai-Ju), an island to the south of Korea, used as a Korean penal settlement. In measures 40 m. from E. to W. and 17 from N. to S. It rises gradually from the seaboard, is heavily wooded and is cleared for cultivation to a height of 2000 ft. There are several crateriform hills, and Hali San (Mount Auckland) has an altitude of 6558 ft. The island is entirely volcanic, and the soil is finely disintegrated lava. Broken black lava forms the beach, and blocks of it are the universal building material. There is no good drinking water. The flora and fauna are scarcely investigated. Pines of three species, junipers, larches, oaks, maples, willows and the Thuja Orientalis have been identified. The known fauna comprise boars, bears, deer, swans, geese, pheasants and quail. The roads are scarcely passable bridle tracks. Quelpart was introduced to European notice by the Dutchman, Hendrik Hamil, who was shipwrecked there in 1653.

The estimated population is 100,000, Korean by race, language and costume. There are about ninety villages. The valleys and slopes arg carefully cultivated in fields divided by stone walls, and produce beans, peas, sweet potatoes, " Russian turnip radish," barley, a little rice and millet, the last being the staple article of diet. Nuts, oranges, limes and plums are grown. Small but strong ponies are bred for export, and small cattle and pigs for home use. Apart from agriculture, the industries consist in the manufacture of fine bamboo hats and mats, and wooden combs for export and local use. For fishing the islanders use double-decked raft boats, similar to those of southern Formosa. Their lucrative pearl fisheries have been practically monopolized by the Japanese, who use proper diving apparatus. A valuable product is a species of clam, the shell of which furnishes a specially iridescent mother- o'-pearl, which the natives barter with the Japanese for inlaying lacquer. European goods are not imported, but Japanese articles find ready barter. There are no markets, and only a few poor shops.

Chu-sung, the capital and seat of government, a few miles from Port Pelto, has a black lava wall 25 ft. high, with three gates and towers; an imposing audience-hall in Chinese style;

and a great bell tower, with a fine bronze bell, sounded to drive off " evil dragons." Its population is estimated at 16,000. The governor has a hereditary army for coercive purposes. The uniform is a complete suit of mail, with a helmet, from which leather curtains fall over the shoulders. The weapons are equally antique.

There are no good harbours, and the only anchorage for large vessels is Tai-chung, or Yung-su, at the east end, with 9 to 13 fathoms of water. Pelto has ancient breakwaters for the protection of small boats, erected, as many believe, by the Mongol conqueror, Kublai Khan, who in 1273 built on Quelpart one hundred ships for the invasion of Japan.

QUENSTEDT, FRIEDRICH AUGUST VON (1809-1889), German geologist and palaeontologist, was born at Eisleben in Saxony on the 9th of July 1809. He was educated at Berlin, and after having acted as assistant in the mineralogical museum he was appointed professor of mineralogy and geognosy in the university of Tubingen in 1837, a post which he occupied until his death. His earlier work related chiefly to crystallography and mineralogy, on which subjects he published text-books that were widely used. He became distinguished for his researches on palaeontology, and especially for those on the fossils of the Jurassic system. The museum at Tubingen owed its establishment to his exertions. He died at Tubingen on the 21st of December 1889.

His chief publications were: Method der Krystallographie (1840); Das Flozgebirge Wiirttembergs (1843); Petrefactenkunde Deutschlands (7 vols, and atlases, 1846-84); Die Cephalopoden (1846-49) ; Handbuch der Petrefactenkunde (2 vols., 1852, 3rd ed. 1882-85); Der Jura (2 vols., 1858); Handbuch der Mineralogie (1855, 3rd ed. 1877) ; Die Ammoniten des Schwabischen Jura (1883-84). Obituary by W. T. Blandford, Quart. Journ. Geol. Soc. vol. xlvi., 1890.

QUENTAL, ANTHERO DE (1842-1891), Portuguese poet, was born on the island of St Michael, in the Azores, on the 1 8th of April 1842. He studied at the university of Coimbra, and soon distinguished himself by unusual talent, as well as turbulence and eccentricity. He began to write poetry at an early age, chiefly, though not entirely, devoting himself to the sonnet. After the publication of one volume of verse, he entered with great warmth into the revolt of the young men which dethroned Castilho, the chief living poet of the elder generation, from his place as dictator over modern Portuguese literature. He then travelled, engaged on his return in political and socialistic agitations, and found his way through a series of disappointments to the mild pessimism, a kind of Western Buddhism, which animates his latest poetical productions. His melancholy was increased by a spinal disease, which after several years of retire- ment from the world, eventually drove him to suicide in his native island, on the nth of September 1891. Anthero stands at the head of modern Portuguese poetry after Joao de Deus. His principal defect is monotony — his own self is his solitary theme, and he seldom attempts any other form of composition than the sonnet. On the other hand, few poets who have chiefly devoted themselves to this form have produced so large a proportion of really

exquisite work. The comparatively few pieces in which he either forgets his doubts and inward conflicts, or succeeds in giving them an objective form, are among the most beautiful in any literature. The purely introspective sonnets are less attractive, but equally finely wrought, interesting as psychological studies, and impressiye from their sincerity. His mental attitude is well described by himself as " the effect of Germanism on the unprepared mind of a Southerner." He had learned much, and half-learned more, which he was unable to assimilate, and his mind became a chaos of conflicting ideas, settling down into a condition of gloomy negation, save for the one conviction of the vanity of existence, which ultimately destroyed him. A healthy participation in public affairs might have saved him, but he seemed incapable of entering upon any course that did not lead to delusion and disappointment. The great popularity acquired, notwithstanding, by poetry so metaphysical and egotistic is a testimony to the artistic instinct of the Portuguese.

As a prose writer Quental displayed high talents, though he

wrote little. His most important prose work is the Con- sideracoes sobre a philosophia da historia literaria Portugueza, but he earned fame by his pamphlets on the Coimbra question, Bom senso e bom gosto, a letter to Castilho, and A dignidade das lettras e litteraturas qfficiaes.

His friend Oliveira Martins edited the Sonnets (Oporto, 1 886), supplying an introductory essay; and an interesting collection of studies on the poet by the leading Portuguese writers appeared in a volume entitled Anthero de Quental. In Memoriam (Oporto, I 896). The sonnets have been turned into most European languages; into English by Edgar Prestage {Anthero de Quental, Sixty-four Sonnets, London, 1894), together with a striking autobiographical letter addressed by Quental to his German translator, Dr Storck.

QUERARD, JOSEPH MARIE (1797-1865), French biblio- grapher, was born at Rennes on the 25th of December 1797. He was apprenticed to a bookseller in his native town, and was sent abroad on business. He remained in Vienna from 1819 to 1824, and there drew up the first volumes of his great work, La France litteraire, ou Dictionnaire bibliographique des savants, historiens, et gens de lettres de la France, &c. (10 vols., 1826-1842), dealing especially with the 18th and early 19th centuries, which he was enabled to complete by a government subsidy granted by Guizot in 1830, and by the help of the Russian bibliophile Serge

Poltoratzky. The firm of Didot, who were his publishers, took out of his hands the LitUrature francaise contemporaine with which he had intended to complete his work, and placed it with Ch. Louandre and F. Bourquelot. Querard avenged himself by pointing out the errors of his successors. In spite of his claims Querard was unable to secure a position in any of the public libraries. He died in Paris on the 3rd of December

1865.

Among his other works are: Les supercheries litteraires devoilees (5 vols., 1845-56); Bibliographic La Menaisienne (1849); Diction- naire des ouvrages-polyonymes et anonymes de la litterature francaise, 1700-1850. (1846-47); an additional volume to La France litteraire entitled Ecrivains pseudonymes, &c. (1854-56). See Mar. Jozon d'Erquar, Querard, in La France litteraire (1854), vol. xi.

QUERCITRON, a yellow dyestuff obtained from the bark of the quercitron oak, Quercus tinctoria, a fine forest tree indigenous in North America. The name is a shortened form of " querci- citron," from Lat. quercus, oak, and " citron," and was invented by Dr Edward Bancroft (1744-1821), who by act of parliament in 1785 was granted special privileges in regard to the importa- tion and use of the substance. The dyestuff is prepared by grinding the bark in mills after it has been freed from its black epidermal layer, and sifting the product to separate the fibrous matter, the fine yellow powder which remains forming the quercitron of commerce. The ruddy-orange decoction of quer- citron contains quercitannic acid, whence its use in tanning, and an active dyeing principle, quercitrin, C21H22O12. The latter substance is a glucoside, and in aqueous solution under the influence of mineral acids it yields quercetin, CisHsoO?, which is precipitated, and the pentoside rhamnose. Quercetin is a crystalline powder of a brilliant citron yellow colour, entirely insoluble in cold and dissolving only sparingly in hot water, but quite soluble in alcohol. Either by itself or in some form of its glucoside quercitrin, quercetin is found in several vegetable substances, among others in cutch, in Persian berries (Rhamnus catharticus) , buckwheat leaves {Polygonum Fagopyrum), Zante fustic wood {Rhus Cotinus), and in rose petals, &c. Quercitron was first introduced as a" yellow dye in 1775, but it is principally used in the form of flavin, which is the precipitate thrown down from a boiling decoction of quercitron by sulphuric acid. Chemically, quercetin is a member of a fairly extensive class of natural colouring matters derived from j8 phenyl benzo-7-pyrone or flavone, the constitution of which followed on the researches of St von Kostanecki, A. G. Perkin, Herzig, Goldschmidt and others. Among the related colouring matters are: chrysin from poplar buds, apigenin from parsley, luteolin from weld and dyers' broom, fisetin from young fustic and yellow cedar, galangin from galanga root, and myricetin from Myrica

Nagi.

QUERCY (Lat. pagus Caturcinus, Fr. Cahorsin), a county in France before the Revolution. The name is taken from that of a Gallic tribe, the Cadurci, and was applied to a small

district watered by the Dordogne, the Lot and the Tarn. It was bordered by Limousin, Rouergue, Armagnac, Perigord and Agenais. In the middle ages it was divided into upper, or black, Quercy, and lower, or white, Quercy, the capital of the former being Cahors and of the latter Montauban. Its two other chief towns were Figeac and Moissac. Ecclesiastically it was included almost entirely in the diocese of Cahors until 13 1 7, when a bishopric for lower Quercy was established at Montauban. Judicially it was under the authority of – the parlement of Bordeaux; for financial purposes it was part of the geniralite of Montauban. The estates of the county had the bishop of Cahors for president; other members were the bishop of Montauban and other ecclesiastics, four viscounts, four barons and some other lords and representatives of eighteen towns.

Under the Romans Quercy was part of Aquitania prima, and Christianity was introduced therein during the 4th century. Early in the 6th century it passed under the authority of the Franks, and in the 9th century was part of the Frankish kingdom of Aquitaine. At the end of the 10th century its rulers were the powerful counts of Toulouse. During the wars between England and France in the reign of Henry II., the English placed garrisons in the county, and by the treaty of Paris in 1259 lower Quercy was ceded to England. Both the king of England and the king of France confirmed and added to the. privileges of the towns and the district, each thus hoping to attach the inhabitants to his own interest. In 1360, by the treaty of Bretigny, the whole county passed to England, but in 1440 the English were finally expelled. In the 16th century Quercy was a stronghold of the Protestants, and the scene of a savage religious warfare. The civil wars of the reign of Louis XIII. centred around Montauban. Quercy was early an industrial district. It gave its name to cadurcum, a kind of light linen, and the bankers of Cahors were famous.

QUERETARO, a city of Mexico, capital of the state of Queretaro-Arteaga, 152 m. by rail N.W. of the national capital. Pop. (1900) 33,152, including a large Indian element. Queretaro is served by the Mexican Central railway. The city stands on a plain at the foot of the Cerro de las Campanas, 6168 ft. above sea-level. Among the important buildings are the Cathedral (said to have been built originally about 1535, and subsequently restored at various times), the Iturbide theatre (in which occurred the trial of Maximilian), the government offices, the federal palace and the churches of Santa Rosa, Santa Clara and San Augustin. The federal palace

and the church of Santa Rosa are examples of the work of the celebrated Mexican architect, Francisco Eduardo de Tresguerras (1765- t&Si), who restored the church of Santa Clara also. The gilded wood carvings of Santa Clara are noteworthy; and in the courtyard of the federal palace there are other specimens of the same work. The water-supply is brought over a fine aqueduct 5 m. long, dating from 18th century. Among manufactures are cottons, woollens, pottery and ironwares. Queretaro has one of the oldest and largest cotton factories in Mexico, employing about 2000 operatives, and maintaining a small private military force for protection. It was built in the days when brigandage held the whole country in terror, and was strongly fortified and provided with artillery and garrison. The latter was also used to escort pack trains of goods and supplies before the building of the railway. This old factory has also played its part in the civil wars of the country since 1840, becoming a fortress whenever Queretaro became involved in military operations.

Queretaro occupies the site of an Otomie Indian town dating from about 1400. It was captured by the Spaniards in i53r and was raised to the rank of a city in 1655. It was the scene of a revolutionary outbreak against Spain in 1 810. In 1848 a Mexican congress met here to ratify the treaty of peace with the United States, and in 1867 Queretaro was the scene of Maximilian's last stand against the republicans' (under Escobedo), which resulted in his capture and subsequent execution ' on I the Cerro de las Campanas just N. of the city.

QUERETARO-ARTEAGA, a central state of Mexico, bounded N. by San Luis Potosi, E. by Hidalgo, S.E. by the state of Mexico, S. by Michoacan and W. by Guanajuato; area, 3556 sq. m. Pop. (1900) 232,389, largely Indian. The state belongs to the elevated plateau region, with its semi-arid conditions. The N. part of the state is traversed from E. to W. by the wooded Sierra Gorda, whose spurs reach southward to the central districts. The central and S. parts are covered by plains, broken by low hills. The rivers are small and flow chiefly to the San Juan, a part of the Panuco drainage basin. There are some small lakes and swamps and a number of mineral springs. Sugar, cotton, Indian corn, beans and considerable quantities of wheat are grown, but agriculture is largely hampered by the uncertainty of the rainfall. The chief wealth of the state is in its mines. Silver, gold, copper, mercury, lead, tin, antimony and precious stones are found, in some cases in very rich deposits. The richest mining districts are those of Cadereyta and Toliman, where there are metallurgical works for the reduction of ores. The Mexican Central and Mexican National railways

cross the S. end of the state and afford transportation facilities for the agricultural districts, but the mining districts of the N. are still dependent upon old methods. The capital of the state is the historic city of Queretaro (q.v.), and other important towns, with their populations in 1900, are: San Juan del Rio (8124), Landa (about 7000), Ahuacatlan (5929 in 1895), Jalpan (about 6000), and Toliman, celebrated for its opals.

QUERFURT, a town of Germany, in the province of Prussian Saxony, situated in a fertile country on the Querne, 18 m. \V. from Merseburg, on a branch line from Oberroblingen. Pop. (1905) 4.S84, Its chief industries are sugar-refining, lime-burning and brewing. Querfurt was for some time the capital of a principality which had an area of nearly 200 sq. m. and a population of about 20,000. The ruling family having become extinct in 1496, it passed to that of Mansfeld. In 10 35, by the peace of Prague, it was ceded to the elector of Saxony, John George I., who handed it over to his son Augustus of Saxe-Weissenfels; but in 1746 it was again united with electoral Saxony. It was incorporated with Prussia in 181 5. See Schneider, Querfurter Stadt- und Kreischronik(Querturt,lC)02). QUERN, the primitive form of hand-mill for grinding corn, consisting of two flat circular stones; the lower stone, often shaped with a rim, has a wooden or metal pin in the centre which passes through a hole in the upper stone; the worker pours the grain through the hole with one hand, revolving the upper stone with the other by means of a peg fixed to one side. The Old English word is cweorn; it is a word common to Teutonic languages, cf. Du. kweern, Swed. qvarn and various forms in Old German; cognate words are found in Slavonic languages pointing to a pre-Aryan root. It is not related to " churn." (See Flour.)

*QUESADA Y MATHEUS, JENARO DE (1818-1889), 1ST Marquis of Miravalles, Spanish soldier, was born at Santander, on the 6th of February 1818. He was a son of General Vicente Quesada, a Conservative officer who was murdered and atrociously mutilated in the streets of Madrid by a revolutionary mob in the early days of Queen Isabella's reign. As Quesada belonged to an ancient family connected with the dukes of Fernan Nunez, he was made a cornet when only six years old, was educated at the seminary for nobles and in 1833 was promoted lieutenant in the 1st Foot Guards. He served from 183*3 to l8 36 against the Carlists. When his father was assassinated in 1836 he resigned, went to France, got employment in a merchant's office and was only induced to return to the army in 1837 by his relatives, who got him a company in the guards. He distinguished himself often in the Carlist war, but his promotion was slow, and he declined to have anything to do with politics. He confined himself to his duties as a soldier, always fighting on the side of govern- ments against Carlist, Republican and Progressist risings. He only became a general of division in 1853, and at the head of the Madrid garrison he fought hard in*

1854 to avert the

triumph of Espartero, O'Donnell and Duke, who publicly recognized his gallant conduct. When the war in Morocco broke out, Marshal O'Donnell gave Quesada the command of a division, which played so conspicuous a part in that campaign and at the battle of Wad el Ras that its commander was made lieutenant-general and grand cross of Charles III. He was director-general of the Civil Guard when the military rebellion of the 22nd of June 1866 broke out in Madrid, and after he had been wounded in the leg he remained at the head of the loyal troops until the insurgents were crushed. He did not accept any military post during the revolution until Marshal Serrano in 1874 offered him the direction of the staff, and he only accepted it after clearly stating that he was a royalist and partisan of Alfonso XII. In his long and brilliant career he never swerved from his steadfast resolve never to be mixed up in any political or military intrigues or pronunciamientos — to use his own words, " not even to restore my king." As soon as the king was restored, the government of Senor Canovas made Quesada first general-in-chief of the army of Central Spain, and in February 1875 general-in-chief of the army of the North. With the assistance of another officer who also had never dabbled in pronunciamientos, General O'Ryan, Quesada restored discipline in the armies confronting Don Carlos, and for twelve months concerted and conducted the operations that forced the pretender to retire into France and his followers to lay down their arms. The government confided to the marquis of Miravalles the difficult task of ruling the northern provinces for several years after the war, and he succeeded in conciliating the sympathies of the Basques and Navarrese, though the penalty of their last rising had been the loss of most of their ancient liberties or jueros. Quesada was made marquis of Miravalles, grandee after the war, minister of war in 1883 and senator. Though he was a strict, stern disciplinarian of the old school and an unflinching Conservative, Catholic and royalist, even his political and military opponents respected him, and were proud of him as an unblemished type of the Castilian soldier and gentleman, He died at Madrid on the 19th of January 1889, and was given full military honours. (A. E. H)

QUESNAY, FRANCOIS (1694-1774), French economist, was born at Merey, near Paris, on the 4th of June 1694, the son of an advocate and small landed proprietor. Apprenticed at the age of sixteen to a surgeon, he soon went to Paris, studied medicine and surgery there, and, having qualified as a master- surgeon, settled down to practice at Mantes. In 1737 he was appointed perpetual secretary of the academy of surgery founded by Francois la Peyronie, and became surgeon in ordinary to the king. In 1744 he graduated as a doctor of medicine; he became physician in ordinary to the king, and afterwards his first consulting physician, and was installed in

the palace of Versailles. His apartments were on the entresol, whence the Reunions de I'entresol received their name. Louis XV. esteemed Quesnay much, and used to call him his thinker; when he ennobled him he gave him for arms three flowers of the pansy {pensie), with the motto Propter excogitalionem mentis. He now devoted himself principally to economic studies, taking no part in the court intrigues which were perpetually going on around him. About the year 1750 he became acquainted with Jean C. M. V. de Gournay (1712-1759), who was also an earnest inquirer in the economic field; and round these two distinguished men was gradually formed the philo- sophic sect of the Economistes, or, as for distinction's sake they were afterwards called, the Physiocrates. The most remark- able men in this group of disciples were the elder Mirabeau (author of L' Ami des hommes, 1756-60, and Philosophie rurale, 1763), Nicolas Baudeau {Introduction a la philosophie economique, 1771), G. F. Le Trosne {De I'ordre social, 1777), Andre Morellet (best known by his controversy with Galiani on the freedom of the corn trade), Mercier Lariviere and Dupont de Nemours. Adam Smith, durng his stay on the continent with the young duke of Baccleuch in 1764-66, spent some time in Paris, where he made the acquaintance of

Quesnay and some of his followers; he paid a high tribute to their scientific services in his Wealth of Nations. Quesnay died on the 16th of December 1774, having lived long enough to see his great pupil, Turgot, in office as minister of finance. He had married in 1718, and had a son and a daughter; his grandson by the former was a member of the first Legislative Assembly.

The publications in which Quesnay expounded his system were the following: — two articles, on " Fermiers " and on "Grains," in the Encyclopedic of Diderot and D'Alembert (1756, 1757); a discourse on the law of nature in the Physiocratie of Dupont de Nemours (1768); Maximes generates de gouvernement economique d'un royaume agricole (1758), and the simultaneously published Tableau economique avec son explication, ou extrait des economies royales de Sully (with the celebrated motto, " Pauvres paysans, pauvre royaume; pauvre royaume, pauvre roi"); Dialogue sur le commerce et les travaux des artisans; and other minor pieces. The Tableau economique, though on account of its dryness and abstract form it met with little general favour, may be considered the principal manifesto of the school. It was regarded by the followers of Quesnay as entitled to a place amongst the foremost products of human wisdom, and is named by the elder Mirabeau, in a passage quoted by Adam Smith, as one of the

three great inventions which have contributed most to the stability of political societies, the other two being those of writing and of money. Its object was to exhibit by means of certain formulas the way in which the products of agriculture, which is the only source of wealth, would in a state of perfect liberty be distributed among the several classes of the community (namely, the productive classes of the proprietors and cultivators of land, and the unproductive class composed of manufacturers and merchants), and to represent by other formulas the modes of distribution which take place under systems of Governmental restraint and regulation, with the evil results arising to the whole society from different degrees of such violations of the natural order. It follows from Quesnay's theoretic views that the one thing deserving the solicitude of the practical economist and the statesman is the increase of the net product; and he infers also what Smith afterwards affirmed, on not quite the same ground, that the interest of the landowner is " strictly and indissolubly connected with the general interest of the society." A small edition de luxe of this work, with other pieces, was printed in 1758 in the palace of Versailles under the king's immediate super- vision, some of the sheets, it is said, having been pulled by the royal hand. Already in 1767 the book had disappeared from circulation, and no copy of it is now procurable; but the substance of it has been preserved in the Ami des hommes of Mirabeau, and the Physio- cratie of Dupont de Nemours.

His economic writings are collected in the 2nd vol. of the Princi- paux economistes, published by Guillaumin, Paris, with preface and notes by Eugene Daire; also his CEuvres economiques et philo- sophiques were collected with an introduction and note by Aug. Oncken (Frankfort, 1888); a facsimile reprint of the Tableau economique, from the original MS., was published by the British Economic Association (London, 1895). His other writings were the article " Evidence " in the Encyclopedic, and Recherches sur t'evidence des verites geometriques , with a Projet de nouveaux elements de geometric, 1773. Quesnay s Moge was pronounced in the Academy of Sciences by Grandjcan de Fouchy (see the Recueil of that Academy, 1774, p. 134). See also F. J. Marmontel, Memoires; Memoires de Mme. du Hausset; H. Higgs, The Physiocrats (London, 1897).

QUESNEL, PASQUIER (1634-1719), French Jansenist theologian, was born in Paris on the 14th of July 1634, and, after graduating in the Sorbonne with distinction in 1653, joined the French Oratory in 1657. There he soon became prominent; but his Jansenist sympathies led to his banish- ment from Paris in 168 1. He took refuge with the friendly Cardinal Coislin, bishop of Orleans; four years later, however, foreseeing that a fresh storm of persecution was about to burst, he fled to Brussels, and took up his abode with Antoine Arnauld (q.v.). There he remained till 1703, when he was arrested by order of the archbishop of Malines. After

three months' imprisonment he made a highly dramatic escape, and settled at Amsterdam, where he spent the remainder of his life. After Arnauld's death in 1694 Quesnel was generally regarded as the leader of the Jansenist party; and his Reflexions morales sur le Nouveau Testament played almost as large a part in its literature as Jansen's Auguslinus itself. As its title betokens, this was a devotional commentary on the Scriptures, wherein Quesnel managed to explain the aims and ideals of the Jansenist party better than any earlier writer had done; and it accordingly became the chief object of Jesuit attack. It appeared in many forms and under various

titles, the original germ going back so far as 1668; the first complete edition was published in 1692. The bull Unigenitus, in which no fewer than 101 sentences from the Reflexions morales were condemned as heretical, was obtained from Clement IX. on the 8th of September 17 13. Quesnel died at Amsterdam on the 2nd of December 1719.

See also Mme. Albert Le Roy, Un Janseniste en exit (Paris, 1900; and Maulvault, Repertoire de Port Royal (Paris, 1902).

(St. C.)

QUETELET, LAMBERT ADOLPHE JACQUES (1796-1874), Belgian astronomer, meteorologist and statistician, was born at Ghent on the 22nd of February 1796, and educated at the lyceum of that town. In 18 19 he was appointed professor of mathematics at the athenaeum of Brussels; in 1828 he became lecturer at the newly created museum of science and literature, and he continued to hold that post until the museum was absorbed in the free university in 1834. In 1828 he was appointee! director of the new royal observatory which it had been decided to found, chiefly at his instigation. The building was finished in 1832, and the instruments were ready for work in 1835, from which date the observations were published in 4to volumes {Annates del'Observatoire Royal de Bruxelles), but Quetelet chiefly devoted himself to meteorology and statistics. From 1834 he was perpetual secretary of the Brussels Academy, and published a vast number of articles in its Bulletin, as also in his journal, Correspondance mathimatique et physique (n vols., 1825-39). He died at Brussels on the 17th of February 1874. His son, Ernest Qxietelet (1825-78), was from 1856 attached to the observatory, and on his death succeeded him as director. He made a great number of observations of stars with proper motion.

Quetelet's astronomical papers refer chiefly to shooting stars and similar phenomena. He organised extensive magnetical and meteorological observations, and in 1839 he started regular ob- servations of the

periodical phenomena of vegetation, especially the flowering of plants. The results are given in various memoirs published by the Brussels Academy, and in his works Sur le climal de la Belgique and Sur la physique du globe (the latter forms vol. xiii. of the Annates, 1861). He is, however, chiefly known by the statistical investigations which occupied him from 1823 onward. In 1835 he published his principal work, Sur Vhomme et le developpe- ment de ses facultes, ou essai de physique sociale (2nd ed., 1869), containing a resume of his statistical researches on the develop- ment of the physical and intellectual qualities of man, and on the " average man both physically and intellectually considered. In 1846 he brought out his Lettres d, S. A. R. le due regnant de Saxe- Coburg et Gotha sur la theorie des probability's appliquee aux sciences morales et politiques (of which Sir J. Herschel wrote a full account in the Edinburgh Review), and in 1848 Du systeme social et des lois qui le regissent. In these works he shows how the numbers re- presenting the individual qualities of man are grouped round the numbers referring to the " average man " in a manner exactly corresponding to that in which single results of observation are grouped round the mean result, so that the principles of the theory of probabilities may be applied to statistical researches on the subjects. These ideas are further developed in various papers in the Bulletin and in his V Anthropometric, ou mesure des differentes facultes de Vhomme (1871), in which he lays great stress on the universal applicability of the binomial law, — according to which the number of cases in which, for instance, a certain height occurs among a large number of individuals is represented by an ordinate of a curve (the binomial) symmetrically situated with regard to the ordinate representing the mean result (average height). A detailed Essai sur la vie et les travaux de L. A. J. Quetelet, by his pupil and assistant E. Mailly, was published at Brussels in 1875.

QUETTA, the capital of British Baluchistan, India, which also gives its name to a district. It rose to prominence in 1876, when Sir Robert Sandeman founded a residency there. The name is a variation of the word kwat-kot, signifying a fortress, and the place is still locally known as Shal Kot. Quetta is the southernmost point in the line of frontier posts and system of strategic railways on the north-west frontier of India, 536 m. by rail N. of Karachi. It forms the head- quarters of the fourth division of the southern army, with a strong garrison of all arms. The railway was built in 1879, with a view to its continuance to Kandahar; but its present terminus is New Chaman on the Afghan border. A branch line to Nushki was completed in 1905. The cantonment and

civil station of Quetta stand in the open plain about 5500 ft. above sea-level, within a ring of mountains (such as Takatu, Murdar and Chiltan), which overlook it from a height of over 11,000 ft. To the north-west the view is open across the base of the Pishin valley to the Khojak Pass and Kandahar. South- wards is the open valley leading to the Bolan Pass, traversed by the railway. North of Quetta is the open plain leading to Pishin and the Harnai, also traversed by the Sibi-Pishin railway, which passes through the fortifications. These defensive works, stretching from the base of Takatu to the foot of the Mashelak hills on the west, bar the way to advance from the Khojak Pass. During the last quarter of the 19th century Quetta grew from a dilapidated group of mud build ings, with an inferior bazaar and a few scattered remnants of neglected orchard cultivation, into a strong fortress, and one of the most popular stations of the Indian army. Quetta was visited by the prince of Wales (George V.) in 1906, and a staff college for the Indian army was opened here in 1907. It has become the trade mart for western Afghanistan, eastern Persia, and much of central Asia. The population of the town and cantonment in 1901 was 24,584.

The District of Quetta (including Pishin) has an area of 5127 sq. m. Pop. (1901) 114,087, of whom more than three- fourths are Afghans, showing an increase of 45% in the decade. The general aspect r of the country is hilly, rocky and sterile, particularly towards the north; but in many parts the soil is rich and good, yielding wheat, rice, madder, tobacco, and lucerne, besides numerous grasses. The district has abundant orchards, furnishing grapes, apples, pears, pomegranates, figs, &c; melons and all kinds of English vegetables are also largely cultivated. The valley is watered by the Pishin Lora and by government irrigation works, including artesian wells. Wild sheep and goats abound in the hills of the district. The climate appears to be healthy and the temperature moderate, ranging from 40 F. in the winter to about 78° in the summer. The annual rainfall (including snow) averages about 10 in. The actual line of valley which contains Quetta and the Bolan Pass was originally rented from the khan of Kalat on terms which were changed in 1882 to a quit-rent of Rs25,ooo per annum, and a further compensation of Rs30,ooo in lieu of transit duties in the Bolan Pass. This perpetual leasehold was afterwards extended so as to include Nushki and give the British government the command of the trade route to Sistan. The Quetta district is now administered, together with the assigned districts of Pishin, Tal Chotiali, and Sibi (assigned by the treaty of Gandamak as being nominally Afghan territory) by a regular staff of civil officials.

See Thornton, Life of Sir Robert Sandeman (London, 1896) ; Quetta-Pishin District Gazetteer (Ajmer, 1907). (T. H. H.)*

QUEUE or CUE (from Fr. queue, O. Fr. cue, Lat. cauda, tail), a tail of

hair, either of the natural hair when so worn or of a wig, plaited together and tied with ribbon, hanging down the back of the neck. In Europe and European colonies and settlements this method of wearing the hair prevailed after the heavy periwig had gone out of fashion. The bob-wig or tie-wig with the queue survives in the English barrister's wig. In the second half of the 18th century the queue was worn thick and short and sometimes encased in leather, when it was termed a " club." In the navy and army the queue survived its disuse in civil life. The three pieces of black velvet sewn on to the collar of the full dress tunic of the officers of the Royal Welsh Fusiliers, and styled the " flash," are said to be a relic of the ribbon which tied the queue. The most familiar use of this fashion of wearing the hair is the pigtail of the Manchus, which was imposed on all Chinese men as a symbol of loyalty and obedience at the conquest of China (see China: Social Life). A particular meaning of the word is for the line of persons formed in order awaiting their turn for admission to a theatre or other place. This appears also in French, from which it is borrowed. In the form " cue " (Fr. queue) the word is used of the tapering, striking implement in the game of billiards (q.v.). It is often stated that the theatrical

use of " cue " for the concluding words of an actor's dialogue or speech which marks the beginning of another actor's part is merely an adaptation of the meaning " tail." The New English Dictionary points out that there is no trace of this use in French. In 16th and 17th century plays the endings of parts are marked Q. or qu-, which has been taken to repre- sent Lat. quando, when.

QUEVEDO Y VILLEGAS, FRANCISCO G6MEZ DE (1580- 1645), Spanish satirist and poet, was born at Madrid, where his father, who came from the mountains of Burgos, was secretary to Anne of Austria, fourth wife of Philip II. Early left an orphan, Quevedo was educated at the university of Alcala, where he acquired a knowledge of classical and modern tongues — of Italian and French, Hebrew and Arabic, of philosophy, theology, civil law, and economics. His fame reached beyond Spain; at twenty-one he was in correspondence with Justus Lipsius on questions of Greek and Latin literature. His ab- struse studies influenced Quevedo's style; to them are due the pedantic traits and mania for quotations which characterize most of his works.

He betook himself to the court and mingled with the society that surrounded Philip III. The cynical greed of ministers, the meanness of their flatterers, the corruption of the royal officers, the financial scandals, afforded ample scope to Quevedo's talent as a painter of manners. At Valladolid, where the court resided from 1601 to 1606, he mingled freely with these intrigues and disorders, and lost the purity of his morals but not

his uprightness and integrity. In 16 n he fought a duel in which his adversary was killed, fled to Italy, and later on became secretary to Pedro Tellez Giron, duke de Osuna, and viceroy of Naples. Thus he learned . politics — the one science which he had perhaps till then neglected, — initiated himself into the questions that divided Europe, and penetrated the ambitions of the neighbours of Spain, as well as the secret history of the intriguers protected by the favour of Philip III. The result was that he wrote several political works, particularly a lengthy treatise, La Politica de Dios (1626), in which he lays down the duties of kings by displaying to them how Christ has governed His church. The disgrace of Osuna (1620) compromised Quevedo, who was arrested and exiled to his estate at La Torre de Juan Abad in New Castile. Though involved in the process against the duke, Quevedo remained faithful to his patron, and bore banishment with resignation. On the death of Philip III. (31st of March 162 1) he recommended himself to the first minister of the new king by celebrating his accession to power and saluting him as the vindicator of public morality in an epistle in the style of Juvenal. Olivares recalled him from his exile and gave him an honorary post in the palace, and from this time Quevedo resided almost constantly at court, exercising a kind of political and literary jurisdiction due to his varied relations and knowledge, but especially to his biting wit, which had no respect for persons. General politics, social economy, war, finance, literary and religious questions, all came under his dissecting knife, and he had a dissertation, a pamphlet, or a song for everything. One day he is defending St James, the sole patron of Spain, against a powerful coterie that wished to associate St Theresa with him; next day he is writing against the duke of Savoy, the hidden enemy of Spain, or against the measures taken to change the value of the currency; or once more he is engaged with the literary school of G6ngora, whose affectations seem to him to sin against the genius of the Castilian tongue. And in the midst of this incessant controversy on every possible subject he finds time to compose a picaresque romance, the Historia de la Vida del Buscdn, Ilamado Don Pablos, Exemplo de Vagamundos, y Espejo de Tacanos (1626); to write his Suenos (1627), in which all classes are flagellated; to pen a dissertation on The Constancy and Patience of Job (163 1), to translate St Francis de Sales and Seneca, to compose thousands of verses, and to correspond with Spanish and foreign scholars. But Quevedo was not to maintain unscathed the high position won by his knowledge, talent, and biting wit. The government

of Olivares, which he had welcomed as the dawn of a political and social regeneration, made things worse instead of better, and led the country to

ruin. Quevedo saw this and could not hold his peace. An anonymous petition in verse enumerating the grievances of his subjects was found, in December 1639, under the very napkin of Philip IV. It was shown to Olivares, who exclaimed, " I am ruined "; but before his fall he sought vengeance on the libeller. His suspicions fell on Quevedo, who had enemies glad to confirm them. Quevedo was arrested on December 7, and carried under a strong escort to the monastery of St Mark at Leon, where he was kept in rigorous confine- ment till the fall of the minister (January 1643) restored him to light and freedom, but not to the health which he had lost in his dungeon. He had little more than two years to live, and these were spent in inactive retreat, first at La Torre de Juan Abad, and then at the neighbouring Villanueva de los Infantes, where he died September 8, 1645.

As a satirist and humorist Quevedo stands in the first rank of Spanish writers; his other literary work does not count for much. I. I. Chiffiet, in a letter of February 2, 1629, calls him " a very learned man to be a Spaniard," and indeed his erudition was of a solid kind, but he merits attention not as humanist, philosopher, and moralist, but as the keen polemic writer, the pitiless mocker, the profound observer of all that is base and absurd in human nature, and at the same time as a finished master of style and of all the secrets of the Spanish tongue. His style, indeed, is not absolutely pure; though he ridiculed so well the bad taste of culteranismo, he fell him- self into the style called conceptismo, which strains after ambiguous expressions and alembicated " points." But, though involved and overcharged with ideas, his diction is of singular force and originality; after Cervantes he is the greatest Spanish prose writer of the 17 th century.

There is an excellent collected edition of Quevedo's prose works with ti good life of the author by D. Aureliano Fernandez-Guerra (Bibl. Ribadeneyra, vols, xxiii. and xlviii.) ; his poetical works in vol. lxix. of the same collection are badly edited by D. Florencio Janer. There is a second edition, enlarged and annotated by Senor Menendez y Pelayo. E. Merim6e, in Essai sur la vie et les cemres de Francisco de Quevedo (Paris, 1886), has supplied an excellent critical and biographical monograph with a bibliography.

(J. F.-K.)

QUEZAL, or Quesal, the Spanish-American name for one of the most beautiful of birds, abbreviated from the Aztec or Maya Quetzal-tototl, the last part of the compound word meaning fowl, and the first, also written Quetzal, the long feathers of rich green with which it is adorned. 1 The Quezal is one of the Trogons (q.v.), and was originally described by Hernandez (Historia, p. 13), whose account was faithfully copied by F. Willughby. Yet the bird remained practically unknown to ornithologists

until figured in 1825, from a specimen belonging to Leadbeater, 2 by C. J. Temminck (PL col., 372), who, however, mistakenly thought it was the same as the Trogon pavoninus, a congeneric but quite distinct species from Brazil, that had just been described by Spix. The scientific determination of the Quetzal-bird of Central America seems to have been first made by C. L. Bonaparte in 1826, as Trogon paradiseus, accord- ing to his statement in the Zoological Society's Proceedings

1 The Mexican deity Quetzal-coatl had his name, generally trans- lated " Feathered Snake," from the quetzal, feather or bird, and coatl, snake, as also certain kings or chiefs, and many places, e.g. Quezalapan, Quezaltepec, and Quezaltenango, though perhaps some of the last were named directly from the personages (cf. Bancroft, Native Races of the Pacific States, vol. v., Index). Quetzal- itzli is said to be the emerald.

2 This specimen had been given to Canning (a tribute, perhaps, to the statesman who boasted that he had " called a New World into existence to redress the balance of the Old ") by Mr Schenley, a diplomatist, and was then thought to be unique in Europe; but, apart from those which had reached Spain, where they lay neg- lected and undescribed, James Wilson says (Illustr. Zoology, pi. vi. text) that others were brought with it, and that one of them was given to the Edinburgh Museum. On the 21st day of the sale of Bullock's Museum in 1819, Lot 38 is entered in the Catalogue as " The Tail Feather of a magnificent undescribed Trogon," and probably belonged to this species.

for 1837 (p. 101); but it is not known whether the fact was ever published. In 1832 the Registro Trimestre, a literary and scientific journal printed at Mexico, contained a communication by Dr. Pablo de la Llave, describing this species (with which he first became acquainted before 18 10, from examining more than a dozen specimens obtained by the natural-history expedition to New Spain and kept in the palace of the Retiro near Madrid) under the name by which it is now known, Pharomacrus mocino?

Quezal, male and female.

These facts, however, being almost unknown to the rest of the world, J. Gould, in the Zoological Proceedings for 1835 (p. 29), while pointing out Temminck's error, gave the species the name of Trogon resplendens, which it bore for some time. Vet little or nothing was generally known about the bird until Delattre sent an account of his meeting with it to the Echo du monde savant for 1843, which was reprinted in the Revue zoologique for that. year (pp. 163-165). In i860 the nidification of the species, about which strange stories had been told to the naturalist last named, was determined, and its eggs, of a pale*

3 De la Llave's very rare and interesting memoir was reprinted by M. Sall6 in the Revue et magazin de zoologie for 1861 (pp. 23-33).

bluish-green, were procured by Robert Owen (P. Z. S., i860, p. 374; Ibis, 1861, p. 66, pi. ii. fig. 1); while further and fuller details of its habits were made known by O. Salvin (Ibis, 1861, pp. 138-149), from his own observation of this very local and remarkable species. Its chief home is in the mountains near Coban in Vera Paz, but it also inhabits forests in other parts of Guatemala at an elevation of from 6000 to 9000 ft.

The Quezal is hardly so big as a Turtle-Dove. The cock has a fine yellow bill and a head bearing a rounded crest of filamentous feathers; lanceolate scapulars overhang the wings, and from the rump spring the long flowing plumes which are so charac- teristic of the species, and were so highly prized by the natives before the Spanish conquest that no one was allowed to kill the bird when taken, but only to divest it of its feathers, which were to be worn by the chiefs alone. These plumes, the middle and longest of which may measure from 3 ft. to 35 ft., with the upper surface, the throat, and chest, are of a resplendent golden-green, 1 while the lower parts are of a vivid scarlet. The middle feathers of the tail, ordinarily con- cealed, as are those of the Peacock, by the uropygials, are black, and the outer white with a black base. In the hen the bill is black, the crest more round and not filamentous, the uropygials scarcely elongated, and the vent only scarlet. The eyes are of a yellowish-brown. Southern examples from Costa Rica and Veragua have the tail-coverts much narrower, and have been considered to form a distinct species, P. costaricensis. Among other species are P. anlisianus, P. fulgidus, P. auriceps and P. pavoninus, from various parts of South America, but though all are beautiful birds, none possess the wonderful singularity of the quezal. (A. N.I

QUEZALTENANGO, the capital of the department of Quezaltenango, Guatemala, 70 m. by road W. of Guatemala city and at the terminus of a railway from Champerico on the Pacific coast. Pop. (1905) about 31,000. It is situated on the river Siguila, and at the foot of the volcano of Santa Maria. In size the second city in the republic, it has a large agricultural trade and manufactures of linen, woollen and cotton goods. It contains a fine cathedral and some good public buildings, including two national institutes for higher education; and it is well supplied with water and electricity for light and power. The majority of its inhabitants are Indians or half-breeds of Quiche descent. Quezaltenango was the capital of a Quiche kingdom, and was known as Xelahuh or Xelahue until 1524, when

it was conquered by the Spaniards under Pedro de Alvarado. In 1902 it was partially destroyed by an earthquake and an eruption of Santa Maria.

QUIBERON, CAMPAIGN AND BATTLE OF. Quiberon Bay, on the S. coast of Brittany, France, was the scene of the great naval battle which defeated the plan laid by the ministers of King Louis XV. of France, for the invasion of England in 1759, during the Seven Years' War (q.v). An army had been collected at Vannes, in the south-east of Brittany, and transports had been brought together in the landlocked waters of the Morbihan which are connected with Quiberon Bay. The scheme of the French ministers was to combine twenty-one ships of the line lying at Brest under the command of M. de Conflans, with twelve which were to be brought round from Toulon by M. de la Clue. The army was then to be carried to some point on the coast of England or Scotland by the united squadrons. The British government was well informed of its enemy's intentions, and took vigorous measures of defence. Admiral Sir E. Hawke, afterwards Lord Hawke, was directed to blockade Brest with a fleet of twenty-five sail of the line, four ships of fifty guns and nine frigates. The four ships of fifty guns together with four frigates were detached, first under Commodore John Reynolds, and then under Commodore Robert Duff, to lie in Quiberon Bay and watch the entry to the Morbihan. During the whole summer, from the beginning of June, Sir E. Hawke kept his station off Brest, and the detached squadron occupied Quiberon Bay. The task of blockading M. de la Clue at Toulon was given

1 Preserved specimens, exposed to the light, lose much of their beauty.

to Edward Boscawen, who had with him fourteen sail of the line. Boscawen reached his station on the 16th of May 1759. At the beginning of July want of stores and water, together with the injury inflicted on some of his vessels by a French battery, compelled him to go to Gibraltar to provision and refit. He reached the port on the 4th of August. On the 5th M. de la Clue left Toulon, and on the 17th passed the straits of Gibraltar, where he was sighted by the look-out ships of Boscawen. The British fleet hurried out to sea, and pursued in two divisions, separated by a distance of some miles owing to the haste with which they left port. During the night of the 17th and 18th of August five of M. de la Clue's ships lost sight of his flagship, and steered for Cadiz. The other seven, which had been delayed for a time in the hope of rejoining their consorts, were overtaken by Boscawen and attacked in the after- noon of the 18th. One, the " Centaur " (74), was captured after a very gallant resistance, in which the British flagship was severely damaged.. During the night of the i8th-i9th of August, two of the French ships altered course to the west, and escaped. The remaining four fled to the north, and into Portuguese waters, where two were driven ashore and destroyed, while two were captured near Lagos. The five in

Cadiz were blockaded by Boscawen's second-in-command, Admiral Broderick. La Clue was mortally wounded, and died ashore in Portugal. Although the defeat of his squadron had ruined the scheme for the combination of their forces, the French ministers decided to persevere with the invasion. M. de Conflans was ordered to put to sea. On the 9th of November a severe gale forced Sir E. Hawke from in front of Brest, and as his ships were in want of stores he sailed for Torquay. Finding the way clear, Conflans put to sea on the 14th, and steered for Quiberon. Sir E. Hawke left Torquay to resume his station on the same day. On the 15th he learnt from a look-out ship that the French had been seen at sea to the north-west of Belleisle, and steering south-west. Concluding that they were bound for the Morbihan he followed. Calms and contrary winds prevented either fleet from making much progress till the evening of the 19th, when the French were rather over 60 m. to the south-west of Belleisle, which is south of Quiberon. The wind had now changed to the north-west and was beginning to blow hard. M. de Conflans made for Quiberon under reduced canvas for fear of making the land in the night, the coast being one of the most dangerous in the world, on account of the rocky islands of Houat and Hoedik, and the long string of reefs which He inside Belleisle. Hawke was steering in the same direction farther out at sea. On the morning of the 20th of November, Conflans was nearing the south point of Belleisle. The small squadron of Commodore Duff, warned of his approach, endeavoured to escape to sea before he could shut them in at Quiberon. One of the ships worked out through the very dangerous passage to the north of Belleisle; the others came round the south of the island, where they were nearly cut off and captured. As the pursuers came close to them the sails of Hawke's fleet were seen rising over the horizon. M. de Conflans immediately called off the pursuers, and endeavoured to form his line of battle. By midday he was able to estimate the full strength of Hawke's fleet of twenty-three sail of the line, which with the four 50-gun ships of Commodore Duff made twenty-seven vessels to his twenty-one. He therefore altered his mind, and decided to run inside the islands of Houat and Hoedik, and gain the anchorage of Quiberon. He concluded that as the day was far advanced and the wind was increasing, the British admiral would not dare to follow him into so dangerous a place. But Sir E. Hawke considered that the circumstances justified him in taking all risks, and seeing his enemy in retreat he ordered a pursuit. As the van of the French led by their admiral was turning inside the Cardinal rocks at the southern end of the reefs, his rear was attacked. The two fleets entered the Bay late in the evening, and there followed a battle unique in naval history, for it was fought in the dark, among rocks, in a severe gale, and on a lee shore. Two of the British liners were wrecked on a rock called the Four, but five of the French were taken or

destroyed, among the latter was the flagship of Conflans, who escaped to the shore on a spar. Seven of the French ships ran into the little river Vilaine, being compelled to throw their guns overboard to lighten themselves before crossing the bar. Nine escaped to the south. The small number of prizes taken gives no measure of the importance of the victory, which broke the spirit and strength of the French fleet so effectually that it did not appear at sea again during the rest of the war, i.e. until

1763-

See Beatson's Naval and Military Memoirs of Great Britain, vol. ii. p. 321 et seq.; Burrows's Life of Lord Hawke; Tronde, Batailles navales de la France, vol. i. p. 379 et seq. (D. H.)

QUICHE or Kiches, a tribe of Central American Indians of Mayan stock. They inhabited western Guatemala, where their descendants still survive. They were at the time of the conquest the most powerful of the three Mayan peoples in Guatemala, the other two being the Cakchiquel and the Zutugil. Their chronicles are said to date back to the 8th century. Their sacred book, the Popol Vuh, containing a mythological cos- mogony, survives in a 17th-century manuscript written by a Christianized Guatemalan. To this tradition may be due the remarkable similarity of the Quiche creation story to that of the Old Testament. Their capital was Utatlan, near the site of the modern Santa Cruz Quiche, and was skilfully fortified. They had an elaborate system of government and religion. Records were kept in picture-writing. The Quiche were the first Indians met by Pedro de Alvarado in 1524 on his expedition into Guatemala.

See further Central America and Mexico; for the Popol Vuh see English edition by L. Spence (1909) ; see also Nuttall, Ancient American Civilizations (Camb. Mass., 1901), and W. Bollaert in Proc. Roy. Soc. Lit. vii. 1862.

QUICHERAT, JULES ETIENNE JOSEPH (1814-1882), French historian and archaeologist, was of Burgundian origin. His father, a working cabinet-maker, came from Paray le Monial to Paris to support his large family; Quicherat was born there on the 13 th of October 1814. He was fifteen years younger than his brother Louis, a great Latin scholar and lexicographer, who survived him. Although very poor, he was admitted to the college of Sainte-Barbe, where he received a thorough classi- cal education. He showed his gratitude to this establishment by writing its

history {Histoire de Sainte-Barbe, college, com- munaute, institution, 3 vols. 1860-1864). At the end of his studies he hesitated for some time before deciding what career he would follow, until Michelet put an end to his indecision by inspiring him with a taste for history. In 1835 Quicherat entered the ficole des Chartes; he left two years later at the head of the college. Once more inspired by the example of Michelet, who had just written an admirable work on Joan of Arc (q.v.), he published the text of the two trials of Joan, adding much contemporary evidence on her heroism in his Proces de condamnation et de rehabilitation de Jeanne d'Arc (5 vols. 1841-1849), as well as half a volume of Apcrcus nouveaux sur Vhistoire de Jeanne d'Arc, in which it seems that the last word has been said on important points. From the 15th century he drew other inspirations. He published memoirs of the adventures of a brigand, Rodrigue de Villandrando (1844), which gradually grew into a volume (1877), full of fresh matter. He wrote full biographies of two chroniclers of Louis XL, one very obscure, Jean Castel (in the Bibliotheque de I'Ecole des Chartes, 1840), the other, Thomas Basin, bishop of Lisieux, who was, on the contrary, a remark- able politician, prelate and chronicler. Quicherat published the works of the latter, most of which were now brought out for the first time (4 vols. 1855-1859). In addition to these he wrote Fragments in&dils de Georges Chastellain (1842), Lettres, mi- moires et autres documents relalifs a la guerre du bien public en 1465 (1843, in vol. ii. of Melanges historiques, part of Documents inedits), &c. These works did not wholly occupy his time: in 1847 he inaugurated a course of archaeological lectures at the ficole des Chartes, and in 1849 was appointed professor of diplomacy at the same college. His teaching had exceptionally good results. Although he was not eloquent and had a nasal

voice, his hearers were loth to miss any of his thoughtful teach- ing, which was unbiased and well expressed. Of his lectures the public saw only some articles on special subjects which were distributed in a number of reviews. Note should be made of a short treatise on La Formation franqaise des anciens noms de lieu (1867); a memoir De l' ogive et de V architecture dite ogivale (1850), where he gives his theory on the use of stone arches — important for the history of religious architecture; an article on L' 'Age de la cathedrale de Laon (1874), in which he fixed the exact date of the birth of Gothic architecture; Histoire du costume en France (1875; 2nd ed. 1877), which was first published in the form of anonymous articles in the Magasin pittoresque, and which the author wished to retain the character of a popular work. Following the advice of his friends, he began to write out, towards the end of his life, his lectures on archae- ology, but only the introductory chapters, up to the nth century, were found among his papers. On the other hand, the pupils trained by him circulated his principles throughout France, recognizing him as the founder of national archaeology.

In one point he seems to have taken a false step; with a warmth and pertinacity worthy of a better cause he maintained the identity of Caesar's Alesia with Alaise (Doubs), and he died without becoming a convert to the opinion, now universally accepted, that Alise Sainte-Reine (Cote d'or) is the place where Vercingetorix capitulated. But even this error benefited science; some well directed excavations at Alaise brought many Roman remains to light, which were subsequently sent to enrich the museum at Besancon. After 1871, his course of lectures on diplomacy having been given up, Quicherat,ˆ still professor of archaeology, was nominated .director of the Ecole des Chartes. He filled this post with the same energy which he had shown in the many scientific commissions in which he had taken part. In 1878 he gave up his duties as professor, which then fell to the most conspicuous of his pupils, Robert de Lasteyrie. He died suddenly at Paris on the 8th of April 1882, a short time after having corrected the proofs of Supplement aux temoignages contemporains de Jeanne d'Arc, published in the Revue historique. After his death it was decided to bring out his hitherto unpub- lished papers (Melanges d'archeologie et d'histoire, vol. i., Celtic, Roman and Gallo-Roman antiquities, ed. A. Giry and Aug. Castan, 1885; vol. ii., Archeologie du moyen dge, ed. R. de Lasteyrie, 1886); among these are some important fragments of his archaeological lectures, but his Histoire de la laine, with which he was occupied for many years, is missing.

Bibliography. — Two of Quicherat's best pupils published ex- cellent obituary notices of him: Robert de Lasteyrie, in Jules Quicherat, sa vie et ses travaux (from Bulletin du Comite des travaux historiques, 1883, n. 1); and Arthur Giry, Jules Quicherat (in the Revue historique, vol. xix.), with a Bibliographic des osuvres de Jules Quicherat (in the Bibliotheque de I'Ecole des Chartes, vol. xliii. p. 316). (C. B.)*

QUICHUA, a South American Indian tribe and stock, the ruling people of Peru when the Spaniards arrived. The Quichuan stock then included the Quichuas proper and the many vassal tribes of the ancient empire of Peru. To-day it numbers some three millions. The modern Quichuas aver- age a height of 5 ft. to 5 ft. 6 in. They are of slender build, but with well proportioned muscular limbs, and are capable of enduring great fatigue. Their complexions are of a fresh olive colour, the skin very smooth and soft, beardless, hair straight and black, the nose aquiline. They are skilful farmers and herdsmen. (See Peru.)

QUICK, a word which, by origin, and in early and many surviving uses, meant " living," " alive." It is common to Teutonic languages, cf. Ger. keck, lively, Du. kwik, and Dan. kvik; cf. also Dan. kvaeg, cattle. The original root is seen in Skt. jiva; Lat. vims, living, alive; Gr. Bios, life. In its original sense the chief uses are such as " the quick and the dead," ol the Apostles'

Creed, a " quickset " hedge, i.e. consisting of slips of living privet, thorn, &c, the " quick," i.e. the tender parts of the flesh under hard skin or particularly under the nail. The phrase " quick with child " is a conversion of with a quick, i.e. living child. From the sense of having full

vigour, living or lively qualities or movements, the word got its chief current meaning of possessing rapidity or speed of movement, mental or physical. It is thus used in the names of things which are in a constant or easily aroused condition of movement, e.g. " quicksand," loose water-logged sand, readily yielding to weight or pressure, and " quicksilver," the common name of the metal mercury (q.v.).

QUIERZY [Kiersy], CAPITULARY OF, a capitulary of the emperor Charles the Bald, comprising a series of measures for safeguarding the administration of his realm during his second Italian expedition, as well as directions for his son Louis the Stammerer, who was entrusted with the govern- ment during his father's absence. It was promulgated on the 14th of June 877 at Quierzy-sur-Oise in France (dep. of Aisne), the site of a Carolingian royal palatium, before a great con- course of lords. In this document Charles takes elaborate precautions against Louis, whom he had every reason to distrust. He forbids him to sojourn in certain palaces and in certain forests, and compels him to swear not to despoil his stepmother Richilde of her allodial lands and benefices. At the same time Charles refuses to allow Louis to nominate to the countships left vacant in the emperor's absence. In principle the honores (benefices) and the office of a deceased count must be given to his son, who would be placed pro- visionally in possession by Louis; the definitive investiture, however, could be conferred only by Charles. The capitulary thus served as a guarantee to the aristocracy that the general usage would be followed in the existing circumstances, and also as a means of reassuring the counts who had accompanied the emperor into Italy as to the fate of their benefices. It cannot, however, be regarded as introducing a new principle, and the old opinion that the capitulary of Quierzy was a legis- lative text establishing the hereditary system of fiefs has been proved to be untenable. A former capitulary of Charles the Bald was promulgated at Quierzy on the 14th of February 857, and aimed especially at the repression of brigandage.

See E. Bourgeois, Le Capitulaire de Kiersy-sur-Oise (Paris, 1885), and " L'Assemblee de Quierzy sur-Oise" in Etudes d' histoire du tnoyen- &ge, dediees a Gabriel Monod (Paris, 1896). (R. Po.)

QUIETISM, a complicated religious movement that swept through France, Italy and Spain during the 17th century. Its chief apostles were Miguel de Molinos, a Spaniard resident in Rome; Fenelon, the famous French divine, and his country- woman, Madame Jeanne Marie Guyon. Quietism was essenti- ally a reaction against the bureaucratic ecclesiasticism always latent within the church of Rome, though it had come more especially to the front during the struggles of the counter- Reformation carried through by the Jesuits. A Catholic cut to the orthodox pattern did not look, and would have thought it wrong to look, beyond the spiritual fare provided for him by the ecclesiastical authorities; all his relations with his Maker were conducted through the intermediacy of the Church. In the dogmatic sphere he believed whatever the Church be- lieved, because the Church believed it; to the Church's institu- tions—the sacraments and the confessional — he looked for guidance in the practical affairs of life. Protestantism had tried to put an end. to this state of things by sweeping away the Church altogether, but the Quietists were more tolerant than Luther. They did not wish to abolish the Church; they ad- mitted that it was a necessary stage in the evolution of the human soul; but' they insisted that it could only bring a man on to the lowest slopes of Paradise. Those who aspired to be really holy must learn to look beyond the Church, and enter into immediate, personal relations with their Maker. But how were they to do so? Like their contemporaries, the French Jansenists and the Quakers and Anabaptists of northern Europe, the Quietists fell back on a doctrine of immediate inspiration of the individual conscience. To the many God spoke only in general terms through the Church; but to the few He made His will directly known. But how did He do so? How distinguish the voice of God from the vagaries of our own imagination? Quietism offered an easy test. The less*

" sense of proprietorship " a man had in his own good actions — the more they came from a source outside himself — the surer might he be that they were divine. If, on the other hand, they were the fruit of his deliberate thought and will, that was enough to show that they did not come from God, but from his sinful self. Hence the first duty of the Quietist was to be " passive." So far as was possible he must numb all his spontaneous activities of every kind; then he could fold his hands, and wait in dreamy meditation until inspiration came. And since all our activities have their root in desire, the shortest road to passivity was to suppress all desires and wishes of every kind. Thus the great object of the Quietist was to " sell or kill that cruel beast, self-conscious will." Then he would be dead to hope and fear; he would be icily indifferent to his fate, either in this world or the next. Thenceforward no human tastes or affections would stand in the way of his performing the will of God. He was, as Fenelon said, like a feather blown about by all the winds of grace. His mind was a mere tabula rasa, on which the Spirit printed any pattern that it chose. Hence arose the great

Quietist doctrine of dis- interested love. " The Quietists maintain," says a contem- porary writer, " that Christian perfection means a love of God so absolutely free from all desire of happiness that it is indif- ferent to salvation. The soul is moved neither by hope nor fear, nor even by the foretaste of eternal bliss. Its only motive is to do the will and promote the glory of God. Other things are of no account: neither grace, nor merit, nor happiness, nor even perfection, in so far as it attaches to us. Nay, the soul must be ready to renounce its hopes of heaven, and the scrup- ulous will often feel themselves bound to do so; for in the last and fiercest trials they are invincibly persuaded of their own damnation. In this sentence of condemnation they generously acquiesce; and thenceforward, having nothing more to lose, they stand tranquil and intrepid, without fear and without, remorse. This is what the Quietists call the state of holy indifference. Their soul has lost all wish for action, all sense of proprietorship in itself, and has thereby reached the summit of Christian perfection " (Andre, Vie du Pere Malebranche, ed. Ingold, Paris, 1886, p. 271).

Quietism is an outgrowth from the mysticism of the great 16th-century Spaniards, St Teresa and St John of the Cross, though it would be unfair to hold them responsible for all the utterances of their disciples. Certainly St Teresa made much of " passivity," but she only regarded it as a refuge for a few specially constituted souls; whereas the Quietists designedly brought it within the reach of everyone. In St Teresa the passivity itself was balanced by a strong attachment to the virtues of the active life, and an equally strong devotion to the Church. Among the Quietists both these checks disappear, and passivity becomes the one and only test of holiness. But if passivity is all in all, there is no room for the virtues of the active life; all Quietists cherished the ancient saying that one moment's contemplation is worth a thousand years' good works. Still less room had they for the Church. It only professed to guide men to God; but those who had already found God stood in no need of a guide. Nay, they did not even stand in need of revelation. " If Christ be the way," wrote the Quietist Malaval, " let us certainly pass by Him to God, but he who is always passing never arrives at his journey's end." Such utterances go far to explain the severity with which the Roman Church tried to stamp out the later developments of Quietism. In its earlier stages, before it had crystallized into a definite doctrine, the ecclesiastical authorities had been tolerant enough. The Spanish monk, Juan Falconi, who is generally reckoned as the father of Quietism, died in the odour of sanctity in 1632; some thirty years later his fellow-countryman, Molinos, trans- ported his doctrines to Rome, where they gained unbounded popularity with bishops and cardinals, and even with pope Innocent XL In 1675 Molinos published the Guida Spirituale, the great text-book of his school. But his success soon aroused the suspicion of

the Jesuits, the great champions of militant ecclesiasticism. > " Passivity " accorded ill with a zealous

frequentation of the confessional, their chief centre of influence. Failing to turn public opinion against Molinos in Rome, they brought pressure to bear on Louis XIV. through his confessor, Pere La Chaise. At the instance of the French ambassador Molinos was arrested (1685); his papers were seized, and his chief disciples examined by the Inquisition. Two years later he was convicted of heresy, and sentenced to imprisonment for life. The later stages of the Quietist drama were played out in France. Here Quietist ideas had long been spreading under the leadership of enthusiasts like Francois Malaval (1627-1719), a blind layman of Marseilles. A more romantic figure was Jeanne Marie Guyon (1648-17 17), a widow of good family and remarkable personal charm, who devoted her life to missionary journeys on behalf of " passivity." In 1688 fate brought her to the French court, where she made a great impression on Mme. de Maintenon and other persons of quality. But her most illus- trious captive was Fenelon, then tutor to the duke of Burgundy, eldest son of the Dauphin. " They met," says 'Saint-Simon; " they pleased each other, and their sublime amalgamated." In other words, they corresponded with a freedom that Fenelon afterwards had cause to regret. For Mme. Guyon's paradoxical and extravagant lauguage soon scandalized her friends. In 1693 she was examined by Bossuet, and dismissed with a severe caution. Further imprudences led to her arrest, and a long imprisonment in the Bastille. On her release in 1703 she settled down quietly at Blois, where she died in 1717. Mean- while Fenelon had become involved in her fortunes. When Bossuet first took action, Fenelon defended her with a zeal that drew down suspicion on his own head; and he was only pro- moled to the archbishopric of Cambrai after signing what was really a disguised retractation (1695). Meanwhile Bossuet was at work on an Instruction sur les Stats d'oraison, which was intended to distinguish once for all what was true in Quietism from what was false. Fenelon, feeling sure that Bossuet would do the Quietists less than justice, determined to be beforehand with him. While Bossuet's book was still in the press, he suddenly brought out an Explication des maximes des saints (1697). The little volume raised a violent storm. For two years Fenelon was at bitter feud with Bossuet; he was banished from Versailles; finally, he was censured by the pope (1699), although in very measured terms. For Fenelon by no means shared all the ideas of Mme. Guyon; in the language of the divinity schools he was, at most, a " semi-Quietist." For the more ecstatic side of Quietism, so much in evidence with his friend, he had no taste whatsoever; but he thought that "

passivity," when interpreted with large modifications, led the way to a state of peaceful, other-world serenity highly grateful to the denizens of a crowded court, where was much splendid ennui and but little peace. Further, he was the counsellor of many over-scrupulous souls; and Quietist dis- interestedness, also much modified, enabled him to tell them that they were not necessarily castaways because they suffered much from " spiritual dryness," and seldom enjoyed the sweets of piety. But in the heat of battle with Bossuet, Fenelon carried his principles beyond all reasonable bounds. The theme of his Maxims is that, as men grow in holiness they become utterly indifferent to themselves. Not only do they cease to covet the consolations of religion; they lose all inci- dental pleasure in its exercise. Their whole soul is taken up in loving God; and they neither know nor care whether God loves them in return. But Bossuet had little trouble in persuading the world that Wenn ich Dich Hebe, was geht es Dich an? is but a sorry foundation on which to build up a personal religion; and the condemnation of the Maxims proved the deathblow to official Quietism. But flickers of " passivity," not always easily distinguishable from the teaching of Molinos, are still here and there produced by violent reaction from the prevailing legalism of the church of Rome.

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sur le mysticisme (Paris, 1908); J. Denis, Memoires' de V Academie de Caen for 1894; W. James, The Varieties of Religious Experience (London, 1902); H. Joly, Psychologie des saints (Paris, 1898); J. H. Leuba, " Tendances fondamentales des mystiques chr6tiens," in the Revue philosophique for 1902 ; E. Murisier, Les Maladies du senti- ment religieux (Paris, 1903) ; Rufus M. Jones, Studies in Mystical Religion (1909). See also the articles on Bossuet; Fenelon; Mme. Guyon; and Molinos. (St C.)

QUILIMANE, or Kilmane (the former being the Portu- guese spelling), a town of Portuguese East Africa, in 18 1′ S., 36 59′ E., 14 m. inland from the mouth of the river Quilimane or Qua Qua. The river, an independent stream during the rest of the year, during the rainy season becomes a deltaic branch of the Zambezi, with which it is connected by a channel called Mutu. The town (officially Sao Martinho de Quilimane) lies on the north bank of the river at a point where it is about a mile broad. There is ample and deep anchorage in the river, but the entrance is obstructed by a bar, over which there is 9 ft. of water at low tide, and from 16 to 22 ft. at high tide. Almost all the European merchants live in one long, acacia-shaded street or boulevard skirting the river, while the Indian merchants or Banyans occupy another street running at right angles to the first street.

Behind lies the native town. The total population in 1909 was 2200, including 400 Europeans and 320 Asiatics. The trade of Quilimane, formerly the only port for the produce of the Zambezi valley, steadily declined after the establishment of Chinde (q.v.). Efforts made at the beginning of the 20th century to develop local resources met with little success, owing to high duties and freights. A railway 18 m. long runs to Maquival, a large prazo for the cultivation of tropical produce. The imports are largely cotton goods from England and India, provisions from Portugal, and hardware from Germany. The exports are chiefly copra, ground-nuts, sugar, sesamum, india- rubber, wax, ivory, and beans. The average annual value of the trade for the ten years 1897-1906 was: — imports £60,509, exports £34,547. The natives are noted for their skill in the manufacture of jewelry, chiefly gold and silver ornaments. The town lies low and is unhealthy, despite efforts to improve its condition.

The Quilimane river was entered by Vasco da Gama in 1498, who there discovered an Arab settlement. The present town was founded by the Portuguese in the 16th century, and became in the 18th and the early part of the 19th centuries one of the great slave marts on the east coast of Africa. It was the starting- point of several notable expeditions — that of Francisco Barreto to the country of the Monomotapa in 1569, and that of David Livingstone up the Zambezi to Lake Nyasa in 1861 being the most famous. Until 1853 the trade of the port was forbidden to any save Portuguese. The European population, until the last quarter of the 19th century, consisted mainly of convicts from Portugal. (See Portuguese East Africa, History.)

QUILL, a term applied to the bare, hard, hollow tube of the feather of a bird, also to the large flight feathers or remiges, and especially to the strong feathers of the goose, swan, or crow used in the making of quill pens (see Feather and Pen). The word is of obscure origin; a word with similar meaning, Kiel, is found in German, and French has quille, ninepin, apparently connected with Ger. Kegel. Certain ancient stringed instruments were played with a plectrum or plucker made of the quill of a bird's feather, and the word has thus been used of a plectrum made of other material and differing in shape, and also of an analogous object for striking the strings in the harpsichord, spinet or virginal. The verb " to quill " is to fold lace, muslin or other light material into narrow flutes or pleats; when so pleated the material is called " quilling." The French term " quillon," apparently formed from quille, ninepin, is applied to the pro- jecting arms or cross guards of the hilt of a sword.

QUILLER-COUCH, SIR ARTHUR THOMAS (1863-), English writer, known under the pseudonym of " Q " was born in Cornwall on the 21st of November 1863. He was educated at Newton Abbot College, at Clifton

College, and Trinity College, Oxford. After taking his degree in 1886 he was for a short time classical lecturer at Trinity. While he was at Oxford he

published (1887) his Dead Man's Rock (a romance in the vein of Stevenson's Treasure Island), and he followed this up with Troy Town (1888) and The Splendid Spur (1889). After some journalistic experience in London, mainly as a contributor to the Speaker, in 1801 he settled at Fowey in Cornwall. His later novels include The Blue Pavilions (1891), The Ship of Stars (1899), Hetty Wesley (1903), The Adventures of Harry Revel (1903), Fort Amity (1904), The Shining Ferry (1905), Sir John Constantine (1906). He published in 1896 a series of critical articles, Adventures in Criticism, and in 1898 he completed R. L. Stevenson's unfinished novel, St Ives. From his Oxford days he was known as a writer of excellent verse. With the exception of the parodies entitled Green Bays (1893), his poetical work is contained in Poems and Ballads (1896). In 1895 he published a delightful anthology from the 16th and 17th-century English lyrists, The Golden Pomp, followed in 1900 by an equally successful Oxford Book of English Verse, 1250-1900 (1900). In Cornwall he was an active worker in politics for the Liberal party. He was knighted in 1910.

QUILLOTA, a town of Chile in the province of Valparaiso, on the left bank of the Aconcagua river, 20 m. above its mouth and 26 m. E.N.E. of the city of Valparaiso. Pop. (1902 estimate) 9876. The valley is noted for its beauty, fertility, and healthfulness, and is the centre of thriving fruit and wine industries. Among its fruits is the " chirimoya " {Anona cherimolia). There are rich copper mines in the vicinity. Quillota is situated on a railway between Valparaiso and Santiago, which passes through a mountainous, semi-barren country. It is one of the oldest towns of Chile, dating from the first years of the conquest.

QUILON, a seaport of India, on the Malabar coast, in the state of Travancore. Pop. (1901) 15,691. Quilon enjoys great facilities of water communication, and has an active export trade in timber, coco-nuts, ginger, pepper, &c. The palace of the maharaja of Travancore stands on the bank of Quilon lake, a beautiful sheet of water. Besides being on a projecting point, Quilon is rendered still more unsafe to approach by the bank of hard ground called the Tangasseri reef, which extends some distance to the south-west and west of the point and along the coast to the northward. There is good anchorage, however, in a bight about 3 m. from the fort.

Quilon is one of the oldest towns on the Malabar coast, and continued to be a place of considerable importance down to the beginning ni the 1 6th century. It is now the headquarters of the Travancore army, with a subsidiary battalion. Cotton weaving and spinning and the manufacture of tiles are the chief industries. It is the terminus of a railway across the hills from Tinnevelly. Adjoin- ing Quilon is the British village of Tangasseri, formerly a Portuguese and then a Dutch settlement, which is administered with Anjengo; pop. (1901) 1733.

QUILT, properly a coverlet for a bed, consisting of a mass of feathers, down, wool or other soft substance, surrounded by an outer covering of linen, cloth, or other material. In its earlier uses the " quilt " was made thick, and served as a form of mattress. The term was also given to a stitched wadded lining for body armour, and also, when made stout and closely padded, to a substitute for armour. The word came into English from O. Fr. cuilte, coilte, or coute, mod. couclte. This is derived from Lat. culcita or culcitra, a stuffed mattress or cushion. From the form culcitra came 0. Fr. cotre or coutre, whence coutre pointe, Low Lat. culcita puncta, i.e. stitched or quilted cushion; this was corrupted to contre pointe, Eng. counterpoint, which in turn was changed to " counterpane " (as if from Lat. pannus, piece of cloth). Thus " counterpane," a coverlet for a bed, and " quilt," are by origin the same word.

QUIMPER, formerly Quimper-Corentin, a town of France, capital of the department of Finistere, 158 miles north-west of Nantes and 68 miles south-east of Brest on the railway between those towns. Pop. (1906) 16,559. The delightful valley in which it lies is surrounded by high hills and traversed by the Steir and the Odet, which, meeting above the town, form a navigable channel for vessels of 150 tons to the sea (11 miles).

There is a small general shipping trade. Of the town walls (15th century) a few portions are preserved in the terrace of the episcopal palace and in the neighbourhood of the college. Quimper is the seat of a bishopric in the province of Rennes. The cathedral, dedicated to St Corentin and erected between 1239 and 1515, has a fine facade {c. 1425), the pediment of which is crowned by a modern equestrian statue of King Grallon, and adorned (like several other external parts of the building) with heraldic devices in granite. Two lateral towers with modern spires (1854-56) and turrets reach a height of 247 feet. The axis of the choir is deflected towards the north, a feature not uncommon, but here exaggerated. The nave and the transept are in the style of the 1 5th century, and the central boss bears the arms of Anne of Brittany (1476-1514). The terminal chapel of the apse dates from the 13th century. In the side chapels are the tombs of several early bishops. The high altar, tabernacle, and ciborium are costly works of contemporary art. The pulpit panels represent episodes in the life

of St Corentin. Of the other churches may be mentioned the church of Locmaria, dating from the nth century, and the chapel of the 1 5th century connected with the episcopal palace. A number of houses, in wood or stone, date from the 15th, 16th and 17th centuries. The museum, built in 1869-70, contains archaeological collections and about 1300 paintings and drawings. In 1868 a bronze statue of Laennec the inventor of the stethoscope (born at Quimper in 1781) was erected in Place St Corentin.

Quimper, or at least its suburb Locmaria (which lies below the town on the left bank of the Odet), was occupied in the time of the Romans, and traces of the ancient foundations exist. Later Quimper became the capital of Cornouailles and the residence of its kings or hereditary counts. It is said to have been Grallon Meur {i.e. the Great) who brought the name of Cornouailles from Great Britain and founded the bishopric, which was first held by St Corentin about 495. Hoel, count of Cornouailles, marrying the sister and heiress of Duke Conan in 1066, united the countship with the duchy of Brittany. Quimper suffered in the local wars of succession. In 1344 it was sacked by Charles of Blois. Monfort failed in his attempt to take the town by storm on August n, 1345, but it opened its gates to his son John IV. in 1364 after the victory at Auray. At a later period it sided with the League. Doubtless on account of its distance from the capital, Quimper, like Carpentras and Landerneau, has been a frequent butt of French popular wit. QUIMPERL£, a town of western France, capital of an arrondissement in the department of Finistere, at the con- fluence of two rivers which unite to form the Laiter, 28 m. E.S.E. of Quimper by rail. Pop. (1906) town 6203, commune 9176. Quimperl6 grew up round the abbey of Ste Croix, founded in the nth century, the romanesque basilica of which, restored in modern times, still remains. The church of St Michel (14th and 15th centuries), with a fine tower, crowns the hill above the town. Quimperle has a tribunal of first instance, and carries on the manufacture of farm implements, railway material, paper, &c, and trades in grain, timber, cattle and agricultural products. The town has a small port.

QUIN, JAMES (1693-1766), English actor of Irish descent, was born in London on the 24th of February 1693. He was educated at Dublin, and probably spent a short time at Trinity College. Soon after his father's death in 17 10, he made his first appearance on the stage at Abel in Sir Robert Howard's The Committee at the Smock Alley Theatre. Quin's first London engagement was in small parts at Drury Lane, and he secured his first triumph at Bajazet in Nicolas Rowe's Tamerlane, on the 8th of November 1715. The next year he appeared as Hotspur at Lincoln's Inn, where he remained for fourteen years. On the 10th of July 1718 he was convicted of man- slaughter for having killed Bowen, another actor, in a duel which the victim had himself provoked. Quin was not severely punished, the affair being regarded as more of an accident than a crime. The public took a

similar view of another episode in which Quin, on being attacked by a young actor ■who had been angered by the sarcastic criticism of his superior,

drew upon him and killed him. But if he was eager in his own defence he was no less so in that of others. In 1721 a drunken nobleman reeled on to the stage of the theatre and assaulted the manager, Rich, whose life was saved by Quin's prompt armed interference. This resulted in a riot, and thereafter a guard was stationed in all theatres. In 1732 Quin appeared at Covent Garden, returning to Drury Lane from 1734 to 1741, and in 1742 was again at Covent Garden, where he remained until the close of his career. On the 14th of November 1746 Quin played Horatio and Garrick Lothario to the Calista of Mrs Cibber in .Rose's Fair Penitent. The applause of the audience was so great as to disconcert if not actually to alarm the two actors. Public interest was yet more keenly stimulated in comparing Garrick's and Quin's impersonations of Richard III., the popular verdict being loudly in favour of Garrick. But Quin's Falstaff in King Henry IV. was emphatically preferred to the Hotspur of his rival. In consequence of an attempt made by Garrick in 1750-51 to draw him away from Covent Garden, Quin was enabled to extort from his manager a salary of £1000 a year, the highest figure then reached in the profession. Quin's last regular appearance was on the 15th of May 1757, as Horatio in the Fair Penitent, though in the following year he twice played Falstaff for the benefit of friends. He had retired to Bath, where he lived a happy life, with late hours and much eating and drinking, until his death on the 21st of January 1766. He was buried in the abbey church at Bath. Some coolness which had arisen between Quin and Garrick before the former's retirement was dissipated on their subsequent meeting at Chatsworth at the duke of Devonshire's, and Quin paid many a visit to Garrick's villa at Hampton in the latter part of his life. The epitaph in verse on his tomb was written by Garrick. Quin's will displayed a generous nature, and among numerous bequests was one of fifty pounds to " Mr Thomas Gainsborough, limner."

In the Garrick Club in London are two portraits of the actor ascribed to Hogarth, and a portrait by Gainsborough is in Buckingham Palace. His personality was not gracious. His jokes were coarse; his temper irascible; his love of food, his important airs, and his capacity for deep drinking do not command respect; on the other hand, a few of his jokes were excellent, and there was no rancour in him. On many occa- sions he showed his willingness to help persons in distress. His character is summarized by Smollett in Humphrey Clinker. As an actor his manner was charged with

an excess of gravity and deliberation; his pauses were so portentous as in some situations to appear even ludicrous; but he was well fitted for the delivery of Milton's poetry, and for the portrayal of the graver roles in his repertory.

See The Life of Mr. James Quin, Comedian, published in 1766 and reprinted in 1887.

QUINAULT, PHILIPPE (1635-1688), French dramatist and librettist, was born in Paris on the 3rd of June 1635. H e was educated by the liberality of Tristan 1'Hermite, the author of Mariamne. Quinault's first play was produced at the H6tel de Bourgogne in 1653, when he was only eighteen. The piece succeeded, and Quinault followed it up, but he also read for the bar; and in 1660, when he married a widow with money, he bought himself a place in the Cour des Comptes. Then he tried tragedies (Agrippa, &c.) with more success than desert. He received one of the literary pensions then recently established, and was elected to the Academy in 1670. Up to this time he had written some sixteen or seventeen comedies, tragedies, and tragi-comedies, of which the tragedies were mostly of very small value and the tragi-comedies of little more. But his comedies — especially his first piece Les Rivales (1653), L'Amant indiscret (1654), which has some likeness to Moliere's Etourdi, Le Fantome amoureux (1659), and La Mere coquette (1665), perhaps the best — are much better. But in 167 1 he contributed to the singular miscellany of Psyche, in which Corneille and Moliere also had a hand, and which was set to the music of Lulli. Here he showed a remarkable faculty for lyrical drama, and from this time till just before his death he confined himself

to composing libretti for Lulli's work. This was not only very profitable (for he is said to have received four thousand livres for each, which was much more than was usually paid even for tragedy), but it established Quinault's reputation as the master of a new style, — so that even Boileau, who had previously satirized his dramatic work, was converted, less to the opera, which he did not like, than to Quinault's remarkably ingenious and artist-like work in it. His libretti are among the very few which are readable without the music, and which are yet carefully adapted to it. They certainly do not contain very exalted poetry or very perfect drama. But they are quite free from the ludicrous doggerel which has made the name libretto a byword, and they have quite enough dramatic merit to carry the reader, much more the spectator, along with them. It is not an exaggeration to say that Quinault, coming at the exact time when opera became fashionable out of Italy, had very much to do with establishing it as a permanent European genre. His first piece after Psyche was a kind of classical masque. Les Fetes de V Amour et de Sacchus (1672). Then came Cadmus (1674), Alceste (1674), Thesee (1675), Atys (1676), one of his best pieces, and

Isis (1677). All these were classical in subject, and so was Proserpine (1680), which was superior to any of them. The Triumph of Love (1681) is a mere ballet, but in Persee (1682) and Phaeton (1683) Quinault returned to the classical opera. Then he finally deserted it for romantic subjects, in which he was even more successful. Amadis de Gaule (1684), Roland (1685), and Armide (1686) are his masterpieces, the last being the most famous and the best of all. The very artificiality of the French lyric of the later 17th century, and its resemblance to alexandrines cut into lengths, were aids to Quinault in arranging lyrical dialogue. Lulli died in 1687, and Quinault, his occupa- tion gone, became devout, and began a poem called the " De- struction of Heresy." He died on the 26th of November 1688 The best edition of his works is that of 1739 (Paris, 5 vols.). QUINAZOLINES (Phenmiazines or benzopyrimidines), in organic chemistry, heterocyclic compounds of the structure shown in the inset formula. They may be regarded as resulting (4) from the fusion of a benzene with a pyrimidine

N(. nucleus in the 5.6 position. They are isomeric with the cinnolines, phthalazines and quinoxa- (2 –) lines. They may be obtained by the action of alco- N"d) holic ammonia on the acidyl derivatives of ortho-

aminobenzaldehydes and ortho-amino ketones (A. Bischler, Ber.,

/CHO /CH : N .

1891-95): C 6 H 4 < +NH 3 = C 6 H 4 <; I +2H 2 0;

x NH.CO.R X N : CR

and from the corresponding dihydro compounds on oxidation with potassium permanganate. They are stable, tertiary bases, and may be distilled without decomposition; they form addition products with alkyl iodides and double salts with mercuric and platinum chlorides. On reduction with sodium in presence of alcohol they yield dihydro derivatives. Those in which the ;CH group adjacent to the benzene nucleus is unsubstituted are oxid- ized by chromic acid to ketodihydroquinazolines (quinazolones) .

Quinazoline (C 6 H 2 N 8) is obtained by oxidizing its dihydro-deriv- ative with potassium ferricyanide. The dihydro derivatives exist in three different series, since the addition of two atoms of hydrogen in the diazine ring can take place in three different positions, namely, in the 3.4, 1.4 and 1.2 positions, and these different types are dis- tinguished by the symbols Ai, A2, A3, denoting that the double linkage is between the first and second, second and third, and third and fourth atoms in the diazine ring. The Ai series, which are obtained by the elimination of the elements of

water from the acidyl derivatives of ortho-aminobenzylamines, are rather strong bases which form stable salts and yield the correspond- ing keto derivatives on oxidation (C. Paal, Ber., 1889-1896). 4-Keto-dihydroquinazoline (/3-quinazolone) is formed by oxidiz- ing the dihydro base with potassium permanganate; by boiling acidyl-ortho-aminobenzamide with water (A. Weddige, Jour. prak. Chem., 1885, (2)31, p. 124) ; or by heating anthranilic acid with forma- mide (S. Niementowski, Ber., 1895, 28, p. 443). It reacts both in the enol and keto forms, yielding both N-ethers and O-ethers, the latter being obtained by the action of sodium alcoholates on 4-chlor- quinazolines. The A2 series is obtained by heating acidyl-ortho- aminobenzylamines with zinc chloride, whilst the A3 series, which

is only known in the form of its keto derivatives (a-quinazolines), results from the fusion of urea with ortho-aminobenzaldehydes and benzophenones, the elements of water and of ammonia being elimi- nated (S. Gabriel and Th. Posner, Ber., 1895, 28, p. 1037). They possess feeble basic and phenolic characters. The tetra-hydroquin- azolines are obtained by reducing the quinazolines and dihydro- quinazolines and by condensing ortho-aminobenzylamine with alde- hydes (M. Busch, Jour. prak. Chem., 1896, (2) 53, p. 414). The ring is easily split on hydrolysis, giving rise to or'tho-disubstituted benzenes. The keto derivatives of this series result by the action of carbonyl chloride on ortho-aminobenzylamines of the type H 2 ..C 6 H4.CH 2 NHR (M. Busch, Ber., 1892, 25, p. 2853), or from the urea derivatives of ortho-aminobenzylamine. They are weak bases which are indifferent to both acids and alkalis, and which on oxidation yield the corresponding 2.4-diketo derivatives.

QUINCE (Lat. Cydonia or Cotonea, Ital. Cotogna, Fr. coing, Mid. Eng. coin, quin, whence a collective plural " quins," corrupted to singular " quince "), a fruit-tree concerning which botanists differ as to whether or not it is entitled to take rank as a distinct genus or as a section of the genus Pyrus (natural order Rosaceae, q.v.). It is not a matter of much im- portance whether we call the quince Pyrus Cydonia or Cydonia vulgaris. For practical purposes it is perhaps better to con- sider it as distinct from Pyrus, differing from that genus in the twisted manner in which the petals are arranged in the bud, and in the many-celled ovary, in which the numerous ovules are disposed horizontally, not vertically as in the pears. The quinces are much-branched shrubs or small trees with entire leaves, small stipules, large solitary white or pink flowers like those of a pear or apple, but with leafy calyx lobes and a many-celled ovary, in each cell of which are numerous hori- zontal ovules. The common quince is a native of Persia and Anatolia, and perhaps also of Greece and the Crimea, but in

these latter localities it is doubtful whether or not the plant is not a relic of former cultivation. By Franchet and Savatier P. Cydonia is given as a native of Japan with the native name of "•maroumerou." It is certain that the Greeks knew a common variety upon which they engrafted scions of a better variety which they called kvocovwv, from Cydon in Crete, whence it was obtained, and from which the later names have been derived. Pliny (H.N. xv. 11) mentions that the fruit of the quince, Malum cotoneum, warded off the influence of the evil eye; and other legends connect it with ancient Greek mythology, as exemplified by statues in which the fruit is repre- sented, as well as by representations on the walls of Pompeii. The fragrance and astringency of the fruit of the quince are well known, and the seeds were formerly used medicinally for the sake of the mucilage they yield when soaked in water, a peculiarity which is not met with in pears. This mucilage is analogous to, and has the same properties as, that which is formed from the seeds of linseed.

The quince is but little cultivated in Great Britain, two or three trees planted in the slip or orchard being in general found to be sufficient for a supply of the fruit; in Scotland it seldom approaches maturity, unless favoured by a wall. The fruit has a powerful odour, but in the raw state is austere and astringent; it, however, makes an excellent preserve, and is often used to give flavour and poignancy to stewed or baked apples.

There are three principal varieties of the quince, the Portugal, the apple-shaped and the pear-shaped. The Portugal is a taller and more vigorous grower than the others, and has larger and finer fruit; the apple-shaped, which has roundish fruit, is more pro- ductive, and ripens under less favourable conditions than either of the others; while the pear-shaped has roundish-pyriform fruit, which ripens later than that of the apple-shaped variety.

The quince prefers a rich, light and somewhat moist soil. The tree is generally propagated by cuttings or layers, the former making the best plants, but being longer in growing. It is much used as a dwarfing stock for certain kinds of pears, and for this purpose the young plants when bedded out in the quarters should be shortened back to about 18 or 20 inches; the effect is to restrain the growth of the pear, increase and hasten its fruitfulness, and enable it to withstand the effects of cold. Those required to form standard fruit-bearing trees should be trained up to a single stem till a height of 5 or 6 feet is attained.

The common Japan quince, Pyrus or Cydonia japonica, is grown in gardens for the sake of its flowers, which vary in colour from

creamy white to rich red, and are produced during the winter and early spring months. The fruit is green and fragrant but quite uneatable. C. Maulei, a more recently introduced shrub from Japan, bears a profusion of equally beautiful orange-red flowers, which are followed by fruit of a yellow colour and agreeable fragrance, so that, when cooked with sugar, it forms an agreeable conserve, as in the case of the ordinary quince.

QUINCY, JOSIAH (1744-1775), American patriot, son of Josiah Quincy (1700-1784), was born in Boston on the 23rd of February 1744. He was a descendant of Edmund Quincy, who emigrated to Massachusetts in 1633, and received in 1636 a grant of land at Mount Wollaston, or Merry Mount, after- wards a part of Braintree and now Quincy. He graduated at Harvard in 1763, and studied law in the office of Oxenbridge Thacher (d. 1765), to whose large practice he succeeded. In 1767 Quincy contributed to the Boston Gazette two bold papers, signed "Hyperion," declaiming against British op- pression; they were followed by a third in September 1768; and on the 12th of February 1770 he published in the Gazette a call to his countrymen to break off all social intercourse " with those whose commerce contaminates, whose luxuries poison, whose avarice is insatiable, and whose unnatural oppressions are not to be borne." After the " Boston massacre " (5th of March 1770) he and John Adams defended Captain Preston and the accused soldiers and secured their acquittal. 1 He used the signatures " Mentor," " Callisthenes," " Marchmont Needham," " Edward Sexby," &c, in later letters to the Boston Gazette. He travelled for his health in the South in 1773, and left in his journal an interesting account of his travels and of society in South Carolina; this journey was important in that it brought Southern patriots into closer relations with the popular leaders in Massachusetts. In May 1774 he pub- lished Observations on the Act of Parliament, commonly called " The Boston Port Bill," with Thoughts on Civil Society and Standing Armies, in which he urged " patriots and heroes " to " form a compact for opposition — a band for vengeance." In September 1774 he left for England, where he consulted with leading Whigs as to the political situation in America; on the 1 6th of March 1775 he started back, but he died on the 26th of April in sight of land.

See the Memoir of the Life of Josiah Quincy, Jun., of Massa- chusetts (Boston, 1825; 2nd ed., 1874), by his son, which contains his more important papers.

His son, Josiah Quincy (1772-1864), American lawyer and author, was born in Boston on the 4th of February 1772. He studied at Phillips Academy, Andover, graduated at Harvard in 1790, studied law, and was admitted to the bar in 1793, but was never a prominent advocate He became a leader of the Federalist party in Massachusetts; was an unsuccessful candi- date for the national House of Representatives in 1800; served in the Massachusetts Senate in 1804-5; and was a member in 1805-13 of the national House of Representatives, where he was one of the small Federalist minority. He attempted to secure the exemption of fishing vessels from the Embargo Act, urged the strengthening of the American navy, and vigorously opposed the erection of Orleans Territory (Louisiana) into a state in 181 1, and stated as his " deliberate opinion, that if this bill passes, the bonds of this Union are virtually dis- solved; that the States that compose it are free from their moral obligations to maintain it; and that, as it will be the right of all, so it will be the duty of some to prepare definitely for a separation, — amicably if they can, violently if they must." This is probably " the first assertion of the right of secession on the floor of Congress." Quincy left Congress because he saw that the Federalist opposition was useless, and thereafter was a member of the Massachusetts Senate until 1820; in 1821-22 he was a member and speaker of the state House of Representatives, from which he resigned to become judge of the municipal court of Boston. In 1823-28 he was mayor of Boston, and in his term Faneuil Hall Market House was

1 His eldest brother, Samuel Quincy (1735-1789), was at this time solicitor-general of Massachusetts, and opened this trial. He remained loyal to the Crown, left Boston in 1776, and was attorney for the Crown in Antigua until his death.

built, the fire and police departments were reorganized, and the city's care of the poor was systematized. In 1829-1845 he was president of Harvard College, of which he had been an overseer since 1810, when the board was reorganized; he has been called " the great organizer of the university ": he gave an elective (or " voluntary ") system an elaborate trial; introduced a system of marking (on the scale of 8) on which college rank and honours, formerly rather carelessly assigned, were based; first used courts of law to punish students who destroyed or injured college property; and helped to reform the finances of the university. During his term Dane Hall (for law) was dedicated, Gore Hall was built, and the Astro- nomical Observatory was equipped. His last years were spent principally on his farm in Quincy, where he died on the 1st of July 1864.

He wrote a Memoir of his father (1825); a History of Harvard University (2 vols., 1840), marred by a tendency to belittle the clerical regime; The Journals of Major Samuel Shaw (1847); The History of the Boston Athenaeum (1851); The Municipal History of the Town and City of Boston (1852) ; a Memoir of the Life of J. Q. Adams (1858); and Essays on the Soiling of Cattle (1859), only one of his many practical contributions to agriculture. See Edmund Quincy, Life of Josiah Quincy (Boston, 1867).

Josiah Quincy (1802-1882), son of the last-named, was mayor of Boston in 1845-1849, and author of Figures of the Past (1882); his brother Edmund (1808-1877) was a prominent Abolitionist, and author of the biography of his father and of a romance, Wensley (1854); and his sister Eliza Susan (1798- 1884) was her father's secretary and the biographer of her mother. Josiah Quincy (1802-1882) had two sons — Josiah Phillips (1829-1910), a lawyer, who wrote, besides some verse, The Protection of Majorities (1876) and Double Taxation in Massachusetts (1889); and Samuel Miller (1833-1887), who practised law, wrote en legal subjects, served in the Union army during the Civil War, and was breveted brigadier-general of volunteers in 1865. Josiah Quincy (b. 1859), a son of Josiah Phillips Quincy, was prominent in the Democratic party in Massachusetts, and was mayor of Boston in 1895-1899.

QUINCY, a city and the county-seat of Adams county, Illinois, U.S.A., in the western part of the state, on the Mississippi river, about 105 m. W. of Springfield. Pop. (1890) 31,494; (1900) 36,252, of whom 4961 were foreign-born — 3988 being of German birth — and 2029 were negroes; (1910, census) 36,587. Land area (1906), 5-8 sq. m. Quincy is served by the Chicago, Burlington & Quincy, the Quincy, Omaha & Kansas City, and the Wabash railways, and by lines of river steamers, which find an excellent harbour in Quincy Bay, an arm of the Mississippi. The city is built on the river bluffs, which com- mand an extensive view. In Indian Mounds park, within the city limits and owned by the city, are prehistoric mounds. The Quincy Library, founded in 1837, has been a free public library since 1889. Among the principal public buildings are the Court House and the Federal Government building. The State Soldiers' and Sailors' Home (1887), with grounds cover- ing 222 acres, is in Quincy; one of its fifty-five buildings (Lippincott Memorial Hall) was erected by the veterans of the institution in memory of Charles E. Lippincott, the first superintendent. There is a monument in Quincy in memory of George Rogers Clark, and the homestead (built in 1835) of John Wood, founder of the city, is now owned by the Quincy Historical Society, organized in 1896. Quincy is the seat of St Francis Solanus College (i860) and St Mary's Institute (Roman Catholic) ; The Chaddock Boys' School (Methodist Episcopal), until 1900 known as Chaddock College; two schools of music; and the Gem City Business College. Among the charitable institutions are Blessing Hospital

(1875), St Mary's Hospital (1867; in charge of the Sisters of the Poor of St Francis), the Woodland Home for Orphans and Friendless (1853), St Aloysius Orphans' Home (1865), and several homes for the aged and infirm. The city is the seat of a Protestant Episcopal bishop. Quincy is the industrial and commercial centre of a large region. The value of factory products in 1905 was $10,748,224, an increase of 35-7 per cent, since 1900. Among

the manufactures are stoves and furnaces, foundry and machine shop products, carriages and wagons, flour and grist mill pro- ducts, malt liquors, dairymen's and poulterers' supplies, show- cases, men's clothing, agricultural implements, saddlery and harness, and lumber.

In 1822 John Wood (1798-1880), the first white settler, built a log cabin here, and in 1825, Quincy, then having less than ten inhabitants, was made the county-seat of Adams county, both town and county being named through Wood's influence in honour of John Quincy Adams. Wood was lieutenant- governor of the state in 1857-1860, and acting-governor in 1860- 186 1. A bronze statue (dedicated in 1883) in his memory stands in Washington Park. There was a genera} hospital of the United States Army in Quincy during the Civil War. Quincy was incorporated as a town in 1834, and was chartered as a city in 1839.

QUINCY, a city of Norfolk county, Massachusetts, situated on Massachusetts Bay, and separated from Boston by the Neponset river on the N. and from Weymouth by Fore river on the S. Pop. (1890) 16,723; (1900) 23,899, of whom 7662 were foreign-born; (1910 census) 32,642; area, about 16 sq. m. It is served by the New York, New Haven & Hartford railway, and by an interurban electric line. To a large degree Quincy is a residential suburb of Boston. The birthplaces of John Adams, built in 1681, and of John Quincy Adams, built in 1716, are still standing. The Stone Temple, or First (Unitarian) Congregational Church, is the burial-place of the two Adamses. Quincy was also the home of Charles Francis Adams. John Adams gave to the town his valuable private library, and in 1822 founded here the Adams Academy for boys (now closed). In the home of Josiah Quincy (1802- 1882) in Wollaston Park is the Quincy Mansion School for Girls. Woodward Institute (1894) is an endowed high school for girls. The public school system, the " Quincy' System," was made famous in 187 5-1880 by Col. Francis Wayland Parker (1837-1902), who abolished learning lessons by rote, and intro- duced Froebelian principles. A public library was opened in 187 1, and in 1882 it was housed in the Crane Memorial Hall, designed by H. H. Richardson, and given by the family of Thomas Crane (1803-1875), who had spent his early youth in the town, but had lived in New York City from 1827 until his death. The library contained about 26,000 volumes in 1908. The city has a fine system of

parks, among them being Merrymount and Faxon, the latter named in honour of the family of Henry H. Faxon, who in 1882 secured a negative vote by the town to the question whether " licenses be granted for the sale of intoxicating liquors"; subsequently there has been a similar vote each year. The manufactures of Quincy were long un- important, with the exception of "Quincy granite," 1 which was first quarried in 1825, — this being the first " systematic siliceous crystalline rock quarrying " in New England — and of which the output in the form of tombstones and monuments in 1905 was valued at $2,018,198, and in the form of " marble and stone work " was valued at $364,924. But manufacturing rapidly increased in importance between 1900 and 1905; in this period the value of factory products increased 198.2%, to $8,982,446, and the capital invested increased 389%, to $9,220,870. Quincy granite, a hornblende, pyroxene, bluish or greyish, without mica, was used for the construction of the Bunker Hill monument at Charlestown (in 1826), and of King's Chapel, Boston; and for interior decorations it has found some use, for example in the Philadelphia city buildings. Engines, and iron and steel ships are built at a shipyard 2 on the Fore river, and tubular rivets and studs, gearing, foundry products, and translucent fabrics are among the city's other products.

1 Since 1877 the Granite Cutters' Journal has been published here by the Granite Cutters' International Association of America. For a description of the granite quarried in the vicinity of Quincy, see T. N. Dale, The Chief Commercial Granites of Mass., New Hamp- shire and Rhode Island (Washington, 1908), Bulletin 354 of the U.S. Geol. Survey.

2 Here were built various vessels of the U.S. Navy, including the battleship " North Dakota."

The site of the present city was settled in 1625 as Merry Mount or Mount Wollaston by Thomas Morton (q.v.) — the present Wollaston Heights is a part of the grant of 600 acres made in 1636 by the town of Boston to William Hutchinson, husband of Anne, the Antinomian, and was formerly known as Taylor's Hill. A Puritan settlement was made here in 1634. This first settled part of Braintree {q.v.) — a name given in 1640 to the community then organized — after 1708 was officially called the North Precinct of the Town of Braintree; here the Adamses and the Hancocks lived, and Quincy was the birth- place of John Hancock — in a house on Hancock lot lived the first Josiah Quincy; the Mount Wollaston farm was a legacy to John Quincy (1689-1767), in whose honour the township was

named on its separation from the township of Braintree in 1792, and whose name was borne by his great grandson, John Quincy Adams. In 1826 a railway about 4 m. long to the Neponset river was built here — the first in New England — • for carrying granite from the quarries to tide-water; the cars were drawn by horses. The township hAd previously been engaged in maritime pursuits, agriculture, and the manufacture of leather. Township government, owing to the abolition of the committee on general business and the consequent confusion of handling so many and minute details, and to the addition to the population of a large Irish element and a large New Hampshire element, both workmen in the quarries, reached the minimum of efficiency in 1840-1870; in 1870, how- ever, the town-meetings were reformed, and in 1874 a committee to consider business details was again appointed. In 1888 Quincy was chartered as a city.

See " A Study of Church and Town Government," by C. F. Adams, in the second volume of his Three Episodes of Massachusetts History (Boston, 1892), for an admirable history of the community; his Centennial Milestone, an Address in Commemoration, of the One Hundredth Anniversary of the Incorporation of Quincy, Mass. (Cam- bridge, Massachusetts, 1892); D. M. Wilson, Quincy, Old Braintree and Merry Mount (Boston, 1907), and Where American Independence Began (Boston, 1902); and D. M. Wilson and C. F. Adams, Col. John Quincy of Mount Wollaston, 1689-1767 (Quincy, 1909), pub- lished by the Quincy Historical Society, and containing addresses made at the celebration in February 1908 in honour of Col. Quincy; and W. S. Pattee, History of Old Braintree and Quincy (Quincy,

1878).

QUINET, EDGAR (1803-1875), French historian and man of letters, was born at Bourg-en-Bresse, in the department of the Ain, France, on the 17th of February 1803. His father, Jerome Quinet, had been a commissary in the army, but being a strong republican and disgusted with Napoleon's usurpa- tion, he gave up his post and devoted himself to scientific and mathematical study. Edgar, who was an only child, was much alone, but his mother (Eugenie Rozat Lagis, who was a person of education and strong though somewhat unorthodox religious views) exercised great influence over him. He was sent to school first at Bourg and then at Lyons. His father wished him on leaving school to go into the army, and then suggested business. But Quinet was determined upon literature, and after a time got his way. His first publication, the Tablettes du juif errant, appeared in 1823. Being struck with Herder's Philosophic der Geschichte, he undertook to translate it, learnt German for the purpose, published his work in 1827, and ob- tained by it considerable credit. At this time he was introduced to Cousin, and made the acquaintance of Michelet. He had

visited Germany and England before the appearance of his book. Cousin procured him a post on a government mission to the Morea in 1829, and on his return he published in 1830 a book on La Grece moderne. Some hopes of employment which he had after the revolution of February were frustrated by the reputation of speculative republicanism which he had acquired. But he joined the staff of the Revue des deux monies, and for some years contributed to it numerous essays, the most remark- able of which was that on Les EpopSes francaises du XI Feme sieck, an early, though not by any means the earliest, apprecia- tion of the long-neglected chansons de geste. Ahasvirus, his first original work of consequence, appeared in 1833. This is a singular prose poem, in language sometimes rather bombastic

but often beautiful. Shortly afterwards he married Minna Mor6, a German girl with whom he had fallen in love some years before. Then he visited Italy, and, besides writing many essays, produced two poems, Napolion (1835) and Promethie (1838), which being written in verse (of which he was not a master) art inferior to Akasverus. In 1838 he published a vigorous reply to Strauss's Leben Jesu, and in that year he received the Legion of Honour. In 1839 he was appointed professor of foreigi,. literature at Lyons, where he began the brilliant course ol lectures afterwards embodied in the Genie des religions. Twe years later he was transferred to the College de France, and the Ginie des religions itself appeared (1842).

Quinet's Parisian professorship was more notorious than fortunate, owing, it must be said, to his own fault. His chair was one of Southern Literature, but, neglecting his proper subject, he chose, in conjunction with Michelet, to engage in a violent polemic with the Jesuits and with Ultramontanism. Two books bearing exactly these titles appeared in 1843 and 1844, and contained, as was usual with Quinet, the substance of his lectures. These excited so much disturbance, and the author so obstinately refused to confine himself to literature proper, that in 1846 the government put an end to them — a course which was not disapproved by the majority of his colleagues. By this time Quinet was a pronounced republican, and some- thing of a revolutionist. He appeared in arms during the dis- turbances which overthrew Louis Philippe, and was elected by the department of the Ain to the Constituent and then to the Legislative Assembly, where he figured among the extreme radical party. He had published in 1848 Les Resolutions d'ltalie, one of his principal though not one of his best works. He wrote numerous pamphlets during the short-lived Second Republic, attacked the Roman expedition with all his strength, and was from the first an uncompromising opponent of Prince Louis Napoleon. He was banished from France after the coup d'Stat, and established himself at Brussels. His wife had died some time previously, and he now married Mademoiselle Asaky, the daughter of a Roumanian poet. At Brussels he lived for some

seven years, during which he published Les Esclaves (1853), a dramatic poem, Mamix de Sainte-Aldegonde (1854), a study of that Reformer in which he very greatly exaggerates Sainte-Aldegonde's literary merit, and some other books. He then moved to Veytaux, on the shore of the Lake of Geneva, where he continued to reside till the fall of the empire. Here his pen was busier than ever. In i860 appeared a singular book, somewhat after the fashion of Ahasvirus, entitled Merlin I'enchanteur, in 1862 a Histoire de la campagne de 1815, in 1865 an elaborate book on the French Revolution, in which the author, republican as he was, blamed the acts of the revolution- ists unsparingly, and by that means drew down on himself much wrath from more thoroughgoing partisans. Many pamphlets date from this period, as does La Creation (1870), a third book of the class of Akasverus and Merlin, but even vaguer, dealing not with history, legend, or philosophy, but with physical science for the most part.

Quinet had refused to return to France to join the liberal opposition against Napoleon III., but immediately after Sedan he returned. He was then restored to his professorship, and during the siege wrote vehemently against the Germans. He was elected deputy by the department of the Seine in 1871, and was one of the most obstinate opponents of the terms of peace between France and Germany. He continued to write till his death, which occurred at Versailles on the 27th of March 1875. Le Siege de Paris et la difense nationale appeared in 187 1, La RSpublique in 1872, Le Livre de Vexile in the year of its author's death and after it. This was followed by three volumes of letters and some other work. Quinet had already in 1858 published a semi-biographic book called Histoire de mes idees,

Quinet's character was extremely amiable, and his letters to his mother, his accounts of his early life, and so forth, are likely always to make him interesting. He was also a man of great moral conscientiousness, and as far as intention went perfectly dis- interested. As a writer, his chief fault is want of concentration;

as a thinker and politician, vagueness and want of practical determination. His historical and philosophical works, though showing much reading, fertile thought, abundant facility of expression, and occasionally, where prejudice does not come in, acute judgment, are rather (as not a few of them were in fact) reported lectures than formal treatises. His rhetorical power was altogether superior to his logical power, and the natural conse- quence is that his work is full of contradictions. These contra- dictions were, moreover, due, not merely to an incapacity or an unwillingness to

argue strictly, but also to the presence in his mind of a large number of inconsistent tastes and prejudices which he either could not or would not co-ordinate into an in- telligible creed. Thus he has the strongest attraction for the picturesque side of medievalism and catholicity, the strongest repulsion for the restrictions which medieval and Catholic institutions imposed on individual liberty. He refused to sub- mit himself to any form of positive orthodoxy, yet when a man like Strauss pushed unorthodoxy to its extreme limits Quinet revolted. As a politician he acted with the extreme radicals, yet universal suffrage disgusted him as unreasonable in its principle and dangerous in its results. His pervading character- istic, therefore, is that of an eloquent vagueness, very stimulating and touching at times, but as deficient in coercive force of matter as it is in lasting precision and elegance of form. He is less in- accurate in fact than Michelet, but he is also much less absorbed by a single idea at a time, and the result is that he seldom attains to the vivid representation of which Michelet was a master.

Bibliography.— His numerous works appeared in a uniform edition of twenty-eight volumes (1877-79). His second wife, in 1870, published certain Memoires d'exil, and Lettres d'exil followed in 1885. In that year Prof. George Saintsbury pftblished a selection of the Lettres a sa mere with an introduction. For many years Quinet received little attention in France, but it was revived, though not very strongly, by the publication in 1899 of Madame Quinet's Cinquante ans d'amitie (that between her husband and Michelet), and by the centenary of his birth. On this latter (1903) appeared A V occasion du centenaire, by E. Ledrain; see also Libres Penseurs rUigieux, by E. Paris (1905). There is in English an elaborate Early Life and Writings oj Edgar Quinet, by R. Heath (London, 1881). (G. Sa.)

QUININE, the most important alkaloid contained in cinchona bark (see Cinchona). In 1810 Gomez of Lisbon obtained a mixture of alkaloids which he named cinchonino, by treating an alcoholic extract of the bark with water and then adding a solution of caustic potash. In 1820 Pelletier and Caventou proved that the cinchonino of Gomez contained two alkaloids, which they named quinine and cinchonine. Later quinidine and cinchonidine were discovered, and subsequently several other alkaloids, but in smaller quantity.

Chemistry. — The alkaloids exist in the bark chiefly in com- bination with cinchotannic and quinic acids. The cinchotannic acid apparently becomes altered by atmospheric oxidation into a red-colouring matter, known as cinchono-fulvic or cinchona red, which is very abundant in some species, as in C. succirubra. For this reason those barks which, like C. Caiisaya, C. officinalis, and C. Ledgeriana, contain but little colouring matter are

preferred, the quinine being more easily extracted from them in a colourless form. The exact mode of extraction adopted by manufacturers is secret. That hitherto adopted by the Indian Government for the preparation of the cinchona febrifuge (see below) is simple, but the whole of the alkaloid present in the bark is not obtained by it. This method is to exhaust the powdered bark with water acidulated with hydrochloric acid and then to precipitate the alkaloids by caustic soda. Another method consists in mixing the powdered bark with milk of lime, drying the mass slowly with frequent stirring, exhausting the powder with boiling alcohol, removing the excess of alcohol by distillation, adding sufficient dilute sulphuric acid to dissolve the alkaloid and throw down colour- ing matter and traces of lime, &c, filtering, and allowing the neutralized liquid to deposit crystals. The sulphates of the alkaloids thus obtained are not equally soluble in water, and the quinine sulphate can be separated by fractional crystalliza- tion, being less soluble in water than the other sulphates.

Quinine of commerce is the neutral sulphate, C2oH 2 iN20 2 ‘ H2SOV 8H2Q which occurs in commerce in the form of very light slender white acicular crystals. It is soluble in about 780 parts of cold water, but in 30 of boiling water, 60 of rectified spirit (sp. gr. 0-83), and 40 of glycerin. Its solubility in water is lessened by sodium or magnesium sulphate, but is increased by potassium nitrate, ammonium chloride, and most acids. It is not soluble in fixed oils or in ether, although the pure alkaloid is soluble in both. It becomes phosphorescent on trituration. When prescribed it is generally rendered more soluble in water by the addition of dilute sulphuric acid or of citric acid, one drop of the former or fths of a grain of the latter being used for each grain of the quinine sulphate. Quinine is precipitated from its solution by alkalis and their carbonates. It is, however, very soluble in excess of ammonia. The acid solution of sulphate of quinine is fluorescent, especially when dilute; and it is laevo-rotatory. When a solution of chlorine is first added and then ammonia an emerald green colour, due to the formation of thalleoquin, is developed. This test answers with a solution containing only I part of quinine in 5000, or in a solution containing not more than ?foots part if bromine be used instead of chlorine. The fluorescence is visible in an acid solution containing 1 part in 200,000 of water. By adding an alcoholic solution of iodine to a solution of the sulphate in acetic acid a compound known as herapathite, 4Qu-3H2S04-2HI-l4-6H 2 0, is obtained, which possesses optical properties similar to those of tourmaline; it is soluble in 1000 parts of boiling water; and its sparing solubility in cold alcohol has been utilized for estimating quinine quantitat- ively. The other alkaloids are distinguished from quinine thus : quinidine resembles quinine, but is dextro-rotatory, and the iodide is very insoluble in water; the solution of cinchonidine, which is laevo-rotatory, does not give the thalleoquin test, nor fluorescence;

cinchonine resembles cinchonidine in these respects, but is dextro- rotatory.

Commercial sulphate of quinine frequently contains from I to 10% of cinchonidine sulphate, owing to the use of barks containing it. The sulphate of cinchonidine is more soluble than that of quinine; and, when I part of quinine sulphate suspected to contain it is nearly dissolved in 24 parts of boiling water, the sulphate of quinine crystallizes out on] cooling, and the cinchonidine is found in the clear mother liquor, from which it can be precipitated by a solution of potassium and sodium tartrate. Samples of quinine in which cinchonidine is present usually contain a smaller percentage of water than the pure sulphate. Traces of quinidine are also some- times, though rarely, found in commercial quinine, but its presence does not detract in a medicinal point of view from the value of the latter.

Owing to its voluminous character as much as 18 % of water may remain present in apparently dry samples of sulphate of quinine. If it loses more than 14-6% of water when dried at ioo°C. it contains an excessive amount of moisture. Owing to its variability in this respect, and to its insolubility, certain other salts have largely re- placed the sulphate in modern medicine.

Sulphate of quinine manufactured from cuprea bark {Remijia pedunculata) may contain from -io to 90% of sulphate of homo quinine, which almost coincides in solubility with sulphate of quinine. Homoquinine is decomposed on treatment with caustic soda into quinine and a new alkaloid, cupreine, in the proportion of 2 to 3. Cupreine is soluble in a solution of caustic soda (differing in this respect from quinine), and therefore it is easy to prepare sulphate of quinine perfectly free from either homoquinine or cupreine. The medicinal properties of cupreine and homoquinine are of no practical importance.

In consequence of the high price of the alkaloid an attempt was made some years ago by the Government of India to manufacture from cinchona bark a cheap febrifuge which should represent the alkaloids contained in the bark and form a substitute for quinine. This mixture is known as cinchona febrifuge, and is prepared chiefly from C. succirubra, which succeeds better in India than the other species in cultivation, and grows at a lower elevation, being con- sequently procurable in large quantities at a comparatively low price. A mixture of the cinchona alkaloids, consisting principally of cinchonidine sulphate, with smaller quantities of the sulphates of quinine and cinchonine, is sold under the name of " quinetum " at a cheaper rate than quinine.

The chemical constitution of quinine and the allied alkaloids is not definitely settled, although certain relationships are well established. Thus quinine is methoxycinchonine or methylcupreine, cupreine being an

oxycinchonine. These relations are shown by the formulae: — cinchonine = Ci 9 H2iN 2 -OH; cupreine = CwH 2 oN2(OH)2 ; quinine = Ci9H2oN2(OH)(OCH 3). Cinchonine yields on oxidation cinchoninic acid (7-quinoline carboxylic acid). C9HsN-C02H, whilst quinine gives quininic acid, C9H5(C0aH). This per- mits the writing of cinchonine, for example, as C9H 6 N-CioHi 5 (OH)N, the hydroxy group being in the part ■CioHi 5 (OH)N, about which the constitution is uncertain. The subject has been especi- ally studied by Skraup, Konigs, and von Miller; Konigs and von Miller have proposed formulae consisting of a piperidine ring substituted with a vinyl group; in the former that is a bridge of -CH 2 C(OH) from the nitrogen atom to the 7-carbon atom, connexion with the quinoline residue being made at the

hydroxylic carbon atom through a CH2 group: whilst in the latter the piperidine ring is substituted by a methyl group in addition to the vinyl group and the bridge is simply C(OH), with which connexion is made as before.

Medicine. — The sulphate is still used in medicine, and the British Pharmacopeia has admitted two others, which are much more valuable — the hydrochloride and the acid hydrochloride — whilst the hydrobromide is also used. The hydrochloride — formerly known as the hydrochlorate — C2oH 2 4N20 2 -HCl-2H 2 0, resembles the sulphate in appearance, the crystals being, however, somewhat larger. It is soluble in less than 40 parts of cold water, and in 3 parts of alcohol (90%). The doses are similar to those of the sulphate, but somewhat smaller, owing to its greater solubility. The acid hydrochloride is the most valuable of all salts of quinine. It is soluble in its own weight of water, and is the most rapidly and completely absorbed of all the salts of this alkaloid. It occurs in a colourless crystalline powder, having the formula C 20 H 24 N 2 O 2 -2HCl-3H 2 O.

The sulphate of quinine used in medicine may contain up to 3 % of cinchonidine, but should be free from cinchonine, quinidine and cupreine. There are four pharmacopeial preparations. The ferri et quininae citras, one of the " scale preparations " of iron, is given as a haematinic and tonic in doses of about 10 grains. It is very unpleasant to take. The pharmacopeial pilule quininae contains 5 parts of the sulphate in 6. The syrupus ferri phosphatis cum quinina et strychnina (Easton's Syrup) contains Jths of a grain of quinine in each drachm, that is, in each dose. Here the quinine acts as a bitter tonic. The tinctura quininae arnmoniata or " ammoniated quinine " is made by mixing 175 grains of quinine sulphate,

2 fluid oz. of liquor ammoniae (the pharmacopeial solution of ammonia), and 18 fluid oz. of a 60% solution of alcohol. The dose of J to 1 drachm contains little more than a grain of quinine, the antipyretic action of which is negligible. Its value in the early stages of a bronchitis or tracheitis is due to the ammonia. The small quantity of quinine it contains is conditioned by the solubility of the alkaloid, which is precipitated when this tincture is diluted with water. No particular value attaches, to the pharmacopeial preparations of the hydrochloride.

Physiological Action. — Our knowledge of this subject is mainly due to Professor Binz of Bonn. Quinine has considerable powers as an antiseptic, this term defined for some time as indicating the power to kill bacteria. Whilst quinine possesses this power, however, it is far more potently lethal to a particular form of animal organism known as the Plasmodium malariae. Against the bacteria quinine is not at all an exceptionally powerful antiseptic, though more powerful than carbolic acid. Many bacteria are killed by a -2 % solution of the alkaloid. Quinine does not affect the unbroken skin, and cannot be absorbed from it, but it is slightly irritant to the pain-conducting nerves of a raw surface.

The first feature of the internal action of quinine is its intensely bitter taste. This induces a reflex secretion from the salivary and gastric glands, which is followed or accompanied by increased vascularity of the gastric mucous membrane, and by some degree of activity on the part of the muscular wall of the stomach. This means that the appetite is strengthened, and digestion rendered more rapid and complete. In this sense alone quinine is a tonic. The hydrochloric acid of the gastric juice is stated to convert any salt of quinine into a chloride, and it seems probable that the absorption of quinine takes place mainly from the stomach, for when the drug reaches the alkaline secretions of the duodenum it is precipitated, and probably none of it is thereafter absorbed. The greater part of a dose of quinine sulphate administered by the mouth may be recovered, as a rule, from the faeces, this being much the most wasteful method of giving quinine. The absorption of the acid hydrochloride is much more complete. Quinine hydro- chloride circulates in the alkaline blood without precipitation, probably owing to the presence of carbonic acid in the blood.

The action of quinine on the blood itself — quite apart from its action on malarial blood — is of great complexity and importance. Whilst it is not a haematinic, in that it does not increase the number of the red blood corpuscles, it very markedly influences the stability of the compounds of the haemoglobin with oxygen. Like alcohol and prussic acid, quinine interferes with oxidation, so that oxy- haemoglobin is relatively unable to give up its oxygen to the tissues, the metabolism of which is therefore greatly modified. This pro- perty is doubtless partly — though not wholly — explanatory of

the antipyretic action of quinine. The leucocytes or white blood corpuscles are very markedly affected by quinine, the character- istic " amoeboid " movements of the cells being arrested. Hence quinine stops the process of diapedesis or emigration of the leu- cocytes from the blood-vessels into the tissues, and if applied to the extravascular spaces it arrests the leucocytic movements there. The explanation that this influence on the leucocytes explained the favourable action of quinine on certain inflammatory processes no

longer holds, since we know that the inflammatory conditions are of microbic origin, and that the movements of the leucocytes are not objectionable, but highly desirable as a means of defence against bacteria and their products. Quinine, therefore, is not beneficial in inflammatory conditions as far as this particular property is concerned.

The action of quinine on the circulatory apparatus is not marked. It is only in very large doses that it weakens the intracardiac nervous ganglia, slows and weakens the pulse, and dangerously lowers the blood pressure. Similarly the depressant action on the respiratory centre in the medulla oblongata occurs only after the administration of enormous doses.

The action of quinine on the temperature is important, for it is the safest of all known antipyretics. Its action on the normal temperature is nil. The drug is not an antithermal. But when the temperature is raised, quinine will frequently lower it. The action is not due to any influence on the thermic centres, nor to any pro- duction of diaphoresis, but to the influence of quinine upon the stability of oxyhaemoglobin. Quinine was the first antipyretic used, and after the introduction of such preparations as anti- pyrin and acetanilide it may still be said to be the safest, though it is much less powerful. The maximum dose of the sulphate is about 40 grains, and of the acid hydrochloride about 25 grains. The temperature usually begins to fall in about two hours. The in- fluence of quinine upon a malarial temperature is due to an entirely different cause (see below).

In some of the lower vertebrates quinine reduces the activity of the spinal cord, but in the human species it appears to stimulate the nervous mechanism of the uterus under certain conditions, and it is therefore included under the class of oxytocic or ecbolic drugs.

Quinine is excreted in some degree by nearly all the glands of the body, but mainly by the kidneys. Traces of it may be detected in the urine within an hour of its administration, and most of it is eliminated within eight or ten hours. The study of the urine is highly interesting in correlation with that of the influence of quinine upon the oxidising power of the blood, and upon the move- ments of the leucocytes. The amount of urea, creatin, creatinin,

sulphates and phosphates in the urine is diminished, clearly showing that quinine exerts an inhibitory influence over the metabolic processes of the body. This conclusion is further confirmed by the observation that the amount of carbonic acid excreted by the lungs is also diminished. The uric acid excreted in the urine (mostly in the form of urates) is markedly diminished. This product is largely derived from the nuclei of the leucocytes, which contain large quantities of the nucleo-proteids, of which uric acid is a decomposi- tion product. It is therefore plain that the diminution of leucocytic movement is to be regarded as a sign of diminished metabolism within the cells.

Therapeutics. — The supreme value of quinine is as a specific antidote to malaria, against which it also possesses a powerful prophylactic action. Ten or fifteen grains of the sulphate are often given three times a day for this latter purpose, and smaller doses of the much more efficacious acid hydrochloride will be found to convey even more certain immunity. In treating malaria (including ague, remittent fever, intermittent fever, and all its other forms) with this drug certain important facts are to be observed. Quinine administered by the mouth or by any other means will soon enter the blood, and will then kill the haematozoon malariae, whether it be free in the blood-plasma, in the leucocytes or in the red blood corpuscles. There is one exception, however. Quinine is apparently powerless to kill the organism when it is in its reproductive phase. This phase corresponds to the pyretic attack. There is therefore no purpose to be served by administering quinine during a malarial paroxysm. Two successful methods may be adopted. The quinine may be given in a single large dose — 30 grains of the sulphate, or 20 of the acid hydrochloride — an hour or two before the attack is due, i.e. just before the parent organism in the red blood corpuscles is about to discharge the new generation of young para- sites into the blood-plasma. An equally effective method, which may be combined with the above, is to give the quinine in 10-grain doses of the acid hydrochloride every four hours between the attacks. Whichever method be adopted, the paroxysm that was expected will probably not appear. After a single full dose of quinine no parasites can as a rule be observed in the blood for several days. In beginning treatment, it is well to clear the hepatic and alimentary passages by a preliminary dose of calomel combined with a secretory cholagogue, such as enonymin or iridin. The quinine treatment may be begun with success on the day following an attack. Quinine is much less efficacious in the treatment of post-malarial symptoms, such as neuralgia and haematuria, when no parasites can be detected in the blood. In such cases quinine is often inferior to arsenic.

Quinine is largely used as a bitter tonic in doses of about half a grain. The acid hydrochloride is the best salt to employ.

Quinine has some analgesic power, and is a safe and often efficient drug in the treatment of neuralgia, even when the patient has not had malaria. Somewhat smaller doses than those given in pyrexia should be employed.

QUINOLINE

Cinchonism is the name applied to the congeries of toxic symptoms which follow the prolonged administration of quinine, but may appear after one small dose in certain persons. The symptoms closely resemble those of salicylism, and also, though in less degree, those of carbolism. The patient is deaf, but complains of ringing in the ears, which may assume various forms, especially in musical people. There is headache, which, with the continuance of the drug, becomes exceedingly severe, the vision and equilibrium are affected, and there is often some gastro-intestinal irritation. In cases where the drug has been deliberately given for its poisonous action the results are still more severe. There may be bleeding from the nose, cutaneous congestion, deafness, blindness, coma or de- lirium, and even death from cardiac failure. After death there is found one noteworthy lesion, a commencing acute inflammation of the internal ear. In persons who have a marked idiosyncrasy towards cinchonism, the symptoms may often be successfully averted if small doses of hydrobromic acid — 10 minims of the dilute solution ■ — are given with the quinine.

A non-official preparation of quinine — Warburg's Tincture — occasionally succeeds where the ordinary preparations fail. The dose is I to 4 drachms. It contains I part of quinine in 50. Of the thirteen or more other ingredients, there may specially be noticed the salicylic and benzoic acids.

The other alkaloids of cinchona bark — quinidine, cinchonidine, and cinchonine — also possess similar properties, but all are much less effective than quinine. This is also the case with the cinchona febrifuge prepared from C. succirubra.

The great disadvantage of the official preparations is the bitter taste and insolubility. It is found, however, that all the soluble salts are bitter, whilst the tasteless ones are insoluble. Substitutes may therefore be divided into those administered orally and those administered hypodermically. Of the insoluble salts we may notice the tannate, the propionic acid ester (euquinine) and carbonic acid ester (aristoquin), the salicylic acid ester (salo- quinine) ; and of the soluble substitutes, quinopyrine (a compound of quinine hydrochloride and antipyrine) and quinine hydrochloro-carbamide (a compound of quinine, urea and hydrochloric acid).

Until 1867 English manufacturers of quinine were entirely dependent upon South America for their supplies of cinchona bark, which were obtained exclusively from uncultivated trees, growing chiefly in Bolivia, Peru, and Ecuador, the principal species which were used for the purpose being Cinchona Calisaya; C. officinalis; C. macrocalyx, var. Palton; C. Pitayensis, C. micrantha and C. lancifolia. Since the cultivation of cinchona trees was commenced in Java, India, Ceylon and Jamaica, several other species, as well as varieties and hybrids cultivated in those countries, have been used. 1 Later, C. lancifolia, var. Calisaya, known as the calisaya of Santa Fe, was strongly recommended for cultivation, because the shoots of felled trees afford bark containing a considerable amount of quinine; C. Pilayensia has been introduced into the Indian plantations on account of yielding the valuable alkaloid quinidine, as well as quinine.

The first importation from India took place in 1867, since which time the cultivated bark has arrived in Europe in constantly in- creasing quantities, London being the chief market for the Indian barks and Amsterdam for those of Java. Cinchona Calisaya has also been cultivated extensively in Bolivia and in Tolima, United States of Columbia.

In order to obtain the cultivated bark as economically as possible, experiments were made which resulted in the discovery that, if the bark were removed from the trunks in alternate strips so as not to injure the cambium, or actively growing zone, a new layer of bark was formed in one year which was richer in quinine than the original bark and equal in thickness to that of two or three years' ordinary growth. This is known in commerce as " renewed bark." The process has been found to be most conveniently practised when the trees are eight years old, at which age the bark separates most easily. The yield of quinine has been ascertained to increase annually until the eleventh year, at which it seems to reach its

1 In Java, C. Calisaya, vars. anglica, javanica, Hasskojliana and Ledgeriana; C. officinalis, var. angustifolia ; C. lancifolia, C. caloptera C. micrantha and C. succirubra. In India, C. succirubra, C. officinalis, vars. angustifolia, crispa, Uritusinga and Bonplan- diana, and to a lesser extent C. Calisaya, vars. Boliviano and micro- carpa; C. micrantha, C. Peruviana and C. nitida form only a small proportion of the plantations. Since J. E. Howard pointed out that C. Pahudiana, and C. Calisaya, vars. javanica, Hasskarliana and anglica, were likely to lead to disappointment as quinine-yielding species, these have been replaced in the plantations as rapidly as possible by the more valuable species, of which C. Led- geriana, yielding from 5 to 10% or even more of quinine, C. officinalis, and a hybrid between C. officinalis and C. succirubra, which has been named C. robusta, are the most important.

maximum. The portion of the trunk from which the bark has been removed is sometimes protected by moss, and the new bark which forms is then distinguished by the name of " mossed bark." The species which yield the largest amount of quinine are by no means the easiest to cultivate, and experiments have consequently been made in cross-fertilization and grafting with the view of giving vigour of growth to delicate trees yielding a large amount of alka- loid or of increasing the yield in strong-growing trees affording but little quinine. Grafting, however, has not been found to answer the purpose, since the stock and the graft have been found to retain their respective alkaloids in the natural proportion just as if growing separately. Hybridization also is very uncertain, and is very difficult to carry out effectually; hence the method of propagating the best varieties by cuttings has been adopted, except in the case, of those which do not strike readily, as in C. Ledgeriana, in which the plants are grown from the shoots of felled trees.

Some years ago it was discovered that a bark imported from Colombia under the name of cuprea bark, or " hard " bark, and derived from Remijia pedunculata, Triana, and other species, contained quinine to the extent of J to 2\ %, and in 1881 this bark was exported in enormous quantities from Santander, exceeding in amount the united importations of all the other cinchona barks; and by reason of its cheapness this has since that date been largely used for the manufacture of quinine.

Cinchona bark as imported is never uniform in quality. The South American kinds contain a variable admixture of inferior barks, and the cultivated Indian barks comprise, under the re- spective names of yellow, pale, and red barks, a number of varieties of unequal value.

The alkaloids are contained, according to Howard, chiefly in the cellular tissue next to the liber. No definite knowledge has as yet been attained of the exact steps by which quinine is formed in nature in the tissues of the bark. From analyses of the leaves, bark and root, it appears that quinine is present only in small quantities in the leaves, in larger quantity in the stem bark, and increasing in proportion as it approaches the root, where quinine appears to decrease and cinchonine to increase in amount, although the root bark is generally richer in alkaloids than that of the stem. The altitude at which the trees are grown seems to affect the pro- duction of quinine, since it has been proved that the yield of quinine in C. officinalis is less when the trees are grown below 6000 ft. than above that elevation, and that cinchonidine, quinidine, and resin are at the same time increased in amount. It has also been shown by Broughton that C. Peruviana, which yields cinchonine but no quinine at a height of 6000 ft., when grown at 78QO ft. gives nearly as much quinine, and almost as readily, as C. officinalis. Karsten also ascertained by experiments made at Bogota on C.

lancifolia that the barks of one district were sometimes devoid of quinine, while those of the same species from a neighbouring locality yielded 3i to 41% of the sulphate; moreover, Dr De Vrij found that the bark of C. officinalis cultivated at Utakamand varied in the yield of quinine from I to 9 %. In these cases the variation may have been due to altitude. Free access of air to the tissues also seems to increase the yield of quinine, for the renewed bark is found to contain more quinine than the original bark

QUINOLINE (Benzopyridine), C 9 H 7 N, an organic base first obtained from coal-tar in 1834 by F. Runge {Pogg. Ann., 1834, 31, p. 68), and later by C. Gerhardt by the distillation of cinchonine, quinine and other alkaloids with caustic potash (Ann., 1842, 42, p. 310; 44, p. 279). It also occurs with pyridine and its homologues in bone-oil. It may be prepared by distilling cinchoninic acid with lime; by the reduction of ortho-aminocinnamic aldehyde (A. Baeyer and V. Drewson, Ber., 1883, 16, p. 2207); by passing the vapour of allyl aniline over heated lead oxide; by the condensation of ortho-amino- benzaldehyde with acetaldehyde in the presence of aqueous caustic soda (P. Friedlander and C. F. Gohring, Ber., 1882, 15, p. 2572; 1883, 16, p. 1833); by the action of ortho- toluidine on glyoxal at 150 C. (V. Kulisch, Monats., 1894, 15, p. 276); by the action of phosphorus pentachloride on hydrocarbostyril (the inner anhydride of ortho-aminohydro- cinnamic acid), the chlorinated compound first formed being then reduced by hydriodic acid (A. Baeyer):

/CH 2 -CH 2 /CH = C-C1 /CH = CH

C 6 H 4 (I -> C 6 H 4 < I ->C 6 H 4 < I ;

N\r =

MSTH – CO

X N =C-C1

S N = CH

and by the so-called ” Skraup ” reaction, which consists in oxidizing a mixture of aniline, glycerin and concentrated sulphuric acid, with nitrobenzene (Z. Skraup, Monats., 1880, 1, p. 316; 1881, 2, p. 141). This reaction is a very violent

one, and its mechanism may probably be explained as follows: The glycerin

is first converted into acrolein, which combines with the aniline to form acrolein-aniline, and this product is then oxidized by the nitrobenzene: C 3 H 8 03->C 3 H40 (+C6H5NH 2)->C6H 5 N:CH-CH:CH 2 ->C,H7N. The nitrobenzene may be replaced by arsenic acid, when the reaction proceeds much more quietly and a cleaner product is obtained (C. A. Knueppel, Ber., 1896, 29, p. 703). The Skraup reaction is a perfectly general one for primary amino-compounds; the halogen-, nitro- and oxy-anilines (aminophenols) react similarly, as do also the toluidines, naphthylamines, amino- anthracene, meta- and para-phenylene diamines, and ortho- and 7-aminoquinoline.

Quinoline is a colourless liquid with a smell resembling that of pyridine. It boils at 238 C. and is very hygroscopic. It is a tertiary base and forms well-defined salts. It is almost insoluble in water, but dissolves readily in the common organic solvents. It combines readily with the alkyl halides. H. Decker (Ber., 1905,38ˆ. 1 144) has found that many ortho substi- tuted quinolines will not combine with methyl iodide owing to steric hindrance, but the difficulty can be overcome in most cases by using methyl sulphate and heating the reaction components to 100° C. for half an hour. Nitric acid and chromic acid have little action on quinoline, but alkaline potassium permanganate oxidizes it to carbon dioxide, ammonia, oxalic, and quinolinic acids (S. Hoogewerff and W. A. v. Dorp, Rec. Pays Bas, 1882, 1, p. 107). Bleaching powder oxidizes it to chlorcarbostyril. It is reduced by the action of zinc and ammonia to di-and tetra-hydroquinolines. A hexahydro- and a decahydroquinoline have been obtained by heating tetrahydroquinoline with hydri- odic acid and phosphorus to high temperatures (E. Bamberger, Ber., 1890, 23, p. 1138). Numerous substitu- tion products of quinoline are known, and the positions in the molecule are generally designated in accordance with the scheme shown in the inset formula: the letters o, m, p, a, standing for ortho-, meta-, para-, and ana-.*

The oxyquinolines possess a certain importance owing to their relationship to the alkaloids. Those with the hydroxyl group in the benzene nucleus are prepared from the aminophenols by the Skraup reaction. Only two are known containing the hydroxyl group in the pyridine nucleus, namely, carbostyril (a-oxyquinoline), which is formed by the reduction of ortho-aminocinnamic acid with ammonium sulphide (L. Chiozza, Ann., 1852, 83, p. 118) or with ferrous sulphate and baryta, and kynurine (7-oxyquinoline), which is obtained by the action of nitrous acid on 7-aminoquinoline (A. Clans and H. Howitz, Jour. prak. Chem., 1894, 158, p. 232). It is also formed by the condensation of anthranilic acid with acetalde- hyde (S. Niemeritowski, Ber., 1895, 28, p. 281 1). They are both crystalline solids, the former melting when anhydrous at 199-200°, and the latter at 52° C.

Of the homologues of quinoline, the most important are quin- aldine, lepidine, 7-phenylquinoline, and flavoline. Quinaldine (a-methylquinoline) is present in coal-tar; it may be prepared by condensing aniline with paraldehyde and concentrated hydro- chloric acid (O. Doebner and W. v. Miller, Ber., 1881, 14, pp. 2812 et seq.). The reaction is a perfectly general one, for the aniline may be replaced by other aromatic amines and the aldehyde by other aldehydes, and so a large number of quinoline homologues may be prepared in this way. Quinaldine may also be obtained by condensing ortho-aminobenzaldehyde with acetone in presence of caustic soda (P. Friedlander, loc. cit.). It is a colourless liquid which boils at "247° C. The -CH 3 group is very reactive, condensing readily with aldehydes and with phthalic anhydride. Potassium permanganate oxidizes it to acetylanthranilic acid, HOOC-C e H<-(2)NH-COCHj, while chromic acid oxidizes it to quinaldicacid (quinoline-a-carboxylicacid). Lepidine(y-rnet\iy\qumo- line) was first obtained by distilling cinchonine with caustic potash. It may be prepared synthetically by condensing ortho-aminoaceto-phenone with paraldehyde and caustic soda (L. Knorr, Ann., 1886, 236, p. 69) or from aniline, acetone, formaldehyde and hydrochloric acid (C. Beyer, Jour. prak. Chem., 1885, 140, p. 125). It may also be prepared by condensing a7-dimethyIquinoline and formalde- hyde, the resulting a-ethanollepidine, C 9 H 6 -CH 8 N(CH 2 -CH 2 -OH), breaks down on. heating and forms lepidine (W. Konigs and A. Mengel, Ber., 1904, 37, p. 1322). It is a colourless liquid which boils at 255° C. Chromic acid oxidizes it to cinchoninic^ acid (see below), whilst potassium permanganate oxidizes it to lepidinic acid (7-methylquinolinic acid) and cinchomeronic acid (see Pyri- dine). y-Phenylquinoline, which is probably the parent substance

of the cinchona alkaloids, is prepared by heating 7-pheaj lquinsldic acid, the oxidation product of the 7-phenylquinaldfne, which results from the action of alcoholic potash on a mixture of ortho- aminobenzophenone and acetone (W. Konigs and R. Geigy, Ber.,

1885, 18, p. 2400), or by the action of sulphuric acid on Lenzoyl- acetone anilide (C. Beyer, Ber., 1887, 20, p. 1767). It crystallizes in needles which melt at 61 ° C. Flavoline (a-phenyl-7-methyl- quinoline) is formed on heating flavenol (see below) with excess of zinc dust, or by heating molecular proportions of ortho-amino- acetophenone and acetophenone, in dilute alcoholic solution, with a small quantity of 10% caustic soda solution (O. Fischer, Ber.,

1886, 19, p. 1037). Closely related to flavoline is flavaniline or (a)-para-aminophenyl-7-methylquinoiine, which is formed when acetanilide and anhydrous zinc chloride are heated together for many hours at 250-270° C. (O. Fischer and C. Rudolph, Ber., 1882, 15, p. 1500), or by heating

ortho- and para-aminoacetophenone with zinc chloride to 90° C. (O. Fischer, Ber., 1886, 19, p. 1038). It crystallizes from benzene in prisms,- which melt at 97° C. Sodium nitrite in the presence of excess of acid converts it into the corre- sponding hydroxylic compound flavenol.

The oxy derivatives of the quinoline homologues are best ob- tained from the aniline derivatives of /3-ketonic acids. At no C. aniline and acetoacetic ester condense to form anilido-acetoacetic ester, CH3CO-CH 2 -CO-NH-C 6 H 6 , which is converted by concentrated ‘ acids into a-oxy-7-methylquinoline (L. Knorr, Ann., 1886, 236, p. 73). On the other hand, at about 240° C, the amine and ester react to form /3-anilidocrotonic ester, CH S -C(NHC 6 H 6) : CH-COOC 2 H 6 , which yields 7-oxy- a-methylquinoline (M. Conrad and L. Limpach, Ber., 1887, 20, p. 947).

Numerous carboxylic acids of quinoline are known, ‘ the most important of which are quinaldic, cinchoninic and acridinic acids. Quinaldic acid (quinoline-a-carboxylic acid) is produced when quinaldine is oxidized by chromic acid. It crystallizes in needles, which contain two molecules of water of crystallization, and melt at 1 56° C. When heated above the melting-point it loses carbon dioxide and yields quinoline. Alkaline potassium pern anganate oxidizes it to pyridine tricarboxylic acid (2-3-6). Cinchoninic acid (quinoline-7-carboxylic acid) is formed when cinchonine is oxidized by nitric acid, or by the oxidation of lepidine. It crys- tallizes from water in needles or prisms and in the anhydrous state melts at 253-254° C. Potassium permanganate oxidizes it to pyridine tricarboxylic acid (2-3-4). Acridinic acid (quinoline-a/3- dicarboxylic acid) is formed when acridine is oxidized by potassium permanganate (C. Graebe and H. Caro, Ber., 1880, 13, p. 100). It crystallizes in needles, which are easily soluble in alcohol, and when heated above 130° C. lose carbon dioxide and leave a residue of quinoline-/J-carboxylic acid.

*Isoquinoline, isomeric with quinoline, was first discovered in coal-tar in 1885 by S. Hoogewerff and W. A. v. Dorp (Rec. Pays Bas, 1885, 4, 125); its formula is shown in the inset. It may be separated from the quinoline which, accompanies it by means of the difference in the solubility of the sulphates of the two compounds, v A /*N isoquinoline sulphate being much less soluble than quinoline sulphate. It may be prepared by passing Isoquinoline. the vapour of benzylidene ethylamine through a red-hot tube (A. Pictet and S. Popovici, Ber., 1892, 25, p. 733); by the action of concentrated sulphuric acid on benzyl amino-acetaldehyde, QH 6 -CH 2 -NH-CH 2 CHO (E. Fischer), or on benzylidene amino acetal, C 6 H 6 CH : N • CH 2 •_CH(OC 2 H 6) 2 (C. Pomeranz, Monats., 1892, 14, p. 116); by heating cinnamenyl aldoxime with phos- phorus pentoxide to 70° C. (E. Bamberger, Ber., 1894, 27, p. 1955), G.H5CH : CH-CH : NOH. -»[C,H 5 CH : CH-NH-COHˆC 9 H 7 N; by the action of hydriodic acid on the*

oxydichlorisoquinoline formed when phosphorus pentachloride reacts with hippuric acid; by the distillation of homophthalimide over zinc dust (M. Le Blanc, Ber., 1888, 21, p. 2299), or by treatment with phosphorus oxy chloride followed by the reduction of the resulting dichloriso- quinoline with hydriodic acid (S. Gabriel, Ber., 1886, 19, pp. 1655,

2355):

/CHj-CO /CH = C(OH) /CH=CC1 /CH=CH

CaH< I or C 6 H< ->C 6 H< _ | ->C 6 H.< I .

\CO-NH \C(OH):N . \C-C1=N \CH=N

It is also formed from isobenzalphthalide by the action of ammonia, followed by phosphorus oxychloride and reduction of the chlorinated product (S. Gabriel),

/CH=C-CH 5 /CH=C-C 6 H 5

C 6 H.< I ->C6H< I

\C0-0 \CO-NH

/CH = CC e H 5 /CH=C-CtHj

->C 6 H< I ->c.a< I ;

\CC1 = N \CH=N

and from isocoumarin carboxylic acid by conversion into iso- carbostyril on heating, and subsequent reduction by distillation with zinc dust (E. Bamberger, Ber., 1892, 25, p. 1138). It melts at 22-23° C. and boils at 240° C, and behaves in most respects similarly to quinoline. By oxidation with alkaline potassium permanganate it yields phthalic acid and cinchomeronic acid. Reduction by means of tin and hydrochloric acid gives a tetrahydro derivative.

Numerous derivatives of isoquinoline are obtained in the de- composition of various vegetable alkaloids. Papaverine on fusion

with alkalis yields a dimethoxyisoquinoline, whilst hydrohydras- tinine, hydrocotarnine and the salts of cotarnine may be considered as derivatives

of reduced isoquinoli.ies (see Opium).

QUINONES, in organic chemistry, a group of compounds in which two hydrogen atoms of a benzene nucleus are replaced by two oxygen atoms. This replacement may take place either in the ortho or para positions, giving rise to orthoquin- ones or to paraquinones; metaquinones do not appear to have been isolated. The para or true quinones are obtained by the oxidation of hydrocarbons with chromic acid or of various para di-derivatives of benzene with chromic acid mixture, such, for example, as para-aminophenol, para-phenylene diamine, para- aminoazobenzene, &c. H. v. Pechmann (Ber., 1888, 21, p. 141 7) has shown that a-diketones are converted into para- quinones by the action of warm solutions of the caustic alkalis, diacetyl yielding para-xyloquinone :

CHrCOCO-CHs CH 3 -CCOCH – II E|| CH3COCOCH3 HC-COC-CH 3 ; whilst P. H. Bayrac (Bull. soc. Mm., 1894 (3) 11, p. 1129) ob- tained anilino-derivatives of the paraquinones by the action of an aqueous solution of potassium chromate on an acetic acid solution of para-aminodimethylaniline and phenol: C 6 H 5 OH+H 2 NC 6 H 4 -N (CH 3) 2 -> 0:C 6 H 4 :N-C 6 H 4 N(CH 3) 2 ; these compounds yield the quinone when heated with mineral acids.

The paraquinones are generally crystalline solids of a yellowish colour, having a characteristic sharp odour and being volatile in steam. They are readily reduced to the corresponding hydroquinones or para-dihydroxy-benzenes, and also combine with hydroxylamine hydrochloride to form nitrosophenols, ON-C 6 H 4 -OH, which can further yield quinone dioximes, HON:C 6 H 4 :NOH. Paraquinones also combine with ammonia and with amines yielding amino-derivatives and hydroquinones. The orthoquinones more resemble the a-diketones; they are crystalline solids of a red or yellow colour, but differ from the paraquinones in being devoid of smell and not volatile in a current of steam.

Benzoquinone (para) or ordinary quinone, C 6 H 4 2 , is formed by the oxidation of aniline with sodium bichromate and sulphuric acid. It sublimes in golden yellow needles. Hot concentrated nitric acid oxidizes it to picric acid and oxalic acid, whilst on treat- ment with hydrochloric acid and potassium chlorate it yields chloranil (tetrachloroquinone). It combines directly with two and four atoms of bromine. Free hydroxylamine reduces it to hydro- quinone. It combines directly with aniline to form dianilido-quinone, dianilidoquinone-anil and dianilidoquinone-dianil or azophenine. Two alternative structural formulae have been given to benzoquinone, namely:

/o-C>\ and 0< >0

in absolute ether containing ignited sodium sulphate and then adding dry silver oxide, obtained the quinone in dark red crystalline plates which decompose between 60 ° and 70 C.

For naphthalene quinones see Naphthalene; for anthracene quinone see Anthraquinone; and for phenanthrene quinone see

PHENA NTH RENE.

Qumoles. — The quinoles are a series of compounds of the type

jj) }(ˆ=Q,obtained by the oxidation of para-alky lated phenols

with nitric acid, Caro's acid or bromine (Auwers, Ber., 1897-1903; E. Bamberger, ib., 1903, 36, p. 2028; Th. Zincke, ib., 1895, 28, p. 3121); by the action of sulphuric acid on para-substituted phenyl- hydroxylamines (E. Bamberger), and by the action of the Grignard reagent on quinones (Bamberger). They are crystalline solids which are readily converted into para-alkylated phenols by reducing agents. They possess a weak acid and also an alcoholic character.

QUINOXALINES (Benzopyrazines), in organic chemistry, heterocyclic compounds containing a ring complex made up of a benzene ring and a pyrazine ring (formula I.) ; they are isomeric with the cinnolenes, phthalazines and quinazolines. They are formed by the condensing ortho-diamines with 1-2 diketones (Hinsberg, Ann., 1887, 237, p. 327), the parent substance of the group (quinoxaline) resulting when glyoxal is so condensed, whilst substitution derivatives arise when a-ketonic acids, a-chlorketones, a-aldehyde alcohols and a-ketone alcohols are used in place of diketones.

C 6 H 4

NH 2 OCR

+ I = 'NH 2 OC-R'

= C 6 H 4

N:C-R

+2H 2 0.

N:C-R'

The former, due to C. Graebe (Zeit.f. Chemie, 1867, 3, p. 39), ascribes to the molecule a peroxide configuration which accounts for its oxidizing

powers but not for the fact that each oxygen atom is capable of replacement by one atom of chlorine. The second formula, due to R. Fittig (Ann., 1876, 180, p. 23) readily explains the formation of the mono- and di-oximes of quinone and also that it readily combines with bromine.

Quinone-chlorimide, ON : C 6 H 4 : O, is obtained when para-aminophenol is oxidized with bleaching powder. It is a yellow crystalline solid readily volatile in steam. The dichlorimide, ON : CcH 4 : NCI, is formed in a similar manner from paraphenylene diamine. It is a strong _ oxidizing agent. Quinone-dioxime, HON : C 6 H 4 : NOH, crystallizes in colourless or yellow needles, which decompose when heated to about 240 C. Potassium ferrocyanide in alkaline solution oxidizes it to dinitrosobenzene, whilst cold concentrated nitric acid oxidizes it to para-dinitrobenzene. Quin- hydrone, C6H 4 2 -C6H 4 (OH) 2 , is formed by the direct union of quinone and hydroquinone or by careful oxidation of hydroquinone with ferric chloride solution. On boiling with water it decomposes into quinone and hydroquinone.

Benzoquinone (ortho). — C. L. Jackson (Amer. Chem. Jour., 1901, 26, p. 10) attempted to prepare this compound by the action of iodine on the lead salt of pyrocatechin suspended in chloroform. A deep red solution was obtained, but the free quinone was not iso- lated since the solution on standing deposits nearly black crystals of dihydroxyphenylhydroxybenzoquinone (HO)2C 6 H3-C 6 Hj>0 2 -OH. R. Willstatter (Ber., 1904, 37, p. 4744), by dissolving pyrocatechin

In a similar manner, diamino derivatives are formed when cyanogen is condensed with ortho-diamines, and these amino compounds readily pass into the corresponding dioxy deriva- tives when acted upon with dilute hydrochloric acid.

The quinoxalines are weak bases, and are stable towards oxidizing agents but are readily reduced to hydro derivatives. The tetra- hydroquinoxalines are formed by condensing ortho-diamines with ortho-dihydroxy benzenes, and the keto-dihydro derivatives arise similarly by condensing mono-alkyl diamines with ketonic acids (Kehrmann and Messinger, Ber., 1892, 25, pp. 1628 et seq.).

The azonium bases (formula II.) of this series are produced when the dihydroquinoxalines (obtained by similar condensations from the mono-alkyl-ortho-diamines) are oxidized with ferric chloride. N\ /N: C-R'

I. Quinoxaline. II. Azonium bases.

QUINSY, a common term for acute suppurative tonsilitis (q.v.). The

English word (formerly ” squinzey “) is a corrup- tion of Fr. esquinancie, from Gr. Kxivkyxt (kvuv, dog, and S.yx(lv , to choke), and is derived from the suffocating tendency of the ailment.

QUINTAIN (Q. Fr. quintaine, from Lat. quintana, a street between the fifth and sixth maniples of a camp, where warlike exercises took place), an instrument used in the age of chivalry in practising for the tournament. Originally perhaps the mere trunk of a tree upon which the knight practised his sword- strokes, as may be seen in an ancient illustration reproduced in Strutt’s Sports and Pastimes, the quintain developed into various forms of posts at which the soldier tilted with his lance, not only on horseback but on foot and even in boats. An early form consisted of the wooden figure of a Saracen armed with shield and sword; the object being to strike the figure on the forehead directly between the eyes. This, according to Strutt, was called by the Italians ” running at the armed man ” or ” at the Saracen.” The ” pel,” or post-quintain, was generally about 6 ft. high.

As late as the 18th century running at the quintain survived in English rural districts. In one variation of the pastime the quintain was a tun filled with water, which, if the blow was a poor one, was emptied over the striker. A later form was a post with a cross-piece, from which was suspended a ring, which the horseman endeavoured to pierce with his lance while at full speed. This sport, called ” tilting at the ring,” was very popular in England and on the continent of Europe in the 17th century, and is still practised as a feature of military and equestrian sport.

QUINTANA, MANUEL JOSfi (1772-1857), Spanish poet and man of letters, was born at Madrid on the nth of April 1772, and after completing his studies at Salamanca was called to the bar. In 1801 he produced a tragedy, El Duque de Viseo, founded on M. G. Lewis’s Castle Spectre; his Pelayo (1805), written on a patriotic theme, was more successful. The first volume of his Vidas de Espanoles cilebres (1807-33), containing lives of Spanish patriots, stirred the public imagination and secured Quintana the post of secretary to the Cortes during the French invasion. His proclamations and odes fanned the national enthusiasm into flame. But he was ill rewarded for his services, for on the return of Ferdinand VII. he was imprisoned at Pamplona from 1814 to 1820. He was finally given a small post in the civil service, became tutor to Queen Isabella, and was nominated senator. Though publicly ” crowned ” as the representative poet of Spain (1855), he seems to have lived in poverty. He died on the 11th of March 1857. His poems, thirty-four in number, are inspired by

philanthropy and patriotism; the style is occasionally gallicized, and the thought is not profound, but his nobility of sentiment and resounding rhetoric attract every generation of Spaniards.

See an excellent monograph by E. Pifieyro, Manuel Jose Quintana, ensayo critico y biogrdfico (Paris, 1892).

QUINTESSENCE, in ancient and scholastic philosophy, the name given to the fifth immaterial element, over and above the four material elements, air, water, earth and fire, which Aristotle assumed to be permeating the whole world, and called ovaia: in medieval philosophy this was called quinta essentia, the fifth essence, and by many was considered material and therefore capable of extraction. The ancient Indian philosophers also contain the same idea of a fifth element; thus there were five Sanskrit elements (bhutas), earth, wind, fire, water and aether. In the history of chemistry the name was applied, by analogy, to the most concentrated extract of a substance.

QUINTILIAN [Marcus Fabius Quintilianus] (c. a.d. 35- 95), Roman rhetorician, was born at Calagurris in Spain. Con- cerning his family and his life but few facts remain. His father taught rhetoric, with no great success, at Rome, and Quintilian must have come there at an early age to reside, and must have there grown up to manhood. The years from 61 to 68 he spent in Spain, probably attached in some capacity to the retinue of the future emperor Galba, with whom he returned to the capital. For at least twenty years after the accession of Galba he was at the head of the foremost school of oratory in Rome, and may fairly be called the Isocrates of his time. He also gained some, but not a great, repute as a pleader in the courts. His greatest speech appears to have been a defence of the queen Berenice, on what charge is not known. He appears to have been wealthy for a professional man. Vespasian created for him a professorial chair of rhetoric, liberally endowed with public money, and from this time he was unquestionably, as Martial calls him, " the supreme controller of the restless youth." About the year 88 Quintilian retired from teaching and from pleading, to compose his great work on the training of the orator (Institutio Oratorio). After two years' retirement he was entrusted by Domitian with the education of two grand-nephews, whom he destined as successors to his throne. Quintilian gained the titular rank of consul, and probably died not long before the accession of Nerva (a.d. 96). A wife and two children died early.

Such is the scanty record that remains of Quintilian's unevent- ful life. But it is possible to determine with some accuracy his relation to the literature and culture of his time, which he powerfully influenced. His career brings home to us the vast change which in a few generations had passed over

Roman taste, feeling and society. In the days of Cicero rhetorical teaching had been entirely in the hands of the Greeks. The Greek language, too, was in the main the vehicle of instruction in rhetoric. The first attempt to open a Latin rhetorical school, in 94 B.C., was crushed by authority, and not until the time of Augustus was there any professor of the art who had been born to the full privileges of a Roman citizen. The appointment of Quintilian as professor by the chief of the state marks the last

stage in the emancipation of rhetorical teaching from the old Roman prejudices.

During the hundred years or more which elapsed between the death of Cicero and the birth of Quintilian education all over the Roman Empire had spread enormously, and the educa- tion of the time found its end and climax in rhetoric. Mental culture was for the most part acquired, not for its own sake, but as a discipline to develop skill in speaking, the paramount qualification for a public career. Rome, Italy and the pro- vinces alike resounded with rhetorical exercitations, which were promoted on all sides by professorships, first of Greek, later also of Latin rhetoric, endowed from municipal funds. The mock contests of the future orators roused a vast amount of popular interest. In Gaul, Spain and Africa these pursuits were carried on with even greater energy than at Rome The seeds of the existing culture, such as it was, bore richer fruit on the fresh soil of the western provinces than in the exhausted lands of Italy and the East. While Quintilian lived, men born in Spain dominated the Latin schools and the Latin literature, and he died just too soon to see the first provincial, also of Spanish origin, ascend the imperial throne.

As an orator, a teacher and an author, Quintilian set himself to stem the current of popular taste which found its expression in what we are wont to call silver Latin. In his youth the influence of the younger Seneca was dominant. But the chief teacher of Quintilian was a man of another type, one whom he ventures to class with the old orators of Rome. This was Domitius Afer, a rhetorician of Nimes, who rose to the consul- ship. Quintilian, however, owed more to the dead than to the living. His great model was Cicero, of whom he speaks at all times with unbounded eulogy, and whose faults he could scarce bring himself to mention; nor could he well tolerate to hear them mentioned by others. The reaction against the Ciceronian oratory which had begun in Cicero's own life- time had acquired overwhelming strength after his death. Quintilian failed to check it, as another teacher of rhetoric, equally an admirer of Cicero, had failed — the historian Livy. Seneca the elder, a clear-sighted man who could see in Cicero much to praise, and was not blind to the faults of his own age, condemned the old style as lacking in power, while Tacitus, in his Dialogue on Orators, includes Cicero among the men of rude and " unkempt "

antiquity. The great movement for the poetization of Latin prose which was begun by Sallust ran its course till it culminated in the monstrous style of Fronto. In the courts judges, juries and audiences alike demanded what was startling, quaint or epigrammatic, and the speakers practised a thousand tricks to satisfy the demand. Oratory became above all things an art whose last thought was to conceal itself. It is not surprising that Quintilian's forensic efforts won for him no lasting reputation among his countrymen.

The Institutio Oratoria is one long protest against the tastes of the age. Starting with the maxim of Cato the Censor that the orator is " the good man who is skilled in speaking," Quin- tilian takes his future orator at birth and shows how this good- ness of character and skill in speaking may be best produced. No detail of training in infancy, boyhood or youth is too petty for his attention. The parts of the work which relate to general education are of great interest and importance. Quintilian postulates the widest culture; there is no form of knowledge from which something may not be extracted for his purpose; and he is fully alive to the importance of method in education. He ridicules the fashion of the day, which hurried over pre- liminary cultivation, and allowed men to grow grey while declaiming in the schools, where nature and reality were for- gotten. Yet he develops all the technicalities of rhetoric with a fulness to which we find no parallel in ancient literature. Even in this portion of the work the illustrations are so apposite and the style so dignified and yet sweet that the modern reader, whose initial interest in rhetoric is of necessity faint, is carried along with much less fatigue than is necessary to master most parts of the rhetorical writings of Aristotle and Cicero. Quin- tilian's literary sympathies are extraordinarily wide. When

obliged to condemn, as in the case of Seneca, he bestows gener- ous and even extravagant praise on such merit as he can find. He can cordially admire even Sallust, the true fountain-head of the style which he combats, while he will not suffer Lucilius to lie under the aspersions of Horace. The passages in which Quintilian reviews the literature of Greece and Rome are justly celebrated. The judgments which he passes may be in many instances traditional, but, looking to all the circumstances of the time, it seems remarkable that there should then have lived at Rome a single man who could make them his own and give them expression. The form in which these judgments are rendered is admirable. The gentle justness of the senti- ments is accompanied by a curious felicity of phrase. Who can forget " the immortal swiftness of Sallust," or " the milky richness of Livy," or how "

Horace soars now and then, and is full of sweetness and grace, and in his varied forms and phrases is most fortunately bold "? Ancient literary criticism perhaps touched its highest point in the hands of Quintilian.

To comprehensive sympathy and clear intellectual vision Quintilian added refined tenderness and freedom from self- assertion. Taking him all in all, we may say that his person- ality must have been the most attractive of his time— more winning and at the same time more lofty than that of the younger Pliny, his pupil, into whom no small portion of the master's spirit, and even some tincture of the master's literary taste, was instilled. It does not surprise us to hear that Quin- tilian attributed any success he won as a pleader to his command of pathos, a quality in which his great guide Cicero excelled. In spite of some extravagances of phrase, Quintilian's lament (in his sixth book) for his girl-wife and his boy of great promise is the most pathetic of all the lamentations for bereavement in which Latin literature is so rich. In his precepts about early education Quintilian continually shows his shrinking from cruelty and oppression.

Quintilian for the most part avoids passing opinions on the problems of philosophy, religion and politics. The pro- fessed philosopher he disliked almost as much as did Isocrates. He deemed that ethics formed the only valuable part of philo- sophy and that ethical teaching ought to be in the hands of the rhetoricians. In the divine government of the universe he seems to have had a more than ornamental faith, though he doubted the immortality of the soul. As to politics Quin- tilian, like others of his time, felt free to eulogize the great anti-Caesarean leaders of the dying republic, but only because the assumption was universal that the system they had cham- pioned was gone for ever. But Quintilian did not trouble himself, as Statius did, to fling stones at the emperors Caligula and Nero, who had missed their deification. He makes no remark, laudatory or otherwise, on the government of any emperor before Domitian. No character figured more largely in the rhetorical controversies of the schools than the ideal despot, but no word ever betrayed a consciousness that the actual occupant of the Palatine might- exemplify the theme. Quintilian has often been reproached with his flattery of Domi- tian. No doubt it was fulsome. But it is confined to two or three passages, not thrust continually upon the reader, as by Statius and Martial. To refuse the charge of Domitian's expected successors would have been perilous, and equally perilous would it have been to omit from the Institutio Oratorio. all mention of the emperor. And there was at the time only one dialect in which a man of letters could speak who set any value on his personal safety. There was a choice between extinction and the writing of a few sentences in the loath- some court language, which might serve as an official test of loyalty.

The Latin of Quintilian is not always free from the faults of style which he

condemns in others. It also exhibits many of the usages and constructions which are characteristic of the silver Latin. But no writer of the decadence departs less widely from the best models of the late republican period. The language is on the whole clear and simple, and varied without resort to rhetorical devices and poetical conceits. Besides the Institutio Oratorio., there have come down to us under Quintilian's name 19 longer

(ed. Lehnert, 1905) and 145 shorter (ed. Ritter, 1884) Declamationes , or school exercitations on themes like those in the Controversiae of Seneca the elder. The longer pieces are certainly not Quintilian's. The shorter were probably published, if not by himself, at least from notes taken at his lessons. It is strange that they could ever have been supposed to belong to a later century; the style proclaims them to be of Quintilian's school and time. The works of Quin- tilian have often been edited. Of the editions of the whole works the chief is that by Burmann (1720); of the Institutio Oratorio, that by Spalding, completed by Zumpt and Bonnell (1798-1834, 5th ed., Meister, 1882, the last volume containing a lexicon), and that by Halm (1868), and another by Meister (1886) ; Eng. trans., J. S. Watson (1856). The tenth book of the Institutio Oratoria has often been separately edited, as by Krueger (ed. 3, 1888), Peterson (1891), Bonnell, Mayor and others. (J. S. R.)

QUINTUS SMYRNAEUS, Greek epic poet, probably flourished in the latter part of the 4th century a.d. He is sometimes called Quintus Calaber, because the only MS. of his poem was discovered at Otranto in Calabria by Cardinal Bessarion in 1450. According to his own account (xii. 310), he tried his hand at poetry in his early youth, while tending sheep at Smyrna. His epic in fourteen books, known as Td fxed' "Oˆripov or Posthomerica, takes up the tale of Troy at the point where Homer's Iliad breaks off (the death of Hector), and carries jt down to the capture of the city by the Greeks. The first five books, which cover the same ground as the Aethiopis of Arctinus of Miletus, describe the doughty deeds and deaths of Penthesileia the Amazon, of Memnon, son of the Morning, and of Achilles; the funeral games in honour of Achilles, the contest for the arms of Achilles and the death of Ajax. The remaining books relate the exploits of Neoptolemus, Eurypylus and Dei'phobus, the deaths of Paris and Oenone, the capture of Troy by means of the wooden horse, the sacrifice of Polyxena at the grave of Achilles, the departure of the Greeks, and their dispersal by the storm. The poet has no originality; in conception and style his work is closely modelled on Homer. His materials are borrowed from the cyclic poems from which Virgil (with whose works he was probably acquainted) also drew, in particular the Aethiopis of Arctinus and the Little Iliad of Lesches.

Editio princeps by Aldus Manutius (1504); Kochly (ed. major with

elaborate prolegomena, 1850; ed. minor, 1853); Z. Zimmer- mann (author of other valuable articles on the poet), (1 891); see also Kehmptzov, De Quinti Smyrnaei Fontibus ac Mythopoiia (1889); C. A. Sainte-Beuve, Etude sur . . . Quinte de Smyrne (1857) ; F. A. Paley, Quintus Smyrnaeus and the " Homer " of the tragic Poets (1879); G. W. Paschal, A Study of Quintus Smyrnaeus (Chicago, 1904).

QUIPUS (Khipus, Qippos)', the ancient Peruvian name for a method of recording which was in use at the time of the arrival of the Spaniards. It consisted of a cord two feet in length to which were attached a series of knotted-strings (Peruv. quipu, a knot) hanging like a fringe. These strings were coloured, and the knots, their number and size, their distance apart, the colours, the order in which the coloured threads hung, all had a signification, e.g. white was silver, yellow gold; white meant peace, red war, &c. In this manner' a rough register of im- portant events, of births, deaths and marriages, and other statistics was kept, the quipus even constituting a rude history of the people. They were also much used for conveying orders to military chiefs in the provinces.

The idea of knotted strings to aid memory is so simple that it is common to many peoples. A Pelew islander, visiting England, knotted strings as a diary of all that struck him during his travels. In the Hawaiian Islands native carriers have knotted-string records of their rounds. The Peruvian quipus is simply the perfecting of a system of mnemonics common to the Red Indians. See also Wampum.

QUIRE (in earlier forms quaer, quair and quere, from the O. Fr. quaier, modern cahier, a copy-book, manuscript book; Lat. quaterni, set of four, from qualtuor), originally the term for four sheets of paper or parchment folded so as to make eight leaves, the ordinary unit in manuscripts and early printed books; the term is now chiefly applied to a twentieth part of a ream of writing paper, twenty-four sheets. In bookbinding and publishing the expression " in quires " is used of the sheets of a book when not folded or bound. " Quire " was formerly

used of a small book contained in a single quire of paper, and so is frequently found in the title of short poems, treatises, &c. A familiar example is the Kingis Quair of King James I. of Scotland. " Choir," a body of singers or the part of a church where the singers sit, was formerly spelled " quire," following the pronunciation of the word (See Choir).

QUIRINUS, the Sabine name of the god Mars, probably an adjective meaning " wielder of the spear " (Quiris, cf. Janus Quirinus). Other suggested etymologies are: (1) from the Sabine town Cures; (2) from curia, i.e. he was the god of the Roman state as represented by the thirty curies. A. B. Cook (Class. Rev. xviii., p. 368) explains Quirinus as the oak-god (quercus) , and Quirites as the men of the oaken spear. From early times he was worshipped at Rome on the Quirinal hill, whither, according to tradition, a body of Sabines under Titus Tatius had migrated from Cures and taken up their abode. In the religious system of Numa, Quirinus and Mars were both recog- nized as divine beings, distinct but of similar attributes and functions; thus, like Mars, Quirinus was at once a god of war and a nature god, the protector of fields and flocks. Subse- quently, at the end of the republic, Quirinus became identified with the deified Romulus, son of Mars. One of the greater flamens was attached to the service of Quirinus, a second college of Salii founded in his honour, and a festival " Quirin- alia " celebrated on the 17 th of February, the day of the sup- posed translation of Romulus to heaven. Old Roman formulae of prayer mention a Hora Quirini, his female cult associate, afterwards identified with Hersilia, the wife of Romulus.

The name was also borne by the following saints: (1) a Roman tribune who suffered martyrdom under Hadrian; (2) a bishop of Siscia in Pannonia; (3) the patron of the Tegernsee in Bavaria, beheaded in Rome in 269 and invoked by those suffering from gout. The petroleum (Quirinus-oil) found in the neighbourhood of the lake takes its name from him.

QUIRITES (literally " spearmen "; see Quirinus), the earliest name of the burgesses of Rome. Combined in the phrase " populus Romanus Quirites (or Quiritium) " it denoted the individual citizen as contrasted with the community. Hence ius Quiritium in Roman law is full Roman citizenship. Subse- quently the term lost the military associations due to the original conception of the people as a body of warriors, and was applied (sometimes in a deprecatory sense, cf. Tac. Ann. i. 42) to the Romans in domestic affairs, Romani being reserved for foreign affairs. (For the distinction between Quiritary and praetorian ownership, see Roman Law.)

QUITO, the capital of the republic of Ecuador, the see of an archbishopric covering the same territory, and the capital of the province of Pichincha, in lat. 0° 14′ S., long. 70° 45′ W., about 114 m. from the Pacific coast and 165 m. in a airect line N. E. of Guayaquil, with which it is connected by a railway completed in 1908. Pop. (1906) 50,840, of whom 1365 were foreigners, mostly Colombians. It occupies a small basin of the great central plateau formed by jthe volcano Pichincha on the W., the Puengasi ridge on the E., and ridges N. and S. formed by spurs from the eastern side of Pichincha. The ground upon which the city is built is uneven and is

traversed from W. to E. by two deep ravines (quebradas) , one of which is arched over in great part to preserve the alignment of the streets, the drainage of which escapes through a cleft in the ridge northward to the plain of Tumbaco. The city is in great part laid out in rectangular squares, the streets running nearly with the cardinal points of the compass. The houses of Quito are chiefly of the old Spanish or Moorish style. The building material in general use is sun-dried bricks, which in the better houses is covered with plaster or stucco. The public buildings are of the heavy Spanish type. .Facing the principal square (Plaza Mayor), and occupying the whole S. side, is the cathedral; on the W. side is the government palace; on the N. the archbishop's palace; and on the E. the municipal hall. The elevation of this plaza is 9343 ft. above sea-level. The finest building in the city is the Jesuits' church, whose facade is covered with elaborate carving. Among

public institutions are the university, which occupies part of the old Jesuit college, an astronomical observatory, and eleven large monastic institutions, six of which are for nuns. One of the convents, that of San Francisco, covers a whole block, and ranks among the largest institutions of its kind in the world. A part of it is in ruins, and another part has been for some time used as military barracks by_the government. The university has faculties of theology, law and medicine, and has 200 to 250 students, but it is antiquated in character and poorly supported. The eminent botanist and chemist, Dr William Jameson (1796-1872), was a member of its faculty for many years. The city has no large commercial houses, and only an insignificant export trade, chiefly hides and forest products from the wooded mountain slopes near by. Religious paintings of a medieval type are produced in large numbers and exported. The native manufactures include tanned leather, saddles, shoes, ponchos, woollen and cotton cloth, fibre sandals and sacking, blankets, coarse matting and coarse woollen carpets. Superior hand-made carpets are also made, and Quito artisans show much skill in wood carvings and in gold and silver works; the women excel in fine needlework and lace-making.

Quito derives its name from the Quitus, who inhabited the locality a long time before the Spanish conquest. In 1533 Sebastian Benalcazar took peaceable possession of the native town (which had been successivly a capital of the Seyris and Incas), and in 1541 it was elevated to the rank of a Spanish city. Its full title was San Francisco del Quito, and it was capital of the province or presidency of Quito down to the end of Spanish colonial rule. It has suffered repeatedly from earthquakes, the greatest damage occurring from those of 1797 and 1859.

QUIVER, a case for holding arrows. The word is taken from O. Fr., where it appears in such forms as quivre, cuevre or coivre. This is apparently

cognate with the O. E. cocer, Ger. Kocker, quiver or case. . The ultimate origin is obscure, and the medieval Latin and Greek words cucurum and kovkovpov are stated to be from the German. The word meaning " to shake " or " tremble " must be distinguished; this is connected with " quaver," " quake "; the New English Dictionary takes these words to be onomatopoeic in origin.

QUOINS (an old variant spelling of " coin," from Lat. cuneus, a wedge), in architecture, the term for the external angle of a building, generally applied to the ashlar masonry employed to stop the rubble masonry or brickwork of the wall at the angles, as also of buttresses, doorways or projecting features. In Saxon work the quoins were built with large stones laid horizontally and vertically in alternate courses, technically known as " long and short " work. Sometimes, to give greater importance to the angles of towers, the quoin stones are rus- ticated, and this treatment is found extensively employed in ancient German towns. At Eastbury Manor House in Essex, built in brick, the quoins at the angles of the walls, doorway and windows were plastered in imitation of stonework.

QUOITS (O. Fr. coiter, quoiter, to incite), a pastime resembling the ancient discus-throwing which formed one of the five games of the Greek pentathlon (see Discus), the two main differences between the ancient and modern sports being that the quoit is ring-shaped (one surface being rounded, the other — the back — being flat) and is lighter than the discus, and its throwing is a test rather of accuracy than strength. Few traces of a game resembling quoits can be found on the continent of Europe, and its origin may be sought for on the borderland of Scotland and England. There are references to it in the Midlands dating from the beginning of the 15th century, and it was one of the games prohibited in the reigns of Edward III. and Richard II. in favour of archery. Ascham, in his Toxophilus (1545), says that "quoiting be too vile for scholars," and in old times it was chiefly played by the working classes, who often used horse- shoes for want of quoits, a custom still prevailing in country districts. According to the modern rules, slightly modified from the code drawn up in 1869, two iron or steel pins 18 yds. apart are driven into the ground, leaving 1 in. exposed. Each is situated in the centre of an " end," a circle of stiff clay 3 ft.

in diameter. The quoits, made of iron, may be of any weight, but are usually about 9 lb each. They must not exceed 85 in. in diameter, or be less than 3J in. in the bore, or more than 2j in. in the web. When delivering

his quoit a player must stand within 4 ft. 6 in. of the centre of the end and at its side. Matches are played between teams or individuals, the object of the game being to throw the quoit as near to the pin as possible, a " ringer," i.e. a quoit actually surrounding the pin, counting two, and a quoit nearer to the pin than any of the adversary's, counting one. A match may be for any number of points, the team or player scoring that number first being the winner. In championship .matches all quoits farther than 18 in. from the end, are foul and removed. All measurements are made from the middle of the pin to the nearest edge of the quoit. If one or more quoits are lapped, the one most accessible is first measured and withdrawn. All quoits on their backs are a foul. The general principle of curling, to drive the opponents' quoits away from the pin and place one's own near or on it, is followed. Scotland, Lancashire and the Midlands are the principal centres of quoiting in Great Britain. In Scotland the game is patronized by the Curling Clubs, and this is also the case in the United States and Canada. Billy Hodson was champion of Great Britain in the middle of the 19th century, and his trip to America in the early 'sixties is of historical interest, as it resulted in two contests for the championship of the world with James McLaren of Newark, N. J., a native of Scotland, who was champion of America. One hard-fought match was won by each, the deciding one remaining unplayed. The championship of America is rewarded by the " Bell Medal," presented by the Grand National Curling Club of America.

QUORUM (Lat. for " of whom "), in its general sense, a term denoting the number of members of any body of persons whose presence is requisite in order that business may be validly transacted by the body or its acts be legal. The term is de- rived from the wording of the commission appointing justices of the peace which appoints them all, jointly and severally to keep the peace in the county named. It also runs — " We have also assigned you, and every two or more of you (of whom [quorum], any one of you the aforesaid A, B, C, D, &c, we will shall be one) our justices to inquire the truth more fully," whence the justices so-named were usually called justices of the quorum. The term was afterwards applied to all justices, and subsequently by transference, to the number of members of a body necessary for the transaction of its business. No general rule can be laid down as to the number of members of which a quorum should consist; its size is usually prescribed by definite enactment or provision; it is entirely a matter for self-constituted bodies as to what their quorum shall be, and it usually depends on the size of the body. In bodies which owe their existence to an act of the legislature, the necessary quorum is usually fixed by statute. In England, in the House of Lords, three form a quorum, though on a division there must be thirty members present. In the House of Commons, forty members, including the Speaker, form a quorum. The quorum of a standing committee of the House of Lords is seven, and of the House of

Commons, twenty.

QUOTA, a proportional share or part that is due from or to any person or body of persons, in Med. Lat. quota, sc. pars, from quotus, an adjective formed from quot, how many. The word first appears in connexion with the levying of men, money or supplies for military and naval purposes from districts, towns or seaports, and thus is equivalent to " contingent " (Lat. contingere, to happen to, fall to one's lot or share, cum, with, and tangere, to touch), used since the 18th century specific- ally of a contribution of men or ships according to a scale fixed between the contracting parties.

QUOTATION, a passage repeated from the writings or speech of another. The verb " to quote " comes from Med. Lat.

quotare (from quot, how many), to refer to by numbers, i.e. of page, chapter, &c, also to separate into chapters, verses, &c. The term is also specifically applied to the statement of the current prices of goods and commodities, and of stocks and shares (see Stock Exchange) .

Useful lists of familiar quotations may be found in the following: — H. T. Riley, Dictionary of Latin and Greek Quotations, ed. Bonn; P. H. Dalbiac, Dictionary of English Quotations (1896) ; in the same series, T. B. Harbottle, Classical Quotations (1897), and T. B. Harbottle and P. H. Dalbiac, French and Italian Quotations (1901) ; Robinson Smith, English Quotations (n.d.) ; H. P. Jones, A New Dictionary of Foreign Phrases and Classical Quotations; J. K. Hoyt and A. L. Ward, The Cyclopaedia of Practical Quotations, English and Latin (1892); Cassell's Book of Quotations (1901); J. Bartlett, Familiar Quotations .. .in Ancient and Modern Literature (1902); in Notes and Queries, the indices to the various series contain, grouped under the heading " Quotation," a large number of out- of-the-way quotations.

QUO WARRANTO, in English law, the name given to an ancient prerogative writ calling upon any person usurping any office, franchise, liberty or privilege belonging to the Crown, to show " by what warrant " he maintained his claim, the onus being on the defendant. It lay also for non-user or misuser of an office, &c. If the Crown succeeded, judgment of forfeiture or ousterlemain was given against the defendant. The pro- cedure was regulated by statute as early as 1278 (the statute of Quo Warranto, 6 Edw. I. c. 1), passed in consequence of the commission of quo warranto issued by Edward I. A distinction was drawn in the report between libertates, jurisdiction exercised by the lord as lord, and regalia, jurisdiction exercised by Crown grant. After a time the cumbrousness and inconvenience of the ancient practice led to its being superseded by the modern form of an information in the nature of a quo warranto, exhibited in the King's Bench Division either by the attorney-general ex officio or by the king's coroner and attorney at the instance of a private person called the relator. The information will not be issued except by leave of the court on proper cause being shown. It does not lie where there has been no user or where the office has determined. Nor does it lie for the usurpation of every kind of office. But it lies where the office is of a public nature and created by statute, even though it is not an encroach- ment upon the prerogative of the Crown. Where the usurpation is of a municipal office the information is regulated by 9 Anne c. 25 (1711), under which the defendant may be fined and judg- ment of ouster given against him, and costs may be granted for or against the relator. Such an information must, in the case of boroughs within the Municipal Corporations Act 1882, be brought within twelve months after disqualification (s. 225); in the case of other boroughs, within six years after the defendant first took upon himself the office (32 Geo. III. c. 58, s. 2). The information in the nature of a quo warranto, though nominally a criminal, has long been really a civil proceeding, and has recently been expressly declared to be so (Supreme Court of Judicature Act 1884, s. 15). In cases not falling within 9 Anne c.

25, judgment of ouster is not usually given. The most famous historical instance of quo warranto was the action taken against the corporation of London by Charles II. in 1684. The King's Bench adjudged the charter and franchises of the city of London to be forfeited to the Crown {State Trials, vol. viii. 1039). This judgment was reversed by 2 Will. & Mary, sess. 1, c. 8; and it was further enacted, in limitation of the prerogative, that the franchises of the city should never be seized or forejudged on pretence of any forfeiture or misdemeanour. In Scotland the analogous procedure is by action of declarator.

In the United States the right to a public office is tried by quo warranto or similar procedure, regulated by the state laws. Proceedings by quo warranto lie in a United States court for the removal of persons holding office contrary to art. xiv. s. 3 of the Amendments to the Constitution (act of the 31st of May 1870, c. 14).

R— RABAH ZOBEIR

7 6 5

RTHE twentieth letter in the Phoenician alphabet, the nineteenth in the numerical Greek, the seventeenth in the ordinary Greek and the Latin and (owing to the addition of J) the eighteenth in the English. Its earliest form in the Phoenician alphabet when written from right to left was Jk, thus resembling the symbol for D with one side of the triangle prolonged. In Aramaic and other Semitic scripts which were modified by opening the heads of the letters, the symbol in time became very much changed. Greek, however, maintained the original form with slight variations from place to place. Not infrequently in the Greek alphabets of Asia Minor and occasionally also in the West, R was written as £), thus introducing a confusion with D {q.v.). Elsewhere a short tail was added, as occasionally in the island of Melos, in Attica and in western Greece, but nowhere does this seem to have been universal. The earliest Latin forms are exactly like the Greek. Thus in the very early inscriptions found in the Forum in 1899 R appears as <-l (from right to left), p and D (from left to right). Later the forms R and R come in; sometimes the back is not quite connected in the middle to the upright, when the form R is produced. The name of the Semitic symbol is Resh; why it was called by the Greeks Rho (po>) is not clear. The h which accompanies r in the trans- literation of Greek p, indicates that it was breathed, not voiced, in pronunciation. No consonant varies more in pronunciation than r. According to Brockelmann, the original Semitic r was probably a trilled r, i.e. an r produced by allowing the tip of the tongue to vibrate behind the teeth while the upper surface of the tongue is pressed against the sockets of the teeth. The ordinary English r is also produced against the sockets of the teeth, but without trilling;

another r, also untrilled, which is found in various parts of the south of England, is produced by turning up the tip of the tongue behind the sockets of the teeth till the tongue acquires something of a spoon shape. This, which is also common in the' languages of modern India, is called the cerebral or cacuminal r, the former term, which has no meaning in this connexion, being only a bad translation of a Sanscrit term. The common German r is produced by vibrations of the uvula at the end of the soft palate, and hence is called the uvular r. There are also many other varieties of this sound. In many languages r is able to form syllables by itself, in the same way that /, m, n may do, as in the English brittle (britl), written (ritn). In Europe r with this value is most conspicuous in Slavonic languages like Bohemian (Czech) and Croatian; in English r in this function is replaced by a genuine vowel in words like mother (mo?>&). This syllabic r is first recorded for Sanscrit, where it is common, but is replaced in the languages descended from Sanscrit by r and a vowel or by a vowel only, according to the position in which it occurs. Most philologists are of opinion that syllabic r existed also in the mother-tongue of the Indo-European languages. (P. Gi.)

RAABE, HEDWIG (1844-1905), German actress, was born in Magdeburg on the 3rd of December 1844, and at the age of fourteen was playing in the company of the Thalia theatre, Hamburg. Jn 1864 she joined the German Court theatre at St Petersburg, touring about Germany in the summer with such success that in 1868 she relinquished her Russian engage- ment to devote herself to starring. In 187 1 she married Albert Niemann (b. 1831), the operatic tenor. She excelled in classical r61es like Marianne in Goethe's Geschwister and Franziska in Minna von Barnhelm. It was she who first played Ibsen in Berlin. She died on the 21st of April 1905.

RAABE, WILHELM (1831-1910), German novelist, whose early works were published under the pseudonym of Jakob Corvinus, was born at Eschershausen in the duchy of Brunswick on the 8th of September 1831. He served apprenticeship at a bookseller's in Magdeburg for four years (1849-1854); but tiring of the routine of business, studied philosophy at Berlin

(1855-1857). While a student at that university he pub- lished his first work, Die Chronik der Sperlingsgasse (1857), which at once attained to great popularity. Raabe next returned to Wolfenbiittel, and then lived (1862-1870) at Stuttgart, where he devoted himself entirely to authorship and wrote a number of novels and short stories; notably Unseres Herrgotts Kanzlei (1862); Der Hungerpastor (1864); Abu Telfan (1867) and Der Schiidderump (1870). In 1870 Raabe removed to Brunswick and published the narratives Horacker (1876) — perhaps his masterpiece; Das Odfeld (1889); Kloster Lugau (1894) and Hastenbeck (1 899), and numerous

other stories. The distinguish- ing characteristic of Raabe's work is a genial humour which reminds us occasionally of Dickens; but this humour is often combined with a pessimism that is foreign to the English novelist.

• Raabe's Gesammelte ErzaMungen appeared in 4 vols. (1896-1900) ; there is no uniform edition of his larger novels. See P. Gerber, Wilhelm Raabe (1897) ; A. Otto, Wilhelm Raabe (1899) ; A. Bartels, Wilhelm Raabe: Vortrag (1901).

RABA BEN JOSEPH BEN HAMA (c. 280-352), Babylonian rabbi or amora. He is closely associated in his studies with Abaye. The latter was head of the Academy at Pumbeditha. Raba founded a new school at Mahuza, which eventually be- came so long as Raba lived the only academy in Babylonia (Persia). The development of Talmudic Law (or Halakhah) was much indebted to this rabbi, whose influence in all branches of Jewish learning was supreme. His friendship with the King Shapur II. enabled Raba to secure a relaxation of the oppressive laws enacted against the Jews of Persia.

See Graetz, History of the Jews; (Eng. trans., vol. ii. ch. xxi.); Bacher, Agada der Babyl. Amoraer, p. 108, &c. and 1 14-133. (I. A.)

RABAH ZOBEIR (d. 1900), the conqueror of Bornu (an ancient sultanate on the western shores of Lake Chad, included since 1890 in British Nigeria), was a half- Arab, half- negro chieftain. He was originally a slave or follower of Zobeir Pasha (q.v.), and is said to have formed one of the party which served as escort to Miss Tinne (q.v.) in her journeys in the Bahr-el-Ghazal in 1862-64. In 1879, Zobeir being in Egypt, his son Suleiman and Rabah were in command of Zobeir's forces in the Bahr-el-Ghazal. They persisted in slave- raiding, and denied the khedive's authority, and Colonel C. G. Gordon sent against them Romolo Gessi Pasha. Gessi cap- tured Suleiman and routed Rabah, who in July 1879 fled west- ward with some seven hundred Bazingirs (black slave soldiers). He made himself master of Kreich and Dar Banda, countries to the south and south-west of Wadai. In 1884-85 he was invited by Mahommed Ahmed (the mahdi) to join him at Omdurman, but did not do so. According to one account he learnt that the mahdi intended, had he gone to Omdurman, to put him to death. In 1891 Paul Crampel, a French ex- plorer, was killed in Dar Banda by a chieftain tributary to Rabah, and Crampel's stores, including 300 rifles, were sent to Rabah. With this reinforcement of arms he marched towards Wadai, but being stoutly opposed by the people of that country he turned west and established himself in Bag- irmi, a state south-east of Lake Chad. In 1893 Rabah over- threw the sultan of Bornu. In his administration of the country he showed considerable ability and a sense of public needs. To the British, represented

by the Royal Niger Company, Rabah gave comparatively little trouble. During 1894-95 he con- tinually (but unavailingly) asked the company's representatives at Yola and Ibi to supply him with gunpowder. Rabah then tried threats, and in 1896 all communication between him and the company ceased. Early in 1897 he began an advance in the direction of Kano, the most important city in the Fula empire. The news of the crushing defeat by Sir George Goldie of the Fula at Bida, and of the capture of Illorin, induced

Rabah to return to Bornu. He gave the British no further trouble, but turned his attention to the French. fimile Gentil had in this same year (1897) reached Lake Chad, via the Congo and Bagirmi, and had installed a French resident with the sultan of Bagirmi. As soon as Gentil had withdrawn, Rabah again fell upon Bagirmi, and forced sultan and resident to flee. In 1 899 the French sent an expeditipn to reconquer the country, but atˆ first they were unsuccessful. In the summer of 1899 Rabah attacked and routed the French advanced post, held by Naval-Lieutenant Bretonnet, and the latter was killed. In October following another battle was fought, in which the French, under Captain Robillot, completely defeated Rabah, who retreated north-east towards Wadai. Gathering a fresh army, he returned to Bagirmi and joined issue with the French a third time. In a battle fought on ths 22nd of April 1900 Rabah was slain and his host defeated. The chieftain's head was cut off and taken to the French camp. In this engage- ment Major Lamy, the French commandant, also lost his life.

The French continued the campaign against Rabah's sons,- two of whom were killed. Rabah had left instructions that if his army was finally defeated by the French, his successor should return to Bornu and make friends with the British. Rabah's third son, Fader-Allah, accordingly threw himself entirely upon British protection. He made a favourable im- pression, and it was contemplated to recognize him as sultan of Bornu. However, in the later part of 190T Fader-Allah, who had 2500 riflemen, again made aggressive movements against the French. In retaliation, Captain Dangeville pursued him into British territory. A battle was fought at Gujba, Fader- Allah being defeated. He fled mortally wounded, and died the same night, being buried in the bed of a small river, the course of which had been diverted for the purpose.

Connected accounts of Rabah's career are contained in fi. Gentil's La Chute de I'empire de Rabah (Paris, 1902) and in M. von Oppen- heim'sRabehunddas Tschadseegebiet (Berlin, 1902). (F. R. C.)

RABAT (Ribat), a city on the Atlantic coast of Morocco, in 34 3′ N., 6° 46′ W., 130 m. S. of Cape Spartel, on the southern side and at the mouth of the Bu Ragrag, which separates it from Salli on the northern bank. It is a commercial town of about 26,000 to 30,000 inhabitants, occupying a rocky plateau and surrounded by massive but dilapidated walls, strengthened by three forts on the seaward side. To the south of the town stands a modern palace, defended by earth- works and Krupp guns. The conspicuous feature in the view- from the ocean is the Borj el Hasan, an unfinished square-built tower, 145 ft. high, built on an elevation about 65 ft. above the sea to the west of the walled town. At one time the Bu Ragrag afforded a much better harbour than it does now; the roadstead is quite unprotected, and there is a dangerous bar at the mouth of the river, which hampers the shipping, and makes the growth of trade slow. The depth of water over the bar varies from 7 to 12 ft. Rabat trades with Fez and the interior of Morocco, with the neighbouring coast towns and Gibraltar, and with Marseilles, Manchester and London, and is the greatest industrial centre in Morocco.

Rabat was founded by Yak'ub el Mansur in 1184, but Salli was then already an ancient city, and on the scarped hills to the west of Rabat stand the ruins of Sala, a Roman colony, known as Sheila. It contains a mausoleum of the Beni Marin dynasty.

RABAUT, PAUL (17 18-1794), French pastor of " the Church of the Desert " (see Huguenots), was born at Bedarieux, near Montpellier, on the 29th of January 171 8. In 1738 he was admitted as a preacher by the synod of Languedoc, and in

1740 he went to Lausanne to complete his studies in the seminary recently founded there by Antoine Court (q.v.). In

1 741 Rabaut was placed at the head of the church of Nimes, and in 1744 he was vice-president of the general synod. During the persecution of 1745-1752 Rabaut himself was obliged to hide. When the marquis of Paulmy d'Argenson was sent to Languedoc to make a military inspection, Rabaut

succeeded in interviewing him (1750). For a time the per- secution ceased, but it broke out again in 1753, a price being put upon Rabaut's head. Louis Francois de Bourbon, prince de Conti, interested himself in the Protestants in 1755, and in July Rabaut visited him. During the years 1755-1760 periods of persecution and toleration alternated. By the year 1 760, however, the efforts of Antoine Court and P. Rabaut had been so successful that French Protestantism was well established and organized. Court de Gebelin, Paul Rabaut, and his son Saint-fitienne now exerted themselves to

get it recognized by the law and government. When the people revolted, the minister Turgot in 1775 requested Rabaut to calm them. His success aroused the jealousy of his colleagues, who tried to undo the good work started by Antoine Court. But Rabaut persevered in his efforts to improve legally the position of the Protestants. In 1785, when he was visited by General La Fayette, it was arranged that Rabaut's son, Rabaut Saint-fitienne, should go to Paris on behalf of the Reformed Church. In November 1787 Louis XVI. 's edict of toleration was signed, though it was not registered until the 29th of January 1788. Two years later liberty of conscience was proclaimed by the National Assembly, of which Rabaut Saint-fitienne was chosen vice-president, and it was declared that non-Catholics might be admitted to all positions. After the fall of the Girondists, however, in which Rabaut Saint- fitienne was involved, Paul Rabaut, who had refused to renounce his title of pastor, was arrested, dragged to the citadel of Nimes, and kept in prison seven weeks (1794). He died at Nimes on the 25th of September 1794, soon after his release.

See J. Pons de Nimes, Notice biographique sur Paul Rabaut (1808) ; Charles Dardier, Paul Rabaut, ses lettres a Antoine Court (1884) and Paul Rabaut, ses lettres a divers (1891).

RABAUT SAINT-ETIENNE, JEAN PAUL (1 743-1 793), French revolutionist, was born at Nimes, the son of Paul Rabaut (q.v.), the additional surname of Saint-fitienne being assumed from a small property near Nimes. Like his father, he became a pastor, and distinguished himself by his zeal for his co-religionists, working energetically to obtain the recognition of the civil rights which had been granted to them by Louis XVI. in 1788. Having gained a great reputation by his Histoire primitive de la Grece, he was elected deputy to the States General in 1789 by the third estate of the bailliage of Nimes. In the Constituent Assembly he worked on the framing of the constitution, spoke against the establishment of the republic, which he considered ridiculous, and voted for the suspensive veto, as likely to strengthen the position of the crown. In the Convention he sat among the Girondists, opposed the trial of Louis XVI., was a member of the commission of twelve, and was proscribed with his party. He remained in hiding for some time, but was ultimately discovered and guillotined on the 5th of December 1793.

See J. A. Dartique, Rabaut St-lZtienne d V AssembUe Constituante (Paris, 1903) ; and A. Lods, " Correspondance de Rabaut St-Etienne " in La Revolution francaise (1898), " L'arrestation de Rabaut St Etienne " in La Revolution francaise for 1903 (cf. the same review for 1901), and " Les debuts de Rabaut St-Etienne aux Etats Generaux et a la Convention " in the Bulletin historique de la Societe de. V histoire du protestantisme francais (1901), also an Essai sur la vie de Rabaut Saint-Atienne (1893)

separately published. An edition of the CEuvres de Rabaut Saint-Etienne (2 vols., 1826) contains a notice by Collin de Plancy.

RABBA, a town of British West Africa, in the province of Nupe, Northern Nigeria, on the left bank of the Niger, in 9° 6′ N., and 200 m. above the confluence of the Niger and the Benue. At the time of Richard Lander's visit in 1830 it was a place of 40,000 inhabitants and one of the most important markets in the country. In 1867 Gerhard Rohlfs found it with only 500 inhabitants. The town has somewhat recovered its position since the establishment of British rule in 1902.

RABBAH BAR NAHMANI (c. 270-c. 330), a Babylonian rabbi or amora (q.v.). He was for twenty-two years head of the Academy at Pumbeditha. His great dialectic skill acquired

for him the epithet " uprooter of mountains." The Talmud owes much to this rabbi. He is said to have perished in a jungle into which he had fled from the officers of the Persian king.

See Graetz, History of the Jews (Eng. trans.), vol. ii. ch. xxi. ; Bacher, Agada der Babyl. Amorder, 97-101. (I. A.)

RABBAN BAR SAUMA (fl. 1280-1288), Nestorian traveller and diplomatist, was born at Peking about the middle of the 13th century, of Uigur stock. While still young he started on a pilgrimage to Jerusalem, and travelling by way of Tangut, Khotan, Kashgar, Talas in the Syr Daria valley, Khorasan, Maragha and Mosul, arrived at Ani in Armenia. Warnings of the danger of the routes to southern Syria turned him from his purpose; and his friend and fellow-pilgrim, Rabban Marcos, becoming Nestorian patriarch (as Mar Yaballaha III.) in 1281, suggested Bar Sauma's name to Arghun Khan, sovereign of the Ilkhanate or Mongol-Persian realm, for a European embassy, then contemplated. The purpose of this was to conclude an anti-Moslem alliance, especially against the Mameluke power, with the chief states of Christendom. On this embassy Bar Sauma started in 1287, with Arghun's letters to the Byzantine emperor, the pope and the kings of France and England. In Constantinople he had audience of Andronicus II.; he gives an enthusiastic description of St Sophia. He next travelled to Rome, where he visited St Peter's, and had prolonged negotia- tions with the cardinals. The papacy being then vacant, a definite reply to his proposals was postponed, and Bar Sauma passed on to Paris, where he had audience of the king of France (Philip the Fair). In

Gascony he apparently met the king of England (Edward I.) at a place which seems to be Bordeaux, but of which he speaks as the capital of Alanguitar {i.e. Angle- terre). On returning to Rome, he was cordially received by the newly elected pontiff Nicolas IV., who gave him communion on Palm Sunday, 1288, allowed him to celebrate his own Eucharist in the capital of Latin Christendom, commissioned him to visit the Christians of the East, and entrusted to him the tiara which he presented to Mar Yaballaha. His narrative is of unique interest as giving a picture of medieval Europe at the close of the Crusading period, painted by a keenly intelligent, broad- minded and statesmanlike observer.

See J. B. Chabot's translation and edition of the Histoire du Patriarche Mar Jabalaha III. et du moine Rabban Cawma (from the Syriac) in Revue de I'Orient latin, 1893, pp. 566-610; 1894, pp. 73-143, 235-300; O. Raynaldus, Annates Ecclesiastici (continua- tion of Baronius), A. D. 1288, §§xxxv.-xxxvi. 11289, § lxi. ; L. Wadding, Annates Minorum, v. 169, 196, 170-173; C. R. Beazley, Dawn of Modern Geography, ii. 15, 352; iii. 12, 189-190, 539-541.

RABBET, in carpentry and masonry, the name for a rect- angular groove or slot cut in the edge of a piece of wood or stone, to which another corresponding piece can be fitted (see Joinery and Masonry). The word is an adaptation of the O. Fr. rabat or rabbat, from rabattre, i.e. abattre, beat back, abate, to make a recess, and is thus a doublet of " rebate " (q.v.), which is now frequently used instead of " rabbet," the joint being also known as a " rebated joint."

RABBI, a Hebrew word meaning " my master," " my teacher." It is derived from the adjective rob (in Aramaic, and frequently also in Hebrew, "great"), which acquired in modern Hebrew the signification of "lord," in relation to servants or slaves, and of " teacher," " master," in relation to the disciple. The master was addressed by his pupils with the word rabbi (" my teacher "), or rabbenu (" our teacher "). It became customary to speak of Moses as Moshe rabbenu (" our teacher Moses "). Jesus makes it a reproach against the scribes that they cause themselves to be entitled by the people rabbi (jtafifii, Matt, xxiii. 7): and He Himself is saluted by the disciples of John as rabbi (John i. 38, where the word is explained as equivalent to 5i8

rabbon, and also pronounced as ribbon, cf. pafifiovvi, Mark x. 51; John xx. 16) was prefixed. This title, a higher distinction than that of rabbi, is in tradition borne only by the descendants of Gamaliel I., the last being Gamaliel III., the son of Jehuda I. (Aboth ii. 2), and by Johanan b. Zaccai, the founder of the school of Jamnia (Jabneh). Otherwise all Tannaites (see Tanna), the scholars of the Mishnah period, were distinguished by the title

of " rabbi." The Jehuda I. mentioned above, the redactor of the Mishnah, was honoured as the " Rabbi " /car' eˆoxv v (" P ar excellence "), and in the tradition of the houses of learning, if it was necessary to speak of him or to cite his opinions and utterances, he was simply referred to as " Rabbi," without the mention of any name. Scholars who were not definitely ordained — and among these were men of high distinction — were simply mentioned by their names without the Rabbi-title. In the post-Talmudic age the Qaraites, who rejected the tradition of the Talmud, designated the Jews who adhered to that tradition as Rabbanites. Similarly the term Rabbins, or Rabbis, is applied to modern Jewish clergy. The plural rabbanim was employed to describe the later Jewish scholars (so, for example, in the historian Abraham Ibn Daud, 12th century). By " rabbinical literature " is understood the post-Talmudic Jewish literature; in particular, so far as its subject is the literature of the tradition and its contents.

Rab became a proper name as the standing nomenclature of the celebrated amora, Abba Arika (q.v.). (W. Ba.)

RABBIT, the modern T iame of the well-known rodent, formerly called (as it still is in English legal phraseology) Cony, 1 a member of the family Leporidae (see Rodentia). Till recently the rabbit has generally been known scientifically as Lepus cuni- culus, but it is now frequently regarded, at least by systematic naturalists, as the representative of a genus by itself, under the

The Rabbit (Oryctolagus cuniculus).

name of Oryctolagus cuniculus. Some zoologists, indeed, include in the same genus the South African thick-tailed hare, but by others this is separated as Pronolagus crassicaudatus. From the hare the wild rabbit is distinguished externally by its smaller size, shorter ears and feet, the absence or reduction of the black patch at the tip of the ears, and its greyer colour. The skull is

1 There are no native names either in Teutonic or Celtic languages; such words as German Kaninchen or English cony are from the Latin cuniculus, while the Irish, Welsh and Gaelic are adaptations from English. " Rabbit," which is now the common name in English, was for long confined to the young of the cony, and so the Prompt- orium Parvulorum, c. 1440, " Rabet, yonge conye, cunicellus." The ultimate source of " rabbit " is itself unknown. The New English Dictionary takes it to be of northern French origin. There is a Walloon robett. Skeat suggests a possible connexion with Spanish rabo, tail, rabear, to wag the hind-quarters. The familiar name for toasted cheese, " Welsh rabbit," is merely a joke, and the alteration to " Welsh rare-bit " is due to a failure to see the joke, such as it is. Parallels

may be found in " Prairie oyster," the yolk of an egg with vinegar, pepper, &c. added; or " Scotch woodcock," a savoury of buttered eggs on anchovy toast.

very similar to that of the hare, but is smaller and lighter, with a slenderer muzzle and a longer and narrower palate. Besides these characters, the rabbit is separated from the hare by the fact that it brings forth its young naked, blind, and help- less; to compensate for this, it digs a deep burrow in the earth in which they are born and reared, while the young of the hare are born fully clothed with fur, and able to take care of them- selves, in the shallow depression or " form " in which they are produced. The weight of the rabbit is from 2\ to 3 lb, although wild individuals have been recorded up to more than 5 lb. Its 'general habits are too well known to need detailed description. It breeds from four to eight times a year, bringing forth each time from three to eight young; its period of gesta- tion is about thirty days, and it is able to bear when six months old. It attains to an age of about seven or eight years.

The rabbit is believed to be a native of the western half of the Mediterranean basin, and still abounds in Spain, Sardinia, southern Italy, Sicily, Greece, Tunis and Algeria; and many of the islands adjoining these countries are overrun with these rodents. Thence it has spread, partly by man's agency, north- wards throughout temperate western Europe, increasing rapidly wherever it gains a footing; and this extension is still going on, as is shown by the case of Scotland, where early in the 19th century rabbits were little known, while they are now found in all suitable localities up to the extreme north. It has also gained admittance into Ireland, and now abounds there as much as in England. Out of Europe the same extension of range has been going on. In New Zealand and Australia rabbits, introduced either for profit or sport, have increased to such an extent as to form one of the most serious pests that the farmers have to contend against, as the climate and soil suit them perfectly and their natural enemies are too few and too lowly organized to keep them within reasonable bounds. In North America about thirty species and twice as many geo- graphic races (subspecies) are known, and the occurrence of several distinct fossil forms shows that the genus has long been established. The chief variety is the common grey or cottontail (Lepus floridanus). For the " jack-rabbit," see Hare.

The rabbit has been domesticated from an early period. Little doubt exists amongst naturalists that all the varieties of the domestic animal are

descended from Oryctolagus cuniculus. The variations which have been perpetuated and intensified by artificial selection are, with the exception of those of the dog, greater than have been induced in any other mammal. For not only has the weight been more than quadrupled in some of the larger breeds, and the structure of the skull and other parts of the skeleton greatly altered, but the pro- portionate size of the brain has been reduced and the colour and texture of the fur altered in a remarkable manner. The lop-eared breed is the oldest English variety, and has been cultivated carefully since about 1785, the aim of the breeder being directed to the development of the size of the ears, and with such success that they sometimes measure more than 23 in. from tip to tip and exceed 6 in. in width. This development, which is accom- oanied by changes in the structure of the skull, depends on breed- ing the animals in warm damp hutches, without which the best developed parents fail to produce the desired offspring. In colour lop-eared rabbits vary greatly. The Belgian hare is a large breed of a hardy and prolific character, which closely resembles the hare in colour, and is not unlike it in form. Some years ago these rabbits were sold as " leporides " or hybrids, produced by the union of the hare and the rabbit; but the most careful experimenters have failed to obtain any such hybrid, and the naked immature condition in which young rabbits are born as compared with the clothed and highly developed young hare renders it unlikely that hybrids could be produced. Nor does the flesh of the Belgian rabbit resemble that of the hare in colour or flavour. A closely allied variety, though of larger size, is known as the Patagonian rabbit, although it has no relation to the country after which it is called.

The Angora rabbit is characterized by the extreme elongation and fineness of the fur, which in good specimens reaches 6 or 7 in. in length, requiring great care and frequent combing to prevent it from becoming matted. The Angoras most valued are albinos, with pure white fur and pink eyes; in some parts of the Continent they are kept by the peasants and clipped regularly.

Amongst the breeds which are valued for the distribution of colour on the fur are the Himalayan and the Dutch. The former is white, but the whole of the extremities — viz. the nose, the ears, tail and feet — are black or very dark in colour. This very pretty breed has no connexion with the mountains from which it takes

its name, but is a variety produced by careful breeding and selection. Though produced by crossing, it now generally breeds true to colour, at times throwing back, however, to the silver greys from which it was derived. The rabbits known as Dutch are small, and valued for the disposition of the colour and markings. The entire body behind the shoulder-blades is uniformly coloured, with the excep- tion of the feet; the

anterior part of the body, including the fore legs, neck, and jaws, is white, the cheeks and ears being coloured. In some strains the coloured portion extends in front of the fore legs, leaving only a ring of white round the neck. The more accurately the coloured portion is defined, the higher is the animal esteemed. The silver grey is a uniform-coloured breed, the fur of which is a rich chinchilla grey, varying in depth in the different strains. From the greater value of the fur, silver greys have been frequently employed to stock warrens, as they breed true to colour in the open if the ordinary wild rabbits are excluded. Other colours known, as silver fawn and silver brown, are closely related. A blue breed has been recently introduced. The largest and heaviest of all is the Flemish giant, with iron-grey fur above and white below. Other breeds include the Japanese, with an orange coat, broadly banded on the hind-quarters with black; the pink-eyed and short and thick-furred albino Polish; the Siberian, probably produced by crossing the Himalayan with the Angora; and the black-and-tan and blue-and-tan. See also Hare, Shooting, and Coursing. (W. H. F. ; R. L.)*

RABBLE, a general term for a disorderly crowd, apparently connected with the verb " to rabble," to talk or work in a confused manner, Du. rabbelen, Ger. dialect rabbeln, cf. Gr. pafihoauv, to howl. In iron and steelˆmanufacture, a puddling- tool, for stirring the molten metal, is called a " rabble." This is a different word, adapted from Fr. rdble, for roable, Med. Lat. rotabulum, Lat. rutabulum (ruere, to rake), a fire-shovel or oven rake.

RABBUL&, a distinguished bishop of the Syrian church early in the sth century. He was a native of ICLenneshrin, a town some few miles south of Aleppo and the seat of a bishop- ric. His father was a heathen priest, and though his mother was a devoted Christian he continued in pagan belief and practice until some time after his marriage. During a journey to his country estates he was converted to Christianity partly through coming in contact with a case of miraculous healing and partly through the teaching and influence of Eusebius, bishop of ICenneshrln, and Acacius, bishop of Aleppo. With all the energy of his fiery nature he threw himself into the practice of Christian asceticism, sold all his possessions, and separated from his wife and kinspeople. He resided for some time in a monastery, and then passed to a life of greater hard- ship as a solitary hermit. On the death of Diogenes, bishop of Edessa, in the year 411-412, Rabbula was chosen his successor, and at once accepted the position offered him, without any of the customary show of reluctance. As a bishop he was marked by extraordinary energy, by the continued asceticism of his personal life, by his magnificent provision for all the poor and suffering in his diocese, by his care for discipline among the clergy and monks who were under his authority, and latterly by the fierce determination with

which he combated all heresies and especially the growing school of the followers of Nestorius. On one occasion he visited Constantinople and there preached before Theodosius II. (who was then favourable to Nestorius) and a great congregation a sermon in denunciation of Nes- torian doctrine, of which a portion survives in the Syriac version. 1 He became the friend of Cyril of Alexandria, with whom he corresponded, and whose treatise De recta fide he trans- lated into Syriac. 2 After a busy episcopal life of twenty-four years he died in August 435, and was immensely lamented by the people of his diocese. His successor was the Nestorian Ibas.

The literary remains of Rabbula are small in bulk, and are mostly to be found in Overbeck. Perhaps his main importance to the historian of Syriac literature lies in the zeal with which he strove to replace the Diatessaron or Gospel Harmony of Tatian by the edition of the separate Gospels, ordering that a copy of the latter should be placed in every church and should

1 Overbeck, op. cit. pp. 239-244.

2 The version survives in a British Museum MS. ; see Wright's Catalogue p. 719.

be read (see Wright's Syr. Lit. p. 9). According to his bio- grapher (Overbeck, p. 172) he himself produced a version (or revision) of the New Testament in Syriac. This may have been, as Wright suggests. (Syr. Lit. p. n), " a first step in the direc- tion of the Philoxenian version." But there is great probability in F. C. Burkitt's hypothesis that the product of Rabbula's work, at least as regards the Gospels, is to be found in the current Peshltta text, which " represents the Greek text as read in Antioch about 400 a.d." and " was prepared by Rab- bula . . . and published by his authority as a substitute for the Diatessaron." 1

Rabbula. seems to have been a man of great force, devotion and self-denial: on the one hand intellectually gifted, and on the other thoroughly consistent in his practice of religion. But his attractiveness is marred, as in the case of many of his contemporaries, by the bitterness of a narrow orthodoxy.

(N. M.) RABELAIS, FRANCOIS (c. 1490-1553), French humorist, was born at Chinon on the Vienne in the province of Touraine. The date of his birth is wholly uncertain: it has been put by tradition, and by authorities long subsequent to his death, as 1483, 1490, and 1495. There is nothing in the positive facts of his life which would not suit tolerably well with any

of these dates; most 17th-century authorities give the earliest, and this also accords best with the age of the eldest of the Du Bellay brothers, with whom Rabelais was (perhaps) at school. In favour of the latest it is urged that, if Rabelais was born in 1483, he must have been forty-seven when he entered at Montpellier, and proportionately and unexpectedly old at other known periods of his life. In favour of the middle date, which has, as far as recent authorities are concerned, the weight of consent in its favour, the testimony of Guy Patin (1601-1672), a witness of some merit and not too far removed in point of time, is invoked. The .only contribution which need be made here to the con- troversy is to point out that if Rabelais was born in 1483 he must have been an old man when he died, and that scarcely even tradition speaks of him as such.

With regard to his birth, parentage, youth, and education everything depends upon this tradition, and it is not until he was according to one extreme hypothesis thirty-six, according to the other extreme twenty-four, that we have solid testimony respecting him. In the year 1519, on the 5th of April, the Frangois Rabelais of history emerges. The monks of Fontenay le Comte bought some property (half an inn in the town), and among their signatures to the deed of purchase is that of Francois Rabelais. Before this all is cloudland. It is said that he had four brothers and no sisters, that his father had a country property called La Deviniere, and was either an apothecary or a tavern-keeper. Half a century after his death De Thou mentions that the house in which he was born had become a tavern and then a tennis-court. It still stands at the corner of a street called the Rue de la Lamproie, and the tradition may be correct. An indistinct allusion of his own has been taken to mean that he was tonsured in childhood at seven or nine years old; and tradition says that he was sent to the convent of Seuilly. From Seuilly at an unknown date tradition takes him either to the university of Angers or to the convent school of La Baumette or La "Basmette, founded by good King Rene in the neighbourhood of the Angevin capital. Here he is supposed to have been at school with the brothers Du Bellay, with Geoffroy d'Estissac and others. The next stage in this (so far as evidence goes, purely imaginary) career is the monastery of Fontenay le Comte, where, as has been seen, he is certainly found in 15 19 holding a position sufficiently senior to sign deeds for the com- munity, where he, probably in 1511, took priest's orders, and where he also pursued, again certainly, the study of letters, and especially of Greek, with ardour. From this date, therefore, he becomes historically visible. The next certain intelligence which we have of Rabelais is somewhat more directly bio-

1 See S. Ephraim's Quotations from the Gospel (Cambridge, 1901), p. 57 f. ; Evarigelion du-Mepharreshe (Cambridge, 1904), ii. 5; and Early Eastern Christianity (London, 1904), lecture ii. XXII. 25

graphical. The letters of the well-known Greek scholar Budaeus, two of which are addressed to Rabelais himself and several more to his friend and fellow-monk Pierre Amy, together with some notices by Andr6 Tiraqueau, a learned jurist, to whom Rabelais rather than his own learning has secured immortality, show beyond doubt what manner of life the future author of Gargantua led in his convent. The letters of Budaeus show that an attempt was made by the heads of the convent or the order to check the studious ardour of these Franciscans; but it failed, and there is no positive evidence of anything like actual perse- cution, the phrases in the letters of Budaeus being merely the usual exaggerated Ciceronianism of the Renaissance. Some books and papers were seized as suspicious, then given back as innocent; but Rabelais was in all probability disgusted with the cloister — indeed his great work shows this beyond doubt. In 1524, the year of the publication of Tiraqueau's book above cited, his friend Geoffroy d'Estissac procured from Clement VII. an indult, licensing a change of order and of abode for Rabelais. From a Franciscan he became a Benedictine, and from Fontenay he moved to Maillezais, of which Geoffroy d'Estissac was bishop. But even this learned and hospitable retreat did not apparently satisfy Rabelais. In or before 1 530 he left Maillezais, abandoned his Benedictine garb for that of a secular priest, and, ae he himself puts it in his subsequent Supplicatio pro Apostasia to Pope Paul III., " per seculum diu vagatus fuit." For a time the Du Bellays provided him with an abode near their own chateau of Langey. He is met at Montpellier in the year just mentioned. He entered the faculty of medicine there on the 16th of September and became bachelor on the 1st of November, a remarkably short interval, which shows what was thought of his acquire- ments. Early in 1531 he lectured publicly on Galen and Hippocrates, while his more serious pursuits seem to have been chequered by acting in a morale comMie, then a very frequent university amusement. Visits to the lies d'Hieres, and the composition of a fish sauce in imitation of the ancient garum, which he sent to his friend Etienne Dolet, are associated, not very certainly, with his stay at Montpellier, which, lasting rather more than a year at first, was renewed at intervals for several years.

In 1532, however, he had moved from Montpellier to Lyons. Here he plunged into manifold work, literary and professional. He was appointed before the beginning of November physician to the Hotel Dieu, with a salary of forty livres per annum, and lectured on anatomy with demonstrations from the human subject. He edited for Sebastian Gryphius, in the single year 1532, the medical Epistles of Giovanni Manardi, the Aphorisms of Hippocrates, with the Ars Parva of Galen, and an edition of two supposed Latin documents, which, however, happened unluckily to be forgeries.

At this time Lyons was the centre and to a great extent the headquarters of

an unusually enlightened society, and indirectly it is clear that Rabelais became intimate with this society. A manuscript distich, which was found in the Toulouse library, deals with the death of an infant named Theodule, whose country was Lyons and his father Rabelais, but we know nothing more about the matter. What makes the Lyons sojourn of the greatest real importance is that at this time probably appeared the beginnings of the work which was to make Rabelais immortal. It is necessary to say " probably," because the strange uncertainty which rests on so much of his life and writings exists here also. There is no doubt that both Gargantua and Pantagruel were popular names of giants in the Middle Ages, though, curiously enough, no mention of the former in French literature much before Rabelais's time has been traced. In 1526, however, Charles de Bordigne, in a satiric work of no great merit, entitled la Legende de Pierre Faifeu, has the name Gargantua with an allusion, and in 1532 (if not earlier) there appeared at Lyons les Grandes et inestimables chroniques du grand et tnorme giant Gargantua. This is a short book on the plan of the later burlesques and romances of the Round Table. Arthur and Merlin appear with Grantgosier, as he is here spelt, Galemelle (Gargamelle), Gargantua himself.

and the terrible mare. But there is no trace of the action or other characters of Gargantua that was to be, nor is the manner of the piece in the least worthy of Rabelais. No one supposes that he wrote it, though it has been supposed that he edited it and that in reality it is older than 1532, and may be the direct subject of Bordigne's allusion six years earlier. What does, however, seem probable is that the first book of Pantagruel (the second of the whole work) was composed with a definite view to this chap book and not to the existing first book of Gargantua, which was written afterwards, when Rabelais dis- covered the popularity of his work and felt that it ought to have some worthier starting-point than the Grandes chronlques. The earliest known and dated edition of Pantagruel is of 1533, of Gargantua 1535, though this would not be of itself conclusive, especially as we actually possess editions of both which, though undated, seem to be earlier. But the definite description of Gargantua in the title as " Pere de Pantagruel," the omission of the words " second livre " in the title of the first book of Pantagruel while the second and third are duly entitled " tiers " and " quart," the remarkable fact that one of the most im- portant personages, Friar John, is absent from book ii., the first of Pantagruel, though he appears in book i. {Gargantua), and .many other proofs show the order of publication clearly enough. There is also in existence a letter of Calvin, dated 1533, in which he speaks of Pantagruel, but not of

Gargantua, as having been condemned as an obscene book. Besides this, 1533 saw the publication of an almanac, the first of a long series which exists only in titles and fragments, and of the amusing Prognostication Pantagrueline (still, be it observed, Pantagrueline, not Gargantuine). Both this and Pantagruel itself were published under the anagrammatic pseudonym of " Alcofribas Nasier," shortened to the first word only in the case of the Prognostication.

This busy and interesting period of Rabelais's life was brought to a close apparently by his introduction or reintroduction to Jean du Bellay, who, in October 1533, passing through Lyons on an embassy to Rome, engaged Rabelais as physician. The visit did not last very long, but it left literary results in an edition of a description of Rome by Marliani, which Rabelais published in September 1534. It is also thought that the first edition of Gargantua may have appeared this year.

In the spring of 153 s the authorities of the Lyons hospital, considering that Rabelais had twice absented himself without leave, elected Pierre de Castel in his room; but the documents which exist do not seem to infer that any blame was thought due to him, and the appointment of his successor was once definitely postponed in case he should return. At the end of 1535 Rabelais once more accompanied Jean du Bellay, now a cardinal, to Rome and stayed there till April in the next year. This stay furnishes some biographical documents of importance in the shape of letters to Geoffroy d'Estissac, of the already-mentioned Supplicaiio pro Apostasia, and of the bull of absolution which was the reply to it. This bull not only freed Rabelais from ecclesiastical censure, but gave him the right to return to the order of St Benedict when he chose, and to practise medicine. He took advantage of this bull and became a canon of St Maur. In 1537 he took his doctor's degree at Montpellier, lectured on the Greek text of Hippocrates, and next year made a public anatomical demonstration. During these two years he seems to have resided either at Montpellier or at Lyons. But in 1539 he entered the service of Guillaume du Bellay-Langey, elder brother of Jean, and would appear to have been with him (he was governor of Piedmont) till his death on 9th January 1543. Rabelais wrote a panegyrical memoir of Guillaume, which is lost, and the year before saw the publication of an edition of Gargantua and Pantagruel, book i., together (both had been repeatedly reprinted separately), in which some dangerous expressions were cut away. Nothing at all is known of his life, whereabouts, or occupations till the publication of the third book, which appeared in 1546, " avec privilege du roi," which had been given in September 1545.

Up to this time Rabelais, despite the condemnation of the Sorbonne referred to above, had experienced nothing like persecution or difficulty. Even the

spiteful or treacherous act of Dolet, who in 1542 reprinted the earlier form of the books which Rabelais had just slightly modified, seems to have done him no harm. But the storm of persecution which towards the end of the reign of Francis I. was fatal to Dolet himself and to Des Periers, while it exiled and virtually killed Marot, threatened him. There is no positive evidence of any measures taken or threatened against him; but it is certain that he passed nearly the whole of 1546 and part of 1547 at Metz in Lorraine as physician to the town at the salary of 120 livres, and Sturm speaks of him as having been "cast out of France by the times " (with the exclamation ev tcop Xpbvwv) in a contemporary letter, and says that he himself in another letter gives a doleful account of his pecuniary affairs and asks for assistance. At Francis's death on 31st March 1547 Du Bellay went to Rome, and at some time not certain Rabelais joined him. He was certainly there in February 1549, when he dates from Du Bellay's palace a little account of the festivals given at Rome to celebrate the birth of the second son of Henry II. and Catherine de' Medici. This account, the Sciomachie as it is called, is extant. In the same year a monk of Fontevrault, Gabriel du Puits-Herbault, made in a book called Theotimus the first of the many attacks on Rabelais. It is, however, as vague as it is violent, and it does not seem to have had any effect. Rabelais had indeed again made for himself protectors whom no clerical or Sorbonist jealousy could touch. The Sciomachie was written to the cardinal of Guise, whose family were all-powerful at court, and Rabelais dedicated his next book to Odet de Chatillon, afterwards cardinal, a man of great influence. Thus Rabelais was able to return to France, and in 1550 was presented to the livings of Meudon and St Christophe de Jambet. It may, however, surprise those who have been accustomed to hear him spoken of as " cure de Meudon," and who have read lives of him founded on legend, to find that there is very little ground for believing that he ever officiated or resided there. He certainly held the living but two years, resigning it in January 1552 along with his other benefice, and it is noteworthy that at the episcopal visitation of 1 55 1 he was not present. To this supposed residence at Meudon and to the previous stay at Rome, however, are attached two of the most mischievous items of the legend, though fortunately two of the most easily refutable. It is said that Rabelais met and quarrelled with Joachim du Bellay the poet at Rome, and with Ronsard at Meudon and elsewhere, that this caused a breach between him, and the Pleiade, that he satirized its classicizing tendencies in the episode of the Limousin scholar, . and that Ronsard after his death avenged himself by a libellous epitaph. The facts are these. Nothing is heard of the quarrel with Du Bellay or of any meeting with him, nothing of the meetings and bickerings with Ronsard, till 1697, when Bernier tells the story without any authority. The supposed allusions to the P16iade date from a time when Ronsard was a small boy, and are mainly borrowed from an earlier writer

still, Geoffroy Tory. Lastly, the epitaph, read impartially, is not libellous at all, but simply takes up the vein of the opening scenes of Gargantua in reference to Gargantua's author. There is indeed no reason to suppose that either Ronsard or Du Bellay was a fervent admirer of Rabelais, for they belonged to a very different literary school; but there is absolutely no evidence of any enmity between them, and Du Bellay actually refers to Rabelais with admiration.

Some chapters of Rabelais's fourth book had been published in 1548, but the whole did not appear till 1552. The Sorbonne censured it and the parliament suspended the sale, taking advantage of the king's absence from Paris. But it was soon relieved of the suspension. He died, it is said, on the 9th of April 1553, but actual history is quite silent save on the point that he was not alive in May of the next year, and the legends about his deathbed utterances — " La farce est jouee," " Je vais chercher un grand peut-etre," &c. — are altogether

apocryphal. The same may be said of the numerous silly stories told of his life, such as that of his procuring a free passage to Paris by inscribing packets " Poison for the king," and so forth.

Ten years after the publication of the fourth book and nine after the supposed date of the author's death there appeared at Lyons sixteen chapters entitled it'le sonnante par maistre Francois Rabelais, and two years later the entire fifth book was printed as such. In 1567 it took place with the others, and has ever since appeared with them. But from the beginning of the 17th century there have never been wanting disbelievers in its authenticity. The controversy is one of some intricacy, but as it is also one of capital importance in literary history the heads of it at least must be given here. The opponents of the book rely (1) on the testimony of a certain Louis Guyon, who in 1604 declared that the fifth book was made long after Rabelais's death by an author whom he knew, and who was not a doctor, and on the assertion of the bibliographer Du Verdier, about the same time, that it was written by an " ecolier de Valence "; (2) on the fact that the anti-monastic and even anti-Catholic polemic is much more accentuated in it; (3) on the arguments that parts are apparently replicas or rough drafts of passages already appearing in the four earlier books; and (4) that some allusions are manifestly posterior to even the furthest date which can be assigned for the reputed author's decease. On the other hand, it is urged that, though Guyon and Du Verdier were in a sense contemporaries, they wrote long after the events, and that the testimony of

the former is vitiated, not merely by its extreme vagueness, but by the fact that it occurs in a plaidoycr, tending to exculpate physicians from the charge of unorthodoxy; that Du Verdier in another place assigns the Pantagrueline Prognostication to this same unknown student of Valence, and had therefore probably confused and hearsay notions on the subject; that the rasher and fiercer tone, as well as the apparent repetitions, are sufficiently accounted for on the supposition that Rabelais never finally revised the book, which indeed dates show that he, could not have done, as the fourth was not finally settled till just before his death; and that it is perfectly probable, and indeed almost certain, that it was prepared from his papers by another hand, which is responsible for the anachronous allusions above referred to. But the strongest argument, and one which has never been attacked by authorities really competent to judge, is that the " griffe de l'aigle " is on the book, and that no known author of the time except Rabelais was capable of writing the passage about the Chats fourres, the better part of the history of Queen Whims (La Quinte) and her court, and the conclusion giving the Oracle of the Bottle. To this argument we believe that the more competent a critic is, both by general faculty of appreciation and by acquaintance with contemporary French literature, the more positive will be the assent that he yields. The reader must, however, be on his guard against confusing the authenticity of the fifth book generally with that of supposed early copies of it. Quite recently it was announced that an edition of 1549 had turned up in Germany; but the investigations of M. R. Stein, un Rabelais apocryphe (1001), repeated and confirmed by M. A. Lefranc in the Revue des etudes Rabelaisiennes (1905), disposed of the matter. The substance of the apocryphal document is quite different from our fifth book.

Gargantua and Pantagruel, notwithstanding their high literary standing and the frequency with which certain passages from them are cited, are, owing partly to their archaism of language and partly to the extreme licence which their author has allowed himself, so little read that no notice of them or of him could be complete without some sketch of their contents. The first book, Gargantua, describes the birth of that hero (a giant and the son of gigantic parents), whose nativity is ushered in by the account of a tremendous feast. In this the burlesque exaggeration of the pleasures of eating and drinking, which is one of the chief exterior notes of the whole work, is pushed to an extreme — an extreme which has attracted natural but perhaps undue attention. Very early, however, the author becomes serious in contrasting the early

education of his hero — a satire on the degraded schools of the middle ages — with its subsequent and reformed stage, in the account of which all the best and noblest ideas of the humanist Renaissance in reference to pedagogy are put with exceptional force. Gargantua is recalled from Paris,

whither he had been sent to finish his educa- tion, owing to a war between his father, Grandgosier, and the neighbouring king, Picrochole. This war is described at great length, the chief hero of it being the monk, Friar John, a very unclerical cleric, in whom Rabelais greatly delights. Picrochole defeated and peace made, Gargantua establishes the abbey of Thelema in another of Rabelais's most elaborate literary passages, where all the points most obnoxious to him in monastic life are indicated by the assignment of their exact opposites to this model convent. The second book, which introduces the principal hero of the whole, Pantagruel, Gargantua's son, is, on any other hypothesis but thit already suggested of its prior composition, very difficult to explain, but in itself it is intelligible enough. Pantagruel goes through something like a second edition (really a first) of the educational experiences of his father. Like him, he goes to Paris, and there meets with Panurge, the principal triumph of Rabelaisian character-drawing, and the most original as well as puzzling figure of the book. Panurge has almost all intellectual accomplishments, but is totally devoid of morality: he is a coward, a drunkard, a lecher, a spiteful trickster, a spendthrift, but all the while infinitely amusing. This book, like the other, has a war in its latter part ; Gargantua scarcely appears in it and Friar John not at all. It is not till the opening of the third book that the most important action begins. This arises from Panurge's determination to marry — a determination, however, which is very half-hearted, and which leads him to consult a vast number of authorities, each giving occasion for satire of a more or less complicated kind. At last it is determined that Pantagruel and his followers (Friar John has reappeared in the suite of the prince) shall set sail to consult the Oracle of the Dive Bouteille. The book ends with the obscurest passage of the whole, an elaborate eulogy of the " herb pantagruelion," which appears to be, if it is anything, hemp. Only two probable explanations of this have been offered, the one seeing in it an anticipation of Joseph de Maistre's glorification of the executioner, the other a eulogy of work, hemp being on the whole the most serviceable of vegetable products for that purpose. The fourth and fifth books are entirely taken up with a description of the voyage. Many strange places with stranger names are visited, some of them offering obvious satire on human institutions, others, except by the most far-fetched explanations, resolvable into nothing but sheer extravaganza. At last the Land of Lanterns, borrowed from Lucian, is reached, and the Oracle of the Bottle is consulted. This yields the single word " Trinq," which the attendant priestess declares to be the most gracious and intelligible she has ever heard from it. Panurge takes this as a sanction of his marriage, and the book ends abruptly. This singular romance is diversified by, or, to speak more properly, it is the vehicle of the most bewildering abundance of digression, burlesque amplification, covert satire on things political, social and religious, miscellaneous erudition of the literary and scientific kind.

Everywhere the author lays stress on the excellence of " Pantagruelism," and the reader who is himself a Pantagruelist (it is perfectly idle for any other to attempt the book) soon discovers what this means. It is, in plain English, humour. The definition of humour is a generally acknowledged crux, and till it is defined the definition of Pantagruelism will be in the same position. But that it consists in the extension of a wide sympathy to all human affairs, together with a comprehension of their vanity, may be said as safely as anything else. Moroseness and dogmatism are as far from the Pantagruelism of Rabelais as maudlin sentimentality or dilettantism. Perhaps the chief things lacking in his attitude are, in the first place, reverence, of which, however, from a few passages, it is clear he was by no means totally devoid, and secondly, an appreciation of passion and poetry. Here and there there are touches of the latter, as in the portrait of Quint-essence, but passion is everywhere absent — an absence for which the comic structure and plan of the book do not by any means supply a complete explanation.

For a general estimate of Rabelais's literary character and in- fluence the reader may be referred to the article French Literature. But some detailed remarks must be given here. There are three questions without the discussion of which this notice of one of the foremost writers of the world would not be worthy of its present place. These are — What is the general drift and purpose of Gargantua and Pantagruel, supposing there to be any? What defence can be offered, if any defence is needed, for the extra-ordinary licence of language and imagery which the author has permitted himself? What was his attitude towards the great questions of religion, philosophy and politics? These questions succeed each other in the order of reason, and the answer to each assists the resolution of the next.

There have been few more remarkable instances of the lues commentatoria than the work of the editors of Rabelais. Almost every one appears to have started with a Rabelais ready made in his head, and to have, so to speak, read that Rabelais into the book. Those who have not done this, like Le Duchat, Motteux

and Esmangart, have generally committed the error of tormenting themselves and their author to find individual explanations of personages and events. The extravagance of the last-named commentator takes the form of seeing elaborate allegories; that of some others devotes itself chiefly

to identifying the characters of the romance with more or less famous historical persons. But the first blunder, that of forming a general hypothetical conception of Rabelais and then adjusting interpretation of the work to it, is the commoner. This conception, however, has singularly varied. According to some expositors, among whom one of the latest and not the least respectable is M. Fleury, Rabelais is a sober reformer, an apostle of earnest work, of sound education, of rational if not dogmatic religion, who wraps up his morals in a farcical envelope artly to make them go down with the vulgar and partly to shield imself from the consequences of his reforming zeal. According to others, of whom we have had in England a distinguished example in Sir Walter Besant, Rabelais is all this but with a difference. He is not religious at all; he is more or less anti-religious; and his book is more or less of a general protest against any attempt to explain supernaturally the riddle of the earth. According to a third class, the most distinguished recent representative of which was M. Paul Lacroix, the Rabelaisian legend does not so much err in principle as it invents in fact. Rabelais is the incarnation of the " esprit Gaulois," a jovial, careless soul, not destitute of common sense or even acute intellectual power, but first of all a good fellow, rather preferring a broad jest to a 'fine-pointed one, and rollicking through life like a good-natured undergraduate. Of all these views it may be said that those who hold them are obliged to shut their eyes to many things in the book and to see in it many which are not there. The religious part of the matter will be dealt with presently ; but it is impossible to think that any unbiased judge reading Rabelais can hold the grave-philosopher view or the reckless-good- fellow view without modifications and allowances which practically deprive either of any value. Those who, as it has been happily put, identify Rabelais with Pantagruel, strive in vain, on any view intellectually consistent or morally respectable, to account for the vast ocean of pure or impure laughter and foolery which surrounds the few solid islets of sense and reason and devotion. Those who in the same way identify Rabelais with Panurge can never explain the education scheme, the solemn apparition of Gargantua among the farcical and fantastic variations on Panurge's wedding, and many other passages; while, on the other hand, those who insist on a definite propaganda of any kind must justify themselves by their own power of seeing things invisible to plain men. But these vagaries are not only unjustifiable; they are entirely unnecessary. No one reading Rabelais without parti pris, but with a good know- ledge of the history and literature of his own times and the times which preceded him, can have much difficulty in appreciating his book. He had evidently during his long and studious sojourn in the cloister (a sojourn which was certainly not less than five-and- twenty years, while it may have been five-and-thirty, and of which the studiousness rests not on legend but on documentary evidence) acquired a vast stock of learning. He was, it is clear, thoroughly penetrated

with the instincts, the hopes, and the ideas of the Renaissance in the form which it took in France, in England and in Germany — a form, that is to say, not merely humanist but full of aspirations for social and political improvement, and above all for a joyous, varied, and non-ascetic life. He had thoroughly convinced himself of the abuses to which monachism lent itself. Lastly, he had the spirit of lively satire and of willingness desipere in loco which frequently goes with the love of books. It is in the highest degree improbable that in beginning his great work he had any definite purpose or intention. The habit of burlesquing the romans d'aventures was no new one, and the form lent itself easily to the two literary exercises to which he was most disposed — apt and quaint citation from and variation on the classics and satirical criticism of the life he saw around him. The immense popularity of the first two parts induced him to continue them, and by degrees (the genuineness of the fifth book, at any rate in substance, is here assumed) the possibility of giving the whole something like a consistent form and a regular conclusion presented itself to him. The voyage in particular allowed the widest licence of satirical allusion, and he availed himself of that licence in the widest sense. Here and there persons are glanced at, while the whole scenery of his birthplace and its neighbourhood is curiously worked in; but for the most part the satire is typical rather than individual, and it is on the whole a rather negative satire. In only two points can Rabelais be said to be definitely polemic. He certainly hated the monkish system in the debased form in which it existed in his time; he as certainly hated the brutish ignorance into which the earlier systems of education had suffered too many of their teachers and scholars to drop. At these two things he was never tired of striking, but elsewhere, even in the grim satire of the Chats fourres, he is the satirist proper rather than the reformer. It is in the very absence of any cramping or limiting purpose that the great merit and value of the book consist. It holds up an almost perfectly level and spotless mirror to the temper of the earlier Renaissance. The author has no universal medicine of his own (except Pantagruelism) to offer, nor has he anybody else's universal

medicine to attack. He ranges freely about the world, touching the laughable sides of things with kindly laughter, and every now and then dropping the risibile and taking to the rationale. It is not indeed possible to deny that in the Oracle of the Bottle, besides its merely jocular and fantastic sense, there is a certain " echo," as it has been called, " of the conclusion of the preacher," a certain acknowledgment of the vanity of things. But in such a book such a note could hardly be wanting unless the writer had been a fanatic, which he was not, or a mere voluptuary, which he was not, or a dullard, which he was least of all. It is, after all, little more than a suggestion, and is certainly not strengthened by anything in the body of the work. Rabelais is, in short, if he be read without prejudice,

a humorist pure and simple, feeling often in earnest, thinking almost always in jest. He is distinguished from the two men who alone can be compared with him in character of work and force of genius combined — Lucian and Swift — by very marked characteristics. He is much less of a mere mocker than Lucian, and he is entirely destitute, even when he deals with monks or pedants, of the ferocity of Swift. He neither sneers nor rages; the rire immense which distinguishes him is altogether good-natured ; but he is nearer to Lucian than to Swift, and Lucian is perhaps the author whom it is most necessary to know in order to under- stand him rightly.

If this general view is correct it will probably condition to some extent the answer to be given to the two minor questions stated above. The first is connected with the great blemish of Gargantua and Pantagruel — their extreme coarseness of language and imagery. It is somewhat curious that some of those who claim Rabelais as an enemy of the supernatural in general have been the loudest to condemn this blemish, and that some of them have made the exceedingly lame excuse for him that it was a means of wrapping up his propaganda and keeping it and himself safe from the notice of the powers that were. This is not complimentary to Rabelais, and, except in some very small degree, it is not likely to be true. For as a matter of fact obscenity no less than impiety was charged against him by his ultra-orthodox enemies, and the obscenity no less than the supposed impiety gave them a handle against him before such bodies as the Sorbonne and the parliaments. As for the extreme theory of the anti-Rabelaisians, that Rabelais was a " dirty old blackguard " who liked filth and wallowed in it from choice, that hardly needs comment. His errors in this way are of course, looked at from an absolute standard, unpardonable. But judged relatively there are several, we shall not say excuses, but explanations of them. In the first place, the comparative in- decency of Rabelais has been much exaggerated by persons unfamiliar with early French literature. The form of his book was above all things popular, and the popular French literature of the middle ages as distinguished from the courtly and literary literature, which was singularly pure, can hardly be exceeded in point of coarse- ness. The fabliaux, the early burlesque romances of the Audigier class, the farces of the 15th century, equal (the grotesque iteration and amplification which is the note of Gargantua and Pantagruel being allowed for, and sometimes without that allowance) the coarsest passages of Rabelais. His coarseness, moreover, disgusting as it is, has nothing of the corruption of refined voluptuousness about it, and nothing of the sniggering indecency which disgraces men like Pope, like Voltaire, and like Sterne. It shows in its author a want of reverence, a want of decency in the proper sense, a too great readiness to condescend to the easiest kind of ludicrous ideas and the kind most acceptable at that time to the common run of mankind. The general taste having been considerably refined since,

Rabelais has in parts become nearly unreadable — the worst and most appropriate punishment for his faults. As for those who have tried to make his indecency an argument for his laxity in religious principle, that argument, like another mentioned previously, hardly needs discussion. It is notoriously false as a matter of experience. Rabelais could not have written as he has written in this respect and in others if he had been an earnestly pious person, taking heed to every act and word, and studious equally not to offend and not to cause offence. But no one in his senses would dream of claiming any such character for him.

This brings us to the last point — what his religious opinions were. He has been claimed as a free-thinker of all shades, from undogmatic theism to atheism, and as a concealed Protestant. The last of these claims has now been very generally given up, and indeed Erasmus might quite as reasonably be claimed for the Reformation as Rabelais. Both disliked and attacked the more crying abuses of their church, and both at the time and since have been disliked and attacked by the more imprudent partisans of that church. But Rabelais, in his own way, held off from the Reformation even more distinctly than Erasmus did. The accusation of free-thinking, if not of directly anti-Christian thinking, has always been more common and has recently found much favour. It is, however, remarkable that those who hold this opinion never give chapter and verse for it, and it may be said confidently that chapter and verse cannot be given. The sayings attributed to Rabelais which colour the idea (such as the famous " Je vais chercher un grand peut-ltre," said to have been uttered on his death-bed) are, as has been said, purely apocryphal. In the book itself nothing

of the kind is to be found. Perhaps the nearest approach to it is a jest at the Sorbonne couched in the Pauline phrase about " the evidence of things not seen," which the author removed from the later editions. But irreverences of this kind, as well as the frequent burlesque citations of the Bible, whether commendable or not, had been, were, have since been, and are common in writers whose orthodoxy is unquestioned; and it must be remembered that the later Middle Age, which in many respects Rabelais represents almost more than he does the Renaissance, was, with all its un-questioning faith, singularly reckless and, to our fancy, irreverent in its use of the sacred words and images, which were to it the most familiar of all images and words. On the other hand, there are in the book, in the description of Gargantua's and Pantagruel's education, in the sketch of the abbey of Thelema, in several passages relating to Pantagruel, expressions which either signify a sincere and unfeigned piety of a simple kind or else

are inventions of the most detestable hypocrisy. For these passages are not, like many to be found from the Renaissance to the end of the 18th century, obvious flags of truce to cover attacks — mere bowings in the house of Rimmon to prevent evil consequences. There is absolutely no sign of the tongue in the cheek. They are always written in the author's highest style, a style perfectly eloquent and unaffected; they can only be interpreted (on the free-thinking hypothesis) as allegorical with the greatest difficulty and obscurity, and it is pretty certain that no one reading the book without a thesis to prove would dream of taking them in a non-natural sense. It is not, indeed, to be contended that Rabelais was a man with whom religion was in detail a constant thought, that he had a very tender conscience or a very scrupulous orthodoxy. His form of religious sentiment was not evangelical or mystical, any more than it was ascetic or ceremonial or dogmatic. As regards one of the accepted doctrines of his own church, the excellence of the celibate life, of poverty, and of elaborate obedience to a rule, he no doubt was a strong dissident; but the evidence that, as a Christian, he was unorthodox, that he was even a heretical or latitudinarian thinker in regard to those doctrines which the various Christian churches have in common, is not merely weak, it is practically non- existent. The counter-testimony is, indeed, not very strong, and still less detailed. But that is not the point. It is sufficient to say that there is absolutely nothing within the covers of Rabelais's works incompatible with an orthodoxy which would be recognized as sufficient by Christendom at large, leaving out of the question those points of doctrine and practice on which Christians differ. Beyond this no wise man will go, and short of it hardly any un- prejudiced man will stop.

Bibliography. — The dates of the original editions of Rabelais's works have been given where possible already. The earlier books were repeatedly reissued during the author's life, and always with some correction. What may be called the first complete edition appeared in 1567 at Lyons, published by Jean Martin. It is com- puted that no less than sixty editions were printed before the close of the 16th century. A very considerable time, however, elapsed before the works were, properly speaking, edited. Huet devoted much pains to them, but his results were not made public. The first edition which calls for notice, except in a complete biblio- graphy, is that of Le Duchat (Amsterdam, 171 1). Le Duchat was a very careful student, and on the whole a very efficient editor, being perhaps, of the group of students of old French at the beginning of the 1 8th century, which included La Monnoye and others, the most sober, critical and accomplished. But at that time the knowledge of the period was scarcely far enough advanced. The next important date in the bibliography of Rabelais is 1823, in which year appeared the most elaborate edition of his work yet published, that of Esmangart and Johanneau (9 vols.), including for the first time the Songes

Drolatiques, a spurious but early and not uninteresting collection of grotesque figure drawings illus- trating Gargantua and Pantagruel, and the second edition of M. de l'Aulnaye, containing a bad text but a useful glossary. From this time the editions have been very numerous. Among them may be mentioned those illustrated by Gustave Dore, first on a small scale (1854), afterwards more elaborately (1870); that of the Collection Didot by Burgaud des Marets and Rathery (1857 and later); the Bibliotheque Elzevirienne edition by MM. Lacour and A. de Montaiglon; that of the Nouvelle Collection Jannet (seven small volumes, 1867-74), completed by M. Moland and very useful; and lastly, the edition of M. Marty-Laveaux in the Collection Lemerre (1868-1903), the handsomest, the most accurate, and the most complete, in the scholarly sense, yet published. Commentaries on Rabelais, independent of editions, have been numerous from the work of Jean Bernier, Jugement el nouvelles observations sur les ceuvres . . . de M. Francois Rabelais (1697), onwards. Of those of the last half-century the best are, besides essays in the works of most of the great critics: E. Noel, Rabelais (1850); A. Mayrargues, Rabelais (1868); Jean Fleury (1876); Paul Stapfer (the best of all) (1889); and G. Vallat (1899). Separate points have been treated importantly by A. Heulhard, Dernieres annees de Rabelais (1884), and others; while the Revue des etudes Rabelaisiennes (1903 onwards) contains valuable studies, especially those' of M. Abel Lefranc. Rabelais was very early popular in England. There are possible

allusions to him in Shakespeare, and the current clerical notion of him is very unjustly adopted by Marston in the words " wicked Rabelais " ; but Bacon described him better as the great jester of France, and a Scot, Sir Thomas Urquhart, translated the earlier books in 1653. This was not worthily completed till the luckless Motteux, or, as his compatriots call him, Le Motteux, finished it with an extensive commentary. It has been frequently reprinted. A new translation by W. F. Smith appeared in 1893. Criticism of a scattered kind on Rabelais in English is abundant, that of Coleridge being the most important, while the constant evidence of his influence in Southey's Doctor is also noteworthy. But he was hardly treated as a whole before Sir Walter Besant's book on the subject in the " Foreign Classics for English Readers "(1879), which the author followed up with Readings from Rabelais (1883). Somewhat elaborate treatments of him in connexion with contem- porary literature will be found in George Saintsbury's The Earlier Renaissance (1901) and in A. Tilley's Literature of the French Renaissance (1904). (G. Sa.)

RABENER, GOTTLIEB WILHELM (1714-1771), German satirist, was born on the 17th of September 17 14 at Wachau near Leipzig, and died at Dresden on the 22nd of March 1771. In 1 741 he made his debut as satirist in Schwabe's Belusligungen des Verstandes und Witzes, and was

subsequently a contributor to the Bremer Beitrdge. Rabener's satires are in prose and mainly levelled at the follies of the middle classes. The papers which he published in the Bremer Beitrdge were subsequently collected in a Sammlung satirischer Schriften (2 vols., 1751), to which two volumes were added in 1755.

Rabener's Samtliche Werke appeared in 6 vols, in 1777; the edition by E. Ortlepp (1839) also contains his correspondence, first published by C. F. Weisse in 1772. See P. Richter, Rabener und Liscow (1884), and D. Jacoby in Allg. Deutsche Biographie (1888).

RABIRIUS, a Latin epic poet of the age of Augustus. Among the papyrus fragments discovered at Herculaneum in the early part of the 19th century were sixty-seven (mutilated) hexa- meters, referring to the final struggle between Antony and Octavian and the death of Cleopatra, generally supposed to be part of a poem by Rabirius, since Seneca (De Benef. vi. 3, 1) informs us that he wrote on those subjects. If genuine, they justify the qualified commendation of Quintilian rather than the exaggerated praise of Velleius Paterculus (ii. 36, 3), who couples Rabirius and Virgil as the two most eminent poets of his time.

Fragments in E. Bahrens, Fragmenta Poetarum Romanorum (1885); W. Scott, Fragmenta Herculanensia (Oxford, 1885); O. Ribbeck, Geschichte der romischen Dichtung, ii, (1889); M. Schanz, Geschichte der romischen Litteratur, ii. 1 (1899); Teuffel, Hist, of Roman Literature (Eng. trans., 1900), 252, 9.

RABIRIUS, GAIUS, a Roman senator, who was defended (63 B.C.) by Cicero in a speech still extant. Nearly forty years after the death of L. Appuleius Saturninus, Titus Labienus (whose uncle had lost his life among the followers of Saturninus on that occasion) was put up by Caesar to accuse Rabirius of having been implicated in the murder. Caesar's real object was to warn the Senate against interference by force with popular movements, to uphold the sovereignty of the people and the inviolability of the person of the tribunes. The obsolete accusa- tion of perduellio was revived, and the case was heard before Julius and Lucius Caesar as commissioners specially appointed (duoviri perduellionis) . Rabirius was condemned, and the people, to whom the accused had exercised the right of appeal, were on the point of ratifying the decision, when Metellus Celer pulled down the military flag from the Janiculum, which was equivalent to the dissolution of the assembly. Caesar's object having been attained, the matter was then allowed to drop.

A nephew, known as C. Rabirius Postumtjs, was also defended by Cicero (54 B.C.) in the extant speech Pro Rabirio Postumo, when charged with

extortion in Egypt and complicity with Aulus Gabinius (q.v.).

See Cicero, Pro Rabirio, ed. W. E. Heitland (1882) ; Dio Cassius, xxxvii. 26-38 ; H. Putsche, Uber das genus judicii der Rede Ciceros pro C. Rabirio (Jena, 1881); O. Schulthess, Der Prozess des C. Rabirius (Frauenfeld, 1891).

RACAN, HONORfi DE BUEIL, MAEquis de (1589-1670), French poet, was born at the chateau of La Roche-Racan in 1589. He became page at the court of Henry IV. and then entered the army, seeing some active service. Racan was very poor and was practically uneducated, for, if his own account

may be credited, he had not learnt even Latin. But in middle life he inherited some property, and he was thus able to devote himself to the practice of poetry, in which he was the faithful, and perhaps the most distinguished, disciple of Malherbe. He had known Malherbe when he was a page at the court of Henry IV., and had early contributed to the fashionable albums of the day. In 1625 he published his most important work, Bergeries, a dramatic pastoral in five acts, a part of which, entitled Arthenice, was played in 1618. Racan was also the author of Sept psaumes (163 1), Odes sacrees tirees des psaumes de David (1651), Dernieres eeuvres et poesies chretiennes (1660), in all of which he was hampered by his inability to read the sacred writings except in other French paraphrases. He was one of the original members of the French Academy. He died in February 1670.

His CEuvres completes were edited by Tenant de Latour in 1857, and the edition includes a biographical notice. See Sainte-Beuve, Causeries du lundi.

RACCONIGI, a town of Piedmont, Italy, in the province of Cuneo, 24 m. S. of Turin, and 31 m. N. of Cuneo by rail, 837 ft. above sea-level. Pop. (1001) 7364 (town); 9077 (commune). It has a royal chateau built in 1.570, with a large park laid out in 1755 by the French gardener Molard from designs by Le Notre, and enlarged in 1835. Since 1901 it has been the summer residence of the king of Italy.

RACCOON (or Racoon), a name borne by the typical repre- sentative of a group of American arboreal placental mammals belonging to the order Carnivora (q.v.) and the family Procyonidae. The word is a corruption of the North-American Indian " arrathkune " or " arathcone." The Fr. ralon

or raton laveur, Ger. Wasckbar, and other European names are derived from a curious habit the raccoon has of dipping or washing its food in water before eating it. The typical raccoon (Procyon lotor) is a thickly built animal about the size of a badger, with a coat of long coarse greyish-brown hairs, short ears, and a bushy black-and-white-ringed tail. Its range extends over the whole of the United States, and stretches on the west northwards

The Raccoon {Procyon lotor).

to Alaska and southwards well into Central America, where it attains its maximum size. The following notes on the habits of the raccoon are from Dr C. Hart Merriam's The Mammals of the Adirondacks: —

" Raccoons are omnivorous beasts and feed upon mice, small birds, birds' eggs, turtles and their eggs, frogs, fish, crayfish, molluscs, insects, nuts, fruits, maize and sometimes poultry. Excepting alone the bats and flying-squirrels, they are the most strictly nocturnal of all our mammals, and yet I have several times seen them abroad on cloudy days. They haunt the banks of ponds and streams, and find much of their food in these places, such as crayfish, mussels and fish, although they are unable to dive and pursue the latter under water, like the otter and mink. They are good swimmers and do not hesitate to cross rivers that lie in their path. . . . The raccoon hibernates during the severest part of

the winter, retiring to its nest rather early, and appearing again in February or March, according to the earliness or lateness of the season. It makes its home high up in the hollow of some large tree, preferring a dead limb to the trunk itself. It does little in the way of constructing a nest, and from four to six young are commonly born at a time, generally early in April in this region. The young remain with the mother about a year."

The South-American species, P. cancrivorus , the crab-eating raccoon, is very similar to P. lotor, but differs by its shorter fur, larger size, proportionally more powerful teeth and other minor characters. It extends over the whole of South America, as far south as the Rio Negro, and is common in all suitable localities. Its habits are similar to those of the North-American species.

RACCOON-DOG (Nyclereutes procyonoides) , a small wild dog, with sharp-pointed muzzle, short rounded ears, bushy tail and long fur, found in China, Japan and Amurland. The total length is about 32 in., of which the tail measures 4 in. The prevailing hues are black and dusky yellow, the distribution of which varies in different individuals. In habit these dogs are chiefly nocturnal; and they are said to hibernate. In winter they feed on fish, and in summer on mice, forming small packs to hunt their prey.

RACE, an homonymous word of which the principal meanings are (1) a trial or contest of speed; (2) a tribe, breed, a group of individuals descended from a common ancestor. In the first case the word is an adaptation of O.Nor. rds, a cognate form in O.E. being rah, rush, onset; while the O.E. descendant reese was frequently used in medieval poetry. The particular use of the word for a swift current of water running through a narrow channel, e.g. the Race of Alderney, and for the water conducted in an artificial channel to a point, where its power is to be used, as in " mill-race," may be due to the O.Fr. raz or raze, probably of Breton origin. The second word, an ethnical or national stock, comes from Fr. rase, adapted from Ital. razzo, cf. Span. raza. It has been referred to an O.H.G. reiza, line, mark, cognate with Eng. " write," i.e. the line marking descent.

RACHEL (1821-1858), French actress, whose real name was Elizabeth Felix, the daughter of poor jew pedlars, was born on the 28th of February 182 1, at Mumpf, in the canton of Aargau, Switzerland. At Reims she and her elder sister, Sophia, after- wards known as Sarah, joined a troupe of Italian children who made their living by singing in the cafes, Sarah singing and Elizabeth, then only four years of age, collecting the coppers. In 1830 they came to Paris, where they sang in the streets, Rachel giving such patriotic songs as the Parisienne and the Marseillaise with a rude but precocious energy which evoked special admiration and an abundant shower of coppers. Etienne Choron, a famous teacher of singing, was so impressed with the talents of the two sisters that he undertook to give them gratuitous instruction, and after his death in 1833 they were received into the Conservatoire. Rachel made her first appear- ance at the Gymnase in Paul Duport's La Vendeenne on the 4th of April 1837, with only mediocre success. But on the 12th of June in the following year she succeeded, after great difficulty, in making a dSbut at the Theatre Francais, as Camille in Corneille's Horace, when her remarkable genius at once received general recognition. In the same year she played Roxane in Racine's Bajazet, winning a complete triumph, but it was in Racine's Phedre, which she first played on the 21st of January 1843, that her peculiar gifts were most strikingly manifested. Her range of characters was limited, but within it she was unsurpassable. She excelled particularly in the impersonation of evil or malignant passion, in her presentation of which there was a majesty and dignity which fascinated while it repelled. By careful training her voice, originally hard and harsh, had become flexible and melodious, and its low and muffled notes under the influence of passion possessed a thrilling and pene- trating quality that was irresistible. In plays by contemporary authors she created the characters of Judith and Cleopatra in the tragedies of Madame de Girardin, but perhaps her most successful appearance was in 1849 in Scribe and Legouve's Adrienne Lecouvreur, which was written for her. In 1841 and in 1842 she visited London, where her interpretations of

and Racine were the sensation of the season. In 1855 she made a tour in the United States with comparatively small success, but this was after her powers, through continued ill-health, had begun to deteriorate. She died of consumption at Cannet, near Nice, on the 4th of January 1858, and was buried in the Jewish part of the cemetery of Pere Lachaise in Paris. Rachel's third sister was Lia Felix (q.v.).

See Jules G. Janin, Rachel et la tragedie (1858): Mrs Arthur Kennard, Rachel (Boston, 1888) ; and A. de Faucigny-Lucinge, Rachel et son temps (1910).

RACINE, JEAN (1639-1699), French tragic dramatist, was born at La Ferte Milon in the old duchy of Valois on an uncertain date in December 1639. He was certainly christened on the 22nd, and the ceremony was at that time often, though not invariably, performed on the day of birth. Racine belonged to a family of the upper bourgeoisie, which had indeed been techni- cally ennobled some generations earlier, and bore the punning arms of a rat and a swan {rat, cygne). The poet himself subse- quently dropped the rat. His family were connected with others of the same or a slightly higher station in La Ferte and its neighbourhood — the Desmoulins, the Sconins, the Vitarts, all of whom appear in Racine's life. His mother was Jeanne Sconin. His father, of the same name as himself, was only four-and-twenty at the time of the poet's birth. He seems to have been a soiicitor (procureur) by profession, and held, as his father, the grandfather of the dramatist, had done, the office of controleur au grenier a sel. Racine was the eldest child. Little more than a year afterwards his sister Marie was born and his mother died. Jean Racine the elder married again, but three months later he himself died, and the stepmother is never heard of in connexion with the poet or his sister. They were left without any provision, but their grandparents, Jean Racine the eldest and Marie Desmoulins, were still living, and took charge of them. These grandparents had a daughter, Agnes, who figures in Racine's history. She was a nun and later abbess of Port Royal under the style of Mere de Sainte Thecle, and the whole family had strong Jansenist leanings. Jean Racine the eldest died in 1649, and the poet was sent to the College de Beauvais. This (which was the grammar-school of the town of that name, and not the famous College de Beauvais at Paris) was intimately connected with Port Royal, and to this place Racine was transferred in November 1655. His special masters there were Nicole and Le Maitre. The latter, in an extant letter written to his pupil,

speaks of himself as " votre papa." It is evident from documents that he was a very diligent student both at Beauvais and Port Royal. He wrote verse both in Latin and French, and his Port Royal odes, which it has been the fashion with the more fanatical admirers of his later poetry to ridicule, are far from despicable.

Racine stayed at Port Royal for three years, and left it, when nearly nineteen, in October 1658. He was then entered at the College d'Harcourt and boarded with his second cousin, Nicolas Vitart, steward of the duke of Luynes. Later, if not at first, he lived in the Hotel de Luynes itself. It is to be observed that his Jansenist surroundings continued with him here, for the duke of Luynes was a severe Port Royalist. It is, however, clear from Racine's correspondence, which, as we have it, begins in 1660 and is for some years very abundant and interesting, that he was not at all of an austere disposition at this time. Occasionally the liveliness of the letters passes the bounds of strict decency, though there is nothing very shocking in them, and those to Madame (or, as the habit of the time called her, Mademoiselle) Vitart are free from anything of this kind. It does not appear that Racine read much philosophy, as he should have done, but he occasionally did some business in superintending building operations at Chevreuse, the duke's country house. He would seem, however, to have been already given up irrevocably to literature. This by no means suited the views of his devout relations at Port Royal, and he complains in one of his letters that an unlucky sonnet on Mazarin had brought down on him "excommunications sur excommunica- tions." The marriage of Louis XIV. was the occasion of an

ambitious ode, La nympke de la Seine, which was submitted before publication to Jean Chapelain, the too famous author of the Pucelle. Chapelain made many suggestions which Racine duly adopted. Nor did the ode bound his ambitions, for in 1660 he finished one piece, Amasie, and undertook another, Les Amours d'Ovide, for the theatre. The first, however, was rejected by the actors of the Marais, and it is not certain that the other was ever finished or offered to those of the Hotel de Bourgogne. Racine's letters show that he was intimate with more than one actress at this time; he also made acquaintance with La Fontaine, and the foundations at any rate of the legendary " society of four " (Boileau, La Fontaine, Moliere and Racine) were thus laid.

His relations were pretty certainly alarmed by this very pardonable worldliness, though a severe expostulation with him for keeping company with the abominable actors is perhaps later in date. Racine was accordingly disturbed in his easy- going life at Paris. In November 1661 he went to Uzes in Languedoc to live with his uncle the Pere Sconin, vicar-general of that diocese, whose attempts to secure a benefice for his nephew were,

however, in vain. Racine was back in Paris before the end 'of 1663. His letters from Uzes to La Fontaine, to Le Vasseur, and others are in much the same strain as before, but there is here and there a marked tone of cynicism in them. He also attempted a little courtiership. An ode on the recovery of Louis XIV. from a slight illness probably secured him the promise of a pension, of which he speaks to his sister in the summer of 1664. It is uncertain whether this pension is identical with " gratifications " which we know that Racine for some years received, and which were sometimes eight and sometimes six hundred livres. It would seem not, as one of these gratifications had been allotted to him the year before he so wrote to his sister. The ode in which he thanked the king for his presents, La Renommee, is said to have intro- duced him to Boileau, to whose censorship there is no doubt that he owed much, if not everything; and from this date, November 1663, the familiarity of " the four " seems to have existed in full force. Unfortunately it is precisely at this date that his correspondence ceases, and it is not renewed till after the close of his brief but brilliant career as a dramatist (Esther and Athalie excepted). From this time forward the gossip of the period, and the Life by his son Louis, are the chief sources of information. Unfortunately Louis Racine, though a man of some ability and of unimpeached character, was only six years old when his father died, and had no direct knowledge. Still his account represents family papers and traditions; and seems to have been carefully, as it is certainly in the main impartially, written. From other sources — notably Boileau, Claude Brossette and Jean Baptiste de Valincourt — a good deal of pretty certainly authentic information is obtainable, and there exists a considerable body of correspondence between Boileau and the poet during the last ten years of Racine's life.

The first but the least characteristic of the dramas by which Racine is known, La Thebaide, was finished by the end of 1663, and on Friday 20th June 1664 it was played by Moliere's com- pany at the Palais Royal theatre. Some editors assert that Moliere himself acted in it, but the earliest account of the cast we have, and that is sixty years after date, omits his name, though those of Madeleine Bejard and Mademoiselle de Brie occur. There is also a tradition that Moliere suggested the subject; but Louis Racine distinctly says that his father wrote most of the play at Uzes before he knew Moliere, From Racine's own earlier letters it appears that the play was de- signed for the rival theatre, and that " La Dehanchee," Racine's familiar name for Mademoiselle de Beauchateau, with whom he was intimate, was to play Antigone. The play itself is by far the weakest of Racine's works. He has borrowed much from Euripides and not a little from Jean de Rotrou; and in his general style and plan he has as yet struck out no great variation . from Corneille. It was acted twelve times during the first month, and was occasionally revived during the year following. . This

is apparently the date of the pleasant picture

of the four friends which La Fontaine draws in his Psyche, Racine figuring as Acante, " qui aimait extremement les jardins, les fieurs, les ombrages," in which surroundings he helped to compose the lampoon of C/iapelain decoiffe on a writer who had helped him with criticism, obtained royal gifts for him, and, in a fashion, started him in the literary career.

We have no definite details as to Racine's doings during the year 1664, but in February 1665 he read at the Hotel de Nevers before La Rochefoucauld, Madame de la Fayette, Madame de Sevigne, and other scarcely less redoubtable judges the greater part of his second acted play, Alexandre le Grand, or, as Pomponne (who tells the fact) calls it, Porus. It was anxiously expected by the public, and Moliere's company played it on the 4th of December — Monsieur, his wife Henrietta of England, and many other distinguished persons being present. The gazetteer, Adrien Perdou de Subligny vouches for its success, and the receipts were good and steady. But a fortnight afterwards Alexandre was played, " de complot avec M. Racine," says La Grange, by the rival actors (who had four days before performed it in private) at the H6tel de Bourgogne. A vast amount of ink has been spilt on this question, but no one has produced any valid justification for Racine. That the piece failed at the Palais Royal, as is stated in the earliest attempt to excuse Racine, and the only one made in his lifetime, is not true. His son simply says that he was " mecontent des acteurs," which indeed is self-evident. It is certain that Moliere and he ceased to be friends in consequence of this proceeding; and that Moliere was in fault no one who has studied the character of the two men will easily believe. If, however, Alexandre was the occasion of showing the defects of Racine's character as a man, it raised him vastly in public estimation as a poet. He was now for the first time proposed as a serious rival to Corneille. There is a story that he read the piece to the author of the Cid and asked his verdict. Corneille praised the piece highly, but not as a drama, " II l'assurait qu'il n'etait pas propre a la poesie dramatique." There is no reason for disbelieving this, for the character of Alexander could not fail to shock Corneille, and he was notorious for not mincing his words. The contrast between the two even at this early period was accurately apprehended and put by Saint Evremond in his masterly Dissertation sur I' Alexandre, but this was not published for a year or two. To this day it is the best criticism of the faults of Racine, though not, it may be, of the merits, which had not yet been fully seen. It may be added that in the preface of the printed play the poet showed the extreme sensitiveness

to criticism which perhaps excuses, and which certainly often accompanies, a tendency to criticize others. These defects of character showed themselves still more fully in another matter. The Port Royalists, as has been said, detested the theatre, and in January 1666 Nicole, their chief writer, spoke in one of his Lellres sur les visionnaires, directed against Des- murets de Saint-Sulin, of dramatic poets as " empoisonneurs publics." Racine immediately published a letter to the author. It is very smartly written, and if Racine had contented himself with protesting against the exaggeration of the decriers of the stage there would have been little harm done. But he filled the piece with personalities, telling an absurd story of Mere Angelique Arnauld's supposed intolerance, drawing a ridiculous picture of Le Maitre (a dead man and his own special teacher and friend), and sneering savagely at Nicole himself. The latter made no reply, but two lay adherents of Port Royal took up the quarrel with more zeal than discretion or ability. Racine wrote a second pamphlet as bitter and personal as the first, but less amusing, and was about to publish it when fortu- nately Boileau, who had been absent from Paris, returned and protested against the publication. It remained accord- ingly unprinted till after the author's death, as well as a pre- face to both which he had prepared with a view to publishing them together and so discharging the accumulated resentment arising from a long course of " excommunications.".

After this disagreeable episode Racine's life, for ten years and more, becomes simply the history of his plays, if we except

his liaisons with the actresses Mademoiselle du Pare and Made- moiselle de Champmesle, and his election to the Academy on the 17th of July 1673. Mademoiselle du Pare (marquise de Gorla) was no very great actress, but was very beautiful, and she had previously captivated Moliere. Racine induced her to leave the Palais Royal company and join the Hotel. She died in 1668, and long afterwards the infamous Catherine Voisin accused Racine of having poisoned her. Mademoiselle de Champmesle was plain, but an admirable actress, and ap- parently very attractive in some way, for not merely Racine but Charles de Sevigne and many others adored her. For five years before his marriage Racine seems to have been her amant en litre, but long afterwards, just before his own death, when he heard of her mortal illness, he spoke of her to his son without a flash of tenderness.

The series of his unquestioned dramatic triumphs began with Andromaque, and this play may perhaps dispute with Phedre and Athalie the title of his masterpiece. It is much more uniformly good than Phedre, and the character of Hermione is the most personally interesting on the French tragic stage. It is said that the first representation of Andromaque was on 10th November 1667, in public and by the actors of the Hotel de Bourgogne, but the first contemporary mention of it by the gazettes, prose

and verse, is on the 17th, as performed in the queen's apartment. Perrault, by no means a friendly critic as far as Racine is concerned, says that it made as much noise as the Cid, and so it ought to have done. Whatever may be thought of the tragedie pathetique (a less favourable criticism might call it the " sentimental tragedy "), it could hardly be better exemplified than in this admirable play. A ferocious epigram of Racine's own tells us that some critics thought Pyrrhus too fond of his mistress, and Andromache too fond of her husband, but in the contemporary depreciations is to be found the avowal of its real merit. Pyrrhus was taken by Floridor, the best tragic actor by common consent of his time, and Orestes by Montfieury, also an accomplished player. But Mademoiselle du Pa, who played Andromache, had gener- ally been thought below, not above , her parts, and Mademoiselle des Oeillets, who played the difficult role of Hermione, was old and had few physical advantages. No one who reads Andromaque without prejudice is likely to mistake the secret of its success, which is, in few words, the application of the most delicate art to the conception of really tragic passion. Before leaving the play it may be mentioned that it is said to have been in the part of Hermione, three years later, that Mademoiselle de Champmesle captivated the author. Andro- maque was succeeded, at the distance of not more than a year, by the charming comedietta of Les Plaideurs. We do not know exactly when it was played, but it was printed on the 5th of December 1668. Many anecdotes are told about its origin and composition. The Wasps of Aristophanes, and the known fact that Racine originally destined it, not for a French com- pany, but for the Italian troupe which was then playing the Commedia dell' arte in Paris, dispense us from enumerating them. The result is a piece admirably dramatic, but suffici- ently literary to shock the profanum vulgus, which too frequently gives the tone at theatres. It failed completely, the chief favouring voice being, according to a story sufficiently well attested and worthy of belief even without attestation, that of the man who was best qualified to praise and who might have been most tempted to blame of any man then living. Moliere, says Valincourt, the special friend of Racine, said in leaving the house, " Que ceux qui se moquoient de cette piece meritoient qu'on se moquoient d'eux." But the piece was suddenly played at court a month later; the king laughed, and its fortunes were restored. It need only be added that, if Louis XIV. admired Les Plaideurs, Napoleon did not, and excluded it from his travelling library. It was followed by a very different work, Britannicus, which appeared on 13th December 1669. This was much less successful than Andro- maque, and seems to have held its own but a very few nights. Afterwards it became very popular, and even from the first the*

exquisite versification was not denied. But there is no doubt that in Britannicus the defects of Racine display themselves pretty clearly to any competent critic. The complete nullity of Britannicus himself and of Junie, and the insufficient attempt to display the complex and dangerous character of Nero are not redeemed by Agrippina, who is really good, and Burrhus, who is solidly painted as a secondary character. Voltaire calls it " la piece des connaisseurs," a double-edged compliment. The next play of Racine has, except Phedre, the most curious history 'of all. " Berenice," says Fontenelle succinctly, " fut un duel," and he acknowledges that his uncle was not the conqueror. Henrietta of Orleans proposed (it is said without letting them know the double commission) the subject to Corneille and Racine at the same time, and rumour gives no very creditable reasons for her choice of the subject. Her death preceded the performance of the two plays, both of which, but especially Racine's, were successful. There is no doubt that it is the better of the two, but Claude Chapelle's not un-friendly criticism in quoting the two lines of an old song — "Marion pleure, Marion crie, Marion veut qu'on la marie" —

is said to have annoyed Racine very much, and it has a most malicious appropriateness. Bajazet, which was first played on 4th January 1672, is perhaps better. As a play, technically speaking, it has great merit, but the reproach commonly brought against its author was urged specially and with great force against this by Corneille. It is impossible to imagine anything less Oriental than the atmosphere of Bajazet; the whole thing is not only French but ephemerally French — French of the day and hour; and its ingenious scenario and admirable style scarcely save it. This charge is equally applicable with the same reservations to Mithridate, which appears to have been produced on 13th January 1673, the day after the author's reception at the Academy. It was extremely popular, and Racine could hardly have lodged a more triumphant diploma piece. His next attempt, Iphigenie, was a long step backwards and upwards in the direction of Andromaque. It is not that the characters are eminently Greek, but that Greek tragedy gave Racine examples which prevented him from flying in the face of the propriety of character as he had done in Berenice, Bajazet, and Mithridate, and that he here called in, as in Andromaque, other passions to the aid of the mere sighing and crying which form the sole appeal of these three tragedies. It succeeded brilliantly and deservedly, but, oddly enough, the date of its appearance is very uncertain. It was acted at court on the 18th of August 1674, but it does not seem to have been given to the public till the early spring of 1675.

The last and finest of the series of tragedies proper was the most unlucky. Phedre was represented for the first time on New Year's Day 1677, at the H6tel de Bourgogne. Within a week the opposition company or troupe du roi launched an opposition Phedre by Nicolas Pradon. This singular com-

petition, which had momentous results for Racine, and in which he to some extent paid the penalty of the lex talionis for his own rivalry with Corneille, had long been foreseen. Racine had from the first been bitterly opposed, and his enemies at this time had the powerful support of the duchess of Bouillon, one of Mazarin's nieces, together with her brother the duke of Nevers and divers other personages of high position. These persons of quality, guided, it is said, by Madame Deshoulieres, selected Pradon, a 'dramatist of little talent but of much facility, to compose a Phedre in competition with that which it was known that Racine had been elaborating. The partisans on both sides did not neglect means for correcting fortune. On her side the duchess of Bouillon is accused of having bought up the front places in both theatres for the first six nights; on his, Racine is said to have prevailed on the best actresses of the company that played Pradon's piece to refuse the title part. There is even some ground for believing that he endeavoured to prevent the opposition play from being played at all. It was of no value, but the measures of the cabal had been so well taken that the finest tragedy

of the French classical school was all but driven from the stage, while Pradon's was a positive success. A war of sonnets and epigrams followed, during which it is said that the duke of Nevers menaced Racine and Boileau with the same treatment which Dryden and Voltaire actually received, and was only deterred by the protection which Conde extended to them.

The unjust cabal against his piece no doubt made a deep impression on Racine. But it is impossible to decide exactly how much influence this had on the subsequent change in his life. For thirteen years he had been constantly employed on a series of brilliant dramas. He now broke off his dramatic work entirely and in the remaining twenty years of his life wrote but two more plays, and those under special circum- stances and of quite a different kind. He had been during his early manhood a libertine in morals and religion; he now married, became irreproachably domestic, and almost ostentatiously devout. No authentic account of this change exists; for that of Louis Racine, which attributes the whole to a sudden religious impulse, is manifestly little more than the theory of a son, pious in both senses of the word. Probably all the motives which friends and foes have attributed entered more or less into his action. At any rate, what is certain is that he reconciled himself with Arnauld and Port Royal generally, accepted, with whatever sincerity, their doctrine of the incompatibility of the stage and the Christian life, and on the 1 st of June married Catherine de Romanet and definitely settled down to a quiet domestic life, alternated with the duties of a courtier. For his repentance was by no means a repentance in sackcloth and ashes. The drama was not then very profitable to dramatists, but Louis Racine tells us that his father had been able to furnish a house, collect a

library of some value, and save 6000 livres. His wife had money, and he had possessed for some time (it is not certain how long) the honourable and valuable post of treasurer of France at Moulins. His annual " gratification " had been increased from 800 to 1500 livres, then to 2000, and in the October of the year of his marriage he and Boileau were made historio- graphers-royal with a salary of 2000 crowns. Besides all this he had, though a layman, one or two benefices. It would have been pleasanter if Louis Racine had not told us that his father regarded His Majesty's choice as " an act of the grace of God to detach him entirely from poetry." For the historio- grapher of Louis XIV. was simply his chief flatterer. However, little came of this historiography. The joint incumbents of the office made some campaigns with the king, sketched plans of histories and left a certain number of materials and memoirs; but they executed no substantive work. Racine, whether this be set down to his credit or not, was certainly a fortunate and apparently an adroit courtier. His very relapse into Jansenism coincided with his rise at court, where Jansenism was in no favour, and the fact that he had been in the good graces of Madame de Montespan did not deprive him of those of Madame de Maintenon. Neither in Esther did he hesitate to reflect upon his former patroness. But a reported sneer of the king, who was sharp-eyed enough, " Cavoie avec Racine se croit bel esprit; Racine avec Cavoie se croit courtisan," makes it appear that his comparatively low birth was not forgotten at Versailles.

Racine's first campaign was at the siege of Ypres in 1678, where some practical jokes are said to have been played on the two civilians who acted this early and peculiar variety of the part of special correspondent. Again in 1683, in 1687 and in each year from 1691 to 1693 Racine accompanied the king on similar expeditions. The literary results of these have been spoken of. His labours brought him, in addition to his other gains, frequent special presents from the king, one of which was as much as 1000 pistoles. In 1690 he further received the office of " gentilhomme ordinaire du roi," which afterwards passed to his son. Thus during the later years of his life he was more prosperous than is usual with poets. His domestic life appears to have been a happy one.

77 8

RACINE, JEAN

Louis Racine tells us that his mother " did not know what a verse was," but Racine certainly knew enough about verses for both. They had seven children. The eldest, Jean Baptiste, was born in 1678; the youngest, Louis, in 1692. It has been said that he was thus too young to have many personal memories of his father, but he tells one or two stories which show Racine to have been at any rate a man of strong family affection, as,

moreover, his letters prove. Between the two sons came five daughters, Marie, Anne, Elizabeth, Francoise and Madeleine. The eldest, after showing " vocation," married in 1699, Anne and Elizabeth took the veil, the youngest two remained single but did not enter the cloister. To complete the notice of family matters — much of Racine's later correspondence is addressed to his sister Marie, Madame Riviere.

The almost complete silence which Racine imposed on himself after the comparative failure of Phedre was broken once or twice even before the appearance of his two last exquisite tragedies. The most honourable of these was the reception of Thomas Corneille on 2nd January 1685 at the Academy in the room of his brother. The discourse which Racine then pronounced turned almost entirely on his great rival, of whom he spoke even more than becomingly. But it was an odd conjunction of the two reigning passions of the latter part of his life — devoutness and obsequiousness to the court — which made him once more a dramatist. Madame de Maintenon had established an institution, first called the Maison Saint Louis, and afterwards (from the place to which it was transferred) the Maison de Saint Cyr, for the education of poor girls of noble family. The tradition of including acting in education was not obsolete. At first the governess, Madame de Grinon, composed pieces for representation, but, says Madame de Caylus, a witness at first hand and a good judge, they were " detestable." Then recourse was had to chosen plays of Corneille and Racine, but here there were obvious objections. The favourite herself wrote to Racine that " nos petites filles " had played Andromaque " a great deal too well." She asked the poet for a new play suited to the circumstances, and, though Boileau advised him against it, it is not wonderful that he yielded. The result was the masterpiece of Esther, with music by Moreau, the court composer and organist of Saint Cyr. Although played by schoolgirls and in a dormitory, it had an enormous success, with which it may be charitably hoped that the transparent comparison of the patroness to the heroine had not too much to do. Printed shortly afterwards, it had to suffer a certain reaction, or perhaps a certain vengeance, from those who had not been admitted to the private stage. But no competent judge could hesitate. Racine probably had read and to some extent followed the Aman of Antoine de Montchretien, but he made of it only the use which a proved master in literature has a perfect right to make of his fore- runners. The beauty of the chorus, which Racine had restored more probably from a study of the Pleiade tragedy than from classical suggestions, the perfection of the characters and the wonderful art of the whole piece need no praise. Almost immediately the poet was at work on another and a still finer piece of the same kind, and he had probably finished Athalie before the end of 1690. The fate of the play, however, was very different from that of Esther. Some fuss had been made about the

worldliness of great court fetes at Saint Cyr, and the new play, with settings as before by Moreau, was acted both at Versailles and at Saint Cyr with much less pomp and ceremony than Esther. It was printed in March 1691, and the public cared very little for it. The truth is that the last five-and-twenty years of the reign of Louis XIV. were marked by one of the lowest tides of literary accomplishment and appreciation in the history of France. The just judgment of posterity has ranked Athalie, if not as Racine's best work (and there are good grounds for considering it to be this), at any rate as equal to his best. Thenceforward Racine was practically silent, except for four cantiques spirituelles, in the style and with much of the merit of the choruses of Esther and Athalie. The general literary sentiment led by Fontenelle (who inherited

the wrongs of Corneille, his uncle, and whom Racine had taken care to estrange further) was against the arrogant critic and the irritable poet, and they made their case worse by espousing the cause of La Bruyere, whose personalities in his Caracteres had made him one of the best-hated men in France, and by engaging in the Ancient and Modern battle with Charles Perrault. Racine, moreover, was a constant and spiteful epigrammatist, and the unlucky habit of preferring his joke to his friend stuck by him to the last. A savage epigram on the Sesostris of Hilaire Bernard de Longepierre, who had done him no harm, was his familiar acquaintance, and had actually put him above Corneille in a parallele between them, dates as late as 1695. Still the king maintained him in favour, and so long as this continued he could afford to laugh at Grub Street and the successors of the Hotel de Rambouillet alike. At last, however, there seems to have come a change, and it is even probable that royal displeasure had some effect on his health. Disease of the liver appears to have been the immediate cause of his death, which took place on 12th April 1699. The king seems to have, at any rate, forgiven him after his death, and he gave the family a pension 'of 2000 livres. Racine was buried at Port Royal, but even this transaction was not the last of his relations with that famous home of religion and learning. After the destruction of the abbey in 1711 his body was exhumed and transferred to Saint Etienne du Mont, his gravestone being left behind and only restored to his ashes a hundred years later, in 18 18. His eldest son was never married; his eldest daughter and Louis Racine have left descendants to the present day.

Racine may be considered from two very different points of view, — (1) as a playwright and poetical artificer, and (2) as a dramatist and a poet. From the first point of view there is hardly any praise too high for him. He did not invent the form he practised, and those who, from want of attention to the historical facts, assume that he did are unskilful as well as ignorant. When he came upon the scene the form of French plays was settled, partly by the energetic efforts of the Pleiade and their successors, partly by the

reluctant acquiescence of Corneille. It is barely possible that the latter might, if he had chosen, have altered the course of French tragedy; it is nearly certain that Racine could not. But Corneille, though he was himself more responsible than any one else for the acceptance of the single-situation tragedy, never frankly gave himself up to it, and the inequality of his work is due to this. His heart was, though not to his knowledge, elsewhere, and with Shake- speare. Racine, in whom the craftsman dominated the man of genius, worked with a will and without any misgivings. Every advantage of which the Senecan tragedy adapted to modern times was capable he gave it. He perfected its versification; he subordinated its scheme entirely to the one motive which could have free play in it, — the display of a conventionally intense passion, hampered by this or that obstacle; he set him- self to produce in verse a kind of Ciceronian correctness. The grammar-criticisms of Vaugelas and the taste-criticisms of Boileau produced in him no feeling of revolt, but only a deter- mination to play the game according to these new rules with triumphant accuracy. And he did so play it. He had supremely the same faculty which enabled the rhetoriqueurs of the 15th century to execute apparently impossible tours deforce in ballades couronnees, • and similar tricks. He had besides a real and saving vein of truth to natftre, which preserved him from tricks pure and simple. He would be, and he was, as much a poet as prevalent taste would let him be. The result is that such plays as Phedre and Andromaque are supreme in their own way. If the critic will only abstain from thrusting in tierce, when accord- ing to the particular rules he ought to thrust in quart, Racine is sure to beat him.

But there is a higher game of criticism than this, and this game Racine does not attempt to play. He does not even attempt the highest poetry at all. His greatest achievements in pure passion — the foiled desires of Hermione and the jealous frenzy of Phedre — are cold, not merely beside the crossed love

of Ophelia and the remorse of Lady Macbeth, but beside the sincerer if less perfectly expressed passion of Corneille's Cleopatre and Camille. In men's parts he fails still more completely. As the decency of his stage would not allow him to make his heroes frankly heroic, so it would not allow him to make them utterly passionate. He had, moreover, cut away from himself, by the adoption of the Senecan model, all the opportunities which would have been offered to his remarkably varied talent on a freer stage. It is indeed tolerably certain that he never could have achieved the purely poetical comedy of As You Like It or the Vida es Sueno, but the admirable success of Les Plaideurs makes it at least probable that he might have done

something in a lower and a more conventional style. From all this, however, he deliberately cut himself off. Of the whole world which is subject to the poet he took only a narrow artificial and conventional fraction. Within these narrow bounds he did work which no admirer of literary craftsmanship can regard without admiration. It would be unnecessary to contrast his per- formances with his limitations so sharply if those limitations had not been denied. But they have been and are still denied by persons whose sentence carries weight, and therefore it is still necessary to point out the fact of their existence.

Bibliography. — Nearly all Racine's works are mentioned in the above notice. There is here no room for a bibliographical account of their separate appearances. The first collected edition was in 1675-76, and contained the nine tragedies which had then appeared. The last and most complete which appeared in the poet's lifetime (1697) was perhaps revised by him, and contains the dramas and a few miscellaneous works. Like the editio princeps, it is in 2 vols. i2mo. The posthumous editions are innumerable and gradually became more and more complete. The most noteworthy are the Amsterdam edition of 1722; that by Abbe d'Olivet, also at Amsterdam, 1743; the Paris quarto of 1760; the edition of Luneau de Boisjermain, Paris and London, 1768; the magnificent illustrated folios of 1805 (Paris); the edition of Germain Gamier with La Harpe's commentary, 1807; Geoffroy's of the .next year; Aime Martin's of 1820; and lastly, the Grands ecrivains edition of Paul Mesnard (Paris, 1865-73). This last contains almost all that is necessary for the study of the poet, and has been chiefly used in preparing the above notice. Louis Racine's Life was first published in 1747. Translations and imitations of Racine are innumerable. In English the Distressed Mother of Ambrose Philips and the Phaedra and Hippolytus of Edmund Smith (1672-1710), both composed more or less under Addison's influence, are the most noteworthy.

As for criticism on him, a bibliography of it would be nearly a bibliography of French critical literature. The chief recent instance of substantive work is G. Larroumet's monograph in the Grands ecrivains francais (1898), but F. Brunetiere, Emile Faguet, and other critics have constantly and in various ways endeavoured to' apply the general reaction from Romanticism to a semi-classical attitude to this greatest of French " classics." The conclusions above given remain unaffected by this temporary set of opinion. Racine will never be enfoncS — " put to rout " — as the extravagant Romantics thought him to be for a time. But, on the other hand, his limita- tions will remain, and no ingenious but arbitrary and extemporized theories of drama as to " conflicts of will" and the like can suffice to veil his defect in universality, his comparative shallowness, and his inadequate appreciation, or at least representation, of the rich- ness, the intricacy and the unconventionality of nature.

(G. Sa.)

RACINE, LOUIS (1692-1763), French poet, second son of Jean Racine, was born in Paris on the 6th of November 1692. Early conscious of a vocation for poetry, he had been dissuaded from following his inclination by Boileau on the ground that the gift never existed in two successive generations. In 1722 his small means induced him to accept a position in the revenue in Provence, but a marriage with a certain Mademoiselle Presle secured his independence. In 1755 he lost his son in the disasters consequent on the Lisbon earthquake. This misfortune, commemorated by Ecouchard Lebrun, broke Racine's spirit. He sold his library, and gave himself up entirely to the practice of religion. In 1719 he had become a member of theAcademie des Inscriptions, but had never offered himself as a member of the Academie Francaise, for fear, it is said, of incurring refusal on account of his Jansenist opinions. La Grace (1720) and Religion (1742), his most important work, are inspired by a sincere piety, and are written in verse of uniform clearness and excellence. His other works include epistles, odes, among which

the Ode sur Vharmonie (1736) should be mentioned, Mimoires (1747) of Jean Racine, and a prose translation of Paradise Lost (1755). Louis Racine died on the 29th of January 1763. He was characterized by Voltaire as " le bon versificateur Racine, fils du grand poete Racine."

His (Euvres completes were collected (6 vols.) in 1808.

RACINE, a city and the county-seat of Racine county, Wisconsin, U.S.A., on the W. shore of Lake Michigan at the mouth of the Root river, about 25 m. S.S.E. of Milwaukee and about 60 m. N. of Chicago. Pop. (1890) 21,014; (1900) 29,102, of whom 9242 were foreign-born; (1910 census) 38,002. Racine is served by the Chicago & North Western and the Chicago, Milwaukee & St Paul railways, by two inter- urban electric railways, connecting with Milwaukee and Chicago, and by steamboat lines. The river has been deepened and its mouth protected by breakwaters, providing an excellent harbour; in 1909 vessels drawing 19 ft. could pass through the channel. Among the public buildings are the City Hall, the County Court House, the Federal Building, the Carnegie Library, the High School, two hospitals and the Taylor Orphan Asylum (1872). Among educational institutions, besides the public schools, are Racine College (Protestant Episcopal, 1853), St Catherine's Academy (Roman Catholic) and two business colleges. Racine is, next to Milwaukee, the most important manufacturing centre in Wisconsin. The value of its factory products in 1905 was $16,458,965, an increase of 41% over that of 1900. Of this, $5,177,079 (or 31-5% of the city's total) represented agricultural implements and machinery. Carriages and wagons ($2,729,311) and

automobiles ranked -next in importance.

Racine was the French form of the name of the Root river. The first Europeans positively known to have visited the site of Racine were Vincennes, Tonty and several Jesuit missionaries, ‘ who stopped here for a time on their way down the coast in 1699. Early in the 19th century Jambeau, a French trader, established himself on the Root river, and in 1834 Gilbert Knapp (1798-1889), who had been a lake captain since 1818, induced several residents of Chicago to make their homes at its mouth. The place was at first called Port Gilbert. The settlement grew rapidly, a sawmill was built in 1835, and the present name was adopted in 1837. In 1841 Racine was incorporated as a village and in 1848 was chartered as a city.

See S. S. Hurlburt, Early Days at Racine (Racine, 1872) ; History of Racine and Kenosha Counties (Chicago, 1879).

RACK, an homonymous word of which the principal branches are the words meaning (1) a mass of cloud driving before the wind in the upper air, (2) to draw off wine or other liquor from the lees, (3) a bar or framework of bars, (4) an instrument of torture. The etymology of (1) shows that it is ultimately to be connected with ” wreck ” and ” wrack,” drifted seaweed, and means that which is driven by or drifts with the wind; cf. Norw. rak, wreckage, refuse, Icel. reka, to drive, toss. In (2) the term seems to have come from the Gascon wine-trade, as Skeat (Etym. Diet., 1910) points :0ut, and was adapted from Prov. arracar, to decant wine, raca’, the stems and husks of grapes, dregs. Both (2) and (3) are in origin to be connected. The O. E. reccan and Ger. recken mean ” to stretch,” and so ” rack ” means something stretched out, a straight bar or rail, especially a toothed bar gearing with a cog-wheel, a framework of bars, as in the cradle of upright bars in which fodder can be placed for cattle, and the instrument of torture, which in Ger. is Recke or Rackbank. The ” rack ” for torture was an oblong frame of wood, slightly raised from the ground, having at one end a fixed bar to which the legs were fastened, and at the other a movable bar to which the hands were tied. By means of pulleys and levers this latter could be rolled on its own axis, thus straining the ropes till the sufferer’s joints were dislocated. Its first employ- ment in England is said to have been due to John Holland, 4th duke of Exeter, constable of the Tower in 1447, whence it was popularly known as ” the Duke of Exeter’s daughter.”

In 1628 the whole question of its legality was raised by the attempt of the privy council to rack John Felton, the assassin of the duke of Buckingham. This the judges resisted, unani- mously declaring its use to be contrary to the laws of England. RACKETT, or Rackett-Bassoon (Fr. cervelas or cervelat; Ger. Rackett, Rankett or Wurstfagott), a kind of dwarf bassoon, now obsolete, with a body measuring only from 45 to n in. in length, but nevertheless containing the necessary length of tubing to give the bassoon or contra-bassoon pitch. The rackett consists of a barrel-like body, resembling the barrel drone of the musette (see Bagpipe), made of wood or ivory. Round a centre tube are grouped eight parallel channels of very narrow cylindrical bore communicating with each other and forming a continuous tube nine times the length of the small body.

A reed mouthpiece in combination with a cylindrical tube

invests the latter with the acoustic properties of a closed pipe by

creating a node at the. mouthpiece end; the fundamental note

given by such a tube is, therefore, an octave deeper in pitch than would

be an open pipe of the same length. The bassoon

has a conical bore and the properties of the open

pipe.wherefore the aggregate lengthof thechannels

in the rackett only requires to be half that of the

bassoon, a physical phenomenon to which this

curious freak owed its existence. In the rackett

the holes are bored obliquely through from the

channels to the circumference — three in front for

the left artd three for the right hand, with an

additional hole for the little finger; while at the

back are placed the vent and three holes, one for

the left, thumb and two for the right, the second

hole being controlled by the ball of the thumb.

The rackett is played by means of a large double

reed placed within a pirouette or cap, so that the

From Capt. C. R- lips do not come into contact with the reed, but

Day's Catalogue nf on i y senc j a stream of compressed air into the

me"/' by p"ra£ pirouette, whereby the reed is set in vibration.

sion 'of Eyre & The consequence of this principle of construction,

■*Spottiswoode. peculiar to the bagpipe chaunter and drones (with*

a slight variation) and to cromornes, hautbois de Poitou and a few

other obsolete instruments, is that no harmonics can be obtained,

since the vibrating length and the tension of the reed cannot be

controlled by the player; the compass is therefore obtained by means

of the fundamental and of the ten holes of the instrument, aided by

cross-fingering. (K. S.)

RACQUETS, or Rackets, a game played in an enclosed court with a ball and an implement with which the ball is struck called a racquet, from which the game takes its name. The racquet 1 is about 2\ ft. long, the head, which was formerly pear-shaped, being in the modern racquet nearly circular, from 7 to 8 in. in diameter and tightly cross- strung with cat-gut. The balls, which are about ij in. in diameter, are made of strips of cloth tightly wound over each other, with a sewn covering of smooth white leather, the floor and walls of English courts being coloured black; in India, where the floor and walls of the court are. painted

Fig. 1. — The Racquet. white, black balls are used. There are no regulation dimen- sions for a racquet court, nor for the racquet or ball, though substantial uniformity is observed in practice. The game is usually played either by two or by four players; and in England the court is the same for the four-handed and the two-handed game, the floor measuring usually 60 ft. by 30 ft., or occasionally an inch or two more each way; but in America larger courts measuring on the floor 80 ft. by 40 ft., a size formerly not

1 The word comes, through Fr. raquette, from Sp. and Port, raqueta. The origin is doubtful, but Arab. raha{i), palm of the hand, has been suggested; " fives " played with the hand long preceded the game with a bat; cf. also

Fr. name for fives, paume.

Elevation of End Wall

Service Line 9 from floor

Play Line

uncommon in England, are sometimes built for the foui- handed game. Modern racquet courts have four walls and a roof, though in India they are sometimes left unroofed for the sake of coolness. The floor, which must be perfectly level and smooth, should be made of cement; but is sometimes paved, with less, perfect results. The floor cannot be too hard, since the faster the ball travels the better the game; similarly the walls, which should be built of masonry faced with cement and most carefully smoothed, cannot be too hard and fast. The front and side walls are about 30 ft. high, the back wall being about half that height, with a gallery for spectators (containing the marker's and umpires' box) above it. The court is entered by a door in the centre of the back wall, which when shut must be perfectly flush with that wall, and without any projecting handle. The court is lighted from the roof. The diagram (fig. 2) shows the divisions and markings of the court. On the front wall is fixed a wooden board, the upper edge of which, 26 in. from the floor, constitutes the " play-line," and which usually fills the whole space from that height to the floor; and at a height from the floor of 8 ft. or a few inches more is a second line, called the " cut-line " or " service-line," painted white or in colour. At a distance of 38 ft. (in a court 60 ft. by 30 ft.) from the front wall and parallel to it, a white line is painted on the floor from wall to wall, called the "short-line"; and from the centre of the short-line to the centre of the back wall is the " fault-line," dividing into two equal rectangles the space between the back wall and the short-line. These rectangles are the service-courts and are called the right-hand and left-hand court respectively. Against the side walls outside these courts, but so that one side in each case is formed by the short-line, are squares 8 ft. by 8 ft. called the service-boxes.

The Game. — Racquets is usually played either by two persons (" singles "), or four persons playing two against two (" doubles ") ; and the general idea of the game is the same as that in tennis, lawn tennis and fives, the object of the player in all these games being to score a point by striking the ball either before it reaches the ground or on its first bound, in accordance with the rules of the game, in such a way that his adversary may fail to make a " good," i.e. a valid, stroke in return. In the four-handed game one of each set of partners takes the right- hand court and his partner the left. The game consists of 15 points called "aces." Aces can only be scored by the " hand-in " (the player, or side, having the "innings"), and the " hand-

out " must therefore win a stroke or strokes to obtain innings before he or they can score an ace; in " doubles " each of the partners has an innings, and both must therefore be : ousted before "hand-out" obtains the innings; but to this rule the first innings of each game affords an exception (see below). The " hand-in " always has " service," i.e. he opens the rally (the " rally " being the series of strokes made alternate!} by the two sides until one or other of them fails to make a good return) by " serving " the ball from the hand. This first stroke, or " serve," must be made in the following manner. The server, standing with one foot at least inside one of the service-boxes, must toss the ball from his hand, and while it is in the air he must hit it with his racquet so that it strikes the front wall above the service-line and falls to the floor within the service- court on the opposite side; after striking the front wall the ball may, but need not, strike the side wall or back wall, or both, and it may do so either before or after touching the floor. The serve is a " fault " if the ball (1) strikes the front wall*

1 4 – . .

30'- – -

*• – a'- **

• Service I Box

a'

;Short Line

Service Box

; c

3

Back Wan 15′ high Gallery above

FlG. 2.

RACQUETS

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above the board but on or below the service-line, in which case it is called a " cut "; or (2) touches the floor on the first bound, outside the proper service-court, when it is called " short " or " fault " according to the position of its pitch (see below). If the " hand-out " player to whom the fault is served " takes " it (i.e. if he plays at it), the fault is condoned and

the play proceeds as if the serve had been good. If, however, the fault be not taken, the server must serve again from the same box; and if he serves a second fault he loses his " hand " or innings, and his partner or his opponent, as the case may be, takes his place. Two consecutive faults have thus the same result as the loss of a stroke in the rally by the " hand-in." A serve which makes the ball strike the board, or the floor before reaching the front wall, or which sends it " out-of-court " (i.e. into the gallery or roof of the court), counts the same as two consecutive faults; it costs the server his innings. Skill in service is a most im- portant part of proficiency in racquets; a player can hardly become first-rate unless he possesses a " strong service." As in tennis a great deal of " cut " may be imparted to the ball by the stroke of the racquet, which makes the ball in its rebound from the wall behave like a billiard ball carrying " side " when striking a cushion; and when this " cut " is combined with great pace in the bound of the ball off the side wall, the back wall, and the floor, at varying angles which the server has to a great degree under his control, it becomes exceedingly difficult for hand-out to " get up " the serve (i.e. to hit it on the first bound, sending it above the play-line on the back wall), and still more so to make a good stroke which will render it difficult for his adversary in his turn to get up the ball and thus continue the rally. It often happens, therefore, that a long sequence of aces, sometimes the whole 15 aces of a game, are scored con- secutively by service which hand-out is unable to return. A noteworthy instance of successful service occurred in the semi-final tie of the doubles Amateur Championship matches at the Queen's Club in 1897 when W. L. Foster opened service and scored all the aces in the first two games, and added six in the third, thus putting on a sequence of 36 aces before losing his " hand." To obtain first innings is therefore an initial advantage, although in doubles it is limited by the rule that only one partner shall have a " hand " (innings) in the opening service.

The question which side shall have this advantage is decided by spinning a racquet, the " rough " and " smooth " sides of which take the place of " heads " and " tails " when a coin is tossed. The side winning the spin opens the game by serving as described above. The server may begin in either of the service boxes; but when he has started, the service must proceed from the two boxes alternately till the close of the innings of the side, whether singles or doubles. When the other side obtains the innings they may in like manner begin in either box, without regard to where the last service of their opponents was delivered. In singles, hand-out changes sides in the court after each serve, answering to the'change over of the server; in doubles the serve is taken alternately by the two hand-out players, who perma- nently occupy the right- and left-hand courts respectively, being allowed lo change the order in which they receive the service only once in any game, or at tne end of any game or rubber. Except in the very rare case of left-handed

players most of the play in the left half of the court, including the taking of all service on that side, is back-handed; and the stronger of the two partners in back-hand play usually therefore takes the left-hand court. The best position in the court for the hand-out about to take the serve depends entirely on the nature of the service, and he has to use his judgment the instant the ball leaves the server's racquet in order to determine where it will strike the floor and at what precise point in its course it will be best for him to attempt to take it. A strong fast service, heavily cut, that sends the ball darting round the corner of the court, leaving the back wall at an extremely acute angle, or dropping almost dead off it, can only be got up by standing near the back wall a long way across the court and taking the ball by a wrist stroke at the last instant before it falls to the ground a second time. On the other hand when the server avoids the

side wall altogether and strikes the back wall direct and hard, whether he achieves a " nick " serve (i.e. the ball striking precisely in the angle between the back wall and the floor) or hits the wall high up, hand-out will have little time to spare in changing position to get within reach of the ball. Some good players make a practice wherever possible, especially in the case of heavily cut service, of taking the serve on the volley (i.e. before the ball reaches the ground) , sometimes of taking the ball after it leaves the side wall and before it reaches the back wall; practice alone enables the player to decide with the necessary promptitude how each stroke is to be played. In returning the serve, or in playing any stroke during the rally, the ball may strike any of the other walls before the front wall; but though this " boasted '•' stroke is quite legitimate, and is sometimes the only way of getting up a difficult ball, it is not considered good style deliberately to slash the ball round the corners in order to keep it in the fore end of the court. Good play consists for the most part in hard low hitting, especially as close as possible along the side walls into the corners of the back wall. One of the most effective strokes in racquets is the " drop," which means that the ball is hit so that it only just reaches the front wall and drops close to it, while the player conceals his intention by appearing to strike hard. " The drop-stroke," says«Mr Eustace Miles, who regrets that it is less cultivated than formerly, " is one of the most beautiful, and of all drop-strokes, the volley or half-volley is the best." The " half-volley," in which the ball is struck at the moment of its contact with the floor and before it has had time to rise, is also employed with great effect in hard play; it makes the return much quicker than when the ball is allowed to rise to the full length of the bound, and requires corresponding quickness on the part of the adversary. It sometimes happens, too, that the player finding himself too near the pitch of the ball to take it at the end of the bound, yet not near enough to volley it, is compelled to take it on the half-volley as the only chance of getting it up. Accuracy in volleying and half -volleying, especially

if the ball be kept low, is A most difficult art to acquire, but a good long rally in which are included a number of hard rapid half -volleys within a couple of inches of the board, is the prettiest feature of the game. If hand-out succeeds in returning the serve, the rally pro- ceeds until one side or the other fails to make a good return. A good return means (1) that the ball is struck by the racquet before its second bound on the floor, and without its having touched any part of the clothes or person of the striker or his partner; (2) that it is hit against the front wall above the board without first touching the floor or going out of court; and (3) that it returns off the front wall into play (i.e. to the floor of the court or to an adversary's racquet) without going out of court. If hand-in be the one to fail in making a good return, he loses his " hand," or innings, and (in singles) hand- out goes in and proceeds to serve; in doubles one of the hand- in partners loses his " hand," and the second partner goes in and serves till he in turn similarly loses his " hand," except that in the case of the opening service in the game there is (as already mentioned) only one " hand " in any event. If hand-out fails to make a good return to the serve or to any stroke in the rally, hand-in scores an ace, and the side that first scores 15 aces wins the game. When, however, the score reaches " 13-all " (i.e. when each side has scored 13 aces), hand- out may, before the next serve is delivered, declare that he elects to " set " the game either to 5 or 3, whichever he prefers; and similarly when the score stands at " 14-all," hand-out may "set" the game to 3. He makes this declaration by calling "set-5!" or "set-3!" and it means that 5 aces, or 3 aces, as the case may be, shall be required to win the game.

In the confined space of a racquet court it is not always easy, especially in doubles, for the players to avoid obstructing each other. It is provided in the rules that " each player must get out of his opponents' way as much as possible," and that it shall be a " let " (an Old English word for impediment or hindrance) and " the service or rally shall count for nothing, and the Server shall serve again from the same service-box,

(a) if the ball in play touch the striker's opponent on or above the knee, and if in the marker's opinion it be thereby pre- vented from reaching the front wall above the board (the play- line); or (b) if either player undesignedly prevent his opponent from returning the ball served in play." If a player considers that he has been thus obstructed by his opponent he may " claim a let," and the marker adjudicates his claim. The marker's decision is final; but " if in doubt which way to decide, the marker may direct that the ace be played over again." It is the duty of the marker, who

occupies a box in the gallery, to " call the game." As soon as the server serves the ball the marker calls "Play!" if the ball strikes the front wall above the service-line; and "Cut!" if it strikes below the service- line; if the ball falls in front of the short-line the marker calls "Short!"; if the wrong side of the fault-line he calls "Fault!"; but whether it be "cut," "short," or "fault," the serve counts as a fault in its effect. To every good return, as to every good serve, the marker calls "Play!" If a return is made after the second bound oT the ball (called a "double") the marker calls "Double!" or "Not up!"; if the ball is hit into the gallery, or against its posts or cushions, or above the girders or cross-beams of the roof, he calls "Out-of-court!" At the end of every rally he calls the state of the game, always naming first the score of hand-in: — "One-love" (love -being the term for zero) meaning that hand-in has scored one ace and hand-out nothing, "Two-love," "Five-all," "Five-ten," " Fourteen-eleven," and so on, till one side has scored 15, when the marker calls " Game! " He then in similar fashion calls the state of the match — "Two games to one," or whatever it may be 1 — before the commencement of the next game. The server in possession at the end of the game continues to serve in the new game, subject as before to the rule limiting the first innings of the game to a single " hand." The usual number of games in matches is five for singles, and seven for doubles. In matches where there are umpires and a referee, there is an appeal to them from the marker's decision except as regards questions relating to the service, on which the marker's decision is final.

Records. — Attempts have been made to trace racquets, like tennis, to an ancient origin; but although it is doubtless true that the striking of a ball with the hand or some primitive form of bat is one of the oldest forms of pastimes, and that racquets has been evolved from such an origin, the game as now known can hardly be said to have existed before the 19th century. Joseph Strutt's work on The Sports and Pastimes of the People of England, published at the beginning of the 19th century, makes no mention of racquets; and the century was far advanced before the racquet court was promoted from being an adjunct of the pot-house and the gaol, in which con- nexion the court within the purlieus of the Fleet prison has been immortalized in the pages of Pickwick, to a position scarcely less dignified than that of the tennis-court with its royal and historical associations. It was at the public schools that racquets first obtained repute. The school courts were at first unroofed, and in some cases open also at the back and sides, or on one side. Among the most famous of the early racquets professionals, before the period of the modern closed court, were Robert Mackay (1820), the brothers Thomas and John Pittman, J. Lamb, J. C. Mitchell and Francis Erwood (i860). One of the most famous matches ever played at racquets was that in which Erwood was beaten by Sir William Hart-Dyke, who used the " drop " stroke with telling effect, and who, after

representing Oxford in the first four inter- university matches, was the only amateur racquet player who ever defeated the open champion. A notable date in the history of racquets was the year 1853, when the court at the old Prince's Club in Hans Place, London, was built. Here the annual racquet matches between Oxford and Cam- bridge Universities, singles and doubles, were first played in 1858, and the Public Schools Championship (doubles only) ten years later. Modern racquets may perhaps be said to date from the time of the brothers Gray, who as professionals greatly raised the standard of skill in the game, and as teachers at the

schools and universities improved the play of amateurs. William Gray beat Foulkes, the champion of America, in 1867; Henry Gray and Joseph Gray were also great players. The latter was beaten in 1875 by H. B. Fairs (" Punch ") but held the championship from 1878 to 1887. Another member of the same family was Walter Gray, who was as distinguished for the power of his stroke as his brother William was for the accuracy of his " drop " and the ease and grace of his volley and half- volley. Walter Gray was followed in the championship by Peter Latham, the first professional to combine the open Tennis Championship with the Racquets Championship; and in the opinion of Mr Eustace Miles " there has probably lived no player who could have beaten him at either game." Latham was the first to use the heavily cut service at racquets, and he is also remarkable for the power of his wrist stroke. In the last twelve years or so of the 19th century Latham stood alone, and in the opinion of the best judges he was the greatest of all racquet players. When once he had won the championship he never lost it, and when at last he resigned his title he was suc- ceeded by Gilbert Browne, a player of a decidedly inferior calibre, who in 1903 was challenged and beaten by an Indian marker called Jamsetji. For the next six years, during which Jamsetji held the championship, comparatively little was heard of professional racquets; but in 1909 interest was revived by a handicap at Queen's Club for a prize of £100, in which Peter Latham himself took part, and which was won by Jennings of Aldershot. As a result of this contest a challenge was issued by W. Hawes, the marker at Wellington College, to play any other professional for £200 a side and the championship of England. The challenge was accepted by C. Williams, a young player of Prince's Club, who easily won the match, and with it the title of champion.

The institution of annual matches between Oxford and Cambridge Universities in 1858, and of the Public Schools Championship in 1868, gave an immense stimulus to the game among amateurs. Of the 51 inter-university (singles) matches from 1858 to 1908, Oxford won 26 and Cambridge 25; of the 52 contests in doubles Oxford won 25 and Cambridge 27. Among the public schools Harrow has been far the most successful, having won the championship challenge cup 19 times out of 42 contests. Moreover, under the condition permitting any school winning it in

three consecutive years to retain the challenge cup permanently, Harrow became possessed of three cups, having won the champion- ship 1871-1874 inclusive, 1879-1881 inclusive, and 1883-1887 in- clusive. The next most successful school has been Eton, eight times champion; Charterhouse having won five times, and no other school more than three times. For the first twenty years of the contest, with a single exception when Rugby won in 1870, no school except Eton or Harrow gained the championship; and it is not surprising therefore that the majority of famous amateurs learnt the game at one or other of these schools. Among Etonians were W. Hart-Dyke, C. J. Ottaway, the Hon. Alfred Lyttelton, the Hon. Ivo Bligh (afterwards Lord Darnley), C. T. Studd and H. Philipson; Harrow has produced R. D. Walker, one of the best of the earliest amateur racquet players, C. F. Buller, T. S. Dury, A. J. Webbe, M. C. Kemp, E. M. Butler, the- brothers Eustace Crawley and H. E. Crawley, C. D. Buxton, H. M. Leaf, Percy Ash- worth and C. Browning. The famous Malvern family of Foster has been as conspicuous in the racquet court as on the cricket field, the eldest, H. K. Foster, being probably the finest amateur player of his generation. F. Dames Longworth, Major A. Cooper-Key, Colonel Spens, E.M.Baerlein and Eustace H. Miles have also been in the front rank of amateur players. The opening of the Queen's Club, West Kensington, was a notable event in the history of the game, especially as it was followed by the establishment of amateur championships in singles and doubles in 1888, of which the results have been as follows : —

Amateur Championship

I. Singles

1888.

C. D. Buxton.

1900. H. K. Foster.

1889.

E. M. Butler.

1901. F. Dames Longworth

1890.

P. Ashworth.

1902. E. H. Miles.

1891.

H. Philipson.

1903. E. M. Baerlein.

1892.

F. Dames Longworth.

1904. H. K. Foster.

1893-

F. Dames Longworth.

1905. E. M. Baerlein.

1894.

H. K. Foster.

1906. S. H. Sheppard.

1895.

H. K. Foster.

1907. E. B. Noel.

1896.

H. K. Foster.

1908. E. M. Baerlein.

1897.

H. K. Foster.

1909. E. M. Baerlein.

1898.

H. K. Foster.

1 9 10. E. M. Baerlein.

1899.

H. K. Foster.

• *II. Doubles*

1890. P. Ashworth and W. C. Hedley.

1891. P. Ashworth and E. L. Metcalfe.

1892. E. M. Butler and M. C. Kemp.

1893. F. H. Browning and H. K. Foster.

1894. H. K. Foster and F. C. Ridgeway.

1895. F. Dames Longworth and F. H. Browning.

1896. H. K. Foster and P. Ashworth.

1897. H. K. Foster and P. Ashworth.

1898. H. K. Foster and W. L. Foster.

1899. H. K. Foster and P. Ashworth.

1900. H. K. Foster and P. Ashworth.

1901. F. Dames Longworth and V. H. Pennell.

1902. E. M. Baerlein and E. H. Miles.

1903. H. K. Foster and B. S. Foster.

1904. E. H. Miles and E. M. Baerlein.

1905. E. H. Miles and E. M. Baerlein.

1906. E. H. Miles and F. Dames Longworth.

1907. W.' L. Foster and B. S. Foster.

1908. F. Dames Longworth and V. H. Pennell.

1909. E. M. Baerlein and P. Ashworth.,

1910. B. S. Foster and Hon. C. N. Bruce.

A military championship was inaugurated in 1903 and is played annually at Princes' Club. In 1908, mainly through the exertions of Major A. Cooper-Key, a " Tennis, Racquets and Fives Associa- tion " was founded for the purpose of encouraging these games, safeguarding their interests and providing a legislative body whose authority would be recognized by all tennis and racquet players.

Racquets in America. — In the United States and in Canada racquets is a popular game, and most of the leading athletic clubs have good courts. The American champions Foulkes, Boakes and George Standing were all beaten by English professionals, but had a great reputation in their own country; and Tom Pettitt, Ellis and Moore are names that stand high in the records of the game. Among American amateurs, Lamontayne did much to encourage racquets in New York in the early period of its history; and in more recent times Quincy Shaw, de Garmendia, R. Fearing, Payne Whitney, Mackay, L. Waterbury and P. D. Haughton have shown themselves racquet players of very high merit, although Mr Eustace Miles is of opinion that " an English playerlike H. K. Foster, or Dames Longworth, or Ashworth, would give any American amateur upwards of seven aces."

Squash racquets is a form of the game which provides admirable practice for the beginner, and has advantages of its own which offer attractions even to those who are proficient players of real racquets. It is played with a hollow india- rubber ball about the size of a fives ball (i.e. nearly twice the size of an ordinary racquet ball) and with a racquet rather shorter in the handle than those used in racquets proper. The court may be of any dimensions, but is always much smaller than a real racquet court; the squash ball, being not nearly so fast as the racquet ball, would not reach the back wall in a 60 ft. court on the first bound unless hit high as well as hard against the front wall. The rules of the game itself are precisely the same as in real racquets. Squash racquets originated at Harrow, where the boys were in the habit of playing in an improvised court in the corner of the school- yard against the old school building; the windows, buttresses and water-pipe on the face of the wall forming irregularities which developed great skill on the part of the players in taking advantage of the difficulties thus caused. The marked success of Harrow in the Public Schools Championship at racquets, especially during the first twenty years of its institution (see above), has been attributed to the early training and practice gained at squash racquets in the school-yard, and in other courts which came into use as the popularity of this form of the game increased. Towards the end of the 19th century squash racquets became adopted at

other schools and at the universities; and as the court is much cheaper to build than that required for real or " hard ball " racquets, and the game is cheaper as well as easier to play, many private courts came into existence. On the initiative of Lord Desborough, who had learnt the game at Harrow, several squash courts were provided at the Bath Club, London, where handicap tourna- ments are annually played. At Lord's cricket ground, when a new pavilion was erected in 1890, squash racquet courts were included in the building. The dimensions of the courts at Lord's, which may be taken as the best model, are as follows: length 42 ft. by 24 ft.; height of back wall 8 ft. 8 in.;

height of service-line from floor 8 ft. 9 in.; height of play- line 2 ft. 4 in. The short-line is 23 ft. from the front wall, The place which squash racquets has come to occupy may be estimated from the fact that Mr. Eustace Miles pronounces it " an almost indispensable preparation " for tennis and racquets as those games are played under modern conditions; and the same authority sufficiently describes its merits when he observes that it " gives, at a small cost of time or money, abundance of hard and brisk and simple yet exciting exercise for all times of life , of the year, and even of the day — if we have good artificial light." The squash courts at Lord's and at the Bath Club are lighted by electricity, so that play is not dependent on the condition of the atmosphere, or on the season of the year.

See Tennis, Lawn Tennis, Rackets and Fives in the " Badminton Library " ; Racquets, Tennis and Squash, by Eustace Miles (London, 1902) ; Sporting and Athletic Register (London, 1908). (R. J. M.)

RADAUTZ, a town in Bukovina, Austria, 35 m. S. by W. oi Czernowitz by rail. Pop. (1900) 14,343, of which about 70% are Germans and 25% are Rumanians. It was formerly the seat of a Greek bishopric, removed to Czernowitz in 1786, and possesses a cathedral (1402) with the tombs of several Moldavian princes. The Austrian government has here a large stud. To the W. of Radautz are situated the old monasteries of Putna and Suczawica, dating from the 15th century. They still contain many old and valuable ecclesiastical objects of art, although a great part has been removed to the various monasteries in Moldavia.

RADBERTUS PASCHASIUS (d. c. 860), French theologian, was born at or near Soissons towards the close of the 8th century. He became a monk of Corbie, near Amiens in Picardy, in 814, and assumed the cloister name of Paschasius. He soon gained recognition as a learned and successful teacher, and the younger Adalhard, St Anskar the apostle of Sweden, Odo bishop of Beauvais and Warinus abbot of Corvei iri Saxony may be mentioned among the more distinguished of his pupils. Between 842 and 846 he was chosen abbot, but as a disciplinarian he was more energetic

than successful, and about 851 he resigned the office. He never took priestly orders. He died and was buried in Corbie.

Radbertus is one of the most important theologians in the history of the church. " He was perhaps the most learned and able theologian after Alcuin, as well versed in Greek theology as he was familiar with Augustinianism, a compre- hensive genius, who felt the liveliest desire to harmonize theory and practice, and at the same time give due weight to tradition " (Harnack). His great work was the Liber de Cor pore e) Sanguine Domini (first ed. 831; new ed., with an epistle to Charles the Bald, 844), which was not only the first systematic and thorough treatise on the sacrament of the eucharist, but is the first clear dogmatic statement of transubstantiation, and as such opened an unending controversy. It was at once attacked by Ratramnus and Hrabanus Maurus, but was so completely in touch with the practice of the church and the spirit of the age, as to win the verdict of Catholic ortˆpdoxy.

On the eucharistic controversy see the article on Radbertus by Steitz in Herzog-Hauck's Real-Encyklopadie; Bach, Dogmenge- schichte des Mittelalters, i. 156 ff.; Ernst, Die Lehre des h. Paschasius Radbertus v. d. Eucharistie (1896) ; Renz, Die Geschichte des Messop- ferbegriffs (1901) ; K. G. Goetz, Die Abendmahlsfrage in ihrer geschichtlichen Entwicklung (1904), a complete survey of the whole problem, beginning with Radbertus. A. Harnack's treatment in his History of Dogma (vol. v., p. 308 ff.) is clear and appreciative.

RADCLIFFE, ANN (1764-1823), English novelist, only daughter of William and Ann Ward, was born in London on the 9th of July 1764. She was the author of three famous novels: The Romance of the Forest (1791), The Mysteries of Udolpho (1794) and The Italian (1797). When she was twenty- three years old she married William Radcliffe, an Oxford graduate and student of law. He gave up his profession for literature, and afterwards became proprietor and editor of the English Chronicle. After The Italian she gave up writing for publication, and was reported to have been driven mad

by the horrors of her own creations, but the nearest approach to eccentricity on Mrs Radcliffe's part was dislike of public notice. Of scenery Mrs Radcliffe was an enthusiastic admirer, and she made driving tours with her husband every other summer through the English counties. She died on the 7th of February 1823. In the history of the English novel, Mrs Radcliffe holds an interesting place. She is too often confounded with her

imitators, who vulgarized her favourite " properties " of rambling and ruinous old castles, dark, desperate and cadaverous villains, secret passages, vaults, trapdoors, evidences of deeds of monstrous crime, sights and sounds of mysterious horror. She deserves at least the credit of originating a school of which she was the most distinguished exponent; and none of her numerous imitators approach her in ingenuity of plot, fertility of incident or skill in devising apparently supernatural occurrences capable of explanation by human agency and natural coincidence. She had a genuine gift for scenic effect, and her vivid imagination provided every tragic situation in her stories with its appropriate setting. Sir Walter Scott wrote an appreciative essay for the edition of 1824, and Miss Christina RoSsetti was one of her admirers. She exercised a great influence on her contemporaries, and " Schedoni " in The Italian is one of the prototypes of the Byronic hero.

RADCLIFFE, SIR GEORGE (1593-1657), English politician, son of Nicholas Radcliffe (d. 1599) of Overthorpe, Yorkshire, was educated at Oldham and at University College, Oxford. He attained some measure of success as a barrister, and about 1626 became the confidential adviser of Sir Thomas Wentworth, afterwards earl of Strafford, who was related to his wife, Anne Trappes (d. 1659). Like his master he was imprisoned in 1627 for declining to contribute to a forced loan, but he shared the good, as well as the ill, fortunes of Wentworth, acting as his adviser when he was president of the council of the north. When Wentworth was made lord deputy of Ireland, Radcliffe, in January 1633, preceded him to that country, and having been made a member of the Irish privy council he was trusted by the deputy in the fullest possible way, his advice being of the greatest service. In 1640, Radcliffe, like Strafford, was arrested and was impeached, but the charges against him were not pressed, and in 1643 he wa s with Charles I. at Oxford. He died at Flushing in May 1657. Radcliffe wrote An essay towards the life of my Lord Strafford, from which the material for the various lives of the statesman has been largely taken.

See Sir T. D. Whitaker, Life and Correspondence of Sir G. Radcliffe

(1810).

RADCLIFFE, JOHN (1650-1714), English physician, was born at Wakefield in 1650. He matriculated at University College, Oxford, and after taking his degree in 1669 was elected to a fellowship at Lincoln College, which he gave up in 1677 when, under the statutes of the college, he was called on to take orders. Graduating in medicine in 1675, he practised first in Oxford, but in 1684 removed to London, where he soon became one of the leading physicians. He frequently attended William III. until 1699, whgn he caused offence by remarking, as he looked at the

King's swollen ankles, that he would not have his legs for his three kingdoms. On the 1st of November 1714 he died of apoplexy at his house in Carshalton. By his will he left pro- perty to University College for founding two medical travelling fellowships and for other purposes. Other property was put at the disposal of his executors to use as they thought best, and was employed, among other things, in building the Radcliffe Observatory, Hospital and Library at Oxford, and in enlarging St Bartholomew's Hospital in London. Radcliffe was elected M.P. for Bramber in 1690 and for Buckingham in 1713.

RADCLIFFE, an urban district in the Radcliffe-cum- Farnworth parliamentary division of Lancashire, England, on the river Irwell, 2 m. S.S.W. of Bury, on the Lancashire & Yorkshire railway. Pop. (1901) 25,368. The church of St Bartholomew dates from the time of Henry IV.; some of the Norman portions of the building remain. Cotton-weaving, calico-printing, and bleaching, dyeing, paper-making, iron-

founding and machine-making are the principal industries, and there are extensive collieries in the neighbourhood.

RADEBERG, a town of Germany, in the kingdom of Saxony, pleasantly situated in a fertile district on the Roder, 10 m. N.E. of Dresden, by the railway to Gorlitz and Breslau. Pop. (1905) 13,301. It has an Evangelical and a Roman Catholic church, and an old castle. Its principal industries are the manufacture of glass, machinery, furniture and paper, and it produces a light Pilsener beer which is largely exported. Near the town are the Augustusbad and the Hermannsbad, two medicinal springs.

RADEGUNDA, ST (d. 587), Frankish queen, was the daughter of Berthaire, king of the Thuringians. Berthaire was killed by his brother Hermannfried, who took Radegunda and educated her, but was himself slain by the Frankish kings Theuderich and Clotaire (529), and Radegunda fell to Clotaire, who later married her. Her piety was already so noteworthy that it was said that Clotaire had married a nun, not a queen. She left him when he unjustly killed her brother, and fled to Medardus, bishop of Poitiers, who, notwithstanding the danger of the act, consecrated her as a nun. Radegunda stayed in Poitiers, founded a monastery there, and lived for a while in peace. Here Venantius Fortunatus, the Italian poet, found a friendly recep- tion, and two of the poems printed under his name are usually attributed to Radegunda. From him we gain a most pleasing picture of life at the monastery. The queen died on the 13th of August 587.

See the references in A. Molinier, Sources de I'histoire de France.

RADETZKY, JOSEF, Count of Radetz (1766-1858), Austrian soldier, was

born at Trzebnitz in Bohemia in 1766, to the nobility of which province his family, originally Hungarian, had for several centuries belonged. Orphaned at an early age, he was educated by his grandfather, and after the oM count's death, at the Theresa academy at Vienna. The academy was dissolved during his first year's residence, and he joined the army as a cadet in 1785. Next year he became an officer, and in 1787 a first lieutenant in a cuirassier regiment. He served as a galloper on Lacy's staff in the Turkish War, and in the Low Countries during the Revolutionary War. In 1795 he fought on the Rhine. Next year he served with Beaulieu against Napoleon in Italy, and inwardly rebelled at the indecisive " cordon " system of warfare which his first chief, Lacy, had instituted and other Austrian generals only too faithfully imitated. His personal courage was conspicuous; at Fleurus he had led a party of cavalry through the French lines to discover the fate of Charleroi, and at Valeggio on the Mincio, with a few hussars, he rescued Beaulieu from the midst of the enemy. Promoted major, he took part in Wurmser's Mantua campaign, which ended in the fall of the place. As lieutenant-colonel and colonel he displayed both bravery and skill in the battles of the Trebbia and Novi (1799), and at Marengo, as colonel on the staff of Melas, he was hit by five bullets, after endeavouring on the previous evening to bring about modifications in the plan sug- gested by the " scientific " Zach. In 1801 Radetzky received the knighthood of the Maria Theresa order. In 1805, on the march to Ulm, he received news of his promotion to major- general and his assignment to a command in Italy under the archduke Charles, and thus took part in the successful campaign of Caldiero. Peace again afforded him a short leisure, which he used in studying and teaching the art of war. In 1809, now a lieutenant field marshal, he fought at Wagram, and in 1810 he received the commandership of the Maria Theresa order and the colonelcy of the 5th Radetzky hussars. From 1809 to 181 2, as chief of the general staff, he was active in the reorganization of the army and its tactical system, but, unable to carry out the reforms he desired owing to the opposition of the Treasury, he resigned the post. In 1813 he was Schwarzenberg's chief of staff, and as such had considerable influence on the councils of the Allied sovereigns and generals. Langenau, the quarter- master-general of the Grand Army, found him an indispensable assistant, and he had a considerable share in planning the Leipzig campaign and as a tactician won great praises in the

battles of Brienne and Arris sur Aube. He entered Paris with the allied sovereigns in March 1814, and returned with them to the congress of Vienna, where he appears to have acted as an intermediary between

Metternich and the czar Alexander, when these great personages were not on speaking terms.

During the succeeding years of peace he disappeared from the public view. He resumed his functions as chief of the staff, but his ardent ideas for reforming the army came to nothing in the face of the general war-weariness and desire to " let well alone." His zeal added to the number of his enemies, and in 1829, after he had been for twenty years a lieutenant field marshal, it was proposed to place him on the retired list. The emperor, un- willing to go so far as this, promoted him general of cavalry and shelved him by making him governor of a fortress. But very soon afterwards the Restoration settlement of Europe was shaken by fresh upheavals, and Radetzky was brought into the field of war again. He took part under Frimont in the campaign against the Papal States insurgents, and succeeded that general in the chief command of the Austrian army in Italy in 1834. In 1836 he became a field marshal. He was now seventy years of age, but he displayed the activity of youth in training and disciplining the army he commanded. But here too he was in advance of his time, and the government not only disregarded his suggestions and warnings but also refused the money that would have enabled the finest army it possessed to take the field at a moment's notice. Thus the events of 1848 in Italy, which gave the old field marshal his place in history among the great commanders, found him, in the beginning, not indeed unpre-pared but seriously handicapped in the struggle with Charles Albert's army and the insurgents. How by falling back to the Quadrilateral and there, checking one opponent after another, he was able to spin out time until reinforcements arrived, and how thenceforward up to the final triumph of Novara on the 23rd of March 1849, he and his army carried all before them, is described in the article Italian Wars. The well-disciplined sense of duty to the superior officer, which was remarked even in the brilliant and sanguine young army reformer of 1810, had become more intense in the long years of peace, and after keeping his army loyal in the midst of the confusion of 1848, he made no attempt to play the part of Wallenstein or even to assume Wellington's role of family adviser to the nation. While as a patriot he dreamed a little of a united Germany, he remained to the end simply the commander of one of the emperor's armies. He died, still in harness, though infirm, on the 5th of January

1858.

In military history Radetzky's fame rests upon one great achievement, but in the history of the Austrian army he lives as the frank and kindly " Vater Radetzky " whom the soldiers idolized. He was fortunate in the moment of his death. In the year following, another and a greater Italian war broke out, his beloved army, disintegrated by peace economies which the old field

marshal had been unable any longer to redress by ceaseless personal training, and in addition suffering from divided command and confused staff work, was defeated in every encounter.

RADEVORMWALD, a town of Germany, in the Prussian Rhine province, 10 m. E. from Remscheid, on the branch line of railway from Krebs'oge. Pop. (1903) 10,978. It consists of the town proper and of several suburbs, and has five Evangelical and two Roman Catholic churches. Its chief manufactures are skates, files, locks and similar articles, and it has also cloth and cotton factories.

See J. H. Becker, Geschiehte der Stadt Radevormwald (Cologne,

1864).

RADHANPUR, a native state of India, in the Palanpur agency, Bombay. It is situated in the north-western corner of Gujarat, close to the Runn of Cutch. The country is an open plain without hills and with few trees. It contains an area of irso sq. m. with a population in 1901 of 61,548, showing a decrease of 37 % during the decade, due to the results of famine. The estimated revenue is £2 7 ,000. The chief products are cotton, wheat and the common varieties of grain; the only manufacture

of any importance is the preparation of a fine description of saltpetre. Radhanpur first came under British protection in 1813. The chief, whose title is Nawab, belongs to the Babi family, who have held power in Gujarat for more than twa centuries. The town of Radhanpur had a population in 1901 of 11,879. It i s a walled town, with an export trade in rape- seed, grain and cotton.

RADIATA, a term introduced by Cuvier in 181 2 to denote the lowest of his four great animal groups or " embranche- ments. " He defined them as possessing radial instead of bilateral symmetry, and as apparently destitute of nervous system and sense organs, as having the circulatory system rudimentary or absent, and the respiratory organs on or co- extensive with the surface of the body; he included under this title and definition five classes, — Echinodermata, Acalepha, Entozoa, Polypi and Infusoria. Lamarck (Hist. nat. d. Anim. s. Vertebres) also used the term, as when he spoke of the Medusae as radiata medusaria et anomala; but he preferred the term Radiaria, under which he included Echinodermata and Medusae. Cuvier's term in its wide extension, however, passed into general use; but, as the anatomy of the different forms became more fully known, the difficulty of including them under the common designation made itself increasingly obvious. Milne-Edwards removed the Polyzoa; the group was soon further thinned by the exclusion of the Protozoa on the one hand and

the Entozoa on the other; while in 1848 Leuckart and Frey clearly distinguished the Coelenterata from the Echinodermata as a separate smVkingdom, thus condemning the usage by which the term still continued to be applied to these two groups at least. In 1855, however, Owen included under Lamarck's term Radiaria the Echinodermata, Anthozoa, Acalepha and Hydrozoa, while Agassiz also clung to the term Radiata as including Echinodermata, Acalepha and Polypi, regarding their separation into Coelenterata and Echinodermata as " an exaggeration of their anatomical differences " (Essay on Classification, London, 1859). These attempts, however, to perpetuate the usage were finally discredited by Huxley's important Lectures on Comparative Anatomy (1864), in which the term was finally abolished, and the " radiate mob " finally distributed among the Echinodermata, Polyzoa, Vermes (Platyhelminthes) , Coelenterata and Protozoa.

RADIATION, THEORY OF. The physical activities that flourish on the surface of the earth derive their energy, in a form which is highly available thermodynamically, from the radiation of the sun. This has been ascertained to be dynamic energy, transmitted in waves by the vibrations of a medium occupying space, as the energy of sound is transmitted by the vibrations of the atmosphere. The elasticity that transmits it may be assumed to be mathematically perfect: any slight loss in transit of the light from the most distant stars, which recent statistical comparisons of brightness with distance may possibly indicate, is to be explained far more suitably by the presence of nebulous matter than by any imperfection of the aether. The latter would thus be the one perfect frictionless medium known to us: it could not be such if it were constituted, like matter, of independent molecules. It is thus on a higher plane, and may even be considered to be a dynamical specification of space itself. A molecule of matter is a kinetic system compounded of simpler elements; its energy may be classified into constitutive energy essential to its continued existence, and vibratory energy which it can receive from or radiate away into aether. A piece of matter isolated in free aether would in time lose a„ energy of the latter type by radiation; but the former will remain so long as the matter persists, along with the energy of the uniform translatory motion to which it is ultimately reduced. Thus all matter is in continual exchange of vibratory energy with the aether: it is with the laws of this exchange of energy that the general theory of Radiation deals, as dis- tinguished from the mechanism of the aethereal vibrations, which is usually treated as the Theory of Light (see Aether). 1. The foundation of this subject is the principle, arrived

at independently by Balfour Stewart and Kirchhoff about the year 1858, that the constitution (§ 6) of the radiation which pervades an enclosure, surrounded by bodies in a steady thermal state, must be a function of the temperature of those bodies, and of nothing else. It was subsequently pointed out by Stewart (Brit. Assoc. Report, 1871) that if the enclosure contains a radiating and absorbing body which is put in motion, all being at the same temperature, the constituents of the radiation in front of it and behind it will differ in period on account of the Doppler-Fizeau effect, so that there will be an opportunity of gaining mechanical work in its settling down to an equilibrium; there must thus be some kind of thermodynamic compensation, which might arise either from aethereal friction, or from work required to produce the motion of the body against pressure exerted on it by the surrounding radiation. The hypothesis of friction is now excluded in ultimate molecular physics, while the thermodynamic bearing of a pressure exerted by radiation, such as is demanded by Maxwell's electric theory, has been more recently developed on other lines by Bartoli and Boltzmann (1884), and combined with that of the Doppler effect by W. Wien (1893) in develop- ment of the ideas above expressed.

The original reasoning of Stewart and Kirchhoff rests on the dynamical principle, that by no process of ordinary reflexion or transmission can the period, and therefore the wave-length, of any harmonic constituent of the radiation be changed; each constituent remains of the same wave-length from the time it is emitted until the time it is again absorbed. If we imagine a field of radiation to be enclosed within perfectly reflecting walls, then, provided there is no material substance in the field which can radiate and absorb, the constitution of the radiation in it may be any whatever, and it will remain permanent. It is only the presence of material bodies that by their continued emission and absorption can transform the surrounding radiation towards the unique constitution which corresponds to their temperature. We can define the temperature of an isolated field of radiation, of this definite ultimate constitution, to be the same as that of the material bodies with which it would thus be in equilibrium. Further, the mutual independence of the various constituents of any field of radiation enclosed by perfect reflectors allows us to assign a temperature to each constituent, such as the part involving wave-lengths lying between X and X + 5X; that will be the temperature of a material system with which this constituent by itself is in equilibrium of emission and absorption. But to reason about the temperature of radiation in this way we must be sure that it completely pervades the space, and has no special direction; this is ensured by the continual reflexions from the walls of the enclosure. The question of the temperature of a directed wave-train travelling through space, such as a beam of light, will come up later. The tempera- ture of each constituent in a region of undirected radiation is thus a function of its

wave-length and its intensity alone. It is the fundamental principle of thermodynamics, that temperatures tend to become uniform. In the present case of a field of radiation, this equalization cannot take place directly between the various constituents of the radiation that occupy the same space, but only through the intervention of the emission and absorption of material bodies; the constituent radiations are virtually partitioned off adiabatically from direct interchange. Thus in discussing the transformations of temperatures of the constituent elements of radiation, we are really reasoning about the activity of material bodies that are in thermal equilibrium with those constituents; and the theoretical basis of the idea of temperature, as depending on the fortuitous residue of the energy of molecular motions, is preserved.

2. Mechanical Pressure of Undulatory Motions. — Consider a wave-train of any kind, in which the displacement is £ = a cos m(x+ct) so that it is propagated in the direction in which x decreases; let it be directly incident on a perfect reflector travelling towards it with velocity v, whose position is there-

fore given at time t by x-vt. There will be a reflected train given by £' = «' cos m'ix-ct), the velocity of propagation c being of course the same for both. The disturbance does not travel into the reflector, and must therefore be annulled at its surface; thus when x = vt we must have £+£' = identically. This gives a'= -a, and m'(c-v) = m(c+v). The amplitude of the reflected disturbance is therefore equal to that of the in- cident one; while the wave-length is altered on the ratio

c+v'

which is approximately 1-

2- where c

vjc is small, and

is thus in agreement with the usual statement of the Doppler effect. The energy in the wave-train being half potential and half kinetic, it is given by the integration of p(d£ldt) 2 along the train, where p represents density. In the reflected train it is therefore augmented, when equal lengths are compared, in the

^"^Ty J but the length of the train is diminished by

ratio

the reflexion in the ratio

hence on the whole the

c—v

c+v'

energy transmitted per unit time is increased by the reflexion in

the ratio ˆtH. This increase per unit time can arise only c — v

from work done by the advancing reflector against pressure

exerted by the radiation. That pressure, per unit surface, must

2

therefore be equal to the fraction 77 of the energy in a length

c 2 — u 2 c+v of the incident wave-train; thus it is the fraction — — –

of the total density of energy in front of the reflector, belonging to both the incident and reflected trains. When v is small com- pared with c, this makes the pressure equal to the density of vibrational energy, in accordance with Maxwell's electrodynamic formula (Elec. and Mag., 1871).

The argument may be illustrated by the transverse vibrations of a tense cord, the reflector being then a lamina through a small aperture in which the cord passes; the lamina can thus slide along the cord and sweep the vibratory motion in front of it. In this case the force acting on the lamina is the resultant of the tensions T of the cord on the two sides of the aperture, giving a lengthwise force iTdˆ+ ˆ"y/dx 2 when, as usual, powers higher than the second of the ratio of amplitude to wave-length are neglected; this, when vjc is small, is an oscil- latory force of amount 2pU£/d/) 2 , whose time-average agrees with the value above obtained. If we consider a finite train of waves thus sent back from a moving reflector, the time integral of the pressure must represent force transmitted along the cord, or a gain of longitudinal momentum in the reflected waves, or both together.

When it is a case of transverse waves in an elastic medium, reflected by an advancing obstacle, the origin of the working pressure is not so obvious, because we cannot easily formulate a mechanism for the advancing reflector like that of the lamina above employed. In the case of light-waves we can, however, ima- gine an ideal material body, constituted of very small molecules, that would sweep them in front of it with the same perfection as a metallic mirror actually reflects the longer Hertzian waves.

The pressure will then be identified physically, as in the case of the latter waves, with the mechanical forces acting on the screening oscillatory electric current-sheet which is induced on the surface of the reflector. The displacement represented above by £, which is annulled at the reflector, may then be taken to be either the tangential electric force or the normal component of the vector whose velocity is the magnetic force. The latter interpretation is theoretically interesting, because that vector, which is the dynamical displacement in electron- theory, usually occurs only through its velocity. The general case of oblique incidence can be treated on similar lines; each filament of radiation (ray) in fact exerts its own longitudinal push equal to its energy per unit length, and it is only a matter of summation.

The usual formula for the pressure of electric radiation is

derived from a theory, namely, that of the ordinary electro- dynamic equations, which considers the velocity of the matter, or rather of the electrons associated with it, to be so small com- pared with that of radiation that the square of the ratio of these velocities can be neglected. The formula above obtained is of general application, and shows that for high values of v the pressure must fall off. It has been urged as an objection to the thermodynamic reversibility of a ray (§ 8) that the work of the radiant pressure exerted at its front is lost, as there is no obstacle to sustain it; but on an obstacle moving with the velocity of the wave-front the pressure would vanish, so that this objection does not now hold.

In every such case of an advancing perfect reflector the aggregate amplitude of the superposed incident and reflected wave-trains, of different wave-lengths and periods, will be represented by

$b + b = 20 \sin (* — t) \sin (x\text{-}vi);$

thus the appearance presented will be that of a train of waves each of length (i-v/c)2ir/m, and progressing with the velocity v of the reflector, which travels at one of the nodes of the train. This slowly travelling wave-train corresponds to the stationary train which would be produced by a stationary perfect reflector; but the amplitude is now a varying quantity which, once uniform vibration has been fully established along any path, may itself be described as running on after the manner of a superposed wave-train of very great wave-length (c/v-i)2ir/m and of very great velocity c 2 /u. A somewhat similar state of things arises when a wave-train is incident on a stationary reflector very nearly normally, as may sometimes be seen with incoming rollers along a shelving beach; the visible disturb- ance at a reflecting ridge, arising from each single wave-crest, then rushes along the ridge at a speed which is at first sight surprising, as it is enormously in excess of the speed possible for any simple train of waves travelling into quiescent aether.

3. Wien's Law. — Let us consider a spherical enclosure filled with radiation, and having walls of ideal perfectly reflecting quality so that none of the radiation can escape. If there is no material body inside it, any arbitrarily assigned constitution of this radiation will be permanent. Let us suppose that the radius a of the enclosure is shrinking with extremely small velocity v. A ray inside it, incident at angle 1, will always be incident on the walls in its successive reflexions at the same angle, except as regards a negligible change due to the motion of the reflector (§ 2) ; and the length of its path between successive reflexions is 2a cos 1. Each undulation on this ray will thus undergo reflexion at intervals of time equal to za cos ijc, where c is the velocity of light, and it is easily verified that on each reflexion it is shortened by the fraction 2v cos i/c of itself: thus in the very long time T required to complete the shrinkage it is shortened by the fraction uTo, which is da/a where 5a is the total shrinkage in radius, and is independent of the value of t. The wave-length of each undulation in the radiation inside the enclosure is therefore reduced in the same ratio as the radius. Now suppose that the constitution of the enclosed radiation corresponded initially to a definite temperature. During the shrinkage thermal equilibrium must be maintained among its constituents; otherwise there would be a running down of their energies towards uniformity ' of temperature, if material radiating bodies are present, which would be superposed on the mechanical operations belonging to the shrinkage, and the process could not be reversible. Such a state of affairs is not possible, for it would land us in processes of the following type. Expand the enclosure, gaming the mechanical work of the radiant pressure against its walls, whatever that may be. Then equalize the intensities of the constituent

radiations to those correspond- ing to a common temperature, by taking advantage of the absorptions of material bodies at the actual temperatures of these radiations; when this is done, as it may actually be to some extent by aid of the sifting produced by partitions which transmit some kinds of radiation more rapidly than others, a

further gain of work can be obtained at the expense of the radiant energy. Then contract the remaining radiant energy to its previous volume, which requires' an expenditure of less work on the walls of the enclosure than the expansion of the greater amount of radiation originally afforded; and, finally, gain still more work by again equalizing the temperatures of its constituents. The energy now remaining, being of smaller amount and under similar conditions, must have a temperature lower . than the initial one. This process might be repeated indefinitely, and would constitute an engine without an ex- traneous refrigerator, violating Carnot's principle by deriving an unlimited supply of mechanical work from thermal sources at a uniform temperature.

Thus, independently of any knowledge of the intensity of the mechanical pressure of radiation, or indeed of whether such a pressure exists at all, it is established that the shrinkage of the enclosure must directly transform the contained radiation to the constitution which corresponds to some definite new tempera- ture. Now we have seen that the wave-lengths of its constituents are all reduced in the same ratio by this process. If, then, we can prove that the intensities of these constituents are also all changed in a common ratio by the reflexions at the shrinking envelope, it will follow that the distributions of the radiation among the various wave-lengths are, at these two temperatures, and therefore at any two temperatures, homologous, in the sense that the intensity curves, after the wave-lengths in one of them have been reduced in a ratio depending definitely on the two temperatures, differ only in the absolute scale of magnitude of the ordinates.

This procedure modifies Wien's argument by employing a uniformly shrinking spherical enclosure (cf. Brit. Assoc. Report, 1900). If the enclosure is not spherical, the angles of incidence at successive reflexions of the same ray will differ by finite amounts; we must then estimate the average effect of the shrinkage. In the form of enclosure here employed all rays are affected alike, and no averaging is required; while by the principle of Stewart and Kirchhoff what is established for any one form is of general validity.

4. Pressure of Natural Radiation. — The question reserved above has now to be settled. At first sight it might have appeared that the reflexion is simply total; but, as has been seen in § 2, the advancing perfect reflector

does work against the pressure of the radiation, and this work must be changed into radiant energy and thus go to increase the intensity of the reflected ray. Considering electric radiation incident at angle i, the tangential electric force is annulled at the reflector; hence the amplitude of the electric vibration is conserved on reflexion, though its phase is reversed. As already seen, the wave-length is shortened approximately by the fraction 21/ cos t/e in each reflexion; thus, just as in § 2, the energy transmitted per unit time per unit area is increased in the same ratio; and allowing for the factor cos t of foreshortening, there is therefore a radiant pressure equal to the total density of radiant energy in front of the reflector multiplied by cos 2 t. This argument, being inde- pendent of the wave-length, applies to each constituent of the radiation in this direction separately; thus their energies are all increased in the same ratio by the reflexion, as was to be proved. When we are dealing with the natural radiation in an enclosure, which is distributed equally in all directions, this factor .cos 2 t must be averaged; and we thus attain Boltzmann's result that the radiant pressure is then one-third of the density of radiant energy in front of the reflector, this statement holding good as regards each constituent of the natural radiation taken separately.

5. Adiabatic Relations. — Consider the enclosure filled with radiation of energy-density E at volume V, of any given con- stitution but devoid of special direction, and let it be shrunk to volume V – 5V against its own pressure; if the density thereby become E – 5E, the conservation of the energy requires

*EV-HESV= (E-SE)(V-SV), so that fE5V+V5E = o, or E varies as V -3 *.*

Again — but now with a restriction to radiation with its energy

distributed as regards wave-length so as to be of uniform temperature — the performance of this mechanical work JE5V has changed the energy of radiation EV from the state that is in equilibrium of absorption and emission with a thermal source at temperature T to the state in equilibrium with an absorber of some other temperature T-5T, and that in a reversible manner; thus by Carnot's principle

iE5V/EV=-5T/T, so that T varies as V _i , or inversely as the linear dimensions when the enclosure is shrunk uniformly.

Combining these results, it appears that E varies as T 4 ; this is Stefan's empirical law for the complete radiation corresponding to the temperature,

first established on these lines by Boltzmann. Starting from the principle that this radiation must be a function of the temperature alone, this adiabatic process has in fact given us the form of the function. These results cannot, how- ever, be extended without modification to each separate con- stituent of the complete radiation, because the shrinkage of the enclosure alters its wave-length and so transforms it into a different constituent.

6. Law of Distribution of Energy. — The effect of compressing the complete radiation is thus to change it to the constitution belonging to a certain higher temperature, by shortening all its wave-lengths by the proportion of one-third of the com- pression by volume, the temperature being in fact raised by the same proportion; at the same time increasing in a uniform ratio the amounts corresponding to each interval 5X, so as to get the correct total amount of energy for the new temperature. In the compression each constituent alters so that TX remains constant, and the energy Ea5X in the range 5X in other respects changes as a function of T alone. Hence generally Ea5X must

be of form F(T)/(TX)5X. But for each temperature J° E A 5X is" equal to E and so varies as T 4 , by Stefan's law; that is,

T-'F(T)X/(TX)i(TX) ocT 4 , so that T _1 F(T) cxT 4 . Thus, finally, Ea5X is of form AT 6 /(TX)5X or AX~ 6 <£(TX)5X, which is Wien's general formula.

*7. Transformation of a Single Constituent. — It is of interest to follow out this adiabatic process for each separate con- stituent of the radiation, as a verification, and also in order to ascertain whether anything new is thereby gained. To this end let now E(X,T)5X represent the intensity of the radia- tion between X and X+5X which corresponds to the temperature T. The pressure of this radiation, when it is without special direction, is in intensity one-third of this; thus the application of Carnot's principle shows, as before, that in adiabatic com- pression T ccV~ J , so that a small linear shrinkage in the ratio i-x raises T in the ratio i--x. We have still to express the equation of energy. The vibratory energy E(X,T)5X . V in volume V, together with the mechanical work JE(X,T)SX . 3*V, yields the vibratory energy*

E(X(i-),T(i+*)18X(i-*).V(i-3*); thus, writing E and Ea or E (X,T) we have, neglecting x 2 ,*

-4%),

E(i+) = (E-*xg+«Tg)(i-*

so that

5E+X2f- d

dE

l dT

= 0,

a partial differential equation of which the integral is

E = AX- 6 0(TX), the same formula as was before obtained.

This method, treating each constituent of the radiation separately, has in one respect some advantage, in that it is necessary only to postulate an enclosure which totally reflects that constituent, this being a more restricted hypothesis than an absolutely complete reflector.

To determine theoretically the form of the function we must have some means of transforming one type of radiation into another, different in essence from the adiabatic compression already utilized. The condition that the entropy of the in- dependent radiations in an enclosure is a minimum when they are all transformed to the same temperature with total

energy unaltered, is already implicitly fulfilled; it would thus appear that any further advance must involve (§11) the dynamics of the radiation and absorption of material bodies.

8. Temperature of an Isolated Ray. — The temperature of each independent constituent of a radiation has here been taken to be a function of the intensity Ea, where Ea5X is the energy per unit volume in the range between wave-lengths X and X+5X; the condition is, however, imposed that this radiation is in- different as to direction. When a beam of radiation travels without loss in a definite direction across a medium, its form varies as it progresses; but it is reversible inasmuch as it can be turned back at any stage, or concentrated without loss, by perfect reflectors. If the energy of the beam has a tempera- ture, its value must therefore remain constant throughout the progress of the beam, by the principle of Carnot. Now by virtue of a relation in geometrical optics, which on a corpuscular theory would be one aspect of the fundamental dynamical principle of Action, the cross-section 5S at any place on the beam, and the conical angle &o within which the directions of its rays are there included, are such that the value of V~ 2 5S5co is conserved along the beam, V being the velocity of propagation of the undulations. If we represent the amount of radiant energy transmitted per unit time across the section 5S of the beam by

I5S5co, it will follow that in passing along the beam its intensity of illumination I varies as V 2 , or as the square of the index of refraction, provided there is no loss of energy in trans mission. This condition requires that changes of index shall be gradual, otherwise there would be loss of energy by partial reflexions; in free aether I is itself constant along the beam. The volume-density of the energy in any part of the directed beam is V _1 I5oo; it is thus inversely as the solid angular con- centration of the rays and directly as the cube of the index of refraction. Now we may consider this beam, of aggregate intensity I5S5co, to form an elementary filament of the radiation issuing in the direction of the normal from a perfect radiator. As such a body absorbs completely and therefore radiates equally in all directions in front of it, the total intensity of

radiation from its element of surface 5s is 5s Jl cos 05co, or 5s . rf, while the volume-density of the total advancing and receding radiation in front of it is 2V -1 fldw, and therefore 4irV -1 I. If we take here I5X to represent the intensity between wave-lengths X andX + 5X, this density is the quantity Ea of which the temperature of the radiator is a function. Thus the quantity I — which optically is a measure of the brightness of the beam, and is conserved along it to the extent that ju 2 I is the same from whichever of its cross-sections the beam is supposed to be emitted — also determines its temperature, the latter being that of an enclosure containing undirected radiation of the same range 5X which is density Ea5X given by Ea = 4itV _1 I, where V is the velocity of radiation in the enclosure. When a beam of radiation travels without suffering absorption, its temperature thus continues to be that of its source multiplied by the coefficient of emission of the source for that kind of radiation, this coefficient being less "than unity except in the case of a perfect radiator; but when its intensity I falls by 51 in any part of its path owing to absorption or other irreversible process, this involves a further fall of temperature of the energy of the beam and a rise of entropy which can be completely determined when the relation connecting ju _3 Ea with T and X is known. Any directed quality in radiant energy increases its effective temperature. Splitting a beam into two at s reflecting and refracting surface diminishes the temperature of each part; it is true that if the reflecting surface were non- molecular the operation could be reversed, but actually the reversed rays would encounter the reflecting molecules rn different collocations, and could not (§ n) recombine into the same detailed phase-relations as before. The direct solar radiation falling on the Earth is almost completely convertible into mechanical effect on account of its very high temperature; there seems ground for believing that certain constituents of it can actually be almost wholly turned to account by the

green leaves of plants. But the same solar radiation, when broken up into diffused sky light, which has no definite direction, has fallen into equilibrium with a much lower temperature, through loss of its reversibility. It has been remarked that the temperatures of the planets can be roughly compared by means of this principle, if their coefficients of absorption of the solar radiation are assumed; that of Neptune comes out below — 200 C, if we suppose that it is not kept higher by a supply of internal heat.

To obtain dynamical precision in this discussion an exact definition of the narrow beam such as is usually called a ray is essential. It can be specified as a narrow filament of radiation, such as may be isolated within an infinitely thin, impermeable, bounding tube without thereby producing any disturbance of the motion. If either the tube or the surrounding radiation were not present to keep the beam in shape, it would spread sideways, as in optical diffraction. But the function of the tube is One of pure constraint; thus the change of energy- content of a given length of the tube is represented by energy flowing into it at the end where the radiation enters, and leaving it at the other end, but with no leakage at the sides. The total radiation may be considered as made up of such filaments.

9. Temperature of the Sun. — The mean temperature of the radiating layers of the Sun may be estimated from Stefan's law, by computing the intensity of the radiation at his surface from that terrestrially observed, on the basis of the law of inverse squares; the result is about 6500° C. The application of Wien's law, which makes the wave-length of maximum energy vary inversely as the temperature, for the case of a perfectly radiating source, gives a result 5500 C. These numbers will naturally differ because (i) the Sun is not a perfect radiator, the constitution of his radiation in fact not following the law of that of a black body, (ii) the various radiating layers have different temperatures, (iii) the radiation may be in part due to chemical and electrical causes, and in so far would not be determined by the temperature alone. The fair agreement of these two estimates indicates, however, that the radiation is largely regulated by the temperature, that the layers from which the main part of it comes are at temperatures not very different, and that not very much of the complete radiation established in these layers and emitted from them is absorbed by the overlying layers.

10. Fluorescence. — When radiation of certain wave-lengths falls on a fluorescent body, it is largely absorbed, but in such manner as directly to excite other radiation of different type which is emitted in addition to the true temperature-radiation of the body. The distinction involved is that the latter radia- tion is spontaneously convertible with the heat of the absorbing

body at its own temperature, without any external stimulus or compensation; it is, in fact, on the basis of this convertibility that the thermodynamic relations of the temperature-radiation have been established. According to the experimental law of Stokes, the wave-lengths of the fluorescent radiation are longer than those of the radiation which excites it. If the latter were directly transformed, in undiminished amount, into the fluorescent kind, this is what would be expected. For such a spontaneous change must involve loss of availability; and, beyond the wave-length of maximum energy in the spectrum the temperature of a given density of radiation is greater the shorter its wave-length, as it is a function of that density and the wave-length alone such that greater radiation always corresponds to higher temperature. But it would appear that the opposite should be the case for radiation of long wave- lengths, lying on the other side of the maximum, in which the tendency would thus be for spontaneous change into shorter waves; this may perhaps be related to the fact that the lines of longer wave-lengths in spectra often come out brighter at lower temperatures, for they are then thrown on the other side of the maximum and cannot be thus degraded. The principle does not, however, have free play in the present case, even when the incident radiation is diffused and so has not the abnormally high temperature associated with a directed beam*

(§ 8), since part of it might be degraded into low-temperature heat, or there might be other compensation of chemical type for any abnormally high availability that might exist in the fluorescent radiation. It has been found that fluorescent radiation, showing a continuous or banded spectrum, can be excited in many gases and vapours; milky phosphorescence of considerable duration, and thus doubtless associated with chemical change, is produced in vacuum tubes, containing oxygen or other complexly constituted gases, by the electric discharge.

11. Entropy of a Ray. — If each definitely constituted beam of radiation has its own temperature and everything is rever- sible as above, a question arises as to the location of the process of averaging which enters into the idea of temperature. T he answer can depend only on the fact, that although the btam is definite as to wave-length and intensity, yet it is far from being a simple wave-train, in that it is constitu'% of trains of limited lengths and various phases and polarizations, coming from the independent radiating molecules. When such a beam has once emerged, it travels without change, and can be reflected back intact to its source, and is in so far reversible; but when it has arrived there, the molecules of the source will have changed their positions, and it cannot be wholly reabsorbed in the same manner as it was emitted. There must thus be some feature in the ultimate averaged constitution of the beam, emitted from a body in the definite steady state of internal motion determined by its temperature,

which adapts it for spontaneous uncompensated reabsorption into a body at its own (or a lower) temperature, but not at a higher one.

*The question of the determination of the form of the function in § 6 would thus' appear to be closely connected with the other problems, hitherto imperfectly fathomed, relating to the statistics of kinetic molecular theory. A very interesting attack on the problem from this point of view has recently been made in various forms by Planck. It of course suffices to examine some simple type of radiating system, and the results will be of general validity. He considers an enclosure filled with radiation involving an entirely arbitrary succession of phases and polarizations along each ray, and also containing a system of fixed linear electric oscillators of the Hertzian type, which are taken to represent the transforming action of radiating and absorbing matter. The radiation contained in the enclosure will be passed through these oscillators over and over again, now absorbed, now radiated, and each constituent will thus settle down in a unilateral or irreversible manner towards some definite intensity and composition. But it does not appear that a system of vibrators of this kind, each with its own period, can perform one of the main functions of a material absorber, namely, the transformation of the relative intensities of the various types of radiation in the enclosure to those corresponding to a common temperature. Ther** would be equilibrium established only between the rrˆdE internal vibratory energy in the vibrators of each period antf the density of radiation of that period; there is needed also some means of interchanging energy between vibrators c' different periods, which probably involves doing away with their fixity, or else employing more complex vibrators and assuming a law of distribution of their internal energy. In the absence of any method of introducing this temperature equili~ brium directly, Planck originally sought, in the case of each independent constituent, for a function of its intensity of energy and its wave-length, restricted as to form by a certain assumed molecular relation, which has the property of continu- ally increasing after the manner of entropy, during the progress of that constituent of the radiation in such a system toward? its steady state. If the actual entropy S per unit volume could be thus determined, the relation of Clausius $<5S=8E/T$ would supply the connexion between the temperature and the density of radiant energy E. This procedure led him, in an indirect and tentative manner, to a relation i 2 S/dE 2 $=-a/E$, so that $S=-aE \log/3E$, where a, /3 are functions of X; an expression which conducts through Clausius's relation to $E = (tf/J)\sim 1$ e -1 /'" r .*

The previous argument then gives E(X,T)5X=CiX" 5 e _c/AT 6X, g type of formula which was originally suggested by Wien on the basis of the analogy that it assigns the same distribution for the radiant energy, among the various frequencies of vibra- tion, as for the energy of the molecules in a gas among their various velocities of translation. But the experimental in- adequacy of this formula afterwards suggested a new pro- cedure, as infra.

Processes may be theoretically assigned for the direct continuous transformation of radiant into mechanical energy. Thus we can imagine a radiating body at the centre of a wheel, carrying oblique vanes along its circumference, which reflect the radiation on to a ring of parallel fixed vanes, which finally reverse its path and return it to the centre. The pressure of the radiation will drive the wheel, and in case its motion is not resisted, a very great velocity may be theoretically obtained. The thermodynamic compensation in such cases lies in the reduction of the effective temperature of the portion of the radiation not thus used up. We might even do away with the radiating body at the centre of the wheel, and consider a beam of definite radiation reflected backwards and forwards across a diameter. It is easy to see that its path will remain diametral; the work done by it in driving the wheel will be concomitant with increase of the wave-length, and therefore with expansion of the length occupied by the beam. The thermodynamic features are thus analogous to those of the more familiar case of an envelope filled with gas, which can change its thermal energy into mechanical energy by expansion of the envelope against mechanical resistances. In the case of the expanding gas pv = |E , where E is the total trans- latory energy of the molecules, while in adiabatic expansion p — h>-i. Thus the work gained in unlimited expansion, fpdv, is |E<,/(7 — i). The final temperature being absolute zero, this should by Carnot's principle be equal to the total initial energy of the gas that is in connexion with temperature, constitutive energy of the molecules being excluded; when 7 — 1 is less than f there is thus internal thermal energy in the molecules in addition to the translatory energy. In the case of the beam of radiation, of length /, between n and n+Sn reflexions, where bn is an integer, its total energy E is

by § 2 reduced according to the law 51 = -7^5. Also % =2^ ■

fc. \c--vy I c+v'

thus ■£-=— £j- j. When v is small compared with c, this gives

E = k/- 2 ; and p is then 2E/1, so that fpdl = E, the temperature of the beam being ultimately reduced to absolute zero by the unlimited expansion. This is in accord with Carnot's principle, in that the whole energy of the beam travelling in a vacuum is mechani- cally available when reduction to

absolute zero of temperature is in our power.

12. Experimental Knowledge. — Under the stimulus of Wien's investigation and of improvements in the construction of linear thermopiles and bolometers for the refined measurement of the distribution of energy along a spectrum, the general character of the curve connecting energy and wave-length in the complete radiation at a given temperature has been experimentally ascertained over a wide range. At each temperature there is a wave-length X m of maximum radiation, which is displaced towards the ultra-violet as the temperature rises, and Wien's law of homology (§ 6) shows that X m T should be constant. This deduction, and the law of homology itself, as also the law of Stefan and Boltzmann that the total radiation varies as T 4 , have been closely verified by the experiments of Rubens and Kurlbaum, Lummer and Pringsheim, Paschen and others. They established a steady field of radiation inside a material enclosure by raising the walls to a definite temperature, and measured the radiant intensity emitted from it through an opening or slit in the walls, by means of a bolometer or thermo- pile, this being the radiation of the so-called perfectly black body. The principle here involved formed one of the foundations of Balfour Stewart's early treatment of the theory, and had already been employed by him and Stokes (i860) in experiments on the polarized emission from tourmaline: cf. Stokes, Math, and Phys. Papers, iv. 136. It has been remarked by Planck and by Thiesen that the coefficient of T 4 in Stefan's law, and the value of X m T, are two absolute physical constants independent of any particular kind of matter, which in conjunction with the constant of gravitation would determine an entirely absolute system of physical units. The form of the function 4 > (T\) adopted by Wien and in Planck's earlier discussions, namely, c^' , was found to agree fairly with experiment over the range from ioo° C.to 1300 C, when d= i-24Xio -5 , and c =

1 -4435 in c.g.s. measure, but not so well when the range is farther extended: it appeared that a larger value of c was needed to represent the radiation for high values of TX, that is, for high temperature or for very long wave-lengths. Thiesen proposed the somewhat more general form Ci(TX) A e~ c/TA , and suggested that the value k = 5 agrees better with the experimental numbers than Wien's value k = o. Lord Rayleigh was led (Phil. Mag., June 1900) towards this form with k equal to unity from entirely different theoretical considerations, on the assumption of the Maxwell-Boltzmann distribution of the energy of a system, consisting of an isolated block of aether, among its free periods of vibration, infinite in number; in some cases this form appeared to give as good results as Wien's own.

Acting on a suggestion advanced by Lord Rayleigh, Rubens and Kurlbaum

soon afterwards widely extended the test of the formulae by means of the so-called Reststrahlen. A substance such as an aniline dye, which exhibits selective absorption of any group of rays, also powerfully reflects those rays; and Rubens has been able thus to isolate in considerable purity the rays belonging to absorption bands very far down in the invisible ultra-red, having wave-length of order io~ 3 cm., which are intensely absorbed by substances such as sylvine, by means of five or six successive reflexions of the beam of radiation. By experiments ranging between temperatures -200 C. and + 1500° C. of the source of radiation, it has been found that the intensity of this definite radiation tends to vary simply as T, with close approximation, thus increasing indefinitely with the temperature, whereas Wien's formula would make it tend to a definite limit. The only existing formula (except the one suggested by Lord Rayleigh) that proved to be in accord with this result was a new one advanced shortly before and supported on theoretical grounds by Planck, namely, Ea5X = CX _6 5X/(e c/AT —i), which for small values of XT agrees with Wien's original form, known to be there satisfactory, while for larger values it tends towards C/ c.X~ 4 T; the new formula is, in fact, the simplest and most likely form that satisfies these two conditions. The point of Lord Rayleigh's argument was that, at any rate at low frequencies, the law of distribution would suggest an equable partition of the energy between temperature heat and radiant vibrations, and that therefore the energy of the latter should ultimately vary as T; and this prediction, which has thus been verified, may be grafted on to any formula that is in other respects appropriate.

Recognizing that his previous hypothesis, restricting the nature of the entropy in addition to its property of continually in- creasing, had thus to be abandoned, Planck had in fact made a fresh start on the basis of a train of ideas which was introduced by Boltzmann in 1877, in order to obtain a precise physical conception of entropy. According to the latter, for an indefinitely numerous system of molecules, with known properties and in given circumstances, there is a definite probability of the occurrence of each statistical distribution of velocities, or say each " complexion " of the system, that is formally possible when all velocities consistent with given total energy are con- sidered to be equally likely as regards each molecule; the distri- bution of greatest possible probability is the state of thermal equilibrium of the system, and the probability of any other state is a function of the entropy of that state. This conception can be developed only in very simple cases; the application to an ideal monatomic gas-system led Boltzmann to take the entropy proportional to the logarithm of the probability. This logarithmic law is in fact demanded in advance by the principle that the entropy of a system should be the sum of the entropies of its parts. By means of a priori considerations of this nature, referring to the distribution of internal vibratory energy among a system of linear electric

vibrators of given period, and its equilibrium of exchanges with the surrounding radiant energy, Planck has been guided to an expression for the law of depend- ence of the entropy of that system on the temperature, which corresponds to the form of the law of radiation above stated. The result gains support from the fact that the expressions for the coefficients to which he is led give determinations of the

absolute physical constants of molecular theory, such as the constant of Avogadro, which are in close accord with other recent determinations. But on the other hand these deter- minations are already involved in the earlier formula of Rayleigh, which expresses the distribution for long waves, based merely on the Maxwell-Boltzmann principle of the equable partition of the energy among the high free periods belonging to the enclosure which contains it. It is maintained by Jeans that the reason why this principle is of avail only for very long wave- lengths is that a steady state is never reached for the shorter ones, a doctrine which as he admits would entirely remove the founda- tions of the application of thermodynamic principles to this subject. By an argument based on the theory of dimensions, Lorentz has been led to the conclusion that consistency between temperatures, as measured molecularly, and as measured by the laws of radiation, requires that the ultimate indivisible electric charges or electrons must be the same in all kinds of matter.

The abstract statistical theory of entropy, which is here invoked, admits of generalization in a way which is a modifica- tion of that of Planck, itself essentially different from the earlier idea of Boltzmann. The molecules of matter, whose interactions control physical phenomena, including radiation, are too numerous to be attended to separately in our knowledge. They, and the phenomena in which they interact, must thus be sorted out into differential groups or classes. Elements of energy of specified types might at first sight constitute such classes: but the identity of a portion of energy cannot be traced during its transformations, while an element of physical disturbance can be definitely followed, though its energy changes by interaction with other elements as it proceeds. The whole disturbance may thus be divided into classes, or groups of similar elements, each with permanent existence: and these may be considered as distributed in series of cells, all equivalent in extent, which constitute and map out the material system or other domain of the phenomena. The test of this equivalence of extent is superposition, in the sense that the same element of disturbance always occupies during its wanderings the same number of cells. This framework being granted, the probability of any assigned statistical

distribution of the elements of disturbance now admits of calculation; and it represents, as above, the logarithm of the entropy of that distribution, multiplied however by a coefficient which must depend on the minuteness of scale of the statistics. But in the calculation, all the physical laws which impose restrictions on the migrations of the elements of dis- turbance must be taken into account; it is only after this is done that the rest of the circumstances can be treated as fortuitous. All these physical laws are, however, required and used up in determining the complex of equivalent cells into which the system which forms the seat of the energy is mapped out. On this basis thermodynamics can be constructed in a priori abstract fashion, and with deeper and more complete implications than the formal Carnot principle of negation of perpetual motions can by itself attain to. But the ratio of the magnitude of the standard element of disturbance to the extent of the standard cell remains inherent in the results, appearing as an absolute physical constant whose value is determined somehow by the other fundamental physical constants of nature. A prescribed ratio of this kind is, however, a different thing from the hypothesis that energy is constituted atomically, which underlies, as Lorentz pointed out, Planck's form of the theory. It has indeed already been remarked that the mere fact of the existence of a wave-length \ m of maximum radiation, whether obeying Wien's law X m T = constant or not, implies by itself some prescribed absolute physical quantity of this kind, whose existence thus cannot be evaded, though we may be at a loss to specify its nature.

13. Modification by a Magnetic Field. — The theory of ex- changes of radiation, which makes the equilibrium of radiating bodies depend on temperature alone, requires that, when an element of surface of one body is radiating to an element of surface of another body at the same temperature, the amounts of energy interchanged (when reflexion is counted in along with

radiation) should be equal. This proposition is a general dynamical consequence — on the basis of the laws of reciprocity developed in this connexion (after W. Rowan Hamilton) mainly by Helmholtz, Kirchhoff, and Rayleigh — of the form of the equations of propagation of vibrations in the medium. But in a material medium under the influence of a strong magnetic field these equations are altered by the addition of extraneous terms involving differential coefficients of the third order, and the dynamical consistency of the cardinal principle of the theory of exchanges is no longer thus directly verified. A system of this kind has, in fact, been imagined by Wien in which the principle is imperfectly fulfilled. A beam coming from a body A, and polarized by passage through a nicol, may have its plane of vibration rotated through half a right angle by crossing a magnetically active plate, and may then pass through another nicol, properly orientated for transmission, so as finally to fall on another body

B. On the other hand, the radiation from B which gets through this adjacent nicol will have its plane of vibration rotated through another half right angle by the magnetically active plate, and so will not get through the first nicol to the body A. Such possibilities of unequal ex- change of radiation between A and B are the result of the want of reversibility of the radiation in the extraneous magnetic field, which might have been expected to lead to proportionate inequalities of concentration; in this example, however, though the defect of reversibility is itself slight, its results appear at first sight to prevent any equilibrium at all. But a closer examination removes this discrepancy. In order to make the system self-contained, reflectors must be added to it, so as to send back into the sources the polarized constituents that are turned aside out of the direct line by the nicols. Then, as Brillouin has pointed out, and as in fact Rayleigh had explained some years before, the radiation from B does ultimately get across to A after passage backward and forward to the reflectors and between the nicols: this, it is true, increases the length of its path, and therefore diminishes the concentration of a single narrow beam, but any large change of path would make the beam too wide for the nicols, and thus require other corrections which may be supposed to compensate. The explanation of the slight difference that is to be anticipated on theoretical grounds might conceivably be that in such a case the magnetic influence, being operative on the phases, alters the statistical constitution of the radiation of given wave-length from the special type that is in equilibrium with a definite temperature, so that after passage through the magnetic medium it is not in a condition to be entirely absorbed at that temperature; there would then be some other element, in addition to temperature, involved in equilibrium in a magnetic field. If this is not so, there must be some thermodynamic compensation involving reaction, extremely small, however, on the magnetizing system. 14. Origin of Spectra. — In addition to the thermal radiations of material substances, those, namely, which establish tem- perature-equilibrium of the enclosure in which they are confined, there are the fluorescent and other radiations excited by ex- traneous causes, radiant or electric or chemical. Such radia- tions are an indication, by the presence of higher wave-lengths than belong in any sensible degree to the temperature, that the steady state has not arrived; they thus fade away, either immediately on the cessation of the exciting cause, or after an interval. The radiations, consisting of definite narrow bright bands in the spectrum, that are characteristic of the gaseous state in which each molecule can vibrate freely by itself, are usually excited by electric or chemical agency; thus there is no ground for assuming that they always constitute true tem- perature radiation. The absorption of these radiations by strata of the same gases at low temperatures seems to prove that the unaltered molecules themselves possess these free periods, which do not, therefore, belong specially to dissociated ions. Although very difficult

to excite directly, these free vibrations are then excited and absorb the energy of the inci- dent waves, under the influence of resonance, which naturally becomes extremely powerful when the tuning is exact; this

indicates, moreover, that the true absorption bands in a gas of sufficiently low density must be extremely narrow. There is direct evidence that many of the more permanent gases do not sensibly emit light on being subjected to high temperature alone, when chemical action is excluded, while others give in these circumstances feeble continuous spectra; in fact, looking at the matter from the other side, the more permanent gases are very transparent to most kinds of radiation, and therefore must be very bad radiators as regards those kinds. The dark radiation of flames has been identified with that belonging to the specific radiation of their gaseous products of combustion. There is thus ground for the view that the impacts of the colliding molecules in a gas, or rather their mutual actions as they swing sharply round each other in their orbits during an encounter, may not be sufficiently violent to excite sensibly the free vibrations of the definite periods belonging to the molecules. But they may produce radiation in other ways. While the velocity of an electron or other electric charge is being altered, it necessarily sends out a stream of radiation. Now the orbital motions of the electrons in an actual molecule must be so adjusted, as appears to be theo- retically possible, that it does not emit radiation when in a steady state and moving with constant velocity. But in the violent changes of velocity that occur during an encounter this equipoise will be disturbed, and a stream of radiation, without definite periods, but such as might constitute its share of the equilibrium thermal radiation of the substance, may be expected while the encounter lasts. At very high temperatures the energy of this thermal radiation in an enclosure entirely overpowers the kinetic energy of the molecules present, for the former varies as T^4, while the latter measures T itself when the number of molecules remains the same. The radiation which can be excited in gases, confined as it is to extremely narrow bands in the spectrum, may indeed be expected to possess such intensity as to be thermally in equilibrium with extremely high temperatures. That the same gases absorb such radiations when comparatively cold and dark does not, of course, affect the case, because emissive and absorptive powers are proportional only for incident radiations of the intensity and type corresponding to the temperature of the body. Thus if our adiabatic enclosure of § 3 is prolonged into a tube of unlimited length which is filled with the gas, then when the temperature has become uniform that gas must send back out of the tube as much radiation as has passed down the tube and been absorbed by it; but 'if the tube is

maintained at a lower temperature, it may return much less. The fact that it is now possible by great optical dispersion to make the line-spectra of prominences in the middle of the Sun's disk stand out bright against the background of the continuous solar spectrum, shows that the intensities of the radiations of these prominences correspond to a much higher temperature than that of the general radiating layer underneath them; their luminosity would thus seem to be due to some cause (electric or chemical) other than mere temperature. On the other hand, the general reversing gaseous layer which originates the dark Fraunhofer lines is at a lower temperature than the radiating layer; it is only when the light from the lower layers is eclipsed that its own direct bright-line spectrum flashes out. It is not necessary to attribute this selective flash-spectrum to temperature radiation; it can very well be ascribed to fluor- escence stimulated by the intense illumination from beneath. When the radiation in a spectrum is constituted of wide bands it may on these principles be expected to be in equi- librium with a lower temperature than when it is constituted of narrow lines, if the total intensity is the same in the cases compared; this is in keeping with the easier excitation of band spectra (cf. the banded absorption spectra), and with the fact that various gases and vapours do appear to emit band spectra more or less related to the temperature.

15. Constitution of Spectra. — In the problem of the unravelling of the constitutions of the very complex systems of spectral Sues belonging to the various kinds of matter, considerable

progress has been made in recent years. The beginning of definite knowledge was the discovery of Balmer in 1885, that the frequencies of vibration (n) of the hydrogen lines could be represented, very closely and within the limits of error of observation, by the formula n N/(»»|-ju) 2 . He found that in the group of alkaline metals three series of lines exist, the so-called principal and two subordinate series, whose frequencies fit approximately into this formula, and that similar statements apply to other natural groups of ele- ments; that the constant N is sensibly the same for all series and all substances, while n,, and n have different values for each; and that other approximate numerical relations exist. In each series the lines of high frequency crowd together to- wards a definite limit on the more refrangible side; near this limit they would, if visible, constitute a band. The principal or strongest series of lines shows reversal very readily. The lines of the first subordinate series are usually nebular, while those of the second subordinate or weakest series are sharp; but with a tendency to broaden towards the less refrangible side. In most series there are, however, not more than six lines visible: helium and hydrogen are exceptions, no fewer than thirty lines of the principal series of the latter having been identified, the higher ones in stellar spectra only. But very remarkable progress has recently been made by R. W. Wood, by exciting fluorescent

spectra in a metallic vapour, and also by applying a magnetic field to restore the lines sensitive to the Zeeman effect after the spectrum has been cut off by crossed nicols. The large aggregates of lines thus definitely revealed are also resolved by him into systems in other ways; when the stimulating light is confined to one period, say a single bright line of another substance, the spectrum excited consists of a limited number of lines equidistant in frequency, the interval common to all being presumably the frequency of some intrinsic orbital motion of the molecule. In this way the series belonging to some of the alkali metals have been obtained nearly complete.

Simultaneously with Rydberg, the problem of series was attacked by Kayser and Runge, who, in reducing their extensive standard observations, used the formula $n = A + Bm\sim i$ *-j-Cm*$\sim i$ *, higher terms in this descending series being presumed to be negligible. This cannot be reconciled with Rydberg's form, which gives on expansion terms involving* $m\sim 3$ *; but for the higher values of m the discrepancies rapidly diminish, and do not prevent the picking out of the lines, the frequency-differences between successive lines then varying roughly as the inverse squares of the series of natural numbers. For low values of m neither mode of expression is applicable, as was to be ex- pected; and it remains a problem for the future to ascertain if possible the rational formula to which they are approxima- tions. More complex formulas have been suggested by Ritz and others, partly on theoretical grounds.*

Considered dynamically, the question is that of the deter- mination of the formula for the disturbed motions of the system which constitutes the molecule. Although we are still far from any definite line of attack, there are various indications that the quest is a practicable one. The lines of each series, sorted out by aid of the formulae above given, have properties in common: they are usually multiple lines, either all doublets in the case of monad elements, or generally triplets in the case of those of higher chemical valency; in very few cases are the series constituted of single lines. It is found also that the components of all the double or triple lines of a subordinate series are equidistant as regards frequency. In the case of a related group of elements, for example the alkaline metals, it appears that corresponding series are displaced continually towards the less refrangible end as the atomic weight rises; it is found also that the interval in frequency between the double

lines of a series diminishes with the atomic weight, and is pro- portional to

its square. These relations suggest that the atomic weight might here act in part after the manner of a load attached to a fundamental vibrating system, which might conceivably be formed on the same plan for all the metals of the group; such a load would depress all the periods, and at the same time it would split them up in the manner above described, if it introduced dissymmetry into the vibrator. The discovery of Zeeman that a magnetic field triples each spectral line, and produces definite polarizations of the three components, in many cases further subdividing each component into lines placed usually all at equal intervals of frequency, is explained, and was in part predicted, by Lorentz on the basis of the electron theory, which finds the origin of radiation in a system of unitary electric charges describing orbits or executing vibrations in the molecule. Although tfrese facts form substantial sign-posts, it has not yet been found possible to assign any likely structure to a vibrating system which would lead to a frequency formula for its free periods of the types given above. Indeed, the view is open that the group of "lines constituting a series form a harmonic analysis of a single fundamental vibration not itself harmonic. If that be so, the intensities and other properties of the lines of a series ought all to vary together; it has in fact been found by Preston, and more fully verified by Runge and others, that the lines are multiplied into the same number of constituents in a magnetic field, with intervals in frequency that are the same for all of them. When the series consists of double or triple lines the separate components of the same compound line are not affected similarly, which shows that they are differently constituted. The view has also found support that the different behaviours of the various groups of lines in a spectrum show that they belong to independent vibrators. The form of the vibration sent out from a molecule into the aether depends'on the form of the aggregate hodograph of the electronic' orbits, which is in keeping with Rayleigh's remark that the series-laws suggest the kinematic relations of revolving bodies rather than the vibrations of steady dynamical systems.

According to Rydberg, there is ground for the view that a natural group of chemical elements have all the same type of series spectrum, and that the various constants associated with this spectrum change rapidly in the same directions in passing from the elements of one group to the corresponding ones of the following groups, after the manner illustrated in graphical representations of Mendeleeff's law by means of a continuous wavy curve in which each group of elements lies along this same ascending or descending branch; the chemical elements thus being built up in a series of types or groups, so that the individuals in successive groups correspond one to one in a regular progression, which may be put in evidence by connecting them by transverse curves. Illustrations have been worked out mathematically by J. J. Thomson of the effect of adding successive outer rings of electrons to stable vibrating collocations.

The frequencies of the series of very close lines which con- stitute a single band in a banded spectrum are connected by a law of quite different type, namely, in the simpler cases « 2 = A-Bw 2 . It may be remarked that this is the kind of relation that would apply to a row of independent similar vibrators in which the neighbours exert slight mutual influence of elastic type. If £ denote displacement and x distance along the row,

the equation -^+^£=-£-7-5 would represent the general fea-

tures of their vibration, the right-hand side arising from the mutual elastic influences. If the ends of the line of vibrators, of length /, are fixed, or if the vibrators form a ring, the appropriate type of solution is £ 00 sin jix sin pi, where fd = mir and m is

j?7r^ integral; further- p i +k' — gfi 2 , hence p 2 = k 2 -^-m 2 , which is of

the type above stated. Dynamical systems of this kind are illustrated by the Lagrangean linear system of connected bodies,

such as, for example, a row of masses fixed along a tense cord, and each subject to a restoring elastic force of its own in addition to the tension of the cord. A single spectral line might thus be transformed into a band of this type, as the effect of dis- turbance arising from slight elastic connexions established in the molecule between a system of similar vibrators. But the series in line-spectra are of entirely different constitution; thus for .the series expressed by the formula p 2 = p 2 -Bm" 2 the corresponding period-equation might be expressed in some such form as sin k(p 2 – p 2)~i = constant, which belongs to no type of vibrator hitherto analysed.

Authorities. — The experimental memoirs on the constitution of radiation are mostly in the Annalen der Physik; references are given by P. Drude, Lehrbuch der Optik, Leipzig, 1900; cf. also reports in the collection issued by the International Congress of Physics, Paris, 1900. See also Lord Rayleigh's Scientific Papers, in various connexions; and Larmor, in Brit. Assoc Reports, 1900- 1902, also the Bakerian Lecture, Roy. Soc. Proc, 1909, for a general discussion of molecular statistical theory in this connexion. Planck's Theorie der Wdrmestrahlung, 1906, gives a discussion from his point of view; there is a summary by Wien in Ency. Math. Wiss. v. (3) pp. 282-357; also a lecture of H. A. Lorentz to the Math. Congress at Rome, 1908, and papers by J. H. Jeans, Phil. Mag., ,1909, oh the partition of energy. In spectrum analysis Kayser's extensive treatise is the standard authority. Winckel- mann's Handbuch der Physik, vol. ii. (by Kayser, Drude, &c), may also be consulted. (J. L.)*

RADICAL (Lat. radix, a root), in English politics, a term applied to politicians who desire to make thorough, or radical, changes in the constitution and in the social order generally. Although it had been used in a somewhat similar way during the reign of Charles II., the term Radical, in its political sense, originated about the end of the 18th century, probably owing its existence to Charles James Fox, who, in ,1797, declared that " radical reform " was necessary. The ideas of the first Radicals were borrowed largely from the authors of the French Revolution. The word was more generally employed during the disturbed period between the close of the Napoleonic wars and the passing of the great Reform Bill of 1832, and was applied to agitators like Henry Hunt and William Cobbett. After the Reform Bill had become law, the advocates of violent change were drawn into the Chartist movement, and the Radicals became less revolutionary both in speech and object. Thus in 1842 an observer writes: — " The term Radical, once employed as a name of low reproach, has found its way into high places, and is gone forth as the title of a class who glory in their designation." About this time many members of Parliament were known as Radicals, among these men being George Grote and Joseph Hume. The Radicals never formed a distinct party in the House of Commons, and subsequently they formed simply the advanced section of the Liberal party. For a few years in the 19th century the wearing of a white hat was looked upon as the distinguishing mark of a Radical, a hat of this colour having been worn by Hunt when addressing meetings.

See W. Harris, History of the Radical Party in Parliament (1885) ; S. Bamford, Passages in the Life of a Radical (new ed., 1893) ; C. B. Roylance Kent, The English Radicals: an Historical Sketch (1899).

RADIOACTIVITY. The subject of radioactivity deals with phenomena exhibited by a special class of bodies of high atomic weight of which uranium, thorium, radium and actinium are the best known examples. These substances possess the property of spontaneously emitting radiations of a special character which are able to penetrate through matter opaque to ordinary light. The beginning of this subject dates from 1896, and was an indirect consequence of the discovery of the X rays made a few months before by Rontgen. It was known that the production of X rays in a vacuum tube was accompanied – by a strong phosphorescence of the glass, and it occurred to several investigators that ordinary substances made phosphorescent by visible light might emit a penetrating radiation similar to X rays. Following out this idea, H. Becquerel (i), 1 a distinguished French physicist, exposed amongst other substances a phosphorescent compound of uranium, uranium-

1 These numbers refer to papers noted under References (below).

potassium sulphate, enveloped in paper beneath a photographic plate. A weak photographic effect was obtained. This was shown to be due to a penetrating radiation capable of passing through sheets of matter opaque to ordinary light. Further investigation showed that this photographic action was ex- hibited by all compounds of uranium and by the metal itself, and had nothing to do with phosphorescence. It was shown equally if the uranium were kept in darkness and did not vary appreciably with time. Becquerel showed that the rays from uranium like X rays were capable of discharging a body whether positively or negatively electrified. A uranium compound brought close to the charged plate of a gold leaf electroscope causes a rapid collapse of the gold leaves. This property of uranium, and also of the radioactive bodies in general, has supplied a delicate and quantitative method of accurate comparison of the intensity of the radiations from substances under varying conditions. A modified form of gold leaf electroscope has come into general use for comparison of the radioactivity of substances. Rutherford (2) made a systematic examination of the discharging effect produced by the rays from uranium and showed that it was due to the pro- duction of charged carriers or ions in the volume of the gas through which the radiations pass. In an electric field, the positive ions travel to the negative electrode and vice versa,

thus causing a discharge of the electrified body. If a suffi- ciently strong field is used, the ions are all swept to the electrodes before appreciable loss of their number can occur by recom- bination. The rate of discharge then reaches a steady maximum value which is not altered by a large increase in voltage. This maximum current through the gas is called the saturation current. The ions produced in gases by the rays from uranium and other radioactive substances are in general identical with those produced by X rays, and the mechanism of conductivity of the gas is very similar in both cases (see Conduction, Electric: § Through Gases).

Some time after Becquerel's discovery, Mme Curie (3) made a systematic examination oi the electric method of a large number of chemical elements and their compounds to test whether they possessed the " radioactive " property of uranium. Only one other element, thorium, was found to show this effect to a degree comparable with that of uranium — a result inde- pendently observed by Schmidt. Mme Curie examined the activity of the

various compounds of uranium and found that their radioactivity was an atomic property, i.e. the activity was proportional to the amount of the element uranium present, and was independent of its combination with other sub- stances. In testing the activity of the minerals containing uranium, Mme Curie found that the activity was always four to five times as great as that to be expected from their content

of uranium. If the radioactivity were an atomic phenomenon, this could only be explained by the presence in these minerals of another substance more active than uranium itself. Relying on this hypothesis, Mme Curie made a chemical examination of uranium minerals in order to try to separate this new radio- active substance. In these experiments, the Austrian Govern- ment generously provided Mme Curie with a ton of the residues from the State manufactory of uranium at Joachimstahl, Bohemia. At that place there are extensive deposits of pitch- blende or uranite which are mined for the uranium. After separation of the latter, the residues are three to five times as radioactive weight for weight as the uranium. From this residue Mme Curie separated a substance far more radio- active than uranium, which she called polonium in honour of the country of her birth. This substance is usually separated with bismuth in the mineral, but by special methods can be partly separated from it. A further examination revealed the presence of a second radioactive substance which is normally separated with the barium, to which the name "radium" was given. This name was happily chosen, for in the pure state radium bromide has a very great activity — about two million times as great as an equal weight of uranium. By means of successive fractionations of the chloride, the radium was gradually concentrated, until finally the radium was obtained so that the barium lines showed very faintly. The atomic weight was found by Mme Curie to be 225. In a recent redetermination, using a larger quantity of 0-4 grams of pure radium chloride, Mme Curie (4) found the atomic weight to be 226-2. Thorpe (5) using a smaller quantity obtained a value 227. The spectrum of the purified sample of radium chloride obtained by Mme Curie was first examined by Demarcay. It was found to have a characteristic spark spectrum of bright lines analogous in many respects to the spectra of the alkaline earths. Giesel (6) found that pure radium bromide gives a brilliant carmine colour to the bunsen flame. The flame spectrum shows two broad bright bands in the orange-red. There is also a line in the blue-green and two weak lines in the violet. Giesel (7) has taken an active part in the preparation of pure radium compounds, and was the first to place preparations of pure radium bromide on the market. He found that the separation of radium from the barium mixed with it proceeded much more rapidly if the crystallizations were carried out using the bromide instead of the chloride. He states that six to eight crystallizations are sufficient for an almost complete separation. From the chemical point

of view radium possesses all the characteristic properties of a new element. It has a definite atomic weight, a well-marked and characteristic spectrum, and distinct chemical properties. Its comparative ease of separation and great activity has attracted much attention to this substance, although we shall see that very similar radioactive properties are possessed by a large number of distinct substances.

Radium emits three distinct types of radiation, known as the a, j3 and 7 rays, of which an account will be given later. It produces in addition a radioactive emanation or gas which is about 100,000 times as active weight for weight as radium itself. The emanation released from 10 milligrams of pure radium bromide causes a glass tube into which it is introduced to phosphoresce brightly. A brilliant luminosity is produced in phosphorescent substances like zinc sulphide, willemite and barium platino-cyanide when introduced into a tube containing the emanation. The radium emanation, a more detailed account of which will be given later, has proved of the greatest utility in radioactive experiments. The property of radium of pro- ducing the emanation has been utilized as a very delicate and certain method, not only of detection but of estimation of small quantities of radium. This " emanation method " depends upon the introduction of the emanation, liberated from a sub- stance by boiling or heating, into a suitable electroscope. The rate of discharge of the electroscope due to the emanation affords a quantitative measure of the amount of radium present. In this way, it is not difficult to determine with certainty the

presence of radium in a body which contains only io~ u gram of radium. With care, io 12 gram can just be detected. This emanation method has been employed with great success in measuring the quantity of radium in minerals and in rocks. A very simple method has been devised of'determining the quantity of radium present when it is not less than i/ioo milligram. The tube containing the radium is placed some distance from an electroscope which is surrounded by a lead screen about 3 mms. thick. This cuts off the a and $ rays and the effect in the electroscope is then due to the penetrating 7 rays. By com parison of the rate of discharge with that of a standard prepara- tion of radium at the same distance, the quantity of radium can at once be deduced, provided the radium is in equilibrium with its emanation. This is usually the case if the radium preparation is one month old. This method is simple and direct, and has the great advantage that the radium tube under test need not be opened, nor its contents weighed. We shall see later that the amount of radium in an old mineral is

always proportional to the amount of uranium present. Rutherford and Boltwood (8) found that 3-4 parts of radium by weight are present in ten million parts of uranium. Consequently an old mineral con- taining 1000 kilos of uranium should contain 340 milligrams of pure radium.

In addition to radium and polonium, a number of other radioactive substances have been found in uranium minerals. With the exception of the radium emanation, none of these have yet been isolated in a pure state, although preparations of some of them have been obtained comparable in activity with radium itself. Debierne (9) found a radioactive substance which was separated from pitchblende with the rare earths and had chemical properties similar to those of thorium. This he called actinium. Giesel (10) independently noted the presence of a new radio- active substance which was usually separated with lanthanum and cerium from the minerals. It possessed the property of giving out a radioactive emanation or gas, the activity of which died away in a few seconds. For this reason he called it the emanating substance and afterwards emanium. Later work has shown that emanium is identical in chemical and radioactive properities with actinium, so that the former name will be retained.

We have already seen that Mme Curie gave the name polonium to a radioactive substance separated with bismuth. Later Marckwald found that a very radioactive substance was de- posited from a solution of a radioactive mineral on a polished bismuth plate. The active matter was found to be deposited in the bismuth with tellurium, and he gave the name radio- tellurium to this substance. In later work, he showed that the new substance could be chemically separated from tellurium. By treating the residues from 15 tons of Joachimsthal pitch- blende, Marckwald (11) finally obtained 3 milligrams of intensely active material — far more active weight for weight than radium. It has been definitely settled that the active substance of Marckwald is identical with polonium. Both substances give out a type of easily absorbed a rays and both lose their activity at the same rate. The activity of polonium decays in a geo- metrical progression with the time and falls to half its initial value in 140 days. This law of decay, as we shall see, is char- acteristic of all radioactive products, although the period of decay is different in each case.

Mme Curie and Debierne (12) have described further experi- ments with polonium. The latter substance was extracted from several tons of pitchblende and purified until 2 milligrams of material were obtained containing about 1/10 milligram of pure polonium. From a knowledge of the relative periods of transformation of radium and polonium, it can be calculated that the amount of polonium in a radium mineral is 1/5000 of the amount of radium, while the activity of pure polonium measured by the

a rays should be 5000 times greater than that of radium. As we have seen, polonium is rapidly transformed, and it is of great interest to determine the nature of the substance into which polonium changes. We shall see later that there is considerable evidence that polonium changes into lead.

Recently Boltwood (13) has separated another substance from uranium minerals which he has called " ionium." This substance is sometimes separated from the mineral with actinium and has chemical properties very similar to those of thorium. Preparations of ionium have been obtained several thousand times as active as uranium. Ionium emits a rays of short range and has a period of transformation probably much longer than that of radium. Ionium has a special interest inasmuch as it is the substance which changes directly into radium. A preparation of ionium initially free from radium grows radium at a rapid rate. Hofmann found that the lead separated from uranium minerals and named it radiolead. The active constituent in the lead is radium D, which changes into radium E' and then into radium F (polonium). Both radium D and radium F are products of the transformation of radium. In addition to these radioactive substances mentioned above, a large number of other radioactive substances have been discovered. Most of these lose their activity in the course of a few hours or days. The properties of these substances and their position in the radioactive series will be discussed later.

Radiations from Radioactive Substances. — All the radioactive substances possess in common the property of emitting radia- tions which darken a photographic plate and cause a discharge of electrified bodies. Very active preparations of radium, actinium and polonium also possess the property of causing strong phosphorescence in some substances. Bodies which phosphoresce under X rays usually do so under the rays from radioactive matter. Barium platinocyanide, the mineral willemite (zinc silicate) and zinc sulphide are the best known examples. •

There are in general three types of radiation emitted by the radioactive bodies, called the o, /3 and 7 rays. Ruther- ford (2) in 1899 showed that the radiation from uranium was complex and consisted of (a) an easily absorbed radiation stopped by a sheet of paper or a few centimetres of air which he called the a rays and (b) a far more penetrating radiation capable of passing through several millimetres of' aluminium, called the /3 rays. Later Villard found that radium emitted a very pene- trating kind of radiation called the 7 rays capable of passing before absorption through twenty centimetres of iron and several centimetres of lead.

Giesel and, later, Curie and Becquerel showed that the /? rays of radium were deflected by a magnetic field. By the work of Becquerel and Kaufmann the |3 rays have been shown to consist of negatively charged

particles projected with a velocity ap- proaching that of light, and having the same small mass as the electrons set free in a vacuum tube. v In fact the /3 rays are electrons spontaneously ejected from the radioactive matter at a speed on an average much greater than that observed in the electrons set free in a vacuum tube.

The very penetrating 7 rays are not deflected in a magnetic or electric field and are believed to be a type of radiation similar to X rays. The 7 rays are only observed in radioactive substances which emit /3 rays, and the penetrating power of the 7 rays appears to be connected with the initial velocity of expulsion of the |S rays. Two general theories have been advanced to account for the properties of these rays. On one view, the 7 rays are to be regarded as electromagnetic pulses which have their origin in the expulsion of the /3 particle from the atom. On the other hand Bragg has collected evidence in support of the view that the 7 rays are corpuscular and con- sist of uncharged particles or " neutral doublets." There is as yet no general consensus of opinion as to the true nature of the 7 rays.

Rutherford (14) showed in 1903 that the a rays were deflected in a powerful magnetic or electric field. The amount of deflection is very small compared with the /3 rays under similar con- ditions. The direction of deflection in a magnetic field is opposite to that of the /3 rays, showing that the a rays consist of a stream of positively charged particles. A pencil of rays from a thick layer of radioactive matter is complex and con- sists of particles moving at varying velocities If, however,

a thin film of radioactive matter of one kind is taken, the particles which escape without absorption are found to be homo- geneous and consist of particles projected at an identical speed. Observations of the velocity and mass of the particle have been made by Rutherford. The general method employed for this purpose is similar to that used for the determination of the velocity and mass of the electron in a vacuum tube. The deflection of a pencil of rays in a vacuum is determined for both a magnetic and electric field. From these observa- tions the velocity and value e/m (the ratio of the charge carried by the particle to its mass) are determined. The value of e/m has been found to be the same for the particles from all the types of radioactive matter that have been examined, indicating that the a particles from all radioactive substances are identical in mass. The value of e/m found for the a particle is 5-07 X io 3 . Now the value of e/m for the hydrogen atom set free in the electrolysis of water is 9660. On the

assumption that the value of the charge e is the same for the o particle as for the hydrogen atom, the value would indicate that the a particle has about twice the mass of the hydrogen atom, i.e. has the same mass as the hydrogen molecule. If the charge on the a particle is twice that on the hydrogen atom, the value of e/m indicates that the a particle is a helium atom, for the latter has an atomic weight of four times that of hydrogen. It was difficult at first to decide between these and other hypo- theses, but we shall show later that there is now no doubt that the a particle is in reality a helium atom carrying two elementary charges. We may consequently regard the a rays as a stream of helium atoms which are projected from a radio- active substance with a high velocity. The maximum velocity of the a particle from radium is 2Xio 9 cms. per second, or one- fifteenth of the velocity of light. Although the a rays are the least penetrating of the radiations, it will be seen that they play an extremely important part in radioactive phenomena. They are responsible for the greater part of the ionization and heating effects of radioactive matter and are closely connected with the transformations occurring in them.

Under ordinary experimental conditions the greater part of the ionization observed in a gas is due to the a particles. This ionization due to the a rays does not extend in air at atmospheric pressure for more than 7 cms. from radium, and 8-6 cms. from thorium. If a screen of aluminium about oi cms. thick is placed over the active material, the a rays are com pletely absorbed, and the ionization above the screen is then due to the and 7 rays alone. If a layer of lead about 2 mms. thick is placed over the active material, the (3 rays are stopped, and the ionization is then due almost entirely to the penetrating 7 rays. By the use of screens of suitable thickness we are thus able to sift out the various types of rays. These three types of radiations all set up secondary radiations in passing through matter. A pencil of /3 rays falling on matter is widely scattered in all directions. This scattered radiation is some- times called the secondary /3 rays. The 7 rays give rise to secondary rays which consist in part of scattered 7 rays and in part electrons moving with a high velocity. These secondary rays in turn produce tertiary rays and so on. The impact of the a rays on matter sets free a number of slow moving electrons which are very easily deflected by a magnetic or electric field. This type of radiation was first observed by J. J. Thomson, and has been called by him the 5 rays.

Emanations or Radioactive Gases. — In addition to their power of emitting penetrating radiations, the substances thorium, actinium and radium possess another very striking and im- portant property. Rutherford (15) in 1900 showed that thorium compounds (especially the oxide) continuously emitted a radioactive emanation or gas. This emanation can be carried away by a current of air and its properties tested apart from the substance which produces it. A little later Dorn showed that radium possesses a

similar property, while Giesel and Debierne observed a similar effect with actinium. These emanations all possess the property of ionizing a gas and, if sufficiently intense, of producing marked photographic and

phosphorescent action. The activity of the radioactive gases is not permanent but disappears according to a definite law with the time, viz. the activity falls off in a geometric pro- gression with the time. The emanations are distinguished by the different rates at which they lose their activity. The emanation of actinium is very shortlived, the time for the activity to fall to half value, i.e. the period of the emanation, being 3-7 seconds. The period of the thorium emanation is 54 seconds and of the radium emanation 3-9 days. This pro- perty of emitting an emanation is shown in a very striking manner by actinium. A compound of actinium is wrapped in a sheet of thin paper and laid on a screen of phosphorescent zinc sulphide. In a dark room the phosphorescence, marked by the characteristic scintillation, is seen to extend on all sides from the active body. A puff of air is seen to remove the emanation and with it the greater part of the phosphorescence. Fresh emanation immediately diffuses out and the experiment may be repeated indefinitely. The emanations have all the properties of radioactive gases. They can be transferred from point to point by currents of air. The emanations can be separated from the air or other gas with which they are mixed by the action of extreme cold. Rutherford and Soddy (16) showed that under ordinary conditions the temperature of condensation of the radium emanation mixed was – 1 50 C.

The emanations are produced from the parent matter and escape into the air under some conditions. Rutherford and Soddy (17) made a systematic examination of the emanating power of thorium compounds under different conditions. The hydroxide emanates most freely, while in thorium nitrate, practically none of the emanation escapes into the air. Most of the compounds of actinium emanate very freely. Radium compounds, except in very thin films, retain most of the emana- tion in the compound. The occluded emanation can in all cases be released by solution or by heating. On account of its very slow period of decay, the emanation of radium can be collected like a gas and stored, when it retains its characteristic properties for a month or more.

Induced Activity. — Curie (18) showed that radium possessed another remarkable property. The surface of any body placed near radium, or still better, immersed in the emanation from it, acquires a new property. The surface after removal is found to be strongly active. Like the emanations, this induced activity in a body decays with the time, though at quite a different rate from the emanation itself. Rutherford (19) independently showed that thorium possessed a like property. He showed that the bodies made active behaved as if a thin film of intensely active matter were

deposited on their surface. The active matter could be partly removed by rubbing, and could be dissolved off by strong acids. When the acid was evaporated the active matter remained behind. It was shown that induced activity was due to the emanations, and could not be produced if no emanation was present. We shall see. that induced activity on bodies is due to a deposit of non-gaseous matter derived from the transformation of the emanations. Each emanation gives a distinctive active deposit which decays at different rates. The active deposits of radium, thorium and actinium are very complex, and consist of several types of matter. Several hours after removal from the emanation the active deposit from radium decays to half-value — 26 minutes, for actinium half-value — 34 minutes, for thorium half-value — 10-5 hours. The active deposits obtained on a platinum wire or plate are volatilized before a white heat, and are again de- posited on the cooler bodies in the neighbourhood. Rutherford showed that the induced activity could be concentrated on the negative electrode in a strong electric field, indicating that the radioactive carriers had a positive charge. The distribution of the active deposit in a gas at low pressure has been investi- gated in detail by Makower and Russ.

Theory of Radioactive Transformations. — We have seen that the radioactive bodies spontaneously and continuously emit a great number of a and particles. In addition, new types of radioactive matter like the emanation ?, and active deposits

appear, and these are quite distinct in chemical and physical properties from the parent matter. The radiating power is an atomic property, for it is unaffected by combination of the active element with inactive bodies, and is uninfluenced by the most powerful chemical and physical agencies at our command. In order to explain these results, Rutherford and Soddy (20) in 1903 put forward a simple but comprehensive theory. The atoms of radioactive matter are unstable, and each second a definite fraction of the number of atoms present break up with explosive violence, in most cases expelling an a or /8 particle with great velocity. Taking as a simple illustration that an o particle is expelled during the explosion, the resulting atom has decreased in mass and possesses chemical and physical properties entirely distinct from the parent atom. A new type of matter has thus appeared as a result of the transformation. The atoms of this new matter are again unstable and break up in turn, the process of successive disintegration of the atom continuing through a number of distinct stages. On this view, a substance like the radium emanation is derived from the transformation of radium. The atoms of the emanation are far more

unstable than the atoms of radium, and break up at a much quicker rate. We shall now consider the law of radio- active transformation according to this theory. It is experi- mentally observed that in all simple radioactive substances, the tensity of the radiation decreases in a geometrical pro- gression with the time, i.e. I/I = e" A< where I is the intensity of the radiation at any time /, I the initial intensity, and X a constant. Now according to this theory, the intensity of the radiation is proportional to the number of atoms breaking up per second. From this it follows that the atoms of active matter present decrease in a geometrical progression with the time, i.e. N/N =e"'where N is the number of atoms present at a time /, N the initial number, and X the same constant as .before. Differentiating, we have d~N/dt= XN, i.e. X repre sents the fraction of the total number of atoms present which break up per second. The radioactive constant X has a definite and characteristic value for each type of matter. Since X is usually a very small fraction, it is convenient to distinguish the products by stating the time required for half the matter to be transformed. This will be called the period of the product, and is numerically equal to log f 2/X. As far as our observation has gone, the law of radioactive change is applicable to all radioactive matter without exception. It appears to be an expression of the law of probability, for the average number breaking up per second is proportional to the number present. Viewed from this point of view, the number of atoms breaking up per second should have a certain average value, but the number from second to second should vary within certain limits according to the theory of probability. The theory of this effect was first put forward by Schweidler, and has since been verified by a number of experimenters, including Kohl- rausch, Meyer, and Begener and H. Geiger. This variation in the number of atoms breaking up from moment to moment becomes marked with, weak radioactive matter, where only a few atoms break up per second. The variations observed are in good agreement with those to be expected from the theory of probability. This effect does not in any way invalidate the law of radioactive change. On an average the number of atoms of any simple kind of matter breaking up per second is proportional to the number present. We shall now consider how the amount of radioactive matter which is supplied at a constant rate from a source varies with the time. For clear- ness, we shall take the cSse of the production of emanation, by radium. The rate of transformation of radium is so slow compared with that of the emanation that we may assume without sensible error that the number of atoms of radium breaking up per second, i.e. the supply of fresh emanation, is on the average constant over the interval required. Suppose that initially radium is completely freed from emanation. In consequence of the steady supply, the amount of emanation present increases, but not at a constant rate, for the emanation is in turn breaking up. Let q be the number of atoms of emanation*

produced by the radium per second and N the number present after an interval /, then dN/dt = q-\N where X is the radio- active constant of the emanation. It is obvious that a steady state will ultimately be reached when the number of atoms of emanation supplied per second are on the average to the atoms which break up per second. If N be the maximum number, q=XN a . Integrating the above equation, it follows that N/N = i-e' K> . If a curve be plotted with N as ordinates and time as abscissae, it is seen that the recovery curve is complementary to the decay curve. The two curves for the radium emanation period, yg days, are shown in fig. 1, the maximum ordinate being in each case 100.

This process of •production and disappearance of active matter holds for all the radioactive bodies. We shall now consider some special cases of the variation of the amount of active matter with time which have proved of great importance in the analysis of radioactive changes.

(a) Suppose that initially the matter A is present, and this changes into B and B into C, it is required to find the number of atoms P, Q and R of A, B and C present at any subsequent time /. .

Let Xi, X 2 , X 3 be the constants of transformation of A, B and C respectively. Suppose n be the number of atoms of A initially present. From the law of radioactive change it follows:

iQ/ˆXjP-ˆQ (1)

Q-X 3 R (2)

Substituting the value of Pin terms of n in(l), dQ/dt = \1ne~W-\1Q ; the solution of which is of the form

Q = n(ae"ˆ' + be~ x i l) , where a and b are constants. By substitution it is seen that a = Xi/(X 2 — Xi). Since Q = o when t = o, b= — Xi/(X 2 — Xi)

ThusQ= I (e'-eˆi') (3)

Ai — A2

Similarly it can be shown that

R = n(ae-W+be-tet--ce~W) (4)

, _ X1X2 1 _ A1X2 _ XiAg

wnerea- (Xl _ X2)(Xl _x 3) . "- (x 2 -x 1)(X 2 -X 3)' c ~ (X s -X0 (X 3 -

X 2)'

It will be seen from (3), that the value of Q, initially zero, increases to a maximum and then decays; finally, according to an exponential law, with the period of the more slowly transformed product, whether A or B.

(6) A primary source supplies the matter A at a constant rate, and the process has continued so long that the amounts of the products A, B, C have reached a steady limiting value. The primary source is then suddenly removed. It is required to find the amounts of A, B and C remaining at any subsequent time t.

In this case of equilibrium, the number n a of particles of A supplied per second from the source is equal to the number of particles which change into B per second, and also of B into C. This requires the relation

« =X 1 P =y 2 Q =X 3 R

where P , Q , R are the initial number of particles of A, B, C present, and Xi, X 2 , X3 are their constants of transformation.

Using the same quotations as in case (1), but remembering the new initial conditions, it can easily be shown that the number of particles P, Q and R of the matter A, B and C existing at the time / after removal are given by

Ai

Q =

Xi — x 2

(h

e~A2' — e~ˆi t

)•

R = n (ae _x i< +be~W +ce~V) ,

where a= ■

X 2

b=-

XiXj

(x 1 -x 2)(x 1 -x 3)' " Q^W*^^)' c x 3 (x 1 -x 3)(x 2 x s)

The curves expressing the rate of variation of P, Q, R with time are in these cases very different from case (1).

(c) The matter A is supplied at a constant rate from a primary source. Required to find the number of particles of A, B and C present at any time t later, when initially A, B, and C were absent.

This is a converse case from case (2) and the solutions can be obtained from general considerations. Initially suppose A, B and C are in equilibrium with the primary source which supplied A at a constant rate. The source is then removed and the amounts of A, B and C vary according to the equation given in case (2). The source after removal continues to supply A at the same rate as before. Since initially the product A was in equilibrium with the source, and the radioactive processes are in no way changed by the removal of the source, it is clear that theamount of A present in the two parts in which the matter is distributed is unchanged. If Pi be the amount of A oroduced by the source in the time t, and P

the amount remaining in the part removed, then Pi + P = P where P 3 is the equilibrium value. Thus

Pi/P = i-P/P .

The ratio P/P„ can be written down from the solution given in case (2). Similarly the corresponding values of Qi/Q , Ri/R may be at once derived. It is obvious in these cases that the curve plotted with P/P D as ordinates and time as abscissae is comple- mentary to the corresponding curve with Pi/P as ordinates. This simple relation holds for all recovery and decay curves of radioactive products in general.

We have so far considered the variation in the number of atoms of successive products with time when the periods of the products are known. In practice, the variation of the number of atoms is deduced from measurements of activity, usually made by the electriG method. Using the same notation as before, the activity of any product is proportional to its rate of breaking up, i.e. to XiP where P is the number of atoms present. If two products are present, the activity is the sum of two corresponding terms XiP and X2Q. In practice, however, no two products emit aor/3 particles with the same velocity. The difference in ionizing power of a single o particle from the two products has thus to be taken into account. If, under

the experimental conditions, the ionization produced by an a particle from the second product is K times that from the first product, the activity observed is proportional to X1P + KX2Q. In this way, it is possible to compare the theoretical activity curves of a mixture of products with those deduced experimentally.

Analysis of Radioactive Changes. — The analysis of the suc- cessive changes occurring in uranium, thorium, radium and actinium has proved a very difficult matter. In order to estab- lish the existence of a new product and to fix its position in the scheme of changes, it is necessary to show (a) that the new product has a distinctive period of decay and shows some dis- tinctive physical or chemical properties; (b) that the product under consideration arises directly from the product preceding it in the scheme of changes, and is transformed into the product succeeding it.

In general, it has been found that each product shows some distinctive chemical or physical behaviour which allows of its partial or complete separation from a mixture of other products. It must be remembered that in most cases the amount of radio- active matter under examination is too small to detect by weight, but its presence is inferred from its characteristic radia- tions and rate of change. In some cases, a separation may be effected by ordinary chemical methods; for example thorium X is separated from thorium by precipitation of thorium with ammonia. The Th X remains in the filtrate and is practically free from thorium. In other cases, a separation is effected by a separation of a metal in the solution of active matter. For example, polonium (radium F) always comes down with bismuth and may be separated by placing a bismuth plate in a solution. Radium C is separated from radium B by adding nickel filings to a solution of the two. Radium C is deposited on the nickel. In other cases, a partial separation may be effected by electrolysis or by differences in volatility when heated. For example, when radium A, B and C are deposited on a platinum plate, on heating the plate, radium B is volatilized and is deposited on any cold surface in the neighbourhood. A very striking method of separating certain products has been recently observed depend- ing upon the recoil of an atom which breaks up with the expulsion of an a particle. The residual atom acquires sufficient velocity in consequence of the ejection of an a particle to escape and be deposited on bodies in the neighbourhood. This is especially marked in a low vacuum. This property was independently investigated by Russ and Makower (21) and by Hahn (22). The latter has shown that by means of the recoil, actinium C may be obtained pure from the active deposit containing actinium A, B and C, for B emits a rays, and actinium C is driven from the plate by the recoil. In a similar way a new product, thorium D, has been isolated. By the recoil method, radium B may be separated from radium A and C. The recoil method is one of the most definite and certain methods of settling whether

an a ray product is simple or complex.

While in the majority of cases the products break up either with the emission of o or £ particles, some products have been observed which do not emit any characteristic radiation and have been called ” rayless products.” For example, radium D and

thorium A are changing substances which break up without emittmg either penetrating a or j3 rays. They appear to emit slow 8 rays which can only be detected by special methods. The presence and properties of a rayless product can be easily inferred if it is transformed into a product emitting a radiation, for the variation in activity of the latter affords a method of determining the amount of the parent product present. The distinction between a ” ray ” and a ” rayless ” product is not clear. It may be that the atom of a rayless product undergoes a re-arrangement of its constituent parts giving rise to an atom of the same mass but of different properties. In the case of an a ray or /3 ray product, the expulsion of an a or jS particle affords an obvious explanation of the appearance of a new product with distinctive physical properties.

In the table a list of the known products of transformation is given. In each case, the half period of transformation is given and the type of radiation emitted. If the product emits a rays, the range of ionization of the a particle in air is given.

Table of Radioactive Products

Product.

Half Period

of Transforma- tion.

Rays.

Range

of Rays

in Air in

Cms.

Uranium — Uranium X Ionium .

Radium —

Ra Emanation. Radium A Radium B Radium C Radium D Radium E Radium F Radium G = lea

Thorium—

. , (‘

Mesothorium (‘ Radiothorium Thorium X Th Emanation Thorium A Thorium B Thorium C Thorium D

d? rh. 1)

rh. 2)

5X10 9 years 22 days

?

1760 years 3-86 days 3 mins. 26 mins. 19 mins. 17 years 5 days 140 days

about io 10 yrs. 5-5 years 6-2 hours 737 days 3-6 days

54 sees io-6 hours

55 mins. very short? 3 mins.

a

a

a

a

a

slow /3

a+/3 + T slow

a

rayless

/S+T

a

a

a

slow f$

a

a

/S + 7

3-5

2-8

3-5 433

4-83

7-06 3-86 . 3-5

3-9

5-7 5-5

5-o

8-6

Actinium — Radioactinium . Actinium X Act Emanation Actinium A Actinium B Actinium C

? 19-5 days 1 1 -8 days 3-7 sees. 36 mins. 2-15 mins. 5-1 mins.

rayless a + i8

a

a slow (8

a

4-8

6-55

5-8

In each of the groups under the heading uranium, thorium and actinium, each product is derived from the direct transformation of the product above it.

Products of Radium. — Radium is transformed directly into the emanation which in turn goes through a rapid series of trans- formations called radium A, B and C. The complete analysis of these changes has involved a large amount of work. The emanation changes first into radium A, a substance of period 3 minutes emitting only a rays. Radium A changes into radium B, a product of period 26 minutes emitting 0rays of penetrating power small compared with those emitted, from the next product radium C. The product radium C has proved of considerable importance, for it not only emits very penetrating a rays and /3 rays, but is the origin of the 7 rays arising from radium in equilibrium. When a wire charged negatively has been exposed for some time in the presence of the radium emanation, it becomes coated with an invisible film of radium A, B and C. After

removal from the emanation for 20 minutes, radium A has practically disappeared and the a rays arise entirely from radium C. Radium C has proved very valuable in radioactive measure- ments as providing an intense source of homogeneous a rays. Twenty-four hours after removal, the activity due to radium B and C has become exceedingly small. The wire, however, still shows a very small residual activity, first noted by Mme Curie. This residual activity measured by the a rays rapidly increases with the time and reaches a maximum in about three years. The active deposit of slow change has been examined in detail by Rutherford (23) and by Meyer and Schweidler (24). It has been shown to consist of three successive products called radium D, E and F. Radium D is a rayless substance of slow period of transformation. Its period has been calculated by Rutherford to be about 40 years, and by Meyer and Schweidler about 12 years. Antonoff (25) fixes the period of about 17 years. Radium D changes into E, a fi ray product of period about s days, and E into F, an a ray product of period 140 days. It was at first thought that radium E was complex, but no evidence of this has been observed by Antonoff. The product radium F is of special interest, for it is identical with polonium — the first active body separated by Mme Curie. In a similar way it has been shown that radium D is the primary source of the activity observed in lead or " radiolead " separated by Hofmann. It is interesting to note what valuable results have been obtained from an examination of the minute

residual activity observed on bodies exposed in the presence of the radium emanation.

Radium Emanation. — The radium emanation is to be regarded as a typical radioactive product or transition element which exists in a gaseous form. It is produced from radium at a constant rate, and is transformed into radium A and helium. Its half-period of transformation is 3-86 days. The emanation from radium has been purified by condensing it in liquid air, and" pumping out the residual gases. The volume (26) of the emanation at normal pressure and temperature to be derived from one gram of radium in equilibrium is about o-6 cubic milli- metres. This small quantity of gas contains initially more than three-quarters of the total activity of the radium before its separation. In a pure state, the emanation is 100,000 times as active weight for weight as pure radium. Pure emanation in a spectrum tube gives a characteristic spectrum of bright lines (27). The discharge in the gas is bluish in colour. With continued sparking, the emanation is driven into the walls of the tube and the electrodes. Notwithstanding the minute volume of emanation available, the boiling-point of the emana- tion has been determined at various pressures. At atmo- spheric pressure Rutherford (28) found the boiling-point to be — 67° C, and Gray and Ramsay (29) 71° C. Liquid emanation appears colourless when first condensed; when the temperature is lowered, the liquid emanation freezes, and at the temperature of liquid air glows with a bright rose colour. The density of liquid emanation has been estimated at 5 or 6.

Approximate estimates of the molecular weight of the radium emanation were early made by diffusion methods. The mole- cular weight in most cases came out about 100. In a com- parison by Perkins of the rate of diffusion of the emanation with that of a monatomic vapour of high molecular weight, viz. mercury, the value deduced was 234. Since the radium atom in breaking up gives rise to one atom of the emanation and one atom of helium, its atomic weight should be 226 — 4 = 222. The emanation appears to have no definite chemical properties, and in this respect belongs to the group of inert monatomic gases of which helium and argon are the best known examples. It is partially soluble in water, and readily absorbed by charcoal. Thorium. — The first product observed in thorium was the emanation. This gives rise to the active deposit which has been analysed by Rutherford, Miss Brooks and by Hahn, and shown to consist of probably four products— thorium A, B, C and D. Thorium A is a rayless product of period 10-5 hours; thorium B an a ray product of period about one hour. The presence of thorium C has been inferred from the two types of a rays

present in the active deposit, but no chemical separation of B and C has yet been found possible. Hahn has shown that thorium D — a /3 ray product

of period 3 minutes — can easily be separated by the recoil method. A special interest attaches to the product thorium X (30), which was first separated by Rutherford and Soddy, since experiments with this substance laid the foundation of the general theory of radioactive trans- formations. A close analysis of thorium has led to the separaˆ tion of a number of new products. Hahn (31) found that a very active substance emitting a rays, which gave rise to thorium X, could be separated from thorium minerals. This active substance, called radiothorium, has been closely examined by Hahn and Blanc. Its period of decay was found by Hahn to be about 2 years, and by Blanc to be 737 days. From an examination of the activity of commercial thorium nitrate of different ages, Hahn showed that another product must be present, which he called mesothorium. This is separated from thorium with Th X by precipitation with ammonia. Thorium is first transformed into the rayless product mesothorium, of period about 5 years. This gives rise to a fi ray product of quick transformation, which in turn changes into radiothorium. This changes into thorium X, and so on through a long series of changes. When isolated in the pure state, radiothorium would have an activity about a thousand times greater than radium, but would lose its activity with time with a period of about 2 years. Mesothorium, when first separated, would be inactive, but in consequence of the production of radiothorium, its activity would rapidly increase for several years. After reaching a maximum, it would finally decay with a period of five years. Since a large amount of thorium is separated annually from thorium minerals, it would be of great importance at the same time to separate the radiothorium and mesothorium present. For many purposes active preparations of these substances would be as valuable as radium itself, and the amount of active matter from this source would be greater than that at present available from the separation of radium from uranium minerals.

Actinium. — The transformations observed in actinium are very analogous to those in thorium. Actinium itself is a rayless product which changes into radioactinium, an a ray product of period 19-5 days, first separated by Hahn (32). This changes into actinium X, of period 10-2 days, first separated by Godlewski (33). Actinium X is transformed into the emanation which in turn gives rise to three further products, called actinium A, B and C. Although very active preparations of actinium have been prepared, it has so far not been found possible to separate the actinium from the rare earths with which it is mixed. We do not in consequence know its atomic weight or spectrum.

Origin of Radium. — According to the transformation theory, radium, like all other radioactive products, must be regarded as a changing element. Preliminary calculations showed that radium must have a period of transformation of several thousand years. Consequently in order that any

radium could exist in old minerals, the supply must be kept up by the transformation of some other substance. Since radium is always found asso- ciated with uranium minerals, it seemed probable from the. beginning that uranium must be the primary element from which radium is derived. If this were the case, in old minerals which have not been altered by the action of percolating waters, the ratio of the amount of radium to uranium in a mineral must be a constant. This must evidently be the case, for in a state of equilibrium the rate of breaking up of radium must equal the rate of supply of radium from uranium. If P, Q be the number of atoms of uranium and radium respectively in equilibrium, and Xi, X2 their constants of change, then

X 2 Q = X,P or Q/P =X,A 2 = T 2 /T,. where T2 and Ti are the half - periods of transformation of uranium and radium respectively. The work of Boltwood (34) , Strutt (3 5) and McCoy (36) has conclusively shown that the ratio of radium to uranium in old minerals is a constant. Boltwood and Strutt determined the quantity of radium present in a mineral by the emanation method, and the amount of uranium by analysis.

In order, however, to obtain a direct proof of the genetic relation between uranium and radium, it is necessary to show that radium appears after some time in a uranium compound from which all trace of radium has been initially removed. It can readily be calculated that the growth of radium should be easily observed by the emanation method in the course of one week, using a kilogram of uranium nitrate. Experiments of this kind were first made by Soddy (37), but initially no definite evidence was obtained that radium grew in the solution at all. The rate of production of radium, if it took place at all, was certainly less than 1 o.&oo th part of the amount to be expected if uranium were transformed directly irito radium. It thus appeared probable that one or more products of slow period of trans- formation existed between uranium and radium. Since uranium must be transformed through these intermediate stages before radium appears, it is evident that the initial rate of production of radium under these conditions might be extremely small. This conclusion has been confirmed by Soddy, who has shown that radium does appear in the solution which has been placed aside for several years.

Since the direct parent of radium must be present in radio- active minerals, one of the constituents separated from the mineral must grow radium. This was shown to be the case by Boltwood (38), who found that actinium preparations produced radium at a fairly rapid rate. By the work of

Rutherford and Boltwood, it was found that the growth of radium was not due to actinium itself, but to a new substance separated in some cases with the actinium. This new substance, which emits a rays, was separated by Boltwood (38), and called by him " Ionium." It has chemical properties very similar to thorium. Soddy has shown that the period of ionium is probably not less than 20,000 years, indicating that ionium must exist in uranium minerals in not less than ten times the quantity of radium. It has not yet been directly shown that uranium produces ionium, but there can be no doubt that it does do so. Since ionium produces radium, Boltwood (38) has determined by direct experiment that radium is half transformed in 2000 years — a number in good agreement with other' data on that subject. The constant relation between uranium and radium will only hold for old minerals where there has been no oppor- tunity for chemical alteration or removal of its constituents by the action of percolating water or other agencies. It is quite possible that altered minerals of no great age will not show this constant relation. It seems probable that this is the explanation of some results of Mile Gleditsch, where the relation between uranium and radium has been found not to be constant for some mineral specimens.

Connexion of the Radioelements. — We have already seen that a number of slowly transforming radioactive substances, viz. polonium (radium F), radiolead (radium D) and ionium are linked up to the uranium-radium series of transformations. Boltwood (39) has made a systematic examination of the relative activity in the form of very thin films due to each of the products present in the uranium-radium family. The results are shown in the following table, where the activity of pure uranium itself is taken as unity: —

Uranium

I -00

Radium B . . o-04(?)

Ionium

■ *0-34*

Radium C . . 0-91

Radium

■ *0-45*

Radium F . 0-46

Emanation

0-62

Actinium and its

Radium A

•. °‘5.4

products . . 0-28

Total activity mineral, 4-64 times uranium.

Taking into account the differences in the ionization due to an a particle from the various products, the results indicate that uranium expels two a particles for one from each of the other a ray products in the series of transformations. This indicates either that two particles are expelled during the transformation of the atom of uranium, or that another a ray product is present which has so far not been separated from the uranium.

Although thorium is nearly always present in old uranium minerals and uranium in thorium minerals, there does not

appear to be any radioactive connexion between inese two elements. Uranium and thorium are to be regarded as two distinct radioactive elements. With regard to actinium, there is still no definite information of its place in the scheme of transformations. Boltwood has shown that the amount of actinium in uranium minerals is proportional to the content of uranium. This indicates that actinium, like radium, is in genetic connexion with uranium. On the other hand, the activity of actinium with its series of a ray products is less than that of radium itself or uranium. In order to explain this anomaly, Rutherford has suggested that at a certain stage of disintegration of the uranium-radium series, the disintegration is complex, and two ; distinct kinds of matter appear, one in much larger quantity than the other. On this, view, the smaller fraction is actinium, so that the latter is a branch descendant of the main uranium-radium series.

End Products of Transformation. — It is now definitely estab- lished that the a particle expelled from any type of radioactive matter is an atom of helium, so that helium is a necessary accom- paniment of radioactive changes involving the expulsion of a particles. After the radioactive transformations have come to an end, each of the elements uranium and thorium and actinium should give rise to an end or final product, which may be either a known element- or some unknown element of very slow period of transformation. Supposing, as seems probable, that the expulsion

of an a particle lowers the atomic, weight of an element by four units— the atomic weight of helium — the atomic weights of each of the products in the uranium and radium series can be simply calculated. Since uranium expels two a particles, the atomic weight of the next ray product, ionium, is 238-5-8 or 230-5. The atomic weight of radium comes out to be 266-5, a number in good agreement with the experimental value. Similarly the atomic weight of polonium is 210-5, and that of the final product after the trans- formation of polonium should be 206-5. This value is very close to the atomic weight of lead, and indicates that this sub- stance is the final product of the transformation of radium.

This suggestion was first put forward by Boltwood (40), who has collected a large amount of evidence bearing on this subject. Since in old minerals the transformations have been in progress for periods of time, in some cases measured by hundreds of millions of years, it is obvious that the end product, if a stable element, should be an invariable companion of the radioelement and be present in considerable quantity. Boltwood has shown that lead always occurs in radioactive minerals, and in many cases in amount about that to be expected from their uranium content and age. It is difficult to settle definitely this very important problem until it can be experimentally shown that radium is transformed into lead, or, what should prove simpler in practice, that polonium changes into helium and lead. Un- fortunately for a solution of this problem within a reasonable time, a very large quantity of polonium would be necessary. Mme. Curie and Debierne have obtained a very active pre- paration of polonium containing about rVth milligram of pure polonium. Rutherford and Boltwood and Curie and Debierne have both independently shown that polonium produces helium — a result to be expected, since it emits a particles.

Production of Helium. — In 1902 Rutherford and Soddy sug- gested that the helium which is invariably found in radioactive minerals was derived from the disintegration of radioactive matter. In 1903 Ramsay and Soddy definitely showed that helium was produced by radium and also by its emanation. From the observed mass of the a particle, it seemed probable from the first that the a particle was an atom of helium. This conclusion was confirmed by the work of Rutherford and Geiger (41), who showed that the a particle was an atom of helium carrying two unit charges of electricity. In order to prove definitely this relation, it was necessary to show that the a particles, quite independently of the active matter from which they were expelled, gave rise to helium. This was done by Rutherford and Royds (42), who allowed the a particles from a large quantity of emanation to be fired through the

very thin glass walls of the containing tube. The collected particle gave the spectrum of helium, showing, without doubt, that the a particle must be a helium atom.

Since the a particle is an atom of helium, all radioactive matter which expels a particles must give rise to helium. In agreement with this, Debierne and Giesel have shown that actinium as well as radium produces helium. Observations of the production of helium by radium have been made by Ramsay and Soddy, Curie and Dewar, Himstedt and others. The rate of production of helium per gram of radium was first definitely measured by Dewar (43). His preliminary measure- ments gave a value of 134 cubic mms. of helium per year per gram of radium and its products. Later observations extend- ing over a larger interval give a rate of production about 168 cubic mms. per year. As a result of preliminary measure- ments, Boltwood and Rutherford (44) have found a growth of 163 cubic mms. per year. It is of interest to note that the rate of production of helium by radium is in excellent agreement with the value calculated theoretically. From their work of counting the particles and measuring their charge, Rutherford and Geiger showed that the rate of production of helium should be 158 cubic mms. per year.

*Properties of the a Rays. — We have seen that the rays are positively charged atoms of helium projected at a high velocity, which are capable of penetrating through thin metal sheets and several centimetres of air. Early ol*ervations indicated that the ionization due to a layer of radioactive matter decreased approximately according to an exponential law with the thick- ness of the absorbing matter placed over the active matter. The true nature of the absorption of the a rays was first shown by Bragg and by Bragg and Kleeman (45). The active particles projected from a thin film of active matter of one kind have identical velocities, and are able to ionize the air for a definite distance, termed the "range" of the a particle. It was found that the ionization per centimetre of path due to a narrow pencil of a rays increases with the distance from the active matter, at first slowly, then more rapidly, near the end of the range. After passing through a maximum value the ionization falls off rapidly to zero. The range of an a particle in air has a definite value which can be accurately measured. If a uniform screen of matter is placed in the path of the pencil of rays the range is reduced by a definite amount proportional to the thickness of the screen. All the a par- ticles have their velocity reduced by the same amount in their passage through the screen. The ranges in air of the*

Bragg has shown that the range of an a particle in different elements is nearly proportional to the square roots of their atomic weights. Using the

photographic method, Rutherford (46) showed that the velocity V of an a particle of range R cms. in air is given by V 2 =K(R+i-25), where K is a constant. In his experiments he was unable to detect particles which had a velocity lower than 8-8Xio 8 cms. per second. Geiger (47), using the scintillation method, has recently found that a particles of still lower velocity can be detected under suitable conditions by the scintillations produced on a zinc sulphide screen. He has found that the connexion between velocity and range can be closely expressed by V 3 =KR, where K is a constant.

On account of the great energy of motion of the a particle, it was at first thought that it pursued a rectilinear path in the gas without appreciable deflection due to its encounters with the molecules. Geiger (48) has, however, shown by the scintil- lation method that the a particles are scattered to a marked extent in passing through matter. The scattering increases with the atomic weight of the substance traversed, and becomes more marked with decreasing velocity of the a particle. A small fraction of the a particles falling on a thick screen are deflected through more than a right angle, and emerge again on the side of incidence. xxii. 36

Rutherford and Geiger (40) have devised an electrical method of counting the a particles expelled from radioactive matter. The a particle enters through a small opening into a metal tube containing a gas at a reduced pressure. The ionization produced by the a particle in its passage through the gas is magnified several thousand times by the movement of the ions in a strong electric field. In this way, the entrance of an a particle into the detecting vessel is shown by a sudden and large deflection of the measuring instrument. By this method, they determined that 3-4 X io 10 a particles are ejected per second froiji one gram of radium itself and from each of its a ray products in equilibrium with it. By measuring the charge on a counted number of a particles, it was found that the a particle Carries a positive charge of 9-3 X io 10 electro static units. From other evidence, it is known that this must be twice the fundamental unit of charge carried by the hydrogen atom. It follows that this unit charge is 4-65 X io~ 10 units. This value is in good agreement with numerous recent deter- minations of this fundamental quantity by other methods. With this data, it is possible to calculate directly the values of some important radioactive data. The calculated and observed values are given below: —

Calculated. Observed.

Volume of the emanation in cubic milli- metres per gram of radium . . -585 -6

Volume of helium in cubic millimetres pro- duced per year per gram of

radium. 158 169

Heating effect of radium per gram per hour

in gram calories 113 118

Half-period of transformation of radium

in year 1760 2000

The calculated values are in all cases in good agreement with the experimental numbers.

It is well known from the experiments of Sir William Crookes (50) that the a rays produce visible scintillations when they fall on a screen of phosphorescent zinc sulphide. This is shown in the instrument called the spinthariscope. By means of a suitable microscope, the number of these scintillations on a given area in a given time can be counted. The number so obtained is practically identical with the number of a particles incident on the screen, determined by the electrical method of counting. This shows that each a particle produces a visible flash of light when it falls on a suitable zinc sulphide screen. The scintillations produced by a rays are observed in certain diamonds, and their number has been counted by Regener (51) and the charge on each particle has been deduced. The latter was the first to employ the scintillation method for actual counting of a particles. Kinoshita has shown that the number of a particles can also be counted by the photographic method, and that each particle must produce a detectable effect.

Absorption of ji Rays. — We have seen that the /3 particles, which are emitted from a number of radioactive products, carry a negative charge and have the same small mass as the particles constituting the cathode rays. The velocity of expulsion and penetrating power of the /3 rays varies widely for different products. For example, the rays from radium B are very easily absorbed, while some of the rays from radium C are of a very penetrating type. It has been found that for a single /3 ray product, the particles are absorbed according to an exponential law with the thickness of matter traversed, and Hahn has made use of this fact to isolate a number of new products. It has been generally assumed that the exponential law of absorption is a criterion that the j3 rays are all expelled at the same speed. In addition, it has been supposed that the /? particles do not decrease much in velocity in passing through matter. Wilson has recently made experiments upon homogeneous j3 rays, and finds that the intensity of the radiation falls off in some cases according to a linear rather than to an exponential law, and that there is undoubted evidence that the

/3 particles decrease in velocity in traversing matter. Experiments upon the absorption of j3 rays are greatly complicated by the scattering of the /3 rays in their encounters with the molecules. For example, if a pencil of j3 rays falls on a metal, a large fraction of the rays are scattered

sufficiently tr> emerge on the side of incidence. This scattering of the /3 rays has been investigated by Eve, McLennan, Schmidt, Crowther and others. It has been found that the scattering for different chemical elements is connected with their atomic weight and their position in the periodic table. McCelland and Schmidt have given theories to account for the absorption of |3 rays by matter. The whole problem of absorption and scatter- ing of particles by substances is very complicated, and the question is still under active examination and discussion. The negative charge carried by the /3 rays has been measured by a number of observers. It has been shown by Rutherford and Makower that the number of (3 particles expelled, per second from one gram of radium in equilibrium is about that to be ex- pected if each atom of the /3 ray products in breaking up emits one ft particle.

Heat Emission of Radioactive Matter. — In 1903 it was shown by Curie and Laborde (52) that a radium compound was always hotter than the surrounding medium, and radiated heat at a constant rate of about 100 gram calories per hour per gram of radium. The rate of evolution of heat by radium has been measured subsequently by a number of observers. The latest and most accurate determination by Schweidler and Hess, using about half a gram of radium, gave 118 gram calories per gram per hour (53). There is now no doubt that the evolution of heat by radium and other radioactive matter is mainly a second- ary phenomenon, resulting mainly from the expulsion of a particles. Since the latter have a large kinetic energy and are easily absorbed by matter, all of these particles are stopped in the radium itself or in the envelope surrounding it, and their energy of motion is transformed into heat. On this view, the evolution of heat from any type of radioactive matter is pro- portional to the kinetic energy of the expelled a particles. The view that the heating effect of radium was a measure of the kinetic energy of the a particles was strongly confirmed by the experiments of Rutherford and Barnes (54). They showed that the emanation and its products when removed from radium were responsible for about three-quarters of the heating effect of radium in equilibrium. The heating effect of the radium emanation decayed at the same rate as its

activity. In addition, it was found that the ray products, viz. the emanation radium A and radium C, each gave a heating effect approximately proportional to their activity. Measurements have been made on the heating effect of uranium and thorium and of pitch- blende and polonium. In each case, the evolution of heat has been shown to be approximately a measure of the kinetic energy of the a particles.

Experiments on the evolution of heat from radium and its emanation have brought to light the enormous amount of energy accompanying the transformation of radioactive matter where a particles are emitted. For example, the emanation from one gram of radium in equilibrium with its products emits heat initially at the rate of about 90 gram calories per hour. The total heat emitted during its transformation is about 12,000 gram calories. Now the initial volume of the emanation from one gram of radium is 6 cubic millimetres. Consequently one cubic centimetre of emanation during its life emits 2 X io 7 gram calories. Taking the atomic weight of the emanation as 222, one gram of the emanation emits during its life 2 X io 9 gram calories of heat. This evolution of heat is enormous compared with that emitted in any known chemical reaction. There is every reason to believe that the total emission of energy from any type of radioactive matter during its transformation is of the same order of magnitude as for the emanation. The atoms of matter must consequently be regarded as containing enormous stores of energy which are only released by the dis-integration of the atom.

A large amount of work has been done in measuring the amount of the thorium and radium emanation in the atmo- sphere, and in determining the quantity of radium and thorium distributed on the surface of the earth. The information already obtained has an important bearing on geology and atmospheric electricity.

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(E. Ru.)

RADIOLARIA, so called by E. Haeckel in 1862 (Polycystina, by C. G. Ehrenberg, 1838), the name given to Marine Sarcodina, in which the cytoplasmic body gives off numerous fine radiating pseudopods (rarely anastomosing) from its surface, and is provided with a chitinous " central capsule," surrounding the inner part which encloses the nucleus, the inner and outer cytoplasm communicating through either one or three aper- tures

or numerous pores in the capsule. The extracapsular cytoplasm is largely transformed into a gelatinous substance (" calymma "), through which a granular network of plasm passes to form a continuous layer bearing the pseudopods at the surface; this gelatinous layer is full of large vacuoles, " alveoli," as in other pelagic Sarcodina (Heliozoa, q.v.), Globigerinidae, &c, among Foraminifera (q.v.). The protoplasm may contain oil-globules, pigment-grains, reserve-grains and crystals. There is frequently a skeleton present, either of silica (pure or contain- ing a certain amount of organic admixture), or of " acanthin " (possibly a proteid, allied to vitellin, but regarded by W. Schewiakoff as a hydrated silicate of calcium and aluminium); never calcareous or arenaceous. The skeleton may consist of spicules, isolated or more or less compacted, or form a latticed shell, which, in correlation with the greater resistance of its substance, is of lighter and more elegant structure than in the Foraminifera. The alveoli contain a liquid, which, as shown by Brandt, is rich in carbon dioxide, and in proportion to its abundance may become much lighter than sea- water; arid possibly the gelatinous substance of the calymma is also lighter than the medium. In Acantharia the protoplasm at the base

of the projecting spines is often differentiated into a bundle of fibres converging on to the spines some way up (distally) ; these, comparable to the myonemes of Infusoria (q.v.), &c, and termed " myophrisks ", possibly serve to drag outwards the surface and so extend it, with concurrent dilatation of the alveoli, and lower the specific gravity of the animal. In this group also a thick temporary flagellum " sarcoflagellum " may be formed, apparently by the coalescence of a number of pseudopodia. The pigmented mass or " phaeodium " in the ectoplasm of Phaeodaria appears to be an excretory product, formed within the central capsule and passing immediately outwards; a similar uniform deposit of pigmented granules occurs in the Colloid species, Thalassicolla nudeata. The wall of the central cap- sule is simple in the Spumellaria, but formed of two layers in the Nassellaria and Phaeodaria. In the Nassellaria the oscule is simply a perforated area, and a cone of differentiated fibres in the intracapsular cytoplasm has its base on it: it is termed the "porocone," and the fibres may possibly be muscular (myonemes). In Phaeodaria, the inner membrane at each oscule is prolonged through the outer into a tube ("proboscis"): the outer membrane of the principal oscule forms a large radially

Fig. I. — Thalassicolla pelagica, Haeckel; X25. CK, central capsule; EP, extracapsular protoplasm; al, alveoli, liquid-holding vacuoles in the

protoplasm similar to those of Heliozoa, Hastigerina, &c. ; ps, pseudopodia. The minute unlettered dots are the " yellow cells."

striated circular plate, the " astropyle," or " operculum." The innermost shell of some with concentric shells may lie within the central capsule, or even within the nucleus; this is due to the growth of these organs after the initial shell is formed, so that they pass out by lobes through the latticed openings of the embryonic shell, which lobes ultimately coalesce outside the embryonic chamber, and so come finally to invest it (fig. in. 17). In some, a symbiosis occurs with Zooxanthella, Brandt, a Flagellate of the group Chrysomadineae, which in the resting state inhabits the extracapsular cytoplasm growing and dividing freely therein, and only (under study) becoming free and flagellate on the death of the host (fig. in. 4, 6-13). The Silicoflagellata or Dictyochidae, also possessing a vegetable colouring matter, but with a skeleton of impure silica (like that of Phaeodaria), may pass some of their lives in symbiosis with Radiolaria.

Living Radiolaria were first observed and partially described by W. J. Tilesius in 1803-6 and 1814, by W. Baird in 1830, and by C. G. Ehrenberg in 1831, as luminous organisms in the sea; F. J. F. Meyen in 1834 recognized their animal character and the siliceous nature of their spicules. Ehrenberg a little later described a large number of Nassellarian skeletons under the

name of Polycystina (1838), but without more than a very slight knowledge of a few living forms. T. H. Huxley in 185 i made the first adequate study of the living animal, and was followed by Joh. Miiller in the same decade. E. Haeckel began his publications in 1862, and in two enormous, abundantly illustrated, systematic works, besides minor publications, has dealt exhaustively with the cytology, classification, and distri- bution of the class. Next in value come the contributions of Richard Hertwig (largely developmental), besides those of L. Cienkowsky, Karl Brandt and A. Borgert, while to F. Dreyer and V. Hacker we owe valuable studies on the physical relations of the skeleton.

Our classification is taken from Haeckel.

A. Spumellaria, Haeck. (Peripylaea, Hertwig). Central capsule perforated with numerous evenly distributed pores. Skeleton siliceous, latticed or of detached spicules, or absent. Form homaxonic. or with at least three planes of symmetry intersecting at right angles, rarely irregular or spiral, sometimes forming colonies, i.e. with several central capsules in a common external cytoplasm.

Fig. II. — Eucyrtidium cranioides, Haeck. ; X 1 50 ; one of the Nasoellaria.

Entire animal as seen in the living condition. The central capsule is hidden by the beehive-shaped siliceous shell within which it is lodged.

I. Skeleton of detached spicules, or absent.

Fam. I. Colloidea. Skeleton absent. Thalassicolla, Huxl. (figs. 1. and in. 1); Thalassophysa, Haeck.; Collozoum, Haeck. (fig. in. 2-5, 15, 16); Actissa, Haeck.

Fam. 2. Beloidea. Skeleton spicular. Sphaerozoum, Haeck. ; Raphidozoum, Haeck. II. Skeleton latticed or spongy-reticulate.

Fam. 3. Sphaerojdea. Skeleton homaxial, sometimes colonial. Collosphaera, Mull. ; Haliomma, Ehrb. ; Actinomma, Haeck. (fig. m. 17), showing concentric latticed shells, the smallest intranuclear, all connected by radial spines; Spongosphaera, Haeck. (fig. iv. 8) ; Helio- sphaera, Haeck. (fig. in. 14).

Fam. 4. Prunoidea. Skeleton a prolate spheroid or cylinder of circular section, sometimes con- stricted like a dice-box.

Fam. 5. Discoidea. Shell flattened, of circular plan, rarely becoming spiral.

Fam. 6. Larcoidea. Shell with three unequal axes,

elliptical in the plane of any two, more rarely

becoming irregular or spiral.

B. Acantharia, Haeck. (Actipylaea, Hertw.). Skeleton of

I spicules of acanthin radiating from a centre, and usually twenty.

disposed on five successive zones of four on alternating meridians, the zones corresponding to equator, tropics and circumpolar circles on the globe ; pores of central capsule in scattered groups.

Fam. I. Actinelida. Spines numerous, more than twenty, irregularly grouped. Litholophus, Haeck. ; Xiphacantha, Haeck. Fam. 2. Acanthonida. Spines twenty, simple, usually equal. Acanthometra, J. Mull. (fig. iv. 6, 7); Aslrolonche, Haeck. ; Amphilonche, Haeck. (fig. in. 18). Fam. 3. Sphaerophractida: Spines equal, branching and often coalescing into a latticed shell, homaxonic. Fam. 4. Prunophractida: Branching spines

coalescing into a latticed shell which is elongated and elliptical in at least one plane. C. Nassellaria, Haeck. (Monopylaea, Hertw.). Silico-skeletal Radiolaria in which the central capsule is typically monaxonic (cone-shaped), with a single perforate area (pore-plate) placed on the basal face of the cone; the membrane of the capsule, the nucleus single; the skeleton is extracapsular, and forms a scaffold-like or beehive- like structure of monaxonic form, a tripod or calthrop, a sagittal ring, or a combination of these.

Fam. 1. Nassoidea, Haeck. Skeleton absent. Cystidium, Haeck. Plectida, Haeck. Skeleton formed of a single branching spicule, a tripod or usually a 4- radiate calthrop, its branches sometimes reticulate. Genera: Plagiacantha, Haeck.; Plegmatium, Haeck. Spyroidea. Shell latticed around the sagittal ring (" cephalis "), sometimes with a lower chamber added. Botridea, Haeck. Shell latticed, composed of several chambers agglomerated without definite order; a single central capsule. Genera: Botryocyrtis, Haeck.; Lithobotrys, Haeck. Cyrtoidea, Haeck. Skeleton a monaxonic or triradiate shell, or continuous piece (beehive- shaped). Genera: Halicalyptra, Haeck.; Eucyrtidium, Haeck. (fig. 11.) ; Carpocanium, Haeck. (fig. iv. 3). Stephoidea, Haeck. Skeleton a sagittal ring continuous with the branched spicule, and sometimes growing out into other rings or branches. Genera: Acanthodesmia, Haeck.; Zygostephanus, Haeck. ; Lithocircus, Haeck. (fig. iv. 1). Haeck. (Tripylaea, Hertw.). Radiolaria of

ˆ,, prolonged into tubular processes with three

oscula to the central capsule, one inferior, the principal, and two symmetrically placed on either side of the opposite pole; skeleton of spicules, a network of hollow filaments, or a minutely alveolate shell, of a combination of silica with organic substance; extra- capsular protoplasm containing in front of the large oscule an agglomeration of dusky purplish or greenish pigment (" phae- odium ").

Fam. 1. Phaeocystida, Haeck. Siliceous skeleton absent or of separate needles. Genera: Aulacantha, Haeck.; Thalassoplancta, Haeck. Fam. 2. Phaeosphaerida. Spicules united into a latticed shell. Genera: Aulosphaera, Haeck. (fig. iv. 9); Auloplegma, Haeck.; Canna- cantha, Haeck. Fam. 3. Phaeogromida, Haeck. Shell continuous, traversed by fine canals or finely alveolate, provided with at least one pylome. Genera: Challengeria, Wyv., Thomson; Lithogromia, Haeck. Fam. 4. Phaeoconchida. Shell as in Phaeosphaerida, • but of two symmetrical halves (valves), which meet in the plane of the three oscules (" frontal " of Haeckel, who terms the plane of symmetry through the shells " sagittal "). Genera: Con- chidium, Haeck.; Coelodendrum, Haeck. (fig. iv. 4).

The following passages may be repeated here from Sir E. Ray Lankester's article " Protozoa " in the 9th edition of this Encyclopaedia : —

" The important differences in the structure of the central capsule of different Radiolaria were first shown by Hertwig, who also dis- covered that the spines of the Acanthometridea consist not of silica but of an organic compound (but see above). In view of this latter fact and of the peculiar numerical and architectural features of the Acanthometrid skeleton, it seems proper to separate them altogether from the other Radiolaria. The Peripylaea may be regarded as the starting-point of the Radiolarian pedigree, and have given rise on the one hand to the Acanthometridea, which

Fam. 2.

Fam. 3.

Fam. 4.

Fam. 5.

Fam. 6.

D. Phaeodaria,

cruciate symmetry,

Fig. III. — Radiolaria. 1. Central capsule of Thalassicolla nucleata, Huxley, in radial section, a, the large nucleus (Binnen- blaschen) ; b, corpuscular structures of the intracapsular proto- plasm containing concretions; c, wall of the capsule (membranous shell), showing the fine radial pore-canals; d, nucleolar fibres (chromatin substance) of the nucleus. 2, 3. Collozoum inerme, J. Miiller, two different forms of colonies, of the natural size. 4. Central capsule from a colony of Collozoum inerme,

showing the intracapsular protoplasm and nucleus, broken up into a number of spores, the germs of swarm-spores or flagellulae ; each encloses a crystalline rod. c, yellow cells lying in the extra- capsular protoplasm. 5. A small colony of Collozoum inerme, magnified 25 diameters, a, alveoli (vacuoles) of the extra- capsular protoplasm ; b, central capsules, each containing besides protoplasm a large oil-globule. 6-13. Yellow cells of various Radiolaria: 6, normal yellow cell; 7. 8, division with formation of transverse septum; 9, a modified condition according to Brandt; 10, division of a yellow cell into four; 11, amoeboid condition of a yellow cell from the body of a dead Sphaerozoon; 12, a similar cell in process of division; 13, a yellow cell the protoplasm of which is creeping out of its

cellulose envelope. 14. Heliosphaera inermis, Haeck., living example; a, nucleus; b, central capsule; c, siliceous basket-work skeleton. 15. Two swarm-spores (flagellulae) of Collozoum inerme, set free

from such a central capsule as that drawn in 4; each contains a crystal b and a nucleus a. 16. Two swarm-spores of Collo- zoum inerme, of the second kind, viz. devoid of crystals, and of two sizes, a macrospore and a microspore. They have been set free from central capsules with contents of a different appearance from that drawn in 4. a, nucleus. 17. Actinomma astera- canthion, Haeck. ; one of the Peripylaea. Entire animal in optical section, a, nucleus; b, wall of the central capsule; c, innermost siliceous shell enclosed in the nucleus; e 1 , middle shell lying within the central capsule; c 2 , outer shell lying in the extracapsular protoplasm. Four radial siliceous spines holding the three spherical shells together are seen. The radial fibrilla- tion of the protoplasm and the fine extracapsular pseudopodia are to be noted. 18. Amphilonche messanensis, Haeck.; one of the Acanthometridea. Entire animal as seen living.

Fig. IV. — Radiolaria. I. Lithocircus annularis, Hertwig; one of the Monopylaea. Whole animal in the living state (optical section); a, nucleus; b, wall of the central capsule; c, yellow cells; d, perforated area of the central capsule (Monopylaea). 2. Cystidium inerme, Hertwig; one of the Monopylaea. Living animal. An example of a Monopylaeon destitute of skeleton. a, nucleus; b, capsule- wall ; c, yellow cells in the extracapsular protoplasm. 3. Carpocanium diadema, Haeck. ; optical section of the beehive-shaped shell to show the form and position

of the protoplasmic body, a, the tri-lobed nucleus ; 6, the siliceous shell; c, oil-globules; d, the perforate area (pore-plate) of the central capsule. 4. Coelodendrum gracillimum, Haeck. ; living animal, complete; one of the Tripylaea. a, the character- istic dark pigment (phaeodium) surrounding the central capsule b. The peculiar branched siliceous skeleton, consisting of hollow fibres, and the expanded pseudopodia are seen. 5. Central capsule of one of the Tripylaea, isolated, showing a, the nucleus; b, c, the inner and the outer laminae of the capsule wall ; d, the chief or polar aperture ; e, e, the two secondary apertures. 6, 7. Acanthometra claparedei, Haeck. 7 shows the animal in optical section, so as to exhibit the characteristic meeting of the spines at the central point as in all Acanthometridea ; 6 shows the transition from the uninuclear to the multinuclear condition by the breaking up of the large nucleus, a, small nuclei; b, large fragments of the single nucleus; c, wall of the central

capsule; d, extracapsular jelly (not protoplasm) ; e, peculiar intracapsular yellow cells. 8. Spongosphaera streptacantha, Haeck.; one of the Peripylaea. Siliceous skeleton not quite completely drawn on the right side, a, the spherical extracapsular shell (compare fig. III. 17), supporting very large radial spines which are con- nected by a spongy network of siliceous fibres. 9. Aulo- sphaera eleganlissima, Haeck. ; one of the Phaeodaria. Half of the spherical siliceous skeleton.

retain the archaic structure of the central capsule whilst developing a peculiar skeleton, and on the other hand to the Monopylaea and Phaeodaria, which have modified the capsule but retained the siliceous skeleton.

Phaeodaria.

Peripylaea,

Monopylaea.

Acanthom etridca.

Archi-peripylaea. Radiolaria.

" The occasional total absence of any siliceous or acanthinous skeleton does not appear to be a matter of classificatory importance, since skeletal elements occur in close allies of those very few forms which are totally devoid of skeleton. Similarly it does not appear to be a matter of great significance that some forms (Polycyttaria) form colonies, instead of the central capsules separating from one another after fission has occurred.

" It is important to note that the skeleton of silex or acanthin does not correspond to the shell of other Sarcodina, which appears rather to be represented by the membranous central capsule. The skeleton does, however, appear to correspond to the spicules of Heliozoa, and there is an undeniable affinity between such a form as Clathrulina .and the Sphaerid Peripylaea (such as Heliosphaera, fig. III. 14). The Radiolaria are, however, a very strongly marked group, definitely separated from all other Sarcodina by the membranous central capsule sunk in their protoplasm. Their differences inter se do not affect their essential structure. The varia- tions in the chemical composition of the skeleton and in the perfora- tion of the capsule do not appear superficially. The most obvious features in which they differ from one another relate to the form and complexity of the skeleton, a part of the organism so little character- istic of the group that it may be wanting altogether. It is not known how far the form-species and form-genera which have been distinguished in such profusion by Haeckel as the result of a study of the skeletons are permanent (i.e. relatively

permanent) physio- logical species. There is no doubt that very many are local and conditional varieties, or even merely stages of growth, of a single Protean species. The same remark applies to the species discrimin- ated among the shell-bearing Reticularia. It must not be supposed, however, that less importance is to be attached to the distinguishing and recording of such forms because we are not able to assert that they are permanent species.

" The streaming of the granules of the protoplasm has been observed in the pseudopodia of Radiolaria as in those of Heliozoa and Reticularia; it has also been seen in the deeper protoplasm; and granules have been definitely seen to pass through the pores of the central capsule from the intracapsular to the extracapsular proto- plasm. A feeble vibrating movement of the pseudopodia has been occasionally noticed.

" The production of swarm-spores has been observed only in Acanthometra and in the Polycyttaria and Thalassicollidae, and only in the two latter groups have any detailed observations been made. Two distinct processes of swarm-spore production have been observed by Cienkowski, confirmed by Hertwig, — dis- tinguished by the character of the resulting spores, which are called ' crystalligerous ' and ' isospores ' (fig. III. 15) in the one case, and ' dimorphous ' or ' anisospores ' in the other (fig. III. 16). In both processes the nucleated protoplasm within the central capsule breaks up by a more or less regular cell-division into small

pieces, the details of the process differing a little in the two cases. In those individuals which produce crystalligerous swarm-spores, each spore encloses a small crystal (fig. 1 1 1. 15). On the other hand, in those individuals which produce dimorphous swarm-spores, the contents of the capsule (which in both instances are set free by its natural rupture) are seen to consist of individuals of two sizes, ' megaspores ' and ' microspores,' neither of which contain crystals (fig. in. 16). The further development of the spores has not been observed in either case. Both processes have been observed in the same species, and it is suggested that there is an alternation of sexual and asexual generations, the crystalligerous spores develop- ing directly into adults, which in their turn produce in their central capsules dimorphous swarm-spores (megaspores and microspores), which in a manner analogous to that observed in the Volvocinean Flagellata copulate (permanently fuse) with one another (the larger with the smaller) before proceeding to develop. The adults resulting from this process would, it is suggested, produce in their turn crystalligerous swarm-spores. Unfortunately we have no observa- tions to support this

hypothetical scheme of a life-history.

" Fusion or conjugation of adult Radiolaria, whether preliminary to swarm-spore-production or independently of it, has not been observed — this affording a distinction between them and Heliozoa.

" Simple fission of the central capsule of adult individuals, pre- ceded of course by nuclear fission, and subsequently of the whole protoplasmic mass, has been observed in several genera of Acan- tharia and Phaeodaria, and is probably a general method of repro- duction in the group. In Spumellaria it gives rise to colonial ' Polycyttarian ' forms when the extracapsular protoplasm does not divide.

" The siliceous shells of the Radiolaria are found abundantly in certain rocks from Palaeozoic times onwards. They furnish, together with Diatoms and Sponge spicules, the silica which has been segregated as flint in the Chalk formation. They are present in quantity (as much as 10%) in the Atlantic ooze, and in the celebrated ' Barbados earth ' (a Tertiary deposit) are the chief components."

Bibliography. — The most important systematic works are those of E. Haeckel, Die Radiolarien (1862-87), and the " Report " on the Radiolaria of the " Challenger " Expedition (vol. xviii., 1887), which contains full lists of the older literature. Among the most important recent studies we cite K. Brandt, " Die Koloniebildenden Radiolarien " in Fauna and Flora des Golfes von Neapel, xii. (1885); A. Borgert in Zeitschrift f. Wissenschaftliche Zoologie, li. (1891), and Zoologische Jahrbiicher (Anatomie), xiii. (1900); F. Dreyer in Jenaischer Zeilschr., xix. (1892); V. Hacker in Zeitsch. f. Wiss. Zool., lxxxiii. (1905). (M. Ha.)

RADIOMETER. It had been remarked at various times, amongst others by Fresnel, that bodies delicately suspended within a partial vacuum are subject to apparent repulsion by radiation. The question was definitely investigated by Sir W. Crookes, who had found that some delicate weighings in vacuo were vitiated by this cause. It appeared that a surface black- ened so as to absorb the radiant energy directed on it was repelled relatively to a polished surface. He constructed an apparatus in illustration, which he called a radiometer or light- mill, by pivoting a vertical axle carrying equidistant vertical vanes inside an exhausted glass bulb, one side of each vane being blackened and the other side bright, the blackened sides all pointing the same way round the axle. When the rays of the sun or a candle, or dark radiation from a warm body, are incident on the vanes, the dark side of each vane is repelled more than the bright side, and thus the vanes are set into rotation with accelerated speed, which becomes uniform when the forces produced by the radiation are balanced by the friction of

the pivot and of the residual air in the globe. The name radiometer arose from an idea that the final steady speed of rotation might be utilized as a rough measure of the intensity of the exciting radiation.

The problem of the cause of these striking and novel pheno- mena at first produced considerable perplexity. A preliminary question was whether the mechanical impulsion was a direct effect of the light, or whether the radiation only set up internal stresses, acting in and through the residual air, between the vanes and the walls of the enclosure. The answer to this was found experimentally by Arthur Schuster, who suspended the whole instrument in delicate equilibrium, and observed the effect of introducing the radiation. If the light exerted direct impulsion on the vanes, their motion would gradually drag the case round after them, by reason of the friction of the residual air in the bulb and of the pivot. On the other

hand, if the effects arose from balanced stresses set up inside the globe by the radiation, the effects on the vanes and on the case would be of the nature of action and reaction, so that the establishment of motion of the vanes in one direction would involve impulsion of the case in the opposite direction; but when the motion became steady there would no longer be any torque either on the vanes or on the case, and the latter would therefore come back to its previous position of equilibrium; finally, when the light was turned off, the decay of the motion of the vanes would involve impulsion of the case in the direction of their motion until the moment of the restoring torque arising from the suspension of the case had absorbed the angular momentum in the system. Experiment showed that the latter prediction was what happened. The important part played by the residual air in the globe had also been deduced by Osborne Reynolds from observing that on turning off the light, the vanes came to rest very much sooner than the friction of the pivot alone would account for; in fact, the . rapid sub- sidence is an illustration of Maxwell's great theoretical dis- covery that viscosity in a gas (as also diffusion both of heat and of the gas itself) is sensibly independent of the density. Some phenomena of retardation in the production of the effect had led Sir G. G. Stokes and Sir W. Crookes to the same general conclusion.

The origin of these phenomena was recognized, among the first by O. Reynolds, and by P. G. Tait and J. Dewar, as a consequence of the kinetic theory of the constitution of gaseous media. The temperature of a gas is measured by the mean energy of translation of its molecules, which are independent of each other except during the brief intervals of collision; and collision of the separate molecules with the blackened surface of a vane, warmed by the radiation, imparts heat to them, so that they rebound from it with greater velocity than they approached. This increase of velocity implies an increase of the reaction on the surface, the black side of a vane

being thus pressed with greater force than the bright side. In air of considerable density the mean free path of a molecule, between its collisions with other molecules, is exceedingly small, and any such increase of gaseous pressure in front of the black surface would be immediately neutralized by flow of the gas from places of high to places of low pressure. But at high exhaustions the free path becomes comparable with the dimensions of the glass bulb, and this equalization proceeds slowly. The general nature of the phenomena is thus easily understood; but it is at a maximum at pressures comparable with a milli- metre of mercury, at which the free path is still small, the greater number of molecules operating in intensifying the result. The problem of the stresses in rarefied gaseous media arising from inequalities of temperature, which is thereby opened out, involves some of the most delicate considerations in molecular physics. It remains practically as it was left in 1879 by two memoirs communicated to the Phil. Trans. by Osborne Reynolds and by Clerk Maxwell. The method of the latter investigator was purely a priori. He assumed that the distribution of molecules and of their velocities, at each point, was slightly modified, from the exponential law belonging to a uniform condition, by the gradient of temperature in the gas (see Diffusion). The hypothesis that the state was steady, so that interchanges arising from convection and collisions of the molecules produced no aggregate result, enabled him to interpret the new constants involved in this law of distribution, in terms of the temperature and its spacial differential co- efficients, and thence to express the components of the kinetic stress at each point in the medium in terms of these quantities. As far as the order to which he carried the approximations — which, however, were based on a simplifying hypothesis that the molecules influenced each other through mutual repulsions inversely as the fifth power of their distance apart — the result was that the equations of motion of the gas, considered as subject to viscous and thermal stresses, could be satisfied by a state of equilibrium under a modified internal pressure equal in all directions. If, therefore, the walls of the enclosure held

the gas that is directly in contact with them, this equilibrium would be the actual state of affairs; and it would follow from the principle of Archimedes that, when extraneous forces such as gravity are not considered, the gas would exert no resultant force on any body immersed in it. On this ground Maxwell inferred that the forces acting in the radiometer are connected with gliding of the gas along the unequally heated boundaries; and as the laws of this slipping, as well as the constitution of the adjacent layer, are uncertain, the problem becomes very intricate. Such slipping had shown itself at high exhaustions in the experiments of A. A. Kundt and E. G. Warburg in 1875 on the viscosity of gases; its effects would be corrected for, in general, by a slight effective addition to the thickness of the gaseous layer.

Reynolds, in his investigation, introducing no new form of law of distribution of velocities, uses a linear quantity, proportional to the mean free path of the gaseous molecules, which he takes to represent (somewhat roughly) the average distance from which molecules directly affect, by their con- vection, the state of the medium; the gas not being uniform on account of the gradient of temperature, the change going on at each point is calculated from the elements contributed by the parts at this particular distance in all directions. He lays stress on the dimensional relations of the problem, pointing out that the phenomena which occur with large vanes in highly rarefied gas could also occur with proportionally smaller vanes in gas at higher pressure. The results coincide with Maxwell's so far as above stated, though the numerical coefficients do not agree. According to Maxwell, priority in showing the necessity for slipping over the boundary rests with Reynolds, who also discovered the cognate fact of thermal transpiration, meaning thereby that gas travels up the gradient of temperature in a capillary tube, owing to surface-actions, until it establishes such a gradient of pressure (extremely minute) as will prevent further flow. In later memoirs Reynolds followed up this subject by proceeding to establish definitions of the velocity and the momentum and the energy at an element of volume of the molecular medium, with the precision necessary in order that the dynamical equations of the medium in bulk, based in the usual manner on these quantities alone, without directly con- sidering thermal stresses, shall be strictly valid — a discussion in which the relation of ordinary molar mechanics to the more complete molecular theory is involved.

Of late years the peculiarities of the radiometer at higher gas-pressures

have been very completely studied by E. F. Nichols and G. F. Hull, with the result that there is a certain pressure at which the molecular effect of the gas on a pair of nearly vertical vanes is balanced by that of convection currents in it. By thus controlling and partially eliminating the aggregate gas-effect, they succeeded in making a small radiometer, hori- zontally suspended, into a delicate and reliable measurer of the intensity of the radiation incident on it. With the ex- perience thus gained in manipulating the vacuum, the achieve- ment of thoroughly verifying the pressure of radiation on both opaque and transparent bodies, in accordance with Clerk Maxwell's formula, has been effected {Physical Review, 1901, and later papers) by E. F. Nichols and G. F. Hull; some months earlier Lebedew had published in the Annalen der Physik a verification for metallic vanes so thin as to avoid the gas- action, by preventing the production of sensible difference of temperature between the two faces by the incident radiation. (See Radiation.)

*More recently J. H. Poynting has separated the two effects experimentally on the principle that the radiometer pressure acts along the normal, while the radiation pressure acts along the ray which may be directed obliquely. (J. L. *)*

RADISH, Raphanus sativus (nat. order Cruciferae), in botany, a fleshy-rooted annual, unknown in the wild state. Some varieties of the wild radish, R. Raphanistrum, however, met with on the Mediterranean coasts, come so near to it as to suggest that it may possibly be a cultivated race of the same species. It is very popular as a raw salad. There are

two principal forms, the spindle-rooted and the turnip- rooted.

The radish succeeds in any well-worked not too heavy garden soil, but requires a warm, sheltered situation. The seed is generally sown broadcast, in beds 4 to 5 ft. wide, with alleys between, the beds requiring to be netted over to protect them from birds. The earliest crop may be sown about the middle of December, the seed-beds being at once covered with litter, which should not be removed till the plants come up, and then only in the daytime, and when there is no frost. If the crop succeeds, which depends on the state of the weather, it will be in use about the beginning of March. Another sowing may be made in January, a third early in February, if the season is a favourable one, and still another towards the end of February, from which time till October a small sowing should be made every fortnight or three weeks in spring, and rather more frequently during summer. About the end of October, and again in November, a late sowing may be made on a south border or bank, the plants being protected in severe weather with litter or mats. The winter radishes, which grow to a large size, should be sown in the beginning of July and in August, in drills from 6 to 9 in. apart,

the plants being thinned out to 5 or 6 in. in the row. The roots become fit for use during the autumn. For winter use they should be taken up before severe frost sets in, and stored in dry sand. Radishes, like other fleshy roots, are attacked by insects, the most dangerous being the larvae of several species of fly, especially the radish fly {Anthomyia radicum). The most effectual means of destroying these is by watering the plants with a dilute solution of carbolic acid, or much diluted gas- water; or gas-lime may be sprinkled along the rows.

Forcing. — To obtain early radishes a sowing in the British Isles should be made about the beginning of November, and continued fortnightly till the middle or end of February; the crop will gener- ally be fit for use about six weeks after sowing. The seed should be sown in light rich soil, 8 or 9 in. thick, on a moderate hotbed, or in a pit with a temperature of from 55 ° to 65 °. Gentle waterings must be given, and air admitted at every favourable opportunity; but the sashes must be protected at night and in frosty weather with straw mats or other materials. Some of these crops are often grown with forced potatoes. The best forcing sorts are Wood's early frame, and the early rose globe, early dwarf-top scarlet turnip, and early dwarf-top white turnip.

Those best suited for general cultivation are the following: —

Spindle-rooted. — Long scarlet, including the sub-varieties scarlet short-top, early frame scarlet, and Wood's early frame ; long scarlet short-top, best for general crop.

Turnip-rooted. — Early rose globe-shaped, the earliest of all; early dwarf -top scarlet turnip, and early dwarf -top white turnip; earliest Erfurt scarlet, and early white short-leaved, both very early sorts; French breakfast, olive-shaped; red turnip and white turnip, for summer crops/

Winter sorts. — Black Spanish, white Chinese, Californian mammoth.

RADIUM (from Lat. radius, ray), a metallic chemical element obtained from pitchblende, a uranium mineral, by P. and Mme. Curie and G. Bemont in 1898; it was so named on account of the intensity of the radioactive emanations which it yielded. Its discovery was a sequel to H. Becquerel's observation in 1896 that certain uranium preparations emitted a radiation resem- bling the X rays observed by Rontgen in 1895. Like the X rays, the Becquerel rays are invisible; they both traverse thin sheets of glass or metal, and cannot be refracted; moreover, they both ionize gases, i.e. they discharge a charged electroscope, the latter, however, much more feebly than the former. Char- acteristic, also, is their action on a photographic plate, and the phosphorescence which they occasion when

they impinge on zinc sulphide and some other salts. Notwithstanding these resemblances, these two sets of rays are not indentical. Mme. Curie, regarding radioactivity — i.e. the emission of rays like those just mentioned — as a property of some undiscovered substance, submitted pitchblende to a most careful analysis. After removing the- uranium, it was found that the bismuth separated with a very active substance — polonium; this element was afterwards isolated by Marckwald, and proved to be iden- tical with his radiotellurium; that the barium could be

separated with another active substance — radium; whilst a third fraction, composed mainly of the rare earths (thorium, &c), yielded to Debierne another radioactive element — actinium, which proved to be identical with the emanium of Giesel. Another radioactive substance — ionium — was isolated from car- notite, a uranium mineral, by B. B. Boltwood in 1905. Radio- active properties have also been ascribed to other elements, e.g. thorium and lead. There is more radium than any other radio- active element, but its excessive rarity may be gauged by the facts that Mme. Curie obtained only a fraction of a gramme of the chloride and Giesel -2 to -3 gramme of the bromide from a ton of uranium residues.

There is a mass of evidence to show that radium is to be regarded as an element, and in general its properties resemble those of the metals of the alkaline earths, more particularly barium. To the bunsen flame a radium salt imparts an intense carmine-red colour (barium gives a green). The spectrum, also, is very characteristic. The atomic weight, 226-4, places the element in a vacant position in group II. of the periodic classification, along with the alkaline earth metals.

Generally speaking, the radiation is not simple. Radium itself emits three types of rays: (1) the a rays, which are regarded as positively charged helium atoms; these rays are stopped by a single sheet of paper; (2) the # rays, which are identified with the cathode rays, i.e. as a single electron charged negatively; these rays can penetrate sheets of aluminium, glass, &c, several millimetres thick; and (3) the y rays — which are non-electrified radiations characterized by a high penetrating power, 1 % surviving after traversing 7 cm. of lead or 1 50 cm. of water. In addition, radium evolves an ” emanation ” which is an extraordinarily inert gas, recalling the ” inactive ” gases of the atmosphere. We thus see that radium is continually losing matter and energy as electricity; it is also losing energy as heat, for, as was observed by Curie and Laborde, the tem- perature of a radium salt is always a degree or two above that of the atmosphere, and they estimated

that a gramme of pure radium would emit about 100 gramme-calories per hour.

The Becquerel rays have a marked chemical action on certain substances. The Curies showed that oxygen was convertible into ozone, and Sudborough that yellow phosphorus gave the red modification when submitted to their influence. More interesting are the observations of D. Berthelot, F. Bordas, C. Doelter and others, that the rays induce important changes in the colours of many minerals. (See Radioactivity.)

The action of radium on human tissues was unknown until 1 901, when, Professor Becquerel of Paris having incautiously carried a tube in his waistcoat pocket, there appeared on the skin within fourteen days a severe inflammation which was known as the famous " Becquerel burn." Since that time active investigation into the action of radium on diseased tissues has been carried on, resulting in the establishment in Paris in 1906 of the " Laboratoire biologique du Radium." Similar centres for study have been inaugurated in other countries, notably one in London in 1909. The diseases to which the application has been hitherto confined are papillomata, lupus vulgaris, epithelial tumours, syphilitic ulcers, pigmentary naevi, angiomata, and pruritus and chronic itching of the skin; but the use of radium in therapeutics is still experimental. The different varieties of rays used are controlled by the inter- vention of screens or filtering substances, such as silver, lead or aluminium. Radium is analgesic and bactericidal in its action.

See Radiumtherapie, by Wickham and Degrais (1909); Die therapeutische Wirkung der Radiumstrahlen, by O. Lassar, in Report of Radiology Congress, Brussels, 1906; E. Dorn, E. Baumann and S. Valentiner in Physische Zeitung (1905); Abbe in Medical Record (October 1907).

RADIUS, properly a straight rod, bar or staff, the original meaning of the Latin word, to which also many of the various meanings seen in English were attached; it was thus applied to the spokes of a wheel, to the semi-diameter of a circle or sphere and to a ray or beam of light, " ray " itself coming through the Fr. raie from radius. From this last sense comes

" radiant," " radiation," and allied words. In mathematics, a radius is a straight line drawn from the centre to the circum- ference of a circle or to the surface of a sphere; in anatomy the name is applied to the outer one of the two bones of the fore-arm in man or to the corresponding bone in the fore-leg of animals. It is also used in various other anatomical senses in botany, ichthyology, entomology, &c. A further application of the term is to an area the extent of which is marked by the length of the radius from the point which is taken as the centre; thus, in London, for the purpose of

reckoning the fare of hackney- carriages, the radius is taken as extending four miles in any direction from Charing Cross.

RADNOR, EARLS OF. The 1st earl of Radnor was John Robartes (1606-1685); who succeeded his father, Richard Robartes, as 2nd baron Robartes of Truro in May 1634, the barony having been purchased under compulsion for £10,000 in 1625. The family had amassed great wealth by trading in tin and wool. Educated at Exeter College, Oxford, John Robartes fought on the side of the Parliament during the Civil War, being present at the battle of Edgehill and at the first battle of Newbury, and was a member of the committee of both kingdoms. He is said to have persuaded the earl of Essex to make his ill-fated march into Cornwall in 1644; he escaped with the earl from Lostwithiel and was afterwards governor of Plymouth. Between the execution of Charles I. and the restoration of Charles II. he took practically no part in public life, but after 1660 he became a prominent public man, owing his prominence partly to his influence among the Presbyterians, and ranged himself among Clarendon's enemies. He was lord deputy of Ireland in 1660-1661 and was lord lieutenant in 1669-1670; from 1661 to 1673 he was lord privy seal, and from 1679 to 1684 lord president of the council. In 1679 he was created vis- count Bodmin and earl of Radnor, and he died at Chelsea on the 17th of July 1685. His eldest son, Robert, viscount Bodmin, who was British envoy to Denmark, having predeceased his father, the latter was succeeded as 2nd earl by his grandson, Charles Bodvile Robartes (1660-1723), who was a member of parliament under Charles II. and James II., and was lord lieutenant of Cornwall from 1696 to 1705 and again from 17 14 to 1723. Henry, the 3rd earl (c. 1690-1741), was also a grand- son of the 1st earl, and John, the 4th earl (c. 1686-1757), was another grandson. When John, whose father was Francis Robartes (c. 1650-1718), a member of parliament for over thirty years and a musician of some repute, died unmarried in July 1757, his titles became extinct.

Lanhydrock, near Bodmin, and the other estates of the Robartes family passed to the earl's nephews, Thomas and George Hunt. Thomas Hunt's grandson and heir, Thomas James Agar-Robartes (1808-1882), a grandson of an Irish peer, James Agar, 1st viscount Clifden (1 734-1 789), was created baron Robartes of Lanhydrock and of Truro in 1869, after having represented East Cornwall in seven parliaments. His son and successor, Thomas Charles Agar-Robartes, the 2nd baron (b. 1844), succeeded his kinsman as 6th viscount Clifden in

1899.

In 1765 William Bouverie, 2nd viscount Folkestone (1725- 1776), son of Sir Jacob Bouverie, bart. (d. 1761), of Longford, Wiltshire, who was

created viscount Folkestone in 1747, was made earl of Radnor. Descended from a Huguenot family, William Bouverie was a member of parliament from 1747 until he succeeded to the peerage in February 1761. He died on the 28th of January 1776. His son and successor, Jacob, the 2nd earl (1750-1828), who took the name of Pleydell- Bouverie in accordance with the will of his maternal grand- father, Sir Mark Stuart Pleydell, bart. (d. 1768), was the father of William Pleydell-Bouverie, the 3rd earl (1779-1869), a politician of some note. In 1900 his great-grandson, Jacob Pleydell-Bouverie (b. 1868), became 6th earl of Radnor.

RADNORSHIRE (Sir Faesyfed), an inland county of Wales, bounded N. by Montgomery, N.E. by Shropshire, E. by Here- ford, S. and S.W. by Brecknock and N.W. by Cardigan. This county, which is lozenge-shaped, contains 471 sq. m., and is

consequently the smallest in area of the six South Welsh counties. Nearly the whole surface of Radnorshire is hilly or undulating, whilst the centre is occupied by the mountainous tract known as Radnor Forest, of which the highest point attains an elevation of 2163 ft. Towards the S. and S.E. the hills are less lofty, and the valleys broaden out into considerable plains abounding in rivulets. The hills for the most part present smooth, rounded outlines, and are covered with heather, bracken and short grass, though tracts of boggy soil in the uplands are not uncommon. There are rich pastures and numerous woods in the valleys of the Wye and Teme. The Wye Valley has long been celebrated for its beauty, while Radnor Forest and the wild district of Cwmdauddwr present striking views of primeval and unspoiled scenery. Radnor- shire is well supplied with water, its principal river being the Wye (Gwy), which, after crossing the N.W. corner of the county, forms its boundary from Rhayader onward to the English border. Salmon, trout and grayling are plentiful, and the Wye is consequently much frequented by anglers; as are also its tributaries — the Elan (which has been utilized for the great Birmingham reservoirs) the Ithon, the Edw or Edwy, the Lug, the Arrow and the Somergil. The Teme, which divides Radnor from Shropshire on the N.E., is a tributary of the Severn. All these streams are clear and rapid, and abound in fish. In the numerous rocky ravines of the mountainous districts are found many waterfalls, of which the most celebrated is " Water-break-its-Neck," to the W. of New Radnor. Omit- ting the artificially constructed reservoirs in the valleys of the Elan and Claerwen, the lakes of Radnorshire are represented only by a few pools of which Llynbychlyn near Painscastle is the largest.

Geology. — Ordovician rocks occupy most of the western side of the county, they are succeeded eastward by the Silurian formations, the Llandovery, Wenlock and Ludlow beds in the order here given. East of New Radnor an inlier of Wenlock rocks is surrounded by Ludlow beds; while at Old Radnor a ridge of very ancient rocks appears. In the south-east of the county Old Red Sandstone rests upon the Silurian. Between Llandrindod, where there are saline, sulphurous and chalybeate wells, and Builth, is a disturbed area of Ordovician strata with masses of andesitic and diabasic igneous rocks. In the vicinity of Rhayader the strata have been classed as the Rhayader pale shales (Tarannon), the Caban group (Upper Llandovery), the Gwastaden group (Lower Llandovery); these rest upon shales of Bala age.

Climate and Industries. — The climate of Radnorshire is bracing, if somewhat bleak, and the rainfall is not so heavy as in the neigh- bouring counties of Montgomery and Brecknock, but thick drizzling mists are of constant occurrence. The winters are often very severe, and deep snowfalls are not uncommon. Good hay and tolerable crops of cereals are raised in the valleys, and the margin of cultivation has risen considerably since 1880. The extensive upland tracts, which still cover over one-third of the total area of the county, afford pasturage for mountain ponies and for large flocks of sheep. The quality of the wool of Radnorshire has long been celebrated, and also the delicacy of the Welsh mutton of the small sheep that are bred in this county. The most important sheep fairs are held at Rhayader, which also contains some woollen factories. There are practically no mining industries, nor are the quarries of great value. The valley of the Wye is rich in medicinal springs, and the saline, sulphur and chalybeate waters of Llan- drindod have long been famous and profitable, and are growing in popular esteem.

Communications. — The Central Wales branch of the London & North-Western railway enters the county at Knighton, traverses it by way of Llandrindod and passes into Brecknock at Builth Road Junction on the Wye. The Cambrian railway, after passing through the N.W. corner of the county to Rhayader, follows the course of the Wye, by way of Builth and Hay. Two small branch lines connect New Radnor and Presteign with the system of the Great Western.

Population and Administration. — The area of Radnorshire is 301,164 acres, and the population in 1801 was 21,791, while in 1901 it had risen to 23,362; an increase chiefly due to the immigration of outside labourers to the Elan Valley waterworks. There is no existing municipal borough, although New Radnor, now a mere village with 405 inhabitants (1901), was incorporated in 1561 and its municipal privileges were not formally abolished till 1883. The chief towns are Presteign (pop. 1245);

Llandrindod (1827); Knighton (2139), and Rhayader (1215);

all, except Rhayader, being urban districts. Radnorshire is included in the South Wales circuit, and assizes are held at Presteign, which ranks as the county town. There is no exist- ing parliamentary borough, and the whole county returns one member to parliament. Ecclesiastically, Radnorshire is divided into 46 parishes, of which 38 lie in the diocese of St Davids, and 8 in that of Hereford.

History. — The wild district of Maesyfed (a name of which the derivation is much disputed), corresponding substantially with the modern Radnorshire, originally formed part of the territory of the Silures, who were vanquished by the Romans. Chris- tianity seems to have been introduced into this barren region during the 5th and 6th centuries by itinerant Celtic missionaries, notably by St David, St Padarn and St Cynllo. Towards the close of the gth century Maesyfed was absorbed into the middle kingdom of Powys, and in the 10th century it was included in the realm of Elystan Glodrudd, prince of Fferlys, or Feryllwg, who ruled over all land lying between the Wye and Severn.' In the reign of William the Conqueror, the Normans began to penetrate into Maesyfed, where, according to Domesday Book, the king already laid claim to Radenoure, or Radnor (a name of doubtful meaning), in the lordship of Melenith (Moelynaidd), which was subsequently bestowed on the Mortimer family, when castles were erected at Old Radnor (Penygraig), New Radnor and Cefnllys. Later, the Norman invaders forced their way up the Wye Valley, the de Breos family, lords of Elvel (Elfael), build- ing fortresses at Painscastle and at Colwyn or Maud's Castle In 1 188 Archbishop Baldwin, accompanied by Ranulf de Glan- ville and Giraldus Cambrensis, entered Wales for the purpose of preaching the Third Crusade, and was met in full state at New Radnor by the Lord Rhys, prince of South Wales. The Wye Valley long formed one of the debatable districts between Welsh and Normans, and in 1282 Llewelyn ap Griffith, prince of Wales, was at Aberedw shortly before his death in a skirmish near Builth. After the annexation of Wales by Edward I., the district of Maesyfed remained under the immediate jurisdiction of the Lords-Marchers, represented by the great families of Mortimer and Todeney. During the summer of 1402 Owen Glendower entered the Marches and raided the lands of the young Edward Mortimer, earl of March, whilst the royal troops were severely defeated at the battle of Bryn Glas near Pilleth. By the Act of Union (1536) Maesyfed was erected out of the suppressed lordships into an English shire on the usual model. For administrative purposes it was now divided into six hundreds, and assizes were ordained to be held in alternate years at Presteign and New Radnor. The newly created county was likewise privileged to return two members to parliament; one for the county, and one for the united boroughs of New-Radnor, Rhayader, Knighton, Cefnllys and Knucklas (Cnwclas). The*

parliamentary district of the Radnor boroughs was, however, disfranchised and merged in the county representation under the act of 1885. The shire of Radnor with its immense tracts of sheep-walk, its absence of large towns and its sparse rural population has always been reckoned the poorest and least important of the Welsh counties, nor since its creation under Henry VIII. has it ever played a prominent part in the national life of Wales. During the Commonwealth the local clergy were made to suffer severely under the drastic administration of Vavasor Powell (1617-1670), himself a Radnorshire man as a native of Knucklas. Of recent years the rise of Llandrindod as a fashionable watering-place and the construction of the Birmingham reservoirs in the Elan Valley have tended to increase the material prosperity of the county.

Among the leading families of Radnorshire, may be mentioned Lewis of Harpton Court; Baskerville of Clyro; Thomas (formerly Jones) of Pencerrig; Lewis-Lloyd of Nantgwyllt; Gwynne of Llanelwedd, and Prickard of Dderw.

Antiquities. — Radnorshire contains numerous memorials of early British times, of which the entrenchment called Crug-y- buddair in the parish of Beguildy is specially worthy of note. Of Roman remains, the most important are those of the fortified camp at Cwm near Llandrindod, which is believed to be identical

with the military station of Magos or Magna. The course of Offa's Dyke (Clawdd Offa) is perceptible at various points in the hilly regions west of Knighton and Presteign. Very slight traces exist of the many castles erected at various times after the Norman invasion. The parish churches of Radnorshire are for the most part small and of rude construction, and many of them have been modernized or rebuilt. The churches at Old Radnor, Presteign and Llanbister, however, are interesting edifices, and a few possess fine oaken screens, as at Llananno and Llandegley. There was only one monastic house of conse- quence, the Cistercian abbey of St Mary, founded by Cadwallon ap Madoc in 1143 in " the long valley" of the Clywedog, six miles east of Rhayader, and from its site commonly called Abbey Cwm Hir. Its existing ruins are insignificant, but the proportions of the church, which was 238 ft. long, are still traceable. The modern mansion adjoining, known as Abbey Cwm Hir, was for some generations the residence of the Fowler family, once reputed the wealthiest in the county.

*Customs, 6*c. — Although in most instances the old Celtic place-names survive throughout the western portion of the county, it is only in the wild remote districts of Cwmdauddwr and St Harmon's that the Welsh tongue predominates, and in this region some of the old Welsh superstitions linger amongst the peasants and shepherds of the hills. In the eastern part of the county English is spoken universally, and the manners and customs of the inhabitants differ little from those prevailing in the neighbouring county of Hereford. On the western side of Radnor Forest the modern spirit of progress has destroyed most of the old local customs. Until the beginning of the 19th century the ancient Welsh service of the pylgain on Christmas morning was observed in Rhayader church; and the same town was formerly remarkable for an interesting ceremony, evidently of great antiquity, whereat after a funeral each attendant mourner was wont to throw a stone upon a certain spot near the church with the words " Cam ar dy ben " (a stone on thy head). The laying of malicious sprites by means of lighted tapers was formerly practised in the churches of the Wye Valley; and a curious service, commemorative of the dead and known as " the Month's End," is still observed in certain parish churches, a month after the actual funeral has taken place. The practice of farmers and their wives or daughters riding to the local markets on ponies, the older women sometimes knitting as they proceed, still continues, and is specially characteristic of agri- cultural life in Radnorshire.*

See A General History of the County of Radnor (compiled from the MS. of the late Rev. Jonathan Williams and other sources) (Brecknock,

1905)-

RADOM, a government of Russian Poland, occupying a triangular space between the Vistula and Pilica, and bounded N. by the governments of Warsaw and Siedlce, E. by Lublin, S. by the crownland of Austrian Galicia and the Polish govern- ment of Kielce, and W. by that of Piotrkow. The area is 4768 sq. m. Its southern part stretches over the well-wooded Sandomir heights, a series of short ranges of hills, 800 to 1000 ft. in altitude, intersected by deep valleys, which, running west and east and drained by tributaries of the Vistula, are excel- lently adapted for agriculture. In its central parts, the govern- ment is level, the soil fertile, and the surface, which is diversified here and there with wood, is broken up by occasional spurs (800 ft.) of the Lysa Gora Mountains. The northern districts consist of low, flat tracts with undefined valleys, exposed to frequent floods and covered over large areas with marshes; the basin of the Pilica, notorious for its unhealthiness, is through- out a low marshy plain. Devonian, Carboniferous, Permian and Triassic deposits appear in the south, Cretaceous and Jurassic in the middle, and Tertiary in the north. Extensive tracts are covered with Glacial deposits, — the Scandinavian

erratics reaching as far south as Uza; these last in their turn are overlain by widespread post- Glacial lacustrine deposits. The climate is cold and moist, the mean temperature for the year being 47°-5 Fahr., for January -5°-8, and for July 77 . The Vistula skirts the government on the south and east, and is

an important means of communication, steamers plying as far up as Sandomir (Sedomierz). The Sandomir district suffers occasionally from disastrous inundations of the river. The tributaries of the Vistula are short and small, those of the Pilica are sluggish streams meandering amidst marshes. The estimated population in 1906 was 932,800. The government is divided into seven districts, the chief towns of which are Radom, Ilza, Konskie, Kozienice, Opatow, Opoczno and Sandomir. Out of the total area about 50% is under cultivation and 28% under forests. The principal crops are wheat, rye, barley, oats, buck-wheat, hemp, flax and potatoes, these last chiefly cultivated for distilleries. Grain is exported. Live stock is kept in large numbers. Manu- factures have considerably developed of late years, the govern- ment being rich in iron ore, while coal and zinc occur, as also marble, gypsum, alabaster, potters' clay and red sandstone. The iron industry occupies more than 60,000 workmen, and turns out annually some 100,000 tons of pig iron, 25,000 tons of iron, and 550,000 tons of steel. There are several sugar- works, tanneries, flour-mills, machinery works, distilleries, breweries and brickworks. Trade is not very extensive, the only channel of commerce being the Vistula. (P. A. K., J. T. Be.)

RADOM, a town of Russia, capital of the government of the same name, 100 m. by rail S. from Warsaw. Pop. 28,749, half of whom were Jews. It is one of the best built provincial towns of Poland. The church of St Wlaclaw, contemporary with the foundation of the town, was transformed by the Austrians into a storehouse, and subsequently by the Russian government into a military prison. The old castle is in ruins, and the old Bernardine monastery is used as barracks. Radom has several iron and agricultural machinery works and tanneries. In 1216 it occupied the site of what is now Old Radom. New Radom was founded in 1340 by Casimir the Great, king of Poland. Here Jadwiga was elected queen of Poland in 1382, and here too in 1401 the first act relating to the union of Poland with Lithuania was signed; the seim or diet of 1505, where the organic law of Poland was sworn by the king, was also held at Radom. Several great fires, and still more the Swedish war of 1 701-7, were the ruin of the old city. After the third partition of Poland in 1795 it fell under Austrian rule; it was in 1815 annexed to Russia, and became chief town of the province of Sandomir.

RADOMYSL, formerly Mychek, a town of Russia, in the government of Kiev, 31 m. W. of the city of Kiev, on the Teterev river. Pop. 18,154. It is a

very old town, being mentioned in 1150; from 1746 to 1795 it was the residence of the metropolitan of the United Greek Church. It has tanneries and flour-mills, and exports timber, corn and mushrooms.

RADOWITZ, JOSEPH MARIA VON (1797-1853), Prussian general and statesman, was born at Blankenburg in the Harz Mountains, his family being of Hungarian origin. As a young lieutenant in the Westphalian artillery he was wounded and taken prisoner at the battle of Leipzig (1813), subsequently entered the Hanoverian service, and in 1823 that of Prussia. His promotion was rapid, and in 1830 he became chief of the general staff of the artillery. In 1836 he went as Prussian military plenipotentiary to the federal diet at Frankfort, and in 1842 was appointed envoy to the courts of Carlsruhe, Darm- stadt and Nassau. He had early become an intimate friend of the crown prince (afterwards King Frederick William IV.), and the Prussian constitution of February 1847 was an attempt to realize the ideas put forward by him in his Gesprache aus der Gegenwart iiber Staat und Kirche, published under the pseudonym " Waldheim " in 1846. In November 1847 and March 1848 Radowitz was sent by King Frederick William to Vienna to attempt to arrange common action for the reconstruction of the German Confederation. In the Frankfort parliament he was leader of the extreme Right; and after its break-up he was zealous in promoting the Unionist policy of Prussia, which he defended both in the Prussian diet and in the Erfurt parliament. He was practically responsible for the foreign policy of Prussia from May 1848 onwards, and on the 27th of September 18501

he was appointed minister of foreign affairs. He resigned, however, on the 2nd of November, owing to the king's refusal to settle the difficulties with Austria by an appeal to arms. In August 1852 he was appointed director of military educa- tion; but the rest of his life was devoted mainly to literary pursuits. He died on the 25th of December 1853.

Radowitz published, in addition to several political treatises, Ikcmographie der Heiligen, ein Beitrag zur Kunstgeschichte (Berlin, 1834) and Devisen unci Mottos des spdtern Mittelaiters (ib., 1850). His Gesammelte Schrif ten "were published in 5 vols, at Berlin, 1852-53.

See Hassel, Joseph Maria von Radowitz (Berlin, 1905, &c).

RAE, JOHN (1813-1893), Scottish Arctic explorer, was born on the 30th of September 18 13, in the Orkney Islands, which he left at an early age to

study medicine at Edinburgh Uni- versity, qualifying as a surgeon in 1833. He made a voyage in a professional capacity in one of the ships of the Hudson's Bay Company, and entering the service of the company was resident surgeon for ten years at their station at Moose Factory, at the head of James Bay. In 1846 he made a boat- voyage to Repulse Bay, and having wintered there, in the following spring surveyed 700 miles of new coast-line connecting the earlier surveys of Ross and Parry. An account of this expedi- tion, A Narrative of an Expedition to the Shores of the Arctic Sea in 1846 and 1847, was published by him in 1850. During a visit to London in 1848 he joined the expedition which was then preparing to go out under Sir John Richardson in search of Franklin; and in 1851, at the request of the Government and with a very slender outfit, he travelled some 5300 miles, much of it on foot, and explored and mapped 700 miles of new coast on the south side of Wollaston and Victoria Lands. For this achievement he received the Founder's gold medal of the Royal Geographical Society. In 1853 he commanded another boat-expedition which was fitted out by the Hudson's Bay Company, which connected the surveys of Ross with that of Deane and Simpson, and proved King William's Land to be an island. It was on this journey that he obtained the first authentic news regarding the fate of Franklin, thereby winning the reward of £10,000 promised by the admiralty. He sub- sequently travelled across Iceland, and in Greenland and the northern parts of America, surveying routes for telegraph lines. Dr Rae attributed much to his success in Arctic travel to his adoption of the methods of the Eskimo, a people whom he had studied very closely. He was a keen sportsman, an accurate and scientific observer. He died at his house in London and was buried in the Orkney Islands.

RAE BARELI, a town and district of British India, in the Lucknow division of the United Provinces. The town is on the river Sai, 48 m. S.E. of Lucknow, on the Oudh & Rohilkhand railway. Pop. (1901) 15,880. It possesses many architectural features, chief of which is a strong and spacious fort erected in 1403, and constructed of bricks 2 ft. long by 1 ft. thick and 1 1 wide. Among other ancient buildings are the mag- nificent palace and tomb of nawab Jahan Khan, governor in the time of Shah Jahan, and four fine mosques. The town is an important centre of trade, and muslins and cotton cloth are woven.

The District or Rae Bareli has an area of 1748 sq. m. The general aspect of the district is slightly undulating, and the country is beautifully wooded. The soil is remarkably fertile, and the cultivation of a high class. The principal rivers of the district are the Ganges and the Sai: the former skirts it for 54 miles and is everywhere navigable for boats of 40 tons; the latter traverses it from N.W. to S.E. In 1901 the population was 1,033,761, showing a slight decrease during the decade. The principal crops are rice,

pulse, wheat, barley, millet and poppy. Rae Bareli town is connected with Lucknow by a branch of the Oudh & Rohilkhand railway, which in 1898 was extended to Benares.

See Rae Bareli District Gazetteer, Allahabad, 1905. RAEBURN, SIR HENRY (1756-1823), Scottish portrait- painter, was born at Stockbridge, a suburb of Edinburgh, on the 4th of March 1756, the son of a manufacturer of the city.

He was early left an orphan. Being placed in Heriot's Hospital, he received there the elements of a sound education, and at the age of fifteen was apprenticed to a goldsmith in Edinburgh. Here he had some little opportunity for the practice of the humbler kinds of art, and various pieces of jewelry, mourning rings, and the like, adorned with minute drawings on ivory by his hand, are still extant. Soon he took to the production of carefully finished miniatures; and, meeting with success and patronage, he extended his practice to oil-painting, being all the while quite self-taught. The worthy goldsmith his master watched the progress of his pupil with interest, gave him every encouragement, and introduced him to David Martin, who had been the favourite assistant of Allan Ramsay junior, and was now the leading portrait-painter in Edinburgh. Rae- burn received considerable assistance from Martin, and was especially aided by the loan of portraits to copy. Soon the young painter had gained sufficient skill to render it advisable that he should devote himself exclusively to painting. When he was in his twenty-second year he was asked to paint the portrait of a young lady whom he had previously observed and admired when he was sketching from nature in the fields. She was the daughter of Peter Edgar of Bridgelands , and widow of Count Leslie. The lady was speedily fascinated by the handsome and intellectual young artist, and in a month she became his wife, bringing him an ample fortune. This early insurance against the risks of his chosen profession, did not, however, diminish his anxiety to excel. The acquisition of wealth affected neither his enthusiasm nor his industry, but rather spurred him to greater efforts to acquire a thorough knowledge of his craft. After the approved fashion of artists of the time, it was resolved that Raeburn should visit Italy, and he accordingly started with his wife. In London he was kindly received by Sir Joshua Reynolds, who gave him excellent advice as to his study in Rome, especially recommending to his attention the works of Michelangelo. He also offered him more substantial pecuniary aid, which was declined as unneeded; but Raeburn carried with him to Italy many valuable introductions from the president of the Academy. In Rome he made the acquaintance of Gavin Hamilton, of Batoni, and of Byers. For the advice of the last-named he used to acknowledge himself greatly indebted, particularly for the recommendation that " he should never copy an object from memory, but, from the principal figure to the minutest accessory, have

it placed before him." After two years of study in Italy he returned to Edim burgh in 1787, where he began a most successful career as a portrait-painter. In that year he executed an admirable seated portrait of the second Lord President Dundas.

Of his earlier portraiture we have interesting examples in the bust-likeness of Mrs Johnstone of Baldovie and in the three-quarter-length of Dr James Hutton, works which, if they are somewhat timid and tentative in handling and wanting m the trenchant brush-work and assured mastery of subsequent productions, are full of delicacy and character. The portraits of John Clerk, Lord Eldin, and of Principal Hill of St Andrews belong to a somewhat later period. Raeburn was fortunate in the time in which he practised portraiture. Sir Walter Scott, Blair, Mackenzie, Woodhouselee, Robertson, Home, Ferguson, and Dugald Stewart were resident in Edinburgh, and they all, along with a host of others less celebrated, honoured the painter's canvases. Of his fully matured manner we could have no finer examples than his own portrait and that of the Rev. Sir Henry Moncrieff Wellwood, the bust of Dr Wardrop of Torbane Hill, the two full-lengths of Adam Rolland of Gask, the remarkable paintings of Lord Newton and Dr Alexander Adam in the National Gallery of Scotland, and that of William Macdonald of St Martin's. It was commonly believed that Raeburn was less successful in his female than in his male portraits, but the exquisite full-length of his wife, the smaller likeness of Mrs R. Scott Moncrieff in the Scottish National Gallery, and that of Mrs Robert Bell, and others, are sufficient to prove that he could portray all the grace and beauty of the gentler sex.

Raeburn spent his life in Edinburgh, rarely visiting the metropolis, and then only for brief periods, thus preserving his own sturdy individuality, if he missed the opportunity of engrafting on it some of the fuller refinement and delicacy of the London portraitists. But though he, personally, may have lost some of the advantages which might presumably have resulted from closer association with the leaders of English art, and from contact with a wider public, Scottish art certainly gained much from his disinclination to leave his native land. He became the acknowledged chief of the school which was growing up in Scotland during the earlier years of the ioth century, and to his example and influence at a critical period is undoubtedly due much of the striking virility by which the work of his followers and immediate successors is distinguished. Evidences of this influence can be perceived even in the present day. His leisure was employed in athletic sports, in his garden, and in architectural and

mechanical pursuits, and so varied were the interests that filled his life that his sitters used to say of him, " You would never take him for a painter till he seizes the brush and palette." Professional honours fell thick upon him. In 1812 he was elected president of the Society of Artists in Edinburgh, in 1814 associate, and in the following year full member of the Royal Academy. In 1822 he was knighted by George IV. and appointed His Majesty's limner for Scotland. He died at Edinburgh on the 8th of July 1823.

In his own day the portraits of Raeburn were excellently and voluminously engraved, especially by the last members of the great school of English mezzotint. In 1876 a collection of over 300 of his works was brought together in the Royal Scottish Academy galleries; in the following year a series of twelve of his finest portraits was included in the winter exhibition of the Royal Academy, London; and a volume of photographs from his paintings was edited by Dr John Brown.

Raeburn possessed all the necessary requirements of a popular and successful portrait-painter. He had the power of producing a telling and forcible likeness; his productions are distinguished by breadth of effect, by admirable force of handling, by execution of the swiftest and most resolute sort. Wilkie has recorded that, while travelling in Spain and studying the works of Velazquez, the brush-work of that master reminded him constantly of the " square touch " of Raeburn. But the portraits of Velazquez are unsurpassable examples of tone as well as of handling, and it is in the former quality that Raeburn is often wanting, possibly because his inclinations led him to study effects of diffused light in preference to those which were strong in con- trasts of light and shade. The colour of his portraits is some- times crude and out of relation, inclining to the use of positive and definite local pigments, and too little perceptive of the changeful subtleties and modifications of atmospheric effect. His draperies frequently consist of little more than two colours ---the local hue of the fabric and the black which, more or less graduated, expresses its shadows and modelling. In his flesh, too, he wants — in all but his very best productions — the delicate refinements of colouring which distinguish the works of the great English portrait-painters. His faces, with all their excellent truth of form and splendid vigour of handling, are often hard and bricky in hue. Yet, after all allowances have been made for what deficiencies there may be in his work, his right to a place among the greater British masters cannot be contested. The masculine power, the vitality and the strength of characterization which are so apparent in his paintings entitle him to the serious attention of all lovers of fine achieve- ment; and there is much to be learned from study of his methods. His sincerity and freedom from artificial graces of style can be specially recognized, and his frank directness is always attractive.

See Life of Sir Henry Raeburn, R.A., by his great-grandson William Raeburn Andrew, M.A. Oxon. (2nd ed., 1894), which contains some of the latest information, together with a complete catalogue of the exhibition of 1876. There may also be consulted Works of Sir Henry Raeburn, R.A., with tributes by Dr John Brown and others, published by Andrew Elliot, Edinburgh; Tribute to the Memory of Raeburn by Dr Andrew Duncan, the Catalogues of the

Joan exhibitions in Edinburgh of 1884 and 1901; and the Essay by W. E. Henley — Sir Henry Raeburn by William Ernest Henley (1890) with a finely produced series of plates, printed by T. & A. Constable for the now defunct Royal Association for Promotion of the Fine Arts in Scotland. But the leading work on the subject, and the most splendidly illustrated, is Sir Henry Raeburn by Sir Walter Armstrong, with an introduction by R. A. M. Stevenson and a biographical and descriptive catalogue by J. L. Caw (1901).

R£DWALD (d. c. 620), king of the East Angles, was the son of King Tytili. He became a Christian during a stay in Kent, but on his return to East Anglia he sanctioned the worship both of the Christian and the heathen religions. Very little is known about his reign, which probably began soon after 600. For a time he recognized the overlordship of /Ethelberht, king of Kent, but he seems to have shaken off the Kentish yoke. He gained some superiority over the land south of the Humber with the exception of Kent and is counted among the Bretwaldas. Raedwald protected the fugitive Edwin, afterwards king of Northumbria, and in his interests he fought a sanguinary battle with the reigning Northumbrian king, iEthelfrith, near Retford in Nottinghamshire, where ˆEthelfrith was defeated and killed in April 617. He was followed as king of the East Angles by his son Eorpwald.

See Bede, Historiae ecclesiasticae, edited by C. Plummer (Oxford, 1896); and J. R. Green, The Making of England (1897-1899).

RAETIA (so always in inscriptions; in classical MSS. usually Rhaetia), in ancient geography, a province of the Roman Empire, bounded on the W. by the country of the Helvetii, on the E. by Noricum, on the N. by Vindelicia and on the S. by Cisalpine Gaul. It thus comprised the districts occupied in modern times by the Grisons, the greater part of Tirol, and part of Lombardy. The land was very mountainous, and the inhabitants, when not engaged in predatory expeditions, chiefly supported themselves by cattle-breeding and cutting timber, little attention being paid to agriculture. Some of the valleys, however, were rich and fertile, and produced corn and wine, the latter considered equal to any in Italy. Augustus preferred Raetian wine to any other. Considerable trade was also carried on in pitch, honey, wax and cheese. Little is known of the origin or history of the Raetians, who are

described as one of the most powerful and warlike of the Alpine tribes. It is distinctly stated by Livy (v. S3) that they were of Etruscan origin (a view favoured by Niebuhr and Mommsen). A tradi- tion reported by Justin (xx. 5) and Pliny (Nat. Hist. iii. 24, 133) affirmed that they were a portion of that people who had settled in the plains of the Po and were driven into the moun- tains by the invading Gauls, when they assumed the name of Raetians from their leader Raetus; a more probable derivation, however, is from Celtic rait, " mountain land." Even if their Etruscan origin be accepted, at the time when the land became known to the Romans, Celtic tribes were already in possession of it and had amalgamated so completely with the original inhabitants that, generally speaking, the Raetians of later times may be regarded as a Celtic people, although non-Celtic tribes (Lepontii, Euganei) were settled among them. The Raetians are first mentioned (but only incidentally) by Polybius (xxxiv. 10, 18), and little is heard of them till after the end of the Republic. There is little doubt, however, that they retained their independence until their subjugation in 15 B.C. by Tiberius and Drusus (cf. Horace, Odes, iv. 4 and 14). At first Raetia formed a distinct province, but towards the end of the 1st century a.d. Vindelicia was added to it; hence Tacitus (Ger- mania, 41) could speak of Augusta Vindelicorum (Augsburg) as " a colony of the province of Raetia." The whole province (including Vindelicia) was at first under a military prefect, then under a procurator; it had no standing army quartered in it, but relied on its own native troops and militia for protection. In the reign of Marcus Aurelius it was governed by the com- mander of the Legio iii. Italica. Under Diocletian it formed part of the diocese of the vicarius Italiae, and was subdivided into Raetia prima and secunda (each under a praeses), the former corresponding to the old Raetia, the latter to Vindelicia. The boundary between them is not clearly defined, but may be

stated generally as a line drawn eastwards from the lacus Brigantinus (Lake of Constance) to the river Oenus (Inn). During the last years of the Western Empire, the land was in a desolate condition, but its occupation by the Ostrogoths in the time of Theodoric, who placed it under a dux, to some extent revived its prosperity. The chief towns of Raetia (excluding Vindelicia) were Tridentum (Trent) and Curia (Coire or Chur). It was traversed by two great lines of Roman roads — one leading from Verona and Tridentum across the Brenner (in which the name of the Brenni has survived) to Oenipons (Innsbruck) and thence to Augusta Vindelicorum ; the other from Brigantium (Bregenz) on Lake Constance,, by Coire and Chiavenna to Como and Milan.

See P. C. Planta, Das alte Ralien (Berlin, 1872); T. Mommsen in Corpus Inscriptionum Latinarum, iii. p. 706; J. Marquardt, Romische Staatsverwaltung, i. (2nd ed., 1881) p. 288; L. Steub, Vber die Urbewohner Rdtiens und ihren Zusammenhang mit den Etruskern (Munich, 1843); J. Jung, Romer und Romanen in den Donauldndern (Innsbruck, 1877) ; Smith's Diet, of Greek and Roman Geography (1873); T. Mommsen, The Roman Provinces (Eng. trans., 1886), i. pp. 16, 161, 196; Mary B. Peaks, The General Civil and Military Administration of Noricum and Raetia (Chicago, 1907).

RAFF, JOSEPH JOACHIM (1822-1882), German composer and orchestral conductor, was born near Zurich, Switzerland, on the 27th of May 1822, and educated chiefly at Schwyz. Here, under the care of the Jesuit fathers, he soon became an excellent classical and mathematical scholar, but received scarcely any instruction in his favourite art of music, in which, never- theless, he made extraordinary progress through sheer force of natural genius, developed by persevering study which no ex- ternal obstacles could induce him to discontinue. So successful were his unaided efforts that, when in 1843 ne sen t some MSS. to Mendelssohn, that warm encourager of youthful talent felt justified in at once recommending bim to Breitkopf & Hartel, the .Leipzig publishers, who brought out a large selection of his early works. Soon after this he became acquainted with Liszt, who gave him much generous encouragement. He first became personally acquainted with Mendelssohn at Cologne in 1846, and gave up all his other engagements for the purpose of following him to Leipzig, but his intention was frustrated by the great composer's death in 1847. After this disappoint- ment he remained for some time at Cologne, where his attention was alternately devoted to composition and to the preparation of critiques for the periodical Cdcilia. Thus far he was a self- taught artist; but he felt the need of systematic instruction so deeply that, retiring for a time from public life, he entered at Stuttgart upon a long course of severe and uninterrupted study, and with so much success that in 1850 he appeared before the world in the character of an accomplished and highly cultivated musician. Raff now settled for a time in Weimar in order to be near Liszt. Hans von Biilow had already brought him into notice by playing his Concertstiick for piano- forte and orchestra in public, and the favour with which this fine work was everywhere received encouraged him to attempt a greater one. During his stay in Stuttgart he had begun the composition of an opera entitled Konig Alfred, and had good hope of securing its performance at Dresden; but the political troubles with which Germany was then overwhelmed rendered its production in the Saxon capital impossible. At Weimar he was more fortunate. In due time Konig Alfred was produced there under Liszt's able direction at the court theatre with complete success; and later, in 1870, he wrote his second opera, Dame Kobold, for

performance at the same theatre. A third opera, Samson, remained unstaged.

Raff lived at Weimar until 1856, when he obtained a large clientele at Wiesbaden as a teacher of the pianoforte. In 1859 he married Doris Genast, an actress of high repute, and thence- forward devoted himself with renewed energy to the work of composition, displaying an inexhaustible fertility of invention tempered by great technical skill. He resided chiefly at Wies- baden till 1877, when he was appointed director of the Hoch-Conservatorium at Frankfort, an office which he retained until his death on the 25th of June 1882.

More than 200 of Raff's compositions have been published, in- cluding ten symphonies — undoubtedly his finest works — quartets, concertos, sonatas, songs, and examples of nearly every known variety of style; yet he never repeats himself. Notwithstanding his strong love for the romantic school, he is never guilty of extra- vagance, and, if in his minor works he is sometimes a little common- place, he never descends to vulgarity. His symphonies Lenore and Im Walde are wonderful examples of musical painting.

RAFFAELLINO DEL GARBO (1466, or perhaps 1476-1524), Florentine painter. His real name was Raffaello Capponi; Del Garbo was a nickname, bestowed upon him seemingly from the graceful nicety {garbo) of his earlier works. He has also been called Raffaello de Florentia, and Raffaello de Carolis. He was a pupil of Filippino Lippi, with whom he remained till 1490, if not later. He showed great facility in design, and excited hopes which the completed body of his works fell short of. He married and had a large family; embarrassments and a haphazard manner of work ensued; and finally he lapsed into a very dejected and penurious condition. Three of his best tempera pictures are in the Berlin Gallery; one of the Madonna standing with her Infant between two musician- angels, is particularly attractive. We may also name the oil- painting of the " Resurrection " done for the church of Monte Oliveto, Florence, now in the academy of the same city, ordin- arily reputed to be Raffaellino's masterpiece; the ceiling of the Caraffa Chapel in the church of the Minerva, Rome; and a " Coronation of the Virgin " in the Louvre, which is a pro- duction of much merit, though with somewhat over-studied grace. Angelo Allori was his pupil.

RAFFET, DENIS AUGUSTE MARIE (1804-1860), French illustrator and lithographer, was born in Paris in 1804. At an early age he was apprenticed to a wood turner, but took up the study of art at evening classes. He became acquainted with Cabanel, who made him apply his skill to the decoration of china, and with Rudor, from whom he received instruction in lithography, in the practice of which he was to rise to fame.

He then entered the Ecole des Beaux- Arts, but returned definitely to lithography in 1830, when he produced on stone his famous designs of " Lutzen," " Waterloo," " Le bal," " La revue " and " Les adieux de la garnison," by which his reputa- tion became immediately established. Raffet's chief works were his lithographs of the Napoleonic campaigns, from Egypt to Waterloo, vigorous designs that are inspired by ardent patriotic enthusiasm. As an illustrator his activity was prodigious, the list of works illustrated by his crayon amounting to about forty-five, among which are Beranger's poems, the History of the Revolution by Thiers, the History of Napoleon by de Norvins, the great Walter Scott by Defauconpret, the French Plutarch and Frederic Berat's Songs. He went to Rome in 1849, was present at the siege of Rome, which he made the subject of some lithographs, and followed the Italian campaign of 1859, of which he left a record in his Episodes de la campagne d'ltalie de 1839. His portraits in pencil and water-colour are full of character. He died at Genoa in i860. In 1893 a monument by Fremiet was unveiled in the Jardin de Flnfante at the Louvre, Paris.

See Raffet, by F. Lhomme (Paris, 1892).

RAFFLE, a special kind of lottery, in which a particular article is put up as the prize, the winner being drawn for by lot out of the number of those who have paid a fixed sum for admission to the drawing; the total amount realized by the sale of the tickets is supposed to approximate to the vaiue of the object raffled for. The word appears in English as early as Chaucer {The Parson's Tale) where it is used in its original sense of a game of dice, the winner being that one who threw three dice ail alike, or, next, the highest pair. The Fr. rafle, Med. Lat. raffia, was also used in the sense of a " sweeping-off " of the stakes in a game; it has been connected with Ger. raff en, to carry off.

RAFFLES, SIR THOMAS STAMFORD (1781-1826), English administrator, founder of Singapore, was born on the 5th of July 1 781, on board a merchantman commanded by his father. Benjamin Raffles, wheri off Port Morant, Jamaica. He received

his early education at a school at Hammersmith, but when only fourteen he obtained temporary work in the secretary's office of the East India Company. In 1800 he was appointed junior clerk on the establishment. In 1805 the East India Company decided to make Penang a regular presidency, and sent out a governor with a large staff, including Stamford

Raffles, who was appointed assistant-secretary. On the eve of his departure he married Mrs Fancourt (Olivia Mariamne Devenish), widow of a surgeon on the Madras Establishment; she proved herself a helpful wife and counsellor to her husband in his rapid rise to fortune during the following nine years, dying prematurely in Java in November 1814. On his way out to Penang, Raffles began the study of the Malay language, and had mastered its grammar before his arrival. He continued his studies, finding a congenial fellow- worker and kindred spirit in John Leyden, who was invalided to Penang. In August 1806 Raffles was appointed acting secretary during the illness of that official, and in 1807 he received the full appointment. In the mean- time he had acted as Malay interpreter, which entailed heavy and unappreciated work in addition to his regular duties. In 1808 his health gave way, and he was ordered for a change to Malacca. This proved a turning-point in his career. The East India Company had decided to abandon Malacca, and orders had been issued to dismantle it. Raffles perfected his study of Malay during his stay at this place, and learning from the Malays, with whom he mixed freely, that the abandonment of so important a position would be a grave fault, he drew up a report explaining the great importance of Malacca, and urging in the strongest manner its retention. This report was sent by the Penang authorities not only to London, but to the governor-general, the earl of Minto. The latter was so im- pressed by the report that he at once gave orders for suspending the evacuation of Malacca, and in 1809 the company decided to reverse its own decision. When the whole question was calmly considered in the light of subsequent events, many years later, the verdict was that Raffles had " prevented the alienation of Malacca from the British Crown." A direct correspondence with Lord Minto was established by the mediation of Leyden, who wrote to Raffles that the governor-general would be gratified in receiving communications direct from him. In June 1810 Raffles, of his own accord, proceeded to Calcutta, where Lord Minto gave him the kindest reception. Raffles remained four months in Calcutta, and gained the complete confidence of the governor-general. He brought Lord Minto round to his opinion that the conquest of the island of Java, then in the hands of the French, was an imperative necessity. To prepare the way for the expedition, Raffles was sent to Malacca as " agent to the Governor-General with the Malay States." He did his work well and thoroughly — even to the extent of discovering that the short and direct route to Batavia by the Caramata passage would be safe for the fleet. In August 181 1 the expedi- tion, accompanied by Lord Minto, and with Sir Samuel Auchmuty in command of the troops (11,000 in number, half English and half Indian), occupied Batavia without fighting. On the 25th of the same month a battle was fought at Cornelis, a few miles south of Batavia, and resulted in a complete English victory. On the 1 8th of September the French commander, General Janssens, formally

capitulated at Samarang, and the conquest of the island was completed. Lord Minto's first act was to appoint Raffles lieutenant-governor of Java. From September 181 1 until his departure for England in March 18 16, Raffles ruled this large island with conspicuous success and the most gratifying results. To give only one fact in support of this statement, he increased the revenue eightfold at the same time that he abolished transit dues,, reduced port dues to one-third and removed the fetters imposed on trade and intercourse with the Javanese by Dutch officialdom. In his own words, his administration aimed at being " not only without fear, but without reproach." He had a still greater ambition, which was, in his own words, " to make Java the centre of an Eastern insular Empire," and to establish the closest relations of friend- ship and alliance with the Japanese, whom he described as " a

highly polished people, considerably advanced in science, highly inquisitive and full of penetration." It is interesting to note that when another great Englishman, Rajah Brooke, began his career in Sarawak in 1838, he announced: " I go to carry Sir Stamford Raffles's views in Java over the whole Archipelago."

The policy of Raffles was based on the assumption that Java would be retained, but for reasons of European policy it was decided that it must be restored to Holland. After his return to England in 18 16 he endeavoured to obtain a reconsideration of the question, but the decision taken was embodied in a treaty and beyond all possibility of modification. During his stay in England Raffles was knighted by the prince regent, published his History of Java (181 7) and discussed with Sir Joseph Banks a project for the foundation in London of a zoological museum and garden on the model of the Jardin des Plantes at Paris. He also married his second wife, Sophia, daughter of T. W. Hull of Co. Down; he had many children by both marriages, but the only one to live beyond childhood was a daughter, who died fifteen years after her father's death, and before she was twenty. He left, therefore, no direct descendants.

In November 181 7 Sir Stamford quitted England on his return to the East, where the lieutenant-governorship of Fort Marlborough (Sumatra) had been kept in reserve for him. His administration of Sumatra, which lasted from March 1818 till December 1823, was characterized by the same breadth of view, consistency of purpose and energy in action that had made his government of Java remarkable. He had not, however, done with the Dutch, who, on their recovery of Java, endeavoured to establish a complete control over the Eastern archipelago, and to oust British trade. This design Sir Stamford set himself to baffle, and although he was more frequently censured than praised by his superiors for his efforts, he had already met with no inconsiderable success in minor matters when, by a

stroke of genius and unrivalled statecraft, he stopped for all time the Dutch project of a mare clausum by the acquisition and founding of Singapore on the 29th of January 1819.

In 1824 Sir Stamford returned to England, but unfortunately the differences between him and the East India Company had resulted in an accumulation of disputes which placed a severe strain on his enfeebled constitution. The memorials and state- ments that he had to compile for his own vindication would fill a large volume, but at last the court passed (12th of April 1826) a formal decision in his favour. It did not omit, however, to censure him for " his precipitate and unauthorized emancipation of the Company's slaves," or after his death to make his widow pay £10,000 for various items, which included the expense of his mission to found Singapore ! Harassed as he was by these personal affairs, he still found time to carry out his original scheme with regard to a zoological society in London. He took the largest part in the creation of the existing society, and his fine Sumatra collection formed its endowment. He was unanimously elected its president at the first meeting, and by a remarkable unanimity of opinion on the part of those who helped in the work, he has been recognized as " the Founder of the Zoological Society." He was contemplating entering parliamentary life when his sudden death on his birthday, 1826, ended his brilliant career at the early age of forty-five. Sir Frederick Weld, lieutenant-governor at Singapore, when unveiling the statue of his predecessor at that place in 1887, crystallized the thoughts of his countrymen and anticipated the verdict of history in a single sentence: " In Raffles, England had one of her greatest sons."

See Lady Raffles, Memoir of Sir Thomas Stamford Raffles (1830); D. C. Boulger, Life of Sir Stamford Raffles (1897); Hugh Egerton, Sir Stamford Raffles (1899); J. [Buckley, Records of Singapore (1903). (D. C. B.)

RAFN, KARL CHRISTIAN (1795-1864), Danish archaeo- logist, was born in Brahesborg, Fiinen, on the 16th of January 1795, and died at Copenhagen on the 20th of October 1864. He is chiefly known in connexion with the controversy as to the question of the discovery of America by the Norsemen, his

views being contained in his chief work, Antiquitates Americanae (Copenhagen, 1837). See Leif Ericsson.

RAFTER, a beam in a sloping roof to which is attached the framework for

the slating, tiling or other external covering (see Roofs). The O.Eng. raefter is cognate with Icel. raflr, Dan. and Swed. rafte or raft, a beam, which, in the special sense of a floating collection of timbers, gives the English " raft." The ultimate base of these words is the root raj-, to cover, seen in Gr. 6po4 > os, roof.

RAGATZ, a famous watering-place in the Swiss canton of St Gall, situated on the left bank of the Rhine, and by rail 135 m. N. of Coire or 615 m. S.E. of Zurich. It stands at a height of 1696 ft., at the entrance to the magnificent gorge of the Tamina, about 3 m. up which by carriage road are the extraordinarily placed Baths of Pfafers (2247 ft.). Since 1840 the hot mineral waters of Pfafers are conducted in pipes to Ragatz, which is in a more pleasant position. Consequently Ragatz has much increased in importance since that date. In 1900 its native population was 1866, mainly German-speaking, while there w r ere 1472 Romanists to 392 Protestants. The annual number of visitors is reckoned at 30,000. In the church- yard is the grave of the philosopher Schelling (d. here in 1854). About 2 m. by road above Ragatz are the 17th-century build- ings (now the cantonal lunatic asylum) of the great Benedictine abbey of Pfafers (720-1838), to which all this region belonged till 1798; while midway between them and Ragatz are the ruins of the 14th-century castle of Wartenstein, now accessible from Ragatz by means of a funicular railway. (W. A. B. C.)

RAGLAN, FITZROY JAMES HENRY SOMERSET, ist Baron (1788-1855), British field marshal, was the eighth and youngest son of Henry, 5th duke of Beaufort, by Elizabeth, daughter of Admiral the Hon. Edward Boscawen, and was born on the 30th of September 1788. His elder brother, General Lord (Robert) Edward (Henry) Somerset (1776-1842), distinguished himself as the leader of the Household Cavalry brigade at Waterloo. Lord Fitzroy Somerset was educated at West- minster school, and entered the army in 1804. In 1807 he was attached to the Hon. Sir Arthur Paget's embassy to Turkey, and the same year he was selected to serve on the staff of Sir Arthur Wellesley in the expedition to Copenhagen. In the following year he accompanied the same general in a like capacity to Portugal, and during the whole of the Peninsular War was at his right hand, first as aide-de-camp and then as military secretary. He was wounded at Busaco, became brevet-major after Fuentes de Onoro, accompanied the stormers of the 52nd light infantry as a volunteer at Ciudad Rodrigo and specially distinguished himself at the storming of Badajoz, being the first to mount the breach, and afterwards showing great resolution and promptitude in securing one of the gates before the French could organize a fresh defence. During the short period of the Bourbon rule in 1814 and 1815 he was secretary to the English embassy at Paris. On the renewal of the war he again became aide-de-camp and military secretary to

the duke of Wellington. About this time he married Emily Harriet, daughter of the 3rd earl of Mornington, and Welling- ton's niece. At Waterloo he was wounded in the right arm and had to undergo amputation, but he quickly learned to write with his left hand, and on the conclusion of the war resumed his duties as secretary to the embassy at Paris. From 1818 to 1820, and again in 1826-29, he sat in the House of Commons as member for Truro. In 1819 he was appointed secretary to the duke of Wellington as master-general of the ordnance, and from 1827 till the death of the duke in 1852 was military secretary to him as commander-in-chief. He was then appointed master-general of the ordnance, and was created Baron Raglan. In 1854 he was promoted general and appointed to the command of the English troops sent to the Crimea (see Crimean War) in co-operation with a strong French army under Marshal St Arnaud and afterwards, up to May 1855, under Marshal Canrobert. Here the advantage of his training under the duke of Wellington was seen in the soundness of his generalship, and his diplomatic experience stood him in good

stead in dealing with the generals and admirals, British, French and Turkish, who were associated with him. But the trying winter campaign in the Crimea also brought into prominence defects perhaps traceable to his long connexion with the for- malities and uniform regulations of military offices in peace time. For the hardships and sufferings of the English soldiers in the terrible Crimean winter before Sevastopol, owing to failure in the commissariat, both as regards food and clothing, Lord Raglan and his staff were at the time severely censured by the press and the government; but, while Lord Raglan was possibly to blame in representing matters in a too sanguine light, it afterwards appeared that the chief neglect rested with the home authorities. But this hopefulness was a shining military quality in the midst of the despondency that settled upon the allied generals after their first failures, and at Balaklava and Inkermann he displayed the promptness and resolution of his youth. He was made a field marshal after Inkermann. During the trying winter of 1854-55, the suffering he was com- pelled to witness, the censures, in great part unjust, which he had to endure and all the manifold anxieties of the siege seriously undermined his health, and although he found a friend and ardent supporter in his new French colleague, General Pelissier (q.v.), disappointment at the failure of the assault of the 18th of June 1855 finally broke his spirit, and very shortly afterwards, on the 28th of June 1855, he died of dysentery. His body was brought home and interred at Badminton.

His elder son having been killed at the battle of Ferozeshah (1845), the title descended to his younger son Richard Henry Fitzroy Somerset, 2nd Baron Raglan (1817-1884); and subse- quently to the latter's son, George Fitzroy Henry Somerset, 3rd baron (b. 1857), under-secretary for war 1900-2, lieutenant- governor of the Isle of Man (1902) and a prominent

militia officer.

RAGMAN ROLLS, the name given to the collection of instru- ments by which the nobility and gentry of Scotland were com- pelled to subscribe allegiance to Edward I. of England between the conference of Norham in May 1 291 and the final award in favour of Baliol in November 1292, and again in 1296. Of the former of these records two copies were preserved in the chapter- house at Westminster (now in the Record Office, London), and it has been printed by Rymer (Foedera, ii. 542). Another copy, preserved originally in the Tower of London, is now also in the Record Office. The latter record, containing the various acts of homage and fealty extorted by Edward from Baliol and others in the course of his progress through Scotland in the summer of 1296 and in August at the parliament of Berwick, was published by Prynne from the copy in the Tower and now in the Record Office. Both records were printed by the Banna- tyne Club in 1834. The derivation of the word " ragman " has never been satisfactorily explained, but various guesses as to its meaning and a list of examples of its use for legal instruments both in England and Scotland will be found in the preface to the Bannatyne Club's volume, and in Jamieson's Scottish Dictionary, s.v. " Ragman." The name " ragman roll " survives in the colloquial " rigmarole," a rambling, incoherent state- ment.

The name of " Ragman " has been sometimes confined to the record of 1296, of which an account is given in Calendar of Docu- ments relating to Scotland preserved in the Public Record Office, London (1884), vol. ii., Introd., p. xxiv; and as to the seals see p. lii and appendix.

RAG-STONE (probably equivalent to " ragged " stone), a name given by some architectural writers to work done with stones which are quarried in thin pieces, such as the Horsham sandstone, Yorkshire stone, the slate stones, &c; but this is more properly flag or slab work. By rag-stone, near London, is meant an excellent material from the neighbourhood of Maidstone. It is a very hard limestone of bluish-grey colour, and peculiarly suited for medieval work. It is often laid as un coursed work, or random work (see Random), sometimes a6 random coursed work and sometimes as regular ashlar. The first method, however, is the more picturesque. (See Masonky.)

RAGUSA (Serbo-Croatian Dubrovnik), an episcopal city, and the centre of an administrative district in Dalmatia, Austria. Pop. (1900) of town and commune, 13,174, including a garrison of 1 1 22. Its situation and its

undisturbed atmosphere of antiquity combine to make Ragusa by far the most picturesque city on the Dalmatian coast. It occupies a ridge or promontory, which juts out into the Adriatic Sea, under the bare limestone mass of Monte Sergio. Its seaward fortifications rise directly from the water's edge, one fort, on the north mole, standing boldly on a tall rock almost isolated by a little inlet of the Adriatic. On the landward side a massive round tower domi- nates the city from a still higher eminence. Beyond the walls and the deep moat, especially on the northward side towards the port of Gravosa, are many pleasant villas, surrounded by gardens in which the aloe, palm and cypress are conspicuous among a number of flowering trees and shrubs. The island of Lacroma lies less than half a mile to the south. Between the seaward ridge and the mountain, the Stradone, or main street, runs along a narrow valley which, until the 13th century, was a marshy channel, dividing the Latin island of Ragusa from the Slavonic settlement of Dubrovnik, on the lower slopes of Monte Sergio. Parallel to the Stradone, on the north, is the Prijeki, a long, very narrow street, flanked by tall houses with overhanging balconies, and greatly resembling a Venetian alley. Despite the havoc wrought by earthquake in 1667, the whole city is rich in antiquarian interest. It possesses one church, of the Byzantine period, which is mentioned in 13th- century documents as even then of great age. Two stately convents of the 14th century stand at the ends of the city; for the Franciscans were set to guard the western gate, or Porta Pile, against the hostile Slavs, while the Dominicans kept the eastern gate, or Porta Ploce. The Franciscan cloister is a fine specimen of late Romanesque; that of the Dominicans is hardly inferior, though of later date. The Dominican church is approached by a sloping flagged lane, having on one side a beautifully ornamented balustrade of the 18th century. Another 14th-century building is the Sponza, or custom-house, from which the state derived its principal revenue. A fountain and a curious clock-tower in the Piazza, which terminates the Stradone towards the east, were erected by Onofrio, the archi- tect and engineer whose aqueduct, built about 1440, supplied Ragusa with water from the neighbouring hills. The Rector's Palace, another noteworthy example of late Romanesque, combined with Venetian Gothic, is one of the masterpieces of Dalmatian architecture. It has a fine facade of six arches, and the capitals of the supporting pillars are very curiously carved. Especially interesting is the figure of Aesculapius, whose traditional birthplace was Epidaurum or Epidaurus, the parent city of Ragusa. The cathedral dates from the 1 8th century; and to the same period belongs another church, rebuilt after a fire, but originally erected as a votive offering after the pestilence of 1348, and dedicated to San Biagio (St Blaize), the patron of Ragusa, whose name and effigy con- tinually appear on coins and buildings. Among many fine pieces of jewellers' work preserved in the ecclesiastical treasuries may be mentioned the silver

statuette of San Biagio, and the reli- quary which contains his skull — a 17th-century casket in filigree and enamels with Byzantine medallions of the nth or 12th century.

The harbour of Ragusa, once one of the chief ports of southern Europe, is too small for modern needs; but Gravosa (Gruz), a village at the mouth of the river Ombla, on the north, is a steamship station and communicates by rail with Herzegovina and the Bocche di Cattaro. Ragusa has thus some transit trade with the interior. Its industries include the manufacture of liqueurs, oil, silk and leather; but Malmsey, its famous wine, could no longer be produced after the vine- disease of 1852.

History. — The name Ragusa is of uncertain origin. Con- stantine Porphyrogenitus, in the 10th century, connects its early form, Lausa, with XaO, a " precipice." Jirecek dissents from this view, and from the common opinion that Dubrovnik

is derived from the Slavonic dubrava, " woody." The city first became prominent during the 7th century. In 639 and 656 the flourishing Latin communities of Salona and Epidaurum were destroyed by the Avars, and the island rock of Ragusa was colonized by the survivors. Tradition identifies Epidaurum, whence the majority came, with the neighbouring village of Ragusavecchia; but some historians, including Gelcich, place it on the shores of the Bocche di Cattaro. Both sites show signs of Roman occupation. A colony of Slavs soon joined the Latin settlers at Ragusa, and thus, from an early date, the city formed a link between two great civilizations (see Vlachs). In the 9th century it is said to have repulsed the Saracens; in the 10th it defended itself against the Naren- tine pirates, and Simeon, tsar of the Bulgarians. Some writers consider that it submitted to Venice in 998, with the rest of Dalmatia; but this is generally denied by the native historians. During the nth century an enforced alliance with the Normans drew the republic into war with Venice and Byzantium; and in the 12th century it was attacked by the Bosnians and Serbs. From 1205 to 1358 it acknowledged Venetian suzerainty; its chief magistrate was the Venetian count; and its archbishops, who wielded much political influence, were often Venetian nominees. The constitution took shape during this period, and the first statute-book was published in 1272. Only patricians could hold office in the senate, grand council and lesser council, three bodies which shared the work of govern- ment with the count, or, after 1358, the rector. The ancient popular assembly was almost obsolete before the 14th century. Ragusan policy was usually peaceful, and disputes with other nations were frequently arranged by a system of arbitration called slanicum. To refugees of all nations, even to those who had been its own bitter foes, the city afforded asylum; and by means of treaty and tribute it worked its way to a position of mercantile power which Europe could

hardly parallel. It was conveniently situated at the seaward end of a great trade route, which bifurcated at Plevlje to Byzantium and the Danube. A compact with the Turks, made in 1370 and renewed in the next century, saved Ragusa from the fate of its more powerful neighbours, Servia and Byzantium, besides enabling the Ragusan caravans to penetrate into Hungary, Croatia, Bosnia, Servia, Bulgaria and Rumania. From 1358 to 1526 the republic was a vassal state of Hungary, and no longer controlled by its greatest commercial rival. It acquired, among other territories, the important ship-building and salt- producing centre Stagno Grande {Ston Veliki), on the promon- tory of Sabbioncello; and from 1413 to 1416 it held the islands of Curzola, Brazza and Lesina by lease from Hungary. Mean- while, Ragusan vessels were known not only in Italy, Sicily, Spain, Greece, the Levant and Egypt, but in the more northern parts of Europe. The English language retains in the word " argosy " a reminiscence of the carracks of Ragusa, long known to Englishmen as Argouse, Argusa or Aragosa. In the 1 6th century the Ragusan merchants went even to India and America, but they were unable to compete with their rivals from western Europe. Many of their seamen took service with Spain; and twelve of their finest ships were lost with the Invincible Armada in 1588. After 1526 the downfall of Hun- gary left Ragusa free; and about this time a great develop- ment of art and literature, begun in the 15th century and con- tinued into the 17th, earned for the city its title of the " South Slavonic Athens." (See Servia, Literature.) The earthquake of 1667, which had been preceded by lesser shocks in 1520, 1521, 1536 and 1639, destroyed a considerable portion of the city, and killed about one-fifth of the inhabitants. Only during the Napoleonic wars did the republic regain its pros- perity. From 1800 to 1805 it was the sole Mediterranean state remaining neutral, and thus it secured a very large share of the carrying trade. In 1805, however, it was seized by the French; Napoleon deprived it of independence; and in 1814 it was annexed to Austria.

See L. Villari, The Republic of Ragusa (London, 1904), for a thorough description and history, with a full bibliography. T. G.

Jackson, Dalmatia, the Quarnero and Istria (Oxford, 1887), gives the best account of Ragusan architecture and antiquities. The most accurate native history is G. Gelcich (Gelcic), Dello Sviluppa civile di Ragusa (Ragusa, 1884). The course of Ragusan trade may be studied in C J. Jirecek, Die Handelsstrassen und Bergwerkevon Serbian, &c. (Prague, 1879); and Heyd, Histoire du commerce du Levant au moyen &ge (Leipzig, 1885).

RAGUSA, a town of Sicily in the province of Syracuse, 70 m. S.W. of Syracuse by rail and 32 m. direct. It consists of an upper (Ragusa Superiore) and a lower town (Ragusa Inferiore), each of which forms a separate commune. Pop. (1906) of the former, 35,529; of the latter, 866. It has some churches with fine Gothic architecture, and is commercially of some importance, a stone impregnated with bitumen being quarried and prepared for use for paving slabs by being ex- posed to the action of fire. On the hill occupied by the castle of Ragusa Inferiore stood the ancient Hybla Heraea, a Sicel town, under the walls of which Hippocrates of Gela fell in 491 B.C. A Greek settlement seems to have arisen in the neigh- bourhood close to the present railway station, about the middle of the 6th century B.C., and to have disappeared at the end of the 5th. Orsi points out that the remains (cuttings in the rock and a part of the castle wall), attributed by Freeman (History of Sicily, i. 163) to Sicel times, are in reality post- Roman.

See Orsi in Notizie degli scavi (1899), 402-418. RAHWAY, a city of Union county, New Jersey, U.S.A., in the north-eastern part of the state, on the Rahway river and about 20 m. S.W. of New York City. Pop. (1890) 7105; (1900) 7935, of whom 1345 were foreign-born; (1910 U.S. census) 9337. Rahway is served by the main line of the Pennsylvania railroad, and is connected with neighbouring cities by electric lines. It has wide streets and attractive parks, and is, to some extent, a residential suburb of New York and other neighbouring cities. It has a public library (1864), with upwards of 17,000 volumes, and about i£ m. distant is the New Jersey Reformatory (1903), to which prisoners between the ages of sixteen and thirty may be sentenced instead of to the State Prison. There are various manufactures. Rahway was first settled in 1720, and was named in honour of the Indian chief Rahwack, whose tribe owned the site and the surrounding territory; it was chartered as a city in 1858. For many years Rahway was popularly known as Spanktown, and in January 1777, during the War of Independence, a skirmish, known as the battle of Spanktown, was fought here.

RAICHUR. a town of India, in the state of Hyderabad, at the junction of the Madras and Great Indian Peninsula railways, 351 m. N.E. from Madras. Pop. (1901) 22,165. It gives its name to the doab, or tract between the rivers Kistna and Tunga- bhadra, which was the scene of much fighting between Mahom- medans and Hindus as debatable land during the 16th century. It contains a well-preserved fort and two old mosques. It is a thriving centre of trade, with several cotton-presses. ■ ‘

RAID, in the language of international law, an invasion by armed forces, unauthorized and unrecognized by any state, of the territory of a state which is at peace. Piracy is the attack on the high sea of any vessel by an

armed vessel, not authorized or recognized by any state, for the purpose of robbery. A raid for the purpose of carrying off movable property and converting it to the use of the captors would still be distinguishable from piracy, because it was committed on territory subject to an exclusive territorial jurisdiction. Where the attack or invasion by an armed ship not authorized or recognized by any state is not for the purpose of capturing property, it is properly speaking a raid and not piracy. An attack though in time of peace, by armed forces authorized or recognized by a regular government, is not a raid but an act of war, there being a government responsible for the act com- mitted. The fact of any act being authorized, not by the supreme government, but by a chartered company, or by its governing officer, makes no difference in international law, the directorate of a chartered company exercising its powers by delegation of the state under which it holds its charter.

The acts of its armed forces cannot in reason be distinguished from the acts of the armed forces of the state government. Thus compensation is just as much due for them as for the deliberate acts of the state itself, and any claim of an injured state can only be preferred against the state to which the company belongs. Invasion by the regular forces of a state, or by the regular forces of its delegated authority, being an act of war, the laws of war apply to it, and, on capture, such forces, or any members or part of such forces, are prisoners of war. On the other hand, the state whose subordinate authorities commit acts of war against a friendly state has the option of following them up as a commencement of hostilities, or of giving satisfactory compensation to the invaded state. Where the invasion is not by forces subject to the orders of a state, the invaded state has the right to apply its own laws for the repression of disturbances in its territory. Thus, in the so-called Jameson Raid, the Transvaal government had no right to treat Dr Jameson, an officer holding his powers under the British government, and his subordinates, as out- laws, and it was probably so advised, and the British govern- ment owed proper compensation for an act for the consequences of which, under international law, it was responsible.

British domestic law punishes raiding under the Foreign Enlistment Act 1870 (33 & 34 Vict. c. 90). 1 Section 11 of this act provides as follows. — "If any person within the limits of His Majesty's dominions, and without the licence of His Majesty, prepares or fits out any naval or military ex- pedition to proceed against the dominions of any friendly state, the following consequences shall ensue: (1) Every person engaged in such preparation or fitting out, or assist- ing therein, or employed in any capacity in such expedition, shall be guilty of an offence against this act, and shall be punishable by fine and imprisonment or either of such punish- ments, at the discretion of the Court before which the offender is convicted; and imprisonment, if awarded, may be either with or without hard labour.

(2) All ships and their equip- ments, and all arms and munitions of war, used in or forming part of such expedition, shall be forfeited by His Majesty." Section 12 provides for the punishment of accessaries as principal offenders, and section 13 limits the term of imprison- ment for any offence under the act to two years. In the Sandoval case (1886), 2 in which Colonel Sandoval, who was not a British subject, bought guns and ammunition and shipped them to Antwerp, where they were put on board a vessel; which afterwards made an attack on Venezuela, it was held that the offence of fitting out and preparing an expedition within British territory against a friendly state, under this section, is sufficiently constituted by the purchase of guns and ammunition in the British Empire, and their shipment for the purpose of being put on board a ship in a foreign port, with knowledge of the purchaser and shipper that they are to be used in a hostile demonstration against such state, though the shipper takes no part in any overt act of war, and the ship is not fully equipped for the expedition within any British port. Under the same section, Dr .Jameson, administrator of the British South Africa Company, and his confederates were tried before the Central Criminal Court and sentenced to different terms of imprisonment. 3 The offence committed under a British act is, of course, that of preparing and fitting out an expedition on British territory. Any acts subsequently committed by any British expedition on foreign soil are beyond the operation of domestic legislation, and fall to be dealt with by the domestic legislation of the state within which they occur, or by diplomacy, as the case may be. (T. Ba.)

RAIFFEISEN, FRIEDRICH WILHELM (1818-1888), founder of the German system of agricultural co-operative banks, was

1 The preamble to the Foreign Enlistment Act 1870 stated that its object was "to make provision for the regulation of the conduct of Her Majesty's subjects during the existence of hostilities between foreign states with which Her Majesty is at peace." This preamble was repealed by the Statutes Law Revision (No. 2) Act 1893.

i R. v. Sandoval, 1886, 56 Law Times, 526.

3 R. v. Jemeson, 1896, 2 Q.B., 425.

born at Hamm on the Sieg on the 30th of March 1818, being the son of Gottfried Raiffeisen, burgomaster of that place. Educated privately, he entered the artillery in Cologne, but defective eyesight compelled him to

leave the army. He then entered the public service at Coblenz, and in 1845 was ap- pointed burgomaster of Weyerbusch. Here he was so successful that in 1848 he was transferred in a like capacity to Flammers- feld, and in 1852 to Heddersdorf. Raiffeisen devoted himself to the improvement of the social condition of the cultivators of the soil, and did good work in the planning of public roads and in other ways. The distress of the years 1846-47, the causes of which he discerned in the slight amount of credit obtainable by the small landed proprietors, led him to seek for a remedy in co-operation, and at Heddersdorf and at Weyer- busch he founded the first agricultural co-operative loan banks (Darlehnskassenverein). These banks were called after him, and their foundation resulted in a widespread system of land banks, supported by the government. In 1865 the state of his health compelled him to retire, but he continued to take an interest in the movement he had originated, and in 1878 he founded at Neu wied a periodical, Das landwirtschajtliche Genossen- schaflsblatt. He died on the 1 ith of March 1888.

Among Raiffeisen's writings are, Die Darlehnskassenvereine als Mittel zur Abhilfe (Neuwied, 1866; new ed., 1887); Anleitung zur Geschdfts- und Buchfuhrung landlichen Spar- und Darlehns- kassenvereine (new ed., 1896); and Kurze Anleitung zur Griindung von Darlehnskassenvereinen (new ed., 1893). See A. Wattig, Friedrich Wilhelm Raiffeisen (1890); H. W. Wolff, People's Banks. A Record of Social and Economic Success (1895); and Fassbender, Friedrich Wilhelm Raiffeisen (Berlin, 1902).

RAIGARH, a feudatory state of India, in the Chattisgarh division of the Central Provinces. Area, i486 sq. m. Pop. (1901) 174,929, showing an increase of 4% in the decade. Estimated revenue, £10,000; tribute, £260. The chief belongs to the old Gond royal family. The state is traversed by the Bengal-Nagpur railway, with a station at Raigarh town, 363 m. from Calcutta. Rice is the chief crop; iron ore is worked by indigenous methods, and coal is known to exist. Fine tussore silk is produced at Raigarh town (pop. 6764). Raigarh is also the name of a hill fortress in Kolaba district, Bombay, which Sivaji made his chief place of residence. Here he was crowned in 1674.

RAIKES, ROBERT (1735-1811), English educationist, the founder of Sunday schools, was the son of Robert Raikes, a printer in Gloucester and proprietor of the Gloucester Journal, and was born on the 14th of September 1735. On the death of his father in 1757 he succeeded him in the business, which he continued to conduct till 1802. Along with some others he started a Sunday school at Gloucester in 1780, and on his giving publicity to the enterprise in the columns of his journal the notice was copied into the London papers and awakened considerable attention. For nearly thirty years he continued actively engaged in the promotion of his

undertaking, and he lived to witness its wide extension throughout England. He died on the 5th of April 181 1. His statue stands on the Thames Embankment.

Among various accounts of the life and work of Raikes mention may be made of that by P. M. Eastman, r88o.

RAIL. (1) (From Fr. RAle, cf. Ger. Ralle, Low Lat. Rallus, of unknown origin), originally the English name of two birds, distinguished from one another by a prefix as land-rail and water-rail, but latterly applied in a much wider sense to all the species which are included in the family Rallidae.

The land-rail, also very commonly % known as the corn- crake, and sometimes as the daker-hen, is the Rallus crex of Linnaeus and Crex pratensis of recent authors. Its monotonous grating cry has given it its common name in several languages. With comparatively few individual exceptions, the land-rail is essentially migratory. It is the Ortygometra of classical authors — supposed by them to lead the quail (q.v.) on its voyages — and in the course of its wanderings has now been known to reach the coast of Greenland, and several times that of North America, to say nothing of Bermuda, in every instance

we may believe as a straggler from Europe or Barbary. The land-rail looks about as big as a partridge, but on examination its appearance is found to be very deceptive, and it will hardly ever weigh more than half as much. The plumage above is of a tawny brown, the feathers being longitudinally streaked with blackish brown; beneath it is of a yellowish white; but the flanks are of a light chestnut barred with white. The species is very locally distributed, and in a way for which there is at present no accounting. In some dry upland and corn- growing districts it is plentiful; in others, of apparently the same character, it but rarely occurs; and the same may be said in regard to low-lying marshy meadows, in most of which it is in season always to be heard, while in others having a close resemblance to them it is never met with. The nest is on the ground, generally in long grass, and therein from nine to eleven eggs are commonly laid. These are of a cream- colour, spotted and blotched with light red and grey. The young when hatched are thickly clothed with black down, as is the case in nearly all species of the family.

The water-rail, locally known as the skiddy or billcock, is the Rallus aquaticus of ornithology, and seems to be iess abundant than the preceding, though that is in some measure due to its frequenting places into which from their swampy nature men do not often intrude. Having a general resemblance to the land-rail, 1 it can be in a moment distinguished

by its partly red and much longer bill, and the darker coloration of its plumage — the upper parts being of an olive brown with black streaks, the breast and belly of a sooty grey, and the flanks dull black barred with white. Its geographical dis- tribution is very wide, extending from Iceland (where it is said to preserve its existence during winter by resorting to the hot springs) to China; and though it inhabits Northern India, Lower Egypt and Barbary, it seems not to pass beyond the tropical line. It never affects upland districts as does the land- rail, but always haunts wet marshes or the close vicinity of water. Its love-note is a loud and harsh cry, not continually repeated as is that of the land-rail, but uttered at considerable intervals and so suddenly as to have been termed " explosive." Besides this, which is peculiar to the cock-bird, it has a croaking call that is frog-like. The eggs resemble those of the preceding, but are more brightly and delicately tinted.

The various species of rails, whether allied to the former or latter of those just mentioned, are far too numerous to be here noticed. Hardly any part of the world is without a representative of the genera Crex or Rallus, and every considerable country has one or perhaps more of each— though it has been the habit of systematists to refer them to many other genera, the characters of which are with difficulty found. Thus in Europe alone three other species allied to Crex pratensis occur more or less abundantly; but one of them, the spotted rail or crake, has been made the type of a so-called genus Porzana, and the other two, little birds not much bigger than larks, are considered to form a genus Zapornia. The first of these, which used not to be uncommon in the eastern part of England, has a very near representative in the Carolina rail or sora, Crex Carolina, of North America, often there miscalled the • ortolan, just as its European analogue, C. porzana, is in England often termed the dotterel. But, passing over these as well as some belonging to genera that can be much better defined, and other stilLmore interesting forms of the family, as Aphanapteryx, coot (q.v.), moor-hen (q.v.) and ocydrome (q.v.), a few words must be said of the more distant group formed by the South American Heliornisˆ and the African and Indian Podica, comprising four or five species, to which the name " Finfoots " has been applied— from the lobes or flaps of skin that fringe their toes. Though for a long while placed among the Podicipedidae (see Grebe), their osteology no less than their habits appear to indicate their alliance with the rails, and they are placed as a separate family, Heliorni- thidae of the order Gruiformes, to which the rails belong; but they seem to show the extreme modification of that type in adaptation to aquatic life. The curious genus Mesites of Madagascar, whose systematic place has been so long in doubt, has been referred by A. Milne-Edwards (Ann. Sc. Naturelle, ser. 6, vii. art. 2) to the neighbourhood of the rails, but is now associated as a sub-order Mesitae with Galliform birds. On the

other hand the jacanas or Parridae, which from their long toes were once thought to belong

1 Formerly it seems to have been a popular belief in England that the land-rail in autumn transformed itself into a water-rail, re- suming its own characters in spring.

to the rails, are now generally admitted to be Limicoline, while the genus Aramus — the courlan or limpkin of the southern United States — still occupies a very undetermined position. (A. N.)

(2) (Through O.Fr. reille, from Lat. regula, a rule; the Du. and Swed. regel, Ger. Riegel, bolt or bar, are probably also from the Latin), a horizontal bar of wood, metal or other material resting on, or fixed in, upright posts to form a fence, or as a support for hanging things on, to form the " hand-rail " of a stair, &c; on a ship the upper part of the bulwarks, e.g. the " taffrail," round the stern bulwarks; especially, one of the pair of iron or steel bars on which a train or tram runs (see Railways) .

There are two other words " rail " : (a) an obsolete word (O.E. hrcEgcl), for a garment; often in the compound " night-rail "; and (b) a verb, to abuse, use angry language, from Fr. miller, possibly from the same root as Lat. radere, to scrape. The word is also seen in " rally," to banter, tease (distinguish, however, " rally," to bring together, especially of defeated troops (from Fr. rattier; re, again, and allier, ally, Lat. alligare)).

RAILWAYS. Railways had their origin in the tramways (q.v.) or wagon-ways which at least as early as the middle of the 1 6th century were used in the mineral districts of England round Newcastle for the conveyance of coal from the pits to the river Tyne for shipment. It may be supposed that originally the public roads, when worn by the cartage of the coal, were repaired by laying planks of timber at the bottom of the ruts, and that then the planks were laid on the surface of special roads or ways 1 formed between the collieries and the river. " The manner of the carriage," says Lord Keeper North in 1676, "is by laying rails of timber . . . exactly straight and parallel, and bulky carts are made with four rowlets fitting these rails, whereby the carriage is so easy that one horse will draw down four or five chaldrons of coals " (from io-6 to 13-2 tons). The planks were of wood, often beech, a few inches wide, and were fastened down, end to end, on logs of wood, or " sleepers," placed crosswise at intervals of two or three feet. In time it became a common practice to cover them with a thin

sheathing or plating of iron, in order to add to their life; this expedient caused more wear on the wooden rollers of the wagons, and, apparently towards the middle of the 18th century, led to the introduction of iron wheels, the use of which is recorded on a wooden railway near Bath in 1734. But the iron sheathing was not strong enough to resist buckling under the passage of the loaded wagons, and to remedy this defect the plan was tried of making the rails wholly of iron. In 1767 the Colebrookdale Iron Works cast a batch of iron rails or plates, each 3 ft. long and 4 in. broad, having at the inner side an upright ledge or flange, 3 in. high at the centre and tapering to a height of 2 1 in. at the ends, for the purpose of keeping the flat wheels on the track. Subsequently, to increase the strength, a similar flange was added below the rail. Wooden sleepers continued to be used, the rails being secured by spikes passing through the extremities, but about 1793 stone blocks also began to be employed — an innovation associated with the name of Ben- jamin Outram, who, however, apparently was not actually the first to make it. This type of rail (fig. 1) was known as the plate-rail, tramway-plate or barrow- way-plate — names which are preserved in the modern term " platelayer " applied to the men who lay and maintain the permanent way of a railway.

Another form of rail, distinguished as the edge- rail, was first used on a line which was opened between Loughborough and Nanpantan in 1789. This line was originally designed as a " plate- way " on the Outram system, but objections were raised to rails with upstanding ledges or flanges being laid on the turnpike road which was crossed at Loughborough on the level. In other cases this difficulty was overcome by paving or " cause- the road up to the level of the top of the flanges, but

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Fig. 1. — Plate- Rail.

waving

1 " Another thing that is remarkable is their way-leaves; for, when men have pieces of ground between the colliery and the river, they sell leave to lead coals over their ground " (Roger North).

on this occasion William Jessop, of the Butterley Iron Works, near Derby, proposed to get over it by laying down two plates of iron, perfectly flat and level with the road but each having on its outside a groove f in. wide and J in. deep to control extra guiding wheels which were to be of somewhat larger diameter than the bearing wheels and to be affixed to them. The rest of the line was laid with what were sub- stantially plate-rails placed on their edge instead of flat. These were cast in 3 ft. lengths, of a double-

flanged section, and for the sake of strength they were " fish-bellied " or deeper in the middle than at the ends. At one end of each rail the flange spread out to form a foot which rested on a cross sleeper, being secured to the latter by a spike passing through a central hole, and above this foot the rail was so shaped as to form a socket into which was fitted the end of the next rail. Each length was thus fastened to a sleeper at one end, while at the other it was socketed into the end of its fellow. This method, however, was not found satisfactory: the projecting feet were liable to be broken off, and in 1799 or 1800 Jessop abandoned them, using instead separate cast-iron sockets or chairs, which were fastened to the sleepers and in which the rails were supported in an upright position. In the first instance he proposed to place the guiding wheels outside the bearing wheels, and the Nanpantan line was laid on this plan with a width of 5 ft. between the guide wheels; but before it was opened he decided not only to cast the guiding wheels and bearing wheels in one piece but also to put the former inside the rails, arguing that with this arrangement the edge-rails themselves would keep the wheels in position on the axles, whereas with that first con- templated fastenings would have been required for them (fig. 2). Jessop thus produced what was virtually the flanged wheel of to-day, having the flanges inside the rails, and further, it is said, established what has become the standard gauge of the world, 4 ft. 8§ in., or 5 ft. minus the width of two of his rails.

These two systems of constructing railways — the plate-rail and the edge-rail — continued to exist side by side until well on in the 19th century. In most parts of England the plate-rail was preferred, and it was used on the Surrey iron railway, from Wandsworth to Croydon, which, sanctioned by parliament in 1801, was finished in 1803, and was the first railway available to the public on payment of tolls, previous lines having all been private and reserved exclusively for the use of their owners. In South Wales again, where in 181 1 the railways in connexion with canals, collieries and iron and copper works had a total length of nearly 150 miles, the plate-way was almost universal. But in the north of England and in Scotland the edge-rail was held in greater favour, and by the third decade of the century its superiority was generally established. The manufacture of the rails them-selves was gradually improved. By making them in longer lengths a reduction was effected in the number of joints — always the weakest part of the line; and another advance consisted in the substitution of wrought iron for cast iron, though that material did not gain wide adoption until after the patent for an improved method of rolling rails granted in 1820 to John Birkinshaw, of the Bedlington Ironworks, Durham. His rails were wedge-shaped in section, much wider at the top than at the bottom, with the inter- mediate portion or web thinner still, and he recommended that they should be made 18 ft. long, even suggesting that several of them might

be welded together end to end to form considerable lengths. They were supported on sleepers by chairs at intervals of 3 ft., and were fish-bellied between the points of support. As used by George Stephenson on the Stockton & Darlington and Whitstable & Canterbury lines they weighed 28 lb per yard. On the Liverpool & Man- chester railway they were usually 12 ft. or 15 ft. long and weighed 35 lb to the yard, and they were fastened by iron wedges to chairs weighing 15 or 17 lb each. The chairs wsre

Fig. 2.— Edge- Rail.

in turn fixed to the sleepers by two iron spikes, half-round wooden cross sleepers being employed on embankments and stone blocks 20 in. square by 10 in. deep in cuttings. The fish- bellied rails, however, were found to break near the chairs, and from 1834 they began to be replaced with parallel rails weighing 50 lb to the yard.

The next important development in rail design originated in America, which, for the few lines that had been laid up to 1830, remained content with wooden bars faced with iron. In that year Robert Livingston Stevens (1787-1856), devised for the Camden & Amboy railway a rail similar as to its top to those in use in England, but having a flat base or foot by which it was secured to the sleepers by hook-headed spikes, without chairs (fig. 3); he had to get the first lot of these rails, which were 15 ft. long and weighed 36 lb to the yard, manufactured in England, since there were then no mills in America able to roll them. This type, which is often known as the Vignoles rail, after Charles Blacker Vignoles (1793-1875), who re-invented it in England in 1836, is in general use in America and on the continent of Europe. The bridge-rail (fig. 4) — so called because it was

century and had come into considerable use in connexion with collieries and quarries before it was realized that for the carriage

Fig. 3.— Flat- Bottomed Rail.

Fig. 4. — Bridge- Rail.

first laid on bridges — was supported on continuous longitudinal sleepers and held down by bolts passing through the flanges, and was employed by I. K. Brunei on the Great Western railway, where, however, it was abandoned after the line was converted from broad to standard gauge in

1892. In the double-headed rail (fig. 5), originated by Joseph Locke in 1837, and first laid on the Grand Junction railway, the two tables were equal. This rail was more easily rolled than others, and, being reversible, was in fact two rails in one. But as it was laid in cast-iron chairs the lower table was exposed to damage under the hammering of the traffic, and thus was liable to be rendered useless as a running surface. In consequence the bull-headed rail (fig. 6)

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Fig. 5. — Double- Headed Rail.

Fig. 6.— Bull- Headed Rail.

was evolved, in which the lower table was made of smaller size and was intended merely as a support, not as a surface to be used by the wheels. There was a waste of metal in these early rails owing to the excessive thickness of the vertical web, and subsequent improvements have consisted in adjusting the dimensions so as to combine strength with economy of metal, as well as in the substitution of steel for wrought iron (after the introduction of the Bessemer process) and in minute attention to the composition of the steel employed.

It was found, naturally, that the rails would not rest in their chairs at the joints, but were loosened and bruised at the ends by the blows of the traffic. The fish-joint was therefore devised in 1847 by W. Bridges Adams, the intention being by " fishing " the joints to convert the rails into continuous beams. In the original design two chairs were placed, one under each rail, a few inches apart, as in fig. 7. The joint was thus suspended between the two chairs, and two keys of iron, called " fishes," fitting the side channels of the rails, were driven in on each side between the chairs and the rails. In subse- quent modifications the fishes were, as they continue to be, bolted to and through the rails, the sleepers being placed rather further apart and the joint being generally suspended between them.

The iron tramway or railway had been known for half a

Fig. 7. — The original Fish-Joint of W. Bridges Adams.

of general merchandise it might prove a serious competitor to the canals, of which a large mileage had been constructed in Great Britain during that period. In the article on "Railways" in the Supplement to the Encyclopaedia Brilannica, published in 1824, it is said: "It will appear that this species of inland carriage [railways] is principally applicable where trade is considerable and the length of conveyance short; and is chiefly useful, therefore, in transporting the mineral produce of the kingdom from the mines to the nearest land or water communica- tion, whether sea, river or canal. Attempts have been made to bring it into more general use, but without success; and it is only in particular circumstances that navigation, with the aid either of locks or inclined planes to surmount the elevations, will not present a more convenient medium for an extended trade." It must be remembered, however, that at this time the railways were nearly all worked by horse-traction, and that the use of steam had made but little progress. Richard Trevithick, indeed, h,ad in 1804 tried a high-pressure steam locomotive, with smooth wheels, on a plate-way near Merthyr Tydvil, but it was found more expensive than horses; John Blenkinsop in 18 1 1 patented an engine with cogged wheel and rack-rail which was used, with commercial success, to ctonvey coal from his Middleton colliery to Leeds; William Hedley in 1813 built two locomotives — Puffing Billy and Wylam Dilly — for hauling coal from Wylam Colliery, near Newcastle; and in the following year George Stephenson's first engine, the Blucher, drew a train of eight loaded wagons, weighing 30 tons, at a speed of 4 m. an hour up a gradient of 1 in 450. But, in the words of the same article, " This application of steam has not yet arrived at such perfection as to have brought it into general use."

The steam locomotive, however, and with it the railways, soon began to make rapid progress. On the Stockton & Darlington railway, which was authorized by parliament in 1 82 1, animal power was at first proposed, but on the advice of Stephenson, its engineer, steam-engines were adopted. This line, with three branches, was over 38 m. in length, and was in the first instance laid with a single track, passing-places being provided at intervals of a quarter of a mile. At its opening, on the 27th of September 1825, a train of thirty- four vehicles, making a gross load of about 90 tons, was drawn by one engine driven by Stephenson, with a signalman on horse-back in advance. The train moved off at the rate of from 10 to 12 m. an hour, and attained a speed of 15 m. an hour on favourable parts of the line. A train weighing 92 tons could be drawn by one engine at the rate of 5 m. an hour. The principal business of the new railway was the conveyance of minerals and goods, but from the first passengers insisted upon being carried, and on the 10th of October 1825 the company began to run a daily coach, called the " Experiment," to carry six inside, and from fifteen to twenty outside, making the journey from Slarlington to

Stockton and back in two hours. The fare was is., and each passenger was allowed to take baggage not exceeding 14 lb weight. The rate for carriage of mer- chandise was reduced from 5d. to one-fifth of a penny per ton per mile, and that of minerals from 7d. to ijd. per ton per mile. The price of coals at Darlington fell from 18s. to 8s. 6d. a ton. The example of the Stockton & Darlington line was fol- lowed by the Monklands railway in Scotland, opened in 1826, and several other small lines — including the Canterbury &

Whitstable, worked partly by fixed engines and partly by locomotives — quickly adopted steam traction. But the Liverpool & Manchester railway, opened in 1830, first im- pressed the national mind with the fact that a revolution in the methods of travelling had really taken place; and further, it was for it that the first high-speed locomotive of the modern type was invented and constructed. The directors having offered a prize of £500 for the best engine, trials were held on a finished portion of the line at Rainhill in October 1829, and three engines took part — the Rocket of George and Robert Stephenson, the Novelty of John Braithwaite and John Erics- son, and the Sanspareil of Timothy Hackworth. The last two of these engines broke down under trial, but the Rocket fulfilled the conditions and won the prize. Its two steam cylinders were 8 in. in diameter, with a stroke of i6£ in., and the driving wheels, which were placed in front under the funnel, were 4 ft. 8| in. in diameter. The engine weighed 4J tons; the tender following it, 3 tons 4cwt.; and the two loaded car- riages drawn by it on the trial, 9 tons n cwt.: thus the weight drawn was 12 j tons, and the gross total of the train 17 tons. The boiler evaporated i8j cub. ft., or 114 gals., of water an hour, and the steam pressure was 5° lb per square inch. The engine drew a train weighing 13 tons 35 m. in 48 minutes, the rate being thus nearly 44 m. an hour; subsequently it drew an average gross load of 40 tons behind the tender at 13-3 m. an hour. The Rocket possessed the three elements of efficiency of the modern locomotive — the internal water-surrounded fire-box and the multitubular flue in the boiler; the blast-pipe, by which the steam after doing its work in the cylinders was exhausted up the chimney, and thus served to increase the draught and promote the rapid combustion of the fuel; and the direct connexion of the steam cylinders, one on each side of the engine, with the two driving wheels mounted on one axle. Of these features, the. blast-pipe had been employed by Trevithick on his engine of 1804, and direct driving, without intermediate gearing, had been adopted in several previous engines; but the

use of a number (25) of small tubes in place of one or two large flues was an innovation which in conjunction with the blast-pipe contributed greatly to the efficiency of the engine. After the success of the Rocket, the Stephensons received orders to build seven more engines, which were of very similar design, though rather larger, being four-wheeled engines, with the two driving wheels in front and the cylinders behind; and in October 1830 they constructed a ninth engine, the Planet, also for the Liverpool & Manchester railway, which still more closely resembled the modern type, since the driving wheels were placed at the fire-box end, while the two cylinders were arranged under the smoke-box, inside the frames. The main features of the steam locomotive were thus estab- lished, and its subsequent development is chiefly a history of gradual increase in size and power, and of improvements in design, in material and in mechanical construction, tending to increased efficiency and economy of operation.

In America the development of the locomotive dates from almost the same time as in England. The earliest examples used in that country, apart from a small experimental model constructed by Peter Cooper, came from England. In 1828, on behalf of the Delaware & Hudson Canal Company, which had determined to build a line, 16 m. long, from Carbondale to Honesdale, Pennsylvania, Horatio Allen ordered three locomotives from Messrs Foster & Rastrick, of Stourbridge, and one from George Stephenson. The latter, named the America, was the first to be delivered, reaching New York in January 1829, but one of the others, the Stourbridge Lion, was actually the first practical steam locomotive to run in America, which it did on the 9th of August 1829. The first American-built loccmotive, the Best Friend, of Charleston, was made at the West Point Foundry, New York, in 1830, and was put to work on the South Carolina railroad in that year. It had a vertical boiler, and was carried on four wheels all coupled, the two cylinders being placed in an inclined position and having a bore of about 6 in. with a stroke of 16 in. It

is reported to have hauled 40 or 50 passengers in 4 or 5 cars at a speed of 16-21 m. an hour. After a few months of life it was blown up, its attendant, annoyed by the sound of the escaping steam, having fastened down the safety-valve. A second engine, the West Point, also built at West Point Foundry for the South Carolina railroad, differed from the Best Friend in having a horizontal boiler with 6 or 8 tubes, though in other respects it was similar. In 1831 the Baltimore & Ohio Company offered a prize of $4000 for an American engine weighing 3! tons, able to draw 15 tons at 15 m. an hour on the level: it was won by the York of Messrs Davis & Gartner in the following year. Matthias W. Baldwin, the founder of the famous Baldwin Locomotive Works in Phila- delphia, built his first engine, Old Ironsides, for the Philadelphia, Germantown & Morristown railroad; first tried in November 1832, it was modelled on Stephenson's Planet, and

had a single pair of driving wheels at the fire- box end and a pair of carrying wheels under the smoke-box. His second engine, the E. L. Miller, delivered to the South Carolina railroad in 1834, presented a feature which has re- mained characteristic of American locomotives — the front part was supported on a four-wheeled swivelling bogie-truck, a device, however, which had been applied to Puffing Billy in England when it was rebuilt in 1815.

The Liverpool & Manchester line achieved a success which surpassed the anticipations even of its promoters, and in con- sequence numerous projects were started for the construction of railways in various parts of Great Britain. In the decade following its opening nearly 2000 m. of railway were sanc- tioned by parliament, including the beginnings of most of the existing trunk-lines, and in 1840 the actual mileage reached 1331 m. The next decade saw the " railway mania." The amount of capital which parliament authorized railway com- panies to raise was about 45 millions on the average of the two years 1842-1843, 17! millions in 1844, 60 millions in 1845, and 132 millions in 1846, though this last sum was less than a quarter of the capital proposed in the schemes submitted to the Board of Trade; and the wild speculation which occurred in railway shares in 1845 contributed largely to the financial crisis of 1847. In 1850 the mileage was 6635, in i860 it was 10,410, and in 1870 it was 15,310. The increase in the decade 1860-1870 was thus nearly 50%, but subsequently the rate of increase slackened, and the mileages in 1880, 1890 and 1900 were 17,935, 20,073 and 21,855. In the United States progress was more rapid, for, beginning at 2816 in 1840, the mileage reached 9015 in 1850, 30,600 in i860, 87,801 in 1880, and 198,964 in 1900. Canada had no railway till 1853, and in South America con- struction did not begin till about the same time. France and Austria opened their first lines in 1828; Belgium, Germany, Russia, Italy and Holland in the succeeding decade; Switzer- land and Denmark in 1844, Spain in 1848, Sweden in 1851, Norway in 1853, and Portugal in 1854; while Turkey and Greece delayed till i860 and 1869. In Africa Egypt opened her first line (between Alexandria and Cairo) in 1856, and Cape Colony followed in i860. In Asia the first line was that between Bombay and Tannah, opened in 1853, and in Australia Victoria began her railway system in 1854 (see also the articles on the various countries for further details about their railways).

Transcontinental Railways.— A railway line across North America was first completed in 1869, when the Union Pacific, building from the Missouri river at Omaha (1400 m. west of New York), met the Central Pacific, which built from San Francisco eastwards, making a line 1848 m. long through a country then for the most part uninhabited. This was followed by the Southern Pacific in 1881, from San Francisco to New Orleans, 2489 miles; the Northern Pacific, from St Paul to Portland, Ore.,

in 1883; the Atchison, Topeka & Santa Fe, from Kansas City to San Diego; and the Great Northern, from St Paul to Seattle and New Westminster in 1893. Meanwhile the Canadian Pacific, a true transcontinental line, was built from Montreal, on Atlantic tide-water, to the Pacific at Vancouver, 2906 m. But these lines have been

dwarfed since 1891 by the Siberian railway, built by the Russian government entirely across the continent of Asia from Cheliabinsk (1769 m. by rail east of St Petersburg) to Vladi- vostok, a distance of 4073 m., with a branch from Kharbin about 500 m. long to Dalny and Port Arthur. The main line was finished in 1902, except for a length of about 170 m. in very difficult country around the south end of Lake Baikal; this was constructed in 1004, communication being maintained in the interval by ferry-boats, which conveyed all the carriages of a train across the lake, more than 40 m., when the ice permitted. A transcontinental line was long ago undertaken across South America from Buenos Aires to Valparaiso, where the continent is only about 900 m. wide. The last section through the Andes was finished in 1910. (H. M. R.)

General Statistics

Mileage. — At the close of 1907 there were approximately 601,808 miles of railway in the world, excluding tramways. On the whole, the best statistical source for this information is the annual computation published by the Archiv fur Eisenbahn- ■wesen, the official organ of the Prussian Ministry of Public Works; but the figure quoted above utilizes the Board of Trade returns for the United Kingdom and the report of the Inter- state Commerce Commission for the United States. In the United States and in certain other countries, a fiscal year, ending on the 30th of June or at some other irregular period, is substituted for the calendar year.

The partition of this total between the principal geographical divisions of the world is given in Table I.

Table I. — Mileage of the World

Miles. Miles.

Europe …. 199,371 Africa …. 18,516 America …. 309,974 Australia . . . 17,766 Asia …. 56,181

Table II., classifying the mileage of Europe, shows that Russia has taken the lead, instead of Germany, as in former years. If the Asiatic portions of the Russian Empire were given in the same table, the total Russian mileage would appear nearly as large as that of Germany and Italy together.

Table II. — Railways of Europe in 1907

Miles. Germany . . . 36,066 Austria-Hungary, including

Bosnia and Herzegovina 25,853 GreatBritain and Ireland 23,108 France …. 29,717 EuropeanRussia, includ- ing Finland Italy Belgium . Holland . Switzerland Spain

36,280

10,312

4.874

2,230

2,763

9,228

Miles.

Portugal

1,689

Denmark

2,141

Norway

1,607

Sweden

8,322

Servia

379

Rumania

1.995

Greece .

771

European Tui

key, Bui-

garia, Rumelia •

1,968

Malta, Jersey, Isle of

Man .

68

Total

199.371

In the United States railway mileage now tends to increase at the rate of slightly over 5000 miles a year, which is about 2j% on the present main line mileage. In the ‘ eighties, the country passed through a period of competitive building, which was pro- ductive of much financial disaster. Thus, in 1882, 11,569 m. were built — an addition equivalent to more than 1 1 % of mileage then existing — and in 1887, 12,876 m. were built. Unjustifiable railway expansion had much to do with the American commercial panics of 1 884 and 1893. After the reconstruction period of the 1 893 panic, however, the tendency for a number of years was to spend larger sums in bettering existing railways rather than in new exten- sions. The decade from 1896 until 1905, inclusive, saw huge sums spent on yards, passing tracks, grade reduction, elimination of curves, substitution of large locomotives and cars for small ones, &c. During those ten years, the route mileage increased 34,991 m., or 17%, while the mileage of second, third, fourth and yard tracks and sidings increased 32,666 m., or nearly 57 . The number of locomotives increased 12,407, or 35, and the number of freight cars, 545,222, or 42%. Moreover,. the average tractive power per locomotive and the average capacity per freight car advanced greatly in this period, although specific figures cannot be given.

Thus it may fairly be said that the railway system of the United States was reconstructed between 1896 and 1905, so far as concerns rails, sleepers,

ballast and the general capacity of a given group of lines to perform work. About 1905, however, a new tendency became apparent. At that time the so-called transcontinental

railways, connecting the Pacific coast of the United States with the central portions of the country, and thus with the group of railways reaching the Atlantic seaboard, consisted of five railways within the borders of the United States, and one in Canada. In Canada the Canadian Pacific was the only transcontinental line, extending from St John, on the bay of Fundy, and from Quebec, on the river St Lawrence, to Vancouver, on the strait of Georgia, the distance from St John to Vancouver being approximately 3379 m. Within the boundaries of the United States the northernmost of the trans- continental lines was the Great Northern railway, extending from a point opposite Vancouver, B.C., and from Seattle, Wash., to Duluth, on Lake Superior, and to St Paul and Minneapolis, Minn., where connexion through to Chicago was made over an allied line, the Chicago, Burlington & Quincy, owned jointly by the Great Northern and the Northern Pacific.

Next, south of the Great Northern, lay the Northern Pacific railway, starting on the west from Portland, Ore., and from Seattle and Tacoma, Wash., and extending east to Duluth, St Paul and Minneapolis by way of Helena, Mont. The Central Pacific-Union Pacific route to the coast, with its important affiliated companies, the Oregon Short Line and the Oregon Railroad & Navigation Company, extended from San Francisco, Cal., and Portland, Ore., to Omaha, Neb., by way of Salt Lake City; the Atchison, Topeka & Santa Fe extended from San Francisco and Los Angeles, Cal., to Chicago and to Galveston, Tex. ; while the Southern Pacific had its line from San Francisco and Los Angeles to Galveston and New Orleans, running for the greater part of the distance just north of the Mexican border.

*Thus it will be observed that the five great cities of the Pacific coast — Seattle and Tacoma, Wash., Portland, Ore., and San Francisco and Los Angeles, Cal. — were already well supplied with railways; but the growth of the fertile region lying west of the transcontinental divide was most attractive to American railway builders; and railways serving this district, almost all of them in trouble ten years before, were showing great increases in earnings. In 1903 the Gould lines determined to enter this Pacific territory. Hitherto the western terminus of this group of lines had been Salt Lake City, Utah ; by the exceedingly bold construction of the Western Pacific from Salt Lake City to Oakland, Cal., opposite San Francisco, an additional line to the Pacific coast was provided, having low grades and being in all respects well adapted for cheap operation. *

Shortly after the plans were announced for building the Western Pacific,

the Chicago, Milwaukee & St Paul also decided to extend west. Before that time the St Paul had been a great local railway, operating primarily in the Dakotas, Minnesota, Iowa, Wisconsin and Illinois; but by the construction of a long arm from the Missouri river to Spokane, Seattle and Tacoma, it became a transcontinental line of the first importance, avoiding the mistakes of earlier railway builders by securing a line with easy gradients through the most favourable regions. |

At the same time that these two extensions were being undertaken by old and well-established railways, a new company — the Kansas City, Mexico & Orient — was engaged in constructing a line almost due south-west from Kansas City, Mo., to the lower part of the gulf of California in Mexico; while an additional independent line was under construction from Denver in a north-westerly direction towards the Pacific coast. The guarantee for this activity may be illustrated by a single fact: the combined building opera- tions, in 1908, of San Francisco, Seattle, Portland, Los Angeles, Spokane and Salt Lake City exceeded the combined building opera- tions of Philadelphia, Pittsburg, Kansas City, Boston, Baltimore and Cincinnati during the same year. San Francisco spent more in new permanent structures than Philadelphia, and Seattle spent more than Pittsburg.

Recent American railway development, viewed in its larger aspects, has thus been characterized by what may be described as the rediscovery of the Pacific coast. How far this movement will extend it is impossible to say; it is certain, however, that it will be enormously important in re-aligning trade conditions in the United States, Canada and Mexico.

Table III. illustrates the railway mileage in the continent of America at the close of 1907.

Table III

. — Railways of America in 1907

Miles.

Miles.

United States .

236.949′

Dutch Guiana .

Canada

22,452

Ecuador

186

Newfoundland .

666

Peru ….

1.332

Mexico

13,612

Bolivia

702

Central America .

1.392

Brazil ….

10,714

Greater Antilles.

2,430

Paraguay .

157

Lesser Antilles .

336

Uruguay

1,210

Colombia .

449

Chile . .

2.939

Venezuela .

634

Argentina .

13.673

British Guiana .

104

Total . 309,974

Outside the United States and Canada, the most interesting American developments are in Mexico and Argentina, these countries

having nearly the same amount of railway mileage. In Mexico the national government is carrying out a consistent policy of developing its railway lines. It has succeeded in restoring the credit of these enterprises, and is proceeding with care and skill to form the lines into an efficient transportation system. In Argentina about 15% of the railways are owned and operated by the government, the balance being in the hands of private companies, largely controlled in England. Development of these lines has been primarily an extension from the large cities in the East to the agricultural districts in the West, but a change of great importance was brought about in 1910 by the completion of the last tunnel on the Argentine Transandine Railway, which serves to connect Santiago, Valparaiso and the other great cities of the west coast with Buenos Aires, Montevideo, Bahia, Rio de Janeiro and the other great cities of the east coast. Naturally the company named does not reach all of these points, but its line across the Andes supplies the indispensable link of communication, in the absence of which the east coast towns and the west coast towns have

hitherto been as widely separated as if they had been located on different continents — -indeed, far more widely separated in point of time and of freight charges than Great Britain and the United States.

Table IV. shows as closely as possible the railway route mileage open in Asia at the close of 1907.

Table IV. — Railways of Asia in 1907

les.

Central Russia in Asia. 2,808 S i b e r i a a n d Man- churia . . . 5,565 China …. 4,162 Korea …. 688 Japan …. 5,013 British India . . 29,893 Persia …. 33 Asia Minor, Syria, Arabia

and Cyprus . 2,930

Portuguese East Indies 51

Malay States

Dutch East Indies

Siam

Ceylon .

Cochin China”

Cambodia

Annam

Tonkin

Pondicherry

Malacca

Philippines

Total

Miles.

636

1,509

571

56l

1,761

56,181

Although more than half of the total mileage of Asia is in British India, it is probable that the greatest proportionate gains in the near future will be in China, Siberia and Manchuria, and Central Russia in Asia. In proportion to its population China has the least railway development of any of the great countries of the world ; the probability that its present commercial awakening will extend seems large, and in that case it will need a vast increase in its interior communications.

In Africa, it will be seen by Table V. that the railway mileage in the British possessions amounts to almost five-sixths of the total.

Table V — Railways of Africa in 1907

Miles.

BritishProvinces,except

South Africa French Provinces. Italian Provinces. Portuguese Pro- vinces

Total .

Egypt . . .

3,445

Algiers and Tunis

3,049

Congo States

399

Abvssinia

192

British South Africa

7,028

German Provinces

1,148

Miles.

1,235 1,246

71 703

18,516

The so-called Cape-to-Cairo route shows occasional extensions, particularly in the opening up of new country in Central Africa by the Rhodesian railway system. The Rhodesian railway system in 1910 had penetrated north of Broken Hill, which is just above the fifteenth parallel of south latitude, while the Egyptian railway system had reached Gondokoro, located close to the fifth parallel of north latitude. The intervening distance, through country exceedingly unhealthy for white men, and therefore promising no traffic except raw materials, does not seem a likely field for rapid railway extension.

In Australia the increase in railway mileage in the five years ending December 31st, 1907 was about 7% — a small proportion as compared with America, Asia or Africa. The greatest increase, both relative and absolute, was in Queensland; the smallest in South Australia, which added only 24 m. during the five years. Yet the mileage open per 10,000 inhabitants in Australia, as a whole, far surpasses that in any other of the broad geographical divisions.

Table VI.-

New Zealand . Victoria .

New South Wales South Australia .

—Railways

Miles.

2,571 5,517 3,471

if924

of Australia in

Queensland . Tasmania West Australia Hawaiian Group

1907

Miles.

3,405 620

2,259 88

Table VII. illustrates the mileage open to the end of 1907 per 100 sq. m. of territory and per 10,000 inhabitants. It will be observed that Belgium leads all the countries of the world in what may be called its railway density, with the United Kingdom a far-distant second in the list, and Persia last. In railway mileage per 10,000 inhabitants, however, Queensland, in the Australian group, reports a figure much greater than any other country; while at the other end of the list Persia holds the record for isolation.

Table VII. — Miles open at the End of 1907

Europe

Per 100 sq. miles.

Germany 17-2

Austro-Hungary . . . . . io-o

United Kingdom 19-0

France 14-2

Russia in Europe, including Finland . 1-8

Italy 9-3

Belgium 42-8

Holland 15-0

Switzerland 17-2

Spain 4-8

Portugal 4-7

Denmark 14-3

Norway 1-3

Sweden 4-8

Servia 2-1

Rumania 3-2

Greece 3-1

Turkey in Europe, Bulgaria, Rumelia . 1-9

Malta, Jersey, Man 16-1

Per 10,000

inhabitants-

64

5 5 7 3

3 7 3 8

5 3 8

7

16 1 3 3 2 1

Total America, 1907

United States

Canada

Newfoundland

Mexico

Colombia .

Venezuela .

British Guiana

Ecuador

Peru

Bolivia

Brazil

Paraguay .

Uruguay

Chile

Argentina 1 .

Asia, 1907

Central Russia in Asia

Siberia and Manchuria

China

Korea

Japan

British India

Ceylon

Persia

Asia Minor, Syria, Arabia, Cyprus

Portuguese Indies

Malay Archipelago

Dutch Indies

Siam 2 .

5-3

Per 100 sq. miles.

6.4

o-6

16 1-8 0-08 0-16

o-ii

016 0-32 0-16 0-32 0-16

i-8 i-o i-3

Per 100 sq. miles.

1-3

O-II

o-i

o-8

31 14

2-3

o-oog

o-5

3-5 1-9 0-6 0-16

5-i

Per 10,000 inhabitants.

26-8

. 42- 1

3i-i

9-4

1-13 2-6

3-5 1-3 2-9

3-i

7-1

2-5 13-0

8-9 28-0

Per 10,000

inhabitants.

3-6 9-8

0-12

0-68

i-i

i-o

16

0-04

i”5

0-9 8-8

0-s

0-6

Total . 19,855

Africa, 1907

Per 100 Per 10,000 sq. miles, inhabitants.

Egypt . i-o 3-5

Algiers and Tunis 0-8 4-5

Cape Colony 1-3 21-6

Natal 3-5 12-6

Transvaal i-i 1 5′ 7

Orange Colony 1-8 42-6

Complete estimates for the balance of Africa not available.

1 No accurate returns for Central America, Greater and Lesser Antilles and Dutch Guiana.

2 Estimates of area and population incomplete for Cochin China, Cambodia, Annam, Tonkin, Pondicherry, Malacca and Philippines.

Australia, 1907

Per 100 sq. miles.

New Zealand 2-4

Victoria 3-9

New South Wales 1 • 1

South Australia 0-16

Queensland 0-5

Tasmania 2-4

West Australia 0-16

Hawaiian Group 1-3

Total . 06

Per 10,000 inhabitants.

30-9 28-5 25-4 53-0 70-2 36-0 54-8 8-1

35-9

Capital. — The total construction capital invested in the railways of the world in 1907 was estimated by the Archivfiir Eisenbahnwesen at £8,986,150,000; the figure is necessarily incomplete, though it serves as a rough approximation. This total was divided nearly evenly between the countries of Europe and the rest of the world. The United States of America, with a capital of £3,059,800,000 invested in its railways on the 30th of June 1906, was easily ahead of every other country, and in 1908 the figure was increased to £3,443,027,685, of which £2,636,569,089 was in the hands of the public. On a route-mileage basis, however, the capital cost of the British railway system is far greater than that of any other country in the world, partly because a vast proportion of the lines are double, treble or even quadruple, partly because the safety requirements of the Board of Trade and the high standards of the original builders made actual construction very costly.

The total paid-up railway capital of the United Kingdom amounted, in 1908, to £1,310,533,212, or an average capitalization of £56,476 per route mile, though it should be noted that this total included £196,364,618 of nominal additions through " stock-splitting," &c. Per mile of single track, the capitalization in England and Wales, Scotland, Ireland and the United Kingdom, is shown in Table VIII.

Table VIII. — Paid-up Capital,

1908

Route Miles.

Single- Track Miles.

Paid-up Capital.

Paid-up Capital

per Route Mile.

Paid-up Capital

per Single- Track Mile.

England and

Wales . Scotland . Ireland United Kingdom

15.999 3.843 3.363

23.205

29,748′ 4.531′ 4.037

39,3i6

£1,080,138,674

185,345,494

45,049,044

1,310,533,212

£67,513

48,229 13,396 56,476

£36,309′ 33.5I0 1

11. 159 33.333

rightly subordinated to the main task to be accomplished. Con- quest is not usually bloodless, whether achieved at the van of a marching column or at the head of a hastily-built railway, and the process under which the American railway system took form left the way open for a distressing record of accidents to the traveller and the railway servant. But as traffic becomes more dense, year by year, the rebuilding process is constant, and American railway lines are gradually becoming safer.

In Europe the average route-mile capital is £27,036, and Table IX. shows the differences between various countries.

Table IX. — Route-Mile Capital in Europe

£22,298

25,285

35,38i

26,008

ro,433

8,027 6,647

16,534

7,3°o

-The study of railway

The table excludes sidings, because they cannot fairly be compared with running tracks, mile for mile. Yet the mileage of sidings in the United Kingdom amounted to 14,353 in 1908, and the cost of constructing them was probably not far from £60,000,000.

On a single-track-mile basis, the following comparison may be made between apparent capital costs in Great Britain and the United States: — ■

Single-Track Paid-up Capital Mileage. per Mile.

United Kingdom, 1908 . . 39,3i6 £33.333

United States, 1908 . . . 254,192 10,372 s

The figures for the United States are from the report of the Inter- state Commerce Commission for the year ended 30th of June 1908, and comprise mileage of first, second, third and fourth tracks, and paid-up capital in the hands of the public only. The British figures are from the Board of Trade returns for the calendar year 1908. In comparing the figures, it should be noted that main line mileage in the Eastern states, as for example that of the Pennsylvania railroad and the New York, New Haven & Hartford, does not differ greatly in standards of safety or in unit cost from the best British construction, although improvement work in America is charged to income far more liberally than it has been in England. But there are long stretches of pine loam in the South where branch lines can be, and are, built and equipped for £2400 or less per mile, while the construction of new main line in the prairie region of the West ought not to cost more than £4000 per single-track-mile, under present conditions.

The problem of the early railway builders in the United States was to

conquer the wilderness, to build an empire, and at the same time to bind the East to the West ana the North to the South. There can be little doubt but that the United States would long ago have disintegrated into separate, warring republics, had they not been bound together by railways, and standards of safety were

1 These figures are derived from a total. They are not exact, but may be taken as representing an approximation correct within one per cent.

s Dollars to pounds sterling @ 4-87.

Germany (1907)

France (1905)

Belgium (State railways 1906)

Italy (State railways 1906-7)

Denmark (State railways 1907-8)

Norway (1907-8)

Sweden (1905)

Russia (excluding Finland; 1905)

Finland (State railways 1907)

Statistical Study of Railway Operation.- operation through statistics has two distinct aspects. It has been well said that statistics furnish the means by which the railway manager disciplines his property; this is the aspect of control. On the other hand, the banker, the government official and the economist use railway statistics to obtain information which may be characterized as static rather than dynamic. Both uses ultimately rest upon comparison of the observed data from a certain property with the observed data from other properties, or with predetermined standards of performance.

In general, the British working unit supplied as public infor- mation has always been the goods-train-mile and the passenger- train-mile, these figures being the products of the number of trains into the number of miles they have travelled. In America, the basic units have been the ton-mile and the passenger-mile, and these figures are now required to be furnished to the Interstate Commerce Commission and to most of the state commissions as well. Both the British manager and the American manager, however, are

supplied with a considerable number of daily, weekly and monthly reports, varying on different railways, which are not made public. The daily sheets usually include a summarized statement of the per- formance of every train on the line, covering the amount of business done, the destination of the loads, &c. For a number of years there has been a movement in Great Britain to require the inclusion of ton-mile statistics in the stated returns to the Board of Trade, but most railway managers have objected to the change on the ground that their own confidential infor- mation was already adequate for purposes of control, and that ton-mile statistics would require additional clerical force to a costly extent. The Departmental Committee of the Board of Trade, sitting in 1909 to consider railway accounting forms, while recommending ton-miles to the careful considera- tion of those responsible for railway working in Great Britain, considered the question of their necessity in British practice to be still open, and held that, at all events, they should not be introduced under compulsion.

References. — Annual Reports of the Interstate Commerce Com- mission ; Poor's Manual of Railroads (annual, New York) ; Statistical Abstract of the United States (annual, Washington, published by the U. S- Bureau of Statistics) ; A. T. Hadley, Railroad Transportation, Its History and Laws (New York, 1885); E. R. Johnson, American Railway Transportation (New York, 1908) ; L. G. McPherson, Railroad Freight Rates (New York, 1909) ; S. Daggett, Railroad Reorganization (Boston, 1908); M. L. Byers, Economics of Railway Operation (New York, 1908) ; E. R. Dewsnup (ed.), Railway Organiza- tion and Working (Chicago, 1906) ; Interstate Commerce Commission; Rate Regulation Hearings before the U.S. Senate Committee (Washing- ton, 5 vols., 1905) ; and on current matters, The Official Railway Guide (monthly, New York), the Railroad Age Gazette (weekly, New York) and the Commercial and Financial Chronicle (weekly, New York). (R. Mo.)

Economics and Legislation It was at one time an axiom of law and of political economy that prices should be determined by free competition. But in the development of the railway business it soon became evident

that no such dependence on free competition was possible, either in practice or in theory. This difficulty is not peculiar to railways; but it was in the history of railway economy and railway control that certain characteristics which are now manifesting themselves in all directions where large

investments of fixed capital are involved were first brought prominently to public notice.

For a large number of those who use a railway, competition in its more obvious forms does not and cannot exist. Inde- pendent carriers cannot run trains over the same line and underbid one another in offering transportation services. It would be practically impossible for a line thus used by different carriers to be operated either with safety, or with economy, or with the advantage to the public which a centralized manage- ment affords. It is equally impossible for the majority of shippers to enjoy the competition of parallel lines. Such duplica- tion of railways involves a waste of capital. If parallel lines compete at all points, they cause ruin to the investors. If they compete at some points and not at others, they produce a discrimination or preference with regard to rates and facilities, which builds up the competitive points at the expense of the non-competitive ones. Such partial competition, with the discrimination it involves, is liable to be worse for the public than no competition at all. It increases the tendency, already too strong, towards concentration of industrial life in large towns. It produces an uncertainty with regard to rates which prevents stability of prices, and is apt to promote the interests, of the unscrupulous speculator at the expense of those whose business methods are more conservative. So marked are these evils that such partial competition is avoided by agreements between the competing lines with regard to rates, and by divisions of traffic, or pools, which shall take away the temptation to violate such rate agreements. The common law has been somewhat unfavourable to the enforcement of such agreements, and statutes in the United States, both local and national, have attempted to prohibit them; but the public advantage .from their existence has been so great as to render their legal dis- abilities inoperative. In those parts of the continent of Europe where railways are owned and administered by state authority, the necessity for such agreements is frankly admitted.

But if rates are to be fixed by agreement, and not by com- petition, what principle can be recognized as a legitimate basis of railway rate-making? The first efforts at railway legis- lation were governed by the equal mileage principle; that is, the attempt was made to make rates proportionate to the distance. It was, however, soon seen that this was inadmissible. So much of the expense of the handling, both of freight and of passengers, was independent of the length of the journey that a mileage rate sufficiently large for short distances was un- necessarily burdensome for long ones, and was bound to destroy long-distance traffic, if the theory were consistently applied. The system has been retained in large measure in passenger business, but only because of the conflict which inevitably occurs between the authorities and the passengers with regard to the privilege of breaking and resuming a journey when passenger rates are arranged on any other

plan. In freight schedules it has been completely abandoned.

A somewhat better theory of rate regulation was then framed, which divided railway expenditures into movement expense, connected with the line in general, and terminal expense, which connected itself with the stations and station service. Under this system each consignment of freight is compelled to pay its share of the terminal expense, independently of distance, plus a mileage charge proportionate to the length of the journey or haul. There has been also a further attempt in England to divide terminal charges into station and service terminals, according to the nature of the work for which compensation is sought. But none of these classifications of expense reaches the root of the matter. A system of charges which compels each piece of traffic to pay its share of the charges for track and for stations overlooks the fundamental fact that a very large part of the expenses of a railway — more than half — is not

connected either with the cost of moving traffic or of handling traffic at stations, but with the cost of maintaining the property as a whole. Of this character are the expenditures necessary for maintenance of way, for general administration and for interest on capital borrowed, which are almost independent of the total amount of business done, and quite independent of any individual piece of business. To say that all traffic must bear its share of these interest and maintenance charges is to impose upon the railways a rate which would cut off much of the long- distance traffic, and much of the traffic in cheap articles, which is of great value to the public, and which, from its very magni- tude, is a thing that railways could not afford to lose. It is also a fact that with each recurring decade these general expenses (also called indirect, undistributed or fixed charges) have an increased importance as compared with the particular (direct, distributed or operating) expense attaching naturally to the particular portions of the traffic. For with increased density of population it becomes profitable to make improvements on the original location, even though this may involve increased charges for interest ani for some parts of its maintenance, for the sake of securing that economy of operation, through larger train-loads, which such an improved location makes possible.

Whatever the ostensible form of a railway tariff, the con- tribution of the different shipments of freight to these general expenses is determined on the principle of charging what the traffic will bear. Under this principle, rates are reduced where the increase of business which follows such reduction makes the change a profitable one. They are kept relatively high in those cases where the expansion of business which follows a reduction is small, and where such a change is therefore unprofitable. This theory of charging what the traffic will bear is an un- popular one, because it has been misapplied by railway managers and made an excuse for charging what the

traffic will not bear. Rightly applied, however, it is the only sound economic principle. It means taxation according to ability — that ability being determined by actual experiment.

In the practical carrying out of this principle, railways divide all articles of freight into classes, the highest of which are charged two or three, or even four times the rates of the lowest. This classification is based partly upon special conditions of service, which make some articles more economical to carry than others (with particular reference to the question whether the goods are offered to the companies in car-loads or in small parcels), but chiefly with regard to the commercial value of the article, and its consequent ability to bear a high charge or a low one. For each of these classes a rate-sheet gives the actual rate- charge per unit of weight between the various stations covered by the tariff. This rate increases as the distance increases, but not in equal proportion; while the rates from large trade centres to other trade centres at a great distance are not higher than those to intermediate points somewhat less remote; if the law permits, there is a tendency to make them actually a little lower. Besides the system of charges thus prescribed in the classification and rate-sheet, each tariff provides for a certain number of special rates or charges made for particular lines of trade in certain localities, independently of their relation to the general system. If these special rates are published in the tariff, and are offered to all persons alike, provided they can fulfil the conditions imposed by the company, they are known as commodity rates, and are apparently a necessity in any scheme of railway charges. If, however, they are not published, and are given to certain persons as individual favours, they become a prolific source of abuse, and are quite indefensible from the standpoint of political economy.

While the superficial appearance of the railway tariff is different for different countries, and sometimes for different parts of the same country, the general principles laid down are followed in rate-making by all well-managed lines, whether state or private. It is a mistake to suppose that the question of public or private ownership will make any considerable difference in the system of rate-making adopted by a good railway. A state system will be compelled, by the exigencies

of the public treasury, to arrange its rates to pay interest on its securities; a private company will generally be prevented, by the indirect competition of

railways in other parts of the country which it serves, from doing very much more than this. The relative merit of the two systems depends upon the question how we can secure the best efficiency and equity in the applica- tion of the principles thus far laid down. There are three different systems of control: —

t. Private operation, subject only to judicial regulation, was exemplified most fully in the early railway history of the United States. Until 1870 railway companies were almost free from special acts of control; and, in general, any company that could raise or borrow the capital was allowed to build a railway wherever it saw fit. In the United Kingdom there was almost as much immunity from legislative interference with charges, but the companies were compelled to secure special charters, and to conform to regulations made by the Board of Trade in the interests of public safety. The advantage of this relatively free system of railway building and management is that it secures efficient and progressive methods. Most of the im- provements in operation and in traffic management have had their origin in one of these two countries. The disadvantage attendant upon this system is that the courts are reluctant to exercise the right of regulation, except on old and traditional lines, and that in the face of new business methods the public may be inadequately protected. There is also this further disadvantage, that in the gradual progress of consolidation railway companies take upon themselves the aspect of large monopolies, of whose apparently unrestricted power the public is jealous. As a result of these difficulties there has been, both in the United Kingdom and in the United States, a progressive increase of legislative interference with railways. In the former the Railway and Canal Traffic Act of 1854 specially prohibited preferences, either in facilities or in rates. The Regulation of Railways Act of 1873 provided for a Railway Commission, which should be so constituted as to take cognizance of cases on the investigation of which the courts were reluctant to enter. Finally, the legislation of 1888 put into the hands of a reorganized Railway Commission and of the Board of Trade powers none the less important in principle because their action has been less in its practical effect than the advocates of active control demanded. In the United States the years from 1870 to 1875 witnessed sweeping and generally ill-considered legislation (" Granger " Acts) concerning railway charges throughout the Mississippi valley; while the years from 1884 to 1887 were marked by more conservative, and for that reason more en- forceable, acts, which culminated in the Interstate Commerce Act, prohibiting personal discrimination and gradually restrict- ing discrimination between places, and providing for a National Commission of very considerable power — not to speak of the pooling clause, which was extraneous to the general purpose of the act, and has tended to defeat rather than strengthen its operation.

2. Operation by private companies, under specific provisions of the government authorities with regard to the method of its exercise, has been the policy consistently carried out in France, and less systematically and consistently in other countries under the domination of the Latin race. It was believed by its advocates that this system of prescribing the conditions of construction and operation of lines could promote public safety, prevent waste of capital and secure passengers and shippers against extortionate rates. These expectations have been only partially fulfilled. Well trained as was the civil service of France, the effect of this supervision in deadening activity was sometimes more marked than in its effect in preventing abuse. Moreover, such a system of regulation almost necessarily carries with it a guarantee of monopoly to the various com- panies concerned, and not infrequently large gifts in the form of subsidies, for without such aid private capital will not sub- mit to the special burdens involved. These rights, whether of monopoly or of subsidy, form a means of abuse in many direc- tions. Where the government is bad, they are a fruitful

source of corruption; even where it is good, they enable the companies to drive hard bargains with the public, and prevent the expected benefits of official control from being realized.

3. Stale operation and ownership is a system which originated in Belgium at the beginning of railway enterprise, and has been consistently carried out by the Scandinavian countries and by Hungary. Since i860 it has been the policy of Australia. It has generally come to be that of Germany and, so far as the finances of the countries allow, of Austria and Russia; British India also affords not a few examples of the same method. The theory of state ownership is excellent. So large a part of the railway charge is of the nature of a tax, that there seem to be a priori reasons for leaving the taxing powers in the hands of the agents of the government. In practice its operation is far more uncertain. Whether the intelligence and efficiency of the officials charged by the state with the handling of its railway system will be sufficient to make them act in the interest of the public as fully as do the managers of private corporations, is a question whose answer can only be determined by actual experience in each case. If they fail to have these qualities, the complete monopoly which a government enjoys, and the powers of borrowing which are furnished by the use of the public credit, increase instead of diminishing the danger of arbitrary action, unprogressiveness and waste of capital. Even in matters like public safety it is by no means certain that govern- ment authorities will do so well as private ones. The question is one which practical railway men have long since ceased to argue on general principles; they recognize that the answer depends upon the respective degree of talent and integrity which characterize the business community on the one hand and the government officials on the other.

Authorities. — On economics of construction and of operation, see Wellington, The Economic Theory of Railway Location (5th ed., New York, 1896). On principles governing railway rates in general, and specifically in England, see Acworth, The Railways and the Traders (London, 1891). On comparative railway legislation and the principles governing it, see Hadley, Railroad Transportation; its History and its Laws (New York, 1885). On the history of railway legislation in England, see Cohn, Untersuchungen iiber die Englische Eisenbahnpolitik (Leipzig, 1874-83). On practice concerning rates in continental Europe, see Ulrich, Das Eisenbahntarifwesen (Berlin, (Since this was published, continental passenger rates have

fallen. The French translation — Paris, 1898 — gives Russian tariffs.) On the question of " nationalization " {i.e. state ownership and operation), see an article by Edgar Crammond in the Quarterly Review (London) for October 1909, which cites, among other works on the subject, Clement Edwards's Railway Nationalization (1898); Edwin A. Pratt's Railway Nationalization (1908), and E. A. Davis's Nationalization of Railways (1908). (A. T. H.)

British Railway Legislation The first thing a railway company in Great Britain has to do is to obtain a special or private act of parliament authorizing the construction of the line. Not that the mere laying or working of a railway requires parliamentary sanction, tl °°^ ruc ' so long as the work does not interfere with other people's rights and interests. An example of a railway built without any legislative authority is the little mountain railway from Llanberis to the summit of Snowdon, which was made by the owner of the land through which it passes. Such a railway has no statutory rights and no special obligations, and the owner of it is liable to be sued for creating a nuisance if the work- ing of the line interferes with the comfort of those residing in the neighbourhood. When, however, a company desires to construct a line on a commercial scale, to acquire land compulsorily, to divert rivers and streams, to cross roads either on the level or by means of bridges, to pass near houses, to build tunnels or viaducts, and to execute all the other works incidental to a railway, and to work the line when completed without inter- ference, it is essential that the authority of parliament should be obtained. The company therefore promotes a bill, which is considered first by select committees of the two houses of parliament, and afterwards by the two houses themselves, during which period it faces the opposition, if any, of rival concerns, of local authorities and of hostile landowners. If this is successfully overcome, and the proposals meet with the

approval of parliament, the bill is passed and, after securing the Royal Assent, becomes an act of parliament. The company is then free to proceed with the work of construction, and at once becomes subject to various general acts, such as the Companies Clauses Act, which affects all joint-stock companies incorporated by any special act; the Land Clauses Act, which has reference to all companies having powers to acquire land compulsorily; the Railway Clauses Act, which imposes certain conditions on all railways alike (except light railways); the various Regulation of Railways Acts; the Carriers Protection Act; acts for the conveyance of mails, parcels, troops; acts relating to telegraphs, to the conveyance of workmen and to the housing of the labouring classes; and several others which it is unnecessary to specify. From the early days of railways parliament has also been careful to provide for the safety of the public by inserting in the general or special acts definite con- ditions, and by laying upon the Board of Trade the duty of protecting the public using a railway.

The first act which has reference to the safety of passengers is the Regulation of Railways Act of 1842, which obliges every

railway company to give notice to the Board of Trade jNywo o j . tg mtent j on t0 pen the railway for passenger

traffic, and places upon that public department the duty of inspecting the line before the opening of it takes place. If the officer appointed by the Board of Trade should, after inspection of the railway, report to the department that in his opinion " the opening of the same would be attended with danger to the public using the same, by reason of the incomplete- ness of the works or permanent way, or the insufficiency of the establishment for working such railway," it is lawful for the department to direct the company to postpone the opening of the line for any period not exceeding one month at a time, the process being repeated from month to month as often as may be necessary. The company is liable to a fine of twenty pounds a day if it should open the line in contravention of such order or direction. The inspections made by the officers of the Board of Trade under this act are very complete: the permanent way, bridges, viaducts, tunnels and other works are carefully examined; all iron or steel girders are tested; stations, including platforms, stairways, waiting-rooms, &c, are inspected; and the signalling and " interlocking " are thoroughly overhauled. A code of requirements in regard to the opening of new railways has been drawn up by the department for the guidance of railway companies, and as the special circumstances of each line are considered on their merits, it rarely

happens that the depart- ment finds it necessary to prohibit the opening of a new railway. The Regulation of Railways Act of 1871 extends the provisions of the above act to the opening of " any additional line of railway, deviation line, station, junction or crossing on the level " which forms a portion of or is connected with a passenger railway, and which has been constructed subsequently to the inspection of it. This act further defines the duties and powers of the inspectors of the Board of Trade, and also authorizes the Board to dispense with the notice which the previous act requires to be given prior to the opening of a railway.

It may be remarked that neither of these acts confers on the Board of Trade any power to inspect a railway after it has once been opened, unless and until some addition or alteration, such as is defined in the last-named act, has been made. When a line has once been inspected and passed, it lies with the company to maintain it in accordance with the standard of efficiency it originally possessed, but no express statutory obligation to do so is imposed upon the company, and whether it does so or not, the Board of Trade cannot interfere.

The act of 187 1 further renders it obligatory upon every railway company to send notice to the Board of Trade in the inquiries case of (i) any accident attended with loss of life or latoAccl- personal injury to any person whatsoever; (2) any dents. collision where one of the trains is a passenger train;

(3) any passenger train or part of such train leaving the rails;

(4) any other accident likely to have caused loss of life or personal injury, and specified on that ground by any order

made from time to time by the Board of Trade. The depart- ment is authorized, on receipt of such report, to direct an inquiry to be made into the cause of any accident so reported, and the inspector appointed to make the inquiry is given power to enter any railway premises for the purposes of his inquiry, and to summon any person engaged upon the railway to attend the inquiry as a witness, and to require the production of all books, papers and documents which he considers important for the purpose. The inspector, after making his investigation, is re- quired to make a report to the Board of Trade as to the causes of the accident and the circumstances attending the same, with any observations on the subject which he deems right, and the Board " shall cause every such report to be made public in such manner as they think expedient." The usual mode of publish- ing such reports is to forward them to railway companies con- cerned, as well as to the press, and on application to any one else who is interested. The reports are subsequently included in a Blue-book and presented to parliament. It

should be noted that although the inspecting officer may in his report make any recommendations that he may think fit with a view to guarding against any similar accident occurring in the future, no power is given to the Board of Trade, or to any other authority, to compel any railway company to adopt such recommendations. This omission is sometimes held to be an error, but as a fact it is an advantage. The moral effect of the report, with the criticisms of the company's methods and recommendations appended thereto, is great, and it rarely happens that a company refuses to adopt, or at any rate to test, the recommendations so made. If, on the other hand, the company is of opinion that the suggestions of the inspecting officer are not likely to prove beneficial, or are for any reason unadvisable, it is at liberty to reject them, the responsibility of doing so resting entirely upon itself. The effect of this latitude is to give the company ample discretion in the matter, and to enable the act to be administered and the object of it to be attained without undue interference.

In 1889 a very important act was passed placing upon the Board of Trade the obligation to call upon railway companies throughout the United Kingdom (1) to adopt upon Workla all passenger lines the "block" system of working; (2) to " interlock " their points and signals; (3) to fit all trains carrying passengers with some form of automatic continuous brake. Prior to this some companies had, to a certain extent, done these things, but few, if any, were completely equipped in these respects. A reasonable period was afforded them, accord- ing to circumstances, to comply with these requirements, and at the present time the work is practically complete. In this respect the lines of the United Kingdom are far ahead of those of any other country, and a diminution of accidents, particularly of collisions, has resulted therefrom. America is now following the lead thus set, and all the most important lines in the United States have adopted block working and interlocking, but a great deal still remains to be done. In certain respects, on the other hand, America has gone further than the United Kingdom, especially in the matter of automatic signalling, and in the operating of points and signals by electrical power or air-pressure instead of manual labour. In America, also, freight trains are fitted with an automatic continuous brake, whereas in the United Kingdom this appliance is required by law only in the case of passenger trains, and in fact is not fitted to goods and mineral trains except in a few isolated instances.

The above-named acts enable the Board of Trade to take all the necessary steps to ensure that the safety of passenger trains is sufficiently guarded. More recently legislation has been passed to safeguard the lives and interests of cabour. railway servants. In 1893 an act was passed by parliament giving the Board power to interfere if or when representations are made to them by or on behalf of any servant or class of servants of a railway company that the hours of work are unduly long, or do not provide

sufficient intervals of uninterrupted rest between the periods of duty, or sufficient relief in respect of Sunday duty. In such cases the company concerned may, after inquiry, be called upon to submit such a

schedule of the hours during which the man or men are em- ployed as will bring those hours within limits which appear to the department reasonable. In the event of the company failing to comply with the demands of the department, the latter is empowered to refer the case to the Railway and Canal Commissioners, who form a special Court constituted by the Railway and Canal Traffic Act of 1888, for deciding, among other things, questions relating to rates and charges, for pro- tecting traders from undue charges and undue preference, for regulating questions of traffic, and for deciding certain disputes between railway companies and the public. The Com- missioners are then empowered to deal with the matter, and if " a railway company fail to comply with any order made by the Railway and Canal Commissioners, or to enforce the provisions of any schedule " approved by them, it is liable to a fine of a hundred pounds for every day during which the default con- tinues. This act has been the means of effecting a considerable reduction in the hours worked by railway men on certain rail- ways, and no case has yet arisen in which a reference to the Commissioners has been necessary. Such modifications of the hours of work have not only been beneficial to the men, but have improved the discipline of the staff and the punctuality and regularity of the train service, particularly in respect of the goods trains.

The Notice of Accidents Act of 1884, which obliges employers of labour to report to the Board of Trade, when " there occurs in any employment " as defined by the schedule of the act, " any accident which causes to any person employed therein, either loss of life or such bodily injury as to prevent him on any one of the three working days next after the occurrence of the accident from being employed for five hours on his ordinary work," affects railways in course of construction, but not, as a rule, otherwise. Although the administration of the above-mentioned acts of parliament has had a beneficial effect upon the safety of the public, and has enabled an enormous volume of traffic Servant. t0 be handled with celerity, punctuality and absence of risk, it has during recent years come to notice that the number of casualties among railway servants is still unduly great, and in 1899 a Royal Commission was appointed to in- vestigate the causes of the numerous accidents, fatal and non- fatal, to railway men. As a

consequence of the report of this Commission the Railway Employment (Prevention of Accidents) Act of 1900 was passed, putting upon the Board of Trade the duty of making " such rules as they think fit with respect to any of the subjects mentioned in the schedule to this act, with the object of reducing or removing the dangers and risks incidental to railway service." Rule's may also be made in respect to other matters besides those mentioned in the schedule, and companies may be called upon to adopt or reject, as the case may be, any appliance, the use or disuse of which may be considered desirable in the interest of the men. Before, however, the rules so made become binding upon the companies, the latter have the right of appealing against them to the Railway Commissioners. Failure to comply with any of the rules renders a company " liable for each offence, on conviction under the Summary Jurisdiction Acts, to a fine not exceeding fifty pounds, or in the case of a continuing offence to a fine not exceeding ten pounds for every day during which the offence continues after conviction." Rules drafted by the Board of Trade under this act came into force on the 8th of August 1902, the subjects referred to being (1) labelling of wagons; (2) movements of wagons by propping and tow-roping; (3) power-brakes on engines; (4) lighting of stations and sidings; (5) protection of points, rods, &c; (6) construction and protection of gauge-glasses; (7) arrangement of tool-boxes, &c, on engines; (8) provision of brake-vans for trains upon running lines beyond the limits of stations; (9) protection to permanent-way men when relaying or repairing permanent way. The final settlement of a rule requiring brake-levers to be fitted on both sides of goods-wagons was, however, deferred, owing to objections raised by certain of the railway companies. Other sicts which are of importance in connexion with

accidents are the Accidents Compensation Act of 1846, the Employers' Liability Act of 1880, and the Workmen's Com- pensation Act of 1897.

The public acts of parliament referring to British railways are collected in Bigg's General Railway A cts. (H. A. Y.)

American Railway Legislation

Before 18/0. — The earliest legislation is contained in charters granted by special act, for the construction of railways. These special acts gradually gave way to general statutes under which railway corporations could be created without application to the legislature. In the east, where, as a rule, charters had been uniform and consistent, the change to general incorporation law was due to a desire to render incorporations speedier and less expensive. In the west, general laws came rather as a result of the abuses of special legislation. By 1850, general incorporation laws were found in nearly all the eastern states, and by 1870 in those of the west.

Early legislation was confined almost entirely to matters of construction. In cases where statutes did touch the question of regulation, they had to do with the operation of trains and with the provision of facilities for shippers and passengers, rather than with questions of rates. It was natural that this should be so, for the new transportation agency was so much more efficient than anything previously available that the people were eager to take advantage of its superior service. As a rule, the making of rates was left to the corporations. If the maximum rates were prescribed, as they sometimes were, the limit was placed so high as to be of no practical value for control. Such crude attempts as were made to prevent rates from being excessive concerned themselves with profits, and were designed to confiscate for the state treasury any earnings beyond a certain prescribed dividend. Publicity of rates was not generally required, and provisions against dis- crimination were rare. In the period before 1850 there was but little realization of the public nature of the railway industry and of the possibilities of injury to the public if railway cor- porations were left uncontrolled.

In regions where capital was lacking eagerness for railway facilities led the people to demand the direct co-operation of the state, and many projects, most of wjiich ended in disaster, were undertaken either by the state itself or through the aid of the state's credit. For example, 7 Michigan, in 1837, in the first session of its state legislature, made plans- for the cojir struction of 557 miles of railway under the direct control of the state, and the governor was authorized to issue bonds for the purpose. The unfortunate results of this policy led many of the states, from about 1850, to put constitutional limitations upon the power of their legislatures to lend the state's credit or to in- volve the state as stockholder in the affairs of any corporation. As railway building increased in response to traffic needs, and as the consolidation of short lines into continuous systems proceeded, legislation applicable to railways became somewhat broader in scope and more intelligent. About 1850 there began to appear on the statute books laws requiring publicity of rates and the submission of annual reports to the legislature, prescribing limits to corporate indebtedness, and also making provision for safety in operation and for the character and quality of railway service. Consolidation and leasing were commonly permitted in the case of continuous lines, but were regularly prohibited in the case of parallel and competing lines. The practice of pooling seems not to have attracted the attention of the legislature. In general it may be asserted that legis- lation of this period was ill-considered, haphazard, and on a petty scale. Moreover, it was of little practical importance even within its narrow range, for it does not appear to have been generally enforced.

1870-iQoo. — Railway legislation first assumed importance in connection with the " Granger Movement " in the middle west. There the policy of subsidies for railway building had been carried to a reckless extreme.

Roads had been constructed in advance of settlement, and land-seekers had been

transported to these frontier sections only to become dependent upon the railways for their very existence. To the unusual temptations thus offered for favouritism and discriminations in rates, the railways generally yielded. This preferential and discriminating policy, combined with other causes which cannot here be discussed, resulted in the Granger legislation of the 'seventies. In the first instance laws were enacted pre- scribing schedules of maximum freight and passenger rates with stringent penalties against rebates and discriminations. These measures proving unsatisfactory, they were soon super- seded by statutes creating railway commissions with varied powers of regulation. The commission method of control was not a new one. Such bodies, established to appraise land for railway purposes, to apportion receipts and expenditures of interstate traffic, and in a general way to supervise railway transportation, had been in existence in New England before i860, one of the earliest being that of Rhode Island in 1839. In 1869 Massachusetts had instituted a commission of more modern type, which was given only powers of investigation and recommendation, the force of public opinion being relied upon to make its orders effective. Western commissions, the offspring of the Granger movement, were of a more vigorous type. Most of them had power to impose schedules of maximum rates; practically all of them had authority to prescribe rates upon complaint of shippers; and they could all seek the aid of the courts to enforce their decrees. Their power to initiate rates, conferred upon them by their legislatures, was sustained by the Supreme Court of the United States, the Court reserving to itself only the power to decide whether the prescribed rates were reasonable.

But the jurisdiction of the state commissions was, by judicial interpretation, limited to commerce beginning and ending within the limits of the single state. The most important part of railway transportation, that which was interstate in character, was left untouched. It was this impotence of the state com- mission that furnished the strongest incentive to Congressional action. The result was the passage, in 1887, of the Interstate Commerce Act, which was directed towards the extirpation of illegal and unjust practices in commerce among the states. Its primary purpose was to embody in statutory form the common- law principle of equal treatment under like circumstances, and to provide machinery for enforcement. It

aimed at the prohibition of discrimination between persons, places and commodities. It made provision for publicity of rates and for due notice of any change in rates; it forbade pooling of freight or earnings, and required annual reports from the carriers. For its enforcement, it created an Interstate Commerce Commission of five members, with powers of investigation, and with authority to issue remedial, orders upon complaint and after hearing. Findings of the Commission were to be prima facie evidence in any court proceeding for the enforcement of its orders.

In this connexion, reference should be made to the Anti-Trust Act of 1890, which, by its judicial interpretation, has been held to include railways and to forbid rate agreements between com- peting carriers.

The act of 1887 remained in force without substantial amend- ment until 1906, although with constantly diminishing prestige, a result largely due to adverse decisions concerning the powers of the Commission. Ten years after the passage of the law, the court decided that the Commission had no power to prescribe a rate, and that its jurisdiction over rates was confined to a determination of the question whether the rate complained of was unreasonable. The Commission had much difficulty at the beginning in securing the testimony of witnesses, who invoked the Constitution of the United States as a bar against self- incrimination, and the immunity clause of the act had to be amended before testimony could be obtained. The so-called " long-and-short-haul clause," which forbade a greater charge for a long than for a short haul over the same line, if circum- stances were substantially similar, was also robbed of all its vitality by court decision. The section requiring annual reports, while it led to the creation of a Bureau of Statistics, did not give

the Commission power to compel complete or satisfactory answers to its requests for information. The only element of real strength that the statute acquired during the first twenty years of its history came from the Efkins Act of. 1903, which stipulated that the published rate should be the legal rate, and declared any departure from the published rate to be a misdemeanour. It held shipper as well as carrier, and corporation as well as its officer or agent, liable for violations of the act, and conferred upon United States courts power to employ equity processes in putting an end to discrimination. Conviction for granting rebates was by this law made easier and more effective.

Since igoo. — The movement in favour of more vigorous railway regulation became pronounced after 1900. Twenty years of experience and observation had revealed the defects of the earlier legislation, and had concentrated public atten- tion more intelligently than ever before upon the problem of strengthening the weak spots. The state commissions, since their

establishment in the 'seventies and the 'eighties, had increased their functions and influence. Many of them, beginning only with powers of recommendation, had obtained a large extension of authority. By 1908, thirty-five of the forty state commissions were of the mandatory type, and thirteen of these had been created since 1904. They had been given power to require complete annual reports from carriers, with a conse- quent great increase in public knowledge concerning railway operation and practice. The most recent type of state com- mission is the so-called Public Utility Commission, of which the best examples are those of New York and Wisconsin, established in 1907. In both states, the Commissions have power over electric railways and local public utilities furnishing heat, light and power, as well as over steam railway transportation, and the Wisconsin Commission also has control over telephone companies. In both states the consent of the Commission is necessary for the issue of corporate securities.

Mention should be made of the mass of general legislation passed, principally by western states, since 1905, in response to a popular demand for lower rates. This demand has in many instances led to ill-considered legislation, has frequently ignored the prerogatives and even the existence of the state commissions, and has brought about the passage by state legislatures of maxi- mum freight and passenger rate laws, with rates so low in many cases that they have been set aside by the courts as unconstitu- tional. The numerous laws limiting the fare for passengers to two cents per mile are an illustration of this tendency.

In the field of federal legislation, no significant change took place until the passage of the Hepburn Act of 1906, which was an amendment of the act of 1887. While failing to correct all the defects in the original statute, the amended law was a decided step in the direction of efficient regulation. It increased the jurisdiction of the Commission by placing under the act express companies, sleeping-car companies and pipe lines for the transportation of oil. It extended the meaning of the term " railroad " to include switches, spurs and terminal facilities, and the term " transportation " to include private cars, and all collateral services, such as refrigeration, elevation and storage. The Elkins Act of 1903 was incorporated in the statute, and an imprisonment penalty was added to the existing fine. It forbade the granting of passes except to certain specified classes, — a provision entirely absent from the original measure. It expressly conferred upon the Commission the power to prescribe maximum rates, upon complaint and after hearing, as well as to make joint rates, and to establish through rates when the carriers had themselves refused to do so. It enacted that published rates should not be changed except on thirty days' notice, whether the change involved an increase or a decrease, and it required annual reports to be made under oath, penalties being prescribed

for failure to comply with the Commission's requests for information. Power was also given to prescribe uniform systems of accounts for all classes of carriers, and to employ special examiners to inspect the books and accounts. Carriers were forbidden to keep any accounts, records or memoranda other than those approved by the Commission.

Orders of the Commission became effective within such time, not less than thirty days, as the Commission should prescribe, and penalties began to take effect from the date fixed by the Com- mission, unless the carrier secured an injunction from the Court suspending the order. Such injunction might not issue except after hearing, of which five days' notice must be given. Decisions of the Commission were not reviewable by the Court unless the Commission had exceeded its authority, or had issued an unconstitutional order.

A new and important act was signed by the President on the 18th of June 1910. It created a Commerce Court (com- posed of five judges nominated by the president of the United States from the Federal circuit judges), transferred to it jurisdiction in cases instituted to enforce or set aside orders ©f the Inter-State Commerce Commission, and made the United States instead of the Commission a party in all such actions. The law forbids a railway or any other common carrier to charge more for a short haul than for a long haul over the same line, unless, in special cases, it is authorized to do so by the Commission. It forbids a railway which has reduced its rates while in competition with a water route to raise them again when the competition has ceased, unless the Commission permits it to do so because of other changed conditions. It extends the initiative of the Commission from the investigation of complaints to the investigation of rates on its own motion; authorizes it to suspend rates in advance of their going into effect, pending an investigation which may be continued for ten months, and to establish through routes; and provides for a special commission, appointed by the President, to investigate questions pertaining to the issuance of railway securities.

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1910); Elkins Committee Report (1905); F. H. Dixon, " The Interstate Commerce Act as Amended," Quarterly Journal of Economics, xxi. 22 (Nov. 1906) ; F. H. Dixon, " Recent Railroad Commission Legislation," Political Science Quarterly, xx. 612 (Dec. 1905). (F. H. D.)*

Accident Statistics Statistics of railway accidents may be divided into three classes: casualties (a) to passengers, (b) to servants or employes and © to other persons; and again into (1) train accidents,

(2) accidents to persons doing work on or about trains and

(3) other accidents.

Such statistics are studied mainly with the object of learning the lessons which they may afford as to preventive measures for the future; and from this point of view the most important element is the single item of passengers killed in train accidents (a 1). The number injured is, indeed, a fact of interest, no less than the number killed, but comparisons under this head are unsatisfactory because it is impracticable or unprofitable to go into sufficient detail to determine the relative seriousness of the injuries. The statistics of the killed usually afford all necessary stimulus to improvement. Accidents to passengers other than those caused by collisions or derailments of trains are very largely due to causes which it is fair to class either as unavoidable or as due mainly to the fault or carelessness of the victim himself. That this is so is indicated by the fact that, although the railways — always made to suffer severely in pecuniary damages for injuries for which their officers or servants are held responsible by the courts — have for years taken almost every conceivable precaution, the number of accidents, in proportion to the number of persons travelling, diminishes but slowly — so slowly that, in view of the variety of conditions to be considered, it would hardly be safe to con- clude that the diminution is due to any definite improvement in the safeguards provided. Collisions, on the other hand, are preventable, and derailments nearly so, and the records of deaths and injuries in this class in successive years are therefore justly taken as an index to the efficiency with which the railways are managed.

The number of servants killed in train accidents is the next in importance. The safety of passengers is, indeed, the first care of the railway manager; but the employe's, exposed to many risks from which the passengers are protected, must be looked after. On the British railways the men who run the trains are safeguarded very efficiently, and the collisions and derailments which are serious enough to do injury to the train- men or the enginemen are really rare. The roadway, tracks and rolling stock are so well maintained that those causes which lead to the worst derailments have

been eliminated almost completely, and the record of serious collisions has been reduced nearly to zero by the universal use of the block system and by systematic precautions at junctions. In America the record is far less satisfactory. The best railways of the United States and Canada have, indeed, been greatly improved, and their main lines approach the high standards of safety which prevail in Great Britain, both as regards maintenance and care of roadway and vehicles (as a preventive of derailments) and the use of the block system (as a preventive of collisions); but when the inquirer looks at America as a whole — the total length of lines in the United States being over 230,000 m., ten times the total of the United Kingdom — he is considering a figure which includes an enormous mileage of railway lying in thinly settled regions where the high standards of safety maintained on the best railways have scarcely been thought of. The duty of a railway with deficient plant or facilities would seem to be to make up for their absence by moderating the speeds of its trains, but public sentiment in America appears so far to have approved, at least tacitly, the combination of imperfect railways and high speeds.

Apart from collisions and derailments, a large proportion of all accidents is found to be due primarily to want of care on the part of the victims. Accidents to workmen in marshalling, shunting, distributing and running trains, engines and cars, may be taken as the most important class, after train accidents, because this work is necessary and important and yet involves considerable hazard. On British railways the duty of the companies to provide all practicable safeguards and to educate and caution the servants may be said to have been faithfully performed, and the accident totals must be taken as being somewhat near the " irreducible minimum" — unless some of the infirmities of the human mind can be cured. In America the number of men killed and injured in handling freight trains has been very large. In the year ending June 30, 1909, exclusive of casualties due to collisions, derailments and other accidents to trains, the number killed was 811 and of injured 28,156 {Accident Bulletin, No. 32, p. 14). The number killed (811) is equal to about three in every thousand trainmen employed. From this and all other causes, the number of trainmen killed in the year ending June 30, 1909, was about 8 in 1000.

The use of automatic couplers for freight cars throughout the United States, introduced in 1 893-1 900, greatly reduced the number of deaths and injuries in coupling, and the use of air brakes on freight cars, now universal, has reduced the risk to the men by making it less necessary for them to ride on the roofs of high box-cars, while at the same time it has made it possible to run long trains with fewer men; but except in these two features the freight service in America continues to be a dangerous occupation. The high and heavy cars, the high speeds, the severe weather in the northern states in winter, the fluctuating nature of the business,

resulting often in the employment of poorly qualified men and in other irregularities, are among the causes of this state of things.

Being struck or run over by a train while standing or walking on the track is the largest single cause of " railway accidents." Workmen are killed and injured in this way, both while on duty and when going to and from their work; passengers, with or without right, go in front of trains at stations and at highway crossings at grade level; and trespassers are killed and injured in large numbers on railways everywhere, at and near stations, at crossings, and out on the open road, where they have no shadow of right. Of trespassers the number killed per mile of

line is about as large in England as in America, the density of population and of traffic in Great Britain apparently counter- balancing the laxity of the laws against trespassing in America. In the thickly settled parts of the United States the number of trespassers killed on the railway tracks, including vagrants who suffer in collisions and derailments while stealing rides, is very large. In New York and four adjacent states, having about as many miJes of railway as the United Kingdom, the number in the- year ending June 30, 1907, was 1552. In the United Kingdom the number for the corresponding year was 447, or less than one-third.

As was suggested at the outset, railway accident statistics are useful only as showing how to make life and limb safer, though in pursuing this object increased economy should also be secured. Railways have always been held by the legis- latures and by the courts strictly accountable for their short-comings, so far as accountability can be enforced by compelling the payment of damages to victims of accidents; but in spite of this, a want of enterprise and even some apparent neglect of passengers' and servants' plain rights, have often been apparent, and the Board of Trade, with its powers of supervision, in- spection and investigation, must therefore be classed as one of the most beneficent factors in the promotion of safety on British railways. Its powers have been exercised with the greatest caution, yet with consistent firmness; and the pub- licity which has been given to the true and detailed causes of scores and scores of railway accidents by the admirable reports of the Board of Trade inspectors has been a powerful lever in improving the railway service. Useful compulsory laws regarding the details of train management are difficult to frame and hard to carry out; but the Board has exercised a persistent persuasiveness and has secured most of its objects. Its in- vestigations justified the law making the block system com- pulsory, thus removing the worst danger of railway

travel. Its constant and impartial expositions of cases of over-work and insufficient training of employes have greatly helped to elevate the character of these employes.

In the United States the governments have done far less. A majority of the states have railway commissions, but the investigation of railway accidents, with comparatively few exceptions, has not been done in such a way as to make the results useful in promoting improved practice. Many of the commissions have done little or nothing of value in this respect. The Federal government, having authority in railway matters only when interstate traffic is affected, gathers statistics and publishes them; but in the airing of causes — the field in which the British Board of Trade has been so useful — nothing so far has been done except to require written reports monthly from the railways. These are useful so far as they go, but they lack the impartiality that would be secured by an inquiry such as is held in England.

Table X.-

-Casualties on the Railways of the United Kingdom

1908.

Passengers: — ■

1. In train accidents

2. Other accidents in or around

trains, &c.

3. Other causes

Total of passengers Servants:—

4. In train accidents

5. Other accidents in or around

trains, &c.

6 Other causes

Total of servants Other Persons: —

7 In train accidents

8. At level crossings

9. Trespassing on line 10. Suicides (including unsuc

cessf ul attempts)

Killed. o

102 5

107 6

In- jured.

283

2,242 863

3.388

I64

1907.

K”led. ˆ

18 534

376 4.976 50 19,041

102 5

125

13

441 55

2,132 836

3.502 236

5.577 15.701

432 24,181 509 21,514

o

51 291

188

7 44 99

5

5o

278

19 169

11

30

115

18

11. 12.

On business at stations Miscellaneous

32

27

580 167

36

39

83I

618 167

Total of " other persons " . 589 916 577

959

Grand total

1,128 28,485 1,211 25,975

Killed. Injured.

21 2

5 10

53

no

H5

874

19

The casualties enumerated in items 1, 4 and 7 of Table X. aggre- gate 6 killed and 454 injured; the six deaths were due to collisions, while of the cases of injury 372 occurred by collisions, 47 by derail- ments, and 35 by other accidents to trains. This undoubtedly is the greatest record for train safety ever known in the world. Item I shows no passengers killed in train accidents during the year. _ This was the case once before, in 1901 ; and the total of fatal accidents to passengers and servants, taken together, has in several years been very low (1896, eight; 1901, eight; 1902, ten; 1904, thirteen), but never before was it down to six.

Items 2 and 5 in Table X. are made up of the classes of accidents shown in Table XI.

Table XL— Detail Causes of Certain Accidents

Year 1908. Item 2, Passengers: —

1 . From falling between trains and platforms —

(a) When entering trains ….

(b) When alighting from trains

2. From falling on to the platform, ballast, &c. : —

(a) When entering trains ….

(b) When alighting from trains

3. From falling off platforms and being struck or

run over by trains …..

4. While crossing the line at stations —

(a) Where there is either a subway or

footbridge .....

(b) Where there is neither a subway nor

footbridge .....

5. By the closing of carriage doors .

6. From falling out of carriages during the running

of trains . .

7. 5V other accident? .....

T , ,, . Total of passengers

Item 5, Servants: — r

By accidents occurring during .“hunting operations, viz,

1. While coupling or uncoupling vehicles .

2. By coming in contact, whil? riding on

vehicles, with other vehicles, &c, standing on adjacent lines

3. While passing over, under, or standing on

buffers

4. When getting on or off, or falling off engines,

wagons, &c

5. While braking, spragging, or chocking wheels

6. While attending to ground-points .

7. While moving vehicles by capstans, turn-

tables, props, levers, &c. ....

8. By other accidents not included in the

preceding . . . . .

9. From falling off trains, engines, &c, in motion 10. When getting on or off engines, vans, &c,

during the running of trains …. n. By coming in contact with over-bridges or

erections on the sides of the line . 12. While attending to the machinery, &c, of

engines in motion

While working on the permanent- way, sidings,

&c

While attending to gates at level-crossings .

While walking, crossing or standing on the

line on duty : —

(a) At stations 84

(b) At other parts of the line … 16. From being caught between vehicles

17 From falling, or being caught between trains

and platforms, walls, &c. ….

1 8 While walking, &c. , along the line to or from work 19, Miscellaneous

Total of servants . 376 4976 Table XII. analyses the classes of accident comprised in items 3 and 6 of Table X.

Table XII.— Detail Causes of Certain Accidents

i3-

14. 15-

9

6

748

19 19

64

247

02

2242

16

675

2

19

2

13

4

15

1

278

627

98

16

498

41 5

587 43

2

226

5

53

2

674

52 3

100 3

84 40

23

245 46

95′

10 34 19

70

3′

595

Passengers: —

a. While ascending or descending

steps at stations ….

b. By being struck by barrows, by

falling over packages, &c, on station platforms . . . .

Killed.

I9O8.

In- jured.

370

Killed,

1907.

In-

142

jufed.

339

122

8 3 2

Table XII.-

RAILWAYS

[ACCIDENT STATISTICS

-Detail Causes of Certain Accidents — continued.

1908. 1907.

KiUed – ju?ed. Bnrf. >’ d .

c. From falling off platforms upon the

ballast I 105 .. no

d. By other accidents …. I 246 . . 265

Total of passengers . Servants: —

1. While loading, unloading or sheet-

ing wagons, trucks and horse- boxes

2. While moving goods and luggage

in stations or sheds

3. While working at cranes or capstans

4. By the falling of wagon-doors,

lamps, bales of goods, &c. .

5. While attending to engines at rest

6. From falling off, or when getting

on or off , engines or vehicles at rest

7. From falling off, or when getting

on or off, platforms

8. From falling off ladders, scaffolds,

&c.

9. By stumbling while walking on

the line

10. By being trampled on or kicked

by horses while engaged in rail- way work

11. From being struck by articles

thrown from passing trains

12. From the falling of rails, sleepers,

&c, when at work on the line

13. Otherwise injured when at work on

the line or in sidings .

14. Miscellaneous ….

5 863 5 836

8 4,018

2

3

1

4

3

1

n

2

1,992 411

583 2,479

1.504

483

449 11 1,068 1

94 ••

/ • •

686 1

2,182 5

3,085 14

2,899

975 304

390 2,363

1.495 404 400

1,049

71

6

611

1,981 2,753

Total of servants . 50 19,041 55 15,701

Table XIII. — Nature of Accidents to Trains, Vehicles and Permanent-Way

1908.

United Kingdom.

(/I) Accidents to trains: —

1. Collisions between passenger trains or parts of passenger trains …. 43

2. Collisions between passenger trains and goods or mineral trains or light-engines . 78

3. Collisions between goods trains or parts of goods trains and light-engines . . 180

4. Collisions between trains and vehicles standing foul of the line …. 7

5. Collisions between trains and buffer-stops or vehicles standing against buffer- stops : —

(a) From trains running into stations or sidings at too high a speed . 20

(6) From other causes . . . 15

6. Trains coming in contact with projections from other trains or vehicles on parallel lines 30

7. Passenger trains or parts of passenger trains leaving the rails …. 94

8. Goods trains or parts of goods trains, light-engines, &c, leaving the rails . . 407

9. Trains running through gates at level-

crossings or into other obstacles . . 368

10. Fires in trains 195

11. Miscellaneous 3

(B) Accidents to or failure of rolling stock and

permanent- way : —

12. Bursting of boilers or tubes, &c, of engines 7

13. Failure of machinery, springs, &c, of

engines 61

14. Failure of tires 125

15. ,, wheels …… 2

16. „ axles 165

17. „ couplings 2,346

18. ,, ropes used in working inclines

19. ,, tunnels, bridges, viaducts, cul- verts, &c 3

Broken rails 287

20. 21. 22. 23-

Flooding of portions of permanent-way Slips in cuttings or embankments Fires at stations or involving injury

bridges or viaducts …. Miscellaneous

to

24 18

30

I

1907.

United Kingdom.

48

70

216

22

17 25

106 483

364 170

4

13

86

172

8

160

2,440

289 40 28

22

servants employed, that the figures showing the percentages vary from year to year considerably ; but in other classes of accidents, in which a large proportion of the cases may be classed as unprevent- able, the percentages do not vary greatly. The following are the more significant ratios in the year 1907, as shown in the Board of Trade returns: — (a) Passengers killed in train accidents, approxi- mately 1 in 83,000,000

(1908, o in 1,500,000,000.) (6) Passengers injured in train accidents, ap- proximately . . . . . 1 in 3,000,000

(1908, approximately I in 6,000,000.) (c) Servants killed in train accidents: —

Number of servants killed per 10,000,000 train miles 0-329

Engine drivers, ratio killed to number

employed . . . . . 1 in 5,628

Firemen, ratio killed to number employed . 1 in 12,857 Passenger guards, ratio killed to number employed . . . ... 1 in 4,237

Goods guards and brakemen, ratio killed

to number employed . . . I in 8,438

{d) Servants killed in work about trains, &c. (ex- cluding train accidents), ratio killed to number employed . . . 1 in 790

Goods guards and brakemen, ratio killed to

number employed . . . 1 in 409

Shunters, ratio killed to number employed 1 in 337

Engine drivers, ratio killed to number

employed . . . . . I in 1,126

Passenger guards, ratio killed to number

employed . . . . . I in 1,059

Railway Accidents in America. — The statistics of accidents in America are kept in a form somewhat different from the fore- going. Table XIV. is taken from the Accident Bulletin of the Interstate Commerce Commission (No. 32), the items being numbered to correspond as nearly as practicable with the numbers in the British table (No. X.). The items 7-8 embrace the statistics which most nearly correspond to the items 7-12 in the British table. Table XIV. — Casualties on the Railways of the United States of America Year ending June 30.

1909. 1908.

Killed. Injured. Killed. Injured. Passengers: —

1. In train accidents … 131 5,865 165 7,430

2, 3. Other causes . . . 204 6,251 241 5,215

Total of passengers . 335 12,116 406 12,645 Servants:—

4. In train accidents . . . 520 4,877 642 6,818

5,6. Other causes . . . 1,936 46,927 2,716 49,526

24.

Percentages. — On British railways the casualties from train acci- dents, especially fatal injuries, have been reduced to so small a pro- portion of the number of passengers travelling, or the number of

Total of servants . 2,456 51,804 3,358 56,344

Year ending June 30, 1907.

Trespassing. Not Trespassing. Total.

Killed. Injured. Killed. Injured. Killed. Injured.

Other Persons :-

7. In train accidents 97 171

8. Struck by trains at

highway cross- ings . . 237 274

Do. at stations 421 423

Do. at other

places . . 3732 2063 Other causes . 1125 2581

52 1202 149 1373

696 1523 89 259

933 1797 510 682

113 200 3845 2263 94 1287 1219 3868

Total of ” other ,

persons ” . (‘ 5<5r2 5512 I044 4471 66 5 6 " 83 The salient feature of Table XIV. is the diminution from 1908 to 1909. This is mainly due to a great falling off in traffic, because of a general business depression; from 1907 to 1909 the reduction in the accident record is still greater. In items I and 4 the increase in safety is due in part, no doubt, to the extension of the use of the block system. The accidents to ” other persons ” cannot readily be compared with items 7-12 in the British record, except as to the totals

and a few of the items.

In any comparison between British and American records the first point to be borne in mind is the difference in mileage and traffic. The American railways aggregate approximately ten times the length of the British lines; but in train miles the difference is far less. In the latest years in which comparisons can be made, the passenger journeys in the United Kingdom amounted to 1500 millions (including season-ticket holders, estimated) and the train miles to 428;3 millions, while the corresponding figures in the United States were 873-9 millions and 1171-9 millions. The average length

of the passenger's journey in the United States is reported to be about 32 m. ; in Great Britain it is undoubtedly less, but no record is published. Of the total train mileage in America more than half is freight; in Great Britain much more than half is passenger. Table XV. — Total Casualties on Railways of the United States

	1908.		1907.	
	Killed.	Injured.	Killed.	Injured.
Passengers ….	383	11,592	610	13,041
Employees ….	3,470	83,367	4,534	87,644
Other persons . . .	6,460	10,275	6,695	10,331
Total	10,313	105,234	11,839	111,016

Table XV. shows the casualties on American railways in 1907 and 1908 (year ending June 30). These figures differ from those in Table XlV. because of differences in classification. In Table XIV. the item " passengers killed " includes those on some electric railways, which presumably are not covered in the statement here given; also passengers in freight trains, &c. Under " employees " this table includes men in shops, &c, not shown in Table XlV.

In 1907 one passenger in 2,318,051 was killed, and one in 107,004 was injured, in train accidents. The number of employes killed in train accidents was 12-9 in 10 million train miles. Of train men (including engine-drivers and firemen), one out of 125 employed was killed (all

causes), and one in eight injured.

The great differences between the records of the United States and the United Kingdom seem to afford justification for the view, which has often been expressed, that in America the spirit of hurry and recklessness manifest in many of the activities of the people prevails even among the men on whom rests the grave responsi- bility of running trains in safety. Yet the best safety devices are made in America, and means of reducing these death records are well known.

France. — Railway accidents in France are recorded in a shape somewhat different from that found in either Great Britain or America. The principal items for the years 1906 and 1907 are shown in Table XVI. The length of railways in the republic was 39,963 km. (24,832 m.), the number of persons employed on them was rather less than 300,000, the number of pas- sengers carried annually being between 450 and 500 millions. The number of passengers (36) killed in train accidents in 1907 was equal to 0-0759 P er million passengers carried and 0-0024 per million kilometres travelled by passengers, or 0-1503 per million kilometres travelled by trains.

Table XVI. — Railway Casualties in France

1907. 1906.

Killed. Injured. Killed. Injured.

36 430 14 500

23 168 21 132

In train accidents — Passengers Servants

Other accidents, due to railway operations — Passengers and others Servants

Other accidents, victim's own fault- Passengers and others Servants . . . .

59

598 35

632

II

18

39 24

14 8

29 17

29

63

22

46

290

281

189 465

305 265

155 421

571

654 570

576

Grand total . 659 1315 627 1254 The most significant item in the table, 36 passengers killed in train accidents, is perhaps to be considered as abnormally large, the totals under this head for the preceding six years beginning with 1901 being 7, 35, 3, 18, 4, 14, or an average of 11-57 P er y ear – The French secretary of Public Works, who has furnished these statistics, keeps also similar records of the local or light railways, on which the number of fatal accidents appears to be exceedingly small.

Germany. — The number of persons killed on the railways of the German Empire in the year 1907 was 1249, classified as in Table XVII. This number does not include suicides and attempts at suicide, of which there were 333, all but 24 being successful. In these statistics, the third item, " other persons," includes post office and customs officials and other persons connected with the railway service, as well as railway officers and servants off duty. The totals of passengers killed and xxii. 27

injured in train accidents are not separated from those killed and injured

from other causes, but ratios are given showing that for four years no passengers were killed in this class.

Table XVII. — Railway Casualties in the German Empire (From Statistic der im Betriebe befindlichen Eisenbahnen; E. S. Mittler & Son, Berlin)

1907. 1906.

Killed. Injured. Killed. Injured. Passengers . . . -z . 135 653 118 597

Servants 714 1673 703 1513

Other persons . . . v . 400 365 360 373

1249 2691 1 181 2483

See the Quarterly and Annual Reports, issued by the Board of Trade, London, and the Annual Statistical Reports and Quarterly Accident Bulletins, published by the Interstate Commerce Commis- sion, Washington. (B. B. A.)

Financial Organization The methods of financing railway enterprises, both new projects and existing lines, have been influenced very largely by the attitude of the state and of municipal authorities. Railways may be built for military reasons or for commercial reasons, or for a combination of the two. The Trans-Siberian railway was a military necessity if Russia was to exercise dominion throughout Siberia and maintain a port on the Yellow Sea or the Sea of Japan. The Union Pacific railroad was a military necessity to the United States if the authority of the national government was to be maintained in the Far West. The cost of such ventures and the detailed methods by which they are financed are of relatively small importance, because they are not required to earn a money return on the investment. To a less degree, the same is true of railways built for a special instead of a general commercial interest. The Baltimore & Ohio railroad was built to protect and further the commercial interests of the city of Baltimore; the Cincinnati Southern railway is still owned by the city of Cincinnati, which built the line in the 'seventies for commercial protection against Louis- ville, Ky. From a commercial point of view such ventures are differentiated from railway projects built for general com- mercial reasons because they do not depend on their own credit. The government, national or local, furnishes the borrowing power, and makes the best bargain it can with the men it designates to operate the line.

Where a railway is built for general commercial reasons, however, it must furnish its own credit; that is to say, it must convince investors that it can be worked profitably and give them an assured return on the funds they

advance. The state is interested in the commercial railway venture as a matter of public policy, and because it can confer or withold the right of eminent domain, without which the railway builder would be subjected to endless annoyance and expense. This govern- mental sanction has been obtainable only with difficulty, and after the exercise of numerous legal forms, in Great Britain and on the continent of Europe. In the United States, on the other hand, it has been obtained with considerable ease. In the earlier years of American railway building, each project was commonly the subject of a special law; then special laws were in turn succeeded by general railway laws in the several states, and these in turn have come to be succeeded in most parts of the country by jurisdiction vested in the state railway com- mission. Each of these changes has tended to improve the existing status, to legitimize railway enterprise, and to safe- guard capital or investment.

The laws regulating original outputs for capital were strictly drawn in Great Britain and on the continent of Europe; in America they were drawn very loosely. As a result it has been far easier for the American than for the European railway builder to take advantage of the speculative instinct in obtain- ing money. Instead of the borrowing power being restricted to a small percentage of the total capital, as in European countries, most of the railway mileage of America has been built with borrowed money, represented by bonds, while stock has been given freely as an inducement to subscribe to the bonds on the

theory that the bonds represented the cost of the enterprise, and the stock the prospective profits. As a natural result weak railway companies in the United States have frequently been declared insolvent by the courts, owing to their inability in periods of commercial depression to meet their acknowledged obligations, and in the reorganization which has followed the shareholders have usually had to accept a loss, temporary or permanent.

The situation in Great Britain has been wholly different. The debt in that country is relatively small in amount, and is not represented by securities based upon hypothecation of the company's real property, as with the American railway bond, resting on a first, second or third mortgage. But British share capital has been issued so freely for extension and im- provement work of all sorts, including the costly requirements of the Board

of Trade, that a situation has been reached where the return on the outstanding securities tends to diminish year by year. Although this fact will not in itself make the com- panies liable to any process of reorganization similar to that following insolvency and foreclosure of the American railway, it is probable that reorganization of some sort must nevertheless take place in Great Britain, and it may well be questioned whether the position of the transportation system of that country would not have been better if it had been built up and projected on the experience gained by actual earlier losses, as in the United States.

Thus the characteristic defect in the British railway organiza- tion has been the tendency to put out new capital at a rate faster than has been warranted by the annual increases in earnings. The American railways do not have to face this situation; but, after a long term of years, when they were allowed to do much as they pleased, they have now been brought sharply to book by almost every form of constituted authority to be found in the states, and they are suffering from increased taxation, from direct service requirements, and from a general tendency on the part of regulating authorities to reduce rates and to make it impossible to increase them. Meantime, the purchasing power of the dollar which the railway company receives for a specified service is gradually growing smaller, owing to the general increases year by year in wages and in the cost of material. The railways are prospering because they are managed with great skill and are doing increasing amounts of business, though at lessening unit profits. But there is danger of their reaching the point where there is little or no margin between unit costs of service and unit receipts for the service. It will probably be inevitable for American railway rates to trend somewhat upward in the future, as they have gradually declined in the past; but the process apparently cannot be accomplished without considerable friction with the governing authorities. The attitude of the courts is not that the railways should work without compensation, but that the compensation should not exceed a fair return on funds actually expended by the railway. This is in line with the provisions in the Constitution of the United States regarding the protec- tion of property, but the difficulty in applying the principle to the railway situation lies in the fact that costs have to be met by averaging the returns on the total amount of business done, and it is often impossible, in specific instances, to secure a rate which can be considered to yield a fair return on the specific service rendered. Hence losses in one quarter must be compensated by gains in another — a process which the law, regarding only the gains, renders very difficult.

The growth of railways has been accompanied by a world-wide tendency toward the consolidation of small independent ventures into large groups of lines able to aid one another in the exchange of traffic and to effect economies in administration and in the purchase of supplies. Both in

England and in America this process of consolidation has been obstructed by all known legis- lative devices, because of the widespread belief that competition in the field of transportation was necessary if fair prices were to be charged for the service. But the general tendency to regulate rates by authority of the state has apparently rendered unnecessary the old plan of rate regulation through competition,

even if it had not been demonstrated often and again that this form of regulation is costly for all concerned and is effective only during rare periods of direct conflict between companies. Nevertheless, in spite of difficulties, consolidation has gone on with great rapidity. When Mr E. H. Harriman died he exercised direct authority over more than 50,000 m. of railway, and the tendency of all the great American railway systems, even when not tied to one another in common owner- ship, is to increase their mileage year by year by acquiring tributary lines. The smaller company exchanges its stock for stock of the larger system on an agreed basis, or sells it outright, and the bondholders of the absorbed line often have a similar opportunity to exchange their securities for obligations of the parent company, which are on a stronger basis or have a broader market. Similarly in Great Britain there is a tendency towards combination by mutual agreement among the com- panies while they still preserve their independent existence.

Table XVIII. shows the paid-up capital, gross receipts, net receipts and proportion of net receipts to total paid-up capital on the railways of the United Kingdom for a series of years.

Table XVIII. — British Railways

Route

Paid-up

Gross

Net

Percent

Miles.

Capital.

Receipts.

Receipts.

Capital.

1878

17.333

£698,545,154

£62,862,674

£29,673,306

4-25

1888

19,812

864,695,963

72,894,665

35,132,558

4-06

1898

21,659

1,134,468,462

96,252,501

40,291,958

3-55

1899

21,700

I,152.317,5°I

101,667,065

41,576,378

361

1900

21,855

1,176,001,890

104,801,858

40,058,338

3-41

1901

22,078

1,195,564,478

106,558,815

39,069,076

3-27

1902

22,152

I,2l6,86l,42I

109,469,720

41,628,502

3-42

1903

22,435

I,235,5 28 ,9I7

110,888,714

42,326,859

3-43

1904

22,634

1,258,294,681

111,833,272

42,660,741

3-39

1905

22,847

1,272,600,935

ns.ssJ.oig

43,466,356

3-42

1906

23,063

1,286,883,341

117,227,931

44,446,077

3-45

1907

23,108

1,294,065,662

121,548,923

44-939,729

3-47

1908

23,205

1,310,533,212

119,894,327

43,486,526

3-32

A similar comparison (Table XIX.) can be made for the United States of America, statistics prior to the establishment of the Inter- state Commerce Commission being taken from Poor's Manual of Railroads as transcribed in government reports.

Table XIX. — American Railways

Route

Issued

Gross

Net

Percent

Miles.

Capital.

Receipts.

Receipts, t

Capital.

1878

81,747

$4,772,297,349

$490,103,351

Sl87,575,l67

3-93

1888

156,114

9,281,914,605

960,256,270

301,631,051

3-25

1898

190,870

10,818,554,031

1,269,263,257

407,018,432

3-76

1899

194,336

11,033,954,898

1,339,655,! H

435-753,291

3-95

1900

198,964

11,491,034,960

1,519,570,830

509,289,944

4-43

1901

202,288

11,688,147,091

1,622,014,685

540,140,744

4-62

1902

207,253

12,134,182,964

1,769,447,408

598,206,186

4-93

1903

213,422

12,599,990,258

1,950,743,636

634,924,788

5-04

1904

220,112

13,213,124,679

2,024,555,061

623,509,113

472

1905

225,196

13,805,258,121

2,134,208,156

679,518,807

4-92

1906

230,761

14,570,421,478

2,386,285,473

774,051,156

5-31

1907

*236,949^*

**i6,o82, 146,683*

2,649,731,911

820,254,887

5-io

1908

237,389t

16,767,544,827

2,393,805,989

651,561,587

3-88

- *Includes $145,321,601 assigned to other than railway property, but earning net receipts.*

t After taxes; to compare with British figures.

} This figure should be received with caution. The Interstate Commerce Commission made certain accounting changes this year.

(R. Mo.)

Construction Location. — An ideal line of railway connecting two terminal points would be perfectly level and perfectly straight, because in that case the resistance due to gradients and curves would be eliminated (see § Locomotive Power) and the cost of mechanical operation reduced to a minimum. But that ideal is rarely if ever attainable. In the first place the route of a railway must be governed by commercial considerations. Unless it be quite short, it can scarcely ever be planned simply to connect its two terminal points, without regard to the intervening country; in order to be of the greatest utility and to secure the greatest revenue it must be laid out

with due consideration of the traffic

arising at intermediate places, and as these will not usually lie exactly on the direct line, deviations from straightness will be rendered necessary. In the second place, except in the unlikely event of all the places on the selected route lying at the same elevation, a line that is perfectly level is a physical impossibility; and from engineering considerations, even one with uniform gradients will be impracticable on the score of cost, unless the surface of the country is extraordinarily even. In these circumstances the constructor has two broad alternatives between which to choose. On the one hand he may make the line follow the natural inequalities of the ground as nearly as may be, avoiding the elevations and depressions by curves; or on the other he may aim at making it as nearly straight and level as possible by taking it through the elevations in cuttings or tunnels and across the depressions on embankments or bridges. He will incline to the first of these alternatives when cheapness of first cost is a desideratum, but, except in unusually favourable circumstances, the resulting line, being full of sharp curves and severe gradients, will be unsuited for fast running and will be unable to accommodate heavy traffic economically. If, however, cost within reasonable limits is a secondary con- sideration and the intention is to build a line adapted for express trains and for the carriage of the largest volume of traffic with speed and economy, he will lean towards the second. In practice every line is a compromise between these two ex- tremes, arrived at by carefully balancing a large number of varying factors. Other things being equal, that route is ; best which will serve the district most conveniently and secure the highest revenue; and the most favourable combination of curves and gradients is that by which the annual cost of con- veying the traffic which the line will be called on to carry, added to the annual interest on the capital expended in construction; will be made a minimum.

Cuttings and Embankments. — A cutting, or cut, is simply a trench dug in a hill or piece of rising ground, wide enough at the bottom to accommodate one or more pairs of rails, and deep enough to enable the line to continue its course on the level or on a moderate gradient. The slopes of the sides vary according to the nature of the ground, the amount of moisture present, &c. In solid rock they may be vertical; in gravel, sand or common earth they must, to prevent slipping, rise 1 ft. for 1 to 1 § or 2 ft. of base, or even more in treacherous clay. In soft material the excavation may be performed

by mechanical excavators or "steam navvies," while in hard it may be necessary to resort to blasting. Except in hard rock, the top width of a cutting, and therefore the amount of material to be excavated, increases rapidly with the depth; hence if a cutting exceeds a certain depth, which varies with the par- ticular circumstances, it may be more economical, instead of forming the sides at the slope at which the material of which they are composed will stand, to make them nearly vertical and support the soil with a retaining wall, or to bore a tunnel. An embankment-bank, or fill, is the reverse of a cutting, being an artificial mound of earth on which the railway is taken across depressions in the surface of the ground. An endeavour is made so to plan the works of a railway that the quantity of earth excavated in cuttings shall be equal to the quantity required for the embankments; but this is not always practic- able, and it is sometimes advantageous to obtain the earth from some source close to the embankment rather than 'incur the expense of hauling it from a distant cutting. As embank- ments have to support the weight of heavy trains 1 , they must be uniformly firm and well drained, and before the line is fully opened for traffic they must be allowed time to consolidate, a process which is helped by running construction or mineral trains over them.

An interesting case of embankment and cutting in combination was involved in crossing Chat Moss on the Liverpool & Manchester railway. The moss was 4! m. across, and it varied in depth from 10 to 30 ft. Its general character was such that cattle could not stand on it, and a piece of iron would sink in it. The subsoil was composed principally of clay and sand, and the railway had to be carried over the moss on the level, requiring cutting, and embanking

for upwards of 4 m. In forming 277,000 cub. yds. of embankment 670,000 yds. of raw peat were consumed, the difference being occasioned by the squeezing out of the water. Large quantities of embanking were sunk in the moss, and, when the engineer, George Stephenson, after a month's vigorous operations, had made up his estimates, the apparent work done was sometimes less than at the beginning of the month. The railway ultimately was made to float on the bog. Where embankment was required drains about 5 yds. apart were cut, and when the moss between them was dry it was used to form the embankment. Where the way was formed on the level, drains were cut on each side of the intended line, and were intersected here and there by cross drains, by which the upper part of the moss was rendered dry and firm. On this surface hurdles were placed, 4 ft. broad and 9 long, covered with heath, upon which the ballast was laid.

Bridges. — For conveying small streams through embank- ments, channels or culverts are constructed in brickwork or masonry. Larger rivers, canals, roads, other railways and sometimes deep narrow valleys are crossed by

bridges (?.■».) of timber, brick, stone, wrought iron or steel, and many of these structures rank among the largest engineering Works in the world. Sometimes also a viaduct consisting of a series of arches is preferred to an embankment when the line has to be taken over a piece of flat alluvial plain, or when it is desired to economize space and to carry the line at a sufficient height to clear the streets, as in the case of various railways entering London and other large towns. In connexion with a railway many bridges have also to be constructed to carry public roads and other railways over the line, and for the use of owners or tenants whose land it has cut through (" accommodation bridges "). In the early days of railways, roads were often taken across the line on the level, but such " level " or " grade " crossings are now usually avoided in the case of new lines in populous countries, except when the traffic on both the road and the railway is very light. In many instances old level crossings have been replaced by over-bridges with long sloping approaches; in this way considerable expenditure has been involved, justified, however, by the removal of a danger to the public and of interruptions to the traffic on both the roads and the railways. In cases where the route of a line runs across a river or other piece of water so wide that the construction of a bridge is either impossible or would be more costly than is warranted by the volume of traffic, the expedient is some- times adopted of carrying the wagons and carriages across bodily with their loads on train ferries, so as to avoid the inconvenience and delay of transshipment. Such train ferries are common in America, especially on the Great Lakes, and exist at several places in Europe, as in the Baltic between Denmark and Sweden and Denmark and Germany, and across the Straits of Messina.

Gradients. — The gradient or grade of a line is the rate at which it rises or falls, above or below the horizontal, and is expressed by stating either the horizontal distance in which the change of level amounts to 1 ft., or the amount of change that would occur in some selected distance, such as 100 ft., 1000 ft. or 1 m. In America a gradient of 1 in 100 is often known as a 1% grade, one of 2 in 100 as a 2% grade, and so on; thus a 0-25% grade corresponds to what in Eng- land would be known as a gradient of 1 in 400. The ruling gradient of a section of railway is the steepest incline in that section, and is so called because it governs or rules the maximum load that can be placed behind an engine working over that portion of line. Sometimes, however, a sharp incline occurring on an otherwise easy line is not reckoned as the ruling gradient, trains heavier than could be drawn up it by a single engine being helped by an assistant or " bank " engine; sometimes also " momentum " or " velocity " grades, steeper than the ruling gradient, are permitted for short distances in cases where a train can approach at full speed and thus surmount them by the aid of its momentum. An incline of 1 in 400 is reckoned easy, of 1 in 200 moderate

and of 1 in 100 heavy. The ruling gradient of the Liverpool & Manchester railway was fixed at 1 in 900, excepting the inclines at Liverpool and at Rainhill summit, for working which special provision was made; and I. K. Brunei laid out the Great Western for a long distance

out of London with a ruling gradient of i in 1320. Other engineers, however, such as Joseph Locke, cheapened the cost of construction by admitting long slopes of 1 in 80 or 70. One of the steepest gradients in England on an important line is the Lickey incline at Bromsgrove, on the Midland railway between Birmingham and Gloucester, where the slope is 1 in 37 for two miles. The maximum gradient possible depends on climatic conditions, a dry climate being the most favourable. The theoretical limit is about 1 in 16; between 1 in 20 and 1 in 16 a steam locomotive depending on the adhesion between its wheels and the rails can only haul about its own weight. In practice the gradient should not exceed r in 22ˆ-, and even that is too steep, since theoretical conditions cannot always be realized; a wet rail will reduce the adhesion, and the gradients must be such that some paying load can be hauled in all weathers. When an engineer has to construct a railway up a hill having a still steeper slope, he must secure practicable gradients by laying out the line in ascending spirals, if necessary tunnelling into the hill, as on the St Gothard railway, or in a series of zigzags, or he must resort to a rack or a cable railway.

Rack Railways. — -In rack railways a cog-wheel on the engine engages in a toothed rack which forms part of the permanent way. The earliest arrangement of this kind was patented by John Blen- kinsop, of the Middleton Colliery, near Leeds, in 1811, and an engine built on his plan by Mathew Murray, also of Leeds, began in 1812 to haul coals from Middleton to Leeds over a line 3i m. long. Blen- kinsop placed the teeth on the outer side of one of the running rails, and his reason for adopting a rack was the belief that an engine with smooth wheels running on smooth rails would not have sufficient adhesion to draw the load required. It was not till more than half a century later that an American, Sylvester Marsh, employed the rack system for the purpose of enabling trains to surmount steep slopes on the Mount Washington railway, where the maximum gradient was nearly 1 in 2 J. In this case the rack had pin teeth carried in a pair of angle bars. The subsequent development of rack railways is especially associated with a Swiss engineer, Nicholas Riggenbach, and his pupil Roman Abt, and the forms of rack introduced by them are those most

commonly used. That of the latter is multiple, several rack-plates being placed parallel to each other, and the teeth break joint at §, i or | of their pitch, according to the number of rack-plates. In this way smoothness of working is ensured, the cog-wheel being constantly in action with the rack. Abt also developed the plan of combining rack and adhesional working, the engine working by adhesion alone on the gentler slopes but by both adhesion and the rack on the steeper ones. On such lines the beginning of a rack section is provided with a piece of rack mounted on springs, so that the pinions of the engine engage smoothly with the teeth. Racks of this type usually become impracticable for gradients steeper than I in 4, partly because of the excessive weight of the engine required and partly because of the tendency of the cog-wheel to mount the rack. The Locher rack, employed on the Mount Pilatus railway, where the steepest gradient is nearly 1 in 2, is double, with vertical teeth on each side, while in the Strub rack, used on the Jungfrau line, the teeth are cut in the head of a rail of the ordinary Vignoles type.

Cable Railways. — For surmounting still steeper slopes, cable railways may be employed. Of these there are two main systems: (1) a continuous cable is carried over two main drums at each end of the line, and the motion is derived either (a) from the weight of the descending load or (fc) from a motor acting on one of the main drums; (2) each end of the cable is attached to wagons, one set of which accordingly ascends as the other descends. The weight required to cause the downward motion is obtained either by means of the material which has to be transported to the bottom of the hill or by water ballast, while to aid and regulate the motion generally steam or electric motors are arranged to act on the main drums, round which the cable is passed with a sufficient number of turns to prevent slipping. When water ballast is employed the water is filled into a tank in the bottom of the wagon or car, its quantity, if passengers are carried, being regulated by the number ascending or descending.

Curves. — The curves on railways are either simple, when they consist of a portion of the circumference of a single circle, or compound, when they are made up of portions of the cir- cumference of two or more circles of different radius. Reverse curves are compound curves in which the components are of contrary flexure, like the letter S; strictly the term is only applicable when the two portions follow directly one on the other, but it is sometimes used of cases in which they are separated by a " tangent " or portion of straight line. In Great Britain the curvature is defined by stating the length of

the radius, expressed in chains (1 chain = 66 ft.), in America by stating the angle subtended by a chord 100 ft. long; the measurements in both methods are referred to the central line of the track. The radius of a i-

degree curve is 5730 ft., or about 86| chains, of a 15-degree curve 383 ft. or rather less than 6 chains; the former is reckoned easy, the latter very sharp, at least for main lines on the standard gauge. On some of the earlier English main lines no curves were constructed of a less radius than a mile (80 chains), except at places where the speed was likely to be low, but in later practice the radius is sometimes reduced to 40 or 30 chains, even on high-speed passenger lines.

When a train is running round a curve the centrifugal force which comes into play tends to make its wheel-flanges press against the outer rail, or even to capsize it. If this pressure is not relieved in some way, the train may be derailed either (1) by " climbing " the outer rail, with injury to that rail and, generally, to the corresponding wheel-flanges; (2) by overturning about the outer rail as a hinge, possibly without injury to rails or wheels; or (3) by forcing the outer rail outwards, occasionally to the extent of shearing the spikes that hold it down at the curve, thus spreading or "destroying the track. In any case the details depend upon whether the vehicle concerned is an engine, a wagon or a passenger coach, and upon whether it runs on bogie-trucks or not. If it is an engine, particular attention must be directed to the type, weight, arrangement of wheels and height of centre of gravity above rail level. In considering the forces that produce derailment the total mass of the vehicle or locomotive may be supposed to be concentrated at its centre of gravity. Two lines may be drawn from this point, one to each of the two rails, in a plane normal to the rails, and the ends of these lines, where they meet the rails, may be joined to complete a triangle, which may conveniently be regarded as a rigid frame resting on the rails. As the vehicle sweeps round the curve the centre of gravity tends to be thrown outwards, like a stone from a horizontal sling. The vertical, pressure of the frame upon the outer rail is thus increased, while its vertical pressure on the inner rail is diminished. Simultaneously the frame as a whole tends to slide horizontally athwart the rails, from the inner towards the outer rail, urged by the same centri- fugal forces. This sliding movement is resisted by placing a check rail on the inner side of the inner rail, to take the lateral thrust of the wheels on that side. It is also resisted in part by the conicity of the wheels, which converts the lateral force partly into a vertical force, thus enabling gravity to exert a restoring influence. When the lateral forces are top great to be controlled " climbing " occurs. Accidents due to simple climbing are, however, exceedingly rare, and are usually found associated with a faulty track, with " plunging " movements of the locomotive or vehicle, or with a " tight gauge " at curves or points. ■•,.■■!

From consideration of the rigid triangular frame described above, it is clear that the " overturning " force acts horizontally from the centre of gravity, and that the length of its lever arm is, at any instant, the vertical distance

*from the centre of gravity to the level of the outer rail. This is true whatever be the tilt of the vehicle at that instant. The restoring force exerted by gravity acts in a vertical line from the centre of gravity; and the length of its lever arm is the horizontal distance between this vertical line and the outer rail. If therefore the outer rail is laid at a level above that of the inner rail at the curve, over- turning will be resisted more than would be the case if both rails were in the same horizontal plane, since the tilting of the vehicle due to this " superelevation " diminishes the overturning moment, and also increases the restoring moment, by shortening in the one case and lengthening in the other the lever arms at which the respective forces act. The amount of superelevation required to prevent derailment at a curve can be calculated * under perfect running conditions, given the radius of curvature, the weight of the vehicle, the height of the centre of gravity; the distance between the rails, and the speed; but great experience ˆ 1 See The Times Engineering Supplement (August 22, 1906), p. 265.*

is required for the successful application of definite formulae to the problem. For example, what is a safe speed at a given curve for an engine, truck or coach having the load equally distributed over the wheels may lead to either climbing or Overturning if the load is shifted to a diagonal position. An ill-balanced load also exaggerates " plunging," and if the period of oscillation of the load happens to agree with the changes of contour or other inequalities of the track vibrations of a dangerous character, giving rise to so-called " sinuous " motion, may occur.

In general it is not curvature, but change of curvature, that presents difficulty in the laying-out of a line. For instance, if the curve is of S-form, the point of danger is when the train enters the contra-flexure, and it is not an easy matter to assign the best superelevation at all points throughout the double bend. Closely allied to the question of safety is the problem of preventing jolting at curves; and to obtain easy running it is necessary not merely to adjust the levels of the rails in respect to one another, but to tail off one curve into the next in such a manner as to avoid any approach to abrupt lateral changes of direction. With increase of speeds this matter has become important as an element of comfort in passenger traffic. As a first approximation, the centre-line of a railway may be plotted out as a number of portions of circles, with intervening straight tangents connecting them, when the abruptness of the changes of direction will depend on the radii of the circular portions. But if the change from straight to circular is made

through the medium of a suitable curve it is possible to relieve the abruptness, even on curves of comparatively small radius. The smoothest and safest running is, in fact, attained when a " transition," " easement " or " adjustment " curve is inserted between the tangent and the point of circular curvature.

For further information see the following papers and the discus- sions on them: "Transition Curves for Railways," by James Glover, Proc. Inst. C.E. vol. 140, part ii.; and " High Speed on Railway Curves," by J. W. Spiller, and " A Practical Method for the Improvement of Existing Railway Curves," by W. H. Shortt, Proc. Inst. C.E. vol. 176, part ii.

Gauge. — The gauge of a railway is the distance between the inner edges of the two rails upon which the wheels run. The width of 4 ft. 8| in. may be regarded as standard, since it prevails on probably three-quarters of the railways of the globe. In North America, except for small industrial railways and some short lines for local traffic, chiefly in mountainous country, it has become almost universal; the long lines of

3 ft. gauge have mostly been converted, or a third rail has been laid to permit interchange of vehicles, and the gauges of 5 ft. and more have disappeared. A considerable number of lines still use

4 ft. 9 in., but as their rolling stock runs freely on the 4 ft. 8§ in. gauge and vice versa, this does not constitute a break of gauge for traffic purposes. The commercial importance of such free interchange of traffic is the controlling factor in determining the gauge of any new railway that is not isolated by its geo- graphical position. In Great Britain railways are built to gauges other than 4 ft. 8§ in. only under exceptional conditions; the old " broad gauge " of 7 ft. which I. K. Brunei adopted for the Great Western railway disappeared on the 20th-23rd of May 1892, when the main line from London to Penzance was converted to standard gauge throughout its length. In Ireland the usual gauge is 5 ft. 3 in., but there are also lines laid to a

3 ft. gauge. On the continent of Europe the standard gauge is generally adopted, though in France there are many miles of

4 ft. 9 in. gauge; the normal Spanish and Portuguese gauge is, however, 5 ft. 5! in., and that of Russia 5 ft. In France and other European countries there is also an important mileage of metre gauge, and even narrower, on lines of local or secondary importance. In India the prevailing gauge is 5 ft. 6 in., but there is a large mileage of other gauges, especially metre. In the British colonies the prevailing gauge is 3 ft. 6 in., as in South Africa, Queensland, Tasmania and New Zealand; but in New South Wales the

normal is 4 ft. 8| in. and in Victoria

5 ft. 3 in., communication between different countries of the

Australian Commonwealth being thus carried on under the disadvantage of break of gauge. Though the standard gauge is in use in Lower Egypt, the line into the Egyptian Sudan was built on a gauge of 3 ft. 6. in., so that if the so-called Cape to Cairo railway is ever completed, there will be one gauge from Upper Egypt to Cape Town. In South America the 5 ft. 6 in. gauge is in use, with various others.

Mono-Rail Systems. — The gauge may be regarded as reduced to its narrowest possible dimensions in mono-rail lines, where the weight of the trains is carried on a single rail. This method of construction, however, has been adopted only to a very limited extent. In the Lartigue system the train is straddled over a single central rail, elevated a suitable distance above the ground. A short line of this kind runs from Ballybunnion to Listowel in Ireland, and a more ambitious project on the same principle, on the plans of Mr F. B. Behr, to connect Liverpool and Manchester, was sanctioned by Parliament in 1901. In this case electricity was to be the motive-power, and speeds exceeding 100 m. an hour were to be attained, but the line has not been built. In the Langen mono-rail the cars are hung from a single overhead rail; a line on this system works between Barmen and Elberfeld, about 9 m., the cars for a portion of the distance being suspended over the river Wupper. In the system devised by Mr Louis Brennan the cars run on a single rail laid on the ground, their stability being maintained by a heavy gyrostat revolving at great speed in a vacuum.

Permanent Way. — When the earth-works of a line have been completed and the tops of the embankments and the bottoms of the cuttings brought to the level decided upon, the next step is to lay the permanent way, so-called probably in dis- tinction to the temporary way used during construction.' The first step is to deposit a layer of ballast on the road-bed or " formation," which often slopes away slightly on each side from the central line to facilitate drainage. The ballast con- sists of such materials as broken stone, furnace slag, gravel, cinders or earth, the lower layers commonly consisting of coarser materials than the top ones, and its purpose is to provide a firm, well-drained foundation in which the sleepers or cross- ties may be embedded and held in place, and by which the weight of the track and the trains may be distributed over the road-bed. Its depth varies, according to the traffic which the line has to bear, from about 6 in. to 1 ft. or rather more under the sleepers, and the materials of the surface layers are often chosen so as to be more or less dustless. Its width depends on the numbers of tracks and their gauge; for a double line of standard gauge it is about 25 ft., a space of 6 ft. (" six- foot way ") being left between the

inner rails of each pair in Great Britain (fig. 8), and a rather larger distance in America

ˆUr ‘“- «

Fig. 8. — Half of English Double Track.

(fig. 9), where the over-hang of the rolling stock is greater. The intervals between the sleepers are filled in level with ballast,

y – - – 39*

Fig. 9. — Half of American Double Track.

which less commonly is also heaped up over them, especially at the projecting ends.

Sleepers, called ties or cross-ties in America, are the blocks or slabs on which the rails are carried. They are nearly always placed transversely, across the direction of the lines, the longi- tudinal position such as was adopted in connexion with the broad gauge on the Great Western in England having been abandoned except in special cases. Stone blocks were tried as sleepers in the early days of railways, but they proved too rigid, and besides, it was found difficult to keep the line true with them. Wood is the material most widely used, but steel is employed in some countries where timber is scarce or liable to destruction by white ants, though it is still regarded as too expensive in comparison with wood for general adoption. Steel sleepers were used experimentally on the London & Xorth-Western, but were abandoned owing to the shortness of their life. In Germany, where they have met with greater favour, there were over 26J millions in use in 1905, 1 and they have been tried by some American railways. Numerous forms of ferro-concrete sleepers have also been devised.

In Great Britain, Germany and France, at least 90% of the wooden sleepers are ” treated ” before they are laid, to increase their resistance to decay, and the same practice is followed to some extent in other European countries. A great number of preservative processes have been devised. In that most largely used, known as ” creosoting,” dead oil of tar, to the amount of some 3 gallons per sleeper, is forced into the wood under

pressure, or is sucked in by vacuum, both the timber and the oil being heated. In the United States only a small percentage of the ties are treated in any way beyond seasoning in the open air, timber, in the opinion of the railway officials, being still too cheap in nearly all parts of that country to justify the use of preservatives. Some railway companies, however, having a long mileage in timberless regions, do " treat " their sleepers.

Typical dimensions for sleepers on important British railways are: — length 9 ft., breadth 10 in., and depth 5 in. In America 8 ft. is the most common length, the breadth being 8 in., and the depth 6 or 7 in.

There are two main ways of attaching the rails to the sleepers, corresponding to two main types of rails — the bull-headed rail

the

Fig. 10. — A, Section of British Bull-Headed Rail, 90 lb to yard, showing also chair and fastenings. B, Plan of Chair.

and the Vignoles or flange rail. In the first method, which is practically universal in Great Britain and is also employed to

1 See a full account of steel sleepers in a paper read by A. Haar- mann before the Verein der Deutschen Eisenhuttenleute on Dec. 8, r907, translated in the Railway Gazette (London) on April 3, 10 and

17. 1908.

some extent in France and India, the rails have rounded bases and are supported by being wedged, with wooden keys, in cast- iron chairs which are bolted to the sleepers. In the second method the rails have flat flanged bases which rest directly on the sleepers (fig. 10). The chairs on the British system weigh about 45 or 50 lb each on important lines, though they may be less where the traffic is light, and are fixed to the sleepers each by two, three or four fastenings, either screw spikes, or round drift bolts entered in holes previously bored, or fang bolts or wooden trenails. Sometimes a strip of felt is interposed between the chair and the sleeper, and sometimes a serrated surface is prepared on the sleeper for the chair which is forced into its seat by hydraulic pressure. The keys which hold the rail in the chairs are usually of oak and are placed outside the rails; the inside position has also been employed, but has the disadvantage of detracting from the elasticity of the road since the weight of a passing train presses the rails up against a rigid mass of metal instead of against a slightly yielding block of wood. The rails, which for heavy main line traffic may weigh as much as 100 lb per yard, or even more, are rolled in lengths of from 30 to 60 ft., and sleepers are placed under them at intervals of between 2 and 3 ft. (centre to

centre), n sleepers to a 30 ft. rail being a common arrangement. On the London & North- Western railway there are 24 sleepers to each 60 ft. rail. A small space is left between the end of one rail and that of the next, in order to allow for expansion in hot weather, and at the joint the two are firmly braced together by a pair of fish-plates (fig. n). These are flat bars of iron or steel from 18 in. to 2 ft. long, which are lodged in the channels of the rail, one on each side, and secured with four bolts passing through the web; sometimes, to give additional stiffness, they extend down below the lower table of the rail and are bent round so as to clip it. Occasionally the joints thus formed are " supported " on a sleeper, as was the practice in the early days of rail- F" IG – J 1 – — British way construction, but they are generally K-ail and Rail " suspended " between two sleepers, which are set rather more closely together than at other points in the rail. Preferably, they are so arranged that those in both lines of rails come opposite each other and are placed between the same pair of sleepers.

Flat-bottomed rails are fastened to the sleepers by hook- headed spikes, the heads of which project over the flanges. In the United States the spikes are simply driven in with a maul, and the rails stand upright, little care being taken to prepare seats for them on the sleepers, on which they soon seat them- selves. The whole arrangement is simple and cheap in first cost, and it lends itself admirably to fast track-laying and to repairs and changes of line. On the continent of Europe the practice is common of notching the sleeper so as to give the rail a slight cant inwards — a result obtained in England by canting the rail in the chairs — and metal plates or strips of felt are put under the rail, which is carefully fastened to the sleeper by screwed spikes (fig. 12). This method of construction is more

Fig. 12. — French Rail, 90J lb to the yard, showing rail joint and seat in the sleeper.

expensive than the American in first cost, but it gives a more durable and stable track. Such metal plates, or " tie-plates," have come into considerable use also in the United States, where they are always made of rolled steel, punched with rectangular holes through which the spikes pass. They serve two principal

Fig. 13. — American Rail, 90 fb to the yard, showing rail joint.

purposes: they diminish the wear of the sleeper under the rail by providing

a larger bearing surface, and they help to support the spikes and so to keep the gauge. On all the accepted forms there are two or more flanges at the bottom, running lengthwise of the plate and crosswise of the rail; these are requisite to give proper stiffness, and further, as they are forced into the tie by the weight of passing traffic, they help to fix the plate securely in place. The joints of flanged rails are similar to those employed with bull-headed rails. Various forms, mostly patented, have been tried in the United States, but the one most generally adopted consists of two symmetrical angle bars (fig. 13),

varying in length (from 20 to 48 in.), in weight and in the number of bolts, which may be four or six.

The substitution of steel for iron as the material for rails which made possible the axle loads and the speeds of to-day, and, by reducing the cost of maintenance, contributed enormously to the economic efficiency of railways, was one of the most important events in the history of railways, and a scarcely less important element of progressive economy has been the continued improvement of the steel rail in stiffness of section and in toughness and hardness of material. Carbon is the important element in controlling hardness, and the amount present is in general higher in the United States than in Great Britain. The specifications for bull-headed rails issued by the British Engineering Standards Committee in 1904 provided for a carbon-content ranging from 0-35 to 0-50%, with a phosphorus maximum of 0-075%. I n the United States a committee of the American Society of Civil Engineers, appointed to consider the •question of rail manufacture in consequence of an increase in the number of rail-failures, issued an interim report in 1907 in which it suggested a range of carbon from 0-55 to 0-65% for the heaviest sections of Bessemer steel flange rails, with a phosphorus maximum of 0-085%; while the specifications of the American Society for Testing Materials, current at the same period, put the carbon limits at 0-45 to 0-55%, and the phos- phorus limit at o-io. For rails of basic open-hearth steel, which is rapidly ousting Bessemer steel, the Civil Engineers' specifications allowed from 0-65 to 0-75% of carbon with 0-05% of phosphorus, while the specifications of the American Railway Engineering and Maintenance of Way Association provided for a range of 0-75 to 0-85% of carbon, with a maximum of 0-03% of phosphorus. The rail-failures mentioned above also drew renewed attention to the importance of the thermal treatment of the steel from the time of melting to the last passage through the rolling mill and to the necessity of the finishing temperature being sufficiently low if the product is to be fine grained, homo- geneous and tough; and to permit of this requirement being met there was a tendency to increase the thickness of the metal in the web and flanges of the rails. The standard specification adopted by the Pennsylvania railway in 1908 provided that in rails weighing 100 lb to the yard 41 % of

the metal should be in the head, 18-6% in the web, and 40-4% in the base, while for 85 lb rails 42-2% was to be in the head, 17-8% in the web and 40-0% in the base. These rails were to be rolled in 33-ft. lengths. According to the specification for 85 lb rails adopted by the Canadian Pacific railway about the same time, 36-77% of the metal was to be in the head, 22-2i%in the web and 41-02% in the base.

Points and Crossings. — To enable trains to be transferred from one pair of rails to another pair, as from the main line to a siding, " points " or " switches " arc provided. At the place where the four rails come together, the two inner ones (one of the main line and the other of the siding), known as " switch rails " (b, fig. 14), are tapered to a fine point or tongue, and rigidly connected together at such a distance apart that when one of the points is pressed against the outer or "stock"

rail (a) of either the siding or the main line there is sufficient space between the other tongue and the other stock rail to permit the free passage of the flanges of the wheels on one side of the train, while the flanges on the other side find a con- tinuous path along the other switch rail and thus are deflected in the desired direction. The same ar- rangement is employed at junctions where differ- ent running lines con- verge. The points over which a train travels when directed from the main to a branch line are called " facing points " (FP), while those which it passes when running from a branch to a main line are " trailing points " (TP). In Great Britain the Board of Trade requires facing points to be avoided as far as possible; but, of course, they are a neces- sity at junctions where running lines diverge and at the crossing places which must be provided to enable trains to pass each other on single-track lines. At stations the points that give access to sidings are generally arranged as trailing points with respect to the direc- tion of traffic on the main lines; that is, trains can-

FlG. 14. — Points and Crossings. FP = Facing points. TP= Trailing points.

a = Stock rail.

b — Switch rail. V = Singie or V-crossing.

D = Diamond crossing.

c = Check rails.

rf = Wing rails.

e = Winged check rails.

/= Diamond points.

not pass direct into sidings, but have to stop and then run backwards into them. In shunting yards the points are commonly set in the required direction by means of hand levers placed close beside the lines, but those at junctions and those which give access from the main lines to sidings at wayside stations are worked by a system of rods from the signal cabin, or by electric or pneumatic power controlled from it and interlocked with the signals (see Signal: § Railway). Crossings are inevitable adjuncts of points. Where a branch diverges from a main line, one rail of the one must cross one rail of the other, and a V-crossing is formed (V)- Where, as at a double-line junction, one pair of rails crosses another pair, " diamond " crossings (D) are formed. At both types of crossing, check rails © must be provided to guide the wheel-flanges, and if these are not accur- ately placed the safety of the trains will be endangered. At double-line junctions trains passing over the diamond crossings evidently block traffic going in the opposite direction to that in which they are travelling. To avoid the delay thus caused the branch line which would occasion the diamond crossing if it were taken across on the level is sometimes carried over the main line by an over-bridge (" flying junction ") or undei it by an under-bridge (" burrowing junction").

Railway Stations. — Railway stations are either " terminal " or "intermediate." A terminal station embraces (1) the passenger station; (2) the goods station; (3) the locomotive, carriage and waggon depots, where the engines and the carrying stock are kept, cleaned, examined and repaired. At many intermediate stations the same arrangements, on a smaller scale, are made; in all of them there is at least accommoda- tion for the passenger and the goods traffic. The stations for

passengers and goods are generally in different and sometimes in distant positions, the place .selected for each being that which is most convenient for the traffic. The passenger station abuts on the main line, or, at termini, forms the natural terminus, at a place as near as can conveniently be obtained to the centre of the. population which constitutes the passenger traffic; and preferably its platforms should be at or near the ground level, for convenience of access. The goods station is ap- proached by a siding or fori set off from the main line at a point short

In laying out the approaches and station yard of a passenger station ample width and space should be provided, with well- defined means of ingress and egress to facilitate the stations? 1 ” circulation of vehicles and with a long setting-down pavement to enable them to discharge their passengers and luggage without delay. The position of the main buildings — ticket offices, waiting and refreshment-rooms, parcels offices, &c. — relative to the direction of the lines of rails may be used as a means of classifying terminal stations. They are placed either on the departure side parallel to the platform (” side ” stations) or at right angles to the rails and platforms (” end ” stations). Many large stations, however, are of a mixed type, and the offices are arranged in a fork between two or more series of platforms, or partly at the end and partly on one side. Where ‘ heavy suburban traffic has to be dealt with, the ex- pedient is occasionally adopted of taking some of the lines round the end in a continuous loop, so that incoming trains can deposit their passengers at an underground platform and immediately proceed on their outward journey. Intermediate stations, like terminal ones, should be convenient in situation and easy of approach, and, especially if they are important, should be on the ground level rather than on an embankment or in a cutting. The lines through them should be, if possible, straight and on the level; the British Board of Trade forbids them being placed on a gradient steeper than 1 in 260, unless it is unavoidable. Intermediate stations at the surface level are naturally constructed as side stations, and whether offices are provided on both sides or whether they are mainly concentrated on one will depend on local circumstances, the amount of the traffic, and the direction in which it preponder- ates. When the railway lies below the surface level the bulk of the offices are often placed on a bridge spanning the lines, access being given to the platforms by staircases or lifts, and similarly when the railway is at a high level the offices may be arranged under the lines. Occasionally on a double-track railway one platform placed between the tracks serves both of them; this ” island ” arrangement, as it is termed, has the advantage that more tracks can be readily added without disturbance of existing buildings, but when it is adopted the exit from the trains is at the opposite side to that which is usual, and accidents have happened through passengers alight- ing at the usual side without noticing the absence of a plat- form. At stations on double-track railways which have a heavy traffic four tracks are sometimes provided, the two outside ones only having platforms, so that fast trains get a clear road and can pass slow ones that are standing in the station. In Great Britain, it may be noted, trains almost invariably keep to the left, whereas in most other countries right-handed running is the rule.

The arrangement and appropriation of the tracks in a station materially affect the economical and efficient working of the traffic. There must be a sufficient provision of sidings, con- nected with the running tracks by

points, for holding spare rolling stock and to enable carriages to be added to or taken off trains and engines to be changed with as little delay as possible. At terminal stations, especially at such as are used

by short-distance trains which arrive at and start from the same platform, a third track is often laid between a pair of platform tracks, so that the engine of a train which has arrived at the platform can pass out and place itself at the other end of the train, which remains undisturbed. At the new Victoria station (London) of the London, Brighton & South Coast railways — which is so long that two trains can stand end to end at the platforms— this system is extended so as to permit a train to start out from the inner end of a platform even though another train is occupying the outer end. One of the advan- tages of electric trains on the multiple control system is that they economize terminal accommodation, because they can be driven from either end indifferently, and therefore avoid the necessity for tracks by which engines can change from one end of the train to the other. " –

The platforms on British railways have a standard elevation of 3 ft. above rail level, and they are not now made less than 25 ft. in height. In other countries they are generally lower; in the United States they are commonly level with, or only a few inches higher than, the top of the rails. They may consist of earth with a retaining wall along the tracks and with the surface gravelled or paved with stone or asphalt, or they may be constructed entirely of timber, or they may be formed of stone slabs supported on longitudinal walls. They should be of ample dimensions to accommodate the traffic — the British Board of Trade requires them to be not less than 6 ft. wide at small stations and not less than 12 ft. wide at large ones — and they should be as free as possible from obstructions, such as pillars supporting the roof. At intermediate stations the roofs are often carried on brackets fixed to the walls of the station buildings, and project only to the edge of the platforms. At larger stations where both the platforms and the tracks are covered in, there are two broad types of construction, with many intermediate variations: the roof may either be com- paratively low, of the " ridge and furrow " pattern, borne on a number of rows of pillars, or it may consist of a single lofty span extending clear across the area from the side walls. The advantage claimed for roofs formed with one or two large spans is that they permit the platforms and tracks to be readily rearranged at any time as required, whereas this is difficult with the other type, especially since the British Board of Trade requires the pillars to be not less than 6 ft. away from the edges of the platforms. On the other hand, wide spans are more expensive both in first cost and in maintenance, and there is the possibility of a failure such as caused the collapse in December 1905 of the roof of Charing Cross (S.E.R.) station, London, which then consisted of a single span. . Whatever the pattern adopted for the roof, a sufficient portion of it must be glazed to admit light, and it should be so designed that

the ironwork can be easily inspected and painted and the glass readily cleaned. For the illumination of large stations by night electric arc lamps are frequently employed, but some authorities favour high-pressure incandescent gas-lighting.

*At busy stations separate tracks are sometimes appropriated to the use of light engines and empty trains, on which, they may be run between the platforms and the locomotive and Loco- carriage depots. A carriage depot includes sheds in motive which the vehicles are stored, arrangements for wash- **

ing and cleaning them, and sidings on which they are mar- shalled into trains. At a locomotive depot the chief building is the " running shed " in which the engines are housed and cleaned. This may be rectangular in shape (" straight " shed), containing a series of parallel tracks on which the engines stand and which are reached by means of points and crossings di- verging from a main track outside; or it may take a polygonal or circular form (round house or rotunda), the fines for the engines radiating from a turn-table which occupies the centre and can be rotated so as to serve any of the radiating lines. The second arrangement enables any particular engine to enter or leave without disturbing the other; but on the other hand an accident to the turn-table may temporarily imprison the whole of them. In both types pits are constructed between the rails

on which the engines stand to afford easy access for the inspec- tion and cleaning of their mechanism. Machine shops are usually provided to enable minor repairs to be executed; the tendency, both in England and America, is to increase the amount of such repairing plant at engine sheds, thus lengthening the intervals between the visits of the engines to the main repairing shops of the railway. A locomotive depot further includes stores of the various materials required in working the engines, coal stages at which they are loaded with coal, and an ample supply of water. The quality of the last is a matter of great importance; when it is unsuitable, the boilers will suffer, and the installation of a water-softening plant may save more in the expenses of boiler maintenance than it costs to operate. The water cranes or towers which are placed at intervals along the railway to supply the engines with water require similar care in regard to the quality of the water laid on to them, as also to the water troughs, or track tanks as they are called in America, by which engines are able to pick up water

without stopping. These consist of shallow troughs about 18 in. wide, placed between the rails on perfectly level stretches of line. When water is required, a scoop is lowered into them from below the engine, and if the speed is sufficient the water is forced up jt into the tender-tanks. Such troughs were first employed on the London & North-Western railway in 1857 by John Ramsbottom, and have since been adopted on many other lines.

Goods stations vary in size from those which consist of perhaps a single siding, to those which have accommodation . for thousands of wagons. At a small roadside station,

station, where the traffic is of a purely local character, there will be some sidings to which horses and carts have access for handling bulk goods like coal, gravel, manure, &c, and a covered shed for loading and unloading packages and materials which it is undesirable to expose to the weather. The shed may have a single pair of rails for wagons running through it along one side of a raised platform, there being a roadway for carts on the other side; or if more accommodation is required there may be two tracks, one on each side of the platform, which is then approached by carts at the end. In either case the platform is fitted with a crane or cranes for lifting merchandise into and out of the wagons, and doors enable the shed to be used as a lock-up warehouse. In a large station the arrange- ments become much more complicated, the precise design being governed by the nature of the traffic that has to be served and by the physical configuration of the site. It is generally convenient to keep the inwards and the outwards traffic distinct and to deal with the two classes separately; at junction stations it may also be necessary to provide for the transfer of freight from one wagon to another, though the bulk of goods traffic is conveyed through to its destination in the wagons into which it was originally loaded. The increased loading space required in the sheds is obtained by multiplying the number and the length of lines and platforms; sometimes also there are short sidings, cut into the platforms at right angles to the lines, in which wagons are placed by the aid of wagon turn-tables, and sometimes the wagons are dealt with on two floors, being raised or lowered bodily from the ground level by lifts. The higher floors commonly form warehouses where traders may store goods which have arrived or are awaiting despatch. An elaborate organization is required to keep a complete check and record of all the goods entering and leaving the station, to ensure that they are loaded into the proper wagons according to their destination, that they are unloaded and sorted in such a way that they can be delivered to their consignees with the least possible delay, that they are not stolen or accidentally mislaid, &c; and accommodation must be provided for a large clerical and supervisory staff to attend to these matters. British rail- ways also undertake the collection and delivery of freight, in addition to*

transporting it, and thus an extensive range of vans and wagons, whether drawn by horses or mechanically propelled, must be provided in connexion with an important station.

Shunting Yards. — It may happen that from a large station sufficient traffic may be consigned to certain other large stations to enable full train-loads to be made up daily, or several times a day, and despatched direct to their destinations. In general, however, the conditions are less simple. Though a busy colliery may send off its product by the train-load to an important town, the wagons will usually be addressed to a number of different consignees at different depots in different parts of the town, and therefore the train will have to be broken up somewhere short of its destination and its trucks rearranged, together with those of other trains similarly constituted, into fresh trains for conveyance to the various depots. Again, a station of moderate size may collect goods destined for a great variety of places but not in sufficient quantities to compose a full train-load for any of them, and then it becomes impossible, except at the cost of uneconomical working, to avoid despatching trains which contain wagons intended for many diverse destina- tions. For some distance these wagons will all travel over the same line, but sooner or later they will reach a junction-point where their ways will diverge and where they must be separated. At this point trains of wagons similarly destined for different places will be arriving from other lines, and hence the necessity will arise of collecting together from all the trains all the wagons which are travelling to the same place.

The problem may be illustrated diagrammatically as follows (fig. 15): A may be supposed to be a junction outside a large

t

t f

FlG. 15. — Diagram to illustrate use of Shunting Yards.

seaport where branches from docks a, b, c and d converge, and where the main line also divides into three,' going to B, C and D respectively. A train from a will contain some wagons for B, some for C and some for D, as will also the trains from a, b, c and d. At A therefore it becomes necessary to disentangle and group together all the wagons that are intended for B, all that are intended for C, and all that are intended for D. Even that is not the whole of the problem. Between A and B, A and C, and A and D, there may be a string of stations, p, q, r, s, &c, all receiving goods from a, b, c

and d, and it would manifestly be inconvenient and wasteful of time and trouble if the trains serving those intermediate stations were made up with, say, six wagons from a to p next the engine, five from b to p at the middle, and four from c to p near the end. Hence at A the trucks from a, b, c and d must not only be sorted according as they have to travel along A B, A C, or A D, but also must be marshalled into trains in the order of the stations along those lines. Conversely, trains arriving at A from B, C and D must be broken up and remade in order to distribute their wagons to the different dock branches.

To enable the wagons to be shunted into the desired order yards containing a large number of sidings are constructed at important junction points like A. Such a yard consists essentially of a group or groups of sidings, equal in length at least to the longest train run on the line, branching out from a single main track and often agEtin converging to a single track at the other end; the precise design, however, varies with the amount and character of .the work that has to be done, with the configuration of the ground, and also with the mode of shunting adopted. The oldest and commonest method of shunting is that known as " push-and-pull," or in America as " link-and-pin " or " tail " shunting. An engine coupled to a batch of wagons runs one or more of them down one siding, leaves them there, then returns back with the remainder clear of the points where the sidings diverge, runs one or more others down another siding, and so on till they are all disposed of. The same operation is repeated with fresh batches of wagons, until the sidings contain a number of trains, each intended, it may be supposed, for a particulai- town or district. In some cases nothing more is required than to attach an engine and brake-van (" caboose ") &nd despatch the train; but if, as will happen in others, a further rearrangement of

the wagons is necessary to get them into station order this is effected on the same principle.

Push-and-pull shunting is simple, but it is also slow, and there- fore efforts have been made at busy yards where great numbers of trains are dealt with to introduce more expeditious methods. One of these, employed in America, is known as " poling." Alongside the tracks on which stand the trains that are to be broken up and from which the sidings diverge subsidiary tracks are provided for the use of the shunting engines. These engines have a pole pro- jecting horizontally in front of them, or are attached to a " pole- car "

having such a pole. The method of working is for the pole to be swung out behind a number of wagons; one engine js then started and with' its pole pushes the wagons in front of it until their speed is sufficient to carry them over the points, where they are diverted into any desired siding. It then runs back to the train to repeat the operation, but while it is doing so a second engine similarly equipped has poled away a batch of wagons on the opposite side. In this way a train is distributed with great rapidity, especially if the points giving access to the different sidings are worked by power so that they can be quickly manipulated.

Another method, which was introduced into America from Europe about 1890, is that of the summit or " hump." The wagons are pushed by an engine at their rear up one slope of an artificial mound, and as they run down the other slope by gravity are switched into the desired siding. Sometimes a site can be found for the sorting sidings where the natural slope of the ground is sufficiently steep to make the wagons run down of themselves. One of the earliest and best known of such " gravity " yards is that at Edgehill, near Liverpool, on the London & North-Western railway, which was established in 1873. Here, at the highest level, there are a number of " upper reception lines " converging to a single line which leads to a group of " sorting sidings " at a lower level. These in turn converge to a pair of single lines which lead to two groups of marshall- ing sidings, called " gridirons " from their shape, and these again converge to single lines leading to " lower reception and departure lines" at the bottom of the slope. The wagons from the upper reception lines are sorted into trains on the sorting sidings, and then, in the gridirons, are arranged in the appropriate order and marshalled ready to be sent off from the departure lines. (H. M. R.)

Locomotive Power The term " power " is used in technical sense to mean the rafe at which work is done against a resistance, and is measured in units of energy expended per unit of time. The unit of power commonly used by engineers is the horse-power, and this unit corresponds to a rate of working of 550 foot-lb of work per second. The problems arising out of the special consideration of the power required to propel a railway train against the resistances opposing its motion, the way the power is applied to trains, the agent by means of which the power is exerted, are conveniently grouped together under the general heading of Locomotive Power. There are certain fundamental relations common to all tractive problems, and these are briefly considered in §§ 1 and 2, after which the article refers particularly to steam locomotives, although §§ 4, s, 7, 8, 9, and 10 have a general application to all modes of traction.

§ 1. Fundamental Relations. — The resistance against which a train is moved along a railway is overcome by means of energy obtained from the

combustion of fuel, or in some few cases by energy obtained from a waterfall. If the total resist- ance against which the train is maintained in motion with an instantaneous velocity of V feet per second is R, the rate at which energy is expended in moving the train is represented by the product RV, and this must be the rate at which energy is supplied to the train after deducting all losses due to transmission from the source of power. Thus if R is equal to 10,000 ft when the velocity is 44 ft. per second, equivalent to 30 m. per hour, the rate of working against the resistance is 440,000 foot-lb per second.

In whatever form energy is produced and distributed to the train it ultimately appears as mechanical energy applied to turn one or more axles against the resistance to their rotation imposed by the weight on the wheels and the motion of the train.

The rate at which work is done on a particular axle is measured by the product Tu>, where T is the torque or turning moment exerted on the axle by the motor or mechanism applied to it for this purpose, and u is the angular velocity of the axle in radians per second. Hence if all the energy supplied to the train is utilized at one axle there is the fundamental relation

To> = RV (1)

Continuing the above arithmetical illustration, if the wheels to the axle of which the torque is applied are 4 ft. diameter, 01=44/2—22 radians per second, and therefore T = 440,000/22 = 20,000 lb ft. If the energy supplied is distributed between several axles the relation becomes

Ti« 1 -fT2w 2 -r'Tsa)3 . . . =RV (2)

where Ti, T 2 , T 3 , &c. are the torques on the axles whose respective angular velocities are oji,«2, <->3, &c.

The fundamental condition governing the design of all tractive machinery is that the wheels belonging to the axles to which torque is applied shall roll along the rails without slipping, and exert a tractive force on the train.

The fundamental relation between the applied torque and the tractive force F will be understood from fig. 16, which shows in a diagrammatic form a wheel and axle connected to the framework of a vehicle, in the way adopted for railway trains. The journal of the axle A, is carried in a bear- ing or axle-box B, which is free to move vertically in the wide vertical slot G, formed in the frame and called generally " the horns," under the control of the spring. The weight Wi carried by the part of the frame supported by the wheel (whose diameter is D) is transmitted first to the pins Pi, P 2 , which are fixed to the frame, and then to the spring links Li, L 2 ,

Fig. 16.-

■*Wheel and Connexion to Frame, which are jointed at their respective ends to the spring S, the centre of which rests on the axle-box.*

Let a couple be applied to the axle tending to turn it in the direc- tion shown by the arrow. This couple, we may assume, will be equally divided between the two wheels, so that the torque acting on each will be JT. Assuming the wheels to roll along the rail without slipping, this couple will be equivalent to the couple formed by the equal opposite and parallel forces, Fi acting in the direction shown, from the axle-box on to the frame, and Fi=ju0, acting along the rail. The torque corresponding to this couple is Fi X 5D = J^WiD, and hence follows the fundamental relation, |T = 5F1D = fjitWiD, or if W now represents the weight supported by the axle, F will be the tractive force exerted on the frame by the two axle-boxes to propel the vehicle, and the more convenient relation is established,

T = iFD=4 M WD _ (3)

If T has a greater value than this relation justifies the wheels will slip. F is called the " tractive force " at the rail. The coefficient of friction ,u is a variable quantity depending upon the state of the rails, but is usually taken to be '£. This is the fundamental equa- tion between the forces acting, however the torque may be applied. Multiplying through by a we obtain

Ta> = !Fo>D = iMW«D = RV (4)

This is a fundamental energy equation for any form of locomotive in which there is only one driving-axle.

The couple T is necessarily accompanied by an equal and opposite couple acting on the frame, which couple endeavours to turn the frame in the opposite direction to that in which the axle rotates. The practical effect of this opposite couple is slightly to tilt the frame and thus to redistribute slightly the weights, on the wheels carrying the vehicle.

If there are several driving-axles in a train, the product To> must be estimated for each separately; then the sum of the products will be equal to RV. In equation (4) there is a fixed relation between u, V and D given by the expression

« = 2V/D _ _ (5)

Here D is in feet, V in feet per second and w in radians per second. If the speed is given in miles per hour, S say,

V = i-466S (6)

The revolutions of the axle per second, n, are connected with the radians turned through per second by the relation

» = u/27r = aj/6-38 (7)

§ 2. Methods of Applying Locomotive Power. — By locomotive power is to be understood the provision of power to maintain the rates of working on the driving-axles of a train indicated by the relation (4) . The most usual way of providing this power is by the combustion of coal in the fire-box of a boiler and the utilization of the steam produced in a steam-engine, both boiler and engine being carried on a frame mounted on wheels in such a way that the crank-shaft of the steam-engine becomes the driving-axle of the train. From equation (3) it is clear that the wheels of the driving-axle must be heavily loaded in order that F may have a value sufficiently great to propel the train. The maximum weight which one pair of wheels are usually allowed to carry on a first-class track is from 18 to 20 tons. If a larger

value of the tractive force is required than this provides for, namely from 4 to 5 tons, the driving-wheels are coupled to one or more pairs of heavily loaded wheels, forming a class of what are called ” coupled engines ” in contradistinction to the ” single engine ” with a single pair of loaded driving-wheels. Mechanical energy may be developed in bulk at a central station conveniently situated with regard to a coal-field or a waterfall, and after transformation by means of electric generators into electric energy it may be transmitted to the locomotive and then by means of electric motors be retransformed into mechanical energy at the axles to which the motors are applied. Every axle of an electric locomotive may thus be subjected to a torque, and the large weight which must be put on one pair of wheels in order to secure sufficient adhesion when all the driving is done from one axle may be distributed through as many pairs of wheels as desired. In fact, there need be no specially differentiated locomotive at all. Motors may be applied to every axle in the train, and their individual torques adjusted to values suitable to the weights naturally carried by the several axles. Such an arrangement would be ideally perfect from the point of view of the permanent-way engineer, because it would then be possible to distribute the whole of the load uniformly between the wheels. This perfection, of

distribution is practi- cally attained in present-day practice by the multiple control system of operating an electric train, where motors are applied to a selected number of axles in the train, all of them being under the perfect control of the driver.

The fundamental difference between the two methods is that while the mechanical energy developed by a steam engine is in the first case applied directly to the driving-axle of the loco- motive, in the second case it is transformed into electrical energy, transmitted over relatively long distances, and retrans- formed into mechanical energy on the driving-axles of the train. In the first case all the driving is done on one or at most two axles," sufficient tractive force being obtained by coupling these axles when necessary to others carrying heavy loads. In the second case every axle in the train may be made a driving-axle if desired, in which case the locomotive as a separate machine disappears. In the second case, however, there are all the losses due to transmission from the central station to the train to be considered, as well as the cost of the transmitting apparatus itself. Ultimately the question resolves itself into one of com- mercial practicability. For suburban traffic with a service at a few minutes' interval and short distances between the stations electric traction has proved itself to be superior in many respects to the steam locomotive, but for main line traffic and long dis- tance runs it has not yet been demonstrated that it is com- mercially feasible, though it is known to be practically possible. For the methods of electric traction see Traction; the remainder of the present article will be devoted to the steam locomotive.

§ 3. General Efficiency of Steam Locomotive. — One pound of good Welsh coal properly burned in the fire-box of a locomotive yields about 15,000 British thermal units of heat at a temperature high enough to enable from 50 to 80% to flow across the boiler-heating surface to the water, the rest escaping up the chimney with the furnace gases. The steam produced in consequence of this heat transference from the furnace gas to the water carries heat to the cylinder, where 7 to 11% is transformed into mechanical energy, the remainder passing away up the chimney with the exhaust steam. The average value of the product of these percentages, namely o-65Xo-oo, = o-o6 say, may be used to investigate generally the working of a locomotive; the actual value could only be deter- mined by experiment in any particular case. With this assumption, 0-06 is the fraction of the heat energy of the coal which is utilized in the engine cylinders as mechanical work; that is to say, of the 15,000 B.Th.U. produced by the combustion of I lb of coal, 15,000X0-06 = 900 only are available for tractive purposes.

Coals vary much in calorific value, some producing only 12,000 B.Th.U. per ft when burnt, whilst 15,500 is obtained from the best Welsh coals. Let

E represent the pounds of coal burnt per hour in the fire-box of a locomotive, and let c be the calorific value in B.Th.U. per ft; then the mechanical energy available in foot- pounds per hour is approximately 0-06 X 778 X Ec, and this expressed in horse-power units gives

IH p = o J p6X778XE £ =

1 ,980,000. ˆ

A " perfect engine " receiving and rejecting steam at the same

temperatures as the actual engine of the locomotive, would develop about twice this power, say 1400 I.H.P. This figure represents the ideal but unattainable standard of performance. This question of the standard engine of comparison, and the engine efficiency is considered in § 15 below, and the boiler efficiency in § II below.

The indicated horse-power developed by a cylinder may always be ascertained from an indicator diagram and observations of the speed. Let p be the mean pressure in pounds per square inch, cal- culated from an indicator diagram taken from a particular cylinder when the speed of the crank-shaft is n revolutions per second. Also let / be the length of the stroke in feet and let a be the area of one cylinder in square inches, then, assuming two cylinders of equal size,

I.H.P. =2ˆ/550 (8)

The I.H.P. at any instant is equal to the total rate at which energy is required to overcome the tractive resistance R. The horse- power available at the driving-axle, conveniently called the brake horse-power, is from 20 to 30 % less than the indicated horse-power, and the ratio, B.H.P./I.H.P. =e, is called the mechanical efficiency of the steam engine. The relation between the b.h.p. and the torque on the driving-axle is

550 B.H.P. =T

It is usual with steam locomotives to regard the resistance R as including the frictional resistances between the cylinders and the driving-axle, so that the rate at which energy is expended in moving the train is expressed either by the product RV, or by the value of the indicated horse-power, the relation between them being

550 I.H.P. =RV (10)

or in terms of the torque

550 I.H.P. Xe = RVe=T« (11)

The individual factors of the product RV may have any value consistent with equation (10) and with certain practical conditions, so that for a given value of the I.H.P. R must decrease if V increases. Thus if the maximum horse-power which a locomotive can develop is 1000, the tractive resistance R, at 60 m. per hour (= 88 ft. per second) is R = (iooo X55o)/88 = 6250 ft. If, however, the speed is reduced to 1 5 m. per hour (= 22 ft. per second) R increases to 25,000 lb. Thus an engine working at maximum power may be used to haul a relatively light load at a high speed or a heavy load at a slow speed.

§ 4. Analysis of Train Resistance. — Train resistance may be analysed into the following components: —

(1) Journal friction and friction of engine machinery.

(2) Wind resistance.

(3) Resistance due to gradients, represented by R,.

(4) Resistance due to miscellaneous causes.

(5) Resistance due to acceleration, represented by R„.

(6) Resistance due to curves.

The sum of all these components of resistance is at any instant equal to the resistance represented by R. At a uniform speed on a level straight road 3, 5 and 6 are zero. The total resistance is conveniently divided into two parts: (1) the resistance due to the vehicles hauled by the engine, represented by R„; (2) the resistance of the engine and tender represented by R e . In each of these two cases the resistance can of course be analysed into the six components set out in the above list.

§ 5. Vehicle Resistance and Draw-bar Pull. — The power of the engine is applied to the vehicles through the draw-bar, so that the draw-bar pull is a measure of the vehicle resistance. . The draw-bar pull for a given load is a function of the speed of the train, and numerous experiments have been made to find the relation connecting' the pull with the speed under various conditions. The usual way of experimenting is to put a dynamometer car (see Dynamometer) between the engine and the train. This car is equipped with apparatus by means of which a continuous record of the draw-bar pull is obtained on a distance base; time indications are also made on the diagram from which the speed at any instant can be deduced. The pull recorded on the diagram includes the resistances due to acceleration and to

the gradient on which the train is moving. It is usual to subtract these resistances from the observed pull, so as to obtain the draw-bar pull reduced to what it would be at a uniform speed on the level. This corrected pull is then divided by the weight of the vehicles hauled, in which must be included the weight of the dynamometer car, and the quotient gives the resistance per ton of load hauled at a certain uniform speed on a straight and level road. A series of experiments were made by J. A. F. Aspinall on the Lancashire & Yorkshire railway to ascertain the resistance of trains of bogie passenger carriages of different lengths at varying speeds, and the results are recorded in a paper, " Train Resistance," Proc. Inst. C.E. (1901), vol. 147. Aspinall's results are expressed by the formula

ˆ 2 -5 + 5o-8 + o S 02 7 8,L _ (I2)

where r„ is the resistance in pounds per ton, S is the speed in miles per hour, and L is the length of the train in feet measured over the

carriage bodies. The two following expressions are given in the Bulletin of the International Railway Congress (vol. xii. p. 1275), by Barbier, for some experiments made on the Northern railway of France with a train of 157 tons mean weight; they are valid between 37 and 77 m. per hour: —

i-65S(i-6iS + 5Q)

r„ = 3-58 + -

for 4-wheel coaches, (13)

„ , i-64S(i-6iS + io) , , . ,

»"» = 3-58H lnnn ■ for bogie coache

(14)

(15)

The Baldwin Locomotive Company give the formulae

£ , °-56S

and

r„ = l-68 + o-224S for speeds from 47 to 77 m. per hour. (16) All the above formulae refer to carriage stock. The resistance of goods wagons has not been so systematically investigated. In the paper above quoted Aspinall cites a case where the resistance of a train of empty' wagons 1830 ft. long was 18-33 ft per ton at a speed of 26 m. per hour, and a train of full wagons 1045 ft. long gave only 9-12 lb per ton at a speed of 29 m. per hour. The resistance found from the above expressions includes the components I, 2 and 4 of § 4. The resistance caused by the wind is very variable, and in extreme cases may double the resistance found from the formulae. A side wind causes excessive flange friction on the leeward side of the train, and increases the tractive resistances therefore very considerably, even though its velocity be relatively moderate. The curves corresponding to the above expressions are plotted in fig. 17, four values of L being taken for formula (12) corresponding to trains of 5, 10, 15 and 20 bogie carriages.

The resistance at starting is greater than the running resistance at moderate speeds. From Aspinall's experiments it appears to be about 17 lb per ton, and this value is plotted on the diagram.

The resistance to motion round a curve has not been so systematic- ally studied that any definite rule can be formulated applicable to all classes of rolling stock and all radii of curves. A general result could not be obtained, even from a large number of experiments, because the resistance round curves depends upon so many variable factors. In some cases the gauge is laid a little wider than the standard, and there are varying amounts of superelevation of the outer rail; but the most formidable factor in the production of re- sistance is the guard-rail, which is sometimes put in with the object of guiding the wheel which runs on the inner rail of the curve on the inside of the flange.

§ 6. Engine Resistance. — From experiments made on the North- Eastern railway (see a paper by W. H. Smith on " Express Loco- motive Engines," Proc. Inst. Mech. Eng., October 1898), it appeared that the engine resistance was about 35 % of the total resistance, and in the train-resistance experiments on the Lancashire & Yorkshire railway quoted above the engine resistance was also about 35 % of the total resistance, thus confirming the North-Eastern railway results. Barbier (loc. cit.) gives as the formula for the engine resistance

»-.-8-5i-r-3-24S(i-6iS-r-3o)/iooo (17)

where S is the speed in miles per hour. This formula is valid between speeds of 37 and 77 m. per hour, and was obtained in connexion with the experiments previously quoted on the Northern railway of France with an

engine and tender weighing about 83 tons. Barbier's formula is plotted in fig. 17, together with a curve expressing generally the results of some early experiments on the Great Western railway carried out by Sir D. Gooch. The extension of the Barbier curve beyond the above limits in fig. 17 gives values which must be regarded as only very approximate.

Fig. 17.

$ 7. Rate at which work is done against the resistances given by the curves in fig. 17. — When the weight of the engine and tender and

the weight of the vehicles are respectively given, the rate at which work must be done in the engine cylinders in order to maintain the train in motion at a stated speed can be computed by the aid of the curves plotted in fig. 17. Thus let an engine and tender weighing 80 tons haul vehicles weighing 200 tons at a uniform speed on the level of 40 m. per hour. As given by the Barbier curves in fig. 17, the engine resistance at 40 m. per hour is 20 lb per ton, and the vehicle resistance 8-5 lb per ton at the same speed. Hence

Engine resistance, R e = 80X20 =1600 lb

Vehicle resistance, R v = 200X8-5 = 1700 ,, j Train resistance, R = 3300 „

The speed, 40 m. per hour, is equal to 58-6 ft. per second; therefore the rate of working in foot-pounds per second is 3300X58-6, from which I.H.P. = (3300X58-6) /550 = 354. This is the horse-power, therefore, which must be developed in the cylinders to maintain the train in motion at a uniform speed of 40 m. per hour on a level straight road with the values of the resistances assumed.

§ 8. Rate at which work is done against a gradient. — Gradients are measured either by stating the number of feet horizontally, G say, in which the vertical rise is 1 ft., or by the vertical rise in 100 ft. measured horizontally expressed as a percentage, or by the number of feet rising vertically in a mile. Thus a gradient of I in 200 is the same as a half per cent, grade or a rise of 26-4 ft. per mile. The difference between the horizontal distance and the distance measured along the rail is so small that it is negligible in all practical calcula- tions. Hence if a train is travelling up the gradient at a speed of V ft. per second, the vertical rise per second is V/G ft. If Wi is the weight of the train in pounds, the rate of working against the gradient expressed in horse-power units is

H.P. = W!V/55oG. (18)

Assuming the data of the previous section, and in addition that the train is required to maintain a speed of 40 m. per hour up a gradient of 1 in 300, the extra horse-power required will be „ p _ 28oX224oX58-6

” 300X550 3 ”

This must be exerted in addition to the horse-power calculated in the previous section, so that the total indicated horse-power which must be developed in the cylinders is now 354 + 223 = 577. If the train is running down a gradient this horse-power is the rate at which gravity is working on the train, so that with the data of the previous section, on the assumption that the train is running down a gradient of 1 in 300, the horse-power required to maintain the speed would be 354 — 223 = 131.

§ 9. — Rate at which work is done against acceleration. — If Wi ‘ s the weight of the train in pounds and a the acceleration in feet per second, the force required to produce the acceleration is

. / = WWg. (19)

And if V is the average speed during the change of velocity implied by the uniform acceleration a, the rate at which work is done by this force is

JVˆWiVa/g (20)

or in horse-power units

H.P.-WiVa/55o _ (21)*

Assuming the data of § 7, suppose the train to change its speed from 40 to 41 m. per hour in 13 seconds. The average acceleration in feet per second is measured by the fraction

Change of speed in feet per sec. 60-07 — 58-6 Time occupied in the change — 13 — ‘ 3-

Therefore the horse-power which must be developed in the cylinders to effect this change of speed is from (21)

„ p . 280X2240X0-113X59 .,- 550X32 ~ 237 –

The rate of working is negative when the train is retarded; for instance, if the train had changed its speed from 41 to 40 m. per hour in 13 seconds, the rate at which work would have to be absorbed by the brake blocks would represent 237 H.P. This is lost in heat produced by the friction between the brake blocks and the wheels, though in some systems of electric

driving some of the energy stored in the train may be returned to the central station during retardation. The principal condition operating in the design of locomotives intended for local services with frequent stops is the degree of acceleration required, the aim of the designer being to produce an engine which shall be able to bring the train to its journey speed in the shortest time possible. For example, suppose it is required to start a train weighing 200 tons from, rest and bring it to a speed of 30 m. per hour in 30 seconds. The weight of the engine may be assumed in advance to be 80 tons. The acceleration, a, which may be supposed uniform, is I -465. The average velocity is 15 m. per hour, which is equal to 22 ft. per second; therefore the tractive force required is, from (19),

(280X2240X1 465ˆ32 = 28, 720 ft, and the corresponding horse-power which must be developed in the cylinders is, from (20), /V/550, and this is with / and V equal to the above values, 1 149. To obtain the tractive force the weight on the coupled wheels must be about five times this amount — that is.

64 tons ; and to obtain the horse-power the boiler will be one of the largest that can be built to the construction gauge. After accelera- tion to the journey speed of 30 m. per hour the horse-power required is reduced to about one-third of that required for acceleration alone. § 10. General expression for total rate of working. — Adding the various rates of working together

RV (W.r. + W,r,)V 2240WV 22 4 oWVg , ,

555 = I – H – Pl – 555 $_{550—T}$ 550g . K22)

where W« is weight of engine and tender in tons, W„ the weight of vehicles in tons, W the weight of train in tons = W.-|-W„, r, and r v the respective engine and vehicle resistances taken from the curves fig. 17 at a speed corresponding to the average speed during the acceleration a, G the gradient, g the acceleration due to gravity, and V the velocity of the train in feet per second. In this expression it is assumed that the acceleration is uniform, and this assumption is sufficiently accurate for any practical purpose to which the above formula would be applied in the ordinary working of a locomotive. If a is variable, then the formula must be applied in a series of steps, each step corresponding to a time interval over which the accelera- tion may be assumed uniform.

Dividing through by V and multiplying through by 550,

R = W,. + W„ ± ˆ ± ˆp, (23)

an expression giving the value of R the total tractive resistance. If the draw-bar pull is known to be R„, then applying the same principles to the vehicle alone which above are applied to the whole train,

total draw-bar pu ll = W,r, ± 2 -ˆ ± 2 -ˆˆ. (24)

This expression may be used to find r» when the total draw-bar pull is observed as well as the speed, the changes of speed and the gradient. The speed held to correspond with the resistance must be the mean speed during the change of speed. The best way of deducing r„ is to select portions of the dynamometer record where the speed is constant. Then a disappears from all the above expressions. These expressions indicate what frequent changes in the power are required as the train pursues its journey up and down gradients, against wind resistance, journal friction and perhaps the resistance of a badly laid track; and show how both the potential energy and kinetic energy of the train are continually changing: the first from a change in vertical position due to the gradients, the second from changes in speed. These consideratjpns also indicate what a difficult matter it is to find the exact rate of working against the resistances, because of the difficulty of securing conditions which eliminate the effect both of the gradient and of acceleration.

§ n. The Boiler. — Maximum Power. — The maximum power which can be developed by a locomotive depends upon the maximum rate of fuel combustion which can be maintained per square foot of grate. This maximum rate depends upon the kind of coal used, whether small, friable, bituminous or hard, upon the thickness of the fire, and upon the correct design and setting of the blast-pipe. A limit is reached to the rate of combustion when the draught becomes strong enough to carry heavy lighted sparks through the tubes and chimney. This, besides reducing the efficiency of the furnace, introduces the danger of fire to crops and buildings near the line. The maximum rate of combustion may be as much as 1 50 ft of coal per square foot of grate per hour, and in exceptional cases even a greater rate than this has been maintained. It is not economical to force the boiler to work at too high a rate, because it has been practically demonstrated that the boiler efficiency decreases after a certain point, as the rate of combustion increases. A few experimental results are set forth in Table XX., from which it will be seen that with a relatively low rate of combustion, a rate which denotes very light service, namely 28 lb of coal per square foot of grate per hour, the efficiency of the boiler is 82 %, which is as good a result as can be obtained with the best class of stationary boiler or marine

boiler even when using economizers.

The first group consists of experiments selected from the records of a large number made on the boiler of the locomotive belonging to the Purdue University, Indiana, U.S.A.

The second group consists of experiments made on a boiler be- longing to the Great Eastern Railway Company. The first one of the group was made on the boiler fixed in the locomotive yard at Strat- ford, and the two remaining experiments of the group were made while the engine was working a train between London and March.

The third group consists of experiments selected from the records of a series of trials made on the London & South-Western railway with an express locomotive.

§ 12. Draught. — One pound of coal requires about 20 ft) of air for its proper combustion in the fire-box of a locomotive, though this quantity of air diminishes as the rate of combustion increases.

For instance, an engine having a grate area of 30 sq. ft. and burning 100 lb of coal per square foot of grate per hour would

Table XX

Kind, and calorific value of coal.

Indiana block coal from the neigh- bourhood of Brazil. Esti-

mated calorific value, 13,000 B.Th.U. per lb

Nixon's Naviga- tion. Calorific value, 15,560 B.Th.U. per lb

Dry coal fired per square foot of grate per hour lb

Calorific

13.903

Calorific

12,840

value, value,

49 109 181

35-5 28-1

3i-7

Pounds of water eva- poratedper lb of coal from and at 212 F.

7-83 6-59 5-71

13

13-3

I3-I

Boiler effici- ency.

62-5 80-9

*11*15*

8-86

0-58 0-49 0-42

o-8o

0-82

o-8i

Reference.

077

o-66

Prof. Goss (Amer Soc of Mech. Eng., vol.

22, 1900).

" Experi- ments on SteamBoit- ers," Don- kin and Kennedy, (Engineer- ing, Lon- don, 1897).

Adams and Pettigrew (Proc. Inst. C.E., vol.

125).

require that 60,000 ft of air should be drawn through the furnace per hour

in order to burn the coal. This large quantity of air is forced through the furnace by means of the difference of pressure established between the external atmospheric pressure in the ash-pan and the pressure in the smoke-box.

Fig. 18. — Smoke-box, L. & N.W.R. four-coupled 6 ft. 6 in. passenger engine.

The exhaust steam passing from the engine through the blast- pipe and the chimney produces a diminution of pressure, or

partial vacuum, fn the smoke-box roughly proportional to the weight of steam discharged per unit of time. The difference of pressure between the outside air and the smoke-box gases may be measured by the difference of the water levels in the limbs of a U tube, one limb being in communication with the smoke- box, the other with the atmosphere. The difference of levels varies from i to as much as 10 in. in extreme cases. The draught corresponding to the smallest rate of combustion shown in Table XX. in Professor Goss's experiments, was 1-72 in. of water, and for the highest rate, namely 181, 7-48 in. of water. To get the best effect the area of the blast-nozzle must be properly proportioned to the size of the cylinders and be properly set with regard to the base of the chimney. The best proportions are found by trial in all cases.

Figs. 18 and 19 show two smoke-boxes typical of English practice. Fig. 18 is the smoke-box of the 6 ft. 6 in. six-coupled express passenger engines designed by G. Whale for the London & North-Western Railway Company in 1904, and fig. 19 shows the box of the four- Eoupled express passenger engine designed by J. Holden for the

Fig. 19. — Smoke-box and Spark Arrester, G.E.R. four-coupled express engine.

Great Eastern Railway Company. In' the case of the London & North-Western engine (fig. 18), the blast-pipe orifice B is placed at about the centre of the boiler barrel, and the exhaust steam is discharged straight into the trumpet -shaped end of the chimney, which is continued down inside the smoke-box. In fig. 19 the blast orifice B is set much lower, and the steam is discharged through a frustum of a cone set in the upper part of the smoke-box into the short chimney. Fig. 20 shows the standard proportions

recommended by the committee of the Railway Mas- ter Mechanics' Association on Exhaust Pipes and Steam Passages (Proc.Amer. Railway Master Mechanics' Assoc., 1906). ' According to the Report, for the best results both H and h should be made as great as practicable, and then d = o-2iD+oi6/i, b = 2d or o-5D, P = o-32D, /> = o-22D, L=o-6D or 0-gD, but not of intermediate values. This last relation is, however, not well established. For much detailed information regarding American smoke-box practice, reference may be made to Locomotive Sparks, by Professor W. F. M. Goss (London, 1902). The arrangements for arresting sparks in American practice and on the continent of Europe are somewhat elaborate. In

Fig. 20. — Smoke-box, American Railway Master Mechanics' Association.

English practice where a spark-arrester is put in it usually takes the form of a wire-netting dividing the smoke-box hori- zontally into two parts at a level just above the top row of tubes, or arranged to form a continuous connexion between the blast-pipe and the chimney.

Fig. 19 illustrates an arrangement designed by J. Holden. The heavy sparks are projected from the tubes in straight lines and are caught by the louvres L, L, L, and by them deflected downwards to the bottom of the smoke-box, where they collect in a heap in the space D round a tube which is essentially an ejector. At every blast a small quantity of steam is caught by the orifice O and led to the ejectors, one on each side, with the result that the ashes are blown out into the receptacles on each side of the engine, one of which is shown at E. The louvres I, I, I are placed to shield the central region occupied by the blast-pipe.

As the indicated horse-power of the engine increases, the weight of steam discharged increases, and the smoke-box vacuum is increased, thereby causing more air to flow through the furnace and increasing the rate of combustion. Thus the demand for more steam- is automatically responded to by the boiler. It is this close automatic interdependence of engine and boiler which makes the locomotive so extraordinarily well suited for the purpose of locomotive traction.

§ 13. The Steam Engine. — The steam engine of a locomotive has the general characteristics of a double-acting non-condensing engine (see Steam Engine). Distribution of steam is effected by a slide valve, sometimes fitted with a balancing device, and sometimes formed into a piston valve. All types of valves are with few exceptions operated by a link motion, generally of the Stephenson type, occasionally of the Allan type or the Gooch type, or with some form of radial gear as the Joy gear or the Walschaert gear, though the latter gear has characteristics which ally it

with the link motions. The Stephenson link motion is used almost universally in England and America, but it has graduajly been displaced by the Walschaert gear on the con- tinent of Europe, and to some extent in England by the Joy gear. The general characteristics of the distribution effected by these gears are similar. Each of them, besides being a reversing gear, is an expansion gear both in forward and back- ward running. The lead is variable in the Stephenson link motion, whilst in the Walschaert and the Joy gears it is con- stant. Illustrations of these gears are given in the article Steam Engine, and the complete distribution of steam for both forward and backward running is worked out for a typical example of each of them in Valves and Valve Gear Mechanisms by W. E. Dalby (London, 1906).

' § 14. Cylinder Dimensions. — Adhesion. — Tractive Force. — A locomotive must be designed to fulfil two conditions. First, it must be able to exert a tractive force sufficient to start the train under the worst conditions possible on the railway over which it is to operate — for instance, when the train is stopped by signal on a rising gradient where the track is curved and fitted with a guard-rail. Secondly, it must be able to maintain the train at a given speed against the total resistances of the level or up a gradient of given' inclination. These conditions are to a certain extent mutually antagonistic, since an engine designed to satisfy either condition independently of the other would be a different engine from that designed to make the best com- promise between them.

Equation (3), § 1 expresses the fundamental condition which must be satisfied when a locomotive is starting a train. The torque' exerted on the driving-axle by the steam engine just at starting may be that due to the full boiler pressure acting in the cylinders, but usually the weight on the coupled wheels is hardly sufficient to enable advantage to be taken of the full boiler pressure, and it has to be throttled down by the regulator to prevent slipping. Sand, driven between the wheel and the rail by a steam jet, used just at starting, increases the adhesion beyond the normal value and enables a larger pressure to be exerted on the piston than would otherwise be possible. When the train is started and is moving slowly, the torque acting on the driving-axle may be estimated as that due to about 85% of the full boiler pressure acting in the cylinders. The torque

due to the two cylinders is variable to a greater or less extent depending

upon the degree of expansion in the cylinders and the speed. The form of the torque curve, or crank effort curve, as it is sometimes called, is discussed in the article Steam Engine, and the torque curve corresponding to actual indicator diagrams taken from an express passenger engine travelling at a speed of 65 m. per hour is given in The Balancing of Engines by W. E. Dalby (London, 1906).

The plotting of the torque curve is laborious, but the average torque acting, which is all that is required for the purposes of this article, can be found quite simply, thus : — Let p be the mean effective pressure acting in one cylinder, o, the area of the cylinder, and /, the stroke. Then the work done during one revolution of the crank is 2pla per cylinder. Assuming that the mean pressure in the other cylinder is also p, the total work done per revolution is \pla. If T is the mean torque, the work done on the crank-axle per revolu- tion is 2tT. Hence assuming the mechanical efficiency of the

engine to bet, and substituting-d 2 for the area a,

2aT — /ˆplat = plTt&t, so that

T = ipdHe. But from § 1, T = $DF;

therefore F=pcPU/D (25)

F in this expression is twice the average magnitude of the equal and opposite forces constituting the couple for one driving-wheel illus- trated in fig. 16, one force of which acts to propel the train whilst the other is the value of the tangential frictional resistance between the wheel and the rail. This force F must not exceed the value juW or slipping will take place. Hence, if p is the maximum value of the mean effective pressure corresponding to about 85% of the boiler pressure,

*nW = pd*U/D (26)*

is an expression giving a relation between the total weight on the coupled wheels, their diameters and the size of the cylinder. The magnitude of F when p and e are put each equal to unity, is usually called the tractive force of the locomotive per pound of mean effective pressure in the cylinders. If p is the mean pressure at any speed the total tractive force which the engine is exerting is given by equation (25) above. The value of c is variable, but is between •7 and -8, and for approximate calculations may be taken equal to unity. In the following examples the value will be assumed unity.

These relations may be illustrated by an example. Let an engine have two cylinders each 19 in. diameter and 26 in. stroke. Let the boiler pressure be

175 lb per square inch. Taking 85% of this, the maximum mean effective pressure would be 149 lb per square inch. Further, let the diameter of the driving-wheels be 6 ft. 3 in. Then the tractive force is, from (25),

(i49Xi9 2 X2-i66)/6-25 = i8,6oolb = 8-3 tons. Assuming that the frictional resistance at the rails is given by J the weight on the wheels, the total weight on the driving-wheels necessary to secure sufficient adhesion to prevent slipping must be at least 8-3 X5 = 41 "5 tons. This would be distributed between three coupled axles giving an average of 1-38 tons per axle, though the distribu- tion might not in practice be uniform, a larger proportion of the weight falling on the driving-axle. If the starting resistance of the whole train be estimated at 16 lb per ton, this engine would be able to start 1-163 tons on the level, or about 400 tons on a gradient of I in 75, both these figures including the weight of the engine and tender, which would be about 100 tons.

The engine can only exert this large tractive force so long as the mean pressure is maintained at 149 lb per square inch. This high mean pressure cannot be maintained for long, because as the speed increases the demand for steam per unit of time increases, so that out-off must take place earlier and earlier in.the stroke, the limiting steady speed being attained when the rate at which steam is supplied to the cylinders is adjusted by the cut-off to be equal to the maximum rate at which the boiler can produce steam, which depends upon the maximum rate at which coal can be burnt per square foot of grate. If C is the number of pounds of coal burnt per square foot of grate per hour, the calorific value of which is c B.Th.U. per pound, the maximum indicated horse-power is given by the expression

I.H.P.maximum-ˆZZ§X,,

where A is the area of the grate in square feet, and ij is the combined efficiency of the engine and boiler. With the data of the previous example, and assuming in addition that the grate area is 24 sq. ft., that the rate of combustion is 150 lb of coal per square foot of grate per hour, that the calorific value is 14000, and finally that ij = o-o6, the maximum indicated horse-power which the engine might be expected to develop would be 006X 1 50X14000X24X778/1980000 — 1 190, corresponding to a mean effective pressure in the cylinders of 59-5 lb per square inch.

Assuming that the train is required to run at a speed of 60 m. per hour, that is 88 ft. per second, the total resistance R, which the engine can overcome at this speed, is by equation (10) R = (ii9oX55o)/88 = 7-40olb.

Thus although at a slow speed the engine can exert a tractive force of 18,600 lb, at 60 m. per hour, the tractive force falls to 7400 lb, and this

cannot be increased except by increasing the rate of com- bustion (neglecting any small changes due to a change in the efficiency tj). Knowing the magnitude of R, the draw-bar pull, and hence the- weight of vehicle the engine can haul at this speed, can be estimated if the resistances are known. Using the curves of fig. 17 it will be found that at 60 m. per hour the resistance of the engine and tender is 33 lb per ton, and the resistance of a train of bogie coaches about 14 lb per ton. Hence if W is the weight of the vehicles in tons, and the weight of the engine and tender be taken at 100 tons, the value of W can be found from the equation 1 4W +3300 = 7440, from which W = 296 tons. This is the load which the engine would take in ordinary weather. With exception- ally bad weather the load would have to be reduced or two engines would have to be employed, or an exceptionally high rate of com- bustion would have to be maintained in the fire-box.

It will be seen at once that with a tractive force of 7400 lb a weight of 37,000 lb (= 16-5 tons) would be enough to secure sufficient adhesion, and this could be easily carried on one axle. Hence for a level road the above load could be hauled at 60 m. per hour with a " single " engine. When the road leads the train up an incline, however, the tractive force must be increased, so that the need for coupled wheels soon arises if the road is at all a heavy one.

§15. Engine Efficiency. Combined Engine and Boiler Efficiency. — The combined engine and boiler efficiency has hitherto been taken to be 0-06; actual values of the boiler efficiencies are given in Table XX. Engine efficiency depends upon many variable factors, such as the cut-off, the piston speed, the initial temperature of the steam, the final tem- perature of the steam, the quality of the steam, the sizes, of the steam-pipes, ports and passages, the arrangement of the cylinders and its effect on condensation, the mechanical per- fection of the steam-distributing gear, the tightness of the piston, &c. A few values of the thermal efficiency obtained from experiments are given in Table XXI. in the second column, the first column being added to give some idea of the rate at which the engine was working when the data from which the efficiency has been deduced were observed. The corresponding boiler efficiencies are given in the third column of the table, when they are known, and the combined efficiencies in the fourth column. The figures in this column indicate that o- 06 is a good average value to work with.

Table XXI

a E

Indi-

Engine

Boiler

Com-

Boiler

1

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Pressure

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Effici-

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C.U3 ■£ O.

128

0-073

Mean

Deduced from

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205

0-075

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data given by

2 5″

222

0-080

128 but

Professor Goss

e

399

b-o88

throttled.

(Trans. Am.

Soc. Mec'h.

mean

Eng. vol. 14).

1

129

0-057

0-815

0-047

mean

about

120

Deduced from Kennedy and Donkin's trials ^(Engineering, London, 1887).

2

490

0-098

0-775

0-077

167

Deduced from

3

582

O-II

0-665

0-073

169

Adams and Pettigrew's trials (Proc. Inst. C.E.voi.

125)-

4

520

0-084

0-52

0-044

140

Deduced from

5

692

0-083

0-65

0-054

175

Smith's experi- ments (Proc.

6

558

0-074

0-69

0-051

175

7

603

0-086

0-63

0-054

175

Ins'f. Mec'h.

8

570 '

0-081

064

0-052

160

Eng. October

1898).

It is instructive to inquire info the limiting efficiency of an

engine consistent with the conditions under which it is working,

because in no case can the efficiency of a steam-engine exceed

I a certain value which depends upon the temperatures at which

8 4 8

RAILWAYS

[LOCOMOTIVE POWER

{■37outlofeet

*Indicator diagram corresponding to 1 Ib.ofeteam for the Rankine Engine 0/ Comparison when Initial pre**. is 190 lbs so. inch absolute, and exhaust press,!**

*%rJ4'7 lbs so. inch absolute Areetis Nfe, Eauieatent N&v fofS5 8.7V(l tonal to 1 «*W0 foot »*

t pounds

Fig. 21.

it receives and rejects heat. Thus a standard of comparison for every individual engine may be obtained with which to compare its actual performance. The standard of comparison generally adopted for this

purpose is obtained by calculating the efficiency of an engine working according t6 the Rankine cycle. That is to say, expansion is adiabatic and is continued down to the backpressure which in a non-condensing engine is 14-7 lb per square inch, since any back pressure above this amount is an imperfection which belongs to the actual engine. The back pressure is supposed to be uniform, and there is no compression.

Fig. 21 shows the pressure- volume diagram of the Rankine cycle for one pound of stteam where the initial pressure is 175 lb per

square inch by the gauge, equivalent to 190 lb per square inch absolute. In no case could an engine receiving steam at the tem- perature corre- sponding to this pressure and reject- ing heat at 212 F. convert more heat into work than is represented by the area of this diagram. The area of the diagram may be measured, but it is usually more convenient to calculate the number of B.Th.U. which the area represents from the following formula, which is expressed in terms of the absolute temperature Ti of the steam at the steam-pipe, and the temperature Ts =461 °-f- 212° = 673° absolute corresponding to the back pressure: —

Maximum available work) T , ™_, w . Li. ~ , Ti per pound of steam \ =U=(T-T 2) (i+ˆ-Tlog,ˆ.

With the initial pressure of, 190 lb per square inch absolute it will be found from a steam table that Ti = 83‘8° absolute. Using this and the temperature 673 in the expression, it will be found that U = l85 B.Th.U. per pound of steam. If fa is the water heat at the lower temperature, fa the water heat at the higher temperature, arid Li the latent heat at the higher temperature, the heat supply per pound of steam is equal to fa — fe+Li, which, from the steam tables, with the values of the temperatures given, is equal to 1013 B.Th.U. per pound. The thermal efficiency is therefore

185/1013=0-183.

That is to say, a perfect engine working between the limits of temperature assigned would convert only 18% of the total heat supply into work. This would be an ideal performance for an engine receiving steam at 190 lb initial pressure absolute, and reject- ing steam at the back pressure assumed above, and could never be attained in practice. When the initial pressure is 100 lb per square inch by the gauge the thermal efficiency drops to about nearly 15 % with the same back pressure. The way the thermal efficiency of the ideal engine increases with the pressure is exhibited in fig. 22 by the curve AB. The curve was drawn by calculating the thermal efficiency from the above expression for various values of the initial temperature, keeping the final temperature constant at 673 , and then plotting these efficiencies

against the corresponding values of the gauge pressures.

The actual thermal efficiencies observed in some of the cases cited in Table XXI. are plotted on the diagram, the reference numbers on which refer to the first column in the table. Thus the

“09 110 120 130 140 160 180 “170 180 180 200 210 230 230 240 250 260

Fig. 22. — Engine Efficiency Curves.

cross marked 3 in fig. 22 represents the thermal efficiency actually obtained in one of Adams and Pettigrew’s experiments, namely, o- 1 1 ,

the pressure in the steam-pipe being 167 lb per square inch. From the diagram it will be seen that the corresponding efficiency of the ideal engine is about o- 18. The efficiency ratio is therefore o- 11 jo- 18 =o-6l. That is to say, the engine actually utilized 61 % of the energy which it was possible to utilize by means of a perfect engine working with the same initial pressure against a back pressure equal to the atmosphere. Lines representing efficiency ratios of 0‘6, 0-5 and 0-4 are plotted on the diagram, so that the efficiency ratios corre- sponding to the various experiments plotted may be readily read off. The initial temperature of the standard engine of comparison must be the temperature of the steam taken in the steam-pipe. For further information regarding the standard engine of comparison see the article Steam Engine and also the ” Report of the Committee on the Thermal Efficiency of Steam Engines,” Proc.Inst. C.E. (1898). § 16. Piston Speed. — The expression for the indicated horse-power may be written

I.H-.P. =£a»/550 (27)

where v is the average piston speed in feet per second. For a stated value of the boiler pressure and the cut-off the mean pressure p is a function of the piston speed v. For the few cases where data are available — data, however, belonging to engines representing standard practice in their construction and in the design of cylinders and steam ports and passages — the law connecting p and v is approxi- mately linear and of the form

p = c-bv (28)

where b and c are constants. (See W. E. Dalby, ” The Economical Working of Locomotives,” Proc. Inst. C.E., 1905-6, ‘ vol. 164.) Substituting this value of p in (27)

I.H.P.-^|2 (29)

the form of which indicates .that there is a certain piston speed for which the I.H.P. is a maximum. In a particular case where the boiler pressure was maintained constant at 130 ft per square inch, and the cut-off was approximately 20% of the stroke, the values c = 55 and b = o-03i were deduced, from which it will be found that the value of the piston speed corresponding to the maximum horse- power is 887 ft. per minute. The data from which this result is deduced will be found in Professor Goss's paper quoted above in Table XXI. The point is further illustrated by some curves published in the American Engineer (June 1901) by G. R. Henderson recording the tests of a freight locomotive made on the Chicago & North- Western railway. Any modification of the design which will reduce the resistance to the flow of steam through the steam passages at high speeds will increase the piston speed for which the indicated horse-power is a maximum.

§ 17. Compound Locomotives. — The thermal efficiency of a steam-engine is in general increased by carrying out the expansion of the steam in two, three or even more stages in separate cylinders, notwithstanding the inevitable drop of pressure which must occur when the steam is transferred from one cylinder to the other during the process of expansion. Compound working permits of a greater range of expansion than is possible with a simple engine, and incidentally there is less range of pressure per cylinder, so that the pressures and temperatures per cylinder have not such a wide range of variation. In compound working the combined volumes of the low-pressure cylinders is a measure of the power of the engine, since this represents the final volume of the steam used per stroke. The Volume of the high-pressure cylinder may be varied within wide limits for the same low-pressure volume; the proportions adopted should, however, be such that there is an absence of excessive drop between them as the steam is transferred from one to the other. Compound locomotives have been built by various designers, but opinion is still uncertain whether any commercial economy is obtained by their use. The varying load against which a locomotive works, and the fact that a locomotive is non-condensirig, are factors which reduce the margin of possible economy within narrow limits. Coal-saying can be shown to the extent of about 14 % in some cases, but the saving depends upon the kind of service on which the engine is employed. The first true compound locomotive was constructed in 1876 from designs by A. M. Mallet, at the Creusot works in Bayonne. The first true compound locomotive, in England was constructed at Crewe works in 1878 by F. W. Webb. It was of the same type as Mallet's engine, and was made by simply bushing one cylinder of an ordinary two-cylinder simple engine, the bushed cylinder being the high-pressure and. the other cylinder the low-pressure cylinder. Webb evolved the< type of three- cylinder compound with which his name is associated in 1882.

There were two high-pressure cylinders placed outside the frames and driving on a trailing wheel, and one low-pressure cylinder placed between the frames and driving on a wheel placed in front of the driving-wheel belonging to the high- pressure cylinders. The steam connexions were such that the' two high-pressure cylinders were placed in parallel, both exhausting into the one low-pressure cylinder. The first engines of this class were provided with high-pressure cylinders, n in. diameter and 24 in. stroke, a low-pressure cylinder 26 in. diameter, 24 in. stroke, and driving-wheels 6 ft. 6 in. diameter; but subsequently these dimensions were varied. There were no coupling rods. A Complete account of Webb's engines will be found in a paper, " The Compound Principle applied j to Locomotives," by E. Worthington, Proc. Inst. C.E., 1889, vol. xcvi. Locomotives have to start with the full load on the engine, consequently an outstanding feature of every compound locomotive is the apparatus or mechanism added to enable the engine to start readily. Generally steam from the boiler is admitted direct to the low-pressure cylinder through a reducing valve, and valves and devices are used to prevent the steam so admitted acting as a back pressure on the high-pressure cylinder. In the Webb compound the driver opened communication from the high-pressure exhaust pipe to the blast-pipe, and at the same time opened a valve giving a supply of steam from the boiler direct to the low- pressure valve chest. T. W. Worsdell developed the design of the two-cylinder compound in England and built several, first for the Great Eastern railway and subsequently for the North-Eastern railway. The engines were built on the Worsdell and Von Borries plan, and were fitted with an ingenious starting- valve of an automatic character to overcome the difficulties of starting. Several compounds of a type introduced by W. M. Smith on the North-Eastern railway in 1898 have been built by the Midland railway. In these there are two low- pressure cylinders placed outside the frame, and one high- pressure cylinder placed between the frames. All cylinders drive on one crank-axle with three cranks at 120 . The driving- wheels are coupled to a pair of trailing wheels. A controlling v;dve enables the supply of steam to the low-pressure cylinders to be supplemented by boiler steam at a reduced pressure. For a description and illustrations of the details of the starting devices used in the Webb, Worsdell and Smith compounds, see an article, " The Development of the Compound Locomotive in England," by W. E. Dalby in the Engineering Magazine for September and October 1904. A famous type of com- pound locomotive developed on the continent of Europe is the four-cylinder De Glehn, some of which have been tried on the Great Western railway. There

are two high-pressure cylinders placed outside the frame, and two low-pressure placed inside the frames. The low-pressure cylinders drive on the leading crank-axle with cranks at right angles, the high- pressure cylinders driving on the trailing wheels. The wheels are coupled, but the feature of the engine is that the coupling- rods act merely to keep the high-pressure and low-pressure engines in phase with one another, very little demand being made upon them to transmit force except when one of the wheels begins to slip. In this arrangement the whole of the adhesive weight of the engine is used in the best possible manner, and the driving of the train is practically equally divided between two axles. The engine can be worked as a four-cylinder simple at the will of the driver. S. M. Vauclain introduced a Successful type of four-cylinder com- pound in America in 1889. A ' high- and low-pressure cylinder are cast together, and the piston-rods belonging to them are both coupled to one cross-head which is connected to the driving-wheels, these again being coupled to other wheels in the usual way. The distribution of steam to both cylinders is effected by one piston-valve operated by a link motion, so that there is considerable mechanical simplicity in the arrangement. Later Vauclain introduced the " balanced compound." In this engine the two piston-rods of one side are lot coupled to a common cross-head, but drive on separate

cranks at an angle of 180 , the pair of 180 cranks on each side being placed at right angles.

§18. The Balancing of Locomotives. — The unbalanced masses of a locomotive may be divided into two parts, namely, masses which revolve, as the crank-pins, the crank-cheeks, the coupling- rods, &c. ; and masses which reciprocate, made up of the piston, piston-rod, cross-head and a certain proportion of the con- necting-rod. The revolving masses are truly balanced by balance weights placed between the spokes of the wheels, or sometimes by prolonging the crank-webs and forming the pro- longation into balance weights. It is also the custom to balance a proportion of the reciprocating masses by balance weights placed between the spokes of the wheels, and the actual balance weight seen in a driving-wheel is the resultant of the separate weights required for the balancing of the revolving parts and the reciprocating parts. The component of a balance weight which is necessary to balance the reciprocating masses intro- duces a vertical unbalanced force which appears as a variation of pressure between the wheel and the rail, technically called the hammer-blow, the magnitude of which increases as the square of the speed of the train. In consequence of this action the compromise is usually followed of balancing only J of the reciprocating masses, thus keeping the hammer-blow within proper limits, and allowing 3 of the reciprocating masses to be unbalanced in the horizontal direction. It is not possible to do anything better with two-cylinder locomotives unless bob- weights be added, but with four-cylinder

four-crank engines complete balance is possible both in the vertical, and in the horizontal directions. When the four cranks are placed with two pairs at 180 , the pairs being at 90 , the forces are balanced without the introduction of a hammer-blow, but there remain large unbalanced couples, which if balanced by means of re- volving weights in the wheels again reintroduce the hammer- blow, and if left unbalanced tend to make the engine oscillate in a horizontal plane at high speed. The principles by means of which the magnitude and position of balance weights are worked out are given in the article Mechanics (Applied Mechanics), and the whole subject of locomotive balancing is exhaustively treated with numerous numerical examples in The Balancing of Engines by W. E. Dalby, London, 1906.

§19. Classification. — Locomotives may be classified primarily into " tender engines " and " tank engines," the water and fuel in the latter being carried on the engine proper, while in the former they are carried in a separate vehicle. A tender is generally mounted on six wheels, or in some cases on two bogies, and carries a larger supply of water and fuel than can be carried by tanks and the bunker of a tank engine. A tender, however, is so much dead- weight to be hauled, whilst the weight of the water and fuel in a tank engine contributes largely to the production of adhesion. A classification may also be made, according to the work for which engines are designed, into passenger engines, goods engines, and shunting or switching engines. A convenient way of describing any type of engine is by means of numerals indicating the number of wheels — (1) in the group of wheels supporting the leading or chimney end, (2) in the group of coupled wheels, and (3) in the group supporting the trailing end of the engine. In the case where either the leading or trailing group of small wheels is absent the numeral orhust be used in the series of three numbers used' in the description. Thus 4-4-2. represents a bogie engine with four-coupled wheels and one pair of trailing wheels, the well- known Atlantic type; 4-2-2 represents a bogie engine with a single pair of driving-wheels and a pair of trailing wheels; 0-4-4 represents an engine with four-coupled wheels and a trailing bogie, and 4-4-0 an engine with four-coupled wheels and a leading bogie. A general description of the chief peculiarities of various kinds of locomotives is given in the following analysis of types: —

(1) " Single-driver " type, 4-2-2 or 2-2-2. Still used by several railways in Great Britain for express passenger service, but going out of favour; it is also found in France, and less often in Germany, Italy, and elsewhere in Europe. It is generally designed as a 4-2-2 engine, but some old types are still running with only three axles,

the 2-2-2. , It is adapted for light, high-speed service, and noted for its simplicity, excellent riding qualities, low cost of maintenance, and high mechanical efficiency; but having limited adhesive weight it is unsuitable for starting and accelerating heavy trains.

(2) " Four-coupled " type, 4-4-0, with leading bogie truck. For many years this was practically the only one used in America for all traffic, and it is often spoken of as the " American " type. In America it is still the standard engine for passenger traffic, but for goods service it is now employed only on branch lines. It has been extensively introduced, both in Great Britain and the continent of Europe, for passenger traffic, and is now the most numerous and popular class. It is a safe, steady-running and trustworthy engine, with excellent distribution of weight, and it is susceptible of a wide range of adaptability in power requirements.

(3) " Four-coupled " three-axle type, 2-4-0. Used to some extent in France and Germany and considerably in England for passenger traffic of moderate weight. Engines of this class, with 78-inch driving wheels and the leading axle fitted with Webb's radial axle-box, for many years did excellent work on the London & North-Western railway. The famous engine " Charles Dickens " was one of this class. Built in 1882, it had by the 12th of September 1891 performed the feat ot running a million miles in 9 years 219 days, and it completed two million miles on the 5th of August 1902, having by that date run 5312 trips with express trains between London and Manchester.

(4) " Four-coupled " three-axle type, with trailing axle, 0-4-2. Used on several English lines for fast passenger traffic, and also on many European railways. The advantages claimed for it are : short coupling-rods, large and unlimited fire-box carried by a trailing axle, compactness, and great power for a given weight. Its critics, however, accuse it of lack of stability, and assert that the use of large leading wheels as drivers results in rigidity and produces destructive strains on the machinery and permanent way.

(5) " Four-coupled " type, with a leading bogie truck and a trailing axle, 4-4-2. It is used to a limited extent both in England and on the continent of Europe, and is rapidly increasing in favour in the United States, where it originated and is known as the " Atlantic " type. It has many advantages for heavy high-speed service, namely, large and well-proportioned boiler, practically unlimited grate area, fire-box of favourable proportions for firing, fairly low centre of gravity, short coupling-rods, and, finally, a

combination of the safe and smooth riding qualities of the four- coupled bogie type, with great steaming capacity and moderate axle loads. Occasionally a somewhat similar type is designed with the bogie under the fire-box and a single leading axle forward under the smoke-box— an arrangement in favour for suburban tank engines. In still rarer cases both a leading and a trailing bogie have been fitted.

(6) " Six-coupled " with bogie, or " Ten-wheel " type, 4-6-0. A powerful engine for heavy passenger and fast goods service. It is used to a limited extent both in Great Britain and on the continent of Europe, but is much more common in America. The design combines ample boiler capacity with large adhesive weight and moderate axle loads, but except on heavy gradients or for unusually large trains requiring engines of great adhesion, passenger traffic can be more efficiently and economically handled by four-coupled locomotives of the eight-wheel or Atlantic types.

(7) " Six-coupled " total-adhesion type (all the weight carried on the drivers), 0-6-0. This is the standard goods engine of Great Britain and the continent of Europe. In America the type is used only for shunting. It is a simple design of moderate boiler power.

(8) " Six-coupled " type, with a leading axle, 2-6-0. This is of American origin, and is there known as the " Mogul." It is used largely in America for goods traffic. In Europe it is in con- siderable favour for goods and passenger traffic on heavy gradients. The type is, however, less in favour than either the ten-wheel or the eight -coupled " Consolidation " for freight traffic.

(9) " Eight-coupled " total-adhesion type, 0-8-0; now found on a good many English railways, and common on the continent of Europe for heavy slow goods traffic. In America it is comparatively infrequent, as total-adhesion types are not in favour.

(10J "Eight-coupled" type, with a leading axle, 2-8-0. This originated in America, where it is termed the " Consolidation." In the United States it is the standard heavy slow-speed freight engine, and has been built of enormous size and weight. The type has been introduced in Europe, especially in Germany, where the advantages of a partial-adhesion type in increased stability and a larger boiler are becoming appreciated. Occasionally the American eight-coupled type has a bogie instead of a single leading axle (4-8-0), and is then termed a " Twelve- wheeler," or " Mastodon."

(11) "Ten-coupled" type, with a leading axle, 2-10-0. This originated in America, where it is known as the ".Decapod." It is used to a limited extent

for mountain-grade goods traffic, and has the advantage over the " Consolidation ' or eight-coupled type of lighter axle loads for a given tractive capacity.

In addition to the foregoing list, various special locomotive types have been developed for suburban service, where high rates of acceleration and frequent stops are required. These are generally tank engines, carrying their fuel and water on the engine proper.

Their boilers are of relatively large proportions for the train weight and average speed, and the driving wheels of small diameter, a large proportion of their total weight being " adhesive." Other special types are in limited use for " rack-railways," and operate either by engagement of gearing on the locomotive into a rack between the track rails, or by a combination of this and rail adhesion.

§ 20. Current Developments. — The demand of the present day is for engines of larger power both for passenger and goods service, and the problem is to design such engines within the limitations fixed by the 4 ft. 8£ in. gauge and the dimensions of the existing tunnels, arches, and other permanent works. The American engineer is more fortunately situated than his English brother with regard to the possibility of a solution, as will be seen from the comparative diagrams of construction gauges, figs. 23, 24, 25, 26. Fig. 23 shows the construction

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Figs. 23-26.

gauge for the London & North- Western railway, fig. 24 that for the Great Western 1 railway, fig. 25 that for the Great Eastern railway, whilst fig. 26 gives a general idea of the American gauge in a particular case, generally typical, however, of the American limits. In consequence of this increasing demand for power, higher boiler pressures are being used, in some cases 225 lb per sq. in. for a simple two-cylinder engine, and cylinder volume is slightly increased with the necessary accompani- ment of heavier loads on the coupled wheels to give the necessary adhesion. Both load and speed have increased so much in connexion with passenger trains that it is necessary to divide the weight required for adhesion between three-coupled axles, and the type of engine gradually coming into use in England for heavy express traffic is a six-coupled engine with a leading bogie, with wheels which would have been considered small a few years ago for the

speed at which the engine runs. The same remarks apply to goods engines. There is a general increase in cylinder power, boiler pressure and weight, and in consequence in the number of coupled axles. Not only are the load and speed increasing, but the distances run without a stop are increasing also, and to avoid increasing the size of the tenders, water-troughs, first instituted by J. Ramsbottom on the London & North-Western railway in 1859, have been laid in the tracks of the leading main lines of Great Britain. For local services where stoppages are frequent the demand is for engines capable of quickly

**At the beginning of 1908 the Great Western's loading gauge on its main lines was widened to 9 ft. 8 in. from a height of 5 ft. above rail level.*

Table XXII. — Comparative Data of Locomotives

851

No

Owning Railway.

" Rocket " (Liverpool &

Manchester) . Caledonian

London & South-Western Midland

Great Western .

Great Eastern . London & North- Western

Great Western .

London & South-Western .

Lancashire & Yorkshire . Great Northern .

North-Eastern .

Highland ….

Midland ….

Midland …. North-Eastern . Caledonian Lancashire & Yorkshire .

Great Western Chicago & Alton Atchison, Topeka & i

Sante Fe . . . 1

Central of Georgia . Pennsylvania Chicago, Rock Island & j

Pacific . . . j

Atchison, Topeka & j

Sante Fe . . . j

Great Northern, U.S.A. .

Erie Railroad

Argentine Great Western

Belgian State

Nord ….

Est

Austro-Hungarian State .

Nord .

Paris, Orleans

Italian State

Austrian State Prussian State

Type.

0-2-2 4-4-0 4-4-0 4-4-0 4-6-0

4-4-o

4-6-0

4-6-0

4-6-0

4-4-2 4-4-2 4-4-2 4-6-0 4-4-0 0-6-0 0-6-0 4-6-0 0-8-0

4-4-2 4-4-2 4-4-2

4-6-2 2-6-0

2-8-0

2-6-6-2

0-8-8-0 2-10-0 2-6-0

4-4-2 4-6-0

4-6-0 6-4-0

2-6-2

Cylinders.

Position.

Outside Inside Inside

Inside

Outside

Inside Inside

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5 2 inside) (2 outside

Inside Outside < 2 inside (2 outside Outside (2 L.-P. outside (1 H.-P. inside Inside Inside Outside Inside 5 2 H.-P . outside (2 L.-P. inside

Outside

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Outside

Outside

Outside

(Outside (Outside

$ Outside (Outside

(Outside (Outside Outside 2 outside J 2 inside 1 2 outside 2 inside H.-P. outside 2 L.-P. inside j 2 H.-P. inside (2 L.-P. outside

2 outside 2 outside

2 outside 2 inside 2 H.-P. on one) side j

2 L.-P. on other 2 H.-P. inside 2 L.-P. outside 2 H.-P. outside 2 L.-P. inside

Diam.

In.

8

ig 18J

19

195

Hi

19 19

I4l 19J

142 23‘6

19 32

21}

33

25 39

igj

134 ;

22

1378;

2165

I4‘56 i

24-80 ‘

1575 1 24-8 1

‘4’I7)

23-62)

I4’i7 I

23‘22)

1456 I 2480 J I4’i7 I 2204 J

Stroke.

In. 16}

26 26

26 30 26 26

26 24 26

26 26 26 26 26 26 26

25‘2

28 26 26 28 28

30

32 32

32 32

28 28 28

24

25‘2

2S‘2

28-34

268

25-19

2362

28-34 2362

Diam

of Driving. Wheels.

In.

56}

78

79

78J

80J

84 75

8oJ

72

87 78

85

69

84

63

55

60

54

805

80

79

68

62

63

Weight(Ton-22 4 otb).

Total

of

Engine.

51

5i

78

803

70 57

57‘2

73 75‘6

7I‘5

78

Tons.

4‘25

5i‘7o

4885

58-5

72

503 65‘75

756

73

58-75 58

73‘6

5885

59‘8

438

34‘4

6o‘4

5378

738

828

865

84-0

7I‘43

128-4

I58-S

183 795 82-0

66-2

62-4

77‘2

726 695 689

61 “o

Total

on Coupled Wheels

Tons.

3465

33‘45

38-75

54 ; 8

33‘20

46-75

554

Total

with

Tender.

31

99

39’IS

Il6‘2

43‘85

96‘95

39’ I

102-7

43‘8 34‘4 45‘9 53-78

84‘95 8205 984

«4‘45

38-5

T08-9

43‘7

155

4S‘3

160

50-7

62-09

141

183

708

52’o

325 48-7 67-4

53

I09S

42 – 6

106

42-9

107-9

29‘9

1079

Tons.

745 967

93’o

104-4

112

85-35 10276

iiS‘6

150 125

147

201

124-17

Grate Area.

Sq. Ft.

6 23 24 284

27

2I‘3

25

2605 26-75

29 26 28-4

2I”I

20‘0 21

26’OS

33‘3 335 49′ 5 468 30′ 2

49′ 7

SS-5

78

100

36

324

29-7

276

49‘5

32-3

33 ‘3 7 32-29

43’o

29-0

Total Heating Surface.

REMARKS.

Sq. Ft.

137.75 1600 1500

1557

1630 1990

2076

2727

2052 1442

1969

2050

1458

1412 1658 2018 2038

2755 2696 3215

3357

2431-3

2912

4796

5658

6108 2440 1672

2368

2155

2777

2660

2577 2217 2775

2S20

In Victoria and Albert Museum.South

Kensington. "Dunalastair III." (900) class. Fitted with cross- watertubes in fire-box giving 165 sq. ft. of heating surface. Belpaire fire-box. Pressure 220 lb per

sq. in. Fitted with superheater contributing 360 sq. ft. of heating surface to the total. Boilerpressure2ootbpersq.in. Fired with Holden's system of liquid

fuel. i Experiment class. Boiler pressure I 185 lb per sq. in. | 4-cylinder simple. Fitted with super- J heater contributing 269 sq. ft. of] heating surface to the total. Boiler I pressure 225 tb per sq. in. j 4-cylinder simple. Working pressure •j 175 lb per sq. in. Fitted with (. cross-tubes in fire-box. Belpaire fire-box. 990 class.

Steam pressure 200 lb per sq. in. I 3 cylinder compound. Working pres sure 220 lb per sq. in. 175 lb per sq. in.

Pressure 175 lb per sq. in.

De Glehn compound. Boiler pressure ! 227 tb per sq. in. . Balanced piston valves.

4-cylinder balanced compound. Vauclain type.

Vauclain type. Balanced valve.

Tandem compound.

Driving-wheels divided into two

groups of six-coupled wheels.

Leading group driven by L.-P.

cylinders, trailing group by H.-P.

[cylinders. Mallet type.

Mallet type.

5 ft. 6 in. gauge.

4-cylinder simple expansion. Pres- sure 205 lb per sq. in. , Serve tubes. Boiler pressure 235 lb (per sq. in.

Serve tubes.

I Fitted with superheater contributing (678 sq. ft. to the total, f Articulated tank engine on two motor I bogies mounted on a central girder, splayed at ends to take buffer . beams. H.-P. cylinders drive one 1 bogie, L.-P. the other, f Serve tubes. Boiler pressure 235 lb ^ per sq. in.

Serve tubes. Boiler pressure 220 lb per sq. in.

Boiler pressure 220 lb per sq. in. I Lentz double-beat equilibrium valves. <

Serve tubes. Boiler pressure 205 (lb per sq. in

accelerating the train to the journey speed. The nature of this problem is illustrated by the numerical example in § 9. When the service is frequent enough to give a good power factor continuously, the steam locomotive cannot compete with the electric motor for the purpose of quick acceleration, because the motors applied to the axles of a train may for a short time absorb power from the central station to an extent far in excess of anything which a locomotive boiler can supply.

With regard to the working of the locomotive, J. Holden developed the use of liquid fuel on the Great Eastern railway to a point beyond the experimental stage, and used it instead of coal with the engines running the heavy express traffic of the line, its continued use depending merely upon the relative market price of coal and oil. Compound locomotives have been tried, as stated in § 17, but the tendency in England is to revert to the simple engine for all classes of work, though on the continent of Europe and in America the compound

locomotive is largely adopted, and is doing excellent work. A current development is the application of superheaters to locomotives, and the results obtained with them are exceedingly promising.

The leading dimensions of a few locomotives typical of English American and European practice are given in Table XXII

(W. E. D.) Rolling Stock

The rolling stock of a railway comprises those vehicles by means of which it effects the transportation of persons and things over its lines. It may be divided into two classes, according as it is intended for passenger or for goods traffic.

Passenger Train Stock.— In the United Kingdom, as in Europe generally, the vehicles used on passenger trains include first- class carriages, second-class carriages, third-class carriages, composite carriages containing compartments for two or more classes of passengers, dining or restaurant carriages, sleeping

carriages, mail carriages or travelling post offices, luggage brake vans,

horse-boxes and carriage-trucks. Passenger carriages were originally modelled on the stage-coaches which they superseded, and they are often still referred to as " coaching stock." Early examples had bodies about 15 ft. long, 6J ft. wide and 4? ft. high; they weighed 3 or 4 tons, and were divided into three compartments holding six persons each, or eighteen in all.

The distinction into classes was made almost as soon as the railways began to carry passengers. Those who paid the highest fares (2jd. or 3d. a mile) were provided with covered vehicles, on the roofs of which their luggage was carried, and from the circumstance that they could book seats in advance came the term " booking office," still commonly applied to the office where tickets are issued. Those who travelled at the cheaper rates had at the beginning to be content with open carriages having little or no protection from the weather. Gradually, however, the accommodation improved, and by the middle of the 19th century second-class passengers had begun to enjoy " good glass windows and cushions on the seat," the fares they paid being about 2d. a mile. But though by an act of 1844 the railways were obliged to run at least one train a day over their lines, by which the fares did not exceed the " Parliamentary " rate of id. a mile, third-class passengers paying ijd. or iˆd. a mile had little consideration bestowed on their comfort, and were excluded from the fast trains till 1872, when the Midland railway admitted them to all its trains. Three years later that railway did away with second-class compartments and improved the third class to their level. This action had the effect, through the necessities of competition, of causing travellers in the cheaper classes to be better treated on other railways, and the condition of the third-class passenger was still further improved when Parliament, by the Cheap Trains Act of 1883, required the railways to provide " due and sufficient " train accommodation at fares not exceeding id. a mile. In the United Kingdom it is now possible to travel by every train, with very few exceptions, and in many cases to have the use of restaurant cars, for id. a mile or less, and the money obtained from third-class travellers forms by far the most important item in the revenue from passenger traffic. Since the Midland railway's action in 1875 several other English companies have abandoned second-class carriages either completely or in part, and in Scotland they are entirely unknown.

On the continent of Europe there are occasionally four classes, but though the local fares are often appreciably lower than in Great Britain, only first and second class, sometimes only first class, passengers are admitted to the fastest trains, for which in addition a considerable extra fare is often required. In Hungary and Russia a zone-tariff system is in operation, whereby the charge per mile decreases progressively with the length of the journey, the traveller paying according to the number of zones he has

passed through and not simply according to the distance traversed. In the United States there is in most cases nominally only one class, denominated first class, arid the average fare obtained by the railways is about id. per mile per passenger. But the extra charges levied for the use of parlour, sleeping and other special cars, of which some of the best trains are exclusively composed, in practice constitute a differentiation of class, besides making the real cost of travelling higher than the figures just given.

In America and other countries where distances are great and passengers have to spend several days continuously in a Restaur- tra i n sleeping and restaurant cars are almost a necessity, ant and and accordingly are to be found on most important sleeping through trains. Such cars in the United States are cars ‘ largely owned, not by the railway companies over

whose lines they run, but by the Pullman Car Company, which receives the extra fees paid by passengers for their use. Similarly in Europe they are often the property of the Inter- national Sleeping Car Company (Compagnie Internationale des Wagons-Lits) , and the supplementary fares required from those who travel in them add materially to the cost of a journey. In

the United Kingdom, where the distances are comparatively small, sleeping and dining cars must be regarded rather as luxuries; still even so, they are to be met with very frequently. The first dining car in England was run experimentally by the Great Northern railway between London and Leeds in 1879, and now such vehicles form a common feature on express trains, being available for all classes of passengers without extra charge beyond the amount payable for food. The introduction of corridor carriages, enabling passengers to walk right through the trains, greatly increased their usefulness. The first English sleeping cars made their appearance in 1873, but they were very inferior to the vehicles now employed. In the most approved type at the present time a passage runs along one side of the car, and off it open a number of transverse compartments or berths resembling ships’ cabins, mostly for one person only, and each having a lavatory of its own with cold, and sometimes hot, water laid on. A charge of 7s. 6d. or 10s., according to distance, is made for each bed, in addition to the first-class fare. In the United States the standard sleeping car has a central alley, and along the sides are two tiers of berths, arranged lengthwise with the car and screened off from the alley by curtains. To some extent cars divided into separate compart- ments are. also in use in that country. On the continent of Europe the typical sleeping car has transverse compartments with two berths, one placed above the other.

The first railway carriages in England had four wheels with two axles, and this construction is still largely employed, especially for short-distance trains. Later, when increased length became desirable, six wheels with c .;af,

r three axles came into use; vehicles of this kind were made about 30 ft. long, and contained four compartments for first-class passengers or five for second or third class, carrying in the latter case fifty persons. Their weight was in the neighbourhood of 10 tons. In both the four-wheeled and the six-wheeled types the axles were free to rise and fall on springs through a limited range, but not to turn with respect to the body of the carriage, though the middle axle of the six-wheeled coach was allowed a certain amount of lateral play. Thus the length of the body was limited, for to increase it involved an increase in the length of the rigid wheel base, which was incom- patible with smooth and safe running on curves. (On the continent of Europe, however, six-wheeled vehicles are to be found much longer than those employed in Great Britain.) This difficulty is avoided by providing the vehicles with four axles (or six in the case of the largest and heaviest), mounted in pairs (or threes) at each end in a bogie or swivel truck, which being pivoted can move relatively to the body and adapt itself to the curvature of the line. This construction was introduced into England from America about 1874, and has since been extensively adopted, being now indeed standard for main line stock. It soon led to an increase in the length of the vehicles; thus in 1885 the Midland railway had four-wheeled bogie third-class carriages with bodies 43 ft. long, holding seventy persons in seven compartments and weighing nearly 18 tons, and six- wheeled bogie composite carriages, 54 ft. long and weighing 23 tons, which included 3 first-class and 4 third-class com- partments, with a cupboard for luggage, and held 58 passengers. The next advance, introduced on' the Great Western railway in 1892, was the adoption of corridor carriages having a passage along one side, off which the compartments open, and connected to each other by vestibules, so that it is possible to pass from one end of the train to the other. This arrangement involves a further increase of length and weight. For instance, four- wheeled bogie third-class corridor carriages employed on the Midland railway at the beginning of the 20th century weighed nearly 25 tons, and had bodies measuring 50 ft.; yet they held only 36 passengers, because not only had the number of com- partments been reduced to six, as compared with seven in the somewhat shorter carriage of 1885, by the introduction of a lavatory at each end, but each compartment held only 6 persons, instead of 10, owing to the narrowing of its width by the corridor.

It -foil be seen from these particulars — which are typical of what has happened not only on other British railways, but also on those of other

countries — that much more space has to be provided and more weight hauled for each passenger than was formerly the case. Thus, on the Midland railway in 1885, each third-class passenger, supposing the carriage to have its full complement, was allowed 0-62 ft. of lineal length, and his proportion of the total weight was 5-7 cwt. Less than 20 years later the lineal length allowed each had increased to nearly 1-4 ft., and the weight to nearly 14 cwt. Passengers in sleeping . cars appropriate still more space and weight ; in Great Britain some of these cars, though 40 tons in weight and over 65 ft. in length, accommodate only n sleepers, each of whom thus occupies nearly 6 ft. of the length and requires over si to ns of dead weight to be hauled.

In America the long open double-bogie passenger cars, as originally introduced by Ross Winans on the Baltimore & Ohio railway, are universally in use. They are distinguished essentially from the British type of carriage by having in the centre of the body a longitudinal passage, about 2 ft. wide, which runs their whole length, and each car having communica- tion with those on either side of it, the conductor, and also vendors of books, papers and cigars, are enabled to pass right through the train. The cars are entered by steps at each end, and are provided with lavatories and a supply of iced water. The length is ordinarily about 50 ft., but sometimes 80 or 90 ft. The seats, holding two persons, are placed transversely on each side of the central passage, and have reversible backs, so that passengers can always sit facing the direction in which the train is travelling. Cars of this saloon type have been introduced into England for use on railways which have adopted electric traction, but owing to the narrower loading gauge of British railways it is not usually possible to seat four persons across the width of the car for its whole length, and at the ends' the seats have to be placed along the sides of the vehicle. A considerable amount of standing room is then available, and those who have to occupy it have been nicknamed " strap- hangers," from the fact that they steady themselves against the motion of the train by the aid of leather straps fixed from the roof for that purpose. Cars built almost entirely of steel, in which the proportion of wood is reduced to a minimum, are used on some electric railways, in order to diminish danger from fire, and the same mode of construction is also being adopted for the rolling stock of steam railways.

End doors opening on end platforms have always been characteristic of American passenger equipment. Their use secures a continuous passage-way through the train, but is attended with some discomfort and risk when the train is in motion. The opening of the doors was apt to cause a disagreeable draught through the car in cold weather, and passengers occasionally fell from the open platform, or were blown from it, when the train was moving. To remedy these defects vestibules were introduced, to

enclose the plat- form with a housing so arranged as to be continuous when the cars are made up into trains, and fitted with side doors for ingress and egress when the trains are standing. A second advantage of the vestibule developed in use, for it was found that the lateral swaying of the cars was diminished by the friction between the vestibule frames. The fundamental American vestibule patent, issued to H. H. Sessions of Chicago in November 1887, covered a housing in combination with a vertical metallic plate frame of the general contour of the central passage-way, which projected slightly beyond the line of the couplings and was held out by horizontal springs top and bottom, being connected with the platform housing by flexible connexions at the top and sides and by sliding plates below. A common form is illustrated in fig. 27. Subsequent improvements on the Sessions patent have resulted in a modified form of vestibule in which the housing is made the full width of the platform, though the contact plate and springs and the flexible connexions remain the same as before. The application of vestibules is practically limited to trains making long

journeys, as it is an obstruction to the free ingress and egress of passengers on local trains that make frequent stops.

Vesti- bules.

Fig. 27. — A " Vestibule " ; the " lazytongs " gate is folded away when two cars are coupled together, giving free passage from end to end of the train.

*In the United States the danger of the stoves that used to be employed for heating the interiors of the cars has been realized, and now the most common method is by Heating steam taken from the locomotive boiler and circulated *"d through the train in a line of piping, rendered con- lighting. tinuous between the cars by flexible coupling-hose. The same method is finding increased favour in Great Britain, to the supersession of the old hot-water footwarmers. These in their simplest form are cans filled with water, which is heated by immersing them in . a vessel containing boiling water. In some cases, however, they are filled with fused acetate of soda; this salt is solid when cold, but when the can containing it is heated by immersion in hot water it liquefies, and in the process absorbs heat which is given out again on the change of state back to solid. Such cans remain warm longer than those con- taining only hot water. On electric railways the trains are heated by electric heaters. As to lighting, the oil lamp has been largely displaced by gas and electricity. The former is often a rich oil-gas, stored in steel reservoirs under the coaches at a pressure of six or seven atmospheres, and passed through a reducing valve to the burners; these used to be of the ordinary fish-tail type, but inverted incandescent mantles are coming into increasing use. Gas has the disadvantage that in case of a collision its inflammability may assist any fire that may be started. Electric light is free*

from this drawback. The current required for it is generated by dynamos driven from the axles of the coaches. With " set " or " block" trains, that is, trains having their vehicles permanently coupled up, one dynamo may serve for the whole train, but usually a dynamo is provided for each coach, which is then an

independent unit complete in itself. It is necessary that the voltage of the current shall be constant whatever be the in- crease of the speed of the train, and therefore of the dynamo. In most of the systems that have been proposed this result is attained by electrical regulation; in one, however, a mech- anical method is adopted, the dynamo being so hung that it allows the driving belt to slip when the speed of the axle exceeds a certain limit, the armature thus being rotated at an approxim- ately constant speed. In all the systems accumulators are required to maintain the light when the train is at rest or is moving too slowly to generate current.

In all countries passenger trains must vary in weight accord- ing to the different services they have to perform; suburban Weight trains, for example, meant to hold as many pas- am/ sengers as possible, and travelling at low speeds, do not w weigh so much as long-distance expresses, which include dining and sleeping cars, and on which, from considerations of comfort, more space must be allowed each occupant. The speed at which the journey has to be completed is obviously another important factor, though the increased power of modern loco- motives permits trains to be heavier and at the same time to run as fast, and often faster, than was formerly possible, and in consequence the general tendency is towards increased weight as well as increased speed. An ordinary slow suburban train may weigh about ioo tons exclusive of the engine, and may be timed at an inclusive speed, from the beginning to the end of its journey, as low as 12 or 15 m. an hour; while usually the fastest express trains maintaining inclusive speeds of say 45 m. an hour, and made up of the heaviest and strongest rolling stock, do not much exceed 300 tons in any country, and are often less. The inclusive speed over a long journey is of course a different thing from the average running speed, on account of the time consumed in intermediate stops; the fewer the stops the more easily is the inclusive speed increased, — hence the advantage of the non-stop runs of 1 50 and 200 m. or more which are now performed by several railways in Great Britain, and on which average speeds of 54 or 55 m. per hour are attained between stopping-places. Over shorter distances*

still more rapid running , is occasionally arranged, and in Great Britain, France and the United States there are instances of trains scheduled to main- tain an average speed of 60 m. an hour or more between stops. Still higher speeds, up to 75 or even 80 m. an hour, are reached, and sustained for shorter or longer distances every day by express trains whose average speed between any two stopping- places is very much less. But isolated examples of high speeds do not give the traveller much information as to the train service at his disposal, for on the whole he is better off with a large number of trains all maintaining a good average of speed than with a service mostly consisting of poor trains, but leavened with one or two exceptionally fast ones. If both the number and the speed of the trains be taken into account, Great Britain is generally admitted still to remain well ahead of any other country.

Goods Trains. — The vehicles used for the transportation of goods are known as goods wagons or trucks in Great Britain, and as freight cars in America. The principal types to be found in the United Kingdom and on the continent of Europe are open wagons (the lading often protected from the weather by tarpaulin sheets), mineral wagons, covered or box wagons for cotton, grain, &c, sheep and cattle trucks, &c. The principal types of American freight cars are box cars, gondola cars, coal cars, stock cars, tank cars and refrigerator cars, with, as in other countries, various special cars for special purposes. Most of these terms explain themselves. The gondola or flat car corresponds to the European open wagons and is used to carry goods not liable to be injured by the weather; but in the United States the practice of covering the load with tarpaulins is unknown, and therefore the proportion of box cars is much greater than in Europe. The long hauls in the United States make it specially important that the cars should carry a load in both directions, and so box cars which have carried grain or merchandise one way are filled with wool,

coal, coke, ore, timber and other coarse articles for the Return journey. On this account it is common to put small end doors in American box cars, through which timber and rails may be loaded.

The fundamental difference between American freight cars and the goods wagons of Europe and other lands is in carrying capacity. In Great Britain the mineral trucks can ordinarily hold from 8 to 10 tons (long tons, 2240 lb), and the goods trucks rather less, though there are wagons in use holding 12 or 15 tons, and the specifications agreed to by the railway companies associated in the Railway Clearing House permit private wagon owners (who own about 45% of the wagon stock run on the railways of the United Kingdom) to build also wagons holding 20, 30, 40 and 56 tons. On the continent of Europe the average carrying capacity is rather higher; though wagons of less than 10 tons capacity are in use, many of those

originally rated at 10 tons have been rebuilt to hold 15, and the tendency is towards wagons of 15-20 tons as a standard, with others for special purposes holding 40 or 45 tons.

The majority of the wagons referred to above are compara- tively short, are carried on four wheels, and are often made of wood. American cars, on the other hand, have long bodies mounted on two swivelling bogie-trucks of four wheels each, and are commonly constructed of steel. About 1875 their average capacity differed little from that of British wagons of the present day, but by 1885 it had grown to 20 or 22 short tons (20001b) and now it is probably at least three times that of European wagons. For years the standard freight cars have held 60,000 lb and now many carry 80,000 lb or 100,000 lb; a few coal cars have even been built to contain 200,000 lb. This high carrying capacity has worked in several ways to reduce the cost of transportation. An ordinary British 10-ton wagon often weighs about 6 tons empty, and rarely much less than 5 tons; that is, the ratio of its possible paying load to its tare weight is at the best about 2 to 1. But an American car with a capacity of 100,000 lb may weigh only 40,000 ftt, and thus the ratio of its capacity to its tare weight is only about 5 to 2. • Hence less dead weight has to be hauled for each ton of paying load. In addition the increased size of the American freight car has diminished the interest on the first cost and the expenses of maintenance relatively to the work done; it has diminished to some extent the amount of track and yard room required to perform a unit of work; it has diminished journal and rolling friction relatively to the tons hauled, since these elements of train resistance grow rela- tively less as the load per wheel rises ; and finally, it has tended to reduce the labour costs as the train loads have become greater, because no more men are required to handle a heavy train than a light one.

It is sometimes argued that if these things are true for one country they must be true for another, and that in Great Britain, for example, the use of more capacious cars would bring down the cost of carriage. It may be pointed out, however, that the social and geographical conditions are different in the United Kingdom and the United States, and in each country the methods of carrying goods and passengers have developed in accordance with the requirements of those conditions. In the one country the population is dense, large towns are numerous and close to one another, the greatest distances to be travelled are short, and relatively a large part of the freight to be carried is merchandise and manufactured material consigned in small quantities. In the other country precisely the opposite conditions exist. Under the first set of conditions quickness and flexibility of service are relatively more important than under the second set. Goods therefore are collected and despatched promptly, and, to secure rapid transit, are packed in numerous wagons, each of which goes right

through to its destination, with the consequence that, so far as general merchandise is concerned, the weight carried in each is a quarter or less of its capacity. But if full loads cannot be arranged for small wagons, there is obviously no economy in introducing larger ones. On the other hand, where, as in America, the great

volume of freight is raw material and crude food-stuffs, and the distances are great, a low charge per unit of transportation is more important than any consideration such as quickness of delivery; therefore full car-loads of freight are massed into enormous trains, which run unbroken for distances of perhaps 1000 m. to a seaport or distributing centre.

The weight and speed of goods trains vary enormously according to local conditions, but the following figures, which Weight refer to traffic on the London & North-Western a " a railway between London and Rugby, may be taken

spee ' as representative of good English practice. Coal trains, excluding the engine, weigh up to 800 or 900 tons, and travel at from 18 to 22 m. an hour; ordinary goods or merchandise trains, weighing 430 tons, travel at from 25 to 30 m. an hour; and quick merchandise trains with limited loads of 300 tons make 35 to 40 m. an hour. In the United States mineral and grain trains, running at perhaps 12 m. an hour, may weigh up to about 4000 tons, and loads of 2000 tons are common. Merchandise trains run faster and carry less. Their speed must obviously depend greatly on topographical conditions. In the great continental basin there are long lines with easy gradients and curves, while in the Allegheny and Rocky Mountains the gradients are stiff, and the curves numerous and of short radius. Such trains, therefore, range in weight from 600 to 1800 tons or even more, and the journey speeds from terminus to terminus, including stops, vary from r5 to 30 m. an hour, the rate of running rising in favourable circumstances to 40 or even 60 m. an hour.

Couplers. — The means by which vehicles are joined together into trains are of two kinds — automatic and non-automatic, the difference between them being that with the former the impact of two vehicles one on the other is sufficient to couple them without any human intervention such as is required with the latter. The common form of non-automatic coupler, used in Great Britain for goods wagons, consists of a chain and hook; the chain

hangs loosely from a slot in the draw-bar, which terminates in a hook, and coupling is effected by slipping the chain of one vehicle over the hook of the next. For this opera- tion, or its reverse, a man has to go in between the wagons, unless, as in Great Britain, he is provided with a coupling-stick — that is, a pole having a peculiarly shaped hook at one end by which the chain can be caught and thrown on or off the draw- bar hook. This coupling gear is placed centrally between a pair of buffers; formerly these were often left " dead " — that is, consisted of solid prolongations of the frame of the vehicle, but now they are made to work against springs which take up the shocks that occur when the wagons are thrown violently against one another in shunting. In British practice the chains consist of three links, and are of such a length that when fully extended there is a space of a few inches between opposing buffers; this slack facilitates the starting of a heavy train, since the engine is able to start the wagons one by one and the weight of the train is not thrown on it all at once. For passenger trains and occasionally for fast goods trains screw couplings are substituted for the simple chains. In these the central bar which connects the two end links has screw threads cut upon it, and by means of a lever can be turned so as either to shorten the coupling and bring the vehicles together till their buffers are firmly pressed together, or to lengthen it to permit the end link to be lifted off the hook.

Another form of coupler, which used to be universal in the United States, though it has now been almost entirely super- seded by the automatic coupler, was the " link and pin," which differed fundamentally from the couplers commonly used in Europe, in the fact that it was a buffer as well as a coupler, no side buffers being fitted. In it the draw-bar, connected through a spring to the frame of the car, had at its outboard end a socket into which one end of a solid link was inserted and secured by a pin. The essential change from the link and pin to the auto- matic coupler is in the outboard end or head of the draw-bar. The socket that received the link is replaced by a hook, shown at A in fig. 28, which is usually called the knuckle. This hook

swings on the pivot B, and has an arm which extends backwards, practically at right angles with the working face of the hook,

Fig. 28. — Automatic Coupling for Freight Cars (U.S.A.).

in a cavity in the head, and engages with the locking-pin C. This locking-pin is lifted by a suitable lever which extends to one or both sides of the car; lifting it releases the knuckle, which is then free to swing open, disconnecting the two cars. The knuckle stands open until the coupling is pushed against another coupling, when the two hooks turn on their pivots to the position shown in fig. 28, and, the locking-pin dropping into place,

the couplers are made fast. This arrangement is only partly automatic, since it often happens that when two cars are brought together to couple the knuckles are closed and must be opened by hand. There are various contrivances by which this may be done by a man standing clear of the cars, but often he must go in between their ends to reach the knuckle.

This form of automatic coupler has now gained practically universal acceptance in the United States. To effect this result required many years of discussion and experiment. The Master Car Builders' Association, a great body of mechanical officers organized especially to being about improvement and uniformity in details of construction and operation, expressed its sense of the importance of " self-coupling " so far back as 1874, but no device of the kind that could be considered useful had then been invented. At that time a member of the Associa- tion referred to the disappearance of automatic couplers which had been introduced thirty or forty years before. This body pursued the subject with more or less diligence, and in 1884 laid down the principle that the automatic coupler should be one acting in a vertical plane — that is, the engaging faces should be free to move up and down within a considerable range, in order to provide for the differences in the height of cars. By the fixing of this principle the task of the inventor was considerably simplified. In 1887 a committee reported that the coupler question was the " knottiest mechanical problem that had ever been presented to the railroad," and over 4000 attempted solutions were on record in the United States Patent Office. The committee had not found one that did not possess grave disadvantages, but concluded that the " principle of contact of the surfaces of vertical surfaces embodied in the Janney coupler afforded the best connexion for cars on curves and tangents "; and in 1887 the Association recommended the adoption of a coupler of the Janney type, which, as developed later, is shown in fig. 28. The method of constructing the working faces of this coupler is shown in fig. 29. The principle was patented, but the company owning the patent undertook to permit its free use by railway companies which were members of the Master Car Builders' Association, and thus threw open the underlying principle to competition. From that time the numerous patents have had reference merely to details. Many different couplers of the Janney type are patented and made by different firms, but the tendency is to equip new cars with one of only four or five standard makes. The adoption of automatic couplers was stimulated in some degree by laws enacted by the various states and by the United States; and the Safety Appliance Act passed by Congress in 1893 made it unlawful for railways to permit to be hauled on their lines after the 1st of January 1898 any car used for interstate commerce that was not equipped with couplers which coupled automatically by impact, and which could be uncoupled without the necessity for men going in between the ends of the

cars. The limit was extended to the 1st of August 1900 by the Interstate Commerce Commission, which was given discretion in the matter.

Automatic couplers resembling the Janney are adopted in a few special cases in Great Britain and other European countries,

FlG. 29. — Development of the Working Faces of the Janney Coupler. The sides of the square are 6 in., and the centres AA are taken at 2 in. from the top and bottom of the square. The circles A' A', which are struck with 2-inch radius, define the first portion of the knuckle. The inner circle B has a radius of l§ in. From its intersection with A' A' arcs are struck cutting B in two points. These intersections determine the centres of the semi- circles CC which form the ends of the respective knuckles. These semicircles and the circles A' A' are joined by tangents and short arcs struck from the centre of the figure.

but the great majority of couplings remain non-automatic. It may be pointed out that the general employment of side buffers in Europe greatly complicates the problem of designing a satis- factory automatic coupling, while to do away with them and substitute the combined buffer-coupling, such as is used in the United States, would entail enormous difficulties in carrying on the traffic during the transition stage.

Brakes. — In the United States the Safety Appliance Act of 1893 also forbade the railways, after the 1st of January 1898, to run trains which did not contain a " sufficient number " of cars equipped with continuous brakes to enable the speed to be controlled from the engine. This law, however, did not serve in practice to secure so general a use of power brakes on freight trains as was thought desirable, and another act was passed in 1903 to give the Interstate Commerce Commission authority to prescribe what should be the minimum number of power-braked cars in each train. This minimum was at first fixed at 50%, but on and after the 1st of August 1906 it was raised to 75%, with the result that soon after that date practi- cally all the rolling stock of American railways, whether passenger or freight, was provided with compressed air brakes. In the United Kingdom the Regulation of Railways Act 1889 em- powered the Board of Trade to require all passenger trains, within a reasonable period, to be fitted with automatic con- tinuous brakes, and now all the passenger stock, with a few trifling exceptions, is provided with either compressed-air

or vacuum brakes (see Brake), and sometimes with both. But goods and mineral trains so fitted are rare, and the same is the case on the continent of Europe, where, however, such brakes are generally employed on passenger trains. (H. M. R.)

Intra-Urban Railways

The great concentration of population in cities during the 19th century brought into existence a class of railways to

which the name of intra-urban may be applied. Such meat° P ‘ li nes are primarily intended to supply quick means

of passenger communication within the limits of cities, and are to be distinguished on the one hand from surface tram- ways, and on the other from those portions of trunk or other lines which lie within city boundaries, although the latter may incidentally do a local or intra-urban business. Intra-urban railways, as compared with ordinary railways, are characterized by shortness of length, great cost per mile, and by a traffic almost exclusively passenger, the burden of which is enor- mously heavy. For the purpose of connecting the greatest possible number of points of concentrated travel, the first

railways were laid round the boundaries of areas approximately circular, the theory being that the short walk from the cir- cumference of the circle to any point within it would be no serious detention. It has been found, however, in the case of such circular or belt railways, that the time lost in traversing the circle and in walking from the circumference to the centre is so great that the gain in journey speed over a direct surface tramway or omnibus is entirely lost. Later intra-urban rail- ways in nearly every case have been built, so far as possible, on straight lines, radiating from the business centre or point of maximum congestion of travel to the outer limits of the city; and, while not attempting to serve all the population through the agency of the line, make an effort to serve a portion in the best possible manner — that is, with .direct transit.

The actual beginning of the construction of intra-urban railways was in 1853, when powers were obtained to build a line, 2 1 m. long, from Edgware Road to King’s Cross, in London, from which beginning the Metropolitan and Metropolitan District railways developed. These railways, which in part are operated jointly, were given a circular location, but the shortcomings of this plan soon became apparent. It was found that there was not sufficient traffic to support them as purely intra-urban lines, and they have since been extended into the outskirts of London to reach the suburban traffic.

The Metropolitan and Metropolitan District railways followed the art of railway ; building as it existed at the time they were laid out. Wherever possible the lines were constructed in open cutting, to ensure adequate ventilation; and where this was not possible they were built by a method suggestively named " cut and cover." A trench was first excavated to the proper depth, then the side walls and arched roof of brick were put in place, earth was filled in behind and over the arch, and the surface of the ground restored, either by paving where streets were followed, or by actually being built over with houses where the lines passed under private property. Where the depth to rail-level was too great for cut-and-cover methods, ordinary tunnelling processes were used; and where the trench was too shallow for the arched roof, heavy girders, sometimes of cast iron, bridged it between the side walls, longitudinal arches being turned between them (fig. 30).

Fig. 30. — Type-Section of Arched Covered Way, Metropolitan District railway, London.

The next development in intra-urban railways was an elevated line in the city of New York. Probably the first suggestion for an elevated railway was made by Colonel Stevens, of Hoboken, New Jersey, as early as 183 1, when the whole art of railway construction was in its infancy. He proposed to build an elevated railway on a single line of posts, placed along the curb-line of the street: a suggestion which embodies not only the general plan of an elevated structure, but the most striking feature of it as subsequently built — namely, a railway supported

by a single row of columns. The first actual work, however, was not begun till 1870, when the construction of an iron structure

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Fig. 31. — Single-Column Elevated Structure.

on a single row of columns was undertaken. The superiority, so far as the convenience of passen- gers is concerned, of an elevated over an underground railway, when both are worked by steam loco- motives, and the great economy and rapidity of construction, led to the quick development and exten- sion of this general design. By the year 1878 there were four parallel lines in the cicy of New York, and constructions of the

same character had already been projected in Brooklyn and Chicago and, with certain modifications of details, in Berlin. In the year 1894 an elevated railway was built in Liverpool, and in 1900 a similar railway was constructed in Boston, U.S.A., and the construction of a new one undertaken in New York. These elevated railways as a rule follow the lines of streets, and are of two general types. One (fig. 31), the earliest form, consisted of a single row of columns supporting two lines of longitudinal girders carrying the rails, the lateral stability of the structure being obtained by anchoring the feet of the columns to their foundations.

The other type (fig. 32) has two rows of columns connected at the top by transverse girders, which in turn carry the longitudinal girders that support the railway. In Berlin, on the Stadtbahn — which for a part of its length traverses private property — masonry arches, or earthen embank- ments between retaining walls, were substituted for the metallic structure wherever possible.

The next great develop- ment, marking the third step in the progress of intra-urban railway con- struction, took place in 1886, when J. H. Greathead (q.v.) began the City & South London railway, ex- tending under the Thames from the Monument to Stockwell, a distance of 35 m. Its promoters recog- nized the unsuitability of ordinary steam locomotives for underground railways, and intended to work it by means of a moving cable; but before it was completed, ˆelectric traction had developed so far as to be available for use on such lines. Electricity, therefore, and not the cable, was installed (fig. 33). In the details of construction the shield was the novelty. In principle it had been invented by Sir Marc I. Brunei for the con- struction of the original Thames tunnel, and it was afterwards improved by Beach, of New York, and finally developed by Greathead. (For the details of the shield and method of its operation, see Tunnel.) By means of the shield Great- head cut a circular hole at a depth ranging from 40 to 80 ft.

below the surface, with an external diameter of 10 ft. 9 in.; this he lined with cast-iron segments bolted together, giving a

Fig. 32. — Double-Column Elevated Structure (half-section).

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Fig. 33. — Section of Tunnel and Electric Locomotive, City & South London railway.

clear diameter of 10 ft. 2 in. Except at the shafts, which were sunk on proposed station sites, there was no interference with the surface of the streets or with street traffic during con- struction. Two tunnels were built approximately parallel, each taking a single track. The cross-section of the cars was made to conform approximately to the section of the tunnel, the idea being that each train would act like a piston in a cylinder, expelling in front of it a column of air, to be forced up the station shaft next ahead of the train, and sucking down a similar column through the station shaft just behind. This arrangement was expected to ensure a sufficient change in air to keep such railways properly ventilated, but experience has proved it to be ineffective for the purpose. This method of construction has been used for building other railways in Glasgow and London, and in the latter city alone the " tube railways " of this character have a length of some 40 m. The later examples of these railways have a diameter ranging from 13 to 1 s ft.

The fourth step in the development of intra-urban railways was to go to the other extreme from the deep tunnel which Greathead introduced. In 1893 the construction was com- pleted in Budapest of an underground railway with a thin, flat roof, consisting of steel beams set close together, with small longitudinal jack arches between them, the street pavement

Fig. 34. — Electric Underground Railway, Budapest.

resting directly on the roof thus formed (fig. 34). The object was to bring the level of the station platforms as close to the

surface of the street as the height of the car itself would permit ; in the case of Budapest the distance is about a ft. This prin- ciple of construction has since been followed in the construction of the Boston subway, of the Chemin de Fer Metropolitain in Paris, and of the New York underground railway. The Paris line is built with the standard gauge of 4 ft 8J in., but its tunnels are designedly made of such a small cross- section that ordinary main line stock cannot pass through them.

The New York underground railway (fig. 35) marks a still further step in advance, in that there are practically two

Opera- tion.

Fig. 35.-

-New York Rapid Transit railway, showing also the tracks and conduits of the electric surface tramway.

different railways in the same structure. One pair of tracks is used for a local service with stations about one-quarter of a mile apart, following the general plan of operation in vogue on all other intra-urban railways. The other, or central, pair of tracks is for trains making stops at longer distances. Thus there is a differentiation between the long-distance traveller who desires to be carried from one extreme of the city to the other and the short-distance traveller who is going between points at a much less distance.

To sum up, there are of intra-urban railways two distinct classes: the elevated and the underground. The elevated is used where the traffic is so light as not to warrant the expen- sive underground construction, or where the construction of an elevated line is of no serious detriment to the adjoining property. The underground is used where the congestion of traffic is so great as to demand a railway almost regardless of cost, and where the conditions of surface traffic or of adjoining property are such as to require that the rail- way shall not obstruct or occupy any ground above the surface.

Underground railways are of three general types: the one of extreme depth, built by tunnelling methods, usually with the shield and without regard to the surface topography, where the stations are put at such depth as to require lifts to carry the passengers from the station platform to the street level. This type has the advantage of economy in first construction, there being the minimum amount of material to be excavated, and no interference during construction with street traffic or subsurface structures; it has, however, the disadvantage of the cost of operation of lifts at the stations. The other extreme type is the shallow construction, where the railway is brought to the minimum distance below the street level. This system has the advantage of the greatest convenience in operation, no lifts being required, since the distance from the street surface to the'stari 011 platform is about 12 to 15 ft.; it has the dis- advantages, however, of necessitating the tearing up of the street surface during construction, and the readjustment of sewer, water, gas and electric mains and other subsurface structures, and of having the gradients partially dependent on the surface topography. The third type is the intermediate one between those two, followed by the Metropolitan and Metropolitan District railways, in London, where the railway has an arched roof, built usually at a sufficient distance below the surface of the street to permit the other sub- surface structures to lie in the ground above the crown of the arch, and

where the station platforms are from 20 to 30 ft. beneath the surface of the street — a depth not sufficient to warrant the introduction of lifts, but enough to be inconvenient.

*In the operation of intra-urban railways, steam locomotives, cables and electricity have severally been tried: the first having been used in the earlier examples of underground lines and in the various elevated systems in the United States. The fouling of the air that results from the steam-engine, owing to the production of carbonic acid gas and of sulphurous fumes and aqueous vapour, is well known, and its use is now practically abandoned for underground working. The cable is slow; and unless development along new lines of compressed air or some sort of chemical engine takes place, electricity will monopolize the field. Electricity is applied through a separate locomotive attached to the head of the train, or through motor carriages attached either at one end or at both ends of the train, or by putting a motor on every axle and so utilizing the whole weight of the train for traction, all the motors being under a single control at the head of the train, or at any point of the train for emergency. The distance between stations on intra-urban railways is governed by the density of local traffic and the speed desired to be maintained. As a general rule the interval varies from one-quarter to one-half mile; on the express lines of the New York underground railway, the inter-station interval averages about i§ m. On steam- worked lines the speed of trains is about n to 15 m. per hour, according to the distance between stations Later practice takes advantage of the great increase in power that can be temporarily developed by electric motors during the period of acceleration; this, in proportion to the weight of the train to be hauled, gives results much in advance of those wbtained on ordinary steam railways. Since high average speed on a line with frequent stops depends largely on rapidity of acceleration, the tendency in modern equipment is to secure as great an output of power as possible during the accelerating period, with corresponding increase in weight available for adhesion. With a steam locomotive all the power is concen- trated in one machine, and therefore the weight on the drivers available for adhesion is limited. With electricity, power can be applied to as many axles in the train as desired, and so the whole weight of the train, with its load, may be utilized if necessary. Sometimes, as on the Central London railway, the acceleration of gravity is also utilized; the different stations stand, as it were, on the top of a hill, so that outgoing trains are aided at the start by having a slope to run down, while incoming ones are checked by the rising gradient they encounter. The cost of intra-urban railways depends not only on the type of construction, but more especially upon local conditions, such as the nature of the soil, the presence of subsurface ^^*

structures, like sewers, water and gas mains, electric conduits, &c; the necessity of permanent underpinning or temporary supporting of house

foundations, the cost of acquiring land passed under or over when street lines are not followed, and, in the case of elevated railways, the cost of acquiring easements of light, air and access, which the courts have held are vested in the abutting property. The cost of building an ordinary two-track elevated railway according to American practice varies from $300,000 to $400,000 a mile, exclusive of equipment, terminals or land damages. The cost of construct- ing the deep tubular tunnels in London, whose diameter is about 15 ft. exclusive, in like manner, of equipment, terminals or land damages, is about £170,000 to £200,000 a mile. The cost of the Metropolitan and Metropolitan District railways of London varied greatly on account of the variations in construction. The most difficult section — namely, that under Cannon Street — where the abutting buildings had to be underpinned, and a very dense traffic maintained during construction, while a network of sewers and mains was readjusted, cost at the rate of about £1,000,000 a mile. The contract price of the New York under- ground railway, exclusive of the incidentals above mentioned, was $35,000,000 for 21 m., of which 16 m. are underground- and 5 are elevated. The most difficult portion of the road, 4! m. of four-track line, cost $15,000,000. (W. B. P.)

LIGHT RAILWAYS]

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Light Railways

The term light railways is somewhat vague and indefinite, and therefore to give a precise definition of its significance is not an easy matter. No adequate definition is to be Britain. found even in the British statute-book; for although parliament has on different occasions passed acts dealing with such railways both in Great Britain and Ireland, it has not inserted in any of them a clear and sufficient statement of what it intends shall be understood by the term, as dis- tinguished from an ordinary railway. Since the passing of the Light Railways Act of 1896, which did not apply to Ireland, it is possible to give, a formal definition by saying that a light railway is one constructed under the provisions of that act; but it must be noted that the commissioners appointed under that act have authorized many lines which in their physical characteristics are indistinguishable from street tramways constructed under the Tramways Act, and to these the term light railways would certainly not be applied in ordinary parlance. Still, they do differ from ordinary tramways in the important fact that the procedure by which they have been authorized is simpler and cheaper than the methods by which special private acts of parliament have to be

obtained for tramway projects. Economy in capital outlay and cheapness in construction is indeed the characteristic generally associated with light railways by the public, and implicitly attached to them by parliament in the act of 1896, and any simplifications of the engineering or mechanical features they may exhibit compared with the standard railways of the country are mainly, if not entirely, due to the desire to keep down their expenses.

The saving of cost is effected in two ways: (1) Instead of having to incur the expenses of a protracted inquiry before parliament, the promoters of a light railway under the act of 1896 make an application to the light railway commissioners, who then hold a local inquiry, to obtain evidence of the usefulness of the proposed railway, and to hear objections to it, and, if they are satisfied, settle the draft order and hand it over to the Board of Trade for confirmation. The Board may reject the order if it thinks the scheme to be of such magnitude or importance that it ought to come under the direct consideration of parlia- ment, or it may modify it in certain respects, or it may remit it to the commissioners for further inquiry. But once the order is confirmed by the Board, with or without modifications, it has effect as if it had been enacted by parliament, and it cannot afterwards be upset on the ground of any alleged irregularity in the proceedings. (2) The second source of economy is to be sought in the reduced cost of actually making the line and of working it when made. Thus the gauge may be narrow, the line single, the rails lighter than those used in standard practice, while deep cuttings and high embankments may be avoided by permitting the curves to be sharper and the gradients steeper: such points conduce to cheapness of construction. Again, low speeds, light stock, less stringent requirements as to continuous brakes, signals, block-working and interlocking, road-crossings, stations, &c, tend to cheapness in working. On the lines actually authorized by the Board of Trade under the 1896 act the normal minimum radius of the curves has been fixed at about 600 ft.; when a still smaller radius has been necessary, the speed has been reduced to 10 m. an hour and a guard-rail insisted on inside the curve. Again, the speed has been restricted to 20 m. an hour on long inclines with gradients steeper than 1 in 50, and also on a line which had scarcely any straight portions and in which there were many curves of 600 ft. radius and gradients of 1 in 50. In the case of a line of 25 ft. gauge, with a ruling gradient of 1 in 40, a maximum speed of 15 m. an hour and a minimum radius of curve of 300 ft. have been prescribed. Curves of still smaller radius have entailed a maximum speed of 10 m. an hour. It must be understood that a railway described as " light " is not necessarily built of narrower gauge than the standard. Many lines, indeed, have been designed on the normal 4 ft. 8J in. gauge, and laid with rails weighing from 50 to 70 lb per yard; a flat-footed 60 lb rail,

with the axle load limited to 14 tons, has the advantage for such lines that it permits the employment of a proportion of the locomotives used on main lines. The orders actually granted have allowed 50 lb, 56 lb, 60 lb and 70 lb rails, with correspond- ing axle loads of 10, 12, 14 and 16 tons. On a line of 2 ft. gauge, rails of 40 lb have been sanctioned. In regard to fencing and precautions at level-crossings, less rigid requirements may be' enforced than with standard railways; and in some cases where trains are likely to be few, it has been provided that the normal position of the gates at crossings shall be across the line. Again, if the speed is low and the trains infrequent, the signalling arrangements may be of a very simple and inexpensive kind, or even dispensed with altogether. It should be mentioned that the act provided that the Treasury might advance a portion of the money required for a line in cases where the council of any county, borough or district had agreed to do the same, and might also make a special advance in aid of a light railway which was certified by the Board of Agriculture to be bene- ficial to agriculture in any cultivated district, or by the Board of Trade to furnish a means of communication between a fishing-harbour and a market in a district where it would not be constructed without special assistance from the state.

As a general classification the commissioners have divided the schemes that have come before them into three classes: (A) those which like ordinary railways take their own line across country; (B) those in connexion with which it is proposed to use the public roads conjointly with the ordinary road traffic; and (Neutral) which includes inclined railways worked with a rope, and lines which possess the conditions of A and B in about equal porportions.

The Light Railways Act 1896 was to remain in force only until the end of 1901 unless continued by parliament, but it was continued year by year under the Expiring Laws Continu- ance Act. In 1901 the president of the Board of Trade intro- duced a bill to continue the act until 1906, and to amend it so as to make it authorize the construction of a light railway on any highway, the object being to abolish the restriction that a light railway should run into the area of at least two local authorities; but it was not proceeded with. Towards the end of 1901 a departmental committee of the Board of Trade was formed to consider the Light Railways Act, and in 1902 the president of the Board of Trade (Mr Gerald Balfour) stated that as a result of the deliberations of this committee, a new bill had been drafted which he thought would go very far to meet all the reasonable objections that had been urged against the present powers of the local authorities. This bill, however, was not brought forward. In July 1903, Lord Wolverton, on behalf of the Board of Trade, introduced a bill to continue and amend the Light Railways Act. It provided that the powers of the light railway commissioners should continue until determined by

parliament, and also provided, inter alia, that in cases where the Board of Trade thought, under section (9) subsection (3) of the original act, that a proposal should be submitted to parliament, the Board of Trade itself might submit the proposals to parliament by bringing in a bill for the confirmation of the light railway order, with a special report upon it. Opposition on petition could be heard before a select committee or a joint committee as in the case of private bills. The bill was withdrawn on the nth of August 1903, Lord Morley appealing to the Board of Trade to bring in a more comprehensive measure to amend the unsatisfactory state of legislation in relation to tramways and light railways. In 1904 the president of the Board of Trade brought in a bill on practically the same lines as the amending bill of 1903. It reached second reading but was not proceeded with. Similar amending bills were introduced in the 1905 and 1906 sessions, but were withdrawn. During the first ten years after the act came into force 545 applications for orders were received, 313 orders were made, and 282 orders were confirmed. The orders confirmed were for 1731 m., involving an estimated capital expenditure of £12,770,384. At the end of 1906 only 500 m. had been opened for traffic, and the mileage of lines

opened was much less in proportion to the mileage sanctioned in the cases of lines constructed on their own land than in the case of lines more of the nature of tramways. (In other countries where the mileage of main lines of railways in pro- portion to area and population is roughly the same as in the United Kingdom, the mileage of light railways already con- •structed is considerable, while many additional lines are under construction. At the end of 1903 there were 6150 m. working in France, costing on an average £4500 per mile, earning £275 per mile per annum; 3730 miles in Prussia costing £4180 per mile, earning £310 per mile per annum; 1430 m. in Belgium at £3400 per mile, earning £320 per mile per annum.) The average cost per mile in Great Britain on the basis of the prescribed estimates is £5860, but this figure does not include the cost of equipment and does not cover the whole cost of construction. According to the light railway commissioners, experience satisfied them (a) that light railways were much needed in many parts of the country and that many of the lines proposed, but not constructed, were in fact necessary to admit of the progress, and even the maintenance, of existing trade interests; and (b) that improved means of access were requisite to assist in retaining the population on the land, to counteract the remoteness of rural districts, and also, in the neighbourhood of industrial centres, to cope with the difficulties

as to housing and the supply of labour. They pointed out that while during the first five years the act was in force there were 315 applica- tions for orders, during the second five years there were only 142 applications, and that proposals for new lines had become less numerous owing to the various difficulties in carrying them to a successful completion and to the difficulty of raising the necessary capital even when part of it was provided with the aid of the state and of the local authorities. They ex- pressed the opinion that an improvement could be effected enabling the construction of many much-needed lines by an amendment of some of the provisions of the Light Railways Act, and by a reconsideration of the conditions under which financial or other assistance should be granted to such lines by the state and by local authorities.

The so-called light railways in the United States and the British colonies have been made under the conditions peculiar to new countries. Their primary object being the development and peopling of the land, they have naturally been made as cheaply as possible; and as in such cases the cost of the land is inconsiderable, economy has been sought by the use of lighter and rougher permanent way, plant, rolling stock, &c. Such railways are not " light " in the technical sense of having been made under enactments intended to secure permanent lowness of cost as compared with standard lines. On the continent of Europe many countries have encouraged railways which are light in that sense. France began to move in this direction in 1865, and has formulated elaborate provisions for their construction and regulation. Italy did the same in its laws in 1873, 1879, 1881, 1887 and 1889; and Germany fostered enterprise of this kind by the imperial edicts of 1875, 1878 and 1892. Holland, Hungary and Switzerland were all early in the field; and Belgium has succeeded, through the in- strumentality of the semi-official Societe Nationale de Chemins de Fer Vicinaux, started in 1885, in developing one of the most complete systems of rural railway transport in the world.

In France the lines which best correspond to British light railways are called Chemins de fer i'intiret local. These are regulated by a decree No. 11,264 of 6th August 1881, which the Franco. Ministry of Public Works is charged to carry out. The model " form of regulation " lay's down the scales of the drawings and the information to be shown thereon. For the first installation a single line is prescribed, but the concessionaire must provide space and be prepared to double when required. The gauge may be either 1-44 metres (4 ft. 8-7 in.), or 1 metre (3 ft. 3-37 in.), or -75 metre (2 ft. 5-5 in.). The radius of curves for the 1-44 m. gauge must not be less than 250 metres, 100 metres for the 1 m. gauge and 50 metres for the -75 m. gauge. A straight length of not less than 60 metres for the largest gauge and 40 metres for the smallest must be made between two curves having opposite directions. Except in special cases, gradients must not exceed 3 in

100; and

between gradients in the opposite sense there must be not less than 60 metres of level for 1-44 m. and 40 metres for 1 m. and -75 m. gauges. The position of stations and stopping-places is regulated by the council of the department. The undertaking, once approved, is regarded as a work of public utility, and the undertakers are invested with all the rights that a public department would have in the case of the carrying out of public works. At the end of the period of the concession the department comes into possession of the road and all its fixed appurtenances, and in the last five years of the period the department has the right to enter into possession of the line, and apply the revenue to putting it into a thorough state of repair. It has also the right to purchase the under- taking at the end of the first fifteen years, the net profits of the preceding seven years to govern the calculation of the purchase price. The maximum 1st, 2nd and 3rd class passenger fares are, per kilometre, -067 f. (-6d.), -050 f. (-455d.).and -037 f. (-34d.) respectively, when the trains are run at grande vitesse, the fares including 30 kilogrammes weight of personal baggage.

In Belgium a public company under government control (" Soci6t6 Nationale de Chemins de Fer Vicinaux ") does all that in France forms the responsibility of the Ministry of the Interior and of the prefect of the department. Over an average Bel&um. of years it appears that 27 % of the capital cost was found by the state, 28 % by the province, 40-9 % by the communes and 4- 1 % by private individuals. At the end of 1908 there were 2085 m. in operation, and the total mileage authorized was 2603, while the construction of a considerable further mileage was under consideration. As far as possible, these railways are laid beside roads, in preference to independent formation; the permanent way costs £977 per mile in the former as against £793 in the latter. If laid in paving, the price varies between £1108 and £2266 per mile. Through villages, and where roads have to be crossed, the line is of the usual tramway type. The line is of 1 metre gauge, with steel rails weighing 2I§ kilos (42 lb) per yard. In the towns a deeper rail is used, weighing about 60 lb per yard. In three lines of the Vicinaux system, in the aggregate 45 m. in length, the sharpest curves are 30 metres, 35 metres and 40 metres respectively. There are gradients of 1 in 20 and 1 in 25. The speed is limited to 30 kilometres (about 18 m.) in the country and 6 m. per hour in towns and through villages.

In Italy many railways which otherwise fulfil the conditions of a light railway are constructed with a gauge of 4 ft. 8j in. The weights are governed by what the railway has to carry j ta j

and the speed. Light locomotives, light rails and light rolling stock are employed. There are no bridges, except where watercourses occur. Cuttings

are reduced to a minimum; and where the roads are sufficiently wide, the rails are laid on the margins. The advantage of uniformity of gauge is in the use of trucks for goods which belong to the rolling stock of the main lines. In Italy these railways are called " economic railways," and are divided into five types. Types I., II. and III. are of 4 ft. 8$ in. gauge, type IV. of 0-95 m. and type V. of 0-70 m. ; but as there is no example of type V., the classification is practically one of

1-445 m – (4 ft- 8 i m) an d one °f °'95 (.3 ft °"5 m) The chief difference between the first three types lies in the weight of rails and rolling stock and in the radius of the curves. The real light railway of Italy is that of type IV.: gauge, 0-95 m. (3 ft. 0-5 in.); weight of rails, 12 (26-45 lb) to 20 (44 lb) kilos; mean load per axle, 6 tons; minimum curve, 70 m. (229 ft. 2-6 in.) radius; width of formation, 3-50 m. (11 ft. 5-5 in.); top width of ballast, 2-IO m. (6 ft. 10-7 in.) ; depth of ballast under sleepers, o-io m. (3 ft. 9-5 in.) ; maximum gradient, I in 50; length of sleepers, 1-70 m. (5 ft. 6-92 in.); width between parapets and width of tunnels, I m. over width of carriage; height of tunnels, 5 m. (16 ft. 4-85 in.); locomotives, maximum weight per axle 6 tons, rigid wheel base l-8o m. (5 ft. 10-86 in.), diameter of driving-wheels I m. (3 ft. 3-37 in.).

In Germany the use of light railways (Klein-bahnen) has made great strides. The gauges in use vary considerably between 4 ft. 8£ in., the standard national gauge, and I ft. nf in., Q ermany , which appears to be the smallest in use. They are under the control of the Post and Telegraph department, the state issuing loans to encourage the undertakings; the authorities in the provinces and communes also give support in various w^ys, and under various conditions, to public bodies or private persons who desire to promote or embark in the industry. These conditions, as well as the degree of control over the construction and working of the lines, are left to the regulation of the provincial' governments. Similarly, the same authorities decide for themselves the conditions under which the public roads may be used, and the precautions for public safety, all subject to the confirmation of the imperial government.

What are known as " portable railways " should be included in the same category as light railways. With a 24 in. gauge, lines of a portable kind can be made very handily and Portable the cost is very much less than that of a permanently ra n ways , constructed light railway. The simplicity is great; they can be quickly mounted and dismounted; the correct I gauge can be perfectly maintained; the sections of rails and

sleepers (which are of iron) are very portable, and skilled labour is not required to lay or to take them up; the making of a " turn-out " is easy, by taking out a 15 ft. section of the way and substituting a section with points and crossings. The safe load per wheel varies between 12 cwt. on a 10 in. 16 lb wheel and 40 cwt. on an 18 in. 56 lb wheel. The rolling stock is constructed either for farm produce or heavy minerals, the latter holding 10 to 27 cub. ft. For timber, 4 or 5 ft. bogies can be used. A useful wagon for agricultural transport on a 24 in. gauge line is 16 ft. long by 5 ft. wide; it weighs 72 cwt. and costs £30. A portable line of this kind will have 20 lb steel rails and 2112 steel sleepers — 4 ft. 6 in. long — to a mile, laid 2 ft. 6 in. apart centre to centre. The total cost per mile of such a line, including all bolts, nuts, fish-plates and fastenings, ready for laying, delivered in the United Kingdom, is under £500 a mile.

See Evans Austin, The Light Railways Act i8q6, which con- tains the rules of the Board of Trade; VV. H. Cole, Light Railways at Home and Abroad; Lieut. -Col. Addison, Report to the Board of Trade (1894) on Light Railways in Belgium. (C. E. W. ; E. Ga.)

RAIMBACH, ABRAHAM (1776-1843), English line-engraver, a Swiss by descent, was born in London in 1776. Educated at Archbishop Tenison's Library School, he was an apprentice to J. Hall the engraver from 1789 to 1796. For nine years part of his working-time was devoted to the study of drawing in the Royal Academy and to executing occasional engravings for the booksellers, whilst his leisure hours were employed in painting portraits in miniature. Having formed an intimacy with Sir David Wilkie, Raimbach in 181 2 began to engrave some of that master's best pictures. At his death, in 1843, he held a gold medal awarded to him for his " Village Politicians " at the Paris Exhibition of 1814. He was elected corresponding member of the Institute of France in 1835.

RAIMUND, FERDINAND (1 790-1836), Austrian actor and dramatist, was born on the 1st of June 1790, in Vienna. In 1 8 14 he acted at the Josef stadter Theater, and in 1817 at the Leopoldstadter Theater. In 1823 he produced his first play, Der Barometermacher auf der Zauberinsel, which was followed by Der Diamant des Geisterkonigs (1824) and the still popular Bauer als Millionder. The last-mentioned play, which appeared in 1826, Der Alpenkonig und der Menschenfeind (1828) and Der Verschwender (1833) are Raimund's masterpieces. He com- mitted suicide on the 5th of September 1836, owing to the fear that he had been bitten by a mad dog. Raimund was a master of the Viennese Posse or farce; his rich humour is seen to best advantage in his realistic portraits of his fellow-

citizens.

Raimund's Sdmtliche Werke (with biography by J. N. Vogl) appeared in 4 vols. (1837) ; they have been also edited by K. Glossy and A. Sauer (4 vols., 1881; 2nd ed., 1891), and a selection by E. Castle (1903). See E. Schmidt in Charakteristiken, vol. i. (1886); A. Farinelli, Grillparzer und Raimund (1897) ;"L. A. Frankl, Zur Biographie F. Raimunds (1884); and especially A. Sauer's article in the Allgem. Deutsche Biographie.

RAIN (O.E. regn; the word is common to Teutonic languages, cf. Ger. Re gen, Swed. and Dan. regn; it has been connected with Lat. rigare, to wet, Gr. fiptxtw), the water vapour of the atmosphere when condensed into drops large enough to be precipitated upon the earth. Hence the term is extended to signify the fall of such drops in a shower, and in the plural, " the rains," it signifies the rainy seasons in India and elsewhere where under normal climatic conditions such seasons are clearly dis- tinguished from the dry. A rain-band is " a dark band in the solar spectrum, caused by the presence of water-vapour in the atmosphere " {New Engl. Diet.) ; a rain-gauge is an instrument used to measure the amount of rainfall (see Meteorology, where the whole subject of precipitation is .fully treated).

RAINBOW, formerly known as the iris, the coloured rings seen in the heavens when the light from the sun or moon shines on falling rain; on a smaller scale they may be observed when sunshine falls on the spray of a waterfall or fountain. The bows assume the form of concentric circular arcs, having their common centre on the line joining the eye of the observer to the sun. Generally only one bow is clearly seen; this is known as the primary rainbow; it has an angular radius of about 41 ,

and exhibits a fine display of the colours of the spectrum, being red on the outside and violet on the inside. Sometimes an outer bow, the secondary rainbow, is observed; this is much fainter than the primary bow, and it exhibits the same play of colours, with the important distinction that the order is reversed, the red being inside and the violet outside. Its angular radius is about 57°. It is also to be noticed that the space between the two bows is considerably darker than the rest of the sky. In addition to these prominent features, there are sometimes to be seen a number of coloured bands, situated at or near the summits of the bows, close to the inner edge of the primary and the outer edge of the secondary bow; these are known as the spurious, supernumerary or complementary rainbows.

The formation of the rainbow in the heavens after or during a shower must have attracted the attention of man in remote antiquity. The earliest references are to be found in the various accounts of the Deluge. In the Biblical narrative (Gen. ix. 1 2-1 7) the bow is introduced as a sign of the

covenant between God and man, a figure without a parallel in the other accounts. Among the Greeks and Romans various speculations as to the cause of the bow were indulged in; Aristotle, in his Meteors, erroneously ascribes it to the reflection of the sun's rays by the rain; Seneca adopted the same view. The introduction of the idea that the phenomenon was caused by refraction is to be, assigned to Vitellio. The same conception was utilized by Theodoric of Vriberg, a Dominican, who wrote at some time between 1304 and 13 1 1 a tract entitled De radialibus impressionibus, in which he showed how the primary bow is formed by two refractions and one internal reflection; i.e. the light enters the drop and is refracted; the refracted ray is then reflected at the opposite surface of the drop, and leaves the drop at the same side at which it enters, being again refracted. It is difficult to determine the influence which the writings of Theodoric had on his successors; his works were apparently unknown until they were discovered by G. B. Venturi at Basel, partly in the city library and partly in the library of the Dominican monastery. A full account, together with other early contributions to the science of light, is given in Venturi's Commentari sopra la storia de la Teoria del Oltica (Bologna, 1814). John Fleischer (sometimes incorrectly named Fletcher), of Breslau, propounded the same view in a pamphlet, De iridibus doctrina Aristotelis et Vitellonis (1574); the same explanation was given by Franciscus Maurolycus in his Photismi de lumine et umbra (1575).

The most valuable of all the earlier contributions to the scientific explanation of rainbows is undoubtedly a treatise by Marco Antonio de Dominis (1566-1624), archbishop of Spalatro. This work, De radiis visits et lucis in vitris perspec- tivis et iride, published at Venice in 161 1 by J. Bartolus, although written some twenty years previously, contains a chapter entitled " Vera iridis tota generatio explicatur," in which it is shown how the primary bow is formed by two refractions and one reflection, and the secondary bow by two refractions and two reflections. Descartes strengthened these views, both by experi- ments and geometrical investigations, in his Meteors . (Leiden, 1637). He employed the law of refraction (discovered by W. Snellius) to calculate the radii of the bows, and his theoretical angles were in agreement with those observed. His methods, however, were not free from tentative assumptions, and were considerably improved by Edmund Halley (Phil. Trans., 1700, 714). Descartes, however, could advance no satisfactory explanation of the chromatic displays; this was effected by Sir Isaac Newton, who, having explained how white light is composed of rays possessing all degrees of refrangibility, was enabled to demonstrate that the order of the colours was in perfect accord with the requirements of theory (see Newton's Opticks, book i. part 2, prop. 9).

The geometrical theory, which formed the basis of the investi- gations of

Descartes and Newton, afforded no explanation of the supernumerary bows, and about a century elapsed before an explanation was forthcoming. This was given by Thomas Young, who, in the Bakerian lecture delivered before the Royal Society on the 24th of November 1803, applied his principle

Oeo- metricaJ t: •ory.

Fig. i.

of the interference of light to this phenomenon. His not wholly satisfactory explanation was mathematically examined in 1835 by Richard Potter (Camb. Phil. Trans., 1838, 6, 141), who, while improving the theory, left a more complete solution to be made in 1838 by Sir George Biddell Airy (Camb. Phil. Trans.,

1838, 6, 379).

*The geometrical theory first requires a consideration of the path of a ray of light falling upon a transparent sphere. Of the total amount of light falling on such a sphere, part is reflected or scattered at the incident surface, so rendering the drop visible, while a part will enter the drop. Confining our attention to a ray entering in a principal plane, we will determine its deviation, i.e. the angle between its directions of incidence and emergence, after one, two, three or more internal reflections. Let EA be a ray incident at an angle * (fig. 1) ; let AD be the refracted ray, and r the angle of refraction. Then the deviation experienced by the ray at A is i-r. If the ray suffers one internal reflection at D, then it is readily seen that, if DB be the path of the reflected ray, the angle ADB equals 2r, i.e. the deviation of the ray at D is ir-2r. At B, where the ray leaves the drop, the deviation is the same as at A, viz. i-r. The total devia- tion of the ray is consequently given by D = 2(i-r) + ir-2r.*

Similarly it may be shown that each internal reflection introduces a supplementary deviation of x-2r; hence, if the ray be reflected n times, the total deviation will be D —2{i-r) + n(rr~2r).

The deviation is thus seen to vary with the angle of incidence; and by considering a set of parallel rays passing through the same principal plane of the sphere and incident at all angles, it can be readily shown that more rays will pass in the neighbourhood of the position of minimum deviation than in any other position (see Refraction). The drop will consequently be

more intensely illuminated when viewed along these directions of minimum devia- tion, and since it is these rays with which we are primarily concerned, we shall proceed to the determination of these directions.

Since the angles of incidence and refraction are connected by the. relation sin i = n sin r (Snell's Law), il being the index of refrac- tion of the medium, then the problem may be stated as follows: to determine the valueof the angle i which makesD =2(-r)-r-tt(ir-2r) a maximum or minimum, in which i and f are connected by the relation sin i = jx sin r, m being a constant. By applying the method of the differential calculus, we obtain cos j = V|(^ 8 -l)/(« ! +2«)| as the required value; it may be readily shown either geometrically or analytically that this is' a minimum. For the angle i to be real, cos i must be a fraction, that is » 2 +2«>m 2 — i, or (n + l) 2 >M 2 . Since the value of y. for water is about f , it follows that n must be at least unity for a rainbow to be formed; there is obviously no theoretical limit to the value of n, and hence rainbows of higher orders are possible.*

So far we have only considered rays of homogeneous light, and it remains to investigate how lights of varying refrangibilities will be transmitted. It can be shown, by the methods of the differential calculus or geometrically, that the deviation increases with the refractive index, the angle of incidence remaining constant. Taking the refractive index of water for the red rays as Vi 8 . and for the violet rays as l gf , we can calculate the following values for the minimum deviations corresponding to certain assigned values of n.

therefore, see a coloured band, about 2° in width, and coloured violet inside and red outside. Within the band, the illumination

n

Red.

Violet.

1

2 3 4

X- 42°-I 27T— I29°-2

3— 23i°-4 4ir-3i7°-o7*

7T— 40°-22

27T — 125°-48 3x — 227°-o8 47r-3io°-o7

To this point we have only considered rays passing through a principal section of the drop; in nature, however, the rays impinge at every point of the surface facing the sun. It may be readily deduced that the directions of minimum deviation for a pencil of parallel rays lie on the surface of cones, the semi-vertical angles of which are equal to the values given in the above table. Thus, rays suffering one internal reflection will all lie within a cone of about 42 ; in this direction the illumination will be most intense; within the cone the illumination will be fainter, while, without it, no light will be transmitted to the eye.

Fig. 2 represents sections of the drop and the cones containing the minimum deviation rays after I, 2, 3 and 4 reflections; the order of the colours is shown by the letters R (red) and V (violet). It is apparent, therefore, that all drops transmitting intense light after one internal reflection to the eye will lie on the surfaces of cones having the eye for their common vertex, the line joining the eye to the sun for their axis, and their semi-vertical angles equal to about 41° for the violet rays and 43° for the red rays. The observer will,

Fig. 2

will be faint; outside the band there will be perceptible darkening until the second bow comes into view. Similarly, drops trans- mitting rays after two internal reflections will be situated on covertical and coaxial cones, of which the semi-vertical angles are 51 for the red rays and 54° for the violet. Outside the cone of 54° there will be faint illumination ; within it, no secondary rays will be transmitted to the eye. We thus see that the order of colours in the secondary bow is the reverse of that in the primary; the secondary is half as broad again (3), and is much fainter, owing to the longer path of the ray in the drop, and the increased dispersion.

Similarly, the third, fourth and higher orders of bows may be investigated. The third and fourth bows are situated between the observer and the sun, and hence, to be viewed, the observer must face the sun. But the illumination of the bow is so weakened by the repeated reflections, and the light of the sun is generally so bright, that these bows are rarely, if ever, observed except in artificial rainbows. The same remarks apply to the fifth bow, which differs from the third and fourth in being situated in the same part of the sky as the primary and secondary bows, being just above the secondary.

The most conspicuous colour band of the principal bows is the red ; the other colours shading off into one another, generally with con- siderable blurring. This is due to the superposition of a great number of spectra, for the sun has an appreciable apparent diameter, and each point on its

surface gives rise to an individual spectrum. This overlapping may become so pronounced as to produce a rain- bow in which colour is practically absent; this is particularly so when a thin cloud intervenes between the sun and the rain, which has the effect of increasing the apparent diameter of the sun to as much as 2° or 3 . This phenomenon is known as the " white rainbow " or " Ulloa's Ring or Circle," after Antonio de Ulloa.

We have now to consider the so-called spurious bows which are sometimes seen at the inner edge of the primary and at the outer

Physical

edge of the secondary bow. The geometrical theory can afford no explanation of these coloured bands, and it has been shown that the complete phenomenon of the rainbow " e< "T- is to be sought for in the conceptions of the wave theory of light. This was first suggested by Thomas Young, who showed that the rays producing the bows consisted of two systems, which, although emerging in parallel directions, traversed different paths in the drop. Destructive interference between these superposed rays will there- fore occur, and, instead of a continuous maximum illumination in the direction of minimum deviation, we should expect to find alternations of brightness and darkness. The later investigations of Richard Potter and especially of Sir George Biddell Airy have proved the correctness of Young's idea. The mathematical discussion of Airy showed that the primary rainbow is not situated directly on the line of minimum deviation, but at a slightly greater value; this means that the true angular radius of the bow is a little less than that derived from the geometrical theory. In the same way, he showed that the secondary bow has a greater radius than that previously assigned to it. The spurious bows he showed to consist of a series of dark and bright bands, whose distances from the principal bows vary with the diameters of the raindrops. The smaller the drops, the greater the distance; hence it is that the spurious bows are generally only observed near the summits of the bows, where the drops are smaller than at any lower altitude. In Airy's investigation, and in the extensions by Boitel, J. Larmor, E. Mascart and L. Lorentz, the source of light was regarded as a point. In nature, however, this is not realized, for the sun has an appreciable diameter. Calculations taking this into account have been made by J. Pernter (Neues uber den Regenbogen, Vienna, 1888) and by K. Aichi and T. Tanakadate {Jour. College of Science, Tokyo, 1906, vol. xxi. art. 3).

Experimental confirmation of Airy's theoretical results was af- forded in 1842 by William Hallows Miller (Camb. Phil. Trans, vii. 277). A horizontal pencil of sunlight was admitted by a vertical slit, and then allowed to fall on a column of water supplied by a jet of about ˆth of an

inch in diameter. Primary, secondary and spurious bows were formed, and their radii measured; a com- parison of these observations exhibited agreement with Airy's analytical values. Pulfrich (Wied. Ann., 1888, 33, 194) obtained similar results by using cylindrical glass rods in place of the column of water.

In accordance with a general consequence of reflection and refrac- tion, it is readily seen that the light of the rainbow is partially polarized, a fact first observed in 1811 by Jean Baptiste Biot (see Polarization).

Lunar rainbows. The moon can produce rainbows in the same manner as the sun. The colours are much fainter, and according to Aristotle, who claims to be the first observer of this phenomenon, the lunar bows are only seen when the moon is full.

Marine rainbow is the name given to the chromatic displays formed by the sun's rays falling on the spray drawn up by the wind playing on the surface of an agitated sea.

Intersecting rainbows are sometimes observed. They are formed by parallel rays of light emanating from two sources, as, for example, the sun and its image in a sheet of water, which is situated between the observer and the sun. In this case the second bow is much fainter, and has its centre as much above the horizon as that of the direct system is below it.

References. — For the history of the theory of the rainbow, see G. B. Venturi, Commentari sopra la storia de la teoria del Ottica (Bologna, 1814); F. Rosenberger, Geschichte der Physik (1882-90). The geometrical and physical theory is treated in T. Preston's Theory of Light; E. Mascart's Traite d'optique (1899-1903); and most completely by J. Pernter in various contributions to scientific journals and in his Meteor ologische Optik (1905-9).

RAINOLDS (or Reynolds), JOHN (1549-1607), English divine, was born about Michaelmas 154.9 at Pinhoe, near Exeter, and was educated at Merton and Corpus Christi Colleges, Oxford, becoming a fellow of the latter in 1568. In 1572-73 he was appointed reader in Greek, and his lectures on Aristotle's Rhetoric laid the sure basis of his fame. He resigned the office in 1578 and his fellowship in 1586, through inability to agree with the president William Cole, and became a tutor at Queen's College. By this time he had acquired a considerable reputation as a disputant on the Puritan side, and the story goes that Elizabeth visiting the university in

1592 " schooled him for his obstinate preciseness, willing him to follow her laws, and not run before them." In 1593 he was made dean of Lincoln. The fellows of Corpus were anxious to replace Cole by Rainolds, and exchange was effected, Rainolds being elected president in December 1598. The chief events of his subsequent career were his share in the Hampton Court Conference, where he was the most prominent representative of the Puritan party and re- ceived a good deal of favour from the king, and in the Authorized Version of the Bible. Of this project he was initiator, and himself worked with the company who undertook the transla- tion of the Prophets. He died of consumption on the 21st of May 1607, leaving a great reputation for scholarship and high character.

RAINY, ROBERT (1826-1906), Scotch Presbyterian divine, was born on the 1st of January 1826; his father, Dr Harry Rainy, professor of forensic medicine in Glasgow University, was the son of a Sutherlandshire minister. Young Rainy was intended for his father's profession, but he was caught by the evangelical fervour of the Disruption movement, and after studying for the Free Church he became a minister, first in Aberdeenshire and then in Edinburgh, till in 1862 he was elected professor of Church history in the theological seminary, New College, a post he only resigned in 1900. In 1874 he was made principal of the college and was subsequently known as Prin- cipal Rainy. He had come to the front as a champion of the liberal party in the Union controversy within the Free Church, and in combating Dean Stanley's Broad Church views in the interests of Scotch evangelicism ; and about 1875 he became the undisputed leader of the Free Church. He guided it through the controversies as to Robertson Smith's heresies, as to the use of hymns and instrumental music, and as to the Declaratory Act, brought to a successful issue the union of the Free and United Presbyterian Churches, and threw the weight of the united church on the side of freedom of Biblical criticism. He was the first moderator of the General Assembly of the United Free Church of Scotland, having previously been moderator of the Free General Assembly. Though not a great scholar, he was eminent as an ecclesiastical statesman, and his influence was far-reaching. After the strain of the fight with the so-called " Wee Frees " in 1904-5 his health broke down, and he went to Australia for recovery, but died at Melbourne on the 22nd of December 1906

See Lives by P. Carnegie Simpson (1909) and R. Mackintosh (I9< >7)-

RAIPUR, a town and district of British India, in the Chhattis- garh division of the Central Provinces. The town is 994 ft. above sea-level, 188 m. E. of Nagpur; and has a station on the Bengal-Nagpur railway. Pop. (1901) 32,114. There are ruins of an immense fort, with many tanks and old temples. It has a German mission and a government high school. The Raj- kumar college, for the education of the sons of the chiefs of Chhattisgarh,

was transferred here from Jubbulpore in 1894.

The District of Raipur has an area of 9831 sq. m. It spreads over a vast plateau closed in by ranges of hills branching from the great Vindhyan chain. It is drained by the Seonath and the Mahanadi rivers. Geologically the country consists in the hilly tracts of gneiss and quartzite; the sandstone rocks in the west are intersected with trap dykes. Iron ore is abundant, and red ochre of high repute is found. In the interior the principal strata are a soft sandstone slate (covered generally by a layer of laterite gravel) and blue limestone, which crops out in numerous places on the surface and is invariably found in the beds of the rivers. Throughout the plains the soil is generally fertile. The climate is generally good; the mean temperature is 78 F., and the annual rainfall averages 55 in. The population on the present area in 1901 was 1,096,858, show- ing a decrease of 2-5% in the decade. The principal crop is rice. There are manufactures of cotton goods and brassware. The north-west corner of the district is crossed by the main line of the Bengal-Nagpur railway, and a narrow-gauge branch runs from Raipur town due south. The district suffered severely from famine in 1896-97, and again in 1899-1900.

Raipur was governed by a branch of the Haihaivansi dynasty of Ratanpur for many centuries until their deposition by the Mahrattas in 1 7 50. The country was then already in a condition of decay, and soon afterwards it relapsed into absolute anarchy. In 1818 it was taken under British superintendence and made rapid progress. It fell with the rest of the Nagpur dominions to the British government in 1854. In 1906 its area was reduced by the formation of the new district of Drug.

RAIS (or Retz), GILLES DE (1 404-1440), marshal of France and the central figure of a 15th-century cause c&bbre, whose name is associated with the story of Bluebeard, was the son of Guy de Montmorency-Laval, the adopted son and heir of Jeanne de Rais and of Marie de Craon. He was born at Mache- coul in September or October 1404, and, being early left an orphan, was educated by his maternal grandfather, Jean de Craon. Chief among his great possessions was the barony of Rais (erected in the 16th century into the peerage-duchy of Retz), south of the Loire, on the marches of Brittany. He joined the party of the Montforts, supporting Jean V. of Brit- tany against the rival house of Penthievre. He helped to release Duke John from Olivier de Blois, count of Penthievre, who had taken him prisoner by craft, and was rewarded by extensive grants of land, which were subsequently commuted by the Breton parliament for money payments. In 1420, after other projects of marriage had fallen through, in two cases by the death of the bride, he married Katherine of Thouars, a great heiress in Brittany, La Vendee and Poitou. In 1426 he raised seven companies of men-at-arms, and began active warfare against the English

under Artus de Richemont, the newly made constable of France. He had already built up a military reputation when he was chosen to accompany Joan of Arc to Orleans. He continued to be her special pro- tector, fighting by her side at Orleans, and afterwards at Jar- geau and Patay. He had advocated further measures against the English on the Loire before carrying out the coronation of Charles VII. at Reims. On the 17th of July he was made marshal of France at Reims, and after the assault on Paris he was granted the right to bear the arms of France as a border to his shield, a privilege that was, however, never ratified. In the winter he was in Normandy, at Louviers, whether with a view to the release of Joan, then a prisoner at Rouen, cannot be stated. Meanwhile his fortune was disappearing, although he had been one of the richest men in France. He had expended I great sums in the king's service, and he maintained a court of

knights, squires, heralds and priests, more suited to royal than baronial rank. He kept open house, was a munificent patron of literature and of music, and his library contained many valuable works, he himself being a skilled illuminator and binder. He also indulged a passion for the stage. At the chief festivals he gave performances of mysteries and moralities, and it has been asserted that the Mystere de la Passion, acted at Angers in 1420, was staged by him in honour of his own marriage. The original draft of the Mystery of Orleans was probably written under his direction, and contains much detail which may be well accounted for by his intimate acquaintance with the Maid. In his financial difficulties he began to alienate his lands, selling his estates for small sums. These proceedings provided his heirs with material for lawsuits for many years. Among those who profited by his prodigality were the duke of Brittany, and his chancellor, Jean de Malestroit, bishop of Nantes, but in 1436 his kinsfolk appealed to Charles VII., who proclaimed further sales to be illegal. Jean V. refused to acknowledge the king's right to promulgate a decree of this kind in Brittany, and replied by making Gilles de Rais lieutenant of Brittany and by acknowledging him as a brother-in-arms. Gilles hoped to redeem his fortunes by alchemy; he also spent large sums on necromancers, who engaged to raise the devil for his assistance. On the other hand he sought to guarantee himself from evil consequences by extravagant charity and a splendid celebration of the rites of the church. The abominable practices of which he was really guilty seem not to have been suspected by his equals or superiors, though he had many accomplices and his criminality was suspected by the peasantry. His wife finally left him in 1434-35, and may possibly have become acquainted with his doings, and when his brother

Rene de la Suze seized Champtoce, all traces of his crimes had not been removed, but family considerations no doubt imposed silence. His servants kidnapped children, generally boys, on his behalf, and these he tortured and murdered. The number of his victims was stated in the ecclesiastical trial to have been 140, and larger figures are quoted. The amazing impunity which he enjoyed was brought to an end in 1440, when he was imprudent enough to come into conflict with the church by an act of violence which involved sacrilege and infringement of clerical immunity. He had sold Saint Etienne de Malemort to the duke of Brittany's treasurer, Geffroi le Ferron. In the course of a quarrel over the delivery of the property to this man's brother, Jean le Ferron, Gilles seized Jean, who was in clerical orders, in church, and imprisoned him. He then pro- ceeded to defy the duke, but was reconciled to him by Riche- mont. In the autumn, however, he was arrested and cited before the bishop of Nantes on various charges, the chief of which were heresy and murder. With the latter count the ecclesiastical court was incompetent to deal, and on the 8th of October Gilles refused to accept its jurisdiction. Terrified by excommunication, however, he acknowledged the evidence of the witnesses, and by confession he secured absolution. He had been pronounced guilty of apostasy and heresy by the inquisitor, and of vice and sacrilege by the bishop. A detailed confession was extracted by the threat of torture on the 21st of October. A separate and parallel inquiry was made by Pierre de l'Hdpital, president of the Breton parliament, by ■whose sentence he was hanged (not burned alive as is sometimes stated), on the 26th of October 1440, with two of his accomplices. In view of his own repeated confessions it seems impossible to doubt his guilt, but the numerous irregularities of the pro- ceedings, the fact that his necromancer Prelati and other of his chief accomplices went unpunished, taken together with the financial interest of Jean V. in his ruin, have left a certain mystery over a trial, which, with the exception of the process of Joan of Arc, was the most famous in 15th-century France. His name is connected with the tale of Bluebeard (q.v.) in local tradition at Machecoul, Tiffauges, Pornic and Chemere, though the similarity between the two histories is at best vague. The records of the trial are preserved in the Bibliotheque Nationale in Paris, at Nantes and elsewhere.

See Eugene Bossard, Gilles de Rais, dit Barbe Bleue (2nd ed., 1886), which includes the majority of the documents of the trial published originally by De Maulde; E. A. Vizetelly, Bluebeard (1902); H. C. Lea, Hist, of the Inquisition (iii. 468, seq.) ; A. Molinier, Les Sources de I'histoire de France (No. 4185). Huysmans in La-bas describes his hero as engaged on a life of Gilles de Rais, and takes the oppor- tunity for a striking picture of the trial.

RAISIN (Fr. raisin, grape; Lat. racemus), the name given to the dried fruits of certain varieties of the grape vine, Vitis vinifera, which grow principally in the warm climate of the Mediterranean coasts and are comparatively

rich in sugar. The use of dried grapes or raisins as food is of great antiquity (Num. vi. 3; 1 Sam. xxv. 18, xxx. 12). In medieval times raisins imported from Spain were a prized luxury in England, and to the present day Great Britain continues to be the best customer of the raisin-producing regions. " Raisins of the sun " are obtained by letting the fruit continue on the vines after it has come to maturity, where there is sufficient sunshine and heat in the autumn, till the clusters dry on the stocks. Another plan is partially to sever the stalk before the grapes are quite ripe, thus stopping the flow of the sap, and in that condition to leave them on the vines till they are sufficiently dry. The more usual process, however, is to cut off the fully ripe clusters and expose them, spread out, for several days to the rays of the sun, taking care that they are not injured by rain. In unfavourable weather they may be dried in a heated chamber, but are then inferior in quality. In some parts of Spain and France it is common to dip the gathered clusters in boiling water, or in a strong potash lye, a practice which softens the skin, favours drying and gives the raisins a clear glossy appearance. Again, in Asia Minor the fruit is dipped into hot water on the surface of which swims a layer of olive oil, which communicates a bright lustre and softness to the skin. Some superior varieties are treated with very great care, retained on their stalks, and sent into the market as clusters for table use; but the greater part are separated from the stalks in the process of drying and the stalks winnowed out of the fruit. Raisins come from numerous Mediterranean localities, and present at least three distinct varieties — (1) ordinary or large raisins, (2) sultana seedless raisins, and (3) currants or Corinthian raisins (see Currant). The greater proportion of the common large raisins of English commerce comes from the provinces of Malaga, Valencia and Alicante in Spain; these are known by the common name of Malaga raisins. Those of the finest quality, called Malaga clusters, are prepared from a variety of muscatel grape, and preserved on the stalks for table use. This variety, as well as Malaga layers, so called from the manner of packing, are exclusively used as dessert fruit. Raisins of a somewhat inferior quality, known as " lexias," from the same provinces, are used for cooking and baking purposes. Smyrna raisins also come to some extent into the English market. The best quality, known as Eleme, is a large fruit, having a reddish-yellow skin with a sweet pleasant flavour. Large-seeded dark-coloured raisins are produced in some of the islands of the Greek archipelago and in Crete, but they are little seen in the British markets. In Italy the finest raisins are produced in Calabria, inferior qualities in central Italy and in Sicily. From the Lipari Islands a certain quantity of cluster raisins of good quality is sent to England. In the south of France raisins of high excellence — Provence raisins in clusters — are obtained at Roquevaire, Lunel and Frontignan. Sultana seedless raisins are the produce of a small variety of yellow grape, cultivated exclusively in the neighbourhood of Smyrna. The vines are grown on a soil of decomposed

hippurite limestone, on sloping ground rising to a height of 400 ft. above the sea, and all attempts to cultivate sultanas in other raisin-growing localities have failed, the grapes quickly reverting to a seed-bearing character. The dried fruit has a fine golden-yellow colour, with a thin, delicate, translucent skin and a sweet aromatic flavour. A very fine seedless oblong raisin of the sultana type with a brownish skin-is cultivated in the neighbourhood of 5 I>amascus.

RAJA, the Hindu title for a chief, or prince, derived from the same root as the Latin rex. Other forms are rao, rana and rawal, while chiefs of high rank are styled maharaja, maharao and maharana. The Hindustani form is rai, and the title of the Hindu emperor of Vijayanagar in S. India was raya. It is not confined to the rulers of native states, being conferred by the British government on Hindu subjects, sometimes as an hereditary distinction. In the form of rao it appears as a suffix to the names of most Mahrattas, and to the names of Kanarese Brahmans.

RAJAHMUNDRY, or Rajamahendri, a town of British India, in the Godavari district of Madras. Pop. (1001) 36,408. It stands on the left bank of the river Godavari, at the head of the delta, 360 m. N. of Madras, and has a station on the East Coast railway, which is here carried across the river by a bridge of 56 spans. The government college is one of the four pro- vincial schools established in 1853. There are also a training college and high school. Carpets, rugs and wooden wares are manufactured.

Tradition divides the merit of founding Rajahmundry be- tween the Orissa and Chalukya princes. In 1470 it was wrested from Orissa by the Mahommedans, but early in the 16th century it was retaken by Krishna Raja. It continued under Hindu rule till 1572, when it yielded to the Moslems of the Deccan under Rafat Khan. It passed into the possession of the French in 1753, but they were driven out by the British under Colonel Forde in 1758.

RAJASTHANI (properly Rajasthani, the language of Rajasthan of Rajputana), an Indo-Aryan vernacular closely related to Gujarati {q.v.). It is spoken in Rajputana and the adjoining parts of central India, and has several dialects the principal of which are Jaipurl, Marwarl, Mewatl and Malvi. Harauti, an important variety of Jaipurl, is spoken in the states of Kota and Bundi. Carey, the well-known Seram- pur missionary, paid great attention to Rajasthani in the early part of the 19th century, translating the New Testament into no fewer than six dialects, viz. Harauti, Ujaini (i.e.

Malvi), Udaipuri (a form of Marwarl), Marwarl proper, Jaipurl proper and Blkaneri (another form of Marwarl). In 1901 the total number of speakers of Rajasthani was 10,917,712. (G. A. Gr.)

RAJGARH, a native state of central India, in the Bhopal agency. Area, 940 sq. m. Pop. (1901) 88,376, showing a decrease of 26% in the decade, due to the results of famine. Estimated revenue, £33,000; tribute (to Sindhia), £3640. The chief, whose title is rawat, is a Rajput of the Umat clan. Grain and opium are the principal articles of trade. The town of Rajgarh, which is surrounded by a battlemented wall, had a population of 5399 in 1901.

RAJKOT, India, capital of a native state in Bombay, and headquarters of the political agent for Kathiawar. Pop. (1901) 36,151. It is situated in the middle of the peninsula of Kathia- war, and is the centre of the railway system. There is a military cantonment. The Rajkumar college, for the education of the sons of chiefs on the lines of an English public school, has achieved great success. Besides the high school there are training colleges for masters and mistresses. The Rasulkhanji hospital has a department for women, opened in 1897. All these institu- tions are maintained at the joint expense of the chiefs of Kathia- war. The state of Rajkot, which is a branch of Nawanagar, has an area of 282 sq. m. Pop. (1901) 49,795. Estimated revenue, £20,000.

RAJMAHAL, a former capital of Bengal, India, now a village in the district of the Santal Parganas, situated on the right bank of the Ganges, where that river makes a turn to the south. Pop. (1901) 2047. It was chosen for his residence by Man Singh, Akbar's Rajput general in 1592, but the capital of the province was shortly afterwards transferred to Dacca. It contains many palaces and mosques, now in ruins and over- grown with jungle. It has a station on the loop line of the East Indian railway, but trade has declined since the Ganges aban- doned its old bed; and Sahibganj has taken its place. Rajmahal has given its name to a range of hills, almost the only hills in xxn. 28

Bengal proper, which here come down close to the bank of the Ganges. They cover a total area of 1366 sq. m., and their height never exceeds 2000 ft. They are inhabited by an ab- original race, known as Paharias or "hill-men," of whom two tribes may be distinguished: the Male Sauria Paharias and the Mai Paharias; total pop. (1901) 73,000. The former, if not the latter also, are closely akin to the larger tribe of Oraons. Their language, known as Malto, of the Dravidian family, was spoken by 60,777 persons in 1901. The Paharias have contributed an element to the administrative history of Bengal. Augustus Clevland, a civilian who died in 1784 and whose name is still honoured, was the first who succeeded in winning their con- fidence and recruiting among them a corps of hill-

rangers. The methods that he adopted are the foundation of the " non-regulation " system, established in 1796; and the hills were exempted from the permanent settlement. The Santals, a different aboriginal race, have since immigrated in large numbers into the Daman-i-koh, or " skirts of the hills "; but the Paharias alone occupy the plateaux on the top, where they are per- mitted to practise the privilege of shifting cultivation, which renders scientific forestry impossible. The approach from the plains below to each plateau is guarded by a steep ladder of boulders.

See E. W. Dalton, Descriptive Ethnology of Bengal (Calcutta, 1872); F. B. Bradley-Birt, The Story of an Indian Upland (1905).

RAJPIPLA, a native state of India, in the Rewa Kantha agency, Bombay, occupying a hilly tract between the rivers Nefbudda and Tapti; area, 1517 sq. m. Pop. (1901) 117,175, showing a decrease of 32% in the decade, due to the results of famine; estimated revenue, £60,000; tribute (to the Gaekwar of Baroda), £3000. The chief, whose title is maharana, is a Gohel Rajput, of the same family as the thakor saheb of Bhau- nagar. A light railway, constructed at the cost of the state, connects Nandod with Anklesvar in Broach district. The old fort of Rajpipla, in the hills, is now deserted. The modern capital is Nandod, situated on the river Karjan, 32 m. from Surat. Pop. (1901) 11,236.

RAJPUT, a race of India, not confined to Rajputana, but spread over the N. of the country. According to the census of 1901 there were 9,712,156 Rajputs in all India, of whom only 620,229 lived in Rajputana. The great majority adhere to the Hindu religion, but 1,875,387 are entered as Mahommedans. The Rajputs form the fighting, landowning and ruling caste. They claim to be the modern representatives of the Kshatriyas of ancient tradition; but their early history is obscure, and recent research supports the view that they include descendants of more than one wave of immigrant invaders. Linguistic evidence supports tradition in proving that their unity was broken up by the Mahommedan conquest, for the inhabitants of the Himalayan valleys still speak a language akin to those of Rajputana proper, though separated from them by the wide Gangetic valley.

The Rajputs are fine, brave men, and retain the feudal instinct strongly developed. Pride of blood is their chief characteristic, and they are most punctilious on all points of etiquette. The tradition of common ancestry permits a poor Rajput yeoman to consider himself as well born as any powerful landholder of his clan, and superior to any high official of the professional classes. No race in India can boast of finer feats of arms or brighter deeds of chivalry, and they form one of the main recruiting fields for the Indian army of to-day. They consider any occupation other than

that of arms or government derogatory to their dignity, and consequently during the long period of peace which has followed the establishment of the British rule in India they have been content to stay idle at home instead of taking up any of the other professions in which they might have come to the front. Those who are not zamindars have, therefore, rather dropped behind in the modern struggle for existence. As cultivators they are lazy and indifferent, and they prefer pastoral to agricultural pursuits. Looking upon all manual labour as humiliating, none but the poorest class of Rajput will himself hold the plough.

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RAJPUTANA

Within the limits of Rajputana the Rajputs form a vast body of kindred, and any Rajput can marry any Rajput woman who does not belong to his own clan. The most numerous of the clans is the Rahtor, to which the chiefs of Marwar, Bikanir and Kishangarh belong. Its strength in 1901 was 122,160. Next comes the Kachwaha clan, which is strong in Jaipur and Alwar, both chiefs belonging to its members. It numbers 100,186. The Chauhan follows with an aggregate of 86,460, among whom are the chiefs of Bundi, Kotah and Sirohi. The Jadu or Jadon, which includes in its ranks the chiefs of Karauli and Jaisalmer, numbers 74,666. The Sisodhyias, who include the ancient and illustrious house of Udaipur, number 51,366. The Ponwar clan, to which Vikramaditya, the celebrated king of Ujjain, from whom the Hindu Era is named, is said to have belonged, numbers 43.435- The Solanki and Parihar clans, once powerful, are now only 18,940 and 9448 respectively.

RAJPUTANA, a collection of native states in India, under the political charge of an agent to the governor-general, who resides at Abu in the Aravalli Hills. It lies between 23 and 30 N. and between 69 30′ and 75° 15′ E., and includes 18 states and 2 estates or chiefships. For political purposes these are subdivided into eight subordinate groups, consisting of three residencies and five agencies. These are as follow: (1) Mewar residency, with headquarters at Udaipur, comprising the states of Udaipur (Mewar), Dungarpur, Partabgarh and Banswara; (2) Jaipur residency, with headquarters at Jaipur, comprising the states of Jaipur and Kishangarh, with the estate of Lawa; (3) Western Rajputana states residency, with head- quarters at Jodhpur, comprising the states of Jodhpur, Jaisalmer and Sirohi; (4) Bikanir agency, with headquarters at Bikanir; (5) Alwar agency, with headquarters at Alwar; (6) Eastern Rajputana states agency, with headquarters at Bharatpur, comprising the

states of Bharatpur, Dholpur, and Karauli; (7) Haraoti-Tonk agency, with headquarters at Deoli, com- prising the states of Tonk and Bundi, with the estate of Shah- pura; (8) Kotah-Jhalawar agency, with headquarters at Kotah, comprising the states of Kotah and Jhalawar. All of these states are under Rajput rulers, except Tonk, which is Mahommedan, and Bharatpur and Dholpur, which are Jat. The small British province of Ajmere-Merwara is also included within the geographical area of Rajputana.

Physical Features. — The total area of Rajputana is about 127,541 sq. ra. It is bounded on the west by Sind, and on the north-west by the Punjab state of Bahawalpur. Thence its northern and north- eastern frontier marches with the Punjab and the United Provinces until it touches the river Chambal, where it turns south-eastward for about 200 m., dividing the states of Dholpur, Karauli, Jaipur and Kotah from Gwalior. The southern boundary runs in a very irregular line across the central region of India, dividing the Rajputana states from a number of native states in Central India and Gujarat. The most striking physical feature is the Aravalli range of mountains, which intersects the country almost from end to end in a line running from south-west to north-east. Mount Abu is at the south-western extremity of the range, and the north-eastern end may be said to terminate near Khetn in the Shaikhawati district of Jaipur, although a series of broken ridges is continued in the direction of Delhi. About three-fifths of Rajputana lies north-west of the range, leaving two- fifths on the east and south. The tract lying to the north-west contains the states of Bikanir, Jaisalmer and Jodhpur. With the exception of the sub-montane districts of Jodhpur, which lie im- mediately below the Aravallis, this " division is sandy, ill- watered and unproductive, improving gradually from a desert in the north- west and west to comparatively fertile land on the east. The country to the east and south-east of the Aravallis affords a striking contrast to the sandy plains on the north-west of the range, and is blessed with fertile lands, hill-ranges and long stretches of forest, where fuel and fodder are abundant.

The chief rivers of Rajputana are the Luni, the Chambal and the Banas. The first of these, the only river of any consequence in the north-western division, flows for 200 m. from the Pushkar valley, close to Ajmere, to the Runn of Cutch. In the south- eastern division the river system is important. The Chambal is by far the largest river in Rajputana, through which it flows for about one-third of its course, while it forms its boundary for another third. The source of the river is in the highlands of the Vindhyas, upwards of 2000 ft. above the sea; it soon becomes a considerable stream, collecting in its course the waters of other rivers, and finally discharging itself into the Jumna after a course of 560 m. Next in importance ranks the Banas, which rises in the south-west near

Kankroli in Udaipur. It collects nearly all the drainage of the Udaipur plateau with that of the eastern slopes and hill-tracts of the Aravallis, and joins the Chambal a little beyond the north- eastern extremity of the Bundi state, after a course of about 300 m. Other rivers are the W. Banas and the Sabarmati, which rise among the south-west hills of Udaipur and take a south-westerly course. The river Mahi, which passes through the states of Partabgarh and Banswara, receiving the Som, drains the south-west corner of Rajputana through Gujarat into the Gulf of Cambay. Rajputana possesses no natural freshwater lakes, but there are several important artificial lakes, all of which have been constructed with the object of storing water. The only basin of any extent is the Sambhar salt lake, of about 50 m. in circuit.

Geology. — Geologically considered, the country may be divided into three regions — a central, and the largest, comprising the whole width of the Aravalli system, formed of very old sub-metamorphic and gneissic rocks; an eastern region, with sharply defined boundary, along which the most ancient formations are abruptly replaced by the great basin of the Vindhyan strata, or are overlaid by the still more extensive spread of the Deccan trap, forming the plateau of Malwa; and a western region, of very ill-defined margin, in which, besides some rocks of undetermined age, it is more or less known or suspected that Tertiary and Secondary strata stretch across from Sind, beneath the sands of the desert, towards the flanks of the Aravallis. Rajputana produces a variety of metals. Ore of cobalt is obtained in no other locality in India, and although zinc blende has been found elsewhere it is known to have been extracted only in this province. Copper and lead are found in several parts of the Aravalli range and of the minor ridges in Alwar and Shaik- hawati, and iron ores abound in several states. Alum and blue vitriol (sulphate of copper) are manufactured from decomposed schists at Khetri in Shaikhawati. Good building materials are obtained from many of the rocks of the country, among which the Raialo limestone (a fine-grained crystalline marble) and the Jaisalmer limestone stand pre-eminent.

Climate. — The climate throughout Rajputana is very dry and hot during the summer; while in the winter it is much colder in the north than in the lower districts, with hard frost and ice on the Bikanir borders. The rainfall is very unequally distributed : in the western part, which comes near to the limits of the rainless region of Asia, it is very scanty, and scarcely averages more than 5 in. ; in the south-west the fall is more copious, sometimes exceed- ing 100 in. at Abu; but, except in the south-west highlands of the Aravallis, rain is most abundant in the south-east. Notwith- standing all its drawbacks, Rajputana is reckoned one of the healthiest countries in India, at least for the native inhabitants.

Population. — In 1901 the population was 9,723,301, showing a decrease of 20% in the decade owing to the great famines of 1897-1898 and 1900-1901. The greatest mortality was caused by virulent malarial fever, which raged during the autumn months of 1900 and the early months of 1901. Epidemics of cholera, which occurred during the years of scarcity and famine, also swept away large numbers.

It is commonly supposed that, because nearly the whole country is ruled by Rajputs, therefore the population consists mainly of Rajput tribes; but these are merely the dominant race, and the territory is called Rajputana because it is politic- ally possessed by Rajputs. The whole number of this race is 620,229, and nowhere do they form a majority of the whole population in a state; but they are strongest, numerically, in the northern states and in Udaipur. By rigid precedence the Brahmans occupy the first rank; they are numerous and influential, and with them may be classed the peculiar and important caste of Bhats, the keepers of secular tradition and of the genealogies. Next come the mercantile castes, mostly belonging to the Jain sect; these are followed by the powerful cultivating tribes, such as the Jats and Gujars, and then come the so-called aboriginal tribes, chief of whom are the Minas, Bhils and Meos. Rajasthani is the chief language of the country, one or other of its dialects being spoken by 7,035,093 persons or more than 72 % of the total population. The gross revenue of all the states is estimated at i\ millions sterling.

The mass of the people are occupied in agriculture. In the large towns banking and commerce flourish to a degree beyond what might be expected. In the north the staple products for export are salt, grain, wool and cotton, in the south opium and cotton; while the imports consist of sugar, hardware and piece goods. Rajputana is very poor in industrial production. The principal manufactures are cotton and woollen goods, carvings in ivory and working in metals, &c, all of which handicrafts are chiefly carried on in the eastern states. The system of agriculture is

very simple; in the country west of the Aravallis only one crop is raised in the year, while in other parts south and east of the Aravallis two crops are raised annually, and various kinds of cereals, pulses and fibres are grown. In the desert tracts fine breeds of camels, cattle, horses and sheep are to be found wherever there is pasturage. Irrigation, mostly from wells, is almost confined to the N. portion. The country is traversed throughout by the Rajputana railway, with its Malwa branch in the south, and diverging to Agra and Delhi in the north. Jodhpur, Udaipur and Bikanir have

constructed branch railways at their own cost, the first of which was extended in 1901 to Hyderabad in Sind. In 1909 another line was opened running N. near the E. boundary from Kotah to Bharatpur.

History. — Only faint outlines can be traced of the condition of Rajputana previous to the invasion of Upper India by the Mahommedans, and these indicate that the country was subject for the most part to two or three powerful tribal dynasties. Chief of these were the Rahtors, who ruled at Kanauj; the Chauhans of Ajmere; the Solankis of Anhilwara, in Gujarat; the Gehlots with the Sisodhyias sept, still in Mewar or Udaipur; and the Kachwaha clan, still in Jaipur. These tribal dynasties of Rajputs were gradually supplanted by the Moslem invaders of the nth century and weakened by internal feuds. At the beginning of the 16th century the Rajput power began to revive, only to be overthrown by Baber at Fatehpur Sikri in 1527. The clans were finally either conquered, overawed or conciliated by Akbar — all except the distant Sisodhyia clan, which, however, submitted to Jehangir in 1616. From Akbar's accession to Aurangzeb's death, a period of 151 years, the Mogul was India's master. Aurangzeb's death and the invasion of Nadir Shah led to a triple alliance among the three leading chiefs, which internal jealousy so weakened that the Mahrattas, having been called in by the Rahtors to aid them, took possession of Ajmere about 1756; thenceforward Rajputana became involved in the general disorganization of India. By the end of ihe century nearly the whole of Rajputana had been virtually subdued by the Mahrattas. The victories of Generals Wellesley and Lake, however, saved the Rajputs; but on Lord Wellesley 's departure from India the floodgates of anarchy were reopened for ten years. On the outbreak of the Pindari War in 1817 the British government offered its protection. The Pindaris were put down, Amir Khan submitting and signing a treaty which constituted him the first ruler of the existing state of Tonk. By the end of 1818 similar treaties had been executed by the other Rajput states with the paramount power. Sindhia gave up the district of Ajmere to the British, and the pressure of the great Mahratta powers upon Rajputana was permanently withdrawn. Since then the political history of Rajputana has been comparatively uneventful. The great storm of the Mutiny of 1857, though dangerous while it lasted, was short. Most of the rajas remained loyal; and the capture of the town of Kotah, which had been held by the mutineers of that state, in March 1858, marked the extinction of armed rebellion.

Rajputana is of great archaeological interest, possessing some fine religious buildings in ruins and others in excellent preservation. Among the latter are the mosques at Ajmere and the temples on Abu. But the most characteristic features of architecture in the country are shown in the forts and palaces of the chiefs and in their cenotaphs.

See J. Tod, Annals and Antiquities of Rajasthan (1829, 1832); W. W. Webb, Currencies of the Hindu States of Rajputana (1893); Chiefs and Leading Families of Rajputana (1903) ; and Rajputana Gazetteer (Calcutta, 1908).

RAJSHAHI, a district and division of British India, in the province of Eastern Bengal and Assam. The administrative headquarters are at Rampur Boalia. The area of the district is 2593 sq. m., comprising an alluvial plain seamed with old river-beds and studded with marshes. The Ganges and the Mahananda are its principal rivers; the former constitutes a great natural boundary-line to the south and south-west, and the latter, which rises in the Himalayas, borders the district an the west for a few miles before joining the Ganges. Other

rivers are the Narad and Baral, important offshoots of the Ganges; the Atrai, a channel of the Tista; and the Jamuna, a tributary of the Atrai. Both the Atrai and the Jamuna belong to the Brahmaputra system and are navigable throughout the year for small cargo boats. The drainage of Rajshahi is not carried off by means of its rivers, but through the chains of marshes and swamps, the most important of which is the Chalan bhil or lake, which discharges itself into the Brahmaputra. In 1901 the population was 1,462,407, showing an increase of i-6% in the decade. Rice is the staple crop, with pulses, oilseeds and jute. Indigo has disappeared. Sericulture has received a stimulus from the efforts of the agricultural depart- ment, supported by private enterprise, to improve the breed of silkworms. The hemp grown on a small tract in the north of the district supplies all the ganja that is consumed in Bengal. The district is traversed from south to north by the main line of the Eastern Bengal railway to Darjeeling, with a branch to Bogra. Most of the permanent buildings in the district were severely damaged by the earthquake of the 12th of June 1897. When the East India Company took over the administration oi Bengal in 1765, the zamindari of Rajshahi or Nattor was one of the largest and most important in the province. It appears to have extended from Bhagalpur on the west to Dacca on the east, and to have included an important subdivision called Nij- Chakla Rajshahi on the south of the Ganges. The total area was estimated at 13,000 sq. m., or more than five times the size of the present district. Having been found much too large to be effectually administered by one central authority, Rajshahi was stripped in 1793 of a considerable portion of its outlying territory, and a natural boundary-line was drawn to the west, south and east along the Ganges and Brahmaputra. Its north-western limits were reduced in 1813, when the present district of Malda was constituted. The erection of Bogra into a separate jurisdiction in 1821 still further reduced its area, and in 1832 the limits of Rajshahi were fixed by the constitution of Pabna into an independent jurisdiction.

The Division of Rajshahi is coextensive with northern Bengal, from the Ganges to the mountains. It comprises the seven districts of Rajshahi, Dinajpur, Jalpaiguri, Malda, Rangpur, Bogra and Pabna. Total area, 18,091 sq. m. Pop.

(1901) 9,130,072.

RAKE (O.E. raca, cognate with Du. raak, Ger. Rechen, from a root meaning to scrape together, heap up), an agricultural and horticultural implement consisting of a toothed bar fixed transversely to a handle, and used for the collection of cut hay, grass, &c, and, in gardening, for loosening the soil, light weeding and levelling, and generally for purposes performed in agri- culture by the harrow. The teeth of the hand-rake are of wood or iron. For the horse-drawn rake, a bar with long curved steel teeth is mounted on wheels (see Hay and Haymaking). The word " rake " has been used since the 17th century in the sense of a man of a dissolute or dissipated character. This is a shortened form of the earlier " rake-hell," apparently in common use in the 16th century. In military and naval use " to rake " means to enfilade, to fire so that the shot may pass lengthwise along a ship, a line of soldiers, entrenchments, &c. In the nautical sense of the projection or slope of a ship's bows or stern or the inclination of a mast, the word is apparently an adaptation of the Scandinavian raka, to reach, in the sense of reach forward.

RAK6CZY, the name of a noble Hungarian family, which in the 10th century was settled in the county of Zemplen, and members of which played an important part in the history of Hungary during the 17th century.

George I., prince of Transylvania (1591-1648), who began his career as governor of Onod, was the youngest son of Sigis- mund Rakoczy (1544-1608), who shared in the insurrection of Stephen Bocskay against the Emperor Rudolph II., and was for a short time prince of Transylvania. In 1616 he married bis second wife, the highly gifted zealous Calvinist, Susannah Lorantffy, who exercised a great influence over him. He therj took a leading part in the rebellion of Gabriel Bethlen, who

made him commandant of Kassa, and was elected prince of Transylvania on the 26th of November 1630 by the diet of Segesvar. He followed the policy of Gabriel Bethlen, based on the maintenance of the political and religious liberties of the Hungarians. His alliance with Gustavus Adolphus

of Sweden for that purpose was no secret at Vienna, where the court estimated at their right value Rak6czy's hypocritical assurances of pacific amity. On the 2nd of February 1644, at the solicita- tion of the Swedish and French ambassadors, and with the consent of the Porte, he declared war against the Emperor Ferdinand III. Nearly the whole of imperial Hungary was soon in his hands, and Ferdinand, hardly pressed by the Swedes at the same time, was compelled to conclude (Sept. 16, 1645) with Rakoczy the peace of Linz, which accorded full religious liberty to the Magyars, and ceded to Rak6czy the fortress of Regec and the Tokaj district. On the death of Wladislaus IV. (1648) Rakoczy aimed at the Polish throne also, but died before he could accomplish his design. His capital, Gyula Feh6rvar, was a great Protestant resort and asylum.

See Secret Correspondence of the Age of George Rakoczy I. (Hung.), ed. Agoston Otvos (Klausenburg, 1848) ; Rakoczy' s Correspondence with Pdzmdny, Esterhazy, &c. (Hung.), ed. Antal Beke (Budapest, 1882); Sandor Szilagyi, The Rakoczy Family in the 18th Century (Hung.) (Pest, 1861).

George II., prince of Transylvania (1621-1660), was the eldest son of George I. and Susannah Lorantffy. He was elected prince of Transylvania during his father's lifetime (Feb. 19, 1642), and married (Feb. 3, 1643), Sophia Bathory, who was previously compelled by his mother to reject the Roman faith and turn Calvinist. On ascending the throne (Oct. 11, 1648), his first thought was to realize his father's Polish ambitions. With this object in view, he allied himself, in the beginning of 1649, with the Cossack hetman, Bohdan Chmielnicki, and the hospodars of Moldavia and Wallachia. It was not, however, till 1657, as the ally of Gustavus Adolphus, that he led a rabble of 40,000 semi-savages against the Polish king, John Casimir. He took Cracow and entered Warsaw with the Swedes, but the moment his allies withdrew the whole scheme collapsed, and it was only on the most humiliating terms that the Poles finally allowed him to return to Tran- sylvania. Here (Nov. 3, 1657) the diet, at the command of the Porte, deposed him for undertaking an unauthorized war, but in January 1658 he was reinstated by the Medgyes Diet. Again he was deposed by the grand vizier, and again reinstated as if nothing had happened, but all in vain. The Turks again invaded Transylvania, and Rak6czy died at Nagyvarad of the wounds received at the battle of Gyula (May 1660).

See Imre Bethlen, Life and Times of George Rdkoczy II, (Hung.) (Xagy-Enyed, 1829); Life (Hung.) in Sandor Szilagyi's Hungarian Historical Biographies (Budapest, 1891).

Francis I., prince of Transylvania (1645-1676), was the only son of

George Rakoczy II. and Sophia Bathory. He was elected prince of Transylvania during his father's lifetime (Feb. 18, 1652), but lost both crown and father at the same time, and withdrew to the family estates, where, at Patak and Makovica, he kept a splendid court. His mother converted him to Catholicism, and on the 1st of March 1666 he married Helen Zrinyi. In 1670 he was implicated in the Zrinyi-Frangepan conspiracy, and only saved his life by the interposition of the Jesuits on the payment of an enormous ransom.

See Sandor Szilagyi, The Rdkoczy Family in the 17th Century (Hung.) (Pest, 1861).

Francis II., prince of Transylvania (1676-1735), was born at Borsi, Zemplen county, on the 27th of March 1676. Having lost his father during infancy, he was educated under the guardianship of his heroic mother, Helen Zrinyi, in an ultra- patriotic Magyar environment, though the Emperor Leopold I. claimed a share in his tutelage. In 1682 his mother wedded Imre Thokoly, who took no part in the education of Rak6czy, but used him for his political purposes. Unfortunately his stepfather's speculations suffered shipwreck, and Rakoczy lost the greater part of his estates. It is said that the imperialists

robbed him of 1,000,000 florins' worth of plate and supported a whole army corps out of his revenues (1683-85). As a child of twelve he witnessed the heroic defence by his mother of his ancestral castle of Munkacs against Count Antonio Caraffa (d. 1693). On its surrender (Jan. 7, 1688) the child was transferred to Vienna that he might be isolated from the Hungarian nation aud brought up as an Austrian magnate. Cardinal Kollonics, the sworn enemy of Magyar separatism, now became his governor, and sent him to the Jesuit college at Neuhaus in Bohemia. In 1690 he completed his course at Prague, and in 1694 he married Maria Amelia of Hesse-Rhein- fels, and lived for the next few years on his Hungarian estates. At this time Rakoczy's birth, rank, wealth and brilliant qualities made him the natural leader of the Magyar nation, and his name was freely used in all the insurrections of the period, though at first he led a life of the utmost circumspec- tion (1697-1700). Hungary was then regarded at Vienna as a conquered realm, whose naturally rebellious inhabitants could only be kept under by force of arms. Kollonics was the supreme ruler of the kingdom, and his motto was " Make of the Magyar first a slave, then a beggar, and then a Catholic." It was a matter of life or death for the Magyars to resist such a reign of terror and save the national independence by making Hungary independent of Austria as heretofore. Rakoczy and a few other patriotic magnates deeply sympathized with the suffer- ings of the nation, and on the eve of the war of the Spanish Succession they entered into correspondence with Louis XIV. for assistance

through one Longueval, a Belgian general in the Austrian service, who professed to be a friend of the Rakoczyans, who initiated him into all their secrets. Longueval betrayed his trust, and Rak6czy was arrested and imprisoned at Eperjes. His wife saved him from certain death by enabling him to escape to Poland in the uniform of a dragoon officer. On the 1 8th of June 1703 he openly took up arms against the emperor, most of whose troops were now either on the Rhine or in upper Italy; but, unfortunately, the Magyar gentry stood aloof from the rising, and his ill-supported peasant levies (the Kuruczes) were repeatedly scattered. Yet at first he had some success, and on the 26th of September was able to write to Louis XIV. that the whole kingdom up to the Danube was in his power. He also issued his famous manifesto, Recrudescunt vulnera inclytae gentis Hungarian, to justify himself in the eyes of Europe. The battle of Blenheim made any direct help from France impossible, and on the 13th of June 1704 his little army of 7000 men was routed by the imperialists at Koronco and subsequently at Nagyszombat. Want of arms, money, native officers and infantry, made, indeed, any per- manent success in the open field impossible. Nevertheless, in May 1705, when the Emperor Leopold I. was succeeded by Joseph I., the position of Rakoczy was at least respectable. •With the aid of several eminent French officers and engineers he had drilled his army into some degree of efficiency, and had at his disposal 52 horse and 31 foot regiments. Even after the rout of Pudmerics (Aug. 11, 1705), he could put 100,000 men in the field. In September 1705 he was also able to hold a diet at Szecseny, attended by many nobles and some prelates, to settle the government of the country.

Rak6czy, who had already been elected Prince of Transyl- vania (July 6, 1704), now surrounded himself with a council of state of 24 members. The religious question caused him especial difficulty. An ardent Catholic himself, nine-tenths of his followers were nevertheless stern Calvinists, and in his efforts to secure them toleration he alienated the pope, who dissuaded Louis XIV. from assisting him. Peace negotiations with the emperor during 1705 came to nothing, because the court of Vienna would not acknowledge the independence of Transylvania, while France refused to recognize the rebels officially till they had formally proclaimed the deposition of the Habsburgs, which last desperate measure was actually accomplished by the Onod diet on the 13th of June 1707. This was a fatal mistake, for it put an end to any hope of a com – promise, and alienated both the emperor's foreign allies and the

majority of the Magyar gentry, while from Louis XIV. Rakoczy only got

100,000 thalers, the Golden Fleece, and a promise (never kept) that the Hungarians should be included in the general peace. But into a direct alliance with Rak6czy the French king would not enter, and Laszlo Vetesi, Rakoczy's envoy at Versailles, in 1708 advised his master to place no further reliance on the French court. Shortly afterwards, at Trencsen (Aug 3, 1708), Rakoczy's army was scattered to the winds. The rout of Trencsen was followed by a general abandonment. The remnant of the host, too, was now thor- oughly demoralized and dared not face the imperialists. A fresh attempt to renew the war in 17 10 was speedily ruined by the disaster of Romhany (Jan. 22), and a desperate effort to secure the help of Peter the Great also failing, Rakoczy gave up everything for lost, and on the 21st of February 1711 quitted his country for ever, refusing to accept the general amnesty conceded after the peace of Szatmar (see Hungary, History). He lived for a time in France on the bounty of Louis XIV., finally entering the Carmelite Order. In 1717, with forty comrades, he volunteered to assist the Turks against the Austrians, but on arriving at Constantinople discovered there was nothing for him to do. He lived for the rest of his life at the little town of Rodosto, where he died on the 8th of April 1735. His remains were solemnly transferred to Hungary in 1907 at the expense of the state.

See Autobiography of Prince Francis Rakoczy (Hung.) (Miskolcz, 1903); E. Jurkovich, The Liberation Wars of Prince Francis Rakoczy (Hung.) (Besztercze banya, 1903); S. Endrodi, Kurucz Notes, ijoo- 1720 (Hung.) (Budapest, 1897). (R. N. B.)

RALEIGH, SIR WALTER (c. 1552-1618), British explorer, poet and historian, was born probably in 1552, though the date is not quite certain. His father, Walter Raleigh of Fardell, in the parish of Cornwood, near Plymouth, was a country gentle- man of old family, but of reduced estate. Walter Raleigh the elder was three times married. His famous son was the child of his third marriage with Catherine, daughter of Sir Philip Champernown of Modbury, and widow of Otho Gilbert of Compton. By her first marriage she had three sons, John, Humphrey and Adrian Gilbert. Mr. Raleigh had been com- pelled to give up living in his own house of Fardell. His son was born at the farmhouse of Hayes near the head of Budleigh Salterton Bay, on the coast of Devonshire between Exmouth and Sidmouth. The name is written with a diversity excep- tional even in that age. Sir Walter, his father, and a half- brother used different forms. The spelling Raleigh was adopted by Sir Walter's widow, and has been commonly used, though there has been a tendency to prefer " Ralegh " in recent times. It was almost certainly pronounced " Rawley. H

In 1 568 he was entered as a commoner of Oriel College, Oxford, but he took no degree, and his residence was brief. In 1569 he followed his cousin Henry Champernown, who took over a body of English volunteers to serve

with the French Huguenots. From a reference in his History of the World it has been supposed that he was present at the battle of Jarnac (13th of March 1569), and it has been asserted that he was in Paris during the Massacre of St Bartholomew in 1572. Nothing, however, is known with certainty of his life till February 1575, when he was resident in the Temple. During his trial in 1603 he declared that he had never studied the law, but that his breeding had been " wholly gentleman, wholly soldier." In June 1578 his half-brother Sir Humphrey Gilbert obtained a patent for six years authorizing him to take possession of " any remote barbarous and heathen lands not possessed by any Christian prince or people." The gentry of Devon had been much engaged in maritime adventure of a privateering or even piratical character since the reign of Henry VIII. In the reign of Elizabeth they were the leaders in colonial enterprises in conflict with the Spaniards in America. During 1578 Humphrey Gilbert led an expedition which was a piratical venture against the Spaniards, and was driven back after an action with them and the loss of a ship in the Atlantic. Raleigh accompanied his half-brother as captain of the " Falcon," and was perhaps with him in an equally unsuccessful voyage of

the following year. Gilbert was impoverished by his ventures, and Raleigh had to seek his fortune about the court. In the course of 1580 he was twice arrested for duels, and he attached himself to the queen's favourite, the earl of Leicester, and to the earl of Oxford, son-in-law of Burghley, for whom he carried a challenge to Sir Philip Sidney. By the end of 1580 he was serving as captain of a company of foot in Munster. He took an active part in suppressing the rebellion of the Desmonds, and in the massacre of the Spanish and Italian adventurers at Smerwick in November. His letters prove that he was the advocate of a ruthless policy against the Irish, and did not hesitate to recommend assassination as a means of getting rid of their leaders.

In December 1581 he was sent home with despatches, as his company had been disbanded on the suppression of the Desmonds. His great fortune dates from his arrival at court where he was already not unknown. Raleigh had been in correspondence with Walsingham for some time. The romantic stories told by Sir Robert Naunton in the Fragmenta Regalia, and by Fuller in his Worthies, represent at least the mythical truth as to his rise into favour. It is quite possible that Raleigh, at a time when his court clothes represented " a considerable part of his estate," did (as the old story says) throw his mantle on the ground to help the queen to walk dry-shod over a puddle, and that he scribbled verses with a diamond on a pane of glass to attract her attention, though we only have the gossip of a later genera- tion for our authority. It is certain that his tall and handsome person, his caressing manners and his quick wit pleased the queen. The rewards showered on him were out of all proportion to his services in Ireland, which

had not been more distinguished than those of many others. In March 1582 he was granted a reward of £100, and the command of a company, nominally that he might be exercised in the wars, but in reality as a form of pension, since he was allowed to discharge his office by deputy and remained at court. In February 1583 he was included in the escort sent to accompany the duke of Anjou from England to Flanders. In 1583 the queen made him a grant of Durham House in the Strand (London), the property of the see of Durham, which had however been used of late as a royal guest-house. In the same year the queen's influence secured him two beneficial leases from All Souls, Oxford, which he sold to his advantage, and a patent to grant licences to " vintners," — that is, tavern keepers. This he subleased, and when his agent, one Browne, cheated him, he got the grant revoked, and reissued on terms which allowed him to make £2000 a year. In 1584 he had a licence for exporting woollen cloths, a lucrative monopoly which made him very unpopular with the merchants. He was knighted, in 1584. In 1585 he succeeded the earl of Bedford as Warden of the Stannaries. Raleigh made a good use of the great powers which the wardenship gave him in the mining districts of the west. He reduced the old customs to order, and showed him- self fair to the workers. In 1586 he received a grant of 40,000 acres of the forfeited lands of the Desmonds, on the Blackwater in Ireland. He was to plant English settlers, which he endeavoured to do, and he introduced the cultivation of the potato and of tobacco. In 1587 he received a grant in England of part of the forfeited land of the conspirator Babington.

During these years Raleigh was at the height of his favour. It was the policy of Queen Elizabeth to have several favourites at once, lest any one might be supposed to have exclusive influence with her. Raleigh was predominant during the period between the predominance of Leicester and the rise of the earl of Essex, who came to court in 1587. It is to be noted that Elizabeth treated Raleigh exclusively as a court favourite, to be enriched by monopolies and grants at the expense of her subjects, but that she never gave him any great office, nor did she admit him to the council. Even his post of captain of the Guard, given in 1587, though honourable, and, to a man who would take gifts for the use of his influence, lucrative, was mainly ornamental. His many offices and estates did not monopolize the activity of Raleigh. The patent given to his half-brother Sir Humphrey Gilbert was to run out in 1584. To

avert this loss Raleigh, partly out of his own pocket and partly by securing the help of courtiers and capitalists, provided the means for the expedition

to Newfoundland in 1583, in which Gilbert, who had been reduced to sell " the clothes off his wife's back " by his previous misfortunes, finally perished. Sir Humphrey's patent was renewed in favour of Sir Walter in March 1584.

Raleigh now began the short series of ventures in colonization which have connected his name with the settlement of Virginia. It has often been said that Raleigh showed a wise originality in his ideas as to colonization. But in truth the patent granted to him, which gave him and his heirs the proprietary right over all territory they occupied subject to payment of one-fifth of the produce of all mines of precious metals to the crown, is drawn closely on Spanish precedents. Nor was there any originality in his desire to settle English colonists, and encourage other industries than mining. The Spaniards had pursued the same aim from the first. In April 1584 Raleigh sent out two captains, Philip Amadas and Arthur Barlowe, on a voyage of exploration. They sailed by the Canaries to Florida, and from thence followed the coast of North America as far as the inlet between Albemarle and Pamlico sounds in the modern state of North Carolina. The name of Virginia was given to a vast and undefined territory, but none of Raleigh's captains or settlers reached the state of Virginia. In the same year he became member of parliament for Devonshire, and took the precaution to secure a parliamentary confirmation of his grant. His first body of settlers, sent out in 1585 under Sir Richard Grenville, landed on what is now Roanoke Island in North Carolina Sir R. Grenville showed himself mainly intent on taking prizes, going and coming. The settlers got on bad terms with the natives, despaired, and deserted the colony when Sir Francis Drake visited the coast in 1586. Attempts at colonization at the same place in 1586 and 1587 proved no more successful (see North Carolina), and in 1589 Raleigh, who represented himself as having spent £40,000 on the venture, resigned his rights to a company of merchants, preserving to himself a rent, and a fifth of whatever gold might be discovered.

After 1587 Sir Walter Raleigh was called upon to fight for his place of favourite with the earl of Essex (see Essex, 2nd Earl of). During the Armada year 1588 he was more or less in eclipse. He was in Ireland for part of the year with Sir R. Grenville, and was employed as vice-admiral of Devon in looking after the coast-defences and militia levy of the county. During this year he received a challenge from Essex which did not lead to an encounter. In 1589 he was again in Ireland. He had already made the acquaintance of Edmund Spenser and now visited him at his house at Kilcolman. It was by Raleigh's help that Spenser obtained a pension, and royal aid to publish the first three books of the Faerie Queen. The exact cause of Raleigh's partial disgrace at court is not known, but it was probably due to the queen's habitual policy of check- ing one favourite by the promotion of another. In 1589 he accompanied the expedition to the

coast of Portugal, which was intended to cause a revolt against King Philip II., but failed completely. In 1591 he was at the last moment forbidden to take part in the voyage to the Azores, and was replaced by his cousin Sir R. Grenville, whose death in action with the Spaniards was the subject of one of Sir Walter's most vigorous pieces of prose writing. In 1592 he was again at sea with an expedition to intercept the Spanish trade, but was recalled by the queen. The cause of his recall was the discovery that he had seduced one of her maids of honour, Elizabeth Throgmorton. Raleigh denied in a letter to Robert Cecil that there was any truth in the stories of a marriage between them. On his return he was put into the Tower, and if he was not already married was married there. To placate the queen he made a fantastic display of despair at the loss of her favour. It must be remembered that the maids of honour could not marry without the consent of the queen, which Elizabeth was always most reluctant to give and would be particularly unwilling to give

when the husband was an old favourite of her own. Raleigh proved a good husband and his wife was devoted to him through life. As the ships of the expedition had taken a valuable prize, the Portuguese carrack " Madre de Dios," and as there was a dispute over the booty, he was released to superintend the distribution. He had been a large contributor to the cost of the expedition, but the queen, who sent only two ships, took the bulk of the spoil, leaving him barely enough to cover his expenses.

Raleigh now retired from court to an estate at Sherborne in Dorsetshire, which just before his disgrace he had extorted from the bishop of Salisbury, to whose see it belonged, by a most unscrupulous use of the royal influence. A son was born to him here in 1594, and he kept up a friendly correspondence with Sir Robert Cecil, afterwards earl of Salisbury, the secretary of state. But a life of constant retirement was uncongenial to Raleigh, and as his profuse habits, together with the multiplicity of his interests, had prevented him from making any advantage out of his estates in Ireland, he was embarrassed for money. In 1595 he therefore sailed on a voyage of exploration with a view to conquest, on the coast of South America. The object was undoubtedly to find gold mines, and Raleigh had heard the wild stories of El Dorado which had been current among the Spaniards for long. His account of his voyage, The Discoverie of Guiana, published on his return, is the most brilliant of all the Elizabethan narratives of adventure, but contains much manifest romance. It was received with incredulity. He was now the most unpopular man in England, not only among the courtiers, but in the nation, for his greed, arrogance and alleged scepticism in religion. In 1590 he was named with the poet Marlowe and others as an atheist. At court he was not at first received. The share he took in the capture of Cadiz in 1 596, where he was seriously wounded, was followed by a restoration of favour at court, and he was

apparently reconciled to Essex, whom he accompanied on a voyage to the Azores in 1597. This co- operation led to a renewal of the quarrel, and Raleigh, as the enemy of Essex who was the favourite of the soldiers and the populace, became more unpopular than ever. In 1600 he obtained the governorship of Jersey, and in the following year took a part in suppressing the rebellion of Essex, at whose execution he presided as captain of the Guard. In 1600 he sat as member for Penzance in the last parliament of Elizabeth's reign. In parliament he was a steady friend of religious toleration, and a bold critic of the fiscal and agrarian legislation of the time.

The death of the queen and the accession of James I. were ruinous to Raleigh. Jame's, who looked upon Essex as his partisan, had been prejudiced, and Raleigh's avowed desire for the prolongation of the war with Spain was utterly against the peace policy of the king. Raleigh was embarrassed for money, and had been compelled to sell his Irish estates to Richard Boyle, afterwards 1st earl of Cork, in 1602. He was expelled from Durham House, which was reclaimed by the bishop, dismissed from the captaincy of the Guard, deprived of his monopolies, which the king abolished, and of the government of Jersey. In his anger and despair he unquestionably took some part in the complication of conspiracies which arose in the first months of James's reign, and was committed to the Tower on the 19th of July 1603. Here he made what appears to have been an insincere attempt to stab himself, but only inflicted a small wound. His trial at Winchester, November 1603, was conducted with such outrageous unfairness as to shock the opinion of the time, and his gallant bearing in face of the brutality of the Attorney-General, Sir Edward Coke, turned public opinion in his favour. It is now impossible to reach the truth, but on the whole it appears probable that Raleigh was cognizant of the conspiracies, though the evidence produced against him was insufficient to prove his guilt. Much was kept back by the council, and the jury was influenced by knowing that the council thought him guilty.

The sentence of death passed on Raleigh, and others tried at about the same time, was in most cases not carried out.

Raleigh was sent to the Tower, where he remained till the 19th of March 1616. His estate of Sherborne, which he had transferred to his son, was taken by the king, who availed himself of a technical irregularity in the transfer. A sum of £8000 offered in compensation was only paid in part. Raleigh's confinement was easy, and he applied himself to chemical experiments and literature. He had been known as one of the most poetical

of the minor lyric poets of an age of poetry from his youth. In prison he composed many treatises, and the only volume of his vast History of the World published. He also invented an elixir which appears to have been a very formidable quack stimulant. Hope of release and of a renewal of activity never deserted him, and he strove to reach the ear of the king by appealing to successive ministers and favourites. At last he secured his freedom in a way discreditable to all concerned. He promised the king to find a gold mine in Guiana without trenching on a Spanish possession. It must have been notorious to everybody that this was impossible, and the Spanish ambassador, Gondomar, warned the king that the Spaniards had settlements on the coast. The king, who was in need of money, replied that if Raleigh was guilty of piracy he should be executed on his return. Raleigh gave promises he obviously knew he could not keep, and sailed on the 17th of March 1617, relying on the chapter of accidents, and on vague intrigues he had entered into in Savoy and France. The expedition, on which the wreck of his fortune was spent, was ill-appointed and ill-manned. It reached the mouth of the Orinoco on the last day of 161 7. Raleigh was ill with fever, and remained at Trinidad. He sent five small vessels up the Orinoco under his most trusted captain, Lawrence Keymis, with whom went his son Walter and a nephew. The expedition found a Spanish settlement on the way to the supposed mine, and a fight ensued in which Sir Walter's son and several Spaniards were killed. Alter some days of bush fighting with the Spaniards, and of useless search for the mine, Keymis returned to Sir Walter with the news of his son's death and his own utter ruin. Stung by Raleigh's reproach Keymis killed himself, and then after a miserable scene of recriminations, hesitations and mutiny, the expedition returned home. Raleigh was arrested, and in pursuance of the king's promise to Gondomar was executed under his old sentence on the 29th of October 1618. During his confinement he descended to some unworthy supplications and devices, but when he knew his end to be inevitable he died with serenity and dignity. His wife survived him, and he left a son, Carew Raleigh. His enmity to Spain made him a popular hero. Authorities. — An edition of his Works in eight volumes was published in London in 1829. It contains a Life by Oldys and Birch, written with all the knowledge then available. A Life of Sir Walter Raleigh (London, 1806, 2nd ed.) was much used by Southey in his biography of Sir Walter Raleigh in vol. iv. of The British Admirals in the Cabinet Cyclopaedia (London, 1837). Two biographies appeared simultaneously, Life of Sir Walter Raleigh by J. A. Saint John, and Life of Sir Walter Raleigh by E. Edwards (London, 1868). Mr Edwards's work is in two volumes, of which the second contains the correspondence, and is still the best authority. Smaller lives, which in some cases contain new matter, are those by E. W. Gosse, "Raleigh" in English Worthies (1886); W. Stebbing, Sir W. Raleigh (London, 1891, and 1899) ; Martin Hume, Sir Walter Raleigh (London 1897) ; and H. de Selincourt,

Great Ralegh (1908). For special episodes see Sir John Pope Hennessy, Sir Walter Raleigh in Ireland (London, 1883), and T. N. Brushfield, Raleghana (Ashburton, 1896). Two separate editions of Raleigh's poems have been published, Poems, with biography and critical introduction by Sir F. Brydges (London, 1813), and Poems of Raleigh with those of Sir H. Wotton, Sfc, edited by J. Hannah (London, 1892). S. R. Gardiner made a careful examination of the events of Raleigh's life after 1603 in his History of England from the Accession of James I. to the Outbreak of the Civil War (1883-84). (D. H.)

RALEIGH, the capital of North Carolina, U.S.A., and the county-seat of Wake county, about 145 m. N. by W. of Wil- mington. Pop. (1890) 12,678; (1900) 13,643, of whom 5721 were negroes; (1910, census) 10,218. Area 4 sq. m. It is served by the Southern, the Seaboard Air Line, the Raleigh & Southport, and the Norfolk Southern railways. The city lies about 360 ft. above sea-level on ground sloping gently in all directions from its centre, where there is a beautiful park

of 4 acres known as Union Square, in which is the State Capitol and from which extend four broad streets. On the western border of the city is Pullen Park (about 40 acres), including the campus of the College of Agriculture and Mechanic Arts; it was named in honour of the donor, R. Stanhope Pullen, who was also a benefactor of the college. The State Capitol (1840) is surmounted by a dome and modelled to some extent after the Parthenon and other buildings of ancient Greece; the first Capitol (begun in 1794) was burned in 1831. In the vicinity are the Governor's Mansion, the Supreme Court Build- ing, the State Library, the building of the State Department of Agriculture, housing the State Museum (of geology, mineralogy,, agriculture and horticulture, botany, zoology, ethnology, &c), and the Post Office. Elsewhere are the County Court House, the State Hospital for the Insane (1856), founded through the efforts of Dorothea Lynde Dix, situated on Dix Hill and having in connexion with it a colony for epileptics; a state school for white blind, deaf and dumb (1845), and a state institute for negro deaf mutes and blind (1867); the state penitentiary (with a department for the criminal insane) ; a National Cemetery and a Confederate Cemetery; a Methodist Orphanage (1900) and a Roman Catholic Orphanage, the St Luke's Home for old ladies (1895; under the King's Daughters), a State (Confederate) Soldiers' Home (1891), and three private hospitals and the Rex public hospital (1909). Raleigh is the seat of the North Carolina College of Agriculture and Mechanic Arts (1889), in connexion with which is an agricultural experiment station; of three schools for girls — Peace Institute (Presbyterian, 1857), St Mary's School (Protestant Episcopal, 1842) and Meredith College (Baptist, 1891); of the medical department of the University of North Carolina; and of two schools for negroes — Shaw University (Baptist, 1865), with 530 students in

1908-1909, and St Augustine's School (Protestant Episcopal, 1868), a training school, with 466 students in 1908-1909. In 1908 the State Library (founded 1841) contained 39,000 volumes, the Supreme Court Library (founded 1870) about 17,000 volumes and the Olivia Raney public library (founded 1901) 9250 volumes. The city is the see of a Protestant Episcopal bishop. The principal industrial interests are trade in leaf tobacco and cotton raised in the vicinity, and the manufacture of cotton goods, phosphate fertilizers, foundry and machine-shop products, wooden-ware, &c. The Seaboard Air Line and the Raleigh & Southport railways have repair shops here. In 1905 the factory product was valued at $1,086,671, 14-7% more than in 1900. Electric power is conveyed to the city from Buckhorn Falls, on the Cape Fear river, about 26 m. south of Raleigh, and from Milburnie on the Neuse river, 6 m. distant.

In 1788 the site of the city, then known as Wake Court House, was chosen for the capital of the state; and in 1792 the city was laid out and named in honour of Sir Walter Raleigh. In 1794 the state legislature met here for the first time. Raleigh was incorporated in 1795 and was reincorporated in 1803; its present charter dates from 1899. General William T. Sherman's army, on its march through the Carolinas, passed through the city on the 13 th of April 1865. Raleigh was the birthplace of President Andrew Johnson; the house in which he was born has been removed to Pullen Park. By an extension of its boundaries the city nearly doubled its area and increased its population in 1907.

RALPH (d. 1 1 22), archbishop of Canterbury, called Ralph de Turbine, or Ralph d'Escures from his father's estate of Escures, near Seez in Normandy, entered the abbey of St Martin at Seez in 1079, and ten years later became abbot of this house. Soon afterwards he paid a visit to England, where his half-brother, Seffrid Pelochin, was bishop of Chichester, and in 1 1 00 he took refuge in England from the violence of Robert of Belesme, passing some time with his friends St Anselm and Gundulf. In March 1108 he succeeded Gundulf as bishop of Rochester. After Anselm's death in April 1109 Ralph acted as administrator of the see of Canterbury until April n 14, when he himself was chosen archbishop at Windsor. In this capacity he was very assertive of the rights of the archbishop of Canter-

bury and of the liberties of the English church. He claimed authority in Wales and Scotland, and he refused to consecrate Thurstan as archbishop of York because the latter prelate declined to profess obedience to the

archbishop of Canterbury. This step involved him in a quarrel with the Papacy, and he visited Rome, but was unable to obtain an interview with pope Paschal II., who had left the city. In spite of peremptory orders from Paschal's successors, Gelasius II. and Calixtus II., the archbishop still refused to consecrate Thurstan, and the dispute was unsettled when he died on the 20th of October 1122.

RALPH DE GUADER, earl of Norfolk (fl. 1070), was the son of a Norman who had held high positions in East Anglia, perhaps that of earl, in the reign of Edward the Confessor (c. 1055). His son Ralphfought on the Norman side at Hastings, and was made earl of Norfolk by William the Conqueror. In 1075 the king's refusal to sanction his marriage with the sister of Roger, earl of Hereford, caused the two earls to revolt. They were easily defeated, though Ralph sent to Denmark for ships and went there himself to fetch them. Ralph forfeited his English lands, and took refuge in Brittany on his wife's estate. In 1076, having plotted against Duke Hoel of Brittany, he was besieged at Dol, and the Conqueror came to Hoel's aid; but Ralph finally made his peace. Both he and his wife took part in the first crusade (1009), and died on the road to Palestine.

RALPH OF COGGESHALL (d. after 1227), English chronicler, was at first a monk and afterwards sixth abbot (1207-1218) of Coggeshall, an Essex foundation of the Cistercian order. Ralph himself tells us these facts; and that his resignation of the abbacy was made against the wishes of the brethren, in conse- quence of his bad health. He took up and continued a Ckronicon Anglicanum belonging to his house; the original work begins at 1066, his own share at 1187. He hoped to reach the year 1227, but his autograph copy breaks off three years earlier. Ralph makes no pretensions to be a literary artist. Where he had' a written authority before him he was content to reproduce even the phraseology of his original. At other times he strings together in chronological order, without any links of connexion, the anecdotes which he gathered from chance visitors. Unlike " Benedictus " and Roger of Hoveden, he makes little use of documents; only three letters are quoted in his work. On the other hand, the corrections and erasures of the autograph show that he took pains to verify his details; and his inform- ants are sometimes worthy of exceptional confidence. Thus he vouches Richard's chaplain Anselm for the story of the king's capture by Leopold of Austria. The tone of the chronicle is usually dispassionate; but the original text contained some personal strictures upon Prince John, which are reproduced in Roger of Wendover. The admiration with which Ralph regarded Henry II. is attested by his edition of Ralph Niger's chronicle; here, under the year 1161, he replies to the in- temperate criticisms of the original author. On Richard I. the abbot passes a judicious verdict, admitting the great qualities of that king, but arguing that his character degener- ated. Towards John alone Ralph is uniformly hostile; as a

Cistercian and an adherent of the Mandeville family he could hardly be otherwise. Ralph refers in the Chronicon {s.a. 1001) to a book of visions and miracles which he had compiled, but this is no longer extant. He also wrote a continuation of Niger's chronicle, extending from 1162 to 1178 (printed in R. Anstruther's edition of Niger, London, 1851), and short annals from 1066 to 1223.

The autograph manuscript of the Chronicon Anglicanum is to be found in the British Museum (Cotton, Vespasian D. X). The same volume contains the continuation of Ralph Niger. The Chronicon Terrae Sanctae, formerly attributed to Ralph, is by another hand; it was among the sources on which he drew for the Chronicon Anglicanum. The so-called Libellus de motibus anglicanis sub rege Johanne (printed by Martene and Durand, Ampl. Collectio, v. pp. 871-882) is merely an excerpt from the Chronicon Anglicanum. This latter work was edited for the Rolls series in 1875 by J. Stevenson. (H. W. C. D.)

RAM, PIERRE FRANCOIS XAVIER DE (1S04-1865), Belgian churchman and historian, was born at Louvain in

1804. He took orders early, and was appointed professor of poetry at the seminary of Malines, and archiviste of the diocese. During the years immediately before the revolution of 1830, Ram, who was much influenced by Lamennais, was active in bringing about a coalition of Liberals and Catholics against the Dutch government established by the Powers on the fall of Napoleon, and in endeavouring to give a democratic character to the policy of his church. He declined to stand as a member of the Belgian assembly, and applied himself wholly to teaching and to editing or composing historical books. As professor of philosophy at Malines he succeeded in bringing about the foundation of the Catholic university, which was transferred to Louvain in 1834. He was rector of the university till his death in 1865.

The best known of his publications is the Documents relatifs aux troubles du pays de Liege 1455-1505, published by the Commission royale de I'Histoire de Belgique (Brussels, 1844). A Notice sur la vie etles travaux de Mgr P. F. X. deRam, by J. J. Thonissen, will be found in the Annuaire de I'Acadimie royale de Belgique (Brussels, 1866).

RAM, a male sheep, one kept for breeding purposes in domes- tication and not castrated, as opposed to the castrated " wether " (see Sheep). For the ram as one of the signs of the zodiac, see Aries. The word may be connected with O.Nor. ramme, strong, or with Sansk. ram, to sport. The butting propensities of the ram have given rise to the many transferred senses of the word, chief and earliest of which is that of a battering imple-

ment used before the days of cannon for beating in the gates and breaching the walls of fortified places (see Battering Ram). Many technical uses of the term have been developed from this, e.g. the weight of a pile-driving machine, the piston of a hydraulic press and other machines or portions of machines worked by water power (see Hydraulics). The ancient war-vessels were fitted with a beak (Lat. rostrum, Gr. eicfidKov), projecting from the bows, and used to ram or crush in the sides of an opposing vessel; for the development of this in the modern battleship, see Ship.

RAMADAN, the month of the Mahommedan year in which absolute fasting from dawn to sunset is required. The law is laid down in Koran ii. 170-184, and is as follows: A fast had always been a part of religion. In Islam it was to fall in this month because in it the Koran was revealed, and it was holier than the others. It was to begin when the new moon was actually seen, and last until sight of the next new moon; to extend each day from the time when a white thread could be distinguished from a black one and until nightfall; to be absolute in that time as to food, drink, women. The daytime should be passed, by preference, in retreat (i 'tikaf) in the mosque in pious exercises; during the night all other- wise lawful things to be lawful. The sick and those on a journey might be excused, but should fast thereafter an equivalent number of days. Unexcused breaking of the fast might be atoned for by feeding of the poor. The last ten days of the month are regarded as especially sacred; these Mahomet himself used to pass in retreat. In the course of them falls the " Night of Decree," or " of Power " (Koran xc. 1), but its exact date is not known. On it intercourse between heaven and earth is peculiarly open, and many wonders take place. Fasting in Ramadan is reckoned one of the five pillars, or absolute requirements, of Islam. It is followed by the Lesser Festival, the first three days of the month Shauwal (see Bairam). Naturally, during it all the activities of life are reduced to a minimum, and those who can afford it turn night into day as much as possible.

For details see Hughes, Dictionary of Islam, 533 ff. ; Sell, Faith of Islam, 279 ff. ; Sprenger, Leben Mohammads, iii. 56 ff . ; Snouck Hurgronje, Mekka, 51, 77 ff . ; Meakin, The Moors, 247 ff. ; Juynboll, De Mohammedaansche Wet, 108 ff. (D. B. Ma.)

RAMBAUD, ALFRED NICOLAS (1842-1905), French his- torian, was born at Besancon on the 2nd of July 1842. After studying at the Ecole normale superieure, he completed his studies in Germany. He was one of that band of young scholars, among whom were also Ernest Lavisse, Gabriel Monod and Gaston Paris, whose enthusiasm was aroused by

the principles and organization of scientific study as applied beyond the Rhine, and who were ready to devote themselves to their cherished plan of remodelling higher education in France. He was appointed " repetiteur " at the Ecole des Hautes fitudes on its foundation in 1868. His researches were at that time directed towards the Byzantine period of the middle ages, and to this period were devoted the two theses which he composed for his doctorate in letters, De byzantino hippodromo et circensibus factionibus (revised in French for the Revue des Deux Mondes, under the title of " Le monde byzantin; le sport et l'hippodrome," 1871), and L'Empire grec au X' siecle, Constantin Porphyrogenete (1870). This latter work is still accepted as a good authority, and caused Rambaud to be hailed as a master on the Byzantine period; but with the exception of one article on Digenis Akritas, in the Revue des Deux Mondes (1875), and one other on Michael Psellos, in the Revue historique (vol. iii., 1876), Rambaud's researches were diverted towards other parts of the East: The Franco- German War inspired him with the idea for some courses of lectures which developed into books: La domination franqaise en Allemagne; les Franqais sur le Rhin, 1792-1804 (1873) and L 'Allemagne sous Napoleon I. 1804-1811 (1874). He watched attentively the role played by Russia, and soon observed how much to the interest of France, a good entente with this power would be. He accordingly threw himself into the study of Russian history, staying in Russia in order to learn its language, institutions and customs. On his return, he published La Russie epique, a study of the heroic songs (1876), a short but excellent Histoire de la Russie depuis les origines jusqu'd I'annee 1877 (1878; 5th ed., 1900), Franqais et Russes, Moscou et Sevastopol 1812-1854 (1876; 2nd ed., 1881), and finally the two important volumes on Russian diplomatic history in the Recueil des Instructions donnees aux ambassadeurs (vols. vii. and ix., 1890 and 1891). He was not improbably moved by considerations of foreign policy to publish his Russes et Prussians, guerre de Sept Ans (1895), a popular work, though based on solid research. After teaching history in the Faculties of Arts at Caen (1871) and Nancy (1873), he was called to the Sorbonne (1883), where he was the first to occupy the chair of contemporary history. By this time he had already entered into politics; he had been chef du cabinet of Jules Ferry (1879-1881), though this did not distract him from his literary work. It was under these conditions that he composed his Histoire de la civilisation franqaise (2 vols., 1885, 1887; 9th ed., 1901) and his Histoire de la civilisation contemporaine en France (1888; new ed. entirely revised, 1906), and undertook the general editorship of the Histoire gSnerale du IV' siecle jusqu'd nos jours. The plan of this great work had been drawn up with the aid of Ernest Lavisse, but the entire supervision of its execution was carried out by Rambaud. He

contributed to it himself some interesting chapters on the history of the East, of which he had a thorough knowledge. In 1885 Rambaud published, in collaboration with J. B. Bailie, a French translation of J. R. Seeley's Expansion of England, and in the preface he laid great emphasis on the enormous increase of power brought to England by the possession of her colonies, seeing in this a lesson for France. He was anxious to see the rise of a " Greater France," on the model of " Greater Britain," and it was with this idea that he undertook' to present to the public a series of essays, written by famous explorers or political men, under the title of La France coloniale, histoire, geographie, commerce (1886; 6th ed., 1893). Having become senator for the department of Doubs (1895-1902), Rambaud held the position of minister of Public Instruction from 1896 to 1898, and in that capacity endeavoured to carry on the educational work of Jules Ferry, to whose memory he always remained faithful. He dedicated to his former chief a book {Jules Ferry, 1903), which is a valuable testimony to the efforts made by France to organize public education and found a colonial empire; but this fidelity also won him some enemies, who succeeded for some time in pre- venting him from becoming a member of the Institute. He

was finally elected a member of the Academie des Sciences morales et politiques on the nth of December 1897, in place of the due d'Aumale, of whose life he wrote an account (vol. xxii., 2nd series, of the Memoires of this academy). His many interests ended by wearing out even his robust constitution, and he died at Paris on the 10th of November 1905.

See the notices by Ernest Lavisse in the Revue de Paris for January 15th, 1906, and Gabriel Monod in the Revue historique (vol. xc., pp. 344-348).

RAMBERT, EUGENE (1830-1886), Swiss author, was born at Sales near Swiss Clarens on the 6th of April 1830, the eldest son of a Vaudois schoolmaster, from whom he received his education. When in 1845 his father lost his post, owing to the religious disputes, Rambert became a teacher in Paris, and later a tutor in England and at Geneva. When the affairs of the family improved, Rambert was able to pursue his studies for the ministry, but he was more attracted by literature, and in 1845 became professor of French literature at the academy of Lausanne, and in i860 at the Federal polytechnic school at Zurich, where he remained till 1881, when he again became professor at Lausanne. His principal work, Les Alpes suisses (5 vols., 1866-1875; republished with large additions, according to his own scheme, in 6 vols., 1887-1889), is a mine of miscellaneous information on the subject. He also published several volumes of poetiy, as well as a volume entitled £crivains naliondux (1874, republished 1889), and biographies of the pietist Vinet (1875), of the poet Juste Olivier (1879) and of the artist Alexandre Calame (1883). He died on the 21st of November 1886.

Rambert's Dernieres Poesies were edited (1903) by Henri Warnery, whose Eugene Rambert (Lausanne, 1890) contains a critical estimate.

(W. A. B. C.)

RAMBOUILLET, CATHERINE DE VIVONNE, Marquise de (1588-1665), a lady famous in the literary history of France, was born in 1588. She was the daughter and heiress of Jean de Vivonne, marquis of Pisani, and her mother Giulia was of the noble Roman family of Savelli. She was married at twelve years old to Charles d'Angennes, vidame of Le Mans, and afterwards marquis of Rambouillet. The young marquise found the coarseness and intrigue that then reigned in the French court little to her taste, and after the birth of her eldest daughter, Julie d'Angennes, in 1607, she began to gather round her the circle afterwards so famous. She established herself at the Hotel Pisani, called later the Hotel de Rambouillet, the site of which is close to the Grands Magasins du Louvre. Mme de Rambouillet took great trouble to arrange her house for purposes of reception, and devised suites of small rooms where visitors could move easily, and could find more privacy than in the large reception rooms of the ordinary house. The hotel was rebuilt on these lines in 1618. It maintained its importance as a social and literary centre until 1650. Almost all the more remarkable personages in French society and French literature frequented it, especially during the second quarter of the century, when it was at the height of its reputation. There is abundant testi- mony to Mme de Rambouillet's beauty, though no portrait of her is known to exist. Her success as a hostess was due to many causes. Her natural abilities had been carefully trained, but were not extraordinary. Many people were, however, like herself, disgusted with the intrigues at court, and found the comparative austerity of the Hotel de Rambouillet a welcome change. The marquise had genuine kindness and a lack of prejudice that enabled her to entertain on the same footing princes and princesses of the blood royal, and men of letters, while among her intimate friends was the beautiful Angelique Paulet. The respect paid to ability in her salon effected a great advancement in the position of French men of letters. More- over, the almost uniform excellence of the memoirs and letters of 17th-century Frenchmen and Frenchwomen may be traced largely to the development of conversation as a fine art at the Hotel Rambouillet, and the consequent establishment of a standard of clear and adequate expression. Mme de Rambouillet was known as the " incomparable Arthenice," the name being an anagram for Catherine, devised by Malherbe and Racan.

Among the more noteworthy incidents in the story of the H6tel are the sonnet war between the Uranistes and the Jobistes — partisans of two famous sonnets by Voiture and Benserage — and the composition by all the famous poets of the day of the Guirlande de Julie, a collection of poems on different flowers, addressed in 1641 to Julie d'Angennes, afterwards duchesse de Montausier. Julie herself was responsible for a good deal of the preciosity for which the Hotel was later ridiculed. Charles de Sainte Maure, who become in 1664 due de Montausier, had been wooing her for seven years when he conceived the idea of the famous garland, and she kept him waiting for four years nore.

The Precieuses, who are usually associated with Moliere's avowed caricatures and with the extravagances of Mile, de Scudery, but whose name, it must be remembered, Madame de Sevigne herself was proud to bear — insisted on a ceremonious gallantry from their suitors and friends, though it seems from the account given by Tallemant des Reaux that practical jokes of a mild kind were by no means excluded from the Hotel de Rambouillet. They especially favoured an elaborate and quintessenced kind of colloquial and literary expression, imitated from Marini and Gongora, and then fashionable throughout Europe. The immortal Precieuses ridicules of Moliere was no doubt directly levelled not at the Hotel de Rambouillet itself, but at the numerous coteries which in the course of years had sprung up in imitation of it. But the satire did in truth touch the originators as well as the imitators, — the former more closely perhaps than they perceived. The Hotel de Rambouillet continued open till the death of its mistress, on the 2nd of December 1665, but the troubles of the Fronde diminished its influence.

The chief original authorities respecting Madame de Rambouillet and her set are Tallemant des Reaux in his Historiettes, and Antoine Baudeau de Somaize in his Grand Dictionnaire des Precieuses (1660). Many modern writers have treated the subject, notably Victor Cousin, La Societe frangaise au xvii' Steele (2 vols., 1856), and C. L. Livet, Precieux el Precieuses . . . (1859). There is an admirable edition (1875) of the Guirlande- de Julie by O. Uzanne.

RAMBOUILLET, a town of northern France, capital of an arrondissement in the department of Seine-et-Oise, 30 m. S.W. of Paris on the railway to Chartres. Pop. (1906) town, 3965; commune, 6165. Rambouillet derives its whole interest from the associations connected with the ancient chateau, dating originally from the 14th century, but often rebuilt. A great machicolated tower is all that remains of the medieval building; some apartments with good woodwork are also of interest. The chateau is surrounded by a beautiful park of 3000 acres and by an extensive forest. The gardens, partly in French, partly in English style, are picturesque, and

have an avenue of Louisiana cypress unique in Europe. The park contains the national sheep-farm, where in the 18th century the first flock of merino sheep in France was raised, a school of sheep-farming, and, close to the latter, a small dairy built by Louis XVI. The shooting of the famous coverts of Rambouillet is reserved for the presi- dents of the Republic. The town is the seat of a sub-prefect and has a tribunal of first instance and a preparatory infantry school. Trade is in grain, wool, flour and wood. Watch- springs are manufactured.

Originally a royal domain, the lands of Rambouillet passed in the 14th century to the D'Angennes family, who held them for three hundred years and built the chateau. Francis I. died there in 1 547 ; and Charles IX. and Catherine de Medicis found a refuge there in the Wars of Religion, as Henry III. did after them. The title became a marquisate in 161 2, at which time it was held by Charles d'Angennes, husband of Catherine de Vivonne (g.v.), the famous marchioness of Rambouillet. Created a duchy and peerage in favour of the duke of Toulouse, son of Louis XIV., Rambouillet was subsequently bought and embellished by Louis XVI., who erected a model farm and other buildings. The place was a hunting-seat of Napoleon I. and Charles X., and it was here that in 1830 the latter signed his abdication.

RAMEAU, JEAN PHILIPPE (1683-1764), French musical theorist and composer, was born at Dijon on the 23rd of October 1683. His musical education, partly in consequence of his father's desire that he should study law, still more through his own wayward disposition, was of a desultory character. In 1 701 his father sent him to Milan to break off a foolish love-match. But he learned little in Italy, and soon returned, in company with a wandering theatrical manager, for whom he played the second violin. He next settled in Paris, where he published his Premier livre de pieces de clavecin, in 1706. In 1 71 7 he made an attempt to obtain the appointment of organist at the church of St Paul. Deeply annoyed at his unexpected failure, he retired for a time to Lille, whence, however, he soon removed to Clermont-Ferrand. Here he succeeded his brother Claude as organist at the cathedral.

Burning with desire to remedy the imperfections of his early education, Rameau diligently studied the writings of Zarlino, Descartes, Messenne, F. Kircher and other theorists. He not only mastered their views but succeeded in demonstrating their weak points and substituting for them a system of his own. His keen insight into the constitution of certain chords, which in early life he had studied only by ear, enabled him to propound a series of hypotheses, many of which are now accepted as established facts. While the older contrapuntists were per- fectly satisfied with the laws which regulated the melodious involutions of their vocal and instrumental parts,

Rameau demonstrated the possibility of building up a natural harmony upon a fundamental bass, and of using that harmony as an authority for the enactment of whatever laws might be con- sidered necessary for the guidance either of the contrapuntist or the less ambitious general composer. And in this he first explained the distinction between two styles, which have been called the " horizontal and vertical systems," the " horizontal system " being that by which the older contrapuntists regulated the onward motion of their several parts, and the " vertical system " that which constructs an entire passage out of a single harmony. From fundamental harmonies he passed to inverted chords, to which he was the first to call attention; and the value of this discovery fully compensates for his erroneous theory concerning the chords of the eleventh and the great (Angl. "added") sixth (see Harmony).

Rameau first set forth his new theory in his Traite de I'harmonie (Paris, 1722), and followed it up in his Nouveau systeme (1726), Generation harmonique (1737), Demonstration (175,0) and Nou- velles reflexions (1752). But it was not only as a theorist that he became famous. Returning to Paris in 1722 he first attracted attention by composing some light dramatic pieces, and then showed his real powers in his opera, Hippolyte et Aricie, founded on Racine's Phedre and produced at the Academie in 1733. Though this work was violently opposed by the admirers of Lulli, whose party spirit eventually stirred up the famous " guerre des bouffons," Rameau's genius was too brilliant to be trampled under foot by an ephemeral faction and hi3 ultimate triumph was assured. He afterwards produced more than twenty operas, the most successful of which were Dardanus, Castor et Pollux, Les Indes galantes and La princesse de Navarre. Honours were showered upon him. He was appointed con- ductor at the Opera Comique, and the directors of the opera granted him a pension. King Louis XV. appointed him com- poser to the court in 1745, and in 1764 honoured him with a patent of nobility and the order of St Michael. But these last privileges were granted only on the eve of his death at Paris on the 12th of September 1764.

See biographies in Charles Poisset (1864), Nisard (1867), Pougin

(1876).

RAMESES, or Ramesses (Gen. xlvii. n; Exod. xii. 37; Num. xxxiii. 3), or, with a slight change in the vowel points, Raamses (Exod. i. 11), the name of a district and town in Lower Egypt, is notable as affording the mainstay of the current theory that King Rameses II. was the pharaoh of the oppression and his successor Minephthas the pharaoh of the exodus. The actual facts, however, hardly justify so large an inference. The

first three passages cited above are all by the priestly (post-exile) author and go together. Jacob is settled by his son Joseph in the land of Rameses and from the same Rameses the exodus naturally takes place. The older narrative speaks not of the land of Rameses but of the land of Goshen; it seems probable, therefore, that the later author interprets an obsolete term by one current in his own day, just as the Septuagint in Gen. xlvi. 28 names instead of Goshen Heroopolis and the land of Rameses. Heroopolis lay on the canal connecting the Nile and the Red Sea, and not far from the head of the latter, so that the land of Rameses must be sought in Wadi Tumilat near the line of the modern fresh-water canal. In Exod. i. n, again, the store- cities or arsenals which the Hebrews built for Pharaoh are specified as Pithom and Raamses, to which the Septuagint adds Heliopolis. Pithom also takes us to the Wadi Tumilat. But did the Israelites maintain a continuous recollection of the names of the cities on which they were forced to build, or were these names rather added by a writer who knew what fortified places were in his own time to be seen in Wadi Tumilat? The latter is far the more likely case, when we consider that the old form of the story of the Hebrews in Egypt is throughout de- ficient in precise geographical data, as might be expected in a history not committed to writing till the Israelites had resided for centuries in another and distant land. The post-exile or priestly author indeed gives a detailed route for the exodus (which is lacking in the older story), but he, we know, was a student of geography and might supplement tradition by what he could gather from traders as to the caravan routes. 1 And at all events to argue that, because the Hebrews worked at a city named after Rameses, they did so in the reign of the founder, is false reasoning, for the Hebrew expression might equally be used of repairs or new works of any kind.

It appears, however, from remains and inscriptions that Rameses II. did build in Wadi Tumilat, especially at Tell Maskhuta, which Lepsius therefore identified with the Raamses of Exodus. This identification is commemorated in the name of the adjacent railway station. But Naville's excavations found that the ruins were those of Pithom and that Pithom was identical with the later Heroopolis. Petrie found sculptures of the age of Rameses II. at Tel Rotab, in the Wadi Tflmilat west of Pithom, and concludes that this was Rameses. The Biblical city is probably one of those named Prameses, " House of Ramesses," in the Egyptian texts.

See Pithom; and W. M. F. Petrie, Hyksos and Israelite Cities, p. 28etsqq. (W. R. S., F. Ll. G.)

RAMESWARAM, a town of British India, in the Madura district of Madras, on the island of Pambam in Palk Straits. It contains one of the most venerable Hindu shrines, founded, according to tradition, by Rama himself, which for centuries has been the resort of thousands of pilgrims from all parts of India. The great temple, with its pillared corridors 700 ft. long, is perhaps the finest example of Dravidian architecture.

RAMIE (Rhea, China-grass), the product of one or more species of the genus Boehmeria, a member of the order Urticaceae and nearly allied to the stinging nettle genus (Urtica), from which, however, it differs in absence of stinging hairs. Some confusion has arisen in the use of the various terms China- grass, Ramie and Rhea. Two plants are concerned. One, Boehmeria nivea, China-grass, has been cultivated by the Chinese from very early times under the name Tschou-ma. The other, probably a variety of the same species {Boehmeria nivea, var. tenacissima) , though sometimes regarded as a distinct species (B. tenacissima), is the Ramie (Malay zami) of the Malay Islands and the Rhea of Assam.

Boehmeria nivea is a shrubby plant with the growth of the common nettle but without stinging hairs, sending up each season a number of straight shoots from a perennial under- ground rootstock. The long-stalked leaves recall those of the nettle in their shape and serrated margin, but their backs are

1 From the position of the words it is even not unlikely that " Pithom and Raamses " may be the addition of a redactor, and that the first author of Exod. i. 1 1 only spoke generally of store-cities.

clothed with a downy substance and have a silvery appearance. The minute greenish flowers are closely arranged along a slender axis. This variety has been cultivated by the Chinese for many years, and the fibre, which is obtained from it by a tedious hand-process, has been used more or less as a substitute for silk. The variety tenacissima differs in its more robust habit and larger leaves, which are pale green on the face and a very much paler green on the bark. They are not downy, however, and this affords a ready means of distinction from true China-grass. Boehmeria nivea is sometimes found wild in India, Malaya, China and Japan, and is probably a native of further India and Malaya. China-grass and ramie are widely cultivated not only in China, Formosa, Japan, India and Malaya, but also in Queensland, Mauritius, the Cameroons, the West Indies, Brazil, Mexico and the southern states of North America, and also in south Europe.

The plant, which attains a height of from 3 to 8 ft., is grown from seed, cuttings or layers, or by division of the roots. It is easy to cultivate, and thrives in almost any soil, but especially in a naturally rich, moist, light,

loamy soil. For the best growth a good and equally distributed rainfall is necessary. Sudden changes of weather result in irregularities in growth, and these have a tendency to produce plants the fibres of which vary in strength. Liberal manuring is necessary, as the plant withdraws a large quantity of valuable constituents from the soil. The plants should be cut when the flower is beginning to fall and the seed to form.

It is stated that two to four crops per season may be obtained on suitable ground, each crop yielding about 4 tons of stems per acre. With only two crops per year, and a 4% yield of fibre, the resulting product would nearly reach one-third of a ton per acre. When proper attention is given to the choice of ground, and to planting, there is not much difficulty in the way of raising a good crop; the trouble arises in the extraction of the fibre.

The stems when ripe are cut down, and after the leaves and small branches have been removed, the outer cover and the layers of fibre are stripped off in the form of ribbons. These ribbons contain the bark, the fibre and a quantity of very adhesive gum. The Chinese remove this bark and as much of the gum as possible before the plant has dried. This hand- process is naturally a slow and tedious one, and many decorti- cators have been invented to supplant it. The action of all these decorticators is very similar. The ramie stalks are fed into the machine, and during their passage are beaten by 12 to 20 rapidly revolving blades. These break the stalks into small pieces, and leave the bark and fibre in long ribbons. At the same time, part of the gum is squeezed out between the beaters and the anvil. Up to the present, however, these machines have not been very successful. They usually bruise or otherwise injure the fibre, and they do not squeeze out the gum thoroughly. If the gum be allowed to dry on the ribbons it is difficult to remove it, and the chemicals employed in the degumming, if not thoroughly removed by washing, often injure the fibre to such an extent that the ultimate fabric or article is soon decomposed. If, however, the ribbons be degummed immediately, or soon after the plants are cut down, the gum will be much more easily ‘ extracted — indeed it might be possible to remove it then by boiling water or steam. The fibre cannot be expected to make much headway until the operations of decorticating and degumming are successfully carried out on or near the growing grounds; and, until a proficient decorticator is made, the fibre should be stripped by hand and the degumming operation begun immediately. By this method the least possible damage would result to the fibre, no waste material would be shipped, and a clean fibre would be placed on the market.

The fibre possesses some very valuable properties; it is not only much stronger than any other known fibre, but almost equals silk in its brilliance. This latter property, however, is now challenged by mercerized cotton. It successfully resists atmospheric changes, is easily dyed and is affected but

little by moisture. On the other hand, articles manufactured from it are

said to crack and break easily when sharply bent, and on account of their hairy character have not the same smart appearance as those made from flax. Although the fibre is in some cases 12 in. long, it varies considerably in length. This is one of the drawbacks in the preparing and spinning. It is impossible to make perfect yarns from fibres of various lengths; hence it is necessary either to separate the fibres into reasonable groups, or to cut them into satisfactory lengths. The latter method appears, on the whole, to be the better, and it is the method adopted by Messrs Greenwood & Batley Limited, Leeds, who make special machinery for the dressing, preparing and spinning of ramie and China-grass. If no special machinery be employed, the length of the fibre will decide the class of machinery to be used. The fibre has been prepared and spun on flax, wool and silk-waste machinery, but it must be understood that none of these systems are really suitable for the process. A fibre with special characteristics requires special machinery for its manufacture.

When so many different opinions obtain as to which existing machinery is best adapted for the preparing and spinning of ramie, it is not surprising to find that different methods are employed in the process of manufacture. In general, however, we may say that, after decortication, the first process is that of degumming. This is usually done by immersing the fibre in a caustic soda solution, which is then heated in a closed vessel. The fibre is laid on galvanized trays, of which as many as forty-four can be fitted in a cage, which is then placed inside the boiling keir, the lid of which is screwed down and the necessary pressure of steam admitted. After having been boiled a sufficient time to remove the gum, the material is lifted out, the alkali neutralized, and the fibre thoroughly washed to remove all traces of chemicals. The bulk of the water is removed by a hydro-extractor, and the fibre is then hung up or laid on perforated plates to dry.

To facilitate the subsequent processes, the fibre is softened by passing it through a machine fitted with fluted rollers. Then follow the operations of dressing, roving, wet spinning and doubling, and finally the twisted thread is passed rapidly through a gas flame in ordei to remove all superfluous hairs.*

In spite of the many disappointments which have been experienced in connexion with the treatment of this fibre, we are of the opinion that it will ultimately hold a good place amongst commercial fibres. It is at present

spun in several European countries, but its use is still very limited. This is due, not to any imperfection of the fibre, but to its price and to the limited supply of raw material. It is at present chiefly used for gas mantles, for which it is particularly well adapted. It has also been used for paper-making, ropes, lines, nets, underwear, and for canvas and several other fabrics. If only a good supply of clean fibre could be obtained, there is not the least doubt that manufacturers and machine-makers would quickly provide means for dealing with it. (T. Wo.)

RAMILLIES, a village of Belgium, in the province of Brabant, 13 miles N. by E. of Namur, between the sources of the Little Gheete and of the Mehaigne. It is famous for the victory of the Allies under the duke of Marlborough over the French com- manded by Marshal Villeroy on the i2th/23rd of May 1706. The position of the French on the high ground about Ramillies was marked by the villages of Autreglise (Anderkirch) on the left, Offuz on the left centre, Ramillies on the right centre and Taviers on the right close to the river Mehaigne. In front of the last was a smaller village, Franquenay, which was held as an advanced post. Between these points d'appui the ground was mostly open upland, and the position as a whole was defective in so far that the villages were barely within cannon-shot of each other. It was particularly strong on the flanks, which were protected by the marshy beds of the Mehaigne and the Little Gheete. Ramillies stands almost on the watershed of these adjacent valleys, and here Marlborough decided to deliver his main attack. The forces were about equal, and were at first equally distributed along the whole line of either party. Marl- borough's local concentration of force at the spot where the attack was to be pressed home was made not before, but after the action had opened (cf. Neerwinden). Villeroy 's left wing of cavalry and infantry was secure — and at the same time im- mobilized—behind the upper course of the Little Gheete, and the French commander allowed himself to be imposed upon by a demonstration in this quarter, convinced perhaps by the presence of the British contingent that a serious attack was

intended. The morning was spent in arraying the lines of battle, and it was about 1.30 when the cannonade opened. Soon the first lines of infantry of the Allied centre and left (Dutch) opened the attacks on Franquenay and Taviers and on Ramillies, and, when after a severe struggle Taviers fell into the hands of the Dutch, their commander, Marshal Overkirk, led forward the whole of the left wing cavalry and fiercely engaged the French cavalry opposed to it. The ground was open, both parties had placed the greater part of their horse on this side, and it was only after a severe and prolonged engagement (in which Marlborough himself took part like a trooper and was unhorsed) that the Allies were definitely victorious, thanks to the arrival of a force of cavalry brought over from the Allied right wing. Meanwhile the principal attack on Ramillies had been successfully pressed

home, the necessary concentration of force being secured by secretly and skilfully withdrawing some British battalions from the right wing. While Villeroy was trying to bring up supports from the left to take part in the cavalry battle, the French in Ramillies were driven out into the open, where the Allied cavalry, having now gained the upper hand, rode down many battalions. Most of the French cavalry from the other wing, having to force its way through the baggage trains of the army (these had been placed too near the fighting lines), arrived too late, and once Ramillies had fallen the whole line of the Allies gradually took up the offensive. It was not long before the French line was rolled up from right to left, and the retreat of the French was only effected in considerable confusion. Then followed for once a relentless pursuit, carried on by the British cavalry (which had scarcely been engaged) to Louvain, 20 m. from the field of battle. Marlborough's unequalled tactical skill and judgment thus sufficed not merely to win the battle, but to win it with so large a margin of force unexpended that the fruits of his victory could be gathered. The French army lost, in killed, wounded and missing, some 15,000 men, the Allies (amongst whom the Dutch hati borne the brunt of the fighting) scarcely one-third as many.

RAMLER, KARL WILHELM (1725-1798), German poet, was born at Kolberg on the 25th of February 1725. After com- pleting his studies in Halle, he went to Berlin, where, in 1748, he was appointed professor of logic and literature at the cadet school. In 1786 he became associated with the author, Johann Jakob Engel, in the management of the royal theatre, of which, after resigning his professorship, he became (1790-96) sole director. He died at Berlin on the nth of April 1798. Ramler was a skilful but cold and uninspired versifier; and the reputa- tion he enjoys as poet and critic is mainly due to his skill in imitating and reproducing in German, classical (mostly Horatian) metrical forms; and he had a reputation, not unfounded, of correcting his friends' writings out of recognition. His Tod Jesu, a cantata, is well known owing to its musical setting by Karl Heinrich Graun.

Ramler published Geistlithe Cantaten (1760) and Oden (1767). A collection of his works was published by L. F. G. von Gockingk (2 vols., 1800-1801). See also Heinsius, Versuch einer biographischen Skizze Ramlers (1798); and K. Schiiddekopf, Karl Wilhelm Ramler, bis zu seiner Verbindung mit Lessing (1886).

RAMMELSBERG, KARL FRIEDRICH AUGUST (1813- 1899), German mineralogist, was born at Berlin on the 1st of April 1813. He was educated for the medical profession and graduated in 1837 at Berlin University. In 1841 he became privaldozent in the university, and in 1845 professor extra- ordinary of chemistry. This post he relinquished in 1851 to take the chair of chemistry and mineralogy at the Royal In- dustrial Institute. In 1874 he was appointed professor of inorganic chemistry, and director of

the second chemical labora- tory at Berlin. Distinguished for his researches on mineralogy, crystallography and analytical chemistry, he laboured also at metallurgy, and yet found time for a series of important textbooks, in which his learning and sound judgment were combined with a lucid and accurate statement of facts. He was author of Handworterbuch des chemischen Teils der Miner- alogie (2 vols., 1841; supp. 1843-53); Lehrbuch der chemischen

Melallurgie (1850); Handbuch der Krystallographischen Chetnie (1855); Handbuch der Miner ■alchemie (i860); Handbuch der Kryslallographisch-physikalischen Chemie (2 vols., 1881-82), some of the earlier works being incorporated in later and more comprehensive volumes with different titles. He died at Gross Lichterfelde, near Berlin, on the 28th of December 1899.

RAM MOHAN ROY (1774-1833), Indian religious reformer, and founder of the Brahma Samaj (q.v.) or Theistic Church, was born at Radhanagar, in the district of Hugh, Bengal, in May 1774. He was the son of a small landowner, and in his early life acquired a knowledge of Persian, Arabic and Sanskrit, besides his own vernacular, Bengali. At the age of sixteen he first assailed idolatry in his Bengali work, entitled The Idolatrous Religious System of the Hindus. This gave offence to his ortho- dox father, and Ram Mohan left home and spent some years in travel. At the age of twenty-two he began his study of the English language, and he also acquired a knowledge of other modern and ancient European languages. On the death of his father he obtained an appointment under the British govern- ment in 1800, from which he retired in 18 14, settled down in Calcutta, and devoted himself to religious reform. He had already inaugurated a circle for discussing the absurdities of idol worship, and published a striking book in Persian called Tuhfat-al-Muwahhiddln (" A Gift to Monotheists "). On his settlement in Calcutta he established a little friendly society (Atmiya Sabha), which met weekly to read the Hindu scriptures and to chant monotheistic hymns. In 1820 he issued a selection from the Christian Gospels entitled The Precepts of Jesus the Guide to Peace and Happiness. He also wrote Bengali works on the Vedanta philosophy, translated some of the Upanishads, entered into controversies with Christian missionaries, and on the 23rd of January 1830 definitely established the Brahma Samaj " for the worship and adoration of the Eternal, Un- searchable, Immutable Being who is the Author and Preserver of the Universe." He gave his support to the governor-general, Lord William Bentinck, for the abolition of the suttee rite, i.e. the custom of permitting Hindu widows to burn themselves on the funeral pyre of their husbands. He also worked hard to

spread education among his fellow-countrymen, and to improve the quality and the prestige of the native press. In 1830 the emperor of Delhi bestowed on Ram Mohan the title of raja, and sent him to England as his agent. Raja Ram Mohan Roy gave his evidence before the Select Committee of the House of Commons on the judicial and revenue systems of India. He presented petitions to the House of Commons in support of the abolition of the suttee rite, and had the satisfaction of being present in the House when the appeal against such abolition was rejected on the nth of July 1832. As the first educated and eminent Indian who had come to England, he received a cordial welcome from learned men; and Bentham addressed him as an " intensely admired and dearly beloved collaborator in the service of mankind." Ram Mohan also visited France and contemplated a voyage to America, but a sudden attack of brain fever led to his death on the 27th of September 1833. He was buried at Bristol, where a tomb was erected by his friend Dwarka Nath Tagore.

RAMNAD, a town of British India, in the Madura district of Madras, at the base of the spit of land that projects towards the island of Pamban in Palk strait. Pop. (1901) 14,546. It is the residence of a raja of old family, head of the Maravar caste, whose title is setupathi, or lord of Adam's Bridge. The estate covers an area of 2104 sq. m., and pays a permanent land revenue of £25,000. It is a desolate and generally unfertile tract, traversed by the South Indian railway.

RAMNICU SARAT (Rtmnicu SSrat), the capital of the department of Ramnicu Sarat, Rumania; on the railway from Buzeu to Focshani, and on the left bank of the Raninicu, a tributary of the Sereth. Pop. (1900) 13,134, about 1500 being Jews. The town rises from a marshy plain, east of the Carpathians, and west of the cornlands of southern Moldavia. Salt and petroleum are worked in the mountains, and there is a considerable trade in agricultural produce and preserved

meat. Ramnicu Sarat was the scene of battles between the Moldavians and the Walachians in 1434 and 1573, and between the Walachians and Turks in 1634. Here also, in 1789, an Austro-Russian army defeated the Turks. In 1854 the town was almost destroyed by fire and was rebuilt.

RkMMC\]VkLCEA(Rimnicu Vdlcea), or Rymnik, an episco- pal city and the capital of the department of Valcea, Rumania; situated at the foot of the Carpathians, on the right bank of the river Olt, and on the railway from Caracal to Hermann- stadt in Transylvania. Pop. (1900) 7317. Three monasteries in the Valcea department, those of Bistritza, Cozia and Horezu, are among the finest in Walachia. Besides wine, fruit, grain and timber, the surrounding uplands yield petroleum and salt. Within a few miles are the thermal springs of Olanestzi and the salt mines of Ocnele

Mari. The city is said to be the ancient Castra Traiana, and many traces of old encampments bear evidence of this.

RAMPOLLA, COUNT MARIANO DEL TINDARO (1843-), Italian cardinal, was born on the 17th of August 1843, at Polizzi, in the Sicilian diocese of Cefalu. Having completed his studies in the Capranica College at Rome, and having taken holy orders, he studied diplomacy at the College of Ecclesiastical Nobles, and in 1875 was appointed councillor to the papal nunciature at Madrid. Two years later he was recalled to Rome and appointed secretary of the Propaganda for Eastern Affairs, and for Extraordinary Ecclesiastical Affairs. Consecrated titular archbishop of Heraclea in 1885, he returned to Madrid as nuncio, but was shortly afterwards created cardinal and appointed to the papal secretaryship of state. New to the Sacred College and free from traditional preconceptions, he was admirably fitted to carry out the papal policy under Leo XIII. (see Papacy). Rightly or wrongly, he was held personally responsible for the rapprochement with France and Russia and the opposition to the Powers of the Triple Alliance; and this attitude had its effect on his career when Leo XIII. died. Rampolla was undoubtedly the favourite among the papabili cardinals; but the veto of Austria was interposed (see Conclave), and the votes of the Sacred College fell to Cardinal Sarto, who on the 4th of August 1903 became pope as Pius X. Cardinal Rampolla at once resigned his office as secretary of state, being succeeded by Cardinal Merry del Val, and ceased to play any conspicuous part in the Curia.

RAMPUR, a native state of India, in subordination to the United Provinces. It lies in Rohilkhand, between the British districts of Moradabad and Pilibhit. Area, 893 sq. m. The country is level and generally fertile; being watered in the north by the rivers Kosila and Nahul, and in the south by the Ramganga. The chief crops are maize, rice and sugar cane. Pop. (1901) 533,212, showing a decrease of 3-3% in the decade. Estimated revenue, £234,000; military force, 2556 men, including two squadrons of Imperial Service lancers. The chief, whose title is nawab, is a Rohilla Pathan, representing the family which established their power over this part of the country in the 18th century. When the Rohillas were subjugated by the nawab of Oudh, with the assistance of a force lent by Warren Hastings, one of their number, Faiz-ullah Khan, from whom the present nawab traces his descent, was permitted to retain possession of Rampur. During the Mutiny of 1857 the nawab of Rampur rendered important services to the British, for which he received a grant of land assessed at £9000 in perpetuity, besides other honours. The state is crossed by the main line of the Oudh & Rohilkhand railway from Bareilly to Moradabad. The town of Rampur is on the left bank of the river Kosila, 620 ft. above the sea, with a railway station 39 m. N.W. of Bareilly. Pop. (1901) 78,758. There are manufactures of damask, pottery, sword-blades and sugar. It is partially,

and was once completely, surrounded by a broad bamboo hedge, which formed a strong defence. In addition to a modern fort and several fine buildings, it contains an Arabic college, which attracts students from all parts of India. There are two other towns in India called Rampur, one

of which, the capital of the state of Bashahr in the Punjab, has given its name to the fine woollen shawls, widely known as Rampur chadars.

RAMPUR BOALIA, or Beuleah, a town of British India, the administrative headquarters of Rajshahi district in Eastern Bengal and Assam; on the left bank of the Ganges. Pop. (1001) 21,589. It was originally chosen as a commercial factory for the silk trade, which is again being officially encouraged by the agricultural department. The town contains a government college, and an industrial school for sericulture. Most of the public buildings were severely damaged by the earthquake of the 12th of June 1897. There is a daily steamer service on the Ganges.

RAMSAY, ALLAN (1686-1758), Scottish poet, was born at Leadhills, Lanarkshire, on the 15th of October 1686. He was educated at the parish school of Crawford, and in 1701 was apprenticed to a wig-maker in Edinburgh. He married Christian Ross in 1712; a few years after he had established himself as a wig-maker (not as a barber, as has been often said) in the High Street, and soon found himself in comfortable circumstances. His first efforts in verse-making were inspired by the meetings of the Easy Club (founded in 17 12), of which he was an original member; and in 1715 he became the Club Laureate. In the society of the members he assumed the name of " Isaac Bickerstaff," and later of " Gawin Douglas," the latter partly in memory of his maternal grandfather Douglas of Muthill (Perthshire), and partly to give point to his boast that he was a " poet sprung from a Douglas loin." The choice of the two names has some significance, when we consider his later literary life as the associate of the Queen Anne poets and as a collector of old Scots poetry. By 17 18 he had made some reputation as a writer of occasional verse, which he published in broadsheets, and then (or a year earlier) he turned book- seller in the premises where he had hitherto plied his craft of wig-making. In 1 716 he had published a rough transcript of Christ's Kirk on the Green from the Bannatyne MS., with some additions of his own. In 1718 he republished the piece with more supplementary verses. In the following year he printed a collection of Scots Songs. The success of these ventures prompted him to collect his poems in 1722. The volume was issued by subscription, and brought in the sum of four hundred guineas.

Four years later he removed to another shop, in the neighbouring Luckenbooths, where he opened a circulating library (the first in Scotland) and extended his business as a bookseller. Between the publication of the collected edition of his poems and his settling down in the Luckenbooths, he had published a few shorter poems and had issued the first instal- ments of The Tea-Table Miscellany and The Ever Green (both 1724-1727). The Tea-Table Miscellany is "A Collection of Choice Songs Scots and English," containing some of Ramsay's own, some by his friends, several well-known ballads and songs, and some Caroline verse. Its title was suggested by the pro- gramme of the Spectator : and the compiler claimed the place for his songs " e'en while the tea's fill'd reeking round," which Addison sought for his speculations at the hour set apart " for tea and bread and butter." In The Ever Green, being a Col- lection of Scots Poems wrote by the Ingenious before 1600, Ramsay had another purpose, to reawaken an interest in the older national literature. Nearly all the pieces were taken from the Bannatyne MS., though they are by no means ver- batim copies. They included his version of Christ's Kirk (u.s.) and a remarkable pastiche by the editor entitled the Vision. While engaged on these two series, he produced, in 1725, his dramatic pastoral The Gentle Shepherd. In the volume of poems published in 1722 Ramsay had shown his bent to this genre, especially in " Patie and Roger," which supplies two of the dramatis personae to his greater work. The success of the drama was remarkable. It passed through several edi- tions, and was performed at the theatre in Edinburgh; its title is still known in every corner of Scotland, even if it be no longer read. Ramsay wrote little afterwards, though he pub- lished a few shorter poems, and new editions of his earlier

work. A complete edition of his Poems appeared in London in 1731 and in Dublin in 1733. With a touch of vanity he expressed the fear lest " the coolness of fancy that attends advanced years should make me risk the reputation I had acquired." He was already on terms of intimacy with the leading men of letters in Scotland and England. He cor- responded with Hamilton of Bangour (q.v.), Somerville (q.v.), Gay (q.v.) and Pope. Gay visited him in Edinburgh, and Pope praised his pastoral — compliments which were undoubtedly responsible for some of Ramsay's unhappy poetic ventures beyond his Scots vernacular. The poet had for many years been a warm supporter of the stage. Some of his prologues and epilogues were written for the London theatres. In 1736 he set about the erection of a new theatre, " at vast expense," in Carrubber's Close, Edinburgh; but the opposition was too strong, and the new house was closed in 1737. In 1755 he retired from his shop to the house on the slope of the Castle Rock, still known as Ramsay Lodge. In this house, called by his friends " the goose-pie," because of its octagonal shape, the poet died on the 7th of January 1758.

Ramsay's importance in literary history is twofold. As a pastoral writer (" in some respects the best in the world," according to Leigh Hunt) he contributed, at an early stage, to the naturalistic reaction of the 18th century. His Gentle Shepherd, by its directness of impression and its appreciation of country fife, anticipates the attitude of the school which broke with neo-classical tradition. It has the " mixed " faults which make the greater poem of his Scots successor, Thomson, a " transitional " document, but these give it an historical, if not an individual, interest. His chief place is, however, as an editor. He is the connecting-link between the greater " Makars " of the 15th and 16th centuries, and Fergusson (q.v.) and Burns. He revived the interest in vernacular litera- ture, and directly inspired the genius of his greater successors. The preface to his Ever Green is a protest against " imported trimming " and " foreign embroidery in our writings," and a plea for a return to simple Scottish tradition. He had no scholarly interest in the past, and he never hesitated to trans- form the texts when he could give contemporary " point " to a poem; but his instinct was good, and he did much to stimulate an ignorant public to fresh enjoyment. In this respect, too, he anticipates the reaction in England which followed securely on the publication of Percy's Reliques.

The Tea-Table Miscellany was reprinted in 1871 (2 vols., Glasgow; John Crum) ; The Ever Green in 1875 (2 vols., Glasgow; Robert Forrester); The Poems of Allan Ramsay in 1877 (2 vols., Paisley; Alex. Gardner). These volumes are uniform in size and binding, though issued by different publishers, u.s. A selection of the Poems appeared in 1887 (1 vol. i6mo, London; Walter Scott). There are many popular reprints of The Gentle Shepherd. (G. G. S.)

RAMSAY, ALLAN (1713-1784), Scotch portrait-painter, the eldest son of the author of The Gentle Shepherd, was born at Edinburgh in 17 13. Ramsay manifested an aptitude for art from an early period, and at the age of twenty we find him in London studying under the Swedish painter Hans Huyssing, and at the St Martin's Lane Academy; and in 1736 he left for Rome, where he worked for three years under Solimena and Imperiali (Fernandi). On his return he settled in Edin- burgh; and, having attracted attention by his head of Forbes of Culloden and his full-length of the duke of Argyll, he removed to London, where he was patronized by the duke of Bridgewater. His pleasant manners and varied culture, not less than his artistic skill, contributed to render him popular. In 1767 he was appointed to succeed Shakelton as principal painter to the king; and so fully employed was he on the royal portraits which the king was in the habit of presenting to ambassadors and colonial governors, that he was forced to take advantage of the services of a host of assistants — of whom David Martin and Philip Reinagle are the best known. His life in London was varied by frequent visits to Italy, where he occupied himself more in literary and

antiquarian research than with art. But this prosperous career came to an end, his health being shattered by an accidental dislocation of th$

right arm. With unflinching pertinacity he struggled till he had completed a likeness of the king upon which he was engaged at the time, and then started for his beloved Italy, leaving behind him a series of fifty royal portraits to be com- pleted by his assistant Reinagle. For several years he lingered in the south, his constitution finally broken. He died at Dover on the 10th of August 1784.

Among his most satisfactory productions are some of his earlier ones, such as the full-length of the duke of Argyll, and the numerous bust-portraits of Scottish gentlemen and their ladies which he executed before settling in London. They are full of both grace and individuality; the features show excellent draughtsmanship; and the flesh-painting is firm and sound in method, though frequently tending a little to hardness and opacity. His full-length of Lady Mary Coke is remarkable for the skill and delicacy with which the white satin drapery is managed; while in the portrait of his brown-eyed wife, the eldest daughter of Sir Alexander Lindsay of Evelick, in the Scottish National Gallery, we have a sweetness and tender- ness which shows the painter at his highest. This last-named work shows the influence of French art, an influence which helped greatly to form the practice of Ramsay, and which is even more clearly visible in the large collection of his sketches in the possession of the Royal Scottish Academy and the Board of Trustees, Edinburgh.

RAMSEY, SIR ANDREW CROMBIE (i8i4-i89i), < British geologist, was born at Glasgow on the 31st of January 1814, being the son of William Ramsay, manufacturing chemist. He was for a time actually engaged in business, but from spend- ing his holidays in Arran he became interested in the study of the rocks of that island, and was thus led to acquire the rudi- ments of geology. A geological model of Arran, made by him on the scale of two inches to the mile, was exhibited at the meeting of the British Association at Glasgow in 1840, and attracted the notice of Sir R. I. Murchison, with the result that he received from De la Beche an appointment on the Geological Survey, on which he served for forty years, from 1841 to 1881. He was first stationed at Tenby, and to that circumstance may be attributed the fact that so much of his geological work dealt with Wales. His first book, The Geology of the Isle of Arran, was published in 184 1. In 1845 he became local director for Great Britain, but he continued to carry on a certain amount of field-work until 1854. To the

first volume of the Memoirs of the Geological Survey (1846) he contributed a now classic essay, " On the Denudation of South Wales and the Adjacent Counties of England," in which he advocated the power of the sea to form great plains of denudation, although at the time he under- estimated the influence of subaerial agents in sculpturing the scenery. In 1866 he published The Geology of North Wales (vol. iii. of the Memoirs), of which a second edition was pub- lished in 1881. He was chosen professor of geology at Uni- versity College, London, in 1848, and afterwards lecturer in the same subject at the School of Mines in 1851. Eleven years later he was elected to the presidential chair of the Geological Society, and in 1872 he succeeded Murchison as director- general of the Geological Survey. In 1880 he acted as president of the British Association at Swansea, and in the following year retired from the public service, receiving at the same time the honour of knighthood. In i860 he published a little book entitled The Old Glaciers of Switzerland and North Wales. The study of this subject led him to discuss the Glacial Origin of Certain Lakes in Switzerland, the Black Forest, &"c. He dealt also with the origin of The Red Rocks of England (1871) and The River Courses of England and Wales (1872). He was especially interested in tracing out the causes which have determined the physical configuration of a district, and he devoted much attention to the effects produced by ice, his name being identified with the hypothesis, which, however, has never commanded general assent, that in some cases lake basins have been scooped out by glaciers. A master in the broader questions of stratigraphy and physical geology, he was a clear exponent of facts, but rather impatient of details, while his

original and often bold theories, expressed both in lectures and in writings, stirred others with enthusiasm and undoubtedly exercised great influence on the progress of geology. His lectures to working men, given in 1863 in the Museum oi Practical Geology, formed the nucleus of his famous Physical Geology and Geography of Great Britain (5th ed., 1878; 6th ed., by H. B. Woodward, 1894). He received a Royal medal in 1880 from the Royal Society, of which he became a fellow in 1862; he was also the recipient of the Neill prize of the Royal Society of Edinburgh in 1866, and of the Wollaston medal of the Geological Society of London in 187 1. He died at Beau- maris on the 9th of December 1891. See Memoir, by Sir A. Geikie, 1895.

RAMSAY, ANDREW MICHAEL (1686-1743), French writer, of Scottish birth, commonly called the ” Chevalier Ramsay,” was born at Ayr on the 9th of January 1686. Ramsay served with the English auxiliaries in the Netherlands, and in 1710 visited Fenelon, who converted him to Roman Catholicism. He re- mained in France until 1724, when he was sent to Rome as tutor to the Stuart princes, Charles Edward and Henry, the future cardinal of York. He was driven by intrigue from this post, and returned to

Paris. He was in England in 1730, and received an honorary degree from the university of Oxford. The claim was nominally his discipleship to Fenelon, but in reality beyond doubt his connexion with the Jacobite party. He died at St Germain-en-Laye (Seine-et-Oise) on the 6th of May 1743. Ramsay's principal work was Les voyages de Cyrus (London, 1728; Paris, 1727), a book composed in avowed imitation of Telimaque. He also edited Telemaque itself (Paris, 2 vols., 1717) with an introduction, and wrote a Histoire de la vie et des ouvrages de Fenelon (The Hague, 1723), besides a partial biography (Paris, 1735) of Turenne, some poems (Edinburgh, 1728) in English, and other miscellaneous works.

RAMSAY, DAVID (1749-1815), American physician and historian, the son of an Irish emigrant, was born in Lancastei county, Pennsylvania, on the 2nd of April 1749. He graduatec at Princeton in 1765, and M.B. at the University of Penn sylvania in 1773, and then settled as a physician at Charleston, South Carolina, where he had a large practice. During tlw War of Independence he served as a field-surgeon (1780-1781), and from 1776 to 1783 he was a member of the South Carolint legislature. Having acted as one of the " council of safety ' at Charleston, he was, on the capture of that city in 1780, seized by the British as a hostage, and for nearly a year wa> kept in confinement at St Augustine. From 1782 to 1786 h« served in the Continental Congress, and from 1801 to 1815 ic, the state Senate, of which he was long president. In 1785 he published in two volumes History of the Revolution of SoutH Carolina, in 1789 in two volumes History of the American Revolu- tion, in 1807 a Life of Washington, and in 1809 in two volumes a History of South Carolina. He was also the author of several minor works. He died at Charleston on the 8th of May 1815 from a wound inflicted by a lunatic. His History of the United States in 3 vols, was published posthumously in 1816-1817, and forms the first three volumes of his Universal History Americanized, published in 12 vols, in 1819.

.RAMSAY, ROBERT (1842-1882), Australian statesman, was a native of Hawick, Roxburghshire, but his parents emigrated to Victoria when he was a child of four, and he was educated at the Scottish college in Melbourne. He studied law at Melbourne University, and subsequently became a member of a well-known firm of solicitors in the city. He married in 1868 Isabella Catherine Urquhart, and in 1870 entered the assembly for East Bourke in the Conservative and free trade interest. He was a member of the government of James Goodall Francis in 1872- 74. He was subsequently postmaster-general (1874-75) in the administration of George Biscoe Kerferd; he held the same office in conjunction with the ministry of education (1875-77) under Sir James M'Culloch; and for a short term in 1880 ha was chief secretary and minister of education in the first administration of James Service. He died on the 23rd oj May 1882.

RAMSAY, SIR WILLIAM (1852-), British chemist, nephew of Sir A. C. Ramsay, was born at Glasgow on the 2nd of October 1852. From 1866 to 1870 he studied in his native city, and then went to work under R. Fittig at Tubingen. Returning to Glasgow in 1872 he became assistant in the Young laboratory of technical chemistry at Anderson's College, and from 1874 acted as tutorial assistant in chemistry at the university. In 1880 he was appointed to the chair of chemistry at University College, Bristol, becoming principal in the following year, and in 1887 he succeeded A. W. Williamson as professor of chemistry at University College, London. His earlier work was mainly concerned with organic chemistry, and he published researches on picoline and its derivatives in 1876-78 and on quinine and its decomposition products in 1878-79. Later his attention was taken up with questions of physical and inorganic chemistry. With Sydney Young and others he investigated the critical state and properties of liquids and the relationship between their vapour pressures and temperature, and with John Shields he applied measurements of the surface tension of liquids to the determination of their molecular complexity. In 1894 he was associated with Lord Rayleigh in the discovery of argon, an- nounced at that year's meeting of the British Association in Oxford, and in the following year he found in certain rare minerals such as cleveite the gas helium which till that time had only been known on spectroscopic evidence as existing in the sun. In 1898 his work with Morris William Travers (b. 1872), who from 1894 had assisted him at University College, London, and in 1903 was appointed professor of chemistry at University College, Bristol, enabled him to announce the existence in the atmosphere of three new gases, neon, krypton and xenon. Turning to the study of radioactivity, he noticed its association with the minerals which yield helium, and in support of the hypothesis that that gas is a disintegration-product of radium he proved in 1903 that it is continuously formed by the latter substance in quantities sufficiently great to be directly recogniz- able in the spectroscope. Among the books written by Sir William Ramsay, who was created K.C.B. in 1902, are A System of Chemistry, 1891, The Gases of the Atmosphere, 1896, and Modern Chemistry, vol. i. Theoretical, vol. ii. Systematic, 1901, and he edited a series of "Textbooks of Physical Chemistry."

RAMSAY, SIR WILLIAM MITCHELL (1851-), British archaeologist, was born on the 15th of March 1851. He was educated at the universities of Aberdeen, Oxford and Gottingen, and was a fellow of Exeter College, Oxford (1882; honorary fellow 1898), and Lincoln College (1885; honorary 1899). In 1885 he was elected professor of classical art at Oxford, and in the next year professor of humanity at Aberdeen. From

1880 onwards he travelled widely in Asia Minor and rapidly became the re- cognized authority on all matters relating to the districts associ- ated with St Paul's missionary journeys and on Christianity in the early Roman Empire. He received the honorary degrees of D.C.L. Oxford, LL.D. St Andrews and Glasgow, D.D. Edinburgh, and was knighted in 1906. He was elected a member of learned societies in Europe and America, and has been awarded medals by the Royal Geographical Society, the Royal Scottish Geo- graphical Society and the University of Pennsylvania. His numerous publications include: The Historical Geography of Asia Minor (1890); The Church in the Roman Empire (1893); The Cities and Bishoprics of Phrygia (2 vols., 189s, 1897); St Paul the Traveller and the Roman Citizen (1895; Germ. trans., 1898); Impressions of Turkey (1897); Was Christ born at Bethlehem? (1898); Historical Commentary on Galatians (1899); The Education of Christ (1902); The Letters to the Seven Churches of Asia (1905); Pauline and other Studies in Early Christian History (1906); Studies in the History and Art of the Eastern Provinces of the Roman Empire (1906); The Cities of St Paul (1907); Lucan and Pauline Studies (1908); The Thousand and One Churches (with Miss Gertrude L. Bell, 1909); and articles in learned periodicals and the 9th, 10th and nth editions of the Encyclopaedia Britannica. His wife, Lady Ramsay, granddaughter of Dr Andrew Marshall of Kirk- intilloch, accompanied him in many of his journeys and is the

author of Everyday Life in Turkey (1897) and The Romance of Elisavet (1899).

RAMSBOTTOM, an urban district in the Heywood parlia- mentary division of Lancashire, England, 4 m. N. of Bury, on the Lancashire & Yorkshire railway. Pop. (1901) 15,920. It has iron and brass foundries, machine factories and textile establishments.

RAMSDEN, JESSE (1735-1800), English astronomical instrument maker, was born at Salterhebble near Halifax, Yorkshire, on the 6th of October 1735. After serving his apprenticeship with a cloth-worker in Halifax, he went in 1755 to London, where in 1758 he was apprenticed to a mathe- matical instrument maker. About four years afterwards he started business on his own account and secured a great reputation with his products. He died at Brighton on the 5th of November 1800. Ramsden's speciality was divided circles, which began to supersede the quadrants in observatories towards the end of the 18th century. His most celebrated work was a 5-feet vertical circle, which was finished in 1789 and was used by G. Piazzi at Palermo in constructing his well-known catalogue tof stars. He was the first to carry out in practice a method of reading off angles (first suggested in 1768 by the duke of Chaulnes) by measuring the distance of the index from the nearest division line by means of a micro- meter screw which

moves one or two fine threads placed in the focu's of a microscope. Ramsden's transit instruments were the first which were illuminated through the hollow axis; the idea was suggested to him by Prof. Henry Ussher in Dublin. He published a Description of an Engine for dividing Mathematical Instruments in 1777.

RAMSEY, a market-town in the Northern or Ramsey parliamentary division of Huntingdonshire, England, on the south-western border of the Fen country, on branch lines of the Great Northern and the Great Eastern railways, 13 m. S.S.E. of Peterborough. Pop. of urban district (1901) 4823. The fine church of St Thomas a. Becket is transitional between Norman and Early English, and has a beautiful Norman east end. The tower was built in 1672 of stone from Ramsey Abbey. An old oak lectern, dating from the middle of the 1 5th century, carries a chained copy, in a Tudor binding of brass, of Dean Comber's (1655-99) book on the Common Prayer, and a black-letter copy of Erasmus's Paraphrase of the Gospels. There are many interesting tombs in the churchyard, and the church register contains several entries relating to the Cromwell family, who removed hither from Huntingdon and owned the abbey estates till 1674. Of the ancient Benedictine abbey, the only remains are a part of a gateway, a lodge (a beautiful Perpendicular relic) and some buttresses, while some broken stone arches and walls remain of the conventual buildings. The modern mansion of Ramsey Abbey contains many documentary relics of the abbey, as well as an early monument representing the founder.

According to a 12th-century chronicle of one of the monks, the name Ramsey is derived from the words " ram," referring to the tradition of a solitary ram having taken up its abode here, and " ey " meaning an island. Ramsey, however, was not completely insulated, like some of the monasteries of the Fen district. The abbey was founded by Ailwin, earl of the East Angles, in 969, and a charter of King Edgar granted lands and privileges for the purpose. Ramsey Abbey was noted for the school established within its walls, and for its library of Hebrew works. Its abbot was mitred. The lands were granted after the dissolution to Sir Richard Cromwell.

RAMSEY, a seaport and watering-place on the north-east coast of the Isle of Man, 15 m. N.N.E. of Douglas. Pop. (1901) 4729. It lies on the wide Ramsey Bay, at the mouth of the Sulby river, the estuary of which forms a small harbour. To the north and west the' country is flat, but to the south the lower slopes of the North Ballure hill rise sharply. A creek of the Sulby river on the north side of the town is formed into a picturesque lake. The Queen's pier permits of the landing of passengers at all times, and Ramsey is served by

frequent steamers from Liverpool and other ports. The shore of the bay is sandy and gently sloping, and excellent bathing is afforded. A golf links, a geological and antiquarian museum, the Mooragh Park by the side of the lake, and the palace or concert hall, are among the attractions to visitors. Ramsey is connected with Laxey, the summit of Snaefell, and Douglas by electric tramway, and has connexion with the western part of the island by the Manx Northern railway. The Albert tower, on a wooded hill above the town, commemorating a visit of the Prince Consort in 1847, i s a favourite view-point. The harbour has some coasting and fishing trade.

RAMSGATE, a municipal borough, watering-place, seaport and member of the Cinque Port of Sandwich, in the Isle of Thanet parliamentary division of Kent, England, 79 m. E. by S. of London by the South Eastern & Chatham railway. Pop. (1001) 27,733. This is one of the most popular resorts on the Kent coast, well situated on the east coast of Thanet, practically contiguous with Broadstairs to the north, with which and Margate to the north-west it is united by an electric tramway. During the season steamers connect it with London and the intermediate watering-places on the north coast, and with Calais and Boulogne. The harbour has an area of 42 acres, and a considerable coasting and fishing trade is carried on. There is a fine sea front, and the beach is of firm sand. The promenade pier was erected in 1881. Near it an obelisk commemorates the departure of George IV. to Hanover from here, and his return, in 1821. The church of St George was built in 1826, its tower forming a conspicuous landmark, and the Roman Catholic church of St Augustine was built from the designs and at the expense of A. W. Pugin, who was long a resident here. Trie neighbouring Pegwell Bay, famed for its shrimps, is supposed to have been the scene of the landing of Hengist and Horsa, and at Cliff's End (Ebbs Fleet) a monolithic cross marks the landing-place of St Augustine in 596. On the summit of Osengal Hill, about a mile to the west of the town, a graveyard of early Saxon settlers was discovered during the cutting of the railway. The remains proved it to belong to the 5th and 6th centuries. Ramsgate was incorporated in 1884, and is governed by a mayor, 6 aldermen and 18 councillors. Area, 2304 acres.

Ramsgate (Ramesgate) was originally a small but com- paratively prosperous place united until 1827 to the parish of St Lawrence. The charter of Charles II. mentions it as having been " time out of mind " a member of Sandwich. In 1884 it was incorporated by royal charter, under the title of mayor, aldermen and councillors. A commission of the peace was granted in 1893. Since then the jurisdiction of the Cinque Ports'

justices has ceased within its limits, which include the parishes of Ramsgate and St Lawrence Intra. A daily market was obtained in 1784 by grant from George III. No fair was then held, but from 1792 onwards there has been one yearly on the 10th of August. Under Elizabeth, Ramsgate was still unimportant though possessed of a fair before the reign of Henry VIII. After 1668 the growth of trade increased its prosperity, and at the beginning of the reign of George I. the pier was enlarged and pier-wardens appointed to collect the droits. In 1749, having been selected as a Harbour of Refuge for the Downs, it underwent great improvements, and henceforward paid £200 yearly to Sandwich out of the droits for clearing the Channel and repairing the banks of the river Stour within the Liberty; but by 1790 the harbour was of small account.

RAMSONS, in botany, the popular name for Allium ursinum, a bulbous plant 6 to 18 in. high, with ovate-lanceolate stalked leaves tapering at the apex, surrounding a naked stalk bearing a flat-topped umbel of small white flowers. A rather pretty plant, common in woods and in hedgebanks in spring, but with a pungent garlic-like smell, which is characteristic of the genus (see Allium).

RAMUS, PETRUS, or Pierre de la Ramee (1515-1572), French humanist, was born at the village of Cuth in Picardy in 1515, a member of a noble but impoverished family; his

father was a charcoal-burner. Having gained admission, in a menial capacity, to the college of Navarre, he worked with his hands by day and carried on his studies at night. The reaction against scholasticism was still in full tide; it was the transition time between the old and the new, when the eager and forward- looking spirits had first of all to do battle with scholastic Aris- totelianism. Ramus outdid his predecessors in the impetuosity of his revolt. On the occasion of taking his degree (1536) he actually took as his thesis " Everything that Aristotle taught is false." This tour de force was followed up by the publication in 1543 of Aristotelicae Animadversiones and Dialecticae Par- titiones, the former a criticism on the old logic and the latter a new textbook of the science. What are substantially fresh editions of the Partitiones appeared in 1547 as Institutiones Dialecticae, and in 1548 as Scholae Dialecticae; his Dialectique C 1 555)1 a French version of his system, is the earliest work on the subject in the French language. Meanwhile Ramus, as graduate of the university, had opened courses of lectures; but his audacities drew upon him the hostility of the con- servative party in philosophy and theology. He was accused of undermining the foundations of philosophy and religion, and the matter was brought before the parlement of Paris, and finally before Francis I. By him it was referred to a com- mission of five, who found Ramus guilty of having " acted rashly, arrogantly and impudently,"

and interdicted his lectures (1544). He withdrew from Paris, but soon afterwards returned, the decree against him being cancelled through the influence of the cardinal of Lorraine. In 1551 Henry II. appointed him professor of philosophy and eloquence at the College de France, where for a considerable time he lectured before audiences numbering as many as 2000. He published fifty works in his lifetime and nine appeared after his death. In 1 56 1, however, the enmity against him was fanned into flame by his adoption of Protestantism. He had to flee from Paris; and, though he found an asylum in the palace of Fontainebleau, his house was pillaged and his library burned in his absence. He resumed his chair after this for a time, but in 1568 the position of affairs was again so threatening that he found it advisable to ask permission to travel. Returning to France he fell a victim to his opponents in the massacre of St Bartholomew (1572).

The logic of Ramus enjoyed a great celebrity for a time, and there existed a school of Ramists boasting numerous adherents in France, Germany and Holland. As late as 1626 F. Burgersdyk divides the logicians of his day into the Aristotelians, the Ramists and the Semi-Ramists, who endeavoured, like Goclenius of Marburg, to mediate between the contending parties. Ramus's works appear among the logical textbooks of the Scottish universities, and he was not without his followers in England in the 1 7th century. There is even a little treatise from the hand of Milton, published two years before his death, called Artis Logicae Plenior Institutio ad Petri Rami Methodum concinnata. It cannot be said, however, that Ramus's innovations mark any epoch in the history of logic. His rhetorical leaning is seen in the definition of logic as the " ars dis- serendi " ; he maintains that the rules of logic may be better learned from observation of the way in which Cicero persuaded his hearers than from a study of the Organon. The distinction between natural and artificial logic, i.e. between the implicit logic of daily speech and the same logic made explicit in a system, passed over into the logical handbooks. Logic falls, according to Ramus, into two parts — invention (treating of the notion and definition) and judg- ment (comprising the judgment proper, syllogism and method). This division gave rise to the jocular designation of judgment or mother-wit as the " secunda Petri." He is, perhaps, most suggestive in his emendations of the syllogism. He admits only the first three figures, as in the original Aristotelian scheme, and in his later works he also attacks the validity of the third figure, following in this the precedent of Laurentius Valla. Ramus also set the modern fashion of deducing the figures from the position of _ the middle term in the premises, instead pf basing them, as Aristotle does, upon the different relation of the middle to the so-called major and minor term. On the whole, however, though Ramus may be allowed to have advanced logical study by the wholesome fermenta- tion of thought which he caused, there is little groundfor his pre- tentious claim to supersede Aristotle by a new and

independent system.

See Waddington-Kastus, De Petri Rami vita, scriptis, philosophia (Paris, 1848); Charles Desmaze, Petrus Ramus, professeur au College de France, sa vie, ses Merits, sa mort (Paris, 1864); P. Lobstein,

P. Ramus ah Theolog (Strassburg, 1878) ;E. Saisset, Les pricurseurs de Descartes (Paris, 1 862) ; J . Owen , French Skeptics of the Renaissance (London, 1893); K. Prantl, " tlber P. Ramus' in Munchener Sitzungs berichte (1878); H. Hoffding, Hist, of Mod. Phil. (Eng. trans., 1900), vol. i. 185; Voigt, XJber den Ramismus der Universitdt Leipzig (Leipzig, 1888).

RAMUSIO. The noble Itab'an family of Ramusio — the spelling adopted in the publication of the Navigationi, though it is also written Ramnusio, Rhamnusio, Rannusio, &c— was one of note for literary and official ability during at least four generations. Its original home was in Rimini, and the muni- cipality of that city has within the last few years set up a tablet on the town hall bearing an inscription which may be thus rendered: " The municipality of Rimini here records the claim of their city to the family of the Ramusios, adorned during the 15th and 16th centuries by the illustrious jurist and man of letters Paolo the elder, who rendered the work of Valturius, our fellow-citizen, into the vernacular; by the physician Girolamo, a most successful student of Oriental tongues, and the first to present Europe with a translation of Avicenna; and by Giovanni Battista, cosmographer to the Venetian republic and secretary to the Council of Ten, who bequeathed to the world that famous collection of voyages and travels, regarded in his own day as a marvellous work, and still full of authority among all civilized nations."

Paolo the Elder (c. 1443-1506), the first of those thus commemorated, migrated in 1458 from Rimini to Venice, where he obtained full citizenship, studied law and became a member of the magistracy, filling the offices of vicario, of judicial assessor, and of criminal judge under various adminis- trators of the Venetian provinces on the continent. He con- tinued, however, to maintain relations with the Malatesta princes of his native city, and in 1503 negotiated with them the cession of Rimini to the republic. The wife of Paolo, bearing the singular name of Tomyris Macachio, bore him three sons and four daughters. Paolo died at Bergamo on 19th August 1506 at the age of sixty-three, and was buried in S. Agostino at Padua. Paolo was the author of a variety of legal treatises and the like, and also published at Verona in 1483 both a corrected edition and an Italian

translation of a once famous book, Valturius, De re militari, dedicating both to Pandolfo Malatesta of Rimini. 1

Girolamo (1450-1486), younger brother of Paolo, had a notable history. After he had studied medicine at Padua public suspicion was roused against him in connexion with the death of a lady with whom he had had some love passages, and this ran so high that he was fain, by help of his brother Paolo, to whom he transferred his property, to make his escape (about 1481-1483) to Syria and to take up his abode at Damascus. In i486 he removed to Beyrout, and died the same year, killed, as the family chronicler relates, by a surfeit of " certain fruit that we call armellini and albicocche, but which in that country are known as mazzafranchi," a title which English sailors in southern regions still give to apricots in the vernacular para- phrase of kUljohns. During his stay in Syria Girolamo studied Arabic and made a new translation of Avicenna, or rather, we may assume, of some part of that author's medical works (the Canon?). It was, however, by no means the first such trans- lation, as is erroneously alleged in the Rimini inscription, for the Canon had been translated by Gerard of Cremona (d. 1187), and this version was frequently issued from the early press. Girolamo's translation was never printed, but was used by editors of versions published at Venice in 1579 and 1606. Other works of this questionable member of the house of Ramusio consisted of medical and philosophical tracts and Latin poems, some of which last were included in a collection published at Paris in 1791. 4

Gian Battista (1485-1557), the eldest son of Paolo Ramusio and Tomyris Macachio, was born at Treviso in 1485 (June 20). Having been educated at Venice and at Padua, at an early

' Both works are in the British Museum.

2 " Ramusii Ariminensis Carmina," in Quinque Illustrium Poetarum . . . Lusns in Venerem. Girolamo's are grossly erotic.

age he entered the public service (1505), becoming in 1515 secretary of the senate and in 1533 secretary of the Council of Ten. He also served the republic in various missions to foreign states, e.g. to Rome, to Switzerland and to France, travelling over much of the latter country by special desire of the king, Louis XII. He also on several occasions filled the office of cancellier grande. In 1524 he married Franceschina, daughter of Francesco Navagero, a noble — a papal dispensation being required on account of her being cousin to his mother Tomyris. By this lady he had one son, Paolo. In his old age Ramusio resigned the secretaryship and retired to the Villa Ramusia, a property on the river Masanga, in the province of Padua, which had been bestowed on his father in 1504 in recognition of his

services in the acquisition of Rimini the year before The delights of this retreat are celebrated in the poems and letters of several of Gian Battista's friends. He also possessed a house at Padua in the Strada del Patriarcato, a mansion noted for its paintings and for its collection of ancient sculpture and inscriptions. These, too, are commemorated by various writers. A few days before his death Ramusio removed to this house in Padua, and there died, 10th of July 1557, at the age of seventy-two. He was, by his own desire, buried at Venice, in the tomb which he had made for his mother, in Santa Maria delP Orto. His wife's death had occurred in 1536. In the work called Museum Mazzuchellianum (Venice, 1761, vol. i. pi. lxiv. No. 6) there is represented a 16th-century medal of Ramusio, which looks a genuine like- ness, and a bronze example of which, without the reverse, 3 is preserved in St Mark's Library. There was a portrait of him, represented as in conversation with Andrea Gradenigo, in the Sala del Maggior Consiglio, but in 1577 this perished in a fire, as did also a portrait of his father, Paolo. A professed portrait of Gian Battista by Francesco Grisellini, in the Sala dello Scudo, appears to be, like the companion portrait of Marco Polo, a work of fancy. A public nautical school at Rimini received from the government the title of the Istituto Ramusio.

Ramusio was evidently a general favourite, as he was free from pushing ambition, modest and ingenuous, and, if it be safe to judge from some of the dissertations in his Navigationi, must have been a delightful companion; both his friend Giunti and the historian Giustiniani 4 speak of him with the strongest affection. He had also a great reputation for learning. Before he was thirty Aldus Manutius the elder dedicated to him his edition of Quintilian (1514); a few years later (1519) Francesco Ardano inscribed to him an edition of Livy, and in 1528 Bernardino Donati did the like with his edition of Macrobius and Censorinus. To Greek and Latin and the modern languages of southern Europe he is said to have added a knowledge of " Oriental tongues," but there is no evidence how far this went, unless we accept as such a statement that he was selected in 1530 on account of this accomplishment to investigate the case of one David, a Hebrew, who, claiming to be of the royal house of Judah, wished to establish himself at Venice outside of the Ghetto. 6 But Ramusio had witnessed from his boyhood the unrolling of that great series of discoveries by Portugal and Spain in East and West, and the love of geography thus kindled in him

3 The reverse is an amorphous map. The book is in the British Museum.

4 Rerum Venetarum . . . Historia, bk. xiv.

6 Ramusio's report on this Hebrew is preserved in the diaries of Marcus Sanudo, and is printed by Cigogna. It is curious. David represented himself as a prince of the Bedouin Jews who haunt the caravan-road between

Damascus and Medina ; he claimed to be not only a great warrior covered with wounds but great also in the law and in the cabala, and to have been inspired by God to conduct the dispersed tribes to the Holy Land and to rebuild the temple. In this view he had visited Prester John and the Jews in his kingdom, and then various European countries. David was dark in complexion, " like an Abyssinian, ' lean, dry and Arab-like, well dressed and well attended, full of pretensions to supernatural cabalistic knowledge, and with enthusiastic ideas about his mission, whilst the Jews regarded him as a veritable Messiah.

made that branch of knowledge through life his chief study and delight. He is said, with the assistance of friends touched by the same flame, to have opened a school for geography in his house at Venice. And it appears from a letter addressed to him by his friend Andrea Navagero, that as early as 1523 the preparation of material for his great work had already begun. The task had been suggested and encouraged, as Ramusio himself states in a dedicatory epistle to the famous Girolamo Fracastoro, by that scholar, his lifelong friend; an address to the same personage indeed introduced each of the three volumes, and in the first the writer speaks of his desire to bequeath to posterity, along with his labours, " a testimony to the long and holy friendship that had existed between the two." They were contemporaries in the strictest sense (Ramusio 1485-1557, Fracastorius 1483-1553). His correspondence, which was often devoted to the collection of new material for his work, was immense, and embraced many distinguished men. Among those whose names have still an odour of celebrity were Fracastoro, just mentioned, Cardinal Pietro Bembo, Damiano de Goez, and Sebastian Cabot; among lesser lights, Vettor Fausto, Daniel Barbaro, Paolo Manuzio, Andrea Navagero, the cardinals Gasparo Contarini and Gregorio Cortese, and the printer Tommaso Giunti, editor after Ramusio's death of the Navigationi.

Two volumes only of the Navigationi e Viaggi were published during the life of Gian Battista, vol. i. in 1550, vol. iii. in 1556; vol. ii. did not appear till 1559, two years after his death, delayed, as his friend and printer T. Giunti explains, not only by that event but by a fire in the printing-office (November iSS7)i which destroyed a part of the material which had been prepared. It had been Ramusio's intention to publish a fourth volume, containing, as he mentions himself, documents relating to the Andes, and, as appears from one of the prefaces of Giunti, others relating to explorations towards the Antarctic. 1 Ramusio's collection was by no means the first of the kind, though it was, and we may say on the whole

continues to be, the best. Even before the invention of the press such collections were known, of which that made by a certain Long John of Ypres, abbot of St Bertin, in the latter half of the 14th century was most meritorious, and afforded in its tran- scription a splendid field for embellishment by the miniaturists, which was not disregarded. The best of the printed collections before Ramusio's was the Novus Orbis, edited at Basel by Simon Grynaeus in 1532, and reissued in 1537 and 1555. This, however, can boast of no disquisitions nor of much editorial judgment. Ramusio's collection is in these respects far superior, as well as in the variety and fulness of its matter. He spared no pains in ransacking Italy and the Spanish peninsula for contributions, and in translating them when needful into the racy Italian of his day. Several of the pieces are very rare in any other shape than that exhibited in Ramusio's collection; several besides of importance — e.g. the invaluable travels of Barbosa and Pigafetta's account of Magellan's voyage — were not publicly known in any complete form till the present century. Of two important articles at least the originals have never been otherwise printed or discovered; one of these is the Summary of all the Kingdoms, Cities, and Nations from the Red Sea to China, a work translated from the Portuguese, and dating apparently from about 1535; the other, the remarkable Ramusian redaction of Marco Polo (q.v.). The Prefatione, Espositione and Dichiarazione, which precede this version of Marco Polo's book, are the best and amplest examples of Ramusio's own style as an editor. They are full of good sense and of interesting remarks derived from his large reading and experience, and few pictures in words were ever touched more delightfully than that in which he sketches the return of the Polo family to their native city, as he had received it in the tradition of the Venetian elders.

There were several editions of the Navigationi e Viaggi, and

1 See in vol. iii. the end of Ramusio's Discorso on the conquest of Peru, and Giunti's " Alii Lettori " in the vd edition of the first volume.

as additions continued to be made to the several volumes a good deal of bibliographical interest attaches to these various modifications. 2 The two volumes (i. and iii.) published in Ramusio's lifetime do not bear his name on the title-page, nor does it appear in the addresses to his friend Fracastorius with which these volumes begin (as does also the second and posthumous volume). The editions of vol. i. are as follows: I SS < 5, 1554, 1563, i5 88 > l6o6 i 1613. 3 The edition of 1554 contains the following articles which are not in that of 1550: (1) copious index; (2) " Narr. di un Compagno di Barbosa"; (3) " Informationi del Giapan"; (4) "Alii Lettori di Giov. de Barros"; (5) " Capitoli estratti da di Barros." The edition of 1563 adds to these a preliminary leaf concerning Ramusio, " Tommaso Giunti

alii Lettori." After 1563 there is no change in the contents of this volume, only in the title-page. It should be added that in the edition of 1554 there are three double-page woodcut maps (Africa, India and India extra Gangem), which do not exist in the edition of 1550, and which are replaced by copperplate maps in subsequent editions. These maps are often missing. The editions of vol. ii. are as follows: 1559, 1574, 1583, 1606. There are important additions in the 1574 copy, and still further additions in that of 1583. The additions made in 1574 were: (1) " Herberstein, Delia Moscovia e della Russia"; (2) " Viaggio in Persia di Caterino Zeno"; (3) " Scoprimento dell' Isola Frislanda, &c, per due fratelli Zeni "; (4) " Viaggi in Tartaria per alcuni frati Minori "; (5) " Viaggio del Beato Odorico " (two versions). Further additions made in 1583 were: (1) " Navigatione di Seb. Cabota"; (2) at the end 90 ff. with fresh pagination, containing ten articles on " Sarmatia, Polonia, Lithuania, Prussia, Livonia, Moscovia, and the Tartars by Aless. Guagnino and Matteo di Micheovo." The two latest " editions " of vol. ii. are identical, i.e. from the same type, with a change of title-page only, and a reprint of the last leaf of the preface and of the last leaf of the book. But" the last circumstance does not apply to all copies. In one, whilst the title bears 1606, the colophon bears " Appresso i Giunti, 1583." Vol. iii. editions are of 1556, 1565 and 1606. 4 There is no practical difference between the first two, but that of 1606 has forty-five pages of important new matter, which embraces the Travels of Cesare Fedrici or Federici in India, one of the most valuable narratives of the 16th century, and Three Voyages of the Hollanders and Zealanders to Nova Zembla and Groenland. Vol. iii. also contains (omitting maps and figures inserted in the text, or with type on the reverse) a two-page topographical view of Cuzco, a folding map of Terra Nova and Labrador, a two-page map of Brazil, a two-page map of Guinea, &c, a two-page map of Sumatra, a two-page pictorial plan of the town of Hochelaga in New France, and a general map of the New World in a hemisphere. Brunet's statement mentions issues of vol. ii. in 1564, and of vol. iii. in 1613; but these seem to have no existence. It would thus appear that a set of Ramusio, to be as complete as possible, should embrace — for vol. i., 1563 or any subsequent edition; for vol. ii., 1583 or 1606; for vol. iii., 1606.

Paolo (Girolamo Gaspare) 5 (1532-1600) was the only child of Gian Battista, and was born on the 4th of July 1532. Like his father, he maintained a large correspondence with many persons of learning and note. In 1541 Francesco Contarini, procurator of St Mark's, brought from Brussels a MS. of Ville- hardouin's History of the Conquest of Constantinople, which he presented to the Council of Ten. In 1556 they publicly ordered its translation into Latin, and gave the commission to Paolo Rannusio. His father also seems to have taken much interest in the work, for a MS. vernacular translation by him exists in the Marciana.

Paolo's book was not completed

2 Brunet's statements on the subject are borrowed, and not quite accurate. The detail in Cigogna seems to be accurate, but it is vague as to the deficiencies of the earlier editions.

3 All of these are in the British Museum.

4 AH at the British Museum.

6 This person and his son affected the spelling Rannusio.

till 1573, many years after the father's death, and was in fact a paraphrase enlarged from other sources, thus, according to Cigogna's questionable judgment, " converting the dry story of Villehardouin into an elegant (fiorila) historical work." It was not published till 1609, nine years after Paolo's death; nor was it ever really reprinted, though it became the subject of a singular and unintelligible forgery. For Jacopo Gaffarelli, who was sent to Venice to buy books for Richelieu, having apparently procured the " remainder " copies, removed the title and preliminary pages and substituted a fresh title with the date 1634, and a dedication to his master the cardinal. 1

Girolamo Giuseppe (1555-1611), the son of Paolo, was born at Venice in 1555. He entered the public service in 1577, and was employed in connexion with various foreign missions. In 1601 he published at Lyons the French text of Villehardouin; and, besides an Italian translation of this old historian (who seems thus to have furnished occupation for three generations of Ramusios), he left behind him a Storia o Cronaca di Casa Ramusia, a folio MS still in St Mark's Library. He died at Padua in 161 1, and his posterity did nothing to continue the reputation of the family, official or literary.

Besides the circumstances to be gathered from the Navigation! regarding the Ramusio family, see the Iscrizioni Venete of Emanuele Cigogna. There is also in the British Museum Monografia letta il 14 Marzo 1883 . . . by Guglielmo Carradori (Rimini, 1883); but hardly anything has been found in this except the inscription quoted at the beginning of this article. (H. Y.)

RANADE, MAHADEO GOVIND (1842-1901), Indian lawyer, reformer and author, was born on the 16th of January 1842 at Niphad, in Nasik district, of a Chitpavan Brahman family. When his father was minister at

Kolhapur he attended the Anglo-vernacular school in that town, and joined the Elphin- stone Institute in Bombay at the age of fourteen. He was one of the first graduates of the Bombay University, taking the B.A. in 1862 and the LL.B. in 1866. Having entered government service he became presidency magistrate and then fourth judge of the small cause court at Bombay in 1871, first-class sub-judge at Poona in 1873, and judge of the Poona small cause court in 1884, after which, as special judge under the Deccan Agricul- turists' Relief Act from 1887, he came into close contact with the difficulties of the agrarian classes. In 1886 he was a member of the finance committee appointed to report on the expenditure, both imperial and provincial, with a view to retrenchment. This service won him the decoration of CLE. He became a member of the legislative council of Bombay in 1885, and occupied that position until raised to the high court in 1893. Being an energetic social reformer, he directed his efforts against infant marriages, the shaving of widows, the heavy cost of marriages and other social functions, and the caste restrictions on travelling abroad. He strenuously advocated widow remarriage and female education. He was the founder of the social conference movement, which he supported till his death. In the political sphere he founded the Poona Sarvajanik Sabha, through which he frequently helped the government with sound advice. He was also one of the originators of the Indian National Con- gress. In Bombay University, where he held the offices of syndic and dean in arts, he displayed much organizing power and great intimacy with the needs of the student class. Him- self a thorough Mahratti scholar, he encouraged the translation of standard English works, and tried, with some success, to introduce vernacular languages into the university curriculum. Though reared in the strictest tenets of Hinduism, his deep religious feeling and trained intellect craved something higher and broader than he could find in the traditional forms and orthodox teaching of his race. The same spiritual want being felt by many enlightened Hindus, he joined with his friends, Dr Atmaram Pandurang, Bal Mangesh Wagle and Vaman Abaji Modak, in founding a new sect in Bombay known as the " Par- thana Samaj." This community resembles, in all essential points, the Brahma Samaj of Bengal. Its principles of en- 3ghtened theism are based on the ancient Vedas. He published 1 In the British Museum.

books on Indian economics and on Mahratta history. He died on the 1 6th of January 1901. He left no children, but his widow continued his work of social and educational reform at Poona. See G. A. Mankar, Justice M. G. Ranade (Bombay, 1902).

RANAVALO (Ranavalona) III. (1864-), the last queen of Madagascar, born in 1864, was a great-niece of Radama I. Her name originally was Razafindrahety, but on succeeding to the throne of Madagascar after the death of Queen Ranavalo II. , on the 14th of July 1883, she assumed the

style of Ranavalo III. Although nominally queen, she took no share in the government, which her prime minister, Rainilaiarivony, had controlled since 1864. After placing her on the throne, he married her before the close of the year. Ranavalo became queen just after the French had revived their claim to a protectorate over the island. The Hova government refusing to admit the claim, war broke out, and several sharp engagements took place. The French bombarded the coast towns, but were unable to reach the interior of the island, where the strength of the Hova lay. In December 1885 a treaty was concluded by which it was agreed that the government of the French Republic should represent Madagascar in all foreign relations, but that in internal matters the Hova government should be independent, as formerly. During the next ten years French influence was quietly extended over the island, in spite of the efforts of Rainilaiarivony, who pursued an anti-French policy, encouraging English and Ameri- can planters and traders. In 1894 differences on commercial and territorial questions arose between the Hova government and the French, which terminated in war. In 1895 a well- organized expedition was despatched from France to subjugate the island. Many of the inhabitants sympathized with the invaders, and even the Hova themselves were divided. Al- though Ranavalo endeavoured to arouse a martial spirit in her subjects, the French advanced on the capital without encounter- ing any effective opposition. On the 30th of September they captured Antananarivo. Rainilaiarivony was sent into exile, where he died in the following year; but Ranavalo was suffered to remain as nominal head of the government, under a strict French protectorate. In August 1896, to avoid commercial difficulties with foreign powers, the island was declared a French colony; but no change was made in the internal administration. Later in the year, however, the civil governor was replaced by a military resident, General Gallieni. A formidable insurrection broke out, which Gallieni suppressed, executing or exiling several prominent members of the Hova administration. Finding that the court had been a centre of intrigue, he abolished the sover- eignty by proclamation in February 1897, and exiled Ranavalo to Reunion. In March 1899 she was removed to Algiers. Her exile there was relieved by occasional visits to Paris.

RANC, ARTHUR (1831-1908), French politician and writer, was born at Poitiers on the 20th of December 1831, and was educated for the law. Implicated in a plot against Napoleon III. in 1853, he was acquitted, but shortly afterwards was im- prisoned for belonging to a secret society; for his share in anti- imperialist conspiracies in 1855 he was arrested and deported to Algeria without a trial. The amnesty of 1859 permitted him to return to Paris, where he soon drew the attention of the police to his presence by his violent articles. During the siege of Paris he left the city in a balloon and joined Gambetta, for whom he organized a system of spies

through which General Trochu was kept informed of the strength and disposition of the Prussians around Paris. He was elected to the National Assembly in February 1871, but resigned rather than subscribe to the peace. He had been elected mayor of the ninth arron- dissement of Paris in the autumn of 1870, and in March was sent by the same district to the Commune, from which he resigned when he found no reconciliation was possible between the mayors and the Commune. In July he became a member of the municipal council of Paris, and in 1873 was returned to the National Assembly for the department of the Rh&ne, and took his place on the extreme Left. A month after his election the governor of Paris demanded his prosecution for his share in the Commune. The claim being granted by a large majority, he

escaped to Belgium, where he issued a pamphlet defending his action during the Commune. On his failure to appear before the court he was condemned to death, and remained in Belgium until 1870, when he was included in the amnesty proclaimed by Grevy. During his exile he continued his active collaboration An La RepuUique frattQaise. In 1873 he fought a duel with Paul de Cassagnac, and he acted as second to Clemenceau more than once. He energetically defended the republic against the Boulangist agitation, and took an equally courageous part in the Dreyfus affair. In the Picquart-Henry duel he was second to Colonel Picquart. He succeeded Clemenceau as editor of the Aurore, in which Zola's letter " J'accuse " had appeared, and was president of the Association of Republican Journalists. In 1903 he became senator for Corsica, and died on the 10th of August 1908.

In addition to his purely political writings, Arthur Ranc published political novels of the Second Empire, Sous Vempire (1872) and Le roman d'une conspiration (1868).

RANCfi, ARMAND JEAN LE BOUTHILLIER DE (1626- 1700), founder of the Trappist Cistercians. He was born in Paris of a noble and influential family of Normandy; hence, being destined to the ecclesiastical state, he was when ten years old commendatory abbot of La Trappe and two other abbeys, prior of two priories, and canon of N6tre Dame, Paris. At twelve he published a translation of Anacreon. He went through his course of theological studies with great distinction, defeating Bossuet at the Baccalaureat in theology. He was ordained in 165 1, and embarked on the ambitious and worldly career of a court abbe in the days of Louis XIV. But after a few years he underwent a complete change of life, and in 1662 he

retired to his abbey of La Trappe, of which he became regular abbot in 1664 and introduced an austere reform (see Trappists). The best known episode of his subsequent life was the " Contestation " with Mabillon on the lawfulness of monks devoting themselves to study, which De Ranee denied. He resigned his abbacy in 1695, owing to declining health, and died in 1700.

The best of the early lives is that of P. le Nain, his sub-prior (1715) ; the most recent is by M. Serrant, V 'Abbe de Ranee et Bossuet (1903). A sufficient sketch is given by Helyot, Histoire des ordres religieux (1718), vi. c. 1. On the " Contestation " on Monastic Studies, see Maitland, Dark Ages, § x. (E. C. B.)

RANCH, a term in current usage among the English-speaking peoples for a large farm, particularly one for cattle or horse- breeding. The word came into use in this application in the western states of North America, and was an adaptation of the Spanish-American rancho, herdsmen's huts; in Spanish a gathering of people having their meals in common, a mess.

RANCHI, a town and district of British India, in the Chota Nagpur division of Bengal. The town, which is situated on the Chota Nagpur plateau, about 2100 ft. above sea-level, is the headquarters of both the division and the district. Pop. (1901) 25,970. It is an important centre of local trade and the headquarters of the German Lutheran mission. There are a high school and an industrial school, and it is proposed to found here a residential college for all Bengal. The canton- ments, formerly called Doranda, accommodate a detachment of native infantry.

The District of Ranchi, formerly called Lohardaga after the town which was its headquarters, has an area of 7128 sq. m. It consists of two tablelands, of which the higher rises to about 2000 ft. The whole area is broken by hills and undulations, which are terraced for rice. The steep slopes are covered with a dense forest, where wild animals still abound, but no profit is derived from the timber. The principal rivers are the Subanarekha and the North and South Koel. In 1901 the population was 1,187,925, showing an increase of 5-2% in the decade. Christians form 10% of the total. The district was affected by the famine of 1896-1897, and still more severely by that of 1900. Rice is everywhere the staple crop, with some millets and pulses. Tea cultivation has been introduced, but does not flourish. The only industry on a large scale is the

manufacture of shellac. Myrobalans are also exported. Iron and soapstone are worked in small quantities. Hopes of pro- fitable gold-mining in the quartz veins of the schist formation have proved abortive. There is no railway in the district, though surveys have been made to connect with the

Bengal- Nagpur line.

See F. B. Bradley-Birt, Chota Nagpur (1903).

RAND, a Dutch word meaning border, edge, used in South Africa to designate a low rounded range of hills; specifically it is an abbreviated form of Witwatersrand, an elevated ridge in the southern Transvaal, forming the water-parting between the basins of the Orange and Limpopo. The Rand is famous for its gold-bearing reefs (see Gold), and the word is often used as a synonym for the mining industry carried on over a great part of its area, or for Johannesburg (q.v.), the city which that industry created.

RANDALL, SAMUEL JACKSON (1828-1890), American politician, was born in Philadelphia, Pennsylvania, on the 10th of October 1828. He was educated in the public schools and in the University Academy, Philadelphia. In 1858-1859 he was a Democratic member of the state Senate. During the Civil War he served as a private in the Union army for ninety days in 1861, and two years later took part in the Gettysburg campaign as a volunteer. From 1863 until his death he was a Democratic representative in Congress. During the session of 1874-1875 he first gained a national reputation by the masterful manner in which he prevented the Republican majority from passing the Force Bill or Federal Election law. Under his leadership discipline and party harmony were established among the Democrats for the first time after the Civil War. He was speaker of the House from December 1876 to March 1 88 1, during a period marked by rancorous debates concerning the disputed Hayes-Tilden presidential election. With the disappearance of the Reconstruction questions and the emer- gence of the tariff issue, however, his influence began to wane. As the leader of the Protectionist wing of the party he was superseded by the tariff reform advocates, such as John G. Carlisle, William R. Morrison, and Roger Q. Mills, Carlisle defeating him for the speakership in 1883. He died in Washing- ton, D.C., on the 13th of April 1890.

RANDAN, a name for a boat rowed by three persons, stroke and bow using a single oar each and the central person a pair of sculls. The word is of unknown origin, and can hardly be con- nected with a slang term for a row or spree, which is found as early as the beginning of the 18th century and is generally taken as a variation of ” random,” haphazard.

RANDAZZO, a town of Sicily, in the province of Catania, at the N. foot of Mount Etna, 43 m. N. by W. of Catania by rail, and 26 m. direct. Pop. (1901) 11,798. It has considerable remains of architecture of the 13th and 14th centuries, including three Norman churches and some interesting palaces. The former contain some fine sculptures and goldsmith’s work

(Mauceri in L'Arte, 1906, 185). It is the nearest town to the summit of Etna (9 m.), and is one of the points from which the ascent may be made.

RANDERS, a town of Denmark, capital of the ami (county) of its name in Jutland, on the Gudenaa at the point where it begins to widen into Randers Fjord, an inlet of the Cattegat. Pop. (1901) 20,057. The town is 15 m. from the open Cattegat and the harbour has 15 ft. depth on the bar. The chief exports are butter and eggs; the chief imports sugar, petroleum, coal and iron. Two railways run north to Aalborg, continuing the main East Jutland line from the south, and an eastward branch serves Grenaa and Aebeltoft on the coast. Though a place of considerable antiquity — being mentioned in 1086 as the meeting-place of insurgents against Knud, the saint — Randers has few remains of old buildings and bears the stamp of a compact, modern manufacturing town that owes its im- portance to its distilleries, manufactories of gloves, railway carriages, &c. St Marten's church dates from the 14th century, but was frequently altered and enlarged down to 1870. It has good woodwork of the 17th century. The high school is housed

in a medieval monastery, which was restored in 1894-97. There is a statue to Steen S. Blicher (1782-1848), the national poet and novelist of Jutland.

Randers is best known in history as the scene of the assassina- tion of Count Gerhard by Niels Ebbeson in 1340. In the middle ages it had six churches and four monastic establishments, the oldest a Benedictine nunnery (1170). The Grey Friars' building was turned into a castle (Dronningborg) after the Reformation; its church was burned down in 1698.

RANDOLPH, EDMUND [JENNINGS] (1753-1813), American statesman, was born on the 10th of August 1753, at Tazewell Hall, Williamsburg, Virginia, the family seat of his grandfather, Sir John Randolph (1693-173 7), and his father, John Randolph (1727-84), who (like his uncle Peyton Randolph) were king's attorneys for Virginia. Edmund graduated at the College of William and Mary, and studied law with his father, who felt bound by his oath to the king and went to England in 1775. In August-October 1775 Edmund was aide-de-camp to General Washington. In 1776 he was a member of the Virginia Con- vention, and was on its committee to draft a constitution. In the same year he became the first attorney-general of the state (serving until 1786). He served in the Continental Congress in 1779 and again in 1780-82. He had a large private practice, including

much legal business for General Washington. In 1786 he was a delegate to the " Annapolis convention," and in 1787-88 was governor of Virginia. He was a delegate to the Consti- tutional Convention of 1787, and on the 29th of May presented the " Virginia plan" (sometimes called the " Randolph plan"). 1 In the Convention Randolph advocated a strongly centralized government, the prohibition of the importation of slaves, and a plural executive, suggesting that there should be three executives from different parts of the country, and refused to sign the con- stitution because too much power over commerce was granted to a -mere majority in Congress, and because no provision was made for a second convention to act after the present instrument had been referred to the states. In October 1787 he published an attack on the Constitution; but in the Virginia convention he urged its ratification, arguing that it was too late to attempt to amend it without endangering the Union, and thinking that Virginia's assent would be that of the necessary ninth state. In 1788 he refused re-election as governor, and entered the House of Delegates to work on the revision and codification of the state laws (published in 1794). In September 1789 he was appointed by President Washington first attorney-general of the United States. He worked for a revision of Ellsworth's judiciary act of 1789, and especially to relieve justices of the supreme court

1 The plan was not drafted by Randolph, but he presented it because he was governor. It called for a legislature of two branches, one chosen by the people and based on free population (or on wealth) and the other chosen by the first out of candidates nominated by the state legislatures; a majority vote only was required in each house; and Congress was to have a negative on such state legislation as seemed to the Congress to contravene the articles of the Union. There was to be, under this plan, an executive chosen by the national legislature, to be ineligible for a second term, to have general authority to execute the national laws and to have the executive rights vested in Congress by the Confederation; and the executive with a convenient number of the national judiciary was to compose a Council of Revision, with a veto power on acts of the national legislature and on the national legislature's vetoes of acts of state legislatures — but the national legislature might pass bills (or vetoes of state legislation) over the action of the Council of Revision. The plan provided for a Federal judiciary, the judges to be appointed by the national legislature, to hold office during good behaviour, and to have jurisdiction over cases in admiralty and cases in which foreigners or citizens of different states were parties. The Virginia plan was opposed by the smaller states, Connecticut, New Jersey, Delaware and Maryland, which demanded equal representation in the legislature. It was too radically different from the Articles of Confederation. A draft of a constitution in Randolph's handwriting, discovered in 1887, seems to have been the report (6th August) of a Committee of Detail of five members

(John Rutledge, Edmund Randolph, Nathaniel Gorham, Oliver Ellsworth and James Wilson). It is reproduced in facsimile in W. M. Meigs's The Growth of the Constitution (Philadelphia, 1900). Conway, who discovered it, exaggerated its importance and thought it had been drawn by Randolph alone and before the Convention.

of the duties of circuit judges, and advocated a Federal code; in 1791 he considered Hamilton's scheme for a national bank unconstitutional; and in 1792-93, in the case Chisolm v. Georgia before the supreme court, argued that a state might be sued by a citizen of another state. On the 2nd of January 1794 he succeeded Thomas Jefferson as secretary of state. In 1795 he wrote thirteen letters (signed " Germanicus") defending the President in his attack on the American Jacobin or democratic societies. He was the only cabinet member who opposed the ratification of the Jay treaty (his letters to the President on the subject are reprinted in The American Historical Review, vol. xii. pp. 587-599), and before it was ratified the delicate task of keeping up friendly diplomatic relations with France fell to him. Home despatches of the French minister, Joseph Fauchet, intercepted by a British man-of-war and sent to the British minister to the United States, accused Randolph of asking for money from France to influence the administration against Great Britain. Although this charge was demonstrably false, Ran- dolph when confronted with it immediately resigned, and subsequently secured a retractation from Fauchet ; he published A Vindication of Mr Randolph's Resignation (1795) and Political Truth, or Animadversions on the Past and Present State of Public A fairs (1796). He was held personally responsible for the loss of a large sum of money during his administration of the state department, and after years of litigation was judged by an arbitrator to be indebted to the government for more than $49,000, which he paid at great sacrifice to himself. He re- moved to Richmond in 1803, and during his last years was a leader of the Virginia bar; in 1807 he was one of Aaron Burr's counsel. He died at Carter Hall, Millwood, Clarke county, Virginia, on the 12th of September 1813.

Moncure D. Conway, in his Omitted Chapters of History disclosed in the Life and Papers of Edmund Randolph (New York, 1888; 2nd ed., 1889), greatly exaggerates Randolph's work in the Constitutional Convention; the commoner view underrates him and makes him a " hair-splitter," and a man of no decision of character.

RANDOLPH, JOHN (1773-1833), of Roanoke, American statesman. He was a member of an influential and wealthy Virginian family, and was the third and youngest son of John Randolph of Cawsons, Chesterfield county, where he was born on the 2nd of June 1773. He was a descendant of John Rolfe and his wife Pocahontas. His father having died in 1775, his early

years were passed under the care of his mother and his stepfather, Mr St George Tucker, from whom, however, he eventually became estranged, as he did from almost every one with whom he was intimately associated. He attended a school at Williamsburg, Virginia, and for a short time studied at Princeton and at Columbia; but, although well read in modern works bearing on politics and philosophy, his own statement, " I am an ignorant man, sir," was in other respects not inaccurate. Both his religious and his political views were radical and extreme. At an early period he imbibed deistical opinions, which he promulgated with eagerness. He was also, though a mere boy when the new Federal government was organized in 1789, strongly opposed to the new Constitution of the United States. In order to assist in asserting the right of resistance to national laws, and to withstand the " encroach- ments of the administration upon the indisputable rights " of Virginia, he was in 1 799 elected as a Republican to the national House of Representatives, of which he was a member, with the exception of two terms (1813-15 and 1817-19), until 1825, and again in 1827-29. After the accession of Jefferson to the presidency in 1801, Randolph was appointed chairman of the Committee of Ways and Means, and as such was naturally the leader of the Republican majority in the House. He took an active part in agitating for the reform of the judiciary, and in 1804 moved the impeachment of Judge Samuel Chase (q.v.), acting as the leader of prosecution in the trial before the Senate. Though an avowed Republican, he was far from being sub- servient to his party, and for several years after 1805 led s small faction, called " Quids," which sharply criticized Jeffersos and attempted to prevent the selection of Madison as the

presidential candidate of his party. In March 1807 he lost the chairmanship of the Ways and Means Committee. Pos- sessing considerable wit, great readiness, and a showy if some- what bombastic eloquence, he would undoubtedly have risen to high influence but for his strong vein of eccentricity and his bitter and ungovernable temper. The championship of state's rights was carried by him to an extreme utterly quixotic, inas- much as he not only asserted the constitutional right of Virginia to interpose her protest against the usurpation of power at Washington, but claimed that the protest should be supported by force. From December 1825 to March 1827 he served in the United States Senate, and in April 1826 he was forced to fight a duel with Henry Clay, on account of his violent abuse of that statesman in the course of a debate. In 1830 he was sent by President Jackson on a special mission to Russia, but remained in St Petersburg only ten days, then spent almost a year in England, and on his return in October

1831 drew $21,407 from the United States Treasury for his services. He died of consumption at Philadelphia on the 24th of June 1833. Though his political life was full of inconsistencies — he was even capable of advocating the passage of a bill on one day and of opposing the passage of the same bill on the next — he generally adhered to the principles enunciated by the Republican party in its earliest years, and throughout his later career, in numerous speeches, he laboured to bring about the identification of slavery with the theory of states' rights. In this he was the natural precursor of Calhoun. His last will was disputed in the law courts, and the jury returned a verdict that in the later years of his life he was not of sane mind. He was always in theory opposed to slavery, and by the will which was accepted by the courts, freed his own slaves.

The best biography is that by Henry Adams, John Randolph (Boston, 1882), in the " American Statesmen Series." There is also a biography, which, however, contains many inaccuracies, by Hugh A. Garland (2 vols., New York, 1851).

RANDOLPH, PEYTON (1721-1775), American politician, was born at Tazewell Hall, Williamsburg, Virginia, in 17 21, a son of Sir John Randolph (1693-1737), the king's attorney for Virginia. He graduated at the College of William and Mary, studied law at the Inner Temple, London, and in 1748 was appointed the king's attorney for Virginia. 1 Randolph wrote the address of remonstrance to the king in behalf of the Bur- gesses against the suggested stamp duties in 1764. His policy was conservative and moderate, and in May 1765 he opposed Patrick Henry's radical " Stamp Act Resolutions." In 1766 he resigned as king's attorney and was succeeded by his brother John (1727-1784). In 1769 he acted as moderator of the privately convened assembly which entered into the non-importation agreement, and in May 1773 he became chairman of the first Virginia intercolonial committee of correspondence. He presided over the provincial convention of August 1774, and was a member of the First Continental Congress, of which he was president from the 5th of September to the 22nd of October '1774. He was re-elected to Congress in March 1775, and on the 10th of May was again chosen to preside, but on the 24th he left to attend a meeting at Williamsburg of the Virginia Burgesses. He then returned to Congress, of which John Hancock had meanwhile been made president. Randolph died of apoplexy in Philadelphia on the 22nd of October 1775. He was provincial grand-master of the Masons of Virginia, and was an intimate friend of Washington.

RANDOLPH, THOMAS (1 523-1 590), English diplomatist, son of Avery Randolph, a Kentish gentleman, was educated at Christ Church, Oxford, and in 1549 became principal of Pem- broke College, Oxford, then known as Broadgates Hall. During

1 In 1754 the Burgesses sent him to London to argue against the governor's demand for a fee of one pistole on every land patent ; his plea was successful, but the governor superseded him with George Wythe, who resigned in Randolph's favour upon his return from England. The Burgesses voted Randolph £2500 with the grant of 1 20, 000 to Governor Dinwiddie for Indian warfare; the governor would not approve this appropriation, however, until Randolph apologized for leaving his office without the governor's permission.

the reign of Mary, Randolph, who was a zealous Protestant, sought refuge in Paris, where he cultivated the society of scholars. Returning to England after the accession of Eliza beth, he was soon employed as a confidential diplomatic agent of the English queen in Scotland. Here he succeeded in gaining the confidence of the Protestant party, with whom he became a person of great influence. Randolph's despatches from Scotland between 1560 and 1585 supply important materials for the history of the political intrigues of that period. Randolph, who had hitherto remained ostensibly on terms of friendship with Mary Queen of Scots, exerted his influence on instructions from Elizabeth to prevent Mary's marriage with Darnley; but in 1566 he was driven from Scotland on the charge of having fomented Murray's rebellion, and he then obtained government employment of secondary importance in England. In 1568 he undertook a mission to Russia which resulted in the concession by Ivan the Terrible of certain privileges to English merchants; and in 1570 he returned to Scotland, where, after the murder of the regent Murray in January of that year, he " succeeded," says Andrew Lang, " in making civil war inevitable; he himself was in high spirits, as always when mischief was in hand." After carrying through certain diplomatic business in France in 1573 and 1576, Ran- dolph returned in January 1581 to Scotland, where the earl of Morton, the regent, had been arrested a few days previously. Randolph, acting on Elizabeth's instructions, intrigued with Angus and the Douglases in favour of a plot to seize the person of the young King James, and to save Morton by laying violent hands on the earl of Lennox. Douglas of Whittingham, who was employed in the intrigue, on being arrested made revela- tions which imperilled Randolph, and the latter prudently withdrew to Berwick before the execution of Morton in June 1581. In 1585, when he next visited. Scotland,, he was more successful, being instrumental in arranging a treaty between England and Scotland. For the next four years he was chan- cellor of the exchequer in England, and he died in London in June 1590. Randolph married, in 1571, Anne, daughter of Thomas Walsingham. He was a personal friend of George Buchanan, in whose History of Scotland he took a lively interest, and he has been credited, though on doubtful evidence, with the authorship of a Life of the historian in Latin.

See J. A. Froude, History of England (12 vols., London, 1881); Andrew Lang, History of Scotland, vol. ii. (4 vols., London, 1902-7) ; Calendar of State Papers relating to Scotland (1509- 1603), edited by M. J. Thorpe (2 vols.); Calendar of State Papers, Foreign Series of the Reign of Elizabeth; Anthony a Wood, Athenae Oxonienses and Fasti, edited by P. Bliss (4 vols., London, 1813-20).

RANDOLPH, THOMAS (1605-1635), English poet and dramatist, was born near Daventry in Northamptonshire, and was baptized on the 15th of June 1605. He was educated at Westminster and at Trinity College, Cambridge. He took his B.A. degree in 1628, proceeded M.A. in 1632 and became a major fellow of his college in the same year. He soon gave promise as a writer of comedy. Ben Jonson, not an easily satisfied critic, adopted him as one of his " sons." He addressed three poems to Jonson, one on the occasion of his formal " adoption," another on the failure of The New Inn, and the third an eclogue, describing his own studies at Cambridge. He lived with his father at Little Houghton in Northamptonshire for some time, and afterwards with William Stafford of Blatherwick, at whose house he died before com- pleting his thirtieth year. He was buried in Blatherwick church on the 17th of March 1634-35, and his epitaph was written by Peter Hausted, the author of The Rival Friends.

Randolph's reputation as a wit is attested by the verses addressed to him by his contemporaries and by the stories attached to his name. His earliest printed work is Aristippus, Or, The Joviall Philosopher. Presented in a private shew, To which is added, The Conceited Pedlar (1630). It is a gay interlude burlesquing a lecture in philosophy, the whole piece being an argument to support the claims of sack against small beer. The Conceited Pedlar is an amusing monologue delivered by the pedlar, who defines himself as an " individuum vagunt,

or the primum mobile of tradesmen, a walking-burse or movable exchange, a Socratical citizen of the vast universe, or a peri- patetical journeyman, that, like another Atlas, carries his heavenly shop on's shoulders." He then proceeds to display his wares with a running satirical comment. The Jealous Lovers was presented by the students of Trinity College, Cambridge, before the king and queen in 1632. The Muse's Looking-Glass is hardly a drama. Roscius presents the extremes of virtue and vice in pairs, and last of all the " golden mediocrity " who announces herself as the mother of all the virtues. Amyntas, or The Impossible Dowry, a pastoral printed in 1638, with a number of miscellaneous Latin and English poems, completes the list

of Randolph's authenticated work. Hey for Honesty, down with Knavery, a comedy, is doubtfully assigned to him.

His works were edited by W. C. Hazlitt in 1875.

RANDOM (older forms randon, randcun; from the French, cf. randir, to run quickly, impetuously; generally taken to be of Teutonic origin and connected with Ger. Rand, edge, brim, the idea being possibly of a brimming river), an adjective originally meaning impetuous, hasty, hence done without purpose or aim, haphazard. The term " random work " is used, in "architecture, by the rag-stone masons, for stones fitted together at random without any attempt at laying them

in courses. " Random coursed work " is a like

term applied to work coursed in horizontal beds, but the stones are of varying height, and fitted to one another (see Masonry).

RANELAGH, formerly a popular resort by the Thames in Chelsea, London, England. About 1690 the land lying east of Chelsea Hospital, and bordering the river about the point where Chelsea Bridge now stands, was acquired by Richard, Viscount Ranelagh, later earl of Ranelagh (d. 171 1). He built a mansion and laid out fine gardens, which, in 1742, were thrown open as a proprietary place of entertainment. A building called the Rotunda was erected for concerts, and the gardens quickly became a favourite resort of fashionable society. Balls and masquerades, exhibitions of fireworks, regattas and many other forms of amusement were provided; 3ut by the close of the 18th century Ranelagh was ceasing to attract the public, and in 1803 the Rotunda was closed. The buildings were removed, and the grounds became the property of Chelsea Hospital. They are still included in the pleasant gardens belonging to that foundation, but no traces of the popular Ranelagh are preserved. There is, however, a fashionable modern club of the same name.

See Warwick Wroth, London Pleasure Gardens of the Eighteenth Century (London, 1896).

RANGE-FINDER, Telemeter or Position-Finder (Fr. telemelre; Ger. Distanzmesser; It. Telemetro; Russ. Dalnomier; Span. Telemetro; in the United States the word telemeter is sometimes applied to the stadia used in connexion with the tacheometer) , an instrument, of which many varieties have been invented, for assisting the gunner and the infantry soldier in determining the distance or "range" 1 to their objective. Nearly all range-finders may be described as instruments which automatically solve a triangle. Usually it is a right- angled triangle, the length of the base of

which is known, and one of the sides is the range it is desired to find. They are, in fact, goniometers, but the angle which they measure, whether it may be at the end of the measured base, or that subtended by it, is usually expressed as a function of the angle in terms of the measured base. Thus the range is recorded directly in metres or yards without calculation. It is proposed here

1 The word " range," from O.Fr. range, from ranger, to place in a row or rank {rang being a variant of ranc, whence Eng. "rank "), meant properly a row or line of objects, as still in " mountain- range "; the secondary meanings of an area or space of ground, sphere of action, compass, extent, distance, are derived from the verb " to range," to stretch out in a line, to extend, to move about over a given area.

to describe principally the range-finding instruments in the British services (1) as used in the fleet; (2) by the army in the field; (3) in harbour defence; and (4) to refer briefly to range-finders, not under these heads, of English and foreign design.

1. The necessity for a range-finder afloat caused the British Admiralty in 1891 to issue an advertisement in the press inviting inventors to produce an instrument which would, amongst other conditions, record ranges with an accuracy of within 3% at 3000 yds. The resulting competition was de-clared in favour of a range-finder which is the joint invention of Professor Barr of the Glasgow University and Professor Stroud of the Yorkshire College.

The naval range-finder consists of a tube 3 which contains two telescopes. It is carried on a frame by bearings, in which the tube is free to revolve about its longer axis. To the frame „ rraad is attached a weight capable of movement within a tank, stroud This weight balances the range-finder and frame upon knife-edges. By means of the handle on the left of the instrument and an altitude worm beneath it, the motion of the tube is governed, and the line of sight is directed on the objective. By partially filling the tank with water, the swinging of the weight in a seaway can be checked. The frame is supported on a pedestal and can rotate in azimuth upon it (fig. 1).

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Fig. I. — Barr and Stroud.

A rubber guard is fitted round the eye-pieces. Its functions are to guide the eyes of the observer into the correct position, and to protect them from side light and the distressing effect of wind. It also guards the forehead against the jar occasioned by firing heavy guns. The upper portion of the field presented to the left eye is used as a finder, the lower portion is occupied by the scale upon which the ranges are engraved. The finder is a low-power telescope of large field, to the centre of which the objective is brought. When the telescope is thus correctly aligned, the objective will be seen with the right eye largely magnified, but as two partial images separated by a thin black horizontal line. When coincidence of the images is effected by means of the working head, the range can be

2 The length of tube varies from 3 ft. in the smaller to 9 ft. in the larger instruments.

read off against a pointer from the scale seen with the left eye. For night use, means are provided for illuminating the scale. The range to lights may be ascertained by the use of the astigmatizer, an optical device by which a point of light is drawn out into a vertical streak. A beam of light from the objective falls on each reflector (fig. 2),

or on different parts of the same objective, and thus inaccuracy in the recordecTrange must result. The instruments are expected to give an accuracy of less than

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Finder object glass

prame eye piece pmsws~faj scale

lOBJCCT CLASS CASE iT| PIECES OCfLECTmo PRISM

Fig. 2. — Barr and Stroud.

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OBJECT GLASS REFLECTOR

and passing through the object-glasses, each is received by an arrangement of prisms about the centre of the tube, and reflected through the right eye-piece. Two partial images are thus seen. The images could be united by the rotation of one of the reflectors, but owing to the small base used the necessary movement would be so extremely small that it would be practically impossible to measure it. The difficulty has been surmounted by utilizing fixed reflectors and effect- ing coincidence by means of a prism of small angle. The deflecting prism is situated in the line of the beam of light from the reflector at the right-hand end of the tube. Its multiplying action is of great delicacy. The angle available for subdivision, to measure ranges between infinity and 250 yds., is only one-third of a degree. In a travel of 6 in. the prism renders accurate measurements possible within the required limits. To bring images of distant objectives into coincidence, the prism must be moved towards the eye-piece, and for near objectives in the opposite direction. The range scale is attached to the prism. A consequent advantage is that the accuracy of the instrument is not affected by back lash arising from wear, or irregularity in the actuating mechanism. When once installed, the instrument is always ready for use. Should adjust- ment be required it is readily and easily applied. It is not within the sphere of this article to enter into the detail of the adjusting mechanism. For further particulars the reader is referred to the Proceedings of the Institution of Mechanical Engineers, 30th January 1896. The working of the range-finder is so simple that its use is quickly learnt by any man who can read, and with little instruction and practice he can " take a range " in 8 to 12 seconds. Besides its principal purpose, in connexion with gunnery, there are minor uses in navigation and nautical surveying to which the range-finder can" be applied.

With the high speeds of modern war-vessels, guns and their objective approach each other so quickly that unless ranges can be communicated from the instrument to the guns with rapidity and accuracy the range-finder is deprived of much of its value. In connexion with the naval range-finder an apparatus is provided, which though not part of the range-finder is sufficiently important to claim passing notice. The apparatus consists of a transmitting and a receiving instrument of clockwork mechanism electrically controlled. In appearance they resemble the ordinary engine-room telegraph, on the dials of which ranges take the place of orders. The transmitter can communicate with a number of receiving instruments, disposed as required in different parts of the ship.

2. Before the introduction of the Marindin range-finder described below, the British army in the field used the " meko- meter." The instruments used by the cavalry and infantry are smaller and lighter than those of the artillery pattern, but the principle involved is identical.

The mekometer is practically a box sextant. Two instruments are used simultaneously at the ends of a base of fixed length. One sextant, called the right-angle instrument, is fitted with index and horizon glasses permanently inclined at 45 . It consequently measures a right angle. In the other sextant, called the reading instrument, a graduated drum takes the place of the usual index arm and scale. The drum is graduated spirally with a scale of ranges. Both reading and right-angle instruments are fitted with a vane of gun metal with a white strip down the centre to facilitate observations. Telescopes of low power can be fitted to the instru- ments, and two cords of 50 (or 25!) yds. are provided with which to measure the base.

Two observers attach the ends of the cord of fixed length (usually 50 yds.) to their instruments and separate until it is taut. The observer with the right-angle instrument moves into such a position that coincidence of image will be given between the objective and the vane of the instrument at the other end of the base, i.e. he makes ABC a right angle (fig. 3).

When the right angle is established, the observer at C turns the graduated drum of the reading instrument until the image of the vane of the right angle instrument coincides with the direction of the objective. The range AC is then read on the drum. The ranges on the drum are measures of the angle BAC when the base BC is 50 yds.

The mekometer is open to the objection which is common to all range-finders requiring more than one observer. There is always a danger that observers may cause coincidence on different objectives

Meko- meter.

*Reading l**trumtnt*

2 % at 2000 yds. For ranges over that dis- tance, i.e. for usual artillery ranges, it is desirable to use a double base (100 yds. in length), in which case the range regis- tered on the drum must be doubled. This opera- tion, although slight, is a distinct disadvant- age, since it adds to the time of taking a range Ittghtangle and is a possible source “”’’’’’’’“L of error. For field artillery, however, a range-finder is only an auxiliary adjunct. The true range can be found by a process of trial and error (see Artillery) in as short a time as the mekometer observers take to report it. It must further be remembered that as shrapnel is the principal projectile of field artillery, not only the correct elevation but also the true length of time fuse has to be found. This the range-finder cannot do. Hence it is that the range-finder for field artillery, although a valuable auxiliary, is not of the same importance as in purely defensive positions, such as batteries for harbour defence, and land forts.

The Marindin range-finder was from 1908 gradually intro- duced in the infantry to replace the mekometer. It was the invention of Captain A. H. Marindin, of the Black Watch (Royal Highlanders).

The principle of the instrument is that of coincidence, as in the Gautier Christie, Le Cyre, Souchier, and Barr and Stroud. But it differs from the last mentioned in that the right prism is made movable, and this movement (necessarily extremely small) is a function of the recorded range.

The steel tube, forming the base of the instrument, which carries the prisms.is supported inside an aluminium outer tube in such a way that no direct shock is communicated to it. The Malio < tla appearance of the outside of the instrument, together ?f^*" with the names of the various parts, is shown in fig. 4. Finder.

The instrument can be used in two main positions, viz. horizontally.

*Z£*0 ADJUSTMENT*

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Instrument closed.

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Instrument ready for use. Fig. 4. — Marindin Range-Finder.

for ranging on upright objects, or vertically, for ranging on horizontal targets.

For instance, in the diagram (fig. 5) of a road running uphill, the instrument could be held in any of the three positions indicated,

and would give good ranges, but probably the best range would be obtained if held as at c. If it is required to use the instrument

at night, the two caps of the night-glasses should be opened. On looking through the instrument, any lamp or other Tight will appear like a fine, bright line, and the range can be taken in the ordinary way.

This range-finder possesses the superlative advantage of the one-man instrument, and it is claimed for it that it can range on horizontal objects, such as the crest of a hill, which has no detail suitable for use with a

mekometer, and that it can be adjusted on service with no greater difficulty than the setting of a watch.

3. For harbour defence, owing to the long range of naval guns, and the fast targets which war-vessels present, an accurate range-finder is of first importance. This is largely the case because " ranging " cannot be resorted to in the same manner as in the field, where the targets are comparatively motionless and the effective ranges are less. Successful artillery practice therefore depends, in a great measure, upon the range-finder.

The instrument used in harbour forts is known as the depression range-finder. As its name suggests, it solves a triangle in the vertical plane, of which the base is the height of the instrument above sea-level. Its appearance resembles some forms of theodolite (fig. 6). A framework, capable of rotating in azimuth on a vertical

Fig. 6. — Depression Range-Finder.

pivot, is supported on a plate carried by levelling screws, L, L, L. To the framework are pivoted two arms DC and FE, at C and E respectively. The arm EF is supported at F by a vertical screw H ending in a drum, upon which, in a spiral scale, the ranges are graduated. Motion in altitude is thus given to the telescope. The arm CD is supported by a slider G. This slider is set by a rack and pinion to the height above sea-level (represented on a scale of feet on EF) at which the instrument may be used. A telescope AB is suitably fitted in jaws at the top of the frame. There are spirit- levels at M and Q for adjusting purposes. The telescope is provided with cross wires which can be illuminated for night use. An azimuth circle X and pointer Y enable the direction of any vessel to be indicated, the range of which it is desired to know. The instrument rests on a base plate R, to which it is locked by the top-plate O. The observer directs the cross wires of the telescope upon the water-line of the objective, by means of the drum I and the azimuth handle P, the top of which just appears in the diagram. The reader watches the arrow on the drum and calls out the ranges as the figures arrive beneath it. The ranges are communicated to the officers at the guns by various devices, which differ according to local requirements.

Position-Finder. — The range-finding instrument known in the British service as the Position-Finder (invented by Colonel Watkin, C.B., R.A.) is practically a large depression range- finder. It posesses, however, certain additional appliances which render it capable of automatically recording, upon an oriented chart, the position or course of a vessel. And further, by electrical means it automatically records to a distant battery the range and bearing of the desired objective. The position-finder can therefore, from a concealed and safe position, Coast automatically control the fire of a group

of guns, Defence whose detachments need not necessarily see the meote" tar g et engaged. As the observer follows the objec- tive with the telescope of the instrument the range and bearing is simultaneously shown in the battery on convenient

dials. The distance and direction thus communicated are the range and bearing from the guns, not as measured from the range-finder. The correction due to the displacement between gun and instrument is automatic. In localities where the height does not admit of using the depression system, an alternative arrangement is provided, known as the Horizontal Position-Finder. It is open to the objections common to two-man range-finders, and is only employed where necessity compels its use. Briefly, there are two observing stations at either end of a measured and electrically connected base. One is known as the transmitting and the other the receiving station; the latter contains the principal instrument, which usually is capable of independent use for medium and short ranges as a depression instrument.

It will be seen that the difference between the two systems is, that the first described solves the range triangle in the vertical, and the latter in the horizontal plane. There have been various methods proposed for using the position-finder. The best results are obtained by placing range and bearing dials on the gun-mounting in a position where they can be easily seen by the men elevating and training the gun. The gun is kept directed upon the objective and fired as quickly as it can be loaded. A position-finder can be used for firing mines in a mine field, and instruments are issued to the Royal Navy for this purpose.

In the United States of America the term " position- finder " is applied to a range-finder which gives direction as well as distance. This is substantially correct, but cus- tom, in the British service, confines the use of the expression as defined above.

4. Various appliances, not strictly range-finders, are sometimes used to assist in estimating distance. The following examples are not without interest: —

Acoustic telemeters, depending upon the velocity of sound, are obviously unsuited to the requirements of modern warfare. The names of Thouvenin, Redier and Le Boulenge are connected with such instruments — that of the last-named is perhaps the most convenient. It con- sists of a graduated glass tube filled with liquid, of suitable density, and containing a small metal traveller. At the flash of discharge of a gun or rifle the instrument is brought to a vertical position, and the traveller starts from zero; at the detonation, it is turned to a horizontal position and the traveller stops at

the point on the scale indicating the range.

On this principle is the rough method of ascertaining the distance, in yards, of a thunderstorm, viz. multiply the number of seconds elapsing between the perception of the lightning and that of the thunder by the number of days in the year.

Optical or perspective telemeters determine the distance to any point by observing the size of some object of known dimensions, as seen in a graduated telescope. Porro's telemeter, Elliott's other telescope and Nordenfelt's macrometer illustrate the prin- Tele . ciple. The chief defect of the system is that the objects meters. most conveniently observed — men and horses — vary con- siderably in size, so that the assumption of a constant dimension may be productive of error.

On the continent of Europe the perspective telemeter for military purposes has attracted more attention than in England. The French in their precise terminology call such an instrument " Stadia militaire," a term which at once distinguishes it from a " telemetre," and describes its nature. In rapid military sketching, in locating positions upon maps, &c, perspective telemeters find a use. The telescopes issued .to field batteries and to coast forts in France are provided with a scale in the field of view. By comparing this scale with known heights, such as the average height of a man on foot, or the known height of funnels, masts, turrets, &c, of a war-vessel, distance can be estimated with fair accuracy.

The" jumelle Souchier," which can be used as an ordinary field- glass, is constructed on the stadia principle. By its means ranges can be estimated within an accuracy of 10%. A stand or rest, however, is necessary for good results.

General Percin of the French army has shown, in an interesting pamphlet, that a piece of wood or card cut to a known fraction of the distance between the eye and the end of the thumb, when the arm is fully extended, can be used to estimate distances. Thus it is easy to find a penny in good condition of which the thickness is rJirth part of the arm-length in a man of average height. Provided with such a coin an observer finds its rim to exactly cover a distant man 6 ft. (or 2 yds. high). The range therefore is 400X2 =800 yds. Similarly, if the man's height appeared to be but half the thickness of the. coin the range would be 4X400 = 1600 yds. With a little practice the eye estimates the proportion between the object of

known height and the stadia used. General Percin gives many useful applications of this simple device.

Various range-finders have been produced in countries outside the British Isles which, as they are the outcome of similar necessity and required for identical purposes, naturally resemble, more or less, the instruments already described.

Field artillery officers of all countries usually claim their gun to be their best range-finder. This may be another way of saying that a durable, one-man range-finder, capable of instantaneously finding modern artillery ranges with accuracy, has yet to be invented. In France the " tel6metre Goutier " for field artillery, a two-man instrument, corresponds with the Watkin mekometer.

The " Gautier," used by the Italian field artillery, is a one-man instrument, but requires a measured base-line. The " Aubry " telemeter, used by some of the Russian batteries in Manchuria, is very portable, but requires a measured base-line, and a slide rule to find the range. In the French and Russian infantry the " prisme- telemetre," the invention of Colonel Souchier, is used. It is small, very light, and can be carried in the same manner as field-glasses. French machine guns are ranged by the " tefemetre instantaneV' an instrument of the Barr and Stroud type, with an aluminium base I metre in length.

For work in the field the modern tendency abroad is to follow Barr and Stroud. In Germany, Hahn, Goerz and Zeiss have produced handy and fairly light short base range-finders, in outward appear- ance more or less similar to Marindin's instrument.

The Zeiss range-finder, however, depends on the stereoscopic principle. It is open to the objection that best results can only be obtained with it by persons who are capable of seeing stereoscopically, and also, in individuals possessing this particular gift (a com- paratively small proportion of the human race), stereoscopic vision may vary in power from day to day. Nevertheless the Zeiss range- finder has found favour in many countries, notably as the infantry range-finder in Italy. For naval and harbour defence purposes the Barr and Stroud range-finder is very largely used throughout the world. In Italy a Barr and Stroud instrument, with the large base of 5 metres, was in 1908 under trial for coast artillery.

Of the depression range-finder type in France, " le tefemetre Deve " is used at all heights of about 70 ft. and upwards.

Brazil possesses, in the invention of Captain Mario Netto, an excellent

range-finder. It is supplied to the harbour defences of that country. It is accurate, handy, easily transported and re- erected where required, and is not affected by the concussion of heavy gun-fire. The German coast range-finder of Hahn closely resembles the earlier Watkin instruments. In Italy the Amici instrument is being replaced by the Braccialine. The latter inventor has also supplied his country with a horizontal base instrument.

After extended competitive trials in the U.S.A. the Lewis de- pression range-finder has been found superior to others presented to the Range-Finding Committee, and is recommended for adoption. It is a neat, workmanlike instrument, and gave an average mean error of 24 yds. in the ranges recorded during the trials. The maximum range was 12,000 yds. and the height of base 135J ft.

The details of position-finders abroad, as in the British service, are confidential, and but little is published of the " tefemetre par recoupement " of the French coast batteries, or the " telegonio- metro Sollier " of Italy. In the United States, B. A. Fiske has ingeniously adapted the principle of the Wheatstone bridge in the construction of the position-finder which bears his name.

See de Marre, Instru merits pour la mesure de distances (Paris, 1880); Abridgments of Specifications, Class 97, Patent Office, London; Handbooks and Instructions for Range-Finder, published by the British War Office; Barr and Stroud, Proc. Inst. Mech. Eng., 30th Jan. 1896; Zeiss pamphlet by Carl Zeiss of Jena, which gives a candid statement of the difficulty attending the stereoscopic principle, &c. (F. M. L.)*

RANGER, HENRY WARD (1858-), American artist, was born at Syracuse, New York, in January 1858. He became a prominent landscape and marine painter, much of his work being done in Holland, and showing the influence of the modern Dutch school. He became a National Academician (1906), and a member of the American Water Color Society. Among his paintings are, " Top of the Hill," Corcoran Gallery of Art, Washington, D.C.; and " East River Idyll," Carnegie Institute, Pittsburg.

RANGOON, the capital of Burma, situated on the left bank of the Hlaing or Rangoon river, 21m. from the sea, in 16 47′ N. and 96 13′ E. In 1880 the city was detached from the main district, called Hanthawaddy, and formed into a separate district, with an area of 19 sq. m. Pop. (1901) 234,881, of whom just half were immigrants from India. Rangoon, from being a comparatively insignificant place, has within less than half a century risen to be the third seaport in British India, being surpassed only by Calcutta and Bombay in the

volume of its trade. During the busy season of rice-export, which lasts from the end of December to the middle of May, the pool forming the port of Rangoon presents almost as crowded a scene as the Hugli at Calcutta. Rangoon has the double advantage of being situated near the sea and being served by a great river navigable for 900 m. behind it. The approach to the port is not difficult at any season of the year. With flat and shelving shores, the shoal-banks off the main mouths of the delta form the chief danger to shipping, and this is guarded against by a good service of lighthouses and lightships. For a length of seven or eight miles the river is from a mile to a mile and a quarter in breadth, so that there is plenty of accommo- dation for shipping. Here is concentrated the whole of the rich trade of the delta of the Irrawaddy. Great part of the river front- age is occupied with rice-mills, teak wharves and similar build- ings. The rice exported from Rangoon in 1904-5 amounted to 28 million cwt. with a value of nearly 7 million sterling.

The city is dominated by the great golden pile of the Shwe Dagon pagoda, the centre of Burmese religious life. Rising to a height of 368 ft., this magnificent building is loftier than St Paul's Cathedral in London, and its size is greatly enhanced by the fact that it stands on an eminence that is itself 168 ft. above the level of the city. It is covered with pure gold from base to summit, and once in every generation this gold is renewed by public subscription. Moreover, benefactions to this pagoda are one of the favourite methods of acquiring religious merit among the Burmese. The pagoda itself has no interior. It is a solid stupa of brick, in the form of a cone, raised over a relic chamber; and the place of worship is the surrounding platform with a perimeter of nearly 1400 ft.

Though traditionally a site of great sanctity, Rangoon owes its first importance to its rebuilding in 1753 by Alompra, the founder of the Burmese monarchy, who gave it the present name of Yan Kon, " the end of the war." An English factory was opened here about 1790. On the outbreak of the first Burmese War, in 1824, it was taken by the British, but subsequently restored. It was captured a second time in 1852, and passed along with the province of Pegu into the hands of the British. It was destroyed by fire in 1850, and serious conflagrations occurred again in 1853 and 1855. Since the last devastation Rangoon has undergone considerable improvements. Until 1874, when the existing municipality was constituted, the administration was in the hands of the local government, which devoted itself to raising the centre of the town above the river level, providing land fit for building purposes from the original swamp, which was flooded at spring-tides, and making roads, bridges, culverts and surface drains. In 1892 was intro- duced the sewage system, which now includes 6 m. of mains, 22 m. of gravitating sewers, 4! m. of air mains and 44 Shone's ejectors. The water supply, drawn from the Victoria Lake, 5 m.

distant, has recently been supplemented by an additional reservoir, 10 m. farther off. The city proper of Rangoon with the Kemmendine suburb is laid out on the block system, each block being 800 by 860 ft., intersected with regular streets. In the extensions to the east and west it has been decided to have no streets less than 50 ft. wide. The roads are still lighted by kerosene oil lamps, but electric lighting is in comtemplation. Electric tramways run to Pazundaung in one direction and to Alon and Kemmendine in the other, as well as to the foot of the Shwe Dag6n Pagoda hill. Latterly the erection of masonry buildings, instead of plank houses, has been insisted on in the central portion of the city, with the result that fires have decreased in number. There are two large maidans, or commons, which are used as military parade grounds and for racing, as well as for golf links and other purposes of amusement. There is a garden round the Phayre Museum, managed by the Agri-Horticultural Society, and an extremely pretty and well- kept garden in the cantonments under the pagoda. Beyond these lie the Royal Lake and Dalhousie Park, with 160 acres of water and 205 acres of well-laid-out and well- timbered park land. Dalhousie Park has recently been greatly extended, and the new Victoria Park, declared open on the

occasion of the visit of the prince of Wales in 1906, is quite the finest in the East. There are two cathedrals, Church of England and Roman Catholic, and a Presbyterian church, besides the cantonment church buildings for worship. Religious buildings and lands, indeed, occupy an area in Rangoon out of all propor- tion to its size. Buddhists, Hindus, Mussulmans, Parsees, Armenians and Jews all own lands and pagodas, temples, mosques, churches and synagogues. The Buddhist monasteries, in particular, occupy wide spaces in very central portions of the town and cantonments. Burial-grounds are equally extensive, and exist in every direction in what were once the outskirts, but are now fast becoming central parts of the city. The chief educational institutions are the Government Rangoon college, the Baptist college and St John's college (S.P.G.). Besides the general hospital, a female hospital in connexion with theDufferin Fund has recently been built, and there are hospitals for con- tagious diseases and for lepers in the suburbs. The staple industries are mills for husking rice and for sawing timber, and petroleum refineries. Carving in wood and ivory, and embossed silverwork are also carried on. There are three municipal and eight private markets, which are being improved and extended. Everything, from sacking to jewelry, is sold in them. The introduction of pure water and the establishment of compulsory vaccination have greatly improved the health of Rangoon. But the death-

rate is still high, due partly to the swampy nature of the outskirts of the city proper, and still more to the mortality among Hindu immigrants from the Madras presidency. The total rainfall in 1905 was 104-96 in. Rangoon is the head- quarters of a brigade in the Burma command of the Southern army. (J. G. Sc.)

RANGPUR, or Rungpore, a town and district of British India, in the Rajshahi division of Eastern Bengal and Assam. The town is situated on the little river Ghaghat. Pop. (1901) 15,960. There are a high school, a normal school and an industrial school. The earthquake of the 12th of June 1897 destroyed many of the public buildings and diverted the drainage channels.

The District of Rangpur, with an area of 3493 sq. m., is one vast plain. The greater part of it, particularly towards the east, is inundated during the rains, and the remainder is traversed by a network of streams which frequently break through their sandy banks and plough for themselves new channels over the fields. The river system is constituted by the Brahmaputra and its tributaries, chief of which are the Tista, Dharla, Sankos and Dudhkumar. The climate is generally malarious, owing to the numerous stagnant swamps and marshes filled with decaying vegetable matter. The annual rainfall averages 82 in. About three-fourths of the district is under continuous cultivation. Spare land can hardly be said to exist — even the patches of waste land yield a valuable tribute of reeds and cane. The staple crops are rice, oil-seeds, jute and tobacco. In 1901 the population was 2,154,181, showing an increase of 4.3 % in the decade. Nearly two-thirds are Mahommedans. The Eastern Bengal railway has two branches, one of which crosses the district to the Brahmaputra, and the other runs north towards Assam.

The tract comprised within the district of Rangpur was for- merly the western outpost of the ancient Hindu kingdom of Kamrup, which appears to have attained its greatest power and prosperity under Raja Nilambar, who was treacherously over- thrown by Ala-uddin Hosain of Bengal at the close of the 15th century. Rangpur passed to the East India Company in 1765 under the firman of the emperor Shah Alam. Since then a great number of changes have taken place in the jurisdiction, in con- sequence of which the district area has been much diminished.

RANJIT SINGH, Maharaja (1780-1839), native Indian ruler, was born on the 2nd of November 1780, the son of Sirdar Mahan Singh, whom he succeeded in 1792 as head of the Sukar- chakia branch of the Sikh confederacy. By birth he was only one of many Sikh barons and owed his rapid rise entirely to force of character and will. At the age of seventeen he seized the reins of government. He is said to have poisoned his

mother, though it is more probable that he merely imprisoned her to keep her out of his way. At the age of twenty he obtained from Zaman Shah, the king of Afghanistan, a grant of Lahore, which he seized by force of arms in 1799. Subsequently he attacked and annexed Amritsar in 1802, thus becoming master of the two Sikh capitals. When Jaswant Rao Holkar took refuge in the Punjab in 1805, Ranjit Singh made a treaty with the British, excluding Holkar from his territory. Shortly afterwards acute difficulties arose between him and the British as to the Cis-Sutlej portion of the Punjab. It was Ranjit Singh's ambition to weld the whole of the Punjab into a single Sikh empire, while the British claimed the territory south of the Sutlej by right of conquest from the Mahrattas. The difference proceeded almost to the point of war; but at the last moment Ranjit Singh gave way, and for the future faith- fully observed his engagements with the British, whose rising power he was wise enough to gauge. In 1808 Charles Metcalfe was sent to settle this question' with Ranjit Singh, and a treaty was concluded at Amritsar on the 15th of April 1809. At this period a band of Sikh fanatics called " akalis," attacked Sir Charles Metcalfe's escort, and the steadiness with which the disciplined sepoys repulsed them, so impressed the maharaja that he decided to change the strength of his army from cavalry to infantry. He organized a powerful force, which was trained by French and Italian officers such as Generals Ventura, Allard and Avitabile, and thus forged the formidable fighting instru- ment of the Khalsa army, which afterwards gave the British their hardest battles in India in the two Sikh wars. In 1810 he captured Multan after many assaults and a long siege, and in 1820 had consolidated the whole of the Punjab between the Sutlej and the Indus under his dominion. In 1823 the city and province of Peshawar became tributary to him. In 1833 when Shah Shuja, flying from Afghanistan, sought refuge at his court, he took from him the Koh-i-nor diamond, which subse- quently came into the possession of the British crown. Though he disapproved of Lord Auckland's policy of substituting Shah Shuja for Dost Mahomed, he loyally supported the British in their advance on Afghanistan. Known as " The Lion of the Punjab," Ranjit Singh died of paralysis on the 27th of June

1839- _

In his private life Ranjit Singh was selfish, avaricious, drunken and immoral, but he had a genius for command and was the only man the Sikhs ever produced strong enough to bind them together. His military genius showed itself not so much in actual generalship as in the organization of his plans, the selection of his generals and his ministers, the tenacity of his purpose and the soundness of his judgment. The British were the one power in India that was too strong for him, and as soon as he realized that fact he was unwaveringly loyal to his engagements with them. His power was military aristo- cracy resting on the personal qualities of its

founder, and after his death the Sikh confederacy gradually crumbled and fell to pieces through sheer want of leadership; and the rule of the Sikhs in the Punjab passed away completely as soon as it incurred the hostility of the British.

See Sir Lepel Griffin, Ranjit Singh (Rulers of India Series), 1892; General Sir John Gordon, The Sikhs, 1904; and S. S. Thorburn, The Punjab in Peace and War, 1904.

RANK (O.Fr. ranc or rem, mod. rang, generally connected with the O.E. and O.H.G. hring, a ring), a row or line, as of cabs or carriages, but especially of soldiers drawn up abreast in a line; in " rank and file " the " rank " is the horizontal line of soldiers, the " file " the vertical. From the sense of orderly arrangement " rank " is applied to grades or classes in a social or other organization, and particularly to a high grade, as in such expressions as a " person of rank." This word must be distinguished from the adjective " rank," over- luxuriant, coarse, strong, generally connected with the Low Ger. rank, thin, tall (cf. Du. rank, upright). The O.E. rinc, warrior, i.e. full-grown man, may be also connected with the word; Skeat refers also to " rack," to pull out straight.

RANKE, LEOPOLD VON (1795-1886), German historian, was born on the 20th or the 21st of December 1795, in the small town of Wiehe, in Thuringia, which then formed part of the electorate of Saxony. His father, Gottlob Israel Ranke, was an advocate, but his ancestors, so far back as the family can be traced, had been ministers of religion. Leopold received his education first at Donndorf, a school established in an old monastery near his home, and then at the famous school of Schulpforta, whence he passed to the university of Halle and later to that of Berlin. His studies, both at school and university, were classical and theological. The great political events which occurred during his boyhood and youth seem to have had less effect on him than on many of his contemporaries, and he was not carried away either by enthusiastic admiration for Napoleon or by the patriotic fervour of 181 3. Nor was he implicated in the political movements which during the following years attracted so many students; on the contrary, he already displayed that detachment of mind which was to be so characteristic of him. In 1818 he became a master in a school at Frankfort-on-the-Oder, thereby entering the service of the Prussian government. The headmaster of this school was Ernst Friedrich Poppo (1794-1866), a celebrated Grecian, and Ranke was entrusted with the teaching of history.

With the scholar's dislike of textbooks, he rapidly acquired a thorough knowledge of the ancient historians, quickly passed on to medieval times, and here it was that he formed as the ideal of his life the study of universal history, the works of God as displayed in the history of the human race. Here, too, he composed his first work, which deals with the period to which most of his life was to be devoted, Geschichte der romanischen und germanischen Volker 1494-1514 (Berlin, 1824). To this was appended a critical dissertation on the historians who had dealt with the period (Zur Kritik neuerer Geschichtschreiber) , which, showing as it did how untrustworthy was 'much of traditional history, was to be for modern history as epoch-marking as the critical work of Niebuhr had been in ancient history. A copy of the book was sent to the Prussian minister of education, Karl Albert Kamptz (1769-1849), the notorious hunter of democrats. Within a week Ranke received the promise of a post at Berlin, and in less than three months was appointed supernumerary professor in the university of that city, a striking instance of the promptitude with which the Prussian government recognized scientific merit when, as in Ranke's case, it was free from dangerous political opinions. The connexion thus established in 1825 was to last for fifty years. At the Berlin Library Ranke found a collection of MS. records, chiefly Italian, dealing with the period of the Reformation; from a study of them he found how different were the real events as disclosed in contemporary documents from the history as recorded by most writers; and the result of his researches was embodied in his second work, Filrsten und Volker von Siideuropa im 16 und 17 Jahrhundert (1827). In later editions the title of this book was altered to Die Osmanen und die spanische Monarchic It was now his ambition to continue his exploration of the new world thus opened to him. The Prussian government provided the means, and in September 1827 he started for Italy. His first sojourn was in Vienna, where the friendship of Gentz and the protection of Metternich opened to him the Venetian archives, of which many were preserved in that city — a virgin field, the value of which he first discovered, and which is still unexhausted. He found time, in addition, to write a short book on Die Serbische Revolution (1829), from material supplied to him by Wuk Stephanowich, a Servian who had himself been witness of the scenes he related. This was afterwards expanded into Serbien und die Tiirkei im ig Jahrhundert (1879). In 1828 he at last crossed the Alps, and the next three years were spent in Italy. The recommendations of Metternich opened to him almost every library except the Vatican; and it was during these three years of study in Venice, Ferrara, Rome, Florence and other cities, that he obtained that acquaintance with European history which was to make him the first historian of his time.

At Rome, as he said, he learned to see events from the inside. He wrote nothing but a critical examination of the story of Don Carlos, but he

returned to Germany a master of his craft. For a time Ranke was now engaged in an occupation of a different nature, for he was appointed editor of a periodical in which Friedrich Perthes designed to defend the Prussian government against the democratic press. Ranke, contemptu- ous in politics, as in history, of the men who warped facts to support some abstract theory, especially disliked the doctrinaire liberalism so fashionable at the time. He hoped, by presenting facts as they were, to win the adhesion of all parties. We need not be surprised that he failed; men desired not the scientific treatment of politics, but satire and invective. Exposed thus to attack, his weakness, if not his venality, was long an article of faith among the liberals. He did not satisfy the Prussian conservatives, and after four years the Historische Politische Blatter came to an end. Two- thirds of the matter had been contributed by the editor, and the two stout volumes in which the numbers were collected contained the best political thought which had for long appeared in Germany. For Ranke the failure was not to be regretted; the rest of his life was to be wholly devoted to that in which he excelled. During 1834-36 appeared the three volumes of his Die romischen Piipste, ihre Kirche und ihr Staat im 16 und 17 Jahrhundert (Berlin, 1834-36, and many other editions), in form, as in matter, the greatest of his works, containing the results of his studies in Italy. Hence- forth his name was known in all European countries; the English translation by Mrs Austin was the occasion of one of Macaulay's most brilliant essays. Before it was completed he had already begun the researches on which was based the second of his masterpieces, his Deutsche Geschichte im Zeitalter der Reformation (Berlin, 1839-47), a necessary pendant to his book on the popes, and the most popular of his works in his own country. In 1837 he became full professor at Berlin; in 1841 Frederick William IV., always ready to recognize intellectual eminence, appointed him Prussian historiographer. Stimulated by this, he brought out his Neun Biicher preussischer Geschichte (1847-48), a work which, chiefly owing to the nature of the subject, makes severe demands on the attention of the reader — he is the " Dryasdust " of Carlyle's Frederick; but in it he laid the foundation for the modern appreciation of the founders of the Prussian state. The nine books were subsequently expanded to twelve (Leipzig, 1874). He took no immediate part in the movements of 1848, but in the following years he drew up several memoranda for the king, whom he encouraged in his efforts to defend the character and identity of the Prussian state against the revolutionaries. Though never admitted into the inner circle of the king's associates, he found the king the most appreciative of readers and stimulating of companions, and the queen one of the most faithful of his friends; in biographical works and on other occasions he always defended the memory of the un- fortunate monarch. A friend even more sympathetic he found in Maximilian II. of Bavaria, whom he advised in his expansive schemes for the promotion of learning and letters. In the

quieter years that followed he wrote the third of his masterpieces, Franzosische Geschichte, vomehmlich im 16 und 17 Jahrhundert (Stuttgart, 1852-61), which was followed by his Englische Geschichte, vomehmlich im 16 und 17 Jahr- hundert (1859-68). This, the longest of his works, added much to existing knowledge, especially as to the relations between England and the continent, but it lacked something of the freshness of his earlier books; he was over seventy when it was completed, and he was never quite at home in dealing with the parliamentary foundations of English public life. In his later years his small alert figure was one of the most distinguished in the society of Berlin, and every honour open to a man of letters was conferred upon him. He was ennobled in 1865, and in 1885 received the title of Excellenz. When the weakness of his eyes made it necessary for him to depend almost entirely on the service of readers and secretaries,

in his eighty-first year he began to write the W eltgeschichte (9 vols., Leipzig, 1883-88). Drawing on the knowledge ac- cumulated during sixty years, he had brought it down to the end of the 15th century before his death in Berlin on the 23rd of May 1886.

Ranke's other writings include Zur deutschen Geschichte. Vom Religionsfrieden bis zum 30 jdhrigen Kriege (Leipzig, 1868) ; Geschichte W allensteins (Leipzig, 1869; 5th ed., 1896); Abhand- lungen und Versuche (Leipzig, 1877; a new collection of these writings was edited by A. Dove and T. Wiedemann, Leipzig, 1888); A us dem Briefwechsel Friedrich Wilhelms IV. mit Bunsen (Leipzig, 1873); Die deutschen Mdchte und der Fiirsten- bund. Deutsche Geschichte 1780-go (1871-72); Historisch- biographische Studien (Leipzig, 1878); Ursprung und Beginn der Revolutionskriege 1791-Q2 (Leipzig, 1875); and Zur Geschichte von Oesterreich und Preussen zwischen den Friedensschlussen zu Aachen und Hubertusberg (Leipzig, 1875). He also wrote biographies of Frederick the Great and Frederick William IV. for the Allgemeine Deutsche Biographic

Ranke married, at Windermere, in 1843, Miss Clara Graves, daughter of an Irish barrister. She died in 1870, leaving two sons and one daughter.

At the time of his death Ranke was, not in his own country alone, generally regarded as the first of modern historians. It is no disparagement to point out that the recognition he obtained was due not only to his published work, but also to his success as a teacher. His public lectures, indeed, were never largely attended, but in his more private classes, where he dealt with

the technical work of a historian, he trained generations of scholars. No one since Heyne has had so great an influence on German academical life, and for a whole genera- tion the Berlin school had no rival. He took paternal pride in the achievements of his pupils, and delighted to see, through them, his influence spreading in every university. While his own work lay chiefly in more modern times, he trained in his classes a school of writers on German medieval history. As must always happen, it is only a part of his characteristics which they learnt from him, for his greatest qualities were incommunicable. The critical method which has since become almost a formal system, aiming at scientific certainty, was with him an unexampled power, based on the insight acquired from wide knowledge, which enabled him to judge the credi- bility of an author or the genuineness of an authority; but he has made it impossible for any one to attempt to write modern history except on the " narratives of eye-witnesses and the most genuine immediate documents " preserved in the archives. From the beginning he was determined never to allow himself to be misled, in his search for truth, by those theories and prejudices by which nearly every other historian was influenced — Hegelianism, Liberalism, Romanticism, re- ligious and patriotic prejudice; but his superiority to the ordinary passions of the historian could only be attained by those who shared his elevation of character. " My object is simply to find out how the things actually occurred." " I am first a historian, then a Christian," he himself said. In another way no historian is less objective, for in his greatest works the whole narrative is coloured by the quality of his mind expressed in his style. An enemy to all controversy and all violence, whether in act or thought, he had a serenity of character comparable only to that of Sophocles or Goethe. Apt to minimize difficulties, to search for the common ground of unity in opponents, he turned aside, with a disdain which superficial critics often mistook for indifference, from the base, the violent and the common. As in a Greek tragedy, we hear in his works the echo of great events and terrible catastrophes; we do not see them. He also made it a principle not to relate that which was already well known, a maxim which necessarily prevented his works attaining a popularity with the unlearned equal to their reputation among historians. But no writer has surpassed him in the clearness and brevity with which he could sum up the characteristics of an epoch in the history of the World, or present and define the great forces by which the world

has been influenced. His classicism led to his great limitations as an historian. He did not deal with the history of the people, with economic or social problems — the dignity of history was to him a reality. He belonged to the school of Thucydides and Gibbon, not to that of Macaulay and Taine; he deals by pre- ference with the rulers and leaders of the world, and he strictly limits his field to the history of the state, or, as we should

say, political history; and in this he is followed by Seeley, one of the greatest of his adherents. The leader of modern historians, he was in truth a man of the ancien regime.

Many of Ranke's works have been translated into English. Among these are Civil Wars and Monarchy in France, by M. A. Garvey (1852); History of England, principally in the 17th Century (Oxford, 1875); History of the Latin and Teutonic Nations, 1494-1514, by P. A. Ashworth (1887) and again by S. R. Dennis (1909); History of the Reformation in Germany, byS. Austin (1 845-47) \ History of Servia and the Servian Revolution, by Mrs A. Kerr (1847); Fer- dinand I. and Maximilian II. of Austria; State of Germany after the Reformation, by Lady Duff Gordon (1853) ; Memoirs of the House of Brandenburg and History of Prussia during the 17th and 18th Centuries, by Sir Alexander and Lady Duff Gordon (1849); and History of the Popes during the 16th and 17th Centuries, by S. Austin (1840; new eds.,l84l and 1847), by W. K. Kelly (1843), and by E. Foster (1847-53). A collected edition of Ranke's works in fifty-four volumes was issued at Leipzig (1868-90), but this does not contain the W eltgeschichte.

For details of Ranke's life and work see his own Zur eigenen Lebensgeschichte, edited by A. Dove (Leipzig, 1890); and the article by Dove in the Allgemeine deutsche Biographic. Also Winckler, Leopold von Ranke. Lichtstrahlen aus seinen Werken (Berlin, 1885); W. von Giesebrecht, Geddchtnisrede auf Leopold von Ranke (Munich, 1887) ; Guglia, Leopold von Rankes Leben und Werke (Leipzig, 1893) ; M. Ritter, Leopold von Ranke (Stuttgart, 1895); Nalbandian, Leopold von Rankes Bildungsjahre und Geschichtsauffassung (Leipzig, 1901); and Helmolt, Leopold Ranke (Leipzig, 1907).

RANKINE, WILLIAM JOHN MACQUORN (1820-1872), Scottish engineer and physicist, was born at Edinburgh on the 5th of July 1820, and completed his education in its university. He was trained as an engineer under Sir J. B. Macneill, working chiefly on surveys, harbours and railroads, and was appointed in 1855 to the chair of civil engineering in Glasgow, vacant by the resignation of Lewis Gordon, whose work he had undertaken during the previous session. He was a voluminous writer on subjects directly connected with his chair, and, besides con- tributing almost weekly to the. technical journals, such as the Engineer, brought out a series of standard textbooks on Civil Engineering, The Steam-Engine and other Prime Movers, Machinery and Millwork, and Applied Mechanics, which have passed through many editions, and have contributed greatly to the advancement of the subjects with which they deal. To these must be added his elaborate treatise on Shipbuilding, Theoretical and Practical. These writings, however, corre- sponded to but one phase of Rankine's immense energy and many-sided character. He was an enthusiastic and

most useful leader of the volunteer movement from its beginning, and a writer, composer and singer of humorous and patriotic songs, some of which, as " The Three Foot Rule " and " They never shall have Gibraltar," became well known far beyond the circle of his acquaintance. Rankine was the earliest of the three founders of the modern science of Thermodynamics (q.v.) on the bases laid by Sadi Carnot and J. P. Joule respect- ively, and the author of the first formal treatise on the subject. His contributions to the theories of Elasticity and of Waves rank high among modern developments of mathematical physics, although they are mere units among the 150 scientific papers attached to his name in the Royal Society's Catalogue. The more important of these were collected and reprinted in a handsome volume (Rankine's Scientific Papers, London, 1881), which contains a memoir of the author by Prof. P. G. Tait. Rankine died at Glasgow on the 24th of December 1872.

RANNOCH, a district of north-west Perthshire, Scotland, partly extending into Argyllshire. It measures 32 m. E. and W. and from 10 to 12 m. N. and S. and is surrounded by the districts of Badenoch, Atholl, Breadalbane, Lome and Loch- aber. Much of it is wild, bleak and boggy, and, saving on the E., it is shut in by rugged mountains. The chief rivers are

(he Tummel and the Ericht, and the principal lakes Loch Rannoch and Loch Lydoch, or Laidon (about 6 m. long, J m. wide and 924 ft. above the sea). Loch Rannoch lies E. and W., measures of m. long by fully 1 m. broad, is 668 ft. above the sea, covers an area of nearly 7J sq. m., and has a greatest depth of 440 ft. It receives the Ericht and many other streams, and discharges by the Tummel, draining a total area of 243 § sq. m. At the head of the lake is Rannoch Barracks, so named because it was originally built to accommodate a detach- ment of troops, under ensign (afterwards Sir) Hector Munro, stationed here to maintain order after the Jacobite rising of 1745. Two miles east is Carie, which was the residence of Alexander Robertson, 13th baron of Struan (1670-1749), the Jacobite and poet, who was "out" with Dundee (1689), Mar (17 15) and Prince Charles Edward (1745), and yet managed to escape all punishment beyond self-imposed exile to France after the first two rebellions. Kinloch Rannoch, at the foot of the loch, is the principal place in the district, and is in communication by coach with Struan station (13 m. distant) on the Highland, and Rannoch station (6 m.) on the West Highland railway. Dugald Buchanan (1716-1768), the Gaelic poet, was school- master of the village for thirteen years, and a granite obelisk has been erected to his memory.

RANSOM (from Lat. redemptio, through Fr. rancon), the price for which a captive in war redeemed his life or his freedom, a town secured immunity from sack, and a ship was repurchased from her captors. The practice of taking ransom arose in the middle ages, and had perhaps a connexion with the common Teutonic custom of commuting for crimes by money payments. It may, however, have no such historic descent. The desire to make profit out of the risks of battle, even when they were notably diminished by the use of armour, would account for it sufficiently. The right to ransom was recognized by law. One of the obligations of a feudal tenant was to contribute towards paying the ransom of his lord. England was taxed for the ransom of Richard the Lion Hearted, France for King John taken at Poitiers, and Scotland for King David when he was captured at Durham. The prospect of gaining the ransom of a prisoner must have tended to diminish the ferocity of medieval war, even when it did not reduce the fighting between the knights to a form of athletic sport in which the loser paid a forfeit. Readers of Froissart will find frequent mention of this decidedly commercial aspect of the chivalrous wars of the time. He often records how victors and vanquished arranged their " financing." The mercenary views of the military adventurers were not disguised. Froissart repeats the story that the English " free companions " or mercenaries, who sold their services to the king of Portugal, grumbled at the battle of Aljubarrota in 1385, because he ordered their prisoners to be killed, and would not pursue the defeated French and Spaniards, whereby they lost lucrative captures. The ransom of a king belonged to the king of the enemy by whom he was taken. The actual captor was rewarded at the pleasure of his lord. King Edward III. paid over instalments of the ransom of the king of France to the Black Prince, to pay the expenses of his expedition into Spain in 1367. Occasionally, as in the notable case of Bertrand du Guesclin, the ransom of a valuable knight or leader would be paid by his own sovereign. To trade in ransoms became a form of financial speculation. Sir John Fastolf in the time of King Henry V. is said to have made a large fortune by buying prisoners, and then screwing heavy ransoms out of them by ill-usage. The humane influence of ransom was of course con- fined to the knights who could pay. The common men, who were too poor, were massacred. Thus Lord Grey, Queen Eliza- beth's lord deputy in Ireland, spared the officers of the Spaniards and Italians he took at Smerwick, but slaughtered the common men. Among the professional soldiers of Italy in the 15th century the hope of gaining ransom tended to reduce war to a farce. They would not lose their profits by killing their opponents. The disuse of the practice was no doubt largely due to the discovery that men who were serving for this form of gain could not be trusted to fight seriously.

Instances in which towns paid to avoid being plundered are innumerable.

So late as the war in the Peninsula, 1808-14, it was the belief of the English soldiers that a town taken by storm was liable to sack for three days, and they acted on their con- viction at Ciudad Rodrigo, Badajoz, and San Sebastian. It was a question whether ransoms paid by merchant ships to escape were or were not among the commercia belli. In the early 18th century the custom was that the captain of a captured vessel gave a bond or " ransom bill," leaving one of his crew as a hostage or " ransomer " in the hands of the captor. Frequent mention is made of the taking of French privateers which had in them ten or a dozen ransomers. The owner could be sued on his bond. At the beginning of the Seven Years' War ransoming was forbidden by act of parliament. But it was afterwards at least partially recognized by Great Britain, and was generally allowed by other nations. In recent times — for instance in the Russo-Japanese War — no mention was made of ransom, and with the disappearance of privateering, which was conducted wholly for gain, it has ceased to have any place in war at sea, but the contributions levied by invading armies might still be accurately described by the name.

RANTERS, an antinomian and spiritualistic English sect in the time of the Commonwealth, who may be described as the dregs of the Seeker movement. Their central idea was pantheistic, that God is essentially in every creature, but though many of them were sincere and honest in their attempt to express the doctrine of the Divine immanence, they were in the main unable to hold the balance. They denied Church, Scripture, the current ministry and services, calling on men to hearken to Christ within them. Many of them seem to have rejected a belief in immor- tality and in a personal God, and in many ways they resemble the Brethren of the Free Spirit in the 14th century. Their vague pantheism landed them in moral confusion, and many of them were marked by fierce fanaticism. How far the accusation of lewdness brought against them is just is hard to say, but they seem to have been a really serious peril to the nation. They were largely recruited from the common people, and there is plenty of evidence to show that the movement was widespread. The Ranters came into contact and even rivalry with the early Quakers, who were often unjustly associated with them. The truth is that the positive message of the Friends helped to save England from being overrun with Ranterism. Samuel Fisher, a Friend, writing in 1653, gives a calm and instructive account of the Ranters, which with other relevant information, including Richard Baxter's rather hysterical attack, may be read in Rufus M. Jones's Studies in Mystical Religion (1909), xix. In the middle of the 19th century the name was often applied to the Primitive Methodists, with reference to their crude and often noisy preaching.

RANUNCULACEAE, in botany, a natural order of Dicoty- ledons belonging to the subclass Polypetalae, and containing 27 genera with about 500

species, which are distributed through temperate and cold regions but occur more especially beyond the tropics in the northern hemi- sphere. It is well represented in Britain, where n genera are native. The plants are mostly herbs, rarely shrubby, as in Clematis, which climbs by means of the leaf-stalks, with alternate leaves, opposite in Clematis, generally without stipules, and flowers which show considerable T J^ r ^'*2 variation in the number and development permission of Swan, Son-

of parts but are characterized by free ° ensc eln ~

, * , . . , Fig. 1. — Gynoecium

hypogynous sepals and petals, numerous f Ranunculus- x

free stamens, usually many free one-celled

carpels (fig. 2) and small seeds containing

a minute straight embryo embedded in a

copious endorsperm. The parts of the

flower are generally arranged spirally on

a convex receptacle. The fruit is one-seeded, an achene (fig. 3),

or a many-seeded follicle (fig. 4), rarely, as in Actaea, a berry.

receptacle with the points of insertion of the stamens, which have been removed.

The order falls into several well-defined tribes which are distinguished by characters of the flower and fruit; all are

Prom Strasburger's Lehr- buch der Botanik, by per- mission of Gustav Fischer.

Fig. 2. — Ranunculus arvensis. Carpel in longitudinal section. (After Baillon, en- larged.)

Fig. 3.— Single follicle show- ing dehiscence by the ventral suture.

Fig. 4. — Fruit of Col- umbine (Aquilegia) formed of five fol- licles.

represented among British native or commonly grown garden plants.

Tribe I. Paeonieae, peony group, are mostly herbs with deeply cut leaves and large solitary showy flowers in which the parts are spirally arranged, the sepals, generally five in_ number, passing gradually into the large coloured petals. The indefinite stamens are succeeded by 2-5 free carpels which bear a double row of ovules along the ventral suture. Honey is secreted by a ring-like swelling round the base of the carpels, which become fleshy or leathery in the fruit and dehisce along the ventral suture. There are only three genera, the largest of which, Paeonia, occurs in Europe, temperate Asia and western North America. P. officinalis is the common peony.

Tribe II. Helleboreae are almost exclusively north temperate or subarctic; there are 15 genera, several of which are represented in the British flora. The plants are herbs, either annual, e.g. Nigella (love-in-a-mist), or perennial by means of a rhizome, as in Aconilum or Eranthis (winter aconite). TheTeaves are simple, as in Caltha, but "more often palmately divided as in hellebore (fig. 6), aconite (fig, 5) and larkspur. The flowers are solitary (Eranthis) or in

the posterior sepal being distinguished from the remaining four by its helmet-shape (Aconitum) or spur (Delphinium). In Caltha there are no petals, but in the other genera there are honey-secreting and storing structures varying in number and in form in the different genera. In Trollius they are long and narrow with a honey-secreting pit at the base, in Nigella and Helleborus (fig. 7) they form short-

Fig. 5. — Five-partite leaf Fig. 6. — Pedateleaf of StinkingHelle- of Aconite. bore (Helleborus foetidus). It is a

palmately-partite leaf, in which the lateral lobes are deeply divided. When the leaf hangs down it re- sembles the foot of a bird, and hence the name.

cymes or racemes, and are generally regular as in Caltha (king-cup, marsh marigold), Trollius (globe-flower), Helleborus, Aquilegia (columbine) ; sometimes medianly zygomorphic as in Aconitum (monkshood, aconite) and Delphinium (larkspur). The carpels, generally 3 to 5 in number, form in the fruit a many-seeded follicle, except in Actaea (baneberry), where the single carpel develops to form a many-seeded berry, and in Nigella, where the five carpels unite to form a five-chambered ovary. There is considerable variety in the form of the floral envelopes and the arrangement of the parts. The outer series, or sepals, generally five in number, is generally white or bright-coloured, serving as an attraction for insects, especially bees, as well as a protection for the rest of the flower. Thus in Caltha and Trollius the

sepals form a brilliant golden-yellow cup or globe, and in Eranthis a pale yellow star which contrasts with the green involucre of bracts immediately below it; in Nigella they are blue or yellow, and also coloured in Aquilegia. In Hellebore the greenish sepals persist till the fruit is ripe. Aconitum and Delphinium differ in the irregular development of the sepals,

Fig. 7. — Helleborus niger. 1, vertical section of flower; 2, nectary, side and front view (nat. size), stalked pitchers, in Aquilegia they are large and coloured with a showy petal-like upper portion and a long basal spur in the tip of which is the nectary. In Delphinium they are also spurred, and in Aconitum form a spur-like sac on a long stalk (fig. 8). The parts

of the flower are gene-

rally arranged in a

P ^^>v^t?A\ spiral (acyclic), but are

sometimes hemicyclic, the perianth forming a whorl as in winter aconite; rarely is the flower cyclic, as in Aquilegia (fig. 9) where

Fig. 9. — Floral dia- gram of Columbine (Aquilegia) showing regular cyclic ar- rangement.

Fig. 8. — Part of the flower of Aconite

(Aconilum Napellus), showing two

irregular horn-like petals p, supported

on grooved stalks 0. These serve as

nectaries. s, the whorl of stamens

inserted on the thalamus, and surround- ing the pistil, the parts throughout are arranged in alternating whorls. In Caltha, where there are no petals, honey is secreted by two shallow de- pressions on the side of each carpel.

Tribe III. Anemoneae, with 8 genera, are chiefly north temperate, arctic and alpine plants, but also pass beyond the tropics to the southern hemisphere. They differ from the two preceding tribes in the numerous carpels, each with only one ovule, forming a fruit of numerous achenes. They are annual or perennial herbs, erect as in Anemone, Thalictrum (meadow-rue) and many buttercups, orcreeping as in Ranunculus repens; the section Balrachium of the genus Ranunculus (q.v.) contains aquatic plants with submerged or floating stems and leaves. The flowers are

solitary, as in Anemone Pulsa- tilla (Pasque flower) and the wood anemone, or cymoseas in species of Ranunculus, or in racemes or panicles as in Thalictrum. The parts are spirally. arranged throughout as in Myosurus (mouse-tail), where the very numerous carpels are borne on a much elongated receptacle, or Adonis (pheasant's eye), or the perianth is whorled as in Anemone and Ranunculus. In Anemone there is a whorl of foliage leaves below the flower, as in Eranthis. In Anemone and Thalictrum there is only one series of perianth leaves, which are petaloid and attractive in Anemone where honey is secreted by modified stamens, as in A. Pulsatilla, or, as in A. nemorosa (wood anemone), there is no honey and the flower is visited by insects for the sake of the pollen; in Thalictrum the perianth is greenish or

Fig. 10. — Petal of Crowfoot (Ranun- culus), bearing at the base a honey gland protected by a scale, 5.

slightly coloured and the flower is wind-pollinated (7". minus) or visited for its pollen. In Ranunculus and Adonis a calyx of green protective sepals is succeeded by a corolla of showy petals; in Ranunculus (fig. 10) there is a basal honey-secreting gland which is absent in Adonis. In Anemone the achenes bear the persistent naked or bearded style which aids in dissemination; the same pur- pose is served by the prickles on the achenes of Ranunculus arvensis.

Tribe IV. Clematideae comprise the genus Clematis (q.v.), characterized by its shrubby, often climbing habit, opposite leaves and the valvate, not imbricate as in the other tribes, aestivation of the sepals. The usually four sepals are whorled and petaloid, the numerous stamens and carpels are spirally arranged ; the flowers are visited by insects for the sake of the abundant pollen. The fruit consists of numer- ous achenes which are generally prolonged into the long feathery style, whence the popular name of the British species, old man's beard (Clematis vitalba). The genus, which contains about 170 species, has a wide distribution, but is rarer in the tropics than in temperate regions.

Special articles will be found on the more important genera of Ranunculaceae, e.g. Aconitum, Adonis, Anemone, Baneberry (Actaea), Clematis, Columbine, Hellebore, Ranunculus.

RANUNCULUS, familiarly known as " buttercup," or crow- foot, a characteristic type of the botanical order Ranunculaceae. The Lat. name,

which means a little frog or tadpole (dim. of rana, frog), was also given to a medicinal plant, which has been identified by some with the crowfoot. The Ranunculi are more or less acrid herbs, sometimes with fleshy root-fibres, or with the base of the stem dilated into a kind of tuber (R. bulbosus). They have tufted or alternate leaves, dilated into a sheath at the base, and very generally, but not universally, deeply divided above. The flowers are solitary, or in loose cymes, and are remarkable for the number and distinctness (freedom from union) of their parts. Thus there are five sepals, as many petals, and numerous spirally arranged stamens and carpels. The petals have a little pit or honey-gland at the base, which is interesting as foreshadowing the more fully developed tubular petals of the nearly allied genera Aconitum and Helleborus. The fruit is a head of " achenes " — dry, one- seeded fruits. The genus contains a large number of species (about 250) and occurs in most temperate countries in the northern and southern hemispheres, extending into arctic and antarctic regions, and appearing on the higher mountains in the tropics. About twenty species are natives of Great Britain. R. acris, R. repens, R. bulbosus, are the common buttercups. R. arvensis, found in cornfields, has smaller pale yellow flowers and the achenes covered with stout spines. R. Lingua, spearwort, and R. Flammula, lesser spearwort, grow in marshes, ditches and wet places. R. Ficaria is the pilewort or lesser celandine, an early spring flower in pastures and waste places, characterized by having heart-shaped entire leaves and clusters of club-shaped roots. The section Batrachium comprises the water-buttercups, denizens of pools and streams, which vary greatly in the character of the foliage according as it is submersed, floating or aerial, and when submersed varying in accordance with the depth and strength of the current. The ranunculus of the florist is a cultivated form of R. asiaticus, a native of the Levant, remarkable for the range of colour of the flowers (yellow to purplish black) and for the regularity with which the stamens and pistils are replaced by petals forming double flowers. R. asiaticus is one of the older florists' flowers, which has sported into numberless varieties, but was formerly held in much greater esteem than it is at the present time. According to the canons of the florists, the flowers, to be perfect, should be of the form of two-thirds of a ball, the outline forming a perfect circle, with the centre close, the petals smooth-edged, the colour dense, and the marking uniform.

The ranunculus requires a strong and moist soil, with a fourth of rotten dung. The soil should be from 18 in. to 2 ft. deep, and at about 5 in. below the surface there should be placed a stratum 6 or 8 in. thick of two-year-old rotten cow-dung, mixed with earth, the earth above this stratum, where the roots are to be placed, being

perfectly free from fresh dung. The tubers are planted in rows 5 or 6 in. apart, and 3 or 4 in. apart in the rows, the turban sorts in October, the more' choice varieties in February. They should be so close that the foliage may cover the surface of the bed. The autumn- planted roots must be sheltered from severe frost. The plants when in flower should be screened from hot sunshine with an awning; when the leaves wither, the roots are to be taken up, dried, and stored. The ranunculus is readily propagated from seed obtained from semi-double sorts, which are often of themselves very beautiful flowers. It is generally sown in boxes in autumn or spring. The young plants thus raised flower often in the second, and always in the third year.

The turban varieties, which are very showy for the borders, are of a few positive colours, as scarlet, yellow, brown, carmine, and white. The florists' varieties have been bred from the Persian type, which is more delicate.

Other species known in gardens are R. aconitifolius (white bachelor's buttons), with leaves recalling aconite, and white flowers; the double-flowered form is known in gardens as fair maids of France or fair maids of Kent. A double-flowered form of R. acris is grown under the name yellow bachelor's buttons. R. bulbosus also has a pretty double-flowered variety. Of dwarfer interesting plants there are R. alpestris, 4 in., white; R. gramineus, 6 to 10 in., yellow; R. parnassifolius, 6 in., white; and R. rutaefolius, 4 to 6 in., white with orange centre. Of the taller kinds mention may be made of R. cortusaefolius, a fine buttercup, 3-5 ft. high, from Teneriffe, and hardy in the mildest parts of Britain; and R. hyalli, known as the New Zealand water lily. It is a handsome species, 2 to 4 ft. high, with large peltate leaves often a foot in diameter, and with waxy white flowers about 4 in. across. It is not quite hardy, and even under the best conditions is a difficult plant to grow well.

RAO, SIR DINKAR (1819-1896), Indian statesman, was born in Ratnagiri district, Bombay, on the 20th of December 1819, being a Chitpavan Brahmin. At fifteen he entered the service of the Gwalior state, in which his ancestors had served. Rapidly promoted to the responsible charge of a division, he displayed unusual talents in reorganizing the police and revenue departments, and in reducing chaos to order. In 18 51 Dinkar Rao became dewan. The events which led to the British victories of Maharajpur and Panniar in 1844 had filled the state with mutinous soldiery, ruined the finances, and weakened authority. With a strong hand the dewan suppressed disorder, abolished ruinous imposts, executed public works, and by a reduction of salaries, including his own, turned a deficit into a surplus. When the contingent mutinied in 1857, he never wavered in loyalty ; and although the state troops also mutinied in June 1858 on the approach of Tantia Topi, he adhered to the British cause, retiring with

Maharaja Sindhia to the Agra fort. After the restoration of order he remained minister until December 1859. In 1873 he was appointed guardian to the minor Rana of Dholpur, but soon afterwards he resigned, owing to ill-health. In 1875 the viceroy selected him as a commissioner, with the Maharajas Sindhia and Jaipur, and three British colleagues, to try the Gaekwar of Baroda on a charge of attempting to poison the British resident. He also served in the legislative council of India, and was frequently consulted by viceroys on difficult questions. An estate was conferred upon him, with the hereditary title of Raja, for his eminent services, and the decoration of K. C.S.I. He died on the 9th of January 1896. No Indian statesman of the 19th century gained a higher reputation, yet he only commenced the study of English at the age of forty, and was never able to converse fluently in it; his orthodoxy resented social reforms; he kept aloof from the Indian Congress, and he had received no training in British administration.

RAO, SIR T. MADHAVA (1828-1891), Indian statesman, was born at Combaconum in Madras in 1828. Madhava Rao created a new type of minister adapted to the modern requirements of a progressive native state, and he grafted it upon the old stock. He linked the past with the present, using the advantages of heredity, tradition and conservatism to effect reforms in the public administration and in Indian society. Sprung from a Mahratta Brahmin stock long settled at Tanjore, the son of a dewan of Travancore, he was educated in the strictest tenets of his sacred caste. But he readily imbibed the new spirit of the age. To mathematics, science and astronomy he added a study of English philosophy and international law, and a taste for art

and pictures. Although a devout student of the Shastras, he advocated female education and social reform. Refusing to cross the sea and so break caste by appearing before a parlia- mentary commission, he yet preached religious toleration. A patron of the Indian Congress, he borrowed from the armoury of British administration every reform which he introduced into the native states. He was respected alike by Europeans and natives, and received titles and honours from the British government. As tutor of the maharaja of Travancore, and then as revenue officer in that state, he showed firmness and ability, and became diwan or prime minister in 1857. He found the finances disorganized, and trade cramped by mono- polies and oppressive duties. He co-operated with the Madras government in

carrying out reforms, and when his measures led to misunderstandings with the maharaja, he preferred honourable resignation to retention of a lucrative office in which he was powerless for good. In 1872 he was engaged at Indore in laying down a plan of reform and of public works which he bequeathed to his successor, when a grave crisis at Baroda demanded his talents there. The Gaekwar had been deposed for scandalous misrule, and an entire reorganization was needed. Aided by Sir Philip Melvill, Madhava Rao swept away the corrupt officials, privileged sirdars and grasping contractors who had long ruined Baroda. He wrote able minutes defending the rights and privileges of the Gaekwar from fancied encroach- ment, and justifying the internal reforms which he introduced. He resigned office in 1882, and in his retirement devoted his leisure to reading and writing upon political and social questions. He died on the 4th of April 1891.

RAOUL DE CAMBRAI, the name of a French chanson de geste. The existing romance is a 13th-century recension of a poem by a trouvere of Laon called Bertholais, who professed to have witnessed the events he described. It presents, like the other provincial geste of Garin le Loherain, a picture of the devastation caused by the private wars of the feudal chiefs. A parallel narrative, obviously inspired by popular poetry, is preserved in the chronicle of Waulsort (ed. Achery, Spicilegium, ii. p. 100 seq.), and probably corresponds with the earlier recension. Raoul de Cambrai, the posthumous son of Raoul Taillefer, count of Cambrai, by his wife Alais, sister of King Louis (d'Outre-Mer), whose father's lands had been given to another, demanded the fief of Vermandois, which was the natural in- heritance of the four sons of Herbert, lord of Vermandois. On King Louis's refusal, he proceeded to war. The chief hero on the Vermandois side was Bernier, a grandson of Count Herbert, who had been the squire and firm adherent of Raoul, until he was driven into opposition by the fate of his mother, burned with the nuns in the church of Origny. Bernier eventually slew the terrible Raoul in single fight, but in his turn was slain, after an apparent reconciliation, and the blood-feud descended to his sons. The date of these events is exactly ascertainable. Flodoard {Annates, Anno 943) states that Count Herbert died in that year, and was buried by his sons at St Quentin, that when they learnt that Raoul, son of Raoul de Gouy, was about to invade their father's territory, they attacked him and put him to death. The identity of other of the personages of the story has also been fixed from historical sources. The second part of the poem, of which Bernier is the hero, is of later date, and bears the character of a roman d'aventures.

See Li Romans de Raoul de Cambrai et de Bernier, ed. E. le Glay (Paris, 1840); Raoul de Cambrai, ed. P. Meyer and A. Longnon (Soc. des anc. textes jr., Paris, 1882); J. M. Ludlow, Popular Epics of the Middle Ages

(London and Cambridge, 1865) ; H. Grober, Grundriss d. roman. Phil. (ii. pp. 567 seq.).

RAOUL ROCHETTE, DESIRE (1790-1854), French archaeo- logist, was born on the 9th of March 1790 at St Amand in the department of Cher, and received his education at. Bourges. He was made professor of history in the College de Louis-le- Grand at Paris (1813) and in the Sorbonne (1817). His His- loire critique de I'Stablissement des colonies grecques (4 vols., 18 1 5) is now out of date. He was superintendent of anti- quities in the Bibliotheque at Paris (1819-48), and professor of

archaeology at the Bibliotheque (from 1826), a result of which may be seen in his Cours d'archiologie (1828). In 1829 appeared his Monuments inedits, a work of great value at the time. Still valuable are his Peintures in&dites (1836) and his Peinlures de Pompei(x&44). He contributed to the Annali of the Roman Institute, the Journal des savants and the AcadSmie des in- scriptions. At his death on the 3rd of July 1854 Raoul Rochette was perpetual secretary of the Academy of Fine Arts and a corresponding member of most of the learned societies in Europe.

RAOULT, FRANCOIS MARIE (1830-1901), French chemist, was born at Fournes, in the Departement du Nord, on the 10th of May 1830. He became aspirant repetiteur at the lycee of Rheims in 1853, and after holding several intermediate positions was appointed in 1862 to the professorship of chemistry in Sens lycee, where he prepared the thesis on electromotive force which gained him his doctor's degree at Paris in the following year. In 1867 he was put in charge of the chemistry classes at Grenoble, and three years later he succeeded to the chair of chemistry, which he held until his death on the 1st of April 1 901. Raoult's earliest researches were physical in character, being largely concerned with the phenomena of the voltaic cell, and later there was a period when more purely chemical questions engaged his attention. But his name is best known in connexion with the work on solutions, to which he devoted the last two decades of his life. His first paper on the depression of the freezing-points of liquids by the presence of substances dissolved in them was published in i878;and continued investi- gation and experiment with various solvents, such as benzene and acetic acid, in addition to water, led him to believe in a simple relation between the molecular weights of the substances and the freezing-point of the solvent, which he expressed as the " loi generale de la congelation," that if one molecule of a substance be dissolved in 100 molecules of any given solvent, the temperature of solidification of the latter will be lowered by 0-63° C. (See, however, the article Solution.) Another relation at which he worked was that the diminution in the vapour-pressure of a solvent, caused by dissolving a substance in it, is proportional to the molecular weight of the substance

dissolved — at least when the solution is dilute. These two generalizations not only afforded a new method of determining the molecular weights of substances, but have also been utilized by J. II. van't Hoff and W. Ostwald, among other chemists, in support of the hypothesis of electrolytic dissociation in solutions. An account of Raoult's life and work was given by Professor van't Hoff in a memorial lecture delivered before the London Chemical Society on the 26th of March 1902.

RAOUX, JEAN (1677-1734), French painter, was born at Mont- pellier in 1677. After the usual course of training he became a member of the Academy in 17 17 as an historical painter. His reputation had been previously established by the credit of decorations executed during his three years in Italy on the palace of Giustiniani Solini at Venice, and by some easel paint- ings, the Four Ages of Man (National Gallery), commissioned by the grand prior of Vendome. To this latter class of subject Raoux devoted himself, nor did he even paint portraits except in character. The list of his works is a long series of sets of the Seasons, of the Hours, of the Elements, or of those scenes of amusement and gallantry in the representation of which he was immeasurably surpassed by his younger rival Watteau. After his stay in England (1720) he lived much in the Temple, where he decorated several rooms. He died in Paris in 1734. His best pupils were Chevalier and Montdidier. His works, of which there is a poor specimen in the Louvre, were much engraved by Poilly, Moyreau, Dupuis, &c.

RAPALLO, a seaport and winter resort of Liguria, Italy, in the province of Genoa. Pop. (1901) 5839 (town); 10,343 (commune). It occupies a beautiful and well-sheltered situa- tion on the east side of the Gulf of Rapallo, 185 m. E. by S. from Genoa by rail. It has a fine church, a medieval castle (now used as a prison) and a Roman Bridge, known as " Hanni- bal's Bridge." On the hills above the town is situated the

church and abbey of the Madonna de Montallegro, whose miraculous picture attracts pilgrims from all parts of Italy. Olives and other fruit are grown, and a brisk trade is done in olive oil. A mile to the south is Santa Margherita Ligurc (pop. 7051), another winter resort, with a large 16th-century church. Both places are also frequented for sea-bathing in summer. Lace is made, while the men go in May to the coral fisheries off the Sardinian coast. To the south again is the small seaport of Portofino (the Roman Partus Delphini) under the south-east extremity of the promontory of Portofino (2010 ft.). On the way from S. Margherita to Portofino is the

suppressed monastery of Cervara, in which Francis I. of France was confined after the battle of Pavia on his way to Madrid. At all these places are beautiful villas.

RAPE (Lat. rapum or rapa, turnip), in botany. — Several forms of plants included in the genus Brassica are cultivated for the oil which is present in their ripe seeds. The one most extensively grown for this purpose is known as colza, rape or coleseed, in Germany as Raps (Brassica napus, var. oleijera) : its seeds contain from 30 to 45 % of oil. The leaves are glaucous and smooth like those of a swede turnip. For a seed-crop rape is sown in July or early August in order that the plants may be strong enough to pass the winter uninjured. The young plants are thinned out to a width of 6 or 8 in. apart, and afterwards kept clean by hoeing. The foliage may be eaten down by sheep early in autumn, without injuring it for the production of a crop of seed. In spring the horse and hand hoe must be used, and the previous application of 1 cwt. or 2 cwt. of guano will add to the productiveness of the crop. On good soil and in favourable seasons the yield sometimes reaches to 40 bushels per acre. The haulm and husks are either used for litter or burned, and the ashes spread upon the land. It makes good fuel for clay-burning. There is a " summer " variety of colza which is sown in April and ripens its seed in the same year. It does not yield so much oil as the " winter " kind, but it will grow on soil in poorer condition. Neither of these is much grown in Great Britain for the production of oil, but the " winter " variety is very extensively grown as green food for sheep. For this purpose it is generally sown at short intervals throughout the summer to provide a succession of fodder. It is peculiarly adapted for peaty soils, and is accord- ingly a favourite crop in the fen lands of England, and on recently reclaimed mosses and moors elsewhere. Its growth is greatly stimulated by the ashes resulting from the practice of paring and burning. Its highly nutritious leaves and stems are usually consumed by folding the sheep upon it where it grows, there is no green food upon which they fatten faster. Occasionally it is carried to the homestead, and used with other forage in carrying out the system of soiling cattle.

The wild form Brassica campeslris, the wild coleseed, colza or kohlsaat, of the fields of England and many parts of Europe, is sometimes cultivated on the European continent for its seed, which, however, is inferior in value to rape as an oil-yielding product.

In addition to the previously mentioned rape, a variety of another species (or subspecies) of Brassica, namely, Brassica rapa, var. oleijera (Riibsen in Germany), is grown for its oil- yielding seeds. The leaves in a young state are not glaucous, but sap-green in colour and rough, being very similar to those of the turnip, to which the plant is closely related. Both winter and

summer varieties are grown; they are rarely culti- vated in Britain. The oil is similar to that in the true colza seeds but the plants do not yield so much per acre as the latter: they are, however, hardier and more adapted for cultivation on poor sandy soils.

RAPE (from Lat. rapere, to seize), in law, the crime of having carnal knowledge of a woman by a man, not her husband, forcibly and unlawfully against her will. Under the Mosaic law, rape was punished with death, if the damsel was betrothed to another man, and with a fine of fifty shekels if not so be- trothed, while in this case, also, she was to be the wife of the ravisher all the days of his life (Deut. xxii. 25). The Roman

civil law punished rape with death and confiscation of goods (Cod. L. IX. tit. 13). In England, under the Saxon law — adopted, probably, from a Teutonic code — death was also the penalty, but under the Normans this was changed to the loss of both eyes and castration; this punishment remained in force until after the time of Bracton (de Corond, f. 147). The statute of Westminster I. (1275) reduced the offence to a tres- pass, with a penalty of two years' imprisonment and a fine at the king's will. This lenity, it is said, produced terrible con- sequences, and, accordingly, the statute of Westminster II. (1285) again declared the offence a felony, with, however, benefit of clergy. This was the state of the law until 1575, when the punishment was made more severe by taking away the benefit of clergy. The offence remained capital until the Offences against the Person Act 1861, by which and subsequent amending acts it is now regulated. The present punishment is penal servitude for life or for not less than three years or imprisonment with or without hard labour for not over two years.

The law of England (differing in this respect from the civil law) regards as immaterial whether the woman is chaste or unchaste, married or single, provided the offence has been committed forcibly and without her consent. The offence is complete if consent is extorted by means of threats of death or immediate bodily harm, by fraud or by false pretences or representation, such as the im- personation of a woman's husband (Criminal Law Amendment Act 1885).

Since the passing of the Criminal Law Amendment Act 1885, it is a felony, entailing the same punishment as rape, to have carnal knowledge of a girl under 13 years, whether she consent or not. Between 13 and 16 years of age it is a criminal offence punishable by two years' imprisonment, whether consent is given or not, and even if there be solicitation; but if the jury is satisfied that the person charged has reasonable cause to believe the girl to be over 16 years, the accused is entitled to be acquitted. Prosecution must be within three months of the offence. The administration of any drug or matter, with intent, by producing stupor, to facilitate the accomplishment of

the crime, is an offence punishable by two years' imprisonment. On indictment for rape there may be an acquittal on the actual charge, but a conviction either of the attempt or of an indecent assault.

In charges of rape, from the nature of the offence, the important witness is the woman, and it is essential, apart from medical evidence (see Medical Jurisprudence), that her story be corroborated by evidence implicating the accused. The following points have, of necessity, to be considered. (1) As to the general credibility of the witness and how far her story is to be believed; evidence, therefore, may be given to show that she is of immoral character. (2) As to whether she has made complaint immediately after the alleged outrage and to whom. (3) As to the place where the outrage was alleged to have been committed and the possibility of her being heard if she cried out.

In the United States, rape is universally treated as a felony, and the punishment is either death, imprisonment for life, or imprisonment for a number of years, varying in the different states. In the case of offences against young girls, there is a divergence in the various states as to the age of consent, though the trend of legislation has been to raise it. In North and South Carolina, and Georgia, the age of consent is as low as 10 years, and in Kentucky and Louisiana, 12 years. In nineteen states the age of consent is 14 years. In one (Texas) 15 years. In six, it is 16 years. In Wyoming, New York, Colorado and Kansas it is as high as 18 years.

The essential facts to be proven in order to constitute this crime are the same as in England, but in many of the states the uncorroborated evidence of the woman is sufficient to sustain a conviction. This is so in California, Arizona, Idaho, Missouri, Kentucky, Michigan, Illinois, Oklahoma, &c. [1904; Brenton v. Territory, 78 Pac. Rep. 83]. In New York corroboration is required [Penal Code §283]. In Nebraska also evidence corro- borating the prosecutrix is necessary [1907; Burk v. State, 112 N.W. Rep. 573]. In Texas it is no defence for accused to prove that he believed the prosecutrix to be over 15 years of age, the age of consent [1907; Robertson v. State, 102 So. W. Rep. 1 130], and the crime is punishable with death [1903; Reyna v. State, 75 So. W. Rep. 25], as also apparently it is in the Indian country [U.S. v. Pariello, 48 Fed. R. 670 U.S. Rev. Stats. § 5345], also in Alabama [Criminal Code, § 5444].

In Hawaii there is no age of consent for rape, which is punish- able by $1000 fine and imprisonment at hard labour for life; the carnal knowledge

of females under 10 years is punishable with death or imprisonment for life [Rev. L. 1905, §§ 2927, 2928]. In Porto Rico the age of consent is 14 years and the punishment not less than five years [Pen. Code 1902, §255].

Authorities. — Stephen, Digest of Criminal Law; Russell, On Crimes: Archbold, Criminal Pleading; and for American law, May, The Law of Crimes, and Clark and Marshall, Treatise on the Law of Crimes.

RAPE, a territorial division of the county of Sussex, England, formerly used for various administrative purposes. There are now six of these divisions, Hastings, Pevensey, Lewes, Bramber, Arundel and Chichester, but the latter two apparently formed a single rape at the date of the compilation of Domesday Book. The word, which in England is peculiar to Sussex, is usually said to be closely related to the Icelandic h;e,pp, a small territorial division which in most, but not in all, cases is identical with the parish; but this explanation, which is unsatisfactory on insti- tutional grounds, has also been declared impossible for philo- logical reasons. As an alternative explanation it has been suggested, that " rape " is an early form of the word " rope "; and that the divisions were so called because they were measured and allotted by the rope. Some confirmation of this is to be found in the words of the Norman chronicler, Dudo of St Quentin, who states that Rollo in distributing Neustria " suis fidelibus terrain funiculo divisit " (J. P. Migne, Patrologiae Cursus computus, torn. cxli. p. 652). It is possible that the rapes represent the shires of the ancient kingdom of Sussex, especially as in the 12th century they had sheriffs of their own. But there is no evidence of the existence of the rape before the Norman Conquest, except such as may be gathered from Domesday Book, and this is far from convincing. After the Conquest each rape had its own lord, and all the land within it, save that which belonged to the king or to ecclesiastical tenants, was held of the lord. Thus the rape as a lordship only differed from other honours and baronies by the fact that the lands of its knights were not scattered over England, but lay together in a continuous tract. In form the rapes were parallel bands of land running north and south, and each of them contained a different number of hundreds. The place in which the lord's castle was situate ultimately gave its name to the rape; but in Domesday Book the rapes are often described by the names of their lords, and this is always so in that work in the case of Bramber, which belonged to William de Briouze (rapam Willelmi de Braoza).

See the Victoria County History, Sussex, vol. i. ; New English Dictionary; and M. A. Lower, History of Sussex (Lewes, 1870).

(G.J.T.)

RAPE OIL, an important fatty oil, known also as " sweet oil," either

expressed or extracted from the crushed seeds of culti- vated varieties of the cruciferous genus Brassica, the parent form of the whole apparently being the wild navew, B. catnpes- tris. Under the general name " rape oil " is included the pro- duce of several plants having distinct and fairly constant characters, and one of these oils — colza (q.v.) — is a very well-known commercial variety. In Germany, where the produc- tion of rape oil centres, two principal oil-seeds — rape and Riibsen — are wellrecognized. (See Rape.)

The oil yielded by these seeds is, in physical and chemical properties, practically the same, the range of fluctuations not being greater than would be found in the oil of any specific seed under similar varying conditions of production; the winter varieties of all the seeds are more productive than the summer varieties. Newly pressed rape oil has a dark sherry colour with, at first, scarcely any perceptible smell; but after resting a short time the oil deposits an abundant mucilaginous slime, and by taking up oxygen it acquires a peculiar disagreeable odour and an acrid taste. Refined by the ordinary processes (see Oils), the oil assumes a clear golden yellow colour. In specific gravity it ranges between 0-9112 and 0-9117 in the raw state, and from 0.9127 to 0.9136 when refined; the solidifying point is from-4 to -6° C.

The principal uses of rape oil are for lubrication and lighting; but since the introduction of mineral oils for both these purposes the importance of rape has considerably decreased. It is but little employed in soap-making, as it saponifies with difficulty and yields only an indifferent product. In Germany it is very considerably used as a salad oil under the name of Schmalzol, being for that purpose freed from its biting taste by being mixed with starch, heated till the starch is carbonized, and filtered after the oil has cooled. The offensive taste of rape oil may also be removed by treatment with a small proportion of sweet spirit of nitre (nitrous ether). In the East Indies rape oil and its equivalents, known under various names, are the most important of oils for native use. They are largely consumed as food instead of ghi under the name of " metah " or sweet oil, but for all other purposes the same sub- stance is known as " kurwah " or bitter oil. Most natives prefer it for the preparation of their curries and other hot dishes. Rape oil is the subject of extensive adulteration, principally with the cheaper hemp oil, rosin oil and mineral oils. These sophistications can be most conveniently detected, first by taste and next by saponifica- tion, rosin oil and mineral oil remaining unsaponified, hemp oil giving a greenish soap, while rape oil yields a soap with a yellow tinge. With concentrated sulphuric acid, fuming nitric acid, nitrous acid, and other reagents rape oil gives also characteristic colorations; but these are modified according to the degree of purity of the oil itself. The presence of sulphur in rape and other cruciferous oils also affords a ready means for their identification. Lead

plaster (emplastrum lithargyri) boiled in rape oil dissolves, and, sulphide of lead being formed, the oil becomes brown or black. Other lead compounds give the same black coloration from the formation of sulphide.

RAPHAEL (Hebrew ˆnsi, " God heals "), an angel who in human disguise and under the name of Azarias (" Yahweh helps ") accompanies Tobias in his adventurous journey and conquers the demon Asmodaeus (Book of Tobit). He is said (Tob. xii. 15) to be " one of the seven holy angels [archangels] which present the prayers of the saints and go in before the glory of the Holy One." In the Book of Enoch (c. xx.) Raphael is " the angel of the spirits of men," and it is his business to " heal the earth which the angels have defiled." In later Midrash Raphael appears as the angel commissioned to put down the evil spirits that vexed the sons of Noah with plagues and sicknesses after the Flood, and he it was who taught men the use of simples and furnished materials for the " Book of Noah," the earliest treatise on materia medica.

RAPHAEL SANZIO (1483-1520), the great Italian painter, was the son of Giovanni Sanzio or Santi, a painter of some repute in the ducal city of Urbino, situated among the Apen- nines on the borders of Tuscany and Umbria. 1 For many years both before and after the birth of Raphael (6th of April 1483) the city of Urbino was one of the chief centres in Italy of intel- lectual and artistic activity, thanks to its highly cultured rulers, Duke Federigo II. of Montefeltro and his son Guidobaldo, who succeeded him in 1482, 2 the year before Raphael was born. Giovanni Santi was a welcome guest at this miniature but splendid court, and the rich treasures which the palace contained, familiar to Raphael from his earliest years, , were a very im- portant item among the various influences which formed and fostered his early love for art. It may not perhaps be purely fanciful to trace Raphael's boyish admiration of the oil-paintings of Jan Van Eyck and Justus of Ghent in the miniature-like care and delicacy with which some of his earliest works, such as the " Apollo and Marsyas," were executed.

Though Raphael lost his father at the age of eleven, yet to him he certainly owed a great part of that early training which enabled him to produce paintings of apparently mature beauty when he was scarcely twenty years of age. The altar- piece painted by Giovanni for the church of Gradara, and a fresco, now preserved in the Santi house 3 at Urbino, are clearly prototypes of some of Raphael's most graceful

1 See Pungileoni, Elogio Storico di Raffaello (Urbino, 1829); for a valuable account of Raphael's family and his early life, see also, Id., Vita di Giov. Santi (Urbino, 1822), and Campori, Notizie e Docu- menti per la Vita di Giov. Santi e di Raffaello (Modena, 1870).

2 See an interesting account of the court of Urbino by Delaborde, Etudes sur les B. Arts . . . en Italie (Paris, 1864), vol. i. p. 145.

3 The house of Giovanni Santi, where Raphael was born, still exists at Urbino in the Contrada del Monte, and, being the property of the municipality, is now safe from destruction.

paintings of the Madonna and Child. On the death of his father in 1494 Raphael was left in the care of his stepmother (his own mother, Magia Ciarla, having died in 1491) and of his uncle, a priest called Bartolomeo. 1

First or Perugian Period. — In what year Raphael was appren- ticed to Perugino and how the interval before that was spent are matters of doubt. Vasari's statement that he was sent to Perugia during his father's lifetime is certainly a mistake. On the whole it appears most probable that he did not enter Perugino's studio till the end of 1499, as during the four or five years before that Perugino was mostly absent from his native city. 2 The so-called Sketch Book of Raphael in the academy of Venice contains studies apparently from the cartoons of some of Perugino's Sistine frescoes, possibly done as practice in drawing.

This celebrated collection of thirty drawings, now framed or preserved in portfolios, bears signs of having once formed a bound book, and has been supposed to be a sketch-book filled by Raphael during his Perugian apprenticeship. Many points, however, make this tempting hypothesis very improbable; the fact that the draw- ings were not all originally on leaves of the same size, and the miscellaneous character of the sketches — varying much both in style and merit of execution — seem to show that it is a collection of studies by different hands, made and bound together by some subsequent owner, and may contain but very few drawings by Raphael himself. 3

Before long Raphael appears to have been admitted to share in the execution of paintings by his master; and his touch can with more or less certainty be traced in some of Perugino's panels which were executed about 1502. Many of those who, like Crowe and Cavalcaselle, adopt the earlier date of Raphael's apprenticeship, believe that his hand is visible in the execution of the beautiful series of frescoes by Perugino in the Sala del Cambio, dated 1500; as does also M. Mtintz in his excellent Raphael, sa vie, Paris, 1881, in spite of his accepting the end of 1499 as the period of

Raphael's first entering Perugino's studio, — two statements almost impossible to reconcile. Considering that Raphael was barely seventeen when these frescoes were painted, it is hardly reasonable to attribute the finest heads to his hand; nor did he at an early age master the difficulties of fresco buono. The Resurrection of Christ in the Vatican and the Diotalevi Madonna in the Berlin Museum are the principal pictures by Perugino in parts of which the touch of Raphael appears to be visible, though any real certainty on this point is unattainable. 4

About 1502 Raphael began to execute independent works; four pictures for churches at Citta di Castello were probably the earliest of these, and appear to have been painted in the years 1502-4. The first is a gild-banner painted on one side with the Trinity, and below, kneeling figures of S. Sebastian and S. Rocco; on the reverse is a Creation of Eve, very like Perugino in style, but possessing more grace and breadth of treatment. These are still in the church of S. Trinita. 6 Also

1 The administration of Giovanni Santi's will occasioned many painful family disputes and even appeals to law; see Pungileoni, El. Stor. di Raffaello.

2 Crowe and Cavalcaselle (Life of Raphael, vol. i., London, 1882) adopt the notion that Raphael went to Perugia in 1495, but the reasons with which they support this view appear insufficient.

3 See an excellent critical examination of the Sketch Book by Morelli, Italian Masters in German Galleries, translated by Mrs Richter (London, 1882); according to Morelli, only two drawings are by Raphael. Schmarsow, " Raphael's Skizzenbuch in Venedig," in Preussische Jahrbiicher, xlviii. pp. 122-149 (Berlin, 1881), takes the opposite view. But Kahl, Das venezianische Skizzenbuch (Leipzig, 1882), follows Morelli's opinion, which has been generally adopted.

4 Parts of Perugino's beautiful triptych of the Madonna, with the archangels Raphael and Michael, painted for the Certosa near Pavia and now in the National Gallery of London, have been attributed to Raphael, but with little reason. Perugino's grand altar-piece at Florence of the Assumption of the Virgin shows that he was quite capable of painting figures equal in beauty and delicacy to the St Michael of the Certosa triptych. See Frizzioni, V Arte Italiana nella Gal. Nat. di Londra (Florence, 1880).

s For an account of processional banners painted by distin- guished artists, see Mariotti, Lettere pittoriche Perugine, p. 76 seq.

for Citta di Castello were the coronation of S. Niccolo Tolentino, now destroyed, though studies for it exist at Oxford and Lille (Gaz. d. B. Arts, 1878, i. p. 48), and the Crucifixion, now in the Dudley collection, painted for the church of S. Domenico, and signed RAPHAEL VRBINAS P. It is a panel 8 ft.6 in. high by S ft- S ln – wide, and contains noble figures of the Virgin, St John, St Jerome and St Mary Magdalene. The fourth painting executed for this town, for the church of S. Francesco, is the exquisitely beautiful and highly finished Sposalizio, now in the Brera at Milan, signed and dated RAPHAEL VRBINAS MDIIII. This is closely copied both in composition and detail from Perugino's painting of the same subject now at Caen, but is far superior to it in sweetness of expression and grace of attitude. The Temple of Jerusalem, a domed octagon with outer ambulatory in Perugino's picture, is reproduced with slight alterations by Raphael, and the attitudes and grouping of the figures are almost exactly the same in both. The Con- nestabile Madonna is one of Raphael's finest works, painted during his Perugian period; it is a round panel; the motive, the Virgin reading a book of hours, is a favourite one with him, as it was with his father Giovanni. This lovely picture was lost to Perugia in 1871, when Count Connestabile sold it to the emperor of Russia for £13,200.

Second or Florentine Period, 1 504-1 508. — From 1504 to r5o8 Raphael's life was very stirring and active. In the first half of 1504 he visited Urbino, where he painted two small panels for Duke Guidobaldo, the St George and the St Michael of the Louvre. His first and for him momentous visit to Florence was made towards the end of 1504, when he presented himself with a warm letter of recommendation 6 f rom his.patroness Joanna della Rovere to the gonfaloniere Pier Soderini. In Florence Raphael was kindly received, and, in spite of his youth (being barely of age), was welcomed as an equal by the majority of those great artists who at that time had raised Florence to a pitch of artistic celebrity far above all other cities of the world. At the time of his arrival the whole of artistic Italy was being excited to enthusiasm by the cartoons of the battle of Anghiari and the war with Pisa, on which Leonardo da Vinci and Michelangelo were then devoting their utmost energies. To describe the various influences under which Raphael came, and the many sources, from which he drank in stores of artistic knowledge, would be to give a complete history of Florentine art in the 15th century. 7 With astonishing rapidity he shook off the mannerisms of Perugino, and put one great artist after another under contribution for some special power of drawing, beauty of colour, or grace of composition in which each happened to excel. Nor was it from painters only that Raphael acquired his enlarged field of knowledge and rapidly growing powers. Sculptors like Ghiberti and Donatello must be numbered among those whose works helped to develop his new-born style. 8 The Carmine frescoes of Masaccio and Masolino taught this eager

student long-remembered lessons of methods of dramatic expression. 9 Among his contemporaries it was especially Signorelli and Michelangelo who taught him the importance of precision of line and the necessity of a thorough knowledge of the human form. 10 From da Vinci he learnt subtleties of modelling and soft beauty of expression, 11 from Fra Bartolommeo nobility of composition and skilful treatment of drapery in dignified folds. 12 The friendship between Raphael and the last of these was very close and lasted for many years. The architect Baccio d'Agnolo was another of his special friends, at whose house the young painter enjoyed social intercourse

6 This letter, which still exists, was sold in Paris in 1856, and is now in private hands.

7 See Minghetti, " I Maestri di Raffaello," in the Ntwva Antologia, 1st August 1881.

8 See his sketch of St George and the Dragon, in the Uffizi, largely taken from Donatello's pedestal relief outside Or San Michele.

9 See his cartoon of St Paul preaching at Athens (Victoria and Albert Museum).

10 See many of his life-studies, especially the one he sent to Albert Diirer, now at Vienna.

11 See the portrait of Maddalena Doni in the Pitti.

12 See the Madonna del Baldacchino in the Pitti.

with a large circle of the chief artists of Florence, and probably learned from him much that was afterwards useful in his practice as an architect.

The transition in Raphael's style from his first or Perugian to his second or Florentine manner is well shown in the large picture of the Coronation of the Virgin painted for Maddalena degli Oddi, now in the Vatican, one of the most beautiful that he ever produced, and especially remarkable for its strong religious sentiment — in this respect a great contrast to the paintings of his last or Roman manner which hang near it. The exquisite grace of the angel musicians and the beauty of the faces show signs of his short visit to Florence, while the general formality of the composition and certain details, such as the fluttering ribands of the angels, recall peculiarities of Perugino

and of Pinturicchio, with whose fine picture of the same subject hung close by it is interesting to compare it. Raphael's paint- ing, though by far the more beautiful of the two, is yet inferior to that of Pinturicchio in the composition 'of the whole; an

awkward horizontal line divides the upper group of the Coronation from that below, the apostles standing round the Vir- gin's tomb, filled with roses and lilies (Dante, Par. xxiii. 73), while the older Perugian has skil- fully united the two groups by a less formal arrange- ment of the figures. The predella of this master- piece of Raphael is also in the Vatican; some of its small paintings, especially that of the Fig. 1. — Silver-point study for the main Annunciation to the Vir- figures in the Coronation of the Vir- g in , are interesting as gin (Vatican). In the Lille museum. showing his carefu l study Illustrating Raphael s use of draped . ,, ° . , J

models during his early period. °. f the rules of Perspec-

tive. 1 Several prepara- tory sketches for this picture exist: fig. 1 shows a study, now at Lille, for the two principal figures, Christ setting the crown on His mother's head (see fig. 2). It is drawn from two youths in the ordinary dress of the time ; and it is interesting to compare it with his later studies from the nude, many of which are for figures which in the future picture were to be draped. It was at Florence, as Vasari says, that Raphael began serious life studies, not only from nude models but also by making careful anatomical drawings from dissected corpses and from skeletons.

His first visit to Florence lasted only a few months; in 1505 he was again in Perugia painting his first fresco, the Trinity and Saints for the Camaldoli monks of San Severo, now a mere wreck from injury and restorations. The date MDV and the signature were added later, probably in 1521. Part of this work was left incomplete by the painter, and the fresco was finished in 1521 (after his death) by his old master Perugino. 2 It was probably earlier than this that Raphael visited Siena and assisted Pinturicchio with sketches for his Piccolomini frescoes. 3 The Madonna of S. Antonio was also finished in 1505, but was probably begun before the Florentine visit. 4 A

1 While at Florence he is said to have taught the science of per- spective to his friend Fra Bartolommeo, who certainly gave his young instructor valuable lessons on composition in return.

2 The fresco of the Last Supper, dated 1505, in the refectory of S. Onofrio at Florence, is not now claimed as a work of Raphael's, in spite of a signature partly introduced by the restorer.

3 Raphael probably had no hand in the actual execution of the paintings; see Schmarsow, Raphael und Pinturicchio in Siena (Stuttgart, 1880), and Milanesi, in his edition of Vasari, iii. p. 515 seq., appendix to life of Pinturicchio.

4 This fine altar-piece, with many large figures, is now the property of the heirs of the duke of Ripalta, and is stored in the basement of the National Gallery, London.

record of his visit to Siena exists in a sketch of the antique marble group of the Three Graces, then in the cathedral library,

Fig. 2. — The group for which fig. I is a study.

from which, not long afterwards, he painted the small panel of the same subject now in Lord Dudley's collection.

In 1506 Raphael was again in Urbino, where he painted for the duke another picture of St George, which was sent to England as a present to Henry VII. The bearer of this and other gifts was Guidobaldo's ambassador, the accomplished Baldassare Castiglione (q.v.), a friend of Raphael, whose noble portrait of him is in the Louvre. At the court of Duke Guidobaldo the painter's ideas appear to have been led into a more secular direction, and to this stay in Urbino probably belong the Dudley Graces, the miniature " Knight's Dream of Duty and Pleasure " in the National Gallery (London), 5 and also the " Apollo and Marsyas," sold in 1882 by Morris Moore to the Louvre for £10,000, a most lovely little panel, painted with almost Flemish minuteness, rich in colour, and graceful in arrangement. 6

Towards the end of 1506 Raphael returned to Florence, and there (before 1 508) produced a large number of his finest works, carefully finished, and for the most part wholly the work of his own hand. Several of these are signed and dated, but the date is frequently very doubtful, owing to his custom of using Roman numerals, introduced among the sham Arabic embroidered on the borders of dresses, so that the I.'s after the V. are not always distinguishable from the straight lines of the ornament. The following is a list of some of his chief paintings of this period: the " Madonna del Gran Duca " (Pitti) ; " Madonna del Giardino," 1506 (Vienna); " Holy Family with the Lamb," 1506 or 1507 (Madrid); the " Ansidei Madonna," 1506 or 1507 (National Gallery); the Borghese "Entombment," 1507; Lord Cowper's "Madonna" at Panshanger, 1508; "La bella Giardiniera,"

6 This missal-like painting is about 7 in. square; it was bought in 1847 for

1000 guineas. The National Gallery also possesses its cartoon, in brown ink, pricked for transference.

6 In spite of some adverse opinions, frequently expressed with extreme virulence, the genuineness of this little gem can hardly be doubted by any one who carefully studies it without bias. Sketches for it at Venice and in the UfHzi also,appear to bear the impress of Raphael's manner. See Delaborde, Etudes sur lesB. Arts . . .en Italie, i. p. 236; Gruyer, Raphael et I'antiquite, ii. p. 421; Eitel- berger, Rafael's Apollo und Marsyas (Vienna, i860) ; Batte, Le Raphael de M. Moore (Paris, 1859); and also various pamphlets on it by its former owner, Mr. Morris Moore.

1508 (Louvre); the " Eszterhazy Madonna," probably the same year; as well as the "Madonna del Cardellino " (Uffizi), the "Tempi Madonna" (Munich), the " Colonna Madonna" (Berlin), the " Bridgewater Madonna " (Bridgewater House), and the "Orleans Madonna" (due d'Aumale's collection). The " Ansidei Madonna " was bought in 1884 for the National Gallery from the duke of Marlborough for £70,000, more than three times the highest price ever before given for a picture. 1 It was painted for the Ansidei family of Perugia as an altar- piece in the church of S. Fiorenzo, and is a work of the highest beauty in colour, well preserved and very large in scale. The Virgin with veiled head is seated on a throne, supporting the Infant with one hand and holding a book in the other. Below stands S. Niccolo da Tolentino, for whose altar it was painted ; he holds a book and a crozier, and is clad in jewelled mitre and green cope, under which appear the alb and cassock. On the other side is the Baptist, in red mantle and camel's-hair tunic, holding a crystal cross. The rich jewellery in this picture is painted with Flemish-like minuteness. On the border of the Virgin's robe is a date, formerly read as MDV by Passavant and others; it really is MDVI or MDVII. If the later date is the true one, the picture was probably begun a year or two before. A favourite method of grouping his Holy Families is that seen in-the " Madonna del Cardellino " and the " Bella Giar- diniera," in which the main lines form a pyramid. This arrange- ment is also used in the " Madonna del Giardino " and in the larger group, including St Joseph and St Elizabeth, known as the " Canigiani Holy Family, " now at Munich, one of the least graceful of all Raphael's compositions. The " Entombment of Christ," now in the Galleria Borghese in Rome, was painted during a visit to Perugia in 1507 for Lady Atalanta Baglioni, in memory of the death of her brave and handsome but treacherous son Grifonetto, who was killed in 1500 by his enemies the Oddi party.. 2 The many studies and preliminary sketches 3 for this important picture which exist in various

collections show that it cost Raphael an unusual amount of thought and labour in its composition, and yet it is quite one of his least successful paint- ings, especially in colour. It is, however, much injured by scraping and repainting, and appears not to be wholly by his hand. The " Madonna del Baldacchino," one of the finest compositions of the Florentine period, owing much to Fra Bartolommeo, is also unsatisfactory in execution; being left unfinished by Raphael, it was completed by Ridolfo Ghirlandajo, by whom the ungraceful angels of the upper part and the canopy were wholly executed, and even designed. It was painted for the Dei family as an altar-piece for their chapel in S. Spirito, Florence. The " St Catherine " of the National Gallery was pro- bably painted in 1507; its cartoon, pricked for transference, is in the Louvre. In colouring it much resembles parts of the Borghese " Entombment," being quiet and grey in tone. To the Florentine period belong some of his finest portraits, and it is especially in these that da Vinci's influence appears. The portraits of Angelo Doni and his wife Maddalena (Pitti) are vivid and carefully executed paintings, and the unknown lady with hard features (now in the Uffizi) is a masterpiece of noble realism and conscientious finish. The Czartoriski portrait, a graceful effeminate-looking youth with long hair and tapering hands, now moved to Cracow, is probably a work of this period; though worthy to rank with Raphael's finest portraits, its authenticity has been doubted. Very similar in style is the Herrenhausen portrait, once attributed to Giovanni Bellini, but an undoubted work of Raphael, in his second manner; it also represents a young man with long hair, close-shaven chin, a wide cloth hat and black dress, painted in half-length. The

1 It is engraved at p. 53, vol. ii., of Dohme, Kunst und Kiinstler des Mittelalters (Leipzig, 1878), a work which has many good repro- ductions of Raphael's paintings and sketches.

2 See Symonds, Sketches in Italy, the chapter on Perugia, mainly taken from the contemporary chronicle of Matarazzo.

3 These show that Raphael at first intended to paint a Deposition from the Cross, and afterwards altered his scheme into the Entomb- ment; an excess of study and elaboration partly account for the shortcomings of this picture.

so-called Portrait of Raphael by himself at Hampton Court is a very beautiful work, glowing with light and colour, which may possibly be a genuine picture of about 1506. It represents a pleasant-looking youth with turned-up nose, not bearing the remotest resemblance to Raphael, except the long hair and black cap common to nearly all the portraits of this time.
4 A fine but much-restored portrait of Raphael by himself, painted at Florence, exists in the Uffizi; it represents him at a very early age, and was

probably painted during the early part of his stay in Florence.

Third or Roman Period, 1 508-1 520. — In 1508 Raphael was painting several important pictures in Florence; in September of that year we find him settled in Rome, from a letter addressed in the warmest terms of affectionate admiration to Francia, to whom he sent a sketch for his " Adoration of the Shepherds," and promised to send his own portrait in return for that which Francia had given him. 5 Raphael was invited to Rome by his fellow-citizen (not relation, as Vasari says) Bramante, who was then occupied in the erection of the new church of St Peter, the foundation-stone of which had been laid by Julius II. on the 18th of April 1506. At this time the love of the popes for art had already attracted to Rome a number of the chief artists of Tuscany, Umbria and North Italy, among whom were Michelangelo, Signorelli, Perugino, Pinturicchio, Lorenzo Lotto, Peruzzi, Sodoma, and many others, and it was among this brilliant assembly that Raphael, almost at once, took a leading position. 6 Thanks to Bramante's friendly intervention, Julius II. (Delia Rovere) soon became Raphael's most zealous patron and friend, as did also the rich bankers Agostino Chigi (the Rothschild of his time) and Bindo Altoviti, whose portrait, at the age of twenty, now at Munich, is one of the most beautiful that Raphael ever produced. «...

A series of rooms in the Vatican, over the Appartamenti Borgia, were already decorated with frescoes by Bonfigli,

Fig. 3. — Plan showing position of Raphael's frescoes in the stanze.

A. Stanza della Segnatura (1509-11); 1, Disputa; 2, School of Athens; 3, Justinian giving his code to Trebonian; 4, Gregory IX. giving decretals to a jurist; 5 (over the window), Three Virtues; 6 (over the other window), Apollo and a group of poets on Mount Parnassus; vault with medallions of Poetry, Theology, Science, and Justice, and other paintings. B. Stanza d'Eliodoro (1511-14): 7, Expulsion of Heliodorus from the Temple; 8, Mass of Bolsena; 9, St Peter freed from prison; 10, Attila repulsed by Leo I.; vault with scenes from Old Testament, by pupils. C. Stanza dell' Incendio (1517), nearly all painted by pupils: II, Burning of the Borgo; 12, Victory of Leo IV. over the Saracens at Ostia; 13, Coronation of Charlemagne by Leo III. in St Peter's; 14, Oath of Leo III. before Charlemagne. D. Sala di Costantino, painted by pupils (1520-24): 15 and 16, oil-paintings of Comitas and Justitia attri- buted to Raphael; 17, 17, great fresco of the Defeat of Maxentius. E E. Part of Raphael's loggia, by his pupils. F. Chapel of Nicholas V., painted by Fra Angelico. G. Cortile of Bramante.

Perugino, Piero della Francesca, Andrea del Castagno, Signorelli and

Sodoma; but so rapidly had the taste of the time changed that Julius II. decided to sweep them all away and re-cover the

4 To judge of the authorship of a portrait from internal evidence is especially difficult, as in so many cases the strong individuality of the person represented obscures that of the painter.

6 Malvasia, Felsina pittrice (Bologna, 1678), was the first to publish this letter; see also Miintz, Raphael, sa vie, &c, p. 315 (Paris, 1881). Minghetti (Ntwva Antologia, 1883) throws doubt on the date of this letter.

6 Miintz, " Michel-Ange et Raphael a la cour de Rome," Gaz. des B. Arts, March and April 1882, and Les arts a la cour des papes, vol. iii. (Paris, 1884)

walls with paintings in the more developed but less truly decora- tive style ot Raphael. It was not without regret that Raphael saw the destruction of this noble series of frescoes. One vault, that of the Stanza dell' Incendio, painted by his master Perugino, he saved from obliteration; it still exists, well preserved, a most skilful piece of decorative work; and he also set his pupils to copy a number of portrait-heads in the frescoes of Piero della Francesca before they were destroyed. 1 Fig. 3 shows the positions of Raphael's frescoes in the stanze, which, both from their size and method of lighting, are very unsuited for the reception of these large pictures. The two most im- portant rooms (A and B) are small, and have an awkward cross-light from opposite windows. 2

Stanza della Segnatura (papal signature room), painted in 1509-11 (A on fig. 3). The first painting executed by Raphael in the stanze was the so-called Disputa, finished in 1509. It is very unlike the later ones in style, showing the beginning of transition from his Florentine to his 'Roman manner"; as a decorative work it is very superior to the other frescoes ; the figures are much smaller in scale, as was suitec 1 to the very moderate size of the room, and the whole is arranged mainly on one plane, without those strong effects of perspective which are so unsuited to the decorative treat- ment of a wall-surface. In its religious sentiment, too, it far excels any of the later stanze paintings, retaining much of the sacred character of earlier Florentine and Umbrian art. As a scheme of decoration it appears to have been suggested by some of the early apsidal mosaics. Fig. 4 shows the disposition of its main masses, which seem to indicate the curved re- cess of an apse. Gold is largely used, with much richness of effect, while the later

purely pictorial frescoes have little or none. The subject of this magnificent painting is the hierarchy ot the church on earth and its glory in heaven. 3 The angels in the upper tier and the nude cherubs who carry the books of thi Gospels are among the most beautiful figures that Raphael ever painted.

The painting on the vault of this room is the next in date, and shows further transition towards the " Roman manner." In his treatment of the whole Raphael has, with much advantage, been partly guided by the painting of Perugino's vault in the next room (C). Though not without faults, it is a very skilfui piece of decora- tion; the pictures are kept subordinate to the lines of the vault, and their small scale adds greatly to the apparent size of the whole. A great part of the ground is gilt, marked with mosaic-like squares, a common practice with decorative painters — not intended to de- ceive the eye, but simply to give a softer texture to the gilt surface by breaking up its otherwise monotonous glare. The principal medallions in each cell of this quadripartite vault are very graceful female figures, representing Theology, Science, Justice, and Poetry. Smaller subjects, some almost miniature-like in scale, are arranged in the intermediate spaces, and each has some special meaning in reference to the medallion it adjoins; some of these are painted in warm monochrome to suggest bas-reliefs. The fine painting of the " Flaying of Marsyas ' ' is interesting as showing Raphael's study of antique sculpture: the figure of Marsyas is a copy of a Roman statue, of which several replicas exist. The very beautiful little picture of the " Temptation of Eve " recalls Albert Diirer's treatment of that subject, though only vaguely. Much mutual admiration existed between Raphael and Diirer: in 1515 Raphael sent the German artist a most masterly life study of two nude male figures (now at Vienna) ; on it is written in Albert Diirer's beautiful hand the date and a record of its being a gift from Raphael. It is executed in red chalk, and was a study for two figures in the " Battle of Ostia " (see below).

On the wall opposite the Disputa is the so-called School of Athens. 4

Fig. 4 — Diagram to show main lines of the Dis- puta, suggesting an apse, with mosaic decoration.

1 How fine these portrait-heads probably were may be guessed from Piero 's magnificent frescoes at Arezzo, in the retro-choir of 6. Francesco.

2 See Brunn, Die Composition der WandgemcUde Raphaels im Vatican (Berlin), and Gruyer, Les fresques de Raphael au Vatican (Paris, 1859).

- *It need hardly be said that the name Disputa is a misnomer; there could be no dispute among the saints and doctors of the church about so well-established a dogma as the real presence: the mon-*

strance with the Host below and the figurt of Christ above indicate His double presence both on earth and in heaven. Dr Braun, Springer, and Hagen have published monographs in German on this painting.

4 See Trendelenburg, tjber Rafael's Schule von Athen (Berlin, 1843), and Richter (same title) (Heidelberg, 1882); the title "School of Athens " is comparatively modern.

In this and the succeeding frescoes all notion of decorative treat- ment is thrown aside, and Raphael has simply painted a magnifi- cent series of paintings, treated as easel pictures might have been, with but little reference to their architectural surroundings.' The subject of this noble fresco, in contrast to that opposite, is " Earthly Knowledge," represented by an assembly of the great philosophers, poets and men of science of ancient Greece. The central figures are Plato and Aristotle, while below and on each side are groups arranged with the most consummate skill, including the whole " filosofica famiglia " of Dante {Infer, iv. 133-144), and a number of other leaders of thought, selected in a way that shows no slight acquaintance with the history of philosophy and science among the ancient Greeks. Many interesting portraits are introduced — Bramante as the aged Archimedes, stooping over a geometrical diagram; a beautiful fair-haired youth on the left is Francesco Maria della Rovere, duke of Urbino; and on the extreme right figures of Raphael himself and Sodoma are introduced (see fig. 5, below). The stately building in which these groups are arranged is taken with modifications from Bramante's first design for St Peter's. Over the window (No. 6 on fig. 3) is a group of poets and musicians on Mount Parnassus, round a central figure of Apollo; it contains many heads of great beauty and fine portraits of Dante and Petrarch. The former, as a theologian, appears also in the Disputa. Over the opposite window (No. 5) are graceful figures of the three chief Virtues, and at one side (No. 4) Gregory IX. (a portrait of Julius II.) presenting his volume of decretals to a jurist; beside him is a splendid portrait of Cardinal de' Medici (afterwards Leo X.) before his face was spoiled by getting too stout. This painting shows the influence of Melozzo da Forli. 6 On the other side Justinian presents his code to Trebonianus (No. 3) ; this is inferior in execution, and appears to have been chiefly painted by pupils.

The next room (B), called La Stanza d'Eliodoro, was painted in 1511-14; 7 it is so called from the_ fresco (No. 7 in fig. 3) represent- ing the expulsion of Heliodorus from the Temple (2 Mace. iii.),an allusion to the struggles between Louis XII. of France and Julius II. The whole spirit of the subjects in this room is less broad and tolerant than in the first: no pagan ideas are admitted, and its chief motive is the glorification of the pontificate, with insistence on the temporal power. The main incident of

this picture is the least successful part of it : the angel visitant on the horse is wanting in dignity, and the animal is poorly drawn, as is also the case with the horses of Attila's army in the fresco opposite. The group of women and children on the left is, however, very beautiful, and the figures of Julius II. and his attendants are most nobly designed and painted with great vigour. The tall standing figure of Marc Antonio Raimondi, as one of the pope's bearers, is a marvellous piece of portrait-painting, as is also the next figure who bears his name on a scroll— 10 . PETRO . DE . FOLIARHS . CREMONEN. Behind, Giulio Romano is represented as another papal attendant. This picture was completed in 1512. Over the window (No. 8) is the scene of the Miracle at Bolsena'of 1264, when the real presence was proved to a doubting priest by the appearance of blood-stains on the Corporal (see Orvieto). Julius II. is introduced kneeling behind the altar; and the lower spaces on each side of the windows are filled with two groups, that on the left with women, that on the right with officers of the papal guard. The last group is one of the most masterly of all throughout the stanze: each face, a careful portrait, is a marvel of expression and power, and the technical skill with which the whole is painted to the utmost degree of finish, almost without any tempera touches, is most wonderful. The next fresco in date (No. 10) is that of the Repulsion of Attila from the walls of Rome by Leo I., miraculously aided by the apparitions of St Peter and St Paul; it contains another allusion to the papal quarrels with France. It was begun in the lifetime of Julius II., but was only half-finished at the time of his death in 1513; thus it happens that the portrait of his successor, the Medici pope Leo X., appears twice over, first as a cardinal riding behind the pope, painted before the death of Julius II., and again in the character of S. Leo, instead of the portrait of Julius which Raphael was about to paint. 8 Attila with his savage-looking

6 He has shown great skill in the way in which he has fitted his end frescoes into the awkward spaces cut into by the windows, but they are none the less treated in a purely pictorial manner.

6 Compare his fresco of Sixtus IV., now in the picture-gallery of the Vatican.

7 The vault of this room is painted with scenes from the Old Testament on a harsh blue ground, much restored; they are prob- ably the work of Giulio Romano, and in a decorative way are very unsuccessful — a striking contrast to the beautiful vaults of Perugino and Raphael in rooms C and A. The deep blue grounds so much used by Raphael's school are very liable to injury from damp, and in most cases have been coarsely restored. Those in the Villa Madama are untouched, and in parts the damp has changed the ultramarine into emerald green.

8 A pen sketch in the Louvre by Raphael shows Julius II. in the place afterwards occupied by Leo X. ; another difference in this sketch is that the pope is borne in a chair, not on horseback as in the fresco.

army is not the most successful part of the fresco : the horses are very wooden in appearance, and the tight-fitting scale armour, put on in some impossible way without any joints, gives a very unreal and theatrical look to the picture. Part is the work of pupils. In 1514 he painted the " Deliverance of St Peter from Prison," with a further political allusion (No. 9). It is very skilfully arranged to fit in the awkward space round the window, and is remarkable for an attempt, not much suited for fresco-painting, to combine and contrast the three different qualities of light coming from the moon, the glory round the angel, and the torches of the sentinels.

For room C Raphael designed and partly painted the " Incendio del Borgo " (No. 11), a fire in the Borgo or Leonine City, which was miraculously stopped by Leo IV. appearing and making the sign of the cross at a window in the Vatican. On the background is shown the facade of the old basilica of St Peter, not yet destroyed when this fresco was painted. One group on the left, in the fore- ground, is remarkable for its vigour and powerful drawing; the motive is taken from the burning of Troy; a fine nude figure of z£neas issues from the burning houses bearing on his back the old Anchises and leading the boy Ascanius by the hand. Some of the female figures are designed with much grace and dramatic power. Many studies for this picture exist. This is the last of the stanze frescoes on which Raphael himself worked. Others designed by him and painted by Giuiio Romano, Gianfrancesco Penni, and other pupils were the " Battle of Ostia " (No. 12), a very nobly composed picture, and the " Oath of Leo III. before Charlemagne " (No. 14). The other great picture in this room (No. 13), the " Coronation of Charlemagne " (a portrait of Francis I. of France), is so very inferior in composition that it is difficult to believe that Raphael even made a sketch for it. The enormous fresco of the " Defeat of Maxentius by Constantine " (room D, No. 17) was painted by Giuiio Romano, soon after Raphael's death, from a sketch by the latter; it is even more harsh and disagreeable in colour than most of Giuiio Romano's early frescoes. 1 Among the other very inferior frescoes in this great hall are two female figures (Nos. 15 and 16) representing Comitas and Justitia, painted on the wall in oil colours, very harmonious and rich in tone; they are usually, though wrongly, attributed to Raphael himself.

Technical Methods employed in Raphael's Frescoes. — Having made many studies, both nude and draped, for single figures and groups, the painter made a small drawing of the whole composition, which was enlarged by his pupils with the help of numbered squares, drawn all over it, to the full size required, 2 on paper or canvas. Holes were then pricked along the outlines of the cartoon, and the design pounced through on to an undercoat of dry stucco on the wall, with pounded charcoal and a stiff brush. Over this, early in the morning, a patch of wet stucco was laid, about enough to serve for the day's painting; this of course obliterated the out line on the wall, and the part covered by the patch was again sketched in by freehand, with a point on the wet stucco, so as to be a guide for the outline traced with the brush and the subsequent painting. A line impressed on the wet stucco was easily smoothed out, but a touch of the brush full of pigment sank deeply into the moist stucco, and could not easily be effaced. It will thus be seen that in fresco painting the only use of pouncing the whole design on to the wall was to keep the general positions of the figures right, and was no guide as to the drawing of each separate part. Fig. 5 shows the portrait-heads of himself and Perugino (?), at the extreme right of the School of Athens; on this are visible many of the impressed sketch-lines, and also part of the " fresco edge " of the patch on which this part is painted. The heads in this figure are less than one day's work. It will be seen that there is no attempt at any accuracy of drawing in the impressed lines. Raphael, especially in his later frescoes, worked with wonderful rapidity: three life-sized busts, or half a full-length figure, more than life-size, was a not unusual day's work. In some of the frescoes the edges of each day's patch of stucco can easily be traced, especially in the Incendio del Borgo, which has a strong side light. In the Disputa much use was made of tempera in the final touches, but less was used in the subsequent frescoes, owing to his increasing mastery of the difficulties of the process.

The paintings in the stanze were only a small part of Raphael's work between 1509 and 1513. To this period belong the Madonna of Foligno (Vatican), painted in 1511 for Sigismondo Conti; it is one of his most beautiful compositions, full of the utmost grace and sweetness of expression, and appears to be wholly the work of his hand. It has suffered much from repainting. Of about the same date are the gem-like Garvagh Madonna (National Gallery, bought for £9000; once in the possession of the Aldobrandini family), the Diademed Virgin

1 See Montagnani, Sala di Costantino (Rome, 1834). Though he was never a good colourist, the great frescoes by Giuiio Romano in the Palazzo del Te, Mantua, show some improvement as compared with his Roman work.

1 These three stages were usually distinguished as study, sketch and cartoon.

of the Louvre, and the Madonna del Pesce at Madrid. The last is a very noble picture but the design is more pleasing than the

Fig. 5.— Heads of Raphael and Perugino (?), from the School of Athens, showing incised lines and " fresco edges."

colour, which, like other paintings of Raphael's at Madrid, suggests the inferior touch of a pupil; it was executed in 1513 for S. Domenico in Naples. In addition to other easel pictures a number of his finest portraits belong to this period — that of Julius II. (Uffizi), 3 of which a good replica or con- temporary copy exists in the National Gallery, the so-called Fornarina in the Palazzo Barberini, the Baldassare Castiglione of the Louvre, and the unfinished portrait of Federigo Gonzaga of Mantua.

When Giovanni de' Medici, at the age of thirty-eight, became pope as Leo X., a period of the most glowing splendour and reckless magnificence succeeded the sterner rule of Julius II. Agostino Chigi, the Sienese financier, was the chief of those whose lavish expenditure contributed to enrich Rome with countless works of art. For him Raphael painted, in 1513-14, the very beautiful fresco of the Triumph of Galatea in his new palace by the Tiber bank, the Villa Farnesina, and also made a large series of magnificent designs from Apuleius's romance of Cupid and Psyche, which were carried out by a number of his pupils. 4 These cover the vault and lunettes of a large loggia (now closed in for protection) ; in colouring they are mostly harsh and gaudy, 6 as is usually the case with the works of his pupils, a great contrast to the fresco of the Galatea, the greater part of which is certainly the master's own work. 6 For the same patron he painted (also in 15 13) his celebrated Sibyls

3 A very fine ancient copy of this portrait is in the Pitti Palace ; certain peculiarities in its execution show it to be by some Venetian painter, as was pointed out to Professor Middleton by Mr Fairfax Murray.

4 Chiefly by Giuiio Romano, Gianfrancesco Penni and Giovanni da Udine; much injury has been done to these frescoes by re- painting, especially in the coarse blue of the ground.

6 These and other frescoes by his pupils are much disfigured by the disagreeable hot tone of the flesh, very unlike the pearly tone of the flesh of Galatea.

6 Dorigny, Psychis et Anions fabula a Raphaele, &c. (Rome, 1693); and Gruner, Fresco Decorations in Italy (London, 1854), pis. 16-18. The group of the Triton and Nymph on the left of the composition was probably executed by Giuiio Romano.

in S. Maria della Pace, — figures of exquisite grace, arranged with perfect skill in an awkward space. It is not without

reason that Vasari gives these the highest position among his fresco-paintings. 1 Agos- tino Chigi also employed Raphael to build for him a private chapel I in S. Maria del Popolo, and to make a series of cartoons to be exe- cuted in mosaic on the inner dome. 2 The central medal- lion has a figure of God among clouds and angel boys, Fig. 6. — Mosaic of God creating the stars, such as Raphael from the Chigi chapel, in centre of dome, drew with un- designed by Raphael. rivalled grace (fig.

6), and around are the eight planets, each with its pagan deity and directing angel. 3 He has not hampered himself by any of the usual rules which should apply to the design- ing of mosaic; they are simply treated as pictures, with almost deceptive effects of perspective. The execution of these brilliant mosaics was carried out by the Venetian Luigi della Pace, whose signature is introduced on the torch of Cupid in the panel representing the star Venus (Ludovico della Pace Veneziano fecit, 1516). These mosaics are still as perfect and brilliant as if they were the work of yesterday. Probably in the early years of Leo X.'s reign were painted the Madonna della Seg-giola (Pitti), the S. Cecilia at Bologna (not completed till 1516), the miniature Vision of Ezekiel (Pitti) and three important pictures at Madrid. The latest of these, known as Lo Spasimo, from the church at Palermo, for which it was painted, is one of Raphael's finest compositions, representing Christ bearing His Cross. It bears signs of Giulio Romano's hand in its heavy colouring with unpleasant purple tones. The Madonna called Delia Perla has much changed from the darkening of the pig- ments; in design it recalls Leonardo da Vinci. 4 The small Madonna della Rosa is the most perfect in colour of all the master's pictures in the Madrid Gallery, and is usually rather undervalued; it is a most graceful little picture. The portrait of Leo X. with Cardinals de' Rossi and de' Medici, in the Pitti, is one of his finest portrait-pictures, especially as regards the figure of the pope. 6 Little is known about the Madonna di S. Sisto, the glory of the Dresden Gallery; no studies or sketches for it exist. In style it much resembles the Madonna di Foligno; it is less injured by restoration than the latter.

Among the latest works of Raphael are the large " St Michael and the Devil," in the Louvre, signed " Raphael Urbinas pinge- bat, mdxviii.," and the very beautiful portrait of the Violin- player, in the Sciarra-Colonna Palace in Rome, also dated 1 518; this last bears much resemblance to the painter himself. The British Museum possesses one of Raphael's finest

portraits,

1 Thanks to Michelangelo's generous intervention, Raphael was paid the large sum for that time of 900 gold ducats for this fresco.

2 Gruner, Mosaici in S. Maria del Popolo (Rome, 1839).

3 In accordance with Dante's scheme in the Paradiso.

- *La Perla, " the pearl " of the Spanish royal collection, was originally painted for Bishop Louis of Canossa; it was sold by Cromwell with the greater part of Charles I.'s collection at Hampton Court. The composition, though not the execution, of this picture belongs to Raphael's early years in Rome; it is very remarkable for its delicacy of touch and high finish.*

6 The magnificent portrait-heads of the Venetian scholars Nava- gero and Beazzano, now in the Doria Gallery in Rome, are worthy of Raphael at his best, and have for long been attributed to him. There are good contemporary copies at Madrid.

though only a chalk drawing, that of his friend the painter Timoteo della Vite, a masterpiece of expression and vigour; it is executed in black and red, and is but little inferior in chromatic effect to an oil-painting; it is life size, and is exe- cuted with wonderful skill and evident keen interest in the subject.

The tapestry cartoons, seven of which are in the Victoria and Albert Museum, were painted by pupils from Raphael's designs. They are part of a set of ten, with scenes from the Acts of the Apostles, intended, when copied in tapestry, to adorn the lower part of the walls of the Sistine chapel. The tapestries themselves, worked at Brussels, are now, after many vicissitudes, hung in a gallery in the Vatican; the set is complete, thus preserving the design of the three lost cartoons. The existing seven, after being cut up into strips for use on the looms, were bought by Rubens for Charles I. 6 The tapestry copies are executed with wonderful skill, in spite of Raphael's having treated the subjects in a purely pictorial way, with little regard to the exigencies of textile work. The designs are reversed, and the colours far more brilliant than those of the cartoons, much gold and silver being introduced. The noble figure of Christ in the Delivery of the Keys to St Peter is in the tapestry much disfigured by the addition of a number of large gold stars all over the drapery, which spoil the simple dignity of the folds. The rich framework round each picture, designed by Raphael's pupils, probably by Penni and Giovanni da Udine, exists in the tapestries and adds greatly to their decorative effect. The cartoons were executed in

1515 and 1516, and the finished tapestries were first exhibited in their place in the Sistine chapel on the 26th of December 1 5 19 — a very short time for the weaving of such large and elaborate pictures. The three of which the cartoons are lost represent the Martyrdom of St Stephen, the Conversion of St Paul, and St Paul in Prison at Philippi. Probably no pictures are better known to have been more often engraved and copied than these seven cartoons. 7

The Transfiguration} — In 15 19 Cardinal Giuliano de' Medici (afterwards Clement VII.), as bishop of Narbonne, ordered two altar-pieces for his cathedral — the one by Raphael, the other by Raphael's Venetian rival Sebastiano del Piombo. That by the latter painter is the noble Resurrection of Lazarus, now in the National Gallery, in the drawing of which the Venetian received important aid from Michelangelo. Several studies for Raphael's picture exist, showing that he at first intended to paint a Resurrection of Christ as a pendant to Sebastiano's subject, but soon altered his scheme into the Transfiguration. The eight or nine existing studies are scat- tered through the Oxford, Lille, Windsor and some private collections. A great part of the lower group was unfinished at the time of the painter's sudden death in 1520, and a good deal of the heavy colouring of Giulio Romano is visible in it. On the death of Raphael the picture became too precious to send out of Rome, and Cardinal de' Medici contented himself with sending the Resurrection of Lazarus to Narbonne. The Transfiguration was bequeathed by him to the monks of S. Pietro in Montorio, in whose church it remained till it was stolen by Napoleon I. It now hangs in the Vatican Gallery.

Architectural Work. 9 — Though he designed but few buildings, Raphael's great repute even in this branch of art is shown by the

6 Fortunately they were not sold with the bulk of Charles's collection, and remained at Hampton Court till a few years ago. See Koch, Rafael's Tapeten im Vatican (Vienna, 1878), and Miintz, Hist, de la tapisserie italienne (Paris, 1880).

' The name " arazzi " given by Italians to these tapestries is derived from Arras, where they were erroneously thought to have been woven; they were made at Brussels. It is much to be re- gretted that visitors to the Vatican are no longer allowed to see these priceless examples of textile work.

8 See Morgenstern, Uber Rafael's Verklarung (Leipzig, 1822), and Justi, Die Verklarung Christi (Leipzig, 1870).

9 See Ojetti, Discorso su Raffaello Architetto_ (Rome, 1883), but more especially Geymiiller's work mentioned in the text, and his Projets primitifs

pour la Bas. de S. Pierre (Paris, 1875-80); also the works of Hofmann and Bloch (Dresden, 1900).

fact that Bramante, before his death in March 15 14, specially requested that Raphael should be made his successor as chief architect of St Peter's. To this most important post he was ap- pointed by a brief of Leo X., dated the 1st of August 1514. The progress of St Peter's was, however, too slow for him to leave much mark on its design. Another work of Bramante's completed, by Raphael, was the graceful Cortile di S. Damaso in the Vatican, including the loggie, which were decorated with stucco-reliefs and paintings of sacred subjects by his pupils under his own supervision, but only very partially from his designs. 1 The Palazzo dell' Aquila, built for Giovanni Battista Branconio, and destroyed in the 17th century during the extension of St Peter's, was one of Raphael's chief works as an architect. He also designed the little cross church, domed at the intersection like a miniature St Peter's, called S. Eligio degli Orefici, which still exists near the Tiber, almost opposite the Farnesina gardens, a work of but little merit. According to M. Geymiiller, whose valuable work, Raffaello come Architetto (Milan, 1883), has done so much to increase our knowledge of this subject, the Villa Farnesina of Agostino Chigi, usually attri- buted to Peruzzi, was, as well as its palace-like stables, designed by Raphael; but internal evidence makes this very difficult to believe. It has too much of the delicate and refined character of the 15th century for Raphael, whose taste seems to have been strongly inclined to the more developed classic style, of which Palladio afterwards became the chief exponent. The Palazzo Vidoni, near S. Andrea della Valle, also in Rome, is usually attributed to Raphael, but an original sketch for this in Peruzzi's own hand has recently been identified among the collection of drawings at Siena; this, however, is not a certain proof that the design was not Raphael's. M. Geymiiller has, however, shown that the Villa Madama, on the slopes of Monte Mario above Rome, was really designed by him, though its actual carrying out, and the unrivalled stucco- reliefs which make its interior one of the most magnificent palaces in the world, are due to Giulio Romano and Giovanni da Udine, as mentioned in Vasari's life of the latter. 2 The original design for this villa made by Raphael himself has been discovered by M. Geymiiller. Anotherarchitectural work was the little Chigi chapel in S. Maria del Popolo, built in 1516, for the dome of which the above- mentioned mosaics were designed (see fig. 6). At the time of his death he was preparing to build himself a handsome palace near the church of S. Eligio; the deed for the purchase of its site was signed by him only a few days before his last short illness. Though not completed till 1530, the

Palazzo Pandolfini at Florence was also designed by him; it is a dull scholastic building without any special beauty either in proportion or treatment of the mass; it is illustrated by Montigny and Famin, Architecture Toscane (Paris, 1815), pis. 33-36.

A sober criticism of Raphael's architectural works must force one to refuse him a high position in this branch of art. In the church of S. Eligio and the Chigi chapel he is merely a copyist of Bramante, and his more original works show but little power of invention or even mastery of the first principles of architectural design. His details are, however, often delicate and refined (especially in the Palazzo Pandolfini), and he was supremely success ful in the decorative treatment of richly ornamented interiors when he did not, as in some of the Vatican stanze, sacrifice the room to the frescoes on its walls.

Sculpture. — That Vasari is right in attributing to him the model for the beautiful statue of Jonah in the Chigi chapel (fig. 7) is borne witness to by two important documents, which show that his almost universal talents led him to attempt with success the preliminary part of the sculptor's art, though there is no evidence to show that he ever worked on marble.' One of these is a letter written to Michelangelo to warn him that Raphael had been in- vading his province as a sculptor by modelling a boy, which had been executed in marble by a pupil, and was a work of much beauty. Again, after his death his friend Baldassare Castiglione, in a letter

1 See Mariani, La Bibbia nelle Loggie del Vaticano (Rome) ; Anon., Dipinti nelle Loggie del Vaticano (Rome, 1841); and Gruner, Fresco Decorations (London, 1854), pis. 1-5. Too great a share in the decoration of the loggie is usually given to Raphael; not only the harsh colour but also the feebleness of much of the drawing shows that he can have had but little to do with it.

2 See Gruner, Fresco Decorations, &c. (London, 1854), pis. 6-12, and Raffaelle Santi, Ornati della Villa Madama, &fc. (Rome, 1875). Two other little known but very beautiful architectural works, executed under Raphael's influence by his pupils, are the bathroom of Cardinal Bibbiena in the Vatican and the bathroom of Clement VII. in the castle of S. Angelo, both richly decorated with delicate stucco-reliefs and paintings, treated after a classical model.

3 See note on p. 369, vol. iv., of Milanesi's edition of Vasari (Florence, 1879). To one branch of the sculptor's art, practised under Raphael's supervision, belong the elaborate and delicately executed stucco-reliefs of the loggie and elsewhere. Among these occur many panels with figure-subjects, large in scale and important in composition; those executed during

his lifetime are free from the too pictorial character which is an obvious fault in the very magnificent reliefs of the Villa Madama.

Fig. 7. — Statue of Jonah in the Chigi chapel, designed by Raphael, sculptured by Lorenzetto ; heroic size.

dated the 8th of May 1523, asks his steward in Rome " if Giulio Romano still possesses a certain boy in marble by Raphael and what his lowest price for it would be," — " s'egli [Giulio Romano] ha piu quel puttino di marmo di mano di Raffaello e per quanto si daria all' ultimo." A group in marble of a Dead Boy on his Dolphin Playfellow, now in the St Petersburg Hermitage, has been erroneously supposed to be Raphael's " puttino," which has also been identified with a statu- ette of a child formerly at Florence in the pos- session of Signor Molini. 4 The statue of Jonah was executed in marble by Lorenzetto, a Florentine sculptor; and it re- mained in his studio for many years after Ra- phael's death. The Vic- toria and Albert M useum possesses a small clay sketch for this beautiful group, slightly different from the marble; it is probably the original design by the master's own hand. The whole feeling of the group — a beautiful youth seated on a sea-monster — is purely classical, and the motive is probably taken from some antique statue representing Arion or Taras on a dolphin. 6 Being intended for a church it was necessary to give the figure a sacred name, and hence the very incongruous title that it received. There is no trace of Raphael's hand in the design of the other statue, an Elijah by Lorenzetto, though it also is ascribed to him by Vasari.

Lesser Arts practised by Raphael. — Like other great artists, Raphael did not disdain to practise the lesser branches of art: a design for a silver perfume-burner with female caryatids is preserved in an engraving by Marco da Ravenna; and he also designed two handsome repouss6 salvers for Agostino Chigi, drawings for which are now at Dresden. In designs for tarsia-work and wood-carv- ing he was especially skilful; witness the magnificent doors and shutters of the stanze executed by his pupil Giovanni Barile of Siena. 6 The majolica designs attributed to him were by a name- sake and relation called Raffaello di Ciarla; 7 and, though many fine dishes and ewers of Urbino and other majolica are decorated with Raphael's designs, they are all taken from pictures or engrav- ings, not specially done by him for ceramic purposes. With the frivolity of his age Leo X. occasionally wasted Raphael's skill on unworthy subjects, such as the scenery of a temporary theatre; and in 1516 the pope set him to paint in fresco the portrait life-size of a large elephant, the gift of the king of Portugal, after the animal was dead. 8 This elephant is also introduced among the stucco reliefs of the Vatican loggie, with the poetaster Barrabal sitting in mock triumph on its back.

Though Raphael himself does not appear to have practised the art of engraving, yet this formed one of the many branches of art which were carried on under his supervision. A large number of his designs were engraved by his pupils Marcantonio Raimondi and Agostino Veneziano. These valuable engravings are from Raphael's sketches, not from his finished pictures, and in some cases they show

4 See Appendix, p. 406, vol. iv., of Milanesi's edition of Vasari; Rembadi, Del putto . . . di Raffaello (Florence, 1872); Gennarelli, Sopra una Scultura di Raffaello (Florence, 1873). The evidence which would attribute this piece of sculpture to Raphael is almost worthless. See on the St Petersburg group, Guodeonoff, Uber die dem Raphael zugeschr. Marmorgruppe (St Petersburg, 1872).

6 Compare this latter subject on reverses of the beautiful di- drachms of Tarentum, c. 300 B.C.

*6 The very beautiful and elaborate choir-stalls of the church of S. Pietro de' Casinensi at Perugia, with panels carved in relief, executed ■ n *535 by Stefano da Bergamo, are mainly adapted from Raphael's designs.*

7 Campori, Notizie Stor. d. Maiolica di Ferrara (3rd ed., Pesaro, 1879), pp. 132-133.

8 Under it was inscribed — " Raphael Urbinas quod natura ab- stulerat arte restituit."

important alterations made in the execution of the picture. Raimondi's engraving of the S. Cecilia of Bologna in design is very inferior to that of the actual painting. Several of Raphael's most important compositions are known to us only by these early engravings, e.g. the Massacre of the Innocents (engraved by Raimondi), which is one of his finest works, both for skilful com- position and for masterly drawing of the nude. Another magnifi- cent design is the Judgment of Paris, containing a large number of figures; the nude figure of Minerva is a work of especial force and beauty. A standing figure of Lucretia 1 about to stab herself is also one of his most lovely figures. Many of Raphael's studies for Marcantonio's engravings still exist.

Archaeology. — As an antiquary Raphael deserves to take the highest rank. His report 2 to Leo X. in 1518 is an eloquent plea for the preservation of ancient buildings. In 1515 he had been appointed by Leo X.

inspector of all excavations in Rome and within 10 miles round. His careful study of the antique, both statues and modes of decoration, is clearly shown in many of his frescoes, and especially in the graceful stucco reliefs and painted grotteschi, of which he and his pupils made such skilful use in the decorations of the Vatican loggie, the Villa Madama and elsewhere. 3

Raphael's Fame. — Among all the painters of the world none has been so universally popular as Raphael, or has so steadily main- tained his pre-eminent reputation throughout the many changes in taste which have taken place in the last three and a half centuries. Apart from his combined merits as a draughtsman, colourist and master of graceful composition, he owes the constancy of admiration which has been felt for him partly to the wide range of his subjects, but still more to the wonderful varieties of his style. If the authorship of his paintings were unknown, who would guess that the Sposalizio of the Brera, the Madonna del Baldacchino of the Pitti, and the Transfiguration could possibly be the work of one painter? In the seventeen or eighteen years which composed his short working life he passed through stages of development for which a century would not have seemed too long, while other painters lived through the same changeful time with but little alteration in their manner of work. Perugino, who outlived his wonderful pupil, completed in 1 52 1 Raphael's San Severo fresco in a style differing but little from his paintings executed in the previous century.

In versatility of power Raphael (as a painter) remains almost without a rival; whether painting an altar-piece for a church, a large historical fresco, a portrait or decorative scenes from classical mythology, he seems to excel equally in each; and the widely different methods of painting in tempera, oil or fresco are employed by him with apparently equal facility. His range of scale is no less remarkable, varying from a miniature, finished like an illuminated MS., to colossal figures in fresco dashed in with inimitable breadth and vigour.

His personal beauty, charm of manner and deep kindliness of heart endeared him to all who knew him. 4 His sincere modesty was not diminished by his admission as an equal by the princes of the church, the distinguished scholars and the world-famed men of every class who formed the courts of Julius II. and Leo X. 'In accordance with the spirit of the age he lived with considerable display and luxury, and was approached with the utmost deference by the ambassadors of foreign princes, whether their master desired a picture, or, as the duke of Ferrara did, sent to consult him on the best cure for smoky chimneys. To his pupils he was as a father, and they were all, as Vasari says, " vinti dalla sua cortesia "; they formed round him a sort of royal retinue, numbering about fifty youths, each talented in some branch of the arts. 5 Giuiio Romano and Gianfrancesco

Penni, his two favourite pupils, lived with him in the Palazzo di Bramante, a house near St Peter's, where he resided during the greater part of his life in Rome. This fine

1 On a pedestal is inscribed in Greek — " Better to die than live basely."

2 Published by Visconti, Letlera di Raffaello a Leone X. (Rome, 1840); see also Miintz, " Raphael Archeologue," &c, Gaz. des B. Arts, October and November 1880.

1 See Gruyer, Raphael el I'antiquile (Paris, 1864).

- *See the eloquent eulogy of his character at the end of Vasari's Life.*

6 See Minghetti, " Gli Scolari di Raffaello." Nuova Antologia (June 1880).

palace, designed by Bramante, was destroyed in the 17th century at the same time as Raphael's Palazzo dell' Aquila.

It is difficult to realize the grief and enthusiasm excited by the master's death on Good Friday (April 6th) 1520. at the age of thirty-seven exactly, after an attack of fever which lasted only ten days. His body was laid out in state in his studio, by the side of the unfinished Transfiguration, and all Rome flocked to the place for a last sight of the " divino pittore." His property amounted to about £30,000; his drawings and MSS. he left to Giuiio Romano and Gianfrancesco Penni; his newly bought land to Cardinal Bibbiena, the uncle of the lady to whom he had been betrothed; there were liberal bequests to his servants; and the rest was mostly divided among his relatives at Urbino. He desired to be buried in the Pantheon, under the noble dome which he and Bramante had dreamed of rival- ling. His body is laid beside an altar, which he endowed with an annual chantry, and on the wall over it is a plain slab, with an inscription written by his friend Cardinal Bembo. Happily his grave has as yet escaped the disfigurement of a pretentious monument such as those erected to Michelangelo, Dante and other great Italians; it has not, however, remained undis- turbed: in 1833 it was opened and the bones examined. 6 In March 1883 a festival was held at Urbino, on the occasion of the 4th centenary of his birth, and on this occasion many interesting articles on Raphael were published, especially one by Gey- miiller, " Le IV me centenaire de la naissance de Raphael," 1483-1883, in the Gaz. de Lausanne, March 1883.

Literature. — Comolli, Vita inedita di Raffaello (1790); Duppa, Life of Raphael (London, 1816); Braun, Raphael . . . Leben und Werke (Wiesbaden, 1819); Fea, Raffaello . . . ed alcune di lui Opere (Rome, 1822); Rehberg, Rafael Sanzio aus Urbino (Munich, 1824); Quatremere

de Quincy, Vila ed Opere di Raffaello, trans, by Longhena (Milan, 1829) (a work marred by many inaccuracies); Rumohr, Uber Raphael und sein Verhallniss (Berlin, 1831); Rio, Michelange et Raphael (Paris, 1863); Gruyer, Raphael et I'antiquile (Paris, 1864), Les vierges de Raphael (Paris, 1878) and Raphael, peintre de portraits (Paris, 1880); Grimm, Das Leben Raphaels von Urbino (Berlin, 1872) (intended specially to point out the errors of Vasari and Passavant, and not written in a very fair spirit) ; Gher- ardi, Delia Vita di Raffaello (Urbino, 1874); Anton Springer, Raffael und Michelangelo (Leipzig, 1878) ; C. C. Perkins, Raphael and Michel- angelo (Boston, 1878) ; Dohme, Kunst und Kilnstler des Mitlelalters (Leipzig, 1878) (vol. ii. of this valuable work, with many illustrations, is devoted entirely to Raphael and Michelangelo); Alippi, II Raffaello (Urbino, 1880); Clement, Michelange el Raphael (5th ed., improved) (Paris, 1881); Eug. Miintz, Raphael, sa vie, son muvre, &c. (Paris, 1881) (with numerous well-chosen illustrations); Passa- vant, Rafael und sein Vater (Leipzig, 1839-58) (a valuable book, especially for its list of Raphael's works; a new edition translated by Guasti into Italian was published at Florence in 1882, but this edition is in no way superior to the French one of Lacroix (Paris, i860), which is a great advance on the original German text) ; Crowe and Cavalcaselle, Life and Works of Raphael (London, 1 882- 85) ; Eug. Miintz, Les historiens et les critiques de Raphael (Paris, 1883) (contains a good bibliography of the subject) ; Morelli, Italian Masters (in German, 1880; in English, 1882, and subsequently republished), — practically the starting-point of modern technical criticism; B. Berenson, Central Italian Painters (1897) (expert characterization and list of works).

Reproductions of_ Raphael's Works. — From the time of Raimondi downwards no painter's works have been so frequently engraved. The Calcografia Camerale (now called Regia) of Rome possesses an enormous number of copper-plates of his pictures by a great many good (and bad) engravers of the 1 8th and 19th centuries. Electrotypes of the old coppers are still worked, and are published by the Stamperia at very moderate prices; in the catalogue Nos. 736 to 894 are the works of Raphael, including several books of engravings containing whole sets, such as the Vatican loggie, &c. A very complete collection of photographs from these and other engravings was published by Gutbier and Liibke, Rafael's Werke, sammtliche Tafelbilder und Fresken (Dresden, 1881-82), in three large volumes, divided into classes, — pictures of the Madonna, frescoes, stanze of the Vatican, tapestry cartoons, &c. The descriptive text and life of Raphael are by Ltibke. The Malcolm, Oxford, British Museum, Lille, Louvre, Dresden and other collections of Raphael's drawings have mostly been published in photographic facsimile, and an enormous number of illustrated monographs on single pictures exist. Braun's autotypes of the

stanze and Farnesina frescoes are especially good. (J. H. M.)

6 See " Ritrovamento delle ossa di Raffaello," Soc. Virtuosi al Panteone (Rome, 1833); other pamphlets on this were pub- lished in the same year by Fea, Falconieri and Odescalchi.

RAPIER, the name given to two distinct types of sword. Originally the " rapier " (Fr. rapiere) was a long two-edged and pointed weapon with a wide cup hilt, used together with the dagger in fencing and duelling chiefly as a thrusting weapon, the cut taking a secondary position. This was the typical duelling sword of the 16th and 17th centuries. In the 18th century the " small-sword " took its place; this was a pointed weapon only, the " cut " having entirely dropped out, and the dagger being discarded. The word rapier is of doubtful origin. Du Cange (Glossarium, s.v. " Rapparia ") quotes an example of the word used as an adjective to qualify espee as early as 1474, and gives as a conjectural derivation Gr. pawiˆei.v = La.t. caedcre, to cut. Skeat (Etym. Did., 1910) follows the suggestion of Diez that rapiere is from raspiere, a rasper or poker, and was a name given in contempt by the old cut-and-thrust fencers to the new weapon. Spanish has raspadera, a raker, and there are several 16th and 17th century quotations alluding to the con- tempt with which the rapier was greeted, and to its Spanish origin (see Fencing and Sword).

RAPIN, PAUL DE (1661-1725), sieur of Thoyras, French historian, was the son of Jacques de Rapin, avocat at Castres (Tarn), where he was born on the 25th of March 1661. He was educated at the Protestant academy of Saumur, and in 1679 became an advocate, but soon afterwards entered the army. The revocation of the Edict of Nantes in 1685, and the death of his father led him to come to England; but, unable to find employment there, he crossed to Holland and enlisted in the company of French volunteers at Utrecht commanded by Daniel de Rapin, his cousin-german. He accompanied the prince of Orange to England in 1688, and during the Irish campaign he took part in the siege of Carrickfergus and the battle of the Boyne, and was wounded at the battle of Limerick. Soon afterwards he was promoted captain; but in 1693 he resigned in order to become tutor to the earl of Portland's son. After travelling with his charge, he settled with his family in Holland, first at the Hague, then, for economy's sake, at Wesel, in 1707, where he began his great work, L'Histoire d'Angleterre. Though he was of a strong constitution, the seventeen years' application ruined his health. He died in 1725.

Rapin was also the author of a Dissertation sur les Whigs et les Torys (1717). L'Histoire d'Angleterre, embracing the period from the invasion of the Romans to the death of Charles I., was printed at the Hague in 1724 in 8 vols. It was translated into English and improved with notes by Tindal, in 2 vols, folio, 1725-31. Rapin's history of England was almost the only one available in France in the first half of the 18th century.

RAPOPORT, SAMUEL JUDAH LOB (1790-1867), Jewish scholar, was born at Lemberg in 1 790. After various experiences in business, Rapoport became successively rabbi of Tarnopol (1837) and of Prague (1840). He was one of the founders of the new learning in Judaism. His chief work was the first part of an (unfinished) encyclopaedia ('Erekh Millin, 1852). Equally notable were his biographies of the Gaon Saadiah, Nathan author of the Arnkh, the Gaon Hai, Eleazar Kalir and others. He died at Prague in 1867. (I. A.)

RAPPAREE, properly a short pike (Irish rapaire); the term being hence applied in the war in Ireland from 1688-92 to the Irish irregular soldiers armed with this weapon. It thus became synonymous with robber or freebooter, and in 1707 appears in the title of an act (6 Anne, cap. n) " for the more effectual suppression of . . . robbers and rapparees."

RAPPOLTSWEILER (French Ribeauville) , a town of Germany, in the imperial province of Alsace-Lorraine. Pop. (1905) 5986. It lies at the entrance of the valley of the Strengbach, under the eastern slope of the Vosges mountains, 33 m. S.W. of Strass- burg on the railway to Basel, being connected with its station on that line, 2J m. distant, by a tramway. It is in part sur- rounded by ancient walls, and has many picturesque medieval houses, and two old churches, of St Gregory and St Augustine, both fine Gothic buildings. The town hall contains a valuable collection of antiquities. The Carolabad, a saline spring with a temperature of 64 F., which had a great repute in the middle ages, was rediscovered in 1888, and made Rappoltsweiler a

watering-place. The industries include the spinning and weaving of cotton and wool, printing, dyeing and tanning, while there is a brisk trade in wine.

Rappoltsweiler, known in the 8th century as Rathaldovilare, passed from the bishops of Basel to the lords of Rappoltstein, who were among the most famous nobles in Alsace. The lord of Rappoltstein was the king or protector of the wandering minstrels of the land, who purchased his protection by paying him a tax. When the family became extinct in 1673 this office of king of the pipers (Pfeiferkonig) passed to the counts palatine of Zweibriicken-Birkenfeld. The minstrels had a pilgrimage chapel near Rappoltsweiler, dedicated to their patron saint, Maria von Dusenbach, and

here they held an annual feast on the 8th of September. Near the town are the ruins of three famous castles, Ulrichsburg, Girsberg and Hohrappoltstein, which formerly belonged to the lords of Rappolt- stein. '

See Bernhard, Reckerches sur Vhistoire de la ville de Rappolts- weiler (Colmar, 1888); and Kube, Rappoltsweiler, das Carolabad und Umgebung (Strassburg, 1905). For the lords of Rappoltstein, see Brieger, Die Herrschaft Rappoltstein (Strassburg, 1907).

RARE EARTHS, in chemistry, the name given to a group of oxides of certain metals which occur in close association in some very rare minerals. Although these metals resemble each other in their chemical relationships, it is convenient to subdivide them into three groups: the cerium, terbium and ytterbium groups. The first includes scandium (Sc, 441-1), yttrium (Y, 89-0), lanthanum (La, 139-0), cerium (Ce, 140-25), praseodymium (Pr, 140-6), neodymium (Nd, 144-3), and sam- arium (Sa, 150-4); the second includes europium (Eu, 152-0), gadolinium (Gd. 157-3), and terbium (Tb, 159-2); and the third includes dysprosium (Dy, 162-5), holmium (Ho, ?) erbium (Er, 167-4), thulium (Tm, 168-5), ytterbium or neoytterbium (Yb, 172-0), and lutecium (Lu, 174-0); the letters and numbers in the brackets are the symbols and atomic weights (inter- national). Although very rare, a large number of minerals contain these metals; they are chiefly found in Scandinavia, parts of the Urals, America and Australia, generally associated with Archean and eruptive rocks, and more rarely with sedimentary deposits. They are usually silicates, but many complex tantalates, niobates, phosphates, uranates and fluorides occur. The chief mineral species are monazite, a phosphate of the cerium metals, containing thorium (this mineral supplies the ceria and thoria employed in making incandescent gas mantles) ; cerite, a hydrated silicate of calcium and the cerium metals; gadolinite, a silicate of beryllium, iron, and the yttrium metals; samarksite, a niobate and tantalate of both the cerium and yttrium metals, with uranium, iron, calcium, etc.; and keilhauite, a titanosilicate of yttrium, iron, calcium and aluminium; other species are fergusonite, orthite, aeschy- nite, euxenite and thorianite.

The chemistry of this group may be regarded as, beginning with Cronstedt's description of the mineral cerite from Bastnaes in 1751, and the incorrect analyses published by T. O. Bergman and Don Fausto d'Elhuyar in 1784. Ten years later Gadolin investigated the mineral subsequently named gadolinite, which had been found at Ytterby in 1788 by Arrhenius. This dis- covery of a new earth was confirmed by A. G. Ekeberg in 1799, who named the base yttria. Cerite was examined simultane- ously by Klaproth in Germany and by Berzelius and Hisinger in Sweden; and a new base was discovered in 1803 which the Swedish chemists named ceria. Both these oxides have proved to be mixtures. In 1839 Mosander separated " ceria "

into true ceria and an earth which he termed lanthana (Gr. \avdaveiv, to lie hidden), and in 1841 he showed that his lanthana con- tained another base, which he called didymia (Gr. Si8i>noi, twins). This didymia was separated in 1879 by Lecoq de Bois- baudran into a new base, samaria, and a residual didymia which was shown by Auer von Welsbach in 1885 to consist of a mixture of two bases, praseodidymia and neodidymia; more- over, samaria was split by Demarcay in 1900 into true samaria I and a new base named europia. In 1843 Mosander also split

yttria into two new bases which he called " erbia " and " terbia," and a true yttria, but in i860 N. J. Berlin denied the existence of Mosander's "erbia," and gave this name to his "terbia." The new erbia has itself proved to be a mixture. Marignac in 1878 separated an ytterbia which was split by Nilson in 1879 into scandia (the metal of which proved to be identical with Mendele- eff's predicted eka-boron)and a new ytterbia, which, in turn, was separated by Urbain in 1907 into neoytterbia and lutecia (C. A. von Welsbach proposed for these elements the names alde- barianum and cassiopeium). Berlin's erbia was also examined by Soret in 1878 and by Cleve in 1879; the new base then isolated, Spret's X or Cleve's holmia, was split by Lecoq de Boisbaudran in 1886 into a true holmia and a new oxide dys- prosia. The same erbia also yielded another base, thulia, to Cleve, in 1879, in addition to true erbia. The original erbia of Mosander was confirmed by M. A. Delafontaine in 1878 and renamed terbia; this base was split by Marignac in 1886 into gadolinia and true terbia. These relations are schematically shown below; the true earths are in italics, mixtures in Roman.

Ceria

I

Ceria

Lanthana J

1

Lanthana

Didymia

Samaria

Didymia

Samaria Europia Praseodidymia Yttria

Neodidymia

Yttlia

Erbia (Mosander)

Terbia (Delafontaine)

Terbia

(Mosander)

I

Erbia

(Berlin)

Terbia

I

Gadolinia Ytterbia Thulia

Scandia

Soret 's X

I Holmia

Erbia

Ytterbia I

Holmia Dysprosia

Neoytterbia Lutecia

Methods of Separation. — The small proportions in which the rare earths occur in the mineral kingdom and the general inter- mixture of several of them renders their efficient separation a matter of much difficulty, which is increased by their striking chemical resemblances. While it is impossible to treat the separations in detail, a general indication of the procedure may be given. The first step is to separate the rare earths from the other components of the mineral. For this purpose the mineral is evaporated with sulphuric or hydrochloric acid, or fused with potassium bisulphate, and the residue extracted with water. The solution of chlorides or sulphates thus obtained is treated with sulphuretted hydrogen, to remove copper, bismuth and molybdenum, and the filtrate, after the ferrous iron has been oxidized with chlorine, is precipitated with oxalic acid. The oxalates (and also thorium oxalate) may be converted into oxides by direct heating, into nitrates by dissolving in nitric acid, or into hydroxides by boiling with potash solution. The thorium may be removed by treating the nitrate solution with hydrogen peroxide, and warming, whereupon it separates as

thorium peroxide. The next step consists in neutralizing the nitric acid solution and then saturating with potassium sulphate. Double salts of the general formula R 2 (SQi)3 . 3K 2 S0 4 are formed, of which those of the cerium group are practically insoluble, of the terbium group soluble, and of the ytterbium group very

soluble. The sulphates thus obtained may be reconverted into oxalates or oxides and the saturation with potassium sulphate repeated.

To separate the individual metals many different methods have been proposed; these, however, depend on two principles, one, on the different basicities of the metals, the other, on the different solubilities of their salts. Bahr and Bunsen worked out a process of the first type, which utilized the fractional decomposition of the nitrates into oxides on heating. The mixed oxalates are converted into nitrates, which are then mixed with an alkali nitrate to lower the melting-point, and the mixture fused. The nitrates decompose in order of the basicities of the metals, and after a short fusion the residue is extracted with boiling water, and the basic salt which separates when the solution is cooled is filtered off. This contains the most negative metal; and the filtrate, after evaporation and a repetition of the fusion and extraction, may be caused to yield the other oxides. A second method, based on the same principle, con- sists in the fractional precipitation by some base, such as ammonia, soda, potash, aniline, &c. The neutral nitrates are dissolved in water, and the base added in such a quantity to precipitate the oxides only partially and very slowly. Obviously the first deposit contains the least basic oxide, which by re-solution as nitrate and re-precipitation yields a purer product. To the filtrate from the first precipitate more of the base is added, and the second less basic oxide is thrown down. By repeating the process all the bases can be obtained more or less pure.

Many processes depending upon the different solubilities of certain salts have been devised. They consist in forming the desired salt and fractionally crystallizing. The mother liquor is concentrated and crystallized, the crystals being added to the filtrate from a re- crystallization of the first deposit. These operations are repeated after the manner shown in the following scheme; the letter C denotes crystals, the M.L mother liquor, whilst a bracket means mixing before re-crystallization.

Original Solution

C

M.L

M.L

f

M.L

M.L C

M.L C

M.L

M.L C

M.L C

M.L

M.L

Obviously the fractions contain salts which increase in solu- bility as one passes from the left to right, and with sufficient care and patience this method permits a complete separation. The salts which have been used include the sulphates, nitrates, chromates, formates, oxalates and malonates. R. J. Meyer (Zeit. anorg. Chem., 1904, 41, p. 97) separates the cerium earths by forming the double potassium carbonates, e.g. K2Ce2(C03J4 . 12HjO, which are soluble in potassium carbonate solution, being precipitated in the order lanthanum, praseodymium, cerium and neodymium on diluting the solution ; C. A. von Welsbach (Chem. News, 1907, 95, p. 196; 1908, 98, pp. 223, 297) separates the metals of the ytterbium group by converting the basic nitrates into double ammonium oxalates and fractionating; C. James (ibid., 1907, 95, p. 181; 1908, 97, pp. 61, 205) formed the oxalates of the yttrium earths and dissolved them in dilute ammonia saturated with ammonium carbonate; by boiling this solution the earths are precipitated in the order yttrium, holmium and dysprosium, and erbium; he also fractionally crystallized the bromates (see, e.g. Jour. Amer. Chem. Soc, 1910, 32, p. 517, for thulium). Complex organic reagents are also employed. Neish (Jour. Amer. Chem. Soc, 1904, 26, p. 780) used meta-nitrobenzoic acid ; O. Holmberg sepa- rates neodymium, praseodymium and lanthanum (and also thorium) with meta-nitrobenzene sulphonic acid, and has investigated many other organic salts (see Abs. J. C. S., 1907, ii. p. 90), whilst H. Erdmann and F. Wirth (Ann., 1908, 361, p. 180) employ the 1-8 naphthol sulphonates.

In order to determine whether any chosen method for separating these earths is really effective, it is necessary to analyse the frac- tions. For this

purpose two processes are available. We may convert the salt into the oxalate from which the oxide is obtained by heating. A weighed quantity of the oxide is now taken and converted into sulphate by evaporating with dilute sulphuric acid. The sulphate is gently dried until the weight is constant, and from this weight the equivalent of the earth can be calculated. When repeated fractionation is attended by no change in the equivalent we may conclude that only one element is present. This process, however, is only rough, for the elements with which we are dealing have very close equivalents. A more exact method employs the

spectra — spark, arc, phosphorescence and absorption ; the evidence, however, cannot in all cases be accepted as conclusive, but when taken in conjunction with chemical tests it is the most valuable method.

Chemical Relations. — The rare earth metals were at first regarded as divalent, but determinations of the specific heats of cerium by Mendeleeff and Hillebrand and of lanthanum and didymium by Hillebrand pointed to their trivalency; and this view now has general acceptance. They are comparatively reactive: they burn in air to form oxides of the type Me20 3 ; combine directly with hydrogen at 20o°-3oo° to form hydrides of the formula MH 2 or MH 3 ; nitrides of the formula MN are formed by passing nitrogen over the oxides mixed with mag- nesium; whilst carbides of the type MC 2 are obtained in the electrolytic reduction of the oxides with carbon. In addition to the oxides M2O3, several, e.g. cerium, terbium and neodymium, form oxides of the formula M0 2 . The sesquioxides are bases which form salts and increase in basicity in the order Sc, Yb, Tm, Er, Ho, Tb, Gd, Sm, Y, Ce, Nd, Pr, La; the latter hissing with water like quicklime.

The placing of these elements in the periodic table has attracted much attention on account of the many difficulties which it presented. The simplest plan of regarding them all as trivalent and placing them in the third group is met by the fact that there is not room for them. Another scheme scatters them in the order of their atomic weights in the last four groups of the system, but grave objections have been urged against this plan. A third device places them in one group as a bridge between barium and tantalum. This was suggested by Benedick in 1904 (Zeil. anorg. Chem., 1904, 39, p. 41), and adopted in Werner's table of 1905 (Ber. 38, p. 914), whilst in 1902 Brauner (ibid. 32, p. 18) placed the group as a bridge on a plane perpendicular to the planes containing the other elements, thus expanding the table into a three-dimensional figure. The question has also been considered by Sir William Crookes (Jour. Chem. Soc, 1888, 53,

p. 487; 1889, 55, pp. 257 et seq.), whose inquiries led him to a new conception of the chemical elements.

References. — For the general chemistry see R. Bohm, Seltene Erden (1905); Abegg, Handbuch der anorganischen Chemie (1906), vol. iii. (article by R. T. Meyer) ; H. Moissan, Traite de chimie minerale (1904), vol. iii. (article by G. Urbain) ; Roscoe and Schorlemmer, Treatise on Chemistry (1908), vol. ii.; P. E. Browning, Introduction to the Rarer Elements (1909); see also A. W. Stewart, Recent Advances in Physical and Inorganic Chemistry (1909). For the rare earth minerals see J. Schilling, Das Vorkommen der seltenen Erden im Miner air eiche (1904).

RAS, the Arabic for a " head," hence a cape, promontory or headland; a common word in place names.

RASCAL, a term originally used in the sense of a rabble, especially descriptive of camp-followers or the dregs of an army, or of the lowest of the people; now only of a single person, in the sense of a rogue or knave. The origin of O.Fr. rascaille, modern racaille, from which the word came into English, is uncertain. The word was early used, in hunting, for the weaker or poorer male deer of a herd; the word has been connected with O.Fr. rascler, mod. racier, to scrape, rake, in the sense of the off-scourings of the herd.

RASHBAM (1085-1174), Jewish scholar, so called from the initials of his full name, Rabbi Samuel ben Meir, was a leading member of the French school of Biblical exegesis. ' He was a grandson of Rashi (q.v.), but differed in his method of inter- pretation. He wrote commentaries on the Pentateuch and some other parts of the Scriptures. Rashbam adopts a natural (as distinct from a homiletical and traditional) method; thus (in agreement with the modern school) Rashbam (on Gen. i. 5) maintained that the day began at dawn and not from the previous sunset (as later Jewish custom assumed). Another famous interpretation was Rashbam's view that the much disputed phrase in Gen. xlix. 10 must be rendered " Until he cometh to Shiloh," and refers to the division of the kingdom of Judah after Solomon's death. Rashbam's notes on the Bible are remarkable for brevity, but when he comments on the Talmud — he wrote explanations on several tracts — he is equally noted for prolixity. (I. A.)

RASHI (1040-1105), Jewish scholar. Rabbi Solomon Izhaqi (son of Isaac), usually cited as Rashi from the initials of those words, was born at Troyes in 1040 and died in the same town in 1105. Legends concerning him are many. Isaac's wife, shortly before the birth of their famous son, was walking one day down a narrow street in Worms, when two vehicles moving in opposite directions seemed about to crush her. As she leant

hopelessly against a wall, it miraculously fell in- wards to make a niche for her. So with his education. Legend sends the student to southern France, and even on a tour of the world. At an inn in the Orient he cured a sick monk, who later on, as bishop of Olmtitz, returned the kindness by saving the Jews from massacre. In fact, Rashi never went farther than from the Seine to the Rhine; the utmost limit of his travels were the academies of Lorraine. Situated between France and Germany, Lorraine was more French than German, and French was the common language of Jew and Christian. This is shown by the glosses in Rashi's works, almost invariably in French. He seems to have passed the decade beginning with 1055 in Worms, where the niche referred to above is still shown. Within this, it is said, Rashi was wont to teach. A small edifice on the east of the synagogue is called the " Rashi Chapel," and the " Rashi Chair," raised on three steps in the niche, is one of the objects of the pious admiration of pilgrims. At Worms Rashi worked under Jacob ben Yaqar, and at Mainz under Isaac ben Judah, perhaps combining at the same time the functions of teacher and student. Besides the oral tuition that he received, the medieval schools habitu- ally kept the notes of former teachers. From these Rashi learned much, and probably he incorporated some of these notes in his own works! In the middle ages there was a com- munism in learning, but if Rashi used some of the stones quarried and drafted by others, it was to his genius that the finished edifice was due.

Rashi was twenty-five years of age when he returned to Troyes, which town thenceforward eclipsed the cities of Lorraine and became the recognized centre of Jewish learning. Rashi acted as rabbi and judge, but received no salary. Not till the 14th century were Jewish rabbis paid officials. Rashi and his family worked in the vines of Troyes (in the Cham- pagne); in his letters he describes the structure of the wine- presses. His learning and character raised him to a position of high respect among the Jewries of Europe, though Spain and the East were long outside the range of his influence. As was said of him soon after his death: " His lips were the seat of wisdom, and thanks to him the Law, which he examined and interpreted, has come to life again." His posterity in- cluded several famous names, those of his grandchildren. Rashi had no sons, but his three daughters were women of culture, and two of the sons of Jochebed (see Rashbam and Tam), as well as others of his descendants, carried on the family tradition for learning, adding lustre to Rashi's fame. The latter part of Rashi's life was saddened by the incidents connected with the first Crusade. Massacres occurred in the Rhine- lands. According to legend, Rashi and Godfrey of Bouillon — of the foremost leaders of the Crusade — -were intimate friends. Rashi died peacefully in Troyes in 1105.

Rashi was the most conspicuous medieval representative of the Jewish spirit. A century later Maimonides was to give a new turn to Jewish

thought, by the assimilation of Aristotelianism with Mosaism, but Rashi was a traditionalist pure and simple. He was in no sense a philosopher, but he exemplified in his person and in his works the stored up wisdom of the Synagogue. Yet through all that he wrote there runs a vein of originality. Besides minor works, such as a recension of the Prayer-Book (Siddur), the Pardes and ha-Orah, Rashi wrote two great commentaries on which his fame securely rests. These were the commentaries, on the whole of the Hebrew Bible and on about thirty treatises of the Talmud. His commentary on the Pentateuch, in particular, has been printed in hundreds of editions; it is still to Jews the most beloved of all commentaries on the Mosaic books. More than a

hundred supercommentaries have been written on it. Rashi unites homily with grammatical exegesis in a manner which explains the charm of the commentary. His influence in Christian circles was great, especially because of the use made of the commentary by Nicolaus de Lyra (q.v.), who in his turn was one of the main sources of Luther's version. Even more important was Rashi's commentary on the Talmud, which became so acknowledged as the definitive interpretation that Rashi is cited simply under the epithet of " the Commentator." It is no exaggeration to assert that the modern world owes its power to understand the Talmud to Rashi. In this field the " Commentator " is supreme. He practically edited the text of the Talmud besides explaining it, and the Talmud is never printed without Rashi's commentary on the margin. An important feature of Rashi's commentaries is the frequency of French translations of words. These glosses (lo'azim) have now been in part edited from the manuscripts of the late Arsene Darmesteter.

Bibliography. — M. Liber, Rashi (1906), published as a memorial of Rashi on the 800th anniversary of his death. Rashi's commentary on the Bible has been translated into Latin by Breithaupt (1710- 1714); and into German (Pentateuch) by Dukes (1833-38) and others. The foundation of recent investigation into Rashi's life is Zunz's Salomon b. Isaac (1823), to which I. H. Weiss added much in his (Hebrew) biography (in Bet Talmud ii., Nos. 2-10. See also Graetz, History of the Jews (Engl, trans., vol. iii. ch. ix.). A critical edition of Rashi's Pentateuch commentary was published by A Berliner (2nd ed., 1905). (I. A.)

RASHTRAKUTA, an Indian dynasty which ruled in the Deccan (q.v.) from about a.d. 750 to 973. The Rashtrakuta or Ratta clan are supposed to have held power during the historical blank before the 6th century; but they

came to the front in a.d. 750, when Dantidurga overthrew the Chalukya dynasty and made himself ruler of the Deccan. He was succeeded by his uncle Krishna I. (c. 760), who completed his conquests, and whose reign is memorable for the execution of the Kailasa, the rock-cut temple at Ellora. His grandson Govinda III. (780-815) extended the power of the family from the Vindhya Mountains and Malwa on the north to Kanchi on the south. The next king, Amogavarsha, reigned for sixty-two years. The reign of Krishna III. was remarkable for a war with the Cholas, in which the Chola king was killed on the field of battle in 949. The last of the Rashtrakuta kings was Karka II., who was overthrown by the Chalukyas in 973.

See R. G. Bhandarkar, Early History of the Deccan (Bombay,

1884).

RASK, RASMUS CHRISTIAN (1 787-1832), Danish scholar and philologist, was born at Brandekilde in the island of Fiinen or Fyen in Denmark in 1787. He studied at the university of Copenhagen, and at once showed remarkable talent for the acquisition of languages. In 1808 he was appointed assistant keeper of the university library, and some years afterwards professor of literary history. In 181 1 he published, in Danish, his Introduction to the Grammar of the Icelandic and other Ancient Northern Languages, from printed and MS. materials accumu- lated by his predecessors in the same field of research. The reputation which Rask thus acquired recommended him to the Arna-Magnaean Institution, by which he was employed as editor of the Icelandic Lexicon (1814) of Bjorn Haldorson, which had long remained in manuscript. Rask visited Iceland, where he remained from 1813 to 1815, mastering the language and familiarizing himself with the literature, manners and customs of the natives. To the interest with which they in- spired him may probably be attributed the establishment at Copenhagen, early in 1816, of the Icelandic Literary Society, of which he was the first president.

In October 1816 Rask left Denmark on a literary expedition, at the cost of the king, to prosecute inquiries into the languages of the East, and collect manuscripts for the university library at Copenhagen. He proceeded first to Sweden, where he remained two years, in the course of which he made an excursion into Finland to study the language. Here he published, in Swedish, his Anglo-Saxon Grammar in 1817. In 1818 there

appeared at Copenhagen, in Danish, an Essay on the Origin 0) the Ancient Scandinavian or Icelandic Tongue, in which he traced the affinity of that idiom to the other European lan- guages, particularly Latin and Greek. In the same year he brought out the first complete editions of Snorro's Edda

and Saemund's Edda, in the original text, along with Swedish translations of both Eddas. From Stockholm he went in 1 8 19 to St Petersburg, where he wrote, in German, a paper on " The Languages and Literature of Norway, Iceland, Sweden and Finland," in the sixth number of the Vienna Jahrbiicher. From Russia he proceeded through Tartary into Persia, and resided for some time at Tabriz, Teheran, Persepolis and Shiraz. In about six weeks he made himself sufficiently master of Persian to be able to converse freely. In 1820 he embarked at Bushire for Bombay; and during his residence there he wrote, in English, " A Dissertation on the Authenticity of the Zend Language" {Trans. Lit. Soc. of Bombay, vol. iii., re- printed with corrections and additions in Trans. R. As. Soc). From Bombay he proceeded through India to Ceylon, where he arrived in 1822, and soon afterwards wrote, in English, " A Dissertation respecting the best Method of expressing the Sounds of the Indian Languages in European Characters," in the Transactions of the Literary and Agricultural Society of Colombo. Rask returned to Copenhagen in May 1823, bringing a considerable number of Oriental manuscripts, Persian, Zend, Pali, Sinhalese and others, with which he enriched the collec- tions of the Danish capital. He died at Copenhagen on the 14th of November 1832.

During the period between his return from the East and his death Rask published in his native language a Spanish Grammar (1824), a Frisic Grammar (1825), an Essay on Danish Orthography (1826), a Treatise respecting the Ancient Egyptian Chronology and an Italian Grammar, (1827), and the Ancient Jewish Chronology pervious to Moses (1828). He also edited an edition of Schneider's Danish Grammar for the use of Englishmen (1830), and superintended the English translation of his Anglo-Saxon Grammar by Thorpe (1830). He was the first to point out the connexion between the ancient Northern and Gothic on the one hand, and the Lithuanian, Sclavonic, Greek and Latin on the other, and he also deserves credit for having had the original idea of " Grimm's Law " for the transmutation of consonants in the transition from the old Indo- European languages to Teutonic, although he only compared Teutonic and Greek, Sanskrit being at the time unknown to him. In 1822 he was master of no less than twenty-five languages and dialects, and is stated to have studied twice as many. His numerous philological manuscripts were transferred to the king's library at Copenhagen. Rask's Anglo-Saxon, Danish and Icelandic Grammars were brought out in English editions by Thorpe, Repp and Dasent respectively.

RASPBERRY, known botanically as Rubus Idaeus (nat. ord. Rosaceae, q.v.), a fruit-bush found wild in Great Britain and in woods throughout Europe, North Africa and in north and west Asia. The raspberry was known to classic writers, and is mentioned by Pliny as one of the wild brambles known to the Greeks as Idea, from Mt. Ida in Asia Minor on

which it grew. Parkinson (Paradisus, 1629) speaks of red, white and thornless varieties as suitable for the English climate, and Gerarde (Herbal, 1597) figures and describes the Raspis or Framboise bush as one of the four kinds of bramble. It is propagated from suckers, which may be taken off the parent stools in October, and planted in rows 5 or 6 ft. apart, and at 3 ft. asunder in the rows. It is the habit of the plant to throw up from the root every year a number of shoots or canes, which bear fruit in the subsequent year, and then decay. In dressing the plants, which is done immediately after the crop is gathered, all these exhausted stems are cut away, and of the young canes only three or four of the strongest are left, which are shortened about a third. The stems, being too weak to stand by themselves, are sometimes connected together by the points in the form of arches, or a stake is driven in midway between the plants, and half the canes are bent one way and half the other, both being tied to the stake. Sometimes they are tied upright to stakes fixed to each stool. The best support, however, is obtained by fastening the points of the shoots to a slight horizontal rail or bar, placed a foot and a half on the south side of the rows,

by which means the bearing shoots are deflected from the per- pendicular to the sunny side of the row, and are not shaded by the annual wood. When this mode of training is adopted, the plan of planting i foot apart in the row and leaving one or two canes only to each shoot is preferable. The ground between the rows should never be disturbed by deep digging; but an abundant supply of good manure should be given annually in autumn as a dressing, which should be forked in regularly to a depth of 4 or 5 inches. All surplus suckers should be got away early in the summer before they have robbed the roots — five or six, to be reduced to the four best, being reserved to each root. Fresh plantations of raspberries should be made every six or seven years. The double-bearing varieties, which continue to fruit during autumn, require light soils and warm situations. These should be cut close down in February, as it is the strong young shoots of the current year which bear the late autumnal crops. The other varieties may be made to bear in autumn by cutting the stems half-way down at an early period in spring; but, as with all other fruits, the flavour of the raspberry is best when it is allowed to ripen at its natural season.

The following are some of the finer sorts now in cultivation : —

Baumforth's Seedling — a large summer-bearing red.

Carter's Prolific — a large summer-bearing red.

Fastolf or Fiiby — a large summer-bearing red.

M'Laren's Prolific — a large double-bearing red.

Northumberland Fillbasket — a large summer red.

October Red — a fine autumn-bearing red.

October Yellow — a fine autumn-bearing yellow.

Prince of Wales — -a large summer-bearing red.

Red Antwerp — a large summer-bearing red.

Rogers's Victoria — a large autumn-bearing red.

Round Antwerp — a large summer-bearing red.

Semper Fidelis — an excellent bright red variety; heavy cropper.

Superlative — fruits rich red; perhaps the best raspberry in

cultivation. Sweet Yellow Antwerp — a large summer-bearing yellow.

The European raspberry, though admittedly of better quality, has been largely displaced in the United States of America by a closely allied native species, R. strigosus, the numerous varieties of which are hardier than the varieties of the European species and ripen their crop much more rapidly. The stems are more slender and flexible than in R. Idaeus, usually brown or reddish- brown in colour and beset with stiff straight prickles. The most important raspberry of cultivation in America is R. occi- dentalis, the black raspberry or thimbleberry, which is at once distinguished by its firm black, rarely yellow, fruit. The purple- cane raspberry, R. neglectus, with fruit varying in colcur from dull purple to dark red or sometimes yellowish, is perhaps a hybrid between R. strigosus and R. occidentalis.

For a detailed account of the American species of Rubus see F. W. Card, Bush-fruits (i.~

The Loganberry is a hybrid between the raspberry (Rubus Idaeus) and the blackberry or bramble {R. fruticosus), and derives its name from its raiser, Judge Logan of the American Bar. It is a strong-growing plant, partaking more of the habit of the blackberry than the raspberry, and making shoots often 10 to 15 ft. long in the course of the year. These bear leaves with 5 leaflets, and fruit the following year. The fruiting shoots have leaves with

only 3 leaflets; but young and old stems are densely covered with sharp crimson prickles. The fruits are borne profusely in loose trusses, and are ripe in southern localities in July, and about early August in northern parts. They are at first reddish like raspberries in a half-ripened state, but when fully ripe are deep purplish red, and much more palatable, each fruit being about i\ in. long, and shaped like a raspberry.

The Loganberry flourishes in heavy loamy soil, and is a useful plant for old fences or trellises, or even in waste places, where it is fully exposed to the sunshine. The old fruiting shoots should be cut away each winter, and in the spring the young shoots should have a foot or two taken off the ends, to induce the better and riper buds lower down to throw masses of white flowers, to be succeeded in due course by the fruits. Propagation is by means of suckers from the base.

*RASPE, RUDOLF BMGHq (*737-i794), the original author of the Adventures of Baron Munchausen (see- Munchausen); was born in Hanover in 1737, and studied at G&ttingeh and Leipzig. In 1762 he became a clerk in the university library at Hanover, and in 1764 secretary to the university library at Gottingen. He had become known as a versatile scholar and a student of natural history and antiquities, and he published some original poems and also translations, among the latter of Leibnitz's philosophical works and of Ossian's poems; he also wrote a treatise on Percy's Reliques. In 1767 he was appointed professor in Cassel, and subsequently librarian. He contributed in 1769 a zoological paper to the 59th volume of the Philosophical Transactions, which led to his being selected an honorary member of the Royal Society in London, and he wrote voluminously on all sorts of subjects. In 1774 he started a periodical called the Cassel Spectator. But having gone to Italy in 1775 to buy curios for the landgrave of Hesse, to whom he was keeper of the gems, he was found to have sold the land- grave's valuables for his own profit ; and, on orders being issued for his arrest, he decamped to England. In London he employed his knowledge of English and his learning to secure a living by publishing books on various subjects, and English transla- tions of German works, and there are allusions to him as " a Dutch savant " in 1780 in the writings of Horace Walpole, who gave him money and helped him to publish an Essay on the Origin of Oil-painting (1781). But he remained poor, and the Royal Society expunged his name off its list. He went to Cornwall in 1782, and till about 1788 was assay-master and storekeeper at the Dolcoath mine, where memories of his ingenuity remained to the middle of the 19th century. While there, he seems to have written the original version of Mun- chausen, which was subsequently elaborated by others. Be- tween 1785 and 1790 he compiled a descriptive catalogue of James Tassie's collection of pastes and casts of gems, in two quarto volumes (1791) of laborious industry and bibliographical rarity. Raspe*

then went to Scotland, and in Caithness found a patron in Sir John Sinclair of Ulbster, whose mineralogical proclivities he proceeded to impose upon by pretending to discover valuable and workable veins on his estates; but Raspe had " salted " the ground himself, and on the verge of exposure he absconded. He next betook himself to Ireland, but died at Muckross in 1794, when he was only beginning some mining operations in Donegal. His career is interesting because of his connexion with the famous book of stories of Baron Munchausen (q.v.). His authorship was not known in his lifetime, except to his friend Gottfried August Burger and possibly a few of his other intimates (such as Kastner and Lichtenburg) in his student days at Gottingen; and it was not till 1824 that the biographer of Burger (who had been credited with writing Munchausen instead of only translating it, as he did in 1786) revealed the truth about the book.

RASSAM, HORMUZD (1826-1910), Assyriologist and traveller, was born at Mosul of native Christian parents. His first work was done as assistant to Sir A. H. Layard in his first expedition (1845-47). He subsequently came to England, studied at Oxford, and was again sent by the British Museum trustees to accompany Layard in his second expedition (1849-51). Layard having entered upon a political career, Rassam continued the work (1852-54) in Assyria under the direction of the British Museum and Sir Henry Rawlinson at Nimrud and Kuyunjik. In 1866 he was sent by the British government to Abyssinia, where, however, he was imprisoned for two years until freed by the victory of Sir Robert Napier. From 1876 to 1882 he was again in Assyria conducting important investigations, especially at Nineveh, and during the Russo-Turkish War he was sent on a mission of inquiry to report on the condition of the Christian communities of Asia Minor arid Armenia. His archaeological work resulted in many important discoveries and the collection of valuable epigraphical evidence. See The Times, Sept. 17, 1910.

RASTATT, a town of Germany, in the grand duchy of Baden, on the Murg, 4 m. above its junction with the Rhine and 15 m.

by rail S.W. of Karlsruhe. Pop. (1905) i4,4°4- The old I palace of the margraves of Baden, a large Renaissance edifice in red sandstone, is now partly used for military purposes and contains a collection of pictures, antiquities and trophies from the Turkish wars. The chief manufactures are stoves, beer and tobacco. Until the end of the 17th century Rastatt was unimportant, but after its destruction by the French in 1689 it was rebuilt on a larger scale by Louis William, margrave of Baden, the imperial

general in the Turkish wars. It was then the residence of the margraves until 1771. The Baden revolu- tion of 1849 began with a mutiny of soldiers at Rastatt in May 1849, and ended here a few weeks later with the capture of the town by the Prussians. For some years Rastatt was one of the strongest fortresses of the German empire, but its forti- fications were dismantled in 1890.

See Schuster, Rastatt, die ehemalige badische Residenz und Bundes- festung (Lahr, 1902) ; and Lederle, Rastatt und seine Umgebung (Rastatt, 1905).

Rastatt has been the scene of two congresses. At the first congress, which was opened in November 1713, negotiations were carried on between France and Austria, for the purpose of ending the war of the Spanish succession. These culminated in the treaty of Rastatt signed on the 7th of March 17 14. The second congress, which was opened in December 1797, was intended to rearrange the map of Germany by providing com- pensation for those princes whose lands on the left bank of the Rhine had been seized by France. It had no result, however, as it was ended by the outbreak of the European war, but it had a sequel of some interest. As the three French repre- sentatives were leaving the town in April 1799 they were waylaid, and two of them were assassinated by some Hungarian soldiers. The origin of this outrage remains shrouded in mystery, but the balance of evidence seems to show that the Austrian authorities had commanded their men to seize the papers of the French plenipotentiaries in order to avoid damag- ing disclosures about Austria's designs on Bavaria, and that the soldiers had exceeded their instructions. On the other hand, some authorities think that the deed was the work of French emigrants, or of the party in France in favour of war.

For fuller particulars of the two sides of this controversy see K. Mendelssohn-Bartholdy, Der Rastadter Gesandtenmord (Heidel- berg, 1869); J. A. Freiherr von Helfert, Der Rastadter Gesandten- mord (Vienna, 1874) ! Bohtlingk, Napoleon und der Rastadter Gesand- tenmord (Leipzig, 1883); and Zum Rastadter Gesandtenmord (Heidel- berg, 1895); H. Hiiffer, Der Rastadter Gesandtenmord (Bonn, 1896) ; and H. von Sybel, in Band 39 of the Historische Zeilschrift.

RASTELL (or Rastall), JOHN (d. 1536), English printer and author, was born in London towards the end of the 15th century. He is vaguely reported by Anthony a. Wood to have been " educated for a time in grammatical and philosophical " at Oxford. He became a member of Lincoln's Inn, and practised successfully as a barrister. He was also M.P. for Dunheved, Cornwall, from 1529 to the time of his death. He began his printing business some time before 1516, for in his preface to the undated Liber Assisarum he announced the forthcoming publication of Sir A. Fitzherbert's

Abbreviamentum librorum legum Anglorutn, dated 1516. Among the works issued from the . " sygne of the meremayd at Powlysgate," where he lived and worked from 1520 onwards, are The Mery Geslys of the Wydow Edyth (1325), and A Dyaloge of Syr Thomas More (1529). The last of his dated publications was Fabyl's Ghoste (1533), a poem. In 1530 he wrote, in defence of the Roman doctrine of Purgatory, A New Boke of Purgatory (1530), dialogues on the subject between " Comyngs and Almayn a Christen man, and one Gyngemyn a Turke." This was answered by John Frith in A Disputation of Purgatorie.ˆ Ras- tell replied with an Apology against John Frytk, also answered by the latter. Rastell had married Elizabeth, sister of Sir Thomas More, with whose Catholic theology and political views he was in sympathy. More had begun the controversy with John Frith, and Rastell joined him in attacking the Protestant writer, who, says Foxe (Actes and Monuments, ed. G. Townsend, vol. v. p. 9), did so " overthrow and confound " his adversaries

that he converted Rastell to his side. Separated from his Catholic friends, Rastell does not seem to have been fully trusted by the opposite party, for in a letter to Cromwell, written probably in 1536, he says that he had spent his time in uphold- ing the king's cause and opposing the pope, with the result that he had lost both his printing business and his legal practice, and was reduced to poverty. He was imprisoned in 1536, perhaps because he had written against the payment of tithes. He probably died in prison, and his will, of which Henry VIII. had originally been appointed an executor, was proved on the 18th of July 1536. He left two sons: William, noticed below, and John. The Jesuit, John Rastell (1532-1577), who has been frequently confounded with him, was no relation.

Rastell's best-known work is The Pastyme of People, the Chrony- cles of dyvers Realmys and most specially of the Realme of England (1529), a chronicle dealing with English history from the earliest times to the reign of Richard III., edited by T. F. Dibdin in 1811. His Expositiones terminorum legum Angliae (in French, translated into English, 1527; reprinted 1629, 1636, 1641, &c, as Les Termes de la Ley), and The Abbreviation of Statutis (1519), of which fifteen editions appeared before 1625, are the best known of his legal works.

Rastell was also the author of a morality play, A new Interlude and a Mery of the 1111 Elements, written about 1519, which is no doubt the " large and ingenious comedy " attributed to him by Wood. The unique copy in the British Museum is incomplete, and contains neither the date nor the name of the author, identi- fied with John Rastell on the authority of Bale, who catalogues Natura Naturata among his works, adding a Latin version of the first line of the piece. This interlude was printed in W. C. Hazlitt's edition of Dodsley's Old English Plays, by J. O. Halliwell-Phillipps for the Percy

Soc. {Early English Poetry, vol. 22, 1848), and by Julius Fischer (Marburger Studien zur englischen Philologie, vol. v., 1903). See also an article on " John Rastell and his Contemporaries " in Bibliographica, vol. II, 437 seq., by Mr. H. R. Plomer, who unearthed in the Record Office an account of a law-suit (1534-35) in connexion with Rastell's premises at the " Mermaid." For the books issued from his press see a catalogue by R. Proctor, in Hand- Lists of English Printers (Bibliographical Soc, 1896).

RASTELL, WILLIAM (c. 1508-1565), English printer and judge, son of the preceding, was born'in London about 1508. At the age of seventeen he went to the university of Oxford, but did not take a degree, being probably called home to super- intend his father's business. The first work which bears his own imprint was A Dyaloge of Sir Thomas More (1531), a reprint of the edition published by his father in 1529. He also brought out a few law-books, some poetry, an edition of Fabyan's Cronycle (1533), and The Apologye (1533) and The Supply- cacyon of Soulys of his uncle Sir Thomas More. His office was " in Fletestrete in saynt Brydys chyrche yarde." He became a student at Lincoln's Inn on 12th September 1532, and gave up the printing business two years later. In 1547 lie was appointed reader. On account of his Catholic convictions he left England for Louvain; but upon the accession of Mary he returned, and was made serjeant-at-law and treasurer of Lincoln's Inn in 1555. His patent as judge of the Queen's Bench was granted on the 27th of October 1558. Rastell continued on the bench until 1562, when he retired to Louvain without the queen's licence. By virtue of a special commission issued by the barons of the Exchequer on the occasion an inventory of his goods and chattels was taken. It furnishes an excellent idea of the modest nature of the law library (con- sisting of twenty-four works) and of the chambers of an Elizabethan judge (see Law Magazine, February 1844). He died at Louvain on the 27th of August 1565.

It is difficult to distinguish between the books written by him and those by his father. The following are believed to be his: A Collection of all the Statutes (1559), A Table collected of the Yeares of the Kynges of Englande (1561), both frequently reprinted with continuations, and A Collection of Entrees, of Declarations, &c. (1566), also frequently reprinted. The entries are not of Rastell's own drawing, but have been selected from printed and MS. collec- tions; their " pointed brevity and precision " are commended by Story. He supplied tables or indexes to several law-books, and edited La novel natura brevium de Monsieur Anton. Fitzherberl (1534) and The Workes of Sir T. More in the English Tonge (1557). He is also stated to have written a life of SirT. More, but it has not ' come down to us.

RASTENBURG, a town of Germany, in the province of East Prussia, lying in a fiat sandy plain on the Guber, 64 m. S.E. of Konigsberg by the railway to Prostken. Pop. (1905) 11,889. Its principal manufactures are flour, sugar, oil, beer and machinery. In the vicinity is Karlshof, a celebrated establishment for the cure of epileptic diseases.

See Beckherrn, Mittheilungen aus Rastenburgs Vergangenheit (Rastenburg, 1891); and Schaffer, Chronik von Raslenburg (Rasten- burg, 1889).

RAT (a word common to Teut. and Rom. languages; probably first adopted in Teut. ; the ultimate origin is not known ; Skeat sug- gests the root rad-, to scratch ; cf . Ger. Ratte, Dan. rotte, Fr. rat, &c.) , probably in its original sense the designation of the British rodent mammal commonly known as the black rat (Mus raltus), but also applied indifferently to the brown or Norway rat (M. norvegicus), and in a still wider sense to 2 11 the larger representatives of the genus Mus, as to many other members of the family Muridae. In fact, as mentioned in the article Mouse, there is no possi- bility of defining the term " rat " when used in a sense other than as relating to the two species above mentioned; while there is also no hard-and-fast limit between the terms " rats " and " mice " when these are likewise employed in their now extended sense, " rats " being merely larger " mice, " and vice versa. Rats have, however, generally more rows of scales

on the tail (reaching to 210 or more) than mice, in which the number does not exceed 180. For the distinctive character- istics of the family Muridae and the genus Mus, to which true rats and true mice alike belong, see Rodentia. Of the two British species the brown, or Nor- way rat (M. norvegi- cus) is distinguished by its large size, brownish grey colour, short tail and ears, stout skull, and the possession of from 10 to 12 teats. . It is fierce and cunning, and easily overcomes all allied species with which it is brought in contact. Its original home would seem to have been some part of Central Asia, an indigenous species from China, M. humiliatus, being so like it that in all prob- ability the latter is the original race from which it has sprung. Thence it has spread to all parts of the world, driving out the house-haunting species everywhere, as it has in England all but exterminated the black rat. The brown rat migrated westwards from Central Asia early in the 18th century, and is believed to have first reached Great Britain about 1730. Its already evil reputation has been increased of late years by the fact that it is one of the chief disseminators of bubonic plague. Black phases are not uncommon. The black rat (M. raltus) is distinguishable from the brown rat by its smaller size, longer ears and tail, and glossy black colour. It shares the roving habits of the latter, frequenting ships and by these means reaching various parts of the world. On this

account either the typical form or the tropical M. rattus alex- andrinus is common in many places to which the brown species lias not yet penetrated, for instance in South America. This long-tailed rat, originally a native of India, would seem to have iirst penetrated to all parts of the world and to have nearly or quite exterminated the indigenous rats. After this fol- lowed the advance of the more powerful brown rat. The black rat first reached Europe in the 13th century; but of late years another and still darker phase of the species, the Black Sea black rat (M. rattus ater) made its appearance in

Brown Rat (M. norvegicus).

England. The Isle of Dogs and Yarmouth, in Norfolk, are reported to be the chief of the English strongholds of the black rat. Both species agree in their predaceous habits, omnivorous diet and great fecundity. They bear, four or five times in the year, from four to ten blind and naked young, which are in their turn able to breed at an age of about six months; the time of gestation being about twenty days.

See J. G. Millais, " The True Position of Mus rattus and its Allies," Zoologist, June 1905. (R. L.)*

RATAFIA, a liqueur or cordial flavoured with peach or cherry kernels, bitter almonds, or other fruits; many different varieties are made. The same name is given to a flavouring essence resembling bitter almonds, and also to a light biscuit. The word is adapted from the French of the 17th century. Skeat (Etym. Diet., 1910) quotes as a possible origin a combina- tion of Malay araq, arrack, and tafia, rum.

RATE, a general term for proportion, standard, allowance, tax (Med. Lat. rata, from pro rata parte, ratus being the participle of reri, to think, judge). In England the term is specially applied to the levying of public money contributions for local purposes, as distinguished from the " taxes " raised for what are treated as general state purposes. The money required for local administration in England is raised (when the ordinary revenues are insufficient) by assessments on lands and buildings based on their annual rental value. The financial authority estimates what additional amount beyond revenue is required for the expenses of administration, and levies a rate to meet it. The earliest rate levied in England was that for poor relief, and of the great variety of rates now existing, the majority are based on the poor rate and levied with it, under the term of precept rates. Next to the poor rate came that for highways, and other special rates have been authorized from time to time, as for police, education, public lighting, cemeteries, libraries, sanitary purposes, &c. To distinguish the rate the name of the pre- cepting authority is frequently added or the purpose for

which it is levied specified, as county rate, watch rate, &c. The valuation list of a parish is the basis on which the poor rate is levied. This valuation list contains the gross estimated rental and rateable value of all rateable property in the parish. The gross estimated rental is the rent at which a property might reasonably be expected to let from year to year, the tenant paying tithes, rates and taxes. From this is deducted the average annual cost of repairs, insurance and renewals, the balance constituting the rateable value. The rateable value of the parish being known, so much on each pound of the rateable value as will equal the amount required to be raised is levied, and is known as the " rate." See further England, Local Government; Taxation.

Rating, in maritime vocabulary, is the classification of men according to rank, and was formerly employed to class ships of a navy according to strength. A sailor is said to be " rated A.B.," or in the navy " rated petty officer," " seaman," " gunner," and so on. The rating of ships began in the 17th century, and was at first done roughly by size and number of crew. Later the rating was by guns. Thus in 1741 in the British navy there were six rates: 1st, 100 guns; 2nd, 90; 3rd, 70 to 80; 4th, 50 to 60; 5th, 40; and 6th, 20. Sloops, fire- ships, bomb-vessels and royal yachts were said to be not rated. The classification of ships into six rates, and into rated and non-rated ships, continued during the existence of the old sailing fleets, with modifications in detail. The practice of other navies was similar to the British.

RATEL, or Honey-Badger, the name of certain Indian and African small clumsy-looking creatures of about the size and appearance of badgers, representing the genus Mellivora in the family Mustelidae (see Carnivora). Two species of ratel are commonly recognized, the Indian (M. indica), and the African (M. ratel), which ranges over Africa, but a black ratel from the Ituri forest has been separated as M . coltoni. Both the two former are iron-grey on the upper parts, and black below, a style of coloration rare among mammals, as the upper side of the body is in the great majority darker than the lower.

The body is stout and thickly built; the legs are short and strong, and armed, especially the anterior pair, with long curved claws; the tail is short; and the ears are reduced to rudiments. The skull is conical, stout and heavy, and the teeth, although sharper and less rounded than those of badgers, are less suited to a carnivorous diet than those of stoats, weasels and martens. The two ratels may be distinguished by the fact that the

African species has a distinct white line round the body at the junction of the grey of the upper side with the black of the lower, while in the Indian this line is absent; the teeth also of the former are larger, rounder and heavier than those of the latter. The two are, however, so nearly allied that they might almost be considered geographical races of a single species. Dr T. C. Jerdon states that the Indian ratel is found throughout the

Italien und Griechenland nach dem Heiligen Land (2 vols., 1882). See Obituary with bibliography by Professor H. Laspeyres, in Sitzungsbericht des nat. Vereins der preussischen Rheinlande (i£

The African Ratel {Mellivora ratel).

whole of India, from the extreme south to the foot of the Himalaya, chiefly in hilly districts, where it has greater facilities for constructing the holes and dens in which it lives; but also in the north of India in alluvial plains, where the banks of large rivers afford equally suitable localities wherein to make its lair. It is stated to live usually in pairs, and to eat rats, birds, frogs, white ants and various insects, and in the north of India it is accused of digging out dead bodies, and several of the native names mean " grave-digger. " Dr W. T. Blanford, in the Fauna of British India, is of opinion that the reproach is without foundation. Like its Cape congener it occasionally partakes of honey, and is often destructive to poultry. In confinement the Indian ratel becomes tame and even playful, displaying a habit of tumbling head over heels. (R. L.)*

RATH, GERHARD VOM (1830-1888), German mineralogist, was born at Dinsburg in Prussia, on the 20th of August 1830. He was educated at Cologne, at Bonn University, and finally at Berlin, where he graduated Ph.D. in 1853. In 1856 he became assistant to Noggerath in the mineralogical museum at Bonn, and succeeded to the directorship in 1872. Mean- while in 1863 he was appointed extraordinary professor of geology, and in 1872 he became professor of geology and miner- alogy in the university at Bonn. He was distinguished for his accurate researches on mineralogy and crystallography; he described a great many new minerals, some of which were discovered by him, and he contributed largely to our know- ledge of other minerals, notably in an essay on tridymite. He travelled much in southern Europe, Palestine and the United States, and wrote several essays on petrology, geology and physical geography, on earthquakes and on meteorites. He died at Coblenz on the 23rd of April 1888.

His separate publications included Ein Ausflug nach Kalabrien (1871); Der Monzoni im siidostlichen Tirol (1875); and Durch

RATHENOW, a town of Germany, in the Prussian province of Brandenburg, on the Havel, 45 m. N.W. of Berlin on the main railway to Hanover. Pop. (1905) 23,095, including the garrison. The Protestant church of St Mary and St Andrew, originally a basilica, and transformed to the Gothic style in 151 7-1 589, and the Roman Catholic church of St George, are noteworthy. Rathenow is known for its " Rathenow stones, " bricks made of the clay of the Havel, and for its spectacles and optical instruments, which are exported.

Rathenow received its incorporation as a town in 1295. In 1394 it was taken and partly destroyed by the archbishop of Magdeburg. It suffered much from the ravages of the Thirty Years' War, being occupied in turn by the Saxons and the Swedes, from whom in 1675 it was taken by the Brandenburgers, when most of the garrison were put to the sword.

See Wagener, Denkwiirdigkeiten der Stadt Rathenow (Berlin,

1903)-

RATIBOR (Polish Raciborz), a town of Germany, in the Prussian province of Silesia, pleasantly situated on the left bank of the Oder at the point where the river becomes navig- able, 13 m. from the Austrian frontier and 97 m. by rail S.E. of Breslau, on the main line to Oderberg. Pop. (1905) 32,690. The most prominent buildings are the handsome law-courts by Schinkel and the imposing chateau of the dukes of Ratibor, which occupies a commanding position on the right bank of the Oder. The town is the seat of various industries, the chief products of which are machinery, railway gear, ir6n wares, tobacco, cigars, paper, sugar, furniture and glass. Trade is carried on in these and in coal, wood and agricultural produce, while hemp and vegetables are largely grown in the environs.

Ratibor, which received municipal privileges in 1217, was formerly the capital of an independent duchy, 380 sq. m. in extent, which existed from 1288 to 1532, and afterwards passed successively into the hands of Austria and Prussia. In 182 1 a small mediate principality was formed out of the old lordship of Ratibor and certain ecclesiastical domains, and was con- ferred upon Victor Amadeus, landgrave of Hesse-Rotenburg, as compensation for some Hessian territory absorbed by Prussia. The title of duke of Ratibor was revived in 1840 for his heir, Prince Victor of Hohenlohe-Schillingsfurst (1818-1893).

See A. Weltzel, Geschichte der Stadt und Herrschaft Ratibor (2nd ed., Ratibor, 1881).

RATIONALISM (from Lat. rationalis, pertaining to reason, ratio), a term

employed both in philosophy and in theology for any system which sets up human reason as the final criterion and chief source of knowledge. Such systems are opposed to all doctrines which rest solely or ultimately upon external authority; the individual must investigate everything for himself and abandon any position the validity of which cannot be rationally demonstrated. The rationalist spirit is, of course, coeval with human evolution; religion itself began with a rational attempt to maintain amicable relations with unknown powers, and each one of the dead religions succumbed before the development of rationalist inquiry into its premises. But the term has acquired more special connotations in modern thought. In its commonest use it is applied to all who decline to accept the authority of the Bible as the infallible record of a divine revelation, and is practically synonymous with free- thinking. This type of rationalism is based largely upon the results of modern historical and archaeological investigation. The story of the Creation in the book of Genesis is shown, from the point of view of chronology, to be a poetic or symbolic account by the discovery of civilizations of much greater anti- quity. Again, the study of comparative religion (e. g. the study of the Deluge (q.v.), showing as it does that similar stories are to be found in primitive literature, both oriental and other) has placed the Bible in close relation with other ancient litera- ture. The Bible, especially the Old Testament, is thus regarded even by orthodox Christians from a rationalist standpoint,

very different from that of the early and medieval Church. Rationalism within the Christian Church differs, however, from that which is commonly understood by the term, inas- much as it accepts as revealed the fundamental facts of its creed. Thoroughgoing rationalism, on the other hand, either categorically denies that the supernatural or the infinite — whether it exist or not — can be the object of human know- ledge (see Agnosticism), or else, in the mouth of a single person, states that he at least has no such knowledge. In addition to the difficulties presented by the Bible as an historical record, and the literary problems which textual and other critics have investigated, the modern freethinker denies that the Christianity of the New Testament or its interpretation by modern theologians affords a coherent theory of human life and duty. Apart from the general use of the term for a particular attitude towards religion, two more technical uses require notice: (i) the purely philosophical, (ii) the theological.

(i) Philosophical rationalism is that theory of knowledge which maintains that reason is in and by itself a source of knowledge, and that knowledge

so derived has superior authority over knowledge acquired through sensation. This view is opposed to the various systems which regard the mind as a tabula rasa (blank tablet) in which the outside world as it were imprints itself through the senses. The opposition between rationalism and sensationalism is, however, rarely so simple and direct, inasmuch as many thinkers (e.g. Locke) have ad- mitted both sensation and reflection. Such philosophies are called rationalist or sensationalist according as they lay emphasis specially on the function of reason or that of the senses. More generally, philosophic rationalism is opposed to empirical theories of knowledge, inasmuch as it regards all true know- ledge as deriving deductively from fundamental elementary concepts. This attitude may be studied in Descartes, Leibnitz and Wolff. It is based on Descartes' fundamental principle that knowledge must be clear, and seeks to give to philosophy the certainty and demonstrative character of mathematics, from the a priori principle of which all its claims are derived. The attack made by David Hume on the causal relation led directly to the new rationalism of Kant, who argued that it was wrong to regard thought as mere analysis. A priori concepts there are, but if they are to lead to the amplification of knowledge, they must be brought into relation with em- pirical data.

(ii) The term " rationalism " in the narrow theological sense is specially used of the doctrines held by a school of German theologians and Biblical scholars which was prominent roughly between 1740 and 1836. This rationalism within the Church was a theological manifestation of the intellectual movement known as the Enlightenment (Aujklarung), and must be studied in close connexion with the purely philosophical rationalism already discussed. It owed much to the English deists, to the Pietistic movement, and to the French esprits forts who had already made a vigorous attack on the super- natural origin of the Scriptures. The crux of the difficulty was the doctrine of the supernatural, the relation between revealed and natural religion. The first great rationalist leader was J. S. Semler (q.v.), who held that true religion springs from the individual soul, and attacked the authority of the Bible in a comprehensive spirit of criticism. He ultimately reached a point at which the Bible became for him simply one of many ancient documents. At the same time he did not impugn the authority of the Church, which he regarded as useful in main- taining external unity. Among those who followed in Semler's path were Gruner Ernesti, J. D. Michaelis, Griesbach, J. G. Eichhorn. This spirit was exhibited on the philosophical side by Kant who in his Die Religion innerhalb der Grenzen der blossen Vernunjt (1793) set forth his doctrine of rational morality (Vernunftglauben) as the only true religion. These two great rationalist movements, the critical and the philo- sophical, ultimately led to, or were accompanied by, the gradual reduction of religion to a system of morals based at the most on two or three fundamental religious

principles. This is the

rationalism known as ralionalismus vulgaris, the period of which is practically from 1800 to 1833. Among its exponents were Wegscheider, Bretschneider and H. E. G. Paulus (qq.v.). The general attitude of German theology, however, became gradually more and more hostile, and the works of Schleier- macher, though in a sense themselves rationalist, renewed the general desire for a positive Christianity. Hase's Hutterus Redivivus, an exposition of orthodoxy in the light of modern development, called forth a final exposition of the rationalist position by Rohr. From that time the school as such ceased to have a real existence, though the results of its work are traceable more or less in all modern Biblical criticism, and its influence upon the attitude of modern .theologians and Biblical critics can scarcely be overestimated.

See Standlin, Geschichte des Ralionalismus (Gottingen, 1826) ; Hase, Theologische Streitschriften in Gesammelte Werke, viii. (1892); Ruckert, Der Ralionalismus (1859); Tholuck, ~V or geschichte des Rat. (1853-1861) and Geschichte des Rat. (1865); Ritschl, Christ. Lehre von der Rechtfertigung, &c. (1870), vol. i. ; Benn, History of Rationalism (1906). See also histories of philosophy and theology in the 19th century, and the valuable article s.v. by O. Kirn in Herzog-Hauck, Realencyk. xvi. (1905).

RATISBONNE, LOUIS GUSTAVE FORTUNE (1827-1900), French man of letters, was born at Strassburg on the 29th of July 1827. He studied at the school of his native town and at the College Henry IV. in Paris. He was connected with the Journal des Debats from 1853 to 1876; became librarian of the palace of Fontainebleau in 187 1, and three years later to the Senate. Louis Ratisbonne's most important work was a verse translation of the Divina Comtnedia, in which the original is rendered tercet by tercet into French. L'Enfer (1852) was crowned by the Academy; Le Purgatoire (1857) and Le Paradis 1859) received the prix Bordin. He is also the author of some charming fables and verses for children: La Comedie enjantine (i860), Les Figures jeunes (1865) and others. He was literary executor of Alfred de Vigny, whose Destinees (1864) and Journal d'un poete (1867) he published. Ratisbonne died in Paris on the 24th of September 1900.

RATITAE (from Lat. ratis, a raft), the name given by B. Merrem (Abh. Ah. Wiss., Berlin, 1812-1813; Phys. K.I., p. 259) to the " flat-breasted birds," in opposition to the Carinatae,or those which normally possess a keeled sternum. In thus dividing the birds into two great equivalent groups, he was followed only by C. L. Nitzsch (1829), T. H. Huxley (1867), P. L. Sclater (1880), A. Newton (1884), R. B. Sharpe (1891), whilst in most of the

other numerous classifications the Ratitae (vicariously named Struthiones, Cursores, Brevipennes, Proceres) were treated as of much lower rank.

A diagnosis covering all the Ratitae (struthio, rhea, casuarius, dromaeus, apleryx and the allied fossils dinornis and aepyornis) would be as follows — (i) terrestrial birds without keel to the sternum, absolutely flightless; (ii) quadrate bone with a single proximal articulating knob; (iii) coracoid and scapula fused together and forming an open angle; (iv) normally without a pygostyle; (v) with an incisura ischiadica; (vi) rhamphotheca compound; (vii) without apteria or bare spaces in the plumage; (viii) with a complete copulatory organ, moved by skeletal muscles.

The separation of the Ratitae from the other birds, and their seemingly fundamental differences, notably the absence of the keel and of the power of flight, induced certain authors to go so far as to derive the Ratitae from the Dinosaurian reptiles, whilst Archaeopteryx {q.v.) and the Carinatae were supposed to have sprung from some Pterosaurian or similar reptilian stock. Such vagaries require no refutation. But it is quite another question, whether the "Ratitae" form a natural group. Sir R. Owen was the first (Comp. Anal, and Physiol, of Vertebrates, ii. 1866) to indicate that the various Ratitae might be referable to various natural groups of the Carinatae. A. W. Forbes likewise had doubts about them. B. Lindsay (P. Z.S., 1885, pp. 684-716, pis. lii.-lv.) found vestiges of a keel in a young rhea, and apteria in the embryonic ostrich, and she concluded that they were descendants of birds which originally possessed

the power of flight. This has been settled by M. Fiirbringer (U 'titer suchungen . . . 1888), and there is now no doubt that the absence of the power of flight is a secondary, not primitive, feature in the Ratitae as well as in the flightless bona fide Carinatae, e.g. Didus, and penguins. It had already been understood that the various genera of the Ratitae were the representatives of so many different groups, each of which was at least equivalent to ordinal rank, and that therefore, if the Ratitae were still to. be considered a natural group, this common ancestry must be referred to a remote geological epoch. Fiirbringer, however, separated Apteryx with Dinornis from the rest, combining his " Apteryges " with Crypturi and Galli as Alectorornithes, the latter being practically A. H. Garrod's Galliformes. of which his " Struthiones " form part together with the Tinamidae or Crypturi. Relationship of this other- wise typically carinate, neotropical family with the Ratitae had already been insisted upon by T. H. Huxley; hence his term Dromaeognathae for the Crypturi. L. Stejneger (Standard

Nat. Hist., iv., Boston, 1885) applied this term in a new wider sense to all the Ratitae, and recently W. P. Pycraft has revived this notion by his division of the Neornithes into Dromaeo- and Neognathae. At any rate we begin to see that some of the Ratitae, namely the Rheidae, may possibly be an early and then much modified offshoot of such of the Carinatae as are now represented by the Crypturi, whilst in another part of the world, and at a much later time, kiwis and moas have sprung from a somewhat more Galliform stock, which points to a descent from a still undivided Galliform-Tinamiform mass. Further, it is the opinion of competent ornithologists that there is affinity of the Australian emeus and cassowaries with the New Zealand moas and with the Malagasy Aepyornis. Struthio alone still stands aloof, possibly because it is the oldest and most specialized form. This genus was already typically developed in late Miocene times, and with a very wide geographical distribution (see Bird, Fossil), but of the affinities of the other mid- and early tertiary flightless birds we know nothing, and it must be emphasized that we should probably not be able to classify a truly ancestral Ratite, namely, a bird which is still to a certain extent carinate and not yet ratite. It is impossible to give a satisfactory diagnosis of such intermediate forms.

All the recent Ratitae still possess a considerable number of rather primitive characters, e.g. they are typically nidifugous; the simple structure of their neossoptiles; quintocubital ; compound rhamphotheca; holorhinal nares imperviae; basi- pterygoid processes; simple articular facet of the quadrate; configuration of the palatal bones, including the large vomer; incisura ischiadica; simple hypotarsus; the thigh muscles; the copulatory organ.

We restrict the origin of the Ratitae to that great branch of still primitive Carinatae which, after separation of the Ratitae, has further developed into the legion of the Alectoromorphae, notably Tinami- and Galliformes, together with still low Grui- formes (see Bird, Classification). From such a rudis indiges- taque moles, after it had attained an almost world-wide distribution, have arisen the various Ratitae, independently at various epochs and in various countries. Most of them are now restricted to widely separated countries of the southern hemisphere. Although loss of flight (correlated with more or less reduction of the wings and the sternal keel, and often com- pensated by stronger hind limbs) has occurred, and is still taking place in various groups of birds, it is quite impossible that a new Ratite can still come into existence, because the necessary primitive substratum, whence arose the true Ratitae, is no longer available. Consequently we are justified in retaining " Ratitae " in our classification, although they are a hetero- geneous, not strictly monophyletic, assembly. (H. F. G.)

RATKE (RATCHIUS), WOLFGANG (1571-1635), German educationist,

was born at Wilster, Holstein, on the 18th of October 1571, and educated at the university of Rostock. His system of education was based upon Bacon's philosophy, the principle being that of " proceeding from things to names,"

from the particular to the general, and from the mother tongue to foreign languages. In 161 8 he opened schools at Augsburg and elsewhere, but at Kothen difficulties with the clergy led to his imprisonment for eight months, and after starting another school at Magdeburg in 1620 which failed, he became a wanderer and died at Erfurt on the 27th of April 1635. His ideas were far in advance of his time, but he lacked executive ability.

RATLAM (or Rutlam), a native state of central India, in the Malwa agency. Area, 902 sq. m. Its territory is closely interlaced with that of Sailana. It is held as tributary to Sindhia; but in 18 19 an arrangement was made by which Sindhia engaged never to send any troops into the country or to interfere with the internal administration, and in 1861 the tribute was assigned to the British government in part payment of the Gwalior contingent. The population in 1901 was 83,773, showing a decrease of 6% in the decade; estimated revenue, £34,000; tribute, £2850. The chief, whose title is raja, is a Rahtor Rajput of the Jodhpur family. The chief Sujjan Singh succeeded in 1893, and attained full powers in 1898. The town of Ratlam is 1577 ft. above sea-level. Pop. (1901) 36,321. It is a junction on the Rajputana-Malwa railway, and an important centre of trade, especially in opium.

RATNAGIRI, a town and district of British India, in the southern division of Bombay. The town is on the seacoast, 136 m. S. of Bombay. Pop. (1901) 16,094. A leading industry is the sardine fishery, which usually takes place in January and February, and engages fleets of canoes.

The District of Ratnagiri has an area of 3998 sq. m. It forms a strip between the western Ghats and the sea, and its general character is rugged; nearly all the fertile land lies on the banks of the streams which intersect the country. The coast, about 150 m. in length, is almost uniformly rocky and dangerous. At intervals of about 10 m. a river or bay opens, sufficiently large to form a secure harbour for native craft, and the promontories at the river mouths are almost invariably crowned with the ruins of an old fort. The rivers and creeks are generally navigable for about 20 m., and afford facilities for a coasting trade. At the beginning of British rule there were no roads, and traffic was confined to places where there was water carriage; but a network of roads has been made, opening communication by hill passes with the Deccan. Ratnagiri formed part of the dominions of the peshwa, and was annexed by the British government in 1818 on the overthrow of Baji Rao. In 1901 the population was

1,167,927, showing an increase of 6% in the decade. Ratnagiri is the home of the influential class of Chitpavan Brahmans. It also supplies factory hands to Bombay and sepoys to the native army.

RATNAPURA (i.e. " The City of Gems "), the chief town in the province of Sabaragamuwa, Ceylon. It is the centre of a long established industry in digging for precious stones — rubies, sapphires, cat's-eyes, &c. There is also much rice and fruit cultivation and planting of tea in the district. Pop. of town (1901) 4084; of district 132,964.

RATON, a city and the county seat of Colfax county, New Mexico, U.S.A., in the N.E. part of the state, and about 193 m. by rail N.E. of Santa Fe. Pop. (1890) 1255; (1900) 3540 (337 foreign-born); (1910 census) 4539. Raton is served by the Atchison, Topeka & Santa Fe, the Saint Louis, Rocky Mountain & Pacific, and the Santa Fe, Raton & Eastern railways. The city lies immediately W. of the Raton Mountains, from which it derives its name, and has an elevation of 6400-6650 ft. above the sea. Among its institutions are a miners' hospital, main- tained by the state, and a picturesque public park. The city lies within the Raton coal field, a southern continuation of the field of the same name in Colorado, and the richest coal- producing area in New Mexico. In 1907 70% of the total coal product of New Mexico came from Colfax county, in which this field is situated. Ores of gold, silver and lead have been mined in Colfax county. South and east of the city there is good farming land. Raton is a place of railway origin, and owes its development to its extensive railway shops, as well as to the proximity of mines. It was incorporated in i&gi.

RATRAMNUS (d. c. 868), a theological controversialist of the second half of the gth century, was a monk of the Benedictine abbey of Corbie near Amiens, but beyond this fact very little of his history has been preserved. He is best known by his treatise on the Eucharist {De corpore et sanguine Domini liber), in which he controverted the doctrine of transubstantiation as taught in a similar work by his contemporary Radbertus Paschasius. Ratramnus sought in a way to reconcile science and religion, whereas Radbertus emphasized the miraculous. Ratramnus's views failed to find acceptance; their author was soon forgotten, and, when the book was condemned at the synod of Vercelli in 1050, it was described as having been written by Johannes Scotus Erigena at the command of Charle-magne. In the Reformation it again saw the light; it was published in 1532 and immediately translated. In the con- troversy about election, when appealed to by Charles the Bald, Ratramnus wrote two books De

praedestinatione Dei, in which he maintained the doctrine of a twofold predestination; nor did the fate of Gottschalk deter him from supporting his view against Hincmar as to the orthodoxy of the expression " trina Deitas. " Ratramnus perhaps won most glory in his own day by his Contra Graecorum opposita, in four books (868), a valued contribution to the controversy between the Eastern and Western Churches which had been raised by the publication of the encyclical letter of Photius in 867. An edition of De corpore et sanguine Domini was published at Oxford in 1859.

See the article by G. Steitz and Hauck in Hauck's Realency- klopddie fiir protest. Theologie, Band xvi. (Leipzig, 1905) ; Naegle, Ratramnus und die heilige Eucharistie (Vienna, 1903); Schnitzer, Berengar von Tours; and A. Harnack, History of Dogma, v., pp.

309-322 (1894-9).

RATTAZZI, URBANO (1808-1873), Italian statesman, was borp on the 29th of June 1808 at Alessandria, and from 1838 practised at the bar. In 1848 he was sent to the chamber of deputies in Turin as representative of his native town. By his debating powers he contributed to the defeat of the Balbo ministry, and for a short time held the portfolio of public in- struction; afterwards, in the Gioberti cabinet, he became minister of the interior, and on the retirement of the last-named in 1849 ne became practically the head of the government. The defeat at Novara compelled the resignation of Rattazzi in March 1849. His election as president of the chamber in 1852 was one of the earliest results of the so-called " connubio " with Cavour, i. e. the union of the moderate men of the Right and of the Left; and having become minister of justice in 1853 he carried a number of measures of reform, including that for the suppression of certain of the monastic orders. During a momentary reaction of public opinion he resigned office in 1858, but again entered the cabinet under La Marmora in 1859 as minister of the interior. In consequence of the negotiations for the cession of Nice and Savoy he again retired in January i860. He was entrusted with the formation of a new ministry in March 1862, but in consequence of his policy of repression towards Garibaldi at Aspromonte he was driven from office in the following December. He was again prime minister in 1867, from April to October. He died at Frosinone on the 5th of June 1873. His wife, whom he married in 1863, was a remark- able woman. She was the daughter of Sir Thomas Wyse, British plenipotentiary at Athens, and Laetitia Bonaparte, niece of Napoleon I. Born in Ireland in 1833, sne was educated in Paris, and in 1848 married a rich Alsatian named Solms; but the prince- president refused to recognize her, and in 1852 she was expelled from Paris. Her husband died soon after; and calling herself the Princesse Marie de Solms, she spent her time in various fashion- able places and dabbled in literature, Eugene Sue and Francois

Ponsard being prominent in her court of admirers. She pub- lished Les Chants de I'exilee (1859) and some novels. After Rattazzi's death, she married (1877) a Spaniard named Rute; she died in February 1902.

See Madame Rattazzi, Rattazzi et son temps (Paris, 1881); Bolton King, History of Italian Unity (London, 1899).

RATTLESNAKE. Rattlesnakes are a small group of the sub-family of pit-vipers (Crolalinae, see Snakes; Viperidae) , characterised by a tail which terminates in a chain of horny, loosely connected rings, the so-called "rattle." The "pit" by which the family is distinguished from the ordinary vipers is a deep depression in the integument of the sides of the snout, between the nostrils and the eye; its physiological function is unknown. The rattle is a complicated and highly specialized organ, developed from the simple conical scale or epidermal spine, which in the majority of snakes forms the termination of the general integument of the tail. The bone by which the root of the rattle is supported consists of the last caudal verte-brae, from three to eight in number, which are enlarged, dilated, compressed and coalesced (fig. 1,0). This bone is covered

Fig. 1. — Rattle of Rattlesnake (after Czermak).

1. Caudal vertebrae, the last coalesced in a single bone a. 2. End of tail (rattle removed); a, cuticular matrix covering terminal bone. 3. Side view of a rattle; c and d the oldest, a and b the youngest joints. 4. A rattle with joints disconnected; x fits into b and is covered by it; 2 into d in like manner.

with thick and vascular cutis, transversely divided by two constrictions into three portions, of which the proximal is larger than the median, and the median much larger than the distal. This cuticular portion constitutes the matrix of a horny epidermoid covering which closely fits the shape of the under- lying soft part and is the beginning of the rattle, as it appears in young rattlesnakes before they have shed their skin for the first time. When the period of a renewal of the skin approaches a new covering of the extremity of the tail is formed below the old one, but the latter, instead of being cast off with the remainder of the epidermis, is retained by the posterior swelling of the end of the tail, forming now the first loose joint of the rattle. This process is repeated on succeeding moultings — the new joints being always larger than the old ones as long as the snake grows. Perfect rattles therefore taper towards the point, but generally the oldest (terminal) joints wear away in time and are lost. As rattlesnakes shed their skins more than once every year, the number of joints of the rattle does not indicate the age of the animal but the number of exuviations which it has undergone. The largest rattle in the British Museum has twenty-one joints.

The rattle consists thus of a variable number of dry, hard, horny cup-shaped joints, each of which loosely grasps a portion of the preceding, and all of which are capable of being shaken against each other. If the interspaces between the joints are filled with water, as often happens in wet weather, no noise can be produced. The motor power lies in the lateral muscles of the tail, by which a vibratory motion is communicated to the rattle, the noise produced being similar to that of a child's rattle and perceptible at a distance of from 10 to 20 yds. The habit of agitating the tail is not peculiar to the rattlesnake, but has been observed in other venomous and innocuous snakes with the ordinary tail, under the influence of fear or anger. It is significant that the tip of such snakes is sometimes rather conspicuously coloured and covered with peculiarly modified

scales, notably in Acanthophis. The use of such a tail probably consists in attracting or fixing the attention of small animals, by slightly raising and vibrating the tip. The rattle no doubt acts as a warning, every snake preferring being left alone to being forced to bite. Many a man has been warned in time by the shrill sound, and this principle applies undoubtedly to other

Fig. 2. — Rattlesnake {Crotalus adamanteus s. durissus).

mammals. Moreover, rattlesnakes are rather sluggish, and comparatively not vicious. First they try to slink away; when overtaken or cornered they use every means of frightening the foe by swelling up, puffing, rattling and threatening atti- tudes; it is as a rule not until they are touched, or provoked by a rapid movement, that they retaliate, but then they strike with fury. They are viviparous, and as destroyers of rats, mice and other small rodents they are useful. The surest way of clearing a ground of them and any other snakes is to drive in pigs, which are sure to find and to eat them, without harm to themselves. They inhabit localities to which the sun has free access, prairies, rough stony ground, &c. Specimens of 5 ft. in length are not rare. Formerly common in the eastern parts of the United States, and still so in thinly inhabited districts, rattlesnakes, like the vipers of Europe, have gradually succumbed to the persecution of man.

Rattlesnakes are confined to the New World. North-American authors distinguish a great number of different kinds, S. W. Garman (" Reptiles and Batrachians of North America," Harvard Mus. Zool. Mem., 1883, 410) enumerating twelve species and thirteen additional varieties. E. D. Cope has split them into twenty; but all these species or varieties fall into

two groups. One, Sistrurus, has the upper side of the head covered with the ordinary nine shields; only three species, of comparatively small size, in North America

(Sistrurus miliarius from Florida to Sonora; 5. catenatus in many of the middle states. of the Union, and elsewhere, as far north as Michigan; S. ravus in Mexico).

The second group forms the genus Crotalus, in which the shields between and behind the eyes are broken up and replaced by small scales. This genus ranges throughout the United States through Central and South America into Patagonia, but is not represented on any of the West Indian islands. C. horridus, with the tail uni- formly black, from Maine to Kansas and Louisiana to Florida. C. adamanteus, tail light, with black crossbands, body with a hand- some pattern of rhombs with lighter centres and yellowish edges; chiefly south-eastern states, to Arizona and Mexico; the largest of rattlers, giants of 8 ft. in length having been recorded. C. con- fluentus, tail with brown or indistinct bands; with a continuous series of large brown or reddish rhomboidal spots on the back; Texas to California. C. cerastes, with a pair of horns above the eyes; the "sidewinder" of Arizona and California to Nevada. C. terrificus, easily distinguished by the possession of three pairs of symmetrical shields on the top of the muzzle, ranging from Arizona into Argentina. It is the only kind of rattlesnake in Central and South America. C. triseriatus, a small species, with a feebly developed rattle, on Mexican mountains, on the pic of Orizaba up to 12,500 ft. (St G. M. ; H. F. G.)

RAU, KARL HEINRICH (1792-1870), German political economist, was born at Erlangen on the 29th of November 1792. He studied from 1808 to 181 2 at the university there, where he afterwards remained as a Privatdozent. In 18 14 he obtained the prize offered by the academy of Gottingen for the best treatment of the question how the disadvantages arising from the abolition of trade gilds might be removed. His memoir, greatly enlarged, was published in 1816 under the title Uber das Zunftwesen mid die Folgen seiner Aufhebung. In the same year appeared his Primae lineae historiae politices. In 1818 he became professor at Erlangen. In 1822 he was called to the chair of political economy at Heidelberg where the rest of his life was spent, in the main, in teaching and research. He took some part, however, in public affairs: in 1837 he was nominated a member of the first chamber of the duchy of Baden, and in 1 8 51 he was one of the commissioners sent to England on the part of the Zollverein to study the Industrial Exhibition. A result of this mission was his account of the agricultural imple- ments exhibited at London (Die landwirthschaftlichen Gerathe der Londoner Ausstellung, 1853). He was elected a correspond- ing member of the French Institute in 1856. He died

at Heidelberg on the 18th of March 1870.

His principal work is the Lehrbuch der politischen Okonomie (1826-37), an encyclopaedia of the economic knowledge of his time, written with a special view to the guidance of prac- tical men. The three volumes are respectively occupied with (1) political economy, properly so called, or the theory of wealth, (2) administrative science (Volkswirthschaftspolitik) and (3) finance. The two last he recognizes as admitting 01 varia- tions in accordance with the special circumstances of different countries, whilst the first is more akin to the exact sciences, and is in many respects capable of being treated, or at least illustrated, mathematically. This threefold division marks his close relation to the older German cameralistic writers, with whose works he was familiarly acquainted. It is a consequence in part of his conformity to their method and his attention to administrative applications that his treatise was found peculiarly adapted for the use of the official class, and long maintained its position as their special text-book. He was the economic teacher, says Roscher, of the well-governed middle states of Germany from 1815 to 1848. The book has passed through many editions; in that of 1870 by Adolf Wagner it was trans- formed into a new book.

In the earlier part of his scientific life Rau tended strongly towards the relative point of view and an historical method in economics, but he never actually joined the historical school. To the end he occupied a somewhat indeterminate position with respect to that school; on the whole, however, he more and more subordinated historical investigation to immediate practical interests, and in his economic politics moved in the direction of limiting rather than extending the sphere of state action. His general merits are thoroughness of treatment, accuracy of state- ment, and balance of judgment; he shows much industry in the

collection and skill in the utilization of statistical facts; and his exposition is orderly and clear.

Besides the publications already mentioned, he was author of the following : — A nsichten der Volkswirthschaft, 1 82 1 ; Malthus und Say iiber die Ursachen der jetzigen Handelsstockung, 1821; Grundriss der Kameralwissenschaft oder Wirthschaftslehre, 1823; Uber die-Kameralwissenschaft, Entwickelung ihres Wesens und ihrer Theile, 1825; Uber die Landwirthschaft der Rheinpfalz, 1830; and Geschichle des Pfluges, 1845.

Rau founded in 1834 the Archiv der politischen Okonomie und Polizeiwissenschaft, in which he wrote a number of articles, after- wards issued in separate form: amongst them may be named those on the debt of Baden, on the accession of Baden to the Zollverein, on the crisis of the Zollverein in the summer of 1852, on the American banks, on the English poor law, on List's national system of political economy and on the minimum size of a peasant property.

RAUCH, CHRISTIAN DANIEL (1777-1857), German sculptor, was born at Arolsen in the principality of Waldeck on the 2nd of January 1777. His parents were poor and unable to place him under efficient masters. His first instructor taught him little else than the art of sculpturing gravestones, and Professor Ruhl of Cassel could not give him much more. A wider field of improvement opened up before him when he removed to Berlin in 1797; but he was obliged to earn a livelihood by becoming a royal lackey, and to practise his art in spare hours. Queen Louisa, surprising him one day in the act of modelling her features in wax, sent him to study at the Academy of Art. Not long afterwards, in 1804, Count Sandrecky gave him the means to complete his education at Rome, where William von Humboldt, Canova and Thorwaldsen befriended him. Among other works, he executed bas-reliefs of " Hippo- lytus and Phaedra," " Mars and Venus wounded by Diomede," and a " Child praying." In 1811 Rauch was commissioned to execute a monument for Queen Louisa of Prussia. The statue, representing the queen in a sleeping posture, was placed in a mausoleum in the grounds of Charlottenburg, and procured great fame for the artist. The erection of nearly all public statues came to be entrusted to him. There were, among others, Bulow and Scharnhorst at Berlin, Bliicher at Breslau, Maximilian at Munich, Francke at Halle, Diirer at Nuremberg, Luther at Wittenberg, and the grand-duke Paul Frederick at Schwerin. At length, in 1830, he began, along with Schinkel the architect, the models for a colossal equestrian monument at Berlin to Frederick the Great. This work was inaugurated with great pomp in May 185 1, and is regarded as one of the master-pieces of modern sculpture. Princes decorated Rauch with honours and the academies of Europe enrolled him among their members. A statue of Kant for Konigsberg and a statue of Thaer for Berlin occupied his attention during some of his last years; and he had just finished a model of " Moses praying between Aaron and Hur " when he was attacked by his last illness. He died on the 3rd of December 1857.

RAUCOURT, MLLE (1756-1815), French actress, whose real name was Francoise Marie Antoinette Saucerotte, was born in Nancy on the 3rd of March 1756, the daughter of an actor, who took her to Spain, where she played in tragedy at the age of twelve. By 1770 she was back in France at Rouen, and her success as Euphemie in Belloy's Gaston et Bayard caused her to be called to the Comedie Francaise, where in 1772 she made her

debut as Dido. She played all the classical tragedy parts to crowded houses, until the scandals of her private life and her extravagance ended her popularity. In 1776 she suddenly disappeared. Part of the ensuing three years she was in prison for debt, but some of the time she spent in the capitals of northern Europe, followed everywhere by scandal. Under protection of the queen she reappeared at the Theatre Frangais in 1779, and renewed her success in Phedre, as Cleopatra, and all her former roles. At the outbreak of the Revolution she was imprisoned for six months with other royalist members of the Comedie Frangaise, and she did not reappear upon that stage until the close of 1793, and then only for a short time. She deserted, with a dozen of the best actors in the company, to found a rival colony, but a summons from the Directory brought her back in 1797. Napoleon gave her a pension, and

in 1806 she was commissioned to organize and direct a company that was to tour Italy, where, especially in Milan, she was enthusiastically received. She returned to Paris a few months before her death on the 15th of January 181 5. Her funeral was the occasion of a riot. The clergy of her parish having refused to receive the body, the crowd broke in the church doors, and were only restrained from further violence by the arrival of an almoner sent post-haste by Louis XVIII. She is buried at Pere Lachaise.

RAUDNITZ (Czech Roudnice nad Labem), a town of Bohemia, Austria, 44 m. N. of Prague by rail. Pop. (1900) 7986, mostly Czech. It is situated on the Elbe, and its chief attraction lies in the interesting and valuable collections in its chateau, which has belonged to the princely family of Lobkowitz since the beginning of the 17th century. These include a library with a large number of the earliest specimens of printing and valuable MSS., together with a series of pictures from the time of Charles V. to the Thirty Years' War. In 1350 Cola di Rienzi, " the last of the tribunes," was confined by the emperor Charles IV. in the castle, which occupied the site of the present chateau, previous to his despatch under arrest to the pope at Avignon. In 1184 Raudnitz is mentioned as belonging to the see of Prague. The title of duke of Raudnitz was conferred on the head of the family of Lobkowitz by the emperor Joseph II. in 1786.

RAUMER, FRIEDRICH LUDWIG GEORG VON (1781-1873), German historian, was born at Worlitz in Anhalt on the 14th of May 1781. His father (d. 1822), as Kammerdireklor in Anhalt, did excellent service to agriculture. After studying at the Joachimsthal Gymnasium, Berlin, and at the universities of Halle and Gottingen, Raumer began to practise law, and rose in the civil service under Hardenberg, the chancellor. He was made a professor at the university of Breslau in 1811, and in 1819 he became professor of political science and history at Berlin, holding the chair until 1847, and giving occasional lectures until 1853. In 1815 he had carried on

historical investi- gations in Venice, and in the two following years he had travelled in Germany, Switzerland and Italy. In 1848 he was elected a member of the German parliament at Frankfort, where he associated himself with the right centre, supporting the proposal for a German empire under the supremacy of Prussia; and he was one of the deputation which offered the imperial crown to Frederick William IV. After the break- down of the German parliament, Raumer returned to Berlin, where he was made a member of the first chamber of the Prussian parliament. He died at Berlin on the 14th of June 1873. Raumer's style is direct, lucid and vigorous, and in his day he was a popular historian, but judged by strictly scientific standards he does not rank among the first men of his time.

His first work, published anonymously in 1806, was entitled Sechs Dialoge iiber Krieg und Handel. This was followed by Das britische Besteuerungssystem (18 10), Handbuch merkwiirdiger Stellen aus den lateinischen Geschichtschreibern des Mittelalters (1813), Herbstreise nach Venedig (1816) and other books. His most famous works are Geschichle der Hohenstaufen und ihrer Zeit (1 823-25 ; 5th ed., 1876) and Geschichle Europas seit dent Ende des i$ten Jahr- hunderts (1832-50). In 1831 appeared Brieve aus Paris und Frank- reich im Jahre 1830 and Briefe aus Paris zur Erlauterung der Geschichte des i6ten und ijlen Jahrhunderts. He went to England in 1835, to Italy in 1839 and to America in 1843, and these visits led to the publication of various works — England in 183$ (1836), Beitrdge zur neuern Geschichte aus dent Britischen Museum und Reichs- archive (1836-39), Italien, Beitrdge zur Kenntniss dieses Landes (1840), Die Vereinigten Staaten von Nordameriha (1845). Among his later books may be mentioned Antiquarische Briefe (1851), Historisch-politische Briefe iiber die geselligen Verhaltnisse der Men- schen (i860), Lebenserinnerungen und Briefwechsel (1861) and Hand- buch zur Geschichte der Literatur (1864-66). In 1830 Raumer began the Historisches Taschenbuch published by Brockhaus, which from 1871 was continued by Riehl.

RAUPACH, ERNST BENJAMIN SALOMO (1784- 1852), German dramatist, was born on the 21st of May 1784 at Straupitz, near Liegnitz in Silesia, a son of the village pastor. He attended the gymnasium at Liegnitz, and studied theology at the university of Halle. In 1804 he obtained a tutorship

in St Petersburg. He preached at times in the German Lutheran church, wrote his first tragedies, and in 1817 was appointed professor of German

literature and history at a training college in connexion with the university. Owing to an outburst of jealousy against Germans in Russia, culminating in police supervision, Raupach left St Petersburg in 1822 and undertook a journey to Italy. The literary fruits of his travels were Hirsemenzels Briefe aus und iiber Italien (1823). He next visited Weimar, but, being coldly received by Goethe, abandoned his idea of living there and settled in 1824 in Berlin. Here he spent the remainder of his life, writing for the stage, which for twenty years he greatly influenced, if not wholly controlled, in the Prussian capital. He died at Berlin on the 1 8th of March 1852.

Raupach was a prolific writer of both tragedies and comedies; of the former, Die Fiirsten Chawansky (1818), Der Liebe Zau- berkreis (1824), Die Leibeigenen, oder Isidor und Olga (1826), Rafaele (1828), Der Nibelungenhort (1834) and Die Schule des Lebens (1841), and of the latter Die Schleichhdndler (1828) and Der Zeitgeist (1830) are pieces which have enjoyed great popu- larity owing to their skilful dramatic handling. On the other hand, the historical dramas with which his name is chiefly associated, Die Hohenstaufen (1837-38), a cyclus of 15 dramatic pieces founded on Friedrich von Raumer's Geschichte der Hohen- staufen, as also the trilogy Cromwell (1841-44), are superficial in treatment. Raupach had a great knowledge of theatrical effect and situations, but he contorts historical facts in order to suit his political hobby, which was the separation of church and state.

Raupach's collected dramas appeared under the title Dramatische Werke ernster Gattung (16 vols.," 1830-43) and Dramatische Werke komischer Gattung (4 vols., 1829-35). For his life see Pauline Raupach, Raupach, eine biographische Skizze (1853); also K. Goedeke, Grundriss zur Geschichte der deutschen Dichtung, 2nd ed. (1905), vol. viii., pp. 646-668.

RAVAILLAC, FRANCOIS (1578-1610), the assassin of Henry IV. of France, was born near Angouleme. He was of humble origin and began life as a valet de chambre, but after- wards became a lawyer and also teacher of a school. After having been imprisoned by his creditors, he sought admission to the recently founded order of Feuillants, but after a short probation was dismissed as a visionary. An application for admission to the Society of Jesus was equally unsuccessful in 1606. His disappointments fostered a fanatical temperament, and rumours that the king was intending to make war upon the pope suggested to him the idea of assassination, which he carried out on the 14th of May 16 10. In the course of his trial he was frequently put to the torture, but persistently (and it is now believed truly) denied that he had been prompted by any one or had any accomplices. Sentence of death was carried out on the 27th of May following.

See Jules Loiseleur, Ravaillac et ses complices (1873), and E. Lavisse, Histoire de France, tome vi. (Paris, 1905).

RAVAISSON-MOLLIEN, JEAN GASPARD FELIX (1813- 1900), French philosopher and archaeologist, was born at Namur on the 23rd of October 1813. After a successful course of study at the College Rollin, he proceeded to Munich, where he attended the lectures of Schelling, and took his degree in philosophy in 1836. In the following year he published the first volume of his famous work Essai sur la metaphysique d' Aristote, to which in 1846 he added a supplementary volume. This work not only criticizes and comments on the theories of Aristotle and the Peripatetics, but also deduces from them a modern philo- sophical system. In 1838 he received the degree of doctor, and became professor of philosophy at Rennes. From 1840 he was inspector-general of public libraries, and in i860 became inspector-general in the department of higher education. He was also a member of the Academy, and of the Academy of Moral and Political Science, and curator of the Department of Anti- quities at the Louvre (from 1870). He died in Paris on the 18th of May 1900. In philosophy, he was one of the school of Cousin, with whom, however, he was at issue in many important

points. The act of consciousness, according to him, is the basis of all knowledge. These acts of consciousness are manifesta- tions of will, which is the motive and creative power of the intellectual life. The idea of God is a cumulative intuition given by all the various faculties of the mind, in its observation of harmony in nature and in man. This theory had considerable influence on speculative philosophy in France during the later years of the 19th century.

Ravaisson's chief philosophical works are: " Les Fragments philosophiques de Hamilton " (in the Revue des Deux Monies, November, 1840); Rapport sur le stoicisme (1851); La Philosophic en France au dix-neuvieme siecle (1868; 3rd ed., 1889); Morale et metaphysique (1893). Eminent as a philosopher, Ravaisson was also an archaeologist, and contributed articles on ancient sculpture to the Revue Archeologique and the Memoir es de I'Academie des Inscriptions. In 1871 he published a monograph on the Venus of Milo.

See Renouvier, in VAnnee philosophique (Paris, 1868); Dawriac, " Ravaisson philosophe et critique " (La Critique philosophique, 1885, vol. ii.).

RAVANASTRON, an Indian stringed instrument played with a bow, used by wandering pilgrims. A Hindu tradition affirms that the musical bow was invented before 3000 B.C. by Ravanon, king of Ceylon, and that the instrument for which he invented it was named after him Ravanastron. 1

Judging from precedent, it is probable that the ravanastron of the present day has changed little, if at all, for many centuries. It consists of half a round gourd, over which is fixed a sound-board of skin or parchment; to this primitive body without incurvation is attached a neck about twice the length of the body. The strings are either one or four in number, the pegs being set in the sides of the neck. The bridge is primitive and either straight or slightly arched, so that in bowing more than one string sounds at once.

The ravanastron is regarded by some writers as the first ancestor of the violin, on account of the alleged invention of the bow for use with it. This theory can only be accepted by those who consider the bow, which after all was common to such inferior instruments as the rebec, as of paramount importance, and the structural features of the instrument itself, the box sound-chest with ribs, which have always belonged to the most artistic types of instruments, such as the cithara and the guitar-fiddle, as of secondary importance.

(K. S.)

RAVELLO, a village of Campania, Italy, in the province of Salerno, about 3 m. N.N.E. of Amalfi by road, 1227 ft. above sea-level. It commands a magnificent view. Pop. (1901) 1 85 1. The history of Ravello cannot be traced beyond the 9th century. In the nth it was called Rebellum, because it refused to acknowledge the sovereignty of Amalfi, and in the 13th, when at the height of its prosperity, it had 36,000 inhabitants. The Palazzo Rufolo, begun in the nth century, has two lofty towers and beautiful Saracenic decoration in the courtyard. The ex-cathedral of S. Pantaleo, almost entirely modernized, has fine bronze doors by Barisanus of Trani (n 79), and two pulpits in Cosmatesque work. The larger, supported by six columns resting on the backs of lions, was made in 1272 by Nicolaus of Foggia; the bust over the entrance to it is said to be a portrait of Sigilgaita Rufolo. The smaller, of the same date, is simpler, and has curious repre- sentations of Jonah and the whale. The parish church of S. Giovanni in Toro, spoilt by restorations in the 18th century, contains a splendid pulpit in Cosmatesque work, supported on four pillars, and the crypt some 14th-century frescoes. In front of it is the porch of the Palazzo dell' Afflitto, composed of ancient fragments. S. Maria Immacolata is another Roman- esque church.

See A. Avena, Monumenti dell' Arte Meridionale (Naples, 1902), i. 349 sqq.

RAVEN (O.E. hrcefn, Icel. hrafn, Dan. ravn, Du. raaf, Ger. Rabe), the largest of the birds of the order Passeres, and a member of the family Corvidae, probably the most highly developed of all birds. Quick-sighted, sagacious and bold, the raven preys on the spoils of fishers and hunters, as

also on weakly

J An illustration appears in Sonnerat's Voyages aux Indes orien- tates (Paris, 1806), vol. i. p. 182.

animals among flocks and herds. A sentiment of veneration or superstition has from remote ages and among many races attached to it. The raven is associated with various characters of history, sacred or profane — Noah and Elijah, Odin and Flokki, the last of whom by its means discovered Iceland. It is said to have played its part in the mythology of the Red Indian; and it has often figured in prose and verse, from the time of Shakespeare to that of Poe and Dickens. Superstition has been generally succeeded by persecution, which in many districts has produced extirpation.

The raven breeds very early in the year, in England resorting to its nest, which is usually an ancient if not an ancestral structure, about the middle or towards the end of January. Therein are laid from five to seven eggs of the common Corvine coloration (see Crow), and the young are hatched before the end of February. In more northern countries the breeding season is naturally delayed, but everywhere this species is almost, if not quite, the earliest breeder. The raven measures about 26 in. in length, and has an expanse of wing consider- ably exceeding a yard. Its bill and feet are black, and the same may be said of its whole plumage, but the feathers of the upper parts as well as of the breast are glossy, reflecting a bright purple or steel-blue. The species (Corvus corax) inhabits the whole of Europe, and the northern if not the central parts of Asia; but in the latter continent its southern range is not well determined. In America it is, or used to be, found from the shores of the Polar Sea to Guatemala if not to Honduras, but is said hardly to be found of late years in the eastern part of the United States. In Africa its place is taken by three allied but well-differentiated species, two of which {Corvus umbrinus, readily distinguished by its brown neck, and C. qffinis, having its superior nasal bristles upturned vertically) also occur in south-western Asia, while the third (C. leptonyx or C. tingitanus, a smaller species characterized by several slight differences) inhabits Barbary and the Atlantic Islands. Farther to the southward in the Ethiopian region three more species appear whose plumage is varied with white — C. scapulatus, C. albicollis, and C. crassirostris — the first two of small size, but the last rivalling the real raven in that respect. (A. N.)

RAVEN-HILL, LEONARD (1867-), English artist and illustrator, was born

on the 10th of March 1867, He was educated at Bristol grammar school and the Devon county school, and studied art at Lambeth and then in Paris under MM. Bougereau and Aime Morot. He began to exhibit at the Salon in 1887, and in the Royal Academy in 1889. In 1893 he founded, with Arnold Golsworthy, the humorous and artistic monthly The Butterfly (1893-94, revived in 1 899-1 900). He contributed to mariy illustrated magazines, and began to work for Punch, with which he was afterwards prominently associ- ated, in 1896. He illustrated Sir Walter Besant's East London (1901) and J. H. Harris's Cornish Saints and Sinners; he published the impressions of his visit to India on the occasion of the tour of the prince and princess of Wales as An Indian Sketch-Book (1903); and his other published sketch-books include Our Battalion (1902) and The Promenaders (1894).

RAVENNA, a city and archiepiscopal see of Emilia, Italy, capital of the province of Ravenna, standing in a marshy plain 13 ft. above sea-level, 6 m. from the sea and 45 m. by rail east of Bologna. Pop. (1906) 35,543 (town), 67,379 (commune) — a considerable increase, as the population of 1881 was only 34,270 (commune). The industries are few, the growing of wine, breeding of silkworms, making of agricultural instruments, printing and the manufacture of laces being the chief. The town is connected with the sea by the Corsini Canal, the two small rivers Ronco and Montone no longer serving as means of communication. Ravenna has railway communication with Bologna (via Castel Bolognese), Ferrara and Rimini, and by steam tram with Forli. At the mouth of the canal is a small harbour.

No other city in the world offers so many and such striking examples of the ecclesiastical architecture of the centuries from the 5th to the 8th. The style is commonly called Byzantine;

but some of the most striking features of the churches of Ravenna — the colonnades, the mosaics, perhaps the cupolas — are not so much Byzantine as representative of early Christian art generally. The following are the most important churches of Ravenna, arranged in the order of the dates generally attri- buted to them: —

Church.

Builder.

Date.

1. Metropolitan Church, or

Ecclesia Ursiana, and

baptistery adjoining

S. Ursus .

37°-390(?)

2. S. Giovanni Evangelista .

Galla Placidia .

425

3. S. Agata . . ...

Gemellus .

about 430

4. S. Pier Crysologo (chapel)

S. Peter Chrysologus

about 450

5. S. Giovanni Battista .

Baduarius

,,

6. SS. Nazario e Celso .

Galla Placidia .

ir

7. S. Pier Maggiore (now S.

Francesco)

Bishop Neon (?)

about 458

8. S. Teodoro (now Santo

Spirito) — A.

Theodoric (?) .

493-526

9. S.Maria in Cosmodin (Arian

baptistery) — A.

,,

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10. S. Martino in Coelo Aureo

(now S. Apollinare Nuovo)

— A. ....

11. S. Vitale ....

Julianus Argentarius

about 530

12. S. Maria Maggiore .

Bishop Ecclesius

it

13. S. Apollinare in Classe

Julianus Argentarius | about 535

(The churches marked A. were originally erected for the

Arian worship.)

Almost the only sacred building previous to the 5th century of which we have any record is unfortunately lost. The cathedral of Ravenna, built by S. Ursus in 370-390, which had a nave and four aisles, was destroyed in 1734-44, only the (inaccessible) crypt and the round campanile remaining from the earlier structure; there are fragments of reliefs from a pulpit erected by Archbishop Agnellus (556-569) in the interior. A rare work on the earlier church (Buonamici, La Metropolitana di Ravenna) gives details of its construction. The present cathedral contains several early Christian marble sarcophagi, a silver cross of the 6th century (that of Agnellus), and

the so-called throne of the Archbishop Maximian (546- 552), adorned with reliefs in ivory, which, however, was really brought to Ravenna in 1001 by John the Deacon, who recorded the fact in his Venetian chronicle, as a present from the Doge Pietro Orseolo to the Emperor Otho III.

The period from the transference of the imperial residence to Ravenna to the death of Valentinian III. (404-455) was the first period of great building activity in Ravenna, when the archiepiscopal see of Ravenna attained great importance. It was to it that we owe the erection of the Basilica Petriana at Classe (396-425), which has entirely disappeared, of the churches of S. Giovanni Evangelista (425), of S. Agata (425- 432), of the chapel of S. Pier Crisologo (433-449), of the tomb of Galla Placidia (440), the church of S. Pier Maggiore (now S. Francesco) (433-458), the baptistery of Neon (449-458), S. Giovanni Battista and S. Croce.

Rivoira, in the book cited below, shows that many of the characteristic architectural details can be traced back to a classical and in particular a Roman origin, and were not derived from the East, e.g. the use of blind arches as an external decoration, and of brick cornices with the points of the bricks projecting like the teeth of a saw, the use of pulvini (cushions) above the capitals of columns and under the spring of an arch, &c. &c, the use of round arches springing direct from these cushions, spherical pendentives, &c.

Of this group of churches, S. Giovanni Evangelista, erected by Galla Placidia in fulfilment of a vow made on her voyage from Constantinople, has been entirely rebuilt, though the columns are ancient (the Corinthian capitals are probably from a classical building), and the crypt may be original. The Gothic portal is fine, and the church contains a mosaic pavement of 1 2 13 with curious representations and some frescoes by Giotto, painted during a visit to Dante between 13 17 and 1320. S. Agata was almost entirely rebuilt in 1476-94. The

chapel of S. Pier Crisologo in the archiepiscopal palace pre- serves its original mosaics, and so also does the tomb of Galla Placidia (SS. Nazario e Celso), a small structure in the form of a Latin cross with a dome (in which, as in the baptistery of Neon, the old cathedral, &c, the constructional use of amphorae is noteworthy), with a plain brick exterior, and rich mosaics on a dark blue ground within. The sarcophagus of Galla Placidia has, like the two others that stand here, been despoiled of its contents. The altar, like that at S. Vitale, is made of thin slabs of alabaster,

behind which lamps were intended to be placed.

S. Francesco, as it has been called since 1261, when it came into the possession of the Franciscans, has been almost entirely modernized, except for the crypt and campanile (nth century). The baptistery adjacent to the cathedral was, according to Ricci, originally part of the Roman baths, converted to a Christian baptistery by the Archbishop Neon (440-452), though according to other authorities it is a Christian building dating from before a.d. 396. It is an octagon, with a dome; in the interior are two arcades one above the other. The mosaics of the 5th century, in the dome, are the earliest and perhaps the finest at Ravenna for their splendid decorative effect and rich colouring, and are less stiff and conventional than the later mosaics.

Of S. Giovanni Battista, also erected in this period, hardly anything remains after the restoration of 1683, and S. Croce has been overtaken by a similar fate.

After the death of Valentinian III. the activity in building for which Ravenna had been so remarkable suffered a check; but the reign of Theodoric (493-526) marks another era of magnificence. In the eastern part of the city he built for himself a large palace, which probably occupied about a sixth of the space now enclosed within the city walls, or nearly the whole of the- rectangle enclosed by Strada di Porta Alberoni on the south, Strada Nuova di Porta Serrata on the west and the line of the city walls on the north and east. There still remains close to the first-named street and fronting the Corso Garibaldi a high wall built of square Roman bricks, with pillars and arched recesses in the upper portion, which goes by the name of Palazzo di Teodorico. Freeman, on account of the Romanesque character of the architecture, thought it probable that it really belongs to the time of the Lombard kings, and his opinion is shared by Ricci and Rivoira, who consider it to be a guardhouse erected by the exarchs, recent explorations having made it clear that it was an addition to the palace, while mosaic pavements and an atrium once surrounded by arcades really belonging to the latter were found in 1870 behind S. Apollinare Nuovo and in 1908 behind the so-called Palazzo at a lower level and a different orientation. A mosaic in the church of S. Apollinare Nuovo gives some faint idea of the palace. A more memorable and clearly authentic monument of Theodoric is furnished by his tomb, a massive mausoleum which stands still perfect outside the walls near the north-east corner of the city. It is circular internally and decagonal externally, in two storeys, built of marble blocks, and surmounted by an enormous monolith, brought from the quarries of Istria and weighing more than 300 tons. The plan is no doubt derived from that of a Roman tomb. In this mausoleum Theodoric was buried, but his body was cast forth from it, perhaps during the troublous times of the siege

of Ravenna by the imperial troops, and the Rotunda (as it is now generally called) was converted into a church dedicated to the Virgin.

S. Apollinare Nuovo, the most important basilica in the town, was built by Theodoric to be the largest of Arian churches, and originally called S. Martino in Coelo Aureo (a name which it lost in the 9th century). The exterior is uninteresting, and the church lost both atrium and apse in the 16th century. The interior has twenty-four columns of marble (from Constantinople according to some, from Rome according to others), with almost uniform capitals. The walls of the nave are adorned with mosaics of the 6th century; the scenes from the New Testament above the windows date from the time of Theodoric, while the

somewhat stiff processions below, of virgins on one side and of saints on the other, are substitutions of the latter half of the 6th century for representations which probably contained some allusion to Arianism or episodes in the life of Theodoric (so Ricci). The mosaics have been in parts much restored; but the earlier ones still show, like those which preceded them in Ravenna, classical forms, variety of treatment and freedom of colouring, while the processions are monotonous and inferior in execution, intended rather to produce a decorative effect than beauty of form. The pulpit appears to be of Byzantine origin (Rivoira). The campanile (850-878) is circular, and has perhaps the earliest example of the use of disks of coloured majolica as a decoration. This, like the other campanili of Ravenna, is later than the church to which it belongs. Those of the cathedral of S. Apollinare in Classe, S. Maria Maggiore and S. Agata, also circular, probably belong also to the 9th century, while the two square campanili of S. Giovanni Evangelista and S. Francesco probably belong to the early nth century. The other churches erected by Theodoric are: S. Teodoro (or S. Spirito), erected by Theodoric for the Arian bishops, but entirely modified: the baptistery of this church (afterwards the oratory of S. Maria in Cosmedin) formed out of the octagonal hall of a Roman bath (?) — unless it is an originally Christian building — with mosaics of the 6th century imitating those of the baptistery of Neon, and freely restored; S. Maria Maggiore, founded by the Archbishop Ecclesius (521-534), but almost entirely rebuilt; and S. Vittore, which has suffered a similar fate. To the same period probably belong a few columns of the so-called Basilica of Heracles in the Piazza Vittorio Emanuele, with capitals like those of S. Apolli- nare in Classe.

The impulse given by Theodoric was continued by his successors, and during the regency of Amalasuntha and the reigns of Theodatus and Vitiges (526-539), S. Vitale and S. Apollinare in Classe were constructed by Julius Argentarius contemporaneously with S. Lorenzo in Milan and the cathedral of Parenzo — also S. Michele in Africisco, nothing of the original structure

of which now exists. The former, well restored by Ricci in 1898-1900 (except for the dome with its baroque frescoes which has not been altered), is a regular octagon, with a vestibule, originally flanked by two towers on the west, a choir added on the east, triangular outside and circular within; it is surrounded within by two galleries interrupted at the presbytery, and supported by eight large pillars, the intervals between which are occupied by open exedrae. The mosaics of the choir (547) are due to Justinian, and, though inferior in style, are remarkable for their splendour of colouring and the gorgeous dresses of the persons represented, and also for their historical interest, especi- ally the scenes representing the emperor and the empress Theodora presenting offerings. The marble screens of the altar are wonderfully finely carved. The marble mosaic pave- ment (nth century) is very effective. Remains of the original marble wall lining and stucco decoration also exist. The capitals are, in the lower order, the characteristic funnel-shaped rectangular Byzantine capitals, some of them with open work> bearing cushions; this is a type probably derived from the cushion itself, and developed in the East about the second half of the 5th century.

The architecture of S. Vitale (for plan see Architecture, sect. Early Christian), according to Rivoira, was inspired not by Byzantium, where similar churches — S. Sofia and SS. Sergio and Bacco — are slightly later in date, but by the churches of Salonica (a.d. 495), while the plan is derived from a Christian baptistery, or from such a building as the so-called temple of Minerva Medica at Rome.

S. Apollinare in Classe, erected at the same time outside the walls of Classis, and now standing by itself in the lonely marshes, is the largest basilica existing at Ravenna. It has a nave and aisles with a closed vestibule on the west, and a fine round campanile of the 9th (?) century. The exterior brick walls are divided by shallow arches and pilasters, as in other churches of Ravenna. It has twenty-four columns of Carystian (cipollino) marble, with capitals probably of Byzantine work with swelling

acanthus leaves; but the rest of the church is due to native architects. The lofty presbytery and the crypt under it belong to the 1 2th century. The walls of the interior were stripped of their marble panelling by Sigismondo Malatesta in 1449, for the adornment of his church at Rimini. The apse has mosaics of the 6th and 7th centuries. The 18th-century series of portraits of the archbishops of Ravenna is no doubt copied from an earlier original. There are a number of fine carved sarcophagi in the church (5th to 8th century). The building activity of the Gothic kings was continued by

Justinian, to whose time we owe the completion of S. Vitale and S. Apollinare in Classe, and some of the mosaics in S. Appollinare Nuovo.

The buildings of a subsequent period are of minor im- portance, but the basilica of S. Maria in Porto near the ancient harbour (1096 sqq.), a basilica with open roof, with frescoes by masters of the Rimini school, may be noticed. The massive concrete substructures of the campanile are attributed to an old lighthouse. The tomb of Dante, who died at Ravenna in 13 21, is close to S. Francesco; it is a square-domed structure, with a relief by Pietro Lombardo (1482) representing the poet, and a sarcophagus below, in an urn within which lie the poet's remains. Close by is a small court with early Christian sarco- phagi, containing the remains of the Braccioforte family. The secularized monastery of Classe, in the town, built by the monks of S. Apollinare in Classe in 155 sqq. as a refuge from the malaria, which prevailed at Classe itself, with fine 17th-century cloisters, contains the important museum, which has Roman and By- zantine antiquities, inscriptions, sculptures, jewelry, &c. — including the possible remains of a suit of gold armour of Theodoric — and a collection of Italian woodcuts; also the library with rare MSS. and incunabula (among the former the best extant MS. of Aristophanes). The Accademia, close by, has a few pictures by local masters, e.g. N. Rondinelli (end of 15th century), of no great importance, and a fine recumbent statue of Guidarello Guidarelli, a condottiero of Ravenna, and a partisan of Caesar Borgia (d. 1501), by Tullio Lombardo (?) or Severo da Ravenna (?).

In the Piazza Vittorio Emanuele are two granite columns erected by the Venetians, in 1483, with statues of SS. Apollinaris and Vitalis. The cloisters of S. Maria di Porto erected in the town in the 16th century (owing to malaria, as in the case of those of Classe), and of S. Vitale, are pleasing 16th-century structures. The 15th-century castle in the north-east corner of the town erected by the Venetians is a picturesque brick building. The famous pineto or pinewood of Ravenna, which already existed in Odoacer's time, and has been sung by poets since Dante, lies some 5 m. south of Ravenna.

History. — Strabo mentions a tradition that Ravenna was founded by Thessalians, who afterwards, finding themselves pressed by the Etrurians, called in their Umbrian neighbours and eventually departed, leaving the city to their allies. Pliny, on the other hand, calls it Sabine. Throughout the valley of the Po the Gauls took the place of the Etrurians as a conquering power; but Ravenna may possibly have retained its Umbrian character until, about the year 191 B.C., by the conquest of the Boii, thewholeof this region passed definitely under the dominion of Rome. Either as a colonia or a municipium, Ravenna re- mained for more than two centuries an inconsiderable city of Gallia Cisalpina, chiefly noticeable as the place in

which Caesar during his ten years' command in Gaul frequently resorted in order to confer with his friends from Rome, and from which he started for his advance into Italy. At length under Augustus it suddenly rose into importance, when that emperor selected it as the station for his fleet on " the upper sea." Two hundred and fifty ships, said Dion (in a lost passage quoted by Jordanes), could ride at anchor in its harbour. At the same time Augustus conducted a branch of the Po (the fossa Augusta) through the city into the sea. It also became important for the export of timber from the Alps. Strabo, writing probably a few years after Ravenna had been thus selected as a naval arsenal, gives us a description of its appearance which certainly corre- sponds more closely with modern Venice than with modern

Ravenna. " It is the largest of all the cities built in the lagoons, but entirely composed of wooden houses, penetrated in all directions by canals, wherefore bridges and boats are needed for the wayfarer. At the flow of the tide a large part of the sea comes sweeping into it; and thus, while all the muddy deposit of the rivers is swept away, the malaria is at the same time removed, and by this means the city enjoys so good a sanitary reputation that the government has fixed on it as a place for the reception and training of gladiators." On the other hand, good water was proverbially difficult to obtain at Ravenna — dearer than wine, says Martial, who has two epigrams on the subject. Trajan, however, built an aqueduct nearly 20 miles long, which was restored by Theodoric in 503. Of this some traces still exist in the bed of the Ronco above Ravenna. Flies and frogs were also complained of, and Sidonius, writing in the 5th century, complains bitterly of the " feculent gruel " (cloac- alis puis) which filled the canals of the city, and gave forth fetid odours when stirred by the poles of the bargemen. The port of Ravenna, situated about 3 miles from the city, was named Classis. A long line of houses called Caesarea connected it with Ravenna, and in process of time there was such a con- tinuous series of buildings that the three towns seemed like one. It was a municipium under the Empire, as the inscrip- tions show, but it seems to have had magistrates rather suited to a vicus or village, its importance being due entirely to the naval station (cf. the state of things at Mediolanum, Milan). It had large gilds of jabri (smiths and carpenters) and centonarii (firemen).

Of Roman Ravenna nothing remains above ground, though a little has been found by excavation, including a mosaic pavement at Classe near S. Severo (Ricci, op. cit. p. 50). Among the tombs many of the poorer under the Empire were simply formed of amphorae, in which the body was placed. A pre- historic station was found in 1894 at S. Zaccaria near Ravenna, belonging to a Terramare (E. Brizio in Notizie degli Scavi, 1896, 85). In a.d. 339 it is spoken of as having previously been the chief town of Picenum, but having recently been assigned to Aemilia. It was connected with Ariminum, 33 miles to the south by the coast road, the Via Popillia,

which ran on north to Hatria, and joined the road between Patavium and Altinum at Ad Portum.

The great historical importance of Ravenna begins early in the 5th century, when Honorius, alarmed by the progress of Alaric in the north of Italy, transferred his court hither. From this date (404) to the fall of the Western Empire in 476 Ravenna was the chief residence of the Roman emperors. Here Stilicho was slain; here Honorius and his sister Placidia caressed and quarrelled; here Valentinian III. spent the greater part of his life; here Majorian was proclaimed; here the little Romulus donned his purple robe; here in the pinewood 1 outside the city his uncle Paulus received his decisive defeat from Odoacer. Through all these changes Ravenna maintained its character as an impregnable " city m the sea," not easily to be attacked even by a naval power on account of the shallowness and devious nature of the channels by which it had to be approached. Odoacer, like the emperors who had gone before him, made Ravenna his chief place of residence, and here he shut himself up when Theodoric the Ostrogoth had invaded Italy and defeated him in two battles. Theodoric's siege of Ravenna lasted for three years (489-492), and was marked by one bloody encounter in the pinewood on the east of it. The Ostrogoth collected a fleet and established a severe blockade, which at length caused Odoacer to surrender the city. The terms, arranged through the inter- vention of John, archbishop of Ravenna, were not observed by

1 The great pinewood to the east of the city, which is still one of the great glories of Ravenna, must therefore have been in exist- ence already in the 5th century. Byron's description, " [The] immemorial wood Rooted where once the Adrian wave flowed o'er," is probably true; but there is no evidence that it was in historic time that this change took place. It may be conjectured that the Pineta grew on a large peninsula somewhat resembling the Lido of Venice.

Theodoric, who, ten days after his entry into the city, slew his rival at a banquet in the palace of the Laurel Grove (March 1 5, 493). Ravenna was Theodoric's chief place of residence, and his reign (493-526) may be considered the time of its greatest splendour.

Nine years after the death of Theodoric Justinian sent an army to destroy the Gothic monarchy and restore Italy to the empire. Long after the Goths had lost Rome they still clung to Ravenna, till at length, weary of the feebleness of their own king, Vitiges, and struck with admiration of their

heroic conqueror, they offered to transfer their allegiance to Belisarius on condition of his assuming the diadem of the Western Empire. Belisarius dallied with the proposal until he had obtained an entrance within the walls of the capital, and proclaimed his inviolable fidelity to Justinian. Thus in the year 539 was Ravenna re-united to the Roman empire. Its connexion with that empire — or, in other words, its dependence upon Constantinople — lasted for more than 200 years, during which period, under the rule of Narses and his successors the exarchs, Ravenna was the seat of Byzantine dominion in Italy. In 728 the Lombard king Luitprand took and destroyed the suburb Classis; about 752 the city itself fell into the hands of his successor Aistulf, from whom a few years after it was wrested by Pippin, king of the Franks. By this time the alteration of the coast-line and the filling up of the lagoons had probably commenced, and no historical importance attaches to its subsequent fortunes. It formed part of the Frankish king's donation to the pope in the middle of the 8th century, though the archbishops, as a fact, retained almost independent power. It was an independent republic, generally taking the Guelph side in the 13th century, subject to rulers of the house of Polentani in the 14th, Venetian in the 15th (1441), and papal again in the 16th, — Pope Julius II. having succeeded in wresting it from the hands of the Venetians. St Romuald and St Peter Damian were both natives of Ravenna. From this time (1509) down to our own days, except for the interruptions caused by the wars of the French Revolution, Ravenna -continued subject to the papal see and was governed by a cardinal legate. In 1849 Garibaldi's wife Anita, who had accompanied him on his retreat from Rome, succumbed to fatigue in the marshes near Ravenna. In 1859 it was one of the first cities to give its vote in favour of Italian unity, and it has since then formed a part of the kingdom of Italy.

Charles the Great carried off the brazen statue of Theodoric and the marble columns of his palace to his own palace at Aix-la-Chapelle. More than five centuries later (1320) Dante became the guest of Guido Novello di Polenta, lord of Ravenna, and here he died on the 14th September of the following year. The marble urn containing the body of the poet still rests at Ravenna, where what Byron calls " a little cupola more neat than solemn" has been erected over it. In 151 2 (see below) the French army under Gaston de Foix fought a fierce battle with the Spanish, Venetian, and papal troops on the banks of the Ronco about two miles from Ravenna. The French were victorious, but Gaston fell in the act of pursuing the enemy. His death is commemorated by the Colonna dei Francesi erected on the spot where he fell. Lord Byron resided at Ravenna for eighteen months in 1820-21, attracted by the charms of the Countess Guiccioli.

Authorities. — The most important authority for the history of Ravenna is Bishop Agnellus, who wrote, about 840, the Liber Pontificalis Ecclesiae

Ravennalis. The best edition is that by Holder- Egger in the Monumenta Germaniae Historica (1878). See also E. Bormann, in Corpus Inscript. Latin, xi. (Berlin, 1888), p. I sqq.; G. T. Rivoira, Origini dell' Architettura Lombarda, I. (Rome, 1901); C. Ricci, Ravenna (Bergamo, 1902). To the careful restorations of the last named the buildings of Ravenna owe much. (T. H. ; T. As.)

Battle of 1 512. — This battle, one of the principal events of the long Italian wars of Charles VIII., Louis XII., and Francis I. of France, is, like Marignano, interesting in a tactical sense, from the fact that the feudalism of the past and the expert soldiership of the future were strangely mingled. It arose out >f the attempt of the Spanish and Italian forces to relieve

Ravenna, besieged by Gaston de Foix, duke of Nemours. The most celebrated captains of these wars were present on either side — under Gaston de Foix were Bayard, Yves d'Allegre, La Palisse ; and under Cardona the Spanish viceroy of Naples, Pedro Navarro the great engineer, and Pescara the originator of the Spanish tactical system. After some preliminary manoeuvres the two armies drew up face to face on the left bank of the Roneo, the Spanish left and the French right resting on this river. The Spaniards were entrenched, with their heavy artillery distributed along the front, but, thanks to Navarro, they had a more mobile artillery in the shape of 200 arquebuses a croc mounted in groups upon carts, after the German fashion, and this was held ready to move wherever its services might be needed. The left wing was composed of the papal contingent, 6000 infantry and 800 gendarmes under Fabrizio Colonna; the centre, of half the Spanish contingent, 4000 infantry and 600 lancers under the viceroy; the right, of 1000 light horse under Pescara. Behind the centre was the rest of the Spanish con- tingent, 600 lancers and 4000 infantry. On the other side the right wing was commanded by the duke of Ferrara, who had like Navarro organized a mobile field artillery (the artillery material of this prince was thought to be the best conditioned in Europe). It consisted besides of 800 French gendarmes under Louis de Breze and 5000 German landsknechts under Jakob Empser. In the centre were 8000 French infantry (the ancestors of the later Picardie and Piedmont regiments) under the seigneur de Molart, and 5000 Italian infantry. On the left were the light horse. A reserve of 600 gendarmes under La Palisse was behind the centre. The battle opened with a prolonged cannon- ade from the Spanish lines. For three hours the professional regiments of all sorts in the French lines rivalled one another in enduring the fire unmoved, the forerunners of the military systems of to-day, landsknechts, Picardie and Piedmont, show- ing the feudal gendarmerie that they too were men of honour. There was no lying down. The captains placed themselves in the front, and in the centre 38 out of 40 of them were struck down. Molart and Empser, drinking each other's health in the midst of the cannonade, were killed by the same shot.

Sheltered behind the entrenchments, the Spaniards scarcely suffered, for they were lithe active troops accustomed to lie down and spring up from the ground. But after three hours, Pescara's light horse having meantime been driven in by the superior light horse of the enemy, the artillery-loving duke of Ferrara conceived the brilliant plan of taking his mobile field-guns to the extreme right of the enemy. This he did, and so came in sight of the prone masses of the Spaniards. Disciplined troops as they were, they resisted the temptation to escape Ferrara's fire by breaking out to the front; but the whole Spanish line was enfiladed, and on the left of it the papal troops, who were by no means of the same quality, filled up the ditch in front of their breastworks and charged forward, followed by all the gendarmerie. Once in the plain they were charged by the French gendarmes under Gaston himself, as well as by the lands- knechts, and driven back. The advantage of position being thus lost, the Spanish infantry rose and flung itself on the attackers; the landsknechts and the French bands were dis-ordered by the fury of the counterstroke, being unaccustomed to deal with the swift, leaping, and crouching attack of swords- men with bucklers. But La Palisse's reserve wheeled in upon the rear of the Spaniards, and they retreated to the entrench- ments as fast as they had advanced. The papal infantry, the gendarmes, and the light horse had already vanished from the field in disorder; but the Spanish regulars were of different mettle, and it was only after a long struggle that the lands- knechts and the French bands broke into the entrenchments. A captain of landsknechts, Fabian by name, holding his long pike crosswise, brought it down with all his force upon the opposing spears, and at the cost of his life made a narrow gap through which the French broke into the mass of the enemy. Still the conflict continued, but at last La Palisse, with all the gendarmerie still in hand, rode completely round the entrench- ments and charged the Spaniards' rear again. This was the

end, but the remnant of the Spanish infantry retreated in order along the river causeway, keeping the pursuers at bay with their arquebuses. Gaston de Foix, recklessly charging into the midst of them, was killed. (C. F. A.)

RAVENNA, EXARCHATE OF, the official name of that part of Italy which remained in the allegiance of the Roman emperors at Constantinople from the closing years of the 6th to the middle of the 8th century. The civil and military head of these possessions, the exarch (q.v.), was stationed at Ravenna. The territory round the town, from the southern border of the modern Venetia to the beginning of the Pentapolis at Rimini, was under his direct administration and formed in a limited sense the exarchate. The

other provinces were governed by dukes and magistri militum, titles which were generally, but not always, borne by the same person. But as all were subject to his authority, they were included in the exarchate of Ravenna, which was therefore another name for the province of Italy. The borders of these dominions varied according to the fortunes of the imperial authority in its long struggle with the Lombards. Sicily formed a separate government. Corsica and Sardinia belonged to the exarchate of Africa. The reorganization of the province of Italy into the exarchate was forced on the emperors by the Lombard invasion, which began in 568, and their permanent settlement. The Lombards thrust a wedge into Italy. Its base was in Venetia, and its point was advanced to the Tiber. From the early days of the conquest they spread to the south, and estab- lished the duchies of Spoletum and Beneventum in the modern kingdom of Naples. They may thus be said to have hollowed out the imperial, or Byzantine, possessions in Italy, the interior being under their power, and the coast remaining to the imperial officers. This illustration, however, is subject to two serious exceptions. As the Lombards spread they came into pos- session of many parts of the coast. Then a belt of imperial territory stretching from Rimini on the Adriatic, S.W. to the mouth of the Tiber, and including the duchies of Perugia and Rome, served to unite the immediate territory of Ravenna with the duchy of Naples, and to separate the two bodies under Lombard dominion, the kingdom in the north, and the southern duchies Spoletum and Beneventum. The organization of the exarchate is placed by modern investi- gators under the reign of the emperor Maurice (582-602), when the imperial government began to recognize the necessity of providing for a new and a long struggle. At the end of the 6th century the exarchate included Istria; the maritime part of Venetia as distinct from the interior which was in the hands of the Lombard kings at Pavia; the exarchate proper, or territory around Ravenna on the eastern side of the Apennines, to which was added Calabria, which at that period meant the heel and not the toe of the boot; the Pentapolis, or coast from Rimini to Ancona with the interior as far as the mountains; the duchy of Rome, or belt of territory connecting the Pentapolis with- the western coast, the coast of Naples, w'th Bruttium the toe of the boot, the modern Calabria, and Liguria, or the Riviera of Genoa. The Piedmont, Lombardy, mainland of Venetia, Tuscany and the interior of Naples be- longed to the Lombards. The advance of these barbarians was for a time checked during the anarchy which followed the death of Alboin, and was subject to other suspensions. The superior organization of the imperial government enabled" it to regain lost territory and delay complete ruin. In 590 the empire regained much of Venetia. But these revivals were not permanent. The superiority of the empire was a mechanical one, and during the two centuries or so that the exarchate lasted it lost ground. In 640 the Ligurian seacoast fell under the power of the Lombards, and ceased to be an imperial pro- vince. About a century

later the exarchate had been greatly reduced, though the imperial officials endeavoured to conceal the fact by retaining and transferring names when the reality of possession was lost. About 740 it consisted of Istria, Venetia (the maritime portion of which was ceasing to be a province and was becoming a protected state, the forerunner

of the future republic of Venice), Ferrara, Ravenna (the exarchate in the limited sense), Pentapolis, Perusia, Rome, the coast of Naples and Calabria (in the sense of the toe and not the heel of the boot) which was being overrun by the Lom- bards of the duchy of Beneventum, which with Spoletum held the interior. In Rome the pope was the real master. These fragments of the " province of Italy," as it was when recon- quered by Justinian, were almost all lost either to the Lom- bards, who finally conquered Ravenna itself about 750, or by the revolt of the pope, who separated from the empire on account of the iconoclastic reforms. The intervention of Pippin the Carolingian, who was called in by the popes to protect them against the Lombards and the Eastern emperors alike, made a revival of the exarchate impossible. It disappeared, and the small remnants of the imperial possessions on the mainland, Naples and Calabria, passed under the authority of the " patri- cius " of Sicily, and when Sicily was conquered by the Arabs in the 10th century were erected into the themes of Calabria and Langobardia. Istria was attached to Dalmatia.

In its internal history the exarchate was subject to the influences which were everywhere, in central and western Europe at least, leading to the subdivision of sovereignty and the establishment of feudalism. Step by step, and in spite of the efforts of the emperors at Constantinople, the great imperial officials became landowners, the owners of land — kinsmen or at least associates of these officials — intruded on the imperial administration, while the necessity for providing for the defence of the imperial territories against the Lombards led to the formation of local militias, who at first were attached to the imperial regiments, but gradually became independent. These armed men formed the exercitus romanae militiae, who were the forerunners of the free armed burghers of the Italian cities of the middle ages. The exercitus of Rome was divided into scholae, and had a chief or patronus, and its banner. Other cities of the exarchate were organized on the same model. Diehl is of opinion that the exercitus was formed of the ancient " possessores," or landowners and free townsmen, who were of a less rank than the ordo senatorius. The great landowners who were developing into feudal lords, and the smaller freemen who were becoming independent burghers, broke the imperial administration to pieces, and prepared the way for the final ruin of the exarchate.

See Etudes sur V administration Byzantine dans Vexarchat de Ravenne

(568-751), by Charles Diehl (Paris, iS “”

RAVENSBURG, a town of Germany, in the kingdom of Wurttemberg, pleasantly situated amid vine-clad hills on the river Schussen, 12 m. N. of Friedrichshafen on the lake of Constance, by the railway of Ulm. Pop. (1905) 14,614, the great majority of whom are Roman Catholics. Its aspect is medieval; it still retains its walls and nine picturesque towers, the most prominent of which, dating from the 15th century, is known as the ” Mehlsack,” or sack of flour. The town hall is a handsome 15th-century building. The manufactures include linen, cotton, embroidered muslins, pottery, glass and playing-cards. The fruit market is important, and there is trade in cattle, grain and timber. Ravensburg was founded in the nth century by the Guelphs, and in their ancestral castle on the Veitsburg, which was partially restored in 1892, the Saxon duke, Henry the Lion, was born. In 11 80 the town passed to the Hohenstaufens, and a century later it became a free town of the Empire. In the 15th century it was a flourishing commercial place, its chief industry being the manufacture of paper. Annexed to Bavaria from 1803 to 1810, it was ceded to Wurttemberg in the latter year.

See Hafner, Geschichte von Ravensburg (Ravensburg, 1887).

RAVENSCROFT, EDWARD (fl. 1671-1697), English dra- matist, belonged to an ancient Flintshire family. He was entered at the Middle Temple, but devoted his attention mainly to literature. Among his pieces are Mamamouchi, or The Citizen turned Gentleman (Dorset Garden, 1671, pr. 1675); The Careless Lovers (Dorset Garden, 1673, pr. 1673), a comedy

of intrigue; Scaramouch a Philosopher, Harlequin a Schoolboy, Bravo a Merchant and Magician (Theatre Royal, 1677); English Lawyer (Theatre Royal, 1678), an adaptation of George Ruggle’s Latin play of Ignoramus, presented before James I. at Cambridge in March 1615; The London Cuckold (Dorset Garden, 1683), which became a stock p’ece, but was struck out of the repertory by Garrick in 1751; and The Italian Husband (Lincoln’s Inn Fields, 1697). He wrote in all twelve plays, in which he adapted freely from Moliere and others, confessing on one occasion that he ” but winnowed Shakespeare’s corn.” He ventured to decry the heroic drama, and Dryden retaliated by satirizing his Mamamouchi, a foolish adaptation from Moliere’s Bourgeois Gentilhomme and Monsieur de Pourccaugnac, in the prologue to the Assignation (Dryden, Works, ed. Scott, iv.

345 seq.).

RAVI, a river of India, one of the " Five Rivers " of the Punjab. It rises in the Kulu subdivision of Kangra district, flows through Chamba state, and enters British territory again in Gurdaspur district. At Madhupur the head works of the Bari Doab canal draw off a large portion of its waters. Thence it flows through the plains of the Punjab, passing within a mile of Lahore, and finally falls into the Chenab after a course of about 450 m.

RAVINE, a deep, narrow gorge, cleft or valley in a mountain, worn by the violent rush of water, whence the name, which comes through Fr. from Lat. rapina, violent robbery or plunder (rapere, to seize). The doublet " ravin " or " raven," robbery, greed, has given place to the more learned form " rapine," but is still seen in " ravenous," greedy, voracious.

RAWALPINDI, a town of British India, which gives its name to a district and a division in the Punjab. The town is situated on the north bank of the little river Leh, 1726 ft. above the sea, mm. E. by S. of Peshawar, and 1443 m. N.W. of Calcutta. Pop. (1001) 87,688. It is chiefly notable as the largest military station in India, and the key to the British system of defence upon the North-West Frontier. Railways radiate to Peshawar, Kohat, and the Malakand Pass, and a road runs to the Abbotabad frontier. It is also the starting- point of the cart-road to the hill-station of Murree and of the route into Kashmir. It is protected by a strong chain of forts, connected by the Circular Road. It is the headquarters of the second division of the northern army with a strong force of all arms, and contains an arsenal. Besides the locomotive works of the North-Western railway, there are gas-works, a tent factory, an iron foundry, and a brewery. An annual horse fair is held in April.

The District of Rawalpindi has an area of 2010 sq. m., Attock having been separated from it and formed into a separate district in 1904. It is situated on the southern slopes of the north-western extremities of the Himalayas, including large mountain tracts with rich valleys traversed by mountain torrents. It contains the Murree hills with the sanatorium of that name, the chief hill-station in the Punjab. The Indus and the Jhelum are the chief rivers, and the climate is noted for its healthiness. The principal crops are wheat, barley, maize, millets, and pulses. The district is traversed by the main line of the North-Western railway, crossing the Indus at Attock, and also by a branch towards the Indus at Kushalgarh. The population in 1901 was 558,699, showing an increase of 4-7% in the decade.

The Division of Rawalpindi lies in the north-west of the Punjab. It consists of the five districts of Gujrat, Attock, Shahpur, Jhelum, and Rawalpindi. The total area is 15,736 sq. m. and the population in 1901 was 2,799,

RAWENDIS, a Persian sect that took its name from a town Rawend near Isfahan. Its origin is unknown, but they held ultra-Shiite doctrines (see Shiites). Under the year 158 (a.d. 775) Tabarisays that a man of the Rawendis, called al-Ablaq (because he was leprous), asserted that the spirit that was in Jesus was in 'AH, then in the imams one after the other to Ibrahim ibn Mahommed, and that thus these were gods. Asad ibn 'Abdallah, then governor of Khorasan, put many of them to

death. Under the year 135 (a.d. 752-3) the historian again mentions a rising of the Rawendis of Talaqan, and its suppression. Under 141 (a.d. 758-9) he gives a fuller account of them. They believed in metempsychosis, or the transmigration of souls, and asserted that the spirit of Adam was in Othman ibn Nahik, that the Lord who fed them and gave them drink was Abu Ja'far ul-Mansur, and that al-Haitham ibn Moawiya was Gabriel. Accordingly they came to the palace of Mansur in Hashimiya and began to hail him as Lord. Mansur, however, secured their chiefs and threw them into prison. By means of a mock funeral they succeeded in reaching the prison and delivering their leaders. They then turned in wrath against Mansur and almost succeeded in capturing him, but were defeated and slain by al-Haitham. (G. W. T.)

RAWITSCH (Polish Ravicz), a town of Germany, in the Prussian province of Posen, lying near the Silesian frontier, 37 m. N. of Breslau, at the junction of railways to Posen and Liegnitz. Pop. (1905) 11,403. It contains a handsome Pro- testant church and a medieval town hall. The principal industry is the manufacture of snuff and cigars, and for the former it enjoys a considerable reputation. Trade is carried on in grain, wool, cattle, hides, and timber. Rawitsch was founded by Protestant refugees from Silesia during the Thirty Years' War. It passed to Prussia at the second partition of Poland in 1793.

RAWLINSON, GEORGE (1812-1902), English scholar and historian, was born at Chadlington, Oxfordshire, on the 23 rd November 1812, being the younger brother of Sir Henry Rawlinson (q.v.). Having taken his degree at Oxford (from Trinity College) in 1838, he was elected to a fellowship at Exeter College in 1840, of which from 1842 to 1846 he was fellow and tutor. He was ordained in 1841; was Bampton lecturer in 1859, and Camden professor of ancient history from 1861 to 1889. In 1872 he was appointed canon of Canterbury, and after 1888 he was rector of All Hallows, Lombard Street. In 1873 he was appointed proctor in Convocation for the Chapter of Canterbury. He married Louisa, daughter of Sir R. A. Chermside, in 1846. His chief publications are his translation of the History of Herodotus (in collaboration with Sir Henry Rawlinson

and Sir Gardner Wilkinson), 1858-60; The Five Great Monarchies, of the Ancient Eastern World, -1862-67; The Sixth Great Oriental Monarchy (Parthian), 1873; The Seventh Great Oriental Monarchy (Sassanian), 1875; Manual of Ancient History, 1869; Historical Illustrations of the Old Testament, 1871; The Origin of Nations, 1877; History of Ancient Egypt, 1881; Egypt and Babylon, 1885; History of Phoenicia, 1889; Parthia, 1893; Memoir of Major-General Sir H. C. Rawlinson, 1898. He was a contributor to the Speaker's Commentary, the Pulpit Commentary, Smith's Dictionary of the Bible, and various similar publications; and he was the author of the article " Herodotus " in the 9th edition of the Ency. Brit. He died on the 7th of October 1902.

RAWLINSON, SIR HENRY CRESWICKE (1810-1895), English soldier and orientalist, was born at Chadlington, Oxford- shire, on the nth of April 1810. In 1827 he went to India as cadet under the East India Company; and after six years' life with his regiment as subaltern, during which time he had become proficient in the Persian language, he was sent to Persia in company with some other English officers to drill and reorganize the Shah's troops. It was at this time that he was first attracted to the study of inscriptions, more particularly those in the hitherto undeciphered cuneiform character. In the course of the two years during which he was in its immediate neighbourhood he transcribed as much as he was able of the great cuneiform inscription at Behistun {q.v.) ; but the friction between the Persian court and the British government ended in the departure of the British officers.

He was appointed political agent at Kandahar in 1840. In that capacity he served for three years, his political labours being as meritorious as was his gallantry during various engage- ments in the course of the Afghan War; for these he was rewarded by the distinction of C.B. in 1844. A fortunate chance, by which

he became personally known to the governor-general, led to his being appointed, at his own desire, as political agent in Turkish Arabia; thus he was enabled to settle in Bagdad, where be devoted much time to the cuneiform studies which attracted him. He was now able, under considerable difficulties and with no small personal risk, to make a complete transcript of the Behistun inscription, which he was also successful in deciphering and interpreting. Having collected a large amount of invaluable information on this and kindred topics, in addition to much geographical knowledge gained in the prosecution of various explorations

(including visits with Layard to the ruins of Nineveh), he returned to England on leave of absence in 1849. He remained at home for two years, published in 1851 his memoir on the Behistun inscription, and was promoted to the rank of lieutenant-colonel. He disposed of his valuable collec- tion of Babylonian, Sabaean, and Sassanian antiquities to the trustees of the British Museum, who also made him a consider- able grant to enable him to carry on the Assyrian and Babylonian excavations initiated by Layard. In 1851 he returned to Bagdad. The excavations were carried on under his direction with valuable results, among the most important being the discovery of material that greatly contributed to the final decipherment and interpretation of the cuneiform character. An accident with which he met in 1855 hastened his determina- tion to return to England, and in that year he resigned his post in the East India Company. On his return to England the distinction of K.C.B. was conferred upon him, and he was appointed a crown director of the East India Company. The remaining forty years of his life were full of activity — political, diplomatic, and scientific — and were mainly spent in London. In 1858 he was appointed a member of the first India Council, but resigned in 1859 on being sent to Persia as envoy extra- ordinary and minister plenipotentiary. The latter post he held only for a year, owing to his dissatisfaction with circumstances connected with his official position there. Previously he had sat in Parliament as M.P. for Reigate from February to September 1858; he sat again as M.P. for Frome, 1865-68. He was appointed to the Council of India again in 1868, and con- tinued to serve upon it until his death. He was a strong advocate of the forward policy in Afghanistan, and counselled the retention of Kandahar. His views were more particularly expressed in England and Russia in the East, 1875. He was a trustee of the British Museum from 1876 till his death. He was created G.C.B. in 1889, and a Baronet in 1891; was president of the Geographical Society from 1874 to 1875, and of the Asiatic Society from 1878 to 1881; and received honorary degrees at Oxford, Cambridge, and Edinburgh. He married, in September 1862, Louisa Caroline Harcourt Seymour, who bore him two sons and died in 1889. He died in London on the 5th of March 1895. His published works include (apart from minor contributions to the publications of learned societies) four volumes of cuneiform inscriptions, published under his direction between 1870 and 1884 by the trustees of the British Museum; The Persian Cuneiform Inscription at Behistun, 1846-51, and Outline of the History of Assyria, 1852, both re- printed from the Asiatic Society's journals; A Commentary on the Cuneiform Inscriptions of Babylon and Assyria, 1850; Notes on the Early History of Babylonia, 1854; England and Russia in the East, 1875. He contributed to the Encyclopaedia Britannica (9th edition) the articles on Bagdad, the Euphrates and Kurdistan, and several other articles dealing with the East; and assisted in editing a translation of Herodotus by his

brother, Canon George Rawlinson. See G. Rawlinson, Memoir of Henry Creswicke Rawlinson (1898).

RAWLINSON, RICHARD (1690-1755), English antiquary and divine, was a younger son of Sir Thomas Rawlinson (1647- 1708), lord mayor of London in 1705-6, and a brother of Thomas Rawlinson (1681-1725), the bibliophile. Born on the 3rd of January 1690, he was educated at St Paul's school, at Eton, and at St John's College, Oxford. In 17 16 he was ordained, but as he was a nonjuror and j. Jacobite the ceremony was performed by a nonjuring bishop, Jeremy Collier. Rawlinson then xxn. 30

travelled in England and on the continent of Europe, where he passed several years, making collections of manuscripts, coins and curiosities. In 1728 he became a bishop among the non- jurors, but he hardly ever appears to have discharged episcopal functions, preferring to pass his time in collecting books and manuscripts, pictures and curiosities. He died at Islington on the 6th of April 1755. Rawlinson left his manuscripts, his curiosities, and some other property to the Bodleian Library; he endowed a professorship of Anglo-Saxon at Oxford, and was a benefactor to St John's College.

RAWLINSON, SIR ROBERT (1810-1898), English engineer and sanitarian, was born at Bristol on the 28th of February 18 10. His father was a mason and builder at Chorley, Lanca- shire, and he himself began his engineering education by working in a stonemason's yard. In 1831 he obtained employment under Jesse Hartley in the engineer's office at the Liverpool docks, and for four years from 1836 he was engaged under Robert Stephenson as assistant resident engineer for the Blis- worth section of what is now the London & North-Western main line from London to the North. Returning to Liverpool, he spent some years as assistant-surveyor to the corporation, and then in 1844 accepted an engineering post on the Bridgewater Canal. Three years later he returned to Liverpool, to superintend the design and construction of the famous brick-arched ceiling in the St George's Hall, in succession to. his friend H. L. Elmes. During this period Rawlinson's reputation as a sanitarian had been growing, and when the Public Health Act was passed in 1848 he was appointed one of the first inspectors under it. He inspected many of the chief towns of England, and his reports on the sanitary conditions he found brought him in many cases into great unpopularity with the -municipal rulers. Early in 1855 popular feeling was so aroused by the waste of life that was going on among the British troops in the Crimea through disease, and by the mismanagement of the campaign, that the Aberdeen ministry was forced to resign. Lord Palmerston, who then became prime minister, sent a sanitary commission, consisting of Rawlinson and two medical members (Dr John Sutherland and Dr H. Gavin), with full powers from the War Office, to do whatever it

thought would lead to better hygienic conditions in camp and hospital. The commission reached Constantinople in March, and, by insisting on what now seem the most obvious precautions, succeeded within a few weeks in reducing the death-rate in the Levantine hospitals from 42 to 2j%. Passing on to the Crimea, it effected a similar improvement there, and by the end of the year the health of the whole British army in the field was even better than it enjoyed at home. Rawlinson's next great public service, for which he was made C.B. in 1865, was in connexion with the distress caused in Lancashire by the collapse of the cotton- manufacturing industry consequent on the American Civil War. In 1863 it was suggested that, in order to provide employment for the starving operatives, the government should start works of " utility, profit and ornament," and Rawlinson being sent to make an official investigation into the question, reported, after visiting nearly 100 towns, that i| million sterling might be advantageously expended in providing water-supply and drainage, forming streets, &c, in those places. The result was that the Treasury was authorized to advance £1,200,000 the amount was afterwards increased) at 3!% for carrying out such works, which proved of enormous public benefit. In 1866 he acted as chairman of the Royal Commission on the Pollution of Rivers, and a few years later was appointed chief engineering inspector to the Local Government Board; on retiring from this position in 1888 he was promoted to be K.C.B. In 1894 he served as president of the Institution of Civil Engineers. He died in London on the 31st of May

1898.

RAWMARSH, an urban district in the Rotherham parlia- mentary division of the West Riding of Yorkshire, England, 7% m. N.E. of Sheffield by the Midland railway. Pop. (1891) 11,983; (1901) 14,587. It is situated on the ridge of a hill above the valley of the Don. The church of St Lawrence was rebuilt

in 1839 with the exception of the Norman tower. Rawmarsh has large iron-works, steel rolling-mills and potteries, and there are collieries in the neighbourhood. At the time of the Conquest the manor was granted to Walter d'Eyncourt, and in the 12th century it was divided among the three daughters of his tenant Ralph Paganel, who is supposed to have been the founder of the church.

RAWTENSTALL, a municipal borough in the Rossendale parliamentary division of Lancashire, England, 17J m. N. by W from Manchester by the Lancashire & Yorkshire railway. Pop. (1001) 31,053. This town is a modern creation of the cotton industry; at the beginning of the 19th century it was a secluded village in the wild hilly district of Rossendale Forest. The cotton and woollen industries employ the majority of the inhabitants, and there are stone quarries in the neighbourhood. The town was incorporated in 189 1, and the corporation consists of a mayor, 6 aldermen and 18 councillors. Area, 9535 acres.

RAY (Lat. raid). The rays (Batoidci) together with the sharks (Selachoidei) form the suborder Plagiostomi of Elasmo- branch fishes, and are divided into six families (see Ichthyology). The first family, Pristidae, contains only the saw-fishes (Pnstis), of which five species are known, from tropical and sub- tropical seas. They frequent es- pecially estuaries and river-mouths, and in some cases make their way over a hundred miles from the sea. Although saw-fishes possess all the essential characteristics of the rays proper, they retain the elongate form of the body of sharks, the tail being excessively muscular and the sole organ of locomotion. The " saw " (fig. 1) is a flat prolongation of the snout, with an endoskeleton which con- sists of three to five cartilaginous tubes; these are the rostral pro- cesses of the cranial cartilage and are found in all rays, though com- monly much shorter. The in- tegument of the saw is hard, covered with shagreen; and a series of strong teeth, sharp in front and flat behind, are em- bedded in it, in alveolar sockets, on each side. The saw is a for- midable weapon of offence, by means of which the fish tears pieces of flesh off the body of its victim, or rips open its abdomen to feed on the intes- 1 tines. The teeth proper, with

which the mouth is armed, are extremely small and obtuse, and unsuitable for wounding or

seizing animals. Saw-fishes are , . abundant in the

tropics; in their stomachs pieces of intestines and fragments of cuttle-fish have been found. They grow to a large size,

Fig. 1. — Pnstis perrotteti.

specimens with saws 6 ft. long and 1 ft. broad at the base being common.

The rays of the second family, Rhinobatidae, bear a strong resemblance to the saw-fishes, but lack the saw. Their teeth are consequently more developed, flat, obtuse, and adapted for crushing hard-shelled marine animals. There are about twenty known species, from tropical and

subtropical seas.

The third family, Torpedinidae, includes the electric rays For the peculiar organ (fig. 2) by which the electricity is pro- duced, see Ichthyology. The fish uses this power voluntarily either to defend itself or to stun or kill the smaller animals on

F ™ firFuˆ uˆ (Mediterranean). A portion of the skin on the left side has been removed to show the electric organ.

which it feeds. To receive the shock, the object must complete the galvanic circuit by communicating with the fish at two distinct points, either directly or through the medium of some conducting body. The electric currents created in these fishes exercise all the other known powers of electricity: they render the needle magnetic, decompose chemical compounds and emit the spark. The dorsal surface of the electric organ is positive the ventral negative. Shocks from a large healthy fish will temporarily paralyse the arms of a strong man. The species of the genus Torpedo are distributed over the coasts of the Atlantic Pacific and Indian Ocean, and at least one reaches the coasts of Great Britain (T. hebetans). On the west coast of North America T. calif ornica occurs, while on the Atlantic coast there is found the black crampfish (T. occidentalis) . This latter is said to reach a weight of ,200 lb, but such gigantic specimens are scarce, and prefer sandy ground at some distance from the shore, where they are not disturbed by the agitation of the surface-water. Seven genera with about fifteen species have been described, mostly from the warmer seas. All the rays of this family have, like electric fishes generally, a smooth and naked body.

The fourth family, Raiidae, comprises the skates and rays proper, or Raia. More than thirty species are known, chiefly from the temperate seas of both hemispheres, but much more numerously from the northern than the southern. A few species descend to a depth of nearly 600 fathoms, without, however essentially differing from their surface congeners. Rays as is

indicated by their shape, are bottom-fishes, living on flat sandy- ground, generally at no great distance from the coast or the surface. They lead a sedentary life, progressing, like the flat- fishes, by an undulatory motion of the greatly extended pectoral fins, the thin slender tail having lost the function of an organ of locomotion, and acting merely as a rudder. They are carnivor- ous and feed exclusively on molluscs, crustaceans and fishes. Some of the species possess a much larger and more pointed snout than the

others, and are popularly distinguished as " skates." The following are known as inhabitants of the British seas: — (a) short-snouted species: (i) the thornback (R. clavata), (2) the homelyn or spotted ray {R. maculata), (3) the stany ray (R. radiata), (4) the cuckoo or sandy ray (R. circularis); (b) long-snouted species: (5) the common skate (R. batis), (6) the flapperskate or jumbo skate (R.macrorhynchus), (7) the burton skate (R. alba), (8) and (9) the shagreen skates (R. oxyrhynchus and R. fullonica). A few deep-sea species are known, including R. abyssicola from 1588 fathoms off the coast of British Columbia. Most of the skates and rays are eaten, except during the breeding season; and even the young of the former are esteemed as food. The skates attain to a much larger size than the rays, viz. to a width of 6 ft. and a weight of 400 and 500 lb.

The members of the fifth family, Trygonidae or sting-rays, are distinguished from the rays proper by having the vertical fins replaced by a strong spine attached to the upper side of the tail. Some fifty species are known, which inhabit tropical more than temperate seas, some species being found in great tropical rivers over 1000 m. from the sea. The spine is barbed on the sides and is a most effective weapon of defence; by lashing the tail in every direction the sting-rays can inflict dangerous or at least extremely painful wounds. The danger arises from the lacerated nature of the wound rather than from any specially poisonous property of the mucus inoculated. Generally only one or two spines are developed. Sting-rays attain to about the same size as the skates and are eaten on the coasts of the Mediterranean and elsewhere. One species (Trygon pastinaca) is not rarely found in the North Atlantic and extends northwards to the coasts of Ireland, England and Norway.

The rays of the sixth and last family, Myliobatidae, are popu- larly known under various names, such as " devil-fishes," " sea-devils " and " eagle-rays." In them the dilatation of the body, or rather the development of the pectoral fins, is carried to an extreme, whilst the tail is very thin and sometimes long like a whip-cord (fig. 3). Caudal spines are generally present and

perfectly flat molars, adapted for crushing hard substances. In some of the eagle-rays the molars are large and tessellated (fig. 4),

Fig. 3. — Aetobatis narinari (Indo-Pacific Ocean).

similar to those of the sting-rays. In the enormous " sea-devils," sometimes classed as a separate family (Mobulidae) , the anterior part of the pectoral fin is detached and forms a " cephalic " lobe or pair of lobes in front of the snout. The dentition consists of

Fig. 4. — Jaws of an Eagle- Ray, Myliobatis aquila.

in others extremely small. Of the twenty-seven species which are known, from tropical and temperate seas, the majority attain a very large and some an enormous size: one mentioned by Risso, which was taken at Messina, weighed 1250 lb. A foetus taken from the uterus of the mother (all eagle-rays are viviparous), captured at Jamaica and preserved in the British Museum, is 5 ft. broad and weighed 20 lb. The mother measured 15 ft. in width and as many in length, and was between 3 and 4 ft. thick. At Jamaica, where these rays are well known under the name of " devil-fishes, " they are frequently attacked for sport's sake, but their capture is uncertain and sometimes attended with danger. The eagle-ray of the Mediterranean and Atlantic {Myliobatis aquila) is occasionally found off the British coasts.

(A. C. G.; J. G. K.) RAY (or Wray, as he wrote his name till 1670), JOHN (1628- 1705), sometimes called the father of English natural history, was the son of the blacksmith of Black Notley near Braintree in Essex, where he was born on the 29th of November 1628, or, according to other authorities, some months earlier. From Braintree school he was sent at the age of sixteen to Catharine Hall, Cambridge, whence he removed to Trinity College after about one year and three-quarters. His tutor at Trinity was Dr James Duport (1606-1679), regius professor of Greek, and his intimate friend and fellow-pupil the celebrated Isaac Barrow. Ray was chosen minor fellow of Trinity in 1649, an d in due course became a major fellow on proceeding to the master's degree. He held many college offices, becoming successively lecturer in Greek (1651), mathematics (i653),andhumanity(i655), praelector (1657), junior dean (1657), and college steward (1659 and 1660); and according to the habit of the time, he was accustomed to preach in his college chapel and also at Great St Mary's before the university, long before he took holy orders. Among his sermons preached before his ordination, which was not till the 23rd of December 1660, were the famous discourses on The Wisdom of God in the Creation, and on the Chaos, Deluge and Dissolution of the World. Ray's reputation was high also as a tutor; and he communicated his own passion for natural history to several pupils, of whom Francis Willughby is by far the most famous.

Ray's quiet college life closed when he found himself unable to subscribe to the Act of Uniformity of 1661, and was obliged to give up his fellowship in 1662, the year after Isaac Newton had entered the college. We are told by Dr Derham in his Life of Ray that the reason of his refusal " was not (as some have imagined) his having taken the ' Solemn League and Covenant,' for that he never did, and often declared that he ever thought it an unlawful oath; but he said he could not declare for those that had taken

the oath that no obligation lay upon them, but feared there might." From this time on- wards he seems to have depended chiefly on the bounty of his pupil Willughby, who made Ray his constant companion while he lived, and at his death left him £60 a year, with the charge of educating his two sons.

In the spring of 1663 Ray started together with Willughby and two other pupils on a tour through Europe, from which he returned in March 1666, parting from Willughby at Montpellier, whence the latter continued his journey into Spain. He had previously in three different journeys (1658, 1661, 1662) travelled through the greater part of Great Britain, and selections from his private notes of these journeys were edited by George Scott in 1760, under the title of Mr Ray's Itineraries. Ray himself published an account of his foreign travel in 1673, entitled Observations topographical, moral, and physiological, made on a Journey through part of the Low Countries, Germany, Italy, and France. From this tour Ray and Willughby returned laden with collections, on which they meant to base complete systematic descriptions of the animal and vegetable kingdoms. Willughby undertook the former part, but, dying in 1672, left only an ornithology and ichthyology, in themselves vast, for Ray to edit; while the latter used the botanical collections for the groundwork of his Methodus plantarum nova (1682), and his great Historia generalis plantarum (3 vols., 1686, 1688, 1704). The plants gathered on his British tours had already been described in his Catalogus plantarum Angliae (1670), which work is the basis of all later English floras.

In 1667 Ray was elected a fellow of the Royal Society, and in 1669 he published in conjunction with Willughby his first paper in the Philosophical Transactions on " Experiments concerning the Motion of Sap in Trees." They demonstrated the ascent of the sap through the wood of the tree, and supposed the sap to " precipitate a kind of white coagulum or jelly, which may be well conceived to be the part which every year between bark and tree turns to wood and of which the leaves and fruits are made." Immediately after his admission into the Royal Society he was induced by Bishop John Wilkins to translate his Real Character into Latin, and it seems he actually completed a translation, which, however, remained in manu- script; his Methodus plantarum nova was in fact undertaken as a part of Wilkins's great classificatory scheme.

In 1673 Ray married Margaret Oakley of Launton (Oxford); in 1676 he went to Sutton Coldfield, and in 1677 to Falborne Hall in Essex. Finally, in 1679, he removed to Black Notley, where he afterwards remained. His life there was quiet and uneventful, but embittered by bodily weakness and chronic sores. He occupied himself in writing books and in keeping up a wide scientific correspondence, and lived, in spite of his infirmities, to the age of seventy-six, dying at Black Notley on the 17th of January 1705. The Ray Society, for the publica- tion of works on natural history, was founded in his honour in

1844.

Ray's first book, the Catalogus plantarum circa Cantabrigiam nascentium (1660, followed by appendices in 1663 and 1685), was written in conjunction with his " amicissimus et individuus comes," John Nid. The plants, 626 in number, are enumerated alphabeti- cally, but a system of classification differing little from Caspar Bauhin's is sketched at the end of the book ; and the notes contain many curious references to other parts of natural history. The stations of the plants are minutely described; and Cambridge students still gather some of their rarer plants in the copses or chalk-pits where he found them. The book shows signs of his indebtedness to Joachim Jung of Hamburg, who had died in 1657, leaving his writings unpublished; but a MS. copy of some of them was sent to Ray by Samuel Hartlib in 1660. Jung invented or gave precision to many technical terms which Ray and others at once made use of in their descriptions, and which are now classical ; and his notions of what constitutes a specific distinction and what characters are valueless as such seem to have been adopted with little change by Ray. The first two editions of the Catalogus plantarum Angliae (1670, 1677) were likewise arranged alphabeti- cally; but in the Synopsis stirpium Britannicarum (1690, 1696, also re-edited by Dillenius, 1724, and by Hill, 1760) Ray applied the scheme of classification which he had by that time elaborated in the Methodus and the Historia plantarum. The Methodus plant- arum nova (1682) was largely based on the works of Caesalpinus and Jung, and still more on that of Robert Morison of Oxford. The greatest merit of this book is the use of the number of cotyledons as a basis of classification; though it must be remembered that the difference between the monocotyledonous and dicotyledonous embryo was detected by Nehemiah Grew. After dividing plants into flowerless and flowering, Ray says, " Floriferas dividemus in Dicotyledones, quarum semina sata binis foliis anomalis, seminal-

lbus dictis, quae cotyledonorum usum praestant, e terra exeunt, vel in binos saltern lobos dividuntur, quamvis eos supra terrem foliorum specie non efferunt; et Monocotyledones, quae nee folia bina seminalia efferunt nee

lobos binos condunt. Haec divisio ad arbores etiam extendi potest ; siquidem Palmae et congeneres hoc respectu eodem modo a reliquis arboribus differunt quo Monocotyle- dones a reliquis herbis." But a serious blemish was his persistent separation of trees from herbs, a distinction whose falsity had been exposedby Jung and others, but to which Ray tried to give scientific foundation by denying the existence of buds in the latter. At this time he based his classification, like Caesalpinus, chiefly upon the fruit, and he distinguished several natural groups, such as the grasses, Labiatae, Umbelliferae and Papilionaceae. The classifica tion of the Methodus was extended and improved in the Historia plantarum, but was disfigured by a large class of Anomalae, to include forms that the other orders did not easily admit, and by the separa- tion of the cereals from other grasses. This vast book enumerates and describes all the plants known to the author or described by his predecessors, to the number, according to Adanson, of 18,625 species. In the first volume a chapter " De plantis in genere " contains an account of all the anatomical and physiological know- ledge of the time regarding plants, with the recent speculations and discoveries of Caesalpinus, Grew, Malpighi and Jung; and Cuyier and Dupetit Thouars, declaring that it was this chapter which gave acceptance and authority to these authors' works, say that " the best monument that could be erected to the memory of Ray would be the republication of this part of his work separately." The Stirpium Europaearum extra Britannias nascentium Sylloge (1694) is a much amplified edition of the catalogue of plants collected on his own European tour. In the preface to this book he first clearly admitted the doctrine of the sexuality of plants, which, how- ever, he had no share in establishing. Here also begins his long controversy with Rivinus (Augustus Quirinus Bachmann) which chiefly turned upon Ray's indefensible separation of ligneous from herbaceous plants, and also upon what he conceived to be the mis- leading reliance that Rivinus placed on the characters of the corolla. But in the second edition of his Methodus (1703) he followed Rivinus and J. P. de Tournefort in taking the flower instead of the fruit as his basis of classification: he was no longer a fructicist but a corollist.

Besides editing his friend Willughby's books, Ray wrote several zoological works of his own, including Synopsis methodica Animalium Quadrupedum et Serpentini Generis (1693), that is to say, both mammals and reptiles, and Synopsis methodica Avium et Piscium (1713); the latter was published posthumously, as was also the more important Historia Insectorum (1710), which embodied a great mass of Willughby's notes.

Most of Ray's minor works were the outcome of his faculty for carefully amassing facts; for instance, his Collection of English Proverbs (1670), his Collection of Out-of-the-way English Words (1674), his Collection of Curious Travels and Voyages (1693), and his Dictionariolum trilingue

(1675, 5th edition as Nomenclator classicus, 1706). The last was written for the use of Willughby's sons, his pupils; it passed through many editions, and is still useful for its careful identifications of plants and animals mentioned by Greek and Latin writers. But Ray's influence and reputation have depended largely upon his two books entitled The Wisdom of God manifested in the Works of the Creation (1691), and Miscellane- ous Discourses concerning the Dissolution and Changes of the World (1692). The latter includes three essays on " The Primitive Chaos and Creation of the World," " The General Deluge, its Causes and Effects," and " The Dissolution of the World and Future Conflagrations." The germ of these works was contained in sermons preached long before in Cambridge. Both books obtained immediate popularity, and the former, at least, was translated into several languages. In The Wisdom of God, &c, Ray recites innumerable examples of the perfection of organic mechanism, the multitude and variety of living creatures, the minuteness and usefulness of their parts, and many, if not most, of the familiar examples of purposive adaptation and design in nature were suggested by him, such as the structure of the eye, the hollowness of the bones, the camel's stomach and the hedgehog's armour.

Authorities.- —Select Remains, Itineraries and Life, by Dr Derham, edited by George Scott, 1740; notice by Sir J. E. Smith in Rees's Cyclopaedia; notice by Cuvier and A. Dupetit Thouars in the Biographie universelle; all these were collected under the title Memorials of Ray, and edited (with the addition of a complete catalogue of his works) by Dr Edwin Lankester, 8vo (Ray Society), 1846; Correspondence (with Willughby, Martin Lister, Dr Robinson, Petiver, Derham, Sir Hans Sloane and others), edited by Dr Derham, 1718; Selections, with additions, edited by Lankester (Ray Society), 1848. For accounts of Ray's system of classification, see Cuvier, Legons hist. s. Sci. Nat., p. 488; Sprengel, Gesch. d. Botanik, ii. p. 40; Sachs, Gesch. d. Botanik; also Whewell, Hist. Ind. Sci., iii. p. 332 (ed. 1847), and Wood, art. " Classification " in Rees's Cyclopaedia. (D. W. T.)

RAYAH (Arabic ra'iyah, peasants, subjects, flock, herd, ra'a, to pasture, cf. " ryot," an Indo-Persian variant of the same word), the name given to the non-Moslem subjects of a

Mahommedan ruler; all who pay the haraj or poll-tax levied on unbelievers. Five classes of rayahs existed under Turkish rule, — (i) the Greek, or Roum milleti; (2) the Armenian, or Emeni milleti; (3) the Catholic Armenians — eremeni gatoliki milleti; (4) the Latin Christians, or

Roum gatoliki milleti; and (5) the Jews, or ichondi milleti. The name ray ah is most commonly used of the peasants, but it does not apply only to the agricultural populations. It depended on status, fixed by religious faith.

RAYLEIGH, JOHN WILLIAM STRUTT, 3rd baron (1842-), English physicist, was born in Essex on the 12th of November 1842, being the son of the 2nd baron. 1 Going to Trinity College, Cambridge, he graduated as senior wrangler in 1865, and obtained the first Smith's prize of the year, the second being gained by Professor Alfred Marshall. He married in 1 87 1 a sister of Mr A. J. Balfour, and succeeded to the title in 1873. From 1879 to 1884 he was Cavendish professor of experimental physics in the university of Cambridge, in succession to Clerk Maxwell; and in 1887 he accepted the post of professor of natural philosophy at the Royal Institution of Great Britain, which he resigned in 1905. His early mathe- matical and physical papers, written under the name of J. W. Strutt, made him known over Europe; and his powers rapidly matured until, at the death of Clerk Maxwell, he stood at the head of British physicists, Sir George Stokes and Lord Kelvin alone excepted. The special feature of his work is its extreme accuracy and definiteness; he combines the highest mathe- matical acumen with refinement of experimental skill, so that the idea of ranking him as higher in one department than another does not arise. His experimental investigations are carried out with plain and usually home-made apparatus, the accessories being crude and rough, but the essentials thought- fully designed so as to compass in the simplest and most perfect manner the special end in view. A great part of his theoretical work consists in resurveying things supposed superficially to be already known, and elaborating their theory into precision and completeness. In this way he has gone over a great portion of the field of physics, and in many cases has either said the last word for the time being, or else started new and fruitful develop- ments. Possessing an immense range of knowledge, he has filled up lacunae in nearly every part of physics, by experiment, by calculation, and by clear accurate thought. The following branches have especially felt his influence: — chemical physics, capillarity and viscosity, theory of gases, flow of liquids, photo- graphy, optics, colour vision, wave theory, electric and magnetic problems, electrical measurements, elasticity, sound and hydrodynamics. The numerous scientific memoirs in which his original work is set forth were collected under his own editorship in four large volumes, the last of which was published in 1903. His most extensive single work is a book on Sound, which, in the second edition, has become a treatise on vibrations in general. His familiarity with the methods of mathematical analysis and a certain refinement of taste in their application have resulted in great beauty of form. His papers are often difficult to read, but never diffuse or tedious; his mathematical treatment is never needlessly abstruse, for when his analysis is complicated it is only so because the

subject-matter is com- plicated. Of discoveries superficially sensational there are few or none to record, and the weight of his work is for the most . part to be appreciated only by professed physicists. One remarkable discovery, however, of general interest, was the outcome of a long series of delicate weighings and minute experimental care in the determination of the relative density of nitrogen gas — undertaken in order to determine the atomic weight of nitrogen — namely, the discovery of argon, the first of a series of new substances, chemically inert, which occur, some only in excessively minute quantities, as constituents of the 1 The barony was created at George IV. 's coronation in 1821 for the wife of Joseph Holden Strutt, M.P. for Maldon (1790-1826) and Okehampton (1826-1830), who had done great service during the French War as colonel of the Essex militia. He died in 1845, his wife, the baroness, predeceasing him in 1836. Their son (d. 1873) was the 2nd baron.

earth's atmosphere. Lord Rayleigh had an interest in abnormal psychological investigations, and became a member and vice- president of the Society for Psychical Research. He was one of the original members of the Order of Merit, instituted in con- nexion with the coronation of King Edward VII. In 1904 he was awarded a Nobel prize, and at the end of 1905 he became president of the Royal Society, of which he had been elected a fellow in 1873, and had acted as secretary from 1885 to 1896. He remained president till 1908, in which year he was chosen to succeed the 8th duke of Devonshire as chancellor of Cambridge University.

For a popular but authentic account of some of Lord Rayleigh's scientific work and discoveries, see an article by Sir Oliver Lodge in the National Review for September 1898.

RAYMOND, HENRY JAR VIS (18 20-1 869) , American journalist, was born near the village of Lima, Livingston county, New York, on the 24th of January 1820. He graduated from the university of Vermont in 1840. After assisting Horace Greeley (q.v.) in the conduct of more than one newspaper, Raymond in 1851 formed the firm of Raymond, Jones & Co., and the first issue of the New York Times appeared on the 18th of September 1851; of this journal Raymond was editor and chief proprietor until his death. Raymond was a member of the New York Assembly in 1850 and 1851, and in the latter year was speaker. He supported the views of the radical anti-slavery wing of the Whig party in the North. His nomination over Greeley on the Whig ticket for lieutenant-governor in 1854 led to the dissolution of the famous political " firm " of Seward, Weed and Greeley. Raymond was elected, and served in 1854-56. He took a prominent part in the formation of the Republican party, and drafted the famous " Address to the People " adopted by the Republican convention which met in Pittsburg on the 22nd of February 1856. In 1862 he was

again a member, and speaker, of the New York Assembly. During the Civil War he supported Lincoln's policy in general, though deprecating his delays, and he was among the first to urge the adoption of a broad and liberal attitude in dealing with the people of the South. In 1865 he was a delegate to the National Republican Convention, and was made a member, and chairman, of the Republican National Committee. He was a member of the National House of Representatives in 1865-67, and pn the 22nd of December 1865 he ably attacked Thaddeus Stevens's theory of the " dead " states, and, agreeing with the President, argued that the states were never out of the Union, inasmuch as the ordinances of secession were null. In consequence of this, of his prominence in the Loyalist (or National Union) Convention at Philadelphia in August 1866, and of his authorship of the " Address and Declaration of Principles," issued by the convention, he lost favour with his party. He was removed from the chairmanship of the Re- publican National Committee in 1866, and in 1867 his nomina- tion as minister to Austria, which he had already refused, was rejected by the Senate. He retired from public life in 1867 and devoted his time to newspaper work until his death in New York city on the 18th of June 1869. Raymond was an able and polished public speaker; one of his best known speeches was a greeting to Kossuth, whose cause he warmly defended. But his great work was in elevating the style and general tone of American journalism. He published several books, including a biography of President Lincoln — The Life and Public Services of Abraham Lincoln (1865), which in substance originally appeared as A History of the Administration of President Lincoln (1864).

See Augustus Maverick, Henry J. Raymond and the New York Press for Thirty Years (Hartford, Conn., 1870); and "Extracts from the Journal of Henry J. Raymond," edited by his son, Henry H. Raymond, in Scribners' Monthly, vols. xix. and xx. (New York,

1879-80).

RAYMOND OF SABUNDE, or Sabiende (fl. 1434), Spanish scholar, was a teacher of medicine and philosophy and finally regius professor of theology at Toulouse. His Liber naturae sive creaturarum,&c. (written 1434-36), marks an important stage in the history of Natural Theology. The book was directed against the position then generally held, that reason and faith,

philosophy and theology were antithetical and irreconcilable. Raymond declares that the book of Nature and the Bible are both Divine revelations, the one general and immediate, the other specific and mediate. The Editio Princeps of the book, which found many imitators, is undated but probably

belongs to 1484; there are many subsequent editions, one by J. F. von Seidel as late as 1852. In 1595 the Prologus was put on the Index for its declaration that the Bible is the only source of revealed truth. Montaigne (Essays, bk. ii. ch. xii., " An Apologie of Raymond Sebond ") tells how he translated the book into French and found " the conceits of the author to be excellent, the contexture of his work well followed, and his project full of pietie. . . . His drift is bold, and his scope adventurous, for he undertaketh by humane and naturall reasons, to establish and verifie all the articles of Christian religion against Atheists."

See D. Beulet, Vn Inconnu celebre: recherches historiques et critiques sur Raymond de Sabunde (Paris, .1875).

RAYMUND, prince of Antioch (1099-1149), was the son of William VI., count of Poitou. On the death of Bohemund II. of Antioch iq.v.), the principality devolved upon his daughter, Constance, a child of some three years of age (n 30). Fulk, the king of Jerusalem, and, as such, guardian of Antioch, was concerned to find a husband for her, and sent envoys to England to offer her hand to Raymund, who was then at the court of Henry I. Raymund accepted the offer, and stealing in disguise through southern Italy, for fear of apprehension by Roger of Sicily, who claimed the inheritance of Antioch as cousin of Bohemund I., he reached Antioch in 113 5. Here he was married to Constance by the patriarch, but not until he had done him homage and fealty. The marriage excited the indignation of Alice, the mother of Constance, who had been led by the patriarch to think that it was she whom Raymund desired to wed; and the new prince had thus to face the enmity of the princess dowager and her party. In 1137 he had also to face the advent of the eastern emperor, John Comnenus, who had come south partly to recover Cilicia from Leo, the prince of Armenia, but partly, also, to assert his rights over Antioch. Raymund was forced to do homage, and even to promise to cede his principality as soon as he was recompensed by a new fief, which John promised to carve for him in the Mahommedan territory to the east of Antioch. The expedition of 1138, in which Raymund joined with John, and which was to conquer this territory, naturally proved a failure: Raymund was not anxious to help the emperor to acquire new territories, when their acquisition only meant for him the loss of Antioch; and John had to return unsuccessful to Byzantium, after vainly demanding from Raymund the surrender of the citadel of Antioch. There followed a struggle between Raymund and the patriarch. Raymund was annoyed by the homage which he had been forced to pay to the patriarch in 1135; and the dubious validity of the patriarch's election offered a handle for opposition. Eventually Raymund triumphed, and the patriarch was deposed (1139). In 1142 John Comnenus returned to the attack; but Raymund refused to recognize or renew his previous submission; and John, though he ravaged the neighbourhood of Antioch,

was unable to effect anything against him. When, however, Raymund demanded from Manuel, who had succeeded John in 1143, the cession of some of the Cilician towns, he found that he had met his match. Manuel forced him to a humiliating visit to Constantinople, during which he renewed his oath of homage and promised to receive a Greek patriarch. The last event of importance in Raymund 's life was the visit to Antioch in n 48 of Louis VII. and his wife Eleanor, Raymund's niece. Raymund sought to prevent Louis from going south to Jerusalem, and to induce him to stay in Antioch and help in the conquest of Aleppo and Caesarea. Perhaps for this end he acquired an influence over his niece, which was by some interpreted as a guilty intimacy. At any rate Louis hastily left Antioch, and Raymund was balked in his plans. In 1149 he fell in battle during an expedition against Nureddin. Raymund is described by William of Tyre (the main authority for his career) as handsome and affable; pre-eminent in the use of arms and military experi-

ence; litter -atorum, licet ipse illiteratus esset, cultor (he caused the Chanson des chetifs to be composed); a regular churchman and a faithful husband; but headstrong, irascible and unreasonable, with too great a passion for gambling (bk. xiv. c. xxi.). For his career see Rey, in the Revue de I' orient latin, vol. iv.

(E. Br.)

RAYMUND OF TOULOUSE (sometimes also called Raymund of St Giles, after a town to the south of Nimes) , count of Provence, one of the leaders of the first Crusade. According to an Armenian authority, he had lost an eye on a pilgrimage to Jerusalem before the first Crusade; but the statement probably rests on the fact that he was one-eyed, vir monoculus. He is also re- corded to have fought against the Moors in Spain before 1096; and it is certain that he was the first of the princes of the West to take the cross after Pope Urban's sermon at Clermont. The oldest and the richest of the crusading princes, the count of Provence started, at the end of October 1096, with a large com- pany, which included his wife, his son, and Adhemar, bishop of Puy, the Papal Legate. His march lay by Ragusa and Scutari to Durazzo, whence he struck eastward, along the route also used by Bohemund, to Constantinople. At the end of April 1097 he was with difficulty induced to take a somewhat negative oath of fealty to Alexius; for the obstinacy which was one of his characteristics, coupled perhaps with some hope of acquiring new territories, made him reluctant to submit like the other crusaders to Alexius. He was present at Nicaea and Dory-laeum; but he first showed his hand in October 1097, when, as the army neared Antioch, and a rumour was spread that Antioch had been deserted by the Turks, he sent a detachment in advance to occupy the city — an action which presaged his future difficulties with Bohemund, the would-be

prince of Antioch. In the siege of Antioch (which was far from having been deserted) Raymund played his part. When the city was taken by Bohemund (June 1098), the count garrisoned the palatium Cassiani (the palace of the emir, Yagi Sian) and the tower over the Bridge Gate. He lay ill during the second siege of Antioch by Kerbogha; but in his camp a great spiritualistic activity culminated in the discovery of the Holy Lance by the Provencals. The miracle stimulated the crusaders to defeat Kerbogha: the Lance itself, discovered by the Provencals and carried henceforward by their count, became a valuable asset in Raymund's favour; and he began to put difficulties in the way of Bohemund 's retention of Antioch, obstinately alleging the oath to Alexius, and refusing to surrender the positions in the city which he had occupied. A struggle thus arose between the Provencals and the Normans, partly with regard to the genuine- ness of the Lance, which the Normans naturally doubted, and partly with regard to the possession of Antioch — the real issue at stake. Raymund was the first of the princes to leave Antioch, moving southward in the autumn of 1098 to the siege of Marra, but leaving a detachment of his troops in Antioch. With Bohe- mund left behind in Antioch; with the possession of the Holy Lance to give him prestige; and with the wealth which he had at his disposal, the count of Provence now definitely began to figure as the leader of the Crusade. If he could have consented to leave Bohemund in possession of Antioch and push south- ward, he might have achieved much. But he could not stomach the greatness of Bohemund; and when the Normans turned his troops out of Antioch in January 1099, he marched from Marra (which had been captured in December 1098) into the • emirate of Tripoli, and began the siege of Area (February 1099), evidently with the idea of founding a power in Tripoli which would check the expansion of Bohemund's principality to the south. The siege of Area was protracted; and the selfish policy of the count, which thus deferred the march to Jerusalem, lost him all support from the mass of the crusaders. A wave of indignation in the ranks, and the inducements which the emir of Tripoli offered to the other princes, forced Raymund to desist from the siege (May 1098), and to march southwards to Jerusa- lem. After the capture of Jerusalem, Raymund was offered, but refused, the advocacy of the Holy Sepulchre. He alleged I his reluctance to rule in the city in which Christ had suffered;

it is perhaps permissible to suspect that he hankered for the principality of Tripoli and the renewal of hostilities with Bohemund. As at Antioch, so at Jerusalem, he fell into strife with the new ruler; and it was only with difficulty that Godfrey was able to secure from him the possession of the

Tower of David, which he had originally occupied. The grasping nature of Raymund again appeared after the battle of Ascalon, when his eagerness to occupy Ascalon for himself prevented it from being occupied at all; while Godfrey also blamed him for the failure of his army to capture Arsuf. It almost seems as if the count could not appear without becoming a centre of storms; and when he went north, in the winter of i 099-1100, his first act was one of hostility against Bohemund, from whom he helped to wrest Laodicea. From Laodicea he went to Con- stantinople, where he fraternized with Alexius, the great enemy of his own enemy Bohemund. Joining in the ill-fated Crusade which followed in the wake of the First, he was successful in escaping from the debacle, and returning to Constantinople. In 1102 he came by sea from Constantinople to Antioch, where he was imprisoned by Tancred, regent of Antioch during the cap tivity of Bohemund, and only dismissed upon promising not to attempt any conquests in the country between Antioch and Acre. He broke his promise, attacking and capturing Tortosa, and beginning to build a castle for the reduction of Tripoli (on the Mons Peregrinus). In this policy he was aided by Alexius, who was naturally willing to see the erection of a tributary county of Tripoli to the south of Bohemund's principality. In 1 105 Raymund died. He was succeeded by his nephew William, who in 1 109, with the aid of Baldwin I., captured the town and definitely established the county of Tripoli. William was ousted in the same year by Raymund's eldest son Bertrand; and the county continued in the possession of his house during the 1 2th century. 1

Raymund of Toulouse represents the Provencal element in the first Crusade, as Bohemund represents the Norman, and Godfrey and Baldwin the Lotharingian. Religiosity, obstinacy and greed seem curiously blended in his composition. The first quality appears in the episode of the Lance, and in his renuncia- tion of the advocacy of Jerusalem: the second appears in the whole of his attitude to Bohemund: the third appears again and again, whenever the progress of the Crusades brought any new conquest. If in temperament he is the least attractive among the princes of the first Crusade, he was yet one of its foremost leaders, and he left his mark upon history in the foundation of the county of Tripoli.

Raymund of Agiles, a clerk in the Provencal army, gives the history of the first Crusade from his master's point of view. For a modern account of Count Raymund's part in the crusading movement, one may refer to Rohricht's works (see / CRUSADEs).

(E. Br.)

RAYMUND OF TRIPOLI, the most famous of the descendants of Raymund of Toulouse, was a great-grandson of his eldest son Bertrand: his mother

was Hodierna, a daughter of Baldwin II., and through her he was closely connected with the kings of Jerusalem. He became count of Tripoli in 1152, on the assassination of his father. In n 64 he was captured by Nur-eddin, and was only released in 11 72 after a captivity of eight years. In 1 1 74 he claimed the regency on behalf of Baldwin IV. (at once a minor and a leper), in virtue of his close relationship; and the claim was acknowledged. After two years the regency seems to have passed to Reginald of Chatillon; but Raymund, who had married the heiress of the county of Tiberias, continued to figure in the affairs of the kingdom. His great ability pro- cured him enemies; for two years, 1180-1182, Baldwin IV. was induced by evil advisers to exclude him from his territories. But as Saladin grew more threatening, Raymund grew more indispensable; and in 1184 he became regent for Baldwin V., on condition that, if the king died before his majority, his successor should be determined by the great powers of the West. Raymund conducted the regency with skill, securing a truce from

1 For the future history of the county, see under Raymund of Tripoli and Bohemund iv.

Saladin in 1185; but when Baldwin V. died, in 1186, all went wrong. Raymund summoned an assembly of the barons to Naplous to deliberate on the situation; but while they deliber- ated, the supporters of Guy de Lusignan (the husband of Baldwin IV. 's sister, Sibylla) acted, and had him crowned, in defiance of the stipulation under which Raymund had become regent. The rest of the barons came over to Guy; and Raymund, left in isolation, retired to Tiberias and negotiated a truce for himself with Saladin. His ambiguous position led contemporaries to accuse him of treasonable correspondence with Saladin; but his loyalty to the Christian cause was nobly shown in n87, when he reconciled himself to Guy, and aided him in the battle of Hattin, which was engaged, however, in the teeth of his earnest advice. He escaped from the battle wounded, and ultimately retired to Tripoli, where he died (1187).

In the corrupt society of the latter days of the kingdom of Jerusalem, Raymund showed himself at least as disinterested as any other man, and certainly more capable than the rest of his contemporaries. He might have saved Jerusalem, if Jerusalem could have been saved; but his was the vox clamantis in deserto. " He is worthy of the throne," wrote a contemporary Arabic chronicler: " he seems destined for it by nature, who has given him pre-eminent wisdom and courage." (E. Br.)

RAYNAL, GUILLAUME THOMAS FRANQOIS (1713-1796), French writer, was born at Saint- Geniez in Rouergue on the 12th of April 1713. He was educated at the Jesuit school of Pezenas, and received priest's

orders, but he was dismissed for unexplained reasons from the parish of Saint-Sulpice, Paris, to which he was attached, and thenceforward h« devoted himself to society and literature. The Abbe Raynal wrote for the Mercure de France, and compiled a series of popular bu\ superficial works, which he published and sold himself. These — L'Histoire du stathouderat (The Hague, 1748), L'Histoire du parlement d'Angleterre (London, 1748), Anecdotes historiques (Amsterdam, 3 vols., 1753) — gained for him access to the salons of Mme. Geoffrin, Helvetius, and the baron d'Holbach. He had the assistance of various members of the philosophe coteries in his most important work, L'Histoire philosophique et politique des etablissemenls et du commerce des Europiens dans les deux Indes (Amsterdam, 4 vols., 1770). Diderot indeed is credited with a third of this work, which was characterized by Voltaire as " du rechauffe avec de la declamation." The other chief collaborators were Pechmeja, Holbach, Paulze, the farmer- general of taxes, the Abbe Martin, and Alexandre Deleyre. To this piecemeal method of composition, in which narrative alternated with tirades on political and social questions, was added the further disadvantage of the lack of exact information, which, owing to the dearth of documents, could only have been gained by personal investigation. The " philosophic " decla- mations perhaps constituted its chief interest for the general public, and its significance as a contribution to democratic propaganda. The Histoire went through many editions, being revised and augmented from time to time by Raynal; it was translated into the principal European languages, and appeared in various abridgments. Its introduction into France was forbidden in 1779; the book was burned by the public execu- tioner, and an order was given for the arrest of the author, whose name had not appeared in the first edition, but was printed on the title page of the Geneva edition of 1780. Raynal escaped to Spa, and thence to Berlin, where he was coolly received by Frederick the Great, in spite of his connexion with the philosophe party. At St Petersburg he met with a more cordial reception from Catherine II., and in 1787 he was permitted to return to France, though not to Paris. He showed generosity in assigning a considerable income to be divided annually among the peasant proprietors of upper Guienne. He was elected by Marseilles to the States-general, but refused to sit on the score of age. Raynal now realized the impossibility of a peaceful revolution, and, in terror of the proceedings for which the writings of himself and his friends had prepared the way, he sent to the Constituent Assembly an address, which was read on the 31st of May 179, deprecating the violence of its reforms. This address is said*

by Sainte-Beuve (Nouveaux lundis, xi.) to have been composed chiefly by

Clermont Tonnerre and Pierre V. Malouet, and it was regarded, even by moderate men, as ill-timed. The published Lettre de I'abbe Ray-nal a I'Assemblee nationale (roth Dec. 1790) was really the work of the comte de Guibert. During the Terror Raynal lived in retirement at Passy and at Montlhery. On the establishment of the Directory in 1795 he became a member of the newly organized Institute of France. He died in the next year on the 6th of March at Chaillot.

A detailed bibliography of his works and of those falsely attributed to him will be found in Querard's La France litteraire, and the same author's Supercheries devoilees. The biography by A. Jay, prefixed to Peuchet's edition (Paris, 10 vols, 1820-1821) of the Histoire . . . des Indes, is of small value. To this edition Peuchet added two supplementary volumes on colonial development from 1785 to 1824. See also the anonymous Raynal dSmasgue (1791) ; Cherhal Montreal, iioge . . . de G. T. Raynal (an. IV.) ; a notice in the Moniteur (5 vendemiaire, an. V.); B. Lunet, Biographie de I'abbe Raynal (Rodez, 1866); and J. Morley, Diderot (1891).

RAYNALD OF CHATILLON (d. 1187), a knight in the service of Constance, princess of Antioch, whom she chose for her husband in 1153, four years after the death of her first husband, Raymund (q.v.). One of Raynald's first acts was a brutal assault on the patriarch of Antioch; while two years later he made an unjustifiable attack on Cyprus, in the course of which the island was ravaged. The act brought its punishment in 1 1 59, when he had to humiliate himself before the emperor Manuel, doing homage and promising to accept a Greek patriarch; and when Manuel came to Antioch in the same year, and was visited there by Baldwin III., Raynald led his horse into the city. Later in the year he was captured by the Mahommedans, during a plundering raid against the Syrian and Armenian peasants of the neighbourhood of Marash, and confined at Aleppo. His captivity lasted seventeen years. Released in n 76, he married Stephanie, the widow of Humphrey of Toron, and heiress of Krak and Mont Royal, to the S.E. of the Dead Sea — fortresses which controlled the trade-routes between Egypt and Damascus, and gave him access to the Red Sea. In November 1177, at the head of the army of the kingdom, he won a victory over Saladin, who only escaped with difficulty from the pursuit. But in 1181 the temptation of the caravans which passed by his fortress proved too strong, and in spite of a truce between Saladin and Baldwin IV. he began to plunder. Saladin demanded reparations from Baldwin IV. Baldwin could only reply that he was unable to coerce his unruly vassal. The result was a new outbreak of war between Saladin and the Latin kingdom (1182). In the course of the hostilities Raynald launched ships on the Red Sea, partly for buccaneering, partly, it seems, with the design of attacking Mecca, and of challenging Mahommedanism in its own holy place. His ships were captured by one of Saladin's officers; and at the end of the year

Saladin himself attacked Raynald in his fortress of Krak, at a time when a number of guests were assembled to celebrate the marriage of his stepson, Humphrey of Toron. The siege was raised, however, by Count Raymund of Tripoli; and till n 86 Raynald was quiet. In that year he espoused the cause of Sibylla and Guy de Lusignan against Count Raymund, and his influence contributed to the recognition of Guy as king of Jerusalem. His policy at this crisis was not conceived in the best interests of the kingdom; and a step which he took at the end of the year was positively fatal. Hearing of a rich caravan, in which the sister of Saladin was travelling, he swooped down from his fortress upon it. Thus, for the second time, he broke a truce between the kingdom and Saladin. Guy could not extort from him the satisfaction which Saladin demanded: Raynald replied that he was lord in his lands, and that he had no peace with Saladin to respect. Saladin swore that Raynald should perish if ever he took him prisoner; and next year he was able to fulfil his oath. He invaded the kingdom, and, at the battle of Hittin, Raynald along with King Guy and many others fell into his hands. They were brought to his tent; and Saladin, after rebuking Raynald strongly for his treachery, offered him his life if he would become a Mahommedan. He refused, and

Saladin either slew him with his own hands or caused him to be slain (for accounts differ) in the presence of his companions.

The death of Raynald caused him to be regarded as a martyr; his life only shows him to have been a brigand of great capacity. He is the apotheosis of the feudal liberty which the barons of the Holy Land vindicated for themselves ; and he shows, in his reckless brigandage, the worst side of their character. Stevenson, Crusades in the East (Cambridge, 1907), takes a most favourable view of Raynald's career: cf. especially pp. 240-241. But his whole life seems to indicate a self-willed and selfish temper. (E. Br.)

RAYNAUD'S DISEASE, a malady first described by P. Edouard Raynaud in 1862 in a paper on " Local Asphyxia and Symmetrical Gangrene of the Extremities." The condition is said to be of central nervous origin, and cold, fright, or emotional disturbances are predisposing causes. It is a disease of child- hood or early adult life, and females are more frequently affected than males. Raynaud attributed the symptoms to an arrest of the passage of blood to the affected parts, and considered this due to a spasm of the arterioles. If the spasm be suffi- ciently prolonged and intense to completely close the arterial channels gangrene of the part may be the result.

The local symptoms are divided into three well-marked stages. The first is local syncope, in which the affected parts become temporarily bloodless, white, cold, and anaesthetic. The condition is familiar in what is termed a

" dead finger," and is usually bilateral. After a variable time the circulation may become restored with a tingling sensation, or the disease may progress to the second stage, that of local asphyxia. In this condition some part of the body, usually a finger, toe, or the whole hand or foot, becomes painful to the touch and is noticed to be dusky in colour, or bluish-purple or even mottled, and the surface is cold. This discoloration may deepen until the skin is almost black, the tactile sense being lost. After several hours the pain may subside, the attack of lividity pass off, and warmth return to the skin. Such attacks of local asphyxia may return every day for a time. Sometimes severe abdominal pain is present, accompanied -by haematuria. The frequency of haematuria in this connexion was first noticed by Hutchinson in 187 1. In the third stage, that of local gangrene, the involved areas assume a black and shrivelled appearance, livid streaks marking the course of the arteries; blebs may form containing bloody fluid. The degree of destruction varies from the detachment of a patch of soft tissue down to the loss of even a whole limb, the part becoming separated by a line of demarcation as in senile gangrene.

In Raynaud's disease the patients have been noticed to be very susceptible to cold and low temperatures; every effort should be made to keep the extremities warm; woollen underclothing and stockings should be worn, and the activity of the circulation roused by douches and exercise; by these means an attack may be prevented. Should local asphyxia have taken place, one of the best treatments to lessen pain and obtain the return of the natural colour is the application of the constant current. Sir T. Barlow directs its application, the limb being placed in a bath of warm salt and water. Cushing's method of inducing active hyperaemia has been attended with much success. This treatment is only applicable when the vascular spasm affects the extremities, and consists in the artificial constriction of the limb by the application of a tourni- quet or Esmarch's bandage for a few minutes daily. This is followed by hyperaemia and increased surface temperature, and affords much relief to the pain of the stage of asphyxia. Drugs which dilate the peripheral vessels, such as amyl nitrite and trinitrine, have also been recommended. When gangrene occurs in the affected part it should be well wrapped in absor- bent cotton and kept dry, and all active treatment should cease until a fine of demarcation has formed and the gangrenous portion separated. The disease tends towards recovery with more or less loss of tissue if the stage of gangrene has been

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RAYNOUARD, FRANCOIS JUSTE MARIE (1761-1836), French dramatist and savant, was born at Brignoles (Provence), on the 8th of September 1761. He was educated for the bar

and practised at Draguignan. In 1791 he went to Paris as deputy to the Legislative Assembly, but after the fall of the Girondists, to whose party he was attached, he had to go into hiding. He was, however, discovered and imprisoned in Paris. During his imprisonment he wrote his play Caton d'Utique (1794). Eleonore de Bavieres and Les Templiers were accepted by the Comedie Francaise. Les Templiers was produced in 1805, and, in spite of the protests of Geoffroy, had a great success Raynouard was admitted to the Academy in 1807, and from 1817 to 1826 he was perpetual secretary. He wrote other plays, in one of which, Les Etats de Blois (acted 1810), he gave offence to Napoleon by his freedom of speech, but, realizing that the public taste had changed and that the romanticists were to triumph, he abandoned the stage and gave himself up to linguistic studies. He was admitted to the Academy of Inscriptions in 181 5. His researches into the Provencal dialect were somewhat inexact, but his enthusiasm and perseverance promoted the study of the subject. His chief works are Choix de poesies originates des troubadours (6 vols., 1816- 182 1), of which the sixth volume, Grammaire compare" e des langues de I' Europe laline dans leurs rapports avec la langue des troubadours (1821), was separately published; Lexique roman (6 vols., 1838-1844). He spent the last years of his life at Passy, where he died on the 27th of October 1836.

RAZGRAD, the capital of the department of Razgrad, Bulgaria, on the river Bieli-Lom, 40 m. S.E. of the Danubian port of Rustchuk by the Varna-Rustchuk railway. Pop. (1906) 13,783, about one-third being Moslems. The railway station is at Inebektchi, 2 m. N. Razgrad possesses a fine mosque, built by Ibrahim Pasha in 1614. Many Turkish families emigrated after the Russo-Turkish War of 1877, but since then the population has again increased, and the town has a thriving agricultural and general trade. Carpet- weaving and viticulture are important local industries. On the 13th of June 1 8 10 and the 14th of August 1877 Razgrad was the scene of battles between the Turks and Russians.

RAZIN, STEPHEN TIMOFEEVICH (d. 1671), Cossack hetman and rebel, whose parentage and date and place of birth are unknown. We first hear of him in 166 1 on a diplomatic mission from the Don Cossacks to the Kalmuck Tatars, and in the same year we meet him on a pilgrimage of a thousand miles to the great Solovetsky monastery on the White Sea " for the benefit of his soul." After that all trace of him is lost for six years, when he reappears as the leader of a robber community established at Panshinskoe, among the marshes between the rivers Tishina and Ilovlya, from whence he levied blackmail on all vessels passing up and down the

Volga. His first considerable exploit was to destroy the " great water caravan " consisting of the treasury-barges and the barges of the patriarch and the wealthy merchants of Moscow. He then sailed down the Volga with a fleet of thirty-five galleys, capturing the more important forts on his way and devastating the country. At the beginning of 1668 he defeated the voivode Jakov Bezobrazov, sent against him from Astrakhan, and in the spring embarked on a predatory expedition into Persia which lasted for eighteen months. Sail- ing into the Caspian, he ravaged the Persian coasts from Derbend to Baku, massacred the inhabitants of the great emporium of Resht, and in the spring of 1669 established himself on the isle of Suina, off which, in July, he annihilated a Persian fleet sent against him. Stenka, 1 as he was generally called, had now become a potentate with whom princes did not disdain to treat. In August 1669 he reappeared at Astrakhan, and accepted a fresh offer of pardon from the tsar there; the common people were fascinated by his adventures. The semi-Asiatic kingdom of Astrakhan, where the whole atmosphere was predatory and nine-tenths of the population were nomadic, was the natural milieu for such a rebellion as Stenka Razin's. In 1670 Razin, while ostensibly on his way to report himself at the Cossack headquarters on the Don, openly rebelled against the govern- ment, captured Cherkask, Tsaritsyn and other places, and on the 24th of June burst into Astrakhan itself. After massacring

1 Steevy.

all who opposed him, and giving the rich bazaars of the city over to pillage, he converted Astrakhan into a Cossack republic, dividing the population into thousands, hundreds and tens, with their proper officers, all of whom were appointed by a vyecha or general assembly, whose first act was to proclaim Stephen Timofeevich their gosudar (sovereign). After a three weeks' carnival of blood and debauchery Razin quitted Astrakhan with two hundred barges full of troops to establish the Cossack republic along the whole length of the Volga, as a preliminary step towards advancing against Moscow. Saratov and Samara were captured, but Simbirsk defied all efforts, and after two bloody encounters close at hand on the banks of the Sviyaga (October 1st and 4th), Razin was ultimately routed and fled down the Volga, leaving the bulk of his followers to be extirpated by the victors. But the rebellion was by no means over. The emissaries of Razin, armed with inflammatory proclamations, had stirred up the inhabitants of the modern governments of Nizhniy-Novgorod, Tambov and Penza, and penetrated even so far as Moscow and Great Novgorod. It was not difficult to revolt the oppressed population by the promise of deliverance from their yoke. Razin proclaimed that his object was to root out the boyars and all officials, to level all ranks and dignities, and establish Cossackdom, with its corollary of absolute equality, throughout Muscovy. Even at the beginning

of 1671 the issue of the struggle was doubtful. Eight battles had been fought before the insurrection showed signs of weakening, and it continued for six months after Razin had received his quietus. At Simbirsk his prestige had been shattered. Even his own settlements at Saratov and Samara refused to open their gates to him, and the Don Cossacks, hearing that the patriarch of Moscow had anathematized Stenka, also declared against him. In 1671 he was captured at Kagalnik, his last fortress, and carried to Moscow, where, on the 6th of June, after bravely enduring unspeakable torments, he was quartered alive.

See N. I. Kostomarov, The Rebellion of Stenka Razin (Rus.) (2nd ed.. Petersburg, 1859); S. M. Solovev, History of Russia (Rus.), vol. ii. (Petersburg, 1895, &c); R. N. Bain, The First Romanovs (London, 1905). (R. N. B.)

RAZOR (O.F. rasor, mod. rasoir, from raser, to scrape, rase, Late Lat. rasare, frequentative of radere, to scrape), a sharp-edged cutting instrument, used for shaving the hair and beard. The typical razor consists of a blade, usually curving slightly back- ward, folding into a handle, to which it is fastened by a tang and rivet. The back of the blade is thick and the sides are hollowed or slope to the fine edge (see Cutlery). In modern times various forms of safety-razor have been invented, in which the blade fits into a fixed handle with a toothed or comb-like shield which protects the face from cutting.

RAZORBILL, or Razor-billed Auk, known also on many parts of the British coasts as the Marrot, Murre, Scout, Tinker or Willock — names which it, however, shares with the Guillemot (q.v.) and to some extent with the Puffin (q.v.) — a common sea-bird of the North Atlantic, 1 resorting in vast numbers to certain rocky cliffs for the purpose of breeding, and returning to deeper waters for the rest of the year. It is the Alca torda of Linnaeus 2 and most modern authors, congeneric _with the G are- fowl (q.v.), if not with the true Guillemots, between which two forms it is intermediate — differing from the former in its small size and retaining the power of flight, which that extinct species had lost, and from the latter in its peculiarly-shaped bill, which is vertically enlarged, compressed, and deeply furrowed, as well as in its elongated, wedge-shaped tail. A fine white line, running

1 Schlegel (Mus. des Pays-Bas, Urinatores, p. 14) records an example from Japan ; but this must be in error.

2 The word Alca is simply the Latinized form of this bird's common Teutonic name, Alk, of which Auk is the English modification. It must therefore be held to be the type of the Linnaean genus Alca, though some

systematists on indefensible grounds have removed it thence, making it the sole member of a genus named by Leach, after Aldrovandus (Ornithologia, bk. xix. chap, xlix.), Vlamania — an extraordinary word, that seems to have originated in some mistake from the no less extraordinary Vuttamaria, given by Belon {Observations, i. c. xi.) as the Cretan name of some diving bird, which could not have been the present species.

on each side from the base of the culmen to the eye, is in the adult bird in breeding-apparel (with rare exceptions) a further characteristic. Otherwise the appearance of all these birds may- be briefly described in the same words — head, breast and upper parts generally of a deep glossy black, and the lower parts and tip of the secondaries of a pure white, while the various changes of plumage dependent on age or season are alike in all. In habits the razorbill closely agrees with the true guillemots, laying its single egg (which is not, however, subject to the same variety of coloration as in the guillemot) on the ledges of cliffs, but it is said as a rule to occupy higher elevations, and when not breeding to keep farther out to sea. On the east side of the Atlantic the Razorbill has its breeding stations from the North Cape to Brittany, besides several in the Baltic, while in winter it passes much farther to the southward, and is sometimes numerous in the Bay of Gibraltar, occasionally entering the Mediterranean, but apparently never extending east of Sicily or Malta. On the west side of the Atlantic it breeds from 70° N. lat. on the eastern shore of Baffin's Bay to Cape Farewell, and again on the coast of America from Labrador and Newfoundland to the Bay of Fundy, while in winter it reaches Long Island. (A. N.)

RAZZIA (an adaptation of the Algerian Arabic ghaziah, from ghasw, to make war), a foray or raid made by African Moslems. As used by the Arabs, the word denotes a military expedition against rebels or infidels, and razzias were made largely for punishment of hostile tribes or for the capture of slaves. English writers in the early years of the 19th century used the form ghrazzie, and Dixon Denham in his Travels (1826) styles the raiding force itself the ghrazzie. The modern English form is copied from the French, while the Portuguese variant is gazia, gaziva.

RE, the Egyptian solar god, one of the most important figures in the Pantheon. See Egypt, section Egyptian Religion. RE, ILE DE, an island of western France, belonging to the department of Charente-Inferieure, from the nearest mainland point of which it is distant about 2 m. The island has an area of nearly $3 sq. m., with a breadth varying from 1 to 45 m. and a

length of 15 m. It is separated from the coast of Vendee on the N. by the Pertuis Breton, some 6 m. broad, and from the island of Oleron on the S. by the Pertuis DAntioche, 75 m. broad. The coast facing the Atlantic is rocky and inhospitable, but there are numerous harbours on the landward side, of which the busiest is La Flotte. Towards the north-west extremity of the island there is a deep indentation, the Fier d'Ars, which leaves an isthmus only 230 ft. wide, strengthened by a breakwater. The north coast is fringed by dunes and by the salt-marshes which are the chief source of livelihood for the inhabitants. Some of them are employed in fishing, oyster-cultivation and the collection of seaweed for manure; the island has corn-lands and vineyards, the latter covering about half its surface, and produces good figs and pears. Apart from its orchards it is now woodless, though once covered by forests. There are two cantons, St Martin (pop. in 1906, 8362) and Ars-en-Re (pop. 471 1) forming part of the arrondissement of La Rochelle. St Martin, the capital, which has a secure harbour and trade in wine, brandy, salt, &c, was fortified by Vauban in 1681 and used to be the depot for .convicts on their way to New Caledonia. In 1627 it repulsed an English force after a siege of three months.

READE, CHARLES (1814-1884), English novelist and dramatist, the son of an Oxfordshire squire, was born at Ipsden, Oxfordshire, on the 8th of June 1814. He entered Magdalen College, Oxford, proceeded B.A. in 1835, and became a fellow of his college. He was subsequently dean of arts, and vice- president of Magdalen College, taking his degree of D.C.L. in 1847. His name was entered at Lincoln's Inn in 1836; he was elected Vinerian Fellow in 1842, and was called to the bar in 1843. He kept his fellowship at Magdalen all his life, but after taking his degree he spent the greater part of his time in London. He began his literary career as a dramatist, and it was his own wish that the word "dramatist" should stand. first in the description of his occupations on his tombstone. He was dramatist first and novelist afterwards, not merely chrono-

logically but in his aims as an author, always having an eye to stage-effect in scene and situation as well as in dialogue. His first comedy, The Ladies' Battle, appeared at the Olympic Theatre in May 1851. It was followed by Angelo (1851), A Village Tale (1852), The Lost Husband (1852), and Gold (1853). But Reade's reputation was made by the two-act comedy, Masks and Faces, in which he collaborated with Tom Taylor. It was produced in November 1852, and later was expanded into three acts. By the advice of the actress, Laura Seymour, he turned the play into a prose story which appeared in 1853 as Peg Woffington. He followed this up in the same year with Christie Johnstone, a close study of Scottish fisher folk, an extraordinary tour de force for the son of an English squire, whether we consider the dialect or the skill with which he enters into alien habits of

thought. In 1854 he produced, in con- junction with Tom Taylor, Two Loves and a Life, and The King's Rival; and, unaided, The Courier of Lyons — well known under its later title, The Lyons Mail — and Peregrine Pickle. In the next year appeared Art, afterwards known as Nance Oldfield.

He made his name as a novelist in 1856, when he produced It's Never Too Late to Mend, a novel written with the purpose of reforming abuses in prison discipline and the treatment of criminals. He described prison life with a fidelity which becomes at times tedious and revolting; but the power of the descriptions was undeniable, and the interest was profound. The truth of some of his details was challenged, and the novelist defended himself with vigour against attempts to rebut his contentions. Five minor novels followed in quick succession, — The Course of True Love never did run Smooth (1857), Jack of all Trades (1858), The Autobiography of a Thief (1858), Love Me Little, Love Me Long (1859), and White Lies (i860), dramatized as The Double Marriage. Then appeared, in 1861, his master- piece, The Cloister and the Hearth, relating, the adventures of the father of Erasmus. He had dealt with the subject two years before in a short story in Once a Week, but, seeing its capabilities, expanded it; and the work is now recognized as one of the finest historical novels in existence. Returning from the 15th century to modern English life, he next produced another startling novel with a purpose, Hard Cash (1863), in which he strove to direct attention to the abuses of private lunatic asylums. Three more such novels, in two of which at least the moral purpose, though fully kept in view, was not allowed to obstruct the flow of incident, were afterwards undertaken, — Foul Play (1869), in which he exposed the iniquities of ship- knackers, and paved the way for the labours of Samuel Plimsoll; Put Yourself in his Place (1870), in which he grappled with the tyrannous outrages of trades-unions; and A Woman-Hater (1877), in which he exposed the degrading conditions of village life. The Wandering Heir (1875), of which he also wrote a version for the stage, was suggested by the Tichborne trial. Outside the line of these moral and occasional works Reade produced three elaborate studies of character, — Griffith Gaunt (1866), A Terrible Temptation (1871), A Simpleton (1873). The first of these was in his own opinion the best of his novels, and his own opinion was probably right. He was wrong, however, in his own conception of his powers as a dramatist. At intervals throughout his literary career he sought to gratify his dramatic ambition, hiring a theatre and engaging a company for the representation of his own plays. An example of his persistency was seen in the case of Foul Play. He wrote this in 1869 in combination with Mr Dion Boucicault with a view to stage adaptation. The play was more or less a failure; but he produced another version alone in 1877, under the title of A Scuttled Ship, and the failure was pronounced.

His greatest success as a dramatist attended his last attempt — Drink — an adaptation of Zola's L'Assommoir, produced in 1879. In that year his friend Laura Seymour, who had kept house for him since 1854, died. Reade's health failed from that time, and he died on the nth of April 1884, leaving behind him a completed novel, A Perilous Secret, which showed no falling off in the arts of weaving a complicated plot and devising thrilling situations.

Reade was an amateur of the violin, and among his works is an essay on Cremona violins with the title, A Lost Art Revived.

It was characteristic of Reade's open and combative nature that he admitted the public freely to the secrets of his method of composition. He spoke about his method in his prefaces; he introduced himself into one of his novels — " Dr Rolfe " in A Terrible Temptation ; and by his will he left his workshop and his accumulation of materials open for inspection for two years after his death. He had collected an enormous mass of materials for his study of human nature, from personal observation, from newspapers, books of travel, blue-books of commissions of inquiry, from miscellaneous reading. This vast collection was classified and arranged in huge ledgers and notebooks. He had planned a great work on " the wisdom and folly of nations," dealing with social, political and domestic details, and it was chiefly for this that his collection was destined, but in passing he found the materials useful as a store of incidents and sugges- tions. A collector of the kind was bound to be systematic, otherwise his collection would have fallen into confusion, and Reade's collection contains many curiosities in classification and tabulation. On the value of this method for his art there has been much discussion, the prevalent opinion being that his imagination was overwhelmed and stifled by it. He himself maintained the contrary; and it must be admitted that a priori critics have not rightly understood the use that he made of his laboriously collected facts. He did not merely shovel the contents of his notebooks into his novels; they served rather as an atmosphere of reality in which he worked, so that his novels were like pictures painted in the open air. His imagination worked freely among them and was quickened rather than im- peded by their suggestions of things suited to the purpose in hand; and it is probably to his close and constant contact with facts, acting on an imagination naturally fertile, that we owe his marvellous abundance of incident. Even in his novels of character there is no meditative and analytic stagnation; the development of character is shown through a rapid unceasing progression of significant facts. This rapidity of movement was perhaps partly the result of his dramatic studies;

it was probably in writing for the stage that he learned the value of keeping the attention of his readers incessantly on the alert. The hankering after stage effect, while it saved him from dullness, often be- trayed him into rough exaggeration, especially in his comic scenes. But the gravest defect in his work is a defect of temper. His view of human life, especially of the life of women, is almost brutal; his knowledge of frailties and vices is obtruded with repellent force; and he cannot, with all his skill as a story-teller, be numbered among the great artists who warm the heart and help to improve the conduct. But as a moral satirist, which was the function he professed over and above that of a story- teller, he did good service, both indirectly in his novels and directly in his own name.

See Charles L. Reade and Compton Reade, Charles Reade, a Memoir (2 vols., 1887); A. C. Swinburne, Miscellanies (1886); and some recollections by John Coleman, Charles Reade as I knew him (1903).

READING, a municipal, county and parliamentary borough and the county town of Berkshire, England, 36 m. W. by S. of London by the Great Western railway. Pop. (1901) 72,217. It is an important junction on the Great Western system, and has communication southward by a joint line of the South- western and South-Eastern and Chatham companies. The Kennet and Avon canal, to Bath and Bristol, and the Thames, afford it extensive connexions by water. It lies in the flat valley of the Thames on the south (right) bank, where' the Kennet joins the main river. The population more than doubled in the last thirty years of the 19th century, and the town is of modern appearance. All the ancient churches are much restored and in part rebuilt. Greyfriars church, formerly monastic, was completed early in the 14th century; and after the dissolution of the monasteries served successively as a town hall, a workhouse and a gaol, being restored to its proper use

in 1864. St Mary'b is said to have been rebuilt in 1551 from the remains of a nunnery founded by ˆElfthryth in expiation of the murder of her stepson Edward the Martyr. St Lawrence's is a large Perpendicular building, and St Giles's, in various styles, was much damaged during the siege of the town in 1643 by the parliamentary forces, and is almost wholly rebuilt. A Bene- dictine abbey was founded at Reading in n 21 by Henry I., and became one of the richest in England, with a church among the largest in the country. Its founder was buried here, but his monument was destroyed in the time of Edward VI. The church was the scene of John of Gaunt's marriage to Blanche of Lancaster in 1359. By Henry VIII. the abbey was converted into a royal palace, and was so used until its destruction during the civil wars of the 17th century. Little remains of the founda- tion; only a gateway and a fragment of the great hall, the meeting-place of several parliaments, are of importance. The greater part of the site

is occupied by public gardens.

The educational establishments are important. The site of an ancient hospice of St John is occupied by the University Extension College. It was opened in 1892, is affiliated to Oxford University, and has accommodation for 600 students, of both sexes, giving instruction in every main branch of higher university education, agriculture, &c. The grammar school, founded in 1485, occupies modern buildings and ranks among the lesser public schools. Archbishop Laud was educated here, and became a generous benefactor of the school. There are also a blue-coat school (1656), and other charitable schools of early foundation. The municipal museum, besides an art gallery and other exhibits, includes a fine collection of Romano-British relics from Silchester, the famous site not far distant in Hamp- shire. Besides the public grounds on the site of the abbey there may be mentioned Prospect Park of 131 acres, purchased by the Corporation, and Palmer Park, presented by a member of the firm of Huntley & Palmer, together with extensive recreation grounds.

The industry for which Reading is chiefly famous is the biscuit manufacture, the principal establishment for which is that of Messrs Huntley & Palmer, employing about 5000 hands. In the town and its vicinity are large seed warehouses and testing- grounds. There are also iron foundries, engineering works and factories for agricultural implements, and manufactures of tin boxes, sauces, velvet and silk, and sacking, together with river- side boat-building yards. Reading gives title to a suffragan bishopric in the diocese of Oxford. The parliamentary borough returns one member. The municipal borough is under a mayor, 10 aldermen and 30 councillors. Area, 5876 acres.

Reading (Redinges, Rading, Redding) early became a place of importance. In 871 the Danes encamped here between the Thames and the Kennet, and in 1006 it was burned by Sweyn. It consisted of only thirty houses at the time of the Domesday Survey. There is some reason to think that a fortification existed there before the Conquest, and Stephen probably built a masonry castle which Henry II. destroyed. On the foundation of Reading abbey the town, hitherto demesne of the crown, was granted to the abbey by Henry I. Henceforth, until the 16th century, the chief feature of its history was the struggle as to rights and privileges. This was carried on between the abbey and the merchant gild which claimed to have existed in the time of the Confessor, and the chief officer of which was from the 15th century styled warder or mayor.

A 16th-century account of the gild merchant shows that many trades were then carried on, but Leland says the town " chiefly stondith by clothing." The story of Thomas Cole, written by Deloney (d. c. 1600) and purporting

to refer to the reign of Henry I., indicates that the industry was carried on at an early date. Archbishop Laud was the son of a Reading clothier. By the 17th century the trade was beginning to decline; the bequest of Kendrich " the Phoenix of worthy Benefactors " did little to revive it, and it was greatly injured by the Civil War. In the 1 8th century the chief trade was in malt. The first town charter is that given by Henry III. (1253) on behalf of the burgesses in the Gild Merchant," which was confirmed and

amplified by succeeding sovereigns. The governing charter until 1835 was that of Charles I. (1639) incorporating the town under the title of the mayor, aldermen and burgesses. Reading returned two members to parliament from 1295 to 1885, when it was deprived of one; until 1832 the Scot-and-Lot franchise was used. The town surrendered to the parliamentary troops, after a siege, in 1643; it was occupied subsequently by the forces of both parties: in 1688 a skirmish took place in the town between some Irish soldiers of James II. and the troops of William of Orange. The market, chiefly held on Saturday, can be traced to the reign of Henry III.; four fairs granted by the charter of 1562 are still held, that on the 25th of July dating originally from a grant of Henry II. to Reading abbey.

See C. Coates, History of Reading (1806); Victoria County History, Berks.

READING, a city and the county-seat of Berks county, Pennsylvania, U.S.A., in the S.E. part of the state, on the E. bank of the Schuylkill river, and about 58 m. N.W. of Philadelphia. Pop. (1880) 43,278; (1890) 58,661; (1900) 78,961, of whom 5940 were foreign-born; (1910, census) 96,071. Reading is served by the Pennsylvania and the Philadelphia & Reading railways, by the Schuylkill Canal, which carries freight to Philadelphia, and by electric railways to several villages in Berks county. The city occupies an irregular tract of land gradually descending from the base of Mt. Penn westward to the Schuylkill river, and therefore possesses excellent drainage facilities. The river, which is unnavigable and winding at this point, forms the western boundary of the city for more than 4 m., and is spanned by three public bridges and a number of railway bridges. Neversink Mountain (878 ft. high), lying to the S. of the city, and Mt. Penn (800 ft.), are pleasure resorts in the neighbourhood. On the neighbouring mountains are several summer hotels and sanatoria. Within the city is Penn Common, containing 50 acres, reserved by the Penns for the use of the town when it was first laid out, and since 1878 used as a public park. Mineral Spring Park, con- taining 63 acres, lies on the

outskirts of the city. Other parks are maintained by the street railway companies. In Penn Common are a monument erected to the "First Defenders," to commemorate the fact that the "Ringgold Light Infantry," the first volunteer company to report at Washington for service in the Civil War, came from this city; a mon- ument to President McKinley, and one to the volunteer fire companies of the city. Among interesting landmarks are the Federal Inn (1763), in which President Washington was entertained in 1794, and which has been used as a banking house since 1814; the old county gaol (1770), used as such until 1848; and the site of the " Hessian Camp," where some of the prisoners captured during the War of Independence were confined. Charitable institutions are numerous; among them are the Reading Hospital (1867), St Joseph's Hospital (1873), Homoeopathic Hospital (1891), the Home for Widows and Single Women (1875), the Hope Rescue Mission (1897) for homeless men, the Home for Friendless Children (1888), St Catharine's Female Orphan Asylum (1872), St Paul's Orphan Asylum for Boys, and the House of the Good Shepherd (1889). Other institutions are the public library, which from 1808 to 1898 was a subscription library; the Berks County Law Library; the Berks County Historical Society; and the Harmonie Maennerchor, organized in 1847 and one of the oldest singing societies in the United States.

Lying within the rich agricultural region of the Lebanon and Schuylkill valleys and near vast fields of anthracite coal and iron ore, Reading possesses unusual business and industrial advantages. The chief industry is the manufacture of iron and steel. There are large shops of the Philadelphia & Reading railway here. The total value of factory products in 1905 was $30,848,175 (in 1900 it had been $32,682,061), and the most important of these were the products of steel-works and rolling-mills; the products of railway repair shops; foundry and machine-shop products; hardware, hosiery and knitted goods; cigars and cigarettes, and felt hats. Other

important manufactures are bicycles, brick and other clay products, brooms, brushes, and cotton and woollen goods.

Reading was surveyed and laid out as a town in 1748, in accordance with the plans of Thomas and Richard Penn, sons of William Penn, and was named Reading after the county town of Berkshire, England. The first settlers were mostly Germans, but the direction of municipal affairs until the out- break of the War of Independence was in the hands of the English-speaking inhabitants. As the latter were largely of Loyalist sympathies during the war, the control of the local government then fell into the hands of the German inhabitants. German was long used in Reading; Pennsylvania German (or " Dutch ") is still spoken in the surrounding country; and several German periodicals are published in the city, including among them the weekly Adler since 1796. During the War of*

Independence Reading was an inland depot for supplies for the American army, and prisoners of war were sent here in large numbers. The development of the town dates from the opening in 1824 of the Schuylkill Canal, from Reading to Philadelphia. This was followed in 1828 by the Union Canal, running westward to Lebanon and Middletown, and in 1838 by the entrance into Reading of the Philadelphia & Reading railway. The establishment of these means of communication hastened the development of the natural resources of the region, and Reading early became an industrial centre. A system of water-works, established in 1821, was acquired by the municipality in 1865. Reading was incorporated as a borough in 1783, and was chartered as a city in 1847.

See M. L. Montgomery, History of Reading, Pennsylvania, and the Anniversary Proceedings of the Sesqui- Centennial (Reading, 1898).

READING BEDS, in geology, a series of marine and estuarine beds consisting of variegated plastic clays and bright-coloured sands, which form, with the Woolwich beds, a subdivision of the Lower Eocene (see Woolwich and Reading Beds).

READYMONEY, SIR COWASJI JEHANGIR (181 2-1878), " the Peabody of Bombay." Early in the 18th century three Parsee brothers moved from Nowsari, near Surat, in Gujarat, to Bombay, and became the pioneers of a lucrative trade with China. They gained the sobriquet of " Readymoney," which they adopted as a surname. Only Hirji Jewanji Readymoney left issue, two daughters, the elder of whom married a Banaji, and the younger a Dady Sett. The son of the former, Jehangir Hirji, married Mirbae, the daughter of the latter, and was made the heir not only of his grandfather, but of his two grand- uncles. The younger of their two sons was Cowasji Jehangir. His only English education was at the then well-known school kept by Serjeant Sykes in the Fort of Bombay. At the age of 15 he entered the firm of Duncan, Gibb & Co. as " godown keeper," or warehouse clerk. In 1837 he was promoted to the responsible and lucrative appointment of " guarantee broker " to two of the leading European firms of Bombay. In 1846 he was able to begin trading on his own account. He was made a J.P. for the town and island of Bombay, and a member of the board of conservancy; and in 1866 was appointed a commissioner of income tax, his tactful management being largely responsible for the fact that this tax, then new to Bombay and unpopular, was levied with unexpected financial success. He was made C.S.I, in 187 1; and in 1872 he was created a Knight Bachelor of the United Kingdom, and his statue, by T. Woolner, R. A., was erected in the town hall. His donations to the institutions of Bombay amounted to close on £200,000. His health broke down in 1871, and he died in 1878, being succeeded by his son, Sir J. Cowasji Jehangir [Readymoney], who was created a Knight Bachelor in 1895, and a

Baronet in

1908.

See J. Cowasji Jehangir, Sir Cowasji Jehangir Readymoney (1890).

(M. M. Bh.)

REAGAN, JOHN HENNINGER (1818-1905), American politician, was born in Sevier county, Tennessee, on the 8th of October 1818. He removed to Texas in 1839, was deputy surveyor of public lands in 183 9- 1843, was admitted to the bar in 1846, was a member of the state House of Representatives

In 1847-1848, served as district judge in 1852-1857, and in 1857-1861 was a representative in Congress. His political views were determined by the ultra-democratic influence of Andrew Jackson and the state-sovereignty philosophy of John C. Calhoun. In 1861 he was a member of the Texas secession convention, served in the Confederate provisional Congress, and on the 6th of March was appointed postmaster-general in President Davis's cabinet. He served in this capacity through- out the war, and for a short time before its close was also acting secretary of the treasury. He was captured with the Davis party on the 10th of May 1865, and was imprisoned in Fort Warren, Boston Harbour, until the following October. While in prison he wrote the "Fort Warren letter" (August nth), in which he urged the people of Texas to recognize their defeat, grant civil rights to the freedmen, and try to conciliate the North. From 1875 to 1887, when he entered the U.S. Senate, he was again a representative in Congress, and from 1877 almost continuously to the close of his service he was chairman of the Committee on Commerce, in which capacity he had a prominent part in securing the passage of the Interstate Commerce Act of 1887. He was a member of the state constitutional convention of 1876. In state politics his sympathies were with the Radicals. In 1 89 1, believing that his first duty was to his state, he resigned from the Senate to accept the chairmanship of the newly estab- lished state railway commission. In 1901 he retired from public service. From 1899 until his death he was president of the Texas State Historical Association. He died at his home, near Palestine, Texas, on the 6th of March 1905.

See his Memoirs; with Special Reference to Secession and the Civil War (New York, 1906), edited by W. F. McCaleb.

REALGAR, a mineral species consisting of arsenic mono- sulphide (AsS) and occurring as monoclinic crystals of a bright red colour. There is a perfect cleavage parallel to the plane of symmetry (r in fig.). The lustre is resinous, and the streak has the same colour as the crystals, namely, orange-red to aurora-red. The hardness is 1ˆ-2 and the specific gravity 3-55. On exposure to light the crystals crumble to a yellow powder. The name realgar is of Arabic origin, and was used by the alchemists; the substance was known to Theophrastus under the name ~Za.vbapa.ia], and to Pliny as Sandaracha. The mineral usually occurs in association with the yellow arsenic sulphide, orpi- ment. Good crystals are found with ores of silver and lead in the mineral veins of Felsobanya, near Nagy-Banya, Kapnik-Banya and Nagyag, near Deva, in Hungary; with blende in the white crystalline dolomite of the Binnenthal in Switzerland; and in a bed of sandy clay at Mercur in Utah. It is deposited by the solfataras near Naples and by the hot springs of the Yellowstone National Park. Realgar has been used as a pigment and in pyrotechny for producing a brilliant white fire; but it is now replaced by the artificially prepared compound.

The other native arsenic sulphide, AS2S3, known as orpiment (Lat. auripigmentum, meaning "golden paint"'), occurs as foliated masses of a lemon-yellow colour, the foliation being parallel to a direction of perfect cleavage. It is sectile and soft (H. = iˆ-2), and has a specific gravity 3-4. Distinctly developed crystals are rare; they have usually been considered to be orthorhombic and isomorphous with stibnite (Sb 2 S 3), but it is probable that they are really monoclinic. Orpiment is ex- tensively mined near Julamerk in Asiatic Turkey. (L. J. S.)

REALISM (from Low Lat. realis, appertaining to res, things, as opposed to ideas and imaginations), a philosophical term used in two opposite senses. The older of these is the scholastic doctrine, traceable back to Socrates, that universals have a more " real " existence than things. Universals are, in scholastic language, ante res, in rebus and post res. Behind all numerous types of chairs there is in the mind the ideal chair of which particular chairs are mere copies. In the most extreme form realism denies that anything exists in any sense except

universals. It is opposed to nominalism (q.v.) and conceptualism (q.v.). For the history of the doctrine, see Scholasticism. Realism in this sense has been called " an assertion of the rights of the subject " (cf. the Protagonean maxim, " Man is the measure of all things "). The modern application of the term is to the opposing doctrine that there is a reality apart from its presentation to consciousness. In this sense it is opposed to idealism (q.v.), whether the purely subjective or that more comprehensive idealism which makes subject and object mutually interdependent. In its crude form it is known as " Natural " or " Naive " Realism. It appears, however, in more

complex forms, e.g. as Ideal Realism (or Real Idealism), which combines epistemological idealism with realism in meta- physics. Again, Kant distinguishes ” empirical ” realism, which maintains the existence of things in space independent of consciousness, from ” transcendental ” realism, which ascribes absolute reality to time and space.

In literature and art ” realism ” again is opposed to ” ideal- ism ” in various senses. The realist is (1) he who deliberately declines to select his subjects from the beautiful or harmonious, and, more especially, describes ugly things and brings out details of an unsavoury sort; (2) he who deals with individuals, not types; (3) most properly, he who strives to represent the facts exactly as they are.

REALM, the dominions of a king, a kingdom. The O.Fr. reaume (mod. royaume) was the form first adopted in English, and the modern spelling does not appear fixed till the begin- ning of the 17th century. The word must be referred to a supposed Med. Lat. regalimen, from regalis, of or belonging to a rex, king.

REAL PROPERTY. The land law of England and of countries whose law is based upon that of England stands in a peculiar position, which can be understood only by an outline of its history.

History.— Such terms as ” fee ” or ” homage ” carry us back into feudal times. Rights of common and distress are based upon still older institutions, forming the very basis of primitive law. The conception of tenure is the fundamental ground of distinction between real and personal estate, the former only being strictly entitled to the name of estate (q.v.). The division into real and personal is coincident to a great extent with that into immovable and movable, generally used by systems of law founded on the Roman (see Personal Property.) That it is not entirely coincident is due to the influence of the Roman law itself. The Greeks and the Romans of the republic were essentially nations of citizens; the Teutons were essentially a nation of land-folk; the Roman empire bridged the gulj between the two. It is probable that the English land law was produced by the action of the policy adopted in the lower empire, finally developed into feudalism, upon the previously existing course of Teutonic custom. The distinguishing features of the Teutonic system were enjoyment in common and the absence of private ownership, except to a limited extent. The principal features of the old English land law before the Con- quest, from which the modern law has developed, were (1) liberty of alienation, either by will or inter vivos, of such land as could be alienated, chiefly, if not entirely, bocland, subject always to the limits fixed by the hoc; (2) publicity of transfer by enrolment in the shire-book or church-book; (3) equal partition of the estate of a deceased among the sons, and failing sons among the

daughters; (4) cultivation to a great extent by persona in various degrees of serfdom, owing money or labour rents; (5) variety of custom, tending to become uniform, through the application of the same principles in the local courts; (6) sub- jection of land to the trinoda necessitas, a burden imposed for the purpose of defence of the realm. The rudiments of the conceptions of tenure and of the crown as lord paramount were found in the old English system, and laenland was an anticipation of the limited interests which afterwards became of such import- ance. 1 The connexion of political privileges with the ownership

1 The name has not remained as in Germany and Denmark. A fief is still Lehen in Germany, Lehn in Denmark.

of land is not peculiar to the pre-Conquest or any other period. It runs through the whole of English history.

The elements of feudalism so far existed in England under the Anglo-Saxon and Danish kings as to make it easy to introduce it in full at the Norman Conquest. What the Norman Conquest did was not to change all at once allodial into feudal tenure, but to complete the association of territorial with personal dependence in a state of society already prepared for it. 1 " Nulle terre sans seigneur " was one of the fundamental axioms of feudalism. There might be any number of infeudations and subinfeudations to mesne lords, but the chain of seigniory was complete, depend- ing in the last resort upon the king as lord paramount. Land was not owned by free owners owing only necessary militia duties to the state, but was held of the king by military service of a more onerous nature. The folkland became the king's land; the soldier was a landowner instead of the landowner being a soldier. Free owners tended to become tenants of the lord, the township to be lost in the manor. 2 The common land became in law the waste of the manor, its enjoyment resting upon a presumed grant by the lord. On the other hand, the whole of England did not become manorial; the conflict between the township and the manor resulted in a compromise, the result of which aiffects English tenure to this day. But it was a com- promise much to the advantage of the privileged class, for in England more than in any other country the land law is the law of the nobility and not of the people. One reason of this is that, as England was never so completely feudalized as were some of the European continental states, the burden of feudalism was not so severely felt, and has led to less agitation for reform.

The land forfeited to the Conqueror was regranted by him to be held by

military service due to the king, not to the mesne lord as in European continental feudalism. In 1086 at the council of Salisbury all the landholders swore fealty to the crown. In the full vigour of feudalism the inhabitants of England were either free or not free. The free inhabitants held their lands either by free tenure (liberum tenementum, franktenement) or by a tenure which was originally that of a non-free inhabitant, but attached to land in the possession of a free man. Franktene- ment was either military tenure, called also tenure in knight service or chivalry (including barony, the highest tenure known to the law, grand serjeanty and the special forms of escuage, castle-guard, cornage and others) or socage (including burgage and petit serjeanty), or frankalmoign (libera eleemosyna) or divine service, by which ecclesiastical corporations generally held their land. 3 The non-free inhabitants were in Domesday Book servi, cotarii or bordarii, later nalivi or villani, the last name being applied to both free men and serfs. All these were in a more or less dependent condition. The free tenures all exist at the present day, though, as will appear later, the military tenures have shrunk into the unimportant and exceptional tenure of grand serjeanty. The non-free tenures are to a certain extent represented by copyhold. The most important difference between the military and socage tenures was the mode of descent. Whether or not a feudal benefice was originally hereditary, it had certainly become so at the time of the Conquest, and it descended to the eldest son. This applied at once in England to land held by military service as far as regarded the capital fief. The descent of socage lands or lands other than the capital fief for some time followed the old pre-Conquest rule of descent. Thus in the so- called " Laws of Henry I." the lands other than the capital fief, and in Glanvill, who wrote in the time of Henry II., socage lands, if anciently partible (antiquitus divisum), were divided among all the sons equally. But by the time of Bracton (Henry III.) the course of descent of lands held by military service had so far

1 " The relation of vassalage, originally personal, became annexed to the tenure of land " (Palgrave, Rise and Progress of the English Commonwealth, vol. i. p. 505).

2 It is a disputed point whether the manor organization existed before the Conquest; but its full development seems to have been later than that event.

3 Frankalmoign was not always regarded as a distinct tenure. Thus Littleton (§ 118) says that all that is not tenure in chivalry is tenure in socage.

prevailed that, though it was a question of fact whether the land was partible or not, if there was no evidence either way descent to the eldest son was presumed. Relics of the old custom still remain in the case of

gavelkind. The military tenant was sub- ject to the feudal incidents, from which the tenant in socage was exempt. These incidents, especially wardship and mafriage, were often oppressive. Alienation of lands by will, except in a few favoured districts, became impossible; alienation inter vivos was restrained in one direction in the interests of the heir, in another in the interests of the lord. At the time of Glanvill a tenant had a greater power of alienation over land which he had purchased (terra acquietata) than over land which he had in- herited. But by the time of Bracton the heir had ceased to have any interest in either kind of land. The lords were more success- ful. It was enacted by Magna Carta that a free man should not give or sell so much of his land as to leave an amount insufficient to perform his services to his lord. In spite of this provision, the rights of the lords were continually diminished by subinfeuda- tion until the passing of the Statute of Quia Emptores. Aliena- tion by a tenant in chief of the crown without licence was a ground of forfeiture until 1 Edw. III. st. 2, c. 12, by which a fine was substituted. The modes of conveyance at this time were only two, feoffment with livery of seisin for corporeal heredita- ments, grant for incorporeal hereditaments. Livery of seisin, though public, was not officially recorded like the old English transfer of property. The influence of local custom upon the land law must have become weakened after the circuits of the judges of the King's Court were established by Henry II. Jurisdiction over litigation touching the freehold was taken away from the lord's courts by 15 Ric. II. c. 12.

The common law as far as it dealt with real estate had in the main assumed its present aspect by the reign of Henry III. The changes which have been made since that date have been chiefly due to the action of equity and legislation, the latter sometimes interpreted by the courts in a manner very different from the intention of parliament. The most important influence of equity has been exercised in mortgage and trusts in the doctrine of specific performance of contracts concerning real estate, and in relief from forfeiture for breach of covenant.

History of Real Estate Legislation. — The reign of Edward I. is notable for three leading statutes, all passed in the interests of the superior lords. The Statute of Mortmain (7 Edw. I. st. 2, c. 13) is the first of a long series directed against the acquisition of land by religious and charitable corporations. The statute De Donis Conditionalibus (13 Edw. I. c. 1) forbade the alienation of estates granted to a man and the heirs of his body, which before the statute became on the birth of an heir at once alienable (except in the case of gifts in frankmarriage), and so the lord lost his escheat. The statute Quia Emptores (18 Edw. I. c. 1) preserved those rights of the lords which were up to that time subject to be defeated by subinfeudation, by enacting that in any alienation of lands the alienee should hold them of the same lord of the fee as the alienor. 4 Since 1290 it

has been impossible to create an estate in fee-simple to be held of a mesne lord, or to reserve a rent upon a grant of an estate in fee (unless in the form of a rent-charge), or to create a new manor. The statute, however, does not bind the crown. The practical effect of the statute was to make the transfer of land thenceforward more of a commercial and less of a feudal trans- action. The writ of elegit was introduced by the Statute of Westminster II. in 1285 as a creditor's remedy over real estate. It has, however, been considerably modified by subsequent legislation. From 1290 to the reign of Henry VIII., there is no statute of the first importance dealing with real estate. The reign of Henry VIII., like the reign of Edward I., is signalized by three acts, the effects of which continue to this day. The one which has had the most lasting influence in law is the Statute of Uses, 27 Hen. VIII. c. 10 (see Conveyancing; Trust). The Statute of Uses was intended to provide against secrecy of sales of land, and as a necessary sequel to it an act of the same

4 Tenants in chief of the crown were liable to a fine on alienation until 12 Car. II, c.

year (27 Hen. VIII. c. 16) enacted that all bargains and sales of land should be duly enrolled. Bargain and sale was a form of equitable transfer which had for some purposes superseded the common law feoffment. It applied only to estates of inheritance and not to terms of years. The unforeseen effect of 27 Hen. VIII. c. 16 was to establish as the ordinary form of conveyance until 1 84 1 the conveyance by lease and release. 1 Uses having become legal estate by the Statute of Uses, and therefore no longer devisable, 32 Hen. VIII. c. 1 (explained by 34 & 35 Hen. VIII. c. 5) was passed to remedy this inconvenience. It is still law as to wills made before 1838 (see Will). In the reign of Elizabeth the acts of 13 Eliz. c. 5 and 27 Eliz. c. 4 avoided fraudulent conveyances as against all parties and voluntary conveyances as against subsequent purchasers for valuable consideration. Early in the reign of Charles II. the act of 1661 (12 Car. II. c. 24) turned all the feudal tenures (with the exception of frankalmoign and grand serjeanty) into tenure by free and common socage and abolished the feudal incidents. The Statute of Frauds (29 Car. II. c. 3) contained provisions that certain leases and assignments, and that all agreements and trusts relating to land, should be in writing (see Fraud). The land registries of Middlesex and Yorkshire date from the reign of Anne (see Land Registration). Devises of land for charitable purposes were forbidden by the Mortmain Act (9 Geo. II. c. 36). In the next reign the first general Inclosure Act was passed, 41 Geo. III. c. 109 (see Commons). In the reign

of William IV. were passed the Prescription, Limitation and Tithe Commuta- tion Acts; fines and recoveries were abolished and simpler modes of conveyance substituted by 3 & 4 Will. IV. c. 74; and the laws of inheritance and dower were amended by 3 & 4 Will. IV. cc. 105, 106. In the reign of Victoria there was a vast mass of legislation dealing with real estate in almost every conceivable aspect. At the immediate beginning of the reign stands the Wills Act. The transfer of real estate was simplified by 8 & 9 Vict. c. 106 and by the Conveyancing Acts of 1881 and 1882. Additional powers of dealing with settled estates were given by the Settled Estates Act 1856, later by the Settled Estates Act 1877, and the Settled Land Act 1882. Succession duty was levied for the first time on freeholds in 1853. The strictness of the Mortmain Act has been relaxed in favour of gifts and sales to public institutions of various kinds, such as schools, parks and museums. The period of limitation was shortened for most purposes from twenty to twelve years by the Real Property Limitation Act 1874. Several acts were passed dealing with the enfranchisement and commutation of copyholds and the preservation of commons and open spaces. The Naturalization Act 1870 enabled aliens to hold and transfer land in England. The Felony Act 1870, abolished forfeiture of real estate on conviction for felony. The Agricultural Holdings Acts 1883 and 1900, and other acts, gave the tenant of a tenancy within the acts a general right to compensation for improvements, substituted a year's notice to quit for the six months' notice previously necessary, enlarged the tenant's right to fixtures, and limited the amount of distress. By the Intestate Estates Act 1884 the law of escheat was extended to incorporeal here- ditaments and equitable estates. Among other subjects which have been dealt with by legislation in the 19th century may be mentioned land transfer, registration, mortgage, partition, excambion, fixtures, taking of land in execution, declaration of title and apportionment. Hardly a year passes in which the land law is not altered to a greater or less degree.

Real estate at the present day is either legal or equitable, a difference resting mainly upon historical grounds. The following observations apply in general to both kinds of estate. The usual classification of interests in real estate regards either the extent, the time or the mode of enjoyment. The division according to the extent is in the first instance into corporeal and incorporeal hereditaments, a division based upon the Roman law division of res into corporales and incorporates, and open to the same objection,

1 From the reign of Edward IV. at latest up to the Fines and Recoveries Act of 1833 fines and recoveries were also recognized as a means of conveyance. They are so regarded in the Statute of Uses.

that it is unscientific as co-ordinating subjects of rights with the rights themselves. 2 Corporeal hereditaments, says Blackstone, " consist of such

as affect the senses, such as may be seen and handled by the body; incorporeal are not the objects of sensation, can neither be seen nor handled, are creatures of the mind, and exist only in contemplation." Corporeal hereditaments are all necessarily freehold; 3 an interest in land less than freehold, such as a term of years, is personalty only. There was no room for such an interest in the feudal gradation of tenure; it was regarded as a mere personal contract and was incapable of the incidents of tenure By the Conveyancing Act 188 1 the residue of a long term of years could in certain cases be enlarged into the fee-simple. A copyhold is in strict law only a tenancy at the will of the lord. Estates of freehold are either estates for life or in fee (called also estates of inheritance), the latter being in fee-tail or in fee-simple. An estate for life may be either for the life of the tenant or for the life of another person, the latter called an estate pur autre vie. The former kind of estate includes estates of dower and curtesy. An estate in fee is called a fee simply, an obvious sign of its feudal origin. Estates tail are either general or special, the latter being in tail male or (rarely) in tail female. There may also be a quasi- entail of an estate pur autre vie. An estate in fee-simple is the largest estate known to English law. Its ordinary incidents are an oath of fealty (never exacted), escheat, and (in a manor) suit of the court baron, and occasionally a small quit-rent and relief. All these are obviously relics of the once important feudal incidents. Incorporeal hereditaments consist chiefly, if not wholly, of rights in alieno solo. They are divided by Joshua Williams {Real Property, pt. ii.) into (1) reversions, remainders and executory interests, (2) hereditaments purely incorporeal, the last being either appendant, appurtenant or in gross,, Examples are profits a prendre (such as rights of common), easements (such as rights of way), 4 seigniories, advowsons, rents, tithes, titles of honour, offices, franchises. Before 1845 corporeal hereditaments were said to lie in livery, incorporeal in grant. But by the Real Property Act 1845 all corporeal hereditaments are, as regards the conveyance of the immediate freehold thereof, to be deemed to lie in grant as well as in livery. With regard to the time of enjoyment, estates are either in possession or in expectancy — that is, in reversion or remainder or executory interests (see Remainder). With regard to the mode of enjoyment, estates are either joint, in common, in coparcenary or in severalty.

Exceptional ■ Tenures. — It has been already stated that there are still to be found survivals of the old pre-Conquest customary law. They are found both in the tenure and in the conveyance of land. The only customs of which judicial notice is taken are gavelkind (q.v.) and borough-English (q.v.). Any other local customs, as in manors, must be proved by evidence. The tenures of frankalmoign and grand serjeanty were specially preserved by 12 Car. II. c. 24.

Title. — This is the name given to the mode of acquisition of rights over

real estate. Title may arise either by alienation, voluntary or involuntary, or by succession. Voluntary alienation is either inter vivos or by will. The former branch is practically synonymous with conveyance, whether by way of sale, settlement, mortgage or otherwise. As a general rule alienation of real estate inter vivos must be by deed since 8 & 9 Vict. c. 106. Since that act a deed of grant has superseded the old forms of feoffment and lease and release. Considerable alterations in the direction of shortness and simplicity have been made in the law of transfer of real estate by the Conveyancing Acts 1881, 1882 and the Land Transfer Acts 1875 and 1897. The word " grant " is no longer necessary for a conveyance, nor are the old words of limitation " heirs " and " heirs of the body." It is sufficient to use the words " in fee-simple," " in tail," " in tail male," " in tail female." Many provisions usually inserted in deeds, such as covenants for title by a beneficial owner and powers of appointment of new trustees, obtain statutory sanction. Forms of mortgage, con- veyance' and settlement are appended to the act. The Solicitors' Remuneration Act 1881 was passed as a necessary sequel to the Conveyancing Act, and the remuneration of solicitors now stands upon a different and more satisfactory basis. For acquisition by will and succession, see Will; Inheritance. Involuntary aliena- tion is by bankruptcy (q.v.) and by other means of enforcing the rights of creditors over land, such as distress or execution. It may also arise by the exercise by the state of its right of eminent domain for public purposes, as under the Lands Clauses and other acts. 6

2 In spite of this objection the division is adopted by the legisla- ture; see, for instance, the Intestate Estates Act 1884.

3 In the category of corporeal hereditaments are also included certain accessories to corporeal hereditaments proper, such as growing crops, fixtures, title-deeds, &c.

4 It should be noticed that an easement in gross cannot exist.

5 The right of the state to contribution from land for revenue purposes and to stamp duties on deeds perhaps falls under this head. These imposts are really involuntary alienations of part of the profit of the land.

Restraints on Alienation. — The alienation of real estate may be subject to almost any conditions, provided that such conditions do not contravene the law. As a general rule there "can be no restric- tions upon the alienation of

an estate in fee-simple; the two ideas are incompatible. In the case, however, of a married woman a restraint on anticipation is allowed within certain limits (see Restraint). In another direction the imposition of a course of devolution upon property is forbidden by the law against perpetuities (see Perpetuity), while the accumulation of income is also forbidden with a few exceptions. Certain persons are by the general policy of the law disabled from exercising full proprietary rights, such as convicts, infants and lunatics.

Procedure. — In some cases rights attaching to real estate are pro- tected by peculiar remedies. At an early period it became more convenient to try the right to the possession of, rather than the right to the property in, real estate. Possessory tended to super- sede proprietary remedies, from their great simplicity and elasticity. The general mode of trying the right to both property and posses- sion was from the time of Henry II. the real action, the form called " writ of right " (after Magna Carta gradually confined to the court of common pleas) being used to determine the property, that called " assise of novel disseisin " being the general means by which the possession was tried. About the reign of Elizabeth the action of ejectment became the ordinary form of possessory remedy. Real actions existed until the Real Property Limitation Act 1833, by which they were finally abolished, with the exception of writ of right of dower, writ of dower unde nihil habet, quare impedit and ejectment. Of these quare impedit (q.v.) appears to be the only one now in use. The assise of novel disseisin, the action of ejectment in both its original and its reformed stage, and finally the action for the recovery of land in use since the Judicature Acts are all histori- cally connected as gradual developments of the possessory action. There are certain matters affecting real estate over which the court of chancery formerly had exclusive jurisdiction, in most cases because the principles on which the court acted had been the creation of equity. The Judicature Act 1873 assigned to the chancery division of the high court of justice all causes and matters for (inter alia) the redemption or foreclosure of mortgages, the raising of portions or other charges on land, the sale and distribution of the proceeds of property subject to any lien or charge, the specific performance of contracts between vendors and purchasers of real estates, including contracts for leases, the partition or sale of real estates, and the wardship of infants and the care of infants' estates. In the case of rent a summary mode of remedy by act of the creditor still exists (see Distress, Rent).

Ireland. — The law of real estate in Ireland is the English law, which finally superseded the native law in James I.'s reign, as modified by subsequent legislation. The main difference is in the law of landlord and tenant, modified by the various land acts (see Ireland) and the operation of the Irish Land Commission.

United States. — The law of real estate in the United States is the law of England modified to suit a different state of circumstances. The main point of difference is that in the United States the occupiers of land are generally wholly or in part owners, not tenants, as in England. This is to a great extent the effect of the home- stead laws (see Homestead and Exemption Laws). The traces of the feudal origin of the law are, as might be expected, consider- ably less prominent than in England. Thus estates tail are practically obsolete; in some states they are specially forbidden by the state constitutions. The law of descent is the same in real and personal estate. Manors do not exist, except in the state of New York, where they were created by the crown in colonial days (Bouvier, Law Diet., " Manor "). Registration of deeds is general. In some states forms of deed are prescribed by statute. Conveyancing is for the most part simpler than in England. The holding of real estate by religious or charitable corporations is generally restricted by the act creating them rather than by anything like the English law of mortmain. Perpetuities are forbidden in most states. The right of eminent domain is at once acknowledged and limited by the Constitution of the United States. By art. 5 of the Amendments private property is not to be taken for public use without just com- pensation. A similar provision is found in many of the state constitutions. By an Act of Congress of 9th April 1866, c. 31, all citizens of the United States have the same right in every state and Territory as is enjoyed by white citizens thereof to inherit, purchase, lease, sell, hold and convey real and personal property. In most states aliens may hold land ; but in some states they cannot do so without becoming naturalized or at least filing in the specified manner a declaration of intention to become naturalized.

International Law. — The law of the place where real estate is situated [lex loci rei sitae) governs its tenure and transfer. The laws of England and of the United States are more strict on this point than the laws of most other countries. They require that the for- malities of the locus rei sitae must be observed, even if not necessary to be observed in the place where the contract was made. The lex loci rei sitae determines what is to be considered real estate. A foreign court cannot as a general rule pass title to land situated in another country. The English and United States courts of equity have to a certain extent avoided the inconvenience which this in-

ability to deal with land out of the jurisdiction sometimes cause by the use of the theory that equity acts upon the conscience of the party and not upon the title to the foreign land. Thus in the leading case of Penn. v. Lord Baltimore in 1750 (1 Vesey, 444) the court of chancery on this ground decreed specific performance of articles for settling the boundaries of the provinces of Pennsyl- vania and Maryland. The difficulty always arises that, although the court professes to act upon the conscience, it must indirectly act upon the property, and that it cannot carry its decision into*

execution without the aid of the local tribunals.

REAM (either through Du. riem, or O.Fr. rayme, reyme, mod. rame, Med. Lat. risma, from Arabic rizmah, bale or bundle), a certain quantity of paper, viz. 20 quires containing 24 sheets each or 480 sheets; a " printer's ream " contains 215 quires or 516 sheets. The word owes its introduction into Europe to the Moors, who were the originators of the paper manufactured in Spain. Its original meaning was simply bundle, applied either to paper or clothes.

REAPING (from O.E. ripan, rypan, probably allied to " ripe," mature, i.e. " fit for reaping "; the cognate forms are found in other languages), the action of cutting ripe grain crops. Till the invention of the reaping machine, which came into practical use only about the middle of the 19th century, sickles and scythes were the sole reaping implements. Of the two the sickle is the more ancient, and indeed there is some reason to conclude that its use is coeval with the cultivation of grain crops. Among the remains of the later Stone period in Great Britain and on the European continent curved flint knives have occasionally been found, the form of which has led to the suggestion that they were used as sickles. Sickles of bronze occur quite commonly among remains of the early inhabitants of Europe. Some of these are deeply curved hooks, flat on the under side, and with a strengthening ridge or back on the upper surface, while others are small curved knives, in form like the ordinary hedge-bill, Among the ancient Egyptians toothed or serrated sickles of both bronze and iron were used. Ancient Roman drawings show that both the scythe and the sickle were known to that people, and Pliny makes the distinction plain. 1 Although both imple- ments have lost much of their importance since the general introduction of mowing and reaping machinery, they are still used very extensively, especially in those countries like France where small agricultural holdings prevail. The principal modern forms are the toothed hook, the scythe book, the Hainault scythe and the common scythe.

The toothed hook, which was in general use till towards the middle of the 19th century, consisted of a narrow-bladed curved hook, having on its cutting edge a series of fine close-set serratures cut like file- teeth, with their edges inclined towards the heft or handle. The curve is that known to mathematicians as the " cissoid," where tangents at any point form equal angles with lines drawn to the middle of the handle: it has been called the "curve of least exertion" because experience has shown that it tires out the arm of the worker less than any other curve. Sickles were formerly made of iron edged with steel; but in recent times they came to be made of cast steel entirely. Towards the middle of the 19th century the toothed hook was gradually supplanted by the scythe hook or smooth-edged sickle, a somewhat heavier and broader-bladed implement, having an ordinary knife

edge. Both these implements were intended for " shearing " handful by handful, the crop being held in the left hand and cut with the tool held in the right. A heavy smooth-edged sickle is used for " bagging " or " clouting," — an operation in which the hook is struck against the straw, the left hand being used to gather and carry along the cut swath. The Hainault scythe is an implement intermediate between the scythe and the sickle, being worked with one hand, and the motion is entirely a swinging or bagging one. The implement consists of a short scythe blade mounted on a vertical handle, and in using it the reaper collects the grain with a crook, which holds the straw together till it receives the cutting stroke of the instrument. The Hainault scythe was extensively used in Belgium. The common hay scythe consists of a slightly curved broad blade varying in length from 28 to 46 in., mounted on a bent, or sometimes straight, wooden sned or snathe, to which two handles are attached at such distances

1 " Of the sickle there are two varieties, the Italian, which is the shorter and can be handled among brushwood, and the two-handed Gallic sickle, which makes quicker work of it when employed on their [the Gauls'] extensive domains; for there they cut their grass only in the middle, and pass over the shorter blades. The Italian mowers cut with the right hand only " {H. N. xviii. 67).

as enable the workman, with an easy stoop, to swing the scythe blade along the ground, the cutting edge being slightly elevated to keep it clear of the inequalities of the surface. The grain-reaping Bcythe is similar, but provided with a cradle or short gathering rake attached to the heel and following the direction of the blade for about 12 in. The object oi this attachment is to gather the stalks as they are cut and lay them in regular swaths against the line of still-standing corn. The reaping scythe, instead of a long sned, has frequently two helves, the right hand branching from the left or main helve and the two handles placed about 2 ft apart. The best scythe blades are made from rolled sheets of steel, riveted to a back frame of iron, which gives strength and rigidity to the blade. On the continent of Europe it is still common to mould and hammer the whole blade out of a single piece of steel, but such scythes are difficult to keep keen of edge. There is a great demand for scythes in Russia, chiefly supplied from the German empire and Austria. The principal manufacturing centre of scythes and sickles in the United Kingdom is Sheffield.

It was not until the beginning of the 19th century that any attempt was

made to invent a reaping machine on anything like the lines that have been adopted since. In 1826 the Rev. Patrick Bell of Carmylie in Fifeshire brought out the first success- ful machine. He had worked at the making of it when a young man on his father's farm, and the principle he adopted, that of a series of scissors fastened on the " knife-board," was followed for a long time. There had been many trials during the thirty i>r forty years before his time both in this country and in America, but his invention was the first practical success.

After many modifications, however, the present or recent form of the common reaper was evolved by C. H. McCormick in America in 1831. A truck or carriage is carried on two travelling wheels some 30 to 36 in. high, with spuds or teeth on the circumference to make them " bite " the ground and thus give motion to the machinery without skidding; two horses are yoked in front with a pole between, with martingale and surcingle belts as part of their harness, to ease the backing of the machine by the horses; the knife-board is fixed out at right a"ngles to the side of the carriage and in front, while the knives consist of a series of triangular " sections " on a bar which travels backwards and forwards in slots in the " fingers," as the dividing teeth are called. The motion was given to the knives by a connecting rod and crank driven by suitable gearing from the truck wheels. The cutting was thus done by a straight shearing action and not by clipping like scissors as in Bell's machine.

There were many modifications tried before the favourite form was ultimately adopted: thus the horses were yoked behind the truck or carriage of the machine so that they pushed it before them; a revolving web of cloth was placed behind the knives so as to deliver the cut corn in a continuous swathe at the side; revolving "sails " or " rakes " pushed the standing grain against the knives as the machine advanced — some of which arrangements have been revived in our modern string- binders — and so on.

In the early days — from about i860 to 1870 — machines were fitted with a tilting board behind the cutting bar which caught the corn as it fell, and it was held there until enough for a sheaf was gathered, when the load was " tilted " off by a suitable rake handled by a man who sat and worked the tilting board simul- taneously with his foot and dropped the corn, to be lifted and tied into a sheaf by hand afterwards. The same machine was generally used for mowing (grass) by an interchange of parts, and the " combined " reaper and mower was in common use in the 'seventies and 'eighties. Later, various devices were adopted to do the tilting or sheafing mechanically, and the self end- delivery and self side-delivery have long been in use whereby through the adoption of revolving rakes on frames the sheaf-lots are delivered in sizes ready for tying up by hand. The subse-

quent tying or binding was done variously in different parts of the country. In the south of England it was customary for five men to make bands, lift the sheaf lot, place in the band and tie, and leave the sheaf lying on the ground to be set up after wards, the gang of five being expected to keep up on a reaper cutting round the four sides of a field. In the north and in Scotland the cutting was only done on one side at a time, the

machine riding back empty, and three boys made the bands (" straps "), three women lifted the lots and laid them on the bands, and three men bound the sheaves and set up in stooks. Thus three gangs of three each were required to keep a machine going, and only about five acres per day could be reaped in this way.

Fig. 1. — The Hornsby String-binder.

The development of the modern binder to reduce all this labour has been a very gradual process. There was no great difficulty in cutting the corn and delivering the stuff, but the tying of it into sheaves was the problem to be solved. As early as 1858 Marsh in America designed and carried out an arrange- ment whereby the cut grain crop was caught on revolving webs of canvas and carried up on to a table, where two men stood who made bands of its own material and bound it into sheaves as it fell in front of them, dropping the sheaves off on to the ground as made, while the machine travelled along. The invention of a tying apparatus was the next advance, and in the 'seventies the American firm of Walter A. Wood & Co. brought out an arrangement for tying the sheaves up with wire. So slow and expensive had been the process of evolution, however, that it was reported at the time that the above firm had spent £20,000 in invention and experiment before they had even a wire-binder fit to put on the market.

Binding with string, however, was the aim of all, and it was reserved for J. F. Appleby, an English inventor, to hit on the arrangement now in use, or which was the prototype of all the knot- ters now to be met with in different varieties of the string-binder throughout the world.

While the string-binder is now in universal use in Great Britain, the British Colonies, America and all countries where farming and farm work are advanced, and hand labour is only followed where peasant-farming or small farming obtains, it must be noted that in certain regions the system of reaping or harvesting of corn crops has developed a good deal beyond this. In Australia and some of the hotter districts in the west of the United States the " stripper " is in use, an implement which carries long grooved teeth which are passed through the standing grain crop and strip off the heads, leaving the straw standing. The heads are passed backwards to a thrashing (rubbing) arrangement, which separates the corn from the chobs, chaff, &c,

and the grain is sacked up straight away. The sacks are dropped off the machine as the work proceeds and are picked up by wagon for transport afterwards. It is a significant fact that strippers worked by hand, though pushed through the crop by oxen, were in use on the plains of Gaul in the first

Fig. 2.

-The Hornsby Knot as tied by the String-binder.

century of our era, though this system seems to have been lost sight of till re-invented by the Australians.

Again, in the Western states of America, where the climate is not hot and dry enough for stripping purposes, the method followed is to cut the straw as short as possible — just below the heads— and these fall on to a travelling canvas and are carried up into a thrasher and the grain separated and sacked as the work proceeds. An immense combined implement is used for this reaping and thrashing purpose, taking a width of up to 40 ft. of crop at a time, and being propelled by a 50-horse-power traction engine running on broad roller-wheels, though smaller machines pulled by, say, 20 horses are also common. Some- times the " heading " only is carried out, and the cut heads carried on a canvas up into a wagon travelled alongside, and then carted away for subsequent thrashing, the "header" thus being the form of reaper adopted also in the Western states of America. In these regions, as in many other places on the prairies in general, the straw is of no value, and therefore the whole is set fire to and burned off, thus returning a certain amount of fertility to the soil in the ashes.

In the normal and ordinary system of reaping with the string-binder in Great Britain the rule is to " open up " a field by cutting " roads " round it: that is, a headland or roadway is mowed by the scythe and tied up by hand. Then the string- binder is started to cut around and continued till a finish is made at the centre of the field. Sometimes the crop is partly lodged and can only be cut on three sides of the field, and the binder is " slipped " past the fourth side. It is customary in some parts to yoke three horses to the machine and keep these at work all day with an interval for the midday meal only, but a better plan is to allow two men and four horses to each, and

stackyard, where they are built up sheaf by sheaf into round or oblong

stacks: that is, they are stored until required for thrash- ing or foddering purposes. The drying may be a tedious affair, and wet weather in harvest time is a national disaster from the spoiling of the corn, both grain and straw.

The tremendous development in labour-saving in the matter of reaping the corn crops is well exemplified in a comparison of harvesting with the hand hook or sickle as compared with the string-binder. With hand-reaping six men (or women) cut the corn and laid it on the bands in sheaf-lots: one man came behind and tied the sheaves and set them up in stooks. Thus a gang of seven worked together and harvested about two acres per day. With the binder three or four men handle say twelve or fourteen acres daily : in other words, there is only one-tenth of the manual labour required now in reaping that was necessary only a genera- tion ago, for the string-binder has revolutionized farming as a whole, and given the nations cheap bread. (P. McC.)

REAR, the back or hind portion of anything, particularly a military or naval term for that part of a force which is placed last in order, in opposition to " van." As the last word, shortened from " van-guard," is an aphetic form of Fr. avant, in front, Lat. ab ante, so " rear " is an aphetic form of " arrear," O. Fr. arere, mod. arriere, Med. Lat. ad retro, to the back, back- ward. From this word must be distinguished the verb " to rear," used in two main senses: of a horse, to stand up on its hind legs, and to raise up or lift, of the construction of a building or of the breeding and bringing to maturity of domestic or

Fig. 3. — American Header and Thrasher.

put one couple on and one couple off for meals and resting alternately. By this means the binder is kept going con- tinuously without any stoppage for perhaps 14 hours daily in fine harvest weather. With a six-feet cutting width an acre per hour is fair work, but some have exceeded that, especially with wider cutting widths. A ball of twine weighing 3 to 4 lb is the usual requisite per acre for binding the sheaves, and it ought to be of Manilla hemp: " sizal " fibre (derived from the Ameri- can agaves and named after the port on the coast of Yucatan) is not so strong and good, though cheaper. Good twine is de- sirable, as otherwise frequent breakages leave many sheaves in a loose state.

The sheaves are dropped off on to the ground as tied, but some farmers use the " sheaf-carrier," which catches these as they are shot out from the binding apparatus, and dumps them in lots of six or so — sufficient to make a stook or shock. The stooking— that is, the setting up of the sheaves on end to dry — is a separate operation, and from two to three men can

set up an ordinary good crop as fast as the binder can cut it. In this work the sheaves are set with their butts wide apart and the heads leaning against one another like the two legs of the letter A: a full-sized stook or " threave " is 24 sheaves — a relic of the days when the crop was all hand-reaped by piecework at so much per threave — but in practice now seldom more than 6 sheaves (3 each side) are put to each stook. When sufficiently dried or " fielded " the sheaves are then carried by cart or wagon to the

other animals, often used also of young children. The O.E. rmran, of which it is the modern representative, is a doublet of the Scandinavian reisa, which has given English " raise," both being causative verb forms of " rise."

REAR VAULT (Fr. arriere voussure), the term in architecture employed for the vault of the internal hood of a doorway or window to which a splay has been given on the reveal; some- times the vaulting surface is terminated by a small rib known as the scoinson rib (g.v.), and a further development is given by angle shafts carrying this rib, known as scoinson shafts.

REASON (Lat. ratio, through French raison), in philosophy, the faculty or process of drawing logical inferences. Thus we speak of man as essentially a rational animal, it being implied that man differs from all other animals in that he can con- sciously draw inferences from premises. It is, however, exceedingly difficult in this respect to draw an absolute dis- tinction between men and animals, observation of which un- doubtedly suggests that the latter have a certain power of making inferences. Between the higher animals and the lower types of mankind the distinction is so hard to draw that many psychologists argue that the difference is one of degree rather than of kind (see also Instinct). There can be little doubt, however, that inference by man differs from that of the brute creation in respect of self-consciousness, and, though there can be no doubt that some animals dream, it is difficult to find evidence for the presence of ideal images in the minds of

any but the highest animals. In the nature of the case satis- factory conclusions as to the rationality which may be pre- dicated of animals are impossible.

The term " reason " is also used in several narrower senses. Thus reason is opposed to sensation, perception, feeling, desire, as the faculty (the existence of which is denied by empiricists) by which fundamental truths are intuitively apprehended. These fundamental truths are the causes or "

reasons " (dpxat) of all derivative facts. With Kant, reason {Vernunft) is the power of synthesizing into unity, by means of comprehensive principles, the concepts provided by the intellect {Ver stand). The reason which gives a priori principles Kant calls " Pure Reason " (cf. the Kritik der reinen Vernunft), as distinguished from the " Practical Reason " {praktische Vernunft) which is specially concerned with the performance of particular actions. In formal logic the drawing of inferences (frequently called " ratiocination," from Lat. ratiocinari, to use the reasoning faculty) is classified from Aristotle downwards as deductive (from generals to particulars) and inductive (from particulars to generals); see Logic, Induction, Syllogism. In theology, reason, as distinguished from faith, is the human intelligence exercised upon religious truth whether by way of discovery or by way of explanation. The limits within which the reason may be used have been laid down differently in different churches and periods of thought: on the whole, modern Christianity, especially in the Protestant churches, tends to allow to reason a wide field, reserving, however, as the sphere of faith the ultimate (supernatural) truths of theology.

The Greek words for reason are vovs and X670S, both vaguely used. In Aristotle the X670S of a thing is its definition, in- cluding its formal cause, while the ultimate principles of a science are a.pxo.1, the " reasons " (in a common modern sense) which explain all its particular facts. 1 NoOs in Plato and Aristotle is used both widely for all the meanings which " reason " can have, and strictly for the faculty which apprehends in- tuitively. Thus, in the Republic, vovs is the faculty which apprehends necessary truth, while 56£a (opinion) is concerned with phenomena.

For the Stoic and Neoplatonic uses of A670S, as also for those of Philo Judaeus and the Fathers, see Logos.

REAUMUR, RENE ANTOINE FERCHAULT DE (1683-1757), French man of science, was born on the 28th of February 1683 at La Rochelle and received his early education there. He was taught philosophy in the Jesuits' college at Poitiers, and in 1699 went to Bourges to study civil law and mathematics under the charge of an uncle, canon of La Sainte-Chapelle. In 1703 he came to Paris, where he continued the study of mathematics and physics, and in 1708, at the early age of twenty-four, was elected a member of the Academie des Sciences. From this time onwards for nearly half a century hardly a year passed in which the Memoires de I' Academie did not contain at least one paper by Reaumur. At first his attention was occupied by mathematical studies, especially in geometry. In 17 10 he was appointed to the charge of a great government work — the official description of the useful arts and manufactures — which led him to many practical researches that resulted in the establishment of manufactures new

to France and the revival of neglected industries. For discoveries regarding iron and steel he was awarded a pension of 12,000 livres; but, being content with his ample private income, he requested that the money should be secured to the Academie des Sciences for the furtherance of experiments on improved industrial processes. In 1731 he became interested in meteorology, and invented the thermometer scale which bears his name. In 173s family arrangements obliged him to accept the post of commander and intendant of the royal and military order of Saint-Louis; he discharged his duties with scrupulous attention, but declined the emoluments. He took great delight in the systematic study of natural history. His friends often called him the

1 The Schoolmen's distinction of ratio cugnoscendd (a reason for acknowledging a fact) and ratio essendi (a reason for the existence of this fact).

Pliny of the 18th century. He loved retirement and lived much at his country residences, at one of which, La Bermon- diere (Maine), he met with a fall from horseback, the effects of which proved fatal on the 17th of October 1757. He bequeathed his manuscripts, which filled 138 portfolios, and his natural history collections to the Academie des Sciences.

Reaumur's scientific papers deal with nearly all branches of science; his first, in 1708, was on a general problem in geometry; his last, in 1756, on the forms of birds' nests. He proved experimentally the fact that the strength of a rope is less than the sum of the strengths of its separate strands. He examined and reported on the auriferous rivers, the turquoise mines, the forests and the fossil beds of France. He devised the method of tinning iron that is still employed, and investi- gated the differences between iron and steel, correctly showing that the amount of carbon (sulphur in the language of the old chemistry) is greatest in cast iron, less in steel, and least in wrought iron. His book on this subject (1722) was translated into English and German. The thermometer by which he is now best remembered was constructed on the principle of taking the freezing-point of water as 0°, and graduating the tube into degrees each of which was one-thousandth of the volume contained by the bulb and tube up to the zero mark. It was an accident dependent on the dilatability of the par- ticular quality of alcohol employed which made the boiling- point of water 8o°; and mercurial thermometers the stems of which are graduated into eighty equal parts between the freez- ing- and boiling-points of water are not Reaumur thermometers in anything but name.

Reaumur wrote much on natural history. Early in life he described the locomotor system of the Echinodermata, and showed that the supposed vulgar error of Crustaceans replacing their lost limbs was an actual fact. In

17 10 he wrote a paper on the possibility of spiders being used to produce silk, which was so celebrated at the time that the Chinese emperor Kang-he caused a translation of it to be made. He treated also of botanical and agricultural matters, and devised processes for preserving birds and eggs. He elaborated a system of artificial incubation, and made important observations on the digestion of carnivorous and graminivorous birds. His greatest work is the Memoires pour servir a I'histoire des insectes, 6 vols., with 267 plates (Amsterdam, 1734-42). It describes the appearance, habits and locality of all the known insects except the beetles, and is a marvel of patient and accurate observation. Among other important facts stated in this work are the experiments which enabled Reaumur to prove the correctness of Peyssonel's hypothesis, that corals are animals and not plants.

REBAB, or Rabab (Persian rubdb; 2 Arabic rabab, rababa; 3 Sp. rave, rabe, 4 rabel, arrabel, arrabilf Fr. rubebe; It. rubeba), an ancient stringed instrument, having a body either pear- shaped or boat-shaped and the characteristics of vaulted back and the absence of neck; also a generic modern Arabic term applied by the Mahommedans of northern Africa to various stringed instruments played with a bow.

As the rebab exercised a very considerable influence on the history of stringed instruments in Europe, and was undoubtedly the means through which the bow was introduced to the West, it is necessary to examine its construction before deciding whether it may be accepted as the ancestor of the violin in deference to the claim made for it by certain modern writers. 6

2 F. Riickert, Grammatik, Poetik und Rhetorik der Perser, nach dem 7 ,e " Bande des Heftes Kohum (Gotha, 1874), p. 80. This translation of the introduction to the Seven Seas contains a reference to musical instruments; the one translated haute (lute) is rendered in Persian rubdb, a point ascertained through the courteous assistance of Mr A. G. Ellis, of the Oriental Department, British Museum.

3 Al-Farabi, 10th century, translation into Latin by J. G. Kose- garten, Alii Ispahenensis Liber. Cantilenarum . . . arabice editur adjectaque translatione adnotationibusque (Greifswald, 1840), vol. i. pp. 36, 41, 105, 109, &c.

4 See poem by Juan Ruiz, archipreste de Hita, 14th century, from MS. in library of the cathedral at Toledo, "quoted by Mariano Soriano Fuertes, Hist, de la Musica espanola (Madrid), vol. i. p. 105.

5 From the Arabic treatise of Mahamud Ibrain Axalchi, MS. No. 69, Escorial.

6 See F. J. Fetis, Antoine Stradivari . . . Precede de recherches historiques et critiques sur I'origine et les transformations des inslru-

REBAB

The two principal forms of rebab with which we are concerned as prototypes of European instruments of the middle ages are: (i) the long and narrow boat-shaped rebab, which may be traced back to Persia in the 8th century B.C., and is still in use in that country; and (2) the lute-shaped rebab, with rudimentary neck consisting of the gradual narrowing of the body, which has the outline of a longitudinal section of a pear. This variety became very popular in medieval Europe under the names of rebec, gigue, geige and Iyra; the archetype has been traced back to 1000 B.C. The most characteristic feature in the construction of the rebab, and of all instruments derived from it, was the body, composed of a back originally scooped out of a solid piece of wood, to which was glued without the intermediary of ribs (an important struc- tural feature of the violin) a flat sound-board of parchment or thin wood.

The rebab-esh-sha'er, or " poet's rebab," had a body consisting of an almost rectangular box covered with parchment and sup- ported on an iron foot; the instrument was held like the modern violoncello. No evidence has yet been brought forward that the rebab-esh-sha'er was in use among the Arabs who conquered Spain in the 8th century; if the instrument was indeed ever introduced into Spain it has left no trace.

The bowed instruments of the middle ages fall naturally into two distinct classes, according to the principles observed in con- struction. One is the type having a body formed on the model of a Greek or a Roman cithara, from which it was evolved by the addition of a neck and finger-board (see Guitar and Guitar- Fiddle). Instruments of this type were at all times recognized as superior and belonging. to the realm of art, whereas type 2, derived from the Eastern rebab, never attained to any artistic development, and at the time when the first type had nearly reached its apogee the second was placed beyond the pale of art.

According to Al-Farabi, the rebab had either one string, two strings or four, obtained by doubling these two; they were tuned most often in minor thirds or in major thirds. 1 The Arab scholar Ash-Shakandi, who flourished in Spain about a.d. 1200, states that the rebab had been known for centuries in Spain, but was not mentioned on account of its want of artistic merit. Juan Ruiz, archipreste de Hita, in his enumeration 2 of the musical instruments in use in his day (14th century), mentions two rebabs, and

speaks of il ravS gritador con su alta nota and il rabe morisco; the " shrill rebab " (or rather rebec) " with its high note " is thus quoted somewhat contemptuously already in the 14th century.

The history of the origin of the rebab had until now not gone back beyond the 7th century A.D., and has been a matter of con- jecture founded on the word rubab or rilbab, which is of Persian origin, and on the statement that the Arabs themselves declare they obtained the instrument from the Persians. Recent archaeo- logical discoveries, however, provide abundant evidence of arche- types of both pear-shaped and boat-shaped rebabs in high antiquity. We have at present no clue to the name of the archetype, but it is clear that the el-Oud or lute of the Arabs and the wide pear-shaped rebab were practically one and the same instrument, until the advent of the bow, which had probably also been made known to the Arabs through the Persians, since their word for the bow, kaman, is borrowed from the Persian, but at what date is unknown. Al-Farabi does not mention the bow, 3 and his chapter on the rabdba does not deal with the construction of the instrument so much as with the production of sound and the divisions of the scale.

*As far as is known at present, the archetype of the rebab and lute family is the instrument shown in fig. I. The terra-cotta figure of the musician discovered in Egypt (1905-6) by Professor Flinders Petrie during the course of excavations in the cemetery of Goshen * is Greek work of the post-Mycenaean age; it was*

ments d. archet (Paris, 1856) ; Edward Heron Allen, Violin-making as it was and is (London, 1884); E. J. Payne, article "Violin" in Grove's Dictionary of Music (1st ed.). See also The Instruments of the Orchestra (London, 1910), part ii., " Precursors of the Violin Family," by Kathleen Schlesinger, where the evolution of the violin is traced from the cithara of the Greeks.

1 See J. P. N. Land's paper, " Recherches sur l'histoire de la gamme arabe," VI. Intern. Orient. Congress, part ii. (Leiden, 1884) (Brit. Mus. press-mark, acad. 8806), p. 130, and also p. 56.

2 See Mariano Soriano Fuertes, loc. cit.

3 The copy of Farabi's MS., used for their translations by Kose- garten and Land, Escorial, No. 911, dates from the middle of the 12th century. See Michael Casiri, Bibl. Arab. Hisp., vol. i. p. 347, and Forkel, Allgemeine Litteratur der Musik (Leipzig, 1792), p. 487; also R. G. Kiesewetter, Die Musik der Araber nach Originalquellen dargestellt (Leipzig, 1842), p. 64 and preface. Another MS. copy of Al-Farabi, in the Bibliotheca

Ambrosiana in Milan, is described by Hammer von. Purgstall in the Bibliotheca Italiana, torn. xciv. (Milan, 1839), p. 44; cf. preface in Kiesewetter, p. viii.

4 Excavations carried out by the Brit. School of Archaeology in Egypt and by the Egyptian Research Account. See " Hyksos and Israelite Cities," by W. M. Flinders Petrie and J. Garrow Duncan, Mem. Brit. Sch. of Arch., 1906.

found in surroundings assigned to the XXth Dynasty (c. 1000 B.C.), and shows the earliest pear-shaped instrument yet discovered. This statuette clearly establishes the origin of the instruments named by some lyra, b by others (including the present writer) rebab or rebec, common all over western Europe from the nth centur3', whose main characteristic is an almost entire absence of neck. Two terra-cotta statuettes of musicians playing upon ancient Persian rebabs (see fig. 2) have been excavated from the

Fig. 1. — Prototype of Lute — Pear-shaped Rebab. 1000 B.C. Discovered by Professor Flinders Petrie in the cemetery at Goshen.

Fig. 2. — Boat-shaped Rebab. 789 b.c. FromJ.de Morgan, Delegation en Perse, by permission of Ernest Leroux.

Tell at Suza 6 amongst objects referred to the reign of Shutruk- Nakhounta, who was king of Elam c. 789 B.C. The pear-shaped instrument, wide at the base and elongated to form a neck, with the head bent back at right angles and the strings plucked by the fingers, — the lute of the 6th century A.D., — is seen first on a frieze from Afghanistan, forming one of the risers of steps to the tope of Jamal-Garhi. These sculptures, preserved at the British Museum, are assigned to the 2nd or 3rd century, and are said to show traces of classical influence. The same instrument is found engraved on a Sassanian silver dish in the British Museum, 7 of workmanship assigned to a period not later than the 7th century A.D., but probably earlier, as well as on other dishes of similar origin ; one in the Hermitage, St Petersburg, was found at Irbit in 1880, on which Eros is depicted playing the lute and riding on a lion. 8 A third, found at Perm, forms part of Count Stroganov's collection. 9

Excavations carried out in ancient Khotan 10 or Ilchi (Turkestan, on the caravan route to Kashgar) have brought to light further evidence of the ubiquity of the rebab type in Asia. In addition to the two principal types of rebab (fig. 3) mentioned above there is also to be found the spoon-shaped instrument with no neck and large round head (fig. 4), sometimes seen in European medieval sculptures and MSS. of the nth and 12th centuries. 11

The pear-shaped rebab or lute appears also among the celebrated paintings in the Buddhist cave temples of Ajanta, 12 assigned to the 6th century a.d. A later example at the British Museum, a fragment of a dish found at Rhajes or Ray, 13 in northern Persia,

6 See Laurent Grillet, Les ancetres du violon, &c. (Paris, 1901), tome i. p. 29. " Portail occidental de l'eglise de Moissac," 12th century.

6 See Delegation en Perse, by J. de Morgan (Paris, 1900), vol. i. pi. 8, Nos. 8 and 9, text, pp. 130 and 131.

7 See Ormonde M. Dalton, The Treasures of the Oxus, catalogue of the Franks bequest to the British Museum, 1905, pi. xxvi. No. 190.

8 See for an illustration and description, Comptes rendus de la commission imperiale d ' archeologie pour I'annSe 1881 (St Petersburg, 1883), text, p. 53, and atlas of the same date, pi. ii. No. 10.

9 See J. R. Aspelin, Antiquites du nord, p. 141, No. 608.

10 See Ancient Khotan, a detailed report of archaeological explora- tions in Chinese Turkestan, carried out by H.M. Indian govern- ment, by Marc Aurel Stein (Oxford, Clarendon Press, 1907), vol. ii. pi. xlvi. Nos. Yoonk, yoond (spoon-shaped rebab), pi. xliii. Nos. Y0028 and Y009i.

11 See, for instance, Psalter of Labeo Notker, 10th century, Bibl. Stift St Gallen, on the top of left-hand gable pillar. Illustration in Kathleen Schlesinger, The Instruments of the Orchestra (London, 1910), part ii., " Precursors," pi. iv. p. 154.

12 See reproductions by John Griffiths (London, 1896), vol. ii. pi. 105, cave I., 10, e.

13 Brit. Mus., Ceramic Gallery, case A, Henderson Bequest, 1891.

destroyed by Jenghiz Khan in the 13th century, has the four pegs in the side of the head. Finally, we find the instrument on the

From Marc. Aurel. Stein, Ancient Khotan, by permission of the Clarendon Press.

Fig. 3. — Pear-shaped rebab, Fig. 4. — Spoon-shaped

from Khotan. : rebab, from Khotan.

doorway of the H6pital du Moristan 1 (Cairo), carved work of the 13th century.

In all these examples it is noteworthy that the strings are vibrated by plucking them with the fingers, not by means of the bow, the use of which, in conjunction with those structural features, constitutes the violation of an acoustic principle, and therefore accounts for the failure of the instrument as Rebab and its suc- cessful development as Lute. There are, however, two early ex- amples of bowed rebabs of Byzantine origin to be cited. A pear-shaped rebab, held like a violoncello and played by means of a very long and slender bow, is carved on one of the reliefs of an ivory casket of Italo-Byzantine work of the 8th or 9th century, belonging to the Carrand Collection, Florence (see Rebec). Another bowed instrument, of still earlier date, is to be seen among the wonderful mural paintings of the necropolis and monastery of Baouit, 2 assigned to the 8th century at the latest, but probably dating from the 6th or 7th.

The examination of all these representations of the rebab, ranging from 1000 B.C. to the 13th century A.D., tends to show that the instrument had its origin in the East, and was widely distributed over Asia Minor, India and Persia before the 6th century a.d. Similar archaeological documents of the middle ages suggest the possibility that we are not indebted to the Arabs alone for the introduction of the rebab and bow and of the lute into Europe by way of Spain, early in the 8th century, but that they had probably already made their way into southern and central Europe from the East through the influence of the Byzantine Empire and of the Christian East generally.

It is clear also that the instruments of the rebab type were at first twanged with the fingers, and the bow was apparently not invented for the rebab but only applied to it. All arguments in favour of including the rebab among the ancestors of the violin on the score of the bow lose their force, and as the rebab possessed no structural feature in common with the violin the question may be considered settled negatively.

For the European development of the rebab, see Rebec. (K. S.) REBATE (Fr. rabat, from rabattre, to beat back), a term used in commerce, banking, &c. In banking, a rebate is an allowance made to a drawee taking up a bill of exchange before it is due. This allowance is the interest on the unexpired period of the bill, and in practice may be either a fixed or arbitrary rate; more often it is |%, about the usual bank deposit rate. In commerce, rebate is sometimes used to mean a discount allowed for prompt payment; it is often equivalent to drawback, i.e. the repayment of part of the duty on

imported goods when such goods are subsequently exported in their original or in another form. By the Customs Consolidation Act, 1853, a rebate or deduction is allowed at the custom-house from the fixed duties on certain kinds of goods, on account of damage or loss sustained in warehouses.

1 See Prisse d'Avennes, V Art arabe d'apres les monuments du Caire du vii e au xviii" siecle (Paris, 1877). The unnumbered plates are to be identified by the list given at the beginning of the work.

' For the illustration, see Jean C16dat, " Le monastere et la neoropole de Baouit," Mem. de I'Inst. fr. d'archeol. orient, du Caire, tome xii., 1904. Chapelle, xviii. pi. lxiv. (2). Descriptive text, p. 92. See also article " Baouit " by the same author, descriptive of the paintings in F. Cabrol's Diet, d'arch. chr6t. et de liturgie (Paris, 1907), fasc. xii. B., p. 250b

REBEC, or Rebeck (Med. Fr. rubebe, rebelle, rebec, gigue; Ger. Rubeba, Rebek, Geige, Lyra; Ital. ribeba, ribeca, lyra; Sp. rabel, rabeca, ravi, rabe), a medieval stringed instrument played with a bow, derived from the Oriental rebab. Like the rebab (q.v.), the rebec assumed at first one of two forms — the pear- shaped body with a wide base, strung with three strings, or the long, narrow pear- or boat-shaped body with two strings and, in addition, the other Oriental characteristics of the rebab, i.e. the vaulted back, the absence of ribs and pegs set in the back of the head. Except for the addition of a fingerboard, what is now recognised as the rebec underwent no structural development and never entered the domain of art. When the guitar-fiddle and the oval vielle with five strings made their appearance in Europe, apparently during the nth century, a number of hybrids combining characteristics of both types of construction spread rapidly over western Europe.

A spoon-shaped instrument, in most cases without neck, the head being joined directly to the wide shoulders of the body, must not be confounded with these hybrids; the compass and capabilities of the instrument, which sometimes had but one single string, must have been extremely limited. What the name of the instrument was in the various ages is not known, but it may be classed with the rebab and rebec, from which it only differs in the outline of the body. The present writer discovered an Oriental archetype on a small terra-cotta figure 3 in the style of the Gandhara school, unearthed at Yotkan on the site of the ancient Khotan. The round head is fastened directly to the shoulders, the three strings are thrown into relief by deep indentations, the bridge tail-piece has three notches. The instrument (assigned to some period between the 5th and 8th centuries a.d.) may be compared with the European medieval type, such, for instance, as the bowed spoon-shaped rebec on the capital of the left pillar in the miniature 4 of King David and his musicians, belonging to the 10th-century psalter of

Labeo Notker at St Gallen; also with the musicians' lyra on the western doorway of the church at Moissan; 5 and with the British Museum Add. MS. 17333, m which several of these spoon-shaped, neckless instruments are to be found.

The pear-shaped rebec with wide base was in all probability intro- duced into Europe through the Byzantine Empire, and the narrow boat-shaped by the Moors byway of Spain. The first of these types is represented on one of the sides of an ivory casket of Italo- Byzantine Workmanship preserved among the Carrand Collection 6 in the Palazzo del Podesta in Florence. It belongs to the same group as the Veroli casket at the South Kensington Museum, all of which are assigned to the 9th century at the latest.

The pear-shaped rebec on the ivory casket, although like all rebecs it had no separate neck, was elongated to form one, and terminated in a lozenge-shaped head all in one piece with back and neck, the soundboard being cut to the same outline and glued to the back. There were four strings to these rebecs, of which there are many examples in English MSS. from the 1 ith century. One of the best known, sometimes described as the Anglo-Saxon fythele, is the one played by Jeduthun in the usual illustration of King David and His musicians prefaced to the Psalms in an Anglo-Saxon psalter (Cotton MS., Tib. C. VI., Brit. Mus.). Other examples are to be found in a Latin psalter illuminated by an English artist at the be- ginning of the 12th century (Lansd., 383, Brit. Mus.), in which the rebec has but one string and resembles the lyra teutonica mentioned above. 7

Medieval documentary evidence points to the fact that the long boat-shaped rebec had survived in Spain and spread by way of France over western Europe. The much-quoted 14th-century

3 See Marc. Aurel Stein, Ancient Khotan : Detailed Report of the Archaeological Explorations in Chinese Turkestan carried out by H.M. Indian Government (Clarendon Press, 1907), vol. i. pi. xlvii. No. Yoond.

4 See Laurent Grillet, Les ancetres du violon (Paris, 1901), vol. i. p. 29. The author calls these instruments lyra, which is a synonym of rebab.

6 See Kathleen Schlesinger, The Instruments of the Orchestra, part ii., " Precursors of the Violin Family " (London, 1910), pi. iv. p. 154. The spoon-shaped instrument with a long neck on pi. v. (9th century) must be referred to the pandoura family.

6 The casket has been reproduced by A. Venturi in Gallerie Naz. Ital., vol. iii., 1897, p. 263; and L' Arte, vol. i. 1896, p. 24.

7 See also English psalters of the 13th century in the British Museum.

Lansd. MS., 4.20, and Arundel, 157, fol. 71b.

poem by Juan Ruiz, archipreste de Hita, 1 containing an enumera- tion of the musical instruments of his day, includes el rave gritador con su alia nota (the shrill rebec with its high note) and el rabe morisco. By a process of deduction we have no difficulty in identi- fying the long, narrow, boat-shaped instrument as el rabe morisco, since the instrument has survived almost unchanged among the Arabs of the present day 2 from the 13th century, and probably from the early centuries of our era. The shrill rebec [_el rave gritador) with thinner strings was the pear-shaped instrument. In the magnificent MS. known as the Cantigas di Santa Maria, assigned to the 13th century, 3 there are three of those boat-shaped rebecs played with a bow and one twanged by the fingers; they have finger-boards and two strings, and are held like the violoncello. Rebabs of this type, but without bows, were in use in ancient Persia, c. 789 B.C., as is demonstrated by some little terra-cotta figures of musicians unearthed in a tell at Suza. 4 Two of the instruments, held, however, like the violin, are unmistakably the archetypes of this rebec.

The rebec did not escape the general tendency so noticeable in Europe from the 12th to the 15th century towards the ornamentation of musical instruments with grotesque heads. The socket of the chaunter of the bagpipe, the heads of the cittern and ghittern, the mandoline and the rebec, were all alike decorated with grotesque human or animal heads, which in England became proverbial as cittern-heads.

The boat-shaped rebec survived as the sordino or pochette, 6 an instrument widely used by dancing masters until the 19th century, when it was abandoned for the kit, a diminutive violin. The pochette, as its name in French and also in German {Taschengeige) indicates, was small enough to be carried in the pocket ; it measured from 15 to 18 in. and was played with a correspondingly small bow. The 15th- and 16th-century rebec or geige, as the pear-shaped variety was called in Germany {gigue in France), is figured by Sebastian Virdung; 6 there were three strings tuned to G, D, A, and it had a finger-board cut in one piece with the sound-board in some cases and forming a step. Some writers consider that the addition of the finger-board constituted the difference between the geige and the rebec. Facts hardly support this theory, since the lyra teutonica in the 9th or nth century already had a finger-board, and Farabi, the Arabic scholar of the 10th century, who was equally familiar with the Greek, Persian and Arabic musical systems, distinctly states that the rebab was also known as the

lyra. The modern Greek rebec with three strings is to this day played by rustic musicians under the name of lyra. Moreover, in Germany, bowed instruments of all kinds were at first known as geige, in contradis- tinction to those whose strings were plucked, classed together as cytharas or some word derived from it, the most modern example of which is the zither. With the rise of the viols and later of the violin, which represent the most perfect type of construction for stringed instruments, the rebec tribe, inferior in every respect and without artistic merit, was gradually relegated beyond the pale, 7 and by the 1 8th century had fallen into disuse except in certain rural districts, where for outdoor music, their shrill, penetrating tone continues to endear them to itinerant and village musicians. (K. S.)

1 See Mariano Soriano Fuertes, Historia de la Musica espanola (Madrid, 1855), vol. i. p. 105. Aymeric du Peyrac, in his Vita Caroli Magni (13th century), mentions the rebec; see Du Cange, Glossarium, s.v. " Baudosa." Hieronymus of Moravia mentions the rubebe, and states that it has three strings, whereas the vielle had five (MS. Fonds Latin, No. 16 [663 actuel.], Paris Bibl. Nat.). In the Minne Regel (" Rules of the Minnesingers "), 1404, line 415: " Noch dan quinterna, gyge, videle, lyra, rubeba "; see Der Minne Regel von Eberhardus Cercne aus Minden, 1404, edited by Franz Xaver Woeber (Vienna, 1861), p. 24.

2 For an illustration see Carl Engel, Researches into the History of the Violin Family, and E. Heron-Allen, The Violin, and how to make it.

3 Edward Buhle is of opinion that the miniatures in these MSS. are the work of a 14th-century artist. See Die Musik-instrumente in den Minaturhandschriften des Mittelalters (Leipzig, 1903).

4 See J. de Morgan, La Delegation en Perse (Paris, 1900), vol. i. pi. viii., Nos. 8 and 9.

5 There is a pochette in the Galpin Collection, c, 1700; for an illustration see Kathleen Schlesinger, The Instruments of the Orchestra, part ii., " Precursors of the Violin Family," p. 201, fig. 158.

6 Musica getutscht und ausgezogen, Basel, 151 1, reprinted in Publikationen d. Ges.f. Musikforschwng, Berlin, 1 883, Bd. xi.

7 Antoine Vidal in La Lutherie et les luthiers, to show the contempt with which the rebec was viewed in France in the 15th century, quotes from the charges of King Charles VIII., 1483, where the following entry occurs: "On donna sur son ordre 35 sols a une poure insensee qui jouoit du rebec." The lieutenant of Paris, in March 27, 1628, issued the following order: " Faisant defence a tous musiciens de jouer dans les cabarets et mauvais

lieux des dessus, basses ou autres parties de violon ains seulement du rebec." A well-known passage in Chaucer testifies to a similar contempt in 14th-century England: "Brother, quod he, here woneth an old rebekke," &c. (Freres Tale, 7156).

REBECCA RIOTS, the name given to some disturbances which occurred in 1843 in tne counties of Pembroke, Carmarthen, Glamorgan, Cardigan and Radnor, after a slight outbreak of the same nature four years previously. During a period of excep- tional distress the rioting was caused mainly by the heavy charges at the toll-gates on the public roads in South Wales, and the rioters took as their motto the words in Genesis xxiv. 60, " And they blessed Rebekah, and said unto her, Thou art our sister, be thou the mother of thousands of millions, and let thy seed possess the gate of those which hate them." Many of the rioters were disguised as women and were on horseback; each band was led by a captain called " Rebecca," his followers being known as " her daughters." They destroyed not only the gates but also the toll-houses, and the work was carried out suddenly and at night, but usually without violence to the toll-keepers, who were allowed to depart with their belongings. Emboldened by success, a large band of rioters marched into the town of Carmarthen on the 10th of June and attacked the workhouse, but on this occasion they were dispersed by a troop of cavalry which had hurried from Cardiff. The Rebeccaites soon became more violent and dangerous. They turned their attention to other grievances, real or fancied, connected with the system of land- holding, the administration of justice and other matters, and a state of terrorism quickly prevailed in the district. Under these circumstances the government despatched a large number of soldiers and a strong body of London police to South Wales, and the disorder was soon at an end. In October a commission was sent down to inquire into the causes of the riots. It was found that the grievances had a genuine basis; measures of relief were introduced, and South Wales was relieved from the burden of toll-gates, while the few rioters who were captured were only lightly punished.

REBELLION, the act or continuance in act of a rebel or rebels (Lat. rebellio, rebellis, a compound of re-, against, and helium, war). A rebel is one who engages in armed resistance to the government to which he owes allegiance. For the distinction between Civil War and Rebellion, see War, Laws of. Where individuals as distinguished from groups of men are concerned the character of rebel is easier to determine. That the alleged act of war was done by order of another cannot be in principle an excuse for a subject or citizen of any state taking arms against it. Under the rules of war adopted at the Hague in 1907, moreover, any excuse for doing so is removed by the provision that a belligerent is forbidden to compel nationals of the hostile party to take part in operations of war against their own country, " even if they were in the belligerent's service before the

commencement of the war " (art. 123). In the case of R. v. Louw, known as the " Calvinia Flogging case " (Supreme Court of the Cape Colony, Feb. 18, 1904), the question of the validity of the excuse of acting under orders contrary to allegiance was discussed in an uncertain spirit, and in a previous case, the Moritz case, tried before the Treason Court at Mafeking (Nov. 7, 1901), the court held that insurgent nationals " who had joined the burghers must be placed on the same footing as burghers fighting against us." There may be special circumstances operating to qualify the application of a principle, but the above stated principle, as such, must be regarded as the only legal basis of argument on the subject. (T. Ba.)

REBUS (Lat. rebus, " by things "), a sort of riddle consisting of the representation of some sentence or thing by means of pictures or words, or a combination of both. Rebuses first became popular in France, where they were at first called rebus de Picardie, that province, according to G. Menage (1613-1692), having been the scene of their origin, which he found in the satires written by the students and young clerks on the foibles of the day under the title " De rebus quae geruntur." Camden mentions an instance of this kind of wit in a gallant who ex- pressed his love to a woman named Rose Hill by painting in the border of his gown a rose, a hill, an eye, a loaf and a well; this, in the style of the rebus, reads " Rose Hill I love well." This kind of wit was happily ridiculed by Ben Jonson in the humorous description of Abel Drugger's device in the Alchemist and by

the Spectator in the device of Jack of Newberry. The name is also applied to arrangements of words in which the position of the several vocables is to be taken into account in divining the meaning. Thus " I understand you undertake to overthrow my undertaking " makes the rebus

stand take to taking

I you throw my;

or in French

pir vent venir

un vient d'un

may be read " un soupir vient souvent d'un souvenir." A still simpler French rebus is expressed by the two letters G a, which may be read, J'ai grand appetit (G grand, a petit). " Rebus " (or " allusive arms "), in

heraldry, is a coat of arms which bears an allusion to the name of the person, — as three castles for Castleton, three cups for Butler, three conies for Coningsby.

RECAMIER, JEANNE FRANCOISE JULIE ADELAIDE (1777- 1849), a famous Frenchwoman in the literary and political circles of the early 19th century, was born on the 4th of December 1777 at Lyons. Her maiden name was Bernard. She was married at fifteen to the banker Jacques Recamier (d. 1830), who was more than old enough to be her father. Beautiful, accomplished, with a real love for literature, she possessed at the same time a temperament which protected her from scandal, and -from the early days of the consulate to almost the end of the July monarchy her salon in Paris was one of the chief resorts of literary and political society that pretended to fashion. The habitues of her house included many former royalists, with others, such as Bernadotte and General Moreau, more or less disaffected to the government. This circumstance, together with her refusal to act as lady-in-waiting to the Empress Josephine and her friendship for Madame de Stael, brought her under suspicion. It was through Madame de Stael that Madame Recamier became acquainted with Benjamin Constant, whose singular political tergiversations during the last days of the empire and the first of the restoration have been attributed to her persuasions. Madame Recamier was eventu- ally exiled from Paris by Napoleon's orders. After a short stay at Lyons she proceeded to Rome, and finally to Naples, where she was on exceedingly good terms with Murat and his wife, who were then intriguing with the Bourbons. She persuaded Constant to plead the claims of Murat in a memorandum addressed to the congress of Vienna, and also induced him to take up a decided attitude in opposition to Napoleon during the Hundred Days. Her husband had sustained heavy losses in 1805, and she visited Madame de Stael at Coppet in Switzerland. There was a project for her divorce, in order that she might marry Prince Augustus of Prussia, but though her husband was willing it was not arranged. In her later days she lost most of the rest of her fortune; but she continued to receive visitors at the Abbaye-aux- Bois, the old Paris convent to which she retired in 1814. Here Chateaubriand was a constant visitor, and in a manner master of the house; but even in old age, ill-health and reduced circumstances Madame Recamier never lost her attraction. She seems to have been incapable of any serious attachment, and although she numbered among her admirers Mathieu de Montmorency, Lucien Bonaparte, Prince Augustus of Prussia, Ballanche, J. J. Ampere and Constant, none of them obtained over her so great an influence as did Chateaubriand, though she suffered much from his imperious temper. If she had any genuine affection, it seems to have been for Prosper de Barante, whom she met at Coppet. She died in Paris on the nth of May 1849.

There are well-known portraits of her by Louis David in the galleries of the

Louvre, and by Francois Gerard in the possession of the prefecture of the Seine. In 1859 Souvenirs et correspondences tires des papiers de Madame Recamier was edited by Mme Lenor- mant. See Mme Lenormant's Madame Recamier, les amis de sa jeunesse et sa correspondance intime (1872); Mme Mohl, Madame Recamier, with a sketch of the history of society in France (1829 and 1862); also Guizot in the Revue des deux mondes for December 1859 and February 1873; H. Noel Williams, Madame Recamier

and her Friends (London, 1901); E. Herriott (Engl, trans., by Alys Hallard), Madame Recamier et ses amis (1904) (elaborate and exhaustive).

RECANATI, a city of the Marches, Italy, in the province of Macerata, 8 m. direct N.N.E. of the city of that name. Pop. (1901) 14,590 (town), 16,389 (commune). It has a station on the railway 175 m. S. of Ancona, and distant 4J m. from the town, which is built on a hill, 931 ft. above the sea, and retains portions of its 15th-century walls and gateways. It was the birthplace of the poet Leopardi (1798-1837), whose monument adorns the principal piazza and whose family has collected in the town a very interesting museum of Leopardiana; it also contains fine old mansions of the Leopardi, Mazzagalli, Massucci and Carradori in the main street, and a Gothic cathedral, built towards the close of the 14th century and dedicated to S Flavianus, patriarch of Constantinople. The churches of S Maria sopra Mercanti and San Domenico contain characteristic examples of the work of Lorenzo Lotto, as also does the new municipal palace, with a fine old battlemented tower, while the palace of Cardinal Venier has a fine Renaissance loggia by Giuliano da Maiano, who was probably responsible for the designs for the portals of S Agostino and S Domenico. The older buildings of the town are noteworthy for the curious terra-cotta work which adorns the majority of them.

Recanati appears as a strong castle in the 10th century or earlier. Round this gathered a community whose petty wars with Osimo (Auximum) called for the interference of Innocent III. in 1 198. From Frederick II. it obtained the right of having a port on the Adriatic; and by Gregory IX. it was made a city and the seat of the bishopric transferred from Osimo. This oscillation between Guelf and Ghibelline continued character- istic of Recanati. Urban IV. abolished the " city " and bishopric; Nicholas IV. restored them. John XXII. again, in 1320, removed the bishopric and placed the city under interdict. The interdict was withdrawn in 1328 on payment of a heavy fine, but the bishopric remained in abeyance till 1357. Gregory XII., who on his deposition by the council of Constance was made papal legate of the sees of Macerata and Recanati, died in this city in 1417. The assistance rendered by Recanati to the popes in. their struggles with the Sforza seems to have exhausted its resources, and it began to decline. Considerable

damage was done by the earthquake of 1741; and the French, who were twice in possession of the city in 1797, pillaged it in 1799.

RECEIPT (M.E. receite, derived through Fr. from Lat. recepta, participle of recipere, to receive), in law, an acknowledgment in writing that a sum of money or other valuable considered has been received by the person signing the acknowledgment in discharge of a debt or other obligation. Such a receipt is prima facie evidence only of payment, and it may be shown, for example, that it was signed by mistake, or obtained by fraud or misrepresentation. By the Stamp Act of 1891, which repealed and re-enacted other acts, a duty of id. is imposed on every receipt or form of writing discharging a debt of £2 or upwards; the payment of the duty is denoted by affixing a penny stamp to the document, and the cancelling of the same by the person giving the receipt. By § 103 if a person gives a receipt, liable to duty, not duly stamped, or refuses to give a receipt, liable to duty, duly sta'mped or, on payment to the amount of £2 or upward, gives a receipt for a less sum than £2 or divides the amount paid with intent to evade the duty, he is liable to a fine of £10. A receipt not duly stamped may be stamped at the Inland Revenue Office within fourteen days on payment of a fine of £5 or within one month on payment of £10.

RECEIVER, in English law, an officer or manager appointed by a court to administer property for its protection, to receive rent or other income and to pay authorized outgoings. Receivers may be either appointed pendente lite or by way of equitable execution, e.g. for the purpose of enabling a judgment creditor to obtain payment of his debt, when the position of the real estate is such that ordinary execution will not reach it. Formerly receivers were appointed only by the court of chancery, but by the Judicature Act 1873 it is now within the power of all

divisions of the High Court to appoint receivers. Their powers and duties are exhaustively set by Kerr, On Receivers (5th ed., 1905), who classifies the cases in which they may be appointed under the following heads: (a) infants; (b) executors and trustees; (c) pending litigation as to probate; (d) mortgagor and mortgagee; (e) debtor and creditor; (/) public companies; (g) vendor and purchaser; (h) covenanter and covenantee; (i) tenant for life and remainderman; (J) partners; (k) lunacy; (/) tenants in common; (m) possession under legal title, and (n) other cases. The appointment of receivers is entirely within the discretion of the courts, and the power may be exercised " in all cases in which it shall appear just and convenient." Applica- tion for a receiver is usually made by motion, and the court will

appoint the fittest person, without regard to who may propose him, the appointment of a receiver being for the benefit of all parties. Under the Conveyancing Act 1881, when a mortgagee has become entitled to exercise his powers of sale, he may, by writing under his hand, appoint such person as he think fit to be receiver. In bankruptcy practice a receiver, termed official receiver, is an officer of the court who in this capacity takes possession on the making of a receiving order, of all a debtor's assets. He is also an officer of the Board of Trade with the duty of taking cognisance of the conduct of the debtor and administering his estates (see Bank- ruptcy) .

Receiver-general is the title given to a chief receiver, more especially as applied to the collection of public revenue. The title survived in the Inland Revenue up to 1891, but it is now only used as the designation of an officer of the duchy court of Lancaster, who receives the revenues, &c, of the duchy.

RECEPT (from Lat. recipere, to take back), a philosophical term, used by Romanes {Mental Evolution of Man, ii. 36, 37), on the analogy of " concept and percept," for mental images assumed to be produced by the simple repetition of percepts. The process is supposed to be the gradual elimination of elements in which the percepts disagree, and the emphasizing of those in which they agree. Thus the final residuum is a unity in differ- ence. Recepts are, in fact, " spontaneous associations, formed unintentionally as what may be termed unperceived abstrac- tions," i.e. what are generally known as " generic images."

RECESS (Lat. recessus, a going back, withdrawal, from recedere, to withdraw), a term particularly used of a cessation of work or relief from duty, e.g. of the periods during the life of a parliament when it is not sitting. The word is also applied to an indentation in a line, especially of a small alcove sunk in the wall of a room. A particular use is the historical one for the acts and decrees of the Imperial Diet, the recessus Imperii, and also for those of the Hanseatic League. According to Du Cange (s.v. Recessus) the reason for the use of this word was that these decrees, &c. (codex deliberationutn), were written out antequam a conventibus recedant proceres congregati.

RECHABITES, or Sons of Rechab, a sort of religious order among the Israelites in some respects analogous to the Nazarites (q.v.), with whom they shared the rule of abstinence from wine. They also eschewed the luxuries and pursuits of settled life, and lived in tents, refusing to sow grain as well as to plant vineyards. They represent a protest against the contemporary Canaanite civilization and a reaction towards the simplicity of life which was felt more strongly in Judah or to the east of the Jordan than in the northern kingdom of Israel. Their " father," or founder, was

that Jehonadab or Jonadab, son of Rechab, who encouraged Jehu to abolish the Tyrian Baal-worship (2 Kings x.). The order founded by Jehonadab must from its constitution have soon become a sort of hereditary clan, and as such the " house of Rechab " appears in Judah after the fall of the northern kingdom and continued to observe the ordinance of Jehonadab till the approach of Nebuchadrezzar drove them for protection into Jerusalem (Jer. xxxv.). Jeremiah promised them as a reward of their obedience that they should never lack a man to represent them (as a priest) before Yahweh, whence perhaps the later Jewish tradition that the Rechabites intermarried with the Levites and so entered the temple service.

Later references to them probably indicate that the term was used as meaning merely ascetes (Euseb., H. E. ii. 23), the particular form of asceticism (q.v.) being less essential. One may compare the modern society of total abstainers known as the " Rechabites." In 1 Chron. ii. 55 the " house of Rechab " is associated with the Kenites (q.v.) as a family of scribes. Their origin is ascribed to Hammath (conceivably the Naphtalite city, Josh. xix. 35), but in I Chron. iv. 12 Rechab (so the LXX) is of Calebite descent.

RECHBERG – R0THENL6wEN, JOHANN BERNHARD,

Count (1806-1899), Austrian statesman, was the second son of the Bavarian statesman Count Aloys von Rechberg-Rothen- lowen (1766-1849). Johann Bemhard was destined for the Bavarian public service, his elder brother being a hereditary member of the Upper House in the parliament of Wurttemberg. He was educated at the universities of Strassburg and Munich, but he incurred the displeasure of King Louis I. by the part he played as second in a duel, and in 1828 he transferred him- self to the Austrian diplomatic service. After being attached to the embassies in Berlin, London and Brussels, he was ap- pointed envoy at Stockholm (1841) and at Rio de Janeiro (1843). Returning to Europe in 1847, on the outbreak of the revolu- tion of 1848 in Vienna he was of great service to Prince Metter- nich, whom he accompanied and assisted in his flight to England. In July 1848 he was appointed Austrian plenipotentiary in the German federal diet at Frankfort, in 1851 became Austrian intemuncius at Constantinople, and in 1853 Radetzky's civilian colleague in the government of Lombardo-Venetia. In 1855 he returned to Frankfort as Austrian representative and president of the federal diet. As a pupil of Metternich he would have wished to preserve the good understanding with Prussia which seemed the necessary foundation for a conservative policy; he was, however, made the instrument for the anti-Prussian policy of Buol; this brought about constant disputes with Bismarck, at that time Prussian envoy at the diet, which were sharpened by

Rechberg's choleric temper, and on one occasion nearly led to a duel. Bismarck, however, always expressed a high appreciation of his character and abilities. In May 1859, on the eve of the war with Italy, he was appointed Austrian minister of foreign affairs and minister president, surrendering the latter post to the archduke Rainer in the following year.

The five years during which Rechberg held the portfolio of foreign affairs covered the war with Italy and France, the insurrection in Poland, the attempted reform of the German Confederation through the Frankfort Furstentag, and the Austro-Prussian war with Denmark. After the defeat of Magenta Rechberg accompanied the emperor to Italy, and he had to meet the crisis caused by a war for which he was not responsible. He began the concessions to Hungary and in the Polish question, and was responsible for the adhesion of Austria to the alliance of the Western Powers. In the German question Rechberg's policy was one of compromise. To the project of the Fiirstentag he was altogether opposed. The project had been suggested to the emperor Francis Joseph by his son-in-law, the hereditary prince of Turn and Taxis, and by a pamphlet of Julius Frobel, and the preliminary arrangements were made without Rechberg being informed. When at last he was told, he tendered his resignation, which was not accepted, and he accompanied the emperor to the abortive meeting at Frankfort (August 1863). The attempt made by Rechberg at the subsequent ministerial conference at Nuremberg to establish a German league without Prussia was equally unsuccessful, and he now returned to the policy, which in opposition to Schmerling he had throughout advocated, of a peaceful arrangement between Prussia and Austria as the indispensable preliminary to a reform of the Confederation.

At this juncture the death of King Frederick VII. of Denmark (15th of November 1863) opened up the whole Schleswig-Hol- stein question (q.v.). In the diplomatic duel that followed Rechberg was no match for Bismarck. It suited Austrian policy to act in concert with Prussia against Denmark; but Rechberg well knew that Bismarck was aiming at the annexation of the duchies. He attempted to guard against this by laying

down as a condition of the alliance that the duchies should only be separated from Denmark by common consent of the two German powers. Bismarck, however, insisted that the question of the ultimate destination of the duchies should be left open; and, when he backed his argument with the threat that unless Austria accepted his proposal Prussia would act alone, Rechberg gave way. His action was made the object of violent attacks in

the Austrian Lower House (28-30 January 1864), and when the war was victoriously concluded and Prussia's designs on the duchies had become evident, public opinion turned more and more against him, demanding that Austria should support the duke of Augustenburg even at the risk of war. Rechberg yielded so far as to assure the duke's representative at Vienna that Austria was determined to place him in possession of the duchies, but only on condition that he did not sign away any of his sovereign rights to Prussia. The outcome of this was that the duke refused the terms offered by King William and Bismarck.

On the 22nd of August there was a meeting of the emperor Francis Joseph and King William at Schonbrunn, both Rech- berg and Bismarck being present. Rechberg himself was in favour of allowing Prussia to annex the duchies, on condition that Prussia should guarantee Austria's possession of Venice and the Adriatic coast. On the first point no agreement was reached; but the principles of an Austro-Prussian alliance in the event of a French invasion of Italy were agreed upon. This latter proposal was, however, received with violent opposition in the ministry, where Rechberg's influence had long been over- shadowed by that of Schmerling; public opinion, utterly dis- trustful of Prussian promises, was also greatly excited; and on the 27th of October Rechberg handed in his resignation, receiving at the same time the order of the Golden Fleece from the emperor as a sign of special favour. He had been made an hereditary member of the Upper House of the Reichsrat in 1861, and as late as 1879 continued occasionally to take part in debates. He died at his chateau of Kettenhof near Vienna on the 26th of February 1899. He had married, in 1834, Barbara Jones, eldest daughter of the 6th Viscount Ranelagh, by whom he had one son, Count Louis (b. 1835).

See the biography by Franz Ilwof in Allgemeine Deutsche Bio- graphic B. 53. Nachtrage (Leipzig, 1907).

RECIDIVISM (from Fr. recidiver, to relapse and fall again into the same fault, or repeat the same offence as one committed before), a modern expression for "habitual crime." The recidivist is now universally known to exist in all civilized countries as one who has adopted wrong-doing and law-breaking as a profession. His persistency is ceaseless and inextinguish- able by the ordinary methods of combating crime. Penal justice as generally exercised is unavailing, and is little better than an automatic machine which draws in a vast number within its wheels and casts them out again practically unchanged in character to qualify again for the ineffective treatment. This dangerous contingent is for ever on the move, into prison and out of it and in again; a large proportion of it, the criminal residuum, the very essence of the criminality of a country, resists all processes devised for its regeneration and cure. Nothing will mend it; neither severity nor

kindness, neither the most irksome restraints nor the philanthropic methods of moral and educational persuasion. This failure has encouraged some ardent reformers to recommend the system of indefinite imprisonment or the indeterminate sentence, by which the enemy once caught is kept perpetually or for a lengthy period, and thus rendered innocuous. Habitual offenders, it is argued, should be detained as hostages until they are willing to lay down their arms and consent to make no further attempt to attack or injure society. The theory is sound and has been adopted in part in several countries, especially in the United States.

It was not until 1909 that the system of preventive detention was put into operation in the United Kingdom, when, by the Prevention of Crime Act 1908, power was given to the courts to pass on habitual criminals a sentence of preventive detention

in addition to one of penal servitude. This further period may range within limits of from five to ten years, according to the discretion of the court. The English system is hardly more than tentative at present; the machinery is admittedly capable of improvement. The charge of being an habitual criminal has to be inserted in the indictment on which the offender is to be tried, and this cannot be done without the consent of the director of public prosecutions and after certain notice has been given to the officer of the court trying the prisoner and to the offender himself. The decision to charge a prisoner with being an habitual criminal has hitherto rested on the local police authorities, and it has been felt that a more even and a more general application of such a drastic method of treatment would result if the decision were transferred to one authority, and some such reform was foreshadowed by the Home Secretary in a speech in the House of Commons on prison reform on the 20th of July 1910.

RECIFE, or Peenambuco, a city and seaport of Brazil, capital of the state of Pernambuco, in 8° 3′ S. and 34° 55′ W., near the extreme eastern point of South America. Pop. (1904 estimate) 186,000. Recife is frequently called the ” Venice of America “; it is at the mouths of the rivers Beberibe and Capibaribe which unite to form a small lagoon or bay inside the sea beach. In the angle between the two rivers is the delta island of Antonio Vaz. The city is built on the southern extremity of the sandy sea beach, on the island of Antonio Vaz, and on the mainland to the westward, the river channels being crossed by numerous bridges. With the exception of the hills on which Olinda is built about 5 m. northward, the surrounding country is low and flat, the general elevation averaging 10 ft. As the tide rises about 6 ft., the general level of the city and neighbouring coast, which is wet and swampy to the southward, is too low to be generally healthy, and Pernambuco has a high death-rate (52ˆ per 1000 in 1904), with malaria as one of the principal causes of death. The climate is hot, although

agreeably tempered by the S.E. trade winds; the temperature ranges from an absolute minimum of 61° to an absolute maxi- mum of 99 (1904). The rainfall (1904) is 75-3 in. The three principal parishes of the city are known as Sao Jos6 do Recife, occupying the sandy peninsula or beach north of the outlet of the united rivers; Santo Antonio, on the island of Antonio Vaz, which was called Mauritia or Mauritzstad during the Dutch occupation; and Boa Vista, on the mainland to the westward, which is the most modern and the most rapidly growing part. The first is the oldest and most crowded section, and is now devoted chiefly to the commercial and financial interests of the port; here are the custom house, merchants' exchange (Praca do Commercio), shipping offices, banks and wholesale houses. Santo Antonio dates from the Dutch occupation. Prince Maurice of Nassau, when governor-general, built here his private residence (Fribourg House) and made it his capital. Its business edifices and residences are largely of Dutch architec- ture, with many storeys and steep roofs. The older part of Boa Vista dates from the 17th century. Recife has few public squares or gardens, and its streets are not usually well cared for. The older buildings are of the Portuguese type, usually plain, low and heavy, constructed of broken stone and mortar, and plastered and coloured on the outside. The city has gas and electric illumination, street and suburban railways, drainage and a public water supply drawn from a small tributary of the Beberibe about 7 m. to the N.W., in the direction of Caxanga. Among its notable public buildings and institutions are the old government palace in Santo Antonio built upon the foundations of the official residence of Prince Maurice of Nassau, with a pretty garden attached; a theatre facing upon the Praca da Republica, dating from the second empire; the palace of the Provincial Assembly in Boa Vista, built in 1860-66, sur- mounted by a high dome; the municipal palace, or prefecture, on Rua do Imperador, with the public library (Biblioteca Publica) occupying its third floor and containing about 30,000 volumes; the Gymnasium, a large plain building of two floors standing near the legislative palace; the Pedro II. hospital

built between 1847 and 1861; a large penitentiary, insane asylum, orphans' asylum, and beggars' asylum; a law school, artisans' school (Lyceu de Artes e Officios), and archaeological institute; a normal school and school of engineering; and war and naval arsenals. One of the most attractive churches is that of Nossa Senhora da Penha, surmounted by two slender spires and a dome.

The port of Recife is one of the most important of Brazil, on account of its

proximity to Europe and its convenience for vessels passing around the east shoulder of the continent. It is the landing-place for two transatlantic and one coastwise cable lines. Its harbour consists of an outer and inner anchorage, the former an open roadstead, which are separated by a remarkable stone reef running parallel with the shore-line, leaving an inside passage 400 to 500 ft. wide. The entrance to the inner anchorage, which has a depth of about 20 ft., is opposite Fort Brum in the northern part of the city, and is marked by a small Dutch fort (Picao) and a lighthouse at the northern extremity of the reef. This remarkable natural breakwater, which is about 50 ft. wide on top and has been repaired with masonry in some places, covers a considerable part of the coast- line in this part of Brazil. It is not a coral reef, as is sometimes stated, but is a consolidated ancient beach, now as hard and firm as stone. 1 In 1910 contractors were at work on improve- ments to the port to cost about £1,666,000, under a decree of the 3rd of December 1908. The exports include sugar, rum, cotton, hides, skins, rubber, wax, fibres, dyewoods, cacau, mandioca flour, pineapples and other fruits. Pernambuco is the principal sugar-producing state of Brazil, and Recife is therefore an important centre for this product. Its railway communications with the interior are good, and include the Sul de Pernambuco, Recife and Sao Francisco, Central de Pernambuco, and the Recife to Limoeiro lines, the first three now being under the management of the Great Western of Brazil Co. There are also suburban lines to Olinda and Caxanga, the latter providing communication with some of the prettiest suburbs about the city.

Recife was settled about 1535, when Duarte Coelho Pereira landed there to take possession of the captaincy granted him by the Portuguese crown. The site of Coelho's capital was Olinda, but Recife remained its port and did not become an independent villa (town) until 17 10. Down to the close of the 18th century, when Rio de Janeiro became important, Recife was the second city of Brazil, and for a .time its most important port. It was captured and plundered in 1595 by the English privateer James Lancaster. It was also captured by the Dutch in 1630 and remained in their possession till 1654, during which time the island of Antonio Vaz was occupied and the town greatly improved. At the end of the Dutch War the capital was removed from Olinda to Recife, where it has since remained.

RECIPE, a statement of the materials and ingredients used in the making and preparation of a dish for cooking, a receipt. This is the principal current use, which was first applied to medieval prescriptions from the custom of placing the word, meaning "take this" (imperative of Lat. recipere, to receive), often abbreviated R or JJ , at the head of the formula.

RECIPROCITY (Lat. reciprocus, returning back the same way, alternating, probably from re back and pro forward), the condition or state of being

reciprocal, i.e. where there is give and take, mutual influence or correspondence between two parties, persons or things. In a more particular sense, re- ciprocity is a special arrangement between two nations under which the citizens of each obtain advantages or privileges in their trading relations with the other. This meaning of reciprocity, however, bears a different interpretation in European and in American usage. In the former, reciprocity between two nations usually means little more than the extension by one to the other of most favoured nation treatment, i.e. such advantages as it extends to any third country (see Commercial Treaties).

1 See J. C. Branner's The Stone Reefs of Brazil (Bui. Comp. Zool., Harvard Univ., xliv., Cambridge, 1904).

But in the United States reciprocity is the term applied to the concessions or arrangements made between that country and another without reference to any third country. Thus in the United States there are a maximum and minimum tariff, the rates of the maximum tariff being enforced on the goods of those countries which have no reciprocity treaty with the United States, and the rates of the minimum on certain products of those countries which have by a reciprocity treaty given special advantages or concessions to certain products of the United States.

RECITAL (from Lat. recitare, to read out, particularly of a public document), an account or repetition of the details of some act, proceeding, fact, &c, particularly, in law, that part of a legal document, such as a lease, which contains a statement of certain facts, e.g. the purport for which the deed is made. In music, the word is used of an instrumental performance given by a single person, and also of a performance of the works of a single composer.

RECKLINGHAUSEN, a town of Germany, in the Prussian province of Westphalia, 22 m. by rail N.W. of Dortmund on the railway to Minister. Pop. (1905) 44,396. In the neighbour- hood are extensive coal-mines and brick-works, and the industries embrace the manufacture of linen, beer, spirits and tobacco.

The county of Recklinghausen belonged to the archbishopric of Cologne until 1803, when it passed to the duke of Arenberg. It was known as the Vest Recklinghausen. In 1810 it was divided by Napoleon between the grand duchy of Berg and France, but was, in 181 5, restored to the duke of Arenberg as a fief under Prussian sovereignty.

See Ritz, Die alter e Geschichte des Veste und der Stadt Reckling- hausen (Erzen, 1904).

RECLAMATION OF LAND. The boundaries between sea and land are perennially changing. In many sheltered bays and estuaries the sea is receding, while along other portions of the sea-coast it is continuously encroaching. The same causes operate to produce both results: the rivers carry down with them detritus and sediment from the higher ground; the sea, aided by wind and tide, is always eroding exposed portions of the seaboard; and even such lesser influences as rain and frost assist in disintegrating cliffs composed of softer strata.

The main object of reclaiming land from the sea is to increase the area of ground available for cultivation. Land which has been raised by accretion nearly to high-water level can be shut off from the sea by works of a simple and inexpensive nature, and the fresh alluvial soil thus obtained is generally very fertile. Accretion in estuaries takes place very slowly under ordinary conditions. Although at any one time the sheltered areas may be large and the deposit of silt fairly rapid, not much permanent accretion will take place owing to the frequent shifting of the channels. Directly, - however, a fixed channel is secured by longitudinal embankments or training walls, accretion progresses rapidly and uninterruptedly by the deposit of sediment in the slack-water behind the embankments and at the sides of the estuary; and this is especially the case if the training works are raised to the level of high water, for this has the effect of restricting the greater part of the scour of tide and fresh-water discharge to the one fixed channel. The rate of accretion varies with the shelter of the site and the amount of sediment carried by the water; but by degrees the foreshores, in the upper portion and at the sides of the embanked estuary, are raised sufficiently for samphire to make its appearance, and, later on, a coarse grass. Ultimately the time arrives when the water may be altogether excluded by the construction of enclosing embankments; these must be raised above the level of the highest tide, and should have a flat slope on the exposed side, protected, in proportion to exposure and depth of water, against the face with clay, sods, fascines or stone pitching.

In the intermediate stages of the process outlined above much may be done to promote the growth of accretion, or warping as it is termed, and to ensure the fertility of the reclaimed land. The deposit of warp is accelerated by anything which tends to reduce the flow and consequent scour of the ebb-tide over the

foreshore: thus considerable advantage will accrue from placing rows of faggots or sods across the lines of flow; and banks, enclosing the higher

portions of the foreshore, may often be constructed so as materially to increase the period of stagnation, near high tide, of the silt-bearing water upon the lower adjacent foreshore. The light, fertilizing alluvium only deposits in shallow water at high tide, and where there are no tidal currents. The final enclosure, therefore, should not be effected until this deposit has taken place. The enclosing works, also, should be so carried out that increasing shelter may favour the deposits of this alluvium during construction. A final and rapid deposit can sometimes be effected by making sluices in the banks: the turbid water is admitted near high tide, and retained until the whole of its silt has been deposited, the clear water being allowed to escape slowly towards low tide. Premature enclosure must be guarded against; it is more difficult, the cost greater, the reclaimed land is less fertile and, being lower, less easy to drain.

The practice of reclaiming land in British estuaries is a very ancient one. The Romans effected reclamations in the Fen districts; the enclosing of Sunk Island in the Humber was begun in the 17th century, and now produces an annual revenue of something like £10,000; large reclamations in the Dee estuary took place in the 18th century; and, in recent times, works have been carried out in the estuaries of the Seine, the Ribble and the Tees.

In the reclamation of land adjoining the sea-coast, sites where accretion is taking place are obviously the most suitable. Marsh lands adjoining the sea, and more or less subject to inunda- tion at high tides, can be permanently reclaimed by embank- ments; but these, unless there is protection from sand dunes or a shingle beach, require to be stronger, higher, with a less steeply inclined and better protected slope than is required in estuaries. The width of the bank will generally prevent percolation of water at the base; but if there is any danger of infiltration, owing to unsuitability of material, a central core of puddled clay or a row of sheet-piling should be employed. Waves over- topping the bank will quickly cause a breach, and produce disastrous results; the height of the bank must, therefore, be calculated to meet the case of the severest on-shore gale coinciding with the highest spring tide. Undermining, caused by the recoil of waves on the beach, is liable to occur in exposed sites; this may be prevented by a line of sheet-piling along the outer toe of the bank.

Sea-coast embankments should not generally be constructed farther down the foreshore than half-tide level, as the cost of construction and maintenance would increase out of all propor- tion to the additional area obtained. It is, as a rule, more economical to reclaim a large area at one time, instead of enclosing it gradually in sections, as the cost varies with the length of embankment; it is, however, more difficult to effect the final closing of a bank, where a large area is thus reclaimed, on account of the

greater volume of tidal-water flowing in and out of the contracted opening. The final closing of a reclamation embankment is best accomplished ‘ by leaving a fairly wide aperture, and by gradually raising a level bank across its entire length. The enclosed area may be left full of water to the height of the unfinished bank, or the tide-water may be allowed to escape and enter again by sluices in the finished sections. The embankments in Holland are closed by sinking long fascine mattresses across the opening; these are weighted with clay and stone, and effectually withstand the scour through the gap ; the two terminal slopes of the finished sections are similarly protected.

There are many examples of sea-coast reclamation: Romney marsh was enclosed long ago by the Dymchurch wall (see fig. 1), and a large portion of Holland has been reclaimed from the sea by embankments (see fig. 2); the reclamation bank for the Hodbarrow iron mines (see fig. 3) illustrates the use of puddled clay to prevent infiltration.

The repair of a breach effected in a completed reclamation embankment is a more difficult task than that of closing the

final gap during construction; this is owing to the channel or gully scoured out upon the opening of the breach. When a

Fig. i.— Sea-wall at Dymchurch.

breach occurs which cannot be closed in a single tide, the forma- tion of an over-deep gully may to some extent be prevented

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Fig. 2. — Dutch Reclamation Embankment.

by enlarging the opening. Breaches in embankments have been closed by sinking barges across the gap, by piling and planking

Fig. 3. — Reclamation Bank for the Hodbarrow Iron Mines.

up, by lowering sliding panels between frames erected to receive them, and by making an inset wall or bank round the breach. By the last-mentioned method the new connecting bank can be formed on solid ground, and the necessary width of opening obtained to obviate excessive scour during the influx and efflux of the tide over the bank while it is being raised.

The gradual drying of reclaimed land lowers the surface some two or three feet; the land therefore becomes more liable to inundation after reclamation than before. Accordingly, it is most important to prevent breaching of the bank by promptly repairing any damage caused by storms; and if a breach should occur, it must be closed at the earliest possible opportunity.

The protection of the coast-line from encroachment by the sea is a matter of considerable importance and great difficulty: the more rapid the erosion, the more exposed must be the site; and, consequently, the more costly will be the construction and maintenance of protective works. These are of two kinds: sea-walls or banks, and groynes.

Upright sea-walls with some batter on the face have been constructed along the frontage of many sea-side towns, with the double purpose of making a promenade or drive, and of affording protection to the town. A very sloping and also a curved batter breaks the stroke of the wave by facilitating its rising up the face of the wall, but the force of the recoil is correspondingly augmented. A wall with a vertical face offers more direct opposition to a wave, minimizes the tendency to rise, and consequently the recoil; while a stepped face tends to break up both the ascending and recoiling wave in proportion to the recession of the steps, but there is a corresponding liability to displacement of the blocks composing the wall. The concrete sea-walls erected in front of Hove, Margate, and the north cliff at Scarborough (see figs. 4, 5, 6) exhibit straight, stepped, and curved forms of batter. The curvature of the last-named wall, though diverting the coil at its base, did not prevent erosion of the shale bed on which it was founded, and a protective apron in front of the toe had to be added subsequently.

The Beaconsfield sea-wall at Bridlington (see fig. 7) is stepped and slightly curved; it has a stone face with concrete backing,

strengthened at intervals by counterforts. The thickness of the wall varies from 1 1 ft. 6 in. at the base to 3 ft. at the top, and is

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Fig. 4. — Sea-wall at Hove. Fig. 5. — Sea-wall at Margate. Fig. 6.- surmounted by a dressed cornice and coping; the length is 340 yards. The work was constructed, in 1888, at a cost of £10,000, or £29, 8s. per lineal yard.

Walls with almost vertical faces, or slightly stepped, appear to be the best. Unless, however, the foreshore consists of hard rock, or a raised beach maintained by groynes, a wall of this kind should be protected by an apron, in order to prevent the

Fig. 7. — Sea-wall at Bridlington.

destructive undermining to which such forms of wall are necessarily liable.

Where the coast is fringed with sand dunes, and the beach protected from erosion by a regular series of groynes, as at Ostend (Belgium), the sand dunes, or an embankment for a promenade in front of them, may be sufficiently protected by a simple slope, paved with brickwork or masonry, and having a maximum inclination of two to one. The paving requires to be laid on a bed of clay, rubble or concrete. Parts of the sea bank at Ostend

had to be protected from undermining at the toe with piles and planks, and an apron of concrete or pitching, laid on fascines, extending down the foreshore. For the parts above high-water mark a short paved slope, with moderate protection at the toe, has been found sufficient. The top face of these slopes is reflexed so as to protect the esplanade from surf during storms.

Sea-walls are very costly and, while temporarily resisting, do not diminish, but actually increase, the erosive action of the sea. In short, sea-walls are a most unsatisfactory type of protective work.

The protection afforded to the coast by groynes is based on a totally dif- 3 «T ferent principle, which may be sum-

— 1 ” marized as that of promoting natural

■*Sea-wall at Scarborough. accretion by the construction of arti- ficial shelter. Along most coasts there is a littoral drift of sand or shingle; by means of groynes, projecting from the coast-line down the beach, this drift may be intercepted so as to produce accretion to the foreshore, where previously there has been constant erosion. The problem, however, of coast protection by this method presents difficulties. Littoral drift is the product of erosion, and the fate of a large portion of this drift is to be deposited in*

deep water. Any scheme, therefore, of stopping erosion altogether by means of groynes would be purely chimerical; in the same way, partial failure of groynes, from lack of drift and inability to stop wastage, must be ex- pected in many localities. Another difficulty may be illustrated by the action of such natural projections as Dungeness: this point, by completely arresting the easterly drift of shingle, causes a rapid accretion to the beach on the one side, but a corresponding denudation on the other. The old type of high groyne, erected at Cromer and Hastings, has produced the same undesirable result; moreover, the general effect of groyn- ing certain portions of the foreshore is to render the adjacent unprotected portions more liable to erosion. Nevertheless, the benefit which may be derived locally from suitable groyn- ing is very great. The timber groynes erected between Lancing and Shoreham raised the shingle beach sufficiently to cause high-water mark to recede 85 ft. seawards in the course of a few years.

The eroding action of the river Scheldt in front of Blanken- berghe has been arrested by carrying out groynes at right angles to the coast-line, and down to below low water (see

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Fig. 8. — Sea Embankment at Ostend.

(see fig. 8) have been carried out beyond high-water mark to gain a strip of land for the esplanade; and these portions have

Fig. 9. — Groynes on North Sea coast at Blankenberghe.

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Fig. 10. — Sections of Groynes at Blankenberghe.

figs. 9, 10). These, on the average, are about 820 ft. long and 680 ft. apart: they are made wide, with a curved top raised only slightly above the beach, so as to minimize the scour from currents and wave action, and facilitate the ever

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distribution of drift over the protected area. They are constructed with a foundation of fascines and concrete, faced with brickwork or stone pitching. The result has been the formation of a gently sloping beach which reduces wave action; such loss, too, as is still occasioned by storms is speedily made good by natural accretion in moderate weather. The Blankenberghe groynes are too expensive a type for ordinary use. The beach at Bridlington, which rests on boulder clay, was rapidly disappearing owing to the increased scour due to the sea-walls. Accordingly, groynes (see figs, n, 12) made

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Fig. II. — Groynes at Bridlington.

of 14 ft. X in. X 9 in. pitch-pine piles, and n in. X 4 in.

planking, were erected along the foreshore. The piles origin- ally projected about 6 ft.; but, to prevent heaping up of sand to windward with denudation to leeward, the planking was never raised more than two strakes above sand-level, fresh planks being added as the sand rose. The south-easterly gales are said to be the most erosive here, and prevalent during the winter months ; on this account the groynes were given an

Fig. 12. — -Enlarged inclination of 10° south of east, that is

, cross-section of IO ° from tne perpendicular. It may be

Groynes. doubted whether this was the best

angle, but the result has been very satisfactory. The cost of

construction was from 12s. 3d. to 18s. per lineal foot.

The sand-banks at the entrance to Poole Harbour have been

protected by groynes (see fig. 13) inclined at slightly varying

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Fig. 13. — Groynes for Protecting the Sand-banks enclosing Poole Harbour.

angles, some yielding better results than others. This is a good example of the important work which may be accom- plished by groyning. Unprotected, a breach would soon have been effected in these sand-banks; with a double entrance to the bay the present deep channel would have silted up, and Poole Harbour would have been practically destroyed.

It is evident that the efficacy of groynes in collecting drift is proportionate to the distance which they can be carried out seawards, and that they should always be extended to low- water mark; whilst, by raising them only slightly above the beach, the accumulation of drift to leeward is promoted, the passage of drift over the obstruction being facilitated and the scour of

the waves diminished. By this means, and by gradually raising and extending the groynes as the drift accumulates, the general elevation of the beach can be secured. Drift generally travels in both directions along a coast, veering with the wind; thus the prevailing wind determines the preponderating travel of the drift. Groynes are usually con-

structed at right angles to the shore, but it is believed that increased benefit may be obtained by slightly inclining them to leeward of the prevailing wind. Some engineers have advocated the extension of groynes below low-water mark; and as wood when permanently submerged is specially liable, even when creosoted, to be attacked by the teredo and limnoria, the use of reinforced or ferro-concrete has been suggested as the most suitable material for submarine groyning. These suggestions, however, and many other current theories on groyning, require to be demonstrated by repeated experiments.

For a useful bibliography of the subject see British Parliamentary Reports, Coast Erosion and the Reclamation of Tidal Lands, Cd. 3684, Appendix No. X. pp. 146-158. (L. W. V.-H.)

RECLUS, JEAN JACQUES ELISEE (1830-1905), French geographer, was born at Sainte-Foy la Grande (Gironde) , on the 15th of March 1830. He was the second son of a Protestant pastor, who had a family of twelve children, several of whom acquired some celebrity either as men of letters, politicians or members of the learned professions. His education, begun in Rhenish Prussia, was continued in the Protestant college of Montauban, and completed at the university of Berlin, where he followed a long course of geography under Karl Ritter. Withdrawing from France in consequence of the events of December 1851, he spent the next six years (1852-57) visiting the British Isles, the United States, Central America, and Colombia. On his return to Paris he contributed to the Revue des deux mondes, the Tour du monde and other periodicals a large number of articles embodying the results of his geographical work. Among other works at this period was an excellent short book, Histoire d'un ruisseau, in which he traces the development of a great river from source to mouth. In 1867-68 he published La Terre; description des ph&nomenes de la vie du globe, in two volumes. During the siege of Paris, Reclus shared in the aerostatic operations conducted by M. Nadar, and also served in the National Guard, while as a member of the Association Nationale des Travailleurs he published in the Cri du Peuple a hostile manifesto against the government of Versailles in con- nexion with the Communist rising of the 18th of March 187 1. Continuing to serve in the National Guard, now in open revolt, he was taken prisoner on the 5th of April, and on the 16th of November sentenced to transportation for life; but, largely at the instance of influential deputations from England, the sentence was commuted in

January 1872 to perpetual banish- "ment. Thereupon, after a short visit to Italy, he settled at Clarens, in Switzerland, where he resumed his literary labours, and, after producing the Histoire d'une montagne (a companion to Histoire d'un ruisseau), wrote nearly the whole of his great work, La Nouvelle Geographie universelle, la terre et les homtnes, 19 vols. (1875-94). This is a stupendous compilation, profusely illustrated with maps, plans, and engravings, and was crowned with the gold medal of the Paris Geographical Society in 1892. An English edition appeared simultaneously, also in 19 vols., the first four by E. G. Ravenstein, the rest by A. H. Keane. Extreme accuracy and brilliant exposition form the leading characteristics of all Reclus's writings, which thus possess permanent literary and scientific value. In 1882 Reclus initiated the " Anti-Marriage Movement," in accordance with which he allowed his two daughters to marry without any civil or religious sanction whatever. This step caused no little embarrassment to many of his well-wishers, and was followed by government prosecutions, instituted in the High Court of Lyons, against the anarchists, members of the International Association, of which Reclus and Prince Kropotkin were designated as the two chief organizers. The prince was arrested and condemned to five years' imprisonment, but Reclus, being resident in Switzerland, escaped. After 1892 he filled the chair of com- parative geography in the university of Brussels, and con- tributed several important memoirs to French, German and English scientific journals. Among these may be mentioned " The Progress of Mankind " (Contemp. Rev., 1896); " Attila de Gerando " (Rev. Geograph., 1898); " A great Globe " (Geograpk. Journ., 1898) ; " L'Extreme-Orient " (Bui. Antwerp Geo. Soc,

1898), a thoughtful study of the political geography of the Far East and its possible changes; " La Perse " (Bui. Soc. Neuchateloise, 1899); "La Phenicie et les Pheniciens " (ibid., 1900); La Chine et la diplomatic europeenne (" L'Humanite nouvelle " series, 1900); L' Enseignement de la geographic (Instit. Geograph. de Bruxelles, No. 5, 1901). Shortly before his death Reclus had completed L 'Homme et la terre, in which he set the crown on his previous greater works by considering man in his development relative to geographical environment. Reclus died at Thourout, near Bruges, on the 4th of July 1905.

RECOGNIZANCE (from Lat. recognoscere, to acknowledge), a term of English law usually employed to describe an obligation of record, entered into before some court or magistrate duly authorized, whereby the party bound acknowledges (recognizes) that he owes a personal debt to the

Crown, with a defeasance, i.e. subject to a condition that the obligation to pay shall be avoided if he shall do some particular act — as if he shall appear at the assizes, keep the peace, or the like. The system of taking recognizances in favour of the Crown at an early date super- seded the common law practice as to pledges and main-prize (see re Nottingham Corporation, 1897, 2 Q.B. 502, 514).

Blackstone's definition extends the term recognizance to bonds in favour of private persons. But at present it is rarely if ever used in this sense. Recognizances are now used almost solely with reference to criminal proceedings. In the Court of Chancery it was the practice to require recognizances from the guardian of a ward of court that the ward should not marry or leave the country with the privity of the guardian and without the leave of the court. The security given by a receiver appointed by the High Court is still in the form of a recognizance acknowledging a debt to named officers of the court, and securing it on the real and personal estate of the receiver.

By an act of 1360 (34 Edw. III. c. 1), extended to Ireland by Poyning's Act, and by the terms of the commission of the peace, justices of the peace have jurisdiction to cause to come before them or any one "of them " all those who to any one or more of our people concerning their bodies or the firing of their houses have used threats to find sufficient security for the peace or their good behaviour towards us and our people; and if they shall refuse to find such security, then there in our prisons until they shall find such security to cause to be safely kept." The security taken is by recognizance of the party and his sureties, which can be forfeited on conviction of any offence which is a breach of the conditions of the recognizance.

The procedure under the act of 1360 and the commission is usually described as exhibiting articles of the peace or swearing the peace. The High Court (King's Bench Division) has the same power as justices in quarter sessions. This procedure is in practice superseded in England, so far as concerns courts of summary jurisdiction, by an equivalent but more modern procedure (42 & 43 Vict. c. 49, s. 25). Recognizances ordered under these enactments cannot be forfeited or as it is termed estreated without an order of court made upon proof of breach of the conditions, or of a conviction involving such breach. The procedure for estreats is governed by the Levy of Fines Acts 1822 and 1833, and by 16 & 17 Vict. c. 30, s. 2.

There is also a general jurisdiction on conviction of misdemeanour to put the offender under recognizances to keep the peace and (or) be of good behaviour in addition to or in substitution for other punishment. This power

is specifically applied by the Criminal Law Consolidation Acts of 1861 to all indictable misdemeanours punishable under these acts, and power is given to put persons convicted of any felony (not capital) punishable under the acts under a recognizance to keep the peace. On refusal to enter into recognizances as above, the court may order imprisonment for the refusal, limited in cases within the acts of 1861 to twelve months, and in cases within the act of 1879 to six months.

The recognizances above described may be described as a form of punishment or a judicial security for good conduct. Recogniz- ances are, however, most used with reference to proceedings before conviction and judgment, fn preliminary inquiries into indictable offences the inquiring justices take recognizances to ensure the attendance of the accused if liberated during any adjournment, and on committal for trial take the recognizances of the accused (if allowed bail) to attend the court of trial and take his trial, and of the prosecutor and the witnesses for the prosecution or defence to attend and prosecute or give evidence. As to witnesses this power was first given in 1554 (1 Ph. & M. c. 13). The procedure

is regulated by the Indictable Offences Act 1848 (11 & 12 Vict, c. 42) as amended in 1867 (30 & 31 Vict. c. 35) and the forms oi recognizance are scheduled to the act of 1848. In the case of inquisitions of murder or manslaughter taken before a coroner a similar procedure is followed (Coroners Act 1887, 50 & 51 Vict, c. 71, s. 5). The recognizances taken are returnable under penalty to the court of trial, which orders their estreat in the event of breach of the conditions.

Similar powers as to the recognizances of persons prosecuted summarily are given by the Summary Jurisdiction Acts 1848 and 1879; and in the event of appeals to quarter sessions or by special case to the High Court from courts of summary jurisdiction, recognizances or security are required from the appellant (42 & 43 Vict. c. 49, ss. 31, 33). On the transfer of indictments from inferior to superior courts recognizances to pay the costs on con- viction are also required (Crown Office Rules, 1906). In certain cases the police have authority to give bail to accused persons on their entering into a recognizance; and governors of prisons are allowed to release prisoners on bail on compliance with the terms on which it is allowed by the committing justices.

By the Land Charges Act 1900 (63 & 64 Vict. c. 26, s. 2 (1) a recognizance, whether obtained or entered into on behalf of the Crown or otherwise, does not operate as a charge on land or on any interest on land or on the unpaid purchase money for any land, unless a writ or order for the purpose of enforcing it is registered under s. 5 of the Land Charges, &c,

Act 1888 (51 & 52 Vict. c. 51) in the office of the Land Registry. This enactment is clearly applicable to receivers' recognizances, supra; and on purchases of land search is made for registered recognizances and an official certificate can be obtained affirming or negativing the existence of a registered entry (Conveyancing Act 1882, s. 2). By s. 30 of the Bankruptcy Act 1883, a discharge in bankruptcy does not release the debtor from debts on a recognizance unless the Treasury certifies in writing its consent to the discharge.

By ss. 32, 34 of the Forgery Act 1861, it is made felony to forge recognizances, and to acknowledge them in the name of another without lawful authority is also felony (24 & 25 Vict. c. 98).

In Scotland the place of recognizances is filled by cautions; a caution in " law-burrows " corresponds very nearly to a recog- nizance to keep the peace.

In the United States recognizances are used for much the same purposes as in England. (W. F. C.)

RECONNAISSANCE (from Fr. reconnailre, to recognize, Lat. recognoscere), a military term denoting the reconnoitring or examination of an enemy's position or movements, or of a tract of ground. Reconnaissances naturally vary indefinitely according to the purposes for which they are undertaken. A topographical reconnaissance is practically a survey of a tract of country or route, comprising both a map and a report as to its advantages and disadvantages. All reconnoitring work of this character is done by officers with small patrols, escorts or assistants. Strategical reconnaissance is performed by contact squadrons, which send forward officers and patrols to find the enemy. Tactical reconnaissance falls to the lot of troops of all arms, whether in contact with the enemy or for self-protection. A reconnaissance by a large force of all arms with the idea of provoking an enemy into showing his hand, if necessary by fighting, is called a reconnaissance in force.

RECORD (Lat. recordari, to recall to mind, from cor, heart or mind), a verb or noun used in various senses, all derived from the original one of preserving something permanently in memory. In this article, however, we are only concerned with documentary records, or archives. In its accurate sense a record is a document regularly drawn up for a legal or ad- ministrative purpose and preserved in proper custody to per- petuate the memory of the transaction described in it; for the most part it forms a link in a complicated process, and unless the connexion between it and the other documents making up the process has been preserved, a portion of its meaning will have perished. The first care, therefore, of the custodian of

records should be to preserve this connexion, where it exists. In the majority of countries a previous task awaits him; it has been his duty to collect and arrange his documents. There are few countries in which records have not passed through a period of neglect; each office of state has kept or rather neglected its own papers; each court of justice has been the keeper of its own records; the student has been paralysed by a multitude of repositories among which he vainly sought the documents he required. To this stage two systems have succeeded; the system of centralization both of records and of

staff; and the system under which the records are left in local repositories and the staff is centralized. There are of course countries which cannot be brought under either of these for- mulae. But for the most part it will be found that the second system has prevailed; there are a central office for records of state, provincial offices for legal records and those of local administration, town offices for municipal records, and a staff of archivists depending more or less strictly upon the central office. In England the first system has been preferred; almost all the records that can be collected have been gathered into the central office. In the future, indeed, it is inevitable that collec- tions of administrative records should grow up for each county; but there is at present no means of ensuring their arrange- ment and preservation. Many towns possess old and valuable collections of municipal archives, and over these also the central office has no control. It would be absurd to affirm that such control is needed for the preservation of the documents; but it is a curious fact that the English government, which has centralized records more freely than any other, should have refrained from establishing any system of administration for records in general. The following article is intended to give a full account of the administration and nature of the records of Great Britain, and brief notices of those of other countries concerning which informa- tion is obtainable. It may be noticed that the directory of the learned world published by Trubner at Strassburg under the title Minerva will be found a useful guide to the situation and staff of repositories of records.*

England. The most important repository of English records is the Public Record Office, Chancery Lane, London, established under the Act i & 2 Vict., c. 94. The head of the office is the Master of the Rolls for the time being; and the staff consists of the deputy- keeper, secretary, assistant-keepers and clerks, with a subordinate staff.

Until the establishment of this office, the records of the various courts- of

law and government offices were stored in separate places, mostly of an unsuitable nature, whose contents were inaccessible and unknown. The Tower of London contained the records of the Chancery, which were kept in fair order; the records of the Exchequer were scattered in many places, chiefly unsuitable; and other collections were almost as unfortunately bestowed : the only attempt to provide a special place of custody was made in the 17th century, when the State Paper Office was set up as a place of deposit for the papers of the secretaries of state. From time to time efforts were made, chiefly by means of committees of the House of Lords, to procure reforms in the custody of documents whose value was well understood. In the reign of Queen Anne, an attempt was made by Thomas Rymer to publish in the Foedera such documents as could be found bearing upon foreign politics; and this drew fresh attention to the question of custody. In 1 73 1 the disastrous fire in the Cottonian Library produced a committee of the House of Commons and another report. But it was not until 1800 that any serious steps were taken. In that year a committee of the House of Commons presented a valuable report dealing with all the public records in repositories in England and Scotland. The result of this committee was the appointing of a royal commission charged with the arrangement and publica- tion of the public records and the control of all public repositories. This commission was renewed from year to year and did not expire until 1837. It fell partly because of internal dissensions, but principally owing to gross extravagance and almost complete neglect of its duty, so far as the arrangement and custody of the records was concerned. The publications sanctioned by it are often badly designed and badly executed; but their most prominent characteristic was their expense. To this commission succeeded the Public Record Office, whose constitution has already been described. The first duty of the new office was the establishment of a central repository into which the scattered collections of records could be gathered ; and the preparation of manuscript inventories of the documents so obtained. In 1851 the construction of the central repository was begun ; and with the completion of each portion ot it further groups of records were brought in. At first only those collections specified in the act of parliament were dealt with; but in 1852 the State Paper Office was placed under the control of the Master of the Rolls, and its contents removed to the Public Record Office. Other government departments in turn transferred to the same keeping papers not in current use; and at present the only important collections of papers not so treated are those of the India Office and the Privy Council Office, which are still kept apart.

The publications of the Record Office are of three kinds: reports, lists and indexes, and calendars. The reports are the annual

reports of the Deputy Keeper, and now deal merely with the administrative work of the office; up to 1889 they also contained, in the form of

appendices, inventories and detailed descriptions of various classes of records. In the present article these reports are referred to by number. The lists and indexes are either inventories of special classes with more or less detail, or indexes to the contents of certain documents grouped for that purpose; they are here cited by their number. The calendars are volumes containing full abstracts intended to make the consultation of the original docu- ment unnecessary except for critical purposes; they are equipped with full indexes. The contents of the Record Office are classified for the most part under the collections in which they were found. For a general account of the whole, see S. R. Scargill-Bird's Hand- book to the Public Records (3rd ed. 1908). No student can afford to neglect C. Gross's Sources and Literature of English History from the Earliest Times to about 1485, which contains much information as to books and articles based upon English records.

We may now turn to the documents themselves, under the following heads : —

Exchequer Records. — The records of the administrative and judicial sides of the Exchequer (q.v.) are here described under its several divisions.

(i)Ufper Exchequer, OR Exchequer of Audit. — (a)Lord Treas- urer's Remembrancer's Office, or office of final audit. The result of the final audit is recorded in duplicate on the Pipe and Chan- cellor's Rolls. These consist of a solitary (Pipe) roll for 31 Henry I., and a duplicate series extending from 2 Henry II. to 2 William IV. The Record Commission has printed the following rolls: Pipe Rolls, 31 Henry I., 2-4 Henry II., 1 Richard I.; Chancellor's Rolls, 3 John. The Pipe Roll Society has printed the Pipe Rolls for 5-24 Henry II.

Foreign Rolls or Rolls of Accounts. — These contain the records of the preliminary audit of accounts other than county accounts of the sheriffs; they run from 42 Edward III. to modern times: closely connected with them are the Enrolled Accounts, which deal with the more important accountants separately. It should be noted that the final audit is not recorded upon either Foreign Rolls or Enrolled Accounts, but must be sought on the Pipe Roll, unless the accountant is found to be quit or to have a balance due to him. The Record Office has published a classified list (No. XI.) of the Foreign and Enrolled Accounts taken from all the foregoing rolls of audit, but omitting the accounts of Customs and Subsidies.

Declared Accounts. — A list (No. II.) of these records with an introduction has been published by the Record Office. The series begins in the 16th century, and from the 17th century is fairly complete.

Originalia Rolls (20 Henry III. to 1837), or extracts from the Chancery Rolls communicated to the Exchequer for its information and guidance. Latin abstracts of the rolls from Henry TIL to Edward III. were printed by the Record Commission as Abbreviatio Rolulorum Originalium (2 vols, folio).

Lord Treasurer' s Remembrancer' s Memoranda Rolls. — These contain the letters received and issued by the Exchequer and notes of the general business of the department. They run from 1 Henry III. to 1848. Edward Jones's Index to the Records contains a few scattered references to them; and many extracts will be found in the notes to Thomas Madox's History of the Exchequer.

Judicial. — The only judicial proceedings on the Lord Treasurer's Remembrancer' s side are in cases connected directly with the revenue. These are enrolled upon the Memoranda Rolls; and for the period 35 Charles II. to William IV. there are Order Books. (6) King's Remembrancer's Office, or office of preliminary audit. The most important financial records of this branch of the Exchequer are the class known as " Exchequer K. R. accounts, &c," which comprise vouchers and audited accounts of expendi- ture. Of similar accounts relating to receipts, the Escheator's accounts have been listed in the 10th Report; but the inquisitions there described as filed with the accounts as vouchers are now kept separately, and are described with the Chancery Inquisitions in the calendars. Accounts and vouchers relating to Subsidies and Customs are at present only described in manuscript (see below under Special Collections).

King's Remembrancer's Memoranda Rolls (1 Henry III. to 13 Victoria). — These run parallel with those of the Lord Treasurer and to a large extent contain the same matter. Adam Martin's Index to Exchequer Records contains a certain number of references to them.

In the reign of Edward VI., returns were made into the Exchequer by commissioners appointed to take inventories of Church Goods. Volumes of these for several counties are being published by the Alcuin Club (see Mely et Bishop, Bibliographie generate des inven- taires imprimis, vol. i. p. 245).

Judicial. — The court of Exchequer on the King's Remembrancer's side was a court of equity held before the lord treasurer, the chan- cellor of the exchequer and the barons. The usual records of a court of equity, Bills and Answers, Decrees and Orders, Affidavits and other subsidiary documents exist for it. Martin's Index to Exchequer Records contains references to the Decrees and Orders.

Of the proceedings under special commissions issuing from this court a descriptive catalogue (Elizabeth to Victoria) has been published in the 38th Report. Depositions taken by commission (Elizabeth to George III.) are catalogued in the Reports 38-42. A catalogue of the later depositions exists in manuscript.

(2) Lower Exchequer, or Exchequer of Receipt. — The principal financial records of this department are the Receipt and Issue Rolls showing the payments made to and by the Ex- chequer. The former consist of an exceptional roll for 14 John and a series from Henry III. to George III. The latter run from Henry III. to Edward IV. and from Elizabeth to George III. A translation of the issue rolls (2) for 44 Edward III. was published by F. Devon; who also published a volume of extracts from the issue rolls of the reign of James I., and another volume of extracts from the rolls for the period 41 Henry III. to 39 Henry VI. The other records of this department are very numerous.

(3) Exchequer of Pleas. — The barons of the Exchequer without the lord treasurer had a court of their own, where process took place by common law. A list of the Plea Rolls of this court (20 Henry III. to 1855) will be found at p. 64 of the Record Office List of Plea Rolls (No. IV.). A partial index to the tithe-suits on these rolls is contained in the 2nd Report.

(4) Exchequer of the Jews. — Suits between Jews, or in which Jews were concerned, were tried before a special subordinate court. The Plea Rolls (3 Henry III. to 4 Edward I.) are listed in the Record Office List of Plea Rolls. For specimens see Select Pleas, Starrs and Records of the Jewish Exchequer, edited for the Selden Society and the Jewish Historical Society of England by J. M. Rigg.

(5) First Fruits and Tenths. — After the breach with Rome, the crown obtained a new source of revenue in the first fruits due to the pope from every holder of a benefice upon appointment, and from the tenths payable during his tenure of it. For a few years under Henry VIII. a special office administered this revenue. At the accession of Mary the business was transferred to a depart- ment of the Exchequer. The principal records are the following: Bishop's Certificates of Institutions to Benefices; Composition books giving the names of incumbents and the sums paid by them in lieu of first fruits; and documents relating to the valuation of livings. The most important entries touching valuation were printed by John Ecton in the Liber Decimarum (1711), which has passed through many editions under the titles of Thesaurus Rerum Ecclesiasticarum and Liber Regis. The first fruits and tenths are now transferred to Queen Anne's Bounty, and are

managed by that office.

(6) Valor Ecclesiasticus. — In 26 Henry VIII. a commission was issued for a valuation of all ecclesiastical property. The re- turns were made into the Exchequer and consist of eighteen volumes and three portfolios of rolls. Of these abstracts were made in three volumes known as Liber Valorum or King's Books, and a portion was copied in two volumes known as Liber Regis. The original returns for the diocese of Ely, most of that of London and part of those of Salisbury, Lincoln, Durham and York are not now known to exist, and are very imperfectly represented by the abstracts and copies mentioned above. From these materials the Record Commission compiled six volumes folio known as the Valor Ecclesiasticus provided with maps and indexes. The introduction and general map were published later (1834) in a separate octavo volume; but some copies were struck off in folio and inserted into Vol. I., which was published in 1810.

(7) Court of Augmentations. — This office was instituted to administer the property of the suppressed monasteries and the revenues of the duchy of Cornwall. The records consist of the muniments of the suppressed houses taken over with them and of documents connected with their actual seizure and subsequent administration (for the former, see Special Collections below; the latter are in great part calendared in the Letters and Papers relating to the Reign of Henry VIII.).

There was also a judicial side of the office, in which the proceedings were by bill and answer. In 38 Henry VIII. this court absorbed an earlier one known as the Court of General Surveyors of the King's Lands, which had been set up in 33 Henry VIII. A calendar of the decrees of' the court will be found in the 30th Report. The court of augmentations was merged in the Exchequer in I Mary.

Chancery. — The records of the chancery are here treated in two divisions, administrative and judicial.

(1) Chancery Administrative. — These are either enrolments of letters issued under the great seal, documents forming part of the process of issuing such letters, or documents drawn up for the information of the chancery.

Enrolments. — The Charter Rolls (1 John to 8 Henry VIII.) contain the enrolments of the most formal letters. The Record Commission published one volume folio containing a transcript of the rolls for the reign of John; and a badly designed and executed calendar entitled Calendarium Rotulorum Chartarum. The Record Office has published three volumes of a complete calendar of the Charter Rolls from 11 Henry III. The Patent Rolls

(3 John to the present day) contain enrolments of less formal letters addressed generally. The Record Commission published one volume folio containing a transcript of the rolls for the reign of John, with a valuable itinerary of that king. The Record Office has also printed in full

the rolls for the period 1-16 Henry III. From this point over 30 volumes of a Calendar have been published, and the remaining gaps in the series are being closed. For these gaps the Record Commission's Calendarium Rotulorum Patentium is still useful, but only refers to a small proportion of the matter on the rolls. The rolls for the reign of Henry VIII. are calendared in the Letters and Papers of Henry VIII. The Close Rolls (6 John to the present time) contain the enrolments of letters directed to specified persons and also enrolments of deeds made according to statute or for safe custody. The Record Commission published two volumes folio containing a transcript of the rolls for the period from 6 John to 11 Henry III. The Record Office has also published several volumes of rolls for the reign of Henry III. From the. reign of Edward I. eighteen volumes of a calendar have appeared. The Fine Rolls (1 John to 23 Charles I.) contain the record of judicial writs issued under the great seal with a note of the fine or fee paid ; also of letters of appointment to offices and letters relating to the administration of the feudal incidents of tenure. The Record Commission published a transcript of the rolls for the reign of John under the title Rotuli de Oblatis et Finibus; for the reign of Henry III. they also published two volumes of Excerpta e Rotulis Finium consisting of the entries relating to the feudal incidents. There were also other rolls containing letters issued under the great seal relating to special countries and subjects. The most important of these are here mentioned. French Rolls, Gascon Rolls, and Norman Rolls deal with the affairs of the English dominions in France and with relations with that country. A catalogue of many of the entries on these rolls down to the reign of Edward IV. was published by Thomas Carte in two volumes folio. Of the French Rolls (16 Edw. III. to 26 Charles II.) those for the reign of Henry V. are briefly calendared in the 44th Report; and those for the reign of Henry VI. in the 48th Report. Of the Gascon Rolls (38 Henry III. to 7 Edw. IV.) the earlier rolls have been printed in full in the Documents inedits published by the French government under the care of MM. Francisque-Michel and Bemont. Of the broken series of Norman Rolls (1 John to 10 Henry V.) those for the reign of John and that for 5 Henry V. have been printed in full in one volume by the Record Commission; to the remainder a calendar will be found in the 41st Report. The books here mentioned deal with some rolls now placed in other classes.

Other rolls contain letters under the great seal relating to Ireland, Scotland and Wales. Of these the Record Commission printed the Scottish Rolls (19 Edward I. to 8 Henry VIII.) in full, omitting the numerous letters of protection contained in them. For the Welsh and Irish Rolls there is only a

very partial calendar in Ayloffe's Calendar of Ancient Charters. The Roman and Almain Rolls have been used in Foedera, and many entries from the other chancery rolls will be found there. The Liberate Rolls (2 John to 14 Henry VI.) contain the enrolments of writs for the issue of money out of the Exchequer. The rolls for 2-4 John have been printed in full by the Record Commission.

Documents forming Part of the Process of issuing Letters under the Great Seal. — These are known as Chancery warrants, and consist of Privy Seals, Signed bills and other documents forming steps in the process. Series I. of these documents extends to the end of the reign of Richard III., and Series II. to the end of the reign of Henry VIII. ; Series III. ends with the reign of Anne, and Series IV. with that of William IV., while Series V. is still in progress. Series I. and II. are arranged in chronological order (Series I. being also classified); the remainder are in monthly bundles. The warrants for the reign of Henry VIII. are calendared in the Letters and Papers of Henry VIII. ; those for the first seven years of Charles I. are calendared in the 43rd Report. With these may be placed the Inquisitions ad quod damnum. Of these the Record Office has published a descriptive list (Nos. XVII. and XXII.) for the period 28 Henry III. to 2 Richard III.

Documents drawn up for the Information of the Chancery. — The most important of these are the inquiries held under writs issued from the chancery. The first series of these (Henry III. to Richard III.) is now arranged in three classes, Inquisitions Post Mortem including analogous documents relating to the feudal tenure of land, Criminal Inquisitions and Miscellaneous In- quisitions. The Record Office has published three volumes of a calendar of Inquisitions Post Mortem. The Record Commission calendars refer to the old arrangements of these inquiries into two series, known as Inquisitions Post Mortem. &c. and Inquisitions ad quod damnum &c, a distinction of title which concealed the identity of the documents described. Both calendars contain many inaccuracies and omit much useful information. To s.upply some of these defects for the period Henry III. to Edward I. the Record Office published the Calendarium Genealogicum, but this work does not attempt to deal with the lands mentioned in the inquiries. In the second series of these inquiries the three classes of inquisitions are all placed together. One volume of a calendar to the Inquisitions Post Mortem for the reign of Henry VII. has appeared. Certificates of Gilds are returns made under the statute of 12 Richard II. Those in English have been printed by J. and L. Toulmin Smith for the Early English Text Society. Charitable Uses: a list (No. X.) of all inquisitions and decrees of commissioners

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appointed under two statutes of Elizabeth to examine and rectify abuses of charitable bequests has been published by the Record Office. Forests {Chancery) contain perambulations and proceedings before the justices in eyre of the forest. The perambulations for certain counties have been printed by G. J. Turner in Select Pleas of the Forest (Selden Society).

Scottish Documents. — Five rolls relating to the policy of Edward I. towards Scotland. The first two contain the proceedings touching the claims to the crown of Scotland and are printed in Foedera, vol. ii. p. 762 (Record edition) ; the remaining three, known as Ragman Rolls, contain in triplicate the submissions of the Scottish nobility to Edward I., and were printed by the Bannatyne Club in 1834. Other chancery documents relating to Scotland are described in J. Bain's Calendar of Documents relating to Scotland. Most of these together with the earlier Forest proceedings are included in the Miscellanea of the Chancery, which contains numerous other detached documents and rolls. Many of those relating to foreign affairs are printed in the Foedera.

(2) Chancery Judicial. — These may be divided into Proceedings, or Bills and Answers, &c, filed by the parties; Decrees and Orders of the court; and Affidavits and other documents connected with the course of the action. The series known as Early Chancery Proceedings (Richard II. to Philip and Mary), comprising documents of all three classes, is arranged roughly in chronological order. The Record Office has published three volumes of a descriptive list (Nos. XII., XVI. and XX.) of the whole of this series; and the first two bundles have been printed in full in the Record Commission's Calendar of Proceedings in Chancery, Elizabeth; other specimens are printed in Select Pleas of the Chancery (Selden Society), edited by W. P. Baildon. For the reign of Elizabeth the Proceedings are arranged alphabetically under the plaintiff's name in two series. Series I. is calendared in the Record Commission volumes already mentioned for Series II.; the Record Office has published a descriptive list (Nos.VII.and VI 1 1.) covering the years 1558-162 1. To the Bills and Answers of the reign of Charles II. Messrs Phillimore and Fry have published in the Index Library of the British Record Society an index taken from Topham's manuscript index in the Record Office. The same society has reproduced in an alphabetical form an index to the proceedings in Reynardson's division for the years 1694-1714. These last indexes contain only the surnames of the parties, without reference to the nature of the suit. Decrees and Orders (36 Henry VIII. to the present time) are the entry-books of the. orders of the court; with them may be classed the Reports and Certificates of the masters and chief clerks. The Affidavits, &c, date from 161 1.

The chancellor formerly had a common law jurisdiction relating to certain matters touching feudal incidents and tenures, to repeals of letters patent, and to actions upon recognizances acknowledged in chancery or concerning officers of the court. No printed means of referring to these records exist.

Court of King's Bench. — The principal records of this court are the rolls recording its proceedings and judgments, of which classified lists are given in the Record Office List of Plea Rolls (No. IV.), under the following heads. Curia Regis Rolls (5 Richard I. to 56 Henry III.) include all the rolls of the king's court with the exception of a few Eyre Rolls. Of these the Record Commission printed those for 6, 9, 10 Richard I. and I John; and also published in the Abbreviatio Placitorum certain abstracts from a portion of the pleas on these rolls made in the 17th century. For specimens see Selden Society volumes, Select Civil Pleas, edited by W. P. Baildon, and Select Pleas of the Crown, edited by F. W. Maitland, who has also edited for the Pipe Roll Society four rolls of the reign of Richard I. From the end of the reign of Henry III. the rolls of the king's bench and those of the common pleas (see below) have been separated. The former, named Coram Rege Rolls (1 Edward I. to 13 William III.), divide from I Anne into two portions, Judgment Rolls, containing pleas between private persons, and Crown Rolls, containing crown business. References to some pleas on the Coram Rege Rolls will be found in the Abbreviatio Placitorum; the complete roll for 25 Edward I. has been printed by the British Record Society.

Assize Rolls, &c. — Under this head are grouped rolls containing the proceedings before justices in eyre, of assize, of oyer and terminer, of gaol delivery (a few) and before justices sent on special commission. References to some of these will be found in the Abbreviatio Placitorum; and specimens in the Selden Society volumes already mentioned. The Eyre Roll for Gloucestershire, 5 Henry III., has been published by F. W. Maitland. The pleadings taken under writs of Quo Warranto during the period Edward I. to Edward III. were published by the Record Com- mission. For specimens of Coroners Rolls (Henry III. to Henry VI.) see the Selden Society's volume edited by C. Gross. Baga de Secrelis (since 17 Ed. IV.) contains the proceedings in trials for treason or felony held before the court of king's bench or special commissioners. An inventory and calendar will be found in the 3rd, 4th and 5th reports.

Court of Common Pleas. — The Plea Rolls of this court, known as De Banco Rolls, run from 1 Edward I., before which date pleas before justices of the common bench form part of the Curia Regis

Rolls, to 24 Henry VII., from which date the Plea Rolls are known as Common Rolls. But in 25 Elizabeth all common recoveries and enrolments of deeds were transferred to a new roll called the Recovery Roll, the series of which extends to 1837. In the Year Books edited for the Rolls Series by L. O. Pike, and those edited for the Selden Society by F. W. Maitland, the cases reported have, when possible, been traced on to the De Banco Rolls and extracts from those rolls printed. Feet of Fines (up to 1835) are the official part of the triplicate document constituting the complete fine. Those for the period 7 Richard I. to 16 John have been printed by the Record Commission for the counties Bedfordshire to Dorset in alphabetical order. Four volumes printed for the Pipe Roll Society cover the years down to 10 Richard I. for all counties. The feet of fines are arranged in counties year by year up to the reign of Henry VIII. Afterwards they are arranged term by term in counties. Notes of Fines (since Edward I.) are the records of an earlier stage in the procedure; Concords of Fines (since 1559) form another stage; but to neither of these are there printed means of reference.

Court of Star Chamber. — The relation between the king's council sitting as a judicial body and the Court of Star Chamber set up by the act of 3 Henry VII., c. I, is matter of controversy. The records of this court are nearly all of later date than this act. They consist of Bills, Answers, Depositions and similar documents, with a very few Decrees and Orders. The Record Office has published a descriptive list (No. XIII.) of a portion of these records; for specimens see Selden Society, Select Cases in the Star Chamber, 1 477-1 5 00, edited by I. S. Leadam.

Court of Requests. — The origin of this court and the manner in which it died out at the time of the Civil War are alike uncertain. The records that remain are of two kinds, Proceedings and Books. Of the former the Record Office has published a descriptive list (No. XXI.) ; and specimens will be found in Select Cases in the Court of Requests, edited for the Selden Society by I. S. Leadam. The Books contain among other matters the Decrees and Orders of the court.

Parliamentary Records. — The proceedings of parliament were recorded either on a roll prepared for each session, or on detached documents and petitions made up into sessional files. The files have now disappeared, although transcripts of some still exist, and in many cases their constituents can be traced among the Ancient Petitions (see below under Special Collections). The rolls known as Parliament Rolls form a broken series, 18 Edward I. to 48-49 Victoria. The tolls for Edward I. and Edward II. are among the Exchequer records, and the remainder are in the chan- cery. Of these rolls and files, and of certain pleadings found in the records of the King's Remembrancer, the Record Commission published what was meant to be a complete reprint. But the editors relied partly upon transcripts and

partly upon original documents, and it is often difficult to determine the sources from which they drew. So prepared, the Rolls of Parliament (6 vols.) cover the period from 6 Edward I. to 1 Mary. The roll for 33 Edward I., unknown to them, has been edited (Rolls Series, vol. 98) by F. W. Maitland, with a valuable introduction and appendices; rolls for 18 Edward I. and 12 Edward II. are printed in H. Coles' Docu- ments Illustrative of English History. The Parliament Roll includes enrolments of statutes among its contents. But from Edward I. to Edward IV. the statutes after receiving the royal assent were also enrolled upon the Statute Roll (chancery), of which only six rolls now remain. From these rolls and other sources the Record Commission prepared the volumes known as Statutes of the Realm on principles described in the introduction to that work. Unfor- tunately the editors made use of early printed texts, and trans- lations based upon the inferior texts contained in Exchequer K.R. Miscellaneous Books 9, 10 and 11, and so diminished the value of their work. The Statutes of the Realm extend to the end of the reign of Queen Anne. Since then public general acts have been pub' lished in many forms; private acts ceased to be enrolled upon the Parliament Rolls during the 16th century; the originals are preserved in the House of Lords. The Record Office contains detached documents relating to parliamentary proceeding known as Exchequer Parliamentary and Chancery Parliamentary, but neither class has yet taken a final form.

State Papers. — This class contains the documents belonging to the offices of the secretaries of state, formerly deposited in the place of custody called the State Paper Office. This office was estab- lished about the year 1578, but the first attempt to arrange its contents seems to have been due to Sir Thomas Wilson, who in the reign of James I. divided the papers into two classes, Domestic and Foreign, to which at a later date the class of Colonial Papers was added. These series all come to an end at the year 1782, at which date the modern history of the office of Secretary of State begins.

Domestic. — Calendars of these papers have been published for the period 1547-1676, with special volumes dealing with the papers of the Committee for Advance of Money (1642-1656), and of the Committee for Compounding (1643-1660). Another series of volumes begins with the year 1689, and a third extends from 1760 to 177?.: these last are called Home Office Papers, but are in no way differeur

in character from the State Papers Domestic. The Domestic Papers relating exclusively to Ireland have been calendared under the title of State Papers,

Ireland, for the years 1509-1601 and 1603-1665, with a special volume dealing with the papers concerning Adven- turers for Land. From 1670 these papers are calendared in the Domestic volumes.

Scotland. — Originally there were in the State Paper Office two sets of papers relating to Scotland, State Papers Domestic, Border Papers, containing papers concerning the Council of the North and the Wardens of the Marches; and State Papers Foreign, Scotland, before the union of the two crowns. The first calendar of these was a Calendar of State Papers, Scotland, 1509-1603, containing brief notes of all the State Papers Foreign, Scotland, and of many of the Border Papers which were removed from their places without any record of the removal. Next came the Calendar of State Papers Foreign, in which were included apparently all the Border Papers for the period covered which had escaped the previous raid ; notes, however, were made of the papers so taken. Out of the original 75 volumes of Border Papers only 36 remained. At a later date the papers drawn for the Foreign Calendar were restored and now form the first 19 volumes of the series, while the 36 volumes originally remaining have now become the final 23. At the same time the State Papers Foreign, Scotland, were annexed, and became State Papers Domestic, Scotland. In their present arrangement the Border Papers have been calendared in the following volumes: vols. 1-19 in the State Papers Foreign 1547-1560; vols. 20-42 in the Scottish General Register Office Calendar of Border Papers 1560-1603. The State Papers Domestic, Scotland, from 1547 on- wards, are being fully calendared in the Scottish General Register Office Calendar of Scottish Papers with other material. Those from 1509 to 1547 are dealt with in the Letters and Papers of Henry VIII. (see below, Special Collections). A list of these three Classes has been published (No. III.).

Foreign. — Calendars of the State Papers Foreign have been published for the period 1 547-1 580. A few of these papers are also calendared in the first . volume of the State Papers Spanish (see below under Spain). The Record Office has published a list of the State Papers Foreign (No. XIX.).

Colonial. — These papers are calendared in two sets, an " East Indies " (1513-1634, which has been continued to 1639 by the India Office in Miss E. B. Sainsbury's Court Minutes of the East India Company) and an " America and West Indies " (1574-1693, In progress).

Departmental Records. — From timfe to time all the govern- ment departments, with the exception of the India Office, deposit such papers as they wish to preserve in the Public Record Office; thus the Treasury, Home Office, Foreign Office, Colonial Office, Admitalty, War Office, Local Government Board and Board of Trade have all placed important papers in the care of the Master of the Rolls. A calendar of the earlier Treasury

Papers, which extends from 1660 to 1668 and 1720 to 1745 has been published; also a list of the Admiralty Records (No. XVII.). For each department a limiting date is fixed from time to time; documents before that time are open to students; later ones are only accessible under special conditions.

Subordinate and Independent ' Jurisdictions.— Palatinate of Durham.- — For the earlier records see G. T. Lapsley's County Pala- tine of Durham (Harvard Historical Series, vol. viii.), pp. 327-337. The letters sent out from the bishops' chancery are enrolled on the Cursitors' Records, Nos. 29 to 184. They are calendared in Reports 31 to 37 and 40. One of the registers (Bishop Kellawe's) has been printed in full in the Rolls series (No. 62) with additions from the register of Bishop Bury. The Cursitors' Records also include seven bundles of Inquisitions Post Mortem (Nos. 164-180), calendared in the 44th Report; and a volume (No. 2) contains transcripts of similar documents, calendared in the 45th Report. The records of the Exchequer of Durham, though deposited in the Public Record Office, are treated as the private records of the Ecclesiastical Com- mission, and are only accessible with a special permit. To the judicial records the only printed means of reference is the list of Judgment Rolls (20 Henry VII. to 7-8 Victoria) in the Record Office list of Plea Rolls (No. IV.)

Palatinate of Chester. — The letters sent out from the chancery are enrolled upon the Chester Recognizance Rolls (1 Edward II. to 34 Charles II. with a few rolls down to 1 William IV.) calendared in Reports 36-37 and 39. The financial records of the Exchequer of Chester are listed among the Ministers' Accounts (List No. V.) of the county of Chester. The Inquisitions post Mortem and ad quod damnum (Edward III. to Charles I.) are indexed in the 25th report. The judicial records consist of Pleas in the Exchequer, a court of equity. Its records are Bills and Answers (Henry VIII. to George IV.), calendared in the 25th Report up to Philip and Mary; and Decrees and Orders. The court of the justices of Chester was at common law; its Plea Rolls (44 Henry III. to 1 William IV.), with a separate series for Flint (from 12 Edward I.) are listed among the Plea Rolls (List No. IV.). The Deeds, Inquisitions and Writs of Dower upon these rolls for the period Henry III. to Henry VIII. are calendared in the 26th~30th Reports without an index. The Assize Rolls for the counties of Chester and Flint and for the

honour of Macclesfield are listed among the other assize rolls (List No. IV.).

Wales. — The following are the principal records of the princi- pality of Wales: Ministers' Accounts and Court Rolls, including those of the principality and of the honours and manors of the Lords Marchers, listed in

Lists Nos. V. and VI. Of the judicial records of the Great Sessions .of Wales, set up by the act 34 & 35 Henry VIII., c. 26, the Plea Rolls are listed in the list of Plea Rolls (No. IV). For an account of the Court of the Marches in Wales, see C. A. Skeel's The Council in the Marches of Wales.

The Duchy and Palatinate of Lancaster.— The duchy of Lancaster comprises all the estates of the duke of Lancaster; the palatinate is limited to the county of Lancaster. The records of the pala tinate, transferred to the Public Record Office from Lancaster castle, related to the county and are either enrolments of writs or of a judicial nature. The records of the duchy, transferred from the office of the duchy at Westminster, include similar records and others dealing with the manorial and financial records of all the estates within and without the county. For the Duchy Records see the detailed list (No. XIV.), where the means of reference to this collection are fully described. Of the Palatinate Records the enrolments of writs are classified as Patent and Close Rolls. The former, a broken series from 5 John of Gaunt to 21 Henry VII., are calendared in the 40th Report; the latter (in 3 rolls, a broken series, 11 Henry IV. to 9 Edward IV.) in the 37th Report; but certain enrolments of the palatinate are among the duchy records. The judicial records of the chancery are not calendared ; but the proceedings by way of appeal from that court to the Duchy Chamber at Westminster are dealt with in the duchy list. Pro- ceedings under common law include Plea Rolls (2 Henry IV. to 1 1 Victoria) listed in the list of Plea Rolls (No. IV.) ; and for criminal proceedings there are palatinate Assize Rolls (Henry VI. to 6 Victoria), of which there is a list in the same place. But certain rolls which were among the Duchy Records will be found apart at pages 139-140 of the same list.

Bishopric of Ely. — The act I & 2 Victoria, c. 94, places the records of this palatinate under the charge of the Master of the Rolls. They have never been removed to the Record Office, but remain at Ely with the episcopal records, where they can be inspected. A valuable descriptive list has been published by Alfred Gibbons for private circulation.

_ Special Collections. — For the classification of the records hitherto described the knowledge preserved of their origin and purpose has been used. There exist, however, masses of records where this path is now inaccessible; these have been formed by putting together records of a similar nature either in ignorance of their history or without regarding it; the justification of this course of action must be found in the special circumstances of each case. These collections are as follows : —

Ministers' Accounts are the accounts of bailiffs, receivers, and other officers managing estates, including, first, those of the duchy of Lancaster; second, accounts of crown lands filed as vouchers in the King's

Remembrancer's Office; third, accounts of monastic and other lands seized by the crown, or acquired by it by purchase, inheritance or marriage. A list of these accounts has been published by the Record Office (Nos. V. and VIII.) covering the period down to 1485. For the accounts of the duchy of Lancaster a list will be found in the 45th Report, extending to the reign of George III.

Court Rolls are records of the proceedings and profits of manorial and other private courts coming from the same sources as the Ministers' Accounts, and closely connected with them. For a list see Record Office, Lists and Indexes, No. VI.; and for specimens Select Pleas in Manorial Courts, edited for the Selden Society by F. W. Maitland.

Ancient Deeds. — In this collection are placed all documents which appear to have formed part of a title to land, some original royal charters and other analogous records. There are five series, A, B, C, D, and E, distinguished by their former place of custody. Documents too large for the ordinary method of packing have a double letter, e.g. A.A., and to those bearing fine seals the letter S is added, e.g. AS or AAS. There are thus in all fifteen classes. The A classes are derived from the Treasury of Receipt, or Chapter House at Westminster, and are largely monastic; the B classes are from the court of Augmentations; the C classes are chancery deeds, probably deposited as exhibits in suits or for enrolments; the D classes are from the King's Remembrancer's office; and the E classes are from the Land Revenue office. In 1907 five volumes of a descriptive catalogue had been published by the Record Office.

Ancient Correspondence consists of documents which in form are rather of the nature of a letter than a writ or petition. Most of them were found detacHed in the chancery records, but similar documents from other sources have been added. The intro- duction to the Record Office List (No. XV.) contains some account of the formation of the class, and the list gives references to printed collections based upon these documents. Vol. 53 contains letters of the Cely Family and is published (Camden Society, 3rd series, vol. i.).

Ancient Petitions. — The history of the formation of this class

is obscure; an account of it is in the Record Office Index to the class (No. I.); but see also the Introduction to F. W. Maitland's Memoranda de Parliamento (Rolls Series, vol. 98), in which volume a number of these

petitions are printed in full.

Diplomatic Documents. — In the Chapter House at Westminster was a collection of treaties and other documents connected with foreign affairs, and to these have been added other similar docu- ments found there. Of these there is a descriptive list in the 45th and 49th Reports. A collection of so-called Diplomatic Documents from the chancery forms part of the Chancery Miscellanea.

Letters and Papers, Foreign and Domestic, of the Reign of Henry VIII. — This great collection of materials for the reign of Henry VIII. (Calendar of 20 volumes in 30) at present extends to the year 1547, and is intended to contain abstracts of all documents bearing upon that reign in the Record Office, the British Museum and other collections. Record Office documents dealt with in this Calendar have sometimes been left in their original place of custody and sometimes transferred to a series of bound volumes known as Letters and Papers, Henry VIII. References will be found in the Calendar to a previous series of State Papers of the Reign of Henry VIII., printed by a Royal Commission for printing State Papers.

Miscellaneous Books. — The many books and registers preserved in the Record Office will be found described in the Handbook. The following have been printed : —

Exchequer King's Remembrancer Vol. 2. The Red Book of the Exchequer (Rolls Series, No. 99). Vol. 3. Book of Aids. (See Feudal Aids, published by Record

Office.) Vol. 4. Book of Knight's Fees. (See Feudal Aids.) Vols. 5 & 6. Testa de Nevill ; printed by the Record Commission. Vol. 12. Liber Niger Parvus, printed by Thomas Hearne. Vols. 13 & 14. Taxatio Ecclesiastica; printed by the Record Com- mission. Vol. 17. A 16th-century transcript of an abstract of Kirkby's

Quest for certain counties; used in Feudal Aids. Vol. 24. Chartulary of Malmesbury Abbey (Rolls Series, No. 72). Vol. 28. Chartulary of Ramsey Abbey (Rolls Series, No. 79). Vol. 32. The Book of Common Prayer deposited under the Act of

Uniformity. Vols. '35 & 36. Accounts of the voyages of Martin Frobisher (Hakluyt's Voyages).

Exchequer Treasury of Receipt Domesday Book. — Indexes and supplementary matter were printed by the Record Commission. Since then facsimiles of the text for each county have been issued.

Miscellaneous Books. Vols. 16-55. Certificates of Musters. (See Letters and Papers of

the Reign of Henry VIII.) Vol. 69. Extents of Knights' Fees in the Honour of Richmond;

printed in Gale's Registrum Honoris de Richemond. Vol. 87. Abstracts of Placita Coram Rege, &c. ; printed in Ab- breviate Placitorum (Record Commission). Vol- 92. Statutes of the Order of the Garter. Cf. J. Anstis, Register of the Order of the Garter.

Exchequer Augmentation Office Vol. 57. Rentals and Custumals of Battle Abbey (Camden Society,

Series 2, vol. 41). Vols. 179-184. Copies of Leases. Indexed in 49th Report. Vols. 495-515. Inventories of Church Goods. For details of those

printed, see Mely et Bishop, Bibliographie Generate des

Inventaires Imprimis. The following accounts of other collections of records are necessarily less detailed : — ■

Privy Council Office. — The registers of the Privy Council are still preserved in that office, with the exception of a few volumes which have strayed into other places. J. R. Dasent has edited for the Master of the Rolls a series of volumes containing The Acts of the Privy Council, from 1 542 to 1604. The Proceedings and Ordinances of the Privy Council, 10 Rich. II.-33 Henry VIII., edited for the Record Commission by Sir N. Harris Nicolas, are from documents in the Cotton MSS. and from transcripts made by Rymer from documents then at the Pells Office.

India Office. — The records of the India Office are preserved there. Complete printed lists exist for the whole collection, and the following documents have been published : The First Letter Book of the East India Company, edited by Sir G. Birdwood and W. Foster ; Letters received by the East India Company from its Servants in the East, edited by F. C. Danvers and W. Foster (6 vols.). The records in India may be mentioned here. Each presidency and each province keeps its own; and this is the case also with the smaller subdivisions. No printed lists appear to exist for any of the collections. The following volumes have been published : Letters, Despatches and other Papers of the Foreign Department of the Government of India, 1772-85, edited by G. W. Forrest (3 vols.,

Calcutta); Bengal 1756-1757, edited by S. C. Hill (3 vols. 1905); and Old Fort William, edited by C. R. Wilson (3 vols., 1906-7).

Ireland. The Public Record Office of Ireland was established in 1867 by the Act 30 & 31 Vict. c. 70, when the records of the various courts of law, all wills proved in Ireland, and certain financial records, were collected into one building. The State Paper Office remains a separate, though subordinate, department in one of the towers of Dublin Castle, whence the papers are only transferred to the Record Office by special order. The Deputy Keeper of the Irish Record Office publishes yearly reports with appendices. The most important calendar published in these is that of Fiants or warrants for the issue of letters under the Great Seal, Henry VIII. to Elizabeth, contained in Reports 7-9, 11-13, 15-18, with indices for each reign. A calendar of the Deeds of Christ Church, Dublin, is contained in the 20th, 23rd, 24th and 27th Reports. The Wills of the diocese of Dublin, down to the year 1800, are indexed under the names of the testators in the 26th and 30th Reports. The series of Proclamations by the lord lieutenant and council, and by the crown, which is among the records in the Record Tower of Dublin Castle, is catalogued in the 23rd and 24th Reports. Of the financial records very little has been published. In the 33rd Report there is a good account of the Books of the Treasury and A ccounting Departments from the reign of Henry VIII. Scattered entries from the Pipe Rolls (13 Henry III.— 33 Edward I.) are printed in the 33rd and 35th-38th Reports. Before the establishment of the Record Office the Irish Record Commission published a Latin calendar of the Patent and Close Rolls from Henry II. to Henry VII., and an incomplete calendar in English for the years 5-35 Henry VIII. Under the authority of the Master of the Rolls a calendar was published for the period Henry VIII. to Elizabeth, upon which some severe comments will be found in J.T.Gilbert's The History . . . of the Public Records of Ireland.

An English calendar for the reign of James I. was published by the Record Commission; and a calendar for the years 1-8 Charles I., under the authority of the Master of the Rolls. Two large folio volumes entitled Liber Hibernie should here be mentioned. The history and contents of this astounding work can be gathered from its introduction, and from an index to it in the 9th Report. In- quisitions post mortem and on attainder, for the provinces of Leinster and Ulster only, are dealt with in the Record Commission's Inquisi- tionum in officio Rotulorum Cancellarie Hibernie asservatarum Reper- torium. Of strictly judicial records the Record Office has published one volume of an admirable calendar of the Justiciary Rolls (1295-1303).

Scotland.

The records of the kingdom are deposited in several places in Edinburgh. The principal repository is the General Register House, at present governed by the Act 42 & 43 Vict. c. 44. But certain records of the chancery and all

the records of the court of teinds are in separate repositories. A general account of these records is given in M. Livingstone's Guide to the Public Records of Scotland deposited in H.M. General Register House, Edinburgh, with appendices describing those contained in other repositories.

Parliamentary. — The Record Commission of Great Britain published The Acts of the Parliament of Scotland (1 124-1707), a text derived from many sources described in the introductory volume; The Acts of the Lords Auditors of Causes and Complaints (1466-14ˆ94), being the proceedings of the parliamentary committee for hearing petitions; and The Acts of the Lords of Council (1478- 1495), being proceedings of a similar body.

Privy Council. — The register of the Privy Council of Scotland from 1545 is in course of publication at the General Register House.

Exchequer. — The Exchequer Rolls, corresponding to the Great Roll of the English Exchequer, are being printed in full from 1264 at the General Register House; and the accounts of the Treasurer of Scotland from 1473 are being published at the same office.

Chancery. — The enrolments of letters issued under the Great Seal of Scotland are contained in twelve rolls and a series of volumes. The Record Commission printed these registers in full for the period 1306-1424; and the General Register House is continuing the publication in an abridged form.

Court of Chancery. — Only the enrolments of letters under the Great Seal are transferred to the General Register House; the remainder are preserved in the court of chancery. The most important of these are the Retours to Chancery. To these the only printed means of reference is the Inquisitionum ad capellam Domini Regis retornatarum abbreviatio (16th and 17th centuries), published by the Record Commission.

Local Records. To deal with the municipal and local records of Great Britain in any detail is quite impossible in this article. Fortunately the admirable work of C. Gross, entitled The Bibliography of Municipal History (Harvard Historical Studies), contains a complete account of the work done on municipal records up to 1 897 ; while the Report of the Committee appointed to inquire as to the existing arrangements for the collection and custody of local records (1902) affords a complete view of the questions dealt with by it.

Private Collections. — The publications of the Historical Manuscripts Commission are in most cases the only printed means of reference to private muniments. The 17th Report of the Commission contains an index to all the collections of papers so far dealt with by them.

Wills. — Up to the date of the Probate Act (20 & 21 Vict. c. 77) the proving of wills was under ecclesiastical jurisdiction, and the wills themselves were scattered among peculiar courts — courts of the various bishops, and the prerogative court of Canter- bury. By the passing of the act a general registry was established at Somerset House, to which were transferred all the wills of the prerogative court of Canterbury and of many of the other registries. But even at the present time there remains much confusion and uncertainty as to the place of deposit of the wills of any particular court; and for accurate information on this point the inquirer must be referred to the Handbook to the Ancient Courts of Probate and Depositories of Wills, by G. W Marshall.

British Colonies. For the British colonies the most important records, historically speaking, are the Colonial Office papers deposited in the Public Record Office, London ; and those colonies which have published the records relating to their history have usually gone to that source. In New South Wales, however, there is in the Colonial Secretary's office at Sydney a collection of records dating from 1789, which are included in the volumes published by that State Cape Colony possesses records dating from 1652 ; G. McCall Theal, historiographer of the colony, has also published important series of volumes of documents drawn from the Public Record Office and other European sources. Canada has recently cen- tralized its records, of which a large part so far consists of transcripts made in Europe. For an account see E. C. Burnett's List of printed guides to and descriptions of ArcJtives and other repositories of Historical Manuscripts (American Historical Manu- scripts Commission Report, 1897). The Dominion Archivist submits yearly to the Minister for Agriculture a report, in which (in Appendices) are given many lists and accounts of records.

European Countries. In dealing with Great Britain it has seemed desirable to give some account of publications dealing with the contents of the repositories described. In the remainder of the article this will not be attempted. For the most part the books mentioned are in themselves bibliographies and guides, and do not contain even abstracts or descriptions of actual documents. It is scarcely necessary to explain that much of the following information is based on the work of Langlois and Stein.

Austria and Hungary. — The records of Austria-Hungary, Bohemia, and the other states under the same government, are still preserved locally. There are repositories of government records at Vienna, Budapest and

Prague, and ten provincial places of deposit. Even at Vienna there is nothing resembling the English Public Record Office; the Kaiserliches und hbnigliches Haus-, Hof- und Staatsarchiv contains the papers of the imperial family and the records of imperial administration and of that of foreign affairs. Of other departmental papers those at the Ministry of War are the most important. There is no complete inventory of all these records. At Budapest since 1875 have been collected the archives of Hungary, Transylvania, Croatia and the government of Fiume: for an account of the records in this and other Hungarian and Transylvanian repositories see Fr. Zimmermann's Uber Archiv in Ungarn; ein Füihrer durch ungar- landische und siebenburgische Archive.

Belgium. — The records are numerous and valuable. State Records comprise all those of the central governments, :£ the modern kingdom, of the governments preceding it and of the various states such as Brabant, Flanders, Gueldres and Hainault out of which Belgium was formed. They are preserved partly at Brussels as General Records of the Kingdom and partly in provincial repositories. Thus at Ghent are archives of the county of Flanders, at Liege of the principality of that name and of the duchy of Limburg, at Mons of the county of Hainault, at Bruges of the liberty of Bruges and other jurisdictions of eastern Flanders; at Namur, Arlon, Hasselt and Tournai are repositories of less importance: at the same time the repository at Brussels contains many records of the same kind as those in the provincial offices and is the chief one of the country; the collection there has been formed from various collections in Belgium combined with records restored by the Austrian government and other acquisitions. Archives Provinciates, the records of provincial administrations since 1794, are placed in the chief towns of each province: each collection falls into three periods, French (1794-1814), Dutch (1814-1830) and Belgian.

Municipal Archives. — The most important are those of Antwerp, Bruges, Ghent", Malines, Mons, Tournai and Ypres.

The best book of general bibliographical reference for Belgian records is Pirenne's Bibliographie de I'histoire de Belgique.

Denmark. — -At Copenhagen there has been, since 1889, a central Record office (Rigsarchiv) containing all the previously existing

collections of records, and receiving those of the various ministries and offices. There are also repositories there, and at Odense and Viborg, for local records, municipal and others. The central office is publishing a series of inventories of documents in its charge.

France. — The best general work is Les Archives de I'histoire de France, by

Langlois and Stein. The administration of the records is attached to the Ministry of Public Instruction, acting through a commission and inspectors.

Archives Nationales, in the H6tel Soubise at Paris, are divided into three sections, Historique, Administrative et Domaniale and Legislative et Judiciaire, each including subsections distinguished by letters or groups of letters. The classification is by subject, not necessarily by origin or function; but some of the classes, e.g. the archives of the Tresor des Charles, the Parliament of Paris and the Chdtelet, represent real groups of records with a common history.

Archives des Ministeres. — In theory the Archives Nationales should receive all government office records, except those in current use: actually several offices retain their own. Thus the Ministry of Foreign Affairs keeps its archives, divided into Correspondance politique and Memoires et Documents : it also publishes series of Inventaires analytiques des Archives du Minister e des Affaires etrangeres, and Recueils des instructions donnees aux ambassadeurs et ministres de France depuis les traites de Westphalie jusqu'd, la Revolution francaise. The Ministries of War and the Marine likewise possess and administer their own archives.

Archives Departementales. — Each department possesses a special office for the custody of its records, which are in many cases of great importance, consisting partly of the records of the ancient provincial governments, private documents seized at the Revolution, muniments of religious houses, &c, and partly of modern administrative records. A system of uniform classification by subjects has been applied to these, coupled with a rule that documents having a common history and origin are not to be separated; it is understood that the intelligence of the archivists in charge has enabled them to disobey neither of these regulations. For a general view of the arrangement and contents of depart- mental repositories see Etat general par fonds des archives departementales, ancien regime et periode revolutionnaire (1903), and the Inventaires Sommaires for the several departments. For the publication of local societies see Manuel de bibliographie de I'histoire, by Ch. V. Langlois, (1901) p. 385 seq.

Archives Municipales et Communales : the value of these arises largely from their having had an undisturbed history: inventories of most of the collections exist in print. (See Langlois and Stein, op. cit. pp. 278-442.)

Archives Hospitalieres form an important body of records, for the most part undisturbed. For their classification, and a list of the repositories of them, see Langlois and Stein, p. 443 seq. ; the many other places in France where records exist are men- tioned in the same work; note, however, that the archives of the Bastille are now in the Bibliotheque de V Arsenal at Paris.

There are in the English -Public Record Office seventy-three volumes of transcripts from French archives, taken partly from the Archives Nationales (Letters of Henrietta Maria, &c.) and partly from Archives Departementales. The Record Office Calendar of Documents, France, edited by J. H. Round, containing early monastic charters, is based on these.

Germany. — Unfortunately lists of German State archives (Geheimes Archiv) are not published. Repositories are very numerous: for their localities, see the Hand- und Addressbuch der deutschen Archive of C. A. H. Burkhardt (2nd ed., 1887). In "Prussia, besides the central repository at Berlin, there are sixteen provincial ones of importance. The other kingdoms and states forming part of the German empire have each their repository, not always at the capital. Some account of their contents will be found in Langlois and Stein {op. cit.) and in Fr. von Loher's Archivlehre. Grundziige der Geschichte, Aufgaben und Einrichtung unserer Archive : for the publication of State Records see Dahl- mann-Waitz, Quellenkunde zur deutschen _Geschichte; and for Prussian archives in particular R. Koser's Uber den gegenwdrtigen Stand der archivalischen Forschung in Preussen (1900). For the numerous and valuable records of German towns reference may be made to the works already mentioned. Many of the towns, e.g. Cologne, publish volumes drawn from their archives, _ and even include in them documents from other sources. Of special interest to English students is Konstantin Hohlbaum's work upon the Hanse towns. The Record Office has a volume of transcripts from German archives.

Holland.— There is one repository for each of the eleven states. That at the Hague, for south Holland, serves also as a central repository for the whole kingdom. This collection occupies a special building, and includes the records of Foreign Affairs, classed under the countries to which they relate, and certain documents acquired from the collection of Sir Thomas Phillips. There are many printed and manuscript lists, and access to the documents is easy. This is also the case with the other provincial archives, of which the most important are those at Arnheim,

Hertogenbosch, Groningen, Haarlem, Maastricht, Middelburg and Utrecht.

Town archives are for the most part well preserved. Printed inventories generally exist, and in some cases, e.g. at Doesburg, the archives contain information as to the relations between the Hanse and England in the 14th century.

Dutch repositories have no administrative inter-connexion. Each archivist reports yearly to the archivist-in-chief of the kingdom, and since 1878 these Verslagen omtrent Rijks oude Archieven have been printed.

The English Public Record Office has four volumes of transcripts from Dutch archives.

Italy. — The administration of the public records of the kingdom is attached to the Ministry of the Interior, for which office Signor Vazio published (1 883) his Relatione sugli archivi di stato italiani. There are seventeen repositories, representing the ancient divisions of the kingdom. The most important are the following : —

Florence, containing records of the foreign correspondence of the dukes of Tuscany and the Florentine republic. Genoa , records of the republic.

Milan, records of the duchy, in particular the registers called L'Archivio Panigarola. Modena, records of the family of Este.

Naples, in particular the Cancelleria Angioma, records of the Angevin kings of Naples, containing documents relative to their extensive dominions in Provence, Anjou and elsewhere, for a bibliographical account of which see Les Archives Angevines de Naples; etudes sur les registres du Roi Charles I"", by Paul Durrieu. Naples also possesses the important Archivio Farnesiano, mainly records of the duke of Parma, brought there by Charles I. of Bourbon on his accession to the throne of the Two Sicilies in 1735. Palermo, the records of the island of Sicily. Rome, the most important records of the Archivio di Stato are those relating to the papal government which were not transferred to the Vatican in 187 1.

Turin, the archives of the house of Savoy, especially the letters from envoys at foreign courts, a series of very important reports.

Venice, the convent dei Frari contains probably the most interesting collection of records in Italy. Rawdon Brown, G. Cavendish Bentinck, and H. F. Brown have edited many of the principal documents relating to England in the State Papers: Venetian (Record Office), which are still in progress. The Record Office also possesses two hundred and ten volumes of transcripts from Venetian archives, mostly the reports and correspondence of ambassadors, together with Rawdon Brown's large collection of similar materials, mainly originals or early copies (see Report 46). The Vatican. — For the history of the papal archives the work of H. Bresslau, Handbuch der Urkundenlehre fur Deutschland und Italien (Leipzig, 1889), may be consulted. The best English account is contained in an article in the American Historical Review (October 1896), by C. H. Haskins. But certain

of the prefaces to the Record Office Calendar mentioned below may be consulted ; and the description given by Langlois and Stein {op. cit.) is useful. The Vatican archives have been open to .students only since the year 1881. The chief portion of the collection is that called the Archivio Segreto, which may be divided into two heads, the original Archivio Segreto and the archives added to it from Avignon, from the castle of St Angelo and from special offices such as the Consistory, Dataria Apostolica, Rota, Secretaria Brevium, Signatura Gratiae, Penitentiary, and Master of the Ceremonies. The records of the congregations of the Index, the Holy Office and the Propaganda are not usually accessible to students.

Since 1881 the importance of the archives has attracted to Rome many bands of students. Most European governments have arranged for the publication of records dealing with their own countries. The classes of documents that have received most attention are the Regesta, or registers of bulls and briefs, issued by the papal chancery; the Supplicationes , or petitions; and the Nuntiaturae, or despatches received from the nuncios and instruc- tions sent to them. An account of the numerous publications will be found in the works already mentioned. Here it is only possible to mention - the English publications. The Record Office in London has published one volume of Petitions, 1342-1417, and a Calendar from the Regesta, which covers the period 1198-1431. The French government is publishing a complete Calendar of the Regesta up to the end of the 13th century. There are in the English Public Record Office one hundred and sixty-two volumes of transcripts from the Vatican archives arranged in two series.

Norway. — The records of Norway are preserved at Christiania, and include a collection of papers of Christian II., king of Denmark. For the contents of the collection, see Diplomatarium Norvegicum, by Lange and Unger (1849-1891); and Norske Rigsregistranter tildeels i uddrag, dealing with the 16th and 17th centuries.

Portugal.- — Portuguese royal records are in the monastery of Sao Bento at Lisbon. The collection suffered much during the earthquake of 1755. It includes the registers of the Chancery since the 13th century, and a large number of documents subsidiary to them. In addition to this repository there are collections at the various ministries; from the records of the Ministry for Foreign

Affairs, Borges de Castro, and afterwards Judice Biker, published their Colleccao dos Tratados . . . entre a Corona de Portugal e as mais potentias. There are three volumes of transcripts from Portuguese records in the English Public Record Office.

Russia. — The records of the Russian government are distributed in various

repositories in Moscow and St Petersburg. At the former are preserved the records of the foreign relations of Russia down to 1 801; permission to use them can be obtained from the Minister for Foreign Affairs: there are no printed lists, but many in manuscript. At Moscow are also preserved the records of the Ministry of Justice. In vol. xliv. of the Revue historique (1890) there is an article by J.-J. Chemko and L.M. Balffol on Les Archives de Vempire russe a Moscow. The records of government offices at St Petersburg are not open to students. There are minor re positories at various provincial capitals, and the records of the Grand Duchy of Finland are at Helsingfors. There are three volumes of transcripts from Russian records at the English Public Record Office.

Spain. — The nearest approach to a central Record Office for Spain is the Archivo General Central, established by a royal ordin- ance of 1858 at Alcala de Henares, near Madrid. The collection there includes, in addition to the general administrative records of the kingdom, valuable historical matter concerning the Inquisition, the Jesuits, and other subjects. There is also at Madrid a repository known as the A rchivo Historico Nacional, which contains the archives of crown lands and suppressed monasteries, with a printed inventory. The remaining records are distributed locally in separate reposi- tories containing the archives of the old kingdoms. Those of Castile are partly at Simancas and partly at Alcala de Henares. Those of Aragon are at Barcelona in the Palacio de los Condes. Those of Navarre are at Pamplona and difficult of access. The remainder are of small importance.

In addition to these there are two collections requiring notice, the Archivo general de Indias at Seville and the papers of the Con- sulado del Mar at Bilbao.

The English Public Record Office is publishing a Calendar of the papers relating to England in Spanish and other connected archives. The introduction to the first volume, edited by C. Bergenroth, contains a sketch of the records used by him; and the series, under the successive editorship of Bergenroth, Don Pasquale de Gayangos and Major Martin Hume, now extends from the reign of Henry VIII. to the year 1603. The Record Office possesses sixty-five volumes of transcript from Spanish archives.

Sweden. — The archives have not yet been centralized, and large collections exist at the various ministries. The most important records,_ however, are the Royal Archives (Rigsarchivet) , pre- served in the island of Riddarholmen, Stockholm. A great many publications have been based on these: there are for instance an inventory, Middlelanden fran Svenska Rigsarchivet ; a work bearing generally on Scandinavian history, Handlingar rbrande Scandin- naviens historia ; and the Diplomatarium

Suecicum, which is still in progress. The English Record Office has seven volumes of transcripts from the Stockholm archives, with a report.

Private collections are numerous and valuable, and a society for exploring and publishing such records is supported by the state.

Switzerland. — The Swiss records are of two kinds : records of the confederation, and records of the several cantons. The first are in the Bundes-Archiv at Berne, and date from 1798; see General Repertorium der Aden des helvetischen Centralarchivs in Bern, 171)8-1803, and Schweizerisches Urhunden-Register, by B. Hidber, vol. ii. (Berne, 1877). The Cantonal records, some of them of very early date, are at the chief town of each canton, and for the most part are provided with manuscript inventories. For those of Geneva, see also Les Archives de Geneve, edited by F. Turrettini and A. C. Grivel (1877). For the records of the Abbey of St Gall, see Urkundenbuch der Abtei St Gallen, edited by H. Wartmanne (1863-1882); and for those of Zurich, Urkundenbuch der Stadt und Landschaft Zurich, by P. Schweitzer and E. Escher (1889-1892).

There are in the English Public Record Office five volumes of tran- scripts from the Bundes-Archiv.

United States of America The records, among which transcripts made in England, France, and Holland hold an important place, may be divided into : Federal, kept at Washington; those in private collections; and State Records at the various state capitals. The publication and care of all these are often the work of private bodies subsidized or recognized by government. Thus, although Federal archives are now centralized under the charge of the head of the division of Manuscripts in the Library of Congress, which office is acquiring important collections of the papers of former presidents, and may also have transferred to it departmental records not in current use, publication of guides is the concern of the historical section of the Carnegie Institution and of the Archives Commission of the Historical Association. The same association explores private collections through its Histor- ical Manuscripts Commission; and numerous societies publish state records. Some states, however, have themselves published American and European documents relating to their history; and mention must be made of the large series of American Archives and State Papeis published from 1832 onwards by Congress.

The best guide for Federal records is the work of Leland and Valentine; for

a general bibliographical work of reference see E. C. Burnett's List of Printed Guides . . . (Historical MSS. Commission Report, 1897).

EXTRAVAGANTIA

In various ways records are apt to wander from their proper custody and to lose their legal character. But in spite of this loss the historian is bound to pursue them either into the hands of private collectors or on to the shelves of some museum. No attempt can be made to discuss private collections or the manuscripts of foreign libraries. Even among English libraries it must be sufficient to mention the British Museum as the principal destination of wandering records. Of the collections in that library the most important to the student of records are the Cottonian, the Harleian and the Lansdowne, all catalogued by the Record Commission; the Additional, catalogued from time to time as fresh matter accrues; the Egerton, catalogued with the Additional; the Sloane and the Stowe, both catalogued^ No distinction is made between documents that have been technically " records " and others. The whole collection is divided technically into Manuscripts, by which are meant volumes, and Charters and Rolls, meaning de- tached documents. To the latter class an Index locorum, compiled by H. F. Ellis and F. B. Bickley, has been printed. (C. G. Cr.)

RECORDE, ROBERT (c. 1510-1558), Welsh physician and mathematician, was descended from a respectable family of Tenby in Wales. He entered the university of Oxford about 1525, and was elected fellow of All Souls' College in 1531. Having adopted medicine as a profession, he went to Cambridge, where he took the degree of M.D. in 1545. He afterwards returned to Oxford, where he publicly taught mathematics, as he had done prior to his going to Cambridge. It appears that he afterwards went to London, and acted as physician to Edward VI. and to Queen Mary, to whom some of his books are dedicated. He died in the King's Bench prison, Southwark, where he was con- fined for debt, in 1558.

Recorde published several works upon mathematical subjects, chiefly in the form of dialogue between master and scholar, viz. : — The Grounde of Aries, teachinge the Worke and Practise, of Arith- meticke, both in whole numbers and fractions (1540) ; The Pathway to Knowledge, containing the First Principles of Geometry . . . bothe for the use of Instrumentes Geometricall and Astronomicall, and also for Projection of Plattes (London, 1551); The Castle of Know- ledge, containing the Explication of the Sphere both Celestiall and Materiall, &c. (London, 1556); The Whetstone of Witte, which is the second part of Arithmetike, containing the Extraction of Rootes, the Cossike Practice, with the Rules of Equation, and the Woorkes of Surde Numbers (London, 1557). This was the first English

book on algebra. He wrote also a medical work, The Urinal of Physic (1548), frequently reprinted. Sherburne states that Recorde also published Cosmographiae isagoge, and that he wrote a book De Arte faciendi Horologium and another De Usu Globorum et de Statu temporum. Recorde's chief contributions to the progress of algebra were in the way of systematizing its notation (see Algebra, History) .

RECORDER, in its original sense, one who sets down or records. Hence applied to a person with legal knowledge who was appointed by the mayor and aldermen to " record " or keep in mind the proceedings of their court, as well as the customs of the city. The word is now chiefly used of the principal legal officer of a city or borough having a separate court of quarter sessions. He must be a barrister of five years' standing, appointed by the crown and holding office during good behaviour, and receiving " such yearly salary, not exceeding that stated in the petition on which the grant of a separate court of quarter sessions was made," as the sovereign directs (Municipal Corporations Act 1882, s. 163). The re- corder holds, once in every quarter of a year, or oftener, if he thinks fit, a court of quarter sessions in and for the borough. He is sole judge of the court, " having cognizance of all crimes, offences, and matters cognizable by courts of quarter sessions for counties in England," except that he may not allow or levy any borough rate, or grant licences (s. 165). He is not eligible to serve in parliament for the borough, or to be an alderman or councillor, or stipendiary magistrate for the borough, though he may be revising barrister and is eligible to serve in Parliament except for the borough. He may be appointed recorder for two or more boroughs conjointly. He may, in case of sickness or unavoidable absence, appoint in writing a barrister of five years' standing to act as deputy

recorder for him. A recorder is ex officio a justice for the borough.

The recorder of London is judge of the lord mayor 's court, and one of the commissioners of the central criminal court. His salary is £4000 a year. He is appointed by the lord mayor and aldermen, but by the Local Government Act 1888, s. 42, sub-s. 14, after the vacancy next after the beginning of the act, no recorder may exercise any judicial function unless he is appointed by the sovereign to exercise such function. See Quarter Sessions, Court of.

RECORDER, Fipple Flute or English Flute (Fr. flute- A-bec, flute douce, flute anglaise or flute a neuf trous: Ger. Block- or Plockflote, Schnabelflole, Langflote; Ital. flauto dolce, flauto diritto), a medieval flute, blown by means of a whistle mouthpiece and held vertically in front of the performer like a clarinet. The recorder only survives in the now almost obsolete flageolet and in the so-called penny-whistle. The recorder consisted of a wooden tube, which was at first cylindrical or nearly so, but became, as the

instrument developed and im- proved, an inverted cone. The whistle mouthpiece has been traced in almost prehistoric times in Egypt and other Oriental countries. The principle of the whistle mouthpiece is based on that of the simplest flutes without embouchure, like the Egyptian nay, with this modification, that, in order to facilitate the production of sound, the air current, instead of being directed through ambient air to the sharp edge of the tube (or the lateral embouchure in the modern flute), is blown through a chink directly into a narrow channel. This channel is so constructed within the mouthpiece that the stream of air impinges with force against the sharp edge of a lip or fipple cut into the pipe below the channel. This throws the air current into the state of vibration required in order to generate sound-waves in the main column of air within the tube. The inverted cone of the bore has the effect of softening the tone of the recorder still further, earning for it the name of flute douce. Being so easy to play, the recorder always enjoyed great popularity in all countries until the greater possibilities of the transverse flute turned the tide against it. The want of character which dis- tinguishes the timbre of the whistle-flute is due to the paucity of harmonic overtones in the clang. The recorder had seven holes in front and one at the back for the thumb. As long as the tube was made in one piece the lowest hole stopped by the little finger was generally made in duplicate to serve equally well for right- and left-handed players, the unused hole being stopped with wax. Being an open pipe, the recorder could overblow the octave and even the two following harmonics {i.e. the twelfth and second octave). The holes produced the diatonic scale, and by means of harmonics and cross-fingering the second and part of a third octave were obtained.

The recorder is described and figured by Sebastian Virdung, Martin Agricola and Ottmar Luscinius in the 16th century, and by Michael Praetorius and Marin Mersenne in the 17th century. Praetorius mentions eight different sizes ranging from the small flute two octaves above the cornetto to the great bass. The lowest notes of the large flutes were provided with keys enclosed in per- forated wooden or brass cases, which served to protect the mechan- ism, as yet somewhat primitive; the keys usually had double touch pieces to suit right- or left-handed players.

There are at least two fine sets of recorders extant : one is pre- served in the Germanisches Museum at Nuremberg, consisting of eight flutes in a case and dating from the 17th century; the other is the Chester set of four 18th-century instruments, which are fully described and illustrated in a paper by Joseph C Bridge. 1

The recorder has been immortalized by Shakespeare in the famous scene in Hamlet (II. 3), which has been treated from the musical point of view in an excellent and carefully written article by Christopher Welch, the author of

an equally valuable paper, " The Literature of the Recorder." 2

The small whistle-pipe used to accompany the tabor (Fr. galoubet ; Ger. Stamentienpfeiff or Schwegel), which had but three holes, belongs to the same family as the recorder, but from its association with the tabor it acquired distinctive characteristics (see Pipe and Tabor). (K. S.)

1 " The Chester Recorders " in Proc. Mus. Assoc, London, 1901.

2 " Hamlet and the Recorder," ibid., 1902 and 1898.

RECTOR (Lat. for "ruler," "guide," &c, from regere, " rule "), a title given to the bearers of certain ecclesiastical and academical offices. In the Roman empire, after Constan- tine, the title rector was borne by governors of provinces subordinate to the prefects or exarchs. In the middle ages it was given to certain secular officials, e.g. the podestas of some Italian towns, but more especially to the heads of the univer- sities, the representatives and rulers of the universitas magis- Irorum et scholarium, elected usually for a very short time. After the humanistic movement of the Renaissance the style rector was also given to the chief masters of schools containing several classes, and in some parts of Germany {e.g. Saxony, Wiirttemberg) it is still thus used instead of the more modern title of Director. Rector is also still the title of the heads of the Scottish universities (Lord Rector), who are elected for three years, and of the German universities {Rector Magnificus) , in which the office is held for a year by a representative of each faculty in turn. In those German universities where the rectorship is held by the sovereign {Rector Magnificentissimus) , the acting head is known as Prorector. " Rector " is also the title of the heads of Exeter and Lincoln Colleges, Oxford. The heads of all Jesuit colleges are " rectors."

As an ecclesiastical title rector was once loosely used for rulers of the Church generally, whether bishops, abbots or parish priests (see Du Cange, Rectores ecclesiarum) . The Rectores Apostolici Patrimonii were clerics of the Roman Curia charged with the duty of looking after the interests of the patrimony of St Peter. The ecclesiastical title rector, however, became ultimately confined in certain parts of Europe (Poland, Spain and notably England) to the office of a priest having a cure of souls. In its English use it is thus synonymous with " curate" in the sense used in the Prayer Book. In the middle ages a large number of rectories were held by religious houses, which drew the bulk of the tithes and appointed vicars to do the work.

Hence the modern distinction in England between rectors and vicars. A rector is incumbent of a benefice never held under a monastery, and he receives all the tithes; a vicar (i.e. of an ancient benefice) draws only such tithes as were left to the benefice by the religious house which held it. On the suppression of the monasteries the " great tithes " were often bestowed by the crown on laymen, who, as owning the rectorial tithes, were and are known as " lay rectors." It follows that, rectories being usually richer than vicarages, the style of " rector " is in England slightly more dignified than that of " vicar." In the American Protestant Episcopal Church the incumbents of churches are called rectors.

RECUSANT (from Lat. recusare, to refuse), the name, in English history, given in the 16th and 17th centuries to those persons who persisted in refusing to attend the services of the English Church, and particularly to those of the Roman Catholic faith (see Roman- Catholic Church, § English Law).

REDAN, in fortification, a work of V-shape presenting a salient angle towards the expected attack. The gorge (rear) of a redan is open. When unsupported by other works, it has the dis- advantage that its fire is divergent and but few guns can be brought to bear directly towards the front. Further, both its faces are usually open to enfilade. Redans were therefore almost always used in conjunction with other works, one of the most common forms being the " fines of redans " used as field works. These consisted of lengths of plain trenches facing the front, with redans at intervals along the line. In the present day the term redan is loosely applied to works merely possessing saliency, as in the case of the celebrated bastions Nos. 3 and 2 at Sevastopol in 1854-55, usually called the " Redan " and " Little Redan " respectively (see Crimean War). The " Redan " was a large work of irregular outline, generally resembling a redan, but having the salient angle blunted or rounded off and the side faces broken into several minor fronts so as to obtain a field of fire in many directions. (See Forti- fication and Siegecraft.)

RED BANK, a borough of Monmouth county, New Jersey, U.S.A., on an estuary known as Navesink river, at the head of

navigation, about 6 m. W. of the Atlantic Ocean, and about 25 m. S. of New York City. Pop. (1905) 6263; (1910) 7398. Red Bank is served by the Central of New Jersey and the Pennsylvania railways, and by steamboats to New York, and is connected with the neighbouring towns by electric lines. It is a residential suburb of New York City and a summer resort. In the winter ice-boating is a popular amusement, and Red Bank has fish and oyster industries of some importance.

The name Red Bank was applied to this locality as early as 1734, and in 1781 there were several buildings within the limits of the present borough. Red Bank was incorporated as a town in 1870 and became a borough in 1908. Near Red Bank was established in 1843 the North American phalanx, a Fourierite community, with a capital of about $8000 and 112 members, on about 673 acres; it was financially the most successful and the longest lived of the Fourierist phalansteries in America, but broke up in 1855 because of internal dissensions, following a fire which destroyed the mills. 1

REDBREAST, 2 or Robin, perhaps the favourite among English birds because of its pleasing colour, its sagacity and fearlessness of man, and its cheerful song, even in winter. In July and August the hedgerows of the southern counties of England are beset with redbreasts, not in flocks, but each individual keeping its own distance from the next 3 — all, how- ever, on their way to cross the Channel. On the European continent the migration is still more marked, and the redbreast on its autumnal and vernal passages is the object of bird- catchers, since its value as a delicacy has long been recognized. Even those redbreasts which stay in Britain during the winter are subject to a migratory movement. The first sharp frost makes them change their habitation, and a heavy fall of snow drives them towards the homesteads for food. The redbreast exhibits a curious uncertainty of temperament in regard to its nesting habits. At times it will place the utmost confidence in man, and at times show the greatest jealousy. The nest is usually built of moss and dead leaves, with a moderate lining of hair. In this are laid from five to seven white eggs, sprinkled or blotched with light red.

Besides the British Islands, the redbreast (Molacilla rubecula of Linnaeus and the Erithacus rubecula of modern authors) is generally dispersed over the continent of Europe, and is in winter found in the oases of the Sahara. Its eastern limits are not well determined. In northern Persia it is replaced by a nearly allied form, Erithacus hyrcanus, distinguishable by its

1 The borough of Red Bank should be distinguished from a place of the same name in Gloucester county, New Jersey, about 6 m. below Camden, on the Delaware river, nearly opposite the mouth of the Schuylkill river, which was the site of Fort Mercer in the American War of Independence. Fort Mercer, with Fort Mifflin (nearly opposite it on an island in the Delaware), prevented the co-operation of the British navy with the army which had occupied Philadelphia in September. On the 22nd of October Fort Mercer, held by 600 men under Col. Christopher Greene (1737-1781), was unsuccessfully attacked by a force of about 2500 men, mostly Hessians, under Col. Carl Emil Kurt von Donop, the Hessians losing about;-400 men, including Donop, who was mortally wounded. The British

naval force was prevented by the " Pennsylvania navy " under John Hazelwood (c. 1726-1800) from taking part in the attack; two British ships were destroyed; and the fire from the American vessels added to the discomfiture of the Hessians. On the 15th of November Fort Mifflin was destroyed after a five days' bombardment from batteries on the Pennsylvania shore and from British vessels in the rear; and on the 20th Fort Mercer was abandoned before Cornwallis's approach and was destroyed by the British. Philadelphia was then put in touch with Admira) Howe's fleet and with New York City. Near Red Bank a monu- ment to Christopher Greene was erected in 1829.

2 English colonists in distant lands have applied the common nickname of the redbreast to other birds that are not immediately allied to it. The ordinary " robin " of North America is a thrush, Turdus migratorius (see Fieldfare), and one of the bluebirds of the same continent, Sialia sialis, is in ordinary speech the blue "robin"; the Australian and Pacific "robins" of the genus Peiroeca are of doubtful affinity and have not all even the red breast; the Cape " robin " is Cossophya caffra, the Indian " robin " Thamnobia and the New Zealand " robin " Miro.

3 It is a very old saying that Unum arbustum non alit duos eritha- cos — One bush does not harbour two redbreasts.

more ruddy hues, while in northern China and Japan another species, E. akahige, is found of which the sexes differ somewhat in plumage — the cock having a blackish band below his red breast and greyish-black flanks, while the hen closely resembles the familiar British species — but both cock and hen have the tail of chestnut-red. The genus Erithacus, as well as that containing the other birds to which the name " robin " has been applied, with the doubtful exception of Petroeca, belong to the sub-family Turdinae of the thrushes (q.v.).

REDCAR, a watering-place in the Cleveland parliamentary division of the North Riding of Yorkshire, England, 8 m. N.E. of Middlesbrough, on a branch of the North-Eastern railway. Pop. of urban district (including the township of Coatham, iooi) 7695. Its long range of firm sands from Tees mouth to Saltburn, a distance of 10 m., has made it a popular summer resort. Race meetings are held here on Whit Monday and Tuesday, and in August. Redcar is close to the Cleveland iron-working district of which the centre is Middlesbrough, and is in great favour with the large industrial population of that district.

REDDITCH, a town in the eastern parliamentary division of Worcestershire, England, situated on an eminence near the Warwickshire border, 15! m. S. of Birmingham by the Midland railway. Pop. of urban district (1001) 13,493. It is the centre of a district producing needles and fish-hooks. There are also motor-engineering works. The town possesses a literary and scientific institute (1850). In the modern church of St Stephen (1854) are preserved tiles from the former Cistercian abbey of Bordesley, founded in 1138, of which the site may be traced at Bordesley Park, 2 m. N.

REDESDALE, JOHN FREEMAN-MITFORD, Baron (1748- 1830), English lawyer and politician, younger son of John Mitford (d. 1761) and brother of the historian William Mitford, was born in London on the 18th of August 1748. Having become a barrister of the Inner Temple in 1777, he wrote A Treatise on the Pleadings in Suits in the Court of Chancery by English Bill, a work of great value, which has been reprinted several times in England and America. In 1788 Mitford became member of parliament for the borough of Beeralston in Devon, and in 1791 he introduced the important bill for the relief of Roman Catholics, which was passed into law. In 1793 he succeeded Sir John Scott, afterwards Lord Eldon, as solicitor-general for England, becoming attorney-general six years later, when he was returned to parliament as member for East Looe, in Cornwall. In February 1801 Sir John Mitford (as he was now) was chosen speaker of the House of Commons. Exactly a year later, he was appointed lord chancellor of Ireland and was created a peer of the United Kingdom as Baron Redesdale. Being an outspoken opponent of Roman Catholic emancipation, Redesdale was unpopular in Ireland. In February 1806 he was dismissed on the formation of the ministry of Fox and Lord Grenville. Although Redesdale declined to return to official life, he was an active member of the House of Lords both on its political and its judicial sides. In 1813 he secured the passing of acts for the relief of insolvent debtors, and later he was an opponent of the repeal of the Test and Corporation Acts and of other popular measures of reform. Redesdale, who was a fellow of the Royal Society and a member of three commissions on the public records, died on the 16th of January 1830. In 1803 he married Frances (d. 1817), daughter of John, 2nd earl of Egmont. He took the additional name of Freeman in 1809 on succeeding to the estates of Thomas Edwards Freeman.

His only son, John Thomas Freeman Mitford (1805-1886), succeeded to the title. In 1851 he was chosen chairman of committees in the House of Lords, a position which he retained until his death, and in 1877 he was created earl of Redesdale. His chief interest was reserved for ecclesiastical questions, and he won some repute as a Protestant controversialist. He assisted to revive Convocation in 1853; was an active opponent of the

disestablishment of the Irish Church; and engaged in controversy with Cardinal Manning on the subject of com-

munion in both kinds. On his death, on the 2nd of May 1886, his titles became extinct. He wrote Thoughts on English Prosody and Translations from Horace, and Further Thoughts on English Prosody (Oxford, 1859), in addition to various pam- phlets on ecclesiastical topics.

The earl bequeathed his estates to his kinsman, Algernon Bertram Freeman-Mitford (b. 1837), a great-grandson of William Mitford. He had been in the diplomatic service from 1858 to 1873, and had been secretary to the Office of Works from 1874 to 1886. From 1892 to 1895 he was member of parliament for the Stratford-on-Avon division of Warwickshire, and he was created Baron Redesdale in 1902. He was well known for his writings on Japan, Tales of Old Japan (1871), The Attache at Peking (1900), &c.

See O. J. Burke, History of the Lord Chancellors of Ireland (Dublin, 1879); J. R. O'Flanagan, Lives of the Lord Chancellors of Ireland (1870); Sir J. Barrington, Personal Sketches of His Own Times (1869); Sir S. E. Brydges, Autobiography (1834); and C. Abbot, Lord Colchester, Diary and Correspondence (London, 1861).

REDFERN, a municipality of Cumberland county, New South Wales, Australia, adjoining the city of Sydney on the S.S.W. Pop. (1901) 24,282. It is a busy manufacturing centre, having numerous ironworks, coach factories, boot factories, printing works, iron and brass foundries, soap factories and extensive railway works.

REDGRAVE, RICHARD (1804-1888), English artist, was born at Pimlico on the 30th of April 1804, and worked at first as a designer. He became a student in the Royal Academy Schools in 1826, and was elected an Associate in 1840 and an Acade- mician in 1851 (retired, 1882). His " Gulliver on the Farmer's Table " (1837) made his reputation as a painter. He began in 1847 a connexion with the Government Art Schools which lasted for a long term of years, and among other posts he held those of inspector-general of art in the Science and Art Department, and art director of the South Kensington Museum. He was greatly instrumental in the establishment of this institution, and he claimed the credit of having secured the Sheepshanks and Ellison gifts for the nation. He was also surveyor of the royal pictures. He was offered, but declined, a knighthood in 1869. Redgrave was an assiduous painter of landscape and genre; his best pictures being " Country Cousins " (1848) and " The Return of Olivia " (1848), both in the national collection, " The Sempstress " (1844), " Well Spring in the Forest " (1865). He died on the 14th of December

1888.

See the Memoir by F. M. Redgrave, 1891.

REDLANDS, a city of San Bernardino county, in southern California, U.S.A., 67 m. (by rail) E. of Los Angeles. Pop. (1900) 4797; (191°) 10,449. It is served by the Southern Pacific and the Atchison, Topeka & Santa Fe railways and by interurban electric lines. The city lies at an altitude of 1350-1600 ft. at the eastern end of the San Bernardino Valley, surrounded on three sides by mountains. To the east Grayback (11,725 ft.) and San Bernardino (11,600 ft.), to the south-east San Jacinto (10,805 ft.), and to the north-west Cajon Pass (4119 ft.) and San Antonio, of Old Baldy (10,142 ft.), are conspicuous landmarks. The city is a well-known tourist and health resort, with beautiful drives. Canyon Crest Park (Smiley Heights) contains about 300 acres, and Prospect Park 50 acres. The city has the A. K. Smiley Public Library, the gift of A. K. Smiley, and is the seat of the University of Redlands (Baptist; co-educa- tional), incorporated in 1907 and opened in 1909. Redlands is one of the most famous orange-growing and shipping centres of California; it also ships other citrus fruits, olive oil, barley, wheat and stone. Olive oil and jam, marmalade and preserved fruits are manufactured. There are electric power plants in the mountains (three in Mill Creek Canyon and two in Santa Ana Canyon). A settlement called Lugonia was established within the limits of the present city in 1874, but Redlands dates from 1887, when it was settled by people from New England, and was chartered as a city.

REDMOND, JOHN EDWARD (1851-), Irish politician, son of W. A. Redmond, M.P., was bon at Waterford in 1851.*

He was educated at Trinity College, Dublin, and was called to the bar at Gray's Inn in 1886, and subsequently to the Irish bar, though he never practised. He was a clerk in the vote office of the House of Commons before he entered parliament in 1881 as member for New Ross. From 1885 to 1891 he represented North Wexford. As party whip he rendered great service to the Irish members by his thorough grasp of the procedure of the House. At the time of the rupture of the Irish party consequent on the Parnell scandals, Redmond was the most eloquent member of the minority who continued to recognize his leadership, and in 1891 he became the accredited leader of the Parnellites. In 1900 the two Nationalist parties were amalgamated under his leadership. He contested Cork unsuccessfully in 1891, but was elected for Waterford, where he was re-elected in 1906.

(For the political events under his leadership of the Irish parliamentary party up to 1910, see Ireland: History; English History and allied articles.)

REDON, a town of western France, capital of an arrondisse- ment in the department of Ille-et-Vilaine, 45 m. S.S.W. of Rennes by rail. Pop. (1906) 5170. Redon is situated on the right bank of the Vilaine, above the confluence of the Oust and on the canal from Nantes to Brest. The Church of St Sauveur, formerly belonging to an abbey, has a Romanesque central tower, square in form but with rounded angles. A fine tower of the 14th century with a stone spire stands isolated from the church, from which it was separated owing to the destruction of part of the nave by fire in 1782. The choir, with ambulatory and radiating chapels, forms one of the most remarkable examples of 13th-century architecture in Brittany. The abbey has been converted into an ecclesiastical college. Some 16th- century timbered houses have interesting carvings. The industries include the manufacture of emery and polish, agri- cultural implements and boat-building, tanning, brewing and flour-milling. The port is accessible at high tides for vessels of 606 to 700 tons. Redon grew up round a monastery founded in the first half of the 9th century. In the 14th century Jean de Treal, one of the abbots, surrounded the town with walls, of which a remnant is still to be seen.

REDONDA, an island in the British West Indies. It is a dependency of Antigua, and lies 25 m. S.W. of it, in 25° 6′ N. and 61° 35′ W. Pop. (1901) 120. It is a rocky mountain, rising abruptly from the sea to a height of 1000 ft., and has an area of 5 sq. m. It is valuable for its phosphate of alumina (discovered in 1865), of which 7000 tons are exported every year to the United States.

REDONDELA, a town of north-western Spain, in the pro- vince of Pontevedra; 7 m. N.E. of Vigo, in a bend of the Vigo estuary, and at the junction of the Tuy-Vigo and Vigo-Ponte- vedra railways. Pop. (1900) 10,843. The river is only acces- sible for small coasting vessels; it is the headquarters of a prosperous fishing industry. In the neighbourhood are ruins of several medieval castles, and the fine hall of the Marquess Vega de Armijo.

REDOUBT (Fr. redoute, from Med. Lat. reduclus, a place of retreat, refuge, reducere, lead back, retire; the intrusive b is due to the O. Fr. redoubter, to fear, Lat. dubitare, to doubt), a term in fortification for a small closed work of plain trace, generally used in conjunction with lines of infantry trenches (see Fortification and Siegecraft). The term ” reduit ” (Fr. reduit). often confused with ” redoubt,” is only used for a keep or interior refuge for the garrison of a larger work, corre- sponding, on a small scale, to the citadel of a fortress.

RED RIVER, the name of two American rivers, one emptying into the Mississippi near its mouth, and the other emptying into Lake Winnipeg.

1. The Red river, sometimes called the Red River of Louisiana, is the southernmost of the large tributaries of the Mississippi. It rises in northern Texas, in the northern part of the Staked Plains, or Llano Estacado, flows E. by S. in Texas, between Texas and Oklahoma, and to Fulton, in south-western Arkansas, there turns S.E. and continues in a general south-easterly direction through Louisiana to the bank of the Mississippi,

where it discharges partly into the Mississippi and partly into the Atchafalaya. Its length is estimated at 1200 m. or more; its drainage basin has an area of at least 90,000 sq. m. ; and its discharge ranges from 3500 cub. ft. to 180,000 cub. ft. per second. It is somewhat saline in its upper course, and in its middle and lower course is laden with a reddish silt from which it takes its name. From an elevation on the Staked Plains of about 2450 ft., the river plunges into a canyon which is about 60 m. long and has nearly perpendicular walls of sandstone and gypsum formation 500 to 800 ft. high. Immediately below the canyon the river spreads out over a broad and sandy bed and flows for about 500 m. through a semi-arid plain. It narrows on entering the alluvial bottom lands, through which it pursues a sluggish and meandering course for the last 600 m. At high stages, from December to June, it is continually shifting its channel in this part of its course, by eroding one bank and making deposits on the other, and as the upper portion is densely wooded the falling trees, unless removed, become an obstruction to navigation. In 1828 the trees which the river had felled formed the great "Red River raft" extending from Loggy Bayou, 65 m. below Shreveport, Louisiana, to Hurricane Bluffs, 27 m. above Shreveport. Congress began in that year to make appropriations for the removal of the raft, and by 1841 Henry M. Shreve had opened a channel. The river was neglected from 1857 to 1872 and another raft, 32 m. in length, formed above Shreveport. A channel was opened through this in 1872-73, and the complete removal of the obstruction a few years later so improved the drainage that a large tract of waste land was reclaimed. In its course through Louisiana the river has built up a flood-plain with silt deposits more rapidly than its tribu- taries, with the result that numerous lakes and bayous have been formed on either side, and Cypress Bayou was so flooded that boats plied between Shreveport, Louisiana and Jefferson, Texas, 45 m. apart; but with the improvement of the river these lakes have become shallow or dry. For the improvement of navigation here not only the removal of snags is necessary, but there must be dredging, closure of outlets, building of levees to narrow and deepen the channel, and revetment works to protect the banks. The cost of these works has been great (up to July 1909 more than $2,360,000 below Fulton, Arkansas, and more than $215,000 above Fulton), but they have rendered the river navigable,

except at very low stages, by vessels drawing 3 ft. of water from its mouth to Fulton, Arkansas, a distance of 508-6 m., and at the highest stages, 1 in March and April, it is navigable to Denison, Texas, 292 m. farther up. The Ouachita and Black (one river), which is the principal tributary of the Red, joins it near its mouth and is navigable at high stages to Arka- delphia, Arkansas; and in 1910 a system of nine locks with movable dams was under construction by the Federal govern- ment for the purpose of securing a channel 6| ft. deep at all stages to a point 10 m. above Camden, Arkansas, a distance of 360 m.

During the Civil War, in March and April 1864, Major-General Nathaniel P. Banks conducted a combined military and naval expedition up the Red river in an attempt to open a Federal highway to Texas, but on the 8th of April the vanguard of his army was repulsed with heavy loss at Sabine Cross-Roads by the Confederates under Lieutenant-General Richard Taylor and the expedition was abandoned; the gunboats commanded by D. D. Porter were held above Alexandria by the lowness of the river, but it was flooded by a hurriedly built dam, and they escaped.

See R. B. Marcy and G. B. McClellan, Exploration of the Red River of Louisiana (Washington, 1853), and the annual Reports of the Chief of Engineers of the U.S. Army.

2. The Red river, commonly called the Red River of the North, rises in the lake region of western Minnesota, not far from the headwaters of the Mississippi, flows north between Minnesota and North Dakota, continues northward through the Canadian province of Manitoba, and discharges into Lake Winnipeg. It has cut a gorge 20-50 ft. deep through clay deposits through-

1 The range between low water and high water at Fulton is 35-65 ft.

out the greater part of its course; it drains a region that is famous for the production of wheat; and much water power has been developed on its tributaries. The United States govern- ment has improved its channel from the international boundary to Breckenridge, Minnesota, a distance of 395-5 m., and occasion- ally the water reaches a height which permits small steamboats to ascend its S.W. branch to Lake Traverse and from there to descend the Minnesota river to the Mississippi.

RED RIVER SETTLEMENT, a Scottish colony founded in 181 1 near the present city of Winnipeg by a philanthropic Scottish nobleman, Lord

Selkirk, who at that time controlled the Hudson's Bay Company. Quarrels soon arose with the French and half-breed employes of the North- West Fur Company, and were fostered by its officials. On June 19, 1816, in a fight between the rivals, Governor Semple of the Hudson's Bay Company and twenty of his twenty-seven attendants were killed, an affair known as the Battle of Seven Oaks. New settlers were sent by Selkirk, and founded the village of Kildonan, now part of Winnipeg. In 1821 the rival companies united, and in 1836 repurchased from Selkirk's heirs all rights to the territory. In 1821 and in 1835 two forts, known as Lower and Upper Fort Garry, were built to command the junction of the Red and Assiniboine rivers, and around them grew up a mixed population of Scots, French and Indians. The purchase in 1869 of the territorial rights of the Company by the Dominion of Canada led to a rebellion, and the setting up of a provisional government under Louis Riel, which was dispersed by a force of British regulars under Colonel (later Lord) Wolseley.

See Canada (History) ; also George Bryce, Remarkable History of the Hudson's Bay Company (1900).

REDRUTH, a market town in the Camborne parliamentary division of Cornwall, England, 17 m. E.N.E. of Penzance, on the Great Western railway. Pop. of urban district (1901) 10,451. It lies high, on the northward slope of the central elevation of the county, with bare rocky moors to the south. It is the chief mining town in Cornwall, and the bulk of the population is engaged in the tin mines or at the numerous tin- streaming works. The parish church of St Uny, of which only the tower is ancient (Perpendicular), stands outside the town to the west, at the foot of a rugged hill named Cam Brea. On the summit of this hill, besides a monument (1836) to Lord de Dunstanville and a small ancient castle, various prehistoric remains are traceable. A museum attached to the science and art schools and a miners' hospital are notable institutions in Redruth. A large quantity of the tin is sold by public auction at the mining exchange, the sales being known as tin-ticketings. There are manufactures of safety fuses, breweries, iron foundries and railway works. Tramways serve the neighbouring mines and the small port of Portreath on the north coast.

RED SEA, a narrow strip of water extending S.S.E. from Suez to the Strait of Bab el-Mandeb in a nearly straight line, and separating the coasts of Arabia from those of Egypt, Nubia and Abyssinia. Its total length is about 1200 m., and its breadth varies from about 250 m. in the southern half to 130 m. in 27° 45′ N., where it divides into two parts, the Gulf of Suez and the Gulf of Akaba, separated from each other by the peninsula of Sinai.

The Gulf of Suez is shallow, and slopes regularly down to the northern

extremity of the Red Sea basin, which has a maximum depth of 640 fathoms, and then over a shoal of 60 fathoms goes down to 1200 fathoms in 22 7′ N. The Gulf of Akaba is separated from the Red Sea by a submarine bank only 70 fathoms from the surface, and in 28 39′ N. and 34° 43′ E. it attains the depth of 700 fathoms. South of the 1 200-fathom depression a ridge rises to 500 fathoms in the latitude of Jidda, and south of this again a similar depres- sion goes down to 1190 fathoms. Throughout this northern part, i.e. to the banks of Suakin and Farsan in 20 N., the 100-fathom line keeps to a belt of coral reef close inshore, but in lower latitudes the shaDow coral region, 300 m. long and 70 to 80 m. across, extends farther and farther seaward, until in the latitude of Hodeda the deep channel (marked by the 100-fathom line) is

Depths.

only 20 m. broad, all the rest of the area being dangerous to navigation, even for small vessels. In the middle of the gradu- ally narrowing channel three depressions are known to exist; soundings in two of these are: n 10 fathoms in 20° N. and 890 fathoms in 16 N., a little to the north of Massawa. To the north-west of the volcanic island of Zebayir the depth is less than 500 fathoms; the bottom of the channel rises to the 100- fathom line at Hanish Island (also volcanic), then shoals to 45 fathoms, and sinks again in about the latitude of Mokha in a narrow channel which curves westward round the island of Perim (depth 170 fathoms), to lose itself in the Indian Ocean. This western channel is 16 m. wide in the Strait of Bab el-Mandeb; the eastern channel of the strait is 2 m. broad and 16 fathoms deep.

*Murray estimates the total area at 158,750 sq. m., and its volume at 67,700 cub. m., giving a mean depth of 375 fathoms. Karstens gives the area at 448,810 sq. kilometres ^^^ (130,424 sq. geographical m.) and the volume at volume 206,901 cub. kilometres (32,413 cub. geographical and mean m.), which gives a mean depth of 252 fathoms. ep * Both these computations, however, were made before the date of the Austrian exploring expeditions (1896-98). Bludau's measurements give the total area draining to the Red Sea at about 255,000 sq. geographical m. Krummel's more recent calculations (see Ocean) give values somewhat higher than those of Karstens.*

The Red Sea is formed by a line of fracture, probably dating from Pliocene times, crossing the centre of a dome of Archean rocks, on both flanks of which, in Egypt and Arabia, p rma- rest Secondary and Tertiary deposits. The granite rocks . forming the core of the dome appear at the surface on the Red Sea coast, at the western end of the transverse line of heights crossing Nejd. Along the line of fracture traces of volcanic activity are

frequent; a group of volcanic islands occurs in 14° N., and on Jebel Teir, farther north, a volcano has only recently become extinct. The margin of the Red Sea itself consists, on the Arabian side, of a strip of low plain backed by ranges of barren hills of coral and sand formation, and here and there by mountains of consider- able height. The greater elevations are for the most part formed of limestones, except in the south, where they are largely volcanic. The coasts of the Gulf of Akaba are steep, with numerous coral reefs on both sides. On the African side there are in the north wide stretches of desert plain, which towards the south rise to elevated tablelands, and ultimately to the mountains of Abyssinia. The shores of the Red Sea are little indented; good harbours are almost wanting in the desert regions of the north, while in the south the chief inlets are at Massawa, and at Kamaran, almost directly opposite. Coral formations are abundant; immense reefs, both barrier and fringing, skirt both coasts, often enclosing wide channels between the reef and the land. The reefs on the eastern side are the more extensive ; they occur in places as much as 25 m. from the land. It has long been known that the whole Red Sea area is undergoing gradual elevation, and much has been done in recent years in investigating the levels of raised beaches found in different localities.

In the northern part, down to almost 19 N., the prevailing winds are north and north-west. The middle region, to I4°-i6° N., has variable winds in an area of low barometric pres- sure, while in the southern Red Sea south-east and east winds prevail. From June to August the north- west wind blows over the entire area; in September it retreats again as far as 16 N., south of which the winds are for a time variable. In the Gulf of Suez the westerly, or " Egyptian," wind occurs frequently during winter, sometimes blowing with violence, and generally accompanied by fog and clouds of dust. Strong north-north-east winds prevail in the Gulf of Akaba during the greater part of the year; they are weakest in April and May, sometimes giving place at that season to southerly breezes. The high temperature and great relative humidity make the summer climate of the Red Sea one of the most disagreeable in the world.

The mean annual temperature of the surface waters near the head is 77° F.; it rises to 8o° in about 22° N., to 84 in 16° N., and drops again to 82 ° at the Strait of Bab el-Mandeb. xempera- Daily variations of temperature are observable to a tojre depth of over 50 fathoms. Temperature is, on the whole, higher near the Arabian than the Egyptian side, but it everywhere diminishes with increase of depth and latitude, down to 380 fathoms from the surface; below this depth a uniform constant temperature of 70-7° F. is observed throughout. In the Gulf of Suez temperature is relatively low, falling rapidly from south to north. The waters of the Gulf of Akaba are warmer towards the Arabian than the Sinai coasts; a uniform temperature of 70-2° is observed at all depths below 270 fathoms.

Meteor- ology.

The salinity of the waters is relatively great, the highest re- corded being 42-7 per mille (Gulf of Suez), and the lowest 362 SaUaltv (Perim harbour). The distribution is, speaking . “””• generally, the opposite to that of temperature; salinity increases from the surface downwards, and from the south north- wards, and it is greater towards the western than the eastern side. This statement holds good for the Gulf of Suez, in which the water is much Salter than in the open sea; but in the Gulf of Akaba the distribution is exceedingly uniform, nowhere differing much from an average of 40-6 per mille.

The movements of the waters are of great irregularity and com- plexity, rendering navigation difficult and dangerous. Two features stand out with special distinctness: the ex- Circula- change of water between the Red Sea and the Indian tion. Ocean, and the tidal streams of the Gulf of Suez.

From the observations of salinity it is inferred that a surface current flows inwards to the Red Sea in the eastern channel of the Strait of Bab el-Mandeb, while a current of very salt water flows outward to the Indian Ocean, through the western channel, at a depth of 50 to 100 fathoms from the surface. In the Gulfs of Suez and Akaba, almost the only part of the Red Sea in which tidal phenomena are well developed, a sharply defined tidal circulation is found. Elsewhere the surface movements at least are controlled by the prevailing winds, which give rise in places to complex ” transverse ” currents, and near the coast are modified by the channels enclosed by the coral reefs. During the prevalence of the north and north-west winds the surface level of the northern part of the Red Sea is depressed by as much as 2 ft. The great evaporation going on from the surface probably causes a slow vertical circulation in the depth, the Salter colder waters sinking, and ultimately escaping to the Indian Ocean. Extensive collections of the deposits forming the bed were made by the expeditions of the Austrian ship ” Pola ” (1896 and 1898). These were analysed by Dr K. Natterer, whose conclusions, however, have been disputed by a number of other investigators. The zoological collections of the ” Pola ” expeditions show that certain well-defined districts are extremely rich in plankton, while others are correspondingly poor; and it appears that the latter occur in districts surrounded by currents of relatively low temperature, while the richer parts are where the movements of water are blocked by irregularities in the coast-line.

Authorities. — A. Issel, Morfologia e genesi del Mar Rosso. Saggip di Paleogeografia, Congresso Geogr. Ital. (Florence, 1899) ; " Die Korallenriffe der Sinai-Halbinsel," Abhandl. Math.phys. Gesell. Wiss., vol. xiv. (Leipzig, 1888); Meteorological Charts of the Red Sea (Meteorological Office, 1895); Report of the Voyage of the Russian Corvette " Vitiaz " (1889); " Berichte der Commis sion fur oceanographische Forschungen," 6th series, 1898 in vol. LXV. of the Denkschriften der K.K. Akademie der Wissenschaften (Vienna) ; also various notes and preliminary reports in the Sitzungsberichte of the Vienna Academy of Sciences; Report of the Voyage of H. M.S. " Challenger," "Oceanic Circulation," p. 30; J. Hann, Klimatologie (1897), vol. iii. p. 76. (H. N. D.)

REDSHANK, the usual name of a bird — the Scolopax calidris of Linnaeus and Totanus calidris of modern authors — so called in English from the colour of the bare part of its legs, which, being also long, are conspicuous as it flies or runs. In suitable localities it is abundant throughout the greater part of Europe and Asia, from Iceland to China, mostly retiring to the south- ward for the winter, though a considerable number remain during that season along the coasts and estuaries of some of the more northern countries. Before the great changes effected by drainage in England it was a common species in many districts, but at the present day there are very few to which it can resort for the purpose of reproduction. The body of the redshank is as big as a snipe's, but its longer neck, wings and legs make it appear a much larger bird. Above, the general colour is greyish-drab, freckled with black, except the lower part of the back and a conspicuous band on each wing, which are white, while the flight-quills are black, thus producing a very har- monious effect. In the breeding season the back and breast are mottled with dark brown, but in winter the latter is white. The nest is generally concealed in a tuft of rushes or grass, a little removed from the wettest parts of the swamp whence the bird gets its sustenance, and contains four eggs, usually of a rather warmly tinted brown with blackish spots or blotches; but no brief description can be given that would point out their differences from the eggs of other birds, more or less akin, among which, those of the lapwing (q.v.) especially, they are taken and find a ready sale.

The name Redshank, prefixed by some epithet as Black, Dusky or Spotted, has also been applied to a larger but allied species —

the Totanus fuscus of ornithologists. This is a much less common bird, and in Great Britain as well as the greater part of Europe it only occurs on its passage to or from its breeding-grounds, which are usually found south of the Arctic Circle, and differ much from those of its congeners — the spot chosen for the nest being nearly always in the midst of forests and, though not in the thickest part of them, often with trees on all sides, generally

where a fire has cleared the undergrowth, and mostly at some distance from water. This peculiar habit was first ascertained by Wolley in Lapland in 1853 and the following year. The breeding-dress this bird assumes is also very remarkable, and seems (as is suggested) to have some correlation with the burnt and blackened surface interspersed with white stones or tufts of lichen on which its nest is made — for the head, neck, shoulders and lower parts are of a deep black, con- trasting vividly with the pure white of the back and rump, while the legs become of an intense crimson. At other times of the year the plumage is very similar to that of the common redshank, and the legs are of the same light orange-red. (A. N.)

REDSTART, a bird well known in Great Britain, in many parts of which it is called firetail — a name of almost the same meaning, since " start " is from the Anglo-Saxon steort, a tail. This beautiful bird, Ruticilla pkoenicurus, returns to England about the middle or towards the end of April, and at once takes up its abode in gardens, orchards and about old buildings, when its curious habit of flirting at nearly every change of position its brightly-coloured tail, together with the pure white forehead, the black throat, and bright bay breast of the cock, renders him conspicuous, even if attention be not drawn by his lively though intermittent song. The hen is much more plainly attired; but the characteristic colouring and action of the tail pertain to her equally as to her mate. The nest is almost always placed in a hole of a tree or building, and contains from five to seven eggs of a delicate greenish blue, occasionally sprinkled with faint red spots. The young on assuming their feathers present a great resemblance to those of the redbreast (q.v.) at the same age; but the red tail, though of duller hue than in the adult, forms even at this early age an easy means of dis- tinguishing them. The redstart breeds regularly in all the counties of England and Wales. It also reaches the extreme north of Scotland; but in Ireland it is very rare. It appears throughout the whole of Europe in summer, and is known to winter in the interior of Africa. Several very nearly allied forms occur in Asia; and one, R. aurorea, in Japan.

A congeneric species which has received the name of black redstart, Ruticilla titys, 1 is very common throughout the greater part of the continent of Europe, where, from its partiality for gardens in towns and villages, it is often better known than the preceding species. It yearly occurs in certain parts of England, chiefly along or near the south coast, and curiously enough during the autumn and winter, since it is in central Europe only a summer visitor, and it has by no means the high northern range of R. pkoenicurus. The males of the black redstart seem to be more than one year in acquiring their full plumage (a rare thing in Passerine birds), and since they have been known to breed in the intermediate stage this fact has led to such birds being accounted a distinct species under the name of R. cairii, thereby perplexing ornithologists for a long while, though

now almost all authorities agree that these birds are, in one sense, immature.

More than a dozen species of the genus Ruticilla have been described, and the greater number of them seem to belong to the Himalayan sub-region or its confines. One very pretty and interesting form is the R. moussieri of Barbary, which allies the redstart to the stone-chats (see Wheatear), and of late some authors have included it in that genus. In an opposite direction the bluethroats, apparently nearer to the redstarts than to any other type, are placed in the genus Cyanecula, containing two or three distinguishable forms: (1) C. suecica, with a bright bay spot in the middle of its clear blue throat, breeding in Scandinavia, Northern Russia and Siberia, and wintering in Abyssinia and India, though rarely appearing in the intermediate countries, to the wonder of all who have studied the migration

1 The orthography of the specific term would seem to be titis (Ann. Nat. History, ser. 4, x. p. 227), a word possibly cognate with the first syllable of titlark and titmouse.

of birds; (2) C. leucocyanea, with a white instead of a red gular spot, a more Western form, ranging from Barbary to Germany and Holland; (3) C. wolfi, with its throat wholly blue — a form of comparatively rare occurrence. The first of these is a not infrequent, though very irregular, visitant to England, while the second has appeared there but seldom, and the third never, so far as is known. The redstarts with their allies mentioned in this article belong to the subfamily Turdinae of the thrushes (q.v.).

In America the name redstart has been bestowed upon a bird which has some curious outward resemblance, both in looks and manners, to that of the Old Country, though the two are in the opinion of some systematists nearly as widely separated from each other as truly Passerine birds well can be. The American redstart is Setophaga ruticilla, belonging to the purely New-World family Mniotiltidae, and to a genus which contains about a dozen species, • onging from Canada (in summer) to Bolivia. (A. N.)

RED WING, a city and the county seat of Goodhue county, Minnesota, U.S.A., on the W. bank of the Mississippi river, near the head of Lake Pepin, about 40 m. S.E. of St Paul. Pop. (1Q05, state census) 8149, 2138 being foreign-born; (1910) 9048. [t is served by the Chicago Great

Western and the Chicago, Milwaukee & St Paul railways. Red Wing is the seat of the Lutheran Ladies' Seminary (1894) and the Red Wing Theological Seminary (Lutheran, 1885), and in the vicinity is the State Training School for Boys and Girls, originally the Minnesota State Reform School. In the city are the Carnegie-Lawther library, a Federal building, a municipal theatre, the T. B. Sheldon Memorial Auditorium, in connexion with which is a School of Music, a Y.M.C. A. building, a City Hospital, St John's Hospital (1902) and an old ladies' home. Red Wing is an important wheat market and shipping point.

In 1695 Le Sueur built a post on Prairie Island, in the Mis- sissippi, about 8 m. above the site of Red Wing, for the purpose, according to Charlevoix, of interposing a barrier between the w'arring Dakotas and Chippewas; and in 1727 Rene Boucher built on the shore of Lake Pepin a fort which, after various vicissitudes, was abandoned in 1753- An Indian village occu- pied the site of Red Wing probably for many years before the arrival of the first whites, two Swiss missionaries, Samuel Denton and Daniel Gavin, who maintained a mission here in 1837-46. In 1848 another mission was established by the American Board. Red Wing (named from an Indian chief) was platted in 1853 and was chartered as a city in 1857.

REDWING (Swed. Rodvinge, Dan. Roddrossel, Ger. Rot- drossel, Du. Koperwiek) , a species of thrush (q.v.), Turdus iliacus, which is an abundant winter visitor to the Bri, ish Islands, "arriving in autumn generally about the same time as the fieldfare (q.v.) does. This bird has its common English name 1 from the sides of its body, its inner wing-coverts and axillaries being of a bright reddish orange, of which colour, however, there is no appearance on the wing itself while the bird is at rest, and not much is ordinarily seen while it is in flight. In other respects it is very like a song-thrush, and indeed in France and some other countries it bears the name mauvis or mavis, often given to that species in some parts of Britain; but a conspicuous white streak over the eye at once affords a ready diagnosis. The redwing breeds in Iceland, in the subalpine and arctic districts of Norway, Sweden and Finland, and thence across Northern Russia and Siberia, becoming scarce to the eastward of the Yenisei, and not extending beyond Lake Baikal. In winter it visits the whole of Europe and North Africa, occa-

1 Many old writers assert that this bird used to be known in England as the "swinepipe"; but, except in books, this name does not seem to survive to the present day. There is no reason, however, to doubt that it was once in vogue, and the only question is how it may have arisen. If it has not been corrupted from the German Weindrossel or some other similar name, it may refer to the soft inward whistle which the bird often utters, resembling the sound of the pipe used by the swineherds of old when collecting the

animals under their charge. Another form of the word (which may, however, be erroneous) is " windpipe." " Whindle " and " wheenerd " have also been given as old English names of this bird (Had. Miscellany, 1st ed., ii. p. 558), and these may be referred to the local German Weindrustle and Winsel.

sionally reaching Madeira, while to the eastward it is found at that season in Persia, and, it is said, at times in the north- western Himalayas and Kohat. Many writers have praised the song of this bird, comparing it with that of the nightingale (q.v.); but herein they seem to have been as much mistaken as in older times was Linnaeus, who according to S. Nilsson (Orn. Suecica, i. 177, note), failed to distinguish in life this species from its commoner congener T. musicus. Its nest and eggs a good deal resemble those of the blackbird, and have none of the special characters which distinguish those of the song- thrush. (A. N.)

REDWITZ, OSKAR, Freiherr von (1823-1891), German poet, was born at Lichtenau, near Ansbach, on the 28th of June 1823. Having studied at the universities of Munich and Erlangen, he was apprenticed to the law in the Bavarian State service (1846-49). He next (1849-50) studied languages and literature at Bonn, and in 1851 was appointed professor of aesthetics and of the history of literature at Vienna. In 1852, however, he gave up this post and retired to his estate of Schellenberg, near Kaiserslautern. The pious sentimentality of his romantic epic Amaranth (1849; 42nd ed., 1898) had already gained him enthusiastic admirers, and this work was followed, in 1850, by Ein Marchen and by Gedichte (1852) and the tragedy Sieglinde (1854). He next settled on his estates near Kronach, and here wrote the tragedy Thomas Morus (1856), the historical dramas Philippine Welser (1859) and Der Zunft- meister von Number g (i860), of which the first two met with great success. Elected member of the Bavarian Second Chamber for the district in which he lived, he removed to Munich in 1862. In 1 868 he published the novel Hermann Stark, deutsches Leben, and in 1871 Das Lied vom neuen deutschen Reich (which contains several hundred patriotic sonnets). In 1872 he took up his residence at Meran, but passed the last years of his life at a sanatorium for nervous disorders near Bayreuth, where he died on the 6th of July 1891.

See R. Prutz, Die deutsche Literatur der Gegenwart (1870), i. pp. 148 ff. ; H. Keiter, Zeitgenossische katholische Dichter Deutsch- lands (1884) ; H. von Volderndorff, Harmlose Plaudereien eines alien Miincheners (1892); M. M. Rabenlechner, 0. von Redwitz' religioser Entwicklungsgang (1897).

REED, ANDREW (1787-1862), English nonconformist divine and philanthropist, was born in London on the 27th of November 1787. He entered Hackney Independent College in 1807 and was ordained minister

of New Road Chapel in 181 1. About 1830 he built the larger Wycliffe Chapel, where he remained until 1861. He visited America on a deputation to the Congregational Churches in 1834 and received the degree of D.D. from Yale. Reed's name is permanently associated with a long list of philanthropic achievements, including the London Orphan Asylum, the Infant Orphan Asylum and the Reedham Orphanage, which he undertook on non-denomi- national lines because the governors of the other institutions had made the Anglican Catechism compulsory. Besides these he originated in 1847 an asylum for idiots at Highgate, after- wards moved to Earlswood in Surrey with a branch at Col- chester, and in 1855 the Royal Hospital for Incurables at Putney. He died on the 25th of February 1862. Besides an account of his visit to America (2 vols., 1834), he compiled a hymn-book (1841), and published some sermons and books of devotion.

His second son, Sir Charles Reed (1819-1881), was a suc- cessful typefounder and a keen supporter of popular education. As a common councillor of the city of London he developed the Guildhall Library of the City of London School. He was elected M.P. for Hackney (1868 and 1874) and for St Ives, Cornwall (1880), and served as chairman of the London School Board (1873-1881) in succession to Lord Lawrence. He was interested in antiquarian research and in philanthropic work, being an associate of George Peabody and an active worker in connexion with the Sunday School Union, the Bible Society, the Religious Tract Society and the London Missionary Society. His eldest son, Charles Edward Baines Reed (1845-1884) was

educated at Trinity College, Cambridge, and became Congre- gational minister at Warminster (1871) and a secretary of the British and Foreign Bible Society. Hu was killed by a fall in Switzerland. Sir Charles Reed's thii 1 son, Talbot Baines Reed (1852-1893), educated at the City of London School, became managing director of his father's firm, and was one of the founders and secretary of the Bibliographical Society. He is best known as the author of popular boys' books.

REED, ISAAC (1742-1807), English Shakespearian editor, son of a baker, was born on New Year's Day, 1742, in London. He was articled to a solicitor, and eventually set up as a con- veyancer at Staple Inn, where he had a considerable practice. His first important work was the Biographia dramatica (2 vols., 1782), consisting of biographies of the dramatists and a descriptive dictionary of their plays. This book, which was an enlargement of David Erskine Baker's Companion to the Play- house (2

vols., 1764), was re-edited (3 vols.) by Stephen Jones in 181 1, and is a valuable authority. The original work by Baker had been based on Gerard Langbaine's Account of the English Dramatick Poets (1691), Giles Jacob's Poetical Register (17 19), Thomas Whincop's "List of all the Dramatic Authors " (printed with his tragedy of Scanderbeg, 1747) and the MSS. of Thomas Coxeter (1 689-1 747), an industrious antiquary who had collected much useful material. Reed's Notitia dramatica (Addit. MSS. 25390-2, British Museum), supplementary to the Biographia, was never published. He revised Dodsley's Collection of Old Plays (1 2 vols., 1 780) . He also re-edited Johnson and Steevens's edition (1773) of Shakespeare. Reed's edition was published in 10 vols. (1785), and he gave great assistance to Steevens in his edition (1793). He was Steevens's literary executor, and in 1803 published another edition (21 vols.) based on Steevens's later collections. This, which is known as the first variorum, was re-issued ten years later. He died on the 5th of January 1807. His valuable library of theatrical literature was catalogued for sale as Bibliotheca Reediana (1807).

See John Nichol's Lit. Anec. of the 18th Century (vol. ii., 1812); and Edward Dowden, Essays, Modern and Elizabethan.

REED, JOSEPH (1741-1785), American politician, was born in Trenton, New Jersey, on the 27th of August 1741. He graduated at Princeton in 1757, studied law under Richard Stockton and, in 1763-65, at the Middle Temple, London, and practised in Trenton from 1765 until his removal to Phila- delphia in 1770. He was president of the second Provincial Congress of Pennsylvania in 1775, was aide-de-camp and military secretary to General Washington in 1775-76, and was adjutant-general with the rank of, colonel in 1776-77. He resigned his commission in the autumn of 1777, and in 1777-78 was a delegate to the Continental Congress. From December 1778 to October 1781 he was president of the state Executive Council. During his administration the proprietary rights of the Penn family were abrogated (1779), and provision was made for the gradual abolition of slavery (1780). During this time Reed led the attack on Benedict Arnold (q.v.) for the latter's administration of Philadelphia. Reed was elected to Congress in 1784, but died in Philadelphia on the 5th of March 1785.

The Life and Correspondence of Joseph Reed (2 vols., Philadelphia, 1874), by his grandson, William B. Reed, is based upon the family papers. It pictures Reed as an heroic patriot and statesman; George Bancroft, on the other hand, in the ninth volume (p. 229) of his History (1866) and in Joseph Reed: an Historical Essay (1867), pictures him as a trimmer of the most pronounced type. Bancroft's principal charge against Reed was based on a passage in Count Donop's diary referring to a Col. Reed protected by the British in 1776. In 1876, however, Mr W. S. Stryker discovered that

the reference in the diary was really to Col. Charles Read (1715— c. 1780). Bancroft withdrew this definite charge in the 1876 edition of his History, in which, however, his tone towards Joseph Reed was unchanged.

Joseph Reed's son, Joseph Reed (1 772-1846), published the Laws of Pennsylvania (5 vols., 1822-24), continuing the work of Charles Smith, published in 18 10-12, which began with the laws of 1700. His grandson, William Bradford Reed (1806-1876), graduated at the university of Pennsylvania

in 1822, was a representative in the Pennsylvania legislature in 1834-35, attorney-general of the state in 1838, and a state senator in 1841. He was professor of American history in the university of Pennsylvania in 1850-56, United States minister to China in 1857-58, and in 1858 negotiated a treaty with China, proclaimed in i860. Besides the biography of his grandfather mentioned above, he published one of Joseph Reed's wife, Life of Esther De Berdt, afterwards Esther Reed

(1853).

W. B. Reed's brother, Henry [Hope] Reed (1808-1854), graduated at the university of Pennsylvania in 1825, practised law in Philadelphia, and was assistant-professor of moral philosophy in the university of Pennsylvania in 1831-34 and professor of English literature and rhetoric there in 1835-54. He assisted Wordsworth in the preparation of an American edition of his poems in 1837, edited in America Christopher Wordsworth's Memoirs of William Wordsworth (1851) and published Lectures on English Literature from Chaucer to Tennyson (1855).

REED, THOMAS BRACKETT (1839-1902), American states- man, was born in Portland, Maine, on the 18th of October 1839. He graduated at Bowdoin College in i860; was acting assistant-paymaster in the U.S. navy from April 1864 to November 1865; and in 1865 was admitted to the bar. He was a member of the Maine House of Representatives in 1868-69 and of the state Senate in 1870, was attorney-general of the state in 1870-72, and was city solicitor of Portland in 1874-77. He was a Republican member of the National House of Representatives from 1877 until 1899; was a member of the Potter Committee to investigate the disputed presi- dential election of 1876, and conducted the examination of Samuel J. Tilden; and he was Speaker of the House in 1889-91, and in 1895-99. He was a " strong " speaker in his control of the proceedings, and he developed an organized committee system, making the majority of the Committee on Rules consist of the speaker and chairman of the committees on ways and means and on appropriations. The " Reed Rules," drawn up by him, William McKinley and J. G. Cannon, were adopted on the 14th of

February 1890; they provided that every member must vote, unless pecuniarily interested in a measure, that members present and not voting may be counted for a quorum, and that no dilatory motion be enter- tained by the speaker. His parliamentary methods were bitterly attacked by his political enemies, who called him " Tsar Reed." He greatly hastened the passage of the McKinley Bill in 1890, and of the Dingley Bill in 1897. His rules and methods of control of legislation were adopted by his successors in the speakership, and t'he power of the Rules Committee was greatly increased under Charles F. Crisp (184 5-1896), Democratic speaker in 1891-1895. After the war with Spain Reed broke with the administration on the issue of imperialism. He resigned his seat in 1899 and practised law in New York City. He died in Washington on the 7th of December 1902. Reed was a remarkable personality, of whom many good stories were told, and opinions varied as to his conduct in the chair; but he was essentially a man of rugged honesty and power, whose death was a loss to American public life.

Reed's Rules were published as a parliamentary manual. He edited with others a Library of Modern Eloquence (10 vols., 1901). See the chapter on Reed in H. B. Fuller's Speakers of the House (Boston, 1909).

REED, a term applied to several distinct species of large, water- loving grasses. The common or water-reed, Phragmites communis (also known as Arundo phragmites) , occurs along the margins of lakes, fens, marshes and placid streams, not only throughout Britain, but widely distributed in arctic and temperate regions. Another very important species in Ammophila arenaria (also known as A . arundinacea or Psamma arenaria) , the sea-reed or marram-grass, a native of the sandy shores of Europe and N. Africa. Both species have been of notable geological import- ance, the former binding the soil and so impeding denudation, and actually converting swamp into dry land, largely by the

aid of its tall (5 to 10 ft.) close set stems. The latter species, of which the branching rootstocks may be traced 30 or even 40 ft., is of still greater importance in holding sand-dunes against the sea, and for this purpose has not only been long protected by law, but has been extensively planted on the coasts of Nor- folk, Holland, Gascony, &c. Other reeds are Calamagroslis (various species), Gynerium argenteum (pampas grass), Deyeuxia, &c, also Arundo Donax, the largest European grass(6 to 12 ft. high), which is abundant in Europe. Reeds have been used from the earliest times in thatching and in other branches of construction, and also for

arrows, the pipes of musical instru- ments, &c. Reed pens are still used in the East. Plants belonging to other orders occasionally share the name, especially the bur- reed (Sparganium) and the reed-mace (Typha), both belonging to the natural order Typhaceae. The bulrushes (Scirpus), belonging to the natural order Cyperaceae, are also to be distinguished.

REEDBUCK (Dutch rietbok), the popular name of a foxy red South African antelope (Cervicapra arundineum) of medium size, with a moderately long bushy tail, a bare gland-patch behind the ear, and in the male rather short horns which bend forwards in a regular curve. There are several other species of allied African antelopes included in the genus Cervicapra to which the name of reedbuck is also applied, one of these ranging as far N. as Abyssinia, and another inhabiting W. Africa.

REED INSTRUMENTS (Fr. instruments a anche; Ger. Blas-instrumente mit Zungen; It. Strumenti a ancia), a class of wind instruments in the tubes of which sound-waves are generated by the vibrations of a reed mouthpiece. Reed instruments fall into two great classes: (1) those blown directly by the breath of the performer, who is thus able in all but a few obsolete instruments to express his emotional feelings in music; (2) those in which the wind supply is obtained by mechanical devices, such as the bag of bagpipe instruments or the bellows of such keyboard instruments as the regal, harmonium and kindred instruments.

Directly-blown reed instruments comprise the section of modern wind instruments known as the "wood wind," with the exception of flute and piccolo; they are classified according to the kind of reed vibrator of which the mouthpiece is composed. There are three kinds of reed mouthpieces: (1) the single or beating reed; (2) the double reed; (3) the free reed, all of which perform the function of sound-producer (see Mouthpiece and Free Reed Vibrator). The reed used consists of a thin tongue or strip of reed, cane or some elastic material, thinned gradually to a delicate edge. It is adapted to a resonating tube in such a manner that when it is at rest the opening at the mouthpiece end of the tube consists only of a very slight aperture or chink, which is periodically opened and closed by the pulsations of the reed when acted upon by the compressed breath of the player. This principle is common to all reed mouthpieces, and the difference in timbre is in a measure due to the manner in which the pulsations are brought about and the degree of elasticity secured.

The double reed consists of two blades of reed or laminae of elastic material tightly bound together by many turns of] waxed silk, so that above the construction the tube has an oval section; below, where it communicates with the main bore of the instru- ment, the tube is strictly cylindrical. The chink here is formed by two thin walls of reed of equal

elasticity (see Oboe, Bassoon). The double reed is common to the members of the oboe family, consisting, besides the oboe, of the cor anglais or tenor, of the fagotto or bassoon, and of the contra fagotto or double bassoon. The double reed mouthpiece is used besides on thesarrusophone family, instruments of brass but classed with the wood wind on account of the mouthpiece and fingering.

The single or beating reed consists of a single blade bevelled at the edge and placed over a table or frame communicating with the main bore of the instrument, against which it beats, causing a series of pulsations. The single reed is common to all the members of the clarinet family, consisting, besides the

clarinet, of the basset-horn or tenor, and of the bass and pedal clarinets; of the batyphone, an early bass clarinet, and of the saxophone, a metal oboe with a beating reed instead of a double reed. The ancient Greek aulos was undoubtedly used with a beating reed during some period of its history.

The free reed is not represented among members of the modern wood wind, and, as adapted to a directly-blown instrument, only finds application in the Chinese cheng, the prototype of the harmonium, and in the mouth organ or harmonica.

The reed in wind instruments produces a peculiar tone quality to which it has given its name; it varies in the three different kinds of mouthpieces without losing the fundamental reedy timbre. In the single reed the impact against the hard wood or vulcanite of the table against which it beats produces a sound harsh and strident in inverse proportion to the degree of elasticity possessed by the vibrating tongue. In the clarinet the reed is carefully and delicately made of cane with due regard to the interdependence of reed and clarinet tube. The strong wooden or metallic beating reeds of the early organ reed pipes must have had an unpleasantly harsh timbre, which won for them in Germany the epithet Schnarrwerk.

In the double reed the two delicately shaped pieces of reed vibrate against each other, producing the somewhat nasal, reedy tone of the oboe family. In the free reed compressed air is the only buffer which the vibrator encounters while swinging through the aperture, alternately closing and reopening it; hence the soft and mellow timbre which it is possible to produce by proper treatment of the free reed. Experience has shown that the best results for the double reed are obtained when it is used in conjunction with a tube of conical bore, whereas the beating reed is heard to greater advantage in instruments with cylindrical bore, one notable exception in practice being, as already mentioned, the saxophone family. The double reed adapted to a conical tube confers upon the latter the

acoustic properties of the open pipe, whose wave-length is equal to that of the tube and which is capable of overblowing the octave and successive harmonics (theoretically). Either a single or a double reed adapted to a cylindrical pipe converts it for all acoustic purposes into a closed pipe, in which the whole wave- length is twice the length of the tube, a node forming at the mouthpiece end. The fundamental note of such a tube will therefore be an octave lower than that of an open pipe of the same length, and it can only overblow the uneven numbers of the harmonic series, such as the third harmonic (or twelfth above the fundamental).

In order to overblow on instruments with reed mouthpieces, greater pressure of breath must be exerted, and the vibrating length of the reed must be decreased by the action of the lips upon it. This is what occurs in instruments of the oboe and clarinet type, which are blown directly from the mouth. There are, however, cases in which the reed is concealed within the instrument out of reach of the lips, either in a capsule, as in the old instruments hautbois de Poitou and cromorne, or else in a socket, as in the chaunter and drones of the bagpipe, or, again, as in the mouthpieces of organ reed pipes. In the last (each of which gives but one fixed note) the vibrating length of the reed tongue is fixed, as is also the pressure of the compressed air supply fed to them. The result in all these cases is similar: no harmonics can be obtained, and therefore the scale of the instrument depends solely on the number of holes and keya provided, whereas, where the lips control the reed, fewer holes are necessary to produce any given compass. The chaunters of bagpipes have double reeds, but the drones are as a rule provided with beating reeds and are of cylindrical bore, a combination which, for the reason explained above, gives them a note an octave deeper in pitch, the length of pipe being equal, than would be the case if the bore were conical. In the musette, in the cornemuse used in concert with the hautbois de Poitou, and in the Neapolitan surdelina (see Bagpipe), both chaunter and drones had double reeds.

The aulos of the ancient Greeks and tibia of the Romans con- sisted in the older instruments of a cylindrical tube of very narrow

bore, which facilitated the production of the harmonics. The aulos, though often erroneously translated flute, was an oboe or clarinet. Writers on musical instruments are not agreed as to which mouthpiece was in use on the aulos; the probability is that both were in use at one time or another, and that the double reed, being the most primitive and also the more adaptable, was the older contrivance. There is no sign of any suitable

attachment for a beating reed on any of the pipes of ancient Greece extant, whereas among the ivory pipes recovered from the ruins of Pompeii there is a fragment which may have been a beak mouth- piece with beating reed similar to that of the modern clarinet.

The ancient Egyptians used the primitive beating reed familiarly known as " squeaker," obtained by making a slight _ lateral slit across a reed pipe or stem of straw, and with the knife splitting back longitudinally until a tongue was raised; the shorter the tongue the quicker the vibration and the higher the pitch. This small beating reed was then sunk some 3 or 4 in. within the main tube of the instrument; some of these reeds have been discovered in tombs by Professor Flinders Petrie. 1 It is certain that the ancient Greeks did not use the reed in this form in the aulos, for classical writers distinctly describe the effect produced on a reed by taking it into the mouth, but it is equally certain that they were acquainted with the principle of the drone.

The history of the keyboard instruments furnishes instances of the early use of reeds. In the modern English church organ the reed work is provided with beating reeds only, but in Germany, for the sake of obtaining the power of expression, a set of free-reed stops is nearly always added. 2 It is probable that some of the early pneumatic and hydraulic organs (see Organ) at the beginning of our era were provided with beating reeds in imitation of the bagpipe chaunter and drones. In the middle ages the regal (q.v.), a small, portative reed-organ fitted with beating reeds, was extremely popular in England and all over the continent of Europe, but more especially in Germany and Italy. (K. S.)

REEF (1) (Du. rif, cf. Ger. Riff, Swed. ref, &c, all from O. Nor. rif, rib), in physical geography, a narrow ridge of rock, shingle or sand culminating at or near the surface of the sea. In a transformed sense the word is used in mining of a vein or lode of gold-bearing quartz; (2) (Du. reef, rif, cf. Ger. Ref, Swed. raf, O. Nor. rif, possibly a transferred sense of rif, rib), a part of a sail which can be rolled or folded up, thus diminishing the amount of canvas spread to the wind. In square sails, " reefs " are taken from the top, in fore-and-aft sails from the foot.

REEL (O.E. hreol, glossed by the Med. Lat. alibrum in A el fries Glossary, c. 1050; the word is of unknown origin; it does not appear in cognate languages, and Celtic forms such as Gaelic ruidhil are from English), a cylinder or apparatus of cylindrical shape on which a thread or line can be wound; e.g. the small wooden cylinder with projecting rims at either end on which sewing cotton or silk is wound for immediate use, the revolving " click-reel " attached to a fishing-rod, and the open revolving framework on which thread is wound as it is spun. The name of the Scottish dance

(Gaelic righil, ruithil) is probably the same word (see Dance). In architecture, an ornamental moulding consisting of spherical-shaped bodies alternating with flat reel-shaped disks placed on edge is known as a "bead and reel" moulding.

REES, THOMAS (17 77-1864), Welsh Nonconformist divine, was born at Gelligron, Glamorgan, and educated at the Pres- byterian College, Carmarthen. He entered the Unitarian ministry in 1807 at Newington Green Chapel, London, removing' to Southwark 1813 and to Stamford Street, Blackfriars, in 1823. He had the degree of LL.D. of Glasgow (1819). He had a great knowledge of the history of anti-trinitarian opinion, especially during the 16th century. His scattered papers, chiefly in the Monthly Repository (1818-22), on such subjects as " Faustus Socinus and Francis David," " The Italian Reforma- tion," " Memoirs of the Socini," are important. Financial troubles drove him to Spain in 1853, and he died in obscurity at Brighton on the 1st of August 1864.

Another Thomas Rees (1815-1885), a native of Pen Pontbren, Carmarthenshire, held pastorates at Aberdare (1840), Llanelly (1842), Cendl, Mon. (1849) and Swansea (1862),

1 An illustration of one of these is given in T. L. Southgate's paper, " The Regal and its Successors," in English Music, 1604- 1904, Music Story Series, 1906, p. 385.

2 The addition dates from the very end of the 18th or the beginning of the 19th century, and is connected with the advent of the harmonium (q.v.).

and became chairman of the Congregational Union of England and Wales, but died just before his term of office was to begin. His History of Protestant Nonconformity in Wales (1861; 2nd ed. 1883) is a sound and judicious piece of work.

REEVE, CLARA (1729-1807), English novelist, daughter of William Reeve, a Suffolk clergyman, was born at Ipswichin 1729. She was an industrious writer, and produced many works in prose and verse, including a history of the Progress of Romance (1785); but her only eminent success was the novel of The Old English Baron (1777), originally published under the title of The Champion of Virtue. In the history of the English novel she stands midway between Walpole and Mrs. Radcliffe. She died at Ipswich on the 3rd of December 1807.

REEVE, HENRY (1813-1895), English publicist, younger son of Henry Reeve, a well-known Whig physician and writer of Norwich, and nephew of Mrs. Sarah Austin, was born at Norwich on the 9th of September 1813. He

was educated at the Norwich grammar school under Edward Valpy. During his holidays he saw a good deal of the young John Stuart Mill. In 1829 he studied at Geneva and mixed in Genevese society, then very brilliant, and including the Sismondis, Huber, Bonstetten, De Candolle, Rossil, Krasinski (his most intimate friend), and Mickiewicz, whose Faris he translated. During a visit to London in 1831 he was introduced to Thackeray and Carlyle, while through the Austins he made the acquaintance of other men of letters. Next year, in Paris, he met Victor Hugo, Cousin, and Scott. He travelled in Italy, sat under Schelling at Munich and under Tieck at Dresden, became in 1835-36 a frequenter of Madame de Circourt's salon, and numbered among his friends Lamartine, Lacordaire, De Vigny, Thiers, Guizot, Montalembert, and De Tocqueville, of whose books, Democratic en Amerique and the Ancien regime, he made standard trans- lations into English. In 1837 he was made clerk of appeal and then registrar to the judicial committee of the Privy Council. From 1840 to 1855 he wrote for The Times, his close touch with men like Guizot, Bunsen, Lord Clarendon, and his own chief at the Privy Council Office, Charles Greville, enabling him to write with authority on foreign policy during the critical period from 1848 to the end of the Crimean War. Upon the promotion of Sir George Cornewall Lewis to the Cabinet early in 1855 Reeve was asked by Longman to edit the April number of the Edinburgh Review, to which his father had been one of the earliest contributors, and in the following July he became the editor. His friendship with the Orleanist leaders in France survived all vicissitudes, but he was appealed to for guidance by successive French ambassadors, and was more than once the medium of private negotiations between the English and French governments. In April 1863 he published what was perhaps the most important of his contributions to the Edin- burgh — a searching review of Kinglake's Crimea; and in 1872 he brought out a selection of his Quarterly and Edinburgh articles on eminent Frenchmen, entitled Royal and Republican France. Three years later appeared the first of three instal- ments (1875, 1885 and 1887) of his edition of the famous Memoirs which Charles Greville had placed in his hands a few hours before his death in 1865. A purist in point of form and style, of the school of Macaulay and Milman, Reeve outlived his literary generation, and became eventually one of the most reactionary of old Whigs. Yet he continued to edit and upon the whole to maintain the reputation of the Edinburgh until his death at his seat of Foxholes, in Hants, on the 21st of October 1895. He had been elected a member of "The Club" in 1861, and was made a D.C.L. by Oxford University in 1869, a C.B. in 1871, and a corresponding member of the French Institute in 1865. A striking panegyric was pronounced upon him by his lifelong friend, the due d'Aumale, before the Academie des Sciences in November 1895.

His Memoirs and Letters (2 vols., with portrait) were edited by Sir J. K. Laughton, in 1898. (T. Se.)

REEVE (O. E. gerefa), an English official who in early times was entrusted with the administration of a division of the country. He was the chief magistrate of a town or district,

and is the ancestor of the sheriff, the shire-reeve. In addition to the sheriff there were several kinds of reeves, and we are told in the body of laws known as the laws of Edward the Confessor that it is " multiplex nomen; greve enim dicitur de scira, de wapentagiis, de hundredis, de burgis, de villis." Thus we hear of port-reeves, burg-reeves, and tun-reeves, while the Anglo- Saxon Chronicle mentions high reeves. It was the tun-reeve or reve of the township who with four other men represented the township in the courts of the hundred and the shire. In free townships he was probably chosen by the inhabitants; in dependent townships by the lord. A little later there were manor reeves, these being elected by the villains; according to Fleta, their duties were to attend to the cultivation of the land, and to see that each villain performed his proper share of service. The reve of Chaucer's Canterbury Tales was doubtless a steward or bailiff, something equivalent to the grieve in Scotland to-day.

In early English the word reeve was sometimes used as a trans- lation for the prefect or governor of Roman and Jewish times. Some authorities have thought that there is some connexion between the Anglo-Saxon gerefa and the German Graf, but Max Muller (Lectures on the Science of Language, 1885) is inclined to doubt this. J. M. Kemble (Saxons in England, 1 876), who goes at length into the history of the reeve, connects the word with rofan or refan, to call aloud, this making him the original of the bannitor, or proclaimer of the court. At the present time the word reeve -is sometimes used to describe a foreman or overseer in a coal mine. It is also used in Canada for the president of a village or town council.

REEVES, JOHN SIMS (1818-1900), English vocalist, was born at Woolwich on the 26th of September 1818, and received his musical education from his father, a musician in the Royal Artillery. At the age of fourteen he had progressed so far as to be appointed organist of North Cray church, and could play the oboe, bassoon, violin, and violoncello. He

seems to have studied medicine for a year, but changed his mind when he gained his adult voice: it was at first a baritone, and he made his earliest

appearance at Newcastle in 1839 in various baritone parts. He studied with Hobbs and T. Cooke, and, his voice having become a tenor, he appeared under Macready's management at Drury Lane (1841-43) in subordinate tenor parts in Purcell's King Arthur, Der Freischiitz, and Acts and Galatea, when Handel's pastoral was mounted on the stage with Stanfield's scenery. Four years were spent in study on the Continent, under Bordogni in Paris and Mazzucato in Milan, and his dibut in Italian opera was made at the Scala as Edgardo in Lucia. He reappeared in London in May 1847 at a benefit concert for Vincent Wallace, and at one of the Ancient Concerts in the following month, his career on the English operatic stage beginning at Drury Lane in December 1847 in Lucia, under the conductorship of Hector Berlioz. In Balfe's Maid of Honour he created the part of Lyonnel in the same season. In 1848 he went to Her Majesty's Theatre, singing in Linda di Chamounix; and in the autumn of that year, at the Norwich Festival, made a great sensation in " The enemy said," from Israel in Egypt, a song in which the finest qualities of his ringing voice could be appreciated. From his first appearance at the Sacred Harmonic Society in the following November he was recognized as the leading English tenor; and in Costa's Eli and Naaman the tenor parts were written for him. His first Handel Festival was that of 1857, and the effect of his ■wonderful declamation in the Crystal Palace was a main attrac- tion of this and of many subsequent festivals. His retirement from public life, at first announced as to take place in 1882, did not actually occur till 1891, when a farewell concert for his benefit was given at the Albert Hall. His savings were invested in an unfortunate speculation, and he was compelled to reappear in public for a number of years. Ke died at Worthing on the 25th of October 1900.

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Lecturer on Construction, Architecture, Sanitation, Quantities, &c, at King's . College, London. Member of Society of Architects. Member of Institute of Junior Engineers.

John Bagnall Bury, D.Litt., D.C.L.

See the biographical article: Bury, J. B.

James Bass Mullinger, M.A.

Lecturer in History, St John's College, Cambridge. Formerly University Lecturer in History and President of the Cambridge Antiquarian Society. Birkbeck Lecturer • in Ecclesiastical History at Trinity College, Cambridge, 1890-1894. Author of History of the University of Cambridge ; The Schools of Charles the Great ; &c.

James David Bourchier, M.A., F.R.G.S.

King's College, Cambridge. Correspondent of The Times in South-Eastern Europe. Commander of the Orders of Prince Danilo of Montenegro and of the Saviour of Greece, and Officer of the Order of St Alexander of Bulgaria.

Rev. Joseph Estlin Carpenter, M.A., D.Litt., D.D., D.Th.

Principal of Manchester College, Oxford. Author of The First Three Gospels, their Origin and Relations; The Bible in the Nineteenth Century; &c.

Sir John Francis Harpin Broadbent, Bart., M.A., M.D., F.R.C.P., M.R.C.S. Physician to Out- Patients, St Mary's Hospital, London; Physician totheHamp- stead General Hospital; Assistant Physician to the London Fever Hospital. Author of Heart Disease and Aneurysm; &c.

James Fitzmaurice-Kelly, Litt.D., F.R.Hist.S.

Gilmour Professor of Spanish Language and Literature, Liverpool University. Norman McColl Lecturer, Cambridge University. Fellow of the British Academy. Member of the Royal Spanish Academy. Knight Commander of the Order of Alphonso XII. Author of A History of Spanish Literature; &c.

James Fullarton Muirhead, LL.D.

Editor of many of Baedeker's Guide Books. Author of America, the Land of Contrasts.

John Forbes White, M.A., LL.D. (d. 1904).

Joint-author of the Life and Art of G. P. Chalmers, R.S.A. ; &c.

His Eminence Cardinal James Gibbons. See the biographical article :

Gibbons, James.

(Ricci, Matteo; Rubruquis, William of {in part). Ritual Murder; Sabbatai Sebi; Sabbation; L Sachs, Michael.

Rhaetic.

< Renaissance. -I Rochet.

Roofs.

Roman Empire, Later.

Richard of Cirencester.

Joseph G. Horner, A.M.I.Mech.E.

Author of Plating and Boiler Making ; Practical Metal Turning ; &c.

John Henry Arthur Hart, M.A.

Fellow, Theological Lecturer and Librarian, St John's College, Cambridge.

John Henry Middleton, M.A., Litt.D., F.S.A., D.C.L. (1846-1896).

Slade Professor of Fine Art in the University of Cambridge, 1886-1895. Director of the Fitzwilliam Museum, Cambridge, 1 889-1 892. Art Director of the South Kensington Museum, 1 892-1 896. Author of The Engraved Gems of Classical Times; Illuminated Manuscripts in Classical and Mediaeval Times.

John Horace Round, M.A., LL.D.

Balliol College, Oxford. Author of Feudal England ; Studies in Peerage and Family History; Peerage and Pedigree.

\ Ristitch, Jovan. -j Religion. 1 Rheumatism.

Ruiz, Juan.

Rhine (in part).

-I Rembrandt (in part).

/Roman Catholic Church:

1 United States.

J Rolling-mill.

-! Sadducees.

Rietsehel, Ernst;

Ring (in part) ;

Rome: The Ancient City (in

part); and Christian Rome

(in part) ; Round Towers.

Register.

J. L. W.

J. H. R.* James Harvey Robinson, A.M., Ph.D. f

Professor of History, Columbia University, New York. Author of Petrarch, the\ Reformation, The. First Modern Scholar ; History of Western Europe ; &c. I

J. HI. R. John Holland Rose, M.A., Litt.D. f

Christ's College, Cambridge. Lecturer on Modern History to the Cambridge J Reichstadt Duke of. University Local Lectures Syndicate. Author of Life of Napoleon I. ; Napoleonic 1 '

Studies ; The Development of the European Nations ; The Life of Pitt ; &c. L

J. H. V. C. John Henry Verrinder Crowe. r

Lieut.-Colonel, Royal Artillery. Commandant of the Royal Military College of RusSO-Turkish War* Canada. Formerly Chief Instructor in Military Topography and Military History \ i o _ o\ and Tactics at the Royal Military Academy, Woolwich. Author of Epitome of the v. I °77 _ 7"A Russo-Turkish War, 1877-78; &c. (•

J. J. L.* Rev. John James Lias, M.A. f

Chancellor of Llandaff Cathedral. Formerly Hulsean Lecturer in Divinity and . Lady Margaret Preacher, University of Cambridge.

Author of Miracles, Science 1 and Prayer ; &c. L

J. J. T. Sir Joseph John Thomson, D.Sc., LL.D., Ph.D., F.R.S.

Cavendish Professor of Experimental Physics and Fellow of Trinity College, Cam- bridge. President of the British Association, 1909-1910. Author of A Treatise on ■ the Motion of Vortex Rings; Application of Dynamics to Physics and Chemistry; Recent Researches in Electricity and Magnetism ; &c.

Reuseh, Franz H.

Rontgen Rays.

Jessie Laidlay Weston. f Round T h]p Th

Author of Arthurian Romances unrepresented in Malory. ˆnounu lauie, ine.

J. Mt. James Mofeatt, M.A., D.D.

Minister of the United Free Church of Scotland. Jowett Lecturer, London, 1907. -j Romans, Epistle to the. Author of Historical New Testament ; &c. [

J. S. P. John Smith Flett, D.Sc, F.G.S. f

PetYographer to the Geological Survey. Formerly Lecturer on Petrology in Edin- J Rhvolite burgh University. Neill Medallist of the Royal Society of Edinburgh. Bigsby] Medallist of the Geological Society of London. I.

J. S. H. John Scott Haldane, M.A. , M.D., LL.D., F.R.S. r

Fellow of New College, Oxford, and University Reader in Physiology. Metro- Respiratory System: Physio- politan Gas Referee to the Board of Trade. Joint-editor and founder of the Journal s ;_,,., of Hygiene. Author of Blue-books on ” The Causes of Death in Colliery Explo- °

sions “; &c. I

J. S. R. James Smith Reid, M.A., LL.M., Litt.D., LL.D. [ˆ chl ‘ Friedrich W.;

Professor of Ancient History and Fellow and Tutor of Gonville and Caius College, J “Unnken, Da Via; Cambridge. Hon. Fellow, formerly Fellow and Lecturer, of Christ’s College.] RutiliUS, Claudius Editor of

Cicero’s Academica; De Amicitia; &c. I Namatianus.

J. T. Be. John Thomas Bealby. f Riga _(*» part) ;

Joint-author of Stanford’s Europe. Formerly Editor of the Scottish Geographical < Russia: Geography and Magazine.' Translator of Sven Hedin's Through Asia, Central Asia and Tibet; &c. [Statistics (in part).

J. T. S.* James Thomson Shotwell, Ph.D. J” Richelieu, Cardinal;

Professor of History in Columbia University, New York City. \ Sacrilege.

J. W. James Williams, M.A., D.C.L., LL.D. T Roman Catholic Church-

All Souls’ Reader in Roman Law in the University of Oxford, and Fellow of Lincoln 4 M0 ™,. 7* ln0UC ˆ nuren – College. Barrister-at-Law of Lincoln’s Inn. Author of Law of the Universities ; &c. I English Law.

J. Wal.* James Walker, M.A. f

Christ Church, Oxford. Demonstrator in the Clarendon Laboratory. Formerly J Dofrnntinn • n™,/,7„ Pˆ/tW,™ Vice-President of the Physical Society. Author of The Analytical Theory of Light; \ Reftactl0n – DouUe Reaction. &c. I

J. We. Julius Wellhausen, D.D. J «„;„„„ T m,„„„„ to„„»,

See the biographical article: Wellhausen, Julius. ˆKeiSKe, jonann jacoo

J. W. H. John Wesley Hales, M.A.

Emeritus Professor of English Literature at King’s College, London. Hon. Fellow,

formerly Fellow and Tutor, of Christ’s College, Cambridge. Clark Lecturer in -J Robin Hood (in part),

English Literature at Trinity College, Cambridge. Author of Shakespeare Essays

and Notes; Folia Litteraria; &c.

K. S. Kathleen Schlesinger.

Editor of the Portfolio of Musical Archaeology. Author of The

Instruments of the – Orchestra.

L. F. A. , Lawrence F. Abbott. f D ., _. ,

President of The Outlook Company, New York. \ “OOSevelt, Theodore.

L. F. V.-H. Leveson Francis Vernon-Harcourt, M.A., M.Inst.CE. (1839-1907). r

Professor of Civil Engineering at University College, London, 1882-1905. Author J River Engineering of Rivers and Canals ; Harbours and Docks, ; Civil Engineering as applied in Con- 1 struction ; &c. _

L. J. S. Leonard James Spencer, M.A. r

Assistant in Department of Mineralogy, British Museum. Formerly Scholar of J] Sidney Sussex College, Cambridge, and Harkness Scholar. Editor of the Mineral- 1 ogical Magazine. _

L. L. S. Lionel Lancelot Shadwell, M.A. J n – , t .

Barrister-at-Law, Lincoln’s Inn. One of H.M. Commissioners in Lunacy. -ˆ Kegisnauon.

M.A. Matthew Arnold ” f Sainte-Beuve.

See the biographical article: Arnold, Matthew. ˆ

Regal; Rotta; Sackbut.

Rutile.

INITIALS AND HEADINGS OF ARTICLES

XI

M.Cr. H.G.

M. fla. M. H. S.

M. 0. B. C. M.P,*

N. W. T.

0, A.

O.Ba. O.M.*

P. A. A.

P. A. K. P. C. M.

P. Gi.

P. G. K.

P.V. R. A.N.

R. C. J. R. H. C.

Francis Marion Crawford.

See the biographical article: Crawford, F. Marion.

Moses Gaster, Ph.D.

Chief Rabbi of the Sephardic Communities of England. Vice-President, Zionist Congress, 1898, 1899, 1900. Ilchester Lecturer at Oxford on Slavonic and Byzantine . Literature, 1886 and 1891. President, Folk-lore Society of England. Vice- President, Anglo-Jewish Association. Author of History of Rumanian Popular Literature; &c. L

J Rome: The Modem City.

Rumania: Literature.

Marcus Harxog, M.A., D.Sc, F.L.S.

Professor of Zoology, University College, Cork. Author of ” Protozoa,’ bridge Natural History; and papers for various scientific journals.

. „ J Rhizopoda; in Cam- < n … '

[Rotifera.

Marion H. Spielmann, F.S.A.

Formerly Editor of the Magazine of Art. Member of Fine Art Committee of Inter- national Exhibitions of Brussels, Paris, Buenos Aires, Rome and the Franco-British Exhibition, London. Author of History of ” Punch ” ; British Portrait Painting to the Opening of the Nineteenth Century ; Works of G. F. , Watts, R.A . ; British Sculpture and Sculptors of To-day; Henrietta Ronner; &c.

Relief; Repousse; Roubiliac, Louis F.

Maximilian Otto Bismarck Caspari, M.A.

Reader in Ancient History at London University. University, 1 905-1 908.

r Rhodes (in part) ; Lecturer in Greek at Birmingham -i Romanus I.-IV. (Eastern

I Emperors).

Retz, Seigneurs and Dukes of; Rouault, Joachim.

Sacrifice.

Russell, Lord William.

Leon Jacques Maxime Prinet. r

Formerly Archivist to the French National Archives. Auxiliary of the Institute J of France (Academy of Moral and Political Sciences). Author of L 'Industrie du sel 1 en Frenche-Comte; Francois I et le comte de Bourgogne; &c. I

Northcote Whitridge Thomas, M.A. f

Government Anthropologist to Southern Nigeria. Corresponding Member of the J Societe d'Anthropologie de Paris. Author of Thought Transference ; Kinship and 1 Marriage in Australia; &c. I

Osmund Airy, M.A., LL.D. f

H.M. Divisional Inspector of Schools and Inspector of Training Colleges, Board of J Education. Author of Louis XIV. and the English Restoration; Charles II.; &c. 1 Editor of the Lauderdale Papers ; &c. I

Oswald Barron, F.S.A. f

Editor of The Ancestor, 1902-1905. Hon. Genealogist to Standing Council of the-j Honourable Society of the Baronetage. [

Octave Maus, LL.D.

Advocate of the Court of Appeal at Brussels. Director of L'Art Moderne and of the Libre Esthetique. President of the Association of Belgian writers. Officer of the – Legion of Honour. Author of Le Thedtre de

Bayreuth; Aux Ambassadeurs; Malta, Constantinople et la Crimee ; &c.

Philip A. Ashworth, M.A., Doc. Juris.

New College, Oxford. Barrister-at-Law. Translator of H. R. von Gneist's History ■ of the English Constitution.

Prince Peter Alexeivitch Kropotkin.

See the biographical article: Kropotkin, Prince P. A.

Peter Chalmers Mitchell, M.A., F.R.S., F.Z.S., D.Sc, LL.D.

Secretary of the Zoological Society of London. University Demonstrator in Com- parative Anatomy and Assistant to Linacre Professor at Oxford, 1 888-1 89 1 . Author " of Outlines of Biology ; &c.

Peter Giles, M.A., LL.D., Litt.D. r

Fellow and Classical Lecturer of Emmanuel College, Cambridge, and University J e Reader in Comparative Philology. Formerly Secretary of the Cambridge Philological 1 ‘ Society. L

‘Paul George Konody. fu. m i».»jt««j,™rt.

Art Critic of the Observer and the Daily Mail. Formerly Editor of The Artist. \ KemDranai l*» m*). Author of The Art of Walter Crane; Velasquez: Life and Work- &c. [Rubens (in part).

Russell (Family).

Rops, Felicien.

Rhine (in part).

‘ Riga (in part) ; Russia: Geography and Statistics (in part).

Regeneration of Lost Parts; Reproduction: of Animals.

Pasquale Villari.

See the biographical article: Villari, Pasquale.

Reynold Alleyne Nicholson, M.A., Litt.D.

Lecturer in Persian in the University of Cambridge. Sometime Fellow of Trinity College, Cambridge, and Professor of Persian at University College, London. , Author of Selected Poems from the Dlvani Shamsi Tabriz; A Literary History of the Arabs; &c.

Sir Richard Claverhouse Jebb, LL.D., D.C.L.

See the biographical article: Jebb, Sir Richard Claverhouse.

Rev. Robert Henry Charles, M.A., D.D., D.Litt.

Grinfield Lecturer, and Lecturer in Biblical Studies, Oxford. Fellow of Merton College. Fellow of the British Academy. Formerly Professor of Biblical Greek, Trinity College, Dublin. Author of Critical History of the Doctrine of a Future Life; Book of Jubilees ; &c.

J Rimini; Rome: Roman Re- 1 public in the Middle Ages.

Sabians.

{

Rhetoric.

Revelation, Book of.

Xll

INITIALS AND HEADINGS OF ARTICLES

R. J. M

R. L.*

R. N. B.

R. R. M.

R. S. C.

R. W. F. H. S. A. C.

stc.

S. H. V.*

S.N. T. As.

T.

A, I.

T.

Ba.

T.

B. L.

T.

H.*

T.

Wo.

T.

W.-D.

W

. A. B.

C

W. A. P.

Ronald John McNeill, M.A.

Christ Church, Oxford. Barrister-at-Law. Gazette, London.

Formerly Editor of the’SJ James’s

Richmond, Earls and

Dukes of; Richmond and Lennox,

Duchess of; Saeheverell, William.

Reindeer; Rhinoceros(w part) ; Rhytina; River-hog; Rocky Mountain Goat; Rodentia; Roe-buck; Rorqual.

Repnin;

Reuterholm, Baron; Sadolin, Jorgen.

Religion: Primitive Religion; Ritual.

Richard Lydekker,.F.R.S., F.Z.S., F.G.S.

Member of the Staff of the Geological Survey of India, 1 874-1 882. Author of Catalogues of Fossil Mammals, Reptiles and Birds in the British Museum ; The Deer of all Lands ; &c.

Robert Nisbet Bain (d. 1909).

Assistant Librarian, British Museum, 1883-1909. Author of Scandinavia: the Political History of Denmark, Norway and Sweden, 15 13-1900; The First Romanovs, 1613-172$: Slavonic Europe: the Political History of Poland and Russia from 1469 to 1796 ; &c.

Robert Ranulph Marett, M.A. r

Reader in Social Anthropology, Oxford University, and Fellow and Tutor of J Exeter College. Formerly Dean and Sub-Rector of Exeter College. Author of 1 The Threshold of Religion. [

Robert Seymour Conway, M.A., D.Litt. _ r Rome: Ancient History {in

Professor of Latin and Indo-European Philology in the University of Manchester. J part) ; Formerly Professor of Latin in University College, Cardiff, and Fellow of Gonville | Rutuli" Sabellic* and Caius College, Cambridge. Author of The Italic Dialects. _ e a v n – ‘ ‘

Robert William Frederick Harrison. J _ . _ . , _,

Barrister-at-Law, Inner Temple. Assistant Secretary of the Royal Society, London. \ KOvaI society, ine.

Stanley Arthur Cook, M.A

Lecturer in Hebrew and Syriac, and formerly Fellow, Gonville and Caius College, Cambridge. Editor for the Palestine Exploration Fund. Author of Glossary of Aramaic Inscriptions; The Law of Moses and the Code of Hammurabi; Critical Notes on Old Testament History; Religion of Ancient Palestine; &c.

Viscount St Cyres.

See the biographical article: Iddesleigh, 1st Earl of.

Sydney Howard Vines, M.A., D.Sc, F.R.S.

Sherardian Professor of Botany, Oxford University, and Fellow of Magdalen College. Fellow of the University of London. Hon. Fellow, formerly Fellow and – Lecturer, of Christ's College, Cambridge. President of the Linnean Society, 1900- 1904. Author of A Student's Text-Book of Botany; &c.

Ruth, Book of (in part) ; Sabbath (in part).

J Roman Catholic Church (in

I part).

Reproduction: of Plants; Sachs, Julius von.

Simon Newcomb, D.Sc, L.L.D.

See the biographical article : Newcomb, Simon.

(“Refraction: Astronomical \ Refraction.

Thomas Ashby, M.A., D.Litt. (Oxon.).

Director of British School of Archaeology at Rome. Formerly Scholar of Christ Church, Oxford. Craven Fellow, 1897. Conington Prizeman, 1906. Member of. the Imperial German Archaeological Institute. Author of The Classical Topography of the Roman Campagna

Regillus;

Regium; Rovigo;

Rusellae; Ruvo;

St Bernard Passes (in part).

Thomas Allan Ingram, M.A., LL.D. Trinity College, Dublin.

\ Sacrilege:

English Law.

Sir Thomas Barclay. r

Member of the Institute of International Law. Officer of the Legion of Honour. J „ • a i e Author of Problems of International Practice and Diplomacy; &c. M.P. for Black- 1 Ke P nsals ‘ burn, 1910. [_

Thomas Bell Lightfoot, M.Inst.C.E., M.Inst. Mech.E. Author of Preservation of Foods by Cold ; &c.

Thomas Harris, M.D., F.R.C.P.

Formerly Hon. Physician to Manchester Royal Infirmary, and Lecturer on Diseases of the Respiratory Organs at Owens College, Manchester. Author of numerous ” articles on diseases of the respiratory organs.

Thomas Woodhouse.

Head of the Weaving and Textile Designing Department, Technical College, Dundee.

Walter Theodore Watts-Dunton.

See the biographical article : Watts-Dunton, Walter Theodore.

Rev. William Augustus Brevoort Coolidge, M.A., F.R.G.S., Ph.D.

Fellow of Magdalen College, Oxford. Professor of English History, St David's College, Lampeter, 1 880-1 881. Author of Guide du Haut Dauphine; The Range of- the Todt; Guide to Grindelwald; Guide to Switzerland; The Alps in Nature and in History; &c. Editor of the Alpine Journal, 1880-1881 ; &c.

Walter Alison Phillips, M.A.

Formerly Exhibitioner of Merton College and Senior Scholar of St John's College, Oxford. Author of Modern Europe ; &c.

1 Refrigerating.

Respiratory System: Pathology (in part).

Rope and Rope-making; Sacking and Sack Manu- facture; Sailcloth.

Rossetti, Dante Gabriel.

"Referendum and Initiative;

Reschen Scheideck;

Rhine: Swiss Portion;

Rhone; Rorschach;

Rosa, Monte; Rovereto;

St Bernard Passes (in part). ■ Rochet: Church of England,;

Roman Catholic Church (in part) ;

Russia: Government and Ad- ministration.

INITIALS AND HEADINGS OF ARTICLES

xm

W. E. A. A.

W. H. F. W. J. H.*

W. M.-L.

W. M. R. W. P. C. W. P. P. L.

W. R. D.

W. R. K. W. R. M.

W. R. S.

William Edmund Armytage Axon, LL.D.

Formerly Deputy Chief Librarian of the Manchester Free Libraries. On Literary Staff of Manchester Guardian, 1 874-1905. Member of the Gorsedd, with the bardic name of Manceinion. Author of Annals of Manchester; &c.

Sir William H. Flower, F.R.S.

See the biographical article: Flower, Sir W. H.

William James Hughan.

Past S.G.D. of the Grand Lodge of England. of Freemasonry.

i Roscoe, William. -T Rhinoceros (in part).

Author of Origin of the English Rite -j Rosierucianism.

WlLHELM MEYER-LUBKE, Ph.D.

Hofrat of the Austrian Empire. Professor of Romance Philology in the University of Vienna. Author of Grammatik der Romanischen Sprachen ; &c.

William Michael Rossetti.

See the biographical article : Rossetti, Dante G.

William Prideaux Courtney.

See the biographical article: Courtney, Baron.

William Pitt Preble Longfellow.

Fellow of the American Institute of Architects. Editor of the American Architect. Author of Cyclopaedia of Architecture in Italy, Greece and the Levant; &c.

Wyndham Rowland Dunstan, M.A., LL.D., F.R.S., F.C.S.

Director of the Imperial Institute. President of the International

Association of Tropical Agriculture. Member of the Advisory Committee for Tropical Agri- culture, Colonial Office.

Romance Languages.

f Ribera, Giuseppe; I Rosa, Salvator.

fRosslyn, Earl of; I Russell, 1st Earl.

•j Richardson, Henry Hobson.

Rubber.

Rt. Hon. Sir William Rann Kennedy, LL.D.

Lord of Appeal. Hon. Fellow of Pembroke College, Cambridge. Fellow of the ,

British Academy. Judge of King's Bench Division of High Court of Justice, 1892- \ Russell of Killowen, Lord.

1907. I

William Richard Morfill, M.A. (d. 1010).

Formerly Professor of Russian and the other Slavonic Languages in the University I „ . r ., .

„ f rw„_.j r-..„.„. „r .,._ r….„_.._ Institution> Oxford. Author of Russia; 1 Russian Literature.

of Oxford. Curator of the Taylorian Slavonic Literature; &c.

William Robertson Smith, LL.D.

See the biographical article : Smith, William Robertson.

{Reuchlin; Ruth, Book of (in part); Sabbath (in part).

PRINCIPAL UNSIGNED ARTICLES

Reflection of Light.

Regensburg.

Regent.

Reims.

Renfrewshire.

Rennes.

Reporting.

Republic.

Resorcin.

Retainer.

Reunion.

Reuss.

Reynard the Fox.

Rhine Province.

Rhode Island.

Rhodium.

Rhubarb.

Rice.

Richmond (Surrey).

Richmond (Va.).

Rickets.

Riding.

Riesengebirge.

Rinderpest.

Rio de Janeiro.

Rio Grande do Sul (State).

Riot.

Ripon.

Roads and Streets.

Rochester (Kent).

Rochester (N.Y.).

Rodney.

Rodriguez.

Roland, Legend of.

Rome (N.Y.).

Romulus.

Root.

Rosaceae.

Roscommon, Co.

Rose.

Roses, Wars of the.

Ross and Cromarty.

Rostock.

Rothschild.

Rotterdam.

Rouen.

Roulette.

Roussillon.

Roxburghshire.

Rubidium.

Rubinstein.

Rflgen.

Running.

Russo-Japanese War.

Rutebeuf.

Ruthenium.

Rutland.

Ryazan.

Sacramento (Cal.).

Saffron.

Saint Albans.

Saint Andrews.

St Augustine (Fla.).

St Denis.

ENCYCLOPAEDIA BRITANNICA

ELEVENTH EDITION

VOLUME XXIII

REFECTORY (med. Lat. refectorium, from reficere, to refresh), the hall of a monastery, convent, &c, where the religious took their chief meals together. There frequently was a sort of ambo, approached by steps, from which to read the legenda sanctorum, &c, during meals. The refectory was generally situated by the side of the S. cloister, so as to be removed from the church but contiguous to the kitchen; sometimes it was divided down the centre into two aisles, as at Fountains Abbey in England, Mont St Michel in France and at Villiers in Belgium, and into three aisles as in St Mary's, York, and the Bernardines, Paris. The refectory of St Martin-des-Champs in Paris is in two aisles, and is now utilized as the library of the Ecole des Arts et Metiers. Its wall pulpit, with an arcaded staircase in the thickness of the wall, is still in perfect preservation.

REFEREE, a person to whom anything is referred ; an arbitrator. The court of referees in England was a court to which the House of Commons committed the decision of all questions as to the right of

petitioners to be heard in opposition to private bills. As originally constituted the referees consisted of the chairman of ways and means, and other members, the Speaker's counsel and several official referees not members of the House of Commons. In 1903 the appointment of official referees was discontinued. The court now consists of the chairman of ways and means, the deputy chairman and not less than seven other members of the House appointed by the Speaker, and its duty, as defined by a standing order, is to decide upon all petitions against private bills, or against provisional orders or provisional certificates, as to the rights of the petitioners to be heard upon such petitions. In the high court of justice, under the Judicature Act 1873, cases may be sub- mitted to three official referees, for trial, inquiry and report, or .assessment of damages. Inquiry and report may be directed "n any case, trial only by consent of the parties, or in any matter requiring any prolonged examination of documents or accounts, or any scientific or local investigation which cannot be tried in *ie ordinary way.

REFERENDUM and INITIATIVE, two methods by which the wishes of the general body of electors in a constitutional xxm. 1

state may be expressed with regard to proposed legislation. They are developed to the highest extent in Switzerland, and are best exemplified in the Swiss federal and cantonal constitu- tions. By these two methods the sovereign people in Switzerland (whether in the confederation or in one of its cantons) approve or reject the bills and resolutions agreed upon by the legislative authority (Referendum), or compel that authority to introduce bills on certain specified subjects (Initiative) — in other words, exercise the rights of the people as regards their elected repre- sentatives at times other than general elections. The Referendum means " that which is referred " to the sovereign people, and prevailed (up to 1848) in the federal diet, the members of which were bound by instructions, all matters outside which being taken " ad referendum." A similar system obtained previously in the formerly independent confederations of the Grisons and of the Valais, in the former case not merely as between the Three Leagues, and even the bailiwicks of each within its respective league, but also (so far as regards the upper Engadine) the communes making up a bailiwick, though in the Valais the plan prevailed only as between the seven Zehnten or bailiwicks. The Initiative, on the other hand, is the means by which the sovereign people can compel its elected representatives to take into consideration either some specified object or a draft bill relating thereto, the final result of the deliberations of the legislature being subject by a referendum vote to the approval or rejection of the people. These two institutions

therefore enable the sovereign people to control the decisions of the legislature, without having recourse to a dissolution, or waiting for the expiration of its natural term of office.

As might have been expected, both had been adopted by different cantons before they found their way into the federal constitution, which naturally has to take account of the sovereign rights of the cantons of which it is composed. Further, they (at any rate the referendum) were employed in the case of con- stitutional matters relating to cantonal constitutions before being applied to all or certain specified laws and resolutions. Finally, the action of both has been distinctly conservative in the case of the confederation, though to a less marked degree in the case of the cantons.

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REFLECTION OF LIGHT

Two forms of the Referendum should be carefully distin- guished : the facultative or optional (brought into play only on the demand of a fixed number of citizens), and the obligatory or compulsory (which obtains in all cases that lie within its sphere as defined in the constitution). The Initiative exists only in the facultative form, being exercised when a certain number of citizens demand it. Both came into common use during the Liberal reaction in Switzerland after the Paris revolution of July 1830. In 1831 St Gall first adopted the ” facultative referendum ” (then and for some time after called the ” Veto “), and its example was followed by several cantons before 1848. The “obligatory referendum ” appears first in 1852 and 1854 respectively in the Valais and the Grisons, when the older system was reformed, but in its modern form it was first adopted in 1863 by the canton of rural Basel. The Initiative was first adopted in 1845 by Vaud. Of course the cantons with Landsgemeinden, Uri, Unterwalden, Appenzell and Glarus (where the citizens appear in person) possessed both from time immemorial. Excluding these there were at the end of 1907 9j cantons, which had the ” obligatory referendum ” (Aargau, rural Basel, Bern, the Grisons, Schaffhausen, Schwyz, Soleure, Thurgau, the Valais and Zurich), while 7 J cantons possess only the ” facultative referendum ” (Basel town, Geneva, Lucerne, Neuchatel, St Gall, Ticino, Vaud and Zug). Fribourg alone had neither, save an obligatory referendum (like all the rest) as to the revision of the cantonal constitution. As regards the Initiative, all the cantons have it as to the revision of the cantonal constitution; while all but Fribourg have it also as to bills or legislative projects. In the case both of the facultative referendum and of the Initiative each canton fixes the

number of citizens who have a right to exercise this power. The constitution of the Swiss confederation lags behind those of the cantons. It is true that both in 1848 (art. 113) and in 1874 (art. 120) it is provided that a vote on the question whether the constitution shall be revised must take place if either house of the federal legislature or 50,000 qualified voters demand it — of course a popular vote (obligatory referendum) must take place on the finally elaborated project of revision. But as regards bills the case is quite different. The ” facultative referendum ” was not introduced till 1874 (art. 89) and then only as regards all bills and resolutions not being of a pressing nature, 8 cantons or 30,000 qualified voters being entitled to ask for such a popular vote. But the Initiative did not appear in the federal constitution till it was inserted in 1891 (art. 121), and then merely in the case of a partial (not a total) revision of the constitution, if 50,000 qualified voters require it, whether as regards a subject in general or a draft bill, — of course the federal legislature had an Initiative in this matter in 1848 already. The results of the working of these two institutions in federal matters up to the end of 1908 are as follows. Excluding the votes by which the two federal constitutions of 1848 and 1874 were adopted, there have been 30 (10 of them between 1848 and 1874) votes (obligatory referendum) as to amendments of the federal constitution; in 15 cases only (of which only one was before 1874) did the people accept the amendment proposed. In the case of bills there have been 30 votes (very many bills have not been attacked at all), all of course since the facultative referendum was introduced in 1874; in n cases only have the people voted in the affirmative. Finally, with regard to the Initiative, there have been 7 votes, of which two only were in the affirmative. Thus, between 1874 and 1907, of 57 votes 27 only were in the affirmative, while if we include the 10 votes between 1848 and 1874 the figures are respectively 67 and 28, one only having been favourable during that period. The result is to show that the people, voting after mature reflection, are far less radically disposed than has sometimes been imagined.

The method of referendum by itself is also in use in some of the’ states of the American Union (see United States) and in Australia, and under the name of plebiscite has been employed in France; but it is best studied in the Swiss con- stitution.

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Fig. 1.

Authorities.— W. A. B. Coolidge, “The Early History of the Referendum ” (article in the English Historical Review for October 1891); T. Curti, Die schweizerischen Volksrechte, 1848 bis igoo (Bern, 1900) (Fr. trans, by J. Ronjat with additions by the author, Paris, 1905) — Curti’s earlier work, Geschichte d. schweiz. Volks-gesetzgebung (Bern, 1882), is not entirely superseded by his later one; S. Deploige, The Referendum in Switzerland, Engl, trans, with additional notes (London, 1898); N. Droz, “The Referendum in Switzerland ” (article in the Contemporary Review, March 1895); J. M. Vincent, Government in Switzerland, chaps, v. and xiv. (New York and London, 1900). See also, for the United States and generally, the American works on the Referendum by E. P. Ober- holtzer (1893 and 1900). (W. A. B. C.)

REFLECTION OF LIGHT. When a ray of light in a homo- geneous medium falls upon the bounding surface of another medium, part of it is usually turned back or reflected and part is scattered, the remainder traversing or being absorbed by the second medium. The scattered rays (also termed the irregu- larly or diffusely reflected rays) play an important part in rendering objects visible — in fact, without diffuse reflection non-luminous objects would be invisible; they are occasioned by irregularities in the surface, but are governed by the same law as holds for regular reflection. This law is: the incident and reflected rays make equal angles with the normal to the reflecting surface at the point of incidence, and are coplanar with the normal. This is equivalent to saying that the path of the ray is a minimum. 1 In fig. 1 , MN represents the section of a plane mirror; OR is the in- cident ray, RP the reflected ray, and TR the normal at R. Then the law states that the angle of incidence ORT equals the angle of reflection PRT, and that OR, RT and RP are in the same plane.

This natural law is capable of ready experimental proof (a simple one is to take the altitude of a star with a meridian circle, its depression in a horizontal re- flecting surface of mercury and the direction of the nadir), and the most delicate instruments have failed to detect any

divergence from it. Its explanation by the Newtonian corpuscular theory is very simple, for we have only to assume that at the point of impact the perpendicular velocity of a corpuscle is reversed, whilst the horizontal velocity is unchanged (the mirror being assumed horizontal). The wave-theory explanation is more complicated, and in the simple form given by Huygens incomplete. The theory as developed by Fresnel shows that regular reflection is due to a small zone in the neighbourhood of the point R (above), there being destructive interference at all other points on the mirror; this theory also accounts for the polarization of the reflected light when incident at a certain angle (see Polarization or Light). The smoothness or polish of the sur- face largely controls the reflecting power, for, obviously, crests and furrows, if of sufficient magnitude, disturb the phase relations. The permissible deviation from smoothness depends on the wave-length of the light employed: it appears that surfaces smooth to within |th of a wave-length reflect regularly; hence long waves may be regularly reflected by a surface which diffuses short waves. Also the obliquity of the incidence would diminish the effect of any irregularities; this is experi- mentally confirmed by observing the images produced by matt surfaces or by smoked glass at grazing incidence.

We now give some elementary constructions of reflected rays, or, what comes to the same thing, of images formed by mirrors.

1. If O be a luminous point and OR a ray incident at R on the plane mirror MN (fig. 1) to determine the reflected ray and the image of O. If RP be the reflected ray and RT perpendicular

1 This principle of the minimum path, however, only holds for plane and convex surfaces; with concave surfaces it may be a maximum in certain cases.

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to MN, then, by the law of reflection, angle ORT = TRP

or ORM = PRN. Hence draw OQ perpendicular to MN, and

produce it to S, making QS = OQ; join SR and produce to P. It is easily seen that PR and OR are equally in- clined to RT (or MN). A point-eye at P would see a point object at S, i.e. at a distance below the mirror equal to its height above. If the object be a solid, then the images of its cor- ners are formed by taking points at the same distances below as the corners are above the mirror, and joining these points. The eye, however, sees the image per- verted, i.e., in the same relation as the left hand to the F IG – 2 – right. Fig. 2 shows

how an extended object is viewed in a mirror by a natural

eye.

2. If A, B be two parallel plane mirrors and O a luminous point between them (fig. 3) to determine the images of O all the

B images must lie

on the line (pro- duced) PQ passing through and perpendicular to the mirrors. Let OP = p, OQ = g. F Then if O' be

- IG – 3- the image of O

in A, 00′ = 2/>; now O' has an image O* in B, such that 00″ =OQ +QO" =q+q+2p = 2p+2q; similarly O" has an image O'" in A, such that 00'" = 4^+20. In the same way O forms an image Oi in B such that OOi = 2q ; Oi has an image Oh in A, such that 00n = 2p--2q; On has an image Om in B, such that 00m = 2^+42, and so on. Hence there are an infinite number of images at definite distances from the mirrors. This explains the vistas as seen, for example, between two parallel mirrors at the ends of a room.

3. If A, B be two plane mirrors inclined at an angle 0, and inter- secting at C, and O a luminous point between them, determine the position and number of images.

Call arc OA = o, 0B=/3. The image of O in A, i.e. a', is such that Oa' is perpendicular to CA, and Oa' = 2a. Also Ca' = CO; and it is easily seen that all the images lie on a circle of centre C and radius CO. The image a' forms an image a" in B such that Oa" = OB-r-Ba"=|S-|-Ba'=/S-|-OB+Oa' = 2/S+2a = 20. Also a" forms an image a'" in A such that Oa'"=OA-|-Aa' = 2a-|-20. And gener- ally Oa 2n = 2ra0, Oa 2 " +1 = 2n0-|-2a. In the same way it can be shown that the image first formed in B gives foci of the general distances: Ob in = 2nB, Ofc 2n+1 = 2n0-|-2/3. The number of images is limited, for when any one falls on the arc ab between the mirrors produced, it lies

behind both mirrors, and hence no further image is possible. Suppose a” n be the first image to fall on this arc, then arc Oa 2n >OBa, i.e. 2n0>x— a or 2n> (x- a)/0. Similarly if a 2 ”” 1 ” 1 be the first to fall on ab, we obtain 2w+i> (x — a)/0. Hence in both cases the number of images is the integer next greater than (x — a)/$. In the same way it can be shown that the number of images of the 6 series is the integer next greater than (x — /S)/0. If x/0 be an integer, then the number ot images of each series is x/9, for o/0 and 0/0 are proper fractions. But an image of each series coincides; for if x/0 = 2n, we have Oa 2n -|-O6 2n = 2n0-)-2n0 = 2x i.e. a 2 ” and 6 2n coincide; and if x/0 = 2re+i, we have Oa 2n+1 | O& 2 »+ 1 = 4n0+2(a +/3) = (4tt+2) = 2x, i.e. a 2o+1 and 6 2n+1 coincide. Hence the number of images, including the luminous point, is 2x/0. This principle is utilized in the kaleidoscope (q.v.), which produces five images by means of its mirrors inclined at 60° (fig. 4). Fig. 5 shows the seven images formed by mirrors inclined at 45°.

4. To determine the reflection at a spherical surface. Let APB (fig. 6) be a section of a concave spherical mirror through its centre and luminous point U. If a ray, say UP, meet the surface, it will be reflected along PV, which is coplanar with UP and the normal PO at P, and makes the angle VPO = UPO. Hence VO/VP=OU/UP. This expression may be simplified if we assume P to be very close to A, i.e. that the ray UP is very slightly inclined to the axis. Writing A for P, we have VO/AV = OU/AU; and calling AU = m, AV = n and A0 = r, this reduces to « _1 +ir 1 = 2»^ 1 .

This formula connects the distances of the object and image formed by a spherical concave mirror with the radius of the mirror. Points satisfying this relation are called ” conjugate foci,” for obviously they are reciprocal, i.e. u and v can be interchanged in the formula.

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If « be infinite, as, for example, if the luminous source~.be a star, then ir 1 = 2r- 1 , i.e. v = §r. This value is called the focal length of

Fig. 6.

the mirror, and the corresponding point, usually denoted by F, is called the ” principal focus.” This formula requires modifica- tion for a convex mirror. If u be always considered as positive (v may be either positive or negative), r must be regarded as positive with concave mirrors and negative with convex. Similarly the focal length, having the same sign as r, has different signs in the two cases.

In this formula all distances are measured from the mirror; but it is sometimes more convenient to measure from the principal focus. If the distances of the object and image from the principal focus be x and y, then u = x+f and v = y+f (remembering that j is positive for concave and negative for convex mirrors). Sub- stituting these values in_«- 1 (!r 1 =/- 1 and reducing we obtain xy=p-. Since f 2 is always positive, x and y must have the same sign, i.e. the object and image must lie on the same side of the principal focus.

We now consider the production of the image of a small object placed symmetrically and perpendicular to the axis of a concave (fig. 7) and a convex mirror (fig. 8). Let PQ be the object and A

the vertex of the mirror. Consider the point P. Now a ray through P and parallel to the axis after meeting the mirror at M is reflected through the focus F. The line MF must therefore contain the image of P. Also a ray through P and also through the centre of curva- ture C of the mirror is reflected along the same path ; this also con- tains the image of P. Hence the image is at P, the intersection of the lines MF and PC. Similarly the image of any other point can be found, and the final image deduced. We notice that in fig. 6 the image is inverted and real, and in fig. 7 erect and virtual. The ” magnification ” or ratio of the size of the image to the object can be deduced from the figures by elementary geometry; it equals the ratio of the distances of the image and object from the mirror or from the centre of curvature of the mirror.

The positions and characters of the images for objects at varying

REFORMATION, THE

distances are shown in the table (F is the principal focus and C the centre of curvature of the mirror MA).

Concave Mirror

Position of Object.ˆ

Position of Image.

Character of Image.

oo

Between ˚o and C

C Between C and F Between F and A

A

F Between F and C

C Between C and oo Between A and – °°

A

Real.

Real.inverted, diminished „ „ same size „ „ magnified

Virtual, erect, magnified

Erect, same size

Convex Mirror

Position of Object. Position of Image. Character of Image.

CO Between oo and A A

Between F and A A

Virtual Virtual, erect, diminished Erect, same size

The above discussion of spherical mirrors assumes that the mirror has such a small aperture that the reflected rays from any point unite in a point. This, however, no longer holds when the mirror has a wide aperture, and in general the reflected rays envelop a caustic (q.v., see also Aberration). The only mirror which can sharply reproduce an object-point as an image-point has for its section an ellipse, which is so placed that the object and image are at its foci. This follows from a property of the curve, viz. the sum of the focal distances is constant, and that the focal vectores are equally inclined to the normal at the point. More important than the elliptical mirror, however, is the parabolic, which has the pro- perty of converting rays parallel to .the axis into a pencil through its focus; or, inversely, rays from a source placed at the focus are con- verted into a parallel beam; hence the use of this mirror in search- lights and similar devices.

REFORMATION, THE. The Reformation, as commonly understood, means the religious and political revolution of the 1 6th century, of which the immediate result was the partial dis- ruption of the Western Catholic Church and the establishment of various national and territorial churches. These agreed in repudiating certain of the doctrines, rites and practices of the medieval Church, especially the sacrifice of the Mass and the headship of the bishop of Rome, and, whatever their official designations, came generally to be known as ” Pro- testant.” In some cases they introduced new systems of ecclesiastical organization, and in all they sought to justify their innovations by an appeal from the Church’s tradition to the Scriptures. The conflicts between Catholics and Pro- testants speedily merged into the chronic political rivalries, domestic and foreign, which distracted the European states; and religious considerations played a very important part in diplomacy and war for at least a century and a half, from the, diet of Augsburg in 1530 to the English revolution and the

league of Augsburg, 1688-89. The terms ” Reformation ” and “Protestantism” are inherited by the modern historian; they are not of his devising, and come to him laden with re- miniscences of all the exalted enthusiasms and bitter anti- pathies engendered by a period of fervid religious dissension. The unmeasured invective of Luther and Aleander has not ceased to reecho, and the old issues are by no means dead.

The heat of controversy is, however, abating, and during the past thirty or forty years both Catholic and Protestant The lie- investigators have been vying with one another in formation adding to our knowledge and in rectifying old mis- chfslve'iya ta ˆ es ; while an ever-increasing number of writers Religious pledged to neither party are aiding in developing an Revoiu- idea of the scope and nature of the Reformation which tion. differs radically from the traditional one. We now

appreciate too thoroughly the intricacy of the medieval Church; its vast range of activity, secular as well as religious; the inextricable interweaving of the civil and ecclesiastical govern- ments; the slow and painful process of their divorce as the old ideas of the proper functions of the two institutions have changed in both Protestant and Catholic lands: we perceive all too clearly the limitations of the reformers, their distrust of reason and criticism — in short, we know too much about medieval institutions and the process of their disintegration longer to see in the Reformation an abrupt break in the general history

of Europe. No one will, of course, question the importance of the schism which created the distinction between Protestants and Catholics, but it must always be remembered that the religious questions at issue comprised a relatively small part of the whole compass of human aspirations and conduct, even to those to whom religion was especially vital, while a large majority of the leaders in literature, art, science and public affairs went their way seemingly almost wholly unaffected by theological problems.

That the religious elements in the Reformation have been greatly overestimated from a modern point of view can hardly be questioned, and one of the most distinguished students of Church history has ventured the assertion that ” The motives, both remote and proximate, which led to the Lutheran revolt were largely secular rather than spiritual.” ” We may,” continues Mr H. C. Lea, ” dismiss the religious changes incident to the Reformation with the remark that they were not the object sought, but the means for attaining the object. The

existing ecclesiastical system was the practical evolution of dogma, and the overthrow of dogma was the only way to obtain permanent relief from the intolerable abuses of that system ” (Cambridge Modern History, i. 653). It would perhaps be nearer the truth to say that the secular and spiritual interests inter- mingled and so permeated one another that it is almost im- possible to distinguish them clearly even in thought, while in practice they were so bewilderingly confused that they were never separated, and were constantly mistaken for one another.

The first step in clarifying the situation is to come to a full realization that the medieval Church was essentially an inter- national slate, and that the character of the Protestant secession from it was largely determined by this fact. * esen »- As Maitland suggests: ” We could frame no ac- fthe ceptable definition of a State which would not com- medieval prehend the Church. What has it not that a State f b “^ b should have ? It has laws, law givers, law courts, state. lawyers. It uses physical force to compel men to obey the laws. It keeps prisons. In the 13th century, though with squeamish phrases, it pronounced sentence of death. It is no voluntary society; if people are not born into it they are baptized into it when they cannot help them- selves. If they attempt to leave they are guilty of crimen laesae majestatis, and are likely to be burned. It is supported by involuntary contributions, by tithe and tax ” (Canon Law in the Church of England, p. 100). The Church was not only organized like a modern bureaucracy, but performed many of the functions of a modern State. It dominated the intellectual and profoundly affected the social interests of western Europe. Its economic influence was multiform and incalculable, owing to its vast property, its system of taxation and its encourage- ment of monasticism. When Luther made his first great appeal to the German people in his Address to the German Nobility, he scarcely adverts to religious matters at all. He deals, on the contrary, almost exclusively with the social, financial, educational, industrial and general moral problems of the day. If Luther, who above all others had the religious issue ever before him, attacks the Church as a source of worldly disorder, it is not surprising that his contemporary Ulrich von Hutten should take a purely secular view of the issues involved. Moreover, in the fascinating collection of popular satires and ephemeral pamphlets made by Schade, one is constantly im- pressed with the absence of religious fervour, and the highly secular nature of the matters discussed. The same may be said of the various Gravamina, or lists of grievances against the papacy drafted from time to time by German diets.

But not only is the character of the Reformation differently conceived

from what it once was; our notions of the process of change are being greatly altered. Formerly, mstoric writers accounted for the Lutheran movement by so contlnu- magnifying the horrors of the pre-existing regime ity of the that it appeared intolerable, and its abolition con- ˆ etormam sequently inevitable. Protestant writers once con- tented themselves with a brief caricature 01 the Church,

a superficial account of the traffic in indulgences, and a rough and ready assumption, which even Kostlin makes, that the darkness was greatest just before the dawn. Unfortunately this crude solution of the problem proved too much; for conditions were no worse immediately before the revolt than they had been for centuries, and German complaints of papal tyranny go back to Hildegard of Bingen and Walther von der Vogelweide, who antedated Luther by more than three centuries. So a new theory is logically demanded to explain why these conditions, which were chronic, failed to produce a change long before it actually occurred. Singularly enough it is the modern Catholic scholars, Johannes Janssen above all, who, in their efforts further to discredit the Protestant revolt by rehabilitating the institutions which the reformers attacked, have done most to explain the success of the Reformation. A humble, patient Bohemian priest, Hasak, set to work toward half a century ago to bring together the devotional works published during the seventy years immediately succeeding the invention of printing. Every one knows that one at least of these older books, The German Theology, was a great favourite of Luther's; but there are many more in Hasak's collection which breathe the same spirit of piety and spiritual emulation. Building upon the founda- tions laid by Hasak and other Catholic writers who have been too much neglected by Protestant historians, Janssen pro- duced a monumental work in defence of the German Church before Luther's defection. He exhibits the great achievements of the latter part of the 15th and the early portion of the 16th centuries; the art and literature, the material prosperity of the towns and the fostering of the spiritual fife of the people. It may well be that his picture is too bright, and that in his obvious anxiety to prove the needlessness of an ecclesiastical revolution he has gone to the opposite extreme from the Pro- testants. Yet this rehabilitation of pre-Reformation Germany cannot but make a strong appeal to the unbiased historical student who looks to a conscientious study of the antecedents of the revolt as furnishing the true key to the movement.

Outwardly the Reformation would seem to have begun when, on the 10th of December 1520, a professor in the university Revolt °^ Wittenberg invited all the friends of evangelical of the truth among his students to assemble outside the

various wall at the ninth hour to witness a pious spectacle — a, ™™* fl the burnin g of the “godless book of the papal meats decrees.” He committed to the flames the whole from the body of the canon law, together with an edict of papal the head of the Church which had recently been moaarc y. j ssue(j against his teachings. In this manner Martin Luther, with the hearty sympathy of a considerable number of his countrymen, publicly proclaimed and illustrated his repudiation of the papal government under which western Europe had lived for centuries. Within a genera- tion after this event the states of north Germany and Scandinavia, England, Scotland, the Dutch Netherlands and portions of Switzerland, had each in its particular manner permanently seceded from the papal monarchy. France, after a long period of uncertainty and disorder, remained faithful to the bishop of Rome. Poland, after a defection of years, was ultimately recovered for the papacy by the zeal and devo- tion of the Jesuit missionaries. In the Habsburg hereditary dominions the traditional policy and Catholic fervour of the ruling house resulted, after a long struggle, in the restoration of the supremacy of Rome; while in Hungary the national spirit of independence kept Calvinism alive to divide the religious allegiance of the people. In Italy and Spain, on the other hand, the rulers, who continued loyal to the pope, found little difficulty in suppressing any tendencies of revolt on the part of the few converts to the new doctrines. Individuals, often large groups, and even whole districts, had indeed earlier rejected some portions of the Roman Catholic faith, or refused obedience to the ecclesiastical government; but previously to the burning of the canon law by Luther no prince had openly and permanently cast off his allegiance to the international

ecclesiastical state of which the bishop of Rome was head. Now, a prince or legislative assembly that accepted the doctrine of Luther, that the temporal power had been ” ordained by God for the chastisement of the wicked and the protection of the good ” and must be permitted to exercise its functions ” un- hampered throughout the whole Christian body, without respect to persons, whether it strikes popes, bishops, priests, monks, nuns, or whoever else ” — such a government could proceed to ratify such modifications of the Christian faith as appealed to it in a particular religious confession; it could order its subject to conform to the innovations, and could expel, persecute or tolerate dissenters, as seemed good to it. A ” reformed ” prince could seize the property of the monasteries, and appro- priate

such ecclesiastical foundations as he desired. He could make rules for the selection of the clergy, disregarding the ancient canons of the Church and the claims of the pope to the right of ratification. He could cut off entirely all forms of papal taxation and put an end to papal jurisdiction. The personnel, revenue, jurisdiction, ritual, even the faith of the Church, were in this way placed under the complete control of the territorial governments. This is the central and sig- nificant fact of the so-called Reformation. Wholly novel and distinctive it is not, for the rulers of Catholic countries, like Spain and France, and of England (before the publication of the Act of Supremacy) could and did limit the pope's claims to unlimited jurisdiction, patronage 'and taxation, and they introduced the placet forbidding the publication within their realms of papal edicts, decisions and orders, without the express sanction of the government — in short, in many ways tended to approach the conditions in Protestant lands. The Reforma- tion was thus essentially a stage in the disengaging of the modern state from that medieval, international ecclesiastical state which had its beginning in the ecclesia of the Acts of the Apostles. An appreciation of the issues of the Reformation— or Protestant revolt, as it might be more exactly called — depends therefore upon an understanding of the development of the papal monarchy, the nature of its claims, the relations it established with the civil powers, the abuses which developed in it and the attempts to rectify them, the sources of friction between the Church and the government, and finally the process by which certain of the European states threw off their allegiance to the Christian commonwealth, of which they had so long formed a part.

It is surprising to observe how early the Christian Church assumed the form of a state, and how speedily upon entering into its momentous alliance with the Roman imperial Character government under Constantine it acquired the chief otthe privileges and prerogatives it was so long to retain. Monarchy In the twelfth book of the Theodosian Code we see and its the foundations of the medieval Church already laid; claims. for it was the 4th, not the 13th century that established the principle that defection from the Church was a crime in the eyes of the State, and raised the clergy to a privileged class, exempted from the ordinary taxes, permitted under restrictions to try its own members and to administer the wealth which flowed into its coffers from the gifts of the faithful. The bishop of Rome, who had from the first probably enjoyed a leading position in the Church as " the successor of the two most glorious of the apostles," elaborated his claims to be the divinely appointed head of the ecclesiastical organization. Siricius (384-380), Leo the Great (440-461), and

Gelasius I. (492-496) left little for their successors to add to the arguments in favour of the papal supremacy. In short, if we recall the characteristics of the Church in the West from the times of Constantine to those of Theodoric — its reliance upon the civil power for favours and protection, combined with its assumption of a natural superiority over the civil power and its innate tendency to monarchical unity — it becomes clear that Gregory VII. in his effort in the latter half of the nth century to establish the papacy as the great central power of western Europe was in the main only reaffirming and developing old claims in a new world. His brief statement of the papal powers as he

conceived them is found in his Dictatus. The bishop of Rome, who enjoys a unique title, that of “pope,” may annul the decrees of all other powers, since he judges all but is judged by none. He may depose emperors and absolve the subjects of the unjust from their allegiance. Gregory’s position was almost inexpugnable at a time when it was conceded by practically all that spiritual concerns were incalculably more momentous than secular, that the Church was rightly one and indivisible, with one divinely revealed faith and a system of sacraments abso- lutely essential to salvation. No one called in question the claim of the clergy to control completely all ” spiritual ” matters. Moreover, the mightiest secular ruler was but a poor sinner dependent for his eternal welfare en the Church and its head, the pope, who in this way necessarily exercised an indirect control over the civil government, which even the emperor Henry IV. and William the Conqueror would not have been disposed to deny. They would also have conceded the pope the right to play the r61e of a secular ruler in his own lands, as did the German bishops, and to dispose of such fiefs as reverted to him. This class of prerogatives, as well as the right which the pope claimed to ratify the election of the emperor, need not detain us, although they doubtless served in the long run to weaken the papal power. But the pope laid claim to a direct power over the civil governments. Nicholas II. (1058-1061) declared that Jesus had conferred on Peter the control (jura) of an earthly as well as of a heavenly empire; and this phrase was embodied in the canon law. Innocent III., a century and a half later, taught that James the brother of the Lord left to Peter not only the government of the whole Church, but that of the whole world (totum seculum gubemandum) } So the power of the pope no longer rested upon his headship of the Church or his authority as a secular prince, but on a far more comprehensive claim to universal dominion. There was no reason why the bishop of Rome should justify such acts as Innocent himself performed in

deposing King John of England and later in annulling Magna Carta; or Gregory IV. when he struck out fourteen articles from the Sachsenspiegel; or Nicholas V. when he invested Portugal with the right to sub- jugate all peoples on the Atlantic coast; or Julius II. when he threatened to transfer the kingdom of France to England ; or the conduct of those later pontiffs who condemned the treaties of Westphalia, the Austrian constitution of 1867 and the establishment of the kingdom of Italy. The theory and practice of papal absolutism was successfully promulgated by Gratian in his Decretum, completed at Bologna about 1142. This was supplemented by later collections composed mainly of papal decretals. (See Canon Law and Decretals, False.) As every fully equipped university had its faculty of canon law in which the Corpus juris canonici was studied, Rashdall is hardly guilty of exaggeration when he says: " By means of the happy thought of the Bolognese monk the popes were enabled to convert the new-born universities — the offspring of that intellectual new birth of Europe which might have been so formidable an enemy to the papal pretensions — into so many engines for the propagation of Ultramontane ideas." Thomas Aquinas was the first theologian to describe the Church as a divinely organized absolute monarchy, whose head con- centrated in his person the entire authority of the Church, and was the' source of all the ecclesiastical law (conditor juris), issuing the decrees of general councils in his own name, and claiming the right to revoke or modify the decrees of former councils — indeed, to make exceptions or to set aside altogether anything which did not rest upon the dictates of divine or natural law. In practice the whole of western Europe was subject to the jurisdiction of one tribunal of last resort, the Roman Curia. The pope claimed the right to tax church property throughout Christendom. He was able to exact an oath of fidelity from the archbishops, named many of the bishops, and asserted the right to transfer and dispose them. The organs of this vast monarchy were the papal Curia, which first appears distinctly in the nth century (see Cukia Romana), 'See further, Innocent III.

and the legates, who visited the courts of Europe as haughty representatives of the central government of Christendom.

It should always be remembered that the law of the Church was regarded by all lawyers in the later middle ages as the law common to all Europe (jus commune). The laws of Relations the Carolingian empire provided that one excom- "tthe municated by the Church who did not make his peace ticai'and within a year and a day should be outlawed, and this civil gov general principle was not lost sight of. It was a capital emments. offence in the eyes of the State to disagree

with the teachings of the Church, and these, it must be remembered, included a recognition of the papal supremacy. The civil authorities burnt an obstinate heretic, condemned by the Church, without a thought of a new trial. The emperor Frederick IL's edicts and the so-called etablissemenls of St Louis provide that the civil officers should search out suspected heretics and deliver them to the ecclesiastical judges. The civil government recognized monastic vows by regarding a professed monk as civilly dead and by pursuing him and returning him to his monastery if he violated his pledges of obedience and ran away. The State recognized the ecclesiastical tribunals and accorded them a wide jurisdiction that we should now deem essentially secular in its nature. The State also admitted that large classes of its citizens — the clergy, students, crusaders, widows and the miserable and helpless in general — were justiceable only by Church tribunals. By the middle of the 13th century many lawyers took the degree of doctor of both laws (J.U.D.), civil and canon, and practised both. As is well known, temporal rulers constantly selected clergymen as their most trusted advisers. The existence of this theocratic international state was of course conditioned by the weakness of the civil government. So long as feudal monarchy continued, the Church supplied to some extent the deficiencies of the turbulent and ignorant princes by endeavouring to maintain order, administer justice, protect the weak and encourage learning. So soon as the modern national state began to gain strength, the issue between secular rulers and the bishops of Rome took a new form. The clergy naturally stoutly defended the powers which they had long enjoyed and believed to be rightly theirs. On the other hand, the State, which could count upon the support of an • ever-increasing number of prosperous and loyal subjects, sought to protect its own interests and showed itself less and less inclined to tolerate the extreme claims of the pope. Moreover, owing to the spread of education, the king was no longer obliged to rely mainly upon the assistance of the clergy in conducting his government.

The chief sources of friction between Church and State were four in number. First, the growth of the practice of " reserva- tion " and " provision," by which the popes assumed the right to appoint their own nominees to vacant sees and other benefices, in defiance of the claims of the crown, the chapters and private patrons. In the case of wealthy bishoprics or abbacies this involved a serious menace to the secular authority. Both pope and king were naturally anxious to place their own friends and supporters in these influential positions. The pope, moreover, had come to depend to a considerable extent for his revenue upon the payments made by his nominees, which represented a corresponding drain on the resources of the secular states. Secondly,

there was the great question, how far the lands and other property of the clergy should be subject to taxation. Was this vast amount of property to increase indefinitely without contribution to the maintenance of the secular government? A decretal of Innocent III. permitted the clergy to make voluntary contributions to the king when there was urgent necessity, and the resources of the laity had proved inadequate. But the pope maintained that, except in the most critical cases, his consent must be obtained for such grants. Thirdly, there was the inevitable jealousy between the secular and ecclesiastical courts and the serious problem of the exact extent of the original and appellate jurisdiction of the Roman Curia. Fourthly, and lastly, there was the most fundamental difficulty of all, the extent to which the pope, as the universally acknowledged head

of the Church, was justified in interfering in the internal affairs of particular states. Unfortunately, most matters could be viewed from both a secular and religious standpoint; and even in purely secular affairs the claims of the pope to at least indirect control were practically unlimited. The specific nature of the abuses which flourished in the papal monarchy, the unsuccessful attempts to remedy them, and the measures taken by the chief European states to protect themselves will become apparent as we hastily review the principal events of the 14th and 15th centuries.

As one traces the vicissitudes of the papacy during the two centuries from Boniface VIII. to Leo X. one cannot fail to be The impressed with the almost incredible strength of the

papacy In ecclesiastical state which had been organized and the 14th fortified by Gregory VII., Alexander III., Innocent III. century. anc j Q re g 0r y jx. In spite of the perpetuation of all the old abuses and the continual appearance of new devices for increasing the papal revenue; in spite of the jealousy of kings and princes, the attacks of legists and the preaching of the heretics; in spite of seventy years of exile from the holy city, forty years of distract- ing schism and discord, and thirty years of conflict with stately oecumenical councils deliberating in the name of the Holy Spirit and intent upon permanently limiting the papal prerogatives; in spite of the unworthy conduct of some of those who ascended the papal throne, their flagrant political ambitions, and their greed; in spite of the spread of knowledge, old and new, the development of historical criticism, and philosophical speculation; in spite, in short, of every danger which could threaten the papal monarchy, it was still intact when Leo X. died in 1521. Nevertheless,

permanent if partial dissolution was at hand, for no one of the perils which the popes had seemingly so successfully overcome had failed to weaken the constitution of their empire; and it is impossible to comprehend its comparatively sudden disintegration without reckoning with the varied hostile forces which were accumulating and com- bining strength during the 14th and 15th centuries. The first serious conflict that arose between the developing modern state and the papacy centred about the pope's claim that the property of the clergy was normally exempt from royal taxation. Boniface VIII. was forced to permit Edward I. and Philip the Fair to continue to demand and receive subsidies granted by the clergy of their realms. Shortly after the bitter humiliation of Boniface by the French government and his death in 1303, the bishop of Bordeaux was elected pope as Clement V. (1305)- He preferred to remain in France, and as the Italian cardinals died they were replaced by Frenchmen. The papal court was presently established at Avignon, on the confines of France, where it remained until 1377. While the successors of Clement V. were not so completely under the control of the French kings as has often been alleged, the very proximity of the curia to France served inevitably to intensify national jealousies. The claims of John XXII. (1316-1334) to control the election of the emperor called forth the first fundamental and critical attack on the papal monarchy, by Marsiglio of Padua, who declared in his Defensor pads (1324) that the assumed supremacy of the bishop of Rome was without basis, since it was very doubtful if Peter was ever in Rome, and in any case there was no evidence that he had transmitted any exceptional prerogatives to succeeding bishops. But Marsiglio's logical and elaborate justification for a revolt against the medieval Church produced no perceptible effects. The removal of the papal court from Rome to Avignon, however, not only reduced its prestige but increased the pope's chronic financial embarrassments, by cutting off the income from his own dominions, which he could no longer control, while the unsuccessful wars waged by John XXII., the palace building and the notorious luxury of some of his successors, served enormously to augment the expenses. Various devices were resorted to, old and new, to fill the treasury. The fees of the Curia were raised for the numberless favours, dispensations, absolutions, and exemptions of all kinds which were sought by clerics and laymen. The right claimed by the

pope to fill benefices of all kinds was extended, and the amount contributed to the pope by his nominees amounted to from a third to a half of the first year's revenue (see Annates). Boni- face VIII. had discovered a rich source of revenue in the jubilee, and in the jubilee

indulgences extended to those who could not come to Rome. Clement VI. reduced the period between these lucrative occasions from one hundred to fifty years, and Urban VI. determined in 1389 that they should recur at least once in a generation (every thirty-three years). Church offices, high and low, were regarded as investments from which the pope had his commission.

England showed itself better able than other countries to defend itself against the papal control of church preferment. From 1343 onward, statutes were passed by parliament England forbidding any one to accept a papal provision, and and the cutting off all appeals to the papal curia or ecclesias- papacy In tical courts in cases involving benefices. Neverthe- the jˆ tb less, as a statute of 1379 complains, benefices continued to be given ” to divers people of another language and of strange lands and nations, and sometimes to actual enemies of the king and of his realm, which never made residence in this same, nor cannot, may not, nor will not in any wise bear and perform the charges of the same benefice in hearing confessions, preaching or teaching the people.” When, in 1365, Innocent VI. demanded that the arrears of the tribute promised by King John to the pope should be paid up, parliament abrogated the whole contract on the ground that John had no right to enter into it. A species of anti-clerical movement, which found an unworthy leader in John of Gaunt, developed at this time. The Good Parliament of 1376 declared that, in spite of the laws restricting papal pro- visions, the popes at Avignon received five times as much revenue from England as the English kings themselves. Secularization was mentioned in parliament. Wycliffe began his public career in 1366 by proving that England was not bound to pay tribute to the pope. Twelve years later he was, like Marsiglio, attacking the very foundations of the papacy itself, as lacking all scriptural sanction. He denounced the papal government as utterly degraded, and urged that the vast property of the Church, which he held to be the chief cause of its degradation, should be secularized and that the clergy should consist of ” poor priests,” supported only by tithes and alms. They should preach the gospel and encourage the people to seek the truth in the Scriptures themselves, of which a translation into English Was completed in 1382. During the later years of his life he attacked the doctrine of transubstantiation, and all the most popular institutions of the Church — indulgences, pilgrimages, invocation of the saints, relics, celibacy of the clergy, auricular confession, &c. His opinions were spread abroad by the hundreds of sermons and popular pamphlets written in English for the people (see Wycliffe). For some years after Wycliffe’s death his followers, the Lollards, continued to carry on his work; but they roused the effective opposition of the

conservative clergy, and were subjected to a persecution which put an end to their public agitation. They rapidly disappeared and, except in Bohemia, Wycliffe's teachings left no clearly traceable impressions. Yet the discussions he aroused, the attacks he made upon the institutions of the medieval Church, and especially the position he assigned to the Scriptures as the exclusive source of revealed truth, serve to make the develop- ment of Protestantism under Henry VIII. more explicable than it would otherwise be.

Wycliffe's later attacks upon the papacy had been given point by the return of the popes to Rome in 1377 and the opening of the Great Schism which was to endure The qˆˆ for forty years. There had been many anti-popes in Schism the past, but never before had there been such pro- U377- longed and genuine doubt as to which of two fines ˆ' of popes was legitimate, since in this case each was supported by a college of cardinals, the one at Rome, the other at Avignon. Italy, except Naples, took the side of the Italian pope; France, of the Avignon pope; England, in its hostility to France,

sided with Urban VI. in Rome, Scotland with Clement VII., his rival; Flanders followed England; Urban secured Germany, Hungary and the northern kingdoms; while Spain, after re- maining neutral for a time, went over to Clement. Western Christendom had now two papal courtsˆto support. The schism extended down to the bishoprics, and even to the monasteries and parishes, where partisans of the rival popes struggled to obtain possession of sees and benefices. The urgent necessity for healing the schism, the difficulty of uniting the colleges of cardinals, and the prolonged and futile negotiations carried on between the rival popes inevitably raised the whole question of the papal supremacy, and led to the search for a still higher ecclesiastical authority, which, when the normal system of choosing the head of the Church broke down, might re-establish that ecclesiastical unity to which all Europe as yet clung. The idea of the supreme power on earth of a general council of Christendom, deliberating in the name of the Holy Spirit, convoked, if necessary, independently of the popes, was de- fended by many, and advocated by the university of Paris. The futile council of Pisa in 1409, however, only served to increase to three the number of rival representatives of God on earth. The considerable pamphlet literature of the time substantiates the conclusion of an eminent modern Catholic historian, Ludwig Pastor, who declares that the crisis through which the church passed in this

terrible period of the schism was the most serious in all its history. It was at just this period, when the rival popes were engaged in a life-and-death struggle, that heretical movements appeared in England, France, Italy, Germany, and especially in Bohemia, which threatened the whole ecclesiastical order.

The council of Constance assembled in 1414 under auspices hopeful not only for the extinction of the schism but for the

T . general reform of the Church. Its members showed

The ° ..... .

councils no patience with doctrinal innovations, even such

of Con- moderate ones as John Huss represented. They s(*“g . turned him over to the secular arm for execution, although they did not thereby succeed in check- ing the growth of heresy in Bohemia (see Huss). The healing of the schism proved no very difficult matter; but the council hoped not only to restore unity and suppress heresy, but to re-establish general councils as a regular element in the legislation of the Church. The decree Sacrosancta (April 1415) proclaimed that a general council assembled in the Holy Spirit and representing the Catholic Church militant had its power immediately from Christ, and was supreme over every one in the Church, not excluding the pope, in all matters pertaining to the faith and reformation of the Church of God in head and members. The decree Frequens (October 141 7) provided for the regular convocation of councils in the future. As to ecclesiastical abuses the council could do very little, and finally satisfied itself with making out a list of those which the new pope was required to remedy in co-operation with the deputies chosen by the council. The list serves as an excellent summary of the evils of the papal monarchy as recognized by the unim- peachably orthodox. It included: the number, character and nationality of the cardinals, the abuse of the ” reserva- tions ” made by the apostolic see, the annates, the collation to benefices, expectative favours, cases to be brought before the papal Curia (including appeals), functions of the papal chancery and penitentiary, benefices in commendam, con- firmation of elections, income during vacancies, indulgences, tenths, for what reasons and how is a pope to be corrected or deposed. The pope and the representatives of the council made no serious effort to remedy the abuses suggested under these several captions; but the idea of the superiority of a council over the pope, and the right of those who felt aggrieved by papal decisions to appeal to a future council, remained a serious menace to the theory of papal absolutism. The decree Frequens

was not wholly neglected; though the next council, at Siena, came to naught, the council at Basel, whose chief business was to put an end to the terrible religious war that

had been raging between the Bohemians and Germans, was destined to cause Eugenius IV. much anxiety. It reaffirmed the decree Sacrosancta, and refused to recognize the validity of a bull Eugenius issued in December 143 1 dissolving it. Two years later political reverses forced the pope to sanction the existence of the council, which not only concluded a treaty with the Bohemian heretics but abolished the papal fees for appointments, confirmation and consecration— above all, the annates — and greatly reduced papal reservations; it issued indulgences, imposed tenths, and established rules for the government of the papal states. France, however, withdrew its support from the council, and in 1438, under purely national auspices, by the famous Pragmatic Sanction of Bourges, adjusted the relations of the Gallican Church to the papacy; and Eugenius soon found himself in a position to repudiate the council and summoned a new one to assemble in 1438 at Ferrara under his control to take up the important question of the pending union with the Greek Church. The higher clergy deserted the council of Basel, and left matters in the hands of the lower clergy, who chose an anti-pope; but the rump council gradually lost credit and its lingering members were finally dispersed. The various nations were left to make terms with a reviving papacy. England had already taken measures to check the papal claims. France in the Pragmatic Sanction reformulated the claim of the councils to be superior to the pope, as well as the decision of the council of Basel in regard to elections, annates and other dues, limitations on ecclesi- astical jurisdiction, and appeals to the pope. While the canonical elections were re-established, the prerogatives of the crown were greatly increased, as in England. In short, the national ecclesiastical independence of the French Church was established. The German diet of Regensburg (1439) ratified in the main the decrees of the council of Basel, which clearly gratified the electors, princes and prelates; and Germany for the first time joined the ranks of the countries which subjected the decrees of the highest ecclesiastical instance to the placet or approval of the civil authorities. But there was no strong power, as in England and France, to attend to the execution of the provisions.

In 1448 Eugenius's successor, Nicholas V., concluded a con- cordat with the emperor Frederick III. as representative of the German nation. This confined itself to papal appointments and the annates. In practice it restored and'the the former range of papal reservations, and extended papacy in the papal right of appointment to all benefices

(except thelsth the higher offices in cathedrals and collegiate churches) which fell vacant during the odd months. It also accorded him the right to confirm all newly elected prelates and to receive the annates. Nothing was said in the concordat of a great part of the chief subjects of complaint. This gave the princes an excuse for the theory that the decrees of Constance and Basel were still in force, limiting the papal prerogatives in all respects not noticed in the concordat. It was Germany which gave the restored papacy the greatest amount of anxiety during the generation following the dissolution of the council of Basel. In the ” recesses ” or formal statements issued at the con- clusion of the sessions of the diet one can follow the trend of opinion among the German princes, secular and ecclesiastical. The pope is constantly accused of violating the concordat, and constant demands are made for a general council, or at least a national one, which should undertake to remedy the abuses. The capture of Constantinople by the Turks afforded a new excuse for papal taxation. In 1453 a crusading bull was issued imposing a tenth on all benefices of the earth to equip an expedition against the infidel. The diet held at Frankfort in

1456 recalled the fact that the council of Constance had for- bidden the pope to impose tenths without the consent of the clergy in the region affected, and that it was clear that he proposed to ” pull the German sheep’s fleece over its ears.” A German correspondent of Aeneas Sylvius assures him in

1457 that ” thousands of tricks are devised by the Roman see which enables it to extract the money from our pockets very

neatly, as if we were mere barbarians. Our nation, once so famous, is a slave now, who must pay tribute, and has lain in the dust these many years bemoaning her fate.” Aeneas Sylvius issued, immediately after his accession to the papacy as Pius II. the bull Execrabilis forbidding all appeals to a future council. This seemed to Germany to cut off its last hope. It found a spokesman in the vigorous Gregory of Heimburg, who accused the pope of issuing the bull so that he and his cardinals might conveniently pillage Germany unhampered by the threat of a council. ” By forbidding appeals to a council the pope treats us like slaves, and wishes to take for his own pleasures all that we and our ancestors have accumulated by honest labour. He calls me a chatterer, although he himself is more talkative than a magpie.” Heimburg’s denunciations of the pope were widely circulated, and in spite of the major excom- munication he was taken into the service of

the archbishop of Mainz and was his representative at the diet of Nuremberg in 1462. It is thus clear that motives which might ultimately lead to the withdrawal of a certain number of German princes from the papal ecclesiastical state were accumulat- ing and intensifying during the latter half of the 15th century.

It is impossible to review here the complicated political history of the opening years of the 16th century. The Con- names of Charles VIII. and Louis XII. of France, of

ditioas la Ferdinand and Isabella of Spain, of Henry VII. and a uh" ny Henr y VIIL of England, of Maximilian the German opening ot ki n g> of Popes Alexander VI., Julius II. and Leo X., the 16m stand for better organized civil governments, with century. growing powerful despotic heads; for a perfectly worldly papacy absorbed in the interests of an Italian prin- cipality, engaged in constant political negotiations with the European powers which are beginning to regard Italy as their chief field of rivalry, and are using its little states as convenient counters in their game of diplomacy and war. It was in Ger- many, however, seemingly the weakest and least aggressive of the European states, that the first permanent and successful revolts against the papal monarchy occurred. Nothing came of the lists of German gravamina, or of the demands for a council, so long as the incompetent Frederick III. continued to reign. His successor, Maximilian, who was elected emperor in 1493, was mainly preoccupied with his wars and attempts to reform the constitution of the empire; but the diet gave some attention to ecclesiastical reform. For instance, in 1501 it took measures to prevent money raised by the granting of a papal indulgence from leaving the country. After the disruption of the league of Cambray, Maximilian, like Louis XII., was thrown into a violent anti-curial reaction, and in 1510 he sent to the well-known humanist, Joseph Wimpheling, a copy of the French Pragmatic Sanction, asking his advice and stating that he had determined to free Germany from the yoke of the Curia and prevent the great sums of money from going to Rome. Wimpheling in his reply rehearsed the old grievances and complained that the contributions made to the pope by the archbishops on receiving the pallium was a great burden on the people. He stated that that of the archbishop of Mainz had been raised from ten to twenty-five thousand gulden, and that there had been seven vacancies within a generation, and consequently the subjects of the elector had been forced to pay that amount seven times. But Wimpheling had only some timid suggestions to make, and, since Maximilian was once more on happy terms with the pope, political considerations served to cool completely his momentary ardour for ecclesiastical reform. In 15 14 the archbishopric of Mainz fell vacant

again, and Albert of Brandenburg, already archbishop of Magdeburg and administrator of Halberstadt, longing to add it to his possessions, was elected. After some scandalous negotiations with Leo X. it was arranged that Albert should pay 14,000 ducats for the papal confirmation and 10,000 as a ” composition ” for permission to continue to hold, against the rules of the Church, his two former archbishoprics. Moreover, in order to permit him to pay the sums, he was to have half the proceeds in his provinces from an indulgence

granted to forward the rebuilding of St Peter’s. A Dominican monk, Johann Tetzel, was selected to proclaim the indulgence (together with certain supplementary graces) in the three provinces of the elector. This suggestion came from the curia, not the elector, whose representatives could not suppress the fear that the plan would arouse opposition and perhaps worse. Tetzel’s preaching and the exaggerated claims that he was re- ported to be making for the indulgences attracted the attention of an Augustinian friar, Martin Luther, who had for some years been lecturing on theology at the university of Wittenberg. He found it impossible to reconcile Tetzel’s views of indulgences with his own fundamental theory of salvation. He accordingly hastily drafted ninety-five propositions relating to indulgences, and posted an invitation to those who wished to attend a disputation in Wittenberg on the matter, under his presidency. He points out the equivocal character of the word poenitentia, which meant both “penance” and “penitence”; he declared that ” true contrition seeks punishment, while the ampleness of pardons relaxes it and causes men to hate it.” Christians ought to be taught that he who gives to a poor man or lends to the needy does better than if he bought pardons. He concludes with certain ” keen questionings of the laity,” as, Why does not the pope empty purgatory forthwith for charity’s sake, instead of cautiously for money ? Why does he not, since he is rich as Croesus, build St Peter’s with his own money instead of taking that of poor believers ? It was probably these closing reflections which led to the translation of the theses from Latin into German, and their surprising circulation. It must not be assumed that Luther’s ninety-five theses produced any con- siderable direct results. They awakened the author himself to a consciousness that his doctrines were after all incompatible with some of the Church’s teachings, and led him to consider the nature of the papal power which issued the indulgence. Two or three years elapsed before Luther began to be generally known and to exercise a perceptible influence upon affairs.

In July 1518 a diet assembled in Augsburg to consider the new danger from the Turks, who were making rapid conquests under Sultan Selim

I. The pope's representative, The diet ot Cardinal Cajetan, made it clear that the only safety Augsburg lay in the collection of a tenth from the clergy otisis. and a twentieth from laymen; but the diet appointed a committee to consider the matter and explain why they pro- posed to refuse the pope's demands. Protests urging the diet not to weaken came in from all sides. There was an especially bitter denunciation of the Curia by some unknown writer. He claims that " the pope bids his collectors go into the whole world, saying, ' He that believeth, and payeth the tenths, shall be saved.' But it is not necessary to stand in such fear of the thunder of Christ's vicar, but rather to fear Christ Himself, for it is the Florentine's business, not Christ's, that is at issue." The report of the committee of the diet was completed on the 27th of August 1518. It reviews all the abuses, declares that the German people are the victims of war, devastation and dearth, and that the common man is beginning to comment on the vast amount of wealth that is collected for expeditions against the Turk through indulgences or otherwise, and yet no expedition takes place. This is the first recognition in the official gravamina of the importance of the people. Shortly after the committee submitted its report the clergy of Liege presented a memorial which, as the ambassador from Frankfort observed, set forth in the best Latin all the various forms of rascality of which the curtizanen (i.e. curiales, officials of the curia) were guilty. From this time on three new streams begin to reinforce the rather feeble current of official efforts for reform. The common man, to whom the diet of Augsburg alludes, had long been raising his voice against the "parsons" (Pfaffen); the men of letters, Brand, Erasmus, Reuchlin, and above all Ulrich von Hutten, contributed, each in their way, to discredit the Roman Curia; and lastly, a new type of theology, repre- sented chiefly by Martin Luther, threatened to sweep away the very foundations of the papal monarchy.

The growing discontent of the poor people, whether in country or town, is clearly traceable in Germany during the 15th century, . and revolutionary agitation was chronic in southern of the Germany at least during the first two decades of the

masses 1 6th. The clergy were satirized and denounced in 10 the popular pamphlets and songs. The tithe was an Germany, oppressive form of taxation, as were the various fees demanded for the performance of the sacraments. The so-called " Reformation of

Sigismund," drawn up in 1438, had demanded that the celibacy of the clergy should be abandoned and their excessive wealth reduced. " It is a shame which cries to heaven, this oppression by tithes, dues, penalties, excommunication, and tolls of the peasant, on whose labour all men depend for their existence." In 1476 a poor young shepherd drew thousands to Nicklashausen to hear him denounce the emperor as a rascal and the pope as a worthless fellow, and urge the division of the Church's property among the members of the community. The "parsons" must be killed, and the lords reduced to earn their bread by daily labour. An apoca- lyptic pamphlet of 1508 shows on its cover the Church upside down, with the peasant performing the services, while the priest guides the plough outside and a monk drives the horses. Doubtless the free peasants of Switzerland contributed to stimulate disorder and discontent, especially in southern Germany. The conspiracies were repeatedly betrayed and the guilty parties terribly punished. That discovered in 1517 made a deep impression on the authorities by reason of its vast extent, and doubtless led the diet of Augsburg to allude to the danger which lay in the refusal of the common man to pay the ecclesiastical taxes. " It was into this mass of seething discontent that the spark of religious protest fell — the one thing needed to fire the train and kindle the social conflagration. This was the society to which Luther spoke, and its discontent was the sounding board which made his words reverberate." x

On turning from the attitude of the peasants and poorer townspeople to that of the scholars, we find in their writings Attitude a good deal of harsh criticism of the scholastic theology, ot the satirical allusions to the friars, and, in Germany, sharp human- denunciations of the practices of the Curia. But there are many reasons for believing that the older estimate of the influence of the so-called Renaissance, or " new learning," in promoting the Protestant revolt was an exaggerated one. The class of humanists which had grown up in Italy during the 15th century, and whose influence had been spreading into Germany, France and England during the generation immedi- ately preceding the opening of the Protestant revolt, repre- sented every phase of religious feeling from mystic piety to cynical indifference, but there were very few anti-clericals among them. The revival of Greek from the time of Chryso- loras onward, instead of begetting a Hellenistic spirit, trans- ported the more serious-minded to the nebulous shores of Neo- Platonism, while the less devout became absorbed in scholarly or literary ambitions, translations, elegantly phrased letters, clever epigrams or indiscriminate invective. It is true that Lorenzo Valla (d. 1457) showed the Donation of Constantine to be a forgery, denied that Dionysius the Areopagite wrote the works ascribed to him, and

refuted the commonly accepted notion that each of the apostles had contributed a sentence to the Apostles' Creed. But such attacks were rare and isolated and were not intended to effect a breach in the solid ramparts of the medieval Church, but rather to exhibit the ingenuity of the critic. In the libraries collected under humanistic influences the patristic writers, both Latin and Greek, and the scholastic doctors are conspicuous. Then most of the humanists were clerics, and in Italy they enjoyed the patronage of the popes. They not unnaturally showed a tolerant spirit on the whole toward existing institutions, including the ecclesiastical abuses, and, in general, cared little how long the vulgar herd was left in the superstitious darkness which befitted their estate, so long as the superior man was permitted to hold discreetly any views he pleased. Of this attitude Mutian (1471-1526), 'Lindsay.

the German humanist who perhaps approached most nearly the Italian type, furnishes a good illustration. He believed that Christianity had existed from all eternity, and that the Greeks and Romans, sharing in God's truth, would share also in the celestial joys. Forms and ceremonies should only be judged as they promoted the great object of life, a clean heart and a right spirit, love to God and one's neighbour. He defined faith as commonly understood to mean " not the conformity of what we say with fact, but an opinion upon divine things founded upon credulity which seeks after profit." " With the cross, " he declares, " we put our foes to flight, we extort money, we consecrate God, we shake hell, we work miracles."

These reflections were, however, for his intimate friends, and like him, his much greater contemporary, Erasmus, abhorred anything suggesting open revolt or revolution. The Erasmus extraordinary popularity of Erasmus is a sufficient (Rev- indication that his attitude of mind was viewed with lS36)- sympathy by the learned, whether in France, England, Germany, Spain or Italy. He was a firm believer in the efficacy of culture. He maintained that old prejudices would disappear with the progress of knowledge, and that superstition and mechanical devices of salvation would be insensibly abandoned. The laity should read their New Testament, and would in this way come to feel the true significance of Christ's life and teachings, which, rather than the Church, formed the centre of Erasmus's religion. The dissidence of dissent, however, filled him with uneasiness, and he abhorred Luther's denial of free will and his exaggerated notion of man's utter depravity; in short, he did nothing whatever to promote the Protestant revolt, except so far as his frank denuncia- tion and his witty arraignment of clerical and monastic weaknesses and soulless ceremonial, especially in his Praise of Folly and Col- loquies, contributed to bring the faults of the Church into strong relief, and in

so far as his edition of the New Testament furnished a simple escape from innumerable theological complications.

A peculiar literary feud in Germany served, about 1515, to throw into sharp contrast the humanistic party, which had been gradually developing during the previous fifty years, and the conservative, monkish, scholastic group, who found their leader among the Dominicans of the university of Cologne. Johann Reuchlin, a well-known scholar, who had been charged by the Dominicans with heresy, not only received the support of the newer type of scholars, who wrote him encouraging letters which he published under the title Epistolae clarorum virorum, but this collection suggested to Crotus Rubianus and Ulrich von Hutten one of the most successful satires of the ages, the Epistolae obscurorum virorum. As Creighton well said, the chief importance of the ” Letters of Obscure Men ” lay in its success in popularizing the conception of a stupid party which was opposed to the party of progress. At the same time that the Neo-Platonists, like Ficino and Pico de la Mirandola, and the pantheists, whose God was little more than a reverential conception of the universe at large, and the purely worldly humanists, like Celtes and Bebel, were widely diverging each by his own particular path from the ecclesiastical Weltanschauung of the middle ages, Ulrich von Hutten was busy attacking the Curia in his witty Dialogues, in the name of German patriotism. He, at least, among the well-known scholars eagerly espoused Luther’s cause, as he understood it. A few of the humanists became Protestants — Melanchthon, Bucer, Oecolampadius and others — but the great majority of them, even if attracted for the moment by Luther’s denunciation of scholasticism, speedily repudiated the movement. In Socinianism (see below) we have perhaps the only instance of humanistic antecedents leading to the formation of a religious sect.

A new type of theology made its appearance at the opening of the 1 6th century, in sharp contrast with the Aristotelian scholasticism of the Thomists and Scotists. This was Th new due to the renewed enthusiasm for, and appreciation of, theology St Paul with which Erasmus sympathized, and which and found an able exponent in England in John Colet and j” *?~ in France in Lefevre of Staples (Faber Stapulensis) . Luther was reaching somewhat similar views at the same time,

although in a strikingly different manner and with far more momentous results for the western world. Martin Luther was beyond doubt the most important single figure in the Protestant revolt. His influence was indeed by no means so decisive and so pervasive as has commonly been supposed, and his attacks on the evils in the Church were no bolder or more comprehensive than those of Marsiglio and Wycliffe, or of several among his con- temporaries who owed nothing to his example. Had the German princes not found it to their interests to enforce his principles, he might never have been more than the leader of an obscure mystic sect. He was, moreover, no statesman. He was recklessly impetuous in his temperament, coarse and grossly superstitious according to modern standards. Yet in spite of all these allowances he remains one of the great heroes of all history. Few come in contact with his writings without feeling his deep spiritual nature and an absolute genuineness and marvellous individuality which seem never to sink into mere routine or affectation. In his more important works almost every sentence is alive with that autochthonic quality which makes it unmistakably his. His fundamental religious con- ception was his own hard-found answer to his own agonized question as to the nature and assurance of salvation. Even if others before him had reached the conviction that the Vulgate's word justitia in Romans i. 16-17 meant " righteousness " rather than " justice " in a juridical sense, Luther exhibited supreme religious genius in his interpretation of " God's righteousness " (Gerechtigkeit) as over against the " good works " of man, and in the overwhelming importance he attached to the promise that the just shall live by faith. It was his anxiety to remove everything that obscured this central idea which led him to revolt against the ancient Church, and this conception of faith served, when he became leader of the German Protestants, as a touchstone to test the expediency of every innovation. But only gradually did he come to realize that his source of spiritual consolation might undermine altogether the artfully constructed fabric of the medieval Church. As late as 1516 he declared that the life of a monk was never a more enviable one than at that day. He had, however, already begun to look sourly upon Aristotle and the current scholastic theology, which he believed hid the simple truth of the gospel and the desperate state of mankind, who were taught a vain reliance upon outward works and ceremonies, when the only safety lay in throwing oneself on God's mercy. He was suddenly forced to take up the consideration of some of the most fundamental points in the orthodox theology by the appearance of Tetzel in 1517. In his hastily drafted Ninety-five Theses he sought to limit the potency of indulgences, and so indirectly raised the question as to the power of the pope. He was astonished to observe the wide circulation of the

theses both in the Latin and German versions. They soon reached Rome, and a Dominican monk, Prierius, wrote a reply in defence of the papal power, in an insolent tone which first served to rouse Luther's suspicion of the theology of the papal Curia. He was summoned to Rome, but, out of consideration for his patron, the important elector of Saxony, he was permitted to appear before the papal legate during the diet of Augsburg in 1518. He boldly contradicted the legate's theological statements, refused to revoke anything and appealed to a future council. On returning to Wittenberg, he turned to the canon law, and was shocked to find it so completely at variance with his notions of Christianity. He reached the conclusion that the papacy was but four hundred years old. Yet, although of human origin, it was established by common consent and with God's sanction, so that no one might withdraw his obedience without offence.

It was not, however, until 1520 that Luther became in a sense the leader of the German people by issuing his three great pamphlets, all of which were published in German as well as in Latin — his Address to the Christian Nobility of the German Nation, his Babylonish Captivity of the Church, and his Freedom of the Christian. In the first he urged that, since the Church had failed to reform itself, the secular government should come to the rescue. " The Romanists have with great

dexterity built themselves about with three walls, which have hitherto protected them against reform; and thereby is Christianity fearfully fallen. In the first place, when the temporal power has pressed them hard, they have affirmed and maintained that the temporal power has no jurisdiction over them — that, on the contrary, the spiritual is above the temporal. Secondly, when it was proposed to admonish them from the Holy Scriptures they said, ' It beseems no one but the pope to interpret the Scriptures,' and, thirdly, when they were threatened with a council, they invented the idea that no one but the pope can call a council. Thus they have secretly stolen our three rods that they may go unpunished, and have entrenched themselves safely behind these three walls in order to carry on all the rascality and wickedness that we now see."

He declares that the distinction between the " spiritual estate," composed of pope, bishops, priests and monks, as over against the " temporal estate " composed of princes, lords, artisans and peasants, is a very fine hypocritical invention of which no one should be afraid. " A cobbler, a smith, a peasant, every man has his own calling and duty, just like the conse- crated priests and bishops, and every one in his

calling or office must help and serve the rest, so that all may work together for the common good." After overthrowing the other two walls, Luther invites the attention of the German rulers to the old theme of the pomp of the pope and cardinals, for which the Germans must pay. " What the Romanists really mean to do, the 'drunken Germans' are not to see until they have lost everything. ... If we rightly hang thieves and behead robbers, why do we leave the greed of Rome unpunished ? for Rome is the greatest thief and robber that has ever appeared on earth, or ever will; and all in the holy names of the Church and St Peter." After proving that the secular rulers were free and in duty bound to correct the evils of the Church, Luther sketches a plan for preventing money from going to Italy, for reducing the number of idle, begging monks, harmful pilgrimages and excessive holidays. Luxury and drinking were to be sup- pressed, the universities, especially the divinity schools, re- organized, &c.

Apart from fundamental rejection of the papal supremacy, there was little novel in Luther's appeal. It had all been said before in the various protests of which we have spoken, and very recently by Ulrich von Hutten in his Dialogues, but no one had put the case so strongly, or so clearly, before. In addressing the German nobility Luther had refrained from taking up theological or religious doctrines; but in September 1520 he attacked the whole sacramental system of the medieval Church in his Babylonish Captivity of the Church. Many reformers, like Glapion, the Franciscan confessor of Charles V., who had read the Address with equanimity if not approval, were shocked by Luther's audacity in rejecting the prevailing fundamental religious conceptions. Luther says: " I must begin by denying that there are seven sacraments, and must lay down for the time being that there are only three — baptism, penance and the bread, and that by the court of Rome all these have been brought into miserable bondage, and the Church despoiled of her liberty." It is, however, in the Freedom of the Christian that the essence of Luther's religion is to be found. Man cannot save himself, but is saved then and there so soon as he believes God's promises, and to doubt these is the supreme crime. So salvation was to him not a painful progress toward a goal to be reached by the sacraments and by right conduct, but a state in which man found himself so soon as he despaired absolutely of his own efforts, and threw himself on God's assurances. Man's utter incapacity to do anything to please God, and his utter personal dependence on God's grace seemed to render the whole system of the Church well-nigh gratuitous even if it were purged of all the " sophistry " which to Luther seemed to bury out of sight all that was essential in religion. Luther's gospel was one of love and confidence, not of fear and

trembling, and came as an overwhelming revelation to those who understood and accepted it.

The old question of Church reform inevitably reappeared

when the young emperor Charles V. opened his first imperial diet at Worms early in 1521, and a committee of German princes drafted a list of gravamina, longer and bitterer than The edict any preceding one. While the resolute papal nuncio of Worms, Aleander was indefatigable in his efforts to induce the 1521. fa et t0 con(j emn Luther's teachings, his curious and

instructive despatches to the Roman Curia complain constantly of the ill-treatment and insults he encountered, of the readiness of the printers to issue innumerable copies of Luther's pamphlets and of their reluctance to print anything in the pope's favour. Charles apparently made up his mind immediately and once for all. He approved the gravamina, for he believed a thorough reform of the Church essential. This reform he thought should be carried out by a council, even against the pope's will; and he was destined to engage in many fruitless negotiations to this end before the council of Trent at last assembled a score of years later. But he had no patience with a single monk who, led astray by his private judgment, set himself against the faith held by all Christians for a thousand years. " What my fore-fathers established at the council of Constance and other councils it is my privilege to maintain," he exclaims. Although, to Aleander's chagrin, the emperor consented to summon Luther to Worms, where he received a species of ovation, Charles readily approved the edict drafted by the papal nuncio, in which Luther is accused of having " brought together all previous heresies in one stinking mass," rejecting all law, teaching a life wholly brutish, and urging the lay people to bathe their hands in the blood of priests. He and his adherents were outlawed; no one was to print, sell or read any of his writings, " since they are foul, harmful, suspected, and come from a notorious and stiff-necked heretic." The edict of Worms was entirely in harmony with the ljiws of Western Christendom, and there were few among the governing classes in Germany at that time who really understood or approved Luther's fundamental ideas; nevertheless — if we except the elector of Brandenburg, George of Saxony, the dukes of Bavaria, and Charles V.'s brother Ferdinand — the princes, including the ecclesiastical rulers and the towns, commonly neglected to publish the

edict, much less to enforce it. They were glad to leave Luther unmolested in order to spite the ” Curtizanen,” as the adherents of the papal Curia were called. The emperor was forced to leave Germany immediately after the diet had dissolved, and was prevented by a succession of wars from returning for nearly ten years. The governing council, which had been organized to represent him in Germany, fell rapidly into disrepute, and exercised no restraining influence on those princes who might desire to act on Luther’s theory that the civil government was supreme in matters of Church reform.

The records of printing indicate that religious, social and economic betterment was the subject of an ever-increasing Wide number of pamphlets. The range of opinion was

diyerg- wide. Men like Thomas Murner, for instance, heartily ence of denounced ” the great Lutheran fool,” but at the same opinion la t j me D ;tterly attacked monks and priests, and popular- ized the conception of the simple man with the hoe (Karsthans). Hans Sachs, on the other hand, sang the praises of the ” Wittenberg Nightingale,” and a considerable number of prominent men of letters accepted Luther as their guide — • Zell and Bucer, in Strassburg, Eberlin in Ulm, Oecolampadius in Augsburg, Osiander and others in Nuremberg, Pellicanus in Nordlingen. Moreover, there gradually developed a group of radicals who were convinced that Luther had not the courage of his convictions. They proposed to abolish the ” idolatry ” of the Mass and all other outward signs of what they deemed the old superstitions. Luther’s colleague at Wittenberg, Carlstadt (q.v.), began denouncing the monastic life, the celi- bacy of the clergy, the veneration of images; and before the end of 1521 we find the first characteristic outward symptoms of Protestantism. Luther had meanwhile been concealed by his friends in the Wartburg, near Eisenach, where he busied himself with a new German translation of the New Testament, to be followed in a few years by the Old Testament. The

Bible had long been available in the language of the people, and there are indications that the numerous early editions of the Scriptures were widely read. Luther, however, possessed resources of style which served to render his version far superior to the older one, and to give it an important place in the develop- ment of German literature, as well as in the history of the Protestant churches. During his absence two priests from parishes near Wittenberg married; while several monks, throwing aside their cowls, left their cloisters. Melanchthon, who was for a moment carried away by the movement, partook, with several of his students, of the communion under both kinds, and on

Christmas Eve a crowd invaded the church of All Saints, broke the lamps, threatened the priests and made sport of the venerable ritual. Next day, Carlstadt, who had laid aside his clerical robes, dispensed the Lord's Supper in the " evangelical fashion." At this time three prophets arrived from Zwickau, eager to hasten the movement of emancipation. They were weavers who had been associated with Thomas Miinzer, and like him looked forward to a very radical reform of society. They rejected infant baptism, and were among the forerunners of the Anabaptists.

In January 1522, Carlstadt induced the authorities of Witten- berg to publish the first evangelical church ordinance. The revenues from ecclesiastical foundations, as well as those from the industrial gilds, were to be placed in a ˆstaal" common chest, to be in charge of the townsmen and the Revolt magistrates. The priests were to receive fixed salaries; begins in begging, even by monks and poor students, was pro- ffJi ony ' hibited; the poor, including the monks, were to be supported from the common chest. The service of the Mass was modified, and the laity were to receive the elements in both kinds. Reminders of the old religious usages were to be done away with, and fast days were to be no longer observed. These measures, and the excitement which followed the arrival of the radicals from Zwickau, led Luther to return to Wittenberg in March 1522, where he preached a series of sermons attacking the impatience of the radical party, and setting forth clearly his own views of what the progress of the Reformation should be. " The Word created heaven and earth and all things; the same Word will also create now, and not we poor sinners. Faith must be unconstrained and must be accepted without compulsion. To marry, to do away with images, to become monks and nuns, or for monks and nuns to leave their convent, to eat meat on Friday or not to eat it, and other like things — all these are open questions, and should not be forbidden by any man …. What we want is the heart, and to win that we must preach the gospel. Then the Word will drop into one heart to-day and to-morrow into another, and so will work that each will forsake the Mass." Luther succeeded in quieting the people both in Wittenberg and the neighbour- ing towns, and in preventing the excesses which had threatened to discredit the whole movement.

In January 1522, Leo X. had been succeeded by a new pope, Adrian VI., a devout Dominican theologian, bent on reforming the Church, in which, as he injudiciously Adrian VI. confessed through his legate to the diet at Nuremberg, 1S22- the Roman Curia had perhaps been the chief source lS23 – of " that corruption which had spread from the head to the members." The Lutheran heresy he held to be God's

terrible judgment on the sins of the clergy. The diet refused to accede to the pope's demand" that the edict of Worms should be enforced, and recommended that a Christian council should be summoned in January, to include not only ecclesiastics but laymen, who should be permitted freely to express their opinions. While the diet approved the list of abuses drawn up at Worms, it ordered that Luther's books should no longer be published, and that Luther himself should hold his peace, while learned men were to admonish the erring preachers. The decisions of this diet are noteworthy, since they probably give a very fair idea of the prevailing opinion of the ruling classes in Germany. They refused to regard Luther as in any way their leader, or even to recognize him as a discreet

and south la 1524.

person. On the other hand, they did not wish to take the risk of radical measures against the new doctrines, and were glad of an excuse for refusing the demands of the pope. Adrian soon died, worn out by his futile attempts to correct the abuses at home, and was followed by Clement VII., a Medici, less gifted but not less worldly in his instincts than LeoX.

Clement sent one of his ablest Italian diplomatists, Cam- peggio, to negotiate with the diet which met at Spires in 1524. He induced the diet to promise to execute the edict of B ****" Worms as far as that should be possible; but it was there- generally understood that it .was impossible. The Ugious diet renewed the demand for a general council to meet cleft be- j n a German town to settle the affairs of the Church German m Germany, and even proposed the convocation of states of a national council at Spires in November, to effect the north a temporary adjustment. In this precarious situation Campeggio, realizing the hopelessness of his attempt to induce all the members of the diet to co-operate with him in re-establishing the pope's control, called together at Regensburg a certain number of rulers whom he believed to be rather more favourably disposed toward the pope than their fellows. These included Ferdinand, duke of Austria, the two dukes of Bavaria, the archbishops of Salzburg and Trent, the bishops of Bamberg, Spires, Strassburg and others. He induced these to unite in opposing the Lutheran . heresy on condition that the pope would issue a decree providing for some of the most needed reforms. There was to be no more financial oppres- sion on the part of the clergy, and

no unseemly payments for performing the church services. Abuses arising from the granting of indulgences were to be remedied, and the excessive number of church holidays, which seriously interfered with the industrial welfare of Germany, was to be reduced. The states in the Catholic League were permitted to retain for their own uses about one-fifth of the ecclesiastical revenue; the clergy was to be subjected to careful discipline; and only authorized preachers were to be tolerated, who based their teachings on the works of the four Latin Church fathers. Thus the agree- ment of Regensburg is of great moment in the development of the Protestant revolt in Germany. For Austria, Bavaria and the great ecclesiastical states in the south definitely sided with the pope against Luther's heresies, and to this day they still remain Roman Catholic. In the north, on the other hand, it became more and more apparent that the princes were drift- ing away from the Roman Catholic Church. Moreover, it should be noted that Campeggio's diplomacy was really the beginning of an effective betterment of the old Church, such as had been discussed for two or three centuries. He met the long-standing and general demand for reform without a revolu- tion in doctrines or institutions. A new edition of the German Bible was issued with the view of meeting the needs of Catholics, a new religious literature grew up designed to sub- stantiate the beliefs sanctioned by the Roman Church and to carry out the movement begun long before toward spiritual- izing its institutions and rites.

In 1525 the conservative party, which had from the first feared that Luther's teaching would result in sedition, received The a new and terrible proof, as it seemed to them, of the

Peasant noxious influence of the evangelical preachers. The Revolt, peasant movements alluded to above, which had caused ls2S ' so much anxiety at the diet of Augsburg in 1518, cul-

minated in the fearful Peasant Revolt in which the common man, both in country and town, rose in the name of " God's justice " to avenge long-standing wrongs and establish his rights. Luther was by no means directly responsible for the civil war which followed, but he had certainly contributed to stir up the ancient discontent. He had asserted that, owing to the habit of foreclosing small mortgages, " any one with a hundred gulden could gobble up a peasant a year." The German feudal lords he pronounced hangmen, who knew only how to swindle the poor man — " such fellows were formerly called scoundrels, but now we must call them ' Christians and

revered princes.'" Yet in spite of this harsh talk about princes, Luther

relied upon them to forward the reforms in which he was interested, and he justly claimed that he had greatly increased their powers by reducing the authority of the pope and subjecting the clergy in all things to the civil government.

The best known statement of the peasants' grievances is to be found in the famous " Twelve Articles " drawn up in 1524. They certainly showed the unmistakable influence of the evangelical teaching. The peasants demanded that the gospel should be taught them as a guide in life, and that each community should be permitted to choose its pastor and depose him if he conducted himself improperly. " The pastor thus chosen should teach us the gospel pure and simple, without any addition, doctrine or ordinance of man." The old tithe on grain shall continue to be paid, since that is established by the Old Testament. It will serve to support the pastor, and what is left over shall be given to the poor. Serfdom is against God's word, "since Christ has delivered and redeemed us all without exception, by the shedding of. his precious blood, the lowly as well as the great." Protests follow against hunting and fishing rights, restrictions on wood-cutting, and ex- cessive demands made on peasants. " In the twelfth place," the declaration characteristically concluded, " it is our con- clusion and final resolution that if one or more of the articles here set forth should not be in agreement with the word of God, as we think they are, such articles will we willingly retract if it be proved by a clear explanation of Scripture really to be against the word of God." More radical demands came from the working classes in the towns. The articles of Heilbronn demanded that the property of the Church should be con- fiscated and used for the community; clergy and nobility alike were to be deprived of all their privileges, so that they could no longer oppress the poor man. The more violent leaders, like Miinzer, renewed the old cry that the parsons must be slain. Hundreds of castles and monasteries were destroyed by the frantic peasantry, and some of the nobles were murdered with shocking cruelty. Luther, who believed that the peasants were trying to cloak their dreadful sins with excuses from the gospel, exhorted the government to put down the in- surrection. " Have no pity on the poor folk; stab, smite, throttle, who can!" To him the peasants' attempt to abolish serfdom was wholly unchristian, since it was a divinely sanctioned institution, and if they succeeded they would " make God a liar." The German rulers took Luther's advice with terrible literalness, and avenged themselves upon the peasants, whose lot was apparently worse afterwards than before.

The terror inspired by the Peasant War led to a new alliance, the League of Dessau, formed by some of the leading rulers of central and

northern Germany, to stamp out the . ” accursed Lutheran sect.” This included Luther’s old anceot enemy, Duke George of Saxony, the electors of Bran- an evan- denburg and Mainz, and two princes of Brunswick. geHcal The rumour that the emperor was planning to return y ‘

to Germany in order to root out the growing heresy, led a few princes who had openly favoured Luther to unite also. Among these the chief were the new elector of Saxony, John (who, unlike his brother, Frederick the Wise, had openly espoused the new doctrines), and the energetic Philip, landgrave of Hesse. The emperor did not return, and since there was no one to settle the religious question in Germany, the diet of Spires (1526) determined that, pending the meeting of the proposed general council, each prince, and each knight and town owing immediate allegiance to the emperor, should decide individually what particular form of religion should prevail within the limits of their territories. Each prince was ” so to live, reign and conduct himself as he would be willing to answer before God and His Imperial Majesty.” While the evangelical party still hoped that some form of religion might be agreed upon which would prevent the disruption of the Church, the conservatives were confident that the heretics

would soon be suppressed, as they had so often been in the past. The situation tended to become more, rather than less, complicated, and there was every variety of reformer and every degree of conservatism, for there were no standards for those who had rejected the papal supremacy, and even those who continued to accept it differed widely. For example, George of Saxony viewed Aleander, the pope’s nuncio, with almost as much suspicion as he did Luther himself.

The religious ideas in South Germany were affected by the de- velopment of a reform party in Switzerland, under the influence _ of Zwingli, who claimed that at Einsiedeln, near the

and the lake of Zurich, he had begun to preach the gospel of Reforms- Christ in the year isr6 ” before any one in my locality tlonia nac j so mucn as heard the name of Luther.” Three land, years later he became preacherin the cathedral of Zurich.

Here he began to denounce the abuses in the Church, as well as the

traffic in mercenaries which had so long been a blot upon his country's honour. From the first he combined religious and political reform. In 1523 he prepared a complete statement of his beliefs, in the form of sixty-seven theses. He maintained that Christ was the only high priest and that the gospel did not gain its sanction from the authority of the Church. He denied the existence of purgatory, and rejected those practices of the Church which Luther had already set aside. Since no one presented himself to refute him, the town council ratified his conclusions, so that the city of Zurich prac- tically withdrew from the Roman Catholic Church. Next year the Mass, processions and the images of saints were abolished. The shrines were opened and the relics burned. Some other towns, including Bern, followed Zurich's example, but the Forest cantons refused to accept the innovations. In 1525 a religious and political league was arranged between Zurich and Constance, which in the following year was joined by St Gallen, Biel, Miihlhausen, Basel and Strassburg. Philip of Hesse was attracted by Zwingli's energy, and was eager that the northern reformers should be brought into closer relations with the south. But the league arranged by Zwingli was directed against the house of Habsburg, and Luther did not _ . u deem it right to oppose a prince by force of arms. and Moreover, he did not believe that Zwingli, who con-

Luther. ceived the eucharist to be merely symbolical in its r/ie character, " held the whole truth of God." Never-

' Articles! theless, Philip of Hesse finally arranged a religious conference in the castle of Marburg (1529) where Zwingli and Luther met. They were able to agree on fourteen out of the fifteen " Marburg Articles," which stated the chief points in the Christian faith as they were accepted by both. A fundamental difference as to the doctrine of the eucharist, however, stood in the way of the real union.

The diet of Spires (1529) had received a letter from the emperor directing it to look to the enforcement of the edict of The diet Worms against the heretics. No one was to preach of Spires, against the Mass, and no one was to be prevented from 1529, and attending it freely. This meant that the evangelical t t he t "£f'„ princes would be forced to restore the most character- istic Catholic rite. As they formed only a minority in the diet, they could only draw up a protest, which was signed by John Frederick of Saxony, Philip of Hesse, and fourteen of the three towns, including Strassburg, Nuremberg and Ulm. In this they claimed that the majority had no right to abrogate the stipulations of the former diet of Spires, which permitted each prince to determine religious matters provisionally for him- self, for all had

unanimously pledged themselves to observe that agreement. They therefore appealed to the emperor and to a future council against the tyranny of the majority. Those who signed this appeal were called Protestants, a name which came to be generally applied to those who rejected the supremacy of the pope, the Roman Catholic conceptions of the clergy and of the Mass, and discarded sundry practices of the older Church, without, however, repudiating the Catholic creeds.

During the period which had elapsed since the diet of Worms, the emperor had resided in Spain, busy with a series of wars, waged mainly with the king of France. 1 In 1530 the Tnedlet emperor found himself in a position to visit Germany and con- once more, and summoned the diet to meet at Augsburg, fession ot with the hope of settling the religious differences and Augsburg, bringing about harmonious action against the Turk. The Protestants were requested to submit a statement of their opinions, and on June 25th the ” Augsburg Confession ” was read to the diet. This was signed by the elector of Saxony and his son and successor, John Frederick, by George, margrave of Brandenburg, two dukes of Liineburg, Philip of Hesse and Wolfgang of Anhalt, and by the representatives of Nuremberg and Reutlingen. The confession was drafted by Melanchthon, who sought consistently to minimize the breach which separated the Lutherans from the old Church. In the first part of the confession the Protestants seek to prove that there is nothing in their doctrines at variance with those of the universal Church ” or even of the Roman Church so far as that appears in the writings of the Fathers.” They made it clear that they still held a great part of the beliefs of the medieval Church, especially as represented in Augustine’s writings, and repudiated the radical notions of the Anabaptists and of Zwingli. In the second part, those practices of the Church are enumerated which the evangelical party rejected; the celibacy of the clergy, the Mass, as previously understood, auricular confession, and monastic vows, the objections to which are stated with much vigour. ” Christian perfection is this: to fear God sincerely, to trust assuredly that we have, for Christ’s sake, a gracious and merciful God; to ask and look with confidence for help from him in all our affairs, accordingly to our calling, and outwardly to do good works diligently, and to attend to our vocation. In these things doth true perfection and a true worship of God consist. It doth not consist in going about begging, or in wearing a black or a grey cowl.” The Protestant princes declared that they had no intention of depriving the bishops of their jurisdiction, but this one thing only is requested of them, ” that they would suffer the gospel to be purely taught, and would relax a few observances in which we cannot adhere without sin.”

The confession was turned over to a committee of conserva- tive theologians, including Eck, Faber and Cochlaeus. Their refutation of the Protestant positions seemed needlessly Course ot sharp to the emperor, and five drafts were made of it. events in Charles finally reluctantly accepted it, although he Germany, would gladly have had it milder,, for it made reconcilia- }£j!~ tion hopeless. The majority of the diet approved a recess, allowing the Protestants a brief period of immunity until the 15th of April 1531, after which they were to be put down by force. Meanwhile, they were to make no further innovations, they were not to molest the conservatives, and were to aid the emperor in suppressing the doctrines of Zwingli and of the Anabaptists. The Lutheran princes protested, together with fourteen cities, and left the diet. The diet thereupon decided that the edict of Worms should at last be enforced. All Church property was to be restored, and, perhaps most important of all, the jurisdiction of the Imperial court (Reichskammergericht), which was naturally Catholic in its sympathies, was extended to appeals involving the seizure of ecclesiastical benefices, contempt of episcopal decisions and other matters deeply affect- ing the Protestants. In November the Protestants formed the Schmalkaldic League, which, after the death of Zwingli, in 1531, was joined by a number of the South German towns. The period of immunity assigned to the Protestants passed by; but they were left unmolested, for the emperor was involved in many difficulties, and the Turks were threatening Vienna. Consequently, at the diet of Nuremberg (1532) a recess was drafted indefinitely extending the religious truce and quashing such cases in the Reichskammergericht as involved Protestant

1 In 1527 the pope's capital was sacked by Charles's army. This was, of course, but an incident in the purely political relations of the European powers with the pope, and really has no bearing upon the progress of the Protestant revolt.

innovations. The conservatives refused to ratify the recess, which was not published, but the Protestant states declared that they would accept the emperor's word of honour, and furnished him with troops for repelling the Mahommedans. The fact that the conservative princes, especially the dukes of Bavaria, were opposed to any strengthening of the emperor's power, and were in some cases hereditary enemies of the house o£ Habsburg, served to protect the Protestant princes. In 1534 the Schmalkaldic League succeeded in

restoring the banished duke of Wurttemberg, who declared himself in favour of the Lutheran reformation, and thus added another to the list of German Protestant states. In 1 539 George of Saxony died, and was succeeded by his brother Henry, who also accepted the new faith, and in the same year the new elector of Brandenburg became a Protestant. Indeed, there was reason to believe at this time that the archbishops of Mainz, Trier and Cologne, as well as some other bishops, were planning the secularization of their principalities.

To the north, Lutheran influence had spread into Denmark; Sweden and Norway were also brought within its sphere. Denmark, Christian II. of Denmark, a nephew of the elector of Norway Saxony, came to the throne in 1513, bent on bringing Sweden Sweden and Norway, over which he nominally ruled in become accordance with the terms of the Union of Kalmar Protest- (1397), completely under his control. In order to do "* this it was necessary to reduce the power of the nobility

and clergy, privileged classes exempt from taxation and rivals of the royal power. Denmark had suffered from all the abuses of papal provisions, and the nuncio of Leo X. had been forced in 1518 to flee from the king's wrath. Christian II. set up a supreme court for ecclesiastical matters, and seemed about to adopt a policy similar to that later pursued by Henry VIII. of England, when his work was broken off by a revolt which compelled him to leave the country. Lutheranism continued to make rapid progress, and Christian's successor permitted the clergy to marry, appropriated the annates and protected the Lutherans. Finally Christian III., an ardent Lutheran, ascended the throne in 1536; with the sanction of the diet he severed, in 1537, all connexion with the pope, introducing the Lutheran system of Church government and accepting the Augsburg Confession. 1 Norway was included in the changes, but Sweden had won its independence of Denmark, under Gustavus Vasa, who, in 1523, was proclaimed king. He used the Lutheran theories as an excuse for overthrowing the ecclesi- astical aristocracy, which had been insolently powerful in Sweden. In 1527, supported by the diet, he carried his measures for secularizing such portions of the Church property as he thought fit, and for subjecting the Church to the royal power (Ordinances of Vesteras); but many of the old religious cere- monies and practices were permitted to continue, and it was not until 1592 that Lutheranism was officially sanctioned by the Swedish synod. 2

Charles V., finding that his efforts to check the spread of the religious schism were unsuccessful, resorted once more to The conferences

between Roman Catholic and Lutheran

Council theologians, but it became apparent that no permanent of Trent, compromise was possible. The emperor then succeeded in disrupting the Schmalkaldic League by winning over, on purely political grounds, Philip of Hesse and young Maurice of Saxony, whose father, Henry, had died after a very brief reign. Charles V. had always exhibited the greatest confidence in the proposed general council, the summoning of which had hitherto been frustrated by the popes, and at last, in 1545, the council was summoned to meet at Trent, which lay con- veniently upon the confines of Italy and Germany (see Trent, Council of). The Dominicans and, later, members of the newly born Order of Jesus, were conspicuous, among the

1 The episcopal office was retained, but the ” succession ” broken, the new Lutheran bishops being consecrated by Buggenhagen, who was only in priest’s orders.

2 The episcopal system and succession were maintained, and the ” Mass vestments ” {i.e. alb and chasuble) remain in use to this day.

theological deputies, while the Protestants, though invited, refused to attend. It was clear from the first that the decisions of the council would be uncompromising in character, and that the Protestants would certainly refuse to be bound by its decrees. And so it fell out. The very first anathemas of the council were directed against those innovations which the Protestants had most at heart. The emperor had now tried threats, conferences and a general council, and all had failed to unify the Church.

Maurice of Saxony, without surrendering his religious beliefs, had become the political friend of the emperor, who had promised him the neighbouring electorate of Saxony. Events John Frederick, the elector, was defeated at Miihlberg, cuiminat- April 1547, and taken prisoner. Philip of Hesse ˆ.glf’J” also surrendered, and Charles tried once more to peaceo f establish a basis of agreement. Three theologians, in- Augsburg, eluding a conservative Lutheran, were chosen to draft tsss. the so-called ” Augsburg Interim.” This reaffirmed the seven sacraments, transubstantiation and the invocation of saints, and declared the pope head of the Church, but adopted Luther’s doctrine of justification by faith in a conditional way, as well as the marriage of priests, and considerably modified the theory and practice of the Mass. For four years Charles, backed by the Spanish troops, made efforts to force the Protestant towns to observe the Interim, but with little success. He rapidly grew extremely unpopular, and in 1552

Maurice of Saxony turned upon him and attempted to capture him at Innsbruck. Charles escaped, but Maurice became for the moment leader of the German princes who gathered at Passau (August 1552) to discuss the situation. The settlement, however, was deferred for the meeting of the diet, which took place at Augsburg, 1555. There was a general anxiety to conclude a peace — ” bestdndiger, beharrlicher, un- bedingter, fiir und fur ewig wahrender .” There was no other way but to legalize the new faith in Germany, but only those were to be tolerated who accepted the Augsburg Confession. This excluded, of course, not only the Zwinglians and Ana- baptists, but the ever-increasing Calvinistic or ” Reformed ” Church. The principle cujus regio ejus religio was adopted, according to which each secular ruler might choose between the old faith and the Lutheran. His decision was to bind all his sub- jects, but a subject professing another religion from his prince was to be permitted to leave the country. The ecclesiastical rulers, however, were to lose their possessions if they abandoned the old faith. 3 Freedom of conscience was thus established for princes alone, and their power became supreme in religious as well as secular matters. The Church and the civil government had been closely associated with one another for centuries, and the old system was perpetuated in the Protestant states. Scarcely any one dreamed that individual subjects could safely be left to believe what they would, and permitted, so long as they did not violate the law of the land, freely to select and practise such religious rites as afforded them help and comfort.

During the three or four years which followed the signing of the Augsburg Confession in 1530 and the formation of the Schmalkaldic League, England, while bitterly de- Religious nouncing and burning Lutheran heretics in the name sit “^ t, o” of the Holy Catholic Church, was herself engaged in |”^T/ A/ , severing the bonds which had for well-nigh a thousand ope ningot years bound her to the Apostolic See. An in- theKtb dependent national Church was formed in 1534, century. which continued, however, for a time to adhere to all the characteristic beliefs of the medieval Catholic Church, excepting alone the headship of the pope. The circum- stances which led to the English schism are dealt with elsewhere (see England, Church of), and need be reviewed here only in the briefest manner. There was some heresy in England during the opening decades of the 16th century, survivals of the Lollardy which now and then brought a victim to the stake. There was also the old discontent among the orthodox in regard to the Church’s exactions, bad clerics and

3 This so-called ” ecclesiastical reservation ” was not included in the main peace.

dissolute and lazy monks. Scholars, like Colet, read the New Testament in Greek and lectured on justification by faith before they knew of Luther, and More included among the institutions of Utopia a rather more liberal and enlightened religion than that which he observed around him. Erasmus was read and approved, and his notion of reform by culture no doubt attracted many adherents among English scholars. Luther's works found their way into England, and were read and studied at both Oxford and Cambridge. In May 1521 Wolsey attended a pom- pous burning of Lutheran tracts in St Paul's churchyard, where Bishop Fisher preached ardently against the new German heresy. Henry VIII. himself stoutly maintained the headship of the pope, and, as is well known, after examining the arguments of Luther, published his Defence of the Seven Sacraments in 15 21, which won for him from the pope the glorious title of " Defender of the Faith. " The government and the leading men of letters and prelates appear therefore to have harboured no notions of revolt before the matter of the king's divorce became prominent in 1527.

Henry's elder brother Arthur, a notoriously sickly youth of scarce fifteen, had been married to Catherine, daughter of „ Ferdinand and Isabella, but had died less than five

Yin. months after the marriage (April 1502), leaving

and the doubts as to whether the union had ever been physi- divorce cally consummated. Political reasons dictated an case ' alliance between the young widow and her brother-in-

law Henry, prince of Wales, nearly five years her junior; Julius II. was induced reluctantly to grant the dispensation necessary on account of the relationship, which, according to the canon law and the current interpretation of Leviticus xviii. 16, stood in the way of the union. The wedding took place some years later (1509), and several children were born, none of whom survived except the princess Mary. By 1527 the king had become hopeless of having a male heir by Catherine. He was tired of her, and in love with the black-eyed Anne Boleyn, who refused to be his mistress. He alleged that he was beginning to have a horrible misgiving that his marriage with Catherine had been invalid, perhaps downright " incestuous. " The negotiations with Clement VII. with the hope of obtaining a divorce from Catherine, the reluctance of the pope to impeach the dispensation of his predecessor Julius II., and

at the same time to alienate the English queen's nephew Charles V., the futile policy of Wolsey and his final ruin in 1529 are described elsewhere (see English History; Henry VIII. ; Catherine of Aragon). The king's agents secured the opinion of a number of prominent universities that his marriage was void, and an assembly of notables, which he summoned in June 1530, warned the pope of the dangers involved in leaving the royal succession in uncertainty, since the heir was not only a woman, but, as it seemed to many, of illegitimate birth.

Henry's next move was to bring a monstrous charge against the clergy, accusing them of having violated the ancient laws Beginning of praemunire in submitting to the authority of papal of Eng- legates (although he himself had ratified the appoint- 4"o« ment of Wolsey as legate a latere). The clergy of the

against province of Canterbury were fined £100,000 and com- papacy. pelled to declare the king " their singular protector and only supreme lord, and, as far as that is permitted by the law of Christ, the supreme head of the Church and of the clergy." This the king claimed, perhaps with truth, was only a clearer statement of the provisions of earlier English laws. The following year, 1532, parliament presented a petition to the king (which had been most carefully elaborated by the monarch's own advisers) containing twelve charges against the bishops, relating to their courts, fees, injudicious appointments and abusive treatment of heretics, which combined to cause an unprecedented and " marvellous disorder of the godly quiet, peace and tranquillity" of the realm. For the remedy of these abuses parliament turned to the king, " in whom and by whom the only and sole redress, reformation and remedy herein absolutely rests and remains." The ordinaries met these accusations with a lengthy and dignified answer; but this did not satisfy the king, and convocation was compelled on the

15th of May 1532, further to clarify the ancient laws of the land, as understood by the king, in the very brief, very humble and very pertinent document known as the " Submission of the Clergy." Herein the king's " most humble subjects daily orators, and bedesmen " of the clergy of England, in view of his goodness and fervent Christian zeal and his learning far exceeding that of all other kings that they have read of, agree never to assemble in convocation except at the king's summons, and to enact and promulgate no constitution or ordinances except they receive the royal assent and authority. Moreover, the existing canons are to be subjected to the examination of a commission appointed by the king, half its members from parliament,

half from the clergy, to abrogate with the king's assent such provisions as the majority find do not stand with God's laws and the laws of the realm. This appeared to place the legislation of the clergy, whether old or new, entirely under the monarch's control. A few months later Thomas Cranmer, who had been one of those to discuss sympathetically Luther's works in the little circle at Cambridge, and who believed the royal supremacy would tend to the remedying of grave abuses and that the pope had acted ultra vires in issuing a dispensation for the king's marriage with Catherine, was induced by Henry to succeed Warham as archbishop of Canterbury. About the same time parliament passed an interesting and important statute, forbidding, unless the king should wish to suspend the operation of the law, the payment to the pope of the annates. This item alone amounted during the previous forty-six years, the parliament declared, " at the least to eight score thousand pounds, besides other great and intolerable sums which have yearly been conveyed to the said court of Rome by many other ways and means to the great impoverishment of this realm." The annates were thereafter to accrue to the king; and bishops and archbishops were thenceforth, in case the pope refused to confirm them, 1 to be consecrated and invested within the realm, " in like manner as divers other archbishops and bishops have been heretofore in ancient times by sundry the king's most noble progenitors." No censures, excommunications or interdicts with which the Holy Father might vex or grieve the sovereign lord or his subjects, should be published or in any way impede the usual performance of the sacraments and the holding of the divine services. In February parliament discovered that " by divers sundry old authentic histories and chronicles " it was manifest that the realm of England was an empire governed by one supreme head, the king, to whom all sorts and degrees of people — both clergy and laity- ought to bear next to God a natural and humble obedience, and that to him God had given the authority finally to deter- mine all causes and contentions in the realm, " without restraint, or provocation to any foreign princes or potentates of the world." The ancient statutes of the praemunire and provisors are recalled and the penalties attached to their violation re-enacted. All appeals were to be tried within the realm, and suits begun before an archbishop were to be deter- mined by him without further appeal. Acting on this, Cranmer tried the divorce case before his court, which declared the marriage with Catherine void and that with Anne Boleyn, which had been solemnized privately in January, valid. The pope replied by ordering Henry under pain of excommuni- cation to put away Anne and restore Catherine, his legal wife, within ten days. This sentence the emperor, all the Christian princes and the king's own subjects were summoned to carry out by force of arms if

necessary.

As might have been anticipated, this caused no break in the policy of the English king and his parliament, and a series of famous acts passed in the year 1534 completed and Secession confirmed the independence of the Church of England, of Eng- which, except during five years under Queen Mary, “.J/ was thereafter as completely severed from the papal monarchy, monarchy as the electorate of Saxony or the duchy 1534. of Hesse. The payment of annates and of Peter’s pence

1 Cranmer himself had taken the oath of canonical obedience to the Holy See and duly received the pallium.

was absolutely forbidden, as well as the application to the bishop of Rome for dispensations. The bishops were thereafter to be elected by the deans and chapters upon receiving the king’s congS d’eslire (q.v.). The Act of Succession provided that, should the king have no sons, Elizabeth, Anne’s daughter, should succeed to the crown. The brief Act of Supremacy confirmed the king’s claim to be reputed the ” only supreme head in earth of the Church of England “; he was to enjoy all the honours, dignities, jurisdictions and profits thereunto appertaining, and to have full power and authority to reform and amend all such errors, heresies and abuses, as by any manner of spiritual authority might lawfully be reformed, or amended, most to the pleasure of Almighty God, and the increase of virtue in Christ’s religion, ” foreign authority, prescription, or any other thing or things to the contrary hereof, notwithstanding.” The Treasons Act, terrible in its operation, included among capital offences that of declaring in words or writing the king to be ” a heretic, schismatic, tyrant, infidel or usurper.” The convocations were required to abjure the papal supremacy by declaring ” that the bishop of Rome has not in Scripture any greater jurisdiction in the kingdom of England than any other foreign bishop.” The king had now clarified the ancient laws of the realm to his satisfaction, and could proceed to abolish superstitious rites, remedy abuses, and seize such por- tions of the Church’s possessions, especially pious and monastic foundations, as he deemed superfluous for the maintenance of religion.

In spite of the fact that the separation from Rome had been carried out during the sessions of a single parliament, and The that there had been no opportunity for a general

reform expression of opinion on the part of the nation, there of the j s no reason to suppose that the majority of the clwrch people, thoughtful or thoughtless, were not ready to under reconcile themselves to the abolition of the papal Henry supremacy. It seems just as clear that there was vm. n0 strong evangelical movement, and that Henry's

pretty consistent adherence to the fundamental doctrines of the medieval Church was agreeable to the great mass of his subjects. The ten " Articles devised by the Kyng's Tlighnes Majestie to stablysh Christen quietness " (1536), together with the " Injunctions " of 1536 and 1538, are chiefly noteworthy for their affirmation of almost all the current doctrines of the Catholic Church, except those relating to the papal supremacy, purgatory, images, relics and pilgrimages, and the old rooted distrust of the Bible in the vernacular. The clergy were bidden to exhort their hearers to the " works of charity, mercy and faith, specially prescribed and commanded in Scripture, and not to repose their trust or affiance in any other works devised by men's phantasies beside Scripture; as in wandering to pilgrimages, offering of money, candles or tapers to images or relics, or kissing or licking the same, saying over a number of beads, not understood or minded on, or in such-like superstition." To this end a copy of the whole English Bible was to be set up in each parish church where the people could read it. During the same years the monasteries, lesser and greater, were dissolved, and the chief shrines were despoiled, notably that of St Thomas of Canter- bury. Thus one of the most important of all medieval ecclesi- astical institutions, monasticism, came to an end in England. Doubtless the king's sore financial needs had much to do with the dissolution of the abbeys and the plundering of the shrines, but there is no reason to suppose that he Was not fully con- vinced that the monks had long outlived their usefulness and that the shrines were centres of abject superstition and ecclesi- astical deceit. Henry, however, stoutly refused to go further in the direction of German Protestantism, even with the prospect of forwarding the proposed union between him and the princes of the Schmalkaldic League. An insurrection of the Yorkshire peasants, which is to be ascribed in part to the distress caused by the enclosure of the commons on which they had been wont to pasture their cattle, and in part to the

destruction of popular shrines, may have caused the king to defend his orthodoxy by introducing into parliament in 1539 the six questions. These parliament enacted into the terrible statute of " The Six Articles," in which a felon's death was prescribed for those who obstinately denied transubstantiation, demanded the communion under both kinds, questioned the binding character of vows of

chastity, or the lawfulness of private Masses or the expediency of auricular confession. On the 30th of July 1540 three Lutheran clergymen were burned and three Roman Catholics beheaded, the latter for denying the king's spiritual supremacy. The king's ardent desire that diversities of minds and opinions should be done away with and unity be " charitably established " was further promoted by publishing in 1543 A Necessary Doctrine and Erudition for any Christian Man, set forth by the King's Majesty of England, in which the tenets of medieval theology, except for denial of the supremacy of the bishop of Rome and the unmistakable assertion of the supremacy of the king, were once more restated.

Henry VIII. died in January 1547, having chosen a council of regency for his nine-year-old son Edward, the members of which were favourable to further religious innova- England tions. Somerset, the new Protector, strove to govern becomes on the basis of civil liberty and religious tolerance. Protestant The first parliament of the reign swept away almost SJJˆ all the species of treasons created during the previous vi., two centuries, the heresy acts, including the Six 1S47- Articles, all limitations on printing the Scriptures in ISS3. English and reading and expounding the same — indeed " all and every act or acts of parliament concerning doctrine or matters of religion." These measures gave a great impetus to religious discussion and local innovations. Representatives of all the new creeds hastened from the Continent to England, where they hoped to find a safe and fertile field for the particular seed they had to plant. It is impossible exactly to estimate the influence which these teachers exerted on the general trend of religious opinion in England; in any case, however, it was not unimportant, and the Articles of Religion and official homilies of the Church of England show unmistakably the influence of Calvin's doctrine. There was, however, no such sudden breach with the traditions of the past as characterized the Reformation in some continental countries. Under Edward VI. the changes were continued on the lines laid down by Henry VIII. The old hierarchy continued, but service books in English were sub- stituted for those in Latin, and preaching was encouraged. A royal visitation, beginning in 1547, discovered, however, such a degree of ignorance and illiteracy among the parish clergy that it became clear that preaching could only be gradually given its due place in the services of the Church. Communion under both kinds and the marriage of the clergy were sanctioned, thus gravely modifying two of the fundamental institutions of the medieval Church. A conservative Book of Common Prayer and Administration of the Sacraments and other Rites and Ceremonies after the Use of the Church of England — commonly

called the First Prayer Book of Edward VI. — was issued in 1549. This was based upon ancient ” uses,” and represented no revolutionary change in the traditions of the ” old religion.” It was followed, however, in 1552 by the second Prayer Book, which was destined to be, with some modifications, the permanent basis of the English service. This made it clear that the communion was no longer to be regarded as a propitiatory sacrifice, the names ” Holy Communion ” and ” Lord’s Supper ” being definitively sub- stituted for ” Mass ” (q.v.), while the word ” altar ” was replaced by ” table.” In the Forty-two Articles we have the basis of Queen Elizabeth’s Thirty-nine Articles. Thus during the reign of Edward we have not only the. founda- tions of the Anglican Church laid, but there appears the beginning of those evangelical and puritanical sects which were to become the ” dissenters ” of the following centuries.

With the death of Edward there came a period of reaction lasting for five years. Queen Mary, unshaken in her attach- Catboiic ment to the ancient faith and the papal monarchy, reaction was a bi e with the sanction of a subservient parlia- “lUan ment to turn back the wheels of ecclesiastical legis-

1553- lation, to restore the old religion, and to reunite the

1558. English Church with the papal monarchy; the pope’s

legate, Cardinal Pole, was primate of all England. Then, the ancient heresy laws having been revived, came the burnings of Rogers, Hooker, Latimer, Ridley, Cranmer and many a less noteworthy champion of the new religion. It would seem as if this sharp, uncompromising reaction was what was needed to produce a popular realization of the contrast between the Ecdesia anglicana of Henry VIII. and Edward VI., and the alternative of ” perfect obedience to the See Apostolic.”

Elizabeth, who succeeded her sister Mary in 1558, was sus- pected to be Protestant in her leanings, and her adviser, Cecil, Settle- had received his training as secretary of the Protector meat Somerset; but the general European situation as

under we n as t ne young queen’s own temperament pre-

a e ‘ eluded any abrupt or ostentatious change in religious matters.

The new sovereign's first proclamation was directed against all such preaching as might lead to contention and the breaking of the common quiet. In 1559 ten of Henry VIII. 's acts were revived. On Easter Sunday the queen ventured to display her personal preference for the Protestant conception of the eucharist by forbidding the celebrant in her chapel to elevate the host. The royal supremacy was reasserted, the title being modified into " supreme governor "; and a new edition of Edward VI. 's second Prayer Book, with a few changes, was issued. The Marian bishops who refused to recognize these changes were deposed and imprisoned, but care was taken to preserve the " succession " by consecrating others in due form to take their places. 1 Four years later the Thirty-nine Articles imposed an official creed upon the English nation. This was Protestant in its general character: in its appeal to the Scriptures as the sole rule of faith (Art. VI.), its repudiation of the authority of Rome (Art. XXXVII.) , its definition of the Church (Art. XIX.), its insistence on justifica- tion by faith only (Art. XL) and repudiation of the sacrifice of the Mass (Arts. XXVIII. and XXXI.). As supreme governor of the Church of England the sovereign strictly controlled all ecclesiastical legislation and appointed royal delegates to hear appeals from the ecclesiastical courts, to be a " papist " or to " hear Mass " (which was construed as the same thing) was to risk incurring the terrible penalties of high treason. By the Act of Uniformity (1559) a uniform ritual, the Book of Common Prayer, was imposed upon clergy and laity alike, and no liberty of public worship was permitted. Every subject was bound under penalty of a fine to attend church on Sunday. While there was in a certain sense freedom of opinion, all printers had to seek a licence from the government for every manner of book or paper, and heresy was so closely affiliated with treason that the free expression of thought, whether reactionary or revolutionary, was beset with grave danger.

Attempts to estimate the width of the gulf separating the Church of England in Elizabeth's time from the corresponding institution as it existed in the early years of her father's reign are likely to be gravely affected by personal bias. There is a theory that no sweeping revolution in dogma took place, but that only a few medieval beliefs were modified or rejected owing to the practical abuses to which they had given rise. To Professor A. F. Pollard, for example, " The Reformation in England was mainly a domestic affair, a national protest against national grievances rather than part of a cosmopolitan move- ment toward doctrinal change" (Camb. Mod. Hist. ii. 478-9). This estimate appeals to persons of widely different views and temperaments. It is as grateful to those who, like many " Anglo-Catholics," desire on religious grounds to establish the doctrinal

continuity of the Anglican Church with that of the

1 Only one of the Marian bishops, Kitchin of Llandaff, was found willing to conform.

middle ages, as it is obvious to those who, like W. K. Clifford, perceive in the ecclesiastical organization and its influence nothing more than a perpetuation of demoralizing medieval superstition. The nonconformists have, moreover, never wearied of denouncing the ” papistical ” conservatism of the Anglican establishment. On the other hand, the impartial historical student cannot compare the Thirty-nine Articles with the contemporaneous canons and decrees of the council of Trent without being impressed by striking contrasts between the two sets of dogmas. Their spirit is very different. The un- mistakable rejection on the part of the English Church of the conception of the eucharist as a sacrifice had alone many wide- reaching implications. Even although the episcopal organiza- tion was retained, the conception of ” tradition,” of the conciliar powers, of the ” characters ” of the priest, of the celibate life, of purgatory, of ” good works,” &c. — all these serve clearly to differentiate the teaching of the English Church before and after the Reformation. From this standpoint it is obviously un- histbrical to deny that England had a very important part in the cosmopolitan movement toward doctrinal change.

The little backward kingdom of Scotland definitely accepted the new faith two years after Elizabeth’s accession, and after having for centuries sided with France against England, Tae R e f or . she was inevitably forced by the Reformation into an motion in alliance with her ancient enemy to the south when they Scotland, both faced a confederation of Catholic powers. The lS60 ‘ first martyr of Luther’s gospel had been Patrick Hamilton, who had suffered in 1528; but in spite of a number of executions the new ideas spread, even among the nobility. John Knox, who, after a chequered career, had come under the influence of Calvin at Geneva, returned to Scotland for a few months in 1555, and shortly after (1557) that part of the Scottish nobility which had been won over to the new faith formed their first ” covenant ” for mutual protection. These ” Lords of the Congregation ” were able to force some concessions from the queen regent. Knox appeared in Scotland again in 1559, and became a sort of second Calvin. He opened negotiations with Cecil, who induced the reluctant Elizabeth to form an alliance with the Lords of the Congregation, and the English sent a fleet to drive away the French, who were endeavouring to keep their hold on Scotland. In 1560 a confession of faith was prepared by John Knox and five companions. This was adopted by the Scottish parliament, with the resolution ” the bishops

of Rome have no jurisdiction nor authoritie in this Realme in tymes cuming." The alliance of England and the Scottish Protestants against the French, and the common secession from the papal monarchy, was in a sense the foundation and beginning of Great Britain. Scottish Calvinism was destined to exercise no little influence, not only on the history of England, but on the form that the Protestant faith was to take in lands beyond the seas, at the time scarcely known to the Europeans. < While France was deeply affected during the 16th century by the Protestant revolt, its government never undertook any thoroughgoing reform of the Church. During the Begin- latter part of the century its monarchs were en- "lags 0/ gaged in a bloody struggle with a powerful religious- te e staat ' political party, the Huguenots, who finally won a movement toleration which they continued to enjoy until the i" Prance. revocation of the edict of Nantes in 1685. It was not until 1789 that the French Church of the middle ages lost its vast possessions and was subjected to a fundamental reconstruction by the Civil Constitution of the Clergy (1791). 2 Yet no summary of

2 In 1795 the National Convention gruffly declared that the Republic would no longer subsidize any form of worship or furnish buildings for religious services. " The law recognizes no minister of religion, and no one is to appear in public with costumes or orna- ments used in religious ceremonies." Bonaparte, in the Concordat which he forced upon the pope in 1801, did not provide for the return of any of the lands of the Church which had been sold, but agreed that the government should pay the salaries of bishops and priests, whose appointment it controlled. While the Roman Catholic re- ligion was declared to be that accepted by the majority of French- men, the state subsidized the Reformed Church, those adhering to the Augsburg Confession and the Jewish community. Over a

the Protestant revolt would be complete without some allusion to the contrast between the course of affairs in France and in the neighbouring countries. The French monarchy, as we have seen, had usually succeeded in holding its own against the centralizing tendencies of the pope. By the Pragmatic Sanction of Bourges (1438) it had secured the advantages of the conciliar movement. In 1516, after Francis I. had won his victory at Marignano, Leo X. concluded a new concordat with France, in which, in view of the repudiation of the offensive Pragmatic Sanction, the patronage of the French Church was turned over, with scarce any restriction, to the French monarch,

although in another agreement the annates were reserved to the pope. The encroachments — which had begun in the time of Philip the Fair — of the king's lawyers on the ancient ecclesiastical juris- diction, had reached a point where there was little cause for jealousy on the part of the State. The placet had long prevailed, so that the king had few of the reasons, so important in Germany and England, for quarrelling with the existing system, unless it were on religious grounds. France had been conspicuous in the conciliar movement. It had also furnished its due quota of heretics, although no one so conspicuous as Wy cliff e or Huss. Marsiglio of Padua had had Frenchmen among his sympathizers and helpers. The first prominent French scholar to " preach Christ from the sources " was Jacques Lefebvre of Etaples, who in 1512 published a new Latin translation of the epistles of St Paul. Later he revised an existing French translation of both the New Testament (which appeared in 1523, almost con- temporaneously with Luther's German version) and, two years later, the Old Testament. He agreed with Luther in rejecting transubstantiation, and in believing that works without the grace of God could not make for salvation. The centre of Lefebvre's followers was Meaux, and they found an ardent adherent in Margaret of Angouleme, the king's sister, but had no energetic leader who was willing to face the danger of disturb- ances. Luther's works found a good many readers in France, but were condemned (1521) by both the Sorbonneand the parle- ment of Paris. The parlement appointed a commission to discover and punish heretics; the preachers of Meaux fled to Strassburg, and Lefebvre's translation of the Bible was publicly burned. A council held at Sens, 1528-29, approved all those doctrines of the old Church which the Protestants were attacking, and satisfied itself with enumerating a list of necessary conservative reforms. After a fierce attack on Protestants caused by the mutilation of a statue of the Virgin, in 1528, the king, anxious to con- Joha ciliate both the German Protestants and anti-papal

Calvin England, invited some of the reformers of Meaux and his £ preach in the Louvre. An address written by tut" sot a y° un S man °f twenty-four, Jean Cauvin (to the become immortal under his Latin name of Calvinus)

Christian wa s read by the rector of the university. It was Religion." a defence of the new evangelical views, and so aroused the Sorbonne that Calvin was forced to flee from Paris. In October 1534, the posting of placards in Paris and other towns, containing brutal attacks on the Mass and denouncing the pope and the " vermin " of bishops, priests and monks as blasphemers and liars, produced an outburst of persecution, in which thirty-five Lutherans were burned, while many

fled the country. The events called forth from Calvin, who was in Basel, the famous letter to Francis which forms the preface to his Institutes of the Christian Religion. In this address he sought to vindicate the high aims of the Protestants, and to put the king on his guard against those mad men who were disturbing his kingdom with their measures of persecution. The Institutes, the first great textbook of Protestant theology, was published in Latin in 1536, and soon (1541) in a French version. The original work is much shorter than in its later editions, for, as Calvin says, he wrote learning and learned century elapsed before the Concordat was abrogated by the Separation Law of 1905 which suppressed all government appropriations for religious purposes and vested the control of Church property in " associations for public worship " {associations cultuelles), to be composed of from seven to twenty-five members according to the size of the commune.

writing. His address had little effect on the king. The parle- ments issued a series of edicts against the heretics, culminating in the very harsh general edict of Fontainebleau, sanctioned by the parlement of Paris in 1543. The Sorbonne issued a concise series of twenty-five articles, refuting the Institutes of Calvin. This statement, when approved by the king and his council , was published throughout France, and formed a clear test of orthodoxy. The Sorbonne also drew up a list of prohibited books, including those of Calvin, Luther and Melanchthon; and the parlement issued a decree against all printing of Pro- testant literature. The later years of Francis's reign were noteworthy for the horrible massacre of the Waldenses and the martyrdom of fourteen from the group of Meaux, who were burnt alive in 1546. When Francis died little had been done, in spite of the government's cruelty, to check Protestantism, while a potent organ of evangelical propaganda had been developing just beyond the confines of France in the town of Geneva.

In its long struggle with its bishops and with the dukes of Savoy, Geneva had turned to her neighbours for aid, especi- ally to Bern, with which an alliance was concluded in 1526. Two years later Bern formally sanctioned becomes the innovations advocated by the Protestant preachers, a centre and although predominantly German assumed the of P"> P a – role of protector of the reform party in the Pays " de Vaud and Geneva. William Farel, one of the group of Meaux, who had fled to Switzerland and had been active in the conversion of Bern, went to Geneva in 1531. With the protection afforded him and his companions by Bern, and the absence of well-organized opposition on the part of the Roman Catholics, the new doctrines rapidly spread, and by 1535 Farel was preaching in St Pierre itself. After a public

disputation in which the Catholics were weakly represented, and a popular demonstration in favour of the new doctrines, the council of Geneva rather reluctantly sanctioned the abolition of the Mass. Meanwhile Bern had declared war on the duke of Savoy, and had not only conquered a great part of the Pays de Vaud, including the important town of Lausanne, but had enabled Geneva to win its complete inde- pendence. In the same year (September 1536), as Calvin was passing through the town on his way back to Strassburg after a short visit in Italy, he was seized by Farel and induced most reluctantly to remain and aid him in thoroughly carrying out the Reformation in a city in which the conservative senti- ment was still very strong. As there proved to be a large number in the town councils who did not sympathize with the plans of organization recommended by Calvin and his col- leagues, the town preachers were, after a year and a half of unsatisfactory labour, forced to leave Geneva. For three years Calvin sojourned in Germany; he signed the Augsburg Con- fession, gained the friendship of Melanchthon and other leading reformers, and took part in the religious conferences of the period. In 1541 he was induced with great difficulty to sur- render once more his hopes of leading the quiet life of a scholar, and to return again to Geneva (September 1541), where he spent the remaining twenty-three years of his life. His ideal was to restore the conditions which he supposed prevailed during the first three centuries of the Church's existence; but the celebrated Ecclesiastical Ordinances adopted by the town in 1 541 and revised in 1561 failed fully to realize his ideas, which find a more complete exemplification in the regulations govern- ing the French Church later. He wished for the complete independence and self-government of the Church, with the right of excommunication to be used against the ungodly. The Genevan town councils were quite ready to re-enact all the old police regulations common in that age in regard to excessive display, dancing, obscene songs, &c. It was arranged too that town government should listen to the " Consistory," made up of the " Elders," but the Small Council was to choose the members of the Consistory, two of whom should belong to the Small Council, four to the Council of Sixty, and six to the Council of Two Hundred. One of the four town syndics was to preside over its sessions. The Consistory was thus a sort of committee of

the councils, and it had no power to inflict civil punishment on offenders. Thus " we ought," as Lindsay says, " to see in the disciplinary powers and punishments of the Consistory of Geneva not

an exhibition of the working of the Church organ- ized on the principles of Calvin, but the ordinary procedure of the town council of a medieval city. Their petty punishments and their minute interferences with private life are only special instances of what was common to all municipal rule in the 16th century." This is true of the supreme crime of heresy, which in the notorious case of Servetus was only an expression of rules laid down over a thousand years earlier in the Theodosian Code. Geneva, however, with its most distinguished of Protestant theo- logians, became a school of Protestantism, which sent its trained men into the Netherlands, England and Scotland, and especially across the border into France. It served too as a place of refuge for thousands of the persecuted adherents of its beliefs. Calvin's book furnished the Protestants not only with a compact and admirably written handbook of theology, vigorous and clear, but with a system of Church government and a code of morals.

After the death of Francis I., his successor, Henry II., set himself even more strenuously to extirpate heresy; a special

. . . branch of the parlement of Paris — the so-called Huguenot Chambre ardente (q.v.) — for the trial of heresy cases party was established, and the fierce edict of Chateaubriand

under (June 1551) explicitly adopted many of the expedients eary ' of the papal inquisition. While hundreds were im- prisoned or burned, Protestants seemed steadily to increase in numbers, and finally only the expostulations of the parlement of Paris prevented the king from introducing the Inquisition in France in accordance with the wishes of the pope and the cardinal of Lorraine. The civil tribunals, however, practically assumed the functions of regular inquisitorial courts, in spite of the objections urged by the ecclesiastical courts. Notwith- standing these measures for their extermination, the French Protestants were proceeding to organize a church in accordance with the conceptions of the early Christian communities as Calvin described them in his Institutes. Beginning with Paris, some fifteen communities with their consistories were established in French towns between 1555 and 1560. In spite of continued persecution a national synod was assembled in Paris in 1559, representing at least twelve Protestant churches in Normandy and central France, which drew up a confession of faith and a book of church discipline. It appears to have been from France rather than from Geneva that the Presbyterian churches of Holland, Scotland and the United States derived their form of government. A reaction against the extreme severity of the king's courts became apparent at this date. Du Bourg and others ventured warmly to defend the Protestants in the parle- ment of Paris

in the very presence of the king and of the cardinal of Lorraine. The higher aristocracy began now to be attracted by the new doctrines, or at least repelled by the flagrant power enjoyed by the Guises during the brief reign of Francis II. (1559-1560). Protestantism was clearly becoming inextricably associated with politics of a very intricate sort. The leading members of the Bourbon branch of the royal family, and Gaspard de Coligny, admiral of France, were conspicuous among the converts to Calvinism. Persecution was revived by the Guises; Du Bourg, the brave defender of the Protestants, was burned as a heretic; yet Calvin could in the closing years of his life form a cheerful estimate that some three hundred thousand of his countrymen had been won over to his views. The death of Francis II. enabled Catherine de' Medici, the queen mother, to assert herself against the Guises, and become the regent of her ten-year-old son Charles IX. A meeting of the States General had already been summoned to consider the state of the realm. Michel de l'Hopital, the chancellor, who opened the assembly, was an advocate of toleration; he deprecated the abusive use of the terms " Lutherans," " Papists " and " Huguenots," and advocated deferring all action until a council should have been called. The deputies of the clergy were naturally conservative. } but advocated certain reforms, an abolition of the Concordat, J and a re-establishment of the older Pragmatic Sanction. The 1

noblesse were divided on the matter of toleration, but the cahiers (lists of grievances and suggestions for reform) submitted by the Third Estate demanded, besides regular meetings of the estates every five years, complete toleration and a reform of the Church. This grew a little later into the recommendation that the revenues and possessions of the French Church should be appropriated by the government, which, after properly sub- sidizing the clergy, might hope, it was estimated, that a surplus of twenty-two millions of livres would accrue to the State. Two hundred and thirty years later this plan was realized in the Civil Constitution of the Clergy. The deliberations of 1561 resulted in the various reforms, the suspension of persecution and the liberation of Huguenot prisoners. These were not accorded freedom of worship, but naturally took advantage of the situation to carry on their services more publicly than ever before. An unsuccessful effort was made at the conference of Poissy to bring the two religious parties together; Beza had an opportunity to defend the Calvinistic cause, and Lainez, the general of the Order of Jesus, that of the bishop of Rome. The government remained tolerant toward the movement, and in January 1562 the Huguenots were given permission to hold public services outside the walls of fortified towns and were not forbidden to meet in private houses within the walls. Catherine, who had promoted

these measures, cared nothing for the Protestants, but desired the support of the Bourbon princes. The country was Catholic, and disturbances inevitably occurred, culminating in the attack of the duke of Guise and his troops on the Protestants at Vassy, less than two months after the issuing of the edict.

It is impossible to review here the Wars of Religion which distracted France, from the ” massacre of Vassy ” to the publication of the edict of Nantes, thirty-six years The later. Religious issues became more and more domin- Preach ated by purely political and dynastic ambitions, and Wars or the whole situation was constantly affected by the KeI L g !u” policy of Philip II. and the struggle going on in the edict of Netherlands. Henry IV. was admirably fitted to Nantes, reunite France once more, and, after a superficial 1562- con version to the Catholic faith, to meet the needs of his former co-religionists, the Huguenots. The edict of Nantes recapitulated and codified the provisions of a series of earlier edicts of toleration, which had come with each truce during the previous generation. Liberty of conscience in religious matters was secured and the right of private worship to those of the ” so-called Reformed religion.” Public worship was permitted everywhere where it had existed in T596-1597, in two places within each baittiage and sinechaussee, and in the chateaux of the Protestant nobility, with slight restrictions in the case of lower nobility. Protestants were placed upon a political equality and made eligible to all public offices. To ensure these rights, they were left in military control of two hundred towns, including La Rochelle, Montauban and Montpellier. Jealous of their ” sharing the State with the king,” Richelieu twenty-five years later reduced the exceptional privileges of the Huguenots, and with the advent of Louis XIV. they began to suffer renewed persecution, which the king at last flattered himself had so far reduced their number that in 1685 he revoked the edict of Nantes and reduced the Protestants to the status of outlaws. It was not until 1786 that they were restored to their civil rights, and by the Declaration of the Rights of Man, in 1789, to their religious freedom.

Contemporaneously with the Wars of Religion in France

a long and terrible struggle between the king of Spain and his

Dutch and Belgian provinces had resulted in the The

formation of a Protestant state — the United Nether- Unltea

lands, which was destined to play an important r61e ; an(fa aatt

in the history of the Reformed religion. Open both their im-

to German and French influences, the Netherlands portance

had been the scene of the first executions of Lutherans ; P. . _

..’ history

they had been a centre of Anabaptist agitation ; but Cal- f tolera-
vinism finally triumphed in the Confession of Dordrecht, tion. 1572,
since Calvin’s system of church government did not, like

Luther’s, imply the sympathy of the civil authorities. Charles V. had valiantly opposed the development of heresy in the Nether- lands, and nowhere else had there been such numbers of martyrs, for some thirty thousand are supposed to have been put to death during his reign. Under ‘Philip II. it soon became almost impossible to distinguish clearly between the religious issues and the resistance to the manifold tyranny of Philip and his representatives. William of Orange, who had passed through several phases of religious conviction, stood first and foremost for toleration. Indeed, Holland became the home of modern religious liberty, the haven of innumerable free spirits, and the centre of activity of printers and publishers, who asked for no other imprimatur than the prospect of intelligent readers.

It is impossible to offer any exhaustive classification of those who, while they rejected the teachings of the old Church, The Ana- refused at the same time to conform to the particular baptists, types of Protestantism which had found favour in the eyes of the princes and been imposed by them on their subjects. This large class of ” dissenters ” found themselves as little at home under a Protestant as under a Catholic regime, and have until recently been treated with scant sympathy by historians of the Church. Long before the Protestant revolt, simple, obscure people, under the influence of leaders whose names have been forgotten, lost confidence in the official clergy and their sacraments and formed secret organizations of which vague accounts are found in the reports of the 13th-century inquisitors, Rainerus Sacchoni, Bernard Gui, and the rest. Their anti-sacerdotalism appears to have been their chief offence, for the inquisitors admit that they were puritanically careful in word and conduct, and shunned all levity. Similar groups are mentioned in the town chronicles of the early 16th century, and there is reason to

assume that informal evangelical movements were no new things when Luther first began to preach. His appeal to the Scriptures against the traditions of the Church encouraged a more active propaganda on the part of Balthasar Hubmaier, Carlstadt, Munzer, Johann Denk (d. 1527) and others, some of whom were well-trained scholars capable of maintaining with vigour and effect their ideas of an apostolic life as the high road to salvation. Munzer dreamed of an approaching millennium on earth to be heralded by violence and suffering, but Hubmaier and Denk were peaceful evangelists who believed that man's will was free and that each had within him an inner light which would, if he but followed it, guide him to God. To them persecution was an outrage upon Jesus's teachings. Luther and his sympathizers were blind to the reasonableness of the fundamental teachings of these " brethren." The idea of adult baptism, which had after 1525 become generally accepted among them, roused a bitterness which it is rather hard to understand nowadays. But it is easy to see that informal preaching to the people at large, especially after the Peasant Revolt, with which Munzer had been identified, should have led to a general condemnation, under the name " Anabaptist " or " Catabaptist," of the heterogeneous dissenters who agreed in rejecting the State religion and associated a condemnation of infant baptism with schemes for social betterment. The terrible events in Munster, which was controlled for a short time (1533-34) by a group of Anabaptists under the leadership of John of Leiden, the introduction of polygamy (which appears to have been a peculiar accident rather than a general principle), the speedy capture of the town by an alliance of Catholic and Protestant princes, and the ruthless retribution inflicted by the victors, have been cherished by ecclesiastical writers as a choice and convincing instance of the natural fruits of a rejection of infant baptism. Much truer than the common estimate of the character of the Anabaptists is that given in Sebastian Franck's Chronicle: " They taught nothing but love, faith and the crucifixion of the flesh, manifesting patience and humility under many sufferings, breaking bread with one another in sign of unity and love, helping one another with true helpfulness, lending, borrowing, giving, learning to have all things in common, calling each other ' brother.' " Mejmo

Simons (b. circ. 1500) succeeded in bringing the scattered Ana- baptist communities into a species of association; he dis- couraged the earlier apocalyptic hopes, inculcated non-resist- ance, denounced the evils of State control over religious matters, and emphasized personal conversion, and adult baptism as its appropriate seal. The English Independents and the modern Baptists, as well as the Mennonites, may

be regarded as the historical continuation of lines of development going back to the Waldensians and the Bohemian Brethren, and passing down through the German, Dutch and Swiss Anabaptists.

The modern scholar as he reviews the period of the Pro- testant Revolt looks naturally, but generally in vain, for those rationalistic tendencies which become so clear in the socinlans latter part of the 17th century. Luther found no in- orAnti- tellectual difficulties in his acceptance and interpreta- Trini- tion of the Scriptures as God's word, and in maintain- ia " ans – ing against the Anabaptists the legitimacy of every old custom that was not obviously contrary to the Scriptures. Indeed, he gloried in the inherent and divine unreasonableness of Christianity, and brutally denounced reason as a cunning fool, " a pretty harlot." The number of questions which Calvin failed to ask or eluded by absolutely irrational expedients frees him from any taint of modern rationalism. But in Servetus, whose execution he approved, we find an isolated, feeble revolt against assumptions which both Catholics and Protestants of all shades accepted without question. It is pretty clear that the common accounts of the Renaissance and of the revival of learning grossly exaggerate the influence of the writers of Greece and Rome, for they produced no obvious rationalistic movement, as would have been the case had Plato and Cicero, Lucretius and Lucian, been taken really seriously. Neo- Platonism, which is in some respects nearer the Christian patristic than the Hellenic spirit, was as far as the radical religious thinkers of the Italian Renaissance receded. The only religious movement that can be regarded as even rather vaguely the outcome of humanism is the Socinian. Faustus Sozzini, a native of Sienna (1539-1603), much influenced by his uncle Lelio Sozzini, after a wandering, questioning life, found his way to Poland, where he succeeded in uniting the various Anabaptist sects into a species of church, the doctrines of which are set forth in the Confession of Rakow (near Minsk), published in Polish in 1605 and speedily in German and Latin. The Latin edition declares that although this new statement of the elements of the Christian faith differs from the articles of other Christian creeds it is not to be mistaken for a challenge. It does not aim at binding the opinions of men or at condemn- ing to the tortures of hell-fire those who refuse to accept it. Absit a nobis ea mens, immo amentia. " We have, it is true, ventured to prepare a catechism, but we force it on no one; we express our opinions, but we coerce no one. It is free to every one to form his own conclusions in religious matters; and so we do no more than set forth the meaning of divine things as they appear to our minds without, however, attacking or insulting those who differ from us. This is the golden freedom of preaching which the holy words of the New Testa-

ment so strictly enjoin upon us. . . . Who art thou, miserable man, who would smother and extinguish in others the fire of God's Spirit which it has pleased him to kindle in them ? " The Socinian creed sprang from intellectual rather than re- ligious motives. Sufficient reasons could be assigned for accepting the New Testament as God's word and Christ as the Christian's guide. He was not God, but a divine prophet born of a virgin and raised on the third day as the first-fruits of them that slept. From the standpoint of the history of enlight- enment, as Harnack has observed, " Socinianism with its sys- tematic criticism (tentative and imperfect as it may now seem) and its rejection of all the assumptions based upon mere ecclesiastical tradition, can scarcely be rated too highly. That modern Unitarianism is all to be traced back to Sozzini and the Rakow Confession need not be assumed. The anti-Trini- tarian path was one which opened invitingly before a consider- able class of critical minds, seeming as it did to lead out into

a sunny open, remote from the unfathomable depths of mystery and clouds of religious emotion which beset the way of the sincere Catholic and Protestant alike.

The effects of the Protestant secession on the doctrines, organization and practices of the Roman Catholic Church are Tbe difficult to estimate, still more so to substantiate. It

Catholic is clear that the doctrinal conclusions of the council Reforms- f Trent were largely determined by the necessity """" of condemning Protestant tenets, and that the result

of the council was to give the Roman Catholic faith a more precise form than it would otherwise have had. It is much less certain that the disciplinary reforms which the council, following the example of its predecessors, re-enacted, owed anything to Protestantism, unless indeed the council would have shown itself less intolerant in respect to such innovations as the use of the vernacular in the services had this not smacked of evangelicalism. In the matter of the pope's supremacy, the council followed the canon law and Thomas Aquinas, not the decrees of the council of Constance. It prepared the way for the dogmatic formulation of the plenitude of the papal power three centuries later by the council of the Vatican. The Protestants have sometimes taken credit to themselves for the indubitable reforms in the Roman Catholic Church, which by the end of the 16th century had done away with many of the crying abuses against which councils and diets had so long been protesting. But this conservative reformation

had begun before Luther's preaching, and might conceivably have followed much the same course had his doctrine never found popular favour or been ratified by the princes.

In conclusion, a word may be said of the place of the Re- formation in the history of progress and enlightenment. A The place "philosopher," as Gibbon long ago pointed out, of the . who asks from what articles of faith above and against Reforms- reason tne ear i y Reformers enfranchised their followers hˆistoofat wiu be surprised at their timidity rather than scandal- progress, ized by their freedom. They remained severely orthodox in the doctrines of the Fathers— the Trinity, the Incarnation, the plenary inspiration of the Bible — and they condemned those who rejected their teachings to a hell whose fires they were not tempted to extenuate. Although they sur- rendered transubstantiation, the loss of one mystery was amply compensated by the stupendous doctrines of original sin, redemption, faith, grace and predestination upon which they founded their theory of salvation. They ceased to appeal to the Virgin and saints, and to venerate images and relics, procure indulgences and go on pilgrimages, they deprecated the monastic life, and no longer nourished faith by the daily repetition of miracles, but in the witch persecutions their demonology cost the lives of thousands of innocent women. They broke the chain of authority, without, however, recognizing the propriety of toleration. In any attempt to determine the relative im- portance of Protestant and Catholic countries in promoting modern progress it must not be forgotten that religion is natur- ally conservative, and that its avowed business has never been to forward scientific research or political reform. Luther and his contemporaries had not in any degree the modern idea of progress, which first becomes conspicuous with Bacon and Descartes, but believed, on the contrary, that the strangling of reason was the most precious of offerings to God. " Free- thinker " and "rationalist" have been terms of opprobrium whether used by Protestants or Catholics. The pursuit of salvation does not dominate by any means the whole life and ambition of even ardent believers; statesmen, philosophers, men of letters, scientific investigators and inventors have commonly gone their way regardless of the particular form of Christianity which prevailed in the land in which they lived. The Reformation was, fundamentally, then, but one phase, if the most conspicuous, in the gradual decline of the majestic medieval ecclesiastical State, for this decline has gone on in France, Austria, Spain and Italy, countries in which the Protestant revolt against the ancient Church ended in failure,

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the Reformation as a whole. Only recent books are men- tioned, since the older works have been largely superseded owing to modern critical investigations: Thomas M. Lindsay, A History of the Reformation, 2 vols. (1906-7), the best general treatment; The Cambridge Modern History, vol. i. (1902), chaps, xviii. and xix., vol. ii. (1904), ” The Reformation,” and vol. iii. (1905), ” The Wars of Religion, ‘ with very full bibliographies; M. Creighton, History of the Papacy during the Reformation, 6 vols, (new ed. 1899-1901). From a Catholic standpoint: L. Pastor, Geschichte der Papste seit dem Ausgang des Mittelalters (1891 sqq., especially vol. iv. in two parts, 1906-7, and vol. v., 1909). This is in course of publica- tion and is being translated into English (8 vols, have appeared, 1891-1908, covering the period 1305-1521); J. Janssen, History of the German People at the Close of the Middle Ages, 12 vols., 1896- 1907, corresponding to vols, i.-vi. of the German original, in 8 vols., edited by Pastor, 1897-1904. This is the standard Catholic treat- ment of the Reformation, and is being supplemented by a series of monographs, Erganzungen zu Janssens Geschichte des deutschen Volkes, which have been appearing since 1898 and correspond with the Protestant Schriften des Vereins fur Reformations- geschichte (1883 sqq.). F. von Bezold, Geschichte der deutschen Reformation (1890), an excellent illustrated account; E. Troeltsch, Protestantisches Christentum und Kirche der Neuzeit, in the series ” Kultur der Gegenwart,” Teil i. Abt. 4, i. Halfte, 1905; Charles Beard, The Reformation of the Sixteenth Century in its Relation to Modern Thought and Knowledge (The Hibbert Lectures for 1883), and by the same, Martin Luther, vol. i. (no more published; 1889); A. Harnack, History of Dogma (trans, from the 3rd German edition, vol. vii., 1900); A. E. Berger, Die Kultur aufgaben der Reformation (2nd ed., 1908) ; Thudichum, Papsttum und Reformation (1903) ; ” Janus,” The Pope and the Council (1869), by Dollinger and others, a suggestive if not wholly accurate sketch of the papal claims; W. Maurenbrecher, Geschichte der Katholischen Reformation, vol. i. (no more published) (1880); J. Haller, Papsttum und Kirchenreform, vol. i. (1903) relates to the 14th century; J. Kostlin, Martin Luther, sein Leben und seine Schriften, new edition by Kawerau, 2 vols., 1903, the most useful life of Luther; H. Denifle, Luther und Luthertum, 2 vols. (1904-6), a bitter but learned arraignment of Luther by a distinguished Dominican scholar. H. Boehmer, Luther im Lichte der neueren Forschungen (1906), brief and sug- gestive. First Principles of the Reformation, the Three Primary Works of Dr Martin Luther, edited by Wace and Buchheim, — an English translation of the famous pamphlets of 1520. (J. H. R.*)

REFORMATORY SCHOOL, an institution for the industrial training of

juvenile offenders, in which they are lodged, clothed and fed, as well as taught. They are to be distinguished from ” industrial schools,” which are institutions for potential and not actual delinquents. To reformatory schools in England are sent juveniles up to the age of sixteen who have been con- victed of an offence punishable with penal servitude or im- prisonment. The order is made by the court before which they are tried; the limit of detention is the age of nineteen. Reformatory schools are regulated by the Children Act 1908, which repealed the Reformatory Schools Act 1866, as amended by acts of 1872, 1874, 1891, 1893, 1899 and 1901. See further Juvenile Offenders.

REFORMED CHURCHES, the name assumed by those Pro- testant bodies who adopted the tenets of Zwingli (and later of Calvin), as distinguished from those of the Lutheran or Evangeli- cal divines. They are accordingly often spoken of as the Calvin- istic Churches, Protestant being sometimes used as a synonym for Lutheran. The great difference is in the attitude towards the Lord’s Supper, the Reformed or Calvinistic Churches re- pudiating not only transubstantiation but also the Lutheran consubstantiation. They also reject the use of crucifixes and other symbols and ceremonies retained by the Lutherans.

Full details of these divergences are given in M. Schneckenburger, Vergleichende Darstellung des lutherischen und reformierten Lehrbe- griffs (Stuttgart, 1855); G. B. Winer, Comparative Darstellung (Berlin, 1866; Eng. tr., Edinburgh, 1873). See also Reformation; Presbvterianism ; Cameronians.

REFORMED CHURCH IN AMERICA, until 1867 called offi- cially ” The Reformed Protestant Dutch Church in North America,” and still popularly called the Dutch Reformed Church, an American Calvinist church, originating with the settlers from Holland in New York, New Jersey and Delaware, the first permanent settlers of the Reformed faith in the New World. Their earliest settlements were at Manhattan, Walla- bout and Fort Orange (now Albany), where the West India Company formally established the Reformed Church of Holland.

Their first minister was Jonas Michaelius, pastor in New Amsterdam of the ” church in the fort ” (now the Collegiate Church of New York City). The second domine, Everardus Bogardus (d. 1647), migrated to

New York in 1633 with Gover- nor Wouter van Twiller, with whom he quarrelled continually; in the same year a wooden church ” in the fort ” was built; and in 1642 it was succeeded by a stone building. A minister, John van Mekelenburg (Johannes Megapolensis) migrated to Rensselaerwyck manor in 1642, preached to the Indians— probably before any other Protestant minister — and after 1649 was settled in New Amsterdam. With the access of English and French settlers, Samuel Drisius, who preached in Dutch, German, English and French, was summoned, and he laboured in New Amsterdam and New York from 1652 to 1673. On Long Island John T. Polhemus preached at Flatbush in 1654-76. During Peter Stuyvesant’s governorship there was little toleration of other denominations, but the West India Company reversed his intolerant proclamations against Lutherans and Quakers. About 1659 a French and Dutch church was organized in Harlem. The first church in New Jersey, at Bergen, in 1661, was quickly followed by others at Hackensack and Passaic. After English rule in 1664 displaced Dutch in New York, the relations of the Dutch churches there were much less close with the state Church of Holland; and in 1679 (on the request of the English governor of New York, to whom the people of New Castle appealed) a classis was constituted for the ordination of a pastor for the church in New Castle, Delaware. The Dutch strongly opposed the establishment of the Church of England, and contributed largely toward the adoption (in October 1683) of the Charter of Liberties which confirmed in their privileges all churches then ” in practice ” in the city of New York and elsewhere in the province, but which was repealed by James II. in 1686, when he established the Church of England in New York but allowed religious liberty to the Dutch and others. The Dutch ministers stood by James’s government during Leisler’s rebellion. Under William III., Governors ‘ Sloughter and Fletcher worked for a law (passed in 1693 and approved in 1697) for the settling of a ministry in New York, Richmond, Westchester and Queen’s counties; but the Assembly foiled Fletcher’s purpose of establishing a Church of England clergy, although he attempted to construe the act as applying only to the English Church. In 1696 the first church charter in New York was granted to the Reformed Protestant Dutch Church (now the Collegiate Church) of New York City; at this time there were Dutch ministers at Albany and Kingston, on Long Island and in New Jersey; and for years the Dutch and English (Episcopalian) churches alone received charters in New York and New Jersey — the Dutch church- being treated practically as an establishment — and the church of the fort and Trinity (Episcopalian; chartered 1697) were fraternally harmonious. In 1 700 there were twenty-nine Reformed Dutch churches out of a total of fifty in New York. During the administration of Governor Edward

Hyde, Lord Cornbury, many members joined the Episcopal Church and others removed to New Jersey. The Great Awakening crowned the efforts of Theodore J. Frelinghuysen, who had come over as a Dutch pastor in 1720 and had opposed formalism and preached a revival. The Church in America in 1738 asked the Classis of Amsterdam (to whose care it had been transferred from the West India Com- pany) for the privilege of forming a Coetus or Association with power to ordain in America; the Classis, after trying to join the Dutch with the English Presbyterian churches, granted (1747) a Coetus first to the German and then to the Dutch churches, which therefore in September 1754 organized them- selves into a classis. This action was opposed by the church of New York City, and partly through this difference and partly because of quarrels over the denominational control of King's College (now Columbia), five members of the Coetus seceded, and as the president of the Coetus was one of them they took the records with them; they were called the Con- ferentie; they organized independently in 1764 and carried on a bitter warfare with the Coetus (now more properly called

the American Classis) , which in 1 7 66 (and again in 1770) obtained a charter for Queen's (now Rutgers) College at New Brunswick. But in 1771-72 through the efforts of John H. Livingston (1 746-1825), who had become pastor of the New York City church in 1770, on the basis of a plan drafted by the Classis of Amster- dam Coetus and Conferentie were reunited with a substantial independence of Amsterdam, which was made complete in 1792 when the Synod (the nomenclature of synod and classis had been adopted upon the declaration of American Independ- ence) adopted a translation of the eighty-four Articles of Dort on Church Order with seventy-three "explanatory articles." 1 In 1800 there were about forty ministers and one hundred churches. In 1819 the Church was incorporated as the Re- formed Protestant Dutch Church; and in 1867 the name was changed to the Reformed Church in America. Preaching in Dutch had nearly ceased in 1820, but about 1846 a new Dutch immigration began, especially in Michigan, and fifty years later Dutch preaching was common in nearly one-third of the churches of the country, only to disappear almost entirely in the next decade. Union with other Reformed churches was planned in 1743, in 1784, in 1816-20, 1873-78 and 1886, but unsuc- cessfully; however, ministers go from one to another charge in the Dutch and German Reformed, Presbyterian, and to a less degree Congregational churches.

A conservative secession " on account of Hopkinsian errors " in 1822 of six ministers (five then under suspension) organized a General Synod and the classes of Hackensack and Union (central New York) in

1824; it united with the Christian Re- formed Church, established by immigrants from Holland after 1835, to which there was added a fresh American secession in 1882 due to opposition (on the part of the seceders) to secret societies.

The organization of the Church is: a General Synod (1794); the (particular) synods of New York (1800), Albany (1800), Chicago (1856) and New Brunswick (1869); classes, corresponding to the presbyteries of other Calvinistic bodies; and the churches, num- bering, in 1906, 659. The agencies of the Church are: the Board of Education, privately organized in 1828 and adopted by the General Synod in 1831; a Widows' Fund (1837) and a Disabled Ministers' Fund; a Board of Publication (1855); a Board of Domestic Missions (1831 ; reorganized 1849) with a Church Building Fund and a Woman's Executive Committee; a Board of Foreign Missions (1832) succeeding the United Missionary Society (1816), which included Presbyterian, Dutch Reformed and Associate Re- formed Churches, and which was merged (1826) in the American Board of Commissioners for Foreign Missions, from which the Dutch Church did not entirely separate itself until 1857; and a Woman's Board of Foreign Missions (1875). The principal missions are in India at Arcot (1854; transferred in 1902 to the Synod of S. India) and at Amoy in China (1842) ; and the work of the Church in Japan was very successful, especially under Guido Fridolin Verbeck 2 (1830-1898), and 1877 native churches built up by Presby- terian and Dutch Reformed missionaries were organized as the United Church of our Lord Jesus Christ in Japan. There is also an Arabian mission, begun privately in 1888 and transferred to the Board in 1894.

The colleges and institutions of learning connected with the Church are: Rutgers, already mentioned; Union College (1795), the out- growth of Schenectady Academy, founded in 1785 by Dirck Romeyn, a Dutch minister; Hope College (1866; coeducational) at Holland, Michigan, originally a parochial school (1850) and then (1855) Holland Academy; the Theological Seminary at New Brunswick (q.v.); and the Western Theological Seminary (1869) at Holland, Michigan.

In 1906 (according to Bulletin 103 (1909) of the Bureau of the U.S. Census) there were 659 organizations with 773 church edifices reported and the total membership was 124,938. More than one- half of this total membership (63,350) was in New York state, the principal home of the first great Dutch immigration; more than one-quarter (32,290) was in New Jersey; and the other states were: Michigan (11,260), Illinois (4962), Iowa (4835), Wisconsin (2312), and Pennsylvania (1979). The Church was also represented in Minne- sota,

S. Dakota, Oklahoma, Nebraska, Indiana, Ohio, Kansas, N. Dakota, S. Carolina, Washington and Maryland — the order being that of rank in number of communicants.

The Christian Reformed Church, an ” old school ” secession, had in 1906, 174 organizations, 181 churches and a membership of 26,669,

1 In 1832 the articles of Church government were rearranged and in 1872-74 they were amended.

2 See W. E. Griffis, Verbeck of Japan (New York, 1900).

of which more than one-half (14,779) was in Michigan, where many of the immigrants who came after 1835 belonged to the seces- sion church in Holland. There were 2990 in Iowa, 2392 in New Jersey, 2332 in Illinois, and smaller numbers in Wisconsin, Indiana, Minnesota, S. Dakota, Ohio, New York, Washington, Kansas, Massachusetts, Montana, N. Dakota, New Mexico, Nebraska and Colorado.

See D. D. Demarest, The Reformed Church in America (New York, 1889) ; E. T. Corwin, The Manual of the Reformed Church in America {ibid., 4th ed., 1902), his sketch of the history of the Church in vol. viii. {ibid., 1895) of the American Church History Series, and his Ecclesiastical Records of the State of New York (Albany, 1901 sqq.), published by the State of New York.

REFORMED CHURCH IN THE UNITED STATES, a

German Calvinistic church in America, commonly called the German Reformed Church. It traces its origin to the great German immigration of the 17 th century, especially to Pennsylvania, where, although the German Lutherans afterwards outnumbered them, the Reformed element was estimated in 1 730 to be more than half the whole number of Germans in the colony. In 1709 more than 2000 Palatines emigrated to New York with their pastor, Johann Friedrich Hager (d. c. 1723), who laboured in the Mohawk Valley. A church in Germantown, Virginia, was founded about 1714. Johann Philip Boehm (d. 1749), a school teacher from Worms, although not ordained, preached after 1725 to congregations at Falckner’s Swamp, Skippack, and White Marsh, Pennsylvania, and in 1729 he was ordained by Dutch Reformed ministers in New York. Georg Michael

Weiss {c. 1700-c. 1762), a graduate of Heidelberg, ordained and sent to America by the Upper Consistory of the Palatinate in 1727, organized a church in Philadelphia; preached at Skippack; worked in Dutchess and Schoharie counties, New York, in 1731-46; and then returned to his old field in Pennsylvania. Johann Heinrich Goetschius was pastor {c. 1731-38) of ten churches in Pennsylvania, and was ordained by the Presbyterian Synod of Philadelphia in 1737. A part of his work was undertaken by Johann Conrad Wirtz, who was ordained by the New Brunswick (New Jersey) Presbytery in 1750, and in 1761-63 was pastor at York, Pennsylvania. A church was built in 1736 at Lancaster, Pennsylvania, where Johann Bartholomaeus Rieger (1707-1769), who came from Germany with Weiss on his return in 1731, had preached for several years. Michael Schlatter (1716-1790), a Swiss of St Gall, sent to America in 1746 by the Synods (Dutch Reformed) of Holland, immediately convened Boehm, Weiss and Rieger in Philadelphia, and with them planned a Coetus, which first met in September 1747; in 1751 he presented the cause of the Coetus in Germany and Holland, where he gathered funds; in 1752 came back to America with six ministers, one of whom, William Stoy (1726-1801), was an active opponent of the Coetus and of clericalism after 1772. Thereafter Schlatter's work was in the charity schools of Pennsylvania, which the people thought were tinged with Episcopalianism. Many churches and pastors were independent of the Coetus, notably John Joachim Zubly (1724-1781), of St Gall, who migrated to S. Carolina in 1726, and was a delegate to the Continental Congress from Georgia, but opposed independence and was banished from Savannah in 1777. Within the Coetus there were two parties. Of the Pietists of the second class one of the leaders was Philip William Otterbein (1726-1813), born in Dillenburg, Nassau, whose system of class-meetings was the basis of a secession from which grew the United Brethren in Christ, commonly called the "New Reformed Church," organized in 1800. During the War of Independence the Pennsylvania members of the Church were mostly attached to the American cause, and Nicholas Herkimer and Baron von Steuben were both Reformed; but in New York and in the South there were many German Loyalists.

Franklin College was founded by Lutherans and Reformed, with much outside help, notably that of Benjamin Franklin, at Lancaster, Pennsylvania, in 1787.

The Coetus had actually assumed the power of ordination in 1772 and formally assumed it in 1791; in 1792 a synodical constitution was prepared; and in 1793 the first independent

synod met in Lancaster and adopted the constitution, thu9 becoming independent of Holland. Its churches numbered 178, and there were about 15,000 communicants. The strongest churches were those of Philadelphia, Lancaster and Germantown in Pennsylvania, and Frederick in Maryland. The German Reformed churches in Lunenburg county, Nova Scotia, became Presbyterian in 1837; a German church in Waldoboro, Maine, after a century, became Congregational in 1850. The New York churches became Dutch Reformed. The New Jersey churches rapidly fell away, becoming Presbyterian, Dutch Reformed, or Lutheran. In Virginia many churches became Episcopalian and others United Brethren. By 1825, 13 Re- formed ministers were settled W. of the Alleghanies. The Synod in 1819 divided itself into eight Classes. In 1824 the Classis of Northampton, Pennsylvania (13 ministers and 80 congregations), became the Synod of Ohio, the parent Synod having refused to allow the Classis to ordain. In 1825 there were 87 ministers, and in the old Synod about 23,300 communicants.

A schism over the establishment of a theological seminary resulted in the organization of a new synod of the ” Free German Reformed Congregations of Pennsylvania,” which returned to the parent synod in 1837.

John Winebrenner (q.v.), pastor in Harrisburg, Pennsylvania, left the Church in 1828, and in 1830 organized the ” Church of God “; his main doctrinal difference with the Reformed Church was on infant baptism.

In 1825 the Church opened a theological seminary at Carlisle, Pennsylvania, affiliated with Dickinson College. James Ross Reily (1788-1844) travelled in Holland and Germany, collecting money and books for the seminary. It was removed in 1829 to York, where an academy was connected with it; in 1835 the academy (which in 1836 became Marshall College) and in 1837 the seminary removed to Mercersburg, where, in 1840, John W. Nevin (q.v.) became its president, and with Philip Schaff (q.v.) founded the Mercersburg theology, which lost to the Church many who objected to Nevin’s (and Schaff’s) Romanizing tendencies. The seminary was removed in 1871 from Mercersburg to Lancaster, whither the college had gone in 1853 to form, with Franklin College, Franklin and Marshall College.

In 1842 the Western Synod (i.e. the Synod of Ohio) adopted the constitution of the Eastern, and divided into classes. It founded in 1850 a theological school and Heidelberg University at Tiffin, Ohio. The Synods organized a General Synod in 1863. New German Synods

were: that of the North- West (1867), organized at Fort Wayne, Ind.; that of the East (1875), organized at Philadelphia:; and the Central Synod (1881), organized at Galion, Ohio. New English Synods were: that of Pittsburg (1870); that of the Potomac (1873); and that of the Interior (1887), organized at Kansas City, Missouri. In 1894 there were eight district synods.

After a long controversy over a liturgy (connected in part with the Mercersburg controversy) a Directory of Worship was adopted in 1887.

The principal organizations of the Church are: the Board of Publication (1844) ; the Society for the Relief of Ministers and their Widows (founded in 1755 by the Pennsylvania Coetus; incorporated in 1 8 10; transferred to the Synod in 1833); a Board of Domestic Missions (1826); a Board of Foreign Missions (1858; reorganized in 1873), which planted a mission in Japan (1879), now a part of the Union Church of Japan, and one in China (1900). The Church has publishing houses in Philadelphia (replacing that of Chambers- burg, Pa., founded in 1840 and destroyed in July 1864 by the Confederate army) and in Cleveland, Ohio.

Colleges connected with the Church, besides the seminary at Lancaster, Franklin and Marshall College and Heidelberg University, are: Catawba College (1851) at Newton, North Carolina; and Ursinus College (1869), founded by the Low Church wing, at Collegeville, Pennsylvania, which had, until 1908, a theological seminary, then removed to Dayton, Ohio, where it united with Heidelberg Theological Seminary (until 1908 at Tiffin) to form the Central Theological Seminary.

In 1906, according to Bulletin 103 (1909) of the Bureau of the United States Census, the Church had 1736 organizations in the

United States, 1740 churches and 292,654 communicants, of whom 177,270 were in Pennsylvania, and about one-sixth (50,732) were in Ohio. Other states in which the Church had communicants were: Maryland (13,442), Wisconsin (8386), Indiana (8289), New York (5700), North Carolina (4718), Iowa (3692), Illinois (2652), Virginia (2288), Kentucky (2101), Michigan (1666), Nebraska (.1616), and (less than 1500 in each of the following arranged in rank) S. Dakota,

Missouri, New Jersey, Connecticut, Kansas, W. Virginia N. Dakota, Minnesota, District of Columbia, Oregon, Massachusetts, Tennessee, California, Colorado, Arkansas and Oklahoma.

See James I. Good, History of the Reformed Church in the United States, 1725-1792 (Reading, Pa., 1899), and Historical Handbook (Philadelphia, 1902); and the sketch by Joseph Henry Dubbs in vol. viii. (New York, 1895) of the American Church History Series.

REFORMED EPISCOPAL CHURCH, a Protestant community in the United States of America, dating from December 1873. The influence of the Tractarian movement began to be felt at an early date in the Episcopal Church of the United States, and the ordination of Arthur Carey in New York, July 1843, a clergyman who denied that there was any difference in points of faith between the Anglican and the Roman Churches and con- sidered the Reformation an unjustifiable act, brought into relief the antagonism between Low Church and High Church, a struggle which went on for a generation with increasing bitterness. The High Church party lost no opportunity of arraigning any Low Churchman who conducted services in non-episcopal churches, and as the Triennial Conference gave no heed to remonstrances on the part of these ecclesiastical offenders they came to the conclusion that they must either crush their consciences or seek relief in separation. The climax was reached when George D. Cummins (1822-1876), assistant bishop of Kentucky, was angrily attacked for officiating at the united communion service held at the meeting of the Sixth General Conference of the Evangelical Alliance in New York, October 1873. This prelate resigned his charge in the Episcopal Church on November nth, and a month later, with seven other clergy-men and a score of laymen, constituted the Reformed Episcopal Church. Cummins was chosen as presiding officer of the new body, and consecrated Charles E. Cheney (b. 1836), rector of Christ Church, Chicago, to be bishop. The followingDeclaration of Principles (here abridged) was promulgated:—

I. An expression of belief in the Bible as the Word of God, and the sole rule of faith and practice, in the Apostles' Creed, in the divine institution of the two sacraments and in the doctrines of grace substantially as set out in the 39 Articles. ...

II. The recognition of Episcopacy not as of divine right but as a very ancient and desirable form of church polity.

III. An acceptance of the Prayer Book as revised by the General Convention of the Protestant Episcopal Church in 1785 with liberty to

revise it as may seem most conducive to the edification of the people.

IV. A condemnation of certain positions, viz. : —

(a) That the Church of God exists only in one form of ecclesi-

astical polity.

(b) That Christian ministers as distinct from all believers

have any special priesthood.

(c) That the Lord's Table is an altar on which the body and

blood of Christ are offered anew to the Father.

(d) That the presence of Christ is a material one.

(e) That Regeneration is inseparably connected with

Baptism.

The Church recognizes no orders of ministry, presbyters and deacons; the Episcopate is an office, not an order, the bishop being the chief presbyter, primus inter pares. There are some 7 bishops, 85 clergy and about 9500 communicants. _ £1600 annually is raised for foreign missionary work in India. The Church was introduced into England in 1877, and has in that country a presiding bishop and about 20 organized congrega- tions. The Church has a theological seminary in Philadelphia.

REFRACTION (Lat. refringere, to break open or apart), in physics, the change in the direction of a wave of light, heat or sound which occurs when such a wave passes from one medium into another of different density.

I. Refraction of Light

When a ray of light traversing a homogeneous medium falls on the bounding surface of another transparent homogeneous

medium, it is found that the direction of the transmitted ray in the second medium is different from that of the incident ray; in other words, the ray is refracted or bent at the point of incidence. The laws governing refraction are: (1) the refracted and incident rays are coplanar with the normal to the refracting surface at the point of incidence, and (2) the ratio of the sines of the angles between the

normal and the incident and refracted rays is constant for the two media, but depends on the nature of the light employed, i.e. on its wave length. This constant is called the relative refractive index of the second medium, and may be denoted by Hah, the suffix ab signifying that the light passes from medium a to medium b; similarly ix.\, a denotes the relative refractive index of a with regard to b. The absolute refractive index is the index when the first medium is a vacuum. Ele- mentary phenomena in refraction, such as the apparent bending of a stick when partially immersed in water, were observed in very remote times, but the laws, as stated above, were first grasped in the I'/th century by W. Snell and published by Descartes, the full importance of the dependence of the refractive index on the nature of the light employed being first thoroughly realized by Newton in his famous prismatic decomposition of white light into a coloured spectrum. Newton gave a theor- etical interpretation of these laws on the basis of his corpuscular theory, as did also Huygens on the wave theory (see Light, II. Theory of). In this article we only consider refractions at plane surfaces, refraction at spherical surfaces being treated under Lens. The geometrical theory will be followed, the wave theory being treated in Light, Diffraction and Dis- persion.

Refraction at a Plane Surface. — Let LM (fig. 1) be the surface

dividing two homogeneous "media A and B; let 10 be a ray in the first medium incident on LM at O, and let OR be the refracted ray. Draw the normal POQ. Then by Snell 's law we have invariably sin IOP/sin QOR =/*„&. Hence if two of these quantities be given the third can be calculated. The commonest question is: Given the incident ray and the refractive index to construct the refracted ray. A simple construction is to take along the incident ray 01, unit distance OC, and a distance OD equal to the refractive index in the same units. Draw CE perpendicular to LM, and draw an arc with centre O and radius OD, cutting CE in E. Then EO produced downwards is the refracted ray. The proof is left to the reader.

In the figure the given incident ray is assumed to be passing from a less dense to a denser medium, and it is seen by the con- struction or by examining the formula sin /3 = sin o/ju that for all values of a there is a corresponding value of P . Consider the case when the light passes from a denser to a less dense medium. In the equation sin /3 = sin a/p we have in this case ji I and there is no refraction into the second medium, the rays being totally reflected back into the first medium; this is called total internal reflection.

Images produced by Refraction at Plane Surfaces. — If a luminous

point be situated in a medium separated from one of less density by a plane surface, the ray normal to this surface will be unre- fracted, whilst the others will undergo refraction according to their angles of emergence. If the rays in the less dense medium be produced into the denser medium, they envelop a caustic, but by restricting ourselves to a small area about the normal ray_ it is seen that they intersect this ray in a point which is the geometrical

image of the luminous source. The position of this point can be easily determined. If I be the distance of the source below the surface, /' the distance of the image, and p. the refractive index, then I' = 1/ p. This theory provides a convenient method for determining the refractive index of a plate. A micrometer microscope, with vertical motion, is focused on a scratch on the surface of its stage; the plate, which has a fine scratch on its upper surface, is now introduced, and the microscope is successively focused on the scratch on the stage as viewed through the plate, and on the scratch on the plate. The difference between the first and third readings gives the thickness of the plate, corresponding to / above, and between the second and third readings the depth of the image, corresponding to /'.

Refraction by a Prism. — In optics a prism is a piece of trans- parent material bounded by two plane faces which meet at a definite angle, called the refracting angle of the prism, in a straight line called the edge of the prism; a section perpendicular to the edge is called a principal section. Parallel rays, refracted succes- sively at the two faces, emerge from the prism as a system of parallel rays, but the direction is altered by an amount called the deviation. The deviation depends on the angles of incidence and emergence; but, since the course of a ray may always be reversed, there must be a stationary value, either a maximum or minimum, when the ray traverses the prism symmetrically, i.e. when the angles of incidence and emergence are equal. As a matter of fact, it is a minimum, and the position is called the angle of minimum deviation. The relation between the minimum deviation D, the angle of the prism i, and the refractive index li is found as follows. Let in fig. 2, PQRS be the course of the

ray through the prism; the internal angles <#>', 4>' each equal ii, and the angles of incidence and emergence 0, \[> are each equal and connected with ' by Snell's law, i.e. sin0 = ˆ sin0'. Also the deviation D is 2 (<£-<#>')• Hence M = sin 0/sin <£' = sin§ (D+i)/sinJ?.

Refractometers. — Instruments for determining the refractive indices of media are termed refractometers.

The simplest are really spectrometers, consisting of a glass prism, usually hollow and fitted with accurately parallel glass sides, mounted on a table which carries a fixed collimation tube and a movable observing tube, the motion of the latter being recorded on a graduated circle. The collimation tube has a narrow adjustable slit at its outer end and a lens at the nearer end, so that the light leaves the tube as a parallel beam. The refracting angle of the prism, i in our previous notation, is deter- mined by placing the prism with its refracting edge towards the collimator, and observing when the reflections of the slit in the two prism faces coincide with the cross-wires in the observing telescope; half the angle between these two positions gives i. To determine the position of minimum deviation, or D, the prism is removed, and the observing telescope is brought into line with the slit; in this position the graduation is read. The prism is replaced, and the telescope moved until it catches the refracted rays. The prism is now turned about a vertical axis until a position is found when the telescope has to be moved towards the collimator in order to catch the rays ; this operation sets the prism at the angle of minimum deviation. The refractive index n is calculated from the formula given above.

More readily manipulated and of superior accuracy are refracto- meters depending on total reflection. The Abbe refractometer (fig. 3) essentially consists of a double Abbe prism AB to contain the substance to be experimented with ; and a telescope F to ob- serve the border line of the total reflection. The prisms, which are right-angled and made of the same flint glass, are mounted in a hinged frame such that the lower prism, which is used for purposes of illumination, can be locked so that the hypothenuse faces are distant by about 0-15 mm., or rotated away from the upper prism. The double prism is used in examining liquids, a few drops being placed between the prisms; the single prism is used when solids or plastic bodies are employed. The mount is capable of rotation about a horizontal axis by an alidade /. The telescope is provided with a reticule, which can be brought into exact coincidence with the observed border line, and is rigidly fastened to a sector

S graduated directly in refractive indices. The reading is effected by a lens L. Beneath the prisms is a mirror for reflecting light

Fig. 3.

into the apparatus. To use the apparatus, the liquid having been

inserted between the prisms, or the solid attached by its own adhesiveness or by a drop of monobromnaphthalene to the upper prism, the prism case is rotated until the field of view consists of a light and dark portion, and the border line is now brought into coincidence with the reticule of the telescope. In using a lamp or daylight this border is coloured, and hence a compensator, consisting of two equal Amici prisms, is placed between the objective and the prisms. These Amici prisms can be rotated, in opposite directions, until they produce a dispersion opposite in sign to that originally seen, and hence the border line now appears perfectly sharp and colourless. When at zero the alidade corresponds to a refractive index of 1-3, and any other reading gives the corresponding index correct to about 2 units in the 4th decimal place. Since temperature markedly affects the refractive index, this apparatus is provided with a device for heating the prisms. Figs. 4 and 5 show the course of the rays when a solid and liquid

Fig. 4-

Fig. 5-

are being experimented with. Dr R. Wollny's butter refracto- meter, also made by Zeiss, is constructed similarly to Abbe's form, with the exception that the prism casing is rigidly attached to the telescope, and the observation made by noting the point where the border line intersects an appropriately graduated scale in the focal plane of the telescope objective, fractions being read by a micrometer screw attached to the objective. This apparatus is also provided with an arrangement for heating.

This method of reading is also employed in Zeiss's " dipping refractometer" (fig. 6). This instrument consists of a telescope R having at its lower end a prism P with a refracting angle of 63 °, above which and below the objective is a movable compensator A for purposes of annulling the dispersion about the border line. I»

the focal plane of the objective O there is a scale Sc, exact reading being made by a micrometer Z. If a large quantity of liquid be

Fig. 6. — Zeiss 's Dipping Refractometer.

available it is sufficient to dip the refractometer perpendicularly into a

beaker containing the liquid and to transmit light into the instrument by means of a mirror. If only a smaller quantity be available, it is enclosed in a metal beaker M, which forms an exten- sion of the instrument, and the liquid is retained there by a plate D. The instrument is now placed in a trough B, containing water and having one side of ground glass G; light is reflected into the refractometer by means of a mirror S outside this trough. An accuracy of 3-7 units in the 5th decimal place is obtainable.

The Pulfrich refractometer is also largely used, especially for liquids. It consists essentially of a right-angled glass prism placed on a metal foundation with the faces at right angles horizontal and vertical, the hypothenuse face being on the support. The horizontal face is fitted with a small cylindrical vessel to hold the liquid. Light is led to the prism at grazing incidence by means of a collimator, and is refracted through the vertical face, the deviation being observed by a telescope rotating about a graduated circle. From this the refractive index is readily calculated if the refractive index of the prism for the light used be known: a fact supplied by the maker. The instrument is also available for determining the refractive index of isotropic solids. A little of the solid is placed in the vessel and a mixture of monobromnaph- thalene and acetone (in which the solid must be insoluble) is added, and adjustment made by adding either one or other liquid until the border line appears sharp, i.e. until the liquid has the same index as the solid.

The Herbert Smith refractometer (fig. 7) is especially suitable for determining the refractive index of gems, a constant which is

Fig. 7.

most valuable in distinguishing the precious stones. It consists of a hemisphere of very dense glass, having its plane surface fixed

at a certain angle to the axis of the instrument. Light is admitted by a window on the under side, which is inclined at the same angle, but in the opposite sense, to the axis. The light on emerging from the hemisphere is received by a convex lens, in the focal plane of which is a scale graduated to read directly in refractive indices. The light then traverses a positive eye-piece. To use the instru- ment for a gem, a few drops of methylene iodide (the refractive index of which may be raised to i-8oo by dissolving sulphur in it) are placed on the plane surface of the hemisphere and a facet of the stone then brought into contact with the surface. If mono- chromatic light be used (i.e. the D line of the sodium flame) the field is sharply divided into a light and a

dark portion, and the posi- tion of the line of demarcation on the scale immediately gives the refractive index. It is necessary for the liquid to have a higher refractive index than the crystal, and also that there is close con- tact between the facet and the lens. The range of the instrument is between 1-400 and 1-760, the results being correct to two units in the third decimal place if sodium light be used. (C. E.*)

II. Double Refraction

That a stream of light on entry into certain media can give rise to two refracted pencils was discovered in the case of Iceland spar by Erasmus Bartholinus, who found that one pencil had a direction given by the ordinary law of refraction, but that the other was bent in accordance with a new law that he was unable to determine. This law was discovered about eight years later by Christian Huygens. According to Huygens' fundamental principle, the law of refraction is determined by the form and orientation of the wave-surface in the crystal — the locus of points to which a disturbance emanating from a luminous point travels in unit time. In the case of a doubly refracting medium the wave-surface must have two sheets, one of which is spherical, if one of the pencils obey in all cases the ordinary law of refraction. Now Huygens observed that a natural crystal of spar behaves in precisely the same way which- ever pair of faces the light passes through, and inferred from this fact that the second sheet of the wave-surface must be a surface of revolution round a line equally inclined to the faces of the rhomb, i.e. round the axis of the crystal. He accordingly assumed it to be a spheroid, and finding that refraction in the direction of the axis was the same for both streams, he concluded that the sphere and the spheroid touched one another in the axis.

So far as his experimental means permitted, Huygens veri- fied the law of refraction deduced from this hypothesis, but its correctness remained unrecognized until the measures of W. H. Wollaston in 1802 and of E. T. Malus in 1810. More recently its truth has been established with far more perfect optical appliances by R. T. Glazebrook, Ch. S. Hastings and others.

In the case of Iceland spar and several other crystals the extraordinarily refracted stream is refracted away from the axis, but Jean Baptiste Biot in 1814 discovered that in many cases the reverse occurs, and attributing the extraordinary refractions to forces that act as if they emanated from the axis, he called crystals of the latter kind " attractive," those of the former "repulsive." They are now termed " positive " and " negative " respectively; and Huygens' law applies to both classes, the spheroid being prolate in the case of positive, and

oblate in the case of negative crystals. It was at first supposed that Huygens' law applied to all doubly refracting media. Sir David Brewster, however, in 181 5, while examining the rings that are seen round the optic axis in polarized light, discovered a number of crystals that possess two optic axes. He showed, moreover, that such crystals belong to the rhombic, monoclinic and anorthic (triclinic) systems, those of the tetragonal and hexagonal systems being uniaxal, and those of the cubic system being optically isotropic.

Huygens found in the course of his researches that the streams that had traversed a rhomb of Iceland spar had acquired new properties with respect to transmission through a second crystal. This phenomenon is called polarization (q.v.), and the waves are said to be polarized — the ordinary in its principal plane and the extraordinary in a plane perpendicular to its principal plane, the principal plane of a wave being the plane containing its normal and the axis of the crystal. From the facts of polarization Augustin Jean Fresnel deduced that the

vibrations in plane polarized light are rectilinear and in the plane of the wave, and arguing from the symmetry of uniaxal crystals that vibrations perpendicular to the axis are propa- gated with the same speed in all directions, he pointed out that this would explain the existence of an ordinary wave, and the relation between its speed and that of the extraordinary wave. From these ideas Fresnel was forced to the conclusion, that he at once verified experimentally, that in biaxal crystals there is no spherical wave, since there is no single direction round which such crystals are symmetrical; and, recognizing the difficulty of a direct determination of the wave-surface, he attempted to represent the laws of double refraction by the aid of a simpler surface.

The essential problem is the determination of the propaga- tional speeds of plane waves as dependent upon the directions of their normals. These being known, the deduction of the wave-surface follows at once, since it is to be regarded as the envelope at any subsequent time of all the plane waves that at a given instant may be supposed to pass through a given point, the ray corresponding to any tangent plane or the direction of transport of energy being by Huygens' principle the radius- vector from the centre to the point of contact. Now Fresnel perceived that in uniaxal crystals the speeds of plane waves in any direction are by Huygens' law the reciprocals of

the semi- axes of the central section, parallel to the wave-fronts, of a spheroid, whose polar and equatorial axes are the reciprocals of the equatorial and polar axes of the spheroidal sheet of Huygens' wave-surface, and that the plane of polarization of a wave is perpendicular to the axis that determines its speed. Hence it occurred to him that similar relations with respect to an ellipsoid with three unequal axes would give the speeds and polarizations of the waves in a biaxal crystal, and the results thus deduced he found to be in accordance with all known facts. This ellipsoid is called the ellipsoid of polarization, the index ellipsoid and the indicatrix.

We may go a step further; for by considering the intersection of a wave-front with two waves, whose normals are indefinitely near that of the first and lie in planes perpendicular and parallel respectively to its plane of polarization, it is easy to show that the ray corresponding to the wave is parallel to the line in which the former of the two planes intersects the tangent plane to the ellipsoid at the end of the semi-diameter that determines the wave-velocity; and it follows by similar triangles that the ray-velocity is the reciprocal of the length of the perpendicular from the centre on this tangent plane. The laws of double refraction are thus contained in the following proposition. The propagational speed of a plane wave in any direction is given by the reciprocal of one of the semi-axes of the central section of the ellipsoid of polarization parallel to the wave; the plane of polarization of the wave is perpendicular to this axis; the corresponding ray is parallel to the line of intersection of the tangent plane at the end of the axis and the plane containing the axis and the wave-normal; the ray- velocity is the reciprocal of the length of the perpendicular from the centre on the tangent plane. By reciprocating with respect to a sphere of unit radius concentric with the ellipsoid, we obtain a similar proposition in which the ray takes the place of the wave-normal, the ray- velocity that of the wave-slowness (the reciprocal of the velocity) and vice versa. The wave-surface is thus the apsidal surface of the reciprocal ellipsoid; this gives the simplest means of obtain- ing its equation, and it is readily seen that its section by each plane of optical symmetry consists of an ellipse and a circle, and that in the plane of greatest and least wave-velocity these curves intersect in four points. The radii-vectors to these points are called the ray-axes.

When the wave-front is parallel to either system of circular sections of the ellipsoid of polarization, the problem of finding the axes of the parallel central section becomes indeterminate, and all waves in this direction are propagated with the same speed, whatever may be their polarization. The normals to the circular sections are thus the optic axes. To determine the rays corresponding to an optic axis, we may

note that the ray

and the perpendiculars to it through the centre, in planes perpendicular and parallel to that of the ray and the optic axis, are three lines intersecting at right angles of which the two latter are confined to given planes, viz. the central circular section of the ellipsoid and the normal section of the cylinder touching the ellipsoid along this section: whence by a known proposition the ray describes a cone whose sections parallel to the given planes are circles. Thus a plane perpendicular to the optic axis touches the wave-surface along a circle. Similarly the normals to the circular sections of the reciprocal ellipsoid, or the axes of the tangent cylinders to the polarization-ellipsoid that have circular normal sections, are directions of single-ray velocity or ray-axes, and it may be shown as above that corre- sponding to a ray-axis there is a cone of wave-normals with circular sections parallel to the normal section of the corre- sponding tangent cylinder, and its plane of contact with the ellipsoid. Hence the extremities of the ray-axes are conical points on the wave-surface. These peculiarities of the wave- surface are the cause of the celebrated conical refractions discovered by Sir William Rowan Hamilton and H. Lloyd, which afford a decisive proof of the general correctness of Fresnel's wave-surface, though they cannot, as Sir G. Gabriel Stokes (Math, and Phys. Papers, iv. 184) has pointed out, be employed to decide between theories that lead to this surface as a near approximation.

In general, both the direction and the magnitude of the axes of the polarization-ellipsoid depend upon the frequency of the light and upon the temperature, but in many cases the possible variations are limited by considerations of symmetry. Thus the optic axis of a uniaxal crystal is invariable, being deter- mined by the principal axis of the system to which it belongs: most crystals are of the same sign for all colours, the refractive indices and their difference both increasing with the frequency, but a few crystals are of opposite sign for the extreme spectral colours, becoming isotropic for some intermediate wave-length. In crystals of the rhombic system the axes of the ellipsoid coincide in all cases with the crystallographic axes, but in a few cases their order of magnitude changes so that the plane of the optic axes for red light is at right angles to that for blue light, the crystal being uniaxal for an intermediate colour. In the case of the monoclinic system one axis is in the direction of the axis of the system, and this is generally, though there are notable exceptions, either the greatest, the least, or the intermediate axis of the ellipsoid for all colours and temperatures. In the latter case the optic axes are in the plane of symmetry, and a variation of their acute bisectrix

occasions the phenomenon known as “inclined dispersion “: in the two former cases the plane of the optic axes is perpendicular to the plane of symmetry, and if it vary with the colour of the light, the crystals exhibit ” crossed ” or ” horizontal dispersion ” according as it is the acute or the obtuse bisectrix that is in the fixed direction.

The optical constants of a crystal may be determined either with a prism or by observations of total reflection. In the latter case the phenomenon is characterized by two angles — the critical angle and the angle between the plane of incidence and the line limiting the region of total reflection in the field of view. With any crystalline surface there are four cases in which this latter angle is oo°, and the principal refractive indices of the crystal are obtained from those calculated from the correspond- ing critical angles, by excluding that one of the mean values for which the plane of polarization of the limiting rays is perpendicular to the plane of incidence. A difficulty, however, may arise when the crystalline surface is very nearly the plane of the optic axes, as the plane of polarization in the second mean case is then also very nearly perpendicular to the plane of incidence; but since the two mean refractive indices will be very different, the ambiguity can be removed by making, as may easily be done, an approximate measure of the angle between the optic axes and comparing it with the values calculated by using in turn each of these indices (C. M. Viola, Zeit. filr Kryst., 1902, 36, p. 245).

A substance originally isotropic can acquire the optical

properties of a crystal undef the influence of homogeneous strain, the principal axes of the wave-surface being parallel to those of the strain, and the medium being uniaxal, if the strain be symmetrical. John Kerr also found that a dielectric under electric stress behaves as an uniaxal crystal with its optic axis parallel to the electric force, glass acting as a negative and bisulphide of carbon as a positive crystal {Phil. Mag., 1875 (4),

L 337) , p .

Not content with determining the iaws of double refraction, Fresnel also attempted to give their mechanical explanation. He supposed that the aether consists of a system of distinct material points symmetrically arranged and acting on one another by forces that depend for a given pair only on their distance. If in such a system a single molecule be displaced, the projection of the force of restitution on the direction of dis- placement is proportional to the inverse square of the parallel radius- vector of an ellipsoid; and of all displacements that can occur in a given plane, only those in the direction of the axes of the parallel central section of the quadric develop forces whose projection on the plane is along the displacement. In undula- tions, however, we are concerned with the elastic forces due to relative displacements, and, accordingly, Fresnel assumed that the forces called into play during the propagation of a system of plane waves (of rectilinear transverse vibrations) differ from those developed by the parallel displacement of a single molecule only by a constant factor, independent of the plane of the wave. Next, regarding the aether as incompressible, he assumed that the components of the elastic forces parallel to the wave-front are alone operative, and finally, on the analogy of a stretched string, that the propagational speed of a plane wave of permanent type is proportional to the square root of the effective force developed by the vibrations. With these hypotheses we immediately obtain the laws of double refraction, as given by the ellipsoid of polarization, with the result that the vibrations are perpendicular to the plane of polarization.

In its dynamical foundations Fresnel's theory, though of considerable historical interest, is clearly defective in rigour, and a strict treatment of the aether as a crystalline elastic solid does not lead naturally to Fresnel's laws of double refraction. On the other hand, Lord Kelvin's rotational aether (Math, and Phys. Papers, iii. 442) — a medium that has no true rigidity but possesses a quasi-rigidity due to elastic resistance to absolute rotation — gives these laws at once, if we abolish the resistance to compression and, regarding it as gyrostatically isotropic, attribute to it aeolotropic inertia. The equations then obtained are the same as those deduced in the electro-magnetic theory from the circuital laws of A. M. Ampere and Michael Faraday, when the specific inductive capacity is supposed aeolotropic. In order to account for dispersion, it is necessary to take into account the interaction with the radiation of the intra-molecular vibrations of the crystalline substance: thus the total current on the electro-magnetic theory must be regarded as made up of the current of displacement and that due to the oscillations of the electrons within the molecules of the crystal.

Bibliography. — An interesting and instructive account of Fresnel's work on double refraction has been given by Emile Verdet in his introduction to Fresnel's works: CEuvres d'Augustin Fresnel, i. 75 (Paris, 1866); CEuvres de E. Verdet, i. 360 (Paris, 1872). For an account of theories of double refraction see the reports of H. Lloyd, Sir G. G. Stokes and R. T. Glazebrook in the Brit. Ass. Reports for 1834, 1862 and 1885, and Lord Kelvin's Baltimore Lectures (1904). An exposition of the rotational theory of the aether has been given by H. Chipart, Theorie gyrostatique de la lumiere (Paris, 1904); and P. Drude's Lehrbuch der Optik, 2 te Auf. (1906), the first German edition of which was translated by C. Riborg Mann and R. A. Milliken in 1902, treats the subject from the standpoint of the electro-magnetic theory. The methods of determining the optical constants of crystals will be found in Th. Liebisch's Physikalische Krystallographie (1891); F. Pockel's Lehrbuch der Kristalloptik (1906); and J. Walker's Analytical Theory of Light (1904). A detailed list of papers on the geometry of the wave-surface has been published by E. Wollfing, Bibl. Math., 1902 (3), iii. 361 ; and a general account of the subject will be found in the following treatises: L. Fletcher, The Optical Indicatrix (1892); Th. Preston, The Theory of Light, 3rd ed. by C. J. Joly (1901); A. Schuster, An Introduction to the Theory of

Optics (1904); R. W. Wood, Physical Optics (1905); E. Maseart, Traite d'optique (1889) ; A. Winkelmann, Handbuch der Physik.

(J. Wal.*)

III. Astronomical Refraction

The refraction of a ray of light by the atmosphere as it passes from a heavenly body to an observer on the earth's surface, is called " astronomical." A knowledge of its amount is a necessary datum in the exact determination of the direction of the body. In its investigation the fundamental hypothesis is that the strata of the air are in equilibrium, which implies that the surfaces of equal density are horizontal. But this condition is being continually disturbed by aerial currents, which produce con- tinual slight fluctuations in the actual refraction, and commonly give to the image of a star a tremulous motion. Except for this slight motion the refraction is always in the vertical direction; that is, the actual zenith distance of the star is always greater than its apparent distance. The refracting power of the air is nearly proportional to its density. Consequently the amount of the refraction varies with the temperature and barometric pressure, being greater the higher the barometer and the lower the temperature.

At moderate zenith distances, the amount of the refraction varies nearly as the tangent of the zenith distance. Under ordinary conditions of pressure and temperature it is, near the zenith, about 1 ” for each degree of zenith distance. As the tangent increases at a greater rate than the angle, the increase of the refraction soon exceeds 1″ for each degree. At 45° from the zenith the tangent is 1 and the mean refraction is about 58”. As the horizon is approached the tangent increases more and more rapidly, becoming infinite at the horizon; but the re- fraction now increases at a less rate, and, when the observed ray is horizontal, or when the object appears on the horizon, the refraction is about 34’, or a little greater than the diameter of the sun or moon. It follows that when either of these objects is seen on the horizon their actual direction is entirely below it. One result is that the length of the day is increased by refraction to the extent of about five minutes in low latitudes, and still more in higher latitudes. At 60° the increase is about nine minutes.

The atmosphere, like every other transparent substance, refracts the blue rays of the spectrum more than the red; conse- quently, when the image of a star near the horizon is observed with a telescope, it presents somewhat the appearance of a spectrum. The edge which is really highest, but seems lowest in the telescope, is blue, and the opposite one red. When the atmosphere is steady this atmospheric spectrum is very marked and renders an exact observation of the star difficult.

Bibliography. — Refraction has been a favourite subject of research. See Dr. C. Bruhns, Die astronomische Strahlenbrechung (Leipzig, 1861), gives a rSsume of the various formulae of refraction which had been developed by the leading investigators up to the date 1861. Since then developments of the theory are found in: W. Chauvenet, Spherical and Practical Astronomy, i. ; F. Briinnow, Sphdrischen Astronomie; S. Newcomb, Spherical Astronomy; R. Radau, “Recherches sur la theorie des refractions astronomiques” {Annates de V observatoire de Paris, xvi., 1882), ” Essai sur les refrac- tions astronomiques ” (ibid., xix., 1889).

Among the tables of refraction which have been most used are Bessel’s, derived from the observations of Bradley in Bessel’s Fundamenta Astronomiae; and Bessel’s revised tables in his Tabulae Regiomontanae, in which, however, the constant is too large, but which in an expanded form were mostly used at the observatories until 1870. The constant use of the Poulkova tables, Tabulae re~ fractionum, which is reduced to nearly its true value, has gradually replaced that of Bessel. Later tables are those of L. de Ball, published

at Leipzig in 1906. (S. N.)

REFRESHER, in English legal phraseology, a further or additional fee paid to counsel where a case is adjourned from one term or sittings to another, or where it extends over more than one day and occupies, either on the first day or partly on the first and partly on a subsequent day or days, more than five hours without being concluded. The refresher allowed for every clear day subsequent to that on which the five hours have expired is five to ten guineas for a leading counsel and from three to seven guineas for other counsel, but the taxing

master is at liberty to allow larger fees in special circumstances. See Rules of the Supreme Court, O. 65, r. 48.

REFRIGERATING and ICE-MAKING. ” Refrigeration ” (from Lat. frigus, frost) is the cooling of a body by the transfer of a portion of its heat to another and therefore a cooler body. For ordinary temperatures it is performed directly with water as the cooling agent, especially when well water, which usually has a temperature of from 52 to 55° F., can be obtained. There are, however, an increasingly large number of cases in which temperatures below that of any available natural cooling agent are required, and in these it is necessary to resort to machines which are capable of producing the required cooling effect by taking in heat at low temperatures and rejecting it at temperatures somewhat above that of the natural cooling agent, which for obvious reasons is generally water. The function of a refrigerating machine, therefore, is to take in heat at a low temperature and reject it at a higher one.

This involves the expenditure of a quantity of work W, the amount in any particular case being found by the equation W = Q2 — Qi, where W is the work, expressed by its equivalent in British thermal units; Qa the quantity of heat, also in B.Ther.U., given out at the higher temperature T 2 ; and Qi the heat taken in at the lower temperature Ti. It is evident that the discharged heat Q 2 is equal to the abstracted heat Qi, plus the work expended, seeing that the work W, which causes the rise in temperature from Ti to T 2 , is the thermal equivalent of the energy actually expended in raising the temperature to the level at which it is rejected. The relation then between the work expended and the actual cooling work performed denotes the efficiency of the process, and this is expressed by Qi/(Qs — Qi) ; but

as in a perfect refrigerating machine it is understood that the whole of the heat Qi is taken in at the absolute temperature Ti, and the whole of the heat Q 2 , is rejected at the absolute temperature T 2 , the heat quantities are proportional to the temperatures, and the expression Ti/ (T S — T) gives the ideal coefficient of performance for any stated temperature range, whatever working substance is used. These coefficients for a number of cases met with in practice are given in the following table. They

Table I.

Ti.

Temperature at

which Heat is extracted

in Degrees Fahr.

T 2 . . Temperature at which Heat is rejected in Degrees Fahr.

-10°

0°

10°

20°

3°:

40°

5°°

60°

70°

80°

90°

loo°

7-5 9-2

n-7

16-0

24-5 50-0

6-4 7-7 9-4

12-0

16-3 25-0

5-6 6-6 7-8 9-6

12-2

16-7

5-0 5-8 6-7 8-0 9-8 12-5

4‘5

5-i

5-9 6-8

8-2

IO-O

4-1 4-6 5-2

6-o

7-0 8-3

show that in all cases the heat abstracted exceeds by many times the heat expended. As an instance, when heat is taken in at 0° and rejected at 70 , a perfect refrigerating machine would abstract 6-6 times as much heat as the equivalent of the energy to be applied. If, however, the heat is to be rejected at 100°, then the coefficient is reduced to 4-6.

By examining Table I. it will be seen how important it is to reduce the temperature range as much as possible, in order to obtain the most economical results. No actual refrigerating machine does, in fact, take in heat at the exact temperature of the body to be cooled, and reject it at the exact temperature of the cooling water, but, for economy in working, it is of great importance that the differences should be as

small as possible.

There are two distinct classes of machines used for refrigerat- ing and ice-making. In the first refrigeration is produced by the expansion of atmospheric air, and in the second by the evaporation of a more or less volatile liquid.

Compressed-air Machines. — A compressed-air refrigerating machine consists in its simplest form of three essential parts — a compressor, a compressed-air cooler, and an expansion cylinder. It is shown diagrammatically in fig. 1 in connexion with a chamber which it is keeping cool. The compressor draws in air from the room and compresses it, the work expended in compression being almost entirely converted into heat. The compressed air, leaving the compressor at the temperature T 2 , passes through the cooler, where it is cooled by means of water, and is then admitted to the expansion cylinder, where it is

expanded to atmospheric pressure, performing work on the piston. The heat equivalent of the mechanical work per- formed on the piston is abstracted from the air, which is dis- charged at the temperature Ti. This temperature Tj is neces-

Compression Cylinder Expansion Cylinder

Fig. i. —Compressed -Air Refrigerating Machine.

sarily very much below the temperature to be maintained in the room, because the cooling effect is produced by transferring heat from the room or its contents to the air, which is thereby heated. The rise in temperature of the air is, in fact, the measure of the cooling effect produced. If such a machine could be constructed with reasonable mechanical efficiency to compress the air to a temperature but slightly above that of the cooling water, and to expand the air to a temperature but slightly below that required to be maintained in the room, we should of course get a result approximating in efficiency somewhat nearly to the figures given in Table I. Unfortunately, however, such results cannot be obtained in practice, because the extreme lightness of the air and its very small heat capacity (which at constant pressure is 2379) would necessitate the employment of a great volume, with extremely large and mechanically in efficient cylinders and apparatus. A pound of air, represent- ing about 12 cub. ft., if raised io° F. will only take up about 2-4 B.T.U. Consequently, to make such a machine mechani- cally successful a comparatively small weight of air must be used, and the temperature difference increased;

in other words, the air must be discharged at a temperature very much below that to be maintained in the room.

This theory of working is founded on the Carnot cycle for a perfect heat motor, a perfect refrigerating machine being simply a reversed heat motor. Another theory involves the use of the Stirling regenerator, which was proposed in connexion with the Stirling heat engine (see Air Engines). The air machine invented by Dr. A. Kirk in 1862, and described by him in a paper on the " Mechanical Production of Cold " (Proc. Inst. C.E., xxxvii., 1874, 244), is simply a reversed Stirling air engine, the air working in a closed cycle instead of being actually discharged into the room to be cooled, as is the usual practice with ordinary compressed- air machines. Kirk's machine was used commercially with success on a fairly large scale, chiefly for ice-making, and it is recorded that it produced about 4 lb of ice for 1 lb of coal. In 1868 J. Davy Postle read a paper before the Royal Society of Victoria, suggesting the conveyance of meat on board ship in a frozen state by means of refrigerated air, and in 1869 he showed by experiment how it could be done; but his apparatus was not commercially developed. In 1877 a compressed-air machine was designed by J. J. Coleman of Glasgow, and in the early part of 1879 one of his machines was fitted on board the Anchor liner " Circassia," which successfully brought a cargo of chilled beef from America — the first imported by the aid of refrigerating machinery, ice having been previously used. The first successful cargo of frozen mutton from Australia was also brought by a Bell-Coleman machine in 1879. In the Bell-Coleman machine the air was cooled during compression by means of an injection of water, and further by being brought into contact with a shower of water. Another, perhaps the principal, feature was the interchanger, an apparatus whereby the compressed air was further cooled before expansion by means of the comparatively cold air from the room in its passage to the compressor, the same air being used over and over again. The object of this interchanger was not only to cool the compressed air before expansion, but to condense part of the moisture in it, so reducing the quantity of ice or snow produced during expansion. A full description of the machine may be found in a paper on " Air- Refrigerating Machinery " by J. J. Coleman (Proc. Inst. C.E. lxviii., 1882). At the present time the Bell-Coleman machine has practically ceased to exist. In such compressed-air machines

as are now made there is no injection of water during compression, and the compressed air is cooled in a surface cooler, not by actual mixture with a shower of cold water. Further, though the inter-changer is still used by some makers, it has been found by experience that, with properly constructed valves and passages in the expansion cylinder, there is no trouble from the formation of snow, when, as is the general practice, the same air is used over and over again, the compressor taking its supply from the insulated room. So far as the air discharged from the expansion cylinder is concerned, its humidity is precisely the same so long as its temperature and pressure are the same, inasmuch as when discharged from the expansion cylinder it is always in a saturated condition for that temperature and pressure.

The ideal coefficient of performance is about 1, but the actual coefficient will be about f , after allowing for the losses incidental to working. In practice the air is compressed to about 50 lb per square inch above the atmosphere, its temperature rising to about 300 F. The compressed air then passes through coolers in which it is cooled to within about 5° of the initial temperature of the cooling water, and is deprived of a portion of its moisture, after which it is admitted into the expansion cylinder and expanded nearly to atmospheric pressure. The thermal equi- valent of the power exerted on the piston is taken from the air, which, with cooling water at 6o° F. and after allowing for friction and other losses, is discharged at a temperature of 6o° to 80° below zero F. according to the size of the machine. The pistons of the compression and expansion cylinders are connected to the same crankshaft, and the difference between the power expended in compression and that restored in expansion, plus the friction of the machine, is supplied by means of a steam engine coupled to the crankshaft, or by any other source of power. For marine purposes two complete machines are frequently mounted on one bed-plate and worked either together or separately.

In some machines used in the United States the cold air is not discharged into the rooms but is worked in a closed cycle, the rooms being cooled by means of overhead pipes through which the cold expanded air passes on its way back to the compressor.

Liquid Machines. — Machines of the second class may con- veniently be divided into three types: (a) Those in which there is no recovery of the refrigerating agent, water being the agent employed; they will be dealt with as ” Vacuum machines.”

(b) Those in which the agent is recovered by means of mechan- ical compression; they are termed ” Compression machines.”

(c) Those in which the agent is recovered by means of absorption by a liquid; they are known as ” Absorption machines.”

In the first class, since the refrigerating liquid is itself rejected, the only agent cheap enough to be employed is water. The Vacuum boiling point of water varies with pressure; thus at machines, one atmosphere or 14-7 lb per square inch it is 212° F., whereas at a pressure of -085 lb per square inch it is 32°, and at lower pressures there is a still further fall in temperature. This property is made use of in vacuum machines. Water at ordinary temperature, say 6o°, is placed in an air-tight glass or insulated vessel, and when the pressure is reduced by means of a vacuum pump it begins to boil, the heat necessary for evapor- ation being taken from the water itself. The pressure being still further reduced, the temperature is gradually lowered until the freezing-point is reached and ice formed, when about one-sixth of the original volume has been evaporated.

The earliest machine of this kind appears to have been made in 1755 by Dr. William Cullen, who produced the vacuum by means of a pump alone. In 1810 Sir John Leslie combined with the air pump a vessel containing strong sulphuric acid for absorbing the vapour from the air, and is said to have succeeded in producing I to 1 J lb of ice in a single operation. E. C. Carre later adopted the same principle. In 1878 F. Windhausen patented a vacuum machine for producing ice in large quantities, and in 1881 one of these machines, said to be capable of making about 12 tons of ice per day, was put to work in London. The installation was fully described by Carl Pieper (Trans. Soc. of Engineers, 1882, p. 145) and by Dr. John Hopkinson (Journal of Soc. of Arts, 1882, vol. xxxi. p. 20). The process, however, not being successful from a commercial point of view, Was abandoned. At the present time vacuum machines are only employed for domestic purposes. The hand apparatus invented by H. A. Fleuss consists of a vacuum |

pump capable of reducing the air pressure to a fraction of a milli- metre, the suction pipe of which is connected first with a vessel containing sulphuric acid, and second with the vessel containing the water to be frozen. Both these vessels are mounted on a rocking base, so that the acid can be thoroughly agitated while the machine is being worked. As soon as the pump has sufficiently exhausted the air from the vessel containing the water, vapour is rapidly given off and is absorbed by the acid until sufficient heat has been abstracted to bring about the desired reduction in temperature, the acid becoming heated by the absorption of water vapour, while the water freezes. The small Fleuss machine will produce about 1 J lb of ice in one operation of 20

minutes. Iced water in a carafe for drinking purposes can be produced in about three minutes. The acid vessel holds 9 lb of acid, and nearly 3 lb of ice can be made for each 1 lb of acid before the acid has become too weak to do further duty. Another machine, which can be easily worked by a boy, will produce 20 to 30 lb of ice in one hour, and is perhaps the largest size practicable with this method of freezing. The temperature attainable depends on the strength and condition of the sulphuric acid; ordinarily it can be reduced to zero F., and temperatures 20 lower have frequently been obtained.

Though prior to 1834 several suggestions had been made with regard to the production of ice and the cooling of liquids by the evaporation of a more volatile liquid than water, the Compres- first machine actually constructed and put to work s'°" was made by John Hague in that year from the designs macAfae s- of Jacob Perkins (Journal of Soc. of Arts, 1882, vol. xxxi. p. 77). This machine, though never used commercially, is the parent of all modern compression machines. Perkins in his patent specification states that the volatile fluid is by preference ether. In 1856 and 1857 James Harrison of Geelong, Victoria, patented a machine ernbodying the same principle as that of Perkins, but worked out in a much more complete and practical manner. It is stated that these machines were first made in New South Wales in 1859, but the first Harrison machine adopted success- fully for industrial purposes in. England was applied in the year 1861 for cooling oil in order to extract the paraffin. In Harrison's machine the agent used was ether (C 2 H 5) 2 0. Improvements were made by Siebe & Company of London, and a considerable number of ether machines both for ice-making and refrigerating purposes were supplied by that firm and others up to the year 1880. In 1870 the subject of refrigeration was investigated by Professor Carl Linde of Munich, who was the first to consider the question from a thermodynamic point of view. He dealt with the coefficient of performance as a common basis of com- parison for all machines, and showed that the compression vapour machine more nearly reached the theoretic maximum than any other (Bayerisches Industrie und Gewerbeblatt, 1870 and 1871). Linde also examined the physical properties of various liquids, and, after making trials with methylic ether in 1872, built his first ammonia compression machine in 1873. Since then the ammonia compression machine has been most widely adopted, though the carbonic acid machine, also compression, which was first made in 1880 from Linde's designs, is now used to a considerable extent, especially on board ship.

Compressor

Condenser

Refrigerator

Regulating Valve Fig. 2. — Vapour Compression Machine.

A diagram of a vapour compression machine is shown in fig. 2. There are three principal parts, a refrigerator or evaporator, a compression pump, and a condenser. The refrigerator, which

consists of a coil or series of coils, is connected to the suction side of the pump, and the delivery from the pump is connected to the condenser, which is generally of somewhat similar construction to the refrigerator. The condenser and refrigerator are connected by a pipe in which is a valve named the regulator. Outside the re- frigerator coils is the air, brine or other substance to be cooled, and outside the condenser is the cooling medium, which, as previously stated, is generally water. The refrigerating liquid (ether, sulphur dioxide, anhydrous ammonia, or carbonic acid) passes from the bottom of the condenser through the regulating valve into the refrigerator in a continuous stream. The pressure in the refrigerator being reduced by the pump and maintained at such a degree as to give the required boiling-point, which is of course always lower than the temperature outside the coils, heat passes from the substance outside, through the coil surfaces, and is taken up by the entering liquid, which is converted into vapour at the temperature Ti. The vapours thus generated are drawn into the pump, compressed, and discharged into the condenser at the temperature T 2 , which is some- what above that of the cooling water. Heat is transferred from the compressed vapour to the cooling water and the vapour is converted into a liquid, which collects at the bottom and returns by the re- gulating valve into the refrigerator. As heat is both taken in and discharged at constant temperature during the change in physical state of the agent, a vapour compression machine must approach the ideal much more nearly than a compressed-air machine, in which there is no such change.

This will be seen by taking as an example a case in which the cold room is to be kept at io° F., the cooling water being at 60°. Under these conditions, the actual evaporating temperature Ti, in a well-constructed ammonia compression machine, after allowing for the differences necessary for the exchange of heat, would be about 5°

below zero, and the discharge temperature T would be about 75°. An ideal machine, working between 5 below zero and 75 above, has a coefficient of about 5-7, or nearly six times that of an ideal compressed-air machine of usual construction performing the same useful cooling work.

A vapour compression machine does not, however, work precisely in the reversed Carnot cycle, inasmuch as the fall in temperature between the condenser and the refrigerator is not produced, nor is it attempted to be produced, by the adiabatic expansion of the agent, but results from the evaporation of a portion of the liquid itself. In other words, the liquid-refrigerating agent enters the refrigerator at the condenser temperature and introduces heat which has to be taken up by the evaporating liquid before any useful refrigerating effect can be performed. The extent of this loss is determined by the relation between the liquid heat and the latent heat of vaporization at the refrigerator temperature. If r represents the latent heat of the vapour, and g 2 and ?i the amounts of heat contained in the liquid at the respective temperatures of T2 and Ti, then the loss from the heat carried from the condenser into the refrigerator is shown by (qi-qO/r and the useful refrigerating effect produced in the refrigerator is r — (qz — qi). Assuming, as in the previous example, that T 2 is 75 F., and that Ti is 5 below zero, the results for various refrigerating agents are as follows : —

Table II.

Latent Heat.

r

Liquid Heat.

52-31

Net ‘ Refrigeration.

r-(}2-?i)

Proportion of Loss.

Anhydrous ammonia Sulphurous acid Carbonic acid .

590-33 173-13 119-85

72-556 29-062

47-35

517-774

144-068

72-50

0-1225

0-168

o-395

The results show that the loss is least in the case of anhydrous ammonia and greatest in the case of carbonic acid. At higher condenser temperatures the results are even much more favourable to ammonia. As the critical temperature (88-4° F.) of carbonic acid is approached, the value of r becomes less and less and the refrigerating effect is much reduced. When the critical point is reached the value of r disappears altogether, and a carbonic-acid machine is then dependent for its refrigerating effect on the reduction in tem- perature produced by the internal work performed in expanding the gaseous carbonic acid from the condenser pressure to that in the refrigerator. The abstraction of heat does not then take place at constant temperature. The expanded vapour enters the re- frigerator at a temperature below that of the substance to be cooled, and whatever cooling effect is produced is brought about by the superheating of the vapour, the result being that above the critical point of carbonic acid the difference T 2 — T 2 is in- creased and the efficiency of the machine is reduced. The critical temperature of anhydrous ammonia is about 266 F., which is never approached in the ordinary working of refrigerating machines. Some of the principal physical properties of sulphurous acid, anhydrous ammonia, and carbonic acid are given in Tables III., IV. and V.

Table III. — Ledoux's

Table for Saturated Sulphur

Dioxide

Vapour (S0 2).

t

Vapour- tension

1

r

u

Volume of

Temp, of

in Pounds per

Heat of Liquid

Latent Heat of

one Pound

Ebullition.

sq. in.

from 3 2 Fahr.

Evaporation.

of Saturated

Degs. Fahr.

Absolute.

B.T.U.

B.T.U.

Vapour. Cub. ft.

— 22

5-546

-19-55

176-98

I3-I68

-13

7-252

-16-31

174-94

10-268

- 4

9-303

-13-05

172-91

8-122

5

11-803

- 9-79

170-82

6-504

14

14-789

- 6-85

168-75

5-254

23

18-544

- 3-26

166-63

4-293

32

22-468

0-00

164-47

3-540

41

27-445

3-27

162-39

2-931

50

33-275

6-55

160-24

2-451

59

39-958

9-83

158-08

2- 066

68

47-637

13-10

I55-89

1-746

77

56-3″

16-38

I53-67

1-490

86

66-407

19-69

151-49

1-266

95

77-641

22-99

149-27

1-089

104

90-297

26-28

147-02

0-913

Table IV ‘ .—Mollier’ ‘s Table for Saturated Anhydrous Ammonia Vapour (NH 3).

•

Vapour-tension

5

r

u Volume of

Temp, of

in Pounds per

Heat of Liquid

Latent Heat of

one Pound

s-q. in.

from 32 Fahr.

Evaporation.

of Saturated

Degs. Fahr.

Absolute.

B.T.U.

B.T.U.

Vapour. Cub. ft.

-40

I0-238

— 60-048

600-00

25-630

-31

I3-324

-53-064

597-24

20-120

— 22

16-920

-45-918

595-08

15-971

-13

21-472

-38-646

593-0O

I2-783

- 4

27-000

— 3I-2I2

590-00

I0-3I6

5

33-701

-23-634

586-82

8-394

14

41-522

-15-894

581-00

6-888

23

50-908

- 8-028

576-00

5-703

32

61-857

o-ooo

571-00

4-742

4i

74-513

8-172

562-50

3-973

50

89-159

16-506

555-48

3-364

59

105-939

24-966

55O-0O

2-851

68

124-994

33-588

541-00

2-435

77

146-908

42-354

53i-oo

2-098

86

170-782

51-282

523-00

1-810

95

197-800

60-336

512-50

1 -57o

104

227-662

69-552

501-50

1-361

Table V. — Mollier ‘s

Table for Saturated Carbon Dioxide

Vapour (C0 2)

t

Vapour- tension

Q

‘ Vo

u lume of

Temp, of

in Pounds per

Heat of Liquid

Latent Heat of on <

j Pound

Ebullition.

sq. m.

from 3 2 Fahr.

Evaporation. of £

aturated

Degs. Fahr.

Absolute.

B.T.U.

B.T.U. V C

apour. ub ft.

— 22

213-345

— 24-80

126-72

4330

-13

248-903

— 21-06

123-25

3670

- 4

288-727

-17-19

H9-43

3130

5

334-240

-13-17

115-25

2680

14

385-443

— 9-00

110-65

2295

23

440-913

- 4-63

105-53

1955

32

503-497

O-00

99-81

1670

41

573-187

4-93

93-35

1430

50

649-991

10-28

85-93

1202

59

733-906

16-22

77-40

1010

68

826-356

23-08

66-47

0833

77

930-184

3I-63

51-80

0673

86

1039-701

45-45

27-00

O481

87-8

10621458

51-61

15-12

O416

88-43

1070-991

59-24

0-00

0352

The action of a vapour compression machine is shown in fig. 3. Liquid at the condenser temperature being introduced into the re- frigerator through the regulating valve, a small portion evaporates and reduces the remaining liquid to the temperature Ti. This is shown by the curve AB, and is the useless work represented by the expression (q2~qi)/r. Evaporation then continues at the constant temperature T, abstracting heat from the substance outside the refrigerator as shown by the line BC. The vapour is then compressed along the line CD, to the temperature T 2 , when, by the action of the cooling water in the condenser, heat is abstracted at constant temperature and the vapour condensed along the line DA.

In a compression machine the refrigerator is usually a series of iron o>- steel coils surrounded by the air, brine or other substance it

23

REFRIGERATING

33

6 c

Fig. 3. — Action of Vapour Compression Machine.

is desired to cool. One end (generally the bottom) of the coils is connecced to the liquid pipe from the condenser and the other end

to the suction of the compressor. Liquid from the condenser is ad- mitted to the coils through an ad- justable regulating valve, and by taking heat from the substance out- side is evaporated, the vapour being continually drawn off by the com- pressorand discharged under increased pressure into the condenser. The condenser is constructed of coils like the refrigerator, the cooling water being contained in a tank; fre- quently, however, a series of open coils is employed, the cooling water falling over the coils into a collecting tray below, and this form is perhaps the most convenient for ordinary use as it affords great facilities for inspection and painting. The compressor may be driven by a steam engine or in any other convenient manner. The pressure in the condenser varies according to the temperature of the cooling water, and that in the refrigerator is dependent upon the temperature to which the outside substance is cooled. In an ammonia machine copper and copper alloys must be avoided, but for carbonic acid they are not objectionable.

The compression of ammonia is sometimes carried out on what is known as the Linde or ” wet ” system, and sometimes on the ” dry ” system. When wet compression is used the regulating valve is opened to such an extent that a little more liquid is passed than can be evaporated in the refrigerator. This liquid enters the compressor with the vapour, and is evaporated there, the heat taken up preventing the rise in temperature during compression which would otherwise take place. The compressed vapour is dis- charged at a temperature but little above that of the cooling water. With dry compression, vapour alone is drawn into the compressor, and the temperature rises to as much as 180 or 200 degrees. Wet compression theoretically is not quite so efficient as dry compression, but it possesses practical advantages in keeping the working parts of the compressor cool, and it also greatly facilitates the regulation of the liquid, and ensures the full duty of the machine being. continu- ously performed. Very exact comparative trials have been made by Professor M. Schroeter and others with compression machines using sulphur dioxide and ammonia. The results are published in Vergleichende Versuche an K dllemaschinen, by Schroeter, Munich, 1 890, and in Nos. 32 and 5 1 of Bayerisches Industrie und Gewerbeblatt, 1892. Some of the results obtained by Schroeter in 1893 with an ordinary brine cooling machine on the Linde ammonia system are given in Table VI. : —

Table VI.

Temperature reduction in refriger-

‘

ator. Degs. Fahr

42-8 to 37-41

28-4 to 23

14 to 8-6

-0-4 to -5-8

I. H. P. in steam cylinder ….

IS‘79

16-48

15-29

I4‘2S

11-98

14-33

I4‘3

13-54

Pressure in refrigerator in pounds

per sq. in. above atmosphere . .

45‘2

3»‘6

19-8

0”9

Pressure in condenser in pounds

per sq. in. above atmosphere .

116-0

IIS’O

Iio-O

108-0

Heat abstracted in refrigerator.

B.T.U. per hour

342102

263400

171515

X21218

Heat rejected in condenser.

3775ˆ7

301200

214347

158594

The principle of the absorption process is chemical or physical rather than mechanical; it depends on the fact that many Absorp- vapours of low boiling-point are readily absorbed in tloa water, and can be separated again by the application

machines. f heat. In its simplest form an absorption machine consists of two iron vessels connected together by a bent pipe. One of these contains a mixture of ammonia and water, which on the application of heat gives off a mixed vapour containing a large proportion of ammonia, a liquid containing but little ammonia being left behind. In the second vessel, which is placed in cold water, the vapour rich in ammonia is condensed under pressure. To produce refrigeration the operation is reversed. On allowing the weak liquor to cool to normal temperature, it becomes greedy of ammonia (at 6o° F. at atmospheric pressure water will absorb about 760 times its own volume of ammonia vapour), and this produces an evaporation from the liquid in the vessel previously used as a condenser. This liquid, containing a large proportion of ammonia, gives off vapour at a low temperature, and therefore becomes a refrigerator abstracting heat from water or any surrounding body. When the ammonia is evaporated the operation as described must be again commenced. Such an apparatus

is not much used now. Larger and more elaborate machines were made by F. P. E. Carr6 in France; but no very high degree of perfection was xxiii. 2

ftetnfl r*Lor

arrived at, owing to the impossibility of getting an anhydrous product of distillation. In 1867 Rees Reece, taking advantage of the fact that two vapours of different boiling-points, when mixed, ran be separated by means of fractional condensation, brought out an absorption machine in which the distillate was very nearly anhydrous. By means of vessels termed the analyser and the rectifier, the bulk of the water was condensed at a comparatively high temperature and run back to the generator, while the ammonia passed into a condenser, and there assumed the liquid form under the pressure produced by the heat in the generator and the cooling action of water circulating outside the condenser tubes.

Fig. 4 is a diagram of an absorption apparatus. The ammonia vapour given off in the refrigerator is absorbed by a cold weak solution of ammonia and water in the absorber, and the strong liquor is pumped back into the generator condenser through an interchanger through which also the weak hot liquor from the generator passes on its way to the absorber. In this way the strong liquor is heated before it enters the generator, and the weak liquor is cooled iterator- 1 before it enters the absorber.›^ The generator being heated by means of a steam coil, ammonia vapour is driven off at such a pressure as to

cause its condensation in the Fig. 4.

condenser. From the con- denser it passes into the refrigerator through a regulating valve in the usual manner. The process is continuous, and is identical with that of the compression machine, with the exception of the return from the temperature Ti to the temperature T 2 , which is brought about by the direct application of heat instead of by means of mechan- ical compression. With the same temperature range, however, the same amount of heat has to be acquired in both cases, though from the nature of the process the actual amount of heat demanded frbm the steam is much greater in the absorption system than in the compression. This is chiefly due to the fact that in the former the heat of vaporization acquired in the refrigerator is rejected in the absorber, so that the whole heat of vaporization has to be supplied again by the steam in the generator. In the latter the vapour passes direct from the refrigerator to the pump, and power has to be expended merely in raising the temperature to a sufficient degree to

enable condensation to occur at the temperature of the cooling water. On the other hand, a great advantage is gained in the absorption machine by using the direct heat of the steam, without first converting it into mechanical work, for in this way its latent heat of vaporization can be utilized by condensing the steam in the coils and letting it escape in the form of water. Each pound of steam can thus be made to give up some 950 units of heat; while in a good steam engine only about 200 units are utilized in the steam cylinder per pound of steam, and in addition allowance has to be made for mechanical inefficiency. In the absorption machine the cooling water has to take up about twice as much heat as in the compression system, owing to the ammonia being twice liquefied— namely, once in the absorber and once in the condenser. It is usual to pass the cooling water first through the condenser and then through the absorber.

The absorption machine is not so economical as the compres- sion ; but an actual comparison between the two systems is difficult to make. Information on this head is given in papers read by Dr. Linde and by Professor J. A. Ewing before the Society of Arts (Journal of the Society of Arts, vol. xlii., 1894, p. 322, and Howard Lectures, January, February and March 1897).

An absorption apparatus as applied to the cooling of liquids consists of a generator containing coils to which steam is supplied at suitable pressure, an analyser, a rectifier, a condenser either of the submerged or open type, a refrigerator in which the nearly anhydrous ammonia obtained in the condenser is allowed to eva- porate, an absorber through which the weak liquor from the gener- ator continually flows and absorbs the anhydrous vapour produced in the refrigerator, and a pump for forcing the strong liquor produced in the absorber back through an economizer into the analyser where, meeting with steam from the generator, the ammonia gas is again driven off ,_ the process being thus carried on continuously. Sometimes an additional vessel is employed for heating liquor by means of the exhaust steam from the engine driving the ammonia pump. Absorption machines are also made without a pump for returning the strong liquor to the generator. In these cases they work intermittently. In some machines the same vessel is used alternately as a generator and absorber, while in others; in order

to minimize the loss of time, two vessels are provided which can be used alternately as generators and absorbers.

Applications. — Apart from the economical working of the machine itself, whatever system may be adopted, it is of importance that cold once produced should not be wasted, and it is therefore necessary to use some form of insulation to protect the vessels in which liquids are being cooled, or the rooms of ships' holds in which the freezing or storage processes are being carried on. This insulation generally consists of materials such as charcoal, silicate cotton, granulated cork, small pumice, hair-felt, sawdust, &c, held between layers of wood or brick, and forming a more or less heat-tight box. There is no recognized standard of insulation. For a cold store to be erected inside a brick or stone building, and to be maintained at an internal temperature of from i8° to 20 F., a usual plan is shown in fig. 5. The same insulation is used for the floors and

Mfetl

ˆTAt*- Some* ?'&UiCftte CrttOA

-Insulation of a Cold Store.

ceilings, except that the wearing surface of the floor is generally made thicker than the inside lining of the sides. Should the walls or floor be damp, waterproof paper is added. Granulated cork has practically the same insulating properties as silicate cotton, and the same thicknesses may be used. About 10 in. of flake charcoal and vegetable silica, or n of small pumice, are required to give the same protection as 7 in. of good silicate cotton. Cork bricks made of compressed granulated cork are frequently used, a thickness of about 5 in. giving the same protection as 7 in. of silicate cotton. The walls and ceilings are finished off with a smooth coating of hard cement and the floors are protected by cement or asphalt, according to the nature of the traffic on them. For lager-beer cellars and fermenting rooms, for bacon-curing cellars, and for similar purposes, brick walls with single or double air spaces are used, and sometimes a space filled with silicate cotton or other in- sulating material. In Australia and New Zealand pumice, which is found in enormous quantities in the latter country, takes the place of charcoal and silicate cotton. In Canada air spaces are largely used either alone or in combination with silicate cotton or planer shavings. The air spaces, two or three in number, are formed between two layers of tongued and grooved wood, and the total thickness of the insulation is about the same as when silicate cotton alone is used. On board ship charcoal has been almost entirely

employed, but silicate cotton and granulated cork are sometimes used. The material is either placed directly up to the skin of the vessel, and kept in place by a double lining of wood inside, in which case a thickness of about 10 in. is used depending upon the depth of the frames, or it is placed between two layers of wood, with an air space next the skin, in which case about 6 in. of flake charcoal is generally sufficient for the insulation of the holds, though for deck-houses and other parts exposed to the sun the thickness must be greater. A layer of sheet zinc or tin has frequently to be used as pro- tection from rats. Given a certain allowable heat transmission, the principal points to be considered in connexion with insulation are, first cost, durability, weight and space occupied, the two last named being specially important factors on board ship. No exact rules can be laid down, as the conditions vary so greatly; and though experiments have been made to determine the actual heat conduction of various materials per unit of surface, thickness and temperature difference, the experience of actual practice is at present the only accepted guide.

With compressed-air machines which discharge the cold air direct into the insulated room or hold, a snow box is provided close to the outlet of the expansion cylinder to catch the snow and congealed oil. The air is distributed by means of wood air trunks with openings controlled by slides, and similar trunks are pro-

vided in connexion with the suction of the compresser to conduct the air back to the machine. With liquid machines of the compres- sion and absorption system, the rooms are either cooled by means of cold pipes or surfaces placed in them, or by a circulation of air cooled in an apparatus separated from the rooms. The cold pipes may be direct-expansion pipes in which the liquid evaporates, or they may be pipes or walls through which circulates an un- congealable brine previously cooled to the desired temperature. The pipes are placed on the ceilings or sides according to circum- stances, but they must be arranged so as to induce a circulation of air throughout the compartment and ensure every part being cooled. With what is termed the air circulation system the air is generally circulated by means of a fan, being drawn from the rooms through ducts, passed over a cooler, and returned again to the rooms by other ducts. In some coolers the cooling surfaces consist of direct-expansion pipes placed in clusters of convenient form ; in others brine pipes are used ; in others there is a shower of cold brine, and in some cases combinations of cold pipes and brine showers. Whether pipes in the rooms or air circulation give the best results is to some extent a matter of opinion, but at the present time the tendency is decidedly in favour of air circulation, at any rate for general cold storage purposes. Whichever system be

adopted, it is important for economical reasons that ample cooling surface be allowed, and that all surfaces be kept clean and active, to make the difference between the temperature of the evaporating liquid and the rooms as small as possible. Small surfaces reduce first cost, but involve higher working expenses by decreasing the value of Ti/(Ts — Ti), and thus demanding more energy, and consequently more fuel, to effect the given result than if larger surfaces were employed.

The general arrangement of an ice factory for producing can ice is shown in fig. 6. The water to be frozen is contained in galvanized W

Fig. 6. — General Arrangement of an Ice Factory.

or terned steel moulds suspended in a tank filled to the proper level with brine maintained at the desired temperature. The moulds are frequently arranged in frames, so that by means of an overhead crane one complete row is lifted at a time. When the water is frozen the moulds are dipped in a tank containing warm water, and on being tipped the blocks of ice fall out. Ordinary water contains air, and ice made from it is generally opaque, due to the inclusion of numerous small air-bubbles. To produce clear ice the water must be agitated during the freezing process, or previously boiled to get rid of the air. Distilled water is frequently used, as well as the water produced by the condensation of the steam from the engine, which of course must be thoroughly purified and filtered. It should be noted, however, that with an ice- making plant of moderate size and a steam-engine of good con- struction the weight of steam used will not nearly equal the weight of ice produced, so that ‘the difference must be made up either by distillation, which is a costly process, or by ordinary water. Can ice is usually made in blocks weighing 56, 112 or 224 lb, and from 4 to 8 in. thick. For cell ice ordinary water is used, agitated

during freezing. The cells are flat and constructed of galvanized iron, so as to form a hollow space of about 2 in. in width, through which cold brine is circulated by a pump. They are placed vertically in a tank, the distance between them being from 8 to 14 in., according to the thickness of the ice to be produced. The tank is filled with water, which is kept in agitation by means of a reciprocating paddle or piston; in this way the air escapes, and with proper care a block of great transparency is produced. To thaw it off, warm brine is

circulated through the cells. A usual size for cell ice is 4 ft. by 3 ft. by I ft. mean thickness, the weight being about 6 cwt. If perfectly transparent ice is required, the two sides of the block are not allowed to join up, and it is then called plate ice, which is often made in very large blocks, afterwards divided by saws or steam cutters. In such cases the evaporation of the ammonia or other refrigerating liquid frequently takes place in the cells themselves, brine being dispensed with. With a well- constructed can ice-plant of say 25 tons capacity per day, from 15 to 16 tons of ice should be made in Great Britain to a ton of best steam coal. For cell and plate ice the production is considerably below this, and the first cost of the plant is much greater than that for can ice.

Fig. 7 shows an arrangement of cold storage on land, refrigerated on the air circulation system. The insulated rooms, on two floors,

Fig. 7. — Cold Stores.

are approached by corridors, so as to exclude external air, which if allowed to enter would deposit moisture upon the cold goods. The air cooler is placed at the end, and the air is distributed by means of wood ducts furnished with slides for regulating the temperature of the rooms, which are insulated according to the method shown in fig. 5. In some cases, instead of the entrance being at the sides or ends, it is at the top, all goods being raised to the top floor in lifts and lowered by lifts into the rooms. With good machinery the cost of raising is not great, and is probably equalled by the saving in refrigeration, since the rooms hold the heavy cold air as a glass holds water.

Large passenger vessels and yachts are now generally fitted with refrigerating machinery for preserving provisions, cooling water and wine, and making ice. Usually two insulated compartments are provided, one for frozen meats at about 20° F., and one for vegetables, &c, at about 40 . They have a capacity of from 1500 to 3000 cub. ft. or more, according to the number of passen- gers carried, and they are generally cooled by means of brine pipes, though direct expansion and air circulation are sometimes adopted. A passenger vessel requires from 2 to 4 cwt. of ice per day. On battleships and cruisers the British Admiralty use small compressed- air machines for ice-making, and larger machines, generally on the carbonic-acid system, for cooling the magazines. A modern frozen- meat-carrying vessel will accommodate as much as 120,000 carcases, partly sheep and partly lambs, requiring a hold capacity of about 300,000 cub. ft. In some vessels both fore and aft holds and ‘tween decks are insulated. Lloyd’s Committee, now issue certificates for refrigerating installations, if constructed

according to their rules, and most modern cargo-carrying vessels have their refrigerating machinery classed at Lloyd's. In the meat trade between the River Plate, the United States, Canada and Great Britain, ammonia or carbonic acid machines are now exclusively used, but for the Australian and New Zealand frozen- meat trade compressed-air machines are still employed to a small extent. The holds of meat-carrying vessels are refrigerated either by cold air circulation or by brine pipes.

Though the adoption of refrigerating and ice-making machinery for industrial purposes practically dates from the year 1880, the manufacture of these machines has already assumed very great proportions; indeed, in no branch of mechanical engineering, with the exception of electrical machinery, has there been so re- markable a development in recent years. The sphere of application is extending year by year. The cooling of residential and public buildings in hot countries, though attempted in a few cases in the United States and elsewhere, is yet practically untouched, the manufacture of ice and the preservation of perishable foods (apart from the frozen and chilled meat trades) have in many countries hardly received serious consideration, but in breweries, dairies, margarine works and many other industries there is a large and increasing field for refrigerating and ice-making machinery. A recent application is in the cooling and drying of the air blast for blast furnaces. Though this matter had been discussed for some years, it was only in 1904 that the first plant was put to work at Pittsburg.

For further information reference may be made to the following: Siebel, Compend. of Mechanical Refrigeration (Chicago) ; Red- wood, Theoretical and Practical Ammonia Refrigeration (New York) ; Stephansky, Practical Running of an Ice and Refriger- ating Plant (Boston) ; Ledoux, Ice-Making Machines (New York) ; Wallis-Taylor, Refrigerating and Ice-Making Machines (London); Ritchie Leask, Refrigerating Machinery (London); De Volson Wood, Thermodynamics, Heat Motors and Refrigerating Machinery (New York) ; Linde, Kalteerzeugungsmaschine Lexikon der gesamten Technik; Behrend, Eis und Kalteerzeugungs- Maschinen (Halle) ; De Marchena, Kompressions Kdltemaschinen (Halle) ; Theodore Roller, Die Kdlteindustrie (Vienna) ; Voorhees, Indicating the Refrigerating Machine (Chicago) ; Norman Selfe, Machinery for Refrigeration (Chicago) ; Hans Lorenz, Modern Re- frigerating Machinery (London) ; Lehnert, Moderne Kaltetechnik (Leipzig) ; L. Marchis, Production et utilisation du froid (Paris) ; C. Heinel, Bau und Betrieb von Kdltemaschinen Anlagen (Oldenburg) ; R. Stetefeld, Eis und Kdlteerzeugungs-Maschinen (Stuttgart). (T. B. L.)

REGAL, a small late-medieval portable organ, furnished with beating-reeds and having two bellows like a positive organ; also in Germany the name given to the reed-stops (beating-reeds) of a large organ, and more especially the ” vox humana ” stop. The name was not at first applied to the small table instrument, but to certain small brass pipes in the organ, sounded by means of beating-reeds, the longest of the 8-ft. tone being but 5ˆ in. long. Praetorius (1618) mentions a larger regal used in the court orchestras of some of the German princes, more like a positive, containing 4-ft., 8-ft. and even sometimes 16-ft. tone reeds, and having behind the case two bellows. These regals were used not only at banquets but often to replace positiyes in small and large churches. The very small regal, sometimes called Bible-regal, because it can be taken to pieces and folded up like a book, is also mentioned by the same writer, who states that these little instruments, first made in Nuremberg and Augsburg, have an unpleasantly harsh tone, due to their tiny pipes, not quite an inch long. The pipes in this case were not intended to reinforce the vibrations of the beating-reed or of its overtones as in the reed pipes of the organ, but merely to form an attachment for keeping the reed in its place without interfering with its functions. The beating-reed itself in the older organs of the early middle ages, many of which undoubtedly were reed organs, was made of wood; those of the regal were mostly of brass (hence their ” brazen voices “). The length of the vibrating portion of the beating-reed governed the pitch of the pipe and was regulated by means of a wire passing through the socket, the other end pressing on the reed at the proper distance. Drawings of the reeds of regals and other reed-pipes, as well as of the instrument itself, are given by Praetorius (pi. iv., xxxviii.). H

There is evidence to show that in England, and France also, the word ” regal ” was applied to reed-stops on the organ; Mersenne (1636) states that ” now the word is applied to the vox humana stop on the organ.” In England, as late as the reign of George III., there was the appointment of ” tuner of the regals ” to the Chapel Royal.

The reed-stops required constant tuning, according to Prae- torius, who lays special emphasis on the fact’fthat the pitch of the reed-pipes alone falls in summer and rises in winter.

During the 1 6th and 17th centuries the regal was a- very great favourite, and. although, owing to the civil wars and the ravages

of time, very few specimens now remain, the regals are often mentioned in old wills and inventories, such as the list of Henry VIII. ‘s musical instruments made after his death by Sir Philip Wilder (Brit. Mus. Harleian MS. 1415, fol. 200 seq.), in which no fewer than thirteen pairs of single and five pairs of double regals are mentioned. Monteverde scored for the regals in his operas, and the instrument is described and figured by S. Virdung in 151 1, Martin Agricola in 1528, and Ottmar Luscinius in 1536, as well as by Michael Praetorius in 1618. (K. S.)

REGALIA (Lat. regalis, royal, from rex, king), the ensigns of royalty. The crown (see Crown and Coronet) and sceptre (see Sceptre) are dealt with separately. Other ancient symbols of royal authority are bracelets, the sword, a robe or mantle, and, in Christian times, a ring. Bracelets, as royal emblems, are mentioned in the Bible in connexion with Saul (2 Sam. i. 10), and they have been commonly used by Eastern monarchs. In Europe their later use seems to have been fitfully confined to England, although they were a very ancient ornament for kings among the Teutonic races. Two coronation bracelets are mentioned among the articles of the regalia ordered to be destroyed at the time of the Commonwealth, and two new ones Were made at the Restoration. These are of gold, i| in. in width, and ornamented with the rose, thistle, harp and fleur-de-lis in enamel round them. They have not been used for modern coronations.

The sword is one of the usual regalia of most countries, and is girded on to the sovereign during the coronation. In England the one sword has been developed into five. The Sword of State is borne before the sovereign on certain state occasions, and at the coronation is exchanged for a smaller sword, with which the king is ceremonially girded. The three other swords- of the regalia are the ” Curtana,” the Sword of Justice to the Spirituality, and the Sword of Justice to the Temporality. The Curtana has a blade cut off short and square, indicating thereby the quality of mercy.

The mantle, as a symbol of royalty, is almost universal, but in the middle ages other quasi-priestly robes were added to it (see Coronation). The English mantle was formerly made of silk; latterly cloth of gold has been used. The ring, by which the sovereign is wedded to his kingdom, is not of so wide a range of usage. That of the English kings held a large ruby with a cross engraved on it. Recently a sapphire has been substituted for the ruby. Golden spurs, though included among the regalia, are merely used to touch the king’s feet, and are not worn.

The orb and cross was not anciently placed in the king's hands during the coronation ceremony, but was carried by him in the left hand on leaving the church. It is emblematical of monarchical rule, and is only used by a reigning sovereign. The idea is undoubtedly derived from the globe with the figure of Victory with which the Roman emperors are depicted. The larger orb of the English regalia is a magnificent ball of gold, 6 in. in diameter, with a band round the centre edged with gems and pearls. A similar band arches the globe, on the top of which is a remarkably fine amethyst i| in. in height, upon which rests the cross of gold outlined with diamonds. There is a smaller orb made for Mary II., who reigned jointly with King William III.

The English regalia, with one or two exceptions, were made for the coronation of Charles II. by Sir Robert Vyner. The Scottish regalia preserved at Edinburgh comprise the crown, dating, in part, from Robert the Bruce, the sword of state given to James IV. by Pope Julius II., and two sceptres.

Besides regalia proper, certain other articles are sometimes included under the name, such as the ampulla for the holy oil, and the coronation spoon. The ampulla is of solid gold in the form of an eagle with outspread wings. It weighs 10 oz., and holds 6 oz. of oil. The spoon was not originally used for its present purpose. It is of the 12th or 13th century, with a long handle and egg- shaped bowl. Its history is quite unknown.

See Cyril Davenport, The English Regalia, with illustrations in colour of all the regalia; Leopold Wickham Legg, English Corona- tion Records; The Ancestor, Nos. I and 2 (1902); Menin, The Form, &c, of Coronations (translated from French, 1727).

REGENERATION OF LOST PARTS. A loss and renewal of living material, either continual or periodical, is a familiar occurrence in the tissues of higher animals. The surface of the human skin, the inner lining of the mouth and respiratory organs, the blood co/puscles, the ends of the nails, and many other portions of tissues are continuously being destroyed and replaced. The hair of many mammals, the feathers of birds, the epidermis of reptiles, and the antlers of stags are shed and replaced periodically. In these normal cases the regeneration depends on the existence of special formative layers or groups of cells, and must be regarded in each case as a special adapta- tion, with individual limitations and peculiarities, rather than as a mere exhibition of the fundamental power of growth and reproduction displayed by living substance. Many tissues, even in the highest animals, are capable of replacing an ab- normal loss of substance.

Thus in mammals, portions of muscular tissue, of epithelium, of bone, and of nerve, after accidental destruction or removal, may be renewed. The characteristic feature of such cases appears to be, in the higher animals at any rate, that lost cells are replaced only from cells of the same morphological order — epiblastic cells from the epiblast, mesoblastic from the mesoblast, and so forth. It is also becoming clear that, at least in the higher animals, regenera- tion is in intimate relation with the central nervous system. The process is in direct relation to the general power of growth and reproduction possessed by protoplasm, and is regarded by pathologists as the consequence of " removal of resistances to growth." It is much less common in the tissues of higher plants, in which the adult cells have usually lost the power of reproduction, and in which the regeneration of lost parts is replaced by a very extended capacity for budding. Still, more complicated reproductions of lost parts occur in many cases, and are more difficult to understand.

In Amphibia the entire epidermis, together with the slime-glands and the integumentary sense-organs, is regenerated by the epidermic cells in the vicinity of the defect. The whole limb of a Salamander or a Triton will grow again and again after amputation. Similar renewal is either rarer or more difficult in the case of Siren and Pro- teus. In frogs regeneration of amputated limbs does not usually take place, but instances have been recorded. Chelonians, croco- diles and snakes are unable to regenerate lost parts! to any extent, while lizards and geckoes possess the capacity in a high degrte. The capacity is absent almost completely in birds and mammals. In coelenterates, worms, and tunicates the power is exhibited in a very varying extent. In Hydra, Nais, and Lumbriculus, after transverse section, each part may complete the whole animal. In most worms the greater, and in particular the anterior part, will grow a new posterior part, but the separated posterior portion dies. In Hydra, sagittal and horizontal amputations result in the completion of the separated parts. In worms such operations result in death, which no doubt may be a mere consequence of the more severe wound. Extremely interesting instances of regenera- tion are what are called " Heteromorphoses," where the removed part is replaced by a dissimilar structure. The tail of a lizard, grown after amputation, differs in structure from the normal tail: the spinal cord is replaced by an epithelial tube which gives off no nerves; the vertebrae are replaced by an unsegmented carti- laginous tube; very frequently " super-regeneration " occurs, the amputated limb or tail being replaced by double or multiple new structures.

J. Loeb produced many heteromorphoses on lower animals. He lopped

off the polyp head and the pedal disc of a Tubularia, and supported the lopped stem in an inverted position in the sand; the original pedal end, now superior, gave rise to a new polyp head, while the neck-end, on regeneration, formed a pedal disc. In Cerianthus, a sea-anemone, and in done, an ascidian, regeneration after his operations resulted in the formation of new mouth-openings in abnormal places, surrounded by elaborate structures character- istic of normal mouths. Other observers have recorded hetero- morphoses in Crustacea, where antennulae have been regenerated in place of eyes. It appears that, in the same fashion as more simply organized animals display a capacity for reproduction of lost parts greater than that of higher animals, so embryos and embryonic structures generally have a higher power of renewal than that displayed by the corresponding adult organs or organisms. Moreover, experimental work on the young stages of organisms has revealed a very striking series of phenomena, similar to the hetero- morphoses in adult tissues, but more extended in range. H. Driesch, O. Hertwig and others, by separating the segmentation spheres, by destroying some of them, by compressing young embryos by glass plates, and by many other means, have caused cells to develop

REGALIA

Plate I

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-St EDWARD’S CROWN, The ancient crown was destroyed at the

Commonwealth, and a model made for Charles IPs coronation.

2.— THE IMPERIAL STATE CROWN, as worn by Queen Victoria. The Black

Prince's ruby is in the centre. Modifications in the cap were made for the coronation

of King Edward VII. and the smaller "Cullman" diamond substituted for the sapphire

below the ruby.

3-— QUEEN ALEXANDRA'S CO RON ATIO

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4-— THE COROXET OF THE PRINCE OF WALES.

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5.— THE LARGER OR KING'S ORB.

6.— THE LESSER OR QUEEN’S ORB.

Plate II.

REGALIA

i.— THE SCEPTRES: (a) The Scepter with the Dove; (b) The Royal Sceptre with the Cross {cf. Fig. 3); (c) The Queen’s Sceptre with the Cross; \d) The Queen’s Ivory Rod; ie) The Queen’s Sceptre with the Dove.

.j._ THE HEAD OF THE ROYAL >

1 SCEPTRE with (he largest of J the “Star of Africa” (Cullman) Li Diamonds. Photo, W. E. Gray.

5.- THE BRACELETS.

6.— THE AMPULLA.

7.— THE St GEORGE’S SPURS.

23

REGALIA

Plate 111.

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..—THE SILVER-GILT CHRISTENING FONT, made { Charles II.

2 — QUEEN ELIZABETH’S SALT-CELLAR.

3.—SILVER-GILT ALTAR DISH, used at Christmas and Easter in the Chapel of St Peter ad Vincula, Tower of London.

4.— THE GOLD SALT-CELLAR presented to the Crown by the City of Exeter.

Plate IV.

REGALIA

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REGENSBURG— REGENT

so as to give rise to structures which in normal development they would not have formed.

It is clear that there are at least three kinds of factors in- volved in regeneration. There are: (i) Regenerations due to the presence of undifferentiated, or little differentiated, cells, which have retained the normal capacity of multiplication when conditions are favourable. (2) Regenerations due to the presence of special complicated rudiments, the stimulus to the development of which is the removal of the fully formed structure. (3) Regeneration involving the general capacity of protoplasm to respond to changes in the surroundings by changes of growth. The most general view is to regard re- generations as special adaptations; and A. Weismann, following in this matter Arnold Lang, has developed the idea at con- siderable length, and has found a place for regenerations in his system of the germ-plasm (see Heredity) by the conception of the existence of ” accessory determinants.” Hertwig, on the other hand, attaches great importance to the facts of regeneration as evidence for his view that every cell of a body contains a similar essential plasm.

In E. Schwalbe’s Morphologic der Minbildungen (1904), part i. chap, v., an attempt is made to associate the facts of regeneration with those of embryology and pathology. Our knowledge of the facts, however, is not yet systematic enough to allow of important general conclusions. The power of regeneration appears to be in some cases a special adaptation, but more often simply an expression of the general power of protoplasm to grow and to reproduce its kind. It has been suggested that regenerated parts always repre- sent ancestral stages, but there is no conclusive evidence for this view. (P- C. M.)

REGENSBURG (Ratisbon), a city and episcopal see of Germany, in the kingdom of Bavaria, and the capital of the government district of the Upper Palatinate. Pop. (1905) 48,412. It is situated on the right bank of the Danube, opposite the influx of the Regen, 86 m. by rail N.E. from Munich, and 60 m. S.E. of Nuremberg. On the other side of the river is the suburb Stadt-am-Hof, connected with Regensburg by a long stone bridge of the 12th century, above and below which are the islands of Oberer and Unterer Worth. In appearance the town is quaint and romantic, presenting almost as faithful a picture of a town of the early middle ages as Nuremberg does of the later. One of the most characteristic features in its architecture is the number of strong loopholed towers attached to the more ancient dwellings. The interesting ” street of the envoys ” (Gesandtenstrasse) is so called,

because it contained the residences of most of the envoys to the German diet, whose coats-of-arms may still be seen on many of'the houses.

The cathedral, though small, is a very interesting example of pure German Gothic. It was founded in 1275, and completed in 1634, with the exception of the towers, which were finished in 1869. The interior contains numerous interesting monuments, including one of Peter Vischer's masterpieces. Adjoining the cloisters are two chapels of earlier date than the cathedral itself, one of which, known as the " old cathedral," goes back perhaps to the 8th century. The church of St James — also called Schottenkirche — a plain Romanesque basilica of the 1 2th century, derives its name from the monastery of Irish Benedictines (" Scoti ") to which it was attached; the principal doorway is covered with very singular grotesque carvings. The old parish church of St Ulrich is a good example of the Transition style of the 13th century, and contains a valu- able antiquarian collection. Examples of the Romanesque basilica style are the church of Obermunster, dating from 1010, and the abbey church of St Emmeran, built in the 13th century, and remarkable as one of the few German churches with a detached belfry. The beautiful cloisters of the ancient abbey, one of the oldest in Germany, are still in fair preservation. In 1809 the conventual buildings were converted into a palace for the prince of Thurn and Taxis, hereditary postmaster-general of the Holy Roman Empire. The town hall, dating in part from the 14th century, contains the rooms occupied by the imperial diet from 1663 to 1806. An historical interest also •attaches to the Gasthof zum Goldenen Kreuz (Golden Cross Inn),

where Charles V. made the acquaintance of Barbara Blomberg, the mother of Don John of Austria (b. 1547). The house is also shown where Kepler died in 1630. Perhaps the most pleasing modern building in the city is the Gothic villa of the king of Bavaria on the bank of the Danube. At Kumpfmuhl, in the immediate neighbourhood of the city, was discovered, in 1885, the remains of a Roman camp with an arched gateway; the latter, known as the Porta Praetoria, was cleared in 1887. Among the public institutions of the city should be mentioned the public library, picture gallery, botanical garden, and the institute for the making of stained glass. The educational establishments include two gymnasia, an episcopal clerical seminary, a seminary for boys and a school of church music. Among the chief manufactures are iron and steel wares, pottery, parquet flooring, tobacco, and lead pencils. Boat-building is also prosecuted, and a brisk transit trade is carried on in salt, grain and timber.

Near Regensburg are two very handsome classical buildings, erected by Louis I. of Bavaria as national monuments of German patriotism and greatness. The more imposing of the two is the Walhalla, a costly reproduction of the Parthenon, erected as a Teutonic temple of fame on a hill rising from the Danube at Donau- stauf, 6 m. to the east. The interior, which is as rich as coloured marbles, gilding, and sculptures can make it, contains the busts of more than a hundred German worthies. The second of King Louis's buildings is the Befreiungshalle at Kelheim, 14 m. above Regensburg, a large circular building which has for its aim the glorification of the heroes of the war of liberation in 1813.

The early Celtic settlement of Radespona (L. Lat. Ratisbona) was chosen by the Romans, who named it Castra Regina, as the centre of their power on the upper Danube. It is mentioned as a trade centre as early as the 2nd century. It afterwards became the seat of the dukes of Bavaria, and one of the main bulwarks of the East Frankish monarchy; and it was also the focus from which Christianity spread over southern Germany. St Emmeran founded an abbey here in the middle of the 7th century, and St Boniface established the bishopric about a hundred years later. Regensburg acquired the freedom of the empire in the 13th century, and was for a time the most flourishing city in southern Germany. It became the chief seat of the trade with India and the Levant, and the boat- men of Regensburg are frequently heard of as expediting the journeys of the Crusaders. The city was loyally Ghibelline in its sympathies, and was a favourite residence of the emperors. Numerous diets were held here from time to time, and after 1663 it became the regular place of meeting of the German diet. The Reformation found only temporary acceptance at Regensburg, and was met by a counter-reformation inspired by the Jesuits. Before this period the ˆcity had almost wholly lost its commercial importance owing to the changes in the great highways of trade. Regensburg had its due share in the Thirty Years' and other wars, and is said to have suffered in all no fewer than seventeen sieges. In 1807 the town and bishopric were assigned to the prince primate Dalberg, and in 1810 they were' ceded to Bavaria. After the battle of Eggmiihl in 1809 the Austrians retired upon Regensburg, and the pursuing French defeated them again beneath its walls and reduced a great part of the city to ashes.

See Gemeiner, Chronik der Stadt und des Hochstifts Regensburg (4 vols., Regensburg, 1800-24) ; Chroniken der deutschen Stddte, vol. xv. (Leipzig, 1878) ; Count v.Waldersdorf, Regensburg in seiner Vergangen- heit und Gegenwart (4th ed., Regensburg, 1896) ; Fink, Regensburg in seiner Vorzeit und Gegenwart (6th ed., Regensburg,

1903) ; and Schratz, Fuhrer durch Regensburg (5th ed., G. Dengler, Regensburg, 1904).

REGENT (from Lat. regere, to rule), one who rules or governs, especially one who acts temporarily as an administrator of the realm during the minority or incapacity of the king. This latter function, however, is one unknown to the English common law. ” In judgment of law the king, as king, cannot be said to be a minor, for when the royal body politic of the king doth meet with the natural capacity in one person the whole body shall have the quality of the royal politic, which is the greater and more worthy and wherein is no minority. For omne majus continet in se minus ” (Coke upon Littleton, 43a) . But for reasons of necessity a regency, however anomalous it may be in strict law, has frequently been constituted both in England and Scotland. The earliest instance in English history is the appointment of the earl of Pembroke with the assent of the loyal barons on the accession of Henry III.

Whether or not the sanction of parliament is necessary for the appointment is a question which has been much discussed. Lord Coke recommends that the office should depend on the will of

parliament (Inst., vol. iv. p. 58), and in modern times provision for a regency has always been made by act of parliament. In Scotland the appointment of regents was always either by the assent of a council or of parliament. Thus in 1315 the earl of Moray was ap- pointed regent by Robert I. in a council. At a later period appoint- ment by statute was the universal form. Thus by an act of 1542 the earl of Arran was declared regent during the minority of Mary. By an act of 1567 the appointment by Mary of the earl of Moray as regent was confirmed. As late as 1704 provision was made for a regency after the death of Arine. The earliest regency in England resting upon an express statute was that created by 28 Hen. VIII. c. 7, under which the king appointed his executors to exercise the authority of the crown till the successor to the crown should attain the age of eighteen if a male or sixteen if a female. They delegated their rights to the protector Somerset, with the assent of the lords spiritual and temporal. No other example of a statutory provision for a regency occurs till 1751. In that year the act of 24 Geo. II. c. 24 constituted the princess-dowager of Wales regent of the kingdom in case the crown should descend to any of her children before such child attained the age of eighteen. A council,

called the council of regency, was appointed to assist the princess. A prescribed oath was to be taken by the regent and members of the council. Their consent was necessary for the marriage of a successor to the crown during minority. It was declared to be unlawful for the regent to make war or peace, or ratify any treaty with any foreign power, or prorogue, adjourn or dissolve any parliament without the consent of the majority of the council of regency, or give her assent to any bill for repealing or varying the Act of Settlement, the Act of Uniformity, or the Act of the Scottish parliament for securing the Protestant religion and Presbyterian church government in Scotland (1707, c. 6). The last is an invariable provision, and occurs in all subsequent Regency Acts. The reign of George III. affords examples of pro- vision for a regency during both the infancy and incapacity of a king.

The act of 5 Geo. III. c. 27 vested in the king power to ap-‘ point a regent under the sign manual, such regent to be one of certain named members of the royal family. The remaining pro- visions closely followed those of the act of George II. In 1788 the insanity of the king led to the introduction of a Regency bill. In the course of the debate in the House of Lords the duke of York disclaimed on behalf of the prince of Wales any right to assume the regency without the consent of parliament. Owing to the king’s recovery the bill ultimately dropped. On a return of the malady in 1810 the act of 51 Geo. III. c. I was passed, appointing the prince of Wales regent during the king’s incapacity. The royal assent was given by commission authorized by resolution of both Houses. By this act no council of regency was appointed. There was no restriction on the regent’s authority over treaties, peace and war, or parliament, as in the previous acts, but his power of granting peerages, offices and pensions was limited. At the accession of William IV. the duchess of Kent was, by I Will. IV. c. 2, appointed regent, if necessary, until the Princess Victoria should attain the age of eighteen. No council of regency was appointed. By I Vict. c. 72 lords justices were nominated as a kind of regency council without a regent in case the successor to the crown should be out of the realm at the queen’s death. They were restricted from granting peerages, and from dissolving parliament without direc- tions from the successor. By 3 & 4 Vict. c. 52 Prince Albert was appointed regent in case any of Queen Victoria’s children should succeed to the crown under the age of eighteen. The only restraint on his authority was the usual prohibition to assent to any bill repealing the Act of Settlement, &c. When George V. came to the throne a Regency Bill was again required, as his eldest son was under age, and Queen Mary was appointed. By 10 Geo. IV. c. 7 the office of regent of the United

Kingdom cannot be held by a Roman Catholic. A similar disability is imposed in most, if not all, Regency Acts.

REGGIO CALABRIA (anc. Regium, q.v.), a town and archi- episcopal see of Calabria, Italy, capital of the province of Reggio, on the Strait of Messina, 248 m. S.S.E. from Naples by rail. Pop. (1906) 39,941 (town); 48,362 (commune). It is the terminus of the railways from Naples along the west coast, and from Metaponto along the east coast of Calabria. The straits are here about 7 m. wide, and the distance to Messina nearly 10 m. The ferryboats to Messina therefore cross by preference from Villa S. Giovanni, 8 m. N. of Reggio, whence the distance is only 5 m. In 1894 the town suffered from an earthquake, though less severely than in 1783. It was totally destroyed, however, by the great earthquake of December 1908; in the centre of the town about 35,000 out of 40,000 persons perished. The cathedral, which dated from the 17th century, and the ancient castle which rose above it, were wrecked. Great damage was done by a seismic wave following the shock. The sea front was swept away, and the level of the land here- abouts was lowered. (See further Messina.)

REGGIO NELL' EMILIA, a city and episcopal see of Emilia, Italy, the capital of the province of Reggio nell' Emilia (till 1859 part of the duchy of Modena), 38 m. by rail N.W. of Bologna. Pop. (1906) 19,681 (town); 64,548 (commune). The cathe- dral, originally erected in the 12th century, was reconstructed in the 15th and 16th; the facade shows traces of both periods, the Renaissance work being complete only in the lower portion. S. Prospero, close by, has a facade of 1504, in which are incor- porated six marble lions belonging to the original Romanesque edifice. The Madonna della Ghiara, built in 1597 in the form of a Greek cross, and restored in 1900, is beautifully proportioned and finely decorated in stucco and with frescoes of the Bolognese school of the early 17th century. There are several good palaces of the early Renaissance, a fine theatre (1857) and a museum containing important palaeo-ethnological collections, ancient and medieval sculptures, and the natural history collection of Spallanzani. Lodovico Ariosto, the poet (1474-1533), was born in Reggio, and his father's house is still preserved. The industries embrace the making of cheese, objects in cement, matches, and brushes, the production of silkworms, and printing; and the town is the centre of a rich agricultural district. It lies on the main line between Bologna and Milan, and is con- nected by branch lines with Guastalla and Sassuolo (hence a line to Modena).

Regium Lepidi or Regium Lepidum was probably founded by M. Aemilius Lepidus at the time of the construction of the Via Aemilia

(187 B.C.). It lay upon this road, half-way between Mutina and Parma. It was during the Roman period a flourishing munici- pium, but perhaps never became a colony; and it is associated with no event more interesting than the assassination of M. Brutus, the father of Caesar's friend and foe. The bishopric dates perhaps from the 4th century A.D. Under the Lombards the town was the seat of dukes and counts; in the 12th and 13th centuries it formed a flourishing republic, busied in surrounding itself with walls (1229), controlling the Crostolo and constructing navigable canals to the Po, coining money of its own, and establishing prosperous schools. About 1290 it first passed into the hands of Obizzo d'Este, and the authority of the Este family was after many vicissitudes more formally recognized in 1409. In the contest for liberty which began in 1796 and closed with annexation to Piedmont in 1859, Reggio took vigorous part.

REGICIDE (Lat. rex, a king, and caedere, to kill), the name given to any one who kills a sovereign. Regicides is the name given in English history at the Restoration of 1660 to those persons who were responsible for the execution of Charles I. On the 4th of April 1660 Charles II. in the Declaration of Breda promised a free pardon to all his subjects " excepting only such persons as shall hereafter be excepted by parliament," and on the 14th of May the House of Commons ordered the immediate arrest of " all those persons who sat in judgment upon the late king's majesty when sentence was pronounced." The number of regicides was estimated at 84, this number being composed of the 67 present at the last sitting of the court of justice, 11 others who had attended earlier sittings, 4 officers of the court and the 2 executioners. Many of them were arrested or surrendered themselves, and the House of Commons in con- sidering the proposed bill of indemnity suggested that only twelve of the regicides, who were named, should forfeit their lives; but the House of Lords urged that all the king's judges, with three exceptions, and some others, should be treated in this way.

Eventually a compromise was agreed upon, and the bill as passed on the 29th of August 1660 divided the regicides into six classes for punishment: (1) Four of them, although dead — Cromwell, Ireton, Bradshaw and Pride — were to be attainted for high treason. (2) The estates of twenty others, also dead, were to be subjected to fine or forfeiture. (3) Thirty living regicides were excepted from all indemnity. (4) Nineteen living regicides were also excepted, but with a saving clause that their execution was to be suspended, until a special act of parliament was passed for this purpose. (5) Six others were to be punished, but not capitally. (6) Two, Colonels Hutchinson and Thomas Lister, were simply declared incapable of holding any

office. Two regicides — Ingoldsby, who declared he had only signed the warrant under compulsion, and Colonel Matthew Thomlinson — escaped without punishment. A court of thirty-four commissioners was then appointed to try the regicides, and the trial took place in October 1660. Twenty-nine were condemned to death, but only ten were actually executed, the remaining nineteen

with six others being imprisoned for life. The ten who were exe- cuted at Charing Cross or Tyburn, London, in October 1660, were Thomas Harrison, John Jones, Adrian Scrope, John Carew, Thomas Scot, and Gregory Clement, who had signed the death-warrant; the preacher Hugh Peters; Francis Hacker and Daniel Axtel, who commanded the soldiers at the trial and the execution of the king; and John Cook, the solicitor who directed the prosecution. In January 1661 the bodies of Cromwell, Ireton, and Bradshaw were exhumed and hanged at Tyburn, but Pride's does not appear to have been treated in this way. Of the nineteen or twenty regicides who had escaped and were living abroad, three, Sir John Barkstead, John Okey and Miles Corbet, were arrested in Holland and executed in London in April 1662; and one, John Lisle, was murdered at Lausanne. The last survivor of the regicides was probably Edmund Ludlow, who died at Vevey in 1692.

Ludlow's Memoirs, edited by C. H. Firth (Oxford, 1894), give interesting details about the regicides in exile. See also D. Masson, Life of Milton, vol. vi. (1880), and M. Noble, Lives of the English Regicides (1798). (A. W. H.*)

REGILLUS, an ancient lake of Latium, Italy, famous in the legendary history of Rome as the lake in the neighbourhood of which occurred (496 B.C.) the battle which finally decided the hegemony of Rome in Latium. During the battle, so runs the story, the dictator Postumius vowed a temple to Castor and Pollux, who were specially venerated in Tusculum, the chief city of the Latins (it being a Roman usage to invoke the aid of the gods of the enemy), who appeared during the battle, and brought the news of the victory to Rome, watering their horses at the spring of Juturna, close to which their temple in the Forum was erected. There can be little doubt that the lake actually existed. Of the various identifications proposed, the best is that of Nibby, who finds it in a now dry crater lake (Pantano Secco), drained by an emissarium, the date of which is uncertain, some 2 m. N. of Frascati. Along the south bank ll the lake, at some 30 or 40 ft. above the present bottom, ran the aqueducts of the Aqua Claudia and Anio Novus. Most of the other sites proposed are not, as Regillus should be, within the limits of the territory of Tusculum.

See T. Ashby in Rendiconti del Lincei (1898), 103 sqq., andClassical Review, 1898. (T. As.)

REGIMENT (from Late Latin regimentum, rule, regere, to rule, govern, direct), originally government, command or authority exercised over others, or the office of a ruler or sovereign; in this sense the word was common in the 16th century. The most familiar instance is the title of the tract of John Knox, the First Blast of the Trumpet against the Monstrous Regiment of Women. The term as applied to a large body of troops dates from the French army of the 16th century. In the first instance it implied ” command,” as nowadays we speak of ” General A’s command,” meaning the whole number of troops under his command. The early regiments had no similarity in strength or organization, except that each was under one commander. With the regularization of armies the commands of all such superior officers were gradually reduced to uniformity, and a regiment came to be definitely a colonel’s command. In the British infantry the term has no tactical significance, as the number of battalions in a regiment is variable, and one at least is theoretically abroad at all times, while the reserve or terri- torial battalions serve under a different code to that governing the regular battalions. The whole corps of Royal Artillery is called ” the Royal Regiment of Artillery.” In the cavalry a regiment is tactically as well as administratively a unit of four squadrons. On the continent of Europe the regiment of infantry is always together under the command of its colonel, and consists of three or four battalions under majors or lieutenant-colonels.

REGINA, the capital city of the province of Saskatchewan, Canada, situated at 104 36′ W. and 50° 27′ N., and 357 m. W. of Winnipeg. Pop. (1907) 9804. After the Canadian Pacific railway was completed in 1885, the necessity for a place of government on the railway line pressed itself upon the Dominion government. The North-West Territories were but little settled then, but a central position on the prairies was necessary, where the mounted police might be stationed and where the numerous Indian bands might be easily reached. The minister of the interior at Ottawa, afterwards Governor Dewdney, chose

this spot, and for a number of years Regina was the seat of the Territorial government. The governor took up his abode on the adjoining plain, and the North-West Council met each year, with a show of constitutional government about it. On the formation of the province of Saskatchewan in 1905 the choice of capital was left to the first legislature of the province. Prince Albert, Moose Jaw and Saskatoon all advanced claims, but Regina was decided on as the capital. It probably doubled in population between 1905 and 1907. Its public buildings, churches and residences are worthy of a place of greater pre- tensions. It is the centre for a rich agricultural district,

and for legislation, education, law and other public benefits. It remains the headquarters of the mounted police for the western provinces, and near it is an Indian industrial school of some note.

REGINON, or Regino of PrtJm, medieval chronicler, was born at Altripp near Spires, and was educated in the monastery of Priim. Here he became a monk, and in 892, just after the monastery had been sacked by the Danes, he was chosen abbot. In 899, however, he was deprived of this position and he went to Trier, where he was appointed abbot of St Martin's, a house which he reformed. He died in 915, and was buried in the abbey of St Maximin at Trier, his tomb being discovered there in 1581.

Reginon wrote a Chronicon, dedicated to Adalberon, bishop of Augsburg (d. 909), which deals with the history of the world from the commencement of the Christian era to 906, especially the history of affairs in Lorraine and the neighbourhood. The first book (to 741) consists mainly of extracts from Bede, Paulus Diaconus and other writers; of the second book (741-906) the latter part is original and valuable, although the chronology is at fault and the author relied chiefly upon tradition and hearsay for his informa- tion. The work was continued to 967 by a monk of Trier, possibly Adalbert, archbishop of Magdeburg (d. 981). The chronicle was first published at Mainz in 1 521; another edition is in Band I. of the Monumenta Germaniae historica. Scriptofes (1826); the best is the one edited by F. Kurze (Hanover, 1890). It has been translated into German by W. Wattenbach (Leipzig, 1890). Reginon also drew up at the request of his friend and patron Radbod, archbishop of Trier (d. 915), a collection of canons, Libri duo de synodalibus causis et disciplines ecclesiasticis, dedicated to Hatto I., archbishop of Mainz; this is published in Tome 132 of J. P. Migne's Patrologia Lalina. To Radbod he wrote a letter on music, Epistola de harmonica institutione, with a Tonarius, the object of this being to improve the singing in the churches of the diocese. The letter is published in Tome I. of Gerbert's Scriptores ecclesiastici de musica sacra (1784), and the Tonarius in Tome II. of Coussemaker's Scriptores de musica medii aevi. See also H. Ermisch, Die Chronih des Regino bis 813 (Gottingen, 1872); P. Schulz, Die Glaubwiirdig- keit des Abtes Regino] von Priim (Hamburg, 1894); C. Wawra, De Reginone Prumensis (Breslau, 1901); A. Molinier, Les Sources de I'histoire de France, Tome I. (1901); and W. Wattenbach, Deutschlands Geschichtsquellen, Band I. (1904).

REGIOMONTANUS (1436-1476), German astronomer, was born at Kbnigsberg in Franconia on the 6th of June 1436. The son of a miller, his name originally was Johann Miiller, but he called himself, from his

birthplace, Joh. de Monteregio, an appellation which became gradually modified into Regiomontanus. At Vienna, from 1452, he was the pupil and associate of George Purbach (1423-1461), and they jointly undertook a reform of astronomy rendered necessary by the errors they detected in the Alphonsine Tables. In this they were much hindered by the lack of correct translations of Ptolemy's works; and in 1462 Regiomontanus accompanied Cardinal Bessarion to Italy in search of authentic manuscripts. He rapidly mastered Greek at Rome and Ferrara, lectured on Alfraganus at Padua, and completed at Venice in 1463 Purbach's Epitome in CI. Ptolemaei magnam compositionem (printed at Venice in 1496), and his own De Triangulis (Nuremberg, 1533), the earliest work treating of trigonometry as a substantive science. A quarrel with George of Trebizond, the blunders in whose translation of the Almagest he had pointed out, obliged him to quit Rome pre- cipitately in 1468. He repaired to Vienna, and was thence summoned to Buda by Matthias Corvinus, king of Hungary, for the purpose of collating Greek manuscripts at a handsome salary. He also finished his Tabulae Directionum (Nuremberg, 1475), essentially a n astrological woijc, but containing a valuable table of tangents. An outbreak of war, meanwhile, diverted

the king's attention from learning, and in 1471 Regiomontanus settled at Nuremberg. Bernhard Walther, a rich patrician, became his pupil and patron; and they together equipped the first European observatory, for which Regiomontanus himself constructed instruments of an improved type (described in his posthumous Scripta, Nuremberg, 1544). His observations of the great comet of January 1672 supplied the basis of modern cometary astronomy. At a printing-press established in Walther's house by Regiomontanus, Purbach's Theoricae planetarunt novae was published in 1472 or 1473; a series of popular calendars issued from it, and in 1474 a volume of Ephemerides calculated by Regiomontanus for thirty-two years (1474-1506), in which the method of "lunar distances," for determining the longitude at sea, was recommended and explained. In 1472 Regiomontanus was summoned to Rome by Pope Sixtus IV. to aid in the reform of the calendar;. and there he died, most likely of the plague, on the 6th of July 1476.

Authorities. — P. Gassendi, Vita Jo. Regiomontani (Parisiis, 1654) ; J. G. Doppeimayr, Historische Nachricht von den Niirn- bergischen Mathematicis, pp. 1-23 (1730); G. A. Will, Niirnber- gisches Gelehrten-

Lexikon, iii. 273 (1757); P. Niceron, Memoires pour servir A I'histoire des homines illustres, xxxviii. 337 (1737); J. F. Weidler, Hist. Astronomiae, p. 313; A. G. Kastner, Geschichte der Mathematik, i. 556, 572; J. F. Montucla, Hist, des mathe- matiques, 1. 541 ; E. F. Apelt, Die Reformation der Sternkunde, p. 34; M. Cantor, Vorlesungen titer Geschichte der Math., ii. 254- 264; M. Curtze, Urkunden zur Gesch. der Math., i. 187 (1902); Corr. Astr. vii. 21 (1822); G. H. Schubert, Peurbach und Regio- montan (Erlangen, 1828); A. Ziegler, Regiomontanus ein . geistiger Vorldufer des Columbus (1874) ; J. B. J. Delambre, Hist, de I'astrono- mie au moyen Age, p. 284; J. S. Bailly, Hist., de I'astr. moderne, i. 311; R. Wolf, Geschichte der Astronomie, p. 87; S. Giinther, Allg. Deutsche Biog., Bd. xxii. p. 564; C. G. Jocher's Gelehrten- Lexikon, iii. 1959, and Fortsetzung, vi. 1551 (H. W. Rotermund, Bremen, 1819); Ersch-Gruber' s Encyklopaedie, ii. th. xx. p. 205; C. T. von Murr, Memorabilia Bibliothecarum Norimbergensium, i. 74 (1786). – •;'■-•; (A. M.C.)

REGISTER, a record of facts, proceedings, acts, events, names, &c, entered regularly for reference in a volume kept for that purpose, also the volume in which the entries are made. The Fr. registre is taken from the Med. Lat. registrum for registum, Late Lat. regesta, things recorded, hence list, catalogue, from regerere, to carry or bear back, to transcribe, enter on a roll. For the keeping of public registers dealing with various subjects see Registration and the articles there referred to, and for the records of baptisms, marriages and burials made by a parish clergyman, see section Parish Registers below. The keeper of a register was, until the beginning of the 19th century, usually known as a " register," but that title has in Great Britain now been superseded by "registrar"; it still survives in the Lord Clerk Register, an officer of state in Scotland, nominally the official keeper of the national records, whose duties are per- formed by the Deputy Clerk Register. In the United States the title is still " register." The term " register " has also been applied to mechanical contrivances for the automatic registration or recording of figures, &c. (see Cash Register), to a stop in an organ, to the compass of a voice or musical instrument, and also to an apparatus for regulating the in- and outflow of air, heat, steam, smoke or the like. Some of these instances of the application of the term are apparently due to a confusion in etymology, with Lat. regere, to rule, regulate.

Parish Registers were instituted in England by an order of Thomas Cromwell, as vicegerent to Henry VIII., " supreme hedd undre Christ of the Church of Englande," in September 1538. The idea appears to have been of Spanish origin, Cardinal Ximenes having instituted, as archbishop of Toledo, registers of baptisms in 1497. They included,

under the above order, baptisms, marriages and burials, which were to be recorded weekly. In 1597 it was ordered by the Convocation of Canterbury that parchment books should be provided for the registers and that transcripts should be made on parch- ment of existing registers on paper, and this order was repeated in the 70th canon of 1603. The transcripts then made now usually represent the earliest registers. It was further pro- vided at both these dates that an annual transcript of the

register should be sent to the bishop for preservation in the diocesan registry, which was the origin of the " bishop's tran- scripts." The " Directory for the publique worship of God," passed by parliament in 1645, provided for the date of birth being also registered, and in August 1653, an Act of " Bare- bones' Parliament " made a greater change, substituting civil " parish registers " (sic) for the clergy, and ordering them to record births, banns, marriages and burials. The " register " was also to publish the banns and a justice to per- form the marriage. The register books were well kept under this civil system, but at the Restoration the old system was resumed.

A tax upon births, marriages and burials imposed in 1694 led to the clergy being ordered to register all births, apart from baptisms, but the act soon expired and births were not again registered till 1836. Lord Hardwicke's Marriage Act (1754), by its rigid provisions, increased the registration of marriages by the parochial clergy and prescribed a form of entry. In 181 2 parish registers became the subject of parlia- mentary enactment, owing to the discovery of their deficiencies. Rose's Act provided for their safer custody, for efficient bishops, transcripts, and for uniformity of system. This act continued to regulate the registers till their supersession for practical purposes, in 1837, by civil registration under the act of 1836.

In age; completeness and condition they vary much. A blue book on the subject was published in 1833, but the returns it contains are often inaccurate. A few begin even earlier than Cromwell's order, the oldest being that of Tipton, Staffs, (1513). Between 800 and 900, apparently, begin in 1538 or 1539. The entries were originally made in Latin, but this usage died out early in the 17th century: decay and the crabbed handwriting of the time render the earlier registers extremely difficult to read. There is general agreement as to the shocking neglect of these valuable records in the past, and the loss of volumes appears to have continued even through the 19th century. Their custody is legally vested in the parochial clergy and their wardens, but several proposals have been made for their removal to central depositories. The fees for searching them are determined by the act of 1836, which prescribes

half a crown for each certified extract, and sixpence a year for searching, with a shilling for the first year.

The condition of the ” bishops’ transcripts ” was, through- out, much worse than that of the parish registers, there being no funds provided for their custody. The report on Public Records in 1800 drew attention to their neglect, but, in spite of the provisions in Rose’s Act (181 2), little or nothing was done, and, in spite of their importance as checking, and even some- times supplementing deficient parish registers, they remained ” unarranged, unindexed and unconsultable.” Of recent years, -however, some improvement has been made. It has also been discovered that transcripts from ” peculiars ” exist in other than episcopal registries.

Outside the parochial registers, which alone were official in character, there were, till 1754, irregular marriage registers, of which those of the Fleet prison are the most famous, and also registers of private chapels in London. Those of the Fleet and of Mayfair chapel were deposited with the registrar- general, but not authenticated. The registers of dissenting chapels remained unofficial till an act of 1840 validated a number which had been authenticated, and was extended to many others in 1858. Useful information on these registers, now mostly deposited with the registrar-general, will be found in Sims’ Manual, which also deals with those of private chapels, of English settlements abroad preserved in London, and with English Roman Catholic registers. These last, however, begin only under George II. and are restricted to certain London chapels.

The printing of parish registers has of late made much progress, but the field is so vast that the rate is relatively slow. There is a Parish Register Society, and a section of the Harleian Society engaged on the same work, as well as some county societies and also one for Dublin. But

so many have been issued privately or by individuals that reference should be made to the lists in Marshall’s Genealogist’s Guide (1893) and Dr Cox’s Parish Registers (1010), and even this last is not perfect. The Huguenot Society has printed several registers of the Protestant Refugees, and Mr Moens that of the London Dutch church. There are also several registers of marriages alone now in print, such as that of St Dunstan’s, Stepney, in 3 vols. Colonel Chester’s extensive MS.

collection of extracts from parish registers is now in the College of Arms, London, and the parishes are indexed in Dr Marshall's book. MS. extracts in the British Museum are dealt with in Sims' Manual.

In Scotland registers of baptisms and marriages were insti- tuted by the clergy in issr, and burials were added by order of the Privy Council in 1616; but these were very imperfectly kept, especially in rural parishes. Yet it was not till 1854 that civil registration was introduced, by act of parliament, in their stead. Some 900 parish registers, beginning about 1563, have been deposited in the Register House, Edinburgh, under acts of parliament which apply to all those prior to 1819. Mr Hallen has printed the register of baptisms of Muthill Episcopal Church.

In Ireland, parish registers were confined to the now dis- established church, which was that of a small minority, and were, as in Scotland, badly kept. Although great inconvenience was caused by this system, civil registration of marriages, when introduced in 1844, was only extended to Protestants, nor was it till 1864 that universal civil registration was intro- duced, great difficulty under the Old Age Pensions Act being now the result. No provision was made, as in Scotland, for central custody of the registers, which, both Anglican and Nonconformist, remain in their former repositories. Roman Catholic registers in Ireland only began, apparently, to be kept in the 19th century.

In France registers, but only of baptism, were first instituted in 1539. The Council of Trent, however, made registers both of baptisms and of marriages a law of the Catholic Church in 1563, and Louis XIV. imposed a tax on registered baptisms and marriages in 1707.

See Burn, The History of Parish Registers (1829, 1862) ; Sims, Manual for the Genealogist (1856,. 1888) ; Chester Waters, Parish- Registers in England (1870, 1882, 1887); Marshall, Genealogist's Guide (1893) ; A. M. Burke, Key to the Ancient Parish Registers (1908); J. C. Cox, Parish Registers of England (1910); W. D. Bruce, Account . . . of the Ecclesiastical Courts of Record (1854); Bigland , Observations on Parochial Registers (1764) ; Report of the Commis- sioners on the state of Registers of Births, &c. (1838); Lists of Non- parochial Registers and Records in the custody of the Registrar- General (1841); Report on Non-parochial Registers (1857); Detailed List of the old Parochial Registers of Scotland (1872). (J. H. R.)

REGISTRATION. In all systems of law the registration of certain legal facts has been regarded as necessary, chiefly for the purpose of

ensuring publicity arid simplifying evidence. Registers, when made in performance of a public duty, are as a general rule admissible in evidence merely on the production from the proper custody of the registers themselves or (in most cases) of examined or certified copies. The extent to which registration is carried varies very much in different countries. For obvious reasons, judicial decisions are registered in all countries alike. In other matters no general rule can be laid down, except perhaps that on the whole registration is not as fully enforced in the United Kingdom and the United States as in continental states. The most important uses of registra- tion occur in the case of judicial proceedings, land, ships, bills of sale, births, marriages and deaths, companies, friendly and other societies, newspapers, copyrights, patents, designs, trade marks and professions and occupations. In England registrars are attached to the privy council, the Supreme Court and the county courts. In the king's bench division (except in its bankruptcy jurisdiction) the duty of registrars is performed by the masters. Besides exercising limited judicial authority, registrars are responsible for the drawing up and recording of various stages of the proceedings from the petition, writ or

plaint to the final decision. 1 With them are filed affidavits, depositions, pleadings, &c, when such filing is necessary. The difference between filing and registration is that the documents filed are filed without alteration, while only an 4 epitome is usually registered. The Judicature Act 1873 created district registries in the chief towns, the district registrar having an authority similar to that of a registrar of the Supreme Court. In the admiralty division cases of account are usually referred to the registrar arid merchants. The registration in the central office of the supreme court of judgments affecting lands, writs of execution, recognizances and lites pendentes in England, and the registration in Scotland of abbreviates of adjudications and of inhibitions, are governed by special legislation. All these are among the incumbrances for whkh search is made on investigating a title. Decisions of criminal courts are said to be recorded, not registered, except in the case of courts of summary jurisdiction, in which, by the Summary Jurisdiction Act 1879, a register of convictions is kept. Probates of wills and letters of administration, which are really judicial decisions, are registered in the principal or district registries of the probate division. In Scotland registration is used for giving a summary remedy on obligations without action by means of the fiction of a judicial decision having been given establishing the obligation.

See also the separate articles Land Registration; Shipping; Bill of Sale; Companies; Friendly Societies; Building Societies; Press Laws;

Registration of Voters. — Prior to 1832 the right of parlia- mentary electors in England was determined at the moment of the tender of the vote at the election, or, in the event of a petition against the return, by a scrutiny, a committee of the House of Commons striking off those whose qualification was held to be insufficient, and, on the other hand, adding those who, having tendered their votes at the poll, with a good title to do so, were rejected at the time. A conspicuous feature of the Reform Act of that year was the introduction of a new mode of ascertaining the rights of electors by means of an entirely new system of published lists, subject to claims and objections, and after due inquiry and revision forming a register of voters. Registration was not altogether unknown in Great Britain in connexion with the parliamentary franchise before the Reform Acts of 1832. Thus in the Scottish counties the right to vote depended on the voter's name being upon the roll of freeholders established by an act of Charles II.; a similar register existed in Ireland of freeholders whose free- holds were under £20 annual value; and in the universities of Oxford and Cambridge the rolls of members of Convocation and of the Senate were, as they still are, the registers of par- liamentary voters. But except in such cases as the above, the right of a voter had to be determined by the returning officer upon the evidence produced before him when the vote was tendered at a poll. This necessarily took time, and the result was that a contested election in a large constituency might last for weeks. The celebrated Westminster election of 1784, in which the poll began on the 1st of April and ended on the 17th of May, may be mentioned as an illustration. More- over, the decision of the returning officer was not conclusive; the title of every one who claimed to vote was liable to be reconsidered on an election petition, or, in the case of a rejected vote, in an action for damages by the voter against the returning officer.

The inconvenience of such a state of things would have been greatly aggravated had the old practice continued after th? enlargement of the franchise in 1832. The establishment of a general system of registration was therefore a necessary and important part of the reform then effected. It has enabled an election in the most populous constituency to be completed in a single day. It has also been instrumental in the extinction

1 The antiquity of registration of this kind is proved by the age of the Registrum Brevium, or register of writs, called by Lord Coke " a most ancient book of the Common Law " (Coke upon Littleton, I59a).

of the ” occasional voter,” who formerly gave so much trouble to returning officers and election committees — the person, namely, who acquired a qualifying tenement with the view of using it for a particular election and then disposing of it. The period of qualification now required in all cases, being fixed with reference to the formation of the register, is neces- sarily so long anterior to any election which it could effect, that the purpose or intention of the voter in acquiring the qualifying tenement has ceased to be material, and is not inves- tigated.

England. — The reform of parliamentary representation in 1832 was followed in 1835 by that of the constitution of municipal corporations, which included the creation of a uniform quali- fication (now known as the old burgess qualification) for the municipal franchise. In 1888 the municipal franchise was enlarged, and was at the same time extended to the whole country for the formation of constituencies to elect county councils; and in 1894 parochial electors were called into existence for the election of parish councils and for other pur- poses. Inasmuch as provision was made for the registering of persons entitled to votes for the above purposes, there are now three registers of voters, namely, the parliamentary register, the local government register {i.e. in boroughs under the Municipal Corporation Acts, the burgess rolls, and elsewhere the county registers) and the register of parochial electors. Under the Municipal Corporations Act 1835 the registration of burgesses, though on similar lines to that of parliamentary voters, was entirely separate from it. Since, however, the qualification for the municipal franchise covered to a great extent the same ground as that for the parliamentary franchise in boroughs which sent members to parliament, a considerable number of voters in such boroughs were entitled in respect of the same tenement to be upon both parliamentary register and burgess roll. The waste of labour involved in settling their rights twice over was put an end to in 1878, when the system of parliamentary registration was extended to the boroughs in question for municipal purposes, and the lists were directed to be made out in such a shape that the portion common to the two registers could be detached and combined with the portion peculiar to each, so as to form the parliamentary register and the burgess roll respectively. This system of registration was extended to the non-parliamentary boroughs and to the whole country in 1888, the separate municipal registration being completely abolished.

The procedure of parliamentary registration is to be found in its main lines in the Parliamentary Registration Act 1843, which p superseded that provided by the Reform Act of 1832,

” and has itself been considerably amended by later legis-

‘ lation. The acts applying and adapting the system to local government and parochial registration are the Parliamentary and Municipal Registration Act 1878, the County Electors Act 1888, and the Local Government Act 1894. Registration is carried out by local machinery, the common-law parish being taken as the registration unit; and the work of preparing and publishing the lists, which when revised are to form the register, is committed to the overseers. The selection of these officers was no doubt due to their position as the rating authority, and to their consequent opportunities for knowing the ownership and occupation of tene- ments within their parish. They do not always perform the duties themselves, other persons being empowered to act for them in many parishes by general or local acts of parliament ; but in all or almost all cases they are entitled to act personally if they think fit, they sign the lists, and the proceedings are conducted in their name.

In order to render intelligible the following summary of the procedure, it will be necessary to divide the voters to be regis- tered into classes based on the nature of their qualification, since the practice differs in regard to each class. The classes are as follows: (1) Owners, including the old forty-shilling freeholders, and the copyholders, long leaseholders and others entitled under the Reform Act of 1832 to vote at parliamentary elections for counties; (2) occupiers, including those entitled to (a) the £10 occupation qualification, (b) the household qualification and © the old burgess qualification; (3) lodgers, subdivided into (a) old, i.e. those on the previous register for the same lodgings, and (b) new ; (4) those entitled to reserved rights, i.e. in addition to those (if any still remain) who were entitled to votes before the Reform Act of 1832 in respect of qualifications abolished by that act, (a) free-

hold and burgage tenants in Bristol, Exeter, Norwich, and Notting- ham, and (b) liverymen of the City of London and freemen of certain old cities and boroughs, whose right to the parliamentary franchise was permanently retained by the same act. In regard to these classes it may be said that the general scheme is that owners must make a claim in the first instance before they can get their names upon the register, but that, once entered on the register, the names will be retained from year to year until removed by the revising barrister; that the lists of

occupiers and of freehold and burgage tenants are made out afresh every year by the over- seers from their own information and inquiries, without any act being required on the part of the voters, who need only make claims in case their names are omitted; that lodgers must make claims every year; and that liverymen and freemen are in the same posi- tion as occupiers, except that the lists of liverymen are made out by the clerks of the several companies, and those of freemen by the town clerks, the overseers having nothing to do with these voters, whose qualifications are personal and not locally connected with any parish.

The overseers and other officers concerned are required to perform their duties in connexion with registration in accordance with the instructions and precepts, and to use the notices and forms pre- scribed by Order in Council from time to time. The Registration Order, 1895, directs the clerk of every county council, on or within seven days before the 15th of April in every year, to send to the overseers of each parish in his county a precept with regard to the registration of ownership electors, and to every parish not within a parliamentary or municipal borough a precept with regard to the registration of occupation electors (which expression for this purpose includes lodgers as well as occupiers proper). The town clerk of every borough, municipal or parliamentary, is to send to the overseers of every parish in his borough a precept with regard to the registration of occupation electors. These precepts are set out in the Registration Order, and those issued by the town clerks differ according as the borough is parliamentary only, or municipal only, or both parliamentary and municipal; in the cases of Bristol, Exeter, Norwich and Nottingham they contain direc- tions as to freehold and burgage tenants. The duties of the over- seers in regard to registration are set out in detail in the precepts. Along with the precepts are forwarded forms of the various lists and notices required to be used, and with the ownership precept a certain number of copies of that portion of the parliamentary register of the county at the time in force which contains the ownership voters for the parish, the register being so printed that the portion relating to each parish can be detached. It is the duty of the overseers to publish on the 20th' of June, in manner hereinafter described, the portion of the register so received, together with a notice to owners not already registered to send in claims by the 20th of July. Mean- while the overseers are making the inquiries necessary for the preparation of the occupier list. For this purpose they may require returns to be furnished by owners of houses let out in separate tenements, and by employers who have servants entitled to the service franchise. The registrars of births, deaths and marriages

are required to furnish the overseers with returns of deaths, as must the assessed tax collectors with returns of defaulters; the relieving officers are to give information as to recipients of parochial relief. On or before the 31st of July the overseers are to make out and sign the lists of voters. These are the following: the list of ownership electors, consisting of the portion of the register previously published with a supplemental list of those who have sent in claims by the 20th of July; the occupier list; and the old lodger list, the last being formed from claims sent in by the 25th of July. The overseers do not select the names in the first and last of these lists; they take them as supplied in the register and claims. It is, however, their dufy to write ” dead ” or ” objected ” in the margin against the names of persons whom they have reason to believe to be dead or not entitled to vote in respect of the qualifica- tion described. The ownership and old lodger lists will be divided into two parts, if the register contains names of owners entitled to a parochial vote only, or if claims by owners or old lodgers have been made limited to that franchise. The occupier list contains the names of persons whom the overseers believe to be qualified, and no others, and therefore will be free from marginal objections. Except in the administrative county of London, it is made out in three divisions — division I giving the names of occupiers of pro- perty qualifying for both parliamentary and local government votes, divisions 2 and 3 those of occupiers of property qualifying only for parliamentary and only for local government votes respec- tively. It happens so frequently that a tenement, if not of sufficient value to qualify for the £10 occupation franchise (parliamentary and local government), qualifies both for the household franchise (parliamentary) and for the old burgess franchise (local govern- ment), that division I would in most cases be the whole list, but for two circumstances. The service franchise is a special modification of the household franchise only; and the service occupants, being therefore restricted to the parliamentary vote, form the bulk of division 2; while peers and women, being excluded from the parliamentary vote, are consequently relegated to division 3. In the administrative county of London the local government register, being coextensive with the register of parochial electors, includes

the whole of the parliamentary register. The occupier lists are consequently there made out in two divisions only, the names which would elsewhere appear in division 2 being placed in division 1. The lists of freehold and burgage tenants in Bristol, Exeter, Norwich and

Nottingham are to be made out and signed by the same date. The overseers have also to make out and sign a list of persons qualified as occupiers to be elected aldermen or councillors, but as non-residents disqualified from being on the local government register. By the same date also the clerks of the livery companies are to make out, sign and deliver to the secondary (who performs in the City of London the registration duties which elsewhere fall on the town clerk) the lists of liverymen entitled as such to the parliamentary vote; and the town clerks are to make out and sign the lists of freemen so entitled in towns where this franchise exists.

On the 1st of August all the above lists are to be published, the livery lists by the secondary, lists of freemen by the town clerks and the rest by the overseers. In addition the overseers may have to publish a list of persons disqualified by having been found guilty of corrupt or illegal practices; this list they will receive, when it exists, from the clerk of the county council or town clerk with the precept. Publication of lists and notices by overseers is made by affixing copies on the doors of the church and other places of worship of the parish (or, if there be none, in some public or conspicuous situation in the parish), and also, with the exception to be men- tioned, in the case of a parish wholly or partly within a municipal borough or urban district, in or near every public or municipal or parochial office and every post and telegraph office in the parish. The exception is that lists and notices relating to ownership electors need not be published at the offices mentioned when the parish is within a parliamentary borough. Publication by the secondary is made by affixing copies outside the Guildhall and Royal Exchange ; publication by town clerks is made by affixing copies outside their town hall, or, where there is none, in some public or conspicuous place in their borough. From the 1st to the 20th of August inclusive is allowed for the sending in of claims and objections. Those whose names have been omitted from the occupier or reserved rights lists, or the non-resident list, or whose names, place of abode or particu- lars of qualification have been incorrectly stated in such lists, may send in claims to have their names registered; lodgers who are not qualified as old lodgers, or who have omitted to claim as such, may claim as new lodgers; persons whose names are on the corrupt and illegal practices list may claim to have them omitted. Any person whose name is on the list of parliamentary, local government or parochial electors for the same parliamentary county, administrative county, borough or parish, may object to names on the same lists. Notices of claim and objection in the case of liverymen and freemen are to be sent to the secondary and town clerk, and in other cases to the overseers ; and notices of objection must also

in all cases be sent to the person objected to. All notices must be sent in by the 20th of August, and on or before the 25th of August the overseers, secondary and town clerks are to make out, sign and publish lists of the claimants and persons objected to. It remains to be added that any person on a list of voters (i.e. on one of the lists published on the 1st of_ August) may make a declaration before a magistrate or commissioner for oaths correcting the entry relating to him. In the case of ownership electors the correction can only deal with the place of abode ; in the case of other lists it extends to all particulars stated, and is useful inasmuch as it enables the revising barrister to make corrections as to the qualification which he could not make in the absence of a declaration. The declarations must be delivered to the clerk of the county council or town clerk on or before the 5th of September.

The next stage is the revision of the lists. For this purpose revising barristers are appointed yearly. The period within which revision courts can be held is from the 8th of September Revising to t jj e 12th of October, both days inclusive. The clerk of barrls- ˆ e county CO uncil attends the first court held for each ters ‘ parliamentary division of his county, and the town clerk

the first court held for his city or borough; and they respectively produce all lists, notices and declarations in their custody, and answer any questions put to them by the revising barrister. The overseers also attend the courts held for their parish, produce the rate books, original notices of claim and objection, &c, and answer questions. The claimants, objectors and persons objected to appear personally or by representative to support their several conten- tions. Any person qualified to be an objector may also appear to oppose any claims, upon giving notice to the barrister before such claims are reached. The powers of the revising barristers are as follows: As regards persons whose names are on the lists of voters published on the 1st of August, he is to expunge the names, whether objected to or not, of those who are dead or subject to personal in- capacity, such as infants and aliens, and for parliamentary purposes peers and women. If an entry is imperfect, the name must be removed, unless the particulars necessary for completing it are supplied to the barrister. All names marginally objected to by over- seers must be expunged, unless the voters prove to the barrister that they ought to be retained. Objections made by other objectors must be supported by prima facie proof, and if this is not rebutted the name is struck out. Claimants must be ready to support their claims. The declaration attached to a lodger claim is indeed prima

facie proof of the facts stated in it, but other claimants require evidence to make out even a prirna facie case, and if they fail to produce it their claims will be disallowed. The barrister is required to correct errors in the lists of voters, and has a discretion to rectify mistakes in claims and objections upon evidence produced to him, although his power in this respect is limited. Lastly, the barrister has to deal with duplicates, as a voter is entitled to be on the register once, but not more than once, as a parliamentary voter for each

Earliamentary county or borough, as a burgess for each municipal orough, as a county elector for each electoral division, and as a parochial elector for each parish in which he holds a qualification. Consequently, he deals with duplicate entries by expunging or transferring them to separate parochial lists. The decision of the re- vising barrister is final and conclusive on all questions of fact; but an appeal lies from him on questions of law at the instance of any person aggrieved by the removal of his name from a list of voters, by the rejection of his claim or objection or by the allowance of a claim which he has opposed. Notice of the intention to appeal must be given to the barrister in writing on the day when his decision is given. The barrister may refuse to state a case for appeal; but if he does so without due cause he may be ordered by the High Court to state a case. The appeal is heard by a divisional court, from whose decision an appeal lies (by leave either of the divisional court or of the court of appeal) to the court of appeal, whose decision is final.

On the completion of the revision the barrister hands the county and borough lists (every page signed and every alteration initialled by him) to the clerk of the county council and the town clerk respectively, to be printed. With the following exceptions the revised lists are to be made up and printed by the 20th of December, and come into force as the register for all purposes on the 1st of January. In the boroughs created by the London Government Act 1899, the whole register is to be made up and printed by the 20th of October, and to come into force for the purpose of borough elections under the act on the 1st of November. In boroughs subject to the Muni- cipal Corporations Acts, divisions I and 3 of the occupiers' list are to be made up and printed by the 20th of October, and come into force for the purpose of municipal and county council elections on the 1st of November. Corrections ordered in consequence of a successful appeal from a revising barrister are to be made by the officers having the custody of the registers, but a pending appeal does not affect any right of voting. The register in its final form will consist of the lists published on the 1st of August as corrected, with the claims which have been allowed on revision incorporated with them. It is printed in

such form that each list and each division of a list for every parish can be separated from the rest for the purpose of making up the parliamentary, local government and parochial registers respectively. The alphabetical order is followed, except in London and some other large towns, where street order is adopted for all except the ownership lists and lists of liverymen and freemen. The parliamentary register for a parliamentary county will consist of the ownership lists for all parishes in the county, and of the lodger lists and divisions I and 2 of the occupier lists for parishes within the county and not within a parliamentary borough. The parliamentary register for a parliamentary borough will consist of the lodger lists, of the lists of freehold and burgage tenants (if any), and of divisions 1 and 2 of the occupier lists for all parishes within the borough, and also of the borough lists (if any) of liverymen or freemen. The local government register for an administrative county will consist of divisions 1 and 3 of the occupier lists for all parishes in the county, and the burgess roll for a municipal borough of divisions I and 3 of the occupier lists for all parishes in the borough. It will be seen, therefore, that, except in county boroughs, the burgess roll is also a part of the local government register of the administrative county within which the borough is situate. The register of parochial electors consists of the complete set of lists for each parish; but this does not include the lists of liverymen and freemen, which, as has been stated, are not parish lists.

No one whose name is not on the register can vote at an election. The fact that a man's name is on the register is now so far con- clusive of his right that the returning officer is bound to receive his vote. Only two questions may be asked of him when he tenders his vote, namely, whether he is the person whose name is on the register, and whether he has voted before at the election. The Reform Act 1832 allowed him to be asked at parliamentary elections whether he retained the qualification for which he had been registered; but the Registration Act 1843 disallowed the question, and made the register conclusive as to the retention of the qualification. When, however, a petition is presented against an election, the register, although conclusive as to the retention of the qualification, does not prevent the court from inquiring into the existence of personal incapacities, arising in connexion with the election or otherwise, and striking off on scrutiny the votes of persons subject thereto, e.g. aliens, infants, or in parliamen- tary elections peers, &c.

The City of London is not within the Municipal Corporations Acts, and is not subject to the general registration law in the formation of its roll of citizens for municipal purposes. But a register of parliamentary,

county and parochial electors is made in

the ordinary way. The universities are also exempt from the general law of registration. At Oxford and Cambridge the members of Convocation and the Senate respectively have always formed the parliamentary constituencies; and, as has been already stated, the registers of those members were before 1832, and still are, the parliamentary registers. Similarly, the Reform Act of 1867, which gave parliamentary representation to the university of London, simply enacted that the register of graduates constituting the Convocation should be the parliamentary register of that body.

Scotland. — In Scotland the qualifications for local government and parish electors are the same as those for parliamentary voters, the only difference in the registers being in respect of personal incapacities for the parliamentary franchise, incapacity for the other franchises by reason of non-payment of rates, and duplicates. The principal act regulating registration in burghs is 19 & 20 Vict. c. 58, amended in some particulars as to dates by 31 & 32 Vict, c. 48, § 20. County registration, formerly regulated by 24 & 25 Vict. c. 83, has been assimilated to burgh registration by 48 & 49 Vict. c. 3, § 8 (6). The procedure consists, as in England, of the making and publication of lists of voters, the making of claims and objections and the holding of revision courts; but there are im- portant differences of detail. Though the parish is the registration unit, parochial machinery is not used for the formation of the register. The parliamentary lists for a county are made up yearly by one or more of the assessors of the county, and those for a burgh by one or more of the assessors for the burgh, or by the clerk of the commissioners. They are published on the 15th of September; and claims and objections must be sent in by the 21st and are published on the 25th of the same month. Publication is made in burghs by posting on or near the town hall, or in some other conspicuous place, in counties by posting the part relating to each

Carish on the parish church door, and in both cases giving notice y newspaper advertisement of a place where the lists may be perused. The revision is conducted by the sheriff, the time within which his courts may be held being from the 25th of September to the 16th of October, both days inclusive. An appeal lies to three judges of the Court of Session, one taken from each division of the Inner House, and

one from the Lords Ordinary of the Outer House. The revised lists are delivered in counties to the sheriff clerk, in burghs to the town clerk, or person to whom the registration duties of town clerk are assigned. The register comes into force for all purposes on the 1st of November.

The municipal register of a royal burgh which is coextensive, or of that part of a royal burgh which is coextensive with a parlia- mentary burgh, consists of the parliamentary register with a supple- mental list of women who but for their sex would be qualified for the parliamentary vote. The municipal register for a burgh, or for that part of one which is not within a parliamentary burgh, consists of persons possessed of qualifications within the burgh which, if within a parliamentary burgh, would entitle them, or but for their sex would entitle them, to the parliamentary vote. The register of county electors consists of the parliamentary register for a county with the supplemental list hereafter mentioned; but inasmuch as exemption from or failure to pay the consolidated county rate is a disqualification for the county electors' franchise, the names of persons so disqualified are to be marked with a dis- tinctive mark on the register; as are also the names of persons whose qualifications are situated within a burgh, such marks indi- cating that the persons to whose names they are attached are not entitled to vote as county electors. Every third year, in prepara- tion for the triennial elections of county and parish councils (casual vacancies being filled up by co-optation), a supplemental list is to be made of peers and women possessed of qualifications which but for their rank and sex would entitle them to parlia- mentary votes. The register of county electors in a county and the municipal register in a burgh form the registers of parish electors for the parishes comprised in each respectively. Inasmuch, how- ever, as a man is entitled to be registered as a parish elector in every parish where he is qualified, duplicate entries are, when required, to be made in the register, with distinctive marks to all but one, to indicate that they confer the parish vote only. These dis- tinctive marks and those previously mentioned are to be made in the lists by the assessors, subject to revision by the sheriff. The register is conclusive to the same extent as in England, except that the vote of a parish elector who is one year in arrear in payment of a parish rate is not to be received. The clerk of the parish council is to furnish the returning officer one week before an election with the names of persons so in arrear; and the returning officer is to reject their votes except upon the production of a written receipt. _ Provision is made by 31 & 32 Vict. c. 48, §§ 27-41, for the formation of registers of parliamentary electors for the universities. The register for each university is to be made annually by the university registrar, with the assistance of two members of the

council, from whose decisions an appeal lies to the university court.

Ireland. — There are no parish councils in Ireland, and no par- ochial electors. There are therefore but two registers of voters, the parliamentary and the local government registers, the latter of which consists of the former with a local government supplement

containing the names of those excluded from the parliamentary register by reason of their being peers or women, and duplicate entries relating to those whose names are registered elsewhere for the same parliamentary constituency. The principal acts regula- ting registration are 13 & 14 Vict. c. 69, 31 & 32 Vict. c. 112, 48 & 49 Vict. c. 17, and 61 & 62 Vict. c. 2. The lord lieutenant is empowered to make by Order in Council rules for registration, and to prescribe forms; and under this power has made the Regis- tration (Ireland) Rules 1899, now in force. The registration unit is not the parish, but the district electoral division, except where such division is subdivided into wards, or is partly within and partly without any town or ward of a borough or town, in which cases each ward of the division or part of a division is a separate registration unit.

The procedure is as follows, subject to variation in cases where there are clerks of unions who held office on the 31st of March 1898, and have not agreed to transfer their registration duties. The clerk of the peace sends out on the 1st of June a precept in the form prescribed for county registration to the secretary of the county council and clerks of urban district councils,, together with a copy of the existing register for their county or district; and a precept in the form prescribed for borough registration to town clerks of boroughs. As regards registration units not in a parliamentary or municipal borough, the secretary of the county council or clerk of the urban district council is to put marginal objections, ” dead ” or ” objected,” where required, to £10 occupiers and householders in the copy of the register, both in the parliamentary list and in the local government supplement. He is also to make out supple- mental parliamentary and local government lists of £10 occupiers and householders not on the existing register, and to put marginal objections where required to these. He is to verify on oath before a magistrate the copy of the register and supplemental lists, and to return them to the clerk of the peace by the 8th of July. As regards registration units in a parliamentary borough, but outside a municipal borough, the secretary of the county council or clerk of the urban district council is to make out lists of £10 occupiers and householders with local government supplement, and transmit them to the town clerk of the municipal borough or town. The clerk of the peace is to publish the copy of the register, after himself placing

marginal objections where required to voters other than £10 occupiers and householders, and the supplemental lists as re- ceived, and also the corrupt and illegal practices list, if any, on the 22nd of July. On the same day the' town clerk will publish the lists received as aforesaid for registration units outside the muni- cipal borough, and the lists, which he will have made out himself for the municipal borough, including the freemen's list and corrupt and illegal practices list. Freemen being entitled to the local government vote will, if resident, be placed on the list of the regis- tration unit where they reside, and will, if non-resident, be allotted by the revising barrister among the registration units Of the borough for local government purposes in proportion to the number of electors in each registration unit. Claims are to be sent in to the clerk of the peace and town clerk by the 4th of August, including old lodger claims and, in the case of the clerk of the peace, owner- ship claims. Lists of claimants with marginal objections, where required, are to be published by the clerk of the peace .and town clerk by the nth of August. Notices of objection to voters or claimants may be given by the 20th of August ; and lists of persons objected to are to be published by the clerk of the peace and town clerk by the 24th of the same month. Publication of lists and notices by a clerk of the peace is made by posting copies of those relating to each registration unit outside every court-house, petty sessions court, and other public offices in the unit; publication by a town clerk is made by posting copies outside the town hall, or, if there be none, in some public and conspicuous place in the borough.

Revising barristers are specially appointed for the county and city of Dublin by the lord lieutenant; elsewhere the county court judges and chairmen of quarter sessions act as such ex officio, assisted, when necessary, by additional barristers appointed by the lord lieutenant. The time for the holding of revision courts is from the 8th of September to the 25th of October inclusive. An appeal lies to the court of appeal, whose decision is final. The revised lists are handed to the clerk of the peace; they are to be made up by him by the 31st of December, and come into force on the 1st of January.

The registrar of the university of Dublin is to make out in December a list of the persons entitled to the parliamentary vote for the university, and to print the same in January, and to publish a copy in the university calendar, or in one or more public journals circulating in Ireland. He is to revise the list annually, and ex- punge the names of those dead or disqualified; but an elector whose name has been expunged because he was supposed to be dead is entitled, if alive, to have his name immediately restored and to vote at any election. (L. L. S.)

REGIUM (Gr. ‘Viiyiov. in Latin the aspirate is omitted), a city of the territory of the Bruttii in South Italy, on the east side of the strait between Italy and Sicily (Strait of Messina).

A colony, mainly of Chalcidians, partly of Messenians from the Peloponnesus, settled at Regium in the 8th century B.C. About 404 B.C. Anaxilas, a member of the Messenian party, made him- self master of Regium (apparently — from numismatic evidence, for the coins assignable to this period are modelled on Samian types — with the help of the Samians: see Messina) and about 488 joined with them in occupying Zancle (Messina). Here they remained. (See C. H. Dodd in Journal of Hellenic Studies, xxviii. (1008) 56 sqq.) This coinage was resumed after the establishment of the democracy about 461 B.C., when Anaxilas’ sons were driven out. In 433 Regium made a treaty with Athens, and in 427 joined the Athenians against Syracuse, but in 415 it remained neutral. An attack which it made on Dionysius I. of Syracuse in 399 was the beginning of a great struggle which in 387 resulted in its complete destruction and the dispersion of its inhabitants as slaves. Restored by the younger Dionysius under the name of Phoebias, the colony soon recovered its prosperity and resumed its original designation. In 280, when Pyrrhus invaded Italy, the Regines admitted within their walls a Roman garrison of Campanian troops; these mercenaries revolted, massacred the male citizens, and held the city till in 270 they were besieged and put to death by the Roman consul Genucius. The city remained faithful to Rome throughout the Punic wars, and Hannibal never succeeded in taking it. Up till the Social War it struck coins of its own, with Greek legends. Though one of the cities promised by the triumvirs to the veterans, Regium escaped through the favour of Octavius (hence it took the name Regium Julium). It continued, however, to be a Greek city even under the Empire, and never became a colony. Towards the end of the Empire it was made the chief city of the Bruttii.

Of ancient buildings hardly anything remains at Regium, and nothing of the archaic Greek period is in situ, except possibly the remains of a temple of Artemis Phacelitis, which have not yet been explored, though various inscriptions relative to it have been found. The museum, however, contains a number of terra-cottas, vases, inscriptions, &c, and a number of Byzantine lead seals. Several baths of the Greek period, modified by the Romans, have been found, and the remains of one of these may still be seen. A large mosaic of the

3rd or 4th century a.d. with representations of wild animals and the figure of a warrior in the centre was found in 1904 and covered up again. The aqueduct and various cisterns connected with it have been traced, and some tombs of the 5th or 4th century B.C. (or even later) were found in 1907.

See Notizie degli scavi, passim; P. Larizza, Rhegium Ckalcidense (Rome, 1905). ♦ (T. As.)

REGIUM DONUM, or Royal Gift, an annual grant formerly made from the public funds to Presbyterian and other Non- conformist ministers in Great Britain and Ireland. It dates from the reign of Charles II., who, according to Bishop Burnet, after the declaration of indulgence of 1672 ordered sums of money to be paid to Presbyterian ministers. These gifts or pensions were soon discontinued, but in 1690 William III. made a grant of £1 200 a year to the Presbyterian ministers in Ireland as a reward for their services during his struggle with James II. Owing to the opposition of the Irish House of Lords the money was not paid in 1711 and some subsequent years, but it was revived in 1715 by George I., who increased the amount to £2000 a year. Further additions were made in 1784 and in 1792, and in 1868 the sum granted to the Irish Presbyterian ministers was £45,000. The Regium Donum was withdrawn by the act of 1869 which disestablished the Irish church. Pro- vision was made, however, for existing interests therein, and many Presbyterian ministers commuted these on the same terms as the clergy of the church of Ireland.

In England the Regium Donum proper dates from 1 721, when Dr Edmund Calamy (1671-1732) received £5°° from the royal bounty ” for the use and behalf of the poor widows of dissenting ministers.” Afterwards this sum was increased to £1000 and was made an annual payment ” for the assisting either ministers or their widows,” and later it amounted to £1695 per annum. It was given to distributors who represented the three denomina- tions, Presbyterians, Baptists and Independents, enjoying the grant. Among the Nonconformists themselves, however, or

at least among the Baptists and the Independents, there was some objection to this form of state aid, and in 1851 the chancellor of the exchequer announced that it would be withdrawn. This was done six years later.

See J. Stoughton, History of Religionin England (1901) ; J. S. Reid, History of the Presbyterian Church in Ireland (Belfast, 1867); and E. Calamy, Historical Account of my own Life, edited by J.T. Rutt

(1829-30).

REGLA, formerly an important suburb of Havana, Cuba, opposite that city, on the bay; now a part of Havana. Pop. (1899) 11,363. It was formerly the scene of the Havana bull- fights. The church is one of the best in Cuba; the building dates substantially from 1805, but the church settlement goes back to a hermitage established in 1690. Regla is the shipping- point of the Havana sugar trade. It has enormous sugar and tobacco warehouses, fine wharves, a dry dock, foundries and an electric railway plant. It is the western terminus of the eastern line of the United Railways of Havana, and is connected with the main city of Havana by ferry. A fishing village was estab- lished here about 1733. At the end of the 18th century Regla was a principal centre of the smuggling trade, and about 1820 was notorious as a resort- of pirates. It first secured an ayuntamiento (city council) in 1872, and after 1899 was annexed to Havana.

REGNARD, JEAN FRANCOIS (1655-1709), French comic dramatist, was born in Paris on the 7th of February 1655. His father, a rich shopkeeper, died when Regnard was about twenty, leaving him master of a considerable fortune. He set off at once for Italy, and, after a series of romantic adventures, he journeyed by Holland, Denmark and Sweden to Lapland, and thence by Poland, Turkey, Hungary and Germany back to France. He returned to Paris at the end of 1683, and bought the place of treasurer of France in the Paris district; he had a house at Paris in the Rue Richelieu; and he acquired the small estate of Grillon near Dourdan in the department of Seine-et-Oise, where he hunted, feasted and wrote comedies. This latter amusement he began in 1688 with a piece called Le Divorce, which was performed at the ThMtre Italien. In four slight pieces of the same nature he collaborated with Charles Riviere Dufresny. He gained access to the Theatre Francais on the 19th of May 1694 with a piece called Attendez-moi sous I'orme, and two years later, on the 19th of December 1696, he produced there the masterly comedy of Le Joueur. The idea of the play was evolved in collaboration with Dufresny, but the authors disagreed in carrying it out. Finally they each produced a comedy on the subject, Dufresny in prose, and Regnard in verse. Each accused the other of plagiarism. The plot of Regnard's piece turns on the love of two sisters for Valere, the gambler, who loves one and pretends to love the other, really deceiving them both, because there is no room for any other passion in his character except the love of play. Other of his plays were La Sfrinade (1694), Le Bourgeois de Falaise (1696), Le Distrait (1697), Democrite (1700), Le Retour imprevu (1700), Les Folies amoureuses (1704), Les MSneckmes (1705), a clever following of Plautus, and his masterpiece, Le L&gataire universel

(1708).

Regnard's death on the 4th of September 1709 renews the doubtful and romantic circumstances of his earlier life. Some hint at poison, but the truth seems to be that his death was hastened by the rate at which he lived.

Besides the plays noticed above and others, Regnard wrote miscellaneous poems, the autobiographical romance of La Provencale, and several short accounts in prose of his travels, published posthumously under the title of Voyages. Regnard had written a reply to the tenth satire of Boileau, Centre les femmes, and Boileau had retorted by putting Regnard among the poets depreciated in his epistle Sur mes vers. After the appearance of Le Joueur the poet altered his opinion and cut out the allusion. The saying attributed to Boileau wh&i some one, thinking to curry favour, remarked that Regnard was only a mediocre poet, " II n'est pas mediocrement gai," is both true and very appropriate. His French style, especially in his purely prose works, is not considered faultless. He is often un- original in his plots, and, whether Dufresny was or was not justified in his complaint about Le Joueur, it seems likely that Regnard owed not a little to him and to others; but he had a thorough grasp 0/

comic situation and incident, and a most amusing faculty of dialogue. , .

The first "edition of Regnard's works was published in 1731 (5 vols., Rouen and Paris). There is a good selection of almost every- thing important in the Collection Didot (4 vols., 18 19), but there is no absolutely complete edition. The best is that published by Crapelet (6 vols., Paris, 1822). A selection by L. Moland appeared in 1893. See also a Bibliographie et iconographie des ceuvres de J. F. Regnard (Paris, Rouquette, 1878); Le Poete J. F. Regnard en son chasteau de Grillon, by J. Guyot (Paris, 1907).

REGNAULT, HENRI (1843-1871), French painter, born at Paris on the 31st October 1843, was the son of Henri Victor Regnault {q.v.). On leaving school he successively entered the studios of Montfort, Lamothe and Cabanel, was beaten for the Grand Prix (1863) by Layraud and Montchablon, and in 1864 exhibited two portraits in no wise remarkable at the Salon. In 1866, however, he carried off the Grand Prix with a work of unusual force and distinction — " Thetis bringing the Arms forged by Vulcan to Achilles " (School of the Fine

Arts). The past in Italy did not touch him, but his illustrations to Wey's Rome show how observant he was of actual life and manners; even his " Automedon " (School of Fine Arts), executed in obedi- ence to Academical regulations, was but a lively recollection of a carnival horse-race. At Rome, moreover, Regnault came into contact with the modern Hispano-Italian school, a school highly materialistic and inclined to regard even the human subject only as one amongst many sources whence to obtain amusement for the eye. The vital, if narrow, energy of this school told on Regnault with ever-increasing force during the few remaining years of his life. In 1868 he had sent to the Salon a life-size portrait of a lady in which he had made one of the first attempts to render the actual character of fashionable modern life. While making a tour in Spain, he saw Prim pass at the head of his troops, and received that lively image of a military demagogue which he afterwards put on canvas, somewhat to the displeasure of his subject. But this work made an appeal to the imagination of the public, whilst all the later productions of Regnault were addressed exclusively to the eye. After a further flight to Africa, abridged by the necessities of his position as a pensioner of tne school of Rome, he painted " Judith, " then (1 8 70) " Salome," and, as a work due from the Roman school, despatched from Tangier the large canvas, " Execution without Hearing under the Moorish Kings," in which the painter had played with the blood of the victim as if he were a jeweller toying with rubies. The war arose, and found Regnault foremost in the devoted ranks of Buzenval, where he fell on the 19th of January 1871.

See Correspondance de H. Regnault; Duparc, H. Regnault, sa vie et son osuvre; Cazalis, H. Regnault, 184.3-1871; Bailliere, Les Artistes de mon temps; C. Blanc, H. Regnault; P. Mantz, Gazette des Beaux Arts (1872).

REGNAULT, HENRI VICTOR (1810-1878), French chemist and physicist, was born on the 21st of July 1810 at Aix-la- Chapelle. His early life was a struggle with poverty. When a boy he went to Paris and obtained a situation in a large drapery establishment, where he remained, occupying every spare hour in study, until he was in his twentieth year. Then he entered the Ecole Poly technique, and passed in 1832 to the Ecole des Mines, where he developed an aptitude for experi- mental chemistry. A few years later he was appointed to a professorship of chemistry at Lyons. His most important con- tribution to organic chemistry was a series of researches, begun in 1835, on the haloid and other derivatives of unsaturated hydrocarbons. He also studied the alkaloids and organic acids, introduced a classification of the metals according to the facility with which they or their sulphides

are oxidized by steam at high temperatures, and effected a comparison of the chemical composition of atmospheric air from all parts of the world. In 1840 he was recalled to Paris by his ap- pointment to the chair of chemistry in the ficple Polytech- nique; at the same time he was elected a member of the Acad6mie des Sciences, in the chemical section, in room of P. J. Robiquet (1 780-1840); and in the following year he be- came professor of physics in the College de France, there suc- ceeding P. L. Dulong, his old master, and in many respects

his model. From this time Regnault devoted almost all his attention to practical physics; but in 1847 he published a four-volume treatise on Chemistry which has been translated into many languages.

Regnault executed a careful redetermination of the specific heats of all the elements obtainable, and of many compounds — solids, liquids and gases. He investigated the expansibility of gases by heat, determining the coefficient for air as 0-003665, and showed that, contrary to previous opinion, no two gases had precisely the same rate of expansion. By numerous delicate experiments he proved that Boyle's law is only approximately true, and that those gases which are most readily liquefied diverge most widely from obedience to it. He studied the whole subject of thermometry critically; he introduced the use of an accurate air-thermometer, and compared its indications with those of a mercurial thermometer, determining the ab- solute dilatation of mercury by heat as a step in the process. He also paid attention to hygrometry and devised a hygrometer in which a cooled metal surface is used for the deposition of moisture.

In 1854 he was appointed to succeed J. J. Ebelmen (1814-1852) as director of the porcelain manufactory at Sevres. He carried on his great research on the expansion of gases in the laboratory at Sevres, but all the results of his latest work were destroyed during the Franco-German War, in which also his son Henri (noticed above) was killed. Regnault never recovered from the double blow, and, although he lived until the 19th of January 1878, his scientific labours ended in 1872. He wrote more than eighty papers on scientific subjects, and he made important researches in conjunction with other workers. His greatest work, bearing on the practical treatment of steam-engines, forms vol. xxi. of the Mimoires de V Academic des Sciences.

REGNAULT, JEAN BAPTISTE (1754-1829), French painter, was born at Paris on the 9th of October 1754, and died in the same city on the 12th of November 1829. He began life at sea in a merchant vessel, but at the age of fifteen his talent attracted attention, and he was sent to Italy by M. de Monval under the care of Bardin. After his return to

Paris, Regnault, in 1776, obtained the Grand Prix, and in 1783 he was elected ■ Academician. His diploma picture, the ” Education of Achilles by Chiron,” is now in the Louvre, as also the ” Christ taken down from the Cross,” originally executed for the royal chapel at Fontainebleau, and two minor works — the ” Origin of Painting ” and ” Pygmalion praying Venus to give Life to his Statue.” Be- sides various small pictures and allegorical subjects, Regnault was also the author of many large historical paintings; and his school, which reckoned amongst its chief attendants Guerin, Crepin, Lafitte, Blondel, Robert Lefevre and Menjaud, was for a long while the rival in influence of that of David.

REGNAULT DE SAINT JEAN D’ANGELY, MICHEL LOUIS ETIENNE, Comte (1761-1819), French politician, was born at Saint Fargeau (Yonne) on the 3rd of December 1761. Before the Revolution he was an avocat in Paris and lieutenant of the maritime provostship of Rochefort. In 1 789 he was elected deputy to the States General by the Third Estate of the stnechaussie of Saint Jean d’Angely. His eloquence made him a prominent figure in the Constituent Assembly, where he boldly attacked Mirabeau, and settled the dispute about the ashes of Voltaire by decreeing that they belonged to the nation. But the moderation shown by the measures he proposed at the time of the flight of the king to Varennes, by his refusal to accede to the demands for the king’s execution, and by the articles he published in the Journal de Paris and the Ami des patriotes, marked him out for the hostility of the advanced parties. He was arrested after the revolution of the 10th of August 1792, but succeeded in escaping, and during the reaction which followed the fall of Robespierre was appointed administrator of the military hospitals in Paris. His powers of organization brought him to Bonaparte’s notice, and he took part in the coup d’etat of 18 Brumaire, year VIII. (9th of November 1799). Under the Empire he enjoyed the confidence of Bonaparte, and was made councillor of state, president of section in the Council of State,

member of the French Academy, procureur giniral of the high court, and a count of the Empire. He was dismissed on the first restoration of the Bourbons, but resumed his posts during the Hundred Days, and after Waterloo persuaded the emperor to abdicate. He was exiled by the government of the second Restoration, but subsequently obtained

leave to return to France. He died on the day of his return to Paris (nth of March 1819). Les Souvenirs du Comte Regnault de St Jean d'Angely (Paris, 1817) are spurious. His son, Auguste Michel Etienne Regnault de Saint Jean d'Angely (1794-1870), an army officer, was dismissed from the army by the Restora- tion government, fought for the Greeks in the Greek War of Independence, and rejoined the French army in 1830. In 1848 he was elected deputy and sat on the right. Under the Second Empire he went through the Crimean and Italian cam- paigns, and was made senator and marshal for bravery at the battle of Magenta.

REGNIER, HENRI FRANCOIS JOSEPH DE (1864-), French poet, was born at Honfleur (Calvados) on the 28th of December 1864, and was educated in Paris for the law. In 1885 he began to contribute to the Parisian reviews, and his verses found their way into most of the French and Belgian periodicals favourable to the symbolist writers. Having begun, however, to write under the leadership of the Parnassians, he retained the classical tradition, though he adopted some of the innovations of Moreas and Gustave Kahn. His gorgeous and vaguely suggestive style shows the influence of Stephane Mallarme, of whom he was an assiduous disciple. His first volume of poems, Lendemains, appeared in 1885, and among numerous later volumes are Poemes anciens et romanesques (1890), Les Jeux rustiques et divins (1890), Les MSdailles d'argent (1900), La CiU des eaux (1903). He is also the author of a series of realistic novels and tales, among which are La Canne de jaspe (2nd ed., 1897), La Double Maitresse (5th ed., 1900), Les Vacances d'un jeune homme sage (1904), and Les Amants singuliers (1905). M. de Regnier married Mile. Marie de Heredia, daughter of the poet, and herself a novelist and poet under the name of Gerard d'Houville.

See E. Gosse, French Profiles (1905), and Poltes d'aujourd'hui (6th ed., 1905), by van Bever and L6autaud.

REGNIER, MATHURIN (1573-1613), French satirist, was born at Chartres on the 21st of December 1573- His father, Jacques Regnier, was a bourgeois of good means and position; his mother, Simone Desportes, was the sister of the poet Des- portes. Desportes, who was richly beneficed and in great favour at court, seems to have been regarded as Mathurin Regnier's natural protector and patron; and the boy himself, with a view to his following in his uncle's steps, was tonsured at eight years old. Little is known of his youth, and it is chiefly conjecture which fixes the date of his visit to Italy in a humble position in the suite of the cardinal, Francois de Joyeuse, in 1587. The cardinal was accredited to the papal court in that year as " protector "

of the royal interests. Regnier found his duties irksome, and when, after many years of constant travel in the cardinal's service, he returned definitely to France about 1605, he took advantage of the hospitality of Desportes. He early began the practice of satirical writing, and the enmity which existed between his uncle and the poet Malherbe gave him occasion to attack the latter. In 1606 Desportes died, leaving nothing to Regnier, who, though dis- appointed of the succession to Desportes's abbacies, obtained a pension of 2000 livres, chargeable upon one of them. He was also made in 1609 canon of Chartres through his friendship with the lax bishop, Philippe Hurault, at whose abbey of Royaumont he spent much time in the later years of his life. But the death of Henry IV. deprived him of his last hope of great preferments. His later life had been one of dissipation, and he died at Rouen at his hotel, the Ecu d'Orleans, on the 22nd of October 1613.

About the time of his death numerous collections of licentious and satirical poems were published, while others remained in manuscript. Gathered from these there has been a floating

mass of licentious epigrams, &c, attributed to Regnier, little of which is certainly authentic, so that it is very rare to find two editions of Regnier which exactly agree in contents. His undoubted work falls into three classes: regular satires in alexandrine couplets, serious poems in various metres, and satirical or jocular epigrams and light pieces, which often, if not always, exhibit considerable licence of language. The real greatness of Regnier consists in the vigour and polish of his satires, contrasted and heightened as that vigour is with the exquisite feeling and melancholy music of some of his minor poems. In these Regnier is a disciple of Ronsard (whom he defended brilliantly against Malherbe), without the occasional pedantry, the affectation or the undue fluency of the Pleiade; but in the satires he seems to have had no master except the ancients, for some of them were written before the publication of the satires of Vauquelin de la Fresnaye, and the Tragiques of D'Aubign6 did not appear until 1616. He has sometimes followed Horace closely, but always in an entirely original spirit. His vocabulary is varied and picturesque, and is not marred by the maladroit classicism of some of the Ronsardists. His verse is extraordinarily forcible and nervous, but his chief distinction as a satirist is the way in which he avoids the commonplaces of satire. His keen and accurate knowledge of human nature and even his purely literary qualities extorted the admiration of Boileau. Regnier displayed remarkable in- dependence and acuteness in literary criticism, and the famous passage (Satire ix., A Monsieur Rapin) in which he satirizes Malherbe contains the best denunciation of the

merely ” correct ” theory of poetry that has ever been written. Lastly, Regnier had a most unusual descriptive faculty, and the vividness of what he called his narrative satires was not approached in France for at least two centuries after his death. All his merits are displayed in the masterpiece entitled Macette ou I’Hypocrisie diconcertee, which does not suffer even on com- parison with Tartuffe; but hardly any one of the sixteen satires which he has left falls below a very high standard.

Les Premibres CEuvres ou satyres de RSgnier (Paris, 1608) included the Discours au roi and ten satires. There was another in 1609, and others in 1612 and 1613. The author had also contributed to two collections— Lei Muses gaillardes in 1609 and Le Temple d’Apollon in 161 1. In 1616 appeared Les Satyres et autres ceuvres folastres du sieur RSgnier, with many additions and some poems by other hands. Two famous editions by Elzevir (Leiden, 1642 and 1652) are highly prized. The chief editions of the 18th century are that of Claude Brossette (printed by Lyon & Woodman, London, 1729), which supplies the standard commentary on Regnier, and that of Lenglet Dufresnoy (printed by J. Tonson, London, 1733). The editions of Prosper Poitevin (Paris, i860), of Ed. de Barthflemy (Paris, 1862), and of E. Courbet (Paris, 1875), may be specially mentioned. The last, printed after the originals in italic type, and well edited, is perhaps the best. See also Vianey’s Mathurin Regnier (1896); M. H. Cherrier, Bibliographic de Mathurin RSgnier (1884).

RE6NITZ, a river of Germany, and a left-bank tributary of the Main, the most important river of the province of Lower Bavaria. It is formed by the confluence, near Fiirth, of the Rednitz and Pegnitz. The united river flows north through an undulating vine-clad country, past Erlangen, Baiersdorf and Forchheim, from which point it is navigable, and falls into the Main at Bischberg, just below Bamberg, after a course of 126 m. Near Bamberg it is joined by the Ludwigskanal, which, running parallel to it from Fiirth and separated by the railway, forms the water-connexion between the Main and the Danube. Its main tributaries from the right are the Grundlach and the Wiesent, and from the left the Zenn, the Aurach and the Aisch.

REORATING (O.Fr. regrater, to sell by retail), in English criminal law, was the offence of buying and selling again in the same market, or within four miles thereof. (See En- grossing.)

REGULA, the Latin word for a rule, hence particularly applied to the rules of a religious order (see Monasticism). In architecture the term is applied to a rule or square, the short fillet or rectangular block, under

the taenia (q.v.) on the architrave of the Doric entablature.

REGULAR, orderly, following or arranged according to a rule (Lat. regula, whence O.Fr. reule, whence English ” rule “), steady, uniform, formally correct. The earliest and only use in English until the 16th century was in the Med. Lat. sense of regularis, one bound by and subject to the rule (regula) of a monastic or religious order, a member of the ” regular ” as opposed to the ” secular ” clergy, and so, as a substantive, a regular, i.e. a monk or friar. Another specific application is to that portion of the armed forces of a nation which are organized on a permanent system, the standing army, as opposed to ” irregulars,” levies raised on a voluntary basis and disbanded when the particular campaign or war for which they were raised is at an end. In the British army, the forces were divided into regulars, militia and volunteers, until 1906, when they were divided into regular and territorial forces.

REGULUS, MARCUS ATILIUS, Roman general and consul (for the second time) in the ninth year of the First Punic War (256 B.C.). He was one of the commanders in the Punic naval expedition which shattered the Carthaginian fleet at Ecnomus, and landed an army on Carthaginian territory (see Punic Wars). The invaders were so successful that the other consul, L. Manlius Vulso, was recalled to Rome, Regulus being left behind to finish the war. After a severe defeat at Adys near Carthage, the Carthaginians were inclined for peace, but the terms proposed by Regulus were so harsh that they resolved to continue the war. In 255, Regulus was completely defeated and taken prisoner by the Spartan Xanthippus. There is no further trustworthy information about him. Accord- ing to tradition, he remained in captivity until 250, when after the defeat of the Carthaginians at Panormus he was sent to Rome on parole to negotiate a peace or exchange of prisoners. On his arrival he strongly urged the senate t6 refuse both proposals, and returning to Carthage was tortured to death (Horace, Odes, iii. 5). This story made Regulus to the later Romans the type of heroic endurance; but most historians regard it as insufficiently attested, Polybius being silent. The tale was probably invented by the annalists to excuse the cruel treatment of the Carthaginian prisoners by the Romans.

See Polybius i. 25-34; Florus ii. 2; Cicero, De Officiis, iii. 26; Livy, Epit. 18; Valerius Maximus ix. 2; Sil. Ital. vi. 299-550; Appian, Punica,

4; Zonaras viii. 15; see also O. Jager, M. Ahlius Regulus (1878).

REHAN, ADA (i860-), American actress, whose real name was Crehan, was born in Limerick, Ireland, on the 22nd of April i860. Her parents removed to the United States when she was five years old, and it was in Newark, N.J., that in 1874 she made her first stage appearance in a small part in Across the Continent. She was with Mrs John Drew's stock company in Philadelphia, John W. Albaugh's in Albany and Baltimore, and other companies for several seasons, playing every kind of minor part, until she became connected with Augustin Daly's theatrical management in 1879. Under his training she soon showed her talents for vivid, charming por- trayal of character, first in modern and then in older comedies. She was the heroine in all the Daly adaptations from the German, and added to her triumphs the parts of Peggy in Wycherly's Country Girl, Julia in the Hunchback, and especially Katharina in The Taming of the Shrew, besides playing Rosalind and Viola. Miss Rehan accompanied Daly's company to England (first in 1884), France and Germany (1886). Her life-size portrait as Katharina is in the picture-gallery, and her bust, with Ellen Terry's, at the entrance to the theatre in the Shake- speare Memorial at Stratford-on-Avon.

REHEARSAL (from " rehearse," to say over again, repeat, recount, O.Fr. rehercer, from re, again, and hercer, to harrow, cf. " hearse," the original meaning being to rake or go over the same ground again as with a harrow), a recital of words or statements, particularly the trial performance in private of a play, musical composition, recitation, &c, for the purpose of practice preparatory to the performance in public. In the theatre a " full rehearsal " is one in which the whole performance is gone through with all the performers, a " dress rehearsal "

one in which the performance is carried out with scenery, costumes, properties, &c, exactly as it is to be played in public.

REHOBOAM (Heb. rehab'am, probably " the clan is en- 'arged," see Ecclus. xlvii. 23, although on the analogy of Rehabiah and Bab. ra'bi-ilu, % Am may represent some god; Septuagint reads po/3oo/x), son of Solomon and first king of Judah. On the events which led to his accession and the partition of the Hebrew monarchy, see Jeroboam, Solomon. Although his age is given as forty-one (1 Kings xiv. 21), the account of his treatment of the Israelite deputation (1 Kings xii.), as also 2 Chron. xiii. 7, give an impression of youth. He was partly of Ammonite origin (1 Kings xiv. 21), and, like his father, continued the foreign worship which his connexions involved. The chief event of his

reign was the incursion of Egypt under Sheshonk (Shishak) I., who came up against Judah and despoiled the temple about 930 B.C. (see Egypt, History, § ” Deltaic Dynasties “). That this invasion is to be connected with the friendly relations which are said to have subsisted between the first of the Libyan dynasty and Rehoboam’s rival is unlikely. Sheshonk has figured his campaign outside the great temple of Karnak with a list of some 150 places which he claims to have conquered, but it is possible that these were only tributary, and the names may be largely based upon older lists. Towns of both Judah and Israel are incorporated, and it is possible that Jerusalem once stood where now the stone is mutilated. 1 The book of Chronicles enumerates several Judaean cities fortified by Rehoboam (not necessarily connected with Sheshonk’s cam- paign), and characteristically regards the invasion as a punish- ment (2 Chron. xi. 5 sqq., xii. 1-15; for the prophet Shemaiah see 1 Kings xii. 21-24). Of Rehoboam’s successor Abijah (or Abijam) little is known except a victory over Jeroboam re- corded in 2 Chron. xiii. See further Asa, Omri, and Jews (History), §§ 7, 9.

REICHA, ANTON JOSEPH (1770-1836), French musical theorist and teacher of composition, was born at Prague on the 27th of February 1770, and educated chiefly by his uncle, Joseph Reicha (1746-1795), a clever violoncellist, who first received him into his house at Wallerstein in Bohemia, and afterwards carried him to Bonn. Here, about 1789, he was made flutist in the orchestra of the elector. In 1794 he went to Hamburg and gave music lessons there, also producing the opera Godefroid de Montfort. He was in Paris in 1799 and in Vienna from 1802 to 1808, during which period he saw much of Beethoven and Haydn. In the latter year he returned to Paris> where he produced three operas without much success. In 181 7 he succeeded Mehul as professor of counterpoint at the Conservatoire. In 1829 he was naturalized as a Frenchman, and in 1835 he was admitted as a member of the Institute in the place of Boieldieu. He died in Paris on the 28th of May 1836. He produced a vast quantity of church music, five operas, a number of symphonies, oratorios and many miscellaneous works. Though clever and ingenious, his compositions are more remarkable for their novelty than for the beauty of the ideas upon which they are based. His fame is, indeed, more securely based upon his didactic works. His Traits de melodie (Paris, 1814), Cours de composition musicale (Paris, 1818), Traite de haute composition musicale (Paris, 1824-26), and Art du compositeur dramatique (Paris, 1833), are valuable and instructive essays for the student, though many of the theories they set forth are now condemned as erroneous.

REICHENAU, a picturesque island in the Untersee or western arm of the lake of Constance, 3 m. long by 1 broad, and connected with the east shore by a causeway three-quarters of a mile long. It belongs to the grand duchy of Baden. The soil

1 The once popular view that ” king of Judah ” stands in no. 29 is untenable. See Petrie, Hist, of Egypt, ii. p. 235; L. B. Paton, Syria and Pal. p. 193 sq.; W. M. Miiller, Mitteil. Vorderasiat. Gesell., 1900, p. 19 sq., and Ency. Bib. col. 4486. Breasted (Amer. Journ. of Sem. Lang., 1904, p. 36) has made the interesting observation that the list mentions ” the field of Abram ” (nos. 71 and 72I : see further, id., Egypt Hist. Records, iv. pp. 348-357.

is very fertile, and excellent wine is produced in sufficient quantity for exportation. The Benedictine abbey of Reichenau, founded in 724, was long celebrated for its wealth and for the services rendered by its monks to the cause of learning. In 1540 the abbey, which had previously been independent, was annexed to the see of Constance, and in 1799 it was secularized. The abbey church, dating in part from the 9th century, contains the tomb of Charles the Fat (d. 888), who retired to this island in 887, after losing the empire of Charlemagne. It now serves as the parish church of Mittelzell, while the churches of Oberzell and Unterzell are also interesting buildings of the Carolingian era.

REICHENBACH, GEORG VON (1772-1826), German astro- nomical instrument maker, was born at Durlach in Baden on the 24th of August 1772. From 1796 he was occupied with the construction of a dividing engine; in 1804, with Joseph, Liebherr and Joseph Utzschneider, he founded an instrument- making business in Munich; and in 1809 he established, with Joseph Fraunhofer and Utzschneider, optical works at Benedict- beuern, which were moved to Munich in 1823. He withdrew from both enterprises in 1814, and founded with T. L. Ertel a new optical business, from which also he retired in 1821, on obtaining an engineering appointment under the Bavarian government. He died at Munich on the 21st of May 1826.

Reichenbach’s principal merit was that he introduced into ob- servatories the meridian or transit circle, combining the transit in- strument and the mural circle into one instrument. This had already been done by O. Romer about 1704, but the idea had not been

adopted by any one else, except in the transit circle constructed by Edward Troughton for Stephen Groombridge in 1 806. The transit circle in the form given it by Reichenbach had one finely divided circle attached to one end of the horizontal axis and read by four verniers on an " alidade circle," the unaltered position of which was tested by a spirit level. The instrument came almost at once into universal use on the continent of Europe (the first one was made for F. W. Bessel in 1819), but in England the mural circle and transit instrument were not superseded for many years.

REICHENBACH, a town of Germany, in the Prussian province of Silesia, situated on the Peile, at the foot of the Eulengebirge, a spur of the Riesengebirge, 30 m. S.W. of Breslau by rail. Pop. (1905) 15,984. Among its industries are weaving, spinning, dyeing, brewing and machine building, and there is a considerable trade in grain and cattle. Reichenbach is memor- able for the victory gained here on the 16th of August 1762 by the Prussians over the Austrians. Here was held the congress which resulted in the convention of Reichenbach — signed on the 27th of July 1790 between Great Britain, Prussia, Austria, Poland and Holland— guaranteeing the integrity of Turkey. Here, too, in June 1813, was signed the treaty of alliance between Austria and the Allies for the prosecution of the war against France. See the Kurze Geschichte der Stadt Reichenbach (Reichenbach, 1874).

REICHENBACH, a town in the kingdom of Saxony, situated in a hilly district, known as the Vogtland, n m. S.W. of Zwickau, at the junction of the main lines of railway Dresden-Leipzig- Hof. Pop. (1005) 24,915. It contains a handsome town-hall rebuilt in 1833, and a natural history museum. The industries embrace the manufacture of cloth, machinery and carriages, also dyeing and bleaching. The earliest mention of the town occurs in a document of 1212, and it acquired municipal rights in 1367. The woollen manufacture was introduced in the 15th century, and took the place of the mining industry which had been established earlier.

REICHENBERG (Czech, Liberec), a town of Bohemia, 87 m. N.E. of Prague by rail. Pop. (1900) 34,099, chiefly German. The most prominent buildings are the new town-hall (1893); the castle of Count Clam Gallas, built in the 17th century, with additions dating from 1774 and 1850; the Erzdekanatskirche, of the 16th century; the Protestant church, a handsome modern Romanesque edifice (1864-68) and the hall of the cloth-workers. Reichenberg is one of the most important centres of trade and industry in Bohemia, its staple industry being the cloth manufacture. Next in importance comes the

spinning and weaving of wool, cotton, linen and carpet manufactures, and dyeing.

Reichenberg is first mentioned in a document of 1348, and from 1622 to 1634 was among the possessions of the great Wallenstein, since whose death it has belonged to the Gallas and Clam Gallas families, though their jurisdiction over the town has long ceased. The cloth-making industry was introduced in 1579.

REICHENHALL, a town and watering-place in the kingdom of Bavaria, finely situated in an amphitheatre of lofty moun- tains, on the river Saalach, 1570 ft. above sea-level, 9 m. S.W. of Salzburg. Pop. (1900) 4927, excluding visitors. Reichen- hall possesses several copious saline springs, producing about 8500 tons of salt per annum. The water of some of the springs, the sources of which are 50 ft. below the surface, is so strongly saturated with salt (up to 24%) that it is at once conducted to the boiling houses, while that of the others is first submitted to a process of evaporation. Reichenhall is the centre of the four chief Bavarian salt-works, which are connected with each other by brine conduits having an aggregate length of 60 m. The surplus brine of Berchtesgaden is conducted to Reichen- hall, and thence, in increased volume, to Traunstein and Rosen- heim, which possess larger supplies of timber for use as fuel in the process of boiling. Since 1846 Reichenhall has become one of the most fashionable spas and climatic health resorts in Germany, and it is now visited annually by about ten thousand patients, besides many thousand passing tourists. The saline springs are used both for drinking and bathing, and are said to be efficacious in scrofula and incipient tuber- culosis.

The brine springs of Reichenhall are mentioned in a docu- ment of the 8th century and were perhaps known to the Romans; but almost all trace of antiquity of the town was destroyed by a conflagration in 1834. The brine conduit to Traunstein dates from 16 18. The environs abound in numerous charming Alpine excursions.

See G. von Liebig, Reichenhall, sein Klima und seine Heilmittel (6th ed., Reichenhall, 1889) ; and Goldschmidt, Der Kurort Bad Reichenhall und seine Umgebung (Vienna, 1892).

REICHENSPERGER, AUGUST (1808-1895), German poli- tician, was born at Coblenz on the 22nd of March 1808, studied law and entered government service, becoming counsellor to the court of appeal (Appellalionsgerichlsrat) at Cologne in 1849. He was a member of the German parliament at Frankfort in 1848, when he attached himself to the Right, and of the Erfurt parliament in 1850, when he voted against

the Prussian Union. From 1850 to 1863 he sat in the Prussian Lower House, from 1867 to 1884 in the Reichstag, and from 1879 onwards also in the Prussian Chamber of Deputies. Originally of Liberal tendencies, he developed from 1837 onwards ultramontane opinions, founded in 1852 the Catholic group which in 1861 took the name of the Centre party {Centrum) and became one of its most conspicuous orators. He died on the 16th of July 1895 at Cologne. He published a considerable number of works on art and architecture, including Die christlich-ger- manische Baukunst (Trier, 1852, 3rd ed., i860); Fingerzeige auf dem Gejpete der christlichen Kunst (Leipzig, 1854); Augustus Pugin, der Neubegrunder der christlichen Kunst in England (Freiburg, 1877).

See L. v. Pastor, August Reichensperger, 2 vols. (Freiburg-im-Breisgau, 1899).

His brother, Peter Reichensperger (1810-1892), counsellor to the appeal court at Cologne (1850) and until 1879 to the Obertribunal at Berlin, was elected to the Reichstag in 1867 as a member of the Liberal Opposition, but subsequently joined the Centre party. In the Kulturkatnpf he took an active part on the ultramontane side. He had been a member of the Prussian National Assembly in 1848, and in 1888 he published his Erlebnisse eines alien Parlamentariers im Revolti- tionsjahr 1848.

REICHSTADT, NAPOLEON FRANCIS JOSEPH CHARLES, Duke of (1811-1832), known by the Bonapartists as Napo- leon II., was the son of the Emperor Napoleon I. and Marie Louise, archduchess of Austria. He was born on the 20th of

March 1811, in Paris at the Tuileries palace. He was at first named the king of Rome, after the analogy of the heirs of the emperors of the Holy Roman Empire. By his birth the Napoleonic dynasty seemed to be finally established; but in three years it crumbled in the dust. At the time of the downfall of the empire (April 1814) Marie Louise and the king of Rome were at Blois with Joseph and Jerome Bonaparte, who wished to keep them as hostages. This design, however, was frustrated. Napoleon abdicated in favour of his son; but events prevented the reign of Napoleon II. from being more than titular. While Napoleon repaired to Elba, his consort and child went to Vienna; and they remained in Austria during the Hundred Days

(1815), despite efforts made by the Bonapartists to carry off the prince to his father at Paris.

Meanwhile the congress of Vienna had carried out the con- ditions of the treaty of Fontainebleau (March 1814) whereby the duchies of Parma and Guastalla were to go to the ex- Empress Marie Louise and her son, although much opposition was offered to this proposal by Louis XVIII. and even (so it now appears) by Metternich. The secret treaty of the 31st of May 1815 between Austria, Russia and Prussia secured those possessions to her, her son bearing the title Prince of Parma, with hereditary rights for his descendants. But after the second abdication of Napoleon in favour of his son (22nd of June 181 5) — a condition which was wholly nugatory — the powers opposed all participation of the prince in the affairs of Parma. He therefore remained in Austria, while Marie Louise proceeded to Parma. From this time onward he be- came, as it were, a pawn in the complex game of European politics, his claims being put forward sometimes by Metternich, sometimes by the unionists of Italy, while occasionally mal- contents in France used his name to discredit the French Bourbons. The efforts of malcontents increased the resolve of the sovereigns never to allow a son of Napoleon to bear rule; and in November 18 16 the court of Vienna informed Marie Louise that her son could not succeed to the duchies. This decision was confirmed by the treaty of Paris of the 10th of June 181 7. Marie Louise demanded as a slight compensa- tion that he should have a title derived from the lands of the ” Bavarian Palatinate ” in northern Bohemia, and the title of ” duke of Reichstadt ” was therefore conferred on him on the 22nd of July 1818. Thus Napoleon I., who once averred that he would prefer that his son should be strangled rather than brought up as an Austrian prince, lived to see his son reduced to a rank inferior to that of the Austrian archdukes.

His education was confided chiefly to Count Dietrichstein, who found him precocious, volatile, passionate and fond of military affairs. The same judgment was given by Marshal Marmont, duke of Ragusa, who recognized the warlike strain in his character. His nature was sensitive, as appeared on his receiving the news of the death of his father in 1821. The upheaval in France in 1830 and the disturbances which ensued led many Frenchmen to turn their thoughts to Napoleon II.; but though Metternich dallied for a time with the French Bonapartists, he had no intention of inaugurating a Napoleonic revival. By this time, too, the duke’s health was on the decline ; his impatience of all restraint and his indulgence in physical exercise far beyond his powers aggravated a natural weakness of the chest, and he died on the 22nd of July 1832.

See A. M. Barthelemy and J. P. A. M6ry, Le Fits de Vhomme (Paris, 1829), Baron G. I. Comte de Montbel, Le Due de Reichstadt (Paris, 1832); J. de Saint-F61ix, Histoire de Napoleon II. (Paris, 1853); Guy de l'Herault, Histoire de Napoleon II. (Paris, 1853); Count Anton von Prokesch-Osten, Mein Verhaltniss zum Herzog von Reichstadt (Stuttgart, 1878) ; H. Welschinger, Le Roi de Rome (Paris, 1897); E. de Wertheimer, The Duke of Reichstadt (Eng. ed., London, 1905); M. Rostand's play L'Aiglon is a dramatic setting of the career of the prince. (J. Hl. R.)

REID, SIR GEORGE (1841-), Scottish artist, was born in Aberdeen on the 31st of October 1841. He developed an early passion for drawing, which led to his being apprenticed in 1854 for seven years to Messrs Keith & Gibb, lithographers in Aberdeen. In 1861 Reid took lessons from an itinerant

portrait-painter, William Niddrie, who had been a pupil of James Giles, R.S.A., and afterwards entered as a student in the school of the Board of Trustees in Edinburgh. He returned to Aberdeen to paint landscapes and portraits for any trifling sum which his work could command. His first portrait to attract attention, from its fine quality, was that of George Macdonald, the poet and novelist, now the property of the university of Aberdeen. His early landscapes were conscientiously painted in the open air and on the spot. But Reid soon came to see that such work was inherently false, painted as the picture was day after day under varying con- ditions of light and shade. Accordingly, in 1865 he proceeded to Utrecht to study under A. Mollinger, whose work he ad- mired, from its unity and simplicity. This change in his method of viewing Nature was looked on as revolutionary by the Royal Scottish Academy, and for some years his work found little favour in that quarter; but other artists gradually adopted the system of tone-studies-, which ultimately pre- vailed. Reid went to Paris in 1868 to study under the figure painter Yvon; and he worked in 1872 with Josef Israels at the Hague. From this time forward Reid's success was continuous and marked. He showed his versatility in land- scape, as in his " Whins in Bloom," which combined great breadth with fine detail; in flower-pieces, such as his " Roses," which were brilliant in rapid suggestiveness and force; but most of all in his portraits, which are marked by great indi- viduality, and by fine insight into character. His work in black-and-white, his admirable illustrations in brushwork of Edinburgh and its neighbourhood, and also his pen-drawings, about which it has been declared that " his work contains all the subtleties and refinements of a most delicate etching," must also be noted. Elected Associate of the Royal Scottish Academy in 1870, Reid attained full membership in

1877, and took up his residence in Edinburgh in 1882. In 1801 he was elected President — a post which he held until 1902 — receiving also the honour of knighthood, and he was awarded a gold medal at the Paris Exhibition of 1900. His brother Samuel (b. 1854) was also a painter and a writer of tales and verse.

REID, ROBERT (1862-), American artist, was born at Stockbridge, Mass., on the 29th of July 1862. He studied at the art schools of the Boston Museum of Fine Arts, the Art Students' League, New York, and under Boulanger and Lefebvre in Paris. His early pictures were figures of French peasants, painted at Etaples, but subsequently he became best known for mural decoration and designs for stained glass. He contributed with others to the frescoes of the dome of the Liberal Arts Building at the Columbian Exposition, Chicago, in 1893. Other work is in the Congressional Library, Washing- ton, the Appellate Court House, New York, and the State House, Boston, where are his three large panels, " James Otis Delivering his Speech against the Writs of Assistance," " Paul Revere's Ride " and the " Boston Tea Party." He executed a panel for the American Pavilion at the Paris Ex- hibition, 1900, and in 1906 he completed a series of ten stained glass windows for a church at Fairhaven, Mass., for the Rogers Memorial. In 1906 he became a full member of the National Academy of Design.

REID, SIR ROBERT GILLESPIE (1840-1908), Canadian railway contractor, was born at Coupar-Angus, Scotland. When a young man he spent a few years in Australia gold- mining, and in 1871 he settled in America, where he began his career as a contractor. He built one section of the Canadian Pacific railway, and was responsible for the erection of the international bridge over the Niagara river, the international railway bridge over the Rio Grande river and the Lachine bridge over the St Lawrence. In 1893 Reid signed a contract with the government of Newfoundland by which he under- took to construct a railway from St John's to Pcrt-aux-Basques and to work the line for ten years in return for a large grant of land. In 1898 he further contracted to work all the railways in Newfoundland for fifty years on condition that at the end

of this time they should become his property. This bargain, which included other matters such as steamers, docks and telegraphs, was extraordinarily favourable to Reid; who, by further enormous grants of land, became one of the largest landed proprietors in the world;

public opinion was aroused against it, and at first the governor, Sir Herbert Murray, refused to ratify it. After the premier, Sir James Winter, had been replaced by Mr (afterwards Sir) Robert Bond, the terms of the contract were revised, being made more favourable to Newfoundland, and Reid's interests were transferred to a company, the Reid Newfoundland Company, of which he was the first president (see Newfoundland, Roads and Railways). Reid was knighted in 1007, and he died on the 3rd of June 1908. REID, THOMAS (1710-1706), Scottish philosopher, was born at Strachan in Kincardineshire, on the 26th of April 17 10. His father was minister of the place for fifty years, and traced his descent from a long line of Presbyterian ministers on Dee- side. His mother belonged to the brilliant Gregory family (?.».), which, in the 18th century, gave so many representatives to literature and science in Scotland. Reid graduated at Aber- deen in 1726, and remained there as librarian to the university for ten years, a period which he devoted largely to mathematical reading. In 1737 he was presented to the living of Newmachar near Aberdeen. The parishioners, violently excited at the time about the law of patronage, received him with open hostility; and tradition asserts that his uncle defended him on the pulpit stair with a drawn sword. Though not dis- tinguished as a preacher, he was successful in winning the affections of his people. The publication of Hume's treatise turned his attention to philosophy, and in particular to the theory of external perception. His first publication, however, dealt with a question of philosophical method suggested by the reading of Hutcheson. The " Essay on Quantity, occa- sioned by reading a Treatise in which Simple and Compound Ratios are applied to Virtue and Merit," denies the possibility of a mathematical treatment of moral subjects. The essay appeared in the Transactions of the Royal Society (1748). In 1740 Reid married a cousin, the daughter of a London physician. In 1752 the professors of King's College, Aberdeen, elected him to the chair of philosophy, which he held for twelve years. The foundation of the Aberdeen Philosophical Society (the " Wise Club "), which numbered among its members Campbell, Beattie, Gerard and Dr John Gregory, was mainly owing to the exertions of Reid, who was secretary for the first year (1758). Many of the subjects of discussion were drawn from Hume's speculations; and during the last years of his stay in Aberdeen Reid propounded his new point of view in several papers read before the society. The results of these papers were embodied in the Enquiry into the Human Mind on the Principles of Common Sense (1764). The Enquiry does not go beyond an analysis of sense perception, and is therefore more limited in scope than the later Essays; but if the latter are more mature, there is more freshness about the earlier work. In this year, Reid succeeded Adam Smith as professor of moral

philosophy in the university of Glasgow. After seventeen years of active teaching, he retired in order to complete his philosophical system. As a lecturer, he was inferior in charm and eloquence to Brown and Stewart; the latter says that ” silent and respectful attention ” was accorded to the ” sim- plicity and perspicuity of his style ” and ” the gravity and authority of his character.” His philosophical influence was exerted largely through the writings of Dugald Stewart and Sir William Hamilton. The Essays on the Intellectual Powers of Man appeared in 1785, and their ethical complement, the Essays on the Active Powers of the Human Mind, in 1788. These, with an account of Aristotle’s Logic appended to Lord Karnes’s Sketches of the History of Man (1774), conclude the list of works published in Reid’s lifetime. Hamilton’s edition of Reid also contains an account of the university of Glasgow and a selection of Reid’s letters, chiefly addressed to his Aberdeen friends the Skenes, to Lord Karnes, and to Dr James Gregory. With the two last named he discussed the materialism of .Priestley and

the theory of necessitarianism. He reverted in his old age to the mathematical pursuits of his earlier years, and his ardour for knowledge of every kind remained fresh to the last. He died of paralysis on the 7th of October 1706, his wife and all his children save one having predeceased him. His portrait by Raeburn is the property of Glasgow University, and in the National Portrait Gallery, Edinburgh, there is a good medallion by Tassie, taken in his eighty-first year. His char- acter was marked by independence, economy and generosity.

The key to Reid’s philosophy is to be found in his revulsion from the sceptical conclusions of Hume. In several passages of his writings he expressly dates his philosophical awakening from the appearance of the Treatise of Human Nature. In the dedication of the Enquiry, he says: “The ingenious author of that treatise upon the principles of Locke — who was no sceptic — hath built a system of scepticism which leaves no ground to believe any one thing rather than its contrary. His reasoning appeared to me to be just; there was, there/ ore, a necessity to call in question the principles upon which it was founded, or toˆadmit the conclusion.” Reid thus takes Hume’s scepticism as, on its own showing, a reductio ad impossibUe (see Hume, ad fin.) of accepted philbsophical principles, and refuses, accordingly, to separate Hume from his intellectual progenitors. From its origin in Descartes and onwards through Locke and Berkeley, modern philosophy carried with it, Reid contends, the germ of scepticism. Embracing the whole philosophic movement under the name of ” the Cartesian system,” Reid detects its fundamental error in

the unproved assumption shared by these thinkers ” that all the objects of my knowledge are ideas in my own mind.” This doctrine or hypothesis he usually speaks of as the ideal system ” or ” the theory of ideas”;andto it he opposes his own analysis of the act of perception. In view of the results of this analysis, Reid’s theory (and the theory of Scottish philosophy generally) has been dubbed natural realism or natural dualism, in contrast to theories l;ke subjective idealism and materialism or to the cosmothetic idealism or hypothetical dualism of the majority of philosophers. But this unduly narrows the scope of Scottish philosophy, which does not exhaust itself, as is sometimes supposed, in uncritically reasserting the independent existence of matter and its immediate presence to mind. The real significance of Reid’s doctrine lies in its attack upon Hume’s fundamental principles, (1) that all our perceptions are distinct existences, and (2) that the mind never perceives any real connexion among distinct existences (cf. Appendix to the third volume of the Treatise, 1740). It is here that the danger of ” the ideal system ” really lies — in its reduction of reality to ” particular perceptions,” essentially unconnected with each other. This theory admitted, nothing is left for philosophy save to explain the illusion of necessary connexion. Reid, however, attacks the fundamental assumption. In logical language, he denies the actuality of the abstract particular. The unit of knowledge is not an isolated impression but a judgment; and in such a judgment is contained, even initially, the reference both to a permanent subject and to a permanent world of thought, and, implied in these, such judgments, for example, as those of existence, substance, cause and effect. Such principles are not derived from sensation, but are ” suggested ” on occasion of sensation, in such a way as to constitute the necessary conditions of our having perceptive experience at all. Thus we do not start with ” ideas, and afterwards refer them to objects; we are never restricted to our own minds, but are from the first immediately related to a permanent world. Reid has a variety of names for the principles which, by their presence, lift us out of subjectivity into perception. He calls them ” natural judgments,” ” natural sug- gestions,” “judgments of nature,” “judgments immediately inspired by our constitution,” ” principles of our nature,” ” first principles,” ” principles of common sense.” The last commoo designation, which became the current one, was un- sense. doubtedly unfortunate, and has conveyed to many a false impression of Scottish philosophy. It has been understood as if Reid had merely appealed from the reasoned conclusions of philo- sophers to the unreasoned beliefs of common life. But Reid’s actions are better than his words; his real mode of procedure is to redargue Hume’s conclusions by a refutation of the premises in- herited by him from his predecessors. For the rest, as regards the question of

nomenclature, Reid everywhere unites common sense and reason, making the former ” only another name for one branch or degree of reason.” Reason, as judging of things self-evident, is called common sense to distinguish it from ratio- cination or reasoning. And in regard to Reid’s favourite proof of the principles in question by reference to ” the consent of ages and nations, of the learned and unlearned,” it is only fair to observe that this argument assumes a much more scientific form in the Essays, where it is almost identified with an appeal to ” the structure and grammar of all languages.” ” The structure of all languages,” he says, ” is grounded upon common sense.” To take but one example, ” the distinction between sensible qualities and the substance to which they belong, and between thought and the mind that thinks, is not the invention of philosophers ; it is found

in the structure of all languages, and therefore must be common to all men who speak with understanding ” (Hamilton’s Reid, pp.

229 and 454). . . . ,

The principles which Reid insists upon as everywhere present in experience evidently correspond pretty closely to the Kantian

categories and the unity of apperception. Similarly, Reid s Reid and asser ti on f the essential distinction between space or KaaU extension and feeling or any succession of feelings may_

be compared with Kant’s doctrine in the Aesthetic. ” Space, he says, ” whether tangible or visible, is not so properly an object [Kant’s ” matter “] as a necessary concomitant of the objects both of sight and touch.” Like Kant, too, Reid finds in space the source of a necessity which sense, as sense, cannot give (Hamilton’s Reid, p. 323) . In the substance of their answer to Hume, the two philosophers have therefore much in common. But Reid lacked the art to give due impressiveness to the important advance which his positions really contain. Although at times he states his principles with a wonderful degree of breadth and insight, he mars the effect by looseness of statement, and by the incorporation of irrelevant psychological matter. And, if Kant was overridden by a love of symmetry, Reid’s indifference to form and system is an even more dangerous defect. Further, Reid is inclined to state his principles dogmatically rather than as logical deductions. The transcendental deduction, or proof

from the possibility of experi- ence in general, which forms the vital centre of the Kantian scheme, is wanting in Reid; or, at all events, if the spirit of the proof is occasionally present, it is nowhere adequately developed. Never- theless, Reid's insistence on judgment as the unit of knowledge and his sharp distinction between sensation and perception must still be recognized as of the highest importance.

The relativism or phenomenalism which Hamilton afterwards adopted from Kant and sought to engraft upon Scottish philosophy

is wholly absent from the original Scottish doctrine. One c* C «i t, or two passages may certainly be quoted from Reid in c 1 1 which he asserts that we know only pioperties of things

and are ignorant of their essence. But the exact meaning which he attaches to such expressions is not quite clear; and they occur, moreover, only incidentally and with the air of current phrases mechanically repeated. Dugald Stewart, however, deliberately emphasizes the merely qualitative nature of our knowledge as the foundation of philosophical argument, and thus paves the way for the thoroughgoing philosophy of nescience elaborated by Hamilton. But since Hamilton's time the most typical Scottish thinkers have repudiated his relativistic doctrine, and returned to the original tradition of the school. For Reid's ethical theory, see Ethics.

The complete edition of the works by Sir William Hamilton, published in two volumes with notes and supplementary disserta- tions by the editor (6th ed. 1863), has superseded all others. For Reid's life see D. Stewart's Memoir prefixed to Hamilton's edition of Reid's works. See also McCosh, Scottish Philosophers (1875); Rait, Universities of Aberdeen, pp. 190-203, 223; A. C. Fraser, Monograph (1898); A. Bain, Mental Science, p. 207, p. 422 (for his theory of free will), and Appendix, pp. 29, 63, 88, 89.

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REID, THOMAS MAYNE (1818-1883), better known as Mayne Reid, British novelist, the son of a Presbyterian minister, was born at Ballyroney, Co. Down, Ireland, on the 4th of April 1818. His own early life was as adventurous as any boy reader of his novels could desire. He was educated for the church, but did not take orders, and when twenty years old went to America in search of excitement and fortune. He made trading excursions on the Red river, studying the ways of the red man and the white pioneer. He made acquaintance with the Missouri in the same manner, and roved through all the

states of the Union. In Philadelphia, where he was engaged in journalism from 1843ˆ0 1846, he made the acquaintance of Edgar Allan Poe. When the war with Mexico broke out in 1846 he obtained a captain's commission, was present at the siege and capture of Vera Cruz, and led a forlorn hope at Chapulte- pec, where he sustained such severe injuries that his life was despaired of. In one of his novels he says that he believed theoretically in the military value of untrained troops, and that he had found his theories confirmed in actual warfare. An enthusiastic republican, he offered his services to the Hungarian insurgents in 1849, raised a body of volunteers, and sailed for Europe, but arrived too late. He then settled in England, and began his career of a novelist with the publication, in 1850, of the Rifle Rangers. This was followed next year by the Scalp Hunters. He never surpassed his first productions, except perhaps in The White Chief (1859) and The Quadroon (1856): but he continued to produce tales of self-reliant enter- prise and exciting adventure with great fertility. Simplicity of

plot and easy variety of exciting incident are among the merits that contribute to his popularity with boys. His reflections are not profound, but are frequently more sensible than might be presumed at first from his aggressive manner of expressing them. He died in London on the 22nd of October 1883.

See Memoir (1890) by his widow, Elizabeth Mayne Reid.

REID, WHITELAW (1837-), American journalist and diplomatist, was born of Scotch parentage, near Xenia, Ohio, on the 27th of October 1837. He graduated at Miami Uni- versity in 1856, and spoke frequently in behalf of John C. Fremont, the Republican candidate for the presidency in that year; was superintendent of schools of South Charleston, Ohio, in 1856-58, and in 1858-59 was editor of the Xenia News. In i860 he became legislative correspondent at Columbus for several Ohio newspapers, including the Cincinnati Gazette, of which he was made city editor in 1861. He was war correspondent for the Gazette in 1861-62, serving also as volunteer aide-de-camp (with the rank of captain) to General Thomas A. Morris (1811-1904) and General William S. Rosecrans in West Virginia. He was Washington correspondent of the Gazette in 1862-68, acting incidentally as clerk of the mili- tary committee of Congress (1862-63) and as librarian of the House of Representatives (1863-66). In 1868 he became a leading editorial writer for the New York Tribune, in the following year was made managing editor, and in 1872, upon the death of Horace Greeley, became the principal proprietor and editor-in-chief. In 1905 Reid relinquished his active editorship of the Tribune, but retaine'd

financial control. He declined an appointment as United States minister to Germany in 1877 and again in 1881, but served as minister to France in 1889-92, and in 1892 was the unsuccessful Republican candi- date for vice-president on the ticket with Benjamin Harrison. In 1897 he was special ambassador of the United States on the occasion of Queen Victoria's jubilee; in 1898 was a member of the commission which arranged the terms of peace between the United States and Spain; in 1902 was special ambassador of the United States at the coronation of King Edward VII., and in 1905 became ambassador to Great Britain. He was elected a life member of the New York State Board of Regents in 1878; and in 1902 he became vice-chancellor and, in 1904, chancellor of the university of the state of New York. In 1881 he married a daughter of Darius Ogden Mills (1825-1910), a prominent financier.

His publications include After the War (1867), in which he gives his observations during a journey through the Southern States in 1866; Ohio in the War (2 vols., 1868); Some Consequences of the Last Treaty of Paris (1899); Our New Duties (1899); Later Aspects of Our New Duties (1899); Problems of Expansion (1900); The Greatest Fact in Modern History (1906), and How America faced its Educational Problem (1906).

REID, SIR WILLIAM (1 791-1858), Scottish administrator and man of science, was born on the 25th of April 1791 at the manse of Kinglassie, Fifeshire, and entered the Royal Engineers in 1809. He saw active service in the Peninsula under Wellington, and took part in the bombardment of Algiers in 1816. In 1835 and 1836 he again saw active service, in Spain against Don Carlos. In 1838 he published his Attempt to develop the Law of Storms, which obtained wide popularity. In 1839 he was appointed governor of the Bermudas, where he did much to develop the agricultural resources of the islands, and in 1846 he was transferred to Barbados. In 1850-51 he was chairman of the executive committee of the Great Exhi- bition; on the completion of the work he was made a K.C.B. and appointed governor of Malta. He died in London on the 31st of October 1858.

REIGATE, a market town and municipal borough in the Reigate parliamentary division of Surrey, England, 24 m. S. by W. of London by the South-Eastern & Chatham rail- way. Pop. (1901) 25,993. It is situated at the head of the long valley of Holmsdale Hollow, beneath the North Downs. A very fine prospect over a great part of Surrey and Sussex, and extending to Hampshire and Kent, is obtained from the I neighbouring . Reigate Hill. Of the old castle, supposed to

have been built before the Conquest to command the pass through the valley, there only remains the entrance to a cave beneath, 150 ft. long and from 10 to 12 ft. high, excavated in the sandstone, which was used as a guardroom. The grounds are laid out as a public garden. Near the market house is the site of an ancient chapel dedicated to Thomas a. Becket. In the chancel of the parish church of St Mary, a building ranging from Transitional Norman to Perpendicular, is buried Lord Howard, the commander of the English navy against the Spanish Armada. Above the vestry there is a library contain- ing choice manuscripts and rare books. The grammar school was founded in 1675. Among the other public buildings are the town hall, the public hall, the market hall, and the working men's institute. The borough includes the township of Red- hill, adjacent on the east. The town has some agricultural trade, and in the neighbourhood are quarries for freestone, hearthstone and white sand. The borough is under a mayor, 6 aldermen and 18 councillors. Area, 5994 acres.

Reigate {Cherchefelle, Regat, Reygate) owed its first settlement to its situation at a cross-road on the Pilgrim's Way, at the foot of the North Downs ; and its early importance to the castle which was the stronghold of the De Warennes in the 12th, 13th and 14th centuries. On the death of Edith, the widow of Edward the Confessor, to whom it belonged, William I. secured the manor of Cherchefelle, as it was then called. It was granted by William Rufus to Earl Warenne, through whose family it passed in 1347 to the earls of Arundel. The name Reigate occurs in 1199. Burgesses of Reigate are mentioned in a close roll of 1348, but no eaily charter is known. The town was incorporated in 1863. It returned two members to parliament from 1295 till 1831, and afterwards one member only until 1867, when it was disfranchised for corruption. In the reign of Edward I. Earl Warenne held a weekly market on Saturdays, and fairs on Tuesday in Whitsun-week, the eve and day of St Lawrence, and the eve and day of the Exaltation of the Cross, by prescriptive right. Edward II. granted a market on Tuesdays, which is still held. The fair days are now Whit-Tuesday and the 9th of December.

REIMARUS, HERMANN SAMUEL (1694-1768), German philosopher and man of letters, was born at Hamburg, on the 22nd of December 1694. He was educated by his father and by the famous scholar J. A. Fabricius, whose son-in-law he subsequently became. He studied theology, ancient languages, and philosophy at Jena, became

Privatdozent in the university of Wittenberg in 1716, and in 1720-21 visited Holland and England. In 1723 he became rector of the high school at Wismar in Mecklenburg, and in 1727 professor of Hebrew and Oriental languages in the high school of his native city. This post he held till his death, though offers of more lucrative positions were made to him. His duties were light, and he employed his leisure in the study of philology, mathematics, philosophy, history, political economy, natural science and natural history, for which he made large collections. His house was the centre of the highest culture of Hamburg, and a monu- ment of his influence in that city still remains in the Haus der patriotischen Gesellschaft, where the learned and artistic societies partly founded by him still meet. He had seven children, only three of whom survived him — the distinguished physician Johann Albrecht Heinrich, and two daughters, one of them being Elise, Lessing's friend and correspondent. He died on the 1st of March 1 768.

Reimarus's reputation as a scholar rests On the valuable edition of Dio Cassius (1750-52) which he prepared from the materials collected by J. A. Fabricius. He published a work on logic {Vernunftlehre als Anweisung zum richtigen Gebrauche der Vernunft, 1756, 5th ed., 1790), and two popular books on the religious questions of the day. The first of these was a col- lection of essays on the principal truths of natural religion {Abhandlungen von den vornehmsten Wahrheiten der natilrlichen Religion, 1755, 7th ed., 1798); the second (Betrachtungen ilber die Triebe der Thiere, 1760, 4th ed., 1798) dealt with one par- ticular branch of the same subject. His philosophical position is essentially that of Christfan Wolff. But he is best known by his Apologie oder Schutzschrift fur die vernjinftigen Verehrer Gottes (carefully kept back during his lifetime), from which, after his death, Lessing published certain chapters under the title of the WolfenbUUel Fragments (see Lessing). The original

MS. is in the Hamburg town library; a copy was made for the university library of Gottingen, 18 14, and other copies are known to exist. In addition to the seven fragments pub- lished by Lessing, a second portion of the work was issued in 1787 by C. A. E. Schmidt (a pseudonym), under the title Uebrige noch ungedruckte Werke des Wolfenbiittelschen Fragmentislen, and a further portion by D. W. Klose in Niedner's Zeitschrift fiir historische Theologie, 1850-52. Two of the five books of the first part and the whole of the second part, as well as appen- dices on the canon, remain unprinted. But D. F. Strauss has given an exhaustive analysis of the whole work in his book on Reimarus.

The standpoint of the Apologie is that of pure naturalistic deism. Miracles and mysteries are denied, and natural religion is put forward as the absolute contradiction of revealed. The essential truths of the former are the existence of a wise and good Creator and the immortality of the soul. These truths are discoverable by reason, and are such as can constitute the basis of a universal religion. A revealed religion could never obtain universality, as it could never be intelligible and credible to all men. Even supposing its possi- bility, the Bible does not present such a revelation. It abounds in error as to matters of fact, contradicts human experience, reason and morals, and is one tissue of folly, deceit, enthusiasm, selfishness and crime. Moreover, it is not a doctrinal compendium, or catechism, which a revelation would have to be. What the Old Testament says of the worship of God is little, and that little worthless, while its writers are unacquainted with the second fundamental truth of religion, the immortality of the soul. The design of the writers of the New Testament, as well as that of Jesus, was not to teach true rational religion, but to serve their own selfish ambitions, in pro- moting which they exhibit an amazing combination of conscious fraud and enthusiasm. It is important, however, to remember that Reimarus attacked atheism with equal effect and sincerity, and that he was a man of high moral character, respected and esteemed by his contemporaries.

Modern estimates of Reimarus may be found in the works of B. Punjer, O. Pfleiderer and H. Hoffding. Punjer states the position of Reimarus as follows: ” God is the Creator of the world, and His wisdom and goodness are conspicuous in it. Immortality is founded upon the essential nature of man and upon the purpose of God in creation. Religion is conducive to our happiness and alone brings satisfaction. Miracles are at variance with the divine purpose; without miracles there could be no revelation ” (Punjer, History of Christian Philosophy of Religion since Kant, Engl, trans., PP- 550-57.I which contains an exposition of the Abhandlungen and Schutzschrift). Pfleiderer says the errors of Reimarus were that he ignored historical and literary criticism, sources, date, origin, &c, of documents, and the narratives were said to be either purely divine or purely human. He had no conception of an immanent reason {Philosophy of Religion, Eng. trans., vol. i. p. 102). H. Hoffding also has a brief section on the Schutzschrift, stating its main position as follows: ” Natural religion suffices; a revelation is therefore superfluous. Moreover, such a thing is both physically and morally impossible. God cannot interrupt His own work by miracles; nor can He favour some men above others by revelations which are not granted to all, and with which it is not even

possible for all to become acquainted. But of all doctrines that of eternal punishment is most contrary, Reimarus thinks, to true ideas of God, and it was this point which first caused him to stumble ” {History of Modern Phil., Eng. trans. (1900), vol. ii. pp. 12, 13).

See the ” Fragments ” as published by Lessing, reprinted in vol. xv. of Lessing’s Werke, Hempel’s edition; D. F. Strauss, H. S. Reimarus und seine Schutzschrift fur die vernilnftigen Verehrer Gottes (1862, 2nd ed. 1877); Charles Voysey, Fragments from Reimarus (London, 1879) (a translation of the life of Reimarus by Strauss, with the second part of the seventh fragment, on the ” Object of Jesus and his Disciples”); the Lives of Lessing by Danzel and G. E. Guhrauer, Sime, and Zimmern; Kuno Fischer, Geschichte der neuern Philosophie (vol. ii. pp. 759-72, 2nd ed. 1867); Zeller, Geschichte der deutschen Philosophie (2nd ed., 1875, pp. 243-46).

REIMS (Rheims), a city of north-eastern France, chief town of an arrondissement of the department of Marne, 98 m. E.N.E. of Paris, on the Eastern railway. Pop. (1906) 102,800. Reims is situated in a plain on the right bank of the Vesle, a tributary of the Aisne, and on the canal which connects the Aisne with the Marne. South and west rise the ” montagne de Reims ” and vine-clad hills. Reims is limited S.W. by the Vesle and the canal, N.W. by promenades which separate it from the railway and in other directions by boulevards lined with fine residences. Beyond extend large suburbs, the chief of which are Ceres to the N.E., Coutures to the E., Laon to the N. and Vesle to the W. Of its squares the principal are the Place

Royale, with a statue of Louis XV., and the place du Parvis, with an equestrian statue of Joan of Arc. The rue de Vesle, the chief street, continued under other names, traverses the town from S.W. to N.W., passing through the Place Royale.

The oldest monument in Reims is the Mars Gate (so called from a temple to Mars in the neighbourhood), a triumphal arch 108 ft. in length by 43 in height, consisting of three archways flanked by columns. It is popularly supposed to have been erected by the Remi in honour of Augustus when Agrippa made the great roads terminating at the town, but probably belongs to the 3rd or 4th century. In its vicinity a curious mosaic, measuring 36 ft. by 26, with thirty-five medallions representing animals and gladiators, was discovered in

i860. To these remains must be added a Gallo- Roman sarcophagus, said to be that of the consul Jovinus (see below) and preserved in the archaeological museum in the cloister of the abbey of St Remi. The cathedral of Notre-Dame, where the kings of France used to be crowned^ replaced an older church (burned in 121 1) built on the site of the basilica where Clovis was baptized by St Remigius. The cathedral, with the exception of the west front, was completed by the end of the 13th century. That portion was erected in the 14th century after 13th-century designs — the nave having in the meantime been lengthened to afford room for the crowds that attended the coronations. In 1481 fire destroyed the roof and the spires. In 1875 the National Assembly voted £80,000 for repairs of the fagade and balustrades. This fagade is the finest portion of the building, and one of the most perfect masterpieces of the middle ages. The three portals are laden with statues and statuettes. The central portal, dedicated to the Virgin, is surmounted by a rose-window framed in an arch itself decorated with statuary. The ” gallery of the kings ” above has the baptism of Clovis in the centre and statues of his successors. The towers, 267 ft. high, Were originally designed to rise 394 ft.; that on the south contains two great bells, one of which, named ” Charlotte ” by Cardinal de Lorraine in 1570, weighs more than II tons. The facades of the transepts are also decorated with sculptures — that on the north with statues of the principal bishops of Reims, a representation of the Last Judgment and a figure of Christ (le Beau Dieu) while that on the south side has a beautiful rose-window with the prophets and apostles. Of the four towers which flanked the transepts nothing remains above the height of the roof since the fire of 1481. Above the choir rises an elegant bell-tower in timber and lead, 59 ft. high, reconstructed in the 15th century. The interior of the cathedral is 455 ft. long, 98 ft. wide in the nave, and 125 ft. high in the centre, and comprises a nave with aisles, transepts with aisles, a choir with double aisles, and an apse with deambulatory and radiating chapels. It has a profusion of statues similar to those of the outside, and stained glass of the 13th century. The rose-window over the main portal and the gallery beneath are of rare magnificence. The cathedral possesses fine tapestries. Of these the most important series is that presented by Robert de Lenoncourt, archbishop under Francis I., representing the life of the Virgin. The north transept contains a fine organ in a Flamboyant Gothic case. The choir clock is ornamented with curious mechanical figures. Several paintings, by Tintoretto, Nicolas Poussin, and others, and the carved woodwork and the railings of the choir, also deserve mention. The treasury contains the Sainte Ampoule, or holy flask, the successor of the ancient one broken at the Revolution (see below), a fragment of which it contains.

The archiepiscopal palace, built between 1498 and 1509, and in part rebuilt in 1675, was occupied by the kings on the occasion of their coronation. The saloon (salle du Tau), where the royal banquet was held, has an immense stone chimney of the 15th century, medallions of the archbishops of Rei.ns, and portraits of fourteen kings crowned in the city. Among the other rooms of the royal suite, all of which are of great beauty and richness, is that now used for the meetings of the Reims Academy ; the building also contains a library. The chapel of the archiepiscopal palace consists of two storeys, of which the upper still serves as a place of worship. Both the chapel and the salle du Tau are decorated with tapestries of the 17th century, known as the Perpersack tapestries, after the Flemish weaver who executed them.

After the cathedral, which it almost equals in size, the most celebrated church is St Remi, once attached to an important abbey, the buildings of which are used as a hospital. St Remi dates from the nth, 12th, 13th and 15th centuries. The nave and transepts, Romanesque in style, date mainly from the earliest, the facade of the south transept from the latest, of those periods, the choir and apse chapels from the 12th and 13th centuries. The valuable monu- ments with which the church was at one time filled were pillaged during the Revolution, and even the tomb of the saint is a modern work; but there remain the 12th-century glass windows of the apse and tapestries representing the history of St Remigius, given by Robert de Lenoncourt. The churches of St Jacques, St Maurice (partly rebuilt in 1867), St Andrd, and St Thomas (erected from 1847 to 1853, under the patronage of Cardinal Gousset, now buried within its walls), are all of minor interest. Of the fine church of St Nicaise only insignificant remains are to be seen.

The town hall, erected in the 17th and enlarged in the 19th

century, has a pediment with an equestrian statue of Louis XIII. and a tall and elegant campanile.* It contains a picture gallery, ethnographical, archaeological and other collections, and the public library. There are many old houses, the House of the Musicians (13th century) being so called from the seated figures of musicians which decorate the front.

In 1874 the construction of a chain of detached forts was begun in the vicinity, Reims being selected as one of the chief defences of the northern approaches of Paris. The ridge of St Thierry is crowned with a fort of the same name, which with the neighbouring work of Chenay closes the west side of the place. To the north the hill of Brimont has three works guarding the Laon railway and the Aisne canal. Farther east, on the old Roman road, lies the fort de Fresnes. Due east the hills

of Arnay are crowned with five large and important works which cover the approaches from the upper Aisne. Forts Pompelle and Montbre close the south-east side, and the Falaise hills on the Paris side are open and unguarded. The perimeter of the defences is not quite 22 m., and the forts are a mean distance of 6 m. from the centre of the city.

Reims L the seat of an archbishop, a court of assize and a sub-prefect. It is an important centre for the combing, carding and spinning of wool and the weaving of flannel, merino, cloth and woollen goods of all kinds, these industries employing some 24,000 hands; dyeing and ” dressing ” are also carried on. It is the chief wool market in France, and has a ” con- ditioning house ” which determines the loss of weight resulting from the drying of the wool. The manufacture of and trade in champagne is also very important. The wine is stored in large cellars tunnelled in the chalk. Other manufactures are machinery, chemicals, safes, capsules, bottles, casks, candles, soap and paper. The town is well known for its cakes and biscuits.

History. — Before the Roman conquest Reims, as Durocor- torum, was capital of the Remi, from whose name that of the town was subsequently derived. The Remi made voluntary submission to the Romans, and by their fidelity throughout the various Gallic insurrections secured the special favour of their conquerors. Christianity was established in the town by the middle of the 3rd century, at which period the bishopric was founded. The consul Jovinus, an influential supporter of the new faith, repulsed the barbarians who invaded Cham- pagne in 336; but the Vandals captured the town in 406 and slew St Nicasus, and Attila afterwards put it to fire and sword. Clovis, after his victory at Soissons (486), was baptized at Reims in 496 by St Remigius. Later kings desired to be consecrated at Reims with the oil of the sacred phial which was believed to have been brought from heaven by a dove for the baptism of Clovis and was preserved in the abbey of St Remi. Meetings of Pope Stephen III. with Pippin the Short, and of Leo III. with Charlemagne, took place at Reims; and here Louis the Debonnaire was crowned by Stephen IV. Louis IV. gave the town and countship of Reims to the archbishop Artaldus in 940. Louis VII. gave the title of duke and peer to William of Champagne, archbishop from n 76 to 1202, and the archbishops of Reims took precedence of the other eccle- siastical peers of the realm. In the 10th century Reims had become a centre of intellectual culture, Archbishop Adalberon, seconded by the monk Gerbert (afterwards Pope Silvester II.), having founded schools where the ” liberal arts ” were taught. Adalberon was also one of the prime authors of the revolution which put the Capet house in the place of

the Carolingians. The most important prerogative of the archbishops was the consecration of the kings of France — a privilege which was exercised, except in a few cases, from the time of Philip Augustus to that of Charles X. Louis VII. granted the town a communal charter in 1139. The treaty of Troyes (1420) ceded it to the English, who had made a futile attempt to take it by siege in 1360; but they were expelled on the approach of Joan of Arc, who in 1429 caused Charles VII. to be consecrated in the cathedral. A revolt at Reims, caused by the salt tax in 1461, was cruelly repressed by Louis XL The town sided with the League (1585), but submitted to Henry IV. after the battle of

Ivxy. In the foreign invasions of 1814 it was captured and recaptured; in 1870-71 it was made by the Germans the seat of a governor-general and impoverished by heavy re- quisitions.

See G. Marlot, Histoire de la ville, cM et university de Reims, 4 vols. (Reims, 1843-46); J. Justinus (Baron I. Taylor), La Ville de Reims (Paris, 1854).

REIN, a guiding or controlling leather strap or thong, attached to the bit of a ridden or driven horse (see Saddlery). The word is taken from the O. Fr. rene, modern fine, and is usually traced to a supposed Late Latin substantive retina formed from retinere, to hold back, restrain, cf. classical Latin retinaculum, halter. The word, usually in the plural, has been often used figuratively, as a type of that which guides, restrains or controls, e.g. in such phrases as the ” reins of government,” &c. The ” reins,” i.e. the kidneys (Lat. renes, cf. Gr. (jtpfiv, the midriff), or the place where the kidneys are situated, hence the loins, also, figuratively, the seat of the emotions or affections, must be distinguished.

REINACH, JOSEPH (1856-), French author and politician, was born in Paris on the 30th of September 1856. After leaving the Lycee Condorcet he studied for the bar, being called in 1887. He attracted the attention of Gambetta by articles on Balkan politics published in the Revue bleue, and joined the staff of the Ripublique franqaise. In Gambetta’s grand ministere M. Reinach was his secretary, and drew up the case for a partial revision of the constitution and for the electoral method known as the scrutin de liste. In the Ripublique francaise he waged a steady war against General Boulanger which brought him three duels, one with EdmondMagnier and two with Paul

Deroulede. Between 1889 and 1898 he sat for the Chamber of Deputies for Digne. As member of the army commission, reporter of the budgets of the ministries of the interior and of agriculture he brought forward bills for the better treatment of the insane, for the establishment of a colonial ministry, for the taxation of alcohol, and for the repara- tion of judicial errors. He advocated complete freedom of the theatre and the press, the abolition of public executions, and denounced political corruption of all kinds. He was indirectly implicated in the Panama scandals through his father-in-law, Baron de Reinach, though he made restitution as soon as he learned that he was benefiting by fraud. But he is best known as the champion of Captain Dreyfus. At the time of the original trial he attempted to secure a public hearing of the case, and in 1897 he allied himself with Scheurer-Kestner to demand its revision. He denounced in the Steele the Henry forgery, and Esterhazy's complicity. His articles in the Siecle aroused the fury of the anti-Dreyfusard party, especially as he was himself a Jew and therefore open to the charge of having undertaken to defend the innocence of Dreyfus on racial grounds. He lost his seat in the Chamber of Deputies, and, having refused to fight Henri Rochefort, eventually brought an action for libel against him. Finally, the " affaire " being terminated and Dreyfus pardoned, he undertook to write the history of the case, the first four volumes of which appeared in 1901. This was completed in 1905. In 1906 M. Reinach was re-elected for Digne. In that year he became member of the commission of the national archives, and next year of the council on prisons. Reinach was a voluminous writer on political subjects. On Gambetta he published three volumes in 1884, and he also edited his speeches. For the criticisms of the anti-Dreyfusard pi ess see Henri Dutrait-Croyon, Joseph Reinach, historien (Paris, 1905), a violent criticism in detail of Reinach's history of the " affaire."

His brother, the well-known savant, Salomon Reinach (1858-), born at St Germain-en-Laye on the 29th of August 1858, was educated at the Ecole normale sup6rieure, and joined the French school at Athens in 1879. He made valuable archaeological discoveries at Myrina near Smyrna in 1880-82, at Cyme in 1881, at Thasos, Imbros and Lesbos (1882), at Carthage and Meninx (1883-84), at Odessa (1893) and elsewhere. He received honours from the chief learned societies

of Europe, and in 1886 received an appointment at the National Museum of Antiquities at St Germain; in 1893 he became assistant keeper, and in 1902 keeper of the national museums. In 1903 he became joint editor of the Revue archSologique, and in the same year officer of the Legion of Honour. The lectures he delivered on art at the Ecole du Louvre in 1902-3 were pub- lished by him under the title of

Apollo. This book has been translated into most European languages, and is one of the most compact handbooks of the subject.

His first published work was a translation of Schopenhauer's Essay on Free Will (1877), which passed through many editions. This was followed by many works and articles in the learned re- views of which a list — up to 1903— is available in Bibliographie de S. R. (Angers, 1903). His Manuel de philologie classique (1880- 1884) was crowned by the French association for the study of Greek; his Grammaire latine (1886) received a prize from the Society of Secondary Education; La Necropole de Myrina (1887), written with E. Pottier, and Antiquites nationales were crowned by the Academy of Inscriptions. He compiled an important Re- pertoire de la statuaire grecque et romaine (3 vols., 1897-98); also Repertoire de peintures du moyen Age et de la Renaissance 1280-1580 (190,5, &c); Repertoire des vases peints grecs et ttrusques (1900). In 1905 he began his Cultes, mythes et religions; and in 1909 he published a general sketch of the history of religions under the title of Orpheus. He also translated from the English H. C. Lea's History of the Inquisition.

A younger brother, Theodore Reinach (i860-), also had a brilliant career as a scholar. He pleaded at the Parisian bar in 1881-86, but eventually gave himself up to the study of numismatics. He wrote important works on the ancient kingdoms of Asia Minor — Trois royaumes de I'Asie Mineure, Cappadoce, Bithynie, Pont (1888), Mithridate Eupator (1890); also a critical edition and translation with H. Weil of Plutarch's Treatise on Music; and an Histoire des Israelites depuis la mine de leur indSpendance nalionale jusqu'a nos jours (2nd ed., 1901). From 1888 to 1897 he edited the Revue des itudes grecques.

REINAUD, JOSEPH TOUSSAINT (1795-1867), French orien- talist, was born on the 4th of December 1795 at Lambesc, Bouches du Rh6ne. He came to Paris in 1815, and became a pupil of Silvestre de Sacy. In' 181 8-1 9 he was at Rome as an attache to the French minister, and studied under the Maronites of the Propaganda, but gave special attention to Mahommedan coins. In 1824 he entered the department of oriental MSS. in the Royal Library at Paris, and in 1838, on the death of De Sacy, he succeeded to his chair in the school of living oriental languages. In 1847 he became president of the Societe Asiatique, and in 1858 conservator of oriental MSS. in the Imperial Library. His first important work was his classical description of the collections of the due de Blacas (1828). To history he contributed an essay on the Arab in- vasions of France, Savoy, Piedmont and Switzerland (1836), and various collections for the period of the

crusades; he edited (1840) and in part translated (1848) the geography of Abulfeda; to him too is due a useful edition of the very curious records of early Arab intercourse with China of which Eusebe Renaudot had given but an imperfect translation (Re- lation des voyages, &c, 1845), and various other essays illus- trating the ancient and medieval geography of the East. Reinaud died in Paris on the 14th of May 1867.

REINDEER, in its strict sense the title of a European deer distinguished from all other members of the family Cervidae (see Deer), save those of the same genus, by the presence of antlers in both sexes; but, in the wider sense, including Asiatic and North American deer of the same general type, the latter of which are locally designated caribou. Reindeer, or caribou, constitute the genus Rangifer, and are large clumsily built deer, inhabiting the sub-Arctic and Arctic regions of both hemispheres. As regards their distinctive features, the antlers are of a complex type and situated close to the occipital ridge of the skull, and thus far away from the sockets of the eyes, with the brow-tines in adult males palmated, laterally compressed, deflected towards the middle of the face, and often unsymmetrically developed. Above the brow-tine is developed a second palmated tine,

which appears to represent the bez-tine of the red-deer; there is no trez-tine, but some distance above the bez the beam is suddenly bent forward to form an ” elbow,” on the posterior side of which is usually a short back-tine; above the back-tine the beam is continued for some distance to terminate in a large expansion or palmation. The antlers of females are simple and generally smaller. The muzzle is entirely hairy; the ears and tail are short; and the throat is maned. The coat is unspotted at all ages, with a whitish area in the region of the tail. The main hoofs are short and rounded and the lateral hoofs very large. There is a tarsal, but no metatarsal gland and tuft. In the skull the gland-pit is shallow, and the vacuity of moderate size; the nasal bones are well developed, and much expanded at the upper end. Upper canines are wanting; the cheek-teeth are small and low-crowned, with the third lobe of the last molar in the lower jaw minute. The lateral metacarpal bones are represented only by their lower extremities; the importance of this feature being noticed in the article Deer.

In spite of the existence of a number of more or less well-marked geographical forms, reindeer from all parts of the northern hemi-

sphere present such a marked similarity that it seems preferable to regard them as all belonging to a single widespread species, of which most of the characters will be the same as those of the genus. American naturalists, however, generally regard these as distinct species. The coat is remarkable for its density and compactness; the general colour of the head and upper parts being clove-brown, with more or less white or whitish grey on the under parts and inner surfaces of the limbs, while there is also some white above the hoofs and on the muzzle, and there may be whitish rings round the eyes ; there is a white area in the region of the tail, which includes the sides but not the upper surface of the latter; and the tarsal tuft is gener- ally white. The antlers are smooth, and brownish white in colour, but the hoofs jet black. Albino varieties occasionally occur in the wild state. A height of 4 ft. 10 in. at the shoulder has been re- corded in the case of one race.

The wild Scandinavian reindeer (Rangifer larandus) may be re- garded as the typical form of the species. It is a smaller animal than the American woodland race, with antlers approximating to those of the barren-ground race, but less elongated, and with a distinct back-tine in the male, the brow-tines moderately palmated and frequently nearly symmetrical, and the bez-tine not exces- sively expanded. Female antlers are generally much smaller than those of males, although occasionally as large, but with much fewer points. The antlers make their appearance at an unusually early age.

Mr Madison Grant considers that American reindeer, or caribou, may be grouped under two types, one represented by the barren- ground caribou R. tarandus arcticus, which is a small animal with immense antlers characterized by the length of the beam, and the consequent wide separation of the terminal palmation from the brow-tine; and the other by the woodland-caribou {R. t. caribou), which is a larger animal with shorter and more massive antlers, in which the great terminal expansions are in approximation to the brow-tine owing to the shortness of the beam. Up to 1902 seven other American races had been described, four of which are grouped by Grant with the first and three with the second type. Some of these forms are, however, more or less intermediate between the two main types, as is a pair of antlers from Novaia Zemlia described by the present writer as R. t. pearsoni. The Scandinavian reindeer is identified by Mr Grant with the barren-ground type.

Reindeer are domesticated by the Lapps and other nationalities of northern Europe and Asia, to whom these animals are all-im- portant. Domesticated reindeer have also been introduced into Alaska.

See Madison Grant, ” The Caribou,” ph Annual Report, New York Zoological Society (1902); J. G. Millais, Newfoundland and its Untrodden Ways (1908). (R. L.*)

REINECKE, CARL HEINRICH CARSTEN (1824-1910), German composer and pianist, was born at Altona on the 23rd of June 1824; his father, Peter Reinecke (who was also his teacher), being an accomplished musician. At the age of eleven he made his first appearance as a pianist, and when scarcely eighteen he went on a successful tour through Denmark and Sweden. After a stay in Leipzig, where he studied under Mendelssohn and under Schumann, Reinecke went on tour with Konigslow and Wasielewski, Schumann’s biographer, in North Germany and Denmark. From 1846 to 1848 Reinecke was court pianist to Christian VIII. of Denmark. After resigning this post he went first to Paris, and next to Cologne, as professor in the Con- servatorium. From 1854 to 1859 he was music director at Barmen, in the latter year filling this post at Breslau University;

in i860 he became conductor of the famous Leipzig Gewandhaus, a post which (together with that of professor at the Conserva- torium) he held with honour and distinction for thirty-five years. He finally retired into private life in 1902 and died in March 1910. During this time Reinecke continually made concert tours to England and elsewhere. His pianoforte playing belonged to a school now almost extinct. Grace and neatness were its characteristics, and at one time Reinecke was probably unrivalled as a Mozart player and an accompanist. His grand opera Konig Manfred, and the comic opera Auf hoken Befekl, were at one time frequently played in Germany; and his cantata Hakon Jarl is melodiously beautiful, as are many of his songs; while his Friedensfeier overture was once quite hack- neyed. By far his most valuable works are those written for educational purposes. His sonatinas, his ” Kinder- garten ” and much that he has ably edited will keep his name alive.

REINHART, CHARLES STANLEY (1844-1896), American painter and illustrator, was born at Pittsburg, Pennsylvania, and after having been employed in railway work and at a steel factory, studied art in Paris and at the Munich Academy under Straehuber and Otto. He afterwards settled in New York, but spent the years 1882-1886 in Paris. He was a regular exhibitor at the National Academy in New York, and contri- buted illustrations in black and white and in colours to the leading American periodicals. He died in 1896. Among his best-known pictures are: ” Reconnoitring,” ” Caught Napping,” ” September Morning,” ” Mussel Fisherwoman,” ” At the Ferry,” ”

Normandy Coast," " Gathering Wood," " The Old Life Boat," " Sunday," and " English Garden "; but it is as an illustrator that he is best known.

REINHART, JOACHIM CHRISTIAN (1761-1847), German painter and etcher, was born at Hof in Bavaria in 1 761, and studied under Oeser at Leipzig and under Klingel at Dresden. In 1789 he went to Rome, where he became a follower of the classicist German painters Carstens and Koch. He devoted himself more particularly to landscape painting and to aquatint engraving. Examples of his landscapes are to be found at most of the important German galleries, notably at Frankfort, Munich, Leipzig and Gotha. In Rome he executed a series of landscape frescoes for the Villa Massimi. He died in Rome in 1847.

REINHOLD, KARL LEONHARD (1758-1823), German philosopher, was born at Vienna. At the age of fourteen he entered the Jesuit college of St Anna, on the dissolution of which (1774) he joined a similar college of the order of St Barnabas. Finding himself out of sympathy with monastic life, he fled in 1783 to North Germany, and settled in Weimar, where he became Wieland's collaborateur on the German Mercury, and eventually his son-in-law. In the German Mercury he published, in the years 1786-87, his Brief e uber die Kantische Philosophic, which were most important in making Kant known to a wider circle of readers. As a result of the Letters, Reinhold received a call to the university of Jena, where he taught from 1787 to 1794. In 1789 he published his chief work, the Versuch einer neuen Theorie des menschlichen Vorstellungsvermogens, in which he attempted to simplify the Kantian theory and make it more of a unity. In 1794 he accepted a call to Kiel, where he taught till his death in 1823, but his independent activity was at an end. In later life he was powerfully influenced by Fichte, and subsequently, on grounds of religious feeling, by Jacobi and Bardili. His historical importance belongs entirely to his earlier activity. The development of the Kantian standpoint contained in the " New Theory of Human Understanding " (1789), and in the Fundament des philosophischen Wissens (1791), was called by its author Elementarphilosophie.

" Reinhold lays greater emphasis than Kant upon the unity and activity of consciousness. The principle of consciousness tells us that every idea is related both to an object and a subject, and ie partly to be distinguished, partly united to both. Since form cannot produce matter nor subject object, we are forced to assume a thine-in-itself. But this is a notion which is self-contrac\ictory if consciousness be essentially a relating activity. There is there-

for« something which must bethought and yet cannot be thought” (Hoffding, History of Modern Philosophy, Eng. trans., vol. ii.).

See R. Keil, Wieland und Reinhold (2nd ed., Leipzig, 1890); J. E. Erdmann, Grundriss der Geschichle der Philosophie (Berlin, 1866); histories of philosophy by R. Folckenberg and W. Windel- band.

REINKENS, JOSEPH HUBERT (1821-1896), German Old Catholic bishop, was born at Burtscheid, near Aix-la-Chapelle, on the 1 st of March 1821, his father being a gardener. In 1836, on the death of his mother, he took to manual work in order to support his numerous brothers and sisters, but in 1840 he was able to go to the gymnasium at Aix, and he after- wards studied theology at the universities of Bonn and Munich. He was ordained priest in 1848, and in 1849 graduated as doctor in theology. He was soon appointed professor of ecclesi- astical history at Breslau, and in 1865 he was made rector of the university. During this period he wrote, among other treatises, monographs on Clement of Alexandria, Hilary of Poitiers and Martin of Tours. In consequence of an essay on art, especially in tragedy, after Aristotle, he was made doctor in philosophy in the university of Leipzig. When, in 1870, the question of papal infallibility was raised, Reinkens attached himself to the party opposed to the proclamation of the dogma. He wrote several pamphlets on church tradition relative to infallibility and on the procedure of the Council. When the dogma of infallibility was proclaimed, Reinkens joined the band of influential theologians, headed by Dollinger, who resolved to organize resistance to the decree. He was one of those who signed the Declaration of Nuremberg in 1871, and at the Bonn conferences with Orientals and Anglicans in 1874 and 1875 he was conspicuous. The Old Catholics having decided to separate themselves from the Church of Rome, Reinkens was chosen their bishop in Germany at an enthusiastic meeting at Cologne in 1873 (see Old Catholics). On the nth of August of that year he was consecrated by Dr Heykamp, bishop of Deventer. Reinkens devoted himself zealously to his office, and it was due to his efforts that the Old Catholic movement crystallized into an organized church, with a definite status in the various German states. He wrote a number of theological works after his consecration, but none of them so important as his treatise on Cyprian and the Unity of the Church (1873). The chief act of his episcopal career was his consecration in 1876 of Dr Edward Herzog to preside as bishop over the Old Catholic Church in Switzerland. In 1881 Reinkens visited England, and

received Holy Communion more than once with bishops, clergy and laity of the Church of England, and in 1894 he defended the validity of Anglican orders against his co-religionists, the Old Catholics of Holland. He died at Bonn on the 4th of January 1896.

See Joseph Hubert Reinkens, by his nephew, J. M. Reinkens (Gotha, 1906).

REISKE, JOHANN JACOB (1716-1774), German scholar and physician, was born on the 25th of December 1716 at Zorbig in Electoral Saxony. From the Waisenhaus at Halle he passed in 1733 to the university of Leipzig, and there spent five years. He tried to find his own way in Greek literature, to which German schools then gave little attention; but, as he had not mastered the grammar, he soon found this a sore task and took up Arabic. He was very poor, having almost nothing beyond his allowance, which for the five years was only two hundred thalers. But everything of which he could cheat his appetite was spent on Arabic books, and when he had read all that was then printed he thirsted for manuscripts, and in March 1738 started on foot for Hamburg, joyous though totally unprovided, on his way to Leiden and the treasures of the Warnerianum. At Hamburg he got some money and letters of recommendation from the Hebraist Wolf, and took ship to Amsterdam. Here d'Orville, to whom he had an intro- duction, proposed to retain him as his amanuensis at a salary of six hundred guilders. Reiske refused, though he thought the offer very generous; he did not want money, he wanted manuscripts. When he reached Leiden (June 6, 1738) he found that the lectures were over for the term and that the MSS.

were not open to him. But d'Orville and A. Schultens helped him to private teaching and reading for the press, by which he was able to live. He heard the lectures of A. Schultens, and practised himself in Arabic with his son J. J. Schultens. Through Schultens too he got at Arabic MSS., and was even allowed sub rosa to take them home with him. Ultimately he seems to have got free access to the collection, which he re-catalogued— the work of almost a whole summer, for which the curators rewarded him with nine guilders.

Reiske's first years in Leiden were not unhappy, till he got into serious trouble by introducing emendations of his own into the second edition of Burmann's Petronius, which he had to see through the press. His patrons withdrew from him, and his chance of perhaps becoming professor was gone; d'Orville indeed soon came round, for he could not do without Reiske, who did work of which his patron, after dressing it up in his own style, took the credit. But A. Schultens was

never the same as before to him; Reiske indeed was too independent, and hurt him by his open criticisms of his master's way of making Arabic mainly a handmaid of Hebrew. Reiske, however, himself admits that Schultens always behaved honourably to him. In 1742 by Schultens's advice Reiske took up medicine as a study by which he might hope to live if he could not do so by philology. In 1746 he graduated as M.D., the fees being remitted at Schultens's intercession. It was Schultens too who conquered the difficulties opposed to his graduation at the last moment by the faculty of theology on the ground that some of his theses had a materialistic ring. On the 10th of June 1746 he left Holland and settled in Leipzig, where he hoped to get medical practice.

But his shy, proud nature was not fitted to gain patients, and the Leipzig doctors would not recommend one who was not a Leipzig graduate. In 1747 an Arabic dedication to the electoral prince of Saxony got him the title of professor, but neither the faculty of arts nor that of medicine was willing to admit him among them, and he never delivered a course of lectures. He had still to go on doing literary task-work, but his labour was much worse paid in Leipzig than in Leiden. Still he could have lived and sent his old mother, as his custom was, a yearly present of a piece of leather to be sold in retail if he had been a better manager. But, careless for the morrow, he was always printing at his own cost great books which found no buyers. His academical colleagues were hostile; and Ernesti, under a show of friendship, secretly hindered his promotion. His unsparing reviews made bad blood with the pillars of the university.

At length in 1758 the magistrates of Leipzig rescued him from his misery by giving him the rectorate of St Nicolai, and, though he still made no way with the leading men of the university and suffered from the hostility of men like Ruhnken and J. D. Michaelis, he was compensated for this by the esteem cf Frederick the Great, of Lessing, Karsten Niebuhr, and many foreign scholars. The last decade of his life was made cheerful by his marriage with Ernestine Muller, who shared all his interests and learned Greek to help him with collations. In proof of his gratitude her portrait stands beside his in the first volume of the Oratorcs Graeci. Reiske died on the 14th of August 1774, and his MS. remains passed, through Lessing's mediation, to the Danish minister Suhm, and are now in the Copenhagen library.

Reiske certainly surpassed all his predecessors in the range and quality of his knowledge of Arabic literature. It was the history, the realia of the literature, that always interested him; he did not care for Arabic poetry as such, and the then much praised Hariri seamed to him a

grammatical pedant. He read the poets less for their verses than for such scholia as supplied historical notices. Thus for example the scholia on Jarir furnished him with a remarkable notice of the prevalence of Buddhist doctrine and asceticism in ‘Irak under the Omayyads. In the Adnotationes historicae to his Abulfeda (Abulf. Annates Moslemici, 5 vols., Copenhagen, 1789-91), he collected a veritable treasure of sound and original research ; he knew the Byzantine writers as thoroughly as the Arabic authors, and was alike at home in modern works of travel in all languages and in ancient and medieval authorities. He was interested too in

numismatics, and his letters on Arabic coinage (in Eichhorn’s Repertorium, vols, ix.-xi.) form, according to De Sacy, the basis of that branch of study. To comprehensive knowledge and very wide reading he added a sound historical judgment. He was not, like Schultens, deceived by the pretended antiquity of the Yemenite Kasldas. 1 Errors no doubt he made, as in the attempt to ascertain the date of the breach of the dam of Marib.

Though Abulfeda as a late epitomator did not afford a starting- point for methodical study of the sources, Reiske’s edition with his version and notes certainly laid the foundation for research in Arabic history. The foundation of Arabic philology, however, was laid not by him but by De Sacy. Reiske’s linguistic knowledge was great, but he used it only to understand his authors; he had no feeling for form, for language as language, or for metre.

In Leipzig Reiske worked mainly at Greek, though he continued to draw on his Arabic stores accumulated in Leiden. Yet his merit as an Arabist was sooner recognized than the value of his Greek work. Reiske the Greek scholar has been rightly valued only in recent years, and it is now recognized that he was the first German since Sylburg who had a living knowledge of the Greek tongue. His reputation does not rest on his numerous editions, often hasty or even made to booksellers’ orders, but in his remarks, especially his conjectures. He himself designates the Animadversation.es in Scriptores Graecos nsflos ingenii sui, and in truth these thin booklets outweigh his big editions. Closely following the author’s thought he removes obstacles whenever he meets them, but he is so steeped in the language and thinks so truly like a Greek that the difficulties he feels often seem to us to lie in mere points of style. His criticism is empirical and unmethodic, based

on immense and careful reading, and applied only when he feels a difficulty ; and he is most successful when he has a large mass of tolerably homogeneous literature to lean on, whilst on isolated points he is often at a loss. His corrections are often hasty and false, but a surprisingly large proportion of them have since received confirmation from MSS. And, though his merits as a Grecian lie mainly in his conjectures, his realism is felt in this sphere also ; his German translations especially show more freedom and practical insight, more feeling for actual life, than is common with the scholars of that age. 2

For a list of Reiske's writings see Meusel, xi. 192 seq. His chief Arabic works (all posthumous) have been mentioned above. In Greek letters his chief works are Constantini Porphyrogeniti libri II. de ceremoniis aulae Byzant., vols, i ii. (Leipzig, 1751-66), vol. iii. (Bonn, 1829) ; Animadv. ad Graecos auctores (5 vols., Leipzig, 1751-66) (the rest lies unprinted at Copenhagen) ; Oratorum Graec. quae super sunt (8 vols'., Leipzig, 1770-73); A pp. crit. ad Demosthenem (3vols.,i6., 1774-75); Maximus Tyr. {ib., 1774) ; Plutarchus (11 vols., ib., 1774-79) I Dionys Italic. (6 vols., ib., 1774-77) > Libanius (4 vols., Altenburg, 1784-97). Various reviews in the Acta eruditorum and Zuverl. Nachrichten are characteristic and worth reading. Compare D. Johann Jacob Reiskens von ihm selbst aufgesetzte Lebensbe- schreibung (Leipzig, 1783). (J. We.)

REJANE, GABRIELLE [Charlotte Rfju] (1857-), French actress, was born in Paris, the daughter of an actor. She was a pupil of Regnier at the Conservatoire, and took the second prize for comedy in 1874. Her debut was made the next year, during which she played attractively a number of light — especially soubrette — parts. Her first great success was in Henri Meilhac's Ma camarade (1883), and she soon became known as an emotional actress of rare gifts, notably in DScori, Germinie Lacerteux, Ma cousine, Amoureuse and Lysistrata. In 1892 she married M. Porel, the director of the Vaudeville theatre, but the marriage was dissolved in 1905. Her per- formances in Madame Sans Glne (1893) made her as well known in England and America as in Paris, and in later years she appeared in characteristic parts in both countries, being particularly successful in Zaza and La Passerelle. She opened the Theatre Rejane in Paris in 1906. The essence of French vivacity and animated expression appeared to be concentrated in Madame Rejane's acting, and made her unrivalled in the parts which she had made her own.

RELAND, ADRIAN (1676-1718), Dutch Orientalist, was born at Ryp, studied at Utrecht and Leiden, and was professor of Oriental languages successively at Harderwijk (1699) and Utrecht (1701). His most

important works were Palaestina ex veteribus monumentis illustrata (Utrecht, i7i4),and Antiquitates sacrae veterum Hebraeorum. (See also Burman, Traj. Erud., p. 296 seq.).

1 ,” Animadvers. criticae in Hamzae hist, regni Joctanidarum,” in Eichhorn’s Mon. Ant. Hist. Ar., 1775.

8 For this estimate of Reiske as a Greek scholar the writer is in- debted to Prof. U. v. Wilamowitz-Moellendorff.

RELAPSING FEVER (Febris recurrens), the name given to a specific infectious disease occasionally appearing as an epidemic in communities suffering from scarcity or famine. It is char- acterized mainly by its sudden invasion, with violent ‘febrile symptoms, which continue for about a week and end in a crisis, but are followed, after another week, by a return of the fever.

This disease has received many other names, the best known of which are famine fever, seven-day, bilious relapsing fever, and spirillum fever. As in the case of typhoid, relapsing fever was long believed to be simply a form of typhus. The distinction between them appears to have been first clearly established in 1826, in connexion with an epidemic in Ireland.

Relapsing fever is highly contagious. With respect to the nature of the contagion, certain important observations have been made (see also Parasitic Diseases). In 1873 Obermeier discovered in the blood of persons suffering from relapsing fever minute organisms in the form of spiral filaments of the genus Spirochaete, measuring in length 5 fo to iˆb inch and in breadth fuJinj to sfijjnj inch, and possessed of rotatory or twisting movements. This organism received the name of Spirillum obermeieri. Fritz Schaudinn has brought forward evidence that- it is an animal parasite. The most constantly recognized factor in the origin and spread of relapsing fever is destitution; but this cannot be regarded as metre than a predisposing cause, since in many lands widespread and destructive famines have prevailed without any outbreak of this fever. In- stances, too, have been recorded where epidemics were distinctly associated with overcrowding rather than with privation. Relapsing fever is most commonly met with in the young. One attack does not appear to protect from others, but rather, according to some authorities, engenders liability.

The incubation of the disease is about one week. The symptoms of the fever then show themselves with great abruptness and violence by a rigor, accompanied with pains in the limbs and severe head- ache. The

febrile phenomena are very marked, and the tempera- ture quickly rises to a high point (i05°-io7° Fahr.), at which it con- tinues with little variation, while the pulse is rapid (100-140), full and strong. There is intense thirst, a dry brown tongue, bilious vomiting, tenderness over the liver and spleen, and occa- sionally jaundice. Sometimes a peculiar bronzy appearance of the skin is noticed, but there is no characteristic rash as in typhus. There is much prostration of strength. After the continuance of these symptoms for a period of from five to seven days, the tem- perature suddenly falls to the normal point or below it, the pulse becomes correspondingly slow, and a profuse perspiration occurs, while the severe headache disappears and the appetite returns. Except for a sense of weakness, the patient feels well and may even return to work, but in some cases there remains a condition of great debility, accompanied with rheumatic pains in the limbs. This state of freedom from fever continues for about a week, when there occurs a well-marked relapse with scarcely less abruptness and severity than in the first attack, and the whole symptoms are of the same character, but they do not, as a rule, continue so long, and they terminate in a crisis in three or four days, after which convalescence proceeds satisfactorily. Second, third and even fourth relapses, however, may occur in exceptional cases.

The mortality in relapsing fever is comparatively small, about 5 % being the average death-rate in epidemics (Murchison). The fatal cases occur mostly from the complications common to continued fevers. The treatment is essentially the same as that for typhus fever. Lowenthal and Gabritochewsky by using the serum of an immune horse succeeded in averting the relapse in 40% of cases.

RELATIVITY OF KNOWLEDGE, a philosophic term which was much used by the philosophers of the middle of the 19th century, and has since fallen largely into disuse. It deserves explanation, however, not only because it has occupied so large a space in the writings of some great British thinkers, but also because the main question for which it stands is still matter of eager debate. We get at the meaning of the term most easily by considering what it is that ” relativity ” is opposed to. ” Relativity ” of knowledge is opposed to absoluteness or positiveness of knowledge. Now there are two senses in which knowledge may claim to be absolute. The knower may say, ” I know this absolutely,” or he may say, “I know this absolutely.” With the emphasis upon the ” know ” he asserts that his know- ledge of the matter in question cannot be affected by anything whatever. ” I know absolutely that two and two are four ” makes an assertion about the knower’s intellectual state: he is convinced that his certain knowledge of the result of adding two to two is independent of any other piece of

knowledge. With

the emphasis upon the object of knowledge, ” I know this ,” we have the other sense of absoluteness of knowledge: it is an assertion that the knower knows the ” this,” whatever it may be, in its .essence or as it truly is in itself. The phrase ” relativity of knowledge” has therefore two meanings: (a) that no portion of knowledge is absolute, but is always affected by its relations to other portions of knowledge; (b) that what we know are not absolute things in themselves, but things conditioned in their quality by our channels of knowledge. Each of these two propositions must command assent as soon as uncritical ignorance gives place to philosophic reflection; but each may be exaggerated, indeed has currently been exaggerated, into falsity. The simplest experience — a single note struck upon the piano — would not be what it is to us but for its relation by contrast or comparison with other experiences. This is true; but we may easily exaggerate it into a falsehood by saying that a piece of experience is entirely constituted by its relation to other experiences. Such an extreme relativity, as advocated by T. H. Green in the first chapter of his Prolegomena to Ethics, involves the absurdity that our whole experience is a tissue of relations with no points of attachment on which the relations depend. The only motive for advocating it is the prejudice of absolute idealism which would deny that sensation has any part whatever in the constitution of experience. As soon as we recognize the part of sensation, we have no reason to deny the common-sense position that each piece of experience has its own quality, which is modified indefinitely by the relations in which it stands.

The second sense of relativity, that which asserts the impossi- bility of knowing things except as conditioned by our perceptive faculties, is more important philosophically and has had a more interesting history. To apprehend it is really the first great step in philosophical education. The unphilosophical person assumes that a tree as he sees it is identical with the tree as it is in itself and as it is for other percipient minds. Reflection jhows that our apprehension of the tree is conditioned by the jense-organs with which we have been endowed, and that the ipprehension of a blind man, and still more the apprehension of a dog or horse, is quite different from ours. What the tree is m itself — that is, for a perfect intelligence — we cannot know, any more than a dog or horse can know what the tree is for a human

intelligence. So far the relativist is on sure ground; but from this truth is developed the paradox that the tree has no objective existence at all and consists entirely of the conscious states of the perceiver. Observe the parallelism of the two paradoxical forms of relativity: one says that things are relations with nothing that is related; the other says that things are perceptive conditions with nothing objective to which the conditions apply. Both make the given nothing and the work of the mind everything.

To see the absurdity of the second paradox of relativity is easier than to refute it. If nothing exists but the conscious states of the perceiver, how does he come to think that there is an objective tree at all ? Why does he regard his conscious states as produced by an object ? And how does he come to imagine that there are other minds than his own ? In short, this kind of relativity leads straight to what is generally known as ” the abyss of solipsism.” But, like all the great paradoxes of philosophy, it haa its value in directing our attention to a vital, yet much neglected, element of experience. We cannot avoid solipsism (q.v.) so long as we neglect the element of force or power. If, as Hegel asserted, our experience is all knowledge, and if knowledge is indefinitely transformed by the conditions of knowing, then we are tempted to regard the object as super- fluous, and to treat our innate conviction that knowledge has reference to objects as a delusion which philosophical reflection is destined to dispel. The remedy for the paradox is to recognize that the foundation for our belief in the existence of objects is the force which they exercise upon us and the resistance which they offer to our will. What the tree is In regard to its specific qualities depends on what faculties we have for perceiving it. But, whatever specific qualities it may have, it will still exist

as an object, so long as it comes into dynamic relations with our minds.

In the history of thought the relativity of knowledge as just described begins with Descartes, the founder of modern philosophy: the characteristic of modern philosophy is that it lays more stress upon the subjective than upon the objective side of experience. It is a mistake to refer it back to the Greeks. The maxim of Protagoras, for example, ” Man is the measure of all things,” has a different purpose; it was meant to point to the truth that man rather than nature is the primary object of human study : it is a doctrine of humanism rather than of relativism. To appreciate the relativistic doctrines we find in various thinkers we must take account of the use to which they were put. By Descartes the principle was used as an instrument of scepticism, the beneficent scepticism of pulling down medieval

philosophy to make room for modern science; by Berkeley it was used to combat the materialists; by Hume in the cause of scepticism once more against the intellectual dogmatists; by Kant to prepare a justification for a noumenal sphere to be apprehended by faith; by J. S. Mill and Herbert Spencer to support their derivation o(all our experience from sensation. It is in Mill's Examination of Sir William Hamilton's Philosophy that the classical statement of the Relativity of Knowledge is to be found. The second chapter of that book sets forth the various forms of the doctrine with admirable lucidity and precision, and gives many references to other writers.

For the sake of clearness it seems desirable to keep for the future the term " relativity of knowledge " to the first meaning explained above: for the second meaning it has been superseded in contem- porary philosophizing by the terms " subjectivism," " subjective idealism," and, for its extreme form, " solipsism " (q.v.). (H. St.)

RELEASE (O.Fr. reles, variant of relais, from relaisser, to release, let go, Lat. relaxare), freedom or deliverance from trouble, pain or sorrow, the freeing or discharge from some obligation or debt, the action of letting go or releasing something fixed or set in position. In law, the term is applied to the discharge of some obligation, by which it is extinguished (see Debt), and to the conveyance of an estate or interest in real or personal property to one who has already some estate or interest therein. For the special form of conveyancing known as " lease and release," see Conveyancing.

RELICS (Lat, reliquiae, the equivalent of the English " remains " in the sense of a dead body), the name given in the Catholic Church to,(i) the bodies of the saints, or portions of them,(2) such objects as the saints made use of during their lives, or as were used at their martyrdom. These objects are held by the Church in religious veneration, and by their means it hopes to obtain divine grace and miraculous benefits {Cone. Trid. sess. 24).

These ideas had taken shape, in all essentials, during the early days of the Church, underwent further development in the middle ages, and were maintained by the Catholic Church in the face of the opposition of the Reformers, while all the Protestant Churches rejected them.

The origins of the veneration of relics lie in the anxiety for the preservation of the bodies of the martyrs. Nothing is more natural than that the pious solicitude felt by all men for the bodies of their loved ones should in the primitive Christian Churches have been turned most strongly towards the bodies of those who had met with

death in confessing their faith. The account given by the church at Smyrna of the death of their bishop Polycarp (155) gives us an insight into these feelings, The church collected and buried the remains of the martyr, who had been burnt, in order duly to celebrate the anniversary of the martyrdom at the place of burial. The possession of the relics seemed to assure the continuation of the common life of the church with their bishop, of the living with the dead {Mart. Polyc. c. 17).

The custom of which we have here for the first time an account had become universal by the 3rd century. In all parts the Christians assembled on the anniversary of the martyrs' death at their graves, to celebrate the Agape and the Eucharist at this spot. It was a favourite custom to bury the dead near the graves of the martyrs; and it was the highest wish of many to " rest with the saints." It was the body lying in the tomb which was venerated (see Euseb. Hist. eccl. vii. n, 24; viii. 6, 7).

But these customs soon underwent a further development. About the end of the 3rd and the beginning of the 4th century

it became customary for the bodies of the martyrs not to be buried, but preserved for the purpose of veneration. Already individual Christians began to possess themselves of portions of the bodies of martyrs, and to carry them about with them. Both these practices met with criticism and opposition, especially from the leading men of the Church. According to the testi- mony of Athanasius of Alexandria, the hermit Anthony decided that it should be held to be unlawful and impious to leave the bodies of the martyrs unburied (Vita Ant. 90). In Carthage the archdeacon and later the bishop Caecilianus severely blamed a certain Lucilla for carrying about with her a relic which she used to kiss before receiving the Eucharist (Optatus, De schism. Donat. i. 16). The compiler of the Acta S. Fructuosi, a Spanish ecclesi- astic, represents the martyred bishop as himself requesting the burial of his relics. But energetic as the opposition was, it was unsuccessful, and died out. For in the meantime opinion as to the efficacy of relics had undergone a transformation, parallel with the growth of the theory, which soon predominated in the Church, that material instruments are the vehicles of divine grace. When the Christians of Smyrna decided that the bones of the martyrs were of more worth than gold or gems, and when Origen (Exh. ad mart. 50) spoke of the precious blood of the

martyrs, they were thinking of the act of faith which the martyrs had accomplished by the sacrifice of their life. Now, on the other hand, the relic came to be looked upon as in itself a thing of value as the channel of miraculous divine powers. These ideas are set forth by Cyril of Jerusalem. He taught that a certain power dwelt in the body of the saint, even when the soul had departed from it; just as it was the instrument of the soul during life, so the power passed permanently into it (Cat. xviii. 16). This was coming very near to a belief that objects which the saints had used during their life had also a share in their miraculous powers. And this conclusion Cyril had already come to (loc. cit.).

We can see how early this estimate of relics became general from the fact that the former hesitation as to whether they should be venerated as sacred died out during the 4th century. The Fathers of the Greek Church especially were united in recommending the veneration of relics. All the great theologians of the 4th and 3th centuries may be quoted as evidence of this: Eusebius of Caesarea (Praep. Ev. xiii.n), Gregory of Nazianzus (Oral, in Cypr. 17), Gregory of Nyssa (Oral, de S. Tkeod. mart.), Basil of Caesarea (Ep. ii. 197), Chrysostom (Laud. Drosidis), Theodoret of Cyrus (Inps. 67, n), &c. John of Damascus, the great exponent of dogma in the 8th century, gave expression to the result of a uniform development which had been going on for centuries when he taught that Christ offers the relics to Christians as means of salvation. They must not be looked upon as something that is dead; for through them all good things come to those who pray with faith. Why should it seem impossible to believe in this power of the relics, when water could be made to gush from a rock in the desert? (De fide orthod. iv. 15).

Such was the theory; and the practice was in harmony with it. Throughout the whole of the Eastern Church the veneration of relics prevailed. Nobody hesitated to divide up the bodies of the saints in order to afford as many portions of them as possible. They were shared among the inhabitants of cities and villages, Theodoret tells us, and cherished by everybody as healers and physicians for both body and soul (Decur.Graec. off. 8). The transition from the true relic to the hallowed object was especially common. Jerusalem, as early as the time of Eusebius, rejoiced in the possession of the episcopal chair of James the Just (Hist. eccl. vii. 19); and as late as the 4th century was discovered the most important of the relics of Christ, the cross which was alleged to have been His. Cyril of Jerusalem already remarks that the whole world was filled with portions of the wood of the cross (Cat. iv. 10).

The development which the veneration of relics underwent in the West did not differ essentially from that in the East. Here also the idea came to prevail that the body of the saint,

(Paulinus of Nola, Poem. xix. 14 et seq., xxvii. 443). The objection raised by the Aquitanian presbyter Vigilantius (c. 400) to the belief that the souls of the martyrs to a certain extent clung to their ashes, and heard the prayers of those who ap- proached them, appeared to his contemporaries to be frivolous; and he nowhere met with any support.

The only doubt which was felt was as to whether the bodies of the saints should be divided, and removed from their original resting-place. Both practices were forbidden by law under the emperor Theodosius I. (Cod. Theodos. ix. 17, 7), and the division of the bodies of martyrs into pieces was prohibited for centuries. Even Pope Gregory I., in a letter to the empress Constantia, disapproved it (Ep. iv. 30). Ambrose of Milan, by the discovery of the relics of Protasius and Gervasius (cf. Ep. 22 and Augustine, Confess, ix. 7), started in the West the long series of discoveries and translations of hitherto unknown relics. His example was followed, to name only the best known instances, by Bishop Theodore of Octodurum (now Martigny in the Vaud), who discovered the relics of the Theban legion which was alleged to have been destroyed by the emperor Maximian on account of its belief in the Christian faith (see Passio Acaun. Mart. 16), and by Clematius, a citizen of Cologne, to whom the virgin martyrs of this city revealed themselves (Kraus, Inschriften der Rheinlande, No. 294), after- wards to be known as St Ursula and her eleven thousand virgins.

The West was much poorer in relics than the East. Rome, it is true, possessed in the bodies of Peter and Paul a treasure the virtue of which outshone all the sacred treasures of the East. But many other places were entirely wanting in relics. By the discoveries which we have mentioned their number was notably increased. But the longing for these pledges of the divine assistance was insatiable. In order to satisfy it relics were made by placing pieces of cloth on the graves of the saints, which were afterwards taken to their homes and venerated by the pilgrims. The same purpose was served by oil taken from the lamps burning at the graves, flowers from the altars, water from some holy well, pieces of the garments of saints, earth from Jerusalem, and especially keys which had been laid on the grave of St Peter at Rome. All these things were not looked upon as mementoes, but the conviction pre- vailed that they were informed by a miraculous power, which had passed into them through contact with that which was originally sacred (cf. Greg. Tur. De Glor. mart. i. 25; Greg. I. Ep. iv.

29, No. 30). A dishonest means of satisfying the craving for relics was that of forging them, and how common this became can be gathered from the many complaints about spurious relics (Sulp. Sev. Vita Mart. 8; Aug. De op. mon. 28; Greg. I. Ep. iv. 30, &c).

But in the long run these substitutes for relics did not satisfy the Christians of the West, and, following the example of the Eastern Church, they took to dividing the bodies of the saints. Medieval relics in the West also were mostly portions of the bodies of saints or of things which they had used during their lives. The veneration of relics also received a strong impulse from the fact that the Church required that a relic should be deposited in every altar. Among the first of those whom we know to have attached importance to the placing of relics in churches is Ambrose of Milan (Ep. 22), and the 7th general council of Nicaea (787) forbade the consecration of churches in which relics were not present, under pain of ex- communication. This has remained part of the law of the Roman Catholic Church.

The most 'famous relics discovered during the middle ages were those of the apostle James at St Jago de Compostella in Spain (see Pilgrimage), the bodies of the three kings, which were brought from Milan to Cologne in 1164 by the emperor Frederick I. (Chron. reg. Colon, for the year n 64), the so- called sudarium of St Veronica, which from the 12th century onwards was preserved in the Capella Santa Maria ad praesepe of St Peter's in Rome (see Dobschiitz, Christusbilder,p. 218 seq.), and the seamless robe of Christ, the possession of which lent

renown to the cathedral of Trier since the beginning of the 1 2th century (fiesta Trevir., Mon. Germ. Scr. viii. p. 152).

The number of relics increased to a fabulous extent dur- ing the middle ages. There were churches which possessed hundreds, even thousands, of relics. In the cathedral of Eichstatt were to be found, as early as 107 1, 683 relics (Gundech, Lib. pont. Eist., Mon. Germ. Scr. vii. p. 246 seq.); the monastery of Hirschau had 222 in the year 1091 (De cons, mai. mon., Mon. Germ. Scr. xiv. p. 261); the monastery of Stedernburg 515 in the year 1166 (Ann. Sled. Scr. xvi. p. 212 seq.). But these figures are trifling compared with those at the end of the middle ages. In the year 1520 could be counted 19,013 in the Schlosskirche at Wittenberg, and 21,483 in the Schlosskirche at Halle

in 1521 (Kostlin, Friedrich der W., und die Schlosskirche zu Wittenberg, p. 58 seq. ; Redlich, Cardinal Albrecht und das Neue Stiff zu Halle, p. 260). There were also collections on the same scale belonging to individuals; a patrician of Nuremberg named Muffel was able to gain pos- session of 308 relics (Chroniken der deutschen StSdte, xi. p. 745).

It is curious that while the popular craving for relics had passed all bounds, medieval theology was very cautious in its declarations on the subject of the veneration of relics. Thomas Aquinas based his justification of them on the idea of reverent commemoration; since we venerate the saints, we must also show reverence for their relics, for whoever loves another does honour to that which remains of him after death. On this account it is our duty, in memory of the saints, to pay due honour to their relics and especially to their bodies, which were the temples and dwellings of the Holy Ghost in which He dwelt and worked, and which in the resurrection are to be made like to the body of Christ; and in likewise because God honours them, in that He works wonders in their presence (Summa theol. iii. qu. 25, art. 6). The great scholastic philo- sopher abandoned the theory that the relics in themselves are vessels and instruments of the divine grace and miraculous power. But these ideas were revived, on the other hand, by the Catholicism of the counter-Reformation, which again taught and teaches that God grants many benefits to mankind through the sacred bodies of the martyrs (Cone. Trid. sess. xxv.). The doctrine has adapted itself to the popular belief. (A. H.*)

RELIEF (through Fr. from Lat. relevare, to lift up), an act of raising or lifting off or up. Apart from the general sense of a mitigation, cessation or removal of pain, sorrow, discomfort, &c, and the artistic use (It. relievo) of the projection of a figure or design in sculpture from the ground on which it is formed, which is treated below, the term “relief” is used in the following senses; it was one of the feudal incidents between lord and vassal, and consisted of a payment to the lord in kind or money made by the heir on the death of the ancestor for the privilege of succession, for, fiefs not being hereditary, the estate had lapsed to the lord; by this payment the heir caducum praedium relevabat (Du Cange, Gloss, s.v. Relevare). The word is also generally used, in law, for any exemption granted by a court from the strict legal consequences of an act, &c, e.g. to a parlia- mentary candidate from the penal consequences ensuing from breaches of the regulations of the Corrupt and Illegal Practices Acts. Relief is also the term used in English law for the assist- ance given to the indigent poor by the Poor Law authorities (see Poor Law).

RELIEF, a term in sculpture signifying ornament, a figure or figures raised from the ground of a flat surface of which the sculptured portion forms an inherent part of the body of the whole. The design may be in high relief — “alto-relievo”(gM>.),or low relief — ” bas-relief” or “basso-relievo” (q.v.); in the former case the design is almost wholly detached from the ground, the attachment, through ” under-cutting,” remaining only here and there; in the latter it is wholly attached and may scarcely rise above the surface (as in the modern medal), or it may exceed in projection to about a half the proportionate depth (or thickness) of the figure or object represented. Formerly three terms were commonly employed to express the degree of relief — alto- relievo, basso-relievo and mezzo-relievo (or half - relief) ; but the

two last-named have been merged by modern custom into ” low-relief,” to the disadvantage of accurate description. The term relief belongs to modern sculpiuie. Io low relief as under- stood by us Pliny applied th>: word anaˆlypta, but it is to be observed that embossing and chasing came within the same category. It may be considered that less sculptural skill (independently of manipulative skill) is needed in high relief than in low relief, because in the former the true relative pro- portions in the life (whether figure or other object) have to be rendered, while in the latter, although the true height and, in a measure, breadth can be given, the thickness of the object is reduced by at least one-half, sometimes to almost nothing; and yet in spite of this departure from actuality, this abandon- ment of fact for a pure convention, a true effect must still be produced, not only in respect to perspective, but also of the actual shadows cast. And insomuch as the compositions are often extremely complicated and have sometimes to suggest retreating planes, the true plane of the material affords little scope for reproducing the required effect. In the beginning the essential idea of the relief was always maintained: that is to say, the sense of the flatness of the slab from which it was cut was impressed throughout the design on the mind of the spectator. Thus the Egyptians merely sunk the outlines and scarcely more than suggested the modelling of the figures, which never projected beyond the face of the surrounding ground. The Persians, the Etruscans and the Greeks carried on the art to the highest perfection, alike in sculpture and architectural ornament, and they applied it to gem sculpture, as in the case of ” cameo.” Similarly, the inverse treatment of relief — that is, sunk below the surface, in order that when ased for seals a true relief is obtained — was early brought to great completeness; this form of engraving is called ” intaglio.” The degree of projection in relief, broadly speaking, has varied greatly with the periods of art. Thus, in

Byzantine and Romanesque art the relief was low. In Gothic it increased with the increased desire to render several planes one behind the other. With the advent of the Renaissance it became still more accentuated, the heads and figures projecting greatly; but such high relief is sometimes found in early work, especially in metal-work. Although we see a return to lower relief in the Henri II. period, it becomes stronger in the Louis XIII. style, very full in Louis XIV. and Louis XV., but in Louis XVI. is considerably reduced. (M. H. S.)

RELIGION. The origin of the Latin word rlligio or relligio has been the subject of discussion since the time of Cicero. Two alternative derivations have been given, viz. from rSKgere, to gather together, and r&ligare, to bind back, fasten. Relegere meant to gather together, collect, hence to go over a subject again in thought, from re and legere, to collect together, hence to read, collect at a glance. This view is that given by Cicero (Nat. Deor. ii. 28, 72). He says: ” Qui omnia quae ad cultum deorum pertinerent diligenter retractarent et tanquam relegerent, sunt dicti religiosi ex relegendo,” ” men were called ‘religious ‘ from relegere, because they reconsidered carefully and, as it were, went over again in thought all that appertained to the worship of the gods.” He compares elegantes from eligere, diligentes from diligere, and continues, ” his enim in verbis omnibus inest vis legendi eadem quae in religioso.” This view is supported by the form of the word in the verse quoted by Gellius (iv. 9), ” religentem esse oportet, religiosum nefas,” and by the use of the Greek AXeyetp, to pay heed to, frequently with a negative, in the sense of the Latin negligere (nec-legere), cf. Qe&v fariv obn HKkyovres (Homer, 77. xvi. 388), heeding not the visitation of the gods, or ov yhp KukXcottcs Aids . . . iXkyovcnv (Od. ix. 275). The alternative derivation, from religare, to fasten, bind, is that adopted by Lactantius (Inst. iv. 28), “Vinculo pietatis obstricti, Deo religati sumus unde ipsa religio nomen cepit. ” He quotes in support the line from Lucretius (i. 931), ” religionum nodis animos exsolvere.” Servius (on Virgil, Aen. viii. 349) and St Augustine (Retract, i. 13) also take religare as the source of the word. It is one that has certainly coloured the meaning of the word, particularly in that use which restricts

it to the monastic life with its binding rules. It also has appealed to Christian thought. Liddon (Some Elements of Religion, Lecture I. 19)

says: ” Lactantius may be wrong in his etymology, but he has certainly seized the broad popular sense of the word when he connects it with the idea of an obligation by which man is bound to an invisible God.” Archbishop Trench (Study of Words) supposed that when ” religion ” became equivalent to the monastic life, and ” religious ” to a monk, the words lost their original meaning, but the Ancren Riwle, ante 1225, and the Cursor Mundi use the words both in the general and the more particular sense (see quotations in the New English Dictionary), and both meanings can be found in the Imitatio Christi and in Erasmus’s Colloquia. (X.)

The study of the forms of belief and worship belonging to different tribes, nations or religious communities has only recently acquired a scientific foundation. The Greek historians early directed their attention to the ideas and customs of the peoples with whom they were brought into contact; and Herodotus has been called the ” first anthropologist of reli- gion.” Theopompus described the Persian dualism in the 4th century B.C., and when Megasthenes was ambassador to the court of Chandragupta, 302 B.C., he noted the religious usages of the middle Ganges valley. The early Christian Fathers recorded many a valuable observation of the Gentile faiths around them from varying points of view, sympathetic or hostile; and Eusebius and Epiphanius, in the 4th century a.d., attributed to the librarian of Ptolemy Philadelphus the design of collecting the sacred books of the Ethiopians, Indians, Persians, Elamites, Babylonians, Assyrians, Romans, Phoenicians, Syrians and Greeks. The Mahommedan Blruni (b. a.d. 973) compared the doctrines of the Greeks, Christians, Jews, Manichaeans and Sufis with the philosophies and reli- gions of India. Akbar (1 542-1605) gathered Brahmans and Zoroastrians, Jews, Christians and Mahommedans at his court, and endeavoured to get translations of their scriptures. In the next century the Persian author of the Dabistan exhibited the doctrines of no less than twelve religions and their various sects. Meanwhile the scholars of the West had begun to work. Thomas Hyde (1636-1703) studied the religion of the ancient Persians; John Spencer (1630-1693) analysed the laws of the Hebrews; and Lord Herbert of Cherbury (De Religione Gentilium, 1645) endeavoured to trace all religions back to five ” truly Catholic truths ” of primitive faith, the first being the existence of God. The doctrine of a primeval revelation survived in various forms for two centuries, and appeared as late as the Juventus Mundi of W. E. Gladstone (1868, p. 207 ff.). David Hume, on the other hand, based his essay on The Natural History of Religion (1757) on the conception of the development of human society from rude beginnings, and all modern study is frankly founded on the general idea of Evolution. 1

The materials at Hume's command, however, were destined to vast and speedy expansion. The Jesuit missionaries had already been at work in India and China, and a brilliant band of English students, led by Sir William Jones and H. T. Colebrooke, began to make known the treasures of Sanskrit literature, which the great scholars of Germany and France proceeded to develop. In Egypt the discovery of the Rosetta stone placed the key to the hieroglyphics within Western reach; and the decipherment of the cuneiform character enabled the patient scholars of Europe to recover the clues to the contents of the ancient libraries of Babylonia and Assyria. With the aid of inscriptions the cults of Greece and Rome have been largely reconstructed. Travellers and missionaries reported the beliefs and usages of uncivilized tribes in every part of the world, with the result that " ethnography knows no race devoid of religion, but only differences in the degree to which religious ideas have developed " (Ratzel, History of Mankind, i. 40). Meanwhile philosophy was at work on the problem of the religious consciousness. The great series of German thinkers, Lessing, Herder, Kant, Hegel, Fichte, Schleiermacher and their

1 This does not, of course, preclude the possibility of degeneration in particular instances.

successors, sought to explain religion by means of the phenomena of mind, and to track it to its roots in the processes of thought and feeling. While ethnography was gathering up the facts from every part of the globe, psychology began to analyse the forms of belief, of action and emotion, to discover if possiole the key to the multitudinous variety which history revealed. From the historical and linguistic side attention was first fixed upon the myth, and the publication of the ancient hymns of the Rig Veda led Max Miiller to seek in the common elements of Aryan thought for the secrets of primitive religion (essay on Comparative Mythology, 1856). The phenomena of day and night, of sunshine and storm, and other aspects of nature, were invoked by different interpreters to explain the conceptions of the gods, their origins and their relations. Fresh materials were gathered at the same time out of European folk-lore; the work begun by the brothers Grimm was continued by J. W. E. Mannhardt, and a lower stratum of beliefs and rites began to emerge into view beneath the poetic forms of the more developed mythologies. By such preliminary labours the way was prepared for the new science of anthropology.

Since the appearance of Dr E. B. Tylor's classical treatise on Primitive Culture (1871), the study of the origins of religion has been pursued with the utmost zeal. Comte had already described the primitive form of the religious consciousness as that in which man conceives of all external bodies as animated by a life analogous to his own (Philos. Positive, tome v., 1841, p. 30). This has been since designated as polyzoism or panthelism or panvilalism? and represents the obscure undifferentiated groundwork out of which Tylor's Animism arises. Many are the clues by which it has been sought to explain the secret of primitive religion. Hegel, before the anthropological stage, found it in magic. Max Miiller, building on philosophy and mythology, affirmed that " Religion consists in the perception of the infinite under such manifestations as are able to influence the moral character of man " (Natural Religion, 1899, p. 188). Herbert Spencer derived all religion from the worship of the dead (Principles of Sociology, i.), like Grant Allen, and Lippert in Germany. Mr Andrew Lang, on the other hand, supposes that belief in a supreme being came first in order of evolution, but was afterwards thrust into the background by belief in ghosts and lesser divinities (Magic and Religion, 1901, p. 224). 3 Dr' Jevons finds the primitive form in totemism (Introd. to the History of Religion, 1896, chap. ix.). Mr J. G. Frazer regards religion (see his definition quoted below) as superposed on an antecedent stage of magic. In The Tree of Life (1905), MrE. Crawley interprets it by the vital instinct, and connects its first manifestations with the processes of the organic life. The veteran Wilhelm Wundt (Mythus und Religion, ii. 1906, p. 177) recurs to the primitive conceptions of the soul as the source of all subsequent development. The origin of religion, however, can never be determined archaeologically or historically; it must be sought conjecturally through psychology. (J. E. C.)

A. Primitive Religion

There is a point at which the History of Religion becomes in its predominant aspect a History of Religions. The conditions that we describe by the comprehensive term " civilization " occasion a specification and corresponding differentiation of the life of societies; whence there result competing types of culture, each instinct with the spirit of propagandism and, one might almost say, of empire. It is an age of conscious selection as between ideal systems. Instead of necessitating a wasteful and precarious elimination of inadequate customs by the actual destruction of those who practise them — this being the method of natural selection, which, like some Spanish Inquisition, abolishes the heresy by wiping out the heretics one and all — progress now becomes possible along the more direct and less

2 Comte's own term " fetishism " was most unfortunately mis- leading (see Fetishism). Marett proposed the term " Animatism," Folk Lore (1900), xi. p. 171.

- See his treatise on The Making of Religion (1898), and Hartland's article on " The ' High Gods ' of Australia," Folk Lore (1898), ix. P- 290.

painful path of conversion. The heretic, having developed powers of rational choice, perceives his heresy, to wit, his want of adaptation to the moral environment, and turning round embraces the new faith that is the passport to survival.

Far otherwise is it with man at the stage of savagery — the stage of petty groups pursuing a self-centred life of inveterate custom, in an isolation almost as complete as if they were marooned on separate atolls of the ocean. Progress, or at all events change, does indeed take place, though very slowly, since the most primitive savage we know of has his portion of human intelligence, looks after and before, nay, in regard to the pressing needs of every day shows a quite remarkable shrewdness and resource. Speaking generally, however, we must pronounce him unprogressive, since, on the whole, unreflective in regard to his ends. It is the price that must be paid for social discreteness and incoherency. And the consequence of this atomism is not what a careless thinker might be led to assume, extreme diversity, but, on the contrary, extreme homogeneity of culture. It has been found unworkable, for instance, to classify the religions of really primitive peoples under a plurality of heads, as becomes necessary the moment that the presence of a dis- tinctive basis of linked ideas testifies to the individuality of this or that type of higher creed. Primitive religions are like so many similar beads on a string; and the concern of the student of comparative religion is at this stage mainly with the nature of the string, to wit, the common conditions of soul and society that make, say, totemism, or taboo, very much the same thing all the savage world over, when we seek to penetrate to its essence.

This fundamental homogeneity of primitive culture, however, must not be made the excuse for a treatment at the hands of psychology

and sociology that dispenses with the study of details and trusts to an a priori method. By all means let universal characterization be attempted — we are about to attempt one here, though well aware of the difficulty in the present state of our knowledge — but they must at least model themselves on the composite photograph rather than the impressionist sketch. An enormous mass of material, mostly quite in the raw, awaits reduction to order on the part of anthropological theorists, as yet a small and ill-supported body of enthusiasts. Under these circumstances it would be premature to expect agreement as to results. In regard to method, however, there is little difference of opinion. Thus, whereas the popular writer abounds in wide generalizations on the subject of primitive humanity, the expert has hitherto for the most part deliberately restricted himself to departmental investigations. Religion, for example, seems altogether too vast a theme for him to embark on, and he usually prefers to deal with some single element or aspect. Again, origins attract the litterateur; he revels in describing the transition from the pre-religious to the religious era. But the expert, confining his attention to the known savage, finds him already religious, nay, encumbered with religious survivals of all kinds; for him, then, it suffices to describe things as they now are, or as they were in the comparatively recent fore-time. Lastly, there are many who, being competent in some other branch of science, but having small acquaintance with the scientific study of human culture, are inclined to explain primitive ideas and institutions from without, namely by reference to various external conditions of the mental life of peoples, such as race, climate, food-supply and so on. The anthropological expert, on the other hand, insists on making the primitive point of view itself the be-all and end-all of his investi- gations. The inwardness of savage religion — the meaning it has for those who practise it — constitutes its essence and meaning likewise for him, who after all is a man and a brother, not one who stands really outside.

In what follows, then, we shall, indeed, venture to present a wholesale appreciation of the religious idea as it is for primitive man in general; but our account will respect the modern anthropological method that bids the student keep closely to the actualities of the religious experience of savages, as it can with reasonable accuracy be gathered from what they do and say.

We have sought to render onlv the spirit of primitive religion, keeping clear both of technicalities and of departmental investi- gations. These are left to the separate articles bearing on the subject. There the reader will find the most solid results of recent anthropological research. Here is he merely offered a flimsy thread that, we hope, may

guide him through the maze of facts, but alas! is only too likely to break off short in his hand. Definition of Primitive Religion.— In dealing with a develop- ment of culture that has no immutable essence, but is intrinsically fluid and changing, definition must consist either in a definition of type, which indicates prevalence of relevant resemblance as between specimens more or less divergent, or in exterior defini- tion, which delimits the field of inquiry by laying down within what extreme limits this divergence holds. Amongst the numberless definitions of religion that have been suggested, those that have been most frequently adopted for working purposes by anthropologists are Tylor's and Frazer's. Dr E. B. Tylor in Primitive Culture (1), i. 424, proposes as a " minimum definition" of religion " the belief in spiritual beings." Objec- tions to this definition on the score of incompleteness are, firstly, that, besides belief, practice must be reckoned with (since, as Dr W. Robertson Smith has made clear in his Lectures on the Religion of the Semites, 18 sqq., ritual is in fact primary for primitive religion, whilst dogma and myth are secondary); secondly, that the outlook of such belief and practice is not exclusively towards the spiritual, unless this term be widened until it mean next to nothing, but is likewise towards the quasi- material, as will be shown presently. The merit of this defini- tion, on the other hand, lies in its bilateral form, which calls attention to the need of characterizing both the religious attitude and the religious object to which the former has refer- ence. The same form appears in Dr J. G. Frazer's definition in The Golden Bough (2nd ed.), i. 63. He understands by religion " a propitiation or conciliation of powers superior to man which are believed to direct and control the course of nature and of human life." He goes on to explain that by " powers" he means " conscious or personal agents." It is also to be noted that he is here definitely opposing religion to magic, which he holds to be based on the (implicit) assumption " that the course of nature is determined, not by the passions or caprice of personal beings, but by the operation of immutable laws acting mechani- cally." His definition improves on Tylor's in so far as it makes worship integral to the religious attitude. By regarding the object of religion as necessarily personal, however, he is led to exclude much that the primitive man undoubtedly treats with awe and respect as exerting a mystic effect on his life. Further, in maintaining that the powers recognized by religion are always superior to man, he leaves unclassed a host of practices that display a bargaining, or even a hectoring, spirit on the part of those addressing them (see Prayer). Threatening or beating a fetish cannot be brought under the head of magic, even if we adopt Frazer's principle {op. cit. i. 64) that to constrain or coerce a personal being is to treat him as an inanimate agent; for such a principle is quite inapplicable to cases of

mere terrorism, whilst it may be doubted if it even renders the sense of the savage magician's typical notion of his modus operandi, viz. as the bringing to bear of a greater mana or psychic influence (see below) on what has less, and must therefore do as it is bidden. Such definitions, then, are to be accepted, if at all, as definitions of type, selective designations of leading but not strictly universal features. An encyclopaedic account, however, should rest rather on an exterior definition which can serve as it were to pigeon-hole the whole mass of significant facts. Such an exterior definition is suggested by Mr E. Crawley in The Tree of Life, 209, where he points out that " neither the Greek nor the Latin language has any comprehensive term for religion, except in the one iepci, and in the other sacra, words which are equivalent to 'sacred.' No other term covers the whole of religious phenomena, and a survey of the complex details of various worships results in showing that no other conception will comprise the whole body of religious facts." It may be added that we have here no generalization imported from a

higher level of culture, but an idea or blend of ideas familiar to primitive thought. An important consequence of thus giving the study of primitive religion the wide scope of a comparative hierology is that magic is no longei divorced f 1 om religion, since the sacred will now be found to be coextensive with the magico- religious, that largely undifferentiated plasm out of which religion and magic slowly take separate shape as society comes more and more to contrast legitimate with illicit modes of dealing with the sacred.- We may define, then, the religious object as the sacred, and the corresponding religious attitude as con- sisting in such manifestation of feeling, thought and action in regard to the sacred as is held to conduce to the welfare of the community or to that of individuals considered as members of the community.

Aspects of the Nature of the Sacred. — To exhibit the general character of the sacred as it exists for primitive religion it is simplest to take stock of various aspects recognized by primitive thought as expressed in language. If some, and not the least essential, of these aspects are quasi-negative, it must be remembered that negations — witness the Unseen, the Unknown, the Infinite of a more advanced theology — are well adapted to supply that mystery on which the

religious consciousness feeds with the slight basis of conceptual support it needs, (i) The sacred as the forbidden. The primitive notion that perhaps comes nearest to our ” s?.cred,” whilst it immediately underlies the meanings of the Latin sacer and sanctus, is that of a taboo, a Polynesian term for which equiva- lents can be quoted from most savage vocabularies. The root idea seems to be that something is marked off as to be shunned, with the added hint of a mystic sanction or penalty enforcing the avoidance. Two derivative senses of a more positive import call for special notice. On the one hand, since that which is tabooed is held to punish the taboo-breaker by a sort of mystic infection, taboo comes to stand for un- cleanness and sin. On the other hand, since the isolation of the sacred, even when originally conceived in the interest of the profane, may be interpreted as self-protection on the part of the sacred as against defiling contact, taboo takes on the connotation of ascetic virtue, purity, devotion, dignity and blessedness. Primary and secondary senses of the term between them cover so much ground that it is not surprising to find taboo used in Polynesia as a name for the whole system of religion, founded as it largely is on prohibitions and abstin- ences. (2) The sacred as the mysterious. Another quasi- negative notion of more restricted distribution is that of the mysterious or strange, as we have it expressed, for example, in the Siouan wakan, though possibly this is a derivative meaning. Meanwhile, it is certain that what is strange, new or por- tentous is regularly treated by all savages as sacred. (3) The sacred as the ‘secret. The literal sense of the term churinga, applied by the Central Australians to their sacred objects, and likewise used more abstractly to denote mystic power, as when a man is said to be ” full, of churinga,” is ” secret,” and is symptomatic of the esotericism that is a striking mark of Australian, and indeed of all primitive, religion, with its insistence on initiation, its exclusion of women, and its strictly enforced reticence concerning traditional lore and proceedings. (4) The sacred as the potent. Passing on to positive conceptions of the sacred, perhaps the most fundamental is that which identifies the efficacy of sacredness with such mystic or magical power as is signified by the mana of the Pacific or orenda of the Hurons, terms for which analogies are forthcoming on all sides. Of mana Dr R. H. Codrington in The Melanesians, 119 «., writes: “It essentially belongs to personal beings to originate it, though it may act through the medium of water, or a stone, or a bone. All Melanesian religion consists . . . in getting this mana for oneself, or getting it used for one’s benefit.” E. Tregear’s Maori- Polynesian Comparative Dic- tionary shows how the word and its derivatives are used to express thought, memory, emotion, desire, will — in short, psychic energy of all kinds. It also stands for the vehicle of the magician’s energy — the

spell; which would seem like-

wise to be a meaning, perhaps the root-meaning, of orenda (cf. J. N. B. Hewitt, American Anthropologist, N.S., iv. 40). Whereas everything, perhaps, has some share of indwelling potency, whatever is sacred manifests this potency in an extra- ordinary degree, as typically the wonder-working leader of society, whose mana consists in his cunning and luck together. Altogether, in mana we have what is par excellence the primitive religious idea in its positive aspect, taboo representing its negative side, since whatever has mana is taboo, and what- ever, is taboo has mana. (5) The sacred as the animate. The term ” animism,” which embodies Tylor’s classical theory of primitive religion, is unfortunately somewhat ambiguous. If we take it strictly to mean the belief in ghosts or spirits having the ” vaporous materiality ” proper to the objects of dream or hallucination, it is certain that the agency of such phantasms is not the sole cause to which all mystic happenings are referred (though ghosts and spirits are everywhere believed in, and appear to be endowed with greater predominance as religious synthesis advances amongst primitive peoples). Thus there is good evidence to show that many of the early gods, notably those that are held to be especially well disposed to man, are conceived rather in the shape of magnified non- natural men dwelling somewhere apart, such as the Mungan- ngaur of the Kurnai of S.E. Australia (cf. A. Lang, The Making of Religion 2 , x. sqq.). Such anthropomorphism is with difficulty reduced to the Tylorian animism. The term, however, will have to- be used still more vaguely, if it is to cover all attribution of personality, will or vitality. This can be more simply brought under the notion of mana. Mean- while, since quasi-mechanical means are freely resorted to in dealing with the sacred, as when a Maori chief snuffs up the sanctity his fingers have acquired by touching his own sacred head that he may restore the virtue to the part whence it was taken (R. Taylor, Te Ika a Maui, 165), or when un- cleanness is removed as if it were a physical secretion by washing, wiping and so forth, it is hard to say whether what we should now call a ” material ” nature is not ascribed to the sacred, more especially when its transmissibility after the manner of a contagion is the trait that holds the attention. It is possible, however, that the savage always distinguishes in a dim way between the material medium and the indwelling principle of vital energy, examples of a pure fetishism, in the sense of the cult of the purely material, recognized as such, being hard to find. (6) The sacred as the ancient. The prominence of the notion of the Alcheringa ” dreamtime,” or sacred past, in Central Australian religion illustrates the essential con- nexion perceived by the savage to lie between the sacred and the traditional. Ritualistic

conservatism may be instanced as a practical outcome of this feeling. Another development is ancestor-worship, the organized cult of ancestors marking, however, a certain stage of advance beyond the very primitive, though the dead are always sacred and have mana which the living may exploit for their own advantage.

The Activity of the Sacred. — The foregoing views of the sacred, though starting from distinct conceptions, converge in a single complex notion, as may be seen from the many-sided sense borne by such a term as wakan, which may stand not only for ” mystery,” but also for ” power, sacred, ancient, grandeur, animate, immortal ” (W J McGee, 15th Report of U. S. Bureau of Ethnology, 182). The reason for this convergence is that, whereas there is found great difficulty in characterizing the elusive nature of (the sacred, its mode of manifesting itself is recognized to be much the same in all its phases. Uniform characteristics are the fecundity, ambiguity, relativity and transmissibility of its activity. (1) Fecundity. The mystic potency of the sacred is no fixed quantity, but is big with possibilities of all sorts. The same sacred person, object, act, will suffice for a variety of purposes. Even where a piece of sympathetic magic appears to promise definite results, or when a departmental god is recognized, there would seem to be room left for a more or less indefinite expectancy. It must be re- membered that the meaning of a rite is for the most, part obscure

to the participants, being overlaid by its traditional character, which but guarantees a general efficacy. ” Blessings come, evils go,” may be said to be. the magico-religious formula implicit in all socially approved dealings with the sacred, however specialized in semblance. (2) Ambiguity. Mystic potency, however, because of the very indefiniteness of its action, is a two-edged sword. The sacred is not to be approached lightly. -It will heal or blast, according as it is handled with or without due circumspection. That which is taboo, for instance, the person of the king, or woman’s blood, is poison or medicine according as it is manipulated, being inherently just a potentiality for wonder-working in any direction. Not but what primitive thought shows a tendency to mark off a certain kind of mystic power as wholly bad by a special name, e.g. the arungquiltha of Central Australia; and here, we may note, we come nearest to a conception of magic as

something other than religion, the trafficker in arungquiltha being socially suspect, nay, liable to persecution, and even death (as amongst the Arunta tribe, see Spencer and Gillen, Native Tribes of C. Australia, 536), at the hands of his fellows. On the other hand, wholly beneficent powers seem hardly to be recognized, unless we find them in beings such as Mungan-ngaur (" father-our"), who derive an ethical character from their association with the initiation cere- monies and the moral instruction given thereat (cf. Lang, I.e.). (3) Relativity. So far we have tended to represent the activity of the sacred as that of a universal force, somewhat in the style of our " electricity" or " mind. " It remains to add that this activity manifests itself at numberless independent centres. These differ amongst themselves in the degree of their energy. One spell is stronger than another, one taboo more inviolable than another. Dr W. H. R. Rivers (The Todas, 448) gives an interest- ing analysis of the grades of sanctity apparent in Toda religion. The gods of the hill-tops come first. The sacred buffaloes, their milk, their bells, the dairies and their vessels are on a lower plane; whilst we may note that there are several grades amongst the dairies, increase of sanctity going with elaboration of dairy ritual (cf. ibid. 232). Still lower is the dairyman, who is in no way divine, yet has sanctity as one who maintains a condition of ceremonial purity. (4) Transmissibility. If, however, this activity originates at certain centres, it tends to spread therefrom in all directions. Dr F. B. Jevons (in An Introduction to the History of Religion, vii.) distinguishes between " things taboo," which have the mystic contagion inherent in them, and " things tabooed," to which the taboo-infection has been transmitted. In the former class he places supernatural beings (including men with mana as well as ghosts and spirits), blood, new-born children with their mothers, and corpses; which list might be considerably extended, for instance, by the inclusion of natural portents, and animals and plants such as are strikingly odd, dangerous or useful. Any one of these can pass on its sacred quality to other persons and objects (as a corpse defiles the mourner and his- clothes), nay to actions, places and times as well (as a corpse will likewise cause work to be tabooed, ground to be set apart, a holy season to be observed). Such transmissibility is commonly explained by the association of ideas, that becoming sacred which as it were reminds one of the sacred; though it is important to add, firstly, that such association takes place under the influence of a selective interest generated by strong religious feeling, and, secondly, that this interest is primarily a collective product, being governed by a social tradition which causes certain possibilities of ideal com- bination alone to be realized, whilst it is the chief guarantee of the objectivity of what they suggest.

The Exploitation of the Sacred. A. Methods. — It is hard to find terms general enough to cover dealings with the sacred that range from the manipulation of an almost inanimate type of power to intercourse modelled on that between man and man. Primitive religion, however, resorts to either way of approach so indifferently as to prove that there is little or no awareness of an inconsistency of attitude. The radical contrast between mechanical and spiritual religion, though fundamental for modern theology, is alien to the primitive point of view, and is xxni. 3

therefore inappropriate to the purposes of anthropological description. (1) Acquisition. Mystic power may be regarded as innate so far as skill, luck or queerness are signs and con- ditions of its presence. On the whole, however, savage society tends to regard it as something acquired, the product of acts and abstinences having a traditional character for imparting magico- religious virtue. An external symbol in the shape of a ceremony or cult-object is of great assistance to the dim eye of primitive faith. Again, the savage universe is no preserve of man, but is an open field wherein human and non-human activities of all sorts compete on more or less equal terms, yet so that a certain measure of predominance may be secured by a judicious combination of forces. (2) Concentration. Hence the magico- religious society or individual practitioner piles ceremony on ceremony, name of power on name of power, relic on relic, to consolidate the forces within reach and assume direction thereof. The transmissibility of the sacred ensures the fusion of powers drawn from all sources, however disparate. (3) Induction. It is necessary, however, as it were to bring this force to a head. This would appear to be the essential significance of sacrifice, where a number of sacred operations and instruments are made to discharge their efficacy into the victim as into a vat, so that a blessing-yielding, evil-neutralizing force of highest attainable potency is obtained (see H. Hubert and M. Mauss, ” Essai sur la nature et la fonction du sacrifice” in L’Annee sociologique, ii.). (4) Renovation. An important motif in magico-religious ritual, which may not have been without effect on the development of sacrifice, is, as Dr Frazer’s main thesis in The Golden Bough asserts, the imparting of reproductive energy to animals, plants and man himself, its cessation being suggested by such phenomena as old age and the fall of the year. To concentrate, induce and renovate are, however, but aspects of one process of acquisition by the transfusion of a transmissible energy. (5) Demission. Hubert and Mauss show in their penetrating analysis of sacrifice that after the rite has been brought to its culminating point there follows as a pendant a ceremony of re-entry into ordinary life, the idea of which is preserved in the Christian formula Ite, missa est.

(6) Insulation. Such deposition of sacredness is but an aspect of the wider method that causes a ring-fence to be erected round the sacred to ward off casual trespassers at once in their own interest and to prevent contamination. We see here a natural outcome of religious awe supported by the spirit of esotericism, and by a sense of the need for an expert handling of that which is so potent for good or ill. (7) Direction. This last consideration brings to notice the fact that throughout magico-religious practice of all kinds the human operator retains a certain control over the issue. In the numberless transitions that, whilst connecting, separate the spell and the prayer we observe as the accompaniment of every mood from extreme imperiousness to extreme humility an abiding will and desire to help the action out. Even ” Thy will be done ” preserves the echo of a direction, and, needless to say, this is hardly a form of primitive address. At the bottom is the vague feeling that it is man’s own self-directed mysterious energy that is at work, however much it needs to be reinforced from without. Meanwhile, tradition strictly prescribes the ways and means of such reinforcement, so that religion becomes largely a matter of sacred lore; and the expert director of rites, who is likewise usually at this stage the leader of society, comes more and more to be needed as an intermediary between the lay portion of the community and the. sacred powers.

B. Results. — Hitherto our account of primitive religion has had to move on somewhat abstract lines. ‘ His religion is, however, anything but an abstraction to the savage, and stands rather for the whole of his concrete life so far as it is penetrated by a spirit of earnest endeavour. The end and result of primitive religion is, in a word, the consecration of life, the stimulation of the will to live and to do. This bracing of the vital feeling takes place by means of imaginative appeal to the great forces man perceives stirring within him and about him, such appeal proving effective doubtless by reason of the psychological law that to conceive strongly is

to imitate. Meanwhile, that there shall be no clashing of conceptions to inhibit the tendency of the idea of an acquired ” grace ” to realize itself in action, is secured by the complete unanimity of public opinion, dominated as it is by an inveterate custom. To appreciate the consecrating effect of religion on primitive life we have only to look to

the churinga-v/orship of the Central Australians (as described by Spencer and Gillen in The Native Tribes of Central Australia and The Northern Tribes of Central Australia). Contact with these repositories of mystic influence “makes them glad” (Nat. Tr. 165); it likewise makes them ” good,” so that they are no longer greedy or selfish (North. Tr. 266); it endows them with second sight (ibid.) ; it gives them confidence and success in war (Nat. Tr. 135) ; in fact, there is no end to its “strengthening” effects (ibid. «.). Or, again, we may note the earnestness and solemnity that characterize all their sacred ceremonies. The inwardness of primitive religion is, however, non-existent for those who observe it as uninitiated strangers; whilst, again, it evaporates as soon as native custom breaks down under pressure of civilization, when only fragments of meaningless superstition survive: wherefore do travesties of primitive religion abound.

It remains to consider shortly the consecration of life in relation to particular categories and departments. (1) Educa- tion. Almost every tribe has its initiation ceremonies, and in many tribes adult life may almost be described as a continuous initiation. The object of these rites is primarily to impart mystic virtue to the novice, such virtue, in the eyes of the primitive man, being always something more than social use- fulness, amounting as it does to a share in the tribal luck by means of association with all it holds sacred. Incidentally the candidate is trained to perform his duties as a tribesman, but religion presides over the course, demanding earnest endeavour of an impressionable age. (2) Government. Where society is most primitive it is most democratic, as in Australia, and magico-religious powers are possessed by the whole body of fully initiated males, age, however, conferring increase of sacred lore and consequently of authority; whilst even at this stage the experts tend to form an inner circle of rulers. The man with man a is bound to come to the top, both because his gifts give him a start and because his success is taken as a sign that he has the gift. A decisive ” moment ” in the evolu- tion of chief ship is the recognition of hereditary mana, bound up as this is with the handing on of ceremonies and cult-objects. Invested, as society grows more complex, with a sanctity in- creasingly superior to that of the layman, the priest-king becomes the representative of the community as repository of its luck, whilst, as controller of all sacred forces that bear thereon, he is, as Dr Frazer puts it, ” dynamical centre of the universe” (The Golden Bough (2nd ed.), i. 233). Only when the holy man’s duty to preserve his holiness binds him hand and foot in a network of taboos does his temporal power tend to devolve on a deputy. (3) Food-supply. In accordance with the principle of

Renovation (see above), the root-idea of the appli- cation of religion to economics is not the extorting of boons from an unwilling nature, but rather the stimulation of the sources of life, so that all beings alike may increase and multiply. (4) Food-taking. Meanwhile, the primitive meal is always more or less of a sacrament, and there are many food-taboos, the significance of which is, however, not so much that certain foods are unclean and poisonous as that they are of special virtue and must be partaken of solemnly and with circum- spection. (5) Kinship. It is hard to say whether the unit of primitive society is the tribe or the group of kinsmen. Both are forms of union that are consolidated by means of religious usages. Thus in Australia the initiation ceremonies, concerned as they partly are with marriage, always an affair between the kin-groups, are tribal, whilst the totemic rites are the prime concern of the members of the totem clans. The significance of a common name and a common blood is immensely enhanced by its association with mystic rights and duties, and the pulse of brotherhood beats faster. (6) The Family. Side by side with the kin there is always found the domestic group, but

the latter institution develops fully only as the former weakens, so that the one comes largely to inherit the functions of the other, whilst the tribe too in its. turn hands over certain interests. Thus in process of time birth-rites, marriage-rites, funeral- rites, not to mention subordinate ceremonies such as those of name-giving and food-taking, become domestic sacraments. (7) Sex. Woman, for certain physiological reasons, is always for primitive peoples hedged round with sanctity, whilst man does all he can to inspire awe of his powers in woman by keep- ing religion largely in his own hands. The result, so far as woman is concerned, is that, in company with those males who are endowed with sacredness in a more than ordinary degree, she tends as a sex to lose in freedom as much as she gains in respect. (8) Personality. Every one has his modicum of innate mana, or at least may develop it in himself by com- municating with powers that can be brought into answering relation by the proper means. Nagualism, or the acquisition of a mystic guardian, is a widely distributed custom, the essence of which probably consists in the procuring of a personal name having potency. The exceptional man is recognized as having mana in a special degree, and a belief thus held at once by others and by himself is bound to stimulate his individuality. The primitive community is not so custom-bound that per- sonality has no chance to make itself felt, and the leader of men possessed of an inner fund of inspiration is the wonder- worker who encourages all forms of social advance.

Psychology of the Primitive Attitude towards the Sacred. — We are on

firmer ground when simply describing the phenomena of primitive religion than when seeking to account for these in terms of natural law — in whatever sense the conception of natural law be applicable to the facts of the mental life of man. One thing is certain, namely, that savages stand on virtually one footing with the civilized as regards the type of explanation appropriate to their beliefs and practices. We have no right to refer to “instincts” in the case of primitive man, any more at any rate than we have in our own case. A child of civilized parents brought up from the first amongst savages is a savage, neither more nor less. Though race may count for something in the matter of mental endowment — and at least it would seem to involve differences in weight of brain — it clearly counts for much less than does milieu, to wit, that social environment of ideas and institutions which depends so largely for its effectiveness on mechanical means of tradition, such as the art of writing. The outstanding feature of the mental life of savages known to psychologists as ” primitive credulity ” is doubtless chiefly due to sheer want of diversity of suggestiveness in their intellectual surroundings. Their notions stick fast because there are no competing notions to dislodge them. Society suffers a sort of perpetual obsession, and remains self-hypnotized as it were within a magic circle of traditional views. A rigid orthodoxy is sustained by means of purblind imitation assisted by no little persecution. Such changes as occur come about, not in conse- quence of a new direction taken by conscious policy, but rather in the way that fashions in dress alter amongst ourselves, by subconscious, hardly purposive drifting. The crowd rather than the individual is the thinking unit. A proof is the mysterious rapid extinction of savages the moment that their group-life is broken up; they are individually so many lost sheep, without self-reliance or initiative. And the thinking power of a crowd — that is, a mob, not a deliberative assembly — is of a very low order, emotion of a ” panicky ” type driving it hither and thither like a rudderless ship. However, as the students of mob-psychology have shown, every crowd tends to have its meneur, its mob-leader, the man who sets the cheering or starts the running-away. So too, then, with the primitive society. Grossly ignorant of all that fails outside ” the daily round, the common task,” they are full of panicky fears in regard to this unknown, and the primary attitude of society towards it is sheer avoidance, taboo. But the mysterious has another face. To the mob the mob-leader is mysterious in his power of bringing luck and salvation; to himself also he is a wonder, since he wills, and lo ! things happen accordingly. He has

mana, power, and by means of this mana, felt inwardly by himself, acknowledged by his fellows, he stems the social impulse to run away from a mystery. Not without nervous dread- witness the special taboo to which the leader of society is subject — he draws near and strives to constrain, conciliate or cajole the awful forces with which the life of the group is set about. He enters the Holy of Holies; the rest remain without, and are more than half afraid of their mediator. In short, from the standpoint of lay society, the manipulator of the sacred is himself sacred, and shares in all the associations of sacred- ness. An anthropomorphism which is specifically a ” mago- morphism ” renders the sacred powers increasingly one with the governing element in society, and religion assumes an ethico- political character, whilst correspondingly authority and law are invested with a deeper meaning.

The Abuse of the Sacred. — Lest our picture of primitive religion appear too brightly coloured, a word must be said on the perversions to which the exploitation of the sacred is liable. Envy, malice and uncharitableness are found in primitive society, as elsewhere, and in their behoof the mystic forces are not unfrequently unloosed by those who know how to do so. To use the sacred to the detriment of the community, as does, for instance, the expert who casts a spell, or utters a prayer, to his neighbour’s hurt, is what primitive society understands by magic (cf. arungquiltha, above), and anthropology has no business to attach any other meaning to the word if it under- takes to interpret the primitive point of view. On the other hand, if those in authority perpetrate in the name of what their society holds sacred, and therefore with its full approval, acts that to the modern mind are cruel, silly or revolting, it is bad science and bad ethics to speak of vice and degradation, unless it can be shown that the community in which these things occur is thereby brought nearer to elimination in the struggle for existence. As a matter of fact, the earlier and more demo- cratic types of primitive society, uncontaminated by our civilization, do not present many features to which the modern conscience can take exception, but display rather the edifying spectacle of religious brotherhoods encouraging themselves by mystical communion to common effort. With the evolution of rank, however, and the concentration of magico-religious power in the hands of certain orders, there is less solidarity and more individualism, or at all events more opportunity for sectional interests to be pursued at other than critical times; whereupon fraud and

violence are apt to infect religion. Indeed, as the history of the higher religions shows, religion tends in the end to break away from secular government with its aristocratic traditions, and to revert to the more democratic spirit of the primitive age, having by now obtained a clearer consciousness of its purpose, yet nevertheless clinging to the inveterate forms of human ritual as still adequate to symbolize the consecration of life — the quickening of the will to face life earnestly.

Bibliography. — The number of works dealing with primitive religion is endless. The English reader who is more or less new to the subject is recommended to begin with E. B. Tylor, Primitive Culture (4th ed., Lond. 1903), and then to proceed to J. G. Frazer, The Golden Bough (2nd ed., Lond. 1900). The latter author's Lectures on the Early History of the Kingship (Lond. 1905) may also be consulted. Only second in importance to the above are VV. Robertson Smith, Lectures on the Religion of the Semites (2nd ed., Lond. 1904); A. Lang, Myth, Ritual and Religion (2nd ed., Lond. 1899), and Magic and Religion (Lond. 1902); E. S. Hartland, The Legend of Perseus (Lond. 1 894-1 896) ; F. B. Jevons, An Introduction to the History of Religion (2nd ed., 1902); E. Crawley, The Mystic Rose (Lond. 1902), and The Tree of Life (Lond. 1905). The two last- mentioned works perhaps most nearly represent the views taken in the text, which are also developed by the present writer in " Pre- Animistic Religion," Folk-Lore xi. (1900), " From Spell to Prayer," Folk-Lore, xv. (1904), and " Is Taboo a Negative Magic?" Anthropo- logical Essays presented to E. B. Tylor (1907); L. R. Farnell, The Evolution of Religion (1905), follows similar lines. The present writer owes something to Goblet d'Alviella, Ilibberl Lectures (Lond. 1891), and more to H. Hubert and M. Mauss, " Essai sur la nature et la fonction du sacrifice," L'Annee sociologique, ii. ; and " Esquisse d'une theone g£n6rale de la magie," ibid. vii. If the reader wish to keep pace with the output of literature on this vast subject, he will find L' Annie sociologique (1896 onwards) a wonderfully complete bibliographical guide.

Side by side with works of general theory, first-hand authorities should be freely used. To make a selection from these is not easy, but the following at least are very important: R. H. Codrington, The Melanesians (Oxford, 1891); W. B. Spencer and F. J. Gillen, The Native Tribes of Central Australia (Lond. 1899); The Northern Tribes of Central Australia (Lond. 1904); A. W. Howitt, The Native Tribes of South-Eastern Australia (Lond. 19:34); A. C. Haddon, Reports of the Cambridge Anthropological Expedition to Torres Straits (Cambridge, 1904, vol. v.) ; A. B. Ellis, The Tshi-Speaking Peoples of the Gold Coast (Lond. 1897); The Ewe-Speaking Peoples cf the Slave Coast (Lond. 1890); The Yoruba-Speaking Peoples cf the Slave Coast (Lond.

1894) ; Miss M. H. Kingsley, Travels in West Africa (Lond. 1898), and West African Studies (Lond. 1899); A. C. Hollis, The Masai (1905); W. Crooke, The North-West Pro- vinces of India (Lond. 1897); W. H. R. Rivers, The Todas (1906). An immense amount of valuable evidence is to be obtained in the Reports of the Bureau of Ethnology, Smithsonian Institution, Wash- ington. See Nos. 2, 5, 6, 7, 8, 9, II, 13, 14, 15, 16, 18, 19, 21, 22, 23, and specially J. O. Dorsey, A Study of Siouan Cults, in No. 11 ; A. C. Fletcher, The Hako, in No. 22; and M. C. Stevenson, The ZuHi Indians, in No. 23. Though dealing primarily with a more advanced culture, J. J. M. de Groot, The Religious System of China (1892-1901), will be found to throw much light on primitive ideas. Finally let it be repeated that there is offered here no more than an introduc- tory course of standard authorities suitable for the English reader. (R. R. M.)

B. The Higher Religions

Various phenomena associated with the religions of the lower culture will be found discussed in the articles on Animism; Fetishism; Magic; Mythology; Prayer; Ritual; Sacrifice; and Totemism. In this article religions are treated from the point of view of morphology, and no attempt can be made in the allotted limits to connect them with the phases of ritual, sociological or ethical development. See the separate articles on each religious system, and the separate headings for different forms of ritual.

1. Developments of Animism. — Animism is not, indeed, itself a religion; it is rather a primitive kind of philosophy which provides the intellectual form for the interpretation alike of Man and of Nature. It implies that the first great step has been taken for distinguishing between the material objects — whether the conscious body, or the rocks, trees and animals — and the powers that act in or through them. The Zufiis of New Mexico, U.S.A., supposed ” the sun, moon and stars, the sky, earth and sea, in all their phenomena and elements, and all inanimate objects as well as plants, animals and men, to belong to one great system of all-conscious and interrelated life, in which the degrees of relationship seem to be deter- mined largely, if not wholly, by the degrees of resemblance.” 1 If the earliest conception is that of an obscure undifferentiated animation (panvitalism) , the analysis of the human person into body and spirit with the corresponding doctrine of ” object- souls ” (e.g. the tornait, or ” invisible rulers ” of every object among the Eskimo) 2 constitutes an’ important development. Matter is no longer animated or self-acting; it is subject to the will of an agent which can enter or quit it, perhaps at its own pleasure, perhaps at the compulsion of another. The transition has

usually been effected ages before the higher religions come into view; but it has left innumerable traces in language and custom. Thus the Vedic hymns, which ex- hibit the deposits of so many stages of thought, are founded ultimately on the conception of the animation of nature. The objects of the visible world are themselves mighty to hurt or help. The springs and rivers, the wind, the sun, fire, the Earth-Mother, the Sky-Father, are all active powers. The animals, domesticated or wild, like the horse or cow, the guardian dog, the bird of omen, naturally share the same life, and are approached with the same invocation. The sacred energy is also discerned in the ritual implements, in the stones for squeezing the soma-juice, and the sacrificial post to which animals were bound; nay, it was even recognized in fabricated products like the plough (the ” tearer ” or ” divider “), the

1 F. H. Cushing, on ” Zuni Fetiches ” in Second Annual Report of the Bureau of Ethnology, Washington, 1883, p. 9.

- Dr. Franz Boas, in the Sixth Annual Report of the Bureau of Ethnology, 1888, p. 591.

war-car, the drum, quiver, bow and axe. The Earth-Mother and Sky-Father are to be found again and again in religions, at various stages of development, as co-ordinating conceptions which comprehend the universe. 1 Sometimes one is more prominent, sometimes the other. In many cases the Sky has been already resolved into the visible firmament and its lord and owner, like the Yoruban Olorun or the Finnic Ukko. The consort of Ukko is Maan-emo, ” mother of the earth,” or maan emanta, ” mistress of the earth.” But the rare expression mdan-ema, ” Mother-earth,” still used in the ancient lays, 2 points to the older type of belief in the animation of the pro- ductive soil. So the Peruvians designated the Earth as Pacha- mama, ” mother of (all) things.” In Egypt the relation was curiously reversed; the earth-god Keb was the husband of Nut, the sky, represented sometimes as a woman, overarching the earth and supported on hands and feet, sometimes as a gigantic cow, upheld on the outstretched hands of Shu, the atmosphere. 3 When earth and sky were still unseparated, Shu thrust himself between them and raised Nut to the heights. So in the New Zealand myth, Rangi and Papa, Sky and Earth,,

who once clave together in the darkness, were rent asunder by the forest-god Tane-mahuta, who forced up the sky far above him. 4 The most elaborate presentment of this mode of thought is to be seen in the organized animism of the ancient state religion of China, where the supreme power is lodged in the living sky (Tien). 6 Tien was originally the actual firma- ment. In the Shi-King it is addressed in prayer as ” great arfd wide,” as ” vast and distant “; it is even ” blue ” (Pt. II. v. 6, 5). So it is the ancestor of all things; and Heaven and Earth are the father and mother of the world. From the imperial point of view the sky bore the name of_ Ti, ” ruler,” or Shang Ti, “supreme ruler” (emperor); and later com- mentators readily took advantage of this to discriminate between the visible expanse and the indwelling spirit, producing a kind of Theism. But the older conception still holds its own. ” Why ” (says Edkins, Religion in China, 95), ” they have been often asked, should you speak of those things which are dead matter, fashioned from nothing by the hand of God, as living beings? And why not? they have replied. The Sky pours down rain and sunshine; the Earth produces corn and grass. We see them in perpetual movement, and we therefore say that they are living.” Tien Ti, Fu Mu, ” Heaven and Earth, Father and Mother,” are conjoined in common speech, and are the supreme objects of imperial worship. The great altar to Heaven, round in shape like the circuit of the sky, and white as the symbol of the light principle (Yang), stands in the southern suburb of Peking in the direction of light and heat. The altar to the Earth is dark and square, on the north side of the city, the region of yin, the principle of cold and gloom. Associated with the Sky are tablets to the sun and moon, the seven stars of the Great Bear, the five planets, the twenty-eight constellations, and all the stars of heaven; tablets to clouds, rain, wind and thunder being placed next to that of the moon. With the Earth are grouped the tablets to the five lofty Mountains, the three Hills of perpetual peace and the four Seas, the five celebrated Mountains and the four great Rivers. 6 The ancient ritual (Chow Li) carefully graded the right of sacrifice from the viceroys of provinces down to the humblest district-superintendent who offered to the spirits of his district, the hills, lakes and grains. With these spirits ranged in feudal order in two vast groups beneath Heaven and Earth is associated a third class, those of human beings. They are designated by the same name, shin; and they are in-

1 The Japanese name is Ame-tsuchi, ” heaven and earth,” a trans- lation of the Chinese ten-chi, Aston, Shinto (1905), p. 35.

2 Castrˆn, Finnische Mythologie, p. 86.

3 Erman, Handbook of Egyptian Religion (1907), pp. 8, 12. * Sir

George Grey, Polynesian Mythology (1855), pp. 1-4.

6 The English “Heaven” has acquired a quasi-personal mean- ing, and is usually employed as its equivalent, but, like the Jewish use (e.g. Luke xv. 18), tends to carry too definite religious associa- tions with it.

6 Blodget, on ” The Chinese Worship of Heaven and Earth,” Journ. of the American Oriental Society, xx. p. 58 ff .

extricably mingled with the operations of nature. So in the Vedic hymns the departed ” Fathers ” inhabit the three zones of earth, air and sky; they are invoked with the streams and mountains of this lower earth, as well as with the dawns and the sky itself; even cosmic functions are ascribed to them; and they adorn the heaven with stars. The Chinese concep- tion of the Shin under the name of Shin-to (Chinese tao) or ” spirits’way ” profoundly influenced Japanese thought from the 6th century a.d. onwards; and the great Shinto revival of the 1 8th century brought the doctrine again into prominence. The Japanese Kami are the ” higher ” powers, the superi, conceived as acting through nature on the one hand and govern ment on the other. Just as the emperor is kami, and provincial officers of rank, so also mountains, rivers, the sea, thunder, winds, and even animals like the tiger, wolf or fox, are ail kami. 1 The spirits of the dead also become kami, of varying character and position; some reside in the temples built in their honour; some hover near their tombs; but they are constantly active, mingling in the vast multitude of agencies which makes every event in the universe, in the language of Motowori (1730-1801), the act of the Kami. They direct the changing seasons, the wind and the rain; and the good and bad fortunes of individuals, families and states are due to them. 8 Everywhere from birth to death the entire life of man is encompassed and guided by the Kami, which are sometimes reckoned at 8,000,000 in number.

2. Transition to Polytheism. — In such ways does the Poly-daemonism of early faith survive in the modern practice of religion. The process of enrolling the spirits of the dead in the ranks of what may be more or less definitely called ” gods ” may be seen in the popular usages of India at the present day, or traced in the pages of the Peking Gazelle under the direction of the Board of Rites, one of the most ancient branches of Chinese administration. Whether the higher polytheisms were produced in this fashion out of the cultus of the dead, may, however, be doubted. Many influences have doubtless contri- buted, and different races have followed different lines of development. No definite succession like the series of ages marked by the use of stone, bronze and iron can be clearly marked. But there

must always have been some correspondence between the stages of social advance (or, in certain cases, of degeneration) and the religious interpretation of the world. The formation of clans and tribes, the transitions from the hunting to the pastoral life, and from the pastoral to the agricultural — the struggle with forest and swamp, the clearings for settlement, the protection of the dwelling-place, the safety of flocks and herds, the production of corn, — the migration of peoples, the founding of colonies, the processes of conquest, fusion, and political union — have all reacted on the elaboration of the higher polytheisms, before bards and poets, priesthoods and theological speculators, began to systematize and regulate the relations of the gods. Certain phases of thought may be more or less clearly indicated ; certain elements of race, of local condition, of foreign contact, may be distinguished with more or less historic probability; but no single key can explain all the wide diversity of phenomena. Broadly speaking it may be said that a distinction may be drawn between ” spirits ” and ” gods,” but it is a distinction of degree rather than of kind, obvious enough at the upper end, yet shading off into manifold varieties of resemblance in the lower forms. Some writers only recognize friendly agencies as gods; but destructive powers like the volcano, or the lords of the underworld, cannot be regarded as the protectors of the life of man, yet they seem in many mythologies to attain the full personalised stature of gods with definite names. Early Greek religion recognized a class of gods of Aversion and Riddance, d-TOTp&iraioi and aTcnronvaioi. Neither the spirit nor the god is conceived as

‘ So the epithet ‘il might be applied in Hebrew to men of might, to lofty cedars, or mountains of unusual height, as well as to the Supreme Being.

8 See E. M. Satow, ” Revival of Pure Shinto,” Trans. As. Soc. of Japan, vol. iii. pt. 1 (1875), Appendix, p. 26.

immaterial. They can take food, though the crudest form of this belief soon passes into the more refined notion that they consume the impalpable essence of the meals provided for them. The ancient Indian ritual for the sacrifice to the Fathers required the officiating priest to turn away with bated breath that he might not see the spirits

engaged upon the rice-balls laid out for them. The elastic impalpable stuff of the spirit-body is apparently capable of compression or expansion, just as Athena can transform herself into a bird. The spirits can pass swiftly through the air or the water; they can enter the stone or the tree, the animal or the man. The spirit-land of the Ibo on the Lower Niger had its rivers, forests or hills, its towns and roads, as upon earth: 1 the spirits of the Mordvinian mythology, created by Chkal, not only resembled men, they even possessed the faculty of reproduction by multiplication. 2 The Finns ascribed a haltia or genius to each object, which could, how- ever, guard other individuals of the same species. This is the beginning of the species-god, and implies a step of thought comparable to the production in language of general terms. These protecting spirits were free beings, having form and shape, but not individualized; while above them rose the higher deities like the forest-god Tapio and his maiden Hillervo, protectress of herds, or Ahto the water-god who gradually took the place of Vesi, the actual element originally conceived as itself divine, and ruled over the spirits of lakes and rivers, wells and springs. 3 The Finns came to apply to the upper gods the term Yumala which originally denoted the living sky; the Samoyedes made the same use of Num, and the Mongols of Tengri. 4 Above the innumerable wongs of the Gold Coast rose Nyongmo, the Sky-god, giver of the sunshine and the rain. The Yoruba-speaking peoples generalized the spirits of mountain and hill into Oke, god of heights; and the multitude of local sea-gods on the western half of the slave coast was fused into one god of the Ocean, Olokun. 5 The Babylonian theology recognized a Zi or ” spirit ” in both men and gods, somewhat resembling the Egyptian ” double ” or ka; spirits are classed as spirits of heaven and spirits of earth; but the original identity of gods and spirits may be inferred from the fact that the same sign stands before the names of both. 6 Out of the vast mass of undifferentiated powers certain functional deities appear; and the Kami of Japan to-day who preside over the gilds and crafts of industry and agriculture, over the trees and grasses of the field, the operations of the household, and even the kitchen- range, the saucepan, the rice-pot, the well, the garden, the scarecrow and the privy, have their counterparts in the lists of ancient Rome, the Indigitamenta over whose contents Tertullian and Augustine made merry. The child was reared under the superintendence of Educa and Potina. Abcona and Adeona taught him to go out and in. Cuba guarded him when he was old enough to exchange a cradle for a bed. Ossipaga strengthened his bones; Levdna helped him to get up, and Stalina to stand. 7 There were powers protecting the threshold, the door and the hinge: and the duties of the house, the farm, the mill, had each its appointed guardian. But such powers were hardly persons. The settler who went

into the woods might know neither the name nor the sex of the indwelling numen; ” si deus si dea,” ” sive mas sive femina,” ran the old formulae. 8 So the Baals

1 Leonard, The Lower Niger and its Tribes (1906), p. 186. 5 Mainof, ” Les Restes dc la mythologie mordvine,” Journal tic la Soc. Finno-Ougrienne, v. (1889), p. 102.

3 Castren, Finn. Mythol. pp. 92 ff., 72.

4 Ibid. pp. 7, 14, 17, 24.

‘ A. B. Ellis, The Yoruba-speaking Peoples (1894), P- 2 &9-

‘Jastrow, Religion of Babylonia and Assyria (1898), p. 181. The Zunis applied the term a-hai ” All-Life ” or ” the Beings ” to all supernatural beings, men, animals, plants, and many objects in nature regarded as personal existences, as well as to the higher anthropomorphic powers known as ” Finishers or Makers of the Paths of Life,” Report of Bureau of Ethnol. (1883), p. 11. On the distinction between ” gods ” and ” spirits,” cf. Ed. Meyer, Gesch. desAlterthums, 2nd ed. Band i. crstc Ilaelfte (1907), p. 97 ff.

7 Tert. De Anima, 39 Aug. De Civ. Dei, iv. 1 1, &c.

•On the Dei Certi and the Dei Incerti, see von Domaszewski in the Archivfiir Religionswiss., x. (1907), pp. 1-17.

of the Semitic peoples constituted a group of powers fertilizing the land with water-springs, the givers of corn and wine and oil, out of which under conditions of superior political development a high-god like the Tyrian Baal, the majestic City-King, might be evolved. The Celts who saw the world peopled with the spirits of trees and animals, rocks, mountains, springs and rivers, grouped them in classes like the Dervonnae (oak-spirits), the Niskai (water-spirits), the Proximae, the Matronae (earth- goddesses) 9 and the like. Below the small band of Teutonic divinities were the elves of forest and field, the water-elves or nixes and spirits of house and home. The Vedic deities of the nobler sort, the shining devas, the asuras (the ” breathers ” or. living, perhaps to be identified with the Scandinavian

3. Polytheism. — The lower and unprogressive religions practically remain in the polydaemonistic stage, though not without occasionally feeling the stimulus of contact with higher faiths, like some of the West African peoples in the presence of the Mahommedan advance. Among the more progressive races, on the other hand, continual

processes of elevation and decline may be observed, and the activities of the greater gods are constantly being enriched with new functions. Personal or social experiences of the satisfaction of some desire or escape from some danger are referred to some particular deity. Elements of race-consciousness help to shape the outlook on nature or life: and slight differences of linguistic use in the coining of descriptive terms sometimes lead to the multiplication of divine forms. Exacter observation of nature; closer attention to its contrasts of life and death, or light and darkness, or male and

9 Cf. the groups of ” Mothers ” in modern India, of various origins, Crooke, Popular Religion and Folklore (2), i. 1 1 1.

10 Cf. Andrew Lang, Myth, Ritual and Religion; and Miss Harrison, Prolegomena to the Study of Greek Religion.

11 Cf. A. J. Evans, on The Mycenean Tree and Pillar Cult (1901), and Sir W. M. Ramsay, ” Religion of Greece and Asia Minor,” in Hastings' Diet, of the Bible, extra vol.

female; the distinction between its permanent objects, and its occasional or recurring operations; the recognition that behind sudden manifestations of power, like the thunder-storm, there are steady forces and continuous cosmic agencies at work — lead to the gradual rise of the higher deities. And from the social side the development of law, the influence of city life, the formation of priesthoods, the connexion of particular deities with the fortunes of dynasties or the vicissitudes of nations, the processes of migration, of conquest and political fusion, the deportations of vanquished peoples, even the sale of slaves t o distant lands and the growth of trade and travel, all contribute to the processes which expand and modify different pantheons, and determine the importance of particular deities. In the midst of the bewildering variety, where all types co-exist together and act and react on each other, it is impossible to do more than point out some obvious groups receiving their special forms chiefly from the side (i) of nature, (2) of human life, and (3) from moral or theological speculation. Divine persons, objects or powers, connected with ritual, are not here considered, such as the Brahman priests who claimed to be manushyadevdh (human-gods), or the sacred soma-juice which

grew by strange analogies into a mysterious element, linking together heaven and earth.

I. On the side of Nature the lowest rank (1) seems to belong to what Usener has designated ” momentary ” or ” occasional ” gods. 1 They embody for the time being a vague consciousness of the divine, which is concentrated for some single act into an outward object, like a warrior’s spear or the thunderbolt, 2 or the last sheaf of corn into which the Corn-Mother has been driven. 3 (2) Above these, to use again Usener’s nomenclature, 4 are the ” special ” or ” functional ” gods, ” departmental gods,” as Mr Lang has called them. Such were some of the deities of the Indigitamenta already compared with the Japanese Kami. Among them, for example, were twelve deities of ploughing and harvest operations, who were invoked with Tellus and Ceres. (3) Another class may be seen in the species- deities previously named; the Samoan gods which could become incarnate as a heron or an owl, did not die with particular birds. A dead owl was not a dead god; he yet lived in all other owls. 5

(4) The worship of trees, plants and animals is a particular phase of the wider series of nature-cults, only named here because of its frequency and its obvious survivals in some of the higher polytheisms, where, as in Egypt, the Apis bulls were worshipped; or where, as in Mesopotamia, the great gods are partly symbolized by animal forms; or where, as in Israel, Yahweh might be represented as a bull; or where, as in Greece, such epithets as Dendrites and Endendros preserved traces of the association of Dionysus and Zeus with vegetation; while sacred animals like the serpents of Aesculapius were preserved in the temples. 6

(5) The higher elemental gods sometimes, like the sun, as the Indian Surya, the Egyptian Re, the Babylonian Shamash (Samas), the Greek Helios, retain their distinct connexion with the visible object. It was naturally more easy for a relatively spiritual worship to gather round a god whose name did not immediately suggest a familiar body. No one ever thought of confessing sin, for instance, to a river. But the daily survey of the sun (occasionally also the function of the moon as measurer of time), together with his importance for life, secured him a high moral rank; and Re, united with the Theban Ammon, became (under the New Empire) the leading god of Egypt for a thousand years, ” He who hath made all, the sole One with many hands.” Other deities, like Zeus, rise to the head of a monarchical polytheism, in which their physical base is almost,

1 Gotternamen, Bonn, 1896, p. 279 ff. But cp. Dr Farncll’s eseay ” On

the Place of the Sonder-Gotter in Greek Polytheism," in Anthropological Essays presented to Edward Burnett Tylor (1907), p. 81.

5 Ibid. pp. 285, 286.

1 Frazer, The Golden Bough (2), ii. 170-1.

4 Gotternamen, p. 75.

'Turner, Samoa, 1884, p. 21.

' Cf. de Visser, Die nicht Menschen-Gestaltigen Gbtter der Griechen (Leidsn, 1903).

if not quite, forgotten in cosmic and moral grandeur. The gods are often arranged in groups, three, seven and twelve being frequent numbers. Egyptian summaries recognized gods in the sky, on earth and in the water; gods of the north and south, the east and west, gods of the field and the cities. Indian theologians classified them in three zones, earth, air and sky. Babylonian speculation embraced the world in a triad of divine powers, Anu the god of heaven, Bel of earth and Ea of the deep; and these became the symbols of the order of nature, the divine embodiments of physical law. 7 Sometimes the number three is reached by the distribution of the universe into sky, earth and underworld, and the gods, of death claim their place as the rulers of the world to come. Among these deities all kinds of relationships are displayed; consorts must be provided for the unwedded, and the family conception, as distinct from the regal, presents a divine father, mother and child. The Ibani in Southern Nigeria recognized Adum the father-god, Okoba the mother-god and Ebercbo the son-god. 8 In Egypt, Osiris, Isis and Horus proved an influential type. Perhaps at a relatively earlier stage maternity alone is emphatically asserted, as in the figure of the Cretan Mother, productive without distinctly sexual character. 9 Or, again, maternity disappears, while parenthood survives, and causation is embodied in a universal " Father of all that are and are to be," like the Indian Brahma in the days of Gotama the Buddha." 10

II. On the human side polytheism receives fresh groups in connexion with the development of social institutions and national feeling. (1) In the family the hearth-fire is the scene of the protecting care of deity; the gods of the household watch over its welfare. Each Roman householder had his Genius, the women their Junones. These stood at a higher level than the " occasional gods," having permanent

functions of supervision. (2) From the household a series of steps embodied the divine power in higher forms for social and political ends. Hestia presided over cities; there was even a common Hestia for all Greece. The fravashi or ideal type, the genius of both men and gods in the Zend Avesta (possibly connected originally with the cultus of the dead u) , rises in successive ranks from the worshipper's own person through the household, the village, the district and the province, up to the throne of Ahura himself. 12 The Chinese Shin were similarly organized; so (less elaborately) were the Japanese Kami" 3 and the Roman lares, the old local land-gods, found their highest co-ordinating term in the Lares Augusti, just as the Genius was extended to the legion and the colony, and finally to Rome itself. (3) In the case of national deities the tie between god and people is peculiarly close, as when Yahweh of Israel is pitted against Chemosh of Amnion (Judges xi. 24). The great gods of Greece, in their functions as "saviours " and city-guardians, acquire new moral characters, and become really different gods, though they retain the old names. Ashur rises into majestic sovereignty as the " Ruler of all the gods," the supreme religious form of Assyrian sway: when the empire falls beneath the revived power of Babylon, he fades away and disappears. (4) The earthly counterpart of the heavenly monarch is the divine king, who may be traced back in Egypt, for example, to the remotest antiquity, 14 and who survives to-day among the civilized powers in the emperor of Japan (anciently Arahito-gami, "incarnate Kami"). "To the end of time,"

7 Jastrow, Rel. of Babylonia, p. 432.

8 Leonard, The. Lower Niger and its Tribes, p. 354.

9 Cf. Farnell, Cults of Greece, iii. 295.

10 Digha Nikaya, i. 18.

11 This is denied by Tiele, Religion im Alter turn, tr. Gehrich, ii. (1898), p. 259.

12 Cf. Yasna, Ixxi. 18; S.B.E. xxxi. p. 331; and Soderblom's essay in the Rev. de I'hist. des religions, xxxix. (1899), pp. 229, 373.

13 Hirata's morning prayer in the last century included 800 myriads of celestial kami, 800 myriads of ancestral kami, the 150c myriads to whom are consecrated the great and small temples in all provinces, all islands, and all places of the great land of eight islands, &c.

14 Moret, Du caractere religieux de la royaute pharaonique (1902).

For instances in the lower culture see Frazer, Golden Bough (2), i. 140 ff.

said Motowori (18th century), ” the Mikado is the child of the Sun-goddess.” (5) The dead hero (historical or mythic) signalizes his power by gracious saving acts; and Heracles, Asclepius, Amphiaraus, and others pass into the ranks of the gods, which are thus continually recruited from below.

III. A third great group rises out of the sentiments and affections of man, or the moral energies which he sees working in human life. (1) The Vedic Craddhd, ” faith,” the Greek Melameleia, “repentance,” 1 the Latin Spes, and a band of other figures, represent the dispositions of the heart; Nemesis and Nike and Concordia and their kin belong to a somewhat different sphere, the divine powers avenging, conquering, harmonizing the counterparts of the ” departmental ” gods in the field of moral agencies. (2) Over these theological speculation erects a few lofty and impressive forms; sometimes below the highest, like Vohu Mano, ” the Good Mind ” of Ahura Mazda; or the Bodhisattva Avalokitecvara, who vowed not to enter into final peace till every creature had received the saving truth; some- times supreme, like Brahma or Prajapati (” lord of creatures “) in the early Brahmanic theology; or Adi Buddha, or the Zervan Akarana, ” boundless time,” of a kind of Persian gnosticism; or the 0e6s wpioros whose worship appears among other syncretistic cults of the Roman empire.

4. The Order of Nature. — Polytheism is here on the way to monotheism, and this tendency receives significant support from the recognition of an order in nature which is the ground and framework of social ethics. Not only does a sky-god like Varuna, or a sun-god like the Babylonian Shamash, survey all human things, and take cognizance of the evil-doer, but the daily course of the world is itself the expression of an intellectual and moral power. In the Chinese combination of Heaven and Earth as the parents and nourishers of all things, the energy and action lie with Tien, Earth being docile and receptive. Tien is intelligent and all-observing, and its ” sincerity ” or stead- fastness, displayed in the courses of the sun and moon and the succession of the seasons, becomes the basis of right human conduct, personal and social. The ” way ” of Heaven, the ” course ” of Heaven,

the ” lessons ” of Heaven, the law or ” decree ” {ming) of Heaven, are constantly cited as the pattern for the emperor and his subjects. This conception is even reflected in human nature: ” Heaven in giving birth to the multitude of the people, to every faculty and relationship affixed its laws ” {Shi King, III. iii. 6; cf. IV. iii. 2, tr. Legge), and the ” Grand Unity ” forms the source of all moral order {Li Ki, in Sacred Books of the East, xxvii. p. 387). Indian thought pre- sented this Order in a semi-personal form. The great elemental gods imposed their laws {dhaman, dharman, vrata) on the visible objects of nature, the flow of rivers, the march of the Heavenly bodies across the sky. But the idea of Law was generalized in the figure of Rita (what is ” fitted ” or ” fixed “; or the ” course ” or ” path ” which is traversed), whose Zend equivalent asha shows that the conception had been reached before the separation of the Eastern Aryans produced the migrations into India and Iran. 2 In the Rig Veda the gods (even those of storm) are again and again described as ” born from the Rita,” or born in it, according to it, or of it. Even Heaven and Earth rejoice in the womb or lap of the Rita. In virtue of the mystic identity between the cosmic phenomena and sacrifice, Rita may be also viewed as the principle of the cultus; and from that sphere it passes into conduct and acquires the meaning of morality and is equated with what is ” true.” The fundamental idea remains the same in the Zend Asha, its philological counterpart, but it is applied with a difference. Its form is more personal, for Asha is one of the six Holy Immortals round the throne of Ahura Mazda (Auramazda). In the primeval conflict between the powers of good and evil, the Bounteous Spirit chose Asha, the Righteous Order which

1 Worshipped at Argos. Usener, Gotternamen, p. 366.

2 Cf. Max Miiller, Lectures on the Origin and Growth of Religion (Hibbert Lect., 1878), v., and the Vedic treatises of Ludwig, Ber- gaigne and Wallis.

knit the world together and maintained the stars. 3 The im- mediacy of the relation between Ahura and Asha is implied in the statements that Ahura created Asha and that he dwells in the paths which proceed from Asha; and when he created the inspired word of Reason, Asha consented with him in his deed. In its ritual form Asha becomes the principle of sacrifice, and hence of holiness, first ritual and then moral. Like Rita, it rises into an object of worship, and in its most exalted aspect {Asha vahista, the ” best ” Asha, most excellent righteousness) it is identified with Ahura himself, being fourth among his sacred names {Ormazd Yasht, § 7; S.B.E. xxiii. p. 25). Egyptian speculation, in like manner, impersonated the con- ceptions of

physical and moral order as two sides cf a funda- mental unity in the goddess Maat. Derived from the verb ma, ” to stretch out,” her name denoted the ideas of right and rule, and covered the notions of order, law, justice and truth, which remained steadfast and unalterable. Mythologically she was the daughter (or the eye) of the sun-god Re; but she became Lady of Heaven and Queen of Earth, and even Lady of the land of the West, the mysterious habitation of the dead. Each of the great gods was said to be lord or master of Maat; but from another point of view she ” knew no lord or master,” and the particular quality of deity was expressed in the phrase anx em maat, ” living by Maat,” which was applied to the gods of the physical world, the sun and moon, the days and hours, as well as to the divine king. She was solemnly offered by the sovereign to his god; and the deity replied by laying her within the heart of his worshipper “to manifest her everlastingly before the gods.” So in the famous scene of the weighing of the soul, which first appears pictorially under the New Empire, she introduces the deceased before the forty-two assessors of the heavenly judge, Osiris, and presides over the scale in which his actions and life are weighed. From the zenith to the realm of the departed she is the “queen of all gods and goddesses.”' 1 The Hellenic polytheism of Homer and Hesiod is already at work upon similar ideas, and a whole group of mythic per- sonifications slowly rises into view representing different phases of the same fundamental conception. Themis (root 0e = Sanskr. dha, as in dhaman) appears in Homer as the embodiment of what is fit or right; 5 she convenes or dismisses assemblies, she even keeps order at the banquet of the gods. Next, Hesiod supplies a significant biography. She is the daughter of Ouranos and Gaia; and after Metis she becomes the bride of Zeus. 6 Pindar describes her as born in a golden car from the primeval Oceanus, source of all things, to the sacred height of Olympus to be the consort of Zeus the saviour; and she bears the same august epithet, as the symbol of social justice and the refuge for the oppressed. 7 Law was thus the spouse of the sovereign of the sky, but Aeschylus identified her with the Earth (worshipped at Athens as Ge-Themis), not only the kindly Mother, but the goddess who bound herself by fixed rules or laws of nature and life. 8 For the cultus of the earth as the source of fertility was associated with the maintenance of the family, with the operations of agriculture and the social order of marriage. So Themis became the mother of the seasons; the regular sequence of blossom and fruit was her work; and Good Order, Justice and Peace were her offspring. 9 By such conceptions the Hellenic polytheism was moralized; the physical character of the greater gods fell into the background, and the sculptor’s art came to the aid of the poet by completely enduing them with personality.

8 Yasna, xxx. 5 ; Sacred Books of the East, xxxi. p. 30 ; cf . pp. 44,

51, 248.

4 Cf. Renouf, Hibbert Lectures, p. 119; Brugsch, Rel. und Mythol., p. 477; Wiedemann, Ann. du Mus£e Guimet, x. p. 561; Budge, Gods of Egypt, i. p. 416.

5 Cf. Aids Bktuarts, Od. xvi. 403; cf. Apollo, Horn. Hymn. 394.

6 Theog. 135, 901.

7 Fr. 6, 7 ; 01. viii. 29.

8 Farnell, however, supposes that Ge acquired the cult-appellative through her prophetic character {Cults of the Greek States, iii. p. 12). The union of Zeus and Themis is, then, a later equivalent of the marriage of Zeus and Earth (ibid. p. 14).

• Paus. v. 17; Hes. Theog. 901 ; Pindar, 01. xiii. 6; fat. 26.

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5. Transition to Monotheism. — From the higher Polytheism an easy step leads to some form of Monotheism. The transition may be effected in various ways. Max Muller observed the Vedic poets addressing themselves to the several objects of their devotion; as if each occupied the field alone. Varuna or Indra was for the time being the only god within the worshipper's view; and to this mode of thought he gave the name Heno- theism. 1 It obviously reappears elsewhere, as it is the natural attitude of prayer, and may be seen in the pious homage of the pilgrims to the Virgin of Loretto or Einsiedeln. Pfleiderer employed the word to denote a relative monotheism like that of the early religion of Israel, whose teachers demanded that the nation should worship but one god, Yahweh, but did not deny the existence of other gods for other peoples. Yet once again the term has been applied to characterize a whole group of religions, like the Indo-Germanic, which are ultimately founded on the unity of the divine nature in a plurality of divine persons. A designation of such doubtful meaning it seems better (with Chantepie de la Saussaye) to abandon. But the unifying process may advance along different lines. The deities of different local centres may be

identified; many such combinations took place in Egypt, and Isis in late days served to her votaries as the unitary principle which appeared in one figure after another of whole pantheons. Again, the gods may be viewed as a collective totality, like the ” All-gods ” of the Vedic poets, or as at Olympia where there was a ” common altar for all the gods ” (cf. the frequent Roman dedication in later days, ” Jovi optimo maximo caeterisque dis immortalibus “)• Or the relation between the inferior deities and the most exalted may be conceived politically and explained by Tertullian’s formula, ” Imperium penes unum, officia penes multos.” One particular god may be eminent enough, like Zeus, to rise above all others, and supply cultivated thought with a name for the supreme power; and this may be strengthened by the national motive as in the case of Israel. Or philosophic theology may penetrate to an abstract conception of deity, like the Babylonian ‘iluth, or the Vedic devatva and asuratva; and some seer may have the courage and insight to formulate the principle that ” the great asuratva of the devas is one ” (R.V. iii. 55. 1). ” The One with many names ” was recognized alike in India and in Greece; ” iroWQv bvonaruv fiopˆrj fila,” says Aeschylus, almost in the words of the Vedic poet. 2 Historians – have usually recognized only three monotheistic religions, Judaism”, Chris- tianity and Islam. The Christian apologists of the 2nd century, however, found plenty of testimony to their doctrine of the unity of God in the writings of Greek poets and philo- sophers; it was a commonplace in the revival under the Empire; and among the group of religions embraced under the name Buddhism more than one form must be ranked as mono- theistic. The idealist philosophy of the Prajfia Paramita in the system of the ” Great Vehicle ” declared that ” every pheno- menon is the manifestation of mind ” (Beal, Catena, p. 303). In the ” Lotus of the Good Law ” {S.B.E. xxi.) the Buddha is the ” Father of the World,” ” Self-born ” or Uncreate (like the eternal Brahma of the Hindu theology), the protector of all creatures, the Healer (Saviour) of the sickness of their sins. These types have reappeared in Japan. Nichiren taught a philosophical monism in the 13th century which is the basis of a vigorous sect at the present day; and the ” True Sect of the Pure Land,” founded by his older contemporary Shin-ran, and now the most numerous, wealthy and powerful of the Buddhist denominations, has dropped the original Gotama altogether out of sight, and permits worship to Amida alone, the sublime figure of ” Boundless Light,” whose saving power is appro- priated by faith. Here is a monotheism of a definite and clear- cut type, arising apparently by spontaneous development apart from any external impulse. 3 On the other hand, the mono-

1 Or Kathenotheism, a term which did not succeed in gaining permanent support, Hibbert Lect., p. 271.

2 R.V. i. 164. 46, ” Men call him Indra, Mitra, Varuna, Agni. . . . Poets name variously what is but one.”

3 Cf. Carpenter, ” Japanese Buddhism,” in Hibbert Journal, April 1906, p. 522.

theism of Judaism was subject to serious qualifications. An exuberant demonology admitted all kinds of interfering causes in the field of human life. Above man on earth rose rank after rank of angels in the seven heavens. These were of course created, but they were in their turn the agents of the phenomena of nature, ” the angels of the spirit of fire and the angels of the spirit of the winds, and the angels of the spirits of the clouds and of darkness and of snow and of hail and of hoarfrost, and the angels of the voices and of the thunder and of the lightning, and the angels of the spirits of cold and of heat, and of winter and of spring and of autumn and of summer ” (Jubilees, tr. R. H. Charles, ii. i). These powers are of a well-marked animistic type, and correspond to the Chinese Shin, save that they were not incorporated in the cultus. Higher in rank came various med ating forms, like Wisdom, Memra (the Word) or Shekinah (the Presence), more or less definitely personalized. Mahom- medanism still recognizes innumerableyiraw peopling the solitudes of the desert, and over the grave of the deceased saint a little mosque is built, and prayers are offered and miracles performed. 4 Christianity has, in like manner, in the course of its long and eventful history, admitted numerous agencies within the sphere of superhuman causation. The Virgin, the angelic hierarchy, the saints, have received the believer’s homage, and answered his petitions. Theology might draw subtle distinctions between different forms of devotion; but, tried by the comparisons ol the anthropologist, the monotheism even of historical Chris- tianity cannot be strictly maintained.

6. Classification. — In the panorama of religious development thus briefly sketched, the different stages constantly appear to shade off into one another, and any one of the higher seems to contain elements of all the rest. This is the great difficulty of classification. All religions, even the most conservative and traditional, are in constant flux, they either advance or decay. In these processes, which do not take place at equal rates in different cases, all kinds of survivals remain lodged, and embarrass every attempt to fix the place of specific religions in any general course of development. The theologian, the philosopher, the historian, have all tried their hands at dis- tribution, (i.) The 18th-

century divine who divided religions into True and False grimly remarked that the second chapter was much the longer of the two. 6 The corresponding distinction into Natural and Revealed breaks down in view of the fact that revelation by dream and oracle, by inspired seer or divine teacher and law-giver, is a practically universal phenomenon in more or less distinctly defined forms, (ii.) Philosophy, in the person of Hegel, classified religion in a threefold form : (a) the religion of Nature, (b) the religion of Spiritual Individuality, (c) the Absolute Religion (Christianity). 6 The subdivisions of this scheme have been long since abandoned, as the progress of knowledge rendered them untenable. K. F. A. Wuttke, however, adopted its fundamental idea 7 and distinguished three periods or phases: (1) the objective, producing the religions of nature;

(2) the subjective, God as comprehended in the individual mind;

(3) God as Absolute Spirit. In the same way Dr Edward Caird 8 recognizes three similar stages: (1) objective consciousness, the divine in nature; (2) self-consciousness, the divine in man (e.g. Judaism, Stoicism, and modern philosophy of the type of Kant); (3) God-consciousness, where God is above the contrast of subject and object, yet is revealed in both (Christianity), (iii.) On the historical side numerous bases have been suggested. (1) Max Muller proposed to group religions ethnologically by tests of language. This had the obvious advantage of lifting two great families into prominence, the Semitic and the Indo- Germanic. The Semitic peoples were closely bound together by common types of thought and civilization, and produced three of the leading religions of the world, Judaism, Christianity and Islam. But a glance at the table of Indo-Germanic religions

4 Cf . Goldziher, Rev. de I'Hist. des Rel. ii. 257 ; Weir, The Shaikhs of Morocco (1904).

6 Broughton, Diet, of all Religions (1745), preface.

6 Philosophy of Religion (Eng. trans.), i. p. 266.

7 Geschichte des Heidenthums (1852), i. p. 95.

8 Evolution of Religion (1893), lect. vii.

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drawn up by Tiele (Ency. Brit., oth ed., vol. xx. p. 360) will show what diversified products are blended together. Why should philosophical Brahmanism, or the Buddhism which reacted against it, be associated with so undeveloped a form as • the religion of the ancient Latin settlers in mid-Italy? And why, on the other hand, should the religions of the lower culture, which are practically of a common type, be separated genea- logically into numerous independent families? (2) Whitney 1 found the most important distinction to lie between religions which were the collective product of the wisdom of the com- munity, race-religions as they might be called, and those which proceeded from individual founders. But, as Tiele pointed out, the "individual" element cannot be eliminated from the " race-religion," where each myth has been first uttered, each rite first performed, by some single person. And the founder who enters history with an impressive personality can only do his work through the response made to him by the insight and feeling of his time. (3) Kuenen disengaged another character- istic, the scope and aim of any given religion; was it limited to a particular people, or could it be thrown open to the world? On this foundation the higher religions were classed as national or universal, the latter group being formerly supposed to include Buddhism, Christianity and Mahommedanism. Here, once more, the student is confronted with many qualifications. A missionary religion like Mithraism, which established itself all the way from Western Asia to the borders of Scotland, was certainly not " national." Judaism and Brahmanism both passed beyond the confines of race. The Confucian morality could be adopted without difficulty in Japan. In other words, there was either a definite tendency to expansion, or the r e was no impediment in the religion itself when circumstances promoted its transplantation. Further, there are elements of Islam, like the usages of the hajj (or pilgrimage to the sacred places at Mecca), the dryness of its official doctrine and the limitations of its real character as indicated in the Wahhabi revival, which so impair its apparent universalism that Kuenen found himself obliged to withdraw it from the highest rank of religions. 2 (4) Professor M. Jastrow, jun., starting from the relation of religion to life, distinguishes four groups, the religions of savages, the religions of primitive culture, the religions of .advanced culture and the religions which emphasize as an ideal the coextensiveness of religion with life. It may, however, be doubted whether the fundamental assumption of such a scheme, viz. that in the life of the savage religion plays a comparatively small part, can be satisfactorily established. The evidence rather implies that, so far as the sanctions of religion affect

the savage at all, they affect him with unusual force. In the absence of other competing interests his religious beliefs and duties occupy a much larger share of his attention than the votaries of many higher faiths bestow on theirs; and though his ethical range may be very limited, yet the total influence of his religion in determining for him what he may do and what he may not, brings the greater part of conduct under its control. The savage who finds himself encompassed by taboos which he dare not break, lives up to his religion with a faithfulness which many professing Christians fail to reach. (5) There remains a broad distinction between religions that are in the main founded on the relation of man to the powers of Nature, and those based on ethical ideas, which partly corresponds to the philosophical division already cited. This enabled Professor Tiele to arrange the chief religions in certain groups, starting from the primitive conception of the common life of the objects of the surrounding scene: — *

1 Princeton Review, May 1881, quoted by Tiele, Elements of the Science of Religion (1897), i. p. 42.

- National Religions and Universal Religions (Hibbert Lectures,

1882).

3 Ency. Brit., 9th ed., art. ” Religions ” ; Elements of the Science of Religion, vol. i. (1897), with some corrections communicated by letter to Professor Chantepie de la Saussaye, Religionsgesch. (3rd ed., 1905), vol. i. p. 11.

4 For a long series of suggested bases of classification see Raoul de la Grasserie, Des Religions Comparers au Point de Vue Sociologique (1899), chap. xii. ; cf. further E. von Hartmann, Religionsphilosophie

I. Nature Religions —

1. Polyzoic Naturalism (hypothetical).

2. Polydemonistic-magical religions under the control of

Animism (religions of savages).

3. Purified or organized magical religions. Therianthropic

Polytheism.

(a) Unorganized (religions of the Japanese, Dravidians,

Finns, Esths, the ancient Arabs, the ancient Pelasgi, the Oid-Italian peoples, the Etruscans (?), the Old-Slavs).

(b) Organized (religions of the half-civilized peoples of

America, ancient Chinese state-religion, religion of the Egyptians).

4. Worship of beings in human form, but of superhuman

power and half-ethical nature. Anthropomorphic poly- theism (religions of the Vedic Indians.the ancient Persians, the later Babylonians and Assyrians,the advanced Semites, the Kelts, Germans, Hellenes, Greeks and Romans). II. Ethical Religions (spiritualistic ethical religions of Revelation)—

1. National Nomistic (nomothetic) Religious Communions

(Taoism and Confucianism, Brahmanism, Jainism.Mazde- ism, Mosaism and Judaism, the two last already passing into 2).

2. Universalistic Religious Communions(Buddhism, Christian-

ity: Islam with its particularistic and nomistic elements only partially belongs to this group). 4

7. Revelation. — The second group in this division practically corresponds to the second stage recognized by Caird; but it rests upon a somewhat different basis, the conception of revela- tion addressed to the conscience in the form of religious law. Neither Taoism nor Confucianism, indeed, makes this claim. The Tao-teh-king, or book of aphorisms on ” the Tao and virtue ” ascribed to Lao Tsze, is wholly unlike such a composition as Deuteronomy; and the disciples of Confucius carefully refrained from attributing to him any kind of supernatural inspiration in his conversations about social and personal morality. The sacred literatures of India and Israel, however, present many analogies, and emerge out of a wide range of phenomena which have their roots in the practices of the lower culture. The belief that the Powers controlling man’s life are willing upon occasion to disclose something of their purpose, has led to widespread rites of divination, which Plato described as the ” art of fellowship between gods and men,” and the Stoics defended on grounds of a priori religious expectation as well as of universal experience. Through the dream the living was put into communication with the dead, which sometimes embodied itself in peculiar and pathetic literary forms, such as the Icelandic dream-verses imparted by the spirits of those who had been lost at sea or overwhelmed by the snow; and a whole series of steps

leads up from necromancy to prophecy and oracle, as the higher gods become the teachers of men. The gods of revelation are naturally not the highest, since they appear as the interpreters of one superior to themselves. The revealing agency may be only a voice like Aius Locutius, to which the Romans raised a temple; or, like Hermes, he may be the messenger of the gods; or, like Marduk, pre-eminently the god of oracles in Babylonia, he may be the son of Ea, the mighty deep encompassing the earth, source of all wisdom and culture. To Marduk the prophet-god Nabu in his turn became son, and his consort Tashmlt (" causing to hear ") was the personification of Revelation. Egyptian thought ascribed this function to Thoth, who played somewhat different parts in different systems, but emerges as the representative of the immanent intelligence

(1888); Siebeck, Lehrbuch der Religionsphilosophie (1893); Dorner, Grundriss der Religionsphilosophie (1903). Siebeck proposed to distribute religions in three grades: (1) Nature-Religions, i.e. those of the lower culture; (2) Morality-Religions in various grades and stages, e.g. Mexicans and Peruvians, Arcadians, Chinese, Egyptians, Hindus, Persians, Germans, Romans, with the Creek religion in the highest rank; (3) Religions of Redemption (Judaism forming the transition from the second group), Buddhism in the sense of world- negation, and, positively, Christianity. Bousset, What is Religion? (1907) reckons Platonism along with Buddhism. For criticism of Siebeck's scheme see Tiele, Elements of the Science of Religion, vol. i. (1897), pp. 62, 65. Pfleiderer, Religion and Historic Faiths (1907), p. 88, recognizes more clearly the difficulty of carrying almost any division through the whole field, without frequent breach of historical connexions.

of the world, brother of Maat and the giver of laws and culture to man. 1 Thoth " the thrice-great " passed into Hermes Trismegistus whom Christian fathers could recognize, 2 when the supremely beautiful figure of Greek theology, Apollo, had lost his dignity and ceased to be desired. Thoth was a voluminous author, and the collection of forty-two books which bore his name was a kind of primitive cyclopaedia of theology, astronomy, geography and physiology. Apollo proclaims at his birth that he will declare the counsel of Father Zeus to men. 3 But his utterances have been only

casually preserved. A special literature of oracles did indeed arise; the divine words were collected and the circumstances which produced them were recorded; and had Delphi become in fact the centre of Greece, as Piato conceived it, here might have been the nucleus of a scripture. Theories of inspiration lurk behind the rich vocabulary of Greek prophecy; the seer is tvdtos, deo\iprTo$, BtiyKvtvcTos, deofoprjTOS, and Bakis and Musaeus give their names to sacred verses. The story of the Sibylline books in Rome, on the other hand, shows the growth of the idea of authority. They are deposited in a temple, in charge of a small sacred college; new deities and rites are introduced under their sanction; when they are accidentally destroyed, envoys are sent to the East and fresh collections are made; these are in their turn purged, the false are discarded and the true reverently preserved. By what method the books were consulted is not known; but they exhibit the idea of a sacred canon in process of formation. The theologians of India guarded their ancient hymns with the utmost care. A vast literary apparatus was devised for their protection. The famous Purusha-hymn (R. V. x. 90) already claimed a divine origin for the three Vedas, the Rik, the Saman and the Yajush. The ” triple knowledge ” was sometimes derived from the ” Lord of Creatures ” Prajapati — one of the unifying forms of Brahmanical theology — through Vac or ” speech.” The Veda, that is to say, had existed in the divine mind ere it was made known to men, and as such it belonged to the realm of the deathless and the infinite. The tribal poets were supposed to have ” seen ” the heavenly originals; elaborate arguments were devised to explain how the names of particular objects like rivers and mountains could have existed in the Eternal; while the grounds of belief in the infallibility of the sacred verses were enforced with the double weight of philosophy and tradition. Buddhism repudi- ated the authority of the Veda, but found it needful to supply its place; and the word of the omniscient Teacher, faithfully reported by his disciples and guaranteed by concurrent tradi- tions, became the rule of belief for the new Order. Nor were the authors of the scriptures whose fragments are preserved in the Zend Avesta less conscious of their divine value. The ancient Gathas, which were supposed to be the composition of Zarathustra himself, received the homage of later worshippers. 4 Daena, the ideal personification of law and religion, is the object of praise and sacrifice. She dwells on high in the Heavenly Home, the radiant’ ” Abode of song,” but Zarathustra summons her thence, begs for her fellowship, and prays her for righteous- ness of thought, speech and deed. 6 She is produced by Vohu Mano, the ” Good Thought ” of Ahura, one of the six Holy Immortals; she thus belongs to the ideal creation before the earth and its inhabitants; 6 but how the heavenly Daena was wrought by

Zarathustra into written form is nowhere stated. This conception of pre-existent spiritual counterparts was not without influence on the later theology of Israel. The sacred law (Torah) was the earthly reproduction of a heavenly Torah which had no origin in time, and constituted the sum of ideal wisdom into which God looked when he would create the world. 7

1 Cf. Maspero, Dawn of Civilization, p. 204; Wiedemann, Religion of the Ancient Egyptians, p. 227 ; Budge, Gods of Egypt, i. p. 415.

s Aug. De Civ. Dei, xviii. 39, attributes the origin of philosophy to his era.

3 Horn. Hymn. i.

- Yasna, lv. ; S.B.E. xxxi. p. 294.

6 S.B.E. xxiii. p. 264.

- Bundahis, i. 25; S.B.E. v. p. 9.

7 Midrash Bereshith Rabba, tr. Wunsche, I. i. ver. i.

Even Mahommedanism felt the spell of the same modes of thought. The idea of revelation was expressed by ” sending down ” (from nazala, to descend) ; that which passed from heaven to earth was a pre-existent word, eternal as God Himself. Allusions in particular passages of the Koran to the ” mother of the scripture,” the invisible originals of the prophet’s speech, led to the doctrine of its uncreated being. The whole history of religion presents perhaps no more singular spectacle than the mosques of Bagdad in the middle of the 9th century filled with vast crowds of twenty and thirty thousand of the faithful, assembled to discuss the dogmas of the created and the un- created Koran. 8

8. Ethics and Eschatology. — The second distinguishing mark in Tiele’s higher group is implied in the term ” Ethical.” By this it is not intended to assert that moral ideas are wanting in the so-called ” naturist ” religions. Anthropologists have, it is true, taken widely different views of the relation of ethics and religion, and the stage at which an effective alliance between them might be recognized. Like all problems oi origins, the question is necessarily extremely obscure, and cannot be definitely settled by historical evidence. Broadly speaking, however, it may be said that the attempt to show that certain savages are destitute of moral feeling cannot be sustained; 3 and evidence has been already cited above (in the section on Primitive

Religion) proving the varied and immediate effects of religion on the life of the lowest tribes. Continuous interaction marks the slow courses of advance. At a very early period in social development the rules of conduct are referred to some higher source. Thus among the tribes of south-eastern Australia described by Mr Howitt, 10 the native rites and laws handed dc wn from generation to generation were supposed to have beeh first imparted by some higher being such as Nurrundere, who made all things on the earth; or Nurelli, who created the whole country, with the rivers, trees and animals; or Daramulun, who (like Nurrundere) bestowed weapons on the men, and instituted the rites and ceremonies connected with life and death. As religion advances with improved social organization, a series of figures, partly human, partly divine, embodies the idea that the command of nature implied in the progress of the arts is due to some kind of instruction from above, and that the obli- gations of law are of more than human origin. The Algonquin. Manibozho and Quetzalcoatl of Mexico stand for a whole group of typical personalities in North and Central America. The mysterious fish-man Oannes,who taught the primitive inhabitants of Babylonia, according to Alexander Polyhistor, has been identified with Ea, god of the deep, the source of wisdom, culture and social order. Zeus gave laws to Minos; Apollo revealed the Spartan constitution to Lycurgus; Zaleucus received the laws for the Locrians from Athena in a dream; Vishnu and Manu condescended to draw up law-books in India. The worship of ancestors has again and again gathered around it powerful and ethical influences, emphasizing the parental and filial relations, and strengthening the mutual obligations of communal life. Hirata answered by anticipation the modern reproach against Shinto, founded on the absence of any definite morality connected with it, by laying down the simple rule, ” Act so that you need not be ashamed before the Kami of the unseen.” u The mythological embodiments of the connexion of law in nature with the social and moral order have already been briefly noted: a few words may be said in conclusion on another product of the union of religion and ethics, viz. the doctrine of judgment after death. That this doctrine is not essential to a highly moralized religion is clear from the fact that it formed no part of the earlier Hebrew prophecy. Judgment, indeed, was an inevitable outcome of the sovereignty of Yahweh, but it would be passed upon the nation in the immediate scene of its misdoings; and even when the scope of the divine doom

8 Von Kremer, Die Herrschenden Ideen des Islams, p. 233 ff.

‘ See Westermarck, Origin and Development of Moral Ideas, /ol.i. (1906), p. 125, on Lord Avebury’s conclusions.

10 Native Tribes of S.E. Australia (1904), pp. 488, 489, 495, 543.

11 Satow, ” Revival of Pure Shinto,” Trans. As. Soc. Japan, vol. iii. Appendix, p. 87.

was extended to include the nations of the world, it was still upon the living that it would alight. The seers of Israel were content to dismiss their dead to a land of silence and darkness, the vast hollow gloom of the subterranean Sheol. 1 A far ruder outlook on life, however, which has again and again appealed to some form of the divine cognizance by means of the ordeal and the oath, frequently supplements the moral issues of this world by the judicial award of the next. Assuming the proper fulfilment of the ritual of death, ethics gradually extends its control over the future. At first the social distinctions of this life are simply continued hereafter: the chief remains a chief, the slave a slave; and the conditions of the future only prolong those of the present. In so far as tribal eminence depends on superior skill or courage or wisdom, the germs of ethical differ- entiation may be discovered even here. The process is carried further (i) in individual cases of retribution, when (as among the Kaupuis) crime within the tribe was punished, and a murderer becomes in the next life his victim’s slave; 2 or (2) when service to the community received special reward, and warriors who had fallen in battle, women who had died in childbirth and merchants who had perished on a journey were sent in Mexico to the house of the sun. 3 As the social order acquires more definiteness and stability, the control of life by the gods tends to become more clearly moralized. This brings with it new standards independent of clan-customs or tribe- usage. Only the worst offences, however, at first draw down post-mortem punishment. The Homeric Erinyes chastise outrages on the poor, injuries to guests, failure to show the respect due to parents or to recognize the rights of age, in this life; only on perjury does the divine doom extend to the next. 4 On the other hand, the Egyptian version of ” the whole duty of man ” in the famous 125th chapter of the Book of the Dead embraces a singular complex of ritual, social and personal sins, in which the inward states of lying, anger and ill-will are condemned along with murder, theft and adultery, beside violation of the times of offerings to the gods, or interference with the food of the blessed dead. The great judgment of Osiris formulates with the utmost precision the alliance

between morals and religion. The doctrine established itself in Greek theology under the influence of Orphism, and supplied Plato with mythic forms for his ” criticism of life.” In India the union of morality and religion was effected in another manner. True, Yama, first of men to enter the world beyond, became the ” King of Righteousness ” before whose tribunal the dead must appear. But a new agency began to engage the speculations of thinkers, the moral values of action embodied in the Deed. ” The deed does not perish,” ran an early formula. 6 ” A man is born into the world that he has made,” said another: 6 and what was laid down first as a ritual principle survived as an ethical. Buddhism conceived men as constantly making their own world for good and ill; it took over from Brahmanism a whole series of heavens and hells to provide an exact adjustment in the future for the virtue or vice of the present; and its eschatologic confidence was one of the potent instruments of its success in countries which, like China and Japan, had developed no theories of retribution or reward beyond the grave. Along, a different line of thought the Iranian teachers, beholding the world divided between hostile powers, demanded, as the fundamental postulate of religion, the victory of the good. The conflict must end with the triumph of light, truth and right. The details of this remarkable scheme must be studied elsewhere (see Zoroaster). The award of the angel-judges at the Bridge of Assembly, soon after death, despatched the individual to his appropriate lot in the homes of Good or Evil Thought, Word

1 Cf . Ezek. xxxii. 17-32; Ps. lxxxviii 3-4, 10, 11; Job x. 21-22,

and many other passages.

2 Watt, Journ. Anthrop. Institute, xvi p. 356. Cf. Codrington, The Melanesians (1 891), p. 274.

3 Bancroft, Native Races of tlie Pacific States of N. America, iiL

P- 532.

4 II. 111. 278-79; xix. 258-60.

6 S.B.E. ii. p. 271 ; xiv. pp. 116, 310. 6 Ibid. xli. p. 181.

and Deed. But at length the long struggle would draw to an end. The great ” divine event,” the frasho-kereli, the renova- tion, would set in. A new heaven and a new earth would be created: a general resurrection should take place; the powers of evil should be overthrown and extinguished; and hell should be brought back for the enlargement of the world. Eschatology has again and again expressed

the alliance between ethics and religion. It remains for the future to show how long that alliance will require its support.

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REMAGEN, a town of Germany, in the Prussian Rhine Province, on the left bank of the Rhine, 12 m. above Bonn, by the railway from Cologne to Coblenz, and at the junction of the Ahr valley railway to Adenau. Pop. (1900) 3534. The (Roman Catholic) parish church is remarkable for a gate (Romertor) with grotesque sculptures of animals, dating from the 12th century. Archaeologists have variously interpreted its original purpose, whether as church door, city gate or palace gate. The industry of the place is almost wholly concerned with

the preparation of wine, in which a large export trade is done. Just below the town, on a height overlooking the Rhine, stands the Apollinaris church, built 1839-53 on the site of a chapel formerly dedicated to St Martin, and containing the relics of St Apollinaris. It is a frequent place of “pilgrimage from all parts of the lower Rhine. According to legend, the ship con- veying the relics of the three kings and of Bishop Apollinaris from Milan to Cologne in 1164 could not be got to move away from the spot until the bones of St Apollinaris had been interred in St Martin’s chapel.

Remagen (the Rigomagus of the Romans) originally belonged to the duchy of Jiilich. Many Roman antiquities have been discovered here. In 1857 a votive altar dedicated to Jupiter, Mars and Mercury was unearthed, and is now in the Provincial Museum at Bonn.

See Kinkel, Der Fuhrer durch das Ahrthal nebst Beschreibung der Stadt Remagen (2nd ed., Bonn, 1854).

REMAINDER, REVERSION. In the view of English law a remainder or reversion is classed either as an incorporeal hereditament or, with greater correctness, as an estate in expectancy. That is to say, it is a present interest subject to an existing estate in possession called the particular estate, which must determine before the estate in expectancy can become an estate in possession. A remainder or reversion is in strictness confined to real estate, whether legal or equitable, though a similar interest may exist in personalty. The particular estate and the remainder or reversion together make up the whole estate over which the grantor has power of disposition. 1 Accordingly a remainder or reversion limited on an estate in fee simple is void. The difference between a remainder and a reversion, stated as simply as possible, is that the latter is that undisposed-of part of the estate which after the determination of the particular estate will fall into the possession of the original grantor or his representative, while a remainder is that part of the estate which under the same circumstances will fall into the possession of a person other than the original grantor or his 1 Compare the life-rent and fee of Scots law.

representative. A reversion, in fact, is a special instance of a remainder, distinguishable from it in two important respects: (1) a reversion arises by operation of law on every grant of an estate where the whole interest is not parted with, whereas a remainder is created by express words; (2) tenure exists between the reversioner and the tenant of the particular estate, but not between the latter and the remainderman. Accordingly rent service is said to be an incident of a reversion but not of a remainder, and a reversioner could distrain for

it at common law. A reversion may be limited upon any number of remainders, each of them as it falls into possession becoming itself a particular estate. A remainder or reversion may be alienated either by deed or by will. A conveyance by the tenant of a particular estate to the remainderman or reversioner is called a surrender; a conveyance by the remainderman or reversioner to the tenant is a release.

Remainder. — Remainders are either vested or contingent. ” An estate is vested in interest when there is a present fixed right of future enjoyment. An estate is contingent when a right of enjoy- ment is to accrue on an event which is dubious and uncertain. A contingent remainder is a remainder limited so as to depend on an event or condition which may never happen or be performed, or which may not happen or be performed till after the determination of the preceding estate ” (Fearne, Contingent Remainders, 2, 3). Contingent remainders are of two kinds, those limited to uncertain persons and those limited on uncertain events. A grant by A to B for life, followed by a remainder in fee to the heir of C is an example of a contingent remainder. 2 Until the death of C he can have no heir. If C die during the lifetime of B, the contingent remainder of his heir becomes vested; if C survive B, the remainder is at common law destroyed owing to the determination of the par- ticular estate, for every remainder must have a particular estate to support it. In the case of a contingent remainder, it must become vested during the continuance of the particular estate or at the instant of its determination. This rule of law no doubt arose from the disfavour shown by the law to contingent remainders on their first introduction. They were not firmly established even when Littleton wrote in the reign of Edward IV. (see Williams, Real Property). The inconveniences resulting from this liability of contingent remainders to destruction were formerly overcome by the device of appointing trustees to preserve contingent remainders, at law. Equitable contingent remainders, it should be noticed, were indestructible, for they were supported by the legal estate. In modern times the matter has been dealt with by act of Parlia- ment. By the Real Property Act 1845, § 8, a contingent remainder is rendered capable of taking effect notwithstanding the deter- mination by forfeiture, surrender or merger of any preceding estate of freehold in the same manner as if such determination had not happened. The case of determination by any other means is met by the Contingent Remainders Act 1877. The act provides that a contingent remainder which would have been valid as a springing or shifting use or executory devise or other limitation had it not had a sufficient estate to support it as a contingent re- mainder is, in the event of the particular estate determining before the contingent

remainder vests, to be capable of taking effect as though the contingent remainder had originally been created as a springing or shifting use or executory devise or other executory limitation. It will accordingly only be good if the springing use, &c. (for which see Trust), would be good. If the springing use be void as a breach of the rule against perpetuities (see Perpetuity), the remainder will likewise be void. Apart from this act, there is some un- certainty as to the application of the rule against perpetuities to remainders. The better opinion is that it applies to equitable remainders and to legal remainders expectant upon an estate for life limited to an unborn person. In the latter case the rule as applied to contingent remainders is somewhat different from that affecting executory interests. The period is different, the remainder allowing the tying up of property for a longer time than the execu- tory interest. There is also the further difference that the rule does not affect a contingent remainder if it become vested before the determination of the particular estate. An executory interest is void if it may transgress the rule, even though it do not actually do so. For the rule in Shelley's case, important, in connexion with remainders, see that title.

The state laws of the United States affecting remainders will be found_ in Washburn, Real Property, ii. bk. ii. As a general rule contingent remainders have been rendered of little practical importance by enactments that they shall take effect as executory devises or shall not determine on determination of the particular estate.

Reversion. — Unlike remainders, all reversions are present or vested estates. The law of reversion, like that of remainder, has been considerably modified by statute. It was formerly considered

_ * A contingent remainder amounting to a freehold cannot be limited on a particular estate less than a freehold.

that on the grant of the reversion the tenant should have the opportunity of objecting to the substitution of a new landlord. It was therefore necessary that he should attorn tenant to the purchaser. Without such attornment the grant was void, unless mdeed attornment were compelled by levying a fine. The neces- sity of attornment was abolished by 4 & 5 Anne c. 16. Its only use at present seems to be in the case of mortgage. A mortgagor in possession sometimes attorns tenant to the mortgagee in order that the latter may treat him as his

tenant and distrain for his interest as rent. The legal view that rent was incident to the reversion led at common law to a destruction of the rent by de- struction of the reversion. This would chiefly happen in the case of an under-tenant and his immediate reversioner, if the inter- mediate became merged in the superior reversion. To obviate this difficulty it was provided by the Real Property Act 1845, § 9, that, on surrender or merger of a reversion expectant on a lease, the rights under it should subsist to the reversion conferring the next vested right. The question as to what covenants run with the reversion is one of the most difficult in law. The rule of common law seems to have been that covenants ran with the land but not with the reversion, that is to say, the benefit of them survived to a new tenant but not to a new landlord. The effect of the act of 32 Hen. VIII. c. 34, and of the Conveyancing Act 1881, has been to annex to the reversion as a general rule the benefitof the rent and the lessee's covenants and the burden of the lessor's covenant. Merely collateral covenants, however, do not run with the reversion, but are regarded as personal contracts between lessor and lessee. At common law on the severance of a reversion a grantee of part of the reversion could not take advantage of any condition for re-entry, on the ground that the condition was entire and not severable. This doctrine was abolished by one of Lord St Leonard's Acts in 1859. The Conveyancing Act 1881, § 12, now provides in wider terms than those of the act of 1859 that on severance of the reversion every condition capable of apportionment is to be apportioned. In order to guard against fraudulent concealment of the death of a cestui que vie, or person for whose life any lands are held by another, it was provided by 6 Anne c. 18 that on applica- tion to the court of chancery by the person entitled in remainder, reversion or expectancy, the cestui que vie should be produced to the court or its commissioners, or in default should be taken tobe dead. In Scotland reversion is generally used in a sense approaching that of the equity of redemption of English law. A reversion is either legal, as in an adjudication, or conventional, as in a wadset. Reversions are registered under the system established by the Act 1617 c. 16. ,,.,,,

In the United States the act of 32 Hen. VIII. c. 34 is held to be in force in Massachusetts, Pennsylvania, Illinois, and Connecti- cut, but was never in force in New York till re-enacted " (Wash- burn, Real Property, i.).

REMAND (Lat. remandare), a term of English law meaning the return of a prisoner by order of a court to the custody from which he came to the court. Thus where an application for release is unsuccessfully made by means of habeas corpus, the applicant is remanded to the custody which he has challenged as illegal. Where trials or

indictments are not concluded at a single sitting the cotirt of trial has power to remand the accused into proper custody during any necessary adjournment. Where a preliminary inquiry into an indictable offence is not completed at a single sitting, the prisoner, if not released on bail, may be remanded to prison or some other lawful place of custody for a period not exceeding eight days, and so on by further remands till the inquiry is completed and the accused is discharged, or committed to prison to await his trial, or released on bail to take his trial. If the remand is for more than three days the order must be in writing (Indictable Offences Act 1848, 11 & 12 Vict. c. 42, s. 21). Similar powers of remand or committal to prison during adjournments are given to justices in the exercise of their summary criminal jurisdiction, whether as to offences punishable only on summary conviction, or as to indictable offences with which it is proposed to deal summarily (Summary Jurisdiction Acts 1848, s. 16, and 1879, s. 24).

In the case of charges against children or young persons, where the justices commit for trial or order a remand pending inquiry, or with a view to sending a child to an industrial school or a reformatory, they may remand to the workhouse or to some fit custody instead of remanding to prison (Youthful Offenders Act 1901, s. 4). For this purpose remand homes have been established.

REMBRANDT (1606-1669). Rembrandt Harmens van Rijn, Dutch painter, was born in Leiden on the 15th of July 1606. It is only within the past fifty years that we have come

to know anything of his real history. A tissue of fables formerly represented him as ignorant, boorish and avaricious. These fictions, resting on the loose assertions of Houbraken (De Grooie Schouburgh, 1718), have been cleared away by the untiring researches of Scheltema and other Dutchmen, notably by C. Vosmaer, whose elaborate work (Rembrandt, sa vie el ses ceuvres, 1868, 2nd ed., 1877) is the basis of our knowledge of the man and of the chronological development of the artist. 1 Rembrandt's high position in European art rests on the originality of his mind, the power of his imagination, his profound sympathy with his subjects, the boldness of his system of light and shade, the thoroughness of his modelling, his subtle colour, and above all on his intense humanity. He was great in conception and in execution, a poet as well as a painter, an idealist and also a realist; and this rare union is the secret of his power. From his dramatic action and mastery of expression Rembrandt has been well called "the Shakespeare of Holland."

In the beginning of the 17th century Holland had entered on her grand career of national enterprise. Science and literature flourished in her universities, poetry and the stage were favoured by her citizens, and art found a home not only in the capital but in the provincial towns. It was a time also of new ideas. Old Conventional forms in religion, philosophy and art had fallen away, and liberty was inspiring new conceptions. There were no church influences at work to fetter the painter in the choice and treatment of his subject, no academies to prescribe rules. Left to himself, therefore, the artist painted the life of the people among whom he lived and the subjects which inter- ested them. It was thus a living history that he painted — scenes from the everyday life and amusements of the people, as well as the civic rulers, the ” regents ” or governors of the hospitals and the heads of the guilds, and the civic guards who defended their towns. So also with religious pictures. The dogmas and legends of the Church of Rome were no longer of interest to such a nation; but the Bible was read and studied with avidity, and from its page the artist drew directly the scenes of the simple narrative. Perhaps the earliest trace of this new aspect of Bible story is to be found in the pictures painted in Rome about the beginning of the 17th century by Adam Elsheimer of Frankfort, who had undoubtedly a great influence on the Dutch painters studying in Italy. These in their turn carried back to Holland the simplicity and the picturesque effect which they found in Elsheimer’s work. Among these, the precursors of Rembrandt, may be mentioned Moeyaert, Ravesteyn, Lastman, Pinas, Honthorst and Bramer. Influenced doubtless by these painters, Rembrandt determined to work Out his own ideas of art on Dutch soil, resisting apparently every inducement to visit Italy. Though an admirer of the great Italian masters, he yet maintained his own individuality.

Rembrandt was born at No. 3 Weddesteg, on the rampart at Leiden overlooking the Rhine. He was the fourth son of Gerrit Harmens van Rijn, a well-to-do miller. As the older boys had been sent to trade, his parents resolved that he should enter a learned profession. With this view he was sent to the High School at Leiden; but the boy soon manifested his dislike of the prospect, and determined to be a painter. Accordingly he was placed for three years under Swanenburch, a painter of no great merit, who enjoyed some reputation from his having studied in Italy. His next master was Lastman of Amsterdam, a painter of very considerable power. In Lastman’s works we can trace the germs of the colour and sentiment of his greater pupil, though his direct influence cannot have been great, as it is said by Orlers that Rembrandt remained with him only six months, after which time he returned to Leiden, about 1623. During the early years of his life at

Leiden Rembrandt seems to have devoted himself entirely to studies, painting and etching the people around him, the beggars and cripples, every pic- turesque face and form he could get hold of. Life, character,

1 Vosmaer's first volume, on the precursors and apprenticeship of Rembrandt, was published in 1863. New light has since been thrown on important points by Dr Bode (Hollandische Malerei t 1883), De Roever, De Vries and others.

and above all light were the aims of these studies. His mother was a frequent model, and we can trace in her features the strong likeness to her son, especially in the portraits of himself at an advanced age. In the collection of Rembrandt's works at Amsterdam in 1898 were shown three portraits of his father, who died about 1632; nine are catalogued altogether. The last portrait of his mother is that of the Vienna Museum, painted the year before her death in 1640. One of his sisters also frequently sat to him, and Bode suggests that she must have accompanied him to Amsterdam and kept house for him till he married. This conjecture rests on the number of portraits of the same young woman painted in the early years of his stay in Amsterdam and before he met his bride. Then, again, in the many portraits of himself painted in his early life we can see with what zeal he set himself to master every form of expression, now grave, now gay — how thoroughly he learned to model the human face not from the outside but from the inner man. Dr Bode gives fifty as the number of the portraits of himself (perhaps sixty is nearer the actual number), most of them painted in youth and in old age, the times when he had leisure for such work.

Rembrandt's earliest pictures were painted at Leiden, from 1627 to 1631. Bode mentions about nine pictures as known to belong to these years, chiefly paintings of single figurts, as "St Paul in Prison" and "St Jerome"; but now and then compositions of several, as " Samson in Prison " and " Presenta- tion in the Temple." The prevailing tone of all these pictures is a greenish grey, the effect being somewhat cold and heavy. The gallery at Cassel gives us a typical example of his studies of the heads of old men, firm and hard in workmanship and full of detail, the effects of light and shade being carefully thought out. His work was now attracting the attention of lovers of art in the great city of Amsterdam; and, urged by their calls, he removed about 163 1 to live and die there. At one bound he leaped into the position of the first

portrait painter of the city, and received numerous commissions. During the early years of his residence there are at least forty known portraits from his hand, firm and solid in manner and staid in expression. It has been remarked that the fantasy in which he indulged through life was reserved only for the portraits of himself and his immediate connexions. The excellent painter Thomas de Keyser was then in the height of his power, and his influence is to be traced in some of Rembrandt's smaller portraits. Pupils also now flocked to his house in the Bloemgracht, among them Gerard Douw, who was nearly of his own age. The first important work executed by Rembrandt in Amsterdam is " Simeon in the Temple," of the Hague Museum, a fine early example of his treatment of light and shade and of his subtle colour. The concentrated light falls on the principal figure, while the background is full of mystery. The surface is smooth and enamel-like, and all the details are carefully wrought out, while the action of light on the mantle of Simeon shows how soon he had felt the magical effect of the play of colour. In the life-sized " Lesson in Anatomy " of 1632 we have the first of the great portrait subjects — Tulp the anatomist, the early friend of Rembrandt, discoursing to his seven associates, who are ranged with eager heads round the foreshortened body. The subject had been treated in former years by the Mierevelts, A. Pietersen and others, for the Hall of the Surgeons. But it was reserved for Rembrandt to make it a great picture by the grouping of the expressive portraits and by the completeness of the conception. The colour is quiet and the handling of the brush timid and precise, while the light and shade are somewhat harsh and abrupt. But it is a marvellous picture for a young min of twenty-five, and it is generally accepted as marking a new departure in the career of the painter.

About 700 pictures are known to have come from Rembrandt's own hand. It is impossible to notice more than the prominent works. Besides the Pellicorne family portraits of 1632 now in the Wallace Collection, we have the calis*raphist Coppenol of the Cassel Gallery, interesting in the first place as an early example of Rembrandt's method of pivinp permanent interest to a portrait by converting it into a picture. He invests it with a sense of life by a momentary expression as Coppenol raises his head towards the

spectator while he is mending a quill. The same motive is to bt found in the " Shipbuilder," 1633 (Buckingham Palace), who looks up from his work with a sense of interruption at the approach of his wife. Coppenol was painted thrice and etched twice by the artist, the last of whose portrait etchings (1661) was the Coppenol of large size. The two small pictures of " The Philosopher " of the Louvre date from

1633, delicate in execution and full of mysterious effect. ˆ

The year 1634 is especially remarkable as that of Rembrandt's marriage with Saskia van Uylenborch, a beautiful, fair-haired Frisian maiden of good connexions. Till her death in 1642 she was the centre of his life and art, and lives for us in many a canvas as well as in her own portraits. On her the painter lavished his magical power, painting her as the Queen Artemisia or Bath* sheba, and as the wife of Samson — always proud of her long fair locks, and covering her with pearls and gold as precious in their play of colour as those of the Indies. A joyous pair we see them in the Dresden Gallery, Saskia sitting on his knee while he laughs gaily, or promenading together in a fine picture of 1636, or putting the last touches of ornament to her toilette, for thus Bode interprets the so-called " Burgomaster Pancras and his Wife." These were his happy days when he painted himself in his exuberant fantasy, and adorned himself, at least in his portraits, in scarfs and feathers and gold chains. Saskia brought him a marriage portion of forty thousand guilders, a large sum for those times, and she brought him also a large circle of good friends in Amsterdam. She bore him four children, Rumbartus and two girls, successively named Cornelia after his beloved mother, all of whom died in infancy, and Titus, named after Titia a sister of Saskia. We have several noble portraits of Saskia, a good type of the beauty of Holland, all painted with the utmost love and care, at Cassel (1633), at Dresden (1641), and a posthumous one (1643) at Berlin. But the greatest in workmanship and most pathetic in expression seems to us, though it is decried by Bode, that of Antwerp (1641), in which it is impossible not to trace declining health and to find a melan- choly presage of her death.

One of Rembrandt's greatest portraits of 1634 is the superb full-length of Martin Daey, which, with that of Madame Daey, painted according to Vosmaer some years later, formed one of the ornaments of the Van Loon collection at Amsterdam. Both now belong to Baron Gustave de Rothschild. From the firm detailed execution of this portrait one turns with wonder to the broader handling of the " Old Woman " (Frangoise van Wasserhoven) , aged eighty-three, in the National Gallery, of the same year, remarkable for the effect of reflected light and still more for the sympathetic rendering of character.

The life of Samson supplied many subjects in these early days. The so-called " Count of Gueldres threatening his Father-in-law " of the Berlin Gallery has been restored to its proper signification by M. Kolloff, who finds it to be Samson. It is forced and violent in its action. The greatest

of this series, and one of the pro- minent pictures of Rembrandt's work, is the " Marriage of Samson," of the Dresden Gallery, painted in 1638. Here Rembrandt gives the rein to his imagination and makes the scene live before us. Except the bride (Saskia), who sits calm and grand on a dais in the centre of the feast, with the full light again playing on her flowing locks and wealth of jewels, all is animated and full of bustle. Sam- son, evidently a Rembrandt of fantasy, leans over a chair pro- pounding his riddle to the Philistine lords. In execution it is a great advance on former subject pictures; it is bolder in manner, and we have here signs of his approaching love of warmer tones of red and yellow.

The story of Susannah also occupied him in these early years, and he returned to the subject in 1641 and 1653. " The Bather " of the National Gallery may be another interpretation of the same theme. In all of these pictures the woman is coarse in type and lumpy in form, though the modelling is soft and round, the effect which Rembrandt always strove to gain. Beauty of form was outside his art. But the so-called " Danae " (1636) at St Peters- burg is a sufficient reply to those who deny his ability ever to ap- preciate the beauty of the nude female form. It glows with colour and life, and the blood seems to pulsate under the warm skin. In the picturesque story of Tobit Rembrandt found much to interest him, as we see in the beautiful small picture of the d'Arenberg Collection at Brussels: Sight is being restored to the aged Tobias, while with infinite tenderness his wife holds the old man's hand caressingly. The momentary action is complete, and the picture goes straight to the heart. In the Berlin Gallery he paints the anxiety of the parents as they wait the return of their son. In 1637 he painted the fine picture now in the Louvre of the " Flight of the Angel "; and the same subject is grandly treated by him.

apparently about 1645, ' n the picture exhibited in the winter exhibi- tion at Burlington House in 1885. Reverence and awe are shown in every attitude of the Tobit family. A similar lofty treatment is to be found in the " Christ as the Gardener," appearing to Mary, of 1638 (Buckingham Palace).

We have now arrived at the year 1640, the threshold of his second manner, which extended to 1654, the middle age of Rembrandt. During the latter part of the previous decade we find the shadows more transparent and the blending of light and shade more perfect.

There is a growing power in every part of his art. The coldness of his first manner had disappeared, and the tones were gradually changing into golden-brown. He had passed through what Bode calls his ” Sturm-und-Drang ” period of exaggerated expression, as in the Berlin Samson, and had attained to a truer, calmer form of dramatic expression, of which the ” Manoah ” of Dresden is a good example (1641). The portraits painted ” to order ” became more rare about this time, and those which we have are chiefly friends of his circle, such as the ” Mennonite Preacher ” (C. C. Ansloo) and tie ” Gilder,” a fine example of his golden tone, formerly in the Morny collection and now in America. His own splendid portrait (1640) in the National Gallery illustrates the change in his work. It describes the man well — strong and robust, with powerful head, firm and compressed lips and determined chin, with heavy eyebrows, separated by a deep vertical furrow, and with eyes of keen penetrating glance — altogether a self-reliant man that would carry out his own ideas, careless whether his popularity waxed or waned. The fantastic rendering of himself has disappeared; he seems more conscious of his dignity and position. He has now many friends and pupils, and numerous commissions, even from the stadtholder; he has bought a large house in the Breedstraat, in which during the next sixteen years of his life he gathers his large collection of paintings, engravings, armour and costume which figure afterwards in his inventory. His taste was wide and his purchases large, for he was joint owner with picture-dealers of paintings by Giorgione and Palma Vecchio, while for a high-priced Marcantonio Raimondi print he gave in exchange a fine impression of his ” Christ Healing the Sick,” which has since been known as the ” Hundred Guilder Print.” The stadtholder was not a prompt payer, and an interesting correspondence took place between Rembrandt and Constantin Huygens, the poet and secretary of the prince. The Rembrandt letters which have come down to us are few, and these are therefore of importance. Rembrandt puts a high value on the picture, which he says had been painted ” with much care and zeal,” but he is willing to take what the prince thinks proper; while to Huygens he sends a large picture as a present for his trouble in carrying through the business. There is here no sign of the grasping greed with which he has been charged, while his unselfish conduct is seen in the settlement of the family affairs at the death of his mother in 1640.

The year 1642 is remarkable for the great picture formerly known as the ” Night Watch,” but now more correctly as the ” Sortie of the Banning Cock Company,” another of the landmarks of Rem- brandt’s career, in which twenty-nine life-sized civic guards are introduced issuing pell-mell from their club house. Such gilds of arquebusiers had

been painted admirably before by Ravesteyn and notably by Frans Hals, but Rembrandt determined to throw life and animation into the scene, which is full of bustle and move- ment. The dominant colour is the citron yellow uniform of the lieutenant, wearing a blue .sash, while a Titian-like red dress of a musketeer, the black velvet dress of the captain, and the varied green of the girl and drummer, all produce a rich and harmonious effect. The background has become dark and heavy by accidmt or neglect, and the scutcheon on whi-h the names are painted is scarcely to be seen. It is to be observed that, as proved by the copy by Gerrit Lundens in the National Gallery, it represents not a " night watch," except in name, but a day watch.

But this year of great achievement was also the year of his great loss, for Saskia died in 1642, leaving Rembrandt her sole trustee for her son Titus, but with full use of the money till he should marry again or till the marriage of Titus. The words of the will express her love for her husband and her confidence in him. With her death his life was changed. Bode has remarked that there is a pathetic sadness in his pictures of the Holy Family — a favourite subject at this period of his life. All of these he treatsˆwith the naive simplicity of Reformed Holland, giving us the real carpenter's

shop and the mother watching over the Infant reverently and lovingly, with a fine union of realism and idealism.

The street in which he lived was full of Dutch and Portuguese Jews, and many a Jewish rabbi sat to him. He accepted or invented their turbans and local dress as characteristic of the people. But in his religious pictures it is not the costume we look at; what strikes us is the profound perception of the sentiment of the story, making them true to all time and independent of local circumstance. A notable example of this feeling is to be found in the " Woman Taken in Adultery " of the National Gallery, painted in 1644 in the manner of the " Simeon " of the Hague. Beyond the ordinary claims of art, it commands our attention from the grand conception of the painter who here, as in other pictures and etchings, has invested Christ with a majestic dignity which recalls Lionardo and no other. A similar lofty ideal is to be found in his various renderings of the " Pilgrims at Emmaus," notably in the Louvre picture of 1648, in which, as Mrs Jameson says, " he returns to those first spiritual principles which were always the dowry of ancient art." From the same year we have the " Good Samaritan " of the Louvre, the story of which is told with intense pathos. The helpless suffering of the wounded man, the curiosity of the boy on tiptoe, the excited faces at the upper window, are all conveyed with masterly skill. In these last two pictures we find

a broader touch and freer handling, while the tones pass into a dull yellow and brown with a marked pre- dilection for deep rich red. Whether it was that this scheme of colour found no favour with the Amsterdamers, who, as Hoog- straten tells us, could not understand the ” Sortie,” it seems certain that Rembrandt was not invited to take any leading part in the celebration of the congress of Westphalia (1648).

Rembrandt touched no side of art without setting his mark on it, whether in still life, as in his dead birds or the ” Slaughtered Ox ” of the Louvre (with its repetitions at Glasgow and Budapest), or in his drawings of elephants and lions, all of which are instinct with life. But at_ this period of his career we come upon a branch of his art on which he left, both in etching and in painting, the stamp of his genius, viz. landscape. Roeland Roghman, but ten years his senior, evidently influenced his style, for the resemblance between their works is so great that, as at Cassel, there has been confusion of authorship. Hercules Seghers also was much appreciated by Rembrandt, for at his sale eight pictures by this master figure in the inventory, and Vosmaer discovered that Rembrandt had worked on a plate by Seghers and had added figures to an etched ” Flight into Egypt.” The earliest pure landscape known to us from Rem- brandt s hand is that at the Ryks Museum (1637-38), followed in the latter year by those at Brunswick, Cracow and Boston (U.S.A.), and that dated 1638 and belonging to Mr G. Rath in Budapest. Better known is the ” Winter Scene ” of Cassel (1646), silvery and delicate. As a rule in his painted landscape he aims at grandeur and poetical effect, as in the ” Repose of the Holy Family ” of 1647 (formerly called the ” Gipsies “), a moonlight effect, clear even in the shadows. The ” Canal ” of Lord Lansdowne, and the ” Mountain Landscape with Approaching Storm,” the sun shining out behind the heavy clouds, are both conceived and executed in this spirit. A similar poetical vein runs through the ” Castle on the Hill ” of Cassel, in which the beams of the setting sun strike on the castle while the valley is sunk in the shades of approaching night. More powerful still is the weird effect of Lord Lansdowne’s ” Windmill,” with its glow of light and darkening shadows. In all these pictures light with its magical influences is the theme of the poet-painter. From the number of landscapes by himself in the inventory of his sale, it would appear that these grand works were not appreciated by his contemporaries. The last of the landscape series dates from 1655 or 1656, the close of the middle age or manhood of Rembrandt, a period of splendid power. In the ” Joseph Accused by Potiphar’s Wife ” of 1654 we have great dramatic vigour and perfect mastery of expression, while the brilliant colour and glowing effect of light and shade attest hi* strength. To

this period also belongs the great portrait of himself in the Fitzwilliam Museum at Cambridge.

But evil days were at hand. The long-continued wars and civil troubles had worn out the country, and money was scarce. Rembrandt's and doubtless Saskia's means were tied up in his house and in his large collection of valuable pictures, and we find Rembrandt borrowing considerable sums of money on the security of his house to keep things going. Perhaps, as Bode suggests, this was the reason of his extraordinary activity at this time. Then, unfortunately, in this year of 1654, we find Rembrandt involved in the scandal of having a child by his servant Hendrickje Jaghers or Stoffels, as appears by the books of the Reformed Church at Amsterdam. He recognized the child and gave it the name of Cornelia, after his much-loved mother, but there is no proof that he married the mother, and the probability is against such a marriage, as the provisions of Saskia's will would in that case have come into force, and her fortune would have passed at once to her son Titus. Hendrickje seems to have continued

to live with him, for we find her claiming a chest as her property at his sale in 1658. Doubtless she is the peasant girl of Rasdorf to whom Houbraken says Rembrandt was married. Sad as the story is, Hendrickje has an interest for us. Bode asserts that in his art there was always a woman in close relationship to Rem- brandt and appearing in his work — his mother, his sister and then Saskia.

He also suggests that the beautiful portrait of the " Lady " in the Salon Carre of the Louvre and the " Venus and Cupid " of the same gallery may represent Hendrickje and her child. Both pictures belong to this date, and by their treatment are removed from the category of Rembrandt's usual portraits. But if this is conjecture, we get nearer to fact when we look at the picture exhibited at Burlington House in 1883 to which tradition has attached the name of " Rembrandt's Mistress," now in the Edinburgh National Gallery. At a glance one can see that it is not the mere head of a model, as she lies in bed raising herself to put aside a curtain as if she heard a well-known footstep. It is clearly a woman in whom Rembrandt had a personal interest. The date is clearly 165 — the fourth figure being illegible; but the brilliant carnations and masterly touch connect it with the " Potiphar's Wife " of 1654 and the Jaghers period. In 1656 Rembrandt's financial affairs became more involved, and the Orphans' Chamber transferred the

house and ground to Titus, though Rembrandt was still allowed to take charge of Saskia's estate. Nothing, however, could avert the ruin of the painter, who was declared bankrupt in July 1656, an inventory of all his property being ordered by the Insolvency Chamber. The first sale took place in 1657 in the Keizerskroon hotel; and the second in 1658, when the larger part of the etchings and drawings were disposed of — " collected by Rembrandt himself with much love and care," says the catalogue. The sum realized, under 5000 guilders, was but a fraction of their value. The time was unfavourable over the whole of Europe for such sales, the renowned collection of Charles I. of England having brought but a comparatively small sum in 1653. Driven thus from his house, stripped of everything he possessed, even to his table linen, Rembrandt took a modest lodging in the same Keizerskroon hostelry (the amounts of his bills are on record), apparently without friends and thrown entirely on himself.

But this dark year of 1656 stands out prominently as one in which some of his greatest works were produced, as, for example, " John the Baptist preaching in the Wilderness," of the Berlin Gallery, and "Jacob blessing the Sons of Joseph," of the Cassel Gallery. It is impossible not to respect the man who, amid the utter ruin of his affairs, could calmly conceive and carry out such noble work. Yet even in his art one can see that the tone of his mind was sombre. Instead of the brilliancy of 1654 we have for two or three years a preference for dull yellows, reds and greys, with a certain uni- formity of tone. The handling is broad and rapid, as if to give utterance to the ideas which crowded on his mind. There is less caressing of colour for its own sake, even less straining after vigorous effect of light and shade. Still the two pictures just named are among the greatest works of the master. To the same year belongs the " Lesson in Anatomy of Johann Deyman." The sub- ject is similar to the great Tulp of 1632, but his manner and power 6(colour had advanced so much that Sir Joshua Reynolds, in his visit to Holland in 1781, was reminded by it of Michelangelo and Titian. 1 Vosmaer ascribes to the same year, though Bode places it later, the famous " Portrait of Jan Six," the future burgo- master, consummate in its ease and character, as Six descends the steps of his house drawing on his glove. The connexion between Rembrandt and the great family of Six was long and close. In 1641, the mother of Six, Anna Wymer, had been painted with con- summate skill by Rembrandt, who also executed in 1647 the beauti- ful etching of Six standing by a window reading his tragedy of Medea, afterwards illustrated by his friend. Now he paints his portrait in the prime of manhood, and in the same year of gloom paints for him the masterly " John the Baptist." Six, if he could not avert the disaster of

Rembrandt's life, at least stood by him in the darkest hour, when certainly the creative energy of Rembrandt

1 This picture has had a strange history. It had suffered by fire and was sold to a Mr Chaplin of London in 1841, was exhibited in Leeds in 1868, and again disappeared, ultimately to be found in the storeroom of the South Kensington Museum as a doubtful Rem- brandt. The patriotism of some Dutch lovers of art restored it to its native country; and it now hangs, a magnificent fragment, in the museum of Amsterdam.

was in full playv The same period gives us the " Master of the Vineyard," and the " Adoration of the Magi " of Buckingham Palace.

After the sale of the house in the Breedstraat, Rembrandt retired to the Rosengracht, an obscure quarter at the west end of the city. We are now drawing to the splendid close of his career in his third manner, in which his touch became broader, his impasto more solid and his knowledge more complete. We may mention the " Old Man with the Grey Beard " of the National Gallery (1657) and the " Bruyningh, the Secretary of the Insolvents' Chamber," of Cassel (1658), both leading up to the great portraits of the "Syndics of the Cloth Hall " of 1661. Nearly thirty years separate us from.the " Lesson in Anatomy," years of long-continued observation and labour. The knowledge thus gathered, the problems solved, the mastery attained, are shown here in abundance. Rembrandt returns to the simplest gamut of colour, but shows his skill in the use of it, leaving on the spectator an impression of absolute enjoy- ment of the result, unconscious of the means. The plain burghers dealing with the simple concerns of their gild arrest our attention as if they were the makers of history. They live for ever; and we close our eyes to the strange perspective of the table.

In his old age Rembrandt continued to paint his own portrait as assiduously as in his youthful and happy days. About twenty of these portraits are known; a typical one is to be found in the National Gallery. All show the same self-reliant expres- sion, though broken down indeed by age and the cares of a hard life.

About the year 1663 Rembrandt painted the (so-called) " Jewish Bride " of the Ryks Museum in Amsterdam, and the " Family Group " of Brunswick, the last and perhaps the most brilliant works of his life, bold and rapid in execution and marvellous in the subtle mixture and play of colours in which he seems to revel. The woman and children are painted with such love that the impression is conveyed that they represent a fancy family group of the painter in his old age. This idea

received some confirmation from the supposed discovery that he left a widow Catherine Van Wyck and two children, but this theory falls to the ground, for de Roever has shown {Oud Holland, 1883) that Catherine was the widow of a marine painter Theunisz Blanckerhoff, who died about the same time as Rem- brandt. The mistake arose from a miscopying of the register. The subject of these pictures is thus more mysterious than ever.

In 1668 Titus, the only son of Rembrandt, died, leaving one child, and on the 8th of October 1669 the great painter himsel/ passed away, leaving two children, and was buried in the Westei Kerk. He had outlived his popularity, for his manner of paint- ing, as we know from contemporaries, was no longer in favour with a people who preferred the smooth trivialities of Van der Werff and the younger Mieris, the leaders of an expiring school.

We must give but a short notice of Rembrandt's achievements in etching. Here he stands out by universal confession as first, excel- ling by his unrivalled technical skill, his mastery of expression and the lofty conceptions of many of his great pieces, as in the " Death of the Virgin," the " Christ Preaching," the " Christ Healing the Sick" (the " Hundred Guilder Print), the " Presentation to the People," the " Crucifixion " and others. So great is his skill simply as an etcher that one is apt to overlook the nobleness of the etcher s ideas and the depth of his nature, and this tendency has been doubt- less confirmed by the enormous difference in money value between " states " of the same plate, rarity giving in many cases a factitious worth in the eyes of collectors. A single impression of one of his etchings — " Rembrandt with a Sabre "—realized £2000 at the Holford sale in 1893, when " Ephraim Bonus, with black ring " fetched £1050, and the " Hundred Guilder Print," £1750. The points of difference between these states arise from the additions and changes, made by Rembrandt on .the plate ; and the prints taken off by him have been subjected to the closest inspection by Bartsch, Gersaint, Wilson, Daulby, De Claussin, C. Blanc, Willshire, Seymour Haden, Middleton and others, who have described them at great length, and to whom the reader is referred. The classifica- tion of Rembrandt's etchings adopted till lately was according to the subject, as Biblical, portrait, landscape, and so on; until Vosmaer attempted the more scientific and interesting line of chronology. This method has been developed by Sir F. Seymour Haden and Middleton. But even in 1873 C. Blanc, in his fine work L'CEuvre complet de Rembrandt, still adheres to the older and less intelligent arrangement, resting his preference on the frequent absence of dates on the etchings and more strangely still on the equality of the work. Sir Seymour Haden's reply is " that the more important etchings

which may be taken as types are dated, and that, the style of the etchings at different periods of Rembrandt's career being fully as marked as that of his paintings, no more

difficulty attends the classification of one than of the other." In- deed Vosmaer points out in his Life of Rembrandt that there is a marked parallelism between Rembrandt's painted and etched work, his early work in both cases being timid and tentative, while he gradually gains strength and character both with the brush and the graver's tools.

In his L'CEuvre complet de Rembrandt (Paris, 1885), Eugene Dutuit rejects the classification of C. Blanc as dubious and unwarranted, dismisses the chronological arrangement proposed by Vosmaer and adopted by Seymour Haden and Middleton as open to discussion and lacking in possibility of proof, and reverts to the order estab- lished by Gersaint, ranging his materials under twelve heads: Portraits (real and supposed), Old Testament and New Testament subjects, histories, landscapes, &c. Sir Seymour Haden originated the theory that many of the etchings ascribed to Rembrandt up to 1640 were the work of his pupils, and seems to make out his case, though it may be carried too far. He argues (in his monograph on the Etched Work of Rembrandt, 1877) that Rembrandt's real work in etching began after Saskia's death, when he assumes that Rembrandt betook himself to Elsbroek, the country house of his " powerful friend " Jan Six. But it must be remembered that the future burgomaster was then but a student of twenty-four, a member of a great family it is true, but unmarried and taking as yet no share in public life. That Rembrandt was a frequent visitor at Elsbroek, and that the " Three Trees " and other etchings may have been pro- duced there, may be admitted without requiring us to believe that he had left Amsterdam as his place of abode. The great period of his etching lies between 1639 and 1661, after which the old painter seems to have renounced the needle. In these twenty years were produced his greatest works in portraiture, landscape and Bible story. They bear the impress of the genius of the man.

In addition to the authors named, the reader is referred to W. Burger, (the nom de plume of T. Thor6), Musees de la Hollande (1858-60), E. Fromentin, Matlres d'aulrefois; H. Havard, L'£cole Hollandaise ; Scheltema, Rembrandt, discours sur sa vie (1866); Ath. Cocquerel fils, Rembrandt, son individualisme dans I' art (Paris, 1869) ; Dr Langbehn, Rembrandt als Erzieher (Leipzig, 1890); Emile Michel,

Rembrandt, sa vie, son ceuvre, el son temps (Paris, 1893); P. G. Hamerton, Rembrandt's Etchings (London, 1894); Malcolm Bell, Rembrandt van Rijn and his Work (London, 1899); Adolf Rosenberg, Rembrandt, des Meisters Gemdlde (Stuttgart and Leipzig, 1906), a useful work, admirably reproducing 565 of the artist s pictures, and its companion volume, Hans Wolfgang Singer, Rem- brandt, des Meisters Radierungen (Stuttgart and Leipzig, 1906), reproducing 402 etchings. The chronological, geographical and classifying indexes in both books are of particular utility.

(J. F. W.; P. G. K.)

REMEDIOS, or San Juan de Los Remedios, town of Santa Clara province, Cuba, in the municipality of San Juan de Los Remedios. Pop. of the town (1907), 6988; of the munici- pality, 21,573. The town is served by a branch of the Cuban Central railway, extending from Caibarien to Camajuani, where it connects with the main line. The site is low and flat, and unhealthily wet in the rainy season. The port of Remedios is Caibarien (pop. in 1907, 8333), on the N. coast, about 5 m. E. Both are in the sugar country, and sugar is the base of their economic interests. The first settlement on the site of the present town was made in 1515-16, and in 1545 Remedios was created a villa with an ayuntamiento (council).

REMEMBRANCER, the name originally of certain subordinate officers of the English Exchequer. The office itself is of great antiquity, the holder having been termed remembrancer, memorator, rememorator, registrar, keeper of the register, despatcher of business (Maddox, History of the Exchequer). There were at one time three clerks of the remembrance, styled king's remembrancer, lord treasurer's remembrancer and re- membrancer of first-fruits. The latter two offices have become extinct, that of remembrancer of first-fruits by the diversion of the fund (Queen Anne's Bounty Act 1838), and that of lord treasurer's remembrancer on being merged in the office of king's remembrancer (1833). By the Queen's Remembrancer Act 1859 the office ceased to exist separately, and the queen's remembrancer was required to be a master of the court of exchequer. The Judicature Act 1873, s. 77, attached the office tp the Supreme Court, and the Supreme Court of Judicature (Officers) Act 1879 transferred it to the central office of the Supreme Court. By s. 8 the king's remembrancer is a master of the Supreme Court, and the office is usually filled by the senior master. The king's remembrancer department of the central office is now amalgamated with the judgments and married women's acknowledgments department. The king's

remembrancer still assists at certain ceremonial functions — relics of the former importance of the office — such as the nomina- tion of sheriffs, the swearing-in of the lord mayor of London, the trial of the pyx and the acknowledgments of homage for crown lands. Other duties are set out in the Second Report q1 the Legal Departments Commission, 1874.

” Remembrancer ” is also the title of an official of the cor- poration of the city of London, whose principal duty is to represent that body before parliamentary committees and at council and treasury boards.

REMIGIUS, ST (c. 437-533), bishop of Reims and the friend of Clovis, whom he converted to Christianity. According to Gregory of Tours, 3000 Franks were baptized with Clovis by Remigius on Christmas Day, 496, after the defeat of the Ala- manni. With the growing power of the papacy a good many fictions grew up around his name, e.g. that he anointed Clovis with oil from the sacred ampulla, and that Pope Hormisdas had recognized him as primate of France. The Commentary on the Pauline Epistles (ed. Villalpandus, 1699) is not his work, but that of Remigius of Auxerre.

For authorities see H. Jadart, Bibliographie des ouvrages cone, la vie el le culte de S. Remi . . . (Reims, 1891), which contains 126 references.

REMINGTON, FREDERICK (1861-1909), American artist, was born at Canton, New York, on the 4th of October 1861. He was a pupil of the Yale Art School, and of the Art Students’ League, New York, and became known as an illustrator, painter and sculptor. Having spent much time in the West, whither he went for his health, and having been with the United States troops in actual warfare, he made a specialty of rendering the North American Indian and the United States soldier as seen on the western plains. In the Spanish-American War he was with the army under General Shafter as war corre- spondent. He died on the 26th of December 1909, near Ridge- field, Connecticut. His statuettes of soldiers, Indians, cowboys and trappers are full of character, while his paintings have been largely reproduced. He wrote several volumes of stories, including Pony Tracks (1895), Crooked Trails (1898), Sundown Leflare (1899), and John Ermine of the Yellowstone (1902).

REMINISCENCE (from Lat. reminisci, to remember), the recognized translation of the Greek avhˆvqais, which is used technically by Plato in his doctrine that the soul recovers knowledge of which it had direct intuition in a former incorporeal existence. The doctrine may be

regarded as the poetical precursor of modern a priori theories of knowledge and of ” race-memory ” and the like. In common language ” remi- niscence ” is synonymous with ” recollection.”

REMIREMONT, a town of eastern France, capital of an arrondissement in the department of Vosges, 17 m. S.S.E. of Epinal by rail, on the Moselle, a mile below its confluence with the Moselotte. Pop. town, 8782; commune, 10,548. Remire- mont is surrounded by forest-clad mountains, and commanded by Fort Parmont, one of the Moselle line of defensive works. The abbey church, consecrated in io5i,has a crypt of the nth century in which are the tombs of some of the abbesses, but as a whole belongs to the late 13th century. The abbatial residence (which now contains the mairie, the court-house and the public library) has been twice rebuilt in modern times (in 1750 and again after a fire in 1871), but the original plan and style have been preserved in the imposing front, the vestibule and the grand staircase. Some of the houses of the canonesses dating from the 17th and 18th centuries also remain. Remiremont is the seat of a sub-prefect and has a tribunal of first instance, a communal college, a board of trade-arbitration and a chamber of arts and manufactures. Its industries include cotton-spinning and weaving, the manufacture of hosiery and embroidery, iron and copper founding and the manufacture of boots and shoes and brushes.

Remiremont (Romarici Mons) derives its name from St Romaric, one of the companions of St Columban of Luxeuil, who in the 7th century founded a monastery and a convent on the hills above the present town. In 910 the nuns, menaced

by the invasion of the Hungarians, took refuge at Remiremont, which had grown up round a villa of the Frankish kings, and in the nth century they permanently settled there. Enriched by dukes of Lorraine, kings of France and emperors of Germany, the ladies of Remiremont attained great power. The abbess was a princess of the empire, and received consecration at the hands of the pope. The fifty canonesses were selected from those who could give proof of noble descent. On Whit-Monday the neighbouring parishes paid homage to the chapter in a ceremony called the “Kyrioles”; and on their accession the dukes of Lorraine, the immediate suzerains of the abbey, had to come to Remiremont to swear to continue their protection. The ” War of the Scutcheons ” (Panonceaux) in 1566 between the duke and the abbess

ended in favour of the duke; and the abbess never recovered her former position. In the 17th century the ladies of Remiremont fell away so much from the original monastic rule as to take the title of countesses, renounce their vows and marry. The town was attacked by the French in 1638 and ruined by the earthquake of 1682. With the rest of Lorraine it was joined to France in 1766. The monastery on the hill and the nunnery in the town were both suppressed in the Revolution.

REMONSTRANTS, the name given to those Dutch Protestants who, after the death of Arminius (g.v.), maintained the views associated with his name, and in 1610 presented to the states of Holland and Friesland a ” remonstrance ” in five articles formulating their points of departure from stricter Calvinism. These were: (1) that the divine decree of predestination is conditional, not absolute; (2) that the Atonement is in intention universal; (3) that man cannot of himself exercise a saving faith; (4) that though the grace of God is a necessary condition of human effort it does not act irresistibly in man; (5) that believers are able to resist sin but are not beyond the possibility of falling from grace. Their adversaries (the Gomarists) met them with a ” counter-remonstrance,” and so were known as the Counter-Remonstrants. Although the states-general issued an edict tolerating both parties and forbidding further dispute, the conflict continued, and the Remonstrants were assailed both by personal enemies and by the political weapons of Maurice of Orange, who executed and imprisoned their leaders for holding republican views. In 1618-19 the synod of Dort (see Dort ; Synod or), the thirteen Arminian pastors headed by Simon Episcopius (q.v.) being shut out, established the victory of the Calvinist school, drew up ninety-three canonical rules, and confirmed the authority of the Belgic Confession and the Heidelberg Catechism. The judgment of the synod was enforced by the deposition and in some cases the banishment of Remon- strant ministers; but the government soon became convinced that their party was not dangerous to the state, and in 1630 they were formally allowed liberty to reside in all parts of Holland and build churches and schools. In 16 21 they had already received liberty to make a settlement in Schleswig, where they built the town of Friedrichstadt. This colony still exists. The doctrine of the Remonstrants was embodied in 162 1 in a confessio written by Episcopius, their great theologian, while J. Uyten- bogaert gave them a catechism and regulated their churchly order. The Remonstrants adopted a simple synodical constitu- tion; but their importance was henceforth more theological than ecclesiastical. Their seminary in Amsterdam has boasted of many distinguished names — Curcellaeus, Limborch,

Wetstein, Le Clerc; and their liberal school of theology, which naturally grew more liberal and even rationalistic, reacted powerfully on the state church and on other Christian denominations. The Remonstrants first received official recognition in 1795. As a church they now number 27 communities with about 12,500. members, in a flourishing condition and respected for their traditions of scholarship and liberal thought. Their chief congregation is in Rotterdam.

REMPHAN, the Authorized Version's rendering of the Greek word variously appearing in Acts vii. 48 as 'T?on&, 'Vefufrbv, 'YtuQafi, 'Faidv, Teˆdc. It is part of a quotation from Amos v. 26, where the Septuagint 'Potˆac or 'Petpav stands

for the Hebrew P*? Chuin or Kewan. The Greek forms are probably simple mistakes for the Hebrew, k (D) having been replaced by r C 1) and ph (<£) substituted for v 0). Kewan is probably the old Babylonian Ka(v)awanu, the planet Saturn, another (the Akkadian) name for which is Sakkut, which appears as Siccuth in the earlier part of the verse.

REMSCHEID, a town of Germany, in the Prussian Rhine Province, situated on an elevated plateau, 1100 ft. above sea- level, 6 m. by rail S. of Barmen and 20 m. N.E. of Cologne. Pop. (1905) 64,340. Remscheid is a centre of the hardware industry, and large quantities of tools, scythes, skates and other small articles in iron, steel and brass are made for export to all parts of Europe, the East, and North and South America. The name of Remscheid occurs in a document of 1132, and the town received the first impulse to its industrial importance through the immigration of Protestant refugees from France and Holland.

REMUSAT, CHARLES FRANCOIS MARIE, Comte de (1797- 1875), French politician and man of letters, was born in Paris on the 13th of March 1797. His father, Auguste Laurent, Comte de Remusat, of a good family of Toulouse, was chamber- lain to Napoleon, but acquiesced in the restoration and became prefect first of Haute Garonne, and then of Nord. His mother's maiden name was Claire Elisabeth Jeanne Gravier de Ver- gennes, born in 1780. She married at sixteen, and was attached to Josephine as dame du palais in 1802. Talleyrand was among her admirers, and she was generally recognized as a woman of great intellectual capacity and personal grace. After her death (1824) an Essai sur I'educalion des femmes was published and received an academic couronne. But it was not until her grandson Paul de Remusat published her Memoires (3 vols., Paris, 1 8 70-80) ; which have since been followed by some corre- spondence with her son (2

vols., 1881), that justice could be done to her literary talent. Much light was thrown on the Napoleonic court by this book, and on the youth and education of her son Charles. He early developed political views more liberal than those of his parents, and, being bred to the bar, published in 1820 a pamphlet on trial by jury. He was an active journalist, showing in philosophy and literature the influence of Cousin, and is said to have furnished to no small extent the original of Balzac's brilliant egoist Henri de Marsay. He signed the journalists' protest against the Ordinances of July 1830, and in the following October was elected deputy for Haute Garonne. He then ranked himself with the doctrin- aires, and supported most of those measures of restriction on popular liberty which made the July monarchy unpopular with French Radicals. In 1836 he became for a short time under- secretary of state for the interior. He then became an ally of Thiers, and in 1840 held the ministry of the interior for a brief period. In the same year he became an Academician. For the rest of Louis Philippe's reign he was in opposition till he joined Thiers in his attempt at a ministry in the spring of 1848. During this time Remusat constantly spoke in the chamber, but was still more active in literature, especially on philosophical subjects, the most remarkable of his works being his book on Abtlard (2 vols., 1845). In 1848 he was elected, and in 1840 re-elected, for Haute Garonne, and voted with the Conservative side. He had to leave France after the coup d'Uat; nor did he re-enter political life during the Second Empire until 1869, when he founded a moderate opposition journal at Toulouse. In 1871 he refused the Vienna embassy offered him by Thiers, but in August he was appointed minister of foreign affairs in succession to M. Jules Favre. Although minister he was not a deputy, and on standing for Paris in September 1873 he was beaten by Desir6 Barodet. A month later he was elected (having already resigned with Thiers) for Haute Garonne by a great majority. He died in Paris on the 6th of January 1875.

During his abstention from politics Bemusat continued to write on philosophical history, especially English. Saint Anselme de Cantorbiry appeared in 1854; V Angleterre au XVIIIeme siecle in 1856 (2nd ed. enlarged, 1865); Bacon, sa vie,

son temps, &c, in 1858; Charming, sa vie et ses ceuvres, in 1862; John Wesley in 1870; Lord Herbert de Cherbury in 1874; His- toire de la philosophie en Angleterre depuis Bacon jusqu' a Locke in 1875;

besides other and minor works. He wrote well, was a forcible speaker and an acute critic; but his adoption of the indeterminate eclecticism of Cousin in philosophy and of the somewhat similarly indeterminate liberalism of Thiers in politics probably limited his powers, though both no doubt accorded with his critical and unenthusiastic turn of mind.

His son Paul de Remusat (1831-1897) became a distin- guished journalist and writer. He was for many years a regular contributor to the Revue des deux mondes. He stood for election in Haute-Garonne in 1869 in opposition to the imperial policy and failed, but was elected to the National Assembly in 187 1 and later. In 1890 he entered the Academie des sciences morales et politiques.

REMUSAT, JEAN PIERRE ABEL (1788-1832), French Chinese scholar, was born in Paris on the 5th of September 1788. He was educated for the medical profession, but a Chinese herbal in the collection of the Abbe Tersan attracted his atten- tion, and he taught himself to read it by great perseverance and with imperfect help. At the end of five years' study he produced in 181 1 an Essai sur la langue et la litttrature chinoises, and a paper on foreign languages among the Chinese, which procured him the patronage of Silvestre de Sacy. In 1814 a chair of Chinese was founded at the College de France, and Remusat was placed in it. From this time he gave himself wholly to the languages of the Far East, and published a series of useful works, among which his contributions from Chinese sources to the history of the Tatar nations claim special notice. Remusat became an editor of the Journal de savants in 1818, and founder and first secretary of the Paris Asiatic Society in 1822; he also held various Government appointments. He died at Paris on the 4th of June 1832. A list of his works is given in Querard's France litteraire s.v. Remusat.

RENAISSANCE, THE.— The " Renaissance " or " Renascence " is a term used to indicate a well-known but indefinite space of time and a certain phase in the development of Europe. 1 On the one hand it denotes the transition from that period of his- tory which we call the middle ages (q.v.) to that which we call modern. On the other hand it implies those changes in the intellectual and moral attitude of the Western nations by which the transition was characterized. If we insist upon the literal and etymological meaning of the word, the Renaissance was a re-birth; and it is needful to inquire of what it was the re-birth. The metaphor of Renaissance may signify the entrance of the European nations upon a fresh stage of vital energy in general, implying a fuller consciousness and a freer exercise of faculties than had belonged to the medieval period. Or it may mean the resuscitation

of simply intellectual activities, stimulated by the revival of antique learning and its application to the arts and literatures of modern peoples. Upon our choice between these two interpretations of the word depend important differences in any treatment of the subject. The former has the disadvantage of making it difficult to separate the Renaissance from other historical phases — the Reformation, for example — with which it ought not to be confounded. The latter has the merit of assigning a specific name to a limited seres of events and group of facts, which can be distinguished for the purpose of analysis from other events and facts with which they are intimately but not indissolubly connected. In other words, the one definition of Renaissance makes it denote the whole change which came over Europe at the close of the middle ages. The other confines it to what was known by our ancestors as the Revival of Learning. Yet, when we concentrate attention on the recovery of antique culture, we become aware that this was only one phenomenon or symptom of a far wider and more comprehensive alteration in the conditions of the European races. We find it needful to retain both terms, Renaissance and Revival of Learning, and

1 For a somewhat different view of the parcelling out into such periods, see the article Middle Ages.

to show the relations between the series of events and facts which they severally imply. The Revival of Learning must be regarded as a function of that vital energy, an organ of that mental evolution, which brought into existence the modern world, with its new conceptions of philosophy and religion, its reawakened arts and sciences, its firmer grasp on the realities of human nature and the world, its manifold inventions and discoveries, its altered political systems, its expansive and progressive forces. Im- portant as the Revival of Learning undoubtedly was, there are essential factors in the complex called the Renaissance with which it can but remotely be connected. When we analyse the whole group of phenomena which have to be considered, we perceive that some of the most essential have nothing or little to do with the recovery of the classics. These are, briefly speaking, the decay of those great fabrics, church and empire, which ruled the middle ages both as ideas and as realities; the development of nationalities and languages; the enfeeblement of the feudal system throughout Europe; the invention and application of paper, the mariner’s compass, gunpowder, and printing; the exploration of continents beyond the ocean; and the substitution of the Copernican for the Ptolemaic system of astronomy. Europe in fact had been prepared for a thorough- going metamorphosis before that new ideal of human life and culture which the Revival of Learning brought to

light had been made manifest. It had recovered from the confusion conse- quent upon the dissolution of the ancient Roman empire. The Teutonic tribes had been Christianized, civilized and assimilated to the previously Latinized races over whom they exercised the authority of conquerors. Comparative tranquillity and material comfort had succeeded to discord and rough living. Modern nationalities, defined as separate factors in a common system, were ready to co-operate upon the basis of European federation. The ideas of universal monarchy and of indivisible Christendom, incorporated in the Holy Roman Empire and the Roman Church, had so far lost their hold that scope was offered for the introduction of new theories both of state and church which would have seemed visionary or impious to the medieval mind. It is therefore obvious that some term, wider than Revival of Learn- ing, descriptive of the change which began to pass over Europe in the 14th and 15th centuries, has to be adopted. That of Renaissance, Rinascimento, or Renascence is sufficient for the purpose, though we have to guard against the tyranny of what is after all a metaphor. We must not suffer it to lead us into rhetoric about the deadness and the darkness of the middle ages, or hamper our inquiry with preconceived assumptions that the re-birth in question was in any true sense a return to the irrecoverable pagan past. Nor must we imagine that there was any abrupt break with the middle ages. On the contrary, the Renaissance was rather the last stage of the middle ages, emerging frcm ecclesi- astical and feudal despotism, developing what was original in medieval ideas by the light of classic arts and letters, holding in itself the promise of the modern world. It was therefore a period and a process of transition, fusion, preparation, tentative endeavour. And just at this point the real importance of the Revival of Learning may be indicated. That rediscovery of the classic past restored the confidence in their own faculties to men striving after spiritual freedom; revealed the continuity of history and the identity of human nature in spite of diverse creeds and different customs; held up for emulation master- works of literature, philosophy and art; provoked inquiry; encouraged criticism; shattered the narrow mental barriers imposed by medieval orthodoxy. Humanism, a word which will often recur in the ensuing paragraphs, denotes a specific b’as which the forces liberated in the Renaissance took from contact with the ancient world, — the particular form assumed by human self-esteem at that epoch,— the ideal of life and civilization evolved by the modern nations. It indicates the endeavour of man to reconstitute himself as a free being, not as the thrall of theological despotism, and the peculiar assistance he derived in th : s effort from Greek and Roman literature, the litterae humaniores, letters leaning rather to the side of man than of divinity.

‘RENAISSANCE

In this article the Renaissance will be considered as implying a comprehensive movement of the European intellect and will Method toward self-emancipation, toward reassertion of the of treat- natural rights of the reason and the senses, toward menU the conquest of this planet as a place of human occu-

pation, and toward the formation of regulative theories both for states and individuals differing from those of medieval times. The Revival of Learning will be treated as a decisive factor in this process of evolution on a new plan. To exclude the Reformation and the Counter-Reformation wholly from the survey is impossible. These terms indicate moments in the whole process of modern history which were opposed, each to the other, and both to the Renaissance; and it is needful to bear in mind that they have, scientifically speaking, a quite separate existence. Yet if the history of Europe in the 16th century of our era came to be written with the brevity with which we write the history of Europe in the 6th century B.C., it would be difficult at the distance of time implied by that supposition to distinguish the Italian movement of the Renaissance in its origin from the German movement of the Reformation. Both would be seen to have a common starting-point in the reaction against long dominant ideas which were becoming obsolete, and also in the excitation of faculties which had during the same period been accumulating energy.

The Renaissance, if we try to regard it as a period, was essentially the transition from one historical stage to another. It cannot therefore be confined within strict chronological limits. Chroao- There is one date, however, which may be remembered logical w ; tll a d van tage as the starting-point in time of the Rc- limlts. naissance, after the departure from the middle ages had

been definitely and consciously made by the Italians. This is the vear US1, when Constantinople, chosen for his capital by the first Christian emperor of Rome, fell into the hands of the Turk One of the survivals of the old world, the shadow of what had been the Eastern Empire, now passed suddenly away. Almost at the same date that visionary revival of the Western Empire, which had im- posed for six centuries upon the imagination of medieval Europe, hampering Italy and impeding the consolidation of Germany, ceased to reckon among political actualities; while its more robust rival the Roman Church, seemed likely to sink into the rank of a petty Italian principality. It

was demonstrated by the destruction of the Eastern and the dotage of the Western Empire, and by the new papal policy which Nicholas V. inaugurated, that the old order of society was about to be superseded. Nothing remained to check those centrifugal forces in state and churcl. which substituted a confederation of rival European powers for the earlier ideal of universal monarchy, and separate religious constitutions lor the previous Catholic unity. At the same time the new learning introduced by the earlier humanists awakened free thought, encour- aged curiosity, and prepared the best minds of Europe for specula- tive audacities from which the schoolmen would have shrunk, and which soon expressed themselves in acts of cosmopolitan importance. If we look a little forward to the years 1492-1500, we obtain a second date of great importance. In these years the expedition of Charles VIII. to Naples opened Italy to French, Spanish and German interference. The leading nations of Europe began to compete for the prize of the peninsula, and learned meanwhile that culture which the Italians had perfected. In these years the secular- ization of the papacy was carried to its final point by Alexander VI., and the Reformation became inevitable. The same period was marked by the discovery of America, the exploration of the Indian seas, and the consolidation of the Spanish nationality. It also witnessed the application of printing to the diffusion of knowledge. Thus, speaking roughly, the half-century between 1450 and 1500 mav be termed the culminating point of the Renaissance, the transition from the medieval to the modern order was now secured if not accomplished, and a Rubicon had been crossed from which no retrogression to the past was possible. Looking yet a little farther, to the years 1527 and 1530, a third decisive date is reached. In the first of these years happened the sack of Rome, in the second the pacification of Italy by Charles V. under a Spanish hegemony. The asre of the Renaissance was now closed for the land which gave it birth The Reformation had taken firm hold on northern Europe. The Counter-Reformation was already imminent.

It must not be imagined that so great a change as that implied by the Renaissance was accomplished without premonitory Pncur. symptoms and previous endeavours. In the main sors ot we mean by it the recovery of freedom for the human the Re- sp j r i t after a long period of bondage to oppressive nalssaace. eccles j astica i an d political orthodoxy— a return to the liberal and practical conceptions of the world which

the nations of antiquity had enjoyed, but upon a new and enlarged platform. This being so, it was inevitable that the finally successful efforts after self-emancipation should^ have been anticipated from

time to time by strivings within the ages that are known as dark and medieval. It is therefore part of the present inquiry to pass in review some of the claimants to be considered precursors of the Renaissance.

First of all must be named the Frank in whose lifetime the dual conception of universal empire and universal church, divinely appointed, sacred and inviolable, began to control the order of European society. Charles the Great (Charlemagne) lent his forces to the plan of resuscitating the Roman empire at a moment when his own power made him the arbiter of western Europe, when the papacy needed his alliance, and when the Eastern Empire had passed under the usurped regency of a female. He modelled an empire, Roman in name but essentially. Teutonic, since it owed such substance as its fabric possessed to Frankish armies and the sinews of the German people. As a structure composed of divers ill-connected parts it fell to pieces at its builder's death, leaving little but the incubus of a memory, the fascination of a mighty name, to dominate the mind of medieval Europe. As an idea, the empire grew in visionary power,- and remained one of the chief obstacles in the way of both Italian and German national coherence. Real force was not in it, but rather in that counterpart to its unlimited pretensions, the church, which had evolved it from barbarian night, and which used her own more vital energies for undermining the rival of her creation. Charles the Great, having proclaimed himself successor of the Caesars, was obscurely ambitious of imitating the Augusti also in the sphere of letters. He caused a scheme of humanistic education to be formulated, and gave employment at his court to rhetoricians, of whom Alcuin was the most considerable. But very little came of the revival of learning which Charles is supposed to have encouraged ; and the empire he restored was accepted by the medieval intellect in a crudely theological and vaguely mystical spirit. We should, however, here remember that the study of Roman law, which was one important precursory symptom of the Renaissance, owed much to medieval respect for the empire as a divine institution. This, together with the municipal Italian intolerance of the Lombard and Frankish codes, kept alive the practice and revived the science of Latin jurisprudence at an early period.

Philosophy had attempted to free itself from the trammels of theological orthodoxy in the hardy speculations of some schoolmen, notably of Scotus Erigena and Abelard. These innovators _. found, however, small support, and were defeated by t f oaand opponents who used the same logical weapons with auth- her ln ority to back them. Nor were the rationalistic opinions mi ddle of the Averroists without their value, though the church & condemned these deviators from her discipline as heretics. Such medieval materialists, moreover,

had but feeble hold upon the substance of real knowledge. Imperfect acquaintance with authors whom they studied in Latin translations made by Jews from Arabic commentaries on Greek texts, together with almost total ignorance of natural laws, condemned them to sterility. Like the other schiomachists of their epoch, they fought with phantoms m a visionary realm. A similar judgment may be passed upon those Paulician, Albigensian, Patenne and Epicurean dissenters from the Catholic creed who opposed the phalanxes of orthodoxy with frail imaginative weapons, and alarmed established orders in the state by the audacity of their communistic opinions. Physical science struggled into feeble life in the cells of Gerbert and Roger Bacon. But these men were accounted magicians by the vulgar; and, while the one eventually assumed the tiara, the other was incarcer- ated in a dungeon. The schools meanwhile resounded still to the interminable dispute upon abstractions. Are only umversals real, or has each name a corresponding entity? From the midst of the Franciscans who had persecuted Roger Bacon because he presumed to know more than was consistent with human humility arose John of Parma, adopting and popularizing the mystic prophecy of Joachim of Flora. The reign of the Father is past; the reign of the Son is passing; the reign of the Spirit is at hand. Such was the formula of the Eternal Gospel, which, as an unconscious forecastˆ the Renaissance, has attracted retrospective students by its felicity of adaptation to their historical method. Yet we must remember that this bold intuition of the abbot Joachim indicated a monastic reaction against the tyrannies and corruptions of the church, rather than a fertile philosophical conception. The Fraticelli spiritualists, and similar sects who fed their imagination with his doctrine, ex- pired in the flames to which Fra Dolcino Longino and Marghanta were consigned. To what extent the accusations of profligate morals brought against these reforming sectarians were justified remains doubtful; and the same uncertainty rests upon the alleged iniquities of the Templars. It is only certain that at this epoch the fabric of Catholic faith was threatened with various forms of pro- phetic and Oriental mysticism, symptomatic of a widespread desire to grasp at something simpler, purer and less rigid than Latin theology afforded. Devoid of criticism, devoid of sound learning, devoid of a firm hold on the realities of life, these heresies passed away without solid results and were forgotten.

RENAISSANCE

We are too apt to take for granted that the men of the middle ages were immersed in meditations on the other world, and that their Natural- intellectual exercises were confined to abstractions of the ism la schools, hallucinations of the fancy, allegories, visions.

... This assumption applies indeed in a broad sense to that life and Period which was dominated by intolerant theology and literature deprived °f positive knowledge. Yet there are abundant signs that the native human instincts, the natural human appetites, remained unaltered and alive beneath the crust of ortho- doxy. In the person of a pope like Boniface VIII. those ineradicable forces of the natural man assumed, if we may trust the depositions of ecclesiastics well acquainted with his life, a form of brutal atheistic cynicism. In the person of an emperor, Frederick II., they emerged under the more agreeable garb of liberal culture and Epicurean scepticism. Frederick dreamed of remodelling society upon a mundane type, which anticipated the large toleration and cosmopolitan enlightenment of the actual Renaissance. But his efforts were defeated by the unrelenting hostility of the church, and by the incapacity of his contemporaries to understand his aims. After being forced in his lifetime to submit to authority, he was consigned by Dante to hell. Frederick's ideal of civilization was derived in a large measure from Provence, where a beautiful culture had prematurely bloomed, filling southern Europe with the perfume of poetry and gentle living. Here, if anywhere, it seemed as though the ecclesiastical and feudal fetters of the middle ages might be broken, and humanity might enter on a new stage of joyous unim- peded evolution. This was, however, not to be. The church preached Simon de Montfort's crusade, and organized Dominic's Inquisition; what Quinet calls the " Renaissance sociale par l'Amour " was extirpated by sword, fire, famine and pestilence. Meanwhile the Provencal poets had developed their modern language with incomparable richness and dexterity, creating forms of verse and modes of emotional expression which determined the latest medieval phase of literature in Europe. The naturalism of which we have been speaking found free utterance now in the fabliaux of jongleurs, lyrics of minnesingers, tales of trouveres, romances of Arthur and his knights — compositions varied in type and tone, but in all of which sincere passion and real enjoyment of life pierce through the thin veil of chivalrous mysticism or of allegory with which they were sometimes conventionally draped. The tales of Lancelot and Tristram, the lives of the troubadours and the Wacht- lieder of the minnesingers, sufficiently prove with what sensual freedom a knight loved the lady whom

custom and art made him profess to worship as a saint. We do not need to be reminded that Beatrice's adorer had a wife and children, or that Laura's poet owned a son and daughter by a concubine, in order to perceive that the mystic passion of chivalry was compatible in the middle ages with commonplace matrimony or vulgar illegitimate connexions. But perhaps the most convincing testimony to the presence of this ineradicable naturalism is afforded ˆby the Latin songs of wandering students, known as Carmina Burana, written by the self-styled QollanUc Goliardi. In these compositions, remarkable for their poetry l ac " e handling of medieval Latin rhymes and rhythms, " # the allegorizing mysticism which envelops chivalrous poetry is discarded. Love is treated from a frankly carnal point of view. Bacchus and Venus go hand in hand, as in the ancient ante- Christian age. The open-air enjoyments of the wood, the field, the dance upon the village green, are sung with juvenile lighthearted- ness. No grave note, warning us that the pleasures of this earth are fleeting, that the visible world is but a symbol of the invisible, that human life is a probation for the life beyond, interrupts the tinkling music as of castanets and tripping feet which gives a novel charm to these unique relics of the 13th century. Gohardic poetry is further curious as showing how the classics even at that early period were a fountain-head of pagan inspiration. In the taverns and low places of amusement haunted by those lettered songsters, on the open road and in the forests trodden by their vagrant feet, the deities of Greece and Rome were not in exile, but at home within the hearts of living men. Thus, while Christendom was still preoccupied with the Crusades, two main forces of the Renaissance, naturalism and enthusiasm for antique modes of feeling, already brought their latent potency to light, prematurely indeed and precociously, yet with a promise that was destined to be kept.

When due regard is paid to these miscellaneous evidences of intellectual and sensual freedom during the middle ages, it will be M dl al seen t ' lat tnere were by no means lacking elements of attitude nat i ye vigour ready to burst forth. What was wanting otmiud was not v ' ta " t X an ˆ licence, not audacity of speculation, not lawless instinct or rebellious impulse. It was rather the right touch on life, the right feeling for human independence, the right way of approaching the materials of philosophy, religion, scholarship and literature, that failed. The courage that is born of knowledge, the calm strength begotten by a positive attitude of mind, face to face with the dominant over-shadowing Sphinx of theology, were lacking. We may fairly say that natural and untaught people had more of the just intuition that was needed than learned folk trained in the schools. But these people

were rendered licentious in revolt or impotent for salutary action by ignorance, by terror, by uneasy dread of the doom declared for heretics and rebels. The

massive vengeance of the church hung over them, like a heavy sword suspended in the cloudy air. Superstition and stupidity hedged them in on every side, so that sorcery and magic seemed the only means of winning power over nature or insight into mysteries surrounding human life. The path from darkness to light was lost; thought was involved in allegory; the study of nature had been perverted into an inept system of grotesque and pious parable- mongering; the pursuit of truth had become a game of wordy dialectics. The other world, with its imagined heaven and hell, haunted the conscience like a nightmare. However sweet this world seemed, however fair the flesh, both world and flesh were theoretically given over to the devil. It was not worth while to master and economize the resources of this earth, to utilize the good and ameliorate the evils of this life, while every one agreed, in theory at any rate, that the present was but a bad prelude to an infinitely worse or infinitely better future. To escape from these preoccupa- tions and prejudices except upon the path of conscious and deliber- ate sin was impossible for all but minds of rarest quality and courage; and these were too often reduced to the recantation of their supposed errors no less by some secret clinging sense of guilt than by the church's iron hand. Man and the actual universe kept on reasserting their rights and claims, announcing their goodliness and delightfulness, in one way or another; but they were always being thrust back again into Cimmerian regions of abstractions, fictions, visions, spectral hopes and fears, in the midst of which the intellect somnambulistically moved upon an unknown way.

At this point the Revival of Learning intervened to determine the course of the Renaissance. Medieval students possessed a considerable portion of the Latin classics, though Italy— the Greek had become in the fullest sense of the phrase Revival ol a dead language. But what they retained of ancient Learning. literature they could not comprehend in the right spirit. Between them and the text of poet or historian hung a veil of mysticism, a vapour of misapprehension. The odour of unsanctity clung around those relics of the pagan past. Men bred in the cloister and the lecture-room of the logicians, trained in scholastic disputations, versed in allegorical interpretations of the plainest words and most apparent facts, could not find the key which might unlock those stores of wisdom and of beauty. Petrarch first opened a new method in scholarship, and revealed what we denote as humanism. In his teaching lay the twofold discovery of man and of the world. For humanism, which was the vital element in the Revival of

Learning, consists mainly of a just perception of the dignity of man as a rational, volitional and sentient being, born upon this earth with a right to use it and enjoy it. Humanism implied the rejection of those visions of a future and imagined state of souls as the only absolute reality, which had fascinated the imagination of the middle ages. It involved a vivid recognition of the goodliness of man and nature, displayed in the great monuments of human power recovered from the past. It stimulated the curiosity of latent sensibilities, provoked fresh inquisition into the groundwork of existence, and strengthened man's self-esteem by knowledge of what men had thought and felt and done in ages when Christianity was not. It roused a desire to reappropriate the whole abandoned provinces of mundane energy, and a hope to emulate antiquity in works of living loveliness and vigour. The Italians of the 14th century, more precocious than the other European races, were ripe for this emancipation of enslaved intelligence. In the classics they found the food which was required to nourish the new spirit; and a variety of circumstances, among which must be reckoned the pride of a nation boasting of its descent from the Populus Romanus, rendered them apt to fling aside the obstacles that had impeded the free action of the mind through many centuries. Petrarch not only set his countrymen upon the right method of studying the Latin classics, but he also divined the importance of recovering a knowledge of Greek literature. To this task Boccaccio addressed himself; and he was followed by numerous Italian enthusiasts, who visited Byzantium before its fall as the sacred city of a new revelation. The next step was to collect MSS., to hunt out, copy and preserve the precious relics of the past. In this work of accumulation Guarino and Filelfo, Aurispa and Poggio, took the chief part, aided by the wealth of Italian patricians, merchant-princes and despots, who were inspired by the sacred thirst for learning. Learning was then

no mere pursuit of a special and recluse class. It was fashionable and it was passionate, pervading all society with the fervour of romance. For a generation nursed in decadent scholasticism and stereotyped theological formulae it was the fountain cf renascent)'outh, beauty and freedom, the shape in which the Helen of art and poetry appeared to the ravished eyes of medieval Faustus. It was the resurrection of the mightiest spirits of the past. " I go," said Cyriac of Ancona, the inde-fatigable though uncritical explorer of antiquities, " I go to awake the dead I " This was the enthusiasm, this the vitalizing faith, which made the work of scholarship in the 15th century so highly strung and

ardent. The men who followed it knew that they were restoring humanity to its birthright after the expatriation of ten centuries. They were instinctively aware that the effort was for liberty of action, thought and conscience in the future. This conviction made young men leave their loves and pleasures, grave men quit their counting-houses, churchmen desert their missals, to crowd the lecture-rooms cf philologers and rhetoricians. When Greek had been acquired, MSS. accumulated, libraries and museums formed, came the age of printers and expositors. Aldus Manutius in Italy, Froben in Basel, the Etiennes in Paris, committed to the press what the investigators had recovered. Nor were there wanting men who dedicated their powers to Hebrew and Oriental erudition, laying, together with the Grecians, a basis for those Biblical studies which advanced the Reformation. Meanwhile the languages of Greece and Rome had been so thoroughly appropriated that a final race of scholars, headed by Politjan, Pontano, Valla, handled once again in verse and prose both antique dialects, and thrilled the ears of Europe with new-made pagan melodies. The church itself at this epoch lent its influence to the prevalent enthusiasm. Nicholas V. and Leo X., not to mention intervening popes who showed themselves tolerant of humanistic culture, were heroes of the classical revival. Scholar- ship became the surest path of advancement to ecclesiastical and political honours. Italy was one great school of the new learning at the moment when the German, French and Spanish nations were invited to her feast. _

It will be well to describe briefly, but in detail, what this meeting of the modern with the ancient mind effected over the Nature of whole field of intellectual interests. In doing so, we Italian must be careful to remember that the study of the human- classics did but give a special impulse to pent-up sm ‘ energies which were bound in one way or another to

assert their independence. Without the Revival of Learning the direction of those forces would have been different; but that novel intuition into the nature of the world and man which constitutes what we describe as Renaissance must have emerged. As the facts, however, stand before us, it is impossible to dis- sociate the rejection of the other world as the sole reality, the joyous acceptance of this world as a place to live and act in, the conviction that ” the proper study of mankind is man,” from humanism. Humanism, as it actually appeared in Italy, was positive in its conception of the problems to be solved, pagan in its contempt for medieval mysticism, invigorated for sensuous enjoyment by contact .with antiquity, yet holding in itself the germ of new religious aspirations, profounder science and sterner probings of the mysteries of life than had been attempted even by the

ancients. The operation of this humanistic spirit has now to be traced.

It is obvious that Italian literature owed little at the outset to the Revival of Learning. The Divine Comedy, the Canzoniere

and the Decameron were works of monumental art, fni deriving neither form nor inspiration immediately from Petrarch' t ' le c ' ass ' cs > Dut a PP'yi n g the originality of Italian genius Boccaccio to matter drawn from previous medieval sources. Dante and Villani snowe(l both in his epic poem and in his lyrics that he to the nac * not abandoned the sphere of contemporary thought.

Revlvalof Allegory and theology, the vision and the symbol, still Learning, determine the form of masterpieces which for perfection

of workmanship and for emancipated force of intellect rank among the highest products of the human mind. Yet they are not medieval in the same sense as the song of Roland or the

Arthurian cycle. They proved that, though Italy came late into the realm of literature, her action was destined to be decisive and alterative by the introduction of a new spirit, a firmer and more positive grasp on life and aft. These qualities she owed to her material prosperity, to her freedom from feudalism, to her secular- ized church, her commercial nobility, her political independence in a federation of small states. Petrarch and Boccaccio, though they both held the medieval doctrine that literature should teach some abstruse truth beneath a veil of fiction, differed from Dante in this that their poetry and prose in the vernacular abandoned both allegory and symbol. In their practice they ignored their theory. Petrarch's lyrics continue the Provencal tradition as it had been reformed in Tuscany, with a subtler and more modern analysis of emotion, a purer and more chastened style, than his masters could boast. Boccaccio's tales, in like manner, continue the tradition of the fabliaux, raising that literary species to the rank of finished art, enriching it with humour and strengthening its substance by keen insight into all varieties of character. The Canzoniere and the Decameron distinguish themselves from medieval literature, not by any return to classical precedents, but by free self-conscious handling of human nature. So much had to be premised in order to make it clear in what relation humanism stood to the Renais-sance, since the Italian work of Dante, Petrarch and Boccaccio is sufficient to indicate the re-birth of the spirit after ages of ap- parent deadness. Had the Revival of Learning not intervened it is probable that the vigorous efforts of these writers alone would have inaugurated a new age of European culture. Yet, while noting this

reservation of judgment, it must also be remarked that all' three felt themselves under some peculiar obligation to the classics. Dante, medieval as his temper seems to us, chose Virgil for his guide, and ascribed his mastery of style to the study of Virgilian poetry. Petrarch and Boccaccio were, as we have seen, the pioneers of the new learning. They held their writings in the vernacular cheap, and initiated that contempt for the mother tongue which was a note of the earlier Renaissance. Giovanni Villani, the first chroni- cler who used Italian for the compilation of a methodical history, tells us how he was impelled to write by musing on the ruins of Rome and thinking of the vanished greatness of the Latin race. We have therefore to recognize that the four greatest writers of the 14th century, while the Revival of Learning was yet in its cradle, each after his own fashion acknowledged the vivifying touch upon their spirit of the antique genius. They seem to have been conscious that they could not give the desired impulse to modern literature and art without contact with the classics; and, in spite of the splendour of their achievements in Italian, they found no immediate followers upon that path.

The fascination of pure study was so powerful, the Italians at that epoch were so eager to recover the past, that during the 15th century we have before our eyes the spectacle of this great „ , ., nation deviating from the course of development begun *T,f oa in poetry by Dante and Petrarch, in prose by Boccaccio , "J? 3 ”' and Villani, into the channels of scholarship and anti- scno i ar . quarian research. The language of the Canzoniere and s /,;„aurf Decameron was abandoned for revived Latin and dis- literature. covered Greek. Acquisition supplanted invention; imitation of classical authors suppressed originality of style. The energies of the Italian people were devoted to transcrib- ing codices, settling texts, translating Greek books into Latin, compiling grammars, commentaries, encyclopaedias, dictionaries, epitomes and ephemerides. During this century the best histories — Bruno's and Poggio's annals of Florence, for example — were composed in Latin after the manner of Livy. The best dissertations, Landino's Camaldunenses, Valla's De Voluptate, were laboured imitations of Cicero's Tusculans. The best verses, Pontano's elegies, Politian's hexameters, were in like manner Latin; public orations upon ceremonial occasions were delivered in the Latin tongue; correspondence, official and familiar, was carried on in the same language; even the fabliaux received, in Poggio's Facetiae. a dress of elegant Latinity. The noticeable barrenness of Italian literature at this period is referable to the fact that men of genius and talent devoted themselves to erudition and struggled to express their thoughts and feelings in a speech which was not natural. Yet they were engaged in

a work of incalculable importance. At the close of the century the knowledge of Greece and Rome had been reappropriated and placed beyond the possibility of destruction; the chasm between the old and new world had been bridged; medieval modes of thinking and discussing had been superseded; the staple of education, the common culture which has brought all Europe into intellectual agreement, was already in existence. Humanism was now an actuality. Owing to the uncritical venera- tion for antiquity which then prevailed, it had received a strong tincture of pedantry. Its professors, in their revolt against the middle ages, made light of Christianity and paraded paganism. What was even worse from an artistic point of view, they had con- tracted puerilities of style, vanities of rhetoric, stupidities of weari- some citation. Still, at the opening of the 16th century, it became manifest what fruits of noble quality the Revival of Letters was about to bring forth for modern literature. Two great scholars, Lorenzo de' Medici and Politian, had already returned to the

practice of Italian poetry. Their work is the first absolutely modern work, — modern in the sense of having absorbed the stores of classic learning and reproduced those treasures in forms of simple, natural, native beauty. Boiardo occupies a similar position by the fusion of classic mythology with chivalrous romance in his Orlando Innamorato. But the victor's laurels were reserved for Ariosto, whose Orlando Furioso is the purest and most perfect extant example of Renaissance poetry. It was not merely in what they had acquired and assimilated from the classics that these poets showed the transformation effected in the field of literature by humanism. The whole method and spirit of medieval art had been abandoned. That of the Cinque Cento is positive, defined, mundane. The deity, if deity there be, that rules in it, is beauty. Interest is confined to the actions, passions, sufferings and joys of human life, to its pathetic, tragic, humorous and sentimental incidents. Of the state of souls beyond the grave we hear and are supposed to care nothing. In the drama the pedantry of the Revival, which had not injured romantic literature, made itself perniciQusly felt. Rules were collected from Horace and Aristotle. Seneca was chosen as the model of tragedy; Plautus and Terence supplied the groundwork of comedy. Thus in the plays of Rucellai, Trissino, Sperone and other tragic poets the nobler elements of humanism, considered as a revelation of the world and man, ob- tained no free development. Even the comedies of the best authors are too observant of Latin precedents, although some pieces of

Machiavelli, Ariosto, Aretino, Cecchi and Gelli are admirable for vivid delineation of contemporary manners.

The relation of the plastic arts to the revival of learning is similar to that which has been sketched in the case of poetry. Cimabue started with work which owed nothing directly to anti- Flnearts. q U ; ty jˆ t aDO ut the same time Niccola Pisano (d. 1278) studied the style of sculpture in fragments of Graeco-Roman marbles. His manner influenced Ciotto, who set painting on a forward path. Fortunately for the unimpeded expansion of Italian art, little was brought to light of antique workmanship during the 14th and 15th centuries. The classical stimulus came to painters, sculptors and architects chiefly through literature. Therefore there was narrow scope for imitation, and the right spirit of humanism displayed itself in a passionate study of perspective, nature and the nude. Yet we find in the writings of Ghiberti and Alberti, we notice in the masterpieces of these men and their compeers Brunelleschi and Donatello, how even in the 15th century the minds of artists were fascinated by what survived of classic grace and science. Gradually, as the race became penetrated with antique thought, the earlier Christian motives of the arts yielded to pagan subjects. Gothic architecture, which had always flourished feebly on Italian soil, was supplanted by a hybrid Roman style. The study of Vitruvius gave strong support to that pseudo-classic manner which, when it had reached its final point in Palladio's work, overspread the whole of Europe and dominated taste during two centuries. But the perfect plastic art of Italy, the pure art of the Cinque Cento, the painting of Raphael, Da Vinci, Titian and Correggio, the sculpture of Donatello, Michelangelo and Sansovino, the architecture of Bramante, Omodco and the Venetian Lombardi, however much imbued with the spirit of the classical revival, takes rank beside the poetry of Ariosto as a free intelligent product of the Renaissance. That is to say, it is not so much an outcome of studies in antiquity as an exhibition of emancipated modern genius fired and illuminated by the masterpieces of the past. It indicates a separation from the middle ages, inasmuch as it is permanently natural. Its religion is joyous, sensuous, dramatic, terrible, but in each and all of its many-sided manifestations strictly human. Its touch on classical mythology is original, rarely imitative or pedantic. The art of the Renaissance was an apocalypse of the beauty of the world and man in unaffected spontaneity, without side thoughts for piety or erudition, inspired by pure delight in loveliness and harmony for their own sakes.

In the fields of science and philosophy humanism wrought similar

important changes. Petrarch began by waging relentless war

against the logicians and materialists of his own day.

rf” M(– ‘ tn t ‘ le a dvance made in Greek studies scholastic methods andphilo- Q j tn ; n .; n g f c u ; nto contemptuous oblivion. The newly sop y. aroused curiosity for nature encouraged men like Alberti, Da Vinci, Toscanelli and Da Porta to make practical experiments, penetrate the working of physical forces, and invent scientific instruments. Anatomy began to be studied, and the time was not far distant when Titian should lend his pencil to the epoch-making treatise of Vesalius. The middle ages had been satisfied with absurd and visionary notions about the world around them, while the body of man was regarded with too much suspicion to be studied. Now the right method of interrogating nature with patience and loving admiration was instituted. At the same time the texts of ancient authors supplied hints which led to discoveries so far-reaching in their results as those of Copernicus, Columbus and Galileo. In philosophy, properly so called, the humanistic scorn for medieval dullness and obscurity swept away theological metaphysics as valueless. But at first little beyond empty rhetoric and clumsy compilation was substituted. The ethical treatises of the scholars are deficient in substance, while Ficino’s attempt

to revive Platonism betrays an uncritical conception of his master’s drift. It was something, however, to have shaken off the shackles of ecclesiastical authority; and, even if a new authority, that of the ancients, was accepted in its stead, still progress was being made toward sounder methods of analysis. This is noticeable in Pomponazzo’s system of materialism, based on the interpreta- tion of Aristotle, but revealing a virile spirit of disinterested and unprejudiced research. The thinkers of southern Italy, Telesio, Bruno and Campanella, at last opened the two chief lines on which modern speculation has since moved. Telesio and Campanella may be termed the predecessors of Bacon. Bruno was the pre- cursor of the idealistic schools. All three alike strove to disengage their minds from classical as well as ecclesiastical authority, proving that the emancipation of the will had been accomplished. It must be added that their writings, like every other product of the Re- naissance, except its purest poetry and art, exhibit a hybrid between medieval and modern tendencies. Childish ineptitudes are mingled with intuitions of maturest wisdom, and seeds of future thought germinate in the decaying refuse of past systems.

Humanism in its earliest stages was uncritical. It absorbed the relics of antiquity with omnivorous appetite, and with very im- perfect sense of the distinction between worse and better r …, work. Yet it led in process of time to criticism. The c ” tlc ‘ sm – critique of literature began in the lecture-room of Politian, in the printing-house of Aldus, and in the school of Vittorino. The critique of Roman law started, under Politian’s auspices, upon a more liberal course than that which had been followed by the powerful but narrow-sighted glossators of Bologna. Finally, in the court of Naples arose that most formidable of

all critical engines, the critique of established ecclesiastical traditions and spurious historical docu- ments. Valla by one vigorous effort destroyed the False Decretals and exposed the Donation of Constantine to ridicule, paving the way for the polemic carried on against the dubious pretensions of the papal throne by scholars of the Reformation. A similar criticism, conducted less on lines of erudition than of persiflage and irony, ransacked the moral abuses of the church and played around the very foundations of Christianity. This was tolerated with approval by men who repeated Leo X.'s witty epigram: " What profit has not that fable of Christ brought us !" The same critical and philosophic spirit working on the materials of history produced a new science, the honours of which belong to Machia- velli. He showed, on the one side, how the history of a people can be written with a recognition of fixed principles, and at the same time with an artistic feeling for personal and dramatic episodes. On the other side, he addressed himself to the analysis of man considered as a political being, to the anatomy of constitutions and the classification of governments, to the study of motives underlying public action, the secrets of success and the causes of failure in the conduct of affairs. The unscrupulous rigour with which he applied his scientific method, and the sinister deductions he thought himself justified in drawing from the results it yielded, excited terror and repulsion. Nevertheless, a department had been added to the intellectual empire of mankind, in which fel- low-workers, like Guicciardini at Florence, and subsequently Sarpi at Venice, were not slow to follow the path traced by Machiavelli.

The object of the foregoing paragraphs has been to show in what way the positive, inquisitive, secular, exploratory spirit of the Renais- sance, when toned and controlled by humanism, penetrated the regions of literature, art, philosophy and science. It Educa- becomes at this point of much moment to consider how *

social manners in Italy were modified by the same causes, since the type developed there was in large measure communicated together with the new culture to the rest of Europe. The first subject to be noticed under this heading is education. What has come to be called a classical education was the immediate product of the Italian Renaissance. The universities of Bologna, Padua and Salerno had been famous through the middle ages for the study of law, physics and medicine; and during the 15th and 16th centuries the first two still enjoyed celebrity in these faculties. But at this period no lecture-rooms were so crowded as those in which professors of antique literature and language read passages from the poets and orators, taught Greek, and commented upon the systems of philo- sophers. The medieval

curriculum offered no defined place for the new learning of the Revival, which had indeed no recognizee! name. Chairs had therefore to be founded under the title of rhe- toric, from which men like Chrysoloras and Guarino, Filelfo and Poli- tian expounded orally to hundreds of eager students from every town of Italy and every nation in Europe- their accumulated know- ledge of antiquity. One mass of Greek and Roman erudition, including history and metaphysics, law and science, civic institu- tions and the art of war, mythology and magistracies, metrical systems and oratory, agriculture and astronomy, domestic manners and religious rites, grammar and philology, biography and numis- matics, formed the miscellaneous subject-matter of this so-styled rhetoric. Notes taken at these lectures supplied young scholars with hints for further exploration ; and a certain tradition of treat- ing antique authors for the display of general learning, as well as for the elucidation of their texts, came into vogue, which has

determined the method of scholarship for the last three centuries in Europe. The lack of printed books in the first period of the Revival, and the comparative rarity of Greek erudition among students, combined with the intense enthusiasm aroused for the new gospel of the classics, gave special value to the personal teaching of these professors. They journeyed from city to city, attracted by promises of higher pay, and allured by ever-growing laurels of popular fame. Each large town established its public study, academy or uni- versity, similar institutions under varying designations, for the exposition of the lilerae humaniores. The humanists, or professors of that branch of knowledge, became a class of the highest dignity. They were found in the chanceries of the republics, in the papal curia, in the council chambers of princes, at the headquarters of condottieri, wherever business had to be transacted, speeches to be made and the work of secretaries to be performed. Further- more, they undertook the charge of private education, opening schools which displaced the medieval system of instruction, and taking engagements as tutors in the families of despots, noblemen and wealthy merchants. The academy established by Vittorino da Feltre at Mantua under the protection of Gian Francesco Gonzaga for the training of pupils of both sexes, might be chosen as the type of this Italian method. His scholars, who were lodged in appro- priate buildings, met daily to hear the master read and comment on the classics. They learned portions of the best authors by heart, exercised themselves in translation from one

language to another, and practised composition in prose and verse. It was Vittorino's care to see that, while their memories were duly stored with words and facts, their judgment should be formed by critical analysis, attention to style, and comparison of the authors of a decadent age with those who were acknowledged classics. During the hours of recreation suitable physical exercises, as fencing, riding and gym- nastics, were conducted under qualified trainers. From this sketch it will be seen how closely the educational system which came into England during the reigns of the Tudors, and which has prevailed until the present time, was modelled upon the Italian type. English youths who spend their time at Eton between athletic sports and Latin verses, and who take an Ireland with a first class in " Greats " at Oxford, are pursuing the same course of physical and mental discipline as the princes of Gonzaga or Montefeltro in the 15th century.

The humanists effected a deeply penetrating change in social manners. Through their influence as tutors, professors, orators Social an< ˆ court ' ers ' society was permeated by a fresh ideal of

culture. To be a gentleman in Italy meant at this epoch manners. tQ ˆ e a man ac q uam ted with the rudiments at least of scholarship, refined in diction, capable of corresponding or of speak- ing in choice phrases, open to the beauty of the arts, intelligently interested in archaeology, taking for his models of conduct the great men of antiquity rather than the saints of the church. He was also expected to prove himself an adept in physical exercises and in the courteous observances which survived from chivalry. The type is set before us by Castiglione in that book upon the courtier which went the round of Europe in the 16th century. It is further em- phasized in a famous passage of the Orlando Innamorato where Boiardo compares the Italian ideal of an accomplished gentleman with the coarser type admired by nations of the north. To this point the awakened intelligence of the Renaissance, instructed by humanism, polished by the fine arts, expanding in genial conditions of diffused wealth, had brought the Italians at a period when the rest of Europe was comparatively barbarous.

This picture has undoubtedly a darker side. Humanism, in its revolt against the middle ages, was, as we have seen already, The moral mun dane, pagan, irreligious, positive. The Renaissance defects of ? an ' a ˆ teT a "> be regarded only as a period of transition the Italian ln wn ' c h much of the good of the past was sacrificed while Renals- some of the evil was retained, and neither the bad nor the sance. g°°d of the future was brought clearly into fact. Beneath

the surface of brilliant social culture lurked gross appetites and savage passions, unrestrained by medieval piety, untutored by modern experience. Italian society exhibited an almost un- exampled spectacle of literary, artistic and courtly refinement crossed by brutalities of lust, treasons, poisonings, assassinations, violence. A succession of worldly pontiffs brought the church into flagrant discord with the principles of Christianity. Steeped in pagan learning, emulous of imitating the manners of the ancients, used to think and feel in harmony with Ovid and Theocritus, and at the same time rendered cynical by the corruption of papal Rome, the educated classes lost their grasp upon morality. Political honesty ceased almost to have a name in Italy. The Christian virtues were scorned by the foremost actors and the ablest thinkers of the time, while the antique virtues were themes for rhetoric rather than moving-springs of conduct. This is apparent to all students of Machiavelli and Guicciardini, the profoundest analysts of their age the bitterest satirists of its vices, but themselves in- fected with its incapacity for moral goodness. Not only were the Italians vitiated ; but they had also become impotent for action and resistance. At the height of the Renaissance the five great powers in the peninsula formed a confederation of independent but mutually attractive and repellent states. Equilibrium was

maintained by diplomacy, in which the humanists played a fore- most part, casting a network of intrigue over the nation which helped in no small measure to stimulate intelligence and create a common medium of culture, but which accustomed statesmen to believe that everything could be achieved by wire-pulling. Wars were conducted on a showy system by means of mercenaries, who played a safe game in the field and developed a system of blood- less campaigns. Meanwhile the people grew up unused to arms. When Italy between the years 1494 and 1530 became the battle- field of French, German and Spanish forces, it was seen to what a point of helplessness the political, moral and social conditions of the Renaissance had brought the nation.

It was needful to study at some length the main phenomena of the Renaissance in Italy, because the history of that phase of evolution in the other Western races turns almost Diffusion entirely upon points in which they either adhered of the to or diverged from the type established there. Speak- Bew lea “>- ing broadly, what France, Germany, Spain and f^^° m England assimilated from Italy at this epoch was in the through- first place the new learning, as it was then called, out This implied the new conception of human life, Europe. the new interest in the material universe, the new method of education, and the new manners, which we have seen to be inseparable from Italian humanism. Under these forms of intellectual enlightenment

and polite culture the renascence of the human spirit had appeared in Italy, where it was more than elsewhere connected with the study of classical antiquity. But that audacious exploratory energy which formed the motive -force of the Renaissance as distinguished from the Revival of Learning took, as we shall see, very different directions in the several nations who now were sending the flower of their youth to study at the feet of Italian rhetoricians.

The Renaissance ran its course in Italy with strange indiffer- ence to consequences. The five great powers, held in equilibrium by Lorenzo de' Medici, dreamed that the peninsula could be maintained in statu quo by diplomacy. The church saw no danger in encouraging a pseudo-pagan ideal of life, violating its own principle of existence by assuming the policy of an aggrandizing secular state, and outraging Christendom openly by its acts and utterances. Society at large was hardly aware that an intellectual force of stupendous magnitude and in- calculable explosive power had been created by the new learning. Why should not established institutions proceed upon the customary and convenient methods of routine, while the delights of existence were augmented, manners polished, arts developed, and a golden age of epicurean ease made decent by a state religion which no one cared to break with because no one was left to regard it seriously? This was the attitude of the Italians when the Renaissance, which they had initiated as a thing of beauty, began to operate as a thing of power beyond the Alps.

Germany was already provided with universities, seven of which had been founded between 1348 and 1409. In these haunts of learning the new studies took root after the year 1440, chiefly through the influence of travelling professors, Peter Reylvat ot Luder and Samuel Karoch. German scholars made their LearB '"Z way to Lombard and Tuscan lecture-rooms, bringing back ln Ger ~ the methods of the humanists. Greek, Latin and Hebrew ma °y- erudition soon found itself at home on Teutonic soil. Like Italian men of letters, these pioneers of humanism gave a classic turn to their patronymics; unfamiliar names, Crotus Rubeanus and Pierius Graecus, Capnion and Lupambulus Ganymedes, Oecolampadius and Melanchthon, resounded on the Rhine. A few of the German princes, among whom Maximilian, the prince cardinal Albert of Mainz, Frederick the Wise of Saxony, and Eberhard of Wiirttem- berg deserve mention, exercised a not insignificant influence on letters by the foundation of new universities and the patronage of learned men. The cities of Strassburg, Nuremberg, Augsburg, Basel, became centres of learned coteries, which gathered round scholars like Wimpheling, Brant, Peutinger, Schedel, and Pirckheimer, artists like Durer and Holbein, printers of

the eminence of Froben. Academies in imitation of Italian institutions came into existence, the two most conspicuous, named after the Rhine and the Danube, holding their headquarters respectively at Heidelberg and Vienna. Crowned poets, of whom the most eminent was Conrad Celtes Pro- tucius (Pickel!), emulated the fame of Politian and Pontano. Yet, though the Renaissance was thus widely communicated to the centres of German intelligence, it displayed a different character from that which it assumed in Italy. Gothic art, which was indi- genous in Germany, yielded but little to southern influences. Such

work as that of Durer, Vischer, Cranach, Schongauer, Holbein, con- summate as it was in technical excellence, did not assume Italian forms of loveliness, did not display the paganism of the Latin races. The modification of Gothic architecture by pseudo-Roman elements of style was incomplete. What Germany afterwards took of the Palladian manner was destined to reach it on a circuitous route from France. In like manner the new learning failed to penetrate all classes of society with the rapidity of its expansion in Italy, nor was the new ideal of life and customs so easily substituted for the medieval. The German aristocracy, as Aeneas Sylvius had noticed, remained for the most part barbarous, addicted to gross pleasures, contemptuous of culture. The German dialects were too rough to receive that artistic elaboration under antique influences which had been so facile in Tuscany. The doctors of the universities were too wedded to their antiquated manuals and methods, too satisfied with dullness, too proud of titles and diplomas, too anxious to preserve ecclesiastical discipline and to repress mental activity, for a genial spirit of humanism to spread freely. Not in Cologne or Tubingen but in Padua and Florence did the German pioneers of the Renais- sance acquire their sense of liberal studies. And when they returned home they found themselves encumbered with stupidities, jealousies and rancours. Moreover, the temper of these more enlightened men was itself opposed to Italian indifference and immorality; it was pugnacious and polemical, eager to beat down the arrogance of monks and theologians rather than to pursue an ideal of aesthetical self-culture. To a student of the origins of German humanism it is clear that something very different from the Renaissance of Lorenzo de' Medici and Leo X. was in preparation from the first upon Teutonic soil. Far less plastic and form-loving than the Italian, the German intelligence was more penetrative, earnest, disputative, occupied with substantial problems. Starting with theological criticism, proceeding to the stage of solid studies in the

three learned languages, German humanism occupied the attention of a widely scattered sect of erudite scholars; but it did not arouse the interest of the whole nation until it was forced into a violently militant attitude by Pfefferkorn's attack on Reuchlin. That attempt to extinguish honest thought prepared the Reformation; and humanism after 1518 was absorbed in politico-religious warfare. The point of contact between humanism and the Reformation in Germany has to be insisted on; for it is just here that the relation of the Reformation to the Renaissance in general makes Relation itself apparent. As the Renaissance had its precur- of human- sory movements in the medieval period, so the German ism to the Reformation was preceded by Wickliffe and Huss, by the discontents of the Great Schism and by the councils of Con- stance and Basel. These two main streams of modern progress had been proceeding upon different tracks to diverse issues, but they touched in the studies stimulated by the Revival, and they had a common origin in the struggle of the spirit after self-emancipation. Johann Reuchlin, who entered the lecture-room of Argyropoulos at Rome in 1482, Erasmus of Rotter- dam, who once dwelt at Venice as the house guest of the Aldi, applied their critical knowledge of Hebrew and of Greek to the elucidation and diffusion of the Bible. To the Germans, as to all nations of that epoch, the Bible came as a new book, because they now read it for the first time with eyes opened by humanism. The touch of the new spirit which had evolved literature, art and culture in Italy sufficed in Germany to recreate Christianity. This new spirit in Italy emancipated human intelligence by the classics; in Germany it emancipated the human conscience by the Bible. The indigna- tion excited by Leo X.'s sale of indulgences, the moral rage stirred in Northern hearts by papal abominations in Rome, were external causes which precipitated the schism between Teutonic and Latin Christianity. The Reformation, inspired by the same energy of resuscitated life as the Renaissance, assisted by the same engines of the printing-press and paper, using the same apparatus of scholar- ship, criticism, literary skill, being in truth another manifestation of the same world-movement under a diverse form, now posed itself as an irreconcilable antagonist to Renaissance Italy. It would be difficult to draw any comparison between German and Italian humanists to the disparagement of the former. Reuchlin was no less learned than Pico; Melanchthon no less humane than Ficino; Erasmus no less witty, and far more trenchant, than Petrarch ; Ulrich von Hutten no less humorous than Folengo; Paracelsus no less fantastically learned than Cardano. But the cause in which German intellect and will were enlisted was so different that it is difficult not to make a formal separation between that movement which evolved culture in Italy and that which restored religion in Germany,

establishing the freedom of intelligence in the one sphere and the freedom of the conscience in the other. The truth is that the Reformation was the Teutonic Renaissance. It was the emanci- pation of the reason on a line neglected by the Italians, more impor- tant indeed in its political consequences, more weighty in its bearing on rationalistic developments than the Italian Renaissance, but none the less an outcome of the same ground-influences. We have already in this century reached a point at which, in spite of stubborn Protestant dogmatism and bitter Catholic reaction, we can perceive how the ultimate affranchisement of man will be the work of both.

Ism to the German Reform a tion.

The German Reformation was incapable of propagating itself in Italy, chiefly for the reason that the intellectual forces which it represented and employed had already found specific _.. outlet in that country. It was not in the nature of the catholic Italians, sceptical and paganized by the Revival, to be rev ival keenly interested about questions which seemed to revive]n / ta i K< the scholastic disputes of the middle ages. It was not in '

their external conditions, suffering as they were from invasions, enthralled by despots, to use the Reformation as a lever for political revolution. Yet when a tumultuary army of so-called Lutherans sacked Rome in 1527 no sober thinker doubted that a new agent had appeared in Europe which would alter the destinies of the peninsula. The Renaissance was virtually closed, so far as it concerned Italy, when Clement VII. and Charles V. struck their compact at Bologna in 1530. This compact proclaimed the principle of monarchical absolutism, supported by papal authority, itself monarchically absolute, which influenced Europe until the outbreak of the Revolu- tion. A reaction immediately set in both against the Renaissance and the Reformation. The council of Trent, opened in 1545 and closed in 1563, decreed a formal purgation of the church, affirmed the fundamental doctrines of Catholicism, strengthened the papal supremacy, and inaugurated that movement of resistance which is known as the Counter-Reformation. The complex onward effort of the modern nations, expressing itself in Italy as Renaissance, in Germany as Reformation, had aroused the forces of conservatism. The four main instruments of the reaction were the papacy, which had done so much by its sympathy with the revival to promote the humanistic spirit it now dreaded, the strength of Spain, and two Spanish institutions planted on Roman soil — the Inquisition and the Order of Jesus. The principle contended for and established by this reaction was absolutism as opposed to freedom — monarchical absolutism, papal

absolutism, the suppression of energies liberated by the Renaissance and the Reformation. The partial triumph of this principle was secure, inasmuch as the majority of established powers in church and state felt threatened by the revolutionary opinions afloat in Europe. Renaissance and Reformation were, moreover, already at strife. Both, too, were spiritual and elastic tendencies toward progress, ideals rather than solid organisms.

The part played by Spain in this period of history was deter- mined in large measure by external circumstance. The Spaniards became one nation by the conquest of Granada and the union of the crowns of Castile and Aragon. The war of ˆf “„ national aggrandizement, being in its nature a crusade,

the Re- naissance

inflamed the religious enthusiasm of the people. It Derfod _ was followed by the expulsion of Jews and Moors, and by ‘ˆ . the establishment of the Inquisition on a solid basis, with j e # ere> powers formidable to the freedom of all Spaniards from the peasant to the throne. These facts explain the decisive action of the Spanish nation on the side of Catholic conservatism, and help us to understand why their brilliant achievements in the field of culture during the 16th century were speedily followed by stag- nation. It will be well, in dealing with the’ Renaissance in Spain, to touch first upon the arts and literature, and then to consider those qualities of character in action whereby the nation most distinguished itself from the rest of Europe. Architecture in Spain, emerging from the Gothic stage, developed an Early Renaissance style of bewildering richness by adopting elements of Arabic and Moorish decoration. Sculpture exhibited realistic vigour of indubitably native stamp; and the minor plastic crafts were cultivated with success on lines of striking originality. Painting grew from a homely stock, until the work of Velazquez showed that Spanish masters in this branch were fully abreast of their Italian compeers and contemporaries. To dwell here upon the Italianizing versifiers, moralists and pastoral romancers who attempted to refine the vernacular of the Romancero would be superfluous. They are mainly noticeable as proving that certain coteries in Spain were willing to accept the Italian Renaissance. But the real force of the people was not in this courtly literary style. It expressed itself at last in the monumental work of Don Quixote, which places Cervantes beside Rabelais, Ariosto and Shakespeare as one of the four supreme exponents of the Renaissance. The affectations of decadent chivalry disappeared before its humour; the lineaments of a noble nation, animated by the youth of modern Europe emerging from the middle

ages, were portrayed in its enduring pictures of human experience. The Spanish drama, meanwhile, untram- melled by those false canons of pseudo-classic taste which fettered the theatre in Italy and afterwards in France, rose to an eminence in the hands of Lope de Vega and Calderon which only the English, and the English only in the masterpieces of three or four playwrights, can rival. Camoens, in the Lusiad, if we may here group Portugal with Spain, was the first modern poet to compose an epic on a purely modern theme, vying with Virgil, but not bending to pedantic rules, and breathing the spirit of the age of heroic adventures and almost fabulous discoveries into his melodious numbers. What has chiefly to be noted regarding the achievements of the Spanish race in arts and letters at this epoch is their potent national origin- ality. The revival of learning produced in Spain no slavish imitation as it did in Italy, no formal humanism, and, it may be added, very little of fruitful scholarship. The Renaissance here, as in England.

displayed essential qualities of intellectual freedom, delight in life, exultation over rediscovered earth and man. The note of Renais- sance work in Germany was still Gothic. This we feel in the penetrative earnestness of Diirer, in the homeliness of Hans Sachs, in the grotesque humour of Eulenspiegel and the Narrenschiff, the sombre pregnancy of the Faust legend, the almost stolid mastery of Holbein. It lay not in the German genius to escape from the preoccupations and the limitations of the middle ages, for this reason mainly that what we call medieval was to a very large extent Teutonic. But on the Spanish peninsula, in the master- pieces of Velazquez, Cervantes, Camoens, Calderon, we emerge into an atmosphere of art, definitely national, distinctly modern, where solid natural forms stand before us realistically modelled, with light and shadow on their rounded outlines, and where the airiest creatures of the fancy take shape and weave a dance of rhythmic, light, incomparable intricacy. The Spanish Renaissance would in itself suffice, if other witnesses were wanting, to prove how inaccurate is the theory that limits this movement to the revival of learning. Touched by Italian influences, enriched and fortified by the new learning, Spanish genius walked firmly forward on its own path. It was only crushed by forces generated in the nation that produced it, by the Inquisition and by despotic Catholic absolutism.

In the history of the Renaissance, Spain and Portugal represent the

exploration of the ocean and the colonization of the other Bxolora-hemisphere. The voyages of Columbus and Vespucci Hon of *° America, the rounding of the Cape by Diaz and the the ocean, discovery of the sea road to India by Vasco da Gama, Cortes's conquest of Mexico and Pizarro's conquest of Peru, marked a new era for the human race and inaugurated the modern age more decisively than any other series of events has done. It has recently been maintained that modern European history is chiefly an affair of competition between confederated states for the possession of lands revealed by Columbus and Da Gama. Without challenging or adopting this speculation, it may be safely affirmed that nothing so pregnant of results has happened as this exploration of the globe. To say that it displaced the centre of gravity in politics and commerce, substituting the ocean for the Mediterranean, dethroning Italy from her seat of central importance in traffic, depressing the eastern and elevating the western powers of Europe, opening a path for Anglo-Saxon expansiveness, forcing philosophers and statesmen to regard the Occidental nations as a single group in counterpoise to other groups of nations, the European community as one unit correlated to other units of humanity upon this planet, is truth enough to vindicate the vast significance of these discoveries. The Renaissance, far from being the re-birth of antiquity with its civilization confined to the Mediterranean, with its Hercules' Pillars beyond which lay Cimmerian darkness, was thus effectively the entrance upon a quite incalculably wider stage of life, on which mankind at large has since enacted one great drama.

While Spanish navies were exploring the ocean, and Spanish paladins were overturning empires, Charles V. headed the reaction Doematlc °^ Catholicism against reform. Stronger as king of Spain Catholi- than as emperor, for the Empire was little but a name, elsm. " h e ' ent tne we 'ght of his authority to that system of coercion and repression which enslaved Italy, desolated Germany with war, and drowned the Low Countries in blood. Philip II., with full approval of the Spanish nation, pursued the same policy in an even stricter spirit. He was powerfully assisted by two institutions, in which the national character of Spain expressed itself, the Inquisition and the Society of Jesus. Of the former it is not needful to speak here. But we have to observe that the last great phenomenon of the Spanish Renaissance was Ignatius Loyola, who organized the militia by means of which the church worked her Counter- Reformation. His motto, Perinde oc cadaver, expressed that recognition of absolutism which papacy and monarchy demanded for their consolidation (see JESUITS and Loyola).

The logical order of an essay which attempts to show how Renaissance

was correlated to Reformation and Counter- Fraace la Reformation has necessitated the treatment of Italy, the Re- Germany and Spain in succession; for these three aaissance na tj ons were t ne three main agents in the triple ‘ process to be analysed. It was due to their specific qualities, and to the diverse circumstances of their external development, that the re-birth of Europe took this form of duplex action on the lines of intellectual and moral progress, followed by reaction against mental freedom. We have now to speak of France, which earliest absorbed the influence of the Italian revival, and of England, which received it latest. The Renaissance may be said to have begun in France with Charles VIII. ‘s expedition to Naples, and to have continued until the extinction of the house of Valois. Louis XII. and Francis I. spent a considerable portion of their reigns in the attempt to

secure possession of the Italian provinces they claimed. Henry II. ‘s queen was Catherine of the Medicean family; and her children, Charles IX. and Henry III., were Italianated French- men. Thus the connexion between France and Italy during the period 1494-1589 was continuous. The French passed to and fro across the Alps on military and peaceful expeditions. Italians came to France as courtiers, ambassadors, men of business, captains and artists. French society assumed a strong Italian colouring, nor were the manners of the court very different from those of an Italian city, except that externally they remained ruder and less polished. The relation between the crown and its great feudatories, the military bias of the aristocracy, and the marked distinction between classes which survived from the middle ages, rendered France in many vital points unlike Italy. Yet the annals o’ that age, and the anecdotes retailed by Brantome, prove that the royalty and nobility of France had been largely Italianized.

It is said that Louis XII. brought Fra Giocondo of Verona back with him to France, and founded a school of architects. But we need not have recourse to this legend for the explanation French of such Italian influences as were already noticeable archltec- in the Renaissance buildings on the Loire. Without ture. determining the French style, Italian intercourse helped to stimulate its formation and development. There are students of the 15th century in France who resent this intrusion of the Italian Renaissance. But they forget that France was bound by inexorable laws of human evolution to obey the impulse which communicated itself to every form of art in Europe. In the school of Fontainebleau, under the patronage of Francis I , that Italian influence made itself distinctly felt; yet a true French manner had been already formed, which, when it was subsequently applied at Paris, preserved a marked national quality. The characteristic of the

style developed by Bullant, De l'Orme and Lescot,, in the royal or princely palaces of Chenonceaux, Chambord, Anet, Ecouen, Fontainebleau, the Louvre and elsewhere, is a blending of capricious fancy and inventive richness of decoration with purity of outline and a large sense of the beauty of extended masses. Beginning with the older castles of Touraine, and passing onward to the Tuileries, we trace the passage from the medieval fortress to the modern pleasure-house, and note how architecture obeyed the special demands of that new phenomenon of Renaissance civiliza- tion, the court. In the general distribution of parts these monu- mental buildings express the peculiar conditions wnich French society assumed under the influence of Francis I. and Diane de Poitiers. In details of execution and harmonic combinations they illustrate the precision, logic, lucidity and cheerful spirit of the national genius. Here, as in Lombardy, a feeling for serene beauty derived from study of the antique has not interrupted the evolution of a style indigenous to France and eminently characteristic of the French temperament.

During the reign of Francis I. several Italian painters of eminence visited France. Among these, Del Rosso, Primaticcio, Del Sarto and Da Vinci are the most famous. But their example c renc t was not productive of a really great school of French paint- oa j n ti as! ing. It was left for the Poussins and Claude Lorraine anli in the next century, acting under mingled Italian and sculpture. Flemish influences, to embody the still active spirit of the classical revival. These three masters were the contemporaries of Corneille, and do not belong to the Renaissance period. Sculp- ture, on the contrary, in which art, as in architecture, the medieval French had been surpassed by no other people of Europe, was practised with originality and power in the reigns of Henry II. and Francis I. Ponzio and Cellini, who quitted Italy for France, found themselves outrivalled in their own sphere by Jean Goujon, Cousin and Pilon. The decorative sculpture of this epoch, whether combined with architecture or isolated in monumental statuary, ranks for grace and suavity with the best of Sansovino's. At the same time it is unmistakably inspired by a sense of beauty different from the Italian — more piquant and pointed, less languorous, more mannered perhaps, but with less of empty rhythmical effect. All this while, the minor arts of enamelling, miniature, glass-paint- ing, goldsmith's work, jewellery, engraving, tapestry, wood-carving, pottery, &c, were cultivated with a spontaneity and freedom which proved that France, in the middle point between Flanders and Italy, was able to use both influences without a sacrifice of native taste. It may indeed be said in general that what is true of France is likewise true of all countries which felt

the artistic impulses of the Renaissance. Whether we regard Spain, the Netherlands, or Germany at this epoch, we find a national impress stamped upon the products of the plastic and the decorative arts, notwithstanding the prevalence of certain forms derived from the antique and Italy. It was only at a later period that the formalism of pseudo-classic pedantry reduced natural and national originality to a dead unanimity.

RENAISSANCE

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French literature was quick to respond to Renaissance influences. De Comines, the historian of Charles VIII. ‘s expedition to Naples, Preach differs from the earlier French chroniclers in his way of literature ” e g ar ding the world of men and affairs. He has the perspicuity and analytical penetration of a Venetian ambassador. Villon, his contemporary, may rather be ranked, so far as artistic form and use of knowledge are concerned, with poets of the middle ages, and in particular with the Goliardi. But he is essentially modern in the vividness of his self-portraiture, and in what we are wont to call realism. Both De Comines and Villon indicate the entrance of a new quality into literature. The Rhetoriqueurs, while protracting medieval traditions by their use of allegory and complicated metrical systems, sought to improve the French language by introducing Latinisms. Thus the Revival of Learning began to affect the vernacular in the last years of the 15th century. Marot and his school reacted against this pedantry. The Renaissance displayed itself in their effort to purify the form and diction of poetry. But the decisive revolution was effected by Ronsard and his comrades of the Pleiade. It was their professed object to raise French to a level with the classics, and to acclimatize Italian species of verse. The humanistic movement led these learned writers to engraft the graces of the antique upon their native literature, and to refine it by emulating the lucidity of Petrarch. The result of their endeavour was immediately apparent in the new force added to French rhythm, the new pomp, richness, colouring and polish conferred upon poetic diction. French style gradually attained to fixity, and the alexandrine came to be recog- nized as the standard line in poetry. D’Aubigne’s invective and Regnier’s satire, at the close of the 16th century, are as modern as Voltaire’s. Meanwhile the drama was emerging from the medieval mysteries; and the classical type, made popular by Garnier’s genius, was elaborated, as in Italy, upon the model of Seneca and the canons- of the three unities. The tradition thus formed was continued and fortified by the illustrious playwrights of the 17th century. Translation from Greek and Latin into French

progressed rapidly at the commencement of this period. It was a marked characteristic of the Renaissance in France to appropriate the spoils of Greece and Rome for the profit of the mother tongue. Amyot's Plutarch and his Daphnis and Chloe rank among the most exquisite examples of beautiful French prose. Prose had now the charm of simplicity combined with grace. To mention Bran- l6me is to mention the most entertaining of gossips. To speak of Montaigne is to speak of the best as well as the first of essayists. In all the literary work which has been mentioned, the originality and freshness of the French genius are no less conspicuous than its saturation with the new learning and with Italian studies. But the greatest name of the epoch, the name which is synonymous with the Renaissance in France, has yet to be uttered. That, of course, is Rabelais. His incommensurable and indescribable masterpiece of mingled humour, wisdom, satire, erudition, indecency, profundity, levity, imagina- tion, realism, reflects the whole age in its mirror of hyper- Aristophanic farce. What Ariosto is for Italy, Cervantes for Spain, Erasmus for Holland, Luther for Germany, Shakespeare for England, that is Rabelais for France. The Renaissance can- not be comprehended in its true character without familiarity with these six representatives of its manifold and many-sided inspiration.

The French Renaissance, so rich on the side of arts and letters, was hardly less rich on the side of classical studies. The revival

of learning has a noble muster-roll of names in France : hi Turnebus, the patriarch of Hellenistic studies; the

SC hlo' U The ktiennes of Paris, equalling in numbers, industry and s „ £_.. learning their Venetian rivals; the two Scaligers; impas- llonln ' s ' one d Dolet; eloquent Murct; learned Cujas; terrible France Calvin; Ramus, the intrepid antagonist of Aristotle;

De Thou and De Beze; ponderous Casaubon; brilliant young Saumaise. The distinguishing characteristics of French humanism are vivid intelligence, critical audacity and polemical acumen, perspicuity of exposition, learning directed in its appli- cations by logical sense rather than by artistic ideals of taste. Some of the names just mentioned remind us that in France, as in Germany and Holland, the Reformation was closely connected with the revival of learning. Humanism has never been in the narrow sense of that term Protestant; still less has it been strictly Catholic. In Italy it fostered a temper of mind decidedly averse to theological speculation and religious earnestness. In Holland and Germany, with Erasmus, Reuchlin and Melanchthon, it de- veloped types of character, urbane, reflective,

pointedly or gentlv critical, which, left to themselves, would not have plunged the north of Europe into the whirlpool of belligerent reform. Yet none the less was the new learning, through the open spirit of inquiry it nourished, its vindication of the private reason, its enthusiasm for republican antiquity, and its proud assertion of the rights of human independence, linked by a strong and subtle chain to that turbid revolt of the individual consciousness against spiritual despotism draped in fallacies and throned upon abuses. To this rebellion we give the name of Reformation. But, while the necessities of antagonism to papal Rome made it assume at first the form of

narrow and sectarian opposition, it marked in fact a vital struggle of the intellect towards truth and freedom, involving future results of scepticism and rationalistic audacity from which its earlier champions would have shrunk. It marked, moreover, in the con- dition of armed resistance against established authority which was forced upon it by the Counter-Reformation, a firm resolve to assert political liberty, leading in the course of time to a revolution with which the rebellious spirit of the Revival was sympathetic. This being the relation of humanism in general to reform, French learn- ing in particular displayed such innovating boldness as threw many of its most conspicuous professors into the camp at war with Rome. Calvin, a French student of Picard origin, created the type of Protestantism to which the majority of French Huguenots adhered. This too was a moment at which philosophical seclusion was hardly possible. In a nation so tumultuously agitated one side or the other had to be adopted. Those of the French humanists who did not proclaim Huguenot opinions found themselves obliged with Muretus to lend their talents to the Counter-Reformation, or to suffer persecution for heterodoxy, like Dolet. The church, terrified and infuriated by the progress of reform, suspected learning on its own account. To be an eminent scholar was to be accused of immorality, heresy and atheism in a single indictment; and the defence of weaker minds lay in joining the Jesuits, as Heinsius was fain to do. France had already absorbed the earlier Renaissance in an Italianizing spirit before the Reformation made itself felt as a political actuality. This fact, together with the strong Italian bias of the Valois, serves to explain in some degree the reason why the Counter-Reformation entailed those fierce entangled civil wars, massacres of St Bartholomew, murders of the Guises, regicides, treasons and empoisonments that ter- minated with the compromise of Henry IV. It is no part of the present subject to analyse the political, religious and social interests of that struggle. The upshot was the triumph of the Counter- Reformation, and the establishment of its principle, absolutism, as the basis of French government. It was

,a French king who, when the nation had been reduced to order, uttered the famous word of absolutism, ” L’Etat, e’est moi.”

The Renaissance in the Low Countries, as elsewhere, had its brilliant age of arts and letters. During the middle ages the wealthy free towns of Flanders flourished under conditions not dissimilar to those of the Italian republics. They raised j™f miracles of architectural beauty, which were modified in ™<* er- the 15th and 16th centuries by characteristic elements /an< **—

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Metsys, Mabuse, Lucas van Leyden, struck out a new path ouLh in the revival of painting and taught Europe the secret oa i B ti„. of oil-colouring. But it was reserved for the 1 7th century to witness the flower and fruit time of this powerful art in the work of Porbus, Rubens and Vandyck, in the Dutch schools of landscape and home-life, and in the unique masterpieces of Rembrandt. We have a right to connect this later period with the Renaissance, because the distracted state of the Netherlands during the 16th century suspended, while it could not extinguish, their aesthetic development. The various schools of the 17th century, moreover, are animated with the Renaissance spirit no less surely than the Florentine school of the 15th or the Venetian of the 16th. The animal vigour and carnal enjoyment of Rubens, the refined Italianizing beauty of Vandyck, the mystery of light and gloom on Rembrandt’s panels, the love of nature in Ruysdael, Cuyp and Van Hooghe, with their luminously misty skies, silvery daylight and broad expanse of landscape, the interest in common life displayed by Ter Borch, Van Steen, Douw, Ostade and Teniers, the instinct for the beauty of animals in Potter, the vast sea spaces of Vanderveldt, the grasp on reality, the acute intuition into char- acter in portraits, the scientific study of the world and man, the robust sympathy with natural appetites, which distinguish the whole art of the Low Countries, are a direct emanation from the Renaissance.

The vernacular in the Netherlands profited at first but little by the impulse which raised Italian, Spanish, French and English to the rank of classic languages. But humanism, first of _. all in its protagonist Erasmus, afterwards in the long *J”„ *! h list of critical scholars and editors, Lipsius, Heinsius aa ° y and Grotius, in the printers Elzevir and Plantin, developed fjLjf itself from the centre of the Leiden university with p ‘ massive energy, and proved that it was still a motive force of intellectual progress. In the fields of classical learning the students of the Low Countries broke new ground chiefly by methodical collection, classification and comprehensive criticism of previously accumulated

stores. Their works were solid and sub- stantial edifices, forming the substratum for future scholarship. In addition to this they brought philosophy and scientific thorough- ness to bear on studies which had been pursued in a more literary spirit. It would, however, be uncritical to pursue this subject further; for the encyclopaedic labours of the Dutch philologers belong to a period when the Renaissance was overpast. For the same reason it is inadmissible to do more than mention the name of Spinoza here.

The Netherlands became the battlefield of Reformation and Counter-Reformation in even a stricter sense than France. Hv” > _ . the antagonistic principles were plainly posed in the

” C t course of struggle against foreign despotism. The T’a” ° rf conn ‘ ct ended in the assertion of political independence independ- as QppQggd j absolute dominion. Europe in large measure eace. owes the modern ideal of political liberty to that spirit

of stubborn resistance which broke the power of Spain. Recent history, and in particular the history of democracy, claims for its province the several stages whereby this principle was developed in England and America, and its outburst in the frenzy of the French Revolution. It is enough here to have alluded to the part played by the Low Countries in the genesis of a motive force which may be described as the last manifestation of the Renaissance striving after self-emancipation.

The insular position of England, combined with the nature of the English people, has allowed us to feel the vibration of England European movements later and with less of shock in the Re- than any of the continental nations. Before a wave naissance f progress has reached our shores we have had the pe od. opportunity of watching it as spectators, and of con- sidering how wc shall receive it. Revolutions have passed from the tumultuous stages of their origin into some settled and recognizable state before we have been called upon to cope with them. It was thus that England took the influences of the Renaissance and Reformation simultaneously, and almost at the same time found herself engaged in that struggle with the Counter-Reformation which, crowned by the defeat of the Spanish Armada, stimulated the sense of nationality and developed the naval forces of the race. Both Renaissance and Reformation had been anticipated by at least a century in England. Chaucer’s poetry, which owed so much

to Italian examples, gave an early foretaste of the former. Wickliffe's teaching was a vital moment in the latter. But the French wars, the Wars of the Roses and the persecution of the Lollards deferred the coming of the new age; and the year 1536, when Henry VIII. passed the Act of Supremacy through parliament, may be fixed as the date when England entered definitively upon a career of intellectual development abreast with the foremost nations of the continent. The circumstances just now insisted on explain the specific character of the English Renaissance. The Reformation had been adopted by consent of the king, lords and commons; and this change in the state religion, though it was not confirmed without reaction, agitation and bloodshed, cost the nation comparatively Combined little disturbance. Humanism, before it affected the influences bulk of the English people, had already permeated saace"and l tauan an(i French literature. Classical erudition Reforms- had been adapted to the needs of modern thought. tlon. The hard work of collecting, printing, annotating

and translating Greek and Latin authors had been accomplished. The masterpieces of antiquity had been interpreted and made intelligible. Much of the learning popularized by our poets and dramatists was derived at second hand from modern literature. This does not mean that England was deficient in ripe and sound scholars. More, Colet, Ascham, Cheke, Camden were men whose familiarity with the classics was both intimate and easy. Public schools and universities conformed to the modern methods of study; nor were there wanting opportunities for youths of humble origin to obtain an education which placed them on a level with Italian scholars. The single case of Ben Jonson sufficiently proves this. Yet learning did not at this epoch become a marked speciality in England. There was no class corresponding to the humanists. It should also be remembered that the best works of Italian literature were introduced into Great Britain together with the classics. Phaer's Virgil, Chapman's Homer, Harrington's Orlando, Marlowe's Hero and Lcandcr, Fairfax's Jerusalem Delivered, North's Plutarch, Hoby's Courtier — to mention only a few examples — placed English readers simultaneously in posses- sion of the most eminent and representative works of Greece, Rome and Italy. At the same time Spanish influences reached them through the imitators of Guevara and the dramatists; French influences in the versions of romances; German in-

fluences in popular translations of the Faust legend, Eultn- spiegcl and similar productions. The authorized version of the Bible had also been recently given to the people — so that almost at the same period of time England obtained in the vernacular an extensive library of

ancient and modern authors. This was a privilege enjoyed in like measure by no other nation. It sufficiently accounts for the richness and variety of Elizabethan literature, and for the enthusiasm with which- the English language was cultivated.

Speaking strictly, England borrowed little in the region of the arts from other nations, and developed still less that was original. What is called Jacobean architecture marks indeed an . . interesting stage in the transition from the Gothic style. 2*» But, compared with Italian, French, Spanish, German and T”t

Flemish work of a like period, it is both timid and dry. ■»<"*« Sculpture was represented in London for a brief space by "T'nia. Torrigiani; painting by Holbein and Antonio More; music by Italians and Frenchmen of the Chape! Royal. But no Englishmen rose to European eminence in these departments. With literature the case was very different. Wyat and Surrey began by engrafting the forms and graces of Italian poetry upon the native stock. They introduced the sonnet and blank verse. Sidney followed with the scstine and terza rima and with various experiments in classic metres, none of which took root on English soil. The translators handled the octave stanza. Marlowe gave new vigour to the couplet. The first period of the English Renaissance was one of imitation and assimilation. Academies after the Italian type were founded. Tragedies in the style of Seneca, rivalling Italian and French dramas of the epoch, were produced. Attempts to Latinize ancestral rhythms, similar to those which had failed in Italy and France, were made. Tentative essays in criticism and dissertations on the art of poetry abounded. It seemed as thouglvthe Renaissance ran a risk of being throttled in its cradle by superfluity of foreign and pedantic nutriment. But the natural vigour of the English genius resisted influences alien to itself, and showed a robust capacity for digesting the varied diet offered to it. As there was nothing despotic in the temper of the ruling classes, nothing oppressive in English culture, the literature of that age evolved itself freely from the people. It was under these conditions that Spenser gave his romantic epic to the world, a poem which derived its allegory from the middle ages, its decorative richness from the Italian Renaissance, its sweetness, purity, harmony and imaginative splendour from the most poetic nation of the modern world. Under the same conditions the Elizabethan drama, which in its totality is the real exponent of the English Renaissance, came into existence. This drama very early freed itself from the pseudo-classic mannerism which imposed on taste in Italy and France. Depicting feudalism in the vivid colours of an age at war with feudal institutions, breathing into antique histories the breath of actual life, embracing the romance of

Italy and Spain, the mysteries of German legend, the fictions of poetic fancy and the facts of daily life, humours of the moment and abstrac tions of philosophical speculation, in one homogeneous amalgani instinct with intense vitality, this extraordinary birth of time, with Shakespeare for the master of all ages, left a monument of the Re- naissance unrivalled for pure creative power by any other product of that epoch. To complete the sketch, wc must set Bacon, the expositor of modern scientific method, beside Spenser and Shake- speare, as the third representative of the Renaissance in England. Nor should Raleigh, Drake, Hawkins, the semi-buccaneer explorers of the ocean, be omitted. They, following the lead of Enrllsh Portuguese and Spaniards, combating the Counter-Re- reaction formation on the seas, opened for England her career . t

of colonization and plantation. All this while the political A,thH policy of Tudors and Stewarts tended towards monarchical

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absolutism, while the Reformation in England, modified by contact with the Low Countries during their struggles, ,, 7~ h ~ was narrowing into strict reactionary intolerance. Pun- /?, tanism indicated a revolt of the religious conscience of so ™™' B ' the nation against the arts and manners of the Renais- * sance, against the encroachments of belligerentCatholicism, nal ' s * ace against the corrupt and Italianated court of James I., cuUure – against the absolutist pretensions of his son Charles. In its final manifestation during the Commonwealth, Puritanism won a tran- sient victory over the mundane forces of both Reformation and Renaissance, as these had taken shape in England. It also secured the eventual triumph of constitutional independence. Milton, the greatest humanistic poet of the English race, lent his pen and moral energies during the best years of his life to securing that principle on which modern political systems at present rest. Thus the geo- graphical isolation of England, and. the comparatively late adoption by the English of matured Italian and German influences, give peculiar complexity to the phenomena of Reformation and Re- naissance simultaneously developed on our island. The period of our history between 1536 and 1642 shows how difficult it is to separate these two factors in the re-birth of Europe, both of which contributed so powerfully to the formation of modern English nationality.

It has been impossible to avoid an air of superficiality, and the repetition of facts known to every schoolboy, in this sketch Ne W of so complicated a subject as the Renaissance, — em-

poiitical bracing many nations, a great variety of topics and relations an indefinite period of time. Yet no other treatment dating was possible upon the lines laid down at the outset, from the where it was explained why the term Renaissance Renals- cannot now be confined to the Revival of Learning sance. an(j ˆg e ff ec t f antique studies upon literary and artistic ideals. The purpose of this article has been to show that, while the Renaissance implied a new way of regarding the material world and human nature, a new concep- tion of man's destiny and duties on this planet, a new culture and new intellectual perceptions penetrating every sphere of thought and energy, it also involved new reciprocal relations between the members of the European group of nations. The Renaissance closed the middle ages and opened the modern era, — not merely because the mental and moral ideas which then sprang into activity and owed their force in large measure to the revival of classical learning were opposed to medieval modes of thinking and feeling, but also because the political and international relations specific to it as an age were at variance with fundamental theories of the past. Instead of empire and church, the sun and moon of the medieval system, a federation of peoples, separate in type and divergent in interests, yet bound together by common tendencies, common culture and common efforts, came into existence. For obedi- ence to central authority was substituted balance of power. Henceforth th.e hegemony of Europe attached to no crown, imperial or papal, but to the nation which was capable of winning it, in the spiritual region by mental ascendancy, and in the temporal by force.

That this is the right way of regarding the subject appears from the events of the first two decades of the 16th century, Conserva- those years in which the humanistic revival attained its tive and highest point in Italy. Luther published his theses in s/ve™" I S I 7> sixty-four years after the fall of Constantinople, parties la twenty-three years after the expedition of Charles modem VIII. to Naples, ten years before the sack of Europe. Rome, at a moment when France, Spain and England had only felt the influences of Italian culture but feebly. From that date forward two parties wrestled for supremacy in Europe, to which may be given the familiar names of Liberalism and Conservatism, the party of pro- gress and the party of established institutions. The triumph of the former was most signal among the Teutonic peoples. The Latin races, championed by Spain and supported by the papacy, fought the battle of the latter, and succeeded

for a time in rolling back the tide of revolutionary conquest. Meanwhile that liberal culture which had been created for Europe by the Italians before the contest of the Reformation began continued to spread, although it was stifled in Italy and Spain, retarded in France and the Low Countries, well-nigh extirpated by wars in Germany, and diverted from its course in England by the counter-movement of Puritanism. The aulos da Ji of Seville and Madrid, the flames to which Bruno, Dolet and Paleario were flung, the dungeon of Campanella and the seclu- sion of Galileo, the massacre of St Bartholomew and the faggots of Smithfield, the desolated plains of Germany and the cruelties of Alva in the Netherlands, disillusioned Europe of those golden dreams which had arisen in the earlier days of humanism, and which had been so pleasantly indulged by Rabelais. In truth the Renaissance was ruled by no Astraea redux, but rather by a severe spirit which brought no peace but a sword, reminding men of sternest duties, testing what of moral force and tenacity was in them, compelling them to strike for the old order or the new, suffering no lukewarm halting between two opinions. That, in spite of retardation and retrogression, the old order of ideas should have yielded to the new all over Europe, — that science should have won firm standing-ground, and political liberty should have struggled through those birth-throes of its origin, — was in the nature of things. Had this not been, the

Renaissance or re-birth of Europe would be a term without a meaning. (J. A. S.)

Literature. — The special articles on the several arts and the literatures of modern Europe, and on the biographies of great men mentioned in this essay, will give details of necessity here omitted. Of works on the Renaissance in general may be mentioned Jacob Burckhardt, Die Cultur der Renaissance in Italien (Eng. trans., 1878) ; G. Voigt, Wiederbelebung des Classischen Alterthums (2 vols. 3rd ed., by M. Lehnerdt, 1893); J. A. Symonds, Renaissance in Italy; Marc Monnier, Renaissance de Dante a Luther; Eugene Miintz, Precur- seurs de la Renaissance (1882), Renaissance en Italie et en France (1885), and Hist, de I'art pendant la Renaissance (1889-95); Ludwig Geiger, Humanismus und Renaissance in Italien und Deutschland (1882), and Cambridge Modern History, vol. i., " The Renaissance " (Cambridge, 1903), where full bibliographies will be found.

RENAIX, a town of Belgium in the province of East Flanders, 8 m. S. of Oudenarde. It has extensive dyeworks, bleaching grounds and manufactories for linen and woollen goods. Pop.

(1904) 20,760.

RENAN, ERNEST (1823-1892), French philosopher and Orientalist, was born on the 27th of February 1823 at Treguier. His father's people were of the fisher-clan of Renans or Ronans; his grandfather, having made a small fortune by his fishing smack, bought a house at Treguier and settled there, and his father, captain of a small cutter and an ardent Republican, married the daughter of Royalist trading-folk from the neigh- bouring town of Lannion. All his life Renan was divided between his father's and his mother's political beliefs. He was only five years old when his father died, and his sister Henriette, twelve years older than Ernest, a girl of remarkable character, was henceforth morally the head of the household. Having in vain attempted to keep a school for girls at Treguier, she left her native place and went to Paris as teacher in a young ladies' boarding-school. Ernest meanwhile was educated in the ecclesiastical seminary of his native place. His good-conduct notes for this period describe him as " docile, patient, diligent, painstaking, thorough." We do not hear that he was brilliant, but the priests cared little for such qualities. While the priests were grounding him in mathematics and Latin, his mother completed his education. She was only half a Breton. Her paternal ancestors came from Bordeaux, and Renan used to say that in his own nature the Gascon and the Breton were con- stantly at odds.

In the summer of 1838 Renan carried off all the prizes at the college of Treguier. His sister in Paris told the doctor of the school in which she taught about the success of her brother, and he carried the news to F. A. P. Dupanloup, then engaged in organizing the ecclesiastical college of St Nicholas du Char- donnet, a school in which the young Catholic nobility and the most gifted pupils of the Catholic seminaries were to be educated together, with a view to cementing the bond between the aristocracy and the priesthood. Dupanloup sent for Renan at once. He was fifteen and a half. He had never been outside his Breton province. " I learned with stupor that knowledge was not a privilege of the church … I awoke to the meaning of the words talent, fame, celebrity." Above all, religion seemed to him wholly different in Treguier and in Paris. The super- ficial, brilliant, pseudo-scientific Catholicism of the capital did not satisfy Renan, who had accepted the austere faith of his Breton masters.

In 1840 Renan left St Nicholas to study philosophy at the seminary of Issy. He entered with a passion for Catholic scholasticism. The rhetoric of St Nicholas had wearied him, and his serious intelligence hoped to satisfy itself with the vast and solid material of Catholic theology. Reid and Malebranche first attracted him among the philosophers, and

after these he turned to Hegel, Kant and Herder. Renan began to perceive the essential contradiction between the metaphysics which he studied and the faith that he professed, but an appetite for truths that can be verified restrained his scepticism. ” Philo- sophy excites and only half satisfies the appetite for truth; I am eager for mathematics,” he wrote to his sister Henriette. Henriette had accepted in the family of Count Zamoyski an en- gagement more lucrative than her former place. She exercised

the strongest influence over her brother, and her published letters reveal a mind almost equal, a moral nature superior, to his own

It was not mathematics but philology which was to settle the gathering doubts of Ernest Renan. His course completed at Issy, he entered the college of St Sulpice in order to take his degree in philology prior to entering the church; and here he began the study of Hebrew. He saw that the second part of Isaiah differs from the first not only in style but in date; that the grammar and the history of the Pentateuch are posterior to the time of Moses; that the book of Daniel is clearly apocryphal. It followed from his training that, if you admit one error in a revealed text, you incriminate the whole. Secretly, Renan felt himself cut off from the communion of saints, and yet with his whole heart he desired to livt the life of a Catholic priest Hence a struggle between vocation and conviction; owing to Henriette, conviction gained the day. In October 1845 Renan left the seminary of St Sulpice for Stavistas, a lay college of the Oratorians. Finding himself even there too much under the domination of the church, a few weeks later he reluctantly broke the last tie which bound him to the religious life and entered M. Crouzet’s school for boys as an usher.

It is always dangerous to educate a really great mind in only one order of truth. Renan, brought up by priests in a world ruled by authority and curious only of feeling and opinion, was to accept the scientific ideal with an extraordinary expansion of all his faculties. He was henceforth ravished by the splendour of the cosmos. At the end of his life he wrote of Amiel, ” The man who has time to keep a private diary has never understood the immensity of the universe.” The certitudes of physical and natural science were revealed to Renan in 1846 by the chemist Marcellin Berthelot, then a boy of eighteen, his pupil at M. Crouzet’s school. To the day of Renan’s death their friendship continued. Renan was occupied as usher only in the

evenings. In the daytime he continued his researches in Semitic philology. In 1847 he obtained the Prix Volney — one of the principal dis- tinctions awarded by the Academy of Inscriptions — for the manuscript of his ” General History of Semitic Languages.” In 1847 he took his degree as Agrege de Philosophie; that is to say, fellow of the university, and was offered a place as master in the lycee of Vendome. In 1848 a small temporary appoint- ment to the lycee of Versailles permitted him to return to the capital and resume his studies.

The revolution of 1 848 aroused in Renan that side of him which loved the priesthood because ” the priest lives for his fellows.” He for the first time confronted the problems of Democracy. The result was an immense volume, The Future of Science, which remained in manuscript until 1890. L’Avenir de la science is an attempt to conciliate the privileges of a necessary Mile with the diffusion of the greatest good of the greatest number. The difficulty haunted Renan throughout his life. By the time he had finished his elaborate scheme for regenerating society by means of a devoted aristocracy of knowledge, and the diffusion of culture, the year 1848 was past, and with it his fever of Democracy. In 1849 the French government sent him to Italy on a scientific mission. He remained eight months abroad, during which he forgot his anxiety about the toilers’ lot. Hitherto he had known nothing of art. In Italy the artist in him awoke and triumphed over the savant and the reformer. On his return to Paris Renan lived with his sister Henriette. A small post at the National Library, together with his sister’s savings, furnished him with the means of livelihood. In the evenings he wrote for the Revue des deux mondes and the Debats the exquisite essays which appeared in 1857 and 1859 under the titles Etudes d’histoire religieuse and Essais de morale el de critique. In 1852 his book on Averroes had brought him not only his doctor’s degree, but his first reputation as a thinker. In his two volumes of essays Renan shows himself a Liberal, but no longer a Democrat. Nothing, according to his philosophy, is less important than prosperity. The greatest good of the greatest number is a theory as dangerous as it is illusory. Man is not born to be prosperous, but to realize, in a little vanguard of

chosen spirits, an ideal superior to the ideal of yesterday. Only the few can attain a complete development. Yet there is a solidarity between the chosen few and the masses which produce them; each has a duty to the other. The acceptance of this duty is the only foundation for a moral and just society The aristocratic idea has seldom been better stated.

The success of the Etudes d’histoire religieuse and the Essais de

morale had made the name of Renan known to a cultivated public. While Mademoiselle Renan remained shut up at home copying her brother's manuscripts or compiling material for his work, the young philosopher began to frequent more than one Parisian salon, and especially the studio of Ary Scheffer, at that time a noted social centre. In 1856 he proposed to marry Cornelie Scheffer, the niece and adopted daughter of the great Dutch painter. Not without a struggle Henriette consented not only to the marriage, but to make her home with the young couple, whose housekeeping depended on the sum that she could contribute. The history of this romance has been told by Renan in the memorial essay which he wrote some six years later, entitled Ma Sceur Henriette. His marriage brought much brightness into his life, a naturalness into his style and a greater attention to the picturesque. He did not forsake his studies in Semitic philology, and in 1859 appeared his translation of the Book of Job with an introductory essay, followed in 1859 by the Song of Songs.

Renan was now a candidate for the chair of Hebrew and Chaldaic languages at the College de France, which he had desired since first he studied Hebrew at the seminary of St Sulpice. The death of the scholar Quatremere had left this post vacant in 1857. No one in France save Renan was capable of filling it. The Catholic party, upheld by the empress, would not appoint an unfrocked seminarist, a notorious heretic, to a chair of Biblical exegesis. Yet the emperor wished to conciliate Ernest Renan. He offered to send the young scholar on an archaeological mission to Phoenicia. Renan immediately accepted. Leaving his wife at home with their baby son, Renan left France, accompanied by his sister, in the summer of i860. Madame Renan joined them in January 1861, returning to France in July. The mission proved fruitful in Phoenician inscriptions which Renan published in his Mission de Phenicie. They form the base of that Corpus Inscriptionum Semiticarum on which he used in later years to declare that he founded his claim to re- membrance. He wished to complete his exploration of the upper range of Lebanon; he remained, therefore, with Henriette to affront the dangerous miasma of a Syrian autumn. At Amshit, near Byblos, Henriette Renan died of intermittent fever on the 24th of September 1861. Her brother, himself at death's door, was carried unconscious on board a ship waiting in harbour and bound for France. The sea air revived him, but he reached France broken apparently in heart and health. His sister in her last days had entreated him not to give up his candidature for the chair of Hebrew, and on the nth of January 1862 the Minister of Public Instruction ratified Renan's election to the post. But his opening lecture, in which, amid the applause of the students, Renan declared Jesus Christ " an

incomparable Man," alarmed the Catholic party. Renan's lectures were pronounced a disturbance of the public peace, and he was suspended. On the 2nd of June 1864, on opening the newspaper, Renan saw that he had been transferred from the chair of Hebrew at the College of France to the post of sub- librarian at the National Library. He wrote to the Minister of Public Instruction: " Pecunia tua tecum sit!" He refused the new position, was deprived of his chair, and henceforth depended solely upon his pen.

Henriette had told him to write the life of Jesus. They had begun it together in Syria, she copying the pages as he wrote them, with a New Testament and a Josephus for all his library. The book bears the mark of its origin — it is filled with the atmosphere of the East. It is the work of a man familiar with the Bible and theology, and no less acquainted with the inscrip- tions, monuments, types and landscapes of Syria. But it is scarcely the work of a great scholar: Renan's debt to the school

of Tubingen has been exaggerated, in so far as regards the Life of Jesus. The book appeared on the 23rd of June 1863; before November sixty thousand' copies of it were in circulation. Renan still used his literary gifts to pursue a scientific ideal. In the days when he had composed his huge, immature treatise on the Future of Science, he had written: " I envy the man who shall evoke from the past the origins of Christianity. Such a writer would compose the most important book of the century." He set to work to realize this project, and produced the Apostles in 1866, and St Paul in 1869, after having visited Asia Minor with his wife, where he studied the scenes of the labours of St Paul as minutely as in 1861 he had observed the material surroundings of the life of Jesus.

Renan was not only a scholar. In St Paul, as in the Apostles, he shows his concern with the larger social life, his sense of fraternity, and a revival of the democratic sentiment which had inspired L'Avenir de la science. In 1869 he presented himself as the candidate of the liberal opposition at the parlia- mentary election for Meaux. While his temper had become less aristocratic, his Liberalism had grown more tolerant. On the eve of its dissolution Renan was half prepared to accept the Empire, and, had he been elected to the Chamber of Deputies, he would have joined the group of I' Empire liberal. But he was not elected. A year later war was declared with Germany, the Empire fell,

and Napoleon III. went into exile. The Franco-German War was a turning-point in Renan's history. Germany had always been to him the asylum of thought and disinterested science. Now he saw the land of his ideal destroy and ruin the land of his birth; he beheld the German no longer as a priest, but as an invader. His heart turned to France. In La Reforme intcllectuelle et morale (187 1) he endeavoured at least to bind her wounds, to safeguard her future. Yet he was still under the influence of Germany. The ideal and the discipline which he proposed to his defeated country were those of her conqueror — a feudal society, a monarchical government, an elite, which the rest of the nation exists merely to support and nourish; an ideal of honour and duty imposed by a chosen few on the recalcitrant and subject multitude. The errors of the Commune confirmed Renan in this reaction. At the same time the irony always perceptible in his work grows more bitter. His Dialogues philosophiques, written in 1871, his Ecclesiastcs (1882) and his Antichrist (1876) (the fourth volume of the Origins of Christianity, dealing with the reign of Nero) are incomparable in their literary genius, but they are examples of a disenchanted and sceptical temper. He had vainly tried to make his country follow his precepts. He resigned himself to watch her drift towards perdition. The progress of events showed him, on the contrary, a France which every day left a little stronger, and he aroused himself from his disbelieving, disillusioned mood, and observed with genuine interest the struggle for justice and liberty of a democratic society. For his mind was the broadest of the age. The fifth and sixth volumes of the Origins of Christianity (the Christian Church and Marcus A urelius) show him reconciled with democracy, confident in the gradual ascent of man, aware that the greatest catastrophes do not really interrupt the sure if imperceptible progress of the world — reconciled also in some measure, if not with the truths, at least with the moral beauties of Catholicism, and with the remembrance of his pious youth.

On the threshold of old age the philosopher cast a glance at the days of his childhood. He was nearly sixty when, in 1883, he published those Souvenirs d'enfance el de jeunesse which, after the Life of Jesus, are the work by which he is chiefly known. They possess that lyric note of personal utterance which the public prizes in a man already famous. They showed the Mas? modern reader that a world no less poetic, no less primitive than that of the Origins of Christianity exists, or still existed within living memory, on the north-western coast of France. They have the Celtic magic of ancient romance and the simplicity, the naturalness, the veracity which the 19th century prised so highly. But his Ecclesiastes, published a few months earlier, his

Drames philosophiques, collected in 1888,

give a more adequate image of his fastidious critical, disen- chanted, yet not unhopeful spirit. These books are often bitter and melancholy, yet not destitute of optimism. They show the attitude towards uncultured Socialism of a philosopher liberal by conviction, by temperament an aristocrat. We learn in them how Caliban (democracy), the mindless brute, educated to his own responsibility, makes after all an adequate ruler; how Prospero (the aristocratic principle, or, if we will, the mind) accepts his dethronement for the sake of greater liberty in the intellectual world, since Caliban proves an effective policeman, and leaves his superiors a free hand in the laboratory; how Ariel (the religious principle) acquires a firmer hold on life, and no longer gives up the ghost at the faintest hint of change. Indeed, Ariel flourishes in the service of Prospero under the external government of the many-headed brute. For the one thing needful is not destined to succumb. Religion and knowledge are as imperishable as the world they dignify. Thus out of the depths rises unvanquished the essential idealism of Ernest Renan.

Renan was a great worker. At sixty years of age, having finished the Origins of Christianity, he began his History of Israel, based on a lifelong study of the Old Testament and on the Corpus Inscriptionum Semiticarum, published by the Academie des Inscriptions under Renan's direction from the year 1881 till the end of his life. The first volume of the History of Israel appeared in 1887, the third and finest volume in 1891, the last two only after the historian's decease. As a history of facts and theories the book has many faults; as an essay on the evolution of the religious idea it is (despite some passages of frivolity, irony, or incoherence) of extraordinary importance; as a reflec- tion of the mind ji Ernest Renan it is the most lifelike of images. In a volume of collected essays, Feuillcs detaches, published also in 1891, we find the same mental attitude, an affirmation of the necessity of piety independent of dogma. On the 12th of October 1892 he died after a few days' illness. In his last years he received many marks of honour, being made an administrator of the College de France and grand officer of the Legion of Honour. Two volumes of the History of Israel, his correspondence with his sister Henriette, his Letters to M. Berthelot, and the History of the Religious Policy of Philippe-le- Bel, which he wrote in the years immediately before his marriage, all appeared during the last eight years of the 19th century.

See Desportes and Bournand, E. Renan, sa vie et son ceuvre (1892); E. Grant Duff, Ernest Renan, in memoriam (1893); Seailles, E. Renan, essai de biographie psychologique (1894); G. Monod, Les maitres de

Vhistoire (1894) ; Allier, La Philosophie d”E. Renan (1895) ; M. J. Darmesteter, La vie de E. R. (1898); Platzhoff, E. Renan, ein Lebensbild (1900); Brauer Philosophy of Ernest Renan (1904); W. Barry, Renan (1905); Sorel, Le Systeme historique de R. (1905-1906).

(A. M. F. D.;.X.)

RENARD, ALPHONSE FRANCOIS (1842-1903), Belgian geolo- gist and petrographer, was born at Renaix, in Eastern Flanders, on the 27th of September 1842. He was educated for the church of Rome, and from 1866 to 1869 he was superintendent at the College de la Paix, Namur. In 1870 he entered the Jesuit Train- ing College at the old abbey of Maria Laach in the Eifel, and there, while engaged in studying philosophy and science, he became interested in the geology of the district, and especially in the volcanic rocks. Thenceforth he worked at chemistry and mineralogy, and qualified himself for those petrographical researches for which he was distinguished. In 1874 he became professor of chemistry and geology in the college of the Belgian Jesuits at Louvain, a few years later he was appointed one of the curators of the Royal Natural History Museum at Brussels, and in 1882 he relinquished his post at Louvain. In 1888 he was chosen professor of geology at the university of Ghent, and retained the post until the close of his life. Meanwhile he had been ordained priest in 1877, and had intended to enter the Society of Jesus. He was known as the Abbe Renard; but, as remarked by Sir A. Geikie, ” As years passed, the longing for mental freedom grew ever stronger, until at last it overmastered all the traditions and associations of a lifetime, and he finally separated himself from the church of Rome.” His first work,

written in conjunction with Charles de la Vallee-Poussin (1827- 1904), was the Mimoire sur les caracleres miner alogiques et stratigraphiques des roches dites pluloniennes de la Belgique et de I’Ardenne franqaise (1876). In later essays and papers he dealt with the structure and mineral composition of many igneous and sedimentary rocks, and with the phenomena of metamorphism in Belgium and other countries. In acknow- ledgment of his work the Bigsby Medal was in 1885 awarded to him by the Geological Society of London. Still more important were his later researches connected with the Challenger Expedi- tion. The various rock specimens and oceanic deposits were submitted to him for examination in association with Sir John Murray,

and their detailed observations were embodied in the Report on the Scientific Results of the Voyage of H.M.S. ” Chal- lenger.” Deep Sea Deposits (1891). The more striking additions to our knowledge included ” the detection and description of cosmic dust, which as fine rain slowly accumulates on the ocean floor; the development of zeolitic crystals on the sea-bottom at temperatures of 32 and under; and the distribution and mode of occurrence of manganiferous concretions and of phos- phatic and glauconite deposits on the bed of the ocean ” (Geikie). Renard died at Brussels on the 9th of July 1903.

Obituaries by Sir A. Geikie in Quart. Journ. Geol. Soc, lx. 1904, and in Geol. Mag., Nov. 1903.

RENAUD DE MONTAUBAN (Rinaldo di Montalbano), one of the most famous figures of French and Italian romance. His story was attached to the geste of Doon of Mayence by the 13th- century trouvere who wrote the chanson de geste of Renaus de Montauban, better known perhaps as Les quatre fils Aymon. The four sons of Aymon give their name to inns and streets in nearly every town of France, and the numerous prose versions show what a hold the story gained on the popular imagination. Renaud’s sword Floberge, and his horse Bayard passed with him into popular legend. The poem of Renaus de Montauban opens with the story of the dissensions between Charlemagne and the sons of Doon of Mayence, Beuves d’Aigremont, Doon de Nanteuil and Aymon de Dordone. The rebellious vassals are defeated by the imperial army near Troyes, and, peace established, Aymon rises in favour at court, and supports the emperor, even in his persecution of his four sons, Renaud, Alard, Guichard and Richard. A second feud arises from a quarrel between Renaud and Bertolai, Charlemagne’s nephew, over a game of chess, in the course of which Renaud kills Ber- tolai with the chess-board. The hero then mounts his steed Bayard, and escapes with his brothers to the Ardennes, where they build the castle of Montessor overlooking the Meuse. At Chateau Renaud, near Sedan, there existed in the 18th century a ruined castle with a tower called the ” tour Maugis ” and the reputed stable of Bayard. The outlaws are eventually persuaded to seek their fortune outside Charlemagne’s kingdom, and cross the Loire to take service with King Yon of Gascony against the Saracens, accompanied by their cousin, the enchanter Maugis. Yon, however, is compelled by Charlemagne to withdraw his protection, and the castle of Montauban, which the brothers have built on the Dordogne, is besieged by the emperor. They next seek refuge beyond the Rhine, and sustain a third siege at Tremoigne (Dortmund), after which the emperor is per- suaded by the barons to make peace. Bayard is abandoned to Charlemagne, and thrown into the Meuse, only to rise again. He still

gallops over the hills of the Ardennes on St John's Eve. Renaud, who throughout the story is a type of the Christian and chivalric virtues, makes a pilgrimage to the Holy Land and is invested with some of the exploits of Godfrey de Bouillon. On his return he gives himself up to religion, working as a mason on the church of St Peter at Cologne, where he receives martyrdom at the hands of his jealous fellow-labourers.

The story is closely connected with the legend of Girard de Roussillon. The chanson de geste of Renaus de Montauban falls into sections which had probably been originally the subject of separate recitals. These may have arisen at different dates, and were not necessarily told in the first instance of the same person, the account of Renaud on the crusade being

obviously a late interpolation. The outlaw life of the brothers in the Ardennes bears the marks of trustworthy popular tradition, and it was even at one time suggested that the Gascon and Rhenish episodes were reduplications of the story of Montessor. The connexion of the four brothers with Montessor, Dortmund, Mayence and Cologne, and the abundant local tradition, mark the heroes as originating from the region between the Rhine and the Meuse. Nevertheless, their adventures in Gascony are corroborated by historical evidence, and this section of the poem is the oldest. The enemy of Renaud was Charles Martel, not Charlemagne; Yon was Odo of Gascony, known indifferently as duke, prince, or king; the victory over the Saracens at Toulouse, in which the brothers are alleged to have taken part, was won by him in 721, and in 719 he sheltered refugees from the dominions of Charles Martel, Chil- peric II., king of Neustria, and his mayor of the palace, Ragin- fred, whom he was compelled to abandon. In a local chronicle of Cologne it is stated that Saint Reinoldus died in 697, and in the Latin rhythmical Vila his martyrdom is said to have taken place under Bishop Agilolf (d. 717). Thus the romance was evidently composite before it took its place in the Carolingian cycle.

In Italy Renaud had his greatest vogue. His connexion with the treacherous family of Mayence was thrust into the back- ground, and many episodes were added, as well as the personage of the hero's sister, Bradamante. Rinaldo di Montalbano had been the subject of many Italian poems before II Rinaldo of Tasso.

Bibliography. — The chanson of Maugis d'Aigremont and the prose romance of the Conqueste de Trebizonde belong to the same cycle. The prose Ystoire de Regnault de Montauban (Lyons, c. 1480) had a great vogue. It was generally printed asZ.es quatre fils Aymon, and

was published in English, The Foure Sonnes of Aymon, by William Caxton, and subsequently by Wynkyn de Worde and William Copland. See Hist. litt. de la France, xxii., analysis by Paulin Paris; Renaus de Montauban (Stuttgart, 1862), edited by H. Michelant; F. Wulff, Recherches sur les sagas de Magus et de Geirard (Lund, 1873); Magus saga, ed. G. Cederschiold (Lund, 1876); Renout von Montalbaen, ed. J. C. Matthis (Groningen, 1873); A. Longnon, in Revue des questions historiques (1879); R. Zwick, Vber die Sprache des Renaut von Montauban (Halle, 1884) ; F. Pfaff, Das deutsche Volksbuch von den Heymonskindern (Freiburg in Breisgau, 1887), with a general introduction to the study of the saga; The Four Sonnes of Aimon (E. E. Text. Soc, ed. Octavia Richardson, 1884); a special bibliography of the printed editions of the prose romance in L. Gautier's Bibl. des chansons de geste (1897); rejuvenations of the story by Karl Simrock (Frankfort, 1845), and by Richard Steel (London, 1897); Storia di Rinaldino, ed. C. Minutoli (Bologna, 1865). Stage versions are: Renaud de Montauban, a play translated from Lope de Vega was played at the Th&itre italien, Paris, in 1717 ; Les quatre fils Aymon, opera comique by MM. de Leuven and Brunswick, music by Balfe, in 1884.

RENAUDOT, EUSEBE (1646-1720), French theologian and Orientalist, was born in Paris in 1646, and educated for the church. Notwithstanding his taste for theology and his titlfe of abbe, much of his life was spent at the French court, where he attracted the notice of Colbert and was often employed in confidential affairs. The unusual learning in Eastern tongues which he acquired in his youth and maintained amid the dis- tractions of court life did not bear fruit till he was sixty-two. His best-known books are HistoriaPatriarcharum Alexandrinorum (Paris, 1713) and Liturgiarum orientalium collectio (2 vols., 1715-16). The latter was designed to supply proofs of the " perpetuity of the faith " of the church on the subject of the sacraments, the topic on which most of his theological writings turned, and which was then, in consequence of the controversies attaching to Arnauld's Perpituite de lafoi, a burning one between French Catholics and Protestants. Renaudot was not a fair controversialist, but his learning and industry are unquestion- able. He died in 1720.

RENAUDOT, THEOPHRASTE (1586-1653), French physician and philanthropist, was born at Loudun (Vienna), and studied surgery in Paris. He was only nineteen when he received, by favour apparently, the degree of doctor at Mont- pellier. After some time spent in travel he began to practise in his native town. In 161 2 he was summoned to Paris by

Richelieu, partly because of his medical reputation, but more because of his philanthropy. He received the titles of physician and councillor to the king, and was desired to organize a scheme of public assistance. Many difficulties were put in his way, however, and he therefore returned until 1624 to Poitou, where Richelieu made him " commissary general of the poor." It was six years before he was able to begin his work in Paris by opening an information bureau at the sign of the Grand Coq near the Pont Saint-Michel. This bureau d'adresse was labour bureau, intelligence department, exchange and charity organiza- tion in one; and the sick were directed to doctors prepared to give them free treatment. Presently he established a free dispensary in the teeth of the opposition of the faculty in Paris. The Paris faculty refused to accept the new medicaments pro- posed by the heretic from Montpellier, restricting themselves to the old prescriptions of blood-letting and purgation. In addition to his bureau d'adresse Renaud established a system of lectures and debates on scientific subjects, the reports of which from 1633 to 1642 were published in 1651 with the title Recueil des conferences publiques. Under the protection of Richelieu he started the first French newspaper, the Gazette (1631), which appeared weekly and contained political and foreign news. He also edited the Mercure franc,ais and published all manner of reports and pamphlets. In 1637 he opened in Paris the first Mont de Piete, an institution of which he had seen the advantages in Italy. In 1640 the medical faculty, headed by Guy Patin, started a campaign against the innovator of the Grand Coq. After the death of Richelieu and of Louis XIII. the victory of Renaudot's enemies was practically certain. The parlement of Paris ordered him to return the letters patent for the establish- ment of his bureau and his Mont de Piete, and refused to allow him to practise medicine in Paris. The Gazette remained, and in 1646 Renaudot was appointed by Mazarin historiographer to the king. During the first Fronde he had his printing presses at Saint-Germain. He died on the 25th of October 1653. His difficulties had been increased by his Protestant opinions. His sons Isaac (d. 1688) and Eusebe (d. 1679) were students for ten years before they could obtain their doctorates from the faculty. They carried on their father's work, and defended the virtues of antimony, laudanum and quinine against the schools.

See E. Hatin, Theodore Renaudot (Poitiers, 1883), and La Maison du Coq (Paris, 1885); Michel Emery, Renaudot et I' introduction de la mMication chimique (Paris, 1889) ; and G. Bonnefont, Un Oublie.

Theophraste Renaudot (Limoges, n.d.).

RENDEZVOUS, a place of meeting appointed or arranged for the assembling of troops, ships or persons. The word was adopted in English at the end of the 16th century from the French substantival use of the imperative rendez vous, i.e. ” render or betake yourselves.”

RENDSBURG, a town of Germany, in the Prussian province of Schleswig-Holstein, situated on the Eider and on the Kaiser Wilhelm canal, in a flat and sandy district, 20 m. W. of Kiel, on the Altona-Vamdrup railway. Pop. (1905) 15,577. It consists of three parts — the crowded Altstadt, on an island in the Eider; the Neuwerk, on the south bank of the river; and the Kronwerk, on the north bank. .Rendsburg is the chief place in the basin of the Eider, and when in the possession of Denmark was main- tained as a fortress. Its present importance, however, rests on the commercial facilities afforded by its connexion with the North Sea and the Baltic through the Kaiser Wilhelm canal, by which transit trade is carried on in grain, timber, Swedish iron and coals. The principal industries are cotton-weaving, tanning and the manufacture of artificial manures.

Rendsburg came into existence under the shelter of a castle founded by the Danes about the year 1100 on an island of the Eider, and was an object of dispute between the Danish kings and the counts of Holstein. In 1252 it was adjudged to the latter. The town was surrounded with ramparts in 1539, but the fortifications of the Kronwerk were not constructed till the end of the 17th century. During the Thirty Years’ War Rendsburg was taken both by the Imperialists and the Swedes, but in 1645 it successfully resisted a second siege by the latter.

The war of 1848-50 began with the capture of Rendsburg by the Holsteiners by a coup de main, and it formed the centre of the German operations. On the departure of the German troops in 1852 the Danes demolished the fortifications on the north side. Immediately after the death of King Frederick VII. (15th of November 1863) the town was occupied by the Saxon troops acting as the executive of the German Confederation, and it was the base of the operations of the Austrians and Prussians against Schleswig in the spring of the following year. On the termination of the Danish war in 1864 Rendsburg was jointly occupied by Austrian and Prussian military until 1866, when it fell to Prussia.

See Warmstedt, Rendsburg (Kiel, 1850).

RENE I. (1400-1480), duke of Anjou, of Lorraine and Bar, count of Provence and of Piedmont, king of Naples, Sicily and Jerusalem, was born at Angers on the 16th of January 1409, the second son of Louis II., king of Sicily, duke of Anjou, count of Provence, and of Yolande of Aragon. Louis II. died in 1417, and his sons, together with their brother-in-law, after- wards Charles VII. of France, were brought up under the guardianship of their mother. The elder, Louis III., succeeded to the crown of Sicily and to the duchy of Anjou, Rene being known as the count of Guise. By his marriage treaty (1419) with Isabel, elder daughter of Charles II., duke of Lorraine, he became heir to the duchy of Bar, which was claimed as the inheritance of his mother Yolande, and, in right of his wife, heir to the duchy of Lorraine. Rene, then only ten, was to be brought up in Lorraine under the guardianship of Charles II. and Louis, cardinal of Bar, both of whom were attached to the Burgundian party, but he retained the right to bear the arms of Anjou. He was far from sympathizing with the Burgundians, and, joining the French army at Reims in 1429, was present at the coronation of Charles VII. When Louis of Bar died in 1430 Rene came into sole possession of his duchy, and in the next year, on his father-in-law's death, he succeeded to the duchy of Lorraine. But the inheritance was claimed by the heir-male, Antoine de Vaudemont, who with Burgundian help defeated Rene at Bulgneville in July 1431. The Duchess Isabel effected a truce with Antoine de Vaudemont, but the duke remained a. prisoner of the Burgundians until April 1432, when he recovered his liberty on parole on yielding up as hostages his two sons, Jean and Louis of Anjou. His title as duke of Lorraine was confirmed by his suzerain, the Emperor Sigismund, at Basel in 1434. This proceeding roused the anger of the Burgundian duke, Philip the Good, who required him early in the next year to return to his prison, from which he was released two years later on payment of a heavy ransom. He had succeeded to the kingdom of Naples through the deaths of his brother Louis III. and of Jeanne II. de Duras, queen of Naples, the last heir of the earlier dynasty. Louis had been adopted by her in 1 43 1, and she now left her inheritance to Rene. The marriage of Marie de Bourbon, niece of Philip of Burgundy, with John, duke of Calabria, Rene's eldest son, cemented peace between the two princes. After appointing a regency in Bar and Lorraine, he visited his provinces of Anjou and Provence, and in 1438 set sail for Naples, which had been held for him by the Duchess Isabel. Rene's captivity, and the poverty of the Angevin resources due to his ransom, enabled Alphonso of Aragon, who had been first adopted and then repudiated by Jeanne II., to make some headway in the kingdom of Naples, especially as he was already in possession of the island of Sicily. In 1441 Alphonso laid siege to

Naples, which he sacked after a six months' siege. Rene returned to France in the same year, and though he retained the title of king of Naples his effective rule was never recovered. Later efforts to recover his rights in Italy failed. His mother Yolande, who had governed Anjou in his absence, died in 1442. Rene took part in the negotiations with the English at Tours in 1444, and peace was consolidated by the marriage of his younger daughter, Margaret, with Henry VI. at Nancy. Rene now made over the government of Lorraine to John, duke of Calabria, who was, however, only formally installed as duke of Lorraine on the death of Queen Isabel io

1453. Rene had the confidence of Charles VII., and is said to have initiated the reduction of the men-at-arms set on foot by the king, with whose military operations against the English he was closely associated. He entered Rouen with him in November 1449, and was also with him at Formigny and Caen. After his second marriage with Jeanne de Laval, daughter of Guy XIV., count of Laval, and Isabel of Brittany, Rene took a less active part in public affairs, and devoted himself more to artistic and literary pursuits. The fortunes of his house declined in his old age. The duke of Calabria, after repeated misfortunes in Italy, was offered the crown of Aragon in 1467, but died, apparently by poison, at Barcelona on the 16th of December 1470; the duke's eldest son Nicholas perished in 1473, also under suspicion of poisoning; Rene's daughter Margaret was a refugee from England, her son Prince Edward was murdered in 1471, and she herself became a prisoner, to be rescued by Louis XL in 1476. His only surviving male descendant was then Rene II., duke of Lorraine, son of his daughter Yolande, comtesse de Vaudemont, who was gained over to the party of Louis XL, who suspected the king of Sicily of complicity with his enemies, the duke of Brittany and the Constable Saint- Pol. Rene retired to Provence, and in 1474 made a will by which he left Bar to his grandson Rene II., duke of Lorraine; Anjou and Provence to his nephew Charles, count of Le Maine. Louis seized Anjou and Bar, and two years later sought to compel the king of Sicily to exchange the two duchies for a pension. The offer was rejected, but further negotiations assured the lapse to the crown of the duchy of Anjou, and the annexation of Provence was only postponed until the death of the count of Le Maine. Rene died on the 10th of July 1480, his charities having earned for him the title of " the good." He founded an order of

chivalry, the Ordre du Croissant, which was anterior to the royal foundation of St Michael, but did not survive Rene.

The king of Sicily's fame as an amateur of painting has led to the attribution to him of many old paintings in Anjou and Provence, in many cases simply because they bear his arms. These works are generally in the Flemish style, and were probably executed under his patronage and direction, so that he may be said to have formed a school of the fine arts in sculpture, painting, gold work and tapestry. Two of the most famous works formerly attributed to Rene are the triptych, the " Burning Bush," in the cathedral of Aix, showing portraits of Rene and his second wife, Jeanne de Laval, and an illumin- ated Book of Hours in the Bibliotheque nationale, Paris. The " Burning Bush " was in fact the work of Nicolas Froment, a painter of Avignon. Among the men of letters attached to his court was Antoine de la Sale, whom he made tutor to his son, the duke of Calabria. He encouraged the performance of mystery plays; on the performance of a mystery of the Passion at Saumur in 1462 he remitted four years of taxes to the town, and the representations of the Passion at Angers were carried out under his auspices. He exchanged verses with his kinsman, the poet Charles of Orleans. The best of his poems is the idyl of Regnault and Jeanneton, representing his own courtship of Jeanne de Laval. Le Livre des lournois, a book of ceremonial, and the allegorical romance, Conqueste qu'un chevalier nomme le Cuer d'amour espris feist d'une dame appelee Doulce Mercy, with other works ascribed to him, were perhaps dictated to his secretaries, or at least compiled under his direc- tion. His CEuwes were published by the comte de Quatrebarbes (4 vols., Paris and Angers, 1845-46).

See A. Lecoy de la Marche, Le Roi Rene" (2 vols., 1875) ; A. Vallet de Viriville, in the Nouvelle Biographie generate, where there is some account of the MSS. of his works; and J. Renouvier, Les Peintres et enlumineurs du roi Rene (Montpellier, 1857).

RENJSE OF FRANCE (1510-1575), second daughter of Louis XII. and Anne of Brittany, was born at Blois on the 25th of October rsic After being betrothed successively to Gaston de Foix, Charles of Austria (the future emperor Charles V.), his brother Ferdinand, Henry VIII. of England, and the elector Joachim II. of Brandenburg, she married in 1528

Hercules of Este, son of the duke of Ferrara, who succeeded his father six years later. Renee's court became a rendezvous of men of letters and a refuge for the persecuted French Calvinists. She received Clement Marot and Calvin at her court, and finally embraced the

reformed religion. Her husband, however, who viewed these proceedings with disfavour, banished her friends, took her children from her, threw her into prison, and eventually made her abandon at any rate the outward forms of Calvinism. After his death in 1559, Renee returned to France and turned her duchy of Montargis into a centre of Protestant propaganda. During the wars of religion she was several times molested by “the Catholic troops, and in 1562 her chateau was besieged by her son-in-law, the duke of Guise. She died at Montargis.

See B. Fontana, Renata di Francia (Rome, 1889 seq.); and E. Rodocanachi, Renee de France (Paris, 1896).

RENEVIER, EUGENE (183 1-), Swiss geologist, was born at Lausanne on the 26th of March 1831. In 1857 he became professor of geology and palaeontology in the university at Lausanne. He is distinguished for his researches on the geology and palaeontology of the Alps, on which subjects he published numerous papers in the proceedings of the scientific societies in Switzerland and France. With F. J. Pictet he wrote a memoir on the Fossiles du terrain aptien de la Perte-du-Rhone (1854). In 1894 he was appointed president of the Swiss Geological Commission, and also of the International Geological Congress held that year at Zurich, in the previous meetings of which he had taken a prominent part. He published a noteworthy Tableau des terrains s&dimentaires (1874); and a second more elaborate edition, accompanied by an explanatory article Chronographe geologique, was issued in 1897 as a supplement to the Report of the Zurich Congress. This new table was printed on coloured sheets, the colours for each geological system corresponding with those adopted on the International geological map of Europe.

RENFREW, a royal, municipal and police burgh and county town of Renfrewshire, Scotland, near the southern bank of the Clyde, 7 m. W. by N. of Glasgow, via Cardonald, by the Glasgow & South-Western and Caledonian railways (5 m. by road). Pop. (1891) 6777; (1901) 9296. Industries include ship- building (the construction of dredgers and floating docks is a speciality), engineering, dyeing, weaving, chemicals and cabinet- making. The Clyde trust has constructed a large dock here. Renfrew belongs to the Kilmarnock district group of parlia- mentary burghs (with Kilmarnock, Dumbarton, Rutherglen and Port Glasgow). Robert III. gave a charter in 1396, but it was a burgh (Renifry) at least 250 years earlier. About 1160 Walter Fitzalan, the first high steward of Scotland, built a castle on an eminence by the side of the Clyde (still called Castle Hill), the original seat of the royal house of Stewart. Close to the town, on the site of Elderslie House, Somerled, lord of the Isles, was defeated and slain in 11 64 by the forces of Malcolm IV., against whom he had rebelled. In 1404 Robert II. bestowed upon his son James (afterwards James I.) the title of Baron of Renfrew, still borne by the prince of Wales.

RENFREWSHIRE, a south-western county of Scotland, bounded N. by the river and firth of Clyde, E. by Lanarkshire, S. and S.W. by Ayrshire and W. by the firth of Clyde. A small detached portion of the parish of' Renfrew, situated on the northern bank of the Clyde, is surrounded on the landward side by Dumbartonshire. The county has an area of 153,332 acres, or 239-6 sq. m. Excepting towards the Ayrshire border on the south-west, where the principal heights are Hill of Stake (1711

ft.1, East Girt Hill (1673), Misty Law (1663) and Creuch Hill (1446), and the confines of Lanarkshire on the south-east, where a few points attain an altitude of 1200 ft. — the surface is undulating rather than rugged. Much of the higher land in the centre is well wooded. The Clyde forms part of the northern boundary of the shire. In the N.W. Loch Thom and Gryfe Reservoir provide Greenock with water, and Balgray Reservoir and Glen Reservoir reinforce the water-supply of a portion of the Glasgow area. The other lakes are situated in the S. and S.E. and

include Gastle Semple Loch, Long Loch, Brother Loch, Black Loch, Binend Loch and Dunwan Dam. The Glasgow, Paisley and Johnstone canal has been converted since 1882 into the track of the Glasgow & South-Western railway. Strathgryfe is the only considerable vale in the shire. It extends from the reservoir to below Bridge of Weir, a distance of 10 m. The scenery at its head is somewhat wild and bleak, but the lower reaches are pasture land. The wooded ravine of Glenkillock, to the south of Paisley, is watered by Killock Burn, on which

are three falls.

Geology. — Carboniferous rocks form the substratum of this county. The hilly ground from the neighbourhood of Eaglesham north-westward is formed of volcanic rocks, basalts, porphyrites, tuffs and agglomerates of the age of the Cementstone group of the Cal- ciferous Sandstone series. Here and there the sites of the volcanic cones are distinguishable, the best being those between Misty Law and Queenside Muir. Beneath the volcanic rocks are some red sandstones and conglomerates which occupy a small tract between Loch Thorn and the neighbourhood of Inverkip. Resting upon the volcanic rocks is the Carboniferous Limestone series which at the base consists of ashy sandstones and grits followed by the three subdivisions prevalent in southern Scotland. With unimportant exceptions, all the area north of the volcanic rocks is occupied by the Carboniferous Limestone series. The beds lie in a faulted basin around Linwood, and the following strata may be distinguished from below upwards: the Hurlet coal and limestone, Lillies oil shale, Hosie limestone, Johnstone clay ironstone and Cowglass lime- stone along with other beds of ironstone and coal. The sandstone of Giffnock, used for building; the limestone and coal of Orchard with a very fossiliferous shale bed; and the limestone and coal of Arden all belong to the same series. Besides the

contemporaneous volcanic rocks numerous intrusive sheets are found in the Carbon- iferous rocks such as the large mass of basalt south of Johnstone; and doleritic sheet of Quarrelton and the similar sheets N.E. of Paisley. In the eastern part of the county, near the border the coals and ironstones of this series near Shawlands and Crossmyloof are faulted directly against the coal measures of Rutherglen. Tertiary basalt dikes cut the older rocks in a S.E.-N.W. direction, for example those on Misty Law. Glacial striae abound on the hilly ground, those in the north indicating that the ice took a south-easterly direction which farther south became south-westerly. Boulder clays, gravels and sands also cover considerable areas. Copper ore has been worked in the volcanic rocks near Lochwinnoch and in the grey sandstones near Gourock.

Climate and Agriculture. — The climate is variable. As the prevailing west and south-west winds come in from the Atlantic warm and full of moisture, contact with the land causes heavy rains, and the western area of the shire is one of the wettest districts in Scotland, the mean annual rainfall exceeding 60 in. The temperature for the year averages about 48° F., for January 38°-5 F., and for July 58°-5 F. The hilly tract contains much peat-moss and moorland, but over those areas which are not thus covered the soil, which is a light earth on a substratum of gravel, is deep enough to produce good pasture. In the undulating central region the soil is better, particularly in the basins of the streams, while on the flat lands adjoining the Clyde there is a rich alluvium which, except when soured by excessive rain, yields heavy crops. Of the total area three-fifths is under cultivation, more than half of this being permanent pasture. Oats are grown extensively, and wheat and barley are also cultivated. Potatoes, turnips and swedes, and beans are the leading green crops. Near the populous centres orchards and market gardens are found, and an increasing acreage is under wood. Horses are kept mostly for farming operations, and the bulk of the cattle are maintained in connexion with dairying. Sheep-farming, though on the increase, is not prosecuted so vigor- ously as in the other southern counties of Scotland, and pig-rearing is on the decline.

Other Industries. — Coal, iron, oil-shale and fireclay are the prin- cipal minerals. Limestone is largely quarried for smelting purposes, and for the manufacture of lime. Sandstone is also quarried. The thread industry at Paisley .is the most important in the world. Cotton spinning, printing, bleaching and dyeing are carried on at Paisley, Pollokshaws, Renfrew, Barrhead and elsewhere; woollens and worsteds are produced at Paisley, Greenock and Renfrew. Engineering works and iron and brass foundries are found at Greenock, Port-

Glasgow, Paisley, Renfrew, Barrhead and Johnstone. Sugar is a staple article of trade in Greenock and there are chemical works at Hurlet, Nitshill and Renfrew. Brewing and distilling are carried on at Greenock, Paisley and other places. Shipbuilding is especially important at Greenock and Port-Glasgow. Paper mills are established in Greenock, Cathcart and Johnstone, and tanneries in Paisley and Kilbarchan. Numerous miscellaneous industries — such as the making of starch, cornflour and preserves- have also grown up in Paisley and elsewhere. The sea and river ports are Greenock, Port-Glasgow and Renfrew.

Railway communication is ample in the north, the centre and towards the south-west. The Caledonian railway runs westwards

from Glasgow by Paisley to Greenock, Gourock and Wemyss Bay; south-westwards to Barrhead and other stations; and southwards to Busby. The Glasgow & South-Western railway runs to Greenock by Paisley, Johnstone and Kilmalcolm; to Nitshill and other places south-westwards; by Lochwinnoch (for Dairy and Ardrossan in Ayrshire); and to Renfrew jointly with the Cale- donian. The Clyde and the railway steamers call at Renfrew, Prince's Pier (Greenock), Gourock and Wemyss Bay.

Population and Administration. — In 1891 the population numbered 230,812, and in 1901 it was 268,980, or 11 23 to the sq. m. In 1901 there were 40 persons who spoke Gaelic only and 5585 Gaelic and English. Thus though the shire is but twenty-seventh in point of size of the 33 Scottish counties, it is fifth in respect of population, and only Lanarkshire and Mid Lothian are more densely populated. The county is divided into the upper ward, embracing the easterly two-thirds, with Paisley as district centre, and the lower ward, consisting of the parishes of Inverkip, Greenock, Port-Glasgow and Kil- malcolm, with Greenock as district centre. The chief towns are Paisley (pop. 79,363), Greenock (68,142), Port-Glasgow (16,857), Pollokshaws (11,369), Johnstone (11,331), Barrhead (9855), Renfrew (9296), Gourock (5261), Cathcart (5808). The shire returns one member to parliament for the eastern, and another for the western division. Paisley and Greenock return each one member, and Renfrew and Port-Glasgow belong to the Kilmarnock district group of parliamentary burghs. Renfrew- shire forms a sheriffdom with Bute, and there is a resident sheriff-substitute at Paisley and one at Greenock. The county is under school-board jurisdiction. For secondary and special- ized education there are an academy at Greenock and a grammar school and technical school at Paisley, while some of the schools in the county earn grants for higher education. The county secondary committee

also makes provision for the free educa- tion of Renfrewshire children in Glasgow High School and the Spier School at Beith. The Paisley Technical School and the Glasgow and West of Scotland Technical College are subsidized out of the ” residue ” grant, part of which also defrays the travelling expenses of students and supports science and art and technological classes in the burghs and towns in the county.

History. — At the time of the Roman advance from the Solway the land was peopled by the British tribe of Damnonii. To hold the natives in check the conquerors built in 84. the fort of Vanduara on high ground now covered by houses and streets in Paisley; but after the Romans retired (410) the territory was overrun by Cumbrian Britons and formed part of the kingdom of Strathclyde, the capital of which was situated at Alclyde, the modern Dumbarton. In the 7th and 8th cen- turies the region practically passed under the supremacy of Northumbria, but in the reign of Malcolm Canmore became incorporated with the rest of Scotland. During the first half of the 12th century, Walter Fitzalan, high steward of Scotland, ancestor of the royal house of Stuart, settled in Renfrewshire on an estate granted to him by David I. Till their accession to the throne the Stuarts identified themselves with the district, which, however, was only disjoined from Lanarkshire in 1404. In that year Robert III. erected the barony of Renfrew and the Stuart estates into a separate county, which, along with the earldom of Carrick and the barony of King’s Kyle (both in Ayrshire), was bestowed upon his son, afterwards James I. From their grant are derived the titles of earl of Carrick and baron of Renfrew, borne by the eldest son of the sovereign. Apart from such isolated incidents as the defeat of Somerled near Renfrew in 1164, the battle of Langside in 1568 and the capture of the 9th earl of Argyll at Inchinnan in 1685, the history of the shire is scarcely separable from that of Paisley or the neighbouring county of Lanark.

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RENNELL, JAMES, British geographer, was born on the 3rd of

December 1742, near Chudleigh in Devonshire. His father, an officer in the Artillery, was killed in action shortly after the birth of his son. He entered the navy as a mid- shipman in 1756, and was present at the attack on Cherbourg (1758), and the disastrous action of St Cast in the same year. At the end of the Seven Years' War, seeing no chance of pro- motion, he entered the service of the East India Company, and was appointed surveyor of the Company's dominions in Bengal (1764), with the rank of captain in the Bengal Engineers. To this work he devoted the next thirteen years. In 1766 he received a severe wound in an encounter with some Sannyasis, or religious fanatics, from which he never thoroughly recovered; and in 1777 he retired as major on a pension of £600 a year. The remaining fifty-three years of his life were spent in London, and were devoted to geographical research chiefly among the materials in the East India House. His most valuable works include the Bengal Atlas (1779), the first approximately correct map of India (1783), the Geographical System of Herodotus (1800), the Comparative Geography of Western Asia (183 1), and im- portant studies on the geography of northern Africa — in intro- ductions to the Travels of Mungo Park and Hornemann — and the currents of the Atlantic and Indian Oceans. He also contributed papers to Archaeologia on the site of Babylon, the island of St Paul's shipwreck, and the landing-place of Caesar in Britain. He was elected F.R.S. in 1781; and he received the Copley medal of the Royal Society in 1791, and the gold medal of the Royal Society of Literature in 1825. While in India he had married (1772) Jane Thackeray, a great-aunt of the novelist. He died on the 29th of March 1830, and was buried in the nave of Westminster Abbey.

See Sir Clements Markham Major James Rennell and the Rise of Modern English Geography Condon, 1895).

RENNES, a town of western France, formerly the capital of Brittany and now the chief town of the department of Ule-et- Vilaine. Pop. town, 62,024; commune, 75,640. Rennes is situated at the meeting of the Me and the Vilaine and at the junction of several lines of railway connecting it with Paris (232 m. E.N.E.), St Malo (51 m. N.N.W.), Brest (155 m. W.N.W.). A few narrow winding streets with old houses are left in the vicinity of the cathedral, but the town was for the most part rebuilt on a regular plan after the seven days' fire of 1720. Dark granite was used as building material. The old town or Ville-Haute, where the chief buildings are situated, occupies a hill bounded on the south by the Vilaine, on the west by the canalized Me. The Vilaine flows in a deep hollow bordered with quays and crossed by six bridges leading to the new town or Ville-Basse on its left bank. The cathedral of Rennes was rebuilt in a pseudo-Ionic style between 1787 and 1844

on the site of two churches dating originally from the 4th century. The west facade with its twin towers was finished in 1700 and is in the Renaissance style. The interior is richly decorated, a German altar-piece of the 15th century being conspicuous for its carving and gilding. The archbishop's palace occupies in part the site of the abbey dedicated to St Melaine, whose church is the sole specimen of n-i3th cen- tury architecture among the numerous churches in the town. A colossal statue of the Virgin was placed above its dome in 1867. The Mordelaise Gate, by which the dukes and bishops used to make their state entry into the town, is a curious example of 15th-century architecture, and preserves a Latin inscription of the 3rd century, a dedication by the Redones to the emperor Gordianus. The finest building in Rennes is the old parliament house (now the law-court), designed by Jacques Debrosse in the 1 7th century, and decorated with statues of legal celebrities, carving, and paintings by Jean Jouvenet and other well-known artists. The town hall was erected in the first half of the 18th century. It contains the library and the municipal archives, which are of great importance for the history of Brittany. In the Palais Universitaire, a modern building occupied by the university, there are scientific collections and important galleries of painting =uid sculpture, the chief work being the " Perseus

delivering Andromeda " of Paul Veronese. About 2 m. from the town is the castle (16th century) of La Prevalaye, a hamlet famous for its butter.

Rennes is the seat of an archbishop and a prefect, head- quarters of the X. army corps and centre of an acadimie (educa- tional division). Its university has faculties of law, science and letters, and a preparatory school of medicine and pharmacy, and there are training colleges, a lycee and schools of agriculture, dairying, music, art, architecture and industry (Ecole pratique). The town is also the seat of a court of appeal, of a court of assizes, of tribunals of first instance and commerce, and of a chamber of commerce, and has a branch of the Bank of France. Tanning, iron-founding, timber-sawing and the production of furniture and wooden goods, flour-milling, flax-spinning and the manufacture of tenting and other coarse fabrics, bleaching and various smaller industries are carried on. Trade is chiefly in butter made in the neighbourhood, and in grain, flour, leather, poultry, eggs and honey.

Rennes, the chief city of the Redones, was formerly (like some other places in Gaul) called Condate (hence Condat, Conde), probably from its position at the confluence of two streams. Under the Roman empire it was included in Lugdunensis Tertia, and became the centre of

various Roman” roads still recognizable in the vicinity The name Urbs Rubra given to it on the oldest chronicles is explained by the bands of red brick in the founda- tions of its first circuit of walls. About the close of the 10th century Conan le Tort, count of Rennes, subdued the whole province, and his son and successor Geoffrey first took the title duke of Brittany. The dukes were crowned at Rennes, and before entering the city by the Mordelaise Gate they had to swear to preserve the privileges of the church, the nobles and the commons of Brittany. During the War of Succession the city more than once suffered siege, notably in 1356-57, when Bertrand du Guesclin saved it from capture by the English under Henry, first duke of Lancaster. The parlement of Brittany, founded in 1551, held its sessions at Rennes from 1561, they having been previously shared with Nantes. During the troubles of the League Philip Emmanuel, duke of Mercosur, attempted to make himself independent at Rennes (1589), but his scheme was defeated by the loyalty of the parlement. Henry IV. entered the city in state on the 9th of May 1598. In 1675 an insurrection at Rennes, caused by the taxes imposed by Louis XIV. in spite of the advice of the parlement, was cruelly suppressed by Charles, duke of Chaulnes, governor of the province. The parlement was banished to Vannes till 1689, and the inhabitants crushed with forfeits and put to death in great numbers. The fire of 1720, which destroyed eight hundred houses, completed the ruin of the town. At the beginning of the Revolution Rennes was again the scene of bloodshed, caused by the discussion about doubling the third estate for the con- vocation of the states-general. In January 1789, Jean Victor Moreau (afterwards general) , led the law-students in their demonstrations on behalf of the parlement against the royal government. During the Reign of Terror Rennes suffered less than Nantes, partly through the courage and uprightness of the mayor, Jean Leperdit. It was soon afterwards the centre of the operations of the Republican army against the Vendeans. The bishopric, founded in the 5th century, in 1859 became an arch- bishopric, a rank to which it had previously been raised from 1790 to 1802. In 1899 the revision of the sentence of Captain Alfred Dreyfus was carried out at Rennes.

See Orain, Rennes et ses environs (Reims, 1904).

RENNEVILLE, RENE AUGUSTE CONSTANTIN DE (1650- 1723), French writer, was born at Caen in 1650. In consequence of his Protestant principles, he left France for Holland in 1699, and on his return three years later he was denounced as a spy and imprisoned in the Bastille, where he remained until 17 13. During his imprisonment he wrote on the margins of a copy of Auteurs diguisis (Paris, 1690) poems which he called Olia bastiliaca. These were rediscovered by Mr James Tregaski in 1906. Renneville was set at liberty through the

intercession of Queen Anne, and made his way to England, where he published

his Histoire de la Bastille (7 vols., 1713-24), dedicated to George I. At the time of his death in 1723 he was a major of artillery in the service of the elector of Hesse. His other important work is a Recueil des voyages qui ont servi A I'itablissement de la Compagnie des Indes Orientates aux Provinces Unies (10 vols., new ed., Rouen, 1725).

RENNIE, JOHN (1 761-1821), British engineer, was the youngest son of James Rennie, a farmer at Phantassie, Haddingtonshire, where he was born on the 7th of June 1761. On his way to the parish school at East Linton he used to pass the workshop of Andrew Meikle (17 19-1800), the inventor of the threshing machine, and its attractions were such that he spent there much of the time vhat was supposed to be spent at school. In his twelfth year he was placed under Meikle, but after two years he was sent to Dunbar High School, where he showed marked aptitude for mathematics. On his return to Phantassie he occasionally assisted Meikle, and soon began to erect corn mills on his own account. In 1780, while continuing his millwright's business, he began to attend the classes on physical science at Edinburgh University. Four years later he was commissioned by Boulton and Watt, to whom he was introduced by Professor John Robison (1739-1805), his teacher at Edinburgh, to super- intend the construction of the machinery for the Albion flour mills, which they were building at the south end of Blackfriars Bridge, London, and a feature of his work there was the use of iron for many portions of the machines which had formerly been made of wood. The completion of these mills established his reputation as a mechanical engineer, and soon secured him a large business as a maker of millwork of all descriptions. But his fame chiefly rests on his achievements in civil engineering. As a canal engineer his services began to be in request about 1790, and the Avon and Kennet, the Rochdale and the Lancaster canals may be mentioned among his numerous works in England. His skill solved the problem of draining and reclaiming extensive tracts of marsh in the eastern counties and on the Solway Firth. As a bridge engineer he was responsible for many structures in England and Scotland, among the most conspicuous being three over the Thames — Waterloo Bridge, Southwark Bridge and London Bridge — the last of which he did not live to see com- pleted. A noteworthy feature in many of his designs was the flat roadway. Among the harbours and

docks in the construction of which he was concerned may be mentioned those at Wick, Torquay, Grimsby, Holyhead, Howth, Kingstown and Hull, together with the London dock and the East India dock on the Thames, and he was consulted by the government in respect of improvements at the dockyards of Portsmouth, Sheerness, Chatham and Plymouth, where the breakwater was built from his plans. He died in London on the 4th of October 1821, and was buried in St Paul's. In person he was of great stature and strength, and a bust of him by Chantrey (now in the National Gallery), when exhibited at Somerset House, obtained the name of Jupiter Tonans. Of his family, the eldest son George, who was born in London on the 3rd of September 1791 and died there on the 30th of March 1866, carried on his father's business in partnership with the second son John, who was born in London on the 30th of August 1794 and died near Hertford on the 3rd of September 1874. George devoted himself especially to the mechanical side of the business. John completed the con- struction of London Bridge, and at its opening in 1831 was made a knight. He succeeded his father as engineer to the Admiralty, and finished the Plymouth breakwater, of which he published an account in 1848. He was also the author of a book on the Theory, Formation and Construction of ■ British and Foreign Harbours (1851-54), and his Autobiography appeared in 1875. He was elected president of the Institution of Civil Engineers in 1845, and held the office for three years.

RENO, a city and the county-seat of Washoe county, Nevada, U.S.A., in the W. part of the state, on the Truckee river, and about 244 m. E. of San Francisco. Pop. (1890) 3563; (1900) 4500 (915 foreign-born); (1910 census) 10,867. It is served by the Southern Pacific, the Virginia & Truckee and the Nevada- California-Oregon railways. The city lies near the foot of the

Sierra Nevada Mountains, 4484 ft. above the sea, and is in the most humid district of a state which has little rainfall. Among the public institutions are the university of Nevada (see Nevada), a United States Agricultural Experiment Station, a public library (1903), the Nevada Hospital for Mental Diseases (1882), the City and County Hospital and the People's Hospital. At Reno are railway shops (of the Nevada-California-Oregon railway) and re- duction works, and the manufactures include flour, foundry and machine-shop products, lumber, beer, plaster and packed meats. Farming and stock-raising are carried on extensively in the vicinity. On the site of the present city a road house was erected in 1859 for the accommodation of travellers and freight teams on their way to and from California. By 1863 this place had become known as Lake's Crossing, and five years later" it

was chosen as a site for a station by the Central (now the Southern) Pacific railway, then building through the Truckee Valley. The new station was then named Reno, in honour of Gen. Jesse Lee Reno (1823-1862), a Federal officer during the Civil War, who was commissioned brigadier-general of volunteers in November 1861 and major-general of volunteers in July 1862, and led the Ninth Corps at South Mountain, where he was killed. The city twice suffered from destructive fires, in 1873 and 1879. Reno was incorporated as a town in 1879 and chartered as a city in 1899. Its city charter was withdrawn in 1901, but it was rechartered in 1903.

RENOIR, FIRMIN AUGUSTE (1841-), French painter, was born at Limoges in 1841. In his early work he followed, with pronounced modern modifications, certain traditions of the French 18th-century school, more particularly of Boucher, of whom we are reminded by the decorative tendency, the pink and ivory flesh tints and the facile technique of Renoir. In the ‘seventies he threw himself into the impressionist movement and became one of its leaders. In some of his paintings he carried the new principle of the division of tones to its extreme, but in his best work, notably in some of his paintings of the nude, he retained much of the refined sense of beauty of colour of the 1 8th century. Renoir has tried his skill almost in every genre — in portraiture, landscape, flower-painting, scenes of modern life and figure subject; and though he is perhaps the most un- equal of the great impressionists, his finest works rank among the masterpieces of the modern French school. Among these are some of his nude ” Bathers,” the ” Rowers’ Luncheon,” the ” Ball at the Moulin de la Galette,” ” The Box,” ” The Terrace,” ” La Penste,” and the portrait of ” Jeanne Samary.” He is represented in the Caillebotte room at the Luxembourg, in the collection of M. Durand-Ruel, and in most of the collections of impressionist paintings in France and in the United States. Comparatively few of his works have come to England, but the full range of his capacity was seen at the exhibition of impres- sionist art held at the Grafton Galleries in London in 1905. At the Viau sale in Paris in 1907, a garden scene by Renoir, ” La Tonnelle,” realized 26,000 frs., and a little head, ” Inginue,” 25,100 frs.

RENOUF, SIR PETER LE PAGE (1822-1897), Egyptologist, was born in Guernsey, on the 23rd of August 1822. He was educated at Elizabeth College there, and proceeded to Oxford, which, upon his becoming a Roman Catholic, under the influence of Dr Newman, he quitted without taking a degree. Like many other Anglican converts, he proved a thorn in the side of the Ultramontane party in the Roman Church, though he did not, like some of them, return to the communion of the Church of England. He opposed the promulgation

of the dogma of Papal Infallibility, and his treatise (1868) upon the condemnation of Pope Honorius for heresy by the council of Constantinople in A.D. 680 was placed upon the index of prohibited books. He had been from 1855 to 1864 professor of ancient history and Oriental languages in the Roman Catholic university which Newman vainly strove to establish in Dublin, and during part of this period edited the Atlantis and the Home and Foreign Review, which latter had to be discontinued on account of the hostility of the Roman Catholic hierarchy. In 1864 he was appointed a government inspector of schools, which position he

held until 1886, when his growing celebrity as an Egyptologist procured him the appointment of Keeper of Oriental Antiquities in the British Museum, in succession to Dr Samuel Birch. He was also elected in 1887 president of the Society of Biblical Archaeology, to whose Proceedings he was a constant contri- butor. The most important of his contributions to Egyptology are his Hibbert Lectures on ” The Religion of the Egyptians,” delivered in 1879; and the translation of The Book of the Dead, with an ample commentary, published in the Transactions of the society over which he presided. He retired from the Museum under the superannuation rule iii 1891, and died in London on the 14th of October 1897. He had been knighted the year before his death. He married in 1857 Ludovica von Brentano, member of a well-known German literary family.

RENOUVIER, CHARLES BERNARD (1815-1903), French philosopher, was born at Montpellier on the 1st of January 181 8, and educated in Paris at the Ecole Polytechnique. In early life he took an interest in politics, and the approval extended by Hippolyte Carnot to his Manuel republicain de I’homme et du citoyen (1848) was the occasion of that minister’s fall. He never held public employment, but spent his life writing, retired from the world. He died on the 1st of September 1903. Ren- ouvier was the first Frenchman after Malebranche to formulate a complete idealistic system, and had a vast influence on the development of French thought. His system is based on Kant’s, as his chosen term ” Neo-criticisme ” indicates; but it is a trans- formation rather than a continuation of Kantianism. The two leading ideas are a dislike to the Unknowable in all its forms, and a reliance on the validity of our personal experience. The former accounts for his acceptance of Kant’s phenomenalism, combined with rejection of the thing in itself. It accounts, too, for his polemic on the one hand

against a Substantial Soul, a Buddhistic Absolute, an Infinite Spiritual Substance; on the other hand against the no less mysterious material or dynamic substratum by which naturalistic Monism explains the world. He holds that nothing exists except presentations, which are not merely sensational, and have an objective aspect no less than a subjective. To explain the formal organization of our experience he adopts a modified version of the Kantian categories. The insistence on the validity of personal experience leads Renouvier to a yet more important divergence from Kant in his treatment of volition. Liberty, he says, in a much wider sense than Kant, is man's fundamental characteristic. Human freedom acts in the phenomenal, not in an imaginary notimenal sphere. Belief is not intellectual merely, but is determined by an act of will affirming what we hold to be morally good. In his religious views Renouvier makes a considerable approxima- tion to Leibnitz. He holds that we are rationally justified in affirming human immortality and the existence of a finite God who is to be a constitutional ruler, but not a despot, over the souls of men. He would, however, regard atheism as preferable to a belief in an infinite Deity.

His chief works are: Essais de critique generate (1854-64), Science de la morale (1869), Uckronie (1876), Esqttisse d'une classification systematique des doctrines philosophiques (1885-86), Philosophic analytique de Vhistoire (1896-97), Histoire et solution des problemes metaphysiques (1901); Victor Hugo: Le Poete (1893), Le Philo- sophe (1900); Les Dilemmes de la metaphysique pure (1901); Le Personnalisme (1903) ; Critique de la doctrine de Kant (1906, pub- lished by L. Prat).

See L. Prat, Les Dernier s entretiens de Charles Renouvier (1904) ; M. Ascher, Renouvier und der franzosische Neu-Kriticismus (1900) ; E. Janssens, Le Neocriticisme de C. R. (1904) ; A. Darlu, La Morale de Renouvier (1904); G. Seailles, La Philosophic de C. R. (1905); A. Arnal, La Philosophic religieuse de C. R. (1907).

RENSSELAER, a city of Rensselaer county, New York, U.S.A., in the eastern part of the state, on the E. bank of the Hudson river, opposite Albany. Pop. (1900) 7466, of whom 1089 were foreign-born; (1910 census) 10,711. It is served by the New York Central and the Boston & Albany rail- ways, which have shops here, and is connected with Albany by three bridges across the Hudson. Rensselaer, originally called Greenbush, was first settled in 1631, and the site formed part of the large tract bought from the Indians by the agents

of Killian van Rensselaer and known as Rensselaerwyck. In 1810 a

square mile of land within the present city limits was acquired by a land speculator, was divided into lots and offered for sale. Development followed, and five years later the village was incorporated. In 1897 Greenbush was chartered as a city, and its name was changed to Rensselaer. Its limits were extended in 1902 by the annexation of the village of Bath (pop. in 1900, 2504) and the western part of the township of East Greenbush. Rensselaer manufactures knit-goods, wool shoddy, felt, &c.

RENT. Various species of rent appear in Roman Law: rent (canon) under the long leasehold tenure of Emphyteusis; rent (reditus) of a farm; ground-rent (solarium); rent of state lands (vectigal); and the annual rent (prensio) payable for the jus superficiarum or right to the perpetual enjoy- ment of anything built on the surface of land. (See Roman Law.)

English Law. (As to the rent of apartments, &c, see Lodger and Lodgings.) — Rent is a certain and periodical payment or service made or rendered by the tenant of a corporeal hereditament and issuing out of (the property of) such heredita- ment. Its characteristics, therefore, are (1) certainty in amount; (2) periodicity in payment or rendering; (3) the fact that rent is yielded and is, therefore, said ” to lie in render,” as distinguished from profits d prendre in general, which are taken, and are, therefore, said to lie in prendre; (4) that it must issue out of (the profits of) a corporeal hereditament. A rent cannot be reserved out of incorporeal hereditaments such as advowsons (Co. Litt. 47a, 142a). But rent may be reserved out of estates in reversion or remainder (see Real Property) which are not purely incorporeal. It is not essential that rent should consist in a payment of money. Apart from the rendering of services, the delivery of hens, horses, wheat; &c, may constitute a rent. But, at the present day, rent is generally a sum of money paid for the occupation of land. It is important to notice that this conception of rent was attained at a comparatively late period in the history of the law. The earliest rent seems to have been a form of personal service, generally labour on land, and was fixed by custom. The exaction of a competition or rack rent beyond that limited by custom was, if one may judge from the old Brehon law of Ireland, due to the presence upon the land of strangers in blood, probably at first outcasts from some other group. 1 The strict feudal theory of rent admitted labour on the lord’s land as a lower form, and developed the military service due to the crown or a lord as a higher form. Rent service is the oldest and most dignified kind of existing rent. It is the only one to which the power of distress attaches at common law, giving the landlord a preferential right over other creditors exercisable without the intervention of judicial

authority (see Distress). The increasing importance of socage tenure, arising in part from the convenience of paying a certain amount, whether in money or kind, rather than comparatively uncertain services, led to the gradual evolution of the modern view of rent as a sum due by contract between two independent persons. At the same time the primitive feeling which regarded the position of landlord and tenant from a social rather than a commercial point of view is still of importance.

Rents, as they now exist in England, are divided C i a ff es t into two great classes — rent service and rent charge.

Rent Service. — A rent service is so called because by ‘it a tenure by means of service is created between the landlord and the tenant. The service is now represented by fealty, and is nothing more than nominal. Rent service is said to be incident to the reversion— that is, a grant of the reversion carries the rent with it (see Remainder). A power of distress is incident

“‘The three rents are: rack rent from a person of a strange tribe, a fair rent from one of the tribe, and the stipulated rent which is paid equally by the tribe and the strange tribe.” — Senchus Mor, p. 159, cited by Maine, Village Communities, p. 187. See also Vinogradoff, Villainage in England (Oxford, 1892), pp. 181, 188, 215 ; The Growth of the Manor (by the same author) (London, 1905), pp. 230, 328; Pollock and Maitland, Hist. Eng. Law (Cambridge, 1895), ii. 128-134.

at common law to this form of rent. Copyhold rents and rents reserved on lease fall into this class.

Rent Charge. — A rent charge is a grant of an annual sum payable out of lands in which the grantor has an estate. It may be in fee, in tail, for life— the most common form— or forˆ years. It must be created by deed or will, and may be either at common law or under the Statute of Uses (1536). The grantor has no reversion, and the grantee has at common law no power of distress, though such power may be given him by the instrument creating the rent charge. The Statute of Uses (1536) gave a power of distress for a rent charge created under the statute. The Conveyancing Act 1881, § 44, has given a power of distress for a sum due on any rent charge which is twenty-one days in arrear. By § 45 a power of redemption of certain per- petual rents in

the nature of rent charges is given to the owner of the land out of which the rent issues. Rent charges granted since April 26th, 1855, otherwise than by marriage settlement or will for a life or lives or for any estate determinable on a life or lives must, in order to bind lands against purchasers, mort- gagees or creditors, be registered in the Land Registry in Lincoln's Inn Fields (Judgments Act 1855 and Land Charges Act 1900). In certain other cases it is also necessary to register rent charges, for instance, under the Improvement of Land Act 1864 and the Land Transfer Acts 1873 and 1897. Rent charges are barred by non-payment or non-acknowledgment for twelve years. The period of limitation for the arrears of such rent is six years.

Various Forms of Rent Charge. — Forms of rent charge of special interest are tithe rent charge (see Tithes), and the rent charges formerly used for the purpose of creating " faggot votes." The device was adopted of creating parliamentary voters by splitting up freehold interests into a number of rent-charges of the annual value of 40s., so as to satisfy the freeholders' franchise. But such rent charges are now rendered ineffective by the Repre- sentation of the People Act 1884, § 4, which enacts (subject to a saving for existing rights and an exception in favour of owners of tithe rent charge) that a man shall not be entitled to be registered as a voter in respect of the ownership of any rent charge.

A rent charge reserved without power of distress is termed a rent-seek {reditus siccus) or " dry rent," from the absence of the power of distress. But, as power of distress for rents-seek was given by the Landlord and Tenant Act 1736, the legal effect of such rents has been since the act the same as that of a rent charge.

Other Varieties of Rent. — Rents of assize or Quit rents are a relic of the old customary rents. They are presumed to have been established by usage, and cannot be increased or diminished. A Quit rent {quietus reditus) is a yearly payment made from time immemorial by freeholders or copyholders of a manor to the lord. The term implies that the tenant thereby becomes free and quit from all other services. Owing to the change in the value of money, these rents are now of little value. Under the Conveyancing Act 1881 (s. 45) they may be compulsorily redeemed by the freehold tenant; and the Copyhold Act 1894 provides similarly for their extinction in the case of manors. Quit rents, like ordinary rent charges, are barred by non-payment, or non-acknowledgment, for twelve years. Those paid by freeholders are called chief rents. Fee farm rents are rents reserved on grants in fee. According to some authorities, they must be at least one-fourth of the value of the lands. They, like quit rents, now occur only in manors,

unless existing before the Statute of Quia Emptores or created by the crown (see Real Property). A rent which is equivalent or nearly equivalent in amount to the full annual value of the land is a rack rent. A rent which falls appreciably short of a rack rent is usually styled a ground rent (q.v.). It is generally reserved on land which the lessee agrees to cover with buildings, and is calculated on the value of the land, though the buildings to be erected increase the security for the rent and revert to the lessor at the end of the term. A dead rent is a fixed annual sum paid by a person working a mine or quarry, in addition to royalties varying according to the amount of minerals taken.

The object of a dead rent is twofold — first, to provide a specified income on which the lessor can rely; secondly (and this is the more important reason), as a security that the mine will be worked, and worked with reasonable rapidity. Rents in kind still exist to a limited extent; thus the corporation of London is tenant of some lands in Shropshire by payment to the crown of an annual

rent of a fagot. All peppercorn, or nominal, rents seem to fall under this head. 1 The object of the peppercorn rent is to secure the acknowledgment by the tenant of the landlord's right. In modern building leases a peppercorn rent is sometimes reserved as the rent for the first few years. Services rendered in lieu of payment by tenants in grand and petit serjeanty may also be regarded as examples of rents in kind. Grand serjeanty is a form of tenure in chivalry under which the king's tenants (servientes) in chief owed special military or personal services to the king; e.g. carrying his banner. Petit serjeanty — a form of tenure in socage; — was usually applied to tenure of the king or a mesne lord by some fixed service of trivial value, e.g. feeding his hounds. These forms of tenure were abolished in 1660. Labour rents are represented by those cases, not untrequent in agricultural leases, where the tenant is bound to render the landlord a certain amount of team work or other labour as a part of his rent. It was held in the court of queen's bench in 1845 that tenants who occupied houses on the terms of sweeping the parish church and of ringing the church bell paid rent within the meaning of the Limitation Act of 1833 (see Doe v. Benham (1845), 7 Q.B. 976). As to the apportionment of rents, see Apportionment.

Payment of Rent. — Rent is due in the morning "of the day appointed for payment, but a tenant is not in arrears until after midnight on that day. Rent made payable in advance by agreement between a landlord and his tenant is asto called forehand rent. It is not uncommon in letting payment. a furnished house, or as to the last quarter of the

term of a lease of unfurnished premises, to stipulate that the rent shall be paid in advance. As soon as such rent is payable under the agreement the landlord has the same rights in regard to it as he has in the case of ordinary rent. If a tenant pays his rent before the day on which it is due, he runs the risk of being called upon in certain circumstances to pay it over again. Such a payment is an advance to the landlord, subject to an agreement that, when the rent becomes due, the advance shall be treated as a fulfilment of the tenant's obligation to pay rent. The payment is, therefore, generally speaking, a defence to an action by the landlord or his heirs. But if the landlord mortgages his reversion, either before or after the advance, the assignee will, by giving notice to the tenant, before the proper rent-day, to pay rent to him, become entitled to the rent then falling due. Pay- ment by cheque is conditional payment only, and if the cheque is dishonoured the original obligation revives. Where a cheque in payment of rent is lost in the course of transmission through the post, the loss falls on the tenant, unless the landlord has expressly or impliedly authorized it to be forwarded in that way: and the landlord's consent to take the risk of such trans- mission will not be inferred from the fact that payments were ordinarily made in this manner in the dealings between the parties. A tenant may deduct from his rent (i) the " land- lord's property tax " (on the annual value of the premises for income tax purposes), which is paid by the tenant, if the statute imposing the tax authorizes the deduction (which should be made from the rent next due after the payment); (ii) taxes or rates which the landlord had undertaken to pay but had not paid, payment having thereupon been made by the tenant; (iii) payments made by the tenant which ought to have been made by the landlord, e.g. rent due to a superior landlord; (iv) com- pensation under the Agricultural Holdings Acts 1883-1900.

Remedies for Non-payment of Rent. — A landlord's main remedy for non-payment of rent is distress (Lat. distringere, to draw asunder, detain, occupy), i.e. the right to seize all goods found upon the demised premises, whether those of the tenant or of a stranger, except goods specially privileged, and to detain and, if need be, to sell them, in satisfaction of his claim. The requisites of a valid distress are these: (a) There must be " a certain and proper rent," i.e. rent due in respect of an actual tenancy of corporeal hereditaments: (b) the rent must be in arrear; (c) there must be a reversion in the person distrain- ing; and (d) there must be goods on the premises liable to be distrained.

1 When peppercorn rents were instituted, in the middle ages, they were not, however, nominal, the cost of spices being then very great. A peppercorn rent, generally an obligation to pay I ft) of pepper at the

usual rent days, constituted a substantial impost even as late as the 18th century.

All personal chattels are distrainable with the following excep- tions: (i) Goods absolutely privileged — (a) fixtures (q.v.); Q>) goods sent to the tenant in the way of trade; (c) things which cannot be restored, e.g. meat and milk; growing corn and corn in sheaves formerly fell within this category, but the Distress for Rent Act '737 (s – 8) abolished this exemption in the case of the former, and a statute of 1690 abolished it' in that of the latter; (d) things in actual use, e.g. a horse while it is drawing a cart ; (e) animals ferae naturae (does and tame deer or deer in an enclosed park may be distrained) ; (/) things in the custody of the law, e.g. in the possession of a sheriff under an execution (q.v.) ; (g) straying cattle ; (h) in the case of agricultural holdings under the Agricultural Holdings Acts 1883-1900 hired agricultural machinery and breeding stock; (*') the wearing apparel and "bedding" — a term which includes " bedstead " — of tenant and his family, and the tools and implements of his trade to the value of £5 (Law of Distress Amendment Act 1888) ; (j) the goods of ambassadors and their suites (Diplomatic Privileges Act 1708). (ii) Goods conditionally privileged, i.e. privileged if there are sufficient goods of other kinds on the premises to satisfy the distress — (a) implements of trade not in actual use; (b) beasts of the plough and sheep; (c) agisted cattle; (d) growing crops sold under an execution (Landlord and Tenant Act 185 1, s. 2); (e) lodgers' goods. The Lodgers' Goods Protection Act 187 1 provides that where a lodger's goods have been seized by the superior landlord the lodger may serve him with a notice stating that the intermediate landlord had no interest in the property seized, but that it is the property, or in the lawful possession, of the lodger, and setting forth the amount of the rent due by the lodger to his immediate landlord. On payment or tender of such rent the landlord cannot proceed with the distress against the goods in question.

In general, a landlord cannot distrain except upon the premises demised, but he has a statutory right to follow things clandestinely or fraudulently removed from the premises within 30 days after their removal, unless they have been in the meantime sold bona fide and for valuable consideration. A landlord may, by statute (Landlord and Tenant Act 1709, s. 6), distrain within six months after the determination of the lease provided that the tenant has remained in

possession. A distress must be made in the daytime, i.e. not before sunrise or after sunset. Six years' arrears of rent only are recoverable by distress (Real Property Limitation Act 1833, s. 12): the Real Property Limitation Act 1874 (s. 1), which bars distress for rent after twelve years, applies to rent-charges and not to rent under a lease, and the six years' arrears may be recovered in spite of the lapse of time. In the case of agricultural tenancies falling within the Agricultural Holdings Acts 1883-1900, the right of distress is confined to one year's arrears of rent. Where the tenant is bankrupt, a distress levied after the bankruptcy is limited to six months' rent accrued due prior to the date of adjudica- tion; see Bankruptcy Act 1883 (s. 42) and 1890 (s. 28). Where a company is being wound up, the landlord may not distrain without the leave of the court. An extension of time is allowed in cases where in the ordinary course of dealing between landlord and tenant the payment of rent has been allowed to be deferred for a quarter or half year after the rent became legally due (act of 1883, s. 4). The landlord may distrain in person or may employ a certificated bailiff (Law of Distress Amendment Act 1888, s. 7). An uncerti- ficated person levying a distress is liable to a fine of £10, without prejudice to his civil liability (Law of Distress Amendment Act 1895, s – 2)- The seizure must not be excessive (statute of Henry III., 1267); but enough must be taken to satisfy the claim, for the landlord cannot distrain twice for the same rent where he could have taken sufficient in the first instance. After being seized, the goods must be impounded (Distress for Rent Act 1707, s. 10; arid see the statute of 1690, s. 3, on impounding of corn, straw, hay; the Distress for Rent Act 1737, s. 8, on impounding of growing crops; and the statute of 1554 and the Cruelty to Animals Act 1849, s. 5, on impounding of cattle) ; and the landlord has a statutory power of sale (statute of 1690, s. 5). It is illegal to proceed with a distress if the tenant tenders the rent before the impounding; and a tenant has, by statute (1690, c. 5), five clear days' grace, excluding the date of seizure, between impounding and sale. On the written request of the tenant, this period will be extended to fifteen days (Law of Distress Amendment Act 1888, s. 6). A tenant may, before sale, recover goods illegally distrained by an action of replevin (L. Lat. replegiare, to redeem a thing taken by another). Where no rent was due to the distrainer the tenant may recover by action double the value of the goods sold (statute 1690, s. 5) ; and summary remedies for the recovery of the property have been created by modern enactments (Law of Distress Amendment Act 1895, s. 4, on distress of privileged goods; Agricultural Holdings Act 1883, s. 46). Where rent was due, but the distress was irregular, the tenant can only recover special damage (Distress for Rent Act 1737, s. 19).

Goods taken under an execution {q.v.) are not removable till one year's rent has been paid to the landlord (Landlord and Tenant Act 1709).

The landlord has, besides distress, his ordinary remedy by action. In addition, special statutory remedies are given in the case of tenants

holding over after the expiration of their tenancy. By the Distress for Rent Act 1737 any tenant giving notice to quit, and holding over, is liable to pay double rent for such time as he continues in possession (see further under Ejectment).

Ireland. — The main differences between Irish and English law have been caused by legislation (see Ejectment; Land- lord and Tenant).

Scotland. — Rent is properly the payment made by tenant to landlord for the use of lands held under lease (see Landlord and Tenant). In agricultural tenancies the legal terms for the payment of rent are at Whitsunday after the crop has been shown, and at Martinmas after it has been reaped. But a landlord and tenant may substitute conventional terms of payment, either anticipating (fore, or forehand rent) or post- poning (back, or backhand rent) the legal term. The rent paid by vassal to superior is called feu-duty (see Feu). Its nearest English equivalent is the fee farm rent. The remedy of dis- tress does not exist in Scots law. Rents are recovered (i) by summary diligence, proceeding on a clause, in the lease, of consent to registration for execution; (ii) by an ordinary peti- tory action; (iii) by an action of " maills and duties " (the rents of an estate in money or grain: " maills " was a coin at one time current in Scotland) in the Sheriff Court or the Court of Session; and (iv) in non-agricultural tenancies by procedure under the right of hypothec, where that still exists; the right of hypothec over land exceeding 2 acres in extent let for agri- culture or pasture was abolished as from November 11, 1881 (see Hypothec); (v) by action of removing (see Ejectment). Arrears of rent prescribe in five years from the time of the tenant's removal from the land.

Labour or service rents were at one time very frequent in Scot- land. The events of 171 5 and 1745 showed the vast influence over the tenantry that the great proprietors acquired by such means. Accordingly acts of 1716 and 1746 provided for the commutation of services into money rents. Such services may still be created by agreement, subject to the summary power of commutation by the sheriff given by the Conveyancing Act 1874 (§§ 2 °> 2I)- " In the more remote parts of Scotland it is understood that there still exist customary returns in produce of various kinds, which being regulated

by the usage of the district or of the barony or estate cannot be comprehended under any general rule ” (Hunter, Landlord and Tenant, ii. 298). Up to 1848 or 1850 there existed in Scot- land ” steelbow ” leases — analogous to the chetel de fer of French law (see Landlord and Tenant) — by which the landlord stocked the farm with corn, cattle, implements, &c, the tenant returning similar articles at the expiration of his tenancy and paying in addition to the ordinary rent a steelbow rent of 5 % on the value of the stock.

As to the rent of apartments, &c, see Lodger and Lodgings.

United Stales. — The law is in general accordance with that of England. The tendency of modern state legislation is unfavourable to the continuance of distress as a remedy. In the New England states, attachment on mesne process has, to a large extent, superseded it. In New York and Missouri it has been abolished by statute; in Mississippi the landlord has a claim for one year’s rent on goods seized under an execution and a lien on the growing crop. In Ohio, Tennessee and Alabama it is not recognized, but in Ohio the landlord has a share in the growing crops in preference to the execution creditor. The legislatures of nearly all the states agree with the law of England as to the exemption from distress of household goods, wearing apparel, &c. (see Dillon’s Laws and Jurisprudence of England and America, pp. 360, 361; also Homestead). As to the rent of apartments, &c, see Lodger and Lodgings. Fee farm rents exist in some states, like Pennsylvania, which have not adopted the statute of Quia Emptores as a part of their common law (Washburn’s Real Property, ii. 252).

Other Laws. — Under the French Code Civil (art. 2102) the land- lord is a privileged creditor for his rent. If the lease is by authentic act, or under private signature for a fixed term, he has a right over the year’s harvest and produce, the furniture of the house and everything employed to keep it up, and (if a farm) to work it, in order to satisfy all rent due up to the end of the term. If the lease is not .by authentic act nor for a specified term, the landlord’s claim is limited to the current year and the year next following (see law of 12th Feb. 1872). The goods of a sub-lessee are protected : and goods bailed or deposited with the tenant are in general not

liable to be seized. The French law is in force in Mauritius, and has been reproduced in substance in the Civil Codes of Quebec (arts. 2005

et seq.) and St Lucia (arts. 1888 et seq.). There are analogous provisions in the Spanish Civil Code (art. 1922). The subject of privileges and hypothecs is regulated in Belgium by a special law of the 16th Dec. 1 851; and in Germany by ss. 1 1 13 et seq. of the Civil Code. The law of British India as to rent (Transfer and Property Act 1882) and distress (cf., e.g., Act 15 of 1882) is similar to English law. The British dominions generally tend in the same direction. See, e.g., New South Wales (the consolidating Landlord and Tenant Act 1899); Newfoundland (Act 4 of 1899); Ontario (Act I of 1902, s. 22, giving a tenant five days for tender of rent and expenses after distress); Jamaica (Law 17 of 1900, certification of landlord's bailiffs) ; Queensland (Act 15 of 1904).

Authorities. — English Law: Woodfall, Landlord and Tenant (18th ed., London, 1907) ; Foa, Landlord and Tenant (4th ed., London, 1907); Fawcett, Landlord and Tenant (3rd ed., London, 1905); Gilbert on Distress and Replevin (London, 1823) ; Bullen, Law of Distress (2nd ed., London, 1899) ; Oldham and Foster, Law of Distress (2nd ed., London, 1889). Scots Law: Hunter on Landlord and Tenant (4th ed., Edin., 1876); Erskine's Principles (20th ed., by Rankine, Edin., 1903) ; Rankine's Law of Landowner ship in Scot- land (3rd ed., Edin., 1891); Rankine's Law of Leases in Scotland (2nd ed., Edin., 1893). American Law: McAdam, Law of Landlord and Tenant (New York, 1900) ; Bouvier's Law Dictionary (ed. G. Rawle) (London and Boston, 1897), tit. " Distress " in " Ruling Cases"; Landlord and Tenant (American Notes) (London and Boston, 1894-1901). (A. W. R.)

RENTON, a manufacturing town of Dumbartonshire* Scotland. Pop. (1901) 5067. It is situated on the Leven, 2 m. N.N.W. of Dumbarton by the North British and Caledonian railways. The leading industry is Turkey red dyeing, and calico-printing and bleaching are also carried on. A parish church stands on the site of Dalquhurn House, the birthplace of Tobias Smollett the novelist, to whose memory a Tuscan column was erected in 1774, the inscription for which was revised by Dr Johnson when he visited Bonhill in that year with Boswell. The town was founded in 1782 by Mrs Smollett— previously Mrs Telfer — of Bonhill (sister of Tobias Smollett), who resumed her maiden name when she succeeded to the Smollett estates; it was named after Cecilia Renton, daughter of John Renton of Blackadder, who had married Mrs Smollett's son, Alexander Telfer.

RENWICK, JAMES (1662-1688), Scottish covenanting leader, was born at Moniaive in Dumfriesshire on the 15th of February 1662, being the son of a weaver, Andrew Renwick. Educated at Edinburgh University, he joined the section of the Covenanters known as the

Cameronians about 1681 and soon became pro- minent among them. Afterwards he studied theology at the university of Groningen and was ordained a minister in 1683. Returning to Scotland " full of zeal and breathing forth threats of organized assassination," says Mr Andrew Lang, he became one of the field-preachers and was declared a rebel by the privy council. He was largely responsible for the " apologetical declaration " of 1684 by which he and his followers disowned the authority of Charles II.; the privy council replied by ordering every one to abjure this declaration on pain of death. Unlike some of his associates, Renwick refused to join the rising under the earl of Argyll in 1685; in 1687, when the declarations of indulgence allowed some liberty of worship to the Presbyterians, he and his followers, often called Renwickites, continued to hold meetings in the fields, which were still illegal. A reward was offered for his capture, and early in 1688 he was seized in Edinburgh. Tried and found guilty of disowning the royal authority and other offences, he refused to apply for a pardon and was hanged on the 17th of February 1688. Ren- wick was the last of the convenanting martyrs.

See R. Wodrow, History of the Sufferings of the Church of Scot- land, vol. iv. (Glasgow, 1838); and A. Smellie, Men of the Covenant (1904) ; also Renwick's life by Alexander Shields in the Biographia Presbyteriana (1827).

REP, Repp, or Reps, a cloth made of silk, wool or cotton. The name is said to have been adapted from the French reps, a word of unknown origin; it has also been suggested that it is a corruption of " rib." It is woven in fine cords or ribs across the width of the piece. In silk it is used for dresses, and to some extent for ecclesiastical vestments, &c. In wool and cotton it is used for various upholstery purposes.

REPAIRS (from Lat. reparare, to make ready again), acts necessary to restore things to a sound state after damage; the question of repairs is important in the relations between landlord and tenant. (See the articles Flat; Landlord and Tenant.)

REPEAL (O.F. rapel, modern rappel, from rapeler, rappder, revoke, re and appeler, appeal), the abrogation, revocation or annulling of a law (see Abrogation and Statute). The word is particularly used in English history of the movement led by Daniel O'Connell (q.v.) for the repeal of the act of Union between Great Britain and Ireland in 1830 and 1841-46, which in its later development became known as the Nationalist or Home Rule movement (see Ireland, History).

REPIN, ILJA JEFIMOVICH (1844-), Russian painter, was born in 1844

at Tschuguev in the department of Charkov, the son of parents in straitened circumstances. He learned the rudiments of art under a painter of saints named Bunakov, for three years gaining his living at this humble craft. In 1863 he obtained a studentship at the Academy of Fine Arts of St Petersburg, where he remained for six years, winning the gold medal and a travelling scholarship which enabled him to visit France and Italy. He returned to Russia after a short absence, and devoted himself exclusively to subjects having strong national characteristics. In 1894 he became professor of historical painting at the St Petersburg Academy. Repin's paintings are powerfully drawn, with not a little imagination and with strong dramatic force and characterization. A brilliant colourist, and a portrait-painter of the first rank, he also became known as a sculptor and etcher of ability. His chief pictures are " Procession in the Government of Kiev," " Home-coming," " The Arrest," " Ivan the Terrible's murder of his Son," and, best known of all, " The Reply of the Cossacks to Sultan Mahmoud IV." The portraits of the Baroness V. I. Ulskiil, of Anton Rubinstein and of Count Leo Tolstoy are among his best achievements in this class. The Tretiakov gallery at Moscow contains a very large collection of his work. See " Professor Repin," by Prince Bojidar Karageorgevich, in the Magazine of Art, xxiii. p. 783 (1899); " Russian Art," a paper by E. Brayley Hodgetts in the Proceedings of the Anglo-Russian Literary Society (5th of May 1896); " Ilja Jefimovich Repin," by Julius Norden, in Velhagen and Klasing's Monatshefte, xx. p. I (1905) ; also R. Muther, History of Modern Painting (ed. 1907), iv. 272. (E. F. S.)

REPINGTON (or Repyngdon), PHILIP (d. 1424), English bishop and cardinal, was educated at Oxford and became an Augustinian canon at Leicester before 1382. A man of some learning, he came to the front as a defender of the doctrines taught by John Wycliffe; for this he was suspended and after- wards excommunicated, but in a short time he was pardoned and restored by Archbishop William Courtenay, and he appears to have completely abandoned his unorthodox opinions. In 1394 he was made abbot of St Mary de Pre at Leicester, and after the accession of Henry IV. to the English throne in 1399 he became chaplain and confessor to this king, being described as " clericus specialissimus domini regis Henrici." In 1404 he was chosen bishop of Lincoln, and in 1408 Pope Gregory XII. made him a cardinal. He resigned his bishopric in 1419. Some of Repington's sermons are in manuscript at Oxford and at Cambridge.

REPLEVIN, an Anglo-French law term (derived from replevir, to replevy; see Pledge for further etymology) signifying the recovery by a person of goods unlawfully taken out of his possession by means of a

special form of legal process; this falls into two divisions — (1) the ” replevy,” the steps which the owner takes to secure the physical possession of the goods, by giving security for prosecuting the action and for the return of the goods if the case goes against him, and (2) the ” action of replevin ” itself. The jurisdiction in the first case is in the County Court; in the second case the Supreme Court has also jurisdiction in certain circumstances. The proceedings are now regulated by the County Courts Act 1888. At common law, the ordinary action for the recovery of goods wrongfully taken would be one of detinue; but no means of immediate recovery

was possible till the action was tried, and until the Common Law Procedure Act 1854 the defendant might exercise an option of paying damages instead of restoring the actual goods. The earliest regulations with regard to the action of replevin are to be found in the Statute of Marlborough (Marlebridge), 1267, cap. 21. For the early history, see Blackstone’s Com- mentaries, iii. 145 seq. Only goods and cattle can be the subjects of an action for replevin. Although the action can be brought for the wrongful taking of goods generally, as long as the initial taking was wrongful and it was from the possession of the owner, it is practically confined to goods taken by an illegal as opposed to an excessive distress (see Distress and Rent, § Legal).

REPNIN, the name of an old Russian princely family, the first of whom to gain distinction was

Prince Anikita Ivanovich Repnin (1668-17 26), Russian general, and one of the collaborators of Peter the Great, with whom he grew up. On the occasion of the Sophian insurrection of 1689, he carefully guarded Peter in the Troitsa monastery, and subsequently took part in the Azov expedition, during which he was raised to the grade of general. He took part in all the principal engagements of the Great Northern War. Defeated by Charles XII. at Holowczyn, he was degraded to the ranks, but was pardoned as a reward for his valour at Lyesna and recovered all his lost dignities. At Poltava he commanded the centre. From the Ukraine he was transferred to the Baltic Provinces and was made the first governor-general of Riga after its capture in 17 10. In 1724 he succeeded the temporarily disgraced favourite, Menshikov, as war minister. Catherine I. created him a field-marshal

See A. Bauman, Russian Statesmen of the Olden Time (Rus.), vol. i.

(Petersburg, 1877).

His grandson, Prince Nikolai Vasilevich Repnin (1734- 1801), Russian statesman and general, served under his father, Prince Vasily Anikitovich, during the Rhenish campaign of 1748 and subsequently resided for some time abroad, where he acquired ” a thoroughly sound German education.” He also participated in the Seven Years’ War in a subordinate capacity. Peter III. sent him as ambassador in 1763 to Berlin. The same year Catherine transferred him to Warsaw as minister pleni- potentiary, with especial instructions to form a Russian party in Poland from among the dissidents, who were to receive equal rights with the Catholics Repnin convinced himself that the dissidents were too poor and insignificant to be of any real support to Russia, and that the whole agitation in their favour was factitious. At last, indeed, the dissidents themselves even petitioned the empress to leave them alone. It is clear from his correspondence that Repnin, a singularly proud and high- spirited man, much disliked the very dirty work he was called upon to do. Nevertheless he faithfully obeyed his instructions, and, by means more or less violent or discreditable, forced the diet of 1 768 to concede everything. The immediate result was the Confederation of Bar, which practically destroyed the ambas- sador’s handiwork. Repnin resigned his post for the more congenial occupation of fighting the Turks. At the head of an independent command in Moldavia and Walachia, he prevented a large Turkish army from crossing the Pruth (1770); distin- guished himself at the actions of Larga and Kagula; and captured Izmail and Kilia. In 1771 he received the supreme command in Walachia and routed the Turks at Bucharest. A quarrel with the commander-in-chief, Rumyantsev, then induced him to send in his resignation, but in 1774 he participated in the capture of Silistria and in the negotiations which led to the peace of Kuchuk-KainarjL, In 1775-76 he was ambassador at the Porte. On the outbreak of the war of the Bavarian Suc- cession he led 30,000 men to Breslau, and at the subsequent congress of Teschen, where he was Russian plenipotentiary, compelled Austria to make peace with Prussia. During the second; Turkish war (1787-92) Repnin was, after Suvarov, the most successful of the Russian commanders. He defeated the Turks at Salcha, captured the whole camp of the seraskier, Hassan Pasha, shut him up in Izmail, and was preparing to reduce

the place when he was forbidden to do so by Potemkin (1789). On the retirement of Potemkin (q.v.) in 1791, Repnin succeeded him as commander-in-chief, and immediately routed the grand vizier at Machin, a victory which compelled the Turks to accept the truce of Galatz (31st of July 1791). In 1794 he was made governor-general of the newly acquired Lithuanian provinces. The emperor Paul raised

him to the rank of field-marshal (1796), and, in 1798, sent him on a diplomatic mission to Berlin and Vienna in order to detach Prussia from France and unite both Austria and Prussia against the Jacobins. On his return unsuc- cessful, he was dismissed the service.

See A. Kraushar, Prince Repnin in Poland, 1764-8 (Pol.) (Warsaw, 1900); “Correspondence with Frederick the Great and others” (Rus. and Fr.), in Russky Arkhiv (1865, 1869, 1874, Petersburg); M. Longinov, True Anecdotes of Prince Repnin (Rus.) (Petersburg, 1865). (R. N. B.)

REPORT (O.Fr. report or raport, modern rapport, from O.Fr. reporter, mod. rapporler, Lat. reportare, to bring back, in poetical use only, of bringing back an account, news, &c), an account or statement of events, speeches, proceedings, the results of investigations, &c, ” brought back ” by one who was present either casually or sent for the specific purpose, hence reputation, rumour. A special sense, that of a loud noise, as of the explosion of firearms, appears as early as the end of the 16th century. For the reports of speeches, parliamentary debates, &c, in the daily press see Reporting below, and for the particular form of law reporting see English Law; American Law.

REPORTING, the art or business of reproducing in readable form, mainly for newspapers, but also for such publications as the Parliamentary or Law Reports, the words of speeches, or describing in narrative form the events, in contemporary history, by means of the notes made by persons known generally as reporters. The special business of reporting is a comparatively modern one, since it must not be confounded with the general practice of quoting, or of mere narrative, which is as old as writing. There was no truly systematic reporting until the beginning of the 19th century, though there was parliamentary reporting of a kind almost from the time when parliaments began, just as law reporting (which goes back to 1292) began in the form of notes taken by lawyers of discussions in court. The first attempts at parliamentary reporting, in the sense of seeking to make known to the public what was done and said in parlia- ment, began in a pamphlet published monthly in Queen Anne’s time called The Political State. Its reports were mere indications of speeches. Later, the Gentleman’s Magazine began to publish reports of parliamentary debates. Access to the Houses of Parliament was obtained by Edward Cave (q.v.), the publisher of this magazine, and some of his friends, and they took surreptitiously what notes they could. These were subsequently transcribed and brought into shape for publication by another hand. Dr Johnson for some years wrote the speeches, and he took care, as he admitted, not to let the ” Whig dogs

” get the best of it; the days of verbatim reporting were not yet come, and it was considered legitimate to make people say in print what substantially was supposed to represent their opinions. There was a strict parliamentary prohibition of all public reporting; but the Gentleman’s Magazine appears to have continued its reports for some time without attracting the attention or rousing the jealousy of the House of Commons. The publisher, encouraged by immunity from prosecution by parliament, grew bolder, and began in his reports to give the names of the speakers. Then he was called to account. A standing order was passed in 1728, which declared ” that it is an indignity to, and a breach of, the privilege of this House for any person to presume to give, in written or printed news- papers, any account or minute of the debates or other proceed- ings; that upon discovery of the authors, printers or publishers of any such newspaper this House will proceed against the offenders with the utmost severity.” Under this and other standing orders, Cave’s reports were challenged, with the result that they appeared without the proper names of the speakers, and under the guise of ” Debates in the Senate of Lilliput,”

or some other like title. France was Blefuscu; London was Mildendo; pounds were sprugs; the duke of Newcastle was the Nardac secretary of state; Lord Hardwicke was the Hurgo ‘ Hickrad; and William Pulteney was Wingul Pulnub.

In the latter half of the century the newspapers began to report parliamentary debates more fully, with the result that, in 1 771, several printers, including those of the Morning Chronicle and the London Evening Post, were ordered into custody for publishing debates of the House of Commons. A long and bitter struggle between the House and the public ensued. John Wilkes took part in it. The lord mayor of London and an alderman were sent to the Tower for refusing to recognize the Speaker’s warrant for the arrest of certain printers of parlia- mentary reports. But the House of Commons was beaten. In 1772 the newspapers published the reports as usual; and their right to do so has never since been really questioned. Both Houses of Parliament, indeed, now show as much anxiety to have their debates fully reported as aforetime they showed resentment at the intrusion of the reporter. Elaborate pro- vision is made in the House of Lords and in the House of Commons for reporters. They have a Press Gallery in which they may take notes, writing rooms in which those notes may

be extended, and a special dining-room. Reporting is nowhere carried to such an extent as in the United Kingdom, since in most other countries the newspapers do not find it sufficiently interesting ” copy ” for their readers to justify the amount of space required. Consequently the verbatim reports, though now no longer hindered by law, and made possible by shorthand (which was first employed in the service of parliament in 1802) and by all the arts of communication and reproduction, are considerably restricted.

But parliamentary work is only a small part of newspaper reporting. The newspapers in the beginning of the 19th century rarely contained more than the barest outline of any speech or public address delivered in or in the neighbourhood of the towns where they were published. After the peace of 1815 a period of much political fermentation set in, and the newspapers began to report the speeches of public men at greater length. It was not, however, until well into what may be called the railway era that any frequent effort was made- by English newspapers to go out of their own district for the work of reporting. The London newspapers had before this led the way. Early in the 19th century, greater freedom of access to both Houses was given, and the manager of the Morning Chronicle established a staff of reporters. Each reporter took his “turn”— that is, he took notes of the proceedings for a certain time, and then gave place to a colleague. The reporter who was relieved at once extended his notes, and thus prompt publication of the debates was made possible. The practice grew until there was a good deal of competition among the papers as to which should first issue a report of any speech of note in the country. Reporters had frequently to ride long distances in post-chaises, doing their best as they jolted along the roads to transcribe their notes, so that they might be ready for the printer on arrival at their destination. Charles Dickens, whose efforts in the way of reporting were celebrated, used to tell several stories of his adventures of this kind while he held an engagement on the Morning Chronicle. One result was that the provincial news- papers were stimulated to greater efforts, and as daily news- papers sprang up in all directions, and the electric telegraph provided greater facilities for reporting, the old supremacy of the London journals in this department of newspaper work gradually disappeared. No public man made a speech but it was faithfully reproduced in print. Local governing bodies, charitable institutions, political associations, public companies — all these came in a short time to furnish work for the reporter, and had full attention paid to them. By the second half of the 19th century, parliamentary reporting was a leading feature of the London newspapers. They had a monopoly of it. All * the reporting

arrangements in the House of Lords and in the House of Commons were made with sole regard to their require- ments. There had indeed been a long battle between The

Times and some of the other London newspapers as to which should have the best parliamentary report, and The Times had established its supremacy, which has never been shaken. The provincial newspapers were in the main obliged to copy the London reports, and rarely made any attempt to get reports of their own. When the electric telegraph came into use for commercial purposes a change began. The company which first carried wires from London to the principal towns in the country started a reporting service for the country newspapers. In addition, it procured admission to the parliamentary galleries for reporters in its employment, and began to send short accounts of the debates to the newspapers in the country. These news- papers were thus enabled to publish in the morning some account of the parliamentary proceedings of the previous night, instead of having to take like reports a day later from the London journals. The telegraph companies (not yet taken over by the state) for a long time could or would do no more than they had begun by doing; and they offered no inducements to the pro- vincial newspapers to telegraph speeches. The public meanwhile wanted to know more fully what their representatives were saying in parliament, and gradually the leading provincial newspapers adopted the practice of employing reporters in the service of the London journals to report debates on subjects of special interest in localities; and these reports, forwarded by train or by post, were printed in full, but of course a day late. The London papers paid little attention to debates of local interest, and thus the provincial papers had parliamentary reporting which was not to be found elsewhere. Bit by bit this feature was developed. It was greatly accelerated by a movement which the Scotsman was the first to bring about. About 1865, a new company having come into existence, it was agreed that wires from London should be put at the disposal of such newspapers as desired them. Each newspaper was to have the use of a wire — of course on payment of a large subscrip- tion — from six o'clock at night till three o'clock in the morning. This was the beginning of the " special wire " which now plays so important a part in the production of almost all newspapers. The arrangement was first made by the Scotsman and by other newspapers in Scotland. The special wires were used to their utmost capacity to convey reports of the speeches of leading statesmen and politicians; and, instead of bare summaries of what had been done, the newspapers contained pretty full reports.

When the telegraphs were taken over by the state in 1870 the facilities

for reporting were increased in every direction. The London papers, with the exception of The Times, had given less and less attention to parliamentary debates, while on the other hand several of the provincial newspapers were giving more space than ever to the debates. These newspapers had to get their reports as best they could. The demand for such reporting had led, on the passing of the telegraphs into the hands of the state, to the formation of news agencies, which undertook to supply the provincial papers. These agencies were admitted to the reporters' galleries in the Houses of Parliament, but the reports which any agency supplied were identical; that is to say, all the newspapers taking a particular class of report had exactly the same material supplied to them — the reporter producing the number of copies required by means of manifold copying paper. Accordingly attempts were made to get separate reports by engaging the services of some of the reporters employed by the London papers. The ' ' gallery " was shut to all save the London papers and the news agencies. The Scotsman sought in vain to break through this exclusiveness. The line, it was said, must be drawn somewhere, and the proper place to draw it was at the London Press. Once that line was departed from every newspaper in the kingdom must have admission. But in 1880 a select committee of the House of Commons was appointed to consider the question. It took evidence, and it reported in favour of the extension of the gallery and of the admission of provincial papers. The result was that three or four papers which would be satisfied with the same report joined in providing the necessary reporting

staff. In other cases individual newspapers put themselves on the same footing as the London newspapers by engaging separate staffs of reporters.

The effect of telegraphic improvements may be partially gauged by the fact that in 1871 the number of words handed in for transmission through the British Post Office for Press purposes (special rates being allowed) was 22,000,000, and that in 1900 it had risen to 835,000,000. Meanwhile the evolution of the modern newspaper had brought many other kinds of reporting, besides parliamentary, into play.

What is commonly called " descriptive reporting " has in some cases nearly shouldered the reporting of speeches out of news- papers. The

special correspondent or the war correspondent is a ” descriptive reporter.” The ” interviewer ” came into great prominence during the ” eighties ” and ” nineties,” and the influence of American journalistic methods, which made smart reporting the most valuable commercial asset of the popular newspaper, and the reporter correspondingly important, spread to other countries. No daily newspaper now confines its reporting to the affairs of the part of the country in which it is published. The electric telegraph has made the work of the reporter more arduous and his responsibility greater. The variety of work open to reporting causes considerable difference, of course, in the professional status of the journalists who do such work. This subject generally is discussed in the article Newspapers, but one instance of the recognition of the modern reporter’s responsibility is worth special mention. In the year 1900, in the English case of Walter v. Lane (see Copyright), it was decided, on the final appeal to the House of Lords, that the reporter of a speech, printed verbatim in a newspaper, was under the Copyright Act of 1842 to be considered the ” author.” Absurd as it might seem to call the reporter the author of another man’s speech, the decision gave effect to the fact that it is his labour and skill which bring into existence the ” copy ” to which alone can right of property attach. Strictly speaking, he is the author of the report of the speech ; but for literary purposes the report is the speech. It must, however, be borne in mind that there may be more than one verbatim report, and therefore more than one ” author.”

See also Newspapers; Shorthand; Press Laws; Telegraph.

REPOUSSE (Fr. ” driven back “), the art of raising designs upon metal by hammering from the back, while the ” ground ” is left relatively untouched (see Metal Work and Plate). The term is often loosely used, being applied indifferently to ” embossing.” Embossing is also called ” repousse sur coquille ” and ” estampage,” but the latter consists of embossing by mechanical means and is therefore not to be considered as an art process. Moreover, it reverses the method of repousse, the work being done from the front, and by driving down the ground leaving the design in relief. Gold, silver, bronze, brass, etc., being easily malleable metals, are specially suitable to repouss6, which at the present day, in its finer forms, is mainly employed for silver-plate and jewelry. The silver-plate in repousse of Gilbert Marks (d. 1905) in England, and the portrait-plaques from life by Stephan Schwartz (b. in Hungary, 1851) in Austria, are noteworthy modern examples of the art.

Repousse — a term of relatively recent adoption, employed to differentiate the process from embossing — has been known from

remote antiquity. Nothing has ever excelled, and little has ever approached, the perfection of the bronzes of Siris (4th century B.C., in the British Museum), of which the armour- plate — especially the shoulder-pieces — presents heroic figure- groups beaten up from behind with punches from the flat plate until the heads and other portions are wholly detached— that is to say, in high relief from the ground of which they form a part. Yet the metal, almost as thin as paper, is practically of constant thickness, and nowhere is there any sign of puncture. The ” Bernay treasure,” in the Bibliotheque Nationale, Paris, discovered in 1830, belongs to the 2nd century B.C., and includes silver vases of Roman execution decorated with groups in mezzo-relief, beaten up in sections and soldered together. The best of these, of which perhaps the finest is that known from its subject as ” La nymphe de la fontaine Pirene et Pegase,” belong to the noblest period of Roman art. The Hildesheim treasure (discovered 1868) comprises a patera on the ground of which is a superb emblema representing Minerva in high relief. These repousse emblemata were usually of another metal and applied to the vase which they decorated; indeed repousse was of leading importance in caelatura, or the metallic art (statuary

excepted) of classic times. Thus the patera of Hildesheim, the patera of Rennes, and the earlier shoulder-plate of the Siris bronze may be accepted as illustrative of the highest develop- ment of repouss6.

The art was not only Greek and Graeco-Roman in its early practice; it was pursued also by the Assyrians, the Phoenicians, and other oriental peoples, as well as in Cyprus and elsewhere, and was carried forward, almost without a break, although with much depreciation of style and execution, into medieval times. In the nth century the emperor Henry II. presented as a thank- offering to the Basel cathedral the altar-piece, in the Byzantine style, decorated with fine repousse panels of gold (representing Jesus Christ with two angels and two saints), which is now in the Cluny Museum in Paris. Up to this time, also, repousse instead of casting in metal was practised for large work, and Limoges became a centre for the manufacture and exportation of sepul- chral figures in repousse bronze. These were affixed to wooden cores. By the time of Benvenuto Cellini the art was confined almost entirely to goldsmiths and silversmiths (who, except Cellini himself, rarely cast their work) ; and to them the sculptors and artists of to-day are still content to relegate it.

The elementary principle of the method, after the due prepara- tion and annealing of the plate, was to trace on the back of it the design to be beaten up, and to place it face downwards upon a stiff yet not

entirely unresisting ground (in the primitive stage of development this was wood), and then with hammers and punches to beat up the design into relief. According to Cellini, his master Caradosso da Milano would beat up his plate on a metal casting obtained from a pattern he had previously modelled in wax; but he is not sufficiently explicit to enable us to judge whether this casting was hollow mould, which would result in true repousse, or in the round, which is tantamount to repoussi sur coquille, or embossing.

Nowadays the plate is laid upon and affixed to a ” pitch- block,” a resinous ground docile to heat, usually composed of pitch mixed with pounded fire-brick, or, for coarser work such as brass, with white sand, with a little tallow and resin. This compound, while being sufficiently hard, is elastic, solid, adhesive and easy to apply and remove. Gold and silver are not only the densest and most workable but the most ductile metals, admitting of great expansion without cracking if properly annealed. The tools include hammers, punches (in numerous shapes for tracing, raising, grounding, chasing and texturing the surfaces), together with a special anvil called in French a recingle or ressing, in English ” snarl.” The recingle, or small anvil with projecting upturned point, was known in the 16th century. This point is introduced into the hollow of the vase or other vessel such as punch and hammer cannot freely enter, which it is desired to ornament with reliefs. A blow of a hammer on that part of the anvil where the prolongation first projects from it, produces, by the return spring, a corresponding blow at the point which the operator desires to apply within the vase. The same effect is produced by the modern ” snarl ” or ” snarling iron ” — a bar of steel, with an inch or two of the smaller end upturned and ending in a knob — held firmly in a tightly screwed- up vice, whereby the blow is similarly repeated or echoed by vibration. The repousse work, when complete, is afterwards finished at the front and chased up. The same vase, to be worked up by embossing, would be filled with ” cement ” and laid on a sand-bag, and finally the whole would be heated and the cement run out. In the case of repousse the vase itself may be beaten up out of the metal on the pitch-block. It must be understood that in order to obtain a result not merely excellent in technique but artistic and unmechanical in effect, the blows of the hammer must be made with feeling and ” sentiment,’ 1 otherwise the result cannot be a work of art.

See C. G. Leland, Repousse Work (New York, 1885); and Gaw- thorp, A Manual of Instruction in the Art of Repousse (London, 2nd ed., 1899). (M. H. S.)

REPRESENTATION, a term used in various senses in different

connexions, but particularly in a political meaning, which has developed out of the others.

The word.

The word “represent ” comes from Lat. re-praesentare, to ” make present again,” or ” bring back into presence,” and its history in English may be traced fairly well by the citations given in the New English Dictionary of its earliest uses in literature in senses which are still common. Thus we find the verb meaning (1380) simply to “bring into presence,” and Barbour uses it (1375) in the sense of bringing clearly before the mind, whence the common sense of ” explain,” “exhibit,” “portray.” In 1513 it is used as synonymous with ” describe,” or ” allege to be.” In 1460 we find it em- ployed for the performance of a play or a part in a play, whence comes the sense of symbolizing, standing in the place of some one, or corresponding to something; and in 1655 for acting as authorized agent or deputy of some one. This is a notable point in the development of the word. In Cromwell’s speech to the parliament, January 22, 1655, he says: “I have been careful of your safety, and the safety of those you repre- sented.” This strictly political use of the verb developed, it will be seen, comparatively late.

The noun ” representation ” passed through similar stages. In 1425 we find it equivalent to ” image,” ” likeness,” ” repro- duction,” ” picture,” from which is derived a meaning hardly distinguishable from “pretence.” In 1553 it means a “state- ment ” or ” account,” a sense which leads later (1679) to that of a formal and serious plea or remonstrance. In 1589 it occurs for a performance of a play. In 1647 it is used in psychology for the action of mental reproduction, a technical sense which applies especially to the ” immediate object of imagination ” (Sir W. Hamilton), and in Kantian language becomes the generic term for percepts, concepts and ideas. In 1624 it comes to mean ” substitution of one thing or person for another,” ” substituted presence ” as opposed to ” actual presence,” or ” the fact of standing for, or in place of, some other thing or person,” especially with a right or authority to act on their account. Its application to a political assembly then becomes natural, but for some time it is not so found in literature, the sense remaining rather formal. Good instances of this use are: Gataker, Transubst. 4: “The Rocke was Christ onely symbolically and sacramentally, by representation or re- semblance ” ;

and R. Coke, Power and Subj. iii. : ” So cannot these members be formed into one body but by the king, either by his Royal Presence or representation.” Thus ” presence ” and ” representation ” are used in distinctive meanings. In Scots law (1693) it obtains the technical meaning of the assump- tion by an heir of his predecessor’s rights and obligations.

The term ” representative,” now specially applied to an elected member of a national or other assembly, deriving his authority from the constituency which returns him, appears to have been first used to denote not the member but the assembly itself. In the act abolishing the office of king, after Charles I.‘s execution, 1649, section iv. runs: ” And whereas by the abolition of the kingly office provided for in this Act, a most happy way is made for this nation (if God see it good) to return to its just and ancient right of being governed by its own Representatives or national meetings in council, from time to time chosen and entrusted for that purpose by the people, it is therefore resolved and declared by the Commons assembled in Parliament,” &c, ” and that they will carefully provide for the certain choosing, meeting and sitting of the next and future Representatives,” &c. But the application of the term to the persons who sat in parliament was at all events very soon made, for in 1651 Isaac Penington the younger published a pamphlet entitled ” The fundamental right, safety and liberty of the People; which is radically in themselves, derivatively in the Parliament, their substitutes or representatives.”

It is worth while to dwell on the historical evolution of the various meanings of ” represent,” ” representation ” and ” representative,” because it is at least curious that it was not till the 17th century that the modern political or parliamentary sense became attached to thern; and it is well to remember that though the idea of political representation is older and thus afterwards is expressed by the later meaning of. the word, the

actual use of ” representation ” in such a sense is as modern as that. In Burke’s speeches of 1769 1 and 1774-1775, relating to taxation, we find the word in this sense already in common use, but the familiar modern doctrine of ” no taxation without representation,” however far back the idea may be traced, is not to be found in Burke in those very words. The ” originator of that immortal dogma of our {i.e. American) national greatness ” was, according to the American writer M. C. Tyler (Amer. Lit. i. 1 54), the politician and philanthropist Daniel Gookin (1612-1687), an Irish settler in Virginia, who, moving to Boston and becoming speaker of the Massachusetts legislature, became prominent in standing up for popular rights in the agitation which resulted in the

withdrawal of the colonial charter (1686). But it was the vogue of the ” dogma ” in America, not its phrase, that he seems to have originated; and while the precise form of the phrase does not appear to be attributable to any single author, the principle itself was asserted in England long before the word ” representation,” in a political sense, was current. In English constitutional history the principle was substantially established in 1 297 by the declaration De Tallagio non concedendo, 1 confirmed by the Petition of Right in 1628.

The growth of the parliamentary system in England is traced in the article Parliament, but the account there given may be supplemented here by a more precise reference to The idea the evolution of the idea of political ” representa- ot political tion ” as such, and of its embodiment in the word now represen- employed to express it. The simple idea of the substi- “” lution of one person for another, in some connexion, e.g. hostage, pledge, victim, is so old as to be only describable as primitive; it is found in the proxy system, e.g. in marriage, and in diplo- macy, the legate or ambassador being the alter ego of his sovereign; but, so far as general political legislative action, by one man in an assembly on behalf of others, is concerned, no systematic employment of a ” deputy ” (the word still used both in a general sense and in politics as a synonym for “repre- sentative “) is known among the ancients. So long as political power rests in a small privileged class, such an idea must be slow to develop; and the primitive notion of a law-making body is that of all the members present in person, as in ancient Greece. But, as Stubbs {Const. Hist. i. 586) points out, the early English jury system (see Jury) shows the germ of the true idea of representation in England; it was the established practice of electing or selecting juries to present criminal matters before the king’s judges, and assessors to levy taxes on the county, that suggested the introduction of popular representation in the English political system, and thus brought ” the commons ” into play in addition to the Crown and the nobles. Under Henry III., in 1254, we have the writ (see Parliament) requir- ing the sheriff of each county to ” cause to come 3 before the King’s Council two good and discreet Knights of the Shire, whom the men of the county shall have chosen for this purpose in the stead of all and of each of them, to consider along with knights of other shires what aid they will grant the king.” But the definite establishment of the principle of political representa- tion, in a shape from which the later English system of repre- sentation lineally descended, may be traced rather to the year 1295, in Edward I.‘s famous writ of summons to parliament, of which the following is the important part. In the volume of Select Documents of English Constitutional History (1901), selected by G. B. Adams and

H. M. Stephens, whose version from the Latin we quote, the section is headed (ante-dating the use of the vital word), ” Summons of representatives of the counties and boroughs “: —

” The king to the sheriff of Northamptonshire. Since we intend to have a consultation and meeting with the earls, barons and other principal men of our kingdom with regard to providing remedies

1 The New English Dictionary, for its first citation of ” repre- sentation ” in an assembly, quotes Burke, Late St Nat., Works, ii. 138, i.e. in 1769.

2 ” No tallage or aid shall be laid or levied by us or our heirs in our realm, without the goodwill and assent of the archbishops, bishops, earls, barons, knights, burgesses and other freemen of our realm.

- ” Venire facias,” not ” elegi facias.”

no

REPRESENTATION

la England.

against the dangers which are in these days threatening the same kingdom : and on that account have commanded them to be with us on the Lord’s Day next after the feast of St Martin in the ap- proaching winter, at Westminster, to consider, ordain and do as may be necessary for the avoidance of these dangers: we strictly require you to cause two knights from the aforesaid county, two citizens from each city in the same county and two burgesses from each borough, of those who are especially discreet and capable of labouring, to be elected without delay, and to cause them to come to us at the aforesaid time and place. Moreover, the said knights are to have full and sufficient power for themselves and for ihe com- munity of the aforesaid county, and the said citizens and burgesses for themselves and the communities of the aforesaid cities and boroughs separately, then and there, for doing what shall then be ordained according to the Common Council in the premises, so that the aforesaid business shall not remain unfinished in any way for defect of this power. And you shall have there the names of the knights, citizens and burgesses, and this writ.”

The words ” Elegi facias,” instead of ” venire facias ” (which were retained in 1275; see Parliament), still appear to make the parliament of 1295 the model, rather than that of 1275, though in other respects

the latter appears now to have established the summoning of county and borough representatives.

In this summoning by the king of the two knights and two burgesses with full and sufficient power for themselves and for Growth ˆ e community, we find therefore the origin of political ofrepre- representation of the commons, as opposed to the sentailoa actual presence and personal attendance of the peers. The older English national assemblies had consisted of the privileged class fully summoned as individuals. The change involved has been well explained by E. A. Freeman (Ency. Brit., 9th ed., viii. 297), when he says: “The national assemblies changed their character … by no cause so much as by the growth of the practice of summons. ... In the great assembly at Salisbury (1086), where all the land- owners of England became the men of the king (William the Conqueror), we see the first germs of Lords and Commons. The Witan are distinguished from the ‘ land-sitting men.’ By the Witan, so called long after the Conquest, we are doubtless to understand those great men of the realm who were usually summoned to every assembly. The vast multitude who came to do their homage to the king were summoned only for that particular occasion. The personal right of summons is the essence of the peerage. . . . The earls and bishops of England, by never losing their right to the personal summons, have kept that right to personal attendance in the national assembly which was once common to all freemen, but which other free- men have lost. The House of Lords represents 1 by unbroken succession the Witan of the assembly of Salisbury, that is, it represents by unbroken succession the old assemblies of the Teutonic democracy. . . . The ‘ land-sitting men,’ on the other hand, not summoned personally or Fegularly, but summoned in a mass when their attendance was specially needed, gradually lost the right of personal attendance, till in the end they gained the more practical right of appearing by their representatives.”

From the same authority the account of the intermediate stages in the adoption of the representative principle may be further quoted: — –

” By the time of Henry II. the force of circumstances, especially the working of the practice of summons, had gradually changed the ancient assembly of the whole nation into a mere gathering of the great men of the realm. ... It is in the reign of Richard I. that we begin to see the first faint glimmerings of parliamentary represen- tation. . . . The object of his wise ministers, of Archbishop Hubert among the first, was to gain the greatest amount of money for their master with the least amount of oppression towards the nation. Under Hubert’s administration, chosen bodies of knights or other lawful men, acting

in characters which became more and more dis- tinctly representative, were summoned for every kind of purpose. How far they were nominated, how far freely elected, is not always clear. It seems most likely that in one stage they were nominated by the sheriff in the county court, while at a later stage they were chosen by the county court itself. In other words, the principle of representation was first established, and then the next stage naturally

1 The inevitable use of the word ” represent ” in its wider sense (” corresponds to “), is worth noting in this passage from Freeman, side by side with the more technical one in representative ” (” chosen delegate “).

was that the representatives should be freely chosen. Summo*ed bodies of knights appear in characters which are the forerunners of grand jurors and of justices of the peace. They appear also in a character which makes them distinctly forerunners of the knights of the shire which were soon to come. A chosen body of knights have to assess the imposts on each shire. From assessing the taxes the next stage was to vote or to refuse them. In 1213 the sheriffs are called on to summon four discreet men from each shire, to come and speak with the king about the affairs of the realm. When we have reached this stage, we have come very near to a parliament, name and thing. The reign of John, in short, is marked by common consent as the time from which Englishmen date the birth of their national freedom in its later form . . The (Great) Charter (1215) is the first solemn act of the united English nation after Norman conquerors and Norman settlers had become naturalized Englishmen. . . . Representation was already fast growing up; but it had hardly yet reached such a stage that it could be ordained in legal form. But rules are laid down out of which, even if it had not begun already, representation in the strictest sense could not tai; shortly to arise. The distinction which had been growing up ever since the Conquest, and indeed before, between the Witan and the land-sitting men, now receives a legal sanction. The practice oi summons makes the distinction. Certain great men, prelates, earls and greater barons, are to receive the personal summons. The rest of the king’s tenants-in-chief are to be summoned only in a body. Here we have almost come to a separation of Lords and Commons. But in modern ideas those names imply two distinct houses; and it was not yet settled, it had not yet come into men’s minds to consider, whether the national council should consist of one house or a dozen. But if is decreed in so many words that the acts of those who came would bind those who stayed away. On such a provision, representation, and not only representation but election o.f the representatives, follows almost as a matter of course- The mass stay away: a few appear, specially

commissioned to act in the name of the rest. The Charter mentions only the king's tenants-in-chief; so far had things been marred or feudalized by the influence of the Conquest. But as the election could only be made in the, ancient county court, every freeholder at least, if not every freeman, won back his ancient right. If he could not come himself to say Yea or Nay, he at least had a voice in choosing those who could do so with greater effect."

.(Ibid. pp. 307, 308.) " The constitution of the (national) assembly, as defined in the Great Charter, did not absolutely imply representation; but it showed that the full establishment of representation could not be long delayed. The work of the period 1217-1340 was to call up, alongside of the gathering of prelates, earls and other great men specially summoned, into which the ancient Witanagemot had shrunk up, another assembly directly representing all other classes of the nation which enjoyed political rights. This assembly, chosen by various local bodies, communitates or universitates, having a quasi corporate being, came gradually to bear the name of the commons. The knights of the shire, the barons, citizens and burgesses of the towns, were severally chosen by the communa or communitas of that part of the people which they represented." 2

" The notion of local representation, by which shires and boroughs chose representatives of their own communities, had to some extent to strive with another doctrine, that of the representation of estates or classes of men. The 13th century was the age when the national assemblies, not only of England but of most other Euro- pean countries, were putting on their definite shape. And in most of them the system of estates prevailed. These in most countries were three, — clergy, nobles and commons. By these last were commonly meant only the communities of the chartered towns, while the noblesse of foreign countries answered to the lesser barons and knights, who in England were reckoned among the commons. The English system thus went far to take in the whole free popula- tion, while the estates of other countries, the commons, no less than the clergy and nobles, must be looked on as privileged bodies. In England we had in truth no estates: we had no nobility in the foreign sense. . . . Yet the continental theory of estates so far worked in the development of our parliamentary system that the ' Three Estates of England ' became a familiar phrase. It was meant to denote the lords, the commons and the clergy in their parliamentary character. For it is plain that it was the intention of Edward I. to organize the clergy as a parliamentary estate, alongside of the lords and commons. This scheme failed, mainly through the unwillingness of the clergy themselves to attend in a secular assembly. This left, so far as there were any estates at all, two estates only, —

lords and commons. This led to the common

2 Professor Masterman, lecturing (1908) on the House of Commons, has pointed out how fortunate it was that this beginning of the organization of the communes into a central body did not come earlier than it did. Had there been one assembly representing the local communitates at any earlier time it would have been far too sectional in character and far too little conscious of any common interest. The organization did not begin till England had become a self-conscious body, realizing its common interests and the common destiny that belonged to it as a nation.

in

mistake of fancying the three estates to be king, lords and commons. The ecclesiastical members of the House of Lords kept their seats there; but the parliamentary representation of the clergy as an estate came to nothing. So far as the clergy kept any parliamentary powers, they exercised them in the two provincial convocations. These anomalous assemblies, fluctuating between the character ol an ecclesiastical synod and of a parliamentary estate, kept, from Edward I. to Charles II., the parliamentary power of self -taxation. For a long time lords and commons taxed themselves separately. So did the clergy ; so sometimes did other bodies. . . .

” During the reign of Henry III. assemblies were constantly held, and their constitution is often vaguely described. But in a great many cases phrases are used which, however vague, imply a popular element. We read of knights, of tenants in chief, of freemen, sometimes even of freemen and villeins, sometimes, more vaguely still, of ‘ universi,’ ‘ universitas Angliae,’ and the like. In some cases we are abte better to interpret these vague phrases. For instance, in 1224 each shire sends four knights chosen by the ‘ milites et probi homines.’ Whether these knights were or were not to vote along with the magnates, they were at all events to transact business with them. We must always remember that in these times formal voting in the modern sense is not to be looked for.” 1 (Ibid. pp. 314, 315.)

This summary shows clearly how the idea of ” representa- tion ” as opposed to ” presence in person ” was applied to the The English parliament, so as to give the commons a

Theory of proper voice in it as well as the lords. It is unnecessary Repre- h ere t trace further the gradual increase in power of seniatton. ˆ e jj ouse f Commons till it became the predominant partner in the English bicameral constitution (see Parliament) . But from the point of view of historical theory it is important to note that its representative character does not essentially depend upon the particular method (election by vote) by which its members have for so long been chosen. It is a common error to regard the House of Commons as having a national authority higher than that of the House of Lords merely on the ground that it is composed of elected members, and to stigmatize the House of Lords as “unrepresentative” because it is not elected. But in strictness the question of election, as such, has nothing to do with the matter. 2 The proper distinction (ignoring for the moment the later inclusion in the House of Lords of a certain representative element — strictly so regarded — in the Scotch and Irish peers) is that the House of Lords, as still constituted in 1910, remained a presenlative chamber, while the House of Commons was essentially a representative one; in the former the members, summoned personally as individuals, were entitled to speak in the great council of the nation, while in the latter the members were returned as the mouthpieces of whole eommuni- lates, to whom, in the person of the sheriffs, the summons had been directed to send persons to speak for them. 3 The pre- ponderant authority of the House of Commons is due not to its v members being elected— that is only one way of settling who the mouthpieces of the commons shall be — but to the progress of

1 ” Election ” in these early times has its simple meaning of “choice.” ” We must guard ourselves from supposing that the citizens and burgesses, who were summoned to Parliament, were absolutely elected by the inhabitants of the towns as their repre- sentatives. _ Their presence in Parliament is another instance of representation without election. They were often nominated by the sheriff of the county, and even when that great officer, from negli- gence or favour, permitted the return to be made by those interested in the transaction, the nomination was confined to the small govern- ing body, who returned two of their members, in general very un- willing missionaries, to the great council ” (Disraeli, Vindication of the British Constitution, 1835).

2 In the American federal system the bicameral legislature is divided into a ” House of Representatives,” composed of members elected by popular vote in each state, and a ” Senate,” composed of members elected by the legislature in each state. In spite of the nomenclature, both houses are really composed of ” representatives.” But under a republican system there is no room for a purely pre- sentative assembly, and the term ” representative ” comes to imply a more direct choice by the ” commons.”

3 There was at one time, it may be noted, a sort of ” representative ” element even in the case of the House of Lords, in so far as peers (including peeresses in their own right, abbesses, &c.) could send deputies or proxies. But it must be remembered that the privilege flowed “directly from the personal and presentative character of the summons to a peer, who as such could name a deputy. It is quite illegitimate to strain from it an analogy with the election of a repre- sentative by the commons, who had no personal right to a summons.

popular government. The two British houses have historically existed as assemblies of the separate estates of the realm — the House of Lords of the two estates of lords spiritual and temporal, and the House of Commons of the commons. The third estate has so increased in power as to become predominant in the country; but the authority of its own assembly simply depends on the powers of those it represents. If the balance of political power had hot been shifted in the country itself, the authority and competence of the peers, speaking for themselves in a primary assembly, would in theory actually appear higher, so far as their order is concerned, than that of members of the House of Commons, who can only ” represent ” the popular constituencies. Moreover, the fact that most members of the House of Commons are elected by a party vote is apt to make them very often even less authoritative spokesmen of their constituencies — the communitates — than if they were selected by some method which would indicate that they had the full confidence of the whole body they ” represent.” It is notorious that many members of a modern House of Commons, or of any other ” representative ” assembly, have only been elected by the votes of a minority of their constituency, or (where there have been more than two candidates) a minority even of those who voted; and there always comes a time when it is certain that if a representative has to come again before the electorate for their votes he will be defeated; he, in fact, no longer reflects their views, while he still sits and legislates. The real desires of the commons in a certain British constituency may even be more faithfully, even if only accidentally, reflected by a local peer whose only right to speak in parliament is technically presentative. In his

Vindication of the British Constitution (1835), Disraeli, writing of the Reform Bill of 1832, observed that ” in the effort to get rid of representation without election, it will be well if eventually we do not discover that we have only obtained election without representation.” A truer word was never spoken. A man may be representative, practically consensu omnium, although no vote, resulting from a division of opinion, has been taken for the purpose of selecting him. The vote is merely a method of selection when there is a definite division of opinion involving an uncertainty; and even in the modern House of Commons many members are returned ” un- opposed,” no actual voting taking place. A well-recognized representative character (as regards the functions involved) attaches, for instance, in British public life to other persons in whose selection the method of popular voting has had no place; such as the king himself, the Cabinet (in relation to the political party in power), or the bishops (as regards the Church of England).

The question of remodelling the constitution of the British House of Lords was prominently before the country in 1910 ; and a large number even of those who were prepared to ~.

defend its actions in the past were ready to accept British changes which would make it in form and composi- Houses tion a Second Chamber representative of the nation ofPariia- rather than presentative of its historic order. But ment ‘

it is important to remember, in connexion with the House of Lords question, that, in a country like England, where the con- stitution has provided for a Second Chamber which is composed of members of an estate or estates distinct in the nation from the estate of the commons, these persons may to a predominant degree nevertheless be really representative men by common consent; while their being so. though not theoretically the reason for their legislative power, is substantially the reason why it has so long persisted. In the absence of a written constitution, theoretical considerations have in England always been second to the force of circumstances. Most people regarded the House of Lords, as still unreformed in 1910, as purely a hereditary body; its members had been summoned to parliament as peers (the important question of their right to a summons need not here be discussed), and most peers enjoyed their titles by hereditary succession. But the constant creation of peers by both political parties had in fact introduced even into the constitution of the House of Lords

an essentially representative ele nent (though not resulting from direct election), apart altogether from the fact that heredity maintained there a number of persons whose title had des- cended from men who were originally representative Englishmen, and whose successors, on the whole, were no less so. In the days when kings really governed in England, the most powerful check on the king, in the interest of the nation at large, was the peerage; the earls and barons, in parliament, were the chief bulwark of the people against tyranny. It was they who stood for the nation in extorting Magna Carta from King John; and as time went on, the representation of the commons in parliament was largely due, not to any direct popular pressure, but to the desire of the kings to influence the lower ranks of society independently of the nobles. Up to the reign of Charles I., at all events, the House of Lords was actually the predominant partner in parliament; the House of Commons was recruited from and returned by only a small section of the commons as now understood; and Oliver Cromwell — certainly a " popular " leader in the ordinary sense — made as short work of it as he did of the king himself. Up to 1832, when the first modern Reform Act was passed, the House of Commons was an oli- garchical body, and the electors themselves were a small and privileged class. It is only since then — except in the granting of supplies — that first equality, and then predominance, in respect of the House of Lords, has been asserted by the House of Commons, owing to the fact that an extended suffrage has made the estate of the commons more adequately coincident with the nation as a whole. Prior to 1832 it was the king who directly made and unmade ministries; in 1835 for the first time the result of a general election caused a change of ministry; and the modern view of the House of Lords as purely a revising chamber dates only from then. But the very fact that the responsibility for creating new peerages now passed to ministers dependent on popular suffrage may well justify the contention that hence- forth it indirectly included a select number of representative men of the nation, holding their seats in virtue of authoritative nomination and not by heredity. In the sixty years preceding 1006 no fewer than 419 new peerages were created, 238 by the Liberal party, 181 by the Conservative, or a balance of 57 creations on the Liberal side. 1 It is fair to assume that all these new peers were created as being representative men in the nation for one reason or another. And an analysis of the composition of the House of Lords in 1906 would have led an unprejudiced outside observer to suppose that its competence to speak on national affairs had not been weakened by any dependence on the hereditary title. It included 166 men who had been

M.P.‘s (i.e. had been elected by popular vote to the House of Commons) , 172 who had held government office, 140 who had been mayors of county councils, 207 who had served in the army or navy, 40 who had been judges or lawyers, 7 ex-viceroys, 16 ex- governors of colonies, 50 who had been eminent in art, letters, manufactures or trade, and 21 archbishops or bishops (appointed by ministerial recommendation, but only after they had worked up to eminence from being curates, and therefore had wide experience of the social life of the people).

It is possible to compare a chamber so composed some- what favourably with a modern House of Commons, if the point at issue — the provision of ” representative men ” (i.e. men generally accepted as national spokesmen) — be strictly considered, apart from the method of selecting them by direct popular vote. 2 In the House of Lords the method is heredity plus selection by the political party which the popular vote has put in power; while in the election of members of the House

1 Between January 1906 and January 1910 thirty-five more new peers were created by Liberal premiers, and seven more in June 1910.

2 Speaking at Oldham on December 15, 1909, Lord Curzon said: ” I have taken out the figures of the past 200 years, and I tell you this, that during that time 41 of our prime ministers have sat in the Lords and only 17 in the Commons; of our foreign secretaries, 56 in the Lords and only 8 in the Commons ; of our colonial secretaries, 46 in the Lords and 25 in the Commons; of our war ministers, 29 in the Lords and 31 in the Commons; of first lords of the Admiralty, i& in the Lords and 28 in the Commons.”

of Commons the popular choice is doubly limited — first, by the fact that only the enfranchised commons can vote (in 1910 about 7 J millions out of 43); and secondly, because the choice must be made from among candidates who are themselves not disqualified for various reasons (for instance they must not be clergymen, nor entitled to seats in ihe House of Lords). Now, to carry out the real ” will of the nation ‘.’ in parliament must require (1) a reasonable knowledge of the wishes of the nation, and (2) an understanding of the best ways of expressing those wishes in legislation and adminis- tration. In the case of the peers, those who sit as having been originally created and therefore selected for the purpose — a considerable section of those actively attending — the quali- fications are obvious: and it is only necessary to deal with those qualified by inheritance of title. Here too, in a number of cases, preceding experience in the House of Commons,

to which the popular vote has returned them while they were only in the succession to a peerage, is a frequent factor; but, apart from that, the art of legislation is one which may well be con- sidered to require a certain special disposition and rhental equipment. Though allowance must be made for exceptional cases, it is obvious that the son of a man who has been respon- sible for legislating, who has himself been brought up as one who will have to take his part in legislating, is most likely, in any society, to have qualified himself for the business, as in the case of any profession or trade. He has been accustomed to breathe the parliamentary atmosphere, and as one of a leisured class has had the opportunity to study the subject of legislation, and to obtain experience of its conditions. This is so generally accepted that, in fact, the same theory is com- monly applied to candidates for the House of Commons, and predominantly to members of that House who are given office. The names of more than one generation are writ large in English history in the case of the Pitts, Foxes, Grenviiles, Cannings, Cecils, Stanleys and Cavendishes. The sons of famous political commoners, a Gladstone, a Harcourt, a Churchill, a Primrose, a Chamberlain, have by consent a superior claim, even within the radical or popular party, by no means resting originally or primarily on known personal merit or proved experience, for selection as candidates and then for preferment to office; and it is a very common occurrence for younger sons of peers to be selected as candidates (liberal as much as conservative) for parliament, even though from general intellectual considera- tions they may appear in no way the equals of other men. They have been brought up to the business; and they are -therefore adapted for it by heredity. If the House of Commons were deprived of those members who obtained their seats or their offices primarily for reasons of heredity, it would lose many of its best men — as indeed it occasionally does, to its disadvantage and possibly to the chagrin of the individuals themselves, when succession to a peerage forces a prominent parliamentarian to relinquish his seat in the Lower House and to take his place in the ” unrepresentative ” chamber.

It remains nevertheless the fact that, in politics, ” repre- sentative ” government means not so much government by men really representative of the nation as government in Expres . the name of the whole body of citizens (and predomi- s i oa f nantly the estate of the commons) through a chamber the” Wilt or chambers composed of elected deputies. The j£**f „ object in view is the expression of the ” will of the people ” — the people, that is, who are sovereign. Clearly the only pure case of such government can be in a republic, where there is only one ” estate,” the free citizens. The home and historical

type of representative government, the United Kingdom, is strictly no such case, since the monarchy and the House of Lords exist and work on lines constitutionally independent of any direct contact with the electorate. British practice, however, is of vital importance for the theory of repre- sentative institutions, and it is worth while to point out that the ” will of the people ” may even so be effectively expressed — some people may think even more effectively expressed than in a pure republic. The king and the House of Lords, quti.

estates of the realm, are just as much part of ” the people,” in the widest sense, as ” the commons ” are; they are an integral part of the nation. In a republic they would as individuals be equal citizens, able to become candidates for the representative chamber or chambers; but as it is, since they are expressly debarred from taking part in elections to the House of Commons, they remain entitled and expected to use their historic method of playing a part in the government of the state. They assist to constitute ” the people ” in the wider sense, and in the narrower sense ” the people ” {i.e. the commons) know it and rely on it. Under the British constitution the commons have habitually relied on the monarchy and the House of Lords to play their part in the state, and on many occasions it has been proved, by various methods by which it is open to the commons themselves to show their real feeling, that action on the part of the monarch (e.g. in foreign affairs) or the House of Lords (in rejecting or modifying bills sent up by the House of Commons) , in which a popular vote has played no initiating or controlling part, is welcomed and ratified, by consent of a large majority, on the part of the nation at large. So much is this so that it is notorious, in the case of the House of Lords, that elected members of the House of Commons, tied by purely party allegiance and pledges, have constantly voted for a measure they did not want to see passed, relying on the House of Lords to throw it out. Ultimately, no doubt, the reconciliation of this ” presentative ” element in the British form of constitution with the growth of democracy . and the predominance of the ” representative ” system depends purely on the waiving of historical theory both by king and peers, and its adaptation to the fact of popular government through the recognition that their action rests for its efficient authority upon conformity with the ” will of’the people.” Thus it has become an established maxim in England that while it is the proper function of the House of Lords to reject a measure which in their opinion is not in accordance with the wishes of the nation, they could not repeat such a rejection after a general

election had shown that its authors in the House of Commons were supported by the country. The experience of politics from 1832 to 1910 gave abundant justification to the House of Lords for supposing that in such cases they were interpreting the desire of the country better than the House of Commons; the case of the Irish Home Rule bill of 1893 is, of course, the classical example. 1 So that in practice the House of Lords only acts in opposition to the House of Commons, subject to the remedy of a dissolution of parliament (which depends strictly on the prerogative of the Crown, but in practice on the advice of the leader of the majority in the House of Commons), at which the view of the House of Commons might be confirmed and reasserted, and in that case would prevail. The violent attacks made on the House of Lords by the Liberal party, on occasions when that party has had a majority in the commons and has had its measures rejected or distastefully amended, have always been open to the criticism that if the majority in the House of Commons were really supported by the electorate in the country they had the remedy in their own hands. If it were shown by the result of a general election that their defeated measure were the ” will of the people,” the House of Lords, as was generally understood, must give way. Such a position, though naturally objectionable to a party in power in the House of Commons (because general elections are uncertain things in every respect but that of trouble and expense), could clearly be strong only in view of the confidence of the House of Lords in its action being more truly representative of public opinion. It therefore must be said to have acted, however clumsily and indirectly — and no direct way would be feasible except that of the Referendum — as a ” representative ” body, i.e. as carrying out what it judged to be the national will and not merely the will of the peers, although not constituted as 1 The result of the general election of January 1910, following on the rejection of the Budget by the House of Lords, cannot properly be said to show anything to the contrary. It was notorious that there was no genuine majority in the new House of Commons for the Budget, and that the Irish Nationalists only voted for it as part of an arrangement for ulterior purposes.

such in the narrower sense. In practice, and in accordance with this view, it has on more than one occasion (e.g. in the case of the Trades Disputes Act of 1906) accepted and passed measures which it was notorious, and indeed avowed, that the peers themselves regarded as bad.

The immense extension of the ” representative principle ” in government, by means of popular election, and its adaptation to municipal as well as national councils, has in recent times resulted in

attracting much attention to the ™w es , B problem of making such elected bodies more accurately obtaining representative of public opinion than they frequently Repre- are. There are three distinct problems involved — sentation (1) that of making the number of enfranchised citizens tlon. correspond to a real embodiment of the nation; (2) that of getting candidates to stand for the office of representative who are competent and incorruptible exponents of the national will, and (3) that of adopting a system of voting which shall result in the elected representatives forming an assembly which shall adequately reflect the balance of opinion in the electorate.

(1) The history of the gradual extension of the franchise in the United Kingdom is given under Parliament, and the conditions for other countries under their respective headings. But while, in countries with a representative suffraze system at all, the question as to the extent to which the male citizens shall have the vote is mainly one of degree — as to property or other qualification, up to the inclusion of all adults (see Vote and Voting) — the question of the incapacity of women, as a sex, raises a distinction which is more radical. The facts as to the progress of the movement for women's suffrage are given in the article Women. It is only necessary to say here that, where the franchise is limited to the male sex, the theory of "no taxation without representation " is under modern conditions of life carried out in a decidedly one- sided way. The question of women's suffrage is, however, one of public policy, in whatever state it is raised; and even where, as in Great Britain, it has been adopted for municipal affairs, a distinction is commonly made as regards the national assembly. So far as the historical facts as to the disability of women are concerned, it has been unanimously decided in England by the highest law-court of the realm (judgment of the House of Lords in the Edinburgh University case, December 1938), presided over on this occasion by a Liberal Lord Chancellor (Lord Loreburn), that, according to their authoritative statement of the common law, women never had in earlierˆ times any legal right to vote for members of parliament; this judgment is therefore entirely adverse to such ingenious arguments to the contrary as are ably expressed in Mrs Charlotte Carmichael Stopes's British Free- women (1907).

Sex, however, apart, there are various interesting questions as to the principles which should govern the extension of the suffrage and its limitations, to which a brief reference may here be made. It is noteworthy that John Stuart Mill, the philo- sophical radical whose work on Representative Government (first published in 1861) is a classic on the subject, and who regarded the representative system as the highest ideal of polity, made a good many reservations which have

been ignored by those who frequently quote him. Mill's ideal was by no means that popular government should involve a mere counting of heads, or absolute equality of value among the citizens. While holding that " no arrangement of the suffrage can be permanently satisfactory in which any person or class is peremptorily excluded, or in which the electoral privilege is not open to all persons of full age who desire to obtain it," he insisted on " certain exclusions." Thus he demanded that universal education should precede universal enfranchisement, and laid it down that if education to the required amount had not become universally accessible and thus a hardship arose, this was " a hardship that had to be borne." He would not grant the suffrage to any one who could not read, write and perform a. sum in the rule of three. Further, he insisted on the electors being taxpayers, and emphasized the view that, as a condition annexed to representation, such taxation should descend to the poorest class

" in a visible shape," by which he explained that he did not mean " indirect taxes," a " mode of defraying a share of the public expenses which is hardly felt." He advocated for this purpose " a direct tax, in the simple form of a capitation " on every grown person. But even more than this, he was in favour of a form of plural voting, so that the intellectual classes of the community should have more proportionate weight than the numerically larger working-classes: " though every one ought to have a voice, that every one should have an equal voice is a totally different proposition." The well-informed and capable man's opinion being more valuable than that of the barely qualified elector, it should be given more effect by a system of plural voting, which should give him more votes than one. As to the test of value of opinion, Mill was careful to say he did not mean property — though the principle was so important that he would not abolish such a test where it existed — but individual mental superiority, which he would gauge by the rough indica- tion afforded by occupation in the higher forms of business or profession, or by such a criterion as a university degree or the passing of an examination of a fairly high standard.

" Until there shall have been devised some mode of plural voting, which may assign to education as such the degree of superior in- fluence due to it, and sufficient as a counterpoise to the numerical weight of the least educated class, for so long the benefits of completely universal suffrage cannot be obtained without bringing with them, as it appears to me, more than equivalent evils." " Equal

voting," he repeated, " is in principle wrong, because recognizing a wrong standard, and exercising a bad influence on the voter's mind. It is not useful, but hurtful, that the constitution of the country should declare ignorance to be entitled to as much political power as knowledge."

Modern democracy may ignore Mill's emphatic plea for plural voting, as it ignores his equally strong arguments against the ballot 1 — his contention being that secret voting violated the spirit of the suffrage, according to which the voter was a trustee for the public, whose acts should be publicly known — but Mill's discussion of the whole subject proceeds on high grounds which are still worth careful consideration. Where a representative system, as such, is extolled as the ideal polity, the reservations made by Mill, a liberal thinker who cannot be dismissed as a prejudiced reactionary, should be remembered. Mill postulated, in any event, a state of society which was worthy of such a system, no less than the necessary checks and balances which should make it correspond to the real conditions of rational government. " Representative institutions," he pointed out, " are of little value, and may be a mere instrument of tyranny or intrigue, when the generality of electors are not sufficiently interested in their own government to give their vote, or, if they vote at all, do not bestow their suffrages on public grounds, but sell them for money, or vote at the beck of some one who has control over them, or whom for private reasons they desire to propitiate. Popular election, as thus practised, instead of a security against misgovernment, is but an additional wheel in its machinery." When, in modern days, advocates of repre- sentative institutions seem ready to extend them to all countries, they become doctrinaires who depart widely from the standpoint of Mill, and forget that democracy is itself only a " form of government," as Sir Henry Maine insisted, for which all com- munities may not be ripe or fitted. The ideal form of govern- ment must be relative to a certain state of civilization and certain conditions of national life, and its advantages can only be tested by results and practical working.

(2) As regards the important question of the selection of candidates (which depends partly on their willingness to stand, Selection and partly on the means available for discovering of Candi- suitable persons) , modern practice is entirely dominated

es " by the organization of political parties and the require- ments of party allegiance. Though much has been said as to the desirability or not of paying members for their services (see Payment or Members), this is certainly overshadowed by the question of the availability of really capable men at all to the number required, for all candidates

become ” professional ”

1 Before 1872, when the Ballot Act was passed, voting was public.

politicians, whether paid or not. The ideal of having a ” representative man ” in the broader sense as a ” representative ” in the narrower is only very roughly attained where the conditions of public life make a capacity for electioneering a necessity. To a large extent the political candidate depends purely upon the support of a party organization. His choice rests with party wire-pullers, and the average individual elector is confronted with the task of voting for some one of whom he may personally know very little, except that, if returned, the candidate will in parliament vote for measures embodying certain general prin- ciples as indicated in some vague party programme. Since the elector as a rule himself supports a party, he votes accordingly, but there are always a good many electors who under such a system fail to get a chance of voting for a candidate who fully represents their views. The supremacy of party interests, resulting from the difficulty of having any other form of electoral organization, is apt to bring many evils in its train, including the corruption of the electorate, and the practice of ” lobbying,” i.e. the pressure upon members in parliament of important ” interests ” whose electoral assistance is indispensable.

(3) The more important point to be considered here is the third. When a representative assembly is to be elected by a direct popular vote, it is obviously necessary (a) that Systems either there should be some system by which the whole of Voting. body as a unit should elect all the members en bloc, or, as this usually appears impracticable, that the mass of electors should be divided within defined areas, or ” constituencies “; and (b) that in the latter case voting shall take place for the purpose of electing one or more representatives of each such area according to some method by which due effect shall be given to the preferences of the – electors. In theory there can be no perfectly fair arrangement as between constituency and constituency, where a single repre- sentative is to be returned, except on the terms that they are ex- actly equal in the number of electors; each elector’s voice would then count equally with that of any other in the nation (or mutatis mutandis in the municipality, &c). But in practice it is difficult to the point of impossibility to attempt more than an arbitrary distribution of electoral areas, more or less approximating to equality; and recourse is had to the formation of constituencies out of geographical districts taken as units for historical or practical reasons, and necessarily fluctuating from time to time in population or influence. It may become necessary periodi- cally to revise these areas

by what in England are called Re- distribution Acts, but it has to be admitted that any perfect system of representation is always stultified by the necessary inequalities involved; and what is known as ” gerrymandering ” is sometimes the result, when a party in power so recasts the electoral districts as to give more opportunity for its own candidates to be returned than for those of its opponents. This flaw is particularly noticeable when the arrangement for the method of voting is that which allots only one member or representative to each district {scrutin d’arrondissement). The essential vice of this single-member system, which prevails in the United Kingdom 2 and the United States, is the lack of correspondence between the proportions in which the elected members of each party stand to one another and the proportions in which the numbers of the electors who returned them similarly stand; and it may well be that the minority party in the country obtains a majority of representatives in the assembly, or at any rate that .a substantial minority obtains an absurdly small representation. ” As a result of the district system,” writes Pro- fessor J. R. Commons of Wisconsin (Proportional Representation, I 9°7), ” the national House of Representatives (in America) is scarcely a representative body. In the Fifty-first Congress, a majority of representatives were elected by a minority of the voters “; the figures being 5,348,379 Republican votes with 164 elected, and 5,502,581 Democratic votes with 161 elected. In

2 The House of Commons in 1910 was elected by 643 constituencies, of which 27 (including three universities) returned two members each, and the rest one; and the Royal Commission, which reported in that year, recommended the abandonment of the existing two member constituencies ” at the earliest convenient opportunity.”

the case of the Fifty-second Congress, the Democrats, with 50-6% of the votes, returned 71-1% of the representa- tives; the Republicans, with 42-9% of the votes, returning 26-5% of the representatives. Lord Avebury (Propor- tional Representation, 1890; new ed. 1906) has given various similar experiences in England; thus, at the general election of 1886, the Liberals, with 1,333,400 votes, only obtained 176 seats, while the Unionists, with 1,423,500, obtained 283 (not counting 99 unopposed returns on the Liberal side, and in on the Unionist). In the general election of 1895, at which 132 Unionist seats and 57 Liberal were unopposed, the result in the 481 seats contested was the return of 279 Unionists and 202 Liberals; yet the actual votes

given were 1,800,000 for the Liberals, and 1,775,000 for the Unionists. Again, in 1906, the Unionist vote, though 44% of the total cast, returned only 28% of the members, and the Liberal majority, which in strict proportion would have been 68, actually was 256.

The establishment of mere party majority rule, which is characteristic of a representative system, is a necessity, no doubt, in popular government; but the way in which a substantial minority of voters may only obtain a contemptible minority of members, and may in practice be tyrannized over in con- sequence, somewhat detracts from its blessings, and leads to extreme party measures. The division of the whole electoral body into constituencies is, after all, only a device for getting over the difficulty of the electors voting en bloc, and it does not seem to justify the conversion of a real majority in the country into a minority as represented in parliament, nor the complete exclusion of a substantial number of the electorate from parliamentary representation — so far as their views are concerned — at all. Yet under the English system such results are possible as the capture of every seat in Wales (34), in 1906, by the Liberal party, with 217,462 votes, the 100,547 Unionist voters having no representation in parliament; while in Warwickshire, though 22,490 votes were given to the Unionist candidates against 22,021 for the Liberal, three Liberals were returned against one Unionist.

The attempt to rectify this flaw in the representative method has led to the suggestion of various devices by the adoption Prooor- °^ w hich the elected members may correspond more tlonal equally to the divisions of opinion in the electorate. repre- Under the plan of scrutin de lisle (or ” general ticket “) sentatlon. j ar g er districts are created, each returning several members, and each voter has as many votes as there are members to elect; but while this system apparently provides the opportunity for the return of candidates with different views, it only requires a solid party vote to capture the whole of the representation for a majority. What is known as the ” limited vote ” is a form of scrutin de liste by which the elector has less votes than there are seats to be filled; with (say) three to be elected, the elector has only two votes. Systems of ” limited vote ” are in force in Portugal, Spain and Japan. A somewhat better plan is the ” cumulative vote, ” which gives each elector as many votes as there are members to be elected, but allows him to divide them as he pleases (instead of giving only one vote to any one candidate). This enables an organized minority, by concentrat- ing their votes, to elect at all events some representative; but the ” cumulative vote ” works rather capriciously, and is com- monly defeated by careful party organization.

A more elaborate plan, but depending like the ” limited ” vote and the ” cumulative ” vote on the formation of constitu- encies returning three or more members each, is that of the ” transferable vote. ” By this device an elector can indicate on his ballot paper not only his first choice, but also his second or third, &c. To ensure election a candidate need not obtain a majority of the votes polled, but only a certain number, so fixed that it can be obtained by a number of candidates equal to the number of seats to be filled, but by no more; this number of votes is called the ” quota. ” At the first count first choices only are reckoned, and those candidates who have received a ” quota ” or more are declared duly elected. If all the seats

have not then been filled up, the surplus votes of those candi- dates who have received more than the ” quota ” are trans- ferred according to the names marked (2) on them. If these transfers still do not bring the requisite number of candidates up to the ” quota, ” the lowest candidate is eliminated and his votes transferred according to the next preferences, and so on till the seats are filled This system, which is the one usually associated with the term ” proportional representation ” was first suggested by Thomas Hare, who published in 1857 a pamphlet on The Machinery of Representation, and in 1859 a more complete scheme in his treatise on The Election of Representatives. John Stuart Mill, in Representative Govern- ment (1861) warmly endorsed Hare’s proposal. Hare wished to treat the whole country as one constituency, but by later supporters of the ” transferable vote ” that plan was abandoned as impracticable; and the principle will work so long as the constituencies adopted each return several members. Lord Courtney, in his evidence before the British Royal Commission in 1909, said that his minimum constituency would be a three-membered one, but he would create a fifteen-membered con- stituency without hesitation. The simple ” transferable vote ” has been adopted in Tasmania for all elections (1907)’, after experimental adoption in the constituencies of Hobart and Launceston in 1896-1901, and in the election of the Tasmanian members of the Commonwealth leglislature in 1900. It was proposed in the draft of the South African constitution, but abandoned. The principle has also been adopted in the ” list systems ” of Belgium, some Swiss cantons, Sweden, Finland and parts of Denmark, Wiirttemberg and Servia, where candi- dates are grouped in lists and all votes given to individual candidates on the list count first as votes for the list itself, the seats being divided among the lists in proportion to the total number of votes obtained by the list. The use of the general term ” proportional representation ” for all of these is, however, somewhat misleading; people often suppose that only one identical system of voting is meant, whereas in fact some 300 possible

varieties have been proposed, and each of the states mentioned has a different one from all the others. The only common element is the device of the ” transferable vote, ” i.e. the method of having an ” electoral quota, ” and the filling up of seats, where a quota is not provided by the first choices, by votes transferred from the second choices, and so on. It may be noted here that the ” transferable vote ” is calculated to multiply candidates to a point at which the minds of the electorate may well be embarrassed as to their preferences (the largest Belgian constituency returns 22 mem- bers), and, while undoubtedly providing for ” minority repre- sentation, ” to encourage what may be called ” minority thinking ” and particularist politics. The ” transferable vote ” is commonly objected to as puzzling to the electors and too complicated for the scrutineers, while it is not much favoured by ” machine ” party organizations, which generally prefer the simpler plan of rough-and-ready majorities; but it has received a growing amount of theoretical support, as well as success in practical experiment, in recent years.

The ” second ballot ” is a device for securing absolute majority, instead of relative majority, representation. Where the two- party system prevails, it is usual for only two The candidates, one for each party, to stand for each second single-member constituency. But there is nothing ballot, to prevent a third or even a fourth candidate standing, and this multiplication of candidates becomes the more com- mon in proportion as parliamentary organization- is split up into groups. The consequence is that the candidate who heads the poll may well have only a relative, not an absolute, majority of votes, and to meet this objection the ” second ballot ” has been introduced, and is in operation in Austria-Hungary, France, Germany, Italy and Russia. Under this system, if no candidate receives an absolute majority of all the votes, a second election is held, at which, as a rule, only the two candidates compete who received most; or in cases where more than one seat is to be filled, twice as many candidates compete as there

are seats. In principle the second ballot has much in its favour, though it does not necessarily reflect the real opinion of the electorate, but only what is practicable; and while leading to political bargaining it does nothing for minority representation.

In England the importance of the whole subject of the method of elections was recognized at the end of 1908 by the appoint- ment of a

Royal Commission to inquire and report. Its con- clusions were published in 1910, after much interesting evidence had been taken, but they attracted little attention, being in the main adverse to innovation. The one positive recommenda- tion was for the adoption of the ” alternative vote ” (already in use in Queensland and Western Australia) by which the electors might mark their choices 1, 2, 3, &c; this would not be for the purpose already discussed as part of the method of the ” transferable vote,” but the indications of preference would only be used for the same purpose as the ” second ballot,” while saving the voters the trouble of further elections. One objection to this ” alternative vote,” however, as compared with the ” second ballot,” is that it does not allow the voter to change his mind as to his preference, as he well might do after he knew the result of the original voting.

It may be said broadly that all the devices which have been proposed for mitigating or redressing the defects of electoral methods ignore the essential fact that in any case a representative system can only result in a rather arbitrary approximation to correspondence with the opinions of the electorate. It is by no means certain even that ” proportional representation ” in any of its forms would always result in the return of a repre- sentative assembly reflecting with mathematical accuracy the balance of opinion in the electorate; and even if it did, the electors have a way of changing their opinions long before their representatives come up for re-election. It was stated before the British Royal Commission that in Belgium, in spite of ” proportional representation,” both in 1900 and in 1902 a majority of members was returned by a minority of votes. While under majority rule, as Mr Augustine Birrell once re- marked, ” minorities must suffer ” — even large minorities — it is on the other hand not likely to conduce to the popularity of representative government that minorities should obtain too great a share of political power. The fact is that no ” representation ” can reflect the views of those ” represented ” as accurately as ” presentation ” by those entitled personally to speak. This conclusion, while in no necessary degree qualify- ing the importance of ” popular government,” undoubtedly detracts from the value of the representative method. The result is seen in the increasing desire in really democratic countries to supplement representative government by some form of Referendum, or direct appeal to the electors for their own personal opinion on a distinct issue — a method which involves fundamentally the addition of a ” presentative ” element to the representative system.

Literature. — The number of separate works on various aspects of the theory, history and practice of political representation — a much

wider subject than representative government — is too large for detailed mention. A general reference can only be made here to the standard treatises on constitutional law. The chapter in Sir G. Cornewall Lewis's Remarks on the Use and Abuse of some Political Terms (Sir T. Raleigh's edition, 1898) should also be noted. In addition to works cited above, a valuable account of all parts of the electoral " machine " is given in M. Ostrogorski's Democracy and the Organization of Political Parties (1902). The Congressional Library, Washington, U.S.A., issued in 1904 a " List of Books relat- ing to Proportional Representation," which constitutes a complete bibliography of that subject up to that date. The best discussion of the various methods for securing adequate representation is, however, now to be found in the Report (1910) of the British Royal Commission on Systems of Election (Parliamentary Paper, Cd. 5163). It is chiefly valuable for its description of the devices in use in different countries and for its weighty criticism of the proposals for minority representation. (H. Ch.)

REPRIEVE {reprise, from Fr. reprendre), in English law, a term which originally meant remand to prison: later and more usually, the suspension for a time of the execution of a sentence passed on conviction of crime. The term is now seldom or never used except with reference to sentences of death. In

the case of capital felonies other than murder the recording of sentence of death has the effect of a reprieve by the court. The court which can award a sentence is said to possess as of common right a discretionary power of granting a reprieve. Courts of justice, however, do not grant reprieves by way of dispensation from the penalties of the law, which is not for the judicial department, but for temporary purposes, e.g. of appeal or inquiry as to the state of mind or health of the convict, or to enable him to apply for a pardon. Under the old system of transportation it was a common practice to reprieve convicted felons as a step to induce them to consent to transportation to the American colonies (see the Old Bailey Regulations of 1662, J. Kelyng, ed. 1873, p. 1). In cases of conviction of wilful murder the reprieve, if any, is granted by the home secretary on behalf of the crown, and on convictions of murder the court seems now to have no power to reprieve except in the case of a pregnant woman.

See Hawkins, P.C, bk. 2, c. 51 ; Blackstone, Commentaries.

REPRISALS (Fr. represailles, from reprendre; Lat. repre- hendere, to take back), properly speaking, the act of forcibly seizing something belonging to another state by way of retalia- tion, but currently used

for the retaliation itself. They are acts of violence which are a casus belli according to the manner in which the state against which they are exercised regards them and is able to resist or resent them. Two comparatively recent cases have occurred in which this form of redress was resorted to. In the one case a demand by the British government for an indemnity for injuries inflicted on the British vice-consul and certain other British subjects by Nicaraguan authorities in the Mosquito reserve not having been complied with, British naval forces were landed on April 27th, 1895, at Corinto, where they occupied the customs house and other public buildings till an agreement was arrived at. In the other case the French government in November 1901 ordered the occupation by French naval forces of the customs house at Mytilene until redress was obtained for divers claims of French citizens. A Hague Con- vention of 1907 now places limitations on the employment of force for the recovery of contract debts, and forbids recourse to armed force unless ” the debtor state refuses or neglects to reply to an offer of arbitration, or after accepting the offer prevents any compromise from being agreed on, or after arbitration fails to submit to the award ” (art. 1). (T. Ba.)

REPRODUCTION, in biology, the generation of new organ- isms from existing organisms more or less similar. It is a special case of growth, and consists of an increase of living substance in such fashion that the new substance is either set free as a new individual, or, whilst remaining attached to the parent organism, separated by some sort of partition so as to have a subordinate individuality. Y. Delage has distinguished as multiplication those cases in which the new individual arises from a mass of cells which remain a part of the maternal tissues during differ- entiation, reserving the term reproduction for those cases in which the spore or cell which is the starting-point of the new individual begins by separating from the maternal tissues; but the distinction is inconvenient in practice and does not appear to carry with it any fundamental biological significance. The general relation between parent and filial organisms is discussed under Heredity and Embryology; many of the details of the cellular processes are dealt with under Cytology, and the modes of reproduction exhibited by different kinds of animals and plants are treated of in the various articles describing individual groups. Finally, some of the special problems involved are discussed under the heading Sex. As reproduction is a general biological phenomenon, its manifestations should be dealt with simultaneously in the case of animals and plants, but many of the special details differ so much that it is practically convenient to make two headings.

Reproduction of Animals

A. Asexual. — Many animals possess a more or less limited capacity to repair portions of the body that have been accident- ally removed (see Regeneration), and this capacity may be so

extensive that, if the whole body be cut in pieces, each portion may grow into a new organism. Such a mode of artificial propagation, familiar in horticultural operations, has been made use of in such animals as sponges, and has been performed experimentally in hydroids and some worms. In many Protozoa asexual reproduction by simple division is a normal event. In Coelentera it is common, the plane of division usually passing through the long axis of the body, as in Actinians and many Hydroids, or being horizontal, as in the repeated divisions by which medusae are produced from an asexual polyp; the new individual may separate completely, or serve to build up a colonial or compound organism. In some Turbellarians (Microstomum) and Chaetopods (Sy'lis, Myrianida, Nereis, Eunice viridis (the palolo-worm of Samoa), asexual reproduction occurs in a form that is partly fission and partly budding; portions are constricted transversely or laterally, very much smaller than- the whole animal, and these grow out into new animals which may separate or remain attached in chains. In Salps, chains are formed sometimes by transverse constriction, sometimes by budding. True budding is much more common than fission; it occurs in Protozoa, Coelentera, Sponges, Polyzoa, Tunicates and some Flatworms and Chaetopods, the bud being a multicellular portion of the tissues which is partly or completely separated from the parent before it proliferates into the new form. In various larval stages of many animals, asexual reproduction by fission or budding may be produced experimentally or may occur naturally. It has been suggested that cases of identical twins in vertebrates and many monstrous forms, including even dermoid cysts, are due to embryonic asexual fission or budding. The artificial subdivision of young embryos has been performed successfully by several investi- gators (see Heredity). In Lumbricus trapezoides the gastrula stage of the embryo divides and each half produces a complete individual; and multiplication by budding is common at various stages of the life-history of many parasitic worms. Spore formation, or cellular budding, appears to be limited to the Protozoa amongst animals.

B. Sexual. — Apart from the special and probably secondary cases presently to be considered under the subheading partheno- genesis, sexual reproduction or amphimixis may be defined as the production of a new organism from a zygote, and a zygote may be defined as the cell resulting from the conjugation of two gametes or sexual cells derived from the specialized reproductive tissue of the parent or parents. In asexual reproduction by spore formation, the spore proliferates without the aid of another spore; in true sexual reproduction the gametes may be regarded as special kinds of spores which appear in two forms, the egg- cell, ovum or female gamete not proceeding to proliferate into a new organism until it has been stimulated by partial or complete fusion with the other form, the spermatozoon or male gamete. The act of fusion or conjugation in question is usually spoken of as fertilization, and the zygote, or starting-point of the new organism, is the fertilized egg-cell. Among protozoa and the lower plants there occur a series of forms of conjugation leading towards the specialized form characteristic of the sexual reproduction of higher animals. The conjugation may be isogamous, that is to say the conjugating cells may be actually or at least apparently indistinguishable. The fusion between the cells may be complete, or may concern only the nuclei. The conjugation may be followed by reproduction, or may apparently have no relation to reproduction. In true sexual reproduction the conjugation is heterogamous, i.e. the gametes are unlike; the fusion is chiefly nuclear, and the process is the prelude of the development of the zygote into the new organism.

In all the Metazoa the gametes arise from special reproductive tissues which are supposed to contain (see Heredity) the reproductive material or germ-plasm. In the lower (or simpler and possibly degenerate Metazoa) the reproductive or germinal tissue consists of a few cells, sometimes in a group, sometimes scattered and sometimes migratory; in the vast majority of the Metazoa the germinal tissue becomes aggregated in distinct organs, of which those that give rise to ova or female gametes

are known as the ovaries, and those that give rise to the sper- matozoa or male gametes are known as the testes. The ovary and the testis are the primary reproductive organs; the details of their anatomy and position in the various groups need not be discussed here (see Reproductive System).

The male gamete or spermatozoon was first seen in 1677 by Ludwig van Hammen, a pupil of A. Leeuwenhoek, with the microscope that had been constructed by his master. Leeu- wenhoek, under the

influence of the current preformationist ideas, interpreted these actively moving bodies in the seminal fluids as preformed germs and described them as animalculae spermetia or spermatozoa. Throughout the 18th century the general tendency was to regard them as parasites of no con- sequence in fertilization. In 1837 R. Wagner established that they were present in all sexually mature males and absent in infertile male hybrids, and in 1841 A. Kolliker showed that they were cells proliferated in the testes. The spermatozoon is one of the smallest of known cells, frequently being no more than one hundred thousandth of the size of the ovum, although the extraordinary case of a small Cypris has been recorded in which the spermatozoa are longer than the animal. It is produced in enormous quantities and relatively to other minute cells is extremely tenacious of life. It may retain its vitality in the male organism for a long time after it has become a separate cell, and may exist for lengthy periods in the female organism. The queen-bee is impregnated only once, and the spermatozoa may remain functional within her body for three years. Lord Avebury (Sir J. Lubbock) has described the case of a female ant which laid fertile eggs thirteen years after she had been im- pregnated. It is undoubted that in snakes, birds and many mammals, fertilization may not take place for many days after impregnation. The spermatozoa, with a few exceptions, are actively motile, being elongated in shape, with a vibratile tail sometimes provided with a swimming membrane. In a few cases, chiefly of crustaceans, the spermatozoa are spherical with radiating processes, but are capable of amoeboid movements. The cell nucleus is generally situated near the rounded or pointed extremity, with a centrosome immediately behind it, whilst the scanty protoplasm forms the body and vibratile tail; but there appears to be no general significance in the various configura- tions that occur amongst different animals. The process of spermatogenesis, or production of spermatozoa from the per- manent cells of the testis, varies extremely amongst different animals and has been the subject of many elaborate investiga- tions and much confusing nomenclature. Two factors are involved: first, the arrangements to produce a very large crop of cells so to provide for the enormous numbers of spermatozoa produced by most animals; and second, the final changes of shape and of nucleus by which the ripe spermatozoa arise from the indifferent testis-cells, and these processes may to a certain extent overlap. The point of general significance relates to the nuclear changes. The nuclear matter that occurs in the tissue cells of animals, when these cells divide, breaks up into a number of chromosomes constant for each kind of animal, and the final stage of cell division is such that each chromosome splits and contributes a half to each daughter cell, so that the latter come to

contain the number of chromosomes peculiar to the animal in which they occur. In the case of spermatozoa, however, a ” reducing ” division occurs, in which the chromosomes instead of dividing distribute themselves equally between the two daughter cells, with the result that each of the latter contains only half the number peculiar to the species. In its simplest form, what occurs in the last stage of spermatogenesis is that one cell breaks up into four spermatozoa by two successive divisions, the first of which is normal and the second reducing. The nuclear matter of spermatozoa, therefore, contains half the number of chromosomes normal to the tissue cells of the species, and we shall see later that a similar reduction takes place in the formation of the egg. Further complications, however, exist, at least in certain forms. In 1891 H. Henking showed that in a Hemipteran insect of the genus Pyrrochoris, two kinds of spermatozoa are produced in equal numbers, and F. C. Paulmier

confirmed the observation in the case of some other insects a few years later, whilst other observers have extended the observation to over a hundred species. In all these cases half the spermatozoa differ from the other half by the presence of what E. B. Wilson calls the ” X-element,” and which, in the simplest cases, occurs as an unpaired chromosome of the mother cell which passes into one and not the other of the two spermato- zoa formed from that mother cell. The matter is still obscure, and it is not certain whether the facts are peculiar to insects or have a parallel in spermatogenesis universally. According to E. B. Wilson, the facts demonstrate that eggs fertilized by spermatozoa with the X-element invariably produce females (see Sex). The female gamete or ovum is in a large number of cases expanded by the presence of food-yolk and protective swathings to form the visible mass known as an egg, and the production of embryos from eggs has been studied from the time of Aristotle and Pliny. Galen had described the human ovaries as testes muliebres, and W.Harvey in 165 1 showed that the chick arose from the cicatricula of the yolk of the egg, compared these early stages with corresponding stages in the uterus of mammals, and laid down the general proposition — ovum esse primordium commune omnibus animalibus — that the ovum is a starting- point common to all animals. In 1664 N. Steno identified the sexual organ of the mammalian female with that of sharks, and first named it the ovary. In 1672 R. De Graaf described the structure of the

ovary in birds and mammals, observed the ovum in the oviduct of the rabbit, and repeated Harvey's statement as to the universal occurrence of ova, although he mistook for ova the follicles that now bear his name. In 1825 J. E. Purkyne described the germinal vesicle in the chick, thus distinguishing between the structure of the egg as a whole and the essential germinal area, and in 1827 K. E. von Baer definitely traced the ovum back from the uterus to the oviduct and thence to its origin within the Graafian follicle in the ovary, and thus paved the way for identification of the ovum as a distinct cell arising from the germinal tissue of the ovary. The ovum or female gamete, unlike the spermatozoon, is a large cell, in most cases visible to the naked eye even in the ovary. Also, in definite contrast with the spermatozoon, it is a passive non-motile cell, although in certain cases it is capable of protruding pseudopodia. It is usually spherical, contains a large nucleus, a centrosome and abundant protoplasm, and is generally enclosed in a stout membrane which may or may not have a special aperture known as the micro- pyle. The protoplasm of all eggs contains nutritive material for the nourishment of the future embryo, and this material may be sufficient in quantity to make the whole cell, although remaining microscopic, conspicuously large, or to expand it to the relatively enormous mass of the yellow yolk of a fowl's egg. Finally, the cellular nature of the ovum is frequently further disguised by its being enclosed in a series of membranes such as the albumen and shell of the fowl's egg. Such complexities are ancillary to the growth or protection of the future embryo, and from the general biological point of view the ovum is to be regarded as a specialized cell derived from the germinal tissue of the ovary, just as the spermatozoon is a specialized cell derived from the corresponding stock of germinal material in the testis. The number of ova produced varies from a very few, as in mammals and birds, to a very large number, as in the herring and many invertebrates, but in all cases the number is relatively small compared with that of the spermatozoa produced by the male of the same species. The details of ovogenesis are more sharply divided than in the case of spermatogenesis into processes connected with the production of a crop of large cells bloated with food-yolk, and the peculiar nuclear changes. The latter changes are generally spoken of as the maturation of the ovum, and in most cases do not begin until the full size has been attained. As in the nuclear changes of spermatogenesis, the details differ in different animals, but the salient feature is that the mature ovum contains, like the ripe spermatozoon, half the number of chromosomes normal to the tissue cells of the animal to which it belongs. The simplest form in which the reduction takes place is that the nucleus of the ovum divides by an ordinary

division, each chromosome splitting and sharing itself between the daughter nuclei. Of these nuclei one is extruded from the egg, forming what is called a polar body, and this polar body may again divide by a reducing division, so as to form two polar bodies, each with half the normal number of chromosomes. Finally, the daughter nucleus, remaining in the ovum, also divides by a reducing division, and one of the segments remains to form the nucleus of the ripe ovum, with half the normal number of chromosomes, whilst the other is extruded as a polar body. Very many suggestions as to the meaning of the extrusion of the polar bodies have been made, but the least fanciful of these is to regard the ovum ready for maturation as homo- logous with the cell about to divide into four spermatozoa; in each case the nucleus divides twice and one of the divisions is a reducing division, so that four daughter nuclei are formed each with half the normal number of chromosomes. Many sper- matozoa are required, and each of the four becomes the nucleus of a complete active cell; relatively few ova are required, but each has a large protoplasmic body, and only one of the four becomes a functional mature egg, the other three being simply extruded and so to say wasted. It must be remembered, however, that there is no inherent probability in favour of the apparently simplest explanation of a very complex biological process. It is also to be noted that in many cases the first polar body does not divide, and it is not clearly established that when the first polar body remains single, it is always the result of a normal nuclear division.

When the mature ova and spermatozoa come together in one of the various ways to be discussed later, fertilization, the con- jugation of the gametes to form the zygote, occurs. Alcmaeon (580 B.C.) is believed first to have laid down that fertilization in animals and plants consisted in the material union of the sexual products from both sexes, but it was not until 1761 that it was established experimentally by J. T. Kolreuter's work on the hybridization of plants. In 1780 L. Spallanzani artificially fertilized the eggs of the frog and tortoise, and successfully introduced seminal fluid into the uterus of the bitch, but came to the erroneous conclusion that it was the fluid medium and not the spermatozoa that caused fertilization. This error was corrected in 1824 by J. L. Prevost and J. B. Dumas, who showed that filtration destroyed the fertilizing power of the fluid. In 1843 M. Barry observed spermatozoa within the egg of the rabbit, whilst in 1849 R. Leuckart observed the fertilization of the frog's egg, and in 1851 H. Nelson noticed the entrance of sper- matozoa to the egg of Ascaris, whilst in 1854 a series of observa- tions published independently by T. L. W. Bischoff and Allen Thomson finally and definitely established the fact that ova were fertilized by the actual entrance of spermatozoa. Further

advances in microscopical methods enabled a series of observers, of whom the most notable were E. van Beneden, H. Fol and 0. Hertwig, to follow and record the details of the process. They made it clear that the chief event in fertilization was entrance into the ovum of the nucleus or head of the spermatozoon where it formed the ” male pronucleus,” which gradually approached and fused with the female pronucleus or residual nucleus of the ovum. Still later observers, of whom E. B. Wilson is the most conspicuous, have studied the details of the process in many different animals and have shown that the nucleus of the spermatozoon invariably enters the ovum, that the centrosome generally does so, and that the cytoplasm usually plays no part. The nucleus of the zygote or fertilized ovum, then, possesses the number of chromosomes normal in the tissue cells of the animal to which it belongs, but of these half belong to the female gamete and are derived from the germ plasm of the parental ovary, and half to the male gamete or spermatozoon, derived from the germ plasm of the parental testis. The stimulus which leads to and induces the conjugation of the gametes appears to be chemotactic and to consist of some substance positively attractive to the male gamete, liberated by the mature female gamete, but the attraction is mutual, and in the final stages of approach a protoplasmic outgrowth of the ovum towards the spermatozoon frequently occurs. The

fertilized zygote proceeds to form the embryo (see Em- bryology).

Parthenogenesis is the production of the new organism from the female gamete without previous conjugation with the male gamete, and is to be regarded as secondary to and degenerate from true sexual reproduction. Aristotle recognized that it occurred in the bee. In 1745 C. Bonnet showed that it must occur in the case of Aphides or plant-lice, in which throughout the summer there were developed a series of generations con- sisting entirely of females. R. A. F. de Reaumur repeated the observations, but evaded the difficulty by suggesting that the Aphides were hermaphrodite, an explanation soon afterwards disproved by L. Dufour. In 1849 (Sir) R. Owen brought to- gether the facts as they were, then known and made a remark- able suggestion regarding them. ” Not all the progeny of the primary impregnated germ cell are required for the formation of the body in all animals; certain of the derivative germ cells may remain unchanged and

become included in that body which has been composed of their metamorphosed and diversely combined or confluent brethren; so included, any derivative germ cell or the nucleus of such may begin and repeat the same processes of growth by imbibition, and of propagation by spontaneous fission, as those to which itself owed its origin." Taking hold of the recently published views of J. J. S. Steenstrup on alternation of generations, he correlated the sexual and asexual alternation in hydroids and so forth with the virgin births of insects and Crustacea, and regarded the one and the other as instances, of the subsequent proliferation of included germ cells, applying the word parthenogenesis to the pheno- menon. His theory was a very remarkable anticipation of the germ-plasm theory of A. Weismann, but further knowledge showed that there was an important distinction between the reproduction of the asexual generations described by Steenstrup and the cases of Aphides and Crustacea, the germinal cells in the latter instances being true ova produced from the ovaries of true females, but capable of development without fertilization. In 1856 C. T. E. von Siebold established this fact and limited Owen's term parthenogenesis to the sense in which it is now used, the development without fertilization of ova produced in ovaries. True parthenogenesis occurs frequently amongst Rotifers, and in certain cases (Philodinadae) males either do not exist or are so rare that they have not been discovered. Amongst Crustaceans it is common in Branchiopods and Ostracods; in the case of Daphnids, large thick-shelled ova are produced towards winter, which develop only after fertilization and produce females; the latter, throughout summer, produce thin-shelled ova which do not require fertilization, and from which towards autumn both males and females are produced. Amongst insects it occurs in many forms in many different groups, sometimes occasional, sometimes as a regular occurrence. Apart from Aphides the classical instance is that of the bee, where eggs that are not fertilized develop parthenogenetically and produce only drones. What is known as pathological parthenogenesis has been observed occasionally in higher animals, e.g. the frog, the fowl and certain mammals, whilst in the case of human beings, ovarian cysts in which hair and other structures are produced have been attributed to the incomplete development of parthenogenetic ova. Finally, it has been shown in a number of different instances, notably by J. Loeb, that artificial parthenogenesis may be induced by various mechanical and chemical stimulations. It has been shown that ova may be induced to segment by the presence of spermatozoa belonging even to different classes of the animal kingdom — as, for instance, the ova of echinoderms by the spermatozoa of molluscs. In such cases the resulting embryos have purely maternal characters. A possible

interpretation is that sperma- tozoa have two functions which may be exercised independently; they may act as stimulants to the ovum to segment, and they may convey the paternal qualities. The former function may be replaced by the chemical substances employed in producing artificial parthenogenesis. Juvenile or precocious parthenogenesis, in which there takes' place reproduction without fer-

tilization in immature larvae, has been observed chiefly in insects (Dipterous midges), and to this the term paedogenesis has been applied.

The theory of parthenogenesis remains doubtful. When Weismann and others began to study the polar bodies, they made the remarkable discovery that in some parthenogenetic eggs only one polar body was extruded, but the meaning of this distinction was blurred when other cases were described in which two polar bodies were formed. Later on, Weismann drew attention to the difference between normal and reducing divisions, and it now appears to be clear that, with one set of exceptions, ova which develop without fertilization are those in which no reducing division takes place and which, accordingly, contain the number of chromosomes normal to the tissue cells of the species. Such eggs, in fact, resemble the zygote except that all their chromosomes are of maternal origin and the centrosome which becomes active in the first segmentation is that of the ovum and not, as in normal fertilized eggs, that which came in with the spermatozoon. The case of the bee and other insects in which parthenogenetic development results in the pro- duction of males, is doubtful; it appears to be the case that a reduction division has taken place in the maturation of the egg. A. Petrunkevitch has made the ingenious suggestion, that after the reducing division the normal number of chromosomes is restored by the splitting of each into two. Cases of patho- logical and artificial parthenogenesis would fall into line, on the supposition that the stimulus acted by preventing the occurrence of a reducing division in an ovum otherwise mature. It is to be noticed, however, that such explanations of parthenogenesis are not much more than a formal harmonizing of the behaviour of the chromosomes in the respective cases of fertilized and parthenogenetic development; they do not provide a theory as to why the process occurs.

Accessory Reproductive Organs and Processes. — It has been already stated that the primary organs of reproduction in animals are the germinal tissues producing respectively sper- matozoa and ova, and that in most cases these are aggregated to form testes and ovaries. In certain animals there are no accessory organs, and when the reproductive products are ripe, they are discharged directly to the

exterior if the gonads are external, as in some Coelentera, or if they are internal, break through into some cavity of the body and escape by rupture of the body- wall or through some natural aperture. In a majority of cases, however, special ducts are developed, which in the male serve primarily for the escape of the spermatozoa, but secondarily may be associated with intromittent organs. Similarly, in the female, the primary function of the gonad ducts is to provide a passage for the ova, but in many cases they serve also for the reception of spermatozoa, for the development of embryos and for the subsequent exit of the young. Associated with the oVary and the oviducts are many kinds of yolk-glands and shell-glands, the function of which is to form nutritive material for the future embryo, to discharge this into or around the ovum, and to provide protective wrappings. Although, in the last resort, fertilization de- pends on impulses attracting the spermatozoa to the ova, probably chemical in their nature, the necessary proximity is secured in a number of ways. In many simple cases the ripe products are discharged directly into the surrounding water, and impregnation is a matter of accident highly probable because such animals discharge enormous quantities of ova and spermatozoa, are frequently sessile and live in colonies, and are mature about the same time. In other cases, as, for instance, Tunicates and many Molluscs, the spermatozoa are discharged, and, being drawn into the body of the female with the inhalent currents, there fertilize the ova. In yet a number of other cases, there is sexual congress without intromittence. The males of many fish, such as salmon, attend the females about to discharge their ova, and afterwards pour the male fluid over the liberated eggs; whilst amongst other fish the males seek out a suitable locality and prepare some kind of nest to which the female is enticed and which receives first the ova and then the milt. In many other animals, again; as for instance the frog, the male grasps the ripe female, embracing

her firmly for a prolonged period, during which ova and sper- matozoa are discharged simultaneously. Where internal fer- tilization occurs, there are usually special accessory organs. In the female, the terminal portion of the gonad-duct , or of the cloaca, is modified to receive the intromittent organ of the male, or to retain and preserve the seminal fluid. In the male, the terminal portion of the gonad-duct may be modified into an intromittent organ or penis, grooved or

pierced to serve as a channel by which the semen is passed into the female. In arthropods, ordinary limbs may be modified for this purpose, or special appendages developed; in spiders, the terminal joints of the pedipalps, or second pair of appendages, are enlarged, and are dipped into the semen, which is sometimes shed into a special web, and are used as intromittent organs; in cuttlefish, one of the ” arms ” is charged with spermatozoa, is inserted into the mantle cavity of the female and there broken off. In many cases there is a temporary apposition of the apertures of the male and female, with an injection from the male without a special intromittent organ. The females are usually passive during coitus, and there are innumerable varieties of clasping organs developed by the male to retain hold of the female. Finally, the various secondary sexual characters which are developed in males and females and induce association between them by appeals to the senses, must be regarded as accessory reproductive organs and processes (see Sex).

Another set of accessory organs and processes are concerned with what may be termed in the widest sense of the phrase ” brood-care.” In many cases the relation between parent and offspring ceases with the extrusion of the fertilized ovum, whilst others display every possible grade of parental care. Many of the lower invertebrates choose special localities in which to deposit the ova or embryos, and glands, the viscid secretion of which serves to bind the ova together or to attach them to some external object, are frequently present. In many insects, elaborate preparations are made; special food-plants are selected, cocoons are woven, or, by means of the special organ known as the ovipositor, the eggs are inserted in the tissues of a living or dead host, or in other cases a supply of food is pre- pared and stored with the young larvae. The eggs or larvae may be attached to the parent and carried about with it, as in the gills of bivalves, the brood-pouches of the smaller Crus- tacea, the back of the Surinam toad, the vocal sacs of the frog Rhinoderma, the expanded ends of the oviducts or the mar- supial pouch. In a large number of cases the young are nour- ished directly from the blood of the mother by some kind of placental connexion, as in some of the sharks, in Anablebs, a bony fish, in some lizards and in mammals. In other cases, the young after birth or hatching are fed by the parents, by the special secretion of the mammary glands in the case of mammals, by regurgitated food in many birds and mammals, by salivary secretions or by food obtained and brought to the young by the parents.

Reproductive Period. — In a general way, reproduction begins when the limit of growth has been nearly attained, and the instances of paedogenesis, whether that be parthenogenetic as in midges, or sexual

as in the axolotl, must be regarded as an exceptional and special adaptation. In lower animals, where the period of growth is short or indefinite, reproduction begins earlier and is more variable. But, in all cases, surrounding conditions play a great part in hastening or retarding the onset of reproduction. Increased temperature generally acceler- ates reproductive maturity, excess of food retards it, and sudden privation favours it. In a majority of cases it endures to the end of life, but in some of the higher forms, such as birds and mammals, there is a marked decrease or a cessation of reproductive activity, especially in the case of females, as life advances. In most animals, moreover, periods of re- productive activity alternate with periods of quiescence in a rhythmical series. In its simplest form, the rhythm is seasonal; but although at first associated with actual seasonal changes, it persists in the absence or alteration of these. Many animals brought to Europe from the southern hemisphere come

into reproductive activity at the time of year corresponding to the spring or summer of their native home. ” Heat,” menstruation and ovulation in the higher mammals, including man, are rhythmical, and probably physiologically linked, but the ancestral meaning of the periodicity is unknown.

Reproduction and Increase of the Race. — Two distinct factors are involved in this question — the potential fecundity of organisms, and the chances of the young reaching maturity. The first varies with , the actual output of zygotes, and is determined partly by the reproductive drain on the individual, and especially the female in cases where the ova are provided with much food-yolk, partly on the duration of reproductive maturity, and partly on the various adaptive and environ- mental conditions which regulate the chances of the gametes meeting for fertilization. It is to be noted that as the gametes are simply cells proliferating from the germinal tissue, the poten- tial number that can be produced is almost indefinite; and as it is found that in very closely allied forms the actual number produced varies within very wide limits, it may be assumed that potential fecundity is indefinite. The possibility of zygotes reaching maturity varies first with the individuation of the organism concerned — that is to say, the degree of complexity of its structure — and the duration of the period of its growth ; and secondly, with the incidence of mortality on the eggs and immature young. It is plain that a parasite capable of living only on a particular host may give rise to myriads of progeny, and yet, from the difficulty of these reaching the only environ- ment in which they can become mature, might not increase more rapidly than an elephant which carries a single foetus for about two years, and guards it for many years after birth. The probable adaptation of the variable

reproductive processes to the average conditions of the race is discussed under the heading Longevity. It may be added here that the adapta- tion, in all successful cases, appears to be in excess of what would be required merely to replace fhe losses caused by death, and that there is ample scope for the Malthusian and Darwinian factors. The rate of reproduction tends to outrun the food- supply.

Literature. — Almost any zoological publication may contain matter relating to reproduction, but text-books on Embryology must be specially consulted. The annual volumes of the Zoological Record, under the heading ” General Subject ” until 1906, and thereafter under ” Comprehensive Zoology,” give a classified subject-index of the literature of the year in which references to the separate parts of the subject are given. Amongst the older memoirs referred to in this article the following are the most im- portant: A. Leeuwenhoek, Epistolae ad societatem regiam Angliam (1719); R. A. F. de Reaumur, Memoires pour servir A I’histoire des insectes (Paris, 1734-1742) ; C. Bonnet, CEuvres d’histoire naturelle et de philosophic (Neuchatel, 1 779-1783); L. Spallanzani, Dissertations relative to the Natural History of Animals and Vegetables (Eng. trans., 2nd ed., London, 1789) ; J. L. Provost et J. B. Dumas, ” Observations relatives a l’appareil genˆrateur des animaux males,” Ann. Sci. Nat. i. (1824); K. E. von Baer, Epistola ad Academiam Scient. Petropolitanam; Heusinger, Zeitschrift, ii. (1828); Leon Dufour, Recherches anatomiques et physiologique sur les Hemipferes (Paris 1833) ; R. Wagner, ” Recherches sur la generation,” Ann. Sci. Nat. viii. (1837); A. Kolliker, Tiber das Wesen der sogenannten Saamenthiere, Froriep, Notizenxix. (1841) ; M. Barry, ” Spermatozoa observed within the Mammiferous Ovum,” Phil. Trans. (1743); J. J. S. Steenstrup, On the Alternation of Generations (Eng. trans., Ray Society, London, 1845) ; R. Leuckart, Beitrdge zur Lehre der Befruchtung (Gottingen Nachrichten, 1849) ; (Sir) R. Owen, On Parthenogenesis (London, 1849); H. Nelson, “The Reproduction of Ascaris mystax,” Phil. Trans. (1852); C. T. E. von Siebold, On a True Parthenogenesis in Moths and Bees (Eng. trans., London, 1857); E. van Beneden, ” Recherches sur la maturation de l’ceuf et la fecondation,” Arch, de biol. (1883) ; O. Hertwig, ” Das Problem der Befruchtung,” Jen. Zeitsch. xviii. (1885). (P. C. M.)

Reproduction of Plants The various modes in which plants reproduce their species may be conveniently classified into two groups, namely, vegetative propagation and true reproduction, the distinction between them being roughly this, that whereas in the former the production of the new individual may be effected by the most various parts of the body, in the latter it is always effected by means of a specialised reproductive cell.

I. Vegetative Propagation.

The simplest case of vegetative multiplication is afforded by unicellular plants. When the cell which constitutes the body of the plant has attained its limit of size it gives rise to two either by division or gemmation; the two cells then grow, and at the same time become separated from each other, so that eventually two new distinct individuals are produced, each of which precisely resembles the original organism. A good example of this is to be found in the germination of the yeast plant. This mode of multiplication is simply the result of the ordinary processes of growth. All plant-cells grow and divide at some time or other of their life; but whereas in * multicellular plant the products of division remain coherent, and add to the number of the cells of which the plant consists, in a unicellular plant they separate and constitute new individuals. In more highly organized plants vegetative propagation may be effected by the separation of the different parts of the body from each other, each such part developing the missing members and thus constituting a new individual. This takes place spontaneously in rhizomatous plants, in which the main stem gradually dies away from behind forwards; the lateral branches thus become isolated and constitute new individuals.

The remarkable regenerative capacity of plant-members is largely made use of for the artificial propagation of plants. A branch removed from a parent-plant will, under appropriate conditions, develop roots, and so constitute a new plant; this is the theory of propagation by ” cuttings.” A portion of a root will similarly develop one or more shoots, and thus give rise to a new plant. An isolated leaf will, in many cases, produce a shoot and a root, that is, a new plant; it is in this way that new begonias, for instance, are propagated. The production of plants from leaves occurs also in nature, as, for instance, in certain so-called ” viviparous ” plants, of which Bryophyllum calycinum (Crassulaceae) and many ferns [Nephrodium (Lastraea) Filix-mas, Asplenium (Athyrium) ■ Filix-foemina and other species of Asplenium] are examples. But it is in the mosses, of all plants, that the capacity for vegetative propagation is most widely diffused. Any part of a moss, whether it be the stem, the leaves, the rhizoids, or the sporogonium, is capable, under appropriate conditions, of giving rise

to filamentous protonema, on which new moss-plants are then developed as lateral buds. ‘■’■’-■■

In a large number of plants provision is made for vegetative propagation by the development of more or less highly specialized organs. In lichens, for instance, there are the soredia, which are minute buds of the thallus containing both algal and fungal elements; these are set free on the surface in large numbers, and each grows into a thallus. In the Characeae there are the bulbils or ” starch-stars ” of Char a slelligera, which are under- ground nodes, and the branches with naked base and the pro- embryonic branches found by Pringsheim on old nodes of Chara fragilis. In the mosses small tuberous bulbils frequently occur on the rhizoids, and in many instances (Bryum annotinum, Aulacomnion androgynum, Tetraphis pellucida, &c.) stalked fusiform or lenticular multicellular bodies containing chlorophyll, termed gemmae, are produced on the shoots, either in the axils of the leaves or in special receptacles at the summit of the stem. Gemmae of this kind are produced in vast numbers in Marchantia and Lunularia among the liverworts. Similar gemmae are also produced by the prothallia of ferns. In some ferns (e.g. Nephro-lepis tuberosa and undulata) the buds borne on the leaves or in their axils become swollen and filled with nutritive materials, constituting bulbils which fall off and give rise to new plants. This conversion of buds into bulbils, which subserve vegetative multiplication, occurs also occasionally among Phanerogams, as for instance in Lilium bulbiferum, species of Poa, Polygonum viviparum, &c. But many other adaptations of the same kind occur among Phanerogams. Bulbous plants, for instance, produce each year at least one bulb or corm from which a new plant is produced in the succeeding year. In the potato, tubers are developed from subterranean shoots, each of which in the

following year gives rise to a new individual. In the dahlia, Thladiantha dubia, &c, tuberous swellings are found on the roots, from each of which a new individual may spring.

II. True Reproduction.

This is effected by cells formed by the proper reproductive organs. These cells are of two principal kinds. There are, first, those cells each of which is capable of developing by itself into a new organism: these are the asexual reproductive cells, known generally as spores. Secondly, there are the cells which are incapable of independent germination; it is not until these cells have fused together in pairs that a new organism can be developed: these are the sexual reproductive cells or gametes.

In some exceptional cases the normal mode of reproduction, sexual or asexual, does not take place: instead, the new organism is developed vegetatively from the parent. When sexual reproduction is suppressed the case is one of apogamy; when asexual reproduction by spores is suppressed the case is one of apospory. (Apogamy and apospory are discussed below in the section on Abnormalities of Reproduction.)

Asexual .Re/o-odMcta'oM.— Reproduction by means of som& kind of spore (using the term in its widest sense, so as to include all asexually produced reproductive cells) is common to nearly all families of plants; it is wanting in certain Algae (Conjugatae, Fucaceae, Characeae), and in certain fungi (e.g. some Perono- sporeae). The structure of a spore is essentially this: it consists of a nucleated mass of protoplasm, enclosing starch or oil as re- serve nutritive material, usually invested by a cell- wall. In those cases in which the spore is capable of germinating immediately on its development the cell-wall is a single delicate membrane consisting of cellulose; but in those cases in which the spore may or must pass through a period of quiescence before germina- tion the wall becomes thickened and may consist of two layers, an inner, the endospore, which is delicate and consists of cellulose, and an outer, the exospore, which is thick and rigid, frequently darkly coloured and beset externally with spines or bosses, and which consists of cutin. In some few cases among the fungi, multicellular or septate spores are produced; these approximate somewhat to the gemmae mentioned above as highly specialized organs for vegetative propagation. In some cases, particularly among the algae, and also in some fungi (Peronosporeae, Saprolegnieae, Chytridiaceae, and the Myxomycetes) , spores are produced which are usually destitute of any cell-wall, and are further peculiar in that they are motile, and are therefore termed zoospores; they move sometimes in an amoeboid manner by the protrusion of pseudopodia, but more frequently they are provided with one, two, or many delicate vibratile protoplasmic filaments, termed cilia, by the lashing of which the spore is propelled through the water. The zoospore eventually comes to rest, withdraws its cilia, surrounds itself with a cell-wall, and then germinates.

In the simplest case a single spore is developed from the cell of the unicellular plant, the protoplasm of which surrounds itself with the characteristic thick wall. This occurs only in plants of low organization such as the Schizophyta.

In other cases the contents of the cell undergo division, each portion of the protoplasm constituting a spore. Examples of this are afforded, among unicellular plants, by yeast and the Protococcaceae ; and in

multicellular plants by the Pandorineae, Confervaceae, Ulvaceae, &c, where any cell of the body may produce spores. . ‘

In such cases the spore-producing cell may be regarded as a rudimentary reproductive organ of the nature of a sporangium. In more highly organized plants special organs are differentiated for the production of spores. In the majority of cases the special organ is a sporangium, that is, a capsule in the interior of which the spores are developed; but in many fungi’ the spores are formed by abstriction from an organ termed a sporophore. In the Thallophyta the sporangium is commonly a single cell. In the Bryophyta it is a multicellular capsule. In the Pteridophyta the sporangium is multicellular, but simple in structure, and this is true also of the Phanerogams.

It is important to note that in all the Bryophyta and in some of the Pteridophyta (most of the Filicinae, all existing Equisetinae, and the Lycopodiaceae and Psilotaceae) there is but one kind of sporangium and spore, the plants being homo- sporous or isosporous, whereas the rest of the Pteridophyta (Hydropterideae, Selaginellaceae) and the Phanerogams are heterosporous, having sporangia of two kinds; some produce one or a few large spores (megaspores) , and are hence termed mega- sporangia, while others give rise to a larger number of small spores (microspores) and are hence termed micros porangia. In the Phanerogams the two kinds of sporangia have received special names: the megasporangium, which produces as a rule only one mature spore (embryo-sac), is termed the ovule; the microsporangium, which produces a large number of micro- spores (pollen-grains), is termed the pollen-sac.

The development of spores, except in the simpler Thallophyta, is more or less restricted to definite parts of the body. Thus in the Red Algae (Florideae) there are the organs known as stichidia, nemathecia. In the fungi the number and variety of such organs is very great; they may be described generally as simple and compound sporophores: but for a description the article Fungi should be consulted. In the higher plants the organs are less various. In the Bryophyta the production of spores is restricted to the sporogonium. In the vascular plants (Pteridophyta, Phanerogams) the development of sporangia, speaking generally, is

confined to the leaves. In most ferns the sporangiferous leaves (sporophylls) do not differ in appearance from the foliage leaves; but in other Pteridophyta (Equisetaceae, Marsiliaceae, some species of Lycopodium and Selaginella) they present considerable adaptation, and notably in the Phanero- gams. In the Phanerogams the specialization is so great that the sporophylls have received special names; those which bear the microsporangia (pollen-sacs) are termed the stamens, and those which bear the megasporangia (ovules) are termed the carpels. The sporophylls are usually aggregated together on a short stem, forming a shoot that constitutes a flower.

Many terms are employed to indicate the nature of the various kinds of spores, especially among the fungi, but the endless varieties of asexual (and asexually produced) reproductive cells may be grouped under two heads— (i) Gonidia, (2) Spores proper.

The distinction between these two kinds of asexual repro- ductive cells is as follows.

The gonidiumis a reproductive cell that gives rise, on germina- tion, to an organism resembling the parent. For instance, among the algae, the ” zoospore ” of Vaucheria develops into a Vaucheria-plant. There is thus a close connexion between vegetative multiplication and multiplication by means of gonida. The production of gonida is entirely limited to the Thallophyta, and is especially marked in the fungi, though the nature of all the many kinds of reproductive cells formed in this group has not yet been fully investigated. It is, however, wanting in certain algae (Conjugatae, Fucaceae, Characeae) and fungi (some Peronosporeae and Ascomycetes).

The spore proper is a reproductive cell that as a rule gives rise, on germination, to an organism unlike that which produced it. For instance, the spore of a fern when it germinates gives rise, not to a fern-plant, but to a prothallium. The apparent exceptions to this rule occur only among the Thallophyta, and are explained below in the section on Life-history.

The true spore is developed, usually in a sporangium, after a process of division which presents certain features that call for special notice.

Observation of the process of division of the nucleus (karyo- kinesis) in plants generally has shown (for details see Cytology) that the linin-reticulum of the resting nucleus breaks up into a definite number of segments, the chromosomes, each of which bears a series of minute bodies, the chromatin-disks or chromo- meres, consisting largely of a

substance termed chromatin. In the ordinary homotype divisions of the nuclei the characteristic number of chromosomes is always observable : but when the spore-mother-cells are being formed the number of chromosomes

is reduced to one-half. This, if the number of chromosomes of the parent plant be expressed as 2X the number in the spore will be x. To take a concrete case: it has been observed by Guignard and others that in the early divisions taking place in the developing anther and ovule of the lily the number of chromosomes is 24; whereas in the later divisions which give rise to the pollen-mother-cells in the one case and to the mother- cell of the embryo-sac in the other, the number of chromosomes is only 12. Thus the development of a spore (as distinguished from a gonidium) is always preceded by a reducing- or heterotype- division, a process now more generally termed meiosis (Farmer). The reduced number of chromosomes in the nucleus of the spore-mother-cell persists in the spore, and in all the cells of the organism to which the spore may give rise. (Meiosis is discussed below in the section on Sexual Reproduction.)

It should be explained that cells, to which the name ” spore ” has also been applied, are formed as the result of a sexual act: such are zygospores, oospores, and some carpospores. But these cells differ from spores proper not only in their mode of origin but also in that their nuclei contain the full double number (2x) of chromosomes; hence they may be distinguished as diplospores.

Sexual Reproduction. — Sexual reproduction involves the development of sexual organs (gametangia) and sexual cells (gametes). When the organism is unicellular, as in the lower Green Algae (e.g. Protococcaceae, Conjugatae), the cell becomes a sexual organ and its whole protoplasm gives rise to one or more sexual cells: in the higher forms certain parts of the body are specialized as sexual organs. In many of the lower plants the organs present no external distinction of sex (e.g. lower Green Algae: the Chytridiaceae, Mucorinae, and some Ascomycetes among the fungi): it is impossible to distinguish between the male and female organs, although it cannot be doubted that the essential physiological difference exists; consequently the organs are merely described as gametangia. The gap between these plants and those with differentiated sexual organs is, however, bridged over by intermediate forms, as explained in the article Algae.

When the sexual organs are more or less obviously differ- entiated into male and female, they present considerable variety of form in different

groups of plants, and accordingly bear different names. Thus the male organ is a pollinodium in most of the fungi, a spermogonium in others (certain Ascomycetes, Uredineae); in all other plants it is an antheridium. Similarly the female organ is an oogonium in various Thallophyta (Green and Brown Algae: Oomycetous Fungi); a procarp in the Red Algae; an archicarp in certain Ascomycetous Fungi and in the Uredineae; an archegonium in all the higher plants.

It is generally the case that the protoplasm of the sexual organ is differentiated into one or more sexual cells. Thus, the game- tangium usually gives rise to cells which, as they are externally similar, are termed isogametes or simply gametes. Certain forms of the male organ, the spermogonium and the antheridium, give rise to male cells which are termed spermatia when they are non- ciliate, spermatozoids when they are ciliated and free-swimming. Again, the female organs termed oogonia and archegonia produce one or more female cells called oospheres. But there are im- portant exceptions to this rule. Thus the protoplasm is not differentiated into cells in the gametangium of the Mucorinae; in the male organ (pollinodium), of fungi generally; and in the female organ (procarp) of the Red Algae and (archicarp) of the Ascomycetes and Uredineae. *

The immediate product of the fusion of cells, or of undifferenti- ated protoplasm, derived from sexual organs of opposite sex may be generally termed the zygote; but it is not always of the same kind. Thus when two isogametes, or the undifferentiated contents of two gametangia, fuse together, the process is desig- nated conjugation, and the product is usually a single cell termed zygospore. When an oosphere fuses with a male cell, or with the undifferentiated contents of a male organ, the process is fertilization, and the product is a single cell termed oospore. When, finally, a female organ with undifferentiated contents receives a male cell, the process again is fertilization; here the

product is not a single cell, but a fructification termed cystocarp (Red Algae) , or ascocarp (Ascomycetes) or aecidium (Uredineae) , containing many spores (carpospores).

As a consequence of the diversity in the sexual organs and cells, in the

details of the sexual act, and in the product of it, several modes of the sexual process have to be distinguished, which may be conveniently summarized as follows : —

I. Isogamy: the sexual process consists in the fusion of either two similar sexual cells (iso gametes), or two similar sexual organs (gametangia) : it is termed conjugation, and the product is a zygospore. Its varieties are :—

(a) Gametes ciliated and free-swimming {planogametes), set

free into the water where they meet and fuse: lower Green Algae (Protococcaceae, Pandorineae, most Siphonaceae and Confervaceae) ; some Brown Algae (Phaeo- sporeae) :

(b) Gametangia fuse in pairs, and a gamete is differentiated in

each: the gametes of each pair fuse, but are not set free and are not ciliated (the Conjugate Green Algae): or, no gametes are differentiated, the undifferentiated con- tents of the gametangia fusing (Mucorinae among the Fungi).

II. Oogamy: male and female organs distinct: the protoplasm of the female organ is differentiated into one or (rarely) more oospheres which usually remain enclosed in the female organ : the contents of the male organ are usually differentiated into one or more male cells: the process is fertilization, the product is an oospore.

(A) The sexual organs are unicellular (or coenocytic as in certain Siphonaceous Green Algae and in the Oomycetous Fungi); the female organ is an oogonium.

(a) The male organ is an antheridium giving rise to one or more free-swimming ciliated spermatozoids :

(1) The oogonium contains a single oosphere which is fertilized

in situ: higher Green Algae (Volvox, Vaucheria, Oedogonium, Coleochaete, Characeae) ; some Brown Algae (Tilopteris) ; among the Fungi, Monoblepharis, the only fungus known to have spermatozoids :

(2) The oogonium produces a single oosphere which is extruded

and is fertilized in the water : Dictyota and some Fucaceae (Brown Algae) :

(3) The oogonium contains several oospheres which are fertilized

in situ : Sphaeroplea (Siphonaceous Green Alga) :

(4) The oogonium produces more than one oosphere (2-8) which

are extruded and are fertilized in the water : certain Brown Algae (Pelvetia, Ascophyllum, Fucus): (/S) The male organ is a pollinodium which applies itself closely to the oogonium: the amorphous male cell is not ciliated and is not set free:

(1) The oogonium contains a single oosphere which is fertilized

in situ : Peronosporaceae (Oomycetes) :

(2) The oogonium contains several oospheres; Saprolegnia-

ceae: but it is debated whether or not fertilization actually takes place.

(B) The male and female organs are (as a rule) multicellular; the male organ is an antheridium, the female an archegonium: the archegonium always contains a single oosphere which is fertilized in situ.

(a) The male cell is a free-swimming ciliated spermatozoid : the antheridium produces more than one (usually very many) spermatozoids, each of which is developed in a single cell: all Bryophyta (mosses, &c.) and Pterido- phyta (ferns, &c.) : the only Phanerogams in which spermatozoids have been observed are the gymno- spermous species Ginkgo biloba, Cycas revoluta, Zamia integrifolia. (/S) The male cell is amorphous and passes directly from the pollen-tube into the oosphere {siphonogamy) : all Phanero- gams except the species just mentioned. It roust be explained that in the angiospermous Phanerogams, the male and female organs are so reduced that each is represented by only a single cell : the male, by the generative cell, formed in the pollen-grain, which usually divides into two male cells: the female, by the oosphere. The gradual reduction can be traced through the Gymnosperms.

Attention may here be drawn to the fact (see Angiosperms) that, in several cases, the second male cell has been seen to enter the embryo-sac from the pollen-tube, and its nucleus to fuse with the definitive nucleus (endosperm-nucleus) or with one of the polar nuclei. The significance of this remarkable observation is dis- cussed in the section on the Physiology of Reproduction.

III. Carpogamy: the sexual organs are (as a rule) differentiated into

male and female: the protoplasm of the unicellular or multi- cellular female organ (archicarp, procarp) is never differentiated into an oosphere: in many cases definite male cells, spermatia, are' produced and are set free, but they are not ciliated, and fre- quently have a cell-wall : the process is fertilization : the product is a fructification derived essentially from the female organ con-

taining several (sometimes very many) spores {carpospores) : characteristic of the Red Algae and of the Ascomycetous Fungi.

(A) There are definite male cells {spermatia):

(a) The female organ is a procarp, consisting of an elongated, closed, receptive filament, the trichogyne, and of a basal fertile portion, the carpogonium: on fertilization the latter grows and gives rise directly or indirectly to a cysto- carp: the spermatia are each formed in a unicellular antheridium and have no cell-wall at first: they fuse with the tip of the trichogyne : Red Algae (Rhodophyceae or Florideae) : ;

(/S) The female organ {archicarp) resembles the preceding : in fertilization the fertile portion {ascogonium) develops into an ascocarp containing one or more asci (sporangia) each containing usually eight ascospores: the spermatia are formed by abstriction from the filaments (sterigmata) lining special receptacles, the spermogonia, which are the male organs: certain Ascomycetous Fungi {e.g. Laboul-beniaceae, some Lichen-Fungi, Polystigma). For the Uredineae, see Abnormalities of Reproduction, below).

(B) There are no definite male cells: the more or less distinct male and female organs come into contact, and their undiffer- entiated contents fuse : the product is an ascocarp:

(a) The male and female organs are obviously different : the female organ is an ascogonium, the male a pollinodium: e.g. Pyronema, Sphaerotheca (Ascomycetes) : (/3) The male and female organs are quite similar : e.g. Eremas- cus, Dipodascus (Ascomycetes). It may be explained that carpogamy is the expression of sexual degeneration. In the cases last mentioned, when the sexual organs are quite similar, they have reverted to the condition of gametangia. Still further reduction is observable in other Ascomycetes in which one of the sexual organs, presumably the male, is either much reduced or is altogether wanting. Again in the rusts (Uredineae), there are spermatia, but they are functionless (see section on Abnormalities of Reproduction). In the highest Fungi, the Auto- basidiomycetes, no sexual organs have been discovered.

Details of the Sexual Act. — It has been already stated that the sexual act consists in the fusion of two masses of protoplasm, commonly cells, derived from two organs of opposite sex : but this is only the first stage in the process. The second stage is the fusion of the nuclei, which usually follows quickly upon the fusion of the cells; but nuclear fusion may be postponed so that the two sexual nuclei may be observed in the zygote, as ” conjugate ” nuclei, and even in the cells of the organism developed from the zygote {e.g. Uredineae). The result of nuclear fusion is that the nucleus of the zygote contains the double number of chromo- somes — that is, if the number of chromosomes in each of the fusing sexual nuclei be x, the number in the nucleus of the zygote will be 2X. Moreover, this double number persists in all the cells of the organism developed from the zygote, until it is reduced to one-half by meiosis preceding either the development of the spores, or, less commonly, the development of the sexual cells. But there is yet a third stage, which consists in the temporary fusion of the chromosomes belonging to the two sexual nuclei. This always takes place as a preliminary to meiosis; it may be in the germinating zygote, or after many generations of cells have been formed from it. At the onset of meiosis the (2*) chromosomes are seen to be double, one of each pair having been derived from the male and the female cell respectively: the chromosomes of each pair then fuse so that their chromomeres unite along their length, constituting the pseudo-chromosomes. The paired chromosomes separate and eventually go to form the two daughter-nuclei, one to each, which thus have half (*) the original number of chromosomes. The daughter-nuclei at once divide homotypically, retaining the reduced {x) number of chromosomes to form the four nuclei of a tetrad of spores (more rarely, e.g. Fucus, of sexual cells).

III. Life-history. It will have been gathered from the foregoing sections that plants generally are capable of both sexual and asexual repro- duction; and, further, that in different stages of their life-history they possess the diploid (23c) number of chromosomes in their nuclei, or the haploid {x) number. It may be at once stated that, in all plants in which sexual reproduction and true meiotic spore-formation exist, these two modes of reproduction are restricted to distinct forms of the plant; the sexual form bears only the sexual organs and is haploid; the asexual form/only

produces spores and is diploid. Hence all such plants are to this extent polymorphic — that is, the plant assumes these two forms in the course of its life-history. When, as in many Thallophyta, one or other of these forms can reproduce itself by means of gonidia, additional forms may be introduced into the life- history, which becomes the more complicated the more pro- nounced the polymorphism.

The most straightforward life-histories are those presented by the Bryophyta and the Pteridophyta, where there are but the two forms, the sexual and the asexual. In the life-history of a moss, the plant itself bears only sexual organs: it is the sexual form, and is distinguished as the gametophyte. The zygote (oospore) formed in the sexual act develops into an organism, the sporogonium, which is entirely asexual, producing only spores: it is distinguished as the sporophyte. When these spores germ- inate, they give rise to moss-plants. Thus the two forms, the sexual and the asexual, regularly alternate with each other — that is, the life-history presents that simple form of poly- morphism which is known as alternation of generations. Simi- larly, in the life-history of a fern, there is a regular alternation of a sporophyte, which is the fern-plant itself, with a gametophyte, which is the fern-prothallium.

It is pointed out in the preceding section that, as the result of the sexual act, the nucleus of the zygote contains twice as many chromosomes as those of the fusing sexual cells. This 2X number of chromosomes persists throughout all the cell- generations derived from the zygote, that is, in the cells constituting the sporophyte, up to the time that it begins to produce spores, when meiosis takes place. Again, the cell- generations derived from the spore, that is, the cells constituting the gametophyte, all have the reduced x number of chromosomes in their nuclei up to the sexual act. Hence the sporophyte may also be designated the diplophyte and the gametophyte the haplophyte (Strasburger) : in other words, the sporo- phyte is the pre-meiotic, the gametophyte the post-meiotic generation. Twice in its life-history the plant is represented by a single cell: by the spore and by the zygote. The turning- points in the life-history, the transitions from the one genera- tion to the other, are (i) meiosis, (2) the sexual act.

The course of the life-history in Phanerogams and in those Thallophyta which have been adequately investigated is essenti- ally the same as that of the Bryophyta and of the Pteridophyta as described above, though it is less easy to trace on account of the peculiar relation of the two generations to each other in the Phanerogams and on account of various irregularities that present

themselves in the Thallophyta.

In the Phanerogams, as in the Pteridophyta, the pre- ponderating generation is the sporophyte, the plant itself. Inasmuch as they are heterosporous, the gametophyte is represented by a male and a female organism or prothallium, both rudimentary. The male prothallium consists of the few cells formed by the germinating pollen-grain (microspore) ; and though it is quite independent, since the microspores are shed, it grows parasitically in the tissues upon which the microspore has been deposited in pollination. The female prothallium may consist of many cells with well-developed archegonia, as in the Gymnosperms, or of only a few cells with the female organ reduced to the oosphere, as in the Angiosperms. In either case it is the product of the germination of a megaspore (embryo-sac) which is not shed from its sporangium (ovule): hence it never becomes an independent plant, and was long regarded as merely a part of the sporophyte until its true nature was ascertained, chiefly by the researches of Hofmeister, who first explained the alternation of generations in plants. This intimate and persistent connexion between the two generations affords the explanation of the characteristic features of the Phanerogams, the seed and the flower. The ovule containing the embryo-sac, which eventually contains the embryo, per- sists as the seed — a structure that is distinctive of Phanero- gams, which have, in fact, on this account been also termed Spermatophyta. With regard to the flower, it has been already mentioned that it is, like the cone of an Equisetum or a Lyco-

podium, a shoot adapted to the production of spores. But it is something more than this: for whereas in Equisetum or Lycopodium the function of the cone comes to an end when the spores are shed, the flower of the Phanerogam has still various functions to perform after the maturation of the spores. It is the seat of the process of pollination — that is, the bringing of the pollen-grain by one of various agencies into such a posi- tion that a part (the pollen-tube) of the male prothallium developed from it may reach and fertilize the oosphere in the embryo-sac. Thus the flower of Phanerogams is a reproductive shoot adapted not only for spore-production, but also for pollination, for fertilization, and for the consequences of fertiliza- tion, the production of seed and fruit. However, in spite of these complications, it is possible to determine accurately the limits of the two generations by the observation of the nuclei. The meiosis preceding the formation of the spores marks the beginning of the (haploid) gametophyte, male and female; and the sexual act marks that of the (diploid) sporophyte.

The difficult task of elucidating the life-histories of the Thallophyta has been successfully performed in certain cases by the application of the method of chromosome-counting, with the result that alternation of generations has been found to be of general occurrence. To begin with the Algae. In the Dictyotaceae (Brown Algae) there are two very similar forms in the life-history, the one bearing asexual reproductive organs (tetrasporangia) , the other bearing sexual organs (oogonia and antheridia). It has been shown (Lloyd Williams) that the former is undoubtedly the sporophyte and the latter the gametophyte, since the nuclei of the former contain 32 chromo- somes, and those of the latter 16. Meiosis takes place in the mother-cell of the tetraspores, which, on germination, give rise to the sexual form. Quite a different life-history has been traced in Fucus, another Brown Alga. Here no spores are produced: there is but one form in the life-history, the Fucus- plant, which bears sexual organs and has, on that account, been regarded as a gametophyte. The investigation of the nuclei has, however, shown (Farmer) that the Fucus-pl&nt is actually diploid, that it is, in fact, a sporophyte; but since there is no spore-formation, meiosis immediately precedes the development of the sexual cells, which alone represent the gametophyte (see below, Apospory).

Similarly, two types of life-history have been discovered in the Red Algae. In Polysiphonia violacea, a species in which the tetraspores and the sexual organs are borne by similar but distinct individuals, it has been ascertained (Yamanouchi) that, as in Dictyota, meiosis takes place in the mother-cell of the tetraspores, so that the nuclei of these spores, as also those of the sexual plants to which they give rise, contain 20 chromo- somes: and further, that the nuclei of the carpospores (diplo- spores) produced in the cystocarp as the result of fertilization, contain 40 chromosomes, as do also those of the asexual plant to which the carpospores give rise. Hence the sporophyte is represented by the cystocarp and the resulting tetraspor- angiate plants: the gametophyte, by the sexual plants. Though it is the rule in the Red Algae that the tetrasporangia and the sexual organs are borne on distinct individuals, yet cases are known in which both kinds of reproductive organs are borne upon the same plant; and to those the above conclusions obviously cannot apply. They have yet to be investigated.

The second type of life-history has been traced in Nemalion. Here there is no tetrasporangiate form, consequently meiosis takes place at a different stage in the life-history. It has been observed (Wolfe) that the nuclei of the sexual plant contain 8 chromosomes; those of the gonimoblast-nlaments of the developing cystocarp contain 16, whilst those of the carpospores contain 8: hence meiosis takes place in the

carpo- sporangia. Here the plant is the gametophyte; the sporophyte is only represented by the cystocarp. The carpospores here are true spores (haplospores).

Among the Green Algae, Coleochaete is the only form that has been fully investigated (Allen). Here meiosis takes place in the germinating oospore: consequently the plant is the

gametophyte, and the sporophyte is represented only by the oospore, so that the life-history resembles that of Nemalion. It is probable that this conclusion is generally true of the whole group; at any rate of those forms (Desmids, Spirogyra, Oedogonium, Chara) which have been more or less investi- gated.

Turning to the Fungi, somewhat similar results have been obtained in the few forms that have been studied from this point of view. In the sexual Ascomycetes it appears (Harper) that meiosis takes place in the ascocarp just before the develop- ment of the spores, so that the life-history essentially resembles that of Nemalion. Again, in certain Uredineae, having an aecidium-stage and a teleutospore-stage, which is apparently a sexual process has been observed (Blackman, Christman) which is described in the section on Abnormalities of Reproduction, and the life-history is as follows. The sexual act having taken place, a row of aecidiospores is developed in the aecidium, each of which contains two conjugate nuclei derived from the sexual nuclei. The mycelium developed from the aecidiospore, as well as the uredospores and the teleutospores that it bears, shows two conjugate nuclei. When, however, the teleuto- spore is about to germinate, the two nuclei fuse (thus completing the sexual act) and meiosis takes place. As a result the promy- celium developed from the teleutospore, and the sporidia that it produces, are uninucleate: so are also the mycelium developed from the sporidium, and the female organs (archicarps) borne upon it. Hence the limits of the sporophyte are the aecidio- spore and the teleutospore: those of the gametophyte, the teleutospore and the aecidiospore.

Similar observations have been made upon other Uredineae with a more contracted life-history. Phragmidium Potentillae- canadensis is a rust that has no aecidium-stage: consequently the primary uredospores

are borne by the mycelium produced on infection of the host by a sporidium. It has been observed (Christman) that the sporogenous hyphae fuse in pairs, suggest- ing a sexual act; then the primary uredospores are developed in rows from the fused pairs of hyphae which thus behave as sexual organs (archicarps), and each such uredospore contains two conjugate nuclei. Although the research has not been carried beyond this point, it may be inferred that in this case, as in the preceding, nuclear fusion and meiosis take place in the teleutospore. Here the sporophyte is represented by the uredo-form.

Finally, in some of the fungi in which no sexual organs have yet been discovered, this method of investigation has made it probable that some kind of sexual act takes place nevertheless. Thus in the Uredine Puccinia mahacearum, which has only teleutospore- and sporidium-stages, it has been observed (Black- man) that the formation of the teleutospores is preceded by a binucleate condition of the hyphae. The same idea is suggested by the binucleate basidia of the Basidiomycetes, which corre- spond to the teleutospores of the Uredineae.

The life-histories sketched in the preceding paragraphs show that one of the complexities met with in the Thallophyta is that meiosis does not always take place at the same point in the life-history. In the higher plants the incidence of meiosis is generally, though not absolutely, constant: it may be stated as a rule that in the Bryophyta, Pteridophyta and Phanerogams it takes place in the spore-mother-cells. In the Thallophyta this rule does not hold. In some of them, it is true, meiosis immediately precedes, as in the higher plants, the formation of certain spores, the tetraspores (Dictyotaceae, Polysiphonia), the teleutospores (Uredineae): but in others it immediately precedes the development of the sexual organs (Fucaceae), or follows more or less directly upon the sexual act (Green Algae, Nemalion, Ascomycetes).

The life-history of most Thallophyta is further complicated by the capacity of the gametophyte of the sporophyte to repro- duce themselves by cells termed gonidia, a capacity that is wholly lacking in the higher plants. The karyology of gonidia has not yet been sufficiently investigated: but when, as in the Green Algae and the Oomycetous Fungi, the gonidia are developed

by and reproduce the gametophyte, it may be inferred that they, like the gametophyte, are haploid. One case, at any rate, of the reproduction of the sporophyte by gonidia is fully known, that of the Uredineae just described, in which the uredo- form, which is a phase

of the sporophyte, is reproduced by the uredo-spores which are binucleate, that is diploid, and may be distinguished as diplogonidia. In any case the result is that whereas in the higher plants each of the alternating generations occurs but once in the life-history, in these Thallophyta the life- history may include a succession of gametophytic or of sporo- phytic forms This is, in fact, a distinguishing feature of the group. The higher plants present a regular alternation of generations: whereas, in the Thallophyta, though they probably all present some kind of alternation of generations, yet it is irregular in the various ways and for the various reasons mentioned above

Sufficient information has been given in the preceding pages to render possible the consideration of the origin of alternation of generations. To begin quite at the beginning, it may be assumed that the primitive form of reproduction was purely vegetative, merely division of the unicellular organism when it had attained the limits of its own growth. Following on this came reproduction by a gonidium: that is, the protoplasm of the cell, at the end of its vegetative life, became quiescent, surrounded itself with a proper wall, or was set free as a motile ciliated cell, having in some unexplained way become capable of originating a new course of life (rejuvenescence) on germination. Then, as can be well traced in the Brown and Green Algae (see Algae), these primitive reproductive cells (gonidia) began to fuse in pairs: in other words, they gradually became sexual. This stage can still be observed in some of these Algae {e.g. Ulothrix, Ectocarpus) where the zoospores (gonidia) may either germinate independently, or fuse in pairs to form a zygote. Gradually the sexuality of these cells became more pronounced: losing the capacity for independent germination, they acquired the external characters of more or less differentiated sexual cells, and the gametangia producing them developed into male and female sexual organs. But this advancing sexual differenti- ation did not necessarily deprive the plant of the primitive mode of propagation: the sexual organism still retained the faculty of reproduction by gonidia. The loss of this faculty only came with higher development: it is entirely wanting in some of the higher Thallophyta (e.g. Fucaceae, Characeae), and in all plants above them in the evolutionary series.

With the introduction of the sexual act, a new kind of repro- ductive cell made its appearance, the zygote. This cell, as already explained, differs from other kinds of spores and from the sexual cells, in that its necleus is diploid; and with it the sporophyte (diplophyte) was introduced into the life-history. It has been mentioned that in some plants (e.g. Green Algae) the zygote is all that there is to represent the sporophyte, giving rise, or germination and after meiosis, to one or

more spores. Passing to the Bryophyta, in fhe simpler forms (e.g. Riccia), the zygote develops into a multicellular capsule (sporogonium) ; and in the higher forms into a more elaborate sporogonium, producing many spores. In the Pteridophyta and the Phanerogams, the zygote gives rise to the highly developed sporophytic plant.

Thus the evolution of the sporophyte can be traced from the unicellular zygote, gradually increasing in bulk and in in- dependence until it becomes the equal of the gametophyte (e.g. in Dictyota and Polysiphonia), and eventually far surpasses it (Pteridophyta, Phanerogams) . Moreover, the increase in size was attended by the gradual limitation of spore-production to certain parts only, the rest of the tissues being vegetative, assuming the form of stems, leaves, &c. These facts have been formulated in the theory of ” progressive sterilization ” (Bower), which states that the sporophytic form of the higher plants has been evolved from the simple, entirely fertile, sporophyte of the lower, by the gradually increasing development of the sterile vegetative tissue at the expense of the sporogenous, accompanied by increase in total bulk and in morphological and histological differentiation. In connexion with the study of the evolution of the sporophyte,

the question arose as to its morphological significance; whether it is to be regarded as a modified form of the gametophyte, or as an altogether new form intercalated in the life-history: in other words, whether the alternation is” homologous “or” antithetic.” In certain plants there is a succession of forms which are un- doubtedly homologous: for instance, in Coleochaete where a succession of individuals without sexual organs is produced by zoospores (gonidia). The main fact that has been established is that the sporophyte, from the simple zygote of the Thallophyta to the spore-bearing plant of the Phanerogams, is character- ized by its diploid nuclei; that it is a diplophyte, in contrast to the haplophytic gametophyte. Were these nuclear characters absolutely universal, there could be no question but that the sporophyte is an altogether new antithetic form, and not an homologous generation. But certain exceptions to the rule have been detected, which are described under Abnormalities of Repro- duction: at present it will suffice to say that such things as a diploid

gametophyte and a haploid sporophyte have been ob- served in certain ferns. It can only be inferred that alternation of generations is not absolutely dependent upon the periodic halving in meiosis and the subsequent doubling by a sexual act, of the number of chromosomes in the nuclei, though the two sets of phenomena usually coincide. It must not, however, be overlooked that these exceptional cases occur in plants presenting an abnormal life-history: the fact remains that where there is both normal spore-formation with meiosis, and a sub- sequent sexual act, the haploid form is the gametophyte, the diploid the sporophyte. But the actual observation of a haploid sporophyte and of a diploid gametophyte makes it clear that however generally useful the nuclear characters may be in the distinction of sporophyte and gametophyte, they do not afford an absolute criterion, and therefore their value in determining homologies is debatable.

IV. Abnormalities of Reproduction. In what may be regarded as the type of normal life-history, the transition from the one generation to the other is marked by definite processes: there is the meiotic development of spores by the sporophyte, and the sexual production of a zygote, or something analogous to it, by the gametophyte. But it has been mentioned in the preceding pages that the transition may, in certain cases, be effected in other ways, which may be regarded as abnormal, though they are constant enough in the plants in which they occur, in fact as manifestations of reproductive degeneration.

In the first place, the sporophyte may be developed either after an abnormal sexual act, or without any preceding sexual act at all, a condition known as apogamy. In the second, the gametophyte may be developed otherwise than from a post- meiotic spore, a condition known as apospory.

Apogamy. — The cases to be considered under this head may be arranged in two groups:— .

i. Pseudapogamy: sexual act abnormal. — lhe following abnor- malities have been observed .” — –

(a) Fusion of two female organs : observed (Chnstman) in cer- tain Uredineae (Caeoma nitens, Phragmidium speciosum, Uromyces Caladii) where adjacent archicarps fuse: male cells (spermatia) are present but functionless. (6) Fusion between nuclei of the same” female organ : observed in the ascogonium of certain Ascomycetes, Humaria granu- lata (Blackman), where there is no male organ; Lachnea stercorea (Fraser) , where the male organ (pollinodium) is present but is apparently functionless.

(c) Fusion of a female organ with an adjacent tissue-cell: ob-

served (Blackman) in the archicarp of some Uredineae (Phragmidium violaceum, Uromyces Poae, Puccinia Poarum) : male cells (spermatia) present but functionless.

(d) There is no-female organ: fusion takes place between two

adjacent tissue-cells of the gametophyte; the sporophyte is developed from diploid cells thus produced, but there is no proper zygote as there is in a, b and c : observed (Farmer) in the prothallium of certain ferns (Lastraea pseudo-mas, var. polydactyla): male organs (and sometimes female) present but functionless. Another such case is that_ of Humaria rutilans (Ascomycete), in which nuclear fusion has been observed (Fraser) in hyphae of the hypothecium : the asci are developed from these hyphae, and in them meiosis takes place; there are no sexual organs.

2. Eu-apogamy: no kind of sexual act —

(a) The gametophyte is haploid :

(a) The sporophyte is developed from the unfertilized oosphere: no such case of true parthenogenesis has yet been observed.

(fi) The sporophyte is developed vegetatively from the gameto- phyte and is haploid : observed in the prothallia ofcertain ferns, Lastraea pseudo-mas, var. cristata-apospora(Fsniasr and Digby), and Nephrodium molle (Yamanouchi).

(b) The gametophyte is diploid (see under Apospory) :

(a) The sporophyte is developed from the diploid oosphere: observed in some Pteridophyta, viz. certain , ferns (Farmer), Athyrium Filix-foemina, var. clarissima, Scolopendrium vulgare, var. crispum-Drummondae, and Marsilia (Strasburger) ; also in some Phanerogams, viz. Compositae (Taraxacum, Murbeck; Antennaria alpina, Juel ; sp. of Hieracium (Rosenberg) : Rosaceae (Eu- Alchemilla sp., Murbeck, Strasburger) : Ranunculaceae (Thalictrum purpurascens, Overton).

(j3) The sporophyte is developed vegetatively from the game- tophyte: observed (Farmer) in the fern Athyrium Filix- foemina, var. clarissima.

In all the cases enumerated under Eu-apogamy, apogamy is associated with some form of apospory except Nephrodium molle, full details of which have not yet been published.

Many other ferns are known to be apogamous, but they are not included here because the details of their nuclear structure have not been investigated. Apospory. — The known modes of apospory may be arranged as follows: —

1. Pseudapospory: a spore is formed but without meiosis, so that it is diploid — observed only in heterosporous plants, viz. certain species of Marsilia (e.g. Marsilia Drummondii) where the megaspore has a diploid nucleus (32 chromosomes) and the resulting prothallium and female organs are also diploid (Strasburger) ; and in various Phanerogams, some Compositae (Taraxacum and Antennaria alpina, Juel), some Rosaceae (Eu-Alchemilla, Strasburger), and occasionally in Thalictrum purpurascens (Overton), where the megaspore (embryo-sac) is diploid; in some species of Hieracium it has been found (Rosenberg) that adventitious diploid embryo-sacs are developed in the nucellus : these plants are also apogamous.

2. Eu-apospory: no spore is formed — of this there are two varieties :

(a) With meiosis: this occurs in some Thallophyta which form

no spores; the sporophyte of the Fucaceae bears no spores, consequently meiosis takes place in the developing sexual organs; the Conjugate Green Algae also have no spores, meiosis taking place in the germinating zygospore which develops directly into the sexual plant.

(b) Without meiosis: the gametophyte is developed upon the

sporophyte by budding; that is, spore-reproduction is replaced by a vegetative process: for instance, in mosses it has been found possible to induce the development of protonema, the first stage of the gametophyte, from tissue- cells of the sporogonium: similarly, in certain ferns (varieties of Athyrium Filix-foemina, Scolopendrium vulgare, Lastraea pseudo-mas, Polystichum angulare, and in the species Pteris aquilina and Asplenium dimorphum), the gametophyte (prothallium) is developed by budding on the leaf of the sporophyte, and in some of these cases it has been ascertained that the gametophyte so developed has the same number (2x) of chromosomes in its nuclei as the sporophyte that bears it — that is, it is diploid.

Apospory has been found to be frequently associated with apogamy; in fact, in the absence of meiosis, this association would appear to be inevitable.

Combined Apospory and Apogamy. — Instances have been given of

the occurrence of both apospory and apogamy in the same life-history; but in all of them there is a regular succession of sporophyte and gametophyte. The cases now to be con- sidered are those in which one or other of the generations gives rise directly to its like, sporophyte to sporophyte, gametophyte to gametophyte, the normally intervening generation being omitted.

It is possible to conceive of this abbreviation of the life-history taking place in various ways. Thus, a sporophyte might be developed from a haploid spore instead of a gametophyte as is the normal case, but this has not been observed: again, a sporophyte might be developed from a diploid spore (as dis- tinguished from a zygote or a diploid oosphere), a possibility that is to some extent realized in the life-history of some Uredineae in which successive forms of the polymorphic sporo- phyte are developed from diplogonidia. Similarly a gameto- phyte might be developed from a fertilized or an unfertilized

female cell: the latter possibility is to some extent realized in those Algae (e.g. Ulothrix, Ectocarpus) in which the sexual cells (isogametes), if they fail to conjugate, germinate inde- pendently as gonidia, giving rise to gametophytes.

The more familiar mode is that of vegetative budding, as already mentioned. When a ” viviparous ” fern or Phanerogam reproduces itself by a bud or a bulbil, both spore-formation and the sexual act are passed over: sporophyte springs from sporo- phyte. Remarkable cases of this have been observed in certain Phanerogams (Coelebogyne ilicifolia, Funkia ovata, Nothoscordum fragrans, Citrus, sp. of Euonymus, Opuntia vulgaris) in the ovule of which adventitious embryos are formed by budding from cells of the nucellus: with the exception of Coelebogyne, it appears that this only takes place after the oosphere has been fertilized. In other plants it is the gametophyte that reproduces itself by means of gemmae or bulbils, as commonly in the Bryophyta, the prothallia of ferns, &c.

The abnormalities described are all traceable to reproductive degeneration; the final result of which is that true reproduction is replaced more or less completely by vegetative propagation. It may be inquired whether degeneration may have proceeded so far in any

plant of sufficiently high organization to present spore-formation, or sexual reproduction, or both, as to cause the plant to reproduce itself entirely and exclusively by the vege- tative method. The only such case that suggests itself is that of Caulerpa and possibly some other Siphonaceous Green Algae. In this plant no special reproductive organs have yet been discovered, and it certainly reproduces itself by the breaking off of portions of the body which become complete plants: but it is quite possible that reproductive organs may yet be dis- covered.

V. Physiology of Reproduction.

The reproductive capacity of plants, as of animals, depends upon the fact that the whole or part of the protoplasm of the individual can develop into one or more new organisms in one or other of several possible ways. Thus, in the case of unicellular plants, the whole of the protoplasm of the parent gives rise, whether by simple division or otherwise, to one or more new plants. Reproduction necessarily closes the life of the individual: here, as August Weismann long ago pointed out, there is no natural death, for the whole of the protoplasm of the parent continues to live in the progeny. In multicellular plants, on the contrary, the reproductive function is mainly discharged by certain parts of the body, the reproductive organs, the remainder of the body being essentially vegetative — that is, concerned with the maintenance of the individual. In these plants it is only a part of the protoplasm that continues to live in their progeny; the remainder, the vegetative part, eventually dies. It is therefore possible to distinguish in them, on the one hand, the essentially reproductive protoplasm, which may be designated by Weismann's term germ-plasm, though without necessarily adopting all that his use of it implies, and the essentially vegetative, mortal protoplasm, the somatoplasm, on the other. In the unicellular plant no such distinction can be drawn, for the whole of the protoplasm is concerned in repro- duction. But even in the most highly organized multicellular plant this distinction is not absolute: for, as already explained, plants can, in general, be propagated by the isolation of almost any part of the body, that is vegetatively, and this implies the presence of germ-plasm elsewhere than in the special repro- ductive organs.

If the attempt be made to distinguish between the organs of vegetative propagation and those of true reproduction, the nearest approach would be the statement that the former contain both germ-plasm and somatoplasm, whereas the latter, or at least the reproductive cells, consist entirely of germ-plasm.

The question now arises as to the exact seat of the germ-plasm, and the answer is to be looked for in the results of the numerous researches into the structure and development of the reproductive cells that form so large a part of the biological work of recent years. The various facts already mentioned suffice to prove

that the nucleus plays the leading part in the reproductive processes of whatever kind: the general conclusion is justified that no reproductive cell can develop into a new organism if deprived of its nucleus. It may be inferred that the nucleus either actually contains the germ-plasm, or that it controls and directs the activities of the germ-plasm present in the cell. It is not improbable that both these inferences may be true. At any rate there is no sufficient ground for excluding the co-operation of the cytoplasm, especially of that part of it dis- tinguished as kinoplasm, in the reproductive processes.

Pursuing the ascertained facts with regard to the nucleus, it is established that the part of it especially concerned is the linin-network which consists of the chromosomes. The be- haviour, as already described, of the chromosomes in the various reproductive processes has led to the conclusion that the hereditary characters of the parent or parents are transmitted in and by them to the progeny: that they constitute, in fact, the material basis of heredity (see Heredity) . They can hardly, however, be regarded as the ultimate structural units, for the simple reason that their number is far too small in relation to the transmissible characters. It has been suggested (Farmer) that the chromomeres are the units, but the number of these would seem to be hardly sufficient. It seems necessary to fall back upon hypothetical ultimate particles, as suggested by Darwin, de Vries and Weismann, which may be generally termed pangens. The chromomeres may be regarded as aggregates of such particles, the ” ids ” of Weismann.

The foregoing considerations make it possible to attempt an explanation of the various reproductive processes.

Vegetative Propagation. — It is easily intelligible that the two individuals produced by the division of a unicellular plant should resemble the parent and each other; for, the division of the parent-nucleus being homotypic, the chromosomes which go to constitute the nucleus of each daughter-cell are alike both in number and in nature, and exactly repeat the constitution of the parent-nucleus.

In the more complicated cases of propagation by bulbils, cuttings, &c, the development of the new individual, or of the missing parts of the individual (roots, &c), may be ascribed to the presence in the bulbil or

cutting of the necessary pangens.

Reproduction by Gonidia. — In this case a single cell gives rise to a complete new organism resembling the parent. The inference is that the gonidium is a portion of the parental germ- plasm, in which all the necessary pangens have been accumulated.

Reproduction by Spores. — In this case, also, an entire organism is developed from a single cell, but with this peculiarity that the resulting organism is unlike that which bore the spore, a peculiarity which has not yet been explained. It has been already stated that the development of true spores involves meiosis, and this process is no doubt related to the behaviour of the spore on germination; but the nature of this relation remains obscure. It might be assumed that, as the result of meiosis, the nucleus of the spore receives only gametophytic pangens. But the assumption is rendered impossible by the fact that the spore gives rise to a sexual organism, the repro- ductive cells of which, after the sexual act, produce a sporo- phyte. Clearly sporophytic pangens must be present as well in the spore as in the gametophyte and in its sexual cells. It can only be surmised that they exist there in a latent condition, dominated, as it were, by the gametophytic pangens.

Sexual Reproduction. — Here, again, as yet unanswered questions present themselves. The essence of a sexual cell is that it cannot give rise by itself to a new organism, it is only truly reproductive after the sexual act: this peculiarity is just what constitutes its sexuality. Minute investigation has not yet detected any essential structural difference between a sexual cell and a spore; on the contrary, the results so far obtained have established that they essentially agree in being post-meiotic (haploid). Why then do they differ so fundamentally in their reproductive capacities? Again, sexual cells differ in sex; but there are as yet no facts to demonstrate any essential structural difference between male

and female cells. What is known about them tends to prove their structural similarity rather than their difference. But it is possible that their difference may be chemical, and so not to be detected by the microscope.

The normal sexual act has been described as consisting in the fusion,

first, of two cells, then of their nuclei, and finally, often after a long interval, of their chromosomes and of their chromomeres in meiosis. What causes determined these fusions is a question that is only partly answered. It is known in certain cases (e.g. ferns and mosses) that the male cell is attracted to the female by chemical substances secreted for the purpose by the female organ; that it is a case of chemio- taxis. Probably this is more common than experiment has yet shown it to be. It is quite conceivable that the consequent cell-fusion, as also the subsequent fusions of nuclei and of chromosomes, are likewise cases of chemiotaxis, depending upon chemical differences between the fusing structures.

The sexual process can only take place between cells which are related to each other in a certain degree (see Hybridism); that is, it depends upon sexual affinity. It is the general rule that it takes place between cells derived from different individuals of the same species; that is, cross-fertilization is the rule. This is necessarily the case when the male and female organs are developed upon different individuals, when the plant is said to be dioecious. When both kinds of organs are developed upon the same individual (monoecious), self-fertiliza- tion may and often does occur; but it is commonly hindered by various special arrangements, of which dichogamy is the most common; that is, that the male and female organs are not mature at the same time. But though these arrangements favour cross-fertilization, they do not absolutely prevent self- fertilization. In some cases, cleistogamic flowers, for instance, self-fertilization alone is possible (see Angiosperms). The general conclusion is that though cross-fertilization is the more advantageous form of sexual reproduction, still self-fertilization is more advantageous to the species than no fertilization at all.

In considering this subject, it must be borne in mind that the terms used have different meanings when applied to certain heterosporous plants from those which they convey when applied to isosporus plants. In the latter cases their meaning is direct and simple : in the former it is indirect and somewhat complicated. In heterosporous plants generally the actual sexual organs are never borne upon the same individual, there is always necessarily a male and a female gametophyte; so that, strictly speaking, self-fertilization is impossible. But in the Phanerogams, where there is a process preliminary to fertiliza- tion, that of pollination, which is unknown in other plants, the terms and the conceptions expressed by them are applied, not to the real sexual organs, but to the spores. Thus a dioe- cious Phanerogam is one in which the microspores are developed by one individual, the megaspores by another; and again, self-fertilization is

said to occur when the microspores (pollen) fall upon the stigma of the same flower (see Angiosperms) ; but this is really only self-pollination.

To return to the sexual process itself. Whatever its nature, two sets of results follow upon the sexual act — (i) a zygote is formed, which is capable of developing into a new organism; from two cells, neither of which could so develop; (2) the hereditary sporophytic characters of the two parents are pos- sessed by the organism so developed. These two results will now be considered in some detail.

(1) The Relation between the Sexual Act and Reproductive Capacity. — In the early days of the discovery of the sexual process, it was thought that the capacity for development imparted to the female cell was to be attributed to the doubling of its nuclear substance by the fusion with the male cell. Reproductive capacity does not, however, depend upon the bulk of the nuclear substance, for a spore, like an unfertilized female cell, contains but the x number of chromosomes, and yet it can give rise to a new organism. Again, it has been observed (Winkler) that a non-nucleated fragment of an oosphere of Cystoseira (Fucaceae) ran be ” fertilized ” by a spermatozoid and will then grow and

divide to form a small embryo, though it necessarily contains only the x number of chromosomes. From this it would appear that some stimulating influence had been exerted by the male cell, and it is probably in this direction that the desired explanation is to be sought. Some important confirmatory facts have been recorded with regard to certain animals (sea-urchins). It has been observed (Loeb) that treatment with magnesium chloride will cause the ova to grow and segment; and similar results have been obtained (Winkler) by treating the ova with a watery extract of the male cells. Hence it may be inferred that the male cell carries with it, either in its cytoplasm (kinoplasm), or in its nucleus, extractable substances, perhaps of the nature of enzymes, that stimulate the female cell to growth.

It may be mentioned that the stimulating effect of fertilization is not necessarily confined to the female cell; very frequently adjacent tissues are stimulated to growth and structural change. In a Phanerogam, for instance, the whole ovule grows and develops into the seed: the development of endosperm in the embryo-sac is initiated by another nuclear fusion, taking place between the second male nucleus and the endosperm-nucleus: the ovary, too, grows to form the fruit, which may be dry and hard or more or less succulent: the stimulating effect may extend to other parts of the flower; to the

perianth, as in the mulberry; to the receptacle, as in the strawberry and the apple: or even beyond the flower to the axis of the inflorescence, as in the fig and the pine-apple. Analogous developments in other groups, are the calyptra of the Bryophyta, the cystocarps of the Red Algae, the ascocarps of the Ascomycetes, the aecidia of the Uredineae, &c.

(2) The Relation oj the Sexual Act to Heredity. — The product of the sexual act is essentially a diploid cell, the zygote, which actually is or gives rise to a sporophyte. The sexual heredity of plants consequently presents the peculiar feature that the organism resulting from the sexual act is quite unlike its imme- diate parents, which are both gametophytes. But it is clear that the sporophytic characters must have persisted, though in a latent condition, through the gametophyte, to manifest them- selves in the organism developed from the zygote.

The real question at issue is as to the exact means by which these characters are transmitted and combined in the sexual act. There is a considerable amount of evidence that the hereditary characters are associated with the chromomeres, and that it is rather their linin-constituent than their chromatin which is functional (Strasburger): that they constitute, in fact, the material basis of heredity. From this point of view it is probable that the last phase of the sexual act, the fusion of the chromomeres in meiosis, represents the combination of the two sets of parental characters. What exactly happens in the pseudo-chromosome stage is not known; at any rate this stage offers an opportunity for a complete redistribution of the substance of the chromomeres — in other words, of the parental pangens. It is a striking fact that, in the subsequent nuclear division, the distribution of the chromosomes derived from the male and female parents (when they can be distinguished) seems to be a matter of indifference: they are not equally distributed to the two daughter-nuclei. The explanation would appear to be this, that they are not any longer male and female as they were before meiotic fusion; and that it is because they now contain both male and female nuclear substance that their equal distribution to the daughter-nuclei is unimportant.

The nature of this redistribution of the substance of the chromomeres is still under discussion. Some regard it as essentially a chemical process, resulting in the formation of new compounds: others consider it to be rather a physical process, a new material system being formed in the rearrangement of the pangens; here it must be left for the present.

The various ways in which the parental characters manifest

themselves in the progeny are fully dealt with in the articles Heredity, Hybridism, Mendelism. It will suffice to say that the progeny, though maintaining generally the characters of the species, do not necessarily exactly resemble either of the parents, nor do they, necessarily present exactly intermediate characters:

they may vary more or less from the type. It is an interesting fact, the full significance of which has not yet been worked out, that, as a rule, plants that vary profusely are those in which the characteristic 2X number of chromosomes is high (60-100).

Brief reference may be made to the cases of abnormal sexual or pseudo-sexual reproduction described above under Apogamy. Taking first the cases of true apogamy, there is clearly no need for any sexual process, for, since no meiotic division has taken place, the gametophyte is diploid; its cells, whether vegetative or contained in female organs, possess the capacity for both development and the transmission of the sporophytic characters. It is not remarkable that such a gametophyte should be able to give rise directly to a sporophyte; but it is remarkable, in the converse case of apospory, that a sporophyte should give rise to a diploid gametophyte rather than to another sporophyte. In the latter case the tendency to the regular development of the alternate form appears to override the influence of the diploid nucleus.

Turning to the various forms of pseudo-apogamy, there are first those in which fusion takes place between two apparently female organs (some Uredineae; Christman), and those in which it takes place between nuclei within the same female organ (Humaria; Blackman). If these are to be regarded physiologically as sexual acts, it must be inferred that the fusing organs or nuclei have, come to differ from each other to some extent; for it is unthinkable that equivalent female organs or cells should be able to fertilize, or to be fertilized by, one another. There are finally those cases in which apparently vegetative cells take part in the sexual act, as in Phragmidium (Blackman), where the female organ fuses with an adjacent vegetative cell, and in the fern-prothallium (Farmer), where the nuclei of two vegetative cells fuse. They would seem to indicate that vege- tative cells may, in certain circumstances, contain sufficient germ-plasm to act as sexual organs without being differentiated as such.

An interesting question is that of the origin of apogamy. It is no doubt the outcome of sexual degeneration; but this general statement requires some explanation. In certain cases apogamy seems to be the result of the degeneration of the male organ; as in Humaria, where there is no male organ, and in Lachnea, where the male organ is rudimentary. In others, as in the Uredineae, it is apparently the female organ that has degenerated, losing its receptive part, the trichogyne; the male cells (spermatia) are developed normally, and there is no reason to believe that they might not fertilize the female organ were there the means of penetrating it. In yet other cases the degeneration occurs at a different stage in the life-history, in the development of the spores. In the apogamous ferns in- vestigated, meiosis is suppressed and apogamy results. In the heterosporous plants which have been investigated {e.g. Marsilia, Eu-Alchemilla) it has been observed that the microspores are so imperfectly developed as to be incapable of germinating, so that fertilization is impossible; and it is perhaps to this that the occurrence of apogamy is to be attributed. This abnormal development of the spores may be regarded as a variation; and in most cases it occurs in plants that are highly variable and often have a high 2X number of chromosomes.

It will be observed that such physiological explanation as can be given of the phenomena of reproduction is based upon the results of the minute investigation of the changes in nuclear structure associated with them. The explanation is often rather suggested than proved, and some fundamental facts still remain altogether unexplained. But it may be anticipated that a method of research which has already so successfully justified itself will not fail in the future to elucidate what still remains obscure.

Bibliography. — This article should be read in connexion with the following: Algae, Angiosperms, Bryophvta, Cytology, Fungi,Gymnosperms,Heredity, Hybridism, Mendelism, Plants, Pteridophyta.

As the bibliographies to these articles include all the publications containing the facts and theories mentioned here, it will suffice to append only a few papers of general importance: Blackman and

Vd;

Fraser. ” Further Studies on the Sexuality of the Uredineae,” Ann. Bot. (1906) vol. xx. ; Farmer, ” On the Structural Constituents of the

Nucleus, and their Relation to the Organization of the In- dividual ” (Croonian Lecture), Proc. Roy. Soc. (1907) vol. 79, series B ; Farmer and Digby, ” Studies in Apospory and Apogamy in Ferns,” Ann. Bot. (1907) vol. xxi. ; Strasburger, Vie stoffiichen Grundlagen der Vererbung (1905); ” Apogamie bei Marsilia,”, Flora (1907), vol. 97; D. M. Mottier, Fecundation in Plants (1904), Carnegie Institution, Washington. (S. H, V.*)

REPRODUCTIVE SYSTEM, IN ANATOMY.— The repro- ductive system in some parts of its course shares structures in common with the urinary system (q.v.). In this article the following structures will be dealt with. In the male the testes, epididymis, vasa deferentia, vesiculae seminales, prostate, penis and urethra. In the female the ovaries, Fallopian tubes, uterus, vagina and vulva.

Male Reproductive Organs.

The testes or testicles are the glands in which the male repro- ductive cells are formed. They lie, one on each side, in the scrotum surrounded by the tunica vaginalis (see Coelom and Serous Membranes).” Each is an oval gland about one and a half inches long with its long axis directed downward, backward and inward. There is a strong fibrous coat called the tunica albuginea, from which vertical and horizontal septa penetrate into the substance, thus dividing it into compartments or lobules in which the seminiferous tubes are coiled. It is estimated that the total length of these seminiferous tubes in the two glands is little short of a mile. (See fig. r.)

At the posterior part of the testis the fibrous sheath is greatly thickened to form the mediastinum testis, and con- tains a plexus of tubules called the rete testis (see fig. 1), into which the semini- ferous tubes open. In this way the secretion of the gland is carried to its upper and

back part, whence from fifteen From A. F. Dixon, Cunningham’s Text-book

to twenty small tubes (vasa 0/ Anatomy,

eferentia) pass to the epidi- FlG ; I —Diagram to illustrate the f . ‘_ , r x, • structure of the testis and epidi-

dymis. Each of these is dymis. convoluted before opening, and forms what is known as c – a conus vasculosus.

Under the microscope the seminiferous tubules are seen

to consist of a basement membrane surrounding several layers of epithelial cells, some of which are constantly being transformed into spermatozoa or male sexual cells.

The epididymis (see fig. 1) is a soft body lying behind the testis; it is enlarged above to form the globus major or head, while below is a lesser swelling, the globus minor or tail. The whole epididymis is made up of a convoluted tube about 20 ft. long, from which one long diverticulum (vas aberrans) comes off. Between the globus major and the testis two small vesicles called the hydatids of Morgagni are often found.

The vas deferens is the continuation of the tube of the epidi- dymis and starts at the globus minor; at first it is convoluted, but soon becomes straight, and runs up on the inner (mesial) side of the epididymis to the external abdominal ring in the abdominal wall. On its way up it is joined by several other structures, to form the spermatic cord; these are the artery (spermatic) and veins (pampiniform plexus) of the testis, the artery of the vas, the ilio-inguinal, genito-crural and sympathetic nerves, and the testicular lymphatics. After entering the external abdominal ring, these structures pass obliquely through the abdominal wall, lying in the inguinal canal for an inch and a half, until the internal abdominal ring is reached. Here they separate and the vas passes down the side of the pelvis and turns

Coni vasculosi. Globus major. g.m'. Globus minor. Rete testis Septula testis.

s.t. Seminiferous

tubule. v.d. Vas deferens, p.c. Vas efferens. v.r. Tubuli recti.

inward to meet its fellow at the back of the bladder, just above the prostate. The whole length of the vas is 12 to 18 in. and it is remarkable for the great thickness of its muscular walls, which gives it the feeling of a piece of whipcord when rolled between the finger and thumb.

A little above the globus major a few scattered tubules are found in children in front of the cord; these form the rudi- mentary structure known as the organ of Giraldes or paradidymis. As the vas deferens

approaches the prostate it enlarges and becomes slightly sacculated to act as a reservoir for the secretion of the testis; this part is the ampulla (see fig. 2).

and run, side by side, through the prostate to open into the floor of the prostatic urethra.

The prostate is partly a muscular and partly a glandular struc- ture, situated just below the bladder and traversed by the urethra; it is of a somewhat conical form with the base upward in contact with the bladder. Both vertically and transversely it measures about an inch and a quarter, while antero-posteriorry it is only about three-quarters of an inch, though its size is liable to great variation. It is enclosed in a fibrous capsule from which it is separated by the prostatic plexus of veins anteriorly. It is often described as formed of three lobes two lateral and a median or

posterior, but careful

Posterior superior iliac spine

Ureter

Great sciatic notch

Vas deferens

Spine of ischium

Vas deferens

Seminal vesicle Bladder wall

Levator ani

Prostate

Ischio-rectal fossa

Tuberosity of I

ischium J

Gluteus maximus

and recent throw doubt existence of

Posterior superior iliac spine

Cut end of rectum Apex of sacrum Great sciatic notch Ureter Peritoneum Spine of ischium Bladder wall

Seminal vesicle Ampulla of vas deferens \ Cut end of great sacro- ? sciatic ligament Kpf f

Common ejaculatory duct Oetter

sections research on the the last.

Microscopically the prostate consists of masses of long, slen- der, slightly branching glands, embedded in unstriped muscle and fibrous tissue; these glands open by deli- cate ducts (about twenty in number) into the prostatic urethra, which will be described later. In the anterior part of the gland are seen bundles of striped muscle fibres, which are of interest when the comparative ana- tomy of the gland is studied: they are seen in young

Levator ani Tuberosity of ischium

Ischio-rectal fossa

Cut end of rectum

External sphincter ani

Gluteus maximus

From A. F. Dixon, Cunningham's Text-book of Anatomy.

Fig. 2. — View of the Base of the Bladder, Prostate, Seminal Vesicles and Vasa Deferentia from behind. The coccyx and the sacro-sciatic ligaments, together with the muscles attached to them, have been removed. The levatores ani have been separated along the median raphe, and drawn outwards. A considerable portion of the rectum and the upper part of the right seminal vesicle have been taken away.

The vesiculae seminales are sac-like diverticula, one on each side, from the lower part of the ampullae of the vasa deferentia. They are about 2 in. long and run outward behind the bladder and parallel to the upper margin of the prostate for some little distance, but usually turn upward near their blind extremity. When carefully dissected and unravelled each is found to consist of a thick tube, about 5 in. long, which is sharply bent upon itself two or three times, and also has several short, sac-like pouches or diverticula. The vesiculae seminales are muscular sacs with a mucous lining which is thrown into a series of delicate net-like folds. The convolutions are held together by the pelvic cellular tissue, and by involuntary muscle continuous with that of the bladder. It is probable that these vesicles are not reservoirs, as was at one time thought, but form some special secretion which mixes with that of the testes. Where the vesiculae join the ampullae of the vasa deferentia the ejaculatory ducts are formed; these are narrow and thin-walled,

than in old prostates.

The male urethra begins at the bladder and runs through the prostate and perineum to the penis, which it traverses as far as the tip. It is divided into a prostatic, membran- ous and spongy part, and is altogether about 8 inches in length. The prostatic urethra runs downward through the prostate rather nearer the an- terior than the pos- terior part. It is about an inch and a quarter long, and in the middle of the gland it bends forward forming an angle (see fig. 5); here it is from a third to half an inch wide, though at the base and apex of the prostate it is narrower. When it is slit open from in front a longitudinal ridge is seen in its posterior wall, which is called the verumon- tanum or crista urethra, and on each side of this is a longitudinal depression, the prostatic sinus, into which numerous ducts of the prostate open, though some of them open on to the antero-lateral surface. Near the lower part of the verumontanum is a little pouch, the utriculus masculinus, about one-eighth of an inch deep, the opening of which is guarded by a delicate membranous circular fold, the male hymen. Close to the opening of the utriculus the ejaculatory ducts, already mentioned, open into the urethra by very small apertures. The part of the urethra above the openings of these ducts really belongs to the urinary, system only, though it is convenient to describe it here. After leaving

this prostate the urethra runs more forward for about three- quarters of an inch, lying between the two layers of the triangular

From C. S. Wallace's Prostatic Enlargement. 1

Fig. 3. — Coronal Section through the Pelvis, showing the relations of the bladder above, prostate and bulb below.

ligament, both of which it pierces. This is known as the membranous urethra, and is very narrow, being gripped by the compressor urethrae muscle.

The spongy urethra is that part which is enclosed in the penis after piercing the anterior layer of the triangular ligament. At first it lies in the substance of the bulb and, later, of the corpus spongiosum, while finally it passes through the glans. In the greater part of its course it is a transverse slit, but in tra- versing the glans it enlarges considerably to form the fossa navicularis, and here, in transverse section, it looks like an inverted T (J.), then an inverted Y (A), and finally at its opening

From C. S. Wallace's Prostatic Enlargement.

Fig. 4. — Transverse Section of a young Prostate, showing wavy

striped muscle in front, urethra in the middle, and the two ejacu-

latory ducts behind.

(external meatus) a vertical slit. Into the whole length of the urethra mucous glands {glands of LittrS) open, and in the roof of

1 Figs. 3, 4, 5 and 9 of this article are redrawn from Cuthbert S. Wallace's Prostatic Enlargement by permission of the managers of The Oxford Medical Publications.

the fossa navicularis the mouth of one of these is sometimes so large that it may engage the point of a small catheter and is known as the lacuna magna. As a rule the meatus is the narrowest part of the whole canal.

Opening into the spongy urethra where it passes through the bulb are the ducts of two small glands known as Cowper's glands, which lie on each side of the membranous urethra and are best seen in childhood.

The penis is the intromittent organ of generation, and is made up of

three cylinders of erectile tissue, covered by skin and subcutaneous tissue without fat. In a transverse section two of these cylinders (the corpora cavernosa) are placed above, side by side, while one, the corpus spongiosum, is below. Pos- teriorly, at what is known as the root of the penis, the two corpora cavernosa diverge, become more and more fibrous in structure, and are attached on each side to the rami of the ischium, while the corpus spongiosum becomes more vascular and enlarges to form the bulb. It has already been pointed out that the whole length of the corpus spongiosum is traversed by the urethra. The anterior part of the penis is formed by the glans, a bell-shaped structure, apparently continuous with the corpus spongiosum, and having the conical ends of the cor- pora cavernosa fitted into depressions on its posterior surface. On the dorsum of the penis the rim of the bell-shaped glans projects beyond the level of the corpora cavernosa, and is

From C. S. Wallace's Prostatic Enlargement. Fig. 5. — Sagittal Median Section of Bladder, Prostate and Rectum, showing one of the ejaculatory ducts.

known as the corona glandis. The skin of the penis forms a fold which covers the glans and is known as the prepuce or foreskin ; when this is drawn back a median fold, the frenulum praeputii, is seen running to just below the meatus. After forming the prepuce the skin is reflected over the glans and here looks like mucous membrane. The structure of the cor- pora cavernosa consists of a strong fibrous coat, the tunica albuginea, from the deep surface of which numerous fibrous trabeculae penetrate the interior and divide it into a number of spaces which are lined with endothelium and communicate with the veins. Between the two corpora cavernosa the sheath is not complete and, having a comb-like appearance, is known as the septum pectinatum. The structure of the corpus spongiosum and glans resembles that of the corpora cavernosa, but the trabeculae are finer and the network closer.

Female Reproductive Organs.

The ovary is an organ which in shape and size somewhat resembles a large almond, though its appearance varies con- siderably in different individuals, and at different times of life. It lies in the side wall of the pelvis with its long axis nearly vertical and having its blunt end (tubal pole) upward. Its more pointed lower end is attached to the uterus by the liga- ment of the ovary, while its anterior border has a short reflection of peritoneum, known as the mesovarium, running forward to the broad ligament of the uterus. It is through this anterioi border

that the vessels and nerves enter and leave the gland.

Under the microscope the ovary is seen to be covered by a

layer of cubical cells, which are continuous near the anterior border with the cells of the peritoneum. Deep to these is the ovarian stroma, composed of fibrous tissue, and embedded in it are numerous nests of epithelial cells, the Graafian fol- licles, in various stages of development. During the child- bearing period of life some of these will be nearing the ripe condition, and if one such be looked at it will be seen to con- tain one large cell, the ovum, surrounded by a mass of small cells forming the discus proligerus. At one point this is con- tinuous with a layer of cells called the stratum granulosum which lines the outer wall of the follicle, but elsewhere the two layers are separated by fluid, the liquor folliculi. When the follicle bursts, as it does in time, the ovum escapes on to the surface of the ovary.

The Fallopian tubes receive the ova and carry them to the uterus. That end of each which lies in front of the ovary is called the fimbriated extremity, and has a number of fringes (fimbriae) hanging from it; one of the largest of these is the ovarian fimbria and is attached to the upper or tubal pole of the ovary. The small opening among the fimbriae by which the tube communicates with the peritoneal cavity is known as the ostium abdominale, and from this the lumen of the tube runs from four to four and a half inches, until it opens into the cavity of the uterus by an extremely small opening. In the accompanying figure (fig. 6) the Fallopian tube and ovary

Parovarium Fallopian tube I Ovary

Ligament of ovary

Uterus

of uterus

Hydatid

Round ligament

A. F. Dixon, Cunningham’s Text-Book of Anatomy. .

Fig. 6. — A. The Uterus and Broad Ligament seen from behind (the broad

ligament has been spread out).

a, b and c. the isthmus tubae, the ligament of the ovary, and the round ligament of the

right side cut short. B. Diagrammatic Representation of the Uterine Cavity opened up from in front.

are pulled out from the uterus; this, as has been explained, is not the position of the ovary in the living body, nor is it of the tube, the outer half of which lies folded on the front and inner surface of the ovary, The Fallopian tubes, like many other tubes in the body, are made chiefly of unstriped muscle, the outer layer of which is longitudinal and the inner circular; deep to this are the submucous and mucous coats, the latter being lined with ciliated epithelium (see Epithelial Tissues), and thrown into longitudinal pleats. Superficially the tube is covered by a serous coat of peritoneum. The calibre gradually contracts from the peritoneal to the uterine opening.

The uterus or womb is a pear-shaped, very thick-walled, muscular bag, lying in the pelvis between the bladder and rectum. In the non-pregnant condition it is about three inches long and two in its broadest part, which is above. The upper half or body of the uterus is somewhat triangular with its base upward, and has an anterior surface which is moderately flat, and a posterior convex. The lower half is the neck or cervix and is cylindrical; it projects into the anterior wall of the vagina, into the cavity of which it opens by the os uteri externum. This opening in a uterus which has never been pregnant is a narrow transverse slit, rarely a circular aperture, but in those uteri in which pregnancy has occurred the slit is much wider and its lips are thickened and gaping and often

scarred. The interior of the body of the uterus shows a com- paratively small triangular cavity (see fig. 6, B), the anterior and posterior walls of which are in contact. The base of the triangle is upward, and at each lateral angle one of the Fallopian tubes opens. The apex leads into the canal of the cervix, but between the two there is a slight constriction known as the os uteri internum. The canal of the cervix is about an inch long, and is spindle-shaped when looked at from in front; its anterior and posterior walls are in epntact, and its lining mucous membrane is raised into a pattern which, from its likeness to a cypress twig, is called the arbor vitae. This arrange- ment is

obliterated after the first pregnancy. On making a mesial vertical section of the uterus the cavity is seen as a mere slit which is bent about its middle to form an angle the opening of which is forward. A normal uterus is therefore bent forward on itself, or anteflexed. In addition to this, its long axis forms a marked angle with that of the vagina, so that the whole uterus is bent forward or anteverted. As a rule, in adults the uterus is more or less on one side of the mesial plane of the body. From each side of the uterus the peritoneum is reflected outward, as a two-layered sheet, to the side wall of the pelvis; this is the broad ligament, and between its layers lie several structures of importance. Above, there is the Fal- lopian tube, already described; below and in front is the round ligament; behind, the ovary projects backward, and just above Lateral angle this, when the broad ligament is stretched out as in fig. 6, are the epoophoron and paroophoron with the duct of Gartner.

The round ligament is a cord of un- striped muscle which runs from the lateral angle of its own side of the uterus forward to the internal abdominal ring, and so through the inguinal canal to the upper part of the labium majus.

The epoophoron or parovarium is a collection of short tubes which radiate from the upper border of the ovary when the broad ligament is pulled out as in fig. 6. It is best seen in very young children and represents the vasa effer- entia in. the male. Near the ovary the tubes are closed, but nearer the Fal- lopian tube they open into another tube which is nearly at right angles to them, and which runs toward the uterus, though in the human subject it is generally lost before reaching that organ. It is known as the duct of Gartner, and is the homologue of the male epididymis and vas deferens. Some of the outermost tubules of the epoophoron are sometimes distended to form hydatids. Nearer the uterus than the epoophoron a few scattered tubules are occasionally found which are looked upon as the homologue of the organ of Giraldes in the male, and are known as the parodphoron.

The vagina is a dilatable muscular passage, lined with mucous membrane, which leads from the uterus to the external genera- tive organs; its direction is, from the uterus, downward and forward, and its anterior and posterior walls are in contact, so that in a horizontal section it appears as a transverse slit. As the orifice is neared the slit becomes H-shaped. Owing to the fact that the neck of the uterus enters the vagina from in front, the anterior wall of that tube is only about z\ in., while the posterior is 3§. The mucous membrane is raised into a series of transverse folds or rugae, and between it and the

muscular wall are plexuses of veins forming erectile tissue. The relation of the vagina to the peritoneum is noticed under Coelum and Serous Membranes.

The vulva or pudendum comprises all the female external generative organs, and consists of the mons Veneris, labia majora and minora, clitoris, urethral orifice, hymen, bulbs of the vestibule, and glands of Bartholin. The mons Veneris is the

Vaginai cavity B

elevation in front of the pubic bones caused by a mass of fibro- fatty tissue; the skin over it is covered by hair in the adult. The labia major a are two folds of skin, also containing fibro-fatty tissue and covered on their outer surfaces by hair, running down from the mons Veneris to within an inch of the anus and touching one another by their internal surfaces. They are the homologues of the scrotum in the male. The labia minora are two folds of skin containing no fat, which are usually hidden by the labia majora and above enclose the clitoris, they are of a pinkish colour and look like mucous membrane.

The clitoris is the representative of the penis, and consists of two corpora cavernosa which posteriorly diverge to form the crura clitoridis, and are attached to the ischium; the organ is about an inch and a half long, and ends anteriorly in a rudi- mentary glans which is covered by the junction of the labia minora; this junction forms the prepuce of the clitoris.

The orifice of the urethra is about an inch below the glans clitoridis and is slightly puckered.

The hymen is a fold of mucous membrane which surrounds the orifice of the vagina and is usually only seen in the virgin. As has been pointed out above, it is represented in the male by the fold at the opening of the uterus masculinus. Occasionally the hymen is imperforate and then gives rise to trouble in menstruation.

The bulbs of the vestibule are two masses of erectile tissue situated one on each side of the vaginal orifice: above they are continued up to the clitoris; they represent the bulb and the corpus spongiosum of the male, split into two, and the fact that they are so divided accounts for- the urethra failing to be enclosed in the clitoris as it is in the penis.

The glands of Bartholin are two oval bodies about half an inch long, lying on each side of the vagina close to its opening; they represent Cowper's glands in the male, and their ducts open by minute orifices between the hymen and the labia minora.

From the above description it will be seen that all the parts of the male external genital organs are represented in the female, though usually in a less developed condition, and that, owing to the orifice of the vagina, they retain their original bi-lateral form.

For further details see Quain's Anatomy (London: Longmans, Green & Co.) ; Gray's Anatomy (London: Longmans, Green & Co.) ; Cunningham's Text-Booh of Anatomy (Edinburgh: Young J. Pent-land), or Macalister's Anatomy (London: Griffin & Co.).

Embryology. The development of the reproductive organs is so closely interwoven with that of the urinary that some reference from this article to that on the Urinary System is necessary. It will here be convenient to take up the development at the stage depicted in the accompanying figure (fig. 7), in which the genital ridge (a) is seen on each side of the attachment of the mesentery; external to this, and forming another slight ridge of its own, is the Wolffian duct, while a little later the Miillerian duct is formed and lies ventral to the Wolffian. The early history of these ducts is indicated in the article on the Urinary System. Until the fifth or sixth week the development of the genital ridge is very much the same in the two sexes, and consists of cords of cells growing from the epithelium-covered surface into the mesenchyme, which forms the interior of the ridge. In these cords are some large germ cells which are distinguishable at a very early stage of development. It must, of course, be understood that the germinal epithelium covering the ridge, and the mesenchyme inside it, are both derived from the mesoderm or middle layer of the embryo. About the fifth week of human embryonic life the tunica albuginea appears in the male, from which septa grow to divide the testis into lobules, while the epithelial cords form the seminiferous tubes, though these do not gain a lumen until just before puberty. From the adjacent mesonephros cords of cells grow into the attached part of the genital ridge, or testis, as it now is, and from these the rete testis is developed. Recent research, however, points to these cords of the rete testis et ovarii as being derived from the coelomic epithelium instead of from the mesonephros.

In the female the same growth of epithelial cords into the mesenchyme of the genital ridge takes place, but each one is

Neural tube-— -‘

Aorta-

Mesentery- Blood-vessel —-————.

Spinal ganglion

Spinal nerve

■Vein ■Wolffian duct

- Intestine

From A. F. Dixon, Cunningham’s Tvxl-Book of Anatomy.

Fig. 7. — Transverse Section through a Rat Embryo a. shows position of germinal epithelium.

distinguished by a bulging toward its middle, in which alone the large germ cells are found. Eventually this bulging part is broken up into a series of small portions, each of which contains one germ cell or ovum, and gives rise to a Graafian follicle. Mesonephric cords appear as in the male; they do not enter the ovary, however, but form a transitory network (rete ovarii) in the mesovarium. As each genital gland enlarges it remains attached to the rest of the intermediate cell mass by a constricted fold of the coelomic membrane, known as the mesorchium in the male, and the mesovarium in the female. Lying dorsal to the genital ridge in the intermediate cell mass is the mesonephros, consisting

^

Ep.O.

Mt.N.

Fig. 8. — Diagram of the Formation of the Geni to-Urinary Apparatus. The first figure is the generalized type, the second the male and the third the female specialized arrangements. Suppressed parts are dotted.

Pro. N

Pronephros.

N.

Nephrostome.

M.N.

Mesonephros.

M.C.

Malpighian corpuscle.

Mt.N.

Metanephros.

T.

Testis.

B.

Bladder.

E.

Epididymis.

Clo.

Cloaca.

O.G.

Organ of Giraldes.

R.

Rectum.

V.D.

Vas deferens.

M.D.

Miillerian duct.

TJ.M.

Uterus masculinus.

WD.

Wolffian duct.

0.

Ovary.

Ur.

Ureter.

Ep.O.

Epobphoron.

S.H.

Sessile hydatid.

Par.O.

Paro5phoron.

P.H.

Pedunculated hydatid.

F.T.

Fallopian tube.

S.G.

Sexual gland.

U.

Uterus.

of numerous tubules which open into the Wolffian duct. This at first is an important excretory organ, but during development becomes used for other purposes. In the male, as has been shown, it may form the rete testis, and certainly forms the vasa efferentia and globus major of the epididymis: in addition to these, some of its separate tubes probably account for the vas aberrans and the organ of Giraldes (see

fig. 8, E. and O.G.). In the female the tubules of the epoophoron represent the main part,

while the paroophoron, like the organ of Giraldes in the male, is probably formed from some separate tubes (see fig. 8, Ep. O. and Par. O.).

The Wolffian duct, which, in the early embryo, carries the excretion of the mesonephros to the cloaca, forms eventually the body and tail of the epididymis, the vas deferens, and ejaculatory duct in the male, the vesicula seminalis being developed as a pouch in its course. In the female this duct is largely done away with, but remains as the collecting tube of the epoophoron, and in some mammals as the duct of Gartner, which runs down the side of the vagina to open into the vestibule.

The Miillerian duct, as it approaches the cloaca, joins its fellow of the opposite side, so that there is only one opening into the ventral cloacal wall. In the male the lower part only of it remains as the uterus masculinus (fig. 8, U.M.), but in the female the Fallopian tubes, uterus, and probably the vagina, are all formed from it (fig. 8, F.T. and U.) . In both sexes a small hydatid or vesicle is liable to be formed at the beginning of both the Wolffian and Miillerian duct (fig. 8, P.H. and S.H.); in the male these are close together in front of the globus major of the epididymis, and are known as the sessile and pedunculated hydatids of Morgagni. In the female there is a hydatid among the fimbriae of the Fallopian tube which of course is Miillerian and corresponds to the sessile hydatid in the male, while another is often found at the beginning of the collecting tube of the epoophoron and is probably formed by a blocked mesonephric tubule. This is the pedunculated hydatid of the male. The development of the vagina, as Berry Hart {Journ. Anat. and Phys. xxxv. 330) has pointed out, is peculiar. Instead of the two Miillerian ducts joining to form the lumen of its lower third, as they do in the case of the uterus and its upper two-thirds, they become obliterated, and their place is taken by two solid cords of cells, which Hart thinks are derived from the Wolffian ducts and are therefore probably of ectodermal origin, though this is open to doubt. These cords later become canalized and the septum between them is obliterated.

The common chamber, or cloaca, into which the alimentary, urinary

and reproductive tubes open in the foetus, has the urinary bladder (the remains of the allantois) opening from its ventral wall (see Placenta and Urinary System).

During development the alimentary or anal part of the cloaca is separated from the urogenital, and in the article Alimentary System the hitherto accepted method of this separation is described. The question has, however, lately been reinvesti- gated by F. Wood Jones, who says that the anal part is com- pletely shut off from the urogenital and ends in a blind pouch which grows toward the surface and meets a new ectodermal depression, the main point being that the permanent anus is not, according to him, any part of the original cloacal aperture, but a new perforation. This description is certainly more in harmony with the malformations occurring in this region than the old one, and only awaits confirmatory evidence to be gener- ally accepted.

The external generative organs have at first the same appear- ance in the two sexes, and consist of a swelling, the genital eminence, in the ventral wall of the cloaca. This in the male becomes the penis and in the female the clitoris. Throughout the generative system the male organs depart most from the undifferentiated type, and in the case of the genital eminence two folds grow together and enclose the urogenital passage, thus making the urethra perforate the penis, while in the female these two folds remain separate as the labia minora or nymphae. Sometimes in the male the folds fail to unite completely, and then there is an opening into the urethra on the under surface of the penis — a condition known as hypospadias.

In the undifferentiated condition the integument surrounding the genital opening is raised into a horseshoelike swelling with its convexity over the pubic symphysis and its concavity to- ward the anus; the lateral parts of this remain separate in the female and form the labia majora, but in the male they unite to form the scrotum. The median part forms the mons Veneris or mons Jovis.

The Descent of the Testis. — It has been shown that the testis is formed in the loin region of the embryo close to the kidney, and it is only in the later months of foetal life that it changes this position for that of the scrotum. In the lower part of the genital ridge a fibro-muscular cord is formed which stretches from the lower part of the testis to the bottom of the scrotum ; it is known as the gubernaculum testis, and by its means the testis is directed into the scrotum. Before the testis descends, a pouch of peritoneum called the processus vaginalis passes down in front of the gubernaculum through the

opening in the abdominal wall, which afterwards becomes the inguinal canal, into the scrotum, and behind this the testis descends, carrying with it the mesonephros and mesonephric duct. These, as has already been pointed out, form the epididymis and vas def- erens. At the sixth month the testis lies opposite the abdom- inal ring, and at the eighth reaches the bottom of the scrotum and invaginates the processus vaginalis from behind. Soon after birth the communication between that part of the pro- cessus vaginalis which now surrounds the testis and the general cavity of the peritoneum disappears, and the part which remains forms the tunica vaginalis. Sometimes the testis fails to pass beyond the inguinal canal, and the term ” cryptorchism ” is used for such cases.

In the female the ovary undergoes a descent like that of the testis, but it is less marked owing to the fact that the guber- naculum becomes attached to the Miillerian duct where that duct joins its fellow to form the uterus; hence the ovary does not descend lower than the level of the top of the uterus, and the part of the gubernaculum running between it and the uterus remains as the ligament of the ovary, while the part running from the uterus to the labium is the round ligament. In rare cases the ovary may be drawn into the labium just as the testis is drawn into the scrotum.

Comparative Anatomy. — In the Urochorda, the class to which Salpa, Pyrosoma and the sea squirts (Ascidians) belong, male and female generative glands (gonads) are present in the same individual; they are therefore hermaphrodite.

In the Acrania (Amphioxus) there are some twenty-six pairs of gonads arranged segmentally along the side of the pharynx and intestine and bulging into the atrium. Between them and the atrial wall, however, is a rudimentary. remnant of the coelom, through which the spermatozoa or ova (for the sexes are distinct) burst into the atrial cavity. There are no genital ducts.

In the Cyclostomata (lampreys and hags) only one median gonad is found, and its contents (spermatozoa or ova) burst into the coelom and then pass through the genital pores into the urogenital sinus and so to the exterior. It is probable that the single gonad is accounted for by the fact that its fellow has been suppressed.

In the Elasmobranchs or cartilaginous fishes there are usually two testes or two ovaries, though in the dogfish one of the latter is suppressed. From each testis, which in fish is popularly known as the soft roe, vasa efferentia lead into the mesonephros, and the semen is

conducted down the vas deferens or mesone- phric duct into the urogenital sinus, into which also the ureters open. Sometimes one or more thin-walled diverticula — the sperm sacs — open close to the aperture of the vas deferens. In the female the ova are large, on account of the quantity of yolk, and they burst into the coelum, from which they pass into the large Miillerian ducts or oviducts. In the oviparous forms, such as the common dogfish (Scyllium), there is an oviducal gland which secretes a horny case for the egg after it is fertilized, and these cases have various shapes in different species. Some of the Elasmobranchs, e.g., the spiny dogfish (Acanthias), are viviparous, and in these the lower part of the oviduct is enlarged and acts as a uterus. In male elasmo- branchs the anterior part of the Miillerian duct persists. Paired intromittent organs (claspers) are developed on the pelvic fins of the males; these conduct the semen into the cloaca of the female.

In the teleostean and ganoid fishes (Teleostomi) the nephridial

ducts are not always used as genital ducts, but special coelomic ducts are formed (see Coelom and Serous Mem- branes).

In the Dipnoi or mudfish long coiled Miillerian ducts are present, but the testes either pour their secretion directly into the coelom or, as in Protopterus, have ducts which are probably coelomic in origin.

In both the Teleostomi and Dipnoi the testes and ovaries are paired.

True hermaphroditism is known among fishes, the hag (Myxine) and the sea perch (Serranus) being examples. In many others it occurs as an abnormality.

In the Amphibia both ovaries and testes are symmetrical. In the snakelike forms which are found in the order Gymno- phiona the testes are a series of separate lobules extending for a long distance, one behind the other, and joined by a connecting duct from which vasa efferentia pass into the Mal- pighian capsules of the kidneys, and so the sperm is conducted to the mesonephric duct, which acts both as vas deferens and ureter. The Miillerian ducts or oviducts are long and often coiled in Amphibia, and usually open separately into the cloaca. There is no penis, but in certain forms, especially the Gymno- phiona, the cloaca is protrusible in the male and acts as an intromittent organ. Corpora adiposa or fat bodies are present in all Amphibians, and

probably nourish the sexual cells during the hibernating period.

In Reptilia two testes and ovaries are developed, though they are often asymmetrical in position. In Lizards the vas deferens and ureter open into the cloaca by a common orifice; as they do in the human embryo. In these animals there are two penes, which can be protruded and retracted through the vent; but in the higher reptiles (Chelonia and Crocodilia) there is a single median penis rising from the ventral wall of the cloaca, composed of erectile tissue and deeply grooved on its dorsal surface for the passage of the sperm.

In birds the right ovary and oviduct degenerates, and the left alone is functional. In the male the ureter and vas deferens open separately into the cloaca, and in the Ratitae (ostriches) and Anseres (ducks and geese) a well-developed penis is present in the male. In the ostrich this is fibrous, and bifurcated at its base, suggesting the crura penis of higher forms.

Among the Mammalia the Monotremata (Ornithorhynchus and Echidna) have bird-like affinities. The left ovary is larger than the right, and the oviducts open separately into the cloaca and do not fuse to form a uterus. The testes retain their abdominal position; and the vasa deferentia open into the base of the penis, which lies in a separate sheath in the ventral wall of the cloaca, and shows an advance on that of the reptiles and birds in that the groove is now converted into a complete tunnel. In the female there is a well-developed clitoris, having the same relations as the penis.

In the marsupials the cloaca is very short, and the vagina and rectum open separately into it. The two uteri open separately and three vaginae are formed, two lateral and one median. The two lateral join together below to form a single median lower vagina, and it is by means of these that the spermatozoa pass up into the oviducts. The upper median vagina at first does not open into the lower one, but during parturition a com- munication is established which in some animals remains permanent (see J. P. Hill, Proc. Linn. Soc. N.S. Wales, 1899 and 1900). This tripartite arrangement of the upper part of the marsupial vagina is of especial interest in connexion with the views of the embryology of the canal detailed by Berry Hart and already referred to.

When, as in marsup ials, the two uteri open separately into the vagina by two ora, the arrangement is spoken of as uterus duplex. When the two uteri join below and open by one os externum, it is known as uterus bipartitus. When the uterus bifurcates above and has two horns

for the reception of the Fallopian tubes (oviducts) , but is otherwise single, the term uterus bicornis is given to it, while the single uterus of man and other Primates is called uterus simplex. From the marsupials upward the

ovarian end of the Fallopian tube has the characteristic fimbriated appearance noticed in human anatomy. •

In some mammals, such as the sow and the cow, the Wolffian duct is persistent in the female and runs along the side of the vagina as the duct of Gartner. It is possible that the lateral vaginae of the marsupials are of Wolffian origin.

In marsupials the testes descend into the scrotum, which lies in these animals in front of instead of behind the penis. In some mammals, such as the elephant, they never reach the scrotum at all; while in others, e.g. many rodents, they can be drawn up into the abdomen or lowered into the scrotum. The subject of the descent of the testicles has been very fully treated by H. Klaatsche, ” Ueber den Descensus testiculorum,” Morph. Jahrb., Bd. xvi.

The prostate is met with in its most simple forms in marsupials, in which it is a mere thickening of the mucous membrane of the urethra; in the sheep it forms a bilateral elongated mass of gland tissue lying behind the urethra and surrounded by a well- developed layer of striped muscle. In the sloth it is said to be altogether absent, while in many of the insectivores and rodents it consists of many lobes which usually show a bilateral arrange- ment. The vesiculae seminales are usually present in the Eutheria or higher mammals, and sometimes, as in the hedge- hog, are very large, though they are absent in the Carnivora. Cowper’s glands are usually present and functional throughout

From C. S. Wallace’s Prostatic Enlargement.

Fig. 9. — Transverse Section of Sheep’s Prostate.

life. The uterus masculinus is also usually present, but there is grave doubt whether the large organ called by this name in the rabbit should not rather be regarded as homologous with part of the vesiculae seminales. The penis shows many diversities of arrangement; above the marsupials its two crura obtain an attachment to the ischium. In many mammals it is quite hidden by the skin in the flaccid condition, and its external orifice may range from the perineum in the marsupials to the middle of the ventral wall of the abdomen in the

ruminants. In the Marsupialia, Rodentia, Chiroptera, Carnivora and some Primates an os penis is developed in connexion with the corpora cavernosa. The clitoris is present in all mammals; sometimes, as in the female hyena, it is very large, and at others, as in the lemur, it is perforated by the urethra.

For further details and literature, see Oppel's Lehrbuch der ver- gleich. mikroskop. Anatomie der Wirbelthiere, Bd. iv. (Jena, 1904) ; also Gegenbaur's Vergleich. Anat. der Wirbelthiere, and Wiedersheim's Comparative Anatomy of Vertebrates, translated by W. N. Parker (London, 1907). (F. G. P.)

REPSOLD, JOHANN GEORG (1771-1830), German instru- ment maker, was born at Wremen in Hanover on the 23rd of September 1771, and became an engineer and afterwards chief of the fire brigade in Hamburg, where he started business as an instrument maker early in the 19th century. He was killed by the fall of a wall during a fire at Hamburg on the 14th of January 1830. The business was continued by his sons Georg (1804-1884)

and Adolf (1806-1871), and his grandsons Johann Adolf and Oskar Philipp.

J. G. Repsold introduced essential improvements in the meridian circles by substituting microscopes (on Jesse Ramsden's plan) for the verniers to read the circles, and by making the various parts perfectly symmetrical. For a number of years the firm furnished meridian circles to the observatories at Hamburg, Konigs- berg, Pulkova, &c; later on its activity declined, while Pistor and Martins of Berlin rose to eminence. But after the discon- tinuance of this firm that of Repsold again came to the front, not only in the construction of transit circles, but also of equatorial mountings and more especially of heliometers (see Micro- meter) .

REPTILES (Lat. Reptilia, creeping things, from reptilis; refere, to creep; Gr. epnreiv, whence the term " herpetology," for the science dealing with them) . In the days before Linnaeus, writers comprised the animals which popularly are known as tortoises and turtles, crocodiles, lizards and snakes, frogs and toads, newts and salamanders, under the name of oviparous quadrupeds or four-limbed

animals which lay eggs. Linnaeus, desirous of giving expression to the extraordinary fact that many of these animals pass part of their life in the water and part on land, 1 substituted the name of Amphibia for the ancient term. Subsequent French naturalists (Lyonnet 2 and Brisson 3) con- sidered that the creeping mode of locomotion was a more general characteristic of the class than their amphibious habits, and consequently proposed the scarcely more appropriate name of Reptiles.

As naturalists gradually comprehended the wide gap existing between frogs, toads, &c, on the one hand, and the other oviparous quadrupeds on the other, they either adopted the name of Batrachia for the former and that of Amphibia for the latter, or they restricted the term Amphibia to Batrachians, calling the remainder of these creatures reptiles. Thus the term Amphibia, as used by various authors, may apply (1) to all the various animals mentioned, or (2) to Batrachians only (see Batrachia). The term Reptiles. (Reptilia) is used (1) by some for all the animals mentioned above, and (2) by others, as in the present article, for the same assemblage of animals after the exclusion of Batrachians.

Equally varying are the limits of the term Saurians, which occurs so frequently in every scientific treatise on this subject. At first it comprised living crocodiles and lizards only, with which a number of fossil forms were gradually associated. As the characters and affinities of the latter became better known, some of them were withdrawn from the Saurians, and at present it is best to abandon the term altogether.

I. History of Herpetology

Certain kinds of reptiles are mentioned in the earliest written records or have found a place among the fragments of the oldest relics of human art. Such evidences, however, form no part of a succinct review of the literature of the subject such as it is proposed to give here. We distinguish in it six periods: (1) the Aristotelian; (2) the Linnaean (formation of a class Amphibia, in which reptiles and Batrachians are mixed); (3) the period of the elimination of Batrachians as one of the reptilian orders (Brongniart) ; (4) that of the separation of reptiles and Bat- rachians as distinct subclasses; (5) that of the recognition of a class Reptilia as part of the Sauropsida (Huxley) ; (6) that of the discovery of fossil skeletons sufficiently well preserved to reveal, in its general outlines, the past history of the class.

1. The Aristotelian Period. — Aristotle was the first to deal with the reptiles known to him as members of a distinct portion ..... of the animal kingdom, and to point out the character- istics by which they resemble each other and differ from other vertebrate and invertebrate animals. The plan of his

1 ” Polymorpha in his amphibiis natura duplicem vitam plerisque concessit.”

- TMologie des insectes de Lesser (Paris, 1745), i. 91, note 5. 8 Regne animal divise en neuf classes (Paris, 1756).

work, however, was rather that of a comparative treatise of the anatomical and physiological characters of animals than their systematic arrangement and definition, and his ideas about the various groups of reptiles are not distinctly expressed, but must be gleaned from the terms which he employs. Moreover, he paid less attention to the study of reptiles than to that of other classes. This is probably due to the limited number of kinds he could be acquainted with, to which only very few extra- European forms, like the crocodile, were added from other sources. But while we find in some respects a most remarkable accuracy of knowledge, there is sufficient evidence that he neglected everyday opportunities of information. Thus, he has not a single word about the metamorphoses of Batrachians, which he treats of in connexion with reptiles.

Aristotle makes a clear distinction between the scute or scale of a reptile, which he describes as ohis, and that of a fish, which he designates as Xe7rw. He mentions reptiles (1) as oviparous quadrupeds with scutes, viz. Saurians and Chelonians; (2) as Oviparous apodals, viz. Snakes; (3) as oviparous quadrupeds without scutes, viz. Batrachians. He considered the first and second of these three groups as much more nearly related to each other than to the third. Accurate statements and descriptions are sadly mixed with errors and stories of, to our eyes, the most absurd and fabulous kind. The most complete accounts are those of the crocodile (chiefly borrowed from Herodotus) and of the chameleon, which Aristotle evidently knew from personal observation, and had dissected himself. The other lizards men- tioned by him are the common lizards (aavpa), the common seps (xaX/cw or f i/yvis) and the gecko (acrKaXaiSolmjs or KopSvXos). Of snakes (of which he generally speaks as o$cs) he knew the vipers (ex« or extSva), the common snake (i%>os), and the blindworm (rvcfrXivqs 6$is), which he regards as a snake; he further mentions the Egyptian cobra and dragons (dpanuv) — North-African serpents of fabulous size. Of Chelonians he describes in a perfectly

recognizable manner land tortoises (xeXoji'i;), freshwater turtles (kfivs) and marine turtles (x&Mvy 1ˆ daKaTTia).

Passing over eighteen centuries, we find the knowledge of reptiles to have remained as stationary as other branches of natural history, perhaps even more so. The reptile fauna of Europe was not extensive enough to attract the energy of a Belon or Rondelet; popular prejudice and the difficulty of preserving these animals deterred from their study; nor was man sufficiently educated not to give implicit credence to the fabulous tales of reptiles in the 15th and 16th centuries. The art of healing, however, was developing into a science based upon rational principles, and consequently not only those reptiles which formed part of the materia medica but also the venomous snakes became objects of study to the physician, though the majority of the writers were ignorant of the structure of the venom-apparatus, and of the distinction between non-venomous and venomous snakes.

Nothing can show more clearly the small advance made by herpetology in this long post-Aristotelian period than a glance at the celebrated work, De Differenliis Animalium Libri decern (Paris, 1552), by Edward Wotton (1492- 1 555). Wotton treats of the reptiles which he designates as Quadrupedes oviparae et Serpentes in the sixth book of his work. They form the second division of the Quadrupedes quae sanguinem habent, and are subdivided in the following " genera": —

Crocodilus et scincus (cap. cv.) ; Testudinum genera (cvi.) ; Ran- arum genera (cvii.) ; Lacertae (cviii.); Salamandra et seps quad- rupes (cix.); Stellio (ex.); Chamaeleo (cxi.); Serpentes (cxii.), a general account, the following being different kinds of serpents: Hydrus et alii quidam serpentes aquatiles (cxiii.) ; Serpentes terrestres et primo aspidum genera (cxiv.) ; Vipera, dipsas, cerastes, et hammodytes (cxv.) ; Haemorrhus, sepedon, seps, cenchris, et cenchrites (cxvi.); Basiliscus et alii quidam serpentes quorum venenum remedio caret (cxvii.) ; Draco, amphisbaena, et alii quidam serpentes quorum morsus minus affert periculi (cxviii.).

Wotton's work might with propriety be termed " Aristoteles redivivus." The plan is the same, and the observations of the Greek naturalist are faithfully, sometimes literally, reproduced.

Wotton.

HISTORY]

REPTILES

It is surprising that even the reptiles of his native country were most imperfectly known to the author.

With the enlargement of geographical knowledge that of reptiles was also advanced, as is sufficiently apparent from the Johnston l ar 8 e encyclopaedic works of Gesner, Aldrovandi and Johnston. The last-named author especially, who published the various portions of his Natural History in the middle of the 17th century, was able to embody in his compilations notices of numerous reptiles observed by Francisco Hernandez in Mexico and by Marcgrave and Piso in Brazil. As the author had no definite idea of the Ray-Linnaean term ” species,” it is not possible to give the exact number of reptiles mentioned in his work. But it may be estimated at about fifty, not including some marine fishes and fabulous creatures. He figures (or rather reproduces the figures of) about forty — some species being represented by several figures.

2. Linnaean Period: Formation of a Class Amphibia. — Within the century which succeeded these compilatory works Precur- (1650-1750) fall the labours which prepared the way sorsof for and exerted the greatest influence on Ray and Linnaeus. L; nnaeus _ Although original researches in the field of herpetology were limited in extent and in number, the authors had freed themselves from the purely literary or scholastic tendency. Men were no longer satisfied with reproducing and commenting on the writings of their predecessors; the pen was superseded by the eye, the microscope and the knife, and statements were tested by experiment. This spirit of the age manifested itself, so far as the reptiles are concerned, in Chara’s and Redi’s admirable observations on the viper, in Major’s and Vallisnieri’s detailed accounts of the anatomy of the chameleon, in the researches of Jacobaeus into the metamorphoses of the Batrachians and the structure of lizards, in Dufay’s history of the development of the salamander (for Batrachians are invariably associated with reptiles proper); in Tyson’s description of the anatomy of the rattle- snake, &c. The natural history collections formed by insti- tutions and wealthy individuals now contained not merely skins of crocodiles or serpents stuffed and transformed into a shape to correspond with the fabulous descriptions of the ancient dragons, but, with the discovery of alcohol as a means of preserving animals, reptiles entire or dissected were exhibited for study; and no opportunity was lost of obtaining them from travellers or residents in foreign countries. Fossils also were now acknowledged to be remains of animals which had lived before the Flood, and some of them were recognized as those of reptiles.

The contributions to a positive knowledge of the animal kingdom became so numerous as to render the need of a method- ical arrangement of the abundance of new facts more and more pressing. Of the two principal systematic attempts made in this period the first ranks as one of the most remarkable steps of the progress of natural history, whilst the second can only be designated as a signal failure, which ought to have been a warning to. all those who in after years classified animals in what is called an, ” artificial system.” As the latter attempt, originating with Klein (168 5-1 7 59), did not exercise any further influence on herpetology, it will be sufficient to have merely „ a mentioned it. John Ray (1628-1705) had recognized

the necessity of introducing exact definitions for the several categories into which the animals had to be divided, and he maintained that these categories ought to be characterized by the structure of animals, and that all zoological knowledge had to start from the ” species ” as its basis. His definition of reptiles as ” animalia sanguinea pulmone respirantia cor unico tantum ventriculo instructum habentia ovipara ” fixed the class in a manner which was adopted by the naturalists of the succeeding hundred and fifty years. Nevertheless, Ray was not a herpetologist; his knowledge of reptiles is chiefly derived from the researches of others, from whose accounts, however, everything not based upon reliable demonstration is critically excluded. He begins with a chapter treating of frogs {Rana, with two species), toads {Bufo, with one species) and

tortoises 1 {Testudo, with fourteen species). The second group comprises the Lacertae, twenty-five in number, and includes the salamander and newts; and the third the Serpentes, nine species, among which the limbless lizards are enumerated.

Except in so far as he made known and briefly characterized a number of reptiles, our knowledge of this class was not advanced by Linnaeus. That he associated in the jˆujˆggˆ 12 th edition cartilaginous and other fishes with the reptiles under the name of Amphibia Nantes was the result of some misunderstanding of an observation by Garden, and is not to be taken as a premonitory token of the recent discoveries of the relation between Batrachians and fishes. Linnaeus places reptiles, which he calls Amphibia, as the third class of the animal kingdom; he divides the genera thus: —

Order i. Reptiles. — Testudo (15 species); Rana (17 sp.); Draco (2 sp.); Lacerta (48 sp., including 6 Batrachians).

Order 2. Serpentes. — Crotalus (5 species) ; Boa (10 sp.) ; Coluber (96 sp.); Anguis (15 sp.); Amphisbaena (2 sp.); Caecilia (2 sp.).

None of the naturalists who under the direction or influence of Linnaeus visited foreign countries possessed any special knowledge of or predilection for the study of reptiles; all, however, contributed to our acquaintance with tropical forms, or transmitted well-preserved specimens to the collections at home, so that Gmelin, in the 13th edition of the Systema Naturae, was able to enumerate three hundred and seventy-one species.

The man who, with the advantage of the Linnaean method, first treated of reptiles monographically, was Laurenti. In a small book 2 he proposed a new division of these ˆ aurej0< ; animals, of which some ideas and terms have survived into our times, characterizing the orders, genera and species in a much more precise manner than Linnaeus, giving, for his time, excellent descriptions and figures of the species of his native country. Laurenti might have become for herpetology what Artedi was for ichthyology, but his resources were extremely limited.

The circumstance that Chelonians are entirely omitted from his. Synopsis seems due rather to the main object with which he engaged in the study of herpetology, viz. that of examining and distinguishing reptiles reputed to be poisonous, and to want of material, than to his conviction that tortoises should be relegated to another class. He divides the class into three orders: —

r: Salientia, with the genera Pipa, Bufo, Rana, Hyla, and one species of ” Proteus,” viz. the larva of Pseudis paradoxa.

2. Gradientia, the three first genera of which are Tailed Batrach-

ians, viz. two species of Proteus (one being the P. anguinus), Triton and Salamandra; followed by true Saurians — Caudiverbera, Gecko, Chamaeleo, Iguana, Basiliscus, Draco, Cordylus, Crocodilus, Scincus, Stellio, Seps.

3. Serpentia, among which he continues to keep Amphisbaena,

Caecilia and Anguis, but the large Linnaean genus Coluber is divided into twelve, chiefly from the scutellation of the head and form of the body.

The work concludes with an account of the experiments made by Laurenti to prove the poisonous or innocuous nature of those reptiles

of which he could obtain living specimens.

The next general work on reptiles is by Lacepede. It appeared in the years 1788 and 1790 under the title Histoire naturelle des quadruples ovipares et des serpens (Paris, , ac A-i de 2 vols. 4to). Although as regards treatment of details and amount of information this work far surpasses the modest attempt of Laurenti, it shows no advance towards a more natural division and arrangement of the genera. The author depends entirely on conspicuous external characters, and classifies the reptiles into (1) oviparous quadrupeds with a tail, (2) oviparous quadrupeds without a tail, (3) oviparous

1 In associating tortoises with toads, Ray could not disengage himself from the general popular view as to the nature of these animals, which found expression in the German Schildkrdte {‘ ‘ Shield- toad “).

2 Specimen medicum exhibens Synopsin Reptilium emendatam cum experimentis circa venena et antidota Reptilium Austriacorum (Vienna, 1768, 8vo, pp. 214, with 5 plates).

bipeds (Chiroles and Pseudopus), (4) serpents, — an arrangement in which the old confusion of Batrachians and reptiles and the imperfect definition of lizards and snakes are continued, and which it is worthy of remark we find also adopted in Cuvier’s Tableau ilimentaire de I’histoire naturelle des animaux (1798), and nearly so by Latreille in his Histoire naturelle des reptiles (Paris, 1801, 4 vols. 12 mo). Lacepede’s monograph, however, remained for many years deservedly the standard work on reptiles. The numerous plates with which the work is illus- trated, are, for the time, well drawn, and the majority readily recognizable.

3. The Period of Elimination of Batrachians as one of the Reptilian Orders. — A new period for herpetology commences Broag- with Alex. Brongniart, 1 who in 1799 first recognized alart. the characters by which Batrachians differ from the

other reptiles, and by which they form a natural passage to the class of fishes. Caecilia (as also Langaha and Acro- chordus) is left by Brongniart with hesitation in the order of snakes, but newts and salamanders henceforth are no more classed with lizards. He leaves

the Batrachians, however, in the class of reptiles, as the fourth order. The first order com- prises the Chelonians, the second the Saurians (including crocodiles and lizards), the third the Ophidians — terms which have been adopted by all succeeding naturalists. Here, however, Brongniart's merit on the classification of reptiles ends, the definition and disposition of the genera remaining much the same as in the works of his predecessors.

The activity in France in the field of natural science was at this period, in spite of the political disturbances, so great that only a few years after Lacepede's work another, almost identical in scope and of the same extent, appeared, viz. the Histoire naturelle generate et particuliere des reptiles of F. M. Daudin (Paris, 1802-3, 8 vols. 8vo). Written and illustrated with less care than that by Lacepede, it is of greater importance to the herpetologists of the present day, as it contains a considerable number of generic and specific forms described for the first time. Indeed, at the end of the work, the author states that he has examined more than eleven hundred specimens, belonging to five hundred and seventeen species, all of which he has described from nature. The system adopted is that of Brongniart, the genera are well defined, but ill arranged; it is, however, noteworthy that Caecilia takes now its place at the end of the Ophidians, and nearest to the succeeding order of Batrachians.

The next step in the development of the herpetological system was the natural arrangement of the genera. This involved a stupendous amount of labour. Although many isolated con- tributions were made by various workers, this task could be successfully undertaken and completed in the Paris Museum only, in which, besides Seba's and Lacepede's collections, many other herpetological treasures from other museums had been deposited by the victorious generals of the empire, and to which, through Cuvier's reputation, objects from every part of the world were attracted in a voluntary manner. The men who devoted themselves to this task were A. M. C. Dumeril, DumirU, Oppel and Cuvier himself. Oppel was a German who, Oppel during his visit to Paris (1 807-1 808), attended the Cuvier. lectures of Dumeril and Cuvier, and at the same time studied the materials to which access was given to him by the latter in the most liberal manner. Dumeril 2 maintains that Oppel's ideas and information were entirely derived from his lectures, and that Oppel himself avows this to be the case. The passage, 3 however, to which he refers is somewhat ambiguous,

1 Bull. Acad. Sci. (1800), Nos. 35, 36.

1 Erpit. gener., i. p. 259.

3 ” Ware es nicht die Ermunterung . . . dieser Freunde gewesen, so wttrde ich tiberzeugt von den Mangeln, denen eine solche Arbeit bei aller moglichen Vorsicht doch unterworfen ist, es nie gewagt haben, meine Eintheilung bekannt zu machen, obwohl selbe Herr Dumeril in seinen Lectionen vorn Jahre 1809 schon vorgetragen, und die Thiere im Cabinet darnach bezeichnet hat ” (preface, p. viii). A few lines further on he emphatically declares that the classification is based upon his own researches.

and it is certain that there is the greatest possible difference between the arrangement published by Dumeril in 1806 {Zoologie Analytique, Paris, 8vo) and that proposed by Oppel in his Ordnungen, Familien,undGattungen der Reptilien (Munich, 1811, 4to). There is no doubt that Oppel profited largely by the teaching of Dumeril; but, on the other hand, there is sufficient internal evidence in the works of both authors, not only that Oppel worked independently, but also that Dumeril and Cuvier owed much to their younger fellow-labourer, as Cuvier himself indeed acknowledges more than once.

Oppel’s classification may be shortly indicated thus: —

Order i. TESTUDINATA or CHfiLONIENS. Fam. 1. Chelonii (gen. Mydas, Coriacea). Fam. 2. Amydae (gen. Trionyx, Chelys, Testudo, Emys). Order 2. SQUAMATA. Sect. A. Saurii. Fam. 1. Crocodilini (gen. Crocodilus, Gavialis, Alligator). Fam. 2. Geckoides (gen. Gecko, Stellio, Agama). Fam. 3. Iguanoides (gen. Camaeleo, Draco, Iguana, Basiliscus,

Lophyrus, Anolis). Fam. 4. Lacertini (gen. Tupinambis, Dracaena, Lacerta, Tachy-

dromus). Fam. 5. Scincoides (gen. Scincus, Seps, Scheltopusik, Anguis). Fam. 6. Chalcidici (gen. Chalcides, Bimanus, Bipes, Ophisaurus).

Sect. B. Ophidii. Fam. 1. Anguiformes (gen. Tortrix, Amphisbaena, Typhlops). Fam. 2. Constrictores (gen. Boa, Eryx). Fam. 3. Hydri (gen. Platurus, Hydrophis). Fam. 4. Pseudo-viperae (gen. Acrochordus, Erpeton). Fam. 5. Crotahni (gen. Crotalus, Trigonocephalus). Fam. 6. Viperini (gen. Vipera, Pseudoboa). Fam. 7. Colubrini (gen. Coluber, Bungarus). Order 3. NUDA or BATRACII.

In this classification we notice three points, which indicate a decided progress towards a natural system. (1) The four orders proposed by Brongniart are no more considered co- subordinate in the class, but

the Saurians and Ophidians are associated as sections of the same order, a view held by Aristotle but abandoned by all following naturalists. The distinction between lizards and snakes is carried out in so precise a manner that one genus only, Amphisbaena, is wrongly placed. (2) The true reptiles have now been entirely divested of all hetero- geneous elements by relegating positively Caecilia to the Batrachians, a view for which Oppel had been fully prepared by Dum6ril, who pointed out in 1807 that ” les cecilies se rapprochent considerablement des batraciens auxquels elles semblent lier l’ordre entier des serpens.” 4 (3) An attempt is made at arranging the genera into families, some of which are still retained at the present day.

In thus giving a well-merited prominence to Oppel’s labours we are far from wishing to detract from the influence exercised by the master spirit of this period, Cuvier. Without his guid- ance Oppel probably never would have found a place among the promoters of herpetological science. But Cuvier’s principal researches on reptiles were incidental or formed part of some more general plan; Oppel concentrated his on this class only. Cuvier adopts the four orders of reptiles proposed by Brong- niart as equivalent elements of the class, and restores the blind- worms and allied lizards and, what is worse, also the Caecilias, to the Ophidians. The chameleons and geckos are placed in separate groups, and the mode of dividing the latter has been retained to the present day. Also a natural division of the snakes, although the foreign elements mentioned are admitted into the order, is sufficiently indicated by his arrangement of the ” vrais serpens proprement dits ” as (1) non-venomous snakes, (2) venomous snakes with several maxillary teeth, and (3) venomous snakes with isolated poison-fangs. He distinguishes the species of reptiles with a precision not attained in any previous work.

Cuvier’s researches into the osteology of reptiles had also the object of discovering the means of understanding the fossil remains which now claimed the attention of French, English and German naturalists. Extinct Chelonian and Crocodilian

- Memoires de zoologie et d’anatomie comparie (Paris, 1807, 8voX, p. 45-

Blala ville.

Menem.

remains, Pterodactylus, Mosasaurus, Iguanodon, Ichthyosaurus, Teleosaurus, became the subjects of Cuvier's classical treatises, which form the contents of the 5th volume (part 2) of his Recherches sur les ossetnens fossiles, oil Von rStablii les caracteres des plusieurs animaux dont les revolutions du globe ont dUruit les especes (new ed., Paris, 1824, 4to).

All the succeeding herpetologists adopted either Oppel's or Cuvier's view as to the number of orders of reptiles, or as to the position Batrachians ought to take in their relation to reptiles proper, with the single exception of D. de Blainville. He divided the " oviparous subtype " of Vertebrates into four classes, Birds, Reptiles, Amphibians and Fishes, 1 a modification of the system which is all the more significant as he designates the reptiles " Squammiferes Ornilhoides, icailleux," and the amphibians " Nudipelliftres, Ichthyoides nus." In these terms we perceive clear indications of the relations which exist to the class of birds on the one hand, and to that of fishes on the other; but, unfortunately, Blainville himself did not follow up the ideas thus expressed, and abandoned even the terms in a- later edition of his systematic tables.

The direct or indirect influence of the work of French anato- mists manifested itself in the systems of the other herpetologists of this period. The Crocodiles, especially, which hitherto (strange to say, even in Cuvier's classification) had been placed as one of the families of Saurians, now commence to be separated from them. Merrem (Versuch eines Systems der Amphibien, Marburg, 1820, 8vo) distinguishes two classes of " Amphibians," Pholidota and Batrachia.

The Pholidota (or Reptiles) are divided into three orders, distin- guished chiefly by osteological and splanchnological characters: — ■

1. Testudinata.

2. Loricata (= Crocodiles).

3. Squamata (= Oppel's Squamata, excluding Crocodiles). Merrem's subdivision of the Squamata into (1) Gradientia

(= limbed Lacertilia), (2) Repentia (= limbless Lacertilia), (3) Serpentia (= Snakes and Amphisbaena) , (4) Incedentia (= Chirotes), and (5) Predentia (= Chamaeleons) was based chiefly on

the modi- fications of the limbs, and not adopted by his successors. The greater part of his work is occupied with a synopsis of all the species of Reptiles known, each being shortly characterized by a diagnosis; but, as only a small proportion (about one hundred and seventy) were known to him from autopsy, this synopsis has all the faults of a compilation.

Latreixle, who commenced the study of reptiles as early as 1 801, had kept pace with the progress of science when he published, in 1825, his Families naturelles du regne animal (Paris, 1825, 8vo). He separated the Batra- chians as a class from the Reptiles, and the latter he divides into two sections only, Cataphracta and Squamosa — in the former Crocodiles being associated with the Chelonians. He bases this view on the development of a carapace in both, on the structure of the feet, on the fixed quadrate bone, on the single organ of copulation. None of the succeeding herpetologists adopted a combination founded on such important characters except J. E. Gray, who, however, destroyed Latreille's idea of Cataphracta by adding the Amphisbaenians 2 as a third order.

A mass of new materials now began to accumulate from all parts of the world in European museums. Among others, Spix had brought from Brazil a rich spoil to the Munich Museum, and the Bavarian Academy charged Joh. Wagler to prepare a general system of reptiles and batra- chians. His work, 3 the result of ten years' labour, is a simple but lasting monument to a young naturalist, 4 who, endowed with an ardent imagination, only too frequently misinterpreted the evidence of facts, or forced it into the service of preconceived ideas. Cuvier had drawn attention to certain resemblances in

l Bull. Set. Soc. Philomat., July 1816.

- Catalogue of the Tortoises, Crocodiles and Amphisbaenians in the Collection of the British Museum (London, 1844, i6mo), p. 2.

3 Naturliches System der Amphibien mit vorangehender Classifica- tion der Saugethiere und Vogel — ein Beitrag zur vergleichenden Zoologie (Munich, 1830, 8vo).

4 Wagler was accidentally killed three years after the publication of his System.

LatreiUe.

Gray.

Wagler.

some parts of the osseous structure of Ichthyosaurus and Pterodactylus to dolphins, birds, crocodiles, &c. Wagler, seizing upon such analogical resemblances, separated those extinct Saurians from the class of Reptiles, and formed of them and the Monotremes a distinct class of Vertebrates, intermediate between mammals and birds, which he called Gryphi. We must admit that he made free use of his imagination by defining his class ol Gryphi as ” vertebrates with lungs lying free in the pectoral cavity; oviparous development of the embryo (within or) without the parent; the young fed (or suckled?) by the parents.” By the last character this Waglerian class is distinguished from the reptiles.

Reptiles (in which Wagler includes Batrachians) are divided into eight orders: Testudines, Crocodili, Lacertae, Serpentes, Angues, Caeciliae, Ranae and Ichthyodi. He has great merit in having employed, for the subdivision of the families of lizards, the structure of the tongue and the mode of insertion of the teeth in the jaws. On the other hand, Wagler entirely failed in arrang- ing snakes in natural families, venomous and non-venomous types being mixed in the majority of his groups.

L. Fitzinger was Wagler’s contemporary; his first work 5 preceded Wagler’s system by four years. As he says in the preface, his object was to arrange the reptiles in FHt- ” a natural system.” Unfortunately, in order to lager. attain this object, Fitzinger paid regard to the most superficial points of resemblance; and in the tabula affinitatum generum which he constructed to demonstrate ” the progress of nature ” he has been much more successful in placing closely allied generic forms in contiguity than in tracing the relationships of the higher groups. That table is prepared in the form of a genealogical tree, but Fitzinger wished to express thereby merely the amount of morphological resemblance, and there is no evidence whatever in the text that he had a clear idea of genetic affinity. The Batrachians are placed at the bottom of the scheme, leading through Hyla to the Geckos (clearly on account of the digital dilatations) and through Caecilia to Amphisbaena. At the top Draco leads through Pterodactylus to the Bats (Pteropus), Ichthyosaurus to the Cetaceans (Del- phinus), Emys to the Monotremes, Testudo to Manis, and the Marine Turtles to the Divers and Penguins.

In Fitzinger’s system the higher groups are, in fact, identical with those proposed by Merrem, while greater originality is shown in the subdivision of the orders. He differed also widely from Wagler in his

views as to the relations of the extinct forms. The order of Loricata consists of two families, the Ichthyosauroidea and Croco- diloidea, the former comprising Iguanodon, Plesiosaurus, Sauro- cephalus and Ichthyosaurus. In the order Squamata Lacertilians and Ophidians are combined and divided into twenty-two families, almost all based on the most conspicuous external characters: the first two, viz. the Geckos and Chameleons, are natural enough, but in the three following Iguanoids and Agamoids are sadly mixed, Pterodactyles and Draco forming one family; Megalo- saurus, Mosasaurus, Varanus, Tejus, &c, are associated in another named Ameivoidea; the Amphisbaenidae are correctly defined; the Colubroidea are a heterogeneous assemblage of thirty genera; but with his family of Bungaroidea Fitzinger makes an attempt to separate at least a part of the venomous Colubrine Snakes from the Viperines, which again are differentiated from the last family, that of Crotaloidea.

If this little work had been his only performance in the field of herpetology his name would have been honourably mentioned among his fellow-workers. But the promise of his early labours was not justified by his later work, and if we take notice of the latter here it is only because his name has become attached to many a reptile through the pedantic rules of zoological nomenclature. The labours of Wiegmann, Miiller, Dumeril and Bibron exercised no influence on him, and when he commenced to publish a new system of reptiles in 1843, 6 of which fortunately one fasciculus only appeared, he exhibited a classification in which morphological facts are entirely superseded by fanciful ideas of the vaguest kind of physiosophy, each class of vertebrates being divided

5 Neue Classification der Reptilien nach ihren naturlichen Ver- wandtschaften (Vienna, 1826, 4to).

6 Systema Reptilium (Vienna, 1843, 8vol.

into five ” sense ” series, and each series into three orders, one comprising forms of superior, the second of medium and the third of inferior development. In the generic arrangement of the species, to which Fitzinger devoted himself especially in this work, he equally failed to advance science.

We have now arrived at a period distinguished by the appear- ance of a work which superseded all its predecessors, which formed the basis for the labours of many succeeding years, and which will always remain one of the classical monuments of descriptive zoology — the Erp&ologie ginerale ou histoire DumStil naturelle complete des reptiles of A. M. C. Dumeril and and G. Bibjron (Paris, 8vo). The first volume appeared in

Blbron. 1834, and the ninth and last in 1854. No naturalist of that time could have been better qualified for the tremendous undertaking than C. Dumeril, who almost from the first year of half a century's connexion with the then largest collection of Reptilia had chiefly devoted himself to their study. The task would have been too great for the energy of a single man; it was, therefore, fortunate for Dumeril that he found a most devoted fellow-labourer in one of his assistants, G. Bibron, whose abilities equalled those of the master, but who, to the great loss of science, died (in 1848) before the completion of the work. Dum6ril had the full benefit of Bibron's knowledge for the volumes containing the Snakes, but the last volume, which treats of the Tailed Batrachians, had to be prepared by Dumeril alone.

The work is the first which gives a comprehensive scientific account of reptiles generally, their structure, physiology and literature, and again each of the four orders admitted by the authors is introduced by a similar general account. In the body of the work 121 Chelonians, 468 Saurians, 586 Ophidians and 218 Batrachians are described in detail and with the greatest precision. Singularly enough, the authors revert to Brong- niart's arrangement, in which the Batrachians are co-ordinate with the other three orders of reptiles. This must appear all the more strange as Von Baer 1 in 1828, and J. Muller 2 in 1831, had urged, besides other essential differences, the important fact that no Batrachian embryo possesses either an amnion or an allantois, like a reptile.

4. Period of the Separation of Reptiles and Batrachians as Distinct Classes or Subclasses. — In the chronological order which we have adopted for these historical notes, we had to refer in their proper places to two herpetologists, Blainville and Latreille, who advocated a deeper than merely ordinal separation of Reptiles from Batrachians, and who were followed by J. Matter F. S. Leuckart. But this view only now began to find- and more general acceptance. J. Muller and Stannius

stannius. were guided ; n their classification entirely by ana- tomical characters, and consequently recognized the wide gap which separates

the Batrachians from the Reptiles; yet they considered them merely as subclasses of the class Amphibia. The former directed his attention particularly to those forms which seemed to occupy an intermediate position between Lacertilians and Ophidians, and definitely relegated Anguis, Pseudopus, Acontias to the former, and Typhlops, Rhinophis, Tortrix, but also the Amphisbaenoids to the latter. Stannius interpreted the characteristics of the Amphisbaenoids differ- ently, as will be seen from the following abstract of his classi- fication: 3 —

Subclassis: AMPHIBIA MONOPNOA (Leuckart). Sect. i. STREPTOSTYLICA (Stann.). Quadrate bone arti- culated to the skull; copulatory organs paired, placed out- side the cloacal cavity. Ordoi. OPHIDIA.

Subordo 1. Eurystomata or Macrostomata (Mull.). The facial bones are loosely connected to admit of great extension of the wide mouth. Subordo 2. Angiostomata or Microstomata (Mull.). Mouth narrow, not extensile; quadrate bone attached to the skull and not to a mastoid.

‘ Entwicklungsgeschichte der Thiere, p. 262. 2 Tiedemann’s Zeitschrift fur Physiologic, vol. iv. p. 200. 8 Siebold and Stannius, Handbuch der Zootomie — Zootomie der Amphibien (2nd ed., Berlin, 1856. 8vo).

Oedo 2. SAURIA.

Subordo 1. Amphisbaenoidea. Subordo 2. Kionocrania (Stann) = Lizards. Subordo 3. Chamaeleonidea. Sect. 2. M ONIMOSTYLICA (Stann.). Quadrate bone sutur- ally united with the skull; copulatory organ simple, placed within the cloaca. Ordo 1. CHELONIA. Ordo 2. CROCODILIA.

This classification received the addition of a fifth Reptilian order which with many Lacertilian characters combined im- portant Crocodilian affinities, and in certain other respects differed from both, viz. the New Zealand Hatteria, which by its first describers had been placed to the Agamoid Lizards. A. Gunther, 4 who pointed out the characteristics of this reptile, considered it to be co-ordinate with the other four orders of reptiles, and characterizes it thus: — ■

Rhynchocephalia. — Quadrate bone suturally and immovably united with the skull and pterygoid ; columella present. Rami of the mandible united as in Lacertilians. Temporal region with two horizontal bars. Vertebrae amphicoelian. Copulatory organs, none.

5. Period of the Recognition of a Class of Reptilia as Part of the Sauropsida. — Although so far the discovery of every new

morphological and developmental fact had prepared naturalists for a class separation of Reptiles and Batrachians, it was left to T. II. Huxley to demonstrate, not merely that the weight of facts demanded such a class separation, but that the reptiles hold the same relation to birds as the fishes to Batrachians. In his Hunterian Lectures (1863) he divided the vertebrates into Mammals, Sauroids and Ichthyoids, subsequently substituting for the last two the terms Sauropsida and Ichthyopsida. 5 The Sauropsida contain the two classes of birds and reptiles, the Ichthyopsida those of Batrachians and fishes.

6. Period of the Consideration of Skeletons of Extinct Reptiles. — ■ Sir R. Owen, while fully appreciating the value of the osteological characters on which Huxley based his division, yet _ admitted into his consideration those. taken from the

organs of circulation and respiration, and reverted to Latreille's division of warm- and cold-blooded (haematothermal and haematocryal) vertebrates, thus approximating the Batrachians to reptiles, and separating them from birds. 6 The reptiles (or Monopnoa, Leuck.) thus form the highest of the five subclasses into which, after several previous classifications, Owen 7 finally divided the Haematocrya. His division of this subclass, however, into nine orders, makes a considerable step in the progress of herpetology, since it takes into consideration for the first time the many extinct groups whose skeletons are found fossil. He shows that the number of living reptilian types bears but a small proportion to that of extinct forms, and therefore that a sys- tematic arrangement of the entire class must be based chiefly upon osteological characters. His nine orders are the follow- ing:

a. Ichthyopterygia (extinct) — Ichthyosaurus.

b. Sauropterygia (extinct) — Plesiosaurus, Pliosaurus, Notho-

saurus, Placodus.

c. Anomodontia (extinct) — Dicynodon, Rhynchosaurus, Ouden-

odon.

d. Chelonia.

e. Lacertilia (with the extinct Mosasaurus).

f. Ophidia.

g. Crocodilia (with the extinct Teleosaurus and Streptospon-

dylus) . h. Dinosauria (extinct) — Iguanodon, Scelidosaurus and Megalo-

saurus. %

i. Pterosauria (extinct) — Dimorphodon, Rhamphorhynchus and

Pterodactylus.

Owen was followed by Huxley and E. D. Cope, who, however, restricted still more the selection of classificatory characters by relying for the purposes of arrangement on a few parts of the

4 ” Contribution to the Anatomy of Hatteria (Rhynchocephalus, Owen),” in Phil. Trans. (1867), part ii.

6 An Introduction to the Classification of Animals (London, 1869, 8vo), pp. 104 seq.

6 Anatomy of Vertebrates (London, 1866, 8vo), vol. i. p. 6.

7 Op. cit. p. 16.

Huxley.

skeleton only. They attempted a further grouping of the orders which in Owen’s system were merely serially enumerated as cosubordinate groups. Huxley used for this purpose almost exclusively the position and character of the rib-articulations to the vertebral centra, the orders themselves being the same as in Owen’s system: —

A. PLEUROSPONDYLIA. Dorsal vertebrae devoid of trans- verse processes and not movable upon one another, nor are the ribs movable upon the vertebrae. A plastron. Order I, Chelonia. , B. The dorsal vertebrae (which have either complete or rudi- mentary transverse processes) are movable upon one another, and the ribs upon them. No plastron.

a. The dorsal vertebrae have transverse processes which are

either entire or very imperfectly divided into terminal facets (ERPETOSPONDYLIA).

o. Transverse processes long; limbs well developed, pad- dles; sternum and sternal ribs absent or rudiment- ary. Order 2, Plesiosauria (= Sauropterygia, Ow.). /3. Transverse processes short.

aa. A pectoral arch and urinary bladder. Order 3,

Lacertilia. bb. No pectoral arch and no urinary bladder. Order 4, Ophidia.

b. The dorsal vertebrae have double tubercles in place of trans-

verse processes {PeROSPONDYLia) . Limbs paddle-shaped. Order 5, Ichthyosauria (= Ichthyopterygia, Ow.).

c. The anterior dorsal vertebrae have elongated and divided

transverse processes, the tubercular being longer than the

capitular division (SUCBOSPONDYUA).

a. Only two vertebrae in the sacrum. Order 6, Croco-

dilia. jS. More than two vertebrae in the sacrum.

aa. Manus without a prolonged ulnar digit.

aa. Hind limb Saurian. Order 7, Dicynodon-

tia (= Anomodontia, Ow.). /?/3. Hind limb Ornithic. Order 8, Ornitho- scelida (= Dinosauria, Ow.). bb. Manus with an extremely long ulnar digit. Order 9, Pterosauria.

Cope, 1 by combining the modifications of the quadrate and supporting bones with the characters used by Huxley, further developed Owen's classification, separating the Pythonomorpha and Rhynchocephalia as distinct orders from the Lacertilia. He eventually 2 elaborated the following classification, based entirely on osteological characters: —

I. The quadrate bone immovably fixed to the adjacent elements by suture.

A. Scapular arch external to ribs; temporal region with a complex bony roof ; no longitudinal postorbital bars. A tabular and

supramastoid bones and a presternum; limbs ambulatory; vertebrae amphicoelous. Order 1,

COTYLOSAURIA.

.iA. Scapular arch internal to ribs ; temporal region with com- plex roof and no longitudinal bars. A presternum; limbs ambulatory. Order 2, Chelydo- sauria. AAA. Scapular arch internal to ribs; sternum extending below coracoids and pelvis ; one postorbital bar. No supramastoid ; a paroccipital ; clavicle not articulating with scapula. Order 3, Testudinata. AAAA. Scapular arch external to ribs; one longitudinal post- orbital bar (Synaptosauria) . A supramastoid and paroccipital bones; ribs two-headed on centrum; carpals and tarsals not distinct in form from metapodials; vertebrae amphicoelous. Order 4, Ichthyopterygia. A supramastoid; paroccipital not distinct; a postorbito- squamosal arch ; ribs two-headed ; a clavicle ; obturator foramen small or none ; vertebrae amphicoelous. Order 5, Theromora. No supramastoid; paroccipital not distinct-; a quadrato- iugal arch; scapula triradiate; no clavicle; ribs one- headed. Order 6, Plesiosauria. & AAAA. Scapular arch external to ribs; two longitudinal post- orbital bars (paroccipital arch distinct) (Archosauria). a. A supramastoid bone. Ribs two-headed; a clavicle and interclavicle ; aceta- bulum closed; no obturator foramen; ambulatory; vertebrae amphicoelous. Order 7, Pelycosauria. aa. No supramastoid.

1 Proc. Amer. Assoc, for the Advancement of Science, 10th meeting (Cambridge, 1871, 8vo), pp. 230 sq.; Amer. Naturalist (1889), vol. xxiii. p. 863.

2 Syllabus of Lectures on the Vertebrata (Philadelphia, 1898, 8vo), P- 54-

Cope.

Ribs two-headed; interclavicle not distinct; external digits greatly elongated to support a patagium for flight. Order 8, Ornithosauria.

Ribs two-headed; no interclavicle; acetabulum open; ambulatory. Order 9, Dinosauria.

Ribs two-headed; an interclavicle; acetabulum closed; ambulatory. Order 10, Loricata.

Ribs one-headed; an interclavicle; acetabulum closed, a large obturator foramen; ambulatory. Order 11, Rhynchocephalia. II. The quadrate bone loosely articulated to the cranium and at the proximal

end only (Streptostylica).

No distinct supramastoid, nor opisthotic; one or no post- orbital bar; scapular arch, when present, external to ribs; ribs one-headed. Order 12, Squamata.

While this classification was being considered and prepared, both Cope and G. Baur made a special study of the bones which surround the quadrate and arch over the biting muscles in the various groups of reptiles. This led to a series of discussions which ended in the idea, that the class could be most naturally divided into two great subclasses, the one culminating in tortoises and mammals, the other in crocodiles, lizards, snakes and birds. Professor H. F. Osborn in 1903 3 therefore proposed the following classification :— Osbora.

Subclass Synapsida. Primarily with single or undivided temporal arches. Giving rise to the mammals through some unknown member of the Anomodontia.

Orders Cotylosauria, Anomodontia, Testudinata and Sauropterygia.

Subclass Diapsida. Primarily with double or divided temporal arches. Giving rise to the birds through some unknown type transitionat between Prolorosauria and Dinosauria.

Orders Diaptosauria (= Prolorosauria, Pelycosauria and Rhyn- chocephalia), Phytosauria (= Belodon, &c), Ichthyosauria, Crocodilia, Dinosauria, Squamata and Pterosauria.

The most exhaustive and modern general work on reptiles is by Dr C. K. Hoffmann in Bronn's Klassen und Ordnungen des Thierreichs (1879-90). A most useful and less technical treatise is the volume on Amphibia and Reptiles contri- Hoff " buted by Dr H. Gadow to the Cambridge Natural History mana. (London, 1902). (A. C. G. ; A. S. Wo.)

II. General Characters of the Class Reptilia Reptiles, as known in the existing world, are the modified, and in many respects degenerate, representatives of a group of lung-breathing vertebrate animals which attained its maximum development in the Mesozoic period. So far as can be judged from the skeleton, some of the members of this group then living might have become mammals by very slight change, while others might as readily have evolved into birds. It is therefore probable that the class Reptilia, as now understood, comprises the direct ancestors both of the Mammalia and Aves. Assuming that its extinct members, which are known only by skeletons, were organized

essentially like its existing representatives, the class ranks higher than that of the lowest five-toed vertebrates (class Batrachia) in the investment of the foetus by two membranous envelopes (the amnion and allantois), and in the total absence of gills even in the earliest embryos. It ranks below both the Mammalia and Aves in the partial mixture of the arterial blood with the venous blood as it leaves the heart, thus causing the organism to be cold-blooded; it also differs both from Mammalia and Aves in retaining a pair of aortic arches, of which only the left remains in the former, while the right one is retained in the latter. No feature in the endoskeleton is absolutely distinctive, except possibly the degeneration of the parasphenoid bone, which separates the Reptilia from the Amphibia. In the exoskeleton, however, the epidermis forms horny scales, such as never occur in Amphibia, while there are no traces of any structures resembling either hairs or feathers, which respectively characterize Mammalia and Ave's.

There is little doubt that true reptiles date back to the latter part of the Palaeozoic period, but at that epoch the Amphibia approached them so closely in the characters of the skeleton that it is difficult to distinguish the members of the two classes among the fossils. Some of the Palaeozoic Amphibia — a few of the so-called Labyrinthodonts — are proved to have had well- developed gill-arches in their immature state, while there are conspicuous marks of slime-canals on their skulls. Others are ‘ Mem. American Mus. Nat. Hist. (November 1903), vol. i. art. viii.

merely regarded as Amphibia because they closely resemble the genera which are proved to have been gill-breathers when immature. All these genera, however, so far as known, agree with the existing Amphibia in the production of their large parasphenoid bone as far forwards as the vomers to form a rigid and complete basicranial axis (fig. 1, A). Those genera

After Credner. After C. W. Andrews.

Fig. i. — A, Palate of Palaeozoic Amphibian (Archegosaurus decheni). B, Palate of Mesozoic Reptile {Plesiosaurus macrocephalus) . b.occ, basioccipital ; bs, basisphenoid ; eept, ectopterygoid ; i.pt, inter-

pterygoid vacuity; j, jugal; mx, maxilla; pas, parasphenoid; pi, palatine; pmx, premaxilla; pt, pterygoid; pt. nar, posterior nares; qu, quadrate; s.o, suborbital vacuity; v, vomer.

which less resemble the typical Labyrinthodonts are charac- terized by the reduction of the parasphenoid bone so that it no longer reaches the vomers; in these animals the weakened skull exhibits a secondary basicranial axis formed by the approxima- tion of the- pterygoids to the median line (fig. 1, B). The latter condition is universal in existing reptiles, and may there- fore perhaps be regarded as a diagnostic feature. If so, the oldest known undoubted reptile is Palaeohatteria, from the Lower Permian of Saxony.

In the structure of the skull Palaeohatteria is much like the existing Sphenodon, the cheek-plates which cover the temporal and masseter muscles on each side being pierced by two great vacuities, one superior-temporal, the other lateral-temporal. The majority of the earliest reptiles, however, either resemble the Labyrinthodonts in having the biting muscles completely covered with a roof of bony plates, or exhibit a slight shrinkage of this investment so that a superior-temporal vacuity appears. As the various groups or orders become differentiated, this shrinkage or reduction continues, while the shape of the ossify- ing ear-capsule changes, and the squamosal bone, which covers the organ of hearing in the fishes, and presumably also in the Palaeozoic Batrachia, is gradually thrust outwards from all connexion with this capsule except at its hinder angle. The resultant modifications are diagrammatically represented in fig 2. In one series of orders, comprising the Anomodontia, Chelonia, Sauropterygia and Ichthyopterygia (fig. 2, B, C), the superior- temporal vacuity (s) first appears, and the cheek- plates in the broad temporal arch thus formed may be variously fused together, sometimes even irregularly perforated — showing at first, indeed, the usual inconstancy of a new and not com- pletely established feature. From the earliest members of this series of reptiles, palaeontology seems to demonstrate that the Mammalia (with one robust temporal arcade or zygomatic arch) arose. In a second series, comprising the orders Rhyncho- cephalia, Dinosauria, Crocodilia and Ornithosauria (fig. 2, D), the broad arch of cheek-plates is regularly pierced by a lateral- temporal vacuity, which leaves a narrow bar above, another narrow bar below, and uncovers the middle part of the quadrate bone. By the constant loss of the lower, and the frequent loss

of the upper, bar, some members of this series eventually pass into the order Squamata (Lacertilia + Ophidia), in which the quadrate bone is completely exposed and loosely attached to the skull (fig. 2, E) ; other

reptiles exhibiting a similar modi- fication may readily have acquired the typical Avian skull (fig. 2, F) by the loss of the upper and the retention of the lower temporal bar in question.

In view of these and other palaeontological con- siderations, the Reptilia may be classified into orders as follows : —

Orders of Class Reptilia

1. Anomodontia. — Bones of postero-lateral region of skull forming a complete roof over the temporal and masseter muscles, or contracted into a single broad zygo- matic arch, leaving a superior-temporal vacuity. Pineal foramen present. Ribs completely or imperfectly double- headed. No abdominal ribs. A large separately ossified epicoracoid. Limbs for support as well as progression; third and fourth digits with not more than three phalanges. Dermal armour feeble or absent. Range. — Permian and Triassic.

2. Chelonia. — Postero-lateral region of skull as in Anomo- dontia, except bones of ear-capsule more modified. No pineal foramen. Ribs single-headed. No sternum. Pectoral and pelvic arches unique in being situated completely inside the ribs. No epicoracoid. Abdominal ribs replaced by three or four pairs of large plates, which, with the clavicles and interclavicle, form a plastron. Limbs only for pro- gression; third and fourth digits with not more than three phalanges. A regular dorsal carapace of bony plates in- timately connected with the neural spines, and ribs of seven to nine dorsal vertebrae. Range. — Upper Triassic. to Recent.

3. Sauropterygia. — Bones of postero-lateral region of skull contracted into a single broad zygomatic arch, leaving a superior-temporal vacuity. Pineal foramen present. No fused sacral vertebrae. All dorsal ribs single-headed, articulating with transverse processes of the neural arches.

Abdominal ribs forming dense plastron. Apparently no sternum. Coracoid, pubis and ischium in form of much-expanded plates. Limbs modified as paddles, with not more than five digits, of which the third and fourth always have more than three phalanges; all digits usually consisting of numerous phalanges. No dermal armour. Range. — Upper Triassic to Cretaceous.

4. Ichthyopterygia. — Bones of postero-lateral region of skull contracted into a single broad zygomatic arch, leaving a superior-temporal vacuity. Pineal foramen present. Vertebral centra short and

deeply biconcave, with feeble neural arches which are almost or completely destitute of zygapophyses. No fused sacral vertebrae. Cervical and dorsal ribs double-headed, articulating with tubercles on the vertebral centra. Abdominal ribs forming dense plastron. Apparently no sternum. Coracoid an expanded plate, probably with cartilaginous epicoracoid. Pelvis very small, not connected with vertebrae. Limbs modified as paddles, with digits of very numerous short phalanges, which are closely pressed together, sometimes with supplementary rows of similar ossicles. No dermal armour. A vertical triangular caudal fin, not supported by skeletal rays. Range.— Triassic to Cretaceous.

5. Rhynchocephalia. — Bones of postero-lateral region of skull contracted into two slender zygomatic bars, leaving a superior-temporal and a lateral-temporal vacuity, and partly exposing the quadrate bone from the side. Pineal foramen present or absent. Ribs single-headed. Abdominal ribs present. Sternum present. Epicoracoid cartilaginous. Limbs only for progression; third and fourth digits with four or five phalanges. Dermal armour feeble or absent. Range. — Lower Permian to Recent.

6. Dinosauria. — Postero-lateral region of skull as in Rhyncho-cephalia. No pineal foramen. Cervical and dorsal ribs double- headed. Rarely abdominal ribs. Sternum present, but apparently no clavicular arch. Limbs for support as well as progression ; third and fourth digits with four and five phalanges respectively. Dermal armour variable. Range.- — Triassic to Cretaceous.

7. Crocodilia. — Postero-lateral region of skull as in Rhyncho-cephalia. No pineal foramen. Cervical and dorsal ribs double- headed. Abdominal ribs present. Sternum present; also inter- clavicle, but no clavicles. Limbs only for progression on land or swimming; third and fourth digits with four or five phalanges. Dermal armour variable. Range. — Lower Jurassic to Recent.

8. Ornithosauria, — All bones extremely dense, light and hollow, the organism being adapted for flight. Postero-lateral region of skull as in Rhynchocephalia. No pineal foramen. Cervical and dorsal ribs double-headed. Abdominal ribs present. Sternum present, and keeled for attachment of pectoral muscles; no clavi- cular arch. Fifth digit of hand much elongated to support a wing- membrane, but with only four phalanges. Hind limb feeble. No dermal armour. Range. — Lower Jurassic to Cretaceous.

GENERAL CHARACTERS]

9. Squamata. — Bones of postero-lateral region of skull much reduced and partly absent, never forming more than a slender superior-temporal bar, thus completely exposing the quadrate, which is only loosely attached to the cranium at its upper end. Pineal foramen present. Ribs single-headed. No abdominal ribs. Sternum present when there are limbs. Limbs, when present, only for progression; third and fourth digits at least with more than three phalanges. Dermal armour feeble or absent. Range. — Cretaceous to Recent.

Order 1. Anomodontia. — The Anomodonts are so named in allusion to the peculiar and unique dentition of the first-dis- covered genera. They are precisely intermediate between the

and India) but they are best represented in the Karoo formation (Permian and Triassic) of South Africa. The Pariasauria most closely resemble the Labyrinthodont Amphibia, but have a single occipital condyle. Pariasauria itself is a massive herbivorous reptile, with a short tail, and the limbs adapted for excavating in the ground. It is known by several nearly complete skeletons, about 3 metres in length, from South Africa and northern Russia. Elginia, found in the Elgin sandstones of Morayshire, Scotland, is provided with horn-like bony bosses on the skull. Another apparently allied genus (Otocoelus) has a carapace suggesting that it may be an ancestral Chelonian. The Therio-

‘qu..

From A. S. Woodward, Outlines of Vertebrate Palaeontology.

Fig. 2. — Diagram of the Cranial Roof in a Labyrinthodont Amphibian, various types of Reptiles, and a Bird. A, Labyrin- thodont Amphibian {Mastodonsaurus giganteus). B, Generalized Anomodont or Sauropterygian, passing with slight modification into the Chelonian (sutures dotted to denote inconstancy in fusion of elements). C, Ichthyosaurus. D, Generalized Rhynchocephalian, Dinosaurian, Crocodilian, or Ornithosaurian. E, Generalized Lacertilian, often losing even the arcade here indicated. F, Generalized Bird.

fr, frontal; j, jugal; /, lateral temporal vacuity; la, lachrymal; mx, maxilla; n, narial opening; na, nasal; 0, orbit; pa, parietal; pmx, premaxilla; prf, prefrontal; ptf, postfrontal; pto, postorbital; q.j, quadrato-jugal; qu, quadrate; s, supratemporal vacuity; s.t,

supratemporals and prosquamosal ; sq, squamosal. Vacuities shaded with vertical lines, cartilage bones dotted.

Labyrinthodont Batrachia and the lowest or Monotreme Mammalia. They flourished at the period when the former are known to have reached their culmination, and when the latter almost certainly began to appear. Many of them would, indeed, be regarded as primitive Mammalia, if they did not retain a pineal foramen, a free quadrate bone, and a complex mandible. The term Theromorpha or Theromora is thus sometimes applied to the order they represent. So far as known, they are all land-reptiles, with limbs adapted for habitual support of the body, and their feet are essentially identical with those of primitive mammals. Most of them are small, and none attain a gigantic size. They first appear in the Permian of Europe and North America, and also occur in the Triassic both of Europe

dontia exhibit the marginal teeth differentiated (in shape) into incisors, canines and molars (fig. 3). They have two occipital condyles, as in mammals. They seem to have been all carni- vorous, or at least insectivorous, but the malariform teeth vary much in shape in the different genera. Cynognathus (fig. 3) and Lycosaurus have cutting teeth, while Tritylodon and Gompho- gnathus possess powerful grinders. The Dicynodontia have one pair of upper tusks or are toothless: their occipital condyle is trefoil-shaped, as in Chelonia. Dicynodon itself occurs in the Karoo formation of S. Africa, while other genera are represented in India, N. Russia and Scotland.

Order 2. Chelonia. — This order occurs first in the Upper Triassic of Wurttemberg, where a complete ” shell” has been

found (Proganocftelys) . Its members are proved to have been toothless since the Jurassic period, and have only changed very

From A. S. Woodward, Outlines of Vertebrate Palaeontology.

Fig. 3. — Skull of an Anoraodont (Theriodont) Reptile (Cynognathus craieronotus), about -/s natural size. — Karoo formation (Permian or Triassic), South Africa.

d, dentary; j, jugal; l.t.f, incipient lateral temporal vacuity; la,

lachrymal; mx, maxilla; na, nasal; orb, orbit; pa, parietal; pmx, premaxilla; prf, prefrontal; pto., postorbital; ptf, post- frontal ; s.t, supratemporal (prosquamosal) ; sq, squamosal.

slightly since their first appearance. The marine turtles seem to have first acquired elongated paddles and vacuities in the shell during the Cretaceous period, and the Trionychia, destitute of epidermal shields, apparently arose at the same time.

Order 3. Sauropterygia. — These are amphibious or aquatic reptiles (fig. 4). The head is comparatively small in most

Fig. %.ˆ—Plesiosaurus rostratus: restoration of skeleton by W. G. Ridewood. — Lower Lias, Dorsetshire.

genera, and the neck is usually elongated though not flexible. The tail is insignificant, generally short, and both pairs of paddles seem to have been concerned in progression. The order appears to have arisen from a group of land-reptiles, for its earliest members, from the Triassic of Europe (Lariosaurus) and from the Permo-Carboniferous of S. Africa (Mesosaurus) and Brazil (Stereosternum) , are all amphibious animals. They are comparatively small, and their limbs are only just becoming paddle-like. The skull suggests affinities with the terrestrial

effective paddles with elongated digits, and as the genera an> traced upwards in the geological formations it is possible to observe how the arches supporting the limbs become more rigid until the maximum of strength is reached. A few genera, such as Pliosaurus from the Jurassic and Polyptychodon from thfl Cretaceous of Europe, are distinguished by their relatively large head and stout neck. Some of the largest Upper Jurassic and Cretaceous species must have been 10 metres in length. They were cosmopolitan in their distribution, but became extinct before the dawn of the Tertiary period.

Order 4. Ichthyopterygia. — The Ichthyosaurians are all fish-shaped, with a relatively large head and very short neck. Both pairs of paddles are retained, but the hinder pair is usually very small, and locomotion seems to have been chiefly effected by a large caudal fin. This fin, as shown in impression by certain fossils from Wurttemberg and Bavaria, is a vertical, triangular, dermal expansion, without any skeletal support except the hindermost part of the attenuated vertebral column, which extends along the border of its lower lobe (fig. 5). Another triangular fin, without skeletal support, is known to occur on the back, at least in one species (fig. 5). Some of the genera are proved to have been viviparous. Like the Sauropterygia, the

Ichthyopterygia appear to have originated from terrestrial ancestors, for their earliest Triassic representatives (Mixosaurus) have the teeth less uniform and the limbs slightly less paddle-, shaped than the latter genera. In this connexion it is noteworthy that their hollow conical teeth exhibit curious infoldings of the wall, like those observed in many Labyrintho.donts, while their short, biconcave vertebrae almost exactly resemble those of the Labyrinthodont Mastodonsaurus and its allies. As the Ichthyosaurs are traced up- wards in geological time, some genera become almost, or quite, toothless, while the paddles grow wider, and are rendered more flexible by the persistence of cartilage round their constituent bones (Ophthalmosaurus). They were cosmopolitan in distribution, but dis- appeared from all seas at the close of the Cretaceous period. The largest forms, with a skull 2 metres in length, occur in the Lower Lias. Order 5. Rhynchocephalia. — These are small lizard-shaped reptiles, which have scarcely changed since the Triassic period. Though now represented only by Sphenodon or Hatteria, which survives in certain islands off New Zealand, in the Mesozoic epoch they ranged at least over Europe, Asia, and North America. They comprise the earliest known reptile, Palaeohatteria, from the Lower Permian of Saxony, which differs from the Triassic and later genera in having an imperfectly ossified pubis and ischium, more numerous abdominal ribs, and the fifth metatarsal

Fig. 5. — Ichthyosaurus quadriscissus : outline of specimen showing dorsal and caudal fins, about one-sixth natural size. — Upper Lias, Wurttemberg. (After E. Fraas.) The irregularities behind the triangular dorsal fin are torn pieces of skin.

Anomodontia, and the shape of the scapula seems to show some connexion with the Chelonia. The truly aquatic Sauropter- ygians of the Jurassic (fig. 4) and Cretaceous periods possess most

bone normal. They are also represented in the Permian, chiefly of North America, by the so-called Pelycosauria, which have sharp teeth in sockets, and are remarkable for the extreme

elongation of the spines of their cervical and dorsal vertebrae (Dimetrodon, fig. 6). They seem to include various Triassic

From Prof. E. C- Case’s Revision of the Pelycosauria of North America,

by permission of the Carnegie Institution of Washington.

Fig. 6.-

-Dimetrodon incisivus : restoration of skeleton by E. C. Case, about one-eighteenth natural size.

nearly similar, and is represented by at least one complete skele- ton in the Yale University Museum. There are also members of the same group with a heavy armour of bony plates and spines, sometimes termed Stegosauria. Stegosaurus itself occurs in the Upper Jurassic of Colorado, and Omosaurus, from the Kimmeridge and Oxford clays of England, is a nearly similar reptile. Polacanthus, from the Wealden of the Isle of Wight, has the hip-region armoured with a continuous bony shield. Triceratops (fig. 8) and its allies, from the Upper Cretaceous (Laramie) of western N. America, are the latest members of the group, with a bony frill over the neck, a pair of bony horn- cores above the eyes, and a median bony horn-core on the nose. The skull with the bony frill sometimes measures nearly two metres in length. Another suborder of herbivorous Dino- saurs, that of Sauropoda, comprises the largest known land animals of any age, some measuring from 17 to 25 metres in total length. They have a small head, long neck, and long tail, and must have been quadrupedal in gait. Their teeth are adapted for feeding on succulent water weeds, perhaps with an admixture of small animals living among these; and their vertebrae are of very light construction, while the ribs are raised high on the neural arches to increase the size of the body cavity, perhaps for unusually large lungs or air sacs. Their massive limbs have five toes, of which the three inner alone bear outwardly curved claws. Diplodocus and Brontosaurus, from the Jurassic of Wyoming and Colorado, U.S.A., are the best-known genera. Atlantosaurus, from the same formation, is usually noteworthy for size. Cetiosaurus, from the Jurassic of England, is also known by large parts of the skeleton in the British Museum and the Oxford Museum, indicating species nearly 20 metres in length.

genera (e.g. Aetosaurus, Belodon), which may perhaps belong to the ancestral stock of the Dinosauria and CrOcodilia. Other Triassic genera (Hyperodapedon, Rhynckasaurus) scarcely differ from Sphenodon, except in the denti- tion and in the absence of the pineal foramen in the ;kull. In the late Cretaceous and early Eocene periods one genus {Champsosaurus) was truly aquatic, with gavial-shaped head.

Order 6. Dinosauria. — The dinosaurs are land reptiles which flourished on all the continents during the Jurassic and Cretaceous

periods, in the interval between the decline of the Anomodontia and the dominance of the Mammalia. They first appeared as carnivorous reptiles in the Triassic period in Europe, India, S. Africa, and N. America, but after- wards comprised numerous massive herbivores in nearly all parts of the world except the Australian and New Zealand regions. The skeleton in the carnivorous dinosaurs, or Theropoda, is of very light construction, the vertebrae and limb bones being hollow, with thin, dense walls and often perfectly fitting joints. The fore limbs are small, and the hind limbs are adapted for running, jumping or hopping on the toes. The sabre-shaped cutting teeth are fixed in sockets, and all the claws are sharp. Anchisaurus and Hallopus, from the Trias of N. America, and Scleromochlus from the Elgin sandstones of Scotland, are comparatively small animals. Ceratosaurus and Megalosaurus, from the Jurassic of North America and western Europe re- spectively, must have attained a length of from 5 to 6 metres. Tyrannosaurus, from the Cretaceous of Montana, U.S.A., has a skull more than a metre in length. The herbivorous Dinosaurs of the suborder Ornithopoda resemble the Theropoda in general shape, but are heavier in build, with a pelvis con- structed more nearly on the plan of that of a run- ning bird. It has, indeed, been suggested that certain arboreal Dinosaurs of bipedal gait may have been the ancestors of the class Aves. The best- F IG – 8.— Triceratops prorsus: restoration of skeleton by O. C. Marsh,

known Ornithopod is Iguanodon (fig. 7), from the about one-eightieth natural size.— Cretaceous, Wyoming.

Wealden of W. Europe, with species from 5 to 10 metres in 1 Order 7. Crocodilia. — Typical crocodiles can be traced length. Claosaurus, from the Cretaceous of N. America, is I downwards to the Lower Lias at the base of the Jurassic

Fig. 7. — Iguanodon bernissartensis; restoration of skeleton by O. C. Marsh, about one-eightieth natural size.— -Wealden, Bernissart, Belgium.

formations, but all the Jurassic and some of the Cretaceous genera have the secondary bony plate less extended backwards than that in the Tertiary and existing genera, while their vertebrae have flattened

or concave ends, instead of exhibiting a ball- and-socket articulation. Some of the Upper Jurassic crocodiles (Metriorhynchus) were more truly aquatic than any now living, with the fore limbs degenerate, the hind limbs much enlarged for swimming, and the dermal armour lacking. The end of the vertebral column is bent downwards, as in Ichthyosaurus, so they doubtless possessed a similar triangular tail-fin. Typical crocodiles and alligators date back to the close of the Cretaceous period, and they did not become extinct in Europe until the beginning of the Miocene period. Remains of an extinct alligator (Diplocynodon) are common in the Upper Eocene sands of the Hordwell cliffs, Hampshire.

Order 8. Oenithosauria. — The flying reptiles or Ptero- dactyls (fig. 9) are completely evolved at their earliest known

Fig. 9. — Pterodactylus spectabilis, natural size, from the Litho- graphic Stone, h, humerus; ru, radius and ulna; mc, metacarpals; pt, pteroid bone; 2, 3, 4, digits with claws; 5, elongated digit for support of wing-membrane; st, sternum, crest not shown; is, ischium; pp, prepubis. The teeth are not shown. (After H. von Meyer.)

appearance in the Lower Lias (Dimorphodon), and exhibit little essential change as they are traced upwards through the Mesozoic formations. The latest Cretaceous genera, however, comprise the largest species, which have been found in Europe, N. America and Brazil. Some of these (Pleranodon) are tooth- less, and their wings are so large that for adequate support the pectoral arch is fixed to the vertebrae like a pelvis. The wings occasionally have a span of from 5 to 6 metres. The wing- membranes are only known in the European Jurassic genus, Rhamphorhynchus (fig. 10), found well preserved in the fine- grained lithographic stone of Bavaria. In this genus there is also a rhomboidal flap of membrane at the end of the tail.

Order 9. Squamata. — The ancestors of the lizards and snakes can only be traced back definitely to the latter part of the Cretaceous period. They were then represented by two suborders of aquatic reptiles, the Dolichosauria and Pythono- morpha(or Mosasauria), which are in many respects intermediate between the existing Lacertilia and Ophidia. The Dolichosauria, from the Upper Cretaceous of Europe, are small and snake-like

in shape, but with completely formed limbs. The Pythono- morpha are known from Europe, N. and S. America and New Zealand, and sometimes attained a very large size, the typical Mosasaurus camperi from Maastricht being about 15 metres in length. Their limbs are

powerful paddles. Their trunk and

Fig. 10. — Rhamphorhynchus phyllurus, from the Solenhofen Lithographic Stone, about f natural size, with the greater part of the wing-membranes preserved, x, caudal membrane; st, sternum; h, humerus; sc, scapula and coracoid; wm, wing- membrane. (After O. C. Marsh.)

tail are often much elongated, so that their shape is snake-like, as shown by Clidastes (fig. n), from the Chalk of Kansas, U.S.A. The Lacertilia and Ophidia, so far as known, are exclusively Tertiary and Recent reptiles. Marine snakes (Palaeophis) occur in the Eocene of the London and Hampshire basins.

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Fig. 11. — Skeleton of Clidastes. (After Cope.)

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III. Anatomy or Reptiles The Skull. Sphenodon has the most primitive and still most complex skull, the salient features of which it is easy to derive from Stegocephalian and early, generalized reptilian conditions; whilst in other directions, mostly by reduction, the skull of this “living fossil” affords the key to that of all the other groups of at least recent reptiles. The main features are the following. There are, in the temporal region, three complete bony arches,

the supra-, infra-, and post-temporal, which subdivide the whole temporal fossa into four foramina. The supratemporal bridge is formed by the squamosal and post-orbital, the latter (j in fig. 1 2) being continued forwards and fused with the post-frontal.

These three bones, with the parietal, enclose the supra- temporal foramen. The postorbital joins an ascending branch of the jugal, both together form- ing the hinder border of the orbit, and this is bordered below chiefly by the maxillary. The pos- teriortemporal bridge is formed by the parietal and squamosal, extends laterally over the quadrate and encloses a wide space between itself and the buttress-like transverse expansion of the lateral occipital-

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After Guother. FlG. 12. — Skull of Sphenodon.

1, Ventral aspect; 2, lateral aspect; 3, lateral aspect of mandible, or. articular; 60, basioccipital ; bs, basisphenoid ; c, coronoid; ca, columella auris; d, dentary; j, postorbital; m, maxilla; n, nasal; pa, parietal; pi, palatine; pm, premaxilla; pr, prefrontal; ps, pastlrontai; pt, pterygoid; g, quadrate in the upper figure, quadrato-jugal in the middle figure; qj, jugal; s, squamosal; sp, splenial; v, vomer.

bone (these ” parotic processes ” are made up of the lat. occipital,

parotic and opisthotic bones); this is the post- temporal foramen. The space enclosed between this occipital buttress, the quadrate and the pterygoidal support of the latter represents the wide and large cavity of the middle ear,

and as such is crossed by the auditory columellar chain. The infra-temporal bridge or jugal arch is formed by the jugal (qj in fig. 12), which joins the descending process of the squamosal, and the quadrato-jugal, which is very small and partly fused with the lateral side of the quadrate. Now, between the quadrate on the one side and the squamoso + quadrato-jugal + jugal on the other, is enclosed a gap, met with only in Sphenodon of recent reptiles. This fourth, or quadrato-squamosal foramen, with its squamoso-quadrato-jugal bridge, is, as a rule, not mentioned, being too small to be obvious. The quadrate is very firmly fixed. On the ventral side of the cranium we notice the broad and long bony palate, the large vomers, and the pterygoids meeting in the middle line; aside of the vomers are the long posterior nares; posteriorly the pterygoids diverge to rest upon short basi-sphenoid processes, and they articulate by short flanges with the quadrates.

The occipital condyle is kidney-shaped, triple, composed of the basi and the lateral occipitals. The dorsal median roof of the cranium is formed by the paired parietals, near their anterior symphysis with the large pineal foramen, the paired frontals, nasals and premaxillaries. The outer nares are surrounded by the premaxillaries, maxillaries and nasals. Prefrontals and postfrontals exist. There is a complete cartilaginous, inter- orbital septum, and a cranial columella, a pair of upright buttresses arising in the alisphenoidal walls, connecting the parietals with the pterygoids. . The hyoid apparatus consists of a narrow base, with three pairs of arches; of these the first or hyoid arch is variously connected with the cranium near the paroccipital process, or with the extracolumella (see Middle Ear, below) ; the others are a long and stout pair of first and a smaller pair of second branchial arches.

Crocodiles. — The temporal region is still bridged over by three arches, dividing the whole fossa into three, very much as in Sphenodon. The supratemporal foramen is bordered by the parietal,

postfrontal (postorbital absent) and squamosal. The posttemporal foramen is very much reduced, sometimes to a narrow passage between the parietal, occipitals and squamosal, because the latter bone forms an extensive suture with the paroccipital process. The infratemporal or lateral fossa is wide and rather shallow, bordered above by the postfrontal and squamosal, in front by the postfrontal and jugal, below by the jugal and quadrato-jugal, behind by the latter, the quadrate, tip of the paroccipital and the squamosal. The quadrato-jugal being long and in an almost horizontal position, being wedged in between the jugal and nearly the whole length of the lateral edge of the quadrate, and there being no squamoso-quadrato- jugal bridge, the fourth foramen of Sphenodon is absent. The middle-ear cavity is reduced to a complicated system of narrow passages; one for the passage of the extra-columellar-mandi- bular string of the auditory chain (see Ear, below) , between the quadrate, paroccipital and lateral occipital bones; another passage {Eustachian) opens in the roof of the mouth, between basioccipital and basisphenoid; a third joins that of the other side and forms with it a median opening between the same bones, just behind the posterior pterygoid border of the choanae. These nares, being in the recent crocodiles shifted as far back as possible, communicate with the outer nostrils by very long passages, formed by the whole length of the pterygoids, palatines, maxillaries, vomers and pre-maxillaries, all of which form a long median suture. But this long bony palatal roof is interrupted by a pair of large palatal foramina, bordered usually by palatine, pterygoid, ectopterygoid, or transverse bone and maxillary. On the dorsal side of the cranium we notice the parietals fused into an unpaired bone, without a pineal hole and the likewise unpaired frontal. There are a pair of postfrontals, prefrontals and lacrymals perforated by the naso-lacrymal duct. The nasals vary much in length, mostly in conformity with that of the maxillaries; as a rule they reach the short premaxillaries, but not always the nasal groove. (For taxonomic detail see under Crocodile.)

The occipital condyle is formed mainly by the basioccipital, which always borders part of the foramen magnum, but the

lateral occipitals each send a flange to it, which in immature specimens still partakes of the articulation with the atlas. The opisthotic and eDiotic bones fuse early with the lateral and with supraoccipital bones; only the prootic remains longer as a separate element, anteriorly with a large hole for the exit of the third branch of the trigeminal nerve. The basisphenoid is scarcely visible, being overlaid by the pterygoids. The pre- sphenoid is larger, continued forwards and upwards into the inter-orbital septum, which remains mostly cartilaginous. Near the anterior and upper margin of the pre-

sphenoid is a large notch on either side for the passage of the optic nerve, the three eye- muscle nerves and the first branch of the trigeminal. The place of the orbitosphenoids is taken by membrane or cartilaginous continuations of the interorbital septum, but the alisphenoids are large and abut upwards against the frontals and with a lateral flange against the postfrontals. These send down a conspicuous process which forms sutures with an upward process of the jugal and another of the ectopterygoid; it is this compound pillar which partly divides the orbit from the infratemporal or lateral fossa. The size of these and the upper temporal fossae stand in an inverse ratio to each other. The upper fossae are still comparatively large in the long-snouted Gavialis and Tomis- toma, whilst these holes almost completely disappear in the alligators, namely, in the broad- and short-snouted members of the order, which chew their prey. In extinct Crocodilians the upper fossae were the larger. The temporo-mandibular muscle which lifts or shuts the lower jaw arises from the walls of the upper fossa, passes beneath the jugal-arch and is inserted upon the supra-angular portion of the lower jaw. In the more recent crocodiles this muscle is more and more superseded by the pterygo-mandibular muscle, which, arising chiefly from the dorsal surface of the much-broadened pterygoid, fills the widened space between the latter and the quadrate, and is inserted into the outer surface of the angular bone. The arrangement of this muscle secures a more advantageous leverage of the jaw, and is capable of more powerful development than the other, which is con- sequently on the wane — a nice illustration of onward, ortho- genetic evolution. The dentary bones of the under jaw form a suture, later a symphysis; this is very long in the long-snouted genera, in which the splenials likewise form a long symphysis; in the others the mandibular symphysis is much shorter and the splenials remain widely separated. The articular bone is short, forms a transverse cup for the quadrate, or a saddle-shaped cup, and is perforated by the Siphonium (see below under Ear). The angle is upturned, formed by the articular, angular and, laterally, by the supra-angular bone; the opercular or counter- part of the splenial lies on the outer side, forming part of the anterior border of the oval foramen in the jaw.

The Chelonian skull agrees in many important features with that of Sphenodon and of the crocodiles, but it is composed of fewer bones, the ectopterygoids, lacrymals and postorbitals being absent, often also the nasals, unless they are fused with the prefrontals. The vomer is unpaired and forms a septum between the nasal passages, which, except in Sphargis, are ventrally roofed over to a variable extent by wings sent out by the palatines, joining the sides of the vomer. Most of

the con- figurations of the other cranial bones are well represented in the accompanying figures. The palatines form a continuous broad floor with the pterygoids, which are extensively and firmly joined to the quadrates and to the basisphenoid. There are no Eustachian tubes. The occipital condyle is distinctly triple and the basioccipital is frequently excluded from the foramen magnum. The lateral occipitals early send out a pair of stout wings, the ventral of which joins a stout ventrilateral process of the basioccipital, both forming a thick knob especially in Chelone, and a dorsolateral wing, which broadly joins the large opisthotic bone. This connects the lateral occipital and the supraoccipital with the upper portion of the quadrate. On the top of the quadrate and upon the lateral dorsal portion of this compound transverse process (which of course corresponds to the paroccipital process of crocodiles, &c.) lies the squamosal, about which more presently. The two wings of the lateral

occipital, part of the opisthotic, the quadrate, and part of the pterygoids, form the bony borders of the middle ear-cavity,

pm

Fig. 13. — Dorsal aspect of skull of Testudo tabulata (from nature), an, anterior nares; /, frontal, on either side of which are the orbits, bounded behind by ps, the postfrontal; bo, basioccipital; ep, epiotic; so, supra- occipital ; q, quadrate ; s, squamosal ; pa, parietal ; po, periotic bones.

FlG. 14. — Ventral surface of skull of Tes- tudo tabulata (from nature), bo, basi- occipital ; bs, basisphenoid ; cp, epiotic ; m, maxilla; pi, palatine; pm, pre- maxilla; pt, pterygoid; q, quadrate; q j, quadrato-jugal ; so, supraoccipital.

.which is open behind; through it extends horizontally the columellar rod, received with its outer portion by a notch on the posterior side of the quadrate. This is of very complicated shape. Its outer margins form most of the tympanic frame; the posterior margins being curved backwards leave a wide notch behind in the Cryptodira and in Sphargis, but in the Pleurodira this part of the quadrate is transformed into a trumpet, the rim of which, forming a complete ring, carries the tympanic mem- brane. The tympanic cavity thus formed often leads

into a deep recess which extends into the hollowed-out squamosal (e.g. in Testudo) towards the opisthotic and bears some resem- blance to the intricate tympanic recesses which pervade that region of the crocodile's skull. With its upper anterior and

Fig. 15. — Side view of skull of Testudo tabulata (from nature). an, angular; ar, articular; d, dentary; _f, frontal; j, jugal; m, mandible; n, naso-pref rontal ; pa, parietal; pi, palatine; ps, postfrontal; q, quadrate; qj, quadrato-jugal.

inner portion the quadrate joins the large prootic bone which is usually completely fused with the rest of the opisthotic, but in Sphargis it remains separate, and in this turtle the sutures between the otic bones and the supraoccipital also persist. In front of the prootics the bony lateral walls of the brain-case end in Sphargis, but in most of the other Chelonians bony ali- sphenoids are represented by a pair of epipterygoids which rest upon short upward processes of the pterygoids and are joined by much longer, rather thin, but broad descending lamellae from

the parietals. They represent of course the columellae cranii or pterygoidal columellae; if they are of alisphenoidal origin the term epipterygoids is a misnomer; the same applies to th«se structures in other reptiles. Through the space enclosed by the pterygoid, basioccipital, opisthotic and quadrate, enters the cranial carotid artery, sometimes piercing the posterior rim of the pterygoid; then the canal runs along the dorsal side of this bone and opens near the cranial columella. The arcades over the temporal region are most vari- able. Potentially Chelonians possess all the three arcades of the crocodiles, but it so happens that never more than one fenestra is present. The false roof over the temporal region is most complete in Sphargis and in the Chclonidae. Excepting Sphargis the supraoccipital extends far beyond the back of the cranium in shape of a long unpaired crest, which never diverges, or sends out lateral processes, but it is joined, and partly overlaid for a great part of its length, by the parietals in Chelonidae and Sphargis. In these genera the much- enlarged parietal, the equally large postfrontal, with the squamosal behind, the jugal below, and a large quadrato-jugal, form one continuous bony roof over the whole temporal fossa, which is widely open behind, the space being bordered by supraoccipital, opisthotic, squamosal and parietal. All other Chelonians show a great reduction of this roof. The parietal does not send out dorsolateral expan- sions; and the postfrontal likewise forms no ex- pansions. It joins the rather short malar, forming the posteriororbital bridge, which posteriorly is connected by the quadrato-jugal with the upper portion of the

quadrate and with the squamosal. The latter rests upon the quadrate and is in no connexion with the parietal. Consequently the whole temporal fossa is quite open. The hori- zontal bridge or arcade is to a certain extent homologous with the infra-temporal arcade. All the bones which border the temporal fossa vary much in extent. The greatest reduction has taken place in Cistudo and in Geoemyda, the latter an Indian genus of Testudinidae, in which the quadrato-jugal is lost, leaving a wide gap in the horizontal arcade. — The Chelonians form an instruc- tive parallel to mammalian conditions by the broad contact of the squamosal with the malar, e.g. in Chelone, whilst the quad-

jom

Fig. 16. — Dorsal Aspect of Skull of Chelys matamata. bo, basi-occipital; eo, exoccipital; /, frontal; j, jugal; m, maxilla; pm, premaxilla; pa, parietal; pr, prefrontal; ps, pdstf rontal; pt, pterygoid; q, quadrate; s, squamosal; so, supraoccipital.

rato-jugal, having in all Chelonians lost its original ventral connexion with the jugal, may actually get lost as in all the

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Lacertilia. The zygomatic arch of the Mammalia is formed (cf. also Agamidae) out of the supratemporal arch of Sphenodon,

pm

Fig. 17. — Ventral Aspect of Skull of Chelys matamata. bo, basi-occipital; bs, basisphenoid ; mdl, mandible; oh, opisthotic; pi, palatine; pm, premaxilla; po, prootic; pb, pterygoid; q, quadrate; 5, squamosal; v, vomer.

Fig. 18. — Lateral Aspect of Skull of Chelys matamata. an, an- gular; ar, articular; bo, basioccipital ; d, dentary; op, opisthotic; m, maxilla; pa, parietal; pm, premaxilla; pr, prefrontal; ps, postfrontal; pt, pterygoid; q, quadrate; 5, squamosal; sg, supra-angular.

after the loss of the postorbital element and of the quadrato- jugal, the squamosal gaining connexion with the upper, not posterior and ventral, branch of the jugal or malar bone.

The mandibular halves form a complete osseous symphysis, the only instance in reptiles; all the other elements retain their sutures. The articular portion of the articular bone forms several shallow cups and a slight anterior knob, best developed in Chelone. The angular bone does not help to form the posterior upper angle. The coronoid, or complementary element, is often small; the supra-angular and the splenial or opercular are always present, mostly also a pre-splenial wanting in Testudinidae (cf. G. Baur).

The hyoid apparatus is well developed, and sometimes assumes large dimensions, especially in Chelys. The two pairs of ” horns ” are the first and second branchial arches, whilst the hyoid arches are reduced to a pair of small, frequently only cartilaginous nodules, attached near the anterior corners of the basis linguae, which generally fuses with the os entoglossum in the tip of the tongue. In Chelydidae the long median basal or copular piece forms a semi-canal for the reception of the trachea.

In the skull of the Lacertilia the arcades over the temporal region vary much in composition and numbers. There are at most two arcades and two windows. First the posttemporal arcade, enclosing the posttemporal fenestra, which is framed mainly by the large paroccipital process below and the long parietal process above, both meeting distally, and the quadrate is carried by the paroccipital process. In the corner, in front, where the three bones meet, lies the squamosal, connecting parietal and quadrate. This squamosal, when not too much

reduced, has an upper parietal and an anterior horizontal arm ; the latter is essential for the formation of the second horizontal arcade, which makes the lower border of the supra-temporal window. The infra-temporal arcade, namely a quadrato-jugal -f-jugal arch, is absent in all Lacertilians owing to the complete absence of the quadrato-jugal element.

In Heloderma and Geckos the posttemporal is the only arcade. In the Amphisbaenids and in Aniella, practically also in Anelytropsis, all the arcades are lost. All the other families

Fig. 19. — Skull of Chlamydosaurus kingii (old male), showing much differentiated teeth. 1, ventral aspect; 2, posterior; 3, profile, showing the enormous process at the hinder end of the lower jaw.

of lizards and the chameleons have two arcades. We begin the description of the horizontal arcade with those families in which it is

most complete, and most like that of Sphenodon. In Varanus it is formed by four bones. The postfrontal is short; to it is attached the postorbital, which sends a long horizontal process to join the squamosal 1 splint, and this connects with the

1 There is a much-debated question of the homologies of the one or two elements, both apparently membrane bones, which connect the upper end of the quadrate with the parietal and with the supra-temporal arch. The question becomes acute in the snakes, whether the single element connecting skull and quadrate has to be called squamosal or supratemporal. Space forbids here to expound the matter, which has been very ably reviewed by S. W. Williston (" Temporal Arches in the Reptiha," Biolog. Bulletin, vii. No. 4, 1904, pp. 175-192; cf. also F. W. Thyng, Tufts College Studies, II. 2, 1906). About ten different names have been applied to these two elements, and two, namely, squamosal and supratemporal, are being used quite promiscuously. When only one element is present, the present writer uses the term squamosal, and there are reasons making it probable that this element is the squamosum of mammals. When both elements are present, the more ventral or lateral of the two is termed squamosal, that which always helps to form the

upper anterior end of the quadrate; between the quadrate, the squamosal and the long parietal process lies the likewise splint-like supratemporal, attached by most of its length to the parietal process. The jugal has only one arm, and this connects the maxilla with the postorbital, completing the posterior orbital border. There is a wide gap between jugal and quadrate. In Tejidae the arcade is the same, but the squamosal reaches the jugal, both meeting the postorbital. In Lacerta the arcade is essentially the same, but the window is completely filled up by the postfrontal, which extends so far back as to reach the supra- temporal. In the Agamidae the arcade is strong and simplified. Postfrontal and postorbital are represented by one forked piece. This squamosal and the post- frontal mass are connected by the upper, much up-curved end of the jugal, which is thrust between them. This arrangement is further emphasized in Iguana, the upper end of the jugal being much enlarged so as to form the greater portion of the arcade, and keeping the postfrontal mass and the ˆf simple squamosal widely asunder. In Heloderma post- and prefrontals are in

contact with each other, Fig. 20. — Dorsal aspect of separating the frontal bone from skullofff elodermahorridum. the orbit; the jugal joins only f, frontal ;j, jugal ;/,lachry- th prefronta l and there is no

mal ; m, maxilla ; n, nasal fa, parietal, pm, premax ilia ; pr,pref rental ; ps, post- frontal; pt, pterygoid; q

further arcade whatever. A

vestige of a supratemporal (?)

. . . _ _ lies on the outside of the base

quadrate; s, squamosal; so, of the squamosal between 5 and

supraoccipital. • n

q m fig. 20.

The chameleons are peculiar. The posttemporal arcade, spanning a wide space, is formed by a long process of the supra- temporal – squamosal, which is directed up- and backwards to join the parietal, which ex- tends back by a long unpaired process. The horizontal arch is broad and short, squamosal and postfrontal, form- ing a broad suture; below they are joined by the jugal; above the suture lies, in cham- eleon, a tiny piece, perhaps a vestige of the dislodged post-orbital.

The jugal bones, to continue the descrip- tion ,of the appendi- cular parts of the skull, are firmly joined to lateral processes of the pterygoids by the ectopterygoids; further forwards they are extensively connected with the maxillaries. These rest against strong transverse palatine processes. The pal- atines form a medium symphysis; posteriorly they diverge together with the pterygoids, which articulate with the quad- supratemporal bridge, generally with the postorbital, sometimes also with the jugal. The more dorsal element is mentioned as supratemporal; it is always smaller, and mostly restricted to the corner between the squamosal and the parietal process against which it rests. Either of these two elements articulate with the quadrate. Both elements are present in Labyrinthodonts and in most of the extinct groups of reptiles; among recent forms in Lacertidae, Varanidae, Tejidae; one three-armed piece in Sphenodon, chameleons and crocodiles, without, in Sphenodon at least, any trace of a compound nature; one piece, forked, in Agamidae; one simple piece in most of the other. Lacertilia, and in snakes.

*jf ay y

Fig. 21. — Skull of Chamaeleon vulgaris. ag, angular; ar, articular; bs, basisphe- noid; d, dentary; j, jugal; m, maxilla; me, median ethmoid ; p l and p 2 , parie- tals; pl, palatine; pr, prefrontal; pt, pterygoid ; q, quadrate; sg, supra-angu- lar; so, supraoccipital; sq, squamosal.

rates and with the basisphenoid by a pair of strong basiptery- goid processes. A slender vertical rod of bone, the columella cranii, arises from the dorsal surface of each pterygoid and, passing at a distance from the cranial capsule, is sutured to a short lateroventral process of the parietals Such a pair of columellas exists in nearly all Lacertilia (distinguished by many systematists as Kionocrania) with the exception of the chame- leons and the Amphisbaenidae. In many lizards, however, this columella, or epipterygoid, does not quite reach the parietal, leaning instead against the prootic; possibly it has been evolved out of the alisphenoid, and Chelonians seem to support this view. The premaxillary bone is single, except in the Skinks and in some Geckos; ventrally it touches the vomers which vary much in size; they are always paired although suturally connected; posteriorly they pass into, and fuse with, the palatines before these send off their maxillary processes. Be- tween the vomer and its maxillary is a longitudinal hole. Often, e.g. in Lacerta, the vomers enclose a median hole near their anterior end, for Jacobson's organ. Dorsally the premaxilla sends a median process backwards to the nasals. These are paired, and fuse together only in Uroplates and in Varanus. The external nasal fossae are sometimes very large, and their anterior half appears blocked by the ossified turbinals, e.g. in Varanus and Tejus. Prefrontals are always present, often fused with the lacrymals; in Heloderma, in Aniella and in chameleons the prefrontals extend so far back as to meet the postfrontals, excluding thereby the frontals from the orbital rim. The frontals are either paired, as in Varanus, Lacertidae, Heloderma, Anguidae, Scincidae, Anelytropsidae, Aniella, Amphis- baenidae, and in some Geckoninae; or they are fused into one bone, as in the Eublepharinae, chameleons, Tejidae, Iguanidae, Agamidae, Xenosaurus. The parietals are double in the Geckos, in Uroplates and Xantusia; in all the others they form one coossified mass, generally with a pineal foramen, except in Eublepharinae, Amphisbaenidae, Tejidae, in Aniella and other degraded forms. In the majority the pineal fora- men lies in the middle of the parietal, but in the Iguanidae it is near the frontal, and actually in the frontal in chameleons.

As regards the brain-case, there is a cartilaginous inter- orbital septum, connected posteriorly with the slender, bony presphenoid;

ventrally on to this is fused a vestige of the parasphenoid, a narrow and thin splint which sometimes can be dislodged. The whole of the anterior wall of the brain-case is membranous, excepting a pair of separate ossifications, which do but rarely touch any of the cranial bones, as frontal, parietal or prootics. The ossifications are irregular in shape, each sending out a downward process which curves inwards almost to meet its fellow; between these issue the olfactory lobes. W. K. Parker recognized them as the alisphenoids; E. D. Cope named them postoptics, and remarked that in Sphenodon they coexist with an orbitosphenoid bone. The prootic has a notch in its anterior lateral margin for the passage of the trigeminal nerve. The opisthotic portion of the petrosal mass is intimately fused with the lateral occipital bones and their paroccipital process, and sometimes, e.g. Tejus, encloses with them many intricate recesses of the middle ear-chamber, which extend also into hollow and swollen thick downward processes of the basioccipital. These cavities of both sides communicate with each other through the cancellous substance of the basioccipital and basisphenoid. There are no Eustachian tubes opening into the mouth through the base of the skull.

The occipital condyle is tripartite, the lateral occipitals partaking of the articulation; very rarely, e.g. in Amphis- baenidae (see fig. 22), the basioccipital portion is so much reduced that the skull articulates by two very broad condyles.

The halves of the under jaw are but loosely united, either by ligament only or by an at least very movable suture. The jaw is compound and the numerous constituent bones mostly retain their sutures. Besides the dentary and articular, angular and supra-angular on the lateral side, and the opercular or splenial on the inner side, there lies on the dorsal side the coronoid, six pairs in all. The posterior angle of the jaw

is always formed by the articular bone, not by the angular which lies on the ventral side, about the middle of the

jaw; it is fused with the articular in Geckos, some Tejidae, Amphis-baenidae, and

some other bur- rowing kinds. The splenial is absent in chameleons; near the vanish- ing point in some of the Agamidae. The coronoid is

always present, for the insertion o f masse ter muscles. In the pleurodont lizards the outer wall of the dentary forms a ledge, against the inner side of which are fixed the teeth with cementum.

The snakes' skull shows many peculiarities, and most of the bones of the cranial capsule fuse together without sutures. The occipital condyle is triple, the lateral occipitals and the basi- occipital taking equal share in its composition; the basioccipital is excluded from the foramen magnum; frequently one common epiphysial pad covers this tripartite condyle. The supra- occipital is likewise excluded from the margin of the foramen magnum by the lateral occipitals. The basisphenoid is prolonged forwards into a long presphenoidal rostrum, on the upper sur- face of which the trabeculae cranii, which persist as cartilages, extend forwards to blend with the median ethmoidal cartilage. There are no ali- and no orbitosphenoids, their places being taken by downward extensions of the frontal bones, which descend to this sphenoidal rostrum and then turn inwards to meet together on the floor of the cranial cavity. There is consequently no interorbital septum. The parietals also de- scend laterally, but unite with the basisphenoid by suture. On

a " " – - – -

Fig. 22. — Skull of Monopeltis sphenorhynchus. I, dorsal aspect; 2, ventral aspect; 3, lateral aspect ; 4, posterior aspect, ar articular ; bs, basisphenoid ; d, dentary ;/, frontal ; m, max- illa; n, nasal; oc, oc, occipital condyles; of, occipital foramen ; pal, palatine ; pa, parietal ; pm, premaxilla ; ptg, pterygoid; q, quadrate; so, supraoccipital ; sq, squamosal; v, vomer.

FlG. 23. — Skull of Python sebae. ar, articular; ca, columella auris; d, dentary; /, frontal; m, maxilla; p, parietal; pm, pre- maxilla; po, prootic; pr, prefrontal; ps, postfrontal; pt, ptery- goid; q, quadrate; s, squamosal; t, transversum; tb, turbinal.

the base of the skull we note various processes for the insertion of ventral cervicooccipital muscles, much used during the act of vigorous striking. Boidae have a long sphenoidal ridge and thick basipterygoid processes; others have one or more median knobs or crests, and the Viperidae have a very pro- minent and large ridge. The parietals fuse together into an unpaired mass whence arises mostly a strong median crest

Fig. 24. — Skull of Vipera nasicornis. ar, articular; ca, columella auris; d, dent- ary;/, frontal; m, maxilla; pf, poison fang; pm, premaxilla; pr,

prefrontal; ps, post- frontal ; pt, pterygoid ; q, quadrate ; s, squa- mosal ; t, transversum or ectopterygoid.

which projects a little beyond the occiput; there is no parietal or pineal foramen. There are paired frontals, postfrontals, prefrontals and nasals; the latter are said to coossify in Charina only. The position of the prefrontals is vari- able. In the boas, for instance, they meet, separating the nasals from the frontals; they are in contact with the nasals in the boas, burrowing snakes and in Xenopeltis, but more or less widely separated from them, and

often from each other, in the Colubridae and Viperidae. The premaxillary is single-, and only in Glauconiidae connected with the maxillaries; in the others it is but loosely connected with the ethmoidal end of the skull, for instance, with the turbinals, which are osseous and well developed in pythons.

The whole appendicular apparatus is most loosely attached to the skull, at least in the typical snakes, and since they do not chew their prey but only hook it in, so to speak, during the act of swallowing, the whole apparatus is as movable as possible.

The whole palatal apparatus shows many modifications, but the maxillaries, palatines and pterygoids always remain widely asunder, and from the mid-line. Some of the modifications, so far as they are used for taxonomic purposes, are mentioned in the article Snakes: Classification. In the majority of snakes the maxillaries form the borders of the mouth, and they are but loosely attached to the other bones, to their palatine processes, to the palatines, and with their posterior ends, by the ectoptery- goids to the pterygoids. In the Viperidae the maxillaries are much shortened and articulate extensively with the prefrontals; they can be erected, or rather pushed forwards, by the ectoptery- goids (see Snakes) ; they are not connected with the palatines. The pterygoids diverge posteriorly and articulate loosely with the quadrates; in the original condition the articulation is near the distal end of the quadrate, e.g. in Boidae, and the pterygoids may form an additional attachment with the mandibles; in the Viperidae the pterygoids are somewhat shortened and are attached to about the middle of the quadrate shafts; in the Amblycepha- lidae they are still shorter and do not reach these bones. The ectopterygoids are lost by the burrowing Typhlopidae and Glau- coniidae. The quadrate is always extremely movable; besides being in a most curious way connected with the outer end of the columellar rod (see below, Ear), it is suspended from the skull by the squamosal. The squamoso-quadrate connexion is very loose; that of the squamosal with the skull varies

much. In the majority of snakes it slides quite freely upon the parietal; it is much longer than the quadrate in the boas, much shorter than the elongated and slender quadrate in most of the poisonous snakes. Lastly, in most of the ancient burrowing snakes, e.g. Typhlops, Glauconia, Ilysia and Uropeltis, the squamosal has worked its way into the cranial wall so that the quadrate, itself also much shortened, rests directly upon the cranium.

The Vertebral Column. The vertebrae of all reptiles are gastrocentrous, that is to say, the centra or bodies of the vertebrae are formed by the originally paired, interventral cartilages, while the basiventrals are reduced, persisting either as so-called intercentra or wedge-bones, or as intervertebral pads, or disappearing altogether; the basidorsal elements form the neural arch. At the earlier stages of develop- ment the gastrocentrous vertebrae behave in the same way as in the Urodela, except that the interdorsal pair of elements is suppressed from the beginning (the very elements which in

Stegocephali and most Amira form the centre), therefore the typical batrachian vertebrae are notocentrous. If the re- maining three pairs of constituent elements of each vertebra (the neural arch, the centrum and the intercentra) remain separate, the vertebrae are called temnospondylous {rkuvw, I cut, o-irovSv'Kos, a vertebra) . If the neural arches and the centra are suturally united, or are fused with each other, the vertebrae are called stereospondylous (orepeos, solid). In many fossil reptiles most or many of the vertebrae are temnospondylous; in most of the recent Amniota 1 they are consolidated, but the atlas or first vertebra remains usually in a relatively primitive condition, and is temnospondylous but for the usual modification that its centrum becomes attached to that of the second vertebra and forms its odontoid process. The composition of gastrocent- rous vertebrae is best illustrated by the first and second cervical vertebrae of crocodiles, whence by reduction and fusion the structure of every other vertebra can be explained. We have only to add that the ribs are genetically derived from lateral outgrowths of the basiventral elements, whilst the chevron bones are mere ventral outgrowths from the same basal cartilages. The most primitive vertebral column is that of the Geckos. The

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Fig. 25. — Composition of Vertebrae of Reptiles. In all the figures the right side looks towards the head.

I . Diagram showing the relative position of the four pairs of arcualia which constitute a complete quadripartite vertebra. B.D., Basi- dorsal; B.V., basiventral; I.D., interdorsal; I.V., interyentral, shaded vertically in all figures; N., position of axil of the spinal nerve, i.e. behind the neural arch of its vertebra. 2, 3. Side views of the constituent cartilaginous blocks of a caudal vertebra (2) and a trunk vertebra (3) of Archegosaurus, as typical examples of temnospondyl- ous quadripartite and tripartite vertebrae. For comparison with Reptilian vertebrae. 4. Temnospondylous tripartite vertebra of the trunk of Eryops, a Permian reptile. 5. Composition of the second vertebra of a crocodile. 6. A vertebra of which the vasi- ventrals are reduced to an ” interventrum.” 7. Side view of the first and second 1 cervical vertebra of a crocodile. 8. The same analysed. Ni, N2 and N3, position of the first, second and third spinal nerves; S.D., occasionally called Proatlas, the detached spinous process, or supradorsal, of the atlas or first vertebra. 9. The first three vertebrae of Sphenodon. 10. The complete atlas vertebra of an adult Trionyx, still typically temnospondylous.

vertebra consists chiefly of a large neural arch which rests broadly upon the centrum; this is a tube, more or less calcified and ossified, with a narrow waist in the middle, widening head- and tailwards. The tube is hollow, the chorda dorsalis passing through the whole column, and there are no proper joints between the centra, which are amphicoelous. Between the centra lies a separate element, the so-called intercentrum, which is ring-shaped and acts as an interarticular pad instead of a joint. The first of these rings forms the ventral half of the atlas ring; the second is attached to the cranial surface of the second centrum, and produces, like some of the next following ones, a vertical median blade of bone, a true hypapophysis. Such intercentra exist throughout the length of the vertebral column; in the tail they are enlarged and carry a pair of chevrons, which are cartilaginous and have the tendency of fusing by superficial

1 There remained a flaw in the correctness of the view that the bodies of the amniotic vertebrae are formed by the paired interven-)ral pieces, since the bodies were known always to appear from the first as

unpaired, cartilaginous masses, until G. B. Howes found them to consist of a right and left pair in the embryos of Sphenodonˆ

ossification on to the caudal ends of the centrum next in front, to which they do not belong genetically. Exactly in the middle of each vertebra the thin shell of the centrum forms a cartil- aginous septum, of what is often wrongly called chordal car- tilage. When this septum is complete, and this seems to be the normal condition in the tail, the chorda is here rent asunder, otherwise it is only constricted. This septum is but slightly invaded by ossification, and consists of large cells which retain the appearance of young or embryonic cartilage. It coincides exactly with the line of transverse division of most of the caudal vertebrae into an anterior and a posterior half, the division gradually extend- ing right through the bone of the neural arch. The same kind of division, and from the same causes, exists in Sphenodon and in many lizards, in fact in all those reptiles which can

Fig. 26. — Vertical section of four (7th to 10th) caudal vertebrae of Sphenodon. a, line passing through the middle of centrum and through part of the neural arch, where the vertebrae break off. (After Gimther.)

reproduce their broken-ofl tail. It is from the septal cartilage that the regeneration starts 2 (fig. 26).

Sphenodon also has biconcave vertebrae owing to the per- sistence of the chorda dorsalis in the intervertebral region; otherwise the vertebrae are solid. Intercentra- occur from the atlas regularly into the tail, where they carry chevron bones. The atlas-ring (fig. 25, 9) is composed of the first intercentrum and a pair of neural arches which remain quite separate and carry on the dorsal side a pair of ossicles, the disconnected supradorsal elements of the atlas, erroneously supposed to be the remnants of the ” proatlas.”

Crocodiles. — Remnants of the chorda persist in the middle of the centra, which, in recent species, are mostly procoelous, and with a convex knob behind, but the first caudal is strongly biconvex. Cartilaginous intercentral rings, pads or menisci, occur throughout the column; in the tail they carry chevrons. For the instructive detail of the composition of the first and second cervical vertebrae see fig. 25, 7 and 8. Some of the posterior neck and anterior thoracic vertebrae have an unpaired hypapophysis arising from the centrum. The vertebrae have the usual processes, viz. spinous process, a pair of anterior and posterior zygapophyses arising from the neural arch, diapophyses likewise from this arch for the articulation with the

tubercular portion of the rib; short parapophyses from the centra for the capitular ends of the ribs; the transverse processes of the 1 2th vertebra, and following, carry the whole rib, and are like the processes of the lumbar vertebrae diapapophyses; the so-called transverse processes of the tail are mainly the anchy- losed or fused ribs themselves.

Chelonians. — The vertebrae are sometimes in the various regions of the same column opistho-pro-or amphicoelous, or even biconvex. Intercentra occur regularly on the first two or three cervicals, and on the tail as paired or unpaired nodules, or as chevrons, which articulate mostly with the previous centra and occasionally fuse with them. Intercentral, fibrocartilaginous disks occur regularly, mostly in the shape of rings; the first is the transverse ligament of the atlas-ring. In the Trionychidae (fig. 25, 10), but also in some other tortoises, the various pieces of the atlas do not anchylose, and the first centrum remains also movably attached to the second, although it sometimes carries,

2 Regeneration of the tail can take place in Sphenodon, all Geckos, Anguidae, Gerrhosauridae, Lacertidae, most Scincidae, and in many Tejidae and Iguanidae; certainly not in chameleons, Varanus, Agamidae, snakes, crocodiles and tortoises. Often the tail is so brittle and the muscular cones are so loosely connected that part can be thrown off by the muscular exertion of the creature itself. The reproduced tail is, however, only a sham tail, since neither centra nor arches, but only a non-segmented rod or tube of fibro- cartilage is produced. It is, however, invested with new muscles and with skin, but the scales often differ considerably from those of the normal organ, sometimes showing reversion to an ancestral form. For further detail see G. A. Boulenger, P.Z.S. (1888), p. 351, and (1891), p. 466.

and fuses with, the second intercentral piece. The entire atlas remains in a primitive, typically temnospondylous condition. On the other hand, in some Pleurodira, e.g. Platemys and Chelys, all the constituent parts of the atlas coossify and form a com- plete, solid vertebra, which articulates by a concave-convex joint with the true centrum of the second vertebra. The normal number of cervical vertebrae is eight in all Chelonians. The last cervical has sometimes, e.g. Chelydra, a very

peculiar shape with strangely modified articular facets, in correlation with the retractile neck. The neural spines of the trunk verte- brae broaden out and fuse with the neural plates of the carapace. A tertiary modification takes place in many Pleurodira with the reduction of the neurals by the costal plates, which then meet in the dorsal line and cover the neural spinal processes. The caudal vertebrae are often much reduced in size, although not always in numbers, when the tail is very short, as in the marine turtles. In various species of Testudo about half a dozen of the last caudal vertebrae fuse together into a veritable urostyle, which is covered with a claw- or nail-shaped sheath of horn. In some of the gigantic tortoises of Mauritius this caudal vertebral complex is fully 3 in. long and 2 in. broad, of an extraordinary appearance.

The vertebrae of the Lacertae, or Lizards proper, are a direct further development of those of Sphenodon. The chorda dis- appears; the vertebrae are procoelous, with an articulating knob behind. Intercentrals, in the shape of osseous, unpaired nodules or wedges, persist on most of the cervical vertebrae; they are absent in the trunk and reappear in the tail, either as wedges or with chevrons. The first intercentral forms the central half of the atlas, with the neural half of which it is con- nected by suture. The second fuses mostly with the cranial end of the second centre and with the caudal and ventral surface of the odontoid, forming a downward-directed hook. Fre- quently the fusion remains incomplete, or the wedges may completely merge into the epistropheal mass without leaving any outward traces. Boulenger has made the important observation that the intercentra of the tail are sometimes paired, e.g. in Heloderma. When the caudal vertebrae are strongly procoelous, the knob is very long and the chevrons are attached to its neck, having shifted on to the vertebra in front, while their basal intercentral piece, or pieces, remain in the original position. In Ophisaurus the chevrons are absolutely fused with the caudal ends of the centra and thus assume a superficial resemblance to the vertebrae of Urodela. The splitting of the tail-vertebrae and regeneration have been described on a previous page. The trunk-vertebrae of the Tejidae and the larger Iguanidae possess additional articulating processes and facets, besides the usual processes. The Zygosphene is a wedge-shaped process with two articular facets, which projects forward from the anterior side of each neural arch. The Zygantrum forms a corresponding excavation with a pair of articular surfaces on the hinder side of the arch. The crests on the tail and trunk of many lizards, e.g. Iguanidae, are entirely tegumentary structures and not supported by the axial skeleton, except in some chame- leons, e.g. Ch. cristatus, and in the peculiar

genus Brookesia; in these the accessory much-complicated processes are enor- mously elongated and support the high cutaneous crest which arises from the back, especially in B. ebenaud.

The vertebrae of the snakes are procoelous (figs. 27, 28, 29). Besides the zygapophyses, they have zygosphenes on the neural arches; the ribs articulate with the parapophyses. Long, unpaired hypapophyses arise from the centre of the anterior neck and trunk vertebrae to a variable extent. In Dasypeltis and Rhachiodon a considerable number of these processes perforate the oesophagus and act as crushers of the shell of the eggs which these snakes swallow. The often- repeated statement that these processes are capped with enamel is erroneous. The caudal vertebrae are devoid of chevron bones, but they carry paired hypapophyses, and they have transverse processes which also are generally bent downwards.

Lastly, the numbers of vertebrae composing the whole column and its various regions. In the snakes we can distinguish only

between atlas and epistropheus, trunk and tail. The numbers vary exceedingly, in the trunk up to several hundred.

»*»,

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Fig. 27. — Lateral aspect of two trunk vertebrae of Python, a, articular processes of the zyga- pophyses ; wo, neural arches ; ns, neural spines; t, parapophyses. zs, zygosphene.

Fig. 28. — Posterior aspect of a trunk vertebra of Python (from nature). a, zygapophyses ; b, ball on the surface of the centrum ; /, parapo- physis; zg, zygantrum.

The tail may contain only a few, e.g. in the burrowing Typhlops, Glauconia, Uropeltis; or it may be very long, as for instance in Boa. There is no obvious reciprocal cor- relation between the length of the trunk and the tail. In the other

orders of reptiles the neck is well ,, . , . .

, , , . , 1 , , , r ig. 29. — Anterior aspect

marked, except in the snake-shaped of a trunk vertebra of

lizards. If we define as first thoracic vertebra that which is the first

con- nected with the sternum, all those anterior being cervical, the neck- vertebrae number 5 in chameleons the Chelonians and in the lizards, with the exception of the majority of Varanus, which have 9 like the Crocodilia

Python (from nature), a, zygapophyses; c, cup on the surface of the centrum.

7 in Sphenodon, 8 in

The Number of Vertebrae of some Specimens in the Museum of Zoology, Cambridge, England

Serial

13

Numbers

“3

u

“£

U

‘G

O

T3 ■

of the

Sacral

Vertebrae.

Caudal.

Sphenodon punctatum

7

3,4

15

ri4in

all.

26, 27

±30

Crocodilus vulgaris .

9

5

3

2

5

25,26

33

Alligator misstssippien.

9

5

3

2

5

25,26

40

Gavialis gangeticus .

9

7

2

3

3

25.26

33

Chelone viridis .

8

9

19,20,21

16 + py- gostyle

27

MacrolefHys temmincki

8

9

1

19, 20

Chelys matamata

8

8

17,18

17

Varanus niloticus

8

4

4

11

2

30,31

75 +

,, giganteus

9

2

1

16

1

30,31

99

Iguana tuberculata .

8

4

2-3

10-9

1

26, 27

46

Uromastix spinipes .

8

4

1

11

25,26

24

Trachysaurus rugosus

6

4

1

25

37,38

7 + py-

gostyle of about 6

Cyclodus gigas .

7

4

2

21

35-36

Lacerta viridis .

7

3

2

15

28, 29

40 +

Ophisaurus apus

55, 56

Chamaeleo vulgaris .

5

2

1

12

2

23, 24,

= ” = 50

Rhampholeon spectrum

5

1

3

8

2

20, 21

17

The ribs, having arisen as lateral, separated off processes from the basiventral elements, show many modifications in their proximal attachments. These can be best studied on the skeleton of a young crocodile (fig. 25, 7 and 8). The first pair of ribs is very long and broad, attached to the unpaired ventral piece of the atlas-ring; the tubercular portion is indicated by a very small rugosity. The second pair of ribs is still larger; the capitulum attached to the second intercentral piece which fuses with the odontoid process; the tubercular process is weak or represented only by a ligamentous connexion with a small knob of the odontoid process; consequently the tuberculum has shifted its attachment away from the second vertebra. The other cervical, and the anterior thoracic, ribs have complete

capitular and tubercular processes, the bodies and with dorsolateral

which, articulating with processes of the neural arches of their vertebrae, enclose typical transverse canals. In the posterior thoracic region the ribs are attached entirely to transverse processes of the neural arches, both capitular and tubercular portions having left the bodies or centra; the same arrangement pre- vails in the tail, but the ribs are very short and soon fuse with the pro- cesses. The two sacral ribs are very thick, Fig. 30.— Lateral aspect of Three Thor- articulating with the acic Vertebrae of Crocodilus vulgaris centra and the bases of (after Mivart). c, cup on the anterior their neural arch, and surface of centrum; cp, capitula of fa eyen form t f

ribs; ns, neural spines; t, tuber- .1 • . . 1 1 1 ■ f 1

cula of ribs; u, uncinate processes; tne intervertebral Joint . »r, dorsal

or vertebral portions of In Sphenodon the first the ribs; re, ventral or sternal carti- three ribs are repre- laginous portions of ribs. sented by bands of CQn .

nective tissue only, with similar attachments as in crocodiles. The other cervical ribs are osseous; their short capitula retain their partly intercentral attachment, while the tubercula are carried by low processes of the centra. In the thorax both capitulum and tuberculum merge into one facet, which is gradually shifting farther tailwards and upwards until the attachment reaches them, and then lies upon the neuro-central suture. The first caudal vertebrae also possess ribs, very short and soon fusing with the diapophyses of the neural arches. In the cervical region of the Chelonia the ribs seem to be absent. In the thorax they retain their primitive intercentral position throughout life, assuming (except the first pair, which remains short and least modified) an absolutely intervertebral position. From the lumbar or presacral region backwards the capitula are gradually shifting upon short processes of the centra, until in the tail the vestigial ribs are carried by the diapophyses of the neural arches. In Sphargis (fig. 31) all the ribs are free; in

the other Chelonians the ribs, generally in the recent species, flatten and become sur- rounded by the grow- ing membrane bone of the dorsal plates, and the cartilage of the ribs (except the capit- ular and neck portion

„ „„, ,7 ˆ ■ t oa; of the rib, which cannot

Fig. 31. — Three Vertebrae of Sphargis , ‘ , , .

coriacea. c, vertebral centra; n, neural be got at by tne dermal

arches; r, ribs. bones) undergoes a pro-

cess of calcification. Ultimately this is resorbed and its place is taken by the dermal bone, which forms, so to speak, a cast of the rib. Several of the short presacral ribs, and of course the postsacrals, are not drawn into these enormous changes, although the carapace covers, and indirectly affects, them.

Certain changes initiated in Sphenodon are more marked in the ribs of the Lacertilia; cervical ribs are often long in the lower neck. In the trunk the capitular portions are often much reduced, and in these cases the ribs are suspended mainly by their tubercular portions, usually from the diapophyses of the neural arches near the anterior end.

In the snakes all the vertebrae, from the second cervical to the tail, carry ribs. These are very movable, articulating with a rather large, more or less vertically placed facet, which is borne by the parapophysis or transverse process; sometimes the

rib retains traces of the original division into a capitular and tubercular portion. The ribs of the snakes, although long, consist only of their dorsal portions. In snake-shaped lizards, e.g. Pseudopus, rather long ribs begin with the fourth vertebra.

Uncinate processes are developed only in Sphenodon and in the Crocodilia. They are not homologous structures, arising in the former from the posterior margin of the middle of the dorsal portions of the ribs, overlapping the shaft of the next following rib; in the crocodiles they arise out of the middle portion of the ribs, remaining cartilaginous, whilst the middle portion coossifies with the dorsal. Only in Sphenodon and Crocodiles the thoracic ribs consist of three successive pieces; in the Lacertilia they consist only of the dorsal and the ventral or costosternal. The latter remain cartilaginous, or they calcify, but they never ossify.

The sternum and further modifications of the ribs of the trunk. — The sternum of most reptiles consists (1) of an anterior portion (presternum, Parker; prosternum, Fiirbringer; mesosternum of Gegenbaur), which is generally broad, more or less rhomboid and carries the shoulder-girdle, and on its posterior sides several pairs of ribs; (2) of a posterior portion (mesosternum and xiphi- sternum of Parker; xiphisternum of Fiirbringer; metasternum of Gegenbaur), which is narrow, sometimes metameric, carries several pairs of ribs, and generally divides into a right and left xiphoidal half, each of which is continued into one or more ribs. These ribs tend to lose their connexion, and in these cases the sternum ends in two typical xiphoid processes. The distinction between pre- and metasternum is arbitrary. In Sphenodon the broad sternal plate carries only three pairs of ribs, the 8th to 10th, and there is no xiphisternum. The other ribs of the trunk are long and compound, but they remain free and do not approach the mid-line. From the posterior edge of the sternum to the pelvis extends the complicated paraslernum, embedded in the abdominal wall; it is composed of about two dozen sets of abdominal ribs, each set containing a Tight and a left and a median chevron-shaped piece. In the Crocodilia the presternum carries only two or one pair of ribs, always that of the 10th vertebra. The narrow, more or less metameric metasternum carries seven or eight ribs, the last one to three being xiphoidal. The post-thoracic ribs gradually decrease in length; about three presacral vertebrae have no ribs, and so are

typically lumbar. The sacral ribs are generally the 25th and 26th in Crocodilus and Alligator; sometimes the 24th and 25th in Gamalis. The parasternum consists of only seven or eight transverse sets, each composed of two right and two left narrow splint-bones. All these parasternal elements belong to the category of dermal bones, together with those of the plastron of tortoises, inherited from Stegocephalian conditions.

The Lacertilia present an almost endless variety. The presternum is rhomboid and broad; it carries from three to six pairs of ribs, mostly four or five; the first thoracic rib is that of the 9th vertebra, the only exceptions being the chameleons with only five cervical vertebrae, and Varanus, which has usually nine cervicals like the crocodiles. The last cervical rib in these long-necked lizards is very long and has all the appearance of having but recently severed its connexion with the sternum. The presternum of Lacertilia sometimes has a window, e.g. some species of Lacerta, Phrynosoma, Iguana, or a pair of windows, e.g. Agama, Liolepis, Goniocephalus. The xiphi- sternum carries a variable number of ribs; it is either scarcely distinguished from the anterior plate, or it is long, and in these cases either double, e.g. Iguana, Gerrhonotus, Varanus, Zonurus, Agama, Cyclodus, Lacerta; or single, e.g. Zonosaurus. The post- sternal ribs shorten gradually in the majority of the Lacertae, and there is sometimes a ribless lumbar vertebra, e.g. in Iguana; in many Lacertilia, however, the ventral cartilaginous halves of the ribs are connected with those of the other side, either by ligaments, or they join together, forming complete hoops of thin cartilages. Such ribs occur in all Geckones and Chameleons, but also in many Iguanidae, Scincidae, and even in the Anelytropidae; their numbers vary much, from 27 in the Scincoid Aconlias meleagris, 7-10 in Polychrus, 8 in Chamaeleo

vulgaris, 4 or 5 in Anolis, to 1-3 in some other iguanids, skinks and geckos. Uroplates fimbriatus has 14, and the last four pairs are separated from the dorsal portions of their ribs; similar discontinuity occurs in geckos, the median portions bearing a striking, although not fundamental, resemblance to parasternal ribs.

In the lizards with much reduced fore limbs, the sternum loses its connexion with the ribs from behind forwards; two

ˆ sternal ribs existing in the Tejid

Jrˆ \r\ r*0 Ophiodes and in the Scincoid

, * Acontias, one only in Pygopus,

Fig. 3 2.Rudiments of pec none ™ pphisaums s Pseudo- toral arch— 1, of Acontias P us and Angms (m the latter one meleagris; 2, of Typhlo- rib is still connected in the saurus aurantiacus (after embryo). The sternum is like- ■frurbringerj. w ˆ se qu j te f ree m Chirotes in spite

of its functional limbs; the sternum is still a large plate, with a window, and ending in two long, xiphoid processes.

Lastly, the sternum has vanished without a trace, as in the snakes, in some species of Acontias, in the Anelytropidae, Dibamus and Aniella (Fiirbringer). In the limbless genera of Amphisbaenidae the sternum is very much reduced; in Trogonophis alone it is still represented by a narrow trans- verse bar connecting the ossicular vestiges of the shoulder-girdle; in the other genera the sternum has shrunk to a pair of nodules or to a single nodule.

The pectoral or shoulder-girdle in its completest condition consists of a right and left scapula, coracoid, precoracoid and clavicles, and an unpaired interclavicle or episternum. The dorsal portion of the scapula remains cartilaginous, with or without calcification, and is usually distinguished as supra- scapula. The ventral portion of the precoracoidal and cora- coidal mass remains likewise more or less cartilaginous, rather unnecessarily distinguished as epicoracoid. Ossification begins near the glenoid cavity and thence spreads, eventually with the formation of a dorsal and a ventral centre. The resulting suture separates the dorsal or scapular from the ventral or coraco-precoracoidal mass. A kind of landmark, not always reliable, between coracoid and precoracoid is the exit of the supra-coracoidal nerve. The ventral margins of the coracoids articulate in tenon and mortice fashion with the antero-lateral margins of the sternum. The interclavicle, usually T-shaped, is a dermal bone and rests upon the ventral side of the girdle. The paired clavicles, sometimes fused together, rest upon the anterior end of the interclavicle and extend transversely to the acromial process of the scapula; the detail of the attachments varies much.

The girdle is most complete in Sphenodon and in Lacertilia. In Sphenodon the coracoid forms one continuous mass with the precoracoid, without further differentiation; the clavicles are fused

with the interclavicle into one T-shaped mass, the cross-arms of which are attached to the acromia by ligaments. In the lizards (except Heloderma) the much-broadened central and anterior halves of the girdle are fenestrated; the windows, always closed by membranes, are bordered by bony processes, distally by unossified cartilage. The first window to appear, or the most constant, lies between the coracoid and its pre- coracoid; in Anguis it is the only window, in this case not a primary feature. In other lizards, e.g. Uromastix, a second window occurs between precoracoid and scapula, and even a third window can appear in the scapula itself, causing in many Iguanidae, e.g. Amblyrhynchus (see fig. 33, ms.), the so- called mesoscapula; an analogous window within the coracoid produces the mesocoracoid; unnecessary distinctions of little morphological value considering the great variability of these fenestrations in closely allied genera.

The chameleons have lost the clavicles and the interclavicle, and the scapula, which is very slender and long, is devoid of an acromial process. The coracoid forms one mass with the precoracoid, through the middle of which passes the supra- coracoidal nerve; the coracoids articulate by their whole bases with the sternum.

Geckos possess a complete shoulder-girdle; the ventral por- tion shows, e.g. Hemidactylus, three pairs of windows; only

Fig. 33. — Sternum and Shoulder-Girdle of Amblyrhynchus subcristatus (after Steindachner). cl, clavicle; co, coracoid; k, humerus; ic, interclavicle ; mc, mesocoracoid ; ms, mesoscapula ; pc, pre- coracoid; s, scapula; st, sternum.

one in Uroplates. In the latter the interclavicle is much re- duced; the clavicles meet each other and are slender rods. In the Geckoninae and Eublepharinae the ventral halves of the clavicles are dilated and possess each a foramen; the inter- clavicle is cross-shaped.

In the more or less limbless genera of lizards the shoulder- girdle is much reduced. In Chirotes, which still has functional fore limbs, the clavicles and the interclavicle are absent, the coracoids are not divided from the precoracoids; in the limb- less Amphisbaenidae the girdle is reduced to a pair of cylindrical ossicles in Amphisbaena, Blanus and Trogonophis; no vestiges exist in Rhineura, Lepidosternon and Anops.

Foramina in the broadened clavicles occur also in various Lacertae, for instance in the Iguanid Laemanctus, in the Scin- coid Trachy saurus, in Plestiodon, Zonosaurus and in Lacerta simonyi, but not in L. agilis. In Mabuia the median portions are especially broad and show each two

foramina. Their pres- ence can be of but very doubtful taxonomic value.

The girdle of the Crocodiles is considerably simplified. Scapula and coracoidae, movably united, at least in younger specimens. The precoracoid is slightly indicated by a process of the coracoid, which is perforated by the supra-coracoidal nerve near the glenoid cavity. Clavicles are absent. The interclavicle is reduced to a long, flat splint-bone, which is firmly fused on to the sternal cartilage. The Chelonian shoulder- girdle shows several .very remarkable modifications. Instead of lying outside the trunk, it has been transferred into the cavity of the trunk, the carapace with the ribs covering it fiom the outside. An explanation of the changes implied in this trans- position is still extant. Chelonians are, moreover, the only reptiles besides Pterosauria in which the scapula is attached to the skeleton of the trunk. The scapulae stand in a more or less vertical position, and their dorsal end rests against the inside- of the nuchal plate, where this is sutured to the first, neural and the first costal plate, a little in front of and side-wards from the first short rib. From near its ventral end the scapula sends off a long process, which converges transversely with its fellow. This process, the clavicle(l) or the precoia- coid of many authors, is the acromial process, the Plesiosauri giving the clue as to how an acromion can assume such an abnormal position. The coracoid, with a suture between it and the scapula* is very long and extends horizontally back- wards, not meeting that of the other side. The sternum being

absent, and clavicles and interclavicles forming the epi- and endo-plastral elements of the plastron, the shoulder-girdle is nowhere in contact with the skeleton except at its dorsal end. The Fore Limbs. — The humerus has near its upper enda median process, and at a variable distance a lateral process, near which is the biceps-fossa. Above the radial or outer condyle exists a foramen for the passage of the radial nerve in Sphenodon, in the Lacertilia, and in many Chelonians, e.g. Cholone and Sphargis; such an ectepicondylar foramen is absent in crocodiles. Above the ulnar condyle exists, but only in Sphenodon, the entepi- condylar foramen, for the passage of the nervus medianus and brachial vessels. Thus Sphenodon alone possesses both foramina, the crocodiles neither.

Ulna and radius always remain distinct; the former is generally the stouter although not always the larger bone. The carpus may contain as many as 12 separate elements ulnare, intermedium, radiale, 2 centralia, a pisiform on the ulnar and a small nodule in a corresponding position on the medial side, and 5 distal carpals. In Sphenodon the centralia are sometimes fused into one, and the radial nodule is absent ; the numbers of phalanges are, 2, 3, 4, 4 and 3 proceeding from the first to the fifth finger. The carpus of the Chelonia is like- wise primitive, with various unimportant reductions; Chelydra possesses one or two centralia, whilst pisiform and extra radial are absent; both these bones are present in Emys, but the centrale fuses with the radial carpal, and the fourth and fifth distal carpal are fused together. In Testudo the pisiform is small; intermedium, centrale and radiale are represented by one bone only, and the first, second and third distal carpals are fused, whilst the two remaining are free. In the marine turtles the fore limbs are transformed into paddles; the ulna is considerably shorter than the radius; all the normal nine carpal elements remain distinct; the pisiform is much enlarged, helping to increase the paddling surface, and it has moved from the ulnar carpal to the side of the fifth distal carpal. The three middle fingers and toes have mostly 3 phalanges; the pollex and hallux have always 2 ; the number of phalanges of the fifth finger varies from 3 to 1, of the fifth toe from 2 to o. The greatest reduction occurs in Testudo and its allied genera of typical land-tortoises, Homopus, Pyxis and Cinixys, the formula for the fingers being 2, 2, 2, 2, 2 or 1, and 2, 2, 2, 2, o for the toes. In Pelomedusa all the fingers possess 2 free phalanges only, owing to fusion of the first and second phalanges with each other.

Considerable advance is marked by the Crocodiles. The intermedium and centrale are lost, the pisiform is small, ulnar and radiale are considerably elongated and enlarged. Of the distal carpals the two last are fused into one bone, and the three first, together with the central, are transformed into a pad-like cartilaginous and ligamentous piece between the large radial and the first and second finger, to which the pad is firmly attached. The other fingers articulate with the ” humatum ” The result of the whole arrangement is the formation of two main joints, one between fore arm and carpus, the other inter-carpal. The number of phalanges is 2, 3, 4, 4, 3.

The conditions prevailing in Lacertilia are connected with those of Sphenodon. The intermedium is lost, the other normal carpalia are present, also the pisiform; the first distal carpal is much reduced and the correspondingly enlarged radial carpal comes into articulating contact with the first metacarpal. The numbers of phalanges are 2, 3,

4, 4, and 2 or 3 for the fifth finger. The hand of the chameleons is most modified; the first three fingers form an inner bundle opposed to the outer or fourth and fifth fingers; in correlation herewith the third and fourth distal carpals are fused into one rather large mass; the other elements remain free, and A. Stecker has found a small intermedium present in the young, in a position which indicates that its subsequent absence is due to loss, not fusion with neighbouring elements.

The Pelvic Girdle. — The ilium is attached to the vertebral column by means of the two sacral ribs. 1 The ischia and the

1 In all reptiles, except a few fossil groups, the ilio-sacral connexion is post-acetabular, i.e. it lies in a transverse plane tailwards from

pubic bones join the ilium at the acetabulum, which is not perforated, except in crocodiles. The ischia and pubes invariably form symphyses at their ventral ends, except the so-called pubes of the crocodiles, and these two symphyses are further con- tinuous with each other, dividing the pubo-ischiadic space into a right and left foramen obturatum of very variable size. Their are small and round in Testudo, divided by a broad, bony bridge, larger in Chelone, separated by a chiefly ligamentous, partly cartilaginous string; largest they are in Sphenodon and in th« Lacertilia. Frequently the symphysial portion at the anterior end of the pubic symphysis remains cartilaginous, unpaired, e.g. in most Chelonians and Lacertilians, comparable with the epipubis of Urodela. A corresponding cartilage, the os cloacae or hypoischium, is continued backwards, from the ischiadic symphysis towards the vent, serving for the attachment of sphincter muscles; it occurs in many lizards and tortoises. In the Chelonians the pubic bones are generally much stronger than the ischia, and they send out each a strong lateral pubic process, directed forwards and outwards; the obturator nerve passes through the wide obturator foramen. In the pleuro- dirous tortoises the ends of the ilia and those of the lateral processes of the pubes are much broadened and firmly anchy— losed with the posterior costal plates and with the xiphiplastron respectively. The whole pelvis, like the shoulder-girdle, lies insido the body. The pelvis of Sphenodon is essentially like that of the Lacertilia. The pubes are slender ; they send out a pair of lateral processes, near the base of which the obturator nerve pierces the shaft of its pubis. This lateral process is the homologue of the long, slender pubis of birds. The ‘chameleons’ pelvis is peculiar. The pubes are devoid of lateral processes, but from their anterior end arises a pair of small cartilages, in a transverse direction; their ends are connected by ligament with the median anterior portion of the ischiadic symphysis.

The crocodilian pelvis is very aberrant. The ilium is broad and sends two processes to the acetabulum, which retains a foramen; the posterior process articulates movably with the ischium; the preacetabular process fuses in very young speci- mens with a separate, ossifying, cartilaginous piece, which then forms a rough joint with the anterior portion or process of the ischium, which closes the acetabulum on its ventral side. To this anterior ischiadic process is attached the freely-movable, club- shaped bone, generally called pubis. The homologies of these club-shaped bones and of the small bone mentioned above are not clear. The club-shaped bones remain asunder; the ischia form a long and firm symphysis. The obturator nerve passes out of the pelvis between the ischium and the club-shaped bone, close to the posterior margin of the latter.

The posterior limbs show essentially the same composition as the fore limbs, but the modifications in the various reptilian orders are much greater. The femur has generally a well- marked neck. Fibula and tibia remain distinct; the former usually shows a reduction in thickness. In the tarsus we observe never more than two proximal tarsal elements, a re- duction due either to the suppression of the intermedium or to its enlargement and concomitant loss of the tibial element. The least-modified foot-skeleton is that of the Chelydridae, the lowest Chelonians. The proximal row is composed of a fibulare, and a much larger piece articulates with both tibia and fibula, the ” astragalus” ; the centrale is present; the first three distal tarsals remain separate, each carrying a toe. The fused fourth and fifth tarsals carry the fourth toe, and, laterally attached, the hook-shaped fifth metatarsal. Chelone shows the same arrangement, except that the centrale is fused with the astra- galus; in Testudo, Emys, the fibulare, astragalus and centrale are fused into one broad mass, with the result of forming a cruro-tarsal and an intertarsal joint. The same arrangement reached by the Testudinidae is universal in the Lacertae, with the further modification that the three first distal tarsals fuse on to the proximal ends of their respective metatarsals. Most aberrant is the tarsus of Chameleons, in which the first and second toe

one passing; through the acetabulum, in mammals pre-acetabular.

In birds it is likewise post-

form a bundle opposed to the rest; the fibulare and tibiale are fused into one bone; the fused fifth and fourth distal tarsals form a very large half-globular piece for the three outer toes, whilst the second toe is carried by the third distal tarsal, besides which there are three more small cartilages, one of which may be the displaced second tarsal or the still independent central. The tarsus of Sphenodon is like that of typical lizards, but none of its distal tarsals are fused on to metatarsals. The Crocodilian foot marks an advance. The astragalus is large, articulating well with tibia and fibula, and against the fibulare, which forms a typical, heel-shaped calcaneum. The fifth and fourth distal tarsals carry the fourth toe and the hook-shaped fifth meta-tarsal to which the fifth toe is reduced. The third, second and first distal tarsalia scarcely contain osseous nodules; they form together a wedge-shaped cartilaginous pad between the astra- galus and the first and second toes. This attachment of the distal tarsals to the metatarsals reminds us of the Lacertilian condition, the result in either case being a still more marked intertarsal joint in addition to the cruro-tarsal.

Most well-footed reptiles retain all the five toes; only the crocodiles and a few tortoises have lost all the phalanges of the fifth toe. The phalangeal numbers are in the Lacertilia 2, 3, 4, 5 and 3 in the fifth toe; in chameleons 2, 3, 4, 4, 3; in most tortoises 2, 3, 3, 3, 2; but in Homo pus, Pyxis and Cinixys 2, 2, 2, 2, o; in the crocodiles 2, 3, 4, 4, o. The embryos of crocodiles are said to be hyperphalangeal; i.e. as many as 7 phalanges on the fourth; 5 or 6 on the fifth finger; 6 on the fourth toe, and there are traces of the fifth toe. In the adult the fourth toe remains without a claw. Burrowing and living in sand, or humus, is in many lizards correlated with reduction of the limbs and their girdles. The vestiges of the hind limbs come to lie as near

the vent as possible. The reduction occurs in various families, independently. In most cases the fore limbs disappear first, but in the Amphisbaenidae, cf. Chirotes, and in the Tejidae, the reverse takes place. Whilst degeneracy

r

Fig. 34. — Vestiges of of Lialis bartonii

pelvic limb — I,

, of A nguis fra-

gilis; 3, of Amphisbaena fuliginosa.

- fe ubis-f' tibia" ; ^' iliopectineum; of the shoulder-girdle is

p ' p ' ' " delayed long after the loss

of the anterior limbs, that of the pelvic arch precedes the loss

of the hind limbs. Cope has drawn up a tabular statistic of

the loss of digits, limbs and their girdles on pp. 202-3 0I his work, Crocodiles, Lizards and Snakes of North America (Washington, 1900). The peculiar hind limbs of the Dibamidae are described in the article Lizard.

The majority of snakes have lost all traces of the limbs and their girdles, ex- cept the so-called Peropoda (see Snakes: Classification). The vestiges of a Boa and of a Glauconia are shown in

% 35-

Tegumentary System.

The skin of reptiles is characterized by the strong development of its horny stratum; on the outside of it exists a thin cuticular or epitrichial layer. An important feature in most lizards and in the snakes is the existence of a " subepirdemoidal " or transi- tional layer which is produced by the migration of ectodermal cells into the cutis. The immigration takes place during the embryonic development, observed first by Kerschner, who, however, misinterpreted the process. Pigment cells, black chromatophores also, make their first appearance in the epiderm and then migrate into the transitional stratum, as has been first

FiG. 35. — 1, Vestigial pelvis and limb of Glauconia macrblepis. 2, The same parts of Boa (after Fiirbringer). /, lemur; il, ilium ; ip, bone called " iliopectineum " by Fiirbringer; p, pubis; t, tibia.

correctly stated by F. Maurer. The horny stratum is shed periodically, several times during the year, and as one entire piece in snakes and a few lizards, e.g. Anguidae; in most lizards, chameleons, geckos and in Sphenodon the thin, transparent colourless layer comes off in flakes. In crocodiles it is not shed except for the usual wear and tear, nor in tortoises, although in some e.g. Chrysemys, a periodical peeling of the large shields has been observed.

In all reptiles the cutis is raised into papillae, or folds. When the papillae are small the skin appears granular; when they are large, flat,

mostly imbricating, they form scales; when they are very broad-based and still larger, they are called scutes or shields. The overlying epidermal covering partakes of these elevations, often e.g. in many snakes, with a very fine system of ridges of its own. Such a scale, cutis and horny sheath, may form spikes, or crests. They all have only basal growth. Thus, for instance, a shield of a tortoise-shell is a much flattened scale, or cone, with the apex more or less in the centre, surrounded by marginal ridges which indicate the continuous additional growth at the base. The central ” areola ” represents in fact the size of the shield at the time of hatching.

Of very common occurrence is the development of bone in the cutaneous portion of the scales; such osteoderms occur in many lizards, very strongly developed in the scutes of the crocodiles, especially on the back; they also occur in the skin of tortoises especially on their legs and on the tail, and they probably constitute the peculiar shell of Sphargis, the leathery turtle (see Tortoise). Sphenodon and chameleons are devoid of such osteoderms, in geckos they are likewise absent, but calcifications occur in their tubercular skin. A similar process seems to have produced the egg-tooth of crocodiles and tortoises (see under Teeth below). Calcareous deposits, or at least deposits of guanine and more commonly of carbonate of lime, play a considerable role in the skin of lizards and snakes. These waste products of the metabolism are always deposited within cells, and a favourite place is the subepidermal layer. In combination with superimposed yellow or red pigment, and with the black chromatophores as a foil, partial or complete screen to the light, as the case may be, these mineral deposists are to a great extent answerable for the colours and their often mar- vellous changes in the skin (see Chameleon) .

Peculiar pits in the scales of snakes and crocodiles are described under Sense-Organs below.

The skin of reptiles is very poor in glands, but the few which exist are well developed. Crocodiles possess a pair of glandular musk bags which open by rather large slits on the under jaw, against the inner side of the jaw. Another pair of musk glands are the anal glands. During great excitement all these glands can be everted by the crocodiles. Sphenodon and snakes have only the anal pair. Water tortoises have inguinal glands, which secrete a strongly scented fluid, opening near the posterior rim of the bridge. Trionyx has additional glands opening near the anterior part of the plastron. Peculiar glandular structures are the femoral pores of many lizards. They lie in a line from the inner side of the knee to the anterior margin of the

anal region, to which they are restricted in the limbless Amphisbaenidae. Each pore leads into a subcutaneous pocket, sometimes with slightly acinous side chambers, the walls of which produce a smeary, yellowish matter consisting chiefly of the debris of disintegrated cells which dries or hardens on the surface in the shape of a little projecting rod. They occur in both sexes, but are most active in males during the pairing season. Their use is unknown. It would be far-fetched to liken them to fore- runners of the sebaceous portions of milk glands, although not so imaginary as to see in them and in the sensory pits of snake scales the forerunners of the mammalian hairs!

Claws, scarcely indicated in Batrachia, are fully developed in all limbed reptiles. The base is sunk into the skin like our own finger nails; the dorsal and ventral halves are differenti- ated into a harder, more curved dorsal sheath-like portion, and into the beginning of a sole, especially in crocodiles and in blunt-toed tortoises. The first claw to be reduced is that of

the fifth digit. The claws of many geckos are ” retractile,” like those of cats; the adhesive lamellae on the under side of their digits have already been described (see Gecko).

Nervous System.

The hemispheres are still much longer than broad, and pass, especially in lizards, gradually into the olfactory lobes, into which continue the ventricles of the hemispheres. The dorsal walls of these are thin, especially in crocodiles, although they possess already a considerable amount of grey matter. The basal masses of the fore-brain bulge into the roomy ventricles like cushions. Fibres referable to a corpus callosum are scarcely separated from those of the still much stronger anterior commissure. The epiphysis comes to the surface between the hinder parts of the hemispheres. The pineal eye is described below under Sense Organs. The hypo- physis has but a shallow infundibulum. The mid-brain shows a pair of dorsal globular swellings, each with a cavity; they separate the hemispheres from the cerebellum. Of the hind- brain, the middle portion is by far the largest; although the dorsal wall of this cerebellum is thick, and rich in grey matter, its surface is still quite smooth and it shows no trace of an

arbor vitae. It covers but a small portion of the wide fourth ventricle.

The spinal cord shows a brachial and a lumbar longitudinal swelling, especially marked in tortoises, but without a rhom- boidal sinus. The cord is continued into the end of the tail.

The cranial nerves of the reptiles agree in their arrangement and distribution more with those of birds and mammals than with those of the Batrachia. The facial nerve sends a palatine branch to the palate and to the superior maxillary of the trige- minus, and a strong mandibular branch joins the third of the trigeminal, and further ramifications supply the sphincter muscle of the neck. The vagus and glossopharyngeus leave the cranium separately. The vagus then goes towards the

heart, which in the Sauropsida is far re- moved from the head, and there possesses another ganglion, vari- ously called ganglion trunci vagi or g. nodosum. It is con- nected by a nerve with the large gang- lion supremum of the sympathetic. From the cardiac ganglion, the con- of the sent off several branches in sue cession, which, having to pass below or tailwards from the transverse carotic, aortic and Botal- lian vessels, have to take again a headward course to the larynx and pharynx; a side branch enters the heart by its truncus. The main mass of the vagus then supplies lungs, stomach and further viscera. The accessory or nth cranial nerve arises with about half a dozen roots which extend often beyond the second . cranial nerve ; they collect into a thin stem which leaves the cranium together with the vagus, with which it is often fused; it supplies the cucullaris s. trapezius muscle.

The hypoglossus arises by two ventral roots, leaving the skull by two holes through the lateral occipital bone, near the condyle. The united stem is invariably joined by strong branches from cervical nerves, always from the first, mostly also from the second, sometimes also from the third. The details vary much; occasionally there are three cranial roots and foramina, and then only the first cervical joins the hypo- glossus; this often fuses with the glossopharyngeal or with

Fig. 36. — Brain of Lacerta agilis. (After Ley- dig.) 1, Dorsal aspect; 2, vertical longi- and from tudinal section, cb, cerebellum; ch, tinuation cerebral hemisphere ; m, medulla oblon- vaeus gata; olf, olfactory lobes; on, optic nerve; „„„„„„„„’, opl, optic lobes; p, pineal body or epiphysis ; py, base of pituitary body.

the vagus. In the broad and well-muscularized tongue of the

crocodiles the right and left hypoglossal branches form a com- plete ansa, an arrangement in which A. Schneider saw the infraoesophageal nerve ring of Invertebrata!

The spinal nerves each issue behind, or through, the neural arch of the vertebra to which they belong genetically. The first spinal, or suboccipital, nerve has no dorsal roots, and, having lost its vertebra, an apparently anomalous arrangement has come to pass, in this way, that there are x cervical vertebrae, but * + 1 cervical nerves, a condition prevailing in, and char- acteristic of, all Amniota. The hypoglossal-cervical plexus is separated from the brachial plexus by several metameres, according to the length of the neck. The brachial plexus is composed of about 5 nerves; the variations have been studied chiefly by M. Fiirbringer. It is interesting to note that the brachial plexus still persists in snakes, although they have completely lost the anterior girdle and the limbs (Albertina Carlsson). A disturbance in the pelvic region likewise indi- cates in snakes the former existence of a pelvic or lumbo-sacral plexus, which in limbed reptiles is composed of about 5 nerves, the last of which is weak and in many cases (by no means the rule) issues between the two sacral vertebrae, sending one branch to the ischiadic, another to the public plexus which supplies the cloacal region. (For details of these plexuses see the papers by Mivart, Jhering and Gadow.)

The sympathetic system shows considerable modifications in the various orders and even families of the reptiles. In the neck region, in Sphenodon and most lizards it is, on the right and left side, composed of two portions. One, more lateral and placed deeply, runs along the side of the vertebral column, starting from the first and second spinal nerves, with which it is connected by so-called rami communicantes; it is not con- nected with the other spinal nerves until it reaches, in the thorax, the first stem of the brachial plexus, and hereabout lies the so-called second thoracic ganglion. The other, super- ficial and more ventral, portion arises from the petrosal gan- glion of the glossopharyngeal, and from the vagus ganglion, and then forms a long loop which joins the second thoracic gan- glion. In its long course it sometimes, e.g. in Varanus, forms one common stem with the vagus before it splits off. At a variable distance, but not far above the heart, the vagus pos- sesses a big swelling, the ganglion trunci vagi, and the sym- pathetic stem, in the same level, or farther down, has likewise a large ganglion, the g. supremum vagi, or first thoracic gan- glion. The vagus ganglion receives several nerve strands from this big sympathetic ganglion, and then divides as described above.

In the crocodiles the deep portion of the sympathetic begins at the

vagus and extends in rope-ladder fashion into the thorax, there being, as in birds, regular transverse communicating branches with the spinal nerves, and the longitudinal strands run through the transverse foramina between the capitular and tubercular portions of the cervical ribs. The other, ventral, por- tion starts by a right and a left branch from the vagus ganglia, but both branches unite at once into one unpaired stem, which is deeply embedded in the middle line between the ventral muscles of the cervical vertebrae. Very thin branches connect this unpaired stem with the right and left sympathetic portions; small ganglia are embedded in the unpaired nerve.

The so-called second thoracic ganglion is in reality a compound of all the sympathetic ganglia of the four or five metameres of the brachial plexus. It forms the point of juncture of the deep and the superficial cervical sympathetic portions. From the posterior region of the thorax backwards the right and left strands run along their side of the vertebral column, with a communicating branch and a ganglion for each metamere; sometimes one or more successive ganglia are combined, for instance near the cloaca. After having supplied the latter, the sympathetic system appears exhausted and is continued into the tail by but a very thin strand, which runs between the caudal vein and artery. The best illustrations of the sympathetic system are those by Vogt (neck of crocodile), J. G. Fischer (many

lizards), H. Gadow (cloaca of crocodile), J. F. v. Bemmelen (Sphenodon and others), W. H. Gaskell and H. Gadow (heart of tortoise).

Sense Organs.

i. Tegumentary Organs of some Tactile or other Sense. — Reptiles possess apparently no traces of those tegumentary sense organs which, belonging to the domains of the trigeminal and vagus nerves, have spread far over the body in fishes and batrachia. They were developed by those classes in correlation with their essentially aquatic life. This does not apply to the reptiles which, as a class, are of absolutely terrestrial origin. Never- theless all recent reptiles possess numerous low sense-organs, ” tactile bodies,” in most parts of the skin, connected with the regional, spinal nerves. They are most obvious in

snakes, appearing as one or more little colourless spots near the apex of each scale on the back. The spot is formed by a little cluster of epidermal cells, connected with a sensory nerve. Their lowest stage they show in Sphenodon and in lizards, whilst in crocodiles they have reached a higher stage, at the bottom of the pit, since the tactile bodies, mostly several together, have sunk into the cutis, below the epiderm, forming a little pit, mostly near to the anterior margin of the flat scutes. They are most obvious on the belly of crocodiles, whilst in the American alligator such pits are scarcer, not because the organs are absent, but because these have sunk still farther into the skin. The last stage is that met with in tortoises, which possess such tactile bodies in considerable numbers in the softer subepidermal layers, beneath the large horny shields which themselves show no traces of them.

2. Taste. — The respective organs do not seem to have been investigated. That they exist is amply proved by the careful predilection for certain kinds of food which is shown especially by vegetarian tortoises and lizards, independent of smell. Many lizards are, for instance, very fond of sugar.

3. Nose. — The sense of smell is well developed in all rep- tiles. In none is the olfactory organ degraded; that the nasal passages, the nose itself, are never degraded is explained by the fact that all reptiles invariably breathe through the nose, except snakes during the act of swallowing their prey. The nostrils, always paired, are frequently provided with valves, to shut out the water, or sand. In some water tortoises, e.g. Trionyx, Chelys, the nostrils are prolonged into a soft, unpaired proboscis. Double tubes exist in the snake Herpeton (see Snakes, Opis- thoglypha). The nostril leads into an antrum or vestibulum, this again into the nasal cavity proper, at the dorsal farther end enters the olfactory nerve, whilst ventrally it leads into the naso- iaryngeal duct, with its posterior narial opening, or choana. The ducts are short in snakes and lizards, the choanae lying in the front part of the palate, but in tortoises and crocodiles they are placed far backwards, as has been described under Skull above. Into the nasal cavity projects, from the septum, a concha, least developed in tortoises, most in lizards and snakes. Crocodiles show a beginning of separation into several conchae as in birds and mammals. A large nasal gland lies against the lateral, or ventral, side of the outer wall of the nasal cavity, into which also opens the naso-lacrymal duct. Jacobson's organ, of uncertain function, is present in most reptiles. It is paired. In tortoises it is still placed within its nasal cavity, against the median wall, and is still nothing but a recess of the same and its mucous lining. In lizards and snakes the organ has become completely

separated from the nasal cavity, lying below it and opening, each by a separate passage, into the palate mouth, close to or still within the choanae. In snakes it is mushroom-shaped, with a very” short stalk. It lies immediately below the floor of the nasal capsule, and the membranous wall of the cavity on which it lies is covered and protected by a bone, commonly called the turbihal, which extends out from the median nasal system to the maxilla. In crocodiles these organs are vestigial and soon disappear.

4. Ear. — In crocodiles the outer ear lies in a recess, dorsally overhung by the lateral edge of the bony squamoso-frontal

bridge; it carries a flap of skin, provided with muscles, to close the ear tightly. In lizards the outer ear is quite unprotected, and when the meatus is very short and wide, the drum is quite exposed. No reptiles possess cartilages comparable to the mammalian outer ear. Sphenodon, chameleons, snakes have no outer ear, the skin passing over the region. So also in tortoises, but in some of the aquatic kinds its position is well indicated by softer and thinner skin; in others, for instance marine turtles, a thick leathery plug, or a bigger scale marks the former position. In various lizards, chiefly burrow- ing in sand, the ear passage is very narrow, or closed. The middle ear or tympanic cavity is quite obliterated in snakes, Amphisbaenas and some other snake-shaped lizards. In Anguis may exist individual traces. The cavity communicates with the mouth. In lizards the communication is a wide recess, lined with black pigment, so that in these creatures the whole auditory chain can easily be inspected from the opened mouth. In tortoises the recesses are contracted into the Eustachian tubes, each of which opens by a separate aperture into the roof of the mouth. In the crocodiles part of the cavities is trans- formed into an intricate system of canals and passages. The two Eustachian tubes open together in the mid-lines protected by a valve, between the basioccipital and basisphenoid; thence arises a median passage which with lateral arms and loops extends upward through the occiput into the cranial roof, communicating with the tympanic cavity, and further continued through the quadrates and beyond into the mandibles, by the siphonium.

In spite of the obliterated tympanic cavity of snakes, and the closed up outer ear passage and absence of a tympanic membrane in snakes and tortoises, these creatures can hear very well. The same applies to Sphenodon, but it seems doubtful whether chameleons can hear.

Through the whole middle ear, from the fenestra ovalis to the drum-membrane, stretches the chain of auditory ossicles or cartilages, partly

attached to the posterior wall by the common lining membrane. The arrangement appears simplest in snakes, in chameleons and in tortoises, not because it is primitive but because it is so much reduced, partly in correlation with the abolition of the outer ear. In these creatures the columella goes as a bony, slender rod straight to the middle of the quadrate, against which it leans, or with which it articulates by a short piece of cartilage, the extra-columella. Here the whole chain ends. It looks like a proof that columella = stapes, extra-columella = incus, and quadrate = malleus; or, with the usual ignoring of the little extra-columellar piece, that quadrate = incus, Gegenbaur's favourite impossibility. In those lizards which have a tympanic membrane conditions are far less reduced. The extra-columellar piece sends out three distal processes; one leans on to the middle of the tympanic membrane, the second usually is fastened to the bony dorsal rim of the meatus, the third is directed downwards and is continued as a thin ligament towards the inner angle of the articular of the mandible, but before reaching this it comes to grief, being squeezed in between the quadrate and the posterior end of the pterygoid. The hyoid proper is of no account in snakes and tortoises, since it is reduced to very short distal pieces attached to the base of the tongue; but in lizards it remains in its original length, or it even lengthens, and shows many vagaries in its position and attachments. In embryos of Sphenodon and lizards it arises from near the junction of the columella with the extra-columella. It becomes very long, too long for the available space (perhaps correlated with lingual functions), and it forms a high loop, thereby causing the peculiar loop of the chorda tympani; the upward bend of the hyoid becomes connected with the parotic process of the cranium. Next aborts the portion between this connexion and the original proximal end of the hyoid, near the columellar mass. The upper end of the hyoid either remains attached to the parotic process (various lizards and Sphenodon) whence the lingual apparatus remains suspended, or the hyoid, having broken loose, leaves a little cartilage, Versluy's cartilage, behind, at the end of the parotic process, and the hyoid horn remains free, in the majority of lizards. In Sphenodon, whilst

passing the distal portion of the extra-columella, part of the hyoid fuses with it, often forming thereby a little hole, the remnant of ' imperfect fusion.

In the crocodiles the arrangement is at first complete and diagrammatically clear, not obscured by vagaries of the hyoid, which is free and much reduced. In the embryo the large extra-columellar cartilage, abutting against the tympanic membrane, and with another process against the quadrate, sends its third, downward, process as a thick rod of cartilage to the posterior inner angle of the mandible with which it is directly in cartilaginous continuity. It was W. K. Parker's mistake to call this cartilage the cerato-hyal. In young embryos it looks like an upward continuation of Meckel's cartilage, much resembling mammalian conditions. But in nearly ripe embryos this cartilage is already reduced to a string of connective tissue, cartilage remaining only at the upper end, and where this string enters the mandible lies the siphonium, the tube which connects the air cavities of the mandible with the Eustachian passages, the long connecting channel becoming — side by side with the extracolumellar-mandibular ligament — embedded into a canal of the quadrate, so that in older stages, and above all in the adult, the proper display of the whole arrangement requires a

Fig. 37. — Diagram showing Evolution of the Ossicular Chain of the Ear. 1. Hyostylic Elasmobranch. H, hyoid; Hm, hyomandible; M, mandible; P Q, palatoquadrate. 2. Lacertilian. Co, colu- mella or stapes; and E, extra-columella with supra-, extra- and infra- " stapedial " processes. 3. Hypothetic stage between 2 and 4, Sphenodon. Par = parotic bone. 5. Lacertilian. Parotic pro- cess with a piece of cartilage at its end, remnant of piece of the hyoid; connexion of inira-stapedial process with mandible vanish- ing. 6. Embryo of Crocodile. Continuous cartilaginous connexion of extra-columella with Meckel's cartilage. 7. Embryonic Mammal; for comparison. Cd, the new condyle, articulating with Sq, squamosal; Cor, coronoid process; quadrate trans- forming into tympanic ring.

little anatomical skill. The whole string, whether cartilaginous or ligamentous, which connects the downward extracolumellar process with the articulare, is of course homologous with the continuation of Meckel's cartilage into the malleus of foetal and young mammals; and the chain of bones and cartilages between the auditory capsule, fenestra ovalis, and the proximal part of the mandible is also homologous wherever such a chain occurs; lastly, fenestra ovalis and membrana tympani are fixed points. Consequently columella = stapes, extracolumella of Sauropsida = lentiform + incus-1- malleus of Mammalia.

The inner ear has been studied minutely and well by C. Hasse, E. Clason and G. Retzius. It is enclosed by the periotic bones. The

fenestra rotunda is surmounted by the opisthotic, the fenestra ovalis by the same and by the pro-otic, and this protects also the anterior vertical semicircular canal. The posterior canal is opisthotic, the horizontal is pro- and opisthotic. The anterior canal is the largest of the three, a feature characteristic of the Sauropsida. The lagena, with its own acoustic papilla, begins to show a basilar membrane with papilla, at the expense of that in the sacculus. In Sphenodon and lizards a slight curving of the lagena indicates the beginning of a cochlea, and a scala is developed in crocodiles, but neither cochlea nor scala is specially twisted. The endo-lymphatic ducts end as closed sacs, in lizards and snakes, in the roof of the skull, between the occipital and xxiii. 6

parietal bones. They reach an enormous development in many geckos, where they form large twisted sacs beneath the skin, covering the sides of the neck, which then assumes a much swollen appearance. They contain white otolithic masses, with lymph. It is remarkable that the extent of these sacs varies not only in allied species, but even individually, independent of sex and age, although they are naturally liable to increase with age.

5. Eyes are present in all reptiles, although in many of the burrowing snakes and lizards they may be so completely covered by the skin as to have lost their function. Most reptiles have upper and lower lids, moved by palpebral muscles, and a third lid, the nictitating membrane, which can be drawn over the front of the cornea from the inner angle obliquely up and backwards. Its mechanism is simplest in lizards. A muscle, a split from the retractor muscle of the eyeball, arises from the posterior part of the orbit, is attached to the posterior wall of the eyeball, and there forms a. pulley for the long tendon which arises from the median side of the orbit and passes over the back of the ball forwards into the nictitating [membrane. Contraction of this muscle draws the membrane backwards and over the eye. In crocodiles and tortoises the tendon of the nictitating membrane broadens out into a muscle (M. pyramidalis) , which arises from the median side of the posterior portion of the ball; above, the optic nerve it crosses over the broad insertion of the retractor of the ball, without being much guided by it, although this muscle by its contraction slightly prevents the nictitating tendon and muscle from touching the optic nerve.

It is easy to recognize the mechanism of birds as a combina- tion of the two types just described; their muse, quadrates s. bursalis is of course the single muscle of the lizards, but now restricted. to, and broadened out upon, the eyeball.

Special Modifications of the Lids. — In the snakes the upper and lower lids are reduced to the rim, and the nictitating membrane has become the permanent cover, which protects the eye like a watch-glass, leaving between itself and the cornea a space, drained by the naso-lacrymal duct, and behind this space the eyeball moves as freely as in other animals. A similar arrange- ment exists in the true geckos, not in the Eublepharidae, which still possess the outer lids. In some lizards, especially such as live in deserts, the middle of the lower lid has a transparent disk, and it is always the lower lid which is drawn over the eye, the upper in nearly all Sauropsida being much smaller and less movable; for instance, some specimens of the Lacertine genus Eremias in Africa and India. In the Indian genus Cabrita, and in Ophiops of Africa and India, the lower lid is permanently fused with the rim of the shrunken upper lid and forms a trans- parent window superficially looking like that of the snakes. Exactly the same arrangement has been developed by A blepharus, one of the Scincidae.

The eyeball is provided with the usual rectus and obliquus muscles, in addition to a retractor oculi. Apparently all reptiles possess a pair of Harderian or nictitating glands, which open in front, in the nasal, inner corner, and lacrymal glands which open likewise into the conjunctival sac, but near the outer or temporal corner. The secretion of both is drained off through the lacrymal canals, which in lizards open below in the outer wall of the posterior nares; in snakes they open into the mouth by a narrow aperture on the inner side of the pala- tine bone.

The walls of the anterior half of the sclerotic of lizards, tortoises and Sphenodon contain numerous cartilaginous or osseous plates, which imbricate in ring shape; they are absent in snakes and crocodiles. Internally the eye of most reptiles possesses at least traces of a pecten; very small indeed in tortoises, or in crocodiles where it is represented by only a few mosslike, pigmented vessels. In many lizards these vessels, arising from near the optic nerve, form a network which extends right up to the posterior side of the lens; in others, especially in Iguanidae, is developed a typical, large pecten, deeply pigmented with black, fan-shaped or umbrella-shaped, some- times folded. In chameleons it is a short cone; apparently

quite absent in Sphenodon. A falciform process and other remnants of a campanula are absent. In most of those reptiles which have but a rudimentary pecten, the retina is supplied by hyaloid vessels which spread over the surface of the vitreous body; such superficial vessels disappear with a greater develop- ment of the pecten, and the retina receives a choroid supply; special retinal arteries from the a. centralis retinae, and veins, exist in snakes.

Ciliary processes of the choroid are usually small, a proper ciliary body being least developed in crocodiles; all reptiles have a ciliary muscle. The shape of the contracted pupil varies from round to a vertical slit; the latter is most marked in Sphenodon.

The retina shows usually a fovea centralis, sometimes but slightly indicated by a shallow depression; it is well marked in chameleons. The retina contains only cones, rods being absent; fat-drops on the apex of the cones are common; their usual colours are green and blue.

6. The pineal, median or parietal eye is the terminal organ of the epiphysis of the brain, with which it is connected by a nerve-containing string. Among recent reptiles it exists in Sphenodon and in the Lacertilia, with vestiges in snakes. It is embedded in the median parietal foramen. Externally its presence is generally marked by the scales being arranged in a rosette, with a transparent central scale. The organ itself is distinctly a dioptric apparatus,- with all the essential features of an eye; a pigmented retina of the arthropodous simple type surrounds an inner chamber which is nearly filled by a cellular globular mass which projects into it from above; this is the so-called lens, in reality much more like the corpus vitreum in its still cellular condition, while the real lens has to be looked for in the superimposed tissue. The whole organ is best developed in Sphenodon, even in the adult; but whether it is still functional, and what its function is, remain unknown. The throwing of a beam of light upon this eye, by means of a lens, produces no effect. Whilst in Sphenodon the ” lens ” is rather dull and the efferent nerve is still present, in various lizards the ” lens ” is more perfect, but the nerve is degenerated. We conclude that the whole organ is now without the least visual function, whilst in various extinct groups of reptiles and Stego- cephali it was fully developed. It has been well investigated by de Graaff, W. B. Spencer and A. Dendy.

The Muscular System.

A useful account of the differentiation of the muscles in the main reptilian groups, with their almost endless modifications in correlation with walking, climbing, swimming, gliding and burrowing, with limbs complete or absent, would fill several pages of this article and would necessitate many illustrations. The literature is great; it comprises many good detailed de- scriptions of various kinds of reptiles, and several monographs. M. Furbringer has devoted a whole series to the muscles of the neck, shoulder-girdle and fore limbs. Hand in hand with these investigations went that of the innervation, without which myology would lack scientific value. The present writer has devoted much time to the muscles and nerves of the pelvis and hind limbs, and has, in tabular form, compared them with those of other vertebrates. The results of all these labours are rather disappointing, except for the study of myology as such, which raises many interesting questions. Broadly speaking, the muscles of typical reptiles, crocodiles and lizards are more highly differentiated ; (by no means always more numerous, but more individualized by origin and insertion, the behaviour of the tendons), more effectively disposed according to mechanical principles, than in Batrachia, and less than in birds and mammals. This can easily be proved, whether we take for comparison the muscles of the neck, of the larynx or hyoid, or limbs. Lowest in general stands Sphenodon, next to it the lizards, highest the crocodiles, while tortoises and snakes show the greatest reduction and specialization. In the tortoises it is the non-yielding box of carapace and plastron which has caused great changes within the region of the trunk proper. First, all the epiaxial muscles have

vanished; the same applies to the costal muscles; but traces of dorso-lateral muscles occur on the inside of the posterior half of the carapace, extending as a longitudinal system from one transverse process to the next in many of the lower aquatic tortoises, as perfectly useless vestiges; or more striking, these muscles exist in the young, and disappear with age, for instance in Testudo. Secondly, it is rather surprising that the rigid shell has offered so little or no inducement to the muscles of the girdles, neck and tail to transfer their origins upon it. Thirdly, the retractile neck of the typical cryptodirous tortoises is correlated with a pair of long retractor muscles, which in the shape of a pair of broad, vertical ribbons (between which is received the S-kinked neck) extend far back along the vertebral column, almost to the level of the pelvis.

In snakes, owing to the loss of limbs and girdles, only the spinal and costal muscles remain, besides of course those of the abdomen and the visceral arches. The vestigial muscles of the limbless lizards and of the peropodous snakes have been monographed by Furbringer in much

detail without great results.

Respiratory Organs.

All reptiles breathe by lungs, and they possess no vestiges of gills, not even during their embryonic stages, although gill clefts are invariably present in the embryo. Nor does any part of the outer skin assist respiration, as is so commonly the case in Batrachia; yet, strictly speaking, the lungs are not the only organs of respiration in the class of reptiles, since various tortoises possess additional breathing apparatus in the anal sacs and in certain recesses of the throat, to be mentioned farther on.

The Larynx, instead of lying at the bottom and, far back in the throat, as in the Batrachia, is considerably moved for- wards so as to rest upon the hyoid and to project into the pharyngeal cavity. A pair of arytenoid cartilages, enclosing the glottis, rest upon several more or less fused tracheal cartil- ages, which thus represent the cricoid, but there is no thyroid cartilage. A small process from the anterior median edge of the cricoid is the beginning of an epiglottis. Vocal chords are indicated by lateral projecting folds of the inner membran- ous lining of the larynx, and are in a few cases effective in producing a voice. Crocodiles and alligators have a powerful, loud, bellowing voice; many tortoises utter weak, piping sounds, especially during the pairing season; and also various lizards can emit a feeble squeak, for instance, Psammodromus hispanicus, and the geckos. Sphenodon, at least the males, can grunt. Snakes have no voice; they can only hiss like all other reptiles, but a curious modification exists in the larynx of the North American Coluber s. Pityophis, e.g. C. ■ melanoleucus: the epiglottis is more enlarged, and laterally compressed so that the hissing sound is much strengthened by the vibration of the epiglottis. The larynx possesses a constrictor and a dilator muscle, which arise from the ary- tenoids and from the cricoid respectively, and are attached to the hyoid. Chameleons have bladder-shaped sacs which can be filled with air from a slit immediately below the larynx. For further modifications see G. Tornier.

The Trachea is furnished with cartilaginous rings and semi- rings, which extend to the lungs. As a rule the trachea is straight; in Crocodilus americanus it forms a loop; and similar curvings occur in various tortoises in correlation with the retractile neck. The two bronchi are shortest in Sphenodon, very long in most tortoises, where they begin frequently already half down the neck. In Sphargis most of the trachea is divided by a longitudinal partition. It is an advance upon amphibian conditions that the bronchus enters its lung no longer

at its apex, since an anterior, pre-bronchial lung-portion has come into existence. This is still very short in Sphenodon, while in crocodiles, tortoises and in the highly developed Varanidae the bronchus enters near the middle of its lung, so that the anterior portion is nearly as long as the posterior. The shape of the trunk influences that of the lungs. In the snake-shaped forms, both snakes and lizards alike, the lungs have become

very asymmetrical, one of them being much larger than the other, which is often quite aborted.

The simplest form of lungs is that of Sphenodon; the pre j bronchial part is still small. Each lung is still a sac with one large lumen, the walls being honeycombed. In the lizards the walls are more spongy, and several septa begin to extend more or less far from the walls into the lumer, towards each bronchus. Some of these septa begin to cut the lung into lobes, especially in Varanus and in chameleons. In the latter exists a further specialization, a side-departure, in the shape of several long, hollow processes which are sent out from the posterior portions of the lungs and extend far into the body- cavity and between the viscera. By means of them these creatures can ” blow ” themselves out. They are of mor- phological interest since they are first stages of air-sacs so marvellously developed in birds, and possibly also in various Dinosaurs. In the Amphisbaenids the left lung alone remains.

The lungs of crocodiles have reached a considerably higher stage. They alone in reptiles are, on the ventral side, com- pletely shut off from the viscera by a pleural, partly mus- cularized, membrane. From each bronchus extend a number of broad septa towards the periphery, dividing the originally single lumen into many chambers, perhaps a dozen, from the walls of which wide secondary or parabronchial canals extend into the alveolar meshwork, in very regular arrangement, in series like organ-pipes.

The lungs of the tortoises are, in adaptation to the peculiar shape of the body, stowed away along the back, as far as the pelvis, and only their ventral surface is covered by a strong peritoneal membrane which receives muscular, diaphragmatic fibres. The inner division of the lungs into chambers has pro- gressed so much that a sort of

mesobronchus has become dis- cernible; the arrangement of the side-bronchi is far less regular than in crocodiles; the whole lung is much more honeycombed, meshy and spongy.

The mechanism of breathing of tortoises is not such a puzzle as it is sometimes stated to be. Of course the rigid box of the trunk excludes any costal, or abdominal breathing, but by pro- truding the limbs or the neck, piston-like, an effective vacuum is produced in the box. Moreover, the throat is distended and worked considerably by the unusually large and very movable hyoid apparatus, by which air is pumped into the lungs.

The lungs of the snakes are very thin-walled, with a very wide lumen, and only for about the first half from the heart backwards the walls are alveolar enough for actual respiratory function, while towards the blind end the sacs are so thin and sparsely vascularized that they act mainly as reservoirs of a large amount of air. Frequently their posterior portions receive blood vessels not from the pulmonary arteries but directly from those of the trunk. In correlation with the long, cylindrical body, the lungs are much elongated and they are not equally developed. The asymmetry shows great differences in the various groups, consequently the asymmetry has been developed independently in those groups. It is usually stated that the left lung is much smaller than the right. This is but rarely the case. The most recent observations are those of E. D. Cope (Proc. Am. Phil. Soc. (1894), xxxiii. 217). In Boidae both lungs are large, although unequal: the left or more dorsally placed one being the larger. In Ilysia the right is functional, the left is ventral and vestigial. In Rhinophis the right is very small, the left larger. In Clauconia and Typhlops the right lung alone is developed: the left is quite aborted. In Colubridae the left lung alone is functional, while the right is vestigial. There is no trace of the right in Elapinae and Hydro- phinae and most Viperidae. In the Colubridae the right, or ventral, lung is, when present at all, reduced to a length of from 2-5 mm., and it then communicates with the anterior portion of the left lung by a foramen, in level of the heart, whilst the right bronchus is aborted.

A further complication is the so-called tracheal lung, which is present in Typhlopidae, Ungalia of the Boidae, in Chersydrus of the Acrochordinae, in the Hydrophinae and Viperidae. This

peculiar organ is a continuation of the anterior portion of the functional lung, extending far headwards, along the trachea, with the lumen of which it communicates by numerous openings. In Chersydrus this mysterious organ is ” composed of coarse cells and

without lumen, extends from the heart to the head, and is discontinuous with the true lung; the trachea communi- cates with it by a series of symmetrical pores on each side.” In Typhlops it extends likewise from the heart to the throat, as a cellular body but without lumen or connexion with either trachea or lung.

Thyroid and Thymus.

The Thyroid of the reptiles is a single, unpaired organ, placed ventrally upon the trachea and one or other of the arterial trunks, more or less distant from the heart. In snakes it lies on the mid-line near the heart; a little farther up in Sphenodon; still farther in lizards, and chameleons near the root of their gular sac. In tortoises it is globular, at the division of the carotic trunk. In crocodiles it is bilobed.

The Thymus is paired. It is largest in crocodiles, extending on either side of nearly the whole neck, along the carotids and jugulars. In the tortoises they are much shorter; in Sphenodon and lizards are two pairs, more or less elongated; in the snakes are sometimes as many as three pairs, elongated but small, attached to the carotis near the heart. As usual the thymus bodies become much reduced with age.

The Spleen.

The Spleen varies much in shape and position. In lizards it is mostly roundish, elongated in Sphenodon, and placed near the stomach; in crocodiles it lies in the duodenal loop behind the pancreas; similarly situated in snakes, but in the tortoises it is much concentrated, large and attached to the hind-gut.

The Body Cavity.

The body cavity of the reptiles is subdivided into several sacs or cavities by serous membranes of peritoneal origin. The number of these subcavities differs much in the various groups. The pericardial sac is always complete. In tortoises the lungs are retro-peritoneal, a dense serous membrane spreading over their ventral surface from the walls of the carapace forwards to the liver and shutting off a saccus hepato-pulmonalis from the rest of the peritoneal cavity. Snakes possess, besides the modifications mentioned above, separate chambers for the stomach, right and left liver, and for the gut, whilst the pleural cavities as such have been destroyed. In lizards a ” post-hepatic septum ” divides liver, lungs and heart from the rest of the intestines. This transverse vertical septum is best developed, almost

complete, in some of the Tejidae, in others it seems to be more imperfect, and it is probably a further development of the suspensorial ligament of the liver, which is ultimately inserted upon the ventral wall of the body.

The subdivisions have reached their highest development in the crocodiles, there being, besides the pericardial and the two pleural cavities and the usual peritoneal room, a right and left hepato-pericardiac, an hepato-gastric, and an hepato-pulmonal sac. The caudal and ventral edges of these liver-sacs are fused on to the ventral body-wall, thus producing a complete trans- verse partition, headwards of which lie the lungs, liver and heart. This partition, morphologically not homologous with the mammalian diaphragm, more resembling the imperfect structure in birds, acts, however, as a perfect diaphragm, since it is well furnished with muscular fibres. These are attached to its whole periphery, with centripetal direction, especially on the ventral half. These fibres are transgressors upon this septum from a broad sheet of muscles, which, inserted together with the septum upon the body-wall, arise from the iliac bones, the pubes, and the greater portion of the last pair of abdominal ribs. This broad muscular sheet, covering the intestines, is the so-called abdominal diaphragm or peritoneal muscle. Its continuation upon the transverse septum is the crocodilian muse, diaphragmaticus, and in functional effect very similar

to that of the Mammalia, whilst the abdominal diaphragm undoubtedly causes abdominal respiration. We have seen that these crocodilian conditions do not stand quite alone, but are connected with simpler features in the other reptiles. Two recent, very lengthy papers have been written on this subject by I. Bromann (1904) and by F. Hochstetter (1906), besides two in 1902 by G. Butler.

The Heart.

The Heart of all reptiles is removed from the head and is placed well in the thorax, in the Varanidae even a little beyond it. Only in snakes the heart lies headwards from the hilus of the lungs, not caudalwards, generally at about the end of the first fifth of the body. The batrachian conus arteriosus is reduced, one set of semilunar valves guarding the

entrances into the truncus arteriosus which now issues directly from the heart. A sinus venosus exists still in Sphenodon and Chelonians, in which it may even receive separate hepatic veins, but in crocodiles, lizards and snakes the sinus as such exists no longer, forming part, of the right atrium. All the hepatic veins enter the st;em of the posterior vena cava, which henceforth enters the heart as inferior vena cava. This, the largest, and the right and left anterior vena cavae, are the only three veins which enter the right atrium. Into the left open the two pul- monary veins. Right and left atrium have in all reptiles a complete septum between them. The ventricular portion shows considerable steps towards the differentiation into a right and a left ventricle, but the partition is very incomplete in tortoises, lizards and snakes, quite complete only in the crocodiles. The most important character of the reptilian heart, absolutely diagnostic of it, is the fact that the systemic vessel which leaves the right ventricle turns to the left to form the left aorta, while the stem which comes from the left ventricular half arches over to the right as the right aorta. It is not at all necessary to conclude that this fact excludes the reptiles from the mammalian ancestry and to hark back to conditions as indifferent as are those of the batrachia. The Foramen Panizzae shows the way to a solution, how ultimately all the arterial blood from the left ventricle may pass, first through the root of the right arch, then through this hole into the left, whilst the rest of the right arch, and the root of the left, obliterate. The difficulty is not much greater than that of deriving the birds' condition from the reptilian. The Foramen Panizzae, which exists only in the Crocodilia, lies exactly where the right crosses dorsally over the left aorta. The whole is not the last remnant of the originally undivided truncus, as is taught generally, but it is a new foramen, a hole dug by the left arterial blood into the venous right aorta. According to the recent observations made by F. Hochstetter the foramen comes into existence in a very late embryonic stage.

Whilst the batrachian single ventricle possesses only one ostium ventriculare or outlet into the truncus, in the reptiles the inter-atrial septum extends considerably downwards into the base of the ventricle, so as to produce a right and a left niche, and correspondingly two ostia instead of one. The atrio- ventricular valves are still membranous, even in crocodiles; attached to them are muscles, trabeculae cameae, from, the very trabecular walls of the ventricle; they are especially spongy in tortoises. By means of the arrangement of some of these trabeculae, perhaps still more through the confluence of their basal portions, an imperfect ventricular septum is initiated. Certainly even in tortoises, which represent the lowest stage, the venous blood is received into and sent out by the same right

side of the ventricle, while the arterial blood is correspondingly managed and dodged by the left side. That there is not very much mixture of the two kinds of blood, in spite of the wide communication in the ventricle, is further due to the peristaltic systole and diastole of the various divisions of the heart. — The heart of Chelonians is broader than long. In correlation with the very much flattened body of Trionyx and its allied genera, the whole heart is dislodged from the middle line, far over to the right side; the vessels of the left side are correspondingly much

elongated and have to cross the neck, trachea and oesophagus. — The apex of the heart is attached to the pericardium by a special ligament in the Crocodilia and in many Chelonia, e.g. Testudo, but it is absent in Clemmys. Sometimes this little ligament sends a tiny blood vessel into the liver.

Arterial System.

Crocodiles. — The left aorta crosses obliquely beneath the right and gives off only the coeliac, just before joining the right aorta in the level of the eighth thoracic vertebra. The aorta descendens sends off, besides intercostals and other segmentals into the body-wall, the mesenteric, right and left iliac, a pair of renal and ischiadics, a cloacal and the caudal artery. The right aorta forms the main root of the a. descendens. Close to the heart it sends off two coronaries and a short carotis primaria which divides at once into two anonymae, the left of which is the stronger. The right anonyma divides into the subclavia and collateralis colli, the left into subclavia and carotis subverte- bralis. Each subclavia sends off an a. vertebralis communis, which runs headwards and, with another longer branch, down- wards, giving off intercostals, and then joins the descending aorta.

Tortoises. — The left aorta is rather more separated from the truncus, which it crosses ventrally in an oblique forward direc- tion; it sends off a left cardiac to stomach and oesophagus, a coeliac and mesenteric, and then a communicating branch to the right aorta. The a. descendens gives off paired supra- renals, spermatics, very large iliacs, then a pair of renals, hypogastrics and the caudal. Each iliac artery divides into a recurrent intercostal anastomosing with the axillaries, an epigastric (sending off the crural and anastomosing with thoracics and humerals), and other arteries to abdominal muscles and to the shell. The hypogastrics supply the cloacal region and then continue as the ischiadics. But there are many anastomoses which cause great variation in the different tortoises. The right aorta sends off a right cardiac, the coronary, and the right and left anonymae

which are quite symmetrical, each dividing into subclavia and carotis; in the angle lies the thymus.

Lizards. — Two common carotids arise either side by side, or by one carotis primaria, from the right aortic root. In the majority each common carotis ascends the neck and then divides into the vessels for the head and: another branch which turns back and goes into the descending part of the aortic arch. In chameleons two carotid stems ascend the neck and there is no recurrent vessel. In the Varanidae the two common carotids start from a long carotis primaria; there is no recurrent vessel. The vertebral arteries come from the origin of the subclavians and run to the head in a very lateral position. The subclavian arteries (which occur also in limbless lizards) arise far away from the carotids out of the descending arch of the right aorta, in a level often far behind the heart. ” Anonymous ” arteries are consequently absent in lizards.

Snakes. — The left aorta is stronger than the right, both com- bining soon to form the descending aorta. Owing to the absence of fore limbs and shoulder-girdle the conditions are much simpli- fied. In most snakes the right aorta sends off but one strong carotic vessel which represents the left carotis communis whilst the right is much reduced or even quite absent; further, there is only one vertebral artery, which either runs along the right side of the vertebral column or it divides soon into a right and a left vessel along the neck. In conformity iˆith the reduction of one lung there is usually but one pulmonary vessel.

Venous System.

Crocodiles. — Each, right and left, anterior vena cava is com- posed of a subclavian (axillary and external jugular), an internal jugular, common vertebral and an internal mammary vein. The posterior vena cava is composed of the two revehent renals, veins from the genital glands and ducts, revehent veins of the suprarenals (which, like birds, still have a portal system), and the big vein from the fat body. Thus the vena cava posterior

perforates the right liver, receiving from it many hepatic reve- hent veins and also the big revehent vessel from the left lobe; next it receives the coronary vein and then enters the heart as inferior vena

cava. The portal vein arises out of the coccygo-mese'nteric (which comes out of the bifurcation of the caudal), collecting the blood from most abdominal viscera and from the thorax and breaks up in the right liver. The rest of the venous system is rather complicated. The big caudal vessel divides near the vent, receives an unpaired cloacal and a rectal vessel, and goes off to the right and left, each of which trunks receives an ischiadic and an inter-sacral vein and then divides into the v. renalis advehens which breaks up in the kidney, and the abdominal vein. The latter are interesting; they run in the abdominal wall, receive the obturator and other pelvic veins, intervertebrals and intercostals, the crurals, and the epigastrics out of the body- wall. Then these two abdominals (Rathke's internal epigastrics) go to the liver, which they enter to either side of the gall bladder, collecting also blood from the stomach and from the vertebral column: Both break up in the liver. Consequently all the blood from " below the heart " passes through some portal system— renal or hepatic — except that which comes from the genital glands and ducts and from the fat body.

Tortoises. — The venous system much resembles that of the crocodiles, but many and wide anastomoses, especially on the inside of the carapace and plastron, exist between often distant vessels, so that one lucky injection may fill the whole system. There are three advehent renal veins which collect on the back of their kidney into one stem; they dissolve completely into a portal system, and leave the kidney on its ventral surface as one v. renalis revehens. The Tight and left then form the v. c. posterior which perforates the posterior margin of the right liver, then headwards of the liver takes up the hepatic and enters the heart. The three pairs of afferent renal veins are composed as follows. The externa collects from the shell and the abdominal muscles; the posterior collects along the rectum from the genital glands, the bladder, and from parts of other pelvic viscera; the anterior comes from the anterior part of the shell and runs back-wards to the kidney, with frequent anastomoses with the other advehent renal veins. The abdominals arise, as in the crocodiles, with the external advehent renal from the lateral continuation of the bifurcated caudal, which takes up vessels from the pelvis, the shell and the crural. The abdominal itself takes up a femoral vein, vessels from the abdominal and pelvic muscles, and from the plastron, and then dives into the body-cavity, receives veins from the fore limbs, and enters the right lobe of the liver, there to break up. The hepatic portal collects from the intestinal tract, spleen and pancreas. Consequently in tor- toises all the blood from below the heart passes through some portal system.

The most important peculiarity of the Lizards is the condition of the abdominal veins; they combine into a single stem (after having collected the blood from the fat body and from the ventral body- wall of the pelvic region) which dives into the body-cavity to join, embedded in the ventral hepatic ligament, the left branch of the portal vein. The chief characteristic of the abdominal is that it does not communicate directly with the caudal, and that it forms an unpaired stem. The renal portal system receives its blood from the tail, the hind limbs, the abdominal wall and the urino-genital organs, all the blood passing into a right and a left advehent vein. The suprarenal portal system drains from the abdominal wall and the supra- renal bodies, and issues into the revehent renals. These, with some intervertebrals and with hepatics, constitute the inferior vena cava.

Lymphatic System.

The lymphatic vessels frequently accompany the big arteries of the trunk, either surrounding them with a meshwork or ensheathing them completely, especially in tortoises. The lymphatics from the head and neck combine with stems which accompany the veins Of the fore limbs; they join the thoracic

ducts and these open into the brachio-cephalic veins, as they do in birds. The lymph from the tail flows into the ischiadic veins or into the advehent renal veins. Reptiles possess only a posterior pair of lymph-hearts; they are placed near the root of the tail against the ends of one of the transverse processes. In snakes they lie in a space protected by the ribs and transverse processes of the original sacral vertebrae. Lymph glands proper are not developed in reptiles, except in the shape of the so-called mesenteric gland of crocodiles.

Blood. The red corpuscles are invariably oval, and, since they still possess a nucleus, biconvex. Numerous measurements have been made by G. Gulliver (P.Z.S., 1845, pp. 93-102), their long and short axes range between 0-015-0-023 and 0-009-0-21 mm. respectively. That means to say they are very much larger than those of mammals, considerably larger than those of most birds, and in turn much smaller than those of amphibia.

Digestive System.

Teeth. — All the groups of recent reptiles have teeth, except the tortoises, which have lost even embryonic traces of them. In the under jaw they are restricted to the dentary bones. In the upper they are almost universal in the maxilla and premaxilla, although the latter has

lost them m most of the snakes. The pterygoids are toothed in most snakes and in a few lizards, e.g. Lacerta and Iguana. The palatines are toothed in Sphenodon and in some lizards.

Only the young of Sphenodon and the chameleons have a few small teeth on the vomer. The teeth themselves consist of dentine with a cap of enamel and with cementum around their base. In the crocodiles they are planted into separate alveoles in the maxilla, premaxilla and under jaw. In lizards they are either pleurodont, i.e. they stand in a series upon a longitudinal ridge which projects from the lingual side of the supporting bone, or they stand upon the upper rim of the bone, acrodont. In either case they are, when full grown, cemented on to the bone. Acrodont are amongst lizards only the Agamidae; the Tejidae are intermediate, almost acrodont. All the snakes and Sphe- nodon are acrodont. The latter is in so far peculiar as its broad- based, somewhat triangular teeth are much worn down in old specimens; originally there are several in the premaxilla, but the adults bite with the somewhat curved-down portions of the premaxillaries themselves, or with what remains of the anchy- losed bases of the original teeth, which then, together with the bone, look like a pair of large chisel-shaped incisors. The lateral edges of the palatines of Sphenodon likewise carry teeth, those of the mandibles fit into a long slit-like space between the palatine and the maxillary teeth. This is a unique arrange- ment. Further, it is surprising that in this old, Rhyncho-cephalian type the supply of teeth has become exhausted, whilst in the other recent reptiles the supply is continuous and appar- ently inexhaustible. The new teeth lie on the lingual side of the old set, and long before the new tooth is finished part of the base-of its older neighbour is absorbed, so that the pulp-cavity which persists in nearly all reptilian teeth becomes free. Ulti- mately the old tooth is pushed off and the new is cemented into its place. In the crocodiles it has come to pass that several sets of teeth are lodged more or less into one another's bases. Where crocodiles and alligators collect habitually the ground is sometimes found strewn with thousands of teeth, large and small, every creature shedding about seventy teeth many times during its long life.

Some or all teeth of various families of lizards and snakes have a more or less pronounced groove or furrow along their anterior convex curve. The usefulness of this furrow in facili- tating the entering of saliva into the bitten wound is merely incidental, but this preformed feature has in many snakes been improved into a fearful weapon. In the Opisthoglypha a few of the most posterior teeth in the maxilla are enlarged, have deeper furrows, and lie in the vicinity of the poison ducts. In the Proteroglypha one or two of the most anterior maxillary

Fig. 38. — Two Aspects of a Tooth of Helo- derma horridum (after Bocourt). 1, antero – internal as-

teeth are enlarged and furnished with a deep groove for the reception of poison. In the Solenoglypha or Viperidae the enlarged teeth of the Opisthoglypha have moved to the front, owing to re- duction of the anterior portion of the maxilla. The latter, much shortened, moves with the firmly anchylosed poison fang upon the prefrontal as its pivot, being pushed forward, or ” erected,” by the ectopterygoid bone, which con- nects it with the pterygoid, and this in turn can be moved forwards and backwards, together with the quad- rate. (See fig. 24, skull of Vipera nasicomis and the diagram of the pect of the tooth, mechanism in article Snakes.) In fon1tudinaT r roove? the stiU unfinished fang the furrow 2, postero – external i § open, later the edges close together aspect of the same and the end of the duct of the gland tooth, showing a itself is surrounded by the substance

ina7 loove {0nSltUd ~ of the g rowin S basal Portion of the tooth, so that the furrow is converted into a canal continuous with that of the gland. The poison is now sure to be projected into the very deepest part of the wound with the precision of a surgical instrument. The Pro- teroglypha, with their long, non-erectile maxillae, bite, or, like Elaps, deliberately chew their victim; the Viperidae rather strike with the mouth widely open. The teeth of snakes and lizards are often of irregular size; but it is rare that a kind of differentiation into incisors, canines and molars occurs. In many lizards, especially in Iguanidae, some teeth are multi- cuspid, trilobed, or somewhat serrated; in Tiliqua, universally known as Cyclodus, most of the hinder teeth are roundish crushers.

Lizards and snakes are born with an ” egg-tooth ” which is lost a day or two after hatching. Its function is the filing through of the eggshell. This tooth, always unpaired, is in Tropidonotus natrix one millimetre long and half a millimetre broad at its base, which rests upon a middle depression of the premaxillary bone; it stands forward above the mouth and is curved upwards. In crocodiles and tortoises the same effect is produced by another organ, which, as in birds, lies well out- side the mouth on the top of the end of the snout and consists of a little cone of calcified epidermis.

Tongue. — The tongue of the crocodiles is very broad and flat, and with nearly its whole broad base attached to the floor of the mouth; however, in its whole circumference its edge is well marked, and it arises on its hinder border as a transverse fold which meets a similar fold descending from the palate in front of the posterior nares. By these folds the mouth can be com- pletely shut off from the nasal passages into the trachea. The upper surface of the tongue contains several dozen large flat papillae, each with a central pit-like opening; it is not known whether they are gustatory organs. Besides scarce mucous glands on the tongue, there is an absence of salivary glands in the mouth. The tongue of tortoises is likewise short, broad, and not protractile, and there appears to be only a sublingual gland; the surface of the tongue is covered with velvety papillae in the terrestrial, with larger folds in the marine Chelonians. In the Lacertilia the tongue presents a number of variations which have been referred to as diagnostic characters of the various families of Lizards (q.v.). The chief modifications are the following: Either flat and broad, not protractile, e.g. Agamidae; or the body of the tongue is somewhat cylindrical, elongated, and the whole organ can be protruded; lastly, the anterior half of the tongue, which can be protruded, is retractile or telescoped into the posterior portion, e.g. Anguidae. In nearly all cases the posterior dorsal end of the body of the tongue is well marked off by a margin raised above the root, a character which does not occur in any snake. The upper surface is either smooth or curved with velvety, flat, or scaly, always soft*, papillae. In the majority the tip of the tongue

is bifid, either slightly niched or deeply bifid. The tips con- tain tactile corpuscles, although sometimes covered with a horny epithelium. The most specialized is the tongue of the chameleon. The body of this tongue is very thick, club- shaped, fleshy and full of large mucous glands which cover it with a sticky secretion. The base or root is very narrow, composed of extremely elastic fibres and supported by a much elongated copular piece of the hyoid. This elastic part is, so to speak, telescoped over the style-shaped copula, and the whole apparatus is kept in a contracted state like a spring in a tube. A pair of wide blood vessels and elastic bands extend from the base into the thick end, which in an ordinary chame- leon can be shot out to a distance of about. 8 in.

The tongue of the snakes is invariably slender, smooth and almost entirely retractile into its posterior sheath-like portion. It is always bifid and contains many tactile and other sensory corpuscles by which these creatures seem to investi- gate. The tongue is always protruded during excitement. How this is done is not very obvious, since the

hyoid apparatus itself is much reduced. There is a niche in the middle of the rostral shield to permit protrusion of the tongue whilst the mouth is shut, and probably herewith is correlated the almost unu versal absence of teeth in the premaxilla. The tongue and the larynx are placed very far forwards in the mouth and, during the act of swallowing, the larynx approaches the chin, or it may even protrude out of the mouth to secure breathing during the often painfully protracted act.

Of Glands, sublingual glands are of general occurrence in reptiles; they open near the root or in the sheath of the tongue. Labial glands seem to be absent in crocodiles and tortoises, but upper and lower labial glands exist in lizards and snakes, generally in considerable numbers. Heloderma is the only lizard in which some of these glands — those along the lower jaw — produce a poisonous secretion, each small gland conducting its secretion towards the base of one of the somewhat furrowed teeth. In the snakes, upper and lower labial glands are well developed for salivation. It is the upper series which attracts our interest by its eventual modification into the deadly poison glands. Probably the saliva of most snakes, like their serum, possesses toxic properties. In most of the harmless Colubrine snakes the glands extend in a continuous series from behind the premaxilla along the whole of the upper jaw, with numer- ous openings. In the Opisthoglypha a gradual differentiation takes place into an anterior, middle and posterior portion; the middle, extending from below and behind the eye back- wards, is the thickest and yellowish in colour; behind it follows a small portion, reddish grey like the anterior portion, with which it is more or less continuous below the middle complex. Thus, still rather indifferent, is Dryophis. In Dipsas, e.g. D. fusca, the middle portion has become predominant; some of its enlarged ducts lead to the pair of posterior, enlarged and well-grooved, maxillary teeth. It is this middle portion which becomes the characteristic poison gland with one long duct. The gland itself retains its position; all the other upper labials, except the anterior series, abort. In the Viperidae the poison duct opens near the base of the perforated fangs, which, owing to the shortening of the anterior portion of the maxilla with its teeth, have come to be the only teeth in the upper jaw. In the Elapine, still more in the Hydrophine snakes, the position of the gland and its duct is the same, but the duct has been carried past the smaller harmless teeth which stand in the maxilla and open at the base of the anterior maxillary teeth. The effect is the same, although the poison fangs are not homologous, in the one case the most posterior, in the other the most anterior, of the maxillary series. In Doliophis, one of the Malay genera of Elapine snakes, each poison

gland sends an enormously elongated recess far into the body-cavity. (For some other details see Snakes; Viper; and Rattlesnake. The best account of the buccal glands and teeth of poisonous snakes is that by G. S. West, P.Z.S., 1805, pp. 812-826.)

Stomach, &c. — In lizards and in Sphenodon the wide pharynx and oesophagus passes gradually into the stomach, which is

more or less spindle-shaped, never transversely placed. The walls of the stomach are thrown into longitudinal folds which contain the specific gastric glands, whilst glands are absent in the oesophagus, excepting scattered and very simple slime glands. The circular muscular fibres of the stomach are much stronger than the longitudinal fibres. The end of the stomach is generally marked by a pyloric valve. The walls of the mid gut are said to be devoid of glands. The end gut, marked by a circular valve, is considerably wider and there is a caecum, mostly left-sided, largest in leaf-eating lizards, rarely absent, as, for instance, in Anguis. The absorbent portion of the rectum is always strongly marked off from the cloaca by a circular fold or sphincter, which projects into the widened coprodaeum of the cloaca. In those lizards which, like Varanus, have no urinary bladder, there are two successive sphincters, marking off two chambers, one, the upper or innermost, for the reception of the faeces, the lower for that of the urine. In adult crocodiles the stomach is transformed into a gizzard; it is more or less oval, with a wide fundus and with two opposite apo-neurotic or tendinous disks whence radiate the muscular fibres. The muscular walls remain, however, comparatively thin, like those of birds of prey. There is a distinct pyloric stomach and then follows the pylorus. The inner lining of the stomach is velvet- like with numerous gastric glands which form groups with net- like interstices. There is a distinct duodenal loop which contains the pancreas. The more convoluted mid gut is lined with net-like meshes which farther back assume a longitudinal zigzag arrange- ment; towards the end gut the walls become quite smooth, but in the end gut the walls again show a very narrow-meshed structure. None of these folds of the mid and hind gut is said to contain digestive glands; they seem to be entirely absorbent. The oesophagus of most tortoises shows longitudinal folds with very numerous mucous glands. In the Chelonidae the pharynx and adjoining part of the gullet are covered

with little tubercles upon each of which opens a small gland. Farther down they give way to large, more or less conical papillae, which assume a considerable size, point backwards, and are covered with a somewhat horny epithelium. Similar conical, homy papillae exist also in Sphargis, in which the oesophagus, moreover, makes. a long loop half round the stomach before passing into it, an absolutely unique feature. The transition into the stomach is quite gradual. The latter is strongly muscular, partly transversely placed, and possesses often a very distinct pyloric stomach. In Chelone conical papillae extend into the cardiac portion. In the majority of tortoises the inner lining shows longitudinal folds with numerous small glands, mucous and gastric, but their distribution differs much in the various families and even genera. The lining of the mid gut shows either longitudinal folds or a network, without glands, except in some cases, Lieberkiihn crypts, e.g. in Trionyx, not in Testudo and Chelone. The hind gut begins suddenly, but there is no caecum; its inner walls contain numerous glands in Testudo, Emys, not in Chelys, Trionyx, Cinosternum.

In the snakes the oesophagus is very thin-walled and passes imperceptibly into the stomach, which continues in a longitudinal direction, scarcely wider in the middle. Its muscular coating is surprisingly weak. There is a small pyloric portion. Mucous and especially long-bodied gastric glands are numerous. The wall of the mid gut carries numerous papillae variably arranged, velvet-like, or densely crowded little blades supported by longitudinal or by meshy folds. The hind gut is short, often constricted into several successive chambers, mostly smooth inside; there is a short, rather wide caecum which seems best developed in Viperidae; sometimes absent. The total length of the snakes' gut is always short, there being only short folds possible or necessary in the body cavity, which itself is of extra-ordinary length. Yet, while in Typhlops the gut is almost straight, it forms numerous convolutions in Tortrix.

Whilst in all other reptiles the gut, at least stomach, liver and mid gut, are suspended by the mesentery from the vertebral column and hang free into the body cavity, in some snakes, especially often described in Boa and Python, the body cavity

is cut up into numerous spaces, by peritoneal folds which connect neighbouring twists of the canal into bundles and attach them to the ventral surface of the body-wall. Probably the gut is thereby secured against dislocations in adaptation to the peculiar twisting contortions of the body, especially in the act of climbing. The mesentery of reptiles is remarkable for the possession of smooth, non-striated, muscular fibres. In most lizards, not in other orders, the peritoneum so

far as it covers the abdominal cavity shows a deep black pigmentation; this pigment is situated in the connective tissue, not in the epithelial layer; it stops suddenly towards the thorax. In some lizards, e.g. in Anguis, the black pigment extends, more or less scattered, upon the mesentery and thence upon the intestines. The same pigment colours the pharynx with its recesses entirely black in many lizards. There is no compensating correlation between this internal pigment and that in the outer skin.

The Liver of lizards is more or less bilobed; more so in crocodiles; while in tortoises the broad right and left lobes are connected by a narrow isthmus. . In the snakes it is much elongated and extends from the heart backwards along the right side of the oesophagus, closely connected in its long course with numerous short branches into, or from, the inferior vena cava and the portal vein. A gall bladder is always present. The ducts into and from the cyst sometimes form a complicated network, for instance in Varanus (F. E. Beddard); the bile is carried by one or more ducts into the duodenal portion of the mid gut. The microscopic structure of the reptilian liver has been compared with that of monotremes by M. Fiirbringer.

The Pancreas is a compact body attached to the duodenal region, which surrounds it by a loop in the crocodiles, as is the .case in birds and mammals. . The Cloaca of the reptiles shows a great advance upon the simple batrachian arrangement. It is no longer one common chamber, but consists of three successive chambers with the further tendency of separating the temporary retention and the passage of the faecal, urinary and genital products from each other. The arrangement is simplest and most typical in the lizards. There is first the proctodaeum or vestibulum of the cloaca, epiblastic in origin. Its outer boundary is formed by the cloacal lips, covered so far by the usual scaly integument. Just within this chamber arise the paired copulatory organs, and, when they are present, as in Sphenodon and snakes, the two anal glands. Secondly, the urodaeum, middle or urino- genital chamber, hypoblastic in origin. It is separated from the proctodaeum by a more or less circular fold which is pro- vided with sphincter muscles, which form the true vent, and this is always round; whilst the outermost opening in lizards and snakes is a transverse slit. Farther inwards, headwards, the urodaeum is shut off by another circular fold, generally very well marked, especially in its dorsal half, which is higher and thicker. Into the dorsal, and innermost, recess of this urodaeum open the genital and urinary ducts; on the ventral side arises the urinary bladder. The whole chamber is always empty, being only a passage room, and in the female the copulatory chamber. The urine is of course collected in the bladder; when this is absent the

fluid is pressed into the third chamber, the coprodaeum, which is often subdivided into two, or even three, successive rooms by circular folds. This coprodaeum serves for the temporary storage of the faeces, eventually mixed with the urine. Micturition and defaecation are in most lizards two successive separate acts.

The snake's arrangement is a side-departure of that prevailing in lizards. The urodaeum is transformed into a dorsal recess into which open above the oviducts, while the ureters open below, in the caudal corner. A horizontal fold imperfectly shuts off the wide urino-genital chamber or recess from the ventral half of the original urodaeum. The coprodaeum is marked above and below by strong sphincters. There is no urinary bladder.

In crocodiles the protodaeum is rather shallow, but long; from its ventral wall arises the unpaired copulatory organ, the basal investing membranes of which continue into the ventral

half of the uro-proctodaeal fold, near which open the male ducts. Very young crocodiles possess a typical middle chamber or urodaeum, into the dorso-lateral corners of which open the ureters, but soon the strong circular fold between urodaeum and coprodaeum disappears completely, so that both chambers now form one large oval room, which is used solely for the storage of the urine, there being no bladder. The faeces are kept in the not specially dilated rectum.

The cloacal arrangement of the Chelonia is a further develop- ment of early crocodilian conditions, but it has become rather complicated and shows a surprising resemblance to that which still prevails in the Monotremes. The proctodaeum is deep and very long, especially in the males. From its innermost and ventral walls arises the large copulatory organ. From the urodaeum is separated off a deep ventral recess into which open the ureters and the genital ducts, and it is continued by a long neck into the large bladder. Between the dorsal wall of this recess and the ventral wall of the main portion of the urodaeum arises a horizontal fold which, diverging, is continued on to the investing skin of the penis, helping to form the edges of the deep longitudinal furrow on its morphologically dorsal surface. If the lips of this furrow were closed, urine and all the genital products would pass

through this urethral canal, but in reality only the semen is conducted through it (the furrow during the state of turgescence being transformed into a closed tube), whilst urine and eggs escape through the wide slit near its inner end. This is an arrangement almost the same as that of Ornithorhynchus. The urodaeum is separated from the rectum by a strong sphincter, and there is, as in the crocodiles and mammals, no special coprodaeum. The Chelonian urodaeum is further complicated by the occurrence of a pair of large anal sacs, thin-walled diverticula on the dorsal side. Such sacs, not to be confounded with the anal glands of other reptiles, exist in many water tortoises, especially in the Chelydidae, also in various aquatic Testudinidae, e.g. Emys, in Platysternum, and sometimes in Trionyx; they are absent in the Chelonidae and in the typically terrestrial tortoises. These sacs have highly vascularized walls and a considerable layer of circular and longitudinal non-striped muscular fibres; their inside is some- times villous, never glandular. They are incessantly filled and emptied with water through the vent, and act as additional respiratory organs, like a kind of water lungs. When such a tortoise is suddenly taken out of the water it squirts out a stream of water, which is not, as is usually supposed, the urine from the bladder.

In connexion with the cloaca may be mentioned the frequent occurrence of peritoneal canals. In the tortoises their abdominal openings are situated in a recess of the peritoneal cavity close to either side of the neck of the bladder; in the females they extend as funnels, generally blind, into the cloaca on or near the base of the clitoris. In the males they extend, without having communication with the cavities of the corpora cavernosa, and without ramifications, as canals along the dorsum penis and either terminate blindly in the glans (Tesludo, C ketone), or they open, each by a small orifice, in the groove at the base of the glans. In crocodiles these canals are short and open near the base of the copulatory organ, protected by a small papilla. They are present in both sexes, but are still closed in newly hatched and very immature specimens. In an adult Nile crocodile they are wide enough to pass an ordinary lead pencil. The function of these outlets from the body cavity is obscure. In Sphenodon the writer has found them as closed funnels which project as soft papillae into the proctodaeum a little to the right and left and caudalwards from the urino-genital papillae.

Urinary Organs.

The kidneys of the reptiles show, like those of the birds and mammals, a considerable advance upon those of the Batrachia. They are, in the adult, represented entirely by the metanephros; the segmental tubes

have no longer any nephro- stomes opening into the body cavity, not even during any time of their development, and it has come to a complete

separation of the efferent genital ducts from the kidneys and from their ureters. Yet these differences are but of degree, there being a continuous bridge from Batrachian to Lacer- tilian conditions. In Lacerta, for instance, in which these features have been studied most thoroughly, the mesonephros continues as the only functional excretory organ during the first year of the young creature until and during its first hiber- nation, when the formation of the metanephros takes place, and with it the complete separation of the vasa deferentia from the kidneys. Until then the segmental canals remain in the male as common carriers of semen and urine, at least morphologically, not physiologically, since in the immature there is no occasion for the conduction of semen. The kidneys of these young lizards show precisely the same arrangement as that of the Batrachia, excluding the Discoglossidae.

Clearly the metanephros is developed from, and is part of, the posterior portion of the mesonephros, the glomeruli of which no longer open into the segmental duct, but become connected with a new canal, the future ureter, which sprouts from the distal portion of the segmental duct and grows headwards. Or let us put these important changes in another way. Since there are originally several segmental ducts (permanent in the male newt) which tailwards more and more lose their connexion with the testes, until — in the posterior portion of the mesonephros— they become entirely urinary ducts, the hindmost of these sprouts (in lizards postembryonic, much earlier in birds and mammals) independently, but at the same time as the neigh- bouring mass of the mesonephros, the growing glomeruli of which then connect with the sprouting processes of the ureter. Phylogenetically and ontogenetically it is evident enough that the kidneys are essentially one organ, the anterior portion of which is the oldest and decays, whilst farther backwards new and more differentiated portions continue to grow. Pro-, meso- and metanephros and successive wave-like stages of the same organ with morphological and functional continuity, until the next, improved portion is ready. It is important that in the Discoglossidae, especially in the male Alytes, an arrangement has come to pass which much resembles that of the Amniota. The mesonephros has, by a simple contrivance, become a metane- phros, provided we define the former as a kidney which is still connected with true segmental ducts.

The supra-renal bodies, adrenals, head-kidneys or Nebennieren, are

yellowish bodies which lie more; in connexion with the generative glands than with the kidneys, always closely attached to the vena cava posterior just, above the kidneys. They are very elongated in the snakes, in a 10-foot python they measure about one inch in length; they are flattened in tortoises, roundish in crocodiles.

In all reptiles the kidneys are retroperitoneal, and they do not project into the body cavity. Their position is different in the various groups, and their general shape is much affected by the shape of the body. In the Ophidia they are much elongated, and of course far in front of the pelvic region, which has been moved to the cloaca. They are placed asymmetrically, the right extending farthest forwards. They consist of many transverse lobes, sometimes in such a way as to appear spirally twisted. Each terminates considerably in front of the cloaca. Each ureter begins at the anterior end of the kidney, and thence proceeds on its inner and dorsal border, receiving ducts from the interspaces of the numerous lobes. In the male each ureter opens upon a papilla, together with the vas deferens; in the female the ureter is joined by a blind canal, the vestige of the male duct. No snake has a urinary bladder. The urinary excretion is white, chalky, consisting mainly of uric acid in crystals, with very little fluid.

In the Lacertilia the kidneys are more posteriorly placed than in snakes. They lie between the pelvis and the cloaca and are generally close together, sometimes partly fused with each other. Only in the Amphisbaenids the right kidney extends more forwards. They are usually transversely furrowed. The ureters open dorso-laterally into the urodaeum upon papillae as, in the snakes. In the females the remnants of the segmental

ducts, or vestigial representatives of the vasa efferentia, are often of considerable length, persistent in chameleon and Uromastix, much reduced in geckos, or disappearing with age as in Lacerta. The urine of most lizards contains much solid uric acid, which is retained in the urodaeum and voided as a rather solid, white mass, not united with the faeces. Those which have a greater amount of fluid urine have a bladder which receives the fluid portion. The opening of this bladder is on the ventral side of the cloaca, not in direct connexion with the ureters. The bladder is very rarely absent, e.g. in Varanidae and

Amphisbaenidae.

The Crocodilia have the kidneys placed below the pelvis; their surface shows meandering convolutions separated by furrows. The ureters are for the greater part of their length deeply sunk into the substance of the kidneys, which they leave near the hinder ends, to run freely for a short distance along the dorsal sides of the cloaca, and they open, each separately, and away from the vasa deferentia, into the dorsal side of the urodaeum, which, together with the coprodaeum, forms a large oval chamber, and this being filled with the very fluid urine, functionizes instead of the absent bladder.

In Chelonia the kidneys lie in the pelvis, short and thick, more or less trihedral; the surface is marked with many shallow meandering grooves and fewer deeper furrows. Each ureter, composed of several large successive canals, leaves its kidney near the inner hinder end, and then runs free for a short space, crossing the gut to open into the neck of the urinary bladder, which arises ventrally out of the urodaeum, which itself has become a recess of the cloaca. The bladder is large, often more or less two-horned, attached to the pelvic wall by a peritoneal fold, and.it contains very fluid urine.

The kidneys of Sphenodon are very small and far removed from the generative organs. The ureters open, each close to the vas deferens of its side, beneath a little papilla, on the dorsal side, rather near the midline of the urodaeum, whence arises a long-necked bladder.

Reproductive System.

The Ovaries are always in pairs, placed headwards at a distance from the kidneys in Sphenodon, lizards and snakes ; in the latter the right ovary lies farther forward. In tortoises, and especially in the crocodiles, where they are very long and much twisted or lobated, they are situated close to the kidneys and even accompany them. The ovaries of lizards and snakes con- tain many and large lymph spaces; those of the other reptiles are much denser in structure. The ripening eggs always cause them to assume the shape of a bunch of grapes. The oviducts are each held by a peritoneal fold which arises from near the dorsal midline. The abdominal ostia are long slits and are turned towards the side, away from the ovaries. The walls of the ducts gradually become thicker, glandular and much folded. Whilst the ripe eggs, often in considerable numbers, receive their shell, each egg lies in a separate chamber; in the geckos, which lay only one pair of eggs, the two respective chambers have become permanent features. In Sphenodon each oviduct opens together with the ureter of its side

near the dorsomedian line of the urodaeum. In most lizards the two oviducts and the two ureters have four separate openings in the dorsal wall of the rather deep dorsal recess of the urodaeum. But in Lophura both oviducts unite (like the ureters) and have only one opening, which is placed a little nearer towards the pelvis than the urinary opening, but they are divided by a longitudinal septum which extends almost to their common orifice. In the snakes the oviducts likewise open into the dorsal recess, sometimes by a common ostium, which is provided with a strong sphincter. The whole recess acts like a vagina for the reception of one of the copulatory organs. The oviducts of the crocodiles open in a decidedly ventral position, on either side close to the base of the clitoris, a considerable distance from the openings of the ureters. In the tortoises the oviducts open separately into a wide ventral urino-genital sinus, at the base of the neck of the bladder.

The Testes correspond in position with the ovaries; in snakes and Amphisbaenids the right is placed farther head-

wards than the left. The usual shape is elongated, sometimes pointed forwards. The 'Epididymis is sometimes of the same size as the testis and then consists of many meandering con- volutions of the vas deferens which is composed of several canals from the testis. The convolutions are held together by a peritoneal lamella. Towards the cloaca they become much smaller and shorter, and the vas deferens passes along the median side of the ureter. In Sphenodon these open separately, each near and below the same papilla near which opens the ureter of the same side. In most lizards the vas deferens unites with its ureter into one short canal which opens beneath or upon a small papilla in the upper corner of the urodaeal recess, far away from the penis. In snakes vas deferens and ureter of each side are likewise commonly united. In the crocodiles each vas deferens passes from the dorsal side of the cloaca to the ventral side, not accompanied by the ureter, and opens into the blind sac which forms the basal continuation of the deep groove on the dorsal side of the penis. In the tortoises the epididymis is very large and the vas deferens is also much convoluted; each opens separately near the neck of the large urinary bladder close to the backward continuation of the deep longitudinal groove of the copulatory organ.

Remnants of the Mullerian ducts run parallel with the vasa deferentia, and similar remnants of the Wolffian ducts accompany the oviducts in crocodiles and tortoises, least degenerated of course in young specimens. Such reciprocal vestiges occur most likely also in lizards, and in female snakes a vestige of the male duct joins its ureter. In a nearly adult male Sphenodon the present writer missed the female

remnants.

The copulatory organs show very important modifications. Sphenodon is the only recent reptile which is devoid of such an organ; its imperfect substitute is an unpaired, thin, but high membranous fold which arises from the dorsal middle of the circular fold between urodaeum and coprodaeum. During copulation this part of the cloaca is probably everted to secure conception, a striking resemblance to the arrangement found in the Caecilia. The organs of all lizards and snakes are paired, in their quiescent state withdrawn into deep pockets which open on the right and left posterior corners of the proctodaeum or outer chamber of the cloaca, which for this reason has assumed the shape of a transverse slit in all lizards and snakes. Hence these have sometimes been called Plagiotremata. Each organ can be everted and tucked in like the finger of a glove, a muscle being attached to the inside of the apex; when everted, the muscle extends through the length of the organ; each muscle arises from the ven- tral side of several trans- verse processes of the tail ^^$<$£g$$>g& vertebrae, at a consider- organs of right and left sides- able distance from the between thera is the anal aperture; cloaca. In the embryo each PP< preanal plate, organ arises as a conical protuberance, or papilla, which projects out of the vent. Later it becomes inverted. Prob- ably this ontogenetic feature recapitulates the phylogeny of these organs, which have to be looked upon as swell- ing flaps or portions of the walls of the cloaca which were pro- truded during copulation, and which in time borrowed, and specialized, muscular fibres from the ventral tail muscles. On the outer everted side of each organ is a furrow for the reception of the semen. The apex is either single or more or less deeply bifurcated, each arm being followed by the likewise divided furrow. The outer investing membrane of these very muscular erectile bodies is epidermal; often, especially in snakes, pro- vided with numerous papillae, folds or other excrescences. In

many snakes these are spiny and hard, but according to Leydig this hardness is not due to a horny substance but to the deposi- tion of calcifying matter. E. D. Cope has investigated the almost endless minor modifications of these penial features and uses them for taxonomic purposes in the snakes. Vestiges of these organs occur in females of snakes and lizards. Close to these organs of the snakes lies a

pair of anal glands of some size, which pour their very offensive secretion through an opening close to the base of each penis. The same glands occur in the same position in Sphenodon, which has no copulatory organs, and in crocodiles they appear as evertible musk glands. Hence J. E. V. Boas, not knowing of their existence in both sexes of snakes, tried to homologize them with the paired penes of reptiles, an error which has been repeated in C. Gegenbaur's Lehrbuch, vol. ii. p. 533.

The crocodiles and tortoises possess a single, median copula- tory organ; it lies on the ventral or anterior end of the cloaca, the outer opening of which is therefore a longitudinal slit, hence the term ucthotremata. In the crocodiles the organ is attached to the caudal corner of the ischiadic symphysis by a strong and roundish fibrous band, which arises single from the ventral sides and forms partly the continuation of the two fibrous halves of the organ; the bulk of the crura, comparable to corpora cavernosa, is not attached to the pelvis, as generally stated, but projects backwards towards and into the pelvic cavity. This portion is especially rich in venous cavernosities. The outer coating of the glans possesses various papillary pro- jections, which are furnished with sensory, hedonic corpuscles. On the morphologically dorsal side of the organ, not on the dorsum penis, is a deep groove which ends towards the crura in a blind sac, into the farther corner of which open the vasa deferentia. In a full-grown Nile crocodile the whole organ is about 10 in. long. In young females up to a total length of 3 or 4 ft. the clitoris is nearly of the same size as the male organ, but it remains stationary and appears very small in large specimens.

The organ of the tortoises is essentially of the same type as that of the crocodiles, but it is nowhere directly attached to the pelvis or to any other skeletal part. The whole organ, when withdrawn, lies in a ventral, long recess of the wide outer cloacal chamber, and its crura extend so far back as to form the continuation of the ventral and lateral walls of the recessus which is continued into the neck of the urinary bladder. Its orifice and those of the seminal ducts are enclosed by the walls of the deep groove which runs along the underside of the organ. This is always of considerable size, surprisingly large in Trionyx. The clitoris is small, sometimes tiny.

The sexual act is extremely prolonged in Chelonians and still more so are the preliminaries, but in crocodiles it is the deed of a few seconds. Lizards and snakes insert only one side.

There remains the question whether the unpaired organ of the

crocodiles and tortoises, which is the prototype of the mammalian organ in every essential point, and the paired organs of the lizards and snakes, are to a certain extent homo- logous organs in so far as they can both be derived from the same indifferent condition. With this view we assume that originally the protrusible walls of the outer cloacal chamber became specialized into a right and left imperfect intromittent organ, that subsequently, in lizards, those hemipenes were shifted back towards the tail and were henceforth bound to develop separately, while in the crocodiles, tortoises, mammals and birds the two primitive lateral evertile flaps approached each other towards the ventral anterior side of the cloaca, and that this led to a fusion, beginning probably at the basal part, which at the same time was farther withdrawn from the surface and secured the reception of the sperma from both vasa deferentia into one canal. This hypothesis has been objected to by Boas, but accepted by Gegenbaur (p. 538) after having been rejected on p. 533 of his Lehrbuch.

The Fat bodies belong at least physiologically to the genera- tive rystem. They are placed outside the peritoneum. In

lizards they appear as two masses in the pelvic region, the black peritoneal lining covering only their dorsal side. They consist of a network of arteries and connective tissue, the meshy spaces of which are filled with ” fat “; they each receive an artery from the femoral vessel which enters them in the inguinal region; the veins collect into the abdominal. In snakes the fat bodies are very long, extending from the cloaca to the liver. Tortoises seem to have only traces of them, but in Sphenodon and in crocodiles they resemble those of lizards. — The peculiar organ suspended from the right abdominal wall of crocodiles, variously mentioned as mesenteric gland or body, or fatty spleen, by Butler, is possibly related to the same category. The fat bodies of reptiles are sometimes vaguely alluded to as hibernating bodies; like the fat bodies which are attached to the generative glands of Amphibia they do not become reduced during the eventual hibernation but are largest before the pairing season, by the end of which they are exhausted, looking reddish or grey after the loss of their stores of fat and probably other important contents

The Embryonic Development.

Fertilization of the egg always takes place internally, and the egg containing a large amount of food-yolk is of course meroblastic. It is sufficient to mention that many lizards, some chameleons and many snakes (not Sphenodon, geckos, crocodiles and Chelonians) retain their, in these cases very thin-shelled, eggs in the oviducts until the

embryo is ready to burst the egg-membrane during the act of parturition or immediately after it. Such species are usually called ovo- viviparous, although there is no difference between them and other viviparous creatures, for instance the marsupials. The majority of reptiles are oviparous and the egg is enclosed in a strong parchment shell, with or without calcareous deposits. Only gas exchange can take place between such an egg and the outside, and it loses by evaporation, whilst in the batrachian egg various other exchanges are easy through the thin membrane. The salamander embryo, within its thin egg-membrane, even grows to a size many times larger than the original egg, it does not only breathe, but it is also nourished through the gills, and by some means or other the waste products are partly eliminated without filling the bladder. The amphibia are born as larvae and live as such for a long time, often in a most imperfect condition. Nothing of all this applies to the reptile, which leaves the egg as a perfect little imago. A great amount of yolk supplying the material, and a large ” bladder ” to receive the waste products and to act as respiratory organ, have made this possible. That the allantois and the amnion behave precisely in the same way in the mammals with their much reduced yolk, only testifies to the superior value of these organs, and after all there is no difference in this respect between a monotreme and a reptile. These two organs seem to have come into existence with the reptiles and constitute the most reliable diagnostic feature between higher and lower vertebrates. All reptiles, birds and mammals have a navel, a feature unknown and impossible in Batrachia and fishes. A few remarks on these important embryonic organs may not be superfluous, especially concerning their possible origin.

Whilst the urinary bladder of the Batrachia remains within the body throughout the embryonic stage, this organ undergoes in the higher vertebrates, reptiles, birds and mammals, con- siderable modifications, and it assumes, henceforth as Allantois, new important functions besides that of being the receptacle of the embryonic urine. The development of the Allantois is in intimate causal connexion with that of the Amnion. All the Allantoidea are also Amniota and vice versa, but the term Amniota is preferable, since the basal portion of the Allantois remains in the adult as the urinary bladder, as an organ hence- forth equivalent to and homologous with that of the Anamnia. The primary feature seems to be the allantois which leaves the body cavity, remains without the amniotic folds, even after these have enclosed the body within the amniotic bag, and

then spreads nearly all over the inner side of the egg-shell. Having thus come into the closest possible contact with the atmospheric air, the vessels of the allantois can exchange their carbon dioxide for oxygen and the allantois becomes the re- spiratory organ of the embryo. Herewith stands in direct correlation the complete absence of any internal and of external gills in the embryonic reptiles. The blood vessels of the allan- tois are fundamentally the same as those of the batrachian bladder, namely, branches from the pelvic arteries (later hypo- gastrics) and veins which return from the base of the bladder to the abdominal wall and thence to the liver.

In the normal reptilian egg, surrounded by its non-yielding shell, space is absolutely limited, and whilst the yolk is being diminished and increased secretion of urine distends the bladder, this soon protrudes out of the body cavity proper into the extra-embryonal coelomatic space between the true amnion and the false amnion or serous membrane. It fills this space so far as the yolk-sac allows it. It seems reasonable to suppose that this growth of the allantois has been one of the causes of the caudal amniotic fold; the sinking of the embryo into the space of the diminishing yolk-sac is no doubt another cause, but the fact remains that the amnion is the chief hindrance to the closing of the body-wall at the region of the future navel.

The life-histories of embryonic development are the domain of the embryographers. They are the imperfect accounts of the ways and means (often crooked and blurred, owing to short cuts and in adaptation to conditions which prevail during the embryonic period) by which the growing creature arrives at those features which form the account of the anatomical structure of the adult. Comparative anatomy, with physiology, alone lead through the maze of the endless embryonic vagaries and afford the clues for the reconstruction of the real life-history of an animal and its ancestry. For detail the reader is referred to numerous papers quoted in the list of literature, and to the various text-books, above all to the Handbuch d. vergleichenden Entwicklungsgeschichte d. Wirbelthiere, edited by O. Hertwig, Berlin.

Authorities on Anatomy: Bibliography. — The appended list of papers (many with shortened titles) represents but a fraction of the enormous literature dealing with the anatomy of reptiles. Special stress has been laid upon the more recent publications. A great amount of information, general and detailed, is contained in Bronn's Klassen u.

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IV. Distribution in Space

This zoo-geographieal review deals only with modern reptiles; We begin with a survey of the faunas of some of the most obvious land-complexes which bear close resemblance to the now classical " regions " of P. L. Sclater and A. R. Wallace. None of these " regions " has definable frontiers, and what acts as a bar to one family may be tot-

ally ignored by another. According to the several orders of reptiles the world is mapped out in very different ways. The African fauna does not stop at the Suez Canal, nor even at the Red Sea; there is a transitional belt notice- able in the countries from Syria to Arabia, Persia and India. To the north, Indian influence extends right into Turkestan, or vice versa; the Central Asiatic fauna passes into that of India. On the Chinese side prevailing conditions are still almost un-known; Wallace's line is more or less rigidly respected by Trionychidae, hooded Elaps, vipers and Lacertidae, while it has not the slightest influence upon crocodiles, pit vipers, Varanidae, Agamidae, &c. In the western hemisphere we : have a grand illustration of the interchange of two faunas and of the fact that it is neither a narrow strait nor an equally narrow isthmus which decides the limitation of two regions. Central America and the Antilles form one complex with S. America. The nearctic region ends at the edge of the. great Mexican plateau, which itself is a continuation of the north continent. Many nearctic forms have passed southwards into the tropics, even into far- off S. America, but the majority of the southerners, in their northern extension, have been checked by this plateau and have surged to the right and left along the Pacific and Atlantic tropical coastlands. The present writer happens to have made a special study of this part of the world (cf. " The Distribution of Mexican Amphibians and Reptiles," P.Z.S., 1905, pp. 191-294); the N. and S. American faunas have therefore been more fully treated in the following review of the various faunas. No doubt others can be treated in a similar manner, but the physical features between N. and S. America are unique, and the results are closely paralleled by those of the fauna of birds. The narrow and long neck of the isthmus of Panama (once no doubt much broader) is no boundary; if the meeting of N. and S. had taken place there, that narrow causeway would be crowded, and this is not' the case.

New Zealand. — The only recent reptiles are Sphenodon (q.v.), which testifies to the great age of these islands; about half a dozen Scincidae of the genus Lygosoma, members of a cosmopolitan family; and some few geckos, e.g. Naultinus, of a family of great

age, world-wide distribution and with exceptional facilities of distribution.

Australian Region. — Of crocodiles only C. johnstoni in N. Australia and Queensland; C. porosus on the N. coast, and occur- ring on various Pacific islands, as far E. as the Fiji Islands. Tor- toises are represented only by the pleurodirous Chelydidae, e.g. Chelodina; they are absent in Tasmania and on the Pacific islands. New Guinea possesses the aquatic Carettochelys, sole type of a family.

The bulk of the Lacertilian fauna is composed of skinks, geckos, agamoids and Varanidae, with the addition of a small family which is peculiar to the region, the Pygopodidae. A peculiar type, Dibamus, inhabits the borderlands, namely, New Guinea, the Moluccas, Celebes and the Nicobar Islands; and, finally, a single iguanoid, Brachylophus , is common in the Fiji Islands; how it came there, or how it survived its severance from the American stock, is a mystery. The skinks are in this region more highly developed and more specialized than in any other part of the world; they exceed in numbers the geckos, which generally accompany the skinks in their range over the smaller islands of the Pacific ; in these islands members of these two families represent the whole of the Lacertilian fauna. The Australian agamoids are chiefly peculiar and partly much differentiated forms (e.g. Moloch and Chlamy- dosaurus), but some have distinct affinities to, or are even identical with, Indian genera. The ‘ Varanidae are also closely allied to Indian species.

Of snakes, amounting to about one hundred species only, we note about one dozen Typhlopidae, and of Pythoninae simply Python, and the Boine Enygrus on the islands from New Guinea to Fiji. There are but surprisingly few innocuous colubrine snakes, scarcely a dozen, and all belonging to Indian genera. The bulk of the snakes belong to the poisonous Elapinae, all of genera peculiar to the region, e.g. Acanthophis, Pseudechis, Notechis. Such a prepon- derance of poisonous over harmless snakes is found nowhere else in the world. Tasmania is tenanted by poisonous snakes only. In Australia we meet, therefore, with the interesting fact that, whilst it is closely allied to S. America, but totally distinct from India by its Chelonians, its lizards and colubrine snakes connect it with this latter region. With regard to the other Ophidians, they have their nearest allies partly in India, partly in Madagascar, partly in S. America; and the character of the Australian snake fauna consists chiefly in its peculiar composition, differing thereby more from the other equatorial regions than those do among them- selves. Wallace’s line marks the boundary between India and Australia only as far as Chelonians are concerned, but it is quite effaced by the distribution of lizards and snakes. Thus in New Guinea lizards of the Indian region are mixed with Pygopodidae, and an island as far E. as Timorlaut is inhabited by snakes, some of which are

peculiarly Indian, whilst the others are as decidedly Australian. The islands N. of New Guinea and of Melanesia are not yet occupied by the Ophidian type, and only species of Enygrus have penetrated eastwards as far as the Low Archipelago, whilst the Fiji Islands and the larger islands of Melanesia have sufficiently long been raised above the level of the sea to develop quite peculiar genera of snakes.

Indian Region. — Of Crocodilia C, palusiris, the ” mugger ” or marsh crocodile, and C. porosus; Gavialis gangeticus ; Tomistoma schlegeli in Borneo, Malacca and Sumatra. Of tortoises Platy- sternum megacephalum, type of a family from Siam to S. China; many Trionychidae and Testudinidae, mostly aquatic; whilst the terrestrial Testudo is very scantily represented. One species which is common in the Indian peninsula (T. stellata) is so similar to an African species as to have been considered identical with it; the Burmese tortoise is also closely allied to it, and the two others extend far into western-central Asia. Thus this type is to be considered rather an immigrant from its present headquarters, Africa, than a survivor of the Indian Tertiary fauna, which com-

f>rised the most extraordinary forms of land tortoises. Wallace’s ine marks the E. boundary of Trionyx; species of this genus are common in Java and Borneo, and occur likewise in the Philippine Islands, but are not found in Celebes, Amboyna or any of the other islands E. of Wallace’s line. Agamidae are exceedingly numerous, and are represented chiefly by arboreal forms, e.g. Draco {a. v.) is peculiar to the region, Ceratophora and Lyriocephalus exclusively Ceylonese; terrestrial forms, like Agama and Uromastix, inhabit the hot and sandy plains in the N.W., and pass uninterruptedly into the fauna of western-central Asia and Africa. The Geckonidae, Scincidae and Varanidae are likewise well represented, but without giving a characteristic feature to the region by special modification of the leading forms except the gecko Ptychozoon homalocephalum in Malaya. The Lacertidae are represented by one characteristic genus, Tachydromus—Ophiops and Cabrita being more developed Beyond the limits assigned to this region. Finally, the Euble- pharidae and Anguidae, families whose living representatives are probably the scattered remains of once widely and more generally distributed types, have retained respectively two species in W. India, and one in the Khasi Hills, whilst the presence of a single species of chameleon in S. India and Ceylon reminds us again of the relations of <"his part of the fauna to that of Africa.

The Indian region excels all the other tropical countries in the great variety of genuine types and numbers of species of snakes. Boulenger

1 recognizes 267 species, i.e. about one-fifth of the total number of snakes known. India is the only country in the world possessing viperine, crotaline and elapine poisonous snakes (their proportion to harmless snakes being about I : 10), e.g. Vipera russelli, the ” daboia ” (see Viper); Lachesis, e.g. gramineus, an arboreal pit viper; Naja tripudians, the cobra; Bungarus coeruleus, the “krait”; Callophis; and Hydrophinae along the coasts of the whole region. Several sub-families and families are peculiar to the region: the Uropeltidae with Rhinophis in southern India, and Uropeltis confined to Ceylon; Ilysiidae in Ceylon and Malay Islands, elsewhere only in S. America ; the opisthoglyphous Elachis- todon westermanni of Bengal ; the Homalopsinae, with many species from Bengal to N. Australia; further the Amblycephalidae; Xenopeltis unicolor, sole type of a family; and the Acrochordinae, a sub-family of aglyphous Colubridae, ranging from the Khasi Hills to New Guinea. Of other Colubridae, we notice numerous Tropidonotus , Coronella and Zamenis, the latter one of the most characteristic types of the warmer parts of Eurasia. Tree-snakes, e.g. Dipsas and Dendrophis, are common. Of other families we note a great number of Typhlopidae, of which T. braminus occurs even on Christmas Island. Lastly various species of Python, but no Glauconiidae, the only family not represented in the Indian region, which claims the Uropeltidae, Xenopeltidae and Amblycephalidae as peculiar to itself.

Gunther remarks that to this region Japan has to be referred. This is clearly shown by the presence of species of Ophites, Callophis, Trimeresurus s. Lachesis, Tachydromus, characteristically Indian forms, with which species of Clemmys, Trionyx, Gecko, Halys, and some Colubrines closely allied to Chinese and Central Asiatic species are associated. Halys is a central Asiatic pit viper. The few reptiles inhabiting the northern part of Japan are probably of palaearctic origin.

The African Continent. — Of crocodiles, C. vulgaris in the E., C. cataphractus and Osteolaemus tetraspis in the W. There are many Chelonians, especially small land tortoises of Testudo, and with Cinyxis which is peculiar to this continent ; the freshwater Clemmys only in the N.W. corner; several genera of the pleurodirous Pelo-medusidae, Pelomedusa galeata, which is equatorial and southern, with an outlying occurrence in the Sinai peninsula, and Sternothaerus with several tropical and southern species; of Trionychidae the tropical Cycloderma and Cyclanorbis peculiar to the country, and the large Trionyx triunguis which ranges from the Senegal and Congo into the Nile system with its big lakes, but occurring also in Syria.

Of Lacertilia the geckos and skinks, and the typically old world families of Lacertidae and Varanidae are well represented; also Amphisbaenidae ; Gerrhosauridae and Zonuridae, peculiar to Africa and Madagascar ; a few Eublepharinae and a few of the so-called Anelytropidae in West Africa. But the most important feature of this Lacertilian fauna is the almost universal distribution of chameleons in numerous and some highly specialized forms, Chame- leon and Rhampholeon. We note the entire absence of Iguanidae and of Anguidae, the latter represented by Ophisaurus only in the north-western corner.

Of snakes only one sub-family is peculiar, the Rhachiodontinae with the sole species Dasypeltis scabra, the egg-swallowing snake. Many Typhlopidae and Glauconiidae, but no Ilysiidae; large pythons, Eryx in the N., and a boa, Pelophilus fordi in the W. of Africa. Of poisonous snakes there is an abundance, notably the Viperinae have their centre in this continent; besides Echis, which is also Indian, there are peculiar to the continent Bitis, the puff- adder, Causus, Atractaspis, Cerastes, and Atheris which is an arboreal genus, all of which see under Viper. The pit vipers are entirely absent. Elapinae are numerous, e.g. hooded cobras like Naja haje and Sepedon the ” ringhals.” Many opisthoglyphous tree snakes and a considerable number of innocuous colubrines, e.g. Lycodon, Psammophis and Coronella or closely allied genera all also in India, but Coluber-like forms and Tropidonotus are very scantily represented, chiefly in the N.

On the whole the reptilian fauna of Africa is not rich, considering the huge size of the continent, but this may be accounted for by the great expanse of desert in the N. half and of veld in the S. Lastly, the enormous central forests are still scarcely explored.

Madagascar and certain other islands have a fauna which is as remarkable for its deficiencies as it is for its present forms. The following well-defined groups are absent: Trionychidae and Chely-didae; Agamidae, Lacertidae, Anguidae, Amphisbaenidae, Varanidae and Eublepharinae; all the Viperidae and Elapinae, so that this large island enjoys perfect absence of poisonous snakes, not counting the practically harmless opisthoglyphous tree snakes; there are further no pythons and no ilysias.

The actual fauna consists of: Crocodilus vulgaris, which is said to be extremely abundant; of Chelonians, Pelomedusa galeata and

1 The same authority enumerates 536 species of reptiles for British India, i.e. about one-sixth of all the recent species of reptiles (Fauna of

British India, edit. W. T. Blanford, London, 1890).

Sternothaerus, both also in Africa, Podocnemis, which elsewhere occurs in South America only, and several Testudinidae ; of these Pyxis is peculiar to Madagascar, while Testudo has furnished the gigantic tortoises of Aldabra, the Seychelles, and recently extinct in Mauritius and Madagascar. Of lizards are present a few Gerrho- sauridae and Zonuridae, both African types; the remarkable occurrence of two iguanid genera Chalarodon and Hoplurus, both peculiar to the island; skinks, many geckos, and Uroplates, sole type of the Uroplatinae and an abundance of chameleons, of the genera Chameleon, with Ch. parsoni, the giant of the family, and the small species of Brookesia, a genus peculiar to Madagascar. Of snakes we note Typhlopidae and Glauconiidae, and the remarkable occurrence of Bomae, two of the genus Boa (Pelophilus), one of Corallus on the main island and Casarea on Round Island. There are opisthoglyphous mostly arboreal snakes, and the rest are innocuous colubrines, some few with Indian and African affinities, e.g. Zamenis s. Ptyas, more with apparently S. American relation- ship, or at least with resemblance in taxonomic characters.

An analysis of this peculiarly compound and deficient fauna gives surprising results, namely, the almost total absence of affinity with the Indian region, close connexion with Africa by the posses- sion of Gerrhosauridae, Zonuridae, Chameleons and Pelomedusidae ; lastly, the presence of several tree boas, of Podocnemis and of Iguani- dae, i.e. families and genera which we are accustomed to consider as typically neo-tropical. Peculiar to Madagascar, autochthonous and very ancient, is only Uroplates. Ancient are also the tortoises, chameleons, geckos, boas, typhlops, gerrhosaurids and zonurids. The absent families may be as ancient as the others, but most of them, notably Varanus, lacertids and agamids are of distinctly northern, palaeotropical origin, and we can conclude with certainty that they had not spread into S. Africa before Madagascar and its satellites became severed from the continent.

Europe and Temperate Asia. — The present reptilian fauna of this vast area is composed almost entirely of the leavings of those groups which are now flourishing with manifold differentiations under more genial

climes, in Africa and India. Fossils, none too numerous, tell us that it was not always thus, since crocodiles, alligators and long-snouted gavials, all the main groups of chelo- nians, iguanoids, &c, existed in England, the crocodilians persisting even towards the end of the Tertiary period.

There are no crocodiles now in the Eurasian sub-region, excepting small survivors in the Jordan basin, on the borderland of Africa; but the Yang-tse-Kiang is inhabited by an alligator, A. sinensis, while all its congeners are now in America. This finds, to a certain extent, a parallel in Trionyx, of which one species lives in the Eu- phrates basin, likewise borderland, and another, T. maacki, in rivers of N. China, e.g. in the Amoor. Of other Chelonians we note several species of Testudo, two of them European; Emys europaea, chiefly in Europe, with the other species E. blandingi in the eastern United States ; and a few species of Clemmys, a truly periarctic genus.

Of Lacertilia we exclude the chameleon. Of geckos Hemidac- tylus turcicus extends from Portugal to Karachi; Platydactylus facetanus is at home in most S. Mediterranean countries; Teratos- cincus is peculiar to the steppes and deserts of Turkestan and Persia; other geckos in the transitional region from Asia Minor to India. Of Lacertae we have Anguidae, Agamidae, Lacertidae, Amphisbaenidae and Scincidae, most of them in Europe represented by but one or two species. Thus Blanus cinereus in Mediterranean countries, Asia Minor and Syria, represents the Amphisbaenidae which are found nowhere else in Europe or Asia, but plentiful in Africa and both Americas. Of the Anguidae, Anguis fragilis is peculiar to Europe, Ophisaurus apus in S.E. Europe, another in Indo-Burman countries, with the rest of the species in N. America. Of Scincidae few in Europe, e.g. Chalcides s. Seps s. Gongylus, others from Asia Minor eastwards, e.g. Scincus, and Ablepharus in Turke- stan. Agamidae do not occur in Europe but they exist in considerable numbers from Asia Minor and Turkestan to China, with Phryno- cephalus peculiar to central Asia. Lastly, the Lacertidae, of which several species of Lacerta, Psammodromus, Acanthodactylus in Europe, but the majority in Africa and warmer parts of India; in a similar manner the Manchurian forms are related to Chinese.

The total number of palaearctic snakes amounts to about sixty, the majority living in the Mediterranean countries and in W. Asia. One Typhlops in the Balkan peninsula and in W. Asia, in Persia also Glauconia; Eryx jaculus extends into Greece from S.W. Asia as sole representative of the Boidae. Several vipers, the common viper, V. berus, from Wales to Saghalien Island, V. aspis, V. latastei and V.

ammodytes in S. Europe; a pit viper, Ancistrodon, e.g. halys, in the Caspian district, thence this genus through China and again in N. America. Echis extends N. into Turkestan. The Indian cobra ranges N. to Transcaspia and far into China. All the other snakes belong to the aglyphous and opisthoglyphous Colubridae; of the latter Coelopeltis is peculiar to S. Europe and S.W. Asia; Macro- protodon cucullatus to S. Spain, the Balearic Islands and N. Africa; Tephrometopon peculiar to Turkestan and neighbouring countries; none extending into E. Asia. Of the aglyphous colubrines the most characteristic genus is Zamenis incl. Zaocys, very widely spread and including more species than any other palaearctic genus; several species of the wide-ranging genus Tropidonotus, besides Coluber,

with Rhinechis scalaris in S.W. Europe. There are, besides, other genera, especially in the debatable countries of S.W. Asia, Persia and Afghanistan, and speaking generally the colubrines show less affinity to African than to Indian forms, just as we should expect from the prevailing geographical conditions. If it were not for the N.W. corner of Africa and portion of its N. coast, the European fauna would have very little in common with Africa.

North America.— Of this huge continent only the United States and Mexico come into consideration, since N. of 45° latitude reptilian life is very scarce. The area, however, with these restrictions, is larger than the Indian and Malay countries, and larger than the Australian region. Yet the fauna is comparatively poor, very poor indeed, if it were not for Mexico and the Sonoran province, which seems to be the ancient centre of distribution of much of the present typically N. American fauna.

Characteristic of the area is the abundance of Chelonians and Iguanidae, to which Tejidae have to be added in the S.; equally characteristic is the complete absence of Pleurodirous Chelonians, of Chameleons, Agamidae, Lacertidae, Varanidae and Viperinae. The fauna is composed as follows: Crocodilia, with Crocodilus americanus and Alligator mississippiensis in the S. Of Chelonians the Chelydridae, peculiar to the E. half but for the reappearance of a species of Chelydra in Central America; many Cinosternidae like- wise almost peculiar to the area; of Testudinidae an abundance of freshwater forms, notably Chrysemys, ‘and Emys in common with Europe, whilst terrestrial tortoises are extremely scanty, namely one species of Testudo, T. ■polyphemus, the gopher, and two of Cistudo, e.g. C. Carolina; lastly, two Trionyx in the whole of the Mississippi basin and thence N. into Lake Winnipeg, 51 ° N. Lacer- tilia: Geckos are very scarce; N. America has received only Sphaerodactylus notatus from

the Antilles into Florida, and Phyllo- dactylus tuberculosus into California from the Pacific side of Mexico; Eublepharinae are absent. Of Iguanidae we have a typically Sonoran set, e.g. Crotaphytus, Holbrookia, Uta, Phrynosoma, Scelo- porus, and a S. set of which only Anolis extends out of the tropics. It is significant that only a few species of Sceloporus and Phrynosoma extend into the United States, although far N. ; of the large genus Anolis only A. carolinensis enters Texas to Carolina. Sceloporus may be called the most characteristic genus of Sonoraland and Mexico. Of the tropical family of Tejidae only Cnemidophorus, with many species in Mexico, a few in the adjoining N. states, and with C. sexlineatus over the greater part of the Union. Anguidae: Ophisaurus ventralis in the United States; the other species in the Old World. Diploglossus peculiar to mountains of Mexico. Gerrho- notus, the main genus, centred in Mexico, but G. coeruleus ranges from Costa Rica along the Pacific side right into British Columbia, the most northern instance of a New World reptile.

Xenosaurus grandis of Mexican mountains is the monotype of a family, and the same would apply to Heloderma (H. suspectum, the Gila monster of the hottest lowland parts of Arizona and New Mexico ; and H. horridum of Mexico) if it were not for Lanthanotus of Borneo. Scincidae: of this cosmopolitan family America possesses the smallest number, and it is significant that the number of species decreases from N. to S. ; Eumeces from Minnesota and Massachusetts through Mexico, with many species, and Lygosoma s. Mocoa laterale from S.E. and Central States to Mexico. Xantusiidae, a small family, is composed of a N. or Sonoran and a S. or Central American-Antillean group; e.g. Xantusia of the deserts of Nevada and California. Amelia, monotype of a family of California to El Paso, Texas, i.e. peculiar to Sonoraland, Amphisbaenidae with Rhineura in Florida and the marvellous Chirotes in Lower California and the Pacific side of Mexico ; the other members of this family are tropical so far as America is concerned.

Snakes: of Typhlopidae only Anomalepis mexicana, peculiar to Nuevo Leon; of Glauconiidae several extending N. into Texas and Florida. Boinae continue N. as the arenicolous Lichanura of Lower California and Arizona, and the likewise arenicolous Charina boltae which extends from California to the state of Washington; the other members of the family are all tropical, extra-regional. Of Viperidae only pit vipers occur, but of them rattlesnakes cover the whole of the habitable area; Ancistrodon, without a rattle, e.g. the moccasin snake and the water viper, has other species in central and E. Asia. Of Elapinae, far into the E. United .States only the genus Elaps with a few species, of which E. fuhius, the commonest, ranges from S. Brazil far into the S. “and E. states. A few opis- thoglyphous, terrestrial, snakes just enter

the United States from Mexico, e.g. Trimorphodon. Of aglyphous colubrines species of genera like or resembling Tropidonotus, Coronella and Coluber, in- cluding Pityophis and Spilotes, are abundant, the latter being very characteristic; Ischnognathus and Contia, Ficimia and Zamenis likewise are clearly nearctic, or Sonoran.

The Greater Antilles have essentially neotropical, i.e. Central American and S. American affinities, but there is also some Sonoran infusion. — There is Crocodilus americanus; no Chelonians are natives except one or two Chrysemys. Of Lacertilia, geckos are abundant; of Iguanidae several arboreal forms, notably the large Iguana, and Metopoceras of Haiti, and Cyclura, both peculiar; of Anguidae Celestus, peculiar, but closely allied to Diploglossus; of Xantusiidae the peculiar genus Cricosaura s. Cricolepis. Of

Amphisbaenidae Amphisbaena itself occurs in Puerto Rico and on the Virgin Islands. Of Tejidae only Ameiva, not Cnemidophorus. Snakes : a Typhlops in Puerto Rico ; of boas Epicrates, Ungalia and Corallus, the latter re-occurring in Madagascar. Absent are: Viperidae, Elapinae and Opisthoglyphs ; of aglyphous colu- brines the Central American genera Urotheca, Dromicus, Drymobius and Leptophis ; the genera of distinctly northern origin.

South and Central America. — The fauna is very rich. It is advisable first to mention those groups which are either confined to Central America (including the hot lowlands of Mexico), e.g. the Dermatemydidae, Eublepharinae, Anelytropsis and the aglyphous colubrines: Urotheca, Dromicus, Drymobius, Leptophis, Rhadinea, Streptophorus, or which, from their N. centre have sent some genera into Central America, or beyond into the S. continent : e.g. Chelydra rossignoni, ranging from Guatemala to Ecuador; one Cinosternum extending into Guiana; Testudo tabulata, the only terrestrial tortoise of S. America, besides the gigantic creatures of the Gala- pagos Islands; a few Eublepharinae reaching Ecuador; of Anguidae Gerrhonotus coeruleus, extending S. to Costa Rica; of Scincidae, Mabuia and Lygosoma, which extend far into S. America, and the same applies to the Amphisbaenidae. Immigrants from the N. are probably also the Iguanidae, although they have found a congenial home in the S. countries, where they are now represented by an

abundance of genera and species, e.g. Laemanctus and Corytho- phanes of Mexico, Anolis, Iguana, Basiliscus, Ctenosaura, Polychrus, Hoplurus, Chalaroddn. Amongst snakes the following appear to be of N. origin: Boidae (with the Pythonine Loxocaemus bicolor in Mexico), in spite of their great development of boas and anacondas in the S. ; certainly Crotalinae, of which only one species, C. terrificus, is found in S. America; further, some aglyphous colubrines, which have sent a few species only into Central, and still fewer into S. America,* e.g. Tropidonotus, Ischnognathus, Contia* Ficimia, Coluber, Spilotes, Pityophis, Coronella* and Zamenis.

After these numerous restrictions we should expect the genuine autochthonous fauna of the S. American continent to be very scanty, especially if we remember those important Old World groups which are absent in America, e.g. Varanidae, Lacertidae, Agamidae and chameleons, and that Central and S. America have no Triony- chidae. The oldest S. American reptilian fauna is composed as follows. It is the only part of the world which possesses Chelydidae in abundance, e.g. of Chelys the Matamata, Hydromedusa, and of Pelomedusidae, Podocnemis, which re-occurs in Madagascar. Cro- codilia are represented by Crocodilus americanus and C. moreleti in the N. and by about five species of Caiman. Of Lacertilia geckos are rather few, mostly in the N.W. of the continent, more numerous in Central America and the Antilles. The Tejidae are clearly a neotropical family, with several dozen genera in S. America; of all these, only Ameiva and the closely allied Cnemidophorus extend through and beyond Central America: Ameiva into the E. and W. hot lands of Mexico and into the Antilles, Cnemidophorus through Mexico far into most of the United States with a few species. Of snakes there is an abundance. Typhlopidae and Glauconiidae are well represented. Of aglyphous colubrines many genera, some of these extending northwards into Mexico, but not to the Antilles, e.g. Atractes, Tropidodipsas, Dirosema, Geophis, Xenodon.

Opisthoglypha are very numerous in genera and species both in S. and Central America, whence many of the arboreal forms extend into the hot countries of Mexico, while a few terrestrials have spread over the plateau and thence into the United States, none entering the Antilles; such typical neotropical genera are Himan- todes, Leptodira, Oxyrhopus, Erythrolamprus, Conophis, Scolecophis, Homalocranium, Petalognathus, Leptognathus. Most of the Ambly- cephalidae are neotropical, the others in S.E. Asia. Of Elapinae only the genus Elaps occurs, but with many species. Of the Cro- talinae, Lachesis is the essentially neotropical genus, with many species, some of which enter the hot lands of Mexico, e.g. L. lansbergi s. lanceolatus, a very widely

distributed species, the only pit viper which has entered the Lower Antilles.

The above survey of the world shows that but very few of the principal families of reptiles are peculiar to only one of the main

regions." The occurrence of some freak, constituting a little family or sub-family by itself in some small district, and therefore put down as peculiar to a whole wide region, cannot be much of a criterion, e.g. Rhachiodon, Elachistodon, Acrochordinae, Uroplates, Xenosaurus, Heloderma, Aniellidae, Dibamus, Anelytropidae, Platysternum. They are not characteristic of large countries, but rather local freaks. Quite a number of very ancient families have such a wide distribution that they also are of little critical value, notably the peropodous snakes, which have survivors in almost any tropical country; such cosmopolitans are also geckos and skinks.

A difficulty which is ever present in such zoogeographical investigations is the uncertainty as to whether our zoological families and sub-families and even genera are genuine units, or heterogeneous compounds, as for instance the Anelytropidae, of which degraded skinks there is one in Mexico, two others in W. Africa. Heloderma in Mexico and Lanthanotus in Borneo are both without much doubt descendants of some Anguid stock, but when we now combine them, in deference to our highest authority, as one family, we thereby raise the tremendous problem of the present distribution of this

family. Boas and pythons are likewise not above suspicion, cf. some boas in Madagascar and the python Loxocaemus in Mexico. The opisthoglyphous colubrines are almost certainly not a natural group, not to speak of numerous genera of the aglyphous assembly. To avoid arguing in a circle, such doubtful units had better be avoided whilst building hypotheses.

G. Pfeffer has recently endeavoured to show by an elaborate careful paper (" Zoogeographische Beziehungen Siidamerikas," Zool. Jahrb., Suppl. viii., 1905), " that nearly all the principal groups of reptiles, amphibians and fishes had formerly a universal or sub- universal distribution, and that therefore it is not necessary to assume a direct land connexion of S. America with either Africa or Australia, with or without an Antarctic." Many cases of such a former universal distribution are undoubtedly true, but the question remains how the respective creatures managed to attain it.

For true characterization of large areas we must resort to the

combination of some of the large wide-ranging families, and equally important is the absence of certain large groups; both to be selected from the following table.

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1 Including the related Dermatemydidae and Cinosternidae.

2 With an exception.

3 Entering, or in the borderland.

4 Mediterranean countries.

6 Rhineura ; formerly wider distribution. 6 In Asia.

Deductions from this table show, for instance, that Australia is quite sufficiently characterized by the possession of Chelydidae and Varanidae; Madagascar by the presence of chameleons and Pelomedusidae. On the other hand, the separation of the whole of Africa from Asia, or the diagnosis of the palaearctic ” region,” would require the combination of several positive and negative characters.

Chelonians are very diagnostic, expressed by the following combinations of families : —

America as a whole: Chelydridae and Cinosterridae and Dermatemydidae.

N. America: Chelydridae and Trionychidae, but only E. of the Rockies. *

S. America : Chelydidae and Pelomedusidae.

Africa: Trionychidae and Pelomedusidae.

Madagascar: Pelomedusidae and Testudinidae.

India and Eurasia : Trionychidae and Testudinidae.

Australia : Chelydidae only.

That the Chelonians are regionally so very diagnostic that their main families are still in rational agreement with the main divisions of land, is perhaps due, first, to their being an ancient group ; secondly, to their limited means of distribution (none across the seas, omitting of course Cheloniidae, &c.) ; and lastly, to their being rather in- different to climate. Note, for instance, Trionyx ferox from the Canadian lakes to the Gulf of Mexico, Cinosternum pennsylvanicum from New York to

New Orleans. It may be taken for certain that wherever a Testudo occurs as a genuine native, it has got there by land, be the locality the Galapagos, Aldabra, Madagascar or some Malay islands. The Trionychidae reveal themselves as of periarctic origin, being debarred from Australia, Madagascar and the neotropical region (alleged from Eocene Patagonia). Testu- dinidae are cosmopolitan, excluding Australia, and practically also the Antilles; and Testudo is most instructive with its almost similar distribution; but something has gone wrong with this genus in America, where it flourished in mid-Tertiary times.

Pleurodira are less satisfactory than they appear to be from a merely statistical point of view. The Pelomedusidae, being known from European Trias and from nearctic cretaceous formations,

may have had a world-wide distribution; but Chelydidae may well have centred in an antarctic continent. Chelydridae were periarctic and have disappeared from Eurasia; N. American offshoots are the Cinosterridae and Dermatemydidae, the latter now restricted to Central American countries.

Crocodilia, probably once universal, afford through the Chinese alligator an instance of the original intimate connexion of the whole holarctic region, paralleled by many other animals which now happen to be restricted to E. Asia and to eastern N. America.

Lacerhlia are less satisfactory for short diagnoses. America alone combines Iguanidae and Tejidae: —

N. America: Iguanidae, Anguidae, Tejidae (and Rhineura in Florida).

S. America: Iguanidae, Anguidae, Tejidae and many Amphis-baenidae.

Africa and Madagascar : Chameleons and Zonuridae and Gerrho-sauridae.

Madagascar: Chameleons and Iguanidae.

India : Varanidae, Agamidae and Lacertidae, all of which also in Africa.

Australia alone has Pygopodidae.

The Lacertilia are now distributed upon principles very different from those of the tortoises. According to the lizards the world is divided into an E. and a W. half. The W. alone has Iguanidae and Tejidae, the E. alone that important combination of Varanidae and Agamidae. Further subdivision is in most cases possible only by exclusion, e.g. exclusion of Lacertilia and chameleons _ from Australia; of Varanidae and Agamidae from Madagascar. Lizards are rather susceptible to climatic conditions, infinitely more than water tortoises.

As regards Ophidia, America has Crotalinae and Elapinae, but no Viperinae. Eurasia and India alone combines Viperinae, Crotalinae and Elapinae. Africa, Viperinae and Elapinae but no Crotalinae. Australia only Elapinae. Madagascar none of these groups.

The Viperinae must have had their original centre in the palae- arctic countries, and they have been debarred only from Australia and Madagascar. Both vipers ‘ and pit vipers are still in Asia, but true vipers are absent in America, with their fullest develop- ment now in Africa, whilst pit vipers went E., covering now the whole of America, and having developed the rattlesnakes in Sonora- land. The Elapinae are undoubtedly of Asiatic origin; they have overrun Africa, were too late for Madagascar, but early enough for Australia, where they are only poisonous snakes; and only one genus, Elaps, has got into, or rather, has differentiated in America, in the S. of which it is abundant.

Opisthoglypha are useless for our purpose; they are cosmopolitan, with the exception of Australia, but probably they have one ancient centre in S. America, and another in the old world.

Amblycephalidae afford another of those curious instances of apparent affinity between S.E. Asia and Central America; paral- leled by Pelamis bicolor, which ranges from Madagascar to Panama, while all the other Hydrophinae belong to the Indian Ocean and the E. Asiatic seas. Aglyphous Colubrines show undoubted affinity between N. America and Eurasia; the whole group is absolutely cosmopolitan, and many of the genera, e.g. Coluber, Tropidonotus and Coronella, have proved their success by having acquired an enormous range. Snakes have comparatively few enemies, and they possess exceptional means of distribution. It is rare for a terrestrial species to have such a wide range as Crotalus terrificus, from Arizona to Argentina, or as the India cobra, which, like the tiger, is equally at home in Malay islands, Manchuria and Turkestan.

The tortoises divide the habitable world into a S. and a_N. world, much as do the anurous Batrachians; the lizards split it into an E. and a W. hemisphere. The poisonous' snakes, the most recent of reptiles in their full development and distribution, allow us to distinguish between Australia, America and the rest of the world.

(H. F. G.)

REPTON, a village in the S. parliamentary division of Derby- shire, England, 8 m. S.W. of Derby, on the Midland railway. Pop. (1001) 1695. It is famous for its school, founded in 1557 by Sir John Port, of the neighbouring village of Etwall, which has valuable entrance scholarships, and two leaving exhibitions to the universities annually. The number of boys is about 300. The school buildings are modern, but incorporate considerable portions of an Augustinian priory established in 1 1 7 2. There was an ecclesiastical establishment on this site in the 7th century, the first bishop of Mercia being established here. This was destroyed by the Danes in 874. In the second half of the 10th century, during the reign of Edgar, another church was founded. The existing parish church of St Wystan retains pre-Conquest work in the chancel, beneath which is a remarkably fine vaulted crypt, probably dating from the reign of Edgar, its roof sup- ported on fluted columns. The monastery was dissolved by Henry VIII.

REPUBLIC (Lat. respublica, a commonweal or common- Wealth), a term now universally understood to mean a state v or polity, in which the head of the government is elective, and in which those things which are the interest of all are decided upon by all. This is notoriously a very modern interpretation of the term. In the ancient world of Greece and Rome the franchise was in the hands of a minority, who were surrounded by, and who governed, a majority composed of men personally free but not possessed of the franchise, and of slaves. Modern writers have often used respublica, and literal translation, as meaning only the state, even when the head was an absolute king, provided that he held his place according to law and ruled by law. " Republic," to quote one example only of many, was so used by Jean Bodin, whose treatise, commonly known by its Latin name De Republica Libri Sex, first appeared in French in 1577. Englishmen of the middle ages habitually spoke of the commonwealth of England, though they had no conception that they could be governed except by a king with hereditary right. The coins of Napoleon bear the inscription " Republique francaise, Napoleon Empereur." Except as an arbitrary term of art, or as a rhetorical expression, " republic " has, however, always been understood to mean a state in which the head holds his place by the choice of his

subjects. Poland was a republic because its king had in earlier times to be accepted, and in later times was chosen by a democracy composed of gentry. Venice was a republic, though after the ” closing of the great council ” the franchise was confined to a strictly limited aristocracy, which was itself in practice dominated by a small oligarchy. The seven states which formed the confederation of the United Netherlands were republics from the time they renounced their allegiance to Philip II., though they chose to be governed by a stadtholder to whom they delegated large powers, and though the choice of the stadtholder was made by a small body of burghers who alone had the franchise. The varieties are many. What, however, is emphatically not a republic is a state in which the ruler can truly tell his subjects that the sovereignty resides in his royal person, and that he is king, or tsar, ” pure and absolute,” by the grace of God, even though he may hasten to add that ” absolute ” is not ” despotic,” which means government without regard to law. The case of Great Britain, where the king reigns theoretically by the grace of God, but in fact by a parliamentary title and under the Act of Settle- ment, is, like the whole British constitution, unique.

There is in fact a fundamental incompatibility between the conceptions of government as a commonwealth and as an institution based on a right superior to the people’s will. Where the two views endeavour to live together one of two things must happen. The ruler will confiscate the rights of the community to himself and will become the embodiment of sovereignty, which is what happened in most of the states of Europe at the close of the middle ages; or the community, acting through some body politic which is its virtual representative, will confine the head of the government to defined functions.

The question of representation is dealt with separately (see Representation), but the conception of a republic in which all males, who do not belong to an inferior and barbarous race, share in the suffrage is one which would never have been accepted in the ancient or medieval world, for it is based on a foundation of which they knew nothing, — the political rights of man. When the Scottish reformer John Knox based his claim to speak on the government of the realm on the fact that he was ” a subject born within the same ” he advanced a pretension very new to his generation. But it was one which was fated to achieve a great fortune. The right of the subject, simply as a member of the community, to a voice in the community in which he was born, and on which his happiness depended, implied all ” the rights of man ” as they were to be stated by the American Declaration of Independence, and again by the French in 1789. As they could be vindicated only by revolt against monarchical governments in the old

world and the new, and as they were incompatible with all the convictions which make monarchy possible, they embodied

themselves in the modern democratic republics of Europe and America. It is a form of government not much more like the republic of antiquity and the middle ages than the French sans- culottes was like Harmodius and Aristogeiton, whom he admired for being what they most decidedly were not — believers in equality and fraternity. But it does, subject to the imper- fections of human nature, set up a government in which all, theoretically at least, have a voice in what concerns all.

REPUBLICAN PARTY. Of the three important American parties which have called themselves Republican, 1 this article deals only with that one which was organized during the years 1854 to 1856 and has been in control of the government of the United States during the larger portion of the half century since the presidential election of i860

Origin and Character. — Sectionalism, the movement which tended to break the Union into two separate republics, one based on free labour, the other on that of slaves, had gained before the middle of the 19th century such headway as to compel a reconstruction of the party system. The beginning of this reconstruction was heralded by the rise of the Liberty party (q.v.), in 1840, its completion by the disruption in i860 of the Democratic party along sectional lines, and the election of Abraham Lincoln by a sectional vote.

The event which determined the date of the birth of the Republican party was the repeal by the Kansas-Nebraska Bill of 1854 of that provision of the Compromise of 1820 which excluded slavery from national territory N. of the geographical line 36° 30′ and the formal substitution in that bill of ” squatter ” for national sovereignty, in deciding the question of slavery in the Territories. The enactment of this bill introduced a new and highly critical stage in the relations between North and South. Down to 1850 the differences of the two sections over slavery had always been arranged by mutual concessions. In 1854 this expedi- ent was set aside. Without giving anything in return, Douglas and his supporters took from the free-labour section an invalu- able barrier against the extension of slavery: and through the doctrine of ” squatter sovereignty ” denied to Congress the power to erect such barriers in the future. But this only

hast- ened a crisis that could not have been greatly delayed. Cal- houn had already discerned the true source and deadly nature of the growing Sectional estrangement, and Lincoln was soon to utter the prophetic words: “This government cannot endure permanently, half slave and half free.”

The immediate result of the agitation over the repeal was to convince a large number — which soon became a majority— of the best citizens of the North, irrespective of party, that the restriction of slavery was essential to the well-being both of the North and of the Union as a whole. In order to give effect to this conviction it was necessary to form a new party. The agitation which prepared the way for its rise began in Congress during the debates on the Kansas-Nebraska Bill, and spread thence throughout the North. The West was more quickly responsive than the East. But everywhere large elements of the existing parties came together and agreed to unite in resisting the extension of slavery. Before the discussion of the repeal in Congress had reached its later stages, a mass meeting of Whigs, Democrats and Free Soilers at Ripon, Wis- consin, resolved that if the Kansas-Nebraska Bill should pass: ” They would throw old party organizations to the winds and organize a new party on the sole issue of the non-extension of slavery.” The name Republican was formally adopted at a state convention of the new party held at Jackson, Michigan, on the 6th of July 1834, and by other Western state conven- tions on the 13th of the same month.

The great majority of the new party had been either Whigs or Democrats. In two cardinal points they were agreed, namely, opposition to slavery and belief in the national, as opposed to the federative, nature of the Union. In other points there was at the beginning much disagreement. For-

1 The party organized by Thomas Jefferson; the National Republicans, 1824-1834; and the Republican party of the present.

tunately the issues on which there was agreement overshadowed all others long enough to bring about a fusing of the two ele- ments. It was the union of the Whig who believed in making government strong and its sphere wide, with the Democrat who believed in the people and the people’s control of govern- ment, that made the Republican party both efficient and popular.

History. — Before its advent to power, from 1854 to i860, the tasks of the Republican party were three: to propagate the doctrine of slavery restriction by Congressional action; to oppose the extension of slavery

under the operation of the doctrine of squatter sovereignty; and to obtain control of the Federal government. In each it was successful. Through- out the North and under such leaders as Seward, Lincoln, Chase, Sumner, Henry Ward Beecher and Horace Greeley, all the resources of the press, the platform, the pulpit and (an institu- tion then powerful but now forgotten) the lyceum or citizens' debating club, were fully enlisted in the propaganda. Other events that turned to the advantage of the Republicans were the brutal assault upon Charles Sumner in the Senate Chamber in 1856, the Ostend Manifesto, advising in the interest of slavery the acquisition of Cuba by force if Spain should refuse to sell, the enforcement — sometimes brutal and always hateful — of the Fugitive Slave Law (q.v.), and the quarrel of Douglas with the administration and the South over the application of Squatter sovereignty to Kansas. On the other hand, the decision of the Supreme Court in the case of Dred Scott, which the Re- publicans refused to accept as good law, and the raid of John Brown at Harper's Ferry, which they condemned, brought them into serious embarrassment.

In the prosecution of the third task, the attainment of office, the party followed wise counsels and was fortunate. In its first national platform, that of 1856, the party affirmed its adherence to the principles of Washington and Jefferson, denied the constitutional right of Congress or a Territory to establish slavery, and declared that it was " both the right and duty of Congress to prohibit in the Territories those twin relics of barbarism, polygamy and slavery." At the close of the resolutions there was a demand for government aid to a Pacific railway and for the improvement of rivers and harbours.

The platform of i860 was more comprehensive. It added to the planks of the first, an arraignment of the administration and the Dred Scott decision, and demands for a protective tariff and a homestead act. Although the popular vote for Abraham Lincoln was more than a half-million greater than that for John C. Fremont, the party's candidate in 1856, never- theless it was the disruption of the Democratic party that made the Republican triumph possible. On the other hand, the Republican party was the strongest member of the new party system as reorganized on the sectional principle. Moreover, in character and purpose, as well as numerical strength, it was better qualified than its rivals to meet the impending crisis.

The War Period, 1861-1865. — Between the election of Mr Lincoln in November i860, and his inauguration on the following 4th of March, seven of the slave-holding states seceded, formed a Confederacy and withdrew their representatives from the national legislature. All

attempts to arrange a compromise failed. The vacillation of President Buchanan, and the position taken in his annual message that the national government had no right to coerce a seceding state, gave strong support to the disunion movement. These events forced upon the Republican party a change of policy. Hitherto its efforts had been directed chiefly to excluding slavery from the Territories. Now the first duty was to save the Union from disruption. In order to do this it was necessary to unite the North, and to bring to the support of the Union a large proportion of those border slave states, Delaware, Maryland, Virginia, Kentucky, Tennessee and Missouri, in which there was considerable Union sentiment. Hence the party laid aside completely the earlier issue of slavery restriction and accepted as the sole issue of the hour the main- tenance of the Union. Indeed, in order to secure more easily the co-operation of loyal Democrats, it even gave up its own name for a time and called itself the Union party.

During the early period of the war the President checked all efforts on the part of zealous subordinates, civil and military, to make the war for the Union even incidentally a war upon slavery. In his efforts to unionize the border states Mr Lincoln in March 1862 urged that Congress should co-operate with any state in providing for a voluntary, gradual and compensated emancipation. Congress acceded, but not one of the border states would undertake emancipation. Many of the Republican leaders rejected the border state policy of the President and urged a more radical course towards slavery. In replying to Horace Greeley, who voiced the discontent in a public letter, to which he gave the title, The Prayer of Twenty Millions of People, Mr Lincoln in August 1862 wrote: ” My paramount object is to save the Union and not either to save or destroy slavery.”

But as evidence accumulated that slavery was a strong military support of the Confederacy the policy of destroying slavery as a means of saving the Union grew in favour. To this policy Mr Lincoln on the 22nd of September 1862 com- mitted himself, the Republican party and the cause of the Union. The first response was distinctly unfavourable. The immediate effect was ” to unite the South and divide the North.” A considerable element of the Democratic party became disloyal, while the party as a whole opposed all measures looking to the destruction of slavery. The autumn elections greatly reduced the Republican majority in Congress. But the new policy steadily gained ground until the Republican party in its third national

convention, which met on the 7th of June 1864, resolved: ” that as slavery was the cause and now constitutes the strength of this rebellion, justice and national safety demand its utter and complete extirpation from the soil of the republic.” In the following year slavery was finally abolished by the Thirteenth Amendment.

On the Republican party, since it had an effective majority in each house of Congress, rests the responsibility for the legisla- tion of the war period. The theory of loose construction of the Constitution was accepted. Throughout the Civil War, Congress, proceeding upon this theory, made prompt provision for the prosecution of the war. It passed Legal Tender Acts; it established a system of national banks; greatly raised the tariff rates; and in order to hasten the settlement of the Far West and to make that section an integral part of the Union, it passed a Homestead Act and an act providing for a railway to the Pacific. For a time, while disloyalty was most rife in the North, there was a sharp curtailment of the rights of the individual citizen through the suspension, initiated by the President and approved by Congress, of the writ of Habeas Corpus. Most of the acts, which their opponents held to be violations of the Constitution, were in general acts of question- able utility. The results of the war, which came to a close early in 1865, vindicated in a signal way the principles, policies and leadership of the Republican party. It had saved the Union; it had established the national character of the Union so firmly as to bring to an end the doctrine of the right of secession; and it had destroyed slavery.

The party had been singularly fortunate in its founders and leaders. Of these three were pre-eminent: Horace Greeley, William H. Seward and Abraham Lincoln — Greeley in the field of journalism, Seward in the two realms of idealistic and practical politics, and, greatest of all, Abraham Lincoln who won and held the people.

Reconstruction. — The larger tasks of the period from the close of the Civil War in 1865 to the inauguration of Rutherford B. Hayes in 1877 were three: first, to accomplish with the least possible disturbance the transition from war to peace; second, to settle certain matters of dispute with France and England that had arisen during the progress of the war; and third, to reconstruct the South. Full responsibility for the way in which these tasks were discharged rests upon the Republican party, for it was in control of the presidency and the Senate throughout the period and of the House until December 1875. In the first and second it was notably successful. The soldiers of North and South returned at once to the fields of productive labour. The colossal

war establishment was quickly reduced to the requirements of peace. The French withdrew from Mexico. The Alabama Claims were submitted to arbitration. But the reconstruction of the South proved difficult in the extreme. The strain of a prolonged and exhausting war, the upheaval of emancipation, and the utter collapse of the Confederate government, had thrown the elements of social, economic and civil life in the South into almost hopeless disorder. To restore these to normal relations and working was but part of the task; the other and more important part was to apply those methods of reconstruc- tion which would tend to make one nation out of hitherto discordant sections. In his third annual message, Dec. 8th, 1863, Lincoln brought forward the so-called presidential plan of reconstruction. This was rejected on the ground that recon- struction was a Congressional rather than an executive function; and on the 4th of July 1864 Congress passed a bill making Congress instead of the president the chief agent in the work of reconstruction. President Johnson adopted Lincoln's plan, and put it into operation with such vigour that when Congress met in December 1865 all the states that had seceded were quite or nearly ready to demand the readmission of their represen- tatives to the House and Senate.

From the standpoint of party the situation was highly critical. The men whom the newly reconstructed states had sent to Washington represented the old South and would naturally join the opposition. Although the ratification of the Thirteenth Amendment, which abolished slavery, was assured, and a fort- night later was officially proclaimed, nevertheless the recon- structed legislatures were busy enacting police regulations which, in the opinion of most Republicans, threatened to re- enslave the freedmen. With an earnestness like that which the party in earlier days had shown in opposing the extension of slavery, it now resolved to secure full civil rights to the freedmen. Another consideration of great weight in shaping party policy was the need of maintaining the rights of Congress against executive encroachment. Owing to the war and Lincoln's ■masterful personality, the presidency had gained in prestige at the expense of Congress. The tendency thus established would be strengthened to a dangerous degree, it was thought, if the President were to take the leading part in reconstructing as well as in saving the Union. There now took place within the party a change of great importance. Hitherto the conservatives, represented by such leaders as Lincoln and Seward, had always won in struggles with the radical elements; but now the tide changed, and the radicals who were more narrowly national and more strongly partisan gained control, and ruled the party to the end of the period. This revolution within the Republican

party between the years 1865 and 1867 was fostered by a marked re-crudescence of sectional feeling in the North, and by the character of the successor of President Lincoln and of the party leaders in Congress. President Johnson while eminently patriotic and courageous, was tactless and imprudent to the last degree. Mr Sumner, the leader of the Senate, was not conciliatory in manner, and while incapable of revengeful feeling seemed more con- siderate of the freedman than of the Southern white. Thaddeus Stevens, whose influence over the House of Representatives was stronger than that of Sumner over the Senate, regarded the South as ” a conquered province,” and his personal feelings towards the ruling class of the South were harshly vindictive. The policy adopted by the Republican majority in each house of Congress was to refuse admission to the men chosen by the states that had been reconstructed under the presidential plan, until a joint- committee of both houses should investigate conditions in the South. In this rebuff there was distinct intimation of a purpose to set aside altogether .the reconstructive work of the President. Congress proceeded at once to enact measures to continue and extend the earlier temporary provision for helpless freedmen whom emancipation had set adrift, and to give them full civil rights. By passing the Fourteenth Amendment in June 1866 Congress committed itself to the policy of securing the civil rights of the negro by constitutional guarantee. Each of these acts was vetoed by the President, between whom and

Congress political disagreement ripened soon into bitter enmity. ‘ As the quarrel developed Congress ignored the recommendations of the President, repassed by the requisite majority and without due consideration of his objections each measure that he vetoed, took from him the power to remove subordinates which had been exercised by his predecessors, deprived him of his constitutional rights as commander-in-chief of the army, and finally in 1868 undertook to drive him from office by impeach- ment.

In 1867 Congress, under the control of the radical wing of the Republican party, set aside nearly all reconstructive work that had been accomplished previously and put into execution a plan of its own, under which the Southern States were reconstructed anew and admitted to representation in Congress between the years 1867 and 1870. Inevitable consequences of the Con- gressional plan of reconstruction were: first, the erection of state governments that were inefficient, corrupt, ruinously wasteful and shamefully oppressive; second, the extreme demoralization of the freedmen suddenly transformed from slaves into rulers of their former masters; third, the demoraliza- tion, in many cases also extreme, of the great body of the Southern whites by the expedients to which they resorted in order to escape from the rule of the freedman, led by the ” Carpet Bagger ” his Northern, and the ” Scalawag ” his Southern, white ally; fourth, the alienation of the white and coloured races in the South, — an alienation which was to each a source of immeasurable evils; fifth, the speedy overthrow on the withdrawal of military support of the governments set up under the Congressional plan, and the creation of a South ” solid ” in resentful opposition to the North and the Republican party. And sixth, as the out- come of all these results, an unfortunate delay in reuniting North and South. The Republican party suffered during this period a moral decline, seen in the frequent efforts to gain party advantage by kindling anew the earlier sectional animosities, a growing arrogance, the increasing weight of the partisan and spoilsman in party management, and the widespread corruption that came to light in the ” scandals ” of the second administra- tion of General Grant. The mismanaged Liberal Republican movement of 1870-1872 was a reaction against this moral decline and a protest against the Southern policy of the party and its support of the ” Spoils ” system. The service of the Liberal Republicans consisted mainly in the aid they gave to the reform of the Republican party and in the influence they exerted to induce the Democratic party to accept the results of the war.

But despite the warnings it received, the prestige it had gained during

the war and the popularity of President Grant, the Republican party lost ground steadily during the second half of the period. In the election of 1874 the Democratic party gained control of the House of Representatives; and in the election of 1876 came within a hair's breadth of winning the presidency.

Election of Mr Hayes to that of Mr McKinley, i8y6-i8g6. — ■ During these twenty years the subsidence of old and the rise of new issues led to a reconstruction of the party system, which, although less radical than that of 1840 to i860, brought into existence several new parties and changed in important respects the character and policies of those already in the field. From the standpoint of party history the chief interest of these twenty years lies in the answer to the question, How did the discredited Republican party secure in 1896 a new and prolonged lease of power? The task was not easy. The reconstruction policy of the party had alienated many Northern supporters and had made the South solidly Democratic. The prevalence of the spoils system and the scandals of the second administration of General Grant had hurt the prestige of the party as a guardian of public morals and of the national honour. What gave the Republicans a fighting chance wei*e: its record down to the close of the Civil War; its proven aptitude for the tasks of government; and the growth among the people of a more vital national feeling which turned instinctively to the party that had saved the nation. Despite these substantial

advantages over their Democratic rivals the Republicans lost the presidential elections of 1884 and 1892, and the entire Democratic party — some Republicans agreeing — has always held that a just decision of the contested election of 1876 would have seated Samuel J. Tilden, the Democratic candi- date, instead of Mr Hayes. In the Senate the Republicans were in a majority during fourteen years. In the House, whose members are chosen by popular vote, these figures were reversed, the Democrats having control during fourteen years. In each of five successive presidential elections, those of 1876, 1880, 1884, 1888 and 1892, the Democratic popular vote was larger than the Republican. Marked features of the party situation were the apparent similarity for a time of the principles of the two great parties, the influence on their policy exerted by the stronger minor parties, and the rise of the Mugwumps (not strictly a party), who claimed the right to vote for the best candidate independently of party and were in the main of Republican origin.

Of the issues of the period one, the reform of the civil service, was served by both of the great parties with imperfect fidelity. Each of the Republican presidents, Hayes, Garfield, Arthur and Harrison gave it

efficient and steadfast support; and so did Cleveland, the Democratic president, although under stronger pressure from party hunger. The same was true in the case of the more important questions of foreign policy and, to a degree in its early stage, of the question of silver coinage. It was not so with the treatment of the South. President Hayes withdrew the national troops from S. Carolina and Louisiana and thus brought to an end Federal military interference with state governments. For this course a considerable section of the Republican party gave him thereafter a support which was half-hearted and inconstant; Further disaffection resulted from efforts to reform the civil service of New York which brought the President into conflict with the powerful Republican party machine in that state. 1 The high character of the President and his firm, wise and upright course raised the reputation of the party. His veto of the Silver Bill and the resumption of specie payments tended to the same result. The failure in 1889 of the third term movement for General Grant worked for the health of the party. The struggle of President Garfield with New York spoilsmen and his assassina- tion by a disappointed office-seeker, gave a fresh impetus to the movement for the reform of the civil service. President Arthur maintained the high standard established by Presidents Hayes and Garfield.

In the election of 1884 the old parties were competitors for the confidence of the conservative and reforming elements of the country. Mr Blaine, the Republican candidate, who in brilliancy, popularity, patriotism, and disappointing personal fortunes recalled the Whig leader, Henry Clay, lost the election by a narrow margin because, while meeting the requirements of the conservatives, he had lost in a measure the confidence of the reformers.

In the election of 1888 Mr Cleveland, by making tariff reform the issue, turned the manufacturing interests to the support of Mr Harrison, the candidate of the Republicans, who thereby won the election. Mr Harrison, while not personally popular, maintained the best traditions of his Republican predecessors. The highly protective McKinley tariff, framed in obedience to the people's mandate in 1888, proved somewhat disappointing, and in the election of 1892, Mr Cleveland, as the champion of lower tariff rates, was successful for the second time. Mr Cleveland, at the beginning of his second term, secured the repeal of the act for the purchase of silver, and thus strengthened himself with the con- servatives of both parties. Democratic defection in the Senate nullified largely the downward revision of the tariff urged by the President and supported by the House.

The election of 1896 marked the close of the period of party

1 In the course of this conflict, which continued to disturb the harmony of the Republican party until the death of President Garfield, the term ” Stalwarts ” was used to designate the supporters of Senator Conkling, who was in control of the Republican machine in New York state, and the term ” Half-Breeds ” to designate the supporters of the administration.

readjustment. The leading issue was the free coinage of silver under conditions which would have made the monetary standard silver instead of gold, and would have lowered its value. The Democratic convention repudiated Mr Cleveland, accepted free coinage, and nominated W. J. Bryan. The Republicans, at the cost of a formidable party defection, endorsed the gold standard and a highly protective tariff, and nominated William McKinley, whose record and character made him an exceptionally strong candidate. In doing this the Democratic organization became the party of radicalism, the Republican, the party of conservat- ism. The committal of the Republican party to the mainten- ance of the gold standard far more than its continued support of high protection, established its position in the reconstructed party system. In doing this it allied its fortunes with those of all the property-holding classes of the country, while retaining in a high degree the confidence of the wage-earners.

Period i8gj-igio. — During this period there was first a rapid recovery from economic depression, and then ten years of almost unexampled prosperity, followed by two years of moderate depression. But the period is chiefly memorable for the war of 1898 with Spain; for the oversea territorial expansion that followed; for the rise of the so-called policy of imperialism; for the assumption of a far more prominent international r61e; for wide-reaching measures of internal reform; and, lastly, for the establishment of the policy of conserving the natural resources of the nation.

Throughout this period the Republican party had undis- puted control of the national government. One of the earliest acts in the administration of Mr McKinley was the enactment in 1897 of the highly protective Dingley Tariff. The provision for Reciprocity proved at first of little use. But the need of foreign markets for the rapidly growing output of manufactured products, the rising demand that the

interests of the home consumer, as well as those of the producer, should be considered, and the conviction that high protection fostered monopolies, brought about a change of sentiment in the party. Mr McKin- ley, in his last speech, made at the Buffalo Exposition on the 5th of September 1901, gave voice to this change: ” The period of exclusiveness is past. The expansion of our trade and com- merce is the pressing problem. Commercial wars are unpro- fitable. A policy of good will and friendly trade relations will prevent reprisals. Reciprocity treaties are in harmony with the spirit of the times. Measures of retaliation are not.” These views gained headway against the strenuous opposition of the “stand-patters,” 1 until revision of the tariff down- ward was demanded in the platform of 1908, and achieved to a moderate degree in the Tariff Act of 1909. The party has also fulfilled its promise to establish the gold monetary standard on a firm basis. During the. war with Spain and in meeting the new problems of colonial empire, the Republican party has again justified its reputation for efficiency. Not less noteworthy has been the policy of the party initiated and urged by President Theodore Roosevelt and developed by President W. H. Taft for the regulation of railways and all corporations and trusts engaged in interstate business. The latest important event in the history of the Republican party is the rise of the ” Insurgents,” a group of senators and congressmen whose professed aims are to resist centralization in both party and national government, to lessen the influ- ence of the money power over public policy, to regulate tariff schedules largely in the interest of the consumer, and in brief to emphasize anew the subordination of party and government to the will and service of the people.

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1 Those members of the Republican party who would maintain as far as possible the high protective duties of the Dingley Tariff.

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Political and Constitutional History of the United States (Chicago, 1899) ; and E. Stanwood, History of the Presidency (Boston, 1898). (A. D. Mo.)

REQUENA, a town of E. Spain, in the province of Valencia; on the left bank of the river Magro, and on the railway from Valencia to Utiel. Pop. (1900) 16,236. The town was formerly a Moorish fortress, occupying a strong position in the mountainous region of Las Cabrillas (3400 ft). It is dominated by the ancient citadel of the Moors, and still has traces of the original town walls. There are three ancient parish churches; San Nicolas, the oldest, dates from the 13th century, but was partly restored in 1727. Near the town are the sulphurous springs of Fuentepodrida. The chief industries are the cultiva- tion of grain, fruit and saffron, and the manufacture of wine and silk.

REQUESENS, LUIS DE ZUNIGA Y (? -1576), Spanish governor of the Netherlands, had the misfortune to succeed the duke of Alva (q.v.) and to govern amid hopeless difficulties under the direction of Philip II. His early career was that of a government official and diplomatist. In 1563 he gained the king's confidence as his representative at Rome. In 1568 he was appointed lieutenant-general to Don John of Austria during the suppression of the Morisco revolt in Granada, and he also accompanied Don John during the Lepanto campaign, his function being to watch and control his nominal commander- in-chief, whose excitable temperament was distrusted by the king. Philip must have been satisfied with Requesens, for he named him viceroy in Milan, a post usually given to a great noble. Requesens was only " a gentleman of cloak and sword " {caballero de capa y espada), though by the king's favour he was " grand commander " of the military order of Santiago in Castile. He was credited with having shown moderation at Milan, but it is certain that he came into sharp collision with the archbishop, Saint Charles Borromeo, who took up the cause of his flock. His docility rather than his capacity marked him out to succeed Alva. The king wished to pursue a more conciliatory policy, without, however, yielding any one of the points in dispute between himself and the revolted Netherlanders. Requesens came to Brussels on the 17th of November 1573, and till his death on the 5th of March 1576 was plunged into insuperable difficulties. With an empty treasury and unpaid mutinous troops, no faculty could have helped Requesens to succeed; and he was only an honest official who was worn out in trying to do the impossible.

Authorities. — Documentos Inkditos para la historia de Espana (Madrid, 1892); and Nueva Coleccion de documentos, vols. iv. and v. (Madrid).

REQUEST, LETTERS OF. The legal terms “letters rogatory,” or ” of request ” {commission rogatoire), express a request made by one judge for the assistance of another in serving a citation, taking the deposition of a witness, executing a judgment, or the performance of any other judicial act. The later law of Rome imposed a duty of mutual assistance on the courts of the Empire, and this was extended to the courts of different states when, and so far as, Roman law came to rule the modern world. Consequently, outside ecclesiastical law (see below), the only trace of such a practice to be found in England or the United States, independent of statutory enact- ment, is in the admiralty doctrine that the sentence of a foreign court of admiralty may be executed on letters of request from the foreign judge or on a libel by a party for its execution. See the authorities collected by Sir R. Phillimore in The City of Mecca, 5 P.D. 28. The need of assistance in taking the deposi- tions of witnesses outside their jurisdiction was long in being felt by the British and United States courts, because they issued commissions for that purpose to private persons, some- times to foreign judges in their private capacities. But an increasing sensitiveness as to the rights of sovereignty led to

objection being taken to the execution of such commissions by- persons who in that employment were officers of courts foreign to the countries in which they acted, besides which those com- missions could give no power to compel the attendance of witnesses abroad. Consequently both in the mother country and in the United States acts have been passed empowering the courts to issue commissions for taking evidence to colonial or foreign courts, and to execute such commissions when received by them from the courts of the colonies or of foreign countries. The British statutes are 13 Geo. III. c. 63; 1 Will. IV. c. 22; 3 & 4 Vict. c. 105, 6 & 7 Vict. c. 82, 22 Vict. c. 20 and 48 & 49 Vict. c. 74. But neither in England nor in the United States have commissions of the old kind been entirely disused. In the practice under the Anglo-American statutes, the leading rules are that all the acts of the judge whose services are required, and all things done before him, are governed by the law of the country in which the execution takes place (locus regit actum), while the admissibility of the evidence and all else which concerns the conduct of the action is governed by the law of the country in which it is pending (lex fori) . Details may be seen for England and the United States in the usual books of practice, and in Wharton’s Conflict of Laws (2nd ed., 1881), §§ 722-31, and Sir R. Phillimore’s International Law (3rd ed., 1889),

v. 4, §§ 882-85; for other countries in von Bar's Private International Law, translated by Guthrie (2nd ed., 1892), §§ 3 0I > 39 2 > 4°9) 4 IQ – I n ecclesiastical law, letters of request are issued for the purpose of sending causes from one court to another. .Where a diocesan court within a province has juris- diction over the parties concerned, the plaintiff may apply to the judge of such court for letters of request, in order that the cause may be instituted either in the court of arches or the chancery court of York, as the case may be. When the judge of the diocesan court consents to sign such letters and they have been accepted by the judge of the higher court, a decree issues under his seal, calling upon the defendant to answer to the plaintiff in the suit instituted against him. Letters of request are also issued for other purposes, being sometimes sent from one judge to another to request him to examine witnesses who are out of the jurisdiction of the former, but in that of the latter; to enforce a monition, &c.

REQUESTS, COURT OF, a minor court of the king's council in England, under the presidency of the lord keeper of the privy seal. Its possible origin has been assigned to an order in council of 1390 directing the lords of the council to form a committee to examine the petitions of the humble people. Its jurisdiction was chiefly equitable, and owing to the small expenses of procedure it grew in popularity, especially for, cases not of sufficient importance to bring into the court of chancery itself. Under Wolsey the court was fixed permanently at Whitehall. The judges of the court were styled masters of requests. In the reign of Queen Elizabeth there were two masters ordinary and two masters extraordinary. In James I.'s reign there were four masters ordinary. In Henry VIII. 's reign the judges of the court had ceased to be privy councillors, and towards the end of Elizabeth's reign the court incurred the hostility of the common law courts, as having neither a statutory nor prescriptive title to jurisdiction. Notwithstanding a decision in 1598 as to the illegality of its jurisdiction, and subsequent decisions to the same effect in the reigns of James I. and Charles I., it continued to flourish until the suppression of the Star Chamber in 1640 virtually put an end to it. Although it sat until 1642, and masters of requests were appointed even after the Restora- tion, it ceased to exercise judicial functions. There were also courts of requests or, as they were sometimes called, courts of conscience, established in London in the reign of Henry VIII. with jurisdiction in matters of debt under forty shillings. These courts were extended in the reigns of George I. and George II. to various places in England, but they were abolished by an act of 1846 (County Courts Act), which established in their place the tribunal of the county court (q.v.).

REQUIEM, the name of a solemn mass for the dead (Missa pro defunctis) in the Roman Church, appointed to be sung on

All Souls' Day, in memory of all " faithful departed," at funeral services, and at the anniversaries of the death of particular persons. The name is taken from the first words of the Introit, Requiem aeternam dona eis, Domine. The term is specially applied to the musical setting of the mass. The most celebrated Requiem Masses are those of Palestrina, Mozart and Cherubini The word has been also used of memorial services held in honour of a deceased person in churches other than the Roman.

REREDOS (Anglo-Fr. areredos, from arere, behind, and dos, back), an ornamental screen of stone or wood built up, or forming a facing to the wall behind an altar in a church. Reredoses are frequently decorated with representations of the Passion, niches containing statues of saints, and the like. In England these were for the most part destroyed at the Reforma- tion or by the Puritans later; a few medieval examples, however, survive, e.g. at Christchurch, Hants. In some large cathedrals e.g. Winchester, Durham, St Albans, the reredos is a mass of splendid tabernacle work, reaching nearly to the groining. In small churches the reredos is usually replaced by a hanging or parament behind the altar, known as a dossal or dorsal. (See also Altar.) For the legality of images on reredoses in the Church of England, see Image.

The use of the word reredos for the iron or brick back of an open fire-place is all but obsolete.

RESCHEN SCHEIDECK. This Alpine pass is in some sort the pendant of the Brenner Pass, but leads from the upper valley of the Inn or Engadine to the upper valley of the Adige. It is but 4902 ft. in height. Near the summit is the hamlet of Reschen, while some way below is the former hospice of St Valentin auf der Haid, mentioned as early as 1140. Start- ing from Landeck, the carriage road runs up the Inn valley to Pfunds, whence it mounts above the gorge of Finstermiinz to the village of Nauders (27! m.) where the road from the Swiss Engadine falls in (535 m. from St Moritz). Thence the road mounts gently to the pass, and then descends, with the infant Adige, to Mais (155 m.), whence the pass is sometimes wrongly named Malserheide. The road now descends the upper Adige valley, or Vintschgau, past Meran (37} m.) to Botzen (20 m. from Meran, or 100 m. from Landeck) where the Brenner route is joined. (W. A. B. C.)

RESCUE (in Middle Eng. rescous, from O. Fr. recousse, Low Lat. rescussa, from reexcussa, reexcutere, to shake off again, re, again, ex,

off, quatere, to shake), the forcible setting at liberty of a person or thing. To constitute the legal offence of rescue, the person rescued must be in the custody of a constable or private individual, but in the latter case the rescuer must know that the prisoner is in lawful custody. The punishment for the offence is fine and imprisonment, with or without hard labour, if the party rescued has not been convicted of the offence for which he was in custody. But if the prisoner has been imprisoned on a charge of, or under sentence for, high treason, felony or misdemeanour, the rescue is high treason, felony or misdemeanour. The punishment for a felonious rescue may be penal servitude for not more than seven or less than three years, or imprisonment for not more than two years, with or without hard labour. The forcible rescue of goods legally distrained or the rescuing of cattle by pound breach are misdemeanours indictable at common law, but the more usual procedure is a civil action under 2 W. & M. c. 5, s. 3 (1690), which makes an offender liable for treble damages.

RESEARCH (0. Fr. recerche, from recercher, re- and cercer, mod. chercher, to search; Late Lat. circare, to go round in a circle, to explore), the act of searching into a matter closely and carefully, inquiry directed to the discovery of truth, and in particular the trained scientific investigation of the principles and facts of any subject, based on original and first-hand study of authorities or experiment. Investigations of every kind which have been based on original sources of knowledge may be styled ” research,” and it may be said that without ” research ” no authoritative works have been written, no scientific discoveries or inventions made, no theories of any value propounded; but the word also has a somewhat restricted

meaning attached to it in current usage. It is applied more particularly to the investigations of those who devote them- selves to the study of pure as opposed to applied science, to the investigation of causes rather than to practical experiment; thus while every surgeon or physician who treats an individual case of cancer may add to our sum of knowledge of the disease, the body of trained investigators which is endowed by the Cancer Research Fund are working on different lines. Again, the practical engineers who are building aeroplanes, and those who are making practical tests by actual flight in those machines, cannot be called “researchers”; that term should be con fined to the members, for example, of the scientific committee appointed by the British Government in 1909 to make investiga- tions regarding aerial

construction and navigation. Further, the term is particularly used of a course of post-graduate study at a university, for which many universities have provided special Research Studentships or Fellowships. These act as endowments for a specific period, and are conditional on the holder devoting his time to the investigation at first hand of some specified subject.

RESENDE, ANDR& DE (1498-1573), the father of archae- ology in Portugal, began life as a Dominican friar, but about 1340 passed over to the ranks of the secular clergy. He spent many years travelling in Spain, France and Belgium, where he corresponded with Erasmus and other learned men. He was also intimate with King John III. and his sons, and acted as tutor to the Infante D. Duarte. Resende enjoyed considerable fame in his lifetime, but modern writers have shown that he is neither accurate nor scrupulous. In Portuguese he wrote:

(1) Historia da antiguidade da cidade de Evora (ibid. 1553);

(2) Vida do Infante D. Duarte (Lisbon, 1789). His chief Latin work is the De Antiquitatibus Lusitaniae (Evora, 1593).

See the ” Life ” of Resende in Farinha’s Colleccao das antiguidades de Evora (1785), and a biographical-critical article by Rivara in the Revista Litteraria (Oporto, 1839), iii. 340-62; also Cleynarts, Latin Letters. (E. Pr.)

RESENDE, GARCIA DE (1470-1536), Portuguese poet and editor, was born at Evora, and began to serve John II. as a page at the age of ten, becoming his private secretary in 1491. He was present at his death at Alvor on the 25th of October 1495. He continued to enjoy the same favour with King Manoel, whom he accompanied to Castile in 1498, and from whom he obtained a knighthood of the Order of Christ. In 1514 Resende went to Rome with Tristao da Cunha, as secretary and treasurer of the famous embassy sent by the king to offer the tribute of the East at the feet of Pope Leo X. In 1516 he was given the rank of a nobleman of the royal household, and became escrivao de fazenda to Prince John, afterwards King John III., from whom he received further pensions in 1525. Resende built a chapel in the monastery of Espinheiro near Evora, the pantheon of the Alemtejo nobility, where he was buried.

He began to cultivate the making of verses in the palace of John II., and he tells us how one night when the king was in bed he caused him (Resende) to repeat some ” trovas ” of Jorge Manrique, saying it was as needful for a man to know them as to know the Pater Noster. Under

these conditions, Resende grew up no mean poet, and moreover distinguished himself by his skill in drawing and music; while he collected into an album the best court verse of the time. The Cancioneiro Geral, probably begun in 1483 though not printed until 1516, includes the com- positions of some three hundred fidalgos of the reigns of kings Alphonso V., John II. and Manoel. The main subjects of its pieces are love, satire and epigram, and most of them are written in the national redondilha verse, but the metre is irregular and the rhyming careless. The Spanish language is largely employed, because the literary progenitors of the whole collection were Juan de Mena, Jorge Manrique, Boscan and Garcilasso. As a rule the compositions were improvised at palace entertainments, at which the poets present divided into two bands, attacking and defending a given theme throughout successive evenings. At other times these poetical soirees took the form of a mock trial at law, in which the queen of John II. acted as judge.

Resende was much twitted by other rhymesters on his' corpulence, but he repaid all their gibes with interest.

The artistic value of the Cancioneiro Geral is slight. Con- ventional in tone, the greater part are imitations of Spanish poets and show no trace of inspiration in their authors. The Cancioneiro is redeemed from complete insipidity by Resende himself, and his fine verses on the death of D. Ignez de Castro inspired the great episode in the Lusiads of Camoens (q.v.). Resende is the compiler of a gossiping chronicle of his patron John II., which, though plagiarized from the chronicle by Ruy de Pina (q.v.), has a value of its own. The past lives again in these pages, and though Resende's anecdotes may be unim- portant in themselves, they reveal much of the inner life of the rsth century. Resende's Miscellanea, a rhymed commentary on the most notable events of his time, which is annexed to his Chronicle, is a document full of historical interest, and as a poem not without merit. The editions of his Chronicle are those of 1545. 1554, 1596) 1607, 1622, 1752 and 1798.

His Cancioneiro appeared in 1516, and was reprinted by Kausler at Stuttgart in 3 vols., 1846-52. A new edition has recently come from the university press at Coimbra. For a critical study of his work, see Excerptos, seguidos de uma noticia sobre sua vida e obras, um juizo critico, apreciacdo de bellezas e defeitos e estudo da lingua, by Antonio de Castilho (Paris, 1865). Also As sepulturas do Espinheiro, by Anselmo Braamcamp, Freire Lisbon, 1901, passim, especially pp. 67-80, where the salient dates in Resende's life are set out from documents recently discovered ; and Dr Sousa Viterbo, Diccionario dos

Architects . . . Portuguezes, ii. 361-74. (E. Pr.)

RESERVATION (Lat. reservare, to keep back), the act or action of keeping back or withholding something. There are some technical uses of the term. .In English law ” reservation ” is used of the retention by the vendor or lessor, in a conveyance or lease, of some right or interest, which without such reservation would have passed to the purchaser or tenant; such ” reserva- tions ” usually are concerned with rights of way or other ease- ments or sporting rights. In ecclesiastical usage, the term is applied to the practice of preserving unconsumed a portion of the consecrated elements after the celebration of the Eucharist. For the history of this practice and its usage in the Roman, Greek and English churches, see Eucharist, § Reservation of the Eucharist. In the Roman Church, where the pope retains for himself the right to nominate to certain benefices, that action is termed, technically, “reservation.” When in making a state- ment, taking an oath, &c, a person qualifies that statement in his mind, or withholds Some fact, word or expression which, if expressed, would materially alter the effect of his statement or oath, such qualification is termed a ” mental reservation,” or, in the technical language of casuistry, ” mental restriction ” (see Liguori). The system of providing special tracts of land exclusively for the tribes of American Indians, adopted in the United States of America and in Canada, is known as the Reser- vation system, and such tracts are styled Indian Reservations. (See United States and Canada.)

RESHT, the capital of the province of Gilan in Persia, in 37 17′ N., and 49° 36′ E., on the left bank of the Siah-rud (Black river) , which is a branch of the Sefid-rud (White river) , and flows into the Murdab, lagoon of Enzeli. The distance from Enzeli, the port of disembarcation from Russia, on the S. shore of the Caspian, to Resht is 14 m. in a direct line, and is accomplished in an open boat, or (since 1892), depth of water permitting, in a small steamboat to Pir-i-Bazar and thence 6 m. on a good road by carriage. Resht has a population of 60,000 and is the residence of English, Russian, French and Turkish consuls and the seat of the governor-general of the province of Gilan. The town is situated in low, malarious ground, and was originally buried in jungle, but the Russians during their occupation of the place in T 7 2 3~34 cleared much timber and jungle and made some open spaces. The houses are red-tiled and raised from the ground, with broad verandahs and overhanging eaves. Conflagrations are frequent, particularly in the months of January and De- cember, when hot, dry winds resembling the Fohn of the Alps come down from the snow-capped Elburz. A good carriage

road constructed and worked by a Russian company and opened to traffic in 1899 connects Resht with Teheran via Kazvin.

The value of trade probably exceeds £2,000,000, principal exports being rice, raw silk, dry fruit, fish, sheep and cattle, wool and cotton, and cocoons, the principal imports sugar, cotton goods, silkworm " seed " or eggs (£70,160 worth in 1906-7), petroleum, glass and china. The trade in dried silk- worm cocoons has increased remarkably since 1893, when only 76,150 lb valued at £6475 were exported; during the year 1906-7 ending 20th March, 2,717,5401b valued at £238,000 were exported. There are telegraph and post offices and branches of the Imperial Bank of Persia and Banque d'Escompte.

Enzeli, the port of Resht in the S.E. corner of the Caspian, is 14 m. N. of Resht, in 37 29′ N., 49 28′ E. Pop. 4000. Between it and other ports in the Caspian communication is maintained by the mail-steamers of the Caucasus and Mercury Steam Navigation Company and many vessels of commercial firms with head offices chiefly at Baku. (A. H.-S.)

RESIDENCE (Latin, residere, to remain behind, to dwell, reside), in general, a place of abode. In law, it usually means continuance in a place. The ordinary meaning of the word has been defined as " the place where an individual eats, drinks and sleeps, or where his family or his servants eat, drink and sleep " (R. v. North Curry, 1825, 4 B. & C. 959). For certain purposes, however, a man may be said to have his residence not only where he sleeps, but also at his place of business. See Abode ; Domicile. In ecclesiastical law residence is the continuance of a spiritual person upon his benefice. As a general rule, it is necessary for every rector or vicar to reside within his parish, even though there may be no house of residence annexed to the benefice. But under certain circumstances the bishop of the diocese may grant a licence of non-residence (Pluralities Act

1838).

RESIDENT, a political agent or officer representing the Indian government in certain native states in India. He resides in the state and advises on all matters of government, legislative or executive. Residents are divided into three classes or ranks. In certain other dependencies or protectorates of the British Empire the representative

of the government is termed a resident or political agent, notably in Nepaul, Aden, Sarawak, British North Borneo, &c. In general, where the state to which a resident is attached is not an independent one, he exercises consular and magisterial functions.

For ” Resident ” as the title of a diplomatic agent see Diplo- macy.

RESIDUE (through the French, from the Lat. residuum, a remainder, from residere, to remain), in law, that which remains of a testator’s estate after all debts and legacies are discharged, and funeral, administration and other expenses paid. The person to whom this residue or surplus is left is termed the residuary legatee; should none be mentioned in the will the residue goes to the next of kin (see Executors and Admini- strators; Legacy; Will).

RESIN (through O.Fr. resine, modern resine, from Lat. resina, probably Latinized from Greek /Stjtij’j;, resin), a secretion formed in special resin canals or passages of plants, from many of which, such as, for example, coniferous trees, it exudes in soft tears, hardening into solid masses in the air. Otherwise it may be obtained by making incisions in the bark or wood of the secreting plant. It can also be extracted from almost all plants by treatment of the tissue with alcohol. Certain resins are obtained in a fossilized condition, amber being the most notable instance of this class; African copal and the kauri gum of New Zealand are also procured in a semi-fossil con- dition. The resins which are obtained as natural exudations are in general mixtures of different, peculiar acids, named the resin acids, which dissolve in alkalis to form resin soaps, from which the resin acids are regenerated by treatment with acids. They are closely related to the terpenes, with which they occur in plants and of which they are oxidation products. Examples of resin acids are abietic (sylvic) acid, CuHsgOj, occurring in

colophony, and pimaric acid, C20H30O2, a constituent of gallipot resin. Abietic acid can be extracted from colophony by means of hot alcohol; it crystallizes in leaflets, and on oxidation yields trimellitic, isophthalic and terebic acid. Pimaric acid closely resembles abietic acid into which it passes when dis- tilled in a vacuum; it has been supposed to consist of three isomers. Resins when soft are known as oleo-resins, and when containing benzoic or cinnamic acid they are called balsams. Other resinous products are in their natural condition mixed with gum or mucilaginous substances and known as gum-resins. The general conception of a resin is a noncrystalline body, insoluble in water, mostly soluble in alcohol, essential oils, ether and hot fatty oils, softening and melting under the influence of heat, not capable of sublimation, and burning with a bright but smoky flame. A

typical resin is a transparent or translucent mass, with a vitreous fracture and a faintly yellow or brown colour, inodorous or having only a slight turpentine odour and taste. Many compound resins, however, from their admixture with essential oils, are possessed of distinct and characteristic odours. The hard transparent resins, such as the copals, dammars, mastic and sandarach, are principally used for varnishes and cement, while the softer odoriferous oleo-resins (frankincense, turpentine, copaiba) and gum-resins contain- ing essential oils (ammoniacum, asafoetida, gamboge, myrrh, scammony) are more largely used for therapeutic purposes and incense. Amber (q.v.) is a fossil resin.

RESOLUTION, a word used in the two main senses, separa- tion and decision, of the verb ” to resolve ” (Lat. resolvere, to loose, unfasten), to separate anything into its constituent elements or component parts, hence, through the subsidiary meaning of to clear up doubts or difficulties, to settle, determine. The principal applications of the term in its first sense are to the separation of a body into its component parts by chemical process, or, to the eye, by the lens of a microscope or telescope; similarly, in mathematics, to the analysis of a velocity, force, &c, into components. In the second sense, beyond the general meaning of determination, firmness of character, a ” resolution ” is specifically a decision of opinion formally submitted to a legislative or other assembly and adopted or rejected by votes.

RESORCIN (meta-dioxybenzene), C 6 H4(OH) 2 , one of the dihydric phenols. It is obtained on fusing many resins (galbanum, asafoetida, &c.) with caustic potash, or by the distillation of Brazil-wood extract. It may be prepared synthetically by fusing meta-iodophenol, phenol meta-sulphonic acid, and benzene meta-disulphonic acid with potash; by the action of nitrous acid on meta-aminophenol; or by the action of 10% hydrochloric acid on meta-phenylene diamine (J. Meyer, Ber., 1897, 30, p. 2569). Many ortho and para-compounds of the aromatic series (for example, the brom-phenols, benzene para-disulphonic acid) also yield resorcin on fusion with caustic potash. It crystallizes from benzene in colourless needles which melt at 119 C. and boil at 276-5° C. (L. Calderon), or 280° C. (C. Graebe), and is readily soluble in water, alcohol and ether, but insoluble in chloroform and carbon bisulphide. It reduces Fehling’s solution, and ammoniacal silver solutions. It does not form a precipitate with lead acetate solution, as the isomeric pyrocatechin does. Ferric chloride colours its aqueous solution a dark violet, and bromine water precipitates tribromresorcin. Sodium amalgam reduces it to dihydroresorcin, which when heated to 150-160 C. with concentrated baryta solution gives 7-acetylbutyric acid (D. Vorlander) ; when fused with caustic potash, resorcin yields

phloroglucin, pyrocatechin and diresorcin. It condenses with acids or acid chlorides, in the presence of dehydrating agents, to oxyketones, e.g. with zinc chloride and glacial acetic acid at 145° C. it yields resacetophenone (HO) 2 C 6 H3-CO-CH 3 (M. Nencki andN. Sieber, Jour. prak. Chem., 1881 [2], 23, p. 147). With the anhydrides of dibasic acids it yields fluoresceins (q.v.). When heated with calcium chloride- ammonia to 200 C. it yields meta-dioxydiphenylamine (A. Seyewitz, Bull. Soc. Chim., 1890 [3], 3, p. 811). With sodium nitrite it forms a water-soluble blue dye, which is turned red by acids, and is used as an indicator, under the name of lacmoid

(M. C. Traub and C. Hock, Ber., 1884, 17, p. 2615). It condenses readily with aldehydes, yielding with formaldehyde, on the addition of, a little hydrochloric acid, methylene diresorcin [(HO)2-C6H 3] 2 - CH 2 , whilst with chloral hydrate, in the presence of potassium bisulphate, it yields the lactone of tetra-oxydiphenyl methane carboxylic acid (J. T. Hewitt and F. G. Pope, Jour. Chem. Soc, 1897, 71, p. 1084). In alcoholic solution it con- denses with sodium acetoacetate to form /3-methylumbelliferone, CioH 8 C>3 (A. Michael, Jour. prak. Chem., 1888 [2], 37, 470). With concentrated nitric acid, in the presence of cold concen- trated sulphuric acid, it yields trinitro-resorcin (styphnic acid), which forms yellow crystals, exploding violently on rapid heating.

In medicine, resorcin, which is official in the United States under the name of resorcinol, was formerly used as an anti- pyretic, but it has been given up. The dose is 2 to 8 grs. Used externally it is an antiseptic and disinfectant, and is used 5 to 10% in ointments in the treatment of chronic skin diseases such as psoriasis and eczema of a sub-acute character. Weak, watery solutions of resorcin (10 or 15 grs. to the ounce) are useful in allaying the itching in erythematous eczema. A 2% solution used as a spray has been used with marked effect in hay fever and in whooping-cough. In the latter disease 10 minims of the 2% solution has been given internally. It has also been employed in the treatment of gastric ulcer in doses of 2 to 4 grs. in pill, and is said to be analgesic and haemostatic in its action. In large doses it is a poison causing giddiness, deafness, salivation, sweating and convulsions. It is also worked up in certain medicated soaps. Mono-acetyl resorcin, CeHˆOHˆO-COCHs, is used under the name of

“euresol.”

Resaziirin, Ci 2 H 7 N04, obtained by the action of nitrous acid on resorcin (P. Weselsky and R. Benedikt, Monals., 1880, 1, p. 889), forms small dark red crystals possessing a greenish metallic glance. When dissolved in concentrated sulphuric acid and warmed to 210 C, the solution on pouring into water yields a precipitate of resorufin, O2H7NO3, an oxyphenoxazone, which is insoluble in water, but is readily soluble in hot concentrated hydro- chloric acid, and in solutions of caustic alkalis. The alkaline solutions are of a rose-red colour and show a cinnabar-red fluor- escence. A tetrabromresorufin is used as a dye-stuff under the name of Fluorescent Resorcin Blue.

Thioresorcin is obtained by the action of zinc and hydrochloric acid on the chloride of benzene meta-disulphonic acid. It melts at 27 C. and boils at 243 C. Resorcin disulphonic Acid (HO) 2 C6H 2 (HSOs)2, is a deliquescent mass obtained by the action of sulphuric acid on resorcin (H. Fischer, Monats., 1881, 2, p. 321). It is easily soluble in water and decomposes when heated to ioo* C.

RESPIRATORY SYSTEM. (1). Anatomy— The respiratory tract consists of the nasal cavities, the pharynx, the larynx, the trachea, the bronchi and the lungs, but of these the two first parts have been treated in separate articles (see Olfactory System and Pharynx).

The larynx is the upper part of the air tube which is specially modified for the production of notes of varying pitch, though it is not responsible for the whole of the voice. Its frame- work is made up of several cartilages which are moved on one another by muscles, and it is lined internally by mucous mem- brane which is continuous above with that of the pharynx and below with that of the trachea or windpipe. The larynx is situated in the front of the neck and corresponds to the fourth, fifth and sixth cervical vertebrae. For its superficial anatomy see Anatomy, Superficial and Artistic.

The thyroid cartilage (see fig. 1) is the largest, and consists of two plates or alae which are joined in the mid-ventral line. At the upper part of their junction is the thyroid notch and just below that is a forward projection, the pomum Adami, best marked in adult males. From the upper part of the posterior border of each aia the superior cornu rises up to be joined to the tip of the great cornu of the hyoid bone by the lateral thyro-hyoid ligament, while from the lower part of the same border the inferior cornu passes down to be fastened to the cricoid cartilage by the crico-thyroid capsule. From the upper

border of each ala the thyro-hyoid membrane runs up to the

hyoid bone, while near the back of the outer surface of each

the oblique line of

the thyroid cartilage /fH — ; — Epiglottis

runs downward and

forward.

The cricoid carti- lage (see figs. 1 and 2) is something like a signet ring with the' seal behind; its lower border, how- ever, is horizontal. To the mid-ventral part of its upper border is attached the mesial part of the crico – thyroid membrane, which attaches it to the lower border of the thyroid cartilage though the lateral parts of this mem- brane pass up in- ternally to the thyroid cartilage and their upper free edges form the true vocal cords. On the summit of the signet part

Hyoid bone

Cartilago 1

triticea Thyro-hyoid

membrane

•Superior cornu of thyroid cartilage

iiipenor

tubercle on the ala of thyroid cartilage Oblique line

Inferior tubercle Inferior cornu of

thyroid cartilage Crico-thyroid

membrane Cricoid cartilage

After D. J. Cunningham, from Cunningham's Text-Book of Anatomy.

Fig. I. — Profile View of the Cartilages and Ligaments of the Larynx.

of the cricoid are placed the two arytenoid cartilages (see fig. 2), each of which

Cartilago triticea

Thyro-epiglottidean ligament

Superior cornu of thyroid cartilage

‘Cartilage of Santorini ‘Arytenoid cartilage Muscular process of arytenoid cartilage

Inferior cornu of thyroid cartilage

After D. J. Cunningham, from Cunningham’s Text-book of Anatomy.

Fig. 2. — Cartilages and Ligaments of Larynx, as seen from behind.

forms a pyramid with its apex upward and with an anterior posterior and internal or mesial surface. The base articulates with the cricoid by a concave facet, surrounded by the crico-arytenoid capsule, and the two arytenoids are able to glide toward or away from one another, in addition to which each can rotate round a vertical axis. From the front of the base a delicate process projects which, as it is attached to the true vocal cord, is called the vocal process, while from the outer part of the base another stouter process

/Hyoid bone

Hyo-epiglottidean ligament

Cartilage of epiglottis Fatty pad Thyro-hyoid membrane

Thyroid cartilage

Elevation produced by

cuneiform cartilage False vocal cord

Philtrum ventriculi Elevation produced by

arytenoid cartilage Laryngeal sinus True vocal cord Arytenoid muscle

Processus vocalis

Cricoid cartilage Cricoid cartilage

attaches the two ˆcricoarytenoid muscles and so is known as the muscular process. Above each arytenoid are two smaller – cartilages known as the cornicula laryngis or cartilages of San- torini and the cuneiform cartilages, but they are not of any practical importance.

The epiglottis (see fig. 3), on the other hand, is a very important structure, since it forms a lid to the larynx in swallowing: only

the box moves up to the lid instead of the lid moving down to the box. It is leaf- shaped, the stalk (thyro-epiglottid e a n ligament) being at- tached to the junc- tion of the thyroid cartilages inside the larynx, while the anterior surface of the leaf is closely attached to the root of the tongue and body of the hyoid bone. The posterior or laryngeal surface is pitted for glands, and near the point where the stalk joins the leaf is a con- vexity which is known as the cus- hion of the epiglottis. All the cartilages of the larynx are of the hyaline variety except the epi- glottis, the corni- cula laryngis and the cuneiform carti- lages, which are yellow elastic. The result is that all except these three tend to ossify as middle age is approached.

The muscles of the larynx are: (1) the crico-thyroids, which are attached to the lower border of the thyroid and the .anterior part of the cricoid, by pulling up which they make the upper part of the signet, with the arytenoids attached to it, move back and so tighten the vocal cords. (2) The thyro-arytenoids (see fig. 4), which run back from the junction of the thyroid alae to the front of the arytenoids and side of the epiglottis; they pull the arytenoids toward the thyroid and so relax the cords.

(3) The single arytenoideus muscle, which runs from the back of one arytenoid to the other and approximates these cartilages.

(4) The lateral crico-arytenoids (see fig. 4) which draw the muscular processes of the arytenoids forward toward the ring of the cricoid and, by so doing, twist the vocal processes, with the cords attached, inward toward one another; and (5) the posterior crico-arytenoids (see fig. 4) which run from the back of the signet part of the cricoid to the back of the muscular processes of the arytenoid and, by pulling these backward, twist the vocal processes outward and so separate the vocal cords. All these muscles are supplied by the recurrent laryngeal nerve, except the crico-thyroid which is innervated by the external branch of the superior laryngeal (see Nerves, Cranial).

The mucous membrane of the larynx is continuous with that of the pharynx at the aryteno-epiglottidean folds which run from the sides of

the epiglottis to the top of the arytenoid cartilages (see (fig. 3). To the outer side of each fold is the sinus pyriformis (see Pharynx). From the middle of the junction of the alae of the thyroid cartilage to the vocal processes of the arytenoids the mucous membrane is reflected over, and closely bound to, the true vocal cords which contain elastic tissue and, as has

After D. J. Cunningham, from Cunningham's Text-Book ;' of Anatomy.

Fig. 3. — Mesial Section through Larynx to show the outer wall of the right half.

been mentioned, are the upper free edges of the lateral parts of the crico-thyroid membrane. The chink between the two

Epiglottis

Aryteno-epiglottidean muscle

Cuneiform cartilage Thyro-epiglottidean muscle

Thyro-hyoid membrane

iaccule of larynx Muscular process of arytenoid cartilage

-Thyro-arytenoid muscle

'Thyroid cartilage

Crico-arytenoideus lateralis

-Crico-arytenoideus posticus Crico-thyroid membrane

Cricoid cartilage

After D. J. Cunningham, from Cunningham's Text-Book of Anatomy.

Fig. 4. — Dissection of the Muscles in the Lateral Wall of the Larynx. The right ala of the thyroid cartilage has been removed.

true vocal cords is the glottis or rima glottidis. Just above the true vocal cords is the opening into a recess on each side which runs upward and backward and is known as the laryngeal saccule; its opening is the laryngeal sinus. The upper lip of this slit-like opening is called the false weal cord.

The mucous membrane is closely bound down to the epiglottis and to

the true vocal cords, elsewhere there is plenty of sub- mucous tissue in which the products of inflammation may collect and cause ” oedema laryngis,” a condition which is mechanically prevented from passing the true vocal cords. In the upper part of the front and sides of the larynx and over the true vocal cords the mucous membrane is lined by squamous epithelium, but elsewhere the epithelium is of the columnar ciliated variety: it is supplied by the superior laryngeal branch of the vagus nerve and above the glottis is peculiarly sensitive.

The Trachea or windpipe (see fig. 5) is the tube which carries the air between the larynx and the bronchi; it is from four to four and a half inches long arid lies partly in the neck and partly in the thorax. It begins where the larynx ends at the lower border of the sixth cervical, and divides into its two bronchi opposite the fifth thoracic vertebra. The tube is kept always open by rings of cartilage, which, however, are wanting behind, and, as it passes down, it comes to lie farther and farther from the yentral surface of the body, following the concavity of the thoracic region of the spinal column. In the whole of its downward course it has the oesophagus close behind it, while in front are the isthmus of the thyroid, the left innominate vein, the innominate artery and the arch of the aorta. On each side of it and touching it is the vagus nerve.

The cervical part of the tube is not much more than an inch in length, but it can be lengthened by throwing back the head. This, of course, is the region in which tracheotomy is performed, and it should be remembered that in children, and sometimes in adults, the great left innominate vein lies above the level of the top of the sternum.

In transverse section the trachea is rather wider from side to side than from before backward. In life the former measure- ment is said to be about 12-5 mm. and the latter 11 mm. It is made up of an external fibro-elastic membrane in which the cartilaginous rings lie, while behind, where these rings are wanting, is a layer of unstriped muscle which, when it contracts,

draws the hind ends of the rings together and so diminishes the calibre of the tube. Inside these is plentiful submucous tissue

Thyroid cartilage

4-Crico-thyroid membrane

T- Cricoid cartilage

/ Part of trachea covered by

isthmus of thyroid body

Common carotid artery

Subclavian artery

Hyparterial bronchi

Pulmonary artery After D. J. Cunningham, from Cunningham's Text-Book of Anatomy.

Fig. 5. — The Trachea and Bronchi; The thyroid body is indicated by a dotted line.

containing mucous glands and quantities of lymphoid tissue, while the whole is lined internally by columnar ciliated epithelium.

The Bronchi (see fig. 5) are the two tubes into which the trachea divides, but, since the branches, which these tubes give off later, are also called bronchi, it may be clearer to speak of primary, secondary and tertiary bronchi. Each primary bronchus runs downward and outward, but the right one is more in a line with the direction of the trachea than the left. The right primary bronchus has also a greater calibre than the left because the right lung is the larger, and for these two reasons when a foreign body enters the trachea it usually enters the right bronchus.

The first secondary bronchus comes off about an inch from the bifurcation of the trachea on the right side and, as it lies above the level of the pulmonary artery, it is known as the eparterial bronchus. On the left side the first branch is about two inches from the bifurcation and, like all the remaining secondary bronchi, is hyparterial: the left primary bronchus is therefore twice as long as the right. After the eparterial secondary bronchus is given off the direction of the right primary bronchus is carried on by the hyparterial secondary bronchus,

and this, just before reaching the hilum of the lung, divides into upper and lower tertiary bronchi, while the left lower secondary hyparterial bronchus does not divide before reaching the hilum of its lung. Into

the hilum or root of the right lung, therefore, three bronchial tubes enter, while on the left side there are only two. The firmly rooted habit of associating the term bronchi with those parts of the main tubes which lie between the bifurcation of the trachea and the point where the first branch comes off makes it very difficult to suggest a nomen- clature which calls up any picture of the actual state of things to the mind. Certainly the classification into primary, secondary and tertiary bronchi only goes a very little way toward this, and it should be realized that, call them what we may, there are two long tapering tubes which run from the bifurcation of the trachea to the lower and back part of each lung, and give off a series of large ventral and small dorsal branches. The upper part of each of these long tubes or stem bronchi is outside the lung and in the middle mediastinum of the thorax, the lower part embedded in the substance of the lung. The structure of the bronchi is practically identical with that of the trachea. (See G. S. Huntington's " Eparterial Bronchial System of the Mammalia," Am. Journ. Med. Sci. (Phila. 1898). See also Quain's Anatomy, London, last edition.)

The Lungs are two pyramidal, spongy, slate-coloured, very vascular organs in which the blood is oxygenated. Each lies in its own side of the thorax and is surrounded by its own pleural cavity (see Coelom and Serous Membranes), and has an apex which projects into the side of the root of the neck, a base which is hollowed for the convexity of the diaphragm, an outer surface which is convex and lies against the ribs, an inner surface concave for the heart, pericardium and great vessels, a sharp anterior border which overlaps the pericardium and a broad, rounded posterior border which lies at the side of the spinal column. Each lung is nearly divided into two by a primary fissure which runs obliquely downward and forward, while the right lung has a secondary fissure which runs horizontally forward from near the middle of the primary fissure. The left lung has therefore an upper and lower or basal lobe, while the right has upper, middle and lower lobes. On the inner surface of each lung is the root or hilum at which alone its vessels, nerves and ducts (bronchi) can enter and leave it. The structures contained in the root of each lung are the branches and tribu- taries of (1) the pulmonary artery, (2) the pulmonary veins, (3) the bronchi, (4) the bronchial arteries, (5) the bronchial veins, (6) the bronchial lymphatic vessels and glands, (7) the pulmonary plexuses of nerves. Of these the first three are the largest and, in dividing the root from in front, the veins are first cut, then the arteries and last the bronchi. As has been pointed out already, the eparterial bronchus on the right side is above the level of the artery, but all the others (hyparterial) are on a lower level.

The bronchial arteries supply the substance of the lung; there are usually two on each side, and they lie behind the bronchi. The blood which they carry is chiefly returned by the pulmonary veins bringing oxidized blood back to the heart, so that here there is a normal and harmless mixture of arterial and venous blood. If there are any bronchial veins (their presence is doubted by some, and the writer has himself carefully but unsuccessfully searched for them several times), they open into the azygos veins of their own side. The bronchial lymphatic vessels lie behind the pulmonary vessels and open into several large glands which are black from straining off the carbon left iii the lungs from the atmosphere.

There is an anterior and posterior pulmonary plexus of nerves on each side, the fibres of which are derived from the vagus and the upper thoracic ganglia of the sympathetic.

Structure of the Lungs. — As the bronchi become smaller and smaller by repeated division, the cartilage completely surrounds them and tends to form irregular plates instead of rings —they are therefore cylindrical, but when the terminal branches (lobular bronchi) are reached, the cartilage disappears and hemispherical bulgings called alveoli occur (fig. 6 A). At the very end of

Fig. 6. — Diagram of Two Lobules of the Lung. B. Bronchus. A. Alveolus. I. Infundibulum. L.B. Lobular bron- chus. At. Atrium. Lob. Lobule.

each lobular bronchus is an irregular chamber, the atrtum (fig. 6 At), and from this a number of thin- walled sacs, about

1 mm. in diameter, open out. These are called the infundibula (fig. 6 I), and their walls are pouched by hemispherical air-cells or alveoli like those in the lobular bronchi. Each lobular bronchus with its atrium and infundibula forms what is known as a lobule of the lung, and these lobules are separated by connective tissue, and their outlines are evident on the surface of the lung. The muscular tissue, which in the larger tubes was confined to the dorsal part, forms a complete layer in the smaller; but when the lobular bronchi are reached, it stops and the mucous membrane is surrounded by the elastic layer. In the lobular bronchi, too, the lining epithelium

gradually changes from the ciliated to the stratified or pavement variety, and this is the only kind which is found in the infundibula and alveoli. Sur- rounding each alveolus is a plexus of capillary vessels so rich that the spaces between the capillaries are no wider than the capillaries themselves, and it is here that the exchange of gases takes place between the air and the blood.

Embryology. — The respiratory system is developed from the ventral surface of the foregut as a long gutter-like pouch which reaches from just behind the rudiment of the tongue to the stomach. Limiting the anterior or cephalic end of this is a fl-shaped elevation in the ventral wall of the pharynx which separates the ventral ends of the third and fourth visceral bars and is known as the furcula; it is from this that the epiglottis, aryteno-epiglottidean folds and arytenoid cartilages are developed. Later on the respiratory tube is separated from the digestive by two ridges, one on each side, which, uniting, form a transverse partition. In the region of the furcula, however, the partition stops and here the two tubes communicate. The caudal end of the respiratory tube buds out into the two primary bronchi, and the right one of these, later on, bears three buds, while the left has only two; these are the secondary bronchi, which keep on dividing into two, one branch keeping the line of the parent stem to form the stem bronchus, while the other goes off at an angle. By the repeated divisions of these tubes the complex ” bronchial tree ” is formed and from the terminal shoots the infundibula bud out. The alveoli only develop in the last three months of foetal life. The thyroid cartilage is probably formed from the fourth and fifth branchial bars, while the cricoid seems to be the enlarged first ring of the trachea. Before birth the lungs are solid and much less vascular than after breathing is established. Their slaty colour is gradually gained from the deposit of carbon from the atmosphere. (For further details see Quain’s Anatomy, vol. i., Lond. 1908.)

Comparative Anatomy. — It has been shown (see Pharynx) that in the lower vertebrates respiration is brought about by the blood vessels surrounding the gill clefts. In the higher fishes (Ganoids and Teleosteans) the ” swim bladder ” appears as a diverticulum from the dorsal wall of the alimentary canal, and its duct (d. pneumaticus) sometimes remains open and at others becomes a solid cord. In the former case it is probable that the blood is to some extent oxidized in the vascular wall of this bladder. In the Dipnoi (mud-fish) the opening of the swim bladder shifts to the ventral side of the pharynx and the bladder walls become sacculated and very vascular, so that, when the rivers are dried up, the fish can breathe altogether by means of it. In the S. American and African species of mud-fish the bladder or lung,

as it may now be called, is divided by a longitudinal septum in its posterior (caudal) part into right and left halves. In this sub-class of Dipnoi, therefore, a general

agreement is seen with the embryology or ontogeny of Man's lungs. In the Amphibia the two lungs are quite separate though they are mere sacculated bags without bronchi. A trachea, however, appears in some species (e.g. Siren) and a definite larynx with arytenoid cartilages, vocal cords and complicated muscles is established in the Anura (frogs and toads). In most of the Reptilia the bag-like lungs are elaborated into spongy organs with arborizing bronchi in their interior. From the crocodiles upward a main or stem bronchus passes to the caudal end of the lung, and from this the branches or lateral bronchi come off. The larynx shows little advance on that of the Anura.

The respiratory organs of birds are highly specialized. The larynx is rudimentary, and sound is produced by the syrinx, a secondary larynx at the bifurcation of the trachea; this may be tracheal, bronchial or, most often, tracheo-branchial. The lungs are small and closely connected with the ribs, while from them numerous large air sacs extend among the viscera, muscles and into many of the bones, which, by being filled with hot air, help to maintain the high temperature and lessen the specific gravity of the body. This pneumaticity of the bones is to a certain extent reproduced by the air sinuses of the skull in crocodiles and mammals, and it must be pointed out that the amount of air in the bones does not necessarily correspond with the power of flight, for the Ratitae (ostriches and emeus) have very pneumatic bones, while in the sea-gulls they are hardly pneumatic at all.

In mammals the thyroid cartilage becomes an important element in the larynx, and in the Echidna the upper and lower parts of it, derived respectively from the fourth and fifth branchial bars, are separate (R. H. Burne, Journ. Anat. and Phys. xxxviii. p. xxvii.). The whole larynx is much nearer the head than in Man, and in young animals the epiglottis is intra-narial, i.e. projects up behind the soft palate. This pre- vents the milk trickling into the larynx during suckling, and is especially well seen in the Marsupials and Cetacea, though evidences of it are present in the human embryo. In the lower mammals an inter-arytenoid cartilage is very frequent (see J. Symington, " The Marsupial Larynx," /. Anat. and Phys. xxxiii. 31, also " The Monotreme Larynx," ib. xxxiv. 90).

The lungs show a good deal of variation in their lobulation; among the porcupines as many as forty lobes have been counted in the right lung, while in other mammals no lobulation at all could be made out. The

azygous lobe of the right lung is a fairly constant structure and is situated between the post-caval vein and the oesophagus. It is supplied by the terminal branch of the right stem bronchus and, although it is usually absent in Man, the bronchus which should have supplied it is always to be found. (F. G. PO

• (2) Physiology

So far as is known, the intake'of oxygen, either free or combined, and the output of carbon dioxide, are an essential part of the life of all organisms. The two processes are so closely associated with one another that they are always included together under the designation of respiration, which may thus be defined as the physiological process which is concerned in the intake of oxygen and output of carbon dioxide. According to the evidence at present available, it is only within living cells that the respiratory oxygen is consumed and the carbon dioxide formed. The mere conveying of oxygen from the surrounding air or water to these cells, and of carbon dioxide from them to the air or water, is, however, in itself a complex process in the higher animals; and accordingly an account of animal respiration naturally falls into two divisions, the first of which (I.) is concerned with the manner in which oxygen and carbon dioxide are conveyed to and from the living tissues, and the second (II.) with the consumption of oxygen and formation of carbon dioxide by the living tissues themselves.

I. In all the more highly organized animals there are special respiratory organs: the lungs in the higher vertebrates; the gills in fishes; the tracheae in insects; and various rudimentary forms of lungs or gills in other higher invertebrate's. In the

present article attention will be specially confined to the case of the higher vertebrates, and in particular to man.

Air is brought into the lungs by the movements of breathing (see above, Movements of Respiration). Oxygen from this air passes through the delicate lining membrane of the air-cells of the lungs into the blood, where it enters into loose chemical combination with the haemoglobin of the red corpuscles (see Blood). In this form it is conveyed onwards to the heart, and thence through the arteries to the

capillaries, where it again parts from the haemoglobin, and passes through the capillary walls to the tissues, where it is consumed. Carbon dioxide passes out from the tissues into the blood in a corresponding manner, enters into loose combination as bicarbonate, and possibly in other ways, in the blood, and is conveyed by the veins to the lungs, whence it passes out in the expired air. Pure atmospheric air contains 20-93% of oxygen, -03% of carbon dioxide and 79-04% of nitrogen (with which is mixed about 0.9% of argon). The dried expired air in man contains about 3-5% of carbon dioxide and 17% of oxygen, so that roughly speaking the carbon dioxide is increased by about 3-5% and the oxygen diminished by 4%. Expired air as it leaves the body contains about 6 % of moisture, compared with usually about 1 % in the inspired air. The added moisture and higher temperature of expired air make it decidedly lighter than pure air.

Owing to the unpleasant effects often produced in badly ventilated rooms it was for long supposed that some poisonous volatile ” organic matter ” is also given off in the breath. Careful investigation has shown that this is not the case. The un- pleasant effects are partly due to heat and moisture, and partly to odours which are usually not of respiratory origin. The carbon dioxide present in the air of even very badly ventilated rooms is present in far too small proportions to have any sensible effect.

The average volume of air inspired per minute by healthy adult men during rest is about 7 litres or 25 cub. ft. In different individuals the frequency of breathing varies con siderably — from about 7 to 25 per minute, the depth of each breath varying about inversely as the frequency. During mus- cular work the volume of air breathed may be six or eight times as much as during rest. The volume of carbon dioxide given off varies from about half a cubic foot per hour during complete rest to s cub. ft. during severe exertion, but averages about 0-9 cub. ft. per hour, and will reach or exceed’ 1 cub. ft. per hour during even very light exertion. The volume of oxygen consumed is about a seventh greater than that of the carbon dioxide given off.

The breathing is regulated, from a nervous centre situated in the medulla oblongata, which is the lowest part of the brain. If this centre is destroyed or injured the breathing stops and death rapidly results. From the respiratory centre rhythmic efferent impulses proceed down the motor nerves supplying the diaphragm, intercostals and other respiratory muscles. Afferent impulses through various nerves may temporarily affect the rhythm of the respiratory centre. Of these afferent impulses by far the most important are those which proceed up the vagus nerve from the lungs themselves. On distention of the

lungs with air the inspiratory impulses from the respiratory centre are suddenly arrested or ” inhibited “; on the other hand, collapse of the lung strongly excites to inspiratory effort. On section of the vagus nerve these effects disappear, and the breathing becomes less frequent and much more laboured. The vagus nerve is thus the carrier of both inhibitory and exciting stimuli.

As the physiological function of breathing is to bring oxygen to and remove carbon dioxide from the blood, it would naturally be expected that breathing would be regulated in accordance with the amount of oxygen required and of carbon dioxide formed; but until quite recently the actual mode of regulation was by no means clear. It was commonly supposed that afferent nervous impulses in some way regulated the otherwise automatic action of the centre, want of oxygen or excess of

C0 2 in the blood being only an occasional and relatively unim- portant factor in the regulations. The phenomenon of “apnoea” or complete cessation of natural breathing which occurs after forced breathing, was attributed mainly to the already mentioned distension effect through the vagus nerves. To go further back still, it was even supposed that the rate and depth of breathing, and the percentage of oxygen in the inspired air, determine the consumption of oxygen and formation of carbon dioxide in the body, just, as the air-supply to a fire determines the rate of its combustion. This old belief is still often met with — for instance, in the reasons given for recommending ” breathing exercises ” as a part of physical training.

It is evident that if the breathing did not increase correspond- ingly with the greatly increased consumption of oxygen and formation of C0 2 which occurs, for instance during muscular work, the percentage of oxygen in the air contained in the lung cells or alveoli (alveolar air) would rapidly fall, and the per- centage of carbon dioxide increase. The inevitable result would be a very imperfect aeration of the blood. Investigation of the alevolar air has furnished the key to the actual regulation of breathing. Samples of this air can be obtained by making a sudden and deep expiration through a piece of long tube, and at once collecting some of the air contained in the part of this tube nearest the mouth. By this means it has been found that during normal breathing at ordinary atmospheric pressure the percentage of carbon dioxide (about 5-6% on an average for men) is constant for each individual, though different persons vary slightly as regards their normal percentage. The breathing is thus so regulated as to keep the percentage of carbon dioxide constant; and under normal conditions this regulation is surprisingly exact. The ordinary expired air is a

mixture of alveolar air and air from the ” dead space ” in the air passages. The deeper the breathing happens to be, the more alveolar air there will be in the expired air, and the higher, therefore, the percentage of carbon dioxide in it, so that the expired air is not constant in composition, though the alveolar air is. If air containing 2 or 3 % of carbon dioxide is breathed, the breathing at once becomes deeper, in such a way as to prevent anything but a very slight rise in the alveolar carbon dioxide percentage. The difference is scarcely appreciable subjectively, except during muscular exertion. The effect of 1 % of carbon dioxide in the inspired air is so slight as to be negligible, and there is no founda- tion for the popular belief that even very small percentages of carbon dioxide are injurious. With 4 or 5 % or more of carbon dioxide, however, much panting is produced, and the alveolar carbon dioxide percentage begins to rise appreciably, since compensation is no longer possible. As a consequence, headache and other symptoms are produced. If, on the other hand, the percentage of carbon dioxide in the alveolar air is abnormally reduced by forced breathing, the condition of apnoea is produced and lasts until the percentage again rises to normal, but no longer. Forced breathing with air containing more than about 4% of carbon dioxide causes no apnoea, as the alveolar carbon dioxide does not fall.

If oxygen is breathed instead of air there is no appreciable change in the percentage of carbon dioxide in the alveolar air, and no tendency towards apnoea. Want of oxygen is thus not a factor in the regulation of normal breathing. During muscular work the depth and frequency of breathing increase in such a way as to prevent the alveolar carbon dioxide from rising more than very slightly. It is still the carbon dioxide stimulus that regulates the breathing, although with excessive muscular work other accessory factors may come in to some extent.

Under increased barometric pressure the percentage of carbon dioxide in the alveolar air no longer remains constant; it diminishes in proportion to the increase of pressure. For instance, at a pressure of 2 atmospheres it is reduced to half, and at 6 atmospheres to a sixth; while at less than normal atmospheric pressure it rises correspondingly unless symptoms of want of oxygen begin to interfere with this rise. These results show that it is not the mere percentage, but the pressure (or “partial pressure”) of carbon dioxide in the

alveolar air that regulates breathing. The pressure exercised by the carbon dioxide in the alveolar air is of course propor- tional to its percentage, multiplied by the total atmospheric pressure. It follows from this law that at a pressure of 6 atmospheres 1% of carbon dioxide in the inspired air would have the same violent effect as 6% at the normal pressure of 1 atmosphere. To take a concrete practical application, if a diver whose head was just below water were supplied with sufficient air to keep the carbon dioxide percentage in the air of his helmet down to 3 % at most, he would be quite comfortable. But if, with the same air supply as measured at surface, he went down to a depth of 170 ft., where the pressure is 6 atmospheres, he would at once experience great distress culminating in loss of consciousness, owing, not to the pressure of the water, which has trifling effects, but to the pressure of carbon dioxide in the air he was breathing. The air supply must be increased in proportion to the increase of pressure if these effects are to be avoided, and ignorance of this has led to the common failure of diving work at considerable depths.

The foregoing .facts- enable us to understand the regulation of breathing under normal conditions. The pressure of carbon dioxide in the alveolar air evidently determines that of the carbon dioxide in the arterial blood, and the latter in its turn determines the carbon dioxide pressure in the respiratory centre, which is very richly supplied with blood. The centre itself is extremely sensitive to the slightest increase or diminution in carbon dioxide pressure; and thus it is that the alveolar carbon dioxide pressure is so important. That the stimulus of carbon dioxide is from the blood and not through nerves is proved by many experiments. The function of the vagus nerves in regulat- ing the breathing is apparently to, as it were, guide the centre in the expenditure of each separate inspiratory or expiratory effort; for as soon as inspiration or expiration is completed the inspiratory or expiratory effort is cut short by impulse pro- ceeding up the vagus nerve, and much waste of muscular work and risk of injury to the lungs is thereby prevented.

Under ordinary conditions the regulation of carbon dioxide pressure in the alveolar air ensures at the same time a normal pressure of oxygen, since absorption of oxygen and giving off of carbon dioxide normally run parallel to one another. If, however, air containing abnormally little oxygen is breathed, the normal relation between oxygen and carbon dioxide in the alveolar air is disturbed. A similar state of affairs is brought about by any considerable diminution of atmospheric pressure. Not only does the partial pressure of oxygen in the inspired air fall, but this fall is proportionally much greater in the alveolar air; and the effects of want of oxygen depend on its partial

pressure in the alveolar air. It has been known for long that any great deficiency in the proportion of oxygen in the air breathed increases the depth and frequency of the breathing; but this effect is not apparent until the percentage of oxygen or the barometric pressure is reduced by more than a third, which corresponds to a reduction of more than half in the alveolar oxygen pressure. In contrast with this an increase of a fiftieth in the alveolar carbon dioxide pressure has a marked effect on the breathing. Along with the increased breathing caused by deficiency of oxygen there is more or less blueness of the skin and abnormal effects of various kinds, such as partial loss of sensibility, memory and power of thinking. Long exposure often causes headache, nausea, sleeplessness, &c. — a train of symptoms known to mountaineers as “mountain sickness.” That the primary cause of ” mountain sickness ” is lack of oxygen owing to the low atmospheric pressure there is not the slightest doubt. Lack of oxygen is thus not only an important, but also an abnormal form of stimulus to the re- spiratory centre, since it is accompanied by quite abnormal symptoms. A further analysis of the special effect of lack of oxygen on the respiratory centre has shown that this effect still depends on the partial pressure of carbon dioxide in the alveolar air. The lack of oxygen appears, in fact, to have simply increased the sensitiveness of the centre to carbon dioxide, so that a lower partial pressure of carbon dioxide

excites the centre, and the breathing is correspondingly increased. By prolonged forced breathing so much carbon dioxide is washed out of the body that the subsequent apnoea lasts until the oxygen in the alveolar air is nearly exhausted. The subject of the experiment becomes very blue in the face and is partially stupefied by want of oxygen before he has any desire to breathe. The probable explanation of these facts is that want of oxygen does not itself excite the centre, but that some substance — very probably lactic acid, which is known to be formed abundantly — is produced abnormally in the body during exposure to want of oxygen and aids the carbon dioxide in exciting the centre. It is known that the blood becomes less alkaline at high altitudes, and that acids in general excite the centre. A person on a high mountain thus gets out of breath much more easily than at sea-level. The extra stimulus to the centre during work still comes from the extra carbon dioxide formed, but has a greater effect than usual on the breathing. If the extra stimulus came directly from want of oxygen the person on the mountain would probably turn blue and lose consciousness on the slightest exertion. By analysing the alveolar air it can be shown that after a time even a height of 5000 to 6000 ft., or a diminution of only a sixth in the barometric pressure, distinctly

increases the sensitive- ness of the respiratory centre to carbon dioxide, so that there seems to be a slow accumulation of acid in the blood. The effect also passes off very slowly on returning to normal pressure, although the lack of oxygen is at once removed.

The blueness of the skin (" cyanosis ") produced by lack of oxygen is due to the fact that the haemoglobin of the red corpuscles is imperfectly saturated with oxygen. Haemo- globin which is fully saturated with oxygen has a bright red colour, contrasting with the blue colour which it assumes when deprived of oxygen. According to the existing evidence the saturation of the haemoglobin is practically complete under normal conditions in the lungs, or when thoroughly shaken at the body temperature and normal atmospheric pressure with air of the same composition as normal alveolar air. As the partial pressure of the oxygen in this air falls, however, the saturation of the haemoglobin becomes less and less complete, and the arterial blood assumes a more and more blue tinge, which imparts a blue or leaden colour to the skin, accompanied by the symptoms, already referred to, of lack of oxygen. Normal arterial blood in man yields about 19 volumes of physiologically available oxygen for each 100 volumes of blood. Of these 19 volumes about 18J are loosely combined with the haemoglobin of the red corpuscles, the small remainder being in simple solution in the blood. Venous blood, on the other hand, yields only about 1 2 volumes. The combination of haemoglobin with oxygen is only stable in the presence of free oxygen at a pressure of about that in normal alveolar air. As this pressure falls the compound is progressively dissociated. From this it can be readily understood why the blood loses its oxygen in passing through the tissues, which are constantly absorbing free oxygen, and regains it in the lungs. The marked effects produced by abnormal deficiency in the pressure of oxygen in the alveolar air are also readily intelligible; for even although the arterial blood still contains sufficient oxygen to cover the normal difference between the oxygen content of arterial and that of venous blood, yet this oxygen is given off to the tissues less readily — i.e. at a lower pressure, and thus fails to supply their demands completely. It is evident also that in pure air at normal pressure increased ventilation of the lu'ngs does not appreciably increase the supply of oxygen to the blood, whereas in air largely deprived of its oxygen, or at low pressure, the increased alveolar oxygen pressure produced by deep breath- ing helps greatly in saturating the blood with oxygen, and may thus relieve the symptoms of want of oxygen. Hence it is that the increased sensitiveness of the respiratory centre to carbon dioxide, and consequent increased depth of breath- ing, at high altitudes compensates to a large extent for de- ficiency in the oxygen

pressure. Addition of carbon dioxide to the inspired air produces exactly the same result. Indeed

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RESPIRATORY SYSTEM

[PHYSIOLOGY

Professor Angelo Mosso was led by observation of the beneficial effects of carbon dioxide at low atmospheric pressure to attri- bute mountain sickness to lack of carbon dioxide, a condition which he designated by the word ” acapnia. ” When impure air is vitiated, not only by deficiency of oxygen, but also by carbon dioxide, the carbon dioxide causes panting, which not only gives warning of any danger, but prevents the alveolar oxygen percentage from falling in the way it would do if the carbon dioxide were absent. In this way the carbon dioxide greatly lessens the danger. To give instances, air progressively and very highly vitiated by respiration is much less likely to cause danger if the carbon dioxide is not artificially absorbed, and not nearly so dangerous as the great diminution of atmo- spheric pressure (and consequently of oxygen pressure) which occurs in a very high balloon ascent. Indeed the dangers of a very high balloon ascent are notorious, and a number of deaths or very narrow escapes are on record.

Just as oxygen forms a dissociable compound with the haemoglobin of the blood, so does carbon dioxide form dis- sociable compounds. One of’ these compounds appears to be with haemoglobin itself, and another is sodium bicarbonate, which is far more easily dissociated in the blood than in a simple watery solution, owing to the presence of proteid and possibly other substances which act as weak acids and thus help the dissociation process. The whole of the carbon di- oxide can therefore be removed from the blood by a vacuum pump, just as the whole of the oxygen can. Venous blood contains roughly speaking about 40 volumes of carbon di- oxide per 100 of blood, and arterial blood about 34 volumes. Of this carbon dioxide only about 3 volumes can be in free solu- tion, the rest being loosely combined. The conveyance of carbon dioxide from the blood to the lungs is thus readily intelligible, as well as the fact that any increase or diminution of the pres- sure of carbon dioxide in the alveolar air will naturally lead to a damming back or increased liberation of carbon dioxide from the blood, and that by forced breathing carbon dioxide can be washed out of the blood to such an extent that a pro- longed cessation of natural breathing (apnoea) follows, since even in the venous blood the

partial pressure of carbon di- oxide has become too low to excite the respiratory centre.

It will be evident from the foregoing that in order to supply efficiently the respiratory requirements of the tissues not only must the breathing, but also the circulation, be suitably regu- lated. In hard muscular work the consumption of oxygen and output of carbon dioxide may be increased eight or ten times beyond those of rest. Unless, therefore, the blood supply to the active tissues were correspondingly increased, deficiency of oxygen would at once arise, since the amount of oxygen carried by a given volume of the arterial blood is very limited, as already explained. It is known that the supply of blood to each organ is always increased during its activity. This, increase can, for instance, readily be seen and measured in the case of contracting muscles or secreting glands; and the volume and frequency of the pulse are greatly increased during muscular work. But while it is evident enough that the flow of blood through the body is determined in accordance with the metabolic activities of each tissue, our knowledge is as yet very scanty as to the means by which this determination is brought about. Probably, however, carbon dioxide may be nearly as important a factor in the regulation of the circulation as in that of breathing. Just as the rate of breathing was formerly supposed to determine, and not to be determined by, the fundamental metabolic processes of the body, so the circulation was supposed to be another independent determining factor; and under the influence of these mechanistic conceptions the direction of investigation into the phenomena of respiration and' circula- tion has been largely diverted to side issues.

Since the circulation, no less than the breathing, is con- cerned in the supply of oxygen to and removal of carbon dioxide from the tissues, it can readily be understood that defective circulation, such as occurs, for instance, in uncom-

pensated valvular affections of the heart, may affect the breathing and hinder the normal respiratory exchange. Con- versely, also, defects in the aeration or oxygen-carrying power of the blood may be compensated for by increase in the cir- culation. For instance, in the very common condition known as anaemia, where the percentage of haemoglobin, and con- sequently the oxygen-carrying power of the blood, is often reduced to a third or less, the respiratory disturbances may be so slight that the patient is going about his or her ordinary work. A miner suffering from the now well-known " worm- disease," or ankylostomiasis (?.».), may be working under- ground, or a housemaid suffering from chlorosis may be doing her work, with only

a third of the normal oxygen-carrying power of the blood. There seems to be no doubt that in such cases an increased rate of blood circulation compensates for the diminished oxygen-carrying power of the blood. It is well known that at high altitudes a gradual process of adaptation to the low pressure occurs, and the shortness of breath and other symptoms experienced for the first few days gradually become less and less. This adaptation is .partly, at least, due to a marked increase in the percentage of haemoglobin in the blood, though probably circulatory and perhaps ©ther com- pensatory changes are also involved.

In connexion with respiration the action of certain poisons is of great interest. One of these, carbon monoxide, is of very common occurrence, and causes numerous cases of poisoning. Like oxygen, it has the property of combining with the haemo- globin of the blood, but its affinity for haemoglobin is far more strong than that of oxygen. In presence of air containing as little as -05 % of carbon monoxide, the haemoglobin will become about equally shared between oxygen and carbon monoxide, so that, since air contains 20.9% of oxygen, the affinity of carbon monoxide for haemoglobin may be regarded as about 400 times greater than that of oxygen. The blood of a person breathing even a small percentage of carbon monoxide may thus become gradually saturated to a dangerous extent, since the haemoglobin engaged by the carbon monoxide is for the time useless as an oxygen-carrier. Air containing more than about o.r% of carbon monoxide is thus more or less dangerous if breathed for long; but the blood completely recovers in the course of a few hours if pure air is again breathed. The poisonous action of carbon monoxide can be abolished by placing the animal exposed to it in oxygen at an excess pressure of about an atmosphere. The reason for this is that, in consequence of the increased partial pressure of the oxygen, the amount of this gas in free solution in the blood is greatly increased in accordance with Dalton's law, and becomes sufficient to supply the tissues with oxygen quite independently of the haemoglobin. Even at ordinary atmospheric pressure the extra oxygen dissolved in the blood when pure oxygen is breathed is of con- siderable importance. Carbon-monoxide poisoning is the chief cause of death in colliery explosions and fires, and the sole cause in poisoning by lighting gas and fuel gas of various kinds. Its presence in dangerous proportions may be readily detected with the help of a small bird, mouse or other small warm-blooded animal. In such animals the respiratory exchange is so rapid that symptoms of carbon-monoxide poisoning are shown far more quickly than in man. The small animal can thus be em- ployed in mines, &c, to indicate danger from carbon monoxide. A lamp is useless

for this purpose. There are various other poisons, such as nitrites, chlorates, dinitrobenzol, &c, which act by disabling the haemoglobin, and so cutting off the oxygen supply to the tissues.

Between the air in the air-cells of the lungs and the blood of the lung capillaries there intervenes nothing but a layer of very thin, flattened cells, and until recently it was very generally believed that it was by diffusion alone that oxygen passes inwards and carbonic acid outwards through this layer. Similar simple physical explanations of processes of secretion and absorption through living cells have, however, turned out to be incorrect in the case of other organs. It is known, moreover, that in the case of the swimming-bladder of fishes oxygsn is secreted into.

the interior against enormous pressure. Thus, in the case of a fish caught at a depth of 4500 ft., the partial pressure of the oxygen present in the swimming bladder at this depth was 127 atmospheres, whereas the partial pressure of oxygen in sea-water is only about 0-2 atmosphere. Diffusion can therefore have nothing to do with the passage of gas inwards, which is known to be under the control of the nervous system. The cells lining the interior of the swimming bladder are developed from the same part of the alimentary tract as those lining the air-cells of the lungs, so that it seems not unlikely that the lungs should possess the power of actively secreting or excreting gases. The question whether such a power exists, and is normally exercised, has been investigated by more than one method; and although it is not possible to go into the details of the experiments, there can be no doubt that the balance of the evidence at present available is in favour of the view that diffusion alone is incapable of explaining either the absorption of oxygen or the excretion of carbon dioxide through the lining cells of the lungs. The partial pressure of oxygen appears to be always higher, and of carbon dioxide often lower, in the blood leaving the lungs than in the air of the air-cells; and this result is inconsistent with the diffusion theory. As to the causes of the passage of oxygen and carbonic acid through the walls of the capillaries of the general circulation, we are at present in the dark. Possibly diffusion may explain this process.

II. Although we cannot trace the exact changes which occur when

oxygen passes into living cells, yet it is possible to obtain a clear general view of the origin and destiny of the material concerned in the process, and of the physiological conditions which determine it.

The oxidizable material within the body consists, practically speaking, of proteids (albumen-like substances, with which the collagen of connective tissue may be included), fats and carbo- hydrates (sugars and glycogen). All of these substances contain carbon, hydrogen and oxygen in known, though different, proportions, and the former also contains a known amount of nitrogen and a little sulphur. Nitrogen is constantly leaving the body as urea and other substances in the urine and faeces; and a small but easily measurable proportion of carbon passes off in the same manner. The rest of the carbon passes out as carbon dioxide in respiration. Now carbohydrates and fats are oxidized completely in the body to carbon dioxide and water. This follows from the fact that, practically speaking, no other products into which they might have been converted leave the body except carbon dioxide and water. Moreover, a given weight of carbohydrate requires for its oxidation a definite weight of oxygen, and produces a definite weight of carbon dioxide. There is thus a definite relation between the weight of oxygen used up and the weight of carbon dioxide formed in this oxidation. The same is true for the oxidation of fat and of proteid, allowing in the latter case for the fact that the nitrogen, together with part of the carbon and hydrogen, passes out as urea, &c, in an incompletely oxidized form. From all this it follows that if we measure over a given period (1) the discharge of nitrogen from the body, (2) the intake of oxygen and (3) the output of carbonic acid, we can easily calculate exactly what the ultimate destiny of the oxygen has been, and at the ultimate expense of what material the carbonic acid has been formed. What the intermediate stages may have been we cannot say, but this in no way affects the validity of the calcula- tion. If, during the period of measurement, food is taken, the basis of the calculation is still substantially the same, as the oxidizable material in food consists of practically nothing else except proteids, carbohydrates and fats.

Liberation of Energy. — From experiments made outside the body, we know that in the oxidation of a given weight of proteid, carbohydrate or fat, a definite amount of energy is liberated. In the article on Dietetics it is shown that precisely the same liberation of energy occurs in the living body, due allowance being made for the fact that the oxidation of proteid is not quite complete. The following table shows the respiratory quotients (the respiratory quotient being the ratio between

the volume of carbon dioxide formed and that of oxygen used up) and energy expressed in units of heat (calories) liberated per gramme of carbon dioxide produced and oxygen consumed in the living body during the oxidation of proteid, fat and a typical carbohydrate: —

Substance oxidized.

Respiratory quotient.

Calories per gramme of C0 2 pro- duced.

Calories per gramme of

oxygen consumed.

Proteid Fat Cane-sugar .

•78 •71

I -00

2-78 3-35 2-59

3.00 3-27 3-56

In the oxidation of non-living substances the rate varies, within wide limits, according to that at which oxygen is supplied. Thus a fire burns the faster the more air is supplied, and the higher the percentage of oxygen in the air. It was for long believed that in the living body also the rate of oxidation must vary according to the oxygen supply. It has been found, however, that this is not the case. Provided that a certain minimum of oxygen is present in the air breathed, or in the blood supplied to the tissues, it is, practically speaking, indifferent whether the oxygen supply be increased or diminished : only a certain amount is consumed. It might be supposed that the reason for this is that the available oxidizable material in the body is limited, and that if the food supply were increased there would be a corresponding increase in the rate of oxidation. This hypothesis is apparently supported by the fact that, when an increased supply of proteid is given as food, the amount of nitrogen discharged in the urine is almost exactly corre- spondingly increased, so that evidently the oxidation of proteid increases correspondingly with the supply. Similarly, when carbohydrate food is given, the alteration in the respiratory quotient shows that more carbohydrate than before is being oxidized. Closer investigation in recent times has, however, brought out the very striking fact that, if oxidation be measured in terms of energy

liberated by it in the body, it makes but little difference, other things being equal, whether the animal is fasting or not. If more proteid or carbohydrate is oxidized at one time, correspondingly less fat is oxidized, but the total energy liberated as heat, &c, in the body is about the same, unless the diet is very excessive, when there is a slight increase of oxidation. Even after many days of starvation, the rate of oxidation per unit of body weight has been found to remain sensibly the same in man. When more food is taken than is required, the excess is stored up, “chiefly in the form of fat, into which carbo- hydrate and possibly also proteid are readily converted in the body. When less food is taken than is needed, the stock of fat is drawn upon, and supplies by far the greater proportion of the energy requirements of the body.

During the performance of muscular work oxidation is greatly increased, and may amount to ten times the normal or more. Even the slight exertion of easy walking increases oxidation to three times. When the energy represented by the external work done in muscular exertion is compared with the extra energy liberated by oxidation in the body, it is found, as would be expected, that the latter, value largely exceeds the former. In other words, much of the energy liberated is wasted as heat. Nevertheless the muscles are capable of working with less waste than any steam or gas engine. In the work of climbing, for instance, it has been found in the case of man that 35 % of the energy liberated is represented in the work done in raising the body. Muscular work, if at all excessive, leads to fatigue, and consequent rest. On the other hand, unnatural abstinence from muscular activity leads to restlessness and consequen* muscular work. Hence on an average of the twenty-four hours the expenditure of energy by different individuals, with different modes of life, does not as a rule differ greatly.

The rate of oxidation per unit of body weight varies consider- ably according to size and age. If we compare different warm- blooded animals, we find that the rate of oxidation is relatively

to their weight far higher in the smaller ones. In a mouse or small bird, for instance, the rate is about twenty times as great as in a man. The difference is in part due to the fact that the smaller an animal is

the greater is its surface relatively to its mass, and consequently the more heat does it require to keep up its temperature. The smaller animal must therefore produce more heat. Even in cold-blooded animals, however, oxidation appears to be more rapid the smaller the animal. In the case of man, oxidation is relatively more than twice as rapid in children than in adults, and the difference is greater than would be accounted for by the difference in the ratio of surface to mass. Allowing for differences in size, oxidation is about equally rapid in men and women.

It was for long believed that the special function of respiratory oxidation was (i) the production of heat, and (2) the destruction of the supposed ” waste products.” Further investigation has, however, tended to show more and more clearly that in reality respiratory oxidation is an essential and intimate accompani- ment of all vital activity. To take one example, secretion and absorption, which were formerly explained as simple processes of nitration and diffusion, are now known to be] accompanied, and necessarily so, by respiratory oxidation in the tissues con- cerned. The respiratory oxidation of an animal is thus a very direct index of the activity of its vital processes as a whole. Looking at what is known with regard to respiratory oxidation,, we see that what is most striking and most characteristic in ; .t is its tendency to persist— to remain on the whole at about a normal level for each animal, or each stage of development of an animal. The significance of this cannot be over-estimated. It indicates clearly that just as an organism differentiates itself from any non-living material system by the manner in which it actually asserts and maintains its specific anatomical structure, so does it differentiate itself from any mere mechanism by the manner in which it asserts and maintains its specific physiological activities.

Authorities. — For further general information the reader may be referred to the sections by Pembrey and by Gamgee in Schafer’s Handbook of Physiology, vol. i., and by Bohr in Nagel’ s Handbuch der Physiologie, vol. i. The following additional references are to recent investigations: Regulation of Breathing, Haldane and Priestley, Journal of Physiology, xxxii. 225 (1905). Respiration at High Altitudes and Effects of Want of Oxygen, Zuntz, Loewy, Caspari, and Miiller, Das Hohenklima (1905); Boycott and Haldane, Ward, and Haldane and Poulton, Journal of Physiology, xxxvii. (1968). Respiration at High Pressures, ” Report to the Admiralty of the Committee on Deep Diving ” (1907). Respiratory Exchange and Secretion, Barcroft, Journal of Physiology, xxvii. 31 (1901); Bar- croft and Brodie, Journal of Physiology, xxvii. 18, and xxxiii. 52 (1905). Excretion of C0 2 by the Lung Epithelium, Bohr, Zentral- blattfur Physiologie, xxi. 337

(1907). ” Normal Alveolar C0 2 Pressure in Man,” Mabel Fitzgerald and J. Haldane in Physiological Journal (1905). (J- S. H.)

(3) Movements oe Respiration

Normal Respiration. — If the naked body of a person asleep or in perfect inactivity be carefully watched, it will be found that the anterior and lateral walls of the chest move rhythmi- cally up and down, while air passes into and out of the nostrils (and mouth also if this be open) in correspondence with the movement. If we look more closely we shall find that with every uprising of the chest walls the membranous intercostal portions sink slightly as if sucked in, while at the same time the flexible walls of the abdomen bulge as if protruded by some internal force. If respiration be in the slightest degree hurried, these motions become so marked as to escape the attention of no one. The elevation of the chest walls is called inspiration, their depression expiration. Inspiration is slightly shorter than expiration, and usually there is a slight pause or momentary inaction of the chest between expiration and the following inspiration. Apparatuses for measuring the excursion of a given point of the chest wall during respiration are called thoracometers or stethomelers. Apparatuses for recording the movements of the chest are called stethographs or pneumo- graphs.

Frequency of Respiration. — The frequency of respiration

during perfect rest of the body is. 1 16 to 24 per minute, the pulse rate being usually four times the rate of respiration; but the respiratory rhythm varies in various conditions of life. The following are the means of many observations made by Lambert Adolphe Quetelet (1796-1874): at the age of one year the number of respirations is 44 per minute; at 5 years, 26; from 15 to 20 years, 20; from 25 to 30, 16; from 30 to 50, 18-1. Muscular exertion always increases the fre- quency of respiration. The higher the temperature of the environment the more frequent is the respiration. Paul Bert (1 833-1 886) has shown that with higher atmospheric pressures than the normal the frequency of respiration is diminished while the depth of each inspiration is increased. The frequency of respiration diminishes until dinner-time, reaches its maximum within an hour of feeding, and thereafter falls again; if dinner is omitted, no rise of frequency occurs. The respiratory act can be interrupted at any stage, reversed, quickened, slowed and variously modified at will, so long as respiration is not stopped entirely for more than a short space of time; beyond this limit the will is incapable of suppressing respiration.

Depth of Respiration. — The depth of respiration is measured by the quantity of air inspired or expired in the act; but the deepest expiration possible does not suffice to expel all the air the lungs contain. The following measurements have been ascertained, and are here classified according to the con- venient terminology proposed by John Hutchinson (1811-1861). (1) Residual air, the volume of air remaining in the chest after the most complete expiratory effort, ranges from 100 to 130 cub. in. (2) Reserve or supplemental air, the volume of air which can be expelled from the chest after an ordinary quiet expiration, measures about 100 cub. in. (3) Tidal air, the volume of air taken in and given out at each ordinary respiration may be stated at about 20 cub. in. (4) Complemental air, the volume of air that can be forcibly inspired over and above what is taken in at a normal inspiration, ranges from about 100 to 130 cub. in. By vital capacity, which once had an exaggerated importance attached to it, is meant the quantity of air which can be ex- pelled from the lungs by the deepest possible expiration after the deepest possible inspiration; it obviously includes the complemental, tidal and reserve 'airs, and measures about 230 cub. in. in the Englishman of average height, i.e. 5 ft, 8 in. (Hutchinson). It varies according to the height, body weight, age, sex, position of the body and condition as to health of the subject of observation.

Vital capacity is estimated by means of a spirometer, a gradu- ated gasometer into which air may be blown from the lungs. The residual air, which for obvious reasons cannot be actually measured, may be estimated in the following way (Emil Harless, 1820-1862; Louis Grehant, b. 1838). At the end of ordinary expiration, apply the mouth to a mouthpiece communicating with a vessel filled with pure hydrogen, and breathe into and out of this vessel half a dozen times — until, in fact, there is reason to suppose that the air in the lungs at the time of the experiment has become evenly mixed with hydrogen. Then ascertain by analysis the proportion of hydrogen to expired air in the vessel and estimate the amount of the air which the lungs contained by the following formula: —

v : V-fc = /> : 100 ; v(ioo-p) _

where V= volume of air in the lungs at the time of experiment, v = volume of the vessel containing hydrogen, p = proportion of air to hydrogen in the vessel at the end of the experiment. V, then, is the volume of air in the lungs after an ordinary expira- tion; that is, it includes the residual and the reserve air; if we subtract from this the amount of reserve air ascertained by direct measurement, we obtain the 100-130 cub. in. which Hutchinson arrived at by a study of the

dead body.

Volume of Respiration. — It is clear that the ventilation of the lungs in ordinary breathing does not merely depend on

the quantity of air inspired at each breath, but also on the number of inspirations in a given time. If these two values be multiplied together we get what might be called the volume of respiration (Athmungsgrosse, Isidore Rosenthal, b. 1836), in contradistinction to depth of respiration and frequency of respiration. Various instruments have been devised to measure the volume of respiration, all more or less faulty for the reason that they compel respiration under somewhat ab- normal conditions (Rosenthal, Gad, Peter Ludwig, Panum (1820-1885), Ewald Hering (b. 1834). From the data ob- tained we may conclude that the respiratory volume per minute in man is about 366 cub. in. (6000 cub. centim.). In connexion with this subject it may be stated that, after a single ordinary inspiration of hydrogen gas, 6-10 respirations of ordinary air must occur before the expired air ceases to contain some trace of hydrogen.

Types of Respiration. — The visible characters of respiration in man vary considerably according to age and sex. In men, while there is a moderate degree of upheaval of the chest, there is a considerable although not preponderating degree of excursion of the abdominal walls. In women the chest movements are decidedly most marked, the excursion of the abdominal walls being comparatively small. Hence we may distinguish two types of respiration, the costal and the ab- dominal, according to the preponderance of movement of one or the other part of the body wall. In forced respiration the type is costal in both sexes, and so it is also in sleep. The cause of this difference between men and women has been variously ascribed (a) to constriction of the chest by corsets in women, (6) to a natural adaptation to the needs of child- bearing in women, and © to the greater relative flexibility of the ribs in women permitting a wider displacement under the action of the inspiratory muscles.

Certain Concomitants of Normal Respiration. — If the ear be placed against the chest wall during ordinary respiration we can hear with every inspiration a sighing or rustling sound, called ” vesicular,”

which is probably caused by the expansion of the air vesicles; and with every expiration a sound of a much softer sighing character. In children the inspiratory rustle is sharper and more pronounced than in adults. If a stethoscope be placed over the trachea, bronchi or larynx, so that the sounds generated there may be separately com- municated to the ear, there is heard a harsh to-and-fro sound during inspiration and expiration which has received the name of ” bronchial.”

In healthy breathing the mouth should be closed and the ingoing current should all pass through the nose. When this happens the nostrils become slightly expanded with each inspiration, probably by the action of the M. dilatatores naris. In some people this movement is hardly perceptible unless breathing be heavy or laboured. As the air passes at the back of the throat behind the soft palate it causes the velum to wave very gently in the current; this is a purely passive movement. If we look at the glottis or opening into the larynx during respiration, as we may readily do with the help of a small mirror held at the back of the throat, we may notice that the glottis is wide open during inspiration and that it becomes narrower by the approximation of the vocal chords during expiration. This alteration is produced by the action of the laryngeal muscles. Like the movements of the nostril, those of the larynx are almost imperceptible in some people during ordinary breathing, but are very well marked in all during forced respiration.

The Mechanics of Respiration. — The thorax is practically a closed box entirely filled by the lungs, heart and other struc- tures contained within it. If we were to freeze a dead body until all its tissues were rigid, and then were to remove a portion of the chest wall, we should observe that every corner of the thorax is accurately filled by some portion or other of its contents. If we were to perform the same operation of removing a part of the chest wall in a body not first frozen we should find, on the other hand, that the contents of the

thorax are not by any means in such circumstances bulky enough to fill up the space provided for them. If we were to measure the organs carefully we should find that those which are hollow and whose cavities communicate with the regions outside the thorax are all larger in the frozen corpse than in that which was not frozen. In other words, the organs in the thorax are distended somewhat in order that they may completely fill the chest cavity; and the nature of this curious and important condition may best be illustrated by the simple diagrams, figs. 7 and 8 (from Hermann’s Physiologie des

Fig. 7.

Fig. 8.

Menschen), — where t is the trachea, I the lung, v the auricle of the heart, k the ventricle, i an intercostal space with its flexible membranous covering. When the interior of the vessel is rendered vacuous by exhaustion through the tube 0, the walls of the lungs and heart are expanded until the limits of the containing vessel are accurately filled, while all flexible portions of the walls of the vessel (corresponding to the intercostal membranes and the diaphragm of the thorax) are sucked inwards.

From this description it follows that the lungs, even when the thorax is most contracted, are constantly over-distended, and that, when the cause of this over-distension is removed, the lungs, being elastic, collapse. It further follows that if the thorax is dilated, the flexible hollow organs it contains must perforce be still more distended — a distension which in the case of the lungs is followed by an indrawing of air through the trachea in all cases where the trachea is open. Thus, as the act of respiration is primarily a dilatation of the thorax, the part played by the lungs is, as Galen knew, a purely passive one.

How is dilatation of the thorax effected? It has been pointed out that the rib-planes decline from the horizontal in two directions, viz. from behind forwards, and from the antero- posterior mesial plane outwards; a glance at fig. 9 will make this double sloping clear to the reader. It has, moreover, been explained that the diaphragm arches upwards into the thorax in such a manner that the lateral parts of the arch are vertical and in contact with the inner face of the thoracic walls. This being the structure of the thorax, the enlarge- ment of its cavity is brought about (1) by raising the rib- planes until they approach the horizontal, and (2) by depressing the diaphragm and. making its rounded dome more cone-like in outline. A moment's consideration will show how these actions enlarge the boundaries of the thorax, (a) When the postero-anterior slope of the rib-planes is diminished by the raising of the anterior ends of the ribs, the whole sternum is thrust upwards and forwards, and the antero-posterior diameter of the thorax is increased. (6) When the lateral slope of the rib-planes is diminished by the ribs being moved

From Hermann's Handbuch. j

Fig. 9. — Showing Slope of Ribs.

upwards about an axis passing through their sternal and vertebral extremities, it is evident that the lateral diameter

of the thorax must be increased, (c) When the muscular portion of the diaphragm contracts, the curves of its dome-like shape are straightened, the whole diaphragm comes to look more conical on section, and the ap- position of its lateral parts to the inner surface of the thorax is destroyed; the two apposed surfaces are drawn apart much as the leaves of a book might be, and a space is formed between them, into which some portion of the lung slips, (d) When the dia- phragm descends it draws with it the whole con- tents of the thorax; in- asmuch as the contents as a whole are conical in shape with the apex up- ward and are fitted into the conical space of the thoracic cavity, it is clear that the descent of the contents will tend to create a space between them and the thoracic walls; for each stratum of lung, &c, which is adapted to fit a certain level of thorax, will thereby be brought into a lower and (as the thorax is conical) a more spacious level. Hence the descent of the diaphragm causes a much greater enlargement of the thorax than is measured by the mere elongation of the vertical diameter. In this manner the thorax is distended and air is drawn into the lungs. The contraction of the thorax in expiration is brought about by the return of the ribs and diaphragm to their original position of rest.

How the Inspiratory Movements are Produced. — The Rib Move- ments. — These are caused by the contraction of muscles which are fixed either to the central axis of the body (including under that term the head and vertebral column) or to some point rendered sufficiently stable for the purpose by the action of other adjuvant muscles. Thus the M. levatores costarum arise from the transverse processes of the 7 th cervical and eleven upper dorsal vertebrae, and are attached to the ribs below in series; the M. scaleni spring from the cervical vertebrae, and are attached to the anterior parts of the first and second ribs; the M. sternocleido-mastoidei arise from the side and back of the skull, and are inserted into the upper part of the sternum and the clavicle; the M. pectoralis minor arises from the coracoid process of the scapula, and is inserted into the anterior ends of some of the ribs; the M. serratus posticus superior arises from certain of the cervical and dorsal vertebrae, and is inserted into the posterior part of certain of

the ribs; the M. cervicalis ascendens (part of the M. erector spinae) arises from certain of the cervical vertebrae, and is inserted into the posterior part of certain ribs. The M. serratus magnus and the M. pectoralis major, which are affixed on the one hand to the upper arm and to the scapula respectively, and on the other to the ribs and to the sternum respectively, may in certain elevated positions of the arm and shoulder act as inspiratory muscles. When all these muscles contract, the ribs are raised in the twofold way already described, some pulling up the anterior ends of the ribs, and others causing the arched ribs to rotate about an axis passing through their vertebral and sternal joints.

In addition to the muscles just enumerated, the M. inter- costales externi are undoubtedly inspiratory muscles. Every external intercostal muscular fibre between a pair of ribs must, when it contracts, of necessity raise both ribs, as is clearly shown

by the accompanying diagram (fig. 10). Here a'b' must be shorter than ab, for if angle BAa = z, then

a6 2 = AB 2 +(B6-Aa) 2 +2AB(B6-Aa)cosx; hence ab will be larger the smaller the angle *, for the cosine increases as the angle diminishes.

Fig. 11.

By a similar geometrical treatment of the question it may be shown that the internal intercostal muscles when they contract must of necessity depress both the ribs to which they are attached. If the angle BAc' = x(fig. 11), then

e'd' 2 =AB 2 +(Ac'-B

The case, however, is not so clear with reference to the anterior portions of the internal intercostals which lie between the cartilages; for it is evident that these fibres have the same direction with regard to the sternum as an axis as the external intercostals have with regard to the vertebral column as an axis; that is to say, the geometrical diagram in fig. 10 applies to the inter-cartilaginous internal intercostals as perfectly as it does to the inter-osseous parts of the external intercostals, the inference being that the inter-cartilaginous internal intercostals tend to elevate the pair of ribs between which they stretch. The geometrical argument is, however, overborne by physio- logical experiment: Martin and Hartwell have observed in the dog and the cat that the internal intercostals throughout their whole extent contract (not synchronously) but alternately with the

diaphragm; hence we must conclude that their function throughout is not inspiratory like that of the diaphragm, but expiratory.

The Movements of the Diaphragm. — The muscular fibres of the diaphragm are arranged in a radial manner, or, more strictly speaking, in a manner like the lines of longitude on a terrestrial globe. The central tendon of the diaphragm corresponds to the pole of such a globe. The contraction of the fibres is ex- pended on straightening the longitudinal curves rather than on pulling down the central tendon to a lower level; in fact, the central tendon moves very little in ordinary respiration.

How the Expiratory Movements are Produced. — The action of inspiration disturbs many organs from the position of rest into which gravity and their own physical properties have thrown them. The ribs and sternum are raised from the position of lowest level; the elastic costal cartilages are twisted; the elastic lungs are put upon the stretch; the abdominal organs, themselves elastic, are compressed and thrust against the elastic walls of the belly, causing these to bulge outwards. In short the very act of inspiration stores up, as it were, in sundry ways the forces which make for expiration. As soon as the inspiratory muscles cease to act these forces come into play, and the position of rest or equilibrium is regained. It is very doubtful whether any special expiratory muscles are called into action during ordinary respiration. The internal intercostals may in man be exercised in ordinary expiration (although they are certainly not so exercised in the dog and the cat); but in laboured expiration many muscles assist in the expulsive effort. The muscles forming the belly-walls contract and force the abdominal contents against the relaxed diaphragm in such a manner as to drive it farther and farther into the thorax. At the same time by their attachment to the lower edge of the

thorax these same muscles pull down the ribs and sternum. The M. triangularis sterni, which arises from the back or thoracic aspect of the sternum and lower costal cartilages and is inserted into the costal cartilages higher up, can obviously depress the ribs. So also can the M. serratus posticus inferior, which arises from the thick fascia of the loins and is inserted into the last four ribs. So also can the M. quadratus lumborum, which springs from the pelvis and is attached to

the last rib. Indeed there is hardly a muscle of the body but may be called into play during extremely laboured respiration, either because it acts on the chest, or because it serves to steady some part and give a better purchase for the action of direct respiratory muscles.

Certain Abnormal Forms of Respiration.

Coughing. — There is first a deep inspiration followed by closure of the glottis. Then follows a violent expiratory effort which bursts open the glottis and drives the air out of the lungs in a blast which carries away any light irritating matter it may meet with. The act is commonly involuntary, but may be imitated exactly by a voluntary effort.

Hawking, or Clearing the Throat. — In this act a current of air is driven from the lungs and forced through the narrow space between the root of the tongue and the depressed soft palate. This action can only be caused voluntarily.

Sneezing. — There is first an inspiration which is often un- usually rapid; then follows a sudden expiration, and the blast is directed through the nose. The glottis remains open all the time. The act is generally involuntary, but may be more or less successfully imitated by a voluntary effort.

Snoring is caused by unusually steady and prolonged inspira- tions and expirations through the open mouth, — the soft palate and uvula being set vibrating by the currents of air.

Crying consists of short deep inspirations and prolonged expirations with the glottis partially closed. Long-continued crying leads to sobbing, in which sudden spasmodic contractions of the diaphragm cause sudden inspirations and inspiratory sounds generated in larynx and pharynx.

Sighing is a sudden and prolonged inspiration following an unusually long pause after the last expiration.

Laughing is caused by a series of short expiratory blasts which provoke a clear sound from the vocal chords kept tense for the purpose, and at the same time other inarticulate but very characteristic sounds from the vibrating structures of the larynx and pharynx. The face has a characteristic expression. This act is essentially involuntary, and often is beyond control; it can only be imitated very imperfectly.

Yawning is a long deep inspiration followed by a shorter expiration, the mouth, fauces and glottis being kept open in a characteristic fashion. It is involuntary, but may be imitated.

Hiccough is really an inspiration suddenly checked by closure of the glottis; the inspiration is due to a spasmodic contraction of the diaphragm. The closure of the glottis generally leads to a characteristic sound. (A. G.*)

(4) Pathology of the Respiratory System

In the following article we have to give an account of the more important pathological processes which affect the lungs, pleurae and bronchial tubes. In the aetiology of pulmonary affections, the relations between the lungs and the external air, and also between them and the circulatory system, are im- portant. The lungs are, so to speak, placed between the right and left cavities of the heart, and the only way for the blood to pass from the right ventricle to the left side of the heart, except in cases of a patent foramen ovale or other congenital defect forming a communication between the two sides of the organ, is by passing through them. The result is that not only may they become diseased by foreign material carried into them by the blood, but any obstruction to the flow of blood through the left side of the heart tends sooner or later to engorge or con- gest them, and lead to further changes. Through the nose and mouth they are in direct connexion with the external atmo- sphere. Hence the variable condition of the air as regards

temperature, degree of moisture, and density, is liable to produce directly various changes in the lungs, or to predispose them to disease; and the contamination of the air with various patho- genic germs and irritating particles in the shape of dust, is a direct source of many lung affections.

Bronchitis, or inflammation of the mucous membrane of the bronchial tubes, has been generally attributed to exposure to atmospheric changes. It occurs with great frequence in the extremes of life, and it is in early childhood and in old age that it is more liable to be fatal. Bronchitis may often follow exposure to cold, but that low temperature in itself is not sufficient to cause it is shown by the fact that the crews of arctic expeditions have been singularly free from diseases usually attributed to cold, but on their return to moist germ-laden atmospheres have at once been affected. Children reared in heated rooms with lack of ventilation are peculiarly susceptible to attacks on the slightest change of temperature. Bronchitis is also frequently caused by cardiac and renal diseases, and by the extension of inflammatory diseases of the upper air passages (as rhinitis, laryngitis or pharyngitis), while blockage of the nasal passages by adenoid or other growths may, by causing persistent mouth-breathing, lead to bronchial infection. Before the bacterial origin of disease was understood, bronchitis was attributed solely to what is termed ” catching cold, ” and the exact relation of the chill to the bacterial infection is still unknown. It is probable that the chilling of the surface of the body by exposure causes congestion of the mucous membrane, the presence of a virulent micro-organism being then all that is required to produce bronchitis. It is generally accepted that in persons living in the pure air of the country the small bronchi and air-cells are sterile (Barthel in the Zentralblatt fur Bakterio- logie, vol. xxiv.). Bacteria are arrested on their way by the leucocytes of the nasal mucous membrane and by the vibration of the ciliated epithelium of the upper air passages. The mucous membrane of the upper bronchi is, however, tenanted by various micro-organisms such as the diplo-bacillus of Friedlander, bacillus coli communis, micrococcus tetragenus, &c, and it is considered by William Ewart that these organisms may in certain conditions of their host become virulent. ” Specific ” bronchitis occurs in the course of a specific infective disease (e.g. influenza, measles or whooping cough) and is due to the specific micro-organism gaining access by the mucous membrane of the respiratory tract. Cases have been known in which the diphtheria bacillus has been so localized. In glanders, small-pox, syphilis and pemphigus, the infective micro-organism is carried to the bronchi by the blood stream. In common or ” non- specific” bronchitis,

streptococci, pneumococci and staphylococci are found in the sputum together with Friedlander's bacillus and the bacillus coli communis. Microscopically the bronchi show hyperaemia of the mucous and submucous coats, and the whole wall becomes infiltrated with polymorphonuclear leucocytes and round cells. Many cells undergo mucoid de- generation, and there is abundant epithelial proliferation. A large quantity of mucus is secreted by the glands, and the lumen of the bronchi contains an exudate consisting of mucus, degenerated leucocytes and cast-off epithelial cells.

In the rare form of bronchitis known as fibrinous or plastic bronchitis a membranous exudate is formed which forms casts of the bronchi, which may be coughed up. The casts vary from an inch to six or seven inches in length, with branches corre- sponding to the divisions of the bronchi from which they come. The cast consists of mucus and fibrin in varying proportions. The exact pathology of this variety is still undetermined.

Bronchitis may affect the whole bronchial tract, or more especially the larger or the smaller tubes. It may occur as an acute or as a chronic affection. In the acute form the inflamma- tion may remain limited to the bronchial tubes and gradually subside, or it may lead to inflammation of the surrounding lung tissue, giving rise to disseminated foci of inflammation of greater or less extent throughout the lungs (catarrhal or broncho- pneumonia). This is a common complication of bronchitis, especially where the smaller tubes are affected, and is more

frequently seen in children than adults. In cases of chronic bronchitis the affection, as a rule, begins as a slight ailment during the winter, and recurs in succeeding winters. The intervals of freedom from the trouble get shorter, and in the course of a few years it persists during the summer as well as the winter months. A condition of chronic bronchitis is thus established. The persistent cough which this occasions is one of the chief causes of the development of the condition of emphysema, where there is a permanent enlargement of the air-cells of the lungs with an atrophy of the walls of the air vesicles. The emphysema occasions an increase in the shortness of breath from which the person had previously suffered, and later, in

consequence of the greater difficulty with which the blood circulates through the emphysematous lungs, the right side of the heart becomes dilated, and from that we have the development of a general dropsy of the subcutaneous tissues, and less and less perfect aeration of the blood.

The death rate from bronchitis in England and Wales during 1908 was: males 1102, females 1083 per million living. The death rate for the five years 1901-1905 was 1237 per million for all sexes. The death rate for the twenty years 1888-1908 con- sistently showed a slight decline.

Diseases of Occupations. — We all inhale a considerable amount of carbonaceous and other foreign particles, which in health are partly got rid of by the action of the ciliated cells lining the bronchial tubes, and are partly absorbed by cells in the wall of the tubes, and carried in the lymph channels to the bronchial lymphatic glands, where they are deposited, and cause a more or less marked pigmentation of the tissues. Part of such pig- ment is also deposited in the walls of the bronchial tubes and the interstitial tissue of the lungs, giving rise to the grey appearance presented by the lungs of all adults who live in large cities. In certain dusty occupations, such as those of stone masons, knife-grinders, colliers, &c, the foreign particles inhaled cause trouble. The most common affection so produced is chronic bronchitis, to which becomes added emphysema. In some cases not only is bronchitis developed, but the foreign particles lead to an increase of the fibrous tissue round the bronchi and in the interstitial tissue of the lungs, and so to a greater or lesser extent of fibroid consolidation. As this fibrous tissue may later under- go softening and cavities be formed, a form of consumption is produced, which is named according to the particular occupation giving rise to it; e.g. stonemasons' phthisis, knife-grinders' phthisis, colliers' phthisis. It should, however, be pointed out that these dusty occupations are probably not so frequently the cause as was at one time taught of these simple inflammatory fibroid changes in the lungs with their subsequent cavity for- mation; individuals engaged in such occupations are apt to suffer from a chronic tuberculosis of the lung associated with the formation of much fibrous tissue, and the occupation simply predisposes the lung to the attacks of the tubercle bacillus.

The term pneumonia is frequently used of different forms of inflammation of the lungs, and includes affections which run different clinical courses, present diverse appear- monia ances after death, and probably have different excit- ing causes. It would be better if the term acute pneumonia or pneumonic fever were reserved for that form

of acute inflammation of the lungs which is usually characterized by sudden onset, and runs an acute course, which terminates generally by crisis from the fifth to the tenth day, the inflam- mation leading to the consolidation by fibrinous effusion of the greater part or whole of one lobe of a lung. Acute pneu- monia usually occurs in a sporadic form, and is most prevalent in the United Kingdom from November to March. Occasion- ally it is epidemic, and there is evidence to show that sometimes it is an infective disease. There is great difficulty, however, in being quite certain that the occurrence of the disease in those who have been attending upon or brought into intimate connexion with sufferers from pneumonia is the result of infection, for such cases may be due to an epidemic of the disease, or to the various individuals attacked having been exposed to the same cause.

Formerly acute croupous or lobar pneumonia was thought to be due to "catching cold"; we now kno\q it to be an infectious disease resultant on the invasion of one or more specific micro-organisms. The chief micro-organisms which have been found to be present during an attack of acute pneu- monia are the micrococcus lanceolatus or pneumococcus of Frankel and Weichselbaum, which is found in the inflamed lung in a large majority of cases and is capable of produc- ing pneumonia when inoculated into guinea-pigs. Sternberg demonstrated the presence of the pneumococcus in the saliva of healthy individuals; it tends, however, in this case to vary in form. The micro-organism differs in virulence in given strains; thus one epidemic may be more severe than another; and it tends to increase in virulence in its passage through the human subject. The exact conditions necessary for the production of increased virulence in the organism causing an attack of lobar pneumonia are not yet determined, but are usually ascribed to lowered states of the health and to atmo- spheric conditions. The pneumococcus produces in the human organism an intracellular toxin, but the question as to whether it can also produce a soluble toxin in the living body is still debated. The difficulty of obtaining sufficient quantities of the toxins of this organism has prevented the production of antisera of high potency. In lower animals, less potent sera have proved successful in protecting against a fatal dose of pneumococci. The change effected by the administration of a serum is produced by causing a change in the pneumococci, which causes them to be more easily destroyed by the phagocytes. The element which brings about this change is termed an opsonin; see Blood and Bacteriology (ii). The bacillus pneumoniae of Friedlander is also said to be found in a certain percentage of cases, but a number of observers deny its presence in pure culture in primary croupous pneumonia.

Unlike many acute diseases, pneumonia does not render a person less liable to future attacks; on the contrary, those who have been once attacked must be looked upon as more prone to be affected again. Acute pneumonia usually attacks the whole or greater part of one lobe of one lung, but more than one lobe may be affected, or both lungs may be involved. The disease produces a solid and airless condition of the affected part owing to a fibrinous exudation taking place into the air- cells and smaller bronchial passages. In favourable cases the exudation' is partly absorbed and partly expectorated, and the lung returns to its normal healthy condition; in others, death may ensue from the extent of lung affected, or from the- spread of the inflammation to other parts, as for instance the pericardium or meninges of the brain. In such cases it is interesting to note that the same micro-organism has been found in the inflammatory exudation in the pericardium or on the meninges as in the pneumonic lung; probably the organism had been absorbed from the lung, and was the cause of the secondary inflammations. In cases of death from uncomplicated pneumonia a very variable extent of lung is involved. In some cases this result may be ascribed to the weakness of the individual and especially of the heart, but in others the virulence of the micro-organisms and the toxins which they have produced is probably the more correct explanation. The improvement in a patient suffering from pneumonia usually commences suddenly, with a rapid fall in the temperature. The day on which this "crisis" takes place varies, but most commonly it appears to be the seventh from the initial rigor (22 % of the cases, Jurgensen). It may, however, occur a few days earlier or later, being observed in about 74% between the fifth and the ninth day of the disease (Jurgensen). The disease occasionally ends in the formation of an abscess, in gangrene, or in fibroid induration of the lung, but these ter- minations are rare.

The death rate of acute pneumonia for England and Wales in 1908 was 1383 per million living of the population.

Broncho-pneumonia. — It is usual to recognize a form of inflammation of the lungs which differs from the above lobar pneumonia.

and in which small patches of consolidation are usually scattered throughout the lower lobes of both lungs. This broncho- or catarrhal 1

pneumonia is usually preceded by an attack of bronchitis, to which it bears an intimate relation. In some cases the small foci of inflammation may run together so as to affect the greater part of a lobe of a lung, and the distinction between such a form of broncho-pneumonia and lobar pneumonia presents such diffi- culties in the view of some observers, that they have refused to recognize any essential difference between the two. Usually, however, it is not difficult to distinguish the two affections both clinically and anatomically. Broncho-pneumonia is especially seen as a complication of bronchitis, and while it more frequently attacks children than young adults, it is not uncommon in old people, especially secondary to bronchitis. It is frequent in children after acute infectious fevers, especially measles and diphtheria, and in cases of whooping-cough. It differs from the above-mentioned pneumonia in that it does not usually attack the whole of a lobe of a lung, but occurs in small disseminated patches more especially throughout the lower lobe of both lungs. The accompanying fever is more irregular than in the preceding form, and the disease usually runs a more prolonged course. It is an extremely fatal affection in both the very young and old. Young persons who have suffered from it are not unfrequently attacked by pulmonary tuberculosis subsequently. It must be admitted that we are even less certain of its bacteriology than we are of that of lobar pneu- monia. In some cases Frankel's pneumococcus is found, and in others various other micro-organisms. Many of the latter are doubtless saprophytic, and are not the essential cause of the disease, but it is not probable that any one particular form of organism accounts for all forms of broncho-pneumonia.

The bacteriology of broncho-pneumonia presents no one micro-organism which can be definitely said to cause the disease. The micro-organism most frequently found, either alone or associated with other bacteria, is the pneumococcus, which occurred in 67% of a series investigated by Wollstein. Other organisms found are the streptococcus, particularly in broncho- pneumonia following infectious fevers, the staphylococcus aureus and albus, and Friedlander's bacillus. In some cases the bacillus influenzae alone has been found, and the Klebs- Loffler bacillus in cases following upon diphtheria. When the disease is associated with pulmonary tuberculosis the tubercle bacillus is found.

The tuberculous virus, the tubercle bacilli, may gain entrance to the lungs through the inspired air or by means of the blood or lymph currents. Also in some cases it has been culosls. demonstrated that tubercle bacilli may infect the glands of the mesentery following the ingestion of the milk of tuberculous cattle. In this the Government

Com- missions of Great Britain and Germany as well as the United States Bureau of Animal Industry confirm the findings of private investigators. It may be well here to summarize the views generally held as to infection. In the first place, the doctrine of inherited disease is discredited, and the doctrine of specific susceptibility is in doubt. Infants are known to be extremely susceptible, and this susceptibility lessens with increasing age, adults requiring prolonged exposure. As a mode of infection the sputum of diseased persons is of great importance. Infected food, especially milk, comes next, together with food infected by flies; and the mother's milk is a minor source. Infection is not often received through the skin, but most frequently through the mucous membrane of the mouth, air passages and intestine; occasionally the infection is alveolar. Pulmonary tuberculosis is often second- ary to a latent lymphatic form. The tubercle bacillus was discovered by Koch in 1882, and since then it has become generally accepted that the bacillus varies in type. The bacilli have been classified by A. G. Foullerton into (a) occur- ring in fishes and cold-blooded animals, {b) in birds, (c) in rats, (d) in cattle, (e) in man. Exactly how far they

1 The term catarrhal pneumonia has been usually regarded as synonymous with the term broncho-pneumonia, and this usual nomenclature has been maintained in the present article. We must, however, recognize that all simple acute broncho-pneumonias are not purely catarrhal in the strict pathological sense. For instance, a considerable amount of fibrinous exudation is not unfrequently present in the patches of broncho-pneumonia, and some of the cases of septic broncho-pneumonia can scarcely be accurately termed catarrhal.

are interchangeable and can affect the human race is not definitely settled. They may be different varieties of the same species caused by differentiated strains of a common stock, or may be distinct but generically allied species. Von Behring considers that the bovine type may undergo modifica- tion in the human body, a theory which may lead to a complete change in our beliefs in the mode of entry of the bacillus. Re- cent investigators have put forward the view that the tubercle bacillus is not a bacterium, but belongs to the higher group known as streptotricheae or mould fungi.

The action of the tubercle bacillus upon the tissues, like most other infectious agents, gives rise to inflammatory pro- cesses and anatomical changes, varying with the mode of entry and virulence of the micro-organism. The most character- istic result is the formation throughout the lungs in the form of small scattered foci forming the

so-called miliary tubercles. Such miliary tuberculosis of the lungs is frequently only a part of a general tuberculosis, a similar tuberculous affection being found in other organs of the body. In other cases the lungs may be the only or the principal seat of the affection. The source whence the tuberculous virus is derived varies in different cases. Old tubercular glands in the abdomen, neck and elsewhere, and tuberculous disease of bones or joints, are common sources whence tubercule bacilli may become ab- sorbed, and occasion a general dissemination of miliary tubercles in which the lungs participate. Where the source of infection is an old tuberculous bronchial gland or a focus of old tubercle in the lung, the pulmonary organs may be the only seat of- the development of miliary tuberculosis for a time; but even then, if life is sufficiently prolonged, other parts of the body become involved. Acute miliary tuberculosis of the lungs is not infrequently a final stage in the more chronic tuberculous lesions of the different forms of pulmonary phthisis.

In pulmonary phthisis, or consumption, the disease usually commences at the apex of one lung, but runs a very variable course. In a large majority of cases it remains confined to one small focus, and not only does not spread, but undergoes retrograde changes and becomes arrested. In such cases fibrous tissue develops round the focus of disease and the tuberculous patch dries up, often becoming the seat of the deposit of calcareous salts. This arrest of small tuberculous foci in the lung is doubtless of very frequent occurrence, and in post mortem examinations of persons who have died from injuries or various diseases other than tubercle it is common to find in the lungs arrested foci of tubercle, which in the majority of instances have never been suspected during life, and probably have occasioned few, if any, symptoms. It has been shown that in more than 37% of persons, over 21 years of age, dying in a general hospital of various diseases, there is evidence of arrested tubercle in the lungs. As such persons are chiefly drawn from the poorer classes, among whom tubercle is more common than among the well-to-do, this high percentage may not be an accurate indication of the frequency with which pulmonary tubercle does become arrested. It does, however, show that the arrest and the healing of tuberculosis of the lungs is by no means unfrequent, and that it occurs among those who are not only prone to become infected, but whose circumstances are least favourable to the arrest of the disease. These facts indicate that the human organism does offer a resistance to the growth of the tubercle bacilli.

A focus of pulmonary tubercle may become arrested for a time and then resume activity. In many cases it is difficult to say why this is so,

but often it is clearly associated with, a lowering in the general health of the individual. It can- not be too strongly insisted that the arrest of a tuberculous focus in the lung is a slow process and requires a long time. Commonly a person in the early stage of phthisis goes away to a health resort, and in the course of a few weeks or months improves so much that he returns to a densely populated town and resumes his former employment. In a short time the disease shows renewed activity, because the improved

conditions were not maintained long enough to ensure the com- plete arrest of the disease.

Instead of the tuberculous focus becoming arrested, it may continue to spread. The original focus and the secondary ones are at first patches of consolidated lung. Later, their central parts soften and burst into a bronchus; then the softened portion is coughed up, and a small cavity is left, which tends gradually to increase in size by peripheric ex- tension and by merging with other cavities. This process is repeated again and again, and sooner or later the other lung becomes similarly affected. At any stage of the softening process the blood vessels may become involved and give rise by rupture to a large or a small haemorrhage {haemoptysis). It not unfrequently happens that such haemoptysis may be the first symptom that seriously attracts attention. At a later period haemorrhage frequently takes place in large or small amounts from the rupture of vessels, which frequently are dilated and form small aneurysms in the walls of cavities. A fatal termination may be hastened by the absorption by means of the blood vessels and lymphatics of the tuberculous virus from some of the foci of disease, and the occurrence therefrom of a local miliary tuberculosis of the lungs or a general tuberculosis of other organs. The rapidity with which the destructive process spreads throughout the lung varies con- siderably. We therefore recognize acute phthisis, or galloping consumption, and chronic phthisis. In the acute cases the soften- ing progresses rapidly and is associated with the development of v«ry little fibrous tissue; probably various forms of micro-organisms other than the tubercle bacilli assist in the rapid softening. In the more chronic cases there is development of much fibroid tissue, and the disease is associated with periods of temporary arrest of the tubercular process.

The expectoration from cases of pulmonary phthisis contains tubercle bacilli, and is a source of danger to healthy individuals, in whom it may produce the disease. Attendance on persons suffering from pulmonary phthisis involves very little risk of infection if proper care is taken to prevent the expectoration be- coming dry and disseminated as dust; perfect cleanliness is there- fore to be insisted upon in the rooms inhabited by a phthisical person. The tubercle bacilli soon lose their virulence in the presence of fresh air and sunshine, and therefore these agents are not only desirable for the direct benefit of the phthisical patient, but also are agents in preventing the development of fresh disease in healthy individuals.

Although the tubercle bacilli are the essential agents in the development of pulmonary tuberculosis, there are other conditions which must be present before they will produce the disease. It is probable that large numbers of individuals are exposed to the action of tubercle bacilli which gain entrance to the pulmonary tract, and yet do not give rise to the disease, because the conditions of their growth and multiplication do not exist. In such cases we may consider that the seed is present, but that the soil is unsuit- able for its growth. Certain families appear more predisposed to tuberculosis than others.

The most important circulatory disturbances met with in the lungs are those seen in cases of dilated heart, with or with-

out disease of the mitral valve, when engorgement xestioa. °^ t ‘ le pul monar y vessels sets up a condition of venous

engorgement of the lungs. This may lead to various changes. After it has lasted a variable time, and if it is very intense, serous transudation occurs into the substance of the lung and the alveoli, and thus a condition of pulmonary dropsy or oedema is established. The venous engorgement also pre- disposes the subjects of such heart affections to bronchitis and pneumonia. In disease of the mitral valve, in cardiac dilatation and in simple feebleness of the heart, such as is seen in old age and after debilitating fevers, especially typhoid, .there is commonly developed a venous congestion of the bases of the lungs, forming the so-called hypostatic congestion of those organs, and to this is frequently added pneumonia. In long-standing cases of pulmonary congestion brought about by disease of the mitral valve and dilatation of the heart, a certain amount of fibrous tissue may be found in the inter- stitial tissue of the lungs, and from transudation of certain elements of the blood we get the formation in the newly formed fibrous tissue of blood pigment. In these cases blood pigment

is found in the cells, in the pulmonary alveoli, and such cells also carry the pigment into the interstitial tissue. This con- dition constitutes the state known as brown induration of the lungs. Acute congestion of the lungs occurs as part of the first stage of pneumonia. It also probably exists during violent exertion, and may possibly be brought about by excitement.

Another circulatory disturbance of great importance is that arising from blocking of the pulmonary artery or its branches by an embolus or a thrombus. Where the KmboBsm obstruction takes place in the main vessel, death an< / rapidly ensues. Where, however, a small branch of Throw the vessel is occluded, as frequently occurs from a * os/s – coagulum forming in the right side of the heart, or in the pulmonary vessels in cases of disease of the mitral valve, or in dilatation of the heart, or from the detachment of a small vegetation from disease of the tricuspid or pulmonary valves, a haemorrhagic exudation takes place, forming a patch of consolidation in the lung {haemorrhagic infarct). As this haemorrhagic exudation takes place not only into the substance of the lung, but also into the bronchial tubes, such lesions are usually associated with spitting of blood {haemop- tysis). The increased tension produced in the pulmonary vessels in cases of mitral disease may also probably lead to the formation of haemorrhagic exudations into the lungs, apart from the occurrence of embolism or thrombosis. Usually the occurrence of pulmonary embolism and the formation of haemorrhagic infarcts in the lungs mark an important epoch in the course of a case of heart disease. It usually occurs at a late stage of the affection, and not unfrequently contri butes materially to a fatal termination. It is probable that many of the cases of pneumonia and pleuritic effusion, coming on in cases of valvular heart disease and of cardiac dilatation, owe their origin to an embolus and to the formation of a haemor- rhagic infarct.

The term asthma is commonly applied to a paroxysmal dyspnoea of a special type which is associated with a variety of conditions. In true spasmodic asthma there may be no detectable organic disease, and the par- oxysms are generally believed to be due to a nervous influence which, acting upon the bronchial muscles, produces a spasm of the tubes, or, acting through the vaso-motor branches of the sympathetic, produces a congestion of the bronchial mucous membrane. The most probable theory is that lately advanced, that it is caused by a profound toxaemia. An organism has been isolated, which is said to be the cause of certain cases of asthma, and the fact that benefit has been said to follow treatment by a vaccine is in favour of this view. The exciting cause may not be at all apparent, even on the most careful obser-

vation and examination of the sufferer, but in other cases the attacks may be brought about by some reflex irritation. Nasal polypi and other diseases of nasal mucous membrane have been shown in some cases to be a cause of asthma. Irritation of the bronchial mucous membrane appears to be one of the most common, but it is usually difficult to say exactly in what the irritation consists.

The sputum in true asthma is typical, consisting of white translucent pellets like boiled tapioca. These pellets consist of mucus arranged in a twisted mariner and known as Cursch- mann spirals; they also contain Charcot-Leyden crystals, degenerated epithelium and leucocytes, of which the majority are eosinophiles. The spirals consist of a central solid thread round which the mucus is arranged in spiral form. The twisting has been attributed to a rotatory motion of the cilia, helped by the spasm of the bronchial muscles. Allied to true asthma is the bronchial asthma frequently met with in the subjects of bronchitis and emphysema. In such cases the irritation evi- dently proceeds from the inflamed bronchial mucous membrane. Hay asthma is the variety in which the pollen of certain plants, especially grasses, is the exciting cause of the paroxysms. In cardiac feebleness, in valvular disease of the heart, and in cardiac dilatation, we may get dyspnoeic attacks of a more or less

paroxysmal nature, to which the term cardiac asthma has been applied. Similarly, to a form of dyspnoea met with occasionally as a manifestation of uraemia in chronic Bright's disease the term of renal asthma has been given.

Pleurisy, or inflammation of the pleura, is a very common affection, and is met with under different forms. In many Pleuris instances we have simply the pouring out, over a greater or less area of the surface of the pleura, of a fibrinous exudation which may become absorbed or undergo organisation, a certain amount of thickening of the pleura, and adhesions of the two layers resulting. Such cases form the group known as cases of dry pleurisy. In other instances a greater or lesser amount of serous exudation takes place into one or other pleural cavity, forming the cases of serous pleuritic effusion. In others the

exudation into the pleural cavity is purulent, giving rise to the condition known as empyema or purulent pleuritic effusion. The occurrence of dry pleurisy is probably very frequent, and leads to small pleural adhesions which cause little or no inconvenience. In post-mortem examinations of persons who have died from various diseases it is common to find such pleural adhesions present, although they have never been suspected during life. Pleurisy in one or other of the above forms may come on in a person apparently in good health (idiopathic pleurisy) , or it may follow a fracture of the ribs or other injury to the chest. It is not uncommonly secondary to some other disease; thus it is almost a constant accompaniment of acute lobar pneumonia. In such cases the effusion is most commonly a simple fibrinous one, which with the subsidence of the primary disease is in great part absorbed. In other cases of pneumonia we get a certain amount of serous effusion into the pleura; and some- times, especially in children, the pneumonia is followed by the development of an empyema. Pleurisy with effusion is also frequently a complication of valvular heart disease and dilatation of the heart, and in such cases is often associated with the forma- tion of superficial pulmonary infarcts. It is also seen in many other diseases of the lungs. For instance, in chronic pulmonary phthisis pleuritic adhesions over various parts of the lungs are the rule; and we also frequently get serous effusion into the pleura as a complication of the various forms of pulmonary tuberculosis. Purulent effusion is less common in phthisis, but it is the rule where the pleura is perforated by the necrosis of a tuberculous focus in the lung and the establishment of a communication between the pleura and a tuberculous cavity and the bronchial tubes (pyopneumonothorax) , a combination in which there is both air and pus in the pleural cavity. Secondary pleurisy is also seen in an extension of the disease from neigh- bouring parts, as from peritonitis, sub-diaphragmatic abscess, and suppuration in the liver or spleen. As a secondary disease, pleurisy is also known in the course of various forms of nephritis, rheumatism, and the acute specific diseases.

Cases formerly classed as idiopathic pleurisy are now known to be caused by certain micro-organisms. These vary in rela- tion to the character of the effusion. The most frequent is the tubercle bacillus, which is generally present in sero-fibrinous effusions. In this case the pleurisy is really secondary to a possibly unrecognized tuberculous infection either of the lung or pleura. In purulent effusions the pneumococcus may occur as a pure infection, or the streptococcus pyogenes or the staphy- lococcus may be present. Mixed infections occur in 21% of purulent effusions, and varieties of other organisms, such as the influenza bacillus, the typhoid bacillus, the Klebs-Loffler

bacillus and the colon bacillus, have been occasionally found.

There are at least five types of pulmonary emphysema;

(1) hypertrophic, idiopathic or large-lunged emphysema;

(2) senile or small-lunged emphysema; (3) compensatory emphysema; (4) acute vesicular emphysema; (5) interstitial or interlobular emphysema. Two points are usually admitted: that emphysema appears only in lungs that are congenitally weak, and that the exciting cause is increased intra vesicular tension. When one or more lobules are cut off from the working part of the lung the neighbouring vesicles become distended.

Should the plugging of the lobule remain permanent, typical emphysema results. This happens in illnesses inducing violent respiratory efforts, such as chronic bronchitis, whooping cough and asthma. In large-lunged emphysema the lung is excessively large, and does not collapse on opening the chest wall. Micro- scopically two lesions are notable. The septa between the vesicles are atrophied, many have disappeared and the vesicles have coalesced; the loss in lung tissue diminishes the vascular field of the lung and tends to imperfect aeration, whence the dyspnoea. The elastic tissue of the lung is also lost. In small- lunged emphysema there is a condition of senile atrophy. The lung is smaller than normal, and the intravesicular septa are destroyed. In this case the primary cause is atrophy of the bronchi, and increased air pressure is not a factor. Com- pensatory emphysema is that which develops in a portion of a lung in which the other portion is the seat of a lesion, such as pneumonia. Occasionally it is merely physiological, but some' times here too the septa undergo atrophic changes. Acute vesicular emphysema is hardly a pathological variety, and b really rapid distension coming on during an attack of asthma or angina pectoris. The variety is temporary only. Interstitial emphysema is characterized by the presence of air in the inter- stitial connective tissue of the lung. It is usually due to rupture of the air vesicles during paroxysms of coughing.

(T. H.*; H. L. H.)

(5) Surgery of the Respiratory System

About the middle of the 19th century, Manuel Garcia demon- strated the working of the vocal cords in the living subject, by placing a flat mirror of about the size of a shilling at the back of the mouth, and throwing strong light on to it from a concave mirror fixed upon the

observer's forehead. By the use of a laryngoscope and a cocaine spray the most irritable throat can now be made tolerant of the presence of the small mirror, and thus the medical man is enabled to make a prolonged and thorough examination of the interior of the larynx and even to perform delicate operations upon it. Foreign bodies which have become caught in the larynx can thus be seen and extracted, and small growths can be satisfactorily removed even from the vocal cords themselves.

A foreign body in the air-passages may be impacted above the vocal cords, and the prompt thrusting down of a finger may dislodge it and save the person from death by suffocation. If there is doubt as to the site of the impaction, and the symptoms are urgent (as is likely to be the case) immediate laryngotomy should be done. In this operation a tube is introduced through the crevice which can easily be felt in the middle line of the neck, between the thyroid and cricoid cartilages. The procedure is easily and quickly accomplished. It is, moreover, often resorted to when the surgeon is about to perform some extensive opera- tion in the mouth which must needs be accompanied by free haemorrhage. Laryngotomy having been done, and the pharynx having been plugged with gauze, the air passages can be kept free of blood during the whole operation.

If the foreign body be such a thing as a button, cherry-stone, sugar-plum or coin, it may at once set up alarming symptoms of spasmodic suffocation. But when the first alarm has quieted down, the attacks are likely to be only occasional, as when the article, drawn up with the expired air, comes in contact with the under aspect of the vocal cords. It may be that in a violent fit of coughing it will be expelled, but, if not, the surgeon must be at hand ready to perform tracheotomy when the urgency of the symptoms demands it. Tracheotomy is the making of an opening into the trachea, the air-tube below the larynx. It is unsafe to leave a child with a foreign body loose in its windpipe, on account of the risk of sudden and fatal asphyxia. Possibly the X-rays may show its exact position and give help in its removal. But, in any case, the safest thing will be to perform tracheotomy and to leave the edges of the opening into the windpipe wide asunder, so that the object may be coughed out — the nurse being on guard all the while. The operation of tracheotomy is sometimes urgently called for in the case in

which the air-way has become blocked by a child having sucked hot water from the spout of a kettle or teapot, or in the case of obstruction by the swelling of the acute inflammation of laryngitis or of diphtheria. Should the air-way through the larynx become narrowed by the presence of a growth which does not diminish under the influence of iodide of potassium, the question may arise as to whether it should be dealt with by splitting the thyroid cartilage and holding the wings apart, or by the removal of the whole larynx. For such growths are often malignant. If the wide infection of the lymphatic glands of the neck suggests that no radical operation should be undertaken, a bent silver tube may be introduced below the growth (trache- otomy) in order to provide for the entrance of air. This will get over the difficulty of breathing, but it cannot, of course, do more than that.

Acute laryngitis is very often due to diphtheria. The symptoms are those of laryngeal obstruction, together with constitutional disturbances of various kinds. The old-fashioned nurse called the disease ” croup ” — a term devoid of scientific meaning (see Diphtheria). In an ordinary catarrhal case, leeches and fomentations may suffice, though sometimes tracheotomy or intubation is called for. But if bacteriological examination shows the presence of diphtheritic bacilli, antitoxin must at once be injected. (See also Lung.) (E. O.*)

RESPITE (O. Fr. respit, modern repit, Lat. respectus, regard, consideration, respicere, to look back at), properly a delay, given for the further consideration of some matter, hence relief. In law the term is used of the postponement of the immediate execution of the law in criminal cases, e.g. by binding a con- victed prisoner over to come up for judgment when called upon, or when a case is “respited” from one quarter sessions to another. The word is loosely used in the sense of a ” reprieve ”

RESPOND, in architecture, the term given to the half-pier or semi-detached column at the end of a range of piers or columns carrying an architrave or arcade. In Greek temples the respond is known as the anta. The term is also given to the wall pilaster which in Roman and Renaissance work is frequently placed behind the detached columns forming the decoration of a wall.

RESPONDENT (from Lat. respondere, to answer), strictly, one who answers; in law one called upon to answer a petition or other proceeding. In a matrimonial cause the defendant in the suit is called the respondent. The defendant to a quarter sessions appeal is called the respondent, and so generally in appeals is the party, whether

plaintiff or defendant, against whom the appeal is brought.

REST (0. Eng. rcest, reste, bed, cognate with other Teutonic forms, e.g. Ger. Rast, Riiste, rest, and probably Gothic Rasta, league, i.e. resting or stopping place), a cessation from active or regular work, hence a time of relief from mental or manual labour. Specific meanings are for an interval of silence in music, marked by a sign indicating the length of the pause; for the forked support with iron-shod spike carried by the soldier till the end of the 17th century as a rest for the heavy musket; and for the support for the cue in billiards to be used when the striking ball is out of reach of the natural rest formed by the hand. In the medieval armour of the horsed man-at-arms, and later in the armour of the tournament, a contrivance was fixed to the side of the body-armour near the right arm-pit, in which the butt-end of the lance was placed to prevent the lance being driven back after striking the opponent at full charge; hence a knight, as a preliminary to the charge, ” laid his lance in rest.” This ” rest” is a shortened form of ” arrest,” to check, stop, as is seen by the French equivalent, arret. Further, ” rest,” that which remains over and above, is derived from the French rester, to remain over, Lat. restare, to remain, literally, to stay behind. The principal specific use of this word is in com- merce for the balance of undivided profit; it has thus always been the term used by the Bank of England for that which in other banks and companies is called the ” reserve ” (Hartley Withers, The Meaning of Money (iqoq). d. 208). The Bank of

England ” rest ” is never allowed to fall below £3,000,000 (see Banks and Banking).

RESTIF, NICOLAS EDME (1 734-1806), called Restif de la Bretonne, French novelist, son of a farmer, was born at Sacy (Yonne) on the 23rd of October 1734. He was educated by the Jansenists at Bicetre, and on the expulsion of the Jansenists was received by one of his brothers, who was a cure. Owing to a scandal in which he was involved, he was apprenticed to a printer at Auxerre, and, having served his time, went to Paris. Here he worked as a journeyman printer, and in 1760 he married Anne or Agnes Lebegue, a relation of his former master at Auxerre. It was not until five or six years after his marriage that Restif appeared as an author, and from that time to his death, on the 2nd of February 1806, he produced a bewildering multitude of books, amounting to something like two hundred volumes, many of them printed with his own hand, on almost every conceivable variety of subject. Restif suffered at one time or another the extremes of poverty and was acquainted with every kind of intrigue. He drew on the episodes of his own life for his books, which,

in spite of their faded sentiment, contain truthful pictures of French society on the eve of the Revolution. The most noteworthy of his works are Le Pied de Fanchetle, a novel (1769) ; Le Pornographe (1769), a plan for regulating prostitution which is said to have been actually carried out by the Emperor Joseph II., while not a few detached hints have been adopted by continental nations; Le Paysan perverti (1775), a novel with a moral purpose, though sufficiently horrible in detail; La Vie de mon pere (1779); Les Contemporaines (42 vols., 1 780-1 785), a vast collection of short stories; Ingenue Saxancour, also a novel (1785); and, lastly, the extraordinary autobiography of Monsieur Nicolas (16 vols., 1 794-1 797; the last two are practically a separate and much less interesting work), in which at the age of sixty he has set down his remembrances, his notions on ethical and social points, his hatreds, and above all his numerous loves, real and fancied. The original editions of these, and indeed of all his books, have long been bibliographical curiosities owing to their rarity, the beautiful and curious illustrations which many of them contain, and the quaint typographic system in which most are composed. In 1795 he received a gratuity of 2000 francs from the government, and just before his death Napoleon gave him a place in the ministry of police, which he did not live to take up.

Restif de la Bretonne undoubtedly holds a remarkable place in French literature. He was inordinately vain, of extremely relaxed morals, and perhaps not entirely sane. His books were written with haste, and their licence of subject and language renders them quite unfit for general perusal.

The works of C. Monselet, Retif de la Bretonne (1853), and P. Lacroix, Bibliographie et iconographie (1875), J. Ass6zat's selection from the Contemporaines, with excellent introductions (3 vols., 1875), and the valuable reprint of Monsieur Nicolas (14 vols., 1883-1884), will be sufficient to enable even curious readers to form a judgment of him. His life, written by his contemporary Cubieres-Palmezeaux, was republished in 1875. See also Eugen Duhren, Retif de la Bretonne, der Mensch, der Schriftsteller, der Reformator (Berlin, 1906), and a bibliography, Retif -Bibliotheh (Berlin, 1906), by the same author.

RESTOUT, JEAN (1692-1768), French painter, born at Rouen on the 26th of March 1692, was the son of Jean Restout, the first of that name, and of Marie M. Jouvenet, sister and pupil of the well-known Jean Jouvenet. In 171 7, the Royal Academy having elected him a member on his work for the Grand Prix, he remained in Paris, instead of proceeding to Italy, exhibited at all the salons, and filled successively every post of academical distinction. He died on the 1st

of January 1768. His works, chiefly altar-pieces (Louvre Museum), ceilings and designs for Gobelin tapestries, were engraved by Cochin, Drevet and others; his diploma picture may still be seen at St Cloud.

His son, Jean Bernard Restout (1732-1797), won the Grand Prix in 1758, and on his return from Italy was received into the Academy; but his refusal to comply with rules led to a quarrel with that body. Roland appointed him keeper of the Garde Meuble, but this piece of favour nearly cost him his life during the Terror. The St Bruno painted by him at Rome is in the Louvre.

RESTRAINT (from ” to restrain,” Lat. reslringere , to hold back, prevent), in law, a restriction or limitation. The word is used particularly in three connexions: i. Restraint on Anticipa- tion. Although it is a principle of English law that there can be no restriction of the right of alienation of property vested in any person under an instrument, equity makes an exception in the case of a married woman, and has laid down the rule that property may be so settled to the separate use of a married woman that she cannot, during coverture, alienate it or anticipate the income. Restraint on anticipation attaches only during coverture and is therefore removed on widowhood, but it may attach again on remarriage. By the Conveyancing Act 1881, s. 39, a court may however, if it thinks fit, by judgment or order bind a married woman’s interest in her property, with her consent, if it appears to be for her benefit, notwithstanding that she is restained from anticipating.

2. Restraint of Marriage. — A gift or bequest to a person may have a condition attached in restraint of marriage. This condition may be either general or partial. A condition in general restraint of marriage is void, as being contrary to public policy, although a condition in restraint of a second marriage is not void. A condition in partial restraint of marriage is valid, and may be either to restrain marriage with a particular class of persons, e.g. a papist, a domestic servant, or a Scotsman, or under a certain age.

3. Restraint of Trade. — A contract in general restraint of trade is void as being against public policy. In the leading case of Mitchell v. Reynolds, 1711, 1 Smith L.C., it was laid down that “it is the privilege of a trader in a free country, in all matters not contrary to law, to regulate his own mode of carry- ing it on according to his own

discretion and choice. If the law has regulated or restrained his mode of doing this, the law must be obeyed. But no power short of the general law ought to restrain his free discretion." It has been suggested that the rule dates from a time when a covenant by a man not to exercise his own trade meant a covenant not to exercise any trade at all — every man being obliged to confine himself to the trade to which he had been apprenticed. However, contracts which are only in partial restraint of trade are good. A contract not to carry on the business of an ironmonger would be bad; but a contract made by the seller of an ironmonger's business not to Compete with the buyer would be good. To make such a contract binding it must be founded on a valuable consideration and must not go beyond what is reasonably necessary for the protection of the other party. This is the tendency also of the law in the United States.

See Matthew on Restraint of Trade (1907).

RESZKE, JEAN DE (1850-), operatic singer, was born at Warsaw on the 14th of January 1850. His parents were Poles; his father was a state official and his mother a capable amateur singer, their house being a recognized musical centre. After singing as a boy in the Cathedral of Warsaw, he studied law in the university there, but in a few years he abandoned this and went to Italy to study singing. He made his first public appearance, as a baritone, at Venice in January 1874, as Alfonso in La Favorita, and in the following April he sang for the first time in London, appearing at Drury Lane Theatre, and a little later in Paris. He was not entirely successful and retired for a further period of study, during which his voice gained remarkably in the upper register; so that when he made his first reappearance at Madrid in 1879 it was as a tenor, in the title-role of Robert le Diable. Jean de Reszke's great fame as a singer dates from this time. For several seasons he sang regularly in Paris, and he reappeared at Drury Lane in 1887 as Radames. In the next year he was again in London, this time at Covent Garden as Vasco da Gama; this appearance was mainly responsible for the revival of the opera as a fashionable amusement in London. He appeared in London nearly every year from this date until 1900. In 1891 he visited America, and from 1893 to 1899 he was welcomed each year at the Metropolitan Opera House in New York. Jean de Reszke's most successful parts were the title-role of Le Cid, which was written for him by

Massenet, and those of Romeo, Lancelot in Elaine, and Lohengrin, Walther von Stolzing, Siegfried and Tristan in Wagner's operas. In 1904 illness compelled him to retire from the stage, and he subsequently divided his time between teaching singing in Palis and

breeding race-horses in Poland.

Jean de Reszke's younger brother, Edouard, born at Warsaw on the 23rd of December 1855, is also famous as an operatic singer. He appeared for the first time in Paris in April 1896, and has since sung with his brother for many seasons both in London and in New York. His magnificent bass voice and admirable technique earned him fame in such parts as those oi Mephistopheles in Faust, Charles V. in Marchetti's Don Giovanni d' Austria, Walter in Tell, the Count in Sonnambula, Prince Gudal in Demonio, and Hans Sachs, King Mark, Hunding and Hagen in Wagner's operas.

RETABLE (Fr. ritable, a shortened form derived from Med. Lat. retrotabulum) , a term of ecclesiastical art and architecture, applied in modern English usage to an altar-ledge or shelf, raised slightly above the back of the altar or communion table, on which are placed the cross, ceremonial candlesticks and other ornaments. Retables may be lawfully used in the church of England {Liddell Sr Beale, i860, 14 P.C.).

Foreign usage of the term, as in French, is different, and where the word is kept with this foreign application, the distinction should be observed. The Med. Lat. retrotabulum (modernized re- tabulum) was applied to an architectural feature set up at the back of an altar, and generally taking the form of a screen framing a picture, carved or sculptured work in wood or stone, or mosaic, or of a movable feature such as the famous- Pala a" Oro in St Mark's, Venice, of gold, jewels and enamels. The foreign " ratable " is, therefore, what should in English be called a " reredos " (q.v.), though that is not in modern usage a movable feature.

RETAIL, the sale of goods or commodities in small quantities to the immediate consumer, opposed to a sale wholesale or in gross. The O. Fr. retaille, from which the word is taken, meant a piece cut off, from tailler, to cut, Med. Lat. taleare, Lat. talea, a rod, cutting for planting. The English meaning appears in Anglo-French and in the Italian retaglio, selling by the piece. The other meaning of " retail," to repeat a story, is a transferred sense of an early meaning, " to sell at second hand." The Latin source is also seen in the related words "entail," "tailor," "detail" and "tally."

RETAINER (from " retain," Lat. retinere, to hold back, keep), properly the act of retaining or keeping for oneself, or a person or object which retains or keeps; historically, a follower of a house or family, and particularly used of armed followers attached to the barons of the

middle ages. John Cowell, in The Interpreter (1607), defines ” retainer ” as a ” servant not meniall nor familiar, that is, not continually dwelling in the house of his lord or master, but onely using or bearing his name or livery.”

Retainer of Counsel. — When it is considered desirable by a litigant that the services of any particular counsel (bar- rister) should be obtained for the conduct of his case, it is necessary to deposit with counsel a form of retainer together with the necessary fee in cash, from which time counsel is bound to give the party who has thus retained him the first call on his services in the matter in which he has been retained. Retainers are either general or special. A general retainer is one which retains counsel for all proceedings in which the person retaining is a party, and lasts for the joint lives of client and counsel. If any other person offers a special retainer or brief against the general retainer, counsel must give the general retainer notice of such offer — and if after a reasonable time the general retainer does not himself specially retain or brief counsel, the general retainer is forfeited. A special retainer is one which only applies to some particular cause or action. It can only be delivered after the action is begun, and gives ihe client a right to the services of counsel throughout the course of the action, and counsel is entitled to be briefed on all occasions to which the retainer applies. Retainer rules were drawn up in 1901 by the Bar Committee, read by the Bar Council and approved by the Attorney-General and the Council

of the Incorporated Law Society in 1902. They may be found in the Annual Practice.

Retainer of Debt. — In connexion with the administration of an estate under a will, it is the right of the personal repre- sentative — whether executor or administrator — of a deceased person to retain legal assets which have come into his hands towards the payment of a debt due to himself as against creditors of an equal degree, and this even though his debt is barred by the Statutes of Limitation. The privilege arose in all probability from the inability of the representative to sue himself, though it has been suggested that it is merely a corollary to the right of the representative to prefer one creditor to another of equal degree. 1 The principle of retainer is not looked upon with favour by courts of equity, and consequently it has long been the rule that there is no right to retain out of equitable assets. It was thought that the effect of

the Land Transfer Act 1897 was to make all the assets of the deceased legal assets, and so extend the privilege to reality which had till then been exempt; this view, however, has been repudiated by the courts of equity, and it must now be taken that there is still no right to retain out of real estate. 2 It is a rule of the probate division to require a creditor administrator, to whom letters of administration are granted, to enter into a bond with two sureties not to prefer himself. This course, however, is not followed where administration is granted to a person as next of kin who happens also to be a creditor.

The privilege is not lost by judgment for an account being given in a suit by other creditors for the administration of assets, and the representative may retain out of assets which come to his hand subsequent to such judgment. On the other hand, the appointment of a receiver deprives the representative of his right except as regards assets which come to his hands prior to the appointment of the receiver.

RETALIATION, repayment of like with like, especially the return of hostile action, injuries or wrongs by similar action or injury, as in the primitive theory of punishment, an ” eye for an eye,” ” tooth for a tooth.” The Late Lat. retaliare was formed from talis, such as, of the same quality as ; and this source also gave talio, talionis, the name of this type of punishment. (See Punishment, Theory of, and Roman Law, § The Twelve Tables.) A special form of retaliation is familiar in the imposition of differential import duties against the goods of a particular country (see Tariffs and Protection).

RETENE (methyl isopropyl phenanthrene), C I8 Hi 8 , a hydro- carbon present in the coal-tar fraction, boiling above 360° C; it also occurs in the tars obtained by the distillation of resinous woods. It crystallizes in large plates, which melt at 98-5° C. and boil at 390° C. It is readily soluble in warm ether and in hot glacial acetic acid. Sodium and boiling amyl alcohol reduce it to a tetrahydroretene, [whilst if it be heated with phos- phorus and hydriodic acid to 260 C. a dodecahydride is formed. Chromic acid oxidizes it to retene quinone, phthalic acid and acetic acid. It forms a picrate which melts at 123-124° C.

RETFORD (officially East Retford), a market town and municipal borough in the Bassetlaw parliamentary division of Nottinghamshire, England, 1385 m. N. by W. from London by the Great Northern railway, the station being a junction with the Great Central railway. Pop. (1901) 12,340. The church of St Swithin dates from the 13th century, but was rebuilt in 1658 by a brief granted by Richard

Cromwell. Modern buildings are the town hall, the corn exchange, the court house, and the covered markets. There is a large trade in corn and cheese, and the town possesses iron foundries, paper and corn mills, and india-rubber works. The town is governed by a mayor, 6 aldermen, and 18 councillors. Area, 4656 acres.

The situation of Retford (Redforde, Ratford), near one of the Roman roads and on the river Idle, where there was possibly a ford, may account for its origin. In 1086 the archbishop of York

1 Per Jessel, M.R. Talbot v. Frere (1879), L.R. 9. CD. 568, 574.

2 In re Williams; Holder v. Williams (1904), I Ch. 52.

owned a mill at Retford, and Roger de Busli had rights here. Retford was a borough by prescription, and was in the hands of the crown when, in 1276, Edward I. granted it to the burgesses in fee-farm with the right of electing bailiffs. This charter was confirmed by Edward III., Henry VI. and Elizabeth. In 1607 James I. granted a charter of incorporation to the bailiffs and burgesses, under which the town was governed until 1835, when it was reincorporated under a mayor. East Retford returned two members to parliament in 1315, and again from 1572 till 1885, when it was disfranchised. Henry III. granted the burgesses an eight-days' fair at Holy Trinity, altered by Edward II. to St Gregory. Edward III. granted a six-days' fair at St Margaret, and Henry VI. a four-days' fair at St Matthew. Fairs are now held in March, June, July and December. The market held on Saturdays by prescription was sanctioned by Edward III. and still exists.

RETHEL, ALFRED (1816-1859), German historical painter, was born at Aix-la-Chapelle in 1816. He very early showed an interest in art, and at the age of thirteen he executed a drawing which procured his admission to the academy of Dusseldorf. Here he studied for several years, and produced, among other works, a figure of St Boniface which attracted much attention. At the age of twenty he removed to Frankfort, and was selected to decorate the walls of the imperial hall in the Romer with figures of famous men. At the same period he produced a series of designs illustrative of Old Testament history. Four years later he was the successful competitor for the work of ornamenting the restored council house of his native city with frescoes depicting prominent events in the career of Charlemagne, but the execution of this work was delayed for some six years. Meanwhile Rethel occupied himself with the production of easel pictures and of drawings; and in 1842 he began a striking series of designs dealing with the " Crossing of the Alps by Hannibal," in which the weird

power which animates his later art becomes first apparent. In 1844 Rethel visited Rome, executing, along with other subjects, an altar-piece for one of the churches of his native land. In 1846 he returned to Aix, and commenced his Charlemagne frescoes. But mental derangement, remotely attributable, it is believed, to an accident from which he suffered in childhood, began to manifest itself. While he hovered between madness and sanity, Rethel produced some of the most striking, individual and impressive of his works. Strange legends are told of the effect produced by some of his weird subjects. He painted ” Nemesis pursuing a Murderer ” — a flat stretch of land-scape, with a slaughtered body, while in front is the assassin speed-ing away into the darkness, and above an angel of vengeance. The picture, so the story goes, was won in a lottery at Frankfort by a personage of high rank, who had been guilty of an undis- covered crime, and the contemplation of his prize drove him mad. Another design which Rethel executed was ” Death the Avenger,” a skeleton appearing at a masked ball, scraping daintily, like a violinist, upon two human bones. The drawing haunted the memory of his artist friends and disturbed their dreams; and, in expiation, he produced his pathetic design of ” Death the Friend.” Rethel also executed a powerful series of drawings — ” The Dance of Death ” — suggested by the Belgian insurrections of 1848. It is by such designs as these, executed in a technique founded upon that of Dixrer, and animated by an imagination akin to that of the elder master, that Rethel is most widely known. He died at Dusseldorf on the 1st of December 1859.

His picture of ” Peter and John at the Beautiful Gate of the Temple,” is preserved in the Leipzig Museum, and his ” St Boni- face ” and several of his cartoons for the frescoes at Aix in the Berlin National Gallery. His Life, by Wolfgang Miiller von Konigswinter, was published in 1861. See also Art Journal, November 1865.

RETHEL, a town of N. France, capital of an arrondissement in the department of Ardennes, on the right bank of the Aisne and the Ardennes canal, 31 m. S.W. of Mezieres by rail. Pop. (1906) 5254. The church of St Nicholas was formed by the amalgamation of two churches, the oldest of which dates from the 13th century. Rethel has a subprefecture, a tribunal of first instance, a board of trade arbitration, a chamber of arts and manufactures and a school of agriculture, and carries on

wool-spinning, the weaving of light woollen fabrics, and the manufacture of millboard and farm implements.

Rethel (Castrum Retectum), of Roman origin, was from the end of the 10th century the seat of a countship which passed successively to the families of Flanders, Burgundy, Cleves, Foix and Gonzaga. In 1581 it was erected into a duchy in favour of the latter. In 1663 it was sold by Charles VI. de Gonzaga to Mazarin, whose family held it till the Revolution.

RETINITE (Gr. pijrtw?, resin), a general name applied to various resins, particularly those from beds of brown coal, which are near amber in appearance, but contain little or no succinic acid. It may conveniently serve as a generic name, skice no two independent occurrences prove to be alike, and the indefinite multiplication of names, no one of them properly specific, is not to be desired.

RETINUE (0. Fr. retenue, from retenir, Lat. retenere, hold back, retain), a body of persons ” retained ” in the service of a noble or royal personage, a suite of ” retainers.” Such retainers were not in the domestic service of their lord, but were his ” livery ” and claimed his protection. They were a source of trouble and abuse in the 15th and early 16th century (see Livery and Maintenance).

RETORT (Lat. retorquere, to twist or turn back), a word used in two distinct meanings: (1) a sharp reply, answer to an argument, statement or charge; (2) a vessel used in chemistry and manufacture. The chemical retort is a flask-shaped or bulbous vessel made of glass, earthenware or metal, with a neck, bent downwards, which leads to a receiver; such vessels are particularly used for distillation (q.v.). The name is also given to the apparatus, varying in size and shape, used in the dis- tinctive distillation of various substances, such as coal, in the manufacture of gas (q.v.).

RETREAT (O. Fr. retrete, mod. retraite, from Lat. retrahere, to draw back), a withdrawal, especially of a body of troops after a defeat or in face of a superior enemy. In military usage ” retreat ” is also the term for a signal, given by bugle and drum at or about sunset. It is the last general signal before ” tattoo.” In religious usage, a ” retreat ” is a period and place set apart for prayer, self-examination and other spiritual exercises. Such ” retreats ” conducted by a director have long been the practice in the Roman Church. They were introduced into the English Church by Pusey. The word is also used of an institution or home where insane persons or habitual inebriates may be treated. For the law relating to ” licensed retreats ” for inebriates, see Inebriety,

Law of.

RETRENCHMENT (Fr. retrenchement, an old form of retranchement, from retrancher, to cut down, cut short), an act of cutting down or reduction, particularly of expenditure; the word is familiar in this, its most general sense, from the motto of the Gladstonian Liberal party in British politics, ” Peace, Retrenchment and Reform.” A special technical use of the term is in fortification, where it is applied to a work or series of works constructed in rear of existing defences in order to bar the further progress of the enemy should he succeed in breach- ing or storming these. A modern example may be found in the siege of Port Arthur in 1904. When early in the siege Fort Panlung fell into the hands of the Japanese, the Russians connected up the two adjacent first-line forts to a fort in the rear by means of new works, the whole forming a rough semicircle facing the lost fort. This retrenchment prevented the Japanese from advancing, and remained in the hands of the defenders up to the fall of the whole line of forts.

RETRO-COGNITION (from Lat. retro, back, cognitio, the acquiring of knowledge), a word invented by F. W. H. Myers to denote a supposed faculty of acquiring direct knowledge of the past beyond the reach of the subject’s ordinary memory. The alleged manifestations of the faculty are of several kinds, of which the most important are as follows: (1) There are many recorded cases in which an impression has been received in dream or vision representing some recent event — shipwreck, death-bed scene, railway accident — outside the knowledge of the percipient. (2) Analogous to the transmission of habits

and physical peculiarities in particular families, it is alleged that there are also cases of the transmission of definite memories of scenes and events in the life of some ancestor. (3) It is asserted that pictures of past scenes may be called up in certain cases by the presence of a material object associated with those scenes — e.g. a vision of the destruction of Pompeii by a piece of cinder from the buried city, or the scene of a martyrdom by a charred fragment of bone — the percipient being unaware at the time of the nature of the object. For this supposed faculty the American geologist, Professor Denton, has suggested the name ” psychometry.” There are also cases recorded in which pictures of historical scenes unknown to the seer have been described in the crystal. (4) Some spirit mediums profess to realise incidents belonging to their previous incarnation. Thus Flournoy’s medium, Helene Smith, represented herself as having been successively incarnated as a Hindoo Princess, Simandini, and as Marie Antoinette, and gave vivid descriptions of scenes in which she had

figured in these capacities.

It will be gathered that the facts afford little warrant for the assumption of a faculty of retro-cognition. The cases described in the first class, though apparently exhibiting knowledge not within the range of the percipient's ordinary faculties, hardly call for such an extreme hypothesis. In the other cases the result recorded may plausibly be attributed to the imagination of the percipient, working upon hints given by bystanders, or aided by the emergence of forgotten knowledge.

Bibliography. — See W. Denton, The Soul of Things (Wellesley, Mass., U.S.A., 1863); F. W. H. Myers, article "The Subliminal Self " in Proc. S. P. R. vol. xi. ; Human Personality (London, 1903) ; Th. Flournoy, Des Indes a la planets Mars (Geneva, 1900).

(F. P.)

RETROGRADE (from the Lat. retro, backwards, gradiri, to go), in astronomy, the direction of the apparent motion of a planet from E. to W.; the opposite of its regular motion around the sun, and due to the motion of the earth.

RETZ, SEIGNEURS AND DUKES OF. The district of Retz or Rais, in S. Brittany, belonged in early times to a house which bore its name, and of which the eldest branch became extinct in the 13th century in the Chabot family. From the Chabot family the lordship passed to the Lavals. Gilles de Laval, sire de Retz (1404-1440), the comrade-in-arms of Joan of Arc and marshal of France, gave himself over to the most revolting debauchery, and was strangled and burned at Nantes. The barony of Retz passed successively to the families of Tournemine, Annebaut and Gondi. In 1581 it was erected into a duchy in the peerage of France (duche-pairie) for Albert de Gondi, marshal of France and general of the galleys. Pierre de Gondi, brother of the first due de Retz, became bishop of Paris in 1570 and cardinal in 1587. He was succeeded by his nephews, Henri (d. 1622) and Jean Francois de Gondi (d. 1654), for whom the episcopal see of Paris was erected into an arch- bishopric in 1622, and by his great-nephew, Jean Francois Paul de Gondi, the famous cardinal de Retz. With the death of the last male of the house of Gondi in 1676 the duche-pairie became extinct; the lordship passed to the house of Neuville-Villeroy.

(M. P.*)

RETZ, JEAN FRANQOIS PAUL DE GONDI, Cardinal de (1614-1679),

French churchman and agitator, was born at Montmirail in 1614. The family was one of those which had been introduced into France by Catherine de' Medici, but it acquired great estates in Brittany and became connected with the noblest houses of the kingdom. It may be added that Retz himself always spelt his designation " Rais." He was the third son, and according to Tallemant des Reaux was made a knight of Malta on the very day of his birth. The death of his second brother, however, destined him for a closer connexion with the church. The family of Retz had military traditions, but it had also much church influence, and, despite the very unclerical leanings of the future cardinal, which were not corrected by the teachings of his tutor St Vincent de Paul, the intentions of his family never varied respecting him. By unanimous consent his physical appearance was not that of a soldier. He was

short, near-sighted, ugly and exceptionally awkward. Retz, however, despite the little inclination which he felt towards clerical life, entered into the disputes of the Sorbonne with vigour, and when he was scarcely eighteen wrote the remarkable Conjuration de Fiesque, a little historical essay, of which he drew the material from the Italian of Augustino Mascardi, but which is all his own in the negligent vigour of the style and the audacious insinuation, if nothing more, of revolutionary principles. Retz received no preferment of importance during Richelieu's life, and even after the minister's death, though he was presented to Louis XIII. and well received, he found a difficulty in attaining the coadjutorship with reversion of the archbishopric of Paris. But almost immediately after the king's death Anne of Austria appointed him to the coveted post on All Saints' Eve, 1643. Retz, who had, according to some accounts, already plotted against Richelieu, set himself to work to make the utmost political capital out of his position. His uncle, who was old, indolent and absurdly proud, had lived in great seclusion; Retz, on the contrary, gradually acquired a very great influence with the populace of the city. This influence he gradually turned against Mazarin. No one had more to do than Retz with the outbreak of the Fronde in October 1648, and his history for the next four years is the history of that confused and, as a rule, much misunderstood movement. Of the two parties who joined in it Retz could only depend on the bourgeoisie of Paris. The fact, moreover, that although he had some speculative tendencies in favour of popular liberties, and even perhaps of republicanism, he represented no real political principle, in- evitably weakened his position, and when the

break up of the Fronde came he was left in the lurch, having more than once in the meanwhile been in no small danger from his own party. One stroke of luck, however, fell to him before his downfall. He was made cardinal almost by accident, and under a mis- apprehension on the pope's part. Then, in 1652, he was arrested and imprisoned, first at Vincennes, then at Nantes; he escaped, however, after two years' captivity, and for some time wandered about in various countries. He made his appearance at Rome more than once, and had no small influence in the election of Alexander VII. He was at last, in 1662, received back again into favour by Louis XIV. and on more than one occasion formally served as envoy to Rome. Retz, however, was glad in making his peace to resign his claims to the archbishopric of Paris. The terms were, among other things, his appointment to the rich abbacy of St Denis and his restoration to his other benefices with the payment of arrears.

The last seventeen years of Retz's life were passed partly in his diplomatic duties (he was again in Rome at the papal election of 1668), partly at Paris, partly at his estate of Com- mercy, but latterly at St Mihiel in Lorraine. His debts were enormous, and in 1675 he resolved to make over to his creditors all his income except twenty thousand livres, and, as he said, to " live for " them. This plan he carried out, though he did not succeed in living very long, for he died at Paris on the 24th August 1679. One of the chief authorities for the last years of Retz is Madame de Sevigne, whose connexion he was by marriage. Retz and La Rochefoucauld, the greatest of the Frondeurs in literary genius, were personal and political enemies, and each has left a portrait of the other. La Rochefoucauld's character of the cardinal is on the whole harsh but scarcely unjust, and one of its sentences formulates, though in a manner which has a certain recoil upon the writer, the great defect of Retz's conduct: " II a suscite les plus grands desordres dans l'etat sans avoir un dessein forme de s'en prevaloir." He would have been less, and certainly less favourably, remembered if it had not been for his Memoirs. They were certainly not written till the last ten years of his life, and they do not go further than the year 1655. They are addressed in the form of narrative to a lady who is not known, though guesses have been made at her identity, some even suggesting Madame de Sevigne herself. In the be- ginning there are some gaps. They display, in a rather irregular style and with some oddities of dialect and phrase, extraordinary narrative skill and a high degree of ability in that special art

of the 1 7th century— the drawing of verbal portraits or characters. Few things of the kind are superior to the sketch of the early barricade of the Fronde in which the writer had so great a share, the hesitations

of the court, the bold adventure of the coadjutor himself into the palace and the final triumph of the insurgents. Dumas, who has drawn from this passage one of his very best scenes in Vingt ans apres, has done little but throw Retz into dialogue and amplify his language and incidents. Besides these memoirs and the very striking youthful essay of the Conjuration de Fiesque, Retz has left diplomatic papers, sermons, Mazarinades and correspondence in some considerable quantity.

The Memoirs of the cardinal de Retz were first published in a very imperfect condition in 1717 at Nancy. The first satisfactory edition was that which appeared in the twenty-fourth volume of the collection of Michaud and Poujoulat (Paris, 1836). They were then re-edited from the autograph manuscript by Geruzez (Paris, 1844), and by Champollion-Figeac with the Mazarinades, &c. (Paris, 1859). In 1870 a complete edition of the works of Retz was begun by M. A. Feillet in the collection of Grands Hcrivains. The editor dying, this passed into the hands of M. Gourdault and then into those of M. Chantelauze, who had already published studies on the connexion of St Vincent de Paul with the Gondi family, &c. (1882).

(G. Sa.)

REUBEN, a tribe of Israel named after the eldest ” son ” of Jacob and of Leah. Both the meaning of the name (see Gen. xxix. 3 2) and the history of the tribe are extremely obscure. In one version of the story of Joseph, Reuben appears in a some- what favourable light (Gen. xxxvii. 22, 29, xlii. 37), but in Gen. xxxv. 22 he is charged with a grave offence, which in Gen. xlix. 4 is given as a reason why the tribe which called him father did not take in Hebrew history the place proper to its seniority (cp. 1 Chron. v. 1). Dathan and Abiram were Reubenites (Num. xvi.; Deut. xi. 6), and in Deut. xxxiii. 6 the tribe appears as threatened with extinction. In Judg. v. 15 seq. it is described as a pastoral tribe which took no share in the patriotic movement under Barak and Deborah. The district’ allotted to Reuben (Josh. xiii. 15-23; Num. xxxii. 37 seq.) is detailed in late passages which have little historical value for the age to which they are attributed. The tribe is represented as settled E. of the Jordan on the Moabite border, but no mention is made of it in the inscription of the Moabite king Mesha (see Gad; Moab). The references to the tribe’s wars against Arabians (r Chron. v. 10, 18 sqq.) in the time of Saul have caused much fruitless speculation.

For mythological elements in the tribe’s history, see especially E. Stucken, Mittheil. d. vorderasiat. Gesell. (1902), pt. iv. pp. 46 sqq.;

and for a full discussion of the biblical data, see H. W. Hogg, Ency. Bib. s.v., also E. Meyer, Die Israeliten und ihre Nachbarstdmme, pp. 530 sqq.

REUCHLIN, JOHANN (1455-1522), German humanist and Hebraist, was born on the 22nd of February 1455 at Pforzheim in the Black Forest, where his father was an official of the Dominican monastery. In the pedantic taste of his time the name was graecicized by his Italian friends into Capnion, a form which Reuchlin himself uses as a sort of transparent mask when he introduces himself as an interlocutor in the De Verbo Mirifico. For his native place Reuchlin always retained an affection; he constantly writes himself Phorcensis, and in the De Verbo he does not forget to ascribe to Pforzheim his first disposition to letters. Here he began his Latin studies in the monastery school, and, though in 1470 he was a short time in Freiburg, that university seems to have taught him little. Reuchlin's career as a scholar appears to have turned almost on an accident; his fine voice gained him a place in the house- hold of Charles I., margrave of Baden, and by-and-by, having already some reputation as a Latinist, he was chosen to accom- pany to the university of Paris Frederick, the third son of the prince, a lad some years his junior, who was destined for an ecclesiastical career. This new connexion lasted but a year or so, but it determined the course of Reuchlin's life. He now began to learn Greek, which had been taught in the French capital since 1470, and he also attached himself to the leader I of the Paris realists, Jean Heynlin, or k Lapide (d. 1496), a

worthy and learned man, whom he followed to the vigorous young university of Basel in 1474. At Basel Reuchlin took his master's degree (1477), and began to lecture with success, teaching a more classical Latin than was then common in German schools, and also explaining Aristotle in Greek. His studies in this language had been continued at Basel under Andronicus Contoblacas, and here too he formed the acquaint- ance of the bookseller, Johann Amorbach, for whom he prepared a Latin lexicon (Vocabidarius Breviloquus, 1st ed., 1475-76), which did good service in its time and ran through many editions. This first publication and Reuchlin's account of his teaching at Basel in a letter to Cardinal Adrian (Adriano Castellesi) in February 1518 show that he had already found the work which in a larger sphere occupied his whole life. He was no original genius, but a born teacher. But this work of teaching was not to be done mainly from the

professor's chair. Reuchlin soon left Basel to seek further Greek training with George Hieronymus at Paris, and to learn to write a fair Greek hand that he might support himself by copying MSS. And now he felt that he must choose a profession. His choice fell on law, and he was thus led to the great school of Orleans (1478), and finally to Poitiers, where he became licentiate in July 1481. From Poitiers Reuchlin went in December 1481 to Tubingen with the inten- tion of becoming a teacher in the .university, but his friends recommended him to Count Eberhard of Wiirttemberg, who was about to journey to Italy and required an interpreter. Reuchlin was selected for this post, and in February 1482 left Stuttgart for Florence and Rome. The journey lasted but a few months, but it brought the German scholar into contact with several learned Italians, especially at the Medicean Academy in Florence; his connexion with the count became permanent, and after his return to Stuttgart he received important posts at Eberhard's court. About this time he appears to have married, but little is known of his married life. He left no children; but in later years his sister's grandson Melanchthon was almost as a son to him till the Reformation estranged them. In 1490 he was again in Italy. Here he saw Pico della Mirandola, to whose Cabbalistic doctrines he afterwards became heir, and also made the friendship of the pope's secretary, Jakob Questen- berg, which was of service to him in his later troubles. Again in 1492 he was employed on an embassy to the emperor Frederick at Linz, and here he began to read Hebrew with the emperor's Jewish physician Jakob ben Jehiel Loans. He knew something of this language before, but Loans's instruction laid the basis of that thorough knowledge which he afterwards improved on his third visit to Rome in 1498 by the instruction of Obadja Sforno of Cesena. In 1494 his rising reputation had been greatly enhanced by the publication of De Verbo Mirifico.

In 1496 Eberhard of Wiirttemberg died, and enemies of Reuchlin had the ear of his successor, Duke Eberhard. He was glad, therefore, hastily to follow the invitation of Johann von Dalberg (1445-1503), the scholarly bishop of Worms, and flee to Heidelberg, which was then the seat of the " Rhenish Society." In this court of letters Reuchlin's appointed function was to make translations from the Greek authors, in which his reading was already extremely wide. Though Reuchlin had no public office as teacher, and even at Heidelberg was prevented from lecturing, he was during a great part of his life the real centre of all Greek teaching as well as of all Hebrew teaching in Germany. To carry out this work he found it necessary to provide a series of helps for beginners and others. He never published a Greek grammar, though he had one in MS. for use with his pupils, but he put out

several little elementary Greek books. Reuchlin, it may be noted, pronounced Greek as his native teachers had taught him to do, i.e. in the modern Greek fashion. This pronunciation, which he defends in Dialogus de Recta Lat. Graecique Serm. Pron. (1519), came to be known, in contrast to that used by Erasmus, as the Reuchlinian.

At Heidelberg Reuchlin had many private pupils, among whom Franz von Sickingen is the best known name. With the monks he had never been liked; at Stuttgart also his great enemy was the Augustinian Conrad Holzinger. On this man he

took a scholar's revenge in his first Latin comedy Sergius, a satire on worthless monks and false relics.

Through Dalberg, Reuchlin came into contact with Philip, elector palatine of the Rhine, who employed him to direct the studies of his sons, and in 1498 gave him the mission to Rome which has been already noticed as fruitful for Reuchlin's pro- gress in Hebrew. He came back laden with Hebrew books, and found when he reached Heidelberg that a change of govern- ment had opened the way for his return to Stuttgart, where his wife had remained all along. His friends had now again the upper hand, and knew Reuchlin's value. In 1500, or perhaps in 1502, he was given a very high judicial office in the Swabian League, which he held till 1512, when he retired to a small estate near Stuttgart.

For many years Reuchlin had been increasingly absorbed in Hebrew studies, which had for him more than a mere philological interest. Though he was always a good Catholic, and even took the habit of an Augustinian monk when he felt that his death was near, he was too thorough a humanist to be a blind follower of the church. He knew the abuses of monkish religion, and was interested in the reform of preaching as shown in his De Arte Predicandi (1503) — a book which became a sort of preacher's manual; but above all as a scholar he was eager that the Bible should be better known, and could not tie himself to the authority of the Vulgate. The key to the Hebraea Veritas was the grammatical and exegetical tradition of the medieval rabbins, especially of David Kimhi, and when he had mastered this himself he was resolved to open it to others. In 1506 appeared his epoch-making De Rudimentis Hebraicis — grammar and lexicon — mainly after Kimhi, yet not a mere copy of one man's teaching. The edition was costly and sold slowly. One great difficulty was that the wars of Maximilian I., in Italy prevented Hebrew Bibles coming into Germany. But for this also Reuchlin found help by printing the Penitential Psalms with grammatical explanations (1512), and other helps

followed from time to time. But his Greek studies had interested him in those fantastical and mystical systems of later times with which the Cabbala has no small affinity. Following Pico, he seemed to find in the Cabbala a profound theosophy which might be of the greatest service for the defence of Christianity and the reconciliation of science with the mysteries of faith— an unhappy delusion indeed, but one not surprising in that strange time of ferment. Reuchlin's mystico-cabbalistic ideas and objects were expounded in the De Verbo Mirifico, and finally in the De Arte Cabbalistica (151 7).

Unhappily many of his contemporaries thought that the first step to the conversion of the Jews was to take from them their books. This view had for its chief advocate the bigoted Johann Pfeff.erkorn (1469-1521), himself a baptized Hebrew. Pfeffer- korn's plans were backed by the Dominicans of Cologne; and in 1509 he got from the emperor authority to confiscate all Jewish books directed against the Christian faith. Armed with this mandate, he visited Stuttgart and asked Reuchlin's help as a jurist and expert in putting it into execution. Reuchlin evaded the demand, mainly because the mandate lacked certain formalities, but he could not long remain neutral. The execu- tion of Pfefferkorn's schemes led to difficulties and to a new appeal to Maximilian. In 15 10 Reuchlin was summoned in the name of the emperor to give his opinion on the suppression of the Jewish books. His answer is dated from Stuttgart, October 6, 1510; in it he divides the books into six classes — apart from the Bible which no one proposed to destroy — and, going through each class, he shows that the books openly insulting to Chris- tianity are very few and viewed as worthless by most Jews themselves, while the others are either works necessary to the Jewish worship, which was licensed by papal as well as imperial law, or contain matter of value and scholarly interest which ought not to be sacrificed because they are connected with another faith than that of the Christians. He proposed that the emperor should decree that for ten years there be two Hebrew chairs at every German university for which the Jews should furnish books. The other experts proposed that all books

should be taken from the Jews; and, as the emperor still hesi- tated, the bigots threw on Reuchlin the whole blame of their ill success. Pfefferko'rn circulated at the Frankfort fair of 1511 a gross libel {Handspiegel wider und gegen die Juden) declaring that Reuchlin had been bribed; and Reuchlin retorted as warmly in the Augenspiegel

(1511). His adversary's next move was to declare the Augenspiegel a dangerous book; the Cologne theological faculty, with the inquisitor Jakob von Hochstraten (d. 1527) took up this cry, and on the 7th of October 1512 they obtained an imperial order confiscating the Augenspiegel. Reuchlin was timid, but he was honesty itself. He was willing to receive corrections in theology, which was not his subject, but he could not unsay what he had said; and as his enemies tried to press him into a corner he met them with open defiance in a Defensio contra Calumniator es (1513). The uni- versities were now appealed to for opinions, and were all against Reuchlin. Even Paris (August 1514) condemned the Augen- spiegel, and called on Reuchlin to recant. Meantime a formal process had begun at Mainz before the grand inquisitor, but Reuchlin by an appeal succeeded in transferring the question to Rome. Judgment was not finally given till July 1516; and then, though the decision was really for Reuchlin, the trial was simply quashed. The result had cost Reuchlin years of trouble and no small part of his modest fortune, but it was worth the sacrifice. For far above the direct importance of the issue was the great stirring of public opinion which had gone forward. And if the obscurantists escaped easily at Rome, with only a half condemnation, they received a crushing blow in Germany. No party could survive the ridicule that was poured on them in the Epislolae Obscurorum Virorum, the first volume of which written chiefly by Crotus Rubeanus appeared in 1514, and the second by Ulrich von Hutten in 1517. Hutten and Franz von Sickingen did all they could to force Reuchlin's enemies to a restitution of his material damages; they even threatened a feud against the Dominicans of Cologne and Spires. In 1520 a commission met in Frankfort to investigate the case. It condemned Hochstraten. But the final decision of Rome did not indemnify him. The contest ended, however; public interest had grown cold, absorbed entirely by the Lutheran question, and Reuchlin had no reason to fear new attacks. Reuchlin did not long enjoy his victory in peace. In 1519 Stuttgart was visited by famine, civil war and pestilence. From November of this year to the spring of 1521 the veteran statesman sought refuge in Ingolstadt and taught there for a year as professor of Greek and Hebrew. It was forty-one years since at Poitiers he had last spoken from a public chair; but the old man of sixty-five had not lost his gift of teaching, and hundreds of scholars crowded round him. This gleam of autumn sunshine was again broken by the plague; but now he was called to Tubingen and again spent the winter of 1521-22 teaching in his own systematic way. But in the spring he found it necessary to visit the baths of Liebenzell, and here he was seized with jaundice, of which he died on the 30th of June 1522, leaving in the history of the new learning a name only second to that of his younger

contemporary Erasmus.

The authorities for Reuchlin's life are enumerated in L. Geiger, Johann Reuchlin (1871), which is the standard biography. The controversy about the books of the Jews is well sketched by D. F. Strauss, Ulrich von Hutten. See also S. A. Hirsch, " John Reuchlin, the Father of the Study of Hebrew among the Christians," and his " John Pfefferkorn and the Battle of Books," in his Essays (London, 1905). Some interesting details about Reuchlin are given in the autobiography of Conrad Pellicanus (q.v.), which was not published when Geiger's book appeared. See also the article on Reuchlin in Herzog-Hauck, Realencyklopadie, and literature there cited.

(W. R. S.)

REUMONT, ALFRED VON (1808-1887), German scholar and diplomatist, the son of Gerhard Reumont (1765-1829), was born on the 15th of August 1808 and was named Alfred after the English king, Alfred the Great. Educated at the universities of Bonn and Heidelberg, he obtained a position in Florence through the influence of an Englishman, William Craufurd, but soon he entered the Prussian diplomatic service and was employed in

Florence, in Constantinople and in Rome. He also spent some time in the Foreign Office in Berlin. From 1851 to i860 he represented his country in Florence. Reumont was the friend and'adviser of Frederick William IV. In 1879 he founded the Aachener Geschichtsverein, and having spent his concluding years at Bonn and at Aix-la-Chapelle, he died in the latter city on the 27th of April 1887.

Reumont's numerous writings deal mainly with Italy, in which country he passed many years of his life. On the history of Florence and of Tuscany he wrote Tavole cronologiche e sincrone della storia fiorentina (1841; Supplement, 1875); Ceschichle Toscanas seit dem Ende des florentinischen Freistaats (Gotha, 1876-77); and Lorenzo de' Medici (Leipzig, 1874, and again 1883). This last book has been translated into English by R. Harrison (1876). He remembered his connexion with Florence when he wrote Romische Briefe von einem Florentiner (Leipzig, 1840-44), and his residence in Rome was also responsible for his Geschichte der Stadt Rom (3 vols., 1867-70). Turning his attention to the history of Naples, he wrote Die Carafa von Maddaloni: Neapel unter spanischer Herrschaft (1851 ; Eng. trans., 1854), and more general works on Italian history are: Beit- rage zur italienischen Geschichte (6 vols., Berlin, 1853-57), and Charakterbilder aus der neueren Geschichte Italiens (1886). More

strictly biographical in their nature are: Die Jugend Caterinas de' Medici (1854), which has been translated into French by A. Baschet (i866);"J)*e Grafin von Albany (i860) and a life of his close friend Capponi, Gino Capponi, ein Zeit- und Lebensbild (Gotha, 1880). His Ganganelli: Papst Clemens XIV., seine Briefe und seine Zeit (Berlin, 1847) is valuable for the relations between this pope and the Jesuits. Other works which may be mentioned are Zeitgenossen, Biografien und Charakteristiken (Berlin, 1862); Bibliografia dei lavori pubblicati in Germania sulla storia d' Italia (Berlin, 1863); Biographische Denkblatter nach personlichen Erinnerungen (Leipzig, 1878) ; and Saggi di storia e letteratura (Florence, 1880). Reumont's other important work, one which he was peculiarly fitted to write, was his Aus Friedrich Wilhelms IV. gesunden und kranken Tagen (Leipzig, 1885).

See H. Huffer, Alfred von Reumont (Cologne, 1904) ; and the same writer's article in the Allgemeine Deutsche Biographie, Band xxviii.

(1889).

REUNION, known also by its former name Bourbon, an island and French colony in the Indian Ocean, 400 m. S.E. of Tamatave, Madagascar, and 130 S.W. of Port Louis, Mauritius. It is elliptic in form; its greatest length is 45 m. and its greatest breadth 32 m., and it has an area of 965 sq. m. It lies between 20 51′ and 21 22′ S. and 55° 15′ and 55 54′ E.

The coast-line (about 130 m.) is little indented, there are no natural harbours and no small islets round the shore. The narrow coast-lands are succeeded by hilly ground which in turn gives place to mountain masses and tableland, which occupy the greater part of the island. The main axis runs N.W. and S.E., and divides the island into a windward (E.) district and a leeward (W.) district, the dividing line being practically that of the watershed. The form of the mountains is the result of double volcanic action. First there arose from the sea a mountain whose summit is approximately represented by Piton des Neiges (10,069 ft.), a denuded crater of immense proportions, and at a later date another crater opened towards the E., which, piling up the mountain mass of Le Volcan, turned what was till then a circle into an ellipse. The oldest erupted rocks belong to the type of the andesites; the newest are varieties of basalt. The two massifs are united by high table- lands. In the older massif the most striking features are now three areas of subsidence — the cirques of Salazie, Riviere des Galets and Cilaos — which He N.W. and S. of the Piton des Neiges. The first, which may be taken as typical, is surrounded by high almost

perpendicular walls of basaltic lava, and its surface is rendered irregular by hills and hillocks of debris fallen from the heights. Towards the S. lies the vast stratum of rocks (150 to 200 ft. deep) which, on the 26th of November 1875, suddenly sweeping down from the Piton des Neiges and the Gros Morne (a " shoulder " of the piton), buried the little village of Grand Sable and nearly a hundred of its inhabitants. Besides the Piton des Neiges and the Gros Morne the chief heights in this part of the island are the pyramidical Cimandef (7300 ft.), another shoulder of the piton, and the Grand Bernard (9490 ft.), separating the cirques of Mafate and Cilaos.

The second massif, Le Volcan, is cut off from the rest of the island by two " enclosures," each about 500 or 600 ft. deep.

The outer enclosure runs across the island in a N. and S. direc- tion; the inner forms a kind of parabola with its arms (Rempart du Tremblet on the S. and Rempart du Bois Blanc on the N.) stretching E. to the sea and embracing not only the volcano proper but also the great eastward slope known as the Grand Brule. The 30 m. of mountain wall round the volcano is per- haps unique in its astonishing regularity. It encloses an area of about 40 sq. m. known as the Grand Enclos. There are two principal craters, each on an elevated cone, — the more westerly, now extinct, known as the Bory Crater (8612 ft.), after Bory de St Vincent, the geologist, and the more easterly called the Burning Crater or Fournaise (8294 ft.). The latter is partially surrounded by an " enclosure " on a small scale with precipices 200 ft. high. Eruptions, though not infrequent (thirty were registered between 1735 and i860), are seldom serious; the more noteworthy are those of 1745, 1778, 1791, 1812, i860, 1870, 1881. Hot mineral springs are found on the flanks of the Piton des Neiges; the Source de Salazie (discovered in 1831) lies 2860 ft. above sea-level, has a temperature of 90°, and discharges 200 to 220 gallons per hour of water impregnated with bicarbonate of soda, and carbonates of magnesium and lime, iron, &c; that of Cilaos (discovered in 1826) is 3650 ft. above the sea with a temperature of 100°; and that of Mafate 2238 ft. and 87 .

Vertically R6union may be divided into five zones. The first or maritime zone contains all the towns and most of the villages, built on the limited areas of level alluvium occurring at intervals round the coast. In the second, which lies between 2600 and 4000 ft., the sugar

plantations made a green belt round the island and country houses abound. The third zone is that of the forests; the fourth that of the plateaus, where European vegetables can be cultivated; and above this extends the region of the mountains.

Climate. — The year divides into two seasons — that of heat and rain from November to April, that of dry and more bracing weather from May to October. The prevailing winds are from the S.E., sometimes veering round to the S., and more frequently to the N.E. ; the W. winds are not so steady (three hundred and seven days of E. to fifty-eight of W. wind in the course of the year). It is seldom calm during the day, but there is usually a period of complete repose before the land wind begins in the evening. Several years sometimes pass without a cyclone visiting the island; at other times they occur more than once in a single ” winter.” The rat de maree occasionally does great damage. On the leeward side of the island the winds are generally from the W. and S.W., and bring little rain. Mist hangs almost all day on the tops of the mountains, but usually clears off at night. On the coast and lower zones on the windward side the mean temperature is about 73 F. in the ” winter ” and 78° F. in the ” summer.” On the leeward side the heat is somewhat greater. In the Salazie cirque the mean annual average is 66° F.; at the Plaine des Palmistes 62 ° F. The rainfall is very heavy on the windward side, some stations registering 160 in. a year, while on the ” dry ” side of the island not more than 50 in. are registered. On the mountain heights snow falls every year, and ice is occasionally seen. In general the island is healthy, but fever is prevalent on the coast.

Fauna and Flora. — The fauna of Reunion is not very rich in variety of species. The mammals are a brown maki (Lemur mongoz, Linn.) from Madagascar, Pteropus edwardsii now nearly extinct, several bats, a wild cat, the tang or tamec (Centetes setosus, Denn.), several rats, the hare, and the goat. Among the more familiar birds are the ” oiseau de la vierge ” (Muscipeta borbonica), the tec- tec {Pratincola sybilla), Certhia borbonica, the cardinal (Foudia madagascariensis) , various swallows, ducks, &c. The visitants from Madagascar, Mauritius and even India, are very numerous. Lizards and frogs of more than one species are common, but there is only one snake (Lycodon aulicum) known in the island. Various species of Gobius, a native species of mullet, Nestis cyprinoides, Ospkronamus olfax and Doules rupestris are among the freshwater fishes. Turtles, formerly common, are now very rare.

In the forest region of the island there is a belt, 4500-5000 ft. above the sea, characterized by the prevalence of dwarf bamboo (Bambusa

alpina); and above that is a similar belt of Acacia heterophylla. Besides this last the best timber-trees are Casuarina laterifolia, Foetida mauritiana, Imbricaria petiolaris, Elaeodendron orientate, Calophyllum spurium (red tacamahac), Terminalia bor- bonica, Parkia speciosa. The gardens of the coast districts display a marvellous wealth of flowers and shrubs, partly indigenous and partly gathered from all parts of the world. Among the indigenous varieties may be noted the vacoa (Pandanus utilis) and the aloe.

A species of coffee plant is also indigenous. Fruits grown in the island are: the banana, the coco-nut, bread-fruit and jack-fruit, the bilimbi, the carambola, the guava, the litchi, the Japanese medlar, the mango-steen, the tamarind, the Abelmoschus esculentus, the chirimoya, the papaya, &c. Forests originally covered nearly the whole island ; the majority of the land has been cleared by the inhabitants, but there are still some 200 sq. m. of forest land and the administration has in part replanted the higher districts, such as Salazie, with eucalyptus and caoutchouc trees.

Inhabitants. — The inhabitants are divided into various classes, the Creoles, the mulattoes.j the negroes, and Indians and other Asiatics. The Creole population is descended from the first French settlers, chiefly Normans and Bretons, who married Malagasy women. Later settlers included European women, but the presence of non-European blood is so common among the Creoles that the phrase ” Bourbon white ” was given in Mauritius to linen of doubt- ful cleanness. Three kinds of Creoles are recognized — those of the towns and coasts, those of the mountains, and the petits Creoles, originally a class of small farmers living in the uplands, now reduced to a condition of poverty and dependence on the planters. The Creoles blancs de villes, the typical inhabitants of the island, are in general of a somewhat weak physique, quick-witted and of charming manners, brave and very proud of their island, but not of strong character. The mixed races tend to approximate to a single type, one in which the European strain predominates. The Creole patois is French mixed with a considerable number of Malagasy and Indian words, and containing many local idioms. The popu- lation, about 35,000 towards the close of the 18th century, was in 1849, at the period of the liberation of the slaves, 120,000, of whom 60,800 were newly freed negroes. Thereafter coolies were intro- duced from India, and in 1870 the population had increased to 212,000. In 1882 the government of India ceased to authorize the emigration of coolies to Reunion, and in consequence of that and other economic causes the population decreased. In 1902 the inhabitants numbered 173,315. Of these 13,492 were British Indians, 4496 Malagasy, 9457 foreign-born negroes, and 1378 Chinese. Of the

native born the Creoles numbered about 3000, the remainder being negroes or of mixed race. Among the Indian population the males are as three to one to the females, and the birth-rate is lower than the death-rate.

Towns and Communication. — St Denis, the capital of the island, lies on the N. coast. It had in 1902 a population of 27,392. It is built in the form of an amphitheatre, and has several fine public buildings and centrally situated botanic gardens. It is the seat of a bishopric, a court of first instance and an appeal court. It has an abundant supply of pure water. The only anchorage for vessels is an open roadstead. St Pierre (pop. 28,885), the chief town on the leeward side of the island, has a small artificial harbour. Between St Pierre and St Denis, and both on the leeward shore, are the towns of St Louis (pop. 12,541) and St Paul (pop. 19,617). A few miles N. of St Paul on the S. side of Cape Pointe des Galets is the port of the same name, the only considerable harbour in the island. It was completed in 1886 at a cost of £2,700,000, covers 40 acres, is well protected, and has 28 ft. of water. A railway serving the port goes round the coast from St Pierre, by St Paul, St Denis, &c, to St Benoit (a town on the E. side of the island with a pop. of 12,523), a distance of 831 m. This line is carried through a tunnel nearly 6J m. long between La Possession and St Denis. Besides the railway the lower parts of the island are well provided with roads. There is regular steamship communication between Pointe des Galets, Marseilles, Havre and Madagascar. Telegraphic communication with all parts of the world was established in 1906 when a cable connecting Reunion with Tamatave and .Mauritius was laid.

Industries. — The Sugar Plantations. — The area of the cultivated lands is estimated at 148,200 acres (or 230 sq. m.), of which 86,450 acres are under sugar-cane, the remainder being under either maize, manioc, potatoes, haricots, or coffee, vanilla and cocoa. The sugar-cane, introduced in 171 1 by Pierre Parat, is now the staple crop. In the 1 8th century the first place belonged to coffee (intro- duced from Arabia in 1 715) and to the clove tree, brought from the Dutch Indies by Poivre at the risk of his life. Both are now culti- vated on a very limited scale. Vanilla, introduced in 1818, was not extensively cultivated till about 1850. Bourbon vanilla, as it is called, is of high character, and next to sugar is the most important article of cultivation in the island. There are small plantations of cocoa and cinchona; cotton-growing was tried, but proved un- successful.

The sugar industry has suffered greatly from the competition with beet sugar and the effects of bounties, also from the scarcity of labour,

from the ravages of the phylloxera (which made its appearance in 1878) and from extravagant methods of manu- facture. It was not until 1906 that steps were taken for the ‘creation of central sugar mills and refineries, in consequence of the com- pulsory shutting down of many small mills. Rum is largely dis- tilled and forms an important article of export. There are also manufactories for the making of geranium essence, St Pierre being the centre of this industry. Other articles exported are aloe fibre and vacoa casks. The mineral wealth of the island has not been

exploited, except for the mineral springs which yield waters highly esteemed. Almost all the products of the island are exported, so that the import trade is very varied. Cattle are imported from Madagascar; rice, the chief article of food, from Saigon and India; petroleum, largely used in manufactories, from America and Russia ; almost everything else comes from France, to which country go the great majority of the exports. Over 75 % of the shipping is under the French flag.

Commerce. — The total trade amounted in i860 to the value of £4,464,000 (the highest during thecentury); in 1900, to £1,533,240. In 1905 the imports were valued at £727,000 and the exports at £428,000. Of the imports £500,000 were from France or French colonies: of the exports £388,000 went to France or French colonies. The currency consists of notes of the Banquede la Reunion (guaran- teed by i.he government) and nickel token money. Neither the notes nor the nickel money have any currency outside Reunion ; the rate of exchange varies from 5 to 20 %.

Administration and Revenue. — Reunion is regarded practically as a department of France. It sends two deputies and one senator to the French legislature, and is governed by laws passed by that body. All inhabitants, not being aliens, enjoy the franchise, no distinction being made between whites, negroes or mulattoes, all of whom are citizens. At the head of the local administration is a governor who is assisted by a secretary-general, a procureur general, a privy council and a council-general elected by the suffrages of all citizens. The governor has the right of direct communication and negotiation with the government of South Africa and all states east of the Cape. The council-general has wide powers, including the fixing of the budget. For administrative purposes the island is divided into two

arrondissements, the Wind- ward, with five cantons and nine communes, and the Leeward, with four cantons and seven communes. The towns are subject to the French municipal law. The revenue, largely dependent on the prosperity of the sugar trade, declined from an average of £163,765 in the five years 1895-99 to an average of £147,225 in the five years 1900-4. For the same periods the average colonial expenditure, which includes the loss incurred in maintaining the harbour and railway, increased from £224,508 to £225,088. Deficits are made good by grants from France.

History. — Reunion is usually said to have been first discovered in April 1513 by the Portuguese navigator Pedro Mascarenhas, and his name, or that of Mascarene Islands, is still applied to the archi- pelago of which it forms a part ; but it seems probable that it must be identified with the island of Santa Apollonia discovered by Diego Fernandes Pereira on the 9th of February 1507. It was visited by the Dutch towards the close of the 16th century, and by the English early in the 17th century. When in 1638 the island was taken possession of by Captain Gaubert, or Gobert, of Dieppe, it was still uninhabited; a more formal annexation in the name of Louis XIII. was effected in 1643 by Jacques Pronis, agent of the Compagnie des Indes in Madagascar; and in 1649 Etienne de Flacourt, Pronis's more eminent successor, repeated the ceremony at a spot which he named La Possession. He also changed the name of the island from Mascarenhas to Bourbon. By decree of the Convention in 1793, Bourbon in turn gave place to Reunion, and, though during the empire this was discarded in favour of lie Bonaparte, and at the Restoration people naturally went back to Bourbon, Reunion has been the official designation since 1848.

The first inhabitants were a dozen mutineers deported from Madagascar by Pronis, but they remained only three years (1646-49). Other colonists went thither of their own will in 1654 and 1662. In 1664 the Compagnie des Indes orientates de Madagascar, to whom a concession of the island was granted, initiated a regular colonization scheme. Their first commandant was Etienne Regnault, who in 1689 received from the French crown the title of governor. The growth of the colony was very slow, and in 171 7 there were only some 2000 inhabitants. It is recorded that they lived on excellent terms with the pirates, who from 1684 onward infested the neigh- bouring seas for many years. In 1735 Bourbon was placed under the governor of the lie de France (Mauritius), at that time the illus- trious Mahe de Labourdonnais. The Compagnie des Indes orien- tates gave up its concession in 1767, and under direct administration of the crown liberty of trade was granted. The French Revolution effected little

change in the island and occasioned no bloodshed; ‘ the colonists successfully resisted the attempts of the Convention to abolish slavery, which continued until 1848 (when over 60,000 negroes were freed), the slave trade being, however, abolished in 1817. During the Napoleonic wars Reunion, like Mauritius, served the French corsairs as a rallying place from which attacks on Indian merchantmen could be directed. In 1809 the British attacked the island, and the French were forced to capitulate on the 8th of July 1810; the island remained in the possession of Great Britain until April 1815, when it was restored to France. From that period the island has had no exterior troubles. The negro population, upon whom in 1870 the Third Republic conferred the full rights of French citizenship including the vote, being unwilling to labour in the plantations, the immigration of coolies began in i860, but in 1882 the government of India prohibited the further emigration of labourers from that country in consequence of the inconsiderate

treatment of the coolies by the colonists. Reunion has also suffered from the disastrous effects of cyclones. A particularly destructive storm swept over the island in March 1879, and in 1904 another cyclone destroyed fully half of the sugar crop and 75% of the vanilla crop. ‘ » . .

See A. G. Garsault, Notice sur la Reunion (Paris, 1900), a mono- graph prepared for the Paris exhibition of that year; E. Jacob de Cordemoy, Etude sur Vile de la Reunion, geograpKie, richesses natur- elles, &c. (Marseilles, 1905); W. D. Oliver, Crags and Craters; Rambles in the island of Reunion (London, 1896); C. Keller, Natur und Volksleben der Inset Reunion (Basel, 1888); J. D. Brunet, Histoire de V ‘association generate des francs Creoles de file Bourbon (St Denis, Reunion, 1885); Trouette, L’lle Bourbon pendant la periode revolutionnaire (Paris, 1888). Of earlier works consult Demanet, Nouv. Hist, de f Afrique francaise (1767); P. U. Thomas, Essai de slatistique de Vile Bourbon (1828); Dejean de la Batie, Notice sur Vile Bourbon (1847); J. Mauran, Impressions dans un voy. de Paris a Bourbon (1850); Maillard, Notes sur Vile de la Re- union (1862); Azema, Hist, de file Bourbon (1862). The geology and volcanoes of Reunion were the object of elaborate study, by Bory de St Vincent in 18.01 and 1802 {Voyages dans les quatre prin- cipals ties des mers a” Afrique, Paris, 1804), and have since been examined by R. von Drasche (see Die Inset Reunion, &c, Vienna, 1878, and C. Velain, Descriptions geologique de . . . Vile de la Reunion . . ., Paris, 1878). The best map is Pau Lepervanche’s Carte de la Reunion 1-100,000 (Paris, 1906).

REUS, a city of N.E. Spain, in the province of Tarragona, on the

Saragossa-Tarragona railway, 4 m. N. of Salpu, its port on the Mediterranean. Pop. (1900) 26,681. Reus consists of two parts, the old and the new, separated by the Calle Arrabal, which occupies the site of the old city wall. The old town centres in the Plaza del Me'rcado, from which narrow and tortuous lanes radiate in various directions; the new one dates from about the middle of the 18th century, and its streets are wide and straight. There is an active trade in the agricultural products of the fertile region around the city. The local industries developed considerably between 1875 and 1905, and the city has important flour, wine and fruit export houses. There is a model farm belonging to the municipality in the .suburbs. Reus has excellent primary, normal and higher- grade state schools, many private schools, an academy of fine arts and a public library. The hospitals and foundling refuge, the institute and the town hall are handsome modern buildings.

The earliest records of Reus date from about the middle of the 13th century. Its modern prosperity is traced to about the year 1750, when a colony of English settled here and estab- lished a trade in woollens, leather, wine and spirits. The principal incidents in its political history arose out of the occurrences of 1843 (see Spain, History), in connexion with which the town received the title of city, and Generals Zurbano and Prim were made counts of Reus. The city was the birth-place of General Prim (1814-1870) and of the painter Mariano Fortuny (1839-1874).

REUSCH, FRANZ HEINRICH (1823-1900), Old Catholic theologian, was born at Brilon, in Westphalia, on 4th December 1823. He studied general literature at Paderborn, and theology at Bonn, Tubingen and Munich. The friend and pupil of Dollinger, he took his degree of Doctor in Theology at Munich, the university of which Dollinger was so long an ornament. He was ordained priest in 1849, an d was immediately after- wards made chaplain at Cologne. In 1854 he became Privat- dozent in the exegesis of the Old Testament in the Catholic Theological Faculty at Bonn; in 1858 he was made extra-ordinary, and in 1861 ordinary, professor of theology in the same university. From 1866 to 1877 he was editor of the Bonner Theologisches Liter aturolatt. In the controversies on the Infallibility of the Pope, Reusch attached himself to Dollinger's party, and he and his colleagues Hilgers, Knoodt and Langen were interdicted by the archbishop of Cologne in 1871 from pursuing their courses of lectures. In 1872 he was excommunicated. For many years after this he held the post of Old Catholic cure of Bonn, as well as the position of vicar-general to the Old Catholic Bishop Reinkens, but resigned both in 1878, when, with Dollinger, he disapproved of the permission to

marry granted by the Old Catholic Church in Germany to its clergy. From that time he retired into lay communion,

but continued to give lectures as usual in the Old Catholic Faculty of Theology in the university of Bonn, and to write on theological subjects. He was made rector of that university in 1873. In 1874 and 1875 he was the official reporter of the memorable Reunion Conferences held at Bonn in those years and attended by many distinguished theologians of the Oriental and Anglican communions.

Reusch was a profound scholar, an untiring worker and a man of lovable character. Among his voluminous works were contributions to the Revue Internationale de thiologie, a review started at Bern at the instance of the Old Catholic Congress at Lucerne. He wrote also works on the Old Testament; a pamphlet on Die Deutschen Bischbfe und der Aberglaube; and another on the falsifications to be found in the treatise of Aquinas against the Greeks; as well as essays on the history of the Jesuit Order, and a book of prayers. But his fame will mainly rest on the works which he and Dollinger published jointly. These consisted of a work on the Autobiography of Cardinal Bellarmine, the Geschichte der Moralstreitigen in der Romisch-Katholischen Kirche seit dem XVI. Jahrhundert, and the Erorterungen uber Leben und Schriften des hi. Liguori. During the last few years of his life he was smitten with paralysis. He died on the 3rd of March 1900, leaving behind him in manu- script a collection of letters to Bunsen about Roman cardinals and prelates, which has since been published. (J. J. L. *)

REUSCH, HANS HENRIK (1852-), Norwegian geologist, was born at Bergen on the 5th of September 1852. He was educated at Christiania, Leipzig and Heidelberg, and graduated Ph.D. at Christiania in 1883. He joined the Geological Survey of Norway in 1875, and became Director in 1888. He is dis- tinguished for his researches on the crystalline schists and the Palaeozoic rocks of Norway. He discovered Silurian fossils in the highly altered rocks of the Bergen region; and in 1891 he called attention to a palaeozoic conglomerate of glacial origin in the Varanger Fiord, a view confirmed by Mr A. Strahan in 1896, who found glacial striae on the rocks beneath the ancient boulder-bed. Reusch has likewise thrown light on the later geological periods, on the Pleistocene glacial pheno- mena and on the sculpturing of the scenery of Norway. Among his separate publications are Silur fossiler

og pressede Kon- glomerater (1882); Det nordlige Norges Geologi (1891).

REUSS, AUGUST EMANUEL VON (1811-1873), Austrian geologist and palaeontologist, the son of Franz Ambrosius Reuss (176ˆ1830), was born at Bilin in Bohemia on the 8th of July 1811. He was educated for the medical profession, graduating in 1834 at the university of Prague, and afterwards practising for fifteen years at Bilin. His leisure was devoted to mineralogy and geology, and the results of his researches were published in Geognostische Skizzen aus Bohmen (1840-44) and Die Versteinerungen der Bohmischen Kreideformation (1845-46). In 1849 he gave up his medical practice, and became professor of mineralogy at the university of Prague. There he estab- lished a fine mineralogical collection, and he became the first lecturer on geology. In 1863 he was appointed professor of mineralogy in the university of Vienna. He investigated the Cretaceous fauna of Gosau, and studied the Crustacea, including entomostraca, the corals, bryozoa, and especially the foraminifera of various geological formations and countries. He died at Vienna on the 26th of November 1873.

REUSS, EDOUARD GUILLAUME EUGENE (1804-1891), Protestant theologian, was born at Strassburg on the 18th of July 1804. He studied philology in his native town (1819-22), theology at Gottingen under J. G. Eichhorn; and Oriental languages at Halle under Wilhelm Gesenius, and afterwards at Paris under Silvestre de Sacy (1827-28). In 1828 he became Privatdozent at Strassburg. From 1829 to 1834 he taught Biblical criticism and Oriental languages at the Strassburg Theological School; he then became assistant, and afterwards, in 1836, regular professor of theology at that university. The sympathies of Reuss were German rather than French, and after the annexation of Alsace to Germany he remained at Strassburg, and retained his professorship till, in 1888, he retired

on a pension. Amongst his earliest works were: De libris veteris Testamenti apocryphis plebi non negandis (1829), Ideen zur Einleitung in das Evangelium Johannis (1840) and Die Johanneische Theologie (1847). In 1852 he published his Histoire de la theologie chretienne au siecle apostolique, which was followed in 1863 by L'Histoire du canon des saintes ecritures dans Vfglise chretienne. In 1874 he began to publish his translation of the Bible, La Bible, nouvelle traduction avec commentaire. It was the criticism and exegesis of the New Testament which formed the subject of Reuss's earlier labours — in 1842, indeed, he had published in German a history of the books of the New Testament, Geschichte der heiligen Schriften N. Test. ; and though his own views were liberal, he opposed

the results of the Tubingen school. After a time he turned his attention also to Old Testa- ment criticism, for which he was especially fitted by his sound knowledge of Hebrew. In 1881 he published in German his Geschichte der heiligen Schriften A . Test., a veritable encyclopaedia of the history of Israel from its earliest beginning till the taking of Jerusalem by Titus; He died at Strassburg on the 15th of April 1 89 1.

Reuss belonged to the more modern section of the Liberal party in the Lutheran Church. His critical position was to some extent that of K. H. Graf and J. Wellhausen, allowing for the circumstances that he was in a sense their forerunner, and was actually for a time Graf's teacher. Indeed, he was really the originator of the new movement, but hesitated to publish the results of his studies. For many years Reuss edited with A. H. Cunitz (b. 1812) the Beitrage zu den iheologischen Wissen- schaften. With A. H. Cunitz and J. W. Baum (1809-1878), and after their death alone, he edited the monumental edition of Calvin's works (38 vols., 1863 ff.). His critical edition of the Old Testament appeared a year after his death. His son, Ernst Rudolf (b. 1841), was in 1873 appointed city librarian at Strassburg.

See the article in Herzog-Hauck, Realencyklopadie, and cf. Otto Pfleiderer, Development of Theology in Germany since Kant

(1890).

REUSS, the name of two small principalities of the German empire, called Reuss, elder line, or Reuss-Greiz, and Reuss, younger line, or Reuss-Schleiz-Gera. With a joint area of 441 sq. m. they form part of the complex of Thuringian states, and consist, roughly speaking, of two main blocks of territory, separated by the Neustadt district of the duchy of Saxe- Weimar. The more southerly, which is much the larger of the two portions, belongs to the bleak, mountainous region of the Frankenwald and the Vogtland, while the northern portion is hilly, but fertile. The chief rivers are the Weisse Elster and the Saale. About 35% of the total surface is occupied by forests, while about 40% is under tillage and about 19% under meadow and pasture. Wheat, rye and barley are the principal crops grown, and the breeding of cattle is an important industry.

Reuss-Greiz, with an area of 122 sq. m., belongs to the larger of the two divisions mentioned above, and consists of three large and several small parcels of land. On the whole, the soil is not favourable for agriculture, but the rearing of cattle is carried on with much success. About 63% of the inhabitants maintain themselves by industrial pursuits, the chief products of which are the making of woollen fabrics

at Greiz, the capital, and of stockings at Zeulenroda. Other industries are machine- building, printing and the making of paper and porcelain. In 1905 the population of the principality was 70,603 . The constitution Of Reuss-Greiz dates from 1867, and provides for a representative chamber of twelve members, of whom three are appointed by the prince, while two are chosen by the landed proprietors, three by the towns and four by the rural districts. The revenue and expenditure amount to about £76,000 a year, and there is no public debt. The reigning prince is Henry XXIV. (b. 1878), but as he is incapable of discharging his duties, these are now undertaken by a regent.

Reuss-Schleiz-Gera, with an area of 3T9 sq. m., includes part of the southern and the whole of the northern of the two main divisions mentioned above; it touches Bavaria on the south

and Prussian Saxony on the north. The former portion is known as the Oberland and the latter as the Unterland. Owing to the fertility of the Unterland, quite one-quarter of the people are supported by agricultural pursuits, although there is also much industrial activity. The chief industrial product consists of woollen goods, and the manufacture centres in the capital Gera, the largest of the six towns of the principality. Other industries are jute-spinning, dyeing and brewing, and the manufacture of musical instruments, chemicals, tobacco, cigars, porcelain and machinery. A considerable trade is carried on in these goods and also in timber, cattle and slate. Iron is mined in the Oberland, and large quantities of salt are yielded by the brine springs of Heinrichshall. In 1905 Reuss- Schleiz contained 144,584 inhabitants. Its annual revenue and expenditure amount to about £129,000, and in 1908 it had a public debt of £52,027. The constitution, which rests on laws of 1852 and 1856, provides for a representative assembly of 16 members which possesses limited legislative powers, the administrative duties being discharged by a cabinet of three members. The reigning prince is Henry XIV. (b. 1832), but since 1892 his duties have been undertaken by a regent. The states of Reuss return one member each to the Bundesrat, and one each to the Reichstag of the German empire.

History. — The history of Reuss stretches back to the times when the German kings appointed vogts, or bailiffs (advocati imperii), to administer their lands. One of these vogts was a certain Henry, who

died about n 20, after having been entrusted by the emperor Henry IV. with the vogtship of Gera and of Weida, and he is generally recognized as the ancestor of the princes of Reuss. His descendants called themselves lords of Weida, and some of them were men of note in their day, serving the emperors and German kings and distinguishing themselves in the ranks of the Teutonic order. The land under their rule gradually increased in size, and it is said that the name of Reuss was applied to it owing to the fact that one of its princes married a Russian princess, their son being called " der Russe," or the Russian. Another version is that the prince received this sobriquet because he passed many years in Russia. The district thus called Reuss was at one time much more extensive than it is at present, and for some years its rulers were margraves of Meissen. In 1 564 the family was divided into three branches by the sons of Henry XVI. (d. 1535). One of these became ex- tinct in 1616, but the remaining ones are those of Reuss-Greiz and Reuss-Schleiz-Gera, which are flourishing to-day. Although there have been further divisions these have not been lasting, and the lands of the former family have been undivided since 1768 and those of the latter since 1848. The lords of Reuss took the title of count in 1673 i an d the head of the elder line became a prince of the Empire in 1778, and the head of the younger line in 1806. In 1807 the two princes joined the Confederation of the Rhine and in 181 5 the German confederation. In 1866 Reuss-Greiz was compelled to atone for its active sympathy with Austria by the payment of a fine. In 1871 both princi- palities became members of the new German empire. The princes of Reuss are very wealthy, their private domain including a great part of the territory over which they rule. In the event of either line becoming extinct, its possessions will fall to the other.

A curious custom prevails in the house of Reuss. The male members of both branches of the family all bear the name of Henry (Heinrich), the individuals being distinguished by numbers. In the elder line, according to an arrangement made in 1701, the enumeration continues until the number one hundred is reached when it begins again. In the younger line the first prince born in a new century is numbered I., and the numbers follow on until the end of the century when they begin again. Thus Henry XIV. of Reuss younger line, who was born in 1832, was the son of Henry LXVII. (1780-1867), the former being the 14th prince born in the 19th century, and the latter the 67th prince born in the 18th.

See B. Schmidt, Die Reussen, Genealogie des Gesamthauses Reuss (Schleiz, 1903); H. von Voss, Die Ahnen des reussischen Hauses

(Lobenstein, 1882) ; C. F. Collmann, Reussische Geschichte. Das Vogtland im Mittelalter (Greiz, 1892), and O. Liebmann, Das Staats-recht des Fiirstenthums Reuss (1884).

REUTER, FRITZ (1810-1874), German novelist, was born on the 7th of November 1810, at Stavenhagen, in Mecklenburg- Schwerin, a small country town where his father was burgo- master and sheriff (Stadtrichter), and in addition to his official duties carried on the work of a farmer. He was educated at home by private tutors and subsequently at the gymnasiums of Friedland in Mecklenburg-Strelitz, and of Parchim. In 183 1 he began to attend lectures on jurisprudence at the uni- versity of Rostock, and in the following year went to the university of Jena. Here he was a member of the political students' club, or German Burschenschaft, and in 1833 was arrested in Berlin by the Prussian government; although the only charge which could be proved against him was that he had been seen wearing its colours, he was condemned to death for high treason. This monstrous sentence was commuted by King Frederick William III. of Prussia to imprisonment for thirty years in a Prussian fortress. In 1838, through the personal intervention of the grand-duke ' of Mecklenburg, he was delivered over to the authorities of his native state, and the next two years he spent in the fortress of Domitz, but in 1840 was set free, an amnesty having been proclaimed after the accession of Frederick William IV. to the Prussian throne.

Although Reuter was now thirty years of age, he went to Heidelberg to resume his legal studies; but he soon found it necessary to return to Stavenhagen, where he aided in the management of his father's farm. After his father's death, however, he abandoned farming, and in 1850 settled as a private tutor at the little town of Treptow in Pomerania. Here he married Luise Kunze, the daughter of a Mecklenburg pastor. Reuter's first publication was a collection of miscellanies, written in Plattdeutsch, and entitled Lauschen un Riemels ("anecdotes and rhymes," 1853; a second collection followed in 1858). The book, which was received with encouraging favour, was followed by Polterabendgedichte (1855), and De Reis' nah Belligen (1855), the latter a humorous poem describing the adventures of some Mecklenburg peasants who resolve to go to Belgium (which they never reach) to learn the secrets of an advanced civilization. In 1856 Reuter left Treptow and established himself at Neubrandenburg, resolving to devote his whole time to literary work. His next book (published in 1858) was Kein Husung, an epic in which he presents with great force and vividness some of the least attractive aspects of village life in Mecklenburg. This was followed, in i860, by Hanne Niite un de liitte Pudel, the best of the works written by Reuter in verse. In 1861

Reuter's popularity was largely increased by Schurr-Murr, a collection of tales, some of which are in High German, but this work is of slight importance in comparison with the series of stories, entitled Olle Kamellen (" old stories of bygone days "). The first volume, published in i860, con- tained Woans ick tau'ne Fru kam and Ut de Franzosentid. Ut mine Festungstid (1861) formed the second volume; Ut mine Stromtid (1864) the third, fourth and fifth volumes; and Dorch-lauchting (1866) the sixth volume — all written in the Plattdeutsch dialect of the author's home. Woans ick tau 'ne Fru kam is a bright little tale, in which Reuter tells, in a half serious half bantering tone, how he wooed the lady who became his wife. In Ut de Franzosentid the scene is laid in and neai Stavenhagen in the year 1813, and the characters of the story are associated with the great events which then stirred the heart of Germany to its depths. Ut mine Festungstid is of less general interest than Ut de Franzosentid, a narrative of Reuter's hardships during the term of his imprisonment, but it is not less vigorous either in conception or in style. Ut mine Stromtid is by far the greatest of Reuter's writings. The men and women he describes are the men and women he knew in the villages and farmhouses of Mecklenburg, and the circumstances in which he places them are the circumstances by which they were surrounded in actual life. As in Ut de Franzosentid he describes the deep national impulse in obedience to which Germany rose against

Napoleon, so in Ut mine Stromtid he presents many aspects of the revolutionary movement of 1848.

In 1863 Reuter transferred his residence from Neubranden- burg to Eisenach; and here he died on the 12th of July 1874. In the works produced at Eisenach he did not maintain the high level of his earlier writings.

Reuter's Sdmtliche Werke, in 13 vols., were first published in 1863-68. To these were added in 1875 two volumes of Nachgelassene Schriften, with a biography by A. Wilbrandt; and in 1878 two supplementary volumes to the works appeared. A popular edition in 7 vols, was published in 1877-78 (last edition, 1902) ; there are also editions by K. F. Muller (18 vols., 1905), and W. Seelmann(7 vols., 1905-6). See O. Glagau, F. Reuter und seine Dichtungen (1866; 2nd ed., 1875); H. Ebert, F. Reuter und seine Werke (1874); F. Latendorf, Zur Erinnerung an F. Reuter (1879); K. T. Gadertz, Reuter-Studien

(1890); by the same, Aus Reuters alten und jungen Tagen (3 vols., 1894-1900) ; Briefe F. Reuters an seinen Vater, edited by F. Engel (2 vols., 1895); A. Romer, F. Reuter in seinem Leben und Schaffen (1895); G. Raatz, Wahrheit und Dichtung in Reuters Werken (1895); E. Brandes, Aus F. Reuters Leben (1899); K. F. MUller, Der Mecklenburger Volksmund und F. Reuters Schriften (1902). A complete bibliography of F. Reuter will be found in the Niederdeutsche Jahrbuch for 1896 and 1902.

REUTER, PAUL JULIUS, Baron de (1821-1899), founder of Reuter's News Agency, was born at Cassel, Germany. At the age of thirteen he became a clerk in his uncle's bank at Gottingen, where he chanced to make the acquaintance of Professor Gauss, whose experiments in telegraphy were then attracting some attention. Reuter's mind was thus directed to the value of the speedy transmission of information, and in 1849, on the completion of the first telegraph lines in Germany and France, he found an opportunity of turning his ideas to account. There was a gap between the termination of the German line at Aix-la-Chapelle and that of the French and Belgian lines at Verviers. Reuter organized a news-collecting agency at each of these places, his wife being in charge of one, himself at the other, and bridged the interval by a pigeon-post. On the establishment of through telegraphic communication, Reuter endeavoured to start a news agency in Paris, but finding that the French govern- ment's restrictions would render the scheme unworkable, removed in 1851 to England and became a naturalized British subject. The first submarine cable — between Dover and Calais — had just been laid, and Reuter opened an office in London for the transmission of intelligence between England and the continent. At first, however, his business was practi- cally confined to the transmission of private commercial telegrams to places not connected with the new telegraph system. He appointed agents at the various telegraph termini on the con- tinent to take these despatches off the wires and forward them by rail or pigeon-post to the addresses. Simultaneously he endeavoured to induce the English papers to publish the foreign news telegrams supplied by his various agents. These efforts were for some years unsuccessful, until in 1858 The Times published the report of an important speech by Napoleon III. forwarded by Reuter's Paris agent. Reuter now extended his sphere of operations all over the world, and in 1859 obtained leave for the presence of representatives at the headquarters of the Austrian and French armies during the war. In 1866 he laid down a special cable from Cork to Crookhaven, which enabled him to circulate news of the American Civil War several hours before the steamer could reach Liverpool. A concession for a cable beneath the North Sea to

Cuxhaven was granted him by the king of Hanover in 1865, and in the same year a concession was granted him for a cable between France and the United States, the line being worked jointly by Reuter (whose business had just been converted into a limited liability company) and the Anglo-American Telegraph Company. In 1872 he obtained from the shah of Persia an exclusive concession to develop the internal resources of that country, but the con- cession was annulled and its privileges transferred to the Im- perial Bank of Persia. Reuter was in 1871 given the title of baron by the duke of Saxe-Coburg and Gotha, and by a special grant of Queen Victoria he and his heirs were authorized to have the privileges of this rank in England. Baron Reuter died at Nice on the 25th of February 1899.

REUTERHOLM, QUSTAF ADOLF, Baron (1756-1813), Swedish statesman. After a brief military career he was ap- pointed Kammerherr to Sophia Magdalena, queen consort of Gustavus III., and subsequently became intimately connected with the king's brother, Charles, then duke of Sudermania. He remained in the background throughout the reign of Gustavus III., whom he constantly opposed and by whom he was im- prisoned along with the other malcontents in 1789. He was abroad at the time of the king's death, but a summons from his friend, now duke regent, speedily recalled him, and in 1793 he was made a member of the council of state and one of the " lords of the realm." At first he seemed inclined to adopt a liberal system, and reintroduced the freedom of the press. He did this solely, however, to reverse the Gustavian system, and persecuted the stalwarts of the late king {e.g. G. M. Armfelt, J. K. Toll) with a petty vindictiveness which excited general disgust. Towards the end of the regency, Reuterholm inclined towards an alliance with Russia on the basis of a marriage between the young king, Gustavus IV., and the empress Catherine's granddaughter, Alexandra Pavlovna, an alliance frustrated by the bigotry of the intended groom. At home the Swedish government ended as ultra-reactionary, owing to an insignificant riot in Stockholm which so alarmed Reuterholm that he threatened all printers who printed anything relating to the constitutions of the French republic or the United States of America with the loss of their privileges. In March 1795 he closed the Swedish Academy because A. G. Silfverstolpe in his inaugural address had ventured to disapprove of the coup d'etat of 1789. On the accession of Gustavus IV. (November 1st, 1796) Reuterholm was expelled from Stockholm. For the next twelve years he lived abroad under the name of Tempelcrentz. After the revolution of 1809 he returned to Sweden, but was denied all access to Charles XIII., and quitted his country for good. He died in Schleswig on the 27th of December 1813.

See Sveriges Historia (Stockholm, 1877-1881), vol. v. (R. N. B.)

REUTLINGEN, a town of Germany, in the kingdom of Wurttemberg, situated on the Echatz, an affluent of the Neckar, near the base of the Achalm and 36 m. by rail S. of Stuttgart. Pop. (1905) 23,850. It is a quaintly built town, with many picturesque houses and a fine Gothic church of the 13th and 14th centuries dedicated to St Mary, which was restored in 1893-1901; it contains in the choir a replica of the Holy Sepulchre and a sculptured stone font, and has a tower 240 ft. high. Reutlingen has three other Evangelical churches, a Roman Catholic church, a town hall, and several monuments, including one to the emperor William I. and another to Friedrich List. The industries of the town are numerous, and include the spinning and weaving of cotton, dyeing and bleaching; also the manufacture of leather, machinery, furniture, shoes, paper, clothing, hardware, bricks, beer and woollen goods. Hops, vines and fruit are grown, in the neighbourhood. Reutlingen has several schools and educational establishments, including a celebrated pomological institute. It is also famous as the place where Pastor Gustav Werner (1809-1887) founded his Christian Socialist refuge, which has become widely known in philanthropic circles.

Reutlingen, which is first mentioned in 1213, became a free im- perial town in the 13th century and was fortified by the emperor Frederick II., remaining loyal to him and to his son, Conrad IV. A member of the league of Swabian towns, its citizens defeated Count Ulrich of Wurttemberg on the 14th of May 1377. Later it joined the Swabian League and was favoured by the emperor Maxi- milian I. It came into the possession of Wurttemberg in 1802. An explosion which took place on the 27th of December 1852 destroyed many houses in the town.

See Rupp, Aus der Vorzeit Reutlingens und seiner Vmgegend (Stuttgart, 1869); Hochstetter, Filhrer durch Reutlingen und Umgebung (Reutlingen, 1901); and Zwiesele, Geognostischer Fuhrer in der Vmgegend von Reutlingen (Stuttgart, 1897).

REVAL, or Revel (Russ. Revel, formerly Kolyvan; Esthonian, Tallina and Tannilin), a fortified seaport town of Russia, capital of Esthonia, situated on a bay on the S. coast of the gulf of Finland, 230 m. W. of St Petersburg by rail. Pop* (1900) 66,292, of whom half were Esthonians and 30%

Germans. The city consists of two parts — the Domberg or Dom, which occupies a hill, and the lower town on the beach. The Dom contains the castle (first built in the 13th century, rebuilt in 1772), where the provincial administration has its seat, and a cathedral (1894-1900) with five gilded domes. It has its own administration, separate from that of the lower town. The church of St Nicholas, built in 1317, contains many antiquities of the former Roman Catholic times and old German paintings. The Dom church contains many interesting shields, as also the graves of the circumnavigator Baron A. J. von Krusenstern (1770-1846), of the Swedish soldiers Pontus de la Gardie (d. 1585) and Carl Horn (d. 1601), and of the Bohemian Protestant leader Count Matthias von Thurn (1580- 1640). The church of St Olai, first erected in 1240, and often rebuilt, was completed in 1840 in Gothic style; it has a bell tower 456 ft. high. The oldest church is the Esthonian, built in 1 2 19. The public institutions include a good provincial museum of antiquities; an imperial palace, Katharinenthal, built by Peter the Great in 17 19; and very valuable archives, preserved in the town hall (14th century). The pleasant situation of the town attracts thousands of people for sea- bathing. It is the seat of a branch board of the Russian admiralty and of the administration of the Baltic lighthouses. Its port has a depth of 4 to 6 fathoms, and a roadstead 35 m. wide, which freezes nearly every winter. The exports consist chiefly of grain, timber, flax, hides, wool, a species of anchovy, and hemp, and the imports of manufactured goods and machinery. The value of the aggregate trade amounts to an average of seven to nine millions sterling annually. There is considerable trade with Finland. Baltic Port, 30 m. W., is a sort of annex to the port of Reval.

The high Silurian crag now known as Domberg was early occupied by an Esthonian fort, Lindanissa. In 1219 the Danish king Valdemar II. erected here a strong castle and founded the first church. . In 1228 the castle was taken by the Livonian Knights, but nine years later it returned to the Danes. About the same time Liibeck and Bremen merchants settled there, and their settlement became an important seaport of the Hanseatic League. It was fortified early in the 14th century, and in 1343 sustained a siege by the revolted Esthonians. Valdemar III. sold Reval and Esthonia to the Teutonic Knights in 1346, but on the dissolution of the order, in 1561, Esthonia and Reval surrendered to the Swedish king Erik XIV. A great conflagra- tion in 1433, the pestilence of 1532, the bombardment by the Danes in 1569, and the Russo-Livonian War, destroyed its trade. The Russians besieged Reval twice, in 1570 and 1577. It was still an important

fortress, having been enlarged and fortified by the Swedes. In 17 10 it was surrendered to Peter the Great, who immediately began the erection of a military port for his Baltic fleet. His successors continued to fortify the access to Reval from the sea, large works being undertaken, especially in the early years of the 19th century.

REVEILLE (Fr. reveillez, imperative of reveiller, to awaken, Lat. re- and vigilare, to watch), the signal by call of bugle or beat of drum to announce to soldiers the time to awake and begin duty.

REVELATION, BOOK OF, in the Bible, the last book of the New Testament.

Title. — According to the best authorities k CA (in the sub- scription) 2, 8, 82, 93, the title of this book is awoKahflpis ‘Icoavvov. Some cursives (1, 14, 17, 25, 28, 31, 38, 51, 90, 91, 94, 97) read dr. (+ tov aylov 1, 25, 28, 31, 38, 51, 90, 94) ‘Iwavvov tov BeoKbyov; Q and 12, cbr. ‘I. tov 8eoK. ml evayyeXLaTov; P and 42,1) cur. tov airoaToKov ‘I. mi evayyekiarov ‘The word ” apoc- alypse ” gives the current title not only to this book, but to a large body of Jewish and Christian writings. This is one of the first instances of its use in this sense in existing literature. An earlier use is probably to be found in the title of the Syriac Apocalypse of Baruch, which =ypafi rrjs airoKaXbpKJs tov fiapovx vlov tov Nrjpiav. The title is different from what the New Testa- ment use of the term would have led us to expect, i.e. ‘AxoKaXmˆts ‘Itjow, which are indeed the opening words of this book. With

the latter phrase we might compare Gal. i. 12, where we have awoKak&ptbis ‘Ljo-oOXpioroO, ” revelation from Jesus Christ.” For the book is a revelation made by Gcd to Jesus Christ, who through His angel made it known to John for transmission to the churches. Instead of this the Church substituted the name of the disciple through whom the message was delivered for that of his Master, and designated our Apocalypse ” The Apocalypse of John.” This title was familiar before the end of the 2nd century.

MSS. and Versions. — There are six uncials, «, A, C, P, Q, 1, the last of which has not been edited or collated. Of the rest, P and Q are imperfect. The known cursives amount to 229, according to von Soden (Die Schriften des Neuen Testamentes, I. i. 289). There are six ancient versions of various values. (a) The best is the Latin, which is found in the Old Latin (g hm and the text used by Primasius) and the Vulgate, of which there are eight MSS. written between the 6th and 15th centuries. (6) The Syriac version appears in two forms, the

Philoxenian (a.d. 508), recently discovered and edited by Gwynn, and the Harclean (a.d. 616). The true Peshitta did not contain the Apocalypse, (c) The Armenian version. The Apocalypse was admitted to the canon, according to Conybeare, in the 1 2th century through the influence of Nerses, who revised an older version traceable to the opening of the 5th century, (d) The Egyptian version is found in two forms, i.e. the Bohairic and Sahidic. The former has been edited by Horner, who is now also engaged on an edition of the latter. (e,f) The Ethiopic and Arabic versions have not yet been critically edited.

External Evidence and Canonicity, 2nd Century. — It is possible that the Apocalypse was known to Ignatius, Eph. xv. 3 (Rev. xxi. 3); Philad. vi. 1 (Rev. hi. 12). Some have thought also that Barnabas (vi. 13, xxi. 3) was acquainted with our text, but this is highly improbable. Andreas of Caesarea mentions Papias as attesting the credibility of Revelation, and cites two of his remarks on Rev. xii. 7. The fact that Eusebius does not mention Revelation among the New Testament books known to Papias (H.E. iii. 39) may be due to the historian's unfriendly attitude to the book. Moreover, Papias may be one of the presbyters to whom, as having actually seen John, Irenaeus (v. 30 = Eusebius, H.E. v. 8) appeals on behalf of the number 666. From these possible and highly probable references we pass on to the clear testimony of Justin Martyr, who is the first to declare that Revelation is by " John, one of the Apostles of Christ " (Dial, lxxxi. 15), and a book of canonical standing (i. 28). In the latter half of this century it meets with very wide recogni- tion. Thus a treatise of some description was written upon it by Melito of Sardis in Asia Minor (Eus. H.E. iv. 26), and quoted by the anti-Montanist Apollonius (H.E. v. 18) and Theophilus of Antioch (H.E. iv. 24). In Carthage its currency is proven by the references of Tertullian, and the phraseology of the Acts of Perpetua and Felicitas (§§ 4, 12); in Alexandria by the citations of Clement (Paed. i. 6. 36; ii. 10. 108, &c); in Rome by its inclusion in the Muratorian canon, and in Gaul by its use in the Epistle of the churches of Vienne and Lyons (Eus. H.E. v. 10. 58), and in Irenaeus, who defends the apostolic authorship of the Revelation of John (Haer. iv. 14. 1, 17. 6, 18. 6, 20. 11, 21. 3; v. 26. 1, &c).

But in certain quarters the authority of the book was denied. Thus Marcion rejected it on the ground of its Jewish character (Tertullian, c. Marcion, iv. 5), and the Alogi assigned both Revela- tion and the Gospel to Cerinthus (Epiphanius, Haer. Ii. 3). This attitude is more widely represented in the next century.

Third Century. — The attack on Revelation was resumed by abler antagonists in this century. The objections of the Alogi were restated

and maintained by the Roman presbyter Caius in his controversy with the Montanist Proclus (Eus. H.E. ii. 25. 6; iii. 28. 2), but met with such overwhelming refutation at the hands of Hippolytus (see Gwynn, Hermathena, vi. 397-418) that no church writer in the West subsequently except Jerome seriously called in question the authorship of our book.

Dionysius of Alexandria (a.d. 255) wrote a moderate and effective criticism, in which he rejects the hypothesis of the

Cerinthian authorship and urges that it was not written by the apostle, on the ground of its difference in language, style and contents from the other Johannine writings. Its author was some inspired man bearing the same name as the son of Zebedee. The arguments of Dionysius were repeated by Eusebius, who ascribed the work to the presbyter John mentioned by Papias (Eus. H.E. iii. 39) and was in doubt whether he should place Revelation among the spurious (voda) works (H.E. iii. 25.4) or the accepted (duoXoyovfteva).

Eastern Church. — In the Eastern Church the views of Diony- sius and Eusebius were generally accepted. With the exception of Methodius and Pamphilus the book was not received by Eastern scholars. Thus it was either not mentioned or dis- owned by Cyril of Jerusalem, Chrysostom, Theodore of Mop- suestia, Theodoret and Amphilochus of Iconium. It is absent from the so-called Synopsis of Athanasius, the Stichometry of Nicephorus, the List of Sixty Books and other authoritative documents. It formed no part of the Peshitta New Testament. It was apparently unknown to Ephraem. Even when later it found a place in the Philoxenian and Harclean versions it never became a familiar book to the Syrian Churches, while it was unhesitatingly rejected by the Nestorian and Jacobite Churches.

But though the Syrian Church maintained this unconciliatory attitude to the book, opposition to it began gradually to dis- appear in the rest of the East. Thus it came to be acknow- ledged by Athanasius, Isidore of Pelusium, Gregory of Nyssa, and others. Commentaries on the book were written by Andreas, archbishop of Caesarea, in the 5th century, and Arethas in the 9th.

Western Church. — In the Western Church, Revelation was accepted by all writers from Hippolytus onward with the exception of Jerome,

who relegated it to the class lying between the canonical and apocryphal. The authenticity of the book was unquestioned thenceforward till the Reformation, when the view of Jerome was revived by Erasmus, Carlstadt, Luther and others under various forms. In the Lutheran Church this opposition lasted into the next century, but in the Reformed it gave way much earlier. That Revelation has retained its place in the canon is due not to its extravagant claims' to in- spiration or its apocalyptical disclosures, but to its splendid faith and unconquerable hope, that have never failed to awake the corresponding graces in every age of the Church's history.

The History of Interpretation. — This is a most fruitful subject, and the study of it helps to settle other related questions. We first of all might divide the methods of interpretation into two classes: I. Methods which presuppose the literal unity of the book; II. Methods which presuppose some breach of this unity either in the plan of the book as a whole or in some of its details.

I. Methods presupposing the Literal Unity of the £oc%. —Where the book was accepted the problem of its interpretation was differently dealt with according to the age and environment of the interpreter. The book was first taken in a severely literal sense, and particularly in its chiliastic doctrine.

i. Chiliastic Interpretation. — Revelation was held to teach chiliasm, or the doctrine of the literal reign of 1000 years. Amongst the chiliasts were Cerinthus, Papias, Justin, Irenaeus, Hippolytus, Tertullian and Victorinus. 1 When the Church obtained the mastery of the world this method came naturally to be abandoned in favour of a spiritualistic interpretation, to which we shall presently refer. But the growing secularism of the Church led to a revival of the former method in the beginning of the 13th century amongst the Franciscans. Thus Joachim of Floris in his Expositio magni abbatis loachimi in Apoc. teaches that Babylon is Rome, the Beast from the Sea Islam, the False Prophet the heretical sects of the day, and that on the close of the present age which was at hand the millennium would ensue. This method of interpretation was pursued to extravagant lengths by other Franciscans and was subsequently

1 The oldest Latin commentary was written by this scholar (ob. 303). He was the first in extant literature to interpret certain passages in Revelation of Nero.

adopted by the Protestant reformers, who could justify their identification of the papacy with the Antichrist from books written

within the Roman communion. Joachim was the first to apply the ” recapitulation ” theory to Revelation.

ii. Spiritualistic Interpretation.— The founder of this school of interpretation was Ticonius the Montanist {floruit a.d. 380), though he followed therein the precedent set by Origen. His interpretation is on the whole mystical. Historical fulfilments, if not excluded, are not sought for. The millennium is the period between the first and second comings of Christ. The method of Ticonius was dominant in the Church down to the middle ages, amongst his followers being such notable church- men as Augustine, Primasius, Cassiodorus, Bede, Anselm.

iii. Universal Historical Method of Interpretation. — A counter-attempt over against Joachim to interpret Revelation in the light of history was made by Nicolas of Lyra (1329; in his Postilla), following (?) therein the lead of Petrus Aureolus (1317). Here for the first time a consistently elaborated world-historical interpretation is carried out from the reign of Domitian to Lyra’s own period. Under this method might be classed the expositions of Luther, Osiander, Striegel, Flacius, Gerhard and Calovius; and English writers such as Napier, Mede and Newton. Throughout these later commentaries a strong antipapal interest which identified the pope with the Antichrist holds a qentral place— a doctrine which, as we have seen, goes back historically to the immediate disciples of Joachim and like-minded Franciscans.

iv. Contemporary-Historical Method. — Under the stress of the Protestant attack there arose new methods on the papal side, and their authors were the Spanish Jesuits, Ribeira (ob. 1591) and Alcasar (ob. 1614). With these writers we have the be- ginning of a scientific method of interpretation. They approach the book from the standpoint of the author and seek the clue to his writings in the events of his time. It is from these scholars that subsequent writers of Revelation have learnt how to study this book scientifically. 2 This method was adopted and developed by Grotius, 3 Hammond, Clericus, Semler, Corredi and Eichhorn, Liicke, Bleek and Ewald, and the consciousness that Rome and not Jerusalem was the object of attack in Revelation became increasingly clear in the works of these scholars. The work of Ramsay, The Letters to the Seven Churches (1904), is a pure representative of this method.

v.vii. Continuously Historical, Eschatological* and Symbolical Methods. — These methods are now generally regarded as un scientific, and call for no further notice here save to mention that the first was upheld by Hengstenberg, Ebrard, Maitland, Elliott, &c. ; the

second by Kliefoth, Beck, Zahn, and the third by Auberlen, Luthardt, Milligan and Benson.

The learned Cambridge Commentary by Swete (The Apoc- alypse of John, 2nd ed., 1907) makes use of several of the methods of interpretation enumerated above. Thus Dr Swete writes (p. ccxviii) of his work: “With the ‘ preterists ‘ (con- temporary-historical) it will take its stand on the circumstances of the age and locality to which the book belongs, and will connect the greater part of the prophecy with the destinies of the empire under which the prophet lived; with the ‘ futurists ‘ (eschatological) it will look for fulfilments of St John’s pregnant words in times yet to come. With the school of Auberlen and Benson it will find in the Apocalypse a Christian philosophy of history; with the ‘continuous-historical’ school it can see

2 The Jesuit Juan Mariana was the first after Victorinus to explain ” the wounded head ” as referring to Nero. This interpretation was introduced into Protestant exegesis by Corrodi.

3 The beginnings of the literary-critical method are to be found in Grotius. Starting from the different dates assigned by tradition to the exile to Patmos and the different chronological relations implied in the book itself, he conjectured that the Apocalypse was composed of several works of St John, written in different places and at different times, some before, some after A.D. 70. Herein he was followed by Hammond and Lakemacher, but the idea was before its time and practically died stillborn.

- Or futurist. While it is impossible to interpret the Apocalypse scientifically as a whole by the eschatological method, there are un- doubtedly some sections in it which must be so interpreted-

in the progress of events ever new illustrations of the working of the great principles which are revealed. And … it will gladly accept all that research and discovery can yield for the better understanding of the conditions under which the book was written.” The chief value of this very scholarly book is to be found in its textual side.

The greater number of the methods discussed above have made no permanent contribution to the exegesis of Revelation; the method among them that has done most in this direction is the contemporary-historical. But, though this method has been applied in its fullness,

and that by the keenest exegetes, there remains a consciousness that it has failed to solve many of the problems of the book. In many important points, however, its upholders are agreed, i.e. that the book is directed against Rome, that Nero redivivus is to be recognized in the wounded head, that the number 666 denotes Nero Caesar, and that in chap. xi. the preservation of the temple is foretold. Consequently the date of the composition of the book is placed before a.d. 70. Against the date assigned to the opening verses of this chapter modern scholars can make no objection, but, if this be the date of the entire work, then many passages in it are hopelessly inexplicable; for the latter just as certainly demand a date subsequent to a.d. 70 as xi. 1-2, a date prior to it. If, therefore, the possibilities of exegesis were exhausted in the list of methods already enumerated, science would have to put the New Testament Apocalypse aside as a hopeless enigma. But there is no such impasse. For in the New Testament Apocalypse there is not that rigid consistency and unity in detail that the past presupposed. The critical studies of recent years have shown that most of the Old Testament prophetical books are composite. And this holds true in no less a degree of most of the Jewish apocalypses. Such works are to be explained on what might be called the " fragmentary hypothesis." Other books, like the Ethiopic Enoch, exhibit a series of independent sources connected more or less loosely together. Such are to be explained on the " sources hypo- thesis." Others, like the Ascension of Isaiah, betray the handi- work of successive editors, and are accordingly to be explained on the " redaction hypothesis." Now modern scholars have with varying success used in turn these three hypotheses with a v ; ew to the solution of the problems of the New Testament Apocalypse. To these we shall now address ourselves.

II. Methods — Literary-Critical — presupposing some Degree of Compositeness in the Book.

i. Redaction Hypothesis. — Suggestions, as we have already observed, had been made in this direction, but it was not till Weizsacker (Theol. Litteraiurzeitung, 1882, p. 78 seq.) reopened the question that the problem was seriously undertaken. In the same year his pupil Volter (Die Entstehung der Apok., 1882, 1885) put forward the bold theory that the original Apocalypse consisted of i. 4-6, iv. i-v. 10, vi. i-17, vii. 1-8, viii. 1-13, ix. 1-21, xi. 14-19, xiv. 1-3, 6, 7, xiv. 14-20, xviii. 1-24, xix. 1-4, xix. 5-ioa, which he assigned to the year a.d. 66 (so the second edition). To this the original author added as an appendix x. i-xi. 13, xiv. 8, xvii. 1-18, in a.d. 68-70. The work under- went three later redactions at the hands of successive editors in the reigns of Trajan and Hadrian. Instead of the above complex theory this writer

now offers another (Die Offenbarung Johannis, 1004), 1 in which he distinguishes an apocalypse of John, a.d. 65, i. 4-6, iv. i-v. 10, vi. i-vii. 8, viii.-ix., xi. 14-19, xiv. 1-3, 6-7, xiv. 14-20, xviii. i-xix. 4, xix. 5-10 (pp. 3-56), an apocalypse of Cerinthus a.d. 70, x. 1-11, xvii. 1-18, xi. 1-13, xii. 1-16, xv. 5-6, 8, xvi. 1-21, xix. n-xxi. 8, xxi. 9-xxii. 6 (pp. 56-129), a redaction of the work in a.d. 1 14-15, i. 7-8, v. 6b, 11-14, vii. 9-17, xii. n, 18-xiii. 18, xiv. 4-5, 9-12, xv. 1-4, 7, xvi. 19b, xvii. 14, 16, 17, xxi. 14, 22-27, xx ii- I-2 > ˆ∼9 (pp. 129-48), and certain additions, i. 1-3, 9-iii. 22, xiv. 13, xvi. 15, xxii. 7, 10-20, made in the time of Hadrian (pp. 148-171). First of all it should be observed that Volter was the first to

1 Besides the works mentioned here Volter wrote two other works on the Apocalypse: Die Offenbarung Johannis, 1886; Das Problem der Apokalypse, 1893.

call attention to the radical difference in outlook between vii. 1ˆ8 and vii. 9-17 — a difference now generally recognized. Next it is noteworthy that in the second scheme here given Volter has abandoned his theory of a redaction hypothesis in favour of a sources hypothesis + a redactor. The earlier view of Volter was rejected on every side: the later will not prove more acceptable, though individual suggestions of this scholar will be occasionally helpful. The problem was next dealt with by Vischer (Die Offenbarung Johannis, eine Jildische Apokalypse in Christlicher Bearbeitung, 1886, 2nd ed., 1895), who took iv. i-xxii. 5 to be a Jewish apocalypse revised and edited by a Christian, to whom he assigned i.-iii., v. 9-14, vii. 9-17, xi. 8b, xii. 11, xiii. 9, 10, xiv. 1-5, 12, 13, xvi. 15, xvii. 14, xix. 9, 10, 13b, xx. 4b-5a, 6, xxi. 5b-8, 14b, xxii. 6-21, together with some isolated expressions and all references to the Lamb. This scheme met with a better reception than that of Volter, but it also has failed to solve the problem. In 1891 Erbes (Offenbarung Johannis, 1891) maintained that the book was entirely of Christian origin. The groundwork was written about a.d. 62. In this an editor incorporated a Caligula apocalypse, and a subsequent editor revised the existing work in many passages and made considerable additions, especially in the later chapters. Another attempt, mainly from this standpoint, has recently been made by J. Weiss of Marburg (Offenbarung des Johannis, 1904). This writer seeks to estab- lish the existence of an original Christian apocalypse written before a.d. 60. This included (see p. in) i. 4-6 (7, 8), 9-19, ii.-vii., ix., xii. 7-12, xiii. n-18, xiv. 1-5, 14-20, xx. 1-15, xxi. 1-4, xxii. 3-5, 8 sqq. With this a Jewish apocalypse (x.-xi. 13, xii. 1-6, 14-17. x “i. 1-7, xv.-xix., xxi. 9-27 — see p. 115), written a.d. 70, was incorporated by the redactor. This latter apocalypse consisted of a series of independent prophecies which appeared to

have the same crisis in view. This redactor, moreover, was the first who gave to the Apocalypse the character of an attack on the Roman Empire and the imperial cult by means of a series of small additions. In the above work we have a com- bination of the redaction and sources hypotheses.

ii. Sources Hypothesis. — The same year Weyland (Theol. Tijdsch., 1886, 454-70; Omwerkings en Compilatie-Hypothesen toegepast op de Apoc. van Johannis, 1888) advanced the theory of two Jewish sources (» and 2), which were subsequently worked over by a Christian redactor. Such a theory as that just mentioned hopelessly fails to account for the linguistic unity of the book.

A very elaborate form of this theory was issued in 1884 (Offenbarung Johannis) by Spitta, who found three main sources in the Apocalypse. First, there was the primitive Christian apocalypse embracing the letters and the seals written by John Mark soon after a.d. 60, — i. 4-6, 9-19, ii. i-iii. 22, iv.-vi., viii. 1, vii. 9-17, xix. 9b, 10, xxii. 8, 10-13, 16a, 17, 18a, 2ob-2i. Secondly, the trumpet source of the time of Caligula (circa 40), — vii. 1-8, viii. 2-ix., x. 1-7, xi. 15, 19, xii.-xiii. 18, xiv. i-n, xvi. 13-20, xix. 11-21, xx. 1-3, 8-15, xxi. 1, 5a, 6a. Thirdly, the vials source from the time of Pompey (circa 63), — x. ib, 2a, 8a, 9b, io-ii, xi. 1-13, 15b, 17, 18, xiv. 14-20, xv. 2-6, 8, xvi. 1-12, 17a, 21, xvii. i-6a, xviii. 1-23, xix. 1-8, xxi. 9-xxii. 3a, 15. The rest of the book is from the hands of the redactor.

In 1891 Schmidt resolved the book into three independent sources which were put together by a redactor (Anmerkungen iiber d. Komposition der Offenb. Johannis).

In 1895 Briggs (Messiah of the Apostles, 1895) developed this theory to a still more extreme degree.

iii. Fragment Hypothesis. — The previous theories have brought to light and emphasized the fact that within the Apocalypse there are passages inconsistent with the tone and character of the whole. But, notwithstanding this fact, the Apocalypse gives a strong impression of its unity. Thus apparently the only remaining theory which can account for both these pheno- mena is that at which we have now arrived, i.e. the fragment hypothesis. To Weizsacker we owe the first statement of this f theory. In 1882 (Theol. Litterafurz. pp. 78-9) he suggested

that while the book is a unity the author made free use of older materials. Later, in his Apostolic Age (1886, 2nd ed. 1892), he specifies these additions as vii. 1-8 (a.d. 64-66), x.-xi. 1-13 (circa a.d. 67), xii. 1-11, 12-17 (circa 69), xiii. (time of Vespasian), xvii. (time of Domitian).

Sabatier (Les Origines litter aires . . . de I' apocalypse, 1888) regards the book as a unity into which its author had intro- duced older Jewish materials not always consistent with their new contexts, such as xi. 1-13, xii.— xiii., xiv. 6-20, xvi. 13, 14, 16, xvii. i-xix. 2, xix. n-xx. 10, xxi. o-xxii. 5. The author wrote x. with a view to adapting xi. 1-13 to its new context. Schoen (L'Origine de I 'apocalypse, 1887) attached himself in the main to the scheme of Sabatier. Both these writers assign the Apocalypse to the reign of Domitian.

The labours of these scholars, though to the superficial student they seem to prove that everything is possible and nothing certain, have certainly thrown great light on the literary character of the Apocalypse. Though differing in detail, they tend to show that, while the book is the production of one author, all its parts are not of the same date, nor are they one and all his first-hand creation. For many of the facts, the discovery of which we owe to the literary critics, have made the assumption of an absolute unity in the details pf the Apocalypse a practical impossibility. Incongruities manifest themselves not only between certain sections and the main scheme of the book, but also between these and their immediate contexts. These sections are vii. i-8a, xi. 1-13, xii., xiii., xvii., xviii., xx., xxi. 9-xxii. 5. Some of these sections (xi., xii., xiii., xvii.) contain elements that cannot be explained from any of the above methods. The symbols and myths in these are not the creation of the writer, but borrowed from the past, and in not a few instances the materials are too foreign to his subject to lend themselves to his purpose without the help of artificial and violent expedients. For the elucidation of these foreign elements a new method — the traditional-historical — is necessary, and to the brilliant scholar Gunkel we owe its origination.

iv. Traditional-historical Method. — Gunkel (Schopfung und Chaos in Urzeit und Endzeit; eine religions geschichtliche Unter- suchung ilber Gen. 1 und Joh. 12, 1895) opened up new lines of investigation. He criticizes sharply (pp. 173 sqq., 233 sqq.) former methods of interpretation, and with the ardour of a discoverer of a new truth seeks to establish its currency through- out the entire field of apocalyptic. To such an extreme does he carry his theory that he

denies obvious references to his- torical personages in the Apocalypse, when these are clothed in apocalyptic language. Thus he refuses to recognize Nero in the beast and its number. But apart from its extravagances, his theory has undoubted elements of truth. It is true that tradition largely fixes the form of figures and symbols in apocalyptic. Yet each new apocalypse is to some extent a reinter- pretation of traditional material, which the writer uses not wholly freely but with reverence from the conviction that they contained the key to the mysteries of the present and the past. From this standpoint it may be argued that every apocalypse is in a certain sense pseudonymous; for the materials are not the writer's own, but have come down to him as a sacred deposit — full of meaning for the seeing eye and the understanding heart. On the other hand, since much of the material of an apocalypse is a reinterpretation, it is necessary to distinguish between its original meaning and the new turn given to it in the Apocalypse. At times details in the transmitted material are unintelligible to our author, and these in some cases he omits referring to in his interpretation. The presence of such details is strong evidence of the .writer's use of foreign material.

As an illustration of his theory Gunkel seeks at great length to establish the Babylonian origin of chap. xii. of the Apocalypse. His investigation tends to show that in the course of tradition cosmological myths are transformed into eschatological dogmas.

The above method was adopted by Bousset in his work Der Antichrist in der Uberlieferung des Judenthums, des Neuen Testaments, und der alien Kirche (1895), in which he sought to show that a fixed tradition of the Antichrist originating in

Judaism can be traced from New Testament times down to the middle ages, and that this tradition was in the main unaffected by the Apocalypse, though in chap. xi. the Apocalypse shows dependence on it. Next in 1896 he published his commentary Die Ojfenbarung Johannis (2nd ed. 1906). In this work he availed himself of the results of the past and followed the three approved methods — the contemporary-historical, the fragment- ary and the traditional-historical.

Julicher (Einleitung in das Neue Testament, 1901, pp. 204-29) adopts the same three methods of interpretation.

Holtzmann (Einleitung in das N.T. 2 , 1892; Hand-Commentar*, 1893; Lehrbuch der NTlichen Theol., i. 463-76) holds mainly to the contemporary-historical method in his earlier works, though

recognizing signs of a double historical background; but in his last work the importance of tradition as a source of the writer's materials is fully acknowledged.

In 1902 O. Pfleiderer in the second edition of his Urchristenlum (1902, pp. 281-335) abandoned his former view on the Apocalypse and followed essentially the lines adopted by Bousset, though the details are differently treated.

In the same year Porter's able article on " Revelation " appeared in Hastings' Bible Dictionary (iv. 239-66), and in 1905 his still fuller treatment of the same theme in The Mes- sages 0} the Apocalyptical Writers, 169-294. To these works the present writer is indebted for many a suggestion.

A small commentary (no date) by Anderson Scott follows in some measure the lines laid down in Bousset and Porter.

Psychological Method. — It might be supposed that all possible methods had now been considered, and that a combination of the three methods which have established their validity in relation to the interpretation of the Apocalypse would be adequate to the solution of all the problems of the book, but this is not so; for even when each in turn has vindicated the pro- vinces in the book that rightly belong to it, and brought intelligi- bility into these areas, there still remain outlying regions which they fail to illumine. It is not indeed that these methods have not claimed to solve the questions at issue, but that their solutions have failed to satisfy the larger body of reasonable criticism. The main problem, which so far has not been satis- factoiily solved, may be shortly put as follows: Are the visions in the Apocalypse the genuine results of spiritual experiences, or are they artificial productions, mere literary vehicles of the writer's teaching? Weizsacker unhesitatingly advocates the latter view. But the serious students of later times find them- selves unable to follow in his footsteps. The writer's belief in his prophetic office and his obvious conviction of the inviolable sanctity of his message make it impossible to accept Weizsacker's opinion. Nor is it possible to accept Gunkel's theory in Schop- fung und Chaos as an adequate explanation, who explained the author's conviction of the truth of his message as spring- ing always from the fact that he was dealing with traditional material. This theory, which we have already dealt with in other connexions, is undoubtedly helpful, but here we require something more, and Gunkel has in consequence of Weinel's work (Wirkungen des Geisies und der Geister, 1899) subsequently acknowledged that actual spiritual experiences lie behind some of the visions in apocalyptic (Kautzsch,

Pseud, des A.T., ii. 341 sqq.). The fact of such visionary experience can hardly be questioned: the only difficulty lies in determining to what extent it underlies the revelations of apocalyptic. For a short discussion of this question we might refer to Bousset's Ojfen- barung Johannis*, pp. 8 sqq., and Porter's article on " Revela- tion " in Hastings' Bible Dictionary, iv. 248 sqq.

Methods of Interpretation. — As a result of the preceding in- quiry we conclude that the student of the Apocalypse must make use of the following methods — the contemporary- historical, the literary-critical (fragmentary hypothesis), the traditional-historical and the psychological. Each of these has its legitimate province, and the extent of this province can in most cases be defined with reasonable certainty.

Plan and Detailed Criticism of the Book. — Two theories have been advanced to explain the plan and order of the book. The

first of these is the recapitulation theory which Tyconius originated and Augustine adopted, and which has been revived in later times by Hofmann, Hengstenberg and others. This theory holds that no progress is designed in the successive visions of the seven seals, the seven trumpets and the seven bowls; for that in the vision of the seals we have already an account of the last judg- ment (vi. 12-17) an(i tne blessed consummation (vii. 9-17). Thus the three groups form parallel accounts and contain the same or closely related material. But such a view is in conflict with the fact that the Apocalypse exhibits a steady movement from a detailed account of the condition of actual individual churches on an ever-widening sweep to the catastrophes that will befall every nation and country till at last evil is finally overthrown and the blessedness of the righteous consummated. Accordingly later exegetes l hold that the seventh in each series is unfolded in the series of seven that follows. But to this theory also it has been objected (Holtzmann, Hand-Commentar. p. 294) that the bowls are in the main a repetition — in parts weaker, in others stronger — of what has already been put forward in the trumpets; that before the seventh member of each hebdomad there is a pause occasioned by the insertion of visions of a different nature; that the final judgment has already been depicted in vi. 17, and yet further descriptions recur in x. 6, 7, xi. 15-18, xiv. 7, xix. n: the temple in heaven is opened in xi. 19 and yet again in xv. 5: heaven itself has

already been rent in sunder in vi. 12-17, an(i vet m v ”’- 7 -12 is supposed to be in its ancient order: all green grass is burnt up in viii. 7, yet in ix. 4 the locusts are not permitted to injure the grass, and other like inconsistencies.

The impossibility of logically carrying out either theory has given rise to doubts as to the unity of the book. Holtzmann (Hand-Comment. 295) represents its structure as follows: —

i. 1-8 . . Introduction,

i. 9-iii. 22 . . Group of seven letters, iv.-v. 14 . . Heavenly scene of the Vision, vi. 1-17 . . Six seals.

vii. 1-17 . . The sealed and the blessed, viii. 1-5 . . The emergence of the trumpets

from the seventh seal, viii. 6.-ix. 21 . Six trumpets.

x. i-xi. 14 . Destiny of Jerusalem, xi. 15-19 . . The seventh trumpet.

xii. i-xiv. 5 . The great visions of the three chief enemies and of the Kingdom of the Messiah, xiv. 6-20 . . Return to the earlier connexion. xv. i-xvi. 1 . Transition to the bowls, xvi. 2-21 . . Seven bowls.

xvii. i-xix. 10 The great Babylon, xix. n-xx. 15 Final catastrophes.

xxi.-xxii. 5 . The New Jerusalem, xxii. 6-21 . . Conclusion.

It is noteworthy that the sections on the right hand correspond in the main to the elements which have been those to which

1 Swete divides the Apocalypse first of all into forty-two minor sections. Next he groups these sections into fourteen larger masses of apocalyptic matter, and by a process of synthesis seeks to arrive at the plan on which the author constructed his book. In so doing he points out that we become conscious of a great cleavage which practically divides the book into two parts, i. 9-xi. 14 and xii. I- xxii. 5, independently of the prologue and greeting, i. 1-8, and the epilogue and benediction, xxii. 6-21. A further study of the leading thoughts of the above parts enables him to set forth the scheme of the book as follows : —

Prologue and Greeting, i. 1-8. Part I. Vision of Christ in the midst of the churches, i. 9-iii. 22. Vision of Christ in Heaven, iv. i-v. 14. Preparations for the End, vi. i-xi. 19. Part II. Vision of the Mother of

Christ {i.e. the Church) and her enemies, xii. l-xiii. 18. Preparations for the End, xiv. i-xx. 15. Vision of the Bride of Christ arrayed for her husband,

xxi. i-xxii. 5. Epilogue and benediction, xxii. 6-21.

the latest critics have assigned either an earlier date or a different authorship.

Chaps, i.-iii. — These chapters open with a prologue, i. 1-3, which defines the source, character and contents of the book, followed by a greeting, i. 4-8, in which the writer salutes the Seven Churches of Asia. Having so introduced his work the author describes a vision of the ascended Christ, i. 9-20, who sends His messages to the angels of the Seven Churches, ii.-iii. With the conclusion of these epistles the Apocalypse proper really begins. But the way has been prepared for it. Its contents are ” the things which must quickly happen,” i. 1. The visions are not for John’s personal benefit, but for transmission to the church at large, i. n, and the writer is bidden to write down what he has seen and ” the things which are and the things which shall be hereafter,” i. 19.

iv.-vi. — The first three chapters show great artistic skill, and the power of the artist is no less conspicuous in what follows. First of all John is bidden to come up into heaven and see the things that should be hereafter, the vision of iv. 1. Then he beholds the Almighty on His throne surrounded by the four and twenty elders and the four living creatures. Before Him they all bow in worship and acknowledge that by Him were created all things and of His own free will were all created. In the next chapter (v.) the seer has a vision of a roll in the hand of Him that sat on the throne which none could open or look upon, till the Lion of the tribe of Judah, the mighty one with seven horns and seven eyes, appeared. Before Him all the elders and the living creatures fell down and acknowledged that He had power to open the seven seals thereof, and their song was re-echoed by every thing alike in heaven and earth. The contrast be- tween these two chapters and those that follow is striking in the extreme. The time of the seer’s vision is one of direst need. The life and death struggle between the church and the empire has now entered on its final stage, and fear and trouble and woe are rife in the hearts of the faithful. But when the seer is exalted to heaven he sees no trace of the turmoil on earth. The vision of the Almighty is full of majesty and peace. All things do Him service; for all are the free creation of His will. The next vision serves to connect the Source and Sustainer of all things with the world and its history. The closing of the inter- mediate stage

of the history of created things is committed to the Christ who will also be Lord of the age to come. The future of the saints is assured: what can avail against Him that hath ” glory and dominion for ever and ever” the wild attacks of Rome and even of Satan and his hosts ? The Lamb that was slain has taken upon Himself the burden of the world’s history.

In vi. we have the opening of the six seals, and the horrors of the future begin. The choice of three series of seven seals, seven trumpets and seven bowls, to form the framework in which the history of the last woes is to be given, shows the same hand that addressed the churches as seven. But between the sixth and seventh seals and the sixth and seventh trumpets the connexion is more or less disturbed by the insertion of certain interludes containing material foreign in certain aspects to the Apocalypse. These are vii. 1-17 and x. i-xi. 14.

vii. 1-17. — These verses, which interrupt the plan of the book, fall into two independent fragments, 1-8 and 9-17, which are inconsistent in their original meaning with each other. For while 1-8 was most probably a Jewish apocalyptical fragment and strongly particularistic, 9-17 is clearly universalist in character and is probably from the hand of our author. The foreign origin of vii. 1-8 may be concluded with Spitta, Bousset and others from the fact that the four winds, which in vii. 1 are said to be held fast lest they should break in elemental fury on land and sea, are not let loose or referred to in the subsequent narrative, and also from the mention of the 144,000 Israelites of the twelve tribes, to whom no further reference is made; for these can no more be identified with the countless multitudes in vii. 9-17 than with those who are “sealed” in ix. 4 sq. nor with the 144,000 in xiv. 1; for in both these cases the sealed are not Jews but elect Christians. The object of both fragments was to encourage the faithful in the face of the coming strife. In the

latter, in which the Apocalyptist looks forward prophetically to the issue, the assurance held out is of ultimate victory, but of victory through death or martyrdom. In the former (Jewish or Christian-Jewish fragment) the sealing seemed to have carried with it the assurance of deliverance from physical death, as in Ezek. ix. 4 sqq. But in its new context this meaning can hardly . be retained. Not improbably the sealing means to our author the preservation not from death, but through death from unfaithfulness, and the number 144,000 would signify mystically the entire body of true Christians, which formed the true people of God.

Chapter vii., then, interrupts the development of the author's plan, but the interruption is deliberate. He wishes to encourage the persecuted church not only to face without fear, but also to meet with triumphant assurance the onset of those evils which would bring panic and despair on the unbelieving world.

viii.-ix. — These chapters, though presenting some minor difficulties, do not call for discussion here. They recount the six partial judgments which followed the opening of the seventh seal and the blasts of the six trumpets.

x.-xi. 1-13. — This section bristles with difficulties. Chapter x. forms an introduction to xi. 1-13. In it the prophet receives a new commission, x. 11 : " Thou must prophesy again over many peoples and nations and tongues and kings." This new com- mission explains his departure from the plan pursued in the earlier chapters of developing the seventh in each series into a new series of seven. The seer has a vision of the seven thunders, but these he is bidden to seal and not commit to writing. He is instead to write down the new book of prophecies. The end is at hand. It is noteworthy that in the earlier visions it was Christ who spoke to the seer. Here and in the later visions, especially those drawn from foreign sources, it is an angel.

In xi. 1-13 we have a characteristic illustration of our author's dependence on traditional materials and his free adaptation of them to meanings other than originally belonged to them. For it is generally agreed among critics that xi. 1-13 is borrowed from Jewish sources, and that this fragment really consists of two smaller fragments, xi. 1-2 and xi. 3-13. The former oracle referred originally to the actual

Temple, and contained a pre- diction of the preservation of the Temple. It must have been written before a.d. 70 and probably by a Zealot. 1 But our author could not have taken it in this literal sense if he wrote after a.d. 70 or even anterior to that date, owing to the explicit declaration of Christ as to the coming destruction of Jerusalem. The passage, then, must have a spiritual meaning, and its purpose is the encouragement of the faithful by the assurance of their deliverance not necessarily from physical death but from the dominion of the evil one. In xi. 3-13 we have another Jewish fragment of a very enigmatic character. Bousset has shown with much probability that it is part of the Antichrist legend. The prophecy of the two witnesses and their martyrdom belongs to this tradition. The fragment was apparently written before a.d. 70, since it speaks of the fall of only a tenth of the city, xi. 13. 2 The significance of this fragment in our author's use of it is similar to that of xi. 1-2. The details defy at present any clear interpretation, but the incorporation of the fragment may be due in general to the emphasis it lays on the faithful witness, martyrdom and resurrection of the saints.

xi. 14-IQ. — The seventh trumpet, xi. 15, ushers in the third woe, xi. 14. Its contents are given in xii.-xx. In xi. 15-19 the seer hears great voices in heaven singing a triumphal song in anticipation of the victory that is speedily to be achieved. This song forms a prelude to the chapters that follow.

1 The Zealots occupied the inner court of the Temple during its siege by the Romans.

2 The linguistic evidence, as Bousset has pointed out, confirms the critical conclusion that xi. 1-13 were independent sources. For whereas in ix.-x. the verb almost regularly begins the sentence and the object follows the verb, in xi. 1-13 the object frequently precedes the verb and the subject nearly always. The order of the genitive in xi. 4 is elsewhere unknown jn the Apocalypse, and in xi. 2, 3 the construction of bMvtu. followed by koX instead of infinitive or Xva is unique in this book.

*«.— This is the most difficult chapter in the book. Its main intention in its present context is apparently to explain Satan's dominion over the world and the bitterness of his rage against the church and against Christ. Christ, indeed, escapes him and likewise the Jewish Christians (" the woman," xii. 16) but " the rest of her seed," xii. 17 (the Gentile Christians?), are exposed to his fury. But his time is at hand; together with his hosts he has been cast down from heaven, and on the earth he " hath but a short time." The attribution of the seven heads and ten

horns to the dragon, xii. 3, points forward to Rome, which is regarded as a temporary incarnation of Satan, xiii. 1, xvii. 3.

But, though a few of the leading thoughts of this chapter may be obvious, we are plunged into problems that all but defy solution when we essay to discover its origin or interpret its details. Most scholars are agreed that this chapter is not, except in the case of a few sentences, the work of our author. In other words, it has been taken over from pre-existing material — either Christian or Jewish— and the materials of which it is composed are ultimately derived from non-Jewish sources — either Babylonian, Greek or Egyptian — and bore therein very different meanings from those which belong to them in their present connexion. Furthermore, the materials are fragmentary and the order irregular.

(a) First of all, the chapter is not the free creation of a Chris- tian writer. Such an one could never have so represented the life of Christ — a child persecuted by a dragon and carried off to God's throne. No mention of Christ's earthly life and cruci- fixion. Furthermore, the victory over Satan is ascribed to Michael. Again, a Christian could not represent Christ as the son of the wife of the sun-god; for such is the natural inter- pretation of the woman crowned with the twelve stars and with her feet upon the moon. Finally, even if " the woman " who is the mother of Christ be taken to be the ideal Israel in the beginning of the chapter, at its close she is clearly the Christian community founded by Him. We conclude, therefore, that the present chapter is not the work of our author. There are, however, traces of his hand. Thus 7-12, which is really a Jewish fragment recounting the victory of Michael over Satan, has to a certain degree been adapted to a Christian environment by the insertion of the iob-n.

(b) The order is not original. The flight of the woman is mentioned in verse 6 to a place of refuge prepared for her by God. Then comes an account of the casting down of Satan from heaven. Then again in 13-16 the flight of the woman is described. This fact has been variously accounted for by different critics. Wellhausen regards 1-6 and 7-14 as doublets, and differentiates two actions in the original account which are here confused. Spitta takes verse 6 to be an addition of the redactor, which describes proleptically what follows, while Gunkel sees in 6 and 7-16 parallel accounts. In any case we should probably agree with the contention of J. Weiss, supported by Bousset in the second edition of his commentary, that 7-12 is a fragment of a Jewish apocalypse, of which iob-11 is an addition of our author. Next that 6 is a doublet of 13 sqq. What then is to be made of 1-5, 13-17? Different explanations have been offered. Gunkel 3 traces

it to a Babylonian origin. He urges that an adequate explanation is impossible on the assump- tion of a Jewish or Christian origin. At the base of this account lies the Babylonian myth of the birth of the sun-god Marduk, his escape from the dragon who knows him to be his destined destroyer, and the persecution of Marduk's mother by the dragon. But Gunkel's explanation is an attempt to account for one ignotum per ignotius; for hitherto no trace of the myth of the sun-god's birth and persecution and the flight into the wilderness has been found in Babylonian mythology. More- over, Gunkel no longer lays emphasis on the Babylonian, but merely on the mythical origin of the details. A more satis- factory explanation has been offered by Dieterich {Abraxas, 117 sqq.), who finds in this chapter an adaptation of the birth of Apollo and the attempt of the dragon Pytho to kill his mother

3 Schopfung und Chaos § 3, Religionsgesch. Verstandniss d. N.T., 54 sqq.

Leto, because it was foretold that Leto's son would kill the dragon. Leto escapes to Ortygia, which Poseidon covers with the sea in order to protect Leto. Here Apollo is born, who four days later slays the dragon. Yet another explanation from Egyptian mythology is given by Bousset (Ojfenbarung Johannis, 2nd ed., pp. 354, 35s) in the birth of the sun-god Horus. Here the goddess mother is represented with a sun upon her head. Typhon slays Horus. Hathor, his mother, is persecuted by Typhon and escapes to a floating island with the bones of Horus, who revives and slays the dragon. 1 There are obvious points of similarity, possibly of derivation, between the details in our text and the above myths, but the subject cannot be further pursued here, save that we remark that in the sun myth the dragon tries to kill the mother before the child's birth, whereas in our text it is after his birth, and that neither in the Egyptian nor in the Greek myth is there any mention of the flight into the wilderness.

The insertion of the alien matter 7-12 between 1-5 and 13-17 may be due to our author's wish to show that the expulsion of Satan from heaven after Christ's birth and ascension to heaven was owing in some measure to Christ, although he has allowed Michael's name to remain in the borrowed passage, 7-1 2 — a fact which shows how dependent the writer was on tradition.

xiii. — In this chapter we have the two beasts 2 which symbolize respectively Rome and the Roman provincial priesthood of the imperial cult. Thus the world powers of heathen statesmanship and heathen religion are leagued in a confederacy against the rising Christian Church. Against these the church is not to attempt to use physical force; its only weapon is to be passive endurance and loyalty to God.

That this chapter must be interpreted by the contemporary- historical method is now generally admitted. Even Gunkel is obliged to abandon his favourite theory here, though he contests strongly the recognition of any allusion to Nero. Various solutions have been offered as to the seven emperors designed by the seven heads of the beast, xiii. 1. But the details of this passage are not sufficiently definite to determine the question here. It will return in chapter xvii. There are, however, two facts pointing to a late date. The first is the advanced stage of development of this, the Neronic-Antichrist legend. One of the heads ” is smitten unto death,” but is healed of the death stroke. This points, we may here assume, to the Nero redivivus legend, which could not have arisen for a full generation after Nero’s death, and the assumption receives large confirmation from the most probable interpretation of the enigmatical words, xiii. 18, ” the number of the beast . . . is six hundred and sixty six.” Four continental scholars, Fritzsche, Benary, Hitzig and Reuss, independently recognized that Nero was referred to under the mystical number 666. For by transliterating Kcucrap Nepoiv into Hebrew | 1-u ~* a P and adding together the sums denoted by the Hebrew letters we obtain the number 666. This solution is confirmed by the fact that it is possible to explain by it an ancient (Western?) variant for the number 666, i.e. 616. This latter, which is attested by Irenaeus (v. 30. 1), the commentary of Ticonius, and the uncial C, can be explained from the Latin form of the name Nero, which by its omission of the final » makes the sum total 616 instead of 666.

The above solution may be regarded as established, though several scholars, as Oscar Holtzmann (Stade’s Geschichte des Volkes Israel, ii. 661), Spitta and Erbes, have contended that 616 was the original reading (r&i’os Kcucrap = 6i6) and that

1 On the possibility of other points of contact between the Apocalypse and Egyptian mythology, see Mrs Grenfell’s article, ” Egyptian Mythology and the Bible,” in the Monist (1906), pp.

169-200.

2 In xiii. 2 the description of the beast unites the features of the four beasts in Daniel's vision (vii.). It is clear that our author identified the fourth beast (vii. 23) with Rome, as did also the author of 4 Ezra xii. 10. But this was not the original significance of the fourth beast, for the author of Daniel referred thereby to the Greek empire; but, since the prophecy was not realized, it was subsequently reinterpreted, and applied, as we have observed, to Rome.

chapter xiii. was part of a Jewish apocalypse written under Caligula between the years 39 and 41. But this Caligula hypothesis cannot be carried out unless by a vigorous use of the critical knife, in the course of which more than a third of the chapter is excised. Moreover the number 616 is too weakly supported to admit of its being recognized as the original.

The figure of the first beast presents many difficulties, owing to the fact that it is not freely invented but largely derived from traditional elements and is by the writer identified with the seventh wounded head. The second beast, signifying the pagan priesthood of the imperial cult, called " the false prophet " in xvi. 13, appears to be an independent development of the Antichrist legend.

xiv.-xvi. — These chapters contain a vision of Christ on Mount Zion and the 144,000 of the undefiled that follow Him, xiv. 1-5, the last warnings relating to the harvest and vintage of the world, xiv. 6-20: the vision of the wrath of God in the out- pouring of the seven bowls containing the seven last plagues, xv.-xvi.

In the above section most critics are agreed that xiv. 14-20 originally represented the final judgment and was removed frjjm its rightful place at the close of an apocalypse to its present position. In its original setting " the one like unto a Son of Man, having on his head a golden crown " (xiv. 14), undoubtedly designated the Messiah, but the transformation of the final judgment into a preliminary act of judgment by a redactor, necessarily brought with it the degradation of the Son of Man to the level of a mere angel. Some critics hold that this apocalypse was the apocalyptic groundwork, but Bousset is of opinion that it stood originally in connexion with xi. 1-13.

As regards xvi. the views of critics take different directions, but that of Bousset followed by Porter seems the most reason- able. This is that this chapter forms an introduction to xvii., which was an independent fragment. The writer throws this introduction into his favourite scheme of seven acts, in this case symbolized by seven bowls. The earlier verses, 2-1 1, do not amount to much beyond a repetition of

what is found in viii.-ix., save that as a preparation for xvii. references are inserted to the beast and his worshippers (ver. 2) and to Rome (ver. 10). In xvi. 12-16 is a revised form of an older tradition.

xvii. — This chapter presents great difficulties, especially if with the older and some of the recent exegetes we regard it as written at the same time and by the same author. Even so strong an upholder of the unity of the book as Swete is ready to admit that portions of xvii., as well as of xiii., show signs of an earlier date than the rest of the book. He writes: ” The unity of the Book . . . cannot be pressed so far as to exclude the possibility that the extant book is a second edition of an earlier work, or that it incorporates earlier materials, and either hypothesis would sufficiently account for the few indica- tions of a Neronic or Vespasianic date that have been found in it ” (Apoc. of St John 2 , p. civ.). This chapter cannot be interpreted apart from the Neronic myth. Of this there appear to be two stages attested here. Of the earlier we have traces in xvii. 16-17 and xvi. 12, where there are allusions to Nero’s confederacy with the Parthian kings with a view to the destruc- tion of Rome. Of the later stage, when the myth of Nero redivivus was fused with that of the Antichrist, we have at- testation in xvii. 8, 12-14, where Nero is regarded as a demon coming up from the abyss to war not with Rome but with Christ and the elect. This development of the Neronic myth belongs to the last years of the 1st century, and is decidedly against a Vespasianic date. To meet this difficulty a recent interpreter — Anderson Scott — though he assigns the book to the year a.d. 77, is yet willing to admit trjat the book though composed in the reign of Vespasian was ” reissued with additions by the same hand after the death of Domitian” (Revelation, p. 56). Our author represents himself as writing under the sixth emperor. Five have already died, the seventh is yet to come, to be followed by yet an eighth, who is one of the seven (i.e. Nero). In order to arrive at the date here implied, we can

begin the reckoning from Julius Caesar or Augustus, we can include or exclude Galba, Otho and Vitellius, and, finally, when we have drawn our conclusions from these data, there remains the possibility that the book was after all not written under the sixth emperor, but was really a vaticinium ex eventu. Ac- cording to the different methods pursued, some have concluded that Nero was the sixth emperor, and thus dated the Apocalypse before a.d. 70; others Vespasian, and yet others Domitian. No solution of the difficulties of the chapter is wholly satis-

factory, but the best yet offered seems to be that of Bousset (Ojfenbarung 1 , 410-18). He holds that 1-7, 0-11, 15-18, belong to an original source, which was written in the reign of Vespasian and represents the earlier stage of the Neronic myth. To a reviser in Domitian's reign we owe 8,12-14 and 6b, a clause in 9, hrra. 6pij . . . avruv, and another in n, rp> «u ovk torw. If the clause /cot en rod aluaTosrSiv /xaprdpcoi' 'IijcroD in 6 is an addition, then he thinks the source was Jewish and the " blood of the saints " was that shed at the destruction of Jerusalem, and the forecast of the author related to the destruction of Rome. When the reviser recast the passage it dealt not with the destruction of Jerusalem, but with the persecution of the Christians. Nero was now a demonic monster from the abyss, and the ten kings no longer Parthians but ghostly helpers of Nero. The destruction of Rome has now become a secondary event: the reviser's thought is fixed on the final strife between the Lamb and the Antichrist.

xviii.xix. 10. — This section describes in prophetic language borrowed almost wholly from Isaiah and Jeremiah the coming judgment of Rome, and gives the ten lamentations of the kings and the merchants and the seamen over her, and the thanks givings in heaven for her overthrow.

xix. 11-21. — The victory of the warrior Messiah over the two beasts, the Roman Empire and the imperial cultus and the kings of the earth. Many of the ideas set forth in earlier chapters here coalesce and find their consummation. The Messiah, whose birth and escape from the dragon was recounted in xii. 5, and who was to rule the nations with a rod of iron, at last appears in discharge of His office. The beast and the false prophet who are described in xiii. are cast alive into the lake of fire, and the kings of the earth who had assembled for this conflict, xvi. 14, xvii. 14, were slain by the sword of Him that sat on the horse.

The conception of the Messiah may be Jewish: at all events it is not distinctively Christian. The title " Word of God " can hardly be said to establish any connexion with the prologue of the Fourth Gospel; for the conceptions of the Messiah in that Gospel and in these chapters belong to different worlds of thought.

It is to be observed that our author follows the apocalyptic scheme of two judgments which is first attested about 100 B.C. The first judgment precedes the establishment of the temporary Messianic kingdom, as here in xix. 19-21; and the final judg- ment follows at its close, as here in xx. 7-10.

xx. 1-6. — The millennium, or the period between the first and final judgments, when Christ, with His chosen, reigns and Satan is imprisoned. Rome has been overthrown, but, as Rome is only the last secular manifestation of Satan, there is yet the final struggle with Satan and his adherents. But the time for this struggle has not yet arrived. Satan is bound * and cast into the abyss, and the kingdom of Christ and of the martyrs and faithful confessors established for a thousand years. Thus it is shown that evil will be finally overcome; for that the true and ultimate power even in this world belongs to Christ and those that are His.

The main features of this section have been borrowed from Judaism. The Messianic kingdom was originally conceived of as of everlasting duration on the present earth, but about 100 B.C. this idea was abandoned and the hopes of the faithful were directed to a temporary earthly kingdom of 400 or 1000 years or of indefinite duration (see R. H. Charles, Critical History of

1 This idea appears as early as the 2nd century B.C. Levi xviii. 12.

Cf. Test.

the Doctrine of a Future Life, pp. 201-4, 261, 286, 288). More- over, the expectation that the saints would rise to share in the blessedness of this kingdom is also found in Judaism, 4 Ezra vii. 28 (op. cit. p. 285).

xx. 7-10. — Release of Satan and final assault on the city of God by the hosts of Gog and Magog at the instance of Satan. Satan and the beasts condemned to eternal torment.

xx. 11-14. — The Final Resurrection and Judgment.

xxi. 1-8. — The new heavens and the new earth. The language in this and the following section is highly figurative; but as Porter has well remarked: ” Figurative language is the only language in which we can express our hope of heaven, and no figures can have greater power to suggest this hope than those taken from the literal longings of exiled Israel for the recovery of its land and city.”

xxi. Q-xxii. 5. — The vision of the New Jerusalem. There are several grounds for regarding this section as an independent source possibly of Jewish origin and subsequently submitted to a Christian revision. This view is taken by Vischer, Weyland, Spitta, Sabatier, J. Weiss, Bousset and others. Our author has incorporated it as describing the consummation of the prevision contained in xi. 15-18, in which he

foresaw the time when the kingdom of the world would become the kingdom of our Lord and of His Christ, and the saints should enter on their reward. Moreover, he has already hinted at its contents in xix. 7 and xxi. 2, where he speaks of the church as a bride and the marriage supper of the Lamb. But the section betrays incon- sistent conceptions. The standpoint of the heavenly Jerusalem is abandoned in xxi. 24-27, xxii. 2, and the context implies an earthly Jerusalem to which the Gentiles go up as pilgrims. Outside the gates of this city are unclean and abominable things. These inconsistencies are best explained by the hypothesis that our author was drawing upon a literary fixed tradition. The doublets in xxi. 23 and xxii. 5b, in xxi. 25 and xxii. 5a, and in xxi. 27 and xxii. 3, point in the same direction. Various additions were introduced, according to Bousset, by the last redactor, such as the frequently recurring reference to the Lamb, xxi. 9, 22, 23, 27, xxii. 1, 3. In xxii. 3 the fact that the words ” of the Lamb ” are an addition is clear from the context; for, after the clause ” the throne of God and of the Lamb shall be therein ” the singular follows, ” His servants shall do Him service.”

xxii. 6-21. — The conclusion. The promises are sure, the end is near and the judgment at hand. The words of the book are the message of Christ Himself and are inviolable.

Unity. — From the preceding sections it follows that we cannot ascribe a strict literary unity to the book. The book is most probably the work of a single author, but it was not written wholly at one date, nor have all the parts come directly from one brain. We have several good grounds, for regarding vii. 1-8, xi. 1-13, xii., xiii., xvii., as wholly or in part independent sources, which our author has laid under contribution and adapted more or less adequately to his purpose. He appears to have taken over with but slight modification xx. and xxi. 9-xxii. 5. Furthermore, while certain fragments such as xi. 1-2 presuppose a date anterior to a.d. 70, others, as xvi. 12 and xvii. 12, require a date not later than Vespasian’s time; other parts of xvii. postulate a Vespasianic date as the earliest admissible, and, finally, the composition of the book in its present form cannot be placed before the closing years of Domitian. But to this question we shall return presently.

Nevertheless, the book exhibits a relative unity; for, whatever digressions occur in the development of its theme, the main object of the writer is never lost sight of. This relative unity is manifested also in the uniform character of the language, a uniformity, however, which is occasionally conspicuous by its absence in the case of independent sources, as in xi. 1-13. The author or the final redactor

has impressed a certain linguistic character on the book, which differentiates it not only from all secular writings of the time, but also from all the New Testa- ment books, including the Johannine. And yet the Apocalypse shows in many of its phrases an undoubted affinity to the latter —

a fact which requires for its explanation the assumption that the book emanated from certain literary circles influenced by John. Date. — There are many indications of the date, which may be summarized as follows: (a) Condition of the Asian churches. (6) Persecution of the church, (c) Attitude of the author to Rome, (d) The Antichrist legend, (e) Primitive tradition and its confirmation through the discovery of references in the text to certain edicts of Domitian. As a result of these con- siderations we may arrive at the date of the work with almost greater certainty than that of any other New Testament book.

(a) Condition of the Churches. — Christianity appears to have already had a long history behind it. The fact that St Paul founded the church of Ephesus seems to have been forgotten. The earliest zeal has passed away and heathen ways of thought and life are tolerated and practised at Pergamum and Ephesus, and faith is dying or dead at Laodicea and Sardis. These phenomena belong to a period considerably later than the time of Nero.

(b) Persecution of the Church. — Persecution is the order of the day. Each of the seven letters concludes with praise of those who have been victorious therein. There had been isolated instances of persecution at Ephesus, ii. 3, Philadelphia, iii. 8, 10, and at Smyrna, ii. 9, and of an actual martyrdom at Pergamum, ii. 13. But now a storm of persecution was about to break upon the universal church, iii. 10, and in the immediate future. Already the seer beholds the destined number of the martyrs complete, vi. 9-1 1: the great multitude whom no man could number, clothed in white before the throne of God, vii. 9: he exhorts his readers to patient endurance unto death, xiv. 12, and already sees them as victors in heaven, xv. 2. Over the true witnesses and martyrs he pronounces the final beatitude of the faithful: ” Blessed are those who die in the Lord,” xiv. 13.

Such an expectation of persecution is inexplicable from Nero’s time. There is not a trace of any declaration of war on the universal church in his period such as the Apocalyptist anticipates and in part

experiences. Christian persecution under Nero was an imperial caprice. The Christians were attacked on slanderous charges of superstition and secret abominations, but not as a church. Not till the last years of Domitian is it possible to discover conditions which would explain the apprehensions and experiences of our writer. So far as we can discover, no persecution was directed against Christians as Christians till Domitian's time. In the year a.d. 92 Flavius Clemens was put to death and his wife banished, on the ground that they were adherents of the new faith. Thus the temper of the book on this question demands some date after a.d. 90. It marks the transition, from the earlier tolerant attitude of Rome towards Christianity, to its later hostile attitude.

(c) Altitude of the Author towards Rome. — In earlier times the church had strongly impressed the duty of loyalty to Rome, as we see from the Epistle to the Romans and 1 Peter. This was before the pressure of the imperial cult was felt by the Christian church. But in the Apocalypse we have the experi- ences of a later date. The writer manifests the most burning hatred towards Rome and the worship of its head — the beast and the false prophet, who are actual embodiments of Satan. Such an attitude on the part of a Christian is not explicable before the closing years of Domitian; for, apart from Caligula, he was the first Roman emperor who consistently demanded divine honours.

id) The Antichrist Legend. — We find at least two stages of the Neronic and Antichrist myth in the Apocalypse. The earliest form is not attested here, that Nero had not really been slain, but would speedily return and destroy his enemies. The first pretender appeared in a.d. 69, and was put to death in Cythnus. The second stage of this legend was that Nero had taken refuge in the Far East, and would return with the help of his Eastern subjects for the overthrow of Rome. Two pretenders arose in conformity with this expectation among the Parthians in a.d. 80 and 88. This widespread expectation has left its

memorial in our book in xvi. 12 and in xvii. 16-17, which point to the belief that Rome would be destroyed by Nero and the Parthian kings. Finally, in xiii. and xvii. 8, 12-14, we have a later phase of the myth, in which there is a fusion of the Antichrist myth with that of Nero redivivus. This fusion could hardly have taken place before the first half of Domitian's reign, when the last Neronic pretender appeared. As soon as the hope of the living Nero could no longer be entertained, the way was prepared for this transformation of the myth. The living Nero was no longer expected to return from the East, but Nero was to be

restored to life from the abyss by the dragon, i.e. Satan. This expectation is recounted in xiii., but it appears most clearly in the additions to xvii. Thus in xvii. 8 the reference to Nero redivivus as the Antichrist is manifest: ” The beast that thou sawest was, and is not, and is about to come up out of the abyss and to go into perdition.” 1 Thus again we are obliged to postulate a date not earlier than a.d. 90 for the book in its present form.

(e) Primitive Church Tradition and its Confirmation through the Discovery of References in the Text to Certain Edicts of Domitian. — The earliest external evidence is practically unanimous in ascribing the Apocalypse to the last years of Domitian; The oldest testimony is that of Irenaeus v. 30. 3 : St’ tKuvov av ippiSt] too Kal rr)v ‘AiroKaKinj/iv twpanoTos ovSe yap irpo iroWov xp6i > ou eaip&dr), reXet ttJs Aonenavov apxys. The rest of the patristic evidence from Clement of Alexandria, Origen, Victorinus, Eusebius and Jerome will be found in Swete’s Apocalypse of St John 2 , xcix. seq. Though a few later authorities, such as Epiphanius and Theophylact, assign the book to earlier or later periods, the main body of early Christian tradition attests the date of its composition in the closing years of Domitian. Not- withstanding, on various critical grounds, Baur, Hilgenfeld, Lightfoot, Westcott, Hort and Beyschlag assigned the book to the reign of Nero, or to the years immediately following his death, while Weiss, Dusterdieck and Mommsen assign it to the time of Vespasian. When, however, we combine the preceding arguments with that of the early church tradition, the evidence for the Domitian date outweighs that for any other. And this conclusion receives remarkable confirmation from a recent fact brought forward by S. Reinach in an article in the Revue archeologique, ser. III. t. xxxix. (1901), pp. 350-74, and reprinted in Cultes, mythes et religions, ii. 356-80 (1906). This fact explains a passage which has hitherto been a total enigma to every expounder, i.e. vi. 6: “A choenix of wheat for a denarius, and three choenikes of barley for a denarius, and the oil and the wine hurt thou not.” Swete writes here: ” The voice fixes a maximum price for the main food-stuffs. The denarius . . . was the daily wage . . . and a choenix of wheat

•Verse n postulates either a Vespasianic or Domitianic date: ” And the beast that was, and is not, is himself also an eighth, and is of the seven; and he goeth into perdition.” In verse 10 it is stated that five of the seven had fallen, “the one is and another is not yet come, and when he cometh he must continue a little while.” If we reckon from Augustine and omit Galba, Otho and Vitellius, each of whom reigned only a few months, we arrive at Vespasian. The vision, therefore, belongs to his reign, A.b. 69-79. Verse II, with the exception of the

words ” which was and is not,” leads to the identification of the eighth with Nero redivivus. But what then is to be made of the above reckoning when it was taken over by the Apocalyptist who wrote in Domitian’s reign? Some scholars are of opinion that this writer identified Domitian with the eighth emperor, the Nero redivivus, the beast from the abyss. But this is unlikely, notwithstanding the fact that even some pagan writers, such as Juvenal, Pliny and Martial (?), traced a resemblance between Domitian and Nero. On the other hand, if we refuse to accept this identification, and hold that the beast from the abyss is yet to come, any attempt at a strict exegesis of the text plunges us in hopeless difficulties. For Domitian in that case would be the sixth, and the preceding five would have to begin with Galba — a most improbable supposition. But futhermore, since this new reckoning would exclude Nero, how could the eighth be said to be one of the seven, i.e. Nero ? Bousset thinks that the Apocalyptist, knowing not what to make of this reckoning, left it standing as it was and attempted a new interpretation of the seven heads by taking them to refer to the seven hills of Rome in the addition he made to verse 9.

the average daily consumption of the workman. . . . Barley was largely the food of the poor.” According to the words just quoted from the Apocalypse, there was to be a dearth of grain and a superfluity of wine; the price of the wheat was to be seven times the ordinary, according to Reinach’s com- putation, and that of the barley four times, This strange statement suggested some historical allusion, and the discovery of the allusion was made by Reinach, who points out that Domitian by an edict in a.d. 92 prohibited the planting of new vineyards in Italy, and ordered the reduction of those in the provinces by one-half. As Asia Minor suffered specially under this edict, an agitation was set on foot which resulted in the revocation of the edict. In this revocation the Apocalyptist saw the menace of a famine of the necessaries of life, while the luxuries would remain unaffected. From his ascetic stand- point the revocation of the edict could only pander to drunken- ness and immorality. Reinach’s explanation of this ancient crux inlerpretum, which has been accepted by Harnack, Bousset, Porter, Sanday, Swete and others, fixes the earliest date of the composition of the Apocalypse as a.d. 93. Since Domitian died in 96, the book was therefore written between a.d. 93 and 95.

Author. — Before entering on the chief data which help towards the determination of this question, we shall first state the author’s

standpoint. His book exhibits a Christianity that is — as Harnack (Ency. Brit.*, xx. 498) writes — ” free from the law, free from national prejudices, universal and yet a Christianity which is independent of Paul. . . . The author speaks not at air of the law 1 — the word does not occur in his work; he looks for salvation from the power and grace of God and Christ alone . . . nowhere has he made a distinction between Gentile and Jewish Christians. . . . The author of the Apocalypse has cast aside all national religious prejudices.” The writer is not dependent, consciously or unconsciously, on the Pauline teaching. He has won his way to universalism, not through the Pauline method, but through one of his own. He has no serious prefer- ence for the people of Israel as such, but only for the martyrs and confessors, who shall belong to every tribe and tongue and people and nation (vii. 9 seq.). The unbelieving Jews are ” a synagogue of Satan ” (ii. 9).

Yet, on the other hand, our author’s attitude to the world reflects the temper of Judaism rather than that of Christianity. He looks upon the enemies of the Christian Church with uncon- cealed hatred. No prayer arises within his work on their behalf, and nothing but unalloyed triumph is displayed over their doom. The Christian duty of love to those that wrong us does not seem to have impressed itself on our Apocalyptist.

Is the Apocalypse pseudonymous? — All the Jewish apocalypses are pseudonymous, and all the Christian with the exception of the Shepherd of Hermas. Since our book undoubtedly belongs to this category, the question of its pseudonymity must arise. In the articles on Apocalyptic Literature and Apocryphal Literature (qq.v.) we have shown the large lines of differentia- tion between apocalyptic and prophecy. The chief ground for resorting to pseudonymous authorship in Judaism was that the belief in prophecy was lost among the people. Hence any writer who would appeal to them was obliged to do so in the name of some great figure of the past. Furthermore, this belief that prophecy had ceased led the religious personalities of the later time to authenticate their message by means of antedated prophecy. They procured confidence in their actual predictions by appealing to the literal fulfilment of such antedated prophecy. In such literature we find the characteristic words or their equivalents: ” Seal up the prophecy: it is not for this genera- tion,” which are designed to explain the late appearance of the works in which they are found. But this universal character- istic of apocalyptic is almost wholly lacking in the New Testa- ment Apocalypse. The vaticinium ex eventu plays but a very

1 His freedom from legal bondage is as undeniable as his universalism. He lays no further burden on his readers than those re- quired by the Apostolic Decree of Acts xv. 28 seq.

small part in it. Moreover, the chief ground for the develop- ment of a pseudonymous literature was absent in the early Christian church. For with the advent of Christianity prophecy had sprung anew into life, and our author distinctly declares that the words of the book are for his own generation (xxii. 10). Hence we conclude that the grounds are lacking which would entitle our assuming a priori that the Apocalypse is pseudony- mous.

Was the Author the Son of Zebedee, the Apostle? — The evidence of the book is against this assumption. The writer demands a hearing as a prophet (xxii. 6), and in no single passage makes any claim to having been an apostle. Nay more, the evidence of the text, so far as it goes, is against such a view. He never refers to any previous intercourse with Christ such as we find frequently in the Fourth Gospel, and when he speaks of ” the twelve apostles of the Lamb ” (xxi. 14) he does so in a tone that would seem to exclude him from that body. Here internal and external evidence are at strife; for from the time of Justin onwards the Apocalypse was received by the church as the work of the Apostle John (see Swete, op. cit?, p. clxxv). If the writer of the Fourth Gospel was the Apostle John, then the difficulties for the assumption of an apostolic authorship of the Apoca- lypse become well-nigh insuperable. Nay more, the difficulties attending on the assumption of a common authorship of the Gospel and Apocalypse, independently of the question of the apostolic authorship of the Gospel, are practically insuperable. Some decades ago these difficulties were not insurmountable, when critics assigned a Neronic date to the Apocalypse and a Domitianic or later date to the Gospel. It was from such a standpoint conceivable that the thoughts and diction of the writer had undergone an entire transformation in the long interval that intervened between the composition of the two books, on the supposition that both were from the same hand. But now that both books are assigned to the last decade of the 1st century a.d. by a growing body of critics, the hypothesis of a common authorship can hardly be sustained. The validity of such an hypothesis was attacked as early as the 4th century by Dionysius of Alexandria in the fragment of his treatise 7rep£ kirayyektiSiv, in Eusebius, H.E. vii. 24 seq. His arguments, as summed up by Swete (op. cit., p. cxiv seq.), are as follows: ” John the Evangelist abstains from mentioning his own name, but John the Apocalyptist names himself more than once at the very outset of his book, and again near its end. Doubtless there were many who bore the name of John in the early Christian communities;

we read, for instance, of ‘ John, whose surname was Mark,’ and there may have been a second John in Asia, since at Ephesus, we are told, there were two tombs said to be John’s. . . . Again, while the Gospel and the Epistle of John show marks of agreement which suggest a common authorship, the Apocalypse differs widely from both in its ideas and in its way of expressing them; we miss in it the frequent references to ‘ life/ ‘ light,’ ‘ truth,’ ‘ grace ‘ and ‘ love ‘ which are characteristic of the Apostle and find ourselves in a totally different region of thought. . . . Lastly, the linguistic eccentricities of the Apocalypse bar the way against the acceptance of the book as the work of the Evangelist. The Gospel and the First Epistle are written in correct and flowing Greek, and there is not a barbarism, a solecism, or a provincialism in them; whereas the Greek of the Apocalypse is inaccurate, disfigured by unusual or foreign words and even at times by solecisms.”

All subsequent criticism has more or less confirmed the con- clusions of Dionysius. On the other hand, it is impossible to ignore the signs of a relationship between the Apocalypse and the Gospel in the minor peculiarities of language. 2 These, Swete holds, ” create a strong presumption of affinity ” between the two books, while Bousset infers that they ” justify the assump- tion that the entire circle of Johannine writings spring from circles which stood under the influence of the John of Asia Minor.”

We conclude, therefore, that the Gospel and the Apocalypse

2 See Bousset, Offenbarung Johannis 2 , pp. 177-179; Swete 2 , pp. cxxv-cxxix.

are derived from different authors who moved in the same circles. 1

As regards the John mentioned in the Apocalypse, he is now identified by a majority of critics with John the Presbyter, and further the trend of criticism is in favour of transferring all the Johannine writings to him, or rather to his school in Asia Minor. 2

For an independent discussion of the authorship of the Fourth Gospel, see John, Gospel of St. (R. H. C.)

REVELS, MASTER OF THE. 3 — The history of the Revels office has an interesting place in that of the English stage (see also Drama, and

Theatre). Among the expenses of the royal Wardrobe we find provision made for tunicae and viseres in 1347 for the Christmas ludi of Edward III.; during the reign of Henry VII. payments are also recorded for various forms of court revels; and it became regular, apparently, to appoint a special functionary, called Master of the Revels, to superintend the royal festivities, quite distinct from the Lord of Misrule (q.v .). In Henry VII. ‘s time he seems to have been a minor official of the household. In Henry VIII. ‘s time, however, the post became more important, and an officer of the Wardrobe was permanently employed to act under the Master of the Revels. With the patent given to John Farlyon in 1 534 as Yeoman of the Revels, what may be considered as an independent office of the Revels (within the general sphere of the lord chamberlain) came into being; and in 1544 Sir Thomas Cawarden received a patent as Master of the Revels, he being the first to become head of an independent office, M agister J ocorum, Revelorum et Mascorum omnium et singularium nostrorum vulgariter nuncupatorum Revells and Masks. Cawarden was Master till 1559. Soon after his appointment, the office and its stores were transferred to a dissolved Dominican monastery at Blackfriars, having previously been housed at Warwick Inn in the city, the Charterhouse, and then at the priory of St John of Jerusalem in Clerkenwell, to which a return was made after Cawarden’s death. Sir Thomas Benger succeeded Cawarden, and Edmund Tylney followed him (1579-1610); it was the appointment of the latter’s nephew, Sir George Buck, as deputy-master, with the reversion to the mastership, which led to so much repining on the part of the dramatist, John Lyly, who was himself a candidate. Under Tylney, the functions of Master of the Revels gradually became extended to a general censorship of the stage, which in 1624 was put directly in the hands of the lord

1 There are several analogies in Jewish literature. Thus the Testaments of the XII. Patriarchs — a universalist work — and the Book of Jubilees — a particularistic work — are from different authors, though they are written within a few years of each other by Phari- sees and use much common material. Similarly with regard to the Apocalypse of Baruch and 4 Ezra.

2 Several converging lines of testimony tend to prove that John the son of Zebedee was, like his brother James, put to death by the Jews. First, we have the express testimony of Papias to this effect, which is preserved in George Hamartolus and in an epitome of Philip of Side. Attempts have been made to explain away this testimony by Lightfoot, Harnack, Drummond, and Bernard (Irish Church Quarterly, 1908, 52 sqq.). Secondly, Papias’s testi- mony receives support from Jesus’s own words in Mark x. 39; for, as Wellhausen remarks on this passage, ” the

prophecy refers not only to James but also to John; and if it had remained only half fulfilled, it would hardly have kept its place in the Gospel." The third strand of evidence is found in the Martyrologies, Cartha- ginian, Armenian and Syrian. Bernard (op. cit.) has tried to prove that the Martyrologies do not imply the martyrdom but only the faithful witness of John. Finally, Clement of Alexandria (Bousset, Die Offenbarung, p. 38; furnishes evidence in the same direction; for in Clem. Alex. Strom, iv. 9, 71, the Gnostic Herac- leon gives a list of the Apostles who had not been martyred, and these were: " Matthew, Philip, Thomas and Levi" (corrupt for Lebbaeus). If we accept this evidence, the martyrdom cannot have been later than a.d. 69, and may have been considerably earlier. In either case such a fact, if it is a fact, is against an Apostolic origin of the Johannine writings. John the Presbyter is in that case " the disciple whom Jesus loved " and the founder of the Johannine school in Asia Minor. But the question is still at issue.

3 The word " revel " meant properly a noisy or riotous tumult or merry-making, and is derived from O- Fr. reveler, to rebel, to riot, make a noise; Lat. rebellare.

chamberlain, thus leading to the licensing act of 1737 (see Drama).

See E. K. Chambers, The Mediaeval Stage (1904) ; and his Notes on the History of the Revels Office under the Tudor s (1906), with authorities quoted.

REVELSTOKE, an incorporated town of British Columbia, on the Columbia river and the Canadian Pacific railway, 381 m. E. of Vancouver. Pop. (1907) 3526. It is the capital of Kootenay county, and the shipping centre for the mining and lumbering district. It contains large railway shops, several breweries, and saw and shingle mills.

REVENTLOW, CHRISTIAN DITLEV FREDERICK, Count (1748-1827), Danish statesman and reformer, the son of Privy Councillor Christian Ditlev Reventlow, born on March 11, 1748. After being educated at the academy of Soro and at Leipzig, Reventlow, in company with his younger brother Johan Ludwig and the distinguished Saxon economist Carl Wendt (1731-1815), the best of cicerones on such a tour, travelled through Germany, Switzerland, France and England, to examine the social, eco- nomical and agricultural conditions of civilized Europe. A visit to Sweden and Norway to study mining and metallurgy completed the curriculum, and when Reventlow in the course of 1770 returned to Denmark he was an authority on all the

economic questions of the day. In 1774 he held a high position in the Kammerkollegiet, or board of trade, two years later he entered the Department of Mines, and in 1781 he was a member of the Overskattedirectionen, or chief taxing board. He had, in 1774, married Frederica Charlotte von Beulwitz, who bore him thirteen children, and on his father's death in 1775 inherited the family estate in Laaland. Reventlow overflowed with progressive ideas, especially as regards agriculture, and he devoted himself, heart and soul, ; to the improvement of his property and the amelioration of his serfs. Fortunately, the ambition to play a useful part in a wider field of activity than he could find in the country ultimately prevailed. His time came when the ultra-conservative ministry of Hoegh Guldberg was dismissed (April 14th, 1784) and Andreas Bernstorff, the states-man for whom Reventlow had the highest admiration, returned to power.

Reventlow was an excellently trained specialist in many departments, and was always firm and confident in those subjects which he had made his own. Moreover, he was a man of strong and warm feelings, and deeply religious.

The condition of the peasantry especially interested him. He was convinced that free labour would be far more profitable to the land, and that the peasant himself would be. better if released from his thraldom.

His favourite field of labour was thrown open to him when, on the 6th of August 1784, he was placed at the head of the Rente- kammeret, which took cognisance of everything relating to agriculture. His first step was to appoint a small agricultural commission to better the condition of the crown serfs, and amongst other things enable them to turn their leaseholds into freeholds. Observing that the Crown Prince Frederick was also favourably disposed towards the amelioration of the peasantry, Reventlow induced him, in July 1786, to appoint a grand commission to take the condition of all the peasantry in the kingdom into immediate consideration. This celebrated agricultural commission continued its labours for many years, and introduced a whole series of reforms of the highest import- ance. Thus the ordinance of 8th June 1787 modified the existing leaseholds, greatly to the advantage of the peasantry; the ordinance of 20th June 1788 abolished villenage and completely transformed the much-abused hoveri system whereby the feudal tenant was bound to cultivate his lord's land as well as his own; and the ordinance of 6th December 1799, which did away with hoveri altogether. Reventlow was also instrumental in starting the public credit banks, for enabling small

cultivators to borrow money on favourable terms. In conjunction with his friend, Heinricn Ernst Schim- melmann (1747-1831), he also procured the passing of the , ordinances permitting free trade between Denmark and Norway,

the free importation of corn from abroad, and the abolition of the mischievous monopoly of the Iceland trade.

But the financial distress of Denmark, the jealousy of the duchies, the ruinous political complications of the Napoleonic period, and, above all, the Crown Prince Frederick's growing jealousy of his official advisers, which led him to rule, or rather misrule, for years without the co-operation of his Council of State— all these calamities were at last too much even for Reventlow. On 7th December 1813 he received his dismissal and retired to his estates, where, after working cheerfully among his peasantry to the last, he died on the nth of October 1827.

See Adolph Frederik Bergsoe, Grev. C. D. F. Reventloivs Virksomhed (Copenhagen, 1837) ; Louis Theodor Alfred Bobe, Efterl. Papirer fra den Reventlowske Familiekreds (Copenhagen,

1895-97)-

REVENUE (O. Fr. revenu, from revenir, to return), income, return, or profit; more particularly the receipts from all sources of a government or state. The revenue of a state is largely made up of taxation, and the general principles of taxes are discussed in Taxation and Finance. In some countries the public or state domain may contribute substantially to the revenue, as do the crown forests in Russia, while in other countries important contributions are made from the state railways, post and telegraph services, &c. For the historical development of the English revenue see English Finance, and for other countries see the sections on finance in the articles dealing with the various countries. In the United Kingdom the term inland revenue is used to denote that part of the revenue which is derived from death duties, stamps and other taxes, such as income tax, land tax, inhabited house duty, &c. The Board of Inland Revenue is a special department of the English civil service, with headquarters at Somerset House. The Board consists of a chairman, deputy chairman, and two commissioners, with joint secretaries, assistant secretaries and a staff of officials. The other important department engaged in the collection

of the English revenue is the Board of Customs and Excise. The excise department was formerly a branch of the inland revenue, but was amalgamated with the customs department on the 1st of April 1909. The Board of Customs and Excise is constituted as is the Board of Inland Revenue.

In the United States the greater proportion of the national revenue ($547,086,992 out of $663,217,677 in 1909) is derived from customs and internal revenue. The internal revenue consists for the most part of receipts from taxes on spirits, tobaccos and fermented liquors. In 1909 the amount derived from customs revenue was $300,977,438, and internal revenue,

$246,109,554.

REVERE, PAUL (1735-1818), American engraver and patriot, was born in Boston, Massachusetts, on the 1st of January 1735. He had a meagre schooling, and in his father's shop learned the trade of a gold- and silversmith. In 1756 he was second lieutenant of artillery in the expedition against Crown Point, and for several months was stationed at Fort Edward, in New York. He became a proficient copper engraver, and engraved several anti-British caricatures in the years before the War of Independence. He was one of the Boston grand jurors who refused to serve in 1774 because parliament had made the justices independent of the people for their salaries; was a leader in the Boston Tea Party; was one of the thirty North End mechanics who patrolled the streets to watch the move- ments of the British troops and Tories; and in December 1774 was sent to Portsmouth, New Hampshire, to urge the seizure of military stores there, and induced the colonists to attack and capture Fort William and Mary — one of the first acts of military force in the war. His midnight ride from Charlestown to Lexington on the i8th-i9th of April 1775, to give warning of the approach of British troops from Boston, is Revere's most famous exploit; it is commemorated by Longfellow, who, however, has " paid little attention to exactness of fact " (Justin Winsor). In 1775 Revere was sent by the Massachusetts

provincial congress to Philadelphia to study the working of the only powder mill in the colonies, and although he was allowed only to pass through the building, obtained sufficient informa- tion to enable him to set up a powder mill at Canton. He was commissioned a major of infantry in the Massachusetts militia in April 1776; was promoted to the rank of lieutenant-colonel of artillery in November; was stationed at Castle William, defending Boston harbour, and finally received command of this fort. He served in an expedition to Rhode Island in

1778, and in the following year participated in the unsuccessful Penobscot expedition. After his return he was accused of having disobeyed the orders of the commanding officer, was tried by court-martial, and was acquitted. After the war he engaged in the manufacture of gold and silver ware, and became a pioneer in the production in America of copper plating and copper spikes for ships. In 1795, as grandmaster of the Masonic fraternity, he laid the cornerstone of the new State House in Boston, and in this year also founded the Massachusetts Charit- able Mechanic Association, becoming its first president. He died in Boston on the 10th of May 1818.

See Charles F. Gettemy, The True Story of Paul Revere (Boston,

1905)-

REVERE, a township and a coast resort of Suffolk county, Massachusetts, U.S.A., immediately N.E. of Boston on Massa- chusetts Bay. Pop. (1910, U.S. census), 18,219. Area, 4-56 sq. m. The township is served by the Boston & Maine and the Boston, Revere Beach & Lynn railways, and by several electric ” railways connecting [with Boston, Chelsea, Lynn, Maiden, and Medford. Revere Beach, a crescent-shaped beach of white sand extending from the promontory of Winthrop on the S. to the Point of Pines on the N., is a popular bathing resort, and has been called the Coney Island of Boston. The township has a Carnegie library and a handsome town hall. The first settlement here was made about 1626, and, under the name of Rumney Marsh, it was a part of Boston until 1739, when it became a part of the new township of Chelsea. The northern part of Chelsea was organized as the township of North Chelsea in 1846; part of it was separated as Winthrop in 1852; and in 187 1 the name North Chelsea was changed to Revere, in honour of Paul Revere.

REVEREND (Lat. reverendus, gerundive of revereri, to revere, pay respect to), a term of respect or courtesy, now especially used as the ordinary prefix of address to the names of ministers of religion of all denominations. The uses of Med. Lat. reverendus do not confine the term to those in orders; Du Cange (Gloss, s.v.) defines it as titulus honorarius, etiam mulieribus potioris dignitatie concessus, and in the 15th century in English it is found as a general term of respectful address. The usual prefix of address of a parson was ” sir,” representing Lat. dominus (see Sir), or ” master.” It has been habitually used of the parochial clergy of the Cfrurch of England since the end of the 17th century. It is not, however, a title of honour or dignity, and no denomination has any exclusive right to use it. A

faculty was ordered to be issued for the erection of a tombstone, the inscription on which contained the name of a Wesleyan minister prefixed by “reverend”; this the incumbent had refused (Keat v. Smith, 1876, 1 P.D. 73). In the Church of England deans are addressed as ” very reverend,” bishops as ” right reverend,” archbishops as ” most reverend.” The Moderator of the Church of Scotland is also styled ” right reverend.”

REVERIE, a condition of mental abstraction, a fit of musing, a “brown study” (“brown” in the sense of “gloomy,” and not to be referred to Germ. Braune, brow). The word appears in the 14th or 15th centuries in its original meaning in Old French, of joy, delight, also wildness, anger. The French rever, later resver, modern river, to dream, meant originally to wander in speech or thought, and is derived from the Lat. rabiare, cf. ” rabies,” ” rage ” and ” rave.” The French riverie (resverie] was adopted again in the 17th and 18th centuries as meaning a state of dreaminess; thus Locke (Essay on the Human Under- standing, 1695, ii. xix.) says: ” When ideas float in our minds

without any reflection or regard of the understanding, it is that which the French call resvery; our language has scarce a word for it.”

REVIEW (Fr. revue, from revoir, to see again, Lat. re and videre), an inspection or critical examination; it is chiefly used as a military or naval term for an inspection on a large or formal scale of a fleet or body of troops by the sovereign or other person holding a high official position, or for a critical account of a recently published literary work in a magazine or periodical. The earliest use of the word for the title of such a periodical was in the paper begun by Defoe in 1704, the full title of which was A Review of the Affairs of France and of all Europe, as influ- enced by that Nation (see Periodicals and Newspapers). In France there is a particular application of the term revue or, more fully, revue de fin d’annie to a form of dramatic performance, acted or sung, in which the chief events of the past year, and the personages who have been prominently before the public, are satirically and critically passed under review. Attempts have been made to trace such performances to an early origin. In their modern form, however, they date from the reign of Louis Philippe. L’Am84ietl’an IQ41, by the brothers Cogniard, was one of the earliest.

REVILLAGIGEDO, an isolated, uninhabited group of rocky islands in

the N. Pacific, lat. 18 N., long. 112° W., belonging to Mexico, and forming part of the state of Colima. They are about 420 m. from the Mexican coast and comprise the large island of Socorro (San Tomas), 24 m. long by an average of 9 m. wide, and the three widely separated islets of San Betiedicto, Roca Partida and Clarion, with a total area of 320 sq. m. The island of Socorro has an extinct volcano 3660 ft. high. The islands have certain remarkable zoological features, comprising several birds and reptiles allied to those of the Mexican main- land but differing from them in species. The archipelago derives its name from the Spanish viceroy who governed Mexico from 1746 to 1755.

REVILLE, ALBERT (1826-), French Protestant theo- logian, was born at Dieppe on the 4th of November 1826. After studying at Geneva and Strassburg, he became in 1849 pastor at Lunerai near Dieppe, and in 1851 of the Walloon Church at Rotterdam, where he remained until 1872. In 1880 he was made professor of the history of religions in the College de France at Paris. Six years later he was appointed president of the section of religious studies in the Ecole des hautes etudes at the Sorbonne. He is one of the leaders of the French school of advanced critical theology.

Works. — Besides contributing to the Revue de theologie (Paris), the Revue de Vhistoire des religions (Paris), the Revue des deux monies, the following works are important: Manuel d'histoire compares de la philosophic et de la religion (1859; Eng. trans., 1864); Histoire du dogme de la divinite de Jesus Christ (1869, 3rd ed., 1904; Eng. trans., 1905); Prolegomenes de Vhistoire des. re- ligions (1881, 4th ed., 1886; Eng. trans., 1884); Theodore Parker, sa vie et ses ceuvres (1865; Eng. trans., 1865, 2nd ed., 1877); Lectures on the Origin and Growth of Religion as illustrated by the native religions of Mexico and Peru (the " Hibbert Lectures " for 1884); J6sus de Nazareth (1897, 12th ed., 1906).

His son, Jean Reville, was born on the 6th of November 1854, studied at Geneva, Paris, Berlin and Heidelberg, and became professor of patristic literature and secretary of the section of religious studies in the Ecole des hautes etudes at the Sorbonne. In 1884 he became co-editor of the Revue de Vhistoire des religions (Paris).

His books include: La Doctrine du logos (1881); La Religion A Rome sous les Severes (1886) ; Les Origines de Vepiscopat (1895) ; and Le Protestantisme liberal, ses origines, sa nature, sa mission (1903; Eng. trans., 1903).

REVOLUTIONARY TRIBUNAL, THE (le tribunal revolu- tionnaire) , a

court which was instituted in Paris by the Convention during the French Revolution for the trial of political offenders, and became one of the most powerful engines of the Terror. The news of the failure of the French arms in Belgium gave rise in Paris to popular movements on the 9th and 10th of March 1793, and on the 10th of March, on the proposal of Danton, the Convention decreed that there should be established in Paris

an extraordinary criminal tribunal, which received the official name of the Revolutionary Tribunal by a decree of the 29th of October 1793. It was composed of a jury, a public prosecutor, and two substitutes, all nominated by the Convention; and from its judgments there was no appeal. With M. J. A. Hermann as president and Fouquier-Tinville as public prosecutor, the tribunal terrorized the royalists, the refractory priests and all the actors in the counter-revolution. Soon, too, it came to be used for personal ends, particularly by Robespierre, who employed it for the condemnation of his adversaries. The excesses of the Revolutionary Tribunal increased with the growth of Robespierre's ascendancy in the Committee of Public Safety; and on the 10th of June 1794 was promulgated, at his instigation, the infamous Law of 22 Prairial, which forbade prisoners to employ counsel for their defence, suppressed the hearing of witnesses and made death the sole penalty. Before 22 Prairial the Revolutionary Tribunal had pronounced 1220 death-sentences in thirteen months; during the forty-nine days between the passing of the law and the fall of Robespierre 1376 persons were condemned, including many innocent victims. The lists of prisoners to be sent before the tribunal were prepared by a popular commission sitting at the museum, and signed, after revision, by the Committee of General Security and the Committee of Public Safety jointly. Although Robespierre was the principal purveyor of the tribunal, we possess Only one of these lists bearing his signature. The Revolutionary Tribunal was suppressed on the 31st of May 1795. Among its most celebrated victims may be mentioned Marie Antoinette, the Hebertists, the Dantonists and several of the Girondists. Similar tribunals were also in operation in the provinces.

See H. A. Wallon, Histoire du tribunal revolutionnaire de Paris (Paris, 6 vols., 1880-82); E. Campardon, Le Tribunal revolution- naire de Paris (Paris, 2nd ed., 2 vols., 1866) ; C. Berriat Saint- Prix, La Justice revolutionnaire a Paris, Bordeaux, Brest, Lyon, Nantes, . . . (Paris, 1861), and La Justice revolutionnaire (aoUt i?02 L prairial an II.) d'apres des documents originaux (Paris, 1870); also G. Lendtre, Le Tribunal revolutionnaire (1908). For a biblio graphy of its records see M. Tourneux, Bibliog. de la ville de Paris . . . (1890, vol. i. Nos.

3925-3974).

REWA, or Riwa, a native state of Central India in the Bagel- khand agency. It is the only large state in Bagelkhand, and the second largest in Central India, having an area of about 13,000 sq. m. It is bounded N. by the United Provinces, E. by Bengal and S. by the Central Provinces. On the W. it meets other petty states of Bagelkhand. Rewa is divided into two well- defined portions. The northern and smaller division is the plateau lying between the Kaimur range of hills and that portion of the Vindhyas known as Binjh, which overlook the valley of the Ganges. This plateau is for the most part culti- vated and well peopled; rich harvests both of kharif and rabi crops are generally obtained. Water is plentiful, and the country is full of large tanks and reservoirs, which, however, are not used for irrigation purposes; the only system of wet cultivation which has any favour with the villagers is that of bunds, or mounds of earth raised at the lower ends of sloping fields to retain the rain water for some time after the monsoon rains cease. The country to the S. of the Kaimur hills com- prises by far the largest portion of the state; but here cultiva- tion is restricted to the valley between the hills and the Sone river, and to a few isolated patches in scattered parts of the forest wastes. The principal river is the Sone, which flows through the state in a N.E. direction into Mirzapur district. Another important river is the Tons, but neither is navigable. The annual rainfall averages about 41 in. The population in 1901 was 1,327,385, showing a decrease of 12% in the decade. Many of the inhabitants of the hilly tracts are Gonds and Kols. Estimated revenue, £200,000. The staple crops are rice, millets and wheat; but more than one-third of the area is covered with forests, yielding timber and lac.

The S. of the state is crossed by the branch of the Bengal-Nagpur railway from Bilaspur to Katni, which taps the Umaria coal-field. The state suffered from famine in 1896-97, and again to a less

extent in 1899-1900; but on both occasions adequate measures of relief were provided.

The state first came under British influence in 1812. The chief, Venkat Raman Singh, was born in 1876, succeeded in 1880 and was created G.C.S.I. in 1897. During his minority the administra- tion was reformed. He is Rajput of the Baghela branch of the Solanki race, and

is descended from the founder of the Anhilwara Patan dynasty in Gujarat.

The town of Rewa is 131 m. S. of Allahabad. Pop. (1901) 24, 608. It has a high school, also the Victoria and zenana hospitals and a model gaol. The political agent for Bagelkhand resides at Satna, on the East Indian railway: pop. (1901) 7471.

REWA KANTHA, a political agency or collection of native states in India, subordinate to the government of Bombay. It stretches for about 150 m. between the plain of Gujarat and the hills of Malwa, from the river Tapti to the Mahi, crossing the Nerbudda or Rewa, from which it takes its name. The number of separate states is 61, many of which are under British jurisdiction. The only important one is Rajpipla (q.v.). It includes also five second-class states entitled Chota Udaipur, Bariya, Sunth, Lunawada and Balaimor. Total area, 4972 sq. m. In 1901 the population was 479,065, show- ing a decrease of 35 % in the decade, due to the results of famine. Estimated revenue, £140,000; tribute (mostly to the gaekwar of Baroda), £10,000. Many of the inhabitants belong to the wild tribes of Bhils and Kolis. The political agent, who is also collector of the British district of the Panch Mahals, resides at Godhra.

REWARD, recompense, a gift or payment in return for services rendered. ” Reward ” and ” regard ” are forms of the same word. Old French, from which both words came into English, also had rewarder and regarder (the latter form only surviving in modern French), from re-, back, in return, and warder, garder, to watch, protect — ultimately a Teutonic word, from the base war-, to defend; cf. ” ward ” and ” guard,” which are thus also doublets. In early use in English, ” re- ward ” and ” regard ” were interchangeable in meaning; thus in Piers Plowman, xi. 129, ” Reson rod forth and tok reward of no man,” cf. ” The towne doth receave … an annuall regard for the same ” (a 16th-century reference quoted by the New English Dictionary from R. Willis and J. W. Clark, Archit. Hist, of Univ. of Cambridge, 1886). In use the words are now distinct, ” regard ” being restricted to such meanings as atten- tion, respect, esteem, consideration.

In English law the offering of rewards presents two distinct aspects: (1) with reference to the nature of the information or act for the giving or doing whereof the reward is offered; (2) with reference to the nature of the relation created between the person offering and the person claiming the reward.

1. Courts of assize and quarter sessions are empowered to order the

payment of rewards to persons who have been active in or towards the apprehension of persons charged with certain specified crimes against person and property (Criminal Law, 1826, ss. 28, 29; Criminal Justice Administration Act 1851, ss. 7, 8). The rewards are payable according to a scale fixed by the home secretary. In the case of courts of quarter sessions the maximum is £5. Courts of assize may award a larger sum where extraordinary courage and diligence have been shown towards the apprehension. The sums awarded are paid out of the rate or fund chargeable with the costs of assizes and sessions. It is illegal to advertise for the recovery of stolen property (including dogs) on terms of not asking questions (Larceny Act 1861, s. 102;' Larceny Advertisements Acts 1870, s. 3). The advertiser and the newspaper which publishes it incur a penalty of £50. (See Mirams v. Our Dogs Publishing Co., 1901, 2 K.B. 564.) It is a criminal offence at common law to offer any reward on terms leading to compounding a felony or sheltering the offender (R. v. Burgess, 1886, 16 Q.B.D. 141), and under the Larceny Act 1861 (ss. 20, 101) it is criminal to accept a reward for recovery of stolen property without bringing the thief to justice.

2. Where a reward is lawfully offered for information the person who first supplies the required information, i.e. satisfies the -conditions on which the reward is payable, is entitled to

recover by action the reward offered. Performance of the conditions is an acceptance . of the offer {Carlill v. Carbolic Smoke Ball Co., 1893, 1 Q.B. 256, 270). Thus on an advertise- ment for information leading to the arrest and conviction of shop-breakers, T. gave information which led to the arrest of R,, who while in prison told the police where to find the thieves. T. was held entitled to the reward (Tarnerv. Walker, 1866, L.R. 1 Q.B. 641), This rule applies even where the offer is general to all the world (Williams v. Carwardine, 1833, 4 B. & Ad. 621; Spencer v. Harding, 1870, L. R. 5 C.P. 561). It would seem that on grounds of public policy an offender could not claim the reward on surrendering himself to justice (Bent v. Wakefield &c. Bank, 1878, 4 C.P.D. 1, 4). It is not clear whether officers of justice are by their office and duty debarred from claiming rewards offered for the arrest of offenders (Ibid. p. 5).

REWARI, a town of British India, in Gurgaon district of the Punjab, 32 m. S.W. of Gurgaon, on the Rajputana-Malwa railway. Pop. (1901) 27,295. It is an important centre of trade, being the junction for the Rewari-Bhatinda branch of the Rajputana railway. The chief

manufacture is that of brass- ware for cooking utensils.

REWBELL, JEAN FRANgOIS (1747-1807), French politician, was born at Colmar (then in the department of Haut-Rhin) on the 8th of October 1747. He was president (bdtonnier) of the order of avocats in Colmar, and in 1789 was elected deputy to the States- General by the Third Estate of the bailliage of Colmar-Schlestadt. In the Constituent Assembly his oratorical gifts, legal knowledge and austerity of life gave him much influence. During the session of the Legislative Assembly he exercised the functions of procureur syndic and was subsequently secretary-general of the department of Haut-Rhin. In the Convention he was a zealous promoter of the trial of Louis XVI., but was absent on mission at the time of the king's condemnation. He took part in the reactionary movement which followed the fall of Robespierre, and became a member of the reorganized Committees of Public Safety and General Security. The moderation he displayed caused his election by seventeen departments to the Council of Five Hundred. Appointed a member of the Directory on the 1st of October 1795, he became its president in 1796, and retired by ballot in 1799. He then entered the Council of Ancients. After the coup d'etat of 18 Brumaire he retired from public life, and died at Colmar on the 23rd of November 1807.

See L. Sciout, Le Directoire (Paris, 1895-97).

REYBAUD, MARIE ROCH LOUIS (1799-1879), French writer, economist and politician, was born at Marseilles on the 15th of August 1799. After travelling in the Levant and in India, he settled in Paris in 1829. Besides writing for the Radical press, he edited the Histoire scientifique et militaire de I 'expedition francaise en Egypte in ten volumes (1830-36) and Dumont d'Urville's Voyage autour du monde (1833). In 1840 he published Etudes sur les reformateurs ou socialistes modernes (see Socialism) which gained him the Montyon prize (1841) and a place in the Academie des sciences morales et politiques (1850). In 1843 he published Jerome Paturot a la recherche d'une position sociale, a clever social satire that had a prodigious success. In 1846 he abandoned his democratic views, and was elected liberal deputy for Marseilles. His Jerome Paturot a la recherche de la meilleure des rSpubliques (1848) was a satire on the new Re- publican ideas. After the coup d'etat of 1849 he ceased to take part in public life, and devoted himself entirely to the study of political economy. To this period belong his La Vie de I'employS (1855); L'Industrie en Europe (1856); and £tudes sur le regime, de nos manufactures (1859). He died in Paris on the 28th of October 1879.

REYER, ERNEST (1823-), French composer, was born at Marseilles on the 1st of December 1823. At the age of sixteen he went to Algeria, and remained there some years. The out- come of his residence there was a symphonic ode entitled Le Selam, the musical orientalism of which had, unluckily for him, already been anticipated by Felicien David in Le Desert. Maitre Wolfram, a one-act opera, was produced at the Opera comique

in 1854; and in 1858 Sacuntala, a ballet, at the Opera. It was the production of La Statue at the Theatre lyrique in 1861 that brought Reyer's name prominently before the public. But Reyer had to wait several years before obtaining a real and permanent success. Erostrate, an opera produced at Baden- Baden in 1862, and given at the Paris Opera some ten years later, was a failure. The composer had in the meanwhile set to work on Sigurd, the subject of which is the same that inspired Wagner in Siegfried and Gotterdammerung. It was at last produced in Brussels in 1884, and subsequently brought out at the Paris Opera. Sigurd is a work of great value, displaying its composer's elevated notions as regards the form of the " lyrical drama." Salammbd, founded upon Flaubert's romance, was successfully produced at Brussels in 1890. Gluck, Weber, Berlioz and Wagner exercised most influence over Reyer. As a musical critic (preceding Berlioz in that capacity for the Journal des debats) Reyer was a well-known writer; and he became librarian of the Paris Opera, and a member of the Institute. His Quarante Ans de musique (with biographical notice by E. Henriot) was published in 1909.

REYNARD THE FOX, a beast-epic, current in French, Dutch and German literature. The cycle of animal stories collected round the names of Reynard the Fox and Isengrim the Wolf in the 12th century seems to have arisen on the border- land of France and Flanders. Much of the material may be found in Aesop, in Physiologus, and in the 1 2th-century Disciplina Clericalis of Petrus Alfonsus. But the difference is very great. The intention of the trouveres who recited the exploits of Reynard was, in the earlier stages, in no sense didactic. The tales, like those of " Uncle Remus," were amusing in themselves; they were based on widely diffused folklore, and Reynard and his companions were not originally men disguised as animals. Jacob Grimm (Reinhart Fuchs, 1834) maintained their popular origin; his

theories, which have been much contested, have received additional support from the researches of K. Krohn, who discovered many of the stories most characteristic of the cycle in existing Finnish folklore, where they can hardly have arrived through learned channels.

There is abundant evidence that Isengrim and Reynard were firmly established in the popular imagination in the 13th century, and even earlier. Guibert de Nogent (De Vita sua, book 3, chap.viii., printed Paris, 1651), in referring to the disturbances at Laon in 1 n 2, says that the bishop Gaudri was accustomed to call one of his enemies Isengrim, and it is obvious from the context that the taunt was perfectly understood by the popular mind. Philip the Fair is said to have annoyed Pope Boniface III., who died in 1303, by the representation of the "Procession Renart"; and in 1 204-1 206 in Flanders two opposing parties were designated Isangrini and Blavotini (blue-footed). The principal names of the Reynard cycle, and the earliest in use, were German. Reynard himself (Raginohardus, strong in counsel), Bruin the Bear, Baldwin the Ass, Tibert the Cat, Hirsent the She-wolf, had German names, most of which were used as person-names in Lorraine. Whatever the sources of the stories, it was in France that the cycle obtained its greatest vogue. The Roman de Renart as printed by Meon (Paris, 4 vols., 1826) runs to over 40,000 lines, and contains a great number of detached episodes or branches, to which the trouveres gave a certain unity by attaching them to the traditionary feud between Reynard and Isengrim. This rapidly became symbolic of the triumph of craft and eloquence over brute strength. Renart was a popular epic parodying feudal institu- tions as represented in the romances of chivalry, and readily adapting itself to satire of the rich, of the forms of justice, and of the clergy.

The early French originals are lost, the most ancient existing fragments being in Latin. The fable of the lion's sickness and his cure by the wolf's skin occurs in the Ecbasis cujusdam captivi per Tropologiam (ed. E. Voigt; Strassburg, 1875), written by a monk of St Evre at Toul (Meurthe-et-Moselle) about 940. Ysengrimus (ed. E. Voigt; Halle, 1884), a clerical satire written by Nivard of Ghent about 1148, includes the story of

the lion's sickness and the pilgrimage of Bertiliana the Goat. Another Latin poem, Reinardus vulpes (ed. F. J. Mone; Stutt- gart, 1832), contains in addition the theft of the bacon, and how Isengrim is induced to fish with his tail. A simpler version, derived probably from a French original, is Isingrines ndt, written in German about 11 80 by the Alsatian Heinrich der Glichezare. Only fragments of this poem are preserved, but about a quarter of a century later it was re-written with

little change in the subject matter as Reinhart Fucks (ed. J. Grimm, Berlin, 1834; and K. Reissenberger, Halle, 1886). Most later versions of Reynard have been derived, however, from the Flemish Reinaert de vos (ed. J. F. Willems, Ghent, 1836; and E. Martin, Paderborn, 1874), written about 1 250 in East Flanders by Willem. Reinaert is a poem of 3474 fines. The corresponding branch of the French Roman de Renart (for which and its satirical sequels, Le Couronnement Renart, Renart le nouveau, and Renart le contrefait, see French Literature) is one of the earliest and best of the great French cycle.

The fable was, like other French works, known in England, but did not at once pass into the popular stock. Odo of Cheriton, who died in 1247, used the Reynard stories in his sermons, and many of them occur in his collection of Parabolae (ed. Hervieux, Fabulistes latins, 1884, vol. i.). The English poem of the Vox and the Wolf dates from the 13th century; and the ” Nonne Preestes Tale ” of Chaucer, in which, however, the fox is Rossel and the ass Brunei, is a genuine Reynard history.

Willem’s Reinaert de Vos was left incomplete, and the con- tinuation — about 4000 lines in a more didactic vein — was added by an unknown writer of West Flanders about 1370. The first copy printed in any language was the Dutch prose version, Hystorie van Reynaert de Vos, printed at Gouda by Gheraert Leeuw in 1479. On this Caxton based his Historye of reynarl the foxe (reprinted by E. Arber, 1878), which he finished on the 6th of June 148 1. As a satire on the church, especially on monks and nuns, Reynard became popular with reformers, and numerous versions followed in England and Germany. A Low German version, Reineke Fuchs, with a prose commentary by Hinrek Alckmer (Henry of Alkmaar), was issued from the Antwerp press of Gheraert Leeuw in 1487. From this rifaci- mento was derived the Low German Reynke de Vos (ed. Hoffmann von Fallersleben, Breslau, 1834; and Friedrich Prien, Halle, 1887), which was printed at Liibeck in 1498. Michael Beuther is said to have been the translator into High German (Reiniken Fuchs, 1 544) ; and the book was made available to the general European public in the Latin version of Hartmann Schopper, Opus Poeticum de admirabili fallacia et astutia Vulpeculae Reinikes Libros quatuor (Frankfort, 1567). The modern German version (1794) of Goethe has been often reprinted, notably in 1846 with illustrations by Wilhelm von Kaulbach.

Reynard is dealt with by Carlyle in an essay ” On German Literature of the Fourteenth and Fifteenth Centuries ” in the Foreign Quarterly Review (1831). An admirable account of the Reynard cycle is given by W. J. Thorns in his edition of Caxton’s version for the Percy Society

(1844). Prien's edition of Reynke de Vos contains bibliographical particulars of the German, Danish, Swedish, Icelandic and English editions (cp. Brunet, Manuel du libraire, s.v. Renart). The best edition of the Roman de Renart is by Ernest Martin (3 vols., Strassburg and Paris, 1881-1887). See also Leopold Sudre, Les Sources du roman de Renard (Paris, 1890) ; Jacob Grimm, Sendschreiben an C. Lachmann uber Reinhart Fuchs (Leipzig, 1840) ; Gaston Paris, " Le Roman de Renard " in the Journal des savants (Dec. 1894 and Feb. 1895); Kaarle Krohn, Bar und Fuchs (Helsingfors, 1888), 'and the editions mentioned above. The story is told in modern French by Paulin Paris, Les Aventures de Maitre Renart et d'Ysengrin son compere (1861), and in English by Joseph Jacobs, following a modernized text of Caxton made by " Felix Summerley " (Sir H. Cole), in The Most Delectable History of Reynard the Fox (1895), with a valuable introduction.

REYNOLDS, JOHN FULTON (1820-1863), American soldier, was born at Lancaster, Pennsylvania, on the 20th of September 1820, and graduated at West Point in 1841. He became first lieutenant of artillery in 1846, and was breveted captain and major for gallantry in the Mexican War. He took part in the Utah expedition under Brigadier-General Albert Sidney Johnston. In 1859 he was made commandant of cadets

REYNOLDS, SIR JOSHUA

at West Point, where he was stationed at the outbreak of the Civil War in 1861. He was made a lieutenant-colonel of infantry in May and brigadier-general of volunteers in August of that year. In the Peninsular campaign, after taking part in the battles of Beaver Dam Creek and Gaines' Mill, he was taken prisoner in the hard-fought action of Glendale or Frazier's Farm. Exchanged after six weeks' captivity, he commanded a division with conspicuous ability and courage in the second battle of Bull Run. Shortly after this he was placed in command of the militia of his native state when Lee's invasion threatened it. In November 1862 he was commissioned major-general of volunteers, and appointed to command the I. Corps of the Army of the Potomac, and took part in the battle of Fredericksburg. At the time of General Meade's appointment to command the Army of the Potomac many desired to see Reynolds selected for that post, but he gave Meade his whole-hearted support in the three critical days preceding the battle of Gettysburg (g.v.). He was placed by Meade in command of the left wing (I., III. and XI. corps and Buford's cavalry division) and thrown forward to Gettysburg to cover the concentration of the Army of the Potomac. The battle which ensued there, on the 1st of July 1863, took its shape

from Reynolds's resolution to support Buford's cavalry with the I. and XL crops. Meade was notified, and hurried forward the right wing under Hancock. Reynolds himself was killed very early in the day by a rifle bullet. A bronze statue was placed on the field of Gettysburg and a portrait in the library at West Point by the men of the I. Corps. The state of Pennsylvania erected a granite shaft on the spot where he fell, and an equestrian bronze statue stands in Philadelphia.

His elder brother William (1815-1870), a naval officer, served afloat in the Civil War, effected many useful reforms while acting secretary of the navy in 1873 and 1874, and retired from the United States navy in 1877 as a rear-admiral.

REYNOLDS, SIR JOSHUA (17 23-1 792), the most prominent figure in the English school of painting, was born at Plympton Earl, in Devonshire, on the 16th of July 1723. He received a fairly good education from his father, who was a clergyman and the master of the free grammar school of the place. At the age of seventeen, the lad, who had already shown a fondness for drawing, was apprenticed in London to Thomas Hudson, a native of Devonshire, who, though a mediocre artist, was popular as a portrait painter. Reynolds remained with Hudson for only two years, and in 1743 he returned to Devonshire, where, settling at Plymouth Dock, he employed himself in portrait painting. By the end of 1744 he was again in London. He was well received by his old master, from whom he appears previously to have parted with some coldness on both sides. Hudson introduced him to the artists' club that met in Old Slaughter's, St Martin's Lane, and gave him much advice as to his work. Reynolds now painted a portrait of Captain the Hon. John Hamilton, the first that brought him any notice, with those of other people of some repute; but on the death of his father in 1746 he established himself with two of his sisters at Plymouth Dock, where he painted numerous portraits, and it was here that he came under the influence of the works of one of the painters who materially affected his art. This was William Gandy of Exeter, who had died in 1730, and whose painting, derived through his father from VanDyck, was pronounced by Northcote to come nearer to nature in the texture of flesh than that of any artist who ever lived. The influence on him of Gandy may be seen in the early self-portrait of the National Portrait Gallery, so rich in impasto and strong in light and shade, in which he is seen shading his eyes with his hand.

Meanwhile the pleasant urbanity of manner which distin- guished Reynolds throughout life had been winning for him friends. He had made the acquaintance of Lord Edgcumbe, and by him was introduced to Captain (afterwards Viscount) Keppel. Keppel was made aware of

Reynolds's ardent desire to visit Italy; and, as he had just been appointed to the com- mand of the Mediterranean squadron, he gracefully invited the artist to accompany him in his own ship, the " Centurion."

The offer was gladly accepted. While Keppel was conducting his tedious negotiations with the dey of Algiers, relative to the piracy with which that potentate was charged, Reynolds resided at Port Mahon, the guest of the governor of Minorca, painting portraits of the principal inhabitants; and in December 1749 he sailed for Leghorn, and thence, with all eagerness, made his way to Rome.

He has confessed that his first sight of the works of Raphael was a grievous disappointment, but he recognized afterwards, as he said, that the fault was in himself, and he brought his mind ultimately into the fitting posture of reverence. The fact is significant of Reynold's attitude towards the older masters. It has been often noticed that in his " Discourses " and else- where he praises just the very masters whose practice his own work implicitly condemns. The truth is that Reynolds war naturally a good critic, but was not strong enough to believe in his own opinions if they ran counter to the prevailing taste of his times. Of the early Italians he praises the " simplicity and truth " and observes that they " deserve the attention of a student much more than many later artists." In Venice he adopted a method of study that only a born painter could have thought of, making memoranda of the gradations of light and shade in the pictures, " and this without any attention to the subject, or to the drawing of the figures." On the other hand, we find him lavishing both attention and eulogy on the later Italian mannerists, such as Guido and the Carracci, and even Salviati and Vasari.

After a residence of more than two years in Rome, where he caught a severe cold which resulted in the deafness that clung to him for the rest of his life, Reynolds, in the spring of 1752, spent five months in visiting Parma, Florence, Venice and other important cities of Italy. Returning to England by way of Paris, Reynolds, after a brief stay in Devonshire, established himself as a portrait painter in St Martin's Lane, London, whence he afterwards removed to Great Newport Street, and finally, i» 1 760, to Leicester Square, where he continued to paint till his death.

In London, Reynolds stepped at once and without a struggle into a foremost position as the fashionable portrait painter of the day. In this

he was greatly helped by his success in society. Throughout his career his social occupations claimed the next place to his painting, and here it may be noticed that, though we read of some little ostentation in the form of a showy chariot and liveried lackeys, his good taste always kept him from any undue ” push,” or adulation of the great. At the outset Lord Edgcumbe played the part of the generous patron, and exerted himself to obtain commissions for his protege, of whose ability the portraits which he now produced— especially the famous full-length of his old friend Keppel — were sufficient guarantee. The artist’s painting room was thronged with the wealth and fashion of London. In 1755 his clients for the year numbered 120, and in 1757 the number of sittings recorded in his pocket- books reached a total of 677. He was not always so busy, but his popularity never really waned, though various other artists competed with him for popular applause. First the Swiss Liotard had his momemt of popularity; and at a later period there was Opie, and the more formidable, and sustained rivalry of Gainsborough and of Romney; but in the midst of all Reynolds maintained his position unimpaired. During the first year of his residence in London he had made the acquaintance of Dr Johnson, which, diverse as the two men were, became a friendship for life. To him Burke and Goldsmith, Garrick, Sterne and Bishop Percy were before long added. At the hospitable dinner-table of Reynolds such distinguished men enjoyed the freest and most unconstrained companionship, and most of them were members of the ” Literary Club,” established, at the painter’s suggestion, in 1764.

In 1760 the London world* of art was greatly interested by the novel proposal of the Society of Artists to exhibit their works to the public. The hall of the society was at their disposal for the purpose; and in the month of April an exceedingly successful exhibition was opened, the precursor of many that followed. To this display Reynolds contributed four portraits

In 1765 the association obtained a royal charter, and became known as ” The Incorporated Society of Artists “; but much rivalry and jealousy were occasioned by the management of the various exhibitions, and an influential body of painters withdrew from the society. They had access to the young king, George III., who promised his patronage and help. In December 1768 the Royal Academy was founded, and Reynolds, whose adhesion to the movement was for a time doubtful, was hailed by acclamation its first president, an honour

which more than compensated for his failure to obtain the appointment of king's painter, which, the previous year, had been bestowed on Allan Ramsay. In a few months the king signified his approval of the election by knighting the new president, and intimating that the queen and himself would honour him with sittings for portraits .to be presented to the Academy.

Reynolds was in every way fitted for his new position, and till the late Lord Leighton the Academy never had so good a figure-head. He did not take any part in the educational work of the new institution, but on the social side he set the Academy on the lines it has followed with the greatest worldly success ever since. It was at his suggestion that the annual banquet was instituted. To the specified duties of his post he added the delivery of a presidential address at the distribution of the prizes, and his speeches on these occasions form the well-known " Discourses " of Sir Joshua. These discourses alone would be sufficient to entitle their author to literary distinction; indeed, when they were first delivered, it was thought impossible that they could be the production of a painter, and Johnson and Burke have been credited with their composition, in spite of the specific denials of both, and of Dr Johnson's indignant exclamation — " Sir Joshua, sir, would as soon get me to paint for him as to write for him! "

Sir Joshua was too prosperous and successful an artist altogether to escape the jealousy of his less fortunate or less capable brethren, and it must on the other side be admitted that his attitude towards some of his contemporaries was wanting in generosity. His relations with Gainsborough, who on his part was in fault, would require more space for discussion than can here be afforded, but he was not just either to Hogarth or to Richard Wilson. It may be added that though Reynolds's friends were genuinely fond of him, his was not a nature that could inspire or feel any great warmth of personal feeling. Cosmo Monkhouse in the Dictionary of National Biography speaks of " the beauty of his disposition and the nobility of his character," but adds: "he was a born diplomatist." The latter phrase gives the real key to his character. Without going so far as fully to endorse the sentiment of Mrs Thrale's famous line about a " heart too frigid " and a " pencil too warm," we must agree with a recent writer that the attitude of Reynolds towards his fellow men and women was one of detachment. Hence we regard Reynolds as a man with tempered admiration, and reserve our enthusiasm for his art. In 1784, on the death of Ramsay, Reynolds was appointed painter to the king. Two years previously he had suffered from a paralytic attack; but, after a month of rest, he was able to resume his painting with unabated energy and power. In the summer of 1789 his sight began to fail; he was affected by the gutta

serena, but the progress of the malady was gradual, and he continued occasionally to practise his art till about the end of 1790, delivering his final discourse at the Academy on the 10th of December. He was still able to enjoy the companion- ship of his friends, and he exerted himself in an effort to raise funds for the erection of a monument in St Paul's to Dr Johnson, who had died in 1784. Towards the end of 1791 it was evident to the friends of Reynolds that he was gradually sinking. For a few months he suffered from extreme depres- sion of spirits, the result of a severe form of liver complaint, and on the 23rd of February 1792 this great artist and blameless gentleman passed peacefully away.

As a painter Reynolds stands, with Gainsborough, just behind the very first rank. There can be no question of placing him by

the side of the. greatest Venetians or of the triumvirate of the 17th century, Rubens, Rembrandt, Velasquez ; but, if he fail also to equal either Hals or Van Dyck, this is due, not to any defect in his natural capacity, but to deficiencies in his education combined with the absence in his case of that splendid artistic tradition on which the others leaned. He could not draw the figure properly; nor could he as a rule compose successfully on anything like a monumental scale. English painters in his early days possessed a sound technique, and most of Hogarth's best pictures are perfectly well preserved as well as beautifully painted but Reynolds was not content with the tried methods Hudson could have taught him. In the' desire to compass that creaminess, that juicy opulence in colour and texture, of which he conceived, the idea before the Italian journey, and which he found realized in the works of the Venetians and Correggio, he embarked on all sorts of fantastic experiments in pigments and media, so that Haydon exclaimed, " The wonder is that the picture did not crack beneath the brush! " The result was the speedy ruin of many of his own productions, and he inaugurated an era of uncertainty in method which seriously compromised the efforts of his successors in the English school.

The motive for this procedure may explain if it do not justify it. He was all his life intensely in earnest about his art, devoured by what he himself calls " a perpetual desire to advance " ; and he accounts for his own uncertainty partly from his want of training, and partly from his " inordinate desire to possess every kind of excellence " he saw in the works of others. Now if this mental energy led him into hazardous attempts to find a royal road to the painter's ideal, it acted well upon his design in lending to it a certain intellectual solidity, which gives it an advantage over the slighter, though at times more exquisite,

productions of the pencils of Gainsborough or Romney. The weight and power of the art of Reynolds are best seen in those noble male portraits, ” Lord Heath- field,” ” Johnson,” ” Sterne,” ” Goldsmith,” ” Gibbon,” ” Burke,” ” Fox,” ” Garrick,” that are historical monuments as well as sympathetic works of art. In this category must be included his immortal ” Mrs Siddons as the Tragic Muse.”

In portraits of this order Reynolds holds the field, but he is probably more generally admired for his studies of women and of children, of which the Althorp portraits of the Spencer family are classic examples. Nature had singled out Sir Joshua to endow him with certain gifts in which he has hardly an equal. No portrait painter has been more happy in his poses for single figures, or has known better how to control by good taste the piquant, the acci- dental, the daring, in mien and gesture. ” Viscountess Crosbie ” is a striking instance. When dealing with more than one figure he was not always so happy, but the ” Duchess of Devonshire and her Baby,” the ” Three Ladies decking a Figure of Hymen,” and the ” Three Ladies Waldegrave ” are brilliant successes. He was felicitous too in his arrangement of drapery, often following his own fashion of investing his graceful dames in robes of ideal cut and texture, quite apart from the actual clothes worn at the time. Few painters, again, have equalled the president in dainty and at the same time firm manipulation of the brush. The richness of his deeper colouring is at times quite Venetian. For pure delight in the quality of paint and colour we cannot do better than go to the ” Angels’ Heads ” of the National Gallery, or the ” Nelly O’Brien ” in the Wallace Collection.

It corresponds with what has been noted as Reynolds’s habit of mind in regard to older art to find him throughout his life hankering after success in what he was fond of calling the ” grand style ” in ” historical painting.” His failure here is as notorious as his brilliant success in the field of art for which nature had equipped him. His ” Ugolino,” his ” Macbeth,” his ” Cardinal Beaufort,” have no real impressiveness, while his greatest effort in the ” his- toric ” style, the ” Infant Hercules ” at St Petersburg, resulted in his most conspicuous disaster.

It is in the ” Discourses ” that Reynolds unfolds these artistic theories that contrast so markedly with his own practice. The first discourse deals with the establishment of an academy for the fine arts, and of its value as being a repository of the traditions of the best of bygone practice, of ” the principles which many artists have spent their lives in ascertaining.” In the second lecture the study of the painter is divided into three stages,— in the first of which he is busied with

processes and technicalities, with the grammar of art, while in the second he examines what has been done by other artists, and in the last compares these results with Nature herself. In the third discourse Reynolds treats of ” the great and leading principles of the grand style”; and succeeding addresses are devoted to such subjects as ” Moderation,” ” Taste,” ” Genius,” and ” Sculpture.” The fourteenth has an especial interest as containing a notice of Gainsborough, who had died shortly before its delivery ; while the concluding discourse is mainly occupied with a panegyric on Michelangelo.

The other literary works of the president comprise his three essays in The Idler for 1759-1760 (” On the Grand Style in Painting,” and ” On the True Idea of Beauty “), his notes to Du Fresnoyˆs Art of Painting, his Remarks on. the Art of the Low Countries, his brief notes in Johnson’s Shakespeare, and two singularly witty and brilliant fragments, imaginary conversations with Johnson, which

were never intended by their author for publication, but, found among his papers after his death, were given to the world by his niece, the marchioness of Thomond.

The president left to his niece, Mary Palmer, the bulk of his property, about £100,000, with works of art that sold for £30,000 more. There were, besides, legacies amounting to about £15,000. His body rests in St Paul’s.

See Northcote, Memoirs of Sir Joshua Reynolds, Knight, &c. (1813), and Supplement thereto (1815); Farrington, Memoirs of the Life of Sir Joshua Reynolds (1819); Cotton, Sir Joshua Reynolds and his Works (edited by Burnet, 1856); Leslie and Taylor, Life and Times of Sir Joshua Reynolds (2 vols., 1865); Redgrave, A Century of English Painters (1866), vol. i.; Graves and Cronin, A History of the Works of Sir Joshua Reynolds, P.R.A. (4 vols., 1899-1901) ; Sir Walter Armstrong, Sir Joshua Reynolds, First President of the Royal Academy (1900; also a shorter work, 1905); Lord Ronald Gower, Sir Joshua Reynolds (1902). For Reynolds’s literary works, see Malone, The Works of Sir Joshua Reynolds, Knight (3 vols., 1798); Beechy, Literary Works of Sir Joshua Reynolds (1835); Leisching, Sir J. Reynolds zur Aesthetik u. Technik der bildenden Kiinste (Leipzig, 1893) ; Discourses delivered to the Students of the Royal Academy by Sir Joshua Reynolds, Kt., with introductions and notes by Roger Fry (1905).

REYNOLDS, WALTER (d. 1327), archbishop of Canterbury, was the son of a Windsor baker, and became a clerk, or chaplain, in the service of Edward I. He held several livings and, owing perhaps to his histrionic skill, he became a prime favourite with the prince of Wales, afterwards Edward II. Just after the prince became king ‘in 1307 Reynolds was appointed treasurer of England; in 1308 he became bishop of Worcester and in 13 10 chancellor. When Robert Winchelsea, archbishop of Canterbury, died in May 1313 Edward II. prevailed upon Pope Clement V. to appoint his favourite to the vacant archbishop- ric, and Walter was enthroned at Canterbury in February 1314. Although the private life of the new archbishop appears to have been the reverse of exemplary he attempted to carry out some very necessary reforms in his new official capacity; he also continued the struggle for precedence, which had been carried on for many years between the archbishops of Canterbury arid of York. In this connexion in 13 17 he laid London under an interdict after William de Melton (d. 1340), archbishop of York, had passed through its streets with his cross borne erect before him. Reynolds remained in general loyal to Edward II. until 1324, when with all his suffragans he opposed the king in defence of the bishop of Hereford, Adam of Orlton. In the events which concluded Edward’s life and reign the archbishop played a contemptible part. Having fled for safety into Kent he returned to London and declared for Edward III., whom he crowned in February 1327. He died at Mortlake on the 16th of November following.

REZANOV, NICOLAI PETROVICH DE (1764-1807), Russian nobleman and administrator under Catherine II., Paul I. and Alexander I., was one of the ten barons of Russia, and, for his services to the empire, was rewarded with the court title of chamberlain. In 1803 he was made a privy councillor and invested with the order of St Ann. He was also the author of a lexicon of the Japanese language and of several other works, which are preserved in the library of the St Petersburg Academy of Sciences, of which he was a member. He was the first Russian ambassador to Japan (1804), and instigated the first attempt of Russia to circumnavigate the globe (1803), commanding the expedition himself as far as Kamchatka. But Rezanov’s monument for many years after his death was the great Russian American Fur Company; and his interest to students of history centres round the policy involved in that enterprise, which, thwarted by his untimely death, would have changed the destinies of Russia and the United States.

Meeting (in 1788) Shelikov, chief of the Shelikov-Golikov Fur Company, Rezanov became interested in the merchant’s project to obtain a monopoly of the fur trade in those distant dependencies.

Conscious of latent energies, and already tired of the pleasures of a dissolute court, he became a partner in the company, and rapidly developed into a keen and tireless man of business. At the death of Shelikov in 1795 he became the leading spirit of the wealthy and amalgamated but harassed companies, and resolved to obtain for himself and his partners

privileges analogous to those granted by Great Britain to the East India Company. He had just succeeded in persuading Catherine to sign his charter when she died, arid he was obliged to begin again with the ill-balanced and intractable Paul. For a time the outlook was hopeless; but Rezanov's skill, subtlety and address prevailed, and shortly before the assassination of the emperor Paul he obtained his signature to the momentous instrument which granted to the Russian-American Company, for a term of twenty years, dominion over the coast of N.W. America, from latitude 55 degrees northward; and over the chain of islands extending from Kamchatka northward and southward to Japan. This famous " Trust," which crowded out all the small companies and independent traders, was a source of large revenue to Rezanov and the other shareholders, includ- ing members of the Imperial family, until the first years of the 19th century, when mismanagement and scarcity of nourishing food threatened it with serious losses if not ultimate ruiri. Rezanov, his humiliating embassy to Japan concluded, reached Kamchatka in 1805, and found commands awaiting him to remain in the Russian colonies as Imperial inspector and plenipotentiary of the company, and to correct the abuses that were ruining the great enterprise. He travelled slowly to Sitka by way of the Islands, establishing measures to protect the fur-bearing animals from reckless slaughter, punishing or banishing the worst offenders against the company's laws, and introducing the civilizing influence of schools and libraries, most of the books being his personal gifts. He even established cooking schools, which flourished briefly.

At the end of a winter in Sitka, the headquarters of the company, during which he half-starved with the others, he bought a ship from a Yankee skipper and sailed for the Spanish settlements in California, purposing to trade his tempting cargo of American and Russian wares for food-stuffs, and to arrange a treaty by whose terms his colonies should be provisioned twice a year with the bountiful products of New Spain. He cast anchor in the harbour of San Francisco early in April 1806, after a stormy voyage which had defeated his intention to take possession of the Columbia river in the name of Russia. Although he was received with great courtesy and entertained night and day by the gay Californians, no time was lost in informing him that the laws of

Spain forbade her colonies to trade with foreign powers, and that the governor of all the Californias was in- corruptible. Rezanov, had it not been for a love affair with the daughter of the comandante of San Francisco, Don Jose Arguello, and for his personal address and diplomatic skill, with which he won over the clergy to his cause, would have failed again. As it was, when he sailed for Sitka, six weeks after his arrival, the ” Juno’s ” hold was. full of bread-stuffs and dried meats, he had the promise of the perplexed governor to forward a copy of the treaty to Spain at once, and he was affianced to the most beautiful girl in California. Shortly after his arrival in Sitka he proceeded by water to Kamchatka, where he despatched his ships to wrest the island Sakhalen of the lower Kurile group from Japan, then started overland for St Petersburg to obtain the signature of the tsar to the treaty, and also personal letters to the pope and king of Spain that he might ask for the dispensation and the royal consent necessary to his marriage. He died of fever and exhaustion in Krasnoiarsk, Siberia, on the 8th of March 1807.

The treaty with California, the bare suggestion of which made such a commotion in New Spain, was the least of Rezanov’s projects. It was sincerely conceived, for he was deeply and humanely Concerned for his employees and the wretched natives who were little more than the slaves of the company; but its very obviousness raised the necessary amount of dust. His correspondence with the company, and with Zapinsky, betrays a clearly defined purpose to annex to Russia the entire western coast of North America, and to encourage immediate emigra- tion from the parent country on a large scale. Had he lived, there is, all things considered, hardly a doubt that he would have accomplished his object. The treaty was never signed, the reforms of Rezanov died of discouragement, the fortunes of

the colonies gradually collapsed, the Spanish girl who had loved Rezanov became a nun; and one of the ablest and most ambitious men of his time lies forgotten in the cemetery of a poor Siberian town.

See Bancroft’s History of California, and Alaska; Tikmenev’s Historical Review of the Origin of the Russian American Company; Rezdnov-Zapisky Correspondence ; Travels of Krusenstern and Langs- ford, &c. (G. A.*)

RHACIS, or Rachis (Gr. p&xts, a backbone), in botany the axis of an

inflorescence or of a branched leaf; in zoology, the stem of a feather, as opposed to the vesillum, or web.

RHADAMANTHUS (Gr. Rhadamanthys), in Greek mytho- logy, son of Zeus and Europa and brother of Minos, king of Crete. Driven out of Crete by his brother, who was jealous of his popularity, he fled to Boeotia, where he wedded Alcmene. Homer represents him as dwelling in the Elysian fields (Odyssey, iv. 564). According to later legends, on account of his in- flexible integrity he was made one of the judges of the dead in the lower world, together with Aeacus and Minos. He was supposed to judge the souls of Asiatics, Aeacus those of Euro- peans, while Minos had the casting vote (Plato, Gorgias, 424A).

RHAETIC (Fr. RhUien or Rhcetien; Ger. Rhat or Rhatisch; It. Retico), in geology, the assemblage of rocks classed by most English and German authorities in the Triassic system, and by most French geologists placed at the base of the Lias, in the Jurassic system. It has been called the Infra-Lias. This diversity of opinion is due to the fact that the Rhaetic formation presents the characters of a group of passage-beds, uniting certain features of the Trias with others of the Jurassic system; none the less, it has sufficient individuality to be recognized with tolerable certainty over a wide area*in Europe and beyond. The name Rhaetic was first applied by C. W. Giimbel to the strata of this horizon in the Rhaetic Alps, where they are thickly developed and in parts fossiliferous. The labours of E. V. Mojsisovic and E. Suess have demonstrated that in the Alpine Rhaetic several distinct facies may be recognized, viz. a Swabian facies: shore and lagoon deposits with a pelecypod fauna, poor in species but rich in individuals; a Carpathian facies with corals, algae, Terebratula gregaria and Plicatula intusstriata, exemplified in the upper part of the Dachstein limestone; a Kossener facies: black limestones and marls, with a brachiopod fauna in which Spirigera oxycolpos is very noticeable; and a Salzburg facies, characterized by pelagic pelecypods and some ammonites (see table in Triassic System). The whole of the Rhaetic falls within Mojsisovic's zone of Avicula contorta. This epoch is marked off from the earlier Triassic period by a very general marine transgression which proceeded with minor irregularities and retrogressions over the whole area, until at its close it was followed by the more decided trans- gression which indicates the commencement of the Lias.

Among the marine fossils of the Rhaetic, Avicula contorta, the principal zone form, is very characteristic and has a wide range; Myophoria inflata, Modiola minuta, Protocardium rhaeticum and Terebratula gregaria are common species. True belemonites make

their first appearance. Corals, Thecosmilia, &c, are common in some districts. Plant remains are abundant in certain areas, and in places give rise to beds of lignite and coal. The flora is more nearly akin to that of the Trias than to that of the Jurassic rocks. Vertebrate remains are fairly abundant in the form of teeth, isolated bones, scales and coprolites in what are known as “Bone Beds” (q.v.). These beds are a very characteristic feature; they occur on several horizons in many tracts of the European Rhaetic, and recur in beds of this age in America. In England there is usually a bone bed about the base of the formation; in Germany one occupies a similar position; a second occurs less constantly about the middle, and in the Wurttemberg district a third bed separates the Rhaetic and Lias, and constitutes the well-known manure bed of Bebenhausen. In these beds are found the bones of Ichthyosaurus and Pliosaurus, anticipating their great development in the Lias, while the remains of Belodon and Mystriosuchus serve to link this epoch with Triassic stego-

cephalian reptiles. Several coleopterous insects have been found in the same beds, but the most interesting feature of the bone-bed fauna is the first appearance in the northern hemisphere of true mammals: Microlestes in England and Wurttemberg, Triglyphus in Wurttemberg, Dromatherium and Microconodon in America.

In England the Rhaetic formation occurs as a thin but constant series of beds at the base of the Lias and above the Keuper marls. The upper part, often called the ” White Lias,” is a series of thin- bedded shales, limestone and marls, t to 2$ ft. thick; the lower portion consists mainly of dark shales, sometimes with very perfect lamination—‘paper shales.” Below there are beds of grey and ” tea-green ” marls which are now usually regarded as the topmost Keuper beds, but they have often been included in the Rhaetic formation (see Keuper) . The best exposures in Britain are those between Penarth Head and Cavernock Point, Aust Cliff and Garden Cliff near Westbury-on-Severn, and Wainlode Cliff between Tewkes- bury and Gloucester. From their excellent development near Penarth the Rhaetic beds have long been known in England as the Penarth Beds (H. W. Bristow, 1864). The more prominent beds in the White Lias of the west of England and Glamorganshire are the Eslheria beds and the insect limestone or Pseudomonotis-bed, and on both of these horizons the limestone may assume the peculiar characters of landscape marble, sometimes called Cotham marble, from Cotham House near Bristol. A hard fine-grained limestone, known locally as the Sun-bed, occurs at the top of the series near Bath and Radstock; at Street, Wedmore and south of the Mendips generally it is called Jew stone. Wedmore stone is a tough, shelly and sandy limestone in the black shales at Wedmore, near Wells

; it is employed in the neighbourhood as a building stone. North of Somersetshire the White Lias is poorly represented ; in Glamorganshire it appears between Cardiff and Pyle, west of Bridgend and at Sutton and Southerndown. Rhaetic beds have been traced at Market Drayton, Salop; near Audlem, Cheshire; Rugby and Stratford-on-Avon in Warwickshire; Wigston in Leicestershire; Needham Forest in Staffordshire, and in Nottinghamshire and Yorkshire as far as the coast. They have not yet been proved beneath the Lias of Cumberland. Rhaetic fossils have been found in great numbers in fissures in the Carboniferous limestone of the Mendips. On the western side of Scotland Rhaetic rocks occur at Applecross, Ardnamurchan, Morven, Mull, Raasay and Skye. In Sutherlandshire sandstone and conglomerate and large transported masses occur; one of them, at Linksfield, carries a bone bed. Here the black shales of the English type fail; sandstones with coaly layers and yellowish-grey crystalline and oolitic limestones take their place. In Antrim a small outcrop of black shales with Avicula contorta occurs near Port Rush.

On the European continent the Rhaetic rocks are most thickly developed in the Alpine regions; and, as in the case of the older Triassic formations, calcareous and dolomitic strata predominate here and in the Mediterranean province. In the Alpine district the main divisions are the Rhaetic Dachstein limestone and the Kossener beds; shales, marls and limestones. In the northern tract the following subdivisions have been recognized in descending order: beds with Choristeceros Marschi; Starhem passage beds; Rhynchonella fissicostata beds; Lithodendron limestone; beds with Terebratula gregaria; beds with Avicula contorta; ” Platten Kalk ” with Rhynchonella alpina. In the southern tract the subdivisions are: Conchodus dolomite (Conchodus infraliassicus = Lycodius cor.); Lithodendron limestone, Azzarola beds, Contorta marls, ” Plattenkalk.” Much limestone is of the ” reef ” type. In Germany the rocks are mainly fine, clean yellow sands, suggesting littoral or dune conditions, with bituminous clays and marls. The formation is often missing in south-west Germany. Similar beds occur in Lorraine and Luxembourg (gres de Vic, gres de Kedange, gres de Mortinsart). In Cotentin are dolomitic sandstones and marl; round the central plateau of France the rocks are coarse sands, arkoses, and conglomerates; while in the south of France the sandy and calcareous facies occur intermixed. In Spain limestones and dolomites occur up to 100 metres in thickness; in Portugal sandy beds recur. The Rhaetic of Scania, south Sweden, consists mainly of sandstone and shales with beds of coal up to one metre thick. Only the upper beds contain marine fossils; the bulk of the formation is of lacustrine or estuarine origin,

with plant remains and insects. In Italy the formation is well developed in the north and at Rotzo, Spezzia and Carrara; and yields the famous statuary marble and the black variety known as portor. Rhaetic beds have been re- cognized in Sardinia, Corsica, Sicily, in the Balkan Peninsula and Greece; in Asia Minor, Afghanistan, Turkistan, Persia, Siberia and India (limestones and dolomites of Niti and the Mahaveda beds, sandstones and conglomerates, nearly 10,000 feet thick in Satpura); in China, Japan and Tongking (with coal beds). In Australasia the Wianamatta beds of New South Wales, the Bellarine beds of Victoria, the Ipswich and Tivoli beds of Queensland, and the Jerusalem beds of Tasmania, and beds on a similar horizon in New Zealand, have been regarded as equivalents of the Rhaetic. In Africa the Stormberg beds of the Karpo series and the JVIolteno beds

of the Cape have been assigned to this epoch. In America Rhaetic rocks are recognized in N. Carolina, Connecticut, California, Mexico, Bolivia and Chile ; the formation is also recorded from Spitzbergen, Franz Joseph Land and elsewhere in the Arctic regions.

For the English Rhaetic see L. Richardson, ” The Rhaetic Rocks of North-west Gloucestershire,” Proc. Cotteswold Club, xiv. p. 127 (Glos. 1901-1903). (J. A. H.)

RHAMNUS PURSHIANA, or Californian buckthorn, a plant the bark of which is used in medicine under the name of cascara sagrada. An active principle anthra-gluco-sagradin has been isolated by Tschirch. The preparations of it contained in the British pharmacopoeia are: (1) Extractum cascarae sagradae (extractum rhamni purshianae, United States pharmacopoeia), dose 2 to 8 grs.; (2) Extractum cascarae sagradae Uquidum, dose i to 1 fl. dr. From the latter is prepared syrupus cascarae aromalicus, dose 5 to 2 fl. dr. In this preparation the bitter taste of the cascara sagrada is disguised by the addition of tincture of orange, cinnamon water and syrup. In the United States pharmacopoeial preparation Fluid extractum rhamni purshianae aromaticum, does 10 to 30 minims, the taste is similarly obscured. Cascara sagrada. is one of the most useful of all laxatives, since not only does it empty the bowel of faecal matter, but it acts as a tonic to the intestine and tends to pre vent future constipation. It is largely used in the treatment of chronic constipation. A single full dose of the liquid extract may be taken at bedtime, or divided doses, 10 to 15 minims, three times a day before meals. When a strong purgative is

required some drug other than cascara sagrada should be employed, but its use in gradually decreasing doses is indicated after evacuation has been effected by podophyllin or rhubarb. Cascara sagrada is the principal constituent of most of the proprietary laxatives on the market.

RHAMPSINlTUS, a Greek corruption of Ra-messu-pa-neter, the popular name of Rameses III., king of Egypt of the XXth Dynasty. He is well known in connexion with the story of his treasure house told by Herodotus (ii. 121), which greatly resembles that of Agamedes and Trophonius. (See Egypt, History.)

RHANKAVES (commonly also Rhangabe), ALEXANDROS RHIZOS, Greek savant, poet and statesman, was born at Constantinople of a Phanariot family on the 25th of December 1810. He was educated at Odessa and the military school at Munich. Having served as an officer of artillery in the Bavarian army, he returned to Greece, where he held several high educa- tional and administrative appointments. He subsequently became ambassador at Washington (1867), Paris (1868), and Berlin (1874-1886), and was one of the Greek plenipotentiaries at the congress of 1878. After his recall he lived at Athens, where he died on the 29th of June 1892. He was the chief representative of a school of literary men whose object was to restore as far as possible the ancient classical language. Of his various works, Hellenic Antiquities (1842-1855, of great value for epigraphical purposes), Archaeologia (1865-1866), an illustrated Archaeological Lexicon (1 888-1 891), and a History of Modern Greek Literature (1877) are of the most interest to scholars. He wrote also the following dramatic pieces: The Marriage of Kutrules (comedy), Dukas (tragedy), the Thirty Tyrants, The Eve (of the Greek revolution); the romances, The Prince of Morea, Leila, and The Notary of Argostoli; and translated portions of Dante, Schiller, Lessing, Goethe and Shakespeare.

A complete edition of his philological works in nineteen volumes was published at Athens (i874-l89o),and his ‘A7rojiu”)M°»‘si | naTa(Memoirs) appeared posthumously in 1894-1895.

RHAPSODIST (Gk. Rhapsodos), originally an epic poet who recited his own poetry; then, one who recited the poems of others (see Homer).

RHATANY or KRAMERIA ROOT, in medicine, the dried root either of Para rhatany or of Peruvian rhatany. The action of rhatany is due to the rhatania-tannic acid, and re- sembles that of tannic acid, being a powerful astringent. An infusion is used as a gargle for. relaxed throats; and lozenges, particularly those containing rhatany and

cocaine, are useful

in similar cases. Like tannic acid, the powdered extract may be applied as a local haemostatic. All preparations of rhatany taken internally are powerful astringents in diarrhoea and intestinal haemorrhage.

RHAYADER (Rhaiadr-Gwy) , a market town of Radnorshire, Wales, situated amid wild and beautiful scenery on the left bank of the Wye, about i£ m. above its confluence with the Elan. Pop. (1901) 1 215. Rhayader is a station on the Cambrian railway. A stone bridge over the Wye connects the town with the village and parish church of Cwmdauddwr. Rhayader has for some centuries been an important centre for Welsh mutton and wool, and its sheep fairs are largely attended by drovers and buyers from all parts. Near Rhayader are the large reservoirs constructed (1895) by the corporation of Birmingham in the Elan and Claerwen valleys.

Rhayader, built close to the Falls of the Wye (whence its name), owes its early importance to the castle erected here by Prince Rhys ap Griffith of South Wales, c. 1 178, in order to check the English advance up the Wye Valley. Seized by the invaders, castle and town were later retaken in 1231 by Prince Llewelyn ap Iorwerth, who burned the fortress and slew its garrison. Scarcely a trace of the castle exists, although its site near St Clement's church is locally known as Tower Hill. With the erection of Maesyfed into the shire of Radnor in 1536 Rhayader was named as assize-town for the newly formed county in conjunction with New Radnor; but in 1542, on account of a local riot, the town was deprived of this privilege in favour of Presteign. Rhayader constituted one ol the group of boroughs comprising the Radnor parliamentary district until the Redistribution Act of 1885.

RHEA, a goddess of the Greeks known in mythology as the daughter of Uranus and Gaia, the sister and consort of Kronos, and the mother of Zeus. In Homer she is the mother of the gods, though not a universal mother like Cybele, the Phrygian Great Mother, with whom she was later identified. The original seat of her worship was in Crete. There, according to legend, she saved the new-born Zeus, her sixth child, from being devoured by Kronos by substituting a stone for him and entrusting the infant god to the care of her attendants the Curetes (q.v.). These attendants afterwards became the bodyguard of Zeus and the priests of Rhea, and performed ceremonies in her honour. In historic times the resemblances between Rhea and the Asiatic Great Mother, Phrygian Cybele, were so notice- able that the Greeks

accounted for them by regarding the latter as only their own Rhea, who had deserted her original home in Crete and fled to the mountain wilds of Asia Minor to escape the persecution of Kronos (Strabo 469, 12). The reverse view was also held (Virgil, Aen. iii. in), and it is probably true that a stock of Asiatic origin formed part of the primitive population of Crete and brought with them the worship of the Asiatic Great Mother, who became the Cretan Rhea. (See Great Mother of the Gods.) (G. Sn.)

RHEA, the name given in 1752 by P. H. G. Mohring 1 to a South American bird which, though long before known and described by the earlier writers — Nieremberg, Marcgrav and Piso (the last of whom has a recognizable but rude figure of it) — had been without any distinctive scientific appellation. Adopted a few years later by M. J. Brisson, the name has since passed into general use, especially among English authors, for what their predecessors had called the American ostrich; but on the European continent the bird is commonly called Nandu? a word corrupted from a name it is said to have borne among the aboriginal inhabitants of Brazil, where the Portuguese settlers called it ema (see Emeu). The resemblance of the rhea to the ostrich (q.v.) was at once perceived, but the differences between them are also very evident. The former, for instance, has three instead of two toes on each foot, it has no apparent tail, its wings are far better developed, and when folded cover the body, and its head and neck are clothed with feathers, while internal distinctions of still deeper significance have since been

1 What prompted his bestowal of this name, so well known in classical mythology, is not apparent.

2 The name Touyou, also of South American origin, was applied to it by Brisson and others, but erroneously, as Cuvier shows, since by that name, or something like it, the jabiru (g.v.) is properly meant.

dwelt upon by T. H, Huxley (Proc. Zool. Society, 1867, pp. 420- 422) and W. A. Forbes (op. cit., 1881, pp. 784-87). There can be little doubt that they should be regarded as types of as many orders — Struthiones and Rheae — of the subclass Ratitae. Struc- tural characters no less important separate the rheas from the emeus; the former can be readily recognized by the rounded form of their contour-feathers, which want the hyporrhachis or -after-shaft that in the emeus and

cassowaries is so long as to equal the main shaft, and contributes to give these latter groups the appearance of being covered with shaggy hair. The feathers of the rhea have a considerable market value, and for the purpose of trade in them it is annually killed by thousands, so that 1 its total extinction as a wild animal is probably only a question of time. It is polygamous, and the male performs the duty of incubation, brooding more than a score of eggs, the produce of several females — facts known to Nieremberg

Rhea.

more than two hundred and fifty years since, but hardly accepted by naturalists until recently. No examples of this bird seem to have been brought to Europe before the beginning of the present century, and accordingly the descriptions previously given of it by systematic writers were taken at second hand and were mostly defective if not misleading. In 1803 J. Latham issued a wretched figure of the species from a half-grown speci- men in the Leverian Museum, and twenty years later said he had seen only one other, and that still younger, in Bullock's collection (Gen. Hist. Birds, viii. p. 37a). 2 A bird living in con- finement at Strassburg in 1806 was, however, described and figured by Hammer in 1808 (Ann. du Museum, xii. pp. 427-

1 J. E. Harting, in "his and De Mosenthal's Ostriches and Ostrich Farming, from which the woodcut here introduced is by permission copied, gives (pp. 67-72) some portentous statistics of the destruc- tion of rheas for the sake of their feathers, which, he says, are known in the trade as " Vautour " to distinguish them from those of the African bird.

2 The ninth edition of the Companion to this collection (18 10, p. 121) states that the specimen " was brought alive " [?to England].

433) pl- 39)- In England the Report of the Zoological Society for 1833 announced the rhea as having been exhibited for the first time in its gardens during the preceding twelvemonth. Since then many other living examples have been introduced, and it has bred both there and in many private parks in Britain.

Though considerably smaller than the ostrich, and wanting its fine plumes, the rhea in general aspect far more resembles that bird than the other Ratitae. The feathers of the head and neck, except on the crown and nape, where they are dark brown, are dingy white, and those of the body ash-coloured tinged with brown, while on the breast they are brownish-black, and on the belly and thighs white. In the

course of the memorable voyage of the ” Beagle,” C. Darwin came to hear of another kind of rhea, called by his informants Avestruz petise, and at Port Desire on the east coast of Patagonia he obtained an example of it, the imperfect skin of which enabled J. Gould to describe it (Proc. Zool. Society, 1837, p. 35) as a second species of the genus, naming it after its , discoverer. Rhea darwini differs in several well-marked characters from the earlier known R. americana. Its bill is shorter than its head; its tarsi are reticulated instead of scutellated in front, with the upper part feathered instead of being bare; and the plumage of its body and wings is very different, each feather being tipped with a distinct whitish band, while that of the head and neck is greyish- brown. A further distinction is also asserted to be shown by the eggs — those of R. americana being of a yellowish-white, while those of R. darwini have a bluish tinge. Some years afterwards P. L. Sclater described (op. cit., i860, p. 207) a third and smaller species, closely resembling the R. americana, but having apparently a longer bill, whence he named it R. macro- rhyncha, more slender tarsi, and shorter toes, while its general colour is very much darker, the body and wings being of a brownish-grey mixed with black. The precise geographical range of these three species is still undetermined. While R. americana is known to extend from Paraguay and southern Brazil through the La Plata region to an uncertain distance in Patagonia, R. darwini seems to be the proper inhabitant of the country last named, though M. Claraz asserts (op. cit., 1885, p. 324) that it is occasionally found to the northward of the Rio Negro, which had formerly been regarded as its limit, and, moreover, that flocks of the two species commingled may be very frequently seen in the district between that river and the Rio Colorado. On the ” pampas ” R. americana is said to associate with herds of deer (Cariacus campestris), and R. darwini to be the constant companion of guanacos (Lama huanaco) — just as in Africa the ostrich seeks the society of zebras and antelopes. As for R. macrorhyncha, it was found by W. A. Forbes (Ibis, 1881, pp. 360, 361) to inhabit the dry and open ” sertoes ” of north-eastern Brazil, a discovery the more interesting since it was in that part of the country that Marcgrav and Piso became acquainted with a bird of this kind, though the existence of any species of rhea in the district had been long overlooked by or unknown to succeeding travellers.

Besides the works above named and those of other recognized authorities on the ornithology of South America such as Azara, Prince Max of Wied, Professor Burmeister and others, more cr less valuable information on the subject is to be found in Darwin’s Voyage, Dr Bocking’s ” Monographie des Nandu ” in (Wieg- mann’s) Archiv fur Naturgeschichte (1863, i. pp. 213-41); R. O. Cunningham’s Natural

History of the Strait of Magellan and paper in the Zoological Society's Proceedings for 1871 (pp. 105-110), as well as H. F. Gadow's still more important anatomical contributions in the same journal for 1885 (pp. 308 seq.).

(A. N.)

RHEINBERGER, JOSEPH GABRIEL (1830-1001), German composer, was born at Vaduz, Liechtenstein, on the 17th of March 1839. His musical abilities were manifested so early that he was appointed organist of the parish church when he was but seven years old. A three-part Mass composed by him was. performed in the following year. He was taught at first by Philipp Schmutzer, choir director at Feldkirch; he entered the Munich Conservatorium in 1851, and remained there till 1854

as a pupil of Professor E. Leonhard for piano, Professor Herzog for organ and J. J. Maier for counterpoint. After leaving the school he had private lessons from Franz Lachner, and was appointed a professor in the conservatorium in succession to Leonhard in 1859. In i860 he became professor of composition, and was appointed organist of the Michelskirche, a post he held till 1866. In 1877 he succeeded Wiillner as Hof kapellmeister, and from that time his attention was largely devoted to sacred music. His compositions include works of importance in every form, from the operas Die sieben Raben (Munich, 1869) and Turmers Tochterlein (Munich, 1873) and the oratorio Christo- forus, op. 120, to the well-known quartet for piano and strings in E flat, op. 38, the nonet for wind and strings, op. 139, and the seventeen organ sonatas, which form notable additions to the literature of the instrument. He died in November

1901.

RHEINE, a town of Germany, in the Prussian province of Westphalia, situated on the Ems, at the point where it becomes navigable, 29 m. W. by rail of Osnabriick, and at the junction of main lines to Miinster, Rotterdam and Emden. Pop. (1905) 12,801. It is an old-fashioned town with a pronounced Dutch aspect, and has pretty gardens and promenades. Rheine is the seat of cotton industries, has manufactures of jute, machinery, tobacco and flour, and a considerable river trade in agricultural produce. It received municipal rights in 1327. About a

mile north of Rheine is the castle of Bentlage, the family seat of the princes of Rheina-Wolbeck.

RHENANUS, BEATUS (1485-1547), German humanist, was born in 1485 at Schlettstadt in Alsace, where his father, named Bild, a native of Rheinau (hence the surname Rhenanus), was a prosperous butcher. He received his early education at the famous Latin school of Schlettstadt, and afterwards (1503) went to Paris, where he came under the influence of Jacobus Faber Stapulensis, an eminent Aristotelian. In 1511 he removed to Basel, where he became intimate with Desiderius Erasmus, and took an active share in the publishing enterprises of Joannes Froben (q.v.). In 1526 he returned to Schlettstadt, and devoted himself to a life of learned leisure, enlivened with epistolary and personal intercourse with Erasmus (the printing of whose more important works he personally superintended) and many other scholars of his time. He died at Strassburg on the 20th of July 1547.

His earliest publication was a biography of Geiler of Kaisers- berg (1510). Of his subsequent works the principal are Rerum Germanicarum Libri III. (1531), and editions of Velleius Paler- culus (ed. princeps, from a MS. discovered by himself, 1522); Tacitus (1519, exclusive of the Histories); Livius (1535); and Erasmus (with a life, 9 vols, fol., 1540-41).

See A. Horawitz, Beatus Rhenanus (1872), and by the same, Des Beatus Rhenanus literarische Tatigkeit (2 vols., 1872); also the notice by R. Hartfelder in Allgemeine Deutsche Biographic.

RHETICUS, or Rhaetictjs (1514-1576), a surname given to George Joachim, German astronomer and mathematician, from his birth at Feldkirch in that part of Tirol which was anciently the territory of the Rhaeti. Born on the 15th of February 1514, he studied at Tiguri with Oswald Mycone, and afterwards went tu Wittenberg where he was appointed pro- fessor of mathematics in 1537. Being greatly attracted by the new Copernican theory, he resigned the professorship in 1539, and went to Frauenberg to associate himself with Copernicus {q.v.), and superintended the printing of the De Orbium Revolu- tione which he had persuaded Copernicus to complete. Rheticus now began his great treatise, Opus Paiatinum de Triangulis, and continued to work at it while he occupied his old chair at Wittenberg, and indeed up to his death at Cassovia in Hungary, on the 4th of December 1576. The Opus Paiatinum of Rheticus was published by Valentine Otho, mathematician to the electoral prince palatine, in 1596. It gives tables of sines and cosines, tangents, &c, for every 10 seconds, calculated to

ten places. He had projected a table of the same kind to fifteen places, but did not live to complete it. The sine table, however, was afterwards published on this scale under the name of Thesaurus

Mathematicus (Frankfort, 1613) by B. Pitiscus (1561-1613), who himself carried the calculation of a few of the earlier sines to twenty-two places. He also published Narratio de Libris Revolutionum Copernici (Gedenum, 1540), which was subse- quently added to editions of Copernicus's works; and Ephemer- ides until 1551, which were founded on the Copernican doctrines. He projected numerous other works, as is shown by a letter to Peter Ramus in 1568, which Adrian Romanus inserted in the preface to his Idea of Mathematics.

RHETORIC (Gr. prrropiicii rexvv, the art of the orator), the art of using language in such a way as to produce a desired impression upon the hearer or reader. The object is strictly persuasion rather than intellectual approval or conviction; hence the term, with its adjective " rhetorical," is commonly used for a speech or writing in which matter is subservient to form or display. So in grammar, a " rhetorical question " is one which is asked not for the purpose of obtaining an answer, but simply for dramatic effect. The power of eloquent speech is recognized in the earliest extant writings. Homer describes Achilles as a " speaker of words, as well as a doer of deeds ": Nestor, Menelaus arid Odysseus are all orators as well as states- men and soldiers. Again the brilliant eloquence of Pericles is the theme of Aristophanes and Eupolis. Naturally the influ- ence wielded by the great orators led to an investigation of the characteristics of successful rhetoric, and especially from the time of Aristotle the technique of the art ranked among the recognized branches of learning.

A lost work of Aristotle is quoted by Diogenes Laertius (viii. 57) as saying that Empedocles "invented" (evpeiv) rhetoric; Zeno, dialectic (i.e. logic, the art of making a logical argument, apart from the style). This is certainly not to be understood as meaning that Empedocles composed the first "art " of rhetoric. It is rather to be explained by Aristotle's own remark, cited by Laertius from another lost treatise, that Empedocles was " a master of expression and skilled in the use of metaphor " — qualities which may have found scope in his political oratory, when, after the fall of Thrasydaeus in 472 B.C.; he opposed the restoration of a tyranny at Agrigentum. The founder of rhetoric as an art was Corax of Syracuse Barly (c. 466 B.C.). In 466 a democracy was established Greek in Syracuse. One of the immediate consequences rhetoric was a mass of litigation on claims to property, urged ~~ Corax. by democratic exiles who had been dispossessed by Thrasybulus, Hiero or Gelo. Such claims, going many years back,

would often require that a complicated series of details should be stated and arranged. It would also, in many instances/ lack documentary support, and rely chiefly on inferential reasoning. Hence the need of professional advice. The facts known as to the ” art ” of Corax perfectly agree with these conditions. He gave rules for arrangement, dividing the speech into five parts, — proem, narrative, arguments (ayoives), subsidiary remarks (irapk(3ao-ts) and peroration. Next he illustrated the topic of general probability (eiKos), The showing its two-edged use: e.g., if a puny man is topic accused of assaulting a stronger, he can say, ” Is it o/««s«. likely that I should have attacked him?” If vice versa, the strong man can argue, ” Is it likely that I should have committed an assault where the presumption was sure to be against me ? ” This topic of duos, in its manifold forms, was in fact the great weapon of the earliest Greek rhetoric. It was further developed by Tisias, the pupil of Corax, as we see from Plato’s Phaedrus, in an ” art ” of rhetoric which antiquity possessed, but of which we know little else. Aristotle gives the ekos a place among the topics of the fallacious enthymeme which he enumerates in Rhet. ii. 24, remarking that it was the very essence of the treatise of Corax; he points out the fallacy of omitting to distinguish between abstract and particular probability, quoting the verses of Agatho, — ” Perhaps one might call this very thing a probability, that many im- probable things will happen to men.” Gorgias (q.v.) of Leontini captivated the Athenians in 427 B.C. by ‘

his oratory (Diod. xii. 53), which, so far as we can judge, was

characterized by florid antithesis, expressed in short jerky sentences. But he has no definite place in the development of rhetoric as a system. It is doubtful whether he left a written “art”; and his mode of teaching was based on learning prepared passages by heart, — diction (Xe£«), not invention or arrangement, being his great object.

The first extant Greek author who combined the theory with the practice of rhetoric is the Athenian Ailtiphon (q.v.), the first of the Attic orators, and the earliest representative ‘*”””” at Athens of a new profession created by the new

p “”” art of rhetoric — that of the X07 oypaos, the writer of

forensic speeches for other men to speak in court. His speeches show

the art of rhetoric in its transition from the technical to the practical stage, from the school to the law court and the assembly. The organic lines of the rhetorical pleader's thought stand out in bold relief, and we are enabled to form a clear notion of the logographer's method. We find a striking illustra- tion of the fact that the topic of " probability " is the staple of this early forensic rhetoric. Viewed generally, the works of Antiphon are of great interest for the history of Attic prose, as marking how far it had then been influenced by a theory of style. The movement of Antiphon's prose has a certain grave dignity, " impressing by its weight and grandeur," as a Greek critic in the Augustan age says, " not charming by its life and flow." Verbal antithesis is used, not in a diffuse or florid way, but with a certain sledge-hammer force, as sometimes in the speeches of Thucydides. The imagery, too, though bold, is not florid. The structure of the periods is still crude; and the general effect of the whole, though often powerful and impressive, is somewhat rigid.

Antiphon represents what was afterwards named the " austere " or " rugged " style (avarripa apfiovla), Lysias was the model of an artistic and versatile simplicity. But while Antiphon has a place in the history of rhetoric as an art, Lysias, with his more attractive gifts, belongs only to the history of oratory. Ancient writers quote an " art " of rhetoric by Isocrates, but its authenticity was questioned. It is certain, however, that Isocrates taught the art as such. He is said to have / soerates. de g ned ketone " as the science of persuasion " (Sext. Empir. Adv. Mathem.ii. § 62, p. 301 seq.). Many of his particular precepts, both on arrangement and on diction, are cjted, but they do not give a complete view of his method. The <£iXo

In the person of Isocrates the art of rhetoric is thus thoroughly established, not merely as a technical method, but also as a practical discipline of life. If Plato's mildly ironical reference in the Euthydemus to a critic "on the borderland between philosophy and statesmanship " was meant, as is probable, for Isocrates, at least there was a wide difference between the measure of acceptance accorded to the earlier Sophists, such as Protagoras, and the influence which the school of Isocrates exerted through the men whom it had trained. Rhetoric had won its place in

education. It kept that place through varying fortunes to the fall of the Roman empire, and resumed it, for a while, at the revival of learning.

Plato in the Gorgias and the Phaedrus satirized the ordinary textbooks of rhetoric, and himself gave directions for a higher standard of work; but the detailed study of the art Arls . begins with Aristotle. Aristotle's

Rhetoric belongs to totie's the generation after Isocrates, having been composed "Rhe- (but see Aristotle) between 330 and 322 B.C. As "." controversial allusions sometimes hint it holds Isocrates for one of the foremost exponents of the subject. From a purely literary point of view Aristotle's Rhetoric (with the partial exception of book iii.) is one of the driest works in the world. From the historical or scientific point of view it is one of the most interesting. If we would seize the true significance of the treatise it is better to compare rhetoric with grammar than with its obvious analogue, logic. A method of grammar was the conception of the Alexandrian age, which had lying before it the standard masterpieces of Greek literature, and deduced the " rules " of grammar from the actual practice of the best writers. Aristotle in the latter years of the 4th century B.C. held the same position relatively to the monuments of Greek oratory which the Alexandrian methodizers of grammar held relatively to Greek literature at large. Abundant material lay before him, illustrating how speakers had been able to persuade the reason or to move the feelings. He therefore sought thence to deduce rules and so construct a true art. Aristotle's practical purpose was undoubtedly real. If we are to make persuasive speakers, he believed, this is the only sound way to set about it. But the enduring interest of his Rhetoric is mainly retrospective. It attracts us as a feat in analysis by an acute mind — a feat highly characteristic of that mind itself, and at the same time strikingly illustrative of the field over which the materials have been gathered.

The Rhetoric is divided into three books. It deals in great detail with the minutiae of the rhetorical craft. Book i. discusses the nature and object of rhetoric. The means of persuasion (irlaras) are classified into " inartificial " (fe-exwi)', i.e. the facts of the case external to the art, documents, laws, depositions, — and " arti- ficial " (tvTtxvot.), the latter subdivided into logical (the popular syllogism or " enthymeme," the " example," &c), ethical, and emotional. Aristotle next deals with the " topics " (romx), i.e. the commonplaces of rhetoric, general or particular arguments which the rhetorician must have ready for immediate use. Rhetoric is then broadly divided into : — (1) deliberative {avpfiovkevriK-h) , concerned with exhortation or dissuasion, and with future time, its end (t£\os) being the advantage or detriment of the persons addressed; (2) forensic (biKavmi]) , concerned with accusation and defence, and with time past, its standard being justice; (3) epi- deictic, the ornamental rhetoric of display, concerned with praise and blame, usually with the present time, its standard being honour and shame. Each of these kinds is discussed, and the book ends with a brief analysis of the " inartificial proofs." In book ii. Aristotle returns to the " artificial " proofs — those

which rhetoric itself provides. The ” logical ” proof having been discussed in book i., he turns to the ” ethical.” He shows how the speaker may so indicate his own character and the goodness of his motive as to prepossess the audience in his favour, and proceeds to furnish materials to this end. The ” emotional ” proof is then discussed, and an analysis is given of the emotions on which the speaker may play. A consideration follows of the ” universal commonplaces ” (xoieot tottoi) which are suitable to all subjects. The book ends with an appendix dealing with the “example” (TrapaSeiypa) , the general moral sentiments (ˆvSˆot) and the enthymeme. In book iii. Aristotle considers expression (X*{«), including the art of delivery (vtSkputis) , and arrangement (rd£is). Composition, the use of prose rhythm, the periodic style (the “periodic” style, Ka.rtaTpap.p.ivr\, being contrasted with the ” running ‘ {dpop&vq)) are all analysed, and the types of style literary (7 paxpwii) and oral (kyavurriKit) are differentiated. Under ” arrangement ” he concludes with the parts of a speech, proem, narrative, proofs and epilogue.

It is necessary briefly to consider Aristotle s general view of rhetoric as set forth in book i. Rhetoric is properly an art. This is the proposition from which Aristotle sets out. It is so because when a speaker persuades, it is possible to find out why he succeeds in doing so. Rhetoric is, in fact, the popular branch of logic. Hitherto, Aristotle says, the essence of rhetoric has been neglected for the accidents. Writers on rhetoric have hitherto concerned themselves mainly with “the exciting of prejudice, _ of pity, of anger, and such-like emotions of the soul.” All this is very well, but ” it has nothing to do with the matter in hand ; it has regard

to the judge.” The true aim should be to prove your point, or seem to prove it.

Here we may interpolate a comment which has a general bearing on Aristotle’s Rhetoric. It is quite true that, if we start from the conception of rhetoric as a branch of logic, the phantom of logic in rhetoric claims precedence over appeals to passion. But Aristotle does not sufficiently regard the question — What, as a matter of experience, is most persuasive? Logic may be more persuasive with the more select hearers of rhetoric; but rhetoric is for the many, and with the many appeals to passion will sometimes, perhaps usually, be

more effective than syllogism. No formulation of rhetoric can correspond with fact which does not leave it abso- lutely to the genius of the speaker whether reasoning (or its phantom) is to be what Aristotle calls it, the ” body of proof ” {adjia irlareais), or whether the stress of persuading effort should not be rather addressed to the emotions of the hearers.

But we can entirely agree with Aristotle in his next remark, which is historical in its nature. The deliberative branch of rhetoric had hitherto been postponed, he observes, to the forensic. We have, in fact, already seen that the very origin of rhetoric in Hellas was forensic. The relative subordination of deliberative rhetoric, however unscientific, had thus been human. Aristotle’s next statement, that the master of logic will be the master of rhetoric, is a truism if we concede the essential primacy of the logical element in rhetoric. Otherwise it is a paradox; and it is not in accord with experience, which teaches that speakers incapable of showing even the ghost of an argument have sometimes been the most completely successful in carrying great audiences along with them. Aristotle never assumes that the hearers of his rhetorician are as ol x a Pt*VTes, the culti- vated few; on the other hand, he is apt to assume tacitly — and here his individual bent comes out — that these hearers are not the great surging crowd, the oxXos, but a body of persons with a decided, though imperfectly developed, preference for sound logic.

What is the use of an art of rhetoric? It is fourfold, Aristotle replies. Rhetoric is useful, first of all, because truth and justice u . are naturally stronger than their opposites. When rhetoric, awards are not duly given, truth and justice must have

been worsted by their own fault. This is worth correct- ing. Rhetoric is then (1) corrective. Next, it is (2) instructive, as a popular vehicle of persuasion for persons who could not be reached by the severer methods of strict logic. Then it is (3) suggestive. Logic and rhetoric are the two impartial arts; that is to say, it is a matter of indifference to them, as arts, whether the conclusion which they draw in any given case is affirmative or negative. Suppose that I am going to plead a cause, and have a sincere conviction that I am on the right side. The art of rhetoric will suggest to me what might be urged on the other side; and this will give me a stronger grasp of the whole situation. Lastly, rhetoric is (4) defensive. Mental effort is more distinctive of man than bodily effort; and “it would be absurd that, while incapacity for physical self-defence is a reproach, incapacity for mental defence should be no reproach.” Rhetoric, then, is corrective, instructive, sug- gestive, defensive. But what if it be urged that this art may be abused?

The objection, Aristotle answers, applies to all good things, except virtue, and especially to the most useful things. Men may abuse strength, health, wealth, generalship.

The function of the medical art is not necessarily to cure, but to make such progress towards a cure as each case may

admit. Similarly it would be inaccurate to say that denned. tne lunc ti° n of rhetoric was to persuade. Rather

must rhetoric be defined as ” the faculty of discerning in every case the available means of persuasion.” Suppose that among these means of persuasion is some process of reasoning which the rhetorician himself knows to be un- sound. That belongs to the province of rhetoric all the same. In relation to logic, a man is called a ” sophist ” with regard to his moral purpose {irpoaipeaii) , i.e. if he knowingly used a fallacious syllogism. But rhetoric takes no account of the moral purpose. It takes account simply of the faculty {bbvayxs) — the faculty of discovering any means of persuasion.

Aristotle’s Rhetoric is incomparably the most scientific work which exists on the subject. It may also be regarded as having determined the main lines on which the subject was The treated by nearly all subsequent writers. The extant Rhet- treatise on rhetoric (also by Aristotle?) entitled ‘Pijropuo) . *

irpos ‘ hte£ai > Spov, formerly ascribed to Anaximenes of °^ _ ° Lampsacus, was written at latest by 340 B.C. The *” „

introductory letter prefixed to it is probably a late forgery. an er ‘ Its relation towards Aristotle’s Rhetoric is discussed in the article on Aristotle.

During the three centuries from the age of Alexander to that of Augustus the fortunes of rhetoric were governed by the new conditions of Hellenism. Aristotle’s scientific The method lived on in the Peripatetic school. Meanwhile P erfo < *

from Alex-

the fashion of florid declamation or strained conceits prevailed in the rhetorical schools of Asia, where, amid under to mixed populations, the pure traditions of the best Augus- Greek taste had been dissociated from the use of the tus – Greek language. The ” Asianism ” of style which thus came to be constrasted with ” Atticism ” found imitators at Rome, among whom must be reckoned the orator Hortensius (c. 95

B.C.). Hermagoras of Temnos in Aeolis (c. no r

B.C.) claims mention as having done much to revive g0 ras. a higher conception. Using both the practical rhetoric of the time before Aristotle and Aristotle's philosophical rhetoric, he worked up the results of both in a new system, — following the philosophers so far as to give the chief prominence to " inven- tion." He thus became the founder of a rhetoric which may be distinguished as the scholastic. Through the influence of his school, Hermagoras did for Roman eloquence very much what Isocrates had done for Athens. Above all, he counter- acted the view of " Asianism," that oratory is a mere knack founded on practice, and recalled attention to the study of it as an art. 1

Cicero's rhetorical works are to some extent based on the technical system to which he had been introduced by Molon at Rhodes. But Cicero further made an independent cicero. use of the best among the earlier Greek writers, Isocrates, Aristotle and Theophrastus. Lastly, he could draw, at least in the later of his treatises, on a vast fund of reflection and experience. Indeed, the distinctive interest of his con- tributions to the theory of rhetoric consists in the fact that his theory can be compared with his practice. The result of such a comparison is certainly to suggest how much less he owed to his art than to his genius. Some consciousness of this is perhaps implied in the idea which pervades much of his writing on oratory, that the perfect orator is the perfect man. The same thought is present to Quintilian, in whose great work, _

De Institutione Oratorio, the scholastic rhetoric re- man. ceives its most complete expression (c. a.d. 90). Quintilian treats oratory as the end to which the entire mental and moral development of the student is to be directed. Thus he devotes his first book to an early discipline which should precede the orator's first studies, and his last book to a discipline of the whole man which lies beyond them. Some notion of his comprehensive method may be derived from the circumstance that he introduces a succinct estimate of the chief Greek and Roman authors, of every kind, from Homer to Seneca (bk. x. §§ 46-131). After Quintilian, the next important name is that of Hermogenes of Tarsus, who under Marcus Aurelius made a complete digest of the scholastic rhetoric from genes'!* the time of Hermagoras of Temnos (no B.C.). It is contained in five extant treatises, which are remarkable for clearness and acuteness, and still more remarkable as having been completed before the age of twenty-five. Hermogenes continued for nearly a century and a half to be one of the chief authorities in the schools. Longinus (c. a.d. 260) published an Art of Rhetoric which is

still extant; and the more celebrated treatise On Sublimity (xept ityous), if not ˆrUers his work, is at least of the same period. In the later half of the 4th century Aphthonius (q.v.) composed the ” exercises ” (rpoyvuvao-nara) which superseded the work of 1 See Jebb’s Attic Orators, ii. 445.

Hermogenes. At the revival of letters the treatise of Aphthonius once more became a standard text-book. Much popularity was enjoyed also by the exercises of Aelius Theoh (of uncertain date ; see Theon). (See further the editions of the Rhetor es Graeci by L. Spengel and by Ch. Walz.)

During the first four centuries of the empire the practice of the art was in greater vogue than ever before or since. First, Practice there was a general dearth of the higher intellectual ofRhet- interests: politics gave no scope to energy: philosophy oric was stagnant, and literature, as a rule, either arid or

H Eml tbe frivolous – Then the Greek schools had poured their *” pre ” rhetoricians into Rome, where the same tastes which revelled in coarse luxury welcomed tawdry declamation. The law-courts of the Roman provinces further created a continual demand for forensic speaking. The public teacher „. „ of rhetoric was called “sophist,” which was now an

The So m

phists.” academic title, similar to “professor” or “doctor.”

In the 4th century B.C. Isocrates had taken pride in the name of cro< £i

Vespasian (70-79 A.D.), according to Suetonius, was the first emperor who gave a public endowment to the teaching of rhetoric. Under Hadrian and the Antonines (a.d. 1 17-180)

the public chairs of rhetoric became objects of the Rhetoric highest ambition. The complete constitution of the

schools at Athens was due to Marcus Aurelius. The Philosophical school had four chairs (0p6poi)”— Platonic, Stoic, Peripatetic, Epicurean. The Rhetorical school had two chairs, one for ” sophistic,”

the other for ” political ” rhetoric. By ” sophistic ” was meant the academic teaching of rhetoric as an art, in distinction from its ” political ” application to the law-courts. The ” sophistical ” chair was superior to the “political” indignity as in emolument, and its occupant was invested with a jurisdiction over the youth of Athens similar to that of the vice-chancellor in a modern university. The Antonines further encouraged rhetoric by granting immunities to its teachers. Three ” sophists ” in each of the smaller towns, and five in the larger, were exempted from : taxation {Dig- xxvii. 1, 6, § 2). The wealthier sophists affected much personal splendour. Polemon (c. a.d. 130) and Adrian of Tyre. (c. a.d. 170) are famous examples of extravagant display. The aim of the sophist was to impress the multitude. His whole stock- in-trade was style, and this was directed to astonishing by tours

de force. The scholastic declamations were chiefly of tioas. tw0 classes. (1) The suasoriae were usually on

historical or legendary subjects, in which some course of action was commended or censured (cf. Juv. Sat.). These suasoriae belonged to deliberative rhetoric (the fiovkevriKov yevos, deliberativum genus). (2) The controversiae turned especially on legal issues, and represented the forensic rhetoric (BiKavLKov ykvos, judiciale genus). But it was the general characteristic of this period that all subjects, though formally ” deliberative ” or ” forensic,” were treated in the style and spirit of that third branch which Aristotle distinguished, the rhetoric of «ri5et£« or ” display.” The oratory produced by the age of the academic sophists can be estimated from a large extant literature. It is shown under various aspects, and pre- sumably at its best, by such writers as Dio Chrysostom at the end of the 1st century, Aelius Aristides (see Aristides, Aelius) in the 2nd, the chief rhetorician under the Antonines, Themistius, Himerius and Libanius in the 4th. Amid much which is

tawdry or vapid, these writings occasionally present passages of true literary beauty, while they constantly offer matter of the highest interest to the student.

In the medieval system of academic studies, grammar, logic and rhetoric were the subjects of the trivium, or course followed during the four years of undergraduateship. Medieval Music, arithmetic, geometry and astronomy con- study of stituted the quadrivium, or course for the three years Rhetoric from the B.A. to the M.A. degree. These were the seven liberal arts. In the middle ages the chief authorities on rhetoric were the latest Latin epitomists, such as

Martianus Capella (5th cent.), Cassiodorus (5th cent.) or Isidorus (7th cent.).

After the revival of learning the better Roman and Greek writers gradually returned into use. Some new treatises were also produced. Leonard Cox (d. 1549) wrote The Art or Craft of Rhetoryke, partly compiled, partly original, which was reprinted in Latin at Cracow. The Art of Rhetorique, by Thomas Wilson (!553)> afterwards secretary of state, embodied rules chiefly from Aristotle, with help from Cicero and Quintilian. About the same time treatises on rhetoric were published in France by Tonquelin (1555) and Courcelles (1557). The general aim at this period was to revive and popularize the best teaching of the ancients on rhetoric. The subject was regularly Rhetoric taught at the universities, and was indeed important. at the At Cambridge in 1570 the study of rhetoric was Univer- based on Quintilian, Hermogenes and the speeches of ˆ s ”

Cicero viewed as works of art. An Oxford statute of 1588 shows that the same books were used there. In 1620 George Herbert was delivering lectures on rhetoric at Cambridge, where he held the office of public orator. The decay of rhetoric as a formal study at the universities set in during the 18th century. The function of the rhetoric lecturer passed over into that of correcting, written themes; but his title remained long after his office had lost its primary meaning. If the theory of rhetoric fell into neglect, the practice, however, was encouraged by the public exercises (” acts ” and ” opponencies “) in the schools. The college prizes for ” declamations ” served the same purpose.

The fortunes of rhetoric in the modern world, as briefly sketched above, may suffice to suggest why few modern writers of ability have given their attention to the subject. Modem Perhaps one of the most notable modern contributions Writers on to’ the art is the collection of commonplaces framed (in Hhetorlc. Latin) by Bacon, ” to be so many spools from which the threads can be drawn out as occasion serves,” a truly curious work of that acute and fertile mind. He called them ” Antitheta.” A specimen is subjoined: —

Uxor et Liberi

Against.

” He who marries, and has children, has given hostages to fortune.”

” The immortality of brutes is in their progeny; of men, in their fame,

services', and insti- tutions."

" Regard for the family too often overrides regard for the state."

For. " Attachment to the state begins from the family."

” Wife and children are a dis- cipline in humanity. Bachelors are morose and austere.”

” The only advantage of celi- bacy and childlessness is in case of exile.”

This is quite in the spirit of Aristotle’s treatise. The popu- larity enjoyed by Blair’s Rhetoric in the latter part of the 18th and the earlier part of the 19th century was merited rather by the form than by the matter. Campbell’s Philosophy of Rhetoric, which found less wide acceptance than its predecessor, was superior to it in depth, though often marred by an imperfect comprehension of logic. But undoubtedly the best modern book on the subject is Whately’s Elements of Rhetoric. whatel Starting from Aristotle’s view, that rhetoric is ” an *’

offshoot from logic,” Whately treats it as the art of “argu- mentative composition.” He considers it under four heads:

(1) the address to the understanding (= Aristotle’s Xoyikj) irtoris);

(2) the address to the will, or persuasion (= Aristotle’s i?0iW7 and

iraBriTiKri xi

” All a rhetorician’s rules But teach him how to name his tools,”

the assumption is tacitly made that an accurate nomenclature and classification of these tools must be devoid of practical use. The conditions of modern life, and especially the invention of printing, have to some extent diminished the importance which belonged in antiquity to the art of speaking, though modern democratic politics and forensic conditions still make it one which may be cultivated with advantage.

Among more modern works are J. Bascom, Philosophy of Rhetoric (New York, 1885); and numerous books on voice culture, gesture and elocution. For ancient rhetoric see Sir R. C. Jebb’s translation of Aristotle’s Rhetoric (ed. J. E. Sandys, 1909), and his Attic Orators (1876); also Spengel, Artium Scriptores (1828); Westermann, Gesch. der Beredtsamkeit (1833-35;) Cope, in the Cambridge Journal of

Classical and Sacred Philology (1855-57) ; introductions to Cicero's De Oratore (A. S. Wilkins) and Orator (J. E. Sandys) ; Volkmann, Die Rhetorih der Griechen und Romer in system. Ubersicht (ed. 2, 1885). (R. C.J.; X.)

RHEUMATISM (from Gr. peOjua, flux), a general term for various forms of disease, now subdivided more accurately under separate names.

Acute Rheumatism or Rheumatic Fever is the name given to a disease having for its chief characteristics inflammatory affections of the joints, attended by severe constitutional dis- turbances and frequently associated with inflammation of the pericardium and valves of the heart. The acute rheumatism of childhood differs materially from that of adults in that the articular manifestations and constitutional disturbance are usually much less severe, whereas the heart and pericardium are especially liable to be attacked. It will be advisable, therefore, in discussing the symptoms, to deal separately with the rheumatism of adults and that of childhood. There are certain points of importance in connexion with its causation which are generally agreed upon. It is essentially a disease of childhood and early adult life, being most commonly met with between the ages of ten and twenty-five and comparatively rarely after forty. Heredity is unquestionably an important predisposing cause. Climate is also a factor of considerable importance, cold and damp with sudden and wide fluctuations of temperature being especially conducive to an attack. While perhaps more common in Great Britain than elsewhere, it is met with in most parts of the globe. Exposure to cold and wet, and especially a chill after free perspiration and fatigue, are among the most common exciting causes of an attack.

Of recent years much evidence has accumulated tending to show that rheumatism is a specific infective disease due to a micro-organism, and this is now generally recognized. There is still, however, some difference of opinion as to the nature of the micro-organism by which it is produced. In 1900 F. J. Poynton and Paine isolated from eight cases of acute rheumatism in children a minute diplococcus similar to that previously de- scribed by Triboulet and by A. Wasserman, which inoculated into rabbits produced lesions of the joints and of the heart indistinguishable from those met with in acute rheumatism. They have since obtained the same micro-organism from a further large number of cases of acute rheumatism, and their results have been confirmed by Walker, Beattie and others. They therefore claim that this micro-organism, to which they have given the name Diplococcus rheumaticus, is the specific cause of acute rheumatism. The objections

which have been raised by other competent observers against this view are: (1) That this diplococcus is not found in all cases of acute rheumatism. (2) That certain other micro-organisms when inoculated into animals will produce joint and heart affections similar to those produced by the aforesaid Diplococcus rheumaticus. It would be out of place here to enter into the merits of this controversy; suffice it to say that the objections raised do not appear to be cogent enough to invalidate the conclusions arrived at by the authors of the germ theory. The matter is, however, still to a certain extent sub judice.

In adults the affection of the joints is the most striking feature. The attack is usually ushered in by a feeling of chilliness or malaise, with pain or stiffness in one or more joints, generally those of large or medium size, such as the toms.' knees, ankles, wrists or shoulders. At first the pain is confined to one or two joints, but others soon become affected, and there is a tendency to symmetry in the order in which they are attacked, the inflammation in one joint being followed by that of the same joint on the opposite side. The affected joints are swollen, hot and excessively tender, and the skin over them is somewhat flushed. The temperature is raised, ranging from about 101° to io3 p F., the pulse rapid, full and soft; the face is flushed, the tongue coated with a thick white fur, and there is thirst, loss of appetite, and constipation. The body is bathed in a profuse perspiration, which has a characteristic sour, disagreeable odour. The urine is diminished, acid and loaded with urates. The attack is of variable duration, and may pass off in a few days or last for some weeks. Relapses are not uncommon when convalescence appears to have been estab- lished. Among the complications which may arise are hyper- pyrexia, or rapid and extreme rise of temperature, which may run up as high as 110° F., when death will speedily ensue unless prompt and energetic treatment by cold baths or icepacks is resorted to. Affections of the heart, pericarditis (inflammation of the fibro-serous sac investing the heart) and endocarditis (inflammation of the lining membrane and the valves of the heart), which are so frequently associated with rheumatism, should be regarded as part of the disease, rather than as com- plications of rheumatism. They are far more common in children than in adults, and it is the damage to the valves of the heart in children by rheumatism which lays the foundation of much chronic heart disease in later life.

In childhood the affection of the joints is usually slight, and may be confined to a little pain or stiffness in one or two joints, and is sometimes attributed by parents to " growing pains." The constitutional symptoms are also ill-marked and there are no acid sweats, the temperature is not as a rule very high, the tongue not

heavily coated, and the child does not appear to be very ill. The heart and pericardium are, however, especially liable to attack, and this may be so insidious in its onset that attention is not called to it till considerable damage has been done to the heart. It is of importance, therefore, that in children the heart should be frequently examined by a physician, when there is the slightest suspicion of an attack of rheumatism. Chorea or St Vitus's dance is. a common manifestation of rheu- matism in children. Subcutaneous fibrous nodules, attached to tendons or fibrous structures beneath the skin, are a special feature of the rheumatism of childhood. They are painless, and vary in size from one-eighth to half an inch in diameter. They are not Very common, but when present indicate that the rheumatism has a firm hold and that cardiac complications are to be apprehended.

The patient should be placed in bed between blankets, and should wear a light flannel or woollen shirt. The' affected joints should be kept at rest as far as possible, and enveloped in cotton-wool. Salicylate of soda or salicin, first suggested by Dr Maclagan in 1876, appear to exercise a specific influence in acute rheumatism. They have a power- ful effect not only in reducing the temperature, but in relieving the pain and cutting short the attack. Frequent and fairly large doses of salicylate of soda should be administered for the first twenty-four hours: the dose and interval at which it is given should then be gradually reduced till the symptoms subside. In conjunction with this, alkalies such as bicarbonate or citrate of potash should also be administered. The effect of the salicylate should be carefully watched, and the dose reduced if toxic symptoms such as delirium, deafness, and noises in the ears occur. These drugs are of less service in the rheumatism of children than in that of adults, as they do not appear to exercise any specific influence in arresting the cardiac inflammation to which children are specially liable, though they have a marked effect on the joint affections. Aspirin has

Treat- meat-

recently come into use as a substitute for salicylates, and may succeed when salicylates fail.

Subacute rheumatism. — This term is sometimes applied to attacks of the disease of a less severe type in which the symp- toms, though milder in character, are usually of longer duration and more

intractable than in the acute form. It is difficult, however, to draw a hard-and-fast line between the two, but the term may perhaps be most appropriately applied to the repeated and protracted attacks of cardiac rheumatism in children.

Chronic Rheumatism. — This term has been somewhat loosely applied to various chronic joint affections, sometimes of gouty origin or the result of rheumatoid arthritis. Strictly speaking, it may be applied to cases in which the joint lesions persist after an attack of rheumatism, and chronic inflammatory thickening of the tissues takes place, so that they become stiff and deformed. It is also appropriate to certain joint affections occurring in later life in rheumatic subjects, who are liable to repeated attacks of pain and stiffness in the joints, usually induced by exposure to cold and wet. This form of rheumatism is less migratory than the acute, and is commonly limited to one or two of the larger joints. After repeated attacks the affected joints may become permanently stiff and painful, and crackling or creaking may occur on movement. There is seldom any constitutional disturbance, and the heart is not liable to be affected.

Muscular Rheumatism. — By this is understood a painful affection of certain groups of muscles attributable to inflamma- tion of their fibrous and tendinous attachments. It is commonly brought on by exposure to cold and wet, and especially by a chill after violent exercise and free perspiration when the clothes are not changed. Any movement of the affected muscles gives rise to severe and sharp pain which may induce a certain degree of spasm and rigidity at the time. The pain usually subsides and passes off completely while the patient is at rest, but occurs on the slightest movement of the affected muscles.

The chief varieties of muscular rheumatism are: —

i. Lumbago, in which the muscles of the lower part of the back are affected so that stooping, particularly the attempt to rise again to the erect position, induces severe pain.

2. Intercostal rheumatism, affecting the muscles between

the ribs, so that taking a deep breath and certain movements of the arms give rise to pain.

3. Torticollis or stiff neck, affecting the muscles of one side

of the neck. Treatment. — Salicylates, which are of service in acute rheu- matism, are not so reliable in the chronic varieties, but are

some- times of service. Aspirin, salicin, quinine and iodide of potassium may be more successful, but other active treatment is usually required. The application of heat in the form of poul- tices or fomentations, counter irritation by mustard leaves or blisters, are indicated in some cases. In others massage, hot douches, or electricity may be required. Mineral waters and baths of various health resorts are often of great benefit in obstinate cases, such as those of Buxton, Bath, Harrogate, Woodhall Spa, &c, in England, or of Aix-les-Bains, Wiesbaden, Wildbad, &c, and many others on the continent of Europe. Wintering abroad in warm, dry and sunny climates may be advisable in some cases when this is practicable.

a. F. H. B.)

RHEUMATOID ARTHRITIS (osteoarthritis, arthritis de- formans), terms employed to designate a disease or group of diseases characterized by destructive changes in the joints. Though it is only in comparatively recent times that the disease was definitely recognized as separate clinically from either rheumatism or gout, it is certain that it prevailed in ancient times. Characteristic changes in the bones have been found in remains in tombs in Egypt attributed by Petrie to 1300 B.C., and ancient Roman as well as British graves have held bones showing distinct traces of the diseases. Of early medical writers, Paulus Aeginata observed the lesions and seemed to

consider them distinctive. Landre Beauvais in 1800 published a description of the disease under the title of Goutte astheniqut primitif. The first endeavour, however, to separate rheumatoid arthritis as a distinct disease was made by William Heberden in 1803; while in 1805 John Haygarth recognized the difference between it and rheumatism, and suggested the term ” nodosity of the joints.” A wide divergence of opinion during the 19th century as to its relation to rheumatism and to gout gave rise to the unfortunate term ” rheumatic gout.” The name arthritis deformans was, suggested by Virchow in 1859. Various causes, such as nervous origin, inherited arthritic diathesis, a relationship to rheumatism or gout, and reflex irritation, have been put foward as giving rise to the disease, but in the present state of medical knowledge two are most favoured. The first ascribes the disease to an infective process arising from micro-organisms. Several observers have found bacteria in the synovial fluid and membranes of affected joints, — Max Schuller finding both bacilli and cocci, while in 1896 Gilbert Bannatyne, Wohlmann and Blaxall isolated a micro-organism, a bacillus with a bipolar staining, which they stated to be almost constantly present in the joints of patients with true rheumatoid arthritis. The second view is that the disease is

the result of a chronic toxaemia produced by absorption of toxines from the intestine, with perhaps some error in metabolism. In many cases there seems to be a distinct evidence of a local infection, injury being a determining factor, and some families seem to have joints which are specially liable to degeneration. The disease may begin at any age, for there is no doubt that persistent cases have been met with in quite young children; but it usually begins in early middle-age, and statistics seem to confirm the impression of the greater liability of females. Conditions which tend to lower the general health seem to act as a predisposing cause to rheumatoid arthritis, e.g. mental worry, uterine disorders and various lowering diseases, prominent among which are influenza and tonsillitis. In a number of cases in women the onset occurs about the time of the menopause.

The method of onset varies according to the form. There are four well-marked types — (1) the peri-articular form, in which the most marked changes are in the synovial membrane and peri-articular tissues, and the cartilage may be involved to a lesser degree. In this variety is found every grade of severity. The onset may be acute, resembling an attack of rheumatic fever, for which it may be mistaken; the joints, one or more, are swollen, tender and painful to the touch; the temperature elevated to 100°; 101 ; but unlike rheumatic fever, sweating and hyperpyrexia are uncommon. The acute stage may then subside, a slight thickening remaining in the capsule of the joint, and the contours of the limb scarcely regaining the normal; or the attack may gradually develop into the chronic form. The pain varies greatly, and is not necessarily in ratio to the amount of arthritis present. Various joints may be involved, the spinal vertebrae not infrequently sharing in an arthritis; the most usual joints to be attacked, however, are the knee and shoulder. When the knee is attacked there is commonly effusion into the joint. Muscular atrophy is usually present, but varies greatly in its extent. In most cases it is present to a much greater degree than can be accounted for by disuse of the muscles. The skin has in these cases a curious glossy appearance, and pigmentations may be noticed. In chronic forms the onset is gradual, one joint becoming painful and swelling, and then the others successively; in these slow forms the outlook for the recovery of the joint is not so good as in the acute, and some cases may proceed to extreme deformity with little or no pain. Gradually the shape of the joint is altered; this is in a great measure due to synovial thickening, and partly to the presence of osteophytes in the joint. When the affected joint is moved a distinct crepitation can be felt. The muscles about the joint atrophy often to an extreme degree, and con- tractures supervene, flexing the leg upon the thigh if the knees should be

affected, and the thigh upon the abdomen should the hip be affected. In extreme degrees the patient may become a complete cripple. Later, in many cases a quiescent stage of the

disease is reached, the patients cease to suffer pain, and are inconvenienced only by the deformities in the limbs, in which a considerable degree of motion may be retained. Remarkable deformities are seen in hands in which a considerable amount of usefulness still remains. Dyspepsia and anaemia are fre- quently associated with arthritis. Monarticular arthritis more particularly affects the aged; and when it affects the hip is known as morbus coxae senilis.

(2) The atrophic form of arthritis is not very common. The chief anatomical change is due to atrophy in the bone and cartilage. The disease occurs at an earlier period in life than the peri-articular form, from which the initial symptoms do not markedly differ; but the disorganization in the joint is greater, dislocations frequently occur, and ankylosis of the joints follows. This is the most serious form of arthritis.

(3) In the hypertrophic form the anatomical changes include the formation of new bone as well as changes in the cartilage. This new-bone formation may lead to progressive ankylosis in the joints. Should the vertebral column be affected a rigid condition of the spine known as spondylitis deformans (” poker back “) may ensue. What are termed ” Heberden’s nodes ” are small hard knobs about the size of a pea frequently found upon the fingers near the terminal phalangeal joints; they rarely give rise to symptoms. Popularly ascribed to gout, these nodes are in reality a manifestation of arthritis.

(4) A variety of arthritis occurring in children is known as Still’s disease; in which the swelling of the joints is associated with swelling of the lymph glands and of the spleen. The onset is often acute, with fever and rigors; sweating is profuse and the joints are enlarged and painful. There may be much muscular wasting and limitation of movement in the joints, and anaemia is associated with the disease.

The- treatment of rheumatoid arthritis is rarely curative, once the disease has been permanently established; and it is therefore important to begin treatment before destructive changes have taken

place in the joints. In the acute febrile form, which is frequently taken for rheumatism, the essential treatment is rest to the affected joints, with the application of oil of wintergreen; the joint should not be fixed but supported. In the more chronic forms medicinal treatments are usually of little value. Potassium iodide is useful in some cases by promoting absorption of the hypertrophied fibrous tissue, and guaiacol if administered for a sufficiently long time is said to be capable of arresting the disease, diminishing the size of the joint and helping movement. Where anaemia accompanies the disease iron and arsenic are of value. The general health of a patient suffering from rheumatoid arthritis must be maintained, and he should live upon a dry soil. Visits to Aix-les-Bains, Buxton, Bath or Droitwich, with their baths and shampooings, often prove useful, particularly when combined with gentle massage. It is a mistake to keep the joints entirely at rest in the chronic forms, as this tends to the formation of contractures and ankylosis. Moderate exercise without undue fatigue is desirable. Patients should go early to bed and have plenty of rest, sunshine and fresh air. It is important that the diet should be nourishing and plentiful, and should there be intestinal putrefaction fermented milk is useful. As regards the local treatment, it will be well in the majority of cases to determine by the X-rays the exact state of the affected joints. Radiant heat, vibration and hot-air baths are among the best treatments. The active hyperaemia induced by hot air favours restoration of movement and alleviates pain, but where there is pronounced destruction of bone and cartilage full restoration of a joint cannot take place. Systematic exercises of the joints tend to prevent the atrophy of the adjacent muscles, and Bier's passive hyperaemia induced by the temporary use of an elastic bandage has the same results. Should an X-ray photograph reveal the presence of spurs or loose bodies in the joints interfering with free movement their removal is called for. Sometimes the breaking down of adhesions under an anaesthetic is necessary, and gentle passive and later active movements of the joints should follow if freedom of use is to be gained. Recently

treatment by radium has taken a definite place in the therapeutics of chronic arthritis, its analgesic properties seeming of great benefit. ”
(H. L. H.)

RHEYDT, a town of Germany, in the Prussian Rhine pro- vince, situated on the Niers, 19 m. W. of Diisseldorf, on the main line of railway to Aix-la-Chapelle, and at the junction of lines to Crefeld and Stolberg. Pop. (1905) 40,149. It has two Roman Catholic and two Evangelical churches, a handsome new town hall (1895), a gymnasium, and several technical schools. The principal products of

its numerous factories are silk, cotton, woollen and mixed fabrics, velvet, iron goods, machinery, shoes, cables, soap and cigars. Dyeing and finishing, brewing and distilling, are also carried on. Rheydt is an ancient place, but its industrial importance is of very recent growth, and it only received municipal rights in 1856.

See Rheyter Chronik. Geschichte der Herrschaft und Stadt Rheydt (2 vols., Rheydt, 1897); and Strauss, Geschichte der Stadt Rheydt (Rheydt, 1897).

RHIANUS, Greek poet and grammarian, a native of Crete, friend and contemporary of Eratosthenes (275-195 B.C.). Suidas says he was at first a slave and overseer of a palaestra, but obtained a good education later in life, and devoted himself to grammatical studies, probably in Alexandria. He prepared a new recension of the Iliad and Odyssey, characterized by sound judgment and poetical taste. His bold atheteses are frequently mentioned in the scholia. He also wrote epigrams, eleven of which, preserved in the Greek anthology and Athenaeus, show elegance and vivacity. But he was chiefly known as a writer of epics (mythological and ethnographical), the most celebrated of which was the Messeniaca in six books, dealing with the second Messenian war and the exploits of its central figure Aristomenes, and used by Pausanias in his fourth book as a trustworthy authority. Other similar poems were the Achaica, Eliaca, and Thessalica. The Heracleia was a long mythological epic, probably an imitation of the poem of the same name by Panyasis, and containing the same number of books (fourteen).

Fragments in A. Meineke, Analecta Alexandrina (1843); for Rhianus's work in connexion with Homer, see C. Mayhoff, De Rhiani Studiis Homericis (Dresden, 1870) ; also W. Christ, Ges~ chichte der griechischen Litteratur (1898).

RHIGAS, CONSTANTINE, known as Rhigas of Velestinos (Pherae), or Rhigas Pheraios (1 760-1 798), Greek patriot and poet, was born at Velestinos, and was educated at Zagora and at Constantinople, where he became secretary to Alexander Ypsilanti. In 1786 he entered the service of Nicholas Mavro- genes, hospodar of Wallachia, at Bucharest, and when war broke out between Turkey and Russia in 1787 he was charged with the inspection of the troops at Craiova. Here he entered into close and friendly relations with a Turkish officer named Osman Passvan-Oglou (1758-1807), afterwards the famous governor of Widin, whose life he saved from the vengeance of Mavrogenes. After the death of his patron Rhigas returned to Bucharest to serve for some time as interpreter at the French Consulate. At this time he wrote the

famous Greek version of the Marseillaise, well known in Byron's paraphrase as " sons of the Greeks, arise." He was the founder of the Hetaireia, a society formed to organize Greek patriotic sentiment and to provide the Greeks with arms and money. Believing that the influence of the French Revolution would spread to the Near East, he betook himself to Vienna to organize the movement among the exiled Greeks and their foreign supporters in 1793, or possibly earlier. He published in Vienna many Greek translations of foreign works, and presently founded a Greek press there, but his chief glory was the collection of national songs which, passed from hand to hand in MS., roused patriotic enthusiasm throughout Greece. They were only printed posthumously at Jassy in 1 8 14. While at Vienna Rhigas entered into communication with Bonaparte, to whom he sent a snuff-box made of the root of a laurel tree taken from the temple of Apollo, and eventually he set out with a view to meeting the general of the army of Italy in Venice. But before leaving Vienna he forwarded papers, amongst which is said to have been his correspondence

with Bonaparte, to a compatriot at Istria. The papers were betrayed by Demetrios Oikonomos Kozanites into the hands of the Austrian government, and Rhigas was arrested at Trieste and handed over with his accomplices to the Turkish authorities at Belgrade. Immediately on arrest he attempted suicide. His Turkish friend, Passvan-Oglou, sought to secure his escape, and the government apparently consented to release him on the payment of a ransom of about £6000; but meanwhile the Turkish pasha commanding at Belgrade had taken the law into his own hands. Rhigas's five companions were secretly drowned, but he himself offered so violent a resistance that he was shot by two Turkish soldiers. His last words are reported as being: " I have sown a rich seed; the hour is coming when my country will reap its glorious fruits." Rhigas, Writing in the popular dialect instead of in classical Greek, aroused the patriotic fervour of his contemporaries and. his poems were a serious factor in the awakening of modern Greece.

See Rizos Neronlos, Histoire de la revolution grecgue (Paris, 1829) ; I. C. Bolaaachi, Hommes illustres de la Grece moderne (Paris, 1875) ; and Mrs E. M. Edmonds, Rhigas Pheraios (London, 1890).

RHINE (Lat. Rhenus, Ger. Rhein, Fr. Rhin, Dutch Rhyn, or Rijn), the chief river of Germany and one of the most im- portant in Europe. It is

about 850 m. in length and drains an area of 75,000 sq. m. The distance in a direct line between its source in the Alps and its mouth in the German Ocean is 460 m. Its general course is north-north-west, but it makes numerous deflexions and at one point is found running in a diametrically opposite direction. The name Rhine, which is apparently of Celtic origin, is of uncertain etymology, the most favoured derivations being either from der Rinnende (the flowing), or from Rein (the clear), the latter being now the more generally accepted. “”■’

1. The Swiss Portion. — The Rhine rises in the mountains of the Swiss canton of the Grisons, and flows for 233 m. in Swiss territory, within which its drainage basin includes about 14,050 sq. m., and every canton save Geneva. The two main branches of the Rhine, the Hinter Rhine and the Vorder Rhine, unite at Reichenau, 6 m. S.W. of Coire. (1) The principal stream is considered to be that of the Hinter Rhine, which issues (7271 ft.) from the glaciers of the Rheinwaldhor’n group, and then flows first N.E. through the Rheinwald valley, and next N. through the Schams valley, which Communicates by the well-known gorge of the Via Mala with the Tomleschg valley at Thusis, whence the stream continues its N. course to Reich- enau; total length 35! m., total fall 3711 ft. It receives a number of mountain torrents during its course, the most im- portant being that from the Avers glen, and the Albula, both on the right, which is itself formed by many mountain streams. (2) The Vorder Rhine rises in the small Toma lake (7691 ft.), S. of the Oberalp Pass, not far from the St. Gotthard Pass, and then flows N.E. past Disentis and Ilanz, which claims the honour of being the ” first town on the Rhine,” to Reichenau; total length 42 m., total fall 3492I ft. Its chief affluents are the stream dignified by the name of the Medels Rhine, that rises in the Cadlimo glen, W. of the Lukmanier Pass, and, after flowing through the Medels glen, joins the Vorder Rhine at Disentis, and the Glenner, flowing from the Lugnetz glen, both on the right. From Reichenau the united streams flow N.E. to Coire, the capital of the canton of the Grisons, and then turn towards the N., past Ragatz, the valley broadening out, and the river being joined on the right by the Landquart and the 111, before it expands into the Lake of Constance. Extensive ‘■’ corrections ” of the river bed, especially the canal of Diepold- sau, have been carried out in the lower bit of this part of the valley, while from a little north of Ragatz the right bank belongs first to Liechtenstein and then to the Austrian province of the Vorarlberg. On issuing from the Lake of Constance at Con- stance, the Rhine flows nearly due west to Basel, where it leaves Swiss territory, the south bank during this portion of the river being entirely Swiss, save the town of Constance, but the north shore

belongs to Baden, save in the case of the Swiss town of Stein-am-Rhein and the Swiss canton of Schaffhausen. The

chief towns on its banks are Constance (S.), Schaffhausen (N.), Waldshut (N.), Laufenburg (S.), Sackingen (N.), Rheinfelden (S.), and Basel (both banks). About 15 m. below Schaffhausen the river forms the famous Falls of the Rhine, or Falls of Schaff- hausen (60 ft. high), while at Coblenz, opposite Waldshut, it receives its chief affluent, the Aar, recently swollen by the Reuss and the Limmat, and of greater volume than the river in which it loses its identity. (W. A. B. C.)

2. The German and Dutch Portion. — After Basel, when the Rhine turns to the north and enters Germany, its breadth is between 550 and 600 ft., while its surface now lies not more than 800 ft. above the sea, showing that the river has made a descent of 6900 ft. by the time it has traversed a third of its course. From Basel to Mainz the Rhine flows through a wide and shallow valley, bordered on the east and west by the parallel ranges of the Black Forest and the Vosges. Its banks are low and flat, and numerous islands occur. The tendency to divide into parallel branches has been curbed in the interests of naviga- tion, and many windings have been cut off by leading the water into straight and regular channels. At Mannheim the river is nearly 1500 ft. in width, and at Mainz, where it is diverted to the west by the barrier of the Taunus, it is still wider. It follows the new direction for about 20 m., but at Bingen it again turns to the north and begins a completely new stage of its career, entering a narrow valley in which the enclosing rocky hills abut so closely on the river as often barely to leave room for the road and railway on either bank; during this portion of its course the speed of the current at a normal state of the water exceeds 6 m. an hour. This is the most beautiful part of the whole course of the river, abounding in ruined castles, romantic crags and sunny vineyards. At Coblenz the valley widens and the river is 1200 ft. broad, but the hills close in again at Andernach, and this ravine-like part of its course cannot be considered as ending till below the Siebengebirge (Seven Mountains), where the river once more expands to a width of 1300-1600 ft. Beyond Bonn and Cologne the banks are again flat and the valley wide, though the hills on the right bank do not completely disappear till the neighbourhood of Dusseldorf. Farther on the country traversed by the Rhine is perfectly level, and the current becomes more and more sluggish. On entering Holland, which it does below Emmerich, its course is again deflected to the west. Within Holland the banks are so low as to require at places to be protected by embank- ments against inundations. Almost immediately after entering Holland the stream divides into two arms, the larger of which, carrying off about two-thirds of the water,

diverges to the west, is called the Waal, and soon unites with the Maas. The smaller branch to the right retains the name of Rhine and sends off another arm, called the Yssel, to the Zuider Zee. The Rhine now pursues a westerly course almost parallel with that of the Waal. At Wijk another bifurcation takes place, the broad Lek diverging on the left to join the Maas, while the ” Kromme Rijn ” to the right is comparatively insignificant. Beyond Utrecht, where it is again diminished by the divergence of the Vecht to the Zuider Zee, the river under the name of the ” Oude Rijn,” or Old Rhine, degenerates into a sluggish and almost stagnant stream, which requires the artificial aid of a canal and of sluices in finding its way to the sea. In Roman times the Rhine at this part of its course seems to have been a full and flowing river, but by the 9th century it had lost itself in the sands of Katwijk, and it was not until the beginning of the 19th century that its way to the sea was re-opened. Though the name Rhine thus at last attaches to a very insignificant stream, the entire district between the Waal on one side and the Yssel on the other, the Insula Batavorum of Caesar, in reality belongs to the delta of the famous river.

Tributaries. — The Rhine is said to receive, directly or indirectly, the waters of upwards of 12,000 tributaries of all sizes. Leaving out of account the innumerable glacier streams that swell its volume above the Lake of Constance, the most important affluents to it3 upper course are the Wutach, the Alb and the Wiese, descending on the right from the Black Forest, and the Aar, draining several Swiss cantons on the left. In the upper Rhenish basin, between

Basel and Mainz, the tributaries, though numerous, are mostly short and unimportant. The 111 and theNahe on the left and the Neckar and the Main on the right are, however, notable exceptions. Before joining the Rhine the 111 runs almost parallel with it and at no great distance for upwards of 50 m. In the narrow part of the valley, between Bingen and Cologne, the Rhine receives the waters of the Lahn and the Sieg on the right, and those of the Mosel, bringing with it the Saar, and the Ahr on the left. Still lower down, but before the Dutch frontier is reached, come the Ruhr and the Lippe on the right, and the Erft on the left. The numerous arms into which the Rhine branches in’Holland have already been noticed.

Physical Geography.— The Rhine connects the highest Alps with the mud banks of Holland, and touches in its course the most varied

geological periods; but the river valley itself is, geologically speaking, of comparatively recent formation. Rising amid the ancient gneiss rocks of the St Gotthard, the Rhine finds its way down to the Lake of Constance between layers of Triassic and Jurassic formation; and between that lake and Basel it penetrates the chalk barrier of the Jura. The upper Rhenish valley is evidently the bed of an ancient lake, the shores of which were formed by the gneiss and granite of the Black Forest on the one side and the granite and sandstone of the Vosges on the other. Within the valley all the alluvial deposits are recent. Between Bingen and Bonn the Rhine forces its way through a hilly and rocky district belonging to the Devonian formation. The contorted strata of slate and greywacke rock must have been formed at a period vastly anterior to that in which the lake of the upper valley managed to force an outlet through the enclosing barriers. Probably this section may be looked upon as the oldest portion of the river course proper, connecting the upper Rhenish lake with the primeval ocean at Bonn. In this district, too, as has already been remarked, is the finest scenery of the Rhine, a fact due in great part to the grotesque shapes of the quartzose rocks, left denuded of the less durable slate and sandstone. All the strata intersected by the Rhine between Bingen and Bonn contain fossils of the same classes. The deposits of the actual valley here, belonging to the Miocene group of the Tertiary system, are older than the deposits either farther up or farther down the river; but they are contempo- raneous with the basalts of the Rhine, which at Coblenz and in the peaks of the Seven Mountains also contribute to the scenic charm of the river. The very extensive pumice deposits at Neuwied and the lava and other volcanic rocks belong to a more recent epoch. Below Bingen the formations belong almost entirely to the Post-Tertiary period. Numerous extinct volcanoes rise near Neuwied. In the flatter parts of the valley occur large beds of loam and rubble, sometimes in terraces parallel with, but several hundred feet above, the river, proving by their disposition and appearance that the valley has been formed by the action of water.

Navigation.— The Rhine has been one of the chief waterways of Europe from the earliest times; and, as its channel is not exposed to the danger of silting up like those of the Elbe and the Oder, it has always been comparatively easy to keep it open. The Romans exerted themselves to improve the lower navigation of the river, and appointed prefects of the Rhine to superintend the shipping and to exact the moderate dues imposed to keep the channel in repair. The Franks continued the same policy and retained a system of river-dues. Afterwards, as the banks became parcelled out among a host of petty princelings, each of whom arrogated the right of laying a tax on

passing vessels, the imposts became so prejudicial as seriously to hamper the development of the shipping. Many of the riparian potentates derived the bulk of their revenue from this source, and it is calculated that in the 18th century the Rhine yielded a total revenue of £200,000, in spite of the comparatively insignificant amount of the shipping. The first proposal for a free Rhine was mooted by the French at the congress of Rastatt (1797-1799), but Holland, commanding the mouth of the river, placed every obstacle in the way of the suggestion. In 1831, on the separation of Holland and Belgium, the former had become more amenable to reason; and a system was agreed upon which practically gave free navigation to the vessels of the riverine states, while imposing a moderate tariff upon foreign ships. After the war of I #66, Prussia negotiated, with Baden, Bavaria and Hesse-Darmstadt with a view to the removal of all tolls. It was not, however, till 1868 (see Die Rhein-Schijfahrts Akte vom tyten Okt., 1868) that the last vestige of a toll disappeared and the river was thrown open without any restriction. The management of the channel and navigation is now vested in a central commis- sion, meeting at Mannheim on the 1st of July in each year. The channel has been greatly improved and in many places made more direct since the beginning of the 19th century, large sums being annually spent in keeping it in order. Capacious river harbours have been formed at various points, twenty-nine of these being in Germany and eight in Holland. The position of the river is highly favourable for the development of its trade. It flows through the most populous regions of: the continent of Europe, to discharge into one of the most frequented seas opposite Great Britain, and, besides serving as a natural outlet for Germany, Belgium and Holland, is connected with a great part of central and southern

France by the Rhine-Rhone and the Rhine- Marne canals, and with the basin of the Danube by the.Ludwigs-Canal.

The introduction of steam has greatly increased the. shipping on the Rhine; and small steamers ply also on the Main, the Neckar; the Maas and the Mosel. The first Rhine steamer was launched in 1817; and now the river is regularly traversed iby upwards of; a hundred, from the small tug up to the passenger saloon-steamer. The steamboat traffic has especially encouraged the influx of tourists, and the number of passing travellers may now be reckoned as between one and two millions annually. The river is navigable without interruption from Basel to its mouth, a distance of 550 miles, of which 450 lie within Germany. Above Spires, however, the river craft are comparatively small, but lower down vessels of 500 and 600 tons burden find no difficulty in plying. Between Basel and Strassburg the depth of water

is sometimes not more than 3 ft. ; between Strassburg and Mainz it varies from 5 to 25. ft;; while below Mainz it is never less than 9 or 10 ft. The deepest point is opposite the Lorelei (Lurlei) Rock near St Goar, where it is 75 ft. in depth ; at Dilsseldorf the depth is about 50 ft.

London, Hamburg, Bremen and the chief Baltic ports as far as Riga and St Petersburg' participate in the' traffic on the Rhine'. The boats which ply up and down the river itself, without venturing upon the open sea, are mostly craft of 100 to 200 tons, owned, in the great majority of cases by their captains, men principally of German or Dutch nationality. This fleet is computed to humber some 8500 craft, with an aggregate capacity of over 2 million tons, of which about one-tenth are steamships. The traffic at the chief German ports of the river aggregated 4,489,000 tons in 1870, but by 1900 this had grown to a total of 17,000,000 tbns, thus distributed : Ruhrort, 6,512,000 tons; Duisburg, 3,000,000 tons; Cologne, 1,422,000 tons; and Mannheim, 6,021,000 tons. These are not the only ports on the river; a large trade is also done at Kehl, Maxau (for Karlsruhe), Ludwigshafen, Mainz, Bonn, Rotterdam and a host of smaller places. The amount of 'traffic which passed the town of Emmerich near the Dutch frontier, both ways, increased from an annual average of about 6 million tons in 1881-85 to over 21 1 million tons in 1899. Notwithstanding the inherent diffi- culties of construction caused by the great variations in the level of the stream, amounting sometimes to 20 ft. or more, the chief ports of the Rhine are admirably constructed, and well equipped with modern contrivances for loading and unloading vessels. Boats carrying as much as 600 tons are often able to proceed as far up stream as Strassburg, and smaller craft get as far as Hilningen, a little above Basel, Large passenger boats ply regularly between Mainz and Diisseldorf, and sometimes extend their journeys as high up as Mannheim, and as far in the other direction as Rotterdam. The efforts of the river authorities are being directed to the deepen- ing and improvement of the navigable channel from the sea to Strassburg, the low-Water depths aimed at being 10 ft. from Rotterdam to the German frontier, and 10 ft. thence to Cologne; 8 ft. 3 in. from Cologne to St Goar, and 6 ft. 6 in. from St Goar to Mannheim. At present the Rhine in Holland has a depth of about 9 ft. and a width of 1200 to 1300 ft., though the Merwede branch exceeds this depth by 8 in. Altogether a sum approaching £2,500,000 was spent in Holland within the latter part of the 19th century on the improvement of the Rhine and its principal arteries; Above Mannheim the depth of the stream is always less than 5 ft., and generally varies between that figure and 4 ft. 6 in. The difficulty of ascending the rapids near Bingen is usually surmounted by the help of steam hauling machinery placed on the

bank, though powerful tugs have also come into use for this purpose. The work of blasting out the rocks which at that spot projected in the bed of the river, begun in 1830, was continued down to the year 1887, so that now there are two navigable channels of sufficient depth for all vessels which ply up and down that part of the stream. One of the most interesting features of the Rhine navigation is afforded by the huge rafts of timber that are floated down the river. Single tree trunks sent down to the Rhine by the various tributaries are united into small rafts as they reach the main stream; and these again are fastened together to form one large raft about Andernach. Though not so large as formerly, these timber rafts are still sometimes 400 or 500 ft. in length, and are navigated by 200 to 400 men, who live in little huts on the raft, forming actual floating villages. On reaching Dort the rafts are broken up and sold, a single raft sometimes producing as much as £30,000. The voyage from Bingen to Dort takes from one to six weeks, and the huge unwieldy structures require to be navigated with great care. The commerce carried on by the river itself is supplemented by the numerous railways, which skirt its banks and converge to its principal towns. Before the introduction of railways there were no permanent bridges across the Rhine below Basel; but now trains cross it at about a dozen different points in Germany and Holland. ‘

History. — Politically the Rhine has always played a great part. The whole valley seems to have been originally occupier! by Celtic tribes, who have left traces of their presence on the contents of tombs and in the forms of names (Moguntiacum

or Mainz, Borbetomagus or Worms); but at the beginning of the historical period we find the Celts everywhere in retreat before the advancing Teutons. Probably the Teutonic pressure began as early as the 4th century before Christ, and the history of the next few hundred years may be summed up as the gradual substitution of a Germanic for a Celtic population along the banks of the Rhine. Its second historical period begins with the advent of the Romans, who stemmed the advancing Teutonic tide. Augustus and his successors took good care to fortify the Rhine carefully, and a large proportion of the Roman legions were constantly in garrison here. For two hundred years the Rhine formed the boundary between the Roman empire and the Teutonic hordes; and during that period the left or Roman bank made prodigious strides in civilization and culture. The wonderful Roman remains at Trier and elsewhere, the Roman roads, bridges and

aqueducts, are convincing proofs of what the Rhine gained from Roman domination. This Roman civilization was, however, destined to be swamp,ed by the current of Teutonic immigration, which finally broke down the barriers of the Roman empire and overwhelmed the whole of the Rhenish district. Under Charlemagne, whose principal residence was in Aix-la-Chapelle, the culture of the Rhine valley again began to flourish, its results being still to be traced in the important architectural remains of this period. At the partition of the domains of Charlemagne in a.d. 843 the Rhine formed the boundary between Germany and the middle kingdom of Lotharingia; but by 870 it lay wholly within the former realm. For nearly eight hundred years it continued in this position, the frontier of the German empire coinciding more or less with the line of the Rhone. During the early middle ages the bank of the Rhine formed the most cultured part of Ger- many, basing its civilization on its Roman past. The Thirty Years' War exercised a most prejudicial effect upon the district of the Rhine; and the peace of Westphalia gave France a footing on the left bank of the hitherto exclusively German river by the acquisition of Alsace. The violent seizure of Strassburg by France in 168 1 was ratified by the peace of Ryswick in 1697, which recognized the Rhine as the boundary between Germany and France from Basel to about Germersheim. It was an easy inference for the French mind that the Rhine should be the boundary throughout and the Gaul of Caesar restored. This ideal was realized in 1801, when the whole of the left bank of the Rhine was formally ceded to France. The congress of Vienna (1815) restored the lower part of the Rhenish valley to Germany, but it was not till the war of 1870-71 that the recovery of Alsace and Lorraine made the Rhine once more " Germany's river, not Germany's frontier." In the military history of all these centuries constant allusion is made to the Rhine, its passages and its fortresses. Every general who has fought in its neighbourhood has at one time or another had to provide for a crossing of the Rhine, from Julius Caesar, who crossed it twice, down to our own time. The wars carried on here by Louis XIV. are still remembered in the Rhine district, where the devastations of his generals were of the most appalling descrip- tion; and scarcely a village or town but has a tale to tell of the murder and rapine of this period.

The Rhine in Literature. — The Rhine has always exercised a peculiar sort of fascination over the German mind, in a measure and in a manner not easily paralleled by the case of any other river. " Father Rhine " is the centre of the German's patriotism and the symbol of his country. In his literature it has played a prominent part from the Nibelungenlied to the present day; and its weird and romantic legends

have been alternately the awe and the delight of his childhood. The Rhine was the classic river of the middle ages; and probably the Tiber alone is of equal historical interest among European rivers. But of late years the beauties of the Rhine have become sadly marred; the banks in places, especially between Coblenz and Bonn, disfigured by quarrying, the air made dense with the smoke of cement factories and steam-tugs, commanding spots falling a prey to the speculative builder and villages growing into towns.

See Daniel, Deutschland: Beyerhaus, Der Khein von Strassburg bis zur hollandischen Grenze (Coblenz, 1902); Mohr, Die Flosserei auf dent Khein (Mannheim, 1897) ; C. Eckert, Rheinschiffahrt im igten Jahrhundert; Horn, Der Rkein, Geschichte und Sagen seiner Burgen (Stuttgart, 1893); Treutlein, Die neueren Deutschen Rhein-stromstudien und ihre Ergebnisse (in Ausland, 1893) ; A. Chambailu, Die Stromveranderungen des Niederrheins seit der vorromischen Zeit (Cologne, 1892), and handbooks of Baedeker, Meyer and Woerl. .

0- F. M.; P. A. A.)

RHINE PROVINCE, or Rhineland, the most westerly province of the kingdom of Prussia, bounded on the N. by Holland, on the E. by the Prussian provinces of Westphalia and Hesse-Nassau, and the grand duchy of Hesse-Darmstadt, on the S.E. by the Bavarian Palatinate, on the S. and S.W. by Lorraine, and on the W. by Luxemburg, Belgium and Holland. The small district of Wetzlar in the midst of the province of Hesse also belongs to the Rhine Province, which, on the other hand, surrounds the Oldenburg principality of Birkenfeld. The extent of the province is 10,423 sq. m.; its extreme length, from north to south, is nearly 200 m., and its greatest breadth is just under 90 m. It includes about 200 m. of the course of the Rhine, which forms the eastern frontier of the province from Bingen to Coblenz, and then flows through it in a north- westerly direction. *

The southern and larger part of the Rhine province, belong- ing geologically to the Devonian formations of the lower Rhine, is hilly. On the left bank are the elevated plateaus of the Hunsruck and the Eifel, separated from each other by the deep valley of the Mosel, while on the right bank are the spurs of the Westerwald and the Sauerland, the former reaching the river in the picturesque group known as the Seven Mountains {Siebengebirge). The highest hill in the province is the Walder- beskqpf (2670 ft.) in the Hochwald, and there are several other summits above 2000 ft. on the left bank, while on the right there are few which attain a height of 1600 ft. Most of the hills are covered with trees, but the Eifel (q.v.) is a barren and bleak plateau.

To the north of a line drawn from Aix- la-Chapelle to Bonn the province is flat, and marshy districts occur near the Dutch frontier. The climate varies considerably with the configuration of the surface. That of the northern lowlands and of the sheltered valleys is the mildest and most equable in Prussia, with a mean annual temperature of 50° Fahr., while on the hills of the Eifel the mean does not exceed 44 , The annual rainfall varies in the different districts from 1 8, to 32 inches. Almost the whole province belongs to the basin of the Rhine, but a small district in the north-west is drained by affluents of the Meuse. Of the numerous tributaries which join the Rhine within the province, the most important are the Nahe, the Mosel and the Ahr on the left bank, and the Sieg, the Wupper, the Ruhr and the Lippe on the right. The only lake of any size is the Laacher See, the largest of the " maare " or extinct crater lakes of the Eifel.

Of the total area of the Rhine province about 45% is occupied by arable land, 16% by meadows and pastures, and 31% by forests. Little except oats and potatoes can be raised on the high-lying plateaus in the south of the province, but the river-valleys and the northern lowlands are extremely fertile. The great bulk of the soil is in the hands of small proprietors, and this is alleged to have had the effect of somewhat retarding the progress of scientific agriculture. The usual cereal crops are, however, all grown with success, and tobacco, hops, flax, rape, hemp and beetroot (for sugar) are cultivated for commercial purposes. Large quantities of fruit are also produced. The vine-culture occupies a space of about 30,000 acres, about half of which are in the valley of the Mosel, a third in that of the Rhine itself, and the rest mainly on the Nahe • and the Ahr. The choicest varieties of Rhine wine, however, such as Johannisberger and Steinberger, are produced higher up the river, beyond the limits of the Rhine province.* In the hilly districts more than half the surface is sometimes occupied by forests, and large plantations of oak are formed for the use of the bark in tanning. Considerable herds of cattle are reared on the rich pastures of the lower Rhine, but the

number of sheep in the province is comparatively small, and is, indeed, not greatly in excess of that of the goats. The wooded hills are well stocked with deer, and a stray wolf occasionally finds its way from the forests of the Ardennes into those of the Hunsruck. The salmon fishery of the Rhine is very productive, and trout abound in the mountain streams.

The great mineral wealth of the Rhine province probably furnishes its most substantial claim to the title of the ” richest jewel in the crown of Prussia.” Besides parts of the carboni- ferous measures of the Saar and the Ruhr, it also contains important deposits of coal near Aix-la-Chapelle. Iron ore is found in abundance near Coblenz, the Bleiberg in the Eifel possesses an apparently inexhaustible supply of lead, and zinc is found near Cologne and Aix-la-Chapelle. The mineral products of the district also include lignite, copper, manganese, vitriol, lime, gypsum, volcanic stones (used for millstones) and slates. By far the most important item is coal. Of the numerous mineral springs the best known are those of Aix-la- Chapelle and Kreuznach.

The mineral resources of the Prussian Rhine province, coupled with its favourable situation and the facilities of transit afforded by its great waterway, have made it the most important manufacturing district in Germany. The industry is mainly concentrated round two chief centres, Aix-la-Chapelle and Dusseldorf (with the valley of the Wupper), while there are naturally few manufactures in the hilly districts of the south or the marshy flats of the north. The largest iron and steel works are at Essen, Oberhausen, Duisburg, Dusseldorf and Cologne, while cutlery and other small metallic wares are extensively made at Solingen, Remscheid and Aix-la-Chapelle. The cloth of Aix-la-Chapelle and the silk of Crefeld form important articles of export. The chief industries of Elberfeld- Barmen and the valley of the Wupper are cotton-weaving, calico-printing and the manufacture of turkey red and other dyes. Linen is largely made at Gladbach, leather at Malmedy, glass in the Saar district and beetroot sugar near Cologne. Though the Rhineland is par excellence the country of the vine, beer is largely produced; distilleries are also numerous, and large quantities of sparkling Moselle are made at Coblenz, chiefly for exportation to England. Commerce is greatly aided by the navigable rivers, a very extensive network of rail- ways, and the excellent roads constructed during the French regime. The imports consist mainly of raw material for working up in the factories of the district, while the principal exports are coal, fruit, wine, dyes, cloth, silk and other manufactured articles of various descriptions.

The population of the Rhine province in 1905 was 6,435,778, including 4,472,058 Roman Catholics, 1,877,582 Protestants and 55,408 Jews. The Roman Catholics muster strongest on the left bank, while on the right bank about half the population is Protestant. The great bulk of the population is of Teutonic stock, and about a quarter of a million are of Flemish blood. On the north-west frontier reside about 10,000 Walloons, who speak French or Walloon as their native tongue. The Rhine province is the most thickly populated part of

Prussia, the general average being 617 persons per sq. m. The province contains a greater number of large towns than any other province in Prussia. Upwards of half the population are sup- ported by industrial and commercial pursuits, and barely a quarter by agriculture. There is a university at Bonn, and elementary education is especially successful. For purposes of administration the province is divided into the five districts of Coblenz, Dusseldorf, Cologne, Aix-la-Chapelle and Trier. Coblenz is the official capital, though Cologne is the largest and most important town. Being a frontier province the Rhine- land is strongly garrisoned, and the Rhine is guarded by the three strong fortresses* of Cologne with Deutz, Coblenz with Ehrenbreitstein, and Wesel. The province sends 35 members to the German Reichstag and 62 to the Prussian house of representatives.

History. — The present Prussian Rhine province was formed in 1815 out of the duchies of Cleves, Berg, Gelderland and Julich,

the ecclesiastical principalities of Trier and Cologne, the free cities of Aix-la-Chapelle and Cologne, and nearly a hundred small lord- ships and abbeys. At the earliest historical period we find the territories between the Ardennes and the Rhine occupied by the Treviri, the Eburones and other Celtic tribes, who, however, were all more or less modified and influenced by their Teutonic neigh- bours. On the right bank of the Rhine, between the Main and the Lahn, were the settlements of the Mattiaci, a branch of the Germanic Chatti, while farther to the north were the Usipetes and Tencteri. Julius Caesar conquered the tribes on the left bank, and Augustus established numerous fortified posts on the Rhine, but the Romans never succeeded in gaining a firm footing on the right bank. As the power of the Roman empire declined the Franks pushed forward along both banks of the Rhine, and by the end of the 5th century had regained all the lands that had formerly been under Teutonic influence. The German conquerors of the Rhenish districts were singularly little affected by the culture of the pro- vincials they subdued, and all traces of Roman civilization were submerged in a new flood of paganism. By the 8th century the Frankish dominion was firmly established in central Germany and northern Gaul. On the division of the Carolingian realm the part of the province to the east of the river fell to the share of Ger- many, while that to the west remained with the evanescent kingdom of Lotharingia. By the time of Otto I. (d. 973) both banks of the Rhine had become German, and the Rhenish territory was divided between the duchies of Upper and Lower Lorraine, the one on the Mosel and the other on the Meuse. Subsequently, as the central power of the German sovereign became weakened, the Rhineland followed the .general tendency and split up

into numerous small independent principalities, each with its separate vicissitudes and special chronicles. The old Lotharingian divisions passed wholly out of use, and the name of Lorraine became restricted to the district that still bears it. In spite of its dismembered condition, and the sufferings it underwent at the hands of its French neigh- bours in various periods of warfare, the Rhenish territory prospered greatly and stood in the foremost rank of German culture and progress. Aix-la-Chapelle was fixed upon as the place of corona- tion of the German emperors, and the ecclesiastical principalities of the Rhine bulk largely in German history. Prussia first set foot on the Rhine in 1609 by the joint occupation of Cleves; and about a century later Upper Gelderland and Mors also became Prussian. At the peace of Basel in 1795 the whole of the left bank of the Rhine was resigned to France, and in 1806 the Rhenish princes all joined the Confederation of the Rhine. The congress of Vienna assigned the whole of the lower Rhenish districts to Prussia, which had the tact to leave them in undisturbed possession of the liberal institu- tions they had become accustomed to under the republican rule of the French.

RHINOCEROS, the designation for such perissodactyle (odd-toed) ungulate mammals as carry one or more horns on the head, and their extinct relatives (see Perissodactyla). Rhinoceroses are of large size and massive build, but have little intelligence, and are generally timid in disposition, though ferocious when wounded or brought to bay. The African species use the nasal horns as weapons, with which they strike and toss their assailant, but the Asiatic rhinoceroses employ their sharp lower tusks much as does a boar. Rhinoceroses are dull of sight, but their hearing and scent are remarkably acute. They feed on herbage, shrubs and leaves of trees, and, like so many other large animals which inhabit hot countries, sleep the greater part of the day, and are most active in the cool of the evening or even during the night. Some are found in more or less open plains, while others inhabit swampy districts. Members of the group have existed in both east and west hemispheres since the beginning of the Miocene period; but in America they all became extinct before the end of the Pliocene period, and in the Old World their distribution has become greatly restricted. They are, for instance, no longer found in Europe and North Asia, but only in Africa and in portions of the Indian and Indo-Malayan regions. Living rhinoceroses may be arranged in three groups: (1) With a single nasal horn, and very thick skin, which is raised into strong, definitely arranged ridges or folds. In this group there are two well-marked species. The Indian rhinoceros {Rhinoceros unicornis), the largest of the Asiatic forms, is the most’ widely known, from its being exhibited in zoological gardens. A famous rhinoceros

presented to the Zoological Society of London in July 1864 lived till December 1904. This species stands from 5 ft. to 5 ft. 9 in. at the shoulder and is blackish grey in colour; the horn rarely exceeds a foot in length, but one in the British Museum measures 19 in. This species is now only met with in a wild

state in the Assam plain, though it formerly had a wider range.

The first rhinoceros seen alive in Europe since the time when these animals, in common with nearly all the large remarkable beasts of both Africa and Asia, were exhibited in the Roman shows, was of this species. It was sent from India to Emmanuel, king of Portugal, in 1ˆ13; and from a sketch taken in Lisbon, Albert Durer composed his celebrated but fanciful engraving, which was reproduced in so many old books on natural history. This species chiefly frequents swampy grass jungle and is fond of a mud-bath. According to General A. H. Kinloch, it is hunted by ” tracking the animal on a single elephant until he is at last found in his lair, or perhaps standing quite unconscious

Fig. 1. — Indian Rhinoceros (Rhinoceros unicornis). This and the following illustrations are reduced from drawings by J. Wolf, from animals in the London Zoological Society’s Gardens.

Fig. 2. — Javan Rhinoceros (Rhinoceros sondaicus).

of danger; or by beating him out of the jungle with a line of elephants, the guns being stationed at the points where he is most likely to break cover. In the latter case if is necessary to have reliable men with the beaters, who can exercise authority and keep them in order, for both mahouts and elephants have the greatest dread of the huge brute, who appears to be much more formidable than he really is.” The Javan rhinoceros (Rhinoceros sondaicus) is distinguished by its smaller size, and a different arrangement of the skin-folds (as may be seen by comparing figs. 1 and 2). The horn in the female is little developed, if not altogether absent. This species has a more extensive geographical range than the last, being found in the Bengal Sundarbans near Calcutta, Burmq,, the Malay, Peninsula, Java, Sumatra and Borneo. The colour is uniform dusky grey. A female obtained in the Sundarbans

stood 5 ft. 6 in. high. This species is more an inhabitant of tree-forest

than of grass, jungle, and its usual habitat appears to be in hilly countries. ■:’■’.■-■■

In the Second section there is a well-developed nasal, and a small frontal horn separated by an interval. The skin is thrown into folds, but these are not strongly marked, and lower tusks are present. This group or genus is represented at the present day only by the Sumatran rhinoceros, Rhinoceros (Dicer orhinus) sumatrensis, with its sub-species. It is the smallest of all the species, and its geographical range is nearly the same as that of the Javan species, though not extending into Java; it has been found in Assam, Chittagong, Burma, the Malay Peninsula, Sumatra and Borneo. The colour varies from earthy brown to blackish, and the greater part of the body is thinly covered with hair, and the ears and tail are fringed. The average height of adults is from 4 ft. to 4 ft. 6 in. This species inhabits forests, and ascends hills to considerable elevations; it is shy and timid, -but easily tamed even when adult. A specimen from Chittagong acquired in 1872 by the Zoological Society of London was named R. lasiotis, as it differed from the typical form by its larger size, paler and browner colour, smoother skin, longer, finer and redder hair, and the long fringe of hair on the ears. It is now recognized as a local race.

Fig. 3. — Black or common African Rhinoceros (Rhinoceros

(Diceros) bicornis).

To the third group or genus (Diceros) belong the two African rhinoceroses, which have two horns, the skin without definite folds, and no lower tusks. The black rhinoceros (Rhinoceros (Diceros) bicornis) is the smaller of the two, and has a pointed prehensile upper lip. It ranges through the wooded and watered districts of Africa, from Abyssinia in the north to the Cape Colony, but its numbers are yearly diminishing, owing to the opening up of the country. It feeds exclusively on leaves and branches of bushes and small trees, and chiefly frequents the sides of wood-clad rugged hills. Specimens in which the posterior horn has attained a length as great as or greater than the anterior have been separated under the name of R. keitloa, but the characters of these appendages are too variable for specific distinctions. The black rhinoceros is more rarely seen in menageries in Europe than either of thei Asiatic species, but one lived in the gardens of the London Zoological Society from

1868-1891.

Lastly we have the white — Burchell’s, or square-mouthed —

rhinoceros (Rhinoceros (Diceros) simus), the largest of the five, and differing from the other species in having a square truncated upper Up. In conformity with the structure of the mouth, this species lives entirely by browsing on grass, and is therefore more partial to open countries or districts where there are broad grassy valleys between the tracts of bush. In its old haunts in

the south it is practically extinct;. but ten were reported from a reserve in Zululand in 1902. A detached colony exists, however, near Lado, on the Upper Nile. No specimen of this species has ever been brought alive to Europe. Mr F. C. Selous gives the following description of its habits: —

“The square- mouthed rhinoceros is a huge, ungainly looking beast, with a disproportionately large head, a large male stand- ing 6 ft. 6 in. at the shoulder. Like elephants and buffaloes they lie asleep during the heat of the day, and feed during the night and in the cool hours of early morning and evening. Their sight is very bad ; but they are quick of hearing, and their scent is very keen; they are, too, often accompanied by rhinoceros birds, which, by running about their heads, napping their wings, and screeching at the same time, frequently give them notice of the approach of danger. When disturbed they go off at a swift trot, which sOon leaves all pursuit from a man on foot far behind ; but if chased by a horseman they break into a gallop, which they can keep up for some distance. However, although they run very swiftly, when their size and heavy build is considered, they are no match for an average good horse. They are, as a rule, very easy to shoot on horseback, as, if one gallops a little in front of and on one side of them, they will hold their course, and come sailing past, offering a magnificent broadside shot, While under similar circumstances a prehensile-lipped rhinoceros will usually swerve away in such a manner as only to present his hind-quarters for a shot. When either walking or running, the square-mouthed rhinoceros holds its head very low, its nose nearly touching the ground. When a small calf accompanies its mother, it always runs in front and she appears to guide it by holding the point of her horn upon the little animal’s rump; and it is perfectly Wonderful to note how in all sudden changes of pace, from a trot to a gallop, or vice versa, the same position is always exactly maintained. During the autumn and winter months (i.e. from March to August) the square-mouthed rhinoceros is usually very fat; and its meat is then most

excellent, being something like beef, but yet having a peculiar flavour of its own. The part in greatest favour among hunters is the hump, which, if cut off whole and roasted just as it is in the skin, in a hole dug in the ground, would, I think, be difficult to match either for juiciness or flavour.” (W. H. F. ; R. L.*)

RHINTHON (c. 323-285 B.C.), Greek dramatist, son of a potter. He was probably a native of Syracuse and after- wards settled at Tarentum. He invented the hilarotragoedia, a burlesque of tragic subjects. Such travesties were also called phlyaces ,(” fooleries “) and their writers phlyacographi. He was the author of thirty-eight plays, of which only a few titles (Amphitryon, Heracles, Orestes) and lines have been preserved, chiefly by the grammarians, as illustrating dialectic Tarentine forms. The metre is iambic, in which the greatest licence is allowed. The Amphitruo of Plautus, although probably imitated from a different writer (Archippus of the Middle Comedy), may be taken as a specimen of the manner in which such subjects were treated. There is no doubt that the hilaro- tragoedia exercised considerable influence on Latin comedy, the Rhinthonica (i.e. fabula) being mentioned by various authorities amongst other kinds of drama known to the Romans. Scenes from these travesties are probably represented in certain vase paintings from Lower Italy, for which see H. Heydemann, ” Die Phlyakendarstellungen auf bemalten Vasen,” in Jahrbuch des archaologischen Instituts, i. (1886).

Fragments in monograph by E. Volker (Leipzig, 1887); see also E. Sommerbrodt, De Phlyacographia Graecorum (Breslau, 1875); W. Christ, Geschichte der griechischen Litteratur (1898).

RHIZOPODA, the name given by Dujardin (pro parte, 1838) to a group of Sarcodine Protozoa. They are distinguished by their pseudopods, simple or branched, passing by wide bases into the general surface, never fine radial nor fusing into complex networks; skeleton absent or a simple shell (” test,” ” theca “), never (?) a calcareous shell, nor represented by a siliceous net- work, nor spicules. Reproduction by binary fission; by division or abstriction of buds after the body has become multi-nucleate; or by the resolution of the body into numerous uninucleate zoospores (amcebulae or flagellulas) which may conjugate as gametes; Plasmodium formation unknown; encystment (in ” resting cysts ” or ” hypnocysts “) common. Without a knowledge of the history it is impossible to distinguish a naked Lobose from the Amoebula (pseudopodiospore) of a Myxomycete or Proteomyxan. As to the name, Dujardin included the thecate Lobosa, the Filosa, and the Reticularia or Foraminifera

(q.v.). The latter had already received the name Foraminifera (for their shells) from d'Orbigny; and as it is impossible to separate naked from thecate Lobosa we have merged his Amoebina (Amibiens) in the larger group. The Filosa were removed by Lang from the Reticularia; in habit and test they are inseparable from the Lobosa; and though their cytoplasm approximates to that of Reticularia, their ectosarc is much less granular, though not free from granules as stated by Lang.

The majority of Rhizopoda are fresh-water forms, some occurring in the film of water on mosses, among Sphagnum, or about the bases of grass-haulms; many, however, are exclusively marine. The aquatic forms generally may lurk among Confervae or higher weeds, or lie in the bottom of decomposing or excre. mentitious matter in still or slow-flowing waters. Of these some may become temporarily pelagic, floating up by the formation of gas vacuoles (containing probably C0 2) in the cytopla&m. It is easy to verify this by placing Arcella (fig. 1, 7) ii? a drop of water. on a glass cover and inverting this over a glass ring; the Arcella sink to the free convex surface of the drop and escape from this most unnatural position by secreting gas- vacuoles; when they float up to contact with the glass cover, so as to touch it by the convex back of the shell, they put forth long pseudo- podia which attach themselves to the glass and by their con- traction turn the animal over, so that it can crawl over (i.e. under) the glass. Amoeba (Entamoeba) histolytica, Schaudinn, is the cause of tropical dysentery and hepatic abscess in man. Pelomyxa (fig. 1, 5-6) is remarkable for containing symbiotic bacteria. Zooxanthellae (symbiotic green cells — Algae or Flagellates) occur in several species; and Paulinella contains two sausage-shaped blue-green bodies, " chromatophores," which are probably symbiotic Cyanophyceae. The shell, even when not a simple membrane, has always a continuous inner membrane of a complex nitrogenous substance containing sulphur, allied to keratin and termed pseudochitin. The outer layer when present is composed of little hollow prisms (Arcella, fig. 1, 7), sand, or inorganic matter first swallowed by the animal (Difflugia, Pseudodifflugid) , sometimes partially digested (Lecquereuxia), or else of plates secreted as "reserve plates" within the cytoplasm of the animal Cyphoderia (fig. 6, B), Quadrula, Nebelia, Euglypha (figs. 4, 6, A), &c. In Quadrula irregularis alone are the plates said to be calcareous; elsewhere they are always siliceous and simply refractive, so that the silica is probably hydrated (opal). The cement is possibly of silicified pseudochitin. This material is often permeated by a ferric oxide or hydrate, even when it is not coloured rusty brown. Shell formation of the membranous test is by simple surface- excretion; under budding we describe its accomplishment in the aggregated shells.

The ” pylome,” or aperture for the protrusion of the proto- plasm, is usually single. There are two pylomes at opposite poles in several Filosa (Ditrema), hence united by some authors into a distinct family (fig. 7, 1, 5, 11), and in the gelatinous theca of Trichosphaerium (fig. 5) are numerous permanent pylomic pores. The nucleus is variable in form and character. In Amoeba binucleata two nuclei are always present; and some genera are permanently plurinucleate (Pelomyxa, Arcella, fig. 1,7). It often gives forth fragments into the cytoplasm, the ” chromidia” of R. Hertwig, which, as in Foraminifera (q.v.), may play an important part in reproductive processes. The contractile vacuole (there are two in Arcella, fig. 1, 7) in actively progressing Rhizopods always discharges at the hinder end. Absent or sluggish in marine forms, it is of constant occurrence in all fresh-water Rhizopods except Pelomyxa.

The pseudopods vary greatly in type. In Amoeba princeps (fig. 1, 4) they are mere promontory -like extensions of the body; in A. radiosa (fig. 1, 1-3) and Trichosphaerium (fig. 5) they are distinct slender processes, tapering, and either blunt or finely pointed at the apex; in Pelomyxa (fig. 1, 5, 6) as in A. (Litha- moeba) discus (fig. 2) they are ” eruptive, ” hemispherical, formed apparently by the rupture of the ectoplasm, and the outpouring of the endoplasm which at once differentiates a clear outer layer as a new ectoplasm; in Amoeba Umax during

progression the posteriorly and

body is roughly oval with the apex truncated the wide anterior end forming a single anterior

Fig. 1. — 1-3, Amoeba radiosa (Dactylosphaerium polypodium), M. Schultze, in three stages of equal binary fission during fifteen minutes; a, nucleus; b, contractile vacuole (after M. Schultze).

4, Amoeba princeps, Ehr. ; a, nucleus; b, c, vacuoles; food vacuoles shaded (after Auerbach). 5, 6, Pelomyxa palustris:

5, a small example & in. in diameter, moderately extended; 6, a portion more highly magnified; a, ectosarc; b, vacuoles; c,

d, pseudopods formed by eruption and containing endosarc;

e, vesicles containing a solution of glycogen; /, nuclei; the numerous little pods are symbiotic bacteria. 7, Arcella vulgaris: a, shell; b, cytoplasm; c, lobose pseudopods; d, d, d, 3 nuclei; e, one of the contractile vacuoles; the dark shaded circles represent bubbles or gas vacuoles. 8, Cochliopodium pellu- cidum: a, “vesicular” nucleus, with dense central mass or ” karyosome ” (a frequent type of Prbtistic nucleus). (From Lankester.)

pseudopod. Progression chiefly takes place by a rolling over of the anterior end (fig. 3— see also Amoeba); but it may take place by the extension of a pseudopod, its attachment at the tip,

followed by its contraction to pull up the rest of the animal; this is well shown in the thecate species. Another mode is that of A. radiosa (fig. 1, 1-3), which can roll over on the tips of its stiff pseudopods. The pseudopods of the Filosa (figs. 6, 7) are branched, but less rich in granules, and less viscid than those of Foraminifera; they rarely anastomose, and never coalesce to form perforated plates.

A process whose relations to reproduction are not fully made out is that of ” plastogamy,” where two or more individuals unite completely by their cytoplasm, the nuclei remaining distinct; it may be temporary or permanent: in the latter case

Fig. 2. — Amoeba (Lithamoeba) discus (after Lankester). A, quiescent; B, putting forth eruptive pseudopods. ex., contractile vacuole through which the richly vacuolated cytoplasm is seen; /, food particles; cone., concretions, insoluble in dilute HC1 and KHO, soluble in strong HC1 ; n, nucleus.

determining, of course, a much more rapid increase of size than that due to growth. Thanks to the labours of F. Schaudinn, we now know the full life cycles of at least half a dozen species; previously we only knew with certainty of two modes of fission — equal constriction (Amoeba — fig. 1, 1-3) and bud-fission (Difflugia). As in other Sarcodina, chromidia, or fragments of nuclear substance budded off from the nucleus into the endo- plasm, play an important part in many reproductive processes. Equal binary fission is common. In the thecate forms, e.g. Difflugia, Euglypha (fig. 4), this is replaced by bud-fission; half the cytoplasm passes out through the pylome, and becomes

From Jenning’s Contributions to the Study of the Behavior of Lower Organisms, by permission of the Carnegie Institution of Washington, D.C.

Fig. 3. — 1, ideal perspective view o f left half of a crawling Amoeba; 2, diagram showing successive position of marked points on anterior end; 3, diagrammatic section, the arrows showing directions of absolute motion — the rate being indicated by the length of the shaft.

invested with its covering there; the enclosed ” reserve ” skeletal elements pass to the surface in order, so that the pylome of the new shell faces that of the old; the original nucleus divides in situ and one daughter nucleus passes into what we may call the bud-cytoplasm; the two daughters of the original cell, which we may call the ” bud-sister ” and the ” stock-sister ” respectively, now separate. In the plurinucleate forms a true bud-formation takes place, nucleate masses of cytoplasm being constricted off at the surface. A simultaneous resolution into uninucleate cells may affect the multinucleate species (or the multinucleate state of habitually uninucleate species), this is termed schizogony.

In Trichosphaerium (fig. 5) it occurs at the close of two

distinct periods in the life cycle which we may call A and B; the individuals of the A period being distinguished by the

From Calkin’s Protozoa, by permission of the Macmillan Co., New York.

Fig. 4. — Bud-fission of Euglypha alveolata. A, passing out of secreted plates to

surface of bud. B, bud completely invested ; nucleus preparing to divide by mitosis.

C, D, later stages.

presence of radiating spicules of $MgC0_3$ in the gelatinous theca; the resolution of period A is simple (fig. 5, 3) and the uninucleate

brood-cells are .amoebulae (pseudopodiospores) (fig. 5, 4) which grow into the multinucleate B type, with a nonspiculate theca (fig. 5, 5). The resolution of the B type is preceded by rapid multiplication of the nuclei by mitosis (fig. 5, 7), and the uninucleate cells are 2-fiagellate zoospores (fig. 5, 9). These pair with zoospores of a different brood to their own (fig. 5, io) (i.e. they are exogamous gametes); and the fusion

cell (fig. 5, 11) so formed is the starting-point of the A type (fig. 5, 12). Brood formation by resolution of a multinucleate individual has been observed or conjectured in Amoeba, &c.

A formation of numerous pseudopodiospores within Pelomyxa has been repeatedly described, and these have been seen to conjugate equally, the zygote becoming multinuclear. But the possibility of the alleged reproductive cells being parasites has not yet been fully ex- cluded.

Chlamydophrys stercorea is a small Filose, occurring in the faeces, of several mammals, but only forming its characteristic shell out- side the body; plastogamic monstrosities are frequent. The nucleus degenerates, and is expelled with some plasm. The chromidia remain inside the shell, and differentiate or aggregate into about eight nuclei; the cell is then resolved into as many 2-flagellate swarmers, which escape as isogamous exogametes. The zygote becomes surrounded by a brown cyst. When

From The Cambridge Natural History, after Schaudinn, vol. permission of Macmillan & Co. Ltd.

Protozoa, by

FlG. 5. — Trichosphaerium sieboldii. 1, Adult of “A” form; 2, its multiplication by fission and gemmation; 3, resolution into uninucleate amoeboid zoospores; 4, development (from zoospores of ” A “) into ” B ” form (5); 6, its multiplication by fission -and gemmation; 7, its resolution after nuclear bipartition into minute 2-flagellate zoospores (or exogametes); 8, liberation of gametes; 9, 10, more highly magnified pairing of gametes of different origin; II, 12, zygote developing into ” A ” form.

From Eugene Penard, Faune rkizopodique du bassin du Lbnan.

Fig. 6.— A, Euglypha alveolata. 1, Living animal; a, guitar- shaped outline of body, retracted from shell for emission of pseudo- pods; b, b, reserve plates in body for Offspring in next bud-fission; 2, empty shell; 3, round plates; 4, 5, adoral plates with more or less marked denticulations ; 6, oval plates; 7, transverse section of shell, showing circle of reserve plates within.

B, Sphenoderia lenta. 1, Animal, lateral view; 2, same from above; 3, shell, lateral view; 4, shell, oral view of the pylome; 5, optical section through empty shell and pylome; 6, nucleus; 7, surface view of pylome (dotted lines represent its opposite side as seen at a lower

focus).

swallowed by a mammal it develops, and the ordinary form is found in the excreta.

Centropyxis' aculeata is closely allied to Difflugia'. It divides by fission and also at the end of a cycle by schizogony, the

FlG. 7. — Filosa and Foraminifera of similar habit. I. Diplo- phrys archeri (moor pools); a, nucleus; b, contractile vacuoles; c, oil drop. 2. Allogromia fluviatilis (freshwater Foraminifer) ; a, numerous nuclei; the elongated bodies are ingested diatoms. 3. Shepheardella taeniformis (marine Foraminifer), with retracted protoplasm; a, nucleus. 4. The same with expanded pseudopods. 5-9. Nucleus of same in various aspects as carried along in streaming protoplasm. 10. Amphitrema wrighti- anum (moor pools) ; shell membranous.encrusted with foreign bodies. II. Diaphorodon mobile {moor pools); a, nucleus.

offspring being amoebulae. In some these acquire a shell directly; in others a second brood division into four takes place, and it is only then that shells are formed. The latter conjugate as males with the former as females; and the fusion cell encysts within the approximated shells; it emerges as a naked amoeba after a period of rest, forms a shell and assumes the type of the

species. Other types of reproduction are known, Amoeba coli, an inhabitant of the gut of man y showing an endogamous pairing of closely related nuclei similar to that of Actinosphaerium (see Heliozoa).

Classification

Lobosa. — W. B. Carpenter. Cytoplasm with a clear ectosarc, not wetted by the medium; pseudopods never finely branching, usually rounded at the apex; nucleus single or multiple; shell (" test," " theca ") absent, gelatinous, membranous or of cemented granules of ingested sand, &c, or plates secreted in the endosarc.

Selected genera: § 1. Naked Amoeba (q.v.) (" Amibe," Bory), with the subgenera Dactylosphaerium, Hertwig and Lesser (fig. I, 1-3), with slender, pointed pseudopods; Lithamoeba, Lankester, always

containing inorganic granules (fig. 2). Pelomyxa, Greeff (fig. I , 5, 6), with blunt, eruptive pseudopods and numerous nuclei, -fa in. or more in diameter when contracted. A rcuothr jk, Claparede and Lachmahn, with one or more slender, very mobile, flagelliform pseudopods as well as the lobose ones.

§ 2. Test gelatinous, perforated by pseudopods: Amphizonella, Greeff; Trichosphaerium, Schneider (fig. 5).

§ 3. Test membranous: Cochliopodium, Hertwig and Lesser (fig. I, 8).

§ 4. Test ” chitinous,” sbagreened: Arcella, Stein (fig. I, 7).

§ 5. Test of ingested particles: Difflugia, Leclerc; Centropyxis, Stein; Lecqueureuxia, Schlumberger (shell material of diatomaceous tests fusedinto sausage-shaped masses).

§ 6. Test of secreted siliceous or chitinous plates: Quadrula, F. E. Schultze. (In Q. irregularis the plates are said to be cal- careous.)

Filosa. — A. Lang. Cytoplasm without definite ectosarc; pseu- dopods branching, tapering to fine tips, somewhat granular; test present in all known species and varying as in the Lobosa.

Selected genera: §1. Test membranous: Cromia, Dujardin (pro parte) ; Mikrogromia, Hertwig ; Diplophrys, Barker (fig. 7, 1); Ditrema, Archer; Amphitrema, Archer (fig. 7, 11); the last three have a mouth-like aperture (pylome) at either end of the test.

§ 2. Test of ingested or incrusted particles: Pseudodifflugia, Schlumberger; Diaphorodon, Archer (fig. 7, 12).

§ 3. Test of secreted plates : Euglyjiha, Dujardin (figs. 4, 6, A) ; sphenoderia lenta (fig. 6, B) ; PauUnella, Lauterborn.

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RHODE ISLAND, a North Atlantic state of the American Union, belonging to the New England group, and lying between 41 18′ and 42 3′ N. lat. and 71° 8′ and 71° 53′ W. long. 1 It is bounded, N. and E., by the state of Massachusetts; S., by the Atlantic Ocean; and W., by the state of Connecticut, from which it is separated in part by the Pawcatuck river. Rhode Island is the smallest state in the Union, having an extreme length, N. and S., of 48 m., an extreme width, E. and W., of 37 m., and a total area of 1248 sq. m., of which 181 sq. m. are water-surface.

Topography. — The region of which' Rhode Island is a part was at one time worn down to a gently rolling plain near sea- level, but has since been uplifted and somewhat dissected by stream action. As a result the topography is characterized by low, rounded hills, but is nowhere mountainous. Since the uplift and stream dissection a slight depression has allowed the sea to invade the lower portions of the river valleys, forming the bays known as Narragansett Bay, Providence "river," Sakonnet " river," &c. Glaciation has disturbed the river

1 Block Island, over which the jurisdiction of the state extends, lies 10 m. off the coast, and is not included within these limits.

systems, causing, the formation of numerous lakes and of the waterfalls which determined the situation of many of the manufacturing cities of the state.

In the N.W. is Durfee Hill, which attains an elevation of 805′ ft., and is the highest point within Rhode Island. The mean elevation for the entire state is 200 ft. The coast-line, including the shores of the bays and islands, is extensive ; its western portion is only slightly indented, but its eastern portion is deeply indented by Narragansett Bay, a body of water varying in width from 3 to 12m., and extending inland for about 28 m. The land surface E. of this bay is very gently rolling, but to the W. it consists of a somewhat

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more rugged upland which slopes gradually southward. Over the whole state there is a layer of drift deposited by the glaciers which once covered this region. This glacial material is in the form of a till or boulder clay, but in the lowlands, and especially along Narragansett Bay, it is generally overlaid by stratified drift de- posited by glacial streams. Within Narragansett Bay are the numerous islands characteristic of an area which has suffered com- paratively recent depression, the largest being Rhode Island (or Aquidneck), Conanicut Island and Prudence Island. Of these the most important is Rhode Island, 15 m. long and 3 m. wide, which has given the state its name. Lying about 10 m. off the coast and S. of the central part of the state is Block Island, a sandy tract 6 m. long and from 1 to 4 m. wide, with a rolling surface.

The rivers of the state are short and of no great volume, but they flow swiftly and are useful in supplying power for manu-

factories. The Providence riyer is really an arm of Narragansett Bay, into which flow the waters of the Pawtuxet and the Black- stone rivers. The latter stream at Pawtucket has a fall of about 50 ft., and the Pawtuxet river also has a number of falls along its, course. Mount Hope Bay is a north-eastern arm of Narragan- sett Bay, and is also the estuary of the Taunton river. The Sakon- net river is a long bay separating Aquidneck or Rhode Island from the mainland on the E. The Pawcatuck river is the largest stream in the western half of the state, and along the lower part of its course it forms the boundary between Rhode Island and Con- necticut.

Fauna and Flora. — The fauna of the state does not differ from that of southern Connecticut and eastern Massachusetts. The marine fauna is of economic importance. The woodland area of the state has been estimated (census of 1900) at 400 sq. m., or about 37% of the land area, but the trees are generally too small for timber. The most common varieties of trees are the oak, walnut and chestnut. There are a few stretches of pine forest, and in the S. the swamps are sometimes overgrown with cedar.

Climate. — Rhode Island has a more moderate climate than that of the northern sections of New England. There are no great extremes of either heat or cold, and a number of the towns and cities, especially Newport and Nar- ragansett Pier, have become noted summer resorts.

Narragansett Pier has a mean annual temperature of 49 , a mean summer tempera- ture (for June, July and August) of 68°, and a mean winter temperature (for December, January and February) of 29 . The mean annual temperature at Providence is 50°; the mean for the summer, 72°; and for the winter, 30°; while the highest and lowest tempera- tures ever recorded are respectively 102 and -9°. _ The mean annual rainfall is about 50 in., ranging from 47-4 in. at Narragansett Pier to 53-2 in. at Kingston.

Soils. — The boulder clay or ” hard pan ” of which most of the surface lands are composed, forms a very indifferent support for vege- tation, and consequently the state is not well’ adapted for the growing of crops.

Agriculture.— The acreage of improved farm land in Rhode Island decreased from 356,487 in 1850 to 137,354 in 1900, but the value of farm property (including land with improve ments, implements, machinery and live stock) increased in the same period from $19,100,640 to $26,989,189. The number of farms remained about the same — 5385 in 1850 and 5498 in 1900; but the average area decreased from 102 -9 acres to 82-9 acres. The value of farm products increased from $3,670,135 in 1879 to $6,333,864 in 1899. The average value of farms increased from $3547 in 1850 to $4909 in 1900. The number of persons engaged in agricultural pursuits in 1880 was 10,986, and in 1900, io,957-

The total acreage of cereals (barley, buck- wheat, Indian corn, oats, rye and wheat) de- creased from 19,575 acres in 1879 to 10,552 acres in 1899, and the total product of these crops decreased from 801,111 bu. in 1849 to 350,110 bu. in 1899,

The total number of neat cattle on farms decreased from 36,262 in 1850 to 30,696 in 1900, but the number of dairy cows increased from 18,698 to 23,660.

Fisheries. — Whaling was an established in- dustry in Rhode Island as early as 1723, an(* m I ‘ r31 t * le colonial assembly provided a bounty of five shillings a barrel for whale oil, and a penny a pound for whalebone. About 1750 sperm candles were first manufactured. In 1846 about 50 whaling vessels sailed from Rhode Island ports; but by the close of the century the industry had become practically extinct. In 1905 the number of persons employed in the general fisheries industry was 2212; and the value of the catch was $1,546,658, the largest items being: lobsters, $64,358; squeteague (weakfish), $86,478; scup, $138,030; and oysters (for market),

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Minerals. — Rhode Island’s mineral wealth is relatively slight. The total value * of all the mineral products of the state in 1907 was $937,384, and in 1908, $708,694, and of these totals granite

1 United States Geological Survey, Mineral Resources of the United States.

was valued in 1908 at $556,774. The value of the clay products, lime and talc, decreased from $245,378 in 1907 to $112,815 in 1908. The mining of iron ore was begun about 1767 in the vicinity of the present Cranston, and much of the metal was used in the making of cannon during the War of Independence, but the supply was soon exhausted. Near Tiverton and Cranston graphite has been quarried.

Manufactures. — Rhode Island is essentially a manufacturing state; of the 191,923 persons in the state engaged in gainful occupations in 1900, 101,162 (or 52.7%) were employed in manufacturing and mechanical pursuits. By the middle of the 17th century boat-building had become an established industry, and large vessels were built at Newport. In 1777 the state offered a large premium for every pound of steel, similar to German steel, made within its boundaries; and in 1789 a rolling and slitting mill was built near Providence. Cotton was first imported to Providence from Spain in 1785; a company to carry on cotton-spinning, formed at Providence in 1786, established there in the following year a factory con- taining a spinning jenny of 28 spindles (the first machine of the kind to be used in the United States), and also a carding machine and a spinning frame with which was manufactured a kind of jean having a linen warp and a cotton filling. The fly shuttle was also apparently first introduced at Providence in 1788. The first calico printed in the United States was made at East Greenwich about 1794. The Providence Associa- tion of Mechanics and Manufacturers, incorporated in 1789, organized industrial development. The prohibition of the exportation from England of machinery, models or drawings retarded mechanical improvement, but in 1790 an industrial company was formed at Providence to carry on cotton spinning, and in December of that year there was

established at Paw- tucket a factory equipped with Arkwright machines constructed by Samuel Slater. This machinery was operated by water- power, then first used in the United States for the spinning of cotton thread; and from this may be dated the beginning of the factory system in Rhode Island. These machines were soon adapted to the spinning of wool, and in 1804 a woollen factory was built at Peacedale, South Kingston.. The first power- loom used in the United States was invented about 181 2, and was set up at Peacedale, in 1814, for the manufacture of woollen saddlegirths and other webbing. The first power-loom for cotton manufacture was set up in North Providence in 181 7. Textile manufacturing by improved methods was hardly well established in Rhode Island before 1825. The manufacture of jewelry, which was established in Providence in 1784, was greatly promoted ten years later by Nehemiah Dodge's in- vention of the process of " gold-filling," still further improved in 1846 by Thomas H. Lowe. The manufacture of silverware was begun in Providence soon after the close of the War of Independence.

Rhode Island's water powers have been its only natural resources which have aided in the development of its manu- factures, and its transportation facilities have always been inadequate, because of shallow water at Providence and scanty railway communication; but the state's manufacturing enters prises are of great importance.

In 1900 Rhode Island ranked 17th among the states in the value of its manufactured products, but led all of the states in the value per capita ($430). The total number of establishments in 1850 was 864; in 1890, 3377, and in 1900, 4189. In 1900 there were 1678 factories, and in 1905, 1617 factories. 1 The total capital in- vested in manufacturing in 1850 was $12,935,676; in 1890, $126,483,401, and in 1900, $183,784,587, of which $176,901,606 was in factories; in 1905 the capital invested in factories was $215,901,375. The value of all manufactured products in 1850 was $22,117,688; in 1890, $142,500,625, and in 1900, $184,074,378, of which $165,550,382 was the value of factory products; in 1905 the value of factory products was $202,109,583. The average number of employes in 1850 was 20,967; in 1890, 81,111; and in

1 The 1905 census of manufactures gives statistics only for estab- lishments under the factory system, excluding the hand trades, and gives factory statistics for 1905 and for 1900. The statistics given above for 1900 in comparison with 1905 are for factory pro- ducts.

1900, 98,813, of whom 88,197 were factory employes; in 1905 there were 97,318 factory employes.

Rhode Island ranked first in 1900 ($13,229,313) and in 1905 ($14,431,756) among the states of the United States in the value of jewelry, which was fourth in the value of the state's manu- factures; second in worsted goods (1900, $33,341,329; l>9°5. $44,477,596), which were first in value in the state's manufac- tures; and third in dyeing and finishing textiles (1900, $8,484,878; 1905, $9,981,457), which ranked fifth among the state's manu- factures; in the value of cotton goods (second in rank in the state) it fell from the fourth rank in 1900 ($24,056,175) to fifth rank in

1905 ($30,628,843), when the value of Rhode Island's product was less than that of Georgia. Other important manufactures were: combined textiles (not including flax, hemp and jute products) in 1900, $77,998,396; in 1905, $103,096,311; foundry and machine shop products in 1900, $13,269,086; in 1905, $16,338,512; woollen goods in 1900, $5,330,550; in 1905, $8,163,167; rubber boots and shoes in 1900, $8,034,417; electrical machinery, apparatus and supplies in 1900, $5,113,292; in 1905, $5435.4741 silversmithing and silverware in 1900, $4,249,190; in 1905, $5,323,264; gold and silver, reducing and refining (not from ore) in 1900, $3,484,454; in 1905, $4,260,698; cotton small wares in 1900, $2,379,500; in 1905, $3,944,607; hosiery and knit goods in 1900, $2,713,850; in 1905, $3,344,655; silk and silk goods in 1900, $1,311,333; in 1905, $2,555,986. In V905, 1 146 establishments reported power, as against 1360 in 1900 — a decrease of 15-7 , but the total horsepower increased from 155,545 to 190,777, or 22-7.

Transportation. — Steam railway mileage in Rhode Island in- creased from 68 m. in 1850 to 209 m. in 1900, and to 211 m. on the 1st of January 1909 (the New York, New Haven & Hartford being the only railway system of any importance in the state). In 1910 a charter was granted to the Grand Trunk system. In 1902 the mileage of street and electric railways (most of them interurban) operated in the state was 336-33 m. The state has a natural water outlet in the Providence river and Narragansett Bay, but there is lack of adequate dockage in Providence harbour, and insufficient depth of water for ocean traffic. _ The ports of entry are Providence (by far the largest, with imports valued at $1,893,551, and exports valued at $12,517 in 1909), Newport and Bristol.

Population. — The total population of Rhode Island in 1880 was 276,531; in 1890, 345,5°6; in 1900, 428,556; and in 1910, 542, 610. 2 The increase from 1880 to 1890 was 24-9%, from 1890 to 1900 24%, and from 1900 to 1910, 26-6%. Of the total population in 1900, 285,278 were native whites, 134,519 were foreign-born, 9092 were

negroes, 366 were Chinese, 35 were Indians and 13 were Japanese. Of the foreign-born, 35,501 were Irish, 31,533 were French-Canadians and 22,832 were English. Of the total population, 275,143 were of foreign parentage, i.e. either one or both parents were foreign-born — and 81,232 were of Irish parentage, both on the father's and mother's side, and, in the same sense, 49,427 were of French- Canadian and 32,007 of English parentage. Rhode Island in 1900 had the highest percentage of urban population of any state in the Union, 91-6% of the total population living in cities of 4000 or more inhabitants. From 1890 to 1900 the urban population increased from 310,335 to 392,509 or 26-5%; while the rural population {i.e. population outside of incor- porated places), increased from 35,171 to 36,047 — i-i% of the total increase in population. The cities of the state, with population in 1900, 3 are Providence, 175,597; Pawtucket, 39,231; Woonsocket, 28,204; Newport, 22,034; an d Central Falls, 18,167. I n I 9°6 there were in the state 264,712 com- municants of various religious denominations, and of these 199,951 were Roman Catholics. Second in strength were the (. Baptists, who founded the colony; in 1906 they numbered 19,878, of whom 14,304 were of the Northern Convention. There were 15,443 Protestant Episcopalians, 9858 Congrega- tionalists, 7892 Methodists. The Friends, whose influence was so strong in the early history of Providence, numbered in

1906 only 648 in the whole state.

Administration. — The state is governed under the con- stitution of 1842, with amendments adopted in 1854, 1864, 1886, 1888, 1889, 1892, 1893, 1900, 1903, 1909. All native or naturalized citizens of the United States residing in Rhode

2 The populations in other census years were: (1790) 68,825;

(1800) 69,122; (1810) 76,931; (1820) 83,059; (1830) 97,199;

(1840) 108,830; (1850) 147,545; (i860) 174,620; (1870) 217,353.

3 In 1910 the populations of the cities were: Providence, 224,326; Pawtucket, 51,622; Woonsocket, 38,125; Newport, 27,149; and Central Falls, 22,754.

Island are citizens of the state. Under an act of 1724 the suffrage was restricted to adult males who possessed a freehold of the value of

$134 (see History). So far as state and national elections are concerned, the privilege was extended to native non-freeholders by the constitution of 1842, to naturalized foreigners who had served in the Civil War by an amendment of the 7th of April 1886, and to all adult male citizens by the amendment of the 4th of April 1888. A curious survival of the old system exists in the provision that only those who pay taxes on $134 worth of property may vote for members of city councils or on propositions to levy taxes or to expend public money. The working men are thus almost entirely excluded from participating in the government of the large factory towns.

Amendments to the constitution must be passed by both houses of the General Assembly at two consecutive sessions, and must then be ratified by three-fifths of the electors of the state present and voting thereon in town and ward meetings. Fifteen amendments have thus been added to the constitution of 1842. An amendment of the 7th of April 1886 forbade the manufacture and sale of intoxicating beverages, but it was badly enforced and was repealed by a subsequent amendment of the 20th of June 1889.

The powers of the governor are unusually small. Until 1909, when a constitutional amendment was adopted, he had no power of veto, and his very limited nominal powers of appointment and removal are controlled by a rotten-borough Senate. The other administrative officers are a secretary of state, an attorney-general, an auditor, a treasurer, a commissioner of public schools, a railroad commissioner, and a factory inspector, and various boards and commissions, such as the board of education, the board of agri- culture, the board of health, and the commissioners of inland fisheries, commissioners of harbours and commissioners of pilots.

The legislative" power is vested in the General Assembly, 1 which consists of a Senate made up of the lieutenant-governor and of one senator from each of the thirty-eight cities and townships in the state, and a House of Representatives of one hundred members, apportioned according to population, but with the proviso that each town or city shall have at least one member and none shall have more than one-fourth of the total (see History), Members of the legislature and all state officials are elected annually in November. A majority vote was formerly required, but since the adoption of the tenth amendment (Nov. 28, 1893) a plurality vote has elected.

At the head of the judicial system is the supreme court (1747), with final revisory and appellate jurisdiction. Below this are the superior court (1905), the twelve district courts, the town coun- cils, probate

courts in the larger towns, and justices of the peace. The five judges of the supreme court, the six judges of the superior court and the district judges are elected by the General Assembly;_the supreme and the superior court justices hold office until dismissed by the General Assembly or found guilty of official misdemeanour, and the district judges have three-year terms.

The town (or township) is the unit of local government, the county being recognized only for judicial purposes and to a certain extent in the appointment by central administrative boards. There are five counties and thirty-eight towns. The municipal govern- ments of Newport and Providence present interesting features, for which see the separate articles on these cities.

Education. — The public school system of Rhode Island was established in 1800, abolished in 1803, and re-established in 1828. At the head of it is a commissioner of education, appointed by the governor and the Senate, and a board of education, composed of the governor and the lieutenant-governor ex officio and six other members elected by the General Assembly. Under an act of the 12th of April 1883, as amended on the 4th of April 1902, education is compulsory for children between the ages of seven and fifteen, but the maximum limit is reduced to thirteen for children who are employed at lawful labour. The total enrolment in the public schools in 1905 was 71,425 and the total expenditure for public school purposes was $1,987,751. A considerable proportion of the Irish and the French Canadians send their children to the Roman Catholic parochial schools. The chief institutions for higher educa-

1 Under the constitution of 1 842 it was provided that there should be two sessions of the General Assembly annually: one at Newport in May, and the other in October to be held at South Kingstown once in two years, and the intermediate years alternately at Bristol and East Greenwich, an adjournment from the October session being held annually at Providence. In 1854 this was amended: one session was provided for to be held in Newport in May, an adjournment being held annually at Providence. And in 1900 by another amendment Providence became the only meeting-place of the General Assembly.

tion are Brown University (1764), the State School of Design (1877), the State Normal School (reorganized 1898), and the Moses Brown School (1819), all at Providence (q.v.), and the State College of Agriculture and Mechanic Arts (1888) at Kingston, a land grant college under the Morrill Acts of 1862 and 1890, the Hatch Act of 1887 and the Adams Act of 1906. This institution was founded as an

agricultural school in 1888 and became a college in 1892. It has departments of agriculture, engineering and science, a library of 15,000 volumes and an experiment station. There are state training-schools for teachers at Providence, Cranston, Bristol, Barrington, Central Falls, Warwick and Pawtucket.

Charitable and Penal Institutions. — A board of state charities and corrections, established in 1869, supervises and controls all of the penal, charitable and correctional institutions of the state at large and also the local almshouses. There were in 1910 nine members of the board, three from Providence county, one from each of the other counties, and one from the state at large; five were appointed by the governor with the consent of the Senate, and four were elected by the Senate. A group of institutions (under the control of the board) at Howard, in Cranston town- ship, about 7 m. from Providence, including the Workhouse and House of Correction, the Hospital for the Insane (1869), the Alms- house, the State Prison and Providence County Jail, the Sock- anosset School for Boys, and the Oaklawn School for Girls, are supported entirely or in part by the state. In addition to the institutions under the board of charities and corrections there are two under the board of education, and supported wholly or in part by the state, the School for the Deaf (1877) and the Home and School for Dependent and Neglected Children (1885) at Providence. The Soldiers' Home (1891) at Bristol, the Butler Hospital for the Insane (1847) at Providence, and a Sanitarium (1905) at Wallum Lake, in the township of Burrillville, also receive state aid.

Finance.— -The chief sources of revenue in the order named are the general property tax, the tax on savings banks, the tax on insurance companies, and liquor licences. There is no corporation tax. The total receipts from all sources for the year 1909 were $2,317, 5I2,_ the expenditures $2,345,359. The public debt, which originated in 1752, amounted to £70,000 sterling in 1764, to £4000 in 1775 and to $698,000 in 1783. Part of the Revolutionary debt was paid in depreciated paper, part was assumed by the United States government, part was paid at various rates of depreciation between 1803 and 1820, and the remainder, $43,971, was repudiated in 1847. Other obligations had accumulated in the meantime, however, so that the debt in 1848 amounted to $187,000. This was gradually reduced until the Civil War, when it was increased to $3,889,000 by 1865. A sinking fund commission was established in 1875, and the entire sum was extinguished by the 1st of August 1894. The issue of bonds fpr the construction of the new capitol building and other purposes has led, however, to a new debt, which at the beginning of 1910 amounted to $4,800,000. There was at the same time a sinking fund of $654,999.

Before the adoption of the Federal constitution Rhode Island was badly afflicted with the paper money heresy. £5000 were printed in 1710, and from that time until 1751 there were nine separate issues. These were gradually retired, however, through the efforts of the mercantile classes, aided by the parliamentary statutes of 1 75 1 and 1763, and by about 1763 the finances were again placed on a sound money basis. The influx of Continental currency gave some trouble during the War of Independence, but there were no further local issues until 1786, when £100,000 were issued.

The first banks organized in the state were the Providence Bank in 1791, the Bank of Rhode Island at Newport in 1795, and the Washington Bank at Westerly in 1800. Forty-four charters had been issued in 1826 and sixty in 1837. Partly through restrictive local legislation and partly as a result of the operation of the Suffolk system of redemption in Boston, these institutions were always conservative. During practically the entire period before the Civil War their note issues constituted a smaller proportion of the capitalˆ stock than those of any other state. By an act of 1858 which is still in force, annual reports must be presented to the state auditor. Qn the establishment of the national banking • system, 1863-65, nearly all of the banks took out national charters. Since 1865 the most notable features have been the rise and de- cadence of the national banks and the rise of the trust companies. During the decade from 1890 to 1900 the deposits in the national banks increased only 5%, from $16,700,000 to $17,500,000; those of the trust companies increased 330%, from $12,000,000 to more than $40,000,000. During the period from 1890 to 1901 twenty national banks retired from business, and the total capital stock was re- duced from about twenty millions to about thirteen millions of dollars.

History. — Rhode Island was founded by refugees from Massachusetts, who went there in search of religious and political freedom. The first settlements were made at Pro- vidence by Roger Williams (q.v.) in June 1636, and at Portsmouth on the island of Aquidneck by the Antinomians, William Coddington (1601-1678), John Clarke (1600-1676), and Anne Hutchinson (1 591-1643), in March-April 1638.

Becoming dissatisfied with conditions at Portsmouth, Codd- ington and Clarke removed a few miles farther south on the 29th of April

1639, and established a settlement at New- port. In a similar manner Warwick was founded in January

1643 by seceders from Providence under the lead of Samuel Gorton. The union of Portsmouth and Newport, March 12, 1640, was followed by the consolidation of all four settlements, May 19, 1647, under a patent of March 14, 1644, issued by the parliamentary board of commissioners for plantations. The particularistic sentiment was still very strong, however, and in 1651 the union split into two confederations, one in- cluding the mainland towns, Providence and Warwick; the other, the island towns, Portsmouth and Newport. A re-union was effected in 1654 through the influence of Roger Williams, and a charter was secured from Charles II. on the 8th of July 1663. In the patent of 1644 the entire colony was called Providence Plantations. On the 13th of March

1644 the Portsmouth-Newport General Court changed the name of the island from Aquidneck to the Isle of Rhodes or Rhode Island. The official designation for the province as a whole in the charter of 1663, therefore, was Rhode Island and Providence Plantations. The charter was suspended at the beginning of the Andros regime in 1686, but was re- stored again after the Revolution of 1689. The closing yeaˆs of the 17th century were characterized by a gradual transition from the agricultural to the commercial stage of civilization. Newport became the centre of an extensive business in piracy, privateering, smuggling, and legitimate trade. Cargoes of rum, manufactured from West Indian sugar and molasses, were exported to Africa and exchanged for slaves to be sold in the southern colonies and the West Indies. The passage of the Sugar Act of April 5, 1 764, and the steps taken by the British government to enforce the Navigation Acts seriously affected this trade. The people of Rhode Island played a prominent part in the struggle for independence. On the 9th of June 1772 the ” Gaspee,” a British vessel which had been sent over to enforce the acts of trade and navigation, ran aground in Narragansett Bay and was burned to the water’s edge by a party of men from Providence. Nathanael Greene, a native of Rhode Island, was made commander of the Rhode Island militia in May 177s, and a major-general in the Continental army in August 1776, and in the latter capacity he served with ability until the close of the war. In the year 1776, General Howe sent a detachment of his army under General Henry Clinton to seize Newport as a base of operations for reducing New England, and the city was occupied by the British on the 8th of December 1776. To capture this British garrison, later increased to 6000 men, the co-operation of about 10,000 men (mostly New England militia) under Major-General John Sullivan, and a French fleet carrying 4000 French regulars under

Count D'Estaing, was planned in the summer of 1778. On the gth of August Sullivan crossed to the north end of the island of Rhode Island, but as the Frenchmen were disembarking on Conanicut Island, Lord Howe arrived with the British fleet. Count D'Estaing hastily re-embarked his troops and sailed out to meet Howe. For two days the hostile fleets manoeuvred for. positions, and then they were dispersed by a severe storm. On the 20th, D'Estaing returned to the port with his fleet badly crippled, and only to announce that he should sail to Boston to refit. The American officers protested but in vain, and on the 28th they decided to retreat to the north end of the island. The British pursued, and the next day there was a severe engagement in which the Americans were driven from Turkey and Quaker Hills. On the 30th the Americans, learning of the approach of Lord Howe's fleet with 5000 troops under Clinton, decided to abandon the island. The British evacuated Newport the 25th of October 1779, and the French fleet was stationed here from July 1780 to 1781.

The influence of Roger Williams's ideas and the peculiar conditions under which the first settlements were . established have tended to differentiate the history of Rhode Island from

that of the other New England states. In 1640 the General Court of Massachusetts declared that the representatives of Aquidneck were " not to be capitulated withal either for them- selves or the people of the isle where they inhabit," and in 1644 and again in 1648 the application of the Narragansett settlers for admission to the New England Confederacy was refused except on condition that they should pass under the jurisdiction of either Massachusetts or Plymouth. Rhode Island was one of the first communities in the world to advo- cate religious freedom and political individualism.

The individualistic principle was shown in the jealousy of the towns toward the central government, and in the establish- ment of legislative supremacy over the executive and the judiciary. The legislature migrated from county to county up to 1854, 'and there continued to be two centres of govern- ment until 1900. The dependence of the judiciary upon the legislature was maintained until i860, and the governor is still shorn of certain powers which are customary in other states (see Administration). In the main the rural towns have adhered most strongly to the old individualistic sentiment, whereas the cities have kept more in touch with the modern nationalistic .trend of thought. This was shown, for example, in the struggle for the ratification of the Federal constitution. Under. the Articles of Confederation it was principally Rhode Island that defeated the proposal to authorize Congress to levy an impost duty of 5%

mainly as a means of meeting the debts of the Central government. When the constitu- tional convention met in Philadelphia in 1787 to frame a con- stitution for a stronger Federal government, the agriculturists of Rhode Island were afraid that the movement would result in an interference with their local privileges, and especially with their favourite device of issuing paper money, and the state refused to send delegates, and not until the Seriate had passed a bill for severing commercial relations between the United States and Rhode Island, did the latter, in May 1790, ratify the Federal constitution, and then only by a majority of two votes. Rhode Island, like the rest of New England, was opposed to the War of 181 2 and the Mexican War. During the Civil War it sent 23,457 men into the service of the Union.

The economic transition of the later 17th century from the agricultural to the commercial regime was followed by a further transition to the manufacturing regime during the closing years of the 18th and the early years of the 19th centuries. Com- mercial interests have been almost entirely destroyed, partly because of the abolition of the slave trade and partly because of the embargo and the war of 181 2, but mainly because the cities of the state are unfavourably situated to be the termini of interstate railway systems. Providence, owing to its superior water-power facilities, has therefore become one of the leading manufacturing centres of New England, whereas Newport is now known only as a fashionable summer resort. The move- ment as a whole Was of exactly the same character as the industrial revolution in England, and it led to the same result, a struggle for electoral reform. The system of apportionment and the franchise qualifications were worked out to meet the needs of a group of agricultural communities. The charter of 1663 and the franchise law of 1724 established substantial equality of representation among the towns, and restricted the suffrage to freeholders. In the course of time, therefore, the small towns came to be better represented proportionally than the large cities, and the growing class of artisans was entirely disfranchised. The city of Providence issued a call for a constitutional convention in 1796, and similar efforts were made in 1799, 1817, 1821, 1822 and 1824, but nothing was accom- plished. About 1840 Thomas W. Dorr (1805-1854), a young lawyer of Providence, began a systematic campaign for an extension of the suffrage, a reapportionment of representation and the establishment of an independent judiciary. The struggle, which lasted for several years, and in fact is not yet entirely over, was one between the cities and the country, between the manufacturers and the agriculturists. It was

also complicated by racial and religious prejudioes, a large proportion of the factory operatives being foreigners and Roman Catholics, and most of the country people native Protestants. The former were in general associated with the Democratic party, the latter with the Whigs. A convention summoned without any authority from the legislature, and elected on the principle of universal manhood suffrage, met at Providence, October 4-NoVember 18, 1841, and drafted a frame of govern- ment which came to be known as the People's Constitution. A second convention met on the call of the legislature in February 1842 and adopted the so-called Freeman's Constitution. On being submitted to popular vote the former was ratified by a large majority (December 27, 28, 29, 1841), while the latter was rejected by a majority of 676 (March 21, 22, 23, 1842). At an election held on the 18th of April 1842 Dorr was chosen governor. The supreme court of the state and the president of the United States (Tyler) both refused to recognize the validity of the People's Constitution, whereupon Dorr and a few of his more zealous adherents decided to organize a rebellion. They Were easily repulsed in an attack upon the Providence town arsenal, arid Dorr, after a brief period of exile in Connecti- cut, was convicted of high treason on the 26th of April 1844, and was sentenced to imprisonment for life. He was released by act of the Assembly in June 1845, and was restored to the full rights of citizenship in May 1851. The Freeman's Constitution, modified by another convention, which held its session at New- port and East Greenwich, September 12-November 5, 1842, was finally adopted by popular vote on November 21-23, 1842. Only a partial concession was made to the demand for reform. The suffrage was extended to non-freeholders, but only to those of American birth. Representation in the lower house of the legislature was apportioned according to population, but only on condition that no city or town should ever elect more than one-sixth of the total number of members. Each city and town without regard to papulation was to elect one senator. In order to perpetuate this system the method of amending the constitution was made extremely difficult (see Administration). Since the adoption of the constitution the conditions have become worse owing to the extensive immigration of foreigners into the large cities and the gradual decay of the rural towns. From about 1845 to 1880 most of the immigrants were Irish, but since 1880 the French-Canadians have constituted the chief element. In 1900 over 30% of the population of the state was foreign-born. A constitutional amendment of 1888 extended to them the right of suffrage in state and national elections, and an amendment of 1909 partially remedied

the evils in the system of apportionment. When the last Federal census was taken in 1910, Providence, Pawtucket, Woonsocket and Newport, with a combined population of 341,222, had four senators, whereas the remainder of the state, with a population of 201,452, had thirty-four. Providence, with a population of 224,326 out of a total of 542,674, had one member in a Senate of thirty-eight and twenty-five members in a House of Representatives of one hundred. The Republican machine finds it easy with the support of the millionaire summer colony at Newport and the street railway corporations to corrupt the French-Canadians and a portion of the native element in the rural towns and maintain absolute control of the state government. The majority has occasionally protested by electing a Democratic governor, but he has not been able to accomplish a great deal, because until 1909 he did not have veto power nor effectual means to induce the Senate to ratify his appointments. Bonds were issued on the 8th Of November 1892 for the construction of a new state house at Providence, the corner stone was laid in October 1896, and the building was thrown open to use on the 1st of January 1901. A constitutional amendment of 1900 dispensed with the session of the legislature at Newport.

In presidential campaigns the state has been Federalist, 1792-1800; Democratic Republican, 1804; Federalist, 1808- 1812; Democratic Republican, i8r6-i82o; Adams (Republican), 1824-1828; National Republican, 1832; Democratic, r836; Whig, 1840-1848; Democratic, 1852; and Republican since 1856.

GOVERNORS OF RHODE ISLAND

Portsmouth

William Coddington William Hutchinson

Judge,

1638-1639 1 639-1 640

Newport

William Coddington . . Judge, 1 639-1640

Portsmouth and Newport

William Coddington . . Governor, 1640-1647

‘Presidents under the Patent of 1644

John Coggeshall 1647ˆ-1648

Jeremy Clarke 1 648-1649

John Smith …... 1649-1650

Nicholas Easton ….. 1650-1651

Providence and Warwick 1

Samuel Gorton . President, 1651-1652

John Smith . . . ,, 1652-1653

Gregory Dexter … „ 1653-1654

Portsmouth and Newport

John Safiford . . . President, 1653-1654

■ Presidents under the Patent of 1644

Nicholas Easton : 1654 Roger Williams . . Benedict Arnold Wi'lia-m Brenton Benedict Arnold

Governors under the Charter of 1663

1654- 1657 1 65 7- 1 660 1 660-1 662 1 662-1 663

Benedict Arnold William Brenton Benedict Arnold Nicholas Easton William Coddington Walter Clarke Benedict Arnold William Coddington John Cranston Peleg Sanford William Coddington, 2nd Henry Bull Walter Clarke John Coggeshall (acting) Henry Bull John Easton Caleb Carr Walter Clarke Samuel Cranston Joseph Jencks William Wanton John Wanton Richard Ward William Greene Gideon Wanton William Greene Gideon Wanton William Greene Stephen Hopkins William Greene Stephen Hopkins Samuel Ward Stephen Hopkins Samuel Ward Stephen Hopkins Josias Lyndon Joseph Wanton Nicholas Cooke William Greene, 2nd John Collins

Arthur Fenner, 3 Federalist and Democratic Re- publican Paul Mumford (acting), Democratic Republican 1805

1 663-1 666

1 666- I 669

I 669-1 672

1672-1674

1 674- 1 676

1676-167;/

1 67 7- 1 678

1678

1678-1680

1680-1683

1683-1685

1685-1686

1686 2

1 689-1690

1690

1690-1695

1695

I 696-1 698

1698-1727

1727-1732

I73 2 -I73?

I 734-1 740

I 740-1 743

1 743-1 745

1 745-1 746

1746-1747

1 747-1 748 1 748-1 755 1 755-1 757 1757-1758 1 758-1 762 1 762-1 763 1 763-1 765 1 765-1 767 1 767-1 768 1 768-1 769 1 769-1 775 1 775-1 778 1 778-1 786 1 786-1 790

1 790-1 805

Henry Smith, „ „ „ 1 805-1 806

Isaac Wilbour, ,, ,, „ 1806-1807

James Fenner, Democratic Republican . . . 1 807-1 81 1

William Jones, Federalist . .....' '. 1811-1817

Nehemiah R. Knight, Democratic Republican 181 7-1 821

William C. Gibbs, ,, ,, . 1 821-1824

James Fenner 4 (Democratic Republican and

National Republican) 1 824-1831

1 A separation occurred in 165 1 between the towns of Providence arid Warwick on one side and Portsmouth and Newport on the other. They were reunited in 1654.

2 The charter was suspended from 1686 to 1689, during which time the province was under the supervision of Sir Edmund Andros.

3 Arthur Fenner became a Democratic Republican about 1 800.

4 James Fenner was a Democratic Republican to 1826, a National Republican (Adams) to 1829 and a Democrat (Jackson) to 1831.

RHODES, C. J.

Lemuel H. Arnold, National Republican . 1831-1833

John B. Francis, Democrat and Anti-Masonic 1833-1838

William Sprague, Whig 1838-1839

Samuel W. King, Whig 1839-1 843

Under the Constitution of 1842

James Fenner, Whig 1843-1845

Charles Jackson, 1 Democrat . . . 1845-1846

Byron Diman, Whig 1 846-1 847

Elisha Harris, Whig 1 847-1 849

Henry B. Anthony, Whig 1849-1851

Philip Allen, Democrat 1 851-1853

Francis M. Dimond (acting), Democrat . 1 853-1 854

William W. Hoppin, Whig and American . 1854-1857

Elisha Dyer, Republican …. 1857-1859

Thomas G. Turner, Republican . . . 1859-1860

William Sprague, 2 Unionist …. 1 860-1 863

William C. Cozzens (acting), Unionist . . 1863

James Y. Smith, Republican . . . 1 863-1 866

Ambrose E. Burnside, „ 1866-1869

Seth Padelford, 1 869-1 873

Henry Howard, „ J873-1875

Henry Lippitt, „ 1875-1877

Charles C. Van Zandt 1877-1880

Alfred H. Littlefield 1880-1883

Augustus O. Bourn, , 1883-1885

George P. Wetmore, , 1885-1887

John W. Davis, Democrat 1887-1888

Royal C. Taft, Republican 1 888-1 889

Herbert W. Ladd, „ 1889-1890

John W. Davis, Democrat …. 1 890-1 891

Herbert W. Ladd, Republican . . . 1891-1892

D. Russell Brown, „ 1 892-1 895

Charles W. Lippitt 1895-1897

Elisha Dyer, 1897-1900

William Gregory, 1900-1901

Charles Dean Kimball, Republican . . 1901-1903

L. F. C. Garvin, Democrat 1903-1905

George H. Utter, Republican . . . 1905-1907

James H. Higgins, Democrat . . 1907-1909

Aram J. Pothier, Republican . . . 1909-

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1827-1902); Proceed- ings and Publications, 23 numbers (Providence, 1872-1902, to be continued). The Quarterly (8 vols., 1892-1901, discontinued); Rhode Island Historica 1 Tracts, Series I., 20 vols. (Providence, 1877-1884), Series II., 5 vols. (Providence, 1889-96). For

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1 Jackson was a Liberation Whig — favouring the liberation . of Dorf from prison — but hte was elected on the Democratic ticket.

2 Sprague was elected over the radical Republican candidate through a coalition of Democrats and conservative Republicans.

RHODES, CECIL JOHN (1853-1902), British colonial and Imperial statesman, was born on the 5th of July 1853, at Bishop Stortford, in Hertfordshire. His father was a clergyman, but he claimed descent from yeoman stock. Cecil John Rhodes was the fifth son in a large family of sons and daughters. At the time of his birth his father held the living of Bishop Stort- ford. The boy was educated at Bishop Stortford grammar school with the intention of preparing for the Church; but at the age of sixteen his health broke down, and in the latter part of 1870 he was sent to join an elder brother, then engaged in farming in Natal. In that year diamonds were discovered in the Kimberley fields. By the end of 1871 Mr Rhodes and his brother were among the successful diggers. The dry air of the interior restored Mr Rhodes's health, and before he was nineteen he found himself financially independent, physically strong and free to devote his life to any object which commended itself to his choice.

Rhodes has left behind him an interesting record of the manner in which he was affected by the situation. He deter- mined to return to England, and to complete his education by reading for a degree at Oxford; but before doing so, he spent eight months in a solitary journey through the then little known parts of the country lying to the north of the Orange and Vaal rivers. He went through Bechuanaland to Mafeking, thence to Pretoria, Murchison, Middelburg and back through the Transvaal to Kimberley. The journey, made in an ,ox-wagon at a rate of progression of some 15 to 20 miles a day, represented a walking tour of eight months through the vast spaces of rolling veld which at that time filled those regions of Southern Africa. He saw one of the healthiest countries in the world barely occupied. He knew the agricultural possibilities of Natal. He knew its mineral wealth. The effect of the combined influences on his mind, in the

circumstances in which he found himself, was profound. The idea took passionate possession of him that the fine country through which he moved ought to be secured for occupation by the British race, and that no power but Great Britain should be allowed to dominate in the administration of South Africa. When he brought his self-imposed pilgrimage to an end, he had found an object to which he proposed to devote his fife. It was nothing less than the governance of the world by the British race. A will exists written in Mr Rhodes's own handwriting a couple of years later, when he was still only twenty-two, in which he states his reasons for accepting the aggrandizement and service of the British empire as his highest ideal of practical achievement. It ends with a single bequest of everything of which he might die possessed, for the furtherance of this great purpose. Five-and-twenty years later his final will carried out, with some difference of detail, the same intention.

The share which he allotted to himself in the general scheme was the extension of the area of British settlement in Africa, but he did not attempt to address himself immediately to public work. He returned, in accordance with his first resolve, to Oxford, where he matriculated at Oriel. In 1873 his health again failed, and he was sent back to South Africa under what was practically a death sentence. Years afterwards he saw the entry of his own case in the diary of the eminent physician whom he consulted, with a note, " Not six months to live/' South Africa again restored him to health. Three years later he was back at Oxford, and from 1876 to 1878 he kept his terms. During this period he spent the -Long Vacation each year in South Africa, where his large financial interests were daily increasing in importance. He was a member of the Cape ministry when, after a further lapse of years, he kept his last term and took his degree. He did not read hard at Oxford, and was more than once remonstrated with in the earlier terms for non-attendance at lectures. But he passed his examina- tions; and though he was never a student in the university sense of the term, he was to the end of his life a keen devourer of books. He kept always a special liking for certain classic authors. Aristotle was the guide whom as a lad he followed in seeking the " highest object " on which to exercise the

" highest activity of the soul." Marcus Aurelius was his constant companion. There exists at Grote Schuur a copy of the Meditations deeply scored with Mr Rhodes's marks.

During this Oxford time, and on to 1881, Mr Rhodes was occupied

with the amalgamation of the larger number of the diamond mines of Kimberley with the De Beers Company, an operation which established his position as a practical financier and gave him an important connexion and following in the business world. To many admirers who shared his ideas on public questions his connexion with the financial world and his practical success were a stumbling-block. It was often wished for him that he had ” kept himself clear of all that.” But this was not his own view. His ideals were political and practical. To him the making of money was a necessary preliminary to their realization, and he was proud of his practical ability in this direction. He was personally a man of most simple tastes. His immense fortune was spent in the execution of his ideals, and it has been justly said of him that he taught the world a new chapter of the romance of wealth.

In 1881 Mr Rhodes entered public life as a member of the Cape assembly. It was the year of the Majuba settlement. South Africa was convulsed with questions which had arisen between the British and the Dutch, and leaders of Dutch opinion at the Cape ventured to speak openly of the formation of a United States of South Africa under its own flag. The British party needed a rallying-ground, and Mr Rhodes took his stand on a policy of local union combined with the consolidation and expansion of Imperial interests. He offered to Dutch and British alike the ideal of a South African Federation governing itself within the empire, and extending, by its gradual absorption of native territories, the range of Imperial administra- tion. Local self-government was, in his opinion, the only endur- ing basis on which the unity of the empire could be built, and throughout his life he was as keen a defender of local rights as he was of Imperial unity. There was a period somewhat later in his career when this attitude on his part gave rise to a good deal of misapprehension, and his advocacy of the elimination of direct Imperial interference in local affairs caused him to be viewed in .certain quarters with suspicion as a Separatist and Independent. Those who were inclined to take this view were greatly strengthened in their suspicions by the fact that at a critical moment in the struggle for Home Rule in Ireland Mr Rhodes contributed £10,000 to the funds of the Separatist party. The subsequent publication of his correspondence on the subject with Mr Parnell, who was at that time leading the Home Rule party, demonstrated, however, the essential fact that, whatever might have been the secret intentions of the extreme Irish Home Rulers, Mr Rhodes’s contribution was made strictly subject to the retention of the Irish members at West- minster. He remained of the opinion that the Home Rule movement, wisely treated, would have had a consolidating and not a disruptive effect upon the organization of the empire.

In South Africa the influence which he acquired over the local independents and over the Dutch vote was subsequently an important factor in enabling him to carry out the scheme of northern expansion which he had at heart, and which he had fully developed in his own mind at Oxford in 1878. In 1881 the Bechuana territory was a sort of no man's land through which ran the trade routes to the north. It was evident that any power which commanded the trade routes would command the unknown northern territory beyond. The Pretoria Convention of 1881 limited the westward extension of the Transvaal to a line east of the trade routes. Nevertheless, the reconstituted republic showed itself anxious to encroach by irregular overflow into native territories, and Mr Rhodes feared to see the extension of the British colonies permanently blocked by Dutch occupation. One of his first acts as a member of the Cape assembly was to urge the appointment of a delimitation commission. He served m person on the commission, and obtained from the chief Mankoroane, who claimed about half of Bechuanaland, a formal cession of his territories to the British government of the Cape. The Cape government refused to accept the offer. In February

1884 a second convention signed in London again defined the western frontier of the Transvaal, Bechuanaland being left outside the republic. With the consent of Great Britain, Germany had occupied, almost at the same time, the territory on the Atlantic coast now known as German South- West Africa. In August 1884 Mr Rhodes was appointed resident deputy commissioner in Bechuanaland, where, notwithstanding the conventions to the contrary, Boers had ousted the natives from considerable areas and set up the so-called republics of Goshen and Stellaland. An old Dutchman who knew the value of the position said privately to Mr Rhodes, " This is the key of South Africa." The question at issue was whether Great Britain or the Transvaal was to hold the key. It was a question about which at that time the British public knew nothing and cared nothing. Mr Rhodes made it his business to enlighten them. President Kruger, speaking for the government of the Transvaal, professed to regard the Dutch commandoes as freebooters, and to be unable to control them. It devolved upon Great Britain to oblige them to evacuate the territory. Largely as the result of Mr Rhodes's exertions the necessary step was taken. The Warren expedition of 1-884-85 was sent out. In the presence of British troops upon the frontier President Kruger recovered his controlling power over the Transvaal burghers, and without any fighting the commandoes were withdrawn. Thereupon southern Bechuanaland was declared to be British territory, while a

British protectorate was declared over the northern regions up to the 22nd parallel (September 1885).

It was the first round in the long duel fought on the field of South Africa between Mr Rhodes, as the representative of British interests, and President Kruger, as the head of the militant Dutch party. The score on this occasion was to Mr Rhodes, and the entrance to the interior was secured. But the 22nd parallel was far short of the limits to which Mr Rhodes hoped to see British influence extend, and he feared lest Germany and the Transvaal might yet join hands in the native territory beyond, and bar his farther progress towards the north. The discovery of gold on the Witwatersrand in 1886, by adding to the wealth and importance of the Transvaal, gave substance to this fear.

The territory to the north of the 22nd parallel was at that time under the domination of Lobengula, chief of the Matabele, a native potentate celebrated alike for his ability and for the despotic character of his rule. There were rumours of Dutch and German emissaries at the kraal of Lobengula, engaged in persuading that chief to cede certain portions of his territory. Portugal also was putting forward shadowy claims to the country. It was in these circumstances that Mr Rhodes conceived the idea of forming a British Chartered Company, which should occupy the territory for trading and mining purposes as far as the Zambezi, and bring the whole under the protection of Great Britain. The idea took shape in 1887, in which year Mr Rhodes's first emissaries were sent to Lobengula. The charter of the British South Africa Company was granted in October 1889. Between the two dates his conception of the possibilities to be achieved by the Company had expanded. Mr Rhodes no longer limited the sphere of his operations to the Zambezi, but, crossing the river at the back of the Portuguese settlements at its mouth, he obtained per- mission to extend the territories of the Chartered Company to the southern end of Lake Tanganyika, including within the sphere of its operations the British settlements already made in Nyasaland. He hoped to go farther still, and to create a connected chain of British possessions through the continent which might eventually justify the description," Africa British from the Cape to Cairo." The treaty negotiated between Great Britain and Germany in 1800 extended the German sphere of influence from the East Coast to the frontier of the Congo Free State, and defeated this hope. But Mr Rhodes did not wholly renounce the idea. In 1892, when the question of the retention or abandonment of Uganda hung in the balance at home, he threw all the weight of his influence into the scale of retention, and undertook at his own personal expense to connect

that territory by telegraph with British possessions in the south. In the following year, 1893, it was found inevitable to fight the Matabele, and a war, prosecuted with a success that is perhaps unique of its kind, placed the country entirely in British hands. The territory thus added to the British empire covered an extent of 450,000 square miles, of which large portions consist of healthy uplands suitable for white colonization. The pioneer party who constructed the first road and founded the first British stations in the country received their orders to cross the frontier in the end of 1889. By the end of 1899, before the outbreak of the South African War, though the country had passed through the trial of a war, two native rebellions, and the scourge of rinderpest, it had become, under the name of Rhodesia, a well-settled province of the British empire, with a white popula- tion of some 12,000 to 13,000 persons.

The six years which followed the granting of the charter may be regarded as the most successful of a singularly successful life. In 1890, not many months after the granting of the charter, Mr Rhodes accepted the position of prime minister of the Cape. He was maintained in power very largely by the Dutch vote, which he spared no pains to conciliate; and having the confidence of both political sections of the colony, he found himself practically 1 in a position to play the part of benevolent despot in South Africa. He used the position well so far as the public was concerned. While his scheme of northern expansion was making the rapid progress which has been indicated, he did much to elevate and to enlarge the field of local politics. He frankly declared and worked for the policy of uniting British and Dutch interests in South Africa; he took a keen interest in local educa- tion. He also during this period carried through some important reforms in native policy. He had the courage to restrict the franchise, introducing an educational test and limiting the exercise of voting power to men enjoying an income equal to a labourer's wage — thus abolishing; without making any distinction of colour, the abuses of what was known as the " blanket " vote.

But his native policy was far from being one of simple re- striction. He liked the natives; he employed them by thousands in the mining industry, he kept native servants habitually about his person he seemed to understand their peculiarities and was singularly successful in dealing with them. The first canon of his native policy Was that liquor should be kept from them; the second, that they should be

encouraged to labour, and guaranteed the full possession of their earnings; the third, that they should be educated in the practical arts of peace. He appreciated the full importance of raising their territorial con- dition from one of tribal to individual tenure; and while he protested against the absurdity of permitting the 'uncivilized Kaffir to vote on questions of highly civilized white policy, he believed in applying to the native for his own native affairs the principle of self-government. Of these views some received practical embodiment in the much-disputed act known as the Glen Grey Act of 1894. In this connexion it may also be noted that he was one of the warmest and most convinced supporters of Lovedale, the very successful missionary institution for the education of natives in South Africa.

The position of benevolent despot has obvious drawbacks. In Mr Rhodes's case the dependence which the populations of Cape Colony were led to place on him had its reaction on the public in a demoralizing loss of self-reliance, and for himself it must be admitted that the effect on the character of a man already much disposed to habits of absolutism in thought and action was the reverse of beneficial. Mr Rhodes felt himself to be hit stronger than any marl in his own surroundings; he knew himself to be actuated by disinterested motives in the aims which he most earnestly desired to reach. He was pro- foundly impressed by a sense of the shortness of life, and he so far abused his power as to become intolerant of any sort of control or opposition. The inevitable result followed, that though Mr Rhodes did much of great and good work during the six years of his supreme power, he entirely failed during that period to surround himself, as he might have done, by a *drde of able men fit to comprehend and to carry on the work

to which his own best efforts were directed. To work with him was practically impossible for those who were not willing to accept without demur the yoke of dogmatic authority He had a few devoted personal friends, who appreciated his aims and were inspired by his example; but he was lacking in regard for individuals, and a great part of his daily life was spent in the company of satellites and instruments, whom he used with cynical unconcern for the furtherance of his ends.

In 1896 the brilliant period of his premiership was brought to an end by the incident which became famous under the name of the Jameson Raid. The circumstances which led to the Raid belong properly to the history Of the Transvaal. It is enough to say briefly here that the large alien population which had been attracted to the Transvaal by the phenomenal wealth of the Johannesburg goldfields, conceiving

themselves to have reason to revolt against the authority of the Transvaal government, resolved towards the end of 1895 to have recourse to arms in order to obtain certain reforms. Mr Rhodes, as a large mine-owner, was theoretically a member of the mining population. In this capacity he was asked to give his counten- ance to the movement. But as prime minister of a British colony he was evidently placed in a false position from the ‘ moment in which he became cognizant of a secret attempt to overturn a neighbouring government by force of arms. He did more than become cognizant. The subsequent finding of a Cape committee, which he accepted as accurate, was to the effect that ” in his capacity as controller of the three great joint-stock companies, the British South Africa Company, the De Beers Consolidated Mines, and the Gold Fields of South Africa, he directed and controlled the combination which rendered such a proceeding as the Jameson Raid possible.” He gave money, arms and influence to the movement; and as the time fixed for the outbreak of the revolution approached, he allowed Dr Jameson, who was then administrator of the British South Africa Company in Rhodesia, to move an armed force of some 500 men upon the frontier. Here Mr Rhodes’s participation in the movement came to an end. It became abundantly, clear from subsequent inquiry that he was not personally responsible for what followed. A cipher corre- spondence, seized and published by the Boers, left the civilized world in no doubt as to Mr Rhodes’s share in the previous preparation, and he was for a time believed to be responsible for the Raid itself. Subsequent inquiries held by committees of the Cape parliament and of the British House of Commons acquitted him entirely of responsibility for Dr Jameson’s final movement, but both committees found that he had acted in a manner which was inconsistent with his duty as prime minister of the Cape and managing director of the British South Africa Company. ‘

He displayed, in the circumstances, characteristic qualities of pluck and candour. He made no concealment of his own share in the catastrophe; he took full responsibility for what had been done in his name by subordinates, and he accepted all the consequences which ensued. He resigned his premier- ship of the Cape (January 1896); and, recognizing that his presence was no longer useful in the colony, he turned his attention to Rhodesia. His design was to live in that country, arid to give all the stimulus of his own presence and encourage- ment to the development of its resources. The Matabele rebellion of March 1896 intervened to prevent the immediate realization of his plans. In June Imperial troops were sent up, and by the end of July the result of the military operations had driven the natives to the Matoppo Hills, where they held a practically

impregnable position. The prospect was of con- tinued war, with a renewal of a costly campaign in the following year. Mr Rhodes conceived the idea that he might effect single-handed the pacification which military skill had failed to compel. To succeed, it was essential that he should trust and be trusted. He accordingly moved his tent away from the troops to the base of the Matoppo Hills. He lay there quietly for six weeks, in the power of the enemy if they had chosen to attack. Word was circulated among the natives

that he had come alone and undefended to hear their side of the case. A council was held by them in the very depths of the hills, where no armed force could touch them. He was invited to attend it. It was a case of staking his life on trust. He displayed no hesitation, but mounted and rode unarmed with the messenger. Three friends rode with him. The confidence was justified. They met the assembled chiefs at the place appointed. The native grievances were laid before Mr Rhodes. At the end of a long discussion Mr Rhodes, having made and exacted such concessions as he thought fit, asked the question, ” Now, for the future is it peace or is it war?” And the chiefs, laying down their sticks as a symbol of surrendered arms, declared, ” We give you one word: it is peace.” The scene, as described by one of the eye-witnesses, was very striking. Mr Rhodes, riding away, characterized it simply as ” one of the scenes which make life worth living.”

His life was drawing towards its end. He had still a few years, which he devoted with success to the development of the country which bore his name. The railway was brought to Bulawayo, and arrangements were made for carrying the line on in sections as far as the south end of Lake Tanganyika, a construction which was part of his pet scheme for connecting the Cape by a British line of communication with Cairo. He also concluded arrangements for carrying a telegraphic land line through to Egypt, and had the satisfaction of seeing the mineral development of the country fairly started. But the federal union of South Africa, to which he had always worked as the secure basis of the extension of British rule in the southern half of the continent, was not for him to see. The South African War broke out in 1890. Mr Rhodes took his part at Kimberley in sustaining the hardships of a siege; but his health was broken, and though he lived to see victory practically assured to British arms, peace had not been concluded when, on the 26th of March 1902, he died at Muizenberg, near Cape Town.

His life's work did not end actually with his death. He left behind him a will in which he dedicated his fortunes, as he had dedicated himself, exclusively to the public service. He left the bulk of his vast wealth for the purpose of founding scholarships at Oxford of the value each of £300 a year, to be held by students from every important British colony, and from every state and Territory of the United States of America. The sum so bequeathed was very large; but it was not for the munificence of the legacy that the will was received with acclamation throughout the civilized world: it was for the striking manifestation of faith which it embodied in the principles that make for the enlightenment and peace and union of man- kind, and for the fine constancy of Mr Rhodes's conviction that the unity of the British Empire, which he had been proud to serve, was among the greatest of organized forces uniting for universal good. The will was drawn up some years before his death. A codicil, signed during the last days of his life, gave evidence of some enlargement of his views as to the association of races necessary in order to secure the peace of the world, and added to the original scheme a certain number of scholar- ships to be held at the disposal of German students.

The publication of the will silenced Mr Rhodes's detractors and converted many of his critics. It set a seal which could not be mistaken upon his completed life. The revulsion of sentiment towards him was complete, and his name passed at once in the public estimation to the place which it is probably destined to take in history, as one which his countrymen are proud to count among the great makers of the British Empire.

See the Life by Sir Lewis Michell (2 vols., London, 1910) ; consult also Sir T. E Fuller, Cecil John Rhodes: A Monograph and a Reminiscence (London, 1910), and " Vindex," Cecil Rhodes: His Political Life and Speeches (London, 1900).

(F L.L.)

The Rhodes Scholarships. — The scholarship system founded by the will of Cecil Rhodes provides in perpetuity for the support at Oxford, for a term of three years each, of about 175 selected scholars, Each scholai from the colonies and the United States has an allowance of £300 per annum during xxni. 9

the continuance of his scholarship; those from Germany, as being nearer to Oxford, an allowance of £250 each. In each province of Canada, in each state of Australia, in the four collegiate schools of Cape Colony (Rondebosch, Stellenbosch, South African College, and St

Andrew's College, Grahamstown), in the dominion of New Zealand, and in the colonies of Natal, Jamaica, Bermuda and Newfoundland, a scholar is elected each year. Three scholarships annually are assigned to Rhodesia. Each state and Territory of the American Union is entitled to have two scholars in residence, so that an election takes place in two years out of three. Five scholarships are provided annually for scholars from Germany.

In his will Rhodes mentions the objects he had in view in founding the different scholarships: —

I. Colonial. — " I consider that the education of young colonists at one of the universities in the United Kingdom is of great advantage to them for giving breadth to their views, for their instruction in life and manners, and for instilling into their minds the, advantage to the colonies as well as to the United Kingdom of the retention of the unity of the empire."

_ 2. American.—" I also desire to encourage and foster an appreciation of the advantages which I implicitly believe will result from the union of the English-speaking people throughout the world, and to encourage in the students from the United States of North America who will benefit from the American scholarships to be established for the reason above given at the university of Oxford under this my will an attachment to the country from which they have sprung, but without, I hope, withdrawing them or their sym- pathies from the land of their adoption or birth."

3. German. — " I note the German emperor has made instruction in English compulsory in German schools. I leave five yearly scholarships at Oxford of £250 per annum to students of German birth, the scholars to be nominated by the German emperor for the time being. Each scholarship to continue for three years, so that each year after the first three there will be fifteen scholars. The object is that an understanding between the three Great Powers will render war impossible and educational relations make the strongest tie."

He defines as follows the principles on which he wished his scholars to be selected : —

" My desire being that the students who shall be elected to the scholarships shall not be merely bookworms, I direct that in the election of a. student to a scholarship regard shall be had to (1) his literary and scholastic attainments; (2) his fondness for and success in. manly outdoor sports such as cricket, football and the like; (3) his

qualities of manhood, truth, courage, devotion to duty, sympathy for and protection of the weak, kindliness, unselfishness and fellowship; and (4) his exhibition during school days of moral force of character and of instincts to lead and to take an interest in his schoolmates, for those latter attributes will be likely in after life to guide him to esteem the performance of public duties as his highest aim."

The trustees named in the will for the management of the trust were Lord Rosebery, Lord Grey, Lord Milner, Sir Lewis Michell, Dr L. S. Jameson, Mr Alfred Beit and Mr Bourchier F. Hawksley.

After consultation with the educational authorities of all the communities to which scholarships are assigned, the trustees arranged a system for the selection of scholars. This system, which is subject to such changes as experience suggests, may be summarized as follows. Every candidate, in order to become eligible, is required to pass the Responsions examination of the university of Oxford, or some examination accepted by the university as an equivalent. In the case of communities possessing universities or colleges in affiliation with Oxford, a certain standing at those universities is accepted in lieu of Responsions. Examinations are held in two years out of three in each state of the American Union, and annually in colonies which do not have the affiliated universities or colleges referred to. German scholars are nominated by his majesty the emperor of Germany. Candidates must be unmarried — must be between the ages of 19 and 25 (in Jamaica and Queensland, 18-25; in Newfoundland, 18-21; in Western Australia, 17-25), and they must be, in the colonies, British subjects — in the United States and Germany, subjects of those countries. In each British colony electing scholars and in each state of the Union there is a committee of selection, composed commonly of leading educational authorities or high public officials. To these committees all candidates who have passed the qualifying tests submit their claims. The committees are entrusted with the power of selection, but are expected to exercise this power, as closely as circumstances permit, in accordance with the suggestions made by Rhodes. The trust arranges for the distribution of elected scholars among the colleges of Oxford, each of which has agreed to receive a limited number of approved candidates. (G. R. P.)

RHODES, JAMES FORD (1848-), American historian, was born in Cleveland, Ohio, on the 1st of May 1848. He

entered the university of New York as a special student in 1865, studied at the university of Chicago in 1866-67, an d at the College de France in 1867-68, and in 1868 served as occasional Paris correspondent to the Chicago Times. He then took a course in metallurgy in the School of Mines, at Berlin; subsequently inspected iron and steel works in western Germany and in Great Britain; and in 1870 joined his father in the iron, steel and coal business in Cleveland, becoming a member of the firm in 1874. He retired from business with an ample fortune in 1885, and after two years devoted to general reading and travel he began his History of the United States from the Compromise of 18 50, which, closing the narrative with the year 1877, was published in seven volumes in 1893- 1906. In recognition of the merit of his work he received honorary degrees from various American universities, was elected president of the American Historical Association in 1899, and received the Loubat prize of the Berlin Academy of Sciences in 1901. In 1909 he published a volume of Historical Essays.

RHODES, the most easterly of the islands of the Aegean Sea, about 10 m. S. of Cape Alypo in Asia Minor. It forms, with the islands of Syme, Casos, Carpathos, Castelorizo, Telos and Charki, one of the four sanjaks into which the Archipelago vilayet of Turkey is divided. The governor-general of the vilayet resides at the town of Rhodes. The length of the island is about 45 m. from N.E. to S.W., its greatest breadth 22 m., and its area nearly 424 sq. m. The population of the island comprises 7000 Moslems, 21,000 Christians, and 2000 Jews.

The island is diversified in its surface, and is traversed from north to south by an elevated mountain range, the highest point of which is called Atairo (anc. Atabyris or Atabyrium) (4560 ft.). It commands a view of the elevated coast of Asia Minor towards the north, and of the Archipelago, studded with its numerous islands, on the north-west; while on the south-west is seen Mount Ida in Crete, often veiled in clouds, and on the south and south-east the vast expanse of waters which wash the African shore. The rest of the island is occupied in great part by ranges of moderately elevated hills, on which are found extensive woods of ancient pines, planted by the hand of nature. These forests were formerly very thick, but they are now greatly thinned by the Turks, who cut them down and take no care to plant others in their place. Beneath these hills the surface of the island falls lower, and several hills in the form of amphitheatres extend their bases as far as the sea.

Rhodes was famed in ancient times for its delightful climate, and it still maintains its former reputation. The winds are liable to little variation; they blow from the west, often with great violence, for nine months in the year, and at other times from the north; and they moderate the summer heats, which are chiefly felt during the months of July and August, when the hot winds blow from the coast of Anatolia.

Rhodes, in addition to its- fine climate, is blessed with a fertile soil, and produces a variety of the finest fruits and vegetables. Around the villages are extensive cultivated fields and orchards, containing fig, pomegranate and orange trees. On the sloping hills carob trees, and others both useful and agreeable, still grow abundantly; the vine also holds its place, and: produces a species of wine which (was highly valued by the ancients, though it seems to have degenerated greatly in modern times. The valleys afford rich pastures, and the plains produce every species of grain.

The commerce of the island has been of late years increasing at a rapid rate. Many British manufactures are imported by indirect routes, through Smyrna, Constantinople, Beyrout and other places. Cotton stuffs, calicoes and grey linen are among the goods most in demand; they are exported to the neighbouring coast of Anatolia, between Budrum and Adalia, and thence conveyed into the interior. The expansion of the trade has been very much owing to the establishment of steam navigation direct to the island, which is now visited

regularly by French and Austrian steamers, as well as by some from England to Symrna.

The only town of any importance in the island is the capital, Rhodes, which stands at the north-east extremity. It rises in an imposing manner from the sea, on a gentle slope in the form of an amphitheatre. It is surrounded with walls and towers, and defended by a large moated castle of great strength. These fortifications are all the work of the Knights of St John. The interior of the city does not correspond to its outward appear- ance. No trace exists of the splendour of the ancient city, with its regular streets, well-ordered plan and numerous public buildings. The modern city of Rhodes is in general the work of the Knights of St John, and has altogether a medieval aspect. The picturesque fortifications also by which the city is surrounded remain almost unaltered as they were in the 15th century. The principal buildings which remain are the church of St John, which is become the principal mosque; the hospital, which has been transformed into public granaries; the palace of the grand

master, now the residence of the pasha; and the senate-house, which still contains some marbles and ancient columns. Of the streets, the best and widest is a long street which is still called the Street of the Knights. It is perfectly straight, and formed of old houses, on which remain the armorial bearings of the members of the order. On some of these buildings are still seen the arms of the popes and of some of the royal and noble houses of Europe.

The only relics of classical antiquity are the numerous inscribed altars and bases of statues, as well as architectural fragments, which are found scattered in the courtyards and gardens of the houses in the extensive suburbs which now surround the town, the whole of which were comprised within the limits of the ancient city. The foundations also of the moles that separate the harbours are of Hellenic work, though the existing moles were erected by the Knights of St John.

Rhodes has two harbours. The lesser of these lies towards the east, and its entrance is obstructed by a barrier of rocks, so as to admit the entrance of but one ship at a time. It is sufficiently sheltered, but by the negligence of the Turks the sand has been suffered to accumulate until it has been gradually almost choked up. The other harbour is larger, and also in a bad condition; here small ships may anchor, and are sheltered from the west winds, though they are exposed to the north and north-east winds. The two harbours are separated by a mole which runs obliquely into the sea. At the eastern entrance is the fort of St Elmo, with a lighthouse.

History. — It is as yet difficult to determine the part which Rhodes played in prehistoric days during the naval predominance of the neighbouring island of Crete; but archaeological remains dating from the later Minoan age prove that the early Aegean culture maintained itself there comparatively unimpaired until the historic pefiod. A similar conclusion may be drawn from the legend which peopled primitive Rhodes with a population of skilful workers in metal, the ” Telchines.” Whatever the racial affinities of the early inhabitants may have been, it is certain that in historic times Rhodes was occupied by a Dorian population, reputed to have emigrated mainly from Argos subsequently to the ” Dorian invasion ” of Greece. The three cities founded by these settlers — Lindus, Ialysus and Camirus — belonged to the ” League of Six Cities,” by which the Dorian colonists in Asia Minor sought to protect themselves against the barbarians of the neighbouring mainland. The early history of these towns is a record of brisk commercial expansion and active colonization. The position of Rhodes as a distributing centre of Levantine and especially of Phoenician goods is well attested by archaeological finds. Its colonies

extended not only eastward along the southern coast of Asia Minor, but also linked up the island with the westernmost parts of the Greek world. Among such settlements may be mentioned Phaselis in Lycia, perhaps also Soli in Cilicia, Salapia on the east Italian coast, Gela in Sicily, the Lipari islands, and Rhoda in north-east Spain. In home waters the Rhodians exercised political control over Carpathos and other islands.

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The history of Rhodes during the Persian wars is quite obscure. In the 5th century the three cities were enrolled in the Delian League, and democracies became prevalent. In 412 the island revolted from Athens and became the head- quarters of the Peloponnesian fleet. Four years later the in- habitants for the most part abandoned their former residences and concentrated in the newly founded city of Rhodes. This town, which was laid out on an exceptionally fine site according to a scientific plan by the architect Hippodamus of Miletus, soon rose to considerable importance, and attracted much of the Aegean and Levantine commerce which had hitherto been in Athenian hands. In the 4th century its political develop- ment was arrested by constant struggles between oligarchs and democrats, who in turn brought the city under the control of Sparta (412-395, 391-378), of Athens (395-391, 378-357), and of the Carian dynasty of Maussollus (3 5 7-340) • It seems that about 340 the island was conquered for the Persian king by his Rhodian admiral Mentor; in 332 it submitted to Alexander the Great. Upon Alexander's death the people expelled their Macedonian garrison, and henceforth not only maintained their independence but acquired great political influence. The expansion of Levantine trade which ensued in the Hellenistic age brought especial profit to Rhodes, whose standard of coinage and maritime law became widely accepted in the Mediterranean. Under a modified type of democracy, in which the chief power would seem to have rested normally with the six Trpuraras, or heads of the executive, the city enjoyed a long period of remark- ably good administration. The chief success of the government lay in the field of foraign politics, where it prudently avoided entanglement in the ambitious schemes of Hellenistic monarchs, but gained great prestige by energetic interference against aggressors who threatened the existing balance of power or the security of the seas. The chief incidents of Rhodian history during this period are a memorable siege by Demetrius Polior- cetes in 304, who sought in vain to force the city into active alliance with King Antigonus by means of his formidable fleet and artillery; a

severe earthquake in 227, the damages of which all the other Hellenistic states contributed to repair, because they could not afford to see the island ruined; some vigorous cam- paigns against Byzantium, the Pergamene and the Pontic kings, who had threatened the Black Sea trade-route (220 sqq.), and against the pirates of Crete. In accordance with their settled policy the Rhodians eagerly supported the Romans when these made war upon Philip V. of Macedon and Antiochus III. of Syria on behalf of the minor Greek states. In return for their more equivocal attitude during the Third Macedonian War they were deprived by Rome of some possessions in Lycia, and damaged by the partial diversion of their trade to Delos (167). Nevertheless during the two Mithradatic wars they remained loyal to the republic, and in 88 successfully stood a siege by the Pontic king. The Rhodian navy, which had dis- tinguished itself in most of these wars, did further good service on behalf of Pompey in his campaigns against the pirates and against Julius Caesar. A severe blow was struck against the city in 43 by C. Cassius, who besieged and ruthlessly plundered the people for refusing to submit to his exactions. Though Rhodes continued a free town for another century, its commercial prosperity was crippled and a series of extensive earthquakes after a.d. 15s completed the ruin of the city.

In the days of its greatest power Rhodes became famous as a centre of pictorial and plastic art ; it gave rise to a school of eclectic oratory whose chief representative was Apollonius Molon, the teacher of Cicero; it was the birthplace of the Stoic philosopher Panaetius; the home of the poet Apollonius Rhodius and the historian Posidonius. Protogenes embellished the city with his paintings, and Chares of Lindus with the celebrated colossal statue of the sun-god, which was 105 ft. high. The colossus stood for fifty-six years, till an earthquake prostrated it in 224 B.C. Its enormous fragments continued to excite wonder in the time of Pliny, and were not removed till A.D. 656, when Rhodes was con- quered by the Saracens, who sold the remains for old metal to a dealer, who employed nine hundred camels to carry them away. The notion that the colossus once stood astride over the entrance to the harbour is a medieval fiction. During the later Roman empire Rhodes was the capital of the province of the islands. Its

history under the Byzantine rule is uneventful.but for some temporary occupations by the Saracens (653-658, 717-718), and the gradual encroachment of Venetian traders since 1082. In the 13th century the island stood as a rule under the control of Italian adventurers, who were, however, at times compelled to acknowledge the over- lordship of the emperors of Nicaea, and failed to protect it against the depredations of Turkish corsairs. In 1309 it was conquered by the

Knights Hospitallers of St John of Jerusalem at the instiga- tion of the pope and the Genoese, and converted into a great fortress for the protection of the southern seas against the Turks. Under their mild and just rule both the native Greeks and the Italian residents were able to carry on a brisk trade. But the piratical acts of these traders, in which the knights themselves sometimes joined, and the strategic position of the island between Constanti- nople and the Levant, necessitated its reduction by the Ottoman sultans. A siege in 1480 by Mahomet II. led to the repulse of the Turks with severe losses; after a second investment, during which Sultan Suleiman I. is said to have lost 90,000 men out of a force of 200,000, the knights evacuated Rhodes under an honourable capitulation (1522). The population henceforth dwindled in con- sequence of pestilence and emigration, and although the island recovered somewhat in the 1 8th century under a comparatively lenient rule it was brought to a very low ebb owing to the severity of its governor during the Greek revolution. The sites of Lindus, Ialysus, and Camirus, which in the most ancient times were the principal towns of the island, are clearly marked, and the first of the three is still occupied by a small town with a medieval castle, both of them dating from the time of the knights, though the castle occupies the site of the ancient acropolis, of the walls of which considerable remains are still visible. There are no ruins of any importance on the site of either Ialysus or Camirus, but excavations at the latter place have produced valuable and interest- ing results in the way of ancient vases and other antiquities, which are now in the British Museum. Rhodes was again famous for its pottery in medieval times; this was a lustre ware at first imitated from Persian, though it afterwards developed into an independent style of fine colouring and rich variety of design.

See Pindar, yth Olympian Ode; Diodorus v. 55-59, xiii.-xx. passim; Polybius iv. 46-52, v. 88-90, xvi. 2-9, xxvii.-xxix. passim; C. Torr, Rhodes in Ancient Times (Cambridge, 1885), Rhodes in Modern Times (Cambridge, 1887); C. Schumacher, De republica Rhodiorum commentatio (Heidelberg, 1886); H. van Gelder, Geschichte der alten Rhodier (Hague, 1900); B. V. Head, Historia Numorum (Oxford, 1887), pp. 539-542; and Baron de Balabre, Rhodes of the Knights (1909).

(E. H. B.; E. Gr.; M. O. B. C.)

RHODESIA (so named after Cecil Rhodes), an inland country and British possession in South Central Africa, bounded S. and S.W. by the Transvaal, the Bechuanaland Protectorate and German South-West Africa; W. by Portuguese West Africa. N.W. by Belgian Congo; N.E. by

German East Africa; E. by the British Nyasaland Protectorate and Portuguese East Africa. It covers an area of about 450,000 sq. m., being larger than France, Germany and the Low Countries combined. It is divided into two parts of unequal size by the middle course of the Zambezi.

Southern Rhodesia, with an area of 148,575 sq. m., consists of Matabeleland and Mashonaland, the western and eastern provinces, while the trans-Zambezi regions are divided into North-Western Rhodesia (or Barotseland) and North-Eastem Rhodesia.

Physical Features. — Rhodesia forms part of the high tableland which constitutes the interior of Africa . south of the Congo basin. Hydrographically the greater part of the country belongs to the basin of the Zambezi (q.v.), but in the N.E. it includes the eastern headstreams of the Congo, and in the S. and S.E. it is drained by the tributaries of the Limpopo, the Sabi and the Pungwe. The Limpopo forms the boundary between Southern Rhodesia and the Transvaal. The north- western regions, drained by the upper Zambezi and its affluents, are described under Barotseland, and North-Eastem Rhodesia, together with the adjacent Nyasaland Protectorate, under British Central Africa. The highest portion of the tableland of Southern Rhodesia runs from the S.W. to the N.E. and forms a broad watershed between the tributaries of the Zambezi flowing north and the rivers flowing south and east. It is along this high plateau that the railway runs from Bulawayo to Salisbury and onwards to Portuguese East Africa. The eleva- tion of the railway varies from 4500 ft. to 5500 ft. There is a gradual sloping away of the plateau to the N.W. and S.E., so

that only a small portion of Southern Rhodesia is under 3000 ft. The eastern boundary, along Portuguese. East Africa, forms the edge of the. tableland; the height of the edge is accentuated by a series of ridges, so that the country here assumes a mountainous appearance, the grass-clad heights being reminiscent of the Cheviot Hills of Scotland or the lower Alps of Switzerland.

Geology. — The geology of this region is very imperfectly known. Metamorphic rocks extend over immense areas, but these and the other formations are to a great extent hidden beneath superficial deposits. Conglomerates and banded ironstone rocks are found in the metamorphic areas around Bulawayo and the borders of Katanga; but

to what extent these represent the different forma- tions older than the Karroo and newer than the Swaziland schists (see Transvaal) has not been satisfactorily determined. Certain gold-bearing conglomerates are regarded as the equivalents of the Witwatersrand series, but the main sources of gold are the veins of quartz and igneous rocks developed in the metamorphic series. The Karroo formation is well represented, and covers extensive areas in the Zambezi basin. The Dwyka conglomerate

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appears to be developed in the Tuli district. The coal-bearing strata of Tuli and Wankies are certainly of Karroo age. They have yielded the fossil remains of fishes Acrolepis molyneuxi, the fresh- water mollusc Palaeomutela, a few reptilian bones, and species of Glossopteris among plants.

The age of a widely distributed series of red-white sandstones, named by Molyneux the Forest Sandstone, remains uncertain. Molyneux considers them Tertiary, but it is not improbable that sandstones of various ages from Karroo to those of Recent date are represented. They contain numerous interbedded sheets of basalt, but it is doubtful if any of these are of so recent a date as Tertiary. Rocks of Karroo age occur round Lake Bangweulu, and contain numerous fossil plants and a few small shells. . The age of the wide, thick sheet of basalt, through which the Zambezi has cut the Batoka gorge between the Victoria Falls and Wankies, remains uncertain. 1

1 For geology see F. H. Hatch, " Notes on the Geology of Mashonaland and Matabeleland," Geol. Mag., 1895; A. 1. C. Molyneux, " The Sedimentary Deposits of Rhodesia," Quart. Journ. Geol. Soc, vol. 'Hx. (1903); F. P. Mennel, "Geology of Rhodesia," British Association Handbook (Cape Town, 1905) ; G. W. Lamplugh, British Assoc. Rep., South African Meeting, 1905.

Climate.— As Southern Rhodesia extends between 16° S. and 22 ° S., and is thus within the tropics, it might be expected that the climate would be trying for Europeans, but owing to the elevation of the country the temperature is rarely too high for comfort. Another factor that renders the climate equable. is that the rainy season coincides with the summer months, and the winter months are dry. The nights

are always cool, so that the climate approxi- mates to the ideal. On the high tableland which forms the great proportion of the country the temperature in the shade rarely reaches 100 and there is just sufficient frost in the winter to be useful to farmers. The winter months are June, July and August, and the hottest months are the spring months of September, October and November, just before the rains begin. A temperature of 1 10° is sometimes reached in the low-lying district of Tuli (elevation 1890 ft.) and in the Zambezi valley. There is a striking difference between the minimum temperatures on the ground and those registered 4 ft. from the ground. The latter rarely reach freezing-point, but the ground temperature is sometimes as low as 24 . Hoar frost is most noticeable in the vleis and low-lying areas. The period known as the rainy season extends from Sep- tember to March, but the greatest amount falls in the last three months of that period. The mean annual rainfall for various stations in the eastern half of Rhodesia ranges from 24 to 44 in., the greatest rainfall being along the eastern border. For the western half the mean ranges from 19 to 27 in., but in the south-west corner it is much drier, the rainfall so far recorded never reaching 18 in. There is a sufficiency of rain for all summer crops, but winter crops, such as wheat, must be assisted by irrigation. Malaria is prevalent in certain districts during the wet season, but this is now preventable and the country is very healthy, children, especially in towns and on the high veld, growing sturdily. The death-rate amongst Europeans is only about 15 per 1000. «

Fauna. — Rhodesia is rich in the larger grami- nivorous animals, especially in antelope, which number about twenty-five varieties, including kudu, eland, hartebeeste, roan, sable, wilde- beeste and impala. The most common are the duiker, the stembok and the rietbok. Other herbivorous animals found in the country are the buffalo, giraffe, zebra, elephant, hippopotamus, rhinoceros (black and white), warthog, and various baboons and monkeys. The buffalo is now rare, having been almost exterminated by the rinder- pest in 1896. The carnivora include the lion, leopard, cheetah, and various wild cats, foxes, wolves, jackals and dogs. There are at least five varieties of the mongoose. Amongst the rodents are squirrels, dormice, rats (eleven kinds), the porcupine, the Cape hare and the rock hare. Of insectivora the ant-eater, the ant-bear, the hedgehog and various shrews may be mentioned. Bats number eleven varieties. Snakes are numer- ous, the most important being the python, the puff-adder and the cobra. Crocodiles and iguanas are found in most of the rivers, and chameleons and lizards are very common. Rhodesia abounds in beetles, butterflies and moths, and new varieties are frequently discovered in the wet season. Men- tion ought to be made of white

ants (termites) and locusts. The ants are a serious pest, attack-

ing all cut timber resting in or on the ground.

E« 7 w, to *. Th gradually envelop the dead wood in a mound of earth and consume it wholly, so that all poles and house-timber have to be carefully protected either by chemical preparations or by raising them clear from contact with the earth. The mounds which the white ants erect often reach a height of many feet. There are several kinds, the black-headed nipper ant, chiefly found in the west, being the most destructive. Locusts are particularly dreaded in their v/ingless state, when they clean off every green leaf, every bit of vegetation, as they march on in their hundreds of thousands. The rivers are not very plentiful in fish, but occasional sport is afforded by barbel, bream and tiger-fish.

Birds to the number of about 400 varieties have been found in Rhodesia. The largest of these are the ostrich, the secretary-bird, the paauw, the koorhaan, cranes (three varieties), storks (four), vultures (six) and eagles (eight). The chief birds that attract sportsmen, besides the paauw and the koorhaan already men- tioned, are the guinea-fowl (three kinds), partridge and francolin (seven kinds), wild goose, duck and teal. Some of the most in- teresting birds are the weaver-birds (eighteen), the ox- peckers, which find their food on the backs of cattle, the kingfishers (eight), the hornbills (five), the parrots, lovebirds, the polygamous widow birds— whose females are of insignificant appearance, but whose males develop a brilliant plumage and lengthy tails during the

breeding season, when they are on guard over their harems of from ten to fifteen wivesˆ-the sunbirds, with their long curved beaks that search out the nectar of flowers, and the honey-guides, which, with their agitated ” chuck, chuck,” lead the wayfarer to bees’ nests with expectation of joining in the plunder. The small birds of Rhodesia are usually very brilliantly coloured, the most dis- tinguished being what is known as the blue jay, with its bright, iridescent, light blue plumage.

Flora. — The vegetation of the territory is luxurious and mainly subtropical, but in the lower valleys the flora assumes a tropical aspect. The country is well wooded and in this respect differs from the

high tablelands farther south. The trees as a rule attain no greater height than about 20 ft., but in some districts, such as South Melsetter and Wankies, there are remains of forests of large timber. The small growth of the trees is said to be due to the annual veld fires, and it is noticeable that native trees that are protected attain a much greater height. As a rule the wood is either very hard or very soft, so that timber for building has still to be imported, although the existing timber is useful for mining purposes. One of the hardest woods is the so-called Rhodesian teak (native Ikusi), which is about 50% harder than real teak (Tectona grandis). The trees most commonly met with are mapane, used for poles; umkamba, resembling mahogany; m'lanji cedar, chiefly found along the eastern border; umsasa, used for firewood; impachla, the native wisteria. Among other trees are the baobab with enormous very soft trunk, the fruit being a large nut containing citrate of magnesia, which natives use to make a cooling drink; the umvagaz-ˆ-or blood-wood — which issues a blood-coloured juice when cut, and the umkuna, or hissing tree, which hisses when an incision is made. The barks of the umsasa, the umhondo, and the umgosa are much used by natives for binding fibres in making huts and are also used for tanning. The bark of. the baobab yields a fine fibre which natives use in making excellent game nets and fishing nets. The native fruit-bearing trees are the fig (many varieties), the mahobohobo or umjanje, resembling the loquat, the Kaffir plum, very sour and totally different from the Kaffir plum of Cape Colony, and the Kaffir orange. Among the shrubs the proteas, or sugar bushes, with their nectar-stored flowers, are the most frequent. The mimosa thorn, although more of the nature of a tree, grows in dense masses, chiefly in the western province.

The period of the year when flowers begin to bloom is rather remarkable. After the long spell of dry weather, lasting from five to seven months, and before any rain has fallen, blooms appear all over the veld. Most of such flowers are those of bulbous plants or plants with large roots that have been stored with nourishment during the previous growing wet season. The flowers are sustained by this stock of food until the rains appear again to replenish the roots. Even grass sprouts green over the earth before the rains appear, and the hard-baked veld is pierced by the shoots of the gladiolus, the orchid, the asparagus, the solanum, the convolvulus and many other flowers. When the rains are far advanced, the annuals shoot rapidly and make a second show of bloom. A peculiarity of the early spring shoots on trees and shrubs is that they have not the green tints of the colder regions, but are all shades of brown and orange and red and yellow.

One of the chief features of Rhodesia is the vast stretches of grass-

covered veld, the grasses varying from a few inches to 15 ft. in height and numbering about 100 different varieties. Along the rivers are to be found palms, tree ferns, bananas, dracaenas and other hot climate plants. Rubber, indigo and cotton are indigenous and there are groves of lemon trees, but these were most probably introduced by early settlers. Tobacco, which grows luxuriantly, may also have been introduced.

Inhabitants. — In Southern Rhodesia about half the European population, which in 1909 was approximately 16,500, is British born or born of British parents, and about one-third is South African born. There are about 11,500 males and 5000 females, and the population is equally divided between the urban and rural areas. In rural areas the chief occupations are mining and agriculture. Industrial pursuits, including mining, engage about 25% of the population, 8% are employed in agriculture, and 15% in commerce. Mashonaland has 7500 white inhabi- tants;, and Matabeleland 9000. There are about 2000 Asiatics in Southern Rhodesia.

The Natives of Rhodesia belong to the Bantu-Negro stock and are roughly divisible into two groups; those long settled in the country, and the Amazulu, who during the 19th century left Zululand and, passing through the more southern regions, overran Rhodesia and settled in Matabeleland. The Barotse (q.v.) are mainly settled in North-West Rhodesia. In Southern Rhodesia, in spite of incursions from Portuguese territory and from the north, the natives can be still clearly divided into Mashona and Matabele, living in the eastern and western pro-

vinces respectively. The name Mashona is not used by the natives but is useful as distinguishing the allied tribes of the eastern division from the Matabele in the west. The languages of the Mashona tribes are allied and are distinct from that of the Matabele (or Zulu), but it is uncertain whether these Mashona tongues should be regarded merely as different dialects, or languages as different as . those of the various nations of Europe (but see Bantu Languages). The tribes round Salisbury and extending as far as Marondella in the east and about 100 m. north are clearly branches of the Vasezuru people, that is, the people from ” higher up,” the ” higher up ” being a region in the south-east. Their history can be traced from about the beginning of the 18th century; but there is a great lack of tradition amongst this class of native, which, is distinctly inferior in type to the Matabele in the west.

Farther north there are the Makorikori and the Mabudja or Mabushla.

It would appear that the country in which- these people now dwell, was formerly in the possession of the Barotse, and some of the present chiefs obtained their positions by per- mission of the Barotse. Previously, according to Portuguese documents of the 16th and 17th centuries, the Makaranga or Makalanga now located in the south round about Victoria had possession of the country as far north as the Zambezi. Their language is allied to that of the present inhabitants, but in many respects is widely different and of la|e has become more so owing to intercourse with the Matabele. Along the eastern border two more tribes can be differentiated, namely, Umtasa's people in the north and those speaking the Chindawo language in the south. Their languages are merely variants of the language spoken in the Salisbury and Mazoe districts.

All the tribes in the eastern province have very similar habits and customs. Their huts are circular with a wall a foot or two high, made of poles and daga (mud) surmounted by a conical thatched roof. They thus differ from the beehive huts of the Zulus. They are built indiscriminately together and are not surrounded by stockades. The whole family dwells in the same hut along with dogs, goats and fowls, and sometimes even with cattle, though there are usually separate kraals for their cattle. The kraals are as a rule filthy, but the inside of the hut is kept clean. There is a special place for a fire, and a raised portion of the mud floor on which to sleep, but no furniture. Their mealie fields are usually some distance from the place of abode, but their tobacco gardens are near their huts. Their main object in life seems to be to grow sufficient grain for food and beer. The grain they store in granaries, resembling small huts, placed on rocks or on Stakes, out of the reach of white ants and secure from the depredations of animals. They amuse themselves occasionally by making earthenware pots which are very soft and easily broken, or by engaging in iron-work or brass-wire work for ornamentation. In the south they are quite clever in making water-tight baskets from rushes grown by the Sabi river. In their religious beliefs spirits play a great part. Above all there is a vague idea of a Supreme Being whom they call Mwari. They have a fixed belief in the spirits of their ancestors, the spirits of the witch-doctors, Ihe spirits of the Matabele, the spirits of old women, the spirits of the foolish, the spirits of baboons, &c. Every occurrence is attributed to the influence of a spirit, and if the occurrence is an evil one a feast and dance of propitiation are held. Feasts of thanks- giving are also held on such occasions as the gathering of the first-fruits, the harvest festival, or on the return from a long and dangerous journey. Of the tribes already mentioned the most advanced are Umtasa's people and the Makaranga. The pro- bable connexion of the tribes

now inhabiting Mashonaland with , the architects of the ancient stone buildings which are scattered over the country is discussed in the section Archaeology. Of these ruins the most extensive are situated near Victoria and are known as Zimbabwe (q.v.) .

In the western province the Matabele, or rather Amandabele, are the descendants of the Zulus who trekked under the

leadership of the famous Mosilikatze up through the Trans- vaal, whence they were driven by the Boers. Mosilikatze died in 1868, and his son Lobengula, after a fight with a brother, assumed sway in 1870. His people were divided into three main sections: the Abezansi (who were the aristo- crats), the Abenhla and the Amaholi. The Amaholi or Holi were the inhabitants of the land at the time of the invasion and thereafter were practically in the position of bondsmen and rarely allowed to possess cattle. The great spirit of the Holis was the Mlimo, who was practically the spirit of the nation. Among the Holi tribes are the Aba- shangwe, the Abanyai, the Batonke (near the Zambezi), the Abananzwa of the Wankie district, the Ababiro of the Tuli district, and the Abasili, a nomadic tribe chiefly subsisting on game. There is a small tribe in the Belingwe district called the Abalemba, which would appear to have been in touch with the Arabs in early times. Their customs include circumcision and the rejection of pork as food.

The natives in Southern Rhodesia number about 700,000, and of these 10,000 work on the mines and 20,000 are engaged in farm, railway and household work under Europeans.

Chief Towns. — Salisbury, which lies 4880 ft. above the sea, is the capital of Southern Rhodesia, being the seat of government, and is situated in the eastern province (Mashonaland). There are about 1700 white inhabitants and 3000 natives. It is the commercial centre for an extensive mining and farming district. The principal buildings include churches, public library, hospital, schools, banks, post office and numerous hotels. There are a con- siderable number of government offices, and the administrator and resident commissioner live here. The only industries are a brewery and a tobacco factory for grading and packing the tobaccos of the local growers.

Bulawayo (q.v.), situated 4469 ft. above the sea, is the largest town and is in the western province, Matabeleland. It is 301 m. by rail S.W.

of Salisbury, and 1362 m. N.E. of Cape Town. The popula- tion is some 4000 Europeans and about the same number of natives. The town has the advantage of a good pipe water supply and a service of electric light. It was the ancient capital of the Matabele king, Lobengula. There is a Government house which is occa- sionally occupied, and was the residence of Cecil Rhodes. It is from Bulawayo that the World's View, the burial-place of Rhodes in the Matoppo Hills, is usually visited.

The other towns are Umtali, on the eastern border, pop. 800 whites, railway works, centre for numerous large and small gold mines; Gwelo, the central town, about midway between Salisbury and Bulawayo, 370 whites; Victoria and Melsetter in the south, centres of farming districts. Victoria, near which are the famous Zimbabwe ruins, is reached by mail cart (80 m.) from Selukwe, and Melsetter by mail cart (95 m.) from Umtali. There are also small townships at Hartley, Selukwe, Enkeldoorn and Gwanda. Bulawayo and Salisbury are managed by town councils, the other towns have sanitary boards.

Communications. — The Rhodesian railway system connects the chief towns and mining centres with one another and all the other South African countries. The main line is a continuation of the railway from Cape Town through Kimberley and Mafeking. It runs from Mafeking in a general N.E. direction to Bulawayo, whence it goes N.W. to the Zambezi, which is crossed a little below the Victoria Falls. The bridging of the river was completed in April 1905. Thence the railway is continued N.E. (92 m.) to Kalomo, Barotseland, and onward to the Katanga district of Belgian Congo. The section from Kalomo to Broken Hill (261 m.) was completed in 1907, and the extension to the frontier of Belgian Congo (126 m.) in 1909. This main line forms the southern link in the Cape to Cairo railway and steamboat service. From Bulawayo a line goes N.E. by Gwelo to Salisbury and thence S.E. to the Portuguese port of Beira. From Bulawayo another line (120 m. long) runs S.E. to the West Nicholson Mine. From Gwelo a railway (40 m.) goes S.E. to Yankee Doodle, and from this there branches a line (50 m. long) in an easterly direction to Blinkwater. From Salisbury a line runs N.W. to Lomagundi (84 m.). The last-named has a 2 ft. gauge. The other railways are of the standard gauge of South Africa — 3 ft. 6 in. The distances from Bulawayo to the following places are: — Gwelo, 113 m. ; Salisbury, 301 m. ; Umtali, 471 m. ; Beira, 675 m. ; Mafeking, 490 m. ; Kimberley, 713 m.; Cape Town, 1362 m. ; Port Elizabeth, 1 199 m. ; East London, 1260 m. ; Bloemfontein, 800 m. ; Johannesburg, 931 m. ; Pretoria, 977 m.; Lourengo Marques, 1307 m. ; Durban, 1238 m. (the last four places all via Fourteen Streams, a junction 48 m. N. of Kimberley), and Victoria Falls, 282 m. .

About 4000 m. of roads have been built and are maintained by government. The telegraph and telephone system is very com- plete, there being for the whole of Rhodesia about 8000 m. of wires. This total includes the police telephone wires and part of the African

Transcontinental system, and is served by about ninety telegraph offices. In Southern Rhodesia there are about eighty post offices. A post office savings bank was brought into operation on the 1st of January 1905. Over 2,500,000 letters, post-cards and parcels are despatched annually.

Agriculture. — The country is well adapted for agriculture. Chief attention has been paid by farmers to the growing of maize, the annual produce being about half a million bushels. It is a very easily grown cereal, especially in such a fertile country as Rhodesia, and is extensively grown by natives, but the improved methods of the whites easily secure a yield of from twice to eight times that of the native. The average yield by European farmers is about eight bags of 200 ft) per acre, but ten to fifteen bags is quite a common crop. Wheat, barley and oats are grown with success under irrigation in the winter time, but the moisture with attendant rust is too excessive for these crops in summer. Tobacco promises to be a great source of wealth to the territory. Both the Turkish and Virginian tobaccos have been raised and cured and put on the market, where they were easily disposed of. They are of better quality than those grown elsewhere in South Africa. In 1908 only about 500 acres were under cultivation, but there are large tracts of land suitable for this industry.

Fruits of very extensive variety thrive in Rhodesia ; they include plums, bananas, grapes, guavas, paupaus, figs, loquats, pine-apples, Cape gooseberries, mulberries, tree tomatoes, rosellas, granadillas, all kinds of citrus fruits. The most flourishing are the citrus fruits and the Japanese plums, but in the higher altitudes pears and apples are also very successful. Vegetables of nearly all kinds can be grown, especially potatoes, tomatoes, asparagus, sweet potatoes, yams, &c. Coffee produces as much as 4 lb of beans to the shrub in certain parts.

Cattle thrive well in Rhodesia, and stock-raising promises to be the chief agricultural industry of the future. During the early period of European occupation rinderpest and at a later date East Coast fever decimated the country, but the prevention of these diseases is now thoroughly understood and, since the rinderpest of 1896 swept away large herds, cattle have been increasing rapidly in number. There is hardly any portion of the territory which is not suitable for cattle, and the rapid natural increase indicates a speedy prosperity in cattle

ranching. Goats and woolless sheep number about 800,000 in the territory. Donkeys and mules thrive, but horses are very liable to horse-sickness towards the end of the rainy season.

Mining. — When Rhodesia was first opened up to European occupation, attention was immediately called to the large number of gold workings made by unknown former inhabitants of the country. These workings were only carried on to a limited extent, being stopped probably by the presence of water and the lack of suitable machinery. European enterprise has resulted in the discovery of a large number of mines situated in widely scattered areas. The chief mines are the Globe and Phoenix, the Selukwe and the Wanderer in the Gwelo district; the Giant in the Hartley district; the Jumbo in the Mazoe district; the Ayrshire in the Lomagundi district; the Penhalonga and the Rezende in the Umtali district, while there are numerous smaller mines in the Gwanda, Insiza, Gwelo, Hartley and Umtali districts. The output of gold increased in value from £308,000 in 1900 to £2,623,000 in 1909, about one-third of this being produced by small workers whose individual output is not over 1500 oz. a month. As efforts have been restricted mainly to extracting the ore indicated by ancient workings, it is probable that many gold reefs still await discovery. The mineral wealth of Rhodesia is very varied and includes silver, of which 262,000 oz. were produced in 1909; coal, 170,000 tons (1909), and lead, 965 tons. Extensive discoveries of chrome iron have been made in the Selukwe district. There is a steady export of this metal, of which the output in 1909 was oyer 25,000 tons. Besides these, small quantities of copper, wolframite and diamonds have been exported, while scheelite and asbestos have been discovered in payable quantities.

Commerce. — Taking the average for a series of years ending 1908, the total imports amounted to about £1,500,000 per annum, 55% of which were manufactured articles, including £250,000 textile goods and wearing apparel, and £120,000 machinery. Im- ports of food and drink amounted to £330,000. In 1909 the imports amounted to £2,214,000, the chief items being food and drink (£422,000), machinery, animals and cotton goods. Exports consist almost entirely of minerals. In 1909 they were valued at £3,178,000. Included in the total is £342,000 goods imported and re-exported.

Administration. — The administration of Rhodesia is carried on by the British South Africa Company under an order in council of 1898, amended by orders in council of 1903 and 1905. The company is called upon to appoint for Southern Rhodesia an administrator or administrators. The company also ap- points an executive council of

not fewer than four members to advise the administrator upon all matters of importance in administration. An order in council of 1903 provided for a

legislative council consisting of the administrator, who presides, seven nominees of the company approved by the secretary of state, and seven members elected by registered voters (the number of registered voters in 1908 was 5291). In 1907 it was agreed to reduce the company's nominees by one, so. that the elected members should form the majority of the council. The secretary of state appoints a resident commissioner, who sits on both executive and legislative councils without vote. The duty of the resident commissioner is to report to the high commissioner upon all matters of importance. Ordinances passed by the legislative council are submitted to the high commissioner for consent or otherwise, but may be disallowed by the secretary of state.

For the administration of justice there is a High Court with two judges having civil and criminal jurisdiction. There are seven magistrates' courts throughout the territory. For the administration of native affairs there are appointed a secretary for native affairs, two chief native commissioners, twenty-eight native commissioners and six assistant native commissioners. Natives suffer no disabilities or restrictions which do not equally apply to Europeans except in respect of the supply of arms, ammunition and liquor. Native com- missioners may exercise jurisdiction in native affairs not ex- ceeding that exercisable by magistrates. The company has to provide land, usually termed Native Reserves, sufficient and suitable for occupation by natives and for their agricul- tural and industrial requirements.

Revenue. — The administrative revenue of Southern Rhodesia was at first much less than the cost of administration. The figures for 1899-1900 were: revenue, £325,000; expenditure, £702,000. Since that date revenue has increased and expenditure decreased, and from 1905-6 (in which year the revenue exceeded £500,000) the cost of administration has been met out of revenue. For 1909-10 the revenue was approximately £600,000, the two main items being customs duty, £190,000, and native tax, £200,000. The native tax is £1 per head for every adult male and 10s. for every wife after the first.

Education. — Besides a few private schools, there were in 1909 34 schools for Europeans, 26 of which were wholly financed by

government, the remainder being aided. The aided schools are as a rule connected with some religious body, and aid is given to the extent of half the salaries of the teachers and half the cost of school requisites. Loans are also given to assist in school building. A system of boarding grants has been instituted to enable children in the outlying districts to attend school. Education is not free except for poor children, but the fees in government schools do not exceed £6 a year. In 1910 several schools had reached the stage of preparing pupils for matriculation at the Cape University and similar examinations. The number of pupils in 1909 in European schools was 12 12, being more than double what it had been four years previously. The education of natives is in the hands of various religious bodies, but financial aid is given by government to native schools which comply with certain easy conditions. In 1909, 80 native schools with an enrolment of 7622 pupils earned grants.

Military Forces. — The military force in Southern Rhodesia is styled the British South African Police, and numbers about 40 officers, 400 non-commissioned officers and men, and 550 native police. The force is under a commandant-general, who, with the sub- ordinate officers, is appointed by the secretary of state, and is under the direct control and authority of the high commissioner. The commandant-general is paid by the British parliament. The offices of commandant-general and resident commissioner were com- bined in 1905.

The Southern Rhodesia Volunteers, in two divisions, eastern and western, under command of colonels, number altogether 86 officers and 1700 non-commissioned officers and men.

Medical. — There are, including cottage hospitals, ten hospitals in towns and townships, and thirteen district surgeries have been established. (G. Du.)

Archaeology. — Between the Zambezi and the Limpopo, and extending from the coast to at least 27° E., may be found the traces of a large population which inhabited Southern Rhodesia and Portuguese East Africa in bygone times. Apart from numerous mines, some of which are being successfully re- worked at the present day, ruins of stone buildings have bejsn found in several hundred distinct places. Few of these have been explored systematically, but investigations in 1905, though confined to a small number of sites, determined at

least the main questions of date and origin. The fanciful theories of popular writers, who had ascribed these buildings to a remote antiquity, and had even been so audacious as to identify their

founders with the subjects of King Solomon or of his contemporary the queen of Sheba, are now seen to be untenable. J. T. Bent's Ruined Cities of Mashonaland (1892) is now interesting only for its illustrations, and his theories are obsolete. Positive archaeological evidence demonstrates that the " Great Zimbabwe " itself, the most famous and the most imposing of the misnamed " Ruined Cities," was not built before medieval times, and that the earliest date which can be assigned to any of the sites explored is subse- quent to the nth century a.d. Moreover, the complete identity of custom, revealed no less by the details of the dwell- ings than by the type of the articles found within them, proves that the tribe that built these structures was one closely akin to if not actually identical with the present Bantu inhabitants of the country.

These ruins, even when stripped of their false romance, are of extreme interest; but their nature and appearance have been much misunderstood, and the skill and intelligence re- quired for their erection have been grossly overestimated. It should be clearly stated, therefore, that the methods of the old Rhodesians evince their complete ignorance of all the devices employed in the architecture of civilized peoples. They have not attempted to solve the problems' of supporting weight and pressure by the use of pillar, arch or beam; the ingenuity of the builders goes no further than the dexterous heaping up of stones. Indeed, their most finished and ela- borate work must be compared with nothing more ambitious than the dry-built walls which serve to enclose the fields in certain parts of England. The material is the local granite or diorite obtainable in the immediate neighbourhood. Stone- hewing has not been practised; and was unnecessary, since the natural flaking of the boulders provides an abundance of ready-made slabs which need only be detached from the parent rock and broken to the required size. At most the blocks thus obtained have been very roughly trimmed with one or two blows, and any apparent regularity in the fitting has been obtained merely by judicious selection. Mortar has seldom been used; the courses are never laid with any approach to exactness; walls merely abut on one another without being bonded, and the same line often varies greatly in thickness at different parts.

The main principle of the ground plan is invariably circular or elliptical, though it is carried out with a conspicuous lack of symmetry or exactness. Straight lines are unknown, and even accidental approximations to an angle are rare. This is eminently characteristic of the Bantu, whose huts are commonly built in circular form. Indeed, it is the round Bantu hut which has been the original model for even the finest of these stone constructions. The connexion between the two,

however, goes beyond mere resemblance. The stone walls are always accompanied by huts; they are mere parti- tions or ring-fences enclosing and structurally inseparable from platforms of clay or cement on which stand the remains of precisely the same dwellings that the Makalanga make at the present day. Buildings such as those at Dhlo Dhlo, Nana- tali and Khami in Matabeleland, or at Zimbabwe in southern Mashonaland, are merely fortified kraals; remarkable indeed as the work of an African people, but essentially native African in every detail, not excepting the ornamentation.

The best-known and the most attractive of the Rhodesian ruins are those situated in the more central and southern region. In the north-east, however, the remains are even more numerous, though the single units are less remarkable. Over the whole of Inyanga and the Mazoe region are distri- buted hill-forts, pit-dwellings and intrenchments which are more primitive in character though of the same generic type as those found farther south. The inhabitants of these northern districts were occupied more in agriculture than in gold-mining, and one of the most striking features of their settlements is the

irrigation system. There are no aqueducts such as Europeans or Arabs might have built, but water furrows have been carried on admirably calculated gradients for miles along the hill-sides. The amount of labour which has been expended on the great villages between Inyanga and the Zambezi is astounding. On one site, the Niekerk Ruins, an area of fully 50 sq. m. is covered with uninterrupted lines of walls. It is an interesting question which may be solved by future explorations whether these ‘ settlements do not extend north of the Zambezi. In- trenchments like those of the Niekerk Ruins have been reported from the south-east of Victoria Nyanza, and Major Powell Cotton has published a photograph from the Nandi country which exhibits a Structure precisely similar to the hill forts of Inyanga. (See also Zimbabwe; Monomotapa.)’ •’■■

See D. Randall-Maclver, Mediaeval Rhodesia (London, 1906); R. N. Hall and W. G.‘Neal, The Ancient Ruins of Rhodesia (London, 1902); Zeitschrift filr Ethnologie, 1875 and 1876; Journal of the R.G.S., 1890, 1893, 1899, 1906; Journal of Anthropl. Inst., vols. xxxi., xxxv. (D. R.-M.)

History. — There is evidence that from the 10th or nth centuries

onward the lands now forming Rhodesia were in- habited by Bantu-negroes who had made some progress in civilization and who traded with the Arab settlements at Sofala and elsewhere on the east coast (see Archaeology above). From the 1 5th century, if not earlier, until about the close of the 1 8th century, “a considerable part of this area was ruled by a hereditary monarch known as the Monomotapa, whose Zim- babwe (capital) was, in the earlier part of the period indicated, in what is now Mashonaland. Some of the Monomotapas during the r6th and 17th centuries entered into political and commercial relations with the Portuguese (see Monomotapa and Zimbabwe). The Monomotapa ” empire ” included many vassal states, and probably fell to pieces through intertribal fighting, which greatly reduced the number of inhabitants. In the early years of the 19th century the tribes appear to have lost all cohesion. The people were mainly agriculturists, but the working of the gold-mines, whence the Monomotapas had ob- tained much of their wealth, was not wholly abandoned.

The modern history of the country begins with its invasion by the Matabele, an; offshoot of the Zulus. Mosilikatze, their first chief, was a warrior and leader who served- under the Zulu despot Chaka. Being condemned to death by Chaka, Mosilikatze fled, with a large division of the Zulu army. About 181 7 he settled in territories north of the Vaal, not far from the site of Pretoria; and in 1836 a treaty of friendship was entered into with him by the governor of Cape Colony. In the same year a number of the ” trek Boers ” had crossed the Vaal river, and came in contact with the Matabele, who attacked and defeated them, capturing a large number of Boer cattle and sheep. In November 1837 the Boers felt themselves strong enough to assail Mosilikatze, and they drove him and his tribe north of the Limpopo, where they settled and occupied the country subsequently known as Matabeleland. In 1868 Mosilikatze died. Kuruman, son and recognized heir of the old chieftain, had disappeared years before, and though a Matabele who claimed to be the missing heir was brought from Natal he was not acknowledged by the leading indunas, who in January 1870 invested Lobengula, the next heir, with the chieftainship. Those Matabele who favoured the supposed Kuruman were defeated in one decisive battle, and thereafter Lobengula, whose kraal was at Bulawayo, reigned unchallenged. At this time the Matabele power extended north to the Zambezi, and eastward over the land occupied by the Mashona and other Makalanga tribes. North of the Zambezi the western districts were ruled by the Barqtse (q.v.) , while the eastern portion had been overrun by other tribes of Zulu-Xosa origin, among whom the Agoni were the most powerful. The explorations of David

Livings stone, Thomas Baines (1822-1875), Karl Mauch, and other travellers, had made known to Europe the general character of the country and the existence of great mineral wealth. Loben- gula was approached by' several " prospectors " for the grant of concessions; among them two Englishmen, Baines in 1871

and Sir John Swinburne in 1872, obtained cessions of mineral rights, but little effort was made to put them in force. In 1882 President Kruger, who was then bent on extending the bound- aries of the Transvaal in every direction, endeavoured to make a treaty, with Lobengula, but without success. The Warren expedition of 1884 to Bechuanaland (q.v.), while it checked for a time the encroachments of the Transvaal Boers, and preserved to Great Britain the highway to the north through Bechuana- land, also served to encourage colonists to speculate as to the future of the interior. At this time, too, the struggle between the nations of western Europe for the unappropriated portions of Africa had begun, and while tha, Boers, foiled in Matabeleland, endeavoured to get a footing in Mashonaland, both Portuguese and Germans were anxious to secure for their countries as much of this region as they could. In 1887 a map was laid before the Portuguese cortes showing the territories in Africa claimed by Portugal. They stretched across the continent from sea to sea, and included almost the whole of what is now Rhodesia, as well as the British settlements on Lake Nyasa. To the claim of a transcontinental domain Portugal had succeeded in gaining the assent of Germany and France, though Germany, which had secured a footing in south-west Africa, still dreamed of extending her sway over Matabeleland. By the instructions of Lord Salisbury, then foreign secretary, the British representative at Lisbon informed the Portuguese government that except on the seacoast and on portions of the Zambezi river there was not a sign of Portuguese authority or jurisdiction in the districts claimed by them, and that the British government could not recognize Portuguese sovereignty in territory not effectively occupied by her.

This protest, so far as southern Rhodesia is concerned, might have been ineffective save for the foresight, energy and deter- mination of Cecil Rhodes, who had been instrumental in saving Bechuanaland from the Boers, and who as early as 1878 had conceived the idea of extending British influence over central Africa. 1 At this time gold prospecting was being feverishly undertaken all over South Africa as a result of the discoveries at Barberton and on the Rand, and Lobengula was besieged for all sorts of concessions by both Portuguese and Boers, as well as by other adventurers from all parts of the world. ~ h If the country was to be secured for Britain immediate country action was necessary. Sir Sidney Shippard, who had secured succeeded

Rhodes as commissioner in Bechuanaland for Great and who shared his views, kept up a friendly corre- BrU ain. spondence with Lobengula, while at Bulawayo Mr J. S. Moffat was British resident. At the end of 1887 Sir Sidney urged the high commissioner, Lord Rosmead (then Sir Hercules Robinson), to allow him to conclude a treaty with Lobengula, but unavailingly, until Rhodes, by taking upon himself all pecuniary responsibility, succeeded in obtaining the required sanction. On the nth of February 1888, Moffat and Lobengula signed an agreement, whereby the Matabele ruler agreed that he would refrain from entering into any correspondence or treaty with any foreign state or power without the previous knowledge and sanction of the British high commissioner for South Africa. Shortly after the conclusion of this treaty, representatives of influential syndicates directed by Rhodes, in which Alfred Beit and C. D. Rudd were large holders, were sent, with the know- ledge of the British government and the high commissioner, to negotiate with Lobengula, and on the 30th of October of the same year he concluded an arrangement with Messrs Rudd, Rochfort Maguire and F.R. Thomson, by which, in return for the payment of £100 a month, together with 1000 Martini-Henry rifles and 100,000 rounds of ammunition, he gave the syndicate complete control over all the metals and minerals in his kingdom, with power to exclude from his dominions ” all persons seeking land, metals, minerals or mining rights therein,” in which action, if necessary, he promised to render them assistance. The position of the envoys was one of considerable danger, as Lobengula had around him many white advisers strongly antagonistic to

1 See article ” Bechuanaland ” by Sir Henry Shippard in British Africa (London, 1899).

Rhodes’sscheme. The arrival at Bulawayo of Dr L. S. Jameson, who had previously attended Lobengula professionally, and who strongly supported Rudd and his companions, appears to have been the factor which decided Lobengula to sign the concession. This concession once obtained, Rhodes proceeded with rapidity to prosecute his great enterprise. He extinguished the claims of earlier concessionaires by purchase (giving, for instance, £10,046 for the Baines and Swinburne grants), and united all interests in the British South Africa Company, with a share capital of £1,000,000.

Following the example of Sir George Goldie in West Africa and of Sir

William Mackinnon in East Africa, Rhodes determined to apply to the British government for a charter for the newly formed company, whose original directors were, in addition to Rhodes and Beit, the duke of Abercorn, the duke of Fife, Lord Gifford, Albert (afterwards 4th earl) Grey and George Cawston. In applying for a charter (in April 1889) the founders of the company stated their objects toˆ be the following: (1) To extend northwards the railway and telegraph systems in the direction of the Zambezi; (2) to encourage emigration and colonization; (3) to promote trade -and commerce; (4) to develop and work minerals and other concessions under the management of one powerful organization, thereby obviating conflicts and complications between the various interests that had been acquired within these regions, and securing to the native chiefs and their subjects the rights reserved to them under the several concessions. In making this application the boundaries in which they proposed to work were purposely left somewhat vague. They were described to be the region Tht of South Africa lying immediately north of British

b.S.a. Bechuanaland, north and west of the South African Co.‘s Republic, and west of the Portuguese dominions on

charter. ˆ eag(. coast The government, having ascertained the substantial nature of the company’s resources and the composition of the proposed directorate, and also that they were prepared to begin • immediately the development of the country, granted the charter, dated the 20th of October 1889.. From this date onward the company was commonly known as ” the Chartered Company.”

A few points in the charter itself deserve to be noted. In the first place, it gave considerable extension to the terms of the original concessions by Lobengula. In short, it transformed the rights of working minerals and metals, and preventing others from doing so, into rights practically sovereign over the regions in which the company’s activity was to be employed. These rights the crown granted directly itself, not merely con- firming a previous grant from another source. By Article X. the company was empowered to make ordinances (to be approved by the secretary of state), and to establish and maintain a force of police. A strict supervision was provided for, to be exercised by the secretary of state over the relations between the company and the natives. The British government reserved to itself entire power to repeal the charter at any time that it did not consider the company was fulfilling its obligations or endeavouring duly to carry out the objects for which the charter was granted. The sphere of operations of the company was not stated with any greater precision than had been indicated in the applica- tion for the charter; but by agreements

concluded with Germany in 1900, with Portugal in 1 891 and with the Congo State in 1894, the international boundaries were at length defined (see Africa, § 5). The agreements, while, they took the British sphere north to Lake Tanganyika, disappointed Rhodes in that they prevented the realization of the scheme he had formed by the time the charter was granted, namely, for. securing a, continuous strip of British territory from the Cape to Egypt — a scheme which was but an enlargement of his original conception as formulated in 1878.

Much, however, had happened before the boundaries of the British sphere were fixed. While the railway from Cape Town was being continued northward as rapidly as possible, the determination was taken to occupy immediately part of the sphere assigned to the company, and Mashonaland was selected

as not being in actual occupation by the Matabele but the home of more peaceful tribes. A pioneer force was sent up in June 1890 under Colonel Pennefather, consisting of five hundred mounted police and a few hundred pioneers. Accompanying this force as guide was the well-known traveller, F. C. Selous. The work of transport was attended with considerable difficulty, and roads had to be cut as the expedition advanced. Neverr theless, in a few months the expedition, without firing a shot, had reached the site of what is now the town of Salisbury, and had also established on the line of march small forts, at Tuli, Victoria and Charter. Archibald Ross Colquhoun was chosen as the first administrator. He had not long been in office when, in May 1 89 1 , difficulties arose with the Portuguese m as ˆ ona . on their north-west frontier, both parties claiming a land tract of territory in which a Portuguese trading station occupied had been established. The result was a skirmish, in — A Boe ‘ , which a small company of British South Africa police ˆ ea ˆ” were victorious. In 189 iDr Jameson, who had joined the pioneer force, was appointed administrator in succession to Colquhoun. The Boers for several years had been planning a settlement north of the Limpopo, and they now determined, in spite of the Moffat treaty and the British occupation, to carry out their object. An expedition known as the Banyailand Trek: was organized under the leadership of Colonel Ferreira, and two large parties of Boers proceeded to the banks of the Limpopo. Information of the intended trek had been conveyed to Cape Town, and Sir Henry (afterwards Lord) Loch (the high com- missioner) at once sent a strong protest to President Kruger, informing him that any ; attempt . to invade the Chartered Company’s territories would be an act of hostility against the British Crown; and Kruger issued a proclamation forbidding the trekkers to prpceed. Meanwhile, however, a party, had already reached the Limpopo, where they were met by Jameson in

command of the British South Africa Company's forces. He told them that they would not be allowed to proceed except as private individuals, who might obtain farms on applica- tion to the Chartered Company. Colonel Ferreira was arrested and detained for a few days, and the expedition then broke up and dispersed.

The pioneers, who were granted farms and mining claims, having been settled in Mashonaland, Rhodes recognized the extreme importance of, giving the country a port nearer than that provided by Cape Town, On .his initiative proposals were made to Portugal, and the treaty concluded in 1891 between Great Britain and Portugal provided that a railway might be built from Beira in Portuguese territory to Salisbury, on con- dition that Portugal received a duty not exceeding 3 % on the value of the goods imported. The treaty further stipulated for the free navigation of the Zambezi and the construction of telegraphs. Prospecting operations were at once started, and various gold mines were discovered containing traces of old workings. Fresh gold reefs were also opened up., The prospects of the country seemed promising, and although a good deal of fever occurred in the low-lying valleys under the conditions of camp life, the health of the community soon improved as more suitable habitations were erected. In two years a white population of 3000 people had settled in the newly opened country. . . ,

Though the company was now free from international rivalry it was soon faced by serious native trouble. The first pioneers had deliberately chosen Mashonaland as their place of settlement. Ever since the advent, of Mosilikatze north of the Limpopo the unfortunate Ma,shonas had been the prey of the Matabele; they therefore readily accepted the British occupation. The Matabele,,however, were loth to abandon their predatory excursions among the Mashonas, and in July 1893 a large impi (native force) was sent into Mashonaland, and entered not only native kraals, but also the streets of the new township of Victoria. An attempt was made to preserve the peace, but it was evident from the attitude taken by the Matabele that nothing short of the authority which only superior force could command would settle the question. The Matabele were

a proud and fearless race of warriors; the men of that genera- tion had never come in conflict with Europeans, and had never been defeated in their conflicts with native foes. Jameson's forces were slender, and

Rhodes, on being consulted, urged him by telegram to ” Read Luke fourteen, thirty-one.” On obtaining a Bible, Jameson read the words: ” Or what king, going to make war against another king, sitteth not down first, and consul teth whether he be able with ten thousand to meet him that cometh against him with twenty thousand?” He telegraphed in reply: ” All right. I have read Luke fourteen, thirty-one.” The position, though dangerous, admitted of no delay, and Jameson determined to risk an expedition with the forces at his command. His success on this occasion doubtless weighed with him on another and less fortunate one. The force available consisted of about 700 volunteers and 225 British Bechuanaland police, with some 700 natives. Jameson deter- mined to march to Bulawayo, the headquarters of Lobengula and the capital of Matabeleland. The force was divided into two columns, and was to be met by a further column of Bechuanas marching from the south under Khama, the most influential of the Bechuan chiefs and a loyal friend of the British. The first engagement took place on the Shangani river, where the two columns which had started from Fort Charter and Fort Victoria were both engaged. Majors Forbes and Allan Wilson commanded in these engagements; and after a hot contest With between 4000 and 5000 Matabele, the latter were repulsed, machine guns being used with terrible effect upon the enemy. On the 1st of November a second fight occurred on the high ground, in which it was estimated that 7000 of the Matabele attacked the laager of the two columns. The oldest and most tried regiments of Lobengula dashed right up to the muzzles of the guns, but were swept down before the modern rifles and machine guns with which the invaders were armed. Meanwhile the column of Khama ‘s men from the south had reached the Tati, and won a victory on the Singuesi river on the 2nd of November. On the 3rd of November Bulawayo was reached, and the columns from Mashonaland, accompanied by Jameson and Sir John Willoughby, entered the town, Lobengula, and Matabele- his followers being in full flight towards the Zambezi. land coo- An endeavour was made to induce Lobengula to quered. surrender; but as no replies were received to the messages, Major Forbes, on the 13th of November, organized a column and started in pursuit. 1 The pursuing party were delayed by difficult roads and heavy rains, and did not come up with Lobengula until the 3rd of December. Major Allan Wilson, in command of thirty-four troopers, crossed the Shangani river in advance, and bivouacked close to Loben- gula’s quarters. In the night the river rose, and reinforce- ments were unable to join him. During the early morning the Matabele surrounded the little band, and after fighting most gallantly to the last, Major Allan Wilson and all his followers, with the exception of three messengers, who had been sent

back, were killed.

In January 1894 Lobengula died — from fever, or as the result of a wound, accounts differ — at a spot about forty miles south of the Zambezi. After his death his indunas submitted to the Chartered Company's forces, and the war, which cost the company over one hundred lives and £110,000, was thus ended. An order in council of the 18th of July following defined the administrative power of the company over Matabeleland. Charges were made against the company of having provoked the Matabele in order to bring on the war and thus secure their territory, but after inquiry the company was expressly exonerated from the charge by Lord Ripon, then colonial secretary. With the close of the war the Matabele appeared to be crushed, and for over two years there was no serious trouble with the natives. The country was at once thrown

1 Lobengula had in fact sent to the Forbes patrol gold dust worth about £1000, and intimated his desire to surrender; but two troopers to whom the gold and message were entrusted kept the gold and suppressed the message. Their crime was afterwards discovered and the troopers sentenced to fourteen years' penal servitude.

open to white settlers. Close to the site of Lobengula's kraal the new town of Bulawayo was founded, and rapidly grew in "importance. Among the new settlers were many Dutch farmers. The Roman-Dutch law was chosen as that of the new colony, a land commission was established and com- missioners appointed to look after the interests of the natives.

Considerable development in the part of the company's territory north of the Zambezi had meantime taken place. Between 1889 and 1891 a large number of tribes in the region between lakes Nyasa and Tanganyika and the Zambezi had entered into treaty relations with the company, and a settle- ment named Abercorn had been founded at the south end of Tanganyika. This work was undertaken in part to forestall German action, as before the signature of the agreement of July 1890 German agents entertained the design of penetrating west of Lake Nyasa to the Congo State frontier. The company further acquired the property of the African Lakes Company — which had done much to secure British predominance in the Nyasa region — and on the organization of Nyasaland as an imperial protectorate the South Africa Company contributed £10,000 a year for three years (1891-92-93) towards the cost of the administration, the imperial commissioner during this period acting as administrator for the adjacent territories belonging to the company (see British Central

Africa). Farther west, Lewanika, the king of the Barotse, signed, on the 27th of June 1890, a treaty placing his country under the protection of the Chartered Company, which, while obtaining all mineral rights, undertook not to interfere in the internal administration of Barotseland. In securing a position thus early in Barotseland, Rhodes's aim was to prevent the farther extension eastward of the Portuguese province of Angola. The subsequent development of Barotseland had little direct connexion with the events in other parts of Rhodesia (see Barotse and Lewanika). The growth of territory and the outlay on Matabeleland led to a great ■ increase of expenditure, and the capital of the company was raised to £2,000,000 in November 1893, and to £2,500,000 in July 1895.

In every step taken by the company the guiding hand was that of Cecil Rhodes, a fact which received recognition when, by a proclamation of the 3rd of May 1895, the company's territory received officially the name of " Rhodesia." During this year there was great activity in exploiting Matabeleland. " Stands " or plots were sold at extraordinary prices in Bula- wayo; 539 fetched a total of £153,312, about £285 a stand. In within nine months Bulawayo had a population of 1900 whites, and in the various goldfields there were over 2000 prospectors. The construction of telegraphs proceeded with rapidity and by the end of 1895, 500 m. of new lines had been constructed, making about 1500 in all. A new company, the African Transcontinental Company, had been founded under the auspices of Rhodes, with the ultimate purpose of connecting the Cape with Cairo. By the end of 1895, 133 m. of these lines had been laid. At this time too, the railway from Cape Town had passed Mafeking and was approaching the Rhodesian frontier, while on the east coast the line to connect Salisbury with Beira was under construction.

In November 1895 the crown colony of British Bechuanaland was annexed to Cape Colony, and the Chartered Company desired to take over the administration of the Bechuanaland protectorate, which stretched between the newly annexed portion of Cape Colony and Matabeleland, and through which the railway to Bulawayo had to pass. The British government consented, and arrangements were made for the transfer. The company's police were moved down to a camp in the protector- ate at Pitsani Potlogo. It was from this place that on the 29th of December Jameson crossed the Transvaal border and marched on Johannesburg, in his disastrous attempt to upset President Kruger's administration. The " Jameson Raid " put an end to the proposed transfer of the protectorate to the Chartered Company, and caused a serious crisis in its affairs. Rhodes resigned his position as managing director, and Alfred Beit

retired from the directorate in London. Jameson was, on the 9th of January 1896, officially removed from his office of administrator of the company's territories, and was succeeded by Earl Grey. Just at this time rinderpest made its appearance in southern Rhodesia, carrying off large herds of cattle, and this was followed in March 1896 by a revolt of the Matabele, while in June the Mashona also rebelled. The occasion, but not the cause, of the Matabele rising was the withdrawal of the greater part of the company's force to take part in the Jameson Raid. The Matabele had various grievances, chiefly that after the war of 1893 they were treated as a conquered people. All able-bodied young men were required to work for the white farmers and miners a certain number of months per annum at a fixed rate of pay — a most irksome regulation, enforced, on occasions, by the native police in a tyrannical fashion. Another grievance was the seizure by the company, after the death of Lobengula, of the cattle of the Matabele — their chief source of wealth. Not only was there a first con- fiscation after the war, but subsequently there was a periodical taking away of cattle in small numbers — the company acting under the belief that nearly all the cattle in Matabeleland belonged to the king and were therefore lawfully theirs. How- ever, before the end of 1895 the company had settled the ques- tion in agreement with the indunas, two-fifths of the cattle to go to the company and the remainder to become the absolute property of the natives. But it was neither the action of the company in the confiscation of cattle, nor the labour regulations, that induced the mass of the people to rebel; they were induced to act by chiefs who chafed under their loss of power and The position and imagined themselves strong enough to

rebellions throw off the yoke of the conquerors. In the manner of 1896. customary among savages the Matabele began hostil- ities by the murder of defenceless white settlers — men, women and children. Bulawayo was threatened, and soon all the country south of the Zambezi was in a state of rebellion. Imperial troops under Sir Frederick Carrington were hurried up to the assistance of such police as the British South Africa Company still had at its command. Volunteers were enrolled, and much fierce fighting followed. Rhodes hastened to Bula- wayo, and after conferences with the military and other author- ities he determined to go, with Dr Hans Sauer and Mr J. Colen- brander, a well-known hunter and pioneer intimately acquainted with the natives, and interview the chiefs. They went (September 1896) unarmed into the heart of the Matoppo Hills, and

there arranged terms of peace with the indunas. The interview involved grave danger to the emissaries, and depended for its success entirely upon Rhodes's personality and influence over the native races, but it terminated what promised to be a long and disastrous native war. The Matabele, whose legitimate grievances were acknowledged and met, ceased the war after the indaba with Rhodes; the Mashona revolt con- tinued, and was not finally crushed until October 1897, though all danger to settlers was over six months previously. At this time the rinderpest had carried off nearly all the cattle in the country — a disaster which, together with the destruction of grain during the war, had brought the natives almost to starva- tion — and steps had to be taken to supply their needs. Many of the white settlers too were reduced to sore straits and re- quired assistance. The rebellions had cost the company fully £2,500,000, and to meet the debt incurred an additional capital of £1,500,000 was raised in 1898. At the meeting of the com- pany in April 1898, at which this step was taken, Rhodes was re-elected a director.

The events of 1896 — the Jameson Raid and the rebellions — caused the imperial government to remodel the constitution of Rhodesia. The armed forces of the company had already been placed under the direct control of the crown, and on the 20th of October 1898 an order in council was passed providing for the future regulation of the country. An imperial resident commissioner was appointed, who was also to be ex officio a member of the executive and legislative councils; and there was to be a legislative council, consisting of five nominated

and four elected members. The first meeting of the newly appointed council took place at Salisbury on the 15th of May 1899. Other changes, in the direction of giving more power to the non-official element, were made subsequently (see above, Administration). •.

While these political changes were being made the company and the settlers set to work to repair the losses by war and plague. In particular the policy of railway development was pushed forward, and in November 1897 the line from Cape Town reached Bulawayo. The Mashonaland railway connecting Salisbury with Beira was completed in May 1899. In the same year gold-mining on a considerable scale began, the output for the year being over 65,000 oz. In the early part of 1899 Rhodes visited London and Berlin in furtherance of his schemes for the transcontinental telegraph extension from Cape Town to Cairo, and the transcontinental railway j He endeavoured to obtain from the British Government the guarantee of a loan for extending the railway, to be raised at 3 , but was unsuccessful. He received, however, the support of various companies in Rhodesia, who amongst

them subscribed £252,800 at 3 for the immediate extension of the railway for 150 miles; and in May he stated, at a meeting of the Chartered Company, that the Rhodesia Railways Limited would raise another £3,000,000 at 4%, to be guaranteed by the Chartered Company. In this way he. hoped that the remaining 1050 miles of railway from Bulawayo to the frontier of German East Africa might be constructed. In Berlin, Rhodes had an interview with the German Emperor, when arrangements were arrived at for the passage of telegraph lines over German territory, and also in certain contingencies for the continuation of the transcontinental railway through German East Africa.

In many respects the country recovered rapidly from the disasters of 1896, one of the most important measures taken being the compulsory inoculation for rinderpest, which finally stamped out the disease in 1898-99. By the last balance- sheet issued by the company previous to the outbreak of the Boer War it would appear that the revenue of Rhodesia for the year ending the 31st of March 1898 amounted to £260,516 net, of which amount the sale of land plots accounts for £63,628; stamps and licences, £69,658; and posts and telegraphs, £46,745; so that the machinery of civilized life was already in full activity where eight years previously the only white inhabitants had been a few missionaries, hunters and traders. The government buildings were estimated in March 1898 to be worth £165,672, and the assessed value of the town property at Bulawayo was £2,045,000 and that at Salisbury £750,000. (Both those towns had been granted municipal government in 1897.) Education was arranged under the supervision of government inspectors, and various religious communities were also engaged in educational work. The country appeared indeed in 1899 to be starting on the road to industrial and agricultural prosperity, but an almost complete stop to progress resulted from the outbreak of the Boer War in October of that year. The company could point with satisfaction to the fact that Rhodesia contributed nearly 1500 men to the forces serving in the war, 123% of the European population. Rhodesia itself was not subjected to invasion, but the withdrawal of so large a number of able- bodied men seriously interfered with the development of the country, the war not ending until June 1902. Throughout this period the natives, with few exceptions, remained peaceful and gave the administration no serious trouble.

Before the war ended, Cecil Rhodes, whose chief work during the period since the Raid had been the building up of the country which bore his name, was dead (26th of Agitation March 1902). Alfred Beit, who had in 1898 refused for self- to rejoin the directorate, now

consented (June 1902) govern- to return to the board of the Chartered Company, meat ‘ on which he remained until his death in July 1906. The loss of Rhodes’s guiding mind and inspiring personality was, however, manifest, and among the Rhodesians there arose

a feeling of discontent at the company’s conduct of affairs. The company was willing on proper terms to hand over the administration to the colonists, and they secured the services of Sir George Goldie to examine the situation and report on what terms the transfer could be made. Sir George visited Rhodesia in 1003-4, an d drew up a scheme which included the taking over by Rhodesia of the adminis- trative liabilities incurred by the company, which would thus become a public debt. After consultation between leading Rhodesians and the directors of the company the scheme was abandoned, the Rhodesians considering the financial burden proposed too great for an infant colony. The company therefore continued the administration, devoting attention to the develop- ment of agriculture and mining. The two railway systems were linked together by a line from Bulawayo to Salisbury, and several short lines to mining properties were built. From Bulawayo the main line was continued to the Wankie coal-fields, thence to the Zambezi, bridged in 1905 just below the Victoria Falls. From the Zambezi the line went north-east, so as to render accessible the mineral wealth of Barotse- land and that of Katanga on the Rhodesian-Congo frontier. Although Rhodesia was affected by the commercial depression which prevailed in South Africa for some years after the close of -the war, its industries showed considerable vitality. In 1906 the gold output exceeded 500,000 oz., and in the financial year 1905-6 the revenue of Southern Rhodesia slightly ex- ceeded the expenditure.

Only once (1895-96) in the first fifteen years following the settlement of the country had the company’s annual revenue exceeded the amount expended in the same period. As a commercial undertaking, the company therefore was during this period of no pecuniary advantage to the shareholders. This was due in part to unforeseen and unavoidable causes, but it is also true that the founders of the company had other than commercial aims. Rhodes’s chief ambition was to secure the country for Britain and to open it up to the energies of her peoples, and he succeeded in this aim. He acted more quickly, and in many ways more effectively, than the imperial government would have been able to act had it at the outset taken over the

country. To the sturdy colonists Rhodes made available a land rich not only in gold, but in coal and other minerals, and with very great agricultural and pastoral resourcesˆ and all this was done without the cost of a penny to the imperial exchequer. Despite all drawbacks, an area (reckoning Southern Rhodesia only) considerably larger than that of the United Kingdom had in less than twenty years been endowed with all the adjuncts of civilization and made the home of thousands of settlers.

The progress made by the country in the five years 1906-10 demonstrated that the faith Rhodes and his colleagues had placed in it was not ill-founded. Although the white popuˆ lation increased but slowly, in all other respects healthy development took place, the element of speculation which had characterized many of the first attempts to exploit the land being largely eliminated. In 1906 Lord Selborne (the high commissioner) visited Rhodesia. He inquired into the various grievances of the settlers against the Chartered Com- pany; held an indaba with Matabele indunas in the Matoppo Hills, and at Bulawayo had a conference with Lewanika, the paramount chief of the Barotse. In 1907 Dr Jameson and other directors of the Chartered Company travelled through Rhodesia, and the result was to clear up ; some of the matters in dispute between the settlers and the company. Southern Rhodesia had become self-supporting, and the essentially temporary nature of the existing system of government was recognized. But the company held that the time was not yet ripe for Southern Rhodesia to become a self-governing colony. The directors, however, adopted a more liberal land policy, the increased attention given to agriculture being a marked and satisfactory feature of the situation. Mining and railway development were also pushed on vigorously.

The movement for the closer union of the British South

African colonies excited lively interest in Southern Rhodesia. The territory, not possessing self-government, could not take part in the national convention which met at Durban in October 1908 on equal terms with the delegates of the Cape, &c. It was, however, represented by three delegates on the understanding that Rhodesia would not, for the time being at least, be included in any agreement which might be reached. The convention resulted in the union (on the 3rst of May 1910) under one government of the Cape, Transvaal, Natal and Orange River colonies. The position of Rhodesia with respect to the Union was set forth in the South Africa Act 1909. It provides that ” the king, with the advice of the Privy Council, may on addresses from the Houses of Parliament of the Union admit into the Union the

territories administered by the British South Africa Company on such terms and conditions as to representation and otherwise in each case as are ex- pressed in the addresses and approved by the king.”

In Rhodesia itself at this time there was a widespread feeling that there was no urgency as to the territory joining the Union, and the opinion was held by many that a separate existence as a self-governing community would be preferable. A section of the settlers were Content for the present to remain under the government of the Chartered Company.

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RHODIUM [symbol Rh; atomic weight 102-9 (0=i6)], in chemistry, a metallic chemical element found, associated with the other elements of the platinum group, in crude platinum ore, wherein it was discovered in 1803 by W. H. Wollaston {Phil. Trans., 1804, p. 419). It may be obtained from the residues of platinum ore after treatment with aqua regia and removal of the platinum as chlorplatinate. The mother liquors are decomposed by treatment with metallic iron, the precipitate obtained being warmed with concentrated nitric acid and heated in an iron crucible with concentrated caustic potash. The residue thus obtained is mixed with salt and 1 Unless otherwise stated, the place of publication is London.

heated in a current of chlorine, any iridium present being converted into its chloride by treatment with nitric acid and precipitated by ammonium chloride, whilst rhodium ammonium chloride goes into solution with its characteristic rose-red colour (C. E. Claus,. Jour, prakt. Chem., 1843ˆ1845). For other methods of extraction see Gibbs, ib., 1861, 84, p. 65; 1865, 94, p. 10; T. Wilm, Bull. soc. chim., 1880 (2), 34, p. 679; E. Fremy, Comptes rendus, 1854, 38, p. 1008, &c). The metal itself is best obtained by the reduction of chlorpurpureo rhodium chloride, (Cl 2 Rh 2 -10NH 3)-Cl4, in a current of hydrogen, the metal after reduction being cooled in a stream of carbon dioxide (S. M. Jorgensen, Zeit. anorg. Chem., 1903, 34, p. 82). It somewhat resembles aluminium in colour ; its specific gravity varies from n to 12-1; and its specific heat is 0-05527 (V. H. Regnault, Ann. chim. phys., 1861, 63, p. 15). It is less fusible than platinum. It oxidizes superficially when heated, and may be distilled in the electric furnace. It is insoluble in acids, but forms a soluble sulphate when fused with

potassium bisulphate (a reaction which distinguishes it from the other metals of the platinum group). It oxidizes when fused with potassium hydroxide and potassium nitrate, to the dioxide, Rh0 2 . It absorbs hydrogen readily. Rhodium black is obtained by reducing rhodium salts with formic acid; by alcohol in the presence of alkali; or by precipitation with zinc and iron. A colloidal rhodium may be prepared by reducing the sesquichloride with hydrazine hydrate. Rhodium salts may be recognized by their characteristic reaction with freshly prepared sodium hypochlorite solution. A yellow precipitate is obtained, which on shaking for some time with acetic acid gradually dissolves to an orange-coloured solution. This solution after a short time deposits a grey precipitate, and the supernatant liquid becomes azure blue in colour (E. Demarcay, Comptes rendus, 1885, 101, p. 951).

Several oxides of rhodium are known. The monoxide, RhO, formed when the hydrated sesquioxide is heated (Claus) or when finely divided rhodium is heated in a current of air (Wilm), is a grey powder which is insoluble in acids. The sesquioxide, Rh 2 3 , is a black insoluble powder, formed when the corresponding hydrate is heated. This hydrate, Rh 2 (OH)e, is obtained as a yellow powder, by decomposing rhodium salts(not the sulphate)with dilute solutions of the caustic alkalis. It is soluble in acids, and in the moist condition is also soluble in concentrated alkalis. A hydrated rhodium dioxide, Rh0 2 -2H 2 0, is formed when chlorine is passed into a solution of the sesquioxide in concentrated caustic potash, or by adding an alkaline hypochlorite to a concentrated alkaline solution of rhodium and sodium chlorides. It is a greenish-black powder which is soluble in hydrochloric acid. Rhodium chloride, Rh 2 Oe, is obtained impure by heating the metal to dull redness in a current of chlorine, or, purer, by heating an alloy of rhodium and tin in chlorine or by heating the double ammonium rhodium chloride in chlorine at 440 C. (E. Leidi6, Ann. chim. phys., 1889, (6), 17, p. 265; Comptes rendus, 1899, 129, p. 1249). It is a red powder, which decomposes at a red heat, leaving a residue of the metal. It is insoluble in water and acids, but dissolves in concentrated solu- tions of potassium cyanide. The hydrated form Rh 2 Cl 6 8H 2 is obtained impure by dissolving the hydrated sesquioxide in hydro chloric acid, by the action of hydrofluosilicic acid on potassium rhodium chloride, and by the action of chlorine on rhodium in the presence of sodium chloride. In the last method the product is dissolved in a dilute hydrochloric acid (1:1), and the solution saturated with hydrochloric acid gas at o° C, allowed to stand for some time, decanted, and finally evaporated in vacuo (Leidi6, loc. cit.). It forms a very deliquescent, red, amorphous mass, which decom- poses

on exposure. It is very soluble in water, forming a yellow solution. It forms double salts with the alkaline chlorides.

Rhodium monosulphide, RhS, is formed when rhodium or rhodium ammonium chloride are heated with sulphur, and also by precipitating rhodium salts with sulphuretted hydrogen, the precipitate being dissolved in ammonium sulphide and thrown down again by dilute sulphuric acid (Lecoq de Boisbaudran, Ber., 1883, 16, p. 579). It is a dark-coloured powder which is insoluble in acids and other solvents. It loses all its sulphur when heated in air. The sesquisulphide, Rh 2 S 3 , is prepared by heating anhydrous rhodium chloride, Rh 2 Cl$, in a current of sulphuretted hydrogen at 36o°C.,or by passing the gas into a boiling solution of the chloride. It is a black powder which is insoluble in acids and in alkaline sulphides. It decomposes when strongly heated. Rhodium sulphate, Rh 2 (S04) 3 , is prepared by oxidizing the sulphide, by fusing the metal with acid potassium sulphate, or by the action of concentrated sulphuric acid on an alloy of rhodium and lead, or on the hydrated sesquioxide. It is a red powder which decomposes when heated or when boiled with much

water. It forms alums (Leidi6, Comptes rendus, 1888,107, p. 234). Rhodium potassium alum, Rh 2 (S0 4)3-K 2 S04-24H 2 0, is obtained by dissolving the sesquioxide in sulphuric acid and adding two-thirds of the calculated amount of potassium sulphate to the solution (A. Piccini and L. Marino, Zeit. anorg. Chem., 1901, 27, p. 62). It crystallizes in cubes. Rhodium cyanide, Rh 2 (CN)6, is a carmine-red powder formed when rhodium potassium cyanide is boiled with acetic acid. Rhodium potassium cyanide, K6Rh 2 (CN)i 2 , is formed when the sesquioxide is dissolved in caustic potash and an excess of hydrocyanic acid added gradually, the solution being then evaporated in vacuo. It is a colourless crystalline solid soluble in water, and isomorphous with the corresponding iron, cobalt, chromium and manganese compounds.

The rhodium ammonia salts correspond almost with the similar cobalt compounds and may be divided into three series — namely, hexammine salts (luteo-salts), [Rh(NH 3) 6]X 3 ; aquopentammine salts (roseo-salts), [Rh(NH 3) 6 H 2 0]X3; and pentammine salts (purpureo salts), [Rh(NH 3) 6 X]X 2 . (See S. F. Jorgensen, C. W. Biomstrand, Jour. prak. Chem., 1882, et seq.)

The atomic weight of rhodium has been determined by S. F. Jorgensen (Jour, prakt. Chem., 1883, 27, p. 486), by the analysis of chlorpurpureo rhodium chloride, the mean value obtained being 103; whilst K. Seubert and K. Kobbe {Ann., 1890, 260, p. 314), by analysis

of the double chloride and sulphate, obtained as a mean value 102-86.

RHODOCHROSITE, a mineral species consisting of man- ganese carbonate, MnC0 3 , crystallizing in the rhombohedral system and isomorphous with calcite. It usually occurs as cleavable, compact or botryoidal masses, distinct crystals being somewhat rare; these often have the form of the primitive rhombohedron, parallel to the faces of which there are perfect cleavages. When pure, the mineral contains 47”7% of manganese, but this is usually partly replaced by varying amounts of iron, and sometimes by calcium, mag- nesium, zinc, or rarely cobalt (cobalt-manganese-spar). With these variations in chemical composition the specific gravity varies from 3-45 to 3-60; the hardness is 4. The colour is usually rose-red, but may sometimes be grey to brown. The name rhodochrosite, from the Greek ˆ63o-xpojs (rose- coloured), has reference to the characteristic colour of the mineral: manganese-spar and dialogite are synonyms. It is found in mineral veins with ores of silver, lead, copper, &c, or in deposits of manganese ore. Crystals have been met with in the mines at Kapnik-Banya and Nagyag near Deva in Transylvania and at Diez in Nassau, but by far the best specimens are from Colorado. The mineral is used to a limited extent in the manufacture of spiegeleisen and ferromanganese.

RHODODENDRON. Classical writers, such as Dioscorides and Pliny, seem, from what can be ascertained, to have called the oleander (Nerium Oleander) by this name, but in modern usage it is applied to a large genus of shrubs and trees be- longing to the order of heaths (Ericaceae). 1 No adequate distinction can be drawn between this genus and Azalea (q.v.) — the proposed marks of distinction, however applicable in particular cases, breaking down when tested more generally. The rhododendrons are trees or shrubs, never herbs, with simple, evergreen or deciduous leaves, and flowers in terminal clusters surrounded in the bud by bud-scales but not as a rule by true leaves. The flowers are remarkable for the frequent absence or reduced condition of the calyx. The funnel- or bell-shaped corolla, on the other hand, with its five or more lobes, is usually conspicuous, and in some species so much so as to render these plants greatly prized in gardens. The free stamens are usually ten, with slender filaments and anthers opening by pores at the top. The ovary is five- or many- celled, ripening into a long woody pod which splits from top to bottom by a number of valves, which break away from the central placenta and liberate a large number of small bran- like seeds provided with a membranous wing-like appendage at each end. The species are for the most part natives of the mountainous regions of the northern hemisphere, extend- ing as far south as the Malay Archipelago and

New Guinea, but not hitherto found in South America or Australia. None are natives of Britain. They vary greatly in stature, some of the alpine species being mere pygmies with minute leaves and tiny blossoms, while some of the Himalayan species are moderate-sized trees with superb flowers. Some are

epiphytal, growing on the branches of other trees, but not deriving their sustenance from them. The varieties grown in gardens are mostly grafted on the Pontic species {R. ponti- cum) and the Virginian R. catawbiense. The common Pontic variety is excellent for game-covert, from its hardiness, the shelter it affords, and the fact that hares and rabbits rarely eat it. Variety of colour has been infused by crossing or hybridizing the species first named, or their derivatives, with some of the more gorgeously coloured Himalayan-American varieties. In many instances this has been done without sacrifice of hardihood.

§ome of the finest hybrids for the open air, especially in favoured spots, are altaclerense (scarlet) ; Harrisi (rosy crimson) ; Kewense (rose) ; Luscombei (rose-pink) ; Manglesi (white) ; nobleanum (crimson), one of the first to flower after Christmas; praecox (rose-purple); and Shilsoni (crimson). There are almost countless colour variations of these, but one of the most exquisite of late years is that known as Pink Pearl, with large clear rosy-pink blossoms of great purity. What are termed greenhouse rhododendrons are derivatives from certain Malayan and Javanese species, and are consequently much more tender. They are characterized by the possession of a cylindrical (not funnel-shaped) flower-tube and other marks of distinction. The foliage of rhododendrons contains much tannin, and has been used medicinally. Whether the honey mentioned by Xenophon as poisonous was really derived from plants of this genus as alleged is still an open question.

Cultivation. — The hardy evergreen kinds are readily propagated by seed, by layers, and by grafting. Grafting is resorted to only for the propagation of the rarer and more tender kinds. Loamy soil containing a large quantity of peat or vegetable humus is essential, the roots of all the species investigated being associated with a fungus partner (mycorhiza). An excess of lime or chalk in the soil proves fatal to rhododendrons and their allies sooner or later — a fact overlooked by many amateurs. The hardy deciduous kinds are valuable for forcing, and withstand cold-storage treatment well. The tender Malayan and

Javanese species thrive in warm green- house temperature, but are difficult to cultivate where the water is very alkaline.

RHODONITE, a member of the pyroxene group of minerals, consisting of manganese metasilicate, MnSiC>3, and crystallizing in the anorthic system. It commonly occurs as cleavable to compact masses with a rose-red colour; hence the name, from the Greek pbbov (a rose). Crystals often have a thick tabular habit; there are perfect cleavages parallel to the prism faces with an angle of 87° 31!'. The hardness is 5§-6|, and the specific gravity 3-4~3-68. The manganese is often partly replaced by iron and calcium, which may sometimes be present in considerable amounts; a greyish-brown variety containing as much as 20% of calcium oxide is called “bustamite”; ” fowlerite ” is a zinciferous variety containing 7% of zinc oxide. Rhodonite is a mineral liable to alteration, with the formation of manganese carbonate, hydrous silicate or oxides. The compact material, which is cut and polished for ornamental purposes, is often marked in a striking manner by veins and patches of these black alteration products. At Syedelnikova, near Ekaterinburg in the Urals, compact material of a good colour occurs in a clay-slate and is extensively quarried: boulders of similar material found at Cummington in Massachusetts (” cummingtonite “) have also been worked as an ornamental stone. In the iron and manganese mines at Pajsberg near Filipstadt and Langban in Vermland, Sweden, small brilliant and translucent crystals (” pajsbergite “) and cleavage masses occur. Fowlerite occurs as large, rough crystals, somewhat resembling pink felspar, with franklinite and zinc ores in granular limestone at Franklin Furnace in New Jersey.

RHOECUS, a Samian sculptor of the 6th century B.C. He and his son Theodoras were especially noted fpr their work in bronze. Herodotus says that Rhoecus built the temple of Hera at Samos. In the temple of Artemis at Ephesus was a marble figure of night by Rhoecus. His name has been found on a fragment of a vase which he dedicated to Aphrodite at Naucratis. His sons Theodorus and Telecles made a statue of the Pythian Apollo for the Samians.

RHONDDA (formerly Ystradyfodwg), an urban district and parliamentary division of Glamorganshire, South Wales. It is 12 m. long by about 4I m. across at its widest part, and comprises two main valleys, named after their respective rivers,

Rhondda Fawr (oj m.) and Rhondda Fach, or the lesser (6| m.), running S.E. and S.W. respectively till their junction at Porth, and thence the single valley for upwards of a mile farther down the

boundary of the Pontypridd urban district at Trehafod. The valleys are narrow and tortuous, and their lateral boundaries are formed by steep hills varying in height from about 560 ft. on either side of Trehafod to 1340 ft. on the N.E. of Maerdy in the lesser Rhondda and 1742 ft. on the S.W. of Treherbert in the main valley, while the mountains at the upper end of the latter valley culminate in Cam Moesen(ig5o ft.). The two valleys are separated by the steep ridge of Cefn-rhondda, which ranges from 600 ft. high above Porth to 1690 ft. near the upper end of the district. There are a few tributary valleys of which Cwmparc, Clydach Vale and Cymmer are the chief. Though the urban district measures 23,884 acres, the area built upon is generally a narrow strip on either side of each river except at Treorky and Ton, where the valley of the Rhondda Fawr opens out a little. In 1877 the ancient parish of Ystradyfodwg (with the omission of the township of Rhigos, which lies beyond the mountains to the north) was formed into an urban district bearing the parish name, the area having previously been part of a rural district under the Pontypridd rural sanitary authority. In October 1870, portions of the parishes of Llanwonno and Llantrisant, comprising over 5000 acres, were added to the urban area, the whole being consolidated in 1894 into one civil parish. In 1897, the name of the urban district was changed into Rhondda. The Taff Vale railway runs up each of the two valleys from a junction at Porth (16 m. N.W. of Cardiff), and has five stations in the main valley and four in the lesser one. From Porth it runs to Pontypridd, whence there is communication with Cardiff, Barry and Newport. The Rhondda and Swansea Bay railway (authorized in 1882, opened in 1890, and now worked by the Great Western) connects the upper end of the main valley, where it has a station, Blaen-rhondda, with Port Talbot, Neath and Swansea (31 m. distant) by means of a line which has a tunnel 3443 yds. long.

The district occupies almost the centre of the eastern division of the South Wales coal-field, and its coal, upon which the inhabitants are almost entirely dependent, is unsurpassed for its steam-raising properties. In common with other East Glamorgan coal it became commercially known as Cardiff coal from the fact that Cardiff was at first its only port of shipment. The development of the Rhondda coal-field was later in date than those of Aberdare and Merthyr, and it received its chief impetus from the American Civil War. Thus the population of the parish (excluding Rhigos), which was 576 in 1811, 951 in 1851 and 3035 in 1861, increased to 16,914 in 1871. When the bound- aries of the district were extended in 1879 the population of the enlarged area was calculated by the registrar-general to be 23,950 in 1871, but it reached 55,632 in 1881, and 113,735 in 1 901,

showing an increase of 104% in the previous twenty years. In 1901, 35-4% of the population of three years of age and upwards spoke English only, 114% spoke Welsh only, the remainder being bilingual.

Ecclesiastically the parish of Ystradyfodwg was an ancient chapelry dependent on Llantrisant. The old parish church at Ton Pentre (in substitution for which a new church was built in 1893-94) served the whole parish till past the middle of the 19th century. Between 1879 and 1900 the ancient parish (excluding Rhigos) was divided into seven ecclesiastical parishes, the six new ones being Llwyn-y-pia (1879), Tylorstown (1887), Ynyshir (1887), Treherbert (1893), Cwmparc (1898) and Ferndale (1900). The additional area brought into the urban district in 1879 comprises two other ecclesiastical parishes, Cymmer and Porth (1894), and Dinas and Penygraig (1901). These nine parishes, comprised in the urban district, have twenty churches and eighteen mission-rooms, with accommodation for about 12,000 persons. This area, together with Pontypridd, Glyntaff and Llanwonno, form the rural deanery ol Rhondda in the archdeaconry and diocese of Llandaff. There wen at the end of 1905 over one hundred and fifty nonconformis, chapels and mission rooms, with accommodation for over 85,000 persons, of which provision nearly two-thirds was in chapels with Welsh services. There is a Roman Catholic church at Tonypandy. The public buildings include the council house and offices of the district Council, erected in 1883-84 for the local board at Pentre, libraries and workmen's institutes at Ystrad (1895), and Cymmer

(1893), Maerdy (1905), Dinas (1893), and Ferndale public halls, the property of a private company at Treherbert (1872), and Tonypandy (1891) and a county intermediate school at Porth. By means of a tunnel about 2100 yds. long water is obtained for the greater part of the main valley from the lake of Llyn Fawr on the Neath side of the mountain range which shuts in the valley on the north. This lake has been converted into a storage reservoir of about 167 million gallons capacity. The rest of the district is supplied from the Pontypridd Water Company's works above Maerdy in the lesser valley.

The ancient parish (excluding Rhigos) was formed into a parliamentary constituency with one member in 1885. The present urban district substantially corresponds to the ancient territorial division of Glyn-rhondda, one of the four commotes of the cantf ed of

Penychen, and subsequently, in Norman times, one of the twelve ” members ” of the lordship of Glamorgan. Its Welsh lords enjoyed a large measure of independence and had their own courts, in which Welsh law was administered down to I S3S > when the lordship was fully incorporated in the county of Glamorgan. On the ridge of Cefn-rhondda between the two valleys was the Franciscan monastery of Penrhys, famous for its image of the Virgin and for its holy well which attracted large pilgrimages. It was dissolved about 1415, probably owing to its having supported Glyndwr in his rebellion. Edward II. came here from Neath Abbey and was captured on the 16th of November 1326, either at Penrhys, or between it and Llantrisant. (D. Ll. T.)

RHONE (Fr. Rhdne, Lat. Rhodanus) , one of the most important rivers in Europe, and the chief of those which flow directly into the Mediterranean. It rises at the upper or eastern extremity of the Swiss canton of the Valais, flows between the Bernese Alps (N.) and the Lepontine and Pennine Alps (S.) till it expands into the Lake of Geneva, winds round the southernmost spurs of the Jura range, receives at Lyons its principal tributary, the Sa&ne, and then turns southward through France till, by many mouths, it enters that part of the Mediterranean which is rightly called the Golfe du Lion (sometimes wrongly the Gulf of Lyons). Its total length’ from source to sea is 5045 m. (of which the Lake of Geneva claims 45 m.), while its total drainage area in 37,798 sq. m., of which 2772 sq. m. are in Switzerland -(405 sq. m. of the Swiss portion being composed of glaciers), and its total fall 5898 ft. Its course (excluding the Lake of Geneva, q.v.) naturally falls into three divisions: (1) from its source to the Lake of Geneva, (2) from Geneva to Lyons, and (3) from Lyons to the Mediterranean.

1. From its source to the lake the Rhone is a purely Alpine river, flowing through the great trench which it has cut for itself between two of the loftiest Alpine ranges, and which (save a bit at its north-west end) forms the Canton of the Valais. Its length is 1055 m., while its fall is 4679 ft. It issues as a torrent, at the height of 5909 ft., from the great Rhone glacier at the head of the Valais, the recent retreat of this glacier having proved that the river really flows from beneath it, and does not take its rise from the warm springs that are now at some distance from its shrunken snout. It is almost immediately joined on the left by the Mutt torrent, coming from a small glacier to the S.E., and then flows S.W. for a short distance past the well-known Gletsch Hotel (where the roads from the Grimsel and the Furka Passes unite). But about half a mile from the glacier the river turns S.E. and descends through a wild gorge to the more level valley, bending again

S.W. before reaching the first village, Oberwald. It preserves this south-westerly direction till Martigny. The uppermost valley of the Rhone is named Goms (Fr. Conches), its chief village being Miinster, while Fiesch, lower down, is well known to most Swiss travellers. As the river rolls on, it is swollen by mountain torrents, descend- ing from the glaciers on either side of its bed — so by the Geren (left), near Oberwald, by the Eginen (left), near Ulrichen, by the Fiesch (right), at Fiesch, by the Binna (left), near Grengiols, by the Massa (right), flowing from the great Aletsch glaciers, above Brieg. At Brieg the Rhone has descended 3678 ft. from its source, has flowed 28 m. in the open, and is already a consider- able stream when joined (left)by the Saltine, descending from the Simplon Pass. Its course below Brieg is less rapid than

before and lies through the alluvial deposits which it has brought down in the course of ages. The valley is wide and marshy, the river frequently overflowing its banks. Further mountain torrents (of greater volume than those higher up) fall into the Rhone as it rolls along in a south-westerly direction towards Martigny: the Visp (left), coming from the Zermatt valley, falls in at Visp, at Gampel the Lonza (right), from the Lotschen valley, at Leuk the Dala (right), from the Gemmi Pass, av Sierre the Navizen (left), from the Einfisch or Anniviers valley, at Sion, the capital of the Valais, the Borgne (left) from the Val d'Herens; soon the Rhone is joined by the Morgc (right), flowing from the Sanetsch Pass, and the boundary in the middle ages between Episcopal Valais to the east and Savo- yard Valais to the west, and at Martigny by the Dranse (left) its chief Alpine tributary, from the Great St Bernard and the Val de Bagnes. At Martigny, about 50 m. from Brieg, the river bends sharply to the N.W., and runs in that direction to the Lake of Geneva. It receives the Salanfe (left), which forms the celebrated waterfall of Pissevache, before reaching the ancient town and abbey of St Maurice (9§m.). Henceforward the right bank is in the canton of Vaud (conquered from Savoy in 1475) ar >d the left bank in that of the Valais (conquered similarly in 1536), for St Maurice marks the end of the historical Valais. Immediately below that town the Rhone rushes through a great natural gateway, a narrow and striking defile (now strongly fortified), which commands the entrance of the Valais. Beyond, the river enters the wide alluvial plain, formerly occupied by the south-eastern arm of the Lake of Geneva, but now marshy and requiring frequent " correction." It receives at Bex the Avancon (right), flowing from the glaciers of the Diablerets range, at Monthey the Vieze (left), from Champery and the Val d'llliez, and at Aigle the Grande Eau (right), from the valley of Ormonts-dessus. It passes by the hamlet of Port Valais, once on the shore of the lake,

before expanding into the Lake of Geneva, between Villeneuve (right) and St Gingolph (left). During all this portion of its course the Rhone is not navigable, but a railway fine runs along it from Brieg in about 72 m. to either Villeneuve or Le Bouveret.

2. On issuing at Geneva from the lake the waters of the Rhone are very limpid and blue, as it has left all its impurities in the great settling vat of the lake, so that Byron might well speak of the ” blue rushing of the arrowy Rhone ” {Childe Harold, canto iii. stanza 71). But about half a mile below Geneva this limpidity is disturbed by the pouring in of the turbid torrent of the Arve (left), descending from the glaciers of the Mont Blanc range, the two currents for some distance refusing to mix. The distance from Geneva to Lyons by the tortuous course of the Rhone is about 124 m., the fall being only about 689 ft. The characteristic feature of this portion of the course of the Rhone is the number of narrow gorges or cluses through which it rushes, while it is forced by the southern spur of the Jura to run in a southerly direction, till, after rounding the base of that spur, it can flow freely westwards to Lyons. About 12 m. S. of Geneva the Rhone enters French territory, and henceforth till near Lyons forms first the eastern, then the southern boundary of the French department of the Ain, dividing it from those of Haute Savoie and Savoie (E.) and that of the Isere (S.). Soon after it becomes French the river rushes furiously through a deep gorge, being imprisoned on the north by the Credo and on the south by the Vuache, while the great fortress of l’Ecluse guards this entrance into France. The railway pierces the Credo by a tunnel. In the narrowest portion of this gorge, not far from Bellegarde at its lower end, there formerly existed the famous Perte du Rhone (described by Saussure in his Voyages dans les Alpes, chapter xvii.), where for a certain distance the river disappeared in a subterranean channel; but this natural phenomenon has been destroyed, partly by blasting, and partly by the diversion of the water for the use of the factories of Bellegarde. At Bellegarde the Valserine flows in (right), and then the river resumes its southerly direction, from which the great gorge had deflected it for a while. Some way below Bellegarde, between Le Pare and Pyrimont, the

Rhone becomes officially ” navigable,” though as far as Lyons the navigation now consists all but wholly of the floating of flat-bottomed boats, named rigues, laden chiefly with stone quarried from the banks of the river. Above Seyssel (u m. from Bellegarde) the Usses (left) joins

the Rhone, while just below that village the Fier (left) flows in from the Lake of Annecy. Below the junction of the Fier the hills sink on either side, the channel of the river widens, and one may say that it leaves the mountains for the plains. At Culoz (415 m. by rail from Geneva) the railway from Geneva to Lyons (105 m.) quits the Rhone in order to run west by a direct route past Amberieu. The Rhone continues to roll on southwards, but no longer (as no doubt it did in ancient days) enters the Lac du Bourget, of which it receives the waters through a canal, and then leaves it on the east in order to run along the foot of the last spur of the Jura. It flows past Yenne (left) and beneath the picturesque fortress (formerly a Carthusian monastery) of Pierre Chatel (right) before it attains the foot of the extreme southern spur of the Jura, at a height of 606 ft., not far from the village of Cordon, and just where the Guiers flows in (left) from the mountains of the Grande Chartreuse. This is nearly the last of the cluses through which the river has to make its way. The very last is at the Pont du Saut or Sault, a little S. of Lagnieu. The river now widens, but the neighbouring country is much exposed to inundations. It receives (right) its most important tributary in this part of its course, the Ain, which descends from the French slope of the Jura and is navigable for about 60 m. above its junction with the Rhone. Farther down the Rhone meanders for a time with shifting channels in a bed about 2 m. broad, but it gathers into a single stream before its junction with the Sadne, just below Lyons. The Saone (q.v.), which has received (left) the Doubs, is the real continuation of the Rhone, both from a geographical and a commercial point of view, and it is by means of canals branching off from the course of the Saone that the Rhone communicates with the basins of the Loire, the Seine, the Rhine and the Moselle. In fact, up to Lyons, the Rhone (save when it expands into the Lake of Geneva) is a huge and very unruly mountain torrent rather than a great European river.

3. Below Lyons, however, the Rhone becomes one of the great historical rivers of France. It was up its valley that first Greek, then Latin civilization penetrated from the Medi- terranean to Lyons, as well as in the 10th century the Saracen bandits from their settlement at La Garde Freinet, near the coast of Provence. Then, too, from Lyons downwards, the Rhone serves as a great medium of commerce by which central France sends its products to the sea. Its length from Lyons to the sea is some 230 m., though its fall is but 530 ft. But during this half of its course it can boast of having on its left bank (the right bank is very poor in this respect) such historical cities as Vienne, Valence, Avignon, Tarascon and Aries, while it receives (left) the Isere, the Drome and the Durance rivers, all formed by the union of

many streams, and bringing down the waters that flow from the lofty snowy Dauphine Alps. The Ardeche is the only considerable affluent from the right. Near Aries, about 25 m. from the sea, and by rail 1751 m. from Lyons, the river breaks up into its two main branches, the Grand Rhone running S.E. and the Petit Rhone S.W.; they enclose between them the huge delta of the Camargue, which is cultivated on the banks of the river only, but elsewhere is simply a great alluvial plain, deposited in the course of ages by the river, and now composed of scanty pasturages and of great salt marshes. Between Lyons and the sea, the Rhone divides four departments on its right bank (Rhone, Loire, Ardeche and Gard) from as many on its left bank (Isere, Dr6me, Vaucluse and Bouches du Rhone).

Consult in general Ch. Lentheric, Le Rhdne — histoire d'un fleuve, 2 vols. (Paris, 1892). (W. A. B. C.)

RH6KE, a department of south-eastern France, formed in 1793 from the eastern portion of the department of Rh6ne-et- Loire, and comprising the old districts of Beaujolais, Lyonnais, Franc-Lyonnais, Forez and a small portion of Dauphine. Pop.

(1906) &s8,9Q7. Area, 1104 sq m. Rh6ne is bounded N. by the department of Sa6ne-et Loire, E. by Ain and Isere and S. and W. by Loire. The Saone and the Rhone form its natural boundary on the east. The department belongs almost entirely to the basin of the Rhone, to which it sends its waters by the Saone and its tributary the Azergues, and by the Gier. The mountains which cover the surface of the department con stitute the watershed between the Rhone and the Loire, and from north to south form four successive groups — the Beaujolais Mountains, the highest peak of which is 3320 ft.; the Tarare group; the Lyonnais Mountains (nearly 3000 ft.); and Mont Pilat, the highest peak of which belongs to the department of Loire. The lowest point of the department (460 ft. above sea- level) is at the egress of the Rhone. The meteorological con- ditions vary greatly with the elevation and exposure. Snow sometimes lies in the mountains from November to April, while at Lyons and in the valleys the mean temperature in winter is 36 F. and in summer 70 , the annual mean being 53°. The average rainfall is somewhat higher than is general over France owing to the amount of the precipitation on the hilly region.

Good agricultural land is found in the valleys of the Saone and Rhone, but for the most part the soil is stony and only moderately fertile. Wheat, oats, rye and potatoes are ex- tensively cultivated, but their importance is less than that of the vine, the hills of the Beaujolais on

the right bank of the Sa6ne producing excellent wines. Fruit trees, such as peaches, apricots, walnuts and chestnuts, grow well, but the wood in general is little more than copse and brushwood. Good pasture is found in the valleys of the Azergues and its affluents. Mines of iron-pyrites and coal and quarries of freestone are worked.. The production of silk fabrics, the chief branch of manufacture, that of chemicals and machinery, together with most of the other industries of the department, are concentrated in Lyons (q.v.) and its vicinity. Tarare is a centre for the manufacture of muslin and embroidery. Oullins has large railway workshops belonging to the Paris-Lyon-Mediterranee railway, and there are important glass works at Givors. Cotton- spinning and weaving are carried on in several localities. The products of its manufactures, together with wine and brandy, form the bulk of the exports of the department; its imports comprise chiefly the raw material for its industries. It is served by the Paris-Lyon railway. The Rhone and the Saone and in the extreme south the canal of Givors are its navigable waterways. Lyons the capital is the seat of an archbishop and of a court of appeal and centre of an educational division (academic). The department is divided amongst the districts of the VII., VIII., XII., XIII. and XIV. army corps. There are two arrondissements (Lyons and Villefranche) subdivided into 29 cantons and 269 communes. The principal places besides Lyons are Givors, Tarare and Villefranche, which receive separate treatment.

RHONGEBIRGE, or Die Rhon, a mountain-chain of central Germany, running in a north-westerly direction from the Bavarian province of Lower Franconia to the Prussian province of Hesse-Nassau and the grand duchy of Saxe-Weimar, and divided by the Werra from the Thuringian Forest on the N. The other sides are bounded by the Fulda on the W. and the Sinn and Frankish Saab on the E. and S. Its length is 50 m., breadth 5-7 m., and its mean elevation 1900 ft. This district is divided into three groups— the southern, the high (Hohe) and the nearer (Vordere) Rhon. Of these the southern, a con- tinuation of the Spessart, largely consists of flat conical masses and reaches its highest point in the Heiliger Kreuzberg (2900 ft.). The Hohe Rhon, beginning immediately to the north-west of the latter mountain, is a high plateau of red sandstone, covered with fens and basalt peaks. It is a wild, dreary, inclement tract of country, covered with snow for six months in the year and visited by frequent fogs and storms. It is said of it that whoever desires to experience a northern winter can spare himself a journey to the North Cape or Siberia, and find it in his native Rhon. There is little vegetation, and the inhabitants eke out a scanty sustenance from the cultivation of potatoes

and flax. The highest inhabited place is Frankenhausen, lying at a height of 2350 ft. with 6383 inhabitants (1900). The nearer (Vordere) Rhon, forming the northern side of the range, is more attractive, with forests and deep and fertile valleys.

See Lenk, Zur geologischen Kenntnis der sudlichen Rhon (Wiirzburg, 1887); Scheidtweiler, Die Rhon und ihre wirthschaftlichen Verhdlt- nisse (Frankfort, 1887); and Daniel, Deutschland (5th ed., Leipzig,

1878).

RHOXOLANI, a Sarmatian tribe defeated in the Crimea by Diophantus, general of Mithradates, c. 100 B.C., and by the Romans on the lower Danube c. a.d. 60, and also under M. Aurelius. They seem* to have finally succumbed to the Goths.

RHUBARB. This name is applied both to a drug and to a vegetable.

1. The drug has been used in medicine from very early times, being described in the Chinese herbal Pen-king, which is believed to date from 2700 B.C. The name seems to be a corruption of Rheum barbarum or Reu barbarum, a designa- tion applied to the drug as early as the middle of the 6th century, and apparently identical with the pr\ov or pa, of Dioscorides, described by him as a root brought from beyond the Bosporus. In the 14th century rhubarb appears to have found its way to Europe by way of the Indus and Persian Gulf to the Red Sea and Alexandria, and was therefore described as ” East Indian ” rhubarb. Some also came by way of Persia and the Caspian to Syria and Asia Minor, and reached Europe from the ports of Aleppo and Smyrna, and became known as ” Turkey ” rhubarb. Subsequently to the year 1653, wheii China first permitted Russia to trade on her frontiers, Chinese rhubarb reached Europe chiefly by way of Moscow; and in 1704 the rhubarb trade became a monopoly of the Russian government, in consequence of which the term ” Russian ” or ” crown ” rhubarb came to be applied to it. Urga was the great depot for the rhubarb trade in 1719, but in 1728 the depot was transferred to Kiachta. All rhubarb brought to the depot passed through the hands of the govern- ment inspector; hence Russian rhubarb was invariably good and obtained a remarkably high price. This severe super- vision naturally led, as soon as the northern Chinese ports were thrown open to European trade, to a new outlet being sought; and the increased demand for the drug at these ports resulted in less care being exercised by the Chinese in the collection and curing of the root, so

that the rhubarb of good quality offered at Kiachta rapidly dwindled in quantity, and after i860 Russian rhubarb ceased to appear in European commerce. Owing to the expense of carrying the drug across the whole breadth of Asia, and the difficulty of preserving it from the attacks of insects, rhubarb was formerly one of the most costly of drugs. In 1542 it was sold in France for ten times the price of cinnamon and four times that of saffron, and in an English price list bearing date of 1657 it is quoted at 16s. per lb, opium being at that time only 6s. and scammony 12s. per lb.

The dose of rhubarb is anything from \ up to 30 grains, according to the action which is desired. The British Pharmacopeia contains seven preparations, only one of which is of any special value. This is the Pulvis Rhei Compositus, or Gregory's powder, which is composed of 2 parts of rhubarb, 6 of heavy or light . magnesia and I of ginger. The dose is 20 to 60 gr.

Rhubarb is used in small doses — J to 2 gr. — as an astringent tonic, since it stimulates all the functions of the upper part of the alimentary canal. In many cases of torpid dyspepsia it is very efficient when combined with the subnitrate of bismuth and the bicarbonate of sodium. The more characteristic action of rhubarb, however, is purgation, which it causes in doses of 15 gr. and upwards. The action occurs within seven or eight hours, a soft, pulpy motion of a yellow colour being produced. The colour is due to the chrysa- robin, which is also the purgative constituent of the drug. _ Rhubarb is also a secretory cholagogue, increasing the amount of bile formed by the liver. The drug is apt to cause colic, and should therefore never be given alone. The ginger in Gregory's powder averts this unpleasant consequence of the aperient properties of rhubarb. The drug is peculiar in that the purgation is succeeded by definite constipation, said to be due to the rheotannic acid. This explana- tion is hardly satisfactory, however, since it is difficult to see how the rheotannic acid can be retained in the bowel during the process of purgation. Rhubarb has, therefore, definite indications and

contra-indications. It is obviously worse than useless in the treatment of chronic constipation, which it only aggravates. On the other hand, it is very valuable in children and others, when diarrhoea has been caused by an unsuitable dietary. The drug removes the indigestible residue of the food and then gives the bowel rest. Rhubarb is also useful in the weaning of infants, since it, is partly excreted in the maternal milk, and gives it a bitter taste which the baby dislikes.

Some chrysarobin is absorbed and is excreted in the urine, which it

slightly increases and colours a reddish brown. The colour is discharged by the addition of a little dilute hydrochloric acid to the urine.

The botanical source of Chinese rhubarb cannot be said to have been as yet definitely cleared up by actual identification of plants observed to be used for the purpose. Rheum palmatum, R. officinale, R. palmatum, var. tanguiicum, R. colinianum and R. Franzenbachii have been variously stated to be the source of it, but the roots produced by these species under cultivation in Europe do not present the characteristic network of white veins exhibited by the best specimens of the Chinese drug.

Chemistry. — The most important constituent of this drug, giving it its purgative properties and its yellow colour, is chrysarobin, C 3 oH 36 07, formerly known as rhein or chrysophan. The rhubarb of commerce also contains chrysophanic acid, a dioxymethyl anthra- quinone, Ci4H 6 (CH 3)02(OH)2, of which chrysarobin is a reduction product. Nearly 40% of the drug consists of calcium oxalate, which gives it the characteristic grittiness. There is also present rheotannic acid, which is of some practical importance. There are numerous other constituents, such as emodin, CisHioOs, mucilage, resins, rheumic acid, C2oHi 6 9 , aporrhetin, &c.

Production and Commerce. — Rhubarb is produced in the four northern provinces of China proper (Chih-li, Shan-se, Shen-se and Ho-nan), in the north-west provinces of Kan-suh, formerly included in Shen-se, but now extending across the desert of Gobi to the frontier of Tibet, in the Mongolian province of Tsing-hai, including the salt lake Koko-nor, and the districts of Tangut, Sifan and Turfan, and in the mountains of the western provinces of Sze-chuen. 1 Two of the most important centres of the trade are Sining-f u in the province of Kan-suh, and Kwanhien in Sze-chuen. From Shen-se, Kan-suh and Sze-chuen the rhubarb is forwarded to Hankow, and thence carried to Shanghai, whence it is shipped to Europe. Lesser quantities are shipped from Tien-tsin, and occasionally the drug is exported from Canton, Amoy, Fuh-chow and Ning-po.

Very little is known concerning the mode of preparing the drug for the market. According to Mr Bell, who on a journey from St Petersburg to Peking had the opportunity of observing the plant in a growing state, the root is not considered to be mature -until it is six years old. It is then dug up, usually in the autumn, and deprived of its cortical portion and smaller branches, and the larger pieces are divided in half longitudinally; these pieces are bored with holes and strung up on

cords to dry, in some cases being previously subjected to a preliminary drying on stone slabs heated by fire underneath. In Bhutan the root is said to be hung up in a kind of drying room, in which a moderate heat is regularly maintained. The effect produced by the two drying processes is very different: when dried by artificial heat, the exterior of the pieces becomes hardened before the interior has entirely lost its moisture, and consequently the pieces decay in the centre, although the surface may show no change. These two varieties are technically known as kiln-dried and sun-dried; and it was on account of this differ- ence in quality that the Russian officer at Kiachta had every piece examined by boring a hole to its centre.

European Rhubarb. — As early as 1608 Prosper Alpinus of Padua cultivated as the true rhubarb a plant which is now known as Rheum rhaponticum, a native of southern Siberia and the basin of the Volga. This plant was introduced into England through Sir Matthew Lister, physician to Charles I., who gave seed obtained by him in Italy to the botanist Parkinson. The culture of this rhubarb for the sake of the root was commenced in 1777 at Banbury, in Oxfordshire, by an apothecary named Hayward, the' plants being raised from seed sent from Russia in 1762, and with such success that the Society of Arts awarded him a silver medal in 1789 and a gold one in 1794. The cultivation subsequently extended to Somersetshire, Yorkshire, and Middlesex, but is now chiefly carried on at Banbury. English rhubarb root is sold at a cheaper rate than the Chinese rhubarb, and forms a considerable article of export to America, and is said to be used in Britain in the form of powder, which is of a finer yellow colour than that of Chinese rhubarb. The Banbury rhubarb appears to be a hybrid between R. rhaponticum and R. undulatum — the root, according to E. Colin, not presenting the typical microscopic structure of the former. More recently very

ˆAccording to Mr F. Newcombe, Med. Press and Circ, August 2, 1882, the Chinese esteem the Shen-se rhubarb as the best, that coming from Kanchow being the most prized of all; Sze-chuen rhubarb has a rougher surface and little flavour, and brings only about half the price; Chung-chi rhubarb also is greatly valued, while the Chi-chuang, Tai-huang and Shan-huang varieties are considered worthless.

good rhubarb has been grown at Banbury from Rheum officinale, but these two varieties are not equal in medicinal strength to the Chinese

article, yielding less extract — Chinese rhubarb afford- ing, according to H. Seier, 58%, English rhubarb 21 % and R. officinale 17%. In France the cultivation of rhubarb was commenced in the latter half of the 1 8th century — R. com- paction, R. palmatum, R. rhaponticum and R. undidatum being the species grown. The cultivation has, however, now nearly ceased, small quantities only being prepared at Avignon and a few other localities.

The culture of Rheum compactum was begun in Moravia in the beginning of the present century by Prikyl, an apothecary in Austerlitz, and until about fifty years ago the root was largely exported to Lyons and Milan, where it was used for dyeing silk. As a medicine 5 parts are stated to be equal to 4 of Chinese rhubarb. Rhubarb root is also grown at Auspitz in Moravia and at Ilmitz, Kremnitz and Frauenkirchen in Hungary; R. emodi is said to be cultivated for the same purpose in Silesia.

Rhubarb is also prepared for use in medicine from wild species in the Himalayas and Java.

2. The rhubarb used as a vegetable consists of the leaf stalks of R. rhaponticum and its varieties, and R. undulatum. It is known in America as pie-plant. Plants are readily raised from seed, but strong plants can be obtained in a much shorter time by dividing the roots. Divisions or seedlings are planted about 3 ft. apart in ground which has been deeply trenched and manured, the crowns being kept slightly above the sur- face. Rhubarb grows freely under fruit-trees, but succeeds best in an open situation in rich, rather light soil. The stalks should not be pulled during the first season. If a top-dress- ing of manure be given each winter a plantation will last good for several years. Forced rhubarb is much esteemed in winter and early spring, and forms a remunerative crop. Forcing under glass or in a mushroom house is most satisfactory, but open-ground forcing may be effected by placing pots or boxes over the roots and burying in a good depth of stable litter and leaves. Several other species, such as R. palmatum, R. officinale, R. nobile and others, are cultivated for their fine foliage and handsome inflorescence, especially in wild gardens, margins of shrubberies and similar places. They succeed in most soils, but prefer a rich soil of good depth. They are propagated by seeds or by division.

RHYL, a watering-place and urban district of Flint, N. Wales, practically equidistant by rail from Bangor (295 m.) and Chester (30 m.), and 209 m. from London on the London & North-Western railway. Pop. (1901) 8473. It is situated near the mouth of the Clwyd. Formerly, like Llandudno, a small fishing village, the town has now all the appointments of a popular resort. In winter the gales often fill the streets to the depth of several feet, with drifts of sand from the sur- rounding dunes, which, however, are noted in summer for the dry and bracing air. The neighbouring country is inter- esting from its scenery and antiquities. Among the institu- tions of the town may be mentioned the Queen Alexandra Hospital (1902), and several hydropathic establishments and convalescent homes. The estuary harbours coasting vessels, and some shipbuilding is carried on. On the beach towards Prestatyn can be seen the remains of a submerged forest.

RHYME, more correctly spelt Rime, from a Provencal word rim (its customary English spelling is due to a confusion with rhythm), a literary ornament or device consisting of an identity of sound in the terminal syllables of two or more words. In the art of versification it signifies the repetition of a sound at the end of two or more lines in a single composition. This artifice was practically unknown to the ancients, and, when it occurs, or seems to occur, in the works of classic Greek and Latin poets, it must be considered to be accidental. The natural tendency of the writer of verse unconsciously to repeat a sound, however, is shown by the fact that there have been discovered nearly one thousand lines in the writings of Virgil where the final syllable rhymes with a central one, thus — Bella per Emathios plus quam civilia campos.

It is more than doubtful, however, whether the difference of stress would not prevent this from sounding as a rhyme in »o antique ear, and the phenomenon N results more from the

contingencies of grammar than from intention on the part of the poet. Conscious rhyme belongs to the early medieval periods of monkish literature, and the name given to lines with an intentional rhyme in the middle is Leonine verse, the invention being attributed to a probably apocryphal monk Leoninus or Leonius, who is supposed to be the author of a history of the Old Testament preserved in the Bibliotheque Nationale of Paris. This ” history ” is composed in Latin verses, all of which rhyme in the centre. Another very famous poem in Leonine rhyme is the ” De Contemptu Mundi ” of Bernard of Cluny, which was printed. at Bremen in 1595. Rhyme exists to satisfy the ear

by the richness of repeated sound. In the beginnings of modern verse, alliteration, a repetition of a consonant, satisfied the listener. A further ornament was discovered when assonance, a repetition of the vowel-sounds, was invented. Finally, both of these were com- bined to procure a full identity of sound in the entire syllable, and rhyme took its place in prosody. When this identity of sound occurs in the last syllable of a verse it is the typical end- rhyme of modern European poetry. Recent criticism has been inclined to look upon the African church-Latin of the age of Tertullian as the starting-point of modern rhyme, and it is probable that the ingenuities of priests, invented to aid wor- shippers in hearing and singing long pieces of Latin verse in the ritual of the Catholic church produced the earliest conscious poems in rhyme. Moreover, not to give too great importance to the Leonine hexameters which have been mentioned above, it is certain that by the 4th century a school of rhymed sacred poetry had come into existence, classical examples of which we still possess in the " Stabat Mater " and the " Dies Irae." In the course of the middle ages, alliteration, assonance and end-rhyme held the field without a rival in vernacular poetry. There is no such thing, it may broadly be said, as medieval verse in which one or other of these distinguishing ornaments is not employed. After the 14th century, in the north of Europe, and indeed everywhere except in Spain, where asson- ance held a powerful position, end-rhyme became universal and formed a distinctive indication of metrical construction. It was not until the invention of Blank Verse (q.v.) that rhyme found a modern rival, and in spite of the successes of this instrument rhyme has held its own, at all events for non- dramatic verse, in the principal literature of Europe. Certain forms of poetry are almost inconceivable without rhyme. For instance, efforts have been made to compose rhymeless sonnets, but the result has been, either that the piece of blank verse produced is not in any sense a sonnet, or else that by some artifice the appearance of rhyme has been retained. In the heyday of Elizabethan literature a serious attempt was made in England to reject rhyme altogether, and to return to the quantitative measures of the ancients. The prime mover in this heresy was not a poet at all, but a pedantic grammarian of Cambridge, Gabriel Harvey (1545 ?-i63o). He considered himself a great innovator, and for a short time he actually seduced no less melodious a poet than Edmund Spenser to abandon rhyme and adopt a system of accented hexameters and trimeters. Spenser even wrote largely in those measures, but the greater portion of his experiments in this kind, of which The Dying Pelican is supposed to have been one, have' disappeared. From 1576 to 1579 the genius of Spenser seems to have been obscured by this error of taste, but he shook it off completely when he composed The Shepherd's

Calendar. Harvey considered Richard Stonyhurst (1547-1618) the most loyal of his disciples, and this author published in 1582 four books of the Aeneid translated into rhymeless hexameters on Harvey's plan. The result remains, a portent of ugliness and cacophony. A far greater poet, Thomas Campion (1575— 1620), returned to the attack, and in a tract published in 1602 advocated the remission of rhyme from lyrical poetry. He, by dint of a prodigious effort, produced some unrhymed odes which were not without charm, but the best critics of the time, such as Daniel, repudiated the innovation, and rhyme continued to have no serious rival except blank verse.

There have, from time to time, been made experiments of a similar nature, notably by Tennyson, but rhyme has retained its sway as an essential ornament of all English poetry which is not in blank verse. There have been not a few poems composed, principally in the nineteenth century, in rhymeless hexameters, and even the elegiac couplet has been attempted. The experiments of Long- fellow, Clough, Kingsley and others demand respectful notice, but it is more than doubtful whether any one of these, even the melli- fluous Andromeda of the last-named writer, is really in harmony with the national prosody.

In Germany a very determined attack on rhyme was made early in the seventeenth century, particularly by a group of aesthetic critics in the Swiss universities. They attacked rhyme as an artless species of sing-song, which deadened and destroyed the true movement of melody in the rhythm. The argument of this group of critics had a deep influence in German practice, and led to the composition of a vast number of works in unrhymed measures, in few of which, however, is now found a music which justifies the experiment. Lessing recalled the German poets to a sense of the beauty and value of rhyme, but the popularity of Klopstock and his imitators continued to exercise a great influence. Goethe and Schiller, without abandoning rhyme altogether, permitted themselves a great liberty in the employment of unrhymed measures and in imita- tion of classic metres. This was carried to still greater lengths by Platen and Heine, the rhymeless rhythm of the last of whom was imitated in English verse by Matthew Arnold and others, not without an occasional measure of success. In France, on the other hand, the empire of rhyme has always been triumphant, and in French literature the idea of rhymeless verse can scarcely be said to exist. There the rime pleine or riche, in which not merely the sound but the

emphasis is perfectly identical, is insisted upon, and a poet who rhymed as Mrs Browning did, or made ” flying ” an equivalent in sound to ” Zion,” would be deemed illiterate.

In French, two species of rhyme are accepted, the feminine and the masculine. Feminine rhymes are those which end in a mute e, masculine those which do not so end. The Alexandrine, which is the classical metre in French, is built up on what are known as rimes croisees, that is to say a couplet of masculine rhymes followed by a couplet of feminine, and that again by masculine. This rule is unknown to the medieval poetry of France.

In Italian literature the excessive abundance and facility of rhyme has led to a rebellion against its use, which is much more reasonable than that of the Germans, whose strenuous language seems to call for an emphatic uniformity of sound. But it was the influence of German aesthetics which forced upon the notice of Leopardi the possibility of introducing rhymeless lyrical measures into Italian verse, an innovation which he carried out with remarkable hardihood and success. The rhymeless odes of Carducci are also worthy of admiration, and may be com- pared by the student with those of Heine and of Matthew Arnold respectively. Nevertheless, in Italian also, the ear demands the pleasure of the full reiterated sound, and the experiments of the eminent poets who have rejected it have claimed respect rather than sympathy or imitation. At the close of the 19th century, particularly in France, where the rules of rhyme had been most rigid, an effort to modify and minimise these restraints was widely made. There is no doubt that the laws of rhyme, like other artificial regulations, may be too severe, but there is no evidence that the natural beauty which pure rhyme introduces into poetry is losing its hold on the human ear or is in any real danger of being superseded by accent or rhythm.

See Joseph B. Mayer, A Handbook of Modern English Metre (Cambridge, 1903) ; J. Minor, Neuhochdeutsche Metrik (Strassburg, 1893); J. B. Schutze, Versuch einer Theorie des Reimes nach Inhalt und Form (Magdeburg, 1802). (E. G.)

RHYMNEY, an urban district in the western parliamentary division of Monmouthshire, England, on the borders of Glamor- ganshire, 22 m. N. by W. of Cardiff, on the Rhymney, the London & North-Western, and the Brecon & Merthyr railways. Pop. (1901), 7915. The Rhymney river, in the upper valley of which this town lies, forms almost throughout its course, to the estuary of the Severn near Cardiff, the boundary between England and Wales (Monmouthshire and

Glamorganshire).

In its upper part the valley, like others adjacent and parallel to it, is populous with mining townships, and the town of Rhymney owes its importance to the neighbouring coal-mines and to its iron and steel works, which employ nearly the whole population. The works of the Rhymney Iron Company, including blast furnaces and rolling mills, are among the largest of the kind in England.

RHYOLITE (Gr. peTp, to flow, because of the frequency with which they exhibit fluxion structures), the group name of a type of volcanic rock, occurring mostly as lava no we, and characterized by a highly acid composition. They are the most siliceous of all lavas, and, with the exception of the dacites, are the only lavas which contain free primary quartz. In chemical composition they very closely resemble the granites which are the corresponding rocks of plu tonic or deep-seated origin; their minerals also present many points of similarity to those of granite though they are by no means entirely the same. Quartz, orthoclase and plagioclase felspars, and biotite are the commonest ingredients of both rocks, but the quartz of rhyolites is full of glass enclosures and the potash felspar is pellucid sanidine, while the quartz of granite contains dust-like fluid cavities of very minute size and its potash felspar is of the turbid variety which is properly called orthoclase. The granites also are holocrystalline, while in the rhyolites there are usually porphyritic crystals floating in a fine ground-mass. Rhyolites have also been called liparites because many of the lavas of the Lipari Islands are excellent examples of this group. Above all rocks they have a disposition to assume vitreous forms, as when fused they crystallize with great difficulty. Hence it has long baffled experimenters to produce rhyolite synthetically by fusion; it is stated that these difficulties have now been over- come, but geologists believe that the presence of steam and other gases in the natural state expedites crystallization. In crucibles these cannot be retained at the temperatures employed; when the rocks are melted the gases escape and on cooling a pure glass is formed. The vitreous forms of rhyolite are known as obsidian, perlite and pumice (qq.v.).

The minerals of the first generation, or phenocrysts, of rhyolite are generally orthoclase, oligoclase, quartz, biotite, augite or hornblende. The felspars are usually glassy clear, small but of well-developed crystalline form: the potash felspar is sanidine, usually Carlsbad twinned ; the soda-lime felspar is almost always oligoclase, with characteristic polysynthetic structure. Both of these may be corroded and irregular in their outlines; their cleavage and twinning then distinguish them readily from quartz. Glass en- closures,

sometimes rectangular with small immobile bubbles, are frequent. The quartz occurs as blebs or sub-rounded grains, which are corroded double hexagonal pyramids. Its glass enclosures are many and nearly always rounded or elliptical in section. No proper cleavage is seen in the quartz, though arcuate (conchoidal) fractures may often be noticed; they may have been produced by strain on cooling. Phenocrysts of micropegmatite are known in some rhyo- lites; they may have the shape of felspar or of quartz crystals; in the former case Carlsbad twinning is by no means uncommon, but in other cases hour-glass structure is very conspicuous. Biotite is always deep brown or greenish brown, in small hexagonal tablets, generally blackened at their edges by magmatic corrosion. Mus- covite is not known in rhyolites. Hornblende may be green or brown; in the quartz-pantellarites it sometimes takes the form of strongly pleochroic brown cossyrite. Like biotite it is eumorphic but often corroded in a marked degree. Augite, which is equally common or more common than the other ferro-magnesian minerals, is always green; its crystals are small and perfectly shaped, and corrosion phenomena are very rarely seen in it. Zircon, apatite and magnetite are always present in rhyolites, their crystals being often beautifully perfect though never large. Olivine is never a normal ingredient, but occurs in the hollow spherulites or litho- physae of some rhyolites with garnet, tridymite, topaz and other minerals which indicate pneumatolytic action. Among the less common accessory minerals of the rhyolites are cordierite in crystals which resemble hexagonal prisms but break up under polarized light into six radiating sectors owing to complicated twinning: they weather to green aggregates of chlorite and muscovite (pinite) ; garnet, sphene and orthite may also be met with in rhyolites.

The ground-mass of rhyolitic rocks is of three distinct types which are stages in crystalline development, viz. the vitreous, the felsitic or cryptocrystalline, and the microcrystalline. Hence some authorities have proposed to subdivide the group

into the vitrophyres, the felsophyres and the granophyres, but this is not now in use, and the last of these terms has obtained a signification quite different from that originally assigned to it. Mixturesof the different kinds occur; thus a vitreous rhyolite has often felsitic areas in its ground-mass, and in the same lava flow some parts may be vitreous while others are felsitic. The vitreous rhyolites are identical in most respects with the obsidians, from which they can only be separated in

an artificial classification; and in their glassy base the banded or eutaxitic, spherulitic and perlitic structures of pure obsidians are very frequently present (see Obsidian; Perlite). The felso- liparites or liparites with stony ground-mass are especially common among the pre-Tertiary igneous rocks (see Quartz- porphyry), as liparite glass is unstable and experiences devitrification in course of time. Many of these felsites have fluxion banding, spherulites and even perlitic cracks, which are strong evidence that they were originally glassy. In other cases a hyaloliparite, obsidian, or pitchstone becomes felsitic along its borders and joint planes, or even along perlitic cracks, and we may assume that the once fibrous rock has changed into felsite under the action of percolating moisture or even by atmospheric decomposition. In many rhyolites the felsite is original and represents an incipient crystallization of the vitreous material which took place before the rock was yet cold. The felsite in turn is liable to change ; it becomes a fine mosaic of quartz and alkali felspar; and in this way a matrix of the third type, the microcrystalline, may develop. This is proved by the occurrence of the remains of spherulitic and perlitic structures in rocks which are no longer felsitic or glassy. Many micro-crystalline rhyolites have a ground-mass in which much felsitic matter occurs; but as this tends to recrystallize in course of time, the older rocks of this group show least of it. Whilst no quartz-bearing rhyolites are known to have been erupted in recent years, Lacroix proved that portions of the ” dome ” which rose as a great tower or column out of the crater of Mont Pelee after the eruption in 1906 contained small crystals of quartz in the ground-mass. The rock was an acid andesite, and it was ascribed by Lacroix to the action of steam retained in the rock under considerable pressure. The microcrystalline ground- mass of rhyolites is never micrographic as in the porphyries (granophyres); on the other hand it is often micropoikilitic, consisting of small felspars, often sub-rectangular, embedded in little rounded or irregular plates of quartz.

The ground-mass of rhyolites is liable to other changes, of which the most important are silicification, kaolinization and sericitization. Among the older rocks of this group it is the exception to find that secondary quartz has not been de- posited in some parts of them. Often indeed the matrix is completely replaced by silica in the form of finely crystalline quartz or chalcedony; and these rocks on analysis prove to contain over 90% of silica. In the recent rhyolites of Hungary, New Zealand, &c, the deposit of coarse opal in portions of the rock is a very common phenomenon.

Kaolinization may be due to weathering, and the stony dull appearance of the matrix of many microcrystalline rhyolites is a

consequence of the decomposed state of the felspar grains in them; it is even more typically developed by fumarole action, which replaces the felspars with soft, cloudy white products which belong to a mineral of the kaolin group. Seri- citization, or the development of fine white mica after felspar, is usually associated with shearing, and is commonest in the older rhyolites.

Vesicular structure is very common in rhyolites; in fact the pumiceous obsidians have this character in greater perfec- tion than any other rocks (see Pumice); but even the felso- rhyolites are very often vesicular. The cavities are usually lined with opal and tridymite; in the older rocks they may be filled with agate and chalcedony. The ” mill-st’one porphyries,” extensively used in Germany for grinding corn, are porous rhyolites; the abundance of quartz makes them hatd, and their rough surfaces render them peculiarly suitable for this purpose. In some of them the cavities are partly

secondary. These rocks are obtained in the Odenwald, Thur- ingerwald and Fichtelgebirge.

In Britain a pale grey Tertiary rhyolite occurs at Tardree, Antrim (the only British rock containing tridymite), and in Skye. Felsitic rhyolites occur among the Old Red rocks of Scotland (Pent- land Hills, Lome, &c), in Devonshire, and in large numbers in North Wales. The Carnarvonshire rhyolites are often much altered and silicified ; many of them have a nodular structure which is very conspicuous on weathered surfaces. The spheroids may be two or three inches in diameter; some of them are built up of con- centric shells. Rhyolites are also known from Fishguard, Malvern, Westmorland and Co. Waterford. One of the oldest volcanic rocks of Britain (pre-Cambrian, Uriconian) is the spherulitic rhyolite of the Lea Rock near Wellington in Shropshire. It shows bright red spherulites in great numbers and is probably an obsidian completely devitrified. Perlitic structure is also visible in it.

In other parts of Europe rhyolites have a fairly wide distribution though they are not very numerous. In Hungary (Hlinik, &c.) there are many well-known examples of this class. They extend along the margin of the Carpathians and are found also in Sieben- burgen. In Italy they occur in the Euganean Hills and in the Lipari Islands; the latter being the principal source of pumice at the present day. Rhyolites of Recent age occur in Iceland (Myvatn, &c), where they are characterized by the frequent absence of quartz, and the presence of much plagioclase and pyroxene. Some of these rocks have been called trachyte-obsidians, but they seem to be rhyolites which contain an

exceptionally large amount of soda. The older rhyolites, which are generally called quartz- porphyries in Germany, are mostly of Permian or Carboniferous age and are numerous in the Vosges, Odenwald, Thuringerwald, &c. They are often accompanied by basic rocks (melaphyres). Permian rhyolites occur also at Lugano in Italy. Rhyolites are known also in Asia Minor and the Caucasus, in New Zealand, Colorado, Nevada and other parts of western North America. In the Yellowstone National Park there is a well-known cliff of obsidian which shows remarkably perfect columnar jointing. Some of the rhyolites of Nevada are exceedingly rich in porphyritic minerals, so that they appear at first sight to be_holocrystalline rocks, since the ground- mass is scanty and inconspicuous. To this type the name nevadite has been given, but it is rare and local in its distribution.

In the island of Pantellaria, which lies to the south-west of Sicily, there are rocks of rhyolitic affinities which present so many unusual features that they have been designated pantellarites. They contain less silica and alumina and more alkalis and iron than do ordinary rhyolites. Their felspars are of the anorthoclase group, being rich in soda together with potash, and are very variable in crystalline development. Aegirine-augite and forms of soda- amphibole are also characteristic of these rocks: dark brown aenigmatite or cossyrite often occur in them. Quartz is not very plentiful; other ingredients are olivine, arfvedsonite and tridymite. The ground-mass varies much, being sometimes quite vitreous, at other times a glass filled with swarms of microliths, while in certain pantellarites it is a microcrystalline aggregate of quartz and alkali felspar. The absence of plagioclase and biotite are marked distinctions between these rocks and the rhyolites, together with the scarcity of quartz and the prevalence of soda-bearing pyroxenes and amphiboles.

Among the Palaeozoic volcanic rocks of Germany there is a group of lavas, the quartz-keratophyres, which are of acid composition and rich in alkali felspar. Their dominant alkali is soda: hence their _ felspars are albite and cryptoperthite, not sanidine as in rhyolites. Quartz occurs sometimes as corroded phenocrysts, but is often scarce even in the ground-mass. Porphyritic biotite or augite are very rare, but occur in the matrix along with felspars and quartz. Micropegmatite is not infrequent in these rocks, and they may be silicified like the rhyolites. As quartz-keratophyres mostly occur in districts where there has been a good deal of folding, they are often crushed and more or less serialized. They are best known from the Devonian rocks of Westphalia and the Harz, but are also found in Queensland, and similar rocks have been described (as soda-felsites) from Ireland. The rocks which they accompany are usually diabases and spilites.

The other group of rhyolitic rocks rich in alkali felspars and soda pyroxenes and amphiboles are the comendites. They are often porphyritic, with crystals of quartz, sanidine, microperthite or albite: the ground-mass is microcrystalline or rarely micrographic, and often filled with spongy growths of aegirine and riebeckite. They are known from the recent eruptive districts of East Africa, from Sardinia and Texas, and very similar rocks occur as intrusive masses which may be grouped with the porphyries.

The following analyses show the composition of some of the principal types of rhyolites : —

Si0 2 A1 2 3 Fe 2 3 FeO CaO MgO K 2 Na 2 H 2 I. 76-34 13-22 193 1-85 o-2i 3-67 2-84 o-6i

II. 72-15 13-50 3-12 0-93 0-16 4-54 4-20 0-85

HI- 77-59 12-75 0-67 n.f. 0-04 0-16 3-99 2-56 1-54

IV. 67-48 9-70 7-42 2-ai 1-45 0-77 2-94 7-21 0-96 V. 70-97 13-84 3-21 0-78 1-26 0-20 1-57 6-27 0-74

VI. 74-76 u-6o 3-50 0-19 0-07 0-18 4-92 4-35 0-64

I. Rhyolite, Telki Banya, Hungary. II. do. . Mafahlid, Iceland.

III. do. Omahu, New Zealand.

IV. Pantellarite, Pantellaria.

V. Quartz-keratophyfe, Muhlenthal, Harz. VI. Comendite, Sardinia.

We note in the rhyolites I. -III. the very high silica, with alkalis and alumina also in considerable amount, while lime, magnesia and iron are very low. In the pantellarite, keratophyre and comendite the silica tends to be less abundant, while the alkalis, especially soda, increase; they have less alumina but are richer in iron and magnesia.' It is easy to see why the latter types contain less quartz, felspars often very rich in soda, and femic minerals which contain iron and alkalis in notable amounts such as aegirine, riebeckite and arfvedsonite. (J. S. F.)

RHYTHM (Greek pvOnds, from frtiv, to flow), the measured flow of movement, or beat, in verse, music or by analogy in other connexions,

e.g. ” rhythm of life.” The early critic of prosody, Aristoxenus, distinguished as the three elements out of which rhythm is composed, the spoken word, X££u, the tune of music and song, fteXqs, and the bodily motion, dvn

Rhythm in Verse. — Professor Jakob Minor has adduced a figure, valuable in helping us to realize what poetic rhythm is, when he remarks that to strike a bell twelve times, at exactly equal intervals, is to produce what may be called, indeedˆ a rhythmic effect, but not to awaken anything resembling the sensation of poetical rhythm. Into fhe idea of poetic rhythm enters an element of life, of pulse, of a certain inequality of time based upon an equality of tone. Rhythm ceases to be poetic rhythm if it is mechanical or lifeless. Aristotle, from whom a definition might be ex- pected, is very vague in dealing with the subject, and most of the old rhetorical writers darken counsel with statements that are obscure or irrational. The fact is that rhythm is an expression of the instinct for order in sound which naturally governs the human ear, and little practical know- ledge is gained by following Suidas when he says that rhythm is the father of metre, or Quintilian in his epigram that rhythm is male and metre is female. These definitions arise from a rhetorical desire to measure a delicate instinct by rule of three, and, as a matter of fact, Greek criticism on this subject often lost itself in arithmetical absurdities. It is sufficient to say that rhythm is the law which governs the even and periodical progress of sounds, in harmony with the exigencies of human emotion. For the passions, as expressed in verse, various movements are’ appropriate. Joy demands that the voice should leap and sing; sorrow that it should move solemnly and slowly; and poetry, which is founded on rhythm, requires that the movement of words should respond to this instinctive gradation of sounds. The finer the genius of the metrist the more exquisitely does his rhythm convey, as upon an instrument, the nature of ;the passion which burdens his verses. Ecstasy takes a quick, eager, rising movement: —

” Give him the nectar! Pour out for the poet, Hebe, pour free! Quicken his eyes with celestial dew, That Styx the detested no more he may view.”

Mystery and suspense demand a faint, languid and throbbing movement: —

” There is not wind enough in the air To move aˆay the ringlet curl , From the lovely lady’s cheek —

There is not wind enough to twirl The one red leaf, the last of its clan,

That dances as often as dance it can.”

An overpowering sadness interprets itself in rhythm that is full and slow and emphatic: —

” My genial spirits fail, And what can these avail To lift the smothering weight from off my breast? It were a vain endeavour, Though I should gaze for ever On that green light that lingers in the west : I may not hope from outward forms to win The passion and the life, whose fountains are within.”

The rhythm so produced, intimately linked, almost beyond the disintegrating power of analysis, with human feeling, may depend either on accentuation or quantity. The latter forms the principle upon which all classic metre was composed, while the former is dominant in nearly every description of modern verse. Greek and Latin verse depends entirely upon the relation of syllables, long or short. It was a question of time with the ancients, of stress or weight with us. . It is an error to say, as is often done, that ancient verse did not recognize accent, and that in modern verse there is no place for quantity. These state- ments are generally true, but there are various exceptions to both rules. Schipper, in his Englische Metrik, specially points out that ” long and short syllables have no constant length, no constant relation, but they depend on their place in the verse, and on the context; though they do not determine the rhythm of verse, they still act as regulators of our metre in a very im- portant degree.” Pauses take an essential importance in the construction of modern rhythm, of the variety and vitality of which they are the basis. They are introduced for the purpose of relieving the monotony of successive equal groups of syllables. The pause often takes the place of a light syllable, and there are instances in the verse of Shakespeare and Milton where it is even allowed to fill up the space of a heavy syllable. But still more often the pause does not imply the dropping of a syllable at all, but simply dictates a break in the sound, equivalent to a break in the sense. The following extract from a ” Psalm ” in Crashaw’s Steps to the Temple (1646), in wh-A the pauses are numerous and energetic, will exemplify the vs-riety of this artifice:- —

“On the proud banks of great Euphrates’ flood, |

There we sate j and there we wept : | Our harps I that | now | no music understood, |,

Nodding | on the willows slept |

. While I unhappy captiv'd [we

Lovely Sion | thought on thee."

In the blank verse of Milton the free use of pauses constitutes the principal element in the amazing metrical art of the poet, and is the source of the sublime originality of his music. In speaking of rhythm, it is customary to think of the formal rules which govern the fixed cadence of feet in poetry, but there is also a rhythm in prose, which imitates the measured movements of the body in stately speech. According to Renan, the rhythm of the ancient poetry of the Hebrews is solely founded on this prose movement, which differs, in fact, from that of modern European poetry merely in its undefined and indeterminate character.

See J. Minor, Neuhochdeutsche Metrik (Strassburg, 1893); W. Christ, Die Metrik der Greichen (Leipzig, 1874); Roderick Benadix, Das Wesen des deutschen Rhythmus (Leipzig, 1862) ; Jakob Schipper, EnglisChe Metrik (Leipzig, 1895) ; Edwin Guest History of English Rhythms (London, 1838; 2nd ed., 1882); Theodore de Banville, Petit Traite de la poesie frangaise (Paris, 1881); F. B. Gummere, Handbook of Poetics (Boston, 1902). (E. G.)

Rhythm in Music. — The rhythm of modern music began to develop through the attempts of learned medieval musicians to adapt the rhythms of spoken language to the necessities of choral singing; but before the process had gone far, certain much more ancient and powerful principles, always manifest in folk-song and dance, gained ascendancy, so that even the

simplest classical music has a rhythm for which no criteria of poetic metre can be made adequate. From the musical point of view, the rhythm of speech, whether in prose or verse, is very subtle and almost uniformly fluent. The metrical feet which constitute the details of poetic rhythm are musically very minute; and the exaggerated forms in which music represents them are many and varied. On the other hand, the groups of metrical feet which constitute any one kind of verse are of a uniformity which for music on a large scale would be intolerable. Artistic music is soon compelled to draw upon infinite resources of its own, which preserve an appropriate accentuation of the sense and feeling, while obliterating or hugely exaggerating the

poet's rhythmic effects. Musical rhythm cannot be studied on a sound basis unless its radical divergences from speech- rhythm are recognized from the outset.

In the earliest extant musical settings of poetry the treatment of accent and quantity was strictly arithmetical ; and purely aesthetic requirements were satisfied by ex post facto inference from the arithmetical laws, rather than treated as the basis of the laws. Accent, when translated into music, is a rhythmic sensation resembling the stress we put on the left foot in march- ing; while quantity rarely suggests any bodily movement at all, since it can correspond only to variations in the length of steps. Now in modern 'music a sense akin to that of bodily movement is of overwhelming importance. Changes of tempo, and of the grouping of musical beats, are incidents as obvious in their effect as changes in the pace of a running horse. One consequence is that the laws of musical accent are simple and cogent, while the laws of musical quantity, if such exist, are far beyond analysis. Fluent speech and energetic physical exercise cannot be carried on simultaneously by the same person; and hence the laws of quantity belong to speech rather than to dance. Before we could form adequate notions of the musical rhythms of classical Greece, we should need to settle, firstly, how far the dancing in Greek drama included movements other than ideal- ized dramatic gesticulation; secondly, how much bodily energy was involved in all dancing that may have gone beyond this; and lastly, how much dancing of any kind was executed by the singers while singing. What is certain is that ancient Greek musical rhythms were exact translations of verse rhythms, with the quantities interpreted arithmetically.

The extant fragments of Greek music are, whether we have read them correctly or not, undoubtedly very different in rhythm from the system of discant on which European music of the 12th and 13th centuries first developed; but they resemble discant in so far as the modern sense of rhythm is absent and its place is supplied by a sense of the rhythmic expression of unusually slow and emphatic speech. In ordinary speech there is an important difference between long syllables and short; but it is not naturally regulated by an exact rhythm, and the art by which it is organized in verse admits (or indeed demands) considerable freedom on the part of the reciter in varying his pace within such limits as do not destroy the structure of the lines. But when a chorus is made to sing words, it must, if the words are to reach the hearer, sing them slowly; and moreover, it must sing them exactly together, unless, as in much classical music, it can repeat them until they are either understood or dismissed from the mind as a mere pretext for the employment of voices in a merely

musical design. In any case, if a chorus is to sing well together, the contrast between short and long syllables must be placed on an arithmetical basis, the simpler the better. Now the sole function of ancient Greek music was to enhance the emotional effect of poetic words by regulating their rise and fall in a musical scale and their length in a metrical scheme; and it was natural and right that its rhythms should, though accurate, have no stronger ictus than those of the words. To make them as rigid and forcible as the rhythms of a non-vocal music would produce an effect as intolerable to a Greek ear as a schoolboy's worst jog-trotting scansion of poetry. We need not, then, imagine that the human sense of rhythm has suffered any mysterious change, when our best attempts at deciphering the extant fragments of ancient Greek music yield us a rhythm

which scholars can explain by the structure of Greek verse, but which gives us no musical sense. Neither here nor in such strange harmonic phenomena as our complete inversion of medieval harmonic ideas as to the treatment of " perfect con- cords " (see Harmony) do we find any principle involved which is not as true at the present day as it ever was. Ancient musical rhythm shared in the general qualities of that " Flatland " which we know ancient music to have been; modern musical rhythm, like harmony, belongs, as it were, to a three-dimensioned musical space with the vast artistic resources of a consistent perspective.

Indeed, we need much the same kind of mental gymnastic in studying the origins of musical rhythm as we need for the much more abstruse subject of harmonic origins. The two subjects soon begin to show interaction. During the period of discant we find metrical conceptions already strongly modified by two purely musical factors. Firstly, the attempt to make voices produce a harmony from different simultaneous melodies (instead of from combinations conceived as disguised unison) brought with it the necessity for differences of length enormously larger than any possible metrical differences. The metrical influence, however, still so predominated, even in the 14th century, as to produce a rhythm based almost exclusively on what would now be called triple time. Secondly, that sense of bodily movement, for which the less clumsy term " dance- rhythm " is far too narrow, gained ground as the only means powerful enough to hold the various 'iythms of the new and growing polyphony together. In the iater stages of discant the old metrical conceptions struggled against the grain of the polyphony for awhile, only to succumb in a tangle of inextricable technicality: and the new art, which became coherent in the 15th century, disregarded poetic metre, with little or no loss in capacity to interpret words if the composer had leisure or desire to do

so; since, after all, poetic rhythm in its highest forms has a subtle freedom which renders mechanical musical translation worse than useless, while the rhythmic swing of the lighter forms of poetry was soon discovered by the composers of the ” Golden Age ” to be practically identical with the refined dance-rhythm which they in their lighter moments idealized from folk-music. 1

By the middle of the 15th century polyphony attained such independence that the only rhythms which would hold the flow of independent melodious voices together were those in which a steadily duple or steadily triple rhythm (either of which might be subdivided by the other or by itself) could be felt as an absolutely regular musical tread. Such a rhythm is capable of expressing every poetic foot, either by the differ- ence of stress between notes or by a difference in their length. Moreover, emphasis may be obtained by the pitch of the note, or, again, by its harmonic significance. All these forms of emphasis combine and counteract each other in an infinite variety, till the sense of musical movement becomes as remote from crude dance-rhythm as it is from poetic metre. But though the part thus played by accent was already of para- mount importance in the ” Golden Age ” of music, it was not allowed to become evident to the ear except in the lighter and more coarse-grained art-forms. Its highest purpose was served as soon as the listener was able to lose all crude rhythmic impulses in a secure feeling that the mass of polyphonic harmony was held together by a general grouping of the rhythmic beats in fours or threes; and individual parts were at least as free to indulge in other rhythms across the main rhythm as they are in the most complex modern music, so long as the harmony was held together by the average grouping, or ” time,” as we now call it. Hence the rhythmic variety of 16th-century

1 It would be interesting and fruitful to consider how far the growing preference, in modern European languages, of accent to quantity, may not only have modified the conception of musical rhythm, but may itself have been enhanced by the rhythmic tend- encies of popular song, which had so great an influence on the learned music of the middle ages. And it can hardly be said that the subject of musical rhythm has yet been so clearly treated on these lines as to shed the light it seems capable of shedding upon many vexed questions in poetic rhythm.

music is exactly like the harmonic variety, and the limitations and waywardness of the one are no more archaic than those of the other.

When the resources of later music and the treatment of instruments necessitated the publishing of music in score as well as in separate parts, it became necessary to guide the eye by drawing vertical lines (" bars ") at convenient distances. Hence the term " score " (Ger. Partitur, Fr. partition). These divisions naturally coincided with the main rhythmic groups, and eventually became equidistant. This purely practical custom has co-operated with the great increase of rhythmic firmness necessary for the coherence of those large modern forms which decree the shape rather than the texture of the music, until our notions of rhythm may fairly be described as bar-ridden. And, since the vast majority of our musical rhythms absorb the utmost complexity of detail into the most square and symmetrical framework possible, we are taught to regard the " 4-bar period " as a normal (or even ultimate) rhythmic principle, instead of contenting ourselves with broader conceptions which treat symmetry and proportion in time as freely as they are treated in space. It cannot be too strongly emphasized that the bar indicates no universal musical principle. The havoc wrought by mechanical teaching on this point is incalculable, especially in the childish crudeness of current ideas as to the declamation of words in classical and modern music: ideas which mislead even some composers who might have been expected to know better.

As rhythm is contemplated in larger measures, it becomes increasingly difficult to say where the sense of rhythm ends and the sense of proportion begins. The same melody that may be felt as a square and symmetrical piece of proportion in four-bar rhythm if it is taken slowly, will be equally rational as a single bar of " common time " (see below) if it is taken very quickly; and between these two extremes there may be insensible gradations. All that can be laid down is that com- posers are apt to use short bars where they demand constant strong accent, while long bars will imply smoother rhythms. For example, if the scherzo of Beethoven's Ninth Symphony were written in x t instead of J bars, then the passages now marked Ritmo di tre battute would have to appear in I time, and so the changes of rhythm would be much more visible on paper. But the tendency to put a strong accent on the first beat of every bar would make this notation an undesirable substitute for Beethoven's, since it would lead to a neglect of the sub- ordinate accents (all of them bar-accents, as Beethoven writes them). The trio of this scherzo shows the opposite case in the fact that Beethoven first intended to write it in f time, but, in order to indicate a more tranquil flow at the same pace, doubled

the quantity contained in a bar, substituting alia breve bars, each equal to two of the preceding I bars. The alteration produced a discrepancy in the metronome marks, which has always caused controversy among conductors, but the facts admit of only one interpretation. It is clear, then, that the only sound theory of musical rhythm will be that in which accent, beat, bar, and even form and proportion are relative terms.

The kinds of time (i.e. rhythmic groups forming, as it were, invariable molecules in the structure of any continuous piece of music) that are used in all music from the 15th century onwards are nowadays classified as duple and triple, and each of these may be simple or compound. Simple time is that in which the normal subdivision of its beats is by two, whether the number of the beats themselves is duple or triple. Compound time is that in which the beats are regularly divided by three, which three subdivisions are reckoned as subordinate beats. The beats are in all kinds of time reckoned as halves, quarters, 8ths, i6ths or even 32nds of the standard note in modern music, the semibreve: and the time- signature placed at the beginning of a piece of music is really a fraction, of which the numerator expresses the number of beats in a bar, while the denominator expresses the size of a beat. Thus J signifies three crotchets in a bar. Compound time is expressed, not by using normal fractions of a semibreve as main beats and dividing them into triplets, 1 but by using dotted beats. A dot after

1 Triplets are groups of three equal notes crowded into the time normally taken by two. Binary and ternary subdivision answer

a note adds another half to its value, and so not only do ‘we obtain the means of expressing a great variety of rhythmic effects (especi- ally quantitative effects of iambic and trochaic character) in all kinds of time, but we are able to use normal fractions of a semi- breve as the subordinate beats of compound time. Thus ” is the compound time obtained by dotting the two crotchets of J time, and is thus totally different in accent and meaning from J time though that also contains six quavers in a bar. The most highly compound times in classical music are to be found in the last move- ment of Beethoven’s Sonata, Op. ill. He begins by dividing bars of I into their usual compound time 1®. He then divides the six half-beats of £ time by three, producing H (which he in- correctly calls jg), and lastly he divides the 12 quarter-beats by 3, producing H (which he calls H). The special signatures C for 4 time, and C for 2 time are the last survivals of the time system of the middle ages (see Musical Notation). That complicated system of mood, time and prolation was capable of expressing even more highly

compound rhythms than our usual time-signatures, though the complexity was in most cases unreal, since the small rhythmic ictus of ecclesiastical polyphony renders little but the general distinction between duple and triple rhythm audible: especially as the more compound rhythms were not subdivisions but multiples, involving lengths better measurable by an eight-day clock than by human ears. The second Kyrie of Palestrina's Missa L' Homme Arm6 is one of the rare cases which remain both rhythmic and complex when transcribed in modern score. 2 For genuine articulate complexity the ballroom scene in Mozart's Don Giovanni has never been surpassed. So real are its three simultaneous rhythms of minuet, contredanse and waltz that the persons on the stage actually dance to whichever suits their character. Anomalous measures such as J and I time, whether divisible into alternations of ! and f or not, are aesthetically best regarded not as rhythmic units, but as extreme cases of unsym- metrical phrase-rhythm erected into a system for special effect. They tend, however, to group themselves into musical sentences of reactionary squareness; and the J movement of Tschaikovsky's Pathetic Symphony consists of twenty 8-bar periods (twenty-four, counting the repeats) before an unpaired 4-bar phrase is heard in the short coda. Even the last bar is not odd, though it is the 179th, for the rhythm ends with an unwritten 180th bar of silence.

There is, no doubt, a germ of truth in current doctrine as to the fundamental character of 4-bar phrase-rhythms, inasmuch as the human anatomy has a bilateral symmetry with either limb on one side slightly stronger than that on the other. This is probably the basis of our natural tendency to group rhythmic units in pairs, with a stress on the first of each pair; and hence, if our attention is drawn to larger groups, we put more stress on the first of the first pair than on the first of the second; and so with still greater groups, until our immediate and un- analysed sense of rhythm merges into a sense of proportion distributed through time with a clear consciousness of past, present and future. The point at which this merging takes

every ordinary purpose of musical rhythm, being capable of expressing clear distinctions far more minute than have ever been regulated in speech. It is impossible to pronounce a syllable in less than a tenth of a second; but it is easy to play 16 notes in a second on the pianoforte. (That is to say, musical rhythm continues to be measurable up to the point at which atmospheric vibrations coalesce in the ear as low musical notes !) In a series of such rapid notes a single break twice in a second would have a very obvious rhythmic effect directly measured by the ear. If the broken series were levelled into an even series of fourteen notes a second, the rhythmic effect would be

entirely different, though the actual difference of pace would be only ˆ of a second. The special sign for triplets is readily adapted to other subdivisions where necessary; but such adaptation generally indicates rather a freedom of declamatory rhythm than any abstruse arithmetical accuracy. Among the worst barbarisms in musical editing is the persistent reduction of Chopin's septoles, groups of 13 and other indeterminables, into mutton-cutlet frills. A natural freedom in performance is as necessary for the minutiae of musical rhythm as it is in speech; but where all but the finest players fail is in basing this freedom on the superlative accuracy of the rhythmic notation of the great composers.

2 In the critical edition of Palestrina's complete works, vol. xii. p. 177 (Breitkopf and Hartel), the editor has violently simplified it. He is justified in using the ordinary <£ bars to hold the piece together, and he is not called upon to reproduce the riddles of the original notation; but some secondary time signatures ought to have been added to indicate the strong swing of the tune in its conflicting shapes; and there is no justification, in a full score intended for scholars, in supplanting the true rhythm of the quintus by a rough practical compromise.

place depends on the extent to which these larger groups can dominate the details of the rhythm, and this again depends on the listener's capacity for grasping large and slow rhythms. In any case, the only " ultimate " rhythmic element is the tendency to mark off rhythmic beats into pairs, with a stress on the first of each pair. Where this tendency is resisted, the mind will follow the line of least resistance, which will vary according to the pace and detail of the music. Thus in rapid triple time it is easier to seek duple rhythm in the grouping of bars than in the details within the bars; but if the groups of bars are also triple, or irregular, the mind will fix on the first recurring salient feature for a secondary beat, regardless of inequality in length; rather than, so to speak, hop on one leg indefinitely. On this principle there is a distinct tendency in moderate and slow triple times to throw a secondary accent on the third beat; or sometimes on the second, as in the spring- ing step of the mazurka, where the spring gives energy to the first beat and the descent from it gives poise to the second.

The tendency of small rhythmic groups to build themselves into large

and square ones, such as 8-bar, 16-bar and even 32-bar periods, is doubtless important; but the converse tendency of large phrase-rhythms to break up in a tapering series is far more significant, since even in its most regular forms it not only produces more variety the further it goes, but always increases in obvious effect, until the subdivisions attain the minuteness (and therewith the expression) of speech rhythms. (A crude example of the device is Diabelli's waltz, on which Beethoven wrote his gigantic 33 variations. See Variations, where the point is illustrated by a diagram.) Regularly expanding rhythm, on the other hand, not only becomes imperceptible as it is carried further, but tends merely to make musical proportions resemble those of a chess-board. In great music the expanding principle is therefore always contrasted with or modified by the tapering principle, which can indeed exist simultaneously with it and with any other. For, to take only three categories, the harmonic changes of a passage may be designed in tapering rhythm while the melodic phrases expand, and the entries of instruments or parts occur on some third principle, regular or irregular. Such interplay need produce no feeling of complexity; indeed, it is an art most neglected by those composers who most rely on the effect of complex rhythm. It is the main discoverable source of that almost dramatic sense of movement thai distinguishes the great musical styles from the academic methods which play for safety, and from the anti-academic novelties which end in monotony.

Square rhythms become desirable at climaxes where physical energy dominates thought. Strong final cadences accordingly require that the last chord should fall on an accent; and if the pace is rapid the final chord will probably be not only on an accented beat but on an accented bar. Thus it is quite obvious that there is by a mere oversight one bar too many in the four bars of tremolo quavers at the end of the first movement of Beethoven's Fourth Symphony; for they are followed by an important bar leading to the last three chords, which chords can only mean (counting bars as beats) — " One, two, Three " (" four " being silent and therefore unwritten). A fifth bar of tremolo would correct the rhythm in a more vigorous but more vulgar way by bringing the last chord onto " One " of the next imaginary group of four. The former correction is so obviously right that the imagination makes it in spite of the presence of the superfluous bar, which is instinctively ignored as an accidental prolongation of the tremolo. Where the composer writes in bars so short as to be permanently less than the phrases of the piece (as in Beethoven's scherzos), or in bars that are frequently longer than the phrases (as in most of Mozart's movements in slow or moderate common time) , it sometimes

becomes impossible to construe the music without carefully calculating where the accents come; and this calculation is most easily made on the assumption that the strongest cadences bring the tonic chord on an accent. Thus, in Beethoven's Sonata in E flat, Op. 27, No. 1, the first, bar of the second movement must be preliminary

and the first accent must come on the second bar, since the piece refuses to make sense in any other way. Indeed, Beethoven has written some notes twice over in order to bring his double- bars and repeat-marks where they will indicate the true rhythmic joints to the eye. (A double-bar is a mere graphic indication of some important sectional division, not necessarily rhythmic or even coincident with a normal bar-stroke.)

Theorists, however, have developed a tendency to assume that all cadences must be strong. More than one critic has told us that the scherzo of Beethoven's Sonata, Op. 28, is in the same predicament as that of Op. 27, N6. 1; though it not only makes excellent sense with its cadences in the light and weak form in which they appear, but, when reconstrued on the " strong cadence " theory, entirely fails in its middle portion to uphold that theory or to make any other rhythmic sense. And when Professor Prout tells us that the overture to Figaro begins with a silent bar, and that Schubert's Impromptu in B flat is positively ungrammatical in its cadences unless it is entirely rebarred, and when Dr Riemann turns half the ritornello of a Bach con- certo from f into f time, simply in order to make the sequences coincide with the hardest possible accents; then we can only protest that this is regulating musical aesthetics by criteria too crude for the aesthetics of bricklaying. An edition of Paradise Lost, in which the lines were so rearranged as to bring all punctua- tion marks (except perhaps commas) at the end of the line, would be on precisely the same level of ingenious barbarity.

Few technical terms are entirely peculiar to the subject of musical rhythm; but some obvious terms of syntax, such as phrase, period said section are used with varying degrees of system by all writers on music; and the whole terminology of prosody has been annexed — with such success that we are told in Grove's Dictionary (article " Metre ") that " the theme of Weber's Rondo brillante in E flat (Op. 62) is in Anapaestic Tetrameter Brachycatalectic, very rigidly maintained."

One important term has acquired a special significance in music: viz. Syncopation. It means a cross-accent of such strength as to equal or even suppress the main accent; but the use of the term is generally

restricted to cases in which the cross- accent is produced by shifting the notes of a melody or a formula so that they fall between the beats instead of upon them. From what we have said as to the almost physical energy of musical rhythm it is obvious that such a phenomenon is of far greater effect and importance in music than it could possibly be in verse; and, to whichever subject the term may belong by priority, extreme caution is needed in extending any musical notion of it to the Structure of poetry. (D. F. T.)

RHYTINA, a name applied to the northern sea-cow (Rhylina gigas, or stelleri), a gigantic relative of the manati and dugong, which formerly inhabited Bering and Copper Islands, in the North Pacific, where it was discovered during Bering's voyage in 1 74 1, and subsequently described by Steller, who accompanied that expedition as a naturalist. Bering's half-starved sailors soon reduced the numbers of these comparatively helpless creatures; and it was not long after — probably about the year 1768 — that the species, which was the sole representative of its genus, became completely exterminated. The Rhytina was the largest member of the order Sirenia, attaining a length of nearly twenty feet; and had a very thick, rugged, bark-like skin. The jaws, which are bent downwards to a moderate extent, are unprovided with teeth, but in life carried ridged horny plates. The tail Was very deeply forked; and the flippers were short and truncated, lacking apparently the terminal joints of the digits.

When first discovered, this Sirenian was extremely numerous in the bays of Bering Island, where it browsed upon the abundant sea-tangle. Its extirpation is due to the Russian sailors and traders who visited the island in pursuit of seals and sea-otters, and who subsisted on its flesh. Numbers of bones have been discovered in the soil of Bering and Copper Islands, from which more or less nearly perfect skeletons have been reconstructed, so that the osteology of this interesting animal is well represented in most of the larger museums. (R. L.*)

RIANSARES, AUGUSTIN FERNANDEZ MUflOZ, Duke of (1808 or 1810-1873), morganatic husband of Maria Christina, queen and regent of Spain, was born at Tarancon, in the province of Cuenca, in New Castile. His father was the keeper of an " estanco " or office for the sale of the tobacco of the govern- ment monopoly. He enlisted in the bodyguard, and attracted the attention of the queen. According to one account, he distinguished himself by stopping the runaway horses of

her carriage; according to another, he only picked up her hand-kerchief; a third and scandalous explanation of his fortune has been given. It is certain that the queen married him privately, very soon after the death of her husband on the 29th of September 1833. By publishing her marriage, Maria Christina would have forfeited the regency; but her relations with Mufioz were perfectly well known. When on the 13th of August 1836 the soldiers on duty at the summer palace, La Granja, mutinied and forced the regent to grant a constitution, it was generally, though wrongly, believed that they over- came her reluctance by seizing Mufioz, whom they called her " guapo," or fancy man, and threatening to shoot him. When in 1840 the queen found her position intolerable and fled the country, Mufioz went with her and the marriage was published, and on the overthrow of Espartero in 1843 the couple returned. In 1844 Queen Isabella II., who was now declared to be of age, gave her consent to her mother's marriage, which was publicly performed. Mufioz was created duke of Riansares and made a knight of the Golden Fleece. By Louis Philippe, king of the French, he was created duke of Mont-Morot and Grand Cross of the Legion of Honour. Until his wife was finally driven- from Spain by the revolutionary movement of 1854, the duke is credibly reported to have applied himself to making a large fortune out of railway concessions and by judicious stock exchange speculations. Political ambi- tions he had none, and it is said that he declined the offer of the crown of Ecuador. All authorities agree that he was not only good-looking, but kindly and well-bred. He died five years before his wife at L'Adresse, near Havre, on the nth of September 1873. Several children were born of the marriage.

RIAZ PASHA (c. 1835-), Egyptian statesman; born about 1835, was of a Circassian family, but said to be of Hebrew extraction. Little is known of his early life save that until the accession of Ismail Pasha to the vice-royalty of Egypt in 1863 he occupied a humble position. Ismail, recognizing in this obscure individual a capacity for hard work and a strong will, made him one of his ministers, to find, to his chagrin, that Riaz was also an honest man possessed of a remarkable independence of character. When Ismail's financial straits compelled him to agree to a commission of inquiry Riaz was the only Egyptian of known honesty sufficiently intelligent and patriotic to be named as a vice-president of the com- mission. He filled this office with distinction, but not to the liking of Ismail. The khedive, however, felt compelled, when as a sop to his European creditors he assumed the position of a constitutional monarch, to nominate Riaz as a member of the first Egyptian cabinet. For the few months this government lasted (September 1878 to April 1879) Riaz was minister of the interior.

When Ismail dismissed the cabinet and attempted to resume autocratic fule, Riaz had to flee the country. Upon the deposition of Ismail, June 1879, Riaz was sent for by the British and French controllers, and he formed the first ministry under the khedive Tewfik. His administration, marked by much ability, lasted only two years, and was overthrown by the agitation which had for figure-head Arabi Pasha (

that event Riaz, subordinating his vanity to his patriotism, accepted office as minister of the interior under Sherif Pasha (q.v.). Had Riaz had his way Arabi and his associates would have been executed forthwith, and when the British insisted that clemency should be extended to the leaders of the revolt Riaz refused to remain in office, resigning in December 1882. He took no further part in public affairs until 1888, when, on the dismissal of Nubar Pasha (q.v.), he was summoned to form' a government. He now understood that the only policy possible for an Egyptian statesman was to work in harmony with the British agent (Sir Evelyn Baring—afterwards Lord Cromer); This he succeeded in doing to a large extent, wit- nessing if not initiating the practical abolition of the corvie and many'other reforms.' The appointment of an Anglo-Indian official as judicial adviser to the khedive was, however, opposed by Riaz, who resigned in May 1891. In the February followˆ ing he again became prime minister under Abbas II., being selected as comparatively acceptable both to the khedivial and British parties. In April 1894 Riaz finally resigned office on account of ill-health. Superior, probably, both intellectually and' morally to his great rival Nubar, he lacked the latter's broad statesmanship as well as his pliability. Riaz's stand-point was that' of the benevolent autocrat; he believed that the "Egyptians were not fitted for self-government and must be treated like children, protected f roni ill-treatment by others and prevented from injuring themselves. In 1889 he was made an honorary G.C.M.G. A worthy tribute to Riaz was paid by Lord Cromer in his farewell speech at Cairo on- the 4th of May 1907. "Little or no courage is now re- quired," said Lord Cromer, " on the part of a young Egyptian who poses as a reformer, but it was not always so. Ismail Pasha had some very drastic methods of dealing with those who did not bow before him. Nevertheless, some thirty years ago Riaz Pasha stood forth boldly to protest against the mal- administration that then prevailed in Egypt. He was not afraid to bell the cat."

RIB (from O. Eng. ribb; the word appears in many Teutonic languages, cf. Gcr. Rippe, Swed. reb), in anatomy, the primary meaning,. one of the series of elastic arched bones (costae) which form the casing or framework of the thorax (see Skeleton: Axial). The word is in meaning

transferred to many objects resembling a rib in shape or function. In architecture, it is thus used of the arches of stone which in medieval work constitute the skeleton of the vault, and carry the shell or web. Although in the Roman vault the rib played an important element in its construction, it was generally hidden in the thickness of the vault and was made subservient to its geometrical surfaces. The Gothic masons, on the other hand, reversed the process, and not only made the vaulting surface subservient to the rib, but by mouldings rendered the latter a highly decorative feature. The principal ribs are the transverse (arc doubleau), the diagonal (arc ogive) and the wall rib (formeret). Those of less importance are the intermediate, the ridge and lierne ribs. The ridge-rib is one first introduced into the vault to resist the thrust of the intermediate ribs between the wall and diagonal ribs; it also served to mark the junction of the filling-in or web of vaults in those cases where the courses dipped toward the diagonal rib. (See Vault.) A lierne rib (the term is borrowed from the French) is a short rib, introduced into the vaulting in the Early Perpendicular period, which coupled together the transverse and intermediate ribs; in the later period the ” lierne ” rib becomes one of the chief features of the ” Stella ” vault (see further Vault).

RIBADENEIRA, PEDRO A. (1527-1611), hagiologist, was born at Toledo on the 1st of November 1527. As a lad he repaired to Rome for study, and there on the i8th,of September 1540 was admitted by Ignatius Loyola, in his thirteenth year, as one of the Society of Jesus, which had not yet re- ceived papal sanction. He pursued his studies at Paris (1542) in philosophy and theology. Loyola, in 155s, sent him on a mission to Belgium; in pursuance of it he visited England in

1558. A later result of his visit was his Historia Acclesiastica del scisma del Reyno de Inglalerra (1588-1594), often reprinted, and used in later editions of N. Sander’s De Origine et Pro- gressu Schismatis Anglicani. In 1560 he was made Provincial of the Society of Jesus in Tuscany, thence transferred as Pro- vincial to Sicily in 1563, again employed in Flanders, and from 1571 in Spain. In 1574 he settled in Madrid, where he died on the 10th of September 1611. His most important work is the Life of Loyola (1572), which he was the first to write. In his first edition of the Life, as also in the second enlarged issue (1587), Ribadeneira affirmed that Loyola had wrought no miracle, except the foundation of his Society (thus making his claim parallel with that of Mahomet, whose only miracle, originally, was the

Koran). In the process for the canonization of Loyola, a narrative published by Riba- deneira in 1609 exhibited miracles; and these are recorded in an abridgment of the Life by Ribadeneira (published post-humously in 161 2) with a statement by Ribadeneira that he had known of them in 1572 but was not then satisfied of their proof. For this change of opinion he is taken to task by Bayle. That Ribadeneira was, though an able, a very credulous writer, is shown by his lives of the successors of Loyola in the general- ship of the Society, Lainez and Borgia; and especially by his Flos Sanctorum (1599-1610), a collection of saints' lives, entirely superseded by the labours of the Bollandists. His other works are numerous but of little moment, including his Tratado de la religion (1595), intended as a refutation of Machiavelli's Prince.

See his autobiography in his Bibliotheca Scriptorum Societatis Jesu (1602 and 1608, supplemented by P.Alegambe and N.Sotwell in 1676); N. Antonio, Biotheca Hispana Nova (1788) ; Biographic Universelle (Michaud) (1842-1865). (A. Go.*)

RIBALD, a word now only used in the sense of jeering, irreverent, abusive, particularly applied to the uses of low, offensive or mocking jests. It has an interesting early history, of which Du Cange (Gloss, s.v. Ribaldi) gives a full account. It is one of those words, like the Greek rvpavvos, an uncon- stitutional ruler, and the Latin latro, a hired soldier, mercenary, later robber, which have acquired a degraded and evil sig- nificance. The ribaldi were light-armed soldiers, on whom fell the duty of being first in attack, the enfans perdus or " for- lorn hope " of the armies of the French kings; thus Rigordus, in his contemporary history of the reign of Philip Augustus, for the year 1189, speaks of the Ribaldi . . . qui primos im- petus in expuguandis munitionibus facere consueverunt. Later we find the ribaldi among the rabble of camp-followers of an army, and Giovanni Villani, in his 16th-century Chronicle (n, 139), speaks of ribaldi et i raguazzi del hoste, and Froissart of the ribaux as the lowest ranks in an army. Ribaldus (ribaut) was thus a common name for everything ruffianly and aban- doned, and Matthew Paris (Ann. 1251) says: Fures, exules, fugitivi, excommunicati, quos omnes Ribaldos Francia vulgariter consuevit appellare. The name (ribaldae or ribaldi) was particu- larly applied to prostitutes, brothel-keepers and all who fre- quent haunts of vice, and there was at the French court from the 1 2th century an official, known as Rex Ribaldorum, king of the ribalds, changed in the reign of Charles VI. to Prae- Posilus Hospitii Regis, whose duty was to investigate and hold judicial inquiry into all crimes committed within the precincts of the court, and control vagrants, prostitutes, brothels and gambling-houses. The etymology of the word has been much

discussed, and no certainty can be arrived at. The termination — aid — points to a Teutonic origin, and connexion has been suggested with O.H.Ger. Hripd, M.H.Ger. Ribe, prostitute, with Ger. reiben, rub, or with rauben, rob. Neither Skeat nor the New English Dictionary find any relation to, the English ” bawd,” procuress, pander.

RIBAULT (or Ribaut), JEAN (c. 1520-1565), French navigator, famous for his connexion with the early settlement of Florida, was born at Dieppe, probably about 1 520. Appointed by Admiral Coligny to the command of an expedition to prepare an asylum for French Protestants in America, Ribault sailed

on the 1 8th of February 1562, with two vessels, and on the 1st of May landed in Florida at St John’s river, or, as he called it, Riviere de Mai. Having settled his colonists at Port Royal Harbour (now Paris Island, South Carolina), and built Fort Charles for their protection, he returned to France to find the country in the throes of the Civil War. In 1563 he appears to have been in England and to have issued True and Last Discoverie of Florida (Hakluyt Soc, vol. vii.). In April 1564 Coligny was in a position to despatch another expedition under Rene de Laudonniere, but meanwhile Ribault’s colony had come to an untimely end — the unfortunate adventurers, destitute of sup- plies from home, having revolted against their governor and attempted to make their way back to Europe in a boat which was happily picked up, when they were in the last extremities, by an English vessel. In 1565 Ribault was again sent out to satisfy Coligny as to Laudonniere’s management of his new settlement, Fort Caroline, on the Riviere de Mai. While he was still there the Spaniards, under Menendez de Aviles, though their country was at peace with France, attacked the French ships at the mouth of the river. Ribault set out to retaliate on the Spanish fleet, but his vessels were wrecked by a storm near Matanzas Inlet and he had to attempt to return to Fort Caroline by land. The fort had by this time fallen into the hands of the Spaniards, who had slaughtered all the colonists except a few who got off with two ships under Ribault’s son. Induced to surrender by false assurances of safeguard, Ribault and his men were also put to the sword in October 1565. The massacre was avenged in , kind by Dominique de Gourgues (d. 1583) two years laten

See E. and E. Haag, La France prolestante (1846-1859) ; and F. Parkman, Pioneers of France in the New World (new ed., 1899).

RIBBECK, JOHANN CARL OTTO (1827-1898), German classical scholar, was born at Erfurt in Saxony on the 23rd of July 1827. Having held professorial appointments at Kiel and Heidelberg, he

succeeded his tutor Ritschl in the chair of classical philology at Leipzig, where he died on the 18th of July 1898. Ribbeck was the author of several standard works on the poets and poetry of Rome, the most important of which are the following: Geschichte der romischen Dichtung (2nd ed., 1894-1900); Die romische Tragodie im Zeitalter der Republik (1875); Scaenicae Romanorum Poesis Fragmenta, including the tragic and comic fragments (3rd ed., 1897). As a textual critic he was distinguished by considerable rashness, and never hesitated to alter, rearrange or reject as spurious what failed to reach his standard of excellence. These tendencies are strikingly shown in his editions of the Epistles and Ars Poetica of Horace (1869), the Satires of Juvenal (1859) and in the supplementary essay Der echte und unechte Juvenal (1865). In later years, however, he became much more conservative. His edition of Virgil (2nd ed., 1894-1895), although only critical, is a work of great erudition, especially the Prolegomena. His biography of Ritschl (1879-1881) is one of the best works of its kind. The influence of his tutor may be seen in Ribbeck's critical edition of the Miles Gloriosus of Plautus, and Beilrage zur Lehre von den lateinischen Partikeln, a work of much promise, which causes regret that he did not publish further results of his studies in that direction. His miscellaneous Reden und Vortrage were published after his death (Leipzig, 1899). He took great interest in the monumental Thesaurus Linguae Latinae, and it was chiefly owing to his efforts that the government of Saxony was induced to assist its production by a considerable subsidy.

The chief authority for his life is Otto Ribbeck; ein Bild seines Lebens aus seinen Briefen (1901), ed. by Emma Ribbeck.

RIBBON-FISHES (Trachypteridae) , a family of marine fishes readily recognized by their long, compressed, tape-like body, short head, narrow mouth and feeble dentition. A high dorsal fin occupies the whole length of the back; an anal is absent, and the caudal, if present, consists of two fascicles of rays of which the upper is prolonged and directed upwards. The pectoral fins are small, the ventrals composed of several rays, or of one long ray only. Ribbon-fishes possess all the characteristics of fishes living at very great depths. They are

extremely fragile when found floating on the surface or thrown ashore, and rarely in an uninjured condition; the rays of their

Fig. 1. — Trachypterus taenia.

fins especially, and the membrane connecting them, are of a very delicate and brittle structure. In young ribbon-fishes some of the fin-rays are prolonged in an extraordinary degree, and sometimes provided with appendages (see fig. 2). There

Fig. 2. — Young Trachypterus.

are only two genera in the family, Regalecus, the oar-fish, and Trachypterus. In the former the length of the body is about fifteen times its depth. The head likewise is compressed, short, resembling in its form that of a herring; the eye is large; the mouth is small, and provided with very feeble teeth. A long many-rayed dorsal fin, of which the very long anterior rays form a kind of high crest, extends from the top of the head to the end of the tail; the anal and perhaps the caudal fins are absent; but the ventrals (and by this the oar-fish is distinguished from the other ribbon-fishes) are developed into a pair of long filaments, which terminate in a paddle-shaped extremity, but are too flexible to assist in locomotion. The whole body is covered with a layer of silvery epidermoid sub- stance, which easily comes off and adheres to other objects.

Oar-fish.

Oar-fishes are the largest deep-sea fishes known, the majority of the specimens observed measuring 12 ft. in length; but some are recorded to have exceeded 20 ft. Their range in the great depths of the ocean seems to extend over all seas, but, however numerous they may be in the depths which are their home, it is only by rare accident that specimens reach the surface. Thus from the coasts of Great Britain only about twenty captures are known in the long space of a century and a half, and not more than thirteen from those of Norway. Oar-fishes have been considered by naturalists to have

given rise to some of the tales of ” sea-serpents,” but their size as well as the facility with which they are secured when observed render this solution of the question of the existence of such a creature im-probable. When they rise to the surface of the water they are either dead or in a helpless and dying condition. The ligaments and tissues by which the bones and muscles were held together whilst the fish lived under the immense pressure of great depths have then become loosened and torn by the expansion of the internal gases; and it is only with difficulty that the specimens can be taken entire out of the water, and preserved afterwards. Every specimen found has been more or less

mutilated; and especially the terminal portion of the tail, which seems to end in a delicate tapering filament, has never been perfect; — it is perhaps usually lost as a useless appendage at a much earlier period of the life of the fish. Of Trachypterus, specimens have been taken in the Atlantic, the Mediterranean, at Mauritius and in the Pacific. The species from the Atlantic has occurred chiefly on the northern coasts, Iceland, Scandinavia, Orkneys and Scotland. It is known as T. arcticus, in English the deal-fish; its Icelandic name is Vagmaer. Its length is 5 to 8 ft. Specimens seem usually to be driven to the shore by gales in winter, and are sometimes left by the tide. S. Nilsson, however, in Scandinavia observed a living specimen in two or three fathoms of water moving something like a flat-fish with one side turned obliquely upwards.

RIBBONISM, the name given to an Irish secret-society movement, which began at the end of the 18th century in opposition to the Orangemen (q.v.), and which was represented by various associations under different names, organized in lodges, and recruited all over Ireland from the lowest classes of the people. The actual name of Ribbonism (from a green badge worn by its members) became attached to the movement later, about 1826; and, after it had grown to its height about 1855, it declined in force, and was practically at an end in its old form when in 1871 the Westmeath Act declared Ribbonism illegal. See also under Ireland: History.

RIBBONS. By this name are designated narrow webs, properly of silk, not exceeding nine inches in width, used primarily for binding and tying in connexion with dress, but also now applied for innumerable useful, ornamental and symbolical purposes. Along with that of tapes, fringes and other small- wares, the manufacture of ribbons forms a special department of the textile industries. The essential feature of a ribbon loom is the simultaneous weaving in one loom frame of two or more webs, going up to as many as forty narrow fabrics in modern looms. To effect the conjoined throwing of all the shuttles and the various other movements of the loom, the automatic action of the power-loom is necessary; and it is a remarkable fact that the self-acting ribbon loom was known and extensively used more than a century before the famous invention of Cartwright. A loom in which several narrow webs could be woven at one time is mentioned as having been working in Dantzig towards the end of the 16th century. Similar looms were at work in Leiden in 1620, where their use gave rise to so much discontent and rioting on the part of the weavers that the states-general had to prohibit their use. The prohibition was renewed at various intervals throughout the century, and in the same interval the use of the ribbon loom was interdicted in most of the

principal industrial centres of Europe. About 1676, under the name of the Dutch loom or engine loom, it was brought to London; and, although its introduction there caused some disturbance, it does not appear to have been pro- hibited. In 1745, John Kay, the inventor of the fly-shuttle, obtained, conjointly with Joseph Stell, a patent for improvements in the ribbon loom; and since that period it has benefited by the inventions applied to weaving machinery generally.

Ribbon-weaving is known to have been established near St Etienne (dep. Loire) so early as the nth century, and that town has remained the headquarters of the industry. During the Huguenot troubles, ribbon-weavers from St Etienne settled at Basel and there established an industry which in modern times has rivalled that of the original seat of the trade. Crefeld is the centre of the German ribbon industry, the manufacture of black velvet ribbon being there a specialty. In England Coventry is the most important seat of ribbon-making, which is also prose- cuted at Norwich and Leicester.

RIBEIRA, a town of north-western Spain, in the province of Corunna, on the extreme south-west of the peninsula formed between the river of Muros y Noya and Arosa Bay. Pop. (1900) 12,218. Ribeira is in a hilly country, abounding in wheat, wine, fruit, fish and game. Its port is Santa Eugenia de Ribeira, on Arosa Bay. The population is chiefly occupied in agriculture, cattle-breeding and fisheries.

RIBEIRO, BBRNARDIM (1482-1552), the father of bucolic prose and verse in Portugal, was a native of Torrao in the Alemtejo. His father, Damiao Ribeiro, was implicated in the conspiracy against King John II. in 1484, and had to flee to Castile, whereupon young Bernardim and his mother took refuge with their relations Antonio Zagalo and D. Ignez Zagalo at the Quinta dos Lobos, near Cintra. When King Manoel came to the throne in 1495, he rehabilitated the families persecuted by his predecessor, and Ribeiro was able to leave his retreat and return to Torrao. Meanwhile D. Ignez had married a rich landowner of Estremoz, and in 1503 she was summoned to court and appointed one of the attendants to the Infanta D. Beatriz. Ribeiro' accompanied her, and through her influence the king took him under his protection and sent him to the university of Lisbon, where he studied from 1506 to 15 12. When he obtained his degree in law, the king showed him further favour by appointing him to the post of Escrivao da Camarat or secretary, and later by bestowing on him the habit of the military

order by Sao Thiago. Ribeiro's poetic career commenced with his coming to court, and his early verses are to be found in the Cancioneiro Geral of Garcia de Resende (q.v.). He took part in the historic Seroes do Paqo, or palace evening entertainments, which largely consisted of poetical improvisations; there he met and earned the friendship of the poets Si de Miranda (q.v.) and Christovao Falcao (q.v.), who became his literary comrades and the confidants of his romance, in which hope deferred and bitter disappointment ended in tragedy. Ribeiro had early conceived a violent passion for his cousin, D. Joanna Zagalo, the daughter of his protectress, D. Ignez; but, though she seems to have returned it, her family opposed her marriage to a singer and dreamer with small means and prospects, and finally compelled her to wed a rich man, one Pero Gate When the latter met a violent death shortly afterwards, D. Joanna retired to a house in the country, and it is alleged that Ribeiro visited her, and that their ampur resulted in the birth of a child. All we know positively, however, is that in 1521 the lady went into seclusion in the convent of St Clare at Estremoz, where she fell a victim to a violent form of insanity, and that she died there some years later. It is further alleged that Ribeiro's conduct had caused a scandal which led the king to deprive him of his office and exile him. IJut the loss of position and income can have added very little to the poignant grief of such a true lover and profound idealist as Bernardim Ribeiro. He had poured out his heart in five beautiful eclogues, the earliest in Portuguese, written in the popular octosyllabic verse; and now, hopeless of the future and broken in spirit, he decided to go to Italy, for a poet the land of promise. He started early in 1522, and travelled widely in the peninsula, and during his stay he wrote his moving knightly and pastoral romance Menina e Moqg, in which he related the story of his unfortunate passion, personifying himself under the anagram of " Bimnarder," and D. Ignez under that of " Aonia." When he returned home in 1524, the new king, John III., restored, him to his former post, and it is said that he paid a last visit to his love at St Clare's convent and found her in a fit of raving madness. This no doubt preyed on a mind already unhinged by trouble, and hastened the decline of his mental powers, which had already commenced. About 1534 a long illness supervened, and the years that elapsed between that year and his death may be described as the night of his soul. He was quite unable to fulfil the duties of his office, and in 1 549 the king bestowed upon him a pension for his support; but he did not live long to enjoy it, for in 1552 he died insane in All Saints Hospital in Lisbon.

The Menina e MoQa was not printed until after Ribeiro's death, and then first in Ferrara in 1554. On its appearance

the book made such a sensation that its reading was forbidden, because, though it contained nothing heterodox, it disclosed a family tragedy which the allegory could not hide. It is divided into two parts, the first of which is certainly the work of Ribeiro, while as to the second opinion is divided, though Dr Theophilo Braga considers it genuine and explains its progressive lack of lucidity and. order by the mental illness of the author. The first part has been ably edited by Dr Jose Pessanha (Oporto, 1891): Ribeiro's verses, including his five eciogues, which for their sincerity of feeling, simple diction and chaste form are unsurpassed in Portuguese literature, were reprinted in a limited edition de luxe by Dr Xavier da Cunha (Lisbon, 1886).

Authorities. — Visconde Sanches de Baena, Bernardim Ribeiro (Lisbon; 1895) ; Dr Theophilo Braga, Bernardim Ribeiro e Bucolismo (Oporto, I897), containing a full analysis of Ribeiro's novel (sometimes called the Saudades, though it is more commonly described, as here, by the initial words of the story, Menina e Moqo). (E. Pr.)

RIBERA, GIUSEPPE (1 588-1656), commonly called Lo Spagnoletto, or the Little Spaniard, a leading painter of the Neapolitan or partly of the Spanish school, was born near Valencia in Spain, at Xativa, now named S. Felipe, on 12th January 1588. His parents intended him for a literary or learned career; but he neglected the regular studies, and entered the school of the Spanish painter Francisco Ribalta. Fired with a longing to study art in Italy, he somehow made his way to Rome. Early in the 17th century a cardinal noticed him in the streets of Rome drawing from the frescoes on a palace facade; he took up the ragged stripling and housed him in his mansion. Artists had then already bestowed upon the ah'en student, who was perpetually copying all sorts of objects in art and in nature, the nickname of Lo Spagnoletto. In the cardinal's, household Ribera was comfortable but dis- satisfied, and one day he decamped. He then betook himself to the famous painter Michelangelo da Caravaggio, the head of the naturalist school, called also the school of the Tenebrosi, or shadow-painters, owing to the excessive contrasts of light and shade which marked their style. The Italian master gave every encouragement to the Spaniard, but not for long, as he died in 1609. Ribera, who had in the first instance studied chiefly from Raphael and the Caracci, had by this time acquired so much mastery over the tehebroso style that his performances were barely distinguishable from Caravaggio's own. He now went to Parma, and worked after the frescoes of Correggio with great zeal and efficiency: in the museum of Madrid is his "Jacob's Ladder," which is regarded as his ekef-d'eeuvre in this manner. From Parma Spagnoletto returned to Rome, where he resumed the style of

Caravaggio, and shortly after- wards he migrated to Naples, which became his permanent home.

Ribera was as yet still poor and inconspicuous, but a rich picture-dealer in Naples soon discerned in him all the stuff of a successful painter, and gave him his daughter in marriage. This was the turning-point in the 'Spaniard's fortunes. He painted a " Martyrdom of St Bartholomew," which the father- in-law exhibited from his balcony to a rapidly increasing and admiring crowd. The popular excitement grew to so noisy a height as to attract the attention of the Spanish viceroy, the Count de Monterey. From this nobleman and from the king of Spain, Philip IV., commissions nOw flowed in upon Ribera. With prosperity came grasping and jealous selfishness. Spagno- letto, chief in a triumvirate of greed, the " Cabal of Naples," his abettors being a Greek painter, Belisario Corenzio, and a Neapolitan, Giambattista Caracciolo, determined that Naples should be an artistic monopoly; by intrigue, terrorizing and personal violence on occasion they kept aloof all competitors. Annibale Caracci, the Cavalier d'Arpino, Guido, Domenichino, all of them successively invited to work in Naples, found the place too hot to hold them. The cabal ended at the time of Caracciolo's death in 1641.

The close of Ribera's triumphant career has been variously related. If we are to believe Dominici, the historian of Nea- politan art, he totally disappeared from Naples in 1648 and

was no more heard of — this being the sequel vi the abduction by Don John of Austria, son of Philip IV., of the painter's beautiful only daughter Maria Rosa. But these assertions have not availed to displace the earlier and well-authenticated statement that Ribera died peaceably and wealthy in Naples in 1656. His own signature on his pictures is constantly " Jusepe de Ribera, Espanol." His daughter, so far from being disgraced by an abduction, married a Spanish nobleman who became a minister of the viceroy.

The pictorial style of Spagnoletto is extremely powerful. In his earlier style, founded (as we have seen) sometimes on Caravaggio and sometimes on the wholly diverse method of Correggio, the study of Spanish and Venetian masters can likewise be traced. Along with his massive and predominating shadows, he retained from first to last great strength of local colouring. His forms, though ordinary and

partly gross, are correct; the impression of his works gloomy and startling. He delighted in subjects of horror. Salvator Rosa and Luca Giordano were his most distinguished pupils; also Giovanni Do, Enrico FiammingO; Michelangelo Fracanzani, and Aniello Falcone, who was the first considerable painter of battle-pieces. Among Ribera's principal works should be named " St Januarius Emerging from the Furnace," in the cathedral of Naples; the " Descent from the Cross," in the Neapolitan Certosa, generally regarded as his masterpiece; the " Adoration of the Shepherds " (a late work, 1650), now in the Louvre; the " Martyrdom of St Bartholomew," in the museum of Madrid; the " Pieta," in the sacristy of S. Martino, Naples. His mythologic subjects are generally unpleasant — such as the " Silenus," in the Studj Gallery of Naples, and " Venus Lamenting over Adonis," in the Corsini Gallery of Rome. The Louvre contains altogether twenty-five of his paintings; the National Gallery, London, two — one of them, a " Peita," being an excellent though not exactly a leading specimen. He executed several fine male portraits; among others his own likeness, now in the collection at Alton Towers. He also produced twenty-six etchings, ably treated. For the use of his pupils, he drew a number of ele- mentary designs, which in 1650 were etched by Francisco Fernandez, and which continued much in vogue for a long while among Spanish and French painters and students.

Besides the work of Dominici already referred to (1840-46), the Diccionario Historico of Cean Bermudez is a principal authority regarding Ribera and his works; also E. de Lalaing, " Ribera " (in Histoire de quatre grands peintres), 1888. (W. M. R.)

RIBOT, ALEXANDRE FELIX JOSEPH (1842-), French statesman, was born at St Omer on 7th February 1842. After a brilliant career at the university of Paris, where he was lauriat of the faculty of law, he rapidly made his mark at the bar. He was secretary of the conference of advocates and one of the founders of the SociiU de legislation comparSe. During 187 s and 1876 he was successively director of criminal affairs and secretary-general y at the ministry of justice. In 1877 he made his entry into political life by the conspicuous part he played on the committee of legal resistance during the Broglie ministry, and in the following year he was returned to the chamber as a moderate republican member for Boulogne, in his native department of Pas-de-Calais. His impassioned yet reasoned eloquence gave him an influence which was increased by his articles in the Parlement in which he opposed violent measures against the unauthorized congregations. He devoted himself especially to financial questions, and in 1882 was reporter of the budget. He became one of the most prominent republican opponents of the Radical party, distinguishing

himself by his attacks on the short-lived Gambetta ministry. He refused to vote the credits demanded by the Ferry cabinet for the Tongking expedition, and shared with M. Clemenceau in the overthrow of the ministry in 1883. At the general election of that year he was one of the victims of the Republican rout in the Pas-de- Calais, and did not re-enter the chamber till 1887. After 1889 he sat for St Omer. His fear of the Boulangist movement converted him to the policy of ” Re- publican Concentration,” and he entered office in 1890 as

foreign minister in the Freycinet cabinet. He had an intimate acquaintance and sympathy with English institutions, and two of his published works — an address, Biographie de Lord Erskine (1866), and Etude sur Vacte du 5 avril i8?j poiir I’etablissement d’une cour supreme de fustice en Angleterre (1874) — deal with English questions; he also gave a fresh and. highly important direction to French policy by the understanding with Russia, which was declared to the world by the visit of the French fleet to Cronstadt in 1891, and which subsequently ripened into a formal treaty of alliance. He retained his post in the Loubet ministry (February-November 1892), and on its defeat became himself president of the council, retaining the direction of foreign affairs. The government resigned in March 1893 ort the refusal of the chamber to accept the Senate’s amendments to the budget. On the election of Felix Faure as president of the Republic in January 1895, M. Ribot again became premier and minister of finance. On the 10th of June he was able to make the first official announcement of a’ definite alliance with Russia. On the 30th of October the government was defeated on the question of the Chemin de fer du Sud, and resigned office. The real reason of its fall was the mismanagement of the Madagascar expedition, the cost of which in men and money exceeded all expectations, and the alarming social conditions at home, as indicated by the strike at Carmaux. After the fall of the Meline ministry in 1898 M. Ribot tried in vain to form a cabinet of ” conciliation.” He was elected, at the end of 1898, president of the important commission on education, in which he advocated the adoption of a modern system of education. The policy of the Waldeck-Rousseau ministry on the religious teaching congregations broke up the Republican party, and M. Ribot was among the seceders; but at the general election of 1902, though he himself secured re-election, his policy suffered a severe check. He actively opposed the policy of the Combes ministry and denounced the alliance with M. Jaures, and on the 13 th of January 1905 he was one of the leaders of the opposition which brought about the fall of the cabinet. Although he had been most violent in denouncing the anti-

clerical policy of the Combes cabinet, he now announced his willingness to recognize a new regime to replace the Concordat, and gave the government his support in the establishment of the Associations ctdtuecles, while he secured some mitigation of the severities attending the separa- tion. He was re-elected deputy for St Omer in 1906. In the same year he became a member of the French Academy in succession to the due d'Audiffret-Pasquier; he was already a member of the Academy of Moral and Political Science. In justification of his policy in opposition he published in 1905 two volumes of his Discours politiques.

RIBOT, THEODULE (1823-1891), French painter, was born at Breteuil, in Eure, in 1823, and died at Bois Colombes, near Paris, in September 1891. A pupil nominally of Glaize, but more really of Ribera, of the great Flemings and of Chardin, Theodule Ribot had yet conspicuously his own noble and personal vision, his own intensity of feeling and rich sobriety of performance. Beginning to work seriously at art when he was no longer extremely young, and dying before he was extremely old, Ribot crowded into some thirty or thirty-five years of active practice very varied achievements; and he worked in at least three mediums, oil paint, pencil or crayon draughtsmanship and the needle of the etcher. His drawings were sometimes " complete in themselves," and sometimes fragmentary but powerful preparations for painted canvases. The etchings, of which there are only about a couple of dozen, are of the middle period of his practice; they show a diversity of method as well as of theme; the work in the well-nigh Velazquez-like " Priere " — a group of girl children — contrast- ing strongly with that process almost of outline alone, which he employed in the brilliant little group of prints which record, his vision of the character and humours of cooks and kitchen- boys. In etching, the method varied with the theme — not with the period. It is quite otherwise with the paintings. Here the earlier work, irrespective of its subject, is the drier

and the more austere; the later work, irrespective of its subject, the freer and broader. But even in that which is quite early there is a curious and impressive intensity of conception and presentation. His visions of elderly women and young girls remain upon the memory. His wom*en, wrinkled and worn, have had the experience of a hard and grinding world; his children, his young girls, are the quintessence of innocence and happy hopefulness, and life is a jest to his boys. His

religious pieces, in which Ribera affected him, have conviction and force. Into portraits and into character studies, but more especially into genre subjects, Ribot was apt to introduce Still-life, and to make much of it. Herein, as in his sense of homeliness, he resembled Chardin. But again, Chardin-like, he painted Still-life for its own sake, by itself, and always with an extraordinary sense of the solidity and form, the texture and the hue, and, it must be added also, the very charm of matter. (F. We.)

RIBOT, THEODULE ARMAND (1830-), French psycho- logist, was born at Guingamp on the 18th of December 1839, and was educated at the Lycee de St Brieuc. In 1856 he began to teach, and was admitted to the Ecole Normale Superieure in 1862. In 1885 he gave a course of lectures on ” Experi- mental Psychology ” at the Sorbonne, and in 1888 was ap- pointed professor of that subject at the College of France. His thesis for his doctor’s degree, republished in 1882, H&r6ditt: etude psychologique (5th ed., 1889), is his most important and best known book. Following the experimental and synthetic methods, he has brought together a large number of instances of inherited peculiarities; he pays particular attention to the physical element of mental life, ignoring all spiritual or non- material factors in man. In his work on La Psychologic anglaise contemporaine (1870), he shows his sympathy with the sensationalist school, and again in his translation of Herbert Spencer’s Principles of Psychology. Besides numerous articles, he has written on Schopenhauer, Philosophie de Schopenhauer (1874; 7th ed., 1896), and on the contemporary psychology of Germany {La Psychologie allemande contemporaine, 1879; 13th ed., 1898), also four little monographs on Les Maladies de la memoire (1881; 13th ed., 1898); De la volonti (1883; 14th ed., 1899); De la personnalitf (1885; 8th ed., 1899); and La Psychologie de I’ attention (1888), which supply useful data to the student of mental disease.

Other works by him are: — La Psychologie des sentiments (1896); V Evolution des iddes generates (1897); Essai sur V imagination creatrice (1900); La Logique des sentiments (1904); Essai sur les passions (1906). Of the above the following have been translated into English .ˆEnglish Psychology (1873); Heredity: a Psycho- logical Study of its Phenomena, Laws, Causes, and Consequences (1875) ; Diseases of Memory: An Essay in the Positive Psychology (1882); Diseases of the Will (New York, 1884); German Psychology of to-day, tr. J. M. Baldwin (New York, 1886) ; The Psychology of Atten- tion (Open Court Publishing Company, Chicago, 1890); Diseases of Personality (Chicago, 1895); The Psychology of the Emotions (1897); The Evolution of General Ideas, tr. F. A. Welby (Chicago, 1899) ; Essay on

the Creative Imagination, tr. A. H. N. Baron (1906).

RICARD, LOUIS GUSTAVE (1823-1873), French painter, was born in Marseilles in 1823, and studied first under Auber in his native town, and subsequently under Coignet in Paris. The formation of his masterly, distinguished style in portraiture was, however, due rather to ten years' intelligent copying of the old masters at the Louvre and at the Italian galleries, than to any school training. He was a master of technique, and his portraits — about two hundred — reveal an extra-ordinary insight into the character of his sitters. Never- theless, for some time after his death his name was almost forgotten by the public, and it is only of quite recent years that he has been conceded the position among the leading masters of the modern French school which is his due. A portrait of himself, and one of Alfred de Musset, are at the Luxembourg Gallery. Among his best known works are the portrait of his mother, and those of the painters Fromentin, Heilbuth and Chaplin.

See Gustave Ricard, by Camille Mauclair (Paris, Librairie de I'art).

RICARDO, DAVID (1772-1823), English economist, was born in London on the 19th of April 1772, of Jewish origin. His father, who was of Dutch birth, bore an honourable character and was a successful member of the Stock Exchange. At the age of fourteen Ricardo entered his father's office, where he showed much aptitude for business. About the time when he attained his majority he abandoned the Hebrew faith and conformed to the Anglican Church, a change which seems to have been connected with his marriage to Miss Wilkinson, which took place in 1793. In consequence of the step thus taken he was separated from his family and thrown on his own resources. His ability and uprightness were known, and he at once entered on such a successful career in the pro- fession to which he had been brought up that at the age of twenty-five, we are told, he was already rich. He now began to occupy himself with scientific pursuits, and gave some atten- tion to mathematics as well as to chemistry and mineralogy; but, having met with Adam Smith's great work, he threw himself with ardour into the study of political economy.

His first publication (1809) was The High Price of Bullion a Proof of the Depreciation of Bank Notes. This tract was an expansion of a series of articles which the author had con- tributed to the Morning Chronicle. It gave a fresh stimulus to the controversy, which had for some time been discontinued, respecting the resumption of cash payments, and indirectly led to the appointment of a committee of the House of Commons, commonly known as the Bullion Committee, to

consider the whole question. The report of the committee asserted the same views which Ricardo had put forward, and recommended the repeal of the Bank Restriction Act. Not- withstanding this, the House of Commons declared in the teeth of the facts that paper had undergone no depreciation. Ricardo's first tract, as well as another on the same subject, attracted much attention.

In 181 1 he made the acquaintance of James Mill, whose introduction to him arose out of the publication of Mill's tract entitled Commerce Defended. Whilst Mill doubtless largely affected his political ideas, he was, on his side, under obligations to Ricardo in the purely economic field; Mill said in 1823 that he himself and J. R. M'Culloch were Ricardo's disciples, and, he added, his only genuine ones.

In 1815, when the Corn Laws were under discussion, he published his Essay on the Influence of a Low Price of Corn on the Profits of Stock. This was directed against a recent tract by Malthus entitled Grounds of an Opinion on the Policy of Restraining the Free Importation of Foreign Corn. The reasonings of the essay are based on the theory of rent which has often been called by the name of Ricardo; but the author distinctly states that it was not due to him. " In all that I have said concerning the origin and progress of rent I have briefly repeated, and endeavoured to elucidate, the principles which Malthus has so ably laid down on the same subject in his Inquiry into the Nature and Progress of Rent." We now know that the theory had been fully stated, before the time of Malthus, by Anderson; it is in any case clear that it was no discovery of Ricardo. Ricardo states in this essay a set of propositions, most of them deductions from the theory of rent, which are in substance the same as those afterwards embodied in the Principles, and regarded as characteristic of his system, such as that increase of wages does not raise prices; that profits can be raised only by a fall in wages and diminished only by a rise in wages; and that profits, in the whole progress of society, are determined by the cost of the production of the food which is raised at the greatest expense. It does not appear that, excepting the theory of foreign trade, anything of the nature of fundamental doctrine, as distinct from the special subjects of banking and taxation, is laid down in the Principles which does not already appear in this tract. We find in it, too, the same exclusive regard to the interest of the capitalist class, and the same identification of their interest with that of the whole nation, which are generally characteristic of his writings.

RICASOLI

In the Proposals for an Economical and Secure Currency (1816) he first disposes of the chimera of a currency without a specific standard, and pronounces in favour of a single metal, with a preference for silver, as the standard.

Ricardo's chief work, Principles of Political Economy and Taxation, appeared in 1817. The fundamental doctrine of this work is that, on the hypothesis of free competition, exchange value is determined by the labour expended in production, — a proposition not new, nor, except with considerable limitation and explanation, true, and of little practical use, as " amount of labour " is a vague expression, and the thing intended is incapable of exact estimation. Ricardo's theory of dis- tribution has been briefly enunciated as follows: " (1) The demand for food determines the margin of cultivation; (2) this margin determines rent; (3) the amount necessary to maintain the labourer determines wages; (4) the difference between the amount produced by a given quantity of labour at the margin and the wages of that labour determines profit." These theorems are too absolutely stated, and require much modification to adapt them to real life. His theory of foreign trade has been embodied in the two propositions: " (1) Inter- national values are not determined in the same way as domestic values; (2) the medium of exchange is distributed so as to bring trade to the condition it would be in if it were conducted by barter."

A considerable portion of the work is devoted to a study of taxation, which requires to be considered as a part of the problem of distribution. A tax is not always paid by those on whom it is imposed; it is therefore necessary to determine the ultimate, as distinguished from the immediate, incidence of every form of [taxation. Smith had already dealt with this question; Ricardo develops and criticizes his results. The conclusions at which he arrives are in the main as follows: a tax on raw produce falls on the consumer, but will also diminish profits; a tax on rents on the landlord; taxes on houses will be divided between the occupier and the ground landlord; taxes on profits will be paid by the consumer, and taxes on wages by the capitalist.

In 1819 Ricardo, having retired from business and become a landed proprietor, entered parliament as' member for Portarlington. He was at first diffident and embarrassed in speaking, but gradually overcame these difficulties, and was heard with much attentien and deference, especially when he addressed the House on economic questions. He probably contributed in a considerable degree to bringing about the change of opinion on the question of free trade which ulti- mately led to the legislation of Sir Robert Peel on that subject.

In 1820 he contributed to the supplement of the Encyclopaedia Britannica (6th ed.) an ” Essay on the Funding System.” In this besides giving an historical account (founded on Dr Robert Hamilton’s valuable work On the National Debt, 1813, 3rd ed., 1818) of the several successive forms of the sinking fund, he urges that nations should defray their expenses, whether ordinary or extraordinary, at the time when they are incurred, instead -of providing for them by loans.

In 1822 he published a tract On Protection to Agriculture, which is an able application to controversy of the general principles laid down in his systematic work. Its arguments and conclusions are therefore subject to the same limitations which those fundamental principles require.

In his Plan for the Establishment of a National Bank, published posthumously in 1824, he proposes that the issue of the paper currency should be taken out of the hands of the Bank of England and vested in commissioners appointed by the government. The tract describes in detail the measures to be adopted for the introduction and working of the system. A certain step towards realizing the objects of his scheme, though on different lines from Ricardo’s, was taken in Sir Robert Peel’s act of 1844, by which the discount business of the bank was separated from the issue department.

Ricardo died on the nth of September 1823, at his seat

(Gatcomb Park) in Gloucestershire, from a cerebral affection resulting from disease of the ear. James Mill, who was inti- mately acquainted with him, says (in a letter to Napier of November 181 8) that he knew not a better man, and on the occasion of his death published a highly eulogistic notice of him in the Morning Chronicle. A lectureship on political economy, to exist for ten years, was founded in commemoration of him, M’Culloch being chosen to fill it.

In forming a general judgment respecting Ricardo, we must have in view not so much the minor writings as the Principles, in which his economic system is expounded as a whole. By a study of this work we are led to the conclusion that he was an economist only, not at all a social philosopher in the wider sense, like Adam Smith or John Mill. He had great acuteness, but little breadth. For any large treatment of moral and political questions he seems to have been alike by nature and preparation unfitted; and there is no evidence of his having had any but the most ordinary and narrow views of the great social problems. He shows no trace of that hearty sympathy with the

working classes which breaks out in several passages of the Wealth of Nations; we ought, perhaps, with Held, to regard it as a merit in Ricardo that he does not cover with fine phrases his deficiency in warmth of social sentiment. The idea of the active capitalist having any duties towards his employes never seems to occur to him; the labourer is, in fact, merely an instrument in the hands of the capitalist, a pawn in the game he plays.

He first introduced into economics on a great scale the method of deduction from a priori assumptions. The con- clusions so arrived at have often been treated as if they were directly applicable to real life,, and indeed to the economic phenomena of all times and places. But the truth of Ricardo's theorems is now by his warmest admirers admitted to be hypothetical only. Bagehot seems right in believing that Ricardo himself had no consciousness of the limitations to which his doctrines are subject. Be this as it may, we now see that the only basis on which these doctrines could be allowed to stand as a permanent part of economic science is that on which they are placed by Roscher, namely, as a stage in the preparatory work of the economist, who, beginning with such abstractions, afterwards turns from them, not in practice merely, but in the completed theory, to real life and men as they actually are or have been.

The criticisms to which Ricardo's general economic scheme is open do not hold with respect to his treatment of. the subjects of currency and banking. These form precisely that branch of economics into which moral ideas (beyond the plain pre- scriptions of honesty) can scarcely be said to enter, and where the operation of purely mercantile principles is most immediate and invariable. They were, besides, the departments of the study to which Ricardo's early training and practical habits led him to give special attention; and they have a lasting value independent of his systematic construction.

Ricardo's collected works were published, with a notice of his life and writings, by J. R. M'Culloch in 1846.

The Principles have be^en edited (with an introduction, biblio- graphy and notes) by E. C. K. Gonner, 1 891. See also Letters tt H. Trower and Others, ed. J. Bonar and J. H. Hollander, 1899; Letters to J. R. M'Culloch, ed. J. H. Hollander, 1895; Letters to T. R. Mallhus, ed. J. Bonar, 1887. A French translation of the Principles by Constancio, with notes by Say, appeared in 1818; the whole works, translated by Constancio and Fonteyraud, form vol. xiii. (1847) of the Collection des principaux iconomistes, where they are accompanied by the notes of Say, Malthus, Sismondi, Rossi, &c. The Principles was first "

naturalized ” in Germany, says Roscher (though another version by Von Schmid had pre- viously appeared), by Edward Baumstark in his David Ricardo’s Grundgesetze der Volkswirthschaft und der Besteuerung ubersetzt und erlautert (1837), which Roscher highly commends, not only for the excellence of the rendering, but for the value of the explana- tions and criticisms which are added.

RICASOLI, BETTINO, Baron (1800-1880), Italian statesman, was born at Broglio on the 19th of March 1809. Left an orphan at eighteen, with an estate heavily encumbered, he was by special decree of the grand duke of Tuscany declared of age. and

entrusted with the guardianship of his younger brothers. In- terrupting his studies, he withdrew to Broglio, and by careful management disencumbered the family possessions. In 1847 he founded the journal La P atria, and addressed to the grand duke a memorial suggesting remedies for the difficulties of the state. In 1848 he was elected Gonfaloliiere of Florence, but resigned on account of the anti-Liberal tendencies of the grand duke. As Tuscan minister of the interior in 1859 he promoted the union of Tuscany with Piedmont, which took place on the 1 2th of March i860. Elected Italian deputy in 1861 , he succeeded Cavour in the premiership. As premier he admitted the Garibal- dian volunteers to the regular army, revoked the decree of exile against Mazzini, and attempted reconciliation with the Vatican; but his efforts were rendered ineffectual by the non possumus of the pope. Disdainful of the intrigues of his rival Rattazzi, he found himself obliged in 1862 to resign office, but returned to power in 1866. On this occasion he refused Napoleon lll.‘s offer to cede Venetia to Italy, on condition that Italy should abandon the Prussian alliance, and also refused the Prussian decoration of the Black Eagle because Lamarmora, author of the alliance, was not to receive it. Upon the departure of the French troops from Rome at the end of 1866 he again attempted to conciliate the Vatican with a convention, in virtue of which Italy would have restored to the Church the property of the suppressed religious orders in return for the gradual payment of £24,000,000. ” In order to mollify the Vatican he conceded the exequatur to forty-five bishops inimical to the Italian regime. The Vatican accepted his proposal, but the Italian Chamber proved refractory, and, though dissolved by Ricasoli, returned more hostile than before. Without waiting for a vote, Ricasoli resigned office and thenceforward practically disappeared from political life, speaking in

the Chamber only upon rare occasions. He died at Broglio on the 23rd of October 1880. His private life and public career were marked by the utmost integrity, and by a rigid austerity which earned him the. name of the ” iron baron.” In spite of the failure of his ecclesiastical scheme, he remains one of the most noteworthy figures of the Italian Risorgimento. 1

See Tabarrini and Gotti, Lettere e documenti del barone Bettino Ricasoli, 10 vols. (Florence, 1 886-1 894); Passerini, Genealogia e storia delta famiglia Ricasoli (ibid. 1861); Gotti, Vita del barone Bettino Ricasoli {ibid. 1894). (H. W. S.)

RICCATI, JACOPO FRANCESCO, Count (1676-1754), Italian mathematician, was born at Venice on the 8th of May 1676, and died at Treviso on the 15th of April 1754.

He studied at the university of Padua, where he graduated in 1696. His favourite pursuits were scientific, and his authority on all questions of practical science was referred to by the senate of Venice. He corresponded with many of the European savants of his day, and contributed largely to the Acta Erudi- torum of Leipzig. He was offered the presidency of the academy of science of St Petersburg; but he declined, preferring the leisure and independence of life in Italy. Riccati’s name is best known in connexion with his problem called Riccati’s equation, published in the Acta Eruditorum, September 1724. A very complete account of this equation and its various transforma- tions was given by J. W. L. Glaisher in the Phil. Trans. (1881).

After Riccati’s death his works were collected by his sons and published (1758) in four volumes. His sons, Vincenzo (1707- 1775) and Giordano (1700-1790), inherited his talents. The former was professor of mathematics at Bologna, and published, among other works, a treatise on the infinitesimal calculus. Giordano was distinguished both as a mathematician and an architect.

RICCI, MATTEO (1552-1610), Italian missionary to China, was born of a noble family at Macerata in the March of Ancona on the 7th of October 1552. After some education at a Jesuit college in his native town he went to study law at Rome, where in 1571, in opposition to his father’s wishes, he joined the Society of Jesus.

In 1577 Ricci and other students offered themselves for the East Indian missions. Ricci, without visiting his family to take

leave, proceeded to Portugal. His comrades were Rudolfo Acquaviva,

Nicolas Spinola, Francesco Pasio and Michele Ruggieri, all afterwards, like Ricci himself, famous in the Jesuit annals. They arrived at Goa in September 1578. After four years spent in India, Ricci was summoned to the task of opening China to evangelization.

Several fruitless attempts had been made by Xavier, and since his death, to introduce the Church into China,— as by Melchior Nunes of the Jesuit Society operating from Sanchian 1 in 1 555; by Gaspar da Cruz, a Dominican, in that or the follow- ing year; by the Augustinians under Martin Herrada, 1575; and in 1579 by the Franciscans led by Pedro d'Alfaro. In 1571 a house of the Jesuits had been set up at Macao (where the Portuguese were established in 1557), but their attention was then occupied with Japan, and it was not till the arrival at Macao of Alessandro Valignani on a visitation in 1582 that work in China was really taken up. For this object he had obtained the services first of M. Ruggieri and then of Ricci. After various disappointments they found access to Chow-king-fu on the Si- Kiang or West River of Canton, where the viceroy of the two provinces of Kwang-tung and Kwang-si then had his residence, and by his favour were able to establish themselves there for some years. Their proceedings were very cautious and tentative; they excited the curiosity and interest of even the more intelli- gent Chinese by their clocks, their globes and maps, their books of European engravings, and by Ricci's knowledge of mathe- matics, including dialling and the projection of maps. They conciliated some influential friends, and their reputation spread widely in China. This was facilitated by the Chinese system of transfer of public officers from one province of the empire to another, and in the later movements of the missionaries they frequently met with one and another of their old acquaintances in office, who were more or less well disposed. Eventually troubles at Chow-king compelled them to seek a new home; and in 1589, with the viceroy's sanction, they migrated to Chang- chow in the northern part of Kwang-tung, not far from the well- known Meiling Pass.

During his stay here Ricci was convinced that a mistake had been made in adopting a dress resembling that of the bonzes, a class who were the objects either of superstition or of contempt. With the sanction of the visitor it was ordered that in future the missionaries should adopt the costumes of Chinese literates, and, in fact, they before long adopted'Chinese manners altogether.

Chang-chow, as a station, did not prove a happy selection, but it was not till 1 595 that an opportunity occurred of travelling northward. For some time Ricci's residence was at Nan-chang- fu, the capital of Kiang-si; but in 1598 he was able to proceed under favourable

conditions to Nan-king, and thence for the first time to Peking, which had all along been the goal of his missionary ambition. But circumstances were not then pro- pitious, and the party had to return to Nan-king. The fame of the presents which they carried had, however, reached the court, and the Jesuits were summoned north again, and on the 24th of January 1601 they entered the capital. Wan-li, the emperor of the Ming dynasty, in those days lived in seclusion, and saw no one but his women and the eunuchs. But the missionaries were summoned to the palace; their presents were immensely ad-mired, and the emperor had the curiosity to send for portraits of the fathers themselves.

They obtained a settlement, with an allowance for subsistence, in Peking, and from this time to the end of his life Ricci's estimation among the Chinese was constantly increasing, as was at the same time the amount of his labours. Visitors thronged the mission house incessantly; and inquiries came to him from all parts of the empire respecting the doctrines which he taught, or the numerous Chinese publications which he issued. This in itself was a great burden, as Chinese composition, if wrong impressions are to be avoided, demands extreme care and accuracy. As head of the mission, which now had four stations

1 The island (properly Chang-chuen) on which the Portuguese had a temporary settlement before they got Macao, and on which F. Xavier died in 1552.

in China, he also devoted much time to answering the letters of the priests under him, a matter on which he spared no pains or detail. New converts had to be attended to — always welcomed, and never hustled away. Besides these came the composition of his Chinese books, the teaching of his people and the maintenance of the record of the mission history which had been enjoined upon him by the general of the order, and which he kept well up to date. Thus his labours were wearing and incessant. In May 1610 he broke down, and after an illness of eight days died on the nth of that month. His colleague Pantoja applied to the emperor for a burying-place outside the city. This was granted, with the most honourable official testimonies to the reputation and character of Ricci; and a large building in the neighbourhood of the city was at the same time bestowed upon the mission for their residence.

Ricci's work was the foundation of the subsequent success attained by the Roman Catholic Church in China. When the missionaries of other Roman Catholic orders made \their way into China, twenty years later, they found great fault with the manner in which certain Chinese practices had been dealt with by the Jesuits, a matter in which Ricci's action and policy had given the tone to the mission in China — though in fact that tone was rather inherent in the Jesuit system than the outcome of individual character, for controversies of an exactly parallel nature arose two generations later in southern India, between the Jesuits and Capuchins, regarding what were called " Malabar rites." The controversy thus kindled in China burned for considerably more than a century with great fierceness. 1 The chief points were (1) the lawfulness and expediency of certain terms employed by the Jesuits in naming God Almighty, such as Tien, " Heaven," and Shang-ti, " Supreme Ruler " or " Em- peror," instead of Tien-Chu, " Lord of Heaven," and in particular the erection of inscribed tablets in the churches, on which these terms were made use of; 2 (2) in respect to the ceremonial offerings made in honour of Confucius, and of personal ancestors, which Ricci had recognized as merely " civil " observances; (3) the erection of tablets in honour of ancestors in private houses; and (4), more generally, sanction and favour accorded to ancient Chinese sacred books and philosophical doctrine, as not really trespassing on Christian faith.

Probably no European name of past centuries is so well known in China as that of Li-ma-teu, the form in which the name of Ricci {Ri-cci Mat-leo) was adapted to Chinese usage, and by which he appears in Chinese records. 3 The works which he composed in Chinese are numerous; a list of them (apparently by no means complete, however) will be found in Kircher's China Illustrate, and also in Abel Remusat's Nouveaux Me- langes Asiatiques (ii. 213-15). They are said to display an aptitude for clothing ideas in a Chinese dress very rare and remarkable in a foreigner. One of the first which attracted

1 The list of the literature of this controversy occupies forty-one columns in M. Cordier's excellent Bibliographic de la Chine.

2 Compare Browning, The Ring and the Book, x., The Pope,

1589-1603.

3 The name comes forward prominently in the mouth of the emperor Kang-hi, in a dialogue which took place between him and Monsgr. Maigrot, the leader of the anti-Jesuit movement (mentioned in Browning's lines referred to above), at the summer residence in

Tartary, August 1706 — a dialogue which the Jesuits have reported with not a little malice :—

“Emperor, ‘ Tell me why do the people call me Van-sui (10,000 years). The Most Reverend (i.e. Maigrot), ‘ To express their desire for your Majesty’s long life.’ Emp. ‘ Good. You see, then, Chinese words are not always to be taken literally. We pay cult to Confucius and to the dead to express our respect for them. How is that inconsistent with your religion? When did it begin to be so? Is it since . Ly-Mattheu’s time? Hast thou ever read Ly-Mattheu ? ‘ The Most Reverend, turning to P. Parenin, whispers, ‘ Who’s he ? ‘ and learning that it was P. Matteo Ricci, . . . answered the emperor: ‘ I have not read that book.’ Emp. ‘ Ly-Mattheu and his fellows came hither some two centuries ago; and before their time China never heard anything of the Incarna- tion, anything of Tien-chu, who had not become incarnate in this part of the world. Why then, if it was lawful to call God Tien before Ly-Mattheu’s time, should it be improper now?’ ” — Epistola de Eventu Apostolicae Legationis, scripta a PP. Missionariis . . . ad Praepositum Generalem S. J., An. 1706,- 1 Novembris.

attention and reputation’ among Chinese readers was aˆTreatise upon Friendship, in the form of a dialogue containing short and pithy paragraphs; this is stated in the De Expeditions to have been suggested during Ricci’s stay at Nan-chang by a conversa- tion with the prince of Kien-ngan, who asked questions regarding the laws of friendship in the West.

In the early part of his residence at Peking, when enjoying constant intercourse with scholars of high position, Ricci brought, out the T’ien-chu shih-i, or ” Veritable Doctrine of the Lord of Heaven,” which deals with the divine character and attributes under eight heads. “This work,” says A. Wylie, “contains some acute reasoning in support of the propositions laid down, but the doctrine of faith in’ Christ is very slightly touched upon. The teachings of Buddhism are vigorously attacked, whilst “the author tries to draw a parallel between Christianity and the teachings of the Chinese literati.” v ;,

In 1604 Ricci completed the Erh-shih-wu yen, a series of short articles of moral bearing, but exhibiting little of the essentia} doctrines of Christianity. Chi-jen shih pien is another of hfe productions, completed in 1608, and consisting of a record of ten conversations held with Chinese of high position. The subjects are: (l) Years past no’donger ours; (2) Man a sojourner on earth; (3) Advantage of

frequent contemplation of eternity; (4) Preparation for judgment by such contempla- tion; (5) The good man not desirous of talking; (6) Abstinence, and its distinction from the prohibition to take life; (7) Self- examination and self -reproof inconsistent with inaction; (8) Future reward and punishment; (9) Prying into futurity hastens calamity; (10) Wealth with covetousness more wretched than poverty with contentment. To this work is appended a translation of eight European hymns, with elucidations, written in 1609.

Some of the characteristics thus indicated may have suggested the bitterness of attacks afterwards made upon Ricci's theology. An example of these is found in the work called Anecdotes sur I' Stat de religion dans la Chine (Paris, 1733-35), the author of which (Abbe Villers) speaks of the T'ien-chu shih-i in this fashion: " The Jesuit was also so ill versed in the particulars of the faith that, as the holy bishop of Conon, Monsgr. Maigrot, says of him, one need merely read his book on the true religion to convince oneself that he had never imbibed the first elements of theology." ... .," :

Ricci's pointed attacks on Buddhism, and the wide circulation of his books, called forth the opposition of the Buddhist clergy. One of the ablest who took their part was Chu-hang, a priest of Hang-chow, who had abandoned the literary status for the Buddhist cloister. He wrote three articles against the doctrine of the missionaries. These were brought to Ricci's notice in an ostensible tone of candour by Yu-chun-he, a high mandarin at the capital. This letter, with Ricci's reply, the three Buddhist declamations and Ricci's confutation, were published in a collected form by the Christian Sen-Kwang-K'e.

Another work of Ricci's which attracted attention was the Hsi-kuofa, or " Art of Memory as practised in the West." Ricci was himself a great expert in memoria technica, and astonished the Chinese by his performances in this line. He also wrote or edited various Chinese works on geography, the celestial and terrestrial spheres, geometry and arithmetic. And the detailed history of the mission was drawn out by him, which ; after his death was brought home by P. Nicolas Trigault, and published at Augsburg, and later in a complete form at Lyons under the lame De Expeditione Christiana apud Sinas Suscepta, ah. Soc. Jesu, Ex P. Mat. Ricci ejusdem Societatis Commentariis, Trigault himself adding many interesting notes on China and the Chinese'.

Among the scientific works which Ricci took into China was a set of maps, which at first created great interest, but afterwards disgust when the Chinese came tc perceive the insignificant place assigned to

the ” Middle Kingdom,” thrust, as it seemed, into a corner, instead of being set in the centre of the world like the gem in a ring. Ricci, seeing their dissatisfaction, set about constructing a map of the hemisphere on a great scale, so adjusted that China, with its subject states, filled the central

area, and, without deviating from truth of projection, occupied a large space in proportion to the other kingdoms gathered round it. All the names were then entered in Chinese calligraphy. This map obtained immense favour, and was immediately engraved at the expense of the viceroy and widely circulated.

In the accompanying cut we have endeavoured to portray this map. The projection adopted is a perspective of the hemisphere ‘

as viewed from a point at the distance of one diameter from the surface, and situ- ated on the produc- tion of the radius which passes through the intersection of 115° E. long. (Green- wich) with 30° N. lat. Something near this must have been Li- ma-teu’s projection.: With a vertex much more distant the de- sired effect would be impaired, and with one nearer neither of the poles would be seen, whilst the exaggeration of China would have been too gross for a professed representation of the hemisphere.

The chief facts of Ricci’s career are derived from Trigault; some contemporary works on the rites controversy have also been consulted; in the notice of Ricci’s Chinese writings valuable matter has been derived from Notes on Chinese Literature by A. Wylie (London and Shanghai, 1867). A number of Ricci’s letters are extant in the possession of the family, and access to them was afforded to Giuseppe La Farina, author of the work called La.China, considerata nella sua Storia, &c. (Florence, 1843), by the Marchese Amico Ricci of Macerata, living at Bologna. La Farina’s quotations contain nothing of interest. There is a curious Chinese account of Ricci published by Dr Breitschneider in the China Review, iv. 391 sq. (H. Y.)

RICCIARELLI, DANIELE (1509-1566), Italian artist, gener- ally called, from the place of his birth, Daniele da Volterra, studied painting under Sodoma and Peruzzi. Settling in Rome, he received abundant encouragement. His constant friend, Michelangelo, recommended him

on all possible occasions, and he was commissioned to beautify with works of art a chapel in the church of the Trinita, to paint in the Farnese Palace, to execute certain decorations in theTalazzo de' Medici at Navona, and to begin the stucco work and the pictures in the Hall of the Kings. Towards the close of his life he turned his attention to statuary. His last work was a bronze horse intended for an equestrian statue of Henry II. of France. He died in 1566. The principal extant works of Ricciarelli are at Rome. These are a " St John the Baptist " in the picture gallery of the Capitol, a " Saviour bearing the Cross " in the Palazzo Rospigliosi, and a ˆ'Descent from the Cross," his masterpiece, in the church of Trinita de Monti. There is also an " Elijah " at Volterra.

RICCOBONI, MARIE JEANNE (1714-1792), whose maiden name was Laboras de Mezieres, was born at Paris in 17 14. She married in 1735 Antoine Francois Riccoboni, a comedian and dramatist, from whom she soon separated. She herself was an actress,: but did not succeed on the stage. Her works are Lettres de mistress Fanny Butler (1757); the remarkable Histoire du marquis de Cressy (1758); Milady Juliette Catesby (1 759-1760), like her other books, in letter form; Ernestine (1798), which La Harpe thought her masterpiece; and three series of Lettres in the names of Adelaide de Dammartin (comlesse de Sancerre) (2 vols., 1766), Elizabeth Sophie de Valliere (2 vols., 1772), and Milord Rivers (2 vols., 1776). She obtained a small pension from the crown, but the Revolution deprived her of it, and she died on the 6th of December 1792 in great

indigence. Besides the works named, she wrote a novel (1762) on the subject of Fielding's Amelia, and supplied in 1765 a continuation (but not the conclusion sometimes erroneously ascribed to her) of Marivaux's unfinished Marianne.

All Madame Riccoboni's work is clever, and there is real pathos in it. But it is among the most eminent examples of the "sensi- bility " novel, of which no examples but Sterne's have kept their place in England, and that not in virtue of their sensibility. A still nearer parallel may be found in the work of Mackenzie. Madame Riccoboni is an especial offender in the use of mechanical aids to impressiveness — italics, dashes, rows of points and the like. The principal edition of her complete works is that of Paris (6 vols., 1818). The chief novels appear in a volume of Garnier's Biblio- theque amusante (Paris, 1865).

See Julia Kavanagh, French Women of Letters (2 vols., 1862), where an account of her novels is given; J. Fleury, Marivaux et le marivaudage (Paris, 1881); J. M. Querard, La France litteraire (vol.

vii., 1835); and notices by La Harpe, Grimm and Diderot prefixed to her (Euvres (9 vols., Paris, 1826).

RICE, EDMUND IGNATIUS (1762-1844), Irish philan- thropist, founder of the “Irish Christian Brothers,” was born at Westcourt, near Callen, Kilkenny, on the 1st of June 1762. He entered the business of his uncle, an export provision merchant in Waterford, in 1779 and succeeded him in 1790. In 1796 he established an organization for visiting and relieving the poor, and in 1802 .began to educate the poor children of Waterford, renting a school and supporting two teachers. In 1803 he gave up his business and, joined by a number of friends, began to systematize his plans. Others, like-minded, opened schools at Dungarvan and Carrick-on-Suir. The little society numbered nine in 1808, and meeting at Waterford took religious vows from their bishop, assumed a ” habit ” and adopted an addi- tional Christian name, by which, as by the collective title ” Christian Brothers,” they were thenceforth known. Schools were established in Cork (1811), Dublin (1812), and Thurles and Limerick (1817). In 1820 Pope Pius VII. issued a brief sanctioning the order of ” Religious Brothers of the Christian Schools (Ireland),” the members of which were to be bound by vows of obedience, chastity, poverty and perseverance, and to give themselves to the free instruction, religious and literary, of male children, especially the poor. The heads of houses were to elect a superior general, and Rice held this office from 1822 to 1838, during which time the institution extended to several English towns (especially in Lancashire), and the course of instruction grew out of the primary stage. Rice died on the 29th of August 1844. The Irish Christian Brothers have some hundred houses in Ireland with 300 attached schools and over 30,000 pupils. There are also industrial schools and orphanages, and the institute has branches in Australia, India, Gibraltar and Newfoundland.

RICE, JAMES (1 843-1 882), English novelist, was born at Northampton on the 26th of September 1843. Educated at Queens’ College, Cambridge, where he graduated in law in 1867, he was called to the bar at Lincoln’s Inn in 1871. In the meantime (1868) he had bought Once a Week, which proved a losing venture for him, but which brought him into touch with Walter Besant, a contributor [see Besant’s preface to the Library Edition (1887) of Ready-money Mortiboy]. There ensued a close friendship and a literary partnership between the two men which lasted ten years until Rice’s death, and resulted in a large number of successful novels. The first of them, published anonymously, Rice being responsible for the central figure and the leading situation, was Ready-money Morti- boy (1782), dramatized by them later and unsuccessfully produced at the Court

Theatre in 1874. In rapid succession followed My Little Girl (1873); With Harp and Crown (1874); This Son of Vulcan (1876); The Golden Butterfly (1876), the most popular of their joint productions; The Monks of Thelema (1878); By Celia's Arbour (1878); The Seamy Side (1880); The Chaplain of the Fleet (188 1); Sir Richard Whittington (1881), and a large number of short stories, some of them reprinted in The Case of Mr Lucraft, &c. (1876), 'Twas in Trafalgar's Bay, &c. (1879), and The Ten Years' Tenant, &c. (1881).

James Rice died at Redhill on the 26th of April 1S82.

RICE (Greek 6pvfa, Latin oryza, French riz, Italian riso, Spanish arroz, derived from the Arabic), a well-known cereal, botanical name Oryza saliva. According to Roxburgh, the great Indian botanist, the cultivated rice with all its numerous varieties has originated from a wild plant, called in India Newaree or Nivara, which is indigenous on the borders of lakes in the Circars and elsewhere in India, and is also native in tropical Australia. The rice plant is an annual grass with long linear

glabrous leaves, each provided with a long sharply pointed ligule. The spikelets are borne on a compound or branched spike, erect at first but afterwards bent downwards. Each spikelet contains a solitary flower with two outer small barren glumes, above which is a large tough, com- pressed, often awned, flowering glume, which partly encloses the somewhat similar pale. Within these are six stamens, a hairy ovary surmounted by two feathery styles which ripens into the fruit (grain), and which is invested by the husk formed by the persistent glume and pale. The cultivated varieties are extremely numerous, some kinds being adapted for marshy land, others

„. In ,. ... for growth on the hill-

Rl ce {Oryza saHva). ˆ The cultivators

A, spikelet (enlarged) ;B bearded [variety; make two pr i nc ; p al C, sp.kelet of B (enlarged). · according as

the sorts are early or late. Rice has been cultivated from time immemorial in tropical countries. According to Stanislas Julien a ceremonial ordinance was established in China by the emperor Chin-nung 2800 years B.C., in accordance with which the emperor sows the

rice himself while the seeds of four other kinds may be sown by the princes of his family. This fact , joined to other considerations, induced Alphonse de Candolle to consider rice as a native of China. It was very early cultivated in India, in some parts of which country, as in tropical Australia, it is, as we have seen, indigenous. It is not mentioned in the Bible, but its culture is alluded to in the Talmud. There is proof of its culture in the Euphrates valley and in Syria four hundred years before Christ. Crawfurd, on philological grounds, considers that rice was introduced into Persia from southern India. The Arabs carried the plant into Spain. Rice was first cultivated in Italy near Pisa in 1468. It was not introduced into S. Carolina until 1700, and then, it is said; by accident, although at one time the southern United States furnished a large proportion of the rice introduced into commerce. Rice sports into far more varieties than any of the corns familiar to Europeans; for some varieties grow in the water and some on dry land; some come to maturity in three months, while others take four and six months to do so. A very full account of the cultivation of rice in India will be found in Sir George Watt's Dictionary of the Economic Products of India.

Rice constitutes one of the most important articles of food in all tropical and subtropical countries, and is one of the most prolific of all crops. The rice yields best on low lands subject to occasional inundations, and thus enriched by alluvial deposits. An abundant

rainfall during the growing season is also a desideratum. Rice is sown broadcast, and in some districts is transplanted after a fort- night or three weeks. No special rotation is followed: indeed the soil best suited for rice is ill adapted for any other crop. In some cases little manure is employed, but in others abundance of manure is used. No special tillage is required, but weeding and irrigation are requisite. Rice in the husk is known as " paddy." On cutting across a grain of rice and examining it under the microscope, first the flattened and dried cells of the husk are seen, and then one or two layers of cells elongated in a direction parallel to the length of the seed, which contain the gluten or mtrogenous matter. Within these, and forming by far the largest part of the seed, are large polygonal cells filled with very numerous and very minute angular starch grains. Rice is not so valuable as a food as some other cereals, inasmuch as the proportion of nitrogenous matter (gluten) is less. Payen gives only 7 % of gluten in rice as compared with 22 % in the finest wheat, 14 in pats and 12 in maize. The percentage of potash in the ash is as 18 to 23 in wheat. The fatty matter is also less in proportion than in other cereals. Rice, therefore, is chiefly a farinaceous food, and requires to be Combined with fatty and nitrogenous substances, such as milk or meat gravy, to

satisfy the requirements of the system.

A large proportion of the rice brought to Europe is used for starch-making, and some is taken by' distillers of alcohol. Rice is also -the source of a drinking spirit in India, known as arrack, and the national beverage of Japan — sak6 — is prepared from the grain by means of an organic ferment.

RICE PAPER. The substance which has received this name in Europe, through the mistaken notion that it is made from rice, consists of the pith of a small tree, Aralia papyrifera, which grows in the swampy forests of Formosa. The cylindrical core of pith is rolled on a hard flat surface against a knife, by which it is cut into thin sheets of a fine ivory-like texture. Dyed in various colours, rice paper is extensively used for the preparation of artificial flowers, while the white sheets are employed by native artists for water-colour drawings.

RICH, BARNABE (c. 1540-1617), English author and soldier, was a distant relative of Lord Chancellor Rich, He fought in the Low Countries, rising to the rank of captain, and afterwards served in Ireland. He shared in the colonization of Ulster, and spent the latter part of his life near Dublin. In the intervals of his campaigns he produced many pamphlets on political questions and romances. In 1606 he was in receipt of a pension of half a crown a day, and in 1616 he was presented with a gift of £100 as being the oldest captain in the service. He died on the rothof November 161 7. His best-known work is Riche his Farewell to Militarie Profession conteining verie pleasaunt discourses fit for a peaceable tyme (1581). Of the eight stories contained in it, five, he says, " are forged only for delight, neither credible to be believed, nor hurtful to be perused." The three others are translations from the Italian. He claims as his own invention the story of Apolonius and Silla, the second in the collection, from which Shakespeare took the plot of Twelfth Night. It is, however, founded on the tale of Nicuola and Lattantio as told by Matteo Bandello. The eighth, Phylotus and Emilia, a complicated story arising from the likeness and disguise of a brother and sister, is identical in plot with the anonymous play, Philotus, printed in Edinburgh in 1603. Both play and story were edited for the Bannatyne Club in 1835. In the conclusion to his collection Rich tells a story of a devil named Balthaser, who possesses a king of Scots, prudently changed after the accession of James I. to the " Grand Turk." The Strange and Wonderful Adventures of Don Simonides (1581), with its sequel (1584), is written in imitation of Lyly. Among his other romances should be mentioned The Adventures of Brusanus, prince of Hungaria (1592). His authenticated works number twenty-four, and include

works on Ireland, the troubles of which were, according to him, due to the religion of the people and to the lack of consistency and firmness on the part of the English government. Such are: Allarme to England (1578); A New Description of Ireland (1610); The Irish Hubbub, or the English Hue and Crie (161 7), in which he also inveighs against the use of tobacco.

See ” Introduction ” to the Shakespeare Society’s reprint of Riche his Farewell (1846) ; P. Cunningham’s ” Introduction ” to Rich’s Honesty of this Age (reprinted for the Percy Society, 1844) ; and the life by S-Lee in the Dictionary of National Biography.

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RICH, CLAUDItfS JAMES (i 787-1821), English traveller and scholar, was born near Dijon on the 28th of March 1787. His youth was spent at Bristol. He early developed a gift for languages, becoming familiar not only with Latin and Greek but also with Hebrew, Syriac, Persian, Turkish and other Eastern tongues. In 1804 Rich went to Constantinople, where, and at Smyrna, he stayed some time, perfecting himself in Turkish. Proceeding to Alexandria as assistant to the British consul-general there, he devoted himself to Arabic and its various dialects, and made himself master of Eastern manners and usages. On leaving Egypt he travelled by land tQ the Persian Gulf, disguised as a Mameluke, visiting Damascus, and entering the great mosque undetected. At Bombay, which he reached in September 1807, he was the guest of Sir James Mackintosh, whose eldest daughter he married in January 1808, proceeding soon after to Bagdad as resident. There he began his investigations into the geography, history and antiquities of the district. He explored the remains of Babylon, and projected a geographical and statistical account of the pashalic of Bagdad. The results of his work at Babylon appeared first in the Vienna serial Mines de l’ orient, and in 18 15 in England, under the title Narrative of a Journey to the Site of Babylon in j8ii. In 1813-14 Rich spent some time in Europe, and on his return to Bagdad devoted himself to the study of the geography of Asia Minor, and collected much information in Syrian and Chaldaean convents concerning the Yezidis. During this period he made a second excursion to Babylon, and in 1820 undertook an extensive tour to Kurdistan-ˆfrom Bagdad north to Sulimania, eastward to Sinna, then west to Nineveh, and thence down the Tigris to Bagdad. The narrative of this journey, which contained the first accurate knowledge (from scientific observation) regarding the topography and geography of the region, was published by his widow under the title, Narrative of a Residence in Koordistan and on the site of Ancient Nineveh, 6rc. (London, 1836).

In 1821 Rich went to BasOra, whence he made an excursion to Shiraz, visiting the ruins of Persepolis and the other remains in the neighbourhood. At Shiraz he died of cholera on the 5th of October 182 1. His fine collec- tions of manuscripts and coins was purchased by the British Museum.

RICH, JOHN (1692-1761), English actor, the ” father of English pantomime,” was the son of Christopher Rich (d. 1714)* the manager of Drury Lane, with whose quarrels and tyrannies Colley Cibber’s Apology is much occupied. John Rich opened the new theatre in Lincoln’s Inn Fields left unfinished 1 by his father, and here, in 1716, under the stage name of Lun, he first appeared as Harlequin in an unnamed entertainment which developed into an annual pantomine (q.v.). By this departure he made successful headway in his competition with the stronger company at Drury Lane, including Cibber, Wilks and Booth. Rich was less happy in his management of Covent Garden, which he opened in 1733, until Garrick’s arrival (1746), when a most prosperous season ensued, followed by a bad one when Garrick went to Dury Lane. During Rich’s management occurred the rival performances of Romeo and Juliet — Barry and Mrs Cibber at Covent Garden, and Garrick and Miss Bellamy at Dury Lane— and the subsequent competition between the two rival actors in King Lear. Rich died on the 26th of Nov- ember 1761. Garrick’s lines show that his acting was panto- mime pure and simple, without words: —

” When Lun appeared, with matchless art and Whim, He gave the power of speech to every limb : Tho’ masked and mute, conveyed his quick intent, And told in frolic gesture what he meant.”

RICH, PENELOPE, Lady (c. 1562-1607), the Stella of Sir Philip Sidney’s Astrophel and Stella, was the daughter of Walter Devereux, 1st Earl of Essex. She was a child of fourteen when Sir Philip Sidney accompanied the queen on a visit to Lady Essex in 1376, on her way from Kenilworth, and must have been frequently thrown into the society of Sidney, in consequence of the many ties between the two families. Essex died at Dublin 1 in September 15761 He had sent a message to Philip

Sidney from his death-bed expressing his desire that he should marry his daughter, and’ later his secretary wrote to the young man’s father, Sir Henry Sidney, in words which seem to point to the existence of a very definite understanding. Penelope’s great-grandmother was a sister of Anne Boleyn, and she and her brother Robert were therefore

distantly connected with Elizabeth. Perhaps the marriage of Lady Essex with the earl of Leicester, which destroyed Sidney's prospects as his uncle's heir, had something to do with the breaking off of the proposed match with Penelope. Her relative and guardian, Henry Hastings, earl of Huntingdon, secured Burghley's assent in March 1581 for her marriage with Robert Rich, 3rd Baron Rich. Penelope is said to have protested in vain against the alliance with Rich, who is represented as a rough and overbearing husband. The evidence against him is, however, chiefly derived from sources as interested as Sir Philip Sidney's violent denuncia- tion in the twenty-fourth; sonnet of Astrophel and Stella, " Rich fooles there be whose base and filthy hart." Sidney's serious love for Penelope appears to date from her marriage with Rich. The earlier sonnets are in praise of her beauty, or treat of the conventional topic of the struggle between reason and love, while the later ones are marked by unmistakable passion. The eighth song of Astrophel and Stella narrates Stella's refusal to accept Sidney as a' lover. Lady Rich was the mother of six children by her husband when she contracted in 1595 an open liaison with Charles Blount, 8th Lord Mountjoy, a brilliant courtier and favourite of Elizabeth, to whom she had long been attached. Rich took no steps against his wife during her brother's lifetime, and she nursed him through an illness in 1600, but they obtained a legal separation in 1601, and Mountjoy acknowledged her five children born after 1595. Mountjoy was created earl of Devonshire on the accession of James I., and Lady Rich was in high favour at court. In 1605, however, they legitimized their connexion by a marriage celebrated by William Laud, the earl's chaplain. This proceeding, carried out in defiance of canon law, was followed by the disgrace of both parties, who were banished from court. Devonshire died on the 3rd of April 1&06, and his wife within a year of that date. Her eldest son by Lord Rich, who became earl of Warwick in 1618,'was Robert Rich, 2nd earl of Warwick (1587-1658). The second, Henry Rich, earl of Holland, was beheaded in 1649 for his share in the second Civil War., Her eldest son by Mountjoy,Mount joy'Blount, Baron Mountjoy and earl of Newport (c. 1 597-1665) also figured in the Civil War.

See the editions of Astrophel and Stella by Dr A. B. Grosart, E. Arber and A. W. Pollard; also the various lives of Sir Philip Sidney, and Mrs Aubrey Richardson's Famous Ladies of the English Court (London, 1899). John Ford's Broken Heart has been alleged to have been founded on the history of Lady Rich. Richard Barn- field dedicated his Affectionate Shepherd (1594) to her; Bartholomew Yonge his Diana of George of Montemayor (1598) ; and sonnets are addressed to her by John Davies of Hereford and by Henry Constable.

RICH, RICHARD (fl. 1610), English soldier and adventurer, the author of Ncwes from Virginia, sailed from England on the 2nd of June 1609 for Virginia, with Captain Christopher Newport and the three commissioners entrusted with the foundation of the new colony. In his verse pamphlet he relates the adventures undergone by the expedition, and describes the resources of the new country, with the advantages offered to colonists. The title runs: Newes from Virginia. The lost Flocke Triumphant. With the happy Arrivall of that famous and worthy Knight Sr. Thomas Gates: and the well- reputed and valiant Captaine Mr Christopher Newport, and others, into England. With the maner of their distresse in the Hand of Devils (otherwise called Bermoothawes), where they remayned 42 weeks, and builded two Pynaces, in which they returned into Virginia. By R. Rich, Gent., one of the Voyage (1610).” The only known copy of this tract is in the Huth Library. A reprint edited by J. O. Halliwell- Phillips appeared in 1865 (another ed., 1874). The adventures related by Rich are supposed to have been in Shakespeare’s mind when he wrote The Tempest. Another tract by Rich mentioned in the Stationers’ Register, Good Speed to Virginia, is unknown.

RICH, RICHARD, ist Baron Rich (14907-1567), lord chan- cellor, was born of a Hampshire family about 1490, in the parish of St Laurence Jewry, London. His great-grandfather, Richard Rich, was a wealthy mercer and sheriff of the city of London in 1441. Probably Lord Rich’s father was also a mercer, but«he sent his son to the Middle Temple, where Sir Thomas More was among his acquaintances. More told him at the time of his trial that he was reputed light of his tongue, a great dicer and gamester, and not of any commendable fame; but he was a commissioner of the peace in Hertfordshire in 1528, and in the next autumn became reader at the Middle Temple. Other preferments followed, and in 1533 he was knighted and became solicitor-general, in which capacity he was to act under Thomas Cromwell as a ” lesser hammer ” for the demolition of the monasteries, and to secure the operation of Henry VIII. ‘s act of supremacy. He had an odious share in the trials of Sir Thomas More and Bishop Fisher. In both cases he made use in his evidence against the prisoner of admissions made in a professedly friendly conversation, and in More’s case the words he had used were misreported and received a miscon- struction that could hardly be other than wilful. More ex- pressed his opinion of the witness in open court with a candour that might well have dismayed Rich. Rich became the first chancellor (April 19, 1536) of the Court of

Augmentations established for the disposal of the monastic revenues. His own share of the spoil, acquired either by grant or purchase, included Leez (Leighs) Priory and about a hundred manors in Essex. He was Speaker of the House of Commons in the same year, and advocated the king's policy. In spite of the share he had taken in the suppression of the monasteries, and of the part he was to play under Edward VI., his religious convictions remained Roman Catholic. His testimony helped the con- viction of Thomas Cromwell, and he was a willing agent in the Catholic reaction which followed. Anne Askew stated that the Chancellor Wriothesley and Rich screwed the rack at her torture with their own hands.

Rich was one of the executors of the will of Henry VIII., on which so much suspicion has been thrown, and on the 26th of February 1548 he became Baron Rich of Leez. In the next month he succeeded Wriothesley as chancellor, an office in which he found full scope for the business and legal ability he undoubtedly possessed. He supported Protector Somerset in his subversive reforms in church matters, in the prosecution of his brother Lord Seymour of Sudeley, and in the rest of his policy until the crisis of his fortunes in October 1549, when he deserted to Warwick (afterwards Northumberland), and pre- sided over the trial of his former chief. His daughter had married Warwick's son, and both men were at heart no friends to the reformed religion. Nevertheless, Rich took part in the prosecution of bishops Gardiner and Bonner, and in the harsh treatment accorded to the Princess Mary. Possibly this harshness was exaggerated, for Mary on her accession showed no ill-will to Rich. He retired from the chancellorship on the ground of ill-health in the close of 1551, at the time of the final breach between Northumberland and Somerset. He was now sixty years old, and there is no reason to suspect the sincerity of his plea. There is an improbable story, however, to the effect that Rich warned Somerset of his danger in the Tower, and that the letter was delivered by mistake to the duke of Norfolk, who handed it to Northumberland.

Lord Rich took an active part in the restoration of the old religion in Essex under the new reign, and was one of the most active of persecutors. His reappearances in the privy council were rare during Mary's reign; but under Elizabeth he served on a commission to inquire into the grants of land made under Mary, and in 1 566 was sent for to advise on the question of the queen's marriage. He died at Rochford, Essex, on the 12th of June 1567, and was buried in Felsted church. In Mary's reign he had founded a chaplaincy with provision for the singing of masses and dirges, and the ringing of bells in Felsted church. To , this was added a Lenten allowance of herrings to the in- habitants of three parishes. These donations were transferred

in 1564 to the foundation of a grammar-school at Felsted for instruction, primarily for children born on the founder's manors, in Latin, Greek and divinity. The patronage of the school remained in the family of the founder until 1851. By his wife Elizabeth Jenks, or Gynkes, he had fifteen children. The eldest son Robert (1537?-! 581), second Baron Rich, supported the Reformation, and his grandson Robert, third lord, was created earl of Warwick in 1618.

The chief authorities are the official records of the period covered by his official life, calendared in the Rolls Series. See also A. F. Pollard, England under Protector Somerset (1900) ; P. Morant, History of Essex (2 vols., 1768) ; R. W. Dixon, History of the Church of England (6 vols., 1878-1902); and lives in J. Sargeaunt's History of Felsted School (1889), Lord Campbell's Lives of the Lord Chancellors (1845-69), and C. H. &T. Cooper's Athenae Canlabrigienses (2 vols.,

1858-61).

RICHARD, ST, of Wyche (c. 1 197-1253), English saint and bishop, was named after his birthplace, Droitwich in Worcester- shire. Educated at Oxford, he soon began to teach in the university, of which he became chancellor, probably after he had studied in Paris and in Bologna. About 1235 he became chancellor of the diocese of Canterbury under Archbishop Edmund Rich, and he was with the archbishop during his exile in France. Having returned to England some time after Edmund's death in 1240 he became vicar of Deal and chancellor of Canterbury for the second time. In 1244 he was elected bishop of Chichester, being consecrated at Lyons by Pope Innocent IV. in March 1245, although Henry III. refused to give him the temporalities of the see, the king favouring the candidature of Robert Passelewe (d. 1252). In 1246, however, Richard obtained the temporalities. The new bishop showed much eagerness to reform the manners and morals of his clergy, and also to introduce greater order and reverence into the services of the church. His term of office was also marked by the favour which he showed to the Dominicans, a house of this order at Orleans having sheltered him during his stay in France, and by his earnestness in preaching a crusade. He died at Dover in April 1253. It was generally believed that miracles were wrought at his tomb in Chichester cathedral, which was long a popular place of pilgrimage, and in 1262 he was canonized at Viterbo by Pope Urban IV. Richard furnished the chronicler, Matthew Paris, with material for the life of Edmund Rich, and instituted the offerings for the cathedral at Chichester which were known later as " St Richard's pence."

His life by his confessor, Ralph Bocking, is published in the Acta Sanctorum of the Bollandists, where a later and shorter life by John Capgrave is also to be found.

RICHARD (d. 1184), archbishop of Canterbury, was a Norman, who became a monk at Canterbury, where he acted as chaplain to Archbishop Theobald and was a colleague of Thomas Becket. In 1 1 73, more than two years after the murder of Becket, it was decided to fill the vacant archbishopric of Canterbury; there were two candidates, Richard, at that time prior of St Martin's, Dover, and Odo, prior of Canterbury, and in June Richard was chosen, although Odo was the nominee of the monks. Objections were raised against this election both in England and in Rome, but in April 1 1 74 the new archbishop was consecrated at Anagui by Pope Alexander III., and he returned to England towards the close of the year. The ten years during which Richard was archbishop were disturbed by disputes with Roger, archbishop of York, over the respective rights of the two sees, and in 1-175, at a council held in London, there was a free fight between their partisans. Henry II. arranged a truce for five years between the rival prelates, but Richard was soon involved in another quarrel, this being with Roger, abbot of St Augustine's, Canterbury, whose action also trenched upon the privileges of the archbishop. Richard was more acceptable to Henry II. than Becket had been; he attended the royal councils, and more than once he was with the king in Normandy. Henry probably preferred him because he insisted less on the rights of the clergy than his great predecessor had done; but the monastic writers and the followers of Becket regarded this attitude as a sign of weakness. Richard died at Rochester on the 16th of February n 84 and was

buried in his cathedral. See the article by W. Hunt in the Did. Nat. Biog. vol. xlviii. (1896); and W. F. Hook, Lives of the Archbishops of Canterbury.

RICHARD, earl of Cornwall and king of the Romans (1209- 1272), was the second son of the English king John by Isabella of Angouleme. Born in 1209, Richard was the junior of his brother, Henry III., by fifteen months; he was educated in England and received the earldom of Cornwall in 1225. From this date to his death he was a prominent figure on the political stage. In the years 1225-27 he acted as governor of Gascony; between 1227 and 1238, owing to quarrels with his

brother and dislike of the foreign favourites, he attached himself to the baronial opposition and bade fair to become a popular hero. But in 1240 he took the command of a crusade in order to escape from the troubled atmosphere of English politics. He was formally reconciled with Henry before his departure; and their amity was cemented on his return by his marriage with Sancha of Provence, the sister of Henry's queen (1243). Henceforward Richard, though by no means blind to the faults of the govern- ment, was among the most constant supporters of Henry III. While affecting to remain neutral in the quarrels of the barons with the Poitevins and Savoyards he constantly assisted the king with loans, and thus enabled him to withstand the pressure of the Great Council for reform. In 1257 a bare majority of the German electors nominated Richard as king of the Romans, and he accepted their offer at Henry's desire. He was elected partly on account of his wealth, hut also because his family connexion with the Hohenstaufen and his friendly relations with the papacy made it probable that he would unite all German parties. In the years 1257-68 Richard paid four visits to Germany. He obtained recognition in the Rhineland, which was closely connected with England by trade relations. Otherwise, how- ever, he was unsuccessful in securing German support. In the English troubles of the same period he endeavoured to act as a mediator. On the outbreak of civil war in 1264 he took his brother's side, and his capture in a windmill outside Lewes, after the defeat of the royalist army, is commemorated in the earliest of English vernacular satires; he remained a prisoner till the fall of Montfort. But after Evesham he exerted himself, not without success, to obtain reasonable terms for those who had suffered from the vengeance of the royalist party. He died on the 2nd of April 1272. His end is said to have been hastened by grief for his eldest son, Henry of Almain, who had been murdered in the previous year by the sons of Simon de Montfort at Viterbo. The earldom of Cornwall passed to Richard's eldest surviving son Edmund, who was guardian of, England from 1286 to 1289. On Edmund's death, in October 1300, it became extinct.

Authorities. — The original sources and general works of reference are the same as for the reign of Henry III. G. C Gebauer's Leben und Thalen Herrn Richards von Cornwall (Leipzig, 1744), H. Koch's Richard von Corn-wall, 1209-1257 (Strassburg, 1888), and A. Busson's Doppelwahl des Jahres, 1257 (Munster, 1866) are useful monographs.

(H. W. C. D.)

RICHARD I. (1157-1199), king of England, nicknamed " Cceur de Lion " and " Yea and Nay," was the third son of Henry II. by Eleanor of

Aquitaine. Born in September n 57, he received at the age of eleven the duchy of Aquitaine, and was formally installed in 1172. In his new position he was allowed, probably from regard to Aquitanian susceptibilities, to govern with an independence which was studiously denied to his brothers in their shares of the Angevin inheritance. Yet in 1 173 Richard joined with the young Henry and Geoffrey of Brittany in their rebellion; Aquitaine was twice invaded by the old king before the unruly youth would make submission. Richard was soon pardoned and reinstated in his duchy, where he distinguished himself by crushing a formidable revolt (n 75) and exacting homage from the count of Toulouse. In a short time he was so powerful that his elder brother Henry became alarmed and demanded, as heir-apparent, that Richard should do him homage for Aquitaine. Richard having scornfully rejected the demand, a fratricidal war ensued; the young Henry invaded Aquitaine and attracted to his standard many

of Richard's vassals, who were exasperated by the iron rule of the duke. Henry II. marched to Richard's aid; but the war terminated abruptly with the death of the eldei prince (1183).

Richard, being now the heir to England and Normandy, was invited to renounce Aquitaine in favour of Prince John. The proposal led to a new civil war; and, although a temporary compromise was arranged, Richard soon sought the help of Philip Augustus, to whom he did homage for all the continental possessions in the actual presence of his father (Conference of Bonmoulins, 18th of November n 88) In the struggle which ensued the old king was overpowered, chased ignominiously from Le Mans to Angers, and forced to buy peace by conceding all that was demanded of him; in particular the immediate recognition of Richard as his successor.

But the death of Henry II. (1189) at once dissolved the friend- ship between Richard and Philip. Not only did Richard continue the continental policy of his father, but he also reˆ fused to fulfil his contract with Philip's sister, Alais, to whom he had been betrothed at the age of three. An open breach was only delayed by the desire of both kings to fulfil the crusading vows which they had recently taken. Richard, in particular, sacrificed all other interests to this scheme, and raised the necessary funds by the most reckless methods. He put up for auction the highest offices and honours; even remitting to William the Lion of Scotland, for a sum of 15,000 marks, the humiliating obligations which Henry II. had im- posed at the treaty of Falaise. It is true that Richard indemni- fied himself on his return by resuming some of his most important grants and refusing to return the purchase money; but it is improbable that he had originally planned this re-

pudiation of his ill-considered bargains. By such expedients he raised and equipped a force which 1 may be estimated at 4000 men-at-arms and as many foot-soldiers, with a fleet of 100 transports (1191).

Richard did not return to his dominions until 1194. But his stay in Palestine was limited to sixteen months. On the outward journey he wintered in Sicily, where he employed himself in quarrelling with Philip and in exacting satisfaction from the usurper Tancred for the dower of his widowed sister, Queen Joanna, and for his own share in the inheritance of William the Good. Leaving Messina in March 1191, he inter- rupted his voyage to conquer Cyprus, and only joined the Christian besiegers of Acre in June. The reduction of that stronghold was largely due to his energy and skill. But his arrogance gave much offence. After the fall of Acre he in- flicted a gross insult upon Leopold of Austria; and his relations with Philip were so strained that the latter seized the first pretext for returning to France, and entered into negotiations with Prince John (see John, king of England) for the partition of Richard's realm. Richard also threw himself into the disputes respecting the crown of Jerusalem, and supported Guy of Lusignan against Conrad of Montferrat with so much heat that he incurred grave, though unfounded, suspicions of complicity when Conrad was assassinated by emissaries of the Old Man of the Mountain. None the less Richard, whom even the French crusaders accepted as their leader, upheld the failing cause of the Frankish Christians with valour and tenacity. He won a brilliant victory over the forces of Saladin at Arsuf (1191), and twice led the Christian host within a few miles of Jerusalem. But the dissensions of the native Franks and the crusaders made it hopeless to continue the struggle; and Richard was alarmed by the news which reached him of John's intrigues in England and Normandy. Hastily patching up a truce with Saladin, under which the Christians kept the coast-towns and received free access to the Holy Sepulchre, Richard started on his return (9th October 1192).

His voyage was delayed by storms, and he appears to have been perplexed as to the safest route. The natural route over- land through Marseilles and Toulouse was held by his enemies; that through the empire from the head of the Adriatic was little safer, since Leopold of Austria was on the watch for him. Having adopted the second of these alternatives, he was cap-

tured at Vienna in a mean disguise (December 20th, 1192) and strictly confined in the duke's castle of Durenstein on the Danube. His mishap was soon known to England, but the regents were for some weeks uncertain of his whereabouts. This is the foundation for the tale of his discovery by the faithful minstrel Blondel, which first occurs in a French romantic chronicle of the next century. Early in 1103 Leopold surrendered his prize, under compulsion, to the emperor Henry VI., who was aggrieved both by the support which the Plantagenets had given to the family of Henry the Lion and also by Richard's recognition of Tancred in Sicily. Al- though the detention of a crusader was contrary to public law, Richard was compelled to purchase his release by the payment of a heavy ransom and by doing homage to the emperor for England. The ransom demanded was 150,000 marks; though it was never discharged in full, the resources of England were taxed to the utmost for the first instalments; and to this occasion we may trace the beginning of secular taxation levied on movable property.

Richard reappeared in England in March 1194; but his stay lasted only a few weeks, and the remainder of his reign was entirely devoted to his continental interests. He left England to be governed by Hubert Walter (q.v.), and his personal authority was seldom asserted except by demands for new subsidies. The rule of the Plantagenets was still popular in Normandy and Aquitaine; but these provinces were unable or unwilling to pay for their own defence. Though Richard prove'd himself consistently the superior of Philip in the field, the difficulty of raising and paying forces to resist the French increased year by year. Richard could only stand on the defensive; the keynote of his later policy is given by the building of the famous Chateau Gaillard at Les Andelys (1196) to protect the lower courses of the Seine against in- vasion from the side of France. He did not live to see the futility of such bulwarks. In 1199 a claim to treasure-trove embroiled him with the viscount of Limoges. He harried the Limousin and laid siege to the castle of Chalus; while directing an assault he was wounded in the shoulder by a crossbow bolt, and, the wound mortifying from unskilful treatment or his own want of care, he died on the 6th of April 1199. He was buried by his own desire at his father's feet in the church of Fontevrault. Here his effigy may still be seen. 1 Though contemporary, it does not altogether agree with the portraits on his Great Seal, which give the impression of greater strength and even of cruelty. The Fontevrault bust is no doubt idealized.

The most accomplished and versatile representative of his gifted family, Richard was, in his lifetime and long after- wards, a favourite hero with troubadours and romancers. This was natural, as he

belonged to their brotherhood and himself wrote lyrics of no mean quality. But his history shows that he by no means embodied the current ideal of chivalrous ex- cellence. His memory is stained by one act of needless cruelty, the massacre of over two thousand Saracen prisoners at Acre; and his fury, when thwarted or humbled, was ungovernable. A brave soldier, an experienced and astute general, he was never happier than when engaged in war. As a ruler he was equally profuse and rapacious. Not one useful measure can be placed to his credit; and it was by a fortunate accident that he found, in Hubert Walter, an administrator who had the skill to mitigate the consequences of a reckless fiscal policy. Richard's wife was Berengaria, daughter of Sancho VI., king of Navarre, whom he married in Cyprus in May 1191. She was with the king at Acre later in the same year, and during his imprisonment passed her time in Sicily, in Rome and in France. Husband and wife met again in 1195, and the queen long survived the king, residing chiefly at Le Mans. She died

1 The remains of Richard, together with those of Henry II. and his queen Eleanor, were removed in the 17th century from their tombs to another part of the church. They were rediscovered in 1910 during the restoration of the abbey undertaken by the French government.

soon after 1230. Berengaria founded a Cistercian monastery at Espau.

Authorities. — The more important of the general chronicles are: the Gesta Henrici Secundi, ascribed to Benedict of Peter- borough (Rolls Series, 2 vols., 1867); the Chronica of Roger of Hoveden (Rolls Series, 4 vols., 1868-71) ; the Chronica of Gervase of Canterbury (Rolls Series, 1879); the Imagines Hisloriarum of Ralph of Diceto (Rolls Series, 2 vols., 1876); the Historia Rerum Angli- carum of William of Newburgh (in Chronicles of the Reigns of Stephen, &c, Rolls Series, 2 vols., 1884-85) ; the De rebus gestis Ricardi Primi of Richard of Devizes (in Chronicles of the Reigns of Stephen, &c, vol. iii., Rolls Series, 1886) ; the Chronicon Anglicanum of Ralph of Coggeshall (Rolls Series, 1875); the Flores Historiarum of Roger of Wendover (Rolls Series, 3 vols., 1886-89) ; the Gesta Philippi Augusti of Rigord (Societe de I'histoire de France, Paris, 1882) and of Guillaume le Breton (op. cit.). A detailed narrative of Richard's crusade is given in L'Estoire de la guerre sainte, a rhyming French chronicle by the minstrel Ambroise (ed. Gaston Paris, Paris, 1897), and in the Latin prose version known as the Itinerarium O. Peregrinorum et gesta Regis Ricardi; this last, with some valuable historical letters, is printed in W. Stubbs's Chronicles and Memorials of the Reign of Richard I. (Rolls Series, 2 vols., 1864-65). Of modern works the following are useful : W. Stubbs's preface to vols. iii. and iv. of Hoveden; the same author's

Constitutional History of England, vol. i. (Oxford, 1897) ; Miss K. Norgate's England under the Angevin Kings, vol. ii. (London, 1887); Sir J. H. Ramsay's Angevin Empire (London, 1903) ; R. Rohricht's Geschichte des Konigreichs Jerusalem (1898); W. B. Stevenson's Crusaders in the East (Cambridge, 1907); A. Cartellieri's Philipp II. August (Leipzig, 1899, &c).

(H. W. C. D.)

RICHARD II. (1367-1400), king of England, younger son of Edward the Black Prince by Joan " the Fair Maid of Kent," was born at Bordeaux on the 6th of January 1367. He was brought to England in 13 71, and after his father's death was, on the petition of the Commons in parliament, created prince of Wales on the 20th of November 1376. When Edward III. died, on the 21st of June 1377, Richard became king. Popular opinion had credited John of Gaunt with designs on the throne. This was not justified; nevertheless, the rivalry of the boy- king's uncles added another to the troubles due to the war, the Black Death and the prospect of a long minority. At first the government was conducted by a council appointed by parliament. The council was honest, but the difficulties of the situation were too great. The ill-considered poll-tax of 1381 was the occasion, though not the real cause, of the Peasants' Revolt in that year. The ministers were quite unequal to the crisis, and when Wat Tyler and his followers got possession of London, it was Richard who showed a pre- cocious tact and confidence in handling it. It was the boy- king who met and temporized with the rebels on the 13th of June at Mile End, and again next day at Smithfield; and he who, with courageous presence of mind, saved the situation when Tyler was killed, by calling on them to take him for their leader. From this time Richard began to assert himself. His chief ministers, appointed by parliament in 1382, were the earl of Arundel and Michael de la Pole. Arundel Richard disliked, and dismissed next year, when he began his personal government. Pole, whom he retained as chancellor and made earl of Suffolk, was a well-chosen adviser. But others, and especially his youthful favourite Robert de Vere, promoted by unheard-of honour to be marquess of Dublin and duke of Ireland, were less worthy. Further, Richard made his own position difficult by lavish extravagance and unseemly out- bursts of temper. He chafed under the restraint of his relatives, and therefore encouraged John of Gaunt in his Spanish enter- prise. This gave the less scrupulous Thomas of Gloucester his opportunity. Gloucester, supported by Arundel, attacked his nephew's ministers in the parliament of 1386, and by open hints at deposition forced Richard to submit to a council of control. When Richard, with the aid of his friends and by the advice of subservient judges, planned a

reversal of the parliament, Gloucester, at the head of the so-called lords ap- pellant, anticipated him, Richard had been premature and ill- advised. Gloucester had the advantage of posing as the head of the constitutional party. The king's friends were driven into exile or executed, and he himself forced to submit to the loss of all real power (May 1388). Richard changed his

methods, and when the lords appellant had lost credit, asserted himself constitutionally by dismissing Gloucester's supporters from office, and appointing in their place well-approved men like William of Wykeham. In the next parliament of 1390 the king showed himself ready to meet and conciliate his subjects. The simultaneous return of John of Gaunt from Spain put a check on Gloucester's ambition. For seven years Richard ruled constitutionally and on the whole well. The opposition was quiescent except for two outbreaks by Arundel: the first was a violent attack on John of Gaunt, which rather strengthened Richard's position; the second was a wanton insult to the king at the funeral of his queen.

In January 1383 Richard had married Anne of Bohemia (1366-1394), daughter of the emperor Charles IV. The marriage, though childless, was happy; had Anne lived or borne a son the course of events might have been different. Her death on the 7th of June 1394 was a great shock to Richard, and incidentally had important consequences. Richard sought distraction by an expedition to Ireland, the first visit of an English king for more than two centuries. In his policy there he showed a wise statesmanship. At the same time he was negotiating for a permanent peace with France, which was finally arranged in October 1396 to include his own marriage with Isabella, daughter of Charles VI., a child of seven. Gloucester criticized the peace openly, and there was some show of opposition in the parliament of February 1397. But there was nothing to foreshadow the sudden stroke by which in July Richard arrested Gloucester and his chief supporters, the earls of Arundel and Warwick. The others of the five lords appellant, Henry of Bolingbroke afterwards King Henry IV, and the earl of Nottingham, now supported the king. Richard's action was apparently in deliberate revenge for the events of 1387-88. Gloucester, after a forced con- fession, died in prison at Calais, smothered by his nephew's orders. Arundel in a packed parliament was condemned and executed; his brother Thomas archbishop of Canterbury was exiled. The king's friends, including Nottingham and

Boling- broke, made dukes of Norfolk and Hereford, were all promoted in title and estate. Richard himself was rewarded for ten years' patience by the possession of absolute power. He might perhaps have established it if he could have exercised it with moderation. But he declared that the laws of England were in his mouth, and supported his court in wanton luxury by arbitrary methods of taxation. By the exile of Norfolk and Hereford in September 1398 he seemed to have removed the last persons he need fear. He was so confident that in May 1399 he paid a second visit to Ireland, taking with him all his most trusted adherents. Thus when Henry landed at Ravenspur in July he found only half-hearted opposition, and when Richard himself returned it was too late. Ultimately Richard surrendered to Henry at Flint on the 19th of August, promising to abdicate if his life was spared. He was taken to London riding behind his rival with indignity. On the 30th of September he signed in the Tower a deed of abdication, wherein he owned himself insufficient and useless, reading it first aloud with a cheerful mien and ending with a request that his cousin would be good lord to him. The parliament ordered that Richard should be kept close prisoner, and he was sent secretly to Pontefract. There in February 1400 he died: no doubt of the rigour of his winter imprisonment, rather than by actual murder as alleged in the story adopted by Shakespeare. The mystery of Richard's death led to rumours that he had escaped, and an impostor pretending to be Richard lived during many years under the protection of the Scottish government. But no doubt it was the real Richard who was buried without state in 1400 at King's Langley, and honourably reinterred by Henry V. at Westminster in 1413.

Richard II. is a character of strange contradictions. It is difficult to reconcile the precocious boy of 1381 with the way- ward and passionate youth of the next few years. Even if it be supposed that he dissembled his real opinions during the period of his constitutional rule, it is impossible to believe that

the apparent indifference which he showed in his fall was the mere acting of a part. His violent outbursts of passion perhaps give the best clue to a mercurial and impulsive nature, easily elated and depressed. He had real ability, and in his Irish policy, and in the preference which he gave to it over continental adventure, showed a statesmanship in advance of his time. But this, in spite of his lofty theory of kingship, makes it all the more difficult to explain his extravagant bearing in his prosperity. His fall was due to the triumph of national right over absolute government, but it was his personal conduct which made it inevitable. In appearance Richard was tall and handsome, if effeminate. He had some literary tastes, which were

shown in fitful patronage of Chaucer, Gower and Froissart. His fancy for splendid dress may have been due to an artistic sense, which found better expression in his great buildings of Westminster Hall and Abbey. Richard's second queen, Isabella (1389-1409), was born in Paris on the 9th of November 1389, and was married to the English king at Calais in October, or November, 1396, but on account of the bride's youth the marriage was never consummated. When Richard lost his crown in 1399 Isabella was captured by Henry IV.'s partisans and sent to Sonning, near Reading, while her father, Charles VI., asked in vain for the restoration of his daughter and of her dowry. In 1401 she was allowed to return to France; in 1406 she became the wife of the poet, Charles, duke of Orleans, and she died on the 13th of September 1409.

Bibliography. — The best contemporary authorities are the Chronicon Angliae down to 1388, Walsingham's Hisloria Anglicana, the Annates Ricardi II., Knighton's Chronicle (all these in the Rolls Series), the Vita Ricardi II. by a Monk of Evesham (ed. T. Hearne), and the Chronique de la traison et mort (English Hist. Soc). Froissart wrote from some personal knowledge. A metrical account of Richard's fall, probably written by a French knight called Creton, is printed in Archaeologia, xx. The chief collections of documents are the Rolls of Parliament and the Calendar of Patent Rolls. H. A. Wallon's Richard II. (Paris, 1864) is the fullest life, though now somewhat out of date. For other modern accounts see W. Stubbs, Constitutional History, and C. W. C. Oman, The Political History of England, vol. iv., and The Great Revolt of 1381. (C. L. K.)

RICHARD III. (1452-1485), king of England, youngest son of Richard, duke of York, by Cicely Neville, was born at Fothering- hay on the 2nd of October 1452. After the second battle of St Albans in February 146 1, his mother sent him with his brother George for safety to Utrecht. They returned in April, and at the coronation of Edward IV. Richard was created duke of Gloucester. As a mere child he had no importance till 1469- 1470, when he supported his brother' against Warwick, shared his exile and took part in his triumphant return. He distinguished himself at Barnet and Tewkesbury; according to the Lancastrian story, after the latter battle he murdered the young Edward of Wales in cold blood; this is discredited by the authority of Warkworth {Chronicle, p. 18); but Richard may have had a share in Edward's death during the fighting. He cannot be so fully cleared of complicity in the murder of Henry VI., which probably took place at the Tower on the night of the 21-22 of May, when Richard was certainly present there. Richard shared to the full in his brother's prosperity. He had large grants of lands and office, and by marrying

Anne (1456-1485), the younger daughter of Warwick, secured a share in the Neville inheritance. This was distasteful to George, duke of Clarence, who was already married' to the elder sister, Isabel. The rivalry of the two brothers caused a quarrel which was never appeased. Richard does not, however, seem to have been directly responsible for the death of Clarence in 1478; Sir Thomas More, who is a hostile v/itness, says that he resisted it openly " how- beit somewhat (as men deemed) more faintly than he that were heartily minded to his wealth." Richard's share of the Neville inheritance was chiefly in the north, and he resided usually at Middleham in Yorkshire. In May 1480 he was made the king's lieutenant-general in the north, and in 1482 commanded a successful invasion of Scotland. His administration was good, and brought him well-deserved popularity. On Edward's death he was kept informed .of events in London by William, Lord Hastings, who shared his dislike of the Woodville influence.

On the 29th of April 1483, supported by the duke of Bucking- ham, he intercepted his nephew at Stony Stratford and arrested Lord Rivers and Richard Grey, the little king's half-brother. [t was in Richard's charge that Edward was brought to London on the 4th of May. Richard was recognized as protector, the Woodville faction was overthrown, and the queen with her younger children took sanctuary at Westminster. For the time the government was carried on in Edward's name, and the 22nd of June was appointed for his coronation. Richard was nevertheless gathering forces and concerting with his friends. In the council there was a party, of whom Hastings and Bishop Morton were the chief, which was loyal to the boy-king. On the 13 th of June came the famous scene when Richard appeared suddenly in the council baring his withered arm and accusing Jane Shore and the queen of sorcery; Hastings, Morton and Stanley were arrested and the first-named at once beheaded. A few days later, probably on the 25th of June, Rivers and Grey were executed at Pontefract. On the 22nd of June Dr Shaw was put up to preach at Paul's Cross against the legitimacy of the children of Edward IV. On the 25th a sort of parliament was convened at which Edward's marriage was declared invalid on the ground of his precontract with Eleanor Talbot, and Richard rightful king. Richard, who was not present, accepted the crown with feigned reluctance, and from the following day began his formal reign.

On the 6th of July Richard was crowned at Westminster, and immediately afterwards made a royal progress through the Midlands,

on which he was well received. But in spite of its apparent success the usurpation was not popular. Richard's position could not be secure whilst his nephews lived. There seems to be no reasonable' doubt that early in August Edward V. and his brother Richard (whom Elizabeth Woodville had been forced to surrender) were murdered by their uncle's orders in the Tower. Attempts have been made to clear Richard's memory. But the report of the princes' death was believed in England at the time, " for which cause king Richard lost the hearts of the people " (Chronicles of London, 191), and it was referred to as a definite fact before the French states-general in January 1484. The general, if vague, dissatisfaction found its expression in Buckingham's rebellion. Richard, however, was fortunate, and the movement collapsed. He met his only parliament in January 1484 with some show of triumph, and deserves credit for the wise intent of its legislation. He could not, however, stay the undercurrent ' of disaffection, and his ministers, Lovell and Catesby, were unpopular. His position was weakened by the death of his only legitimate son in April 1484. His queen died also a year later (March 16, 1485), and public opinion was scandalized by the rumour that Richard intended to marry his own niece, Elizabeth of York. Thus the feeling in favour of his rival Henry Tudor strengthened. Henry landed at Milford Haven on the 7th of August 1485, and it was with dark forebodings that Richard met' him at Bosworth on the 22nd. The defection of the Stanleys decided the day. Richard was killed fighting, courageous at all events. After the battle his body was carried to Leicester, trussed across a horse's back, and buried without honour in the church of the Greyfriars.

Richard was not the villain that his enemies depicted. He had good qualities, both as a man and a. ruler, and showed a sound judgment of political needs. Still it is impossible to acquit him of the crime, the popular belief in which was the chief cause of his ruin. He was not a monster; but a typical man in an age of strange contradictions of character, of culture combined with cruelty, and of an emotional temper that was capable of high ends, though unscrupulous of means. Tradition represents Richard as deformed. It seems clear that he had some physical defect, though not so great as has been alleged. John Stow told Buck that old men who remembered Richard described him as in bodily form comely enough. Extant portraits show an intellectual face characteristic of the early Renaissance, but do not indicate any deformity.

Bibliography. — -The chief original authorities are Sir Thomas More's History of Richard III., based on information supplied by Archbishop Morton, and therefore to be accepted with caution; the

more trustworthy Continuation of the Croyland Chronicle in Fulman's Scriptores, the History of Polydore Vergil, written in a Tudor spirit ; the Chronicle of London (ed. C. L. Kingsford, 1905), and its biased expansion in Fabyan's Chronicle. See also Letters and Papers Illustrativeˆ of the Reigns of Richard III. and Henry VII., ed. J. Gairdner, in Rolls Series. Of later accounts those in Stow's Annates (preserving some oral tradition) and George Buck's Richard III. ap. Kennet History of England deserve mention. Horace Walpole attempted a vindication in his Historic Doubts (1768). The best modern account is James Gairdner's Life of Richard III. (2nd ed., 1898). The latest and fullest defence is given in Sir Clements Markham's Richard III., His Life and Character (1906); G. B. Churchill's Richard the Third up to Shakespeare {Palaestra x., 1900) is a valuable digest of material. (C. L. K.)

RICHARD, FRANCOIS MARIE BENJAMIN (1819-1908), archbishop of Paris, French prelate, was born at Nantes on the 1st of March 18 19. Educated at the seminary of St Sulpice he became successively vicar-general of Nantes, bishop of Belley, and in 1875 coadjutor of Paris. In 1886 the death of Archbishop Guibert was followed by Mgr. Richard's appoint- ment to the see of Paris, and in 1889 he received a cardinal's hat. In January 1900 the trial of the Assumptionist Fathers resulted in the dissolution of their society as an illegal associaˆ tion. Next day an official visit of the archbishop to the Fathers was noted by government as an act of a political character, and Mgr. Richard was officially censured. His attitude was in general exceedingly moderate, he had no share in the extremist policy of the Ultrarhontanes, and throughout the struggle over the law of Associations and the law of Separations he maintained his reasonable temper. He presided in September 1906 over an assembly of bishops and archbishops at his palace in the rue de Grenelle, a few days after the papal encyclical forbidding French Catholics to form associations for public worship, but it was then too late for conciliation. In December he gave up the archiepiscopal palace to the government authorities. He was then an old man of nearly ninety, and his " eviction " evoked great sympathy. Cardinal Richard died on the 29th of January 1908.

RICHARD, HENRY (1812-1888), Welsh politician, was the son of the Rev. Ebenezer Richard (1781-1837), a Calvinistic Methodist minister, and was born on the 3rd of April 181 2. Educated at Llangeitho grammar school, he also studied at a college at Highbury, and in 1835 he became minister of a Con- gregational church in the Old Kent Road, London, a position which he retained for fifteen years. Richard is chiefly known as an advocate of peace and international arbitration. In 1848 he became secretary of the Peace Society, and in this capacity

he helped to organize a series of congresses in the capitals of Europe, and was partly instrumental in securing the insertion of a declaration in favour of arbitration in the treaty of Paris in 1856. He resigned this post in 1885. In 1868 Richard was elected member of parliament for the Merthyr boroughs, and he remained in the House of Commons until his death aj; Treborth, near Bangor, on the 20th of August 1888. In parliament he was a leading member of the party which advocated the removal of Nonconformist grievances and the disestablishment of the church in Wales; in 1877 he was chairman of the Congregational Union of England and Wales. Among Richard's writings may be mentioned: Defensive War (1846, and again 1890); Memoirs of Joseph Slurge (1864) ; Letters on the Social and Political Condition of the Principality of Wales (1866, and again 1884); and The Recent Progress of International Arbitration (1884). He also prepared some of the material for the life of his friend and associate, Richard Cobden, which was written by Mr John, now Lord, Morley; and he did some journalistic work in the Morning Star and the Evening Star.

See C. S. Miall, Henry Richard, M.P. (1889); L. Appleton, Memoirs of Henry Richard (1889); and articles in Cymru Fydd for 1888.

RICHARD OF CIRENCESTER (c. 1335-e. 1401), historical writer, was a member of the Benedictine abbey at Westminster, and his name (" Circfistre ") first appears on the chamberlain's list of the monks of that foundation drawn up in the year 1355. In the year 1391 he obtained a licence from the abbot to go to Rome, and in this the abbot gives his testimony to Richard's

perfect and sincere observance of religion for upwards of thirty- years. In 1400 Richard was in the infirmary of the abbey, where he died in the following year. His only known extant work is Speculum Historiak de Gestis Regum Angliae, 447-1066. The MS. of this is in the university library at Cambridge, and has been edited for the Rolls Series (No. 30) by Professor J. E. B. Mayor (2 vols., London, 1863-60). It is in four books, and at the conclusion of the fourth book Richard expresses his intention of continuing his narrative from the accession of William I., and incorporating a sketch of the Conqueror's career from his birth. This design he does not, however, appear to have carried into effect. The value of the Speculum as a con- tribution to our historical knowledge is but slight, for it is mainly a compilation from other writers; while even in trans- scribing these the compiler is guilty of great carelessness. He gives, however, numerous charters relating to Westminster Abbey, and also a very complete account of the saints whose tombs were in the abbey church, and especially of Edward the Confessor. The work was, however, largely used by historians and antiquaries, until, with the rise of a more critical spirit, its value became more accurately estimated. Besides the Spec- ulum Richard also wrote, according to the statement of William of Woodford in his Answer to Wycliffe (Edward Brown, Fasciculus Rerum expetendarum, p. 193), a treatise De Officiis; and there was formerly in the cathedral library at Peterborough another tractate from his pen, entitled Super Symbolum. Of neither of these works, however, does any known copy now exist.

The Speculum affords the most conclusive proof of the spurious- ness of another work attributed to Richard and long accepted by the learned world as his. This was the De Situ Britanniae, an elaborate forgery relating to the antiquities of Roman Britain, which first appeared at Copenhagen in the year 1747. It was printed with the works of Gildas and Nennius, under the editorship of Charles Julius Bertram, professor of English in the academy of Copenhagen in the middle of the 1 8th century, with the following special title: " Richardi Corinensis monachi Westmonasteriensis de situ Britanniae libri duo. E. Codici MS. descripsit, Notisque et Indice adornavit Carolus Bertram."

This forgery was accepted as genuine by a well-known antiquary of the 1 8th century, Dr William Stukeley, and under the sanction of his authority continued for a long time to be regarded in the same light by numerous scholars and antiquaries, including Gibbon and Lingard. On the other hand, critics of a later date gave expression, on various grounds, to a contrary conclusion. All doubt on the subject may, however, be held to have been effectually set at rest by the masterly

exposure of the whole fraud drawn up by Professor Mayor in the preface to the edition above referred to of the Speculum. He has there not only demonstrated, from the external and internal evidence alike, the spuriousness of the whole treatise, but in a collation (extending to nearly a hundred pages) of numerous passages with corresponding passages in classical medieval authorities, has also traced out the various sources whence Bertram derived the terminology and the facts which he reproduced in the De Situ. (J. B. M.)

RICHARD OF DEVIZES (fl. 1101), English chronicler, was a monk of St Swithin's house at Winchester. His birthplace is probably indicated by his surname, but of his life we know nothing. He is credited by Bale with the composition of the Annates de Wintonia, which are edited by Luard in the second volume of the Annates Monastici. If this statement be correct, then the chronicler survived King Richard I. But the Chronicon de rebus gestis Ricardi Primi, by which Richard of Devizes is chiefly known, only covers the first three years of that king's reign; it is practically an account of events in England and the Holy Land during the Third Crusade. For the events of the crusade itself, Richard is a poor authority. But his account of the preparations for the crusade, and of English affairs in the king's absence, is valuable, in spite of some inaccuracies. The author is intensely conservative, steeped in the prejudices of his order, and particularly hostile to the Jews and to the chancellor, William Longchamp. He writes in a vivid and epigrammatic style; his Latin shows the effect of the 12th- century renaissance in its polish and in its reminiscences of classical poets.

See the editions of the Chronicon de rebus gestis Ricatdi Primi by J. Stevenson (Eng. Historical Soc., 1838) and by R. Howlett in

Chronicles of the Reigns of Stephen, Henry II. and Richard I., vol. iii. (Rolls Series, 1886); the Annates de Wintonia in H. R. Luard's Annates Monastici, vol. ii. (Rolls Series, London, 1864-69).

(H. W. C. D.)

RICHARD OF HEXHAM (fl. 1141), English chronicler, became prior of Hexham about 1141, and died between n 63 and n 78. He wrote Brevis Annotatio, a short history of the church of Hexham from 674 to 1138, for which he borrowed from Bede, Eddius and Simeon of Durham. This is published by J. Raine in The Priory of Hexham, its Chroniclers, Endowments and Annals (Durham, 1864-65). More important is his Historia de gestis regis Stephani et de bello Standardii, very valuable for the history of the north of England during the earlier part of the reign of Stephen, and especially for the

battle of the Standard. This history, which is a contemporary one, covers the period from the death of Henry I. in 1135 to early in 1139. It has been edited for the Rolls Series by R. Howlett in the Chroniclers of the Reigns of Stephen, Henry II. and Richard I., vol. iii. (1886); and has been translated by J. Stevenson in the Church Historians of England, vol. iv. (1856).

RICHARD OF ILCHESTER (d. 1188), English statesman and prelate, was born in the diocese of Bath, where he obtained preferment. Early in the reign of Henry II., however, he is found acting as a clerk in the king's court, probably under Thomas Becket, and he was one of the officials who assisted Henry in carrying out his great judicial and financial reforms. In 1162, or 1163, he was appointed archdeacon of Poitiers, but he passed most of his time in England, although in the next two or three years he visited Pope Alexander III. and the Emperor Frederick I. in the interests of the English king, who was then engaged in his struggle with Becket. For promising to support Frederick against Alexander he was excommunicated by Becket in 1 166. Before this event, however, Richard had been ap- pointed a baron of the exchequer, his great industry and exceptional abilities as an accountant being recognized by giving him a special seat at the exchequer table, and from 11 68 until his death he frequently acted as one of the itinerant justices. Although totally immersed in secular business he received several rich ecclesiastical offices, and in May n 73 he was elected bishop of Winchester, being consecrated at Canter- bury in October n 74. Richard still continued to serve Henry II. In 117,6 he was appointed justiciar and seneschal of Normandy, and was given full control of all the royal business in the duchy. He died on the 21st or 22nd of December 1188, and was buried in Winchester cathedral. Richard owes his surname to the fact that Henry II. granted him a mill at Ilchester; he is also called Richard of Toclyve.

See the article by Miss K. Norgate in the Diet. Nat. Biog., vol. xlviii. (1896); and W. R. W. Stephens and W. W. Capes, The Bishops of Winchester (1907).

RICHARD OF ST VICTOR (d. 1173), theologian and mystic of the 1 2th century. Very little is known of his life; he was born in Scotland or in England, and went to Paris, where he entered the abbey of St Victor and was a pupil of the great mystic, Hugh of St Victor. He succeeded as prior of this house in 1 162, and was continually contesting the tyrannical authority of the abbot Ervisius. His- writings, some of which are still in manuscript, are very numerous, the best known being his mystical treatises: De statu hominis interioris, De praeparatione animi ad contemptationem, De gratia contemplationis,

De gradibus caritatis, De area nuptica, and his two vsprks on the Trinity: De trinitate libri sex, De tribus appropriatis personis in Trinitate. As is the case with all the Victqrines, his mysticism was a reaction against the philosophy of the schools of his time, a perpetual justification of contemplation as opposed to logical reasoning. According to him, six steps lead the soul to con templation: (1) contemplation of visible and tangible objects; (2) study of the productions of nature and of art; (3) study of character; (4) study of souls and of spirits; (5) entrance to the mystical region which ends in (6) ecstasy. His theory of the Trinity is chiefly based on the arguments of Anselm of Canter- bury, although a certain deification of the social sense is evident.

His style is most affected, and the influence of the neo-Platonist terminology as well as of the works of the pseudo-Dionysius can be clearly detected. In the Paradis Dante has placed Richard de St Victor, whose books were much read by his contem- poraries, among the greatest teachers of the Church. His writ- ings seem to have come into favour again in the 16th and 17th centuries, six editions of his works having been printed between 1506 arid 1650.

Bibliography. CEuvres, edited in the Patrologia latina by Migne, vol. cxcvi.; W. Kaulich, ” Die Lehren des Hugo und Richard von St Victor ” {Abhandlungen der K. bohmischen Gesellschaft der Wissen schaften. V. Folge, vol. xiii. (2nd ed. Paris, 1905), p. 231 (Prague, 1864) ; P. C. F. Daunou, article in Histoire liMraire de la France, tome xiii. (Paris, 1869) ; G. Buonamici, Riccardo da S. Vittore (Alatri, 1899) ; i>eVi\i \(,Histoiredelaphilosophiemedievale{2wi.ed.Pa.ris,igo5),p. 231.

RICHARDIA, a small genus of the nat. ord. Araceae, native in South Africa, to which the ” arum lily ” belongs. They are all greenhouse herbaceous plants of handsome appearance, with thick underground stems and large, more or less fleshy, long-stalked, arrow-shaped leaves and white or yellow flower spathes. They are readily propagated by division of the shoot, also by seed. Water should be given abundantly at all times, and the soil for potting should be rich and retentive. Potting is best effected in spring, and from the end of June to the end of August they should be plunged in a sunny spot out of doors. They will not withstand frost, and should be wintered in a warm greenhouse. They flower throughout the year.

RICHARDS, ALFRED BATE (1820-1876), English journalist, was born in Worcestershire on the 17th of February 1820, and was educated at Westminster School and Exeter College, Oxford. After taking his degree in 1841 he published, anonymously, Oxford Unmasked, a denunciation of abuses in the university. Between 1845 and 1848 he wrote several dramas and some poetry, and in the latter year became editor of a weekly news- paper, the British Army Despatch. His temperament was strongly Imperialist; he opposed Cobden and the Manchester school of politicians, and in a volume entitled Britain Redeemed and Canada Preserved predicted, thirty years before the event, the construction of the Canadian Pacific railway. In 1855 he was appointed the first editor of the London Daily Telegraph, and through the medium of that journal strongly urged the forma- tion of volunteer rifle corps. The National and Constitutional Defence Association was established in 1858 to carry out the idea. Richards himself raised a regiment of a thousand working men in London, becoming major and subsequently colonel of the corps. In 1870 he was appointed editor of the London Morning Advertiser, and retained this position till his death on the 1 2th of June 1876.

RICHARDS, HENRY BRINLEY (1819-1865), English pianist and composer, was born at Carmarthen, and educated at the Royal Academy of Music in London, where later he was a professor. He took much interest in Welsh music and in the Eisteddfod gatherings. He was a prolific composer, but is perhaps principally remembered for writing the song ” God bless the Prince of Wales ” (1862), which has been adopted as an English national anthem.

RICHARDS, WILLIAM TROST (1833-1903), American marine painter, was born at Philadelphia, Pennsylvania, on the 14th of November 1833. He was a pupil of Paul Weber in his native city, and lived much in France, Italy and London. He was a member of the Pennsylvania Academy of the Fine Arts, and of the American Water Colour Society. Examples of his work are in the collections of the Pennsylvania Academy of the Fine Arts, Philadelphia, Penn.; the Metropolitan Museum of Art, New York, the Corcoran Art Gallery, Washington, D.C., and the Schaube Gallery, Hamburg. He died at Newport, Rhode Island, on the 8th of November 1905. His daughter Anna M. Richards (b. 1870), figure and landscape painter, was a pupil of John La Farge and Benjamin Constant.

RICHARDSON, GEORGE, English 18th-century architect and designer. The dates of birth and death of this distinguished contemporary and rival of the brothers Adam are not ascer- tained, but he is conjectured to have been born about 1736

and to have died in 18 17. Richardson spent three years— from 1760 to 1763 — travelling in Dalmatia and Istria, in the south of France and in Italy. During that period he imbibed the inspiration of a lifetime, and acquired the material for its practical application. He soon began to show remarkable skill in adapting classical ideals to the uses of his time, and in 1765 he won a premium offered by the Society of Arts for a design of a street in the classical manner. Richardson's work is so closely allied to that of the brothers Adam that it is often difficult to distinguish between them, and if it possessed less freedom and variety, and bore to a smaller extent the impress of an original mind, it was in the main exceedingly admirable and satisfying. Richardson was an especially successful designer of ceilings and chimneypieces. He published in 1776 a Book of Ceilings in the Style of the Antique Grotesque. Many of its drawings are of exquisite taste. Nor is his fireplace work, as represented by his Collection of Chimneypieces Orna- mented in the Style of the Etruscan, Greek and Roman Architecture (1781), less attractive. Richardson's chimneypieces are still to be found in considerable numbers in town and country houses. They are mostly of marble, but examples in wood are not uncommon. He made extensive use of coloured marbles, and the effect is constantly that of the sumptuous balancing the austere. Like the Adams, Richardson often worked with composition enrichments, and his New Designs in Architecture (1792) contains many drawings of interior friezes and columns to be executed either in this medium or painted to suit the wall hangings. His versatility .was con- siderable, as the titles of his works, a dozen in number, suggest. For many years he exhibited at the Royal Academy as well as in the Galleries of the Society of Arts. Why such a man should have fallen into penury in his old age we have no means of ascertaining, but we know that his necessities were relieved by Nollekens.

His principal works in addition to those already mentioned were, in chronological order: Aedes Pembrochianae (1774); Iconology (2 vols.), with plates by Bartolozzi and other engravers (1778-1779) j New Designs in Architecture (1792); Original Designs for Country Seats or Villas (1795); The New Vitruvius Britannicus, a sequel to Colin Campbell's Vitriwius Britannicus, 2 vols. (1802); Ornaments in the Grecian, Roman and Etruscan Tastes (1816). He also pub- lished volumes dealing with vases and tripods, antique friezes and other architectural and decorative details.

RICHARDSON, HENRY HOBSON (1838-1886), American architect, was born in the parish of St James, Louisiana, on the 29th of September 1838, of a rich family, his mother being a granddaughter of the famous Dr Priestley, the English dis- senting refugee and man of

science. He was graduated from Harvard University in 1859, and going immediately to Paris to study architecture, entered the Ecole des Beaux- Arts. The Civil War, which broke out in the United States while he was in the school, prevented his return to Louisiana, and stripped his family of their possessions, so that Richardson provided for his own support by working in the offices of practising architects in Paris, till the fall of 1865. Coming back, he established himself in New York, where he soon made his way into practice as an architect. In 1878 he moved to Boston, where he passed the remaining years of his life, designing there most of the work that made his reputation. He had married in 1867 Miss Julia Gorham Hayden of Boston; he died on the 27th of April 1886, not yet forty-eight years old*

Richardson's career was short, and the number of his works was small indeed compared with the attention they attracted and the influence he left behind him. The most important and characteristic are: Trinity church and the so-called Brattle Square church, in Boston; the alterations in the State Capitol at Albany; the county buildings at Pittsburg; town halls at Albany, Springfield and North Easton; town libraries at Woburn, North Easton, Quincy, Burlington and Maiden; Sever Hall and Austin Hall at Harvard University; the Chamber of Commerce at Cincinnati. Trinity church, the Pittsburg buildings and the Capitol at Albany were works of great importance, which have had a strong influence on men

who followed him and, brought him wide acknowledgment. It is notable that American architects who have studied in Europe, especially in Paris, are apt to drift either into a pathless eclec- ticism or into the English current. Richardson did neither. The, Romanesque that he saw in Europe, especially in the middle and sojith of France, appealed so strongly to his sense for mass and broad picturesqueness that he soon followed its leading, away from the style he had learned in Paris. His earliest work was modern French in style; his first church, in Springfield, a startlingly independent version of English Gothic. Yet half a dozen buildings made the transition to that derivative of Romanesque to which afterwards in all his buildings he steadfastly adhered. In Trinity church, his first monumental work, perhaps his finest, he broke away absolutely from the prevailing English Gothic fashion. Instead of the wng Latin cross with aisles and transepts, he made a wide cross almost Greek in plan, with short arms fifty feet broad and aisles that are only passages, a narthex flanked by two

western towers, a nave of one double bay, an eastern arm prolonged into a great apse of the full width of the crossing, over which sits a massive square tower. The arms of the church are barrel-ovaulted in wood; under the great tower is a flat coffered ceiling a hundred feet above the floor. The style, though mixed, shows his surrender to the attraction of the churches in Auvergne, which have furnished the material for the design of the apse. The central tower is a reminiscence of the noble lantern of the old cathedral of Salamanca, but the square outline is, insisted on instead of the polygonal, and the forms are in other ways much changed. The alteration of the Capitol at Albany, half a dozen years later, shared with Leopold Eidlitz, was a compromise in style, and so lacks the sure handling of his best work, except in that part of the interior in which he was untrammelled, the Senate Chamber and the great staircase. In the buildings at Pittsburg, on the other hand, he was free from interference, and these satisfied him more than any other of his buildings. His great design for the new cathedral at Albany, an adaptation of the Romanesque forms of Auvergne to a large modern problem, would have displayed his mature manner, and been perhaps his greatest work; but the plan did not lend itself to the tradition or the ritual of the Anglican Church, and it was rejected, to his great disappointment.

At first the breadth of his compositions was offset by a richness of ornament which he afterwards called flamboyant, but there was a continual growth in simplicity; Some of his imitators have abused his example, running into mere baldness and brutality, but his own work never lost the fineness of quality with which he began, nor the adequacy of its detail.

Richardson's uncommon personality so embodied itself in his works that it cannot be overlooked. He had an inexhaustible energy of body and mind, an enthusiasm more genial than combative, but so abounding and at times vehement that' few men and few bodies of men could resist him.

Abounding energy he had, but not health. A serious bodily injury, and later a chronic malady, made his last years a con- stant struggle with suffering and infirmity, borne with in- domitable cheerfulness, but at last fatal.

It is likely that the small number of his designs enhanced their quality. He put twice the labour into his work that the average architect would have given to it, and often twice the time, but the result was apt to be twice as good. He found American architecture restless, incoherent and exuberant; his example did much to turn it back to simplicity and

repose. He came as near to establishing a style as it is given to any one man to come; but the tendency of the time was too strong, and the classic styles, reasserting themselves, once more drove out the medieval.

The best known book about Richardson is Mrs Schuyler van Rensselaer's H. H. Richardson and his Works (Boston, 1888).

(W.P.P.L.)

RICHARDSON, SIR JOHN (1787-1865), British naturalist, was born at Dumfries on the 5th of November 1787. He studied

medicine at Edinburgh, and became a surgeon in the navy in 1807. In 1819 he was appointed surgeon and naturalist to Franklin's first arctic expedition (1810-22), and he served in the same capacity to the second (1825-26). The scientific results of these expeditions he described in contributions to Franklin's Narratives, and especially in the four quarto volumes of his Fauna Boreali- Americana (1829-37). He was knighted in 1846, and in the following year was chosen commander of the Franklin search expedition (1848-49), the journal of which he published in 1851 under the title of An Arctic Searching Expedition. In 1855 he retired to Grasmere, where he died on the 5th of June 1865. He also wrote accounts dealing with the natural history, and especially the ichthyology, of several other arctic voyages, and was the author of Icones Piscium (1843), Catalogue of Apodal Fish in the British Museum, translated from the German MS. (1856), the second edition of Yarrell's History of British Fishes (i860), and The Polar Regions (1861), expanded from an article with the same title which he wrote for the Ency- clopaedia Britannica.

A Life by John Macllraith was published in 1868.

RICHARDSON, SAMUEL (1689-1761), English novelist, is a notable example of that " late-flowering " sometimes applied to Oliver Goldsmith. Born under William and Mary, the reign of the second George was well advanced before, at fifty years of age, he made his first serious literary effort— an effort which was not only a success, but the revelation of a new literary form. He was the son of a London joiner, who, for obscure reasons, probably connected with Monmouth's rebellion, had retired to an unidentified town in Derbyshire, where, in 1689, Samuel was born. At first intended for holy orders, and having little but the common learning of a private grammar school— for the tradition that upon the return of the family to the metropolis he went to Christ's Hospital cannot be sustained —

he was eventually, as some compensation for a literary turn, apprenticed at seventeen to an Aldersgate printer named John Wilde. Here, like the typical ” good apprentice ” of his century, he prospered; became successively compositor, corrector of the press, and printer on his own account; married his master’s daughter according to programme; set up newspapers and books; dabbled a little in literature by compiling indexes and ” honest dedications,” and ultimately proceeded Printer of the Journals of the House of Commons, Master of the Stationers’ Company, and Law-Printer to the King. Like all well-to-do citizens, he had his city house of business and his ■” country box” in the suburbs; and, after a thoroughly ” respectable ” life, died on the 4th of July 1761, being buried in St Bride’s Church, Fleet Street, close to his shop (now demolished), No. 11 Salisbury Court.

To this uneventful and conventional career one would scarcely look for the birth and growth of a fresh departure in fiction. And yet, although Richardson’s manifestation of his literary gift was deferred for half a century, there is no life to which the Horatian ” qualis ab incepto ” can be more appropriately applied. From his youth this moralist had moralized; from his youth — nay, from his childhood — this letter-writer had written letters; from his youth this supreme delineator of the other sex had been the confidant and counsellor of women. In his boyhood he was secretary-general to all the love-sick girls of the neighbourhood; at eleven he addressed a hortatory epistle, stuffed with texts, to a scandal-loving widow; and whenever it was possible to correspond with any one he was as ” correspond- ing ” as even Horace Walpole could have desired. At last, when he was known to the world only as a steady business man, who was also a “dab at an index” and an invaluable compiler of the ” puff prefatory,” it occurred to Mr Rivington of St Paul’s Churchyard and Mr Osborn of Paternoster Row, two book- selling friends who were aware of his epistolary gifts, to suggest that he should prepare a little model letter-writer for such ” country readers “as ” were unable to indite for themselves.” Would it be any harm, he suggested in answer, if he should also ” instruct them how they should think and act in common cases “?. His friends were all the more anxious that he should

set to work. And thus originated his first novel of Pamela; or, Virtue Rewarded.

But not forthwith, as is sometimes supposed. Proceeding with the

compilation of his* model letter- writer, and seeking, in his own words, ” to instruct handsome girls, who were obliged to go out on service . . . how to avoid the snares that might be laid against their virtue ” — a danger which appears to have always abnormally preoccupied him— ‘he came to recollect a story he had heard twenty years earlier, and had often proposed to other persons for fictitious treatment. It occurred to him that it would make a book of itself, and might moreover be told wholly in the fashion most congenial to himself, namely, by letters. Thereupon, with some domestic encouragement, he completed it in a couple of months, between the 10th of Novem- ber 1739 and the 10th of January 1740. In November 1740 it was issued by Messrs Rivington & Osborn, who, a few weeks afterwards (January 1741), also published the model letter- writer under the title of Letters written to and for Particular Friends, on the most Important Occasions. Both books were anonymous. The letter-writer was noticed in the Gentleman’s Magazine for January, which also contains a brief announce- ment as to Pamela, already rapidly making its way without waiting for the reviewers. A second edition, it was stated, was expected; and such was its popularity, that not to have read it was judged ” as great a sign of want of curiosity as not to have seen the French and Italian dancers ” — i.e. Mme Chateauneuf and the Fausans, who were then delighting the town. In February a second edition duly appeared, followed by a third in March and a fourth in May. At public gardens ladies held up the book to show they had got it; Dr Benjamin Slocock of Southwark openly commended it from the pulpit ; Pope praised it; and at Slough, when the heroine triumphed, the enraptured villagers rang the church bells for joy. The other volume of ” familiar letters’” consequently fell into the background in the estimation of its author, who, though it went into several editions during his lifetime, never acknowledged it. Yet it scarcely deserves to be wholly neglected, as it contains many useful details and much shrewd criticism of lower middle-class life.

For the exceptional success of Pamela there was the obvious excuse of novelty. People were tired of the old ” mouthy ” romances about impossible people doing impossible things. Here was a real-life story, which might happen to any one — a story which aroused curiosity and arrested attention — which was not exclusively about ” high life,” and which had, in addition, a moral purpose, since it was avowedly ” published in order to cultivate the principles of virtue and religion in the minds of the youth of both sexes.” Whether it had exactly this effect, or owed its good fortune chiefly to this proclamation, may be doubted. The heroine in humble life who resists the licentious advances of her master until he is forced to marry her, does not

entirely convince us that her watchful prudence and keen eye for the main chance have not, in the long run, quite as much to do with her successful defence as her boasted innocence' and purity. Nor is the book without passages which more than smack of an unpleasant pruriency. Nevertheless, in its extra- ordinary gift of minute analysis; in its intimate knowledge of feminine character; in the cumulative power of its shuffling, loose-shod style, and, above all, in the unquestionable earnest- ness and sincerity of the writer, Pamela had qualities which — particularly in a dead season of letters— sufficiently account for its favourable reception by the contemporary public.

Such a popularity, of course, was not without its draw- backs. That it would lead to Anti-Pamelas, censures of Pamela and all the spawn of pamphlets which spring round the track of a sudden success, was to be anticipated. One of the results to which its rather sickly morality gave rise was the Joseph Andrews (1742) of Fielding (q.v.). But there are two other works prompted by Pamela which need brief notice here. One is the Apology for the Life of Mrs Shamela Andrews, a clever and very gross piece of raillery which appeared in

April 1741, and by which Fielding is supposed to have pre- luded to • Joseph Andrews. Fielding's own works contain no reference to Shamela. But Richardson in his Correspond* ence, both printed and unprinted, roundly attributes it to the writer who was to be his rival; and it is also assigned to Field- ing by other contemporaries (Hist. MSS. Commn., Rept. 12, App. Pt. IX. p. 204). All that can be said is, that Fielding's authorship cannot be proved. If it could, it would go far to justify the after animosity of Richardson to Fielding- much farther, indeed, than what Richardson described as the " lewd and ungenerous engraftment " of Joseph Andrews. The second noteworthy result of Pamela was Pamela's Con- duct in High Life (September 1741), a spurious sequel by John Kelly of the Universal Spectator. Richardson tried to prevent its appearance, and, having failed, set about two volumes of his own, which followed in December, and professed to depict his heroine "in her exalted condition." But the public in- terest in Pamela had practically ceased with her marriage, and the author's continuation, like other continuations— particu- larly continuations prompted by extraneous circumstances- attracted no permanent attention.

About 1744 we begin to hear something of the progress of Richardson's second and greatest novel, Clarissa; or, the History of a Young Lady, usually miscalled Clarissa Har- lowe. The first edition was in seven volumes, two of which came out in November 1747, two

more in April 1748 and the last three in December. Upon the title-page of this, of which the mission was as edifying as that of Pamela, its object was defined as showing the distresses that may attend the misconduct both of parents and children in relation to marriage. Virtue, in Clarissa, is not "rewarded," but hunted down and outraged. The heroine, no longer an opportunist servant-girl, is a most pure, refined and beautiful young woman, invested with every attribute to attract and charm, while her pursuer, Lovelace, the libertine hero of the bookˆ a personage of singular dash and vivacity, in spite of his worth- lessness — is drawn with extraordinary tenacity of power. The wronged Clarissa eventually dies of grief, and her cold- blooded betrayer, whom strict justice would have hanged, if considerately killed in a duel by her soldier cousin. Of thf genius of the story there can be no doubt. Nor is there any doubt as to the ability shown in the delineation of the two chiel characters, to whom the rest are merely subordinate. Thb chief drawbacks of Clarissa are its merciless prolixity (seven volumes, which only cover eleven months); the fact that (like Pamela) it is told by letters; and a certain haunting and uneasy feeling that many of the heroine's obstacles are only molehills which should have been readily surmounted. As to its success, accentuated as this was by its piecemeal method of publication, there has never been any question. Clarissa's sorrows set all England sobbing, and her fame and her fate spread rapidly to the Continent.

Between Clarissa and Richardson's next work appeared the Tom Jones of Fielding — a rival by no means welcome to the elder writer, although a rival who generously (and perhaps penitently) acknowledged Clarissa's rare merits. " Pectus inaniter angit Irritat, mulcet, falsis terroribus implet Ut Magus,"

Fielding had written in the Jacobite's Journal. But even this could not console Richardson for the popularity of the " spurious brat " whom Fielding had made his hero, and his next effort was the depicting of a genuine fine gentleman— a task to which he was incited by a' chorus of feminine wor- shippers. In the History of Sir Charles Grandison, "by the Editor of Pamela and Clarissa " (for he still preserved the fiction of anonymity), he essayed to draw a perfect model of manly character and conduct. In the pattern presented there is, however, too much buckram, too much ceremonial— in plain words, too much priggishness — to make him the de- sired exemplar of propriety in excelsis. Yet he is not entirely a failure, still: less is he to be regarded as no more than " thf

condescending suit of clothes” by which Hazlitt unfairly defines Miss Burney’s Lord Qrville. When Richardson de- lineated Sir Charles Grandison he was at his best, and his experiences and opportunities for inventing such a Character were infinitely greater than they had ever been before. And he lost nothing of his gift for portraying the other sex. Harriet Byron, Clementina della Porretta and even Charlotte Gran- dison, are no whit behind Clarissa and her friend Miss Howe. Sir Charles Grandison, in fine, is a far better book than Pamela, although M. Taine regarded the hero as only fit to be stuffed and put in a museum.

Grandison was published in 1753, and by this time Richard- son was sixty-four. Although the book was welcomed as warmly as its predecessors, he wrote no other novel, content- ing himself instead with indexing his works, and compiling an anthology of the ” maxims,” ” cautions ” and ” instructive sentiments ” they contained. To these things, as a professed moralist, he had always attached the greatest importance. He continued to correspond relentlessly with a large circle of worshippers, mostly women, whose counsels and fertilizing sympathy had not a little contributed to the success of his last two books. He was a nervous, highly strung little man, intensely preoccupied with his health and his feelings, hungry for praise when he had once tasted it, and afterwards unable to exist without it; but apart from these things, well meaning, benevolent, honest, industrious and religious. Seven vast folio volumes of his correspondence with his lady friends, and with a few men of the Young and Aaron Hill type, are pre- served in the Forster Library at South Kensington. Parts of it only have been printed. There are several good portraits of him by Joseph Highmore, two of which are in the National Portrait Gallery.

Richardson is sometimes styled the ” Father of the English Novel,” a title which has also been claimed for Defoe. It would be more accurate to call him the father of the novel of sentimental analysis. As Sir Walter Scott has said, no one before had dived so deeply into the human heart. No one, moreover^ had brought to the study of feminine character so much prolonged research, so much patience of observation, so much interested and indulgent apprehension, as this twitter- ing little printer of Salisbury Court. That he did not more materially control the course of fiction in his own country was probably owing to the new direction which was given to that fiction by Fielding and Smollett, whose method, roughly speaking, was synthetic rather than analytic. Still, his in- fluence is to be traced in Sterne and Henry Mackenzie, as well as in Miss Burney and Miss

Austen, both of whom, it may be noted, at first adopted the epistolary form. But it was in France, where the sentimental soil was ready for the dressing, that the analytic process was most warmly welcomed. Extra- vagantly eulogized by the great critic, Diderot, modified with splendid variation by Rousseau, copied (unwillingly) by Voltaire, the vogue of Richardson was so great as to tempt some modern French critics to seek his original in the Marianne of a contemporary analyst, Marivaux. As a matter of fact, though there is some unconscious consonance of manner, there is nothing whatever to show that the little-lettered author of Pamela, who was also ignorant of French, had the slightest knowledge of Marivaux or Marianne. In Germany Richardson was even more popular than in France. Gellert, the fabulist, translated him; Wieland, Lessing, Hermes, all imitated him, and Coleridge detects him even in the Robbers of Schiller. What was stranger still, he returned to England again under another form. Having given a fillip to the French comidie larmoyante, that comedy crossed the channel as the sentimental comedy of Cumberland and Kelly, which, after a brief career of prosperity, received its death-blow at the hands of Goldsmith and Sheridan.

A selection from Richardson's Correspondence was published by Mrs A. L. Barbauld in 1804, in six volumes, with a valuable Memoir. Recent lives are by Miss Clara L. Thomson, 1900, and by Austin Dobson (" Men of Letters "), 1902. A convenient reprint of the novels, with copies of the old illustrations by Stothard, Edward

Burney and the rest, and an'introducton by Mrs E. M. M. McKenna, was issued in 1901 in 20 volumes. (A. D.)

RICHELIEU, ARMAND EMMANUEL SOPHIE SEPTE- MANIE DU PLESSIS, Due de (1766-1822), French statesman, was born in Paris on the 25th of September 1766, the son of Louis Antoine du Plessis, due de Fronsac and grandson of the marshal de Richelieu (1696-1788). The comte de Chinon, as the heir to the Richelieu honours was called, was married at fifteen to Rosalie de Rochechouart, a deformed child of twelve, with whom his relations were never more than formal. After two years of foreign travel he entered the Queen's dragoons and next year received- a place at court, where he had a reputa- tion for Puritan austerity. He left Paris in 1790 for Vienna, and in company with his friend Prince Charles de Ligne joined the Russian army as a volunteer, reaching the Russian head- quarters at Bender on the 21st of November. He was present at the capture of Ismailia and received from the empress Catherine the cross of St George and a golden sword. By the death of his father in February 1791, he succeeded to the title of due de Richelieu. He . returned to Paris shortly afterwards

on the summons of Louis XVI., but he was not sufficiently in the confidence of the court to be informed of the projected flight to Varennes. In July he obtained a passport from the National Assembly for service in Russia. In the Russian army he obtained the grade of general-major, only to be forced by the intrigues of his enemies to resign. The accession of Alexander I. brightened his prospects. His erasure from the list of Emigres, which he had failed to secure from Napoleon, was accorded on the request of the Russian government, and in 1803 he became governor of Odessa. Two years later he became governor general of the Chersonese, of Ekaterinoslav and the Crimea, then called New Russia. In the eleven years of his administration, Odessa rose from a miserable village to an important city. He commanded a division in the Turkish War of 1806-7, an d was engaged in frequent expeditions to the Caucasus.

Richelieu returned to France in 1814; on the triumphant return of Napoleon from Elba he accompanied Louis XVIII. in his flight as far as Lille, whence he went to Vienna to join the Russian army, believing that he could best serve the interests of the monarchy and of France by attaching himself to the headquarters of the emperor Alexander. Richelieu's character and antecedents alike marked him out as valuable support of the monarchy after its second restoration. Though the bulk of his confiscated estates were lost beyond recall, he did not share the resentment of the mass of the returned emigres, from whom and their intrigues he had held aloof during his exile, and was far from sharing their delusions as to the possibility of undoing the work of the Revolution. As the personal friend of the Russian emperor his influence in the councils of the Allies was likely to be of great service. He refused, indeed, Talley- rand's offer of a place in his ministry, pleading his long absence from France and ignorance of its conditions; but after Talley- rand's retirement he consented to follow him as prime minister, though — as he himself said — he did not know the face of one of his colleagues.

The events of Richelieu's tenure of office are noticed elsewhere (see France: History). Here it need only be said that it was mainly due to his efforts that France was so early relieved of the burden of the allied army of occupation. It was for this purpose mainly that he attended the congress of Aix-la-Chapelle in 1818. There he had been informed in confidence of the renewal by the Allies of their treaty binding them to interfere in case of a renewal of revolutionary trouble in France; and it was partly owing to this knowledge that he resigned office in December of the same year, on the refusal of his colleagues to support a reactionary modification of the electoral law. After the murder of the due de Berry and the enforced retirement of Decazes, he again

became president of the council (21st February 1821); but his position was untenable owing to the attacks of the ” Ultras ” on the one side and the Liberals on the other, and on the 12th of December he again resigned. He died of apoplexy on the 17th of May 1822.

Great part of Richelieu’s correspondence with Pozzp di Borgo, Capo d’Istria and others, with his journal of his travels in Germany and the Turkish campaign, and a notice by the duchesse de Richelieu, is published by the Imperial Historical Society of Russia, vol. 54. There is an exhaustive study of his career by L. de Crousaz-Cretet, Le Due de Richelieu en Russie el en France (1897), with which compare an article by L. Rioult de Neuville in the Rejiue des questions historiques (Oct. 1897). See also R. de Cisternes, Le Due de Richelieu, son action aux conferences d’Aix-la-Chapelle (1898), containing copies of documents.

RICHELIEU, ARMAND JEAN DU PLESSIS DE, Cardinal (1585-1642), French statesman, was born of an ancient family of the lesser nobility of Poitou. The original name of the family was Du Plessis, but in the 1 5th century a ‘ younger branch obtained by marriage the estate of Richelieu with its strong castle surrounded by the waters of the Mable, and took the name of Du Plessis de Richelieu. The family produced not a few turbulent warriors during the Hundred Years’ War, and the cardinal’s father, Francois du Plessis, seigneur de Richelieu, began his career by killing the murderer of his elder brother and then fighting through the wars of religion, first as a favourite of Henry III., and after his death under Henry IV. He was a typical fighting gentleman of the period. The mother of the cardinal, Susanne de La Porte, belonged to a family of the magistrature, her father, Francois de La Porte, being one of the first advocates of the parlement of Paris. Armand was the third son and was born in Paris on the 9th of September 1585. When he was five years old his father died while assisting at the siege of Paris (on the 10th of July 1590); and his mother was left with five children and the estate heavily in debt. By care and economy, however, aided by generous royal grants, she was enabled to pay off mortgages and to bring up the children in a way befitting their rank. At the age of nine Armand was sent to Paris to the College of Navarre, where he passed with credit the regular courses in grammar and philosophy, and then entered a “finishing academy” which prepared the sons of nobles for the life of a courtier or a cavalier. But his training for a military career was suddenly cut short by the refusal of his elder brother, Alphonse,

to accept the office of bishop of Lucon. The right of preferment to that see had been given to the Richelieu family by Henry III. as a reward for the services of Armand's father, and the family drained its revenues for private use. When the cathedral chapter found courage to oppose this and opened suit to recover the ecclesiastical revenues for ecclesiastical purposes, Richelieu's mother proposed to make her second son, Alphonse, bishop. He defeated this scheme, however, by becoming a monk of the Grande Chartreuse, and Armand, whose health was rather feeble in any case for a military career, was induced to propose himself for the priest- hood.

In 1606, at the age of twenty-one, Richelieu was nominated bishop of Lucon by Henry IV. As he was almost five years under the canonical age, he was obliged to go to Rome to obtain a dispensation and was consecrated there in April 1607. In the winter of 1608 Richelieu went out to his poverty-stricken little bishopric, and for the next six years devoted himself seriously to his episcopal duties. He became favourably known among the zealous reformers of the church, and it was during this stage of his career that he made a friend of Father Joseph. Meanwhile he was impatiently waiting for an opening to a larger career. This came in 1614 when he was elected by the clergy of Poitou to the last States-general which met before the Revolution. In this he attracted the favourable attention of Marie de' Medici, the queen-mother, and was chosen at its close to present the address of the clergy embodying its petitions and resolutions. After the States-general was dissolved he remained in Paris, and the next year he became almoner to Anne of Austria, the child-queen of Louis XIII. Then, by adroit courtly intrigue and faithful service to Concini, he was appointed in 1616 a secretary of state to the king. But he owed all to Concini, and his taste of power ended with the murder of his patron on the 24th of August 1617.

The reign which Richelieu was to dominate so absolutely began

with his exile from the court. He had, however, already shown his ability, his firmness, and his diplomatic skill, and conducted the negotiations on the part of the queen-mother with Luynes, the king's representative. Then, as he had incurred too much of the odium of a creature of Concini to hope for royal favour, he resigned himself to the post of chief adviser to Marie de' Medici in her exile at Blois. Here he sought to ingratiate himself with Luynes and the king by reporting minutely, the actions of Marie and by protestations of loyalty. As this unr grateful work brought no reward, Richelieuˆ in spite of the earnest entreaties of the queen-mother, retired once more to his bishopric. But the king, while approving his conduct, was still suspicious of him, and

he was exiled to Avignon, along with his brother and brother-in-law, on the 7th of April 1618. There he lived ill discreet, if melancholy retirement, writing ” A Defence of the Main Principles of the Catholic Faith,” and had apparently little hope of a further political career when the escape of Marie de’ Medici from Blois, on the 22nd of February 1610, again opened paths for his ambition. Luynes and the king recalled him to the post at Angoulgme with the queen-mother, who received him ungraciously but who soon yielded, to his judgment and allowed him to sign the treaty of Angouleme with the Cardinal de la Rochefoucauld, acting for the king. By this treaty Marie was given liberty to live wherever she wished, and the govern- ment of Anjou and of Normandy with several castles was entrusted to her.- The bishop of Lucon was led to believe that the king would recommend him for a cardinalate, but, if we may trust the evidence, Luynes secretly opposed the request, and it was not until after his death that Richelieu was made a cardinal by Pope Gregory XV., on the 5th of September 1622. His rank in the church was due to his skill in intrigue with Marie de’ Medici.

Luynes’s death on the 15th of December 1621 made possible a reconciliation a month later between the king and his mother. Although Louis still distrusted her at heart, and disliked her dominating minister more, he allowed her to take up her residence in the Luxembourg palace in Paris, thus rendering intercourse possible. Richelieu seized his , opportunity. He furnished Marie de’ Medici with political ideas and acute criticisms of the king’s ministry, especially of the Brularts. Marie zealously pushed her favourite towards office, and had gone so far as to absent herself from court for three months on account of the king’s persistent refusal, when Charles, due de La Vieuville, then head of the council, in need of her aid in his negotiations with reference to the marriage of her daughter Henriette Marie, finally agreed to force Richelieu’s appointment to office upon the king, Louis XIII. La Vieuville thought to compromise by forcing the cardinal into a ” council of des- patches,” with merely the privilege of advising the king’s council but entrusted with no power. Richelieu raised many objections to such a partial realization of his ambition, but the king ended them in April 1624 by naming him as a member of his council. By August Vieuville’s worst fears were realized; he was arrested on the 13 th of the month for corrupt practices in office, and the intriguing cardinal who had caused his overthrow became chief minister of Louis XIII. His advent was hailed with joy by both the Catholic party and the patriotic party, eager for the overthrow of Habsburg supremacy in Europe.

For the next eighteen years the biography of Richelieu is the history of

France, and to a large degree that of Europe. His work was directed toward a twofold aim: to make the royal power — his power — absolute and supreme at home, and to crush the rival European power of the Habsburgs. At home there were two opponents to be dealt with: the Huguenots and the feudal nobility. The former were crushed by tht aiege of La Rochelle and the vigorous campaign against the due de Rohan. But the religious toleration of the edict of Nantes was reaffirmed while its political privileges were destroyed, and Huguenot officers fought loyally in >the foreign enterprises of the cardinal. The suppression of the independence of the feudal aristocracy was inaugurated in r626 by an edict calling for the destructipn of all fortified castles not needed for defence against invasion.

The local authorities proceeded to carry this out with a zeal due to long suffering, and the ruined medieval chateaus of France still bear witness to the action of Richelieu. Still there was no serious opposition to the new minister. The first serious conˆ spiracy took place in 1626, the king's brother, Gaston of Orleans, being the centre of it. His governor, Marshal D'Ornano, was arrested by Richelieu's orders, and then his confidant, Henri de Talleyrand, marquis de Chalais and Vend6nie, the natural sons of Henry IV. Chalais was executed and the marshal died in prison. The overthrow of the Huguenots in 1629 made Richelieu's position seemingly unassailable, but the next year it received its severest test. Marie de' Medici had turned against her " ungrateful "minister with a hatred intensified, it is said, by unrequited passion. In September 1630, while Louis XIII. was very ill at Lyons, the two queens, Marie and Anne of Austria, reconciled for the time, won the king's promise to dismiss Richelieu. He postponed the date until peace should be made with Spain. When the news came of the truce of Regensburg Marie claimed the fulfilment of the promise. On the 10th of November 1630 the king went to his mother's apart- ments at the Luxembourg palace. Orders were given that no one should be allowed to disturb their interview, but Richelieu entered by the unguarded chapel door. When Marie had recovered breath from such audacity she proceeded to attack him in the strongest terms, declaring that the king must choose between him or her. Richelieu left the presence feeling that all was lost. The king gave a sign of yielding, appointing the brother of Marillac, Marie's counsellor, to the command of the army in Italy. But before taking further steps he retired to Versailles, then a hunting lodge, and there', listening to two of Richelieu's friends, Claude de Saint-Simon, father of the memoir

writer, and Cardinal La Valette, sent for Richelieu in the evening, and while the salons of the Luxembourg were full of expectant courtiers the king was reassuring the cardinal of his continued favour and support. The ” Day of Dupes,” as this famous day was called, was the only time that Louis took so much as a step toward the dismissal of a minister who was personally distasteful to him but who was indispensable. The queen-mother followed the king and cardinal to Compiegne, but as she refused to be reconciled With Richelieu she was left there alone and forbidden to return to Paris. The next summer she fled across the frontiers into the Netherlands, and Richelieu was made a duke. Then Gaston of Orleans, who had fled to Lorraine, came back with a small troop to head a rebellion to free the king and country from ” the tyrant.” The only great noble who rose was Henri, due de Montmorenci, governor of Languedoc, and his defeat at Castelnaudary on the rst of September 1632 was followed by his speedy trial by the parlement of Toulouse, and by his execution. Richelieu had sent to the block the first noble of France, the last of a family illustrious for seven centuries, the feudal head of the nobility of Languedoc; then, unmoved by threats or entreaties, inexorable as fate itself, he cowed all opposition by his relentless vengeance. He knew no mercy. The only other conspiracy against him which amounted to more than intrigue was that of Cinq Mars in 1642, at the close of his life. This vain young favourite of the king was treated as though he were really a formidable traitor, and his friend, De ThOu, son of the historian, whose sole guilt was not to have revealed the plot, was placed in a boat behind the stately barge of the cardinal and thus conveyed up the Rhone to his trial arid death at Lyons. The voyage was symbolical of Richelieu’s whole pitiless career. ‘ • ‘■ ■

Richelieu’s foreign policy ‘was as inflexible as his home policy. To humble the Habsburgs he aided the Protestant princes of Germany against the emperor, in spite of the strong opposition of the disappointed Catholic party in France, which had looked to the cardinal as a champion of ‘ the faith. The year of Richelieu’s triumph over the Huguenots (,1629) was also that of the Emperor Ferdinand’s triumph in Germany, marked by the Edict of Restitution, and France was threatened by a united Germany. Richelieu, however, turned against the Habsburgs young Gustavus Adolphus of Sweden, paying him a subsidy of a

million livres a year by the treaty of Barwald of the 23rd of January 1631. The dismissal of Wallenstein, which is often attributed to the work of Father Joseph, Richelieu’s envoy to the diet of Regensburg in July and August of 1630, was due rather to the fears of the electors themselves, but it was of double value to Richelieu when his Swedish

ally marched south. After the treaty of Prague, in May 1635, by which the emperor was reconciled with most of the German princes, Richelieu was finally obliged to declare war, and, concluding a treaty of offensive alliance at Compie'grie with Oxenstierna, and in October one at St Germain-en-Laye with Bernard of Saxe- Weimar, he proceeded himself against Spain, both in Italy and in the Netherlands. The war opened 'disastrously for the French, but by 1642, when Richelieu died, his armies — risen from 12,000 men in 1621 to 150,000 in 1638 — had conquered Roussillon from Spain; they held Catalonia, which had revolted from Philip IV. of Spain, and had taken Turin and forced Savoy to allow French troops on the borders of the Milanese. In Germany Torstensson was sweeping the imperialist forces before him through Silesia and Moravia. The lines of the treaty of Westphalia, six years later, were already laid down by Richelieu; and its epochal import- ance in European history is a measure of the genius who threw the balance of power from Habsburg to Bourbon. The pre- dominance of Louis XIV; in European politics was largely due to the statesman who prepared France for his absolutism at home.

The magnitude of Richelieu's achievement grows when one considers his relations with the king. Louis XIII. cordially disliked him, and would gladly have got rid of him if he had not been able to convince the king of the wisdom of everything he did. Thus obliged to assume the unpleasant r61e of tutor when delicate flattery was often most needful, the minister lectured and cajoled his master, always, until towards the last, giving credit to the king for his own successes, and over- awing opposition by his imperious presence even when Louis was dabbling in plots against him (as in the case of Cinq Mars) behind his back. The king's consciousness of his weakness was combined with a sense of duty, and it was upon these two chords that Richelieu played. Besides, he was eternally on the alert. Spies in every salon in Paris and every court in Europe kept the grim courtier informed of every change in his master's disposition and every intrigue against himself. The piquant comments of his platonic friend, Mademoiselle de Hautefort, upon Richelieu were relished by the king until he was informed of others said to have been made by her upon himself. Then it was easy to supplant her with another favourite, Mademoiselle de Lafayette. When this devout maiden began to denounce the ungodly cardinal who was allied with heretics, her confessor — in Richelieu's service — succeeded in inducing her to become a nun. Father Caussin, the king's confessor, ventured the same comments, and Louis plotted like a schoolboy to turn his devotions into secret criticisms of state policies. Caussin was sent into Brittany, and the judicious and learned Jesuit, Jacques Sirmond, who succeeded him, kept clear of politics.

Such was the atmosphere of the court in which Richelieu had to maintain his authority.

His own personality was his strongest ally. The king himself quailed before that stern, august presence. His pale, drawn face was set with his iron will. His frame was sickly and wasted with disease, yet when clad in his red cardinal's robes, his stately carriage and confident bearing gave him the air of a prince. His courage was mingled with a mean sort of cunning, and his ambition loved the outward trappings of power as well as its reality; yet he never swerved from his policy in order to win approbation, and the king knew that his one motive in public affairs was the welfare of the realm — that his religion, in short, was " reason of state," A clear conscience, not less than a sense of his own superiority to others at the court of Louis XIII., made the cardinal haughtily assert his ascendancy, and the king shared his belief in both.

No courtier was ever more assertive of his prerogatives. He claimed precedence over even princes of the blood, and one

like Conde was content to draw aside the curtains for him to pass, arid to sue for the hand of Richelieu's niece for his son, the " Great Conde." His pride and ambition were gratified by the foundation of a sort of dynasty of his nephews and nieces, whose hands were sought by the noblest ill the realm. Like all statesmen of his time, Richelieu made money "out of politics. He came to court in 1617 with an income of 25,000 livres from his ecclesiastical benefices. In the later years of his life it exceeded 3,000,000 livres. He lived in imperial state, building himself the great Palais Cardinal, now the Palais Royal, in Paris, another at Rueil near Paris, and re- building his ancestral chateau in Poitou. His table cost him a thousand crowns a day, although he himself lived simply. He celebrated his triumphs to the full with gorgeous fetes in his palace, especially with lavish theatrical representations. In January 1641 the tragedy of Mirame, said to have been his own, was produced with great magnificence. Richelieu was anxious for literary fame, and his writings are not unworthy of him. But more important than his own efforts as an author were his protection and patronage of literary men, especially of Corneille, and his creation of the French Academy in 1635. His influence upon French literature was considerable and lasting. Hardly less important was his rebuilding of the Sorbonne and his endowments there. When

he died, on the 4th of December 1642, he was buried in the chapel of the Sorbonne, which still stands as he built it. His tomb, erected in 1694, though rifled at the Revolution, still exists.

Many writings are attributed to Richelieu, although owing to his habit of working with substitutes and assistants it is difficult to settle how much of what passes under his name is authentic. Les Thuileries, La Grande Pastorale, Mirame, and the other plays, over whose fate he trembled as over the result of an embassy or a cam- paign, have long been forgotten ; but a permanent interest attaches to his Memoires and correspondence: Memoir e &' Armani du Plessis de Richelieu, eu&que de Lucon, ecrit de sa main, I'annee 1607 ou 1610, alors qu'il meditait de paraitre & la cour, edited by Armand Baschet (1880); Histoire de la mere el du fils (i.e. of Marie de Medici and Louis XIII.), sometimes attributed to Mezeray, published at Am- sterdam in 1730 and, under the title Histoire de la regence de reine Marie de Medicis, femme de Henry IV., at the Hague in 1743; Memoires sur la regne de Louis XIII., extending from 1610 to 1638, and of which the earlier portion is a reprint of the Histoire de la mere et du fils, published in Petitot's collection (Paris, 1823 seq.); Testament politique d 'Armand du Plessis, cardinal de Richelieu (Amsterdam, 1687 seq.); Journal de 1630-31 (Paris, 1645); " Lettres, instructions diplomatiques, et papiers d'6tat," published by G. dAvenel in the Coll. de doc. ined. (Paris, 1853-77); an d " Maximes d'etat et fragments politiques," published by G. Hanotaux in Melanges historiques: Choix de doc. Hi., in the same collection.

See G. Hanotaux, Cardinal Richelieu (1893), one volume of the four then promised, an exhaustive history of the period down to 1614; and G. dAvenel, Richelieu et la monarchie absolue (4 vols., 1895). The most important sources for Richelieu's statesmanship are the "Lettres, instructions diplomatiques, et papiers d'etat," mentioned above, and Richelieu's Memoires (1610-38) may be con- sulted in Petitot's and J. F. Michaud and J. Poujoulat's collections. Innumerable memoirs of the time also bear upon his life, e.g. those of Madame de Motteville, Mathieu Mole, De Brienne, and Bassom- pierre. In English there are short biographies by Richard Lodge (in the Foreign Statesmen series, 1896) and by J. B. Perkins (in Heroes of the Nations series, 1900). (J. T. S.*)

RICHELIEU, LOUIS FRANQOIS ARMAND DU PLESSIS,

Due de (1696-1788), marshal of France, was a grandnephew of Cardinal Richelieu, and was born in Paris on the 13th of March 1696. Apart from his reputation as a man of excep- tionally loose morals, he

attained, in spite of a deplorably de- fective education, distinction as a diplomatist and general. As ambassador to Vienna (1725-29) he settled in 1727 the preliminaries of peace; in 1733-34 he served in the Rhine campaign. His real public career began ten years later. He fought with distinction at Dettingen and Fontenoy, where he directed the grapeshot upon the English columns, and three years afterwards he made a brilliant defence of Genoa; in 1756 he expelled the English from Minorca by the capture of the San Felipe fortress; and in 1757-58 he closed his military career by those pillaging campaigns in Hanover which procured him the sobriquet of Petit Pere de la Maraude. After the wars he plunged again into court intrigue, favoured

the comtesse du Barry and supported his nephew the due

d'Aiguillon. Louis XVI., however, was not favourably inclined

to hini. In his early days he/ was thrice imprisoned in the

Bastille: in 1711 at the instance of his stepfather, in 1716 in

consequence of a duel, and in 1719 for his share in Alberoni's

conspiracy against the regent Orleans. He was thrice married:

first, against his will, at the age of fourteen to Anne Catherine

de Noailles; secondly, in 1734, by the intrigues (according to

the witty Frenchman's own account) of Voltaire, to Marie

Elisabeth Sophie, Mademoiselle de Guise; and thirdly, when

he was eighty-four years old, to an Irish lady. He died in

Paris on the 8th of August 1788. Marshal Richelieu's MSmoires,

published by J. L. Soulavie in nine volumes (1790), are partially

spurious.

See H. Noel Williams, 7%e Fascinating Due de Richelieu (1910).

RICHEPIN, JEAN (1849-), French poet, novelist and

dramatist, the son of an army doctor, was born at Medea

(Algeria) on the 4th of February 1849. At school and at the

Ecole normale he gave evidence of brilliant, if somewhat undisciplined, powers, for which he found physical vent in different directions — first as a franc-tireur in the Franco-German War, and afterwards as actor, sailor and stevedore — and an intellectual outlet in the writing of poems, plays and novels which vividly reflected, his erratic but unmistakable talent.

A play, L'Htoile, written by him in collaboration with Andre Gill (1840-1885), was produced in 1873; but Richepin was virtually unknown until the publication, in 1876, of a volume of verse entitled Chanson des gueux, when his outspokenness resulted in his being imprisoned and fined for outrage aux mmurs. The same quality has characterized his succeeding volumes of verse: Les Caresses (1877), Les Blasphemes (1884), La Mer (1886), Mes paradis (1894), La Bombarde (1899). His novels have developed in style from the morbidity and brutality of Les Moris Uzarres (1876), La Glu (1881) and Le Pave (1883) to the more thoughtful psychology of Madame Andri (1878), Sophie Monnier (1884), Cisarine (1888), L'AimS (1893), Grandes amoureuses (1896) and Lagibasse (1899), and the more simple portrayal of life in Miarka (1883), Les Braves Gens (1886), Truandailles (1890), La Miseloque (1892) and Flamboche (1895). His plays, though occasionally marred by his characteristic proneness to violence of thought and language, constitute in many respects his best work. The most notable are Nana Sahib

(1883), Monsieur Scapin (1886), Le Filibustier (1888), Par le glaive {1892), Vers lajoie (1894), Le Chemineau (i8gj),Le Chien de garde (1898), Les Truands (1899), Don Quichotte (1905), most of which were produced at the Comedie francaise. He also wrote Miarka (1905), adapted from his novel, for the music of Alexandre Georges, and Le Mage (1897) for the music of Jules Massenet.

His son, Jacques Richepin (b. 1880), the author of La Reine de Tyr (1899), La Cavaliere (1901), Cadet-Roussel (1903) and Falstajf (1904), based on Shakespeare's Henry IV., gave promise of making his mark as a dramatist.

RICHERUS, monk of St Remi at Reims, and a chronicler of the roth century, son of Rodulf, a trusty councillor and captain of Louis IV. He studied at Reims under Gerbert, afterwards Pope Silvester II., who taught him mathematics, history, letters and eloquence. He was also well versed in the medical science of his time, and in 991 travelled to Chartres to consult the medical MSS. there. He was still living in 998, but there is no mention of him after that date. In spite of his violent partisanship, — for Richerus was an ardent upholder of the Carolings and French supremacy, — of great defects of style, and of an utter disregard of accuracy and truth, his Historiae has a unique value as giving us the only tolerably full account by a contemporary of the memorable revolution of 987, which placed the Capets on the throne of France. The History, in four books, begins with Charles the Fat and Eudes, and goes down to the year 995. From 969 onwards Richerus had no earlier history before him, and his work is the chief source for the period. It was first edited in Pertz's Monumenta Germaniae, vol. iii.

There are French translations by Guadet (Paris, 1845, Soc. de I'hist. de France); Poinsignon (Reims, 1855, pub. de l'Academie de Rheims) ; and a German version by K. Freiherr v. der Osten- Sacken (Berlin 1854). Cf. Molinier, Sources de I'histoire de France, i. 284 (ed. 1901).

RICHFIELD SPRINGS, a village of Richfield township, Otsego county, New York, U.S.A., about 22 m. S.S.E. of Utica and J m. N. of Schuyler

(or Candarago) lake. Pop. (1890) 1623; (1900) 1537; (1905) 1684; (1910) 1503. It is served by the Delaware, Lackawanna & Western railway > and by the Oneonta & Mohawk Valley electric line connecting with the New York Central railway at Herkimer. The village is situated in a farming country, about 1700 ft. above sea-level. Knit goods are manufactured, but the importance of the place is due to its sulphur springs, the waters of which are used for the treatment of skin diseases, gout, rheumatism, etc., and to the tonic air and fine scenery. In 1908 a Welsh eisteddfod was held here in Earlington Park. The first hotels were built between 1820 and 1830. A post office was established here in 1829, and the village was incorporated in 186 1.

RICH HILL, a city of Bates county, Missouri, U.S.A., situated near the Osage (Marais des Cygnes) river, in the west central part of the state, about 75 m. S. by E. of Kansas City. Pop. (1900) 4053, of whom 255 were foreign-born; (1910) 2755. It is served by the Missouri Pacific and the St. Louis & San Francisco railway systems. The city has two public parks, and is a trading centre for the surrounding fertile farming country. Coal is mined in the vicinity. There are lead and zinc smelters, and a large vitrified brick and tile factory. The municipality owns and operates its waterworks and gas and electric-lighting plants; the city is supplied with natural gas. The original Rich Hill was platted in 1867 somewhat north-west of the site of the present city, which was platted in 1880 by an association that bought out the old settlement. The new settlement was incorporated as a village in 1880, and chartered as a city in 1881.

RICHMOND, EARLS AND DUKES OF. The title earl of Richmond appears to have been in existence in England a considerable time before it was held in accordance with any strict legal principle. Alan, surnamed ” Le Roux,” and his brother Alan (c. 1040-1089), surnamed ” Le Noir,” relatives of Geoffrey, count of Brittany, and kinsman of William the Con- queror, took part in the latter’s invasion of England; and Le Roux obtained grants of land in various parts of England, including manors formerly held by Earl Edwin in Yorkshire, on one of which he built the castle of Richmond, his possessions there being formed into the honour of Richmond, to which his brother Alan Le Noir, or Alan Niger (c. 1045-1093), succeeded in 1089. The latter was in turn succeeded as lord of the honour of Richmond by Stephen (d. 1137), count of Penthievre, who was either his son or another brother. These Breton counts, being territorial barons of great importance in England, and lords of the honour of Richmond where their castle was situated, are often reckoned as earls of Richmond, though they were not so in the strict and later sense. The same should perhaps be said of Stephen’s son Alan Niger II. (c. 1116-1146), though he was styled earl

of Richmond by John of Hexham. This Alan married Bertha, daughter and heiress of Conan, reigning count of Brittany; and his son Conan (c. 1138-1171), who married Margaret, sister of Malcolm IV. of Scotland, asserted his right to Brittany, and transferred it in his lifetime to his daughter Constance (c. 1162-1201). As he left no sons the honour of Richmond and his other English possessions passed to the king in n 71, though Constance is also loosely spoken of as countess of Richmond in her own right. Constance was three times married, and each of her husbands in turn assumed the title of earl of Richmond, in conjunction with that of count, or duke of Brittany. They were: Geoffrey Plantagenet (1158- ir86), son of Henry II., king of England; Randolph de Blunde- vill, earl of Chester (c. 1 172-1232), the marriage with whom Constance treated as null on the ground of consanguinity; and Guy de Thouars (d. 1213), who survived his wife for twelve

years. The only son of the first marriage, Arthur of Brittany (1187-1203), was styled earl of Richmond in his mother's lifetime, and on his murder at the hands of his uncle, King John, the earldom was resumed by the crown.

By her third husband Constance had two daughters, the elder of whom, Alice, was given in marriage by Philip Augustus, king of France, to Peter de Braine in 1213, after which date Peter was styled duke of Brittany and earl of Richmond till about 1235, when he renounced his allegiance to the king of England and thereupon suffered forfeiture of his English earldom.

In 1241 Henry III. granted the honour of Richmond to Peter of Savoy (1203-1268), uncle of Queen Eleanor, who was thereafter described as earl of Richmond by contemporary chroniclers, though how far he was strictly entitled to the designation has been disputed. By his will he left the honour of Richmond to his niece, the queen consort, who transferred it to the crown. In the same year (1268) Henry III. granted the earldom specifically to John, duke of Brittany (1217-86), son of Peter de Braine, in whose family the title continued — though it frequently was forfeited or reverted to the crown and was re-granted to the next heir — till 1342, when it was apparently resumed by Edward III. and granted by that sovereign to his son John of Gaunt, who surrendered it in 1372. It was then given to John de Montfort, duke of Brittany, but on his death without heirs in 1399, or possibly at an earlier date through forfeiture, it reverted to the crown. The earldom now became finally separated from the duchy of Brittany, with which it had been loosely conjoined since the Conquest, although the dukes of Brittany continued to assume the title till a much later

date. From 1414 to 1435 the earldom of Richmond was held by John Plantagenet, duke of Bedford, and in 1453 it was conferred on Edmund Tudor, uterine brother to King Henry VI., whose wife, Margaret Beaufort, was the foundress of St John's College, Cambridge, and of the " Lady Margaret " professorships of divinity at Oxford and. Cambridge (see Richmond and Derby, Margaret, Countess or). When Edmund Tudor's son Henry ascended the throne as Henry VII. in 1485, the earldom of Richmond merged in the crown, and for the next forty years there was no further grant of the title; but in 1525 Henry Fitzroy, natural son of Henry VIII. by Elizabeth Blound, was created duke of Richmond and Somerset and earl of Nottingham, all these titles becoming extinct at his death without children in 1536.

Ludovic Stuart, 2nd duke of Lennox (1574-1624), who also held other titles in the peerage of Scotland, was created earl of Richmond in 1613 and duke of Richmond in 1623. These became extinct at his death in 1624, but his Scottish honours devolved on his brother Esme, who was already earl of March in the peerage of England (see March, Earls of; and Lennox). Esme's son, James, 4th duke of Lennox (1612-1655), was created duke of Richmond in 1641, the two dukedoms as well as the lesser English and Scottish titles thus becoming again united. In 1672, on the death of his nephew Charles, 3rd duke of Rich- mond and 6th duke of Lennox, whose wife was the celebrated beauty called " La Belle Stuart " at the court of Charles II. (see Richmond and Lennox, Frances Teresa, Duchess or), his titles became extinct.

In 1675 Charles II. created his illegitimate son Charles duke of Richmond, earl of March and baron Settrington, and a few weeks later duke of Lennox, earl of Darnley and baron Torboltoun. This Charles (1672-1723), on whom his father the king bestowed the surname of Lennox, was the son of the celebrated Louise de Keroualle, duchess of Portsmouth. His son Charles, 2nd duke (1701-1750), added%to the titles he inherited from his father that of duke of Aubigny in France, to which he succeeded in 1734 on the death of his grandmother the duchess of Ports- mouth; and all these honours are still held by his descendant the present duke of Richmond.

The seven dukes of Richmond of the Lennox line have all borne the Christian name of Charles. The 2nd duke, by his marriage with Sarah, daughter of the 1st Earl Cadogan, was father of Lady Caroline Lennox, who eloped with Henry Fox,

and was the mother of Charles James Fox, and of the beautiful Lady Sarah Lennox (i 745-1826) with whom George III. fell in love and “contemplated marriage, and who afterwards married, first, Sir Thomas Bunbury, from whom she was divorced, and secondly, George Napier, by whom she was the mother of Generals Sir Charles and Sir William Napier.

Charles, 3rd duke of Richmond (1733-1806), was one of the most remarkable men of the 18th century, being chiefly famous for his advanced views on the question of parliamentary reform. Having succeeded to the peerage in 1750, he was appointed British ambassador extraordinary in Paris in 1765, and in the following year he became a secretary of state in the Rockingham administration, resigning office on the accession to power of the earl of Chatham. In the debates on the policy that led to the War of American Independence Richmond was a firm supporter of the colonists; and he initiated the debate in 1778 calling for the removal of the troops from America, during which Chatham was seized by his fatal illness. He also advocated a policy of concession in Ireland, with reference to which he originated the phrase ” a union of hearts ” which long afterwards became famous when his use of it had been forgotten. In 1779 the duke brought forward a motion for retrenchment of the civil list; and in 1780 he embodied in a bill his proposals for parliamentary reform, which included manhood suffrage, annual parliaments and equal electoral areas. Richmond sat in Rockingham’s second cabinet as master-general of ordnance; and in 1784 he joined the ministry of William Pitt. He now developed strongly tory opinions, and his alleged desertion of the cause of reform led to a violent attack on him by Lauderdale in 1792, which nearly led to a duel between the two noblemen. Richmond died in December 1806, and, leaving no legitimate children, he was succeeded in the peerage by his nephew Charles, son of his brother, General Lord George Henry Lennox.

The 4th duke (1 764-1819) and his wife Charlotte, daughter of the 4th duke of Gordon, were the givers of the famous ball at Brussels on the night before the battle of Quatre Bras, immortalized in Byron’s Childe Harold. Their son, the 5th duke (1791-1860), while still known by the courtesy title of earl of March, served on Wellington’s staff in the Peninsula, being at the same time member of parliament for Chichester. He was afterwards a vehement opponent in the House of Lords of Roman Catholic emancipation, and at a later date a leader of the opposition to Peel’s free trade policy. In 1836, on inheriting the estates of his maternal uncle, the 5th and last duke of Gordon, he

assumed the name of Gordon before that of Lennox. On his death in i860 he was succeeded in his titles by his son Charles Henry, 6th duke of Richmond (1818-1903), a statesman who held various cabinet offices in the Conservative administra- tions of Lord Derby, Disraeli and the marquess of Salisbury; and who in 1876 was created earl of Kinrara and duke of Gordon. These honours in addition to the numerous family titles of more ancient creation passed on his death in 1903 to his son Charles Henry Gordon-Lennox (b. 1845), 7th duke of Richmond and Lennox and 2nd duke of Gordon.

See Sir Robert Douglas, The Peerage of Scotland, edited by Sir J. B. Paul; G. E. C, Complete Peerage, vol. vi. (London, 1895); Lady Elizabeth Cust, Some Account of the Stuarts of Aubigny in France (London, 1891). For the dukes of the creation of 1675 see also, Anthony Hamilton, Memoirs of Grammont, edited by Sir W. Scott, new edition (2 vols., Londsn, 1885) ; Horace Walpole, Letters, edited by P. Cunningham (9 vols., London, 1891), and Memoirs of the Reign of George III., edited by G. F. R. Barker (4 vols., London, 1894); the earl of Albemarle, Memoirs of Rockingham and his Contemporaries (2 vols., London, 1852) ; The Grenville Papers, edited by W. J. Smith (4 vols., London, 1852); Earl Stanhope, Life of William Pitt (4 vols., London, 1861); Lord Edmond Fitz- maurice, Life of William Earl of Shelburne (3 vols., London, 1875); the duke of Richmond, The Right of the People to Universal Suffrage and Annual Parliaments (London, 1817), being an edition of the 3rd duke's famous " Letter to Lieut.-Colonel Sharman," originally published in 1783; Lord William Pitt Lennox, Memoir of Charles Gordon-Lennox, $th Duke of Richmond (London, 1862). (R. J. M.)

RICHMOND, LEGH (1772-1827), English divine, was born on the 29th of January 1772, at Liverpool. He was educated at Trinity College, Cambridge, and in 1798 was appointed to

the joint curacies of Brading and Yaverland in the Isle of Wight. He was powerfully influenced by William Wilberforce's Practical View of Christianity, and took a prominent interest in the British and Foreign Bible Society, the Church Mis- sionary Society and similar institutions. In 1805 he became assistant-chaplain to the Lock Hospital, London, and rector of Turvey, Bedfordshire, where he remained till his death on the 8th of May 1827. The best known of his writings is The Dairyman's Daughter, of which as many as four millions in nine- teen languages were circulated before 1849. A collected edition of his stories of village life was first published in 18 14 under the title of Annals of the Poor. He also edited a series of Reforma- tion biographies called Fathers of the English Church (1807-12). See

Memoirs by T. S. Grimshawe (1828); Domestic Portraiture by T. Fry (1833).

RICHMOND, SIR WILLIAM BLAKE (1842-), English painter and decorator, was born in London on the 29th of November 1842. His father, George Richmond, R.A. (1809- 1896), himself the son of a successful miniature painter, was a distinguished artist, who painted the portraits of the most eminent people of his day, and played an important part in society. At the age of fourteen William Richmond entered the Royal Academy schools, where he worked for about three years. A visit to Italy in 1859 gave him special opportunity for studying the works of the old masters, and had an important effect upon his development. His first Academy picture was a portrait group (1861); and to this succeeded, during the next three years, several other pictures of the same class. In 1865 he returned to Italy, and spent four years there, living chiefly at Rome. To this period belongs the large canvas. ” A Procession in Honour of Bacchus,” which he exhibited at the Academy in 1869 when he came back to England. His picture, “An Audience at Athens,” was exhibited at the Grosvenor Gallery in 1885. He became Slade professor at Oxford, succeeding Ruskin, in 1878, but resigned three years later. He was elected an Associate of the Royal Academy in 1888 and Royal Acade- mician in 1895; he received the degree of D.C.L. in 1896, and a knighthood of the Bath in 1897, and became professor of painting to the Royal Academy. Apart from his pictures, he is notable for his work in decorative art, his most conspicuous achievement being the internal decoration and the glass mosaics of St Paul’s Cathedral. Sir William Richmond also took a keen interest in social questions, particularly in smoke-prevention in London.

RICHMOND, a city of Bourke county, Victoria, Australia, 2 m. S.E. of and suburban to Melbourne. It is one of the pleasantest of the metropolitan suburbs, having numerous parks and public gardens. There are a number of prosperous industries in the city. Pop. (1901) 37,722.

RICHMOND, a city and the county-seat of Wayne county, Indiana, U.S.A., on the E. branch of the Whitewater river, about 68 m. E. of Indianapolis. Pop. (1890); 16,608; (1900) 18,226, of whom 1467 were foreign-born and 1009 negroes; (1910 census) 22,324. It is served by the Chicago, Cincinnati & Louisville, the Grand Rapids & Indiana and the Pittsburg, Cincinnati, Chicago & St Louis railways, and by the Terre Haute, Indianapolis & Eastern and the Ohio electric inter- urban railways. Richmond has broad well-shaded streets, several parks, including Glen Miller (139 acres), and handsome public buildings. Its

public institutions include the Morrisson- Reeves (public) Library (1864), one of the largest (39,000 volumes in 1909) and oldest in the state, an art gallery, the Reid Memorial Hospital, a Home for Friendless Women, the Margaret Smith Home for Aged Women (1888), the Wernle Orphans' Home (1879; Evangelical Lutheran), and the Eastern Indiana Hospital for the Insane (1890). Just west of the city limits is Eariham College (co-educational), opened in 1847, chartered in 1859 and controlled by the Society of Orthodox Friends; in 1908-9 it had 30 instructors, 620 students and a library of 18,000 bound volumes. Richmond was for many years the centre, west of Philadelphia, of the activities of the Society of Friends. It is an important railway and commercial centre,

trade in hardware being especially large. Among its manu- factures are agricultural machinery (especially seeding machines) and tools, automobiles, pianos, lawn-mowers, roller-skates, foundry and machine-shop products, furniture, burial caskets, and flour. In 1905 its factory product was valued at $6,731,740, an increase of 41-6% since 1900. Pipe lines supply the city with natural gas. The municipality owns and operates the electric- lighting plant. In 1806 Friends from North Carolina and Pennsylvania settled near here, and Richmond was platted in 1816. Its growth was slow until the opening of the National Road, which entered Indiana near the city, and the construction of railways. Richmond was incorporated as a village in 1818 and chartered as a borough in 1834 and as a city in 1840.

RICHMOND, a city and the county-seat of Madison county, Kentucky, U.S.A., about 95 m. S.E. of Louisville. Pop. (1890) 5073; (1900) 4653, of whom 2087 were negroes; (1910) 5340. It is served by the Louisville & Atlantic and the Louisville & Nashville railways. It is situated in the " Blue Grass Region," near the foothills of the Cumberland Mountains. It is the seat of Madison Institute for girls (1856) and of the Eastern Kentucky State Normal School (1906). From 1874 to 1901 it was the seat of Central University, which in the latter year was consolidated with Centre College at Danville, Ky. (q.v.). The surrounding country is devoted largely to the cultivation of tobacco, Indian corn and wheat, and the breeding of fine horses and cattle; and Richmond is an important live-stock market. Among the manufactures are bricks, flour, tobacco and cigars, and carriages, On the 30th of August 1862 a Confederate force of about 7000 men under General Edmund Kirby Smith won a decisive victory here over a Union force

of a nearly equal number under Generals Mahlon D. Manson (1820-1895) and William Nelson.

RICHMOND, a municipal borough in the Kingston parlia- mentary division of Surrey, England, 9 m. W.S.W. of Charing Cross, London. Pop. (1891) 26,875; (1901) 31,672. It lies on the right bank of the Thames, which is here crossed by a bridge carrying the road to Twickenham. Through its pleasant situation Richmond has grown into a large residential suburb of the metropolis. The town was anciently called Syenes and afterwards Schene and Sheen (a name preserved in the village of East Sheen, adjacent on the London side) until the name was in 1500 changed to Richmond by command of Henry VII., who was earl of Richmond in Yorkshire. It grew up round the royal manor house, which became a frequent residence of sovereigns, but of which nothing more than a gateway remains. Edward I. received the Scotch commissioners at his manor of Sheen in 1300. The palace was rebuilt by Edward III., who died here in 1377. It was frequently used by Richard II., and here his wife Anne of Bohemia died, upon which he cursed the place and ” caused it to be thrown down and defaced.” By Henry V., however, it was rebuilt, and a great tournament was held here in 1492 by Henry VII., who after its destruction by fire in 1498 restored it. Henry VIII. gave it to Wolsey to reside in, after the latter presented him with the new palace of Hampton Court. James I. settled it on his son Henry, prince of Wales, who restored and embellished it at great expense. Charles I. added to it the new deer park generally known as Richmond Park, 2253 acres in extent, which is surrounded by a wall 11 m. in length. After the execution of the king, the parliament presented the park to the citizens of London, who again presented it to Charles II. at the Restoration. Though partly dismantled, the palace was the residence of the queen dowager till 1665, and by James II. it was used as a nursery for the young prince; but, gradually falling into decay, it was parcelled into tenements about 1720. In the old deer park extending northwards from the site of the palace, Kew Observa- tory was erected in 1769, occupying the site of a Carthusian convent founded by Henry V., and a dwelling-house in which Swift for some time resided. The White Lodge was built by George I., and has been a residence of various members of the royal family. To the south-east of the town, at the entrance to Richmond Paxk, is Richmond Hill, from which is seen a

famous view of the Thames with the surrounding country to the west. This view was- secured to the public by an agreement, sealed on the 7th of February 1896, between the corporation and the trustees of the earl of Dysart, by an act of Parliament of 1902, and by the acquisition in the same year, by the London County Council, with the assistance

of the borough of Richmond and other interested local authorities, of the Marble Hill Estate and other property on the Middlesex shore. The church of St Mary Magdalen is of considerable antiquity, but almost entirely rebuilt; it contains a large number of monuments to celebrated persons. A theatre, first established in 1719, was during his later years leased by Edmund Kean. The town has a Wesleyan theological college, founded in 1834. Richmond, which was incorporated in 1890, is governed by a mayor, 10 aldermen and 30 councillors. The borough includes Kew (q.v.), Petersham and North Sheen. Area, 2491 acres.

RICHMOND, a market town and municipal borough in the Richmond parliamentary division of the North Riding of Yorkshire, England, 50 m. N.W. from York, the terminus of a branch of the North-Eastern railway. Pop. (1901) 3837. It is finely situated on the left bank of the Swale, the valley of which is narrow and the banks steep. The interest of the town centres in the castle founded about 1071 by Alan Rufus, a son of Odo, count of Penthievre in Brittany, who is also said to have rebuilt the town on obtaining from William the Conqueror, among other possessions, the estates of the Saxon earl Edwin, embracing some two hundred manors of Richmond and extending over nearly a third of the North Riding. This tract, comprising five wapentakes, was called Richmondshire at this time, but the date of the creation of the shire is uncertain. When Henry VII. came to the throne these possessions reverted to the crown. Henry VIII. gave them to his son Henry, afterwards duke of Richmond, by a daughter of Sir John Blount, and Charles II. bestowed, the title of duke of Richmond on his son by the duchess of Ports- mouth. The castle is situated on a perpendicular rock rising about 100 ft. above the Swale, and from its great strength was considered impregnable. Originally it covered an area of 5 acres, but the only portions of it remaining are the Norman keep, with pinnacled tower and walls 100 ft. high by 11 ft. thick, and some other smaller towers. The view from the keep is very fine, extending westward up the bold valley and over the hills which wall it, and eastward over the rich plain of the centre of the county. The church of St Mary is tran- sitional Norman, Decorated and Perpendicular, and is largely restored. The church of the Holy Trinity retains only the nave and the detached tower. The building is ancient but was restored to use from ruins. Close to the town are ruins of Easby Abbey, a Premonstratensian foundation by Roald, constable of Richmond Castle in 11 52, beautifully situated by the river. The remains, which are considerable, include a Decorated gateway, an Early English chapel and fragments of the transepts and choir of the church, with sufficient portions of the domestic buildings to enable

the complete plan to be traced. For the free grammar-school founded by Elizabeth a Gothic building was erected in 1850, in memory of the Rev. James Tate, a former master. The tower of a Franciscan abbey founded in 1258 remains. The chief modern buildings are the town hall, market hall and the mechanics' institute. The principal trade is in agricultural produce, but there are a paper mill and an iron and brass foundry. An annual meeting is held on the racecourse in September. In 1889 Richmond became the seat of a suffragan bishop in the diocese of Ripon. The town is governed by a mayor, 4 aldermen and 1 2 councillors. Area, 2 5 20 acres.

The nameof Richmond (Richemont, Richemund) has not been traced further back than 1145. But it is probable that there was a settle- ment on the site of the present town before that date. Possibly it was the Hindrelaghe of the Domesday Survey, a place which, although large enough to have a church in 1086, appears to have vanished before the close of the 12th century. As far as is known the earliest charter was granted in 1 145. But a later charter (1146) shows that the burgesses had enjoyed some municipal

liberties at an earlier period. The charter of 1 145 gave the burgesses the borough of Richmond to hold for ever in fee farm at an annual rent of £29. Other charters were granted by Earl Conan in 1 150, by Earl John II. irt 1268 and by Edward III. (the first royal charter) in 1328, and confirmed in subsequent reigns. A charter of incor- poration was granted by Queen Elizabeth under the title of alder- men and burgesses in 1576, and another by Charles II. in 1668 under the name of mayor and aldermen. This last, though superseded later, was restored in the reign of James II. and, until the passing of the Municipal Reform Act of 1835, was regarded as the governing charter of the borough. Although Richmond received a summons as early as 1328, it was not represented in parliament until 1584, from which time it usually sent two members. In 1867 the number was reduced to one. Since 1885 the representation has been merged in the Richmond division of the North Riding. The charter of Earl John II. points to the existence of a market before 1268, but there is no grant of it extant. In 1278, Edward I. granted the same earl a yearly fair to be held at Richmond from the 3rd to the 16th of Sep- tember inclusive. Queen Elizabeth granted the burgesses a market every Saturday, a market every fortnight for animals and a fair each year on the vigil of Palm Sunday. At one time there appear to have been as many as four annual

fairs. There is now only one, which takes place on the 2nd and 3rd of November. The weekly market is still held on Saturday, and there is a fortnightly market for cattle. In the middle ages Richmond had an important market for corn and wool. There is evidence later of traffic in lead, and also of a flourishing manufacture of hand-knitted stockings. As the town possesses the only railway station in Swaledale, the market is still of consequence. But the stocking industry decayed with the intro- duction of machinery. William the Lion of Scotland was imprisoned in the castle in the reign of Henry II., but otherwise the town owes its importance chiefly to its lords. The honour was a valuable possession in the middle ages, and it was usually in royal or semi-royal hands.

See R. Gale, Registrum Honoris de Richemund (London, 1722); C. Clarkson, The History and Antiquities of Richmond (Richmond, 1821); T. D. Whitaker, A History of Richmondshire (London, 1823); Victoria County History, Yorkshire.

RICHMOND, the capital of Virginia, U.S.A., the county- seat of Henrico county, and a port of entry, on the James river (at the head of navigation), about 100 m. S. by W. of Washington, D.C., and about 125 m. by water from the Atlantic Ocean. Pop. (1850) 27,570; (i860) 37,910; (1870) 51,038; (1880) 63,600; (1890) 81,388; (1900) 85,050, of whom 32,230 were negroes and 2865 were foreign-born; (1910 census) 127,628. Richmond is served, by the Atlantic Coast Line, the Chesapeake & Ohio, the Seaboard Air Line, the Southern and the Richmond, Fredericksburg & Potomac railways, and by the Old Dominion, the Virginia Navigation and the Chesa- peake steamship lines. The city has a beautiful situation on the hilly ground (maximum elevation, about 250 ft. above sea-level) along the north and east banks of the James, at a bend where the river changes its south-easterly course for one almost due south. It occupies seven hills, from which fact it has been called ” the Modern Rome.” The western. stretch of the river, opposite the city, breaks into rapids which have a fall of about 116 ft. in 9 m. and provide abundant water power. Belle Isle (the site of a Confederate prison camp during the Civil War), about 5 m. long by about \ m. wide, is in this part of the river; a little farther down stream are a group of small islets, and opposite the south-eastern boundary of the city is Mayo’s Island. Within the city’s lines the river is crossed by two bridges (to Manchester) for vehicles and pedestrians, and three railway bridges. The river has been improved by Federal engineers since 1870; in June 1909 (up to which time $1,799,033 had been expended for improvements) there was a channel 100 ft. wide and 18 ft. deep, nearly continuously from Hampton Roads to the Richmond wharf, and the maxi- mum draft at

low water was 16-1 ft.

About three-fourths of the city's total street mileage (120 m.) is paved, Belgian block or macadam being used on the. principal thoroughfares. About 637-8 acres are devoted to city parks, among which are William Byrd Park (300 acres), in the western part of the city, Joseph Bryan Park (262-6 acres) , Chimborazo Park (29 acres), near its eastern boundary, Gambles Hill Park (8-8 acres), Monroe Square (7J acres), Jefferson Park (6-3 acres) and Marshall Square (7 acres). The State Capitol Square (10 acres) is not owned by the city. Half a mile N.W. of the city are the Fair Grounds, where a state fair is held annually.

Of Richmond's public buildings, several have great historic interest. St John's Episcopal church, built in 1740 (and sub-

sequently much enlarged), is noted especially as the meeting- place of the Virginia Convention of March 1775, before which Patrick Henry made a famous speech, ending, "I know not what course others may take, but as for me, Give me liberty, or give me death!" The Capitol (begun in 1785 and com- pleted- in 1792 — the wings were added in 1906) was designed from a model and plans of the Maison Carree, at Nimes, sup- plied by Thomas Jefferson, while he was minister to France. Aaron Burr was tried for treason and then for misdemeanour in this building in 1807, the Virginia secession convention met here in 1861, and during the Civil War the sessions of the Con- federate Congress were held here. In its rotunda is Jean Antoine Houdon's full-length marble statue of Washington, provided for by the Virginia General Assembly in 1784; and erected in 1796; its base bears a fine inscription written by James Madison. In a, niche is a Houdon bust of Lafayette, a replica of the original presented to the city of Paris by the state of Virginia. The Old Stone House (the oldest building in the city) was erected as a residence in 1737, and is now used for a museum. Masons' Hall, whose corner-stone was laid in 1785, is said to be the oldest exclusively Masonic building, in the United States. The Executive Mansion of the Confederate States of America, built in 1819, purchased by the city in 1862, and leased to the Confederate government and occupied by President Jefferson Davis in 1862-65, was acquired in 1890 by the Confederate Memorial Library Society, and is now a Confederate Museum with a room for each state of the Con- federacy and a general library in the- " Solid South " room; it has valuable historical papers, collected by the Southern Historical Society, and the society has published a Calendar of Confederate Papers (1908). The former residence of Chief- Justice John Marshall, built in 1795, is still standing; and the Lee Mansion, which was the war-time residence of General Robert E. Lee's family, has been

occupied, since 1893, by the Virginia Historical Society (organized 1831; reorganized 1847) as the repository of a valuable library and collection of portraits of historical interest. Libby Prison, which stood on the northern bank of a canal, near the river, in the eastern part of the city, was taken down in 1888-89, and its materials removed to Chicago, where it was reconstructed, in as nearly as possible its original form, and became the Libby Prison War Museum. 1 The Valentine Museum is in a house on Eleventh and Clay Streets, in which Aaron Burr was enter- tained while he was on trial, and which with $50,000 and his collections was devised to a board of trustees in 1892 by Mann S. Valentine. The museum includes 3300 books, many being of the 15th and 16th centuries, a department of engravings, a Virginia Room with portraits and relics, some tapestries, an excellent collection of casts and valuable American archaeological specimens.

The more modern buildings include the City Hall, a fine granite structure (completed in 1893), with a tower 180 ft* tall; the Library building which houses the state library (about 80,000 volumes-, with many portraits and a valuable collection of old manuscripts), the State Law Library and also the offices of most, of the state officials; the Post-Office and Customs House; the State Penitentiary; the Chamber of Commerce; and, among the religious edifices, the Sacred Heart Cathedral (Roman Catholic), presented to the city by Mr and Mrs Thomas F. Ryan; the Monumental Church, built on the site of the Richmond Theatre, in the burning of which, in 1811, Acting-Governor George W. Smith and fifty-nine others lost their lives; and St Paul's Church, where Jefferson Davis was attending services, on the 2nd of April 1865, when he received news from

1 As built in Richmond in 1845 by Luther Libby, it was a brick structure, three storeys high in front and four in the. rear. It had six rooms, each about 100X45 ft., was used as a tobacco ware- house and a ship-chandlery until 1861, and then until the capture of Richmond was used as a prison, chiefly for Federal officers. Frequently it was terribly overcrowded (by as many as 1200 pris- oners at a time), the inmates often suffered great privations, and many died or were physically disabled for the remainder of their lives.

General Lee that General Grant had broken through the lines at Petersburg and that Richmond must be evacuated. Rose- mary Library was given to the city by Thomas Nelson Page in memory of his wife,

who died in 1888.

Richmond has many fine monuments and statues of historic interest and artistic merit, the most noteworthy of the former being the Washington Monument, in Capitol Square. In 1850 the commission accepted the model submitted by Thomas Crawford (1814-1857), an American sculptor, the corner-stone of the monument was laid in that year, and the equestrian statue of Washington, with sub-statues of Patrick Henry and Thomas Jefferson, was unveiled on the 22nd of February 1858. Thereafter were added sub-statues of Chief -Justice John Marshall and George Mason (1726-1792) by Crawford, and statues of Andrew Lewis (1730-1781) and Thomas Nelson (1738-1789), and six allegorical subjects, by Randolph Rogers (1825-1892), the monument being completed in 1869, at a cost of about $260,000, of which about $47,000 represented private gifts and the interest thereon. The greatest height of the monument is 60 ft., and the diameter of its base is 86 ft. In Capitol Square are also a marble statue of Henry Clay, by Joel T. Hart (1810- 1877), a bronze statue of Stonewall Jackson, by John Henry Foley (1818-1874), an English sculptor, ” presented to the city by English gentlemen ” (Hon. A. J. Beresford-Hope and others) and unveiled in 1875; a statue of Hunter Holmes McGuire (1835-1900), a famous Virginia surgeon; and a statue of William Smith (1 796-1887), governor of Virginia in 1846-49 and in 1864-65. In Monroe Park is a statue by E. V. Valentine of Brig.-General Williams Carter Wickham (1820-1888) of the Confederate army. Another noteworthy monument is the noble equestrian statue of General Robert E. Lee, surmounting a lofty granite pedestal at the head of Franklin Street. This statue, by Marius Jean Antonin Merci6 (b. 1845), was unveiled in 1890. Adjacent is an equestrian statue of General J. E. B. Stuart, by Frederick Moynihan, and at the west end of Monu- ment Avenue is the Jefferson Davis Monument, by W. C. Nowland, in front of which is a statue of Jefferson Davis, by E. V. Valentine. On Libby Hill, in the south-eastern part of the city, is a monument to the private soldiers and sailors of the Confederacy.

In Hollywood Cemetery (dedicated in 1849) are the graves of many famous men, including presidents James Monroe and John Tyler; Jefferson Davis, John Randolph of Roanoke, the Confederate generals, A. P. Hill, J. E. B. Stuart and George E. Pickett; Commodore Matthew F. Maury (1806-1873); James A. Seddon (i8r 5-1880), Secretary of War of the Confederate States in 1862-64; and John R. Thompson (1823-1873), widely known in his day as a poet and as the editor of the Southern Literary Messenger in 1847-59. Here, too, are buried about 16,000 Confederate soldiers (to whose memory there is a massive pyramid of undressed granite, 40 ft. sq. at the base and 90 ft.

high) . In the north-eastern part of the city is Oakwood Cemetery, in which are the graves of about 18,000 Confederate soldiers. Two miles north-east of the city is the National Cemetery, with graves of 6571 Federal soldiers (5700 unknown) most of whom were killed in the actions near Richmond.

Richmond is the seat of Richmond College (opened in 1832; chartered in 1840; and co-educational since 1898), which in 1909-10 had 21 instructors and 341 students, of whom 55 were in the School of Law (established 1870; re-established 1890); the Woman's College (Baptist; opened in 1854), which in 1909-10 had 20 in- structors and 275 students; the Virginia Mechanics' Institute (1856), including a Night School of Technology; the Union Theological Seminary in Virginia (Presbyterian; opened in 1824ˆ and removed to Richmond in 1898 from Hampden-Sidney), which in 1909-10 had 7 instructors and 80 students ; the Medical College of Virginia, (founded in 1838), which has medical, dental and pharmaceutical departments, and in 1909-10 had 50 teachers and 253 students; the University College of Medicine (1893), which has departments of medicine, dentistry and pharmacy, and in 1909-10 had 57 teachers and 220 students; the Hartshorn Memorial College (Baptist), for women; and, for negroes, Virginia Union University, founded in

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Many periodicals (including several religious weeklies) are pub- lished in Richmond. The principal newspapers are the Times-

Dispatch (Democratic; Dispatch, 1850; Times, 1886; consoli- dated in 1903) and the News-Leader (Democratic, 1899). Among the city's clubs are the Westmoreland and the Commonwealth.

The city's charitable institutions include the Memorial (1903), Virginia Sheltering Arms (1889) and St Luke's hospitals, the Retreat for the Sick (1877), the Eye, Nose, Ear and Throat In- firmary (1880), the Confederate Soldiers' Home (1884), supported jointly by the state and the city, a Home for Needy Confederate Women (1900), the City Almshouse and Hospital, and several orphanages and homes for the aged.

Richmond is the leading manufacturing city of Virginia, the value of its factory products in 1905 being $28,202,607, an increase of 22-4% since 1900 and nearly 19% of the value of the state's factory products in this year. The chief industry is the manufac- ture of tobacco for smoking and chewing, of cigars and cigarettes and of snuff. There are

large iron and steel works here, notably the Tredegar Iron Works. Other important manufactures, with their product-values in 1905, are lumber and planing-mill products, $5 o8 .953; fancy and paper boxes and wooden packing boxes, *43 2 >5 2 2; coffee and spices, $245,689; foundry and machine- shop products, $238,576; and saddlery and harness, $235,839. Richmond is the port of entry for the District of Richmond; in 1907 its imports were valued at $913,234 and its exports at $158,275; in 1909, its imports at $693,822 and its exports at $24,390. The city has a large jobbing and retail trade.

Richmond is governed under a charter of 1870 with amendments. The mayor is elected for two years and has the powers and authority in criminal cases of a justice of the peace. The city council is composed of a common council (five members from each ward, elected for two years) and of a board of aldermen (three members from each ward to be elected for four years). Other elective officers are the mayor, city treasurer, city sergeant, commonwealth attorney, city collector, city auditor, sheriff and high constable, elected for four years; and clerks of the various courts elected for eight years. The commissioner of the revenue is appointed for a term of four years by the judge of the corporation court. Three justices of the peace are elected from each ward for a term of two years. The city council appoints an attorney for the corporation, a city engineer, a city clerk, a police justice, a board of fire com- missioners and a board of police commissioners, one from each ward, who have control of the fire and police departments, respectively, and a number of other officers. The city owns its gas works, water works and an electric-lighting plant (1910) for municipal lighting. The debt limit is set by the city charter at 18% of the assessed value of the taxable real estate of the city. In 1909 the taxable real estate and personal property was valued at $108,663,716, and the city had no floating debt; on the 1st of February 1910, there were $10,706,318 worth of bonds outstanding, and the sinking fund was $2,011,857.

An exploring party from Jamestown, under command' of Captain Christopher Newport (c. 1565-1617), and including Captain John Smith, sailed up the James river in 1607, and on the 3rd of June erected a cross on one of the small islands opposite the site of the present city. The first permanent settlement within the present limits of the city was made in 1609 in the district long known as Rockett's. Later in the same year Captain Smith bought from the Indians a tract of land on the east bank of the river, about 3 m. below this settlement, and near the site of the present Powhatan. This tract he named " None- such," and here he attempted to establish a small body of soldiers who had occupied a less favourable site in the vicinity; but

they objected to the change and, being attacked by the Indians, sought the protection of Smith, who made prisoners of their leaders, with the result, apparently, that the settlement was abandoned. In 1645 Fort Charles was erected at the falls of the James as a frontier defence. In 1676, during ” Bacon’s Rebellion,” a party of Virginians under Bacon’s command killed about 150 Indians who were defending a fort on a hill a short distance east of the site of Richmond in the ” Battle of Bloody Run,” so called because the blood of the slain savages is said to have coloured the brook (or ” run “) at the base of the hill. Colonel William Byrd, 1 who owned much land along the

1 The Byrds and their ancestors, the Steggs, were conspicuous in the early history of Virginia. The first of the family was Thomas Stegg (or Stegge) (d. 1651), born in England, who became an Indian trader on the James river as early as 1637, and had his home near what is now the village of Westover, Charles City county. He left his estate to his son Thomas (d. 1670), who settled at the falls of the James in 1661, and was auditor-general in 1664-1670. He was succeeded by his nephew, William Byrd (1 652-1 704), who was born in London, went to Virginia about 1670, became a successful Indian trader, was a member of the House of Burgesses in 1677- 1682, was a supporter of Nathaniel Bacon at the beginning of

James river, at the falls, visited the tract in September 1733, and decided to found there the town of Richmond, at the same time selecting and naming the present site of Petersburg. The name Richmond was suggested probably by the similarity of the site to that of Richmond on the Thames. The settlement was laid out in April 1 73 7 by Major William Mayo (c. 1685-1 744) , and was’ incorporated as a town in 1742. The public records of the state were removed thither in 1777 from Williamsburg, and in May 1779 Richmond was made the capital. On the 5th of January 1781 the town was partly burned by a force of about 800 British troops under Gen. Benedict Arnold, the 200 or 300 Virginians offering little resistance, and much of the damage being done by Lieutenant-Colonel John G. Simcoe’s celebrated Rangers. Richmond was first chartered as a city in 17.82, and in 1788 it was allowed a representative in the House of Delegates.

The importance of Richmond during the Civil War was principally due to its having been made the capital of the Confederate States (by act of the Provisional Government on the 8th of May 1861). Its nearness to Washington, the material and manufacturing resources concentrated in it, and the moral im- portance attached to its

possession by both sides, caused it to be regarded as the centre of gravity of the military operations in the east to which the greatest leaders and the finest armies were devoted from 1861 to 1865. (See American Civil War.) The city's system of defences, which began to take form in May 1 86 1, included a line of 17 heavy batteries, completely encircling it at an average distance of about 2 m.; another line of smaller batteries and trenches, from about a mile (or less) to about 2 m. beyond the heavy batteries, and practically unbroken from the north bank of the James (west of the city) to about 1 m. west of that river (south of the city) ; and the outer works, approxi- mately paralleling the inner line, at distances of from 2 to 3 m. from this line north and east of the city. There was much confusion and lawlessness in Richmond during the earlier stages of the war. The city's police force was unable to cope with the situation created by the influx of soldiers, gamblers and adventurers, and on the 1st of March 1862 President Davis (by authority of a secret Act of the Confederate Congress passed on the 2nd of February) declared martial law in the city and the country within a radius of 10 m., suspended the writ of habeas corpus, and appointed General John H. Winder (1800-1865) to enforce military rule. General Winder's arbitrary exercise of his power was, however, resented so vigorously by the citizens that on the 19th of April the Confederate Congress materially modified the law under which he received these powers from the president. The opening of M'Clellan's Peninsula Campaign (see Yorktown; Seven Days, &c.) in 1862 caused great appre- hension in Richmond, and in May 1862 some of the government records were packed up and preparations made to ship them to a place of safety. The approach of the " Monitor " and the Union gunboats up the James river caused a partial and temporary panic; President Davis appointed a day for prayer, and the families of some of the cabinet secretaries and many citizens fled the city precipitately; but confidence, restored by

" Bacon's Rebellion," was auditor-general of the colony from 1687 until his death, and was a member of the committee which founded the College of William and Mary. His residence, within the limits of the present city of Richmond, was preserved until about 1850. His son William (1674-1744), the founder of Richmond — and above referred to — was educated in England; returned to Vir- ginia in 1696; succeeded his father as auditor-general of the colony, and was receiver-general in 1705-1716. In 1727 he was appointed one of the commission (of which William Fitzwilliams and William Dandridge were the other members) to mark the boundary between North Carolina and Virginia, concerning which undertaking he wrote (probably in 1737) The History of the Dividing Line. This with his

other publications, A Journey to the Land of Eden and A Progress to the Mines, was published at Petersburg, Va., in 1841, and again (New York, 1901) as The Writings of Colonel William Byrd of Westover in Virginia, edited by John S. Bassett, and including an extended sketch of the Byrd family. Concerning Byrd's style as a writer, Professor Bassett says: " It would be hard to find before Franklin a better master of the art of writing clear, forceful and charming English."

the checking of the fleet at Drewry's Bluff (Fort Darling), about 8 m. below the city, on the 15th of May 1862, was increased by the battle of Fair Oaks and the Seven Days, after which the Army of the Potomac retreated. Unsuccessful attempts were made in February and March 1864 to free the Federal prisoners in Richmond by means of cavalry raids. The most important of these was that of General H. Judson Kilpatrick, a portion of whose force, under Col. Ulric Dahlgren (b. 1842), was anni- hilated, Dahlgren being killed (2nd March).

General U. S. Grant began the final campaign against Rich- mond in May 1864 (see Wilderness and Petersburg). Sheridan's cavalry, during the " Richmond Raid," carried the city's outer defences (May 12), but found the river line too strong to be taken by assault and moved away. In June Grant's army crossed the James and attacked Lee in Petersburg. Then followed many months of unintermittent pressure upon both Petersburg and Richmond. General Benjamin F. Butler captured the southern outer line of the Richmond defences on the 29th of September 1864. On the 2nd of April 1865 Petersburg fell. Richmond was evacuated that night, after the ironclads, the bridges and many of the military and tobacco store-houses had been set on fire by order of General R. S. Ewell, so that when the Federal troops, under General Godfrey Weitzel (1835- 1884) entered the city on the following morning (3rd April) a serious conflagration was under way, which was not extinguished until about one-third of the city, including several of its historic buildings, had been destroyed. During the war the principal iron foundry of the. Confederacy (Tredegar Iron Works) was in Richmond, and here most of the cannon used by the Confederate armies were cast. In 19 10 the city of Manchester was annexed.

See William W. Henry, " Richmond on the James " in Historic Towns of the Southern States (New York, 1900), edited by Lyman P. Powell; and Samuel Mordecai, Richmond in By-Gone Days (Rich- mond, 1856; 2nd ed., i860).

RICHMOND AND DERBY, MARGARET, Countess of (1443-1509), mother of the English king, Henry VII., and foundress of St John's and

Christ's colleges at Cambridge, was the daughter and heiress of John Beaufort, duke of Somerset, and was born on the 31st of May 1443. In 1455 she married Edmund Tudor, earl of Richmond, who died in the following year; she then took for her husband Henry (d. 1482), son of Humphrey Stafford, duke of Buckingham, and later Thomas Stanley, afterwards earl of Derby. She was in constant com- munication with her son, the future king, during his exile in Brittany, and with her husband, Lord Stanley, aided him to gain the crown in 1485. The countess was very pious and charitable, and under the influence of her confessor, John Fisher, afterwards bishop of Rochester, she founded the Lady Margaret professorships of divinity at the universities of Oxford and Cambridge. She completed the foundation of Christ's College, Cambridge, and after her death, in accordance with her wishes, much of her wealth was devoted to building and endowing St John's College in the same university. She survived her son, whose title to the English throne was derived through her, and died on the 29th of June 1509. The countess translated some devotional books into English, and Fisher said of her, " All England for her death had cause of weeping."

See C. H. Cooper, Memoir of Margaret, Countess of Richmond and Derby (1874).

RICHMOND AND LENNOX, FRANCES TERESA STEWART,

Duchess of (1648-1702), daughter of Walter Stewart, or Stuart, a physician in the household of Queen Henrietta Maria when in exile after 1649, was born in 1648 and was brought up in France. Notwithstanding the desire of Louis XIV. to keep her at his court, she was sent to England by Henrietta Maria in 1683, when she was appointed maid of honour to Catherine of Braganza, Queen of Charles II. Pepys describes her at this time as the greatest beauty he had ever seen, and Henrietta Maria called her the prettiest girl in the world. Charles II., who is said to have first seen " La belle Stewart " in the apart- ments of his mistress Lady Castlemaine (afterwards duchess of Cleveland), quickly became enamoured of her; but for some

time Miss Stewart resisted the king's: importunities, though her behaviour was far from modest and " she had no aversion to scandal." She had numerous suitors, including the duke of Buckingham and Francis Digby, son of the earl of Bristol, whose unrequited love for her

was celebrated by Dryden. Her beauty appeared to her contemporaries to be only equalled by her childish silliness; but her letters to her husband, preserved in the British Museum, are not devoid of good sense and feeling. The king's infatuation was so great that when the queen's life was despaired of in 1663, it was reported that he intended to marry Miss Stewart, and four years later he was considering the possibility of obtaining a divorce to enable him to make her his wife. This was at a time when Charles feared he was in danger of losing her as his mistress, her hand being sought in marriage by Charles Stuart, duke of Richmond and Lennox. The duchess of Cleveland, who was losing her hold on the king's affections, is reported by Hamilton to have led the king to Miss Stewart's apartment at midnight when Richmond was closeted with her, and the duke was immediately expelled from court. In March 1667 the lady eloped from Whitehall with Richmond and married him secretly in the country. The king, who was greatly enraged, suspected Clarendon of being privy to the marriage, and, according to Burnet, deprived him of office for this offence. The duchess of Richmond, however, soon returned to court, where she remained for many years; and although she was disfigured by small-pox in 1668, she retained her hold on the king's affections. Her husband was sent as ambassador to Denmark, where he died in 1672. The duchess was present at the birth of the prince of Wales, son of James II., in 1688, being one of those who signed the certificate before the council. She died in 1702, leaving a valuable property to her nephew the earl of Blantyre, whose seat was named Lennoxlove after her.

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RICHTER, ADRIAN LUDWIG (1 803-1 884), German painter and etcher, was born at Dresden in 1803, the son of the engraver Karl August Richter, from whom he received his training; but he was strongly influenced by Erhard and- Chodowiecki. He was the most popular, and in many ways the most typical German illustrator of the middle of the 19th century. His work is as typically German and homely as are the fairy-tales of Grimm. Richter visited Italy frorti 1823-26, and his " Thunder- storm in the Sabine Mountains " at the

Staedel Institute in Frankfort is one of the rare Italian subjects from his brush. In 1828 he worked as designer for the Meissen factory, and in 1841 he became professor and head of the landscape atelier at the Dresden Academy. The Dresden Gallery owns one of his best and most characteristic paintings in the ” Bridal Procession in a Spring Landscape.” He died at Loschwitz near Dresden in 1884.

RICHTER, ERNST FRIEDRICH EDUARD (1808-1879), German musical theorist, was born at Grosschonau in Saxony, on the 24th of October 1808. He first studied music at Zittau, and afterwards at Leipzig, where he attained So high a reputation that in 1843 he was appointed professor of harmony and counter- point at the conservatorium of music, then newly founded by Mendelssohn. On the death of Hauptmann on the 3rd of January 1868, he was elected cantor of the Thomasschule, which office he retained until his death on the 9th of April 1879. He is best known by three theoretical works— Lehrbuch der Hdrmonie, Lehre vom Contrapunct and Lehre von der Fuge — valuable textbooks known to English students through the excellent translation by Franklin Taylor.

RICHTER, EUGEN (1839-1906), German politician, was born on the 30th of July 1839 at Diisseldorf. After attending the universities of Bonn, Heidelberg and Berlin, he entered the

government service, being stationed in his native town. . In 1864 he was chosen burgomaster of Neuwied; but he was already known for his Liberal opinions, and the government refused to confirm the appointment, He was hereupon transferred to Bromberg, in East Prussia, which to an inhabitant of the Rhine- ■ land was the worst form of exile, and in consequence he resigned his place in the public service. He now went to Berlin, where Jie earned his living, as a journalist. He was the most consistent advocate of those doctrines of laissez faire and individual liberty which the Germans call Manchestertum. He was also keenly interested in the attempts made at that period to create co- operative societies among, the working men, and wrote a work on co-operative stores. It was not long before he came into conflict with the government; an electioneering pamphlet published in 1867 was confiscated; he was put on his trial but acquitted. In 1867 he was elected a member of the newly formed Reichstag, and in 1869 of the Prussian parliament. He soon became one of the most influential politicians in Germany. A member of the Progressive party, in 1880 one of the founders, and eventually the leader, of the Freisinnige, he was always in opposition. Next to Windthorst (q.v.) he was Bismarck’s most dangerous opponent. After the great change of policy in 1878, for a time his influence was a great

impediment to the govern- ment; as a consistent adherent to free trade, he was the leader of the opposition to the introduction of protection, to the new colonial policy, and to State Socialism. It was after 1880 that he raised the cry Bismarck muss fort. He always took a great part in debates on the military and naval establishments, in vain opposing the constant increase of army and navy. It was his refusal to support the government proposals in 1893 for an increase of the army which led to the break up of his party: he was left with only eleven followers; and, except among the middle class of Berlin and some other Prussian cities, the old Radical party, of which he was the chief representative, from that time had little influence in the country. In 1885 he founded the Freisinnige Zeitung, which he edited himself; of his numerous brochures the most successful was his attack on Socialism, entitled Sozialdemohratische Zukunftsbilder . (Berlin, 1891), a clever and successful satire on the Socialist state of the future. This has been translated into the English. He also wrote much on Prussian finance, and under the title Das politische A, B,C Buck compiled a very useful political handbook for Radical voters. He also published in 1892 reminiscences of his youth (Jugend erinnernngen) , and two volumes of parliamentary reminiscences (Im alien Reichstag, 1894-1896).

He died at Jena on the 26th of January 1906.

RICHTER, HANS (1843-), Hungarian musical conductor, born at Raab on the 4th of April 1843, was the son of the kapellmeister at the cathedral, and of his wife, ne'e Josephine Csazinsky, who was the first to perform Venus in Tannhduser at Vienna. Young Hans sang either soprano or alto in the cathedral choir, according to requirement, and occasionally played the organ. But his public debut was made as a drummer in Haydn's Paukenmesse. Ini8s3,attheage of ten, he appeared in a concert as pianist in Hummel's E flat quintet; and in 1854, after his father's death, went to the choristers' school, the Convikt (where Schubert Was educated) in Vienna, and there became chorister in the Court Chapel. For five years from i860 Richter studied under Heissler and Sechter in the Vienna Con- servatorium, and he learnt the horn under Kleinecke. A year and a half after his first lesSon he became hornist in the old Karnth- nerthor Theatre at £3 a month. Meanwhile he had devoted time to conducting. It was not till August 1868 that Richter made his first appearance as a conductor, at the Hof Theater, Munich (where he had just been appointed), in William Tell; but in the next year he resigned this post, went first to Paris, then to Brussels, and finally to Triebschen, where he copied Der Ring des Nibelwngen for Wagner. In April 1871 Richter took up his new duties as conductor of the Hungarian National Opera at Budapest, where he

remained four years, until he began in May 1875 his long connexion with the Vienna Opera, which terminated only with the century. In 1876. Richter

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directed the rehearsals and performances of Der Ring at Bayreuth, and in 1877 paid ;hi& first visit to England to conduct the Wagner Festival at the Albert Hall. There in 1879 he founded the Richter Concerts, which were a revelation to London ‘musical circles of the masterly personality of the conductor, and his influence upon the orchestra; in 1885 he became conductor of the Birmingham ‘ Triennial Festival, • and was created Mus. Doc. Oxon. honoris causa. In 1882 Richter also conducted a famous series of performances of Wagner’s works (including the first in England of Die Meislet singer and Tristan) at Drury Lane, and in 1000 became conductor of the Halle Orchestra in Man- chester. He had established his position as one of the most richly gifted and the most experienced of modern conductors, supreme in the interpretation of Beethoven, Wagner and Brahms.

RICHTER, JEREMIAS BENJAMIN (1762-1807), German chemist, was born at Hirschberg in Silesia on the 10th of March 1762, became a mining official at Breslau in 1794, and in 1800 was appointed assessor to the department of mines and chemist to the royal porcelain factory at Berlin, where; he died on the 4th of April 1807. To him belongs the merit of carrying out some of the earliest determinations of the quantities by weight in which acids saturate bases and bases acids, and of arriving at the conception that those amounts of different bases which can saturate the same quantity of a particular acid are equiva- lent to each other. He was thus led to conclude that chemistry is a branch of applied mathematics and to endeavour to trace a law according to which’ the quantities of different bases required to saturate a given acid formed an arithmetical, and the quantities of acids saturating a given base a geometrical, pro- gression. His results were published in his Anfangsgrilnden der Stochiometrie oder Messkunst chemischer Elemente (1792-94); and tfber die neueren Gegenstande in der Chemie (1792-1802), but it was long before they were properly appreciated, or he himself was accorded due credit for them. This was partly because some of his work was wrongly ascribed to C. F. Wenzel by Berzelius through a mistake which was only corrected in 1841 by Germain Henri Hess (1802-1850), professor of’chemistry at St Petersburg, and author of ” the laws of constant heat-siims and of thermoneutrality ” (see Thermochemistry).

RICHTER, JOHANN PAUL FRIEDRICH (1763-1825), usually called Jean Paul, famous German humorist, was born at Wunsiedel, in Bavaria, on the 21st of March 1763. His father was a schoolmaster and organist at Wunsiedel, but in 1765 he became a pastor at Joditz near Hof, and in 1776 at Schwar- zenbach, where he died in 1770. After attending the gym- nasium at Hof, Richter went in 1 781 to the university of Leipzig. His original intention was to enter his father's profession, but theology did not interest him, and he soon devoted himself wholly to the study of literature. Unable to maintain himself at Leipzig he returned in 1784 to Hof, where he lived with his mother. From 1787 to 1789 he served as a tutor at Topen, a village near Hof; and afterwards he taught the children of several families at Schwarzenbach.

Richter began his career as a man of letters with Gronldnd- ische Prozesse and Auswahl aus des Tenfels Papieren, the former of which was issued in 1783-84, the latter in 1789. These works were not received with much favour, and in later life Richter himself had little sympathy with their satirical tone. His next book, Die unsichtbare Loge, a romance, published in 1793, had all the qualities which were soon to make him famous, and its power was immediately recognized by some of the best critics of the day. Encouraged by the reception of Die unsicht- bare Loge, he sent forth in rapid succession Hesperus (1795), Biographische Belustigungen unlet der Gehimschale einer Riesin (1796), Leben des Quintus Pixlein (1796), Blunten- Frucht- und Dornenstilcke, oder Ehesland, Tod und Hochzeit des Armenadvo- katen Siebenkds (1796-97), Der Jubelsenior (1797), and Das Kampaner Tal (1797). This series of writings won for Richter an assured place in German literature, and during the rest of his life every work he produced was welcomed by a wide circle of admirers.

After his mother's death he went in 1797 to Leipzig, and in the following year to Weimar, where he had much pleasant intercourse with Herder, by whom he was warmly appreciated. He did not become intimate with Goethe and Schiller, to both of whom his literary methods were repugnant ; but in Weimar, as elsewhere, his remarkable conversational powers and his genial manners made him a favourite in general society. In 180.1 he married Caroline Meyer, whom he met in Berlin in 1800. They lived first at Meiningen, then at Coburg; and finally, in 1804, they settled at Bayreuth. Here Richter spent a quiet, simple and happy life, constantly occupied with his work as a writer. In 1808 he was fortunately delivered from anxiety as to outward necessities by the prince-primate, K. T. von Dalberg, who gave him a pension of a thousand florins. Before settling at Bayreuth, Richter had published his most ambitious novel, Titan (1800-3); an d

this was followed by Flegeljahre (1804-5), two works which he himself regarded as his master- pieces. His later imaginative works were Dr Kdtzenbergers Badereise (1809), Des- Feldpredigers Schmelzle Reise nach Fldlz (1809), Leben Fibels (1812), and Der Komet, oder Nikoldus Marggraf- (1820-22). In Vorschule der Aesthetik (1804) he expounded his ideas on art; he discussed the principles of education in Levan'a, oder Erziehungslehre (1807); and the opinions suggested by current events he set forth in Friedens- predigt (1808), Ddmmerungen fiir Deutschland (1809), Mars und Phbbus Thronwechsel imJahre 1814 (1814), and Politische Fastenpredigten (18 17). In his last years he began Wuhrheii aus Jean Pauls Leben, to which additions from his papers and other sources were made after his death by C. Otto and E. Forster. In 182 1 Richter lost his only son, a youth of the highest promise; and he never quite recovered from this shock. He died of dropsy, at Bayreuth, on the 14th November

1825.

Schiller said of Richter that he would have been worthy of admiration " if he had made as good use of his riches as other men made of their poverty." And it is true that in the form of his writings he never did full justice to his great powers. In working out his conceptions he found it impossible to restrain the expression of any powerful feeling by which he might happen to be moved. He was equally unable to resist the temptation to bring in strange facts or notions which occurred to him. Hence every one of his works is irregular in structure, and his style lacks directness, precision and grace. But his imagination was one of extraordinary fertility, and he had a surprising power of suggesting great thoughts by means of the simplest incidents and relations. The love of nature was one of Richter's deepest pleasures; his expressions of religious feelings are also marked by a truly poetic spirit, for to Richter visible things were but the symbols of the invisible, and in the unseen realities alone he found elements which seemed to him to give significance and dignity to human life. His humour, the most distinctive of his qualities, cannot be dissociated from the other characteristics of his writings. It mingled with all his thoughts, and to some extent determined the form in which he embodied even his most serious reflections. That it is some- times extravagant and grotesque cannot be disputed, but it is never harsh nor vulgar, and generally it springs naturally from the perception of the incongruity between ordinary facts arid ideal laws. Richter's personality was deep and many-sided; wi t th all his wilfulness and eccentricity he was a man of a pure and sensitive spirit, with a passionate scorn for pretence and an ardent enthusiasm for truth and goodness.

Richter's Samtliche Werke appeared in 1826-28 in 60 vols., to which were added 5 vols of Literarischer Nachlass in 1836-38; a second edition was published in 1840-42 (33 vols.) ; a third in 1860ˆ 62 (34 vols.). The last complete edition is that edited by R. Gott- schall (60 parts, 1879). Editions of selected works appeared in 16 vols. (1865), in Ktirschner's Deutsche Nationalliteratur (edited by P. Nerrlich, 6 Vols., 1884-87), &c. The chief collections of Richter's correspondence are: jean Pauls Brief e an P. H. Jacobi (1828); Briefwechsel Jean Pauls mit seinem Freunde C. Otto (1829- 33); Briefwechsel zwischen H. Voss und Jean Paul (1833); Brief e an eine Jugendfreundin (1858) ; P. Nerrlich, Jean Pauls Brief- wechsel mit seiner Frau und seinem Freunde Otto (1902), See further

the continuation of Richter's autobiography by C. Otto and E. Forster (1826-33) ; H. Doring, /. P. F. Richters Leben und Charak- teristik (1830-32); R. O. Spazier, J. P. F. Richter: ein biograph- ischer Kommentar zu dessen Werken (5 vols., 1833): E. Forster, Denkwurdigkeiten aus dem Legen von J. P. F. Richter (1863); P. Nerrlich, Jean Paul und seine Zeitgenossen (1876); J. Firmerv, Ittude sur la vie et les otuvres de J. P. F. Richter (1886) ; P. Nerrlich, Jean Paul, sein Leben und seine Werke (1889) ; F. J. Schneider, Jean Pauls Altersdichtung (1901) ; by the same, Jean Pauls Jugend und erstes Auftreten in der Liter atur (1906). All Richter's more important works have been translated into English, Quintus Fixlein and Schmelzles Reise, by Carlyle; see also Carlyle's two admirable essays on Richter.

RICHTHOFEN, FERDINAND, Baron von (1833-1905), German geographer and traveller, was born near Karlsruhe, Silesia, on the 5th of May 1833. He was educated at Breslau and Berlin, and in 1856 carried out geological investigations in the Tirol, subsequently extending them to Transylvania. In 1859 he accompanied as geologist the Prussian diplomatic mission to the Far East under Count von Eulenburg, and visited Ceylon, Japan, Formosa, the Philippines and Java, subsequently making an overland journey from Bangkok to Moulmein and reaching Calcutta in 1862. No important work resulted from these travels, for much of Richthofen's records and collections was lost. China was at the time inaccessible owing to the Taiping rebellion, but Richthofen was impressed with the desirability of exploring it, and after a visit to Cali- fornia, where he remained till 1868, he returned to the East. In a remarkable series of seven journeys he penetrated into almost every part of the Chinese Empire. He

returned home in 1872, and a work comprising three large volumes and an atlas, which, however, did not cover the entire field or complete the author's plan, appeared at Berlin in 1877-85 under the title of China; Ergebnisse eigner Reisen und darauf gegrilndeter Studien. In this standard work the author deals not only with geology but with every subject necessary to a general geographical treatise. Notably he paid close attention to the economic resources of the country he traversed; he wrote a valuable series of letters to the Shanghai Chamber of Com- merce, and first drew attention to the importance of the coalfields of Shantung, and of Kiaochow as a port. In 1875 Richthofen was elected professor of geology at Bonn, but being fully occupied with his work in China he did not take up professorial duties till 1879; in 1883 he became professor of geography at Leipzig, and in 1886 was chosen to the same office at Berlin, and held it till his death. His lectures attracted numerous students who subsequently became eminent in geographical work, and in order to keep in touch with them he established his weekly geographical " colloquium." Of his written works, besides that on China, there may be men- tioned " Die Kalkalpen von Voralberg und Nordtirol " in Jahrbuch der geologischen Reichsanstalt (1850-1861); "Die Metallproduktion Kaliforniens " in Petermanns Mitteilungen (1865); Natural System of Volcanic Rocks (San Francisco, 1867); Aufgaben und Methoden der keutigen Geographic (an address delivered at Leipzig, 1883); Fuhrer filr Forschungs- reisende (Berlin, 1886); Triebkrdfte und Richtungen der Erdkunde in neunzehnten Jahrhundert (address on his election as rector, Berlin, 1903). He was for many years president of the German Geographical Society, and he founded the Berlin Hydrographical Institute. He died on the 16th of October 1905.

RICIMER (d. 472), master of the Roman Empire in the West during part of the 5th century, was the son of a prince of the Suebi and the daughter of Wallia, king of the Visigoths. His youth was spent at the court of Valentinian III., and he won distinction under Aetius. In 456 he defeated the Vandals in a sea-fight near Corsica, and on land near Agrigentum in Sicily, and backed by the popularity thus acquired, Ricimer then gained the consent of the Roman senate to an expedition against the emperor Avitus, whom he defeated in a bloody battle at Piacenza on the 16th of October 456. Avitus was taken prisoner and made bishop of Piacenza, and shortly afterwards sentenced to death. Ricimer then obtained from

Leo I., emperor at Constantinople, the title patrician, but in 457 set up Majorianus as his own emperor in the West, and induced Leo to give his consent. When, however, Majorianus tried to rule by himself,

Ricimer forced him to abdicate and caused his assassination on the 7th of August 461. The successor whom Ricimer placed upon the throne was Libius Severus, who proved to be more docile than" Majorianus, but had to face the rivalry of Leo in the East and Aegidius in Gaul. Upon his death in 465 — said to be due to the poison of Ricimer — this emperor-maker ruled the West for eighteen months without an emperor, and then accepted Leo's candidate Anthemius, diplomatically married his daughter, and for some time lived in peace with him. Before long, however, Ricimer moved to Milan, ready to declare war upon Anthemius. St Epiphanius, bishop of Milan, patched up a truce, but in 472 Ricimer was again before Rome with an army of Germans, proclaimed as emperor Olybrius, whom Leo had sent to pacify the two enemies, and after three months' siege took the city, on the 1st of July 472. Anthemius was massacred and Rome was a prey to Ricimer's soldiers. He himself, however, died on the 18th of August 472, of malignant fever.

RICINA, an ancient town of Picenum, Italy, 3 m. N.W. of the modern Macerata, on the banks of the river Potenza, in a fertile valley. It was probably a municipium until it was refounded by Pertinax and Septimius Severus, after which it bore the name Colonia Helvia Ricina Pertinax. The site is now deserted, but considerable ruins of a theatre and remains of baths and other buildings (all in brickwork of the imperial . period) still exist; also the fragments of an ancient bridge over the Potenza.

RICKETS, a constitutional disease of childhood characterized chiefly by a softened condition of the bones and by other evidences of perverted nutrition. It was first described in 1649 by Arnold de Boot, a Frisian physician practising in Ire- land. Its nature and causation are discussed under Metabolic Diseases. The name " rickets " is from the Old English virickken, to twist; the more technical medical term, rachitis, which comes from Greek pax«, the spine, was suggested by Francis Glisson in 1650, both from similarity of sound and from the part of the body which is one of the first to be affected.

Rickets can seldom be recognized until several months after birth, and it most commonly attracts attention at about the end of the first year. The symptoms which precede the out- ward manifestation of the disease are marked disorders of the digestive and alimentary functions. The child's appetite is diminished, and there is frequent vomiting, together with diarrhoea or irregularity of the bowels, the evacuations being clay-coloured and unhealthy. Along with this there is a falling away in flesh. Importance is to be attached to certain other symptoms present in the early stages, namely, profuse sweating of the

head and upper parts of the body, particularly during sleep, with at the same time dry heat of the lower parts and a tendency in the child to kick off all coverings and expose the limbs. At the same time there is great tenderness of the bones, as shown by the pain produced on moving or handling the child. Gradually the changes in the shape of the bones become visible, at first chiefly noticed at the ends of the long bones, as in those of the arm, causing enlargements at the wrists, or in the ribs, producing a knobbed, appearance at the junction of their ends with the costal cartilages. The bones also from their softened condition tend to become distorted and misshapen, both by the action of the muscles and by the superincumbent weight of the body. Those of the limbs are bent outwards and forwards, and the child becomes “bow- legged ” or ” in-kneed ” often to an extreme degree. The trunk of the body likewise shows various alterations and deformities owing to curvatures of the spine, the flattening of the lateral curves of the ribs, and the projection forwards of the sternum. The cavity of the chest may thus be contracted and the development of the thoracic organs interfered with as well as their functions more or less embarrassed. The pelvis undergoes distortion, which may reduce its capacity to a

degree that in the female may afterwards lead to serious diffi- culties in parturition. The head of the rickety child is large- looking in its upper part, the individual bones of the cranium sometimes remaining long ununited, while the face is small and ill-developed, and the teeth appear late and fall out or decay early. The constitutional conditions of ill-health continue, and the nutrition and development of the child are greatly retarded.

The disease may terminate in recovery, with more or less of deformity and dwarfing, the bones although altered in shape becoming firmly ossified, and this is the common result in the majority of instances. On the other hand, during the progress of the disease, various intercurrent ailments are apt to arise which may cause death, such as the infectious fevers, bronchitis and other pulmonary affections, chronic hydrocephalus, convulsions, laryngismus stridulus, &c.

An acute form of rickets of rare occurrence (really a form of scurvy, q.v.) has been described by writers on diseases of children, in which all the symptoms are of more rapid development and progress, the result in many instances being fatal.

The treatment of rickets is necessarily more hygienic than medicinal, and includes such preventive measures as may be exercised by strict attention to personal health and nutrition on the part of mothers, especially where there appears to be any tendency to a rickety development in any members of the family. Very important also is the avoidance of too prolonged nursing, which by its weakening effects upon the mother's health is calculated to engender the disease in any succeeding children. At the same time it must be admitted that, when the mother is healthy, her milk abundant, and nursing discontinued before the lapse of the first year, there is no better means of preventing the occurrence of rickets than this method of feeding an infant, the disease, as is well known, being far more frequently met with in children brought up by hand. The management of the child exhibiting any tendency to rickets is of great importance, but can only be alluded to in general terms. The digestive disorders characteristic of the setting in of the disease render necessary the greatest care and watch- fulness as to diet. Thus, if the child be not nursed but fed artificially, fresh milk should be almost the only article of diet for at least the first year, and the chief element for the next. When not digested well, as may at times be shown by its appearance as a curd in the evacuations, it may be diluted with water or lime water, or else discontinued for a short time, carefully-made gruel or barley water being substituted. Many of the so-called " infants' foods " which are now so extensively used appear to be well adapted for their purpose, but when employed too abundantly and to the exclusion of the due amount of milk are often productive of digestive and intestinal disorders, probably from their containing a greater amount of starchy matter than can be utilized. From the end of the first year light animal soups may occasionally be given with advantage. The medicinal remedies most to be relied on are those which improve the digestive functions and minister to nutrition, and include such agents as the preparations of iron, quinine, and especially cod-liver oil and phosphorus, and the cautious use of extract of thyroid gland has been advocated by Henoch. Of no less importance, however, are abundance of fresh air, cleanliness, warm clothing, and attention to the general hygiene of the child and to regularity in all its functions.

When the disease is showing evidence of advancing, it is desirable to restrain the child from walking, as far as possible. But this precaution may be to some extent rendered unnecessary by the use of splints and other apparatus as supports for the limbs and body, enabling the child to move about without the risk of bending and deformity of the bones which otherwise would probably be the result.

The condition formerly known as foetal rickets (achondroplasia or

chondrodystrophia foetalis) is now classed as a separate disease. Its chief characteristics are dwarfism with shortening of the limbs and enormous enlargment of the articulations.

RICKMAN, THOMAS (1776-1841), English architect, was born on the 8th of June 1776 at Maidenhead, Berkshire, where he assisted his father (a Quaker) in business as a grocer and druggist until 1797. He was then engaged in various businesses until 1818. All his spare time was spent in sketching and making careful measured drawings, till he gained a knowledge of architecture which was very remarkable at a time when little taste existed for the beauties of the Gothic styles. In 181 1 alone he is said to have studied three thousand ecclesiastical buildings. When in 181 8 a large grant of money was made by the government to build new churches, Rickman sent in a design of his own which was successful in an open competition; thus he was fairly launched upon the profession of an architect, for which his natural gifts strongly fitted him. Rickman then moved to Birmingham, and by 1830 became one of the most successful architects of his time. He built churches at Hampton Lucy, Ombersley, and Stretton-on-Dunsmore, St George's at Birmingham, St Philip's and St Matthew's in Bristol, two in Carlisle, St Peter's and St Paul's at Preston, St David's in Glasgow, Grey Friars at Coventry, and many others. He also designed the new court of St John's College, Cambridge, a palace for the bishop of Carlisle, and several large country houses. These are all in the Gothic style, but show more knowledge of the outward form of the medieval style than any real acquaint- ance with its spirit, and are little better than dull copies of old work, disfigured by much poverty of detail. Rickman never- theless played an important part in the revival of taste for medievalism perhaps second only to Pugin. His Attempt to discriminate the Styles of Architecture in England shows pains- taking research, and ran through many editions. Rickman died at Birmingham on the 4th of January 1841. He was married three times: first to his cousin, Lucy Rickman of Lewes; secondly to Christiana Hornor; thirdly to Elizabeth Miller of Edinburgh, by whom he had a son and a daughter.

RICKMANSWORTH, an urban district in the Watford parliamentary division of Hertfordshire, England; 17J m. W.N.W. of London by the Metropolitan & Great Central joint railway; served also by a branch of the London & North Western railway from Watford. Pop. (1001) 5627. It lies in a pleasant valley at the junction of the Chess with the Colne, and on the Grand Junction canal. The church of St Mary, with the exception of the tower a modern reconstruction, contains some French stained glass of the 16th century. The chief industries are brewing and art-printing. The Colne here holds large trout, which are carefully

preserved. The grounds of Moor Park to the south-east are finely wooded, and the mansion, belonging to Lord Ebury, is a good example of the period of George I. The estate counts among its former owners such famous names as the Botelers; George Neville, archbishop of York; John de Vere, earl of Oxford in Henry VII. ‘s time; Wolsey in the next reign; Robert Carey, earl of Monmouth, and the duke of Monmouth. • •

RICOCHET, a military term expressing the rebound of a projectile that strikes on a hard surface. The origin of the French word ricochet is unknown. Its earliest known use (14th and 15th centuries) was in the sense of ” repetition,” e.g. chanson du ricochet, ” an oft-told tale.” Hence it came to be applied to the rebound of a flat stone skimmed along the surface of water, known familiarly in English as ” ducks and drakes,” and so finally in the military sense defined above, which found its way into the English language.

The use of the now obsolete ” ricochet fire ” in war is well illustrated by ” ducks and drakes.” The shot, striking the ground at a small angle, described for the remainder of its course a succession of leaps and falls. The discovery of this species of fire, usually attributed to Vauban (siege of Ath in 1697), had the greatest influence both on sieges and on operations in the field. In siege warfare, ricochet, especially when com- bined with enfilade, i.e. when directed along the enemy’s line of defence, soon became the principal weapon of the besieger, and with the system of parallels (q.v.) gave the attack a superi- ority so complete that a siege came to be considered as the most

certain operation of war. Enfilade fire by itself was neutralized by traverses (g.v.) in the defences, but by the new method a shot could be so aimed as to skip over each successive traverse and thus to search ground that was immune from direct fire. The application of ricochet fire to operations in the field came somewhat later. In the 18th century field artillery, which was not, before Napoleon’s time, sufficiently mobile to close with the enemy, relied principally Upon the ricochet of round shot, which, sweeping a considerable depth of ground, took effect upon several successive lines of hostile troops. But once artillery was able to gallop up to the enemy and to use its far more terrible close-range projectile, case-shot, ricochet fire came to be used less and less, until finally, with the general adoption of shell (which, of course, burst at the first contact with the ground), the

round shot disappeared altogether from the battle- field. Similarly in siege warfare, as soon as high-angle fire with shells became sufficiently accurate, there was no further need of round shot and ricochet.

The term ” ricochet ” is now only applied, in modem rifle shooting, to the graze of a bullet that has struck short. A modern bullet that has ricochetted inflicts a very severe wound, as its nickel or other hard envelope is torn and jagged by its contact with the ground. With its high remaining velocity it is dangerous even after moire than one ricochet, except at extreme ranges.

RICOLD OF MONTE CROCE (1242-1320), Italian Dominican missionary, was born at Monte Croce, near Florence. In 1267 he entered the Dominican house of Santa Maria Novella in Florence, and in 1272 that of St Catherine in Pisa. He started for Acre with a papal commission to preach in 1286 or 1287: in 1288 or 1289 he began to keep a record of. his experiences in the Levant; this record he probably reduced to final book form in Bagdad. Entering Syria at Acre, he crossed Galilee to the Sea of Tiberias; thence returning to Acre he seems to have travelled down the coast to Jaffa, and so up to Jeru- salem. After visiting the Jordan and the Dead Sea he quitted Palestine by the coast road, retracing his steps to Acre and passing on by Tripoli and Tortosa into Cilicia. From the Cilician port of Lajazzo he started on the great high road to Tabriz in north Persia. Crossing the Taurus he travelled on by Sivas of Cappadocia to Erzerum, the neighbourhood of Ararat and Tabriz. In and near Tabriz; he preached for several months, after which he proceeded to Bagdad via Mosul and Tekrit. In Bagdad he stayed several years, studying the Koran and other works of Moslem theology, for controversial purposes, arguing with Nestorian Christians, and writing.. In 1301 Ricold again appeared in Florence: gome time, after this he proposed to submit his Confutatia Alcorani to the pope; but did not. He died on the 31st of October 1320. As a traveller and observer his merits are conspicuous. His account of the Tatars and his sketch of Moslem religion and manners are especially noteworthy. In spite of strong prejudice, he shows remarkable breadth of view and appreciation of merit in systems the most hostile to his own.

Of Ricold’s Itinerary (Itinerarius [sic]) fifteen MSS. exist, of which the chief are: (1) Florence, Laurentian Library, Fineschi, 326; (2) Paris, National Library, Lat. 4955. fols. 4&-55; (3) Wolfenbiittel, Cod. Weissenb. 40, fols. 73 B.94 B. (all of 14th century). Of his Epistles there is one MS., viz. Rome, Vatican, 3717. fols. 249 A. 267 A. The best edition of the Itinerary is by J. CM. Laurent, in Peregrinatores

Medii Aevi Quatuor, pp. 105 (ioi)-4i (Leipzig, 1864 and 1873). The Epistles have been edited by R. Rohricht in Archives de V orient latin, vol. ii. part ii. (Documents) pp. 258-96 (Paris,' 1884). The Confutatio Alcorani, printed at Seville in 1500, at Venice in 1607, adds hardly anything to the sections of the Itinerary devoted to Moslem belief, &c. Ricold's Libellus contra Nationes Orientates and Contra errores Judaeorum have never been printed. See also C. Raymond Beazley, Dawn of Modern Geo- graphy, iii. 190-202, 218, 390-91, 547. 554. 5 6 4-

RICOTTI-MAGNANI, CESARE (1822-), Italian general and knight of the Annunziata, was born at Borgo Lavezzaro on the 30th of June 1822. As artillery lieutenant he distil guished himself and was wounded at the siege of Peschiera in 1848, and in 1852 gained further distinction by his efforts

to prevent the explosion of a burning powder magazine. After serving from 1856 to 1859 as director of the Artillery School, he became general of division in 1864, commanding the 5th division at the battle of San Martino. lit the war of 1866 he stormed Borgoforte, to open a passage for Cialdini's army. Upon the death of General Govone in 1872 he was appointed minister of war, and after the occupation of Rome bent all his efforts to army reform, in accordance with the lessons of the Franco-German War. He shortened the period of military service; extended conscription to all able-bodied men; created a permanent army, a mobile militia and a reserve; com- menced the renewal of armaments; and placed Italy in a position to put 1,800,000 men on a war footingˆ Ricotti fell from power with the Right in 1876, but returned to office with Depretis in 1884, and amended his previous scheme of reform. Resigning in April 1887, he became a member of the senate in 1890, but took little part in public life until 1896, when, after the battle of Adowa, he was entrusted by King Humbert with the formation of a cabinet. Having constructed his ministry, he made over the premiership to the marquis di Rudini, retain- ing for himself the portfolio of war, and seeking to satisfy popular demands for the reduction of military expenditure by consolidating the tactical structure of the army without weakening its fighting power. Rudini, however, finding that Ricotti's ideas, which he himself shared, were not acceptable at court, obliged him to resign office. His prestige as creator of thfe modern Italian army remained unimpaired, and his views on army consolidation enjoyed a large measure of technical and public favour.

RIDDING, GEORGE (1828-1904), English headmaster and bishop, was born at Winchester College, of which his father, the Rev. Charles

Ridding, vicar of Andover, was a fellow, on the – 16th of March 1828. He was educated at Winchester and at Baliiol College, Oxford. He became a fellow of Exeter College, and was a tutor from 1853 to 1863. In 1853 he married Mary Louisa Moberly, who died within a year of her marriage. He was appointed second master of Winchester College, in 1863, and on the retirement of' his father-in-law, Dr Moberly, he succeeded to the headmastership. During the tenure of this office (1867-1884) he carried out successfully a series of radical reforms in the organization of ' the school, resulting in a great increase both in its reputation and numbers. In 1884 he became the first bishop of Southwell, and brought his powers of organization and conspicuous tact and modera- tion to bear on the management of the new diocese. He took an active share in its educational and social work, and was materially assisted in these respects by his second wife, Lady Laura Palmer, daughter of the 1st earl of Selborne. He resigned his see a short time before his death, which took place on the 30th of August 1904.

See Church Quarterly Review (July 1905).

RIDDLES (A.S. raedan, to interpret), probably the oldest extant form of humour. They spring from man's earliest perception that, there are such things as analogies in nature. Man observes an example of analogy, puts his observations in the form of a question, and there is the riddle ready made. Some Boeotian; humprist, for example, detected the analogy between the life of humanity — the child on all fours, the man erect, on two legs, old age with its staff — on one side, and on the other the conception of an animal with a varying number of limbs. Put this in a question and it is the riddle of the Sphinx; Another instance is the question, "What we caught we threw away, what we could not catch we kept." Homer is said to have died of vexation at not being able to discover the answer to this riddle, still current on the coast of Brittany, in Germany and in Gascony. After inventing the riddle, men began to use it in a kind of game; bets were staked on the answer and sides were made, each side backing its champion. These sports in Marriner's time were common in Tonga; they are no less popular among the African Woloffs. Samson's riddle set to the Philistines is an instance of the sport in a Semitic country. In marchen and ballads,, the hero's chance of

winning his beloved, or of escaping threatened punishment, is often

made to turn on his power of answering riddles. It follows from the artless and primitive character of the riddle that regular popular riddles (Devinettes) are widely distributed, like popular tales, popular songs and popular customs. The Woloffs ask, ” What flies for ever, and rests never ? ” Answer, The wind. The Basutos put this riddle, ” What is wingless and legless, yet flies fast and cannot be imprisoned? ” Answer, The voice. The German riddle runs, “What can go in face of the sun yet leave no shadow ? ” Answer, The wind. In riddles may perhaps be noticed the animistic or personalizing tendency of early human thought, just beginning to be conscious of itself. The person who asked these riddles had the old sense of wind, for example, as a person, yet probably, unlike the bushmen, he would never expect to see the personal wind. He knew the distinction between the personal and impersonal well enough to be sure that his enigma would present some difficulty. The riddle, to be brief, is an interrogatory form of the fable, and like the fable originates among rude people, and is perpetuated in the folklore of peasantry.

Probably the best book on the riddle (a subject less frequently studied than the marchen or the myth) is Eugene Holland, Devinettes ou inigmes populaires, with a preface by M. Gaston Paris. The power of answering riddles among the people who invented the legend of Solomon and the queen of Sheba seems to have been regarded as a proof of great sagacity. The riddle proper is all but extinct outside folklore and savage life, and has been replaced by the conundrum, which is a pun in the interrogative form.

Old English Riddles. — A number of interesting poetical riddles in old English are contained in the Exeter Book, written about A.D. 1000. According to the numbering in the only complete edition (in Grein-Wlilker, Bibliothek der Angels dchsisches Poesie, vol. iii. pp. 184-238), there would appear to be 95 of them; but No. 1 is the monodramatic lyric Wulf and Eadwacer, which was included among the riddles by a mistake of the first editor of the Exeter Book, B. Thorpe; No. 90 is not in Old English, but in Latin; and several others are mere unintelligible fragments. There remain about 85 that have been preserved either entire or with sufficient approach to completeness for their general drift to be perceived.

The riddles Nos. 2-60 occupy 15 folios in the middle of the MS. ; Nos. 62-95 occupy the last 7 folios, and No. 61 and a mutilated and divergent copy of No. 31 are placed by themselves among poems of a different kind. Attempts have been made to show that the two main groups are distinguished from each other by special characteristics that may indicate difference of authorship or date; but there seems to

be no good reason for attaching any significance to the arrangement of the MS. Some of the riddles almost certainly were written in Northumbria in the early part of the 8th century; a copy of one of them (No. 36) , in Anglian dialect, has been preserved in a MS. at Leiden. Whether all the riddles are the work of one author, or whether they belong to different periods and districts, remains at present uncertain. For the reasons stated in the article Cynewulf the attribution of the whole collection to that poet, once almost universally accepted, is now no longer tenable;- and there is no overwhelming probability that he is the author of any portion of it. 1

The investigations of F. Dietrich and A. Ebert have established the fact that a few of the riddles are imitated from the Latin enigmas of Symphosius and Aldhelm. No. 36 is a translation of Aldhelm's riddle De Lorica, and No. 41 is founded on the same writer's riddle De Creatura. The dependence of the Old English riddles on Latin originals has, however, been greatly exaggerated, especially by A. Prehn (Komposition und Quellen der Ralsel des Exeterbuches, 1883), who goes so far as to maintain that every one of them contains reminiscences of one or more of the compositions of Symphosius, Aldhelm, Tatwine and Eusebius. The correspondences alleged are in most cases slight, if not purely fanciful, and it is even doubtful whether the two writers last named were known at all to the authors of the vernacular riddles. All the Englishmen who wrote riddles in the 8th and following centuries, whether they wrote in their native tongue or in Latin, may be said to belong to one school, and their work has many features in common. But except in a few instances the riddles written in Old English are probably not less but more original than those written in Latin. In poetical merit they are generally superior. A good notion of their character and style may be gained from Mr Stopford Brooke's spirited (though not minutely accurate) translations of many of them in his History

1 For the linguistic arguments against Cynewulf's authorship of the Riddles see especially A. Madert, Die Sprache der altengUschen Rdtsel des Exeterbuches und die Cynewulffrage (1900).

of Early English Literature, vol. i. (1892). Mr Brooke's interpreta- tion of No. II (the Barnacle Goose) is original, and no doubt correct; in some other instances the solutions he has adopted are somewhat more questionable than they would appear to be from his transla- tions.

Unlike the Latin riddles of Aldhelm, the riddles of the Exeter Book are unaccompanied with solutions. In some of them, however, the answer is indicated by an anagram, usually expressed in runic characters. ,

Thus No. 24 begins with the words ” Agof is my name reversed,” where the West Saxon scribe, in accordance with the phonetic laws of his own dialect, has substituted F for the final B of his Anglian original; the word is an anagram of boga, ” bow.” In No. 25 the mimic skill of the magpie is described, and at the conclusion the name of the bird (higora) is indicated by the six letters G, A, R, O, H, I.

The solution of nearly all the riddles was attempted by F. Diet- rich, in the 1 ith and 12th volumes of Haupt’s Zeitschrift fur deutsches Alterthum. In many cases Dietrich was certainly right, but in many others his conjectures are strangely perverse, owing to mis- leading comparisons with supposed Latin originals. Subsequent scholars have been much more successful in refuting Dietrich’s explanations than in replacing them by others more satisfactory. The most copious contributor of new interpretations has been Prof. M. Trautmann, in several articles in Anglia, and also in Bonner, Beitrdge zur Anglistik, No. 19 (1905); but very few of his inter- pretations can be considered even plausible, and he sometimes re- jects the solutions of his predecessors when they are probably right. One riddje (No. 51, Fire) was independently solved by Prof. Traut- mann and G. Herzfeld (Die Rdtsel des Exeterbuches und ihr Verfasser, 1890). The articles on the subject by F. Tupper, Jr., in Modern Philology, vol. ii. (1903), and in Modern Language Notes for 1903 and 1906, are extremely valuable, though the author’s original explana- tions do not appear convincing. After all that has been done, the meaning of a considerable number of the fiddles is still un- certain. In some instances this may be due to the corrupt state of the text ; in others the terms in which the object is described are so vague that several solutions are equally plausible. (H. Br.)

RIDGE, WILLIAM PETT (1864- ‘), English author, was born at Chartham, near Canterbury, and was educated at Marden, Kent, and at the Birkbeck Institute, London. He was for some time a clerk in the Railway Clearing House, and began about 1891 to write humorous sketches for the St James’s Gazette and other papers. He secured his first striking success, in volume form, with Mora 1 Em’ly (1&98), an excellent example of his ability to draw humorous portraits of lower class life. His later books include A Son of the State (1899), A Breaker of Laws (1900), Lost Property (1902), Erb (1903), Mrs Caler’s Business (1905), The Wickhamses (1906), &c.

RIDGE (a word, common to many Teutonic languages, meaning “back,” whether of a man or an animal, cf. German Riicke)., the word applied to many objects resembling the projecting line of an animal’s back, such as the strip of soil thrown up by a plough between furrows,

the elevations or protuberances on bones which serve for the attachment of muscles or ligaments, &;c. In architecture the ridge (Fr. faite, crtte; Gr. First; Ital. asinello) is the highest portion of a roof, which is covered with lead, slate, or tiles, and some- times decorated with a cresting in terra-cotfa or metal- work. The term is also applied to the meeting of the common rafters on each side of a roof, which are sometimes butted against an Upright board known as the ridge-piece. For the ridge-rib see Rib.

RIDING, the art or practice of locomotion on the back of an animal or in a vehicle (the verb to ride originally meant ” to travel,” or “go,” as the derived noun road means “away”). Where no vehicle is specified (e.g. “riding a bicycle “), the word is associated with horseback riding, for exercise or pleasure.

The origin of the use of the horse as a means of transport goes back to prehistoric times. The fable of the centaurs, if the derivation from kcvtuv, to goad, raOpos, bull, be accepted (but see Centaur), would indicate the early existence of pastoral peoples living on horseback, like the modern cowboys (cp. ” cow-punchers “) or gauchos of North and South America. Archaeological discoveries in India, Persia, Assyria and Egypt show that in the polished stone age quaternary man had domesticated the horse, while a Chinese treatise, the Goei-leaotse, the fifth book of the Veuking, a sort of military code dating from the reign of the emperor Hoang-Ti (2637 years B.C.), places the cavalry on the wings of the army. The Hebrews understood

the use of the horse in war (Job xxxix. 18-25), as did the Persians (Cyrus at the battle of Thymbra), Greeks and Romans. The Greeks and Romans, especially the former, were skilled horsemen, and feats on horseback were a feature of their games. They used no stirrup, but had both bridle and bit. They rode bareback, or on a cloth or skin.strapped to the horse.

When roads were poor and vehicles cumbersome horseback was almost the only method of travel for both sexes. With the introduction of steam-locomotion and the improvement of roads, however, riding has become to a large extent a sport, rather than a necessity. There are different styles of riding adapted to the different purposes for which horses are ridden — on the road, in the school, hunting, racing, steeple-chasing and in the cavalry service — just as there are different

horses more suitable by conformation, breeding and training for each.

In western civilization there is a traditional difference between the riding of men and women, in this particular, that men ride astride and women on a side-saddle. But in the following observations we deal generally with the more important features of riding as practised astride.

After securing an animal of the right height, weight and disposition, with a saddle of a length of tree and a breadth of seat that fits the rider and that is lined to fit the back of the horse, with a bridle bitted to his mouth, the first step is to mount. Having taken up the reins, the rider should stand at his horse's near (left) shoulder, facing towards the tail, and in that position hold the stirrup with his right hand for the reception of his left foot. By standing at the shoulder the rider is out of harm's way in the event of the horse kicking while he mounts. Ladies generally have the aid of a block or a groom's or escort's hand beneath the left foot. But a woman should be able to mount without aid, by lowering her stirrup, so that she can reach it from the ground, and then raising it again when she is seated in the saddle. Riding astride is sometimes recommended for women. The chief argument in its favour — symmetrical development of the figure — is, however, lost if the growing girl be taught to ride on a side-saddle of which the pommels can be shifted to the off side on alternate days.

Having gained the saddle, the necessity arises for seat and hands. Here good instruction is imperative at the outset. The great desideratum in a seat on horseback is that it should be firm. A rider with an insecure seat is apt to be thrown by any unexpected movement the horse may make; and, without a firm seat, the acquirement of good hands is well-nigh hopeless, because, when the balance is once disturbed the insecure rider will have to depend on something else for the maintenance of his seat, and this generally takes the shape of " riding on the horse's mouth," a practice as cruel as it is ugly.

Having gained the saddle, the rider should adjust the stirrups to the proper length, depending on the kind of riding, the length of his leg and the roughness of the horse's trot. Sitting well in the middle of the saddle, the thighs turned in, and the heels drawn somewhat back, the stirrup leathers may be let out or taken up until the tread of the stirrup is on a level with the inner ankle bone, and at this length, when the rider stands up, his fork will easily clear the pommel of the saddle. For main- taining his seat the horseman should depend upon his thighs and knees only, and not upon the knee and calf; a proper seat should be a mixture of balance and grip ; a man riding by balance

only is sure to be thrown, while to grip with all one's might during an hour's ride is to undertake as much exertion as should last for a whole day. The position of the foot exercises much influence on the security of the seat; it should be opposite the girth, parallel with the barrel of the horse, with the heels depressed. A good seat on a horse should not be strong merely; it should be graceful; above the loins the body should be loose, so as readily to adapt itself to every motion of the horse, but it should be upright.

Beginners are advised to practise riding with and without stirrups; thus, let the pupil who has ridden half an hour in a saddle with stirrups have a cloth substituted for the saddle for about ten minutes, care being taken to observe the rules already

laid down for the position of the legs; in this way the proper seat will be strengthened.

The proper adjustment of the reins is the next thing to be attended to, and as the management of these depends so much upon the seat being firm and independent of the bridle the acquisition of a firm seat is certainly half-way towards the acquirement of good hands. An excellent way to start a pupil is on a sure-footed horse without bridle, the master governing him by a leading rein until the pupil has acquired a firm seat and can be trusted with reins. Assuming that a double-reined bridle is used, the third finger of the left hand should be first inserted between the snaffle reins; then the little, third and second fingers should be between the curb reins, the two outside reins being the curb, and the two inside ones the snaffle. In this manner of holding the reins the snaffle is not so likely to slip, while the curb can be easily slackened or drawn tighter. As military riders use the curb only the position of snaffle and curb as just explained is reversed in the cavalry service. The snaffle reins should be drawn up gently until the rider feels that he has an equal and light hold of his horse's mouth on both sides, with just so much pressure that the slightest movement of the left or right rein would cause him to turn to the left or right respectively. The arms from the shoulder to the elbow should hang naturally, close to the sides, and the arms from elbow to wrist should be about parallel to the ground, the wrist being kept loose, so as to yield gently with every motion of the horse. The rider sitting in the position described, square to the front, with his shoulders well back, will be riding with fairly long reins, one of the secrets of good hands.

When the horse is in motion the hands should not be held rigid,' as the horse's mouth would thereby become dead, and the horse would lean unpleasantly on the hand; but the rider should give and take,

without, however, entirely relaxing the hold.

In order to encourage the horse to walk the head must not be confined, but a light feeling of the horse's mouth must be kept up. Should the horse, unasked, break into a trot, never snatch at his mouth, but restrain him gently. To trot, press the legs to the saddle, and raise the bridle hand a little, and, after a moment's sitting close, begin to rise (" pose ") in cadence with the action of the horse. The rising to the trot should be performed easily; the legs must not swing backwards and forwards, nor should the hands be jerked up and down. To start the canter, which should always be done from the walk and not the trot, take up the curb rein a little and turn the horse's head slightly to the right, at the same time pressing the left leg behind the girth; the horse will then lead with the off (right) fore leg, which is generally preferred; but a well-broken hack should lead with either leg at command, and if he be cantered in a circle to the left he must lead with the near leg, as otherwise an ugly fall is likely to result from the leg being crossed. Galloping is a pace not to be generally indulged in by road or park riders; when it is, the hands should be kept low, the body thrown back, and an extra grip taken with the knees, as nearly all horses pull more or less when extended.

Hitherto only road or park riding has been considered. When a person has become a fair road rider he has made some progress towards being a hunting man. But if first principles are disregarded, and a follower of hounds believes in the system " it doesn't matter how you ride so long as you stick on," he will not only always be a " sight " but a menace in the hunting field. Few self-taught riders attain to excellence; they may keep a good place in hunting, if possessed of plenty of courage, and mounted on a bold and not too tender-mouthed horse, but they never will be riders in the proper sense of the word.

Hunting and Riding to Hounds. — For practical purposes the chief difference between a park seat and a hunting seat consists in the shortening of the stirrups some two or three holes. The seat of the hunting man is the most important of any connected with amusement; he must sit firm, so as not to be thrown off when his horse leaps, or makes a mistake, and he must be able to save his horse under all circumstances, and to make as much of him as possible. As with road riding, so with hunting, the actual

length of the stirrups will depend a good deal upon the shape and action of the horse, but the nature of the animal and the peculiarities of the country ridden over will also have something to do with their adjustment. A puller will compel the rider to shorten his leathers one or perhaps two holes — a course that may also be rendered necessary in a hilly country, for, in going down hill, the stirrups, if kept at the ordinary length, will generally feel a great deal too long. The rider's body must be always close to the saddle in leaping, for if he were jerked up, the weight of say only a 10- stone man coming down on the horse a couple of seconds after he has negotiated a large fence is sufficient to throw the animal down. Nothing but actual practice with hounds can teach a man how to ride where all kinds of going and obstacles of various sorts, natural and artificial, have to be encountered in a day's hunting. For example, the country gone over is seldom level springy turf; it is up hill and down dale, across ridge and furrow, over ground studded with ant-hills (which, unlike mole-hills, are often very hard), over ploughed or boggy land. Each of these varieties requires a different method of riding over, and nearly every horse will require different handling under similar circumstances. It will therefore be seen that much depends on the rider having good hands. This qualifica- tion, though generally understood, is difficult to define. A rider with good hands never depends upon his reins for retaining his seat ; nor does he pull at the horse's mouth so as to make him afraid to go up to his bit; nor again does he ever use more force than is necessary for the accomplishment of what he desires to perform. But besides all this, there is an unaccountable sympathetic some- thing about the man with good hands that cannot be described. Pullers appear to renounce pulling, refusers take to jumping and clumsy horses become nearly as handy as a trick horse in a circus: Though hands can to a great extent be acquired by care and practice, yet in the highest form this is a gift and cannot be learned.

There are different kinds of " fences," as all obstacles are generic- ally called. First, there is timber, such as gates, stiles and rails; the first two are, nine times out of ten, awkward jumps, as the take off is either poached by cattle, or else is on the ascent or descent. Hedges vary according to the custom of the country in which they are found : they either grow in the soil of the field, and are protected by a ditch on one side, or are planted on a bank with a ditch on one side or sometimes on both. Then again there are such large banks as are found in Wales, Devon and Cornwall. Lastly come water jumps, which are met with in two forms: the water is either within an inch or two of the top of the bank, so as to be about on a level with the field through which it flows, or there may be a space of some 6 or 7 ft. from the bank to the

water. For the successful negotiation of brooks a bold horse is required, ridden by a bold man. No fence that is ever encountered stops such a large proportion of the field as water; even a clear 6 ft. of it will prove a hindrance to some, while anything over 10 or 12 ft. will in general be crossed only by a very few. Some horses, good performers over any description of fence, will not jump water under any circumstances; while the chance of a ducking deters many from riding at it; and, however bold the horse may be, he will soon refuse water if his rider be perpetually in two minds when approaching it.

The pace at which a hunter should be ridden at his fences depends upon the nature of the fence, and the peculiarities of each individual horse. With some very good jumpers — they can hardly be called good hunters — to steady them is to bid for a fall, while with some very clever hunters to hurry them is to bring them to grief. With ordinary horses, however, it is a good general rule to ride at fences of all descriptions as slowly as the nature of the obstacle admits. In grass countries, where ” flying fences ” are found, the rate of speed must of necessity be quicker than when about to take a Devonshire bank of some 7 ft. high, but even at a flying fence the rider should steady his horse so as to contract the length of his stride, in order that he may measure the distance for taking off with greater accuracy. Flying fences consist of a hedge with or without a post and rail, and with or without a ditch on one or both sides; consequently a horse has to jump both high and wide to clear them. But in jumping a gate, or a flight of rails, as ordinarily situated, there is no width to be covered, and to make a horse go through the exertion of jumping both high and wide when he need only do one is to waste his power, added to which to ride fast at timber, unless very low with a ditch on the landing side, is highly dangerous.

All hedges on banks, banks and doubles must be ridden at slowly; they are usually of such a size as to make flying them impossible, or at least undesirable. Horses jump them on and off, and in taking them at a moderate pace there is a chance of stopping on the top and choosing a better place to jump from, or, if needs be, of returning and taking the fence at another place. Cramped places will have to be jumped from a walk or even at a stand; for instance, a tree may be in a line with and close to the only practi- cable place in a fence; it then becomes necessary to go round the tree before a run at the place can be managed. So, too, with places that have to be crawled over between trees, or with dykes to be crawled down.

In jumping an ordinary hedge or ditch at moderate speed, there is of course a moment of time during which the horse is on his

hind legs, and in theory the rider should then lean forward, but, in practice, this position is so momentary, and the lash out of the hind legs in the spring is so powerful, that it is best not to lean forward at all, because of the difficulty, if not impossibility, of getting back in time for the reverse movement, when the rider should be preparing to render the horse some assistance with the bridle as his feet touch the ground.

When a line of willows indicates the whereabouts of a brook, the horse should be well collected, a clear place selected, so far as circumstances allow, and the pace increased, though in short strides, up to the very brink. If the hounds jump at the brook, even though they fail to clear it, the rider may take it for granted that at that place the leap is within the capacity of any ordinary hunter in his stride; hence if, when going at three parts speed, a horse's feet come just right to take off, the mere momentum of his body would take him over a place 15 ft. wide.

The experience of a single day's hunting will teach the" novice that gates are far oftener opened than jumped; it is therefore necessary that a hunter should be handy at opening them. Many accidents have arisen from horses rushing through a gateway directly the latch is released, or from their jumping a gate at which they have been pulled up to enable the rider to open it. The horse should be taught to obey the leg as well as the hand, and, by a slight pressure of the leg, should throw his haunches round to the left or right as occasion may require.

Racing (see also Horse-Racing). — The qualities possessed by a good jockey, either on the flat or across country, show the value of early instruction in riding. After having been some time in a train- ing stable, a lad is put on a quiet horse at exercise; his stirrups are adjusted, and the reins knotted for him at a proper length. He subsequently rides other horses, each with some peculiarity perhaps, and, to keep his place in the string, a sluggard must be kept going, and an impetuous one restrained; they cannot both be ridden alike, but they must both be ridden as a jockey should ride them. In this way the lad learns the principle of holding a puller, getting pace out of a lazy one, and leaving well alone with a nice free but temperate mover; he learns to do everything in a horsemanlike manner, and when he has raised himself to the pitch of a ” fashion- able ” jockey, he will frequently be called upon to ride several horses a day at race meetings. A jockey must therefore, more than any other civilian rider, have a hand for all sorts of horses, and in the case of two and three year olds a very good hand it must be. The same ability to adapt himself to circumstances must be possessed by the steeple-chase jockey, who should possess fine hands to enable him to handle his horse while going at his fences at three-quarter speed. In most details the nearer a hunting man approaches to a steeple-chase jockey the better; but in the matter of the seat it must be remembered that a jockey’s exertions last but a few minutes, while none can tell when the hunting man may finish his day’s work; the jockey can therefore ride with more absolute grip during his race than the rider to hounds.

See also Horsemanship; Hunting; Cavalry; Racing and Steeple-Chase ; and- Polo.

RIDINGS are the three districts into which from ancient times Yorkshire has been divided for administrative purposes. Formerly there were similar districts in Lindsey in Lincolnshire. The word riding was originally written as thrithing or thriding. but the initial th has been absorbed in the final th or t of the words north, south, east and west, by which it was normally- preceded. Ridings are Scandinavian institutions. In Iceland the third part of a thing which corresponds roughly to an English county was called thrithjungr; in Norway, however, the thrithjungr seems to have been an ecclesiastical division. According to the 12th-century compilation known as the ” laws of Edward the Confessor,” the riding was the third part of a county (provincia) ; to it causes were brought which could not be determined in the wapentake, and a matter which could not be determined in the riding was brought into the court of the shire. There is abundant evidence that riding courts were held after the Norman Conquest. A

charter which Henry I. granted to the Church of St Peter's at York mentions wapentacmot, tridingmot and shiresmot, and exemptions from suit to the thriding or riding may be noticed frequently in the charters of the Norman kings. As yet, however, the jurisdiction and functions of these courts have not been ascertained. It seems probable from the silence of the records that they had already fallen into disuse early in the 13th century.

Each of the ridings of Yorkshire has its own lord lieutenant and commissioa of the peace, and under the Local Government Act of 1888 forms a separate administrative county. They are distinguished as the north, east and west ridings, but the ancient

divisions of Lindsey were known as the north, south and west ridings respectively.

See. Felix Liebermann, Die Geselze der Angelsachsen (Halle, 1888-89); William Stubbs, Constitutional History of England; Richard Cleasby, Icelandic Dictionary; New English Dictionary; and William Dugdale, Monasticon Anglicanum, vol. vi., edited by John Caley and others (1846). (G. J. T.)

RIDLEY, NICHOLAS (c. 1500-1553), English bishop and martyr, was descended from an old Northumberland family. The second soil of Christopher Ridley of Unthank Hall, near Willemoteswick, in that county, he was born in the beginning of the 1 6th century. From a school at Newcastle-on-Tyne he was sent about 15 18 to Pembroke Hall, Cambridge, being supported there by his uncle, Dr Robert Ridley (d. 1536), and specially distinguishing himself in Greek. Having graduated M.A. in 1526, he went to study at the Sorbonne in Paris and at Louvain, and on his return to Cambridge he was appointed junior treasurer of his college. In 1534 he was one of the university proctors, and he signed the decree of the university against the jurisdiction of the pope in England. About this time Ridley, who was now chaplain to the university, began to distinguish himself as an orator and a disputant, and to show leanings to the reformed faith. Having proceeded B.D. in 1537, he was appointed by Thomas Cranmer, archbishop of Canterbury, one of his chaplains, and in April 1538 the same prelate instituted him to the vicarage of Heme in Kent. In 1540 he was chosen master of Pembroke Hall; in 1541 he became chaplain to Henry VIII. and canon of Canterbury. In 1543 he was accused of

heretical teaching and practices, but he managed to allay the suspicions of the royal commissioners, although just after his exculpation he finally abandoned the doctrine of transubstantiation.

In 1 547 Ridley was presented by his college to the Cambridge- shire living of Soham, and in September of the same year he was nominated bishop of Rochester. Edward VI. was now on the throne and the new bishop was in high favour. He was one of the visitors who were appointed to establish protestantism in the university of Cambridge; in 1548 he helped to compile the English prayer book; and in 1549 he was one of the com- missioners who examined Bishops Gardiner and Bonner. He concurred in their deprivation and succeeded Bonner in the see of London. Having signed the letters patent settling the English crown on Lady Jane Grey, Ridley,, in a sermon preached at St Paul's cross on the 9th of July 1553, affirmed that the princesses Mary and Elizabeth were illegitimate and that the succession of the former would be disastrous to the religious interests of England. When Lady Jane's cause was lost, however, he went to Framlingham to ask Queen Mary's pardon, but at once he was arrested and sent to the Tower of London. From his prison he wrote in defence of his religious opinions, and early in 1554 he, with Cranmer and Latimer, was sent to Oxford to be examined. He defended himself against a number of divines, but was declared a heretic, and this was followed by his excommunication. He refused to recant, and in October 1555 he was tried for heresy under the new penal laws, being degraded and sentenced to death. With Cranmer and Latimer he met his end at the stake in Oxford on the 16th of October 1555.

Ridley was a voluminous writer, but many of his writings have been lost. The Works of Nicholas Ridley D.D. were edited for the Parker Society by the Rev. Henry Christmas in 1841. His Life was written by Dr Gloucester Ridley in 1763, and there is a memoir of him in H. C. G. Moule's edition of the bishops' Declaration of the Lord's Supper (1895). See also John Foxe's Acts and Monuments (new ed., 1877) ; J. Strype's Memorials of Cranmer (new ed., Oxford, 1840} ; G. Burnet's History of the Reformation (new ed., Oxford, 1865); J. A. Froude's History of England (1881 fol.); and J. Lin- gard's History of England (1854-55).

RIDOLFI, or Ridolfo, ROBERTO DI (1 531-16 12), Italian conspirator, belonged to a famous family of Florence, where he was born on the 18th of November 1531. As a banker he had business connexions with England, and about 1555 he settled in London, where he soon became a person of some importance, and consorted with William Cecil and other prominent men.

During the early years of Elizabeth's reign he began to take a more active part in politics, associating with the discontented Roman Catholics in England and communicating with their friends abroad. In 1570 he set to work on the plot against the queen which is usually associated with his name. His intention was to marry Mary, queen of Scots, to the duke of Norfolk and to place her on the. English throne. With the aid of John Lesley, bishop of Ross, he gained the consent of these high personages to the conspiracy, and then in 157 1 he visited the duke of Alva at Brussels, Pius V. at Rome, and Philip II. at Madrid to explain to them his scheme and to gain their active assistance thereto. His messenger, by name Charles Baillie (1542-1625), was, however, seized at Dover, and in other ways the English government heard of the intended rising. Conse- quently, Norfolk and Lesley were arrested, the former being condemned to -death in January 1572. Ridolfi, who was then in Paris, could do nothing when he heard this news, and his scheme collapsed. Afterwards he served the pope, but much of his later life was spent in Florence, where he became a senator and where he died on the 1 8th of February 161 2.

RIEGER, PHILIPP FRIEDRICK VQN (1818-1903), Bo- hemian politician and publicist, was born on the 18th of December 1818 at Semil in the circle of Jicin, Bohemia. He first came into prominence as one of the Czech leaders in the revolution of 1848. He was returned by seven constituencies to the Reichtstag at Vienna, where he was the leader of the Czech party. In 1853 he married a daughter of the historian Palacky. In 1858 he started the Slovnik naucny, the Czech national encyclopaedia, the first volume of which was published in 1859, the nth and last in 1874. He was also instrumental in founding the first Czech political daily newspaper published in Prague, which appeared on the 1st of January 1861, and of which he was for awhile the editor. After the issue of the " October diploma " of i860, Rieger, with his father-in-law, Palacky, undertook the leadership of the reconstituted Czech party, and after the decision of this party in 1863 no longer to attend the Austrian Reichsrath, he led the agitation in favour of the restora- tion of the Bohemian kingdom. In 1871 he conducted the negotiations with the Hohenenwarth ministry for a federal constitution of the empire, which broke down owing to his extreme attitude in the matter of Bohemian independence. On the reappearance of the Czechs in the Bohemian diet (1878) and the Austrian Reichsrath (1879) Rieger was one of the leaders of the federalist majority supporting Count Taaffe's government and the chief of the so-called " Old Czechs." On his seventieth birthday (December 10, 1888) he received a national gift of 100,000 gulden; but, in spite of this evidence of his popularity, his conservatism, his

close connexion with the Bohemian nobility and his clerical tendencies brought him into conflict with the growing influence of the radical ” Young Czech ” party, and in 1891, together with the other ” Old Czechs,” he was defeated at the poll. In March 1897 he was created a baron (Freiherr) and given a seat in the Upper House. He continued occasionally to interfere in politics; but his influence was now at an end, though when he died, on the 3rd of March 1903, his funeral at Prague was made the occasion of a magnificent demonstration of respect.

RIEGO NUNEZ, RAFAEL DEL (1784-1823), Spanish army officer, who has the melancholy distinction of having begun the long series of political military mutinies — pronuncia- ■mientos — in Spain, was born at Santa Maria de Tuna in Asturias on the 2nd of April 1784. He was educated for the legal pro- fession at Oviedo, and passed the necessary examinations. But in 1807 he enlisted in the guard. When the French invasion took place in 1808 he was employed by the junta of Asturias and placed in command of a newly raised battalion. He was taken prisoner at the battle of Espinosa de los Mcnteros, on the 10th and nth of November 1808, and was sent to France. During his years of imprisonment he, like many others of his countrymen, was converted to liberalism on the French model. Riego had the good fortune to escape and to reach England after various wanderings in Switzerland and Germany. In England

he was incorporated : with other rescued or escaped Spaniards, in a corps equipped by the British government, and was sent to Spain in 1814. He continued in service as a military officer, and was commandant of the second battalion of the regiment ” Asturias,” which formed part of the army collected at Cadiz to be sent to South America in 1819. Service in America was unpopular with the soldiers, and there was much discontent in the country with the government of King Ferdinand VII. A conspiracy was formed among the officers to use the army for the purpose of forcing the king to grant a constitution. They were betrayed by a general who at first professed to sympathize with them, and many were arrested. Riego was apparently not suspected, and he decided to act on his own account. On New Year’s Day 1820 he made his pronuncia- miento with his regiment at the village of Cabezas de San Juan. He proclaimed for the constitution drawn up by the Cortes in 181 2, which was unworkable, and which the chiefs of the con- spiracy did not propose to restore. He hoped to

seize Cadiz, but it was held by a loyal officer, and for a time no popular movement took place. Riego now started on a revolutionary propaganda through Andalusia at the head of his regiment. The country proved hostile or at the best indifferent. His following gradually melted away, and he was about to flee to Portugal when Galicia revolted. The rebellion extended rapidly, and the king was compelled to yield. When the liberals were in possession of power they would gladly have kept Riego in a subordinate place. But he came to the capital, where he was soon the most popular spokesman of the extreme parties. There he discredited himself by his vanity, and shocked even the populace of Madrid by appearing drunk at the theatre. He was at last persuaded to accept the military command in Aragon, which he thought below his merits. He began intrigues and agitations. The government was strong enough to ■ put him under arrest at Lerida. When the new Cortes was elected in 1822, he was chosen deputy for his native city Oviedo, and the radicals selected him as president of the chamber on the 17th of February 1823. The unceasing intrigues of the king, the incapacity of the moderate parties and the 1 hysterical excitement of the mob combined to make anarchy worse daily. Riego was the noisiest shouter of all. When the French inter- vention took place, he helped to carry the king to Cadiz, and he fought* a few unsuccessful skirmishes with the invaders. He was at last captured at a farmhouse near Arguillos in the province of Jaen. Unfortunately for him, he fell into the hands of the royalist volunteers, by whom he was carried to the capital. On his way he was repeatedly mobbed and had many narrow escapes from being torn to pieces. He was hanged at Madrid in the Plaza de la Cebada on the 7th of November 1823. At the end he professed abject repentance for his impiety and dis- loyalty. The popular revolutionary tune of Spain, the ” himno de Riego,” is named after him, and his picture is hung in the Cortes, but he was a poor creature, and a bad example of the light-headed military agitators who have caused Spain much

misery.

H. Baumgarten, Geschichte Spaniens (Berlin, 1865-1871).

RIEHM, EDUARD KARL AUGUST (1830-1888), German Protestant theologian, was born at Diersburg in Baden on the 20th of December 1830. He studied theology and philology at Heidelberg and later at Halle under Hermann Hupfeld, who persuaded him to include Arabic, Syriac and Egyptian. Enter- ing the ministry in 1853, he was made vicar at Durlach soon afterwards, and became a licentiate in the theological faculty at Heidelberg. In 1854 he was appointed garrison-preacher at Mannheim; and in 1858 he was licensed to lecture at

Heidelberg, where in 1861 he was made professor extraordinarius. In 1862 he obtained a similar post at Halle, and in 1866 was promoted to the rank of professor ordinarius. Throughout his life he followed Hupfeld's plan in his scientific treatment of the Old Testament — that of reconciling the results of a free criticism with a belief in divine revelations. His practical experience of pastoral work also proved of service to him when he became a professor of theology, for " if there is one quality more striking

than another in the writings of Riehm, it is that of sympathy with orthodox believers" (T. K. Cheyne). In 1865 Riehm was made a member of the commission for the revision of Luther's translation of the Bible, and became one of the editors of the quarterly review, Theologische Studien und Kritiken. He died on the 5th of April 1888. ,
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His works include : Die Gesetzgebung Mosis im Lande Moab (1854), in which the Deuteronomic law book is' assigned to the second half of the reign of Manasseh; Def L'ehrbegriff des Hebtaerbriefs (1858-59, and ed. 1867); Hermann Hupfeld, Lebens-und Charakter- bild eines deutschen Professors (1867); Die Messianische Weissagung (1875, 2nd ed. 1883; Eng. trans. 1890); Religion und Wissen- schaft (1881); and the well-known Handworterbuch des biblischen Altertums (2 vols., 1884; 2nd. ed. revised by F. Baethgen, 1892-94). After his death were published the Einleitung in das Alte Testament (1889, ed. by A. Brandt), in which the date of the Deuteronomic law book is placed earlier than in his book on the legislation of Moses — shortly before or at the beginning of the reign of Hezekiah ; and his Alttestamentliche Theologie (1889, ed. by Pahncke). See Herzog-Hauck, Realencyklopddie, and T. K. Cheyne, Founders of Old Testament Criticism.

RIEL, LOUIS (1844-1885), Canadian agitator, son of Louis Riel and Julie de Lagemaundiere, was born at St Boniface, on the 23rd of October 1844, according to his own account, though others place his birth in 1847. Though known as a half-breed, or M6tis, and though with both Indian and Irish ancestors, his blood was mainly French. From July 1866 he worked for two years at various occupations in Minnesota, returning in July, 1868 to St Vital, near St Boniface. In 1869 the transfer of the territorial rights of the Hudson's Bay Company to the dominion of Canada gave great uneasiness to the Metis, and in October 1869 a party led by Riel turned back at the American frontier the newly appointed Canadian governor; in

November they captured Fort Garry (Winnipeg), the headquarters of the Company, and called a convention which passed a bill of rights. In December a provisional government was set up, of which on the 29th of December Riel was made president, and which defeated two attacks made on it by the English-speaking settlers of the vicinity. So far the Metis had been within their rights, but Riel was flighty, vain and mystical, and his judicial murder on the 4th of March 1870 of Thomas Scott, an' Orange- man from Ontario, roused against him the whole of English speaking Canada. Ah expedition was equipped and sent out under Colonel Garnet, later Lord, Wolseley, 'which captured Fort Garry on the 24th of August 1870, Riel decamping. (See Strathcona, Lord.) He was not arrested, arid on the 4th of August 187 1 urged his countrymen to combine with the Cana- dians against a threatened attack from American Fenians, for which good service he was publicly thanked by the lieutenant- governor. In 1872 for religious reasons he changed his name to Louis David Riel. In October 1873 he became member of the Dominion parliament for Provencher, came to Ottawa and took the oath, but did not sit. On the 1 6th of April 1874 he was expelled the House, but in September was again elected for Provencher; on the 10th of February 1875 he was Outlawed, and the seat thereby again vacated. In 1 8 7 7-7 8 he was for over a year a patient in the Beauport asylum for the insane, but from 1879 to 1884 he lived quietly in Montana, where in 1881 he married Marguerite Bellimeure. In 1884 in response to a deputation from the Metis, who had moved west to the forks of the Saskat- chewan river, he returned to Canada to win redress for their wrongs. His own rashness and the .ineptitude of Canadian politicians and officials brought on a rising, which was crushed after some hard fighting,, and on the 15th of May 1885 Riel surrendered. He was imprisoned at Regina, was tried and on the 1st of August found guilty of treason, and on the 16th of November was hanged at Regina, meeting his fate with courage. His death was the signal for a fierce outburst of racialism in Quebec and Ontario, which nearly overthrew the Conservative government of the Dominion.

See J. S. Willison, Sir Wilfrid Laurier, vol. i. ; George Bryce, History of the Hudson's Bay Company (1900) ; and the Canadian daily press for 1885.

RIEMANN, GEORG FRIEDRICH BERNHARD (1826-1866), German mathematician, was born on the 17th of SeDtember

1826, at Breselenz, near Dannenberg in Hanover. His father, Friedrich Bernhard Riemann, came from Mecklenburg, had served in the war of freedom, and had finally settled as pastor in Quickborn. Here with his five brothers and sisters Riemann spent his boyhood and received, chiefly from his father, the elements of his education. He showed at an early age well- marked mathematical powers, and his progress was so rapid in arithmetic and geometry that he was soon beyond the guidance not only of his father but of schoolmaster Schulz, who assisted in the mathematical department of his training.

In 1840 he went to Hanover, where he attended the lyceum, and two years later he entered the Johanneum at Liineburg. The director, Schmalfuss, encouraged him in his mathematical studies by lending him books (among them Leonhard Euler's works and Adrien Marie Legendre's Theory of Numbers), which Riemann read, mastered and returned within a few days. In 1846 Riemann entered himself as a student of philology and theology in the university of Gottingen. This choice of a university career was dictated more by the natural desire of his father to see his son enter his own profession, and by the poverty of his family, than by his own preference. He attended lectures on the numerical solution of equations and on definite integrals by M. A. Stern, on terrestrial magnetism by Goldschmidt, and on the method of least squares by K. F. Gauss. It soon became evident that his mathematical studies, undertaken at first probably as a relaxation, were destined to be the chief business of his life. He proceeded in the beginning of 1847 to Berlin, attracted thither by that brilliant constellation of mathematical genius whose principal stars were P. G. L. Dirichlet, C. G. J. Jacobi, J. Steiner and F. G. M. Eisenstein. He appears to have attended Dirichlet's lectures on theory of numbers, theory of definite integrals, and partial differential equations, and Jacobi's on analytical mechanics and higher algebra. It was during this period that he first formed those ideas on the theory of functions of a complex variable which led to most of his great discoveries. One stirring social incident at least marked this part of his life, for, during the revolutionary insurrection in March 1848, the young mathematician, as a member of a company of student volunteers, kept guard in the royal palace from 9 o'clock on the morning of the 24th of March till 1 o'clock on the afternoon of the following day.

In 1850 he returned to Gottingen and began to prepare his doctor's dissertation, busying himself meanwhile with " Natur- philosophie " and experimental physics. This double cultiva- tion of his scientific powers had the happiest effect on his subsequent work; for the greatest achievements of Riemann were effected by the application in

pure mathematics generally of a method (theory of potential) which had up to this time been used solely in the solution of certain problems that arise in mathematical physics.

In November 1851 he obtained his doctorate, the thesis being ” Grundlagen fur eine allgemeine Theorie der Functionen einer veranderlichen complexen Grosse.” This memoir excited the admiration of Gauss, and at once marked its author’s rank as a mathematician. The fundamental method of research which Riemann employed has just been alluded to; the results will be best indicated in his own words: —

“The methods in use hitherto for treating functions of a complex variable always started from an expression for the 1 unction as its definition, whereby its value was given for every value of the argument ; by our investigation it has been shown that, in consequence of the general character of a function of a complex variable, in a definition of this sort one part of the determining conditions is a consequence of the rest, and the extent of the determining conditions has been reduced to what is necessary to effect the determination. This essentially simplifies the treatment of such functions. Hitherto, in order to prove the equality of two expressions for the same function, it was necessary to transform the one into the other, i.e. to show that both expressions agreed for every value of the variable; now it is sufficient to prove their agreement to a far less extent ” [merely in certain critical points and at certain boundaries].

The time between his promotion to the doctorate and his habilitation as Privatdozent was occupied by researches undertaken for his Habilitationsschrift, by ” Naturphilosophie,”

and by experimental work. The subject he had chosen for his Habilitationsschrift was the “Representation of a Function by Means of a Trigonometrical Series,” a subject which Dirichlet had made his own by a now well-known series of researches. It was fortunate, no doubt, for Riemann that he had the kind advice and encouragement of Dirichlet himself, who was then on a visit at Gottingen during the preparation of his essay; but the result was a memoir of such originality and refinement as showed that the pupil was fully the equal of the master. Of the customary three themes which he suggested for his trial lecture, that ” On the Hypotheses which form the Foundation of Geometry” was chosen at the instance of Gauss, who was curious to hear what so young a man had to say on this difficult subject, on which he himself had in private speculated so profoundly (see Geometry, Non-Euclidian).

In 1855 Gauss died and was succeeded by Dirichlet, who along with others made an effort to obtain Riemann's nomina- tion as extraordinary professor. In this they were not success- ful; but a government stipend of 200 thalers was given him, and even this miserable pittance was of great importance, so straitened were his circumstances. But this small beginning of good fortune was embittered by the deaths of his father and his eldest sister, and by the breaking up of the home at Quick- born. Meantime he was lecturing and writing the great memoir (Borchardt's Journal, vol. liv., 1857) in which he applied the theory developed in his doctor's dissertation to the Abelian functions. It is amusing to find him speaking jubilantly of the unexpectedly large audience of eight which assembled to hear his first lecture (in 1854) on partial differential equations and their application to physical problems.

Riemann's health had never been strong. Even in his boyhood he had shown symptoms of consumption, the disease that was working such havoc in his family; and now under the strain of work he broke down altogether, and had to retire to the Harz with his friends Ritter and R. Dedekind, where he gave himself up to excursions and " Naturphilosophie." After his return to Gottingen (November 1857) he was made extra- ordinary professor, and his salary raised to 300 thalers. As usual with him, misfortune followed close behind; for he lost in quick succession his brother Wilhelm and another sister. In 1859 he lost his friend Dirichlet; but his reputation was now so well established that he was at once appointed to succeed him. Well-merited honours began to reach him; and in i860 he visited Paris, and met with a warm reception there. He married Elise Koch in June 1862, but the following month he had an attack of pleurisy which proved the beginning of a long illness that ended only with his death. His physician recommended a sojourn in Italy, for the benefit of his health, and Weber and Sartorius von Waltershausen obtained from the government leave of absence and means to defray the cost of the journey. At first it seemed that he would recover; but on his return in June 1863 he caught cold on the Spliigen Pass, and in August of the same year had to go back to Italy. In November 1865 he returned again to Gottingen, but, although he was able to live through the winter, and even to work a few hours every day, it became clear to his friends, and clearest of all to himself, that he was dying. In order to husband his few remaining days he resolved in June 1866 to return once more to Italy. Thither he journeyed through the confusion of the first days of the Austro-Prussian War, and settled in a villa at Selasca near Intra on Lago Maggiore. Here his strength rapidly ebbed away, but his mental faculties remained brilliant to the last. On the 19th of

July 1866 he was working at his last unfinished investigation on the mechanism of the ear. The day following he died. Few as were the years of work allotted to him, and few as are the printed pages covered by the record of his researches, his name is, and will remain, a household word among mathematicians. Most of his memoirs are masterpieces — full of original methods, profound ideas and far-reaching imagination.

The collected works of Riemann were published by H. Weber, assisted by R. Dedekind (8vo, Leipzig, 1876; 2nd ed., 1892).

At the end of this volume there is a touching account of his life by the latter. (G. Ch.)

RIENZI, COLA DI (c. 1313-1354), tribune of the Roman people, was born in Rome, being the son of a tavern-keeper named Lorenzo Gabrini. His father's Christian name was shortened to Rienzo,and his own, Nicholas, to Cola; hence the Cola di Rienzi, or Rienzo, by which he is generally known. His early years were passed at Anagiii. Having devoted much time to the study of the Latin writers, historians, orators and poets, and filled his mind with stories of the glories and the power of ancient Rome, he turned his thoughts to the task of restoring his native city to its pristine greatness, his zeal for this work being quickened by the desire to avenge his brother, who had been killed by a noble, a member of the ruling class. He became a notary and a person of some importance in the city, and was sent in 1343 on a public errand to Pope Clement VI. at Avignon. He discharged his duties with ability and success, and although the boldness with which he denounced the aristocratic rulers of Rome drew down upon him the enmity of powerful rren, he won the favour and esteem of the pope, who gave him an official position at his court. Returning to Rome about April 1344 he worked for three years at the great object of his life, the restoration of the city to its former position of power. He gathered together a band of supporters, plans were drawn up, and at length all was ready for the rising. On the 19th of May 1347 heralds invited the people to a parliament on the Capitol, and on the 20th, the day being Whit-Sunday, the meeting took place. Dressed in full armour and attended by the papal vicar, Cola headed a procession to the Capitol; here he addressed the assembled crowd, speaking " with fascinating eloquence of the servitude and redemption of Rome." A new series of laws was published and accepted with acclaim, and

unlimited authority was given to the author of the revolution. Without striking a blow the nobles left the city or went into hiding, and a few days later Rienzi took the title of tribune (Nicholaus, severus et demons, libertatis, pads jusliciaeque tribunus, et sacre Romane Reipublice liberator).

His authority quickly and quietly accepted by all classes, the new ruler governed the city with a stern justice which was in marked contrast to the recent reign of licence and disorder. In great state the tribune moved through the streets of Rome, being received at St Peter's with the hymn Vent Creator spirilus, while in a letter the poet Petrarch urged him to continue his great and noble work, and congratulated him on his past achievements, calling him the new Camillus, Brutus and Romulus. In July in a sonorous decree he proclaimed the sovereignty of the Roman people over the empire, but before this he had set to work upon his task of restoring the authority of Rome over the cities and provinces of Italy, of making the city again caput mundi. He wrote letters to the cities of Italy, asking them to send representatives to an assembly which would meet on the 1st of August, when the formation of a great federation under the headship of Rome would be considered. On the appointed day a number of representatives appeared, and after some elaborate and fantastic ceremonials Rienzi, as dictator, issued an edict citing the emperor Louis the Bavarian and his rival Charles, afterwards the emperor Charles IV., and also the imperial electors and all others concerned in the dispute, to appear before him in order that he might pronounce judgment in the case. On the following day the festival of the unity of Italy was celebrated, but neither this nor the previous meet- ing had any practical result. Rienzi's power, however, was recognized in Naples, whence both Queen Joanna and her bitter foe, King Louis of Hungary, appealed to him for pro- tection and aid, and on the 15th of August he was crowned tribune with great pomp, wreaths of flowers being placed on his head. Gregorovius says this ceremony " was the fantastic caricature in which ended the imperium of Charles the Great. A world where political action was represented in such guise was ripe for overthrow, or could only be saved by a great mental reformation." He then seized, but soon released, Stephen Colonna and some other barons who had spoken

disparagingly of him. But his power was already beginning to wane. His extravagant pretensions only served to excite ridicule. His government was costly, and to meet its many expenses he was obliged to lay heavy taxes upon the people. He offended the pope by his arrogance and pride, and both pope and emperor by his proposal to set up a new Roman empire, the sovereignty of which would rest

directly upon the will of the people. In October Clement gave power to a legate to depose him and bring him to trial, and the end was obviously in sight. Taking heart, the exiled barons gathered together some troops, and war began in the neighbourhood of Rome. Rienzi obtained aid from Louis of Hungary and others, and on the 20th of November his forces defeated the nobles in a – battle just outside the gates of Rome, a battle in which the tribune himself took no part, but in which his most distinguished foe, Stephen Colonna, was killed. But this victory did not save him. He passed his time in feasts and pageants, while in a bull the pope denounced him as a criminal, a pagan and a heretic, until, terrified by a slight disturbance on the 15th of December, he abdicated and fled from Rome. He sought refuge in Naples, but soon he left that city and spent over two years in an Italian mountain monastery.

Emerging from his solitude Rienzi journeyed to Prague, which he reached in July 1350, and threw himself upon the protection of the emperor Charles IV. Denouncing the temporal power of the pope he implored the emperor to deliver Italy, and especially Rome, from their oppressors; but, heedless of his invitations, Charles kept him in prison for more than a year in the fortress of Raudnitz, and then handed him over to Clement, who had been clamouring for his surrender. At Avignon, where he appeared in August 1352, Rienzi was tried by three cardinals, and was sentenced to death, but this judgment was not carried out, and he remained in prison in spite of appeals from Petrarch for his release. Freedom, however, was at hand. In December 1352 Clement died, and his successor, Innocent VI., anxious to strike a blow at the baronial rulers of Rome, and seeing in the former tribune an excellent tool for this purpose, pardoned and released his prisoner. Giving him the title of senator, he sent him to Italy with the legate, Cardinal Albornoz, and having collected a few mercenary troops on the way, Rienzi entered Rome in August 1354. He was received with great rejoicings and quickly regained his former position of power. But this latter term of office was destined to be even shorter than his former one had been. Having vainly besieged the fortress of Palestrina, he returned to Rome, where he treacherously seized the soldier of fortune, Fra Monreale, who was put to death, and where, by other cruel and arbitrary deeds, he soon lost the favour of the people. Their passions were quickly aroused and a tumult broke out on the 8th of October. Rienzi attempted to address them, but the building in which he stood was fired, and while trying to escape in disguise he was murdered by the mob. Rienzi was the hero of one of the finest of Petrarch's odes, Spirito gentil, and also of some beautiful verses by Lord Byron. He was a man of vivid, but disordered, imagination,

without possessing any conception of . statesmanship. In 1887 a statue of the tribune was erected at the foot of the Capitoline Hill in Rome.

Rienzi's life and fate have formed the subject of a famous novel by Bulwer Lytton, of an opera by Wagner and of a tragedy by Julius Mosen. His letters, edited by A. Gabrielli, are published in vol. vi. of the Fonti per la storia d'ltalia (Rome, 1890). See also Papencordt, Cola di Rienzo und seine Zeit (Hamburg, 1841) ; Auriac, jZtude historique sur N. Rienzi (Amiens, 1885); E. Rodocanachi, Cola di Rienzi (Paris, 1888); Kilhn, Die Entwickelung der Biindnis- plane Cola di Rienzos im Jahre 134J (Berlin, 1905) ; A. von Reumont, Geschichte der Stadt Rom (1867-70) ; and F. Gregorovius, Geschichte der Stadt Rom im Mittelalter, vol. vi. (Eng. trans., by A. Hamilton, 1898). (A. W. H.*)

RIESA, a town of Germany, in the kingdom of Saxony, pleasantly situated on the left bank of the Elbe, 30 m. N.W. of Dresden, on the main line of railway to Leipzig, and at the junction of lines to Chemnitz, Elsterwerda and Nossen. Pop. (1905) 14,073. The river is here crossed by a fine bridge, a

sandstone and iron structure, carrying both railway and road, and replacing the one carried away by floods in 1875. The town contains two Evangelical churches, a castle, formerly a convent and now used as a town hall, and several schools. There is a harbour with quays and a dockyard, also rolling- mills and saw-mills, ironworks and sandstone quarries. Other industries are the manufacture of furniture, beer, soap, carriages and bricks. The most important shipping station on the Elbe in Saxony, Riesa is the lading-place for goods to and from Bavaria, and a mart for herrings, petroleum, wood, coal and grain. A constant passenger steamboat communication is maintained with Meissen and Dresden; and, owing to the artillery practice 1 ranges at Zeithain, on the right bank of the Elbe, Riesa has become of recent years one of the chief depots of the Saxon army. Riesa received municipal rights in 1632, and after a period of decay was again raised to the rank of a town in 1859.

RIESENER, JEAN HENRI (1 734-1806), French cabinet-maker of the Louis XVI. period, was born at Gladbach near Cologne. At an early age he went to Paris, where he entered the workshop in the Arsenal of Jean Francois Oeben (q.v.). When that great master died, Riesener became foreman of the works; two years later he married Mme.

Oeben, and in 1 768 was admitted ” maltre- menuisier-6beniste.” His wife died in 1776, and in 1782 he espoused, as his second wife, Anne Grezel, daughter of a bourgeois of Paris. The union was unhappy, and when, under the first Republic, divorce was legalized, the marriage was dissolved; When Riesener contracted his first marriage he possessed little or nothing; his second contract of marriage recited that in cash and in the money due to him by Louis XVI. he was worth more than £20,000, without counting the finished work in hand, bronze models, jewels and personal effects and invested funds. Thus in fifteen years hehad accumulated a fortune amountingin all to about £40,000. By that time there had been conferred upon him the title, formerly enjoyed by Oeben, of ” Ebeniste du Roi.” He died on the 6th of January 1806, in the Enclos des Jacobins, leaving an only son, Henri Francois (1767-1828), a distinguished portrait- painter of the First Empire. Riesener was unquestionably the greatest of the Louis Seize cabinet-makers. His name is stamped upon the Bureau du Roi in the Louvre, and although the original conception of that master- work was due to Oeben, it cannot be doubted that its consummate finish and perfect achievement must in great measure be attributed to the man who completed it. Occasionally there may, perhaps, be some lack of spon- taneity in his forms, but his work is generally at once bold and graceful. His marquetry presents an extraordinary finish; his chiselled bronzes are of the first excellence. He was especially distinguished for his cabinets, in which he employed many European as well as exotic woods. Wreaths and bunches of flowers form the centres of the panels; on the sides are often diaper patterns in quiet colours. Yet despite his distinction as a maker of cabinets his high-water mark was reached in the Bureau du Roi, finished in 1769 and consequently belonging rather to the Louis Quinze than the Louis Seize period, and a not altogether dissimilar cylinder bureau believed to have been made for Stanislas Leszczynski, king of Poland, now in the Wallace Collection. Stanislas died in 1766, but the desk was not completed until February 20, 1769, as appears by the inscription accompanying the maker’s signature. Upon its completion it passed into the possession of the French crown and was included in a sale of the royal furniture which took place in Holland. It was purchased by Sir William Hamilton, then British Minister at the Hague, and appears to have passed out of his hands when he left Naples, where it was purchased by Sir Richard Wallace. At Buckingham Palace there is a third bureau on the same lines. These pieces are triumphs of marquetry. They are inlaid with trophies of musical instruments, doves, bouquets and garlands of flowers; the bronze vases and ” galleries” are exquisite — they may possibly be the work of Gouthiere, but are more probably from the hands of Duplessis. For several years this great artist appears to have

used the models of his master Oeben, but there was a gradual transition to a style more individual, more

delicately conceived, with finer but hardly less vigorous lines. By the time he had been working alone for ten years he had completely embraced the Louis Seize manner— die had, perhaps, some responsibility for it. One of the most distinguished of his achievements for the court was the famous flat writing-table now at the Petit Trianon, for which he received only £200. The extent of these royal orders may be gauged from the fact that between 1775 and 1785 Riesener received 500,000 livres from the Garde Meubles, notwithstanding that during the whole of this period Gondouin the architect was the official designer of furniture for the royal palaces. Like so many other artists he was con- demned in the end to sacrifice to the false taste of his day, and a certain number of his creations, otherwise delightful, were vitiated by being mounted with panels of Sevres, Wedg wood and other china. The beautiful little secretaire in the Jones collection in the Victoria and Albert Museum suffers seriously by this lapse.

RIESENGEBIRGE (Bohemian Krkonose), or Giant Moun- tains, a lofty and rugged group on the boundary of Silesia and Bohemia, between the upper courses of the Elbe and the Oder. They form the highest portion of the Sudetic system which separates south-east Prussia from the Austrian empire, and finds its natural continuation towards the N.W. in the Erz- gebirge, the Thuringian Forest and the Harz Mountains. Adjoining the Isergebirge and the Lausitzergebirge on the W., and the Eulengebirge and the Adlergebirge on the E. and S.E., the Riesengebirge proper run S.E. and N.W. between the sources of the Zacken and the Bober, for a distance of 23 m., with a breadth of 14 m. They Cover an area of about 425 sq. m., three-fourths of which is in Austrian, and the remainder in Prussian territory. The boundary line follows the crest of the principal chain or ridge (Riesenkamm), which stretches along the northern side of the group, with an average height of over 4000 ft. The principal peaks are the Reiftrager (4430 ft.), the Hohe Rad (4968 ft.), the Great Sturmhaube (4862 ft.), the Little Sturmhaube (4646 ft.)', and, near the east extremity, the Schneekoppe or Riesenkoppe (5266 ft.), the loftiest mountain in northern or central Germany. Roughly parallel to this northern ridge, and separated from it by a long narrow valley known as the Siebengriinde, there extends on the S. a second and lower chain, of broad massive “saddles,” with comparatively few peaks. The chief heights here are Kesselkoppe (4708 ft.), the Krkonose (4849 ft.), the Ziegenriicken and the Brunnen- berg (5072 ft.). From both ridges spurs of greater or less length are sent off at various angles, whence a magnificent view is obtained from

Breslau to Prague; the lowlands of Silesia, watered by the Oder, and those of Bohemia, intersected by the Elbe and the Moldau, appearing to lie mapped in relief. The summit is crowned by a chapel dedicated to St Lawrence, which once also served as a traveller's shelter. Since 1850 the chapel has been restored to its religious use, and a hotel for the accom- modation of tourists is built close by. A remarkable group of isolated columnar rocks are those known as the Adersbacher Felsen in a valley on the Bohemian side of the Riesengebirge, 9 m. W.N.W. of Braunau.

On its northern side this mountain group rises ruggedly and precipitously from the Hirschberg valley; but on its southern side its slope towards Bohemia is very much more gradual. The scenery is in general bold and wild. The Bohemian ridge is cleft about the middle by a deep gorge through which pour the headwaters of the river Elbe, which finds its source in the Siebengriinde. The Iser, Bober, Aupa, Zacken, Queiss, and a great number of smaller streams also rise among these mountains or on their skirts; and small lakes and tarns are not unfrequent in the valleys. The Great and Little Schneegruben — two deep rocky gorge-like valleys in which snow remains all the year round — lie to the north of the Hohe Rad.

Nearly the whole of the Riesenkamm and the western portion of the southern chain are granite; the eastern extremity of the main ridge and several mountains to the south-east are formed of a species of gneiss; and the greater part of the Bohemian chain, especially its summits, consists of mica-slate. Blocks of these minerals lie scattered on the sides and ridges of the mountains and

in the beds of the streams; and extensive turf moors occupy many of the mountain slopes and valleys. The lower parts of the Riesenge- birge are clad with forests of oak, beech, pine and fir; above 1600 ft. only the last two kinds of trees are found, and beyond about 3950 ft. only the dwarf pine {Pinus Pumilio). Various alpine plants are found on the Riesengebirge, some of them having been artificially introduced on the Schneekoppe. Wheat is grown at an elevation of 1800 ft. above the sea-level, and oats as high as 2700 ft. The inhabitants of this mountain region, who are tolerably numerous, especially on the Bohemian side, live for the most part, not in villages, but in scattered huts called " Bauden." They support themselves by the rearing of cattle, tillage, glass-making and linen-weaving. Mining is

carried on only to a small extent for arsenic, although there are traces of former more extensive workings for other metals.

The Riesengebirge has of late years been made easily accessible by railway, several branches from the main lines, both on the Silesian and Bohemian side, penetrating the valleys, and thus many spots in the Riesengebirge are a good deal frequented in the summer. The Schneekoppe and other summits are annually visited by a considerable number of travellers, notably the spas of Warmbrunn (near Hirschberg) and Flinsberg on the Grteis, and Gorbersdorf, known as a climate health resort for consumptives. The Riesenge- birge is the legendary home of Number Nip (Rubezahl), a half- mischievous, half-friendly goblin of German folklore, and various localities in the group are more or less directly associated with his name.

See Beemann's Oratio de monte Giganteo (Frankfort a. O. 1679); Daniel, Deutschland, vol. i. pp. 277-78 ; and Gebauer, Lander- und Volkerkunde, vol. i.

RIETI (anc. Reate), a city and episcopal see of Italy, in the piovince of Perugia, 253 m. by rail and 15 m. direct S.S.E. of Terni, which is 70 m. by rail from Rome. Pop. (1901) 14,145 (town), 17,716 (commune). It occupies a fine position 13 18 ft. above sea-level on the right bank of the Velino (a torrent sub- tributary to the Tiber), which at this point issues from the limestone plateau; the old town occupies the declivity and the new town spreads out on the level. While with its quaint red-roofed houses, its old town walls (restored about 1250), its castle, its cathedral (13th and 15th centuries), its episcopal palace (1283), and its various churches and convents Rieti has no small amount of medieval picturesqueness; it also displays a good deal of modern activity in vine and olive growing and cattle-breeding. The fertility of the neighbourhood is celebrated both by Virgil and by Cicero. A Roman bridge over the Turano, and the Palazzo Vincentini by Vignola deserve to be mentioned.

Reate was reached from Rome by the Via Salaria {q.v.), which may originally have ended there, and a branch road ran from it to Interamna. While hardly mentioned in connexion with the Punic or Civil Wars, Reate is described by Strabo as exhausted by these long contests. Its inhabitants received the Roman franchise at the same time with the rest of the Sabines (290 B.C.), but it appears as a praefectura and not as a municipium down to the beginning of the empire. It was never made a colonia, though veterans of the Praetorian guard and of the eighth (Augusta) and ninth legions were settled there by Vespasian, who belonged to a Reatine family and was

born in the neighbourhood. For the contests of the Reatines with the people of Interamna see Terni. In 1148 the town was besieged and captured by Roger I. of Sicily. In the struggle between church and empire it always held with the former; and it defied the forces of Frederick II. and Otho IV. Pope Nicholas IV. long resided at Rieti, and it was there he crowned Charles II. of Anjou king of the Two Sicilies. In the 14th century Robert, and afterwards Joanna, of Naples managed to keep possession of Rieti for many years, but it returned to the States of the Church under Gregory IX. About the year 1500, the liberties of the town, long defended against the encroachments of the popes, were entirely abolished. An earthquake in 1785 was in 1799 followed by the much more disastrous pillage of Rieti by the papal troops for a space of fourteen days.

RIETSCHEL, ERNST FRIEDRICH AUGUST (1804-1861), German sculptor, was born at Pulsnitz in Saxony. At an early age he became an art student at Dresden, and subsequently a pupil of Rauch in Berlin. He there gained an art studentship, and studied in Rome in 1827-28. After returning to Saxony he soon brought himself into notice by a colossal statue of Frederick Augustus, king of Saxony; was elected a member of the academy of Dresden, and .thenceforth became one of the chief sculptors of his country. In 1832 he was elected to the Dresden professorship of sculpture, and had many foreign orders of merit conferred on him by the governments of different countries. He died at Dresden in 186 1.

Rietschel's style was very varied; he produced works imbued with much religious feeling, and to some extent he occupied the same place as a sculptor that Overbeck did in painting. Other important works by him were purely classical in style. He was specially famed for his portrait figures of eminent men, treated with much idealism and dramatic vigour; among the latter class his chief works were colossal statues of Goethe and Schiller for the town of Weimar, of Weber for Dresden and of Lessing for Brunswick. He also designed the memorial statue of Luther for Worms, but died before he could carry it out. The principal among Rietschel's religious pieces of sculpture are the well-known Christ- Angel, and a life-sized Pieta, executed for the king of Prussia. He also worked a great deal in rilievo, and produced many graceful pieces, especially a fine series of bas-reliefs representing Night and Morning, Noon and Twilight, designed with much poetical feeling and imagination.

For a good biography of Rietschel and account of his works see Appermann, Ernst Rietschel (Leipzig, 1863). (J. H. M.)

RIEU, CHARLES PIERRE HENRI (1820-1902), Swiss Orientalist, was born at Geneva in 1820. He studied at Bonn University, where he received his doctor's degree in 1843. He entered the British Museum in 1847, and after twenty years of service, a new post, that of keeper of Oriental manuscripts, was created for him. He completed in 187 1 the second part; dealing with Arabian MSS., of the Catalogus codicum manu- scriptorum orientalium, which had been begun by William Cureton, and he issued a supplementary volume in 1894. He also drew up a Catalogue of the Turkish Manuscripts (1888) and a Catalogue of the Persian Manuscripts (4 vols., 1879-95), the latter being a storehouse of information on the books and their authors. In 1895 he was made professor of Arabic in the university of Cambridge in succession to Robertson Smith. He died in London on the 19th of March 1902.

RIEVAULX, a village in the North Riding of Yorkshire, England, 3 m. W. by N. of the small town of Helmsley, which is served by a branch of the North-Eastern railway. Here, exquisitely situated in a deep wooded valley, are the ruins of Rievaulx Abbey, a foundation by Walter l'Espec in 1131 for Cistercians. The principal remains are those of the cruciform church, mainly Early English in date, and of the finest workman- ship. There are considerable fragments of the refectory, and all the important domestic buildings may be traced. A beautiful prospect over the ruins and the valley is seen from the terrace on the eastern flanking hill.

RIFFIANS, the name given to the Berbers of the Rif district of Morocco, the mountain region bordering the north coast from Ceuta eastward nearly to the borders of Algeria and forming part of the Atlas range. The name, it has been suggested, is identical with Libyan or Libi. A peculiarity of the Rif dialect is the change of the Arabic " 1 " to " r," and this would seem to support this derivation, " b " and " f " being interchangeable through " v." The Riffians are only nominally subject to the sultan of Morocco, against whose authority they are in constant revolt. They are typical Berbers in physique, tall, well made and muscular, with European features and fair skins bronzed by the sun. In morality they are singularly superior to their neighbours. In order to prevent youthful uncha'stity, marriages are contracted between children of eight years old, the girl being brought home to live with the lad at his parents' home till a child is born, when a separate dwelling is provided for the youthful couple. The women are noted for their beauty. The Riffians understand and speak Arabic very little. They were among the fiercest and most cruel of the pirates of the north coast of Africa. Even now they are entirely untrust- worthy in this respect. See further Berbers, Morocco, Moors, Kabyles,

Mzabites.

RIFLE, a firearm which may be shortly defined as a musket in which, by grooves (cf. Ger. riffeln, to groove) in the bore or otherwise, the projectile is forced to rotate before leaving the barrel. This rotatory motion, maintained during flight, equalizes any irregularities in the form or weight of the bullet, and so lessens the tendency to depart from a straight line, and also in a measure overcomes atmospheric resistance. Rifling was invented about 1520, by Gaspard Koller or Kollner, a gunmaker of Vienna, according to some authorities; by August Kotter of Nuremberg, according to others. It has been said

that at first the grooves were made straight, with the object of admitting a tight-fitting bullet and relieving the effects of fouling, and that the virtue of spiral grooving was subsequently discovered by accident. But this theory is unsupported. The earliest known rifle barrels have spiral grooving. The amount of turn varied in old rifles from a half or three-quarters turn to one turn in two to three feet. The form and depth of the grooving and the number of grooves also greatly varied.

Historical Development of Military Rifles. — For the chief infantry firearms that preceded the modern military rifle, see Gun, Arms and Armour (firearms), Arquebus, &c. Rifles were at first used for amusement. There are, however, in- stances of their occasional employment in war in the 17th and 18th centuries. In 1631 the landgrave of Hesse had a troop of riflemen. Ten years later Maximilian of Bavaria had several troops armed with rifled arquebuses. Louis XIII. armed his bodyguard with rifles. Napoleon withdrew the rifle from those of his troops to whom it had been issued during the wars of the Republic, nor did the French make any considerable use of it again until 1830, when the Chasseurs d'Orleans were armed with it for the invasion of Algeria. The British learnt the value of rifles during the American War of Independence, when the government subsidized continental Jagers armed with rifles to oppose the American riflemen. After the war these corps disappeared, and though they are now represented by the 60th (King's Royal) Rifles, the senior rifle corps in the British Army is the Rifle Brigade, raised in 1800 as the 95th Regi- ment and armed with a flint-lock weapon known as " Baker's Rifle, " which weighed 9ˆ lb. The barrel was i\ ft. long, its calibre 2a-bore, with seven grooves making a quarter-turn in its length. A small

wooden mallet was at first supplied with this rifle to make the ball enter the barrel, and it was loaded with great difficulty. In . 1826 Delvigne, a French infantry officer, invented a breech with abrupt shoulders on which the spherical bullet was rammed down until it expanded and filled the grooves. The objection was that the deformed bullet had an erratic flight. Delvigne's system was subsequently improved upon by Thouvenin, who introduced into the breech an iron stem, upon which the bullet, now of conical form, rested, and was expanded by a sharp blow with the iron ramrod when loading. In William IV.'s reign the Brunswick percussion rifle 1 was introduced into the British rifle regiments. Its weight with bayonet was n lb 55 oz.; length of barrel, 2 ft. 6 in., with two grooves making one turn in the length of the barrel; weight of spherical belted bullet, 557 grs.; diameter, -704 in.; charge of powder, 25 drs. This rifle was not easily loaded, soon fouled, and shot wild beyond 400 yds.

In 1835 W. Greener produced a new expansive bullet, an oval ball, a diameter and a half in length, with a flat end, perforated, in which a cast metallic taper plug was inserted. The explosion of the charge drove the plug home, expanded the bullet, filled the grooves and prevented windage. A trial of the Greener bullet in August 1835 proved successful. The range and accuracy of the rifle were retained, while the loading was made as easy as with a smooth-bore musket. The invention was, however, rejected by the military authorities on the ground that the bullet was a compound one. In 1852 the Government awarded Minie, a Frenchman, £20,000 for a bullet of the same principle adopted into the British service. In 1857 Greener received a belated reward of £1000 for " the first public suggestion of the principle of expansion. " The Mini6 bullet contained an iron cup in a cavity at the base of the bullet. In 1851 a rifled musket of the Minie pattern was introduced into the British army, and, though not generally issued, was used in the Kaffir War of 1851, and in the Crimea. Its weight with bayonet was 10 lb 8 J oz., length of barrel 3 ft. 3 in., with four grooves making one turn in 72 in.; diameter of bore -702 inch;

1 The percussion principle, invented by the Rev. Alexander John Forsyth (1768-1843) in 1805, was not accepted for military arms until the introduction of this rifle. A small and belated money grant was made to Forsyth in 1843. See Major-General A. J. F. Reid's memoir of Forsyth (19 10).

charge of powder i\ drs., and sighted from 160 to 1000 yds. The form of its bullet was at first conoidal, afterwards changed to cylindro-conoidal, with a hemispherical iron cup. In 1855 the Enfield rifle,

having in a series of trials competed favourably with the Minie and Lancaster rifles, was introduced into the British army; it was used during the latter part of the Crimean war, having there replaced the Minie rifle and the percussion musket, and remained the general weapon of the entire infantry until the introduction of the breech-loader in the year 1867. This rifle weighed, with bayonet, 9 lb 3 oz., barrel 39 in.; diameter of bore -577 in.; three-grooved, with one turn in 78 in. It fired a bullet of cylindro-conoidal form with hollow base, weighing 530 grains, made up into cartridges and lubricated as for the Minie rifle, adapted to this rifle by Pritchett, who was awarded £1000 by the Government. This bullet was wrapped in greased paper round the cylindrical part half-way up its length. Short rifles of the same pattern, with five-grooved barrels 2 ft. 9 in. long and a sword bayonet, were supplied to the 60th Rifles and to the Rifle Brigade. Two small carbines of the same principle were at this time introduced for the cavalry and artillery, also a rifled pistol.

In 1854, on the suggestion of General Lord Hardinge, Sir Joseph Whitworth, the first mechanician of the day, began to consider the subject of rifling, and after a long series of experi- ments the Whitworth rifle was produced with hexagonal bore, •45-in. calibre, and with one turn in 20 in. It was tried at Hythe in 1857, and completely defeated the Enfield rifle up to 1800 yds. upon a fixed rest. This trial and Whitworth's experi- ments proved the advantages of a sharp twist, a smaller bore, and elongated projectile; but Whitworth's rifle was never adopted into the Government service, probably because the hexagonal rifling wore badly, and owing to the difficulty of equal mechanical perfection in all similar rifles and ammunition. Several improvements were subsequently made in the sighting, grooving and some other details of the Enfield rifle. In 1855 a boxwood plug to the bullet was used.

Between 1857 and 1861 four breech-loading carbines were experimentally introduced in the cavalry— viz. Sharp's, Terry's, Green's, and Westley-Richards'. Sharp's and other breech- loading carbines and also Spencer repeating carbines were used by the Federal cavalry in the American Civil War. The general adoption of the breech-loading principle may be said to date from 1867. The Prussians were the first to see its great advantages, and about 1841 had adopted the cele- brated needle-gun (?.».), a bolt-action weapon. In 1864 and 1866 committees were appointed by the British 'War Office to report on breech-loading arms, and after protracted experiments, Jacob Snider's method of conversion of the muzzle – loading En- field to a breech- loader (fig. 1) was adopted, with the me- tallic cartridge – case improved in 1867 by Colonel Boxer, R.A. All available En- field

rifles were thus converted, and new

arms made with steel barrels instead of iron, was the first to adopt for her army a

Fig. 1 .—Snider Rifle. {Text Book of Small Arms, -by permission of the Controller, H.M. Stationery Office.)

Great Britain breech-loading

RIFLE

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rifle with metallic cartridge-case, which secured the perfect obturation of the breech. The Snider breech was a hinged block, a type much in favour at the time. The French simil- arly converted their muzzle-loaders, the converted weapon being known as the Tabatiere or snuff-box. Other breech actions on the same principle were the Austrian Werndl and the Bavarian Podewils and Werder rifles. But these were only transitional arms. In 1866 France adopted the bolt-action Chassepot (q.v.); in 1867 Sweden the Hagstrom, and Russia the Carte; in 1868 Italy the Carcano. All these were breech- loaders firing paper cartridges containing their own means of ignition. After further experiments by a fresh committee the Martini-Henry rifle (fig. 2) was definitely adopted by the British

Fig. 2. — Martini-Henry.

Government in 1871, with the short chamber Boxer-Henry ammunition. This rifle was a combination of Martini's block- action breech mechanism with Henry's barrel of -45-in. calibre, firing a papered bullet of 480 grains from Boxer cases with a wad of wax lubrication at base of bullet, as proposed by Henry. The Henry rifling had seven grooves with one turn in 22 in.; the lands and the centres of the grooves were contained in the same circle. About the same time or a little later the various powers re-armed their infantry with breech-loaders of different patterns and names, all of which were of about n mm. (-433 in.) calibre, and nearly all of the bolt-action type.

The next stage in the history of military firearms was the introduction of the repeating or magazine system. The Winchester rifle, an American invention which appeared in 1865, was one of the earliest magazine rifles. This weapon was used by Turkey to some extent in the Russo-Turkish War of 1877-78, but Germany was the first great power to provide its army with a magazine rifle. In 1884 it converted

the 1871 pattern Mauser of 443ˆ. bore into a magazine rifle, holding eight cartridges in a tube magazine in the fore end. In 1885 France followed with the Lebel, which had an enormous advantage in its smokeless powder. In 1886 the question of the best calibre for small arms was reopened in England. In this year, 1886, Austria had adopted a Mannlicher rifle, 433 bore, with a straight pull bolt. This rifle was the first adopted by any European nation embodying Lee's box magazine, an invention patented in 1879 and 1882, and consisting of a box, in rear of and below the entrance to the chamber, containing the cartridges. Another

important improvement, the steel clip loader containing five cartridges, was also introduced with this rifle. In 1888 these rifles were converted to .315 bore, firing black powder cartridges; and in 1890, on the introduction of smokeless powder, the sights were re-graduated. In 1887 the British Small Arms Committee, after experiments with the small-calibre rifle invented in 1883 by the Swiss Major Rubin, director of the Federal laboratory at Thun, recommended the small calibre for adoption into the British service. The essential features of Rubin's system were the employment of a compound bullet with a leaden core in a copper envelope, and the use of a compressed charge of black powder. In 1888 a pattern of 303ˆ1. calibre rifle, rifled on the Metford system and with the improved Lee bolt and maga- zine, was approved for trial by British troops. The Metford rifling is as follows:— diameter of bore, -303 in.; depth of rifling, •004 in.; width of lands, -023 in.; twist of rifling, one turn in 10 in. (left-hand) ; radial grooves, seven in number. About 1862, and later, W. E. Metford had carried out an exhaustive series of experiments on bullets and rifling. He invented the important system of light rifling, with increasing spiral with a hardened bullet. The Metford match rifle was prominent in all N.R.A. competitions from 1871 to 1894. In 1887 he laid down for the Small Arms Committee the proper proportions for the grooving, spiral and cartridge chamber of the -303 military rifle. This weapon proved satisfactory and was adopted by the War Office as the Lee-Metford rifle, Mark I., in December 1888. It had a magazine of eight cartridges. In 1891 the Mark II. pattern was approved, with a ten-cartridge magazine, a simpli- fied bolt, and many minor improvements. A magazine carbine with barrel 21 in. long and a six-cartridge magazine, otherwise identical with the Lee-Metford Mark II., was also approved. The Lee-Metford Mark II. rifle was subsequently further im- proved in its rifling to resist the wear of smokeless powder, and also in its bolt action, and became known as the Lee-Enfield rifle, and under that name was officially adopted as the rifle of the British army. The

number of grooves were reduced from seven to five. Neither the Lee-Metford nor the Lee-Enfield has increasing spiral grooves, which are found inconvenient for military arms from a manufacturing point of view. 1 The L.M. and L.E. carbines are similar to the shorter models of the rifles, but are covered for the whole length of the barrel by a wooden handguard and take only six cartridges; the fore-sights are protected by wings on the nose-cap, and the long-range sights are omitted. These, as also the Martini-Metford and Martini-Enfield carbines (falling-block action small-bores), have practically been replaced by the ” short ” rifle described below.

The efficiency of the modern small-bore magazine rifle is largely due to the production of smokeless nitro-compound powder. France was the first country to adopt, about 1885, a smokeless powder with the Lebel magazine rifle. It was known as ” Vieille ” powder, or ” Poudre B ” (after General Boulanger). Since then smokeless explosives have been universally adopted in all small-bore magazine military rifles. The smokeless explosive known as ” Cordite “or” Cordite M.D.” (see Cordite) is used for the cartridges of the Lee-Metford and Lee-Enfield rifles and rifle-calibre machine guns. (H. S.-K.)

Military Rifles of To-day. — About 1900, the various armies were equipped with weapons of nearly equal efficiency. The weights varied between 8£ and g\ lb, the lengths between 49 and 52 in.; the calibres were -315, -311, -303, with one or two -256. None of the rifles were sighted to less than 2000 yds., and nearly all had a ” fixed ” or ” battle ” sight. All were bolt-action rifles, and had a muzzle velocity of about 2000 f.s. (the -256 Mannlichers, about 2300 f.s.). Except France, with the tube-magazine Lebel, Denmark and the U.S.A. with the horizontal-box Krag-Jorgensen, and Great Britain, all nations used multiple-loading by clip or charger. With Lebel and Krag-Jorgensen weapons, multiple-loading is a practical im- possibility, but in Great Britain the charger was deliber- ately rejected. It was desired to use the rifle normally as a

1 Of all modern military rifles, the Italian 1891 weapon alone has an increasing twist.

single-loader, and to reserve the magazine (which held ten cartridges, or twice as many as the multiple-loading Mausers, Mannlichers, &c.) for emergencies. But from about 1903 this equivalence of infantry

weapons began to be disturbed by two new influences: the tendency towards a ” short ” rifle, and the introduction of the pointed bullet.

In the first, Switzerland took the lead with the short Schmidt- Rubin in 1000. But amongst the greater powers, England and the United States alone have followed her example. At the close of the South African War Great Britain issued 1000 short Lee-Enfield rifles experimentally, and in 1903 the ” short rifle ” was actually approved and issued generally. Since then it has been improved in details. The barrel was shortened by 5 in., multiple-loading by charger was introduced, and by the Musketry Regulations of 1909 magazine fire was laid down as the normal, single-loading being forbidden. The change met with very considerable opposition, especially from target-shooting experts, who maintained that a long rifle, so perfected in details as to be equal to the short in every point except in length, must be more accurate. The view of the military authorities, which was maintained in spite of criticism, was that for service purposes, and especially for prolonged snap-shooting, the handier weapon was preferable. One important factor in the decision was the desire to give the cavalry a weapon with which, when dismounted, it could fight the infantry rifle on equal terms. A more serious objection than that of want of superfine accuracy in bull’s-eye shooting was the loss of 5 in. of reach in bayonet fighting. This objec- tion was met in 1907 by the introduction of a new pattern bayonet with a blade 5 in. longer.’ In 1908 the long Leeˆ Enfield and Lee-Metford rifles in store were converted for charger-loading (fig. 3), fitted with safety catches and

Fig. 3. — Charger-loading L.E. (Text Book of Small Arms, by permission.)

new sights, and issued to the infantry of the Territorial Force in 1909 and 1910. For target purposes many rifle shots prefer this converted weapon to the short rifle (fig. 4).

Fig. 4. — L.E. Short Rifle. (Text Book of Small Arms, by permission.)

The United States in 1904 replaced the Krag-Jorgensen (hand- loading horizontal magazine) by the short Springfield. A sort of spring bayonet was at first fitted to this rifle, but it was soon replaced by an ordinary sword bayonet.

The pointed bullet (” Spitz-geschoss ” or ” S “) was introduced by Germany in 1905, and her example was quickly followed by France (balle D) and other powers. Its advantage is a considerable flattening of the trajectory, chiefly on account of the lessened resistance of the

air. This latter allows of a reduction in the sectional density and consequently in the weight of the bullet. Thus velocities up to 2900 foot-seconds are realized, which enables the ” dangerous space ” to be very greatly augmented (see fig. 20). The “fixed sight” range with the ” S” bullet is 700 yds., as against the Lee-Enfield’s 500. It was announced, in the House of Commons in 19 10 that a modified bullet was being experimented with, and that some increase in the fixed-sight range was expected to be obtained, but the relatively weak breech action of the Lee-Enfield — which is due chiefly to the rearward position of the locking lugs— does not allow designers much freedom in the matter, of increasing velocities, as the chamber pressure has to be kept low. It

will be seen from the table that other rifles are constructed to stand a much higher pressure.

But both these improvements are destined to be eclipsed in importance by the adoption of the automatic rifle. The application of the automatic principle to the modern high- velocity small-arm of precision has been occupying the attention of the small-arms experts of all armies and of numerous private inventors for some years past. These numerous attempts have, in the case of the rifle, been largely doomed to failure because of the necessary limitations of space and weight; although the automatic principle has been successfully applied both to machine guns (q.v.) and to pistols (q.v.). In these weapons the work of extracting the empty cartridge-case, re-loading and re-cocking, is accomplished either by the motive power of the recoil or of the gas generated by the explosion of the powder, thus enabling a rapid and continuous fire to be maintained to the full capacity of the weapon’s magazine. In the case of machine guns the firing also is automatic, but self- firing rifles are not very desirable as infantry weapons and in addition are so heavy as to approximate to machine guns.

Of the recoil-operated class of automatic rifles there are two subdivisions, ” short-recoil ” and ” long-recoil. ” In the former, which is most favoured by inventors, the barrel, body and bolt recoil together for a short distance, about i in., in which space the bolt is unlocked, and the bolt then recoils freely in the body. The bolt is run forward in reloading by a spring. In the long-recoil type the barrel, body and bolt recoil the whole distance, and the barrel and body are run up by one spring, the bolt by another. Several such rifles have been shown at the N.R.A. meetings at Bisley; the Rexer, Mauser and Woodgate rifles being on the long-recoil, the Halle on the short- recoil principle. Gas-operated rifles, like the Hotchkiss and Colt machine

guns, have fixed barrels and are worked, by a portion of the powder-gases which is allowed to escape from the barrel through a small hole near the muzzle, thence entering a cylinder and working a piston in connexion with the breech mechanism. No automatic rifle has as yet (August 10 10) been issued as a service weapon by any power, the problem of ensuring certainty in action under service conditions — i.e. with grit and dirt in the working parts — being the principal difficulty.

Great Britain. — There are two principal types of Lee-Metford and Lee-Enfield rifles in the service, the ” short ” and the ” charger-loading.” The former is carried by all units (cavalry included) of the regular army, by the yeomanry cavalry of the Territorial Force, and by units of the Officers’ Training Corps. The latter is used by the infantry of the Territorial Force. There exist, further, the older, non-charger-loading Lee-Metford and Lee-Enfield rifles, a few carbines of the same type, and some Martini-Metford and Martini-Enfield carbines which have the -303 barrel and cartridge with the falling-block Martini action. -45 Martini-Henry rifles and carbines, and even Sniders, are still used by local police forces in some of the smaller colonies.

The ” long ” charger-loading Lee-Enfield is converted from earlier patterns by the addition of a charger guide, the stripping of the bolt-cover, and improvements in the sighting. The action of the breech mechanism 1 is as follows (the breech mechanism of the ” short ” rifle being practically the same) : The breech is closed by a bolt (I) which slides in a bolt-way cut in the body, the bolt-head (Io) abuts against the base of the cartridge when the rifle is loaded, and when the knob is turned down the whole is locked. On the right side of the bolt is a solid rib, and on the left side a lug ; these support the bolt on firing by contact with the “resisting shoulder ‘ on the right, and the rear face of the ” lug seating ” on the left of the body. Underneath the bolt there are two recesses and two studs. The bolt-head is screwed to the bolt and is fitted with an extractor claw. The bolt-head, instead of being rigidly attached to the bolt, is so far independent that it remains stationary while the bolt is revolved. Inside the bolt is the arrangement of striker (V) and spring (W), and at its rear end, forming the working connexion between trigger and striker, is the ” cocking-piece ” (X) which is fitted with a safety-catch (not in the old pattern rifle illustrated). This cocking-piece (which cannot turn) has a long tongue projecting to the front, lying along the under side of the bolt, and the front end of this tongue (Y), called the ” full-bent”

1 The annexed figures show the old pattern weapon. In both the existing patterns a safety catch is fitted, the magazine spring is _of a

different shape and there is no bolt-cover. But the essential parts of the action remain the same.

engages the nose of the trigger sear when the weapon is loaded (a groove in the tongue, called the ” half-bent ” (Z), serves as a half- cock arrangement, and could be used as a safety -catch if the proper safety-catch were damaged). The trigger sear (K) is a bell-crank lever, the upper long arm of which is put in and out of contact with the ” full-bent,” and the lower or short arm is connected to the trigger. The magazine holds ten cartridges, which rest on a platform, underneath which is the magazine spring that pushes the platform and cartridges up. A “cut-off” is fitted in the ” long ” and in some marks of the ” short ” rifle. This is a sort of lid to the magazine, enabling the magazine to be kept full while the rifle is being used as a single loader. But the present musketry regula- tions forbid single-loading, and the cut-off is now only closed for special purposes, such as unloading a single cartridge (miss-fire, &c.) without unloading the magazine. The magazine is loaded by

Figs. 7 and 8. — Lee-Metford.

inserting a charger in the ” charger guides ” (these, attached to the body, form a sort of bridge over the bolt) and forcing down the strip of cartridges into the magazine (charger guides not shown in diagrams). The action of the mechanism is as follows: Suppose that the rifle has been fired and the magazine is full. On beginning to turn up the knob of the bolt, the Tatter is revolved, but the cocking-piece (the tongue being held by a groove in the body) and the bolt-head remain stationary. Soon, however, a cam on the bolt comes in contact with a stud on the cocking-piece and the latter is brought slightly to the rear, pulling in the point of the striker and partly compressing the spring. At the same time the lug on the left of the bolt, in contact with the front face of a recess in the body (both being cut slantwise to a screw pitch), forces the bolt and with it the claw of the extractor, which grips the base of the cartridge-case, to slide backwards a little. As the bolt con- tinues to turn the rib on the right of it conies up clear of the body and the whole bolt, with the bolt-head, can thus be drawn back until the bolt-head comes against the resisting shoulder on the

right of the body and the extractor attached to it flings out the fired cartridge-case. Another cartridge then Gome’s up from the magazine

and lies in front of the bolt-head ready to be pushed home. At this moment (the beginning of loading) the stud on the cocking- piece has fallen into one of the grooves on the bolt, and as the bolt is pushed forward the tongue or full-bent comes against the nose of the trigger sear and is held there, while the rest of the bolt mechanism goes on. Thus between the moving bolt and the fixed cocking-piece the striker spring is further compressed, and when the sloping faces of the bolt lugs and ribs engage the resisting portions of the body a last forward push is given to the bolt and the spring is completely compressed, ready to propel the striker forward when the full-bent is released from the nose of the sear. Figs. 5-8 of the older pattern rifle show the working of the breech mechanism. Instead of the older single pull-off of the trigger the “short” rifle, like many Continental weapons, has a double pull-off. This is provided for by suitably shaping the portion of the trigger which is in contact with the short arm of the sear. The ” short ” rifle has also a somewhat different pattern of safety-catch.

The sights of British service rifles up to 1903 were of a very simple type, the fore-sight a ” barleycorn ” of triangular shape, and the back-sight a plain leaf with slid- ing bar into which a V was cut, the tip of the fore-sight seen in the middle of the V being brought on to the mark. In the long charger-loader this form of back-sight has been greatly modified, and in the ” short ” rifle it has been alto- gether abolished. The barleycorn fore-sight has been replaced in both cases by an upright blade, protected from injury by two ears or wings, and the V by a U aperture. For elevation the long rifle has still a slide on a vertical leaf, but the movement of this slide is controlled no longer merely by its tight fit but by a clamping screw. The sightof the short rifle is larger and also quite different in appearance and principle. There is a leaf and on it a slide, but the slide (controlled by clamping studs) works on a cam-shaped bed ; its position on the leaf, affecting the point of contact with the cam- shaped bed, elevates the leaf to the required amount, the actual sighting U being on the extremity of the leaf. The short rifle has also a fine adjustment ” which admits of minor changes of eleva- tion within the usual 50 yds. graduation. Both the long and the short rifles have ” wind-gauges,” or mechanisms for fine lateral adjustment of the central U sighting aperture, so as to point the axis of the barrel a little to the left or the right of the line of sight to compensate for wind, error of the individual rifle, &c. In both rifles, on the left side of the stock, is a long-distance sight (graduated to 2800 yds.), which consists of an aperture sight near the bolt and a dial and movable pointer near the hand-guard. The short rifle is cased from breech to muzzle in a wooden hand-guard ; all patterns of long rifle have only a short wooden hand-guard just behind the back-sight

bed. The bayonet }n the long rifle is secured to. the fore-end by a spring catch and to the barrel by a ring passing over the muzzle. This traditional, and still usual, arrangement has been abandoned in the short rifle, as the vibration of the barrel on discharge is more or less checked by the extra weight of the bayonet, and therefore the shooting of the rifle differs according as it is fired with or without the bayonet fixed. With the short rifle the bayonet is fixed to two metal fastenings, a plug for the ring and a catch for the handle.

Continental European Rifles. — These are for the most part of ˆthe Mauser and the Mannlicher types. The Mauser is a bolt weapon with box magazine. The bolt is simple, without separate bolt- head, and is held by two bolt-lugs at its front end engaging with recesses in the body (the German Mauser has an extra lug near the rear end). Near the rear end there is a cam-shaped recess, which, engaging with a stud on the cocking-piece, partially forces back the cocking-piece and spring when the bolt is revolved. When the bolt lever is turned up and the bolt begins to revolve, the cocking- piece and bolt plug, which together form the connexion between the bolt and the trigger, do not revolve, but are forced back slightly, so as to begin the compression of the striker spring. Then, the bolt lever being so shaped as to bear against an inclined-plane edge on the body, the bolt ˆ comes back a little, and with it the extractor jaw and the empty cartridge-case. Lastly, when the bolt has turned through a right angle, all studs are opposite their slots and ways in the body, and the bolt can be drawn back. At the farthest rearward position of the bolt the cocking-stud on the cocking-piece is well behind the nose of the trigger sear, and is thus held when the bolt is pushed forward again, the spring being thereby compressed. All Mauser rifles have a safety-catch and a double pull-off. None have cut-offs except the Turkish pattern. All are constructed for clip or charger loading, but the box magazine contains only five cart- ridges as against the Lee ˆEnfield's ten. Mauser rifles, which are perhaps the strongest and least complicated of magazine arms, are used in the German, Belgian, Spanish, Portuguese and Turkish armies, and were also used by the Boers in the South African War. The type adopted by each of these nations differs from the rest in details only. The German rifle has a long guardless sword bayonet, fixed to the fore-end only and not connected with the barrel, and a peculiar form of back-sight, which bears some resemblance to the

slide and bed arrangement of the British " short " rifle. The special I to

the change of leverage, power at the commencement and rapidity feature ot the Belgian Mauser is a thin steel casing for the barrel, | at the end of the pull. The weapon is a clip loader. The Dutch,

Fig. 9. — Belgian Mauser. (Text Book of Small Arms, by permission.)

Fig. 90. — Spanish Mauser. (Text Book of Small Arms, by permission.)

which is supposed to act as a hand-guard or cooler and to free the barrel from disturbing influences due to its connexion with the fore-end ; but it is expensive, and if strong adds unduly to the weight

Fig, 10. — German Mauser, 1898. (Text Book of Small Arms, by permission.)

of the weapon. The older German magazine rifle, pattern 1888, had a barrel casing, but this was given up when the new 1898 pattern was introduced. The bayonets of the Belgian and Spanish patterns are very short knives.

The Mannlicher rifle, which is extensively used for sporting and target work, has been adopted for military purposes by various states, notably Austria-Hungary. Both the 1890 and

Fig. 13.— Mannlicher, 1895.

Rumanian and other Mannlichers have not straight-pull bolts, but the usual turn-over levers and locking-lugs.

‘f~T 1 1 “ˆflmdmˆfr

Fig. 14. — Austrian Mannlicher Carbine. (Text Book of Small Arms, by permission.)

France. — The breech mechanism of this rifle (see fig. 15) calls for no special remark. Its bolt is very similar to that of the British rifle. Its special peculiarity is the once popular tube magazine under the fore-end. This has many defects as compared with the box magazine. It is more cumbrous for the same number of cart- ridges; its feed and cut-off mechanism is very complicated; the balance of the rifle is altered as the magazine empties; the placing of the cartridges base to point, even when the bullet has a flat point, is not unattended with danger, especially when the magazine is full and the spiral spring strongly compressed; lastly, loading by any form of charger is practically impossible.

Fig. 15.— Lebel Rifle.

3P»to

Fig. 11. — Austrian Mannlicher, 1895. (Text Book of Small Arms, by permission.)

1895 patterns of Austrian . Mannlicher have ” straight-pull ” bolts; that is, bolts which are not turned for locking. The

Fig. 12. — Mannlicher, 1890.

bolts are in two parts, which ” telescope ” into each other. In the 1890 pattern (see fig. 12), when the bolt I is home against the cartridge and the ” lever cylinder ” I’, which carries the bolt knob, is further pushed forward, the hinged block R is caused to drop in front of the resistance-piece Q, and so locks the bolt I against the cartridge. In the 1895 pattern (see fig. 13), the final pushing forward of the lever cylinder causes the head of the bolt I to turn and projections on its head to lock into recesses SS just in rear of the breech. The turning is due to helical feathers (20) on the inside, of the lever cylinder I’ working in grooves in the rear of the bolt I. The 1890 pattern has a double pull-off. It will be seen from the figure that as the trigger is pulled the bearing is taken first at (8) and then at (9). This gives, owing

Fig.“i6.— Lebel Rifle.

United States. — Up to 1904 the U.S. army had the Krag-Jorgensen rifle, in which, as shown in fig. 17, the magazine was placed horizontally under the breech action. At this time most of the second line troops had still the old-fashioned (black powder) Springfield rifle, a single loader with a hinged block similar to the rifles of the “sixties” in Europe, such as the Snider, the Tabatiere and the Werndl. 1 Since 1904, however, the regular army has been re-armed with a short rifle (fig. 18) which in its action has a general resem- blance to a Mauser. As at first issued, the new Springfield had a rod bayonet which, when not in use, lay within the fore-end of the stock, and when required was run forward and fastened by a catch. This novelty was, however, soon discarded in favour of a sword bayonet 16 in long. The United States navy had until about 1900 the Lee ” straight-pull ” rifle. The Russian ” 3-line ” and the Japanese

1 The Springfield was, however, a much improved model of this kind of weapon, dating from 1884 only.

30th year (1900) and ” 38th year ” (1907) rifles are bolt-action weapons, with no special peculiarities. The Swiss rifle (Schmidt-Rubin) is a remarkable weapon of the straight-pull type, short, and possessing a relatively low velocity. (X.)

The Use of the Rifle in War. — The study of ” musketry ” as distinct from target shooting may .. be said to date from the Franco • German War. Previously mili- tary students and practical soldiers concerned themselves rather with the tactical question of fire-power— fire versus shock, Fig. 17. — Krag-Jorgensen. bullet versus bayonet and so on —

Fig. 18.— U.S. Short Rifle. {Text Book of Small Arms, by permission.)

than with the technical question of its application. This was natural enough in the days of short-range fighting. But when bullets began to cause losses at 1000 yds. and more from the firing point, formations that presented the least vulnerable target had to be discovered and tested, aiming grew more difficult as the range increased, and firing by word of command in large units became practically impos- sible. The very accuracy and range of modern weapons involved new problems. The necessity, in the larger area of effective fire, of setting the sights to the distance of the mark made further demands on fire-discipline and brought up the difficult problem of judging distance. The possibilities of varying the rate of fire conferred by the magazine rifle also demanded close study. Each- war, as it came, produced fresh evidence as to what was possible and what was not in matters of fire-control, the best rate of fire for effect, the range at which fire should be opened, and other half-tactical, half- technical problems. Thus, although many points still remain in the region of controversy, certain ideas and principles are almost universally accepted as the basis of service musketry.

The leading idea is that of the ” cone of dispersion.” A modern rifle, even fired from a fixed rest under good conditions, will not place shot after shot in the same spot, but the shot- marks on the target form a more or less close ” group.” When to this error of the rifle and the ammunition there is added the personal error of the marksman, the group is larger, and in the collective fire of a squad it is larger still. Now the trajectories of bullets that do not strike in the same place naturally do not coincide, and the group on the target is represented in the air by a cone or sheaf of trajectories. The bullets of this sheaf

striking the ground on either side of the target form on the ground a much elongated ellipse. The ellipse containing 90 % of the bullets fired is called the beaten zone. It is usual, however, to calculate from the ” effective ” zone, or that which contains 75% of bullets. Within the ” effective ” zone, and at its centre, is found the closely grouped ” nucleus ” of

50% of bullets. With the British -303 rifle in collective fire, the depths of these zones are : —

Nucleus.

Effective.

Beaten.

500 yds.

1000 ,,

I5°° ..

120 yds. 70 „ 60 „

220 yds. 120 „

100 ,,

320 yds. 170 „ r 40 ,,

The target aimed at and sighted for is at the centre of the zone (see fig. 19). The height of the grouping on a vertical target compared to the depth of the grouping on the ground is of course proportionate to the tangent of the angle of descent; hence, small as is the group on a vertical target at 500 yds., the beaten zone is no less than 320 yds. deep. For the same reason, as the range, and consequently the angle of descent, increases, the beaten zone diminishes in depth. Another factor is the ” dangerous space.” This is the space between ” first catch,” i.e. the point at which the bullet (in a sheaf, the lowest bullet) comes low enough to catch a man’s head, and ” first graze,” that at which it strikes the ground. The extent of this dangerous space varies of course with the height of the man’s head. In the case of a mounted man, at 1000 yds., it is 105 yds., while in that of a sharpshooter lying down, it is only 13 yds. (in addition of course to the beaten zone). As nowadays nearly all targets, on service, are lying or three- quarters concealed figures, the dangerous space as compared with the beaten

zone is at such a range too small to count as a factor. It is, however, important at shorter ranges, 500 yds. and under (700 and under with the new pointed bullets). Here the advantages of flat trajectory make themselves felt. Within this distance the bullet is at no point in its career too high to be dangerous to a standing man or a horseman. A lying figure is in danger at any distance beyond 350 yds. if the sights are set to 500 yds. (front half of effective zone no yds., dangerous space 52 yds.). This is the theory under- lying the 500 yds. ” fixed sight ” or ” battle-sight,” a setting which holds good for all less ranges, and can be put on the rifle instantly and without looking at the back-sight graduations.

,300 ■

Oangeroui ‘ Sfiace *” –

. 1- – - Nucleus – - . er j.,

Effective e 2° >

Beaten-‘ — — _.

Range SOO

Rang* JQQ9

Fig. 19. — Beaten Zone.

-Nuclewl – -Effective – ” J Beaten – «-4

Sights BOO yards.

Trajectories of Martini Henry.Lee- Enfieid.and Mauser ‘98 with”S”bnlle4 (Rifie J above ground}

ˆ3-Heights exaggerated 30 ao ° times

Fig. 20. — Trajectories.

These facts, taken in conjunction with the imperfections of the most skilful individual marksmanship and the chances of wrong estimation of distance, are the basis of the musketry training and practice of to-day. At the School of Musketry, Hythe, the standard of judging distance is ” not more than

RIFLE

DETAILS OF MODERN (From the British official

AUSTRIA

AND

BULGARIA.

BELGIUM.

DENMARK.

GREAT BRITAIN.

FRANCE.

GERMANY.

Pattern of the Year .

1895.

1889.

1889.

1907.

1907.

1886.

1898.

Designation ….

Mannlicher.

Mauser.

Krac- Jorgensen.

Charger

Loading

Lee-Enfield,

Mark I.

Short

Lee-Enfield,

Mark III.

Lebel.

Mauser.

Magazine System . .

Box

Box

Horizontal-box

Box

Box

Tube

Box

Number of Cartridges in Magazine

5

5

5

10

10

8

5

Charger or Clip .

Cut off …..

Clip No Yes

Ch. No Yes

Ch. Yes No

Ch. Yes Yes

Ch. Yes Yes

No Yes No

Ch.

No Yes

Weight:— Without bayonet . With bayonet . . .

Length: — Without bayonet . With bayonet ….

Barrel- Length . . . { m “; Calibre . . . . in.

Rifling:—

Number of grooves Twist (to right, except in Lee-i Enfield and Lebel) l turn in > calibres . . . -J

Sights:— Lowest for ….

Highest for ….

Cartridge: — Length . . . .in. Weight …. grs.

Bullet:— Shape of point

Material of envelope

Lengtk . . . .in.

Diameter (max.)

Weight . . . . .grs.

Charge:—

Weight . . . ; . grs.

Muzzle Velocity . . . f.s.

Chamber Pressure: — Tons on sq. in.

8 lb sh oz. 8 ft 152 oz.

4 ft. 2 in. 4 ft. u-5 in.

30-12 8

•315

4 31

500 paces (410 yds.) 2600 paces (2132 yds.)

3-o

455

Round

Steel, lubricated

1-24

■3228

244

•42-44

N-C.

2034

197

8 lb i oz.

9 ft 9i oz.

4 ft. 2-25 in. 4 ft. 11-75 in.

30-67 7-65

•301

4 32-5

500 m. (547 yds.)

2000 m. (2187 yds.) •

3-°55

441

Round C.N.

1-205

•31

219

N.G. and N.C.

2034

19-7

9 lb n2 oz.

10 ft 4I oz.

4 ft. 4-75 in. 5 ft. 3 in.

32-9 8

•315

6

37-5

300 m.

(328 yds.)

1900 m.

. (2078 yds.)

30

460

Round

C.N.

1-187

•323

237

33-95

N.C.

1968 15*

9 ft 4 oz. 8 lb 25 oz. 10 ft 3$ oz. 9ft 10J oz.

4 ft. i-5 in. 3 ft. 8-5 in.

5 ft. 1-5 in. 5 ft. 1-7 in.

3019 25-19 7-7 7-7

•303 -303

5 5 33

183 m. (200 yds.)

2560 m. (2800 yds.)

305

415

Round C.N.

1-25

■J«

215

31-5

Cordite

2060 15-5

9 ft 3

10 lb

4 ft.

5 ft. 1

3f.

8

4 3

250

(273

200c

(2187

3-

447

Round C.N.

1*221

•3 2 28

231

42-43

N.C.

2073

17-75

£ oz. 1} oz.

j-12 in. 1-84 in.

uj6 SIS

m.

yds.)

m.

yds.)

)S

4IS

Pointed

(Copper zinc, I no envelope

1625

•327

198

46-2

N.C.

2380 17-75

9 lb. 9 lb 14 oz.

4 ft. 1-4 in.

5 ft. 9-75 in.

2905 79

•3«

4 30-2

200 m.

(219 yds.)

2000 m.

(2187 yds.)

322 3-18 431 3699

Round Pointed

Steel, coated Steel, coated) with C.N. with C.N. J

1235 1105

•3189 -323

227 1545

40-75 48-4

N.C. N.C.

2093 2882 21 17-5

100 yds. wrong at any range." Now at 1000 yds. an error in judging distance of 13 yds. above or below the true range will cause all the shots of a particular rifle to fall away from the target, and the better the marksman — i.e. the closer his group— the more necessary is perfection in judging distance, a perfection which in reality seems unattainable. The British musketry regulations therefore lay it down that the individual marksman's fire at service targets is unprofitable at ranges of more than 600 yds. Beyond that distance collective fire, controlled and directed by an officer or non-commissioned officer, is the rule. The question as to whether fire is to be opened in any given set of circumstances is decided by the fire- director, who considers first whether the probable error in judging distance is greater than half of the effective zone for the estimated range. If it is so, he must order " com- bined sights," i.e. half of the units under his command use one elevation, the rest another, which method artificially increases the dispersion of the bullets and thereby the probability of the target being included in the zone. This, however, makes the fire less effective, and in practice cannot profitably be used by any body of rifles of less than 80 or 100. The commander of only a single section, therefore, however tempting the target, must refrain from opening fire

at all. At medium ranges, however, controlled and directed fire is effective, and at such ranges troops should still be sufficiently in

Note. — C.N. = Cupro-nickel. N.G. = Nitro-glycerine.

hand to execute the fire-director's orders. Within decisive ranges fire-direction has to give place to fire-control. All that the strongest commander can enforce is the opening and ceasing of fire when he gives the order, and success is sought through making the individual soldier skilful at rapid and snap shooting. Black bull's-eyes on white targets are now used only to teach men to make uniformly good shooting, which is shown by the closeness of the shot-grouping. The rest of the musketry course is fired against grey-green " head and shoulders " targets or brown silhouettes, and consists of slow, rapid and snap shooting, from behind cover, at disappearing or running targets, &c. In 1900 special attention began to be paid to visual training, both as an aid to judging distance and as an actual ingredient of fire-discipline. A method of indicating targets which origin- ated in the French army was adopted and improved upon, consisting essentially of giving two or three conspicuous " auxiliary marks," in artillery language, and naming the target with reference to them. Judging distance is generally associ- ated with fire-discipline practices, and men are frequently exercised in locating and ranging upon a hidden skirmisher, 300-800 yds. away. Perhaps the most important modifica- tion of musketry training, within recent years, has been the adoption of rapid fire in " bursts," as the normal procedure for infantry, instead of slow continuous fire. The complete cessation of fire at intervals enables the leaders to observe the

MILITARY MAGAZINE RIFLES. Text Book of Small Arms, 1909.)

GREECE.

HOLLAND.

ITALY.

JAPAN. '

PORTUGAL.

RUMANIA.

RUSSIA. !

SPAIN.

SWITZER- LAND.

TURKEY.

UNITED STATES. .

1903.

1895.

1891.

1907.

1904.

1893.

1894.

1896.

igoo.

1893.

1904.

Ma’nnlicher- schonauer.

Mannlicher.

Mannlicher- Carcano.

Year ‘38.

Mauser- Verguiero.

Mannlicher.

” 3-Line” Nagant.

Mauser.,

Schmidt-Rubin Short Rifle.

Mauser.

Short Springfield.

Box

Box

• Bo*

Box

Box

Box

Box

Box

Box

Box

Box

s

5

6

5

5

5

s

5

6

5

5 .

Ch.

No Yes

Clip No Yes

Clip No Yes

Ch. No Yes

Ch. No Yes

Clip No

Yes ” ‘

Ch. No Yes

Ch.

■ No Yes

Ch. No

Yes

Ch.

Yes Yes

Ch. Yes- Yes

8 lb S/4 oz. 9 lb

, 4 ft. : 4 ft. 10 in.

2856 6-5

■256

4

200 m. ■ (219 yds.) 2000 m. (2187 yds.)

3-o5

348

Round

(Steel, coated } with C.N.

1-124

•263

159-3

36

N.C.

2223

so- 1 8

9 lb II oz. 10 lb 6)4 oz.

4 ft. 3 in. 5 ft. 0-75 in.

31-125 6-5

•256

■■■■*

30.4

200 m.

(219 yds.)

2000 m.

(2187 yds.)

. 3’OS

338

Round

Steel, coated 1 with C.N. J

1-2.3

•2637

162-

36-26

N.C.

2433

8 lb 6K oz. 9 lb 3 oz.

4 ft. 2-75 in.

5 ft. 2375 ‘n.

3°-75

6-5

■2 S 6

4 32-2

600 m.

(656 yds.)

2000 m.

(2187 yds.)

30 331-8

Round

C.N.

1-182

•266

1630

30-09

Balistite

2395 171

8 lb 10 oz. 9 lb 9 oz.

4 ft. 275 in.

5 ft. 575 in.

31-3 6-5

•256

4 30-7

400 m.

(437 yds.)

2000 m.

(2187 yds.)

2-98 348-5

Round

Copper

1-28

■26 ■

162-9

32-0

N.C.

2396

8 lb. 13 oz.

9 lb. g>ii oz.

4 ft.' . . 4 ft. nji in.

29-08

6-s •256

4 30-76 .

200 m. (219 yds.)

2000 m. C2187 yds.)

3-26

Round

155-3

31-8

N.G. and N.C.

2347

8 lb 12)4 oz. 9 lb gj4 oz.

4 ft. 0-5 in. 4 ft. 10-25 ‘n.

28-56 , 6-5

•256

:4 30-8

500 m.

(547 yds.)

2000 m.

(2187 yds.)

305

35o

Round

C.N.

1-244

•2637

162

36

N.C.

2400

8 lb i5 > < oz.

9 lb 11ˆ4 02 –

4 ft.’ 3-875 in. 5 ft. 9 in. .

3i-S

7-62

•’■’*■

4 31-6

400 paces (310 yds.)

2706 paces.

(2096 yds.)

3025 363

Round’

, . : aN -‘ V

1-194

•308

2.14

33

< , Pyroxiline

1985 ‘7-47

9 lb 6K oz.

10 lb” 5ˆ oz.

4 ft. 0-625 in. 4 ft. 105. in.

29:03;

7′ ‘- -.276

4- : 31-4′

400 m.

‘ (437 yds.)

2000 m, (2187 yds.)

3-o8. ..

373-5

Round

|” C.N.

1

I-2I

:2843 172-8

38-35

N.C.

2296

22-3

8 lb X oz. 8 lb 10ˆ4 bz.

3 ft. 7*12 in. 4 ft 10-75 in.

23-33 7-5

•295

3′

‘36

300 m. (328 yds.)

1200 m.’: (13.12 yds.)

3-043 424

Round

f Nickel plated, < steel envelope (over point

1-18

•319

212-5

3o- 7 : N.C

1920 17-1

, 9 lb I oz. 10 lb 8 oz.

4 ft. o-6 in.

5 ft. 6-6 in.

29-134 7-65

. -30I

4

33-2

.250 m. (273 yds.) 12000 m. : (2187 yds.)

307 416

Round

(Steel, coated I with C.N:

1-212

•311

211-3

40-2

N.C.

2066 19-7

8 lb 8 oz.

9 lb 8 oz.

3 ft. 7-2I- in. 4 ft. 11-21 in.

.23-79

7-62

•30

4

183 m.

(200 yds.)

2.187 m-

(2850 yds.)

3 33 392

Pointed

C.;N. pointed

1-08

•308

150

50

Pyro-cellulose

2600 19-78

N.C. = Nitrb-cellulose.

progress of the engagement, to change their target, to economize ammunition, to select the ground for the next rush and the next burst of fire, and to regain control of the men, whom a prolonged fire-fight hypnotizes and rivets to the ground, The chief use of ” slow ” fire, which is generally employed by skir- mishers working in pairs, is to keep the enemy under; the storm of well-directed ” rapid fire ” the fire-director should hold in his own hands, ready to release it at the right moment. Slow fire averages 3 rounds a minute, rapid (aimed) 8-12. The con- figuration of the ground has often a great influence on fire effect. If the target is on a sharp forward slope, the beaten zone is greatly diminished in depth, ranging errors are no longer neutra- lized by the flatness of trajectory and (the bullets meeting the ground at a steeper angle) the dangerous space is reduced; if, on the other hand, the slope descends gently in rear of the target so that the falling bullets instead of making a pattern upon the ground, skim along parallel to the surface, the zone is increased. For instance, at 1500 yds., if there is a reverse slope of about 5° in rear of the target the depth of the beaten zone is tenfold that of the zone for the same range on level ground. Similarly if the target is on the crest of a hill and the firers below, the ” over ” half of the cone of fire may graze the reverse slope or pass far above, according as the re- verse slope is gentle or sharp with respect to the line of sight. The normal position for the firing infantryman in action is

lying; the kneeling position is used for firing from behind cover, the sitting for firing down hill. Standing, formerly the usual position, is now employed chiefly for firing behind cover with the rifle rested, and for snap-shooting during an advance when it is undesirable to halt and lie down. As regards cover, it may be mentioned that well-covered or intrenched troops generally shoot less accurately than troops in the open, the soldier in security being loth to expose himself long enough to take careful aim. This was particularly noticeable in the Russoˆ Tufkish War, and its effect is to create a zone of unaimed fire behind the assailants’ fighting line, which sometimes causes serious losses to his supports and reserves. The relation between the cone of dispersion of peace-time experiments, even when these are specially designed to establish that relation (for example, series fired in France by third-class shots, after a long march without food), has never been satisfactorily estab- lished. An arbitrary figure of one-tenth or one-

twentieth of peace-time effect has generally been assumed as representing war results, but some think that however the normal cone may be multiplied or divided, no relation can be found between peace and war effect, and that in battle the brave men aim and fire as if on the practice range, and the rest fire absolutely at hazard. From a musketry point of view, this brings again into the fore- ground the question of distance-judging, as, if the sights be wrongly set, the more accurate the fire the less its effect) and a

mistake would nullify even the small amount of aimed fire that can be reckoned upon. Peace-time experiments have their value — and it is very great — in establishing data as to the effect of fire on troops in different formations, the limits of permissible error in ranging, &c, on the principle that of two methods, that which is proved to be better in peace would in much the same proportion be found better in war. (C. F. A.)

See T. F. Freraantle, The Book of the Rifle; W. W. Greener, The Gun and its Development; the British official Text Book of Small Arms (1909); and Musketry Regulations (1909); C. B. Mayne, Infantry Fire Tactics; and Taffin, ” Tir de Combat ” (Revue d’infanterie, 1909).

Match or Target Rifle. — The sport or pastime of target shooting has many times changed its character, owing to the steady improvement in the rifle and the different ranges or distances at which shooting is practised. Range usually governs the construction of the target rifle, long-range rifles not being necessarily the best weapons for a short range of, say, 200 yds. Limitations — such as the amount of powder charge, weight of bullet and rifle — are also usually imposed in order to place all competitors on equal terms. The long-range match rifle is not the superior of the military rifle as a weapon, but as a scientific shooting instrument is the best small-arm produced. The ordinary target rifle is a hybrid arm, combining the points of the long-range match, modern military and best sporting rifles. The miniature match rifle is used for short-range practice.

Shooting at fixed marks has been practised continuously in Switzerland from medieval times. A club (” Societe de l’harquebuse et de la Navigation “) has existed in Geneva since 1474; and the Zurich ” Schiitzen-Gesellschaft ” since about the same date. It is not clear at what period rifles were introduced in these clubs. From the beginning

of the 19th century up to 1844 the rifle generally used in Great Britain had a poly grooved barrel -630 in. in diameter, with spherical ball, and the arm weighed from n to 15 lb. It was not fired in military fashion, but had a handle extending downwards fixed in front of the trigger-guard, which was grasped by the left hand, the left arm being steadied against the body. This method of shooting is still sometimes followed by Swiss and German riflemen. Target shooting as a sport or business was rarely practised in Great Britain until after the formation of the Volunteer Force in 1859. The inauguration of the ” National Rifle Association ” in i860 opened a new and most important era in the history and develop- ment of the rifle. This institution was established ” for the en- couragement of rifle corps and the promotion of rifle shooting throughout Great Britain. ... As a national pastime to make the rifle what the bow was in the days of the Plantagenets, the familiar weapon of those who stand forth in the defence of their country.” The first meeting of the N.R.A. was held at Wimbledon in i860. The first shot was fired by Queen Victoria 1 from a Whit worth rifle on a machine rest, at 400 yds., and struck the bull’s-eye. The Whitworth muzzle-loading rifle won many of the important prizes at this and subsequent meetings prior to 187 1. Its most important features, arrived at after exhaustive experiments, were a smaller bore of -450 in., with a twist of rifling of one turn in 20 in., and an elongated mechanically fitting projectile. Long-range rifle construction is also largely indebted to Whitworth for the highly accurate and superior tools and processes introduced by him in this branch of manu- facture.

In 1866 and after, Metford’s system of hardened expanding bullets and shallow rifling gradually superseded the mechanically fitting system of Whitworth, and the Whitworth rifle gradually lost its position. In 1861, the Henry grooving for a cylindrical

1 The ” Queen’s ” or ” King’s ” prize is the highest distinction to which a rifle shot can attain. The competition is one of three stages, the first and second eliminating all but the best 100 com- petitors. The bronze medal of the N.R.A. is awarded to the highest scorer in the first stage, the silver medal to the leader in the second, and the King’s prize and N.R.A. gold medal to the winner in the last stage: 71 shots in all are fired at distances up to 1000 yds., and the winners’ scores of late years have been 320 to 325 out of a possible 355. Only the service rifle is allowed.

bullet, a modification of the Whitworth, first appeared. In 1864, Rigby, with a five-grooved rifle and a mechanically fitting bullet, tied with the Whitworth rifle in the preliminary rifle trial of the N.R.A. at

1000 yds., and in a subsequent trial took the first place. By 1871 the Whitworth rifle had given place to the Metford system with hardened cylindrical bullets, shallow rifling and increasing spiral. In 1867 the modern breech- loading rifle with a metallic cartridge was first introduced. The Metford system of rifling greatly assisted its development. In this year Rigby also produced a new model long-range rifle designed on the lines followed by Metford. In 1869 the Henry barrel came to the front. In 1870 the Martini-Henry, the new service arm, won the duke of Cambridge's prize, the extreme range in this competition being 800 yds. In 187 1 the Snider breech-loader replaced the Enfield muzzle-loader, and the Martini-Henry replaced the Whitworth in the later stages — 800, 900 and 1000 yds. — of the Queen's prize. The Metford barrel was also used in breech-loaders, and the duke of Cambridge's prize — for the first time fired at 1000 yds. — fell to it. During the twenty-three years from 1871 to 1894 the Metford military match rifle only four times failed to win this prize, while it took a preponderating share of other prizes. The years 1872 and 1873 marked a decided advance in the military breech- loader, though for fine shooting the muzzle-loader still seemed hard to equal. In 1875 a team of American riflemen first visited Wimbledon with " army-pattern " breech-loading rifles, which were .cleaned out after every shot, and met with considerable success. A feature of their shooting was the " back position," then a novelty. In 1877 the superiority of the cleansable and cleansed breech-loader over the increased fouling of the muzzle- loader was clearly demonstrated, though the muzzle-loader did not at once disappear. In 1878 the highest scores ever made with the muzzle-loader in Great Britain were recorded, greater care in cleaning the rifle after every shot being observed.

In 1883 the N.R.A. Council altered the conditions, wiping out after every shot was forbidden, but muzzle-loaders were not disqualified. The result was that the American type of rifle disappeared. The poor shooting of the Martini at 1000 yds. induced the Council to take the retrograde step of reducing the maximum range for the Queen's prize to 900 yds. In 1890 the N.R.A. first met at the new ranges at Bisley. This year was noticeable for the excellent shooting made in the " any " rifle competitions by the Gibbs-Metford match rifle, particularly at 1000 yds. range. The accepted type was -461 calibre; 7 grooves •0045 in. in depth; 80 grains of special black gunpowder, and a bullet of 570 grains. In 1892 and 1893 the Lee-Metford -303 rifle with cordite ammunition was first used by the army teams. In 1890 and later the Hon. T. F. Fremantle, Captain Gibbs and some others used Metford's copper-coated bullets in the Gibbs- Metford rifle with success. In 1895

many match rifle shots followed their example. In 1895 and 1896 the -303 was equalled, and in some instances beaten, by the smaller-calibre Mannlicher rifle. This was partly due to faulty Lee-Metford ammunition. The -303 now proved its superiority to the 450 Martini, especi ally at the longer ranges. The Bisley meeting of 1896 practically closed the series of contests with both the Martini and the military match rifles. The Volunteers were thenceforth armed with the -303.

The results of the Bisley meetings since 1895 have proved that rifles of the -303 class, the British -303 rifle particularly, are not so good for match rifles pure and simple as the larger bores using black powder. The light bullets are more subject to deflection by the wind at long ranges than the heavier speed-retaining bullets of the larger bores. No nitro-powder used appears to have equalled the black powder in regularity of shooting. At the same time the object of the N.R.A. competitions is to encourage the use of the military service rifle in the first place, and in the case of the ” any ” rifle competitions to encourage the production of weapons of the highest efficiency for military purposes. Acting on these principles the rifles allowed by the N.R.A. regulations (1907) are classed as follows: — Class I. — ■ Service rifle (S.R.): government pattern -303 magazine rifles;

sights strictly in accordance with service pattern. 1 Class II. — Match rifles (M.R.) : any breech-loading rifle complying with the following conditions: maximum weight of barrel, 3J lb; maximum calibre, 325; stock sufficiently strong for service purposes, and without pad or shoe on the heelplate; minimum pull of trigger, 4 lb; sights, of any description. Class III. — Military breech loading rifles (M.B.L.) ; any rifle, that is either (a) the regulation military rifle of any country; or (b) a breech-loading rifle comply- ing with the following conditions: maximum weight, exclusive of bayonet, 8$ lb; maximum calibre, 315; minimum pull of trigger, 4 ft). Sights may be of any description except telescopic or magnifying, but must be fixed to the barrel and must be strong enough for military purposes. Class I V.— Sporting rifles: calibre, any; minimum pull of trigger, 3 lb; sights, open or such as are sanctioned by the council or committee. The Lyman back sight and the Beech combination fore-sight have been sanctioned. No lateral adjustment of fore- or back-sight is permitted. The miniature rifles allowed fall into two classes, ” military,” with open sights, only, and ” any,” with no restrictions as to sights except that magnifying and telescopic sights are forbidden.

Modern American Target Rifles. — In America, according to some authorities, there are three recognized departments of target shooting — namely off-hand shooting; shooting from a simple rest; and shooting from a machine rest, with telescopic or any other sight. For the first two classes small-bore rifles of 380 calibre or under only are used. The usual weight is from 8 to 10 lb, with 28 or 30-in. barrel. Light charges for the shorter ranges are used. In the -380 bore only 55 grains of powder with a 330-grain bullet is employed. In the second-class contests, from a simple rest, the barrel is longer and the weight increased to just under 12 lb. The bore is generally -380. The usual range is 200 yds. The third-class shooting from a machine rest, generally with telescopic sights, is not much practised. Every kind of rifle is employed, usually of large bore and weighing from 20 to 60 ft). The long-range breech-loading match rifle, with which so much fine shooting was done when wiping out after each shot was allowed, weighed about 10 ft); the breech mechanism, any falling block, as the Sharp, Farquhar- son, Deeley, and Edge or Wiley, that admitted the insertion of the cleaning rod at the breech; length of barrel, 32 to 34 in.; seven or more grooves -003 to 005 in depth with a complete turn in 20 in. A sharp continual spiral and very shallow grooves constituted the feature of the American plan. Rigby's plan was similar, with one turn in 18 in. and eight grooves, the lands being about half the width of the grooves. In the Wiley the grooves were fewer and wider. The Metford is an increasing twist, starting with one turn in 60 in. and finishing with one in 20, or sharper. The usual bore of the American long range rifle was -458 or 461; powder, 76 grains of special " foul ing " rifle powder; elongated cylindrical bullet of 540 grains. The pull-off was under 3 lb. During recent years smaller-bore smokeless-powder rifles have also been used.

Continental Match Rifles. — The target rifle used by continental marksmen for medium ranges is a modification of the old pattern Swiss rifle, with scroll guard, hollowed butt plate and hair trigger. This latter, a mechanical device to free the tumbler from the sear without sufficient pull on the trigger to influence the aim, is disallowed in military arms.

Sporting Rifles.— Prior to 1845 smooth-bore guns with double charge of powder and an ounce spherical ball were generally preferred to rifles for sporting purposes and for large game; 16 -bore muzzle-loading rifles were occasionally used by British sportsmen in the East Indies before that date, firing ij drs. of powder with a spherical ounce ball. These rifles were sighted to 200 yds., but the trajectory was high and the penetration weak; they were also difficult to load when foul. The twist of the rifling was also too rapid, causing the bullet to strip

with heavy charges of powder. According to Captain Forsyth and others, up to i860 there was no known rifle suitable

1 The N.R.A. have recently sanctioned the use of the aperture sight in service rifles, provided it be attached to the weapon by the hinge-pin which fastens the ordinary folding leaf.

for sporting purposes in India. Rifles of 12-bore gauge, firing a spherical ball, were subsequently made, with broad and shallow grooves making one turn in 10 ft. The bullet, of the same diameter as the bore, was loaded with a thin patch that took the grooving. These rifles proved very successful, possessing velocity equal to a smooth-bore of the same calibre, accuracy for sporting distances, flat trajectory and great striking power. In 1855 W. Greener produced the ” Cape rifle ” for South African sport, calibre -450 or -500; rifling, two deep grooves with one turn in 26 in., with a flanged bullet to fit the grooves; weight, 12 lb; sighted up to 1200 yds. This rifle was successful, and others were built by Purdey, who in 1856 named the pattern ” Express Train.” Since that date the word ” express ” has been generally used to denote a rifle possessing high velocity, flat trajectory and long fixed-sight range. 2 In America small-bore rifles were used earlier in the 19th century. The celebrated Kentucky rifles were of various sizes, firing spherical balls of 90, 60 and 40 to the lb, and were renowned for their accuracy and fixed-sight range up to 100 yds. Some maintain that the express rifle was developed from the Kentucky model. The modern express rifle may be defined as a breech-loading rifle with a height of trajectory not exceeding 45 in. at 150 yds., with a muzzle velocity of at least 1750 f.s. These rifles are usually 5- to 7-grooved, double-barrelled, with 26- to 28-in. barrels of -360, -400, -450, •500 and 577 bores, weighing respectively from 6| to 7 ft), 7 to 8 lb, 7i to 9 lb, 8| to 10 lb and 10J to 12 lb. The re spective average charges are: bullet, 150 grains; powder. 50 grains; 209 and 82; 270 and no; 340 and 130; 520 and 160; the fixed-sight ranges, 130, 160, 150, 130 and 120 yds. Double and single express rifles of -303 bore with 26-in. barrels are also made.

Since the invention of cordite powder and the advent of the small-bore high-velocity rifle for military purposes, the variety of sporting rifles with different-sized bores has increased. Sporting cordite express rifles are now made, both single- and double-barrelled, of the following calibres: -256, -265, -276, •3°3, -31°, -360, -370, -375, -400, -450, -500, -577 and -6oo. Some of these calibres, such as -500, -577 and -6oo, are seldom used with cordite. The 450 cordite express is the largest bore high velocity rifle recommended.

The modern small-bore military rifle already described possesses all the best qualities of an express sporting rifle — namely accuracy, flat trajectory, high muzzle velocity and long point-blank or fixed-sight range up to 200 yds. The muzzle velocity of the -303 bore with black powder is 1850 f.s.; with cordite, 2100 f.s. The hollow-pointed or slit expanding bullet is generally used in these high- velocity rifles, as in the black- powder express, for ordinary sporting purposes, with the solid metal cartridge-case. The pointed bullet is also sometimes used, generally with the -375 and -475 calibre rifles, and gives an increased muzzle velocity of 2500 f.s. The trajectory of the cordite rifle is stated to be 10 in. flatter at 200 yds. than that of a black-powder rifle of similar calibre and corresponding charge. The variety of bores in sporting rifles is due largely to restrictions on the importation of arms of the military calibres (especially •303) into India and South Africa.

The sights of sporting express rifles are of some variety, and are usually designed and made with special care. The open V

2 The term ” point-blank range ” is often used in this connexion. Strictly speaking, there is no such thing as ” point-blank range,” the bullet commencing to drop immediately it leaves the muzzle of the rifle. The path or trajectory of the bullet if fired horizontally is therefore always a downward curve. The higher the muzzle velocity the flatter is this curve. The ” fixed-sight,” or so-called ” point-blank ” range, is usually taken at such range, generally 100 yds. with black powder, and with such elevation as render the amount of drop of the bullet or curve of its path practically imma- terial for sporting purposes, say a maximum of 43 in. At shorter range this curve would therefore take the bullet so much above the line of fixed-sight aim, and must where necessary be allowed for. With the high-velocity small-bore rifle the fixed-sight range can be increased to 200 yds. for the sporting rifle ; and for military purposes in the field to 500 yds. and (with pointed bullets) even more.

back-sight on an ivory pyramid with twoor three leaves up to 300 yds., and the enamelled bead fore-sighty are the most usual form. The more elaborate Lyman and Beech peep-sights are also popular. One or two varieties of telescope sight, attachable to the barrel, are also made by some leading gunmakers, and have been used with success in the field. Solid-drawn brass cartridge-cases are now always used for sporting rifles, except occasionally for some of the larger bores, in

which paper car- tridges may be used. The peculiarity of the express bullet is its hollow point, which is intended to ensure the expansion of the projectile on impact. This diminishes its penetration, but translates its velocity or energy into “shock.” • If greater penetration is needed, the leaden bullet is hardened with mercury or tin, or the military nickel-coated bullet is used. Explosive bullets filled with detonating powder were at one time used in express and large-bore rifles for large game. These are now practically abandoned, owing to their uncertainty of action and the danger in handling them. The use of the large 4- and 8-bore black-powder rifles is restricted to the hunting of large and dangerous game. These are usually double-barrelled. The 4ˆbore weighs from 14 to 18 lb with 20-in. barrels, and fires a charge of 12 to 14 drs. of powder, with a spherical bullet of 1510 grs. The great weight of this rifle is against its general use. The 8-bore rifle weighs from n| to 15 lb with 20- to 24-in. barrels, with a charge of 8 to 12 drs. of powder with a spherical ball. These rifles are accurate and effective up to 120 yds. Rook and rabbit rifles are usually single-barrel breech-loading rifles of from -220 to -380 bore, hammerless, ejectors. The range is ordinarily restricted to 200 yds.

Combined rifles and shot-guns are generally used in countries where the kind of game to be met with is not known beforehand, and by emigrants who can only afford one gun. These weapons are double-barrelled (-450 rifle barrel and 16-bore short barrel; or -500 rifle and 12-bore shot). Such a gun has many drawbacks, being too heavy for a shot-gun and too light for a rifle, with a bad balance. More modern combinations of the rifle and shot-gun are Holland’s ..” Paradox,” a smooth bore with the last three inches of the barrel ratchet-rifled, Lancaster’s ” Colindian ” twisted oval bore, and Bland’s ” Euoplia ” with “invisible”; undulating rifling. AH these weapons fire heavy bullets more or less accurately up to 100 yds., are also used as shot-guns, and are made double- or single-barrelled and of various calibres, 1 2-bore being the most common. There is also Greener’s “under, and over,” the rifle barrel being topmost (usually 16-bore shot-gun barrel and -450 rifle barrel). The Morris tube also enables a shot-gun to be utilized as a small-bore rifle or a large rifle as a saloon rifle for gallery practice. The automatic principle has not yet been applied to sporting rifles.

Miniature. Rifles. — In 1905 a War Office miniature or cadet rifle for instruction purposes was officially adopted by the British military authorities. The details of this rifle were determined by a committee, upon which the National Rifle Association and the Society of Miniature Rifle Clubs were represented. It is a single-loading bolt-action rifle of -22 calibre with military sights (the aperture sight being

barred), shooting a rim-fire cartridge having a 40-gr. bullet propelled by 5 grs. of black gunpowder or its equivalent in some smokeless explosive. It is used at ranges from, 25 yds. up to a maximum of 200 yds. The official adoption of such a rifle was largely due to the civilian rifle club movement, which was the outcome of the South African War, and in which the Society of Miniature Rifle Clubs has played an important part. Until the recent official adoption of the miniature rifle, the council of the N.R.A. regarded marksmanship with the service rifle as its main object of en- couragement, and the service rifle itself as the orthodox weapon. The Society of Miniature Rifle Clubs, on the other hand, makes the encouragement of the use of low-power rifles its special object, with few restrictions as to type of sights, rifle or ammuni- tion. Numerous civilian rifle clubs have adopted the -22 calibre rifle, in many cases with aperture sights, with marked success, and British rifle-makers, were encouraged to cater for this new

demand for low-power rifles. Such weapons can be far more widely and generally used than the ordinary service weapon, owing to their smaller cost, cheaper ammunition, absence of recoil, and their convenience for use at short covered ranges in crowded centres of population. In many parts of Great Britain there is practically no alternative between low-power short-range practice and no shooting at all. The N.R.A. has now admitted the miniature -22 calibre rifle upon equal terms with the service. rifle. The miniature rifle has, to some extent, taken the place of the Morris tube and ” adaptors ” previously used for rifle practice at short ranges. 1 The Morris tube consists of a small-rifled barrel, usually chambered for the 297/230-bore cartridge, and capable of being fitted inside the barrel of the ordinary service weapon, which thus becomes available as a miniature rifle for short-range practice. The Morris tube has been adopted by the British War Office, and affords an excellent means of training the recruit. ” Adaptors ” are dummy cartridge-cases fitted into the breech of the ordinary rifle, by means of which a shorter cartridge firing a lighter charge of powder, but with a bullet of the same calibre as the rifle, can be used for short-range practice. One of the first English miniature target rifles was the ” Sharpshooters’ Club ” rifle, on the Martini principle, of -310 calibre, manufactured and introduced by W. W. Greener, and suitable for ranges from 50 to 300 yds. This rifle was adopted by many rifle clubs, and in 1901 established a record in the miniature rifle competition at Bisley. Miniature rifle shooting has been much encouraged throughout the United Kingdom by the establishment of the Light Rifle Championship competition under the auspices of the Society of Miniature Rifle Clubs. In 1907 Queen Alexandra presented a cup for this event. ,, (H. S-K.)

RIFLEMAN-BIRD, or Rifle-Bird, names given by the English in Australia to a very beautiful inhabitant of that country, 2 probably because in coloration it resembled the well- known uniform of the rifle-regiments of the British army, while in its long and projecting hypochondriac plumes and short tail a further likeness might be traced to the hanging pelisse and the jacket formerly worn by the members of those corps. The cock bird is clothed in velvety-black generally glossed with rich purple, but having each feather of the abdomen broadly tipped with a chevron of green bronze, while the crown of the head is covered with scale-like feathers of glittering green, and on the throat gleams a triangular patch of brilliant bluish emerald, a colour that reappears on the whole upper surface of the middle pair of tail-quills. The hen is greyish-brown above, the crown striated with dull white; the chin/ throat and a streak behind the eye are pale ochreous, and the lower parts deep buff, each feather bearing a black chevron. According to James Wilson (III, Zoology, pi. xi.), specimens of both sexes were obtained by Sir T. Brisbane at Port Ma,cquarie, whence, in August 1823, they were sent to the Edinburgh Museum, where they arrived the following year; but the species was first described by W. Swainson in January 1825 (Zool. Journal, i. 481) as the type of a new genus Ptiloris, more properly written Ptilorrhis, 3 and it is generally known in ornithology as P. paradisea. It inhabits the northern part of New South Wales and southern part of Queensland as far as Wide Bay, beyond which its place is taken by a kindred species, the P. victoriae of J. Gould, which was found by John Macgilliyray on the shores and islets of Rockingham Bay. Farther to the north, in York Peninsula, occurs what is considered a third species, P. alberti,

1 In the military forces short-range practice now takes two forms — practice with Morris tube or miniature rifle, and practice with the full-sized rifle and ammunition on specially protected 30-yd. ranges.

2 Curiously enough, its English name seems to be first mentioned in ornithological literature by Frenchmen — R. P. Lesson and Garnot — in 1828, who say (Voy. ” Coquille,” Zoologie, p. 669) that it was applied ” pour fappeler que ce fut un soldat de la garnison [of New South Wales] qui le tua le premier ” — which seems to be an insufficient reason, though the statement as to how the first specimen was ob- tained may be true.

- Some writers have amended Swainson’s faulty name in the form PMornis, but that is a mistake.

very closely allied to and by some authorities thought to be identical with the P. magnified (Vieillot) of New Guinea — the “Promerops” of many writers. From that country a fifth species, P. wilsoni, has also been described by Mr Ogden (Proc. Acad. Philadelphia, 1875, p. 451, pi. 25). Little is known of the habits of any of them, but the rifleman-bird proper is said to get its food by thrusting its somewhat long bill under the loose bark on the boles or boughs of trees, along the latter of which it runs swiftly, or by searching for it on the ground beneath. During the pairing-season the males mount to the higher branches and there display and trim their brilliant plumage in the morning sun, or fly from tree to tree uttering a note which is syllabled ” yass ” greatly prolonged, but at the same time making, apparently with their wings, an extraordinary noise like that caused by the shaking of a piece of stiff silk stuff. Verreaux informed D. G. Elliot that he believed they breed in the holes of trees and lay white eggs; but on that score nothing is really known. The genus Plilorrhis, thought by Gould to be allied to Climacteris, has been generally placed near Epimachus, which is now considered, with Drepanornis and Seleucides, to belong to the Passerine Paradiseidae, or birds- of-paradise, and in his Monograph of that family all the species then known are beautifully figured by D. G. Elliot. (A. N.)

RIGA (Esth. Ria-Lin), a seaport of Russia, 366 m. by rail S.W. of St Petersburg, the capital of the government of Livonia. The Gulf of Riga, 100 m. long and 60 m. in width, with shallow waters of inconsiderable salinity (greatest depth, 22 fathoms), freezes to some extent every year. The town is situated at the southern extremity of the gulf, 8 m. above the mouth of the Dvina, which brings Riga, by means of inland canals, into water communication with the basins of the Dnieper and the Volga. Below the town the river divides into several branches, among islands and sandbanks, receiving before it enters the sea the Bolderaa river, and expanding towards the east into wider lacustrine basins. Having direct railway communication with the fertile parts of southern and south-eastern Russia, Riga has become the second port for foreign trade on the Baltic, ranking next after St Petersburg. The port freezes on an average 127 days every year. The larger ships cannot reach Riga, and are unloaded at Ust-Dvinsk (formerly Dunamunde). By no means all the trade with the interior is transported by the railways; no inconsiderable portion of the goods is carried by water.

Riga consists of four parts — the old town and the St Peters- burg and Moscow suburbs on the right bank of the Dvina, and the Mitau suburb

on the left bank, the two sides being connected by a floating bridge, which is removed in winterˆ and by a viaduct, 820 ft. long. The old town still preserves its Hanseatic features — high storehouses, with spacious granaries and cellars 1 , flanking the narrow, winding streets. The only open spaces are the market-place and two other squares, one of which, facing the citadel, is adorned with a granite column erected (1818) in commemoration of the defeat of Napoleon I. in 18 12. The suburbs, with their broad and quiet boulevards on the site of the former fortifications, are steadily growing. The St Petersburg suburb is the seat of the German aristocracy and merchant community.

Few antiquities of the medieval town remain. The oldest church, the Dom (St Mary's), founded in 121 5, was burned in 1547, and the present building dates from the second half of the 16th century, but has been thoroughly restored since 1883. Its organ, dating from 1883, is one of the largest in the world. St Peter's church, with a beautiful tower 412 ft. high, was erected in 1406-9. The castle, built in 1494-1515 by the master of the Knights of the Sword, Walter von Plettenberg — a spacious building often rebuilt — is the seat of the Russian authorities. The " House of the Black Heads," a corporation or club of foreign merchants, was founded in 1330, and subsequently became the meeting-place of the wealthier youth of the place. Of the recent erections, the polytechnic, the- exchange, the monument of the German writer, Johann Gottfried von Herder, who lived at Riga towards the end of the 18th century, the

gymnasiums (schools) of Lomonosov and Alexander I. and. the large bonded warehouse are worthy of notice. The esplanade (where a Greek cathedral built in 1877-84 now stands), the Wohrmann Park and the Imperial Park are much visited. Riga gives name to an archiepiscopal see of the Orthodox Greek Church and to an episcopal see of the Roman Catholic Church, and is the headquarters of the XX. army corps. In the environs, Dubbeln and the sea-bathing resorts of Bilderlingshof and Majorenhof have numerous visitors in summer.

The population, which was 102,590 in 1867, increased to 168,728 in 1 88 1 and to 282,943 in 1897, so that Riga now ranks seventh in the empire in order of population; 47% of the inhabitants are Germans, 25 % _ Russians and 23 % Letts, with a small admixture of Esthonians, Jews, &e. The city has a commercial school (1903), a municipal library, the Dom museum, an art museum with picture gallery (1904-5), technical and theological middle schools and a pilot and navigation school. Industrial activity has developed and includes railway-carriage works, works for the manufacture of machinery, oil mills and breweries. Owing to its communication by water and rail

with the forests of White Russia and Volhynia, Riga is a great mart for timber. Flax and linseed also occupy a prominent place, Riga being the chief Russian port for _ the extensive flax-producing region of north-west Russia. Owing to the great railway which crosses the country from Riga to Smolensk, afterwards dividing into two branches, to Orenburg and Tsaritsyn on the lower Volga respectively, Riga is the store- house and place of export for hemp coming by rail from west central Russia, arid for corn, Riga merchants sending their buyers as far east as Tambov. Oats, in particular, are extensively exported to England from the central provinces. Wheat, barley, eggs, butter, oilcake, hides, tallow, leather, tobacco, rugs, feathers and other items add considerably to the total value of the exports, which increased from if million sterling in 1851-60 to 8-14 millions sterling in 1901-5. The imports, consisting chiefly of salt, fish, wine, cotton, metals, machinery, coal, oils, fruits and tobacco, are also rapidly increasing: whereas in 1851-60 they were valued at about § million sterling, in 1 901-5 they reached 6-1 1| millions sterling.

History. — Riga was founded in 1158, as a storehouse at the mouth of the Diina (Dvina), by a few Bremen merchants. About 1 190 the Augustinian monk Meinhard erected a monastery there, and in 1199-1201 Bishop Albert I. of Livonia obtained from Pope Innocent III. permission for German merchants to land at the new settlement, and chose it for his seat, exercising his power over the neighbouring district in connexion with the Teutonic Knights. As early as the first half of the 13th century the young city obtained the right of electing its own magistracy, and enlarged the walls erected during Albert I.‘s time. It joined the Hanseatic League, and from 1253 refused to recognize the rights of the bishop and the knights. In 1420 it fell once more under the rule of the bishop, who maintained his authority until 1566, when it was abolished in consequence of the Reformation. Sigismund II., king of Poland, took Riga in 1547, and in 1558 the Russians burned its suburbs and many ships in the river. In 1561 Gotthard Ketteler publicly abdicated his mastership of the order of the Teutonic Knights,- and Riga, together with southern Livonia, became a Polish possession; after some unsuccessful attempts to reintroduce Roman Catholicism, Stephen Bathory, king of Poland, recognized the religious freedom of the Protestant population. Throughout the 17th century Riga was a bone of contention between Sweden, Poland and Russia. In 1621 Gustavus Adolphus, king of Sweden, took it from Poland, and held it against the Poles and the Russians, who besieged it in 1656. During the Northern War between Sweden and Russia, it was courageously defended (1700), but after the battle of Poltava it succumbed, and was taken in July 1710 by the Russians. In 1781 it

was made by Russia the capital of the Riga viceroyalty, but fifteen years later, the viceroyalty having been abolished, it was made the capital of Livonia. In 181 2, the approach of the French being apprehended, the suburbs were burned. (P. A. K.; J. T. Be.)

RIGAUD, HYACINTHE (1650-1743), French painter, born at Perpignan on the 20th of July 1659, was the descendant of a line of artists. Having early lost his father, he was sent by his mother to Montpellier, where he studied under Pezet and was helped by Ranc, then to Lyons, and in 1681 to Paris. There, whilst following the regular course of academical instruction,

Rigaud produced a great number of portraits so good that Le Brun advised him to give up going to Rome and to devote himself wholly to this class of work. Rigaud, although he had obtained the Grand Prix, followed this advice, and for sixty-two years painted at the rate of thirty to forty portraits a year, all carried through with infinite care by his own hand. His portraits of himself, of the sculptor Desjardins (Louvre), of Mignard and of Le Brun (Louvre) may be cited as triumphs of a still more attractive, if less imposing, character than that displayed in his grand representations of Bossuet (Louvre) and Louis XIV. (Louvre), while his beautiful portraits of his mother, Marie Serre (Louvre), must for ever remain amongst the master- pieces of French art. Rigaud, although the great successes to which he owed his fame were won without exception in portrait- painting, persisted in pressing the Academy to admit him as an historical painter. This delayed his reception, and it was not until January 1700 that he succeeded in obtaining his desire. He presented as his diploma works a St Andrew (Louvre) and the portrait of Desjardins already mentioned, exhibited at the salon of 1704, and filled in turn all the various posts of academical distinction. He died on the 27th of December 1743, having never recovered from the shock of losing his wife in the previous year. He had many pupils, and his numerous works had the good fortune to be reproduced by the greatest of French engravers — Edelinck, Drevet, Wille, Audran and others.

RIGBY, RICHARD (1722-1788), English politician, was the only son of Richard Rigby (d. 1730) of Mistley Hall, Essex, a mer- chant who made a fortune through his connexion with the South Sea Company. Young Rigby became an associate of Frederick, prince of Wales, and entered parliament in 1745. He is chiefly known to fame through his

connexion with John Russell, 4th duke of Bedford, and the " Bloomsbury gang," his audacity earning for him the title of the "brazen boatswain" of the " crew." In 1758 he became secretary to Bedford, who was lord lieutenant of Ireland, and in the following year he was given the sinecure office of master of the rolls for Ireland. Following the political fortunes of the duke he became vice- treasurer of Ireland in 1765, and in 1768 he obtained the lucrative position of paymaster-general of the forces. Rigby often spoke in parliament, and in 1769 he shared in the opposition to Wilkes. In 1784 he was obliged to resign his position as paymaster- general, and he was somewhat surprised and embarrassed when he was requested to pay over the large sum of public money which was in his possession. He left a great fortune when he died at Bath on the 8th of April 1788. A rapacious and un- scrupulous politician, Wraxall says Rigby " possessed talents for addressing a popular assembly which were sustained by a confidence that nothing could abash."

RIGG, JAMES HARRISON (1821-1000), English Noncon- formist divine, was born at Newcastle-on-Tyne on the 16th of January 182 1. His father was a Wesleyan minister and sent his son to the Old Kingswood School, Bristol, where he subse- quently became an assistant teacher. In 1845 he entered the Wesleyan ministry, and during the agitation of 1849-52 wrote successfully in exposition and defence of the polity of Methodism. In 1857 he published Modern Anglican Theology, an acute criticism of the writings of Coleridge, Hare, Maurice, Kingsley and Jowett. The book was timely and well received, and though Kingsley at first resented the criticism he afterwards became a cordial friend of the writer. Rigg had now become a leading figure in his own church, and in 1868 was appointed Principal of the Westminster Wesleyan Training College for day-school teachers, a post which he held with growing dis- tinction for 35 years. In 1870 he was elected on the first School Board for London, one of the most remarkable assemblies of modern times, and took an important part in providing the syllabus of religious instruction and framing the religious settlement for teachers.

In 1873 he wrote National Education in its Social Conditions and Aspects. A resolute opponent of secular education, he main- tained that the state ought not to compete with the churches,

but welcome their aid in the work of national education. He was also strongly against the adoption of a rigid universal code. In 1886 he sat on the Royal Commission of Education, and was brought into close contact with Matthew Arnold, and with Dean Stanley, Bishop Temple and other Anglican prelates, who held him in high esteem. In 1877 he

became chairman of the second London district of Methodism, and for fourteen years helped to make the history of his church in the home counties. In 1878 he was elected president of conference — and again in 1892. From 1881 he was ministerial treasurer of the Wesleyan Missionary Society, taking an active part in its work. He resigned his principalship in 1903 and died at Brixton on the 17th of April 1909. Dr Rigg was universally honoured as the Nestor of Wesleyan Methodism, in the development of which he had taken a foremost part for over 60 years. His Connexional Economy is a standard work, and his Living Wesley a most discriminating study of the character and work of its subject. His Oxford High Anglicanism (1895) showed how keenly he followed modern developments in the Church of England. His lifelong principle was that Methodism is ” a church friendly to all, but owing allegiance to none.”

See Life by John Telford (London, 1909).

RIGGING (A.S. wrigan or wrihan, to clothe), the general term, in connexion with ships, for the whole apparatus of spars (including both masts and yards), sails and cordage, by which the force of the wind is utilized to move the hull against the resistance, and with the support, of the water. (See also Ship and Shipbuilding). The word is often used as meaning the cordage only, but this is a too limited, and even an irra- tional, use of the term. A ship is not rigged until she is pro- vided with all the spars, sails and cordage required to move and control the hull. The straight or curved pieces of wood or metal, called davits, from which the boats carried along the bulwarks are hung, belong to the rigging. All are fastened directly or indirectly to the hull, and all are required to com- plete her “clothing.” Vessels of all classes, from the smallest sailing-boat up to the largest ship, are classed according to the particular combination of their spars, sails and cordage. ” Cutter,” ” brig,” or ” ship,” are only convenient abbrevia- tions for ” cutter-rigged,” ” brig-rigged,” or ” ship-rigged.” They are of such or such a ” rig.” It is strictly correct to speak of the rigging of a mast or a yard, or of a boom, when all that is meant is the special set of ropes, of whatever size or material, required to keep them in their place, or withdraw them from it, when they have to be moved in the ship. In such cases the part is looked upon as a whole, and is mentally abstracted from the total of the vessel’s rigging.

The basis of all rigging is the mast (q.v.), whether it be com- posed of one or of many pieces of wood or metal. The mast is held up and controlled by ropes, which are classed together as the ” standing rigging,” because they are ” that part (of the whole rigging) which is made fast, and not hauled upon ” (Admiral Smyth, Sailor’s Word-

Book). This must be under- stood subject to the restriction that in the case of a mast com- posed of several parts, including topmast and topgallant mast, these subdivisions may be, and often are, lowered. The back- stays, and other ropes which keep the top and topgallant masts in place, are therefore only ” comparative fixtures. ” The bowsprit, though it does not rise from the deck but projects from the bow, is in fact a mast. The masts, including the bowsprit, support all the sails, whether they hang from the ” yards,” which are spars slung to the mast, or from ” gaffs,” which are spars projecting from the mast, or, as in the case of the ” jibs,” are triangular sails, travelling on ropes called ” stays,” which go from the foremast to the bowsprit- and suspended by halliards. The bowsprit is subdivided like other masts. The bowsprit proper corresponds to the lower fore-, main- or mizzen-mast. The jib-boom, which is movable and projects beyond the bowsprit, corresponds to a topmast; the flying jib-boom, which also is movable and projects beyond the jib-boom, answers to a topgallant mast. The whole body of ropes by which the yards, booms and sails are manipulated

constitute the ” running rigging,” since they are ” in constant use, to trim yards, and make or shorten sail ” (Admiral Smyth, op. cit.). The rigging must also provide the crew with the means of going aloft, and with standing ground to do their work when aloft. Therefore the shrouds (see below) are utilized to form ladders of rope, of which the steps are called ratlines, by which the crew can mount. Near the heads of the lower masts are the tops — platforms on which men can stand — and in the same place on the topmasts are the ” cross- trees,” of which the main function is to extend the topgallant shrouds. The yards are provided with ropes, extending from the middle to the extremities or arms, called horses, or foot- ropes, which hang about 2 or 3 ft. down, and on which men can stand. The material of which the cordage is made has differed, and still differs greatly. Leather has been used.

must be adapted to resist two kinds of pressure, the longitudinal, whether applied by the wind or by the motion of the vessel when pitching (i.e. plunging head and stern alternately into the hollow of the sea), and the lateral, when the wind is blow- ing on the side and she is rolling. The longitudinal pressure is counteracted by the bobstays, stays and backstays. A reference to fig. 1 will show that the bobstays hold down the bowsprit, which is liable to be lifted by the

tug of the jibs, and. of the stays connecting it with the fore-topmast. If the bowsprit is lifted the fore-topmast loses part of its support. In the case of a small vessel, the lifting of a bowsprit would wreck her whole system of rigging in an instant. If fig. 1 is followed from the bow to the mizzenmast, it will be seen that a succession of stays connect the masts with the hull of the ship or with one another. All pull together to resist pressure from

Fig. 1. — The Spars and Rigging of a Frigate. References are not repeated for each mast where the names and functions are identical. I, bowsprit; 2, bobstays, three pairs; 3, spritsail-gaffs, projecting on each side of the bowsprit — the ropes at the extremities are jib-guys and flying jib-guys; 4, jib-boom; 5, martingale- stay, and below it the flying-jib martingale; 6, back-ropes; 7, flying jib-boom; 8, fore-royal stay, flying jib-stay and halliards; 9, fore-topgallant-stay, jib-stay and halliards; 10, two fore-topmast-stays and fore-topmast staysail halliards; 11, the foretop-bowlines, stopped into the top and two fore-stays; 12, two fore-tacks; 13, fore-truck; 14, fore-royal mast, yard and lift; 15, topgallant mast, yard and lift; 16, fore-top mast, topsail-yard, lift and reef-tackle; 17, foretop, fore-lift, and topsail-sheet; 18, foremast and fore-shrouds, nine pairs; 19, fore- sheets; 20, fore-gaff; 21, fore-topmast backstays and topsail tye; 22, royal and topgallant backstays; 23, fore-royal-braces and main-royal-stay; 24, fore-topgallant braces and main-topgallant-stay; 25, standing parts or fore-topsail-braces and main- topmast-stays; 26, hauling parts of fore-topsail-braces and main -top-bowlines; 27, fore parts of fore-braces; 28, mainstays; 29, main-tacks; 30, main-truck; 31, main-royal-braces; 32, mizzen-royal-stay and mizzen-royal-braces ; 33, main-topgallant-braces and mizzen-topgallant-braces; 34, standing parts of main -topsail-braces and mizzen-topmast-stay ; 35, mizzen-topsail- braces; 36, hauling parts of main-topsail-braces, mizzen-top-bowlines and cross-jack-braces; 37, main-braces and mizzen- stay; 38, standing part of peak halliards; 39, vangs, similar on each gaff; 40, ensign staff; 41, spanker-boom; 42, quarter- boat's davits; 43, one of the davit topping-lifts and wind-sail; 44, main-yard-taCkle ; 45, a bull-rope.

During historic times, however, the prevailing materials have been hemp or esparto grass (Machrocloa, or Stipa tenacissima) , and in recent days chain and wire. As the whole of the rigging is divided into standing and running, so a rope forming part of the rigging is divided into the " standing part " and the " fall." The standing part is that which is made fast to the mast, deck or block. The fall is the loose end or part on which the crew haul. The block is the pulley through which the rope runs. " Standing " in sea language means " fixed " — thus the standing part of a hook is that which " is attached to block, '•.hain or

anything which is to heave the hook up, with a weight hanging to it; the part opposite the point ” (Smyth, sub voce). ” Tackle ” is the combination of ropes and blocks; the com- bination of cables and anchors constitutes the ” ground tackle.” The function of all cordage may be said to be to pull, for the purpose either of keeping the masts in their places, or of moving spars and sails. The standing rigging which supports the masts

in front. Pressure from behind is met by the backstays, which connect the topmasts and topgallant masts with the sides of the vessel. Lateral pressure is met by the shrouds and breast- backstays. A temporary or ” preventer ” backstay is used when great pressure is to be met. Seamen have at all times had recourse to special devices to meet particular dangers. When Dundonald, then captain of the ” Pallas ” frigate, was chased by a French squadron in stormy weather, he fortified his masts by ordering ” all the hawsers ” (large ropes a little less strong than the cables which hold the anchor) ” in the ship to be got up to the mast heads, and hove taut,” i.e. made fast to the side. Thus she was able to carry more sail than would have been possible with her normal rigging. The running rigging by which all spars and sails are hoisted, or lowered and spread or taken in, may be divided into those which lift and lower — the lifts, jeers, halliards (haulyards) — and those which hold down the lower corners of the sails — the tacks and sheets. A

long technical treatise would be required to name the many combinations of cordage and spars which make up the total rigging. All that is attempted here is to give the main lines and general principles or divisions.

The vessel dealt with here is the fully rigged ship of three or more masts. But she includes all the others and the principles are the same. The simplest of all forms of rigging is the dipping lug, a quadrangular sail hanging from a yard, and always hoisted on the side of the mast opposite to that on which the wind is blowing (the lee side). When the boat is to be tacked so as to bring the wind on the other side, the * sail is lowered and rehoisted. One rope can serve as halliard to hoist the sail and as a stay when it is made fast on the weather side on which the wind is blowing. The difference between such a craft and the fully rigged ship is that between a simple organism and a very complex one; but it is one of degree, not of kind. The steps in the scale

are innumerable. Every sea has its own type. Some in eastern waters are of extreme antiquity, and even in Europe vessels are still to be met with which differ very little if at all from the ships of the Norsemen of the 9th and 10th centuries. For a full account of these varieties of rigging the reader may be referred to Mast and Sail in Europe and Asia (London, 1906), by H. Warington Smyth.

When the finer degrees of variation are neglected the types of rigging may be reduced to comparatively few, which can be classed by the shape of their sail and the number of their masts. At the bottom of the scale is such a craft as the Norse herring boat (fig. 2).

Fig. 2.— Norse Herring Boat.

She has one quadrangular sail suspended from a yard which is hung (or slung) by the middle to a single mast which is placed (or stepped) in the middle of the boat. She is the direct representative of the ships of the Norsemen. Her one sail is a ” course ” such as is still used on the fore and mainmasts of a fully developed ship; a topsail may be added (as in fig. 3) and then we have the beginning

Fig. 3. — Nordland Boat.

of a fully clothed mast. A very similar craft called a Humber keel is used in the north of England. The lug sail is an advance on the course, since it is better adapted for sailing on the wind, with

the wind on the side. When the lug is not meant to be lowered> and rehoisted on the lee side, as in the dipping lug mentioned above, it is slung at a third from the end of the yard, and is called a standing lug. A good example of the lug is the Chinese junk (fig. 4). The

Fig. 4. — Four-masted Junk.

lug is a ■” lifting sail,” and does not tend to press the vessel down as.the fore and aft sail does. Therefore it is much used by fishing vessels in the North Sea. The type of the fore and aft rig is the schooner (fig. 5). The sails on the masts have a gaff above and a boom below. These spars have a prong called ” the jaws,” which fit to the mast, and are held in place by a ” jaw rope ” on which are threaded beads called trucks. Sails of this shape are carried by fully rigged ships on the mizzen- mast, and can be spread on the fore and main. They are then called try- Fig. 5.— Schooner. I, bowsprit, with sails and are used only in martingale to the stem; 2, fore- bad weather when little topmast-stay, jib and stay-foresail; sail can be carried, and 3l fore-gaff -topsail ; 4, foresail and are hoisted on the trysail mainstays; 5, main-

gaff -topsail ; 6, mast, a small mast attached mainsail; 7, end of boom, to the great one. The

Lateen (Latin) sail (fig. 6) is a triangular sail akin to the lug, and is the prevailing type of the Mediterranean. These original types,

Fig. 6. — Lateen Rig.

even when unmodified by mixture with any other, permit of large variations. The number of masts of a lugger may vary from one to five, and of a schooner from two to five or even seven. A small lug may be carried above the large one, and a gaff topsail added to the sails of a schooner. A small-masted fore-and-aft-rigged vessel may be a cutter (fig. 7) or sloop. But the pure types may be com- bined, in topsail schooner, brigantines, barquentines and barques, when the topsail, a quadrangular sail hanging from and fastened to a yard, slung by the middle, is combined with fore and aft sails. The lateen rig has been combined with the square rig to make such a rigging as the xebec — a three-masted vessel square rigged on the main, and lateen on the fore and mizzen. Triangular sails of the

Fig. 7. — Cutter Yacht. 1, bow- sprit and martingale; 2, jib — behind it is the foresail; 3, cross-trees and topmast- shroud ; 4, pennant designating the club to which she belongs; 5, gaff-topsail ; 6, peak of gaff, hoisted by peak and throat halyards; 7, mainsail; 8, end of boom and topping-lift.

From Sir George V. C. Holmes's Ancient and Modem Ships, Part I., by permission of.the Controller of H.M. Stationery Office.

Fig. 8.— Sail Plan of the " Santa Maria."

same type as the jibs can be set on the stays between the masts of a fully rigged ship, and are then known as staysails. But it can only be repeated that the variations are innumerable. Studding- sails are pieces added to increase the breadth (spread) of sails, and require the support of special yards, booms and tackle.

The development of the rigging of ships is a very obscure subject. It was the work of centuries, and of practical men who wrote no treatises. It has never been universal. A comparison of the four – masted junk given above with the figures of ships on medieval seals

shows at least much similarity. Yet by selecting a few lead- ing types of succes- sive periods it is possible to follow the growth of the fully rigged ship, at least in its main ■ ■ lines, in modern times.

Fig. 8 gives the sail plan of the ” Santa Maria,” the flagship of Columbus. It is a modern reconstruc- tion, made in 1893 in Spain at the Carraca arsenal, but is based on good authority. She has only the fixed bowsprit, with a yard and a sail hanging from it, the spritsafl yard and spritsail. The foremast has one course, the mainmast a course and topsail, the mizzen a lateen sail. Fig. 9 is the ” Sovereign of the

Seas,” a British warship of 1637. She still has only the fixed bowsprit, but a small upright mast has been erected at the end, which serves to spread a sprit topsail. In some cases at least a sprit topgallant sail was used. The mizzenmast still carries a lateen sail, but topsails have been added, and the whole rigging has multiplied and developed. Between the ” Sovereign of the Seas ” and the fully developed ship, given in fig. 1 the most apparent differences are in the rigging of the bowsprit and the mizzenmast. The sprit topmast has disappeared, and is replaced

From Sir George V. C. Holmes’s Ancient and ModernShips, Part I., by permission of the Controller of H.M. Stationery Office.. Fig. 9. — The’” Sovereign of the Seas.”

by the jib-boom. The square spritsail, which could not be trained fore and aft, and was of feeble effect in keeping the ship’s head from turning to windward, has been replaced by the jib. The spritsail yard (which continued in use till after 1850) has disappeared amd has been replaced by the spritsail gaffs, two fixed spars which slope downwards and help to support the ” jib-guys,” the lateral supports of the booms. For a time, and after the use of spritsails had been given up, the spritsail yard continued to be used to discharge the function now given to the gaffs (see Smyth, Sailor’s Word-Book, sub voce). The changes in the mizzen have an obscure history. About the middle of the 18th century it ceased to be a pure lateen. The yard was retained, but no sail was set on the forearm. Then the yard was given up and replaced by a gaff and a boom. The new sail was called the spanker. It was, however, comparatively narrow, and when a greater spread of sail was required, a studding- sail (at first called a ” driver “) was added. At a later date ” spanker ” and ” driver ” were used as

synonymous terms, and the studding-sail was called a ” ringtail.” The studding-sails are the representatives of a class of sail once more generally used. In modern times a sail is cut of the extreme size which is capable of being carried in fine weather, and when the wind increases in strength it is reefed — i.e. part is gathered up and fastened by reef points, small cords attached to the sail. Till the 17th century at least the method was often to cut the courses small, so that they could be carried in rough weather. When a greater spread of sail was required, a piece called a bonnet was added to the foot of the sail, and a further piece called a drabbler could be added to that. It is an example of the tenacious conservatism of the sea that this practice is still retained by the Swedish small craft called ” lodjor ” in the Baltic and White Sea. It will be easily understood that no innovation was universally accepted at once. Jib and sprit topsail, lateen, mizzen and spanker, and so forth, would be found for long on the sea together.

The history of the development of rigging is one of adjustment. The size of the masts had to be adapted to the ship, and it was necessary to find the due proportion between yards and masts. As the size of the medieval ship increased, the natural course was to increase the height of the mast and of the sail it carried. Even when the mast was subdivided into lower, top and topgallant, the lower mast was too long, and the strain of the sail racked the hull. Hence the constant tendency of the ships to leak. Sir Henry Manwayring, when giving the proper proportions of the masts, says that the Flemings (i.e. the Dutch) made them taller (” taller ” and ” taunt ” were for long used to mean the same thing) than the English, which again forced them to make the sails less wide. A tall sail could not be cut so wide as a lower one without putting an excessive strain on the mast. He says that the Flemings found an advantage in working to windward, but that they ” wronged ” (i.e. racked) their ships. The English preferred a less lofty mast and a wider spread of sail. *”

It is very difficult to say what changes in the proportions of masts and yards took place in English ships between the early 17th and the 19th centuries. The difficulty arises largely not only from insufficient knowledge of the earlier period, but from the fact that a scale was fixed only after trials, and by degrees. Manwayring, for instance, when giving the proportion of the topmasts to lower masts, says: ” The topmasts are ever half so long as the masts into which they belong; but there is no absolute proportion in these, and the like things, for if a man will have his mast short, he may the bolder make his topmast long.” In some respects the change was certainly slight. In the early 17th century, in England at least, the length of the mainmast was fixed by taking four-fifths of the breadth of the ship and multiplying

by three. Two centuries later the method was to take the length of the lower deck and the extreme breadth, add them together, and divide by two. If we take a 74-gun ship of about the year 1820, which was 176 ft. long on the lower deck and 48 ft. 8 in. wide, she would have, by the system then used, a mainmast of 112 ft. Manwayring's system would have given her one of 117 ft. But in the proportions of the masts to one another there was a change. In the 17th century the foremast was four-fifths of the main, and the bowsprit was of the same length as the foremast. In the 19th the foremast was eight- ninths of the mainmast, while the bowsprit was seven-elevenths of the mainmast in the largest ships, and three-fifths in the others. When we come to the relative proportions of masts and yards the difficulty increases, for the standard was not the same. The seamen of the 17th century calculated the length of the mainyard not by the size of the mast but by the length of the keel. The mainyard, which was the standard for the others, ought according to " the best and most absolute " estimate to be five-sixths of the length of the keel. But Manwayring again explains that " the proportion is not absolute." If it was followed, the yards of a 17th-century ship must have been rather longer than in a vessel of a hundred

and fifty and two hundred years later, when the mainyard was eight-ninths of the mainmast, and. a regular scale was fixed through- out. Even so Manwayring's warning that " the proportion was not absolute " must be borne in mind. Changes were constant. The development of the famous American clippers made a considerable one. So has the growth of the vast four- and five-masted iron sailing ships of recent days. Individual captains have fitted ships according to ideas of their own. It has always happened that extra sails have been invented and set by ingenious devices for particular purposes. One large sail requires more men to handle it than several small ones. For this reason it is that in recent times the topsails of merchant ships have been divided into upper and lower, with a great loss of beauty, but an increase of convenience. To the same cause, the wish to economize in the size of the crew, is to be attributed the introduction of machinery for reefing sail from the deck, which is also an easier, and a safer process than going aloft to reef them by hand. In a general way it may be said that the development of the rigging has been towards establishing a fair balance between the fore and after spread of canvas. Until the jib was invented in the 1 8th century, a ship which was sailing on the wind was subject to a disproportionate pressure aft. If she was at all given to " griping " — that is to say, inclined to turn head to wind (and all ships are liable to have ways and manners which are mysterious in origin and not seldom incurable), the mizzen-

sail could not be used, for if it had been she would never have been ” out of the wind.” Therefore when close-hauled (sailing with the wind on the side and somewhat from before her centre) she lost the use of part of her sail. The spritsail which could not be trained fore and aft was no use ” on the wind.”

A few words may be added concerning the tops. In the earlier form of ships the top was a species of crow’s nest placed at the head of the mast to hold a look-out, or in military opera- tions to give a place of advantage to archers and slingers. They appear occasionally as mere bags attached to one side of the mast. As a general rule they are round. In the 16th century there were frequently two tops on the fore- and main- masts, one at the head of the lower, another at the head of the topmast, where in later times there have only been the two traverse beams which make the crosstrees. The upper top dropped out by the 1 7th century. The form was round, and so continued to be till the 18th century when the quadrangular form was introduced. In quite recent times the military tops of warships have resumed the circular form.

Authorities. — The present writer is indebted to Admiral Sir Cyprian A. G. Bridge, G.C.B., whose practical acquaintance with the older type of sailing ship as well as with the modern steamship makes his authority specially valuable, for the correction or confirmation of the technical details in the above article. Among the literature of the subject, reference may be made to the following works: Sir Henry Manwayring, The Seaman’s Dictionary (London, 1644) ; Darcy Lever, The Young Sea Officer’s Sheet Anchor (London, 1808); Sir George Nares, Seamanship (Portsmouth, 1882); Vice- Admiral Edmond Paris, La Mus&e de marine du Louvre (Paris, 1883). (D. H.)

RIGHT ASCENSION, in astronomy, that co-ordinate of a heavenly body defined by the angle which the meridian passing through it makes with the prime meridian through the vertical equinox (see Astronomy).

RIGHTS OF MAN AND OF THE CITIZEN, DECLARATION OF, a sort of manifesto issued in 1789 by the Constituent Assembly in the French Revolution, to be inscribed at the head of the constitution when it should be completed. It stated the fundamental principles which inspired the revolution. Historians have traced a connexion with the declarations of rights which preceded the constitution of some of the states of the American Union, especially of Virginia, but the situation in France at the time, and the influence of the writings of the philosophes made the proposal for such a statement very natural. The

declaration overturned the political and social principles upon which the existent regime stood. It has served as a base for modern civil legislation and is still a force in European history. The final text voted by the Assembly was accepted by the king on the 5th of October 1789, at first conditionally, then with modifications. It contains a preamble and 17 articles. They proclaim and define political equality and liberty in its various manifestations, determine the character of the law and the conditions of its application, and state at the same time the restrictions upon the individual will which are necessary

for the benefit of society. Similar declarations were attached to the constitution of 1793 and to that of the year III.

See E. Blum, La Declaration des droits de I'homme et du citoyen, text with commentary (Paris, 1902) ; L. Bourgeois and A. Metin, Declaration des droits de I'homme et du citoyen, 1789 (Paris, 1901); G. Jellinck, Die Erkldrung der Menschen und Biirgerrechte (Leipzig, 1895). This study has been translated into English by Rudolf Tombo (New York), and has aroused considerable controversy; see E. Boutmy, " La Declaration des droits de I'homme et du citoyen et M. Jellinck," in Annates des sciences politiques for the 15th of July 1902; also E. Walsh, La Declaration des droits de I'homme et du citoyen et I'assemblee constituant, Travaux priparatoires (Paris, i903)-

RIGORD (c. 1150-c. 1209), French chronicler, was probably born near Alais in Languedoc, and became a physician. After- wards becoming a monk he entered the monastery of Argenteuil, and then that of St Denis, and described himself as regis Francorum chronographus. Rigor wrote the Gesta Philippi Augusti, dealing with the life of the French king, Philip Augustus, from his coronation in 1179 until 1206. The work, which is very valuable, was abridged and continued by William the Breton (q.v.). The earlier part of the Gesta speaks of the king in very laudatory terms, but in the latter part it is much less flattering in its tone. It is published in tome xvii. of Dom Bouquet's Recueil des historiens des Gaules el de la France (Paris, 1738-1876); and with introduction by H. F. Delaborde (Paris, 1882-85). A French translation of the Gesta is in tome xi. of Guizot's Collection des memoires relatifs & I'histoire de France (Paris, 1825). Rigord also wrote a short chronicle of the kings of France.

See A. Potthast, Bibliotheca historica (Berlin, 1896); and A. Molinier,

Les Sources de I'histoire de France, tome iii. (Paris, 1903).

RIGORISM (Lat. rigor, stiffness, firmness), a philosophical term applied by Kant specially to those moralists who take up an anti-hedonist or ascetic standpoint. In general the term is opposed to " latitudinarianism " or " indifferentism," — respectively a morality of compromise and a morality of pure indifference, — and signifies insistence upon the strictest inter- pretation of a principle, rule or criterion. Thus, in Roman Catholic theology, a rigorist holds that in cases of conscience the proper course is to adhere to the strict wording of the law in question.

RILEY, JAMES WHITCOMB (1853-), American poet, was born in Greenfield, Indiana, in 1853. He spent several years as an itinerant sign-painter, actor and musician. During this vagabond experience he had opportunities to revise plays and compose songs, and was brought into close touch with the rural folk of Indiana, becoming familiar with their life and speech. About 1873 he first contributed verses, especially in the Hoosier dialect, to the papers, and he soon became local editor of the Anderson (Ind.) Democrat. In August 1877, over the initials " E.A.P.," he printed in the Kokomo (Indiana) Dispatch a poem, Leonainie, in the manner of Poe. 1 The press throughout the country copied the poem, and many critics of acknowledged authority believed it to have been actually written by Poe, until the hoax was explained by the paper in which it first appeared. To the Indianapolis Daily Journal Riley contributed many poems, the best known being a series in dialect which purported to have been written by one " Ben- jamin F. Johnson, of Boone," a farmer. These he published in book form, under the same pen-name, as The Old Swimmin' Hole and 'Leven More Poems (1883). He wrote, short stories and sketches, some of unusual merit, but is known almost exclusively as a poet. Of his poems some are in conventional English, many others in the Hoosier dialect of the Middle- West. His materials are the homely incidents and aspects of village and country life,

1 The poem was accompanied by a statement from the editor of the paper that it was " from the gifted pen of the erratic poet, Edgar Allan Poe," and by a circumstantial story to the effect that the poem had been found written on the fly-leaf of an old Latin- English dictionary then owned by "an uneducated and illiterate man " in Kokomo, who had received it from his grandfather, in whose tavern, near Richmond, Va., it had been left by " a young man who showed plainly the marks of dissipation."

especially of Indiana, and his manner is marked by delicate

imagination and naive humour and tenderness.

The bulk of his work appeared in The Boss Girl and Other Sketches (1886), republished in 1891 as Sketches in Prose; After-whiles (1887); Pipes 0′ Pan at Zekesbury (1888); Rhymes of Childhood (1890); Neighborly Poems (1891); The Flying Islands of the Night (1891), a fantastic blank verse drama; Green Fields and Running Brooks (1892); Poems Here at Home (1893); Armazindy (1894), which contains the poem ” Leonainie”; A Child-World (1896), reminiscent of his own boyhood; The Rubdiydt of Doc Sifers (1897); Home Folks (1900); The Book of Joyous Children (1902); His Pa’s Romance (1903) ; A Defective Santa Claus (1904) ; and in several books of selections, such as Old Fashioned Roses (1889), published in England; Child Rhymes (1898); Love Lyrics (1899); The Golden Year (1899), published in England; Farm Rhymes (1901); An Old Sweetheart of Mine (1902) ; Out to Old Aunt Mary’s (1904) ; Songs 0′ Cheer (1905) ; Morning (1907) ; and Songs of Summer (1908).

RIMBAUD, JEAN ARTHUR (1854-1891), French poet and adventurer, was born at Charleville, in the Ardennes, on the 20th of October 1854. He was the second son of a captain in the French army, who in i860 abandoned his wife and family. From early childhood Arthur Rimbaud, who was severely brought up by his mother, displayed rich intellectual gifts and a sullen, violent temperament. He began to write when he was ten, and some of the poems which now appear in his works belong to his fifteenth year. Before he was sixteen, in consequence of a violent quarrel with his mother, the boy escaped from Charleville with a packet of his verse, was arrested as a vagabond, and for a fortnight was locked up in the Mazas prison, Paris. A few days after being taken home Rimbaud escaped again, into Belgium, where he lived for some time as a tramp, almost starved, but writing verses with feverish assiduity. In February 187 1 he left his mother for a third time, and made his way to Paris, where he knew no one, and whence, after very nearly dying of hunger and exposure, he begged his way back to Charleville. There he wrote in the same year the extraordinary poem of Le Bateau ivre, which is now hailed as the pioneer of the entire ” symbolist ” or ” decadent ” movement in French literature in all its forms. He sent it to Verlaine, who encouraged the boy of seventeen (whom he supposed to be a man of thirty) to come again to Paris. Rimbaud spent from October 1871 to July 1872 in the capital, partly with Verlaine, partly as the guest of Theodore de Banville, and served in the army of the Commune. With Verlaine he travelled for thirteen months, after the fall of the Commune, through England and Belgium, where in 1873 he published the only work which he ever printed, Une Saison en Enfer, in prose; in

this he gives an allegorical account of his extravagant relations with Verlaine, which ended at Brussels by a double attempt of the latter to murder his young companion. On the second occasion Rimbaud was dangerously wounded by Verlaine's revolver, and the elder poet was imprisoned at Mons for two years. Meanwhile Rimbaud, deeply disillusioned, determined to abandon Europe and literature, and he ceased at the age of nineteen to write poetry. He settled for a while at Stuttgart, studying German, and in 1875 ne disappeared. He set out on foot for Italy, and after extraordinary adventures found employ- ment as a day-labourer in the docks at Leghorn. Returning to Paris, he obtained a little money from his mother, and then definitely vanished. For sixteen years nothing whatever was heard of him, but it is now known that he embarked as a Dutch soldier for the Sunda Isles, and, presently deserting, fled to Sumatra and then to Java, where he lived for some time in the forest. Returning to Europe, after a vagabond life in every capital, he obtained in 1880 some menial employment in the quarries of Cyprus, and then worked his way to Aden and up into Abyssinia, where he was one of the pioneers of European commercial adventure. Here he settled, at Harrar, as a trader in coffee and perfumes, to which he afterwards added gold and ivory; for the next eleven years, during which he led many commercial expeditions into unknown parts of northern Africa, Shoa and Harrar were his headquarters, and he lived almost entirely with the natives, and as one of themselves. From 1888 to 1 89 1, having prospered greatly as a merchant, he became a sort of semi-independent chieftain, intriguing for France, just

outside the borders of -civilization. From documents which were first produced in 1902 it appears that from 1883 to 1889 Rimbaud was in close relations with the Ras Makonnen and with Menelek, then only king of Shoa. At the death of the Negus John, in 1888, he was concerned in the formation of the empire of Ethiopia. From this time Rimbaud had a palace in the town of Harrar, and intrigued with the French government in favour of Menelek and against Italy. Meanwhile, in 1886, believing Rimbaud to be dead, Verlaine had published his poems, under the title of Les Illuminations, and they had created a great sensation in Paris. In this collection appeared the sonnet on the vowels, attributing a different colour to each: "A noir, E blanc, I rouge, U vert, O bleu voyelles." But the author, in his Abyssinian hut of palm-leaves, was, and remained, quite unconscious of the fact. In March 1891 a tumour in his knee obliged Rimbaud to

leave Harrar and go to Europe for surgical advice. He reached Marseilles, but the case was hopeless; the leg had to be amputated, and Rimbaud died there in hospital on the 10th of November 1891. The poems of Rimbaud all belong to his earliest youth. Their violent originality, the influence which they have exercised upon younger writers, the tumultuous existence of their author, and the strange veil of mystery which still hangs over his character and adventures, have given to Rimbaud a remarkable fascination. His life has been written by M. Paterne Berrichon (1897), and valuable reminiscences by his sister, Mile Isabella Rimbaud. His CEuvres were collected in 1898 by MM. Berrichon and Delahaye, and in 1901 his statue was unveiled at Charleville.

(E. G.) See also Lettresde Jean Arthur Rimbaud (Itgypte, Arable, Ahiopie), 1899, edited by P. Berrichon; Paul Verlaine, Les Poetes maudits (1884); George Moore, Impressions and Opinions: Two Unknown Poets (1891); and A. Symons, The Symbolist Movement in Literature

(1900).

RIME ROYAL, the name given to a strophe or stanza-form, which is of Italian extraction, but is almost exclusively identi- fied with English poetry from the fourteenth to the early seventeenth centuries. It appears to be formed out of the stanza called Ottava rima (q.v.), by the omission of the fifth line, which reduces it to seven lines of three rhymes, arranged ababbcc. It was earliest employed with skill, if hot, as seems probable, invented, by Chaucer, who composed his long romantic poem of Troilus and Cressida in rime royal, of which the following is an example: —

” And as the new-abashed nightingale,

Thet stinteth first when she beginneth sing, When that she heareth any herde tale, Or in the hedges any wight stirring, And, after, siker doth her voice out-ring,— Right so Cresseyda, when her drede stint, Opened her heart, and told all her intent.”

The ” Prioress’ Tale,” in the Canterbury Tales, offers another particularly beautiful proof of Chaucer’s skill in the Use of the rime royal. In the fifteenth century this stanza was habitually used, in preference to heroic verse, by Hoccleve and Lydgate, and, with more melody and grace, by the unknown writer of The Flower and the Leaf. In the sixteenth century, rime royal was chosen by Hawes as the vehicle of his Pastime of Pleasure (1506) and by Barclay in his Ship of

Fools (1509); it was now regarded as the almost exclusive classical form for heroic poetry in England, and it had long been so accepted in Scotland, where The King's Quair of King James I., the Fables of Henry- son and The Thistle and the Rose of Dunbar had closely followed Chaucer's pattern. The greater part of that huge poetic miscellany, The Mirror for Magistrates' (1559-1610), was written in rime royal, Sackville's momentous Induction among the rest. The seven-line stanza began to go out of fashion with the revival of Elizabethan poetry, but we find it still used in Spenser's Hymn of Heavenly Beauty, Shakespeare's Lucrece and the Orchestra of Sir John Davys. After the first decade of the seventeenth century rime royal went out of fashion. Since then it has been occasionally revived, but not in poems of great length or particular importance. Rime royal should always be written in iambic metre, and be formed of seven lines of equal length, each containing ten syllables.

; RIMINI, a town and bishop's see of Italy, in the province of Forli, Etnilia, on the Adriatic coast, 69 m. S.E. of Bologna by rail. Pop. (1901) town, 18,022; commune, 46,801. The city is bounded on three sides by water. It faces the Adriatic to the north, has the torrent Aprusa, now called Ausa, on the east, and the river Marecchia on the west. It stands in a fertile plain, which on the southern side soon swells into pleasant slopes backed by the jagged peaks of the Umbrian Apennines. The foremost foothill of the range is the steep crag of Mons Titanus, crowned by the towers of the republic of San Marino. Rimini attracts numerous visitors for the sea-bathing at Porta Marina. It has mineral springs, and the industries comprise fisheries, ironworks and foundries, sulphur furnaces, silk- mills, rope walks, match factories, brickworks, flourmills and furniture. Its main interest, however, is historical. Apart from the ancient buildings, &c, referred to below, Rimini can boast of a good public library, founded by the jurist Gam- balunza in 161 7, a municipal picture gallery, an archaeological museum, a technical school (1882) and a bronze statue of Pope, Paul V. The ancient castle of Sigismondo Malatesta, now dilapidated, has in recent years been used as a prison.

History.- — Rimini is the ancient Ariminum (q.v. for its early history and remains). During the middle ages the history of Rimini has no importance. Alternately captured by Byzan- tines and Goths, it was rigorously besieged by the latter in AJ3. 538. They were, however, compelled to retreat before the reinforcements sent by Belisarius and Narses; thus the Byzan- tines, after various vicissitudes, became masters of the town, appointed a duke as its governor, and included it in the exarchate of Ravenna. It afterwards fell into the power of the Longo- bards, and then of the Franks, who yielded it to the pope, for

whom it was governed by counts to the end of the 10th century. Soon after this period the imperial power became dominant in Rimini. In 11 57 Frederick I. gave it, by imperial patent, the privilege of coining money and the right of self-government; and in the 13th century we find Rimini an independent com- mune waging war on the neighbouring cities.

In the year 1216, Rimini, being worsted by Cesena, adopted the desperate plan of granting citizenship to two members of the powerful Malatesta tribe, Giovanni and Malatesta, for the sake of their aid and that of their vassals in the defence of the state and the conduct of the war. This family quickly struck root in the town and gave birth to future tyrants; for in 1237 Giovanni was named podesta, and this office was the first step towards the sovereign power afterwards assumed by his descendants. Meanwhile, Rimini was torn by the feuds of Guelf* and Ghibelline. The latter were the dominant party in the days of Frederick II., although very unpopular on account of the grievous taxes imposed by the empire. Accordingly, the majority of the urban nobles joined the Guelfs and were driven into exile. But before long, as the Swabian power declined in Italy, the Guelf party was again predominant.

Then followed a long period of confusion, in which, by means of conspiracies and crimes of every kind, the Malatesta succeeded in becoming masters and tyrants of Rimini. Giovanni Malatesta had died in 1247 and been succeeded by his son Malatesta, born in r2i2, and surnamed Malatesta da Verrucchio. This chieftain, who lived to be a hundred years old, had ample time to mature his ambitious designs, and was the real founder of his house. Seizing the first suitable moment, he placed himself at the head of the exiled Guelfs, and restored them to Rimini. Then, as the empire acquired fresh strength in Italy, he quietly bided his time and, on the descent of the Angevins, again assumed the leadership of the Guelfs who now had the upper hand for a long time. Being repeatedly elected podesta for lengthy terms of office, he at last became the virtual master of Rimini. Nor was he checked by Rome. Pope Boniface VIII. was fully aware of the rights and traditional pretensions of the Holy See, but preferred to keep on good terms with one who had so largely contributed to the triumph of the Guelfs in Romagna. Accordingly he not only left Malatesta unmolested, but in 1 299 conferred on him fresh honours and estates, so that

his power went on increasing to the day of his death in

1312.

Four sons had been born to Malatesta — Malatestino, Giovanni the Lame, Paolo the Handsome, and Pandolfo; but only the oldest and youngest survived him. Giovanni the Lame (Sciancato), a man of a daring impetuosity only equalled by his ugliness, had proved so useful a general to Giovanni da Polenta of Ravenna as to win in reward the hand of that potentate's beautiful daughter, known to history as Francesca da Rimini. But her heart had been won by the handsome Paolo, her brother-in-law; and the two lovers, being sur- prised by Giovanni, were murdered by him on the spot (1285). This episode of the story of the Malatesta has been immortalized in Dante's Inferno. Giovanni died in 1304. Thus in 13 12 Malatestino became lord of Rimini, and on his decease in 1317 bequeathed the power to his brother Pandolfo.

Pandolfo died in 1326, leaving two heirs, Malatesta and Galeotto. The former was nicknamed Guastafamiglia, because, although at first willing to let his brother share his power, he rid himself by violence and treachery of other : kinsmen who claimed their just rights to a portion of the state. His intent was to become sole lord and to aggrandize his tiny principality. But the reigning pope, Innocent VI., despatched the terrible Cardinal Albornoz to Romagna, and it was speedily reduced by fire and sword. In 1355 the Malatesta shared the fate of the other potentates of the land. Nevertheless, it was the cardinal's policy to let existing governments stand, provided they promised to act in subordination to the papal see. Thus he granted the Malatesta brothers the investiture of Rimini, Pesaro, Fano and Fossombrone, and they arranged a division of the state. Guastafamiglia took Pesaro, which was held by his descendants down to the brothers Carlo and Galeazzo. The former of these, who died in 1439, was father to the Parisina beheaded in Ferrara, whose tragic love story has been sung by Byron. The latter won the title of " ITnetto " (the In- capable) by the foolish sale of his rights over Pesaro to the Sforza in 1447.

Galeotto, on the other hand, retained the lordship of Rimini, ruling tranquilly and on good terms with the popes, who allowed him to add Cervia, Cesena and Bertinoro to his states: Dying in 138s at the age of eighty, he left two sons— Carlo, who became lord of Rimini, and Pandolfo, who had Fano for his share. Carlo (1364-1429) was energetic, valiant and a friend of the popes, who named him vicar of the church in Romagna. He was a patron of letters and the arts, and

during his reign his court began to be renowned for its splendour. As he left no issue, his inheritance was added to that of his brother Pandolfo, and Fano was once more united to Rimini. Pandolfo (1370-1427) had led the life of a condottiere* taking a prominent part in the Lombard wars following on the death of Galeazzo Maria Visconti, and held rule for some time in Brescia and Bergamo. He left three natural sons who were declared legitimate by Pope Martin V. Theeldest, Galeotto (1411-1432), was an ascetic, gave little or no attention to public business, and, dying early, bequeathed the state to his brother Sigis- mondo Pandolfo. The third son, Novello Malatesta (1418-1465) ruled over Cesena.

Sigismondo (1417-1468) is the personage to whom Rimini owes its renown during the Renaissance, of which indeed he was one of the strangest and most original representatives. He was born in Brescia, and when called to the succession, at the age of fifteen, had already given proofs of valour in the field. His knowledge of antiquity was so profound as to excite the admira 7 tion of all the learned men with whom he discoursed, even when, as in the case of Pius II., they chanced to be his personal enemies. To him is due the erection of the church of St Francis, or temple of the Malatesta, one of the rarest gems of the Renaissance and the greatest of Rimini's treasures (see below for description).

Of so dissolute a life that, although married, he had children by several mistresses at the same time, he gave vent to all his passions with a ferocity that was bestial rather than human.

And — as the crowning contradiction of his strange nature— from his youth to the day of his death he remained the devoted lover of the woman for whose sake he became a poet, whom he finally made his wife, and whom he exalted in every way, even to the point of rendering her almost divine honours. Yet this love never availed to check his excesses. On assum- ing power in. 1432, Sigismondo was already affianced to the daughter of Count Carmagnola; but when that famous leader was arraigned as a traitor by the Venetians, and igno- miniously put to death, he promptly withdrew from his engagement, under the pretext that it was impossible to marry the child of a criminal. In fact, he aimed at a higher alliance, for he espoused Ginevra d'Este, daughter of the duke of Ferrara, and his entry into Rimini with his bride in 1434 was celebrated by splendid festivities. In 1437 a son was born to him, but died within the year, and in 1440 the young mother followed it to the grave.: Every one declared that she died by poison administered by her husband; < This, however, was never proved. The duke of Ferrara remained his friend, nor is it

known what motive Sigismondo could have for wishing to get rid of his wife- Two years afterwards he married Polissena, daughter of the famous condottiere Francesco Sforza, who in 1443 bore him a son named Galeotto Roberto. But by this time he was already madly in love with Isotta degli Atti, and this was the passion that endured to his death. The lady succeeded in gaining an absolute ascendancy over him, which increased with time. She bore him several children, but this did not prevent his having others by different concubines. Such being the nature of the man, it is not astonishing that, as his ardour for Isotta increased, he should have little scruple in ridding himself of his second wife. On the 1st June 1450 Polissena died by strangling, and on the 30th of the same month Isotta's offspring were legitimated by Nicholas V,

It is only just to record that, although Malatesta's intrigue with Isotta had long been notorious to all, and he had never sought to conceal it, no one ever accused her of either direct or indirect complicity in her lover's crimes. Isotta's history, however, is a strange one, and opens up many curious questions. She was of noble birth and seems to have attracted Sigismondo's notice as early as r438, for at the age of twenty he produced verses of some merit in praise of her charms. She was indeed widely celebrated for her beauty and intellect, culture, firmness and prudence; and even Pope Pius II. proclaimed her worthy to be greatly loved. When Sigismondo was absent she governed Rimini wisely and well, and proved herself a match for the statesmen with whom she had to deal. The leading poets of the court dedicated to her a collection of verses entitled Isottaei, styled her their mistress and the chosen of Apollo. Artists of renown perpetuated her features on canvas, on marble and on many exquisjte medals, one of which has a closed book graven on the reverse, with the inscription " Elegiae " in allusion to poems she was said to have written. Nevertheless, Yriarte, in his book on the Malatesta and Rimini, asserted that there was documentary evidence to prove that Isotta was unable to sign her own name. But it is not at all surprising that Isotta should have her letters written and signed by another hand, when such was by no means an uncommon practice among the princes and nobilities of her day. Lucrezia Borgia, for instance, frequently did the same. It is besides simply incredible that a woman of the Italian Renaissance of Isotta's birth, standing and reputation should have been unable to write.

Her marriage with Malatesta did not take place until 1456; but of the ardent affection that had long bound them together there are stronger proofs than the lover's juvenile verses, or than even the children Isotta had borne to him. For, more than all else, the temple of St Francis has served to transmit to posterity the history of their loves. Malatesta

decided on building this remarkable church as a thankoff ering for his safety during a dangerous campaign undertaken for Pope Eugenius IV. about the year 1445.

The first stone was laid in 1446, and the work was carried on

with so much alacrity that mass was performed in it by the close of 1450. Sigismondo entrusted the execution of his plans to Leo Battista Alberti, who had to encase in a shell of classic architecture a 13th-century Franciscan church. The original edifice being left intact, it was a difficult question how to deal with the windows and the Gothic arches of the interior. Alberti solved the problem with marvellous skill, blending the old architecture with the new style of the Renaissance, and giving it variety without destroying its unity of effect.

Being eager to adorn his temple with the most precious marbles, Sigismondo's veneration for antiquity did not prevent him from pillaging many valuable classical remains in Rimini, Ravenna and even in Greece. Such was the zeal with which Alberti pursued his task that the exterior of the little Rimini church is one of the finest and purest achievements of the Renaissance, and surpasses in beauty and elegance all the rest of his works. But it is much to be deplored that he should have left the upper part of the facade unfinished. Alberti came to Rimini, made his design, saw the work begun and then left it to be carried out by very skilful artists, on whom he impressed the necessity of faithfully preserving its general character so as " not to spoil that music."

The internal decorations, especially the enormous quantity of wall ornaments, consisting chiefly of scrolls and bas-reliefs, were executed by different sculptors under the personal direction of Malatesta, who, even when engaged in war, sent continual instructions about their work. It is difficult to give an exact idea of this extraordinary church to those who have no personal acquaintance with it. The vault was never finished, and still shows its rough beams and rafters. The eight side chapels alone are complete, and their pointed arches spring from Renaissance pilasters planted on black marble elephants, the Malatesta emblems, or on baskets of' fruit held by children. The surface of the pilasters is divided into compartments encrusted with bas-reliefs of various subjects and styles. Every- where — on the balustrades closing

the chapels, round the base of the pilasters, along the walls, beneath the cornice of both the exterior and the interior of the church — there is one ornament that is perpetually repeated, the interwoven initials of Sigis- mondo and Isotta. This monogram is alternated with the portrait and arms of Malatesta; and these designs are en- wreathed by festoons linked together by the tyrant's second emblem, the rose. The most singular and characteristic feature of this edifice is the almost total absence of every sacred emblem. Rather than to St Francis and the God of the Christians it was dedicated — and that while Sigismondo's second wife still lived — to the glorification of an unhallowed attachment. Nature, science and antiquity were summoned to celebrate the tyrant's love for Isotta. The bas-reliefs of one of the chapels represent Jupiter, Venus, Saturn, Mars and Diana, together with the signs of the zodiac. And these sub- jects are derived, it appears, from a poem in which Sigismondo had invoked the gods and the signs of the zodiac to soften Isotta's heart and win her to his arms. The pageants of Mars and Diana seem to have been suggested by the Trionfi of Petrarch. Elsewhere we see prophets and sibyls, personifications of the theological virtues and of the sciences. The delicate bas-reliefs of botany and medicine, history and astronomy, have been judged by some writers to be Grecian, on account of the ancient appearance of their marble, their inscriptions in Greek and Latin, and others that have never been deciphered. But a moment's examination of the sculptures is enough to destroy this hypothesis. Besides, some of the inscriptions are very easily read and record " Apollo Ariminaeus " and " Jupiter Ariminaeus."

In the first chapel on the left is the family tomb of the Malatesta, with sculptured records of their triumphs and of their alleged descent from Scipio Africanus. Better worthy of notice is the third chapel to the right, known as that of the Angels, on account of the angels and children carved on its pillars. It is nominally dedicated to the archangel Michael, whose statue is enshrined in it; but the figure has the face of

Isotta, the ruling deity of this portion of the church. For here is the splendid and fantastic tomb erected to this lady, during her life and previous to the death of Sigismondo's second wife. No monument, be it remarked, is raised over the burial-place of Ginevra and Polissena. The urn of Isotta's sarcophagus is supported by two elephants, and bears the inscription, " D. Isottae Ariminensi B. M. Sacrum, MCCCCL." The " D." has been generally interpreted as " Divae " and the "B. M." as " Beatae Memoriae." But some, unwilling to credit such profanity, allege that the letters stand for " Bonae Memoriae." Nevertheless, all who have seen the church must admit the improbability of similar

scruples.

The numerous artists employed on the interior of the church were under the direction of the proto-maestro Matteo de Pasti the celebrated medallist. And indeed the peculiar and fantastic character of the sculptures in this chapel frequently recalls the designs of his famous works. All this decoration is in strange contrast with the grandly austere simplicity of the facade and outer walls of the church. There no ornament disturbs the harmony of the lines. The frieze beneath the cornice, re- producing the lovers' initials and the Malatestian ensigns, is in such very low relief that it only enhances the perfection of " that music " produced by the marvellous skill of Alberti. Also the colour of the stone, a soft creamy white, adds to the general beauty of effect. And everything both within and without contributes to the profane and pagan character which it was Sigismondo's purpose to impress on the Christian church. On each of its outer walls are seven arched recesses, intended to contain the ashes of the first literati and scientists of his court. In the first, to the right, is the urn of the poet Basinio, one of his pensioners, in the second that of Giusto de' Conti, author of some rhymes on the Bella Mano, while the third bore the more famous name of Gemisthus Pletho. This well^ known Byzantine philosopher was the diffuser of Platonism in Florence during the time of Cosimo de' Medici, and had faith in the revival of paganism. Returning to his own people, he had died in the Morea. Sigismondo, having gone there in command of the Venetian expedition against the Turks, exhumed the philosopher's bones as holy relics, and brought them to Rimini for worthy sepulture in his Christian pantheon.: AlLthis is solemnly recorded in the inscription, which is dated 1465. The fourth sarcophagus was that of Roberto Valturio (d. 1489), the engineer, author of De Re Militari, who had been Sigismondo's minister and had aided him in the construction of the castle of Rimini. The other urns on this side were placed by Malatesta's successors, and the arches on the left wall remained untenanted.

Sigismondo understood the science of fortification. He was also the first to discard the use of wooden bomb-shells, and substitute others cast in bronze. As a soldier his numerous campaigns had shown him to be possessed of all the best qualities and worst defects of the free captains of his time. He began his military career in 1432 in the service of Eugenius IV.; but, when this pope doubted his good faith and transferred the command to another, he sided with the Venetians against him, though at a later date he again served under him. On the decease of Filippo Maria Visconti in 1447 he joined the Aragonese against Venice and Florence; but, presently changing his flag, fought

valiantly against Alphonso of Aragon and forced him to raise the siege of Piombino. In 1454 he accepted a command from the Sienese; but suddenly, after his usual fashion, he made peace with the enemies of the republic, and had to save himself by flight from arrest for his perfidy. It was then that the letters from Isotta were confiscated. After this he began scheming to hasten the coming of the Angevins, and took part in new and more hazardous campaigns against adversaries such as the duke of Urbino, Sforza of Milan, Piccinino, and, worst of all, the Sienese pope, Pius II., his declared and mortal foe. This time Sigismondo had blundered; for the cause of Anjou was hopelessly ruined in Italy. He was therefore driven to make his submission to the pope, but, again rebelling, was summoned to trial in Rome (1460) before a tribunal of hostile cardinals. All the old charges against him were now revived

and eagerly confirmed. He was pronounced guilty of rapine, incendiarism, incest, assassination and heresy. Consequently he was sentenced to the deprivation of his state (which was probably the main object of the trial), and to be burnt alive as a heretic.

This sentence, however, could not easily be executed, and Sigismondo was only burnt in effigy. But the pope marked the intensity of his hatred by causing the dummy to be carved and dressed with such lifelike resemblance that he was almost able to persuade himself that his hated enemy was really con- sumed in the flames. Malatesta could afford to laugh at this farce, but he nevertheless prepared in haste for a desperate defence (1462). He knew that the bishop Vitelleschi, together with the duke of Urbino and his own brother Novello Malatesta, lord of Cesena, were advancing against him in force; and, being defeated by them at Pian di Marotta, he was driven to Rome in 1463 to again make submission to the pope. This time he was stripped of all his possessions excepting the city of Rimini and a neighbouring castle, but the sentence of excommunication was withdrawn. The once mighty tyrant of Rimini found himself reduced to penury with a state chiefly composed of a single town. He therefore took service with the Venetians, and in 1464 had the command of an expedition to the Morea. Here his movements were so hampered by the interference of the commissioners of the republic that, with all his valour, he could achieve no decisive success. In 1466 he was able to return to Rimini, for Pius II. was dead, and the new pope, Paul II., was less hostile to him. Indeed, the latter offered to give him Spoleto and Foligno, taking

Rimini in exchange; but Malatesta was so enraged by the proposal that he went to Rome with a dagger concealed on his person, on purpose to kill the pope. But, being forewarned, Paul received him with great ceremony, and surrounded by cardinals prepared for defence; whereupon Sigismondo changed his mind, fell on his knees and implored forgiveness. His star had now set for ever. For sheer subsistence he had to hire his sword to the pope and quell petty rebellions with a handful of men. At last, his health failing, he returned to his family, and died in Rimini on the 7th of October 1468, aged fifty-one years. >

He was succeeded, according to his desire, by Isotta and his son Sallustio. But there was an illegitimate elder son by another mother, named Roberto Malatesta, a valiant and unscrupulous soldier. Befriended by the pope, this man undertook to conquer Rimini for the Holy See, but came there to further his own ends instead (20th October 1469), and, while feigning a desire to share the government With Isotta and her son, resolved, sooner or later, to seize it for himself. This aroused the pope's wrath, and Roberto instantly prepared for defence. Finding an ally in the duke of Urbino, whose eyes were now opened to the aggressive policy of the church, he was able to repulse its forces. Paul II. died soon after, and was succeeded by Sixtus IV. Roberto's position was now more secure, and in order to strengthen his recent alliance he betrothed himself to the daughter of the duke of Urbino. The next step was to dispose of his rival kindred. On the 8th of August 1470 Isotta's son was found murdered in a well belonging to the Marcheselli family; and a bloodstained sword, placed in their courtyard by Roberto, made it appear as though they had been guilty of the crime. Towards the end of the same year Isotta died also, apparently of a slow fever, but really, it was believed, by poison. Another of her sons, Valerio, born in r453, still lived, but he was openly put to death by Roberto on a trumped-up charge of treason. In 1475 the new tyrant celebrated his nuptials with the duke of Urbino's daughter, and, being again taken into favour by the pope, valiantly defended him in Rome against the attacks of the duke of Calabria, and died there in r482 of the hardships endured in the war. His widow was left regent during the minority of his son Pandolfo, who was nicknamed Pandolfaccio on account of his evil nature. Directly he was of age, he seized the reins of government by killing some relations who had plotted against him, and crushed another conspiracy in the same way. A

daring soldier, he distinguished himself at the battle of the Taro against the French; but his tyranny made him hated by his subjects. In 1500, when Cesare Borgia fell on Romagna with violence and fraud,

this Malatesta shared the fate of other petty tyrants and ‘had to fly for his life. After the fall of the Borgia he returned, but, being bitterly detested by his people, decided to sell his rights to the Venetians, who had long desired to possess Rimini, and who gave him in exchange the town of Cittadella, some ready money, and a pension for life.

This arrangement was naturally disapproved by Rome, and especially by Julius II.; he therefore contrived the league of Cambray on purpose to ruin the Venetians, who were crush- ingly defeated in 1509. Thereupon the pope, having accom- plished his own ends, made alliance with the Venetians, who were now prostrate at his feet, and, with them, the Spaniards and the Swiss, fought against the French at Ravenna in 1512. Here the French were victors, but owing to their heavy losses and the death of their renowned leader, Gaston de Foix, were compelled to retreat. Thus Julius became master of Rimini and the other coveted lands. Malatesta made more than one attempt to win back his city, but always in vain, for his subjects preferred the papal rule, and in 1528 Pope Clement VII. became definite master of the town. Thus, after two hundred and. fifty years, the sway of the Malatesta came to an end, and Pandolfo was reduced to beggary. He died in 1534, leaving a daughter and two sons in great poverty. The elder, Sigis- mondo, after various military adventures, died at Reggio d’Emilia in 1543; and Malatesta, the younger, went to fight in the Scotch and English wars, and was never heard of again. Sigismondo had left male heirs who made another attempt to regain Rimini in 1555, but Pope Paul IV. declared them deposed in perpetuity in punishment of Pandolfaccio’s mis- deeds.

From that time the Malatesta became citizens of Venice; their names were inscribed in the Golden Book, and they were admitted to the grand council. With the death, in 1716, of Christina Malatesta, the wife of Niccolo Boldu, the Rimini branch of the family became extinct. The descendants of Giovanni, brother of Malatesta da Verrucchio, who married one of the Sogliano, were known as the Sogliano-Malatesta. The representatives of this branch settled in Rome.

The history of Rimini practically ends with its independence. It fell into obscurity under the rule of the popes, and was not again mentioned in history until, in i83r and 1845, it began taking a prominent part in the revolutionary movements against papal despotism and in favour of Italian independence.

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RIMMER, WILLIAM (1816-1879), an American artist, was born in Liverpool, England, on the 20th of February 1816. He was the son of a French refugee, who emigrated to Nova Scotia, where he was joined by his wife and child in 1818, and who in 1826 removed to Boston, where he earned a living as a shoe-maker. The son learned the father’s trade; at fifteen became a draughtsman and sign-painter; then worked for a lithographer; opened a studio and painted some ecclesiastical pictures; in 1840 made a tour of New England painting portraits; lived in Randolph, Mass., in 1845-55 as a shoe- maker, for the last years of the decade practising medicine; practised in East Chelsea and received a diploma from the Suffolk County Medical Society; and in 1855 removed to East Milton, where he supplemented his income by carving busts from blocks of granite. In i860 he made his head of St Stephen (now in the Boston Athenaeum) and in 1861 his ” Falling Gladiator” (since 1880 in the Boston Museum of Fine Arts), which Truman H. Bartlett calls ” the most remarkable

work of sculpture that has yet [1882] been produced in this country . . . powerful, wonderful, but not alluring.” Rimmer’s sculptures, except those mentioned and ” The Fighting Lions” (now in the Boston Art Club), ” A Dying Centaur ” (in the Boston Museum of Fine Arts), and a statue of Alexander Hamil- ton (made in 1865 for the city of Boston), were soon destroyed. He worked in clay, not modelling but building up and chiselling; almost always without models or preliminary sketches; and always under technical disadvantages and in great haste ; but his sculpture is anatomically remarkable and has an ” early-Greek ” simplicity and strength* He published Elements of Design (1864) and Art Anatomy (1877), but his great work was in the class-room, where his lectures were illustrated with blackboard sketches. His studies in line suggest William Blake in their imaginative power. He died on the 20th of August 1879.

See Truman H. Bartlett, The Art Life of William Rimmer (Boston, 1882). ■

RIMSKY-KORSAKOV, NICOLAS ANDREIEVICH (1844- 1908), Russian composer, was born at Tikhvin, Novgorod, on the 18th (N.S.) of March 1844. He was one of the musical amateurs who, with Borodin, Cui and Moussorsky, gathered round Balakirev in St Petersburg in the days when Wagner was still unknown. By 1865 he had written a symphony (in E minor) which in that year was performed — the first by a Russian composer — under Balakirev's direction, and in 1873 he definitely retired from the navy, having been appointed a professor in the St Petersburg Conservatoire. The same year witnessed his marriage to a talented pianist, Nadejda Pourgold, and the production of his first opera, Pskovitianka. This was followed by May Night (1878), The Snow Maiden (1880), Mlada (1892), Christmas Eve (1894), Sadko (1895), Mozart and ' Salieri (1898), The Tsar's Bride (1899), Tsar Saltana (1900), Servilia (1902), Kostchei the Immortal (1902), Kites (1905). But his operas attracted less attention abroad than his symphonic compositions, which show a mastery of orchestral effect combined with a fine utilization of Russian folk-melody and a happy feeling for " programme music," his writing being peculiarly individual and distinctive in its restraint and avoidance of violent methods. Notable among these works are his first symphony, his second (Op. 9) Antar, his third (Op. 32), and his orchestral suites and overtures, his Spanish Capriccio (1887) being particularly appreciated. He also wrote a number of beautiful songs, pianoforte pieces, &c, and he eventually took Balakirev's place as the leading conductor in St Petersburg, never sparing himself in assisting in the musical development of the Russian school. He died there on the 20th of June iooSj

RINDERPEST (German for " cattle-plague," which is the English synonym), one of the most infectious and fatal diseases of oxen, sheep, goats, camels, buffaloes, yaks, deer, &c; a virulent eruptive fever which runs its course so rapidly and attacks such a large percentage of ruminants when it is intro- duced into a country, that from the earliest times it has ex- cited terror and dismay. It is an Asiatic malady, and has prevailed extensively in south Russia, central Asia, China, Indo-China, Burma, India, Persia, Ceylon and the Malay Archipelago. Thence it has at times been carried into Europe, and towards the end of the 19th century into South Africa. It appeared in Egypt' in 1844 and 1865, Abyssinia in 1890, Japan in 1892, and the Philippines in 1898.

It has been noted that its irruptions into Europe in the earlier centuries of our era always coincided with invasions of barbarous tribes in the east of Europe; and even at a later period the disease accompanied the events of war, when troops with their commissariat

moved from the east towards the west, or cattle, when they were carried in the same direction. One of the earliest recorded irruptions of cattle-plague into western Europe occurred in the 5th century after the sanguinary in- vasion of the Huns under Attila, the expulsion of the Goths from Hungary, and the fierce internecine wars of the whole Germanic population. The disease appears then to have been carried from Hungary through Austria to Dalmatia, while

by Brabant it obtained access to the Low Countries, Picardy, and so on to the other provinces of France. In the curious poem De Mortibus Bovum written by St Severus, who lived at that period, the course and destructiveness of the disease are specially alluded to. Many invasions of Europe are de- scribed, and in several of these Britain was visited by it— as in 809-10, 986-87, ‘1223-25, 1513-14, and notably in 1713, i 74Sj 1 774i I799 I Q 1865 and 1872 it was imported direct from Russia. In 1870-71 it destroyed 70,000 cattle in France, 30,000 in Alsace-Lorraine, and 10,000 in Germany. In England an outbreak occurred in 1877, when it was imported from Germany, where the disease continued until 1879.

The infective agent has not been positively identified, but it is known to exist in all the various secretions and excretions, in the flesh, blood and various organs of the body. Contagion may be direct or indirect, and the disease may be conveyed to healthy cattle by contaminated fodder, litter, water, clothing, pasture, sheds, railway wagons, hides, horns and hoofs. Attend- ants, cats, dogs, birds, vermin and flies may spread the infection. Definite symptoms of the disease may not be recognized until the expiration of three to six days after exposure, the period of incubation.

Symptoms. — Like some other general diseases, this does not offer any exclusive or pathognomonic symptoms, but is rather characterized by a< group of functional and anatomical altera- tions. An exact knowledge of its symptoms and necroscopical appearances is of the utmost importance, as its extension and consequent ravages can only be arrested through its timely recognition and the immediate adoption of the necessary sanitary measures. Intense fever, diarrhoea or dysentery, croupous in- flammation of the mucous membranes in general, sometimes a cutaneous papular eruption, and great prostration mark the course of the affection, which is frequently most difficult to diagnose during life, especially if its presence is not suspected. Its introduction and mode of propagation can, in many instances, be ascertained only at a late period, and when great loss may already have been sustained. In . the majority of cases the examination of the carcase of an animal which has died or been

purposely killed is the best way to arrive at a correct diagnosis. Indeed, this is practically the only Certain means of concluding as to the presence of the malady, as there are considerable varia- tions in the chief symptoms with regard to their intensity as well as in the secondary symptoms or epiphenomena.

Among cattle indigenous to the regions in which this malady may be said to be enzootic the symptoms are often compara- tively slight, and the mortality not great. So much is this the case that veterinary surgeons who can readily distinguish the disease when it affects the cattle of western Europe, can only with difficulty diagnose it in animals from Hungary, Bessarabia, Moldavia, or other countries where it is always more or less prevalent. In these the indications of fever are usually of brief duration, and signs of lassitude and debility are, in some in- stances, the only marks of the presence of this virulent disorder in animals which may, nevertheless, communicate the disease in its most deadly form to the cattle of other countries. Slight diarrhoea may also be present, and a cutaneous eruption, accompanied by gastric disturbance, running at the eyes, and occasional cough. In the more malignant form the fever runs high, 106 to 107° Fahr., and all the characteristic symptoms are well marked: dulness, sunken eyes, eruption on the skin, discharges from eyes, nose and mouth, shivering fits, difficult breathing, dry, harsh cough, miliary eruptions on the gums, accumulation of bran-like exudate within the lips, fetid breath, with certain nervous phenomena, and dysenteric dejections. Death generally occurs in four or five days, the course of the disorder being more rapid with animals kept in sheds than with those living in the open, and in summer than in winter. The post-mortem appearances are most marked in the digestive canal, and comprise red spots and erosions on the palate, lips, tongue and pharynx; intense congestion of the lining of the fourth stomach, which in places is covered with a grey or reddish pultaceous deposit, under which the membrane is deeply

ulcerated. Similar lesions are seen in the small intes- tine, caecum and rectum. The membrane lining the air passages is congested throughout, and the lungs are emphy- sematous. -‘ . ...’”

In recent years much has been done in Russia and India towards the prevention of rinderpest by inoculation and the use of immunizing sera. In South Africa the bile method (or the injection of bile obtained

from cattle. dead of rinderpest), discovered by K,bch, in 1896; bile with adrnixture of glycerine, recommended by Edington; the simultaneous injection ‘6f serum and rinderpest blood, introduced by Turner and Kolle in 1897, and repeated injection of fortified serum atone, have been employed, more or less successfully, in conferring immunity. But elsewhere the main line of action has been in the direction of preventing the introduction of the disease by prohibiting the importation of cattle from infected countries.

RING (O.E. hring; a word common to Teutonic languages, 1 and probably cognate with the Lat. circus, Gr. dpKos or KpUos, Skt. chakrti, wheel, circle, cf. also ” harangue “), in art, a band of circular shape of varying sizes, made of any material and used for various purposes, but, particularly, a circular band of gold, silver or other precious or decorative material used as an orna- ment, not only for the finger, but also for the ear (see Earring), or even for the nose, where it is still worn by certain races in India and Africa. The word is also used of many objects which in structure take the shape of a circle or hoop, such as the tracheal rings, the circular-shaped bands of cartilage in the walls of the windpipe, the “annual rings,” or concentric layers of wood produced each year in the trunks of trees, &c. In transferred senses ” ring ” is also applied to an enclosed space, whether circular, oval or otherwise: hence to the arena of a circus or hippodrome, the enclosure for a boxing contest, or to the place on a racecourse reserved for the bookmakers for the purpose of betting. A particular application in a transferred sense is that to a combination of persons in trade for the purpose of con- trolling markets, prices, etc.

In the art Sense (see also Gems), the English and German “ring” corresponds to the Gr. Sa/crfrXios, Lat. annulus, Fr. anneau. The enlarged part of a ring on which the device is engraved is called the ” bezel,” the rest of it being the ” hoop.” To decorate the human finger with a ring, if possible with one combining beauty, value and a distinctive character, was a widely spread natural impulse. At an early period, when the art of writing was known to but very few, it was commonly the custom for men to wear rings on which some distinguishing sign or badge was engraved (iiri&i)iiov) , so that by using it as a seal the owner could give a proof of authenticity to letters or other documents. Thus, when some royal personage wished to delegate his power to one of his officials, it was not unusual for him to hand over his signet ring, by means of which the full royal authority could be given to the written commands of the subordinate (cf. Gen. xli. 42; Esth. viii. 2). Among the Battas of Sumatra rings of a certain form are used to this day as passports.

The earliest existing rings are naturally those found in the tombs of ancient Egypt. The finest examples date from about the XVIIIth to the XXth Dynasty; they are of pure J%L gold, simple in design, very heavy and massive, and have

usually the name and titles of the owner deeply sunk in hieroglyphic characters on an oblong gold bezel. Rings worn in Egypt by the poorer classes were made of less costly materials, such as silver, bronze, glass or pottery covered with a siliceous glaze and coloured brilliant blue or green with various copper oxides. Some of these had hieroglyphic inscriptions impressed while the clay was moist. Other examples have been found made of ivory, amber and hard stones, such as carnelian. Another form of ring used in the Xllth and subsequent dynasties of Egypt had a scarab in place of the bezel, and was mounted on a gold hoop which passed thrpugh the hole in the scarab and allowed it to revolve.

1 ” To ring,” in the sense of to make a bell sound, is a different word. It also appears in various Teutonic languages and is pro- bably of onomatopoeic origin, and may be akin to Lat. clangor.

Cylin- ders.

In ancient Babylonia and Assyria finger rings do not appear to have been used. In those countries the signet took a different form, namely, that of a cylinder cut in crystal or other hard stone, and perforated from end to end. A cord was passed through it, and it was worn on the wrist like a bracelet. This way of wearing the signet is more than once alluded to in the Old Testament (Gen. xxxviii. 18, R.V., and Cant. viii. 6).

Within the limits necessarily imposed by its purpose the finger ring assumed a considerable variety of form, according to its date and place of origin.

In the Cretan and Mycenaean periods a characteristic form of ring had a broad flat bezel, not organically connected with the hoop, and having an incised design in the gold. The use of inset stones hardly occurs, but rings from Enkomi and Aegina of the late Mycenaean period have inset paste decorations. • The Phoenician type of ring was primarily intended to carry a scarab or scarabaeoid, usually in a box setting on a swivel, called for by the fact that the flat base of the scarab would be wanted for sealing purposes, but in wear would be most con- veniently turned inwards. Strength being necessary, the hoop became massive, A similar arrangement of the signet-scarab is

found attached to a twisted ring, which, from its shape, must have been meant to be suspended, and which is shown thus worn on some of the Cypriote terra-cottas.

The Greek ring of an early period has a characteristic flattened bezel, for an intaglio design in the gold. Such engravings attained great freedom and beauty in the 5th and 4th centuries B.C. An alternative form was a swivel ring for a scarab or scarabaeoid, imitating the Phoenician shape. When the stone was flat and inset the bezel became a mass of metal to hold it securely.

Among the Greeks signet rings were very largely worn. In Sparta a sumptuary law was passed at an early time to forbid any substance more valuable than iron to be used for signet rings; but in other parts of the Hellenic world there appears to have been no restriction of this sort. In some of the numerous tombs of Etruria and Kertch (Panti-capaeum) in the Cimmerian Bosphorus gold rings of great magnificence have been discovered, apparently of the finest Greek workmanship.

Greek rings.

Fig. i. 2

Fig. 2.

Fig. 1 shows a ring from the Crimea with a finely engraved scarabaeus in gold, with an intaglio engraving on the base.

Fig. 2, also from the. Crimea, has a cornelian carved in lion form in place of the scarab, and has an intaglio figure on the base of a running lion.

Fig. 3. Fig. 4.

Fig. 3 shows a Greek ring with an incised design in a plain bezel.

Fig. 4 is a ring from which the idea of a signet is entirely wanting.

2 Figs. 1-6, 8 and 9 are from Dr Robert Forrer's Reallexikon, by permission of W. Spemann, Berlin and Stuttgart.

The Etruscans used very largely the gold swivel ring mounted with a

scarab, a form of signet probably introduced from Egypt. Some found in Etruscan tombs have real

■an rings.

Etruscan £gypjj an scar abs with legible hieroglyphs; others,

Fig. 5. rigid bezel. In either

Roman rings.

probably the work of Phoenician or native engravers, have rude copies of hieroglyphs, either quite or partially illegible. A third and more numerous class of Etruscan signet rings have scarabs, cut usually in sard or carnelian, which are a link ■between the art of Egypt and that of Greece, the design cut on the flat side being Hellenic in style, while the back is shaped like the ordinary Egyptian scarabaeus beetle. One from Etruria, now in the British Museum, is formed by two minutely modelled lions whose bodies form the hoop, while their paws hold the bezel, a scarab engraved with a lion of heraldic character. An alternative type of Etruscan ring (as in fig. 5) has an incised design on the gold [bezel, or a flat stone set in the case the Etruscan rings tend to ex- travagance in size and elaboration.

The Romans appear to have imitated the simplicity of Lacedaemonia. Throughout the republic none but iron rings were worn by the bulk of the citizens, and even these were forbidden to slaves. Ambassadors were the first who were privileged to wear gold rings, and then only while performing some public duty. Next senators, consuls, equites and all the chief officers of state received the jus annuli aurei. In the Augustan age many valuable collections of antique rings were made, and were frequently offered as gifts in the temples of Rome. One of the largest and most valuable of the dactyliothecae was dedicated in the temple of Apollo Palatinus by Augustus's nephew Marcellus (Pliny, H.N. xxx vii. 5). The temple of Concord in the Forum contained another; in this collection was the celebrated ring of Polycrates, king of Samos, the story of which is told by Herodotus; Pliny, however, doubts the authenticity of this relic (H.N. xxxvii. 2).

Different laws as to the wearing of rings existed during the empire: Tiberius made a large property qualification necessary for the wearing of gold rings in the case of those who were not of free descent (Pliny, H.N. xxxiii. 8) ; Severus conceded the right to all Roman soldiers; and later still all free citizens possessed the jus annuli aurei, silver rings being worn by freedmen and iron by slaves. Under Justinian even

these restrictions passed away.

In the rings of the Roman period the decoration is no longer an accessory of the bezel alone. It modifies the form of the hoop, which may be polygonal or angular (see fig. 6). The ring here figured is set with an eye, as an amulet, capable of turning on a swivel.

In the 3rd and 4th centuries Roman rings were made en- graved with Christian symbols. Fig. 7 shows two silver rings of the latter part of the 4th century which were found in 1881 concealed in a hole in the pavement of a Roman villa at Fifehead

iˆACClWh

Fig. 6.

Fig. 7. — Roman silver Fig. 8.

rings.

Neville, Dorset, together with some coins of the same period. Both have the monogram of Christ, and one has a dove within an olive wreath rudely cut on the silver bezel. These rings are of special interest, as Roman objects with any Christian device have very rarely been found in Britain.

Fig. 8 is a choice example of a gold key-ring of the Christian

period, with good wishes inscribed in pierced gold work- dulcis, multis annis (Brit. Mus.).

-accipe

Part of Fig. 9.

Part of Fig. 9.

Celtic rings.

Fig. 9 is a gold ring from Smyrna (Brit. Mus.) with seven incised intaglio medallions, with a figure of Christ on the bezel. Assigned to the 5th century.

Large numbers of gold rings have been found in many parts of Europe in the tombs of early Celtic races. They are usually of very pure gold, often penannular in form — with a slight break, that is, in the hoop so as to form a spring. They are often of gold wire formed into a sort of

rope, or else a simple bar twisted in an ornamental way. Some of the quite plain penannular rings were used in the place of coined money.

Throughout the Middle Ages the signet ring was a thing of great importance in religious, legal, commercial and private matters.

The episcopal ring 1 was solemnly conferred upon the newly made bishop together with his crozier, a special formula for this being inserted in the Pontifical. In the earliest references to rings worn by bishops, there is nothing JJ/itom. to distinguish them from other signet rings. In a.d. 610 the first mention has been found of the episcopal ring as a well-understood symbol of dignity. It is clear that it was derived from the signet. It was only in the 12th century and onwards that it was brought into mystical connexion with the marriage ring. In the time of Innocent III. (1194) the ring was ordered to be of pure gold mounted with a stone that was not engraved; but this rule appears not to have been strictly kept. Owing to the custom of burying the episcopal ring in its owner's coffin, a great many fine examples still exist. Among the splendid collection of rings formed by the dis- tinguished naturalist Edmund Water- ton, and now in the South Kensington Museum, is a fine gold episcopal ring decorated with niello, and inscribed with the name of Alhstan, bishop of Sherborne from 824 to 867 (see fig. 10). In many cases an antique gem Fig. 10.— Ring of Bishop was mounted in the bishop's ring, and s an "

often an inscription was added in the gold setting of the gem to give a Christian name to the pagan figure. The monks of Durham, for example, made an in- taglio of Jupiter Serapis into a portrait of St Oswald by adding the legend capvt s. oswaldi. In other cases the engraved gem appears to have been merely regarded as an ornament with- out meaning — as, for example, a magnificent gold ring found in the coffin of Seffrid, bishop of Chichester (1125-1151), in which is mounted a Gnostic intaglio. Another in the Water- ton collection bears a Roman cameo in plasma of a female head in high relief; the gold ring itself is of the 1 2th century. More commonly the episcopal ring was set with a large sapphire, ruby or other stone cut en cabochon, that is, without facets, and very magnificent in effect (see fig. 11). It was

1 See a paper by Edm. Waterton in Arch. Jour. xx. p. 224, also Cabrol, Diet, d'arch. chretienne, s.v. " Anneaux."

Fig. 11. — 13th-century episcopal ring of Italian workmanship, of gold, set with a sapphire en cabochon.

worn over the bishop's gloves, usually on the forefinger of the right hand; and this accounts for the large size of the hoop of these rings. In the 15th and 16th centuries bishops often wore three or four rings on the right hand in addition to a large jewel which was fixed to the back of each glove.

The papal " Ring of the Fisherman " (annulus piscatoris) bears the device of St Peter in a boat, drawing a net from "Rlngot the water. The first mention of it, as the well-under- the stood personal signet ring of the pope, that has been

Fisher- found, occurs in a letter of Clement IV. in 1265. man. After the middle of the 15th century it was no longer

used as the private seal of the popes, but was always attached to briefs. After the death of a pope the ring is broken. A new ring with the space for the name left blank is taken into the con- clave, and placed on the finger of the newly elected pontiff, who thereupon declares what name he will assume, and gives back the ring to be engraved (see Waterton, Archaeologia, 40, p. 138). The so-called papal rings, of which many exist dating from the 15th to the 17th

centuries, appear to have been given

by the popes to new-made cardinals. They are very rings. large thumb rings, usually of gilt bronze coarsely

worked, and set with a foiled piece of glass or crystal. On the hoop is usually engraved the name and arms of the reigning pope, the bezel being without a device. They are of little intrinsic value, but magnificent in appearance.

The giving of a ring to mark a betrothal was an old Roman custom. The ring was probably a mere pledge, pignus, that Betrothal tne contract would be fulfilled. In Pliny's time and conservative custom still required a plain ring of iron,

wedding but the gold ring was introduced in the course of the rings. 2n(j cen (; Ur y_ This use of the ring, which was thus

of purely secular origin, received ecclesiastical sanction, and formulae of benediction of the ring exist from the nth century. The exact stages by which the wedding ring developed from the betrothal ring can no longer be traced.

Gemel or gimmel rings, from the Latin gemellus, a twin, were made with two hoops fitted together, and could be worn

either together or singly; they were common in the rings. I ˆ t ' 1 an d i7 tn centuries, and were much used as

betrothal rings. Posy rings, so called from the " poesy " or rhyme engraved on them, were specially common in the same centuries. The

name " posy ring " does not occur earlier than the 16th rings. century. A posy ring inscribed with " Love me

and leave me not " is mentioned by Shakespeare {Mer. of Ven., act v. sc. 1). The custom of inscribing rings with mottoes or words of good omen dates from a very early time. Greek and Roman rings exist with words such as zhcaic, xaipe, kaah, or votis meis Claudia vivas. In the Middle Ages many rings were inscribed with words of cabalistic power, such as anam zapta, or Caspar, Melchior and Balthasar, the supposed names of the Magi. In the 17th century they were largely used as wedding rings, with such phrases as " Love and obaye," " Fear God and love me," " No gift can show the love I owe," " God above increase our love " or " Mulier viro subjecta esto." In the same century memorial rings with a name and date of death were frequently made

of very elaborate form, en-

amelled in black and white; a not unusual design was rings'! two skeletons bent along the hoop, and holding a

coffin which formed the bezel. Cramp rings were much worn during the Middle Ages as a preservative against cramp. They derived their virtue from

being blessed by the king; a special form of service rings? was use d Ior tn i s > an < l a l ar ge number of rings were

consecrated at one time, Usually when the sovereign

touched patients for the king's evil.

Decade rings were not uncommon, especially in the 15th

century; these were so called from their having ten knobs

along the hoop of the ring, and were used, after the Decade 6 , . . , . .

rims, manner of rosaries, to say nine aves and a paternoster.

In some cases there are only nine knobs, the bezel

of the ring being counted in, and taking the place of the gaude

in a rosary. The bezel of these rings is usually engraved with a sacred monogram or word.

In the 15th and 16th centuries signet rings engraved with a badge or trademark were much used by merchants and others; these were not only used to form seals, but Mer- the ring itself was often sent by a trusty bearer as chants' the proof of the genuineness of a bill of demand. 1 rlags ' At the same time private gentlemen used massive rings wholly of gold with their initials cut on the bezel, and a graceful knot of flowers twining round the letters. Other fine gold rings of this period have coats of arms or crests with graceful lambrequins.

Poison rings with a hollow bezel were used in classical times; as, for example, that by which Hannibal killed himself, and the poison ring of Demosthenes. Pliny records that, after Crassus had stolen the gold treasure from under rings? the throne of Capitoline Jupiter, the guardian of the shrine, to escape torture, " broke the gem of his ring in his mouth and died immediately." The medieval anello della morte, supposed to be a Venetian invention, was actually used as an easy

method of murder. Among the elaborate ornaments of the bezel a hollow point made to work with a spring was concealed; it communicated with a receptacle for poison in a cavity behind, in such a way that the murderer could give the fatal scratch while shaking hands with his enemy. This device was probably suggested by the poison fang of a snake.

A very large and elaborate form of ring is that used during the Jewish marriage service. Fine examples of the 16th and 17th centuries exist. In the place of the bezel is a model, minutely worked in gold or base metal, of a rinxs W building with high gabled roofs, and frequently movable weathercocks on the apex. This is a conventional representation of the temple at Jerusalem.

Perhaps the most magnificent rings from the beauty of the workmanship of the hoop are those of which Benvenuto Cellini produced the finest examples. They are of gold, richly chased and modelled with caryatides or grotesque figures, and are decorated with coloured enamels in a very skilful and elaborate way. Very fine jewels are sometimes set in these magnificent pieces of 16th-century jewellery.

Thumb rings were commonly worn from the 14th to the 17th century. Falstaff boasts that in his youth he was slender enough to ” creep into any alderman’s rinˆ b thumb ring” (Shakes., Hen. IV., Pt. I., act ii. sc. 4).

The finest collections of rings formed in Britain have been those of Lord Londesborough, Edmund Waterton (now in the Victoria and Albert Museum) and the collection in the British Museum, which was greatly augmented in 1897 by the bequest of the late Sir A. W. Franks.

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RING-GOAL, a game for two persons played on a ground, or indoor rink, 78 ft. long by 10 ft. wide, with a ring of split cane about i\ in. in diameter and weighing about 35 oz., which is propelled in the air by means of two sticks, resembling miniature billiard-cues, which are held inside the ring. The goals consist of two uprights 8 ft. high and 10 ft. apart, from which a net is stretched on an incline, so that its

base will be a few feet behind the goal-line, and the object of the game is to drive the ring into these goals, each goal made scoring one point. The ring must be propelled by the server and caught by his opponent, on one or both of his sticks, if he can, and so returned alternately, and a point is scored for either player if it be stopped by his opponent in any other manner. A point is also scored for the receiver if the server, who begins the game, throw the ring so that it falls to the ground before

1 The celebrated ring given to Essex by Queen Elizabeth was meant to be used for a similar purpose. It is set with a fine cameo portrait of Elizabeth cut in sardonyx, of Italian workmanship.

the receiver can catch it between the creases, which are lines drawn across the court 6 ft. from the goal-lines, or the ring be driven out of court. Eleven points constitute a game. Ring-goal was invented by an under-graduate of Keble College, Oxford, about 1885, and was played at Oxford, but without attracting any wide popularity.

RING WOOD, a market town in the New Forest parliamentary division of Hampshire, England, 1035 m. S.W. by W. from London by the London & South- Western railway. Pop. (1901) 4629. It lies pleasantly on the river Avon, which here divides into numerous branches, flowing through flat meadow land. The church of SS. Peter and Paul, which was almost entirely reconstructed in 1854, the town hall and corn exchange are the chief buildings. A large agricultural trade and manufactures of agricultural implements, linen goods and woollen gloves are carried on.

RINGWORM (or Tinea Tonsurans), a disease of the scalp (especially common within the tropics); it consists of bald patches, usually round, and varying in diameter from half an inch up to several inches, the surface showing the broken stumps of hairs and a fine whitish powdering of desquamated epidermic scales. In scrofulous subjects matter is sometimes produced, Which forms crusts, or glues the hair together, or otherwise obscures the characteristic appearance. The disease is due to a parasite, Trichophyton tonsurans, which exists mostly in the form of innumerable spores (with hardly any mycelium), and is most abundant within the substance of the hairs, especially at their roots. If a piece of the hair near the root be soaked for a time in dilute liquor potassae and pressed flat under a cover-glass, the

microscope will show it to be occupied by long rows of minute oval spores, very uniform in size, and each bearing a nucleus.

The same fungus sometimes attacks the hairs of the beard, producing a disease called ” sycosis.” Sometimes it invades the hairless regions of skin, forming “tinea circinata “; circular patches of skin disease, if they be sharply defined by a margin of papules or vesicles, may be suspected of depending on the tinea-fungus. Interesting varieties of tinea are found in some of the Pacific and East Indian islands. Among the best remedial agents are various mercurial preparations. But in modern practice much success has been found in X-raying the patch in order to remove the dead and diseased hairs, thus leaving a free channel for the passage of antiseptic applications to the follicles. The exposures are followed by inunction of a mercurial preparation or of a lotion of tincture of iodine with methylated spirit.

See also Favus.

RINTOUL, ROBERT STEPHEN (1787-1858), British journalist, was born at Tibbermore, Perthshire, in 1787, and educated at the Aberdalgie parish school. After serving his apprenticeship to ,the printing trade he became the printer and subsequently the* editor of the Dundee Advertiser. In 1826 he came to London, and in July 1828, with the assistance of friends, founded The Spectator. In it Rintoul strongly supported the Reform Bill, and to him was due the catch-phrase ” The bill, the whole bill, and nothing but the bill.” After conducting The Spectator for more than thirty years, he sold it shortly before his death, which occurred on ■ the 22nd of April 1858.

RINUCCINI, GIOVANNI BATTISTA (1302-1653), archbishop of Fermo, was born in Rome on the 15th of September 1502, being the son of a senator. He studied at several Italian universities, became chamberlain to Pope Gregory XV., and in 1625 was made archbishop of Fermo. His participation in Irish politics, which is his chief title to fame, began during the later stages of the Civil War when Ireland was the scene of universal disorder. In 1645 Pope Innocent X. despatched him to that country as papal nuncio; he landed at Kenmare with arms and money in October 1645, and took up his residence at Kilkenny. Before this time the Roman Catholics had banded themselves together for defence. Called the Confederate Catholics, they had set up a provisional government, and when

the nuncio reached Kilkenny they were engaged in negotiating for peace with the lord lieutenant, the marquess, afterwards duke, of Ormonde. Rinuccini took part in the proceedings, but as his demands

were ignored he refused to recognize the peace which was concluded in March 1646, and gaining the support of the Irish general, Owen Roe O'Neill, he used all his influence, both ecclesiastical and political, to prevent its acceptance by others. To a large extent he succeeded.' Meet- ing at Waterford, the clergy condemned the treaty and several towns took up the same attitude. The nuncio's most pliant helper was now Edward Somerset, earl of Glamorgan, after- wards marquess of Worcester, who had been sent to Ireland by Charles I., and who had entered into communication with Rinuccini when the latter first arrived in that country. Gla- morgan bound himself to carry out all the wishes of the nuncio, who intended that he should supplant Ormonde. In September 1646 Rinuccini took over the conduct of affairs. He im- prisoned his opponents on the council and tried to arrange for an attack on Dublin. But there was no harmony among his subordinates, his military plans failed and soon all parties were tacitly ignoring him. Leaving Kilkenny he stayed for some time in Galway, and in February 1649 he left Ireland. After visiting Rome he returned to Fermo in 1650 and died on the 5th 'Of December 1653.

See G. Aiazzi, La Nunziatura in Mania (Florence 1844), English translation as The Embassy in Ireland, by A.'Hutton (Dublin, 1873) ; and S. R. Gardiner, History of the Great Civil War, vols. iii. and iv.

(1905)-

RIOBAMBA or Royabamba, a town of Ecuador, capital of the province of Chimborazo, on the railway between Guaya- quil and Quito, about 85 m. E.N.E. of the former. Pop. (1900, estimate) 12,000. It stands in a barren, sandy basin of the great central plateau, drained by the Chambo, a tributary of the Pastaza, on the old road running southward from Quito into Peru, 9039 ft. above sea-level, and in full view of the imposing heights of Chimborazo, Carahuairazo (Carguairazo), Tunguragua and Altar. Though 300 ft. lower than Quito, its climate is considerably colder, owing, perhaps, to its more exposed situation and the vicinity of so many snow-clad peaks, It is a town of unusually wide streets and one-storeyed adobe houses, being so laid out and built because of earthquakes. It has very little importance as a commercial or industrial centre, having only a small trade and a few unimportant in- dustries. The present town dates from 1797, when the great earthquake of that year destroyed the old town then situated 12 m. W., near the existing village of Cajabamba. The ruins of the old town indicate that it was much larger and finer than its successor.

RIO CUARTO, a town of Argentina in the province of Cordoba, 119 m.

S. of the city of that name, and about 500 m. N.W. of Buenos Aires. Pop. (1904, estimate) 12,000. It stands 1440 ft. above sea-level and about half-way across the great Argentine pampas; on the banks of a river of the same name which finds an outlet through the Carcarafial into the Parana near Rosario. The town is built on the open plain and is surrounded with attractive suburbs. It is the commercial centre of a large district and has a large and lucrative trade. Its geographical position gives it great strategical importance, arid the government maintains here a large arsenal and a garrison of the regular army. The surrounding country belongs to the partially arid pampa region and is devoted to stock- raising — cattle, horses, sheep and goats. Irrigation is em- ployed in its immediate vicinity. Previous to 1872 this region was overrun by the Ranqueles, a warlike tribe of Indians, but the vigorous reprisals of General Ivanovski in that year, supplemented by the tactful intervention of the Franciscan missionaries, who have a convent in this town, put an end to these hostile forays and gave full opportunity for the industrial development of the country. There are some manufacturing industries in the town. The National Andine railway passes through Rio Cuarto, and branch lines connect with the Buenos Aires and Pacific line — all of which give railway communication

with Buenos Aires, Rosario, Tucuman, Cordoba, San Luis and Mendoza.

RIO DE CONTAS, or Villa de Contas, a town of Brazil in the state of Bahia, 230 m. S.W. from the city of Bahia, on the Brumado (Contas-Pequeno), a head stream of the Rio de Contas (Jussiape), which rises on the eastern slope of the neigh- bouring Serra das Almas, and flows S.E. and E. to the Atlantic coast at Barra do Rio de Contas. Pop. (1890), including rural districts, 17,318. The surrounding country is fertile and produces sugar, cotton, mandioca and tobacco, but has lost much of its prosperity through the droughts that have devastated the interior of the state, and because of the costs of transporting produce to market. Stock-raising was at one time an important industry here. The town was founded in 1715 by some ” Paulistas ” who discovered gold there in the sands of the river. It became a ” villa ” in 1724, but was soon afterward moved down the river 5 m. to a more convenient site on the high road between Bahia and Goyaz.

RIO DE JANEIRO, a maritime state of Brazil, bounded N. by Minas

Geraes, E. by Espirito Santo and the Atlantic, S. by the Atlantic, and W. by Sao Paulo. It is one of the smaller states of the republic and has an area of 26,635 sq.m.; pop. (1900) 926,585. The state is traversed longitudinally by the Serra do Mar, which divides it into a low, narrow, irregular coastal zone, and a broad elevated river valley through which the Parahyba flows eastward to the Atlantic. The eastern part of this valley widens out into a great alluvial plain on which are to De found some of the richest sugar estates of Brazil. The central mountainous region is heavily wooded, the coast region is hot and in places malarial, but the valleys are fertile and well watered. The Parahyba valley has long been celebrated for its fertility, and was for many years the centre of the coffee-producing industry. The exhaustion of the soil and antiquated methods of cultivation have caused a great decline in this industry, and many of its coffee plantations are now either abandoned or are producing but a fraction of earlier crops. Stock-raising has been slowly developing since the abolition of slavery (1888) and the decline in coffee pro- duction, and the state now possesses large herds of cattle and droves of swine.

The state's agricultural and pastoral products are coffee, sugar, rum, Indian corn, mandioca (both bitter and sweet), cotton, tropical fruits, cattle, hogs, butter, cheese, fresh milk and lard. The state is well watered by the Parahyba (q.v.) and its tributaries and by numerous short streams flowing from the Serra do Mar to the coast. Manufacturing has been developed largely because of the fine water power supplied by the mountain streams, and among the manufactures are cotton, woollen, silk and jute fabrics, brick, tile and rough pottery, sugar, rum, vehicles, furniture, beer and fruit conserves. The state is well provided with railways, which include the Central do Brazil, Leopoldina, Melhoramentos and Rio do Ouro. The Central line runs from the city of Rio de Janeiro N.N.W. across the Serra do Mar to the Parahyba valley, where it divides into two branches at the station of Barra do Pirahy, one running westward to Sao Paulo, and the other eastward and northward into Minas Geraes. Besides these there are a number of short railways called the Theresopolis, Uniao Valen- ciana, Rio das Flores, Bananal, and Vassourense lines. The total extension of these railways in the state in 1907 was 1445 m. Other than Nictheroy, the ports of the state are Sao Joao da Barra, Macahe' or Imbetiba, Cabo Frio and Paraty, but they are visited only by the smaller coasting vessels.

The capital of the state is Nictheroy on the E. side of the Bay of Rio de Janeiro, and other cities and towns, with their populations in 1890 except where otherwise stated, are: Campos (estimate, in 1907, 35,000), on the lower Parahyba in the midst of a rich sugar-producing

region; Rio Bonito (19,321); Ita- borahy (17,817); Barra Mansa (14,449), on the upper Parahyba; Rezende (14,370), in a fertile district of the upper Parahyba; Petropolis (q.v.); Cantagallo (about 9000), in a rich coffee district of the Serra do Mar; Paraty (10,765), a small port on the W. side of the bay of Angra dos Reis; Valenca (11,965); Vassouras (9666); Sao Fidelis (11,770), a river port on the lower Parahyba having steamboat communication with Campos; Macahe (about 7000 in 1900), an old port on the eastern coast of xxiii. 12

the state at the mouth of the Macahe river Whose original anchorage has been filled with silt, and that of Imbetiba, in the vicinity, with which it is connected by tramway, is now used by vessels both for the town and the Macahe and Campos railway; Barra do Pirahy (7750), an important station and junction of the Central do Brazil railway on the N. side of the Serra do Mar, with large manufacturing and commercial interests; Parahyba do Sul (7343), in a fertile, long-settled district in the N.E. part of the state; Marica, (10,373); Cabo Frio (10,382); Pirahy (10,429); Saquarema (12,489); Nova Friburgo (9857); and Araruama (9087).

RIO DE JANEIRO (in full, SAo Sebastiao do Rio de Janeiro, colloquially shortened to Rio), a city and port of Brazil, capital of the republic, and seat of an archbishopric, on the western side of the Bay of Rio de Janeiro, or Guanabara, in lat. 2 S P 54′23″S., long. 43°8′34″W. (the position of the Observatory). The city is situated in the S.E. angle of the Federal District {Disiricto Federal) formerly known as the Neutral Municipality (Municipio Neutro), an independent district or commune with an area of 538 sq. m., which was detached from the pro- vince of Rio de Janeiro in 1834. The city stands in great part on an alluvial plain formed by the filling in of the western shore of the bay, which extends inland from the shore-line in a north-westerly direction between a detached group of mountains on the S. known as the Serra da Carioca, and the imposing wooded heights of the Serra do Mar on the N. The spurs of the Carioca range project into this plain, in some places, closely up to the margin of the bay, forming picturesque valleys within the limits of the city. Some of the residential quarters follow these valleys up into the mountains and extend up their slopes and over the lower spurs, which, with the hills covered with buildings rising in the midst of the city, give a picturesque appearance. At the entrance to the bay is the Sugar Loaf (Pao de Assucar), a conical rock rising 1212 ft. above the water- level and forming the terminal point of a short range between the city and the Atlantic coast. The culminating point of that part of the Carioca range which projects into and partly divides the city is the Corcovado

(Hunchback), a sharp rocky peak 2329 ft. high overlooking the Botafogo suburb and ap- proachable only on the wooded N.W. side. These spurs are covered with luxuriant vegetation, excepting their perpendi- cular faces and the slopes occupied by the suburbs. Consider- ably beyond the limits of the city on its S.W. side, but within the municipality, is the huge isolated flat-topped rock known as the Gavea, 2575 ft. high, which received its name from its resemblance to the square sail used on certain Portuguese craft. The sky-line of this range of mountains, as seen by the ap- proaching traveller some miles outside the entrance to the bay, forms the rough outline of a huge reclining figure called ” the sleeping giant,” the facial profile of which is also known, as ” Lord Hood’s nose.”

The entrance to the bay, between the Sugar Loaf on the W. and the Pico on the E., with fortress of Santa Cruz on one side and the fort of Sao Joao on the other, is about a mile wide and free from obstructions. Almost midway in the channel are the little island and fort of Lage, so near the level of the sea that the spray is sometimes carried completely over it. On the W. is the semicircular bay of Botafogo, round which are grouped the residences of one of the richest suburbs; on the E., the almost land-locked bay of Jurujuba (see Nictheroy). The bay extends northward nearly 165 nautical miles, with a maximum breadth of 11 m. and a minimum, between the arsenal of war (Ponta do Calabouqo) and the opposite Ponta da Gravata, of about 3 500 yds. The shore-line is irregular, and has been modified by the construction of sea-walls and the filling in of shallow bays. Close to the shore are the islands of Villegaignon (occupied by a fort), Cobras (occupied by fortifications, naval storehouses, hospital and dry docks), Santa Barbara and Enxadas, the site of the Brazilian naval school. A small island just above the lower anchorage, which is occupied by port officials, was once known as Rat island, and is now called Ilha Fiscal. There is one lake

within the urban limits, the Lag6a de Rodrigo de Freitas, near the Botanical Garden, separated from the sea by a narrow sand beach, which is being gradually filled in. Several small streams from the hills are conspicuous .only in times of heavy rains.

The oldest part of the city, which includes the commercial section, lies

between Castle and Santo Antonio hills on the S. and Sao Bento, Conceicao and Livramento hills on the N., and extends inland to the Praca da Republica, though the defensive works in colonial times followed a line much nearer the bay. This section during the past century has extended southward along the bay shore in a string of suburbs known as the Cattete and Botafogo, with that of Larangeiras behind the Cattete in a pretty valley of the same name, and thence on or near the Atlantic coast as Largo dos Leoes, Copacabana and Gavea, the last including the Botanical Garden. The greatest development has been northward and westward, where are to be found the suburbs of Cidade Nova, Sao Christovao, Engenho Novo, Prr.Ia Formoso, Pedregulho, Villa Isabel, Tijuca, and a number of smaller places extending far out on the line of the Central railway. The extreme length of the city along lines of communication is little less than 20 m.

Streets. — Some of the most modern streets on the plain have been laid out with Spanish-American regularity, but much the greater part seems to have sprung into existence without any plan. Most of the streets of the old city are parallel and cross at right angles, but they are narrow and enclose blocks of unequal size. Each suburb is laid out independently, with straight streets where the ground permits, and crooked ones where the shore-line or mountain contour compels. Since the beginning of the 20th century large sums have been borrowed and expended on new avenues, the widening and straightening of old streets, and the improvement of the water-front between the Passeio Publico and the southern extremity of the Praia de Botafogo by the construc- tion of a grand boulevard, partly on reclaimed land. One of these improvements consists of a central avenue cut across the old city from a point on the water-front near the Passeio Publico northward to the Saude water-front. The shore-line boulevard, called the Avenida Beira-Mar, is about 4! m. long, the wider parts being filled in with gardens. It was undertaken in 1903, during the administration of President Rodrigues Alves, as part of a vast scheme to improve the sanitary and traffic conditions of the city, including the construction of a new shore-line and filling in the shallow parts of the shore, which had long been considered one of the prime causes of the unhealthy state of the city. Another improvement was the completion and embellishment of the Mangue canal, originally designed as an entrance to a central market for the boats plying on the bay, but now destined for drainage purposes and as a public pleasure ground. This canal, as completed, is nearly 2 m. long, enclosed with stone walls, crossed by a number of iron bridges and bordered by lines of royal palms. The most famous street of the old city is the Rua do Ouvidor, running west- ward from the market-place

to the Largo de Sao Francisco de Paula, and lined with retail shops, cafes and newspaper offices. It has long been a favourite promenade, and fills an important part in the social and political life of the city. The principal business street is the Rua Primeiro de Margo, formerly called Rua Direita, which extends from the Praca 15 de Novembro northward to Sao Bento Hill. All these old streets, excepting the last, are narrow and paved with squared granite blocks, and have their vehicle traffic regulated to go in one direction only. The side walks are very narrow, and the gas lamps are attached to the walls of the buildings. The streets and suburbs are served by five groups of tramway lines. — Jardim Botanico, Santa Thereza, Sao Christovao, Villa Isabel, and Carris Urbanos — -all using electric traction but the last. The streets are lighted with electricity and gas, the Ouvidor and some other narrow streets having a great number of gas-pipe arches across them for decorative illumination on festal occasions.

Parks. — The public parks and gardens are numerous and include the Botanical Garden with its famous avenue of royal palms (Oreodoxa regia); the Passeio Publico (dating from 1783), a small garden on the water-front facing the harbour entrance; the Jardim dAcclamacao, forming part of the Praca da Republica (once known as the Campo de Sant' Anna) with its artistic walks and masses of shrubbery; the Praca Tiradentes (the old Largo do Rocio, after- wards rechristened Praca da Constituigao) with its magnificent equestrian statue of Dom Pedro I. executed by the French sculptor Luiz Rochet; the Praca 15 de Novembro on the water-front facing the old city palace; and a number of smaller squares with and without gardens.

Water Supply and Sewerage Drainage. — The water supply is derived from three sources: the smaU streams flowing

down the mountain sides which serve small localities; the old Carioca aqueduct, dating from colonial times, which collects a considerable supply from the small streams of the Serra da Carioca and brings it into the city through a covered conduit which once crossed the gap between Santa Thereza and Santo Antonio hills on two ranges of stone arches (now used as a viaduct by the Santa Thereza Tramway Company); and the modern Rio do Ouro waterworks, which brings in an abundant supply from the Serra do Tinqua, N.W. of the city — the length of the iron mains being 2>2> m – between the principal collecting reservoir and the main distributing reservoir at Pedregulho, near the Ponta do Caju. There are three other distributing reservoirs in different parts of the city, and the supply, which has been augmented since the works were inaugurated in 1885, is good and ample. An extensive system of sewers was con- structed by the City

Improvements Co., an English corporation, which initiated the work in ‘1853; and a separate system of rain-water drains. The Leicester system is used because the greater part of the sewers are below sea-level, and it is necessary to use powerful pumps.

Climate. — The climate of Rio de Janeiro is hot, humid and debilitating, the temperature ranging from 50 to 99-5° F. in the shade, with an average for the year of 74°, and the rainfall being about 44 in. The greater part of the city is only 2 or 3 ft. above sea-level, is surrounded by mountains, and has large areas of water, swamp and wet soil in its vicinity. But the unhealthiness of Rio de Janeiro in past years may be charged to insanitary conditions and not to the climate. Yellow fever, whose first recorded appearance was in December 1849, was for many years almost a regular yearly visitant, and the mortality from it has been terrible. Smallpox also is prac- tically endemic, owing in great part to negligent sanitary super- vision. Since 1900 there have been several mild outbreaks of bubonic plague. These dangerous diseases are slowly disappear- ing as sanitary conditions are improved. The death-rate from tuberculosis, however, is high, and apparently shows no abate- ment. This is undoubtedly due to constitutional weakness arising from bad nutrition and the habit of sleeping in closed or badly ventilated apartments. Malarial fevers are also common, and diseases of the digestive organs, in great part easily preventible, figure among the principal causes of death. According to official returns for the five years 1900-1905, the average number of deaths was 15,926, or 20ˆ4 per 1000. Among the deaths 2789 were from tuberculosis, 1200 from smallpox, 778 from malarial diseases, 331 from la grippe, and 106 from beri-beri. There were no unusual epidemics during those years, and the rate given may be considered normal.

Buildings. — There remain many public edifices and dwellings of the colonial period, severely plain in appearance, with heavy stone walls and tile roofs. The old city palace facing upon Praca 15 de Novembro, once the residence of the fugitive Portuguese sovereign Dom Joao VI., is a good example. The 19th century brought no important modifications until near its close, when French and Italian styles began to appear, both in exterior decora- tion and in architectural design. The new Praca do Commercio (Merchants’ Exchange) and Post Office on Rua i° de Marco, and the national printing office near the Largo da Carioca, are notable examples. Since then exterior ornamentation and architectural eccentricities have run riot, and the city is now a mixture of the plain one-storey and two-storey buildings of the Portuguese type, and fanciful modern creations, embellished with stucco and over- topping the others by many storeys. Although a

metropolitan see, Rio has no cathedral, the old imperial chapel facing the Praca 15 de Novembro being used for that purpose. The foundations were once laid for a great cathedral on the Largo de Sao Francisco de Paula, but the building stone was taken for a neighbouring theatre, and the foundations were afterwards used for the Poly- technic School. The most noteworthy church is the Candelaria church, in the commercial district, whose twin towers and graceful dome form one of the most conspicuous landmarks of the city. It was begun in 1775, but was not finished until near the end of the 19th century. Its fine proportions, however, are concealed by commercial buildings and by the narrow streets. Among many other churches, usually plain and bare of interior decoration, are the popular Sao Francisco de Paula church, on the square of that name; the Carmo church in Rua 1° de Margo; the Cruz dos Militares church in the same street; the Rosario church in the

street of that name, belonging to a fraternity of negroes and once occupied by the episcopal chapter; and the prettily situated octagonal Gloria church on a hill of that name overlooking the lower bay. Another church of the same name faces on the Largo do Machado and shows the peculiar combination of a Greek temple surmounted by a modern spire. The British residents have an unpretentious chapel in Rua Evaristo da Veiga, the Methodists a more modern structure on the Largo do Cattete and the Presby- terians a chapel near Praga Tiradentes. There is religious tolera- tion in Brazil, but down to the organization of the republic no non-Catholic church or chapel was permitted to have a spire or other outward symbol of a place of worship.

Among public buildings of an official character the following are noteworthy. The old city palace facing on Praga 15 de Novembro dates from 1743 and was the residence of the royal governors and Dom Joao VI., but is now used by the national telegraph offices. The Sao Christovao palace, in the suburb of that name, was the residence of the Emperor Dom Pedro II. It is a rambling structure now occupied by the National Museum. The Cattete palace, on the street cf that name, originally a private residence, is now the official residence of the President, richly decorated within and partly sur- rounded by a handsome park. The Itamaraty palace near the Praga da Republica, a typical private residence of the better class, was purchased for and occupied by the first presidents and is now occupied by the ministry of, foreign affairs. The palace of justice, on Rua Primeiro de Margo, is one of the finest edifices in the city; and the ministry of industry and

public works, on the south side of the Praca 15 de Novembro may be noticed. The ministry of war has its offices in the immense military quartel (barracks) on the north side of the Praga da Republica, and the ministry of marine in the naval arsenal at the foot of Sao Bento Hill. The ministry of finance is in the Treasury building on Rua do Sacramento — an immense structure of no special architectural merit. The Senate occupies a plain unattractive building on the west side of the Praca da Republica, and the Chamber of Deputies an ugly colonial building in Rua da Misericordia, originally used as a city hall and jail. A new legislative palace is designed to occupy the block on the west side of the Praga Tiradentes. There are a number of theatres, but the city had no large theatre of architectural merit previous to the construction of the Municipal Theatre at the inter- section of the Avenida Central with Rua 13 de Maio, with an elegant marble fagade in the French Renaissance style. Bull-fights have never been popular in Rio de Janeiro, but horse-racing is a favourite sport, and the Jockey Club maintains a racecourse in the Sao Fran- cisco Xavier suburb. Other notable buildings are the ornate Monroe palace at the intersection of the Central and Beira-Mar avenues, the Praga do Commercio (Commercial Exchange) on Rua 1° de Margo, the Caixa da Amortizagao on the Avenida Central, the custom-house with its extensive warehouses, the terminal station of the Central railway at the N.W. angle of the Praga da Republica, and the library building of the Gabinete Portuguez da Leitura with its exquisite ” Manuelino ” fagade of Lisbon marble.

Education. — Although much money is given to hospitals and asylums, Rio de Janeiro has no great educational institu- tions either public or private. The Medical School may be considered the only distinctively professional school in the city. The Polytechnic School, occupying an interesting old building on the Largo de Sao Francisco de Paula, is chiefly devoted to civil engineering. The Gymnasio Nacional, formerly the Collegio D. Pedro II., is a boys’ college of a high school grade, located on Rua Floriano Peixoto, with an intemato or boarding-school in Rua de S. Francisco Xavier. The college dates from 1735, when it was founded as an asylum for orphan boys destined for the Church. In 1837 it became a state institution and took the name of the Emperor Dom Pedro II. One of the most noteworthy schools of the city is the Lycen de Artes e Officios, located on Rua 13 de Maio, opposite the opera- house; it dates from 1858 and has been the means of giving instruction to a multitude of clerks, artisans and others, through its night classes. Another important school, partly of this class, is the Instituto Benjamin Constant, located in a fine new edifice on the Praia da Saudade, Botafogo. The public schools of Rio

de Janeiro are defective both in organiza- tion and administration; the non-attendance of children from the ‘higher classes, and the antagonism of the Church to schools under purely secular administration, must be held responsible for the backwardness of these schools. The episcopal seminary on Castle Hill, called the ” Seminario Episcopal de Sao Jose,” founded in 1739 and devoted exclusively to the education of priests, is the best classical school in the city. There are a number of charitable institutions devoted to the education of orphans, the blind and the deaf and dumb, which are admirably

equipped and administered. Among other educational in- stitutions are a conservatory of music, school of fine arts, normal school, a national library with upwards of 260,000 volumes and a large number of manuscripts, maps, medals and coins, the national observatory on Castle Hill, the national museum now domiciled in the Sao Christovao palace in the midst of a pretty park, a zoological garden in the suburb of Villa Isabel, and the famous Botanical Garden founded by Dom Joao VI. in 1808 and now a horticultural experiment station.

Hospitals, &c. — Rio de Janeiro is well provided with hospitals, asylums and benevolent institutions. Chief of these is the Miseri- cordia Hospital, popularly known as the ” Santa Casa,” belonging to a religious brotherhood dating from 1591. In addition to a large income from rentals, the Santa Casa receives the product of certain port taxes in return for opening its wards to the crews of all vessels in port. Other public hospitals are a lepers’ hospital in Sao Chris- tovao, the military and naval hospitals, the Sao Sebastiao hospital and the isolation and contagious diseases hospitals in Jurujuba. There are also a number of private hospitals maintained by church brotherhoods and charitable associations; among them are the Portuguese hospital in Rua de Santo Amaro and the Strangers’ Hospital (American and British) in Botafogo. Most prominent among the asylums is the Hospicio Nacional for the insane, on the Praia da Saudade, Botafogo, which was erected 1842-52, and is one of the most completely equipped institutions of its class in the world. There are two public cemeteries: Sao Francisco de Xavier, in Sao Christovao, and Sao Joao Baptista, in Botafogo, the former having an unconsecrated section for Protestants. Be- sides these there are five private cemeteries, the one belonging to the British colony being on a hill overlooking the Gamb6a shore- line.

Harbour, Communications and Commerce. — The port and harbour of

Rio de Janeiro are the largest and most important in the republic. The entrance is open to vessels of the largest draught, and there is sufficient deep-water anchorage inside for the navies of the world. The lower anchorage, where the officers of health visit vessels, is below Ilha Fiscal, and the upper, or commercial anchorage, is in the broad part of the bay above Ilha das Cobras, the national coasting vessels occupying the shallower waters near the Saude and Gamb6a districts. The custom-house occupies a' considerable part of the shore-line in front of the old city, and has a protected basin for the discharge of lighters. The new port works, under construction since 1903, consist of a new water-front for the Saude, Gamb6a and Sacco de Alferes districts, in which the shipping interests are centred, and a continuation of the sea-wall across the shallow Sao Christovao bay to the Ponta do Caju, the large reclaimed area to be filled in by the removal of some small hills. The commercial quays are built in deep water and permit the mooring alongside of the largest vessels. The total length of the commercial quays is about 3800 yds. Railway and tram way connexions are provided and both electric and hydraulic power are available. Special surtaxes are levied on imports to meet the interest and redemption charges on the loans raised for the execution of these important works. Another improvement is the extension of the sea-wall southward from the ferry-slips (Praga 15 de Novembro) to the Ponta do Cala- bougo (war arsenal), providing protected basins for the arsenal and enclosing small reclaimed areas. With the completion of these improvements the water-front of the city will consist entirely of deep-water walls from Botafogo to the Ponta do Caju, with the exception of a short section between the Ponta do Calabouco and the Avenida Central. The port is in regular communication with the principal ports of Europe and America. The coastwise service is good, though rates are high. Railway communication with the interior is maintained by the Central do Brazil (formerly the Dom Pedro II.), Leopoldina and Melhora- mentos lines, besides which there is a short passenger line up to the Corcovado about 2$ m. long, an electric line to Tijuca, and a narrow-gauge line running out to the Rio do Ouro water- works. There is daily communication with Petropolis by a branch line of the Leopoldina system, and also by a steamer to the head of the bay and thence by rail up the serra. Ferry- boats cross the bay to Nictheroy at intervals of 20 minutes, and smaller craft provide communication with the islands of Gober- nador and Paqueta.

Rio de Janeiro is the seaport for a large area of the richest, most productive arid most thickly settled parts of Brazil, including the states of Rio de Janeiro and Minas Geraes and a small part of eastern Sao Paulo. Its exports include coffee, sugar, hides, cabinet woods, tobacco and cigars, tapioca, gold, diamonds, manganese and sundry small products. Rio is also a distributing centre in the coasting trade, and many imported products, such as jerked beef {came secca), hay, flour, wines, &c, appear among the coastwise exports, as well as domestic manufactures. The total exports for 1905 were officially valued at 62,572,033 milreis gold, or a little over one-sixth the exportation of the whole country. Formerly Rio led all other ports in the export of coffee, but the enormous increase in production in the state of Sao Paulo has given Santos the lead. The exports of coffee from Rio in 1908 amounted to 3,062,268 bags of 60 kilogrammes each, officially valued at about $27,846,000. The Coffee-producing area tributary to this port is slowly decreasing, owing to the exhaustion of the soil and the greater productiveness of Sao Paulo. The imports include wheat, flour, Indian corn, jerked beef (came secca), lard, bacon, wines and liquors, butter, cheese, conserves of all kinds, coal, cotton, woollen, linen and silk textiles, boots and shoes, earthen- and glasswares,' railway material, machinery, furniture, building material, including pine lumber, drugs and chemicals, and hardware. The imports for 1905 aggregated 103,874,724 milreis gold, or about two-fifths the importation of the whole republic. The shipping arrivals in 1908 were as follows: from foreign ports, 1 195 steamers of 3,479,357 tons and 75 sailing vessels of 84,474 tons; from national ports, 243 foreign steamers of 582,633 tons, 773 national steamers of 475,587 tons and 294 national sailing vessels of 20,250 tons — in all 2580 vessels of 4,642,301 tons.

Manufactures. — The industrial activities of Rio Janeiro have been largely increased since the organization of the republic through increased import duties on foreign products. There were a number of protected industries before this, but they made slight impression on imports. Rio de Janeiro has manufactures of flour from imported wheat, cotton, woollen and silk textiles, boots and shoes, ready- made clothing, furniture, vehicles, cigars and cigarettes, chocolate, fruit conserves, refined sugar, biscuits, macaroni, ice, beer, artificial liquors, mineral waters, soap, stearine candles, perfumery, feather flowers, printing type, &c. There are numerous machine end repair shops, the most important of which are the shops of the Central railway. One of the most important industrial enterprises in the city is the electric plant belonging to the Rio de Janeiro Light and Power Company, which supplies electric currents for public and private

lighting, and power for the tramways and many industries. The hydro-electric works are situated about 50 m. N.W. of the city in a valley of the Serra do Mar, where a large reservoir has been created by building a dam across the Rio das Lages.

Government. — Rio de Janeiro is governed by a prefect, who represents the national government, and a municipal council which represents the people. The prefect is appointed by the President of the republic for a term of four years, and the appointment must be confirmed by the Senate. There are seven directorias, or boards, under the prefect, each one assigned to a special field of work, chief among which are education, health and public assistance, public works and transportation, and finance.. The municipal council is elected by direct suffrage for a term of two years, and is composed of 15 members. The funded debt of the city on the 30th of June 1907 was £7,000,677, a part of which is guaranteed by the national government. There is some confusion in administration and accounts, however, and it is sometimes difficult to determine the exact situation. The Federal District is represented in Congress by 2 senators and 10 deputies, and is credited with the rights and privileges of citizenship. On the other hand, the city is a garrison town and a district under the direct administration ot the national executive, who appoints its chief executive, controls its police force, and exercises part control over its streets, squares and water front. In the work of improving the city, the national government assumed the expense of the commercial quays, the filling of the Sao Christovao bay, the opening of the Mangue canal and its embellishment, the opening of the Avenida Central, the extension of the sewage system arid the addition of new sources to the water supply, while the city was responsible for the Avenida Beira-Mar, the opening of a new avenue from the Largo da Lapa westward to Rua Frei Caneca, the removal of the Morro do Senado, the widening of some streets crossing the Avenida Central and the opening and straightening of other streets.

History. — The discovery of the Bay of Rio de Janeiro is attributed by many Portuguese writers to Andre Goncalves, who entered its waters on the 1st of January 1502, and believed that it was the mouth of a great river, hence the name Rio de Janeiro (River of January). Another Portuguese navigator, Martim Affonso de Souza, visited it in 1531, but passed on to Sao Vicente, near Santos, where he established a colony. The first settlement in the bay was made by an expedition of French Huguenots under the command of Nicholas Durand Villegaignon,

who established his colony on the small island that bears his name. In,

1560 their fort was captured and destroyed by a Portuguese expedition from Bahia under Mem de Sa, and in 1567 another expedition under the same commander again destroyed the French settlements, which had spread to the mainland. The victory was won on the 20th of January, the feast-day of St Sebastian the Martyr, who became the patron saint of the new settlement and gave it his name — Sao Sebastiao do Rio de Janeiro. The French had named their colony La France Antarctique, and their island fort had been called Fort Coligny. In 17 10 a French expedition of five vessels and about 1000 men under Duclerc attempted to regain possession, but was defeated; its commander was captured and later assassinated. This led to a second French expedition, under Duguay Trouin, who entered the bay on the 1 2th of September 1 7 1 1 , and captured the town on the 22nd. Trouin released Duclerc's imprisoned followers, exacted a heavy ransom and then withdrew. The discovery of gold in Minas Geraes at the end of the 17th century greatly increased the importance of the town. It had been made the capital of the southern captaincies in 1680, and in 1762 it became the capital of all Brazil. In 1808 the fugitive Portuguese court, under the regent Dom Joao VI., took' refuge in Rio de Janeiro, and gave a new impulse to its growth. It was thrown open to foreign commerce, foreign mercantile houses were permitted . to settle there, printing was introduced, industrial restrictions were removed, and a college of medicine, a military academy and a public library were founded. Dom Joao VI. returned to Portugal in 1821, and on the 7th of September 1822 Brazil was declared independent and Dom Pedro I. became its first emperor. There was no resistance to this declaration in Rio de Janeiro. There were some political disorders during the reign of Dom Pedro I., who was finally harassed into an abdica- tion in favour of his son, Dom Pedro II., on the 7th of April 1831. The regency that followed was one of many changes, and led in July 1840 to a declaration of the young prince's majority at the age of fifteen. A long and peaceful reign followed, disturbed only by the struggles of rival political factions. In 1839 a steamship service along the coast was opened, but direct communication with Europe was delayed until 1850, and with the United States until 1865. These services added largely to the prosperity of the port. The first section of the Dom Pedro II. railway was opened in 1858, and the second or mountain section in 1864, which, brought the city into closer relations with the interior. In 1874 submarine communication with Europe was opened, which was soon afterwards extended southward to the Platine republics. The first coffee tree planted in Brazil was in a convent garden. of Rio de Janeiro. On the 15th of November 1889 a military revolt in the city under the leadership of General Deodoro da Fonseca led to the declaration of a

republic and the expulsion of the imperial family, which was, accomplished without resistance or loss of life. Disorders followed, a naval revolt in 1891 causing the resignation of President Deodoro da Fonseca, and another in 1893-94 causing a blockade of the port for about six months and the loss of many lives and much property from desultory bombardments. There have been since that time some trifling outbreaks on the part of agitators allied with the extreme republican element, but at no time was the security of the government in danger.

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RIO DE 0R0, a Spanish possession on the N.W. coast of Africa. It is bounded W. by the Atlantic, E. and S. by Saharan territory under French protection. The northern frontier, where the protectorate adjoins the territory of the semi-independent tribes south of Morocco, is undefined. The most northerly point claimed by Spain on the coast is Cape Bojador. The southern and eastern boundaries were defined by a Franco- Spanish convention in 1900. The frontier traverses the middle of the Cape Blanco promontory, then runs eastward along the parallel of 21 20′ N. till it meets the meridian of 13 W., whence it turns first N.W. and afterwards N.E., meeting the tropic of Cancer at 12 W. and thereafter runs due N. Forming part of the Sahara, Rio de Oro is nearly waterless. Oases are few and the sparse population consists almost entirely of nomad Arabs and Berbers. They are Mahommedans. In the south is the hilly country called Adrar Suttuf ,

not to be confounded with Adrar Temur (see Adrar and Sahara). The estimated area of the protectorate is 70,000 sq. m.

The peninsula of Rio de Oro, where is the principal Spanish settlement, occupies the central part of the coast-line in 23 50′ N., 16° W., and is united to the mainland by a sandy isthmus. Its length is 23 m., its breadth 1 J to 2 rri. and it is on an average about 20 ft. above sea-level. The bay between peninsula and mainland — the so-called Rio de Oro — is 22 m. long, 5 broad, navigable over two-thirds of its extent, with good anchorage in most of the channel, but the bar at its mouth is not always easy to pass in rough weather. The peninsula has very sparse vegetation, except in its southernmost part near Cape Durnford. At the head of the bay is a small island — Isla Heme.

The climate is generally temperate, and not unhealthy except in the autumn. Esparto grass and manzanilla are grown in many places, but European plants are not easily acclimatized. On the peninsula and in the neighbouring country there are many wolves, toxes, hyenas, gazelles, lizards, hares, pelicans and large crows. The natives rear cattle, sheep, camels, and have but few horses. In contrast with the sterility of the land the sea throughout the coast of Rio de Oro abounds in fish, especially cod. The fishing industry is in the hands of the Canary Islanders and of the French.

The estuary between the mainland and the peninsula was taken by. its Portuguese discoverers in the middle of the 15th century for a river, and, obtaining there a quantity of gold dust from the natives, they named it Rio d'Ouro (Gold River), Rio de Oro being the Spanish form. At a spot about 50 m. inland from the head of the estuary a Portuguese trading station was estab- lished, of which ruins exist, but the activity of the Portuguese was before long transferred to the true auriferous regions of the Gulf of Guinea.

Spain's interest in the Saharan coast dates from the 13th century, but was particularly directed to that part nearest the Canary Islands, a strip of coast over which she now exercises no sovereignty. The site of the fort of Santa Cruz de Mar Pequefia, established in 1476, though not identified, was north of Cape Bojador. The protection of the Canary Islanders engaged in the fisheries south of that point occasioned, however, the presence of Spanish warships in these waters, and- small trading stations were formed at Rio de Oro, Cape Blanco and elsewhere.' To preserve the interests thus acquired, Spain in January 1885 took the territories on the coast between capes Blanco and Bojador under her protection. The year before the Hispano- American Company had built a trading station on Rio de Oro

peninsula, but in 1885 it was destroyed by the natives. The company renewed its operations, but subsequently ceded its rights to the Transatlantic Company of Barcelona. The exten- sion inland of Spanish influence was opposed by France, which claimed a protectorate over the Sahara. Trie conflicting claims of the two powers were finally settled by the convention of 1000, which fixed the frontier in the manner stated. The administra- tion is carried on under the control of the captain-general of the Canary Islands.

RIO GRANDE, a North American river, which rises in the San Juan Mountains of southern Colorado, flows S.E. and S. in Colorado, S. by W. and S.E. through New Mexico, and S.E. between Tessas and Mexico to the Gulf of Mexico. Its length

is approximately 2200 m., arid for about 1300 m. it forms the international boundary between the United States and Mexico. It presents many features of a complex physiographic type, being first a river of the Rocky Mountains, then of the in- terior deserts and then of the Atlantic Coastal Plain. It also presents a complicated geological history, as it includes what were originally several distinct streams. The Mexicans call it the Rio del Norte in its upper course, the Rio Bravo in the “Big Bend,” from the mouth of the Conchas river to the mouth of the- Devils river, and the Rio Grande only in its course through the Coastal Plain. From its headwaters, 12,000 ft; above the sea, it rushes rapidly down a mountain canyon to San Luis Valley, in Colorado. It flows with moderate speed through this broad valley, enters a long canyon with a maximum depth of 400 ft., about 4 m. above the boundary between Colorado and New Mexico, and is hemmed in between canyon walls rising as high as 1000 ft. or between the sides of narrow mountain valleys throughout its course through New Mexico. It passes through a series of picturesque canyons, some of them 1750 ft. in depth, in the ” Big Bend,” and becomes a silt-laden stream with a shifting channel in its passage through the Coastal Plain. Except in the flood season of May and June, the quantity of water which, for irrigation and by evaporation, is taken from the Rio Grande between its entrance to the Sail Luis Valley and the mouth of the Conchas, is greater than that received, and as a Con- sequence it is an intermittent stream in this region. The flow of the Conchas is constant, and in the ” Big Bend ” the volume of the Rio Grande is enhanced by springs which break out in the bed. The total flow of the Rio Grande is ten times greater in some years than in others, and when its waters have been highest there have been great floods in its lower course and so much shifting of its banks as to cause international complications! Even in its course through the Coastal . Plain its channel is so much obstructed by sand bars that it is of little

importance for navigation. As the increasing diversion of the water of the Upper Rio Grande for irrigation in Colorado and New Mexico resulted in a scarcity of water for this purpose in Mexico, that country complained, and to remedy the evil the Reclamation Service of the United States proposed the construction by the United States of a storage dam across the river near Engle, New Mexico, which would form a storage reservoir having a capacity of 2,000,000 acre-feet and from which Mexico should be furnished with 60,000 acre-feet of water annually. Mexico agreed to this proposal and a treaty covering the matter was proclaimed in January 1907. The principal towns and cities on the river are: Brownsville, Texas; Matamoros, Mexico; Laredo, Texas; El Paso, Texas; and Ciudad Juarez, Mexico.

RIO GRANDE DO SUL, a southern frontier state of Brazil, bounded N. by the state of Santa Catharina, E. by the Atlantic, S. by Uruguay and W. by Uruguay and Argentina— the Uruguay river forming the boundary line with the latter. Area, 91,333 sq. m. Pop. (1900) 1,149,070, an increase of 251,615 since 1890. The northern part of the state lies on the southern slopes of the elevated plateau extending southward from Sao Paulo across the states of Parana and Santa Catharina, and is much rjroken by low mountain ranges whose, general direction across the trend of the slope gives them the appearance of escarpments. A range of low mountains extends southward from the Serra do Mar of Santa Catharina and crosses the state into Uruguay. West of this range is a vast grassy plain devoted principally to stock-raising— the northern and most elevated part being suitable in pasturage and climate for sheep, and the southern for cattle. East of it is a wide coastal zone only slightly elevated above the sea; within it are two great tide-water lakes— Lagoa dos Patos and Lagda Mirim — which are separated from the ocean by two sandy, partially barren peninsulas. The coast is one great sand beach, broken only at one point — that of the outlet of the two lakes, called the Rio - Grande, which affords an . entrance to navigable inland waters and several ports. There are two

distinct river systems in Rio Grande do Sul— that of the eastern slope draining to the tide-water lakes, and that of the La Plata basin draining westward to the Uruguay. Fully one-third of the state belongs to the La Plata drainage basin. The larger rivers of the eastern group are the Jacuhy, Sinos, Cahy, Gravatahy and Camaquam, which flow into the Lagda dos Patos, and the Jaguarao which flows into the Lagoa

Mirim. All of the first named, except the Camaquam, discharge into one of the two arms or estuaries opening into the northern end of Lagda dos Patos, which is called the Rio Guahyba, though in reality it is not a river. It is broad, comparatively deep and about 35 m. long, and with the rivers discharging into it affords upwards of 200 m. of fluvial navigation. The Jacuhy is one of the most important rivers of the state, rising in the ranges of the Coxilha (Cuchilla) Grande of the North and flowing S. and S.E. to the Guahyba estuary, with a course of nearly 300 m. It has two large tributaries — the Vaccacahy from the S. and the Taquary from the N. — besides many small streams. The Jaguarao, which forms part of the boundary line with Uruguay, is navigable 26 m., up to and beyond the town of Jaguarao. Of the many streams flowing northward and westward to the Uruguay, the largest are the Ijuhy- guassu, of the plateau region, the Ibicuhy, which has its source in the central part of the state, near Santa Maria, and flows westward to the Uruguay a short distance above Uruguayana and the Quarahim, or Quarahy, which forms part of the boundary line with Uruguay. The Uruguay river itself is formed by the confluence of the Rio das Candas and Rio Pelotas in about long. 51 30′ W. With its southern confluent, the Rio Pelotas, which has its source in the Serra do Mar, on the Atlantic coast, it forms the northern and western boundary line of the state down to the mouth of the Quarahim, on the Uruguayan frontier. In addition to the Lagda dos Patos and Lagda Mirim there are a number of small lakes on the sandy, swampy peninsulas that he between the coast and these two, and there are others of a similar character along the northern coast. The largest lake is the Lagoa dos Patos (Lake of the Patos — an Indian tribe inhabiting its shores at the time of the discovery), which lies parallel with the coast-line, N.E. and S.W., and is about 133 m. long exclusive of the two arms at its northern end, 25 and 35 m. long respectively, and of its outlet, the Rio Grande, about 24 m. long. Its width varies from 22 to 36 m. The lake is comparatively shallow and filled with sand banks, making its navigable channels tortuous and difficult. The Lagda Mirim occupies a similar position farther S., on the Uruguayan frontier, and is about 108 m. long by 6 to 22 m. wide. It is more irregular in outline and discharges into Lagda dos Patos through a navigable channel known as the Rio Sao Goncalo. A part of the lake lies in Uruguayan territory, but its navigation, as determined by. treaty, belongs exclusively to Brazil. Both of these lakes are evidently the remains of an ancient depression in the coast-line shut in by sand beaches built up by the combined action of wind and current. They are of the same level as the ocean, but their waters are affected by the tides and are brackish only a short distance above the Rio Grande outlet.

Rio Grande lies within the South Temperate zone and has a mild, temperate climate, except in the coastal zone where it is semi-tropical. There are only two well-marked seasons, though the transition periods between them (about two months each) are sometimes described as spring and autumn. The winter months, June to September, are characterized by heavy rains and by cold westerly winds, called minuanos, which sometimes lower the temperature to the freezing

Eoint, especially in the mountainous districts. Snow is unknown, ut ice frequently forms on inland waters during cold winter nights, only to disappear with the first rays of the sun. In summer, which is nominally a dry season, light rains are common, northerly and easterly winds prevail, and the temperature rises to 95° in the shade. Cases of insolation are not rare. Malaria is unusual and the state has a high reputation for healthiness, though insanitary conditions are responsiole for various diseases in large communities. The principal industry of the state is stock-raising, especially on the southern plains, where large estancias (ranches) are to be found. This industry originated with the Jesuit missions on the Uruguay early in the 17th century, and its development here has been much

the same as in Argentina and Uruguay. No general effort was made before the 20th century to improve the herds by the importa- tion of betfer breeds, and the industry was practically in a state of decay until higher tariff rates were imposed on imported carne secca (jerked beef) toward the end of the 19th century. The export of live-stock is insignificant, the practice being to sell the cattle, to the xarqueadas or saladeros where they are slaughtered for xarque, charqui or came secca, which is usually prepared by salting and drying in the sun. The jerked beef is largely exported to other Brazilian states for consumption, while the hides and other by- products are exported to Europe and the United States. The importance of the industry is shown in the exports of 1905, in kilogrammes, viz.: jerked beef, 37,555,951; dry hides, 4,735,987; salted hides, 12,141,779; beef extract, 16,712; ox-tongues, 498,577; tallow,: 6,174,189; and large quantities of leather, horns, hoofs, bone-ash and preserved meats. Horses, mules, sheep, goats and swine are also raised; the raising of sheep being fostered by the building of woollen factories, and that of swine by the higher duties on imported pork and lard. In some parts of the state agriculture Claims much attention, especially in the forested districts of the north where colonies of foreign immigrants have been established. The principal products are wheat, Indian corn, rice, beans, pease, onions, garlic, farinha de mandioca (cassava flour), potatoes, tomatoes, cabbage, fruit, tobacco and peanuts — all of which find a ready market on the coast. Grapes are grown in several

localities (Sao Leopoldo, Alegrete, Bag6, &c.) for wine-making, and the industry has become important — the export in 1905 being 2,092,417 litres. The forest products include herva matte or Paraguay tea {Ilex paraguayensis), timbers and lumber, and vegetable fibre {crina vegetal). Coal of an inferior quality is mined at Sao Jeronymo, on a small tributary (Arroio dos Ratos) of the Jacuhy river, and has been discovered in other localities. Lime is burned at Cagapava, and at some other places. Gold, copper and iron are said to exist, but are not mined. Considerable progress has been made in manu- facturing industries, among whose products are: woollen, cotton and jute textiles, leather, wheat, flour, boots, shoes and sandals (tamnacos), wines and liquors, beer, macaroni, biscuits and other prepared foods, cigars and cigarettes, hats, matches, soap, candles and wrapping paper. Much of this diversity in production is due to the foreign element in the population.

The railway lines in the state are: the Porto Alegre to Novo Hamburgo (27 m.), with an extension to Taquary (28 m.); Porto Alegre to Uruguayana, completed from Margem do Taquary (Bank of the Taquary) to Cacequy (232 m.) ; Santa Maria to Passo Fundo (221 m.); Rio Grande to Bag6 (175 m.), with 14 m. in branches at Rio Grande; an extension from Cacequy to Bag6 (129 m.) ; and the Quarahim to Itaquy (109 m.). All these except the last have been taken over by the national government and leased to the Belgian ”' Compagnie auxiliare de Chemin de Fer au Bresil,” which has undertaken to complete the line from Cacequy to Uruguayana (161 m.), from Margem do Taquary to Neustadt, on the Novo Hamburgo line (60 m.), and some other branches. The Quarahim to Itaquy line belongs to an English company and runs from the Uruguayan frontier, where it connects with the North-Western of Uruguay, northward to Uruguayana and the naval station of Itaquy.

The population in 1900 was 1,149,070. There is a large foreign element: in 1905 the total number of foreigners residing in the state was estimated at 400,000 (not including children born in the country), and of Germans at 250,000. The first German colony was founded in 1824 and settled in 1825 in the rich forested country N. of Porto Alegre, and many large and prosperous communities have been established since then in spite of the wars and political agitations in the state. Several of these colonies, such as Sao Leopoldo, Novo Hamburgo and Conde d’Eu (now Garibaldi), have become important towns and are no longer under colonial administration. Italian colonies were subsequently established, also with good results, but an Irish colony founded at Monte Bonito, near Pelotas, about 185 1, failed completely. The capital of Rio Grande do Sul is Porto Alegre at

the northern extremity of Lag6a dos Patos, and its two next most important cities are Rio Grande and Pelotas, both at the southern extremity of the same lake. Among other important cities and towns, with population returns for 1900, ar% Alegrete (11,438), prettily situated in the W. part of the state on the Porto Alegre to Uruguayana railway; Bage (13,463), about 173 m. by rail N.W. of Rio Grande in a picturesque mountainous region, 702 ft. above sea-level; Jaguarao (9000), on a river of the same name and opposite the Uruguayan town of Artigas, with steamboat communication with Rio Grande; Cacapava (8781 in 1890) in a fine grazing district in the central part of the state, 1732 ft. above sea-level; Quarahim, or Quarahy (about 6500), a town of much commercial

importance on the Quarahim river opposite the Uruguayan town of Santo Eugenio, and surrounded by a rich grazing country which supports one of the largest saladeros in the state; Sao Leopoldo; Santa Maria da Bocca do Monte; and Uruguayana.

The territory was first settled along the Uruguay, river by the Jesuits when they were compelled to abandon their missions on the upper Parana. Between 1632 and 1707, they founded on the E. side of the Uruguay seven missions — all under Spanish jurisdiction— which became highly prosperous, and at the time of their transfer from Spanish to Portuguese rule by a treaty of 1750 had an aggregate population of about 14,000, living in villages and possessing large herds of cattle and many horses. A joint effort of the two powers in 1753 to enforce the treaty, remove the Indians to Spanish territory, and mark the boundary line, led to resistance and a three years' war, which ended in the capture and partial destruction of the missions. On the coast the first recognized settlement — a military post at Estreito, near the present city of Rio Grande — ■ was made in 1737. Before this, and, as early as 1680, according to some chroniclers, the region S. of Santa Gatharina was occupied by settlements, or penal colonies, of degradados (banished men) and immoral women from Santos, Sao Vicente and Sao Paulo, and was known as the " Continente de Sao Pedro." In 1738 the territory (which included the present state of Santa Catharina) became the Capitania d'El Rei and was made a dependency of Rio de Janeiro. Territorial dis- putes between Spain and Portugal led to the occupation by the Spanish of the town of Rio Grande (then the capital of the capitania) and neighbouring districts from 1763 to 1776, when they reverted to the Portuguese. The

capture of Rio Grande in 1763 caused the removal of the seat of government to Viamao at the head of Lagda dos Patos; in 1773 Porto dos Cazaes, re- named Porto Alegre, became the capital. In 1801 news of war between Spain and Portugal led the inhabitants of Rio Grande to attack and capture the seven missions and some frontier posts held by the Spaniards since 1763; since 1801 the boundary lines established by treaty in 1777 have re- mained unchanged. The districts of Santa Catharina and Rio Grande had been separated in 1760 for military convenience, and in 1807 the latter was elevated to the category of a capi- tania-geral, with the designation of ” Sao Pedro do Rio Grande,” independent of Rio de Janeiro, and with Santa Catharina as a dependency. In 181 2 Rio Grande and Santa Catharina were organized into two distinct comarcas, the latter becoming an independent province in 1822 when the empire was organized. In 1835 a separatist revolution broke out in the province and lasted ten years. It was reduced more through the use of money and favours than by force of arms; but the province had suffered terribly in the struggle and did not recover its losses for many years. An incident in this contest was the enlist- ment of Garibaldi for a short time with the forces of the separa- tists. In 1865 a Paraguayan army invaded the state and on the 5th of August occupied the town of Uruguayana. On the 18th of September following, the Paraguayan general (Esti- garribia) surrendered without a fight — an unusual occurrence in the remarkable war that followed. Political agitations have been frequent in Rio Grande do Sul, whose people have some- thing of the temperament of their Spanish neighbours, but no important revolution occurred after the ” ten years’ war ” (1835-45) until the presidency at Rio de Janeiro of General Floriano Peixoto, whose ill-considered interference with the state governments led to the revolt of 1892-94, under Gumers- indo Saraiva. In this struggle the revolutionists occupied Santa Catharina and Parana, capturing Curityba, but were eventually overthrown through their inability to obtain munitions of war. An incident in this struggle was the death of Admiral Saldanha da Gama,-one of the most brilliant officers of the Brazilian navy and one of the chiefs of the naval revolt of 1893-94, who was killed in a skirmish on the Uruguayan frontier at the close of the war.

RIO GRANDE DO SUL, or Sao Pedro do Rio Grande do Sul (sometimes Sao Pedro and commonly Rio Grande), a city and

port of the state of Rio Grande do Sul, Brazil, on the western side of the Rio Grande (as the outlet of the Lagoa dos Patos is called), about 6 m. from its mouth and nearly 780 m. S.W. of Rio de Janeiro, in lat. 32° 7′ S., long. 52 8′ W. Pop. (1890) of the municipio (area, about 656 sq. m.) 24,653; of the city, including its suburbs, 20,193; ˆ9°°,

estimate) of the city, 22,000, and of the city and its suburbs, 30,000. Rio Grande is the coast terminus of the Rio Grande to Bage railway, which now forms part of the railway system of the state leased to the Belgian Compagnie Auxiliare de Chemin de Fer au Bresil. Some of the principal streets are served by tramways, and the Rio Grande to Bage railway has an extension to its shipping wharf called ” Estacao Maritima ” (i£ m.), a branch to some points on the river (15 m.), and a branch to Costa do Mar, on the ocean coast (n m.). The city is a port of call for several steamship lines, and has direct communication with European ports. The bar at the mouth of the river, however, restricts traffic to vessels of light draught, not exceeding 12 to 15 ft. Ex- tensive improvements, at an estimated cost of about 13J millions of dollars, were undertaken in 1908 for deepening the bar to admit vessels of 30 ft. draught.

The city is built on a low sandy peninsula, barely 5 ft. above sea-level, formed by two arms of the Rio Grande projecting westward from the main channel, the peninsula being part of a large sandy plain extending southward along the coast to Lagoa Mirim. The level of the plain is broken by ranges of sand dunes, some of which rise not far from the city on the south/and south-east. The openness of the surrounding country and the proximity of the sea give to Rio Grande unusually healthy conditions, which, however, are largely counteracted by defective sanitary arrangements. Not infrequently the deaths exceed the births, and epidemics of contagious diseases make deadly inroads upon the population. The city has been de- veloped irregularly, but the streets are for the most part broad, and the principal ones are well paved. Gas lighting was introduced about 1 871, and in 1908 acetylene was used for public lighting. In one of the public squares is a shaft com- memorating the abolition of slavery, and said to be the only monument in Brazil of that character. There is a notable scarcity of shade trees in the streets and squares, though flowers, shrubbery and some kinds of fruit trees are grown. In pleasing contrast to the drifting sands which surround the city is the fertile Ilha dos Marinheiros (Sailor’s Island) lying directly in front of the port; it is highly cultivated and supplies the market with fruit and vegetables. The water-front has been improved by substantial stone walls, which permit the mooring of light-draught vessels alongside.

Among noteworthy public buildings and institutions are the municipal palace, the parochial church of Sao Pedro, dating from the 18th century, the modern church of N.S. de Bomfim, the beauti- ful Protestant Episcopal church (Gothic), the public hospital (Hospital de Caridade), the hospital of the Beneficencia Portugueza, the public library (Bibliotheca Riograndense) , created and main- tained by

private effort and containing about 30,000 volumes, the old custom-house and the quartel-geral (military barracks). Rio Grande is wholly a commercial and industrial city. Its exports include salted jerked beef (carne secca. or xarque), preserved meats, tongues, hides, horns, hoofs, woollen fabrics, Paraguay tea, beans, onions, fruit, flour, farinha de mandioca (cassava flour), lard, soap, candles and leather. Its manufactures include cotton, woollen and jute fabrics, wheat flour, biscuits, cigars and cut tobacco, beer, artificial drinks, boots, shoes and sandals (aipergatas), soap and candles, fireworks, ice, earthenware, hats, cast-iron and leather. The pioneer woollen factory in Brazil, and one of the largest in the country, is in Rio Grande. ,

Rio Grande was founded in 1737 by Jose da Silva Paes, who built a fort on the river near the site of the present city and called it Estreito. In 1745 the garrison and settlement was removed by Gomes Freire d'Andrade to its present site, which became a " villa," in 17 51, with the name of Sao Pedro do Rio Grande, and a " cidade " (city) in 1807. It was the capital of the captaincy down to 1763, when it was captured by a Spanish force from Buenos Aires under the command of its governor, Don Pedro Zeballos, the seat of government being then removed to Viamao at the northern end of Lagda dos

Patos. The city was occupied by the national forces in the ten years' wai which began in 1835, and in 1894 it was unsuccess- fully besieged by a small insurgent force that had attempted to overthrow the .government at Rio de Janeiro.

RIOJA, LA, an Andine province of Argentina, bounded N. by Catamarca. E. by Catamarca and Cordoba, S. by San Luis and San Juan and W. by San Juan and Chile. Area, 34,546 sq. m. Pop. (1895) 69,502; (1902, estimate) 82,099. The province is traversed from N. to S. by eastern ranges of the Andes and is separated from Chile by the Cordillera itself. The western part of the province is drained by the Bermejo, which flows south- ward into the closed lacustrine basin of Mendoza. The eastern side of the province is arid, but in the extreme N. some small streams flow northward into Catamarca. The scanty waters of these streams are used for irrigation purposes. The principal industry of the province is that of mining, its mineral resources including gold, silver, copper, nickel, tin, cobalt, coal, alum and salt. Its best known mines are those of the Sierra de Famatina, 16,400 ft. above sea-level, where an aerial wire line is used for transportation to

Chilecito in the valley below. The develop- ment of mining industries is seriously hindered by lack of water 1 . For the same reason, agriculture is in a very backward condition. The climate is hot and dry, and there is no cultivation of the soil except in the valleys of the Cordillera and a few other places where irrigation is possible. Under these conditions; there are grown wheat (a limited extent) , grapes, oranges, olives and tobacco. Alfalfa is grown to a considerable extent and is used for feeding the herds of cattle'driven across country to Chile. The capital of the province is La Rioja (pop., 1904, about 6000), on the eastern flank of the Sierra de Velasco, about 1770 ft. above sea-level and near the gorge of Sanagasta, through which a small stream, also called Rioja, flows northward and affords water for the gardens, vineyards and orchards that surround it. The wines of Rioja are highly esteemed and are an important source of income for the district. The town is connected' by rail with Cordoba and Catamarca. It was founded in 1591 by Velasco and in 1894 was destroyed by an earthquake from which it has only partially recovered. The most important town in the province is the mining centre of Chilecito, or Villa Argentina (pop., 1904, about 4000), about 2950 ft. above sea-level near the Famatina mines.

RIOM, a town of central France, capital of an arrondissement in the department of Puy-de-D6me, 8 m. N. by E. of Clermont- Ferrand by rail. Poo., town, 7839; commune, 10,627. Riom is situated on the left bank of the Ambene, On an eminence rising above the fertile plain of Limagne. It is surrounded with boule- vards and has wide streets, but the houses, being built of black lava, have a sombre appearance. Some belong to the 15th and 16th centuries, and have turrets and carved stonework. The church of St Amable, of Romanesque and early Gothic archi- tecture, dates from the r 2th century, but has been restored in modern times. It has fine carved woodwork of the 17 th century. The church of Notre-Dame du Marthuret (15th century) has a well-known statue of the Virgin at its western entrance. The Sainte-Chapelle of the 14th and 15th centuries is a relic of the palace of Jean de Berry, duke of Auvergne, and contains fine stained glass. Near it stands a statue of the chancellor Michel de l'Hopital, who was born near Riom. The rest of the site of the palace is occupied by the law courts. Other interesting buildings are the belfry of the 16th century and a mansion of the same period known as the Maison des Consuls. The town possesses numerous fountains, some of which are of the Renaissance period.

Riom is the seat of a court of appeal, a court of assizes and a sub-prefect, and has tribunals- of first instance and commerce and a communal college. It has a state manufactory of tobacco, and carries

on the preparation of fruit preserves. Trade is in grain, wine, vegetables, fruit, nut-oil and Volvic stone. ; ‘

Riom (Ricomagus or Ricomum of the Romans) was long the rival of Clermont. Along with Auvergne it was seized for the Crown by Philip Augustus, and it was the capital of this province under the dukes of Berry arid Bourbon.

RIO NEGRO, a territory of Argentina lying between* the Colorado river and the 42nd parallel S. lat., within the geographical area formerly known as Patagonia, bounded N. by the territories of Neuquen arid La Pampa, E. by the province of Buenos Aires and the Atlantic, S by the territory of Chubut and W. by Chile and Neuquen. Area, about 75,924 sq. m.; pop. (1895) 9241; (1904, estimate) 18,648. That part of it lying between the Colorado and Negro rivers has much of the formation and characteristics of the ” sterile pampas,” but with irrigation the greater part of it can be utilized for agriculture and grazing. South of the Negro the country is arid, barren and lies in great shingle-covered terraces sloping eastward to the Atlantic; its larger part is practically uninhabitable, only the river valleys and the foot-hills of the Andes having a regular water supply. The rivers of the territory are the Colorado, which forms a part of its northern boundary, and the Negro, formed by the con* fluence of the Limay (which forms part of the western boundary) and Neuquen on the boundary between Rio Negro territory and the territory of Neuquen. These rivers have no tributaries of im- portance within the territory, but the Limay receives some small streams from the Andean slopes. Lake Nahuel-Huapi lies partly in this territory (see Neuquen), and there are several small lakes scattered ■ over the shingly steppes. The Atlantic coast-line of the territory has one deep indentation— the Gulf of San Matias-M»ut, owing to the arid surroundings, there are no ports or. towns upon it. The Only industry of importance is grazing, Cattle being raised for export to Chile, and a few sheep for their wool. The capital is Viedma (pop. in 1895, estimate, 1500), on the right bank of the Rio Negro, 22 m. from its mouth and opposite Carmen de Patagones, a town and port of Buenos Aires. There are other small settlements on the Rio Negro, which is navigable up to the Neuquen frontier (about 450 m.), but the only place of importance; is General Roca (about 2300), a military and supply station situated a few miles below the confluence of the Limay and Neuquen rivers and connected with Bahia Blanca and Buenos Aires by a branch of the Great Southern railway.

RIO PARDO (formerly Villa do Rio Pardo), a town of Brazil in the state of Rio Grande do Sul, on the left bank of the Jacuhy at its

confluence with the Pardo. Area (of the municipality) 1737 sq.m. Pop. (1890) of the municipality, 19,346; (1908, estimated) of the town, 3500. The town is about 80 m. due west of Porto Alegre, with which it is connected by rail and steamer. The Jacuhy is navigable by small steamers to this place, which was once an important military station and cominercial centre. Its military importance has considerably declined through railway extension. The surrounding districts are fertile but only slightly cultivated, and stock-raising is its chief industry. The town had its origin in a frontier fort built at this point by the Portuguese in 1751, but did not reach the dignity of a" villa " until 1809.

RIOT (O. Fr. riote, of uncertain etymology), the gravest kind of breach of the peace, short of treason, known to the English law. It consists in a tumultuous disturbance of the peace by an assemblage of three or more persons who, with intent to help one another against any one who opposes them in the execution of some enterprise, actually execute that enterprise in a violent and turbulent manner, to the terror of the people. It is not necessary that violence should be used to any person or damage done to any property. Whether the enterprise itself is lawful or unlawful is not material, the gist of the offence lying in the mode in which the enterprise is carried out (The Trafalgar Square Riots, 1888, 16 Cox. Cr. Cas. 420, 427; Stephen, Dig. Crim. Law, 6th ed., art. 77). Nor is it material whether the enterprise is of a private or a public nature, though in the latter case the rioters may also be guilty of sedition or treason. An assembly in its inception perfectly lawful may become a riot if the persons assembled proceed to form and execute a common purpose in the manner above Stated, although they had no such purpose when they first assembled. Riot differs from " Affray " in the number of persons necessary to constitute the offence, from an " Un- lawful Assembly" in that actual tumult or violence is an

essential element, and from " Rout, """which may be described as a beginning or endeavour to create a riot. It was considered as early as the 14th century that the English common law gave an insufficient remedy against riot. In 1360 the statute of 34 Edward III. gave jurisdiction to justices to restrain, arrest and imprison: rioters. In 1393 the statute of 17 Richard II. conferred similar powers on the' sheriff and. posse comitatus. Numerous other acts extending the common law were passed, especially in the Tudor reigns (see Stephen, : History of

the Criminal Law, vol. i. p. 202). Both these acts above mentioned are still on the statute book, but the earliest act now in force of real importance as to this offence is the Riot Act (1716), which creates certain statutory offences for riot attended by circumstances of aggravation. That act makes it the duty of a justice, sheriff, mayor or other authority, wherever twelve persons or more' are unlawfully, riotously and tumultuously assembled together, to the disturbance of the public peace, to resort to the place of such assembly and read the following proclamation: " Our Sovereign Lord the King chargeth and commandeth all persons being assembled immediately to dis- perse themselves, and peaceably to depart to their habitations or to their lawful business, upon the pains contained in the act made in the first year of King George for preventing tumultuous and riotous assemblies. God save the King." It is a felony to obstruct the reading of the proclamation or to remain or continue together unlawfully, riotously and tumultu- ously for one hour after the proclamation was made or for one hour after it would have been made but for being hindered. The act requires the justices to seize and apprehend all persons continuing after the hour, and indemnifies them and those who act under their authority from liabihty for injuries caused thereby. The punishment for the felony is penal servitude for life or for a term of not less than three years, or imprison- ment with or without hard labour for not more than two years. Prosecutions for an offence against the act must be commenced within twelve months after the offence.

By S; n of the Malicious Damage Act 1861 (which is a re- enactment of a similar provision made in 1827 in consequence of the frame-breaking riots), it is a felony for persons riotously and tumultuously assembled together to the disturbance of the public peace to unlawfully and with force demolish or begin to demolish or pull down or destroy any building, public building, machinery or mining plant. The punishment is the same as for a felony under the Riot Act. By s. 12 it is a misdemeanour to injure or damage such building, &c. The punishment is penal servitude from three to seven years, or imprisonment as in the case of the two felonies above described. Under the Shipping Offences Act (1793) a riotous assemblage of three or more seamen, ship's carpenters and other persons, unlawfully and with force preventing and hindering or obstruct- ing the loading or unloading or the sailing or navigation of any vessel, or unlawfully and with force boarding any vessel with intent to prevent, &c, is punishable on a first conviction as a misdemeanour by imprisonment from six to twelve months,

Besides these enactments there are others aimed at similar offences,

such as smuggling, forcible entry and detainer, tumultuous petitioning (1661, 13 Charles II.), holding large political meetings within a certain distance of Westminster Hall during the sitting of parliament (Seditious Meetings Act 1817). For these offences see Stephen, Dig. Cr. Law, 6th ed., arts. 81-87.

It is the duty of a magistrate at the time of a riot to assemble subjects of the realm, whether civil or military, for the purpose of quelling the riot. In this duty he is aided by the common law, and a statute of 1414 (Henry V.), under which all subjects of the realm are bound to assist on reasonable warning, and by various enactments enabling the authorities to call out the

militia, yeomanry and reserve forces for the suppression' of riot, and to close public-houses where a riot is apprehended (Licensing Act 1872). It is his duty to keep the peace; if the peace be broken, honesty of intention will not avail him if he has been guilty of neglect of duty. The question is whether he did all that he knew was in his power and which could be expected from a man of ordinary prudence, firmness and activity. The law as thus stated is gathered from the opinions of the judges on the trials of the lord mayor of London and the mayor of Bristol on indictments for neglect of duty at the time of the Gordon riots of 1780 and the Bristol riots in 1831. 1 In addition to his liability to an indictment at common law, a defaulting magistrate is subject under the provisions of acta of 141 1 (Henry IV.) and 1414 (Henry V.) to a penalty of £ioo for every default, the default to be inquired of by commission under the great seal. A matter of interest is the extent of the protection afforded by the Riot Act to soldiers acting under the commands of their officers. The question was dealt with by Lord Bowen and his fellow-commissioners in the report on the Featherstone riots (Pari. Paper, 1893-1894, c. 7234). The substance of their views is as follows: —

By the law of England every one is bound to aid in the suppression of riotous assemblages. The degree of force, how- ever, which may be lawfully employed in their suppression depends on the nature of each riot, for the force used must always be moderated and proportioned to the circumstances of the case and to the end to be attained. The taking of life can only be justified by the necessity for protecting persons or property against various forms of violent crime, or by the necessity of dispersing a riotous crowd which is dangerous unless dispersed, or in the case of persons whose conduct has become felonious through disobedience to the provisions of the Riot Act, and who resist the attempt to disperse or apprehend them. The necessary prevention of such outrage on person or property justifies the guardians of the peace

in the employment against a crowd of even deadly weapons. Officers and soldiers are under no special privileges and subject to no special re- sponsibilities as regards the principle of the law. A soldier for the purpose of establishing civil order is only a citizen armed in a particular manner. He cannot because he is a soldier be exonerated if without necessity he takes human life. The duty of magistrates and peace officers to summon or abstain from summoning the assistance of the military depends in like manner on the necessities of the case. A soldier can act only by using his arms. The weapons he carries are deadly. They cannot be employed at all without danger to life or limb, and in these days of improved rifles and perfected ammunition without some risk of danger to distant and possibly innocent bystanders. To call for assistance against rioters from those who can interfere only under such grave conditions ought, of course, to be the last expedient of the civil authorities. But when the call for help is made and a necessity for assistance from the military has arisen, to refuse such assistance is in law a misdemeanour. The whole action of the military when once called in ought from first to last to be based on the principle of doing, and doing without fear, that which is absolutely necessary to prevent serious crime, and of exercising care and skill with regard to what is done. No set of rules exists which governs every instance or defines beforehand any contingency that may arise. The presence of a magistrate is not essential, but is usual, and of the highest value to aid the commander of the troops by local knowledge. But his presence or absence has no legal effect on the duties or responsibilities of the military to use their arms when it becomes necessary to do so, and without recklessness or negligence and with reasonable care and caution; and where they have so acted the killing of a rioter is justifiable homicide, and the killing of an innocent bystander is homicide by mis- adventure. It is not usual to resort to extremities with rioters until after reading the proclamation under the Riot Act (1716),

1 Reports of these trials will be found in the State Trials, New Series, vol. iii. pp. I, 11. Most of the important cases of riot are collected or referred to in that series.

but this preliminary is by no means a condition precedent to the exercise of the common-law powers of suppressing riots.

The crown cannot charge upon the local rates the expense of

maintaining soldiers called into a district by the magistrates to suppress a riot (re Glamorgan County Council, L.R. 1899, 2 Q.B. 536); but the cost of extra police drafted in for the like purpose falls on the rates of the district into which they are drafted (see Police Act 1890, s. 25). Until 1886 persons whose property was damaged by riot had a civil remedy of an exceptional character by action against the hundred in which the riot took place. This remedy was a survival of the pre-Conquest liability of the hundred to guarantee the orderly conduct of its inhabitants. The hundred was made liable in case of robbery by the Statute of Winchester (1285). 1 That and subsequent acts were repealed in the reign of George IV., and their provisions were consolidated by an act of 1827 which gave a remedy against the hundred in the case of felonious demolition of churches, chapels, houses, machinery j &c, being feloniously demolished by rioters. The last instance of the use of this exceptional remedy was in the case of a riot at Worthing, and the remedy was abolished in 1886. When the Piccadilly riots occurred in that year no one knew that the injured shops were in the hundred of Ossulston, and difficulties arose in applying the old procedure. So an ex post facto statute was passed (the Metropolitan Police Compensation Act 1886) for a special settlement of the claims, and the old statutes were repealed and replaced by the Riot Damage Act 1886. Under this act compensation is payable where rioters have injured or destroyed houses, shops, buildings, fixed or movable machinery and appliances prepared or used for or in connexion with manufactures or agriculture, or for mines or quarries, or vessels stranded or in distress (see Wreck), or have injured, stolen, or destroyed property in houses, shops or buildings. The compensation is payable out of the police rate for the district in which the damage is done; or if it was done afloat, for the district nearest to the scene of action. The claim is made on the police authority for the district. The time and form for making claims and the mode of fixing the amount of compensation is regulated by rules made by the Home Secretary on the 30th of June 1894 (Stat. R. and O. 1894, No. 636). In adjusting the amount regard is had to the conduct of the claimant, viz. as to precautions taken by him, his share, if any, in the riot, or provocation offered to the rioters. Failure to carry out a programme for athletic sports has been held to debar a claimant from compensation for damage done by a riot among the disappointed spectators who had paid to see the sports. The claimant must give credit for insurance money, or any other compensation received in respect of the damage; but the insurers or persons who paid such com- pensation may file a claim against the police rate for the amount paid by them. Persons dissatisfied with the award of the police authority may sue for the recovery of their claim subject to a

liability to pay all the costs if they do not get judgment for more than the amount awarded. The action, if it is not for more than £100, is to be brought in the county court. The remedy is available in the case of stranded ships plundered by rioters (s. 515 of the Merchant Shipping Act

1894).

The Riot Act does not extend to Ireland, but similar provisions are contained in an act of the Irish Parliament passed in 1787 as amended by acts of 1831 and 1842. These acts create a special offence punishable by penal servitude for life, viz. sending notices, letters or messages inciting or tending to riot. Under the Criminal Procedure Ireland Act 1887 (a temporary act) summary proceedings may be taken against rioters. The civil remedy against the county or borough for malicious injury to property, real or personal, including ships in distress and their cargo, is wider than in England or Scotland, but it includes malicious injury by rioters where

1 There is a curious exception still on the Statute-book depriving persons robbed while travelling on the Lord's Day of any right to compensation from the hundred (Lord's Day Act 1677, s. 5).

the injury is a crime within the Malicious Damage Act of 1861; Claims are now dealt with in the county court, and not as formerly by the grand jury and judge of assize (Local Government Ireland Act 1898, s. 5).

In Scotland a riot may be either " rioting and mobbing " or " rioting and breach of the peace." The first is much the same as riot in English law. Mobbing consists in the assembling of a number of, people and then combining against order or peace to the alarm: of the lieges (Alison, Cr. Law of Scotland, vol. i. p. 509; Macdonald, Criminal Law, 180). The second offence occurs when concourse or a common purpose are wanting. Numerous acts against rioting and unlawful convoca- tion were passed by the Scottish parliament, beginning in 1487. The Riot Act (1716) applies to Scotland. There is a civil remedy against the county or burgh in which a riot takes place in respect of damage done by the rioters to houses, churches, buildings and ships, and buildings or engines used in trade or manufacture. The remedy is given by a series of statutes of 1716, 1812, 1816, 1817 and 1894. The procedure for its enforcement is now regulated by the Riotous Assemblies (Scotland) Act 1822, and amending statutes. The county or burgh authorities may adjust claims without litigation, and pay them out of the general assessments.

British Dominions. — In India the offence of riot, as defined by s. 146 of the Penal Code, consists in the use of force or violence by an unlawful assembly (which must consist of at least five persons, s. 141), or by any member thereof in the prosecution of the common object of such assembly (see Mayne, Ind. Criminal Law, ed. 1896, p. 489). In Ceylon and the Straits Settlements provisions based on the Indian Code are in force. In most of the settled Colonies the English law as to riot applies subject to local legislation. The Criminal Codes of Canada (1892, ss. 79-86), New Zealand (1893, ss. 83-89) and Queensland (1899, ss. 61-67) adopt the substance of the English law as to riot, in terms borrowed from the English draft Code of 1880. In those of the West Indies whose common law is based on that of France, Holland or Spain, the English law as to riot has been applied by ordinance, e.g. in British Guiana (Criminal Code 1893, tit. xix), and St Lucia (Criminal Code 1888, tit. xxv). In the South African colonies the English law of riot does not apply, but under the Dutch Roman law there exists a similar offence, known as ” public violence ” (vis publico), i.e. the use of violence and force by which the public rest and order is endangered and the authority of the lawful authorities and officials is set at naught. The offence was capital (see Van Leeuwen, Roman-Dutch Law, tr. by Kotze, 1886, vol. ii. p. 294; Morice, English and Roman-Dutch Law, 1903, p. 334). Similar provisions based on the French Penal Code are in force in Mauritius (Penal Code of 1838).

United States. — In the United States the law is based upon that of England (see Bishop, Amer. Cr. L., 8th ed., 1892, vol. i. s. 534, vol. ii. ss. 1143 et seq.). In some states there is a statutory proclamation for the dispersion of rioters in terms almost identical with those of the British Riot Act. The city, town, or county is by the statutes of many states rendered liable for damage caused by rioters, with or without a remedy over against the persons who did the damage (see revised Laws of Massachusetts, ed. 1902, chap. 211, sects. 2, 8).

RIO TINTO (Minas de Rio Tinto), a mining town of south- western Spain, in the province of Huelva; near the source of the river Tinto, and at the terminus of a light railway from the port of Huelva. Pop. (1900) 11,603. Ri° Tinto is one of the greatest copper-mining centres in the world; and it is from the discoloration of its waters by copper ore that the river derives its name. Besides the town of Minas, several villages are peopled by the native miners, whose numbers exceed 10,000; and one is occupied solely by British mine officials. The surrounding country is covered for miles with heaps of slag, and has been reduced to a desert. In 1903 the output of the mines included 840,000 tons of copper ore, worth more than £500,000, besides a

relatively small quantity of iron and manganese. Almost the entire product is despatched to Huelva for shipment to Great

Britain. Rio Tinto was probably first exploited by the Cartha- ginians; vestiges of later Roman workings may still be seen. After the Moorish conquest, in 711, it was neglected until 1725, when the mines were leased to a Swede named Wolters. Their modern importance dates from 1872, when a syndicate of London and Bremen capitalists purchased them from the Spanish government for nearly £4,000,000.

RIOU, EDWARD (1758 ?i8oi), British sailor, entered the navy at an early age. In 1780 he was promoted lieutenant, and nine years later he was in command of the ” Guardian ” when that vessel, crowded with convicts, struck a hidden rock off the African coast. Riou, after parting with as many of his men as the boats would hold, not only successfully navigated his half sinking ship 400 leagues to the Cape of Good Hope, but kept order amongst the panic-stricken convicts, an achievement which had few parallels in naval annals, and won Lieutenant Riou’s immediate promotion. He did not long remain a com- mander and in 1791 he was posted. Under Sir John Jervis he was present at the operations about Martinique and Guadeloupe in 1 794, and in the “Amazon” he accompanied the expedition under Sir Hyde Parker to the Baltic in 1801. His frigate led the way through the Channel at Copenhagen, and in the battle he was attached as commodore of a light squadron to Nelson’s division. Through the grounding of three ships of the line, Riou and his frigates found themselves opposed to the full force of the great Trekroner battery. Early in the fight he was wounded, but refused to leave the deck, and, as he was sitting on a gun-carriage and directing his men’s fire, he was cut in two by a cannon ball. Nelson, who had not known him before this expedition, had conceived a great affection for Riou, and spoke of his loss as ” irreparable.” Brenton, the naval historian, declared that he had all the qualities of a perfect officer. Parliament com- memorated the memory of the ” gallant good Riou ” by a memorial in St Paul’s Cathedral.

RIOUW, Rhiouw or Bintang, an archipelago of the Dutch East Indies, E. of Sumatra, and separated from the Malay Peninsula by the Straits of Singapore. With the Lingga, Karimon, Tambelan, Anambas andNatuna Islands, to the N.E., E. and S., and the territory of Indragiri in Sumatra, it forms the Dutch residency of Riouw and dependencies.

The seat of government is at Tanjong Pinang, a small port of 4000 inhabit- ants (including 160 Europeans and about 2000 Chinese), on the S.W. coast of the chief island, Bintang or Riouw. The total area of the residency is about 17,550 sq. m., and its population (1905) 112,216, of whom considerably over a quarter are Chinese. These cultivate gambier and pepper successfully in Bintang, and there is a considerable trade in wood. Bintang has an area of about 440 sq m., and is surrounded by many rocks and small islands, making navigation dangerous. The soil is not fertile, and much of it is swampy. There is an assistant residency of Lingga, to which belongs the island of Singkep, where extensive tin-deposits are worked. Geologically the Riouw and Lingga Islands are appendages of the Malay Peninsula, not of Sumatra. Bintang is mentioned by Marco Polo under the name of Pentam, which is not far from the genuine Malay name Bentin, said to mean a half-moon. After the Portuguese conquest of Malacca (15 11), the expelled Mahommedan dynasty took'up its residence on Bintang, where it long fostered piracy.

RIPLEY, GEORGE (1802-1880), American critic and man of letters, was bom at Greenfield, Massachusetts," on the 3rd of October 1802. He graduated first in his class at Harvard in 1823. From 1826 to 1840 he was pastor of a Unitarian church in Boston, subsequently retiring from the active ministry alto- gether. It was during those years that there grew up in New England that form of thought or philosophy known as Tran- scendentalism. Ripley was prominent, if not the leader, in all practical manifestations of the movement; and it was largely by his earnestness and practical energy that certain of its more tangible results were brought about. The first meeting of the Transcendental Club was held at his house in September 1836. He was a founder and a chief supporter of the magazine, the Dial, which was the organ of the school from 1841 to 1844. Most

important of all, however, he was the originator of " The Brook Farm Institute of Education and Agriculture." Until the abandonment of this experiment in 1847, Ripley was its leader, cheerfully taking upon himself all kinds of tasks, teaching mathematics and philosophy in the school, milking cows and attending to other bucolic duties, and after June 1845 editing the weekly Harbinger, an organ of " association," which he continued to edit in New York from 1847 until it was dis- continued in 1849. The failure of Brook Farm (q.v.) left Ripley poor and feeling keenly the defeat of his project; but the event forced him at last to devote himself to that career of literary labour in which the real success of his life was achieved. In 1849 he joined the staff of the New York Tribune, and in a short time became its literary editor. This position, which, through his steadiness, scholarly conservatism and

freedom from caprice as a critic, soon became one of great influence, he held until his death in New York City on the 4th of July 1880.

During the greater part of the time of his connexion with the Tribune, Ripley was also an adviser of a prominent publishing house, an occasional contributor to the magazines, and a co- operator in several literary undertakings. The chief of these was the American Cyclopaedia, which as the New American Cyclopaedia — so named to distinguish it from Francis Lieber's Encyclopaedia Americana — was issued, under the editorship of Ripley and Charles A. Dana, in 1857-63, a revised edition, with the word " new " dropped from the title, being issued under the same editorship in 1873-76. He also issued, in translation, a series of Specimens of Foreign Standard Literature (14 vols., 1838-42). Ripley was twice married, first in 1827 to Miss Sophia Willard Dana (d. 1861), a daughter of Francis Dana and a conspicuous figure at Brook Farm; and second, in 1865, to a young German widow, Mrs Augusta Schloss- berger, who survived him and subsequently married Alphonse Pinede.

A biography of Ripley (Boston, 1882), written by the Rev. 0. B. Frothingham, forms one of the volumes of the " American Men of Letters series. (E. L. B.)

RIPLEY, a market town in the Ilkeston parliamentary division of Derbyshire, England, 10 m. N. by E. of Derby, on a branch of the Midland railway. Pop. of urban district (1901) 10,111. It lies on high ground between the valleys of the Derwent and the Erewash. In the neighbourhood there are extensive collieries, and coke is largely manufactured. Besides iron foundries, blast furnaces and boiler works, the town possesses silk and cotton mills. The charter for the market was granted by Henry III. The district has a large industrial population. To the west of Ripley lies the township of Heage (pop. 2889).

RIPON, GEORGE FREDERICK SAMUEL ROBINSON, ist Marquess of (1827-1909), British statesman, only son of the ist earl of Ripon and his wife Lady Sarah, daughter of Robert Hobart, 4th earl of Buckinghamshire, was born in London on the 24th of October 1827. The Robinson family was descended from an eminent Hamburg merchant, William Robinson (1522-1616), who represented York. in parliament in Elizabeth's reign. His great-grandson was in 1660 created a baronet. Thomas Robinson, ist Baron Grantham (1695-1770), son of a later holder of the baronetcy, was created a peer in 1761, having been an indefatigable diplomatist pleni- potentiary at the peace of Aix-la-Chapelle, and secretary of state. The 2nd Baron

Grantham (1 738-1 786), ambassador at Madrid, and foreign secretary under Lord Shelburne, had two sons. The elder of these, succeeding as 3rd Baron Grantham (1 781-1859), became in 1833 2nd Earl de Grey, in right of his maternal aunt, and assumed the surname of de Grey; he was lord-lieutenant of Ireland (1841-44). The younger, Frederick John (1782-1859), created Viscount Gode- rich in 1827 and earl of Ripon in 1833, was the well-known “Prosperity Robinson ” who was chancellor of the exchequer from 1823 to 1827; as Lord Goderich he became prime minister (and a peculiarly weak one) from August 1827 to January 1828, colonial secretary in 1831 and 1832, lord privy

seal (1833-34), president of the Board of Trade (1841-43), and president of the India board (1843-46).

His son, the future marquess, began his political life as attachi to a special mission to Brussels in 1849. I n 1851 he married Henrietta Vyner (d. 1907), and their eldest son, after- wards known as Earl de Grey, was born in 1852. Under his courtesy title of Viscount Goderich he was returned to the House of Commons for Hull in 1852 as an advanced Liberal. In 1853 he was elected for Huddersfleld, and in 1857 for, the West Riding of Yorkshire. In January 1859 he succeeded ■ to his father’s title, and in November of the same year to that of his uncle, Earl de Grey. A few months after entering the Upper House he was appointed under-secretary for war, and in February 1861 under-secretary for India. Upon the death of Sir George Gornewall Lewis in April 1863 he became secre- tary for war, with a seat in the cabinet. In 1866 he was ap- pointed secretary of state for India. On the formation of the Gladstone administration in December 1868, Lord Ripon was appointed lord president of the council, and held that office until within a few months of the fall of the government, in 1873, when he resigned on purely private grounds., In 1869 he was created a Knight of the Garter. In 187 1 Lord Ripon was appointed chairman of the High Joint-Commission on the Alabama claims, which arranged the treaty, of Washington. In recognition of his services he was elevated to a marquessate (1871). In 1874 he became a convert to Roman Catholicism, and this involved his resignation of the office of grand master of the English Freemasons. On the return of Gladstone to power in 1880 Lord Ripon was appointed viceroy of India, the appointment exciting a storm of controversy, the marquess being the first Roman Catholic to hold the viceregal office. He went out to reverse the Afghan policy of Lord Lytton, and Kandahar was given up,

the whole of Afghanistan being secured to Abdur Rahman. The new viceroy was also called upon to decide grave questions between the native population and the resident British, and he resolved upon a liberal policy towards the former, among his measures being the repeal of the Vernacular Press Act, the extension of local government and the appointment of an Education Commission. He extended the rights of the natives, and in certain directions curtailed the privileges of Europeans. Several of the viceroy's measures, notably the Ilbert Bill of 1883— so named after its author Sir Courtenay Ilbert— irritated the Anglo-Indian population, and it was fiercely assailed. The purpose of this bill was disclosed in the statement that " the government of India had decided to settle the question of jurisdiction over European British subjects in such a way as to remove from the code, at once and completely, everyjudicial disqualification which is based merely on race distinctions," iriXfact to subject Europeans in certain cases to trial by native magistrates. This announcement raised a storm of indignation among the European community in India, and the government were obliged virtually, though not avowedly, to abandon their measure. Act III. of 1884 was a compromise, which, while subjecting Europeans to the jurisdiction of native district magisˆ trates or sessions judges, reserved to them the right to demand trial by a jury of which at least half should be Europeans. There probably never was a viceroy so unpopular among Anglo-Indians or so popular with the natives. On Lord Ripon's departure from India in November 1884 there were extraordinary manifestations in his favour on the part of the Hindu population of Bengal and Bombay, and more than a. thousand addresses were presented to him. On his arrival in England the marquess delivered a number of vigorous speeches in defence of his adminstration. In 1886 he became first lord of the admiralty in the third Gladstone ministry; and on the return of the Liberals to power in 1892 he was appointed colonial secretary, which post he continued to hold until the resignation of the government in 1895. He was included in Sir Henry Campbell-Bannerman's cabinet at the close of 1905 as lord privy seal, an office which he retained in 1908 when Mr Asquith formed his new ministry, but which

he resigned later in the same year. He died at his seat, Studley Royal, near Ripon, on the 9th of July 1909, when his only son, Earl de Grey, who has been treasurer of the queen's household since 1901, became the 2nd marquess. For many years Lord Ripon was president of the Yorkshire College of Science at Leeds, and chairman of the West Riding County Council.

RIPON, a cathedral city and municipal borough in the Ripon parliamentary division of the West Riding of Yorkshire, England, 214

m, N.N.W; from London, on the North-Eastern railway. Pop. (1901) 8230. It is pleasantly situated at the confluence of the streams Laver and Skell with the river Ure, which is crossed by a fine bridge of nine arches. The streets are for the most part narrow and irregular, and, although most of the houses are comparatively modern, some of them retain the picturesque gables characteristic of earlier times. The cathedral, although not ranking among those of the first class, is celebrated for its fine proportions, and is of great interest from the various styles of architecture which it includes. Its entire length from E. to W. is '266 ft., the length of the transepts 130 ft., and the width of the nave and aisles 87 ft. Besides a large square central tower, there are two western towers. The cathedral was founded oh the ruins of St Wilfrid's abbey about 680, but of this Saxon building nothing now remains except the crypt, called St Wilfrid's Needle. The present building was begun by Archbishop Roger (1154-81), and to this Transition-period belong the transepts and portions of the choir. The western front and towers, fine specimens of Early English, were probably the work of Walter de Grey, archbishop: of York (d. 1255), and about the close of the century the eastern portion of the choir was rebuilt in the Decorated style. The nave, portions of the central tower, and two bays of the choir are Perpendicular ,'having been rebuilt towards the close of the 15th century. Earlier than the rest of the fabric (except the crypt) is part of the chapter-house and the vestry, adjoining the south side of the choir, and terminating eastward in an apse. This is pure Norman work, and there is a crypt of that period beneath, which was formerly filled with unburied bones. There are a number of monuments of historical and antiquarian interest. The diocese includes rather less than One-third of the parishes of Yorkshire, and also a small part of Lancashire. The bishop J s palace, a modern building in Tudor style, is situated in extensive grounds about a mile from the town. In the vicinity is the domain of Studley Royal, the seat of the marquess of Ripon, which contains the celebrated ruins of Fountains. Abbey (ˆd.). The principal secular buildings are the town hall, the public rooms, and the mechanics' institution (1894) where technical and other classes are held. There are several old charities, including the hospital of St John the Baptist, founded in n 09 but modernized; the hospital of St Anne, founded probably in the reign of Henry VI. by an unknown benefactor; and the hospital of St Mary Magdalene for women: This last was founded by Thurstan, archbishop of York (1114-41), as a secular community, one of the special duties of which was to minister to lepers. In the 13th century a master and chaplain took the place of the lay brethren, and in 1334'. a chantry was founded. The chapel remains, with its interesting Norman work, its low side- windows, said to have allowed the lepers to follow the

services, and its pre-Reformation altar of stone, a rare example. There is a considerable trade in varnish, and the saddle-trees and other leather goods pro- duced here are in high repute. The borough is under a mayor, 4 aldermen, and 12 councillors. Area, 1809 acres.

Ripon (In Rhypum, Ad Ripam) owed its origin to the mon- astery founded in the 7th century. A certain king, Alchfrithˆ is said to have given the site of the town to Eata, abbot of Melrose, to found a monastery, but before it was completed Eata was deposed for refusing to celebrate Easter according to the Roman usage, and St Wilfrid was appointed the first abbot. Another version of the story, however, says that the land was given to St Wilfrid, who himself built the monastery. Ripon is said to have been made a royal borough by Alfred the Great, and King jEthelstan, after his victory at Brunanburb

in 937, is stated to have granted to the monastery sanctuary, freedom from toll and taxes, and the privilege of holding a court, although both charters attributed to him are known to be . spurious. At the same time he is said to have given the manor to Wulfstan, archbishop of York. About 950 the monastery and town were destroyed by King Edred during his expedition against the Danes, but the monastery was rebuilt by the arch- bishops of York, and about the time of the Conquest was changed to a collegiate church. In 1318, when the Scots in- vaded England, Ripon only escaped being burnt a second time by the payment of 1000 marks. The custom of blowing the wakeman’s horn every night at nine o’clock is said to have originated about a.d. 700. It was probably at first a means of calling the people together in case of a sudden invasion, but was afterwards a signal for setting the watch. A horn with a baldric and the motto ” Except the< Lord keep the city the watchman waketh but in vain " forms the mayor's badge. The archbishops of York as lords of the manor had various privileges in the town, among which were the right of holding a market and fair, and Archbishop John, being summoned in the reign of Henry I. to answer by what right he claimed these privileges, said that he held them by prescription and by the charter of King ˆEthelstan. Henry I. afterwards granted or confirmed to Archbishop Thomas a fair on the feast of St Wilfrid and four following days. The fairs and markets be- longed to the archbishops of York until they were transferred to the bishop of Ripon in 1837. In 1857 they were transferred to the ecclesiastical commissioners, from whom they were purchased by the corporation of Ripon in 1880. From before the Conquest until the

incorporation charter of 1604 Ripon was governed by a wakeman and 12 elders, or aldermen, but in 1604 the title of wakeman was changed to mayor, and 12 aldermen and 24 common councilmen were appointed. The manufacture of cloth was at one time carried on in Ripon, but was almost lost in the 16th century when the town was visited by Leland. The making of spurs succeeded the cloth manufacture and became so noted that the saying " as true as Ripon ro wells " was a well-known proverb. This manufacture died out in the 18th century. Ripon was summoned to send two members to parliament in 1295, and occasionally from that time until 1328-29. The privilege was revived in 1553, after which the burgesses continued to send two members until 1867, when they were allowed only one. This latter privilege was taken away by the Redistribution Bill of 1885, and it now gives its name to one of the divisions of the county.

See Victoria County History, Yorkshire; and W. Harrison, Ripon Millenary: a Record of the Festival and a History of the City, arranged under its Wakemen and Mayors from the year 1400 (1892).

RIPON, a city of Fond du Lac county, Wisconsin, U.S.A., on Silver Creek, about 22 m. W. of Fond du Lac, and about 75 m. N.W. of Milwaukee. Pop. (1890), 3358; (1900), 3818, of whom 885 were foreign-born; (1905), 3811; (1910), 3739. Ripon is served by the Chicago & North-Western, and the Chicago, Milwaukee & St Paul railways. The city has a Carnegie library, which also houses the library of the Ripon Historical Society, and is the seat of Ripon College (non- sectarian, co-educational), which was founded in 1850 as the Lyceum of Ripon, and was named Ripon College in 1864; in 1908 it had 23 instructors and 279 students. There are grain elevators and various manufactories, among the products of which are cheese and other creamery products, flour, knit goods, pickles and canned goods, woodenware, washing rnachines and gloves.

The site of Ripon was purchased in 1838 by John Scott Horner (1802-1883), of Virginia, secretary and acting-governor of Michigan Territory in 1835, and the first secretary of Wis- consin Territory in 1836-37, who named the village when, it was established in 1849 from the seat of his ancestors in Yorkshire. In May 1844 a settlement, named Ceresco or ” the Wisconsin Phalanx,” a Fourierist community, 1 organized

‘The charter, granted by the legislature in 1845, contained the following features: (1) property to be held in common;

in Southport (now Kenosha), had been established in the vicinity. A

“Long House,” 400 ft. in length, was erected, which contained tenements, an amusement or lecture hall, and a dining-room where all ate at a common table, and where board was provided at cost, sometimes as low as sixty-three cents per week. The ” class of usefulness ” was divided into three groups, agricultural, mechanical and educational, with such subdivisions as necessity dictated, and an exact account of labour was kept. The community prospered materially from the. start. In the second season it consisted of thirty families with property valued at $27,725; in 1846 there were 180 resident members, and the net profit for the year was $9029. Eventually differences of Opinion arose as to the division of labour, and the common dining-hall did not prove popular. Rivalry developed with the village of Ripon, and the community gave up its charter at the close of 1850, dividing property valued at $40,000 among the share- holders. On the whole it was one of the most successful experiments in communism ever tried in America. In 1858 Ripon absorbed the village of Cereseo and was chartered as a city. At Ripon started one of the disconnected movements that resulted in the founding of the Republican party. •

See D. P. Mapes, History of Ripon (Milwaukee, Wis., 1873); Consul W. Butterfield, History of Fond du Lac County. (1880); W. A; Hinds, American Communities and Co-operative Colonies (3rd ed., Chicago, 1908), and F. A. Flower, History of the Republican Party

RIPPERDA, JOHN WILLIAM, Baron, and afterwards duke of (1680-1737), political adventurer and Spanish minister, was a native of Groningen in the Netherlands. According to .a story which he himself set going during his adventures in Spain, his family was of Spanish origin. But there does not appear to be any foundation for this assertion. The name was not uncommon in Groningen, and was borne by several persons of some note in the 16th and 17th centuries, one of whom was a follower of William the Silent. . They were people of some position, possessing ” lordships ” at Jansinia, Poelgast, and other places; and some at least of them were Roman Catholics. John William, if he was, as he asserted, born a Roman Catholic, conformed to Dutch Calvinism in order to obtain his election as delegate to ‘ the states-general from Groningen. In 171 5 he was sent by the Dutch government as ambassador to Madrid. Saint-Simon says that his character for probity was even then considered doubtful. The fortune of Orry, Alberoni and other foreigners in Spain, showed that the court of Philip V. offered a career to adventurers. Ripperda — whose name is commonly spelt Riperda by the Spaniards— devoted himself to the Spanish government, and professed himself a Roman Catholic. He first attached himself to Alberoni, and after the fall of that minister he

became the agent of Elizabeth Farnese, the restless and intriguing wife of Philip V. Though perfectly unscrupulous in money matters, and of a singularly vain and blustering disposition, he did under- stand commercial questions, and he has the merit of having pointed out that the poverty of Spain was mainly due to the neglect of its agriculture. But his fortune was not due to any service of a useful kind he rendered his masters. He rose by undertaking to aid the queen, whose influence over her husband was boundless, in her schemes for securing the succession to Parma, Plasencia and Tuscany for her sons. Ripperda was sent as special envoy to Vienna in 1725. He behaved with ridiculous violence, but the Austrian government, which was under the influence of its own fixed idea, treated him seriously. The result of ten months of very strange diplomacy was a treaty by which the emperor promised very little, but

and shares to be sold at $25 ; (2) land to be limited to 40 acres for each member of the corporation; (3) a unanimous vote of the managers necessary for admission ; (4) an annual settlement of profits on the basis of one-quarter credit to dividend on stock', and three-quarters credit to labour; (5) free public schools, capital paying three-quarters and labour one-quarter of cost; and (6) complete religious toleration and no. involuntary taxatioe for church support. ■ .. ...

Spain was bound to pay heavy subsidies, which its exhausted treasury was quite unable to afford. The emperor hoped to obtain money. Elizabeth Farnese hoped to secure the Italian duchies for her sons, and some vague stipulations were made that Charles VI. should give" his aid for the recovery by Spain of Gibraltar and Minorca. When Ripperda returned to Madrid at the close of 1725 he asserted that the emperor expected him to be made prime minister. The Spanish sovereigns, who were overawed by this quite unfounded assertion, allowed him to grasp the most important posts under the crown. He excited the violent hostility of the Spaniards, and entered into a complication of intrigues with the French and English governments. His career was short. In 1726 the Austrian envoy, who had vainly pressed for the payment of the promised subsidies, came to an explanation with the Spanish sovereigns. It was discovered that Ripperda had not only made promises that he was not authorized to make, but had misappropriated large sums of money. The sovereigns who had made him duke and grandee shrank from covering themselves with ridicule by revealing the way in which they had been

deceived. Ripperda was dismissed with the promise of a pension. Being in terror of the hatred of the Spaniards, he took refuge in the English embassy. To secure the favour of the English envoy, Colonel William Stanhope, afterwards Lord Harrington, he betrayed the secrets of his government. Stanhope could not protect him, and he was sent as a prisoner to the castle of Segovia. In 1728 he escaped, probably with the connivance of the govern- ment, and made his way to Holland. His last years are obscure. It is said that he reverted to Protestantism, and then went to Morocco, where he became a Mahommedan and commanded the Moors in an unsuccessful attack on Ceuta. But this story is founded on his so-called Memoirs, which are in fact a Grub- street tale of adventure published at Amsterdam in 1740. All that is really known is that he did go to Morocco, and that he died at Tetuan in 1737.

See Arnold Ritter von Arneth, Prinz Eugen von Savoy en (Vienna, 1864), for the negotiations of 1725, and Gabriel Syveton, Une Cow et un aventurier au XVIII' siicle (Paris, 1896). His Memoirs were translated into English by J. Campbell, London,

1750.

RISHANGER, WILLIAM (c. 1250-c. 1312), English chronicler, made his profession as a Benedictine at St Alban's abbey in 1271, of which he perhaps became the official chronicler. The most important of his writings is the Narratio de bellis apud Lewes et Evesham. Though written many years afterwards and drawn from other sources, it is a spirited account of the barons' war. He is so great an admirer of Simon de Montfort that this work has been called a hagiography. He is credited with the authorship of a chronicle covering the period 1259-1306; this has been disputed, but the work is printed under his name by Riley. Another work of his, of not much im- portance, is a chronicle entitled Recapitulate brevis de gestis domini Edwardi, &c. He is probably not the author of other works commonly attributed to him.

Authorities. — Wilhelmi Rishanger chronica et annates, Rolls Series, Introduction ed. H. T. Riley; the Narratio de bellis apud Lewes et Evesham, ed. J. O. Halliwell, Camden Society, 1840.

RISK, hazard, chance of danger or loss, especially the chance of loss to property or goods which an insurance company undertakes to make good to the insurer in return for the re- current payment of a sum called the premium (see Insurance). The word appears late in English, and in the 17th century in the Fr. form risque or It. risco or risgo, for risico, risigo; cf. Sp. riesgo. The Med. Lat. riscus, rischium, and risicum

are found, according to Du Cange (Gloss., qq.v.), as early as the 13th century. Skeat (Etym. Diet., 1910) accepts Diez's sugges- tion that the word is originally a sailor's term, and is to be referred to Sp. risco, a steep rock, from Lat. resecare, to cut back, shut off; thus Sp. arriesgar, to run into danger, means literally " to go against a rock."

RIST, JOHANN VON (1607-1667), German poet, was born at Ottensen in Holstein on the 8th of March 1607; the son of

the Lutheran pastor of that place. He received his early training in Hamburg and Bremen; after studying theology at Rinteln and Rostock, he became in 1633 private tutor in a family of Heide, and two years later (1635) was appointed pastor of the village of Wedel on the Elbe, where he laboured until his death on the 31st of August 1667. Rist first made his name known to the literary world by a drama, Perseus (1634), which he wrote while at Heide, and in the next succeeding years he produced a number of dramatic works of which the allegory Das friedewunschende Teutschland (1647) and Das friedejauchzende Teutschland (1653) (new ed. of both by H. M. Schletterer, 1864) are the most interesting. Rist soon became the central figure in a school of minor poets, and honours were showered upon him from every side. The emperor Ferdinand III. crowned him laureate in 1644, ennobled him in 1653, and invested him with the dignity of a Count Palatine, an honour which enabled him to crown, and to gain numerous poets for the Elbschwanen order, a literary and poetical society which he founded in 1656. He had already, in 1645, been admitted, under the name " Daphnis aus Cimbrien," to the literary order of Pegnitz, and in 1647 he became, as " Der Riistige," a member of the Fruchtbringende Gesellschaft. It is, however, as a writer of church hymns (see Hymns) that Rist is best known to fame. Among these several are still retained in the evangelical hymn book: e.g. O Ewigkeit, du Donnerwort and Ermunt're dich, mein schwacher Geist. Collections of his poems appeared under the titles Musa Teutonica (1634) and Himmlische Lieder

(1643). #

Selections of Rist's writings have been published by W. Muller in vol. viii. of his Bibliothek deutscher Dichter des 17. Jahrh. (1822- 1838), and by K. Goedeke and E. Goeze (1885). See T. Hansen, Johann Rist und seine Zeit (1872); K. T. Gaedertz, J. Rist als niederdeutscher Dramatiker (Jahrb.f. niederdeutsche Sprache, vol. vii., 1881); and M. von Waldberg's article in the Allg. deutsche Bio- graphie.

RISTITCH (or Ristich), JOVAN (1831-1899), Servian states- man, was

born at Kragugevats in 183 1. He was educated at Belgrade, Heidelberg, Berlin and Paris. After failing to obtain a professorship in the high school of Belgrade, he was appointed in 1861 Servian diplomatic agent at Constantinople. His reputation was enhanced by the series of negotiations which ended in the withdrawal of the Turkish troops from the Servian fortresses in 1867. On his return from Constanti- nople he was offered a ministerial post by Prince Michael, who described him as ” his right arm,” but declined office, being opposed to the reactionary methods adopted by the prince’s government. He had already become the recognized leader of the Liberal party. After the assassination of Prince Michael in 1868, he was nominated member of the council of regency, and on the 2nd January 1869 the first Servian con- stitution, which was mainly his creation, was promulgated. When Prince Milan attained his majority in 1872, Ristitch became foreign minister; a few months later he was appointed prime minister, but resigned in the following autumn (1873). He again became prime minister in April 1876, and conducted the two wars against Turkey (July 1876-March 1877 and December 1877-March 1878). At the congress of Berlin he laboured with some success to obtain greater advantages for Servia than had been accorded to her by the treaty of San Stefano. The provisions of the treaty of Berlin, however, disappointed the Servians, owing to the obstacles now raised to the realization of the national programme; the Ristitch government became unpopular, and resigned in 1880. In 1887 King Milan (who had assumed the royal title in 1882), alarmed at the threatening attitude of the Radical party, recalled Ristitch to power at the head of a coalition cabinet; a new constitution was granted in 1888, and in the following year the king abdicated in favour of his son, Prince Alexander. Ristitch now became head of a council of regency, entrusted with power during the minority of the young king, and a Radical ministry was formed. In 1892, however, Ristitch transferred the government to the Liberal party, with which he had always been connected. This step and the subsequent

conduct of the Liberal politicians caused serious discontent in the country. On the 1st (13th) of April 1893 King Alexander, by a successful stratagem, imprisoned the regents and ministers in the palace, and, declaring himself of age, recalled the Radicals to office. Ristitch now retired into private life. He died at Belgrade on 4th September 1899. Though cautious and deliberate by temperament, he was a man of strong will and firm character. He was the author of two

published works: The External Relations of Servia from 184.8 to i86y (Belgrade, 1887) and A Diplomatic History of Servia (Belgrade, 1896). (J.D.B.)

RISTORI, ADELAIDE (1822-1906), Italian actress, was born at Cividale del Friuli on the 30th of January 1822, the daughter of strolling players. As a child she appeared upon the stage, and at fourteen made her first success as Francesca da Rimini in Silvio Pellico's tragedy. She was eighteen when for the first time she played Mary Stuart in an Italian version of Schiller's play. She had been a member of the Sardinian company and also of the Ducal company at Parma for some years before her marriage (1846) to the marchese Giuliano Capranica del Grillo (d. 1861); and after a short retirement she returned to the stage and played regularly in Turin and the provinces. It was not until 1855 that she paid her first professional visit to Paris, where the part of Francesca was chosen for her debut. In this she was rather coldly received, but she took Paris by storm in the title role of Alfieri's Myrrha. Furious partisanship was aroused by the appearance of a rival to the great Rachel. Paris was divided into two camps of opinion. Humble playgoers fought at gallery doors over the merits of their respective favourites. The two famous women never actually met, but the French actress seems to have been convinced that Ristori had no feelings towards her but those of admiration and respect. A tour in other countries, was followed (1856) by a fresh visit to Paris, when Ristori appeared in Montanelli's Italian translation of Legouve's Medea. She repeated her success in this in London. In 1857 she visited Madrid, playing in Spanish to enthusiastic audiences, and in 1866 she paid the first of four visits to the United States, where she won much applause, particularly in Giacometti's Elizabeth, an Italian study of the English sovereign. She finally retired from professional life in 1885, and died on the 9th of October 1906 in Rome. She left a son, the marchese Georgio Capranica del Grillo. Her Studies and Memoirs (1888) provide a lively account of an interesting career, and are particularly valuable for the chapters devoted to the psychological explanation of the characters of Mary Stuart, Elizabeth, Myrrha, Phaedra and Lady Macbeth, in her interpretation of which Ristori com- bined high dramatic instinct with the keenest and most critical intellectual study.

See also Kate Field, Adelaide Ristori: A Biography (New York, 1867) ; E. Peron Kingston, Adelaide Ristori: A Sketch of her Life (1856) ; Daily Telegraph (London, Oct. 10, 1906).

RITCHIE, CHARLES THOMSON RITCHIE, ist baron (1838-1906), English politician, was born at Dundee, and educated at the City of

London school. He went into business, and in 1874 was returned to parliament as Conservative member for the Tower Hamlets. In 1885 he was made secretary to the Admiralty, and from 1886 to 1892 president of the Local Govern- ment Board, in Lord Salisbury's administration, sitting as member for St George's in the East. He was responsible for the Local Government Act of 1888, instituting the county councils; and a large section of the Conservative party always owed him a grudge for having originated the London County Council. In Lord Salisbury's later ministries, as member for Croydon, he was president of the Board of Trade (1895-1900), and home secretary (1895-1900); and when Sir Michael Hicks-Beach retired in 1902, he became chancellor of the exchequer in Mr Balfour's cabinet. Though in his earlier years he had been a " fair-trader," he was strongly opposed to Mr Chamberlain's movement for a pre- ferential tariff (see the articles on Balfour, A. J., and Chamber- lain, J.), and he resigned office in September 1903. In December 1905 he was created a peer, but he was in ill-health, and he died at Biarritz on the 9th of January 1906.

RITCHIE, DAVID GEORGE (1853-1903), Scottish philosopher, was born at Jedburgh, son of the Rev. George Ritchie, D.D. He had a distinguished university career at Edinburgh, and Balliol College, Oxford, and after being fellow of Jesus and tutor of Balliol was elected professor of logic and metaphysics at St Andrews. He was president of the Aristotelian Society in 1898. Among his works are: Darwinism and Politics (1889); Prin- ciples of State Interference (1891); Darwin and Hegel (1893); Natural Rights (1895); a translation with R. Lodge and P. E. Matheson of Bluntschli's Theory of the State (1885) ; many articles in Mind, Philosophical Review, &c. His Philosophical Studies was edited with a memoir by R. Latta (1905).

RITSCHL, ALBRECHT (1822-1889), German theologian, was born at Berlin on the 25th of March 1822. His father, Georg Karl Benjamin Ritschl (1783-1858), became in 1810 pastor at the church of St Mary in Berlin, and from 1827 to 1854 was general superintendent and evangelical bishop of Pomerania. Albrecht Ritschl studied at Bonn, Halle, Heidelberg and Tubingen. At Halle he came under Hegelian influences through the teaching of Julius Schaller (1810-1868) and J. H. Erdmann (b. 1805). In 1845 he was entirely captivated by the Tubingen school, and in his work Das Evangelium Marcions und das kanonische Evangelium des Lukas, published in 1846, he. appears as a disciple of F. C. Baur. This did not last long with him, however, for the second edition (1857) of his most important work, on the origin of the old Catholic Church (Die Entstehung der alt-kathol. Kirche), shows considerable divergence from the first edition (1850), and reveals an

entire emancipation from F. C. Baur's method. Ritschl was professor of theology at Bonn (extraordinarius 1852; ordinarius 1859) and Gottingen (1864; Consistorialrath also in 1874), his addresses on religion delivered at the latter university showing the impression made upon his mind by his enthusiastic studies of Kant and Schleiermacher. Finally, in 1864, came the influence of Rudolf Lotze. He wrote a large work on the Christian doctrine of justification and atonement, Die Christliche Lehre von der Rechtfertigung und Versohnung, published during the years 1870-74, and in 1880-86 a history of pietism (Die Geschichle des Pietismus). His system of theology is contained in the former. He died at Gottingen on the 20th of March 1889.

His son, Otto Ritschl (b. i860), after studying at Gottingen, Bonn and Giessen, became professor at Kiel (extraordinarius) in 1889 and afterwards at Bonn (extraordinarius 1894; or- dinarius 1897). He has published, amongst other works, Schleiermachers Stellung zum Ckristentum in seinen Reden fiber die Religion (1888), and a Life of his father (2ˆols., 1829-96).

Ritschl claims to carry on the work of Luther and Schleier- macher, especially in ridding faith of the tyranny of scholastic philosophy. His system shows the influence of Kant's destruc- tive criticism of the claims of Pure Reason, recognition of the value of morally conditioned knowledge, and doctrine of the kingdom of ends; of Schleiermacher's historical treatment of Christianity, regulative use of the idea of religious fellowship, emphasis on the importance of religious feeling; and of Lotze's theory of knowledge and treatment of personality. Ritschl's work made a profound impression on German thought and gave a new confidence to German theology, while at the same time it provoked a storm of hostile criticism: his school has grown with remarkable rapidity. This is perhaps mainly due to the bold religious positivism with which he assumes that spiritual experience is real and that faith has not only a legiti- mate but even a paramount claim to provide the highest inter- pretation of the world. The life of trust in God is a fact, not so much to be explained as to explain everything else. Ritschl's standpoint is not that of the individual subject. The objective ground on which he bases his system is the religious experi- ence of the Christian community. The " immediate object of theological knowledge is the faith of the community," and from this positive religious datum theology constructs a " total view of the world and human life." Thus the essence of Ritschl's work is systematic theology. Nor does he painfully work up to his master- category, for it is given in the knowledge

of JesuS Christ revealed to the community. ■ That God is love and that the purpose of His love is the moral organization of humanity in the ” Kingdom of God “—this idea, with its immense range of application — is applied in Ritschl’s initial datum.

. From this vantage-ground Ritschl criticizes the use of Aristotelianism and speculative philosophy in scholastic and Protestant theology. He holds that such philosophy is too shallow for theology. Hegelianism attempts to squeeze all life into the categories of logic: Aristotelianism deals with ” things in general “and ignores the radical distinction between nature and spirit. Neither Hegel- iariism nor Aristotelianism is ” vital ” enough to sound the depths of religious life. Neither conceives ” God ” as correlative to human ” trust ” (cf. Theologie und Metaphysik, e’sp. pV 8 seq.). But Ritschl’s recoil carries him so far that he is left alone with merely ‘ ‘ practical experience. ” Faith ” knows God in His active relation to the ” kingdom,” but not at all as ” self-existent.”

His limitation of theological knowledge to the bounds of human need might, if logically pressed, run perilously neiar phenomenalism ; and his epistemology (” we only know things in their activities “) does not cover this weakness. In seeking ultimate reality in the circle of “active conscious sensation,” he rules out all ” meta- physic.” Indeed, much that is part of normal Christian faith — e.g. the Eternity of the Son — is passed over as beyond the range of his method. Ritschl’s theory of ” value-judgments ” (Werthur- theile) illustrates this form of agnosticism. Religious judgments of value determine objects according to their bearing on our moral and spiritual welfare. They imply a lively sense of radical human need. This sort of knowledge stands quite apart from that produced by ” theoretic ” and ” disinterested ” judgments. The former moves in a world of ” values,” and judges things as they are related to our “fundamental self-feeling. The latter moves in a world of cause and effect. {N.B. Ritschl appears to confine Metaphysic to the category of Causality.) The theory as formulated has such grave ambiguities, that his theology, which, as we have seen, is wholly based on uncompromising religious realism, has actually been charged with individualistic subjectivism. If Ritschl had clearly shown that judgments of value enfold and transform other types of knowledge, just as the “spiritual man ” includes and trans- figures but does not annihilate the ” natural man,” then within the compass of this spiritually conditioned knowledge all other know- ledge would be

seen to have a function and a home. The theory of value-judgments is part too of his ultra-practical tendency: both ” metaphysic ” and ” mysticism ” are ruthlessly condemned. Faith-knowledge appears to be wrenched from its bearings and sus- pended in mid-ocean. Perhaps if he had lived to see the progress of will-psychology he might have welcomed the hope of a more spiritual philosophy.

A few instances will illustrate Ritschl’s positive systematic theo- logy. The conception of God as Father is given to the community in Revelation.. He must be regarded in His active relationship to the ” kingdom,” as spiritual personality revealed in spiritual pur- posiveness. His ” Love ” is His will as directed towards the realiza- tion of His purpose in the kingdom. His “Righteousness” is His fidelity to this purpose. With God as ” First Cause ” or ” Moral Legislator” theology has no concern; nor is it interested in the ” speculative ” problems indicated by the traditional doctrine of the Trinity. ” Natural theology “has no value save where it leans on faith. Again, Christ has for the religious life of the community the unique value of Founder and Redeemer. He is the perfect Revelation of God and the Exemplar of true religion. His work in founding the kingdom was a personal vocation, the spirit of which He communicates to believers, ” thus, as exalted king,” sustaining the life of His Kingdom. His Resurrection is a necessary part of Christian belief (G. Ecke, pp. 198-99). ” Divinity ” is a predi- cate applied by faith to Jesus in His founding and redeeming activity. We note here that though Ritschl gives Jesus a unique and unapproachable position in His active relation to the kingdom, he declines to rise above this relative teaching. The ” Two Nature ” problem and the eternal relation of the Son to the Father have no bearing on experience, and therefore stand outside the range of theology.

Once more, in the doctrine of sin and redemption, the governing idea is God’s fatherly purpose for His family. Sin is the contra- diction of that purpose, and guilt is alienation from the family. Redemption, justification, regeneration, adoption, forgiveness, reconciliation all mean the same thing — the restoration of the broken family relationship. All depends on the Mediation of Christ, who maintained the filial relationship even to His death, and communicates it to the brotherhood of believers. Everything is defined by the idea of the family. The whole apparatus of ” forensic ” ideas (law, punishment, satisfaction, &c.) is summarily rejected as foreign to God’s purpose of love. Ritschl is so faithful to the standpoint of the religious community, that he has nothing definite to say on many inevitable, questions, such as the relation of God to pagan races,. His school, in which J. G. W. Herrmann, Julius Kaftan and Adolf Harnack are the

chief names, diverges from his teaching in many directions; e.g. Kaftan appreciates the

mystical side of religion, Harnack's criticism is very different from Ritschl's arbitrary exegesis. They are united on the value of faith-knowledge as opposed to " metaphysic."

See A. Ritschl, Die Christliche Lehre von der Rechtfertigung und Versohnung (3rd ed., 1889) ; Unterricht in der Chrisllichen Lehre-. (very many editions); and Theologie und Metaphysik (2nd ed., 1887), give his main position. Many historical and other works besides. — E. Bertrand, Une nouvelle conception de la redemp- tion. La Doctrine de la justification et de la reconciliation dans le sy steme de Ritschl (1891); H. Schoen, Les Origines historiques de la thtologie de Ritschl (1893); G. Ecke, Die theologische Schule, A. Ritschl's und die evangelische Kirche.der Gegenwart (1897); James Orr, The Ritschlian Theology and the Evangelical Faith (London ; and A. E. Garvie, The Ritschlian Theology (Edinburgh

1899), in both of which the bibliography of the movement is given Cf. Otto Pfleiderer, Development of Theology in Germany since Kanl (1890). The German literature on the subject is very large; see article in Herzog-Hauck, vol. xvii.

RITSCHL, FRIEDRICH WILHELM (1806-1876), German scholar, was born in 1806 in Thuringia. His family, in which culture and poverty were hereditary, were Protestants who had migrated several generations earlier from Bohemia. Ritschl was fortunate in his school training, at a time when the great reform in the higher schools of Prussia had not yet been thoroughly carried out. His chief teacher, Spitzner, a pupil of Gottfried Hermann, divined the boy's genius and allowed it free growth, applying only so much either of stimulus or of restraint as was absolutely needful. After a wasted year at the university of Leipzig, where Hermann stood at the zenith of his fame, Ritschl passed in 1826 to Halle. Here he came under the powerful influence of Reisig, a young " Her- mannianer " with exceptional talent, a fascinating personality and a rare gift for instilling into his pupils his own ardour for classical study. The great controversy between the " Realists " and the "Verbalists" was then at its height, and Ritschl naturally sided with Hermann against Boeckh. The early death of Reisig in 1828 did not sever Ritschl from Halle, where he began his professorial career with a great reputation and brilliant success, but soon hearers fell away, and the pinch of poverty compelled his removal to Breslau, where he reached the rank of " ordinary " professor in 1834, and held other offices. The great event of

Ritschl's life was a sojourn of nearly a year in Italy (1836-37), spent in libraries and museums, and more particularly in the laborious examination of the Ambrosian palimpsest of Plautus at Milan. The remainder of his life was largely occupied in working out the material then gathered and the ideas then conceived. Bonn, whither he removed on his marriage in 1839, anc ˆ where he remained for twenty-six years, was the great scene of his activity both as scholar and as teacher. The philological seminary which he controlled, although nominally only joint-director with Welcker, became a veritable officina litterarum, a kind of Isocratean school of classical study; in it were trained many of the fore- most scholars of the last forty years. The names of Georg Curtius, Ihne, Schleicher, Bernays, Ribbeck, Lorenz, Vahlen, Hiibner, Bucheler, Helbig, Benndorf, Riese, Windisch, who were his pupils either at Bonn or at Leipzig, attest his fame and power as a teacher. In 1854 Otto Jahn took the place of the venerable Welcker at Bonn, and after a time succeeded in dividing with Ritschl the empire over the philological school there. The two had been friends, but after gradual estrange- ment a violent dispute arose between them in 1865, which for many months divided into two hostile forces the universities and the press of Germany. Both sides were steeped in fault, but Ritschl undoubtedly received harsh treatment from the Prussian government, and pressed his resignation. He ac- cepted a call to Leipzig, where he died in harness in 1876.

Ritschl's character was strongly marked. The spirited element in him was powerful, and to some at times he seemed overbearing, but his nature was noble at the core; and, though intolerant of inefficiency and stupidity, he never asserted his personal claims in any mean or petty way. He was warmly attached to family and friends, and yearned continually after sympathy, yet he established real intimacy with only a few. He had a great faculty for organization, as is shown by his

administration of the university library at Bonn, and by the light years of labour which carried to success a work of infinite ;omplexity, the famous Priscae Latinitatis Monumenta Epi- graphica (Bonn, 1862). This volume presents in admirable acsimile, with prefatory notices and indexes, the Latin in- scriptions from the earliest times to the end of the republic. It forms an introductory volume to the Berlin Corpus

Inscrip- tionum Latinarum, the excellence of which is largely due to the precept and example of Ritschl, though he had no hand in the later volumes. The results of Ritschl's life are mainly gathered up in a long series of monographs, for the most part of the highest finish, and rich in ideas which have leavened the scholarship of the time. *

As a scholar, Ritschl was of the lineage of Bentley, to whom he looked up, like Hermann, with fervent admiration. His best efforts were spent in studying the languages and literatures of Greece and Rome, rather than the life of the Greeks and Romans. He was sometimes, but most unjustly, charged with taking a narrow view of " Philologie." That he keenly ap- preciated the importance of ancient institutions and ancient art both his published papers and the records of his lectures amply testify. He devoted himself for the most part to the study of ancient poetry, and in particular of the early Latin drama. This formed the centre from which his investigations radiated. Starting from this he ranged over the whole remains of pre-Ciceronian Latin, and not only analysed but augmented the sources from which our knowledge of it must come. Before Ritschl the acquaintance of scholars with early Latin was so dim and restricted that it would perhaps be hardly an exaggeration to call him its real discoverer.

To the world in general Ritschl was best known as a student of Plautus. He cleared away the accretions of ages, and by efforts of that real genius which goes hand in hand with labour, brought to light many of the true features of the original. It is infinitely to be regretted that Ritschl's results were never combined to form that monumental edition of Plautus of which he dreamed in his earlier life. Ritschl's examination of the Plautine MSS. was both laborious and brilliant, and greatly extended the knowledge of Plautus and of the ancient Latin drama.. Of this, two striking examples may be cited. By the aid of the Ambrosian palimpsest he recovered the name T. Maccius Plautus, for the vulgate M. Accius, and proved it correct by strong extraneous arguments. On the margin of the Palatine MSS. the marks C and DV continually recur, and had been variously explained. Ritschl proved that they meant " Canticum " and " Diverbium," and hence showed that in the Roman comedy only the conversations in iambic senarii were not intended for the singing voice. Thus was brought into strong relief a fact without which there can be no true appreciation of Plautus, viz. that his plays were comic operas rather than comic dramas.

In conjectural criticism Ritschl was inferior not only to his great predecessors but to some of his contemporaries. His imagination was in this field (but in this field only) hampered by erudition, and his

judgment was unconsciously warped by the desire to find in his text illustrations of his discoveries. But still a fair proportion of his textual labours: has stood the test of time, and he rendered immense service by his study of Plautine metres, a field in which little advance had been made since the time of Bentley. In this matter Ritschl was aided by an accomplishment rare (as he himself lamented) in Germany

the art of . writing Latin verse.

In spite of the incompleteness, on many sides, of his work Ritschl must be assigned a place in the history of learning among a very select few. His studies are presented principally in his Opuscula collected partly before and partly since his death. The Trinummus (twice edited) was the only specimen of his contemplated edition of Plautus which he completed. The edition has been continued by some of his pupils — Goetz, Loewe and others. –

The facts of Ritschl's life may be best learned from the elaborate biography by Otto Ribbeck (Leipzig, 1879). An interesting and

discriminating estimate of Ritschl's work is that by Lucian Mueller (Berlin, 1877)- (J. S. R.)

RITSON, JOSEPH (1752-1803), English antiquary, was born at Stockton-on-Tees, of a Westmorland yeoman family, on the 2nd of October 1752. He was educated for the law, and settled in London as a conveyancer when twenty-two. He devoted his spare time to literature, and in 1782 published au attack on Warton's History of English Poetry. The fierce and insulting tone of his Observations, in which Warton was treated as a showy pretender, and charged with cheating and lying to cover his ignorance, made a great sensation in literary circles. In nearly all the small points with which he dealt Ritsbn was in the right, and his corrections have since been adopted, but the unjustly bitter language of his criticisms roused great anger at the time, much, it would appear, to Ritson's delight. In 178,3 Johnson and Steevens were assailed in the same bitter fashion as Warton for their text of Shakespeare. Bishop Percy was next subjected to a furious onslaught in the preface to a collection of Ancient Songs (printed 1787, dated 1790, published 1702). The only thing that can be said in extenuation of Ritson's unmatchable acrimony is that he spared no pains himself to ensure accuracy in the texts of old songs, ballads and metrical romances which he edited. His collection of the Robin Hood ballads is perhaps his greatest single achievement. Scott, who admired his industry and accuracy in spite of his temper, was almost the only man who could get on with him. On one occasion, when he called in

Scott’s absence, he spoke so rudely to Mrs Scott that Leyden^ who was present, threatened to ” thraw < his neck, " and throw him out of the window. Spelling was one of his. eccentricities, his own name being an example: Ritson is short pronunciation for Richardson. As early as 1796 Ritson showed signs of mental collapse, and on the 10th of September 1803 he became completely insane, barricaded himself in his chambers at Gray's Inn, made a bonfire of manuscripts, and was finally forcibly removed to Hoxton, where he died ori the 23rd of the month. "■';■

RITTENHOUSE, DAVID (173 2-1 796), American astronomer, was born at Germantown, Pennsylvania, on the 8th of April 1732. First a watchmaker and mechanician he afterwards became treasurer of Pennsylvania (1777-89), and from 1792 to 1795 director of the U\S. mint (Philadelphia). He was largely occupied in 1763 and in 1779-86 in settling the boundaries of several of the states. He was a fellow of the Royal Society of London, and a member of the American Philosophical Society; and was elected president of the latter society in 1791. As an astronomer, Rittenhouse’s principal merit is that he introduced in 1 786 the use of spider lines in the focus of a transit instrument. His priority with regard to this useful invention was acknow- ledged by E. Troughton, who brought spider lines into universal use in astronomical instruments (see von Zach’s Monatliche Correspondenz, vol. ii. p. 215), but Felice Fontana (1730^ 1805), professor of physics at the university of Pisa, and afterwards director of the museum at Florence, had already anticipated the invention in 1775, though no doubt this fact was unknown, to Rittenhouse. His researches were published in the Transactions of the American Philosophical Society (1785-r 1799). He died at Philadelphia on the 26th of June 1796.

See Memoir (1813) by William Barton,

RITTER, HEINRICH (1791-1869), German philosopher, was born at Zerbst on the 21st of November 1791, and died at Gottingen on the 3rd of February 1869. He studied philosophy and theology at Gottingen and Berlin until 1815. In 1824 he became extraordinary professor of philosophy at Berlin, whence he was transferred to Kiel, where he occupied the chair of philosophy from 1833 to 1837. He then accepted a similar position at the university of Gottingen, where he remainea till his death. His chief work was a history of philosophy (Geschichte der Philosophic) published in twelve volumes at Hamburg from 1829 to 1853. This book is the product of a wide and thorough knowledge of the subject aided by an impartial critical faculty, and its value is demonstrated by the

fact that it has been translated into almost all the languages of Europe. He wrote also accounts of ancient schools of philosophy, the Ionians, the Pythagoreans and the Megarians. Beside these important historical works, he published a large number of treatises of which the following may be mentioned: Versuch zur Verstandigung iiber die neueste deulsche Philosophie zeit Kant (1853); Die christliche Philosophie Vis auf die neueslen Zeiten (2 vols., 1858-59), a work which supplemented the Geschichte; Abriss der philosopkischen Logik (1824); Ueber das Verhdltnis der Philosophie zum Leben (1835); Historia philosophiae Graeco-Romanae (in collaboration with Preller, 1838; 7th ed., 1888); Kleine philosophische Schriften (1839-40); System der Logik und Metaphysik (1856); Encyklopddie der philosophischen Wissenschaften (1862-64); Ernest Renan, iiber die Naturwissenschaften und die Geschichte (1865); Ueber das Bbse und seine Folgen (1869). Of these latter, the one best known in England is the History of Greek and Roman Philosophy, which, by reason of the excellence of its arrangement and its judicious quotations and notes, is almost indispensable to the student of ancient philosophy.

RITTER, KARL (1779-18S9), German geographer, was born at Quedlinburg on the 7th of August 1779, and died in Berlin on the 28th of September 1859. His father, a physician, left his family in straitened circumstances, and Karl was received into the Schnepfenthal institution then just founded by Christian Gotthilf Salzmann (1744-1811) for the purpose of testing his educational theories. The Salzmann system was practically that of Rousseau; conformity to natural law and enlightenment were its watchwords; great attention was given to practical life; and the modern languages were carefully taught, to the complete exclusion of Latin and Greek. Ritter already showed geographical aptitude, and when his schooldays were drawing to a close his future course was determined by an introduction to Bethmann Hollweg, a banker in Frankfort. It was arranged that Ritter should become tutor to Hollweg's children, but that in the meantime he should attend the university at his patron's expense. His duties as tutor in the Hollweg family began at Frankfort in 1798 and continued for fifteen years. The years 1814-19, which he spent at Gottingen in order still to watch over the welfare of his pupils, were those in which he began to devote him- self exclusively to geographical inquiries. He had already travelled extensively in Europe when in 18 17-18 he brought out his first masterpiece, Die Erdkunde im Verhdltnis zur Natur und zur Geschichte des Menschen (Berlin, 2 vols., 181 7- 1818). In 1819 he became professor of history at Frankfort, and in 1820 professor extraordinarius of history at Berlin,

where shortly afterwards he began also to lecture at the military college. He remained in this position till his death. The second edition of his Erdkunde (1822-58) was conceived on a much larger scale than the first, but he completed only the sections on Africa and the various countries of Asia. The service rendered to geography by Ritter was especially notable because he brought to his work a new conception of the subject. Geography was, to use his own expression, a kind of physiology and comparative anatomy of the earth: rivers, mountains, glaciers, &c, were so many distinct organs, each with its own appropriate functions; and, as his physical frame is the basis of the man, determinative to a large extent of his life, so the structure of each country is a leading element in the historic progress of the nation. Moreover, Ritter was a scientific compiler of the first rank. Among his minor works may be mentioned Vorhalle europaischer V olkergeschichten vor Herodot (Berlin, 1820); Die Stupas . . . an der indobaktrischen Konigsstrasse und die Kolosse von Bamiyan (1838); Einleitung mr allgemeinen vergleichenden Geographie (Berlin, 1852); * Bemerkungen iiber Veranschaulichungsmittel raumlicher Ver- haltnisse bei graphischen Darstellungen durch Form u. Zahl," in the Trans, of the Berlin Academy, 1828. After his death selec- tions from his lectures were published under the titles Geschichte der Erdkunde (1861), Allgemeine Erdkunde (1862), and Europa (1863). Several of his works (e.g. the " Palestine " volumes

of his Erdkunde) were translated into English. " Karl Ritter " foundations were established in his memory at Berlin and Leipzig, for the furtherance of geographical study.

See G. Kramer, Karl Ritter, ein Lebensbild (Halle, 1864 and 1870; 2nd ed., 1875) ; W. L. Gage, The Life of Karl Ritter (London, 1867) ; F. Marthe, " Was bedeutet Karl Ritter fur die Geographie," in Zeitsch. der Ges.f. Erdk. (Berlin, 1879). All Ritter's works mentioned above were published at Berlin.

RITUAL (from Lat. ritus, a custom, especially a religious rite or custom), a term of religion, which may be defined as the routine of worship. This is a "minimum definition"; " ritual " at least means so much, but may stand for more. Without some sort of ritual there could be no organized method in religious worship. Indeed, viewed in this aspect, ritual is to religion what habit is to life, and its rationale is similar, namely, that by bringing subordinate functions under an effort- less rule it permits undivided attention in regard to vital issues. This analogy — for it is safer to regard such applications of individual

psychology to social phenomena as only analogies — may be carried a step further. Just as the main business of habit is to secure bodily equilibrium in order to allow free play to the mental life, so the chief task of routine in religion is to organize the activities necessary to its stability and con- tinuance as a social institution, in order that all available spontaneity and initiative may be directed into spiritual channels. Such organization will naturally affect far more than the forms of worship; but these at least, to judge from the past history of religion, cannot but submit extensively to its influence. The nature of religion, as the sociologist under- stands it, is bound up with its congregational character. In order that inter-subjective relations should be maintained between fellow-worshippers, the use of one or another set of conventional symbols is absolutely required; for example, an intelligible vocabulary of meet expressions, or (since this is, perhaps, not indispensable) at any rate sounds, sights, actions and so on, that have come by prescription to signify the common purpose of the religious society, and the means taken in common for the realization of that purpose. In this sense, the term ” ritual,” as meaning the prescribed ceremonial routine, is also extended to observances not strictly religious in character.

But, whilst ritual at least represents routine, it tends, his- torically speaking,- to have a far deeper significance for the religious consciousness, A recurrent feature of religion, which many students of its phenomena would even consider constant and typical, is the attribution of a more or less self-contained and automatic efficacy to the ritual procedure as such. Before proceeding to considerations of genesis, it will be convenient briefly to analyse the notion as it appears in the higher religions. Two constituent lines of thought may be distinguished. Firstly, there is the tendency to pass beyond the purely petitionary attitude which as such can imply no more than the desire, hope or expectation of divine favour, and to take for granted the consummation sought, a deity that answers, a grace and blessing that are communicated. Only when such accomplish- ment of its end is assumed can efficacy be held to attach to the act of worship. Secondly, there is the tendency to identify such a self-accomplishing act of worship with its objective expression in the ritual that for purposes of mutual under- standing makes the body of worshippers one.

The Magical Element in Ritual. — Exactly similar tendencies — to impute efficacy, and to treat the ritual procedure as the source of that efficacy — are typically characteristic of magic, and their reappearance in religion can hardly be treated as a coincidence, seeing that magic and religion would appear to have much in common, at

any rate during the earlier stages of their development. In magic a suggestion is made orally, or by dramatic action, or most often in both ways together, that is held ipso facto to bring about its own accomplishment. A certain conditionality attaches- to the magical operation, inasmuch as each magician is subject to interference on the part of other magicians who may neutralize his spell by a

Counter spell of equal or greater power; nevertheless, the in- trinsic tone is that of a categorical assertion of binding force and efficacy. Again, in magic the self-realizing force is apt to seem to reside in the suggestional machinery rather than in the spiritual qualifications of the magician, though this is by no means invariably the case. On the whole, however, spells and ceremonies are wont to be regarded as an inheritable and transferable property containing efficacy in themselves. And what is true of magic is equally true of much of primitive, and even of relatively advanced, religion. Dr J. G. Frazer has pronounced the following to be marks of a primitive ritual: negatively, that there are no priests, no temples and no gods (though he holds that departmental, non-individual ” spirits ” are recognized) ; positively, that the rites are magical rather than propitiatory {The Golden Bough, 2nd ed. ii. 191). If we leave it an open question whether, instead of ” spirits,” it would not be safer to speak of ” powers ” (to which not a soul-like nature, but simply a capacity for exercising magic, is attributed), this characterization may be accepted as apply- ing to many, if not to all, the rites of primitive religion. Thus the well-known totemic ceremonies of Central Australia afford a striking example of rites of a deeply religious import — in the sense that the purpose they embody is that of consecrating certain functions of the common life (see Religion) — yet almost wholly magical in form. They resolve themselves on analysis into (1) direct acts of magical suggestion, and (2) acts commemorative of the magical doings of mythical ancestors, the purport of which may be regarded as indirectly and con- structively magical,” on the principle that in magic to mention a thing’s origin is to control it, to recount another’s wonder- working is to reproduce his power, and so on. It is to be noted, however, that other Australian rites are found, notably those that accompany initiation in the south-eastern region, over which anthropomorphic beings having enough individuality to rank as ” gods ” undoubtedly preside; but even here, though traces of propitiatory worship may be -discernible (the evidence being scanty and conflicting), acts of pure magic are decidedly to the fore. And what is

true of the most primitive and unreflective forms of cult remains true of more advanced types which have become relatively self-conscious. There is little or no felt opposition between processes imply- ing control and processes of a propitiatory character in the religion of the Pueblo Indians, which American ethnologists have been so successful in expounding, or, to mount to a still higher level, in the Vedic, Assyrian or Egyptian cults. The leading idea, we may even say, is that expressed so happily by a character in Renan's Le Pretre de Nimi: " L'ordre du monde depend de l'ordre des rites qu'on observe " (cf. A. Lang, Myth, Ritual and Religion, 2nd ed. i. 251). As regards the most developed forms of religion, whilst the old procedure largely survives unchanged, its original intention is disowned by theologians, though it may be doubted if the popular mind is always strong enough to withstand the appeal of prima facie appearance.

This proneness to impute efficacy to ritual is immensely reinforced by another social proclivity, more or less distinct in its ultimate nature, which causes the rite to rank as a divine ordinance or command. Naturally if the god manifests himself by means of certain forms, if he is reputed to have founded or revealed them, or if he has been known to evince displeasure at departures from them, there is strong reason to think that such forms are efficacious, and that in a sense of themselves, namely, by being what they are. At the sociological level of thought this divine sanction has to be treated as the echo of a social sanction which ratifies and protects religious custom. In early society the influence of what Walter Bagehot (in Physics and Politics, 9th ed. p. 102) calls the " persecuting tendency " in enforcing custom is on the whole not markedly in evidence. The fact is that imitation in a homogeneous group produces such unanimity that, with the help of some education, notably the instruction given at the time of initiation, all non- conformity is nipped in the bud. Of the Central Australian

ceremonies we read that they " had to be performed in precisely the same way in which they had been in the Alcheringa (lit. ' dream-time ' = age of mythical tribal ancestors). Everything was ruled by precedent; to change even the decoration of a per- former would have been an unheard-of thing; the reply, ' It was so in the Alcheringa,' was considered as perfectly satisfactory by way of explanation " (B. Spencer and F. Gillen, The Native Tribes of Central Australia, 324). Here we perceive the social sanction of public opinion insensibly merging in a supernatural sanction. The tribe is a religious partnership with a divine past with which it would not willingly break. As Mr Lang well puts it, " Ritual is preserved because it preserves luck " (loc. cit.). Given an intrinsic sacredness, it is but a step to associate definite gods with the origin or purpose of a rite, whose interest it thereupon

becomes to punish omissions or innovations by the removal of their blessing (which is little more than to say that the rite loses its efficacy), or by the active' infliction of disaster on the com- munity. In the primitive society it is hard to point to any custom to which sacredness does not in some degree attach, but, naturally, the more important and solemn the usage, the more rigid the religious conservatism. Thus there are indications that in Australia, at the highly sacred ceremony of circumcision, the fire-stick was employed after stone implements were known; and we have an exact parallel at a higher level of culture, the stone implement serving for the same operation when iron is already in common use (Spencer and Gillen, ib. 401: cf. E. B. Tylor, Early History of Mankind, 3rd ed. p. 217).

The Interpretation of Ritual. — A valuable truth insisted on by the late W. Robertson Smith {Religion of the Semites, 17 sqq.) is that in primitive religion it is ritual that generates and sustains myth, and not the other way about. Sacred lore of course cannot be dispensed with; even Australian society, which has hardly reached the stage of having priests, needs its Oknirabata or " great instructor " (Spencer and Gillen, ib. 303) . The function of such an expert, however, is chiefly to hand on mere rules for the performance of religious acts. If his lore include sacred histories, it is largely, we may suspect, because the description and dramatization of the doings of divine persons enter into ritual as a means of magical control. Similarly, the sacred books of the religions of middle grade teem with minute prescrip- tions as to ritual, but are almost destitute of doctrine. Even in the highest religions, where orthodoxy is the main requirement, and ritual is held merely to symbolize dogma, there is a remark- able rigidity about the dogma that is doubtless in large part due to its association with ritual forms many of them bearing the most primeval stamp. As regards the symbolic interpretation of ritual, this is usually held not to be primitive; and it is doubtless true that an unreflective age is hardly aware of the difference between " outward sign " and " inward meaning," and thinks as it were by means of its eyes. Nevertheless, it is easier to define fetishism (a fetish " differing from an idol in that it is worshipped in its own character, not as the symbol, image or occasional residence of a deity," New English Dictionary, Oxford, 1901) than it is to bring such a fetishism home to any savage people, the West African negroes not excluded (cf . A. B . Ellis, The Tshi-speaking Peoples of the Gold Coast of W. Africa, 192). It is the magic power, virtue or grace residing in, and proceeding from, the material object — a power the communica- bility of which constitutes the whole working hypothesis of the magico-religious performance — that is valued in those cases where native opinion can be tested. Moreover,

it must be remembered that in the act of magic a symbolic method is consciously pursued, as witness the very formulas employed: ” As I burn this image, so may the man be consumed,” or the even more explicit, ” It is not wax I am scorching; it is the liver, heart and spleen of So-and-so that I scorch ” (W. W. Skeat, Malay Magic, 5 70) , where appearance and reality are distinguished in order to be mystically reunited. Now it is important to observe that from the symbol as embodying an imperative to the symbol as expressing an optative is a transition of meaning that involves no change of form whatever; and, much as theorists love to contrast the suggestional and the petitionary attitudes,

it is doubtful if the savage does not move quite indifferently to and fro across the supposed frontier-line between magic and religion, interspersing ” bluff ” with blandishment, spell with genuine prayer. Meanwhile the particular meanings of the detailed acts composing a complicated piece of ritual soon tend to lose themselves in a general sense of the efficacy of the rite as a whole to bring blessing and avert evil. Nay, unintelligibility is so far from invalidating a sacred practice that it positively supports it by deepening the characteristic atmosphere of mystery. Even the higher religions show a lingering predilection for cabalistic formulas.

Changes in Ritual. — Whilst ritual displays an extraordinary stability, its nature is of course not absolutely rigid; it grows, alters and decays. As regards its growth, there is hardly a known tribe without its elaborate body of magico-religious rites. In the exceptional instances where this feature is relatively absent (the Masai of E. ‘Africa offer a case in point), we may suspect a disturbance of tradition due to migration or some similar cause. Thus there is always a pre-existing pattern in accordance with which such evolution or invention as occurs proceeds. Unconscious evolution is perhaps the more active factor in primitive times; imitation is never exact, and small variations amount in time to considerable changes. On the other hand, there is also deliberate innovation. In Australia councils of the older men are held day by day during the performance of their ceremonies, at which traditions are repeated and procedure determined, the effect being mainly to preserve custom but undoubtedly in part also to alter it. Moreover, the individual religious genius exercises no small influence. A man of a more original turn of mind than his fellows will claim to have had a new ceremony imparted to him in a vision, and such a

ceremony will even be adopted by another tribe which has no notion of its meaning (Spencer and Gillen, ib. 272, 278, 281 n.). Meanwhile, since little is dropped whilst so much is being added, the result is an endless complication and elaboration of ritual. Side by side with elaboration goes systematization, more especially when local cults come to be merged in a wider unity. Thereupon assimilation is likely to take place to one or another leading type of rite — for instance, sacrifice or prayer. At these higher stages there is more need than ever for the expert in the shape of the priest, in whose hands ritual procedure becomes more and more of a conscious and studied discipline, the naive popular elements being steadily eliminated, or rather transformed. Not but what the trans- ference of ritualistic duties to a professional class is often the signal for slack and mechanical performance, with consequent decay of ceremonial. The trouble and worry of having to comply with the endless rules of a too complex system is apt to operate more widely — namely, in the religious society at large — and to produce an endless crop of evasions. Good examples of these on the part alike of priests and people are afforded by Toda religion, the degenerate condition of which is expressly attributed by Dr W. H. R, Rivers to "the over-development of the ritual aspect of religion " (The Todas, 454-55)- It is interesting to observe that a religion thus atrophied tends to revert to purely magical practices, the use of the word of power, and so on (ib. ch. x.). It is to be noted, however, that what are known as ritual substitutions, though they lend themselves to purposes of evasion (as in the well-known case of the Chinese use of paper money at funerals), rest ultimately on a principle that is absolutely fundamental in magico-religious theory — namely, that what suggests a thing because it is like it or a part of it becomes that thing when the mystic power is there to carry the suggestion through.

The Classification of Rites.- — More than one basis of division has suggested itself. From the sociological point of view perhaps the most important distinction in use is that between public and private rites. Whilst the former essentially belong to religion as existing to further the common weal, the latter have from the earliest times an ambiguous character, and tend to split into those which are licit — " sacraments," as they may be termed — and those which are considered anti-social

in tendency, and are consequently put beyond the pale of religion and assigned to the "black art" of magic. Or the sociologist may prefer to correlate rites with the forms of social organization — the tribe, the phratry, the clan, the family and so on. Another interesting contrast (seeing how primary a function of religion it is to establish a calendar

of sacred seasons) is that between periodic and occasional rites — one that to a certain extent falls into line with the previous dichotomy. A less fruitful method of classing rites is that which arranges them according to their inner meaning. As we have seen, such meaning is usually acquired ex post facto, and typical forms of rite are used for many different purposes; so that attempts to differentiate are likely to beget more equivocations than they clear up. The fact is that comparative religion must be content to regard all its classifications alike as pieces of mere scaffolding serving temporary purposes of construction. Negative Rites. — A word must be added on a subject dealt with elsewhere (see Taboo, Genna), but strictly germane to the matter in hand. What have the bestj if not the sole, right to rank as taboos are ritual interdictions (see M. Mauss in L' Annie sociologique, ix. 249). Taboo, as understood in Polynesia, the home of the word, is as wide as, and no wider than, religion, representing one side or aspect of the sacred (see Religion). The very power that can help can also blast if approached improperly and without due precautions. Taboos are such precautions, abstinences prompted, not by simple dread or dislike, but always by some sort of respect as felt towards that which in other circumstances or in other form has healing virtue. Thus the negative attitude of the observer of taboo involves a positive attitude of reverence from which it becomes in practice scarcely distinguishable. To keep a fast, for instance, is looked upon as a direct act of worship. It must be noted, too, that, whereas taboo as at first conceived belongs to the magico-religious circle of ideas, implying a quasi-physical transference of sacredness from what has it to one not fit to receive it, it is very easily reinterpreted as an obligation imposed by the deity on his worshippers. ■ The law observed by a primitive religious community abounds in negative precepts, and if early religion tends to be a religion of fear it is because the taboo-breaker provides the most palpable objective for human and divine sanctions. In the higher religions, to be pure remains amongst the most laudable of aspirations, and, even though the ceremonial aversion of a former age has be- come moralized, and a purity of heart set up as the ideal, it is on " virtues of omission" that stress is apt to be laid, so that a timorous propriety is too often preferred to a forceful grappling with the problems of life. There are signs, however, that the religious consciousness has at length come to appreciate the fact that the function of routine in religion as elsewhere is to clear the way for action.

Bibliography. — A comprehensive study of ritual as such from the comparative standpoint remains yet to be written. Some leading ideas on the subject are struck out by E. B. Tylor, Primitive Culture' (i9 3).

ch. 18; and A. Lang, Myth, Ritual and Religion* (1899); whilst the whole of J. G. Frazer's vast collection of facts in The Golden Bough* (1900) illustrates ritual, more especially on its magical side; see also W. Robertson Smith, , Lectures on the Religion of the Semites (1889). A very valuable work of restricted range but embodying a method that might fruitfully be applied to the whole subject of ritual is H. Hubert and M. Mauss, " Essai sur la nature et sur la fonction du sacrifice" in VAnnee sociologique, ii. ; in close connexion with the above should be studied S. Levi, La Doctrine du sacrifice dans les Brdhmanas (1899) ; W. Caland and V. Henry, L'Agnistoma, description complete de la forme normale du sacrifice de Soma dans le culte vedique (1906) ; see also H. Oldenberg, Die Religion des Veda (1894); A. Hillebrant, Ritual Litteratur: Vedische Opfer und Zaubet (1896). Admirable descriptions of Australian ritual are to be found in B. Spencer and F. J. Gillen, The Native Tribes of Central Australia (1899) and The Northern Tribes of Central Australia (1904). On North American rituals very excellent studies exist in A. C. Fletcher, "The Hako: A Pawnee Ceremony," in 22nd Report of Bureau of American Ethnology; see also various papers by the same authoress in Peabody Reports; likewise in J. W. Fewkes, " Tusayan Katchinas," in 15th Rep. of B. of A. Eth. ; and id., " Hopl Katchinas," in 21st Rep.; M. C. Stevenson, " The Zufii Indians," in 23rd Rep.; cf. F. H. Cushinjj, " Zuiii Fetiches," in 2nd Rep. The following works pay special attention to ritual

features: L. R. Farnell, The Cults of the Greek States (1896-1907); A. Moret, Le Rituel du culte divin journalier en Egypte (1902) ; A. de Marchi II culto privdtQ di Roma antica (1902). (R. R. M.)

RITUAL MURDER, a general term for human sacrifice in connexion with religious ceremonies. False accusations as to the practice of ritual murder by Jews and Christians have often been made. "The, Christians of the second and third centuries suffered severely under them " (S track). Justin Martyr (150-160) in his Second Apology (ch. 12) vigorously defends the Christian community against this charge; Octavius, Minucius Felix, Tertullian, Origen and other Church Fathers all refer to the subject and indignantly repudiate the atrocious libel that the Eucharist involved human sacrifice. The myth was revived against the Montanists, and in the later middle ages against various sects of heretical Christians. In recent years the accusation has been again levelled against " foreigners " during the disturbances in China. The chief sufferers, however, from the charge were the Jews. • The

charge was never coherently defined, but a notion prevailed •that at the Passover Christian blood was used in Jewish rites. For this belief there is no foundation whatever, as is proved in the classical treatise 1 on the subject by Hermann L. Strack, Regius Professor of Theology at Berlin University. The first occasion on which the medieval Jews were accused of the murder of a Christian child was at Norwich in 1144. In the following century other instances of the charge occurred on the Con- tinent, and by this time (middle of the 13th century) the legend had grown into a belief that ” the Jews of every province annually decide by lot ” which congregation or town is to be the scene of the mythical murder. It is easy to understand how” in ages when the Jews were everywhere regarded with superstitious awe, such stories to their detriment would find ready credence, but the revival of the myth in recent times by the anti-Semite is a deplorable instance of degeneration. It is only necessary here to refer to the Lincoln case (1255), the Trent case (1475) and more recently the Damascus case (1840), the Tisza-Eszlar affair (1882), the Xanten charge (1891) and the Polna case (1899). All of these charges — sometimes invented by malicious seceders from the Jewish fold — were followed by spoliation and tragic persecution of the Jews. On the other hand many Jewish proselytes to Christianity have strenuously defended the Jews from the charge, among them may be particularly named Prof. D. Chwolson (Blutan- klage, 1901). In 1840 a protest against the charge was signed by 58 Jewish-Christians, the list being headed by M. S. Alex- ander, Anglican bishop at Jerusalem. Further testimonies of a similar kind are collected in Strack (op. tit. p. 239). Many of the popes have issued bulls exonerating the Jews (cf. Strack, p. 250); similarly temporal princes have often taken a similar step (ibid. p. 260). Many Christian scholars and ecclesiastics have felt it their duty to utter protests in favour of the Jews. Among them have been the most eminent Christian students of Rabbinism of recent times, e.g. Professors Alexander McCaul, P. Lagarde, Franz Delitzsch, A. Merx, T. NSldeke, C. Siegfried, A- Wunsche, G. H. Dalman and J. von Dollinger. A careful examination of the evidence (with a complete acquittal of the Jews) is contained in a notable work by a Catholic priest, F. Frank, Der Ritualmord vor den Gerichtshbfen der Wahrheit und der Gerechtigkeit (1901, 1902). The literature on the other side is entirely antisemitic and in no instance has it survived the ordeal of criticism. The most notorious exponent of the charge was A. Rohling, the worthlessness of whose writings on the subject is exposed by (among many others) Strack (op. cit. pp. 155 seq.).

A list of some of the most important of the cases is given by J. Jacob in the Jewish Encyclopedia, iii. 266-67. (I. A.)

RI VA, a fortified district town of Tirol, Austria, near the Italian frontier. Pop. (1900) 7550. It is a lake port and steamship station at the northern extremity of the Lago di Garda. There are two forts on the Monte Brione a little over

1 Das Blut im Glauben und Aberglauben (Eng. trans., The Jew and Human Sacrifice, London, 1909).

a mile north-east of the town, and the old castle of La Rocca was reconstructed and extended in accordance with modern requirements in 1850. The Minorite Church (1603), with altar pictures by Guido Reni and other Italian painters, is much frequented as a place of pilgrimage. In addition to its transit trade and the entertainment of visitors, the principal resources of the town are the manufacture of paper, iron wares and pottery, the cultivation of the silk-worm and the olive tree, and a considerable commerce in timber, planks and coal. Riva is connected with the Ledro valley by a picturesque road which passes in a series of tunnels and galleries along the rocky and precipitous west shore of the lake.

RIVAL, one who competes with another, one who strives to out-do or excel another or to gain an object or end before or in preference to another. The Latin rivalis, which . was in classical Latin used of a competitor in love, meant by de- rivation one who used the same brook or stream (rivus) as another, hence a neighbour; thus in the Digest, xliii. 20, i. 26, ” si inter rivales, id est qui per eundem rivum aquam ducunt, sit contentio de aquae usu.” The term naturally applied more particularly to those who lived on opposite sides of a stream which would be a frequent subject of dispute as to rights.

RIVAROL, ANTOINE DE (1753-1801), French writer and epigrammatist, was born at Bagnols in Languedoc on the 26th of June 1753, and died at Berlin on the nth of April 1801. It seems that his father was an innkeeper but a man of cultivated tastes. The son assumed the title of comte de Rivarol, and asserted his connexion with a noble Italian family, but his enemies said that the name was really Riverot, and that the family was not noble. After various vicissitudes he appeared in Paris in 1777. After winning some academic prizes, Rivarol distinguished himself in the year 1784 by a treatise Sur I ‘universality de la langue franqaise, and by a translation of the Inferno. The year before the Revolution broke out he, with some assistance from a man of similar but lesser talent, Champcenetz, 2 compiled a lampoon, entitled Petit Almanack de nos grands hontmes pour 1788, in which some writers of actual or future talent and a great many nobodies were ridiculed in the most pitiless manner. When

the Revolution developed the importance of the press, Rivarol at once took up arms on the Royalist side, and wrote in the Journal politique of Antoine Sabatier de Castres (1742-1.817) and the Actes des Apdtres of Jean Gabriel Peltier (1770-1825). But he emigrated in 1792, and established himself at Brussels, whence he removed successively to London, Hamburg and Berlin. Rivarol has had no rival in France except Piron in sharp conversational sayings. These were mostly ill-natured, and mostly have a merely local application. Their brilliancy, however, can escape no one. His brother, Claude Francois (1762-1848), was also an author. His works include Isman, ou le fatalisme (1795), a novel; Le Vtridique (1827), comedy; Essai sur les causes de la revolution franqaise (1827).

The works of Antoine de Rivarol were published in five volumes (Paris, 1805); selections (Paris, 1858) with introductory matter by Sainte-Beuve and others, and that edited in 1862 (2nd ed., 1880) by M. de Lescure, may be specified. See also M. de Lescure's Rivarolet la societe francaise pendant la revolution et V emigration (1882), and Le Breton's Rivarol, sa vie, ses idSes (1895). '

RIVE-DE-GIER, a town of east-central France, in the department of Loire, 14 m. E.N.E. of St fitienne, on the railway to Lyons. Pop. (1906) 15,338.

Situated on the Gier and the Canal de Givors, it is principally dependent on the coal industry, giving its name to a coal- basin which is a continuation of that of St fitienne. It has glass works, the products of which are celebrated on account of the fineness and purity of the sand found on the banks of

5 Louis Rene Quantin de Richebourg, Chevalier de Champcenetz (1760-1794), died on the scaffold. He is not to be confounded with Louis Pierre, marquis de Champcenetz, governor of the Tuileries in 1789, who escaped in 1792 through the protection of Mme. Elliott, mistress of the due d'Orleans.

the Rhone and the Sa6ne. There are also iron and steel works where iron goods and ironmongery of all kinds are manufactured.

Rive-de-Gier is a place of some antiquity, as appears from remains of Gallo-Roman buildings, and mosaics and coins found at various times. In the time of Henry IV. the working of the mines had already given to

the locality a measure of importance.

RIVER, any considerable stream of water flowing in a defined channel. The origin and subsequent formation of rivers and the valleys along which they flow are considered under Geography, § Principles of Geography, and Geology, § viii. The word ” river ” is an adaptation of the O. Fr. rivere (mod. riviere), which descends through Med. Lat. rivera, Low. Lat. riparia, in the sense of river-bank and river, from ripa, bank. The Latin for a stream or river is rivus, whence rivulas, a small stream, Eng. ” rivulet,” which is, therefore, distinct in origin from ” river,” though probably the sense of rivus influenced the Med. Lat. rivera. The etymology of rivus and ripa is disputed; some scholars refer both to the root ri, to drop, flow; others take ripa to be from the root seen in Gr. kpemtiv, to tear, English ” rive,” the sense being a broken cliff or steep bank.

RIVER BRETHREN, the name of a group of three Christian communities in the United States of America, descended from Swiss settlers near the Susquehanna river in Pennsylvania in 1750. The first pastor was Jacob Engle, who became head of the community in 1770. Their system is based on literal obedience to the commands of the New Testament, and they have points of similarity both with the Mennonites and with the Dunkards. They practise foot-washing and baptism by trine immersion; are strict Sabbatarians and simple in their manner of life. The three branches are: (1) The Brethren in Christ, who are the most elaborately organized and are numerous in Ohio, Pennsylvania and Kansas; they have also formed churches in New York and in Canada, and missions in South Africa, India and Texas. In 1909 they had 174 ministers, and 65 churches with 3675 communicants. (2) The Old Order, or Yorker Brethren, consists of a small body which separated from the main body in 1843 and maintained more strictly the original practice. They are found specially in York county, Pennsylvania (whence the name ” Yorkers “). In 1909 they had 24 ministers, 9 churches, and 423 com- municants. (3) The United Zion’s Children date from 1853, when a small body left the parent communion on minor questions of administration. They had in 1909 22 ministers and 28 churches with 749 communicants, all in Pennsylvania.

RIVER ENGINEERING. Before undertaking works for the improvement of rivers, either with the object of mitigating the effects of their inundations, or for increasing and extending their capabilities for navigation, it is most important that their physical characteristics should be investigated in each case, for these vary greatly in different rivers, being dependent upon the general configuration of the land,

the nature of the surface strata and the climate of the country which the rivers traverse.

Physical Characteristics of Rivers

The size of rivers above any tidal limit and their average fresh- water discharge are proportionate to the extent of their basins, and the amount of rain which, falling over these basins, reaches the river channels in the bottom of the valleys, by which it is conveyed to the sea.

River Basins. — The basin of a river is the expanse of country, bounded by a winding ridge of high ground, over which the rainfall flows down towards the river traversing the lowest part of the valley; whereas the rain falling on the outer slope of the encircling ridge flows away to another river draining an adjacent basin. River basins vary in extent according to the configura- tion of the country, ranging from the insignificant drainage-areas of streams rising on high ground very near the coast and flowing straight down into the sea, up to immense tracts of great con- tinents, when rivers, rising on the slopes of mountain ranges far flnand, nave to traverse vast stretches of valleys and plains before

reaching the ocean. The size of the largest river basin of any country depends on the extent of the continent in which it is situated, its position in relation to the hilly regions in which rivers generally rise and the sea into which they flow, and the distance between the source and the outlet of the river drain- ing it.

Great Britain, with its very limited area, cannot possess large river basins, its largest being that of the Thames with an area of 5244 sq. m. Even on the mainland of Europe, river basins augment in extent on proceeding eastwards with the increasing width of the continent; in France the largest basin is that of the Loire with an area of 45,060 sq. m., while the Rhine has a basin of 86,000 sq. m. with a length of 800 m., the Danube a basin of 312,000 sq. m. with a length of 1700 m., and the Volga a basin of 563,000 sq. m. with a length of 2000 m. The more extensive continents of Asia, Africa and North and South America possess still larger river basins, the Obi in Siberia having a basin of about 1,300*000 sq. m. and a length of 3200 m., the Nile a basin of 1,500,000 sq. m. with a length of over 4000 m., and the Missis- sippi, flowing from north to south, having a basin of 1,244,000 sq. m. with a length of 4200 m. The vast basin of the Amazon of 2,250,000 sq. m. is due to the chain of the Andes almost bordering the Pacific coast-line, so that the river rising on its eastern slopes has to

traverse nearly the whole width of South America at its broadest part before reaching the Atlantic Ocean.

Available Rainfall. — The rainfall varies considerably in different localities, both in its total yearly amount and in its distribution throughout the year; also its volume fluctuates from year to year; Even in small river basins the variations in rainfall may be considerable according to differences in elevation or distance from the sea, ranging, for instance, in the Severn basin, with an area of only 4350 sq. m., from an average of under 30 in. in the year to over 80 in. The proportion, moreover, of the rain falling on a river basin which actually reaches the river, or the available rainfall in respect to its flow, depends very largely on the nature of the surface strata, the slope of the ground and the extent to which it is covered with vegetation, and varies greatly with the season of the year. The available rainfall has, indeed, been found to vary from 75% of the actual rainfall on impermeable, bare, sloping, rocky strata, down to about 15% on flat, very permeable soils.

Fall of Rivers.— The rate of flow of rivers depends mainly upon their fall, though where two rivers of different sizes have the same fall, the larger river has the quicker flow, as its retardation by friction against its bed and banks is less in proportion to its volume than that of the smaller river. The fall of a river corre- sponds approximately to the slope of the country it traverses; and as rivers rise close to the highest part of their basins, gener- ally in hilly regions, their ‘fall is rapid near their source and gradually diminishes, with occasional irregularities, till, in tra- versing plains along the latter part of their course, their fall usually becomes quite gentle. Accordingly, in large basins, rivers in most cases begin as torrents with a very variable flow, and end as gently flowing rivers with a comparatively regular discharge.

Variations in the Discharge of Rivers. — The irregular flow of rivers throughout their course forms one of the main difficulties in devising works, either for mitigating inundations or for increasing the navigable capabilities of rivers. In tropical countries, subject to periodical rains, the rivers are in flood during the rainy season and have hardly any flow during the rest of the year; whilst in temperate regions, where the rainfall is more evenly distributed throughout the year, evaporation causes the available rainfall to be much less in hot summer weather than in the winter months, so that the rivers fall to their low stage in the summer and are very liable to be in flood in the winter. In fact, with a temperate climate, the year may be divided into a warm and a cold season, extending from May to October and from November to April respectively; the rivers are low and moderate

floods are of rare occurrence during the first period, and the rivers are high and subject to occasional heavy floods after a

considerable rainfall during the second period in most years. The only exceptions are rivers which have their sources amongst mountains clad with perpetual snow, and are fed by glaciers; their floods occur in the summer from the melting of the snows and ice, as exemplified by the Rhone above the 'Lake of Geneva, and the Arve which joins it below. But even these rivers are liable to have their flow modified by the influx of tributaries subject to different conditions, so that the Rhone below Lyons has a more uniform discharge than most rivers, as the summer floods of the Arve are counteracted to a great extent by the low stage of the Sa&ne flowing into the Rhone at Lyons, which has its floods in the winter when the Arve on the contrary is low.

Transportation of Materials by Rivers. — Another serious ob- stacle encountered in the improvement of rivers consists in the large quantity of detritus brought down by them in flood-time, derived mainly from the disintegration of the surface-layers of the hills and slopes in the upper parts of the valleys by glaciers, frost and rain. The power of a current to transport materials varies with its velocity, so that torrents with a rapid fall near the sources of rivers can carry down rocks, boulders and large stones, which are by degrees ground by attrition in their onward course into shingle, gravel, sand and silt, simultaneously with the gradual reduction in fall, and, consequently, in the transporting force of the current. Accordingly, under ordinary conditions, most of the materials brought down from the high lands by the torrential water-courses are carried forward by the main river to the sea, or partially strewn over flat alluvial plains during floods; and the size of the materials forming the bed of the river or borne along by the stream is gradually reduced on proceeding seawards, so that in the Po, for instance, pebbles and gravel are found for about 140 m. below Turin, sand along the next 100 m., and silt and mud in the last no m. When, however, the fall is largely and abruptly reduced, as in the case of rivers emerging straight from mountainous slopes upon fiat plains, deposit necessarily occurs, from the materials being either too large or too great in volume to be borne along by the enfeebled current; and if the impeded river is unable to spread this detritus over the plains, its bed becomes raised by deposit, causing the river in flood-time to rise to a higher level. The materials, moreover, which are carried in suspension or rolled along the bed of the river to

the sea, tend to deposit when the flow of the river slackens and is finally brought to rest on encountering the great inert mass of the sea, especially in the absence of a tide and any littoral current, and this is the cause of the formation of deltas with their shallow outlets, barring the approach to many large rivers.

Influence of Lakes on Rivers. — Sometimes a peculiar depression along part of a valley, with a rocky barrier at its lower end, causes the formation of a lake in the course of the river flowing down the valley. The intervention of a lake makes the river, on entering at the upper end, deposit all the materials with which it is charged in the still waters of the lake; and it issues at the lower end as a perfectly clear stream, which has also a very regular discharge, as its floods, in flowing into the lake, are spread over a large surface, and so produce only a very slight raising of the level. This effect is illustrated by the river Rhone, which enters the Lake of Geneva as a very turbid, torrential, glacier stream, and emerges at Geneva as a sparkling, limpid river with a very uniform flow, though in this particular case the improvement is not long maintained, owing to the confluence a short distance below Geneva of the large, rapid, glacial river, the Arve.

The influence of lakes on rivers is, indeed, wholly beneficial, in consequence of the removal of their burden of detritus and the regulation of their flow. Thus the Neva, conveying the outflow from Lake Ladoga to the Baltic, is relieved by the lake from the detritus brought down by the rivers flowing into the lake; and the Swine outlet channel of the Oder into the Baltic is freed from sediment by the river having to pass through the Stettiner Haff before reaching its mouth'. The St Lawrence, again, deriving most of its supply from the chain of Great Lakes of North America, possesses a very uniform flow.

River Channels. — The discharge of the rainfall erodes the beds of rivers along the lowest parts of the valleys; but floods occur too intermittently to form and maintain a channel large enough to contain the flow. A river channel, indeed, generally suffices approximately to carry off the average flow of the river, which, whilst comprising considerable fluctuations in volume, furnishes a sufficiently constant erosive action to maintain a fairly regular channel; though rivers having soft beds and carrying down sediment erode their beds during floods and deposit alluvium in dry weather. As the velocity of a stream increases with its fall, the size of a channel conveying a definite average flow varies inversely with the fall, and the depth inversely with the width. A river channel, accordingly, often presents considerable irregularities in section, forming shallow rapids when the

river flows over a rocky barrier with a con- siderable fall, and consisting of a succession of pools and shoals when the bed varies in compactness and there are differences in width, or when the river flows round a succession of bends along opposite banks alternately.

A river flowing through a flat alluvial plain has its current very readily deflected by any chance obstruction or by any difference in hardness of the banks, and generally follows a winding course, which tends to be intensified by the erosion of the concave banks in the bends from the current impinging against them in altering its direction round the curves. Some- times also a large river, bringing down a considerable amount of detritus, shifts its course from time to time, owing to the obstruction produced by banks of deposit, as exemplified by the Po in traversing the portion of the Lombardy plains between Casale and the confluence of the Ticino.

Floods of Rivers. — The rise of rivers in flood-time depends not merely on the amount of the rainfall, but also on its dis- tribution and the nature of the strata on which it falls. The upper hilly part of a river basin consists generally of imperme- able strata, sometimes almost bare of vegetation; and the rain flowing quickly down the impervious, sloping ground into the water-courses and tributaries feeding the main river produces rapidly rising and high floods in these streams, which soon pass down on the cessation of the rain. The river Marne, draining an impermeable part of the Upper Seine basin, is subject to these sudden torrential floods in the cold season, as illustrated by a diagram of the variations in height of the river at St Dizier from November to March 1903-4 (fig. 2). On the contrary, rain falling on permeable strata takes longer in reaching the rivers; and the floods of these rivers rise more gradually, are less high, continue longer and subside more slowly than in rivers draining impervious strata, as indicated by the diagram of the Little Seine at Nogent during the same period, which has a permeable basin (fig. 1). A main river fed by several tributaries, some from impermeable and others from permeable strata, experiences floods of a mixed character, as shown by the diagram of the same floods in 1903-4 of the Seine at Paris, below the confluence of the torrential Marne and Yonne, where the floods of the gently flowing Upper Seine and other tributaries with permeable basins also contribute to the rise of the river (fig. 3).

High floods are caused by a heavy rainfall on land already sodden by recent rains at a period of the year when evaporation is inactive, and especially by rain falling on melting snow. A fairly simultaneous rainfall over the greater part of a moderate- sized river basin is a tolerably common occurrence; and under such conditions, the floods

coming from the torrential tri- butaries reach their maximum height and begin to subside before the floods from the gently flowing tributaries attain their greatest rise. Exceptional floods, accordingly, only occur in a main river when a heavy rainfall takes place at such periods over different parts of the basin that the floods of the various tributaries coincide approximately in attaining their maximum at certain points in the main river.

Mitigation of Floods and Protection from Inundations. — As the size of the channel of a river is generally quite inadequate to carry down the discharge of floods, the river overflows its

banks in flood-time and inundates the adjacent low-lying lands to an extent depending upon the level of the ground and the

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Flood Diagrams, Seine basin, 1903-1904. Fig. 1. — Little Seine at Nogent. Fig. 2. — Marne at St Dizier. Fig. 3. — Seine at Paris.

volume and height of the flood. An enlargement of the bed of the river, principally by deepening it, in order to increase its discharging capacity sufficiently to prevent inundations, is precluded by the cost, and also, in rivers bringing down sediment, by the large deposit that would take place in the enlarged channel from the reduction in the velocity of the current when the flood begins to subside. Where, however, the depth of a tidal river has been considerably increased by dredging for the extension of its sea-going trade, the enlarge- ment of its channel and the lowering of its low-water line have greatly facilitated the passage of land floods from the river above for some distance up, and consequently reduced their height; for instance, the Glasgow quays along the deepened Clyde are no longer subject to inundation, and the lands and quays bordering the Tyne have been relieved from flooding for nearly 10 m. above Newcastle by the deepening of the river from Elswick to the sea (fig. 18).

Sometimes works are carried out in a river valley for dim- inishing the height of floods by delaying the discharge of part of the rainfall into the main river; whilst others are designed to increase the discharging efficiency of the river channels. In certain cases, moreover, it is very important to restrict or to prevent the inundation of some riparian districts by embank- ments; and occasionally low-lying lands are so unfavourably situated that pumping has to be resorted to for the removal of their drainage waters.

Works in River Valleys for diminishing Floods. — Rain falling on bare, impervious, hilly slopes rapidly flows into the nearest water-course, carrying with it any loose soil or disintegrated materials met with in its rush down the ravines, thereby in- tensifying the torrential character of the river, increasing the height of its floods and adding to the sediment obstructing its course to the sea. By encouraging the growth of vegetation and restricting its use for pasturage, and by planting trees on the mountain slopes, which have often been denuded of their natural covering by the reckless clearing of forests, the flow of the rain off the slopes is retarded; the soil, moreover, is bound together by the roots of the plants, and the surface strata are protected from disintegration by the covering of

grass and leaves, so that the amount of detritus carried down into the river is greatly reduced.

Proposals have sometimes been made to reduce the height of floods in rivers and restrict the resulting inundations by impounding sonte of the flood discharge by the construction of one or more dams across the upper valley of a river, and letting it out when the flood has passed down. This arrangement, however, is open to the objection that in the event of a second flood following rapidly on the first, there might not be time to empty the reservoir for its reception. The cost, moreover, of the formation of such reservoirs could rarely be justified merely for the purpose of reducing the flood-level along an ordinary river valley. Nevertheless, when this provision against floods can be combined with the storage of water- supply for a town, it becomes financially practicable. Thus two masonry dams erected across the narrow valley of the river Furens, a torrential tributary of the Loire, form two reservoirs for the supply of the town of St Etienne, in which the water is kept down several feet below the full level in order to provide for the reception of the surplus flood-waters, and thereby protect St fitienne from inundation. Storage reservoirs also, formed solely for water-supply or irrigation, provided adequate compensation water is discharged from them during dry weather, are advantageous, like lakes, in regulating the flow of the river below ;

When a river flowing through flat plains has a very small fall, it requires a proportionately large channel to carry away the drainage waters of the valley; and, accordingly, the low- lying lands bordering the river are very subject to inundations if the rainfall over the higher ground is allowed to flow straight down into the bottom of the valley. By intercepting, how~ ever, the flow off the high parts of the valley in/ small channels excavated along the slopes, termed ” catch-water drains,” the ample fall available from this higher elevation can be utilized for conveying the flow farther down the valley; and the congested river is thereby relieved for a certain part of its length from the rainfall over the higher ground.

Methods of increasing the Discharging Efficiency of River Channels. — The discharging efficiency of a river within the limits of its bed depends on the fall and the cross-section of the channel. The only way of increasing the fall is to reduce the length of the channel by substituting straight cuts for a winding course. This involves some loss of capacity in the channel as a whole, and in the case of a large river with a considerable flow it is very difficult to maintain a straight cut, owing to the tendency of the current to erode the banks and form again a sinuous channel. Even if the cut is preserved by protecting the banks, it is liable to produce changes, shoals and a raising of the flood-level in the channel just below its termination. Never-* thcless, where the available fall is exceptionally small, as in lands originally reclaimed from the sea, such as the English fen districts, and where, in consequence, the drainage is in a great measure artificial, straight channels have been formed for the rivers; and on account of the importance of preserving these fertile, low-lying lands from inundation, additional straight channels have been provided for the discharge of the rainfall, known as drains in the fens. Except where a town is exposed to inundations, a considerable modification of the course of a river and an enlargement of its channel do not produce a reduction in the damage from its floods com- mensurate with the expenditure involved.

The removal of obstructions, whether natural or artificial, from the bed of a river furnishes a simple and efficient means of increasing the discharging capacity of its channel, and, consequently, of lowering the height of floods; for every impediment to the flow, in proportion to its extent, raises the level of the river above it so as to produce the additional arti- ficial fall necessary to convey the flow through the restricted channel, thereby reducing the total available fall. Accidental obstructions, brought down by floods, such as trunks of trees, boulders and accumulations of gravel, require to be periodic- ally removed. In the absence of legal enactments for the

conservancy of rivers, numerous obstructions have in many cases been placed in their channel, such as mining refuse, sluice- gates for mills, fish-traps, unduly wide piers for bridges and solid weirs, which impede the flow and raise the flood-level. Stringent prohibitions with regard to refuse, the enlargement of sluice-ways and the compulsory raising of their gates for the passage of floods, the removal of fish-traps which are fre- quently blocked up by leaves and floating rubbish, a reduction in the number and width of the piers of bridges when rebuilt, and the substitution of movable weirs for solid weirs, greatly facilitate the discharge of a river, and consequently lower its flood-level.

Prediction of Floods in Rivers.— By erecting gauges in a fairly large river and its tributaries at suitable points, and keeping continuous records for some time of the heights of the water at the various stations, the rise of the floods in the different tributaries, the periods they take in passing down to definite stations on the main river, and the influence they severally exercise on the height of the floods at these places, are ascer- tained. With the help of these records, by observing the times and heights of the maximum rise of a particular flood at the stations on the, various tributaries, the time of arrival and height of the top of the flood at any station on the main river can be predicted with remarkable accuracy two or more days beforehand. By telegraphing these particulars about a high flood to places on the lower river, the weir-keepers are enabled to open fully beforehand the movable weirs for the passage of the flood, and the riparian inhabitants receive timely warning of the impending inundation.

Embankments along Rivers to prevent Inundations. — Where portions of a riverside town are situated below the maximum flood-level, or when it is important to protect land adjoining a river from inundations, the overflow of the river must be confined within continuous embankments on both sides. By placing these emhankments somewhat back from the margin of the river-bed, a wide flood-channel is provided for the dis- charge of the river directly it overflows its banks, whilst leaving the natural channel unaltered for the ordinary flow. Low embankments may be sufficient where only exceptional summer floods have to be excluded from meadows. Occasionally the embankments are raised high enough to retain the floods during most years, whilst provision is made for the escape of the rare exceptionally high floods at special places in the embank-

ments, where the scour of the issuing current is guarded against, and the inundation of the neighbouring land is least injurious. In this manner, the increased cost of embankments raised above the highest flood-level of rare occurrence is saved, and the danger of breaches in the banks from an unusually high flood-rise and rapid flow, with their disastrous effects, is avoided. Both the above methods afford the advantage of relieving the embanked channel of some of the sediment deposited in it by the confined flood-waters, when the surplus flow passes over the embankments.

When complete protection from inundations is required, the embankments have to be raised well above the highest flood-level, after allowing for the additional rise resulting from the confinement of the flood within the embankments, instead of spreading over the low-lying land; and they have to be made perfectly watertight and strong enough to resist the water-pressure and current of the highest floods. The system has been very extensively adopted where large tracts of fertile alluvial land below flood-level stretch for long dis- tances away from the river. Thus the fens of Lincolnshire, Cambridgeshire and Norfolk are protected from inundations by embankments along their rivers and drains; a great portion of Holland is similarly protected; and the plains of Lombardy are shut off from the floods of the Po by embankments along each side of the river for a distance of about 265 m., ex- tending from Cornale, 89 m. below Turin, to its outlet.

The system has been developed on a very extensive scale along the alluvial valley of the Mississippi, which is below the high flood-level of the river from Cape Girardeau, 45 m. above Cairo, to the Gulf

of Mexico, and has a length of 600 m. in a straight line with a width ranging between 20 and 80 m., and an area of 29,790 sq. m. These embankments, having been begun by the French settlers in Louisiana, are called levees, and have a total length of 1490 m. They, however, do not afford complete protection from inundations, as they are not quite continuous and are not always strong enough to withstand the water-pressure of high floods, which have at Vicks- burg a maximum rise of 59 ft. above the lowest stage of the river, and tend to increase in height owing to the improved drainage following on the extension of cultivation. Breaches, or crevasses as they are termed in the United States, resulting from a deficiency in the strength or consistency of the banks, or from their being overtopped or eroded by the current, produce a sudden rush of the flood-waters through the opening, which is much more damaging to the land in the neighbourhood of the breach than a gradual inundation. Moreover, the velocity of the outflowing water is intensified by the sloping down of the land on

these alluvial plains for some distance away from the river, owing to the raising of the ground nearest the river by the gradual deposit of layers of sediment from the flood-waters when they begin to overflow the river banks. The levees on the Mississippi are breached in weak places every year during the spring floods, and are liable to be destroyed along con- siderable lengths by the rapid erosion resulting from their being overtopped by exceptional floods at intervals of about ten years; and in places they are undermined and overthrown by changes in the course of the river from the caving-in of concave banks at bends, necessitating reconstruction some distance back from the river at points thus threatened. When towns have been established below the flood-level of an adjoining river, like New Orleans on the Mississippi and Szegedin on the Theiss in Hungary, the channel of the river should be improved to facilitate the passage of floods past the town. The town also must be enclosed within very solid embankments, raised above the highest possible flood-level, to obviate the contingency of an exceptional flood, or a gradually raised flood-level, overtopping the protecting bank at a Tow part, leading to an inevitable breach and a catastrophe such as overwhelmed the greater part of Szegedin in March 1879.

Effect of Embankments in raising the River Bed. — A most serious objection to the formation of continuous, high em- bankments along rivers bringing down considerable quantities of detritus, especially near a part where their fall has been abruptly reduced by descending from mountain slopes on to alluvial plains, is the danger of their bed being raised by deposit, producing a rise in the flood-level, and necessitating a rais- ing of the embankments if inundations are to be prevented. Longitudinal sections of the Po taken in 1874 and 1901 show that its bed was materially raised in this period from the confluence of the Ticino to below Caranella, in spite of the clearance of sediment effected by the rush through breaches; and therefore the completion of the embankments, together with their raising, would only eventually aggravate the injuries of inundations they have been designed to prevent, as the escape of floods from the raised river must sooner or later occur.

The periodical devastating floods of the Hwang Ho or Yellow River in China are due to the raising of the bed of its embanked channel by detritus brought down from the hills, followed by the raising of the banks, whereby the river is forced to flow above the level of the plains. When the river was first embanked, a consider- able space was left between it and its banks on each side, which allowed for deviations in the channel, and also afforded a fair area for the deposit of detritus away from its bed, and a good width for the discharge of

floods. Later, however, in order to appropriate and bring under regular cultivation the riparian land thus prudently left within the embankments and exposed to every flood, lines of inner embankments were formed close to the river, thereby greatly Confining the flood-waters, and, consequently, raising the flood-level and the river-bed, besides exposing these embankments to under- mining by merely a moderate change in position of the river channel. This reckless policy of securing additional land regardless of con- sequences has greatly contributed to the more frequent occurrence of the very widespread inundations resulting from the bursting of the vast volume of pent-up flood-waters through breaches in the banks, which descend with torrential violence upon the plains below, causing great destruction of life and property.

The restriction of the floods on the lower Mississippi by the levees, placed about double the width apart of the ordinary channel, has caused the river to enlarge its very soft alluvial bed, resulting in a lowering of the water-line at the low stage; and it is, therefore, anticipated that the further scour by floods when the levees have been made continuous will, in this instance, prevent any material raising of the flood-level by the levees.

Protection of Vessels during Floods. — On large open rivers, where vessels during high floods are exposed to injury from

large floating dibris and ice floes, shelter can be provided for them in refuge ports, formed in a recess at the side under the protection of a solid jetty or embankment constructed in the river parallel to the bank, these ports being closed against floods at their upper end and having their entrance at the lower end facing down-stream. Many such ports have been provided on several German and North American rivers; where the port, being near a town, is lined with quay walls, it can also be used for river traffic, a plan adopted at the refuge port on the Main just below Frankfort (fig. 8).

Regulation of Rivers for Navigation. As rivers flow onward towards the sea, they experience a considerable diminution in their fall, and a progressive increase in the basin which they drain, owing to the successive influx of their various tributaries. Thus • gradually their current becomes more gentle and their discharge larger in volume and less subject to abrupt variations; and, consequently, they become more

suitable for navigation. Eventually, large rivers, under favourable conditions, often furnish important natural highways for inland navigation in the lower portion of their course, as, for instance, the Rhine, the Danube and the Mississippi; and works are only required for preventing changes in the course of the stream, for regulating its depth, and especially for fixing the low-water channel and concentrating the flow in it, so as to increase as far as practicable the navigable depth at the lowest stage of the water-level. Regulation works for increasing the navigable capabilities of rivers can only be advantageously undertaken in large rivers with a moderate fall and a fair discharge at their lowest stage; for with a large fall the current presents a great impediment to up-stream navigation, and there are generally great varia- tions in water-level, and when the discharge becomes very small in the dry season it is impossible to maintain a sufficient depth of water in the low-water channel.

Removal of Shoals. — The possibility of securing uniformity of depth in a river by the lowering of the shoals obstructing the channel depends upon the nature of the shoals. A soft shoal in the bed of a river is due to deposit from a diminution in velocity of flow, produced by a reduction in fall and by a widening of the channel, or to a loss in concentration of the scour of the main current in passing over from one concave bank to the next on the opposite side. The lowering of such a shoal by dredging merely effects a temporary deepening, for it soon forms again from the causes which produced it. The removal, moreover, of the rocky obstructions at rapids, though increasing the depth and equalizing the flow at these places, produces a lowering of the river above the rapids by facilitating the efflux, which may result in the appearance of fresh shoals at the low stage of the river. Where, however, narrow rocky reefs or other hard shoals stretch across the bottom of a river and present obstacles to the erosion by the current of the soft materials forming the bed of the river above and below, their removal may prove a permanent improvement by enabling the river to deepen its bed by natural scour.

The deepening of the bed of a non-tidal river along a considerable length by dredging merely lowers the water-level of the river during the low stage; and though this deepening facilitates the passage of floods in the first instance, it does not constitute a permanent improvement even in this respect, for the deposit of the detritus brought down by the river as the floods abate soon restores the river to its original condition. Nevertheless, where sand-banks obstruct and divert the low-state channel of a river at its low stage, as in parts of the Mississippi below Cairo, it has been found possible before the river has fallen to its lowest level to form a channel through these sand-

banks, with a depth of 9 or 10 ft. and 250 ft. wide, by suction dredgers, aided by revolving cutters or water-jets (see Dredging), which discharge the sand through floating tubes into a part of the river away from the channel ; and the navigation can thus be maintained throughout the low stage at a reasonable cost. Though, however, these channels across the shoals, connect- ing the deeper parts of the river, can be easily kept open on the Mississippi till the return of the floods, they are obliterated by the currents in flood-time, and have to be dredged out again afresh every year on the abatement of the floods.

Regulation of the Low-Water Channel. — The capability of a river to provide a waterway for navigation during the summer or throughout the dry season depends upon the depth that can be secured in the channel at the lowest stage. Owing to the small discharge and deficiency in scour during this period, it is important to restrict the width of the low-water channel, and concentrate the flow in it, and also to fix its position so that, forming the deepest part of the

bed along the line of the strongest current, it may be scoured out every year by the floods, instead of remaining an undefined and shifting channel. This is effected by closing subsidiary low-water channels with dikes across them, and narrowing the channel at the low stage by low-dipping cross dikes extended from the river banks down the slope, and pointing slightly up-stream so as to direct the water flowing over them into a central channel (figs. 4 and 5). The contraction also of the channel is often still more effectually accomplished at some parts, though at a greater cost, by low

Regulation Works. Figs. 4 and 5. — River Rhone. Fig. 6. — River Rhine.

longitudinal dikes placed along either side of the low-water channel, some distance forward from the banks but connected with them generally at intervals by cross dikes at the back to prevent the current from scouring out a channel behind them during floods (figs. 4 and 6). By raising these dikes only slightly above the surface of the bed of the river, except where it is expedient to produce accretion for closing an old disused channel or rectifying the course of the river, the capacity of the channel for discharging floods is not affected; for the slight obstruction to the flow pro- duced by the dikes at the sides is fully compensated for by the deepening of the low-water channel in the central course of the river.

This system of obtaining a moderate increase in depth during the low

stage of a river, whilst leaving the river quite open for navigation, has been adopted with satisfactory results on several large rivers, of which the Rhone, the Rhine and the Mississippi furnish notable examples. Regulation works were preferred on the Rhone to canalization from Lyons nearly to its outlet, in spite of its large fall, which reaches in some places I in 250, on account of the considerable quantities of shingle and gravel carried down by the river; the comparative regularity of the discharge, owing to the flow being derived from tributaries having their floods at different times of the year, has aided the effects of the works, which have produced an increase of about 3§ ft. in the available navigable depth below Lyons at the lowest water-level. Owing, however, to the unfavour- able natural condition of the river, the depth does not exceed 5 ft. at this stage; and the rapid current forms a serious impediment to up-stream navigation. The Rhine is much better adapted for improvement by regulation works than the Rhone, for it has a basin more than double the area of the Rhone basin, and its fall does not exceed 3-1 ft. per mile up at Strassburg and 2-5 ft. per mile through the rocky defile from Bingen to Kaub, and is much less along most of the length below Strassburg. These works systematically carried out in wide shallow reaches between the Dutch frontier and Mainz, aided by dredging where necessary, have secured a navigable depth at the low stage of the river of 10 ft. from the frontier to Cologne, 8| ft. from Cologne to Kaub, and 6| ft. through the rocky defile up to Bingen, beyond which the same depth is maintained up to Philippsburg, 22J m. above Mannheim. Works, moreover, are in progress by which it is anticipated that the minimum depth of 6| ft. will be extended up to Strassburg by 1916. The Mississippi also, with its extensive basin and its moderate fall in most parts, is well suited for having its navigable depth increased

by regulation works, which have been carried out below St Paul in shallow and shifting reaches, with the object of obtaining a mini- mum navigable depth during the low stage of 6 ft. along thfc upper river from St Paul to St Louis just below the confluence of the Missouri, and 8 ft. thence to Cairo at the mouth of the Ohio.

Various materials are used for the regulation works according to the respective conditions and the materials available in the locality. On the Rhone below Lyons with its rapid current, the dikes have been constructed of rubble-stone, consolidated above low water with concrete. The dikes on the Rhine consist for the most part of

earthwork mounds protected by a layer of rubble-stone or pitch- ing on the face, with a rubble mound forming the toe exposed to the current; but occasionally fascines are employed in conjunction with stone or simple rubble mounds. The dams closing subsidiary channels on the Mississippi are almost always constructed of fascine mattresses weighted with stone; but whereas the regulating dikes on the upper river are usually similar in construction, a common form for dikes in the United States consists of two parallel rows of

Ciles filled in between with brushwood or other materials not affected y water, and protected at the sides from scour by an apron of fascines and stone. Other forms of dikes sometimes used are timber cribs filled with stone, single rows of sheet piling, permeable dikes composed of piles supporting thin curtains of brushwood for promoting silting at the sides, and occasionally rubble-stone in places needing special protection.

Protecting and Easing Bends. — Unless the concave banks of a river winding through wide, alluvial plains are protected from the scour of the current, the increasing curvature presents serious impediments to navigation, sometimes eventually becoming so intensified that the river at last makes a short cut for itself across the narrow strip of land at the base of the loop it has formed. This, however, pro- duces considerable changes in the channel below, and disturbances in the navigable depth. Protection, accordingly, of concave banks is necessary to prevent excessive curvature of the channel and changes in the course of a river. On the Mississippi the very easily

ordinary summer level has to be raised by impounding the flow with weirs at intervals across the channel (see Weir), while a lock (see Canal and Dock) has to be provided alongside the weir, or in a side channel, to provide for the passage of vessels (fig. 8). A river is thereby converted into a succession of fairly level reaches rising in steps up-stream, providing a comparatively still- water navigation like a canal; but it differs from a canal in the introduction of weirs for keeping up the water-level, in the provision for the regular discharge of the river at the weirs, and in the two sills of the locks being laid at the same level instead of the upper sill being raised above the lower one to the extent of the rise at the lock, as usual on canals. Canalization secures a definite available depth for navigation; and the discharge of the river generally is amply sufficient for maintaining the impounded water- level, as well as providing the necessary water for locking. The navigation, however, is liable to be stopped during the descent of high floods, which in many cases rise above the locks (fig. 7); and it is necessarily arrested in cold climates on all rivers by long,

severe frosts, and especially on the break-up of the ice.

Instances of Canalized Rivers. — Many small rivers, like the Thames above its tidal limit, have been rendered navigable by canalization, and several fairly large rivers, have thereby provided a good depth for vessels for considerable distances inland. Thus the canalized Seine has secured a navigable depth of io| ft. from its tidal limit up to Paris, a distance of 135 m., and a depth of 6J ft. up to Mon- tereau, 62 m. higher up. Regulation works for improving the river Main, from its confluence with the Rhine opposite Mainz up

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Fig. 7. — Canalized River Main.

eroded banks are protected along their upper, steeper part by stone pitching or a layer of concrete, and below low-water level by fascine mattresses weighted with stone, extended a short distance out on the bed to prevent erosion at the toe. Dikes, also, projecting into the channel from the banks reduce the curvature of the navigable channel by pushing the main current into a more central course; whilst curved longitudinal dikes placed in the channel in front of concave banks (figs. 4 and 6) are still more effective in keeping the current away from the banks, which is sometimes still further pro- moted by dipping cross dikes in front (fig. 5).

Regulation of Depth. — The regulation works at bends, besides arresting erosion, also reduce the differences in depth at the bends and the crossings, since they diminish the excessive depth round the concave banks and deepen the channel along the crossings, by giving a straighter course to the current and concentrating it by a reduction in width of the channel between the bends (figs. 4 and 5). Where there are deep pools at intervals in a river, shoals are always found above them, owing to the increased fall- which occurs in the water line on approaching the pool, to compensate for the very slight inclination of the water-line in crossing the pool, which serves for the discharge of the river through the ample cross-section of this part of the river-bed. These variable depths can be regulated to some extent

by rubble dikes or fascine mattress sills deposited across the bed of the pool, so as to reduce its excessive depth, but not raised high enough to interfere at all with the navigable depth. These obstructions in the pool raise the water-line towards its upper end, in order to provide the additional fall needed to effect the discharge through the pool with its diminished cross section; and this raising of the water-line increases the depth over the shoal above the pool, so that the general depth in these irregular parts of a river is rendered more uniform, with benefit to navigation.

Canalization of Rivers.

Rivers whose discharge is liable to become quite small at

their low stage, or which have a somewhat large fall, as is

usual in the upper part of rivers, cannot be given an adequate

depth for navigation by regulation works alone; and their

to Frankfort, having failed to secure a minimum depth of 3 ft. at the low stage of the river, canalization works were carried out in 1883-86 by means of five weirs in the 22 m. between the Rhine and Frankfort, and provided a minimum depth of 6J ft. (figs. 7 and 8).

Fig. 8. — Locks, Weir and Haven near Frankfort. This depth was subsequently increased by dredging the shoaler portion towards the upper end of each reach, due to the rise of the river-bed up-stream, so as to attain a minimum depth of 7f ft. just below the lowest lock, and 7f to 8| ft. in the other reaches; whilst a sixth weir was erected at Offenbach above Frankfort (fig. 7). The Great Kanawha, Ohio, and other rivers, furnish instances of canalization works in the United States.

Limits to Canalization. — On ascending a river it becomes increasingly difficult to obtain a good depth by canalization in the upper part, owing to the progressive inclination of the river-bed ; thus, even on the Seine, with its moderate fall, whereas a depth of lo| ft. has been obtained on the Lower Seine by weirs placed on the average 13! m. apart, on the Upper Seine weirs are required at intervals of only about 4! m. to attain a depth of 6| ft. Accordingly, the higher parts of rivers are only suitable for floating down trunks of trees felled on the hills, or rough rafts of timber, conveying small loads of produce, which are broken Ud on reaching their destination. Moreover, sometimes an abrupt fall or rocky shoals make it necessary to abandon a section of the nver and to continue the navigation by lateral canal.

Small River Outlets exposed to Littoral Drift. Rivers with a small discharge flowing straight into the sea on an exposed coast are more or less obstructed at their outlet

by drift of shingle or sand carried along the coast by the waves in the direction of the prevailing winds. When the flow falls very low in dry weather, the outlet of a river is sometimes completely closed by a continuous line of beach, any inland or tidal waters merely trickling through the obstruction; and it is only on the descent of floods that the outlet is opened out. In rivers which always have a fair fresh-water discharge, or a small fresh- water flow combined with a tidal flow and ebb, the channel sometimes has its direct outlet closed, and is deflected parallel to the shore till it reaches a weak place in the line of beach, through which a new outlet is formed; or, where the current is strong enough to keep the outlet open, a bar is formed across the entrance by the littoral drift, reducing the navigable depth.

Jetties at River Outlets. — The bar formed by littoral drift across the outlet of a river not charged with sediment and flowing into a tideless sea can be lowered by carrying out solid jetties on each side

of the outlet across the foreshore,

Fig. 9.-

-Jetty Outlet into Baltic : River Pernau.

so as to scour the bar by con centrating the issuing current over it. Thus by means of jetties, aided by dredging, the depth at the entrance to the Swine mouth of the Oder has been increased from 7 ft. to 22J ft. ; the approach channels to the river Pernau (fig. 9) and other Russian rivers flowing into the Baltic have been deepened by jetties, and the outlet channels of some of the rivers flowing into the Great Lakes of North America have been improved by crib-work jetties and dredging.

Where the littoral drift is powerful enough to divert the outlet of a river, as in the case of the river Yare, which at one time was driven to an outlet 4 m. south of its direct course into the sea at Yarmouth, and the river Adour in France, whose outlet, owing to the was liable to be shifted 18 m.

violent storms of the Bay of Biscay,

from its proper position, it has proved practicable to fix as well as

to deepen the outlet by means of jetties (fig. 10). In such cases,

Fig. 10. — Shifting Outlet, fixed by Jetties: River Yare.

however, where the rivers flow into tidal seas, it is important to place the jetties sufficiently apart to avoid any loss of tidal influx, since the tidal flow assists the fresh-water discharge in keeping the outlet open; whereas, with rivers flowing into tideless seas, a moderate restriction of the width between the jetties increases the scour. The tortuous and somewhat shifting outlet channel of the Scheur branch of the river Maas, emerging on to a sandy coast where the rise of tide is small, and obstructed at its mouth by a bar, has been replaced by a straight cut across the Hook of Holland, and by an outlet guided across the foreshore and fixed in position by fascine mattress jetties (see Jetty), the maintenance of the depth at the mouth by the tidal and fresh waters being aided by frequent dredging (figs. 11 and 12).

Deltaic Outlets of Tideless Rivers.

Large rivers heavily charged with sand and silt, when their

current is gradually arrested on entering a tideless sea,

deposit these materials as a constantly advancing fan-shaped

shoal in front of their mouths, through which comparatively

shallow diverging channels, almost devoid of fall, have to force their way in order to convey the fresh-water discharge

Figs, ii and 12. — Jetty Outlet into North Sea: River Maas.

into the sea (fig. 13). These deltaic channels deposit their burden of sediment in front of their outlets, forming bars which

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Fig. 13. — Mississippi Delta.

advance with the delta and whose rate of progress . seawards and distance in front of each outlet are proportionate to the discharge of

the several channels. A channel simply dredged on the bar in front of one of the outlets of a deltaic river is only maintained for a moderate period on account of the large volume of deposit continually accumulating at the outlet. Thus the channel in front of the outlet of the south-west pass of the Mississippi delta, when deepened from 13 ft. to 18 ft. over its bar by dredging many years ago, was soon silted up again on the discontinuance of the dredging; whilst the depth of the outlet channel of one of the branches of the Volga delta, which was increased from 4 ft. to 8 ft., could only be maintained by regular yearly dredging.

Parallel Jetties at Delta Outlets. — In order to procure and maintain for some time an adequate deepening across the bar in front of the outlets of delta channels, recourse has been had to the scour of the issuing current concentrated and extended out to the bar by parallel jetties, forming prolongations seawards of the banks of the channel. The requisite conditions for the success of this system of improvement are a good depth in the sea beyond the bar, allowing of a considerable deposit of alluvium before the increased depth is interfered with, and a littoral current carrying a portion of the alluvium away from the outlet, both of which retard the progression of the delta in front of the outlet and the inevitable eventual formation of a new bar farther out. The rate of advance of a delta depends also on the proportion of solid matter contained in the river water and on the specific gravity and size of the particles of alluvium discharged into the sea ; for the heavier and coarser materials, and especially those which are rolled along the bed of the channels, come first to rest. Moreover, as the larger channels of a delta bring down a larger volume of alluvium on account of their larger discharge, and as their bars form farther seawards from their outlets owing to the issuing current being less rapidly arrested in proportion to the volume discharged, the rate of advance of the

delta in front of an outlet is proportionate to the size of the channel, and the length of the jetties required for lowering the bar by scour in front of any channel is proportionate to the discharge of the channel. Consequently, the conditions are more unfavourable for the improvement of the outlets of the larger delta channels than of the smaller ones; though, on the other hand, the larger channels crossing the delta are generally more suitable for navigation on account of their size, and the natural depth oyer their bars is greater owing to the

larger discharge.

The discharge of the main branch of the Rhone, which formerly flowed into the Mediterranean and the Gulf of Foz through six mouths, was in 1852-57 concentrated in the direct eastern Rhone. cnanne i by embankments along sides, which closed all the lateral channels. The entire flow of the river, being thus discharged through the eastern outlets, increased for a time the depth over its bar from 4I ft. to 9} ft. ; but as the great volume of alluvium brought down, including an unusually large proportion of sand rolled along the bed of the river, was also all discharged through the one outlet, the bar soon formed again farther out, and naturally advanced with the delta in front of the outlet more rapidly than formerly when the deposit was distributed through six divergent mouths. Accordingly, the very moderate deepening produced by the embankments was not long maintained, and the average depth over the bar has not exceeded 6 J ft. for many years past; the St Louis Canal was con- structed to provide a deeper outlet for the navigation. 1 This want 01 success was due to the selection of an outlet opening on a sheltered, somewhat shallow bay, instead of a southern outlet discharging into deep water in the Mediterranean and having a deep littoral current flowinf across it, and also resulted from the closing of all the -other outlets, whereby the whole of the deposit, as well as all the discharge, was concentrated in front of the badly situated eastern outlet. The southern Roustan branch was reopened in 1893 to prevent the silting-up of the outlet of the St Louis Canal.

The Danube traverses its delta in three branches, the northern one of which', though conveying nearly two-thirds of the discharge n . of the river, is unsuitable for improvement owing to its

uanuoe. splitting up along portions of its course into several channels, and eventually flowing into the sea through twelve mouths of a small independent delta advancing about 250 ft. annually across a shallow foreshore. The central Sulina branch was selected for improvement in 1858 in preference to the southern St George's branch, which had a more favourably situated outlet and a better channel through the delta, on account of the much smaller expenditure required for carrying out jetties to the bar in front of the Sulina outlet, which was only half the distance from the shore of the bar of the St George's outlet, owing to the much smaller discharge of the Sulina branch. 2 The jetties, begun provisionally in 1858 and subsequently consolidated and somewhat extended, were finally completed in 1877. They increased the depth over the bar from an average of about 9 ft. previously to 1858 up to 20§ ft. in 1873, which was maintained for

many years. In 1893, however, the increasing draught of Vessels rendered a greater depth necessary; the wide inshore portion of the jetty channel was therefore narrowed by inner' parallel jetties, and a powerful dredger was set to work in the jetty channel and outside, whereby the depth was increased to 24 ft. in 1897, and was fairly maintained up to 1907, when a second dredger became necessary to cope with the shoaling. The somewhat small ratio of sediment to discharge in the Danube, the fineness of the greater portion of this sediment, its comparatively moderate amount owing to the small proportion of the discharge flowing through the Sulina branch, and its partial dispersion by the southerly littoral current and wave action, have prevented the rapid formation of a shoal in front of the Sulina outlet. Nevertheless, the lines of sound- ings are gradually advancing seawards in the line of the outlet channel, and there are signs of the formation of a new bar farther out, whilst the deposit to the South by the current and waves has deflected the deepest channel northwards. Accordingly, a pro- longation of the jetties will eventually be necessary, notwithstanding the removal of a portion of the deposit from the outlet channel by dredging.

The selection of the outlet of the south pass of the Mississippi delta for improvement by parallel jetties in 1876ˆ79, in spite of the south-west pass possessing a larger channel and a better depth over its bar, was due, as at the Danube, to motives of economy, as the bar of the south-west pass was twice as far off from the shore as that of the south pass (fig. 13). There fascine mattress jetties, weighted with limestone, and with large concrete blocks at their exposed ends (see Jetty), 2| and if m. long, and curved slightly southwards at their outer ends to direct the sedi- ment-bearing current more directly at right angles to the westerly littoral current, increased the depth of 8 ft. over the bar in 1875 up to 31 ft. between the jetties and out to deep water (fig. 14). The prolonged current of the river produced by the jetties has, as at the Sulina outlet, carried the main portion of the heavier sedi- ment into fairly deep water, so that the greatest advance of the

1 L. F. Vernon-Harcourt, Rivers and Canals, 2nd ed. pp. 187-90, plate 5, figs. 1 and 9. s Ibid, plate 5, figs. 2, 3, 4 and 10.

foreshore in front of the south pass has occurred in the 70-ft. line of soundings, though the shallower soundings have also advanced.

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Fig. 14. — Deltaic Jetty Outlet, South Pass, Mississippi.

The shoaling, however, in the jetty channel necessitated its reduction in width by mattresses and spurs from 1000 ft. to 600 ft., and also dredging to maintain the stipulated central depth of 30 ft., and 26 ft. depth for a width of 200 ft., out to deep water; whilst the outer channel was deflected to the east and narrowed by the alluvium carried westwards by the littoral current and also deposited in front of the jetty outlet. Accordingly, dredging has been increasingly needed to straighten the channel outside and maintain its depth and width ; and since the United States engineers took in hand its maintenance in 1901, the available depth of the outlet channel has been increased from 26 ft. up to 28 ft. by extensive suction dredging. In order to provide for the increasing requirements of sea-going vessels, the dredging of a channel 35 ft. deep and 1000 ft. wide, cut front the large south-west pass outlet to deep water in the gulf, was begun at the end of 1903; and jetties of fascine mattresses weighted with stone and concrete blocks have been carried out about 4 and 3 m. respectively from the shore on each side of the outlet for maintaining the dredged channel 3 (fig. 15). These works differ

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Fig. 15. — Deltaic Jetty Outlet, South-West Pass, Mississippi. ‘

from the prior improvement of the south pass in the adoption mainly of suction dredging for the formation of the channel in place of scour alone, so that it will be unnecessary to restrict the width of the jetty channel to secure the desired depth; whilst as the dis- charge through the south-west pass is rather more than three times the discharge through the south pass, and the bar is double the distance seawards of the outlet, the slightly converging jetties, in continuation of the south-west pass, are placed about 3400 ft. apart at their outer ends, and have been given about twice the length of the south pass jetties. As soon as the dredging of the channel has been completed (which depends on the appropriations granted by Congress) the south pass will be abandoned, and the south-west pass will form the navigable approach. Dredging will be required for preserving the depth of the outlet of the south-west pass; and when the large volume of sand and

other alluvium dis- charged by the pass accumulates in front sufficiently to begin forming a bar farther out, an extension of the jetties will be necessary to maintain the elongated channel free from drift, and extend the scour, especially in flood-time.

Improvement of Tidal Rivers for Navigation.

Whereas the size of tideless rivers depends wholly on their fresh-water discharge, the condition of tidal rivers is due to the configuration of their outlet, the rise of tide at their mouth, the distance the tide can penetrate inland, and the space available for its reception. Accordingly, tidal rivers sometimes, even when possessing a comparatively small fresh-water discharge, develop under • favourable conditions intb large rivers in their lower tidal portion, having a much better natural navigable channel at high tide than the largest deltaic rivers, as shown by a comparison of the Thames, the Humber and the Elbe with the Danube, the Nile and the Mississippi. Tidal water is, indeed, unlimited in volume; but, unlike the drainage waters which must be discharged into the sea, it only flows up rivers where there is a channel and space available for its

s Report of the Chief of Engineers for 1906, pp. 382 and 1296 and charts.

reception. Consequently, it is possible to exclude the tide by injudicious works, such as the sluices which were erected long ago across the fen rivers to secure the low-lying lands from the inroads of the sea; the tidal influx is also liable to be reduced by accretion in an estuary resulting from training works. The great aim, on the contrary, of all tidal river improvement should be to facilitate to the utmost the flow of the flood- tide up a river, to remove all obstructions from the channel so as to render the scouring efficiency of the flood and ebb tides as great as possible, and by making the tidal flow extend as far up the river as possible to reduce to a minimum the period of slack tide when deposit takes place.

Tidal Flow in a River. — The progress of the flood-tide up a river and the corresponding ebb are very clearly shown by a diagram giving a series of simultaneous tidal lines obtained from simultaneous observations of the height of the river Hugh during a high spring- tide in the dry season, taken at intervals at several stations along the river,

and exhibiting on a very distorted scale the actual water- level of the river at these periods (fig. 16). The steep form assumed

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Fig. i 6. — Simultaneous Tidal Lines: River Hugli.

by the foremost part of the flood-tide lines from the entrance to beyond Chinsura, attaining a maximum in the neighbourhood of Konnagar and Chinsura, indicates the existence of a bore, caused by the sand-banks in the channel obstructing the advance of the flood-tide, till it has risen sufficiently in height to rush up the river as a steep, breaking wave, overcoming all obstacles and producing a sudden reversal of the flow and abrupt rise of the water-level, as observed on the Severn, the Seine, the Amazon and other rivers. A bore indicates defects in the tidal condition and the navigable channel, which can only be reduced by lowering the obstructions and by the regulation of the river. No tidal river of even moderate length is ever completely filled by tidal water ; for the tide begins to fall at its mouth before the flood-tide has produced high water at the tidal limit, as most clearly shown in the case of a long tidal river by the Hugli tidal diagram. Every improvement of the channel, however, expedites and increases the filling of the river, whilst the volume of water admitted at each tide is further augmented by the additional capacity provided by the greater efflux of the ebb, as indicated by the lowering of the low-water line.

Deepening Tidal Rivers by Dredging. — The improvement of tidal rivers mainly by dredging is specially applicable to small rivers which possess a sufficient navigable width, like the Clyde and the Tyne; for such rivers can be considerably deepened by an amount of dredging which would be quite inadequate for producing a similar increase in depth in a large, wide river, with shifting channels. Both the Clyde below Glasgow and the Tyne below Newcastle were originally insignificant rivers, almost dry in places at low water of spring-tides; and the earliest works on both rivers consisted mainly in regulating their flow and increasing their scour by jetties and training works. They have, however, been brought to their present excellent navigable

condition almost wholly, since 1840 on the Clyde and 1861 on the Tyne, by continuous systematic dredging, rendered financially practicable by the growing importance of their sea-going traffic. The Clyde has been given a minimum depth of about 22 ft. at low water of spring-tides up to Glasgow, and can admit vessels of 27 to 28 ft. draught. In the Tyne (figs. 17 and 18), it was decided in 1902 to provide a minimum dredging depth in the river channel at low water of 25 ft. from the sea to the docks, of 20 ft. thence to Newcastle and of 18 ft. up to Scotswood, the rise of spring-tides increasing these depths by 15 ft. In 1906 it was determined to make the channel 30 ft. deep at low water of spring- tides from the sea to the docks, and in 1908 to deepen it between the docks and Newcastle swing bridge from 20 to 25 ft., and also between the swing bridge and Derwenthaugh from 18 to 25 ft. The natural scour of these rivers has been so much reduced by such an exceptional enlargement of their channels that a considerable amount of dredging will always be required to preserve the depth attained.

Regulation and Dredging of Tidal Rivers.— Considerable improvements in the navigable condition of tidal rivers above their outlet

or estuary can often be effected by regulation works aided by dredging, which ease sharp bends, straighten their course and render

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Figs. 17 and 18. — Improvement of Tidal River by dredging: River Tyne.

their channel, depth and flow more uniform. Examples are the Nervion between Bilbao and its mouth (figs. 19 and 20), and the

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Figs. 19 and 20. — Training Tidal River and protection of Outlet: River Nervion.

Weser from Bremen to Bremerhaven at the head of its estuary (figs. 21 and 22). These works resemble in principle the regulation works on large rivers with only a fresh-water discharge, previously described; but on tidal rivers the main low-water channel should alone be trained with an enlarging width seawards to facilitate the tidal influx, and the tidal capacity of the river above low water should be maintained unimpaired.

To secure a good and fairly uniform depth on a tidal river, it is

essential that the flood and ebb tides should follow the same course, in order to combine their scouring efficiency, and form a single, continuous deep channel. In wide, winding reaches, however, the flood tide in ascending a river follows as direct a course as practicable; and on reaching a bend, the main flood-tide current, in being deflected from its straight course, hugs the concave bank, and] keeping close alongside the same bank beyond the bend, cuts into the shoal projecting from the convex bend of the bank higher up, forming a blind shoaling channel, as clearly indicated near the Moyapur Magazine in fig. 23, and a little below Shipgunj Point in fig. 24. This effect is due to the flood-tide losing its guidance, and consequently its concentration, at the change of curvature beyond the termination of the concave bank," where it spreads out and passes gradually over, in its direct course, to the next concave bend above along the opposite bank. The ebb tide, on the contrary, descending the river, follows the general course of the fresh-water discharge in all rivers, its main current in the Moyapur reach keeping close along the concave bank between Ulabana and Hiragunj Point, and crossing over opposite the point to the next concave bank below (fig. 23) ; whilst in the James and Mary reach the main ebb-tide current runs alongside the concave bank in front of Ninan and Nurpur, and crosses over near Hugli Point to the opposite concave bank below Gewankhali (fig. 24). The main currents, accordingly, of the flood and ebb tides in such reaches act quite independently between the bends, forming channels on opposite sides of the river and leaving a central intervening shoal. The surveys of the two reaches of the Hugli, represented in figs. 23 and 24, having been taken in the dry season, exhibit the flood-tide channels at their deepest phase, and the ebb-tide channels in their worst and least continuous condition.

In tidal rivers the main ebb-tide current, being reinforced by

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Figs. 21 and 22. — Training Tidal River at Estuary: River Weser.

the fresh-water discharge, generally forms the navigable channel, which is scoured out during floods. Narrowing the river between the bends to bring the two channels together would unduly restrict the tidal flow; and in a river like the Hugli dependent on the tidal influx for the maintenance of its depth for two-thirds of the year, and with channels changing with the wet and dry seasons, so that deepening by dredging in the turbid river could not be permanent, training works below low water to bring the ebb-tide current into the flood-tide channel, which latter must not be obstructed at all, offer, aided by dredging, the best prospects of improve- ment.

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Fig. 23. — Moyapur Reach, River Hugli, Jan. 1896.

Fig. 24. — James and Mary Reach, River Hugli, April 1890.

The average rate of enlargement adopted for the trained channel ot the Nervion, in proportion to its length, is 1 in 75 between Bilbao and its mouth, and 1 in 71 for the Weser from Bremen to Bremer- haven; and these ratios correspond very nearly to the enlargement of the regulated channel of the Clyde from Glasgow to Dumbarton of 1 in 83, and of the Tyne from Newcastle to its mouth of 1 in 75. Accordingly, a rate of enlargement comprised between 1 in 70 and I in 80 for the regulated or trained channel of the lower portion of a tidal river with a fairly level bed may be expected to give satis- factory results.

Works at the Outlet of Tidal Rivers. — Tidal rivers flowing straight into the sea, without expanding into an estuary, are subject to the obstruction of a bar formed by the heaping-up action of the v, aves and drift along the coast, especially when the fresh-water discharge is small; and the scour of the currents is generally concentrated and extended across the beach by parallel jetties for lowering the bar, as at the outlets of the Maas (figs. 1 1 and 12) and of the Nervion (figs. 19 and 20). In the latter case, however, the trained outlet was still liable to be obstructed by drift during north-westerly storms in the Bay of Biscay ; and, except in the case of large rivers, the jetties have to be placed too close together, if the scour is to be adequate, to form an easily accessible entrance on an exposed coast. Accordingly, a harbour has been formed in the small bay into which_ the Nervion flows by two converging breakwaters, which provides a sheltered approach to the river and protects the outlet from drift (fig. 19), and a similar provision has been made at Sunderland for the mouth of the Wear; whilst the Tynemouth piers formed part of the original design for the improvement of the Tyne, under shelter of which the bar has been removed by dredging (fig- 17);

Training Works through Sandy Estuaries. — Many tidal rivers flow through bays, estuaries or arms of the sea before reaching the open sea, as, for instance, the Mersey through Liverpool Bay, the Tees through its enclosed bay, the Liffey through Dublin Bay, the Thames, the Ribble, the Dee, the Shannon, the Seine, the Scheldt, the Weser and the Elbe through their re- spective estuaries, the Yorkshire Ouse and Trent through the Humber estuary, the Garonne and Dordogne through the Gironde estuary, and the Clyde, the Tay, the Severn and the St Lawrence through friths or arms of the sea. These estuaries vary greatly in their tidal range, the distance inland of the ports to which they give access, and the facilities they offer for navigation. Some possess a very ample depth in their outer portion, though they generally become shallow towards their upper end ; but dredging often suffices to remedy their deficiencies and to extend their deep-water channel. Thus the St Lawrence, which possesses an ample depth from the Atlantic up to Quebec, has been rendered accessible for sea-going vessels up to Montreal by a moderate amount of dredging; whilst dredging has been resorted to in parts of the Thames and Humber estuaries, and on the Elbe a little below Hamburg, to pro-vide for the increasing draught of vessels; and the Mersey bar in Liverpool Bay, about n m. seawards of the actual mouth of the river, has been lowered by suction dredging from a depth of about 9 ft. down to about 27 ft. below low water of equinoctial spring tides, to admit Atlantic liners at any state of the tide.

Some estuaries, however, are so encumbered by sand banks that their rivers can only form shallow, shifting channels through them to the sea; and these channels require to be guided or fixed by longitudinal training walls, consisting of mounds of rubble stone, chalk, slag or fascines, in order to form sufficiently deep stable channels to be available for navigation. The difficulty in such works is to fix the wandering channel adequately, and to deepen it

sufficiently by the scour produced between the training walls, without placing these walls so close together and raising them so high as to-check the tidal influx and produce accretion behind them, thereby materially reducing the volume of tidal water entering and flowing out of the estuary at each tide. The high training works in the Dee estuary, carried out in the 18th century with the object of land reclamation, unduly narrowed the channel, and led it towards one side of the estuary; and though they effectually fixed the navigation channel, they produced very little increase in its depth, but caused a very large amount of sand to accumulate in the estuary beyond, owing to the great reduction in tidal volume by the reclamations, and diminished considerably the channel through the lower estuary in width and depth without checking its wanderings. 1 The training of the channel of the Ribble through its estuary below Preston, for improving its depth and rendering it stable, was begun in 1839, and has been gradually extended at intervals; but the works have not yet been carried out to deep water, and a. shifting, shallow channel still exists through the sand banks, between the end of the training walls and the open sea. The high training walls adopted along the upper part of the channel enabled the upper end of the estuary on both sides to be

tide (figs. 25 and 26). The channel, however, was made too narrow between Aizier and Berville and was subsequently enlarged, and large tracts of land were reclaimed in the upper estuary. The reduction in tidal capacity by thq .reclamations, together with the fixing and undue restriction in width of the channel, occasioned very large accretions at the back of the lower portions of the training walls and at the sides of the estuary beyond them, and an extension of the sand banks seawards. Moreover, the channel has always remained shallow and unstable beyond the ends of the training walls down to deep water near the mouth of the estuary. 2 . ‘ Conclusions about Training , Works in Estuaries.— Experience has proved that training works

through sandy estuaries, by stopping the wanderings of the navigable channel, produce an increase in its depth, and, consequently, in the tidal scour for main- taining it. This scour, however, being concentrated in the trained channel, is withdrawn from the sides of the estuary, which in its natural condition is stirred up periodically by the wandering channel ; and, therefore, accretion takes place in the parts of the estuaryˆ from which the tidal scour and fresh-water discharge have been permanently diverted, especially where an abundance of sand from outside, put in suspension by the action of the prevalent

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Figs. 25 and 26. — Training Works in Sandy Estuary : River Seine.

reclaimed for a length of 4 m,; whilst the half tide training walls below, placed unduly close together, have led to considerable accretion at the sides of the estuary and some extension of the sand banks seawards. Moreover, by fixing the channel near the northern shore they have enabled the landowners to carry out large reclamations on the southern foreshore. These works, however, besides fixing the navigable channel, have increased; its depth, especially in the upper part, and augmented the tidal scour, along it by lowering the low water line; and the trained channel is further deepened by dredging. The training works in the Weser estuary have been confined to constructing a single low training wall at the upper end, which forms a trumpet-shaped outlet for the river below Bremerhaven, and to guiding the navigable channel by occasional low dikes at the side and closing minor channels, so as to concentrate the tidal scpur and fresh-water discharge in it, whilst additional depth is obtained by dredging (fig. 21). A remarkable improve- ment has oeen effected in the navigable condition of the upper portion of the Seine estuary by training works, begun in 1848; for in place of a shallow, intricate channel through shifting sand banks, whose dangers were at

times intensified by a bore, a stable, deep channel has been provided down to about half-way between Berville and St Sauveur, rendering access easy to the river above at high

iL. F. Vernon-Harcourt, Rivers and Canals, 2nd ed. pp. 289- 2qv and plate 9, fifrs 13 and 14.

winds blowing into the estuary, is brought in by the flood-tide, a9 in the cases of the estuaries of the Dee, the Ribble and the Seine. This accretion; reduces the tidal capacity of the estuary, and, pro ducing a diminution in the tidal volume passing through the outlet, promotes the extension of the sand banks seawards, as indicated by the differettce in the outer portions of the longitudinal section! of different dates of the Weser and Seine estuaries (figs. 22 and 26) To prevent as far as possible the reduction in tidal capacity, the training walls should not be raised more above low-water level than absolutely necessary to fix the channel; and the rate of enlarge- ment of their width apart should not be less than 1 in 80 at the upper end, and should increase considerably towards the mouth of the estuary so as to form a trumpet-shaped outlet. The loss of scour in the channel resulting from this enlargement must be com- pensated for' by dredging to attain the requisite depth. Training works partially carried out through an estuary have the advantage of reducing the length of shallow channel to be traversed between deep water and the entrance to the deepened river; but as these works produce ho influence on the channel for any distance beyond their termination, a shaUow, shifting channel is always found be- tween the end of the trained channel and deep water. Accordingly, when training works are started at the head of a sandy estuary, provision should always be made in their design for their eventu al

1 Id. pp. 293-300, and plate 9, figs. 11 arid 12.

prolongation to deep water at the mouth of the estuary, to ensure the formation of a stable, continuous, navigable channel. Experi- ments with a model, moulded to the configuration of the estuary under consideration and reproducing in miniature the tidal ebb and flow and fresh-water discharge over a bed of very fine sand, in which various lines of training walls can be successively inserted, 1 are capable in some cases of furnishing valuable indications of the respective effects and comparative merits of the different schemes proposed for works

which have often evoked very conflicting opinions and have sometimes produced most unexpected results.

(L. F. V.-H.)

RIVER-HOG, a sportsman's name for the African wild pigs of which the southern representative is known to the Boers as the bosch-vark ("bush-pig"). They constitute a genus, Potamochoerus, nearly allied to the typical pigs of the genus Sus (see Swine), from which they are distinguishable by the presence in the males of a long horny ridge below the eye; while they are further characterized by their thick coat of bristly and often brightly coloured hair, and by tufts of long bristles at the tips of the elongated and pointed ears. The southern P. choeropolamus, of southern and east Africa, is typically a greyish-brown animal, but one of its eastern representatives is orange-red. In north-east Africa occurs the allied P. johnstoni, while in Kordofan and Abyssinia this is in turn replaced by P. hassama. The most remarkable member of the group is, however, the red river-hog, P. porcus, which is a heavy, short-legged species remarkable for its bright red colour, the great length of the ear-tufts and the white rings round the eyes. It is a native of the great forest-tracts, ex- tending from Senegambia, Liberia and Angola on the W., to Monbuttu in the E. Very noteworthy is the occurrence of a small yellow-haired representative of the group (P. larvatus) in Madagascar, which evidently must have reached its present habitat from the mainland. (R. L.*)

RIVERINA, a large tract of pastoral country between the rivers Murray and Darling in New South Wales, Australia. It gives name to the see of an Anglican bishop who has his seat at Hay. The chief towns are Deniliquin, Hay, Moulamein, Oxley and Booligal.

RIVERS, EARL, an English title held in succession by the families of Woodville or Wydeville, Darcy and Savage. In 1299 John Rivers, or de Ripariis, was summoned to parliament as a baron, and his son John was similarly summoned by Edward II. The earldom was created for Sir Richard Wood- ville in 1466 and remained in this family until 1491. (For the three earls of his line see below.) As borne by the Wood- villes the title was not derived from the name of a place, but from an ancient family name, Redvers, or Reviers, members of this family, whose arms are quartered on the Rivers shield, having been sometime earls of Devon.

From 1626 to his death in 1640 the earldom was held by Thomas Darcy, Viscount Colchester, from whom it descended by special remainder to his grandson John (c. 16 10-1654), the son of his

daughter Elizabeth (d. 1651) by her marriage with Sir Thomas Savage (d. 1635), who was created Viscount Savage in 1626. John's son Thomas (c. 1626-1694) was the 3rd earl, and his grandson Richard the 4th earl (see below). The title became extinct when John, the 5th earl, died about 1735.

A new barony of Rivers, held by the family of Pitt and its later representative, that of Pitt-Rivers, was in existence from 1776 to 1880.

RIVERS, ANTHONY WOODVILLE, or Wydeville, 2nd Earl (c. 1442-1483), statesman and patron of literature, and author of the first book printed on English soil, was born probably in 1442. He was the son of Richard de Wydeville and his wife, Jacquetta de Luxemburg, duchess of Bedford. His father was raised to the peerage in his son's infancy, and was made earl of Rivers in 1466. Anthony, who was knighted before he became of age, and fought at Towton in 1461, married the daughter of Lord Scales, and became a peer jure uxoris in 1462, two years after the death of that nobleman. Being lord of the Isle of Wight at the time, he was in 1467 appointed one of the ambassadors to treat with the duke of 1 Rivers and Canals, 2nd ed. pp. 327-342, and plate 10. xxiii. 13

Burgundy, and he exalted his office by challenging Anthony, comte de la Roche, the bastard of Burgundy, to single fight in what was one of the most famous tournaments of the age (see the elaborate narrative in Bentley's Excerpta Historica, 176- 182). In 1469 Anthony was promoted to be lieutenant of Calais and captain of the king's armada, while holding other honorary posts. His father and brother were beheaded after the battle of Edgecot, and he succeeded in August of that year to the earldom. He accompanied Edward in his temporary flight to the Continent, and on his return to England had a share in the victory of Barnet and Tewkesbury and defended London from the Lancastrians. In 1473 he became guardian and governor to the young prince of Wales, and for the next few years there was no man in England of greater responsibility or enjoying more considerable honours in the royal service. It is now that for the first time we become aware of Lord Rivers's literary occupations. His mother, the duchess, died in 1472, and his first wife in 1473; in 1475 and the following year he went on pilgrimage to the holy places of Italy; from this time forth there was a strong tincture of serious reflection thrown over his character; he was now, as we learn from Caxton, nominated " Defender and Director of the Siege Apostolic for the Pope in England." Caxton had in 1476 rented a shop in the Sanctuary at Westminster, and here had set up a printing- press. The first MS. which he undertook in London was one sent to him by " the noble and puissant

lord, Lord Antone, Erie of Ryvyers," consisting of a translation " into right good and fayr Englyssh " of Jean de Teonville's French version of a Latin work, " a glorious fair mirror to all good Christian people." In 1477 Caxton brought out this book, as Dictes and Sayengis of the Philosophers, and it is illustrious as the first production of an English printing-press. To this succeeded the Moral Proverbs of Christine de Pisan, in verse, in 1478, and a Cordial, in prose, in 1479. The original productions of Lord, Rivers, and, in particular, his Balades against the Seven Deadly Sins, are lost. In 1478 a marriage was arranged between him and Margaret, sister of King James III. of Scotland, but it was mysteriously broken off. Rivers began to perceive that it was possible to rise too high for the safety of a subject, and he is now described to us as one who " conceiveth well the mutability and the unstableness of this life." After the death of Edward IV., he became the object of Richard III.'s peculiar enmity, and was beheaded by his orders at Pontefract on the 25th of June 1483. He was succeeded by his brother Richard, the 3rd and last earl of the Wydeville family, who died in 1491. Lord Rivers is spoken of by Commines as " un tres- gentil chevalier," and by Sir Thomas More as " a right honour- able man, as valiant of hand as politic in counsel." His protection and encouragement of Caxton were of inestimable value to English literature, and in the preface to the Dictes the printer gives an account of his own relations with the statesman which illustrates the dignity and modesty of Lord Rivers in a very agreeable way. Rivers was one of the purest writers of English prose of his time.

" Memoirs of Anthony, Earl Rivers " are comprised in the His- torical Illustrations of the Reign of Edward the Fourth (ed. W. H. Bflack]). (E. G.)

RIVERS, RICHARD SAVAGE, 4TH Earl (c. 1660-1712), was the second son of Thomas, 3rd earl; and after the death about 1680 of his elder brother Thomas, styled Viscount Colchester, he was designated by that title until he succeeded to the peerage. Early in life Richard Savage acquired notoriety by his dare-devilry and dissipation, and he was, too, one of the most conspicuous rakes in the society of the period. After becoming Lord Colchester on his brother's death he entered parliament as member for Wigan in 1681 and procured a commission in the Horseguards under Sarsfield in 1686. He was " the first nobleman and one of the first persons " who joined the prince of Orange on his landing in England, and he accompanied William to London. Obtaining promo- tion in the army, he served with distinction in Ireland and in the Netherlands, and was made major-general in 1693 and

lieutenant-general in 1702. In 1694 he succeeded his father as 4th Earl Rivers. He served abroad in 1702 under Marl- borough, who formed a high opinion of his military capacity and who recommended him for the command of a force for an invasion of France in 1706. The expedition was eventually diverted to Portugal, and Rivers, finding himself superseded before anything was accomplished, returned to England, where Marlborough procured for him a command in the cavalry. The favour shown him by Marlborough did not deter Rivers from paying court to the Tories when it became evident that the Whig ascendancy was waning, and his appointment as constable of the Tower in 17 10 on the recommendation of Harley and without Marlborough's knowledge was the first unmistakable intimation to the Whigs of their impending fall. Rivers now met with marked favour at court, being entrusted with a delicate mission to the elector of Hanover in 17 10, which was followed by his appointment in 1711 as master-general of the ordnance, a post hitherto held by Marlborough himself. Swift, who was intimate with him, speaks of him as " an arrant knave"; but the dean may have been disappointed at being unmentioned in Rivers's will, for he made a fierce comment on the earl's bequests to his mistresses and his neglect of his friends. In June 1 7 1 2 Rivers was promoted to the rank of general, and became commander-in-chief in England; he died- a few weeks later, on the 18th of August 1712. He married in 1679 Penelope, daughter of Roger Downes, by whom he had a daughter Elizabeth, who married the 4th earl of Barrymore. He also left several illegitimate children, two of whom were by Anne, countess of Macclesfield. Rivers's intrigue with Lady Macclesfield was the cause of that lady's divorce from her husband in 1701. Richard Savage, the poet, claimed identity with Lady Macclesfield's son by Lord Rivers, but though his story was accepted by Dr Johnson and was very generally believed, the evidence in its support is faulty in several respects. As Rivers left no legitimate son the earldom passed on his death to his cousin, John Savage, grandson of the 2nd earl, and a priest in the Roman Catholic Church, on whose death, about 1735, all the family titles became extinct.

See William Coxe, Memoirs of Marlborough (3 vols., London, i8i8); Letters and Despatches of Marlborough, 1702-1712, vol. v., edited by Sir G. Murray (5 vols., London, 1845); Gilbert Burnet, History of his own Time (6 vols., Oxford, 1833) ; F. W. Wyon, History of Great Britain during the Reign of Queen Anne (2 vols., London, 1876); G. E. C, Complete Peerage, vol. vi. (London, 1895).

RIVERS, RICHARD WOODVILLE, or Wydeville, Earl (d. 1469), was a member of a family of small importance long settled at Grafton in Northamptonshire. His father, Richard Woodville, was a squire to Henry V., and afterwards the trusted servant of John of Bedford, in whose interest he was constable of the Tower during the troubles with Humphrey of Gloucester in 1425. The younger Richard Woodville was knighted by Henry VI. at Leicester in 1426. He served under Bedford in France, and after his master's death married his widow Jacquetta of Luxemburg. The mesalliance caused some scandal, but Woodville enjoyed the king's favour and continued to serve with honour in subordinate positions in France. He also distinguished himself at jousts in London (Chronicles of London, 146, 148). On the 9th of May 1448 Henry VI. created him Baron Rivers. His associations made him a strong Lancastrian. For some years he was lieutenant of Calais in Henry's interests. In 1459, when stationed at Sandwich to prevent a Yorkist landing, he was surprised by Sir John Dinham, and taken prisoner with his son Anthony to the earl of Warwick at Calais. He was, however, released in time to fight for Henry VI. at Towton. Early in the reign of Edward IV. Rivers recognized that the Lancastrian cause was lost and made his peace with the new king. The marriage of his eldest daughter, Elizabeth,, widow of Sir John Grey of Groby, to Edward on the 1st of May 1464, secured the fortunes of his family. Rivers was appointed treasurer on the 4th of March 1466, and a little later created earl. Elizabeth found great alliances for her younger brothers and sisters, and the Wood –

ville influence became all-powerful at court. The power of this new family was very distasteful to the old baronial party, and especially so to Warwick. Early in 1468 Rivers's estates were plundered by Warwick's partisans, and the open war of the following year was aimed to destroy the Woodvilles. After the king's defeat at Edgecot, Rivers and his second son, John, were taken prisoners at Chepstow and executed at Kenilworth on the 1 2 th of August 1469. Rivers had a large family. His third son, Lionel (d. 1484), was bishop of Salisbury. All his daughters made great marriages: Catherine, the sixth, was wife of Henry Stafford, 2nd duke of Buckingham (q.v.).

Bibliography. — The chief contemporary authorities are the Paston Letters, ed. Dr James Gairdner, The Chronicles of London, ed. C. L. Kingsford (1905), and the Chronicles of Commines and Waurin. See also some notices in Calendars of State Papers, Venetian, ed. Rawdon Browne. For modern accounts see Sir James Ramsay's Lancaster and York (1892), The Political History of England, vol. iv., by Professor C. Oman, and The Complete Peerage. by G. E. Qokayne]. For Earl Anthony's connexion with Caxton consult William Blades's Life of

Caxton (1861-63). (C- L. K.)

RIVERSIDE, a city of southern California, U.S.A., and the county-seat of Riverside county, situated on the Santa Ana river, in the San Bernardino valley. Pop. (1890) 4683; (1900) 7973 (!5 2 5 foreign-born); (1910) 15,212. It is served by the Atchison, Topeka & Santa Fe, the Southern Pacific and the San Pedro, Los Angeles & Salt Lake railways. The city occupies a slope (about 800-1000 ft. above sea-level), rising toward the east is beautifully built and is a winter and health resort. In the Albert S. White Park there is a notable collection of cacti; and Huntington Park is high and rocky, is well planted with trees and has a finely shaded automobile drive. Magnolia Avenue, bordered with pepper-trees, is 10 m. long and 130 ft. wide; and Victoria Avenue is similarly parked and lined with semi-tropical trees. Riverside is the seat of an important (non-reservation) boarding-school for Indians, Sherman Institute (1903), which in 1908 had 699 students. Riverside is devoted to the cultivation of oranges, lemons and other subtropical fruits, and has a large trade in these products. It is in the centre of the finest orange district of the state; near Huntington Park is the state citrus experiment station (1906), with an experimental orchard of 20 acres. The cultivation of navel oranges was first introduced from Brazil into the United States at Riverside in 1873; the two original trees, protected by an iron railing, were still standing in 1909. The domestic water supply is obtained from artesian wells. In 1870 the site of the present city, then called Jurupa Rancho, the name of the old Spanish grant, was purchased by the Southern California Colony Association. The settlement was chartered in 1883 as a city, with limits including about 56 sq. m. Riverside county was not organized until ten years later. From 1895 there were no saloons in the city.

RIVES, WILLIAM CABELL (1793-1868), American political leader and diplomat, was born in Nelson county, Virginia, on the 4th of May 1 793. He attended Hampden-Sidney and William and Mary colleges, was admitted to the bar, and practised in Nelson county (till 182 1) and afterwards in Albemarle county. In politics a Democrat, he served in the state constitutional con- vention in 1816, in the Virginia House of Delegates in 181 7-19 and in 1822. and in the Federal House of Representatives in 1823-29. From 1829 to 1832 he was minister to France; in 1833 he entered the United States Senate, but in the following year resigned. From 1836 to 1845 he again served in the Senate, and in 1849-53 ne was again minister to France. In February 1861 he was a delegate to the Peace Conference in Washington; he opposed secession, but was loyal to his state when it seceded, and was one of its representatives in the Confederate Congress during the Civil

War. He died at the country estate of Castle Hill, Albemarle county, Virginia, on the 25th of April 1868. Rives was the author of several books, the most important being his Life and Times of James Madison (3 vols., Boston, 1859-68), the completion of which was prevented by his death. He was the father of Alfred Landon Rives (1830-1903), an engineer of some prominence, whose daughter, Amelie Rives (1863-), became well known as a novelist, her best known book being The

Quick or the Dead? (1888); she married John A. Chanler in 1888, and after their divorce married in 1896 Prince Pierre Troubetzkoy of Russia.

RIVET (O. Fr. rivet, from river, to fix, fasten together, of unknown origin; Skeat compares Icel. rifa, to stitch together), a metal pin or bolt used to fasten metal plates together. A rivet, made of wrought iron, copper or other malleable substance, is usually made with a head at one end, the other end being hammered out after passing through the plates so as to keep them closely fastened together. A ” bolt ” differs from a rivet in that one or both ends have screw-threads to hold a nut (see Shipbuilding).

RIVIERA, the narrow belt of coast which lies between the mountains and the sea all round the Gulf of Genoa in the north of Italy, extending from Nice on the W. to Spezia on the E. It is usually spoken of as Riviera di Ponente (” the coast of the setting sun “), the portion between Nice and the city of Genoa; and as Riviera di Levante (” the coast of the rising sun “), the portion from Genoa to Spezia. All this district, being open to the S. and sheltered from the N. and E. winds, enjoys a remarkably mild climate (winter mean, about 49° Fahr.); so much so that the vegetation in many places par- takes of a subtropical character (e.g. the pomegranate, agave, prickly pear, date, palm and banana). Large numbers of flowers, especially roses, violets, hyacinths, &c, are grown near Nice, Mentone, Bordighera and other towns, and sent to the London and Paris markets. Bordighera is particularly noted for its noble groves of date-palms, one of the few places in Europe where these trees grow. The uncommon mildness of the climate, conjoined with the natural beauty of the coast scenery, — the steep sea-crags, the ruined towers and the range of the Maritime Alps, — attracts thousands of invalids and convalescents to spend the winter in the chain of towns and villages which stretch from the one end of the Riviera to the other, while these resorts are frequented for sea-bathing

in summer by the Italians. Proceeding from W. to E. the following are the places to which visitors principally resort: Nice, Monaco (an independent principality), Monte Carlo, Mentone (the last town on the French Riviera), Ventimiglia, Bordighera, Ospedaletti, San Remo, Porto Maurizio, Oneglia, Diano Marina, Alassio, Arenzano, Pegli (in the Riviera di Ponente),, and Nervi, Santa Margherita, Rapallo, Chiavari, Sestri Levante, Levanto, Spezia, and San Terenzo (Lerici) in the Riviera di Levante. The Riviera labours, however, under the grave drawback of being liable to earthquakes. In the 19th century there were four such visitations, in 18 18, 1831, 1854 and 1887, which especially affected the western Riviera. A railway runs close along the shore all through the Riviera, the distance from Nice to Genoa being 116 m., and the distance from Genoa to Spezia 56 m. In the latter stretch the line burrows through the many projecting headlands by means of more than eighty tunnels. The pearl of the eastern Riviera is the stretch (6 to 7 m.) between Rapallo and Chiavari. Lord Byron and Shelley both lived and wrote on the shores of the Gulf of Spezia, and Dickens wrote The Chimes at Genoa.

RIVIERE, BRITON (1840-), English artist, was born in London on the 14th of August 1840. His father, William Riviere, was for some years drawing-master at Cheltenham College, and afterwards an art teacher at Oxford. He was educated at Cheltenham College and at Oxford, where he took his degree in 1867. For his art training he was indebted almost entirely to his father, and early in life made for him- self a place of importance among the artists of his time. His first pictures appeared at the British Institution, and in 1857 he exhibited three works at the Royal Academy, but it was not until 1863 that he became a regular contributor to the Academy exhibitions. In that year he was represented by “The Eve of the Spanish Armada,” and in 1864 by a “Romeo and Juliet.” Subjects of this kind did not, however, attract him long, for in 1865 he began, with a picture of a ” Sleeping Deerhound,” that series of paintings of animal-subjects which has since occupied him almost exclusively. Among the most

memorable of his productions are: “The Poacher’s Nurse* (1866), “Circe” (1871), “Daniel” (1872), “The Last of the Garrison ” (1875), ” Lazarus ” (1877), ” Persepolis ” (1878), “In Manus Tuas, Domine ” (1879), “The Magician’s Doorway” (18S2), ” Vae Victis ” (1885), ” Rizpah ” (1886), ” An Old-Work, Wanderer ” (1887), ” Of a Fool and his Folly there is no End ” (1889), ” A Mighty Hunter before the Lord ” (1891), ” The King’s Libation ” (1893), ” Beyond Man’s Foot- steps ” (1894), now in the National Gallery of British Art; “Phoebus Apollo” (1895); “Aggravation” (1896), “St George” (1900), and “To the Hills” (1901). He has also painted portraits; and at the outset of his career

made some mark as an illustrator, beginning with Punch. He was elected an Associate of the Royal Academy in 1878, and R.A. in 1881, and received the degree of D.C.L. at Oxford in 1891.

See Sir Walter Armstrong, ” Briton Riviere, R.A. ; His Life and Work,” Art Annual (1891).

RIVINGTON, CHARLES (1688-1742), British publisher, was born at Chesterfield, Derbyshire, in 1688. Coming to London as apprentice to a bookseller, he took over in 1711 the publish- ing business of Richard Chiswell (1639-1711), and, at the sign of the Bible and the Crown in Paternoster Row, he carried on a business almost entirely connected with theological and educational literature. He also published one of Whitefield’s earliest works, and brought out an edition of the Imitation of Christ. In 1736 Rivington founded the company of book- sellers who called themselves the ” New Conger,” in rivalry with the older association, the ” Conger,” dating from about 1700. In 1 74 1 he published the first volume of Richardson’s Pamela. Charles Rivington died on the 22nd of February 1742, and was succeeded by his two sons, John (1720-1792) and James (1724-1802). James emigrated to America, and pursued his trade in New York (see Newspapers, U.S. A .) ; John carried on the business on the lines marked out by his father, and was the great Church of England publisher of the day. In 1760 he was appointed publisher to the Society for Pro- moting; Christian Knowledge, and the firm retained the agency for over seventy years. Having admitted his sons Francis (1745-1822) and Charles (1754-1831) into partnership he undertook for the ” New Conger ” Association the issue of a standard edition of the works of Shakespeare, Milton, Locke and other British classics; also Cruden’s Concordance. John Rivington died on the 16th of January 1792. In 1810 John (1779-1841), the eldest son of Francis, was admitted a partner. In 1827 George (1801-1858) and Francis (1805-1885), sons of Charles Rivington, joined the firm. Rivington contracted further ties with the High Church party by the publication (1833, &c.) of Tracts for the Times. John Rivington died on the 21st of November 1841, his son, John Rivington (1812- 1886) having been admitted a partner in 1836. George Riving- ton died in 1858; and in 1859 Francis Rivington retired, leaving the conduct of affairs in the hands of John Rivington and his own sons, Francis Hansard (b. 1834) and Septimus (b. 1846). In 1890 the business was sold to Messrs Longmans (q.v.). A business of the same character was, however, carried on from 1889 to 1893 by Mr Septimus Rivington and Mr John Guthrie Percival, as Percival & Co. This was changed in 1893 to Rivington, Percival & Co.; and in 1897 the firm revived its earlier title of Rivington & Co., maintaining its reputation for educational works and its connexion with the

Moderate and High Church party.

See The House of Rivington, by Septimus Rivington (1894); also the Publishers' Circular (15th January 1885, 2nd June 1890).

RIVOLI VERONESE, a village of Venetia, Italy, in the province of Verona, on a hill on the right bank of the Adige, 13 m. N.W. of Verona, 617 ft. above sea-level. Pop. (1901) 1340. It is celebrated as the scene of the battle in which, on the 15th of January 1797, Napoleon inflicted a decisive defeat upon the Austrians commanded by Josef Alvintzi, Baron von Barberek (1735-1810) (see French Revolutionary Wars) . A famous street in Paris (Rue de Rivoli) commemorates

the victory, and under the empire Marshal Massena received the title of duke of Rivoli. The strong positions around Rivoli, which command the approaches from Tirol and the upper Adige into the Italian plain, have always been celebrated in military history as a formidable obstacle, and Charles V. and Prince Eugene of Savoy preferred to turn tham by difficult mountain paths instead of attacking them directly. Minor engagements, such as rearguard actions and holding attacks, have consequently often taken place about them, notably in the campaign of 1796-97. An engagement of this character was fought here in 1848 between the Austrian and the Pied- montese troops.

RIXDORF, a town of Germany, lying immediately south of Berlin, of which it practically forms a suburb, though retaining its own civic administration. Pop. (1880) 18,729; (1895) 59,495; (1905) 153,650. It is connected with the metropolis by a railway (Ring-bahn) and by an electric tramway. It contains no public buildings of any interest, and is almost entirely occupied by a large industrial and artisan population, engaged in the manufacture of linoleum, furniture, cloth, pianos, beer, soap, &c.

Rixdorf is chiefly interesting as a foundation of Moravian Brethren from Bohemia, who settled here in 1737 under the protection of King Frederick William I. German Rixdorf, which is now united with Bohemian Rixdorf, was a much more ancient place, and appears as Richardsdorf in 1630 and as Riegenstorp in 1435. Before 1435 it belonged to the order of the Knights of St John.

RIZZIO, or Riccio, DAVID (c. 1 533-1 566), secretary of Mary (q.v.),

queen of Scots, was a native of Turin, and came to Scotland in 1561 in the train of the Piedmontese ambassador. The queen wanted a bass singer, and he entered her service as a musician, becoming also her valet de chambre, and in 1564 private foreign secretary. After her marriage to Darnley in 1565 his influence with Mary became paramount, and he gave himself great airs and affected considerable state, practically superseding Maitland of Lethington as secretary of state. His elevation aroused the active hostility of Dtf.rnley and the other nobles, and he was suspected of being the queen's lover. On the evening of the 9th of March 1566, the earls of Morton and Lindsay, with armed followers, entered Mary's supper chamber at Holyrood, seized Rizzio, hacked him to death with daggers, and threw his body into the courtyard.

See Ruthven's Narrative of Riccio' 's Murder (1836) ;and the articles on Mary, Queen of Scots, and allied biographies.

ROACH (Leuciscus rutilus), a small fish belonging to the Cyprinid family, the genus Leuciscus having many represen- tatives in Europe, in which the rudd, the chub and the dace are included. It may attain a length of over 12 in., but a roach of 2 lb is an unusually large one. It is good sport for anglers, but is not esteemed for the table. The general colour is silvery, with reddish fins. It does not occur in Ireland. In America, the " golden shiner " minnow (Abramis chrysoleucus) is sometimes called a roach.

See Greville Fennell's Book of the Roach, 1870.

ROADS AND STREETS. These words embrace the two divisions into which the lines of communication made by man for vehicular and pedestrian traffic between different places may be roughly classified. In current usage " road " is applied as a general term for all broad made ways from place to place, whether with separate side-paths for foot-passengers or not, while " street " is confined to the roads through towns, villages and other inhabited places, more or less lined by houses and other buildings on either side. The present article is confined to the methods adopted in making roads, from the first great road- makers, the Romans, down to modern times. The roadways of times anterior to the Romans, at least in Europe, were merely the tracks worn by the feet of pedestrians and animals, and the wheels of vehicular traffic.

Etymologically considered, " road " in its current usage is late

in its appearance. The first quotation in the New English Dictionary is

from Shakespeare (1 Henry IV. 2, i. 16). The true O.E. word was weg, way, common to Teut. languages, and probably allied to Lat. via. The O.E. rod meant the act of riding, and is formed from ridan, to ride, and is thus used of a journey on horseback, and in compounds of a track or course, cf . swanrad, the swan's track, a poetic word for the sea- or stream- rod, course of a stream, hweolrad, wheel-track, &c A special use of the word, occurring as early as the Anglo-Saxon Chron. c. 900, was for a hostile foray, an " inroad," a " raid," which is the N. Eng. doublet of " road," and has superseded it in general use. Another use, which still survives, and shows the origin, is that of a space of water where ships may " ride at anchor in security from stress of weather, a roadstead." " Street " (O.E. straet) represents the Lat. strata via, paved way (from slernere, to strew, pave). It is one of the few words adopted in O.E. from the Romans.

The earliest roads about which anything definite is known, so far as construction is concerned, are those of ancient Rome, one of the oldest of which and the most celebrated for the grandeur of its works — the Appian Way — was roa™*" commenced in 312 B.C. Roman roads are remarkable for preserving a straight course from point to point regardless of obstacles which might have been easily avoided. They appear to have been often laid out in a line with some prominent land- mark, and their general straightness is perhaps due to con- venience in setting them out. In solidity of construction they have never been excelled, and many of them still remain, often forming the foundation of a more modern road, and in some instances constituting the road surface now used. It is con- sequently possible, with the help of allusions of ancient writers, to follow the ideal mode of construction, though this was not always adopted. Two parallel trenches were first cut to mark the breadth of the road; loose earth was removed until a solid foundation was reached; and it was replaced by proper material consolidated by ramming, or other means were taken to form a solid foundation for the body of the road. This appears often to have been composed of four layers, generally of local materials, though sometimes they were brought from considerable distances. The lowest layer consisted of two or three courses of flat stones, or, when these were not obtainable, of other stones, generally laid in mortar; the second layer was composed of rubble masonry of smaller stones, or a coarse concrete; the third of a finer concrete, on which was laid a pavement of polygonal blocks of hard stone jointed with the greatest nicety. The four layers are found to be often 3 ft. or more in thickness, but the lower ones were dispensed with on rock, on which the paving stones were sometimes laid almost directly. The paved part of a great road appears to have been about 14 ft. wide, and

on either side, and separated from it by raised stone edgings, were unpaved side- ways, each of half the width of the paved road. Where, as on many roads, the surface was not paved, it was made of hard concrete, or pebbles or flints set in mortar. Sometimes clay and marl were used instead of mortar, and it would seem that where inferior materials were used the road was made higher above the ground and rounder in cross section. Streets were paved with large polygonal blocks laid as above described, and footways with rectangular slabs. Specimens are still to be seen in Rome and Pompeii, while in Britain many of the roads were of hard gravel or had a cobbled surface. There are no traces of Roman influence in the later roads in England, but in France the Roman method appears to have been followed to some extent when new roads were constructed about the beginning of the 18th century. A foundation of stones on the flat was laid, and over that two layers of considerable thickness, of larger and smaller stones, bordered by large stones on edge, which appeared on the surface of the road. In 1764 Tresaguet set the foundation-stones on edge and reduced the thickness of the upper layers, and his method was generally followed until the influence of John Loudon McAdam (1756-1836) began to be felt. A French chaussee with accote- ments still retains some resemblance to the old Roman roads.

18th century.

Gradient.

The almost incredibly bad state of the roads in England towards the latter part of the 17th century appears from the English accounts cited by Macaulay (Hist. c. iii.). It was due roads, chiefly to the state of the law, which compelled each parish.to maintain its own roads by statute labour, but the establishment of turnpike trusts and the main- tenance of roads by tolls do not appear to have effected any great improvement. At the time of Arthur Young’s six months’ tour in 1770 the roads would seem to have been almost as bad as ever, and it is doubtful if there was much improvement up to the beginning of the 19th century. The turnpike roads were generally managed by ignorant and incompetent men until Telford and Mc Adam brought scientific principles and regular system to their construction and repair. The name of Telford is associated with a pitched foundation, which he did not always use, but which closely resembled that which had been long in use in France, and the name of McAdam often characterizes roads

on which all his precepts are disregarded. Both insisted on thorough drainage and on the use of carefully prepared materials, and adopted a uniform cross section of moderate curvature instead of the exaggerated roundness given before; but, while Telford paid particular attention to a foundation for the broken stone, McAdam disregarded it, contending that the subsoil, however bad, would carry any weight if made dry by drainage and kept dry by an impervious covering. McAdam was engaged more with the repair of old roads than with the construction of new ones, and, though it is not possible to agree with all his doctrines, the improvement which he effected in road management and maintenance was great and lasting.

Construction of Roads.— A road should be as short as possible between two points to, be connected, but straightness must often be sacrificed to avoid difficulties and expense and to secure good gradients. The latter should be as easy as practicable, having regard to the country to be traversed, and it is desirable that there should be a ruling gradient than which none should be steeper. On the level macadamized road in ordinary repair the force which the horse has to put forth to draw a load may be taken as one-thirtieth of the load. But in going uphill the horse has also to lift the load, and the additional force to be put forth on this account is very nearly equal to the load drawn, divided by the rate of gradient. Thus on a gradient of 1 in 30 the force spent in lifting is one-thirtieth of the load, and in ascending a horse has to exert twice the force required to draw the load on a level. In descending, on the other hand, on such a gradient, the vehicle, when once started, would just move of itself without pressing on the horse. A horse can without difficulty exert twice his usual force for a time, and can therefore ascend gradients of 1 in 30 on a macadamized surface without sensible diminution of speed, and can trot freely down them. .These considerations have led to 1 in 30 being generally considered as the ruling gradient to be aimed at on first-class roads, though 1 in 40 has been advocated. Telford adopted 1 in 30 as the ruling gradient on the Holyhead road through North Wales, and there are only two gradients steeper, in places where they were unavoidable. All unnecessary rises and falls should be avoided, but a dead level is unfavourable for drainage, and on this account 1 in 100 to 1 in 150 is the flattest gradient that is desirable. Such slight rises and falls are probably rather favourable than otherwise to ease of draught by horses.

In transverse section, roads in the United Kingdom generally consist of a carriage-way, with spaces on each side, on one or both of which there may be a footpath, and fences and ditches. The width of the carriage-way may be from 15 ft., which allows of the easy passage of

two vehicles, to 30 or 50 ft. for roads of importance near towns. The side spaces may be from 4 or 5 to 8 or 10 ft* wide; wide sides give the sun and air access to the road, and tend to keep it dry; and also afford space for the deposit of road materials and scrapings: In cuttings or on embankments the transverse section has of course to be modified. The road surface should have just enough convexity to throw the wet off freely, and a very moder-

Cross section.

ate amount is sufficient when a good surface is maintained: On a too convex road the traffic keeps to the middle, and wears ruts which retain the water, so that the surface is not so dry as with a flatter section which allows the traffic to distribute itself over the whole width. Telford used a cross section differing slightly from an arc of a circle in being more convex in the middle than at the sides. J. Walker recommended two straight lines joined in the middle of the road by a curve, and inclined about 1 in 24 towards the sides, the objection to which is that the flat sides are liable to wear hollow. On the whole a curve of the form of a flat ellipse is the best; the rise in the curve from the sides to the centre need not exceed one-fortieth of the width, and one-sixtieth is generally enough on well-kept roads. It is generally best to obtain the requisite convexity by rounding the formation surface or seat of the road and giving a uniform thickness to the coating of stone, but often, especially in country roads where the traffic is not very heavy and keeps mainly to the centre, the formation is made level and the convexity is obtained by using more road material at the centre than the sides. When there is not a kerb there should be a ■" shouldering " of sods and earth on each side to keep the road materials in place, and to form with the finished surface the water tables or side channels in which the surface drainage is collected, to be conveyed by outlets at frequent intervals to the side ditches. The outlets are open cuts through the sides or drains beneath the footpaths. The side ditches should be deep enough thoroughly to drain the foundation of the road, and cross or mitre drains under the road communicating with the side ditches may be required in wet soil. A thorough drainage of the subsoil is of the greatest importance, and it is economical in the end to go to considerable expense to secure it. In a cutting, or where there are no side ditches, the surface water may be taken off by gratings and under drains beneath the side channels.

Macadam Roads.— The thickness to be given to a road made altogether of broken stone will depend on the traffic it is in- tended for. On a good well-drained soil a thickness of 6 in. will make an excellent road for ordinary traffic, and McAdam's •opinion that 10 in.

of well-consolidated material was sufficient to carry the heaviest traffic on any substratum if properly drained has proved to be generally correct. In a new road the loss of thickness during consolidation must be allowed for, and the materials should be laid about one-half thicker than the coating is intended to be. When the materials are not rolled, a thickness of 3 to 6 in. should be laid first, and when that has partly consolidated under the traffic other coats may be added to make up the full thickness. There is great wear and waste of the materials in consolidating if they are laid too thickly at once. Inferior material is sometimes used in the lower part of the road coating, especially when the surface is to be of granite or other hard expensive stone. Thus flints or gravel may be used for the lower 5 or 6 in. of a road to be coated with 3 or 4 in. of granite. Telford covered the broken stone of new roads with 15 in. of gravel to act as a binding material. McAdam absolutely interdicted the use of any binding material, leaving the broken stone to work in and unite by its own angles under the traffic.

If the ideas of the inventor are strictly followed, macadam, when the fine network of joints is thinly masked with hardened mud worn from the stone, comes near to a perfect surface. But stones that will pass through a ring of a given size may be twice as much in length, and unless their form is about that of a cube not exceeding ij in. on its longest side, they cannot be rammed or rolled into the regular mosaic characteristic of the true macadam. The best modern roads are of hand- broken stone dressed slightly on the surface with stone chips, while the mass of the rOad-metal is kept free from any kind of binding. Some roadmakers, however, have found the large irregularly shaped stones from the machine so difficult to con- solidate that they have had to reconsider the question of binding. The engineer of Central Park, New York, found that, with the greatest care and attention to rolling, such stones would not

consolidate properly without admixture; indeed they became more intractable the more they were abraded by rolling. G. F. Deacon of Liverpool advocated a binding composed of large chips of trap rock or else of siliceous gravel from the size of three-quarters of an inch down to that of a pin’s head, together with about one-fourth part of macadam sweepings obtained in wet weather. This will enable the roller to consolidate the road-metal in a third of the time required for broken stone alone. The harder materials here suggested differ

essentially from the sand and dirt formerly used for binding, since they fill up all the vacant spaces and cannot be washed down.

A new road is preferably finished by rolling, since in that way the materials are consolidated with less waste, and wear and tear of vehicles is saved. A 15-ton steam-roller, 7 ft. wide, giving upwards of 2 tons weight per foot can thoroughly consolidate 1000 to 2000 sq. yds. of newly laid materials per day.

A pitched foundation, as used by Telford, consists of flat stones set on edge in courses across the road with the broader edges downwards. All inequalities must be knocked off, and small stones and chips must be firmly pinned into the interstices with a hammer, so as to form a regular convex surface with every stone fixed firmly in place. A foundation of cement concrete 6 in. thick was used by Sir J. Macneill on the Highgate Archway (London) road on a bad clay bottom, and common lime concrete was subsequently used elsewhere. A bed of lias lime concrete 1 2 in. thick was laid as a foundation in Southwark Street and on the Thames Embankment, but it is too expensive for a macadamized road under ordinary cir- cumstances. Foundations of large and rough hard-core should be rolled down to a surface close enough to keep the finer pieces of road-metal from dropping down, so as to create hollows which, though they may escape the roller, will be detected by the laden wheel and by the pounding of the heavy hoof. But there is no foundation equal to sand, which has the pro- perty of spreading pressure over an enlarged area. A 12-in. bed of sand rolled down to 8 in. has been recommended, but military engineers have found that a layer of so little as 3 or 4 in. is sufficient as a foundation for macadam in very bad ground that has been rolled, or on an embankment that has had time to settle.

Tar Macadam. — Broken stone mixed with some bituminous composition has been found very suitable for suburban roads, and for towns where the nature of the traffic requires smooth roadways reasonably free from noise and dust. In its simplest form, tar macadam is made from a good hard limestone broken into the usual sizes, the fine chips being used for top-dressing. In a shed a large hearth is formed of stone flagging, under which the flues of a furnace are constructed, and upon the hearth the broken stone is spread in a layer just as thick as the heat may be able to penetrate, to dry off the moisture and make the stones distinctly hot. The load of an ordinary barrow is tipped on an iron plate and gas tar is poured over it (from 8 to 12 gals, per cubic yard), while a couple of men with shovels turn it over exactly as they would turn concrete. No more tar should be used than is required completely to blacken the whole surface of every

stone; and when this has been done, the stone can be thrown upon the heap, where it may be kept for one or two months, under cover, to allow the volatile oils to evaporate. Fine siftings are treated in the same way. When it has been properly seasoned, the mass should assume a greenish lustre; and when cut into by a shovel, the particles will cling together and creep down slowly so that the heap is said to be " alive." In that state it may be used. The tar ought to be boiled, and if too thin, a little pitch may be added to it, though not enough to make the heap consolidate. A mixture of tar with pitch and creosote oil is used by more precise makers, one formula being 12 gals, tar, J cwt. pitch and 2 gals, creosote oil to a ton of stone. But these ingredients differ considerably in their chemical composition, and the pro- portions have to be varied according to experience. Moreover, as regards the tar and pitch used in the manufacture of pave-

ments, the varieties that come directly from a vegetable source are liable to melt in hot and to become brittle in cold weather; coal tar is only moderately proof against these extremes.

Tar macadam must be put down in dry weather. If the material seems too dry, hot tar may be applied as before, but only as an expedient, and with great economy, so that the pavement may not soften in the sun. Upon a well-rolled foundation of hard material a layer of the coarser macadam should be put and rolled, then a layer of the smaller grade. For a road of light traffic a coat of the fine siftings may be put down and heavily rolled to a finished surface. For a road of heavier traffic the second coat should be dressed before rolling with tarred stone of a gauge of three-quarters of an inch to an inch and a quarter, and rolled first with a roller of not more than 10 or 12 cwt., then with one of 30 cwt. After the traffic has been turned on the road for a few days it should again be rolled as heavily as may be necessary to restore any parts that have been disturbed. But such roads are often consolidated by steam-rollers of 10 or 15 tons. For refacing an old road the prongs attached to a steam-roller will easily lift the old layer. Small depressions may be well tarred and levelled up with fine stuff, and the whole surface may be dressed every three years with tar and a fresh coat of fine chips. If the surface of the road is irregular, water will hang upon it, and frost may cause it to become slippery. The lack of affinity between granite and bitumen prevents the use of tar macadam upon roads of heavy traffic.

Concrete Macadam. — Rocks like granite and syenite may be used in combination with Portland cement. The ingredients are mixed in about the proportion of four parts of broken stone that has first been well wetted, one and a quarter or two parts of clean sharp sand, and

one of cement put on in two layers, the second being rolled by hand to the required shape and to a good surface. It should remain for two or three weeks to dry and set. Want of elasticity may be urged against concrete macadam, and it is productive of dust, but in some cases it has proved satisfactory.

Gravel Roads. — Smooth rounded gravel is unsuitable for roads unless a large proportion of it is broken, and about an eighth part of ferruginous clay added for binding. Rough pit gravel that will consolidate under the roller may be applied in two or more layers, but each must be of similar composition, or the smaller stuff will work downwards. A gravel road should be always under inspection, and repairs should be done without delay. A track for equestrian exercise should be made of hoggin or fine gravel, that will remain soft when raked or harrowed and watered. It should be well drained. A foundation of rough hard core will let the hoggin pass down into it, so that the hard core will appear at the surface. The best material is rough chalk sufficiently rolled to stop the gravel while draining off the surface water.

Stone Pavements. — Early pitched roadways consisted of pebbles or rounded boulders (" cobblestones ") bedded in the natural surface or in sand or gravel. The next step in advance was to employ roughly squared blocks; but the wide and irregular joints admitted the water to the subsoil, and the mud worked up and the stones sank irregularly under the traffic. Telford, who was called upon to report on the street pavements of the parish of Hanover Square in 1824, saw the necessity of cutting off all connexion between the subsoil and the paving stones. He recommended a bed of about 6 in. of clean river ballast, rendered compact by being travelled upon for some time before the paving was laid, but he subsequently considered that nothing short of 12 in. of broken stone, put on in layers 4 in. thick and completely consolidated by carriages passing over them, would answer the purpose. He recommended paving stones of considerable depth and of from 45 to 6 or 7 1 in. in breadth for the greatest thoroughfares, and he pointed out the importance of working the stones flat on the face and square on all sides, so as to joint close and preserve the bed or base as nearly as possible of the same size as the face, and of carefully placing together in the same course stones of equal

breadth. Many pavements thus laid with stones of consider- able

breadth still remain, but experience proved that it was a mistake to suppose that broad stones having a larger base would support better the weight and shocks of heavy traffic; on the contrary, a wide stone has a tendency to rock on its bed, and also to wear round on the top and become slippery. To obtain an evener surface and a better foothold for the horses the stones were reduced in width, and in 1840 a granite pavement was laid by Walker on Blackfriars Bridge, which may be considered the first of modern set pavements. The stones were 3 in. broad and 9 deep; they were laid on a bed of concrete 1 ft. thick and were jointed with mortar. The reduction of breadth to about 3 in. was generally followed, but it was some time before a concrete foundation was employed to any great extent, the frequent breaking up to which streets are subject having prevented it. In London a foundation of broken stone has been continued in some thoroughfares, the sets being evenly bedded in gravel upon it and rammed with a heavy wooden rammer. Hard core — a mixture of broken stone, clinker, brick rubbish and old building materials — has also been largely used to form a foundation. In the northern towns of England cinders have been employed, and where the traffic is exceptionally heavy a pitched foundation of stones on edge has been laid when the sets were not paved upon an old macadamized surface. The concrete for a foundation to a paved street should be made with the best Portland cement, thoroughly mixed in proper proportions with the sand and gravel or other materials used, water being added as sparingly as possible. A thickness of 6 in. of well-made cement concrete is sufficient for the heaviest traffic, and it can be cut out in slabs for pipe-laying or repairs and can be relaid and cemented in its place. To obtain the best result a new foundation should not be paved upon for a week. A foundation of bituminous concrete is sometimes used where only a thin bed can be laid, in consequence of there being an old foundation which it is undesirable to disturb. It is made by pouring a composition of coal-tar, pitch and creasote oil while hot over broken stone levelled and rolled to the proper form, and then spreading a thin layer of smaller broken stone over the surface and rolling it in. It has the advantage that it can be paved upon a few hours after it has been laid.

The best materials for pavement sets are the hard igneous and metamorphic rocks, though millstone grit and other hard sedimentary rocks of the same nature are used when the traffic is comparatively light. Excessively hard stone which wears smooth and slippery is objectionable in spite of its durability.

Joints simply filled in with gravel are of course pervious to water, and a grout of lime or cement does not make a per- manently watertight

joint, as it becomes disintegrated under the vibration of the traffic. Grouted joints, however, make a good pavement when there is a foundation of concrete or broken stone or hard core. Where there is not a regular foundation imperviousness in the joints is of great importance. In some of the Lancashire towns the joints have for many years past been made by first filling them with clean gravel, well shaken in by ramming, and then pouring in a composition of coal-tar, pitch and creasote oil, which is allowed to percolate and fill up the interstices, the pavement being finished by covering it with small gravel. Joints so formed are impervious to wet and have a certain amount of elasticity; the foundation is kept dry; and the pavement with bituminous grout of this kind keeps its form well for many years. The objection is made that in hot weather the composition runs from the joints and makes the streets unpleasant for foot-passengers.

A pavement consisting of broad, smooth, well-jointed blocks of granite for the wheel tracks, and pitching between for the horse track, was laid by Walker in Commercial Road (London) for the heavy traffic to the West India Docks in 1825, and similar pavements have been successfully used elsewhere, principally for heavy traffic, in streets only wide enough for one vehicle. In Milan, Turin and other towns of northern Italy tramways of the same sort are extensively used for the

ordinary street traffic. The tractive force required is small, while the foothold on the horse track is good; but the tram- stones are slippery for horses to pass over. The rigidity of the roadway renders it more suitable for slow heavy traffic than for light quick vehicles, and the improvement in other pavements has limited the application of this one in ordinary streets.

Brick Paving. — Since about 1885 brick as a paving for carriage-ways has been adopted to a considerable extent, chiefly in the form of shale bricks, in American cities. The clay is a hydrated silicate of alumina, containing about 24% of alumina with 15% of iron, lime, soda, potash and magnesia. Lime is injurious, but alkalis to the extent of 3% are needed to ensure a slight degree of vitrification. Various tests are used to determine their liability to absorb moisture and to be abraded. That for abrasion is made by rolling half-bricks in an iron barrel or rattler in company with pieces of cast- iron for a given time, and noting the effect on the surfaces, but particularly on the angles, which should be tough enough to resist chipping. Comparisons are also made with test pieces of granite that are mixed with the bricks. To guard against chipping, the best-made bricks are pressed over again, and the upper angles rounded to a radius of three-eighths of an inch. Upon a foundation of concrete or well-rolled ballast a cushion or bed of coarse

sand from half an inch to 3 in. thick is laid, and on this the bricks are set. They are then rolled till level, or are heavily rammed, a plank being interposed between the bricks and the rammer. No channel-courses are used. Pitch is poured in at the joints, but by no means on the surface, as that would make them slippery. Brick roadways have stood well under hard wear for fourteen years. Although in the United Kingdom bricks are produced unequalled for hardness and finish, no serious attempt has been made to introduce a tough brick for roadways that will neither chip nor wear smoothly. In various experiments with bricks that seemed most suitable they stood hard traffic for about a year. Clay of absolutely uniform character, and kilns that will ensure perfect equality in firing, are requisite. Slag bricks, made to interlock in the form of a double hexagon, the surface being grooved to a small pattern, have stood good tests for wear and foothold on a perfectly level surface. Many attempts have been made to use compositions, into which asphalt or cement usually enters, for making blocks or slabs, square or hexagonal, that can be laid down on a concrete foundation. A mosaic of macadam set in an iron frame is fixed by running molten slag into the back of the block. Small square pieces of oak are formed into blocks, end-grain upwards. Staffordshire blue bricks, made with holes to hold wooden plugs, have been used with some success. Broad blocks not firmly fixed down usually become loose and tilt when subjected to traffic.

Asphalt Paving. — Asphalt was first used for street paving in Paris in 1854. It was introduced in London in 1869, when Threadneedle Street was paved by the Val de Travers Asphalt Company, and since then it has been extensively used for paving both streets and footways. The material is a hard limestone impregnated with bitumen in the proportion of from 6 to 8% in the Seyssel rock, and from 10 to 12 in that from Val de Travers. Asphalts containing less than the former proportion have not sufficient coherence for street pavements, and those containing more than the latter proportion soften from heat in the summer. Asphalt is employed either as a mastic or compressed. The mastic is previously prepared in cakes and is melted for use in caldrons with a small quantity of bitumen, and for a street pavement is thoroughly mixed with sand or grit. It is spread in one thickness on a concrete foundation, covered with sand, and beaten to an even surface. This material has not proved so successful for street surfaces as compressed asphalt. To produce this, the rock asphalt, previously reduced to a fine powder by mechanical means, is heated in revolving ovens to from about 220 to 250° F., spread while still hot, and compressed into a solid mass by hot

disk-shaped rammers, and afterwards smoothed with irons heated to a dull redness. The original rock is thus, as it were, reconstructed by taking advantage of the power of coherence of the molecules under pressure when hot. In heating the powder the moisture combined in the limestone must be driven off without reducing the’ proportion of the bitumen more than is unavoidable. The powder cools very slowly, and may be conveyed long distances from the ovens; it may even be kept till the next day before use. When laid it should still retain a temperature of from 150 to 200°. It is spread evenly with a rake by skilled workmen for the whole width of the street to a thickness about two-fifths greater than the finished coating is intended to be. Ramming is commenced with light blows to ensure equality of compression* throughout, and is continued with increased force until the whole is solidified. The ramming follows up the spreading, so that a joint is required only when the work is interrupted at the end of a day, or from some other cause. In a few hours after it has been laid an asphalt pave- ment may be used for traffic. When finished, its thickness may be from i| to 2j in., according to the traffic; a greater thickness than the latter cannot be evenly compressed with certainty. The asphalt loses thickness by compression under the traffic for a long time and to the extent, it is said, of one— fifth or one-fourth, but the wear appears to be very small. The wear-resisting power of the asphalt is due to its elasticity; tracks are made by the wheels at ‘first, but when thoroughly compressed by the traffic the surface retains little or no trace of the heaviest loads. Repairs are easily and quickly made by cutting out defective places and ramming in fresh heated powder, which can be done in the early morning without stopping the traffic. An unyielding foundation is indispensable; it should be of the best Portland cement concrete, 6 in. in thickness, which must be well set and perfectly dry throughout before the asphalt is laid, or the steam generated on the application of the hot powder will prevent coherence and lead to cracks and holes in the asphalt, which quickly enlarge under the traffic. For the same reason the asphalt should be laid in dry weather. The concrete foundation must be carefully formed to the proper profile, with an inclination towards the sides of not more than 1 in 50, which is sufficient with so smooth a surface. About 1 in 50 is the steepest gradient; at which an asphalt pavement can be safely laid. When either dry or wet it affords good foothold ‘ for horses, but when beginning to get wet, or drying, it is often extremely slippery. This is said to be due to dirt on the surface; and not to the nature of the material. Sand is strewed over the surface to remedy the slipperiness; it tends, however, to wear out the asphalt, and great cleanliness is the

best preventive. An asphalt pavement can be kept cleaner than any other, is impervious to moisture, and dries quickly. While the road is kept clean, a very slight depression is made by the horser shoe, which for foothold is a great advantage. The noise made on asphalt by horse-traffic is about the same as that made on hard wood, and is not much more than is necessary for the safety of foot-passengers. In American cities asphalt has been adopted in a totally different form. All asphalt pavements are composed of a very large proportion, perhaps five parts in six, of a hard non-bituminous material. In America it is found cheaper to get the purer bitumen of the island of Trinidad, and to procure in the localities the bulky material required for admixture — a coarse angular sand with a little pure carbonate of lime. An asphaltic cement is made from refined asphaltum. Of this, from 12 to 15% is used with 70 to 80% of sand and 5 to 15% of limestone dust. These materials are heated and stirred together into a stiff mastic paste to form the wearing surface of the road. Upon the concrete foundation is first spread a layer of fine bituminous concrete called ” binder, ” 1ˆ in. thick, to unite the wearing surface to the concrete foundation. Upon the binder the asphalt is laid to a thickness of 2 in., being spread with iron rakes and brought to its finished surface by the steam roller. Obviously this is a process requiring great judgment and

experience; but the system has become established in America, to the exclusion of European methods. Its great recom- mendation is the freedom from slipperiness that is said to result from the admixture of sharp sand, and this freedom is really the one quality in which asphalt pavement is seriously deficient. This system has been introduced into England.

Wood-Paving.ˆ Wood pavements were introduced in England in 1839. Hexagonal blocks of fir, 6 to 8 in. across and 4 to 6 deep, were bedded in gravel laid on a foundation previously levelled and beaten. The blocks were either bevelled off at the edges or grooved across the face to afford foothold. Other wood pavements were tried in London about the same time, but they soon got out of order from unequal settlement of the blocks, and most of them lasted but a few years. The ” improved wood pavement” was first used in London in 187 1. After the foundation was formed to the proper cross-section a bed of. sand 4 in. deep was laid, upon which came two layers of inch deal boards saturated with boiling tar, one .layer across the other. The wooden blocks were 3 in. wide, 5 deep, and 9 long; they were dipped in tar and laid, on the boards with the ends close together; but transversely the courses were spaced by fillets of wood three-fourths of an inch wide nailed to the floor and to the blocks. The joints were filled up with clean pebbles rammed in, and were run with a composition of

pitch and tar, the surface being dressed with boiling tar and strewed with small sharp gravel and sand. In this pavement a somewhat elastic foundation was provided in the boards, which wbre also intended to prevent unequal settlement of the blocks;-but the solidity of the pavement depended upon its water-tightness, for, when the surface water reached the sand, as it did sooner Or later, settlement and dislocation of the blocks ;under the traffic arose. Pavements on this system were laid between. 1872 and 1876, and were kept in repair and repaid from time to time, but about 1877 the plank foundation: was abandoned for a foundation of cement concrete, which is now generally: employed. Australian hard woods have to a large extent supplanted the fir and pine which were at one time used as the , materials for wood-paving. The softer woods, which afford reasonably good foothold and are comparatively noiseless,, wear rapidly under heavy traffic, and are very liable to decay. Moreover, the wood actually used has been of mixed qualities, and when a block fails, those near it suffer; thus holes are formed, :SO that the pavement has. to be renewed before its time* English oak and beech, which, are perhaps too hard, have been used with varying results; but the Australian woods of the genus Eucalyptus haye been most extensively tried, and with the most satisfactory results. Those which are best known are jarrah and kauri, but tallow wood, blackr butt, blue-gum, red-gum, and spotted-gum, with others, have been tried. Of these, one or two are too dense and hard to afford foothold, others are not easily procured, but jarrah and kauri are used extensively. When cut from the matured heart-wood they are uniform in quality, hard enough for dura- bility, and rough enough to afford fairly good foothold. A very large quantity of wood has been used in London under the name of American red-gum. In substance it comes between the soft and hard woods above mentioned. Wood blocks for paving must be cut with the utmost precision as to the depth of 5 or 6 in. and the breadth of 3 in. The' usual length of 8 or 9 in. should also be kept well enough for bond. A long block is liable to tilt. As to depth, although a slight depression may be of little account, the least projection in a block will be immediately noted as a jolt by the swift-moving wheel. The laying and jointing of wood blocks on concrete is still a matter of experiment. They may be set on a half -inch bed of sand, which is supposed to, though it is doubtful whether it actually does, make the pavement elastic to the tread. If the blocks are not accurately gauged, the sand enables the paviour to adjust them to a uniform surface. But the practice most approved is to pave directly upon the smoothly finished concrete, trusting for elasticity to the wood. On the revival of wood-paving it was thought necessary, for foothold, to leave

wide joints filled with small gravel grouted with cement; but this is mischievous. The cement breaks up, and when the blocks shrink, the filling-in is driven downwards, and when they again get wet, they have less room to expand, the side kerbs are driven back, and the foot-pavements are displaced, so as to require relaying. To guard against this, a space of about 2 in. has been left between the pavement and the kerb, to be temporarily filled with clay or sand, which can be cleared out as the pavement expands. But cement has no affinity for wood, and its use, together with the wide joints that were thought necessary to give foothold, has been abandoned. They permitted the edge of the block to be beaten down below the centre, so as to produce a succession of ridges, having much of the character of a ” corduroy ” road. Asphalted felt placed in the joints has not succeeded. A method very successfully adopted is to leave the end joints slightly open, and to place strips or laths one-tenth of an inch thick between the courses, so that hot pitch can be poured down to fill the joint and cover the surface. The roadway is then strewn with fine sharp gravel. Hard-wood blocks so laid expand very slightly, so that a space of an inch and a quarter is sufficient between the kerb and the two courses of -blocks that are usually laid parallel to it; this, when filled with pitch, is more than enough to allow for expansion. Paving has been laid with close joints, small vessels of hot pitch being provided, into which each paviour dips the blocks more or less completely before laying them; but wood blocks are more commonly laid dry, a little pitch being brushed over the surface. The gradual abandonment of the’ wide joints once considered necessary for foothold will be noticed. Soft wood seems to wear under very heavy traffic about five times as fast as hard wood.

Plank Roads. — In opening up a new country, roads, temporary or permanent, must be made with such materials as may happen to be at hand. The plank road often used in American forests makes an excellent’ track fdr all kinds of traffic. Upon that side of the space devoted to the road, which the heavy traffic leading to a town will use, two parallel rows of sills 15 to 20 ft. long, 12 in. wide and 4 deep are laid longi tudinally flatwise 4 ft. from centre to centre,’ the earth being well packed and rammed to the level of their faces. The joints are not opposite;- a short piece of sill is put either under or by the side of each joint. Cross-boards about 8 ft. 3 in. long and 3 in. thick are laid down loosely, so that groups of four boards together will project on alternate sides of the road 3 or 4 in., forming a shoulder to enable

vehicles to'gei on to the track at any point. The remainder of the road space is formed as an earthen track, 12 ft. wide, for light vehicles. Its slope outwards may be 1 in 16, that of the plank road 1 in 32. If the soil is too bad for the earthen track, short lengths of plank road of double width are made at intervals to form passing places. The cross boards are spiked down on five sills, and' are sprung so aS to give a fall both ways.

Log Roads. — The log road is formed across swamps by laying young trees of similar length close together. This is ridiculed as a "corduroy" road, but it is better than the swamp. Good temporary roads may be made by laying down half logs roughly squared upon the ground, close together or with spaces between of a couple of niches, into which earth 1 is well rammed. They may be 8 or 9 ft. long, alternate logs being made to project a foot on each side for convenience of driving on and off the track.

Charcoal Roads. — When fuel is available, good roads can be formed of burned materials. Clay is burned into ballast for foundations, or for a temporary track. In American forests charcoal roads have been largely used. Logs from 6 in. to 2 ft. in diameter are piled along the whole route, the stack being 9 ft. broad at the base, 6 ft. high and 2 ft. broad at the top. Dry materials for lighting are intermixed, and the stack is covered up with sods and earth from the side ditches. When burned, the charcoal is simply raked down so as to forma 15-ft. road of a well-rounded section. These roads are dry and hard, and otherwise satisfactory.

The mode of carrying a road across a bog upon a foundation of faggots or brushwood is well known. In India the native roads have been made equal to heavy traffic by laying branches of the mimosa across the track. , And in the great plains, where the soil, when dry, would otherwise be made deep in dust, this is entirely prevented by laying across the track a coarse reed or grass like the pampas-grass, and covering it with 3 or 4 in. of loam. . ,

Sand Dressing. — In carrying traffic over a clay soil a covering of 3 or 4 in. of coarse sand will entirely prevent the formation of the ruts which would otherwise be cut by the wheels; and if the ground has already been deeply cut up, a dressing of sand will so alter the condition of the clay that the ridges will be reduced by the traffic, and the ruts filled in.

Noiseless Roads. — A comparatively noiseless pavement may be formed with bricks made of cork granulated and mixed with fibre and

asphalt; they are set in pitch, and, seem to be suit- able for rather steep gradients. For a perfectly noiseless pavement, such as is specially required where a carriage entrance under bedrooms is used by night, no substance is equal to indiarubber. For this purpose it is made in inch sheets about 3 ft. wide and as long as the width of the roadway; it is fixed over concrete and secured by iron clips. This arrangement carries the whole of the passenger traffic to St Pancras Station, London, and also a considerable amount of traffic passing under the Euston Square Station Hotel.

Dustless Roads.— The necessity for making roads dustless has been rendered urgent by the advent of the mptpr-car. The oldest and least efficacious method is to convert the dust into mud by the aid of the watering cart; at the best, however, the improvement is temporary, though attempts have been made to obtain more lasting results by using a solution of .some hygroscopic salt such as calcium chloride. Various special preparations of petroleum and other oils have been introduced as palliatives, but the most promising treatment for existing macadam roads consists in distributing tar by hand or machine over the surface, care being taken to make the application in fine weather when the roads are dry. The radical solution of the problem, however, is to be sought in the adoption of improved methods and materials for construction, probably with a bituminous binding or matrix. ”■.”•!

This same problem of the motor-car, which, by its rapidity of movement, rendered many of the old country roads in England (suitable, or at least tolerable, as they were for slow- moving traffic) positively dangerous for the new traffic by reason of their narrowness, sharp corners, &c, has been re- sponsible for the passing by the legislature of a very important measure, the Development and Road Improvement Funds Act 1909. This act, in its second part, deals with the question of road improvement, and establishes a Road Board, making it a body corporate. The Board is given powers to ‘ make advances to county councils or other highway authorities for the construction of new roads or the improvement of existing roads, as well as itself to construct and maintain new roads. The expression “improvement of roads ” is defined by the act as including the widening of a road, the cutting off corners, levelling, treating a road for mitigating dust nuisance, &c. Power is given to the Board to acquire land for the purposes of road improvements. The expenses of the Board are met out of a road improvement grant each year, the greater part of which it was proposed should be provided by diverting the tax on motor spirit and on motor vehicles levied under the Finance Act of 1909-10.

Watering. — On macadamized roads in Great Britain watering is only good for the road itself when the materials are of a very sili- cious nature and in dry weather. With other materials the effect is to soften the road and increase wear. In and near towns water- ing is required for the comfort of the inhabitants, but it should not be more than enough to lay the dust without softening the road, and the amount required for this may be greatly reduced by keeping the surface free from mud, and by sweeping off the dust when slightly wetted. Pavements are watered to cleanse them as well as to lay the dust, but it must be remembered that both wood

and asphalt are more slippery when wet, and that therefore watering should be obviated as far as possible by thorough cleansing. Hydro- static vans, by improvements in the distributing pipes and regulating valves, water a wide track uniformly with an amount of water which can be regulated at pleasure. Where hydrants exist in con- nexion with a water supply at high pressure, street watering can be effected by a movable hose and jet, a method much more effective in cleansing the surface, but using a much larger quantity of water. Another method which has been tried, but not much used, is to lay perforated pipes at the back of the kerb on each side of the road, from which jets are thrown upon the surface. The first cost is considerable, and the openings for the jets are liable to choke and get out of order. Deliquescent salts have been used for street watering, by which the surface is kept rnoist, but at the expense of the moisture in the air. Sea water has the same effect in a less degree.

Cleansing. — The principal streets of a town are generally cleansed daily, either by hand-sweeping and hand-scraping or by machines. Sir Joseph Whitworth's machine consists of a series of revolving brooms on an endless chain, whereby the mud or dust is swept up an incline into the cart. A less costly and cumbersome machine consists of a revolving brush mounted obliquely, which sweeps a track 6 ft. wide and leaves the dust or mud on one side to be gathered up by hand. A horse scraping-machine which delivers the mud at the side is also used, the blades of the scrapers being mounted obliquely and covering a width of 6 ft. For general use, more especially in the country, scraping-machines, worked by a man from side to side of the road, and scraping a width of about 4 ft., are more convenient.

All street surfaces suffer from the constant breaking up and dis-

turbance to which they are subjected for the purpose of laying and repairing gas and water pipes. Subways, either under the middle of the road or near the kerbs, in which the pipes may be laid and be always accessible, have often been advocated, and in a few instances have been constructed; but they have not hitherto found general favour.

Footways. — Gravel is the most suitable material for country or suburban footways; it should be bottomed with a coarser material, well drained and should be laid with a roller. An inclination towards the kerb of about half an inch in a foot may be given, or the surface may be rounded, to throw off the wet. Where greater cleanliness is desirable and the traffic is not too great a coal-tar concrete similar to that already described, but of smaller materials, makes a good and economical footway. The coating should be 2§ or 3 in. thick, composed of two or three layers each well rolled, the lower layer of materials of about i} in. gauge, and the upper of a half or a quarter of an inch gauge, with Derbyshire spar or fine granite chippings over all. Concrete footways require to be carefully made and must be allowed to set thoroughly before they are used. Concrete has a tendency to crack from contraction, especially when in a thin layer, and it is better to lay a footway in sections, with joints at intervals of about 2 yds. Concrete slabs, especially when silicated and constituting artificial stone, make an excellent footway. The material is composed of crushed granite, gravel or other suit- able material, mixed with Portland cement and cast in moulds, and when set saturated with silicate of soda. This paving has proved more durable than York stone flagging, but it is more slippery, especially when made with granite. York stone makes a good and pleasant foot pavement, but is somewhat expensive considering its durability; it is apt to wear unevenly and to scale off when the stone is not of the best quality. It should not be laid of a less thick- ness than 2 in.; 2§ or 3 in. are more usual. The flags should be square jointed, not under-cut at the edges, and should be well bedded and jointed with mortar. Caithness flag is much more durable than York stone and wears more evenly; it is impervious to wet and dries quickly by evaporation. The edges are sawn, and the hardness of the stone renders it difficult to cut it to irregular shapes or to fit openings. Staffordshire blue bricks and bricks made of scoria from iron furnaces are both very durable, though somewhat brittle. Asphalt either laid as mastic or compressed is extensively used for footways; the former is considered inferior in durability to York stone and the latter superior to it. Asphalt should not be laid less than three-fourths of an inch thick on 4 in. of cement concrete, and I in. of asphalt is desirable where there is great traffic.

Footways in a street must be retained by a kerbing of granite, York stone, Purbeck or other stone sufficiently strong to stand the blows from wheels to which it is subjected. It should be at least 4 in. wide and 9 deep and in lengths of not less than 3 ft. A granite kerb is usually about 12 by 6 in., either placed on edge or laid on the flat. When set on edge a kerb is generally bedded on gravel with a mall ; when laid on the flat a concrete bed is desirable. In a macadamized street pitched or paved water channels are required to prevent the wash of the surface water from undermining the kerb. The pitching consists of cubical blocks of hard stone about 4 in. deep, bedded on sand or mortar, or preferably on a bed of concrete. A paved channel consists of flat stones about I ft. wide inclining slightly towards the kerb. Moulded bricks and artificial stone are also used both for side channelling and for kerbing. Such an inclination must be given to the channel as will

bring the surface water to gullies placed at proper intervals, and the level of the kerbing and consequently of the footway will depend to some extent on the surface drainage as well as on the levels of adjacent houses. To lay out a street satisfactorily the longitudinal and transverse sections must be considered in relation to these matters as well as to the levels of intersecting streets.

ROAN (0. Fr. rouan, rouen; Ital. roano, rovano; perhaps connected with rufus, red), a word applied to a variety of colour in an animal's coat, especially that of a horse, where there is a mixture of grey or white hair with the prevailing tint of bay, chestnut or sorrel. A sorrel when thus modified is either a strawberry-roan or a cream-roan. The term is also used of a soft, flexible kind of leather made of sheepskin, used in bookbinding as a substitute for or in imitation of morocco; but in this sense the origin is doubtful.

ROANNE, a town of east-central France, capital of an ar- rondissement in the department of Loire, on the left bank of the Loire, 54 m. N.W. of Lyons on the Paris-Lyons railway to Moulins. Pop. (1906) 33,981. The chief buildings are a modern town hall and the church of St fitienne (1835-1843), built in the Flamboyant Gothic style. The lyc6e occupies the buildings of the old college dating from the early 17 th century. A fine bridge of seven arches connects Roanne with the industrial suburb of Le Coteau on the right bank of the river. The town is the seat of a sub-prefect, of tribunals of first instance and of commerce, of a chamber of commerce and a board of trade-arbitration, and has lycees for both sexes. Cotton goods form the staple manufacture, and cotton-spinning is also important. The making of knitted woollen articles gives employment to large numbers of

women in the town and district. There are besides extensive engineering works, foundries, dye-works, tanneries, pottery and tile-works and other industrial establishments. As the centre of the Roannais coalfield, Roanne has trade in coal and coke. It is also the terminus of the Roanne-Digoin Canal and the real starting- point of the Loire navigation.

Roanne (Rodomna, or Roidomna) was an ancient city of the Segusiani and a station on the great Roman road from Lyons to the ocean. In 1447 the lordship of Roannais became the property of the celebrated banker Jacques Cceur, from whom it passed as the result of a law-suit to the family of Gouffier. In their favour the title was raised to the rank of marquisate and in 1566 to the rank of duchy; it became extinct in the first half of the 18th century.

ROANOKE, a river of the South Atlantic Slope, U.S.A. With the Staunton, which rises in the Appalachian Valley in south- western Virginia, it constitutes one river, and, flowing in a general south-easterly direction, crosses the boundary between Virginia and North Carolina just above the Fall Line and discharges into Albemarle Sound. It is nearly 400 m. long, with a drainage area of 9237 sq. m. The United States govern- ment adopted a project in 187 1 for clearing a channel with a minimum depth of 5 ft. at low water from its mouth to Weldon, a distance of 129 m., and in 1909, when the project was 80% completed, vessels drawing 4 ft. of water could ascend at low stages nearly to Weldon. The main river and its principal tributary, the Dan, are also navigable, for many miles above the Fall Line, by pole boats. In 1829 the Weldon Canal, 12 m. long, was opened to afford a passage around the falls, but it was abandoned in 1850.

ROANOKE, a city in (but administratively independent of) Roanoke county, Virginia, on the Roanoke river, about 55 m. W.S.W. of Lynchburg. Pop. (1890) 16,159; (1900) 21,495, of whom 5834 were negroes; (1910 census) 34,874. Roanoke is served by the Virginian railway, by the main line and the Shenandoah and the Winston-Salem divisions of the Norfolk & Western railway, and by electric railway to Vinton and to Salem. The city is about 900 ft. above sea-level and is sur- rounded by high hills; its picturesque situation and its nearness to famous mineral springs make it a health resort. On a mountain slope, about \ m. from the city limits, is the Virginia College for Young Ladies; 7 m. north of the city, at what was

formerly called Botetourt Springs (there is a sulphur spring), is Hollins Institute (1842) for girls; and in the city are the National Business College, the City Hospital (1899), private hospitals, and St Vincent's Orphan Asylum (1893) for boys, under the Sisters of Charity. Stock-raising, tobacco-growing, and coal and iron-mining are the industries of the district. Roanoke's factory product in 1905 was valued at $5,544,907 (2-7% more than in 1900). Its railway car repair and construction shops, belonging to the Norfolk & Western railway, employed in that year 66.9% of the total number of factory wage-earners; pig-iron, structural iron, canned goods, bottles, tobacco, planing-mill products and cotton are among the manufactures. The municipal water supply comes from a reservoir at Crystal Springs at the foot of Mill Mountain near the city limits. Roanoke was the town of Big Lick (founded about 1852; incorporated in 1874; pop. in 1880, 669) until 1882, when it received its present name; in 1884 it was char- tered as a city.

ROARING FORTIES, the name given to the zone in the southern hemisphere, near the 40th parallel of latitude, in which the north-westerly ” anti-trade ” winds attain their greatest development. Since the belt lies in the Great Southern Ocean (q.v.), and is little interrupted by land, the ” planetary circula- tion ” undergoes little modification and barometric gradients are steep. The ” brave west winds ” are accordingly of great strength, and, as in the corresponding belt of the northern hemisphere, the movement is largely broken up into the low and high pressure vortices known as cyclones and anticyclones.

ROBBEN ISLAND, an island at the entrance of Table Bay, 7 m. N.N.W. of Cape Town. It is some 4 m. long by 2 broad. At its southern end is a lighthouse with a fixed light visible for 20 m. It got its name (robben, Dutch for seal) from the seals which formerly frequented it, now only occasional visitants. The island when discovered was uninhabited. It is first mentioned by an English seaman named Raymond, who states that in 1591 seals and penguins were there in large numbers. In 1614 ten criminals from London were landed on the island to form a settlement and supply fresh provisions to passing ships. The attempt, which ended in failure, is interesting as the first recorded settlement of English in South Africa. In the 18th century the slate quarries of Robben Island were extensively worked by the Dutch of Cape Town. The island is now noted for its leper asylum and its convict establishment. For many years an asylum for lunatics was also maintained, but in 1904 the lunatics were removed to the mainland. The common rabbit, brought from England, abounds, but its introduction to the mainland is prohibited. As early as 1657 criminals were banished to the island by the Dutch authorities at Cape Town; it has also served as the place of detention of several noted Kaffir chiefs.

See G. F. Gresley, ” The Early History of Robben Island,” in The Cape Illustrated Magazine (Oct. 1895).

ROBBER SYNOD, the name given to an irregular ecclesiastical council held at Ephesus in a.d. 449. See Ephesus, Council of.

ROBBERY (from O. Fr. rober, to steal), the unlawful and forcible taking of goods or money from the person of another by violence or threatened violence. Robbery is larceny (q.v.) with violence. It is a specific offence under the Larceny Act 1861, and is punishable by penal servitude for any term not exceeding fourteen years and not less than three years, or im- prisonment for any term not exceeding two years, with or without hard labour. Under the Garrotters Act 1863,

whipping may be added as part of the sentence for robbery. In Scots tew robbery is termed stouthrief.

United States. — The nature of the offence is practically the same in America as in England, but what constitutes robbery is provided by statute in each state, as is also the punishment. The chief difference between English and American law is that the latter often divides the offences into grades and takes a liberal view of what constitutes force or fear. Train robbery is specially dealt with in some states owing to the prevalence of that species of crime.

Federal Statute. — Congress has made it piracy punishable with death to commit robbery on the high seas or on shore or in any harbour out of the jurisdiction of any state by landing from a piratical vessel (U.S. Rev. St. § 1047).

In Alabama it is train robbery to ” enter upon or go near to any locomotive, engine, or car, on any railroad and by threats or exhibition of a deadly weapon or discharging a pistol or gun on or near such engine or car induce or compel any one to deliver up anything of value. It is punishable at the discretion of the jury by death or imprisonment for not less than ten years. Any one who stops, impedes or detains any locomotive or car with intent to commit train robbery must be punished by imprisonment for not less than ten nor more than thirty years. Conspiring to commit train robbery is punishable to the same extent (Crim. Code, §§5480-5482). _ _

In Arizona, California and Missouri the ” fear ” may be that of the person robbed or of any relative of his or member of his family or of any one in his company. The punishment is imprisonment for not less than five years.

In Arkansas and Missouri extorting money or property by black- mail is an “attempt to rob”; it is punishable by not less than one nor more than five years’ imprisonment. In Georgia larceny from the person is statutory robbery (Hickey v. State (1906), 125, Ga. 145).

Louisiana. — Train robbery is punishable by imprisonment for not less than five nor more than ten years.

Missouri. — Train robbery is punishable by death or imprisonment for not less than ten years. It may consist in placing an obstruction on the line with intent to rob.

Massachusetts. — Robbery, committed when armed with a dangerous weapon, is punishable by imprisonment for life (Rev. L., 1902, ch.

207, § 17).

Minnesota. — The extreme penalty for robbery is forty years' imprisonment (L. 1905, ch. 114). .

New Jersey. — The extreme penalty is $3000 fine or twelve years' imprisonment.

Texas. — Falsely personating an officer aijd by means of arrest extorting money is robbery (Burnside v. State (1907), 102, S.W. Rep. 178).

ROBERT I., "THE BRUCE" (1274-1329), king of Scotland, was the son of the 7th Robert de Bruce, earl of Carrick by right of his wife Marjorie, daughter of Niel, or Nigel, earl of Carrick, and was the eighth in direct male descent from a Norman baron who came to England with William the Con- queror. After the death of Margaret, the " maid of Norway," in 1290, Bruce's grandfather, the 6th Robert de Bruce, lord of Annandale, claimed the crown of Scotland as the son of Isabella, the second daughter of David, earl of Huntingdon, and great- granddaughter of King David I.; but John de Baliol, grandson of Margaret, the eldest daughter of Earl David, was preferred by the commissioners of Edward I.

The birthplace of Bruce is not certainly known, but was probably Turnberry, his mother's castle on the coast of Ayr. The date is the nth of July 1274. His youth is said by an English chronicler to have been passed at the court of Edward I. At an age when the mind is quick to receive the impressions which give the bent to life he must have watched the progress of the great suit for the crown of Scotland. Its issue in 1292 in favour of Baliol led his grandfather to resign Annandale to his son, the 7th Robert de Bruce, who either then or after the death of his father in 1295 assumed the title of lord of Annandale. Already on his wife's death in 1292 he had resigned the earldom of Carrick to his son, the future king, who presented the deed of resignation to Baliol at Stirling in August 1293, and offered the homage which his father, like his grandfather, was unwilling to render. Feudal law required that the king should take seisin of the earldom before regranting it and receiving the homage, and the sheriff of Ayr was directed to take it on Baliol's behalf. As the disputes between Edward I. of England and Baliol, which ended in Baliol losing his kingdom, commenced in this year, it is doubtful whether Bruce ever rendered homage; but he is henceforth known as earl of Carrick, though in a few instances this title is still given to his father. Both father and son sided with Edward against Baliol. In April 1 294 the

younger Bruce had permission to visit Ireland for a year and a half, and as a further mark of Edward's favour a respite of all debts owing by him to the exchequer.

In August 1296 Bruce and his father swore fealty to Edward I. at Berwick, but in breach of this oath, which had been renewed

at Carlisle, the younger Robert joined Sir William Wallace, who raised the standard of Scottish independence in the name of Baliol after that king had surrendered his kingdom to Edward in 1296. Urgent letters were sent ordering Bruce to support John de Warenne, earl of Surrey, Edward's general, in the summer of 1297; but, instead of complying, he assisted to lay waste the lands of those who adhered to Edward. On the 7th of July Bruce and his friends were forced to make terms by a treaty called the capitulation of Irvine. The Scottish lords were not to serve beyond the sea against their will, and were pardoned for their recent violence, in return owning allegiance to Edward. The bishop of Glasgow, James the steward, and Sir Alexander Lindesay became sureties for Bruce until he delivered his daughter Marjorie as a hostage. Wallace almost alone maintained the struggle for freedom which the nobles, as well as Baliol, had given up, and Bruce had no part in the honour of Stirling Bridge in September 1297, or the reverse of Falkirk, where in July 1298 Edward in person recovered what his generals had lost, and drove Wallace into exile. Shortly afterwards Bruce appears again to have sided with his countrymen; Annandale was wasted, while he, as Walter of Hemingford says, "when he heard of the king's coming, fled from his face and burnt the castle of Ayr which he held." Yet, when Edward was forced by home affairs to quit Scotland, Annandale and certain earldoms, including Carrick, were excepted from the districts he assigned to his followers, Bruce and other earls being treated as waverers whose allegiance might still be retained. About 1299 a regency was appointed in Scotland in the name of Baliol, and a letter of Baliol mentions Robert Bruce, lord of Carrick, as regent, along with William of Lamberton, bishop of St Andrews, and John Comyn the younger, a strange combination — Lamberton the friend of Wallace, Comyn the enemy of Bruce, and Bruce a regent in name of Baliol. Comyn in his own interest as Baliol's nephew and heir was the active regent; the insertion of the name of Bruce was an attempt to secure his co-operation. For the next four years he kept studiously in the background, waiting his time. A statement of Peter Langtoft that he was at the parliament of Lincoln in

1301, when the English barons repudiated the claim of Pope Boniface VIII. to the suzerainty of Scotland, is not to be credited, though his father may have been there. In the campaign of 1304, when Edward renewed his attempt on Scotland and reduced Stirling, Bruce supported the English king, who in one of his letters to him says, “If you complete that which you have begun, we shall hold the war ended by your deed and all the land of Scotland gained.” But, while apparently aiding Edward, Bruce had taken a step which bound him to the patriotic cause. On the nth of June, five weeks before the fall of Stirling, he met Lamberton at Cambuskenneth and entered into a secret bond by which they were to support each other against all adversaries and undertake nothing without consulting together. The death of his father in 1304 may have determined his course, and led him to prefer the chance of the Scottish crown to his English estates and the friendship of Edward.

This determination closes the first chapter of his life; the second, from 1304 to 1314, is occupied by his contest for the kingdom, which was really won at Bannockburn, though disputed until the treaty of Northampton in 1328; the last, from 1314 to his death in 1329, was the period of the establish- ment of his government and dynasty by an administration as skilful as his generalship. It is to the second of these that historians, attracted by its brilliancy even amongst the many romances of history and its importance to Scottish history, have directed most of their attention, and it is during it that his personal character, tried ,by adversity and prosperity, gradually unfolds itself. But ail three periods require to be kept in view to form a just estimate of Bruce. That which terminated in 1304, though unfortunately few characteristics, personal or individual, have been preserved, shows him by his conduct to have been the normal Scottish noble of the time. A conflict of interest and of bias led to contradictory action,

and this conflict was increased in his case by his father’s re- sidence in England, his own upbringing at th& English court, his family feud with Baliol and the Comyns, and the jealousy common to his class of Wallace, the mere knight, who had rallied the commons against the invader and taught the nobles what was required in a leader of the people. The merit of Bruce is that he did not despise the lesson. Prompted alike by patriotism and ambition, at the prime of manhood he chose the cause of national independence with all its perils, and stood by it with an unwavering constancy until he secured its triumph. Though it is crowded with incident, the main facts in the central decade of Bruce’s life may be rapidly told. The fall of Stirling was followed by the capture and execution of Wallace in London in August 1305. Edward hoped still to conciliate the nobles and gain Scotland by

a policy of clemency to all who did not dispute his authority. A parliament in London in September 1305 to which Scottish representatives were sum- moned, agreed to an ordinance for the government of Scotland, which, though on the model of those for Wales and Ireland, treating Scotland as a third subject province under an English lieutenant, was in other respects not severe. Bruce is reputed to have been one of the advisers who assisted in framing it; but a provision that his castle of Kildrummy was to be placed in charge of a person for whom he should answer shows that Edward, not without reason, suspected his fidelity. The details of his final breach with the English king are somewhat obscure. According to one account, the bond between Bruce and Lamberton was revealed to Edward by Comyn while Bruce was at the English court. Alarmed by a hint dropped by Edward, he left England secretly, and in the church of the Friars Minorite at Dumfries on the roth of February 1306 met Comyn, whom he slew before the high altar for refusing to join in his plans. So much is certain, though the precise incidents of the interview are variously told. It was not their first encounter, for a letter of 1299 to Edward from Scotland describes Comyn as having seized Bruce by the throat at a meeting at Peebles, where they were with difficulty reconciled by the regents.

The bond with Lamberton was now sealed by blood, and the confederates lost no time in putting it into execution. Within little more than six weeks Bruce, collecting his adherents in the south-west, passed from Lochmaben to Glasgow and thence to Scone, where he was crowned king of Scotland on the 27th of March 1306. Two days later Isabella, countess of Buchan, claimed the right of her family, the Macduffs, earls of Fife, to place the Scottish king on his throne, and the ceremony was repeated with an addition flattering to the Celtic race. Though a king, Bruce had not yet a kingdom, and his efforts to obtain it were disastrous failures until after the death of Edward I. In June 1306 he was defeated at Methven, and on the nth Of August he was surprised in t Strathfillan, where he had taken refuge. The ladies of his family were sent to Kildrummy in January 1307, and Bruce, almost without a follower, fled to the island of Rathlin. Edward came to the north in the following spring On his way he granted the Scottish estates of Bruce and his adherents to his own followers, Annandale falling to Humphrey de Bohun, 4th earl of Here- ford. At Carlisle there was published a bull excommunicating Bruce; and Elizabeth his wife, Marjorie his daughter, and Christina his sister, were captured in a sanctuary at Tain, while three of his brothers were executed. In a moment all was changed by the death of Edward I. on the 7th of July 1307. Instead of being opposed to the greatest, Bruce had now as his

antagonist the feeblest of the Plantagenets. Quitting Rathlin, he had made a short stay in Arran, and before Edward's death had failed to take Ayr and Turnberry, although he de- feated Aymer de Valence, earl of Pembroke, at Loudoun Hill in May 1306. After wasting the critical moment of the war in the diversions of court life, the new English king, Edward II., made an inglorious march to Cumnock and back without striking a; blow; and then returned south, leaving the war to a succession of generals. Bruce, with the insight of military

genius, seized his opportunity. Leaving Edward, now his only brother in blood and almost his equal in arms, in Galloway, he suddenly transferred his own operations to Aberdeenshire. He overran Buchan either once or twice, and after a serious illness defeated the earl of Buchan, one of his chief Scottish opponents, near Inverurie on the 22nd of May 1308. Then crossing to Argyllshire he surprised another body of his enemies in the pass of Brander early in 1309, took Dunstaffnage, and in March of this year held his first parliament at St Andrews. In 1309 a truce scarcely kept was effected by Pope Clement V. and Philip IV. of France, and in 13 10, in a general council at Dundee, the clergy of Scotland, all the bishops being present, recognized Bruce as king. The support given to him by the national church in spite ' of his excommunication must have been of great importance in that age, and was probably due to the example of Lamberton. The next three years was sig- nalized by the reduction one by one of the strong places still held by the English: Linlithgow towards the end of 13 10, Dumbarton in October 1311, Perth, by Bruce himself, in January 13 1 2. Previous to these two latter successes the king had made two raids into the north of England; after which Buittle, Dalswinton and Dumfries were reduced, and Berwick was threatened. In March 1313 his lieutenant Sir James Douglas surprised Roxburgh, and Thomas Randolph surprised Edin- burgh. In May Bruce was again in England, and though he failed to take Carlisle, he subdued the Isle of Man. About the same time Edward Bruce took Rutherglen and laid siege to Stirling, whose governor, Sir Philip de Mowbray, agreed to capitulate if not relieved before the 24th of June 13 14.

Bruce's rapidity of movement was one cause of his success. His sieges, the most difficult part of medieval warfare, though won sometimes by stratagem, prove that he and his followers had benefited from their early training in the wars of Edward I. We know that he had been

employed by that king to prepare the siege-train for his attack on Stirling in 1304. By the close of 1313 Berwick, Stirling and Bothwell alone remained English. Edward II. felt that if Scotland was not to be lost a great effort must be made. With the whole available feudal levy of England, and a contingent from Ireland, he advanced from Berwick to Falkirk, which he reached on the 22nd of June 13 1 4. After a preliminary skirmish on Sunday the 23rd, in which Bruce distinguished himself by a personal combat with Sir Henry de Bohun, whom he felled by a single blow of his axe, the battle of Bannockburn was fought on Monday the 24th; and the complete rout of the English determined the independence of Scotland and confirmed the title of Bruce. The details of the day, memorable in the history of war as well as of Scotland, have been singularly well preserved, and re- dound to the credit of Bruce, who had studied in the school of Wallace as well as in that of Edward I. He had chosen and knew his ground, lying between St Ninians and the Bannock, a petty burn, yet sufficient to produce marshes dangerous to heavily armed horsemen, while from the rising ground on his right the enemy's advance was seen. His troops were in four divisions: his brother Edward commanded the right, Randolph the centre, Douglas the left. Bruce with the reserve planted his standard at the Bore Stone, whence there is the best view of the field. His camp-followers on the Gillies' Hill appeared over its crest at the critical moment which comes in all battles. The plain on the right of the marshes was prepared with pits and spikes. But what more than any other point of strategy made the fight famous was that the Scots fought on foot in battalions with their spears outwards, in a circular formation serving the same purpose as the modern square. A momentary success of the English archers was quickly reversed by a flank movement on the part of Sir Robert Keith. The Scottish bowmen followed up this advantage, and the fight became general; the English horse, crowded into too narrow a space, were met by the steady resistance of the Scottish pikemen, who knew, as Bruce had told them truly, that they fought for their country, their wives, their children, and all that freemen hold dear. The English rear was either unable to come up in

the narrow space, or got entangled in the broken ranks of the van. The first repulse soon passed into a rout, and from a rout into a headlong flight, in which the English king himself barely escaped. In the career of Bruce, Bannockburn was the turning-point. The enthusiasm of the nation he had saved forgot his tardy adhesion to the popular cause, and at the parliament of Ayr on the 25th of April 13 15 the succession was settled by a unanimous voice on him, and, failing males of his body, on his brother Edward and his heirs male, or failing them on his

daughter Marjorie and her heirs, if she married with his consent. Soon afterwards she married Walter the steward (d. 1326). As a result of Bannockburn, Bruce's queen was restored to her husband; Stirling was delivered up to the Scots; the north of England was ravaged, and Carlisle and Berwick were besieged.

The last part of Bruce's life, from 1315 to 1329, began with an attempt which was the most striking testimony that could have been given to the effect of Bannockburn, and which, had it succeeded, might have altered the future of the British Isles. This was no less than the rising of the whole Celtic race, who had felt the galling yoke of Edward I. and envied the freedom the Scots had won. In 13 15 Edward Bruce crossed to Ireland on the invitation of the natives, and in the following year the Welsh became his allies. In the autumn of 1316 Robert came to his brother, and together they traversed Ireland to Limerick. Dublin was saved by its inhabitants committing it to the flames, and, though nineteen victories were won, of which that at Slane in Louth by Robert was counted the chief, the success was too rapid to be permanent. The brothers retreated to Ulster, and, Robert having left Ireland in May 13 1 7 to protect his own borders, Edward, who had been crowned king of Ireland, was defeated and killed at Dundalk in October 13 1 8. On his return Bruce addressed himself to the siege of Berwick, a standing menace to Scotland. While he was preparing for it two Cardinals arrived in England with a mission from Pope John XXII. to effect a truce, or, failing that, to renew the excommunication of Bruce. The cardinals did not trust themselves across the border; their messengers, however, were courteously received by Bruce, but with a firm refusal to admit the papal bulls into his kingdom because not addressed to him as king. Another attempt by Adam Newton, guardian of the Friars Minorite at Berwick, had a more ignominious result. Bruce admitted Newton to his presence at Aldcamus or Old Cambus, and informed him that he would not receive the bulls until his title was acknowledged and he had taken Berwick. On his return Newton was waylaid and his papers seized, not without suspicion of Bruce's connivance. In March 1318 the town and soon afterwards the castle of Berwick capitulated, and Bruce wasted the English border as far as Ripon. In December he held a parliament at Scone, where he displayed the same wisdom as a legislator which he had shown as a general. The death of his brother and his daughter rendered a resettle- ment of the crown advisable, and it was settled on his grandson, Robert, son of Marjorie and Walter the steward, in case Bruce died without sons, with a provision as to the regency in case of a minor heir in favour of Randolph. The defence of the country was next cared for by regulations for the arming of the whole nation,

down to every one who owned the value of a cow, a measure far in advance of the old feudal levy. Exports during war, and of arms at any time, were prohibited. Internal justice was regulated, and it was declared that it was to be done to poor and rich alike. Leasing-making — a Scottish term for seditious language — was to be sternly punished. The nobles were exhorted not to oppress the commons. Reforms were also made in the tedious technicalities of the feudal law. In Sep- tember 1319 an attempt to recover Berwick was repelled by Walter the steward, and Bruce took occasion of a visit to com- pliment his son-in-law and raise the walls 10 ft.

The king's position was now so strong that foreign states began to testify their respect. Bruges and Ypres rejected a request of Edward II. to cut off the Scottish trade with Flanders. Pope John, who had excommunicated Bruce, was addressed

by the parliament of Arbroath in April 1320 in a letter which compared Bruce to a Joshua or Judas Maccabaeus, who had wrought the salvation of his people, and declared they fought " not for glory, truth or honour, but for that liberty which no virtuous man will survive." Moved by this language and conscious of the weakness of Edward, the pope exhorted him to make peace with Scotland, and three years later Randolph, now earl of Moray, procured the recognition of Bruce as king from the papal see by promising aid for a crusade. In 1326 the French king, Charles IV., made a similar acknowledgment by the treaty of Corbeil. Meantime hostilities more or less constant continued with England, but, though in 1322 Edward made an incursion as far as Edinburgh, the internal weakness of his government prevented his gaining any- real success, while in October of this year Bruce again ravaged Yorkshire, defeated the English near Byland, and almost captured their king. Some of his chief nobles — Thomas, earl of Lancaster, in 13 21, and Sir Andrew Harclay, earl of Carlisle, in 1322 — entered into corre- spondence with the Scots, and, though Harclay's treason was detected and punished by his death, Edward was forced to make a truce of thirteen years at Newcastle on the 30th of May 1323, which Bruce ratified at Berwick. In 1327 Edward III. became king of England, and one of the first acts of the new reign, after a narrow escape of the young king from capture by Moray, was the treaty of York, ratified at Northampton in April 1328, by which it was agreed that " Scotland, according to its ancient bounds in the days of Alexander III., should remain to Robert, king of

Scots, and his heirs free and divided from England, without any subjection, servitude, claim or demand whatsoever." Joanna, Edward's sister, was to be given in marriage to David, the infant son of Bruce, born subsequent to the settlement of 13 18 and now recognized as heir to the crown, and the ceremony was celebrated at Berwick on the 12th of July 1328.

The chief author of Scottish independence barely survived his work. He appears to have conducted an expedition to Ireland in 1327, and on his return led a foray into England. His last years were chiefly spent at the castle of Cardross on the Clyde, which he acquired in 1326, and the conduct of war, as well as the negotiations for peace, had been left to the young leaders, Moray and Sir James Douglas, whose training was one of Bruce's services to his country. Ever active, he employed himself in the narrower sphere of repairing the castle and im- proving its domains and gardens, in shipbuilding on the Clyde, and in the exercise of the virtues of hospitality and charity. The religious feeling, which had not been absent even during the struggles of manhood, deepened in old age, and took the form the piety of the times prescribed. He made careful provision for his funeral, his tomb, and masses for his soul. He procured from the pope a bull authorizing his confessor to absolve him even at the moment of death. He died at Cardross from leprosy, contracted in the hardships of earlier life, on the 7th of June 1329, and was buried at Dunfermline beside his second wife, Elizabeth (d. 1327), daughter of Richard de Burgh, earl of Ulster, whom he had married about 1304, and who bore him late his only son, David, who succeeded him. Of two surviving daughters, Matilda married Thomas Ysaak, a simple esquire, and Margaret became the wife of William, earl of Sutherland. Marjorie, an only child by his first wife, Isabella, daughter of Donald, earl of Mar, had predeceased him. Several children not born in wedlock have been traced in the records, but none of them became in any way famous.

In fulfilment of a vow to visit the Holy Sepulchre, which he could not accomplish in person, Bruce requested Douglas to carry his heart there, but his faithful follower perished on the way, fighting in Spain against the Moors, and the heart of Bruce, recovered by Sir William Keith, found its resting-place at Melrose. When his corpse was disinterred in 1821 the breast-bone was found severed to admit of the removal of the heart, thus confirming the story preserved in the verses of Barbour. That national poet collected in the earliest Scottish poem, written in the reign of Bruce's grand- son, the copious traditions which clustered round his memory. It is a panegyric ; but history has not refused to accept it as a genuine representation of the character of the great king, in spirit,

if not in every detail. Its dominant note is freedom — the liberty of the nation from foreign bondage, and of the individual from oppression. It is the same note which Tacitus embodied in the speech of Galgacus at the dawn of Scottish history. Often as it has been heard before and since in the course of history, seldom has it had a more illustrious champion than Robert the Bruce.

Bibliography. — The chief contemporary authorities for the life of Bruce are coloured to some extent by the nationality of the writers. On the Scottish side The Brus, a poem by John Barbour, edited by W. W-Skeat (Edinburgh, 1894), and the Chronica gentis Scolorum of John of Fordun, edited by W. F. Skene (Edinburgh, 1871-72), are perhaps the most valuable. The Chronicon de Lanercost, edited by J. Stevenson (Edinburgh, 1839), is also very important. The English chronicles which may be consulted with advantage are those of Walter of Hemingford, edited by H. C. Hamilton (London, 1848-49) ; and of Peter Langtoft, edited by T. Wright (London, 1866-68), and the Scalacronica of Thomas Gray, edited by J. Stevenson (Edinburgh, 1836). For the documents of the time reference should be made to the Calendar of Documents relating to Scotland, edited by J. Bain (Edinburgh, 1881-88), Documents and Records illustrating the History of Scotland, vol. i., edited by F. Palgrave (London, 1837); the Rotuli Scotiae (London, 1814-19), and the Foedera of T. Rymer, vol. i. (London, 1704). The chief general histories are: Sir D. Dalrymple, Lord Hailes, Annals of Scotland (Edinburgh, 1819); P. F. Tytler, History of Scotland (Edinburgh, 1841-43); J. H. Burton, History of Scotland, vol. ii. (Edinburgh, 1905); A. Lang, History of Scotland, vol. i. (Edinburgh, 1904); R. Pauli, Geschichte von England (Hamburg, 1834-58). See also Sir H. Maxwell, Robert the Bruce (London, 1897).

ROBERT II. (1316-1390), called “the Steward,” king of Scotland, was a son of Walter, the steward of Scotland (d. 1326), and Marjorie (d. 1316), daughter of King Robert the Bruce, and was born on the 2nd of March 13 16. In 13 18 the Scottish parliament decreed that if King Robert died without sons the crown should pass to his grandson; but the birth of a son, afterwards King David II., to Bruce in 1324 postponed the accession of Robert for nearly forty-two years. Soon after the infant David became king in 1329, the Steward began to take a prominent part in the affairs of Scotland. He was one of the leaders of the Scottish army at the battle of Halidon Hill in July 1333; and after gaining some successes over the adherents of Edward Baliol in the west of Scotland, he and John Randolph, 3rd earl of Moray (d. 1346), were chosen as regents of the kingdom, while David sought safety in France. The colleagues soon quarrelled; then Randolph fell into the hands of the English and Robert became sole regent, meeting

with such success in his efforts to restore the royal authority that the king was able to return to Scotland in 1341. Having handed over the duties of government to David, the Steward escaped from the battle of Neville's Cross in 1346, and was again chosen regent while the king was a captive in England. Soon after this event some friction arose between Robert and his royal uncle. Accused, probably without truth, of desertion at Neville's Cross, the Steward as heir-apparent was greatly chagrined by the king's proposal to make Edward III. of England, or one of his sons, the heir to the Scottish throne, and by David's marriage with Margaret Logie. In 1363 he rose in rebellion, and after having made his submission was seized and imprisoned together with four of his sons, being only released a short time before David's death in February 1371. By the terms of the decree of 1318 Robert now succeeded to the throne, and was crowned at Scone in March 1371. His reign in unimportant. Some steps were taken by the nobles to control the royal authority. In 1378 a war broke out with England; but the king took no part in the fighting, which included the burning of Edinburgh and the Scottish victory at Otterbourne in 1388. As age and infirmity were telling upon him, the estates in 1389 appointed his second surviving son Robert, earl of Fife, afterwards duke of Albany, guardian of the kingdom. The king died at Dundonald on the 13th of May 1390, and was buried at Scone. His first wife was Elizabeth, daughter of Sir Robert Mure of Rowallan, a lady who had formerly been his mistress. By her he had at least four sons, the eldest of whom was his successor, King Robert III., and six daughters. By his second wife, Euphemia, daughter of Hugh, earl of Ross, and widow of Moray, formerly his

colleague as regent, he had two sons and several daughters; and he had also many illegitimate children.

See Andrew of Wyntoun, The Orygynale Cronykil of Scotland, edited by D. Laing (Edinburgh, 1872-1879) ; John of Fordun, Scotichronicon, continued by Walter Bower, edited by T. Hearne (Oxford, 1722); John Major, Historic, majoris Britanniae, trans- lated by A. Constable (Edinburgh, 1892); and P. F. Tytler, History of Scotland (Edinburgh, 1841-1843).

ROBERT III. (c. 1340-1406), king of Scotland, was the eldest son of King Robert II. by his mistress, Elizabeth Mure, and was legitimatized when his parents were married about 1349. In 1368 he was created

earl of Carrick, and he took some part in the government of the kingdom until about 1387, when he was disabled by the kick of a horse. It was probably in consequence of this accident that his brother Robert, earl of Fife, and not the crown prince himself, was made guardian of the kingdom in 1389; but the latter succeeded to the throne on his father's death in May 1390. At this time he changed his baptismal name of John, which was unpopular owing to its connexion with John de Baliol, for that of Robert, being crowned at Scone in August 1390 as King Robert III. Al- though he probably attended several parliaments the new king was only the nominal ruler of Scotland, the real power being in the hands of his brother, the earl of Fife. In 1399, however, owing to the king's " sickness of the body," his elder son, David, duke of Rothesay, was appointed lieutenant of the kingdom; but this event was followed by an English invasion of Scotland, by serious differences between Rothesay and his uncle, Robert, now duke of Albany, and finally in March 1402 by Rothesay's mysterious death at Falkland. Early in 1406 the king's only surviving son, afterwards King James I., was captured by the English; and on the 4th of April 1406 Robert died, probably at Rothesay, and was buried at Paisley. He married Annabella Drummond (c. 1350-1402), daughter of Sir John Drummond of Stobhall, and, in addition to the two sons already mentioned, had four daughters.

ROBERT I. (c 865-923), king of France, or king of the Franks, was the younger son of Robert the Strong, count of Anjou, and the brother of Odo, or Eudes, who became king of the western Franks in 888. Appointed by Odo ruler of several counties, including the county of Paris, and abbot in commendam of many abbeys, Robert also secured the office of duke of the Franks, a military dignity of high importance. He did not claim the crown of France when his brother died in 898; but recognizing the supremacy of the Carolingian king, Charles III., the Simple, he was confirmed in his offices and possessions, after which he continued to defend northern France from the attacks of the Normans. The peace between the king and his powerful vassal was not seriously disturbed until about 921. The rule of Charles, and especially his par- tiality for a certain Hagano, had aroused some irritation; and, supported by many of the clergy and by some of the most powerful of the Frankish nobles, Robert took up arms, drove Charles into Lorraine, and was himself crowned king of the Franks at Reims on the 29th of June 922. Collecting an army, Charles marched against the usurper, and on the 15th of June 923, in a stubborn and sanguinary battle near Soissons, Robert was killed, according to one tradition in single combat with his rival. Robert left a son, Hugh the Great, duke of the Franks, and his grandson was Hugh Capet, king of France.

See F. Lot, Les Verniers Carolingiens (Paris, 1891) ; and E. Lavisse, Histoire de France, tome ii. (Paris, 1903).

ROBERT II. (c. 970-1031), king of France, was a son of Hugh Capet, and was born at Orleans. He was educated at Reims under Gerbert, afterwards Pope Silvester II. As the ideal of medieval Christianity he won his surname of ” Pious ” by his humility and charity, but he also possessed some of the qualities of a soldier and a statesman. His father associated him with himself in the government of France, and he was crowned in December 987, becoming sole king on Hugh’s death in October 996. Robert’s reign is chiefly remembered for its dramatic side. In 988 he had married Rosala, or Susanna, widow of Arnold II., count of Flanders. This lady,

however, was much older than Robert, who repudiated her in 989, fixing his affections upon Bertha, daughter of Conrad the Peaceful, king of Burgundy, or Aries, and wife of Eudes I., count of Blois; and although the pair were related, and the king had been godfather to one of Bertha’s children, they were married in 996, a year after the death of Eudes. Pope Gregory V., whose favour Robert vainly sought to win by allowing Arnulf, the imprisoned archbishop, to return to his see of Reims and forcing Gerbert to flee to the court of the emperor Otto III., excommunicated the king, and a council at Rome imposed a seven years’ penance upon him. For five years the king braved all anathemas, but about 1002 he gave up Bertha and married Constance, daughter of a certain Count William, an intriguing and ambitious woman, who made life miserable for her husband, while the court was disturbed by quarrels between the partisans of the two queens. Still attached to Bertha, Robert took this lady with him to Rome in 1010, but the pope refused to recognize their marriage, and the king was forced to return to Constance. By this wife Robert had four sons, and in 1017, the eldest of these, Hugh, (1007-1025), was crowned as his father’s colleague and successor. After Hugh’s death the king procured the coronation of his second son, Henry, duke of Burgundy, afterwards king of France, a proceeding which displeased Constance, who wished her third son, Robert (d. 1075), afterwards duke of Burgundy, to receive the crown. Robert’s concluding days were troubled by a rising on the part of these two sons, and after a short war, in which he was worsted, the king died at Melun on the 20th of July 103 1. The notable gain to France during this reign was the duchy of Burgundy, which Robert claimed on the death of his uncle, Duke Henry, in 1001. The other claimant, however, Otto William, count of upper Burgundy, or Franche Comte, offered so stubborn a resistance that it was not until 1015 that the king secured the duchy, which he gave as an apanage to his son Henry. Nevertheless, Robert himself kept a close

oversight over its government, and this was one reason which led to the revolt of his sons in 1030. Owing to family quarrels, he could not prevent the kingdom of Burgundy, or Aries, from passing into the hands of the emperor Conrad II., and no serious results followed his interference in Flanders or in Lorraine. Robert added to the royal domains, and was greatly aided by the support of Richard II. and Richard III., dukes of Normandy, the latter of whom was his son-in-law.

His life was written by his chaplain, Helgaud, and this panegyric, Epitoma vitae Roberti regis, is published by J. P. Migne in the Patrologia Latina, tome cxli. (Paris, 1844). See also C. Pfister, Etudes sur le regne de Robert le Pieux (Paris, 1885) ; and E. Lavisse, Histoire de France, tome ii. (Paris, 1901).

ROBERT (1275-1343), king of Naples, was the son of Charles II., duke of Anjou and king of Naples, and in his youth took part in several expeditions to Sicily with the object of wresting the island from Frederick III. of Aragon. But his efforts, like those of his father and grandfather, proved fruitless, and the Angevins were compelled at last to agree to the peace of Caltabellotta (1302). On the death of Charles in 1309 Robert succeeded to the throne, although his nephew Caroberto (Carlo Roberto), son of his elder brother Charles Martel, who had died before his father, had a prior claim. He was crowned by Pope Clement V. at Avignon, and on the descent into Italy of the emperor Henry VII. was appointed papal vicar in Romagna to resist the imperialists; thenceforth he became the recognized leader of the Guelph*s or papal faction in Italy and took part in all the wars against the Ghibellines. On various occasions he obtained for himself or his sons the suzerainty over Rome, Florence, and other cities, and was regarded as the most powerful Italian prince of his day. Pope John XXII. created him papal vicar in Italy against the emperor Louis the Bavarian. In 1320 Robert summoned his kinsman Philip V. of France to Italy, and he waged war against Sicily once more from 1325 to 1341, but failed to drive out the Aragonese. He died in 1343, just as he was about to lead another expedition to the island. Robert was a man of learning, devoted to

literature, and a generous patron of literary men: he be- friended the poet Petrarch, who admired the king so greatly as to express the wish to see him lord of all Italy; while Boccaccio celebrated the virtues and

charms of Robert's natural daughter Maria, under the name of Fiammetta. Dante was perhaps too severe on Robert, whom he described as a re da sermone (word king), and contemporary critics accused him of covetous- ness, a fault partly excused by his pressing need of money to pay the expenses of his perpetual wars. In spite of his power and influence, his position as a leader of the Guelphs was greatly shaken during the latter years of his reign, while at home he was never able completely to subjugate his rebellious barons.

See G. Villani, Cronache; M. Murena, Vita di Roberto d'Angib, re di Napoli (Naples, 1770); and Archivio storico Siciliano (1884, viii. 511 seq.).

ROBERT, the name of two dukes of Normandy.

Robert I. (d. 1035), called Robert the Devil, was the younger son of Richard II., duke of Normandy (d. 1026), who bequeathed to him the county of Exmes. In 1028 he succeeded his brother, Richard III., whom he was accused of poisoning, as duke of Normandy. His time was mainly spent in fighting against his rebellious vassals. At his court Robert sheltered the exiled English princes, Edward, afterwards King Edward the Confessor, and his brother Alfred, and fitted out a fleet for the purpose of restoring them to their inheritance, but this was scattered by a storm. When returning from a pilgrimage to Jerusalem, he died at Nicaea on the 22nd of July 1035. His successor as duke was his natural son, William the Conqueror, afterwards king of England. In addition to winning for him his surname, Robert's strength and ferocity afforded material for many stories and legends, and he is the subject of several poems and romances (see Robert the Devil below).

Robert II. (c. 1054-1134) was the eldest son of William the Conqueror. Although recognized in boyhood as his father's successor in Normandy, he was soon dissatisfied with his position, and about 1078, following a quarrel between his brothers and himself, he revolted. He was obliged to fly from his own country, but after a period of exile he returned, raised some troops, and began to harry the duchy, wounding his father during a skirmish at Gerberoi early in 1079. He was, however, quickly forgiven, and passed two or three years in England and in Normandy until 1083, when he entered upon a second term of exile. When the Conqueror died in September 1087 Robert became duke of Normandy, but not king of England; although he received offers of help, he took no serious steps to displace his younger brother, King William II. In Normandy his rule was weak and irresolute. He lost the county of Maine, which for some years had been united with Normandy, and he was soon at variance with his brothers, the

younger of whom, Henry, he seized and put into prison. In 1089 his duchy was invaded by William II., who soon made peace with Robert, the two agreeing to dispossess their brother Henry of his lands in Normandy. This peace lasted until 1094, when occasions of difference again arose and another struggle began, Robert being aided by King Philip I. of France.

This warfare ended in 1096, when Robert set out on the first crusade, having raised money for this purpose by pledging his duchy to William for 10,000 marks. With his followers he journeyed to Constantinople; then he took part in the siege of Nicaea, the battle of Dorylaeum, and the famous battle under the walls of Antioch in June 1098. He shared in the siege of Jerusalem and other exploits of the crusade, while one account says that he was offered and refused the crown of the new Latin kingdom. Having won a great reputation both for valour and for generosity, the duke left Palestine and arrived in Normandy in September 1 100.

William Rufus died while Robert was on his homeward way, and in Italy the Norman duke was greeted as king of England; but when he reached Normandy he learned that the English throne was already in the possession of Henry I. In July 1101 he crossed over to England, intending to contest his brother's title, but Henry met him near Alton, in Hampshire,

and an amicable arrangement was made between them. Having received presents and the promise of a pension, Robert went quietly home. But the fraternal strife was not allayed. Henry had interests in Normandy in addition to the county of Evreux, which Robert ceded to him about 1102. Visits were exchanged, but no lasting peace was made, and in 1106 the English king crossed over to Normandy, where Robert was in great ex- tremities. At the battle of Tinchebrai, fought on the 28th of September 1106, Henry took his brother prisoner and carried him to England. For twenty-eight years the unfortunate duke was a captive, first in the Tower of London, and later in the castles of Devizes and Cardiff, but the evidence goes to show that he was not treated with cruelty. He died probably at Cardiff on the 10th of February 1134. Robert had a son, William, called the Clito, and several natural children. He was called Curthose, and also Gambaron, his figure being short and stout. Although wanting in decision of character, he was a skilled and able warrior, and the chroniclers tell many stories, some of them obviously legendary, of his exploits in the Holy Land.

The chief sources for the life of Robert II. are Ordericus Vitalis,

William of Malmesbury and other chroniclers of the time. See E. A. Freeman, History of the Norman Conquest (1870-76), and The Reign of Rufus (1882).

ROBERT GUISCARD [i.e. ” the resourceful “] (c. 1015-1085), the most remarkable of the Norman adventurers who con- quered southern Italy. From 1016 to 1030 the Normans were pure mercenaries, serving either Greeks or Lombards, and then Sergius of Naples, by installing the leader Rainulf in the fortress of Aversa in 1030, gave them their first pied-ii- terre and they began an organized conquest of the land. In 1030 there arrived William and Drogo, the two eldest sons of Tancred of Hauteville, a petty noble of Coutances in Normandy. The two joined in the organized attempt to wrest Apulia from the Greeks, who by 1040 had lost most of that province. In 1042 Melfi was chosen as the Norman capital, and in September of that year the Normans elected as their count William “Iron Arm,” who was succeeded in turn by his brothers Drogo, ” comes Normannorum totius Apuliae et Calabriae,” and Humfrey, who arrived about 1044. In 1046 arrived Robert, the sixth son of Tancred of Hauteville. His tall stature, blonde colouring and powerful voice are strikingly described by Anna Comnena.

Guiscard soon rose to distinction. The Lombards turned against their allies and Leo IX. determined to expel the Norman freebooters. The army which he led towards Apulia in 1053 was, however, overthrown at Civitate on the Fortore by the Normans united under Humfrey, Guiscard and Richard of Aversa. In 1057 Robert succeeded Humfrey as count of Apulia and, in company with Roger his youngest brother, carried on the conquest of Apulia and Calabria, while Richard conquered the principality of Capua. The Papacy, foreseeing the breach with the emperor over investitures, now resolved to recognize the Normans and secure them as allies. There- fore at Melfi, on the 23rd of August 1059, Nicholas II. invested Robert with Apulia, Calabria, and Sicily, and Richard with Capua. Guiscard ” by Grace of God and St Peter duke of Apulia and Calabria and future lord of Sicily ” agreed to hold by annual rent of the Holy See and to maintain its cause. In the next twenty years he made an amazing series of con- quests. Invading Sicily with Roger, the brothers captured Messina (1061) and Palermo (1072). Bari was reduced (April 107 1) and the Greeks finally ousted from southern Italy. The territory of Salerno was already Robert’s; in December 1076 he took the city, expelling its Lombard prince Gisulf, whose sister Sikelgaita he had married. The Norman attacks on Benevento, a papal fief, alarmed and angered Gregory VII., but pressed hard by the emperor, Henry IV., he turned again to the Normans, and at Ceprano (June 1080) reinvested Robert,

securing him also in the southern Abruzzi, but reserving Salerno. Guiscard's last enterprise was his attack on the Greek Empire, a rallying ground for his rebel vassals. He

contemplated seizing the throne of the Basileus and took up the cause of Michael VII., who had been deposed in 1078 and to whose son his daughter had been betrothed. He sailed with 16,000 men against the empire in May 1081, and by February 1082 had occupied Corfu and Durazzo, defeating the emperor Alexis before the latter (October 1081). He was, how- ever, recalled to the aid of Gregory VII., besieged in San Angelo by Henry IV. (June i'o83). Marching north with 36,000 men he entered Rome and forced Henry to retire, but ail 6meute of the citizens led to a three days' sack of the city (May 1084), after which Guiscard escorted the pope to Rome. His ■ son Bohemund, for a time master of Thessaly, had now lost the Greek conquests. Robert, returning to restore them, occupied Corfu and Kephalonia, but died of fever in the latter on the 15th of July 1085, in his 70th year. He was buried in S. Trinita at Venosa. Guiscard was succeeded by Roger " Borsa," his son by Sikelgaita; Bohemund, his son by an earlier Norman wife Alberada, being set aside. At his death Robert was duke of Apulia and Calabria, prince of Salerno and suzerain of Sicily. His successes had been due not only to his great qualities but to the " entente " with the Papal See. He created and enforced a strong ducal power which, however, was met by many baronial revolts, one being in 1078, when he demanded from the Apulian vassals an " aid " on the betrothal of his daughter. In conquering such wide territories he had little time to organize them internally. In the history of the Norman kingdom of Italy Guiscard remains essentially the hero and founder, as his nephew Roger II. is the statesman and organizer.

The best modern authorities are F. Chalandon, Histoire de la domination normande en Italie et en Sicile (Paris, 1907), and L. von Heinemann, , Geschichte der Normannen in Unteritalien (Leipzig, 1894). Contemporary authors: Amatus, Ystoire de li Normant, ed, Delarc (Rouen, 1892); Geoffrey Malaterra and William of Apulia, both in Muratori Rer. Ital. SS., vol. v., and Anna Comftena in Corpus script, hist. Byz. (Bonn, 1839). (E. Cu.)

ROBERT OF AUXERRE (c. 1156-1212), French chronicler, was an inmate of the monastery of St Marien at Auxerre. At the request of Milo de Trainel (1155-1202), abbot of this house, he wrote a

Chronicon, or universal history, which covers the period between the creation of the world and 1211. For the years previous to 1181 this is merely a compilation from Prosper of Aquitaine, Sigebert of Gembloux and others, but it is an original authority for the period from 1181 to 1211. It is one of the most valuable sources for the history of France during the reign of Philip Augustus, and it also contains infor- mation about other European countries, the Crusades and affairs' in the East. Molinier, in fact, describes the author as one of the best historians of the middle ages. Robert was evidently a man of great diligence and of sound judgment. Two continuators took the work down to 1228 and it was extensively used by later chroniclers. The original manu- script is now at Auxerre.

The Chronicon was first published by N. Camuzat at Troyes in 1608 ; the best edition is in Band xxvi. of the Monumenta Germaniae historica. Scriptores, with introduction by A. Holder – Egger. Robert has been identified, but on very questionable grounds, vvith a certain Robert Abolant, an official of the monastery of St Marien, who died in 1214. See A. Molinier, Les Sources de I'histoire de France, tomes iii. and iv. (1903-1904).

ROBERT OF COURTENAY (d. 1228), emperor of Romania, or Constantinople, was a younger son of the emperor Peter of Courtenay, and was descended from the French king, Louis VI., while his mother Yolande was a sister of Baldwin and Henry of Flanders, the first and second emperors of Constantinople. When it became known in France that Peter of Courtenay was dead, his eldest son, Philip, marquess of Namur, renounced the succession to the Latin empire of Constantinople in favour" of his brother Robert, who set out to take possession of his distracted inheritance, which was; then ruled by Conon of Bethune as regent. Crowned emperor on the 25th of March 1221. Robert, who was surrounded by enemies, appealed for help to the pope and to the king of France; but meanwhile his lands were falling into the hands of the Greeks. Some little

aid was sent from western Europe, but soon Robert was compelled to make peace with his chief foe, John Ducas Vataces, emperor of Nicaea, who was confirmed in all his conquests. Robert promised to marry Eudoxia, daughter of the late emperor of Nicaea, Theodore Lascaris I., a lady to whom he had been betrothed on a former occasion; however, he soon repudiated this engagement, and married a French lady, already the fiancee of a Burgundian gentleman. Heading a conspiracy, the Burgundian drove Robert from Constantinople, and early in 1228 the emperor died in Achaia.

ROBERT OF GLOUCESTER, English chronicler, is known only through his connexion with the work which bears his name. This is a vernacular history of England, from the days of the legendary Brut to the year 1270, and is written in rhymed couplets. The lines are of fourteen syllables, with a break after the eighth syllable. The author gives his name as Robert; the dialect which he uses, and his acquaintance with local traditions, justify the supposition that he was a monk of Gloucester. He describes, from his own recollections, the bad weather which prevailed in the neighbourhood of Evesham on the day of the battle between the Montfortians and Prince Edward (1265). He also alluded to the canonization of Louis IX. of France, which took place in 1297. He probably wrote about the year 1300. The earlier part of his chronicle (up to 1135) may be from another hand, since it occurs in some manuscripts in a shorter form, and with an exceedingly brief continua- tion by an anonymous versifier. There is no good reason for the theory that this part was translated from a French original; nor does it contain any undoubted borrowings from French sources. The authorities employed for the earlier part were Geoffrey of Monmouth, Henry of Huntingdon, William of Malmesbury, the English Chronicles, and some minor sources; Robert, in making his recension of it, also used the Brut of Layamon. From 1135 to 1256 Robert is still a compiler, although references to oral tradition become more frequent as he approaches his own time. From 1256 to 1270 he has the value of a contemporary authority. But he is more important to the philologist than to the historian. His chronicle is one of the last works written in Old English.

Robert's chronicle was first edited by T. Hearne (2 vols., Oxford, 1724); but this text is now superseded by that of W. Aldis Wright (2 vols., Rolls Series, 1887). Minor works attributed to the author are: a Life of St Alban in verse (MS. Ashmole 43); a Life of St Patrick, also in verse (MS. Tanner 17); a Life of St Bridget (MS. C.C.C. Cambridge, 145); and a Life of St Alphege (MS. Cmz., Julius D. ix). A Martyrdom of St Thomas Becket and a Life of St Brendan, both attributed to Robert, were printed by the Percy Society in 1845.

See T. D. Hardy's Descriptive Catalogue of MSS. i. 25, 68, iii. 181-9, 623; K. Brossman, XJber die Quellen der Chronik des R. von Gloucester (Striegau, 1887); W. Ellmer in Anglia (1888), x. I-37, 291-322; H. Strohmeyer, Der Stil der Reimchronik R. von Gloucester (Berlin, 1891). (H. W. CD.)

ROBERT OF JUMIlSGES (d. c. 1070), archbishop of Canter- bury, was a Norman who became prior of St Ouen at Rouen and then abbot of Jumieges. A close friend of the future king of England, Edward the

Confessor, he crossed over to England with Edward in 1042, and in 1044 became bishop of Lofidon. In English history Robert appears as the most trusted and the most prominent of the king's foreign friends, and as the leader of the party hostile to the influence of Earl Godwine. In 1051, although the chapter had already made an election, Edward appointed him archbishop of Canterbury. He seems to have been sent by the king on an errand to Duke William of Nor- mandy, and on the return of Godwine from exile in 1052 he fled in great haste from England. He was outlawed and deposed, and he died at Jumieges about 1070. The treatment of Robert by the English was put forward by William the Conqueror as a pretext for invading England.

See Two Saxon Chronicles, edited by J. Earle and C. Plummer (Oxford, 1892); and E. A. Freeman, History of the Norman Con- quest (Oxford, 1870-76).

ROBERT OF TORIGNI (c. 1110-1186), medieval chronicler, was prior of Bee in 1149, and in n 54 became abbot of Mont

St Michel, whence he is also sometimes called Robertus de Monte. He died, according to Potthast, on the 29th of May 1 186. He wrote additions and appendices to the chronicle of Sigebert of Genblours, covering the period a.d. 385-1100, and a chronicle in continuation of Sigebert, extending from 1 100 to 1 186, of great value for Anglo-Norman history. Robert was in a good position to obtain information, for the Mont St Michel was one of the four great centres of pilgrimage in Europe. But he was excessively timid and cautious, and hardly mentions events, like the murder of Becket, which were subjects of con- troversy. Besides, his style is that of the driest annalist. It is for continental affairs between 1154 and n 70 that his informa- tion is especially valuable. His notices of English affairs are slight and sometimes misleading.

The best modern editions are the Chronique de Robert de Torigni, 6fc, edited by Leopold Delisle for the Soc. de Vhistoire de Normandie (Rouen, 1872-1873), and Chronicle ofRobert of Torigni, edited, with an introduction, by Richard Howlett (Rolls Series, No. 82, iv. 11″ ”

ROBERT THE DEVIL, hero of romance. He was the son of a duke and duchess of Normandy, and by the time he was twenty was a prodigy of strength, which he used, however, only for outrage and crime. At

last he leamt from his mother, in explanation of his wicked impulses, that he was born in answer to prayers addressed to the devil. He was directed by the pope to a hermit, who imposed on him by way of penance that he should maintain absolute silence, feign madness, take his food from the mouth of a dog, and provoke ill-treat- ment from the common people without retaliating. He became court fool to the emperor at Rome, and delivered the city from Saracen invasions in three successive years in the guise of an unknown knight, having each time been bidden to fight by a celestial messenger. The emperor's dumb daughter recovered speech to declare the identity of the court fool with the deliverer of the city, but Robert refused the hand of the princess and the imperial inheritance, and ended his days in the hermitage of his old confessor.

The French romance of Robert le Diable is one of the oldest versions of the legend, and differs in detail from the popular tales printed in the 15th and 16th centuries. It was apparently founded on folk-lore, not on the wickedness of Robert Guiscard or any historical personage; but probably the name of Robert and the localization of the legend may be put down to the terror inspired by the Normans. In the English version the hero is called Sir Gowther, and the scene is laid in Germany. This metrical romance dates from the beginning of the 15th century, and is based, according to its author, on a Breton lay. The legend had undergone much change before it was used by E. Scribe and C. Delavigne in the libretto of Meyerbeer's opera of Robert le Diable.

See Robert le Diable, ed. E. Loseth (Paris, 1903, for the Soc. des anc. textes fr.) ; Sir Gowther, ed. K. Breul (Oppeln, 1886) ; M. Tardel, Die Sage v. Robert d. Teufel in neueren deutschen Dichtungen (Berlin, 1900). Breul's edition of the English poem contains an examination of the legend, and a bibliography of the literature dealing with the subject. The English prose romance of Robert the Devyll was printed (c. 1510) by Wynkyn de Worde.

ROBERT THE STRONG (\e Fort) (d. 866), count of Anjou and of Blois, is said by Richerus to have been the son of a certain Witichin, but nothing definite is known about his parentage or early life. Quickly attaining a prominent position among the Frankish nobles, he appears as rector of the abbey of Marmoutier in 852, and as one of Charles the Bald's missi dominici, in 853; but soon afterwards he was among those who rebelled against Charles, and invited the king's half- brother, Louis the German, to invade West Francia. How- ever, after the peace between Charles and Louis in 860 Robert came to terms with his sovereign, who made him count of Anjou and of Blois, and entrusted

him with the defence of that part of his kingdom which lay between the Seine and the Loire, a district which had suffered greatly from the ravages of the Normans and the Bretons. By his conduct in many stubborn fights with these foes, Robert thoroughly earned his surname and gained the confidence of the king, who gave him

the counties of Nevers and Auxerre. He was killed in battle at Brissarthe in October 866, leaving two sons, Odo, or Eudes, and Robert, both of whom became kings of the Franks. Robert has been compared to the Maccabees, and the fact that he was the ancestor of the Capetian kings of France has invested him with historical importance.

See K. von Kalekstein, Robert der Tapfere (Berlin, 1871); and E. Favre, Eudes, comte de Paris et roi de France (Paris, 1893).

ROBERT, HUBERT (1753-1808), French artist, born at Paris in 17 53, deserves to be remembered not so much for his skill as a painter as for the liveliness and point with which he treated the subjects he painted. The contrast between the ruins of ancient Rome and the life of his time excited his keenest interest; and, although he had started for Italy on his own responsibility, the credit he there acquired procured him the protection of the minister Marigny and an official allowance. His incessant activity as an artist, his daring character, his many adventures, attracted general sympathy and admiration. In the fourth canto of his L' Imagination Delille celebrated Robert's miraculous escape when lost in the catacombs; later in life, when imprisoned during the Terror and marked for the guillotine, by a fatal accident another died in his place and Robert lived. The quantity of his work is immense; the Louvre alone contains nine paintings by his hand and specimens are frequently to be met with in provincial museums and private collections. Robert's work has more or less of that scenic character which justified his selection by Voltaire to paint the decorations of his theatre at Ferney. Robert died of apoplexy on the 15th of April 1808. His work was much engraved by the abbe Le Non, with whom he had visited Naples in the company of Fragonard during his early days; in Italy his work has also been frequently reproduced by Chatelain, Lienard, Le Veau, and others.

See C. Blanc, Hist, des peintres; Villot, Notice des tableaux du Louvre ; Jjilius Meyer, Gesch. mod. fr. Malerei.

ROBERT, LOUIS LEOPOLD (1794-1835), French painter, was born at Chaux de Fonds (Neuchatel) in Switzerland on the 13th of May 1794, but left his native place with the engraver Girardet at the age of

sixteen for Paris. He was on the eve of obtaining the grand prix for engraving when the events of 181 5 blasted his hopes, for Neuchatel was restored to Prussia, and Robert was struck off the list of competitors as a foreigner. Whilst continuing his studies under Girardet he had never ceased to frequent the studio of David, and he now determined to become a painter, and only returned to his native country when his master himself was exiled. At Neuchatel he attracted the notice of Roullet de Mezerac, who enabled him by a timely loan to proceed to Rome. In depicting the customs and life of the people, of southern Italy especially, he showed peculiar feeling for the historical characteristics of their race. After executing many detached studies of Italian life Robert conceived the idea of painting four great works which should represent at one and the same time the four seasons in Italy and the four leading races of its people. In the " Return from the Fete of the Madonna dell' Arco " (Louvre) he depicted the Neapolitans and the spring. This picture, exhibited at the Salon of 1827, achieved undoubted success and was bought for the Luxem- bourg by Charles X.; but the work which appeared in 1831 — the " Summer Reapers arriving in the Pontine Marshes " (Louvre), which became the property of Louis Philippe — established the artist's reputation. Florence and her autumn vineyards should now have furnished him with his third subject. He attempted to begin it, but, unable to conquer his passion for Princess Charlotte Napoleon (then mourning the violent death of her husband, Robert's devoted friend), he threw up his work and went to Venice, where he began and carried through the fourth of the series, the " Fishers of the Adriatic." This work was not equal to the " Reapers." Worn by the vicissitudes of painful feeling, and bitterly discouraged, Robert committed suicide before his easel on the 20th of March 1835, on the tenth anniversary of the melancholy suicide of a brother to whom he had been much attached.

See Villot, Notice des tableaux du Louvre; C. Blanc, Hist, des peintres; Feuillet de Conches, Correspondance de L. L. Robert; Julius Meyer, Gesch. mod. Jr. Malerei.

ROBERT-FLEURY, JOSEPH NICOLAS (1797-1890), French painter, was born at Cologne. He was sent by his family to Paris, and after travelling in Italy returned to France and made his first appearance at the Salon in 1824; his reputa- tion, however, was not established until three years later, when he exhibited " Tasso at the Convent of St Onophrius." En- dowed with a vigorous original talent, and with a

vivid imagina- tion, especially for the tragic incidents of history, he soon rose to fame, and in 1850 succeeded Granet as member of the Academie des Beaux-Arts. In 1855 he was appointed professor and in 1863 director of the Ecole des Beaux- Arts, and in the following year he went to Rome as director of the French Academy in that city. Among his chief works are: ” A Reading at Mme. de Sevigne’s,” ” Scene of St Bartholomew,” ” Henry IV. taken to the Louvre after his Assassination ” (1836); “Triumphal Entry of Clovis at Tours” (1838), at the Versailles Museum; ” Le Colloque de Poissy ” (1840), at the Luxembourg Museum in Paris; ” The Children of Louis XVI. in the Temple” (1840); “Marino Faliero “; “An Auto-da-fe,” ” Galileo before the Holy Office,” at the Luxem- bourg Museum; ” Christopher Columbus received by the Spanish Court ” (1847), at the same gallery; ” The Last Moments of Montaigne” (1853);’ and “Charles V. in the Monastery of Yuste ” (1857). He died in Paris in 1890.

His son, Tony Robert-Fleury (1837-), French painter, was born in Paris, and studied under his father and under Delaroche and Leon Coignet. His first picture at the Salon, in 1866, was a large historical composition of the ” Warsaw Massacres on April 8, 1861.” In the following year his ” Old Women in the Place Navone, Rome ” was bought for the Luxembourg Museum, as was also the ” Last Day of Corinth ” in 1870. In 1880 he painted a ceiling for the Luxembourg, representing ” The Glorification of French Sculpture.” Tony Robert-Fleury became president of the Societe des Artistes francais in succession to Bouguereau. He acquired a great reputation for his historical compositions and portraits; and from his atelier have issued a great number of the best-known painters of our day.

ROBERTS, DAVID (1796-1864), Scottish painter, was born at Stockbridge, Edinburgh, on the 24th of October 1796. He was apprenticed by his father, a shoemaker, for seven years to a painter and house-decorator; and during this time he em- ployed his evenings in the study of art. In 1820 he formed the acquaintance of Clarkson Stanfield, then painting at the Pan- theon, Edinburgh, at whose suggestion he sent three pictures in 1822 to the Exhibition of Works by Living Artists, held in Edinburgh. In the same year he removed to London, where he worked for the Coburg Theatre, and was afterwards employed, along with Stanfield, at Drury Lane. In 1824 he exhibited at the British Institution a view of Dryburgh Abbey, and sent two works to the first exhibition of the Society of British Artists, of which he was elected president in 183 1. In the same autumn he visited Normandy, and the works which were the results of this excursion began to lay the founda- tion of the artist’s reputation — one of them, a view of Rouen Cathedral, being sold for eighty guineas. His scenes

for an opera, The Seraglio, executed two years later, and the scenery for a pantomime dealing with the naval victory of Navarino, and two panoramas executed jointly by him and Stanfield, were among his last work for the theatres. In 1829 he exhibited the ” Departure of the Israelites from Egypt,” in which his style first becomes apparent; three years afterwards he travelled in Spain and Tangiers, returning in the end of 1833 with a supply of effective sketches, elaborated into attractive and popular paintings. His ” Interior of Seville Cathedral ” was exhibited in the British Institution in 1834, and sold for £300; and he executed a fine series of Spanish illustrations for the Landscape Annual of 1836, while in 1837 a selection of his Picturesque Sketches in Spain was reproduced by lithography.

In 1838 Roberts made a long tour in the East, and accumulated a vast collection of sketches of a class of scenery which had hitherto been hardly touched by British artists, and which appealed to the public with all the charm of novelty. The next ten years of his life were mainly spent in elaborating these materials. An extensive series of drawings was litho- graphed by Louis Haghe in Sketches in the Holy Land and Syria, 1842-1849. In 1851, and again in 1853, Roberts visited Italy, painting the ” Ducal Palace, Venice,” bought by Lord Londesborough, the ” Interior of the Basilica of St Peter’s, Rome,” ” Christmas Day, 1853,” and ” Rome from the Convent of St Onofrio,” presented to the Royal Scottish Academy. His last volume of illustrations, Italy, Classical, Historical and Pictu- resque, was published in 1859. He also executed, by command of Queen Victoria, a picture of the opening of the Great Exhibition of 1851. In 1839 he was elected an associate and in 1841 a full member of the Royal Academy; and in 1858 he was pre- sented with the freedom of the city of Edinburgh. The last years of his life were occupied with a series of views of London from the Thames. He had executed six of these, and was at work upon a picture of St Paul’s Cathedral, when, on the 25th November 1864, he died suddenly of apoplexy.

A Life of Roberts, compiled from his journals and other sources by James Ballantine, with etchings and pen-and-ink sketches by the artist, appeared in Edinburgh in 1866.

ROBERTS, FREDERICK SLEIGH ROBERTS, Earl (1832-), British soldier, second son of General Sir Abraham Roberts, G.C.B., was born at Cawnpore, India, on the 30th of September 1832. Educated at Eton, Sandhurst and Addis- combe, he obtained a commission in the Bengal Artillery on 12th December 1851. In the following year he was posted to a field battery at Peshawar, where he also acted as aide-de- camp to his father, who commanded the Peshawar division. In 1856 Roberts

was appointed to the quartermaster-general's department of the staff, in which he remained for twenty-two years, passing from one grade to another until he became quartermaster-general in India. On the outbreak of the Mutiny in 1857, Roberts, at first, was staff officer to the movable column operating against the mutineers in the Punjab, suc- cessively commanded by Colonels Neville Chamberlain and John Nicholson, but, towards the end of June, he joined the Delhi Field Force, and was deputy assistant quartermaster- general with the artillery during the operations against Delhi. He was wounded in the fight of the 14th of July, but was sufficiently recovered in September to take command as a regimental officer of the left half of No. 2 Siege Battery during the siege. He rejoined the headquarters staff for the assault, and took part in the storm and subsequent seven days' fighting in the city. He then accompanied Colonel Greathed's column to Cawnpore, and during September and October was present at the actions of Bulandshahr, Aligarh, Agra, Bithur and Kanauj. He served under Sir Colin Campbell at the second relief of Lucknow in November, at the battle of Cawnpore on the 6th of December, and the subsequent pursuit and defeat of the Gwalior contingent near Shinrajpur. Roberts dis- tinguished himself at the engagement of Khudaganj, on the 2nd of January 1858, by capturing, in single-handed combat, a standard from two sepoys, and also by cutting down a sepoy about to kill a sowar. For these acts of gallantry he was recommended for the Victoria Cross. He was present at the reoccupation of Fatehgarh on the 6th of January, the storm of Mianganj in February, the siege and capture of Lucknow in March, and the action at Kursi on the 22nd of that month, after which he went home on sick leave. For his services in the Mutiny he was seven times mentioned in despatches, received the medal with three clasps, the Victoria Cross, and on his promotion to captain, in October i860, a brevet majority. On the 17th of May 1859 he married, at Waterford, Miss Nora Bews, and on his return to India was entrusted with the organiza- tion of the viceroy's camps during the progresses through Oudh, the North-West Provinces, the Punjab and Central India in i860 and 1861. In December 1863 he took part, under

Major-General Garvock, in the Umbeyla campaign among the mountains to the north of Peshawar, and was present at the storm of Lalu, the capture of Umbeyla, and the destruction of Mulka, receiving for his services the medal and clasp.

In 1867 Roberts was appointed assistant quartermaster- general to Sir Donald Stewart's Bengal Brigade for Abyssinia. He showed judgment in embarking each unit complete in every detail, instead of despatching camp equipage in one ship, transport in another, and so on, as was customary. He arrived at Zula, Annesley Bay, in the Red Sea, the base of the expedition, on the 3rd of February 1868, and remained there as senior base staff officer during the four months' campaign. At its close he superintended the re-embarkation of the whole army. His duties were so well performed that Sir Robert Napier sent him home with his final despatches. He was three times " mentioned," and received a brevet lieutenant-colonelcy and the war medal. He returned to India the following year as first assistant quartermaster-general. In the autumn of 1871 he made the arrangements for the expedition into Lushai, between south-east Bengal and Burma, fitted out two columns under Brigadiers-General Bourchier and Brownlow, and himself accompanied the first. A road, over 100 m. long, was cut through dense gloomy forests in stifling heat, and the column was attacked by cholera; but the object of the expedition was successfully accomplished, and Roberts, who was present at the capture of the Kholel villages and the action in the Northlang range, and commanded the troops at the burning of Taikum, was mentioned in despatches and made a Companion of the Bath. Qn his return in March 1872, he became deputy quartermaster-general in Bengal, and in 1875 quartermaster- general and colonel. He settled the details of the great camp of exercise at Delhi on the occasion of the visit of the prince of Wales in January 1876, and attended H.R.H. at the man- oeuvres. He also superintended the arrangements for the great durbar at Delhi on the 1st of January 1877, when Queen Victoria was proclaimed empress of India.

In 1878 Roberts was appointed to the command of the Frontier Field Force at Abbottabad, in Hazara; but in the autumn, on ■> the repulse of the Chamberlain Mission by the Afghans, and the formation of three columns to advance into Afghanistan by the Khyber, the Bolan and the Kurram passes, he was given the command of the Kurram Field Force, with the rank of major-general. Concentrating his column at Thai, he advanced to Kurram towards the end of November, and having formed an advanced base there, moved on to Habib Kila. Under cover of preparations for a front attack on the Peiwar Kotal, he reconnoitred that formidable position, and on the night of the 1st of December moved part of his force to attack the Spingawi Kotal, in order to turn the Afghan left flank, leaving the remainder of the force to feign a front attack on the Peiwar* and to= guard the camp. After a very difficult night march the Spingawi Kotal was carried at

daybreak on the 2nd, and, later, the Afghans on the Peiwar Kotal, threatened in rear, abandoned the position. The next morning Roberts occupied the Peiwaf, and on the 6th advanced to Ali Khel. He reconnoitred the Shutargardan and the Sapari passes, and made a strong reconnaissance through Khost, in which some fighting took place, and at the end of January returned to Hagir Pir, in Kurram, where his force remained in occupation. In July Major Cavagnari, the British envoy to the new amir, Yakub Khan, passed through Kurram on his way to Kabul, and, shortly afterwards, Roberts left his Kurram command and went to Simla to take his seat on the army commission, where he strongly advocated the abolition of the three Presi- dency armies, and the substitution for them of four army eorps, a measure which was carried out sixteen years later. While he was at Simla, news arrived on the 5th of September of the murder of Cavagnari and his companions at Kabul. The Peshawar Valley Force had been broken up; Sir Donald Stewart was still at Kandahar, but most of his troops had started for India; Roberts, therefore, had the only force ready to strike rapidly at Kabul. It was hastily reinforced, and he

hurried back to Kurram to take command, as a lieutenant- general, of the Kabul Field Force (7500 men and 22 guns). By the 19th of September a brigade was entrenched on the Shutargardan, and as Roberts advanced, the Amir Yakub Khan came into his camp. An Afghan force of 8000 men blocked the way in a strong position on the heights beyond Charasia, and on the 6th of October Roberts repeated the tactics that had done him such good service at the Peiwar in the previous year, and sending Brigadier-General T. D. Baker with the greater part of his force to turn the Afghan, right flank, threatened the pass in front with the remainder. By the afternoon Baker had seized the position, and the enemy, severely defeated, were in full retreat. Kabul was occupied without further opposition.

The city was spared, but punishment was meted out to those convicted of complicity in the murder of the British Mission. Yakub Khan abdicated on the 12th of October, and was eventually deported to India. The troops occupied the Sherpur cantonments; but in November a religious war was proclaimed by the Mullahs, and early in December, in order to prevent a threatening combination of Afghan tribes against him, Roberts moved out two columns to attack them in detail. After considerable fighting around Kabul, the numbers of the enemy were so great that he was forced to concentrate his troops again at Sherpur, the defences of which had been greatly improved and strengthened. Sherpur was invested by the enemy, and early on the 23rd of December was attacked by over 100,000 Afghans. They were driven off with great loss; and on making a second attempt to

storm the place, were met by Roberts, who moved out, attacked them in flank, and defeated them, when they broke and dispersed. Roberts now recommended the political dismemberment of Afghanistan, and negotiations were carried on with the northern tribes for the appointment of an amir for the Kabul district only. On the 5th of May Sir Donald Stewart arrived with his column from Kandahar and assumed the supreme command in Afghan- istan, Roberts retaining, under Stewart, the command of the two Kabul divisions, and organizing an efficient transport corps under Colonel R. Low, which was soon to be of inestimable value. On the 22nd of July Abdur Rahman was proclaimed Amir of Kabul; and Roberts was preparing to withdraw his troops to India by the Kurram route, when news arrived that a British brigade had been totally defeated at Maiwand on the 27th of July, and that Lieutenant- General Primrose was besieged in Kandahar. Roberts was ordered to proceed thither at once with a specially selected column of 10,000 troops and his new transport corps. He started on his famous march on the 9th of August and arrived at Kandahar on the morning of the 31st, having covered 313 miles in twenty-two days. On the following day he fought the battle of Kandahar and gained a complete victory. His services in the Afghan campaigns of 1878 to 1880 are recorded in eight Gazettes, and were recognized by the thanks of both Houses of Parliament, of the Government of India, and of the Governor-General in Council. He was created K.C.B., G.C.B. and a baronet, re- ceived the medal with four clasps and the bronze star, and was given the command of the Madras army.

Before proceeding to Madras, Roberts went home on furlough, and when the news of the disaster at Majuba Hill in South Africa arrived in London at the end of February 1881, he was appointed governor of Natal and commander-in-chief in South Africa. He arrived at Cape Town to find that peace had been made with the Boers, and that instructions were awaiting him to return home. The same year he attended the autumn manoeuvres in Hanover as the guest of the German emperor. He declined the post of quartermaster-general to the forces in succession to Sir Garnet Wolseley, and returned to India, arriving at Madras in November. The following year he visited Burma with the viceroy, and in 1885 attended the meeting between Abdur Rahnian and Lord Dufferin at Rawalpindi at the time of the Panjdeh incident, in connexion with which he had been nominated to the command of an army corps in

case of hostilities. In July he succeeded Sir Donald Stewart as commander-in-chief in India, and during his seven years' tenure of this high position instituted many measures for the benefit of the army, and greatly assisted the development of frontier communications and defence. At the end of 1886, at the request of the viceroy, he took personal command for a time of the forces in Burma, and organized measures for the suppression of dacoity. For his services he received the medal, was created G.C.I.E., and promoted supernumerary general. In 1890 he did the honours of the army to Prince Albert Victor at a standing camp at Muridki, and in 1801 his attention was occupied with the Zhob and Hunza Nagar frontier campaigns. On the 1st of January 1892 he was raised to the peerage as Baron Roberts of Kandahar and Waterford. In 1893 he left India for good, and the G. C.S.I, was bestowed upon him. He was promoted to be field-marshal in 189s, and in the autumn of that year succeeded Lord Wolseley in the Irish command and was sworn a privy councillor. AkQueen Victoria's diamond jubilee in 1897 he was created K.P.

After the disastrous actions in the Boer war in South Africa in December 1899 at Magersfontein, Stormberg and Colenso, where his only son was killed, Lord Roberts was sent out as commander-in-chief. He arrived at Cape Town on the 10th of January 1900, and after organizing his force, advanced with sound strategy on Bloemfontein, the capital of the Orange Free State, and soon changed the aspect of affairs. The sieges of Kimberley and Ladysmith were raised, and the Boer general, Cronje, flying towards the capital, was overtaken at Paardeberg and, after a fine defence, compelled to surrender, with 5000 men, on the anniversary of Majuba Day, the 27th of February 1900. Roberts entered Bloemfontein on the 13th of March, and after six weeks' preparation, advanced on Pretoria, the capital of the Transvaal. Mafeking was relieved on the :17th of May, and Pretoria occupied on the 5th of June. The two Boer states were annexed, and the wax gradually assuming a guerilla character, Roberts handed over the command to Lord Kitchener and returned to England to fill the office 6f commander-in-chief of the army in succession to Lord Wolseley.

He arrived in the Solent on the 2nd of January 1901, and the same day, at Osborne, had an audience of Queen Victoria, who handed him the insignia of the Order of the Garter. The next day he was received at Paddington by the prince and princess of Wales, and drove in procession to Buckingham Palace, where he was entertained as the guest of the queen. He again had an audience of' the queen at Osborne on the 14th of January On his elevation to an earldom, the last audience given by her majesty before her death, which took place

eight days later. When the German emperor came to London for the queen's funeral, he decorated Lord Roberts with the Order of the Black Eagle. Earl Roberts received the thanks of both Houses of Parliament and a grant of £100,000 for his services in South Africa. In 1905 he resigned his post on the Committee of National Defence, and devoted himself to attempting to rouse his countrymen to the necessity of cultivating rifle- shooting and of adopting systematic general military training and service. As an author he is known by his Rise of Wellington (1895), and his Forty-One Years in India (1897), an autobiography which has passed through numerous editions.

ROBERTSON, FREDERICK WILLIAM (1816-1853), English divine, known as Robertson of Brighton, was born in London on the 3rd of February 1816. The first five years of his life were passed at Leith Fort, where his father, a captain in the Royal Artillery, was then resident. The military spirit entered into his. blood, and throughout life he was characterized by the. qualities of the ideal soldier. In 1821 Captain Robertson retired to Beverley, where the boy was educated. At the age of fourteen he; spent a year at Tours, from which he returned to Scotland; and continued his education at the Edinburgh Academy and university. In 1834 he was articled to a solicitor in Bury St Edmunds, but the uncongenial and sedentary employment soon broke down his health. He was anxious for a military career, and his name was placed upon the list

of the 3rd Dragoons, then serving in India. For two years he worked hard in preparing for the army, but, by a singular conjunction of circumstances and at the sacrifice of his own natural bent to his father's wish, he matriculated at Brasenose College, Oxford, just two weeks before his commission was put into his hands. Oxford he did not find wholly congenial to his intensely earnest spirit, but he read hard, and, as he afterwards said, " Plato, Aristotle, Butler, Thucydides, Sterne, Jonathan Edwards, passed like the iron atoms of the blood into my mental constitution." At the same time he made a careful study of the Bible, committing to memory the entire New Testament both in English and in Greek. The Tractarian movement had no attraction for him, although he admired some of its leaders. He was at this time a moderate Calvinist in doctrine, and enthusiastically evangelical. Ordained in July 1840 by the bishop of Winchesterˆ he at once entered on ministerial work in that city, and during his ministry there and under the influence of the missionaries Henry Martyn and David Brainerd, whose lives he studied, he carried devotional asceticism to an injurious length. In less than a year he was compelled to seek relaxation; and going to Switzerland he there met and married Helen, third daughter of Sir George William Denys, Bart. Early in 1842, after

a few months' rest, he accepted a curacy in Cheltenham, which he retained for upwards of four years. The questioning spirit was first aroused in him by the disappointing fruit of evangelical doctrine which he found in Cheltenham, as well as by intimacy with men of varied reading. But, if we are to judge from his own statement in a letter from Heidelberg in 1846, the doubts which now actively assailed him had long been latent in his mind. The crisis of his mental conflict had just been passed in Tirol, and he was now beginning to let his creed grow again from the one fixed point which nothing had availed to shift: " The one great certainty to which, in the midst of the darkest doubt, I never ceased to cling— the entire symmetry and loveliness and the unequalled nobleness of the huma.nity of the Son of Man." After this mental revolution he felt unable to return to Cheltenham, but after doing duty for two months at St Ebbe's, Oxford, he entered in August 1847 on his famous ministry at Trinity Chapel, Brighton. Here he stepped at once into the foremost rank as a preacher, and his church was thronged with thoughtful men of all classes in society and of all shades of religious belief. His fine appearance, his flexible and sympathetic voice, his manifest sincerity, the perfect lucidity and artistic symmetry of his address, and the brilliance with which he illustrated his points would have attracted hearers even had he had. little to say. But he had much to say. He was not, indeed, a scientific theologian; but his in- sight into the principles of the spiritutal life was unrivalled. As his biographer says, thousands found in his sermons " a living source of impulse, a practical direction of thought, a key to many of the problems of theology, and above all a path to spiritual freedom." His closing years were full of sadness. His sensitive nature was subjected to extreme suffering, arising mainly from the opposition aroused by his sympathy with the revolutionary ideas of the 1848 epoch. Moreover, he was crippled by incipient disease of the brain, which at first in- flicted unconquerable lassitude and depression, and latterly agonizing pain. On the 5th of June 1853 he preached for the last time, and on the 15th of August he died.

' Robertson's published works include five volumes of sermons, two volumes of expository lectures, on Genesisˆand on the epistles to the Corinthians, a volume of miscellaneous addresses, and an Analysis of " In Memoriam." See Life and Letters by Stopford A. Brooke (1865).

. ROBERTSON, GEORGE CROOM (1842-1892), Scottish philosopher, was born at Aberdeen on the 10th of March 1842.. In 1857 he gained a bursary at Marischal College, and graduated MA. in 1861, with the highest honours in classics and philo- sophy. In the same year he won a Fergusson scholarship of £100 a year for two years, which enabled him to pursue his studies outside Scotland. He went first to University

College, London; at Heidelberg he worked at German; at Berlin he studied psychology, metaphysics and also physiology under du Bois-Reymond, and heard lectures on Hegel, Kant and the history of philosophy, ancient and modern. After two months at Gottingen, he went to Paris in June 1863. In the same year he returned to Aberdeen and helped Alexander Bain with the revision of some of his books. In 1864 he was appointed to help Professor Geddes with his Greek classes, but he gave up the vacations to philosophical work. In 1866 he was appointed professor of philosophy of mind and logic at University College, London. This post he retained until ill-health compelled him to resign a few months before his death in 1892. He lectured on logic, deductive and inductive, systematic psychology and ethical theory. He left little published work. A comprehensive work on Hobbes was never completed, though part of the materials were used for an article in the Encyclopaedia Britannica, and another portion was published as one of Blackwood's " Philosophical Classics." Together with Bain, he edited Grote's Aristotle, and was the editor of Mind from its foundation in 1876 till 1891. He was keenly interested in German philosophy, and took every opportunity of making German works on English writers known in the United Kingdom. In philosophy he followed mainly Mill and Bain, but he was acquainted with all philo- sophical literature. He was associated with his wife (a daughter of Mr Justice Crompton) in many kinds of social work; he sat on the Committee of the National Society for Women's Suffrage, and was actively associated with its pre- sident, John Stuart Mill. He warmly supported the admission of women students to University College.

ROBERTSON, JOSEPH (1810-1866), Scottish antiquary, was born at Aberdeen on the 17th of May 1810, the son of a small shopkeeper. He was educated in Marischal College in Aberdeen and was for some years engaged in literary and news- paper work there and in Glasgow and Edinburgh. In 1839 he helped to found the Spalding Club, organized to publish the historical, genealogical, topographical and literary remains of the north-eastern counties of Scotland, and he edited eight of its thirty-eight volumes. In 1853 he was appointed curator of the historical and antiquarian department of the General Register House, Edinburgh, hitherto a subordinate and un- important office, but which, in his hands, became of the first consequence to the interests of antiquarian literature in Scotland. His inventory of the personal property and jewels of Mary Queen of Scots, prefaced by a paper of great learning and research, and his essays on Scottish

architecture, preceded his greatest work, published by the Bannatyne Club (1866), Concilia Scotiae, Ecclesiae Scoticanae Statuta. In 1864 the University of Edinburgh conferred upon him the honorary degree of LL.D. He died on the 13th of December 1866.

ROBERTSON, THOMAS WILLIAM (1829-1871), English actor and dramatist, was born at Newark on the 9th of January 1829. As a dramatist he had a brief but very brilliant career. The son of a provincial actor and manager, chief of a ” circuit ” that ranged from Bristol to Cambridge, Robertson was familiar with the stage from his childhood; he was the eldest of a large family, the actress Margaret (Madge) Robertson (Mrs Kendal) being the youngest. His success came late. A farcical comedy by him, A Night’s Adventure, was produced at the Olympic under Farren’s management as early as 1851, but this did not make good his footing, and he remained for some years longer in the provinces, varying his work as an actor with miscellaneous contributions to newspapers. In i860 he went to London, and edited a mining journal to which he contributed a novel after- wards dramatized with the title Shadow Tree Shaft. He was at one time prompter at the Olympic under the management of Charles Mathews. He wrote a farce entitled A Cantab, which was played at the Strand Theatre in 1861. This brought him a reputation in a Bohemian clique, but so little practical assistance that he thought of abandoning the profession to become a tobacconist. Then, in 1864, came his first marked success, David Garrick, produced at the Haymarket with

Edward Sothern in the principal character. It was not, how- ever, till the production of Society at the Prince of Wales Theatre in 1865, under the management of Miss Marie Wilton, afterwards Mrs Bancroft, that the originality and cleverness of the dramatist were fully recognized. Play-writer and company were exactly suited one to another; the plays and the acting together — the small size of the playhouse being also in their favour — were at once recognized as a new thing. Although some critics sneered at the ” cup-and-saucer comedy,” voted it absurdly realistic, said there was nothing in it but commonplace life represented without a trace of Sheridanian wit and sparkle, all London nocked to the little house in Totten- ham Street, and the stage was at once inundated with imitations of the new style of acting and the new kind of play. Robertson, although his health was already undermined, rapidly followed up Society with a series of characteristic plays which made the reputation of himself, the company and the theatre. All his best known plays (except David Garrick) were written for the old Prince of Wales’s under the Bancrofts, and that regime is now an historical incident in the progress of the English stage. Ours was produced in 1866, Caste in

1867, Play in 1868, School in 1869, M.P. in 1870. Unhappily, Robertson enjoyed his success for but a short time. He died in London on the 3rd of February 1871. His work is notable for its masterly stagecraft, wholesome and generous humour, bright and unstrained dialogue, and high dramatic sense of human character in its theatrical aspects.

See Principal Dramatic Works of Robertson; with Memoir by his son (1889) ; and T. E. Pemberton, Life and Writings of Robertson (1893).

ROBERTSON, WILLIAM (1721-1793), Scottish historian, born at Borthwick, Mid Lothian, on the 19th of September 1721, was the eldest son of the Rev. William Robertson. He was educated at the school of Dalkeith and the university of Edinburgh. He was from the first intended for the ministry; in 1743 he was presented to the living of Gladsmuir in East Lothian, and two years later he lost both his father and his mother, who died within a few hours of each other. The support and education of a younger brother and six sisters then devolved upon him, though at that time his income was less than £100 a year. Robertson's inclination for study was never allowed to interfere with his duties as a parish minister, and his power as a preacher had made him a local celebrity while still a young man.

His energy and decision of character were brought out vividly by the rebellion of 174s- When Edinburgh seemed in danger of falling into the hands of the rebels he joined the volunteers in the capital. When the city was surrendered he was one of the small band who repaired to Haddington and offered their services to the commander of the royal forces. Such a man could not remain in obscurity, and in 1746 he was elected a member of the General Assembly, where his influence as leader of the " moderate " party was for many years nearly supreme (see Presbyterianism).

During all this period of prominent activity in the public life of Edinburgh, Robertson was busy with his historical labours. His History of Scotland, begun in 1753, was published in 1759. Till he had finished his book Robertson had never left his native country; but the publication of his history necessitated a journey to London, and he passed the early months of the year 1758 partly in the capital and partly in leisurely rambles in the counties of England. The success of the History of Scotland was immediate, and within a month a second edition was called for. Before the end of the author's life the book had reached its fourteenth edition; and it soon brought him other rewards than literary fame. In 1755 he was appointed chaplain of Stirling Castle, in 1761 one of His Majesty's chaplains in ordinary, and in 1762 he was chosen principal of the university of Edinburgh. In May

1763 he was elected Moderator of the General Assembly, and in August of the same year the office of king's historiographer was revived, in his favour with a salary of £200 a year.

The rest of Robertson's life was uneventful. His History of

the Reign of the Emperor Charles the Fifth occupied ten con- secutive years of labour. It appeared in three volumes quarto in 1769. In 1777 he published his History of America and in 1791 his Disquisition concerning the Knowledge which the Ancients had of India, which concluded his historical labours and ap- peared only two years before his death, which occurred near Edinburgh on the nth of June 1793. His fame had long been European, and he left no rival in the field of historical com- position save Gibbon alone.

For an adequate appreciation of Robertson's position in British literature, and more especially of his rank as an historian, we have to consider the country and the age in which he was born and his own personal qualities and limits. Considering the small size and poverty of the country, Scotland had made a more than creditable figure in literature in the great age of the Reformation and the Renaissance, and Scottish contribu- tions to British literature in the last half of the 18th century were distinctly superior to those produced in the southern portion of the island.

Of the three great British historians of the 18th century two were Scotsmen. The exact place of Robertson with regard to his two friends Hume and Gibbon, and to such historians as the rest of Europe had to offer, presents a question of some nicety, because it is complicated by extraneous considerations, so to speak, which should not weigh in an abstract estimate, but cannot be excluded in a concrete and practical one. If we regard only Robertson's potential historic power, the question is not so much whether he was equal to either of his two friends as whether he was not superior to both. The man who wrote the review of the state of Europe prefixed to the History of Charles V., or even the first book of the History of Scotland, showed that he had a wider and more synthetic conception of history than either the author of the Decline and Fall or the author of the History of England. These two portions of Robertson's work, with all their shortcomings in the eye of modern criticism, have a distinctive value which time cannot take away. He was one of the first to see the importance of general

ideas in history. He saw that the immediate narrative of events with which he was occupied needed a background of broad and connected generalizations, referring to the social state of which the detailed history formed a part. But he did more than this. In the appendix to the view of Europe called ” Proofs and Illustrations ” he enters into the difficult and obscure question of land tenure in Frankish times, and of the origin of the feudal system, with a sagacity and knowledge which distinctly advanced the comprehension of this period beyond the point at which it had been left by Du Bos, Montes- quieu and Mably. He was well acquainted with the original documents, — many of them, we may conjecture, not easy to procure in Scotland. It must have been a genuine aptitude for historical research of a scientific kind which led Robertson to undertake the labour of these austere disquisitions of which there were not many in his day who saw the importance. Gibbon, so superior to him for wide reading and scholarship, has pointedly avoided them. Robertson’s views are. now out of date. But he deserves the honour of a pioneer in one of the most obscure if also important lines of inquiry connected with European history. On the other hand, it must be admitted that he showed himself only too tame a follower of Voltaire in his general appreciation of the middle ages, which he regarded with the mingled ignorance and prejudice common in the 18th century. In this particular he was not at all in advance of his age.

The neglect and gradual oblivion which have overtaken the greater part of Robertson’s historical work are owing to no fault of his. He had not and could not have- the requisite materials: they were not published or accessible. Justice requires that we should estimate his performance in view of the means at his command, and few critics would hesitate to sub- scribe to the verdict of Buckle, ” that what he effected with his materials was wonderful.” His style is singularly clear, har- monious and persuasive. The most serious reproach made against it is that it is correct to a fault and lacks idiomatic vigour,

and the charge is not without foundation. But there can be no doubt that, if Robertson’s writings are less read than they formerly were, the fact is to be attributed to no defects of style but to* the growth of knowledge and to the immense extension of historical research which has inevitably superseded his initiatory and meritorious labours.

By his wife, Mary Nisbet, whom he married in 1751, Robert- son left three sons: William (1753-1835), who in 1805 was raised to the Scottish bench as Lord Robertson; James, who became a general in the British army; and David, who in 1799 married Margaret, sister of Colonel Donald Macdonald and heiress of Kinloch-Moidart, whose

surname he assumed.

There are lives of Robertson by Dugald Stewart (Edinburgh, 1 80 1 and 1802), prefixed to most of the collective editions of his works; by George Gleig, bishop of Brechin (Edinburgh, 1812); and by Lord Brougham in Lives of Men of Letters, &c. (1845-1846).

ROBERTSON, WILLIAM BRUCE (1820-1886), Scottish divine, was born at Greenhill, St Ninians, Stirlingshire, on the 24th of May 1820, and was educated at Glasgow University and at the Secession Theological Hall, Edinburgh, where he made the acquaintance of Thomas de Quincey, and on his recom- mendation went to Halle and studied under Tholuck. After travelling in Italy and Switzerland he was licensed to preach by the presbytery of Stirling and Falkirk in 1843, and was soon after ordained at the Secession (after 1847, the United Presby- terian) Church in Irvine, Ayrshire. In this charge he remained for 35 years, exercising from his pulpit a truly magnetic in- fluence, not so discernible in his published sermons. From 1871 his health failed, in spite of several visits to Florence and the Riviera. He resigned his charge in 1878 and died at Bridge of Allan on the 27th of June 1886.

He wrote many hymns, among them a version of ” Dies Irae “; several of them, together with letters, &c, are to be found in the Life by James Brown. A volume containing Robertson’s lectures on Martin Luther and other subjects was published in 1892.

ROBERVAL, GILLES PERSONNE (or Personier) DE (1602-1675), French mathematician, was born at Roberval, near Beauvais, on the 8th of August 1602. His name was originally Gilles Personne, that of Roberval, by which he is known, being taken from the place of his birth. Like Rene Descartes, he was present at the siege of La Rochelle in 1627. In the same year he went to Paris, where he was appointed to the chair of philosophy in the Gervais College in 1631, and two years later to the chair of mathematics in the Royal College of France. A condition of tenure attached to this chair was that the holder should propose mathematical questions for solution, and should resign in favour of any person who solved them better than himself; but, notwithstanding this, Roberval was able to keep the chair till his death, which occurred at Paris on the 27th of October 1675.

Roberval was one of those mathematicians who, just before the invention of the infinitesimal calculus, occupied their attention with problems which are only soluble, or can be most easily solved, by some method involving limits or infinitesimals, and in the solution of

which accordingly the calculus is always now employed. Thus he devoted some attention to the quadrature of surfaces and the cubature of solids, which he accomplished, in some of the simpler cases, by an original method which he called the ” Method of Indivisibles ” ; but he lost much of the credit of the discovery as he kept his method for his own use, while Bonaventura Cavalieri published a similar method which he himself had invented. Another of Rober- val’s discoveries was a very general method of drawing tangents, by considering a curve as described by a moving point whose motion is the resultant of several simpler motions. (See Infinitesimal Calculus.) He also discovered a method of deriving one curve from another, by means of which finite areas can be obtained equal to the areas between certain curves and their asymptotes. To these curves, which were also applied to effect some quadratures, Evangelista Torricelli gave the name of ” Robervallian lines.” Between Roberval and Descartes there existed a feeling of ill-will, owing to the jealousy aroused in the mind of the former by the criticism which Descartes offered to some of the methods employed by him and by Pierre de Fermat; and this led him to criticize and oppose the analytical methods which Descartes introduced into geometry about this time. As results of Roberval’s labours out- side the department of pure mathematics may be noted a work on the system of the universe, in which he supports the Copernican system and attributes a mutual attraction to all particles of matter;

and also the invention of a special kind of balance which goe$ by his name.

His works were published in 1693 by the Abb6 Gallois, in the Recueil of the Mimoires de FAcademie des Sciences.

See J. A. N. de C. Condorcet, Eloge de Roberval (Paris,’ 1773): J. E. Montucla, Histoire des mathematiques (1802).

ROBES (Fr. robe, Late Lat. roba, raupa, meaning (1) spoils, (2) robe, stuff, cf. Mod. Ital. roba, connected with a Teutonic root raup, raub, German rauben and English rob), the name generally given to a class of official costume, especially as worn by certain persons or classes on occasions of particular solemnity. According to Du Cange, the word robe was earliest used, in the sense of a garment, of those given by popes and princes to the members of their household or their great

officers. Thus Matthew Paris (Chron. Majora, Rolls Series, V. 38) tells how, in 1248, the pope gave to some Tatar envoys ” vestes pretiosissimas quas Robas vulgariter* appellamus, de escarleto praeelecto, cum pellibus et furruris,” with which Du Carige compares the ” f estiva indumenta” given, e.g., by King John magnatum suorum multitudini at Christmas time (1214, Matt. Paris, Rolls Series, II. 520) and the raubae papales scutiferorum, and the like, given by the popes to members of their households, after the fashion of a livery. It would, however, be perhaps going too far to assume that, e.g., peers’ robes were originally the king’s livery, for there seems to be no proof that this was the case; but it is curious that in most early cases where robes are mentioned, if not of cloth of gold, &c, they are of scarlet, furred. A robe is properly a long garment, and the term ” robes ” is now applied only in those cases where a long garment forms part of the official costume, though in ordinary usage it is taken to include all the other articles of dress proper to the costume in question. The term ” robes,” moreover, con- notes a certain degree of dignity or honour in the wearer. We speak of the king’s robes of state, of peers’ robe’s, of the robes of the clergy, of academic robes, judicial robes, municipal or civic robes; we should not speak of the robes, of a cathedral verger, though he too wears a long gown of ceremony, and it is even only by somewhat stretching the term “robes” that we can include under it the ordinary academical dress of the universities. In the case of the official costume of the clergy, too, a distinction must be drawn. The vestimenta sacra are not spoken of as ” robes “; a priest is not ” robed ” but ” vested ” for Mass; yet the rochet and chimere of an English bishop, even in church, are more properly referred to as robes than as vestments, and while the cope he wears in church is a vestment rather than a robe, the scarlet cope which is part of his parlia- mentary full dress is a robe, not a Vestment. For the sake of convenience the official, non-liturgical costume of the clergy is dealt with under the general heading Vestments and the subsidiary articles (e.g. Cope).

The coronation robes of emperors and kings, representing as they do the sacerdotal significance of Christian kingship, are essentially vestments rather than robes (see Coronation), Apart from these, however, are the royal robes of state; in the case of the king of England a crimson velvet surcoat and long mantle, fastened in front of the neck, ermine lined, with a deep cape or tippet of ermine. 1

The subject of official robes is too vast for any attempt to be made to deal with it comprehensively here. All countries, East and West, which boast an ancient civilization have re- tained them in greater or less degree, and the tendency it) modern times has been to multiply rather than to diminish their number. Even in republican France; they

survived the Revolution, at least in the universities and the law courts. But nowhere has custom been so conservative in this matter as in the United Kingdom, where in this as in other matters the wise Machiavellian principle has been followed of changing

1 For the sovereign's coronation robes, see " The King's Coronation Ornaments," by W. St John Hope, in The Ancestor, vols. i. and ii., also L. Wickham Legg, English Coronation Records, 1901. The " parliamentary robes " used to be of crimson or purple velvet, furred with ermine. See the above, also the inventories of the wardrobes of sovereigns, &c

the substance of institutions without altering their outward semblance. The present article, then, does not attempt to deal with any but British robes, 2 under the headings of (1) peers' robes, (2) robes in the House of Commons, (3) robes of the Orders of Knighthood, (4) judicial and forensic robes, (5) municipal and civic robes, (6) academic costume.

Peers' Robes. — As early as the end of the 14th century peers seem to have worn at their creation some kind of robe of honour; this we may conclude from the description of the investiture of the earl of Somerset in 1397 (Rot. Pari. Hi: 343), which says: " le dit Monsieur John fut amesnee devant le Roy en Parle- ment entre deux Contes, c'est assavoir Huntyngdon et Mares- chall, vestuz en un pane (Du Ca,nge; pannusˆj,. habitus vesti- thentum) come vesture de honor "; while in accounts of various creations of about the same time {Rot. Pari. iii. ,205, 206) are used the words " advenienteque . . . prefato Duce honorifke . , . togato et ornato." An early illustration of their use is to be found in an illumination on the. foundation charter of King's College, Cambridge (see fig. 1), which represents the peers as

From the foundation charter of King's College, Cambridge,, 1 446.

Fig. 1. —Peers spiritual and temporal.

early as 1446 wearing gowns, mantles and hoods of scarlet, furred with miniver, the mantle opening on the right shoulder and guarded with two, three or four bars of miniver, in the form of short stripes high up on the shoulder. The origin of these is as yet unknown, and it is not certain precisely when the peers' velvet robe of estate was first used. At the corona- tion of Henry VI. the king's own parliament robe was of scarlet and miniver (Gregory's Chronicle, ed. Gairdner, Camden Sbc. pp. 165-70), so the peers' robes were certainly not yet of velvet; at that of Henry VII. (see Rutland Papers, 1842; " Device for the

Coronation of Henry VII.”) the king had a robe of crimson velvet and ermine, but the “lords temporall ” are only said to have been ” in their robes “; at that of Henry VIII. (see Hall’s Chronicle) the king in his progress through the city wore a crimson velvet robe furred with ermine, ” his knights and esquires for his body ” wore crimson velvet, and ” all the gentlemen,” &c, scarlet, while we hear of the ” lords spiritual and temporal, and of their costly and rich apparel; of several devises and fashions,” and notably of the duke of Bucking – ham’s robe of gold and needlework (Stow’s Annals, p. 813), which would show that the velvet robe of estate was not yet worn at the king’s coronation. The duke of Richmond at his creation in 1525 (17 Henry VIII., see Brewer, 1 State Papers, iv. 630) is described as clad in robes of estate, and the description of the investiture says that ” the patent was read, the robe, sword, cap and circlet put on,” and about this time references are found to the ” parliament robes ” of peers, implying that there were other-s. : ‘ ■

An account of the coronation of Anne Bbleyn in 1533, in J. Nichols, Progresses of Queen Elizabeth, vol. i. p. 1, says that in her progress through the city ” all the lordes for the most part were clothed in crimson velvet,” while at

2 In the United States few save Federal judges wear robes. The scarlet judicial robes were discarded at the Revolution. Those of black silk now worn are slightly modified academic gowns. John Jay, first Chief Justice of the Supreme Court (1787), set the fashion by sitting in the LL.D. gown granted him by Columbia University.

ROBES

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ROBES

THE CORONATION ROUES

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ROBES

Westminster the barons and viscounts wore their parliament robes, 1 the earls, marquesses and dukes wearing their robes of estate of crimson velvet ” furred with ermins, ppudred according to their degrees.” This was also the case At the coronation of James I., and in S’elden’s Titles of Honour jjrd ed., 1672) the illustrations show the baron and viscount in parliamentary robes, the higher ranks in robes of estate. By the time of James II. ‘s coronation, however, the baron and viscount had the velvet robes of estate (see illustration on p. 188 of Perkins’s The Coronation Book, 1902, where the surcoat also appears to have a pointed collar edged with white and to be sleeveless). The colour of these seems to have been crimsdn at first,

some- times varying to purple. They' consisted of a long gown or surcoat with girdle, a mantle lined with ermine, a hood and a tippet of ermineˆ the rows being as follows: for a duke 4, a marquess 35, an earl 3, a viscount 2ˆ, and a baron 2.

Till late in the 18th century peers continued to attend the House of Lords in parliamentary robes, with the stars and ribbons of their orders, but robes are now only worn in the Hourse of Lords, e.g. at the opening of parliament, on occasions when the sovereign gives his assent to bills by " royal commis- sion " (when five or six peers on the government side appear in robes, and the lord chancellor also wears his peer's robe of scarlet ermine), and at the introduction of a newly created peer, when the new peer and his two introducers wear their parliamentary robes (over morning dress) during the ceremony of introduction only. The mover and seconder of the Address no longer wear robes, but uniform. On all the above occasions, and when the 'peers as a body attend church or some other ceremony, the parliamentary robe of scarlet cloth is worn; in the present day it takes the form of a mantle opening on the right shoulder, with a collar of " ermine," and guarded with rows of ermine and gold lace round the right shoulder, varying in number according to the rank of the wearer. The modern coronation robes consist of a crimson velvet surcoat and a mantle with a tippet of ermine and with rows of ermine as in the parlia- mentary robes. The surcoat is no longer a gown, but a short sleeveless garment.

For Scotland, an order of James II. (1455) prescribed for earls " mantles of brown granick colour" open before, lined and faced in front, as far as the girdle, with white fur, and with hoods to match; for the other lords of parliament a red mantle lined with silk or fur, with a furred hood, while James I. (and VI.) in 1606 had to issue an order restraining the Scotch peers from wearing velvet robes in parliament, and confining them to those of scarlet cloth (Miscellany of the Maitland Club, vol. i. p. 147). The robes of the Scottish peers are now, of course, similar to those of the others.

The peeresses' robes at the coronation of Anne Boleyn are also described in .the account mentioned above. The duchess of Norfolk, the train-bearer, was followed by " ladies being lords' wives " in scarlet robes furred with " lettice," while Wnothesley (loc. cit.) adds that the duchess was also in scarlet. 2 The' order of the earl- marshal for the regulation of the peeresses' robes at the coronation of James II. (given in J. H. T. Perkins's The Coronation Book, 1902, pp. 202-5) shows that by then all peeresses wore the robes of state of crimson velvet, and minutely regulates all details, such as shape, powderings,

length of train and width of the fur edging of the mantle. They have changed very little up to the present day.

Robes of the Orders of Knighthood— The. history of the robes of the two oldest orders is given in great detail in Ashmole's Order of the Garter (London, 1672) and Anstis's Order of the Bath (London, 1725); see also G. F. Beltz, Memorials of the Order of the Garter (London, 1841), p. 1-lii. In each case the robes

1 These are well described in the account of the opening of parliament by Henry VIII. in 1537 given in Wriothesley's Chronicle of England (Camden Soc, 1875, ed. W. Hamilton) : " all erles marques and lordes, all in their Perliament robes of Scarlett furred with white, and their hoodes about their neckes, which were forty in number; everie duke having fower barres of white fur alongest the right side of their robes, and everie earle having three bars, . . and everie lord two barres in likewise."

2 " After her followed ladies being lordes' wives, which had circotes of scarlet, with narrow sleeves, the breast all lettice, with barres of'pduders according to their degrees, and over that they had mantles of scarlet furred, and every mantle had lettice about the necke like a neckerchief, likewise poudered, so that by the pouderings their degrees might be known. Then followed ladies being knights' wivas in gownes of scarlet."

consisted of a mantle, surcoat and hood. The robes of the Garter were originally of blue woollen stuff, the surcoat and hood being, powdered with garters embroidered in silk and gold. In the time of Henry VI. the mantle was first made of velvet, and between the time of Elizabeth and of Charles I. it seems to have been sometimes purple in colour. ■■ The surcoat varied in colour from year to year; in the reign of the founder alone, e.g., it was' first blue, then black (possibly as a sign of mourning for the plague), then " sanguine in grain." The hood . was made of the same material as the surcoat, and when hats began to be worn, was carried hanging over the shoulder. The number of garters embroidered on the surcoat and hood came to be fixed by rank, but after Henry VI. the surcoat seems to have been made of plain velvet. Robes were sometimes granted to ladies in the early days (see Beltz, p. ccxxi., for a list of those ladies), in which case the robe and hood were of the colour of the surcoat worn by the knights that year, and powdered with garters. The last lady to receive the robes was Margaret, countess of Richmond, in 1488. At the present day the mantle is of dark blue velvet, of the same colour as the ribbon, lined with this taffeta, and with the star embroidered on the left shoulder,

the hood and surcoat of crimson velvet lined with white taffeta, and with these are worn a doublet and trunks hose of white satin and a plumed hat (see Lawrence-Archer, The Orders of Chivalry, p. 106).

The robes worn by the knights of the Bath created at the coronation of Henry IV. were green with furred hoods, and a white silk cord hanging from the left shoulder. 3 In the various accounts of later creations of knights of the Bath quoted by Anstis, the costume worn before the ceremonial bath seems to have been a priest-like garment of russet or grey, with a girdle and hood; after the bath, was put on a red surcoat and mantle, the latter with a lace of white silk, from which hung a pair of white gloves; and the final costume was a blue (later a purple) velvet or satin gown, with hood furred with miniver (later lined with sarcenet), and the white cord hanging from the shoulder, until it should be removed by the sovereign or a lady for some deed of valour. The mantle in the present day is of crimson velvet lined with white over a white satin under-coat and trunk-hose, and a plumed hat and white boots with red tops are worn. The mantle of the Thistle is of dark green velvet over surcoat, &c, of cloth of silver; that of St Patrick azure, with doublet and trunk-hose of white satin; that of St Michael and St George of Saxon blue satin lined with scarlet; and that of the Star of India of light blue satin lined with white.

House of Commons. — The. speaker of the House of Commons wears on state occasions a black damask robe with gold lace and a full-bottomed wig; in the House itself he wears a black silk robe with train and a full-bottomed wig. The clerks at the table wear barristers' gowns and wigs.

Judicial and Forensic Robes— -It is frequently stated that judicial robes had their origin in the dress of ecclesiastics. But though ecclesiastics in early days frequently acted as judges, and though, as Fortescue says, the Serjeant's long robe was " ad instar sacerdotis," judicial robes more probably arose from the ordinary civilian dress of the early 14th century. The chief argument for the ecclesiastical origin has been found in the coif (lena, birrelum album), a cap of white linen or silk, tied under the chin, and described by Fortescue as " the principal or chief insignment and habit wherewith serjeants-at-law at their creation are decked," which is said to have been used by ecclesiastics to hide the tonsure when in court. This view is disposed of by Pulling (The Order of the Coif, London, 1884). More probably the coif was a head-dress in common use in the 13th century, which survived as the distinguishing mark of men of law. 4 As such it is found in a wardrobe-roll of

s ” Longues cottes vertes a estroictes manches fourres de menever, et chapperons pareil fourres de menever, en guise de prelats; et avoient les dits chevaliers sur la senestre espaule ung double cordeau de soye blanche a blanche houppettes pendans ” (Froissart).

4 Mr Oswald Barron, in The Ancestor, vols. v. (p. 105) and vii. (p.’ 108 seq., plate xii.), has given reproductions of figures from MSS.

Richard II. (1391, see Fairholt, ii. 341) in an entry for ” twenty-one linen coifs for counterfeiting men of the law in the king’s play at Christmas.” The serjeant-at-law’s ” houve of silk ” is also mentioned in Piers the Plowman (latter half of the 14th century) x together with his furred cloak. Chaucer, at the same period, describes his serjeant-at-law as wearing a party-coloured gown and girdle with bars. 2

The earliest document quoted by Planche and others with refer- ence to judges’ costume is a Close-roll of 20 Edw. III. (1347)- See also a wardrobe-roll of 21 Edw. III., and wardrobe accounts of 11 Richard II. and 22 Henry VI., all quoted in Dugdale’s Origines Juridiciales, from which we gather that the robes of the judges varied in colour, in the 14th and 15th centuries, from scarlet to green or ” violet in grain,” and that their winter gowns were furred with budge or miniver.

For the early 15th century there are more data. Firstly, there is the illumination of the serjeant-at-law in the Ellesmere MS. of The Canterbury Tales (reproduced in Fur- nivall’s 6-text edition for the Chaucer Society), in which he is shown wearing a short, party-coloured rayed gown of red and blue, fined with white fur, a hood and tippet edged with white fur, and a white coif with two little bands showing below the hood. Secondly, there are a certain number of effigies or brasses of judges and Serjeants belonging to the first half of the 15th cen- tury. 3 Of judges, an early brass is that of Sir John Cassy (c. 1400) (see fig. 2). 4

For the second half of the 15th century the authority is Chief-Justice Fortescue, who, writing in the reign of Henry VI., describes the dress of the serjeant-at-law as follows:— ” Roba longa ad instar sacerdotis cum capicio penulato circa humeros ejus, et desuper collo- bium, cum duobus labellulis, qualiter uti solent doctores legum in universitatibus quibusdam, cum supra descripto birreto vestiebatur.” ” He was clothed in a long robe, after the fashion of a priest, with a furred cape

about his shoulders, and above it a hood, with two bands, such as are used by doctors of laws in some universities, with the coif as described above ” (De Laudibus Legum Angliae, From a brass in Deerhurst cap. Ii.). Fortescue continues : ” But being once church, Gloucestershire, made a justice, instead of his hood, he shall Fig. 2. — Sir John wear a cloak closed upon his right shoulder, Cassy, chief baron all the other ornaments of a serjeant still re- of the Exchequer maining; saving that a justice shall wear no (c. 1400). party-coloured vesture, as a serjeant may,

and his cape is furred with miniver, whereas the Serjeant’s cape is furred with white lamb (budge).”

This description of Fortescue’s is borne out by some illuminations from a 15th-century MS. representing sittings of the fo ur superior

of the 13th and 14th century, showing the coif worn by both clerks and laymen.

1 Prol. line 210 (ed. Skeat, Clarendon Press) : ” Jit houed there an hondreth in houues of silke, seriauntz it seemed that serveden atte barre”; and iii. 293: ” Shal no seriaunt for here seruyse ˆwere a silk howue, Ne no pelure in his cloke, for pleding atte barre.”

2 Prol. line 382 (ed. Morris, Clarendon Press) : ” He rood but homely in a medlee cote Girt with a ceint of silk, with barres smale ; of his array telle I no longer tale.”

3 The effigy ” supposed to represent Sir Richard de Willoughby, chief justice of the king’s bench ” temp. Edward III., illustrated by Fairholt, p. 201, wears a long gown with girdle and skull-cap, no distinctively judicial dress. The figure of Robert Grymbald (temp. Henry II.), engraved from his seal by Dugdale, wears the ordinary dress of the time.

4 See also that of Sir Hugh de Holes (1415; see Haines, Brasses, 1. xc), and a stone effigy of Sir William Gascoigne in Harwood Church, Yorks (d. 1419, see Planche^ Cyclopaedia, i. 427). Of serjeants-at-law, an early example is the brass of Nichol Rolond at Cople, Beds. (c. 1410, see Druitt, Costume in Brasses, p. 221); also that of Thomas Rolf at Gosfield, Essex (c. 1440, see Haines, p. 85), who wears a gown, tabard, tippet, hood and coif, with two bands showing below the hood, like the Ellesmere MS. figure. The inscription calls Rolf ” legi professus,” which Haines takes to mean ” professor of law,” Boutell and Clark (Archaeological Journal, vol. i. pp. 203-4) consider that he

is a serjeant-at-law. Druitt (p. 224) remarks on the likeness of his tabard to that of a Master of Arts, but compares a figure on a 15th-century cope, who also appears to be a serjeant- at-law and wears a tabard. That a tabard sometimes formed part of the dress of a serjeant, can be seen in the extract from the Liber famelicus of Sir James Whitelocke. quoted by Druitt, p. 225, footnote.

courts in the time of Henry VI. (reproduced in A rchaeologia, vol. xxxix. p. 358, &c, with an article by G. R. Corner; see plate). In them we see the scarlet robes of the judges furred with min : ver, and the party-coloured rayed gowns, tippets and hoods of the Serjeants, besides the costumaof the minor officials of the court. Both Serjeants and judges wear the coif, certain of the judges also wearing furred caps or turban-like head-dresses. The colour of the Serjeants' party-coloured robes seems to have varied ; 6 in these illuminations they are blue and green, but by the 17th century, to quote Dugdale, Origines Juridiciales, cap. 38: "The robes they now use do still somewhat resemble those of the justices of either bench, and are of three distinct colours, viz. murrey, black, furred with white, and scarlet; but the robe which they usually wear at their creation only is of two colours, viz. murrey and mouse colour; whereunto they have a hood suitable, as also a coif of white silk or linen." (See also Pulling, p. 218, and Druitt, p. 225.) Sir E. Brabrook (Proceedings of the Soc. of Antiquaries, 2nd series, vol. iii. p. 414) quotes descriptions of calls of Serjeants showing that as late as 1700 the Serjeants wore party-coloured gowns at their creation and during the year following, and stating on what occasions they wore their black, scarlet or purple gowns (the last with scarlet or purple hoods). At the last general call (1736), and at the creation of a serjeant in 1762, party-coloured robes were still worn, but at a creation of 1809 they are no longer found. Until their final abolition the Serjeants wore purple robes at their creation, and on ordinary occasions a black cloth or silk gown, with a scarlet robe for state occasions.

Illustrations of judicial cos- tumes in the 16th century are to be found in vol. 1. of Vetusta Monumenta (Soc. of Antiquaries, 1747), in which are reproduced, firstly, a " painted table in the King's Exchequer," temp. Henry VII., on which the officials of the Exchequer are shown wearing long gowns, furred tippets and mantles, with coifs (see fig- 3) I an d secondly, a sitting of the Court of Wards and Liveries, temp. Elizabeth, in which are shown Serjeants wearing party-coloured gowns, tippets, hoods and coifs (see also Pulling, facing pp. 86 and 214).

About this time the square cap, otherwise known as the cornered,

black or sentence cap (the last from the fact of its being put on by the judge when pronouncing sentence of death), begins to be seen in monuments (cf. that of Sir Richard Harpur, temp. Mary; Fairhold, p. 223). Sometimes this cap is worn over the coif only, sometimes over the coif and skull-cap (cf. the portrait of Sir Edward Coke, in Pulling, facing p. 180). The form also varies; sometimes, as in the portrait of Coke, it has no ear-flaps, some times, as in its present form, it has. The form with ear-flaps is held by some to be a combination of the square cap and skull-cap. The square cap was a mark of dignity, worn or carried on solemn occasions, hence its use when pronouncing sentence of death, to mark the solemnity of the moment.

Among the State Papers of 1625 is a ” Discourse on what robes and apparel the judges are to wear, and how the serjeants-at-law are to wear their robes, and when,” and on the 4th of July 1635 there was a ” solemn decree and rule made by all the judges of the courts at Westminster,” which is quoted in Dugdale (loc. cit.) and Pulling (p. 215, footnote).

This costume is illustrated in Hollar’s engraving of the coronation procession of Charles II. Towards the end of the 17th century the judges took to wearing wigs, and have continued to wear them ever since. The wearing of wigs naturally concealed the coif and velvet skull-cap, so a device had to be invented by which they could still be displayed. The expedient was hit upon of putting a round patch of white stuff, with a black spot in the middle of it, on the crown of the wig of certain of the judges, to represent the coif and skull-cap. The rank of serjeant no longer existing, this round patch has now disappeared, the only trace of it left being the circular depression on the crown of the wig.

The costume of judges of the High Court at the present day differs very little from that given in the order of 1635; but the cap is carried in the hand as a part of the full dress, and only worn when a judge is passing sentence of death. 6 The

5 They were probably originally liveries ; see G. R. Corner in Archaeologia, also Pulling, op. cit. pp. 211-12.

6 See an essay by Sir Herbert Stephen in Unwritten Laws and Ideals, ed. E. H. Pitcairn (Smith, Elder, 1899), from which the following paragraph is largely condensed.

From the Standard of Weights and Measures (temp. Henry VIII.), .in Vetusta Monu- menta (Soc. of Antiquaries), vol. i.

Fig. 3. — Figures wearing coif.

ROBES

Plate III.

One of four illuminations belonging to a law treatise, temp. Henry VI, found at YVhaddon Hall. Bucks, depicting five presiding judges of the Court of King's Bench, wearing coifs and scarlet robes; below the King's Coroner, Attorney and Masters of the Court; two ushers at tabic swearing the jury; a tipstaff in charge of a fettered prisoner, two sergeants at law in coif on cither side; in foreground six prisoners.

From Arcliaologia XXXIX.

ROBES

Plate I If.

One of four illuminations belonging to 11 law treatise, temp. Jleimj VI, Found at Whaddon Hall, Bucks, depicting five presiding judges of the Court of King's Bench, wearing coifs and scarlet robes; below the King's Coroner, Attorney and Masters of the Court; two ushers at tabic swearing the jury; a tipstaff in charge of a fettered prisoner, two sergeants at law in coif on cither side; in foreground six prisoners.

From Ardiaologia XXXIX.

ROBES

dress worn when trying criminal cases, attending church officially, and on " red letter days " in the courts, consists of a scarlet gown, with a broad black belt, a tippet trimmed with white fur, known by courtesy as " ermine " (this is worn only on state occasions), and a scarlet casting-hood, always worn with the scarlet gown, the end of which is passed under the belt. For summer the robes are of thinner stuff, faced with slate-coloured silk instead of ermine. The full-bottomed wig is worn on state occasions; at other times a wig is worn similar to that of barristers, except that it has one vertical curl just above the tail of the wig instead of the three rows of horizontal curls going all the way round.

The judges of the King's Bench Division have also a black gown, trimmed with ermine, which may be worn with the scarlet casting-hood when they sit two or more together. The summer equivalent of the black robes is in thin blue stuff, faced with silk. A costume like

that of King's Counsel, namely, a black silk gown, with black cloth court suit, is the dress of judges when sitting alone to try civil actions, and of vice- chancellors and judges of the Chancery Division, but Sir Herbert Stephen remarks that of late years certain of the judges have preferred on grounds of comfort the black or blue gown with scarlet casting-hood. The court dress of the judges of the High Court and of Indian and colonial judges consists of a black damask tufted gown, without train, worn over a black velvet court suit, with full-bottomed wig, lace bands and three-cornered silk hat. 1

The Lord Chancellor, when in the House of Lords, and sitting on Appeals, wears a black silk trained gown, over a black cloth court suit, with full-bottomed wig; he has also his peer's robe (see above), and his state robe of black damask with gold lace, worn over a velvet court suit, with full-bottomed wig, lace bands, &c; the purse is carried on state occasions when in the royal presence. The state robe of the Master of the Rolls, the Lords Justices of the Court of Appeal, and the President of the Probate, Divorce and Admiralty Divisions is the same, except that they have not the purse, and similar to it is the full-dress gown of the Speaker of the House of Commons, the Chancellor of the Exchequer, &c. The Lords Justices of the Court of Appeal sit in court in a costume similar to that of King's Counsel.

The Lords of Appeal have no official robes, but sit in ordinary civilian dress. On state occasions they wear their peers' robes. The robes of state of the Lord Chief Justice of England are the same as those of the judges of the High Court, except that his are trained, and he wears the gold chain of office, the " collar of SS."

The Scottish judges have two sets of robes, one for Justiciary {i.e. the criminal court), which is also their full dress, and one for civil causes (Court of Session). The dress for the President and Ordinary Lords of Session was fixed in 1610 by an order of James I., and was of purple cloth, faced with crimson satin, with hood to match, the President's gown having crimson velvet instead of satin. The four " extraordinary Sessionaries " were to wear black velvet, satin, or silk gowns, lined with black. The Lord Justice General wore a scarlet gown lined with ermine and an ermine hood, the Lord Justice Deputy and Lord Justice Clerk black gowns with crimson satin facings and hoods (see Register of the Privy Council of Scotland, vol. viii. p. 612). At the foundation of the High Court of Justiciary (1672) it was enacted " that for the splendour of that court, all the judges sit in red robes, faced with white, that of the Justice Generalls being lined with ermine for distinction from the rest " (see Acts of Parliament of Scotland, vol. viii. p. 88). The present full dress of the Lord Justice General is a

scarlet silk robe with tippet and hood, the hood falling down the back; the collar is of ermine, with which the tippet, sleeves and gown are edged

‘Minute details of court and lev < §e dress, judicial and legal, will be tound in Dress worn at Court (pp. 60-61), issued with the authority of the Lord Chamberlain, and ed. H. A. P. Trendell, of the Lord Chamberlain s department (London, 1908),— also details of mourning costume.

and the hood lined. The Lord Justice Clerk wears a scarlet cloth robe and hood, and a white silk tippet lined with scarlet, the silk being perforated with small holes to imitate ermine’ as also on the sleeves and edges of the gown. In front of the tippet on each side are two crosses in scarlet silk, and on each side of the gown six crosses. The ordinary Lords Commis- sioners of Justiciary have robes the same as those of the Lord Justice Clerk, except that the satin is not perforated. Instead of the bands worn by English judges, the Scottish judges wear a long fall in front.

The Bar. — There appears to have been no official costume for the bar until the end of the 17th century. Druitt {Costume in Brasses, pp. 232-33) gives a list of several brasses of in lege periti, or apprenticii ad legem, most of whom wear ordinary civilian costume, occasionally with the addition of a high cap. In the 16th and 17th centuries they wear the false-sleeved gown worn by civilians. Before the 17th century the costume worn by students at the Inns of Court and by ” Utter Barristers ” consisted of a stuff gown, and sometimes, in term-time, a round cap, which was worn in hall and in church (see Herbert, History of the Inns of Court (1804), p. 230). In Westminster Hall (see Pulling, p. 223) the same costume was worn, Benchers and Readers having a more elaborate gown with facings of black velvet and tufts of silk. Frequent laws were passed in the 1 6th century and later, forbidding the wearing of swords, cloaks, boots and spurs, &c, in hall, and insisting on the wearing of gowns by students of the Inns of Court when walking in the city. In the 17 th century, barristers, like the judges, adopted wigs, the full-bottomed wigs being confined to judges, ” King’s Counsellors,” &c, and ordinary counsellors wearing small wigs. In Hollar’s engraving of the coronation of Charles II. the King’s Counsel, the King’s Attorney and Solicitor, and the Master of the Rolls wear a laced gown with hanging sleeves. The silk gown, full-bottomed wig and black court dress now worn by King’s Counsel is generally held to date from the funeral of Queen Mary II., being the mourning

dress worn by the wish of King William for a considerable period after the queen's death, and adopted as a convenient costume ever since. There is a well- known jest of Chief Baron Pollock to the effect that " the Bar went into mourning at the death of Queen Anne, and never came out again," which bears out this theory as to the origin of the costume. At the present time barristers wear black stuff gowns, with small wigs having three rows of curls round the head. King's Counsel wear black silk gowns over a cloth court suit (cp. the expression " to take silk," i.e. to become a K.C.); on full-dress occasions they wear a full-bottomed wig, and at court a black damask tufted gown over a velvet court suit. This is also the dress for state occasions of the Attorney- General, Solicitor-General, &c.

Municipal and Civic Robes.— The word " livery," the use of _ which is now practically confined to the costume of the " livery companies," the dress of men-servants, &c, originally meant an- allowance of food or clothing granted to certain persons (Lat. liberata, Fr. livree). It is still used of the aUowances of food made to the fellows of certain colleges. As early as the 13th century, according to Matt. Paris {Chron. Maj.; Rolls Series, III. 337), we find the citizens of London assuming a uniform dress to do honour to some great occasion, as, e.g., when in 1236 a body of them rode out to meet Henry III. and Queen Eleanor, " sericis vestimentis ornati, cicladibus auro textis circumdati, excogitatis mutatoriis amicti," or when 600 citizens rode out to meet Queen Margaret, wife of Edward I., " in one livery of red and white, with the cognizances of their misteries embroidered upon their sleeves " (see Stow's Survey, ed. Morley, p. 444). By the 14th century there is evidence of the adoption of liveries by the trades and fraternities. At the celebrations of the birth of Edward III. (see Riley's Mem- orials, p. 105) the mayor and aldermen were " richly arrayed in suits of robes," while the drapers, mercers and vintners were also "in costume." This need not, however, refer to liveries. G. Unwin {The Gilds of London, 1908) quotes a chron- icler who records that by the year 13 19 " many of the people

of the trades of London were arrayed in livery," and an ordin- ance of 1347 of the fraternity of the Mercers commanding that " all those of the said mistery shall be clothed of one suit once a year at the feast of Easter," and Riley (op. cit. p. 516) quotes an order of 1389 allowing the sheriffs, on grounds of expense, to proceed to Westminster by boat instead of on horseback, " without there being any arraying of men of

the trades in like suit for that purpose; except that such men of the trades as should wish to accompany them should walk in such suit of vestments of the livery of their respective trade as they might then have. ” As to the liveries of the religious frater- nities, Chaucer {Prol. 361) describes: —

” An Haberdasher and a Carpenter A Webbe, a Dyere, and a Tapicer,” As, ” clothed alle in a liveree Of a solempne and greet fraternitee.”

In 1389 there was a petition against the giving of liveries by the fraternities, on the ground that these gatherings were centres of political agitation, but in the statutes of Edward III. and Richard II. against liveries members of guilds were expressly excepted from these prohibitions. However, it was doubtless deemed prudent to make sure .of the privilege, and so, when the livery companies were incorporated, they took care to have their liveries authorized by their charters.

These liveries consisted of a gown and hood, though the hood only was sometimes given; thus the Grocers’ Company had in 1430 55 members in the full livery, 17 in hoods and 42 not in livery. It was also customary for such of the companies as wished it to present liveries to outsiders, for instance, to the mayor, should he belong to another company. Thus in 1399 the Tailors gave liveries to the king, the prince and the mayor, and hoods to the sheriffs. But in 141 5 and 1423 the mayor and aldermen were forbidden to receive any livery except that of their own company. A similar custom was; that by which a member of any company might send to the mayor a certain sum, receiving in return a suit of the livery of the mayor’s company. The colours of the various liveries varied very much from time to time. Thus in 1414 the Grocers wore liveries of scarlet and green, which were’ changed in 1418 to scarlet and black, in 1428 to scarlet and blue and in 1450 to “violet in grain,” with party-coloured hoods of violet and -TfjcsTT^^^. crimson. At first both ” ‘ gowns and hoods Were party-coloured, but later a party-coloured hood was worn with a gown of one colour. The gowns were also lined and edged with * k *’ fur. An early illustration of the liveries is to befriund on the first charter of the Leathersellers’ Company, granted them in 1444 by Henry VI., where the members of the company Fig. 4.— Liverymen of the Leather- are depicted kneeling sellers’ Company, from the charter before the king in short of the Company granted by Henry party-coloured gowns of VL (H44)- red and blue, edged at

the neck, wrists and round the bottom with fur and with white girdles (see fig. 4, from a coloured reproduction in W. H. Black’s History and

Antiquities of the Leathersellers' Co.).

In the reign of Henry VIII., Holbein's picture of the king giving a charter to the Barber-Surgeons' Company shows the members of the latter wearing gowns of rich stuff, with red and black party-coloured hoods, three of the figures also in coifs. The form of gown which has survived, practically unchanged, till the present day; may be seen on the second charter of the Leathersellers' Company, granted them by James I. in 1604 (see fig. 5, and for coloured plate see W. H. Black, op. cit.): Here we see them in flat caps, long black furred gowns, with false sleeves, and having on the right shoulder party-coloured hoods

Fig. 5. — Liverymen of Leather- sellers' Company, from a charter of James I. (1604).

of scarlet and black, the end of which is cast over the left shoulder and hangs. down nearly to the edge of the gown;

Besides the liveries of the city companies, and those of the mayor and sheriffs, there was often a special livery adopted by all the citizens on some great occasion, such as a visit of the sovereign to the City. W. St John Hope (Cor- poration Plate and In- signia, ii. 141) quotes a number of such cases, showing that the city livery was sometimes green, sometimes blue, sometimes violet, some- times red and white, the city colours par ex- cellence. ., ■

As to the costume of the mayor, aldermen, sheriffs, &c, we have seen above the mayor " richly costumed,", and the alder- men " in like suits of robes," at the birth of Edward III., and Riley (op. cit.) gives an order of 1378, that the aldermen are to ride to Westminster in the mayor's proces- sion, " arrayed in a cloak and hood at least, that are party-coloured with red, scarlet and white, the red on the right side "; while he quotes (from Letter -book H. fol. cxlvi) the amusing sentence passed by his fellow-aldermen in 1382 on one John Seley, for disregarding the order to have his green cloak for the Whitsuntide procession lined with green taffeta. Thus before the 15th century the aldermen apparently had not yet theif scarlet robes, but on state occasions wore the ordinary city livery. For the early 15th century we have the Liber Albus (written c. 1419; Rolls Series, ed. Riley), where we are told (p. 35) that " The Mayor, Sheriff and Aldermen were wont to array themselves in like suits of robes twice in the year, viz. when the mayor rode to Westminster to take the oath, and on the day following the feast of SS. Simon and Jude; and this raiment was trimmed with fur as befitting their honourable rank; and they would also dress themselves in. suits of robes against the feast of Pentecost,

these robes having a lining of silk." The scarlet, violet and black robes, still worn by the Lord Mayor, aldermen, &c, were early in use. There is an order of 142 1 (8 Henry V.) that the aldermen should use " togis etarmilausis de scarleto," and in numerous accounts of royal receptions and other solemn occasions in the City we are told that the mayor and alder- men Were in scarlet (W. St John Hope, in Corporation Plate and Insignia, i., Introd. lxxxv seq., and ii. 138-147, quotes a number of these, and treats the whole subject of mayors', &c, robes very fully) . The Liber Albus (i. i, ch. vi.) also shows us the mayor and alderˆ men assembled at the Guildhall on the day of the election of the hew mayor induti togis de violet. As to the form of the dress in the 14th and 1 5th century, we can see from brasses of lord mayors and aldermen (see Haines, Manual, pp. cc-cci ; and Cotman, Norfolk Brasses. There is a fine series of brasses of mayors, &c., at Norwich) that it consisted of a long gown, a mantle fastened on the right shoulder and a hood.

As to the provincial mayors and aldermen there is evidence that at quite an early date many of them followed the fashion of London ; e.g. the Royal Charter of Nottingham, of 1448, contains the words : " that the Aldermen of the same town forever . . . may use gowns, hoods and cloaks of one suit and one livery together with furs and linings suitable to these cloaks, in the same manner and form as the Mayor and Aldermen of our city of London do use, the Statute of Liveries . . . notwithstanding " (see Nottingham Records, ii. 205), while the charter granted by Henry VI. to Kingston-on-Hull , in 1440 contains practically the same words (see St J. Hope, i. lxxxvi). The costume of provincial mayors, &c, is shown by St John Hope (loc. cit.) to have generally consisted of a scarlet furred gown and cloak, with tippet or scarf of black velvet. The colour was not, however, invariably scarlet, but varied to violet, blue and black, sometimes even for the mayor. An account of the robes of modern provincial mayors will be found in St J. Hope, p.Txxxix seq. and under the accounts of the various boroughs, passim.

There is some doubt as to when the Lord Mayor first began to wear his robe of estate of crimson velvet. Stow (Survey, ed. Strype, .1720, ii. 165) says that at the reception of Henry VI. at Eltham the mayor was in crimson velvet, the aldermen in scarlet with " sanguine " hoods, but at the coronation of Edward V. (see 'St J. Hope) he wore scarlet. At the. coronation of Anne Boleyn (see Wriothesley's Chronicle, loc. cit. supr., and Hall's Chronicle) the mayor wore his crimson velvet robe of state,, the aldermen and sheriffs scarlet; and at the entry of Anne of Cleves into London the mayor was again in his crimson velvet robe with his collar of gold, the aldermen and councilmen in robes of black

velvet with chains of gold (but see

ROBES

Plat* IV

Lord Cliu-r JuxtlcL- of Kiiglaiti] in full

robcii. WMtal “Mil ermine, wilh

calliir af S. S.

Judse of the Suirr eme Court n(tlic United Si ni i – or America.

TIN ■•““I I lii:)tL’liiiiicdlar»r Ktigland. iit robe* of Slulc.

Lurd Mayor at Lcndati, In full raba.

Judjreof the IHkIi Court. England, in blnclt rube*.

Aldi-rimm of llio City of I.nndon. in bench robes.

/fairs inrt ay Edt. Sen &• Kttvmimfi. Chancrry I.anc. Linden.

ROBES

PlATSlV

Lord Clitcf Jimtlci; uf EiiglniMl in full

robe*, nem-lct ntid ermine, with

caltnrtif S. S.

Juilsc of Hie Suiirejtw Court of tlic United Stale* of America,

Tlic l-wil 1 liKhtliiuicellciror KtiSland, in rt*bes of Stale,

Lord Mayer <-f LcnJtm, 1» full ruin*.

Judjrc of the ttiirli Court. England. lit black f**l>e*.

Alilt-niiuii uf the City of London.

in bench robes.

ftaiicj Irnt &r Edt, Sen &• /favrmen/i. Chancery Jlaitt, Ijsnden.

St J. Hope, ii. 144, who quotes the order for these same robes, from which it would appear that the mayor also wore black velvet).

About this period begin to occur notices of the wearing of official robes by the wives of mayors and aldermen; e.g. for Lincoln there is an entry in the corporation records in 1544: ” Every alderman that hath not been mayor to prepare for himself and his wife gowns of crimson, and every one that hath been mayor to prepare for himself and his wife gowns of scarlet and tippets of velvet to be worn at all principal feasts ” (see 14th report,Hist. MSS. Commiss. App.VIII). St John Hope (p. lxxxix) quotes numerous instances in the 16th century, in some of which the husband was liable to a heavy fine in the event of his wife’s non-compliance with the rule.

In 1568 (see Stow, and J. G. Nichols, Account of 55 Royal Processions and Entertainments, pt. ii. p. 94) first appeared an ” Order observed by my Lord Mayor, Aldermen and Sheriffs, for their meetings and wearing the apparel throughout the whole year, according as formerly it hath been used,” which has been altered and revised from time to time by order of the Corporation, and is still issued under the name of the Handbook of Ceremonials to the officers of the City Corporation. In 1568 we find the aldermen and sheriffs going to Westminster in the Lord Mayor’s procession in scarlet-furred gowns ” and their cloaks borne with them,” and in 1575 Nichols quotes a London citizen’s description of the same procession; “they of the livery in their long gowns, with hood on the left shoulder, half black and half red. . . . The Mayor in a long gown of scarlet, and on his left shoulder a hood of black velvet, and a collar of SS. . . . The Aldermen in scarlet gowns, those having been mayors with chains of gold, the others with black velvet tippets.” The Order of 1629 gives particulars Of the various gowns; the cloaks are violet from Michaelmas to Whitsuntide, furred, for mayors and ex-mayors, with ” amys,” for aldermen with ” calabre,” and scarlet in summer, lined with ” changeable taffety ” and ” green taffety ” respectively.

After the 16th century the costume of the Lord Mayor can be studied in successive ” Orders ” or Ceremonial Books, accounts of coronations, &c, and in portraits and statues belonging to the various city companies. Early in the 19th century (1806) the Lord Mayor began to wear on some state occasions a black robe with gold lace, similar to that of the Lord Chancellor. The Ceremonial Book was thoroughly

revised in 1864, and the latest edition is that issued in 1906 (Handbook of Ceremonials, &c, ” issued under the direction and with the approval of the Privileges Committee of the Court of Aldermen “).

At the present day the Lord Mayor has several sets of robes; a special coronation robe (see illustration in Naylor, Book of the Coronation of George IV., 1837), a crimson velvet robe of state like that of an earl, worn with the chain and jewel, e.g. in the presence of the sovereign when in the city ; x a black robe of state trimmed with gold, which is worn with the chain and jewel, e.g. at the Guildhall on Lord Mayor’s Day; the scarlet robes, which are worn, with or without the chain, on most public occasions, such as the service at St Paul’s on the first day of the Easter Law Term, audiences of the sovereign, the election -of the Lord Mayor, the opening of the Central Criminal Court, &c; a violet gown, which is worn, e.g., when the Lord Mayor elect is presented to the king, when he is sworn in, at the election of sheriffs, &c, and a black gown worn in church on Good Friday, &c. The aldermen wear scarlet on most occasions of ceremony, ex-mayors ” having the Cap of Dignity attached to their gown, and being entitled to introduce a sword and mace into their badges.” Violet robes are also worn on certain occasions marked in the almanac of the Alderman’s Pocket-Book; and black gowns when the Lord Mayor wears his. The sheriffs and recorders 2 have scarlet, violet

1 Sir G. G. Young in a pamphlet called The Place of the Lord Mayor in proceeding through or within the City of London (1852), quotes various royal visits to the city which seem to show that the Lord Mayor did not always wear his crimson velvet robe on these occasions. Thus in 1638 Charles I., on going to meet Marie de Medicis, was met by the Lord Mayor in scarlet, which was also worn at the entry of Charles II. in 1660. In 1702, when Queen Anne went to a thanks- giving service at St Paul’s, the Lord Mayor wore crimson velvet, with the collar and jewel; but in 1705, at the thanksgiving after Blenheim, he met the queen on horseback, dressed in scarlet. In 1714, at the reception of George I., the Lord Mayor wore crimson velvet robes.

2 The recorders had from an early date annual suits of robes like the mayor, aldermen, &c. See Liber Albus, p. 43: ” Habet itaque Recordator pro feodo de Camera totiens et talem vesturam lineatam sive penulatum, quotiens et qualem Major et Aldermanni capiunt annuatim.” The chamberlain, common Serjeant, &c, had also gowns (see an order of 1523 in St J. Hope, ii. 146). For the sword-bearer’s cap of maintenance see article Cap and St John

and black gowns, and the members of the common council have deep mazarine blue gowns, which seem to have been first prescribed in 1761.

For Scotland an order of James I. and VI. of 1610 (see Register of Privy Council, loc. cit.) ordered that the provosts, aldermen, &c, of every borough should wear, for ordinary occasions, black furred gowns, the officers of the chief boroughs having also scarlet furred gowns for Sundays and other solemn occasions, when the provost of Edinburgh was to wear a gold chain.

Academic Costume. — No thorough study has so far been made of early English academic costume as compared with that of the continental universities — a study which ought to throw much light on the subject. 3 A vexed question, is that of how far academic dress is derived from the ecclesiastical. Anthony Wood's view, that it was derived from the tunica talaris and cucullus of the Benedictines, would not now meet with much support; but many writers seem to be unnecessarily anxious to trace each item of the academic robes to some definite ecclesi- astical garment. The medieval scholar was of course a clerk, and had to wear the clerkly gown and the tonsure. But the fact that this was the case makes it more difficult to distinguish between academical and ecclesiastical robes, notably in the case of brasses and other monuments of university graduates and dignitaries who were also priests. Another source of difficulty is the variety of names by which the different parts of the academic costume are called in the university statutes and elsewhere, resulting sometimes in inextricable confusion.

The earliest information as to English academic dress is found in the second half of the 14th century. Certain early statutes show that "excess in apparel" had already to be rebuked in scholars (cf. the Constitution of Archbishop Strat- ford, 1342), while the statutes of certain colleges require of the scholars the tonsure and a " decent habit " suitable to a clerk (cf. Statutes of Peterhouse, 1344, and of Merton Coll., Oxford), i.e. a long gown (toga or tunica talaris), which it is stipulated in some cases must be closed in front. Some colleges had liveries, prescribed perhaps by the founder of the college and laid down by the statutes. The differences of colour and shape in the undergraduate gowns of most of the Cambridge colleges are supposed to be a survival of this. There was also an ordinance of Richard II. for King's Hall, Cambridge (1379), which fixed the dress of a scholar as the roba talaris, over which, if a bachelor, he should wear a tabard suited to his degree. The under- graduates seem in the early days to have worn a hood, the ordinary head-covering worn by all, but they

gradually ceased to do so, until nobody below the rank of a bachelor might wear one.

It is proposed to give here (1) a list of the various parts of the academic dress, with a few remarks on each; (2) a short account of the early costume of the various degrees; (3) a sketch of any changes which have taken place since the Refor- mation.

The Gown (toga, roba, or tunica talaris) was worn by all degrees, as befitting clerks. It is hard to determine whether there was at first any difference between the gown of the higher degrees, which some maintain was the roba, and that of the lower degrees, the toga or tunica talaris, but it seems improbable. It was frequently fur-lined, but the use of the more costly furs was forbidden to all below the degree of Master, except sons of noblemen, or those possessing a certain income, bachelors using budge (see in Anstey's Munimenta Academica, p. 301, the

Hope i. lxxvi-lxxix. For mayor's and sheriff's chains see ibid, pp. lxxix-lxxxiv.

3 Practically the only detailed study of early English academic costume is a paper on " English Academic Costume (Medieval)," by Dr E. C. Clark, in Archaeolog. Journal, vol. 1. pp. 74 seq., 137 seq. and 183 seq., which contains a mass of information, and upon which the present article is to a great extent based. Rashdall (Universities of Europe in the Middle Ages, vol. ii. pt. ii.) and Druitt (Costume on Brasses, ch. ii.) each devote a chapter to the subject; Rashdall treats of both the English and continental universities, not very thoroughly, Druitt of English academic dress only, but thoroughly. Clark gives many facts about foreign, as well as the English, costume.

statute of 1432 de admissione ad pelluram). Students, and even doctors in theology (Mun. Acad. ii. 393), were also restricted to budge, and to sad-coloured habits. The robes of masters were to be flowing and reach to the ankles (see Mun. Acad. p. 212, an order of 1358 to the tailors not to stint the robes, which should be " largae et talares," because clerks should be distinguished from the laity).

The Cope, worn as part of academic dress over the gown, probably originated in the ordinary cappa clericalis, or every- day mantle of the clergy, which had been introduced into general use in England by synods of 1222, 1237 and 1268. 1 This kind of cope, closed in front, and originally black in colour, is generally known as the cappa clausa, and sometimes, for convenience' sake, had a slit in front to allow of the passage of the hands. It was worn by Regent Masters when lecturing

Fig. 6.— Members of New College, Oxford, from Chandler MS. (15th century).

(Mun. Acad. p. 421) and as a full dress by certain doctors. By the second half of the 14th century differences of colour occur; e.g. the Chancellor represented in a 14th-century miniature in the Oxford Chancellor's Book (reproduced by J. W. Wells, The Oxford Degree Ceremony (1906), facing p. 19) wears a scarlet cope closed in front, lined with miniver and with tippet and hood of miniver, and there is also a mention in an ancient statute of Cambridge of a red cope worn by Inceptors in Canon Law (Clark, p. 102). The Rev. N. F. Robinson

(loc. cit. p. 195) quotes the will of R. Browne, archdeacon of Rochester (d. 1432), to prove that the habit of a doctor of civil law was violet; he also thinks that that of a doctor of theology was green, and of a doctor of canon law scarlet. By the 16th century all copes were scarlet. Clark (p. 138) gives as evidence ” Stokys’ picture ” in the Cambridge Registrary. The scarlet cappa clausa has

1 See Rev. T. A. Lacey in Transactions of the St Paul’s Ecclesio- logical Society, vol. iv. (1900), p. 128, &c. Also Rev. N. F. Robinson in the same (1898), pp. 181-220.

survived to the present day at Cambridge as the dress worn by the Vice- Chancellor and by Regius Professors of Divinity, Law and Medicine when presenting for degrees. It is now open down the front, but the fur edging only reaches half-way down, marking the place where the slit used to be. At Oxford the so-called ” cope ” which is the Convocation robe of certain doctors is not a real cope, but is probably derived from the medieval tabard, the out-of-door dress worn by the clergy and others, it having become customary by the beginning of the 1 6th century for Regent Masters to wear the tabard at lectures as more convenient than the cope (Rashdall, II. ii. 639, and Mun. Acad. p. 421, where the pallium is spoken of as an alterna- tive to the cappa clausa. The pallium is most probably to be identified with the tabard). 2 The capa manicata mentioned in Anstey (Mun. Acad. p. 421, &c.) seems to have been a shorter gown with bell-shaped sleeves reaching to the elbow, and lined with fur, worn by masters and bachelors of arts (see Druitt, p. 124), and a shorter tabard is also occasionally found (Robinson’s Taberdum ad medias tibias). These are illustrated in fig. 6 from a MS. of the 15th century at New College, Oxford. 3 The D.D.‘s wear the cappa clausa, the other doctors tabards (see also pi. iii., xvi. .in Archaeologia, where William of Wykeham and all the doctors wear long sweeping tabards, as ample as copes), the Warden a shorter tabard, reaching just below the knees, and the M.A.‘s gowns or tabards with false sleeves.

The Hood was originally worn by all scholars, as by every- body, and had evidently no academic significance. Sometimes a cap was also worn, the hood being thrown back (Chaucer’s ” clerk of Oxenford ” in the Ellesmere MS. illumination wears a red skull-cap, and a furred tippet and hood, with the hood falling rather back, though not on his shoulders). The liripipe 4 became somewhat elongated, as is seen in the hoods of the so-called M.A. group in the Chandler MS. An early mention of the undergraduate hood is the much-discussed Oxford Statute of 1489 (Mun. Acad. p. 360), which reads: ” ut nullus de cetero scholaris non-graduatus (nobili sanguine insignitis &c. exceptis)

capitio quovis utatur publice . . . nisi liripipium consutum habeat et non contextum, prout antiqua Universitatis laudabilis consuetudo exposcit . . .” 6 but the undergraduate

2 Clark (pp. 138-39) treats of the pallium and tabard as two separate garments, deciding that the pallium was a kind of tippet. Robinson considers the pallium to correspond to the tabard, his taberdum talare, which the Rev. T. A. Lacey (p. 128) also compares with the chimere of Anglican bishops. (See article Chimere, where the chimere is likewise traced to the tabard.) Moroni, Dizionario dell’ erudizione storica-ecclesiastica, s.v. zimarra, says that professors of the university of Rome wear black zimarre while teaching. This recalls the pallium of Regent Masters {Mun. Acad. p. 421) and Inceptors in arts and medicine (id. p. 430).

8 The Chandler MS. The drawings from which the illustration is taken are reproduced in the Transactions of the St Paul’s Ecclesio- logical Society, p. 208, with an explanatory article by the Rev. N. F. Robinson, and in Archaeologia, vol. liii. pi. i., with notes by T. F. Kirby. Robinson identifies the various groups of the Society of New College on his plate i. (xv. in Archaeol.) by the aid of a statute of the College settling the order of standing in choir and at processions, and thus claims to settle the question of the dress of the various kinds of Doctor and Bachelor, M.A.‘s, &c, at the period.

4 In the present article ” liripipe ” will toe used of the tail of the hood, ” tippet ” of the shoulder-cape, sometimes forming part of the same garment as the hood, sometimes not, and ” scarf ” of the ” tippet ” or scarf, e.g. of D.D.‘s, Anglican clergy.

6 ” that no non-graduate scholar (with the usual exceptions of noblemen, &c.) shall wear any kind of hood in public, unless it have the liripipe sewn on, and not woven in one piece, as the ancient and venerable custom of the university demands.” The meaning of this is not clear; Anstey (marginal note ad loc.) takes it to mean that the tail of the hood should be sewn to the hood; others that the tail of the hood should be sewn down to the gown ; cf . Chaucer, Prol. to Canon’s, Yeoman’s Tale: “Till that I understood How that his cloke was sowed to his hood, For which, whan I hadde long avysed me, I demed him some Chanoun for to be,” which shows that this method of sewing the hood, whatever it were, was used to define rank; others again hold that ” liripipium ” here means a tippet or shoulder-cape, and that for some reason the hood was to be sewn to the tippet and not made all in one piece with it. Rashdall reads ” consuetum ” instead of ” consutum ” (footnote ii. p. 641). The Constitution of

Archbishop Bourchier (1463) forbids undergraduates to use liripipes or ” tippets ” round the neck in public (Clark, p. 85), so the sewing down of the liripipe at the back may

ROBES

Plat* V.

D.C.L.. Oxford.

l.U 0., Cuititmrigc.

D.D., Oxford.

D.D.. Cambridge.

Doutur of MuM’r. Oxford.

M. A., Oxford.

M. A,. Cambridge.

M.A., Tiintiy Collect, Dublin. Kotfi lent by F.de. Sen cV Ra?rn t crt>/ I, Chancry Oittf. Lt.iJun

ROBES

PjJW* V,

D.C.L., Oxfurd.

LI., D.» CiiiubrMlgc.

D,t),„ Oxfoni.

D.D., CnmbrMae.

OocturafMiufc. Oxford.

M.A., Oxford,

M.A.,Cnmt)riiJc£,

M.A., Trinity Collect, Dublin- fotft If lit iy Edt. Sen &* Ramucnft, Chanerry Lis»t, L»,;Jt)i%

ROBES

hood had gone out of use by the end of the 16th century. 1 Bachelors' hoods were to be lined throughout with fur (Mun. Acad. p. 361), which we learn from the statute de admissione ad pelluram (1432) to have been budge. Masters and noblemen might use miniver, or silk in summer {Mun. Acad. pp. 283, 301). * There were evidently hoods of at least two kinds for masters, sometimes called respectively caputium and epomis, whether corresponding to the distinction between regents and non- regents we do not know. (See Mun. Acad. p. 638, will of Thomas Bray, M.A., and Robinson, loc. cit. In the Oxford Corpus Statutorum of 1768 the epomis is worn with the ordinary gown, the caputium with the scarlet habit.) At a later date, at Cambridge, a distinction was made between the hoods of non-regents, which were lined with silk, and those of regents, which were lined with miniver. 2 Later again the regents wore their hoods in such a way as to show the white lining, while the non-regents wore theirs" squared," so that the white did not show. Hence the name " White Hoods " and " Black Hoods " given to the upper and lower houses of the old Senate respectively. It is not settled when the modern colourings of hoods arose; they probably followed those of the gowns of the faculties, but about these we are equally uncertain. The Oxford Proctor still wears a miniver hood. The modern Cambridge hood has preserved the original shape more closely than the Oxford one, being a hood and tippet combined, the hood having square corners. The tippet, which appears as part of the early costume of certain doctors, was probably, like the judges' tippet, originally the shoulder-cape forming part of the same garment as the hood. Clark and others would derive it from the almuce (q.v.), but do not seem to show any definite grounds for so doing. Its place seems to have been taken by the scarf worn by D.D.'s, &c, probably developed from the hood with long liripipe as worn turban- wise on the head or as a scarf round the shoulders. It seems rather far-fetched to derive the scarf from the two pendants of the almuce. 3 (See article Vestments and cp. the mayor's scarf mentioned above.)

There seem to have been at least three varieties of academic head-dress: 4 firstly, the doctor's skull-cap with " apex " as illustrated in the Chandler MS. drawings; secondly, the square cap of cloth as prescribed by Laud's statutes of 1636 for graduates and founda- tion scholars (similarly for Cambridge by Burleigh's letter to the vice-chancellor in 1588), with its counterpart of velvet worn by doctors; thirdly, a round cloth cap prescribed by the Laudian statutes and Burleigh's letter for undergraduates who were not foundation scholars, with the round cap of velvet for doctors which survives as part of their

full dress to the present day. The square cap was adopted at the universities, according to Robinson, after 1520, in imitation of the university of Paris. For the development of the modern ” college cap,” see Biretta. In this connexion should be mentioned the term ” tuft-hunting,” i.e. attempting to thrust oneself into the society of one’s social superiors, derived from the gold tufts or tassel worn by noblemen and fellow-commoners on their college caps.

As to the dresses of the different degrees, the drawings from the Chandler MS. give a good idea of the early costume. It is also

have been to prevent this improper use as a scarf. But in this case, what is the force of ” et non contextum “?

1 An interesting survival, which only disappeared about the middle of the 19th century, was the little black hood placed round the neck of candidates going in for viva voce in all examinations subsequent to responsions at Oxford. This was a survival of the custom of conferring on sophistae generates, i.e. those who had passed the first stage of the exercises for the B.A. degree, a hood of plain black cloth. See A. Clark’s Introduction to the Registers of Oxford University, vol. ii. pt. i. p. 22 (Oxford Hist. Soc, 1887).

2 See Caius’ Statutes (1557), also an account of the entertain- ments at Cambridge on the visit of Queen Elizabeth, 1564, given in Nichols, Progresses, vol. iii., ” Theologiae Baccalaureos ac non- Regentes primum, sericis caputiis induti, turn Regentes Magistri suis pelliceis albescentibus decorati; tandem Juris Artiumque Baccalaureos suis agninis bracceis conspicui.”

3 See Rev. E. Wickham Legg in Trans, of St Paul’s Eccles. Soc. vol. iii. Also Lacey and Robinson (loc. cit.).

4 The subject is discussed in detail by Clark, ” College Caps and Doctors’ Hats,” in Archaeol. Journal, vol. lxi.,andN. F. Robinson, ” Pileus Quadratus,” in Transact, of St Paul’s Ecclesiological Socy., vol. v. pt. i. (1901). There is also much miscellaneous information in C. Wordsworth, University Life in the J.Sth Century, p. 499 seq.

well illustrated by brasses. 6 Doctors of theology seem to have worn a tippet but no hood. Masters of Arts seem to have worn a gown, over which was a garment with bell-shaped sleeves reaching to the elbow, a tippet and a hood (see Druitt, plate facing p. 136, and p. 135). The same dress was sometimes worn by B.A.‘s (see brass of John Palmer, B.A., d. 1479, New College, Oxford, in Druitt, p. 141), and bachelors

of iaw and divinity, the latter being generally already M.A.‘s (Druitt, p. 139). Haines’s theory is that after the middle of the 15th century the dress of the M.A.‘s was changed, and they wore a sleeveless tabard reaching to midway between ankle and knee. This costume certainly occurs on brasses, chiefly of the 1 6th or late 15th centuries, but the change is hard to explain.’

Academic dress underwent much inquiry and some revision at the time of the Reformation, chiefly in the direction of sobriety and uniformity, ” excess of apparel ” being repressed as severely as ever, but not with much more effect. 7 Burleigh’s letter to the Vice-Chancellor of Cambridge University (1585), and the statutes of Queen Elizabeth, strictly enforce the wearing of cap and gown by all, and hoods and habits by those entitled to wear them, and similar regulations were made for Oxford by Laud’s statutes of 1633, further details being dealt with by a decree of 1770. Academic dress during the 17th century may be further studied in Bedel Buck’s book (1665, see Appendix B. to Peacock, Observations on the Statutes of the University of Cambridge), and Loggan’s plates of academic costume in Oxonia Illustrata (1675) and Cantabrigia Illustrata (1690, ed. J. W. Clark, 1905).

There have been few far-reaching changes since Loggan’s day. Cambridge has of late years inquired into and revised her regulations as to dress, and in the Ordinances (latest ed. 1908, Statute A, cap. VII. p. 303) clear rules are laid down; the Oxford regulations (see Statuta et Decreta Univ. Oxon.

6 See for doctors’ costume, J. G. and L. A. B. Waller’s Series of Monumental Brasses (London, 1864), plate of ” Four Ecclesiastics, from New College, Oxford, who are also illustrated in Druitt, pp. 131, 129, 119; and for M.A.‘s and B.A.‘s, Druitt, p. 135 seq. and plate facing p. 136. On the brass of John Lowthe, D.C.L., should be noticed the two curious long streamers or liripipes hanging from the back of his tabard or hood. It is hard to say what they can be ; but the closest parallel is in the two streamers on the back of the old Oxford commoners’ gown, which were probably survivals of sleeves. They are said to have given rise to the term ” plucking,” i.e. failing in examination, the story being that a man’s creditors might assemble at the conferring of degrees, and by ” plucking ” at his gown prevent him from going up for his degree.

6 It is just possible that this sleeved garment may be the capa manicata mentioned in Mun. Acad. p. 421, ” nullus regens in artibus ... in capa manicata lectiones legat ordinarias, sed in pallio vel capa

clausa.” Clark (pp. 188, 189, &c.) identifies the cappa manicata with the tabard, but if, as suggested above, the pallium is the tabard, the cappa manicata cannot be the same. Braun, Liturgische Gewan- dung, p. 308, shows that a sleeved cope, called cappa manicata, did develop from the cappa clericalis or everyday cope of the clergy, at the end of the 12th century, its use being forbidden by various synods. It is possible, then, that the capa manicata may have been worn by non-regents, the tabard (which Haines alleges to have been adopted generally by M.A.‘s in the late 15th century), or pallium, by regents.

‘ The essential parts of Laud’s statutes, Burleigh’s letter, &c, with much other matter bearing on academic costume from the 1 6th century onwards, will be found in C. Wordsworth’s University Life in the 18th Century (London and Cambridge, 1874, p. 485 seq.). To the passages quoted by him may be added the following from Johannis Berebloci Commentarii, an eye-witness’s account of Queen Elizabeth’s visit to Oxford in 1566 (published in Elizabethan Oxford, ed. C. Plummer, Oxford Hist. Soc, 1887); at one of the disputa- tions Mr. Campion, M.A., was dressed as follows: ” Toga illi turn Dalmatica talaris fuit, manicis remissis ac largitate sua difnuentibus. Huic pallium inductum est undique consutum, praeter quam qua dextro patebant aditus. Postremo erant humeri superius pellibus albis, candoreque lucentibus, redimiti. Atque hie turn habitus fuit omnium magistrorum, praeterqUam quod nonnulli, loco’palluda- menti illius pellicei, serico utebantur, omni colore variegato.” This points to the wide-sleeved gown, tabard and hood as the dress of masters, but the colour of the hood was evidently not fixed. For Doctor White, D.C.L., ” ei vestis Dalmatica fuerat talaris, ex electiori et clarissima purpura; lato clavo coccineo superius induebatur, additum postremo humeris paludamentum est ejusdem coloris, cum serico subtegmine, similique turn vestiti habitu omnes Doctores sedebant.” Here vestis Dalmatica would be the ordinary gown, clavus latus the scarlet gown, and paludamentum the hood, as before. For costume up to the middle of the 19th cen- tury see Wall-Gunning, Ceremonies observed in the Senate House at Cambridge (1828).

for 1969, Tit. xiv., de vestitu et habitu, pp. 327-328) have not been revised lately, and some of them are a dead letter.

Doctors of both universities have three sets of robes: firstly, the full-dress gown of scarlet cloth; secondly, the con- gregation habit and

hood of scarlet (now at Cambridge a cope, at Oxford the so-called "cope"); thirdly, the black gown. The first is worn by all doctors except the doctor of music, and is accompanied by the round cap of velvet. The Oxford D.D. also wears a cassock, sash and scarf. The scarlet gown is of a different and older shape than the M.A. and B.A. gowns. As now worn, it is faced with silk of the same colour as the hood of the faculty. The second, or cope, has now gone almost out of use, but is still worn when presenting for degrees, &c. It is sometimes worn over the black gown. There are several types of black gown, but the tufted gown of Loggan's daiy has now gone out of use. The M.D. and Mus.D. black gowns at Cambridge are now made after the pattern of the LL.D. gown, with wing-like sleeve and flap collar, trimmed with black lace, but the D.D., D.Sc. and Litt.D. wear the M.A. gown, the former with the scarf, the two latter with lace on the sleeve, placed horizontally for D.Sc. and vertically for Litt.D. Some doctors of divinity wear the full-sleeved gown with scarf. The head-dress of a D.D. is the square cap, that of the lay doctors the velvet bonnet with gold cord. At Oxford, too, some doctors wear the M.A. gown, others the doctor's laced gown. The M.A. and B.A. gowns are two varieties of the civilian gown of the 15th and 16th century. The B.A. loose-sleeved gown is no longer worn with the sleeve tucked up round the elbow.

The Oxford sleeveless commoner's gown, though still by statute talaris, now reaches little below the waist, the full-sleeved scholar's gown to the knees. The tufted silk gown of the gentleman-commoner and the nobleman's gold- laced • gown are not yet abolished by statute, but have fallen into disuse. Vice-Chancellors have no official costume, but wear the habit of their degree. The Chancellors of the older universities wear a black damask robe with gold lace, and a black velvet square cap with gold tassel or a doctor's velvet bonnet with gold cord; those of the newer universities have robes "created " by the robe-makers, who are nowadays to a large extent the arbiters of academic dress.

For the colours of the hoods of the various university degrees see Universities ad fin. (C. B. P.)

ROBESPIERRE, MAXIMILIEN FRANCOIS MARIE ISIDORE DE (1758-1794), French revolutionist, was born at Arras on the 6th of May 1758. His family, according to tradition, was of Irish descent, having emigrated from Ireland at the time of the Reformation on account of religion, and his direct ancestors in the male line had been notaries at the little village of Carvin near Arras from the beginning of the 1.7th century. His grand- father, being more ambitious, established himself at Arras as an advocate; and his father followed

the same profession, marrying Jacqueline Marguerite Carraut, daughter of a brewer in the same city, in 1757. Of this marriage four children were born, two sons and two daughters, of whom Maximilien' was the eldest; but in 1767 Madame Derobespierre, as the name was then spelt, died, and the disconsolate widower at once left Arras and wandered about Europe until his death at Munich in 1769. The children were taken charge of by their maternal grandfather and aunts, and Maximilien was sent to the college of Arras, whence he was nominated in 1770 through the bishop of his native town to a bursarship at the college of Louis-le- Grand at Paris. Here he had for fellow-pupils Camille Des- moulins and Stanislas Freron.

Completing his law studies with distinction, and having been admitted an advocate in 1781, Robespierre returned to his native city to seek for practice, and to struggle against poverty. His reputation had already preceded him, and the bishop of Arras, M. de Conzie, appointed him criminal judge in the diocese of Arras in March 1782. This appointment, which he soon resigned, to avoid pronouncing a sentence of death, did not prevent his practising at the bar, and he speedily became

a successful advocate. He now turned to literature and society, and came to be esteemed as one of the best writers and most popular dandies of Arras. In December 1783 he was elected a member of the academy of Arras, the meetings of which he attended regularly; and, like all other young French- men with literary proclivities, he began to compete for the prizes offered by various provincial academies. In 1784 he obtained a medal from the academy of Metz for his essay on the question whether the relatives of a condemned criminal should share his disgrace, the prize being divided between him and Pierre Louis Lacretelle, an advocate and journalist in Paris. An Moge on J. B. L. Gresset (1709-1777), the author of Vert- Vert and Le Mechant, written for the academy of Amiens in 1785, was not more successful; but Robespierre was com- pensated for these failures by his great popularity in the little literary and musical society at Arras known as the " Rosati," of which Carnot was also a member. There the sympathetic quality of Robespierre's voice, which afterwards did him such good service in the Jacobin Club, always caused his indifferent verses to be loudly applauded by his friends.

In 1 7 88 he took part in the discussion as to the; way in which the statesrgeneral should be elected, showing clearly and forcibly in his Adresse & la nation artesienne- thai, if the former mode of election by- the members of the provincial estates were again adopted, the new states-general would not represent the people of France. Necker also

perceived this, and therefore deter- mined, to make the old royal bailliages and senSchaussies the units of election, which thus took place on the basis of almost universal suffrage. Under this plan the city of Arras was to return twenty-four members to the assembly of the bailliage of Artois, which was to elect the deputies. The corporation claimed the right to a preponderating influence in these city elections, and Robespierre headed the opposition, making himself very conspicuous and drawing up the cahier, or table of complaints and grievances, for the gild of the cobblers. Although the leading members of the corporation were elected, their chief opponent succeeded in getting elected with them. In the assembly of the bailliage rivalry ran still higher, but Robespierre had already made his mark in politics; by the Avis aux habitants de Campagne (Arras, 1789), which is almost certainly by him, he secured the support of the country electors, and, though but thirty years of age, poor and without influence, he was elected fifth deputy of the tiers, etat of Artois to the states-general.

When the states-general met at Versailles on 5th May 1789, the young deputy of Artois already possessed the one faculty which was to lead him to supremacy: he was a fanatic. As Mirabeau is reported to have said: ” That young man believes what he says: he will go far.” Without the courage and wide tolerance which make a statesman, without the greatest qualities of an orator, without the belief in himself which marks a great man, nervous, timid and suspicious, Robespierre yet believed in the doctrines of Rousseau with all his heart, and would have gone to death for them; and in the belief that they would eventually succeed and regenerate France and mankind, he was ready to work with unwearied patience. While the Constituent Assembly Occupied itself in drawing up a constitution, Robes- pierre turned from the assembly of provincial lawyers and wealthy bourgeois to the people of Paris. However, he spoke frequently in the Constituent Assembly, and often with great success, and was eventually recognized as second only to Petion de Villeneuve — if second to him — as a leader of the small body of the extreme left,— the thirty voices, as Mirabeau contemptu- ously called them. It is hardly necessary to examine minutely Robespierre’s speeches and behaviour before 1791, when the death of Mirabeau left the way clear for the influence of his party; but what is noteworthy, as proving the religious cast of his mind and his belief in the necessity of a religion, is that he spoke severaltimes in favour of the lower clergy and laboured to get their pensions increased. When he instinctively felt that his , doctrines would have no success in the Assembly, he turned to the Society of the Friends of the Constitution, known

Jater as the Jacobin Club, which had consisted originally of the Breton deputies only, but which, after the Assembly moved to Paris, began to admit among its members various leaders of the Parisian bourgeoisie. As time went on, many of the more intelligent artisans and small shopkeepers became members of the club, and among such men Robespierre found the hearers he sought. They did more than listen to him: they idolized him; the fanatical leader had found followers. As the wealthier bourgeois of Paris and deputies of a more moderate type seceded to the club of '89, the influence of the old leaders of the Jacobins (Barnave, Duport, Alexandre de Lameth) diminished; and when they themselves, alarmed at the progress of the Revolution, founded the club of the Feuillants in 1791, the followers of Robespierre dominated the Jacobin Club. The death of Mirabeau strengthened Robespierre's influence in the Assembly; but on the 15th of May 1701 he proved his lack of statesmanlike insight and his jealous suspicion of his colleagues by proposing and carrying the motion that no deputies who sat in the Constituent could sit in the succeeding Assembly. The flight of the king on the 20th of Jurte and his arrest at Varennes made Robespierre declare himself at the Jacobin Club to be ni monarchiste ni republicain. After the " massacre " of the Champ de Mars (on the 17 th of July 1791) he established himself, in order to be nearer to the Assembly and the Jacobins, in the house of Duplay, a cabinetmaker in the Rue St Honore, and an ardent admirer of his, where he lived (with but two short intervals) till his death. At last came his day of triumph, when on the 30th of September, on the dissolution of the Con- stituent Assembly, the people of Paris crowned Petion and himself as the two incorruptible patriots.

On the dissolution of the Assembly he returned for a short visit to Arras, where he met with a triumphant reception. In November he returned to Paris, and on the 18th of December made a speech which marks a new epoch in his life. Brissot de Warville, the dme politique of the Girondin party which had been formed in the Legislative Assembly, urged vehemently that war should be declared against Austria, and the queen was equally urgent, in the hope that a victorious army might restore the old absolutism of the Bourbons. Two men opposed the projects of the queen and the Girondins — Marat and Robespierre. Robespierre feared a development of militarism, which might be turned to the advantage of the reaction. This opposition from those whom they had expected to aid them irritated the Girondins greatly, and from that moment began the

struggle which ended in the coups d'etat of the 31st of May and the 2nd of June 1793. Robespierre persisted in his opposi- tion to the war; the Girondins, especially Brissot, attacked him violently; and in April 1792, he resigned the post of public prosecutor at the tribunal of Paris, which he had held since February, and started a journal, Le Defenseur de la Constitution, in his own defence. It is noteworthy that during the summer months of 1792 in which the fate of the Bourbon dynasty was being sealed, neither the Girondins in the Legislative As- sembly nor Robespierre took any active part in overthrowing it. Stronger men with practical instincts of statesmanship, like Danton and Billaud Varenne, who dared to look facts in the face and take the responsibility of doing while others were talking) were the men who made the 10th of August and took the Tuileries. The Girondins, however, were quite ready to take advantage of the accomplished fact; and Robespierre, likewise, though shocked at the shedding of blood, was willing to take his seat on the Commune of Paris, which had overthrown Louis XVI., and might check the Girondins. The strong men of the Commune were glad to have Robespierre's assistance, not because they cared for him or believed in him, but because of the help got from his popularity, his reputation for virtue, which had won for him the surname of " The Incorruptible," and his influence over the Jacobin Club and its branches, which spread all over France. He it was who presented the petition of the Commune of Paris on i6fh August to the Legislative Assembly, demanding the establishment of a revolutionary tribunal and the summoning of a Convention. The massacres *xm. 14

of September in the prisons, which Robespierre in vain at- tempted to stop, showed that the Commune had more confidence in Billaud than in him. Yet, as a proof of his personal popu- larity, he was a few days later elected first deputy for Paris to the National Convention. . •■

On the meeting of the Convention the Girondins immediately attacked Robespierre; they were jealous of his influence in Paris, and knew that his single-hearted fanaticism would never forgive their intrigues with the king at the end of July. As early as the 26th of September the Girondin M. D. A. Lasource accused him of aiming at the dictatorship; afterwards he was informed that Marat, Danton and himself were plotting to be- come triumvirs; and eventually on the 29th of October Louvet de Couvrai attacked him in a studied and declamatory harangue, abounding in ridiculous falsehoods and obviously concocted in Madame Roland's boudoir. But Robespierre had no diffi- culty in rebutting this attack (5th of November), while he denounced the federalist plans of the Girondins. All personal disputes, however, gave way by the month of December 1792 before the great question of the

king's trial, and here Robes- pierre took up a position which is at least easily understood. These are his words spoken on the 3rd of December: " This is no trial; Louis is not a prisoner at the bar; you are not judges; you are — you cannot but be— statesmen, and the representatives of the nation. You have not to pass sentence for or against a single man, but you have to take a resolution on a question of the public safety, and to decide a question of national foresight. It is with regret that I pronounce the fatal truth: Louis ought to perish rather than a hundred thousand virtuous citizens; Louis must die, that the country may live." This great question settled by the king's execution, the struggle between Robespierre and the Girondins entered upon a more acute stage, and the want of statesmanship among the latter threw upon the side of the fanatical Robespierre Danton and all those strong practical men who cared little for personal questions, and whose only desire was the victory of France in her great struggle with Europe. Had it been at all possible to act with that group of men of genius whom history calls the Girondins, Danton, Lazare Carnot, Robert Lindet, and even Billaud- Varenne, would have sooner thrown in their lot with them than with Robespierre, whom they thoroughly understood; but the Girondins, spurred on by Madame Roland, refused to have anything to do with Danton. Government became impossible; the federalist idea, which would have broken France to pieces in the very face of the enemy, grew and nourished, and the men of action had to take a decided part. In the month of May 1793 Camille Desmoulins, acting under the inspiration of Robespierre and Danton, published his Histoire des Brissotins and Brissot dimasque; Maximin Isnard declared that Paris must be destroyed if it pronounced itself against the provincial deputies; Robespierre preached insurrection at the Jacobin Club; and on the 31st of May and the 2nd of June the Commune of Paris destroyed the Girondin party. For a moment it seemed as if France would avenge them; but patriotism was stronger than federalism. The defence of Lyons exasperated the men who were working for France, and the armies who were fighting for her, and on the 27th of July 1793, when the struggle was practically decided, the Convention elected Robespierre to the new Com- mittee of Public Safety. He had not solicited, so it seems, nor even desired this election, yet it marks an important epoch, not only in the life of Robespierre, but in the history of the Revolution. Danton and the men of action had throughout the last two years of the crisis, as Mirabeau had in the first two years, seen that the one great need of France, if she was to see the end of her troubles without the interference of foreign armies, was the existence of a strong executive government. The means for establishing the much-needed strong executive were found in the Committee of Public

Safety. The success of this Committee in suppressing the Norman insurrection had confirmed the majority of the Convention in the expediency of strengthening its powers, and the Committee of General

Security which sat beside it was also strengthened and given the entire management of the internal police of the country. It was not until Robespierre was elected to the Committee that he became one of the actual rulers of France. Indeed, the Committee was not finally constituted until the 13th of Septem- ber, when the last two of the " great " twelve who held office until July 1794 were elected. Of these twelve at least seven — Lazare Carnot, Billaud-Varenne, Collot d'Herbois, Prieur Duvernois (of the Marne), Prieur (of the C6te d'Or), Jean Bon Saint-Andre and Robert Lindet---were essentially men of action, and were entirely free from the influence of Robespierre. Of the other four, "Herault de Sechelles was a professed ad- herent of Danton, Barere de Vieuzac was an eloquent Provencal, who was ready to be the spokesman to the Convention of any view which the majority of the Committee might adopt; and only Georges Couthon and Saint- Just, devoted to Robespierre, adroitly sustained his policy. It is necessary to dwell upon the fact that Robespierre was always in a minority in the great Committee in order to absolve him from the blame of being the inventor of the Terror, as well as to deprive him of the glory of the gallant stand made against Europe in arms.

After this examination of Robespierre's position it is not necessary to investigate closely every act of the great Committee during the year which was pre-eminently the year of the Terror; the biographer is rather called upon to examine his personal position with regard to the establishment of the Terror and the fall of the Hebertists and Dantonists, and then to dwell upon the last three months in which he stood almost alone trying to work up an effective counterbalance to the power of the majority of the great Committee. The Terror was the embodiment of the idea of Danton, that it was necessary to have resort to extreme measures to keep France united and strong at home in order to meet successfully her enemies upon the frontier. This idea was systematized by the Committee of Public Safety. With the actual organization of the Terror Robespierre had little or nothing to do; its two great engines, the revolutionary tribunal and the almost absolute power in the provinces of the representatives on mission, were in existence before he joined the Committee of Public Safety, and the laws of the maximum and of the suspects were by no means of his

creation. The reason why he is almost universally regarded as its creator and the dominant spirit in the Committee is not hard to discover. Men like Lazare Carnot and Billaud-Varenne Were not conspicuous speakers in the Convention, nor were they the idols of any section of the populace; but Robespierre had a fanatical following among the Jacobins and was one of the most popular orators in the Convention, on which his care- fully prepared addresses often made a deep impression. His panegyrics on the system of revolutionary government and his praise of virtue led his hearers to believe that the system of the Terror, instead of being monstrous, was absolutely laudable; his pure life and admitted incorruptibility threw a lustre oil the Committee of which he was a member; and his colleagues offered no opposition to his posing as their repre- sentative and reflecting some of his personal popularity upon them so long as he did not interfere with their work. Moreover, he alone never left Paris, whilst all the others, except Barere, were constantly engaged on missions to the armies, the navy and the provinces. It has been asserted that Robespierre, Couthon and Saint-Just took upon themselves the direction of ” la haute politique,” while the other members acted only in subordinate capacities; undoubtedly it would have suited Robespierre to have had this believed, but as a matter of fact he was in no way especially trusted in matters of supreme importance.

After this explanation it may be said at once that Robes- pierre was not the sole author of the overthrow of the Dantonists and the Hebertists, though he thoroughly agreed with the majority and had no desire to save them, the principles of both parties being obnoxious to him. The Hebertists were communists in the true meaning of the word. They held that each commune should be self-governing, and, while admitting

the right of a central authority to levy men and money for the purposes of the state, they believed that in purely internal matters, as well as in determining the mode in which men and money were to be raised, the local government ought to be supreme. This position of the Hebertists was of course ob- noxious to the Committee, who believed that success could only be won by their retention of absolute power; and in the winter of 1 794-1 795 it became obvious that the Hebertist party must perish, or its opposition to the Committee would grow too formidable owing to its paramount influence in the Commune of Paris. Robespierre shared his colleagues’ fear, of the Hebertist opinions, and he had a personal reason for disliking that party of atheists and sansculottes, since he be- lieved in the necessity of religious faith, and detested their imitation of the grossness that belongs to the lowest class of the populace. In 1792 he had indignantly thrown from him

the cap of liberty which an ardent admirer had placed upon his head; he had never pandered to the depraved tastes of the mob by using their language; and to the last day of his life he wore knee-breeches and silk stockings and wore his hair powdered. His position towards the Dantonist party was of a different character. After having seen established the strong executive he had laboured for, and having moved the resolutions which finally consolidated the power of the Com- mittee of Public Safety in September 1793, Danton retired to his country house. But to his retreat came the news of the means the Committee used to maintain their supremacy. Danton did not believe that this continuous series of sacrifices under the guillotine was necessary, especially since the danger to the country had passed away with the victories of the revolutionary army; hence he inspired Camille Desmoulins to protest against the Terror in the Vieux Cordelier. Where is this system of terror to end? What is the good of a tyranny comparable only to that of the Roman emperors as described by Tacitus? Such were the questions which Camille Des- moulins asked under Danton's inspiration. This " moder- antism," as it was called, was as objectionable to the members of the Committee as the doctrines of the Hebertists. Both parties must be crushed. Before the blows at the leaders of those two parties were struck, Robespierre retired for a month (from 13th February to 13th March 1794) from active business in the Convention and the Committee, apparently to consider his position; but he came to the conclusion that the cessation of the Reign of Terror would mean the loss of that supremacy by which he hoped to establish the ideal of Rousseau; for Danton, he knew, was essentially a practical statesman and laughed at his ideas and especially his politico-religious pro- jects. He must have considered too that the result of his siding with Danton would probably have been fatal to himself. The result of his deliberations was that he abandoned Danton and co-operated in the attacks of the Committee on the two parties. On the 15th of March he reappeared in the Con- vention; on the 19th Hebert and his friends were arrested; and on the 24th they were guillotined. On the 30th of March Danton, Camille Desmoulins and their friends were arrested, and on the 5th of April they too were guillotined.

It was not until after the execution of Danton that Robes- pierre began to develop a policy distinct from that of his col- leagues in the Committee, an opposition which ended in his downfall. He began by using his influence over the Jacobin Club to dominate the Commune of Paris through his devoted adherents, two of whom, Fleuriot-Lescot and C. F. de Payan, were elected respectively mayor and procureur of the Commune. He also attempted to usurp the influence of the other

members of the Committee over the armies by getting his young adherent, Saint Just, sent on a mission to the frontier. In Paris Robes pierre determined to increase the pressure of the Terror: no one should accuse him of moderantism; through the increased efficiency of the revolutionary tribunal Paris should tremble before him as the chief member of the Committee; and the Convention should pass whatever measures he might dictate. To secure his aims, Couthon, his other ally in the Committee,

proposed and carried on the 10th of June the outrageous law of 22nd Prairial, by which even the appearance of justice was taken from the tribunal, which, as no witnesses were allowed, became a simple court of condemnation. The result of this law was that between the 12th of June and the 28th of July, the day of Robespierre's death, no less than 1285 victims perished by the guillotine in Paris. It was the bloodiest and the least justifiable period of the Terror. But before this there had taken place in Robespierre's life an episode of supreme importance, as illustrating his character and his political aims: on the 7th of May he secured a decree from the Convention recognizing the existence of the Supreme Being. This worship of the Supreme Being was based upon the ideas of Rousseau in the Social Contract, and was opposed by Robespierre to Catholicism on the one hand and the Hebertist atheism on the other. In honour of the Supreme Being a great fete was held on the 8th of June; Robespierre, as president of the Convention, walked first and delivered his harangue, and as he looked around him he may well have believed that his position was secured and that he was at last within reach of a supreme power which should enable him to impose his belief on all France, and so ensure its happiness. The majority of the Committee found his popularity — or rather his ascendancy, for as that increased his personal popularity diminished — useful to them, since by increasing the stringency of the Terror he strengthened the position of the Committee, whilst attract- ing to himself, as occupying the most prominent position in it, any latent feeling of dissatisfaction at such stringency. Of the issue of a struggle between themselves and Robes- pierre they had little fear: they controlled the Committee of General Security through their alliance with its leaders, Andre Amar and Marc Guillaume Alexis Vadier; they were hopeful of obtaining a majority in the Convention; for they knew that the chief deputies on the left, or " the Mountain," were Dantonists, who burned to avenge Danton's death; while they felt sure also that the mass of the deputies of the centre, or " the Marsh," could

be hounded on against Robes- pierre if they were to accuse him of aiming at the dictatorship and pour on him the obloquy of having increased the Terror when victory on the frontier rendered it less necessary; and they knew finally that his actual adherents, though devoted to him, were few in number. The devotion of these admirers had been further excited by the news that a half-witted girl, named Cecile Renault, had been found wandering near his house, with a knife in her possession, intending to play the part of Charlotte Corday. She was executed on the 17th of June, on the very day that Vadier raised a laugh at Robes- pierre's expense in the Convention by his report on the conspiracy of Catherine Theot (q.v.), a mad woman, who had asserted that Robespierre was a divinity.

Robespierre felt that he must strike his blow now or never. Yet he was not sufficiently audacious to strike at once, as Payan and Jean Baptiste Coffinhal, the ablest of his adherents, would have had him do, but retired from the Convention for some weeks, as he had done before the overthrow of the H6bertists and the Dantonists, to prepare his plan of action. This retire- ment seemed ominous to the majority of the Committee, and they too prepared for the struggle by communicating with the deputies of the Mountain, who were either friends of Danton or men of proved energy like Barras, Freron and Tallien. These weeks, the last of his life, Robespierre passed very peace- fully, according to his wont all through the Revolution. He continued to live with the Duplays, with whose daughter fileonore he had fallen in love, and used to wander with her and his favourite dog, a great Danish hound, named Bruant, in the Champs Elysees during the long summer evenings. At last, on the 26th of July, Robespierre appeared, for the first time for more than four weeks, in the Convention and delivered a care- fully studied harangue, which lasted for more than four hours, in which he declared that the Terror ought to be ended, that certain deputies who had acted unjustly and exceeded their powers ought to be punished, and that the Committees of

Public Safety and General Security ought to be renewed. Great was the excitement in the Convention: all wondered who were the deputies destined to be punished; all were surprised that the Terror should be imputed as a fault to the very Committee of which Robespierre had been a member. The majority of the Committee of Public Safety determined to act promptly. The Convention, moved by Robespierre's eloquence, at first passed his motions; but he was replied to by Joseph Cambon the financier, Billaud-Varenne, Amar and Vadier, and the Con- vention rescinded their decrees and referred Robespierre's question to their committees. On the following day, the 27th of July,

or in the revolutionary calendar the 9th Thermidor, Saint- Just began to speak on behalf of the motions of Robes- pierre, when violent interruptions showed the temper of the Convention. Jean Lambert, Tallien, Billaud-Varenne and Vadier again attacked Robespierre; cries of ” Down with the tyrant!” were raised; and, when Robespierre hesitated in his speech in answer to these attacks, the words ” C’est le sang de Danton qui t’etouffe ” showed what was uppermost in the minds of the Mountain. Robespierre tried in vain to gain a hearing, the excitement increased and at five in the afternoon Robespierre, Couthon and Saint-Just, with two young deputies, Augustin Robespierre (younger brother of Maximilien) and Philippe Francois Joseph Lebas, the only men in all the Convention who supported them, were ordered to be arrested. Yet all hope for Robespierre was not gone; he was speedily rescued from his prison, with the other deputies, by the troops of the Com- mune and brought to the H6tel de Ville. There he was sur- rounded by his faithful adherents, led by Payan and Coffinhal. But the day was past when the Commune could overawe the Convention; for now the men of action were hostile to the Commune, and its chief was not a master of coups d’Uat. On the news of the release of Robespierre, the Convention had again met, and declared the members of the Commune and the released deputies outlawed. The national guards under the command of Barras had little difficulty in making their way to the Hotel de Ville; Robespierre was shot in the lower jaw by a young gendarme named Meda while signing an appeal to one of the sections of Paris to take up arms for him, though the wound was afterwards believed to have been inflicted by him- self; and all the released deputies were again arrested. After a night of agony, Robespierre was the next day taken before the tribunal, where his identity as an outlaw was proved, and without further trial he was executed with Couthon and Saint- Just and nineteen others of his adherents on the Place de la Revolution on the 10th Thermidor (28th July) 1794.

The character of Robespierre, when looked upon simply in the light of his actions and his authenticated speeches, and apart from the innumerable legends which have grown up about it, is not a difficult one to understand. A well-educated and accomplished young lawyer, he might have acquired a.- good provincial practice and lived a happy provincial life had it not been for the Revolution. Like thousands of other young Frenchmen, he had read the works of Rousseau and taken them as gospel. Just at the very time in life when this illusion had not been destroyed by the realities of life, and without the experience which might have taught the futility of idle dreams and theories, he was elected to the states-general. At Paris he was not understood till

he met with his audience of fellow- disciples of Rousseau at the Jacobin Club. His fanaticism won him supporters; his singularly sweet and sympathetic voice gained him hearers; and his upright life attracted the admiration of all. As matters approached nearer and nearer to the terrible crisis, he failed, except in the two instances of the question of war and of the king's trial, to show himself a statesman, for he had not the liberal views and practical instincts which made Mirabeau and Danton great men. His admission to the Committee of Public Safety gave him power, which he hoped to use for the establishment of his favourite theories, and for the same purpose he acquiesced in and even heightened the horrors of the Reign of Terror. It is here that the fatal mistake of allowing a theorist to have power appeared:

Billaud-Varenne systematized the Terror because he believed it necessary for the safety of the country; Robespierre intensified it in order to carry out his own ideas and theories. Robespierre's private life was always respectable: he was always emphati- cally a gentleman and man of culture, and even a little bit of a dandy, scrupulously honest, truthful and charitable. In his habits and manner of life he was simple and laborious; he was not a man gifted with flashes of genius, but one who had to think much before he could come to a decision, and he worked hard all his life.

On the family of Robespierre see A. J. Paris in the Mimoires (2nd series, vol. iii.) of the Academy of Arras; the CEuvres de Maximilien Robespierre (3 vols., 1840), published by Laponneraye with preface by Armand Carrel, contain some of his speeches and the memoirs of Charlotte Robespierre on her brothers. The standard Work on Robespierre's career is Ernest Hamel, Histoire de Robes- pierre d'apres des papiers de famille, les sources originates et des documents entierement inedits (3 vols., 1865-67). After the appear- ance of the first volume, the publisher refused to proceed for fear of prosecution until compelled to do so by the author. Another edition with a different title appeared in 1878. See also Ch. d'Heri- cault, La Revolution de Thermidor (2nd ed., 1878) ; Karl Brunnemann, Maximilian Robespierre (Leipzig, 1880); F. A. Aulard, Les Orateurs de VAssemblee Constituante (1882); M. de Lescure, " Le Roman de Robespierre," in La Societe frangaise pendant la Terreur (1882); E. Hamel, La Maison de Robespierre (1895); Hilaire Belloc, Robes- pierre (1901); and C. F. Warwick, Robespierre and the French Revolution

(1909). Many of the books which have been written about Robespierre are most untrustworthy, and the picture of him given by Thomas Carlyle in his French Revolution is unjust.

ROBILANT, CARLO FELICE NICOLIS, Conte di (1826- 1888), Italian statesman and diplomat, was a native of Turin. He entered the army, and lost his left hand at Novara, where he was aide-de-camp to Charles Albert, king of Piedmont. He fought in 1859, atid reached the grade of general in the Austrian campaign of 1866, after which he served on the delimitation commission. He was chief of the Military Academy, and in 1867 was made prefect of Ravenna to suppress political dis- order. He was defeated at Turin in the elections for the Chamber in 1870, and was sent in 1871 as minister plenipoten- tiary to Vienna, where he subsequently became ambassador. He was connected with the Prussian nobility by his mother, and he married an Austrian, a daughter of Prince Edmund Clary- Aldringeri. In spite of the active share he had taken in driving Austria from Italy, he was a persona grata at Vienna, and his policy was steadily directed to an alliance between the two powers. This was accomplished by the secret terms of the Triple Alliance in 1882. He was recalled to Rome in 1885 to become minister for foreign affairs in the Depretis cabinet. Robilant's independent attitude as foreign minister secured greater consideration for Italy from her allies, but he did not adapt himself to the exigencies of domestic politics, and his excessive unpopularity contributed to the downfall of the ministry on the 7th of February 1887, consequent on an adverse vote on the Massawa question. Before leaving office, he com- pleted the negotiations for the renewal of the Triple Alliance, and for its extension to cover Anglo-Italian co-operation in the Mediterranean. In the new Depretis-Crispi administration Robilant was not included. He was sent to London as ambas- sador in the next year, but died two months after his arrival, on the 17th of October 1888.

ROBIN HOOD, English legendary hero. The oldest mention of Robin Hood at present known occurs in the second edition — ■ what is called the B text— of Piers the Plowman, the date of which is about 1377. In passus v. of that poem the figure of Sloth is represented as saying—

" I can noujte perfitly my pater-noster, as the prest it syngeth : But I can rymes of Robyn Hood and Randolf Erie of Chestre."

He is next mentioned by Andrew of Wyntoun in his Original Chronicle of Scotland, written about 1420 —

” Lytel Jhon and Robyne Hude Waythmen ware commendyd gude ; In Yngilwode and Barnysdale Thai oysyd all this time [c. 1283] thare trawale “;

next by Walter Bower in his additions of Fordun’s Scotichro-. nicon about 1450 —

“Hoc in tempore [1266] de exheredatis et bannitis surrexit et caput erexit ille famosissimus sicarius Robertus Hode et Littill Johanne cum eorum complicibus, de quibus stolidum vulgus hianter in comoediis et tragoediis prurienter restum faciunt et super ceteras romancias, mimos, er bardanos cantitare delectantur.”

Of his popularity in the latter half of the 15th and in the 16th centuries there are many signs. Just one passage must be quoted as of special importance because closely followed by R. Grafton, J. Stow and W. Camden. It is from John Mair’s Historia Majoris Britanniae tarn Angliae quam Scotiae, which appeared in 1521 — ■

“Circa haec tempora [Ricardi Primi], ut auguror, Robertus Hudus Anglus et Parvus Joannes latrones famatissimi in nemoribus latuerunt, solum opulentorum virorum bona deripientes. Nullum nisi eos invadentem vel resistentem pro suarum rerum tuitione occiderunt. Centum sagittarios ad pugnam aptissimos Robertus latrociniis aluit, quos 400 viri fortissimi invadere non audebant. Rebus hujus Roberti gestis tota Britannia in cantibus utitur . Faeminam nullam opprimi permisit nee pauperum bona surripuit, verum eos ex abbatum bonis sublatis opipare pavit. Viri rapinam improbo, sed latronum omnium humanissimus et princeps erat.”

In the Elizabethan era and afterwards mentions abound; see the works of Shakespeare, Sidney, Ben Jonson, Drayton, Warner, A. Munday, Camden, Stow> Braithwaite, Fuller, &c.

Of the ballads themselves, Robin Hood and the Monk is possibly as old as the reign of Edward II. (see Thomas Wright’s Essays on England in the Middle Ages, ii. 174); Robin Hood and the Potter and Robyn and Gandelyn are certainly not later than the 15th century. Most important of all is A Lytell Geste of Robyn Hode, which was first printed about 1510 (see A. W. Pollard’s Fifteenth Century Prose and Verse, Westminster, 1903). This is evidently founded on older ballads; we read in The Seconds Fytte, 11. 176 and 177 —

” He wente hym forthe full mery syngynge, As men have told in tale.”

In fact, it does for the Robin Hood cycle what a few years before Sir

Thomas Malory had done for the Arthurian romances — what in the 6th century B.C. Peisistratus is said to have done for the Homeric poems.

These are the facts about him and his balladry. Of conjec- tures there is no end. He has been represented as the last of the Saxons — as a Saxon holding out against the Norman conquerors so late as the end of the 12th century (see Augustin Thierry's Norman Conquest, and compare Sir Walter Scott's Ivanhoe). J. M. Gutch maintains that he was a follower of Simon de Montfort. The Rev. Joseph Hunter associated him with the rebel earl of Lancaster of Edward II.'s time. This scholar in a brochure published in 1852 produced evidence from the exchequer accounts and the court rolls of the manor of Wake- field snowing that a " Robyn Hod " and a " Robertus Hood " were living in this reign. The series of coincidences to which he points is undoubtedly striking, but had failed to convince most critics. Professor F. J. Child dismisses his inferences as " ludicrous."

For our part, we are not disinclined to believe that the Robin Hood story has some historical basis, however fanciful and romantic the superstructure. We parallel it with the Arthurian story, and hold that, just as there was probably a real Arthur, however different from the hero of the trouveres, so there was a real Hood, however now enlarged and disguised by the accretions of legend. That Charlemagne and Richard I. of England be- came the subjects of romances does not prevent our believing in their existence; nor need Hood's mythical life deprive him of his natural one. Sloth in Langland's poem couples him, as we have seen, with Randle, earl of Chester; and no one doubts this nobleman's existence because he had " rymes " made about him. We believe him to have been the third Randle (see Bishop Percy's Folio MS., ed. Hales and Furnivall, i. 260). And pos- sibly enough Hood was contemporary with that earl, who " flourished " in the reigns of Richard I., John and Henry III. Wyntoun and Mair, as we have seen, assign him to that period. It is impossible to believe with Hunter that he lived so late as Edward II.'s reign. This would leave no time for the growth

of his myth; and his myth was, as is evident from what we have already said and quoted, full-grown in the first half of the 14th cen- tury. Whatever may have been the immediate genesis of the myth — and it may well be sought in the heartless forest laws— its vitality was

assured by the English love of archery and historical repetition. In the rolls of parliament of 1437 mention is made of Piers Venables, a robber who took to the woods ” like as it had been Robin Hood and his meyne.” There are indications that Robin was identified or confused with Robert Locksley, a manslayer of Bradfield in Hallamshire. The former is said to have been born in ” Merry sweet Locksley town.”

But whether he lived or not, and whenever he lived, it is certain that many mythical elements are contained in his story. Both his name and his exploits remind us of the woodland spirit Robin Goodfellow and his merry pranks. He is fond of dis- guising himself, and devoted to fun and practical jokes. These frolics suggest the wind. ” The whole story,” says Mr H. Bradley, ” is ultimately derived from the great Aryan sun- myth. Robin Hood is Hod, the god of the wind, a form of Woden; Maid Marian is Morgen, the dawn-maiden; Friar Tuck is Toki, the spirit of frost and snow.”

The name Robin (a French form from Rob, which is of course a short form for Robert) would serve both for ” the shrewd and knavish sprite “—the German Knecht Ruprecht (see Grimm’s Tent. Myth. p. 504, trans. Stallybrass) — and for the bandit (see ” Roberdes Knaues ” in the Prologue of Piers the Plowman, 1. 44, and the note in Warton’s Hist, of Eng. Poet. ii. 95, ed. 1840). Hood is a very usual dialectal form of wood; and in his play Edward the First, George Peele actually alludes to the bandit as ” Robin of the Wood.” Mr Gutch thus explains the origin of the name. It is still a common enough surname, of which the earlier shape is Odo (see ” Houdart,” &c, in Larchey’s Did. des Noms) ; notice, too, the name Hudson. But it also reminds one of the German familiar spirit Hudekin, or possibly of the German Witikind (see Wright’s Essays on the Middle Ages, ii. 207). Mr Sidney Lee suggests that Robin was a forest elf so ‘called because elves wore hoods (see Diet, of National Biography, sub. ” Robin Hood “). How certain it is that the Robin Hood story attracted to it and appropriated other elements is illus- trated by its subsequent history — its history after the 14th century. Thus later on we find it connected with the Morris dance; but the Morris dance was not known in England before the 16th century or late in the 15th. The Friar Tuck and Maid Marian elements have been thought to have been intro- duced for the purpose of these performances, which were held on May-day and were immensely popular (see Latimer’s Fruiefull Sermons (London, 1571), p. 75; also Paston Letters, ed. J. Gaird- ner, iii. 89). After 1615, the date of the pageant prepared for the mayoralty of Sir John Jolles, draper, by Anthony Munday and entitled Metropolis Coronata, a peer was imported into it, and the yeoman of the older version was

metamorphosed into the earl of Huntingdon, for whom in the following century William' Stukeley discovered a satisfactory pedigree! The earl of Huntingdon was probably a nickname for a hunter. At last, With the change of times, the myth ceased growing. Its rise and development and decay deserve a more thorough study than they have yet received.

What perhaps is its greatest interest as we first see it is its expression of the popular mind about the close of the middle ages. Robin Hood is at that time the people's ideal as Arthur is that of the upper classes. He is the ideal yeoman as Arthur is the ideal knight. He readjusts the distribution of property: he robs the rich and endows the poor. He is an earnest wor- shipper of the Virgin, but a bold and vigorous hater of monks and abbots. He is the great sportsman, the incomparable archer, the lover of the greenwood and of a free life, brave, adventurous, jocular, open-handed, a protector of women. Observe his instructions to Little John —

" Loke ye do no housbonde harme That tylleth with his plough ; No more ye shall no good yeman That walketh by grene wode shawe ;

Ne no knyght ne no squyer

That wolde be a good felawe : These bysshoppes and thyse archebysshoppes

Ye shall 'them bete and bynde ; The hye sheryfe of Notynghame

Hym holde in your mynde."'

And we are told —

" Robin loved our dere lady; For doute of dedely synne Wolde he never do company harme That ony woman was ynne."

See also Drayton's Polyolbion, Song xxvi. The story is localized in Barnsdale and Sherwood, i.e. between Doncaster and Notting- ham. In Yorkshire, Nottinghamshire and Lincolnshire a host of place-names testify to the popularity of the Robin Hood legend — Robin Hood's Bay, Robin Hood's Cave, Robin Hood's Chase, Robin Hood's Cup (a well), Robin Hood's Chair, Robin Hood's Pricks, and many more.

The best collections of Robin Hood poems are those of Ritson (8vo, 1795) and Gutch (2nd ed., 1847), and of Professor Child in the 5th volume of his invaluable English and Scotch Popular Ballads (Boston, 1888). See also Professor F. B. Gummere's Old English Ballads

(Boston, 1894). The versions in the Percy Folio (edited by Hales and Furnivall, 1867, vol. i.) are unhappily mutilated; but they should be consulted, for they are all more or less unique, and that on ” Robin Hoode his death ” is of singular interest. The literary and artistic value of many of the Robin Hood ballads cannot be pronounced considerable, but eight of them attain the high-water mark of their class. Robin Hood and the Monk and Guy of Gisborne are perhaps the best. There is, however, real vigour and force in this fragment on the hero’s death. The earliest “Garland” was printed in 1670, and in 1678 appeared a prose version which was reprinted by W. J. Thorns in his Early English Prose Romances (vol. ii., 1858). Mr Lee’s memoir in the Diction- ary of National Biography is extremely erudite, and two valuable articles, contributed by Sir Edward Brabrook to the Antiquary for June and July 1906, might be consulted. See also Stukeley, Paleographia Britannica, No. i. 115; Thierry, Conquite de I’Angle- terre (1830) ; and J. Hunter’s Great Hero of the Ancient Minstrelsy of England, Robin Hoed (1852). (J. W. H.; F. J. S.)

ROBIN HOOD’S BAY, a seaside resort in the Whitby parlia- mentary division of the North Riding of Yorkshire, England, 6| m. S.E. of Whitby by a branch of the North-Eastern railway. The bay itself is a shallow indentation of the coast, and is fringed with high picturesque cliffs, breached in places by steep- sided narrow gtillies. The old fishing village overhangs the cliffs, while the more modern watering-place is mostly built a little inland. A fine Stretch of sandy shore is exposed at low tide.

ROBINIA, or Locust-Tree, a genus of about six species native of the United States and Mexico, belonging to the sub- order Papilionaceae of the great family Leguminosae. It was named by Linnaeus in honour of Jean Robin (1 550-1629), herbalist to the king of France and his son and successor, Vespasien Robin (1 579-1660) by whom the best-known species, Robinia Pseudocode, was introduced into Europe, in the Jardin du Roi at Paris in 1636. This tree, the bastard acacia, or false acacia, and often called erroneously acacia, is now widely cultivated as an ornamental tree in this country and on the European continent. It grows from 30 to 60 ft. high, and bears long, graceful, compound leaves with 9 to 17 bright green oblong leaflets, and white fragrant flowers in loose pendulous racemes, recalling the laburnum in habit. There are many varieties in English gardens varying in the method of growth, the presence or absence of thorns (persistent spinose stipules) on the branches and the colour of the flower.

In the eastern United States, where it is native, it grows from 70 to 80 ft. high with a trunk 3 or 4 ft. in diameter. It is one of the most

valuable timber trees of the American forest. The wood is heavy, very hard, strong, close-grained and durable, and is extensively used in shipbuilding, also for posts and other purposes where durability in contact with the ground is essential.

Like many plants of the same family, the leaves show sleep movement, folding together at night and in dull or wet weather; for this reason it is less injurious than many trees to plants growing in its shade, as the rain is able more quickly to reach the ground beneath.

ROBINS, BENJAMIN (1707-1751), English man of science and engineer, was born at Bath in 1707. His parents were Quakers in poor circumstances, and gave him very little educa- tion. Having come to London by the advice of Dr Henry Pemberton (1694-1771), who had recognized his talents, he for a time maintained himself by teaching mathematics, but soon devoted himself to engineering and the study of fortifica- tion. In particular he carried out an extensive series of ex- periments in gunnery, embodying his results in his famous treatise on New Principles in Gunnery (1742), which contains a description of his ballistic pendulum (see Chronograph). Robins also made a number of important experiments on the resistance of the air to the motion of projectiles, and on the force of gunpowder, with computation of the velocities thereby communicated to projectiles. He compared the results of his theory with experimental determinations of the ranges of mortars and cannon, and gave practical maxims for the manage- ment of artillery. He also made observations on the flight of rockets, and wrote on the advantages of rifled barrels. His work on gunnery was translated into German by L. Euler, who added to it a critical commentary of his own. Of less interest nowadays are Robins's more purely mathematical writings, such as his Discourse concerning the Nature and Cer- tainty of Sir Isaac Newton's Methods of Fluxions and of Prime and Ultimate Ratios (173s), " A Demonstration of the Eleventh Proposition of Sir Isaac Newton's Treatise of Quadratures " {Phil. Trans., 1727), and similar works. Besides his scientific labours Robins took an active part in politics. He wrote pamphlets in support of thq opposition to Sir Robert Walpole, and was secretary of a committee appointed by the House of Commons to inquire into the conduct of that minister. He also wrote a preface to the Report on the Proceedings of the Board of General Officers on their Examination into the Conduct of Lieutenant-General Sir John Cope, in which he gave an apology for the battle of Prestonpans. In 1749 he was appointed

engineer-general to the East India Company, and went out to superintend the reconstruction of their forts; but his health soon failed, and he died at Fort St David on the 29th of July

His works were published in two volumes in 1 761.

ROBINSON, EDWARD (1794-1863), American Biblical scholar, was born in Southington, Connecticut, on the 10th of April 1794, the son of William Robinson (1754-1825), minister of the Congregational Church of Southington. He graduated in 1816 at Hamilton College. In 1821 he came under the influence and teaching of Moses Stuart, the second edition of whose Hebrew Grammar he helped to prepare for the press in 1823, and through whom he was appointed in the same year instructor in Hebrew in Andover Seminary. With Stuart he translated in 1825 the first edition of Winer's Grammar of New Testament Greek; and alone he translated Wahl's Clavis Philologica Novi Testamenti (1825). In 1826-30 he studied in Germany, especially at Halle, under Gesenius, Tholuck and Rodiger, and at Berlin, under Neander. He was professor (extraordinary) of sacred literature and librarian at Andover in 1830-33, resigning because of dangerous epileptic attacks; and in 1831-35 he edited the Biblical Repository, which he founded and carried on very largely by his own contributions, assisted somewhat by his young German wife, Theresa Albertina Luise (1797-1869), the daughter of Professor Ludwig Heinrich von Jakob of Halle, a linguist of considerable ability, and a writer (in her early years under, the pseudonym " Talvi ") of essays and stories. In 1837 he accepted the professorship of Biblical literature in Union Theological Seminary, and left America for three years of study in Palestine and Germany, the fruit of which, his Biblical Researches, published in 1 84 1, brought him the gold medal of the Royal Geographical Society in 1842. A second volume of Researches appeared in 1856. His plans to sum up his important topographical studies in a work on Biblical geography were cut short by cataract in 1861 and by his death in New York City on the 27th of January 1863. A great Biblical scholar and exegete, Robinson must

be considered the pioneer and father of Biblical geography — his Biblical Researches, supplemented by the Physical Geography of the Holy Land (1865), were based on careful personal ex- ploration and tempered by a thoroughly critical spirit, which was possibly at times too sceptical of local tradition. Of scarcely less value in their day were his Greek Harmony of the Gospels (1845 and often) and his Greek and English Lexicon of the New Testament (1836; revised 1847 and 1850). He estab- lished in 1843 an< i edited for some years the Bibliotheca Sacra (in which the Biblical Repository was merged in 1852), for

which he wrote until 1855.

See Henry B. Smith and Roswell D. Hitchcock, The Life, Writings and Character of Edward Robinson (New York, 1863); a biography of Mrs Robinson was published, with a collection of her stories, in Leipzig, in 1874.

ROBINSON, HENRY CRABB (1777-1867), English journalist and diarist, the son of a tanner, was born at Bury St Edmunds on the 13th of March 1775. In 1796 he entered the office of a solicitor in London, but two years later, having inherited a sum of money sufficient to give him a small yearly income, he started in 1800 upon a tour on the Continent, travelling chiefly in Germany and Bohemia. In 1802 he became a student at the university of Jena, where he remained until his return to England in 1805. After vain endeavours to obtain a post in the diplomatic service, he was appointed foreign correspondent for The Times at Altona. His letters, ” From the Banks of the Elbe,” were published in this newspaper during 1807, and on his return he became its foreign editor. In 1808 at the outbreak of the Peninsular War he was sent out as special war correspondent — an innovation in English journalism— for The Times to Spain. There he witnessed Sir John Moore’s retreat at Corunna. After his return to England he read for the bar at the Middle Temple, and from 1813 to 1828 he practised as a barrister, retiring as soon as he had acquired a modest com- petence. He is remembered chiefly as the friend of Lamb, Coleridge, Wordsworth and Southey. He was a great con- versationalist, and his breakfast parties rivalled those of Samuel Rogers. He died in London on the 5th of February 1867.

H”Ts Diary of 35 volumes, his Journals of 30 volumes, and his Letters and Reminiscences in 36 volumes, contain vivid pictures drawn by an acute and sympathetic observer who had exceptional opportunities of studying contemporary celebrities. They are preserved at Dr Williams’s Library in Gordon Square, London. Crabb Robinson seems to have intended to edit these for publica- tion, but except for a meagre selection edited by Thomas Sadler and entitled The Diary, Reminiscences and Correspondence of H. Crabb Robinson (1869), they have never been reprinted. Crabb Robinson was one of the founders of the Athenaeum Club and of University College, London.

ROBINSON, JOHN (1659-1723), English diplomatist and prelate, a son of John Robinson (d. 1651), was born at Cleasby, near Darlington, on the 7th of November 1650. Educated at Brasenose College, Oxford, he became a fellow of Oriel College, and about 1680 chaplain to the British embassy to Stockholm, and remained in Sweden for nearly

thirty years. During the absence of the minister, Philip Warwick, Robinson acted as resident and as envoy extraordinary, and he was thus in Sweden during a very interesting and important period, and was per- forming diplomatic duties at a time when the affairs of northern Europe were attracting an unusual amount of attention. Among his adventures not the least noteworthy was his journey to Narva with Charles XII. in 1700. In 1709 Robinson returned to England, and was appointed dean of Windsor and of Wolver- hampton; in 1 7 10 he was elected bishop of Bristol, and among other ecclesiastical positions he held that of dean of the Chapel Royal. In August 171 1 he became lord privy seal, this being, says Lord Stanhope, ” the last time that a bishop has been called upon to fill a political office.” In 1712 the bishop re- presented England at the important congress of Utrecht, and at first plenipotentiary he signed the treaty of Utrecht in April 1713. Just after his return to England he was chosen bishop of London in succession to Henry Compton. He died at Hamp- stead on the nth of April 1723, having been a great benefactor to Oriel College. Robinson wrote an Account of Sweden:

together with an Extract of the History of that Kingdom. By a person of note who resided many years there (London, 1695). This was translated into French (Amsterdam, 17 12), and in 1738 was published with Viscount Molesworth’s Account of Denmark in 1692. Some of his letters are among the Strafford papers in the British Museum.

A member of the same family was Sir Frederick Philipse Robinson (1 763-1852), a Virginian soldier, who fought for England during the American War of Independence. On the conclusion of peace he went to England, and in 1813 and 1814 he commanded a brigade under Wellington in Spain. After- wards he was governor of Tobago, and he became a general in 1841. He died at Brighton on the 1st of January 1852.

ROBINSON, JOHN (1575-1625), English Nonconformist divine, was born probably in Lincolnshire or Nottingham- shire about 1575. He seems to have studied at Cambridge, and to have been influenced by William Perkins. He took orders and held a curacy in Norwich, but was attracted by Puritan doctrines, and finally associated himself with a Con- gregation meeting at Gainsborough (where the ” John Robinson Memorial Church ” bears witness to his work). In 1606 the members divided into two societies, Robinson becoming minister of the one which made its headquarters at Scrooby, a neighbouring

village. The increasing hostility of the authori- ties towards nonconformity soon forced him and his people to think of flight, and, not without difficulty, they succeeded in making their escape in detachments to Holland. Robinson settled in Amsterdam in 1608, but in the following year re- moved, with a large contingent, to Leiden, where he ministered to a community whose numbers gradually grew from one hundred to three hundred. In 1620 a considerable minority of these sailed for England in the ” Speedwell,” and ultimately crossed the Atlantic in the ” Mayflower ” ; it was Robinson’s intention to follow as soon as practicable, along with the rest of his flock, but he died before the plan could be carried out, on the 1st of March 1625.

In the early stages of the Arminian controversy he took the Calvinistic side, and even engaged in a public disputation with the famous Episcopius. He bore a high reputation even among his ecclesiastical opponents, and one of them (Robert Baillie) calls him ” the most learned, polished and modest spirit that ever that sect enjoyed.” He was large-minded and eminently reasonable in spirit, recognizing parish as- semblies where ” the pure word and discipline ” prevailed as true churches of God. His sound judgment is seen in the way in which he adjusted the relations of elders and church — the most delicate practical problem of Congregationalism.

Amongst his publications may be mentioned Justification of Separation from the Church (1610), Apologia Brownistarum (1619), A Defence of the Doctrine propounded by the Synod of Dort (1624), and a volume of Essays, or Observations Divine and Moral, printed in 1625. His Works (with one exception, A Manumission to a Manduction, since published by the Massachusetts Historical Society, ser. iv., vol. i.), including a memoir, were reprinted by R. Ashtoti in three vols, in 185 1. A summary of their contents is given in G. Punchard, History of Congregationalism (New York, 1867), Hi. 300-344. See further Congregationalism, and the literature there cited; also O. S. Davis, John Robinson (Hartford, Connecticut, 1897).

ROBINSON, SIR JOHN BEVERLEY, Bart. (1791-1863), Canadian statesman and jurist, was the son of Christopher Robinson (1764-1798), one of the band known as United Empire Loyalists, who came to Canada at the conclusion of the American Revolution. He was born at Berthier, Quebec, on the 26th of July 1791, and studied under Dr John Strachan, by whom his religious and political ideas were much influenced. He served with distinction at the beginning of the war of 181 2, and later in the war was appointed acting attorney-general of Upper Canada. In 18 15 he visited England and read law at Lincoln’s Inn.

From 1818 till 1829 he was the head of the Tory party in Upper Canada (the so-called “Family Compact”). In 1829 he became chief justice of Upper Canada, which position he held till shortly before his death on the 31st of January 1863.

Not one of his decisions was ever reversed on appeal. In 1824 and again in 1839 he strongly advocated a federal union of British North America, and in 1839 opposed in Canada and the Canada Bill the legislative union of the two Canadas pro- posed by Lord Durham. In 1854 he was created a baronet of the United Kingdom and in 1855 a D.C.L. of Oxford Uni- versity. His unbending Toryism rendered him a reactionary in politics, but his bitterest opponents admitted his sincerity and patriotism.

Several of his sons rose to eminence, John Beverley Robinson (1820-1896) becoming a member of the Dominion , parliament and lieutenant-governor of Ontario (1880-1887). Christopher Robinson (1828-1905) was for many years the acknowledged leader of the Canadian Bar.

His Life, by his son, Major-General C. W. Robinson, C.B. (Toronto and London, 1904), gives a very favourable picture of the fine old colonial gentleman and loyalist. For a less favourable view see J. C. Dent, Canadian Portrait Gallery, vol. iv. (Toronto, 1881).

ROBINSON, JOHN THOMAS ROMNEY (1792-1882), Irish astronomer and physicist, was born in Dublin on the 23rd of April 1792. He studied at Trinity College, Dublin, and ob- tained a fellowship in 1814; for some years he was deputy professor of natural philosophy, until in 1821 he obtained the college living of Enniskillen. In 1823 he was appointed astro- nomer of the Armagh observatory, with which he (from 1824) combined the living of Carrickmacross, but he always resided at the observatory, engaged in researches connected with astronomy and physics, until his death on the 28th of February

1882.

Robinson published a number of papers in scientific journals, and the Armagh catalogue of stars (Places of 534.5 Stars observed from 1828 to 1854 at the Armagh Observatory, Dublin, 1859), but he is best known as the inventor (1846) of the cup-anemometer for registering the velocity of the wind.

ROBINSON, SIR JOSEPH BENJAMIN (1845-), South African mine-

owner, was born at Cradock, Cape Colony, in 1845. At the age of sixteen he started business as a general trader, wool-buyer and stock-breeder, but on the discovery of diamonds in South Africa in 1867 he hastened to the Vaal river district, where, by purchasing the stones from the natives and afterwards by buying diamond-bearing land, notably at Kimberley, he soon acquired a considerable fortune. He was mayor of Kimberley in 1880, and for four years was a representative of Griqualand West in the Cape parliament. On the discovery of gold in the Witwatersrand district in 1886, Robinson purchased the Langlaagte and Randfontein estates. His views as to the westerly trend of the main gold-bearing reef were entirely contrary to the bulk of South African opinion at the time, but events proved him to be correct, and the enormous appreciation in value of his various properties made him one of the richest men in South Africa. As a Rand capi- talist he stood aloof from combinations with other gold-mining interests, and took no part in the Johannesburg reform move- ment, maintaining friendly relations with President Kruger. He claimed that it was as the result of his representations after the Jameson Raid that Kruger appointed the Industrial Com- mission of 1897, whose recommendations — had they been carried out — would have remedied some of the Uitlander grievances. In 1908 he was created a baronet.

ROBINSON, MARY [" Perdita "] (1758-1800), English actress and author, was born in Bristol on the 27th of November 1758, the daughter of a captain of a whaler named Darby. In 1774 she was married to Thomas Robinson, a clerk in London, where her remarkable beauty brought her many attentions; and when, after two years of fashionable life, her husband was arrested for debt, she shared his imprisonment. She had been a precocious child, encouraged to write verses, and while in King's Bench prison she completed the collection published in two volumes in 1775. On her release, thanks to Garrick, she secured an engagement at Drury Lane, making a successful first appearance as Juliet in 1776. On the 3rd of December 1779 she was Perdita in Garrick's version of The Winter's Tale, and her beauty so captivated George, prince of Wales (afterwards

George IV.), then in his eighteenth year, that he began a correspondence with her, signing himself " Florizel." She was for about two years his mistress, but he then deserted her, even dishonouring his bond for £20,000, payable when he came of age, and

left her to obtain a pension of £500 in exchange for it from Charles James Fox. Owing to the hostility of public opinion, she feared to return to the stage, but she published some more volumes of her writings. There are numerous charming portraits of “Perdita”; two in the Wallace Collection, by Reynolds and by Gainsborough, reveal “her grave, refined beauty.” Hoppner, Cosway and Romney also painted her.

See Memoirs of Mary Robinson, ” Perdita,” with introduction and notes by J. F. Molloy (1894).

ROBINSON, THEODORE (1852-1896), American artist, was born at Irasburg, Vermont, in 1852. He was a pupil of J. L. Ger&me and Carolus-Duran in Paris, and worked with Claude Monet. He received the Webb Prize in 1890 for his ” Winter Landscape,” and the Shaw Fund in 1892 for his ” In the Sun,” a study of a peasant girl. He became a member (188 1) of the Society of American Artists. He died in New York City on the 2nd of April 1896.

ROB ROY (1671-1734), the popular designation of a famous Highland outlaw whose prowess is the theme of one of Sir Walter Scott’s novels, was by descent a Macgregor, being the younger son of Donald Macgregor of Glengyle, lieutenant- colonel in the army of James II., by his wife, a daughter Of William Campbell of Gleneaves. He received the name Roy from his red hair, and latterly adopted Campbell as his surname on account of the acts proscribing the name of his clan. Though in stature not much above the middle height, he was so muscular and thickly set that few were his equals in feats of strength, while the unusual length of his arms gave him an extraordinary advantage in the use of the sword. His eyes were remarkably keen and piercing, and with his whole expression formed an appropriate complement to his powerful physical frame. He inherited a small property on the Braes of Balquhidder, and at first devoted himself to the rearing of cattle. Having formed a band of armed clansmen, he obtained, after the accession of William III., a commission from James II. to levy war on all who refused to acknowledge him as king, and in the autumn of 1691 made a descent on Stirlingshire to carry off the cattle of Lord Livingstone, when, being opposed by the villagers of Kippen, he also seized the cattle from all the byres of the village. Shortly afterwards he married Helen Mary, daughter of Macgregor of Comar. On the death of Gregor Macgregor, the chief of the clan, in 1693 he managed, though not the nearest heir, to get himself acknowledged chief, obtaining control of the lands stretching from, the Braes of Balquhidder to the shores of Loch Lomond, and situated between the posses- sions of Argyll and those of Montrose. To assist in

carrying on his trade as cattle-dealer he borrowed money from the 1st duke of Montrose, and, being unable to repay it, he was in 171 2 evicted from his property and declared an outlaw. Taking refuge in the more inaccessible Highlands, Rob Roy from this time forward supported himself chiefly by depredations com mitted in the most daring manner on the duke and his tenants, all attempts to capture him being unsuccessful During the rebellion of 17 15, though nominally siding with the Pretender, he did not take an active part in the battle of Sheriflmuir except in plundering the dead on both sides. He was included in the Act of Attainder; but, having for some time enjoyed the friendship of the duke of Argyll, he obtained, on making his submission at Inveraray, a promise of protection. He now established his residence at Craigroyston, near Loch Lomond, whence for some time he levied blackmail as formerly upon Montrose, escaping by his wonderful address and activity every effort of the English garrison stationed at Inversnaid to bring him to justice. Ultimately, through the mediation of Argyll, he was reconciled to Montrose, and in 1722 he made submission to General Wade; he was carried off, and imprisoned in Newgate, and in 1727 was pardoned just as he was to be transported to Barbados. He then returned to Scotland.

According to a notice in the Caledonian Mercury he died at Balquhidder on the 28th of December 1734. He was buried in Balquhidder churchyard.

The best lives are K. Macleay, Historical Memoirs of Rob Roy (1818; new ed., 1881); A. H. Millar, Story of Rob Roy (1883). See also Sir W. Scott's introduction to the novel Rob Roy. An early account, The Highland Rogue, &c. (1723), is ascribed to Defoe.

ROBSART, the maiden name of Lady Ajiy Dudley (1532- 1560), wife of Lord Robert Dudley, afterwards earl of Leicester. She was the daughter of Sir John Robsart of Norfolk, and was married to Lord Robert on the 4th of June 1550. The marriage was apparently arranged by. the family for business reasons, and there is no ground for supposing that it was a love match, or that she was beautiful. Her attraction lay in her estate, which was a provision for a younger son. During the early years of the marriage her husband was entangled in the rebellion of his family against Queen Mary, and was imprisoned in the Tower. She visited him there, and acted for his interests. After his release she saw little of him. When Elizabeth became queen in 1559 Lord Robert was soon known to be her favourite, and it was believed that she would marry him if he were free. His wife never came to court and was never. in his company. Stories were set about to the

effect that she : was suffering from cancer and would soon die. Quadra, the Spanish ambassador, reported to the king of Spain that the queen had repeated this rumour to him. In 1560 she went by her husband's directions to Cumnor Place, a house near Oxford, rented by his agent Anthony Forster or Forrester, member of parliament for Abingdon. Here she was found lying dead on the floor of the hall on the 8th of September; 1560 by her servants, whom she had allowed to go to Abingdon, Fair. The circumstances of her death never have been, and. now cannot be cleared up. A coroner's jury, which her husband, did his best to pack and influence, attributed her end to accident, ; There is no evidence against Dudley, unless it be evidence that he was a most unscrupulous man, and that he was generally; believed to have murdered several other persons who stood in his way.

See G. Adlard, Amy Robsart and Leycester (London, 1870), and W. Rye, The Murder of Amy Robsart (London, 1885).

ROBSON, STUART (1836-1903), American actor, whose real name was Robson Stuart, was born in Annapolis, Maryland, on the 4th of March 1836. An unintentionally humorous appearance in a serious part in 1852 showed him that his forte was comedy; and in partnership with W. H. Crane from 1877 to 1889 he was very successful as a comedian, The Henrietta being one of their best productions. He died on the 29th of April 1903. His wife, May Robson, also became well known as an actress.

ROBY, HENRY JOHN (1830-), English classical scholar and writer on Roman law, was born at Tamworth on the 12th of August 1830. He was educated at St John's College, Cam- bridge (senior classic, 1853; fellow, 1854). From 1866 to 1868 he was professor of jurisprudence at University College, London, and from 1872 to 1874 commissioner of endowed schools. From 1890 to 1895 he was member of parliament in the Liberal interest for the Eccles division of Lancashire. The book by which he is perhaps best known is his Grammar of the Latin Language from Plaulus to Suetonius, a storehouse of illustrative quota- tions from Latin literature, but his most important works deal with Roman law — Introduction to Justinian's Digest (1884), and Roman Private Law (1902). •.

ROC, or more correctly Rukh, a fabulous bird of enormous size which carries off elephants to feed its young. The legend of the roc, familiar to every one from the Arabian Nights, was; widely spread in the East; and in later times the home of the- monster was sought in the direction of Madagascar, whence gigantic fronds of the Raphia palm very like a quill in form appear to have been brought under the name

of roc's feathers (see Yule's Marco Polo, bk. iii. ch. 33, and Academy, 1884, No. 620). Such a feather was brought to the Great Khan, and we read also of a gigantic stump of a roc's quill; being

brought to Spain by a merchant from the China seas (Abu Ijjimid of Spain, in Damlri, s.v.). The roc is hardly different from the Arabian 'anka (see Phoenix); it is also identified with the Persian simurgh, the bird which figures in Firdausi's epic as the foster-father of the hero Zal, father of Rustam. When we go farther back into Persian antiquity we find an immortal bird, amru, or (in the Minoi-khiradh) sinamru, which shakes the ripe fruit from the mythical tree that bears the seed of all useful things. Sinamru and simurgh seem to be the same word. In Indian legend the garuda on which Vishnu rides is the king of birds (Benfey, Pantschatantra, iii. 98). In the Pahlavi translation of the Indian story as represented by the Syrian Kalilag and Damnag (ed. Bickell, 1876), the simurgh takes the place of the garuda, while Ibn al-Mokaffa' (Calila et Dimna, ed. De Sacy, p. 126) speaks instead of the 'anka. The later Syriac, curiously enough, has behmoth, — apparently the behemoth of Job transformed into a bird.

For a collection of legends about the roc, see Lane's Arabian Nights, chap. xx. notes 22, 62, and Yule, ut supra. Also see Bochart, Hieroz, bk. vi. ch. xiv. ; Damlri, i. 414, ii. 177 seq.; Kazwini, i. 419 seq.; Ibn Baˆuta, iv. 305 seq.; Spiegel, Eran. Altertumsk. u. 118.

ROCAMADOUR, a village of south-western France, in the department of Lot, 36 m. N.N.E. of Cahors by road. Pop. (1906) 296. Rocamadour, a famous place of pilgrimage, is most strikingly situated. Its buildings rise in stages up the side of a cliff on the right bank of the Alzou, which here runs between rocky walls 400 ft. in height. Flights of steps ascend from the lower town to the churches — a group of massive buildings half-way up the cliff. The chief of them is the church of Notre- Dame (1479), containing the wooden figure of the Madonna reputed to have been carved by St Amadour. The church opens on to a terrace called the Plateau of St Michel, where there is a broken sword said to be a fragment of " Durandal," once wielded by the hero Roland. The interior walls of the church of St Sauveur are covered with paintings and inscriptions recalling the pilgrimages of celebrated persons. The sub- terranean church of St Amadour (1166) extends beneath St Sauveur and contains relics of the saint. On the summit' of the cliff stands the chateau built in the middle ages to defend the

sanctuaries.

Rocamadour owes its origin to St Amadour or Amateur, who, according to tradition, chose the place as a hermitage for his devotions to the Virgin Mary. The saint is identified with Zacchaeus the publican and disciple of Jesus, who is said to have journeyed to Gaul to preach the gospel. The renown of Rocamadour as a place of pilgrimage dates from the early middle ages.

ROCAMBOLE, Allium Scorodoprasum, a hardy bulbous perennial occurring in a wild state in sandy pastures and waste places throughout Europe, but not common in the south; in Britain it is rare, and found in the north of England and the south of Scotland. Its cultivation does not appear to be of ancient date; it is not mentioned by Greek and Roman authors, and there are only a small number of original common names among ancient peoples (A. de Candolle, Origin of Cultivated Plants, p. 72). The plant is grown for its bulbs, which are smaller and milder than those of garlic, and consist of several cloves chiefly produced at the roots. The cloves are planted about the end of February or in March, and treated like garlic or shallot. When mature, the bulbs are taken up, dried and stored for use.

ROCH. ST (Lat. Rochus ; . Ital. Rocco; Span. Roque; Fr. Roch) (d. 1327), a confessor whose death is commemorated on the 16th of August; he is specially invoked against the plague. According to his Acta, he was born at Montpellier, France, about 1295. He early began to manifest strict asceti- cism and great devout ness. and on the death of his parents in his twentieth year he gave all his substance to the poor. Coming to Italy during an epidemic of plague, he was very diligent in tending the sick in the public hospitals at Aquapendente, Cesena and Rome, and effected many miraculous cures by

prayer and simple contact. After similar ministries at Piacenza he himself fell ill. He was expelled from the town, arid with- drew into the forest, where he would have perished had not a dog belonging to a nobleman named Gothardus supplied him with bread. On his return to Montpellier he was arrested as a spy and thrown into prison, where he died on the 16th of August 1327, having previously obtained from God this favour — that all plague-stricken persons invoking him should be healed. His cult spread through Spain, France, Germany, Belgium and Italy. A magnificent temple was raised to him at Venice, where his body is believed to lie, and numerous brotherhoods have been instituted in his honour. He is usually represented in the garb of a pilgrim, with a wound in his thigh, and with a dog near him carrying a loaf in its mouth.

See Acta sanctorum, August, iii. 1 380-415; Charles Cahier Les Caracteristiques des saints (Paris. 1867). pp. 216-217. (H. De)

ROCHAMBEAU, JEAN BAPTISTE DONATIEN DE VIMEUR,

Comte de (1725-1807), French soldier, was born at Vendome (Loir-et-Cher) on the 1st of July 1725. He was originally destined for the church and was brought up at the Jesuit college at Blois, but after the death of his elder brother he entered a cavalry regiment, served in Bohemia and Bavaria and on the Rhine, and in 1747 had attained the rank of colonel He took part in the siege of Maestricht in 1748, became governor of Vendome in 1749, and after distinguishing himself in 1756 in the Minorca expedition was promoted brigadier of infantry. In 1757 and 1758 he fought in Germany, notably at Crefeld, received several wounds in the battle of Clostercamp (1760), was appointed marichal de camp in 1761 and inspector of cavalry and was frequently consulted by the ministers on technical points. In 1780 he was sent, with the rank of lieu- tenant-general, in command of 6000 French troops to help the American colonists under Washington against the English. He landed at Newport, Rhode Island, on the 10th of July, but was held here inactive for a year, owing to his reluctance to abandon the French fleet, which was blockaded by the British in Narragansett Bay. At last, in July 1781, Rocham- beau's force was able to leave Rhode Island and, marching across Connecticut, joined Washington on the Hudson. Then followed the celebrated march of the combined forces to York- town, where on the 22nd of September they formed a junction with the troops of Lafayette; as the result Cornwallis was forced to surrender on the 19th of October. Throughout; Rochambeau had displayed an admirable spirit, placing himself entirely under Washington's command and handling his troops as part of the American army. In recognition of his services, Congress voted him and his troops the thanks of the nation and presented him with two cannon taken from the English. These guns, which Rochambeau took back to Venddme, were re- quisitioned in 1792. On his return to France he was loaded with favours by Louis XVI. and was made governor of Picardy. During the Revolution he commanded the Army of the North in 1790, but resigned in 1792. He was arrested during the Terror, and narrowly escaped the guillotine. He was sub- sequently pensioned by Bonaparte, and died at Thore (Loir;- et-Cher) on the 10th of May 1807.

A statue of Rochambeau by Ferdinand Hamar, the gift of France to the United States, was unveiled in Lafayette Square, Washington j by President Roosevelt on the 24th of May 1902. The ceremony was made the occasion of a great demonstration of friendship between the

two nations. France was represented by her ambassador, M. Cambon, Admiral Fournier and General Brugere, a detachment of sailors and marines from the warship ” Gaulois ” being present. Representatives of the Lafayette and Rochambeau families also attended. Of the many speeches perhaps the most striking was that of Senator Henry C. Lodge, who, curiously enough in the circumstances, prefaced his eloquent appreciation of the services rendered to the American cause by France by a brilliant sketch of the way in which the French had been driven out of North America by England and her colonists combined. General Brugere, in his speech, quoted Rochambeau’s words, uttered in 1781: ” Entre vous,

entre nous, A la vie, a la mort.” A ” Rochambeau fete ” was held simultaneously in Paris.

The Memoires tnilitaires, historiques et politiques, de Rochambeau were published by Luce de Lancival in 1809. Of the first volume a part, translated into English by M. W. E. Wright, was published in 1838 under the title of Memoirs of the Marshal Count de R. relative to the War of Independence in the United States. Rocham- beau’s correspondence during the American campaign is published in H. Doniol, Hist, de la participation de la France a I’etablissement des Etats Unis d’Amerique, vol. v. (Paris, 1892). See Duchesne, ” Autour de Rochambeau ” in the Revue des facultes catholiques de I’ouest (1898-1900); E. Gachot, “Rochambeau” in the Nouvelle Revue (1902) ; H. de Ganniers, ” La Derniere Campagne du marechal de Rochambeau ” in the Revue des questions historiques (1901).

ROCHDALE, a municipal, county and parliamentary borough of Lancashire, England, on the river Roch, io| m. N.N.E. from Manchester and 196 m. N.W. by N. from London, on the Lancashire & Yorkshire railway. Pop. (1891) 76,161; (1901) 83,114. By means of the Rochdale canal and con- nexions it has water communications in every direction. The site rises sharply from the Roch, near its confluence with the Spodden, and from the high-lying public park of Rochdale fine views of the picturesque neighbourhood are obtained. Several interesting old houses remain in the vicinity of the town. The parish church of St Chad is built on the site of a church erected in the 12th century, but itself retains no portion earlier than the Perpendicular period. In the churchyard is buried John Collier (T708-1786), a local author, artist and caricaturist, who was among

the first to recognize and utilize in writing the humour of the Lancashire dialect, and attained considerable fame under the pseudonym of Tim Bobbin. The town hall is an extensive and elaborate structure in the Decorated style, with a tower. Of educational charities the principal is the Archbishop Parker free grammar school, founded in 1565. There are also technical and art schools; and a large Roman Catholic orphanage. Among other public institutions are the public library, the infirmary, the literary and scientific society and the art society. Rochdale was the birthplace of the co-operative movement. The Equitable Pioneers Society (1844) numbers over 11,000 members, with a capital of over £350,000. A handsome co-operative store, belonging to the Rochdale Provident Co-operative Society, was opened in 1900. A statue of John Bright (1891) recalls the connexion of the statesman and his family with Rochdale. The staple manu- factures are those of woollens and cottons. There are, besides, foundries, iron-works and machine-factories. Coal and stone are obtained extensively in the neighbourhood. Frequent cattle and horse fairs are held. Rochdale was incorporated in 1856, and includes several townships. The corporation consists of a mayor, 10 aldermen and 30 councillors. The county borough was created in 1888. The parliamentary borough, which has returned one member since 1832, falls between the Middleton and Heywood divisions of the county. Area of municipal borough, 6446 acres.

Rochdale (Recedham, Rachedam, Rachedal) takes its name from the river on which it stands. A Roman road passed the site, and a Saxon castle stood in Castleton, one of the component parts of the town. In Edward the Con- fessor's reign most of the land was held by Gamel the Thane, but after the Conquest the manor probably came into the hands of Roger de Poictou, from whom it passed to the Lacys and like their other lands became merged in the duchy of Lan- caster. From 1462 to 1625 the crown seems to have leased it to the Byron family. In 1625 Charles I. conveyed the manor in trust for the earl of Holdernesse, and in 1638 it was sold to Sir John Byron, afterwards Baron Byron of Rochdale, whose descendants held it till 1823 when it was sold to the Deardens. Manor courts are still held periodically. Henry III. in 1240-41 granted by charter to Edmund de Lacy the right to hold a weekly market on Wednesday and an annual fair on the feast of SS Simon and Jude (28th October). Early in George III.'s reign the market day was changed to Monday. Two of the early industries, cutlery and hat-making, date from about the middle of the 16th century. The woollen

industry is generally, but erroneously, said to have been intro- duced by Flemish immigrants in Edward III.'s reign; but, with the cognate

trades of dyeing and fulling, its importance only dates from the early part of the 17th century. It was not till 1795 that a cotton mill was built here, and in the latter half of the 18th century the town was famed for its woollen, not its cotton manufactures.

See H. Fishwick, History of the Parish of Rochdale (1889).

ROCHE, SIR BOYLE, Bart. (1743-1807), Irish soldier and politician, famous for his ” bulls,” came of a branch of the family of the Viscounts Fermoy. He served in the American War, and sat in the Irish parliament from 1777 onwards, being created a baronet in 1782 for his loyalty to the government. He supported the Union, and one of his recorded ” bulls ” — many, however, being only fastened on him— was his declaration that he would have ” the two sisters ” (England and Ireland) ” embrace like one brother.” Sir Boyle Roche was a characteristically witty and genial Irish- man, and was master of the ceremonies at Dublin Castle.

ROCHEFORT, HENRI, Marquis de Rochefort-Lucay (1830-), French politician, was born in Paris on the 30th of January 1830. His father was a Legitimist noble who as ” Edmond Rochefort ” was well known as a writer of vaude- villes; his mother’s views were republican. After experience as a medical student, a clerk at the H6tel de Ville, a play- wright and a journalist, he joined the staff of the Figaro in 1863; but a series of his articles, afterwards published as Les Francais de la Decadence (3 vols., 1866-68), brought the paper into collision with the authorities and caused the ter- mination of his engagement. In collaboration with different dramatists he had meanwhile written a long series of successful vaudevilles, which began with the Monsieur bien mis at the Folies Dramatiques in 1856. On leaving the Figaro Rochefort determined to start a paper of his own, La Lanterne. The paper was seized on its eleventh appearance, and in August 1868 Rochefort was fined ro,ooo francs, with a year’s imprison- ment. He then published his paper in Brussels, whence it was smuggled into France. Printed in French, English, Spanish, ‘Italian and German, it went the round of Europe. After a second prosecution he fled to Belgium. A series of duels, of which the most famous was one fought with Paul de Cassagnac a propos of an article on Joan of Arc, kept Rochefort in the public eye. In 1869, after two unsuccessful candidatures, he was returned to the Chamber of Deputies by the first circon- scription of Paris. He was arrested on the frontier, only to be almost immediately released, and forthwith took his seat. He renewed his onslaught on the empire, starting a new paper, the Marseillaise, as the organ of political meetings arranged by himself at La Villette. The staff was appointed on the votes of the members, and included Victor

Noir and Pascal Grousset. The violent articles in this paper led to the duel which resulted in Victor Noir's death at the hands of Prince Pierre Bonaparte. The paper was seized, and Rochefort and Grousset were sent to prison for six months. The revolution of September was the signal for his release. He became a member of the government of National Defence, but this short association with the forces of law and order was soon broken on account of his openly expressed sympathy with the Communards. On the nth of May i87r he fled in dis- guise from Paris. A week earlier he had resigned with a handful of other deputies from the National Assembly rather than countenance the dismemberment of France. Arrested at Meaux by the Versailles government, he was detained for some time in prison with a nervous illness before he was con- demned under military law to imprisonment for life. In spite of Victor Hugo's efforts on his behalf he was transported to New Caledonia. In 1874 he escaped on board an American vessel to San Francisco. He lived in London and Geneva until the general amnesty permitted his return to France in 1880. In Geneva he resumed the publication of La Lanterne, and in the Parisian papers articles constantly appeared from his pen. When at length in 1880 the general amnesty

permitted his return to Paris he founded L'Intransigeant in the Radical and Socialist interest. For a short time in 1885-86 he sat in the Chamber of Deputies, but found a great opportunity next year for his talent for inflaming public opinion in the Boulangist agitation. He was condemned to detention in a fortress in August 1889 at the same time as General Boulanger, whom he had followed into exile. He continued his polemic from London, and after the suicide of General Boulanger he attacked M. Constans, minister of the interior in the Freycinet cabinet, with the utmost violence, in a series of articles which led to an interpellation in the chamber in circumstances of wild excitement and disorder. The Panama scandals fur- nished him with another occasion, and he created something of a sensation by a statement in the Figaro that he had met M. Clemenceau at the table of the financier Cornelius Herz. In 1895 he returned to Paris, two years before the Dreyfus affair supplied him with another point d'appui. He became a leader of the anti-Dreyfusards, and had a principal share in the organization of the press campaign. Subsequently he was editor of La Patrie.

Besides his plays and articles in the journals he published several

separate works, among them being : Les Petits Mysteres de I' Hotel des Ventes (1862), a collection of his art criticisms; Les Depraves (Geneva, 1882); Les Naufrageurs (1876); L' Evade (1883), Napoleon dernier (3 vols., 1884); and Les Aventures de ma vie (5 vols., 1896).

ROCHEFORT, a small town of Belgium, situated on the Lomme, a tributary of the Lesse, in the S.E. of the province of Namur close to the Ardennes. Resident pop. (1904) 3068, which in July and August is doubled. It is of ancient origin, its position at the point where the route to St Hubert crossed that from Liege to Bouillon having made it at all times a place of some importance. The ruins of the old castle, which gave the place its name and a title to a long line of counts who had the right of coining their own money, still exist. This castle underwent many sieges and suffered much in the earlier wars, especially at the hands of Marshal de Chatillon in 1636. Roche- fort is noted for its healthiness, and is a favourite place of residence. It also attracts every summer a large number of visitors and tourists, who visit it on account of the remarkable grottoes in its neighbourhood. One of these is situated in the town itself and is known by its name. This grotto contains six halls or chambers, the largest of which is called the Sabbat, and is remarkable for its great height. But the most famous are the grottoes of Han, situated three miles from Rochefort at Han sur Lesse. Here the river Lesse passes by a subterranean and undiscovered passage under the hill called Boeme or Boine. The endeavour to trace the course of the river led to the dis- covery of the grottoes, which consist of fifteen separate halls, connected by passages more or less short and emerging on the river in a dark and extensive cavern forming a sort of side creek or bay. Except in flood-time, when the exit has to be used, the entrance is near the point where the river disappears at what is called the gap or hole of Belvaux, and the exit is made by boat from the cavern last described, which leads out to the open river. A beautiful effect is afforded by the passage from the complete darkness of this cavern into the light. The finest stalactites are in the three halls called the Mysterieuses, the Vigneron and the Draperies. In the last-named is " the tomb," which looks as if chiselled out of white marble. The central hall — called the Salle d'Armes — is immense, and one of the river channels flows through it. Electric light has been introduced. Near Rochefort are the famous red marble quarries of St Remy, and the old Cistercian abbey of that name is now a Trappist seminary.

ROCHEFORT, a town of western France, capital of an arron- dissement in the department of Charente-Inferieure, 20 m. S.S.E. of La Rochelle on the State railway from Nantes to Bordeaux. Pop. (1906) town, 31,433; commune, 36,694. It is situated on the right bank of the

Charente, 9 m. from the Atlantic, and is built partly on the side of a rocky hill and partly on an old marshland. The town is laid out with great

regularity, the streets being wide and straight and centring round the Place Colbert, in the middle of which is a monumental fountain of the 18th century. The public institutions of Rochefort comprise the sub-prefecture, tribunals of first instance and of commerce, a board of trade arbitration, a chamber of commerce, a lycee for boys, a college for girls and schools of drawing and architecture. The fortifications are slight. Below Rochefort the Charente is crossed by a pont transbordeur, the carrier of which is suspended at a height which admits of the tallest ships passing underneath at any time. There are both a naval and a commercial harbour. The former has the ad-vantage of deep anchorage well protected by batteries at the mouth of the river, and the roadstead is perfectly safe. The windings of the channel, however, between Rochefort and the sea, and the bar at the entrance render navigation dangerous, Rochefort is capital of the fourth maritime arrondissement, which stretches from the bay of Bourgneuf to the coast of Spain. The naval harbour and arsenal, separated from the town by a line of fortifications with three gates, contain large covered building yards, repairing docks and extensive timber basins on both banks of the river. The arsenal has also a ropewalk dating from 1668, a school of navigation and pilotage, the offices of the maritime prefecture, the navy commissariat, a park of artillery and various boards of direction connected with the navy. Other government establishments at Rochefort are barracks for infantry, artillery and marines, and the naval hospital and school of medicine. In the grounds of this last institution is an artesian well, sunk in 1862-1866 to a depth of 2800 ft., and yielding water with a temperature of ioo° F. The commercial harbour, higher up the river than the naval harbour, has two small basins, a third basin with an area of 15 acres and a depth at neap-tide of 25 ft., at spring-tide of 295 ft., and a dry dock no yds. long. Besides shipbuilding, which forms the staple industry, flour- and saw-milling, sail- cloth, &c, are among the local manufactures. At the ports of Rochefort and Tonnay-Charente (4 m. higher up) there entered, in 1905, 265 vessels (166 British), with a tonnage of

102,537.

The lordship of Rochefort, held by powerful nobles as early as the nth century, was united to the French Crown by Philip the Fair early in the 14th century; but it was alternately seized in the course of the Hundred Years' War by the English and the French, and in the Wars of

Religion by the Catholics and Protestants. Colbert having in 1665 chosen Rochefort as the seat of a repairing port between Brest and the Gironde, the town rapidly increased in importance; by 1674 it had 20,000 inhabitants; and when the Dutch admiral Cornelius Tromp appeared at the mouth of the river with seventy-two vessels for the purpose of destroying the new arsenal, he found the approaches so well defended that he gave up his enterprise. It was at Rochefort that the naval school, afterwards trans- ferred to Brest, was originally founded. The town continued to flourish in the later part of the 17th century. In 1690 and in 1703 the English made unsuccessful attempts to destroy it. Its fleet, under the command of Admiral la Gallissonniere, a native, of the place, defeated Admiral Byng in 1755 and did good service in the wars of the republic. But the destruction of the French fleet by the English in 1809 in the roadstead of lie d'Aix, the preference accorded to the harbours of Brest and Toulon and the unhealthiness of its climate seriously inter- fered with the prosperity of the place. The convict establish- ment, founded at Rochefort in 1777, was suppressed in 1852.

ROCHESTER, JOHN WILMOT, 2ND Earl of (1647-1680), English poet and wit, was the son of Henry Wilmot, 1st earl. The family was descended from Edward Wilmot of Witney, Oxfordshire, whose son Charles (c. 15 70-c. 1644), having served with distinction in Ireland during the rebellion at the beginning of the 17th century, was president of Connaught from 1616 until his death. In 162 1 he had been created an Irish peer as Viscount Wilmot of Athlone, and he was succeeded by his only surviving son, Henry (c. 1612-1658). Having fought against the Scots at Newburn and been imprisoned and expelled from

the House of Commons for plotting in the interests of the king in 1641, Henry Wilmot served Charles I. well during the Civil War, being responsible for the defeats of Sir William Waller at Round way Down in July 1643 and at Cropredy Bridge in June 1644. In 1643 he was created Baron Wilmot of Adderbury. Wilmot was on bad terms with some of the king's friends and advisers, including Prince Rupert, and in 1644 he is reported to have said that Charles was afraid of peace and to have advised his supercession by his son, the prince of Wales. Consequently he was deprived of his command, and after a short imprisonment was allowed to cross over to France. He was greatly trusted by Charles II., whose defeat at Worcester and subsequent

wanderings he shared, and during this king's exile he was one of his principal advisers, being created by him earl of Rochester in 1652. In the interests of Charles he visited the emperor Ferdinand III., the duke of Lorraine, and the elector of Brandenburg, and in March 1655 he was in England, where he led a feeble attempt at a rising on Marston Moor; near York; on its failure he fled the country.

Born at Ditchley in Oxfordshire on the 10th of April 1647, John Wilmot, who succeeded his father as 2nd earl in 1638, was educated at Wadham College, Oxford, and in 166 1, although he was only fourteen years of age, received the degree of M.A. On leaving Oxford he travelled in France and Italy with a tutor who encouraged his love of literature, and moreover advocated principles of temperance which, however, bore little fruit. He returned in 1664, and at once made his way to Charles II. 's court, where his youth, good looks and wit assured him of a welcome In 1665 he joined the fleet serving against the Dutch as a volunteer, and in the following year distinguished himself by carrying a message in an open boat under fire. This reputation for courage was afterwards lost in private quarrels in which he seems to have shirked danger. He became gentleman of the bedchamber to Charles II., and was the confidant of his various exploits. According to Anthony Hamilton, banishment from court for lampooning the king or his mistresses was with Roch- ester an almost annual occurrence, but his disgrace was never of long duration. Charles seems to have found his company too congenial to be long dispensed with, and Pepys says that all serious men were disgusted by the complaisance with which he passed over Rochester's insolence (Diary, 17th Feb. 1669). In order to restore his rapidly vanishing fortune he became a suitor to Elizabeth Malet. In spite of the king's support of Rochester's suit, Miss Malet refused to marry the earl, who thereupon had her seized (1665) from her uncle's coach. Roch- ester was pursued, and Charles, who was very angry, sent him to the Tower. Miss Malet, however, married him in 1667.

Not content with making or unmaking the reputation of the maids of honour and the courtiers by his squibs and sonˆjs, Rochester aspired to be a patron of poetry and an arbiter of taste, but he was vain and capricious, tolerating no rivals in his capacity of patron. Dryden dedicated to him his Marriage-d- la-Mode (1672) in a preface full of effusive flattery, at the close of which, however, occurs a passage that may be taken to indicate that he already had misgivings. "Your lordship has but another step to make," he says, " and from the patron of wit, you may become its tyrant; and oppress our little reputa- tions with more ease than you now protect them." Dryden had another patron in Lord Mulgrave (afterwards duke of Bucking- ham and

Normanby), to whom he dedicated (1675) Aurengzebe. Mulgrave had engaged in a duel with Rochester, who had re- fused to fight at the last minute on the ground of ill-health. Mulgrave allowed this story to spread, and Rochester, who apparently thought him too dangerous an opponent, revenged himself on Dryden as Mulgrave's protege by setting up as his rivals, first Elkanah Settle, and then John Crowne. By his influence Settle's Emperor of Morocco was played at Whitehall, and Crowne was employed, in direct infringement of Dryden's province as laureate, to write a masque for the court. Both these poets were discarded in turn for Nathaniel Lee and Thomas Otway. In 1679 Mulgrave began to circulate his Essay on Satire in which Rochester was singled out for severe criticism.

Rochester chose to pretend that this was Dryden's work, not Mulgrave's, and by his orders a band of roughs set on the poet in Rose Alley, Covent Garden, and beat him. He obviously felt no shame for this infamous attack, for in his " Imitation of the First Satire of Juvenal " he says, " Who'd be a wit in Dryden's cudgelled skin?" His health was already undermined, and in the spring of 1680 he retired to High Lodge, Woodstock Park. He began to show signs of a more serious temper, and at his own request was visited (July 20th to July 24th) by Bishop Burnet, who attested the sincerity of his repentance. He died, however, two days after the bishop left him. When his son Charles, the 3rd earl, died on the 12th of November 1681, his titles became extinct.

As a poet Rochester was a follower of Abraham Cowley and of Boileau, to both of whom he was considerably indebted. His love lyrics are often happy, but his real vigour and ability is best shown in his critical poems and satires. The political satires are notable for their fierce exposure of Charles II. 's weak- ness, his ingratitude, and the slavery in which he was held by his mistresses. They show that Rochester had it in him to be a very different man from the criticizing courtier and the " very profane wit " who figures in contemporary memoirs.

Bibliography.— Poems on Several Occasions by the Right Honour- able the Earl of Rochester . . . (Antwerp, 1680) was really printed in London. Other issues, slightly varying in title and contents, appeared in 1685, 1691 and 1696. Valentinian, A Tragedy, adapted from Beaumont and Fletcher, was printed in 1685; a scurrilous attack on Charles II. in the shape of a play in heroic couplets, Sodom, was printed in 1684, and is supposed, in spite of Rochester's denial, to have been chiefly his work. No copy' of this is known, but there are two MSS. extant. The completest edition of his works is The Poetical

Works of the Earl of Rochester (1731-32). Expurgated collections are to be found in Johnson's, Anderson's and Chalmers's editions of the British Poets. His Familiar Letters were printed in 1686, 1697 and 1699. His Political Satires are available, with those of Sir John Denham and Andrew Marvell, in the Bibliotheca Curiosa (Some Political Satires of the Seventeenth Century, vol. i,, Edinburgh, 1885). Contemporary accounts of Rochester are to be found in the memoir by Saint-Evremond pre- fixed to an edition of 1709, in Hamilton's Memoires du Comte de Gratnont, in the funeral sermon preached by Robert Parsons (1680), and in Bishop Burnet's Some Passages in the Life and Death of John, Earl of Rochester (1680), reprinted in Bishop Wordsworth's Ecclesi- astical Biography (vol. vi.).

ROCHESTER, LAWRENCE HYDE, Earl of (1641-1711), English statesman, second son of Edward Hyde, earl of Claren- don, was born in March 1641. After the restoration of Charles II. he sat as member of parliament, first, for Newport in Cornwall and afterwards for the university of Oxford, from 1660 to 1679. In 1661 he was sent on a complimentary embassy to Louis XIV. of France, while he held the court post of master of the robes from 1662 to 1673. In 1663 he married Henrietta (d. 1687), daughter of Richard Boyle, earl of Burlington and Cork. When his father was impeached in 1667, Lawrence joined with his elder brother, Henry, in defending him in parlia- ment, but the fall of Clarendon did not injuriously affect the fortunes of his sons. They were united with the royal family through the marriage of their sister, Anne, with the duke of York, afterwards James II., and were both able and zealous royalists. In 1676 Lawrence Hyde was sent as ambas:ad>r to Poland.; he then travelled to Vienna, whence he proceeded to Nijmwegen to take part in the peace congress as one of the English representatives. Having returned to England, he entered the new parliament, which met early in 1679, as member for Wootton Bassett; in November 1679 he was appointed first lord of the treasury, and for a few years he was the principal adviser of Charles II. In April 1681 he was created Viscount Hyde of Kenilworth, and in November following earl of Rochester. He was compelled to join in arranging the treaty of 1 68 1, by which Louis XIV. agreed to pay a subsidy to Charles, at the very moment when he was imploring William, prince of Orange, to save Europe from the ambitions of the French monarch. The conflict between his wishes and his interests may have tended to sour a temper never very equable; at all events the earl made himself so unpleasant to his colleagues that in August 1684 he was removed from the treasury to the

more dignified, but less influential, post of president of the council, a process which his enemy Halifax described as being ” kicked upstairs.” Although appointed lord lieutenant of Ireland, Rochester did not take up this position; he was still president of the council when James II. became king in February 1685, and he was at once appointed to the important office of lord treasurer. But in spite of their family relationship and their long friendship, James and his treasurer did not agree. The . king wished to surround himself with Roman Catholic advisers; the earl, on the other hand, looked with alarm on his master’s leanings to that form of faith. In January 1687 he was removed from his office of treasurer, being solaced with a pension of £4000 a year and a gift of Irish lands.

After the revolution of 1688 Rochester appeared as a leader of the Tories, and he opposed the election of William and Mary as king and queen, raising his voice for the establishment of a regency on behalf of the exiled James. But he soon reconciled himself to the new order, perhaps because he could not retain his pension unless he took the oaths of allegiance. After this he was quickly in the royal favour and again a member of the privy council. He advised the queen in ecclesiastical matters, and returned to his former position as the leader of the High Church party. From December 1700 until February 1703 he was lord lieutenant of Ireland, although he did not spend much time in that country, and the concluding years of his public life were mainly passed in championing the interests of the Church. In 17 10 he was again made lord president of the council. He died oh the 2nd of May 1711, and was succeeded by his only son, Henry (1672-1758), who in 1724 inherited the earldom of Clarendon. When Henry died without issue on the 10th of December 1758 all his titles became extinct.

Lawrence Hyde had some learning and a share of his father’s literary genius. The main employment of his old age was the preparation for the press of his father’s History of the Rebellion, to which he wrote a preface. Like most of the men of his time, he drank deeply, and he was of an arrogant disposition and had a violent temper. In Dryden’s satire of Absalom and Achitophel he is ” Hushai,” the friend of David in distress.

The correspondence of Rochester with his brother the earl of Clarendon, together with other letters written by him, was pub- lished with notes by S. W. Singer (1828). Other authorities are G. Burnet, History of his Own Time, edited by O. Airy (Oxford, 1897- 1900);

John Evelyn, Diary, edited by H. B. Wheatley (1879); and Macaulay, History of England.

ROCHESTER, a city, municipal and parliamentary borough of Kent, England, on the river Medway, 33 m. E.S.E. of London by the South-Eastern & Chatham railway, contiguous to Chatham and Strood. Pop. (1901) 30,590, Chatham lies east of the city on the same bank of the river, while Strood is opposite, on the left bank, being connected with Rochester by a railway bridge and by an iron swing bridge, the latter occupying the site of a bridge which spanned the Medway before the Conquest. The cathedral church of St Andrew was originally founded by Augustine in 604, for whom ˆEthelbert built the church. It was partially destroyed by the Danes, but was rebuilt, with a long choir and square east end, by Bishop Gundulph, the second Norman bishop (1077-1108). Gundulph at the same time (1089) established an order of Benedictine monks here. Bishop Ernulf (n 1 5-24), who as prior of Canterbury and abbot of Peterborough had already distinguished himself as a builder, completed and also renovated the church, lengthening it by two bays eastward; the old chapter-house remains. The beautiful Norman west front was built about 1125-30, and in 1 130 the new cathedral was consecrated About 1201 a baker, William of ‘Perth, while on a pilgrimage was murdered near Rochester by robbers. He was buried in the cathedral and was canonized, his shrine becoming a famous resort of pilgrims, who brought much wealth to, the monastery. The edifice suffered from fire in 1137 and in 11 71. During the whole of the 13th and a part of the 14th century a gradual rebuilding, or sometimes mere recasing, of the church was effected from east to west. The work included an extended choir by William

de Hoo (1227), enlargement of the main transepts, the building of piers for a central tower, and treatment of the nave to the third bay. About 1352 a low central tower was built, to which a spire was added in the next century. Towards the end of \ the 15th century St Mary’s chapel was added, the Norman clerestory was rebuilt, and a great west window inserted! Though a comparatively small building, being only 306 ft. in length and 65 ft. in breadth at the nave, the cathedral is of much architectural interest, and exhibits a variety of styles from Norman to Perpendicular. The rich and varied decoration of the Norman nave (especially the triforium) is very note- worthy, as is also the chapter-house doorway, a fine example of Decorated work. The Early English portion of the building is less successful. The ruins of Gundulph’s Tower stand de- tached from and are earlier than the church; this tower was built by Bishop Gundulph probably as a defensive work for the eastern boundary of the city. The crypt beneath the choir is of special interest, showing early Norman’ work in the

western part. Tiie remainder is Early English, and there are traces of mural painting. The cathedral contains many interesting monuments, including a plain slab assigned to Gundulph, and several tombs of bishops of the 13th century, among them that of Bishop Walter de Merton, founder of Merton College, Oxford (d. 1277). The library attached to the modern chapter-house contains, among various valuable relics, the Textus Rojfensis, being records of the cathedral compiled in the time of Bishop Ernulf. The old episcopal palace is partly converted into dwelling-houses. Portions of the wall of the priory dormitory and the refectory doorway may also still be seen. Among various restorations of the cathedral in the 19th century the earliest was that of Lewis Cottingham (1825-27), who erected a Decorated central tower unsuited to the general character of the building. Bishop Hamo de Hythe (1319-52) had erected a tower with short spire of timber and lead, and of this the general design is re-produced in the present tower and spire from designs of Mr C. H. Fowler, begun in 1904 under Dean Hole, who, however, did not survive to see its dedication on St Andrew's day at the close of the same year.

The parish church of St Nicholas was built in 1421, and restored after a fire in 1892. In Saxon times the cathedral was the parish church, but after the establishment of a monas- tery herfi, monks and parishioners quarrelled as to their rights, and a new parish church was built.

On the eminence overlooking the right bank of the river and, commanding a wide view of the surrounding country are the extensive remains of the Norman castle, part of which was built by Bishop Gundulph at the order of William Rufus to- wards the close of the nth century. The castle was besieged by King John, by Simon de Montfort in the reign of Henry III., and in the reign of Richard II. by a party of rebels during the insurrection of Wat Tyler. It was repaired by Edward IV., but soon afterwards fell into decay, although the massive keep is stijl in good preservation. This, one of the finest relics of its kind in England, is considered to be the work of William de Corbeil, archbishop of Canterbury, to whom the castle was granted in 1126. It is a quadrangular four-storeyed structure, flanked by turrets, with an extreme height of 120 ft. Remains of the 13th-century walls which once surrounded the city also exist. Gad's Hill, above Strood, to the north-west, is famous as the residence of Charles Dickens. At Borstal, south-west of Rochester, is a large convict prison. Among the principal public buildings of secular character in the city are the town hall (1687), the corn exchange with free library and a museum, the county court offices, and the Richard Watt's almshouses (1579). Besides these almshouses there are a number of other charities, among which the

almshouse of St Catherine originated in 13 16 as a leper's hospital. A picturesque Elizabethan mansion was acquired by the corporation for a museum as a memorial of Queen Victoria's Diamond Jubilee. The principal schools are the cathedral grammar-school or King's School, founded in 1544, and the Williamson mathematical school (1704), formerly

for the sons of freemen, but now open to all. Rochester has an oyster fishery of some importance, and there is a con- siderable shipping trade, a quay and landing-place having been erected by the corporation. There is a large steam-engine manufactory. In Strood, which is a ward of the borough of Rochester, there are oil-mills, and brick and cement works. The dockyards and government works of Chatham employ many inhabitants of Rochester. The parliamentary borough returns one member. The city is governed by a mayor, six alder.men, and eighteen councillors. Area, 2933 acres.

History. — Its situation on the Roman way from the Kentish ports to London, as well as its strategical position on the bend of the river Medway, gave Rochester (Durobrivae, Hrofescester or Hrobicester, Roffa) an early importance. It was a walled Romano-British town (though of no great size), and the original bridge across the Medway probably dated from that period. The church of St Andrew was founded by King ˆEthelbert, who also made Rochester a bishop's see. Rochester was a royal borough in the time of William I., who raised a castle here, probably on Boley Hill. Richard I. granted the citizens quittance of passagium from crusaders in the town of Rochester. In 1227 Henry III. granted them the city at a fee farm rent of £25; he also granted them a gild merchant, the right to be impleaded only within the city walls, and other liberties. These charters were confirmed by subsequent sovereigns down to Henry VI., who in 1446 incorporated the city by the title of the bailiff and citizens, and granted them the power of admiralty and many privileges. Edward IV. by his charter of 1461 altered the style of incorporation to the mayor and citizens. Charters were granted in successive reigns down to Charles I., whose charter of 1629 remained the governing charter until 1835. A fair on the i8th, 19th and 20th of May was granted to the citizens by Henry VI., and another fair was formerly held in December by prescription. At the present time fairs are held on the 18th of May and the 26th, 27th and 28th of August. A " formarket " was granted in the second charter of Henry III.; the market days were formerly

Tuesday and Friday. Corn and cattle markets are now held on Tuesday.

ROCHESTER," a city and the county seat of Olmsted county, Minnesota, U.S.A., on the Zumbro river, about 70 m. S.E. of St Paul. Pop. (1890) 5321; (1900) 6843; (1905, state census) 7 2 33 (i9°S foreign-born); (1910 census) 7844. It is served by the Chicago & North-Western and the Chicago Great Western railways. The city has a public library (1865), an d i s the seat of St John's School and the Academy of Our Lady of Lourdes (both Roman Catholic), of a state hospital for the insane (1878), originally planned (1877) as an inebriate asylum, liquor dealers being taxed for its erection, and of St Mary's Hospital (1889), a famous institution founded and maintained by the Sisters of St Francis. There is valuable water-power, and the city has grain elevators and various manufactures. Rochester was first settled in 1854, and was chartered as a city in 1858.

ROCHESTER, a city of Strafford county, New Hampshire, U.S.A., on the Cochecho and Salmon Falls rivers, about 30 m. E. by N. of Concord. Pop. (1890) 7396; (1900) 8466, of whom 1651 were foreign-born; (1910 U.S. census) 8868. Area, about 34 sq. m. Rochester is served by four lines of the Boston & Maine railroad. The rivers furnish excellent water-power for various manufactures. Rochester, named in honour of Lawrence Hyde, earl of Rochester, was incorporated as a town by a royal charter in 1722, but no settlement was made here until 1728. From parts of the original town Farmington and Milton were erected in 1798 and 1802 respectively, and in 1846 part of Rochester was annexed to Barrington. It was the birthplace of John Parker Hale. Rochester was chartered as a city in 1891.

See F. McDuffee, History of the Town of Rochester, New Hamp- shire (Rochester, 1892).

ROCHESTER, a city and the county-seat of Monroe county, New York, U.S.A., about 70 m. E.N.E. of Buffalo and about 230 m. W. of Albany, on the Genesee river, 7 m. above where it empties into Lake Ontario. Pop. (1880), 89,366; (1890), 133,896; (1900), 162,608, of whom 40,748 were foreign-born (including 15,685 Germans; 7746 English-Canadians; 5599 Irish; 3909 English; 1777 Russians; and 1278 Italians) and 601 were negroes; (1910, census) 218,149. Rochester is served by the Erie, the Pennsylvania (two divisions), the Lehigh Valley, the West Shore, the Buffalo, Rochester &

Pittsburg (two divisions), and the New York Central & Hudson River (five divisions) railways. The Genesee river, which cuts through the

centre of the city in a deep gorge whose banks vary in height from 50 to 200 ft., is navigable for lake craft only for 25 m. from the mouth, to a point 45 m. below the city; the Erie Canalruns through the heart of the city and is carried across the river on a stone viaduct of seven arches, 850 ft. long, and having a channel 45 ft. wide. Several lines of freight and passenger steamboats connect with Buffalo, Oswego and other lake ports, and there are daily passenger steamboats to Toronto, Canada, 70 m. distant across the lake. Electric railways connect with neighbouring cities and lake-side resorts on Lake Ontario (Ontario Beach) and Irondequoit Bay, an irregular arm of the lake»5 m. long 2 m. E. of the city limits. Rochester is on high plateaus on either side of the Genesee river at a general altitude of about 500 ft. above sea-level. It occupies an area of 20-3 sq. m. Within the city limits are the famous Falls of the Genesee, 1 three cataracts of 96, 26 and 83 ft. respectively, the banks above the first fall, which is in the heart of the city, rising to a height of fully 200 ft. above the river. From the city limits the river falls 263 ft. in its 7 m. course to the lake. Ten bridges, road and railway, connect the two sides of the river.

Rochester is an attractive city, with many fine avenues. East Avenue is perhaps the most beautiful street in the city, and Plymouth, West and Lake Avenues are other prominent residential streets. The park system of Rochester, planned by Frederick Law Olmsted, was 1264 acres in extent in 1908. The largest park is Eastman-Durand (512 acres), on the shore of Lake Ontario; Genesee Valley Park (443 acres) is on both sides of the river; Seneca Park (212 acres) includes a zoological garden; Highland Park (75 acres) and eleven other smaller parks. In Washington Park there is a soldiers' monu- ment surmounted by a statue of Lincoln, and a statue (1898) by S. W. Edwards of Frederick Douglass, the negro orator and editor, who lived in Rochester in 1847-70, stands at the approach to the New York Central & Hudson River railway station. The principal cemeteries are the Mount Hope, the Holy Sepulchre, and Riverside. The Powers Building, a 7-storey stone and iron structure surmounted by a tower 204 ft. high, was one of the first office buildings in the United States to be equipped with elevator service. The Monroe County Court House (of New Hampshire granite) on West Main Street is in the Renaissance style, and contains a law library of about 25,000 volumes. The City Hall (of grey sandstone) has a tower 175 ft. high. Among the other prominent buildings are the Post Office, the Chamber of Commerce, the Lyceum Theatre, the Temple Theatre, the Masonic Building, the Buffalo, Ro- chester & Pittsburg office building, the Sibley building, the Duffy-Mclnnerney building, and the Young Men's Christian Association building. The following churches are architectur- ally noteworthy: the

Central, the First and the Third Presby- terian, the Brick Presbyterian, St Patrick's Cathedral (Roman Catholic), the Cornhill and the Asbury (Methodist Episcopal), the First Baptist, St Paul's (Protestant Episcopal), and the First Unitarian. Rochester is the see of a Roman Catholic bishop. In Rochester are the Western New York Institution for Deaf Mutes, the Monroe County Penitentiary, a State Arsenal, a State Hospital for the Insane, the Protestant Episcopal Church Home, Rochester City Hospital (1864), and others, including the Rochester Municipal Hospital (1903) for con- tagious diseases and consumption.

Rochester is an important educational centre. Its best- known institution is the University of Rochester (Baptist, 1850; co-educational since 1900), having in 1908-9 28 in- structors, 352 students (231 men and 121 women), and a library of 49,000 volumes. It occupies a tract of 24 acres _ * From the top of the upper falls (96 ft. high), in the centre of the city, Sam Patch (1807-1829) jumped and was killed in November 1829; he had formerly made the same leap, had jumped half the depth of Niagara, and was planning to go to London and jump from London Bridge — he was to go by sailing packet to Liverpool and jump from the yard-arm every fair day.

on University Avenue in the eastern part of the city. With it is connected the Ward Museum, containing the valuable geological and zoological collections of Henry Augustus Ward (1834-1906), an American naturalist, professor of natural sciences here in 1860-75, who had in Rochester a laboratory for the manufacture of plaster-casts of fossils, and who pre- pared natural – history cabinets for many museums. Much of the success of the university was due to Martin Brewer Anderson (1815-1890), president from 1853 to 1888, and David Jayne Hill (b. 1850), who was president from 1888 to 1896, and subsequently was assistant secretary of state in 1898-1903, and minister to Switzerland in 1903-5 and to the Netherlands from 1905 to 1907, when he became ambassador to Germany. Rochester Theological Seminary (1850) is also under the control of the Baptist Church, but has no organic connexion with the university of Rochester. Its library of 36,500 volumes in- cludes the valuable collection (6500 vols.) of the German church historian, Johann August Wilhelm Neander. Other educational institutions include St Bernard's Theological Seminary (Roman Catholic; 1893); Wagner Memorial Lutheran College (German); Academy of the Sacred Heart (Roman Catholic), &c. One of Rochester's most noteworthy institutions is the

Athenaeum and Mechanics' Institute (an outgrowth of the Rochester Athenaeum, established in 1829); it was founded in 1885 by Henry Lomb, of the Bausch & Lomb Optical Co., and has a large building, the gift of George Eastman (b. 1854), of the Eastman Kodak Co. It has an endowment of $650,000, and more than 60 instructors, and in 1907-8 more than 5000 students were enrolled. Since 1907 public school buildings have been used as club-houses for community civic clubs with libraries and gymnasiums; and in 1909 a League of Civic Clubs was organized. Besides the law library and the libraries of the educational institutions mentioned above, Rochester has the Reynolds (Public) Library, containing more than 65,000 volumes in 1910.

The Falls of the Genesee provide a valuable water-power, early utilized by the flour-milling industry, of which, owing largely to the nearness of the fertile wheat-fields of the Genesee Valley and the transportation facilities furnished by the Erie Canal and Lake Ontario, as well as to the water-power, Rochester was for many years the most important centre in the country. Flour-miiling is no longer so important an industry here, but Rochester ranks high among the great manufacturing cities of the country, holding third rank in this as in population in New York state, and is remark- able for the great size and output of several of its manufacturing plants, which are the largest of their sort in the United States or the world. In 1905 the value of the city's factory products was $82,747,370, an increase of 38-7% since 1900. In value of product and in number of wage-earners employed the manu- facture of men's clothing stood first; the value of the product was $14,948,703, or more than 18 % of the total value of all the city's manufactures; and 20% of the factory wage-earners in the city were employed in this industry. The second industry in 1905 was the making of boots and shoes, of which the value was $8,620,01 1, an increase of 24-3% since 1900. In the value of clothing and in the value of boots and shoes manufactured Rochester ranked seventh among the cities of the United States in 1905. In the manufacture of photographic apparatus and materials and optical goods Rochester easily holds first place in the world, and it has the largest establishment for the manufacture of cameras (the Eastman Kodak Co. at Kodak Park) and the largest manufactory of lenses, telescopes, opera and field glasses (Bausch & Lomb Optical Co.). The total value of the photographic apparatus in 1905 was $2,886,071 , which represented 82-9% of the product value of photographic apparatus manufactured in the entire United States, and was 176- 1 % more than in 1900. Photographic materials amounted in value to $4,528,582, 47-4% of the total value of the product of the country. The value of the output of this industry was 2100% more in 1905 than in 1900.

Another remarkable increase was shown in the value of electrical machinery and apparatus, which was only $15,000 in 1900, but in 1905 was $2,078,360. Flour and grist mill products in 1905 were valued at $3,222,257. In Rochester is an immense refinery of lubricating oil, and the oil product more than doubled in value between 1900 and 1905. Other important manufactures, with the value of their product in 1905, are as follows: foundry and machine-shop products, $2,874,142; furniture, $2,364,859; tobacco, cigars, snuff, &c, $2,234,531; malt liquors, $2,173,707; confectionery, $1,512,611; lumber and planing mill products, $1,495,229; carriages and wagons, $1,229,570; and stationery goods, $1,130,873. Rochester is also the nursery-

gardening centre of the United States. The first nursery, that of Ellwanger & Barry, now one of the largest in the world, was established here in 1840. There are now more than a score of large nurseries, representing an investment of several millions of dollars, and annually shipping seeds, bulbs and plants having an approximate value of $2,000,000. Rochester is the port of entry for the Genesee customs-district, importing Canadian lumber and wheat and exporting dairy, garden, farm and orchard products. In 1909 its imports were valued at $1,809,746 and its exports at $1,360,367. The government of Rochester is that of cities of the first class (the state census of 1905 showed that it had more than the 175,000 inhabitants necessary for a city of the first class under the New York state law). The city owns its water supply system, the supply being obtained largely from Hemlock Lake, 30 m. S. of the city limits. The value of the plant is approximately $8,000,000. Rochester is famous for the purity of its milk supply, which is regulated under a strict system of supervision and inspection.

The region about Rochester, when first visited by Europeans, was the home of the Seneca Indians. The Jesuits, Peter Joseph Marie Chaumonot (1611-1693) and Jacques Fremin (d. 1691), worked among the Indians in the neighbourhood. In 1687 the marquis de Denonville fought a battle with the Iroquois near the falls. In 17 10 there was a French post on Irondequoit Bay. The district was included in the Phelps- Gorham Purchase in 1788. It was not until Ebenezer Allan (called ” Indian Allan “) built a saw and grist mill at the falls in 1790 that a small settlement began to grow up. In 1802 a large tract of land, which included the site of the present city, passed into the hands of three Maryland proprietors, Charles Carroll, William Fitzhugh, and Nathaniel Rochester (1752-1831). Rochester, from whom the city took its name, was a native of Virginia, had been a manufacturer at Hagerstown, Maryland, and after settling in Rochester

in 1818 was a member in 1822 of the New York Assembly. He established a settlement, largely of New Englanders, at the falls in 1810-12, but its growth was slow as it was not on the direct road between Albany and Buffalo, and the region was malarial. It was known at first as “The Falls” or “Falls Town.” In 1817 it was incorporated as the village of Rochesterville, the name being shortened to its present form two years later. In 1820 it had only 1502 inhabitants. In 1821 Monroe county was erected with Rochester as the county-seat. The real growth of the place began with the completion of the Rochester and Lock- port section of the Erie Canal in 1823, and in two years the population had about doubled. Rochester was first chartered as a city in 1834, with 12,000 inhabitants. Rochester’s first newspaper, the Gazette, was established in 1816, the Telegraph following in 181 8. The first daily newspaper was the Daily Advertiser (1826). Between 1828 and 1830 Rochester was the centre of the anti-Masonic political movement, and here Thurlow Weed published his Anti-Masonic Enquirer. Sub- sequently it was a centre of the abolitionist movement in New York state; Myron Holley (1 779-1841) began here the publication of his Freeman in 1839, and in 1847 Frederick Douglass established the North Star. For many years before the Civil War it was a busy station of the “Underground Railroad,” by which fugitive slaves were assisted in escaping to Canada. In 1846 Miss Susan B. Anthony settled in Rochester, and the city has been a gathering-place for advo- cates of women’s rights. Here lived the Fox sisters, Margaret (1836-1893) and Katharine (b. 1839), whose spiritualistic de- monstrations became notorious about 1850 as the ” Rochester Rappings,” and the city has been a gathering-place for American spiritualists also. The narrowness of the gorge through which the Genesee river runs has always rendered the city liable to disastrous floods. Several of these in its early history practi- cally destroyed the manufacturing industries along the river, but the loss of property in the more recent ones has been relatively less; that of 1865 entailed a loss of more than $1,000,000, and in that of 1902 the damage exceeded $1,500,000.

See William F. Peck, History of Rochester and Monroe County (2 vols., Chicago, 1908).

ROCHET (Lat. rochettum, from the late Lat. roccus, connected with the O.H.Ger. roch, roc and the A.S. rocc; Fr. rochet, Ital. rocchetto, Sp. roquete, Ger. Rochett, Chorkleid), an ecclesiastical

vestment. In the Roman Catholic Church the rochet is a tunic of white, and usually fine linen or muslin (battiste, mull) reaching about to the knee, and distinguished from the surplice by the fact that its arms are narrow and tight-fitting. The lower edge and the sleeves are usually garnished with lace, lined with violet or red silk in the case of prelates, or — more rarely — with embroidered borders.

The rochet is proper to, and distinctive of, prelates and bishops: but the right to wear it is sometimes granted by the pope to others, especially the canons of cathedral churches. It is not a vestis sacra, and cannot therefore be used as a sub- stitute for the surplice, e.g. in the administering of the Sacra- ments (Decree of the Congregation of Rites of Jan. 10, 1852). None the less, since it is used at choir services and is ordered to be worn over the everyday dress at Mass (Missa rom. Rit. celebr. i. 2), it may be included among liturgical vestments in the widest sense.

The earliest notice of the use of the rochet is found in an inventory of the vestments of the Roman clergy, dating from the 9th century. In this it is called camisia, a name which it retained at Rome until the 14th century, and it seems to have been already at that time proper to particular members of the clergy. Other Roman names for the vestment were succa, sucta; it was not till the 14th century that the name rochettum appeared at Rome, but it was not long before it had superseded all the native designations. Outside Rome, too, the vestment is early met with, e.g. in the Frankish empire (9th century) as alba clericalis, in contradistinction to the liturgical alb, and in England (10th century) under the name of of er slip in the 46th canon of the ecclesiastical laws of Edgar. At the beginning of the 1 2th century the rochet is mentioned, under the name of camisia, by Gilbert of Limerick and by Honorius, and, some- what later, by Gerloh of Reichersperg as tunica talaris'. From the 13th century onward it is frequently mentioned. The name rochettum is first traceable in England; in Germany and northern France the rochet was also called saroht (sarrotus) or sarcos (sarcotium).

Outside Rome the rochet was, until well into the 14th century, a vestment common to all the clergy, and especially to those of the lower orders; and so it remained, in general, until the 1 6th century, and even, here' and there, so late as the 19th. Moreover, in further contradistinction to the Roman use, it had — especially in the German dioceses — a liturgical character, being used instead of the surplice.

The rochet was originally a robe-like tunic, and was therefore girdled, like the liturgical alb. So late as 1260 the provincial synod Of Cologne

decreed that the vestis camisialis must be long enough entirely to cover the everyday dress. A good example of the camisia of the 12th century is the rochet of Thomas Becket, preserved at Dammartin in the Pas de Calais, the only surviving medieval example remarkable for the pleating which, as was the case with albs also, gave greater breadth and more elaborate folds. In the 15th century the rochet only reached half-way down the shin; in the 16th and 17th to the knee; in the 18th and 19th often only to the middle of the thigh. In the middle ages it was always plain. The rochet is unknown in the Eastern Churches. (J. Bra,)

Church of England. — In the English Church the rochet is a vestment peculiar to bishops, and is worn by them, with the chimere (q.v.) both ” at all times of their ministration” in church and also on ceremonial occasions outside, e.g. in the House of Lords or at a royal levee. In general it has retained the medieval form more closely than the Roman rochet, in so far as it is of plain, very fine linen (lawn), and reaches almost to the feet. The main modifications have been in the sleeves. At the time of the Reformation these were still narrow, though already showing a tendency to expand. The portrait of Archbishop Warham at Lambeth, for instance, shows a rochet with fairly wide sleeves narrowing towards the wrists, where they are confined by fur cuffs. This fashion continued until, in the 17th century, the sleeves became much fuller; but it was not till the 18th century that they developed into the familiar

exaggerated balloon shape, confined at the wrists by a ribbon, beyond which a ruffle projected. About the same period, too, arose the custom of making the rochet sleeveless and attaching the “lawn sleeves ” to the chimere. This fashion survived throughout most of the 19th century, but there has since been a tendency to revert to the earlier less exaggerated form, and the sleeves have been reattached to the rochet. The ribbon by which the wrist is confined is black, except when convo- cation robes are worn, when it is scarlet. The rochet is worn without the chimere under the cope by those bishops who use this vestment. At his consecration the bishop-elect is, according to the rubric, presented to the consecrating bishops vested in a rochet only; after the “laying on of hands ” he retires and puts on ” the rest of the episcopal habit,” ‘i.e. the chimere. (W. A. P.)

ROCHFORD, EARL OF, an English title borne by the family of Nassau de Zulestein from 1695 to 1830. William Henry Nassau de Zulestein (1645-1709) was born at Zuylestein, near Utrecht, his father being Frederick Nassau de Zulestein (1608-ˆ 1672), a natural son of Henry Frederick, prince of Orange, and his mother an English lady, Mary

Killegrew: One of the most trusted companions of his kinsman, William of Orange, Zule- stein was' sent to England in 1687 and again in 1688 to report on the condition of affairs, and later in 1688 he sailed with the prince on his famous expedition. After the Revolution he "was naturalized and served the king in the field, being created Viscount Tunbridge and earl of Rochford in 1695. He was succeeded by his son' William (1681-1710), who was killed at the battle of Almenara, and then by another son Frederick (1682-1738). Frederick's son, William Henry, the 4th earl (1717-1781), was a diplomatist and a statesman. Having gained experience as envoy at Turin from 1749 to 1753, he Was ambassador at Madrid from 1763 to r766 and at Paris from 1766 to 1768. From 1768 to 1775 he was one of the secretaries of state. This earl left no children when he died on the 28th of September 1781, and his nephew, William Henry, the 5th earl(i754-i83o), dying in September 1830 the earldom became extinct. The estates of the earls of Rochford were in Suffolk and Essex, their principal residence being St Osyth Priory in the latter county.

ROCHFORD, a town in the south-eastern parliamentary division of Essex, England, 39 m. E. by N. from London by the Southend branch of the Great Eastern railway. Pop. (1901) 1829. It lies on the small river Roach, near the head of a long estuary. The town has a Perpendicular church (St Andrew), a corn exchange and some agricultural trade. Rochford Hall, a picturesque gabled mansion of various dates, belonged once to the Boleyns, and it has been stated that Anne Boleyn, the unfortunate queen of Henry VIII. , was born here, but this is in no way proved. Near Rochford the Lawless or Whispering Court, a remarkable survival of unknown origin, is held by a manorial tenure on the Wednesday following Michaelmas Day, beginning at midnight. No light is permitted, nor may voices be raised above a whisper. Nearly 3 m. N.W. from Rochford is Ashingdon. This is generally accepted as the scene of the fight of Assandun in 1016 between Canute and Edmund Iron- side* in which the English were defeated through treachery in their ranks. Earthworks, of this or an earlier date, remain.

ROCK, DANIEL (1799-1871), English Roman Catholic priest and ecclesiologist, was born at Liverpool on the 31st of August 1799, and educated at St Edmund's College, Ware, Herts, and at the English College, Rome. He was ordained priest in 1824 and successively appointed chaplain to the 16th earl of Shrews- bury at Alton Towers, Staffordshire, and priest in charge of the Roman Catholic congregation at Buckland, near Faringdon in Berkshire. After the re-establishment of the Roman Catholic hierarchy in England, in which he had taken an active part, Rock was elected a canon of St George's Cathedral,

Southwark. He was greatly interested in medieval art, and, having gone to live at South Kensington in 1864, in order to be near the museum, was of great assistance to the authorities there. He died on the 28th of November 1871.

Rock's principal works are: Hierurgia, or the Holy Sacrifice of the Mass expounded (London, 1833; revised edition by W. H. J. Weale, 1893), an exhaustive account of the Eucharistic rites in the Latin, Greek and Oriental Churches, and illustrated from early paintings, sculptures and inscriptions; The Church of Our Fathers, is seen in St Osmund's Rite for the Cathedral of Salisbury, with Dissertations on the Belief and Ritual in England before the Coming of the Normans (3 vols., 1849-54; new edition by G. W. Hart and W. H. Frere, London, 1903).

See the Memoir prefixed to Hart & Frere's edition of The Church of Our Fathers by the Rev. B. W. Kelly; a full list of his writings is given in J. Gillow's Bibl. Diet, of the Engl. Catholics, vol. v. p. 436.

ROCK (O.Fr. roke, Sp. roca, Ital. rocca; possibly from a Lat. form rupica, from rupes, rock), in geology a mass of the mineral matter of which the crust of the earth is composed (see Petrology and Geology). In more general usage a " rock " is a large mass of this mineral matter, as distinguished from smaller pieces which are termed " stones."

From this word must be distinguished the verb " to rock," to swing an object to and fro, particularly of a cradle in which a child is rocked to sleep, the original meaning. The O.Eng. word is roccian, and is cognate with many words in Teutonic languages, e.g. Du. rukkea, Dan. rykke, Ger. riicken, to pull, tug, push.

ROCK-CRYSTAL, a colourless and transparent variety of quartz (q.v.), used as an ornamental stone. It usually occurs as crystals lining cavities in quartz-veins, which often run through granite, gneiss and crystalline schists. The limpidity of the crystal, its coldness to the touch and its common occurrence in rocks among Alpine glaciers, led to the ancient belief that it was a kind of congealed water, whence the name crystal, from Gr. KpvaraWos (ice). In the Swiss Alps the " Strahler," or crystal- gatherer, searches the rocks at much personal risk, and is often led to a drusy cavity by tracing narrow veins, or strings, of quartz on the mountain-side. A remarkable druse, or Kry-

stalkeller, discovered at Zinkenstock in the Bernese Oberland, in 1719, yielded about 20 tons of crystal, a single specimen weighing 8 cwt. The famous discovery of the Galenstock, in 1867, furnished magnificent crystals, but they were dark brown or smoky quartz. La Gardette, near Le Bourg d'Oisans, in the Alps of Dauphine, is a notable locality for fine specimens of rock-crystal. The Alps and India probably furnished the ancients with their supplies.

Rock-crystal has been used for ornamental purposes since the Mycenean period. By the Romans under the Empire it was highly valued, and carved into vases and goblets, in some cases elaborately engraved. Lenses or globes were used for kindling the sacred vestal fire and for cauterizing the flesh, whilst ladies carried balls of crystal in order to cool their hands during the heat of summer. The artists of the Early Renaissance greatly favoured the use of rock-crystal, and executed beautiful carvings in this material. In modern times the use of rock-crystal has been largely superseded by that of glass, and it is notable that flint-glass is known in France as " cristal," probably from its resemblance to limpid quartz, or perhaps from the fact that powdered rock-crystal has been used as a source of silica in the manufacture of the finest glass. Rock- crystal is still cut as a faceted stone for personal decoration, but though not without brilliancy it lacks the " fire " of many gem- stones. It is often known locally by such names as Bristol diamond, Cornish diamond, Isle of Wight diamond, Briancon diamond, Marmaros diamond, Lake George diamond, &c. Rock-crystal is also carved into seals, paper-weights and other trivial objects, and into spheres for divination by crystal- gazing, Japanese balls being specially noteworthy. In Japan the crystal has been obtained for centuries from the granitic districts around Kimpu-san, in the province of Kai. Probably the most valuable application of rock-crystal is for spectacle lenses, which in consequence of their hardness are not readily abraded by use. They should be cut at right angles to the optic axis, or axis of the prism.

The " pebble " for lenses is found loose in the soil in many parts of the provinces of Goyaz, Sao Paulo and Minas Geraes in Brazil. Much of the material for spectacles comes also from Madagascar, where large crystals of clear quartz are found in the beds of certain streams, especially in the N.E. part of the island, having probably

been derived from quartz-veins in the gneiss and pegmatite. In India rock-crystal has been worked at many localities, and the loot of the palace of Delhi yielded marvellous ornaments carved in this material. At the present day it is cut and polished at Vellum in the Tanjore district in Madras, and is known as Vellum stone. Among the

numerous localities in the United States which yield rock-crystal mention may be made of those in Herkimer Co., New York State, whence the Lake George crystals are obtained; and it is notable that some of the Herkimer quartz encloses bituminous matter. Mokelumne Hill, Calaveras Co., California, has furnished some remarkable rock-crystal. In Europe the localities are very numerous, the most important being those in the Alps. Very fine crystals remarkable for pellucidity though not of large size occur in cavities in the statuary marble of Carrara; and remarkably hollowed crystals are known from Porretta near Bologna in Italy. The finest rock-crystal in Great Britain occurs at Tintagel and the Delabole slate quarry in N. Cornwall; and at Snowdon in N. Wales. (p. \y. R.*)

ROCKEFELLER, JOHN DAVISON (1839-), American capitalist, was born in Richford, Tioga county, New York, on the 8th of July 1839. In 1853 his family removed to Ohio, living after 1857 in Cleveland, where Rockefeller had begun to work as a bookkeeper in 1855 and where in 1858 he went into the produce commission business. His firm, Clark & Rockefeller, in 1862 invested in an oil refinery, planned by Samuel Andrews, and in 1865 Rockefeller sold out his share to his partner Clark, bought for $72,500 a larger share in another refinery, and formed the partnership of Rockefeller & Andrews. At about the same time another refinery was started by Rockefeller's brother William (b. 1841), but in 1867 Rockefeller & Andrews absorbed this business, and Henry M. Flagler was added to the partner- ship. In 1870 the two Rockefellers, Flagler, Andrews and a refiner named Stephen V. Harkness formed the Standard Oil Company, with a capital of $1,000,000 (increased in 1872 to $2,500,000 and in 1874 to $3,500,000), of which John D. Rocke- feller was president. This great corporation gradually estab- lished itself in practical control of the oil production in America, by means of business methods and financial operations which have been severely criticized, but which brought immense wealth to those concerned. Its capital was further increased in 1882, when separate companies were organized in each state; and in later years, as the first great American " trust," the Standard Oil Company was hotly attacked during the anti-trust move- ment (see Inter-state Commerce). Into the merits of this question it is impossible to enter here. Rockefeller himself retired from active business in 1895; he had for a time large iron interests (mines and ore-carrying vessels) on Lake Superior, which he sold to the United States Steel Corporation, and his personal wealth was probably greater than that of any other man in the country. In private life he was a devoted member of the Baptist church, and his benefactions were numerous. To " the University of Chicago founded by John D. Rockefeller " (in

1892) he had given, up to 1910, $24,809,666, while to the General Education Board he had given $43,000,000; he founded (1901) and supported the Rockefeller Institute for Medical Research in New York City; he gave large sums to Rush Medical College in Chicago, to Johns Hopkins Hospital in Baltimore, to Barnard College in New York City and to the Baptist Missionary Society; and in 1909 he gave $1,000,000 to endow a medical commission to investigate the nature of the hook-worm and to suppress the hook-worm disease.

See Ida M. Tarbell's History of the Standard Oil Company (New York, 1903), a severe attack on the Trust; also his own Random Reminiscences (1909).

ROCKET. (1) The name (Fr. roquette, Lat. eruca, a kind of cabbage) of two species of plants. The one, Eruca sativa, is a cruciferous annual with white flowers veined with purple; the leaves have a sharp flavour and are used in southern Europe for salads. The other is a hardy perennial herbaceous plant, of the genus Hesperis, of which Hespens matronalis is the most familiar species (see Horticulture).

(2) A cylinder of paper, pasteboard or metal, filled with an explosive mixture. This word, which appears in mary forms in various languages, is from the It. rocchetta, diminutive of rocca, a distaff, the obsolete English " rock "; the application

is due to a resemblance in shape. Rockets are used in pyrotechny for purpose of display, scattering showers of stars, coloured balls, &c, on bursting (see Fireworks). They are also used in signalling, and especially as a part of life- saving apparatus for wrecks (see Lifeboat and Life-Saving Service).

Large and heavy rockets, of which the head formed a pro- jectile, had too a considerable vogue in the early part of the igth century for war purposes. They were invented by Sir William Congreve (q.v.) and employed by him both afloat in coast operations and in field operations. Brought to the notice of all armies by the fact that a rocket battery of the Royal Artillery served in the allied army in the Leipzig cam- paign, war rockets were introduced in many armies, being sometimes issued as an additional portion of the equipment of ordinary field batteries, sometimes reserved for special rocket batteries. The Congreve rocket was in use in the British army as late as

i860. There were four natures — 3 -pounder, 6-pounder, 12-pounder and 24-pounder. The case was of sheet-iron, on to which was screwed a cylindro-conoidal head forming the projectile. The head was made hollow and could be filled with a bursting charge if a shell effect was desired, a base fuze being provided. The iron case contained the rocket composition, and was closed at the rear end by a metal plate with five holes or vents, and on the centre a bush into which the stick was screwed. These rockets were fired from rocket tubes on tripods, the tubes being provided with a tangent sight. Against masses of troops within easy range, the war rocket was considered an efficient engine; it was used also to set fire to buildings, but was always deficient in accuracy. Eventually the Congreve rocket was superseded by the Hale, of which two patterns were in use, the o-pounder and the 24-pounder, for field and fortress warfare respectively. These had no sticks, and were centred ;by the arrangement of the vent, the gases, as they emerged from the vent, im- pinging upon a screw-formed tail, to which they imparted the necessary rotation. These rockets were fired from a trough. The maximum effective range of the o-pounder Hale rocket was about 1200 yards. The use of these engines was dis- continued in the British service about 1885. On the con- tinent of Europe they had disappeared more than twenty years before. Austria, the last power to use them, broke up her rocket batteries in 1867.

ROCKFORD, a city and the county seat of Winnebago county, Illinois, U.S.A., on the Rock river, in the northern part of the state, about 85 m. N.W. of Chicago. Pop. (1890) 23,584; (1900) 31,051, of whom 9337 were foreign-born (6690 Swedes); (1910 census) 45,401. Area, 8-91 sq. m. It is served by the Chicago, Burlington & Quincy, the Chicago & North-Western, the Chicago, Milwaukee & St Paul, the Chicago, Milwaukee & Gary (" Rockford Route ") and the Illinois Central railways, and is connected by interurban electric railway with Chicago and Freeport, Illinois, and Janes- ville, Wisconsin. The city has a Memorial Hall, erected in honour of the soldiers and sailors of Winnebago county, and in charge of the Grand Army of the Republic; a soldiers' memorial fountain; a Carnegie library, containing 51,340 volumes in 1909; and the Velie Museum of natural history. Rockford College (non-sectarian), for the higher education of women, is ranked by the United States Commissioner of Education as one of fifteen women's colleges of the highest grade in the country; it was opened in 1849 as Rockford Seminary, and was named Rockford College in 1892. In 1908-9 it had 196 students. Rockford is the see of a Roman Catholic bishop. In and near the city there are two hospitals and three sanatoriums. Manufacturing is facilitated by good water-power, supplied by a dam across the Rock river about 800 ft. long,

constructed in 1844. Among the manufactures are furniture, hosiery and knit goods, agricultural implements, foundry and machine-shop products, saddlery and harness, &c. The total value of all factory products in 1905 was $15,276,129 (38-6% more than in 1900). The municipality owns and

operates its waterworks; the water supply is obtained from artesian wells. Rockford was first settled in 1834, and was chartered as a city in 1852. More than one-fourth of its area has been annexed to the city since 1889.

ROCKHAMPTON, a town of Livingstone county, Queensland, Australia, on the Fitzroy river 43 m. from its mouth, 335 m. in a direct line N.W. of Brisbane. It has a beautiful situation, and its climate, in spite of heat, is healthy. It is the port of a wide agricultural district, which also produces gold, copper and silver. Much of the trade is carried on through the ports of Alma and Broadmount, near the mouth of the river, both available for ocean steamers. Rockhampton has a large trade in frozen meat, and there are factories for extract and meat preserving. Rockhampton is the terminus of the Queens- land Central railway and the seat of an Anglican and a Roman Catholic bishopric. Population of the municipality (1901), 15,461; within the 5 m. radius, 19,691; of the separate munici- pality of North Rockhampton, 2865.

ROCK HILL, a city of York county, South Carolina, U.S.A., 84 m. by rail N. of Columbia. Pop. (1890) 2744; (1900) 5485 (1706 negroes); (1910) 7216. Rock Hill is served by two lines of the Southern railway. It lies at an elevation of about 670 ft. above the sea. Among its buildings and institutions are the Federal Government Building, the City Hall, the Carnegie Library and the Winthrop Normal and Industrial College (chartered in 1891 and opened in 1894), a state institution for white girls. Cotton is the most important product of the surrounding country. The Catawba river, 5 m. distant, furnishes good water-power, and in a large power-plant electricity is generated for the city's manufactories. Among the manufactures are cotton goods, cotton-seed oil, yarn, wagons and carriages, foundry and machine-shop products; and there are cotton gins, marble and stone works. The growth of the city has been almost entirely since the Civil War. Rock Hill was incorporated as a village in 1870, and was chartered as a city in 1892.

ROCKINGHAM, CHARLES WATSON WENTWORTH, 2ND marquess of (1730-1782), twice prime minister of England, was the son of Thomas Watson Wentworth (c. 1690-17 50), who was created earl of Melton in 1733 and marquess of Rock- ingham in 1746. The family of Watson

was descended from Sir Lewis Watson (1584-1653), son and heir of Sir Edward Watson (d. 1616) of Rockingham Castle in Northamptonshire. For his services to the king during the Civil War Sir Lewis was created Baron Rockingham in 1645. His grandson Lewis, the 3rd baron (1655-1724), was created earl of Rockingham in 1 7 14, and was succeeded by his grandson Lewis (c. 1709- 1745), whose brother Thomas, the 3rd earl, died unmarried in February 1746, when the earldom became extinct. The barony of Rockingham, however, descended to a cousin, Thomas, father of the prime minister, a grandson of Edward, the 2nd baron (1630-1689), who had married Anne, daughter and heiress of Thomas Wentworth, 1st earl of Strafford. The vast estates of the Went worths had passed to Edward's son, Thomas, who took the additional name of Wentworth, and then to his son, the 1st marquess of Rockingham.

Charles Watson Wentworth was born in 1730 on the 19th of March (according to some, the 13th of May), and was educated at Westminster school and St John's College, Cambridge. He showed his spirit as a boy by riding across from Wentworth to Carlisle in 1746 to join the duke of Cumberland in his pursuit of the Young Pretender. He was created earl of Malton in the peerage of Ireland in September 1750, and succeeded his father as 2nd marquess of Rockingham in December of the same year. In 1751 he became lord-lieutenant of the North and East Ridings of Yorkshire and a lord of the bedchamber, and in 1760 was made a knight of the Garter. After George III. had begun his policy of dividing the great Whig families, those Whig noblemen and gentlemen who did not choose to join the sections headed by the Grenvilles, the duke of Bedford, or any other great noblemen, selected as their chief the young marquess of Rockingham. In May 1762 the king's favourite,

the earl of Bute, became first lord of the treasury, and the marquess of Rockingham was amongst those who in the follow- ing year were dismissed from their lord-lieutenancies. The opposition now grew so strong that Lord Bute resigned in April 1763, and the king, true to his policy, appointed George Grenville to be his successor. But Grenville's section of the Whig party was not strong enough to maintain him in power long, and in July 1765 Lord Rockingham formed his first administration with General Conway and the duke of Grafton as secretaries of state. The cabinet seemed stronger than it really was, for it was divided by intestine quarrels, and the earl of Chatham refused

to have anything to do with it. Never- theless, Rockingham recovered his lord-lieutenancies and won reputation as a good administrator. In May 1766 the duke of Grafton, a far abler man than Rockingham, though neither so conciliatory in his manners nor so generally popular, seceded from the government, and in August 1766 he succeeded his former chief as first lord of the treasury and prime minister. Then followed many years of fruitless opposition to the king's personal authority as exhibited through his ministers, but at last, on the 27th of March 1782, Lord Rockingham again became prime minister with Fox and Shelburne (afterwards marquess of Lansdowne) as secretaries of state. This time he enjoyed office for but a few weeks, for he died on the 1st of July 1782. He left no issue, and his property went to his nephew, the 2nd Earl Fitzwilliam, his titles becoming extinct. A few words from his epitaph by Burke deserve quotation as giving the reason of the predominance of such an ordinary man as Lord Rockingham over a party abounding in men of great abilities : " A man worthy to be held in esteem, because he did not live for himself. . . . He far exceeded all other statesmen in the art of drawing together, without the seduction of self-interest, the concurrence and co-operation of various dispositions and abilities of men, whom he assimilated to his character and associated in his labours."

See Memoirs of the Marquis of Rockingham and his Contempor- aries, by George Thomas, earl of Albemarle (2 vols., 1852) ; Horace Walpole's Memoirs of the reign of George III., edited by G. F. R. Barker (1894) ; and the other letters, papers and diaries of the time.

ROCK ISLAND, a city and the county-seat of Rock Island county, Illinois, U.S.A., in the N.W. part of the state, on the E. bank of the Mississippi river, adjoining Moline, and opposite Davenport, Iowa (with which it is connected by two bridges), about 3 m. above the mouth of the Rock river, and at the foot of Rock Island rapids, which extend for nearly 16 m. Pop. (1890) 13,634; (1900) 19,493, of whom 4412 were foreign-born; (1910) 24,335. It is served by the Chicago, Burlington & Quincy, the Chicago, Milwaukee & St Paul, the Chicago, Rock Island & Pacific, and the Davenport, Rock Island & North-Western railways. Near the city, at the mouth of Rock river, the " Hennepin " (or Illinois & Mississippi) canal joins the Mississippi river. The city occupies a plain lying between the river and a series of bluffs. The island of Rock Island, a ridge of limestone rock about 3 m. long and i§ m. wide, is connected with the mainland by bridges to Rock Island and Moline; on it there are a Federal arsenal, the most important in the country for the manufacture of small-arms, gun carriages and artillery equipment, a Federal armoury and a national

cemetery; the island is connected with the Illinois shore at Moline by a dam, whence good water- power is derived. In the city are: a public library (1872), the Augustana College and Theological Seminary (controlled by the Evangelical Lutheran Augustana Synod of North America; co-educational), which was founded as Augustana Seminary in Chicago in i860 chiefly for the education of Swedish Lutheran clergymen, was removed to Paxton, Illinois, in 1863 and to Rock Island in 1875, and received its present name in 1869; and the principal offices of the Modern Woodmen of the World, a fraternal society, founded in 1884 and having 219,729 members in 1909. The city has a large trade by water and rail; com- mercially it forms a unit with Davenport and Moline. Among the city's manufactures are lumber, agricultural implements,

flour, glass, stoves, carriages, soap, &c. In 1005 the value of the factory product was $5,332,967. Some coal is mined in the county.

On the north bank of the Rock river, 3 m. from its mouth, there was a large summer village (sometimes called Saukenuk) of the Sauk Indians, built about 1730 and destroyed in 183 1; and near the mouth of the Rock river is a bluff called " Black Hawk's watch-tower." A settlement on the island was made in 1816, when the fort was built; the first settlement on the mainland was made in 1826. In 1841 the town of Rock Island was formed by the consolidation of two small settlements named Stephenson and Farnhamsburg and was incorporated; it received a city charter in 1849. Upon the west end of the island the United States government in 1816 built Fort Arm- strong, where on the 21st of September 1832, at the close of the Black Hawk War, a treaty of peace was signed by General Winfield Scott and Governor John Reynolds of Illinois and by the chiefs of the Sauk and Foxes, and where, six days before, General Scott and Governor Reynolds had made a treaty with the Winnebagoes. The fort was abandoned in 1836 and was burned in 1855; a monument now marks its site. The Rock Island armoury and arsenal, under an act of 1862, were built in 1863, when a number of captured Confederate soldiers were confined on the island.

ROCKLAND, a city and the county-seat of Knox county, Maine, U.S.A., on Rockland Harbor, Penobscot Bay, 86 m. by rail E.N.E. of Portland. Pop. (1900) 8150; (1910) 8174. It is the eastern terminus of a branch of the Maine Central railway, and is served by an interurban electric line and by steamboat lines to Portland, Boston, Bangor, Bar Harbor and other coast ports. The harbour is protected by a breakwater nearly 5000 ft.. long. The principal buildings are the United States Govern- ment Building and the County Court House. Granite and limestone are

quarried in the vicinity. The granite (biotite, biotite-muscovite and quartz-monzonite) is of fine quality, and has been used extensively in the United States for building and monumental purposes; and the burning of lime is by far the most important industry of the city. The shipbuilding industry is also important. The total value of the city's factory products in 1905 was $1,822,591 (46-5% more than in 1900). Lobsters and fish in considerable quantities are shipped from the city. Rockland was settled in 1769, but its growth began only with the establishment of the lime industry in 1795. It was a part of the township of Thomaston (pop. 2205 in 1910), from 1777 to 1848, when it was incorporated as a separate township under the name of East Thomaston. Two years later the present name was adopted, and in 1854 Rockland was chartered as a city.

ROCKLAND, a township of Plymouth county, Massachusetts, U.S.A., about 20 m. S. of Boston. Pop. (1890) 5213; (1900) 5327; (1910 U.S. census) 6928. Area, about 10 sq. m. It is served by the New York, New Haven & Hartford railway, and by interurban electric railway. Among its manufactures are boots and shoes and tacks. There is a public library (1878). Rockland was erected into a township in 1874, having been previously a part of Abington.

ROCKPORT, a township of Essex county, Massachusetts, U.S.A., on the N.E. end of Cape Ann, on the Atlantic Ocean, north-east of Gloucester, and about 35 m. north-east of Boston. Pop. (1890) 4087; (1900) 4592; (1910, U.S. census) 4211. Rockport is the southern terminus of the Gloucester branch of the Boston & Maine railway, and is served by an electric railway extending from Gloucester through Rockport and around the cape. Off Sandy Bay, a rendezvous of the Atlantic squadron of the U.S. navy, the Federal government began in 1884 a harbour of refuge, with an area of 1664 acres, to be protected from north and north-east winds by a breakwater, 117 ft. wide at a depth of 12 ft. below mean low water, rising 22 ft. above mean low water, and 9000 ft. long. In the town- ship are the North Village or Pigeon Cove and the South Village or Rockport. Rockport is a summer resort, and there are many summer residences at Andrews Point and at the South

End and Headlands. There are large granite quarries along the coast, especially in Pigeon Cove, and there are two varieties of granite, called commercially " grey " and " green," both very hard, the former the more abundant. It has been used in building the great breakwater

off Sandy Bay and various large bridges. Granite for paving-stones is quarried. Like many of the Maine quarries those of Rockport owe much of their development to their nearness to deep water transportation. Isinglass, glue, tools, parts for automobile engines, and copper paint are among the manufactures. Fishing was formerly of importance, but quarrying has displaced it. Sandy Bay, the fifth parish of Gloucester, first settled about 1697, and Pigeon Cove, part of the third parish, were set off from Gloucester and were incorporated as the township of Rockport in 1840. The Bennett & Mackay transatlantic commercial cable was landed in Rockport in May 1884.

ROCKVILLE, a city of Tolland county, Connecticut, U.S.A., in the N.E. part of the state, on the Hockanum river, about 15 m. N.E. of Hartford. Pop. (1890) 7772; (1900) 7287, of whom 2548 were foreign-born, many being Germans and Poles; (1910) 7977. It is served by the New York, New Haven & Hart- ford railway and by electric lines. It is in the township of Vernon (pop. in 1890, 8808; in 1910, 9087; area, 19 sq. m.), which was separated from Bolton township in 1808, and con- tains the villages of Vernon, Vernon Centre, Dobsonville and Talcottville. In the city are the George Maxwell Memorial Library and the Sykes Manual Training School. The river, by a series of falls, makes a descent of 280 ft. here, and furnishes power for large manufacturing establishments. The principal manufactures are woollen, silk and cotton goods, envelopes, -and silk fish-lines. In 1841 fancy cassimeres, probably the first manufactured in the United States, were made here. At the Hockanum Mills (established 1809) worsted for men's clothing was first made (about 1870) in the United States. The first settlement here was made about 1726. Rockville was chartered as a city in 1889.

ROCKY MOUNTAIN GOAT, or White Goat (Oreamnus montanus), a North American hollow-horned ruminant of the family Bovidae, distinguished by its white colour. It is, in fact, the only ruminant, with the exception of the white Alaskan wild sheep, which is entirely white at all seasons of the year; and cannot, therefore, be mistaken for any other animal, and its description may consequently be brief. In the winter coat the hair is long and pendent, elongated into a short beard on the sides of the lower jaw behind the chin; and it is also longer than elsewhere on the neck and the chest; at the base of the long hair is a thick growth of short and woolly under-fur. In summer the coat becomes comparatively short. The muzzle is hairy, the ears are of moderate size, and the tail is short, and partially buried among the long hair of the rump. There are no glands on the face; but there is a large globular one at the base of each horn of the size of half a small orange. The black horns, which are ringed in their basal portion, are

comparatively short and not unlike those of the Asiatic serows in general characters, being subcylindrical, and curving slightly backwards. They taper, however, much more rapidly than those of the serows, and diverge much more widely from the middle line. The lateral hoofs are well developed. Although com- monly described as white, the hair has a more or less decided tinge of yellow, which appears to be more marked in the summer than in the winter coat. The cannon-bones are remarkably short and wide, and in this respect differ from those of all allied ruminants, except the Tibetan takin. The general shape of the animal is ungainly, owing to a huge hump on the withers, at which point the height is about 3 ft.

The head of a white goat obtained in 1900 from the mountains at the mouth of Copper river, opposite Kyak Island, has been described as a species apart. In addition to certain details in the conformation of the skull, the horns are much more slender than in the ordinary white goat, and instead of bending re- gularly backwards till near their tips, curve widely outwards from their bases. Their length is nearly equal to that of the

longest pair of the ordinary form hitherto recorded, while ths tip-to-tip interval is nearly double that of any other known specimen. This animal can scarcely be regarded as more than a local race, and should be styled Oreamnus montanus kennedyi.

The affinities of the white goat (which is really a member of a group intermediate between goats and antelopes) are probably with the Asiatic serows and takin, and hence perhaps with the musk-ox.

See a paper by Madison Grant, entitled ” The Rocky Mountain Goat,” published in the ninth annual report of the New York Zoological Society (1905). (R. L.*)

ROCOCO, or Rocaille, literally ” rock- work,” a style of architectural and mobiliary decoration popular throughout the greater part of Europe during the first half of the 18th century. In France it was especially characteristic of the regency and the reign of Louis XV. A debased style at the best, essentially fantastic and bizarre, it ended in extravagance and decadence. A meaningless mixture of imitation rock-work, shells, scrolls and foliage, the word came eventually to be applied to anything extravagant, flamboyant or tasteless in art or literature. The very exuberance of the rococo forms is, indeed, the negation of art, which is based upon restraint. There is something fundamentally Italian in the bravura upon which the style depends; yet Italy has produced some of the worst examples of what in that

country is called the ” Jesuit style,” in allusion to the supposed lack of directness in Jesuit policy. Everything, indeed, in the rococo manner is involved and tortured, though before a superb example of Jacques Caffieri, such as the famous commode in the Wallace Collection, it is impossible not to admire the art with which genius can treat even the defects and weaknesses of a peculiarly mannered fashion. The best French work possesses a balance and sym- metry which are usually entirely absent from its imitations. Spain and Italy produced many monstrous travesties — it is impossible to imagine anything more grotesque than the flam- boyant convolutions of the monumental Roman style of the third quarter of the 18th century. In Germany, weak and life- less imitations were as popular as might be imagined in a land which was content to take its art, especially its bad art, from France. England did not escape the infection, and Chippendale and his school produced examples of rocaille work and coquillage which were quite foreign to their own sentiment, and rarely rose above respectable mediocrity.

ROCROI, a town of northern France, capital of an arrondisse- ment in the department of Ardennes, 22 m. N.N.W. of Charle- ville by rail, and within 2 m. of the Belgian frontier. Pop. (1906) town, 796; commune, 2116. As a fortified place it commands the Ardennes plateau between the valley of the Meuse and the head-waters of the Oise. The present fortifications, constructed by Vauban, form a pentagon and entirely close in the town, which has regularly built streets converging on a central square. Overlooking the latter is the church, a florid building of the 1 8th century. Rocroi is the seat of a sub-prefect and has a tribunal of first instance.

The place, originally called Croix-de-Rau or Rau Croix, was fortified in the 16th century and besieged by the imperialists m l SSS- Invested by the Spaniards in 1643, it was relieved by Louis II., the duke of Enghien (afterwards the Great- Conde), after a brilliant victory. Captured in 1658 by the same duke, then in the Spanish service, it was not restored to France till the treaty of the Pyrenees in 1659. In 1815 Rocroi was be- sieged for a month by the allies.

ROD, EDOUARD (1857-1910), French-Swiss novelist, was born at Nyon, in Switzerland, on the 31st of March 1857. He studied at Lausanne and Berlin, and in 1878 found his way to Paris. In 1881 he dedicated his novel, Palmyre Veulard, to Zola, of whom he was at this period of his career a faith- ful disciple. A series of novels of similar tendency followed. In 1884 he became editor of the Revue contemporaine, and in 1887 succeeded Marc Monnier as professor of comparative literature at Geneva, where he remained till 1893. La

Course a la mort (1885) marks a turning-point in his career; in it he

forsook the so-called naturalistic novel for the analysis of moral motives. He is at his best in presenting cases of conscience, the struggle between passion and duty, and the virtues of renunciation. Le Sens de la vie (1889), one of his most famous books, is in the nature of a complement to La Course a la mort. It was followed by Les Trois cmurs (1890), La Sacrifice (1892), La Vie privSe de Michel Teissier (1893), trans- lated as The Private Life of an Eminent Politician (1893); La Seconde Vie de Michel Teissier (1894), Le Silence (1894), Les Roches blanches (1895), Le Dernier Refuge (1896), Le Menage du pasteur Naudii (1898), a study of Protestant France; L'Eau courante (1902), L'Inutile Effort (1903), Un Vainqueur (1904), L'Indocile (1905), and L'Incendie (1906). M. Rod's books of literary criticism include Les Idees morales du temps present (1897), an admirable Essai sur Goethe (1898), Stendhal (1892), and some columns of collected essays. He published V Affaire J. J. Rousseau in 1906, and in the same year he drew from an episode in the life of the philosopher a play in three acts, Le Reformateur, which was produced at the Nouveau Theatre. He died in January 1910.

ROD (O.E. rodd, probably related to Norw. rudda, stick, rodda, stake), a twig or shoot of a tree or bush, especially a straight slender stick or wand used as an instrument of punish- ment, as a symbol of office, or as an implement, usually com- posed of several joints, for angling or fishing. The term is thus applied to a metal bar, slender in proportion to its length, used as a tie, brace or connecting shaft between different parts of a machine. It is familiar in the titles, showing the colour of their wands of office, of the gentlemen ushers of the three principal British orders of knighthood, the ushers of the Garter and St Patrick being " Ushers of the Black Rod," and of the Thistle " Green Rod." The use of a rod as a measuring implement has given rise to the use of the word for a measure of length = 5! yds. or i6| ft.; this length is also named a pole or perch, the origin of the application being the same as in " rod "; as a measure of area, a rod = a square pole or perch, 305 square yds. = 2725 square ft., 160 rods = i acre.

RODBERTUS, KARL JOHANN (1805-1875), German socialist, was born at Greifswald on the 12th of August 1805, his father being a professor at the university there. He studied law at Gottingen and Berlin, thereafter engaging in various legal occupations; and, after travelling for some time, he bought the estate of Jagetzow in Pomerania, whence his name of Rodbertus-Jagetzow. In 1836 he settled on this estate, and henceforward devoted his life chiefly to

economic and other studies, taking also some interest in local and provincial affairs. After the revolution of March 1848 Rodbertus was elected member of the Prussian national assembly, in which body he belonged to the left centre; and for fourteen days he filled the post of minister of public worship and education. He sat for Berlin in the second chamber of 1849, and moved the adoption of the Frankfort imperial constitution, which was carried. When the system of dividing the Prussian electorate into three classes was adopted, Rodbertus recommended abstention from voting. His only subsequent appearance in public life was his candidature for the first North German diet, in which he was defeated. His correspondence with Lassalle was an interesting feature of his life. At one time Rodbertus had some intention of forming a ” social party ” with the help of the conservative socialist Rudolf Meyer and of W. Hasen- clever, a prominent follower of Lassalle; but no progress was made in this. Rodbertus was neither disposed nor qualified to be an agitator, being a man, of a quiet and critical tempera- ment, who believed that society could not be improved by violent changes, but by a long and gradual course of develop- ment. He warned the working men of Germany against con- necting themselves with any political party, enjoining them to be a ” social party ” pure and simple. He died on the 8th of December 1875.

The general position of Rodbertus was ” social, monarchical and national.” He held the purely economic part of the creed of the German social-democratic party, but he did not agree with their

methods, and had no liking for the productive associations with state help of Lassalle. He regarded a socialistic republic as a possible thing, but he Cordially accepted the monarchic institution in his own country and hoped that a German emperor might under- take the role of a social emperor. The basis of the economic teach- ing of Rodbertus is the principle laid down by Adam Smith and Ricardo, and insisted on by all the later socialists, that labour is the source and measure of value. In connexion with this he developed the position that rent, profit and wages are all parts of a national income produced by the united organic labour of the workers of the community. Consequently there can be no talk of the wages of labour being paid out of capital; wages is only that part of the national income which is received by the workmen, of a national income which they have themselves entirely produced. The wages fund theory is thus summarily disposed of. But the most important result of the theory is his position that the possession of land and capital enables the landholders and capitalists to compel the workmen to divide the product of their labour with those non-working classes, and in such a proportion that the workers

only obtain as much as can support them in life. Thus the iron law of wages is established. Hence also Rodbertus deduces his theory of commercial crises and of pauperism.

A fundamental part of the teaching of Rodbertus is his theory of social development. He recognized three stages in the economic progress of mankind: (l) the ancient heathen period in which property in human beings was the rule; (2) the period of private property in land and capital ; (3) the period, still remote, of property as dependent on service or desert. The goal of the human race is to be one society organized on a communistic basis; only in that way can the principle that every man be rewarded according to his work be realized. In this communistic or socialistic state of the future land and capital will be national property, and the entire national production will be under national control; and means will be taken so to estimate the labour of each citizen that he shall be rewarded according to its precise amount. An immense staff of state officials will be required for this function. Rodbertus believed that this stage of social development is yet far distant ; he thought that five centuries will need to pass away before the ethical force of the people can be equal to it.

From temperament, culture and social position Rodbertus was averse to agitation as a means of hastening the new era; and, in the measures which he recommends for making the transition towards it, he showed a scrupulous regard for the existing interests of the capitalists and landholders. He proposed that those two classes should be left in full possession of their present share of the national income, but that the workers should reap the benefit of the increasing production. To secure them this increment of production, he proposed that the state should fix a ” normal working day ” for the various trades, a normal day’s work, and a legal wage, the amount of which should be revised periodically, and raised according to the increase of production, the better workman receiv- ing a better wage. By measures such as these, carried out by the state in order to correct the evils of competition, would Rodbertus seek to make the transition into the socialistic era.

The economic work of Rodbertus is an attempt made in a temperate and scientific spirit to elucidate the evil tendencies inherent in the competitive system, especially as exemplified in the operation of the iron law of wages. The remedy he proposes is a state management of production and distribution, which shall extend more and more, till we arrive at a complete and universal socialism, — and all based on the principle that as labour is the source of value so to the labourer should all wealth belong. It is therefore an attempt to place socialism on a scientific basis; and he is certainly entitled to be regarded as one

of the founders of ” scientific socialism.”

The following are the most important works of Rodbertus: Zur Erkenntniss unserer staatswirtschaftlichen Zustande (1842); Sociale Brief e an von Kirchmann (1850); Creditnot des Grund- besitzes (2nd ed., 1876) ; ” Der Normal-Arbeitstag,” in Tub. Zeit- schrift (1878); Letters to A. Wagner, &c, Tub. Zeitschrift (1878-79); Letters to Rudolf Meyer (1882). Rodbertus has received great atten- tion in Germany, especially from Adolf Wagner (Tub. Zeitschrift, 1878); see also Kosak’s Rodbertus sozialokonomische Ansichten (Jena, 1882) ; an excellent monograph by G. Adler, Rodbertus, der Begrilnder des wissenschaf (lichen Sozialismus (Leipzig, 1884) ; Dietzel, Karl Rodbertus, Darstellung seines Lebens und seiner Lehre (Jena, 1886); Jentsch, Rodbertus (Stuttgart, 1899); and E. C. K. Gonner, Social Philosophy of Rodbertus (London, 1899).

RODENTIA, or Glires, an order of placental mammals characterized by the peculiar form and structure of their front or incisor teeth, which are reduced to a single functional chisel- like pair in each jaw, specially adapted for gnawing, and growing throughout the entire life of their owners. Rodents may be characterized as terrestrial, or in some cases arboreal or aquatic, placental mammals of small or medium size, with a milk and a permanent series of teeth, plantigrade or partially planti- grade, and generally five-toed, clawed (rarely nailed or semi-

hoofed) feet, clavicles or collar-bones (occasionally imperfect or rudimentary), no canine teeth, and a single pair of lower incisors, opposed by only one similar and functional pair in the upper jaw.

In all rodents the upper incisors resemble the lower ones in growing uninterruptedly from persistent pulps, and (except in the hare group, Duplicidentata) agree with them in number. The premolars and molars may be rooted or rootless, with tuberculated or laminated crowns, and are arranged in an unbroken series. The orbits are always open behind, never being surrounded by bone. The condyle of the lower jaw is antero-posteriorly elongated. The intestine (except in the dormice or Gliridae) has a large caecum. The testes are in- guinal or abdominal. The uterus is two-horned, with the cornua opening separately into the vagina or uniting to form a corpus uteri. The placenta is discoidal and deciduate. And the smooth hemispheres of

the brain do not extend backwards so as to cover any part of the cerebellum.

Rodents include by far the greater number of species, and have the widest distribution, of any of the orders of terrestrial mammals, being in fact cosmopolitan, although more abundant in some parts, as in South America, which may be considered their headquarters, than in others, as in Australasia and Mada- gascar, where they are represented only by members of the mouse-group, or Myoidea.

All rodents are vegetable-feeders, and this uniformity in their food and in the mode of obtaining it, namely by gnawing, has led to that general uniformity in structure observable throughout the group; a feature which renders their classifica- tion difficult. Indeed, despite the fact that they present much diversity of habit — some being arboreal, as the squirrels, many of which are provided with expansions of skin or parachutes on which they glide from tree to tree; some cursorial, as the hares; others jumpers, as the jerboas; others fossorial, as the mole-rats; and others aquatic, as the beavers and water- rats — no important structural modifications are correlated with such diversity of habit.

Anatomy. — The rodent skull is characterized by the great size of the premaxillae, which completely separate the nasals from the maxillae ; by the presence of zygomatic arches; and by the wide unoccupied space existing between the incisors and the cheek-teeth ; and (except in the Duplicidentata) by the antero-posteriorly elongated glenoid cavity for the articulation of the lower jaw. Post-orbital processes of the frontals exist in squirrels, marmots and hares; but in all other genera they are rudimentary or altogether absent; and the zygoma seldom sends upwards a corresponding process, so that

the orbit is more or less completely continuous with the temporal fossa. The lachrymal for- faamen is always within the orbital margin ; and in many species the infra-orbital fora- men is very large (in some as large as the orbit) and transmits part of the masseter muscle. The zy- gomatic arch is variously deve- loped, and the position of the jugal is a character for grouping the families. The na- sals are, with few exceptions, large, and extend far forwards, the pari- etals are moderate, and there is generally a distinct interparietal. The palate is narrow from before backwards, this being especially the case in the hares, where it is reduced to a mere bridge between the premolars; in others, as in the rodent-moles (Bathyerginae), it is extremely narrow transversely, its width being less than that of one of the molar teeth. Tympanic bullae are always present and generally large; in some

genera, as in the gerbils (Gerbillinae) and jerboas (Jaculidae), there are supplemental mastoid bullae which form great

Fig. I. — Skull of Jumping-Hare (Pedetes caffer). P Mx, premaxilla; Mx, maxilla; Ma, malar; Fr, frontal; L, lachrymal; Pa, parietal; Na, nasal; Sq, squamosal; Ty, tympanic; ExO, exoccipital; AS, alisphenoid; OS, orbito-sphenoid ; Per, mastoid bulla.

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hemispherical bony swellings at the back of the skull (fig. I, Per),. in these genera and the hares the meatus auditorius being tubular and directed upwards and backwards. The lower jaw is character- ized by its abruptly narrowed and rounded front part supporting the pair of large in- cisors, as well as by the small size of the coronoid process, and the great de- velopment of lower hind, angular, portion.

The dental mula varies from i. f, c. , p. |, m. | (total 28) in the hares and rabbits to i. \, c. $,p.,m.l (total 12) in the Australian water-rats; but in the great majority of species it presents striking uniformity, and may be set down typically as i. \, c. I p. J or 8, m. |,

In the Duplicidentata only is there more than a single pair of incisors, and in these the additional pair is small and placed behind the middle pair. In this group the enamel extends par- tially to the back of the incisors, but in all the rest it is restricted to the front surface, so that, by the more rapid wearing-away of the softer structures behind, a chisel-shaped edge is maintained. Both upper and lower incisors are regularly curved, the upper ones slightly more so than the lower; and, their growth being con- tinuous, should anything prevent the normal wear by which their length is regulated — as by the loss of one of them, or by displace- ment owing to a broken jaw or other cause — the unopposed incisor may gradually curve upon itself until a complete circle or more has been formed, the ‘tooth sometimes passing through some part of the animal’s head. The cheek-teeth may be either rooted or

Fig. 2. — Skull of Porcupine (Hystrix cristata), with muscle attached. /, temporal muscle; m, masseter; m’, portion of masseter trans- mitted through the infra-orbital foramen, the superior maxillary nerve passing out- wards between it and the maxilla.

Fig. 3. — Vertical and Longitudinal Section through the Skull of the Beaver (Castor fiber), showing the brain-cavity, the greatly developed plates of bone in the nose-cavity, the mode of im- plantation of the ever-growing chisel-edged incisor, and the curved rootless cheek-teeth.

rootless, and either cusped or formed of parallel plates, this diversity of structure often occurring in the same family. When there are more than three cheek-teeth, those which precede the last three have succeeded milk-teeth, and are premolars. In some species, as in the agoutis (Dasyproctidae), the milk-teeth are long retained, while in the allied cavies (Caviidae) they are shed before birth.

The tongue presents little variability in length, being short and compressed, with a blunt tip, which is never protruded beyond the incisors. In most species there are three circumvallate papillae at the base, and the apical portion is generally covered with small thread-like papillae, some of which in the porcupines become greatly enlarged, forming toothed spines. The stomach varies in form from the simple oval bag of the squirrels to the complex ruminant- like organ of the lemmings. In the water-rat and agoutis it is constricted between the oesophagus and pylorus; while in the dormouse the oesophagus immediately before entering the stomach is much dilated, forming a large egg-shaped bag with thickened glandular walls; and in certain other species, as in Lopkiomys and the beaver, glandular masses are attached to and open into the cardiac or pyloric pouches. All rodents, with the sole exception of the dormice, have a caecum, often of great length and sacculated, as in hares, the water-rat and porcupines; and the long colon in some, as the hamster and water-rat, is spirally twisted upon itself near the commencement. The liver is divided in the typical manner in all, but the lobes are variously subdivided in different species (in Capromys they are divided into minute lobules) ; and the gall- bladder, though present in most, is absent in a few. In most species the penis (which is generally provided with a bone) may be more or less completely retracted within the fold of integument surrounding the vent, and lie curved backwards upon itself under cover of the integument, or it may be carried forward some distance in front of the anal orifice, from which, as in voles and marmots,

in the breeding-season, it is separated by the prominent testicular mass. The testes in the pairing-season form projections in the groins,

but (except in the Duplicidentata) do not completely leave the cavity of the abdomen. Prostate glands and, except in the Duplicidentata, vesiculae seminales are present in all. The uterus may be double, each division opening by a separate os uteri into a common vagina, as in Lepondae, Sciuridae, and Hydrochoerus, or two-horned, as in most species. The teats vary in number from a single abdominal pair in the guinea-pig to six thoracico-abdominal pairs in the rats; while in the Octodontidae and Capromyidae they are placed high up on the sides of the body.

There are generally nineteen dorso-lumbar vertebrae (thirteen thoracic and six lumbar), the form of which varies in different genera ; in the cursorial and leaping species the lumbar transverse processes are generally very long, and in the hares there are large compressed inferior spines, or hypapophyses. The caudal vertebrae _ vary from a rudimentary condition in the guinea-pig to a great size m the jumping-hare and prehensile-tailed porcupines. The scapula is usually narrow, with a long acromion ; the clavicles may be altogether absent or imperfect, as in porcupines, cavies and hares, but in most species are well developed. The humerus has no supra-condylar foramen, and the forearm bones are distinct; and in most species the fore foot has five digits with the phalanges normally developed, the first toe being but rarely rudimentary or absent. The pelvis has large ischia and pubes, with a long and usually bony symphysis. The femur varies considerably in form, but generally has a well- defined third trochanter. In the squirrels and porcupines the tibia and fibula are distinct, but in rats and hares they are united, often high up. The hind foot is more variable than the front one, the digits varying in number from five, as in squirrels and rats, to four, as in hares, or even three, as in the capybara, viscacha and agouti. In the Jaculidae the metatarsals are greatly elongated, and in some of the species, as jerboas, they are welded together.

The mouth is divided into two cavities communicating by a narrow orifice, the anterior one containing the incisors and the posterior the molars, the hairy skin of the face being continued inwards behind the incisors. This evidently prevents substances not intended for food getting into the mouth, as when the animal is engaged in gnawing through an obstacle. In hares and pacas the inside of the cheeks is hairy; and in some species, pouched rats and hamsters, there are large internal cheek-pouches lined with hair, which open near the angles of the mouth and extend backwards behind the ears. In the New World pouched rats (Geomyidae) the pouches open externally on the cheeks.

The peculiar odour evolved by many rodents is due to the secretions

of special glands, which may open into the prepuce, as in Mus, Microtus and Cricetus, or into the rectum, as in Arctomys and Thryonomys, or into the passage common to both, as in the beaver, or into pouches opening near the vent, as in hares, agoutis and jerboas.

The skin is generally thin, and the panniculus carnosus muscle rarely much developed. The fur varies exceedingly in character, — in some, like the chinchillas and hares, being fine and soft, while in others it is more or less replaced by spines on the upper surface, as in spiny rats and porcupines; these spines in several genera, as Xerus, Acomys, Platacanthomys , Echinothrix, Loncheres and Echinomys, being flattened. In muscular structure the chief peculiarities are noticeable in the comparatively small size of the temporal muscles, and in the great double masseters (fig. 2), which are the principal agents in gnawing. The digastric muscles also are remarkable for their well-defined central tendon, and in many species their anterior bellies are united between the two halves of the lower jaw. The cleido-mastoid generally arises from the basi-occipital, and the pectoralis major is connected with the latissimus dorsi. In porcupines and hares the tendons of the flexor digitorum longus and flexor hallucis longus are connected in the foot, while in the rats and squirrels they are separate, and the flexor digitorum longus is generally inserted into the metatarsal of the first toe.

Classification. — Some diversity of view obtains among naturalists with regard to the classification of the order; the scheme here followed being the one adopted (with some modifica- tions of nomenclature) by Professor Max Weber in his Sauge- thiere. The number of genera is so great that only the more important can be noticed. All authorities are agreed in dividing rodents into two great sections or sub-orders, the one, Dupli- cidentata, comprising only the hares, rabbits and picas, and the other, Simplicidentata, all the rest. In the latter there is only one pair of incisor teeth in the upper jaw, in which the enamel is confined to the front surface. The incisive foramina of the palate are moderate and distinct; the fibula does not articulate with the calcaneum; and the testes are abdominal, and descend periodically only into the inguinal canal.

Sewellels. — The first family is represented by certain peculiar North American rodents known as sewellels, constituting the genus

Haplodon (or Aplodori) and the family Haplodontidae and section Haplodontoidea. In common with the next three sections these rodents have the angular process of the lower jaw (fig. 4) arising from the inferior surface of the socket of the incisor. The masseter

Fig. 4. — Skull of the American Marmot {Arctomys monax). The projection at the right-hand lower corner of the figure is the angular process of the lower jaw.

muscle does not pass through the narrow infra-orbital canal. An alisphenoid canal may be present on the palatal aspect of the skull; but there is always a transverse canal. The malleus and incus of the inner ear are separate. The humerus often has a foramen (entepicondylar) on the inner side of its lower end; the tibia and fibula may be separate or united; but the scaphoid and lunar of the carpus are also united, while the centrale is free. The stomach is simple.

Sewellels are medium-sized terrestrial rodents, with no post- orbital process to the skull, which is depressed in form, and root- less cheek-teeth, among which the premolars number f, the first in the upper jaw being very small. The build is stout and heavy, the limbs and tail are short, the ears moderate, the eyes minute and the feet five-toed and plantigrade. Haplodon is represented by a small number of species in America west of the Rocky Mountains, of which H. rufus is the longest known. They are burrowing, and, in some cases at any rate, partially aquatic rodents.

Squirrel Group. — The Sciuroidea, which include the great group of squirrels, sousliks, marmots, &c, all comprised in the single family Sciuridae, differ from the sewellels in having large post-orbital processes to the skull (figs. 4, 5, 6) ; and, with one exception, have rooted cheek-teeth, the premolar-formula being 2-ˆi. The infra-orbital foramen is also narrower,' and the tympanic bulla is cellular. In both groups the tibia and fibula are separate.

The family is divided into three sub-families, the first of which is the Sciurinae. In this the crowns of the molars are more or less shortened, with their cusps either arranged in longitudinal lines, or forming four upper and three lower more or less distinct oblique ridges. The post-orbital processes of the frontal and jugal are widely sundered, and the former may even be small (Xerus). The expanded anterior root of the zygomatic process has its front border oblique. According to modern views the sub-family is broken up into a large number of genera.

The first of these is Rhithrosciurus, represented by one large species (R. notatus) from Borneo, characterized by its finely grooved in- cisors (see Groove-Toothed Squirrel). The second genus, Heliosciurus, includes arboreal African squirrels, typified by TI. stangeri, allied in the characters of their skulls to the under- mentioned Xerus, and with a very large pre-orbital foramen in the more typical forms. The third,

Funisciurus , of which F. pyrrhopus is a well-known example, is also African and allied to Xerus, but has a still longer skull and soft fur. In Xerus itself, which is represented by the terrestrial African spiny squirrels, the ears are short, there are only two teats, and flat spines are mingled with the fur; while the skull, and more especially the frontals, is elongated, with a very short post-orbital process, and the crowns of the molars are taller than usual (see Spiny Squirrel). The well-known Indian palm-squirrel, Funambulus palmarum, typifies an Indo-Malay genus allied to Xerus in skull-characters but with molars more like those of Sciurus. In contrast to these small striped species are the giant squirrels of the same region, such as Ratufa indica and R. bicolor, which are very brightly coloured rodents, with Sciurus-like skulls (fig. 5) but extremely short- crowned molars, and only one pair of upper premolars. Next comes the typical Sciurus, including the great bulk of the entire group, and ranging over Europe, Asia, North Africa and America. The skull is short and broad, especially as regards the frontals, with large post-orbital processes (fig. 5), and very generally two upper premolars, making a total of five pairs of upper cheek-teeth, which have crowns of medium height. The teats are either four or six. Squirrels of this and the other arboreal groups have the bodily form slender and agile, the tail long and bushy, the ears well developed, pointed and often tufted; the feet adapted for

climbing, the anterior pair with four toes and a rudimentary thumb, and the posterior pair with five toes, all the toes having long, curved and short-pointed claws (see Squirrel). The names Glyphotes and

Fig. 5. — Under Side of Skull of the Malay Giant Squirrel (Ratufa bicolor).

Fig. 6.— Under Side of Skull of Prairie-Marmot (Cynomys ludovicianus) .

Sciurotamias have been proposed respectively for one Bornean and some four Chinese squirrels. With Tamias (sometimes split into Tamias and Eutamias) we reach the North American striped ground- squirrels, or chipmunks, well characterized by the large internal cheek-pouches, with one outlying species in Northern Asia and Europe (see Ground-Squirrel). These lead on to the sousliks, Spermophilus (or Citellus), in which the incisors (as in the following genera) differ from those of all the squirrels in not being compressed. The genus which is common to

the northern parts of both hemi- spheres is distinguished by the large cheek-pouches and by the absence or rudimentary condition of the claw of the first hind-toe, resembles Tamias in the slender form of the body, but displays great variation in the length of the tail, which may be a mere stump, or comparatively long. As in the following genera, there are two pairs of premolars, of which the first in this case is small and rounded, while the two series of cheek-teeth are nearly parallel (see Souslik). The prairie-dogs, or prairie- marmots, Cynomys, are a North American group, in which the five-toed forefeet have the claw of the first as large as that of the fifth toe. The skull is heavily built, with the post-orbital processes directed outwards. Dentition (fig. 6) remarkably heavy, the molar teeth differing from those of Spermophilus and Arctomys by having three instead of two transverse grooves on their crowns. First premolar nearly as large as the second. Molar series strongly convergent behind (see Prairie-Marmot). Finally, we have the marmots (Arctomys), which are larger and more heavily built rodents, with short ears, more or less short tails and rudimentary or no cheek-pouches. Fore-feet with the first toe rudimentary and bearing a flat nail. Skull (fig. 4) large and heavy, with the post-orbital process stouter and at right angles to the axis. Incisors broad and powerful. First upper premolar nearly as large as the second. Molar series nearly parallel, scarcely converging behind at all.

The genus is common to the northern half of both hemispheres, and its members, like those of the two preceding groups, burrow and hibernate (see Marmot).

The Nannosciurinae, or second sub-family of Sciuridae, are repre- sented only by the pigmy squirrels (Nannosciurus), characterized by their very short-crowned molars (which approximate to those of dormice in structure) and small premolars, of which the first upper pair is often deciduous, while the upper molars have only three oblique ridges. The front root of the zygomatic arch is nearly vertical, and placed so far back that it is above the second molar, while the orbit — a unique feature among rodents — is almost com- pletely surrounded by bone. The few representatives of this group are all very small rodents, confined to tropical Africa, the Philip- pines and the Malay islands.

The third and last sub-family, the Pteromyinae, is distinguished from the other two by the presence of a parachute-like fold of skin along the sides of the body, the supporting cartilage of which arises from the carpus or wrist. It includes Sciuropterus, repre- sented by small species from the northern parts of both hemi- spheres; Pteromys, comprising large flying-squirrels, ranging from India and the Malay countries to

Japan, characterized by the long cylindrical tail and large inter-femoral membrane; and Eupetaurus, represented by one very large dark grey, long-tailed and long- haired species from Astor and Gilgit, which differs from all other members of the family by its tall-crowned cheek-teeth (see Flying- Squirrel).

Beavers. — The second section, Castoroidea, of the present group includes only the family Castoridae, represented by the beavers, which are large aquatic rodents characterized by their massive skulls, devo'd of post-orbital processes, with the angle of the lower jaw rounded, the molars rootless or semi-rooted, with re-entering enamel-folds, and, one pair of premolars above and below. The tibia and fibula are united inferiorly, the tympanic bulla is hollow and the infra orbital foramen narrow. The single existing genus comprises the European beaver, Castor fiber, of Europe and Northern Asia, and the North American C. canadensis. The upper molars are subequal, each with one internal and two external enamel-folds; the stomach has a large glandular mass situated to the right of the oesophageal orifice; the anal and urino-genital orifices open within a common cloaca; the tail is broad, horizon- tally flattened and naked; and the hind-feet are webbed (see Beaver).

Pouched Rats. — The American pouched rats, or pocket-gophers, constitute the third section, Geomyoidea, with the single family Geomyidae. The dentition includes one pair of premolars above and below, and rooted or rootless molars with but few enamel- folds. In the skull the infra-orbital foramen is narrow, and post- orbital processes and an alisphenoid canal are absent. The tibia are fibula are united. The cheeks are provided with large pouches opening externally. Two sub-families are recognized. The first of these, or Geomyinae, is characterized as follows : Incisors broad ; mastoid not appearing on the top of the skull; eyes small; ears rudimentary; limbs short, subequal. Habits fossorial. Geomys bursarius, the "red pocket-gopher " of North America, with deeply grooved incisors, inhabits the plains of the Mississippi, living in burrows like the mole. Several other species from the Southern States, Mexico and Central America are recognized. Thomomys talpoides, with plain incisors, extending from Canada to the United States west of the Rocky Mountains, typifies the second genus, which has also many species. The following are the characters of the second sub-family, Heteromyinae : Incisors narrow; mastoid appearing largely on the top of the skull ; eyes and ears moderate or large; hind-limbs and tail elongated. " Habits terrestrial. Dipodomys, which has the molars rootless, is typified by D. phillipi, the kangaroo-rat of the desert regions east of the Rocky Mountains, Perodipus and Microdipodops being allied genera. Perognathus and

Heteromys have rooted molars ; the latter genus is distinguished by the presence of flattened spines among the fur, and has species extending into South America. (See Pocket-Gopher, Pocket- Mouse and Kangaroo-Rat.)

Scaly-tailed Squirrels. — The next section, according to Prof. Max Weber's arrangement, is that of the Anomaluroidea, typified by the rodents commonly called African flying-squirrels (Anoma- luridae), but better designated scale-tailed squirrels, or simply " scaly-tails," since one member of the family has no parachute. To this group Prof. H. Winge affiliates the African jumping-hares (Pedetidae), a view which is adopted by Prof. Weber, although Mr O. Thomas places these rodents in the neighbourhood of the porcu- pines. In the more extended sense, the Anomaluroidea are diagnosed as follows: In the skull the infra-orbital foramen (or canal) is large, the lachrymal foramen placed high up, and no transverse canal; while the malleus and incus of the internal ear are fused. In the carpus the scaphoid and lunar bones are united. There is a single pair of premolars in each jaw.

The Anomaluridae are characterized by having rooted cheek-teeth with shallow transverse enamel-folds, the two halves of the lower jaw movably articulated in front, very small post-orbital processes to the skull, and the presence of two rows of scales on the under surface of the base of the tail (figs. 7 and 8), which is cylindrical and thickly haired. • The family is confined to the equatorial forest-tract of Africa, where it is most numerously represented on the west side. The majority of the species belong to the typical genus Anomalurus (fig. 7), which is provided with a parachute supported by a cartilaginous process arising from the olecranon of the ulna, and has well-developed ears and a moderately long tail. Several of the species are considerably larger than an ordinary squirrel. Idiurus, as represented by the West African /. zenkeri (figured in the article Flying-Squirrel), is a mouse-like form, with very small ears and an extremely long tail. The third genus, Zenkerella (Aethurus), which is also West African, has no parachute (fig. 8). _

Jumping-Hares. — The grounds for referring the African jumping-hares (Pedetidae) to the Anomaluroidea rest largely on the evidence of certain Tertiary rodents from Europe, such as Issiodoromys. The family is represented by the South African Pedetes caffer, which is as large as a hare, and the smaller East African P. surdaster. In general habits and appearance these animals recall large jerboas, from which group they are, however, distinguished by the four pairs of rooted cheek-teeth, the premolars being as large as the molars, and the latter having one outer and one inner enamel-fold. The hind-limbs are

elongated, with four toes, of which the meta- tarsals are separate; the tibia and fibula are welded in old age; the calcaneum and astragalus of the tarsus are elongated; and there is a perforation on the inner side of the lower end of the humerus (see Jumping-Hare).

Dormice. — The next three sections of the order, namely, the Myoxoidea, or dormice, Dipodoidea, or jerboas, and Myoidea, or the mouse group, have the following characteristics in common. The

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From Alston.

Fig. 7. — Red Scaly-tailed Squirrel (Anomalurus fulgens).

angular process of the lower jaw has the same relations as in the sewellels and the allied groups. The lachrymal foramen in the

skull is low down and forms an elongated slit. In the carpus the sca- phoid and lunar are welded, but the centrale remains distinct. The tibia and fibula are fused at their upper and lower ends. The malleus and iˆ incus of the inner ear are separate. Except in Lophiomys, the clavicles are complete. The infra- orbital foramen of the skull (fig. 9) is more or less broad; and there is generally a transverse canal. The stomach is generally complex.

In the dormice, form- ing the section Myoxi- dea, with the single family Gliridae (or My- oxidae), a single pair of premolars may or may not be present ; the molars are short-crowned and rooted, with transverse FromdeWinton. enamel-folds. The angle

Fig. 8.— Zenker's Scaly-tailed Squirrel of the lower jaw is twisted {Zenkerella insignis). a , nd , lts coronoid process

slender. Dormice are small arboreal rodents, with long hairy tails, large eyes and ears, and short fore-limbs, ranging over Europe, Asia and Africa. Of the four genera in the typical sub-family Glirinae, the first is Glis, represented by Glis vulgaris (or G. glis) of Europe, with a doubly vaned, bushy tail, simple stomach, and large molars with well-marked enamel-folds ; the second, Muscardinus, with M. avellanarius, the common dor- mouse, distinguished by the cylindrical bushy tail, and thickened glandular walls of the cardiac extremity of the

oesophagus; thirdly, Eliomys, containing several species, with tufted and doubly vaned tails, simple stomachs and smaller molar teeth, having cqjicave crowns and faintly marked enamel-folds; and lastly, the African Graphiurus, represented by several species, with short cylindrical tails ending in a pencil of hairs, and very small molars almost without trace of enamel-folds. None of the members of the typical sub-family extend into India, where the group is represented by Platacanthomys, typifying the sub-family Platacanthomyinae, characterized by the absence of premolars; the other being the Chinese Typfaomys. These are small rodents with somewhat

the appearance of the pigmy squirrels {Nannosciurus) , which in some degree connect the family with the Muridae. (See Dormouse.)

Jerboa Group. — The Dipodoidea, or jerboa-group, which likewise includes only a single family, Jaculidae (or Dipodidae), is characterized by the presence of not more than one pair of premolars in the upper jaw, which, however, may be wanting ; by the rooted cheek-teeth, which have transverse enamel-folds, and the absence of a transverse canal in the skull, and of a horny layer in the stomach. The family is divisible into two sub-families, of which the first, or Sminthinae, is represented only by the genus Sminihus, containing a few species which range from. Denmark into Western Asia, Kashmir and China. They are small rat-like rodents, with one pair of upper premolars, which are mere pins, as is the last molar, and the two pairs of limbs of normal length, with the metatarsals separate; the infra-orbital opening in the skull being triangular and widest below, while the incisive foramina in the palate are elongated. The European & subtilis has a black dorsal stripe bordered with yellow.

The Dipodinae, on the other hand, are leaping rodents, with the metatarsals elongated, a small upper premolar present or absent, and the crowns of the molars tall. Various degrees of specialization occur in the adaptation for leaping. The least specialized genus is Zapus, containing the jumping-mice of North America, with one outlying Siberian species, in which the five metatarsals are free, as are also the cervical vertebrae, the small upper premolar being retained. (See Jdmping-Mouse.)

In the other genera, so far as known, the three central metatarsals of the hind foot are fused into a cannon-bone, of a type unique among mammals and comparable to that of birds. Some of the cervical vertebrae are also united in at least the better- known genera. The tail and ears are generally very long; while, in correlation with the size of the latter, the auditory bullae of the skull are also large. In the typical

jerboas, Jaculus (or Dipus), ranging from North Africa to Persia, Russia and Centra) Asia, there are only three hind toes, the incisors are grooved, and the premolars are generally wanting. The other genera have five toes, of which only the middle three are functional, and smooth incisors. Euchoreutes, with one Yarkand species, has premolars, enormous ears and a long nose. Alactaga, ranging over Russia and Western and Central Asia, inclusive of Persia and Baluchistan, has smaller ears and a shorter nose; by some naturalists it is taken to include the North African A. tetradactylus , which is separated by others as Scarturus. The Turkestan Platycercomys (or Pygeretmus) has a lancet-shaped tail and no premolars; while Cardiocranus of the Nan-shan district of Central Asia has a similar type of tail, but short ears and a peculiarly triangular skull. (See Jerboa.)

Mole-Rats. — The mole-rats (Spalacidae) bring us to the mouse- like section, or Myoidea, in which there are no premolars and the molars may be occasionally re- duced to § ; these teeth being either rooted or rootless, with either cusps or enamel-folds, and the first gene- rally larger than the second. In the skull the zygomatic arch is slender and the jugal bone small and not extend- ing far forwards, being supported by the long zygo- matic process of the maxilla, while

the infra-orbital , ., , . .

foramen is mostly Fig. 9- — Skull of the Muskrat {Fiber zibethicus). large, and there Natural size,

are no post-orbital processes. Although sometimes short, the tail is generally long, sparsely haired and scaly The cardiac portion of the complex stomach has a horny layer, and there is a caecum.

The Spalacidae are burrowing types, allied apparently to the ancestral Jaculidae, and characterized by the second and third molars being equal in size, the presence of enamel-folds in all these teeth, and the superiority in size of the claws of the second, third and fourth front toes over the other two. All these ” rodent- moles ” are thoroughly adapted to a subterranean life, the eyes and ears being small and rudimentary, as is also the tail ; while the bodily form is cylindrical, and the front claws are very large and powerful. The incisors are very large; and the palate of the skull is narrow. The typical representative of the group is the great mole-rat {Spalax typhlus) of Eastern Europe and North- East Africa, which, together with a few closely allied species, has the eyes completely buried in the skin, and the head much flattened.

In the bamboo-rats, Rhizomys, from the Indo-Malay countries, China and Tibet, as well as in the closely allied East African Tachyoryctes, the eyes are, however, functional, and the head is rounded. (See Mole-Rat.)

According to the arrangement here followed, the burrowing zokors may be placed in this family, although they have teeth like those of the vole group in the Muridae. The first representative of this sub-group is the genus Siphneus (or Myotalpa), of which some five Central and North Asiatic species are known. They are characterized by the mole-like form and long, powerful, front claws (fig. 10). In the true zokors (Ellobius), on the other hand,

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Fig. io. — The Tibetan Zokor (Siphneus armandi).

the claws are short and the general form more vole-like. Of three named species, one extends from South Russia to Siberia, while two others are respectively from Kurdistan and Afghanistan. A third type, Prometheomys, from the Caucasus, is represented by a species of the size of a small water-rat, chestnut-brown in colour, with lighter feet, and the minute eyes covered with skin. The teeth are nearest to those of the true zokors {Ellobius). The single example was taken under flowering anemones.

Malagasy Rats. — On account of certain structural peculiarities, the rats of Madagascar, which have a dentition like that of the cricetine Muridae, are separated as a distinct family, Nesomyidae. They are the only rodents in that island. Of these, Hypogeomys is a large, long-tailed, fawn-coloured rat, with large ears and feet; Nesomys is a red species, with long hair; Brachytarsomys is short- footed and long-tailed, with velvety fawn fur; Hallomys has elongated hind feet, as has also Macrotarsomys ; Gymnuromys is naked-tailed; and the several species of Eliurus are dormouse- like.

Mouse Tribe. — The characteristics of the Muridae are those of the Myoidea generally, as given above under the heading of the Spalacidae. With the exception of Madagascar, the family, which may be divided into six sub-families, has a cosmopolitan distribution, and the genera are so numerous that only some of the most im- portant can be even mentioned.

The first group is that of the hamsters, or cricetines (Cricetinae), in which the molars are rooted and tuberculated, with the cusps of the upper ones arranged in two longitudinal rows (fig. 13, B) ; in the upper teeth the outer cusps and in the lower the inner onesare the higher, and when worn the crown surfaces show oblique dentine-areas; in shape the third molar is like the second, but it is smaller. The infra-orbital foramen is generally narrow, and the tympanic bulla hollow. The humerus has a foramen at the lower end. The tail is short. The group is typified by the European hamster {Cricetus vulgaris or C. cricetus), to which a separate article is devoted (see Hamster) ; the genus includes a number of species ranged under several sub-genera, such as Mesocricetus , Cricetulus, and Urocricetus, widely spread in Western and Central Asia, the last-mentioned, which is from Tibet, being distinguished by its relatively long tail. The hamsters all possess cheek-pouches, which are, however, absent in many of the following genera. Africa claims only a single representative of the group, Mystromys, with one southern and one eastern species. Persia is the home of Calomyscus (with one species) , a near relative of the American Peromyscus. In America, where the more typical kinds are known as white-footed, or deer, mice, the cricetines absolutely swarm, and include a host of genera, the majority of which are North American, although others are peculiar to Central and South America. Among these may be named Onychomys, Peromyscus, Rhipidomys, Holochilus (which is South American and includes the largest species), Sigmodon (typified by the North American rice-rat, 5. hispidus), Qryzomys, Rhithrodontomys (with grooved incisors), Ichthyomys and Anotomys _ (fish-eating, aquatic forms, from the mountains of South America), Acodon, and the North American wood-rats, or Neotoma, in which the

molars have a structure simulating that of the under-mentioned Microtinae. A distinct sub-family, Lophiomyinae, is represented by the Central African arboreal spiny rats, Lophiomys, of which there are two or three species. Although agreeing with the Cricetinae in

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Fig. 11. — African Spiny Rat {Lophiomys imhausi).

the hollow tympanic bullae, they have the clavicles imperfect, the first front toe opposable to the rest, the temporal region of the skull roofed with bone, and the crowns of the molars with cusps arranged in rows but eventually covered by a layer of enamel.

The third sub-family is that of the Microtinae, or voles, which are

distributed all over Europe, Northern Asia and North America, and are characterized by the tympanic bulla of the skull being filled with honey-combed bony tissue, the small size of the infra-orbital foramen, and the deep pterygoid fossa on the palatal aspect. The humerus lacks a foramen at the lower end; and the molar teeth, as explained and illustrated in the article Vole {q.v.) , consist of two longitudinal rows of triangular alternating vertical prisms, and may be either rootless or rooted. Voles, as typified by the water-rat and the tailed field- mouse, are stouter built and shorter-nosed rodentsthan the typical rats and mice, with smaller ears and eyes and shorter tails; all being good burrowers. In the circumpolar Evotomys (represented in England by the red-backed field-mouse) and the nearly allied North American Phenacomys, the molars develop roots in old age; but in Microtus (which includes the water-rat, and is circumpolar) they are rootless throughout life, the genus being one of the largest in the mammalian class (see Vole). Fiber — the muskrats — is a North American aquatic type (see Musk rat), characterized by the compression of the tail. Synaptomys is also North American, and characterized by the grooved

After Gould.

Fig. 12. — The Australian Brown-footed Rat (Mus fuscipes).

upper incisors and the presence of distinct enamel-loops on the outer side of the lower molars. The circumpolar lemmings of the genera Lemmus and Dicrostonyx are noticed in the article Lemming. Ellobius, which many naturalists place in this group, has been mentioned among the Spalacidae.

The typical rats and mice, together with their nearest relatives, constitute the sub-family Murinae, which is represented by more than three hundred species, distributed over the whole of the Old World except Madagascar. The molars (fig. 13, A) are rooted and have a plate-like structure, with the cusps or tubercles forming three longitudinal rows in those of the upper jaw, but only two distinct ones in the lower. By this structure the Murinae are broadly distinguished both from the Cricetinae (fig. 13, B) and the Microtinae. In the skull the tympanic bulla is hollow, the pterygoid fossa shallow and the zygomatic arch slender, with a rudimentary jugal bone. The tail is long and scaly (fig. 12). The genus Mus, with about a couple of hundred species, includes the true mice and rats (see Mouse and Rat),

and has Fig. 13.— Upper Molars t h e typical characters of the group, the of Mus (A) and Cnce- incisors being narrow and smooth, the tus (B). molars small, the eyes and ears large

and the tip of the muzzle naked. In some cases there may be spines among the fur. None are much larger than the brown rat (M. norvegicus) or smaller than the harvest mouse; and they all have habits generally similar to those of one or other of the English species, although some live in trees like squirrels, or in the water; among the latter being the brown-footed rat (M. fuscipes) of western and southern Australia (fig. 12). The genus Nesocia is like Mus, but with the incisors and molars broader, and the transverse laminae of the latter more clearly defined. This genus contains a few clumsily built rats spread over Southern Asia from Palestine to Formosa, and from Kashmir to Ceylon (see Bandicoot-Rat). Among other important genera Cricetomys and Eosaccomys (both African) stand apart by the possession of cheek-pouches: C. gambianus being a very large species. The Javan Pithechirus has the thumb opposable, while the Papuan Chiruromys has the tip of the tail naked above and prehensile. The spiny mice, Acomys (or A canthomys) , of Western Asia, Cyprus and Africa, take their name from the fur being almost , entirely replaced by flattened spines, and are further distinguished by the rudimentary coronoid process of the lower jaw. Dasymys is an allied African genus; while Arvicanthis includes the African striped mice. Golunda, from India and Africa, is like Mus,_ but with grooved upper incisors. Vandeleuria, ranging from India to Yunnan, has flat nails on the first and fifth toes of both feet, and a very long tail; while the Indo-Malay Chiropodomys has a flat nail on the first toe of both feet and a tufted tail. In the Philip- pines occur the peculiar genera Batomys, Carpomys and Crateromys, confined to the mountains of Luzon, the third remarkable for its huge size and long hair. Mastacomys is like Mus, but with the molars remarkably broadened, and with only four teats. The single species is from Tasmania, though it has been found fossil in New South Wales; it is somewhat similar in size and appearance to the English water-rat, but has longer and softer fur. Uromys differs from Mus in having the scales of the tail not overlapping, but set edge to edge, so as to form a sort of mosaic work. There are several species, spread over the northern part of the Australian region from the Aru Islands to Queensland. Echinothrix is a rat with an extremely elongated muzzle, all the bones of the face being much produced, and the incisors faintly grooved, the only species, E. leucura, being about the size of the common rat, with its fur thickly mixed with spines, a native of Celebes._ Australia is the home of the group of jumping species, known as jerboa-rats, characterized by the elongation of the

hind limbs, arranged under the genera Notomys, Dipodillus, Ammomys and Conilurus, dis- tinguished from one another by the structure of the molars and the number of teats and foot-pads, the second being further character- ized by its long ears.

The large-eared African Otomys and the allied Oreomys (Oreinomys), often made the type of a distinct sub-family, may be included in this section; as well as the small African tree-mice, Dendromys, allied to which is Deomys, peculiar in the circumstance that only the first molar has three rows of cusps, the other two having only a couple of such rows, as in cricetines. Other allied African genera are Steatomys and Lophuromys, which include several species of small mouse-like rodents, with the habits of dormice generally, though some burrow in cornfields. Here also may be noticed the huge Philippine long-haired rats of the genus Phlaeomys, characterized by their broad incisors, transversely laminated molars and large claws. They are often regarded as forming a sub-family by themselves. The gerbils, which are widely distri- buted over the more or less desert-like regions of the Old World exclusive of the Malay countries and Australia, form the sub-family Gerbillinae. They have long hind limbs, large eyes and ears; and in correlation with the latter an enlarged auditory bulla to the skull, which is hollow and divided into a tympanic and a mastoid portion. The tail is generally long and hairy. There are three pairs of rooted molars, whose crowns carry transverse plates, de- creasing in number from three in the first to one in the last tooth.

Gerbillus_ (or Tatera), with a large number of species, has a range coextensive with that of the sub-family; Pachyuromys, with two African species, has a short club-shaped tail and enormous audi- tory bullae; while the remaining members of the group, which are confined to North Africa, Eastern Europe and Asia, are arranged in the genera Meriones, Psammomys and Rhombomys, the latter represented only by R. opimus from Russia and Central Asia (see Gerbilj.

The last representatives of the Muridae are confined to Australasia and the Philippines, and constitute the sub-family Hydromyinae, characterized by the very general presence of only two pairs of molars in each jaw. In the typical Australian and Papuan Hydromys, locally known as water-rats, the molars origin- ally have transverse ridges, the enamel folds between which form cutting edges whose sharpness depends upon the degree to which the teeth have been worn, while the large hind feet are webbed. The typical H. chrysogaster is a large brown rat with an orange belly, which feeds on small fishes and insects. Limnomys, from New Guinea, is a type less specialized for swimming, the hind-feet being much less twisted than in Hydromys,

and not so fully webbed. Still less specialized are Chrotomys and Xeromys, which include Philip- pine land-rats, while Crunomys, from the same area, retains the third molars, and thus connects the group with the Murinae.

Finally, the Philippine Rhynchomys is represented by a rat with two pairs of molars and a long shrew-like nose, the zygomatic arch of the skull being also placed unusually far backward.

Strand-Moles. — With the so-called strand-moles of South Africa, forming the section Bathyergoidea, and the family Bathyergidae, which were formerly placed with the Spalacidae, we come to the first of two sections in which the lower jaw has a totally different form to that obtaining in all the preceding groups. In the rodents now to be considered, the angular process of the lower jaw arises from the outer side of the sheath of the incisor. The malleus and incus of the internal ear are united, and there is no transverse canal in the skull. At least one pair of premolars is present in each jaw; and these teeth and the molars typically have one outer and one inner enamel fold. There is no foramen at the lower end of the humerus, and no horny layer in the stomach.

In the Bathyergoidea the scaphoid and lunar of the carpus are separate, the tibia and fibula united and the clavicles normal. The masseter muscle does not pass through the narrow infra-orbital canal, and the temporal muscle is large. All the Bathyergidae are African, and adapted to a burrowing life, having minute ears and eyes, a short tail and the thumb armed with a large claw. The largest species represents the genus Bathyergus, while several smaller kinds are included in Georychus. The former constructs its tunnels in the sandy flats near the shore at the Cape, but the latter generally frequent higher ground. In both genera there is only a single pair of premolars in each jaw, but in the smaller Myoscalops there are usually three pairs of these teeth. The most remarkable members of the family are the sand-rats of Somaliland and Shoa, forming the genera Heterocephalus and Fornarina, in which the premolars may be reduced to two pairs. They have large heads, projecting incisors, no ears, almost f unctionless eyes and moderately long tails; the skin, with the exception of a few hairs on the body and fringes on the feet, being naked. They spend their whole time buried in the hot desert sand, in which they construct burrows, throwing up at intervals small hillocks.

Porcupines. — In the second section, or Hystricoidea, including several families, the skull (fig. 14) is characterized by the heavy

Fig. 14. — Skull of the Capybara (Hydrochaerus capybara), reduced.

zygomatic arch, the middle portion of which is formed by the more or less straight and horizontal jugal, and the large infra-orbital canal, traversed by a portion of the masseter muscle. The tibia and fibula are separate, but the scaphoid and lunar are united, and the clavicles are generally incomplete. There is never more

than one pair of premolars, and the original ridges of all the cheek-teeth have become obscured and complicated by the development of secondary enamel-folds. The majority of these rodents, many of which are of large size, are terrestrial, but a few are burrowing, others arboreal and two or three aquatic.

The Old World porcupines, constituting the family Hystricidae, are terrestrial, stoutly built rodents, with limbs of subequal length in front and behind, and the skin covered with strong spines. The upper lip is cleft, the jugal lacks an inferior angle, the fore part of the skull is short and broad; the cheek-teeth are partially rooted, with external and internal enamel-folds, the soles of the feet are smooth, there are six pairs of teats, the clavicles are imperfect and the tail is not prehensile. In the typical genus Hystrix, which

Fig. 15. — The Brazilian Tree-Porcupine {Synetheres (or Coendu)

‘ ensilis) .

is represented in all the three great continents of the Old World, and extends’ as far east as Flores and Celebes, the skull is swollen and convex, the spines are cylindrical, and the tail is short and covered with spines and slender-stalked open quills. In Atherura fasciculata of the Malay Peninsula the spines are flattened, and the tails long and scaly, with a tuft of compressed bristles. A closely allied species, A. africana, inhabits Western Africa. The third genus is Trichys (see Porcupine).

American Porcupines. — All the New World porcupines, repre- senting the family Erethizontidae (or Coendidae) are arboreal in their habits, and have the upper lip undivided, the cheek-teeth rooted, the clavicles complete, the soles of the feet tuberculated and three pairs of teats. Erethizon dorsatus, the urson, is distributed all over the forest regions of North America; Synetheres (or Coendu) pre- hensilis, the

prehensile-tailed porcupine of South America (fig. 15), represents a genus in which the whole upper surface of the body is protected by long white-tipped spines; Chaetomys subspinosus is clothed with strong wavy bristles. In the last two genera the feet have four toes, in place of the five of Erethizon (see Porcupine).

Cavy Group. — In the family Caviidae, typified by the cavies (or guinea-pigs), may be included a large number of South and Central American rodents, among which the agoutis and pacas are often ranked as a family (Dasyproctidae) by themselves. The Caviidae, in the present more comprehensive sense, include the giants of the rodent order. Many of them, like ungulates, are specialized for swift running, and have unusually long limbs, with ridges developed on the articular surfaces of the lower bones; the clavicles are more or less reduced; the thorax is more compressed than usual, with a narrower breast-bone; and there is a marked tendency to the reduction or loss of the lateral toes, more especially in the hind limb. Since these rodents walk more or less entirely on their toes, in such a manner that the edges of the claws or nails come in contact with the ground, these tend to assume somewhat of a hoof-like character; while the foot-pads are more or less horny. The tail is generally very short, and its basal vertebrae are often fused with the sacrum. In the skull the lachrymal bone is large, the par- occipital process is directed vertically downwards and the tympanic bulla is hollow. In the soft parts the caecum is very large, the pˆnis is armed with a pair of barbed horny claspers and the scrotum is spiny.

Special interest attaches to the most aberrant member of the

family, the Peruvian Dinomys, known for more than thirty years only by a single specimen taken in a house in Lima, and only lately rediscovered. It is a large rodent known to the Tupi Indians as the paca-rana, or false paca, in allusion to the resemblance of its coloration to that of the true paca, from which it differs by its well-developed tail, the absence of cheek-pouches, the full development of all five toes and the wider thorax. The Tupi name may be adopted as the popular title of the species. Dr E. Goeldi states that the paca-rana is a rodent of phlegmatic and gentle disposition, which may account, perhaps, for its rarity, if, indeed, it be really scarce in its native home, which is probably the eastern slopes and tablelands of the Bolivian and Peruvian foot-hills bordering on Brazil, inclusive of the headwaters of the Purus, Acre and Jurua rivers. In the true pacas, Coelogenys (or Agouti), the first front toe is small, and both the first and fifth digits of the hind-foot are much inferior in size to the other three. The most remarkable feature of the genus is, however, the

extraordinary development of the zygomatic arches of the skull, which are enormously expanded vertically, forming great convex bony capsules on the sides of the face, enclosing on each side a large cavity lined with mucous membrane internally, and communicating by a small opening with the mouth. C. paca is a white-spotted rodent, about 2 ft. long, and lives generally in the forests or along the banks of rivers (see Paca). The Agoutis, Dasyprocta, include several species of slender-limbed rodents, with three hind-toes, inhabiting Central and South America, one (D. cristata) extending into the West Indian islands. The members of both Coelogenys and Dasyprocta are terrestrial in their habits, and have the fore- and hind-limbs subequal, hoof-like claws, short or obsolete tail and rudimentary clavicles. ■ The masseteric ridge of the lower jaw is obsolete, the palate broad, the incisors long and the molars semi-rooted, with external and internal enamel-folds (see Agouti). The remaining and more typical members of the family, one of which is aquatic, are characterized by their short incisors, the strong masseteric ridges on the sides of the lower jaw, the long and curved par-occipitals and the palate contracted in front. Fore-feet with four digits, hind-feet with three; clavicles imperfect; molars divided by enamel-folds into transverse lobes; milk-teeth shed before birth. In the true cavies, or couies, Cavia, the fore- and hind-limbs are short and of subequal length, the ears are short and there is no tail. They include several species widely distributed throughout South America, extending even to the straits of Magellan, from one of which (C. cutleri of Peru) the guinea-pig is derived. The maras (Dolichotis) have the limbs and ears long and the tail very short. D. pata- gonica is a large species, nearly 3 ft. long, inhabiting the gravelly plains of Patagonia, while D. salinicola is a much smaller rodent from the salt-lagunas of Argentina. The palate is so much contracted in front that the premolars of opposite sides touch by their antero-internal edges. Hydrochaerus, in which all the feet are fully webbed, includes a single species, the capybara, or carpincho, the largest of living rodents. The skull (fig. 14) is distinguished not only by its great size, but by the enormous development of the par-occipital processes and the complex structure and large size of the last molars (see Cavy and Capybara).

Chinchilla Group. — The family, Chinchillidae, typified by the well-known chinchilla, includes a small number of South American rodents with large ears and proportionately great auditory bullae in the skull, elongated hind-limbs, bushy tails, very soft fur and perfect clavicles. The jugal is without an inferior angle, and extends forwards to the lachrymal; the palate is contracted in front and deeply emarginate behind; the incisors are short, and the molars divided by continuous

folds into transverse plates; and the two halves of the lower jaw are welded together in front. It includes three existing genera, represented by some five species. Of these the true chinchilla, Chinchilla lanigera, C. brevicaudata, Lagidium perua; ‘<,m and L. pallipes, are restricted to the alpine zones of the Andes .10m the northern boundary of Peru to the southern parts of Chili; while Lagostomus trichodactylus (or Viscaccia viscaccia), the viscacha, is confined to the pampas from the Uruguay river to the Rio Negro. In Chinchilla the fore-feet have five and the hind four digits, the tail is long and bushy, and the auditory bullae are enormous, appearing on the top of the skull ; Lagidiun has four digits in both fore- and hind-feet, and Lagostomus three only in the hind- feet, while the auditory bullae are much smaller (see Chinchilla and Viscacha).

Hutia Group. — -The three remaining families of the Hystricoidea, of which one is African while the other two are chiefly South American, are very closely allied and often brigaded in a single family group. In the Capromyidae, which includes only the South American and West Indian hutias, the South American coypu and the African cane-rats, the tympanic bulla of the skull is hollow, the par-occipital process straight, the lachrymal small, and the cheek- teeth rooted, with deep enamel-folds; the first front toe being occasionally absent. Of the few living representatives of the group, the genus Myocastor (or Myopotamus) is represented_ only by the South American coypu, M. coypu, which is aquatic in its habits, and measures about 2 ft. in length, being the largest member of the group. It has a long tail, brown fur and red incisors, and lives in burrows near water, feeding on aquatic plants.

The hutia (Capromys pilorides) is nearly as large, arboreal in habits, and a native of Cuba, where it is the largest indigenous mammal. Other species occur in Cuba, Jamaica and the Bahamas, while a Venezuelan species, Procapromys geayi, represents a separate genus. In one kind the tail is prehensile. All these rodents are remarkable for the manner in which the liver is divided into minute lobules. Plagiodontia aedium, another member of the group, is peculiar to Hayti. The African cane- rats, Thryonomys (or Aulacodus), are large terrestrial rodents, ranging from the centre of the continent to the Cape, easily recognized by their deeply fluted incisorsˆ (see Coypu). The Octodontidae, which are exclusively South American, differ from the preceding family by the tympanic bulla being filled with cellular

bony tissue, and by the par-occipital process curving beneath it, while the cheek-teeth are almost or com- pletely rootless and composed of parallel plates. The first front toe may be absent. The more typical members of the family are rat-like burrowing rodents, living in communities. The typical genus is represented by the degu (Octodon degus) and several nearly related species; other genera being Ctenomys, Octodontomys (Neoctodon), Aconaemys, Spalacopus and Abrocoma; the latter taking its name from its unusually soft fur. Among these, the tuco-tucos (Ctenomys) are characterized by their burrowing habits, almost rudimentary ears, small eyes, short tails and the kidney- shaped grinding-surfaces of their cheek-teeth. They take their name of tuco-tuco from their cry, which resembles the blows of a hammer on an anvil, and may be heard all day as the little rodents move in their burrows, generally formed in sandy soil. In some districts the ground is undermined by these burrows, in which stores of food are accumulated. The species of Octodon have larger ears, longer, tufted tails and the sides of the cheek- teeth indented by plates of enamel; they are chiefly found in hedgerows and bushes, where they burrow. In Abrocoma the tail has no tuft, the ears are still larger and the lower cheek-teeth more complex than the upper ones. Aconaemys is an allied Chilean genus in which the enamel-folds meet across the molars. Several of these rodents live in the Andes, where the ground is covered for months with snow. The second group of the family is formed by the genera Loncheres, Dactylomys, Echi[no)mys, Proechimys and a few others, the members of which are rat-like rodents, with long scaly or furry tails, and frequently flattened spines mingled with the fur of the back. Most species are brown above and whitish beneath, but in some the lighter tints extend on to the sides, shoulders and head, communicating a coloration somewhat like that of a guinea-pig (see Octodon). The North African gundis (Ctenodactylus gundi and Ct. vali) axe. the types of an African family, which also includes the genera Massoutiera, Pectinator and Petromys. In the gundi the two inner toes of the hind-foot are furnished with a horny comb and bristles for the purpose of cleaning the fur, and the tail is very short ; but in Pectinator the tail is longer. Petromys has a still longer and more bushy tail, and no comb to the hind-feet. _ The gundi is a diurnal species, inhabiting rocky districts, and having habits very similar to those of a jerboa. Of these Ctenodactylus and Pectinator are characterized by the union of the incus and malleus of the internal ear, the free fibula and the almost rootless cheek-teeth. The premolar is very small, thus showing an approximation to the Myoidea, although in other respects Petromys appears to ap- proximate to the Hystricidae.

Picas and Hares. — The remaining rodents, which include two families — the picas (Ochotonidae) and the hares and rabbits (Leporidae) — constitute a second sub-order, the Duplicidentata, differing from all the foregoing groups in possessing two pairs of incisors in the upper jaw (of which the second is small, and placed directly behind the large first pair), the enamel of which extends round to their posterior surfaces. At birth there are three pairs of incisors, but the outer one is soon lost. The incisive foramina are large and usually confluent; the bony palate is very narrow from before backwards; there is no alisphenoid canal; the fibula is welded to the tibia, and articulates with the calcaneum; and the testes are permanently external. All are terrestrial, and in many cases burrowing, in their habits, and some of them are of extreme fleetness. The Ochotonidae are represented at_the_ present day only by the single genus Ochotona (Lagomys), which includes all the picas, or mouse-hares. They are small rodents with com- plete clavicles, fore- and hind-limbs of nearly equal length, no external tails and short ears. Skull depressed, frontals contracted and without post-orbital processes; p. \ or §; molars rootless, with transverse enamel-folds. In some cases the molar-formula is f . The genus includes about a score of species of guinea-pig-like animals, inhabiting chiefly the mountainous parts of Northern Asia (from 11,000 to 14,000 ft.), one species only being known from South-east Europe and several from the Rocky Mountains and Alaska.

From the picas the hares and rabbits (Leporidae) are distinguished by the imperfect clavicles, the more or less elongated hind-limbs, short recurved tail (absent in one case) and generally long ears. The skull is compressed, with large wing-shaped post-orbital processes (fig. 16); p. %. With the exception of Australasia, the family has a cosmopolitan distribution; and its numerous species resemble one another more or less closely in general external

Fig. 16. — Skull of the Common Hare (Lepus europaeus).

characters. In all the fore-limbs have five and the hind four digits; and the soles of the feet are densely clothed with hairs similar to those covering the legs ; the inner surface of the cheeks being hairy. Although the family has such a wide dis- tribution, the greater number of the species are restricted to Europe, north- ern and cen- tral Asia and North America; South America having very few. Till within the last few years the majority of naturalists fol- lowed the prac- tice of including

all the members of the family in the genus Lepus. It is true that Mr E.

Blyth long ago proposed the name Caprolagus for the remarkable spiny rabbit of the western Himalayas, while the generic name Oryctolagus was suggested later for the rabbit, and Sylvilagus for the American “cotton-tails”; but none of these was accorded general acceptation. Of late years, however, zoologists have come to the conclusion that generic sub- divisions of the Leporidae are advisable. In 1899 Dr Forsyth Major proposed a classification of the family in which a number of species were grouped with the spiny rabbit in the genus Capro- lagus, whilst Oryctolagus was taken to include not only the common rabbit, but likewise the Cape hare. A more recent classification is that of Mr M. W. Lyon, in which by far the largest number of species of the family are retained in the original genus Lepus, which has also the widest geographical distribution of all the genera. It is typified by the blue hare {Lepus timidus), next to which comes the common hare (L. europaeus) and certain other allied forms. The jackass-hares of Mexico, &c, such as L. califomicus, form a second sub-group ; while these are in turn followed by the American hare (L. americanus) and its immediate relatives. The cotton- tails, or wood-rabbits, of North and South America are regarded as forming a genus, Sylvilagus, by themselves, which includes the Brazilian and Paraguay bares, and appears to be chiefly dis- tinguished by a certain feature in the parietal region of the skull. Under the name of Oryctolagus cuniculus, the rabbit is considered to represent a genus by itself, specially characterized by the short- ness of the ears and hind-feet. The swamp-rabbit (L. palustris) and wa.ter-hare (L. aquaticus) of the southern United States form the group Limnotragus, characterized by the harsher fur, the shorter ears, tail and hind-feet, and the complete fusion of the post-orbital process (which is so distinct in the typical hares) with the adjacent parts of the skull, so that neither notches nor perforations are developed in this region. The short-tailed rabbit of the western United States (Brachylagus idahoensis) is the sole member of a group allied in general characters to the typical Lepus, but dis- tinguished by the unusually short tail. Another group is Prono- lagus, typified by the Cape thick-tailed hare, the so-called Lepus crassicaudatus, which is externally similar to Lepus proper, but has the skull and teeth of the general type of the next group. The tail- less rabbit of Mount Popocatepetl, Mexico, originally described as a distinct generic type, under the name of Romerolagus nelsoni, is broadly distinguished by_ the entire absence of the tail, and the short ears and hind-feet, its general form being like that of the Liu-Kiu rabbit, while, as in the latter, the post-orbital process of the skull is small, and represented only by the hinder half. Next come three remarkable rabbits from the Indo-Malay countries, all closely allied, although regarded as representing three generic groups, Nesolagus,

Caprolagus and Pentalagus. In all three the skull is of the type of Romerolagus. The first is represented by the Sumatran rabbit, the so-called iV. netscheri, which apparently differs from the spiny rabbit mainly by the pattern of the cheek- teeth. The spiny rabbit, separated from Lepus by Blyth in 1845 under the name of Caprolagus hispidus, is an inhabitant of Assam and the adjacent districts, and distinguished by its harsh, bristly fur and short ears and tail. In the Liu-Kiu rabbit (Pentalagus furnessi) the coat is equally harsh, but the ears and hind-feet are shorter, and there are only five (in place of the usual six) pairs of upper cheek-teeth. In the loss of the last upper molar, the Liu-Kiu rabbit approximates to the picas, as does the tailless rabbit in the abortion of its caudal appendage. Mr Lyon's scheme seems to be the best attempt to explain the affinities of the members of the group. Whether all his genera be adopted, or all the species be included in Lepus, must largely be a matter of individual opinion.

If the latter course be followed, Mr Lyon's genera must be reduced to the rank of sub-genera, and his sub-generic divisions of Lepus and Sylvilagus ignored. (See Hare and Rabbit.)

Extinct Rodents Among extinct rodents, only a few of the more important types may be noticed. As to the origin of the order, we are still to a great extent in the dark ; and even the relations of the Duplicidentata to the Simplicidentata are not yet fully understood. With regard to the latter point, it is, however, considered probable that both are branches of a common stock, which diverged from each other before all the typical rodent characters were acquired. As to the ancestral stock of the order, it has been suggested that this is re-presented by certain Lower Eocene European and North American mammals, at one time regarded as primitive Primates. In Europe these include Plesiadapis and Protoadapis, and in North America Mixodectes, Microsyops and Cynodontomys ; the last three consti-tuting the family Mixodectidae. Possibly the European forms, in which the dental formula has been given as i. f, c. g, pi, m. f, and there is a gap between the incisors and the cheek-teeth, are more nearly related to modern rodents than the American types, and may indeed belong to the same order. On the other hand, the American forms, which have one pair of large chisel-like incisors in the lower jaw, also possess a lower canine, and show no marked gap in front of the cheek-teeth, nor any indication of the characteristic rodent backwards movement of the lower jaw. On these grounds, while admitting that they are allied

to the rodents, it has been pointed out that they can scarcely be included in the Rodentia, and the order Proglires has in consequence been proposed for their reception. Whatever may be the true affinity of these problematical mammals, undoubted rodents are known from the Lower Eocene of both Europe and North America. In Europe these form the genus Ischyromys and the family Ischyromyidae, and have premolars f, and all the cheek-teeth low-crowned, with simple cusps or ridges. Possibly they are akin to the Sciuridae. In America, Paramys, with transversely ridged molars, is allied ; and the European Sciuromys should perhaps find a place in the same neighbourhood. A more advanced phase is represented in the European Lower Oligocene by the Pseudosciuridae, with the genera Pseudosciurus, Sciuroides, Trechomys, Theridomys, &c, in which part of the masseter passes through the broad infra-orbital canal, and the premolars are }; the molars being low-crowned, many-rooted and either cusped or ridged. These rodents are thought to be allied to the Anomaluridae ; and it is partly on their evidence that the family Pedetidae is placed next the latter. Here it may be mentioned that Leithia, from the Pleistocene of Malta, originally regarded as a giant dormouse, seems near akin to Anomalurus. In the highly specialized mastoid region of the skull, the North American Oligocene Proloptychus approaches to Dipopodomys, while the contemporary Gymnoptychus and En- toptychus likewise appear referable to the Geomyidae. The Upper Oligocene Cricetodon in Europe and Eumys in America are the earliest known forerunners of the cricetine Muridae; while at the same time primitive beavers appear in the form of Steneofiber, to be succeeded in the European Pleistocene by the gigantic Trogontherium.

The still larger North American Pleistocene Castoroides, known by one species of the size of a bear, and the allied West Indian Amblyrhiza, appear to be specialized beavers, although they have been referred to a family by themselves. Near akin is the North American Miocene family Mylagaulidae, typified by Mylagaulus, but including Mesogaulus and Protogaulus. Although showing some dental characters approximating to the porcupines, these rodents are regarded as allied to the Castoridae, although forming an isolated type. The prominent feature, writes Mr E. S. Riggs, is the unusual development of the premolar to the exclusion of the posterior teeth. Associated with this is the strength and sharpness of the lower jaw, the prominence and anterior position of the masseteric ridge, and the depth of the ramus from the alveolar line to the angle. These indicate unusual capacity for crushing or grinding; while the last premolar is a crushing implement, which has reached the highest degree of specialization known in Rodentia. It is suggested that these teeth may

have been employed for cracking nuts or hard seeds, although also used for grinding. The remarkable North American Ceratogaidus, with a large bony nasal horn, belongs to the same family. To discuss the remaining Miocene and later fossil Simplicidentata would be doing little more than adding to the generic names referable to the various existing families. It may be mentioned, however, that the distribution of these later Tertiary types accords very closely with that of their existing re- latives; the families of South American hystricoids being repre- sented by a number of extinct genera in the formations of Argentina and 'Brazil. Special mention may be made of Megamys, from the caves of Brazil, which, while apparently allied to the living viscacha, attained dimensions approximating to those of a hippopotamus.

As regards the Duplicidentata, it appears that the families Ocho- tonidae and Leporidae had become differentiated as early as the Lower Miocene. Titanomys is the earliest form, from the Middle Miocene, succeeded by Lagopsis, and then by the modern Ochotona. In this line there is a tendency to lose the last upper molar, but in Prolagus, which ranges in the Pliocene from Sardinia and Corsica to Spain, and forms a side-branch, the corresponding lower tooth

has likewise disappeared. In contradistinction to Titanomys, in which the cheek-teeth are rooted, is the North American Upper Oligocene Palaeolagus, where they are rootless. In general dental characters, especially the retention of three pairs of molars, this genus approximates to the Leporidae, although in the absence of post-orbital processes and the pattern of the molars it departs less widely from the modern Ochotonidae than does Prolagus.

Authorities. — The above article is partly based on that by G. E. Dobson in the 9th edition of this work. See also H. Winge, lord Fundene og Nulevende Gnadere (Rodentia), E. Museo Lundi (1888); C. J. Forsyth-Major, " On some Miocene Squirrels, with Remarks on the Dentition and Classification of the Sciuridae," Proc. Zool. Soc. London (1893); " On Fossil and Recent Lagomorpha," Trans. Linnean Soc. London, vol. vii. (1899); T. S. Palmer, "A List of the Generic and Family Names of Rodents," Proc. Zool. Soc. Washing- ton, vol. xi. (1897); O. Thomas, "On the Genera of Rodents," Proc. Zool. Soc. London (1896); T. Tuhlberg, XJber das System der Nagethiere (Upsala, 1899); H. F. Osbcrn, "American Eocene Primates, and the Supposed Rodent Family Mixodectidae," Bull. Amer. Mus. Nat. Hist. vol. xvi. (1902); W. Lyon, " Classification of the Hares and their Allies," Smithsonian Miscell. Collections, vol. xlv. (1903). Also numerous papers by O. Thomas, in Proc. Zool. Soc. London and

Annals and Magazine of Nat. Hist., and by several American naturalists in transatlantic zoological serials. (R. L.*)

RODERICK, or Ruadri (d. 1198), king of Connaught and high king of Ireland, was the son of Turlough (Tordelbach) O'Connor, king of Connaught, who had obtained the over- kingship in 1151, but had lost it again in 11 54 through the rise of Muirchertach O'Lochlainn in Ulster. Roderick succeeded to Connaught in n 56, and after ten years' fighting won back the title of high king. His ill-advised persecution of Dermot (Diarmait MacMurchada) , king of Leinster, furnished the pretext for the Anglo-Norman invasion of Ireland. Roderick endeavoured to expel the invaders, but was driven behind the Shannon. He delayed his submission to Henry II. until 1175, when a treaty was concluded at Windsor. Roderick, under this agreement, held Connaught as the vassal of England, and exercised lordship over all the native kings and chiefs of Ireland; in return he undertook to pay an annual tribute. The treaty did not put an end to the wars of the Norman adven- turers against Connaught and Roderick's dependants. He held out till 1 191; but then, weary of strife, retired to the cloister. He died in 1198, the last of the high kings of Ireland.

See Giraldus Cambrensis, Opera, vol. v. (Rolls Series) ; G. Orpen's Song of Dermot and the Earl (1892) ; W. Stubbs's edition of Benedictus Abbas (Rolls Series); Miss K. Norgate's England under the Angevin Kings, vol. ii. (1887).

RODEZ, a town of southern France, capital of the department of Aveyron, 51 m. N.N.E. of Albi by rail. Pop. (1906) town, 11,076; commune, 15,502. Rodez is situated on the southern border of the Causse of Rodez, on an isolated plateau bordered on the E. and S. by the river Aveyron. The cathedral was built between 1277 and 1535. A great Flamboyant rose- window and a gallery in the same style are the chief features of the principal facade, which is flanked by two square towers and has no portal. Each transept has a fine Gothic doorway. On the north side of the building rises a tower (1510-1526) of imposing height (253 ft.). The three upper stages are richly decorated, and the whole is surmounted by a colossal statue of the Virgin. In the cathedral are a fine rood-loft, some good wood-carving and the tombs of several bishops. Other interest- ing buildings are the episcopal palace (17th and 19th centuries), flanked by a massive tower, relic of an older palace; the church of St Amans, of Romanesque architecture, restored in the 18th century; and, among other old houses, the hotel d'Armagnac built in the Renaissance period on the site of the old palace of the counts. The ruins of a Roman amphitheatre still exist in Rodez, which is supplied with water by a Roman aqueduct. About 6

m. to the north of Rodez is the chasm of Tindoul de la Vayssiere, leading to a subterranean river issuing in the springs of the picturesque village of Salles-la-Source.

The town is the seat of a bishop, a prefect and a court of assizes, and has tribunals of first instance and commerce, a chamber of commerce, a branch of the Bank of France, a lycee training college for both sexes and an ecclesiastical seminary. The industries include wool-spinning and the weaving of woollen goods.

Rodez, called Segodunum under the Gauls, and Ruthena under the Romans, was the capital of the Rulheni, a tribe allied to the Arverni, and was afterwards the principal town in the district of Rouergue. In the 4th century it adopted the Christian faith, and St Amans, its first bishop, was elected in 401. During the middle ages contests were rife between the bishops, who held the temporal power in the ” cite,” and the counts in the ” bourg.” The Albigenses were defeated near Rodez in 1210. The countship of Rodez, detached from that of Rouergue at the end of the nth century, belonged first to the viscounts of Carlat, and from the beginning of the 14th century to the counts of Armagnac. From 1360 to 1368 the English held the town. After the confiscation of the estates of the Armagnacs in 1475 the countship passed to the dukes of Alencon and then to the DAlbrets. Henry IV. finally annexed it to the crown of France.

RODGERS, JOHN (1771-1838), American sailor, was born in Harford county, Maryland, on the nth of July 1771. He entered the United States navy when it was organized in 1798. He was second in command to Commodore James Barron (1769-1851) in the expedition against the Barbary pirates, and succeeded him in the command in 1805. In this year he brought both Tunis and Tripoli to terms, and then returned to America. In 1811 he was in command as commodore of the U.S. frigate ” President ” (44) off Annapolis when he heard that an American seaman had been ” pressed ” by a British frigate off Sandy Hook. Commodore Rodgers was ordered to sea ” to protect American commerce,” but he may have had verbal instructions to retaliate for the impressment of real or supposed British subjects out of American vessels, which was causing much ill-feeling and was a main cause of the War of 18 12. On the 16th of May 181 1 he sighted and followed the British sloop ” Little Belt ” (22), and after some hailing and counter- hailing, of which very different versions are given

on either side, a gun was fired, each side accusing the other of the aggression, and an action ensued in which the “Little Belt” was cut to pieces. The incident, which was represented as an accident by the Americans, and believed to be a deliberate aggression by the British navy, had a share in bringing on war. When hostilities broke out Rodgers commanded a squadron on the coast of America, and was wounded by the bursting of one of his guns while pursuing the British frigate ” Belvedere.” He was subsequently President of the Board of Navy Commissioners in 1815-1824 and in 1827-1837, and acting secretary of the navy in 1823 for two weeks. He died in Philadelphia on the 1st of August 1838.

His brother, George Washington Rodgers (1787-1832), a brother-in-law of Commodore Perry, served in the War of 181 2 and in the war with Algiers (18 15). Rear- Admiral John Rodgers (1812-1882), a son of Commodore John Rodgers, served in the Union navy and in 1877-1882 was superintendent of the Naval Observatory at Washington. G. W. Rodgers had two sons who were naval officers, Christopher Raymond Perry Rodgers (1819-1892) and George Washington Rodgers (1822-1863).

RODIN, AUGUSTE (1840-), French sculptor, was born in 1840, in Paris, and at an early age displayed a taste for his art. He began by attending Barye’s classes, but did not yield too completely to his influence. From 1864 to 1870, under pressure of necessity, he was employed in the studio of Carrier- Belleuse, where he learnt to deal with the mechanical difficulties of a sculptor. Even so early as 1864 his individuality was manifested in his ” Man with a Broken Nose.” After the war, finding nothing to do in Paris, Rodin went to Brussels, where from 1871 to 1877 he worked, as the colleague of the Belgian artist Van Rasbourg, on the sculpture for the outside and the caryatides for the interior of the Bourse, besides exhibiting in 1875 a ” Portrait of Gamier.” In 1877 he contributed to the Salon ” The Bronze Age,” which was seen again, cast in bronze, at the Salon of 1880, when it took a third-class medal, was purchased by the State, and is now in the museum of the Luxembourg. Between 1882 and 1885 he sent to the Salons busts of ” Jean-Paul Laurens ” and ” Carrier-Belleuse ” (1882), ” Victor Hugo ” and ” Dalou ” (1884), and ” Antonin Proust ” (1885). From about this time he chiefly devoted himself to a great decorative composition six metres high, which was not finished for twenty years. This is the ” Portal of Hell,” the

most elaborate perhaps of all Rodin’s works, executed to order for the Musee des arts decoratifs. It is inspired mainly by Dante’s Inferno, the poet himself being seated at the top, while at his feet, in under-cut

relief, we see the writhing crowd of the damned, torn by the frenzy of passion and the anguish of despair. The lower part consists of two bas-reliefs, in their midst two masks of tormented faces. Round these run figures of women and centaurs. Above the door three men cling to each other in an attitude ‘ of despair. After beginning this titanic undertaking, and while continuing to work on it, Rodin executed for the town of Damvillers a statue of ” Bastien- Lepage “; for Nancy a ” Monument to Claude le Lorrain,” representing the Chariot of the Sun drawn by horses; and for Calais ” The Burgesses of Calais ” surrendering the keys of the town and imploring mercy. In this, Rodin, throwing over all school tradition, represents the citizens not as grouped on a square or circular plinth, but walking in file. This work was exhibited at the Petit Gallery in 1889. At the time of the secession of the National Society of Fine Arts, or New Salon, in 1890, Rodin withdrew from the old Society of French Artists, and exhibited in the New Salon the bust of his friend ” Puvis de Chavannes ” (1892), ” Contemplation ” and a ” Caryatid,” both in marble, and the ” Monument to Victor Hugo ” (1897), intended for the gardens of the Luxembourg. In this the poet is represented nude, as a powerful old man extending his right arm with a sovereign gesture, the Muses standing behind him. In 1898 Rodin exhibited two very dissimilar works, ” The Kiss,” exhibited again in 1900, a marble group representing Paolo Malatesta and Francesca da Rimini, and the sketch in plaster for a ” Statue of Balzac.” This statue, a commission from the Society of Men of Letters, had long been expected, and was received with vehement dissensions. Some critics regarded this- work, in which Balzac was represented in his voluminous dressing-gown, as the first-fruits of a new phase of sculpture; others, on the contrary, declared that it was incomprehensible, if not ridiculous. This was the view taken by the society who had ordered it, and who ” refused to recognize Rodin’s rough sketch as a statue of Balzac, ” and withdrew the commission, giving it to the sculptor Falguiere. Falguiere exhibited his model in 1899. In the same Salon, Rodin, to prove that the conduct of the society had made no change in his friend- ship with Falguiere, exhibited a bust in bronze of his rival, as well as one of ” Henri Rochefort.” In 1900, the city of Paris, to do honour to Rodin, erected at its own expense a building close to one of the entrances to the Great Exhibition, in which almost all of the works of the artist were to be seen, more especially the great ” Portal of Hell,” still quite incomplete, the ” Balzac,” and a-host of other works, many of them unfinished or mere rough sketches. Here, too, were to be seen some of Rodin’s designs, studies and water-colour drawings. He has also executed a great many etchings and sgraffiti on porcelain for the manufactory at Sevres. His best-known etching is the portrait of Victor

Hugo. Many of Rodin's works are in private collections, and at the Luxembourg he is represented by a " Danai'd " (in marble), a "Saint John" (in bronze, 1880), " She who made the Helmet " (bronze statuette), the busts of " J. P. Laurens " and of " A Lady " and other works. In the Musee Galliera is a very fine bust of Victor Hugo. Rodin's " Hand of God " was exhibited in the New Gallery, London, in 1905. In 1904 Mr Ernest Beckett (Lord Grimthorpe) pre- sented the British nation with the sculptor's " Le Penseur." In the same year Rodin became president of the International Society of Sculptors, Painters and Engravers, in succession to James McNeill Whistler.

See Sculpture (Modern French) ; also Geffroy, La Vie artistique (Paris, 1892, 1893, 1899, 1900); L. Maillard, Rodin (Paris, 1899); La Plume, Rodin et son ceuvre (Paris, 1900) ; Alexandre, Le Balzac de Rodin (Paris, 1898); H. Boutet, Dix dessins choisis de Auguste Rodin (1904) ; R. Dircks ; Auguste Rodin (1904) ; H. Duhem, Auguste Rodin (1903); C. Black, Auguste Rodin: the Man, his Ideas and his Works (1905).

RODNEY, GEORGE BRYDGES RODNEY, Baron (r7i8- 1792), English admiral, second son of Henry Rodney of

Walton-on-Thames, was born In February 1718. His father had served in Spain under the earl of Peterborough, and on quitting the army served as captain in a marine corps which was dis- banded in 1 7 13. George was sent to Harrow, being appointed, on leaving, by warrant dated the 21st of June 1732, a volunteer on board the " Sunderland." While serving on the Mediter- ranean station he was made lieutenant in the " Dolphin," his promotion dating the 15th of February 1739. In 1742 he attained the rank of post-captain, having been appointed to the " Plymouth " on the 9th of November. After serving in home waters, he obtained command of the " Eagle " (60), and in this ship took part in Hawke's victory off Ushant (14th October 1747) over the French fleet. On that day Rodney gained his first laurels for gallantry, under a chief to whom he was in a measure indebted for subsequent success. On the 9th of May 1749 he was appointed governor and com- mander-in-chief of Newfoundland, with the rank of commodore, it being usual at that time to appoint a naval officer, chiefly on account of the fishery interests. He was elected M.P. for Saltash in 17 51, and married his first wife, Jane Compton (1730-1757), sister of the 7th earl of Northampton, in 1753. During the Seven Years' War Rodney rendered important services. In 1757 he had a share in the expedition

against Rochefort, commanding the ” Dublin ” (74). Next year, in the same ship, he served under Boscawen at the taking of Louisburg (Cape Breton). On the 19th of May 1759 he became a rear-admiral, and was shortly after given command of a small squadron intended to destroy a large number of fiat-bottomed boats and stores which were being collected at Havre for an invasion of the English coasts. He bombarded the town for two days and nights, and inflicted great loss of war-material on the enemy. In July 1760, with another small squadron, he succeeded in taking many -more of the enemy’s flat-bottomed boats and in blockading the coast as far as Dieppe. Elected M.P. for Penryn in 1761, he was in October of that year appointed commander-in-chief of the Leeward Islands station, and within the first three months of 1762 had reduced the important island of Martinique, while both St Lucia and Grenada had surrendered to his squadron. During the siege of Fort Royal (now Fort de France) his sea-men and marines rendered splendid service on shore. At the peace of 1763 Admiral Rodney returned home, having been during his absence made vice-admiral of the Blue and having received the thanks of both houses of parliament.

In 1764 Rodney was created a baronet, and the same year he married Henrietta, daughter of John Clies of Lisbon. From 1765 to 1770 he was governor of Greenwich Hospital, and on the dissolution of parliament in 1768 he successfully contested Northampton at a ruinous cost. When appointed commander- in-chief of the Jamaica station in 1771 he lost his Greenwich post, but a few months later received the office of rear-admiral of Great Britain. Till 1774 he held the Jamaica command, and during a period of quiet was active in improving the naval yards on his station. Sir George struck his flag with a feeling of disappointment at not obtaining the governorship of Jamaica, and was shortly after forced to settle in Paris. Election ex-penses and losses at play in fashionable circles had shattered his fortune, and he could not secure payment of the salary as rear-admiral of Great Britain. In February 1778, having just been promoted admiral of the White, he used every pos- sible exertion to obtain a command, to free himself from his money difficulties. By May he had, through the splendid generosity of his Parisian friend Marshal Biron, effected the latter task, and accordingly he returned to London with his children. The debt was repaid out of the arrears due to him on his return. The story that he was offered a French com- mand is fiction.

Sir George was appointed once more commander-in-chief of the Leeward Islands late in 1779. His orders were to relieve Gibraltar en his way to the West Indies. He captured a Spanish convoy off Cape Finisterre on the 8th of January 1780, ar.rt ~udit davs later defeated

the Spanish admiral Don Juan de

Langara off Cape St Vincent, taking or destroying seven ships On the 17th of April an action, which, owing to the careless- ness of some of Rodney's captains, was indecisive, was fought off Martinique with the French admiral Guichen. Rodney, acting under orders, captured the valuable Dutch island of St Eustatius on the 3rd of February 1781. It had been a great entrepot of neutral trade, and was full of booty, which Rodney confiscated. As large quantities belonged to English merchants, he was entangled in a series of costly lawsuits.

After a few months in England, recruiting his health and defending himself in Parliament, Sir George returned to his command in February 1782, and a running engagement with the French fleet on the 9th of April led up to his crowning victory off Dominica, when on the 12th of April with thirty- five sail of the line he defeated the comte de Grasse, who had thirty-three sail. The French inferiority in numbers was more than counterbalanced by the greater size and superior sailing qualities of their ships, yet five were taken and one sunk, after eleven hours' fighting. This important battle baved Jamaica and ruined French naval prestige, while it enabled Rodney to write: " Within two little years I have taken two Spanish, one French and one Dutch admirals." A long and wearisome controversy exists as to the originator of the man- oeuvre of " breaking the line " in this battle, but the merits of the victory have never seriously been affected by any differ- ence of opinion on the question. A shift of wind broke the French line of battle, and advantage was taken of this by the English ships in two places.

Rodney arrived home in August to receive unbounded honour from his country. He had already been created Baron Rodney of Rodney Stoke, Somerset, by patent of the 19th of June 1782, and the House of Commons had voted him a pension of £2000 a year. From this time he led a quiet country life till his death, which occurred on the 24th of May 1792, in London. He was succeeded as 2nd baron by his son, George (1753-1802), from whom the present baron is descended.

Rodney was unquestionably a most able officer, but he was also vain, selfish and unscrupulous, both in seeking prize money, and in using his position to push the fortunes of his family. He made his son a post-captain at fifteen. He was accused by his second-in-command, Hood, of sacrificing the interest of the service to his own profit, and of showing want of energy in pursuit of the French on the 12th of April 1782. It must be remembered that he was then prematurely old and racked by disease.

See General Mundy, Life and Correspondence of Admiral Lord Rodney (2 vols., 1830); David Hannay, Life of Rodney; Rodney letters in 9th Report of Hist. MSS. Com., pt. iii. ; “Memoirs,” in Naval Chronicle, i. 353-93 ; and Charnock, Biographia Navalis, v. 204-28. Lord Rodney published in his lifetime (probably 1789) Letters to His Majesty’s Ministers, &c, relative to St Eustatius, &c, of which there is a copy in the British Museum. Most of these letters are printed in Mundy’s Life, vol. ii., though with many variant readings.

RODOMONTADE, or Rhodomontade, a term for boastful, extravagant language or any inflated bragging speech. The word refers to the brave but boastful Saracen leader Rodomonte in Ariosto’s Orlando Furioso. The name (in the form Roda- mante) appears earlier in Boiardo’s Orlando Innamorato. It is supposed to represent a compound of rodare, to roll, and monte, mountain.

RODOSTO (Turkish, Tekir Dagh), a town of European Turkey, in the vilayet of Adrianople, on the coast of the Sea of Marmora, 78 m. W. of Constantinople. Pop. (1905) about 35,000, of whom half are Greeks. The picturesque Bay of Rodosto is enclosed by the great promontory of Combos, a spur about 2000 ft. in height from the hilly plateau to the north. The church of Panagia Rheumatocratissa contains the graves, with long Latin inscriptions, of the Hungarians who were banished from their country in 1686 by the imperialist captors of Buda. Rodosto was long a great depot for the produce of the Adrianople district, but its trade suffered when DMeagatch became the terminus of the railway up the Maritza, and the town is now

dependent on its maritime trade, especially its exports to Constantinople. It is the administrative centre of a district (sanjak) producing and exporting barley, oats, spelt and canary seed, and largely planted with mulberry trees, on which silk- worms are fed. White cocoons are exported to western Europe (394 cwt. in 1 901), silkworms’ eggs to Russia and Persia.

Rodosto is the ancient Rhaedestus or Bisanthe, said to have been founded by Samians. In Xenophon’s Anabasis it is mentioned as in the kingdom of the Thracian prince Seuthes. Its restoration by Justinian in the 6th century a.d. is chronicled by Procopius. In 813 and again in 1206 it was sacked by the Bulgarians, but it continues to appear as a place of considerable note in later Byzantine history.

RODRIGUEZ (officially Rodrigues), an island in the Indian Ocean in 19 41′ S., 63 23′ E.; the most important dependency of the British colony of Mauritius, from which it is distant 344 nautical miles. It is a station on the ” all-British ” cable route between South Africa and Australia, telegraphic communication with Mauritius being established in 1902. With a length of 13 m. E. and W., and a breadth of 3 to 6 m. N. and S., it has an area estimated at 42! sq. m. On all sides it is surrounded by a fringing reef of coral, studded with istets. This reef, only 100 yds. wide at the eastern end of the island, extends westward 3 m., and both N. and S. forms a flat area partly dry at low water. Two passages through the reef are available for large vessels—these leading respectively to Port Mathurin on the N. coast and to Port South-East.

The island was at one period believed to consist of granite over- laid with limestone and other modern formations, and its supposed formation caused it to be regarded as a remnant of the hypothetical continent of Lemuria. The investigations made by an expedition sent by the British government in 1874 showed, however, that the island is a mass of volcanic rock, mainly a doleritic lava, rich in olivine. The land consists largely of a series of hills. The main ridge, which runs parallel to the longest diameter, rises abruptly on the east, more gradually on the west, where there is a wide plain of coralline limestone, studded with caves, some stalactitic. Of several peaks on the main ridge the highest is Mt. Limon, 1300 ft. above the sea. The ridge is deeply cut by ravines, the upper parts of which show successive belts of lava separated by thin beds of cinders, agglomerate and coloured clays. In places the cliffs rise 300 ft. and exhibit twelve distinct lava flows. The climate is like that of Mauritius, but Rodriguez is more subject than Mauritius to hurricanes during the north-west monsoon (November to April).

Flora and Fauna. — When discovered, and down into the 17th century, Rodriguez was clothed with fine timber trees; but goats, cattle and bush-fires have combined to destroy the great bulk of the old vegetation, and the indigenous plants have in many cases been ousted by intrusive foreigners. Parts are, however, still well wooded, and elsewhere there is excellent pasturage. The – sweet potato, manioc, maize, millet, the sugar-cane, cotton, coffee and rice grow well. Tobacco is also cultivated. Wheat is seldom seen, mainly because of the parakeets and the Java sparrows. Beans (Phaseolus lunatus), lentils, gram (Cicer arietinum), dholl (Cajanus indicus) and ground-nuts are all grown to a certain extent in spite of ravages by rats. Mangoes, bananas, guavas, pine- apples, custard-apples, and especially oranges, citrons and limes flourish. Of the timber trees the most

common are Elaeodendron orientate, much used in carpentry and for pirouges, and Latania Verschaffelti (Leguat's plantane). At least two species of screw-pine (Pandanus heterocarpus, Balf. fil., and P. tenuifolius) occur freely throughout the island. The total number of known species, accord- ing to Professor I. B. Balfour, is 470, belonging to 85 families and 293 genera. The families represented by the greatest number of species are Gramineae, Leguminosae, Convolvulaceae, Malvaceae, Rubiaceae, Cyperaceae, Euphorbiaceae, Liliaceae, Compositae. Mathurina penduliflora (Turneraceae) is interesting, as its nearest congener is in Central America. Of 33 species of mosses 17 are peculiar. Variability of species and heterophylly are characteristic uf the flora to quite an unusual degree.

At present the only indigenous mammal is a species of fruit- eating bat (Pteropus rodericensis) , and the introduced species are familiar creatures as deer, pig, rabbit, rat, mouse, &c; but down to a recent period the island was the home of a very large land- tortoise (Testudo Vosmaeri or rodericensis), and its limestone caves have yielded a large number of skeletons of the dodo-like solitaire (Pezophaps solitarius), which still built its mound-like nest in the island in the close of the 17th century, but is now extinct (see Dodo). Deer, once plentiful, had become very scarce by the beginning of the 20th century, having been indiscriminately hunted by the inhabitants. Of indigenous birds 13 species have been registered. The guinea-fowl (introduced) has become exceedingly aburtdant, partly owing to a protective game-law; and a francolin (F. ponticerianus), popularly a " partridge," is also common. The xxiii. 15

marine fish-fauna does not differ from that of Mauritius, and the freshwater species, with the exception of Mugil rodericensis and Myxus caecuticus, are common to all the Mascarenes. Thirty-five species of crustaceans are known. The insects (probably very imperfectly registered) comprise 60 species of Coleoptera, 15 Hymen- optera, 21 Lepidoptera, 15 Orthoptera, and 20 Hemiptera. Forty- nine species of coral have been collected, showing a close affinity to those of Mauritius, Madagascar and the Seychelles.

flMtory.— Rodriguez or Diego Ruy's Island was discovered by the Portuguese in 1645. In 1690 Duquesne prevailed on the Dutch Government to send a body of French Huguenots to the Island of Bourbon, at that time, he believed, abandoned by the French authorities. As the refugees, however, found the French in possession, they proceeded to Rodriguez, and there eight of their number were landed on the 30th- of April 1691 with a promise that they should be visited by their compatriots within two years. The two years were

spent without misadventure, but, instead of waiting for the arrival of their friends, the seven colonists (for one had meanwhile died) left the island oh the 8th of May 1693 and made their way to Mauritius, where they were treated with great cruelty by the governor. The account of the enterprise by Francis Leguat — Voyages et aventures (London, 1708), or, as it is called in the English translation, A New Voyage to the East Indies (London, 1708) — is a garrulous and amusing narrative, and was for a long time almost the only source of information about Rodriguez. His description of the solitaire is unique.

From the Dutch the island passed to the French, who colon- ized it from Mauritius. Large estates were cultivated, and the islanders enjoyed considerable prosperity. In 1809-10 Rodri- guez was seized by the British, in whose possession it has since remained. The abolition of slavery proved disastrous to the prosperity of the island, and in 1843 the population had sunk to about 250. Since that time there has been a gradual recovery in the economic condition and a steady increase in population. In 1881 the inhabitants numbered 1436; in 1904 the total had risen to 3681. In 1907 the total population was 4231. The inhabitants are mainly of African origin, being descendants of slaves introduced by the French and negro immigrants direct from Africa. There are a few families of European de'scent (besides the comparatively large staff maintained by the Eastern Telegraph Company) and a small colony of Indians and Chinese. The bulk of the people are French-speaking and Roman Catholics. There are two small settlements, Port Mathurin, the capital, and Gabriel, in the centre of the island. The chief industries are fisheries and cattle-rearing. Salt fish is the principal export, next in importance coming goats, pigs and horned cattle and tobacco. The value of the exports for the four years 1903-06 was £50,894; of the imports for the same period, £54,710. The island is administered by a magistrate appointed by the governor of Mauritius, and the laws are regulations issued by the governor in executive council. The revenue, some £1000 a year, is about half the expenditure in- curred, the balance being furnished from the Mauritian treasury. The government maintains a hospital and schools, and pays the salary of a Roman Catholic priest.

Leguat's Voyage, edited by Capt. P. Oliver, forms vols. 82 and 83 of the Hakluyt Soc. publications (1891). See also C. Grant, Hist, of Mauritius and the Neighbouring Islands (1801); Higgin, in Jour. R. G. Soc. (1849) ; the Reports of the Transit of Venus Expedition, 1874-75, published as an extra volume of the Philosophical Trans- actions (clxviii., London, 1879) (Botany, by I. B. Balfour; Petrology, by N. S. Maskelyne, &c.);.Behm, in Petermann's Mittheilungen (1880) ; and the annual reports on Mauritius.

ROE, EDWARD PAYSON (1838-1888), American novelist, was born in Moodna, Orange county, N.Y., on the 7th of March 1838. He studied at Williams College and at Auburn Theo- logical Seminary; in 1862 became chaplain of the Second New York Cavalry, U.S.V., and in 1864 chaplain of Hampton Hospital, at Hampton, Virginia. In 1866-74 he was pastor of the Presbyterian Church at Highland Falls, N.Y. In 1874 he removed to Cornwall-on-the-Hudson, where he devoted himself to the writing of fiction and to horticulture. He died on the 19th of July 1888. During the Civil War he wrote weekly

letters to the New York Evangelist, and subsequently lectured on the war and wrote for periodicals. Among his novels were Barriers Burned Away (1872), which first appeared as a serial in the Evangelist and made him widely known; What Can she Do? (1873), Opening of a Chestnut Burr (1874), From Jest to Earnest (1875), Near to Nature's Heart (1876), A Knight of the Nineteenth Century (1877), A Face Illumined (1878), A Day of Fate (1880), Without a Home(i&8i), Nature's SerialStory (1884), A Young Girl's Wooing (1884), An Original Belle (1885), He Fell in Love with his Wife (1886), The Earth Trembled (1887) and Miss Lou (left unfinished, 1888). He wrote also Play and Profit in My Garden (1873), Success with Small Fruits (1881) and The Home Acre (1887). His novels were very popular in their day, especially with middle-class readers in England and America, and were translated into several European languages. Their strong moral and religious purpose, and their being written by a clergyman, did much to break down a Puritan prejudice in America against works of fiction.

See E. P. Roe: Reminiscences of his Life (New York, 1899), by his sister, Mary A. Roe.

ROE (or Row), SIR THOMAS (c. 1581-1644), English diplo- matist, son of Robert Rowe, and of Elinor, daughter of Robert Jermy of Worstead in Norfolk, was born at Low Leyton near Wanstead in Essex, and at the age of twelve (1593) matriculated at Magdalen College, Oxford. Shortly afterwards he joined one of the inns of court, and was made esquire of the body to Queen Elizabeth. He was knighted by James I. in 1605, and became intimate with Henry, prince of Wales, and also with his sister Elizabeth, afterwards queen of Bohemia, with whom he maintained a correspondence and whose cause he cham- pioned. In 1610 he was sent by Prince Henry on a mission to the West Indies,

during which he visited Guiana and the river Amazon, but failed then, and in two subsequent expedi- tions, to discover the gold which was the object of his travels. In 1614 he was elected M.P. for Tamworth, and in 1621 for Cirencester. His permanent reputation was mainly secured by the success which attended his embassy in 1615-18 to the court at Agra of the Great Mogul, Jahanglr, the principal object of the mission being to obtain protection for an English factory at Surat. Appointed ambassador to the Porte in 1621, which he even then describes as being ” irrevocably sick,” he distinguished himself by further successes. He obtained an extension of the privileges of the English merchants, concluded a treaty with Algiers in 1624, by which he secured the liberation of several hundred English captives, and gained the support, by an English subsidy, of the Transylvanian Prince Bethlen Gabor for the European Protestant alliance and the cause of the Palatinate. Through his friendship with the patriarch of the Greek Church, Cyril Lucaris, the famous Codex Alexandrinus was presented to James I., and Roe himself collected several valuable MSS. which he subsequently pre- sented to the Bodleian library. In 1629 he was again suc- cessful in another mission undertaken to arrange a peace between Sweden and Poland. Subsequently Roe negotiated treaties with Danzig and Denmark, returning home in 1630, when a gold medal was struck in his honour. In January 1637 he was appointed chancellor of the Order of the Garter, with a pension of £1200 a year. Subsequently he took part in the peace conferences at Hamburg, Regensburg and Vienna, and used his influence to obtain the restoration of the Palatinate, the emperor declaring that he had ” scarce ever met with an ambassador till now.” In June 1640 he was made a privy councillor, and in October was returned to parliament as member for the university of Oxford, where his unrivalled knowledge of foreign affairs, commerce and finance, together with his learning and eloquence, gained for him in another sphere considerable reputation. He died on the 6th of Novem- ber 1644. He had married Eleanor, daughter of Sir Thomas Carr of Stamford, Northamptonshire. Roe was a distinguished and most successful diplomatist, an accomplished scholar and a patron of learning, while his •personal character was unblemished.

His Journal of the mission to the Mogul, several times printed, has been re-edited, with an introduction by W. Foster, for the Hakluyt Society (1899). This is a valuable contribution to the history of India in the early 17th century. Of his correspondence, Negotiations in his Embassy to the Ottoman Porte, 1621-28, vol. i. was published in 1740, but the work was not continued. Other correspondence, consisting of letters relating to his mission to Gustavus Adolphus, was edited by S.

R. Gardiner for the Camden Society Miscellany (1875), vol. vii., and his correspondence with Lord Carew in 1615 and 1617 by Sir F. Maclean for the same society in i860. Several of his MSS. are in the British Museum collections. Roe published a True and Faithful Relation . . . concerning the Death of Sultan Osman . . . , 1622; a translation from Sarpi, Discourse upon the Resolution taken in the Valteline (1628) ; and in 1613 Dr T. Wright published Quatuor Colloquia, consisting of theological disputations between himself and Roe; a poem by Roe is printed in Notes and Queries, iv. Ser. v. 9. The Swedish Intelligencer (1632-33), including an account of the career of Gustavus Adolphus and of the Diet of Ratisbon (Regensburg), is attributed to Roe in the catalogue of the British Museum. Several of his speeches, chiefly on currency and financial questions, were also published. Two other works in MS. are mentioned by Wood: Compendious Relation of the Proceedings . . . of the Imperial Diet at Ratisbon and Journal of Several Proceedings of the Order of the Carter.

ROEBLING, JOHN AUGUSTUS (1806-1869), American civil engineer, was born at Muhlhausen, Prussia, on the 6th of June 1806. Soon after his graduation from the polytechnic school at Berlin he removed to the United States,' and in 1831 entered on the practice of his profession in western Pennsylvania. He established at Pittsburg a manufactory of wire-rope, and in May 1845 completed his first important structure, a suspended aqueduct across the Allegheny river. This was followed by the Monongahela suspension bridge at Pittsburg and several suspended aqueducts on the Delaware & Hudson Canal. Removing his wire manufactory to Trenton, New Jersey, he began, in 1851, the erection at Niagara Falls of a long span wire suspension bridge with double roadway, for railway and carriage use (see Bridge), which was completed in 1855. Owing to the novelty of its design, the most eminent engineers regarded this bridge as foredoomed to failure; but, with its complete success, demonstrated by long use, the number of suspension bridges rapidly multiplied, the use of wire-ropes instead of chain-cables becoming all but universal. The completion, in 1867, of the still more remarkable suspension bridge over the Ohio river at Cincinnati, with a clear span of 1057 ft., added to Roebling's reputation, and his design for the great bridge spanning the East river between New York and Brooklyn was accepted. While personally engaged in laying out the towers for the bridge, Roebling received an accidental injury, which resulted in his death, at Brooklyn, from tetanus, on the 22nd of July 1869. The bridge was completed under the direction of his son, Washington Augustus Roebling (b. 1837), who introduced several modifications in the original plans.

ROEBOURNE, a settlement of De Witt county, Western Australia, 8 m. from the N.W. coast, on the Harding river, 920 m. direct N. of Perth. It is the centre of one of the richest and most varied mineral districts in the colony; gold, silver, tin, lead, copper, diamonds and other precious stones are found. There are extensive pearl fisheries off its port at Cossack Bay.

ROEBUCK, JOHN (1718-1794), English inventor, was born in 1 7 18 at Sheffield, where his father had a prosperous manu- facturing business. After attending the grammar school at Sheffield and Dr Philip Doddridge's academy at Northampton, he studied medicine at Edinburgh, where he was imbued with a taste for chemistry by the lectures of William Cullen and Joseph Black, and he finally graduated M.D. at Leiden in 1742. He started practice at Birmingham, but devoted much of his time to chemistry, especially in its practical applications. Among the most important of his early achievements in this field was the introduction, in 1746, of leaden condensing chambers for use in the manufacture of sulphuric acid. To- gether with Samuel Garbett he erected a factory at Prestonpans, near .Edinburgh, for the production of the acid in 1749, and for some years enjoyed a monopoly; but ultimately his methods became known, and, having omitted to take out patents for

them at the proper time, he was unable to restrain others from making use of them. Engaging next in the manufacture of iron, he in 1760 established the ironworks which still exist at Carron, in Stirlingshire. There he introduced various improve- ments in the methods of production, including the conversion (patented in 1762) of cast iron into malleable iron " by the action of a hollow pit-coal fire " urged by a powerful artificial blast. His next enterprise was less successful. He leased a colliery at Bo'ness to supply coal to the Carron works, but in sinking for new seams encountered such quantities of water that the Newcomen engine which he used was unable to keep the pit clear. In this difficulty he heard of James Watt's engine and entered into communication with its inventor. This engine, then at an early stage of its development, also proved in- adequate, but Roebuck became a strong believer in its future and in return for a two-thirds share in the invention assisted Watt in perfecting its details. His troubles at the colliery, however, aggravated by the failure of an attempt to manu- facture alkali, brought him into pecuniary straits, and he parted with his share in Watt's engine to Matthew Boulton in return for the cancellation of a debt of £1200 which he owed the latter. Subsequently, though he had to give up his interest in the Bo'ness

works, he continued to manage them and to reside at the neighbouring Kinneil House, where he occupied himself with farming on a considerable scale. He died on the 17th of July 1794.

ROEBUCK, JOHN ARTHUR (1801-1879), British politician, was born at Madras on the 28th of December 1801. After the death of his father, a civil servant, his mother's second marriage transferred him to Canada, where he was chiefly brought up. He came to England in 1824, was called to the bar (Q.C. 1843), became intimate with the leading radical and utilitarian re- formers, was elected M.P. for Bath in 1832, and took up that general attitude of hostility to the government of the day, be it what it might, which he retained throughout his life. At all times conspicuous for his eloquence, honesty and recal- citrancy, he twice came with especial prominence before the public — in 1838, when, although at the time without a seat in parliament, he appeared at the bar of the Commons to protest, in the name of the Canadian Assembly, against the suspension of the Canadian constitution; and in 1855, when, having over- thrown Lord Aberdeen's ministry by carrying a resolution for the appointment of a committee of inquiry into the mismanage- ment in the Crimean War, he presided over its proceedings. In his latter years his political opinions became greatly modified, but with one interruption he retained his seat for Sheffield, which he had won in 1849, until his death in London on the 30th of November 1879.

ROE-BUCK, the smallest of the British deer (a full-grown buck standing not more than 27 in. high at the shoulder), the typical representative of a genus (Capreolus) in which the antlers lack a brow-tine and belong to what is characterized as the forked type, while the tail is rudimentary (see Deer). The antlers are short, upright and deeply furrowed, the beam forking at about two-thirds of its length, and the upper prong again dividing, thus making three points. The coat in summer is foxy red above and white below; in winter this changes to a greyish fawn, with a white rump-patch. The roe-buck or roe-deer (Capreolus caprea, or C. capreolus) inhabits southern and temperate Europe as far east as the Caucasus, where, as in Syria, it is probably represented by another race or species. It frequents woods, preferring such as have a large growth of underwood and are in the neighbourhood of cultivated ground. The latter it visits in the evening in search of food; and where roe are numerous the damage done to growing crops is consider- able. Pairing takes place in August, but the fawns are not born till the following May. According to one theory, the germ lies dormant until December, when it begins to develop; but it is now believed that this long gestation is due to slow rather than arrested development. Roe were formerly abundant in all the wooded

parts of Great Britain, but were gradually exter- minated, till a century and a half ago they were unknown

south of Perthshire. Since then the increase of plantations has led to the partial restoration of the species in the south of Scotland and the north of England; and it was reintroduced into Dorset early in the 19th century. These deer take readily to the water, and they have been known to swim across lochs more than half a mile in breadth. The Siberian roe (C. pygar- gus), which is common in the Altai, is larger and paler than the type species, with shorter and more hairy ears, a larger white rump-patch, and small irregular snags on the inner border of the antlers. The Manchurian roe (Capreolus manchuricus) is about the size of the European species, with antlers of the type of those of the Siberian roe, but more slender, and the coat shorter. Although described in 1889 as a local variety of the Siberian species, the Manchurian roe really appears, both as regards stature, hairiness and the black and white markings on the muzzle, much more nearly related to the European animal. This is the more remarkable seeing that the habitats of the two are separated by such an enormous tract of country. (R. L.*)

ROEDERER, PIERRE LOUIS, Comte (1754-1835), French politician and economist, was born at Metz on the 15th of February 1754, the son of a magistrate. At the age of twenty- five he became councillor at the parlement of Metz, and was commissioned in 1787 to draw up a list of remonstrances. His work advocating the suppression of internal customs ho.uses (Suppression des douanes int&rieures) , published the same year, is an elaborate treatise on the laws of commerce and on the theory of customs imposts. In 1788 he published Deputation aux Etals gentraux, a pamphlet remarkable for its bold exposition of liberal principles, and partly on the strength of this he was elected deputy to the states-general by the Third Estate of the bailliage of Metz. In the Con- stituent Assembly he was a member of the committee of taxes (comitt des contributions), prepared a scheme for a new system of taxation, drew up a law on patents, occupied himself with the laws relating to stamps and assignats, and was successful in opposing the introduction of an income tax. After the close of the Constituent Assembly he was elected, on the nth of November 1791, procureur gSniral syndic of the depart- ment of Paris. The directory of the department, of which the due de la Rochefoucauld was president, was at this time in pronounced opposition to the advanced views that dominated the Legislative Assembly and the Jacobin Club, and Roederer was not altogether in touch with his colleagues. Thus he

took no share in signing their protest against the law against the non-juring clergy, as a violation of religious liberty. But the directory did not long survive. With the growing anarchy of the capital many of its members resigned and fled, and their places could not be filled up. Roederer himself has left in his Chronique des cinquante jours (1832) an account of the pitiable part played by the directory of the department in the critical period between the 20th of June and the 10th of August 1792. Seeing the perilous drift of things, he had tried to get into touch with the king; and it was on his advice that Louis, on the fatal 10th, took refuge in the Assembly. His conduct arousing suspicion, he went into hiding, and did not emerge again until after the fall of Robespierre. In 1796 he was made a member of the Institute, was appointed to a professorship of political economy, and founded the Journal d'economie publique, de morale et de legislation. Having escaped deportation at the time of the coup d'etat of 18 Fructidor, he took part in the revolution of 18 Brumaire, and was appointed by Napoleon member of the council of state and senator. Under the Empire, Roederer, whose public influence was very considerable, was Joseph Bonaparte's minister of finance at Naples (1806), administrator of the grand duchy of Berg (1810), and imperial commissary in the south of France. During the Hundred Days he was created a peer of France. The Restoration government stripped him of his offices and dignities, but he recovered the title of peer of France in 1832. He died on the 17th of December 1835. His son, Baron Antoine Marie Roederer

(1782-1865), was also a politician of some note in his day.

Among P. L. Roederer's writings may be mentioned Louis XII. (1820); Francois I. (1825); Comedies historiques (1827-30); V Esprit de la revolution de 1789 (1 83 1) ; La Premiere el la deuxteme annee du consulat de Bonaparte (1802); Chronique des cinquante jours, an account of the events of the 10th of August 1792; and Memoire pour servir d I'histoire de la societe polie en France (1835).

See his (Euvres, edited by his son (Paris, 1853 seq.) ; Sainte- Beuve, Causeries du lundi, vol. viii.; M. Mignet, Notices historiques (Paris, 1853).

ROEMER, FRIEDRICH ADOLPH (1809-1869), German geologist, was born at Hildesheim, in Prussia, on the 14th of April 1809. His father

was a lawyer and councillor of the high court of justice. In 1845 he became professor of mineralogy and geology at Clausthal, and in 1862 director of the School of Mines. He first described the Cretaceous and Jurassic strata of Germany in elaborate works entitled Die Versteinerungen des Norddeutschen Oolithen-gebirges (1836-39), Die Versteinerungen des Norddeutschen Kreidegebirges (1840- 1841) and Die Versteinerungen des Harzgebirges (1843). H e died at Clausthal on the 25th of November 1869.

His brother, Carl Ferdinand von Roemer (1818-1891), who had been educated for the legal profession at Gottingen, also became interested in geology, and abandoning law in 1840, studied science at the university of Berlin, where he graduated Ph.D. in 1842. Two years later he published his first work, Das Rheinische Ubergangsgebirge (1844), in which he dealt with the older rocks and fossils. In 1845 he paid a visit to America, and devoted a year and a half to a careful study of the geology of Texas and other Southern states. He published at Bonn in 1849 a general work entitled Texas, while the results of his investigations of the Cretaceous rocks and fossils were published three years later in a treatise, Die Kreidebildungen von Texas und ihre organischen Einschlusse (1852), which included also a general account of the geology, and gained for him the title ” Father of the geology of Texas.” Subsequently he published at Breslau Die Silurische Fauna des westlichen Tennessee (i860). During the preparation of these works he was from 1847 to 1855 ” privat-docent ” at Bonn, and was then appointed professor of geology, palaeontology and mineralogy in the university of Breslau, a post which he held with signal success as a teacher until his death. As a palaeontologist he made important contributions to our knowledge especially of the invertebrata of the Devonian and older rocks. He assisted H. G. Bronn with the third edition of the Lelhaea geognostica (1851-56), and subse- quently he laboured on an enlarged and revised edition, of which he published one section, Lethaea palaeozoica (1876- 1883). In 1862 he was called on to superintend the prepara- tion of a geological map of Upper Silesia, and the results of his researches were embodied in his Geologie von Oberschlesien (3 vols., 1870). As a mineralogist he was likewise well known, more particularly by his practical teachings and by the collec- tion he formed in the Museum at Breslau. He died at Breslau on the 14th of December 1891.

ROEMER, OLE (Latinized Olaus) (1644-1710), Danish astrono- mer, was born at Aarhuus in Jutland on the 25th of September 1644. He became in 1662 the pupil and amanuensis of Erasmus Bartholinus at Copenhagen, and assisted J. Picard in 1671 to determine the geographical position of Tycho Brahe’s observa- tory (Uraniborg on

the island of Hveen). In 1672 he accom- panied Picard to Paris, where he remained nine years, occupied with observations at the new royal observatory and hydraulic works at Versailles and Marly. On the 22nd of November 1675 he read a paper before the Academy on the successive propagation of light as revealed by a certain inequality in the motion of the first of Jupiter's satellites. A scientific mission to England in 1679 made him acquainted with Newton, Halley and Flamsteed. In i68i,on the summons of Christian V., king of Denmark, he returned to Copenhagen as royal mathe- matician and professor of astronomy in the university ; and from 1688 he discharged, besides, many important admini-

strative functions, including those of mayor (1705), chief of police and privy councillor. He died at Copenhagen on the 23rd of September 1710,

Roemer will always be remembered as the discoverer of the finite velocity of light. He showed besides wonderful in- genuity in the improvement of astronomical apparatus. The first transit instrument worthy the name was in 1690 erected in his house. In the same year he set up in the university observatory an instrument with altitude and azimuth circles (for observing equal altitudes on both sides of the meridian) and an equatorial telescope. In 1704 he built, at his own cost, the so-called " Tusculan " observatory at Vridlosemagle, a few miles west of Copenhagen, and equipped it with a meridian circle (the transit instrument and vertical circle: combined) and a transit moving in the prime vertical. Roemer thus effectively realized nearly all our modern instruments of precision, and accumulated with them a large mass of observations, all of which unfortunately perished in the great conflagration of the 21st of October 1728, except the three nights' work discussed by J. G. Galle (O. Roemeri triduum observationum astronomi- carum a. 1706 institutarum, Berlin, 1845).

See E. Philipsen, Nordisk Universitets Tidskrift,v 11 (i860); P. Horrebow, Basis Astronomiae (Copenhagen, 1735); J. B. J. Delambre, Hist, de Vastr. moderne, ii. 632.; J. F. Montucla, Hist, des mathematiques, ii. 487, 579; R. Grant, Hist, of Phys. Astronomy, p. 461; R. Wolf, Gesch. der Astronomie, pp. 452, 489, 576; J. F. Weidler, Historia Astronomiae, p. 538; W. Doberck, Nature, xvii. 105; C. Huygens, (Euvres completes, t. viii. pp. 30-58; L. Ambronn, Handbuch der astr. Instrumentenkunde, ii. 552, 966 ;T. J. J. See, Pop. Astronomy, No. 105, May 1903.

ROERMOND, a town in the province of Lirnburg, Holland, on the right bank of the Maas at the confluence of the Roer, and a junction station

28 m. by rail N.N.E. of Maastricht. Pop. (1900) 12,348. The old fortifications have been dis- mantled and partly converted into fine promenades. At this point the Maas is crossed by a bridge erected in 1866-67, and the Roer by one dating from 1771, replacing an older structure, and connecting Roermond with the suburb of St Jacob. Roermond is the seat of a Roman Catholic episcopal see. The finest building in the town is the Romanesque minster church of the first quarter of the 13th century. In the middle of the nave is the tomb of Gerhard III., count of Gelderland, and his wife Margaret of Brabant. It was formerly the church of a Cistercian nunnery, and in modern times has been elaborately restored. The cathedral of St Christopher is also of note; on the top of the tower (246 ft.) is a copper statue of the saint, and the interior is adorned with paintings by Rubens, Jacob de Wit (1695-1754) and others. The Reformed church was once the chapel of the monastery of the Minorites. There is also a Redemptorist chapel. The old bishop's palace is now the courthouse, and the old Jesuits' monastery with its fine gardens a higher-burgher school. Woollen, cotton, silk and mixed stuffs, paper, flour and beer are manufactured : at Roermond.

Close to Roermond on the west is the village of Horn, once the seat of a lordship of the same name, which is first mentioned in a document of 1166. The lordship of Horn was a fief of the counts of Loon, and after 1361 of the bishop of Liege; but in 1450 it was raised to a countship by the Emperor Frederick II. On the extinction of the house of Horn in 1540, the countship passed to the famous Philip of Montmorency, who, with the count of Egmont, was executed in Brussels in 1568 by order of the duke of Alva. In the beginning of the next century the countship was forcibly retained by the see of Liege, and was incorporated in the French department of the Lower Maas at the end of the 18th century. The ancient castle is in an ex- cellent state of preservation and is sometimes used for the assembly of the states.

ROGATION DAYS (Lat. rogatio, from rogare, to beseech; the equivalent of Gr. Xirctraa, litany), in the Calendar of the Christian Church, the Monday, Tuesday and Wednesday before Ascension Day, so called because long associated with the chanting of litanies in procession (rogationes). The week in which they occur is sometimes called Rogation Week. In 511

the first Council of Orleans ordered that the three days pre- ceding Ascension Day should be celebrated as rogation days with fasting and rogationes. All work was to be suspended that all might join in the processions. Leo III. (pope 795-816) introduced rogation days, but without the fasting, at Rome. St Augustine had earlier introduced the custom into the English Church, learning it on his way through Gaul. The Council of Clovesho in 747 confirmed Augustine's injunction, and ordered that the rogation days be kept up " according to the way of our fathers." The place-name " Gospel Oak," which occurs in London and elsewhere, is a relic of these rogation processions, the gospel of the day being read at the foot of the finest oak the parish boasted. After the Reformation the processions gradually ceased to be ecclesiastical in England, and are now practically secularized into the perambulation of the parish boundaries on or about Ascension Day. See also Procession and Litany.

ROGER I. (1031-1101), ruler of Sicily, was the youngest son of Tancred of Hauteville. He arrived in Southern Italy soon after 1057. Malaterra, who compares Robert Guiscard (see Guiscard, Robert) and his brother to " Joseph and Benjamin of old," says of Roger: " He was a youth of the greatest beauty, of lofty stature, of graceful shape, most eloquent in speech and cool in counsel. He was far-seeing in arranging all his actions, pleasant and merry all with men; strong and brave, and furious in battle." He shared with Robert Guiscard the conquest of Calabria, and in a treaty of 1062 the brothers in dividing the conquest apparently made a kind of " condominium " by which either was to have half of every castle and town in Calabria. 1 Robert now resolved to employ Roger's genius in reducing Sicily, which contained, besides the Moslems, numerous Greek Christians subject to Arab princes who had become all but independent of the sultan of Tunis. In May 1061 the brothers crossed from Reggio and captured Messina. After Palermo had been taken in January 1072 Robert Guiscard, as suzerain, invested Roger as count of Sicily, but retained Palermo, half of Messina and the north-east portion (the Val Demone). Not till 1085, however, was Roger able to undertake a syste- matic crusade. In March 1086 Syracuse surrendered, and when in February 1001 Noto yielded the conquest was complete. Much of Robert's success had been due to Roger's support. Similarly the latter supported Duke Roger, his nephew, against Bohemund, Capua and his rebels, and the real leadership of the Hautevilles passed to the Sicilian count. In return for his aid against Bohemund and his rebels the duke sur- rendered to his uncle in 1085 his share in the castles of Calabria, and in 1091 the half of Palermo. Roger's rule in Sicily was more real than Robert Guiscard's in Italy. At the enfeoff- ments of 1072 and 1092 no great

undivided fiefs were created, and the mixed Norman, French and Italian vassals owed their benefices to the count. No feudal revolt of importance therefore troubled Roger. Politically supreme, the count became master of the insular Church. While he gave full toleration to the Greek Churches, he created new Latin bishop- rics at Syracuse and Girgenti and elsewhere, nominating the bishops personally, while he turned the archbishopric of Palermo into a Catholic see. The Papacy, favouring a prince who had recovered Sicily from Greeks and Moslems, granted to him and his heirs in 1098 the Apostolic Legateship in the island. Roger practised general toleration to Arabs and Greeks, allowing to each race the expansion of its own civilization. In the cities the Moslems, who had generally secured such terms of surrender, retained their mosques, their kadis, and freedom of trade; in the country, however, they became serfs. He drew from the Moslems the mass of his infantry, and St Anselm visiting him at the siege of Capua, 1098, found " the brown tents of the Arabs innumerable." Nevertheless the Latin element began to prevail with the Lombards and other Italians who flocked into the island in the wake of the conquest, and the conquest of Sicily was decisive in the steady decline from this time of Mahommedan power in the western Mediterranean. 1 See Chalandon, La Domination normande, vol. i. p. 200.

Roger, the " Great Count of Sicily," died on the 22nd of June 1101 in his seventieth year and was buried in S. Trinita, of Mileto. His third wife, Adelaide, niece of Boniface, lord of Savona, gave him two sons, Simon and Roger, of whom the latter succeeded him.

See E. Caspar, Roger II. und die Grundung der normannisch-sicilischen Monarchic (Innsbruck, 1904). (E. Cu.)

ROGER II. (1093-1154), king of Sicily, son of the preceding, began personally to rule in n 12, and from the first aimed at uniting the whole of the Norman conquests in Italy. In June 1127, William, duke of Apulia, grandson of Robert Guis- card, died childless, having apparently made some vague promise of the succession to Roger. In any case Roger claimed at once, not only all the Hauteville possessions, but also the overlordship of Capua, for which Richard II. in 1098 had sworn homage to Duke Roger. The union of Sicily and Apulia, however, was resisted by Honorius II. and by the subjects of the duchy itself, averse from any strong ducal power, and the pope at Capua (Dec. 1127) preached a crusade against the claimant, setting against him Robert II. of Capua and Ranulf of Alife, or Avellino, brother-in-law of Roger, who proved himself the real leader of the revolt. The coalition, however, failed, and in August 1128 Honorius

invested Roger at Bene- vento as duke of Apulia. The baronial resistance, which was backed by Naples, Bari, Salerno and other cities, whose aim was civic freedom, also gave way, and at Melfi (Sept. 11 29) Roger was generally recognized as duke by Naples, Capua and. the rest. He began at once to enforce order in the Hauteville possessions, where the ducal power had long been falling to pieces. For the binding together of all his states the royal name seemed essential, and the death of Honorius in February 1 130, followed by a double election, seemed the decisive moment. While Innocent II. fled to France, Roger, with deep design, sup- ported Anacletus II. The price was a crown, and on the 27th of September 1130 a bull of Anacletus made Roger king of Sicily. He was crowned in Palermo on the 25th of December

1130.

This plunged Roger into a ten years' war. Bernard of Clairvaux, Innocent's champion, built up against Anacletus and his " half heathen king " a coalition joined by Louis VI. of France, Henry I. of England and the emperor Lothar. Mean- while the forces of revolt in South Italy drew to a head again. The rebels under Ranulf shamefully defeated the king at Nocera on the 24th of July 1132. Nevertheless, by July 1134 his terrific energy and the savagery of his Saracen troops forced Ranulf, Sergius, duke of Naples, and the rebels to submit, while Robert was expelled from Capua. Meanwhile Lothar's contemplated attack upon Roger had gained the backing of Pisa, Genoa and the Greek emperor, all of whom feared the growth of a powerful Norman kingdom. In February 113 7 Lothar began to move south and was joined by Ranulf and the rebels; in June he besieged and took Bari. At San Severino, after a victorious campaign, he and the pope jointly invested Ranulf as duke of Apulia (Aug. 1137), and the emperor then retired to Germany. Roger, freed from the utmost danger, recovered ground, sacked Capua and forced Sergius to acknow- ledge him as overlord of Naples. At Rignano the indomitable Ranulf again utterly defeated the king, but in April 1139 Ranulf died, leaving none to oppose Roger, who subdued piti- lessly the last of the rebels.

The death of Anacletus (25 Jan. 1138) determined Roger to seek the confirmation of his title from Innocent. The latter, invading the kingdom with a large army, was skilfully ambushed at Galuccio on the Garigliano (22 July 1139). This secured the king's object; on the 25th July the pope invested him as " Rex Siciliae ducatus Apuliae et principatus Capuae." The boundaries of the " regno" were finally fixed, by a truce with the pope in October 1144, at a line south of the Tronto and east of Terracina and Ceprano.

Roger, now become one of the greatest kings in Europe, made Sicily the leading maritime power in the Mediterranean. A powerful fleet was built up under several ” admirals,” or

” emirs,” of whom the greatest was George of Antioch, formerly in the service of the Moslem prince of El Mehdia. Mainly by him a series of conquests were made on the African coast (1135—53) which reached from Tripoli to Cape Bona. The second crusade (1147-48) gave Roger an opportunity to revive Robert Guiscard’s designs on the Greek Empire. George was sent to Corinth at the end of 1147 and despatched an army inland which plundered Thebes. In June 1140 the admiral appeared before Constantinople and defied the Basileus by firing arrows against the palace windows. The attack on the empire had, however, no abiding results. The king died at Palermo on the 26th of February 1154, and was succeeded by his fourth son William.

Personally Roger was of tall and powerful body, with long fair hair and full beard. ” He had,” says Romnald of Salerno, ” a lion face, and spoke with a harsh voice.” With little or none of Robert Guiscard’s personal valour, and living at inter- vals the life of an eastern Sultan, he yet showed to the full his uncle’s audacity, diplomatic skill and determination. It is Roger II. ‘s distinction to have united all the Norman con- quests into one kingdom and to have subjected them to a government scientific, personal and centralized. The principles of this are found in the Assizes of the kingdom of Sicily, pro- mulgated at Ariano in 1140, which enforced an almost absolute royal power. At Palermo Roger drew round him distinguished men of various races, such as the famous Arab geographer Idrisi and the historian Nilus Doxopatrius. The king’s active and curious mind welcomed the learned; he maintained a complete toleration for the several creeds, races and languages of his realm ; he was served by men of nationality so dissimilar as the Englishman Thomas Brun, a kaid of the Curia, and, in the fleet, by the renegade Moslem Christodoulos, and the Antiochene George, whom he made in 113 2 “amiratus amira- torum,” in effect prime vizier. The Capella Palatina, at Palermo, the most wonderful of Roger’s churches, with Norman doors, Saracenic arches, Byzantine dome, and roof adorned with Arabic scripts, is perhaps the most striking product of the brilliant and mixed civilization over which the grandson of the Norman Trancred ruled.

Contemporary authors are: Falco of Benevento, Alexander of Telese,

Romuald of Salerno and Hugo Falcandus, all in the Scrittori e cronisti napoletani, ed. Del Re, vol. i. See also E. Caspar, Roger II. und die Griindung der normannisch-sicilischen Monarchic (Innsbruck, 1904). (E. Cu.)

ROGER (d. 1 139), bishop of Salisbury, was originally priest of a small chapel near Caen. The future King Henry I., who happened to hear mass there one day, was impressed by the speed with which Roger read the service, and enrolled him in his own service. Roger, though uneducated, showed great talent for business, and Henry, on coming to the throne, almost immediately made him chancellor (1101). Soon after Roger received the bishopric of Salisbury. In the Investitures controversy he skilfully managed to keep the favour of both the king and Anselm. Roger devoted himself to administrative business, and remodelled it completely. He created the exchequer system, which was managed by him and his family for more than a century, and he used his position to heap up power and riches. He became the first man in England after the king, and was in office, if not in title, justiciar. He ruled England while Henry was in Normandy, and succeeded in obtaining the see of Canterbury for his nominee, William of Corbeil. Duke Robert seems to have been put into his custody after Tinchebrai. Though Roger had sworn allegiance to Matilda, he disliked the Angevin connexion, and went over to Stephen, carrying with him the royal treasure and adminis- trative system (1135). Stephen placed great reliance on him, on his nephews, the bishops of Ely and Lincoln, and on his son Roger, who was treasurer. The king declared that if Roger demanded half of the kingdom he should have it, but chafed against the overwhelming influence of the official clique whom Roger represented. Roger himself had built at Devizes the most splendid castle in Christendom. He and his nephews

seem to have secured a number of castles outside their own dioceses, and the old bishop behaved as if he were an equal of the king. At a council held in June 1139, Stephen found a pretext for demanding a surrender of their castles, and on their refusal they were arrested. After a short struggle all Roger's great castles were sequestrated. But Henry of Winchester demanded the restoration of the bishop. The king was considered to have committed an almost unpardon- able crime in offering violence to members of the church, in defiance of the scriptural command, " Touch not mine anointed." Stephen took up a defiant attitude, and the question remained unsettled. This quarrel with the church, which immediately preceded the landing of the empress, had a serious effect on Stephen's fortunes. The moment that the fortune of war declared against him, the clergy acknowledged Matilda. Bishop Roger, however, did not live to see himself avenged.

He died at Salisbury in December 1139. He was a great bureaucrat, and a builder whose taste was in advance of his age. But his contemporaries were probably justified in regarding him as the type of the bishop immersed in worldly affairs, ambitious, avaricious, unfettered by any high standard of personal morality.

Roger's nephew Alexander (d. 1148), who became bishop of Lincoln in 1123, was a typical secular ecclesiastic of the middle ages, wealthy, proud, ambitious and ostentatious. He founded monasteries, built castles at Newark, Sleaford and Banbury, and restored his cathedral at Lincoln after the fire of 1145. He followed the policy of Roger, whose imprisonment he shared, and died after a visit to Pope Eugenius III. at Auxerre, early in n 48.

See Sir J. Ramsay's Foundations of England, vol. ii., and J. H. Round's Geoffrey de Mandeville.

ROGER (d. 1 181), archbishop of York, known as Roger of Pont l'Eveque, was a member of the household of Theobald, archbishop of Canterbury, where he quarrelled violently with another future archbishop, Thomas Becket. In 1148 he was appointed archdeacon of Canterbury, and soon afterwards chaplain to King Stephen, who sent him on an errand to Rome in 1 1 52; then in October n 54 he was consecrated archbishop of York in Westminster Abbey. When Henry II. entered upon his great struggle with Becket over the immunity of clerks from secular jurisdiction, he managed to secure the support of Roger, and having been appointed papal legate in England, the archbishop visited Pope Alexander III. and the French king, Louis VII., in his master's interests. In June 1 170 he crowned the king's son Henry, in spite of prohibitions from the pope and from Becket, and for this act he was suspended. One authority declares that Roger, who was then with Henry II. in Normandy, instigated the murder of the rival archbishop, but he swore he was innocent of this crime. He quarrelled with Richard, the new archbishop of Canterbury, about the respective rights of the two archiepiscopal sees, until n 76, when the king arranged a truce between them; and he was constantly endeavouring to assert his supremacy over the Scottish church. The archbishop died at York on the 21st of November 1181. He was always loyal to Henry II., to whom he was very useful during the great rising of n 74; but he has been accused of avarice, and he was certainly not lacking in ambition.

Another English prelate of this name was Roger, bishop of Worcester, a younger son of Robert, earl of Gloucester, and thus a grandson of the English king Henry I. In n 63 his cousin Henry II. appointed him

bishop of Worcester, but almost alone of the English bishops he supported Thomas Becket and not the king during the quarrel between them in 1166. In 1167 he left England to share Becket's exile, but he soon returned to court, although he appears to have remained on friendly terms with the archbishop. He died at Tours in n 79.

ROGER OF HOVEDEN, or Howden (fl. n 74-1 201), English chronicler, was, to judge from his name and the internal evi- dence of his work, a native of Howden in the East Riding of Yorkshire. But nothing is known of him before the year 1 174. He was then in attendance upon Henry II., by whom

he was sent from France on a secret mission to the lords of Galloway. In 1175 he again appears as a negotiator between the king and a number of English religious houses. The interest which Hoveden shows in ecclesiastical affairs and miracles may justify the supposition that he was a clerk in orders. This, however, did not prevent him from acting, in 1189, as a justice of the forests in the shires of Yorkshire, Cumberland and Northumberland. After the death of Henry II., it would seem that Hoveden retired from the public service, though not so completely as to prevent him from drawing on the royal archives for the history of contemporary events. About the year 1192 he began to compile his Chronica, a general history of England from 732 to his own time. Up to the year 1192 his narrative adds little to our knowledge. For the period 732-1148 he chiefly drew upon an extant, but unpublished chronicle, the Historic. Saxonum sive Anglorum post obitum Bedae (British Museum MS. Reg. 13 A. 6), which was composed about 1150. From 1 148 to 1170 he used the Melrose Chronicle (edited for the Bannatyne Club in 1835 by Joseph Stevenson) and a collection of letters bearing upon the Becket controversy. From n 70 to 1 192 his authority is the chronicle ascribed to Benedictus Abbas (q.v.), the author of which must have been in the royal household at about the same time as Hoveden. Although this period was one in which Hoveden had many opportunities of making independent observations, he adds little to the text which he uses; except that he inserts some additional docu- ments. Either his predecessor had exhausted the royal archives, or the supplementary searches of Hoveden were languidly pursued. From 1192, however, Hoveden is an independent and copious authority. Like " Benedictus," he is sedulously impersonal, and makes no pretence to literary style, quotes documents in full and adheres to the annalistic method. His chronology is tolerably exact, but there are mistakes enough to prove that he recorded events at a certain' distance of time. Both on foreign

affairs and on questions of domestic policy he is unusually well informed. His practical experience as an administrator and his official connexions stood him in good stead. He is particularly useful on points of constitutional history. His work breaks off abruptly in 1201, though he certainly intended to carry it further. Probably his death should be placed in that year.

See W. Stubbs's edition of the Chronica (Rolls Series) and the introductions to vols. i. and iv. This edition supersedes that of Sir H. Savile in his Scriptores post Bedam (1596). (H. W. C. D.)

ROGER OF WENDOVER (d. 1236), English chronicler, was probably a native of Wendover in Buckinghamshire. At some uncertain date he became a monk of St Albans; afterwards he was appointed prior of the cell of Belvoir, but he forfeited this dignity in the early years of Henry III., having been found guilty of wasting the endowments. His latter years were passed at St Albans, where he died on the 6th of May 1236. He is the first of the important chroniclers who worked in the scriptorium of this house. His great work, the Flores Historiarum, begins at the creation and extends to 1235. It is of original value from 1202. Some critics have supposed, but on inconclusive evidence, that Wendover copied, up to 1 189, an earlier compilation, the work of John de Cella, the twenty-first abbot of St Albans (1195-1214). Wendover's work is known to us through one 13th-century manuscript in the Bodleian library (Douce MS. 207), a mutilated 14th- century copy in the British Museum (Cotton MS. Otho B. v.), and the edition prepared by Matthew Paris which forms the first part of that writer's Chronica Majora (ed. H. R. Luard, Rolls Series, 7 vols.). The best edition of Wendover is that of H. O. Coxe (4 vols., London, 1841-42) ; there is another (from 1154) in the Rolls Series by H. G. Hewlett (3 vols., 1886-89). Wendover is a copious but inaccurate writer, less prejudiced but also less graphic than Matthew Paris. Where he is the sole authority for an event, he is to be used with caution.

See Luard's prefaces to vols, i., ii., iii. and vii. of the Chronica Majora; and the Monumenta Germaniae Historica. Scriptores, Band xxviii. pp. 3-20. (H. W. C. D.)

ROGERS, HENRY (1806-1877), English Nonconformist divine, was born at St Albans on the 18th of October 1806, and was educated privately and by his father, a surgeon of considerable culture. Rogers was meant to follow his father's profession, but the reading of John Howe turned him to theology, and after qualifying at Highbury

College he accepted a call to the Congregational Church at Poole in 1829. In 1832 he was appointed lecturer in logic at Highbury, in 1836 professor of English at University College, London, and in 1839 professor of English, mathematics and mental philosophy at Spring Hill College, Birmingham. In 1836 appeared his Life and Character of John Howe, and in 1837 The Christian Correspondent, a collection of some 400 religious letters " by eminent persons of both sexes." His contributions to the Edinburgh Review began in 1839 and were collected in volume form in 1850, 1855 and 1874. His most famous book, The Eclipse of Faith, or a Visit to a Religious Sceptic, was published anonymously in 1852 and went through six editions in three years. It drew a Reply from F. W. Newman, which Rogers answered in a Defence (1854). Two volumes of imaginary letters, Selections from the Correspondence of R. E. H. Grey son (an anagram for his own name), appeared in 1857 and show his style at its best. In 1858 he became principal and professor of theology at the Lancashire Inde- pendent College, where he edited the works of John Howe (6 vols., 1862-63) and wrote for the British Quarterly. He retired in 187 1, and died at Machynlleth on the 21st of August 1877. Rogers was widely read, and as a Christian apologist carried on the traditions of the 18th century as illustrated by Butler.

See Memoir by Dr R. W. Dale, prefixed to the 8th edition of The Supernatural Origin of the Bible Inferred from Itself (the Congrega- tional Lecture for 1873, delivered by Rogers).

ROGERS, HENRY DARWIN (1808-1866), American geologist, was born at Philadelphia on the 1st of August 1808. At the age of twenty-one he was chosen professor of chemistry and natural philosophy at Dickinson College, Pennsylvania. After holding this post for three years, he went to Europe and took up the study of geology. Subsequently he was engaged for twenty-two years in the State surveys of Pennsylvania and New Jersey, his Reports on which were published during the years 1836-41. In 1842 he and his brother William Barton Rogers (1805-1882), who had been similarly occupied in Virginia (his Reports were published in 1838-41, and he wrote also on the connexion between thermal springs and anticlinal axes and faults), brought before the Association of American Geologists and Naturalists their conclusions on the physical structure of the Appalachian chain, and on the eleva- tion of great mountain chains. The researches of H. D. Rogers were elaborated in his final Report on Pennsylvania (1858), in which he included a general account of the geology of the United States and of the coal-fields of North America and Great Britain. In this important work he dealt also with the structure of the great coal-fields, the method of formation of the

strata, and the changes in the character of the coal from the bituminous type to anthracite. In 1857 he was appointed professor of natural history and geology at Glasgow. One of his later essays (1861) was on the parallel roads of Lochaber (Glen Roy), the origin of which he attributed to a vast inundation. He died at Glasgow on the 29th of May 1866.

ROGERS, JAMES EDWIN THOROLD (1823-1890), English economist, was born at West Meon, Hampshire, in 1823. He was educated at King's College, London, and Magdalen Hall, Oxford. After taking a first-class degree in 1846, he was ordained, and was for a few years a curate in Oxford. Subse- quently, however, he resigned his orders. For some time the classics were the chief field of his activity. He devoted himself a good deal to classical and philosophical tuition in Oxford with success, and his publications included an edition of Aristotle's Ethics (in 1865). Simultaneously' with these occupations he had been diligently studying economics, with

the result that in 1859 he was appointed professor of statistics and economic science at King's College, London, a post which he filled till his death. From 1862 to 1867 he also held the position of Drummond professor of political economy at Oxford. During that period he published (in 1866) the first two volumes of his History of Agriculture and Prices in England, dealing with the period 1259-1400, a minute and masterly record of the subject, and the work upon which his reputation mainly rests. Two more volumes (1401-1582) were published in 1882, a fifth and sixth (1583-1702) in 1887, and he left behind him at his death copious materials for a seventh and eighth. In 1868 he published a Manual of Political Economy, and in 1869 an edition of Adam Smith's Wealth of Nations. In 1875 ne collected and edited the Protests of the Lords. An intimate acquaintance with Cobden and John Bright led Rogers to take an active part in politics: he represented Southwark in parliament from 1880 to 1885, and Bermondsey from 1885-86, as an advanced Liberal. In 1888, on the death of Professor Bonamy Price, who had succeeded him at Oxford as professor of political economy, he was re-elected to the post, and held it till his death. Previously (in 1883) he had been appointed lecturer in political economy at Worcester College, Oxford. His latter years were mainly spent at Oxford, where he died on the 12th of October 1890. He was celebrated as a caustic wit and humorist. Of his miscellaneous economic and historical writings, which were

numerous, the most note- worthy is his Six Centuries of Work and Wages, published in 1884. As an economist, Thorold Rogers did much to promote the historical study of his subject.' He was, however, apt to be guided too frequently by political prejudice, and the value of his work suffered frorh his aggressively contentious spirit.

ROGERS, JOHN (1627-c. 1665), English preacher, second son of Nehemiah Rogers, a royalist and Anglican clergyman, was born at Messing in Essex, and became a servitor and student of medicine at King's College, Cambridge. When still a youth the violence of his religious despair led him to attempt suicide and ended in his joining the extreme sect of the Puritans. Deprived of his home in 1642, he walked to Cambridge, and found the college establishment broken up; he nearly starved, but obtained in 1643 a scholastic post in Lord Brudenel's house in Huntingdonshire, and subsequently at St Neot's free school. He became known as a preacher, received Presbyterian ordination in 1647, married a daughter of Sir Robert Payne of Midloe in Huntingdonshire, and obtained the living of Purleigh in Essex. Subsequently he came to London, joined the Independents, became lecturer at St Thomas Apostle's, and attracted attention by the violence of his political sermons. He was appointed preacher to Christ Church Cathedral in Dublin by the parliament in i6sr, and while there served in the field, returning in 1652 to St Thomas Apostle's on account of religious dissensions. In 1653 his parishioners at Purleigh, where he had hitherto managed to retain the living, successfully pro- ceeded against him for non-residence. In the quarrel between the army and the parliament Rogers had naturally sided with the former, and he was one of the first to join the Fifth Mon- archy movement. He approved of the expulsion of the Long Parliament, and addressed two letters to Cromwell on the subject of the new government to be inaugurated, but the establishment of the Protectorate at once threw the Fifth Monarchy men into antagonism. Rogers addressed a warning letter to Cromwell, and boldly attacked him from the pulpit on the 9th of January 1654. Thereupon his house was searched and his papers seized, and Rogers then issued another denuncia- tion against Cromwell, Mene, Tekel, Perez: a Letter lamenting over Oliver Lord Cromwell. On the 28th of March, on which day he had proclaimed a fast for the sins of the rulers, he preached a violent sermon against the protector, which occa- sioned his arrest in July. He confronted Cromwell with great courage when brought before him on the 5th of February 1655, and was imprisoned successively at Windsor and in the Isle of Wight, being released in January 1657. He returned to London, and, being suspected of a conspiracy, was again imprisoned

by Cromwell in the Tower from the 3rd of February 1658 till the 16th

of April. On the protector's death and the downfall of Richard Cromwell, the ideals of the Fifth Monarchy men seemed nearer realization, but Rogers was engaged in political controversy with Prynne and became a source of embarrass- ment to his own faction, which endeavoured to get rid of him by appointing him " to preach the gospel " in Ireland. On the outbreak of Sir George Booth's royalist insurrection, how- ever, he became chaplain in Charles Fairfax's regiment, and served throughout the campaign. He obtained a lectureship at Shrewsbury in October and was in Dublin in January 1660, being imprisoned there by order of the army faction and released subse- quently by the parliament. At the Restoration he withdrew to Holland, studied medicine at Leiden and Utrecht, and obtained from the latter university the degree of M.D. in 1662. He returned to England the same year and resided at Bermondsey, was admitted to the degree of M.D . at Oxford in 1 664, and is supposed, in the absence of further record, to have died soon afterwards.

Besides the pamphlet already cited, Rogers wrote in 1653 Ohel or Bethshemesh, a Tabernacle for the Sun, in which he attacked the Presbyterians, and Sagrir, or Doomesday drawing nigh, from his new standpoint as a Fifth Monarchy man, and was the author of Challah, the Heavenly Nymph (1653); Dod, or Chathan; the Beloved or the Bride- groom going forth for his Bride . . . (1653) ; Prison-born Morning Beams (1654) ; Jegar Sahadutha . . . (1657) ; Mr Prynne 's Good Old Cause stated and stunted 10 Year ago . . . (1609) ; AiairoXireia, a Christian Concertation (1659) ; Mr Harrington's Parallel Unparalleled U659); A Vindication of Sir H. Vane (1659); Disputatio Medica Inaugurates (1662).

Authorities. — Life and Opinions of a Fifth Monarchy Man, by Ed. Rogers (1867), compiled from Rogers's own works; Wood, Athenae Oxoniettses and Fasti; Calendars of State Papers (Domestic). See also " English Ancestry of Washington," Harper's Magazine, xxi. 887 (1891); "John Rogers of Purleigh," The Nation, vol. 53, p.

314 (1891).

ROGERS, JOHN (c. 1500-1555), English Protestant martyr, was born in the parish of Aston, near Birmingham, and was educated at Pembroke Hall, Cambridge, where he graduated B.A. in 1526. Six years later he was rector of Holy Trinity, Queenhithe, London, and in 1534 went to Antwerp as chaplain to the English merchants. Here he met William Tyndale, under whose influence he abandoned the Roman Catholic faith, and married an Antwerp lady. After Tyndale's death Rogers pushed on with his predecessor's English version of the

Old Testament, which he used as far as 2 Chronicles, employing Coverdale's translation (1535) for the remainder and for the Apocrypha. Tyndale's New Testament had been published in 1526. The complete Bible was put out under the pseudonym of Thomas Matthew in 1537; it was printed in Antwerp, and Richard Grafton published the sheets and got leave to sell the edition (1500 copies) in England. Rogers had little to do with the translation, but he contributed some valuable prefaces and marginal notes. His work was largely used by those who prepared the Great Bible (1539-40), out of which in turn came the Bishop's Bible (1568) and the Authorized Version of 1611. After taking charge of a Protestant congregation in Wittenberg for some years, Rogers returned to England in 1548, where he published a translation of Melanchthon's Considerations of the Augsburg Interim. In 1550 he was presented to the crown livings of St Margaret Moyses and St Sepulchre in London, and in 1551 was made a prebendary of St Paul's, where the dean and chapter soon appointed him divinity lecturer. He courage- ously denounced the greed shown by certain courtiers with reference to the property of the suppressed monasteries, and defended himself before the privy council. He also declined to wear the prescribed vestments, donning instead a simple round cap. On the accession of Mary he preached at Paul's Cross commending the " true doctrine taught in King Edward's days," and warning his hearers against " pestilent Popery, idolatry and superstition." Ten days after (16th August 1553), he was summoned before the council and bidden to keep within his own house. His emoluments were taken away and his prebend was filled in October. In January 1554 Bonner, the new bishop of London, sent him to Newgate, where he lay with

John Hooper, Laurence Saunders, John Bradford and others for a year, their petitions, whether for less rigorous treatment or for opportunity of stating their case, being alike disregarded. In December 1554 parliament re-enacted the penal statutes against Lollards, and on January 22nd, 1555, two days after they took effect, Rogers with ten others came before the council at Gardiner's house in Southwark, and held his own in the examination that took place. On the 28th and 29th he came before the commission appointed by Cardinal Pole, and was sentenced to death by Gardiner for heretically denying the Christian character of the Church of Rome and the real presence in the sacrament. He awaited and met death (on the 4th of February 1555 at Smithfield) cheerfully, though denied even an interview with his wife.

Noailles, the French ambassador, speaks of the support given to Rogers by the greatest part of the people: “even his children assisted at it, comforting him in such a manner that it seemed as if he had been led to a wedding.” He was the first Protestant martyr of Mary’s reign, and his friend Bradford wrote that ” he broke the ice valiantly.”

The following divines of the same name may be distinguished: — John Rogers (i572?-i603), Puritan vicar of Dedham, Essex, ” one of the most awakening preachers of the age.” — John Rogers (1610-1680), ejected vicar of Croglin, Cumberland, and the founder of Congregational churches in Teesdale and Weardale, where he evangelized the lead miners. — John Rogers (1679-1729), one of George II. ‘s chaplains, famous for his share in the Bangorian con- troversy (1719), his Vindication of the Civil Establishment of Religion (1728), and his Persuasives to Conformity, addressed to Dissenters (1736) and to Quakers (1747). — John Rogers (i740?-i8i4), leader of the Irish seceding divines, minister of Cahans, Co. Monaghan. — John Rogers (1778-1856), rector of Mawnan, Cornwall, and the owner of the Penrose and Helston estates; a good botanist and mineralogist, and a distinguished Hebrew and Syriac scholar.

ROGERS, JOHN (1829-1904), American sculptor, was born at Salem, Massachusetts, on the 30th of October 1829. In 1848 he became an apprentice in a machine shop at Manchester, New Hampshire, and remained there for about ten years. During the latter part of this time he had done some modelling in clay in his leisure hours, and, having decided to become a sculptor, he spent eight months in Rome and Paris in 1858-59. Becoming discouraged, he returned to America and obtained employment as a draughtsman in the office of the city surveyor of Chicago; but soon afterwards, owing to the favourable reception of his group of small figures, ” The Checker Players,” he resumed sculptural work, confining himself to these small figures, known as ” Rogers Groups,” which had an enormous popular success and were extensively reproduced. The Civil War in America gave him patriotic themes that increased his vogue and prosperity, and in 1863 he became a National Academician. His subjects were familiar scenes and incidents of home life known to the masses, and the reproductions of his groups were sold in the most remote districts as well as in the larger cities. He executed several life-sized statues, including ” General John F. Reynolds ” and a seated figure of Lincoln, both in Philadelphia; but it is by his statuettes that he is best remembered, and these were characterized by sentiment and human interest rather than any genuine artistic feeling. He died at New Haven, Connecticut, on the 27th of July 1904.

ROGERS, ROBERT (1727-1784?), American frontier soldier, was born of Irish parentage in 1727, probably at Methuen, Massachusetts, whence his father, James Rogers (often con- fused with James Rogers, an early settler of Londonderry, N.H.), removed in 1739 to Starktown (now Dunbarton), New Hamp- shire. During the Seven Years' War he raised and commanded a force of militia, known as Rogers' Rangers, which won a wide reputation for its courage and endurance in the campaigns about Lake George. He took part in Wolfe's expedition against Quebec, and on the 4th of October 1759 he destroyed an Abnaki Indian village on the St Francis river near its mouth and killed about 200 of its inhabitants. After the Montreal campaign of 1760, in which he served, he was sent by General Amherst to take possession of the north-western posts, occupied Detroit on the 29th of November, and later returned to the east. In 1763, during the Pontiac uprising, he accom-

panied the relief expedition under James Dalyell to Detroit and took part in the battle of Bloody Bridge on the 31st of July (see Pontiac). Soon after this he went to England, and in 1765 published in London a Concise Account of North America, containing a Description of the Several British Colonies . . . also an Account of the Several Nations and Tribes of Indians (new edition, Albany, 1883). In 1766-68 he was commandant of Michilimackinac. He spent the next few years in England, and after 1772 was in the service of the dey of Algiers. At the beginning of the War of Independence he returned to America, and in spite of his protestations of patriotism was considered by Washington and others a Loyalist spy. He was arrested by agents of Congress, but was paroled. His re- arrest he considered a release from his parole. He then openly joined the British, and under a commission from General Howe organized a regiment of Loyalists which was known as the Queen's Rangers, and which after his return to England in 1776 was commanded by Capt. John G. Simcoe. In 1779 he was commissioned to raise a regiment to be called the King's Rangers, and he returned for a short time to America; but the command of the Rangers, which soon became a part of the garrison of St John's, Quebec, was taken by his brother James (d. 1792), who had formerly served under Robert. Rogers died in London probably in 1784.

_ In addition to the Concise Account of North America, he published his Journals (London, 1765), and is supposed to have written, at least in part, Ponteach, or the Savages of America, a Tragedy (London, 1766). See also his " Journal " in the Diary of the Siege of Detroit in the War with Pontiac (Albany, i860; new edition, 1883), edited by F. B. Hough; and Francis Parkman, Montcalm and Wolfe (2 vols., Boston, 1884).

ROGERS, SAMUEL (1 763-1855), English poet, was born at Newington Green, London, on the 30th of July 1763. His father, Thomas Rogers, was the son of a Stourbridge glass manufacturer, who was also a merchant in Cheapside. Thomas Rogers had a place in the London business, and married Mary, the only daughter of his father's partner, Daniel Radford, becoming himself a partner shortly afterwards. On his mother's side Samuel Rogers was connected with the two well-known Nonconformist divines Philip and Matthew Henry, and it was in Nonconformist circles at Stoke Newington that he was brought up. He was educated at private schools at Hackney and Stoke Newington. He wished to enter the Presbyterian ministry, but at his father's desire he joined the banking business in Cornhill. In long holidays, necessitated by delicate health, Rogers became a diligent student of English literature, par- ticularly in Johnson, Gray and Goldsmith. Gray's poems, he said, he had by heart., He had already made some contri- butions to the Gentleman's Magazine, when in 1786 he published a volume containing some imitations of Goldsmith and an "Ode to Superstition" in the manner of Gray. In 1788 his elder brother Thomas died, and Samuel's business responsi- bilities were increased. In the next year he paid a visit to Scotland, where he met Adam Smith, Henry Mackenzie, the Piozzis and others. In 1791 he was in Paris, and enjoyed a hurried inspection of the art collection of Philippe Egalite at the Palais Royal, many of the treasures of which were later on to pass into his possession. With Gray as his model, Rogers took great pains in polishing his verses, and six years elapsed after the publication of his first volume before he printed his elaborate poem on The Pleasures of Memory (1792). This poem may be regarded as the last embodiment of the poetic diction of the 18th century. Here is carried to the extremest pitch the theory of elevating and refining familiar themes by abstract treatment and lofty imagery. In this art of " raising a sub- ject," as the 18th-century phrase was, the Pleasures of Memory is much more perfect than Thomas Campbell's Pleasures of Hope, published a few years later in imitation. The acme of positive praise for the fashionable serious poetry of the time was given by Byron when he said, " There is not a vulgar line in the poem."

In 1793 his father's death gave Rogers the principal share in the banking house in Cornhill, and a considerable income.

He left Newington Green in the same year and established himself in chambers in the Temple. In his circle of friends at this time were "

Conversation ” Sharp and the artists Flaxman, Opie, Martin Shee and Fuseli. He also made the acquaintance of Charles James Fox, with whom he visited the galleries in Paris in 1802, and whose friendship introduced him to Holland House. In 1803 he moved to 22 St James’s Place, where for fifty years he entertained all the celebrities of London. Flax- man and Stothard had a share in the decorations of the house, which Rogers had almost rebuilt, and now proceeded to fill with pictures and other works of art. His collections at his death realized £50,000. An invitation to one of Rogers’s breakfasts was a formal entry into literary society, and his dinners were even more select. His social success was due less to his literary position than to his powers as a conver- sationalist, his educated taste in all matters of art, and no doubt to his sarcastic and bitter wit, for which he excused himself by saying that he had such a small voice that no one listened if he said pleasant things. Above all, he seems to have had a genius for benevolence. ” He certainly had the kindest heart and unkindest tongue of any one I ever knew,” said Fanny Kemble. He helped the poet Robert Bloomfield, he reconciled Moore with Jeffrey and with Byron, and he relieved Sheridan’s difficulties in the last days of ˆ his life. Moore, who refused help from all his friends, and would only be under obligations to his publishers, found it possible to accept assistance from Rogers. He procured a pension for H. F. Cary, the translator of Dante, and obtained for Wordsworth his sinecure as distributor of stamps.

It is difficult to realize the length of time that Rogers played the part of literary dictator in England. He made his repu- tation by The Pleasures of Memory when Cowper’s fame was still in the making. He became the friend of Wordsworth, Scott and Byron, and lived long enough to give an opinion as to the fitness of Alfred Tennyson for the post of poet laureate. Alexander Dyce, from the time of his first introduction to Rogers, was in the habit of writing down the anecdotes with which his conversation abounded. From the mass of material thus accumulated he made a selection which he arranged under various headings and published in 1856 as Recollections of the Table-Talk of Samuel Rogers, to which is added Porsoniana. Rogers himself kept a notebook, in which he entered impressions of the conversation of many of his distinguished friends — Charles James Fox, Edmund Burke, Henry Grattan, Richard Porson, John Home Tooke, Talleyrand, Lord Erskine, Sir Walter Scott, Lord Grenville and the duke of Wellington. They were published by his nephew William Sharpe in 1859 as Recollec- tions by Samuel Rogers; and Reminiscences and Table-Talk of Samuel Rogers, Banker, Poet, and Patron of the Arts, i? 6j- 1ˆ55 (roc’s)* by G. H. Powell, is an amalgamation of these two

authorities. Rogers held various honorary positions: he was one of the trustees of the National Gallery; and he served on a commission to inquire into the management of the British Museum, and on another for the rebuilding of the Houses of Parliament. !”>”■■

Meanwhile his literary production was slow. A poem of some autobiographical interest, An Epistle to a Friend (Richard Sharp), published in 1798, describes Rogers’s ideal of a happy life. This was followed twelve years later by The Voyage of Columbus (1810), and by Jacqueline (1814), a narrative poem, written in the four-accent measure of the newer writers, and published in the same volume with Byron’s Lara. His reflective poem on Human Life (181 9), on which he had been engaged for twelve years, is written in his earlier manner.

In 18 14 Rogers made a tour on the Continent with his sister Sarah. He travelled through Switzerland to Italy, keeping a full diary of events and impressions, and had made his way to Naples when the news of Napoleon’s escape from Elba obliged him to hurry home. Seven years later he returned to Italy, paying a visit to Byron and Shelley at Pisa. Out of the earlier of these tours arose his last and longest work, Italy. The first part was published anonymously in 1822; the second, with his

name attached, in 1828. The production was at first a failure, but Rogers was determined to make it a success. He enlarged and revised the poem, and commissioned illustrations from J. M. Turner, Thomas Stothard and Samuel Prout. These were engraved on steel in the sumptuous edition of 1830. The book then proved a great success, and Rogers followed it up with an equally sumptuous edition of his Poems (1838). In 1850, on Wordsworth’s death, Rogers was asked to succeed him as poet laureate, but declined the honour on account of his great age. For the last five years of his life he was confined to his chair in consequence of a fall in the street. He died in London on the 18th of December 1855.

A full account of Rogers is given in two works by P. W. Clayden, The Early Life of Samuel Rogers (1887) and Rogers and his Contemporaries (2 vols., 1889). One of the best accounts of Rogers, containing many examples of his caustic wit, is by Abraham Hay ward in the Edinburgh. Review for July 1856. See also the Aldine edition (1857) of his Poetical Works, and the Journals of Byron and of Moore.

ROGERS, WILLIAM (1819-1896), English clergyman and educational reformer, was born in London on the 24th of November 1819, the son of a barrister. Educated at Eton and at Balliol College, Oxford, he

entered Durham University in 1842, to study theology, and was ordained in 1843. In 1845 he was appointed to St Thomas Charterhouse, where he remained for eighteen years, throwing s himself passionately into the work of education of his poor, degraded and often criminal parishioners. He began by establishing a school for ragamuffins in a blacksmith's abandoned shed, and with the generous help of friends he gradually extended its scope until the whole parish was a network of schools. In 1858 he was appointed a member of the Royal Commission to inquire into popular education, and he was returned a representative of the London School Board after the passing of Forster's Act in 1870. In 1863 the bishop of London *gave him the living of St Botolph Bishopsgate. Rogers was also made a prebendary of St Paul's, and in 1857 he had been appointed Chaplain in Ordinary to the Queen. Having largely solved at St Thomas's the problem of elementary educa- tion, at Bishopsgate Rogers tackled the no less difficult one of middle-class schools. He believed in secular education, leaving doctrinal training to parents and clergy. To the cry against " godless education," Rogers impulsively replied, " Hang theology; let us begin "; and his nickname of " Hang-theology Rogers " stuck to him for the rest of his life. The Cowper Street Schools, costing £20,000, were the practical result of his energy. His next great work was the reconstruction of Edward Alleyn's charity at Dulwich. The new college was opened in 1870; new buildings were erected for the lower school, and the lion's share of the work fell upon Rogers. The culmination of his labours was the opening, on his seventy-fifth birthday, of the Bishops- gate Institute, including a hall, with accommodation for 500 people and a reference and lending library. On the same day a portrait and gift of plate was made him at the Mansion House, before a distinguished gathering. Lord Rosebery, then Prime Minister, observed in his speech that though bishoprics and deaneries had not been the rector's lot, there was not a poor Jew in Houndsditch or Petticoat Lane whose face would not brighten when he saw him coming. When he died, on the 19th of January 1896, this might have served as an appropriate epitaph.

ROGIER, CHARLES LATOUR (1800-1885), Belgian states- man, descended from a Belgian family settled in the department of the Nord in France, was born at St Quentin on 17th August 1800. His father, an officer in the French army, perished in the Russian campaign of 181 2; and the family moved to Liege, where the eldest son, Firmin, held a professorship. Charles, after being called to the Bar, founded, in collaboration with his lifelong friends, Paul Devaux and Joseph Lebeau, the journal Mathieu Laensberg (afterwards Le Politique), which by its ardent patriotism and its attacks on the Dutch administra-

tion soon acquired a widespread influence. When the insurrec- tion of 1830 broke out at Brussels, Rogier put himself at the head of 150 Liegeois, and inscribing on his banner the motto,

” Vaincre ou mourir pour Bruxelles,” he obtained arms from a local factory, and marched upon the capital. Here he took his place at once among the leaders of the revolutionary party. His influence saved the town-hall from pillage on 19th September. On the 24th a commission administrative was formed, of which Rogier became president. The energetic measures of this body and of its successor, the gouvernement provisoire, soon freed the greater part of the country from the Dutch troops. Rogier was sent in October to suppress an outbreak among the colliers of Hainaut, and then as delegate of the provisional government to Antwerp, where the citadel still held out for Holland. He suc- ceeded in arranging an armistice, and then, in the exercise of the absolute power with which he was invested, reorganized the entire administration of the city. He sat for Liege in the National Congress, voted for the establishment of a hereditary monarchy, and induced the congress to adopt the principle of an elective second chamber. In the long-drawn debates on the be- stowal of the crown he ranged himself on the side of Louis Philippe : he first supported the candidature of Otto of Bavaria, and on his rejection declared for the due de Nemours. Finally, when Louis Philippe declined the crown on behalf of his son, Rogier voted with the majority for Leopold of Saxe-Coburg. In June 1831 he was appointed governor of the province of Antwerp, a post rendered exceptionally difficult by the continued presence of Dutch troops in the citadel. In October 1832 he was made minister of the interior in the Goblet-Devaux cabinet. In the following June he intervened in a quarrel in the chamber of deputies between Devaux and the Opposition leader, Alexandre Gendebien, claimed a prior right to give satisfaction, and fought a duel, in which he was severely wounded. During his term of office he carried, in the teeth of violent opposition, a law that established in Belgium the first railways on the continent of Europe, and thus laid the foundation of her industrial develop- ment. Owing to dissensions in the cabinet, he retired in 1834, together with Lebeau, and resumed the governorship of Antwerp. On Lebeau’s return to power in 1840, Rogier became minister of public works and education. The proposals that he made in the latter capacity were defeated by the determined opposi- tion of the Clerical party, and on the resignation of the ministry in 1841, Rogier gave his support to a

compromise on the subject of education, which passed into law in 1842. He led the Liberal party in Opposition till 1847, when he formed a cabinet in which he held the ministry of the interior. He at once embarked on a programme of political and economic reform. He took effective steps to remedy the industrial distress caused by the decay of the Flemish linen trade. The limits of the franchise were extended; and as the result of the liberal policy of the govern- ment Belgium alone escaped the revolutionary wave that spread over the Continent in 1848. He passed a law in 1850 organizing secondary education under the control of the State, and giving the clergy only the right of religious instruction. The Clerical party, though unable to defeat this measure, suc- ceeded in shaking the position of the cabinet; and it was finally undermined, after Prince Louis Napoleon's coup d'etat of 1851, by the hostility of the French government, which found its political exiles welcomed by the liberal cabinet at Brussels. Rogier retired in October 1852, but was brought back into office by the liberal reaction of 1857. He again became president of the council arid minister of the interior in a cabinet of which Frere-Orban was the most conspicuous member. The first important measure passed by the ministry was one for the fortification of Antwerp. In i860 the fear of French designs on the independence of Belgium led to a movement of reconciliation with Holland, and inspired Rogier to write the only one of his numerous poems that is likely to survive, his national anthem, " La Nouvelle Brabanconne." Some of the ministers resigning in 1 86 1, on the question of recognizing the kingdom of Italy, the cabinet was reconstructed, and Rogier exchanged the ministry of the interior for that of foreign affairs. In this capacity he achieved a diplomatic triumph in freeing the navigation of the Scheldt, and thus enabling Antwerp to become the second port on the mainland of Europe. Defeated at

Dinant, he sat for Tournai from 1863 till his death. His younger and more energetic colleague, Frere-Orban, gradually over- shadowed his chief, and in 1868 Rogier finally retired from power. He continued, however, to take part in public life, and was elected president of the extraordinary session of the chamber of representatives in 1878. From this time his age, his devoted patriotism and the unassuming simplicity of his life made him the idol of all classes. The fiftieth anniversary of the kingdom of Belgium in 1880, and two years later that of his entry into parliament, were the occasion of demonstrations in his honour. He died at Brussels on the 27th of May 1885, and his remains were accorded a public funeral.

See T. Juste, Charles Rogier, 1800-188$, d'aprhs des documents inedits (Verviers, 1885).

ROGUE, a word which came into use about the middle of the 1 6th century as a slang or ” cant ” term for a vagrant vagabond, answering to the modern “tramp,” and was adopted into English legal phraseology together with ” vagabond ” in the Statute of Elizabeth 1572, ” rogue and vagabond ” and ” incorrigible rogue ” remaining as legal terms for certain classes of persons amenable to the law under the Vagrancy Acts (see Vagrancy). The act of Elizabeth defined ” rogues, vagabonds and sturdy beggars ” as including ” idle persons going about and using subtle craft and unlawful games and all persons whole and mighty in body, but having neither land nor roaster, nor able to give an account how they get their living and all common labourers using loitering and refusing to work for the wages commonly given ” (Sir G. Nicholls’ History of the English Poor Law, ed. 1898 by H. G. Willink, vol, i. 159). The word has now the general meaning of a knave or rascal, though also used (by meiosis) as a term of playful or tender banter and in various special applications {e.g. a ” rogue ” elephant, one who has been driven out by the herd and lives a solitary life, becoming very savage and destructive. Gardeners also apply the word to a plant which does not come true from seed, showing some variation from the type).

The derivation of the word has been much disputed. It has usually been referred to Fr. rogue, meaning proud, arrogant, which is variously derived from the Icelandic hroke, rook, long-winded talker, or Breton rok, proud, haughty; cf. Irish and Gaelic rucas, pride. The New English Dictionary, however, rejects this de- rivation, and considers possible a connexion with another early ” cant ” word ” roger,” a begging vagabond pretending to be a poor university scholar.

ROHAN, the name of one of the most illustrious of the feudal families of France, derived from that of a small town in Morbi- han, Brittany. The family appears to have sprung from the viscounts of Porhoet, and claims connexion with the ancient sovereigns of Brittany. Since the 12th century it held an important place in the history of Brittany, and strengthened its position by alliances with the greatest houses in France. It was divided into several branches, the eldest of which, that of the viscounts of Rohan, became extinct in 1527. Of the younger branches the most famous is that of Guemenee, from which sprang the branches of Montbazon, Soubise and Gie. The seigneurs of Frontenay, an offshoot of this last branch, inherited by marriage the property of the eldest branch of the house. Hercule de Rohan, due de Montbazon (1568-1654) served Henry III. and Henry IV. against the League, and was made by Henry IV. governor of Paris and the Isle of France, and master of the hounds. His grandson, Louis de Rohan- Guemenee, the

chevalier de Rohan, who was notorious for his dissolute life, conspired with the Dutch against Louis XIV. and was beheaded in Paris in 1674. In the 18th century the Soubise branch furnished several prelates, cardinals and bishops of Strassburg, among others the famous cardinal de Rohan, the hero of the affair of the diamond necklace. The seigneurs of Gie, a branch founded by Pierre de Rohan (1453- 1513), a cadet of the branch of Guemenee and marshal of France, were conspicuous on the Protestant side during the wars of religion. Rene de Rohan, seigneur of Pontivy and Frontenay, commanded the Calvinist army in 1570, and

defended Lusignan with great valour when it was besieged by the Catholics (1574-75). His son Henry, the first duke of Rohan, also distinguished himself in the Protestant army. His only child, Marguerite de Rohan, married in 1645 Henri Chabot, a cadet of a great family of Poitoii. This marriage was opposed by her mother, Marguerite de Bethune, who put forward a rival heir called Tancred, whom she claimed to be her son by the duke of Rohan. This Tancred perished in the Fronde in 1649. The property and titles of Henry de Rohan thus passed to the Chabot family, which under the name of Rohan-Chabot produced some distinguished soldiers and a cardinal archbishop of Besancon. The male line of the Rohans is now represented by an offshoot of the Rohan- Guemenee branch.

ROHAN, HENRI, Due de (1 570-1638), French soldier, writer and leader of the Huguenots, was born at the chateau of Blain, in Brittany, in 1579. His father was Rene II., count of Rohan (1550-86), and head of one of the oldest and most distinguished families in France, which was connected with many of the reigning houses of Europe. He was educated by his mother, who was a woman of exceptional learning and force of character. Rohan was by birth the second son, but his elder brother Rene dying young he became the heir of the name. He appeared at court and in the army at the age of sixteen, and was a special favourite with Henry IV., after whom, failing the house of Conde, he might be said to be the natural chief of the French Protestants. Having served till the peace of Vervins, he travelled for a considerable time over Europe, including England and Scotland, in the first of which countries he received the not unique honour of being called by Elizabeth her knight, while in the second he was godfather at Charles I.‘s christening. On his return to France he was made duke and peer at the age of twenty-four, and two years later (1603) married

Marguerite de Bethune, the due de Sully's daughter. He served in high command at the celebrated siege of Julich in 1610, but soon afterwards he fell into active or passive opposition to the government over the religious disputes. For a time, however, he abstained from actual insurrection, and he endeavoured to keep on terms with Marie de' Medici; he even, despite his dislike of De Luynes, the favourite of Louis XIII. , reappeared in the army and fought in Lorraine and Piedmont. It was not till the decree for the restitution of church property in the south threw the Bearnese and Gascons into open revolt that Rohan appeared as a rebel. His authority and military skill were very formidable to the royalists; his constancy and firmness greatly contributed to the happy issue of the war for the Huguenots, and brought about the treaty of Montpellier (1623). But Rohan did not escape the results of the incurable factious- ness which showed itself more strongly perhaps among the French Huguenots than among any other of the numerous armed oppositions of the 17th century. He was accused of lukewarmness and treachery, though he did not hesitate to renew the war when the compact of Montpellier was broken. Again a hollow peace was patched up, but it lasted but a short time, and Rohan undertook a third war (1627-29), the first events of which are recounted in his celebrated Memoirs. This last war (famous for the defence of La Rochelle by Soubise, Rohan's younger brother) was one of considerable danger for Rohan. In spite of all efforts he had in the end to sign a peace, and after this he "made his way quickly to Venice. Here he is said to have received from the Porte the offer of the sovereignty of Cyprus. It is more certain that his hosts of Venice wished to make him their general-in-chief, a design not executed owing to the peace of Cherasco (1631). At Venice he wrote his Memoirs; at Padua, Le Parfait Capitaine. But when France began to play a more conspicuous part in the Thirty Years' War Rohan was again called to serve his lawful sovereign, and- entrusted with the war in the Valtelline. The campaign of 1633 was completely successful, but Rohan was still considered dangerous to France, and was soon again in retirement. At this time he wrote his TraiU du gouvernement des treize cantons. Rohan fought another Valtelline campaign,

but without the success of the first, for the motives of France were now held in suspicion. The unfortunate commander retired to Geneva and thence went to the army of Bernhard of Saxe- Weimar. He received a mortal wound at the battle of Rheinfelden on the 28th of February 1638, and died at the abbey of Konigsfeld, canton Berne, on the 13th of April. His body was buried at Geneva, and his arms were solemnly handed over to the Venetian government. With his daughter Marguerite the honours of the family of Rohan-Gie passed to the

house of Chabot.

Rohan's Memoires sur les choses qui se sont passees en France, &c, rank amongst the best products of the singular talent for memoir writing which the French noblesse of the 16th and 17th centuries possessed. Alike in style, in clearness of matter and in shrewd- ness, they deserve very high praise. The first three books, dealing with the civil wars, appeared in 1644; the fourth, containing the narrative of the Valtelline campaigns, not till 1758. Some suspicions were thrown on the genuineness of the latter, but, it would seem, groundlessly. His famous book on the history and art of war, Le Parfait Capitaine, appeared in 1631 and sub- sequently in 1637 and 1693 (see also Quincy, Art de la guerre, Paris, 1741). It treats of the history and lessons of Caesar's cam- paigns and their application to modern warfare, and contains appendices dealing with phalangite and legionary methods of fighting and the art of war in general. He also wrote an account of his travels, the book on Switzerland mentioned above, De Vinlerit des princes et etats de la chretienti, etc. The Memoirs may be conveniently found in the collection of Michaud and Poujoulat, vol. 19.

See Fauvelet de Foix, Histoire du Due Henri de Rohan (Paris, 1667); Schybergson, Le Due de Rohan et la charte du parti proteslant en France (Paris, 1880); Buhring, Venedig, Gustaf Adolf , und Rohan (Halle, 1885); Laugel, Henri de Rohan, son role politique et militaire (Paris, 1889); Veraguth, Herzog Rohan und seine Mission in Grau- biinden (Berne, 1894); and Shadwell, Mountain Warfare.

ROHAN, LOUIS RENE EDOUARD, Cardinal de (1734- 1803), prince de Rohan-Guemenee, archbishop of Strassburg, a cadet of the great family of Rohan (which traced its origin to the kings of Brittany, and was granted the precedence and rank of a foreign princely family by Louis XIV.), was born at Paris on the 25th of September 1734. Members of the Rohan family had filled the office of archbishop of Strassburg from 1704 — an office which made them princes of the empire and the compeers rather of the German prince-bishops than of the French ecclesiastics. For this high office Louis de Rohan was destined from his birth, and soon after taking orders, in 1760, he was nominated coadjutor to his uncle, Constantine de Rohan- Rochefort, who then held the archbishopric, and he was also consecrated bishop of Canopus. But he preferred the elegant life and the gaiety of Paris to his clerical duties, and had also an ambition to make a figure in politics. He joined the party opposed to the Austrian alliance, which had been cemented by the marriage of the archduchess Marie Antoinette to the dauphin. This party was headed by the due

d'Aiguillon, who in 1 771 sent Prince Louis on a special embassy to Vienna to find out what was being done there with regard to the partition of Poland. Rohan arrived at Vienna in January 1772, and made a great noise with his lavish fetes. But the empress Maria Theresa was implacably hostile to him; not only did he attempt to thwart her policy, but he spread scandals about her daughter Marie Antoinette, laughed at herself, and shocked her ideas of propriety by his dissipation and luxury. On the death of Louis XV. in 1774, Rohan was recalled from Vienna, and coldly received at Paris; but the influence of his family was too great for him to be neglected, and in 1777 he was made grand almoner, and in 1778 abbot of St Vaast. In 1778 he was made a cardinal on the nomination of Stanislaus Poniatowski, king of Poland, and in the following year succeeded his uncle as archbishop of Strassburg and became abbot of Noirmoutiers and Chaise-Dieu. His various preferments brought him in an income of two and a half millions of livres; yet the cardinal was restless and unhappy until he should be reinstated in favour at court and had appeased the animosity which Marie Antoinette felt against him. In pursuit of this object he fell into the hands of a gang of intriguers, the comtesse de Lamotte, the notorious Cagliostro and others, whose actions

form part of the " affair of the diamond necklace." This story is disentangled elsewhere (see Diamond Necklace), and diverging views are still taken of it. Rohan certainly was led to believe that his attentions to the queen were welcomed, and that his arrangement by which she received the famous necklace was approved. He was the dupe of others, and at the trial in 1786 before the parlement his acquittal was received with universal enthusiasm, and regarded as a victory over the court and the unpopular queen. He was deprived, however, of his office as grand almoner and exiled to his abbey of Chaise-Dieu. He was soon allowed to return to Strassburg, and his popularity was shown by his election in 1789 to the states-general by the clergy of the bailliages of Haguenau and Weissenburg. He at first declined to sit, but the states-general, when it became the national assembly, insisted on validating his election. But as a prince of the church in January 1791 he refused. to take the oath to the constitution, and went to Ettenheim, in the German pajt of his diocese. In exile his character improved, and he spent what wealth remained to him in providing for the poor clergy of his diocese who had been obliged to leave France; and in 1801 he resigned his nominal rank as archbishop of Strassburg. On the 17th of February 1803 he

died at Ettenheim. See the MSmoires of his secretary, the abbe 1 Georgel, of the baroness d'Oberkirch, of Beugnot, and of Madame Campan; and works cited under Diamond Necklace.

ROHILKHAND, a tract in the United Provinces of India. The name is associated with the Rohilla tribe (q.v.), but in its historical significance it covers an area almost coincident with the modern division of Bareilly, for which it is a common alternative title. This division has an area of 10,720 sq. m., and comprises the districts of Bareilly, Bijnor, Budaun, Mora- dabad, Shahjahanpur and Pilibhit." Pop. (1901) 5,479,688. Political control over the state of Rampur is exercised by the commissioner for the division.

ROHILLA (a Pushtu word for ” mountaineer “), a tribe of Afghan marauders, who, towards the beginning of the 18th century, conquered a district of Hindostan, giving it the name of Rohilkhand, which still survives as an alternative title of the Bareilly division of the United Provinces. The Rohillas are chiefly notable for their association with Warren Hastings, which formed one of the main counts in his impeachment. Having been driven into the mountains by the Mahrattas, they had appealed for aid to Shuja-ud-Dowlah, wazir of Oudh, and ally of the British. The wazir promised to assist them in return for a sum of money; but when the Mahrattas were driven off the Rohilla chiefs refused to pay. The wazir then decided to annex their country, and appealed to Hastings for assistance, which was given in return for a sum of forty lakhs of rupees. Hastings justified his action on the ground that the Rohillas we?e a danger to the British as uncovering the flank of Oudh; and while he would never involve the company in an unjust war, neither did he desire an unprofitable one. The Rohillas were defeated by Colonel Champion in April 1774, and the majority of them fled across the Ganges; but the charges of destroying a nation, brought against Hastings by Burke and Macaulay, were greatly exaggerated. The Rohillas were never a nation, but consisted of a small body of Mahommedans, who had imposed an alien rule upon a million Hindus; and one of their chiefs was left in possession of a tract which now forms the state of Rampur (q.v.).

See Charles Hamilton, History of the Rohilla Afghans (1787) ; and Sir J. Strachey, Hastings and the Rohilla War (Oxford, 1892).

ROHLFS, FRIEDRICH GERHARD (1 831-1896), German explorer of the Sahara, son of a physician, was born at Vege- sack, near Bremen, on the 14th of April 1831. After the ordinary course at the gymnasium of Osnabriick he entered the Bremen corps in 1848, and took part as a volunteer in the Schleswig-Holstcin campaign, being made an officer after the battle of Idstedt (July 1850). He became a medical student at the universities of Heidelberg, Wurzburg and then Got- tingen; but his natural inclination was for travelling, and in 1855 he went to Algeria and enlisted in the Foreign Legion.

He took part in the conquest of Kabylia, and was decorated for bravery as Chevalier of the Legion of Honour. Having made himself master of Arabic and gained a thorough knowledge of native customs, Rohlfs went to Morocco in 1861; presenting himself as a Mussulman, he gained the favour of the enlightened sherif of Wazzan, and was thus enabled to travel over the length and breadth of the country. He then entered the Sahara and traversed the entire extent of the Wad

Draa, being the second European (the first being Rene Caillie) to visit Tafilet. On leaving Tafilet he was robbed by his guides and left for dead; but two marabouts charitably succoured him and he was able to reach Algeria. When scarcely re- covered from his wounds he started once more for the Sahara (August 1862) by way of Algeria. Compelled by tribal dis- turbances to turn back, he went to Tangier and thence in March 1864 made a fresh start. Crossing the Atlas by an eastern route he again visited Tafilet, and thence made his way across the desert to the oasis of Tuat, which he was the first European to describe. Returning by Ghadanies and Tripoli he spent three months in Germany, and then (March 1865) went back to Tripoli, intending to explore the highlands of the Ahaggar; being prevented, however, by a war among the Tuareg, he went from Ghadames to Murzuk, where he spent five months, and thence across the Sahara to Bornu, mapping en route the oasis of Kawar. Rohlfs passed through Mandara and its ancient capital Mora, and struck out for the coast of the Gulf of Guinea. He reached the Benue by way of the Bauchi highlands, and descended that river to its confluence with the Niger, which he ascended to Rabba. Thence he made his way on horseback to Lagos, reaching Liverpool on tnc 2nd of July 1867. In the following year he accompanied the British expedition against Theodore of Abyssinia, and on his return went once more to Tripoli, whence he traversed the Cyrenaica, reaching Egypt by way of the oasis of Siwa (1869). Returning home, he married and settled down in Weimar. He did not rest long, however, for in 1873-74 he took command of an expedition sent by the Khedive Ismail into the Libyan Desert, which made investigations of great value to science. In 1878 Rohlfs and Dr Stecker were commissioned by the German African Society to go to Wadai. They succeeded in reaching the oasis of Kufra, one of the chief centres of the Senussites, but being attacked by the Arabs, they were obliged to retreat, making their way to the coast at Benghazi, reached in October 1879. In 1880 Rohlfs accompanied Dr Stecker in an exploring expedition to Abyssinia; but after delivering a letter from the German emperor to the Negus, he returned to Europe. In 1885, when the rivalry between the British and Germans in East Africa was very, keen, Prince Bismarck appointed Rohlfs consul at Zanzibar, which island Bismarck desired to secure for Germany. Rohlfs, untrained in diplomacy, was no match for Sir John Kirk, the British Agent, and he was soon recalled, and did not again visit Africa. He died at Rungsdorf, near Bonn, on the 2nd of June 1896. Rohlfs visited many regions not before traversed by Europeans, and the value of his work was recognized in 1868 by the Royal Geographical Society, which bestowed on him the Patron’s Medal.

Accounts of each of his expeditions, and other works on Africa were published by Rohlfs, including Mein Erster Aufenthalt in Marokko (Bremen, 1873; English edition, Travels in Morocco, London, 1874); Reise durch Marokko (Bremen, 1868); Quer durch Afrika (Leipzig, 1874-75); Von Tripolis nach Alexandrien (Bremen, 1871); Expedition zur Erforschung der Libyschen Wiiste (Cassel, 1875-76); Kufra: Reise von Tripolis nach der Oase Kufra (Leipzig, 1881); Land und Volk in Afrika (Bremen, 1870); Quid novi ex Africa? (Cassel, 1886). See also a biographical notice by Dr W. Wolkenhauer in the Deutsche geo. Blatter for 1896.

ROHTAK, a town and district of British India, in the Delhi division of the Punjab. The town, which is of great antiquity, became the headquarters of a British district in 1824. Viewed from the sandhills to the south, Rohtak, with its white mosque in the centre, a fort standing out boldly to the east, is striking and picturesque. It has a station on the Southern Punjab

railway, 44 m. N.W. of Delhi. Pop. (1901) 20,323. It is an important trade centre, with factories for ginning and pressing cotton, and a speciality in muslin turbans.

The district of Rohtak has an area of 1797 sq. m. It is situated in the midst of the level tableland between the Jumna and the Sutlej, forming one unbroken plain of hard clay copi- ously interspersed with light yellow sand, and covered in its wild state by a jungle of scrubby brushwood. The only natural reservoir for its drainage is the Najafgarh jhil, a marshy lake lying within the boundaries of Delhi. The Sahibi, a small stream from the Ajmere hills, traverses a corner of the district, and the northern portions are watered by the Rohtak and Butana branches of the Western Jumna canal; but the greater portion of the central plain, comprising about two-thirds of the district area, is entirely dependent upon the uncertain rainfall. The climate, though severe in point of heat, is gener- ally healthy; the rainfall averages annually about 20 in.

The population in 1901 was 630,672, showing an increase of 6-8% in the decade. The principal crops are millets, wheat, barley, pulses, cotton and sugar-cane. The district is traversed by the line of the Southern Punjab railway from Delhi to Jind, and also touched by the Rewari-Ferozepore branch of the Rajputana railway. It is peculiarly

exposed to drought, suffering in the famine of 1896-97, and yet more severely in 1899-1900, when the highest number of persons relieved was 33,632 in March 1900.

Rohtak was formerly included within the region known as Hariana. The district, with the other possessions of Sindhia west of the Jumna, passed to the British in 1803. Until 1832 Rohtak was under the administration of a political agent, resident at Delhi, but in that year it was brought under the general regulations and annexed to the North-Western Pro- vinces. The outbreak of the Mutiny in 1857 led to its abandon- ment, when the mutineers attacked and plundered Rohtak, destroying every record of administration. It was not until after the fall of Delhi that the authority of the British govern- ment was permanently restored. Rohtak was then transferred to the Punjab.

ROJAS ZORRILLA, FRANCISCO DE (1607-c. 1660), Spanish dramatist, was born at Toledo; the only circumstance recorded of his life is that he became a knight of Santiago in 1644. The exact date of his death is unknown. His plays were published in 1640-45; the best of his dramatic compositions, Del Rey abajo Ninguno, is not included in the collection and was printed separately under the title of Garcia del Castanar. Of his other pieces, apart from their intrinsic merit, an international interest attaches to No hay padre siendo rey, which was borrowed by Rotrou for his Venceslas; to Donde hay agravios no hay zelos and the Amo criado, which were imitated by Scarron in his Jodelet Soufflete and Maitre Valet; to Entre Bobos anda el juego, the source of Thomas Corneille's Don Bertrand de Cigarral, as well as of Scarron's Don Japhel d'Armenie; to Obligados y ofendidos, from which are derived Les Genereux Ennemis by Boisrobert, Les Illustres Ennemis by Thomas Corneille, and Scarron's Ecolier de Salamanque; and to La traicidn busca el castigo, upon which are based Vanbrugh's False Friend and Le Sage's Trattre puni. Rojas Zorrilla's power of conveying a tragic impression is manifest in Garcia del Castanar; his chief defect is his persistent preciosity of diction.

ROKITANSKY, CARL, Freiherr von (1804-1878), the founder of the Vienna school of pathological anatomy, was born on the 19th of February 1804 at Koniggratz in Bohemia. He studied medicine at Prague and at Vienna, graduating at the latter place in 1828. Soon afterwards he became assistant to Johann Wagner, the professor of pathological anatomy, and suc- ceeded him in 1834 as prosector, being at the same time made extraordinary professor. It was not until ten years later (1844) that he reached the rank of full professor. To his duties as a teacher he added in 1847 the onerous office of medico-legal anatomist to the city, and from 1863 he filled an influential

office in the ministry of education and public worship, wherein he had to advise on all routine matters of medical teaching,

including patronage. A seat in the upper house of the Reichs- rath rewarded his public labours in 1867, and on his retirement from all his offices in 1874 he was made a commander of the Order of Leopold. He joined the Imperial Academy of Sciences as a member in 1848, and became its president in 1869. He was president also of the medical society of the Austrian capital and an honorary member of many foreign societies. On his retire- ment at the age of seventy his colleagues celebrated the occasion by a function in the aula of the university, where his bust was unveiled. In his leave-taking speech he said that work had always been a pleasure to him and pleasures mostly a toil. His death in Vienna on the 23rd of July 1878 elicited many genuine expressions of affection and of esteem for his upright character. Two of his sons became professors at Vienna, one of astronomy and another of medicine, while a third gained distinction on the lyric stage.

With Rokitansky's name is associated the second great period of the medical school of Vienna, its first success having been identi- fied with the liberal patronage of it by Maria Theresa and with the fame of Van Swieten, whom the empress had attracted thither from Leiden. The basis of its second reputation was morbid anatomy, together with the precision of clinical diagnosis de- pendent thereon, and associated with the labours of Rokitansky's lifelong friend, Joseph Skoda (1805-1881). The anatomical vogue had begun under Wagner while Rokitansky was still a student ; but it reached its highest point while the latter was assistant in the dead-house and afterwards prosector and professor. The enthusiasm for the post-mortem study of disease brought one very serious con- sequence at the outset, in the enormous increase of the death- rate from puerperal fever in the lying-in wards of the general hospital. A comparison between the slight mortality in the wards that were afterwards reserved for the training of midwives and the excessive mortality in those set apart for the training of students proved that the cause was the conveyance of infection from the dead-house by the hands of the latter. # The precautions introduced by I. P. Semmelweiss in 1847 proved adequate in removing that grave reproach from the study of morbid anatomy. Another and more lasting consequence of the assiduous pursuit of post-mortem study, counterbalancing somewhat the advantage of a more precise and localized diagnosis, was the loss of faith in the power of drugs to remedy the textural changes — the so-called " nihilism " of the Vienna school. The immediate outcome of Rokitansky's close application to the work of the dead-house was his Handbuch der pathologischen

Anatomie (1842-46), in 3 vols., of which the first was published last. The value of the work lies in the second and third volumes, containing succinct descriptions of the visible changes and abnormalities in the several organs and parts of the body. Whenever Rokitansky touched the vital problems of general path- ology, as he did in the postponed first volume, he revealed a meta- physical bent, which was strong in him behind all his undoubted powers of outward observation and accurate description. Being a few years too soon to profit by the microscopic movement which led to the cellular pathology, he endeavoured to reconcile the old humoral doctrine with his anatomical observations, and to read a new meaning into the doctrine of the various dyscrasias. In 1862 he entered into possession of a new pathological institute, in which he found means, for the first time, to display his extensive collection of specimens in a museum. Although he had no direct share in the newer developments of pathology, he was far from indifferent or reactionary towards them; indeed, the laboratories and chairs for microscopic and experimental pathology and for pathological chemistry were warmly encouraged and aided by him.

Next to his Handbuch, of which the Sydenham Society published an English translation in 4 vols. (1849-52), his most important writings were four memoirs in the Denkschriften of the Vienna Academy of Sciences (on the anatomy of goitre, cysts, diseases of arteries, and defects in the septa of the heart), the last as late as 1875. Other papers of less importance brought up the total of his writings to thirty-eight, including three addresses of a philosophical turn, on ” Freedom of Inquiry ” (1862), ” The Independent Value of Knowledge ” (1867) and ” The Solidarity of Animal Life ” (1869).

ROLAND [Roland de la Platiere], JEAN MARIE (1734- I 793)> French statesman, was born at Thizy on the 18th of February 1734. He received a good education, and early formed the studious habits which remained with him through life. Proposing to seek his fortune abroad, he went on foot to Nantes, but was there prostrated by an illness so severe that all thoughts of emigration were perforce abandoned. For some years he was employed as a clerk; thereafter he joined a relative who was inspector of manufactures at Amiens, and he himself speedily rose to the position of inspector. To these two employments may be ascribed those qualities of assiduity and

accuracy, and that familiarity with the commerce of the country, which distinguished his public career. In 1781 he married Manon Jeanne Phlipon (1754-1793), and the name of Madame Roland is famous in history. She was the daughter of Gratien Phlipon, a Paris engraver, who was ambitious, speculative and nearly always poor. From her early years she showed great aptitude for study, an ardent and enthusiastic spirit, and un- questionable talent. She was to a considerable extent self- taught; and her love of reading made her acquainted first with Plutarch — a passion for which author she continued to cherish throughout her life — thereafter with Bossuet, Massillon, and authors of a like stamp, and finally with Montesquieu, Voltaire and Rousseau. These studies marked stages of her development, and as her mind matured she abandoned the idea of a convent which for a year or two she had entertained, and added to the enthusiasm for a republic which she had imbibed from her earlier studies not a little of the cynicism and the daring which the later authors inspired. She almost equalled her husband in knowledge, and infinitely excelled him in talent and in tact. Through and with him she exercised a singularly powerful in- fluence over the destinies of France from the outbreak of the Revolution till her death.

For four years after their marriage Roland lived at Amiens, he being still an inspector of manufactures; but his knowledge of commercial affairs enabled him to contribute articles to the EncyclopMie Nouvelle, in which, as in all his literary work, he was assisted by his wife. On their removal to Lyons the in- fluence of both became wider and more powerful. Their fervent political aspirations could not be concealed, and from the be- ginning of the Revolution they threw in their lot with the party of advance. The Courrier de Lyon contained articles the success of which reached even to the capital and attracted the attention of the Parisian press. They were from the pen of Madame Roland and were signed by her husband. A corre- spondence sprang up with Brissot and other friends of the Revolution at headquarters. In Lyons their views were publicly known; Roland was elected a member of the municipality, and when the depression of trade in the south demanded representa- tion in Paris he was deputed by the council of Lyons to ask the Constituent Assembly that the municipal debt of Lyons, which had been contracted for the benefit of the state, should be re- garded as national debt. Accompanied by his wife, he appeared in the capital in February 1791. He remained there until September, frequenting the Society of the Friends of the Con- stitution, and entertaining deputies of the most advanced opinions, especially those who later became the leading Giron- dists. Madame Roland took an active part in the political discussions in these reunions.

In September 1791, Roland's mission being executed, they returned to Lyons. Meanwhile the inspectorships of manu- factures had been abolished; he was thus free; and they could no longer remain absent from the centre of affairs. In December they again reached Paris. Roland became a member of the Jacobin Club. They had made many and influential friends in advance, and Madame Roland's salon soon became the rendezvous of Brissot, Petion, Robespierre and other leaders of the popular movement, above all of Buzot, whom she loved with platonic enthusiasm. In person Madame Roland was attractive though not beautiful; her ideas were clear and far-reaching, her manner calm, and her power of observation extremely acute. It was almost inevitable that she should find herself in the centre of political aspirations and presiding over a company of the most talented men of progress. The rupture had not yet been made evident between the Girondist party and that section still more extreme, that of the Mountain. For a time the whole left united in forcing the resignation of the ministers. When the crisis came the Girondists were ready, and on the 23rd of March 1792 Roland found himself appointed minister of the interior. As a minister of the crown Roland exhibited a bourgeois brusqueness of manner and a remarkable combination of political pre- judice with administrative ability. While his wife's influence

could not increase the latter, it was successfully exerted to foment and embitter the former. He was ex officio excluded from the Legislative Assembly, and his declarations of policy were thus in writing — that is, in the form in which she could most readily exert her power. A great occasion was invented. The decrees against the emigrants and the non-juring clergy still remained under the veto of the king. A letter was penned by Madame Roland and addressed by her husband to Louis. It remained unanswered. Thereupon, in full council and in the king's presence, Roland read his letter aloud. It contained many and terrible truths as to the royal refusal to sanction the decrees and as to the king's position in the state; but it was inconsistent with a minister's position, disrespectful if not insolent in tone. Roland's dismissal followed. Then he completed the plan: he read the letter to the Assembly; it was ordered to be printed, became the manifesto of disaffection, and was circulated everywhere. In the demand for the rein- statement of the dismissed ministers were found the means of humiliation, and the prelude to the dethronement, of the king.

After the insurrection of the 10th of August, Roland was recalled to power, one cf his colleagues being Danton. But now he was dismayed by the progress of the Revolution. He was above all a provincial, and was soon in opposition to the party of the Mountain, which aimed at

supremacy not only in Paris but in the government as well. His hostility to the insurrectional commune of Paris, which led him to propose transferring the government to Blois, and his attacks upon Robespierre and his friends rendered him very unpopular. His neglect to seal the iron chest discovered in the Tuileries, which contained the proofs of Louis XVI.'s relations with the enemies of France, led to the accusation that he had destroyed a part of these documents. Finally, in the trial of the king he demanded, with the Girondists, that the sentence should be pronounced by a vote of the whole people, and not simply by the Convention. He resigned office on the 23rd of January 1793, two days after the king's execution.

Although now extremely unpopular, the Rolands remained in Paris, suffering abuse and calumny, especially from Marat. Once Madame Roland appeared personally in the Assembly to repel the falsehoods of an accuser, and her ease and dignity evoked enthusiasm and compelled acquittal. But violence succeeded violence, and early on the morning of the 1st of June she was arrested and thrown into the prison of the Abbaye. Roland himself escaped secretly to shelter in Rouen. Released for an hour from the Abbaye, she was again arrested and thrown among the horrors of Sainte-Pelagie. Finally, she was transferred to the Conciergerie. In prison she won the affections of the guards, and was allowed the privilege of writing materials and the occasional visits of devoted friends. She there wrote her Appel Al'impartiale posterity, those memoirs which display a strange alternation between self-laudation and patriotism, between the trivial and the sublime. On the 8th of November 1793 she was conveyed to the guillotine. Before yielding her head to the block, she bowed before the clay statue of Liberty erected in the Place de la Revolution, uttering her famous apostrophe — "O Liberty! what crimes are committed in thy name! " When Roland heard of his wife's condemnation, he wandered some miles from his refuge in Rouen; maddened by despair and grief, he wrote a few words expressive of his horror at those massacres which could only be inspired by the enemies of France, protesting that " from the moment when I learned that they had murdered my wife I would no longer remain in a world stained with enemies." He affixed the paper to his breast, and unsheathing a sword-stick fell upon the weapon, which pierced his heart, on the 10th of November 1793.

Madame Roland's Memoires, first printed in 1820, have been edited among others by P. Faugere (Paris, 1864), by C. A. Dauban (Paris, 1864), by J. Claretie (Paris, 1884), and by C. Perroud (Paris, 1905). Some of her Lettres inedites have been published by C. A. Dauban (Paris, 1867), and a critical edition of her Lettres by

C. Perroud (Paris, 1900-2). See also C. A. Dauban, tiude sur Madame Roland et son temps (Paris, 1864) ; V. Lamy, Deux femmes celebres, Madame Roland et Charlotte Cor day (Paris, 1884) ; C. Bader, Madame Roland, d'apres des lettres et des manuscrits inedits (Paris, 1892); A. J. Lambert, Le manage de Madame Roland, trois annees de correspondance amour euse (Paris, 1896); Austin Dobson, Four Frenchwomen (London, 1890); and articles by C. Perroud in the review La Revolution francaise (1896-99).

ROLAND, LEGEND OF. The legend of the French epic hero Roland (transferred to Italian romance as Orlando) is based on authentic history. Charlemagne invaded Spain in 778, and had captured Pampeluna, but failed before Saragossa, when the news of a Saxon revolt recalled him to the banks of the Rhine. On his retreat to France through the defiles of the Pyrenees, part of his army was cut off from the main body by the Basques, who had ambushed in a narrow defile, and now drove the rear- guard into a valley where it was surrounded and entirely destroyed. The Basques, after plundering the baggage, made good their escape, favoured by the darkness and by their knowledge of the ground. The incident is related in the Annales (Pertz i. 159) commonly ascribed to Einhard, and with more detail in Einhard's Vita Karoli (cap. ix.; Pertz ii. 448), where the names of the leaders are given. " In this battle were slain Eggihard, praepositus of the royal table; Anselm, count of the palace; and Hruodland, praefect of the Breton march. . . ." The scene of the disaster is fixed by tradition at Roncevaux, on the road from Pampeluna to Saint Jean Pied de Port. There is no foundation in this story for the fiction of the twelve peers, which may possibly arise from a still earlier .tradition. In 636-37, according to the Chronicles of Fredegarius (ed. Krusch p. 159), twelve chiefs, whose names are given, were sent by Dagobert against the Basques. The expedition was successful, but in an engagement fought in the valley of Subola, or Robola, identified with Mauleon, which is not far from Roncevaux, the Duke Harembert, with other Frankish chiefs, was slain. Later fights in the same neighbourhood and under similar circum- stances are related in 813 {Vita Hludowici; Pertz ii. 616), and especially in 824 (Einhard's Annales; Pertz i. 213). These incidents no doubt served to strengthen the tradition of the disaster to Charlemagne's rear-guard in 778, the importance of which was perhaps underrated by the Frankish historians and was certainly magnified in popular story. The author of the Vita Hludowici, writing sixty years after the battle of Roncevaux,

thought it superfluous to give the names of the fallen chiefs, as being matter of common report.

Growth of the Legend. — The choice of Roland or Hruodland as the hero of the story probably points to the borders of French Brittany as the home of the legend. The exaggeration of a rear-guard action into a national defeat; the substitution of a vast army of Saracens, the enemies of the Frankish nation and the Christian faith, for the border tribe mentioned by Einhard; 1 and the vengeance inflicted by Charlemagne, where in fact the enemy escaped with complete impunity — all are in keeping with the general laws of romance. Charlemagne himself appears as the ancient epic monarch, not as the young man he really was in 778. The earliest version of the legend which we possess dates no earlier than the nth century, but there is abundant evidence of the existence of a continuous tradition dating from the original event, although its methods of transmission remain a vexed question. Roncevaux lay on the route to Compostella, and the many pilgrims who must have passed the site from the middle of the 9th century onwards may have helped to spread the story. Whether the actual cantilena Rollandi chanted by Taillefer at the battle of Hastings (William of Malmesbury, De gestis regum angl. iii. 242, and Wace, Brut. ii. 11, 8035 seq.) was any part of the existing Chanson de Roland cannot be stated, but the choice of the legend on this occasion by the trouvere is proof of its popularity.

The oldest extant forms of the legend are: (a) chapters xix.-xxx. of the Latin chronicle, known as the Pseudo-Turpin,

1 It is noteworthy, however, that an Arab historian, Ibn-al-Athlr, states that Charles's assailants were the Arabs of Saragossa, by whom he had been originally invited to interfere in Spain.

which purports to be the work of Turpin, archbishop of Reims, who died about 800, but probably dates from the 12th century; (b) Carmen de proditione Guenonis, a poem in Latin distichs; and © the Chanson de Roland, a French chanson de geste of about 4000 lines, the oldest recension of which is in the Bcdleian Library, Oxford (MS. Digby 23). It is in assonanced tirades, of unequal length, many of them terminated with the refrain Aoi. This MS. was written by an Anglo-Norman scribe about the end of the 12th century, and is a corrupt copy of a text by a French trouvere of the middle of the nth century. It con- cludes with the words: " Ci fait la geste, que Turoldus declinet." There was a Turold (d. 1098) who was abbot of Peterborough; another was tutor to William the Conqueror and died in 1035. Even if we could identify this personage, we cannot tell whether he was the poet,

the minstrel or the scribe of the MS., but it seems likely that he was merely the scribe. The poem, which was first printed by Francisque Michel (Oxford, 1837), is the finest monument of the heroic age of French epic. In its fundamental features it evidently dates back to the reign of Charlemagne, who is not represented as the capricious despot of the later chansons de geste, but as governing in accordance with Frankish custom, accepting the counsel of his barons, and carrying out the curious procedure of Frankish law. Roland represents the monarchical idea, and was evidently, in its primitive form, written before the feudal revolts which weak- ened the power of Charlemagne's successors. Its unity of conception, the severity and conciseness of the language, the directness, vividness and sobriety of the narrative, place it far above the chansons of later trouveres, with their wordiness and their loose, episodic construction. With the exception of the small place allotted to Aide, women have practically no place in the story, and the romantic element is thus absent. Roland's master-passions are daring and an exaggerated con- ception of honour, the extravagance of which is the cause of the disaster. His address to Oliver before the battle is typical of the warlike spirit of the poem: —

" Notre empereur qui ses Francs nous laissa, Tels vingt mille hommes a pour nous mis a part, Qu'il sait tres bien que pas un n'est couard. Pour son seigneur grands maux on souffrira, Terribles froids, grands chauds endurera, Et de son sang, de sa chair on perdra! Brandis ta lance ; et moi, ma Durendal, Ma bonne epee, que le Roi me donna. Etsi je meurs, peut dire qui l'aura C'etait l'epee d'un tres noble vassal."

(tr. Petit de Julleville xi. n 14 seq.)

The Story as related in the Chanson de Roland. — Charlemagne, after fighting for seven years in Spain, had conquered the whole country with the exception of Saragossa, the seat of the Saracen king Marsile. He was encamped before Cordova when he received envoys from the Saracen king, sent to procure the evacuation of Spain by the Franks through false offers of sub- mission. Charlemagne held a council of his barons, Naimes of Bavaria, Roland, Oliver, Turpin, Ogier, Ganelon and the rest. Roland, the emperor's nephew, was eager for war; the peace party was headed by Ganelon of Mayence. 2 The Franks were weary of campaigning, and Ganelon's counsels won the day. At the suggestion of Roland, Ganelon, who was his stepfather, was entrusted with the embassy to Mars-.ile — a sufficiently perilous errand, since two former envoys had been beheaded by the Saracens. Ganelon, inspired by hatred of Roland and Oliver, agreed with Marsile to betray Roland and his com- rades for ten mule-loads of gold. He then returned to

Charle- magne bearing Marsile's supposed assent to the Frankish terms. The retreat began. Roland, at. Ganelon's instigation, was placed in command of the rear-guard. With him were the rest of the famous twelve peers, 3 his companions-in-arms, Oliver, Gerin, Gerier, Oton, Berengier, Samson, Anseis, Girard

2 Ganelon may perhaps be identified with Wenilo, archbishop of Sens, whose treason against Charles the Bald is related id the Annales Bertiniani (anno 859).

3 The lists vary in different texts.

de Roussilion, Engelier the Gascon, Ivon and Ivoire, and the flower of the Frankish army. They had nearly reached the summit of the pass when Oliver, who had mounted a high rock, saw the advancing army of the Saracens, 400,000 strong. In vain Oliver begged Roland to sound his horn and summon Charlemagne to his aid. A description of the battle, a series of single combats, follows. Oliver, with his sword Hauteclere, rivalled Roland with Durendal. After the first fight, a second division of the pagan army appears, then a third. Roland's army was reduced to sixty men before he consented to sound his horn. Presently all were slain but Roland and Oliver, Turpin and another. Finally, when the Saracens, warned of the return of Charlemagne, had retreated, Roland alone sur- vived on the field of battle. With a last effort he blew his horn once more, and heard before he died the sound of Charle- magne's battlecry of " Montjoie." Charlemagne pursued the enemy, and destroyed their army. The raising of a second army by Baligant, the emir of Babylon, and its defeat by the emperor, who slays Baligant in single combat, is obviously an interpolation in the original narrative. The trouvere then relates the return of the Franks, the burial of the heroes of Roncevaux, and, at great length, the trial of Ganelon at Aix, his execution, and that of his thirty kinsmen, and the death of Aide, Roland's betrothed and Oliver's sister, when she heard the news of Roland's death. The trial of Ganelon is one of the most curious parts of the story, providing, as it does, a full account of the Frankish criminal procedure.

Relations between the Earlier Forms of the Legend. — The Pseudo-Turpin represents a different recension of the story, and is throughout clerical in tone. It was the trouvere of the Chanson de Roland who developed the characters into epic types; he invented the heroic

friendship of Roland and Oliver, the motives of Ganelon's treachery, and many other details. The famous fight' between Roland and the giant Ferragus appears in the Pseudo-Turpin (chapter xviii.), but not in the poem. The Chanson de Roland presupposes the existence of a whole cycle of epic poetry, probably in episodic form; it contains allusions to many events outside the narrative, some of which can be explained from other existing chansons, while others refer to narratives which are lost. In lines 590-603 of the poem Roland gives a list of the countries he has conquered for Charles, from Constantinople and Hungary on the east to Scotland on the west. Of most of these exploits no trace remains in extant poems, but his capture of Bordeaux, of Nobles, of Carcassonne, occur in various compilations. Roland was variously repre- sented by the romancers as the son of Charlemagne's sister Gilles or Berte and the knight Milon d'Anglers. The romantic episode of the reconciliation of the pair with Charlemagne through Roland's childish prattle {Berte et Milon) is probably foreign to the original legend. In the Scandinavian versions Roland is the son of Charlemagne and his sister, a recital prob- ably borrowed from mythology. His enfances, or youthful exploits, were, according to Aspremont, performed in Italy against the giant Eaumont, but in Girais de Viane his first taste of battle is under the walls of Vienne, where Oliver, at first his adversary, becomes his brother-in-arms.

Other Versions. — Most closely allied to the Oxford Roland are (a) a version in Italianized French preserved in a 13th or 14th century MS. in the library of St Mark, Venice (MS. Fr. iv.) ; (6) the Ruolantes Liet (ed. W. Grimm, Gottingen, 1838) of the Swabian priest Konrad (fl. 1 130), who gave, however, a pious tone to the whole ;\(c) the 8th branch of the Karlamagnus-saga (ed. C. Unger, Christiania, i860), and the Danish version of that compilation.

In the 12th century the Chanson de Roland was modernized by replacing the assonance by rhyme, and by amplifications and

1 A proof of the popularity of the legend in Germany is supplied by the so-called Roland statues, of which perhaps the most famous example is that of Bremen. Mention of a statua Rolandi is made in a privilegium granted by Henry V. to the town of Bremen in 1 1 1 1 . The Rolands-saule were probably symbolic of the judicial rights possessed by the towns where they are found, and it has been suggested that the word arises from false etymology with Rothland-sdule, red-land-pillar, the symbol of the possession of the power of life ind death.

additions. Several MSS. of this rhymed recension, sometimes known as Roncevaux, are preserved. In the prose compilations of Galien and in David Aubert's Conquetes de Charlemagne (1458) the story kept its popularity for many centuries. In England the story was understood in the original French, and the English romances of Charlemagne (g.w.) are mostly derived from late and inferior sources. In Spain the legend underwent a curious transformation. Spanish patriotism created a Spanish ally of Marsile, Bernard del Carpio, to be the rival and victor of Roland. It was in Italy that the Roland legend had its greatest fortune : Charlemagne and Roland appear in the Paradiso (canto xviii.) of Dante ; the statues of Roland and Oliver appear on the doorway of the cathedral of Verona; and the French chansons de geste regularly appeared in a corrupt Italianized French. The Roland legend passed through a succession of revisions, and, as the Spagna, forming the 8th book of the great compilation of Carolingian romance, the Reali di Francia, kept its popularity down to the Renaissance. The story of Roland (Orlando) in a greatly modified form is the subject of the poems of Luigi Pulci (Morgante Maggiore, 1481), of Matteo Boiardo {Orlando innamorato, i486), of Ariosto {Orlando furioso, 1516), and of Francesco Berni {Orlando, 1541).

Authorities. — For a complete bibliography of the editions of the various MSS. of the Chanson de Roland, of the foreign versions, and of the enormous literature of the subject, see L6on Gautier, Les ILpopbes francaises (2nd ed., vol. iii., 1880), and the same author's Bibliographie des cliansons de geste (1897). Among critical editions of the Chanson are those by Wendelin Foerster in the Altfranz. Bibliotek, vols. vi. and vii. (Heilbronn, 1883-86), and by E. Stengel, Das altfranzosische Rolandslied (Leipzig, 1900, &c.). The most popular edition is La Chanson de Roland (Tours, 1872, and numerous subsequent editions), by Leon Gautier, with text, translation, introduction, notes, variants and glossary. L. Petit de Julleville published in 1878 an edition with the old French text, and a modern French translation in assonanced verse. There are various other transla- tions in French ; in English prose by I. Butler (Boston, Mass., 1904) ; and a partial English verse translation by A. Way and F. Spencer (London, 1895). Consult further G. Paris, Hist. poet, de Charle- magne (reprint, 1905), and De Pseudo Turpino (Paris, 1865) ; P. Rajna, Le Origini dell' epopea francese (Florence, 1884) and Le Fonti dell' Orlando Furioso (2nd ed., Florence, 1900); F. Picco, Rolando nella storia e nella poesia (Turin, 1901); G. Paris, " Roncevaux," in Legendes du moyen age (1903), on the topography of the battle- field.

ROLANDSECK, a village of Germany, in the Prussian Rhine province, delightfully situated on the left bank of the Rhine, 8 m. above Bonn,

with a station on the railway Cologne-Coblenz. The place consists almost entirely of villas and is a favourite summer resort. Crowning the vine-clad hills behind it lie the ruins of the castle, a picturesque ivy-covered arch, whence a fine view is obtained of the Siebengebirge and the Rhine valley as far as Bonn. Immediately below Rolandseck in mid-river is the island of Nonnenwerth, on which is a nursing school under the conduct of Franciscan nuns, established in 1850. The convent which formerly stood here was founded in n 22 and secularized in 1802. Tradition assigns the foundation of the castle of Rolandseck to Charlemagne's paladin, Roland. It was certainly built at a very early date, as it was restored by Frederick, archbishop of Cologne, in 11 20, and it was a fortress until the end of the 1 5th century.

ROLL, ALFRED PHILIPPE (1846-), French painter, was born in Paris on the 1st of March 1846. Pupil of Gerome and Bonnat at the Ecole des Beaux Arts, he made his debut at the Salon in 1870 with " Environs of Baccarat " and " Evening," and attracted the widest attention in 1875 by his colossal painting of " The Flood at Toulouse " (now at the Havre Museum). All his early work is imbued with the spirit of romanticism under the influence of Gericault, whilst his colour tended to Bolognese heaviness with a strong leaning towards dark shadows in the flesh painting, in which he closely followed Courbet. In 1877 he showed at the Salon the " Fete of Silenus " (now at the Ghent Museum), a painting of such vivid colour and exuberant life that it recalls the work of Jordaens. About this time he began to devote himself to the realistic rendering of modern life, especially among the working classes, and together with romantic subjects he abandoned his earlier heavy colouring, and devoted himself to the study of free light. His " Miners' Strike " of 1880 (now at the Valenciennes Museum) placed him in the front rank of modern French painters, and from that date his career was one of continuous and brilliant success. He became " official painter " to the

French government, and was entrusted with numerous com- missions for the decoration of public buildings and for com- memorative pictures, like the " President Carnot at Versailles at the Centenary of the Etats Generaux " (now at Versailles Palace), and " The Tzar and President Faure laying the Founda- tion Stone of the Alexandre III. Bridge." For the Hotel de Ville he executed " The Pleasures of Life " and " The Rosetime of Youth." Besides the pictures already

mentioned, a vast number of his works are to be found in the public galleries of France. The museum of the Hotel de Ville in Paris owns his “National Fete at Paris in 1880”; the Cognac Museum, ” Labour, Works at Suresnes “; the Luxembourg, his ” War ” and ” Manda Lametrie, farm-hand.” At Avignon Museum is the “Don Juan and Haidee”; at Laval Museum, “Halt!”; at Fontainebleau Palace, ” In Normandy “; at Pau Museum, ” Roubey, cementer” ; and at the Museum of Geneva, ” Marianne Offrey, crieuse de vert.” In portraiture he is known by his ” Yves Guyot,” ” Coquelin cadet,” ” Jules Simon,” &c, but his greatest success was the group of ” Fritz Thaulow and his Wife.” In 1905 he replaced Carolus-Duran as president of the Societe Nationale des Beaux-Arts, of which he was one of the founders.

ROLL (0. Fr. rolle, roulle, mod. rdle, Lat. rotulus, dim. of rota, wheel) , something rolled or wound up in a cylindrical form on an axis, or something which ” rolls,” that is, moves or is moved along a service by a turning motion. Primarily the word is used of a piece of writing material, such as parchment or paper, rolled up for the purpose of convenient storage, handling, &c. This is the meaning of the Med. Lat. rotulus, defined by Du Cangeas” Scheda, charta inspeciem rotulaeseurotaeconvoluta.” It was thus the convenient name for any document kept in this form as an official record, and hence for any register, record, catalogue or official list. ” The Rolls ” was the name of the building where the records of the Chancery Court were kept, the keeper of which was the Master (q.v.) of the Rolls, now the title of the third member of the English Supreme Court of Judicature. Other familiar examples of the use of the word in this sense are the list of those admitted as qualified solicitors, whence the phrase ” to strike off the rolls, ” of removal by the court of a solicitor for offences or delinquencies. There are numerous applications of the word to other objects packed in a cylindrical form, such as tobacco, cloth, &c, and particularly to a small loaf of bread rolled over before baking, the crust being thin and crisp and the crumb spongy.

In architecture a ” roll ” or ” scroll ” moulding is a moulding resembling a section of a roll or scroll of parchment with the end overlapping; a ” roll and fillet ” moulding is a section of a cylindrical moulding with a square fillet running along the centre of the face (see Label). For the sense of an object that rolls, the word ” roller ” is more general, but ” roll ” is frequent in technical usage for revolving cylinders, especially when working in fixed bearings. For the rolling of steel see Rolling Mill.

ROLLAND, JOHN (fl. 1560), Scottish poet, appears to have been a priest of the diocese of Glasgow, and to have been known in Dalkeith

in 1555. He is the author of two poems, the Court of Venus and a translation of the Seven Sages. The former, which was printed by John Ros in 1575, may have been written before 1560. The latter was translated from a Scots prose version at the suggestion of an aunt (" ane proper wenche "), who had found his treatment of the courtly allegory involved and uninteresting.

The Court of Venus was edited by Walter Gregor for the S.T.S. in 1884. See W. A. Craigie's long list of corrections of that edition in the Modern Language Quarterly (March 1898). The Seven Sages was printed in 1578, and frequently during the earlier decades of the 17th century. It was reprinted by David Laing for the Banna – tyne Club (1837). Sibbald, in his Chronicle of Scottish Poetry (iii. 287), hinted that Rolland may be the author of the Thrie Priestis of Peblis. There is not a scrap of evidence in support of this; and there are many strong reasons against the ascription.

ROLLE DE HAMPOLE, RICHARD (d. 1349), English hermit and author, was born near the end of the 13th century, at

Thornton (now Thornton Dale), near Pickering, Yorkshire. His father, William Rolle, was perhaps a dependant of the Neville family. Richard was sent to Oxford at the expense of Thomas de Neville, afterwards archdeacon of Durham. At Oxford he gave himself to the study of religion rather than to the subtleties of scholastic philosophy, for which he professed a strong distaste. At the age of nineteen he returned to his father's house, and, making a rough attempt at a hermit's dress out of two kirtles of his sister's and a hood belonging to his father, he ran away to follow the religious vocation. At Dalton, near Rotherham, he was recognized by John de Dalton, who had been at Oxford with him. After satisfying himself of Rolle's sanity, Dalton's father provided him with food and shelter and a hermit's dress. Rolle then entered on the con- templative life, passing through the preliminary stages of puri- fication and illumination, which lasted for nearly three years, and then entering the stage of sight, the full revelation of the divine vision. He is very exact in his dates, and attained, he says, the highest stage of his ecstasy four years and three months after the beginning of his conversion. Richard belonged to no order and acknowledged no rule. He left the Daltons, and wandered from place to place, resting when he found friends to provide for his wants. He seems to have desired to form a rule of hermits, but met with much opposition. The pious compilers of his " office " evidently thought it necessary to defend him against the charge of mere vagrancy. He nowhere says himself that his preaching made many converts, but his example was followed by many recluses in the north

of England. After some years of wandering he gave up his more energetic propaganda, contenting himself with advising those who sought him out. He began also to write the songs and treatises by which he was to exert his widest influence. He settled in Richmondshire, twelve miles from the recluse Margaret Kirkby, whom he had cured of a violent seizure. To her some of his works are dedicated. Finally he removed to Hampole, near Doncaster, invited by an inmate of the Cistercian nunnery of St Mary. There he died on the 29th of September 1349. Many miracles were wrought at his shrine, and, in view of an expected canonization, an office was drawn up giving an account of his life and the legends connected with it.

Richard Rolle had a great influence on his own and the next generation. In his exaltation of the spiritual side of religion over its forms, his enthusiastic celebration of the love of Christ, and his assertion of the individualist principle, he represented the best side of the influences that led to the Lollard movement. He was himself a faithful son of the church, and the political activity of the Lollards was quite foreign to his teaching. The popularity of his devotional writings is attested by the numerous existing editions and by the many close imitations of them.

A very full list of his Latin and English works is given (pp. 36-43) in Dr Carl Horstmann's edition (1895-96) of his works in the Library of Early English Writers. Some of his works exist in both English and Latin, and it is often not easy to say which is the original version. The most considerable of them are The Pricke of Conscience and his Commentary on the Psalter.

The Pricke of Conscience is a long religious poem, in rhyming couplets, dealing with the beginning of man's life, the instability of the world, why death is to be dreaded, of doomsday, of the pains of hell, and the joys of heaven, the two latter subjects being treated with uncompromising realism. Rolle wrote in the northern dialect, but southern transcripts are also found, and the poem exists in a Latin version {Stimulus conscientiae) . The sources of this work in- cluded the De Contemptu Mundi sive de miseria humanae conditionis of Pope Innocent III., and Rolle also showed a knowledge of Bartholomew Glanville, Thomas Aquinas and Honorius of Awtun. His English devotional commentary on the Psalms follows very closely his Latin Expositio Psalterii, which he based partly on Peter Lombard's Catena. It often agrees with the English metrical Psalter preserved in three MSS. in the British Museum (Cotton Vesp. D. vii., Egerton 614, and Harl. 1770). Dr R. F. Littledale in his edition (1873) of J. M. Neale's Commentary on the Psalms called it a " terse mystical paraphrase,

which often comesvery little short in beauty and depth of Dionysius the Carthusian himself.”

There is no complete and accessible edition of his works. The best collection is by C. Horstmann, Yorkshire Writers: Richard Rolle of Hampole; An English Father of the Church and his Followers

(2 vols., 1895-96), in the ” Library of Early English Writers.” This includes many English prose treatises by Rolle, some beautiful examples of his lyric poems, and other treatises in prose and verse from northern MSS., some of which are attributed to Rolle, and others to his followers. Wynkyn de Worde printed in one volume, in 1 506, Rycharde Rolle Hermyte of Hampull in his contemplacyons of the drede and love of God . . . and the Remedy ayenst the troubles of temptacyons. Neither of these are accepted by Dr Horstmann as Rolle’s work. His Latin treatises, De emendations vitae and De incendio amoris, the latter one of the most interesting of his works, because it is obviously largely autobiographical, were translated (1434-35) by Richard Misyn (ed. R. Harvey, Early English Text Soc, 1896). The Pricke of Conscience was edited (1863) by Richard Morris for the Philological Society. His Commentary on the Psalms was edited by the Rev. H. R. Bramley (Oxford, 1884). Ten prose treatises by Richard Rolle from the Thornton MS.(c. 1440, Lincoln Cathedral Library) were edited by Canon George Perry for the Early English Text Society in 1866. Partial editions of his Latin works are dated Paris (1510), Antwerp (1533), Cologne (1535-36), Paris (1618); and in vol. xxvi. of the ” Bibliotheca Patrum Maxima ” (Lyons, 1677). The office, which forms the chief authority for Rolle’s life, was printed in the York Breviary, vol. ii. (Surtees Soc, 1882), and in Canon Perry’s edition referred to above.

See also Percy Andreae, who collated eighteen MSS. in the British Museum in his Handschriften des Pricke of Conscience (Berlin, 1888); Studien iiber Richard Rolle von Hampole unter besonderer Beriicksichtigung seiner Psalmencommentare, by H. Middendorff (Magdeburg, 1888), with a list of MSS., sources, &c. ; J. Zupitza in Englische Studien (Heilbronn, vols. vii. and xii.) ; A. Hahn, Quellenuntersuchungen zu Richard Rolle’s Englischen Schriften (Halle, 1900) ; and for his prosody, G. Saintsbury, Hist, of English Prosody, vol. i.

ROLLER, a very beautiful bird, so called from its way of occasionally rolling or turning over in its flight, 1 somewhat after the fashion of a tumbler-pigeon. It is the Coracias garrulus of ornithology, and is widely though not very numer- ously spread over Europe and Western Asia in summer, breeding so far to the northward as the middle of Sweden, but retiring to winter in Africa. It occurs almost every year in some part or other of the British Islands, from Cornwall to the Shetlands, while it has visited Ireland several times, and is even recorded from St Kilda. But it is only as a wanderer that it comes, since there is no evidence of its having ever attempted to breed in Great Britain; and indeed its conspicuous appear- ance — for it is nearly as big as a daw and very brightly coloured ■ — would forbid its being ever allowed to escape a gun. Except the back, scapulars and tertials, which are bright reddish- brown, the plumage of both sexes is almost entirely blue — of various shades, from pale turquoise to dark ultramarine — tinted in parts with green. The bird seems to be purely in- sectivorous. The genus Coracias, for a long while placed by systematists among the crows, has really no affinity whatever to them, and is now properly considered to belong to the hetero- geneous group of birds now associated as Coraciiformes, in which it forms the type of the family Coraciidae; and its alliance to the bee-eaters (Meropidae) and king-fishers (Alce- dinidae) (q.v.) is very evident. Some eight other species of the genus have been recognized, one of which, C. leucocephalus or C. abyssinicus, is said to have occurred in Scotland. India has two species, C. indicus and C. affinis, of which thousands upon thousands used to be annually destroyed to supply the demand for gaudy feathers to bedizen ladies' dresses. One species, C. temmincki, seems to be peculiar to Celebes and the neighbouring islands, but otherwise the rest are natives of the Ethiopian or Indian regions. Allied to Coracias is the genus Eurystomus with some half-dozen species, of similar distribution, but one of them, E. pacific-its, has a wider range, for it inhabits Australia and reaches Tasmania.

Madagascar has four or five very remarkable forms which have often been considered to belong to the family Coraciidae; and, according to A. Milne-Edwards, no doubt should exist on that point. Yet if any may be entertained it is in regard to one of them,

1 Gesner in 1555 said that the bird was thus called, and for this reason, near Strassburg, but the name seems not to be generally used in Germany, where the bird is commonly called Rake, apparently from its harsh note. The French have kept the name Rollier. It is a curious fact that the roller, notwithstanding^ its occurrence in the Levant, cannot be identified with any species mentioned by Aristotle.

Leptosomus discolor, which, on account of its zygodactylous feet, some authorities place among the Cuculidae, while others have considered it the type of a distinct family Leptosomatidae. The genera Brachypteracias and Atelornis present fewer structural differences from the rollers, and perhaps may be rightly placed with them; but the species of the latter have long tarsi, and are believed to be of terrestrial habit, which rollers generally certainly are not. These very curious and in some respects very interesting forms, which are peculiar to Madagascar, are admirably described and illustrated by a series of twenty plates in the great work of A. Grandidier and A. Milne-Edwards on that island {Oiseaux, pp. 223- 250), while the whole family Coraciidae is the subject of a mono- graph by H. E. Dresser, as a companion volume to his monograph on the Meropidae. (A. N.)

ROLLER. For agricultural purposes the roller formerly consisted of a solid cylinder of timber or stone attached to a frame and shafts, but to facilitate turning two or more iron cylinders revolving on an axle are now generally used. The simplest form has a smooth surface. The diameter of the drum should be as great as possible — 30 in. being a good size — because the larger this is the more easily it is pulled (within certain limits), while rollers of small diameter are heavier of draught and do their work less efficiently. The implement is used in spring and summer as an aid in pulverizing and cleaning the soil, by bruising clods and lumps of tangled roots and earth which the cultivator or other implement has brought to the surface; in smoothing the surface for the reception of small seeds or the better operation of the mower or reaper; in consolidating soil that is too loose in texture and pressing it down about the roots of young plants. In the case of young plants the roots are close to the surface, which must therefore be kept moist. This end is attained by the compression by the roller of the top-soil of which the capillarity, i.e. the power of drawing water from the sub-soil is thereby increased. On the other hand, when it is desired to conserve the soil-moisture, the roller may be followed by the harrow, which, by pulverizing the surface-soil, breaks the capillarity. Of the variations on the common smooth roller, the clod-crusher and the Cambridge roller are the most important. The clod-crusher combines weight with breaking power. The best-known form was patented about 1841 by Crosskill, and consists of a number of disks with serrated edges threaded loosely on an axle round which they revolve. The Cambridge roller carries on its axle a number of closely packed wheels, the rims of which narrow down to a wedge shape. The tubular roller, instead of drums, has tubes arranged longitudinally, producing a corrugated, surface which is reproduced in

the condition of the soil after it has been rolled.

ROLLER-SKATING, a pastime which, by the use of small wheels instead of a blade on the skate, has provided some of the pleasures of skating on ice without having ice as the surface (see Skating). Wheeled skates were used on the roads of Hol- land as far back as the 18th century, but it was the invention of the four-wheeled skate, working on rubber springs, by J. L. Plimp- ton of New York, in 1863, that made the amusement popular. Still greater advance was made by the Raymond skate with ball and cone bearings. The wheels or rollers were first of turned boxwood, but the wearing of the edges was a fault which has been surmounted by making them of a hard com- position or of steel. The floor of the rink on which the skating takes place is either of asphalt or of wood. The latter is that always used in newly made rinks. The best floors are of long narrow strips of maple. Figure-skating on roller-skates is in some respects easier to learn than on ice-skates, the four points of contact given by the wheels rendering easier the holding of an edge; but some figures, such as loops, are more difficult. • ROLLIN, CHARLES (1661-1741), French historian and educationist, was born at Paris on the 30th of January 1661. He was the son of a cutler, and at the age of twenty-two was made a master in the College du Plessis. In 1694 he was rector of the university of Paris, rendering great service among other things by reviving the study of Greek. He held that post for two years instead of one, and in 1699 was appointed principal of the College de Beauvais. Rollin held Jansenist

principles, and even went so far as to defend the miracles supposed to be worked at the tomb of Francois de Paris, commonly known as Deacon Paris. Unfortunately his religious opinions deprived him of his appointments and disqualified him for the rectorship, to which in 1719 he had been re-elected. It is said that the same reason prevented his election to the French Academy, though he was a member of the Academy of Inscriptions. Shortly before his death (14th December 1 741) he protested publicly against the acceptance of the bull Unigenitus.

Rollin’s literary work dates chiefly from the later years of his life, when he had been forbidden to teach. His once famous Ancient History (Paris, 1730-38), and the less generally read Roman History, which followed it, were avowed compilations, uncritical and somewhat inaccurate. But they instructed and interested generation

after generation almost to the present day. A more original and really important work was his Traite des etudes (Paris, 1726-31). It contains a summary of what was even then a reformed and innovating system of education, including a more frequent and extensive use of the vulgar tongue, and discarded the medieval traditions that had lingered in France.

See Sainte-Beuve, Causeries du lundi, vol. vi.

ROLLINAT, MAURICE (1853-1903), French poet, was born at Chateauroux in 1853. His father represented Indre in the National Assembly of 1848, and was a friend of George Sand, whose influence is very marked in young Rollinat's first volume, Dans les brandes (1877). The volume, however, attracted little attention, and it was with his second publica- tion, very different in manner, that he made his reputation. In Les Nevroses, with the sub-title Les Ames, Les Luxures, Les Refuges, Les Spectres, Les TSnebres, he showed himself as a disciple of Charles Baudelaire. He constantly returns in these poems to the physical horrors of death, and is obsessed by unpleasant images. Less outre in sentiment are L'Abime (1886), La Nature, and a book of children's verse, LeLivre de la Nature (1893). He was musician as well as poet, and set many of his songs to music. He lost his reason in consequence of his wife's death from hydrophobia, and died on the 26th of October 1903.

ROLLING-MILL, a term which includes several types of machines used for producing the sectional forms (fig. 1) in which wrought iron and steel are required for the use of boiler-makers, platers and bridge-builders, and for construc- tional work generally. The production of wrought iron has been a diminishing industry for many years, while that of steel increases. Though the plant employed for both is alike in essential principles of design, the growth in the use of steel has revolutionized the practice, chiefly on account of the more massive dimensions in which steel sections are rolled. Iron sections are relatively small, and many are produced by piling, i.e. by building up with small portions of malleable puddled metal. There is no limit in reason to the dimensions in which steel sections can be rolled, and they are never piled, however large, but always rolled from solid cast ingots.

When steel ingots are rolled into sectional forms the reduction in transverse dimensions is very great. The work begins at nearly a white heat, and continues until a low red is reached. Obviously the stresses to which the material is subjected are very severe. For this reason the process of reduction has to be effected very gradually, and especially

so in those cases where reduction is being done in two directions at right angles with each other, as in channel sections (fig. 6) and joist or beam sections (figs. 7 and 8) .

It might be thought, since steel is always cast previously to rolling, that it might be cast at once into the sectional forms required. But sound results could not be obtained in this way, because the gases occluded in the metal form blow-holes which are sources of weakness. The material itself, even in the solid portions, is not homogeneous. By removing the head of the ingot where the blow-holes chiefly congregate and rolling the remainder at a white or red heat, the metal is improved by consolidation, and by the work done upon it. To this practice there is no exception.

Rolling-mills are known as ” two-high,” or ” three-high,” according as two or three rolls are mounted one over the othel

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Fig. 1. — Forms of the Principal Rolled Sections. I, 2, Flats. 3, Flat with bevelled edges. 4, 5, Flats with rounded edges. 6, Bulb bar. 7, Wedge bar. 8, Scree or grate bar. 9, Square. 10, Triangular, n, Hexagonal. 12, Round. 13, Oval. 14, Hollow half-round. 15, Half-round. 16, Convex. 17, Square-edged convex. 18, Vee. 19, O.G. 20, Angle iron. 21, Square root, or square throat angle. 22, Round-backed angle. 23, Unequal-sided angle. 24, Acute angle. 25, Obtuse angle. 26, Bulb angle. 27, Tee. 28, Bulb tee. 29, 30, Beams or joists, or girders, or H-irons. 31, Channel. 32, Zed. 33, Cruciform section. 34, Pillar section. 35, Troughing. 36, 37, 38, Rail- way rail. 39, Tramway rail. 40, Heavy crane rail.

(figs. 2 and 3). In the two-high type the two rolls revolve in opposite directions, so that an ingot, slab or bloom pre- sented to the entering side is drawn in and between the rolls, which reduce its thickness. In the case of rolls which are two perfectly plain cylinders (plate-rolls) the shape produced is that of broad, long and flat plates or sheets. Several passages (passes) are required to effect the reduction required, because this must be gradual. To regulate the amount the top roll is set down bodily by means of screws pressing on its bearings which slide in the end supports (housings). In the case of plate-rolls, which are plain cylinders, this setting down must be equal at each end. The mass of the top roll is balanced, to avoid shock when a plate is entering. The rolls are made of cast iron, and are either grain rolls or

chilled rolls. The first are formed from a tough strong grade of iron, the quality which is used for all the roughing down and general work. The second are made of a highly mottled iron, cast against a cold mould (chill) of cast iron, by which a steely surface is obtained. These are used for fine finishing, or for imparting a polished surface to a section already nearly reduced to size in grain rolls. In later heavier practice, rolls of cast steel and forged steel are becoming common. They are more costly than iron, but more durable and much lighter for equal strength. They are essential in armour plate rolls. The length of rolls should not exceed about four times their diameter, for otherwise they are liable to spring and produce plates thicker at the centre than towards the edges.

From this elementary design several types are derived. In the two-high mill it is clear that if the direction of the rotation of the rolls is always the same, then the plate being rolled must be taken back after each ” pass ” to the front of the rolls. Hence there is one ” lost pass ” for every reduction in thickness. This is the case in the ” pull-over ” mill, nearly obsolete. In the two-high reversing mill, introduced to avoid this ” lost pass,” as soon as a plate has gone through, the direction of rotation of the rolls is reversed, and the plate is rolled again on the backward journey, so avoiding the lost

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Fig. 2. — General Arrangement of 12-in. Merchant and Guide-Mill Plant. (Thomas Perry & Son Ltd., Bilston.)

A, First roughing rolls. B, Second ditto. C, Guide rolls for ovals or diamonds. D, Ditto for rounds or squares. E, Driving pinions. Engine, 30 in. X 22 in. cylinder, direct- coupled to rolls. Runs from 100 to 180 revolutions per minute to suit work. The shears are used for cutting the smaller sections, the hot saw for cutting the merchant iron.

Fig. 3. — 12-in. Merchant Guide-Mill and Engine. Four-set mill. A, B, Three-high sets. C, Works either three-high or two-high ; a, being a dummy roll. D, Two- high set (guide rolls). E, Coupling pieces. F, Housings. G, Pinions. The mill is capable of rolling rounds, squares, flats, angles, tees or similar sections by changing the rolls. The guide rolls D are used for small sections, and the second set B for merchant iron (larger sections).

pass. An alternative is the three- high mill, in which three rolls are , used. Here the plate is run through

ˆjS m the lower rolls and back through the lˆp _ˆ upper ones, so that there is no reversal of direction of the mill as a whole, but the lower and upper rolls draw the plates in opposite directions (see also Iron and Steel, § 129).

Plate-Mills. — In Great Britain plate mills are generally two-high reversing mills, in America three-high mills. Another difference is that in British practice two stands of rolls are used, in America one only. In the two-stand design there are two sets of rolls coupled endwise., one set being grain-rolls for roughing, and the other chilled rolls for finishing. Sets of live rollers conduct the plates to and from the separate rolls. The plate-mills proper are those which roll from J in. to about 2 in. thick. Armour plate-mills are a special design for massive plates and sheet-mills are for thin plates or sheets having a less thickness than J in. Armour plate-mills are of two- high reversing type usually, with forged steel rolls. They are of immense proportions, the rollers ranging from 10 to 14 ft. in length, by from 3 to 4 ft. in diameter. In sheet-mills, on the other hand,

the rolls seldom exceed 30 in. in diameter, and they are chilled. The size of sheet-mills has within the last few years been consider- ably increased (since the introduction of steel sheets), and all new mills are made from 28 to 30 in. diameter. The mills are of the two- high type and are almost the only instance of the retention in present practice of the non-reversing mill. It is found more con- venient in this case than the reversing or the three-high mills, because two men roll two pieces at once, one handing over a sheet just rolled to his fellow just as the latter has entered a sheet between the rolls on his side. Strip-mills are a smaller but similar type, used for rolling the thin narrow strips required for the hoops of barrels, ties for cotton bales, &c. The details of these mills cannot be discussed here, nor the numerous arguments in favour of the two systems. English practice retains the two-high reversing mill for all heavy work, the exceptions being those just noted. American practice retains the three-high mill.

Grooved Rolls.— In the mills designed for rolling various sectional forms the same distinction between two-high and three-high re- mains, but new problems arise. By ” sectional forms is meant all those which are not plates and sheets, such as bars of round and square section, angles, channels, rails and allied sections (fig. 1), for the production of which grooved rolls are required. The shapes and proportions of these grooves are such that reduction is effected very gradually. When metal is squeezed or hammered, one effect is to spread it laterally, since the metal cannot be appreciably squeezed in on itself. But the lateral extension is very much less than

the longitudinal. The most marked effect of reduction in thickness is extension in length. But as there is some lateral extension, three courses are open: one is to gauge the exact amount of width re- quired for extension; another is to turn a bar over at intervals in order to exercise pressure on the portions extended laterally and obliterate them (open passes) ; and a third is to allow the extensions to take the form of fin to be cut off subsequently (closed passes). The first is generally impracticable. The second can be illustrated by diagrams representing roll sections.

The work of reduction is generally divided between three sets of rolls. The first are the cogging-, or blooming-rolls, as they are termed in America, in which ingots are reduced to blooms with dimensions suitable for rolling the various sections. In these an ingot of say 14 in. square may be reduced to a bloom of 6 in. square. The grooves form rectangular sections (box passes). The top roll being raised, the ingot is passed through the largest groove; then the roll is lowered and it is passed through a second time. Then it is turned round through 90 and re-rolled. Afterwards the same processes are gone through till the last groove is reached. There is a great difference between, say, a plate and a rail, but the cogging-rolls have to be so designed as to produce blooms for varied forms. There are three principal forms: the box just noticed, the gothic and the diamond (fig. 4), all open passes. For plates,

A, Box Pass.

B

Fig. 4. B, Gothic Pass.

C, Diamond Pass.

provision is made in ” slabbing ” rolls for roughing out, first in a box pass, and then in a broad flat groove, alternating with the square groove for correction of the edges. Gothic passes and diamond passes produce blooms which are subsequently used for various shapes having little resemblance to each other. These shapes are simple, and little difficulty arises in the work of drawing down. The rolls make 40 to 50 revolutions per minute; the difference in the area of the cross section (draught) between adjacent grooves is from 20 to 25 %.

The formative rolls for finished sections are of two classes: roughing and finishing. The roughing-rolls approximate much more closely to the finished sections than the cogging-rolls, but the aim is to make them do duty for a wide range of sections, in order to change them as seldom as possible. Thus the gothic pass (fig. 4) will serve alike for rolling square or round bars. Finishing rolls must be changed for every different section, except when slight differences in thicknesses only are made in the webbed portion of a rolled section. With the exception of rounds,_ sections are usually roughed and finished in closed passes — that is, the bar is wholly enclosed by the rolls. The groove in the lower roll is flanked by collars slightly deeper than the enclosed bar. These enter into grooves turned on the upper roll, and between them the bar is confined (fig. 5). It passes through a succession of these grooves,

‘ Fig. 5. — Pair of Rolls for producing Angle Sections. (Thomas Perry & Son Ltd., Bilston.)

being diminished in area and extended at each pass. A certain amount of fin is squeezed out, and this is obliterated in the succeed- ing pass, and more formed, until in the finishing pass the amount of reduction is very slight, a surface finish being the principal result.

Since but a slight amount of lateral extension occurs, it follows that the reduction wholly or mainly in the vertical plane is the most favourable condition. Rounds, squares and flats are wholly

reduced in this way and offer no difficulty. The most unfavourable section is the joist or girder, the channels, tees and rails follow, and after these the various angles. In rolling a channel or a girder section (figs. 6, 7, 8), a square bloom is taken, and passed in succes- sion through closed passes. The first produce shallow grooves in

FlG. 6. — Reduction of Channel Section.

Fig. 7. — Reduction of Girder Section in Roughing Rolls.

Fig. 8. — Reduction of Girder Section in Finishing Rolls.

the opposite faces, gradually deepening until the insides of the flanges assume a definite slope. The angle of slope becomes gradu- ally lessened, and the thicknesses of web and flanges, and also the radius in the corners, are reduced. At the same time the width over the flanges is being gradually increased. While this is going on, the fibres of the flanges are being strained, because the rolls run at a higher speed at their peripheries than next the body. The metal is being violently thrust and drawn in different ways, so that while economy has to be studied by reducing the number of passes as much as possible, undue stress must be avoided by making the reductions as easy as is practicable. These things cannot be put into a formula, but the roll-turners work by experience and em- pirical rules gathered by long practice. In order to avoid these deep groovings, and also severe lateral thrusts on the rolls, angle sections are always rolled with the slope of the flanges approximately equalized; so too are zeds (fig. 1, No. 32). The reduction is then effected with the minimum of stress to the metal. Variations are readily made in the thicknesses of rolled sections without changing the rolls, by simply varying the distance between their centres. This is effected by the adjustment of the top roll (fig. 5). Differ- ences in thickness are made in tˆths of an inch, up to a maximum' of about 5 in. Another detail of design in closed passes is so to shape the rolls as to make any pass obliterate the fin produced in *he previous groove. Sometimes sections are turned over to effect this, but often the bodies of the rolls are turned of suitable diameters to produce the result. Guards are required to prevent the bars from becoming wrapped round the rolls (" collaring "). With the same object the upper roll is always made larger in diameter than the lower. Its speed is therefore slightly greater than that of the lower one. This stretches the plate or bar very slightly on the upper side, and so imparts a downward movement to il towards the floor, which is what is required. The difference in diameter varies with circumstances, ranging from |-th to about 1 in. Besides the standard types of mills noticed, the two-high and three-high, there are special mills. The merchant mill simply denotes either one of the above types used for the production of flat bars. The continuous mills are special designs for rolling small rods to be drawn into wire. In these there are several pairs of rolls placed in series, so that the billet is rolled from one stand to others in succession without re-heating. There are a number of different designs, one of which is the Belgian looping mill, so called because the rod is bent backward and forward in the form of the letter S in its passage through adjacent sets of rolls. In another design a

flying shear is employed, which automatically cuts off billets from the bar while the latter is travelling at the rate of 6 or 8 ft. per second. (J. G. H.)

ROLLOCK, ROBERT (c. 1555-1599), the first principal of the university of Edinburgh, son of David Rollock of Powis, near Stirling, was born about 1555. He received his early education at the school of Stirling from Thomas Buchanan, a nephew of George Buchanan, and, after graduating at St Andrews, became a regent there in 1580. In 1583 he was

appointed by the Edinburgh town council sole regent of the ” town’s college ” (” Academia Jacobi Sexti,” afterwards the university of Edinburgh), and three years later he received from the same source the title of ” principal, or first master,” and was engaged in lecturing on philosophy. When the staff of the young college was increased by the appointment of additional regents, he assumed with consent of the presbytery the office of professor of theology. From 1587 he also preached regularly in the East Kirk every Sunday at 7 a.m., and in 1596 he accepted one of the eight ministerial charges of the city. He took a prominent part in the somewhat troubled church politics of the day, and distinguished himself by gentleness and tact, as well as ability. He was appointed on several occasions to committees of presbytery and assembly on pressing ecclesiastical business. He was elected moderator of the General Assembly held at Dundee in May 1597. In 1598 he was translated to the parish church of the Upper Tolbooth, Edinburgh, and immediately thereafter to that of the Grey Friars (then known as the Magdalen Church). He died at Edinburgh on the 8th’ of February 1599.

Rollock wrote Commentaries on the Epistles to the Ephesians (1590) and Thessalonians (1598) and Hebrews (1605), the book of Daniel (1591), the Gospel of St John (1599) and some of the Psalms (1598); an analysis of the Epistle to the Romans (1594), and Galatians (1602); also Questions and Answers on the Covenant of God (1596), and a Treatise on Effectual Calling (1597). Soon after his death eleven Sermons (Certaine Sermons upon Several Places of the Epistles of Paul, 1599) were published from notes taken by his students. His Select Works were edited by W. Gunn for the Wodrow Society (1844-1849).

A Life by George Robertson and Henry Charteris was reprinted by the Bannatyne Club in 1826. See also the introduction to the Select Works, and Sir Alexander Grant's History of the University of Edinburgh.

ROMA, a town of Waldegrave county, Queensland, Australia, 318 m. by rail W.N.W. of Brisbane. It is the centre of a rich pastoral and wheat-growing district, in which oranges and vines are largely grown and much wine is produced. The town was incorporated in 1867. Flour-milling is its chief industry. Pop. (1901) of town, 2371; of the district, 7110.

ROMAN, capital of the department of Roman, Rumania, on the main line from Czernowitz in Bukovina to Galatz, and on the left bank of the river Moldova, 2j m. W. of its junction with the Sereth. Pop. (1900) 14,019, including 6099 Jews. The river is here spanned by a fine bridge of iron. Roman has been the seat of a bishop since 401. Its seminary dates from 1402. There are several ancient churches, including a cathedral, built-in 1541. Roman has a transit trade in the products of northern Moldavia. A large annual fair is held in August.

ROMAN ARMY. In the long life of the ancient Roman army, the most effective and long-lived military institution known to history, we may distinguish four principal stages. (1) In the earliest age of Rome the army was a national or citizen levy such as we find in the beginnings of all states. (2) This grew into the Republican army of conquest, which gradually subdued Italy and the Mediterranean world. A citizen army of infantry, varying in size with the needs of each year, it eventually developed into a mercenary force with long service and pro- fessional organization. This became (3) the Imperial army of defence, which developed from a strictly citizen army into one which represented the provinces as well as Italy, and was a garrison rather than a field army. Lastly, (4) the assaults of the Barbarian horsemen compelled both the creation of a field force distinct from the frontier garrisons and the inclusion of a large mounted element, which soon counted for much more than the infantry. The Roman army had been one of foot soldiers; in its latest phase it was marked by that predominance of the horseman which characterized the earlier centuries of the middle ages.

So far as we can follow this long development in its details, it was throughout continuous. So unbroken, indeed, is the growth that many of the military technical terms survived in use from epoch to epoch, unchanged in form though deeply modified in meaning, and ordinary readers often miss the

diversity which underlies this unchanged-seeming system. The term legio, for example, occurs in all the four stages above outlined. But in each its significance varies. Throughout, it denoted citizen-soldiers: throughout, it denoted also a force which was chiefly, if not wholly, heavy infantry. But the setting of these two constant features varies from age to age. In the first period legio was the ” levy,” the whole host sum- moned to take the field. In the second period it was not the whole levy, but one of the principal units into which developing organization had divided that levy; the ” legion ” was now a body of some 5000 men — the number of ” legions ” varied with the circumstances, and the army included other troops besides citizens, though they were for the most part unim- portant. In the third or Imperial age there were many legions (indeed, a fixed number) quartered in fixed fortresses; there were also other troops, numerous and important, if not yet so formidable as the legionaries. Finally, the legions became smaller units, and the other troops of the army, notably the cavalry, became the real fighting-line of Rome (see Legion) .

First Stage. — The history of the earliest Roman army is, as one might expect, both ill-recorded and contaminated with much legend and legal fiction. We read of a primitive force of 300 riders and 3000 foot soldiers, in which the horseman counted for almost everything. But the numbers are clearly artificial and invented, while the pre-eminence accorded to the cavalry has no sequel in later Roman history. We reach firmer ground with the organization ascribed to Servius Tullius. In this system the host included all citizens from 17 to 60 years of age, those under 47 for service in the field, those over 46 for garrison duty in Rome. The soldiers were grouped at first by their wealth — that is, their ability to provide their own horses, armour, &c. — into cavalry (18 ” centuries “), heavy infantry, a remainder which it would be polite to call light infantry, and some artificers. The heavy infantry counted for most. Armed with long spears and divided into the three orders of hastati, principes and triarii (the origins and real senses of these names are lost), they formed a phalanx, and charged in a mass, while the cavalry protected the wings. The men were enrolled for a year — that is, for the summer cam- paign; in the autumn, like all primitive armies, they went home. It has been conjectured that about the time of the fall of the kings the normal Roman army comprised some 8500 infantry under 47 years of age, 5000 seniors, 1000 riders and 500 fabri, &c. The evidence for the calculation is un- fortunately inadequate, but the result is not altogether im- probable, and it may help the reader to realize what ” may have been.” It must be added that this Servian system is closely

connected with the political organization (see Rome, History).

Second Stage. — From this Servian army a series of changes which we cannot trace in detail produced the Republican army of conquest. Our ancient authorities ascribe the chief reforms to the half legendary Camillus (q.v.), who introduced the beginnings of pay and long service, improved the armour and weapons, abolished the phalanx and substituted for it an open order based on small subdivisions (maniples), each con taining two centuries.

Whatever the truth about Camillus, some such reforms must at some time have been carried through, to convert the Servian system into the army which was engaged for nearly three centuries (from 350 B.C.) in conquering Italy and the world. This army broke in succession the stout native soldiers of Italy and the mountaineers of Spain and overthrew the trained Macedonian phalanx. Once only did it fail — against Hannibal (see Punic Wars). But not even Hannibal could oust it from entrenchments, and not even his victories could permanently break its moral. Much of its strength lay in the same qualities which made the Puritan soldiers of Cromwell terrible — the excellent character of the common soldiers, the rigid discipline, the high training. Credit, too, must be given to the genius of the Scipios and to the more commonplace capacities of many fairly able generals. But the organism

itself deserves attention, and, as it chances, we know much about it, mainly from Polybius. Its elements were three:—

(A) The principal unit was the legion, generally a division of 4500 men — 3000 heavy infantry, 1200 Tighter-armed (velites), 300 horse — though sometimes including as many as 6000 men. The heavy infantry were the backbone of the legion. They were levied from the whole body of Roman citizens who had some private means and who had not already served 16 campaigns, and in effect formed a yeoman force, For battle they were divided into 1200 hastati, 1200 principes and 600 triarii: all had a large shield, metal helmet, leather cuirass, short Spanish thrusting and cutting sword, and in addition the hastati and principes each carried two short heavy throwing spears (pila), while the triarii had ordinary long spears (see Arms and Armour). They were drawn up in three lines: (1) hastati, (2) principes, (3) triarii; the first two were divided into 10 maniples each (of 120 men,

when the legicn only counted 4500), the third into 10 maniples of half the strength. According to the ordinary interpretation of our ancient authorities, the maniples were arranged in a chess-board fashion (quincunx), the idea being that the front row of maniples could retire through the intervals in the second row without disordering it, and the second row could similarly advance. Recent military writers, however,

Hastati

Principes

Triarii

■ 1

1

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1

doubt whether this arrangement can be considered workable, and it is possible that our authorities did not really mean what has been supposed. In any case the procedure in fighting seems to have been simple: the front line discharged a volley of pila and rushed in with the short sword — a sequence much like the volley and bayonet charge of the 18th century — and if this failed, the second line went in turn through the same process: the third line of triarii, armed with spear instead of pilum, was a reserve. The velites, armed with javelins, were either broken up among the heavy- armed centuries or used as skirmishers or as aids_ to the cavalry. The 300 cavalry, however, were (it seems) of little account — a natural result if, as we have reason to think, the horses were small and stirrups were not used. The officers of the legion consisted of: (a) Six tribunes, in part elected by the comitia, in part appointed by the consuls, and holding command in rotation. They were either veteran officers, sometimes even ex-magistrates, or young noblemen beginning their career, (b) Sixty centurions, each commanding one century, or, rather, a pair

commanding each maniple. They were chosen by the tribunes from among the veteran soldiers serving at the time and were arranged in a complicated hierarchy, by means of which a centurion might move upwards till he became primus pilus, senior centurion of the first maniple of triarii, the chief officer in the legion, (c) There were also standard-bearers and other under-officers, for whom reference must be made to specialist publications.

(B) Besides the legions, composed of citizens, the Roman army included contingents from the Italian ” allies ” (socii), subjects of Rome. These contingents appear to have been large: in many armies we find as many socii as legionaries, but we are ignorant of details. The men were armed and drilled like the legionaries, but they served not in legions but in cohorts, smaller units of 400-500 men, and their conventional positions seem to have been on the wings of the legions. They were principally infantry, but included also a fairly large proportion of cavalry. Despite their_ numbers, they do not appear to have ranked with the heavy legionary infantry, and they were probably used more as detachments from the main army than as infantry of the line.

(C) Besides legionaries and socii, the Roman army included non-Italian troops of special kinds, Balearic slingers, Numidian horsemen, Rhodians, Celtiberians and others: at Trasimene, for example (217 B.C.), the Roman army included 600 Cretan archers. The numbers of these auxilia varied; probably they were not numerous till the latest days of the Republic.

Composition and Size of Armies in the Second Stage. — According to the general practice, each of the two consuls, if he took the field alone, commanded an army of two legions with appropriate socii. If the two consuls combined their forces, commanding the joint force in rotation (as often occurred), the total would be — accord- ing to our authorities — four legions, each of 4200 infantry, the same number of ” allied ” infantry (in all 33,600 infantry), 1200 legionary cavalry and about 3600 ” allied ” cavalry = 38,400 men. Such, for example, was the Roman army at Trebia (218 B.C.), where (says Polybius) there fought 16,000 legionaries and 20,000 allied infantry. The total number of men in the field could be increased; we even hear of 23 legions serving at one time vn the Second Punic War.

Just before this war, in 225 B.C., the total strength of Rome was reckoned at three-quarters of a million, of which about 65,000 were in the field and 55,000 were in a reserve at Rome; of the total, 325,000 were Roman citizens and 443,000 (apparently a rough estimate) were

allies. The battle order in normal circumstances was simple. In the centre stood the legionary infantry: on each side of that was the allied infantry: on the wings the cavalry. But sometimes the legions were held in reserve and the brunt (and honour) of the fight was left to the allies. Sometimes, when the army was a double force, one commander's troops fought and the others lay in reserve. Frequently the attack was begun by one wing, as by Caesar at Pharsalus. At Ilipa in Spain Scipio put his Spanish auxiliaries in the centre, his Roman troops on the wings, and attacked with both wings. The chief command of the army fell (as stated above) to the consul, if present, or, if two consuls acted together, to them in turn. In default of consuls, a pro- consul, praetor, or propraetor, in charge of a province, would command.

Development from the Second Stage to the Third. — Towards the end of the Republic many changes began to work them- selves out in the Roman army. If Camillus began the system of pay and long service, it was effectually developed by long foreign wars in Spain and in the East. Moreover, the growth of Rome as a wealthy state tended to wreck the old theory that every citizen was a soldier, and favoured a division of labour between (e.g.) the merchant and the military, while the increasing complexity of war required a longer training and a more professional soldier. In consequence, the old restriction of legionary service to men with some sort of private property was abolished by Marius about 104 B.C. and the legionaries now became wholly proletariate and professionals. By a second change, also connected with the name of Marius, the legion was reorganized as a body of 6000 men in 60 centuries, divided into 10 cohorts instead of (as hitherto) into 30 maniples; the unit of tactical action thus became a body of 600 instead of 120. This was probably an adaptation within the legion of the system of cohorts already in use for the con- tingents of the socii. Soon after, the extension of the Roman franchise to all Italians converted allies and subjects into citizens, and the socii into legionaries. A fourth change abolished the legionary cavalry and greatly increased the auxilia (C above). And, finally, the appearance of great military leaders in place of civilian statesmen, and of pretenders to a throne in place of patriots, familiarized the world with the notion of large standing armies commanded by permanent chiefs, and at the same time destroyed discipline and military loyalty.

Third Stage. — The Imperial Army of Defence. — The evils of the Civil Wars (49-31 B.C.) furnished the first emperor, Augustus, with both the opportunity and the necessity for reforming the army. Disorganization had reigned for twenty years. It was needful to restore loyalty and system alike. Augustus' did this, as he did all his work, by adapting

the past: yet there is some truth in the view of his latest historian, von Domaszewski, that his army reforms were his greatest and most original work. The main lines of his work are simple. The Imperial army consisted henceforward of two classes or grades of troops, about equal in numbers if unequal in importance. The first grade were the legions, recruited from Roman citizens, whether resident in Italy or in the provinces. The second grade was formed by the auxilia, recruited from the subjects (not the citizens) of the Empire in the provinces, organized in cohorts and alae and corresponding somewhat to both the socii and the auxiliaries (B, C above) of the Republican army. There were also in Rome special ” household” troops (see Praetorians); and a large body of vigiles who were both fire brigade and police.

(A) The legion of the Empire was what Marius had left it — 6000 heavy infantry divided into 10 cohorts: Augustus added only 120 horsemen to serve as despatch-riders and the like. The supreme command was no longer in the hands of the six tribunes. According to a practice which had sprung up in the latest Republic it was in the hands of a legatus legionis, deputy of the general (now of the emperor, commander-in-chief of the whole army) and a man usually of senatorial rank and position. The six tribunes assisted him, in theory: in practice they were now little more than young men of good birth learning their business or wasting their

time. The real officers of the legion were the 60 centurions, men who (at least in the early Empire) generally served up from the ranks, and who knew their work. The senior centurion, primus pilus, was an especially important officer, and on retirement frequently became praefectus castrorum, ” camp adjutant,” or obtained other promotion. Below the centurions were under-officers, standard- bearers, optiones, clerks and the like. The men themselves were recruited from the body of Roman citizens (though we may believe that birth-certificates were not always demanded). During the 1st century Italy, and particularly north Italy, provided the bulk of the recruits. After a.d. 70, recruiting in Italy for the legions practically ceased and men were drawn from the Romanized towns of the provinces. After Hadrian, each province seems to have supplied most of the men for the legion (if any) stationed in it, and so many sons of soldiers born during service (castrenses) flocked to the army that a military caste almost grew up. The term of service was, in full, twenty years, at least in theory, but

recruiting was voluntary and when men were short discharges were often withheld. On discharge the ex-legionary received a bounty or land: many coloniae (municipalities) were established in the provinces by certain emperors for the special purpose of taking discharged veterans — according to a custom of which the first instances occur in the latest Republican age. On the whole, the legionary was still the typical ” Roman ” soldier. If he was no longer Italian, he was generally of citizen birth and always of citizen rank, and his connexion with the Empire and the government was real. Each legion bore a title and a number (e.g. II. Augusta, III. Gallica). The custom of using such titles and numbers can be detected sporadically in the latest Republic, and many titles and numbers then borne by legions passed on into the Empire with the legions themselves. As Augustus gradually became master of the world, he found himself with three armies, his own and those of Lepidus and Antony; from the three he chose certain legions to form his new standing army, and he left these with the titles and numbers which’they had previously borne, although that concession resulted in three legions numbered III. and two numbered IV., V., VI. and X. respectively. Similar titles and numbers were given to legions raised afterwards either to fill up gaps caused by disaster or to increase the army. Here, as elsewhere in the Roman and above all in the Augustan system, precedent defied logic.

(B) Besides the legions Augustus developed a new order of auxilia. Auxiliaries (as is said above) had served occasionally in the Republican armies since about 250 B.C., and in the latest Re- public large bodies of them had been enlisted in the armies of con- tending generals. Thus Caesar in Gaul enrolled a division of native Gauls, free men but not citizens of Rome, which ranked from the first in all but legal status as a legion, the ” Alaudae,” and in due course was formally admitted to the legionary list (legio V.). But this use of non-citizens had been limited in extent and confined in normal circumstances to special troops such as slingers or bowmen. This casual practice Augustus reduced, or rather extended, to system, following in many details the scheme of the Republican socii and veiling the novelty under old titles. Henceforward, regiments of infantry (cohortes) or cavalry (alae), 500 or 1000 strong, were regularly raised (apparently, by voluntary recruiting) from the non-citizen populations of the provinces and formed a force almost equal in numbers (and perhaps ultimately much more than equal) to the legions. The men who served in these units were less well paid and served longer than the legionaries; on their discharge they received a bounty and the Roman’ franchise for themselves and wife and children. They were commanded by Roman praefecti or tribuni, and

were no doubt required to understand Roman orders; they must have generally become Romanized and fit for the citizenship, but they were occasionally (at least in the 1st century a.d.) permitted to retain tribal weapons and methods of fighting and to serve under the command of tribal leaders, who were at once their chiefs and Roman officers. These auxiliaries provided both the whole of the archers, &c, and nearly the whole of the cavalry of the army; they also included many foot regiments. A peculiar arrangement (to which no exact parallel seems to occur in any other army) was that a cohort of 500 men might include 380 foot and 120 horse and a cohort of 1000 men or 760 foot and 240 horse (cohors equitata), and an ala might similarly include a proportion of foot {ala peditata). Each regiment bore a number and a title, the latter often derived from the officer who had raised the corps {ala Indiana, raised by one Julius Indus) or, still more often, from the tribe which supplied the first recruits {cohors VII. Gallorum, cohors II. Hispanorum and the like) . To what extent recruiting remained territorial is uncertain : after the 1st century, probably, the territorial names meant in most cases very little. The total number of the auxiliary regiments probably varied from time to time and can at present hardly be guessed.

Composition of Armies and Distribution of Troops in the Third Stage. — If the system of legions and auxilia in the early Empire was novel, the use made of them was no less so. The latest Republic offers to the student the spectacle of large field armies, and though it also reveals a counter tendency to assign special legions to special provinces, that tendency is very feeble.

Augustus ended the era of large field armies: he could, indeed, leave no such weapons for future pretenders to the throne. By keeping the Empire within set frontiers, he developed the counter tendency. That policy exactly suited the military position in his time. The early Roman Empire had not to face — as Britain or France or Germany might have to face to-day — the danger of a war with an equal enemy, needing the mobilization of all its national forces. From Augustus till a.d. 2 50 Rome had no conterminous foe from whom to fear invasion. Parthia, her one and dangerous equal, was far away in the East and little able to strike home. Elsewhere, her frontiers bordered more or less wild barbarians, who might often harass, but could not do serious harm. To meet this there was need, not of a strong army concentrated in one or two cantonments, but of many small garrisons scattered along each frontier, with a few stronger fortresses to act as military centres adjacent to these garrisons.

Accordingly, a system grew up under Augustus and his im- mediate

successors whereby the whole army was distributed along the frontiers or in specially disorderly districts (such as N.JV. Spain) in permanent garrisons. On the actual frontiers and on the chief roads leading to them were numerous cohorts and alae of auxiliaries, garrisoning each its own caslellum of 3-7 acres in extent. Close behind the frontiers, or even on them, were the twenty-five legions, each (with a few exceptions of early date) holding its own fortress {castra staliva or hiberna) of 50-60 acres. Details varied at different times. Sometimes, where no Rhine or Danube helped, and where outside enemies were many, the frontier was further fortified by a continuous wall of wooden palisades (as in part of Germany, see Limes) or of earth or stone (as in Britain, see article Britain, Roman), or the boundary might be guarded by a road patrolled from forts planted along it (as in part of Roman Africa) . The result was a long frontier guard covering Britain, and Europe from the German Ocean to the Black Sea, and the upper Euphrates valley, and the edge of the Sahara south of Tunis and Algeria and Morocco, while the wide Empire behind it was little troubled by the presence of soldiers.

The following table shows the disposition of the legions about a.d. 120 and for many decades subsequently. It would be im- possible, even if space allowed, to add the auxiliaries, since the details of their distribution are too little known. But it may be in general assumed that the total number of auxiliaries in any province was little less, and probably rather greater, than the number of legionaries, and the sizes of the various provincial armies can thus be calculated roughly. Thus Britain was held probably by 35,000-40,000 men. Each provincial army was commanded either by the governor of the province or (in a few exceptional cases) by the senior legatus of the legions stationed there: —

Britain … II. Augusta {Isca Silurum, now Caer-

leon). Victrix {Eburacum, York). Valeria Victrix {Deva, Chester).

Lower Germany

(= lower Rhine)

Upper Germany

Pannonia (Danube to Semlin)

II.

VI. XX.

I.

XXX.

XXII. VIII.

X.

XIV.

I. II.

Upper Moesia (Middle Danube)

Dacia (now

Transylvania) Lower Moesia (Lower Danube)

IV. VII.

Minervia {Bonna, Bonn). Ulpia Victrix {Vetera, Xanten). Primigenia {Moguntiacum, Mainz). Augusta {Argentorate, Strassburg).

Gemina {Vindobona, Vienna). Gemina {Carnuntum, Petronell). Adiutrix {Brigetio, near Komorn). Adiutrix {Aquincum, near Buda- pest).

Flavia {Singidunum, Belgrade). Claudia {Viminacium, Kostolac).

XIII. Gemina {Apulum, Karlsburg).

I. XI.

„ ■ v.

Asia Minor (Cappadocia) XV. XII.

Italica {Novae, Sistov). Claudia {Durostorum, Silistria). Macedonica {Troesmis, Iglitza). Apollinaris {Satala, Armenian fron- tier). Fulminata {Melitene, on upper Euphrates).

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Syria .

ROMAN ART

. XVI. Flavia (Samosata, on upper Euphrates). „ . . . .IV Scythica”)

. . . . VI. Ferrata > near Antioch (?).

III. Gallica J

Judaea … X. Fretensis (Jerusalem). Arabia . . . III. Cyrenaica (Bostra).

Egypt … II. Trajana (near Alexandria — a dis-

orderly city). Africa . . . III. Augusta {Lambaesis).

Spain . . . VII. Gemina (Legio, Leon, in N.W.

Spain).

The total of legionaries may be put at about 180,000 men, the auxiliaries at about 200,000. If we exclude the ” house- hold ” troops at Rome, the police fleets on the Mediterranean, and the local militia in some districts, we may put the regular army of the Empire at about 400,000 men. This army, as will be plain, was framed on much the same ideas as the British army of the 19th century. It was meant not to fight against a first-class foreign power, but to keep the peace and guard the frontiers of dominions threatened by scattered barbarian raids and risings. Field army there was none, nor any need. . If special danger threatened or some special area was to be con- quered — such as southern Britain (a.d. 43) or a little land across the upper Rhine (a.d. 74) — detachments (vexillationes) were sent by legions and sometimes also by auxiliaries in adjacent provinces, and a field force was formed sufficient for the moment and the work.

Change from the Third Period to the Fourth. — Two principal causes brought gradual change to the Augustan army. In the first place, the pax Romana brought such prosperity to many districts that they ceased to provide sufficient recruits. The Romans, like the British in India, had more and more to look to uncivilized regions and even beyond their borders. Hence comes, in the 2nd century and after, a new class of numeri or cunei or vexillationes who used (like the earlier auxiliaries) their national arms and tactics and imported into the army a more and more non-Roman element. This tendency became very marked in the 3rd century and bore serious fruit at its close. And, secondly, the old days of mere frontier defence were over. The barbarians began to beat on the walls of the Empire as early as a.d. 160: about a.d. 250 they here and there got through, and they came henceforward in ever-growing numbers. Moreover, they came on horseback, bringing new tactics for the Roman infantry to face, and they came in huge masses. We may doubt if any military system could have permanently stayed this astonishing torrent. But the Empire did

what it could. It enlisted barbarians to fight barbarians, and added freely — too freely, perhaps, if there was any choice — to the non-Roman elements of the army. It increased its cavalry and began to form a distinct field force.

Fourth Period. — The results are seen in the reforms of Dio- cletian and Constantine the Great (a.d. 284-circa 320). New frontier guards, styled limitanei or riparienses, were established, and the old army was reorganized in field forces which accom- panied or might accompany the emperors in war {comitatenses, palatini). The importance of the legions dwindled; the chief soldiers were the mercenaries, mostly Germans, enlisted from among the barbarians. New titles now appear, and it becomes plain even to the casual reader that in many points the new order is not the old. The details of the system are as compli- cated as all the administrative machinery of that age. Here it is enought to point out that the significance of such officers and titles as the dux and the comes (duke, count) lies ahead in the history of the middle ages, and not in the past, the history of the Roman army itself.

War Office, General Staff. — Under the Republic we do not find, and indeed should not expect to find, any central body which was especially entrusted with the development of the army system or military finance or military policy in wars. Even under the Empire, however, there was no such organiza- tion. The emperor, as commander-in-chief, and his more or less unofficial advisers doubtless decided questions of policy. But the army was so much a group of provincial armies that

much was left to the chief officers in each province. Here, as elsewhere in the Empire, we trace a love if not for Home Rule, at least for Devolution. There was, however, a central finance office in Rome for the special purpose of meeting the bounties (or equivalent) due to discharged soldiers. This was established by Augustus in a.d. 6 with the title aerarium militare, and had, for receipts, the yield of two taxes, a 5% legacy duty and a 1% on sales (or perhaps only on auction- sales). The legacy duty did not touch legacies to near relations or legacies of small amount.

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(F. J. H.)

ROMAN ART. (1) Introductory: History of Recent Research. — The scientific study of ancient Roman art dates from a com- paratively recent period. The great artists of the Renaissance, headed by Raphael and Michelangelo, showed no lack of apprecia- tion for such models as the bas-reliefs of Trajan’s Column; and it is sufficient to name Mantegna’s ” Triumph of Caesar ” in order to recall the influence exerted by Roman historical sculpture upon their choice and treatment of monumental subjects; but their eyes were fixed on the Greek ideal, however imperfectly represented by monuments then accessible, and the supremacy of this standard became established beyond challenge. In the 18th century Winckelmann, the founder of the science of classical archaeology, directed the gaze of students and critics towards the glories of classical Greek art, which he divined behind the copies which filled the palaces and museums of modern Rome; 1 and the rediscovery of the extant remains of that art, which began early in the 19th century and still continues, has naturally absorbed the attention of the great majority of classical archaeologists. Neverthe- less, towards the close of the 19th century, when the main lines of Greek artistic development had been firmly traced and interest was aroused in its later offshoots, critics were led to examine more closely the products of the Roman period. As early as 1874 Philippi had published a study of Roman triumphal reliefs; 2 but his intention was to show that they were derived from the paintings exhibited on the occasion of a triumph — a theory which can no longer be maintained — • and not to determine their place in the history of art. In 1893, however, Alois Riegl published a series of essays on the history of ornament under the title of Slilfragen, in one of which he expressed the opinion that ” there was in the antique art of the Roman Empire a development along the ascending line and not merely a decadence, as is universally believed.” This thesis was taken up two years later by Franz Wickhoff in a preface contributed to the reproduction in facsimile of the illustrated MS. of Genesis in the imperial library at Vienna. Wickhoff contended that, whilst the art of the Augustan period was the culmination of that which had flourished under the Hellenistic monarchies, it was succeeded by an outburst of genuinely Roman artistic effort, which reached the height of its achievement in the reliefs and portrait-sculpture of the Flavian period, and gave birth in the 2nd century a.d. to the monuments of the ” continuous ” style of representation ex- emplified by the imperial

columns. Wickhoff's work has become familiar to English readers through Mrs Strong's

1 The eleventh book of Winckelmann's Geschichte der Kunst, which deals with art under the Romans, contains notable proofs of the author's sureness of vision; for example, he divined the true date and affinities of the reliefs in the Villa Borghese, after- wards .wrongly attributed to the time of Claudius (see below).

2 " t)ber die romischen Triumphalreliefs und ihre Stellung in der Kunstgeschichte " (Abhandlungen der sachs. Gesellsch. der Wissenschaften, vi., 1874).

excellent translation, with copious illustrations, which ap- peared in 1900; in the following year Riegl published the first (which, by reason of his untimely death, remains the only) volume of his Late Roman Industrial Art in Austria and Hungary, in the opening chapters of which he endeavours to show that the later transformations of Roman art in the 2nd and suc- ceeding centuries after Christ continue to mark a definite advance. On the other hand, the originality of Roman art under the Empire was called in quesion by Josef Strzygowski, whose first important work on the subject, Orient oder Rom, appeared in 1901. Strzygowski holds that even in the imperial period, Rome was receptive rather than creative; that what is termed " Roman imperial art " is in reality the latest phase of Hellenistic art, whose chief centres are to be sought in Asia Minor, Syria and Egypt; and that this late Hellenistic art was itself gradually transformed by the invading spirit of the East into that Byzantine art which is half Greek *nd half Oriental, but wholly un-Roman. The problem thus stated will presently be discussed; in the meantime it is to be noted that the principal monuments which fall within our province have been at length rendered accessible to students by a series of adequate reproductions. In sculpture, the reliefs of Trajan's Column have been published by Cichorius, and those of the column of Marcus Aurelius by Petersen and others; in metal- work, the treasure of Bosco Reale has been reproduced in the Monuments Piot, and that of Hildesheim has been published by the authorities of the Berlin Museum; a series of repro- ductions, including all the important examples of Roman painting, is issued by the firm of Bruckmann under the super- vision of Paul Herrmann; and the ancient paintings preserved in the Vatican library, which include some of the most famous examples of the art,

were published and described by Dr Nogara in 1907. The discussion of the date to be assigned to the Trophy of Trajan at Adam-Klissi in the Dobruja, initiated by Adolf Furtwangler, has led to a closer study of the remains of Roman provincial art; and the discovery of the foundations of the Ara Pacis Augustae at Rome, together with addi- tional remains of its sculptured decoration, has given an impulse to the study of Roman historical monuments. In this field important contributions to knowledge have been made by members of the British school at Rome, which will be noticed below. Finally, the history of Roman sculpture has for the first time been systematically and comprehensively treated by Mrs Strong in a handbook whose copious and well-chosen illustrations add greatly to its value. Thus the necessary equipment has been furnished for students of the problem presented by Roman art.

(2) National Roman Art; Landmarks of its History. — It is impossible to speak of a specifically Roman national art until we approach the latest period of Republican history. The germs of artistic endowment which existed in the Roman character were not developed until her political institutions were matured and her supremacy in the Mediterranean established. Up to that time such works of art as were produced in, or imported into, Rome were without exception Greek or Etruscan. Both in Etruria and in Latium Greek artists were commissioned to decorate the temples in which wood and terra-cotta took the place of the marble which Greece alone could afford to use. In 496 B.C., according to tradition, two Greek artists, Damophilos and Gorgasos, decorated the temple of Ceres, Liber and Libera with paintings and sculpture; when the temple was restored by Augustus their terra-cotta reliefs were carefully removed and framed. 1 But most of the early sculpture preserved in Rome doubtless belonged to the ” Tuscan ” school, whose works Pliny 2 quotes as evidence that there was an art of statuary native to Italy. It is true that Etruscan art was dependent for its motives and technique on Greek models; but in its portraiture — notably in the reclining figures which adorn Etruscan sarcophagi — we can trace the uncompromising realism and close attention to detail which are native to Italian

l H.N. xxxv. 154.

2 H.N. xxxiv. 34; cf. 43; and see Quint, xii. 10, I.

soil; the fragments of temple-sculptures which have been preserved are of less value, since, if not the work of Greeks, they are entirely Greek in conception. Roman portraiture undoubtedly continues the Etruscan tradition. It was a common custom in Etruria to decorate the

urn containing the ashes of the dead with a lid in the form of the human head (such urns are called canopi), and the same desire to record the features of the departed produced the waxen masks, or imagines, which were preserved in the houses of the Roman aristocracy. In architecture, too, Roman builders learnt much from their Etruscan neighbours, from whom they borrowed the characteristic form of their temples, and perhaps also the prominent use of the arch and vault. But the stream of Etruscan influence was met by a counter-current from the south, where the Greek colonies in Campania provided a natural channel by which Hellenic ideas reached the Latin race; and Roman architects soon abandoned the purely Etruscan type of temple for one which closely followed western Greek models. The conquests of the later Republic, however, brought them into more direct contact with the art of Greece proper. Beginning from 212 B.C., when Marcellus despoiled Syracuse of its principal statues, every victorious general adorned his triumph with masterpieces of Greek art, whether of sculpture or of painting, and, when Philhellenism became the ruling fashion at Rome, wealthy connoisseurs formed private collections drawn from the Greek provinces — Greek craftsmen, moreover, were employed in the decoration of the palaces of the Roman nobles and capitalists, which scarcely differed from those of the great Hellenistic cities. Except in portraiture, there was nothing character- istically Roman in the art which flourished in Rome in the time of Caesar and Cicero. But the remains of an altar, preserved partly at Munich and partly in the Louvre (Plate II. fig. 10), which is believed with good reason to have been set up by Cn. Domitius Ahenobarbus shortly before 30 B.C., furnish an early example of the historical, or, to speak more exactly, commemorative art, to whose development the Empire gave so powerful an impulse. On the one face of the altar we find a Greek subject — the marriage of Poseidon and Amphitrite, — on the other a Roman sacrifice, the suovetaurilia, with other scenes from the life of the army. Augustus enlisted art, as he did literature, in the service of the new order. The remarkable technical dexterity which characterizes all forms of art in this period — silver plate and stucco decoration, as well as sculpture in the round or in relief — is purely Greek; but the form is filled with a new content. For Augustus determined to enlist art as well as literature in the service of the new regime, and this purpose was served not only by public monuments, such as the Ara Pacis Augustae (Plate II. figs. 11-13), but by the masterpieces of the silversmith's and gem-engraver's art (Plate VII. figs. 32-37). In the art, as in the literature of the Augustan age, classicism was the dominant note, and the naturalism so congenial to the Italian temperament was repressed, though never extinguished. The result of this was that under the Julio-

Claudian dynasty academic tradition filled the place of inspiration, and Roman art failed to discover its vocation. A change came under the Flavian emperors. The painters who decorated with fairy landscapes the walls of Roman palaces, untrammelled by the conventions of official art, introduced into Rome a summary method of working, which has much in common with that of the modern impressionist school; and the sculptors of the Flavian period laid to heart the lesson taught by their successful ” illusionism ” (to borrow Wickhoff’s term). We shall see that this is true of all forms of sculpture — historical sculpture, portraiture and decorative ornament; and we are entitled to rank this Flavian art as the specific creation of imperial Rome, whatever may have been the precise nationality of the individual workers who adorned the new capital of the world. But this phase was of short duration; and the Roman spirit, which in harmony with that of Greece had produced such brilliant results, triumphed under Trajan and found its characteristic expression in the ” epic in stone ” with which his column is adorned. Wickhoff claims the ” continuous ”

style in which the artist recounts the Dacian campaigns of Trajan as a creation of the Roman genius. We shall see that the term is not altogether a happy one; but there is good ieason (as will be shown below) for the belief that the designer of the column, however profoundly influenced in his selection of motives and in his composition of individual scenes by Greek tradition, nevertheless worked out his main principles for himself. The realism of the Roman is shown in the minute rendering of details, which makes the reliefs a priceless source of information as to military antiquities. Historical art achieved no less a triumph in the great frieze from Trajan’s Forum (Plate II. fig. 16), and in the panels of the arch at Benevento. Imposing as these works are, they suffer from the defects incidental to an art which endeavours to express too much. Overcharged with detail, and packed with meanings which reveal themselves only to patient study, they lack the spacious and reposeful character of Greek art; while, if we regard only their decorative function, we must admit that the excess of ornamental surface mars the effect of the buildings which they adorn. Along the path thus marked out, Roman art continued to progress; it is true that under the influence of Hadrian there was a brief renaissance of classicism which gave birth to the idealized type of Antinous, and to certain eclectic works which belong to Greek rather than to Roman art; but the historical reliefs which survive from

the Antonine period, and more especially the sarcophagi, which reproduce scenes of Greek mythology with a close adherence to the letter but a fresh artistic spirit, show that the new leaven was at work. The main fact underlying the changes of the time was the loss of the true principles of plastic art, which even in Hellenistic times had become obscured by the introduction of pictorial methods into relief-sculpture. Colour, rather than form, now took the highest place in the gamut of artistic values. Painting, indeed, so far as our scanty knowledge goes, was not practised with conspicuous success; but the art of mosaic was carried to an extraordinary degree of technical perfection; and in strictly plastic art the choice of material was often determined by qualities of colour and transparency. For example, porphyry, basalt and alabaster of various hues were used by the sculptor in preference to white marble; and new conventions, such as the plastic rendering of the iris and pupil of the eye, were dictated by the ever-growing need for contrasts of light and shadow. This great revolution in taste has been traced, and doubtless with justice, to the permeation of the Graeco- Roman world of the 2nd century by oriental ideas. The East has always preferred colour to form, and richness of ornament to significance of subject; and in art, as in religion, the West was now content to borrow. Roman official art, however, continued to produce the historical monuments which the achievements of the time demanded; but the principles of figure-composition were less fully grasped. The reliefs of the Aurelian Column form a less intelligible series than those of the Column of Trajan; and the panels of the Arch of Septimius Severus, with their bird's-eye perspective, have not inaptly been compared to Flemish tapestries. The extravagance and pomp of the dynasty founded by Septimius Severus filled Rome with such works as the art of the time could produce; and the busts of Caracalla show that in portraiture Roman crafts- men retained their cunning. Even during the anarchy which followed masterpieces such as the portrait of Philip the Arabian were produced; and during the reign of Gallienus (a d. 253-268), which saw the dismemberment of the Empire, there was a note-worthy outburst of artistic activity, whose products are seen in the naturalistic portraits of the emperor and the court. 1 But by the close of the 3rd century a further transformation had taken place, which coincided with the political revolution by which the absolute monarchy of Diocletian succeeded to the principate of Augustus. The portraits of Constantine and his house can no longer be termed naturalistic; they are

1 It is very remarkable that the coin-portraits of the Gallic usurper Postumus (a.d. 258-68) are executed in precisely the same style ; the

coins were struck either at Trier or at Cologne.

monumental, both in scale and in conception, and, above all, their rigid ” frontality ” carries us back at a bound to the primitive art of the East. The classical standard set by the Greek genius had ceased to govern art, although the fund of types which Hellenism had created still furnished subjects to the artist, or was made the vehicle by which the new ideas derived from Christianity were expressed. The Roman spirit was still strong enough to maintain that interest in the human form and the representation of dramatic events which was lacking in the Oriental; but in the monuments of the Constan- tinian period, such as the narrow friezes of the Arch of Con- stantine, we can see nothing but the work of artists who had lost touch with true plastic principles, in spite of the ingenious arguments adduced by Riegl. If we are to seek for signs of progress, it must be rather in the domain of architecture, which had never ceased to make advances in dealing with the spatial and constructive problems presented by the great building works of the Empire; it was now called upon to face a fresh task in providing Christians with a fit place for public worship. In the solution of this problem the architects of the 4th century showed a wonderful fertility of resource; but to describe their achievements would be to pass the confines of Roman art in the proper sense of the word.

(3) Individual Arts: (a) Architecture. — This branch of the subject may be studied in the article Architecture, and illus- trations will be found in other articles (Capital; Column; Order; Triumphal Arch; &c). Architecture, regarded as a fine art, had been brought by the Greeks to the highest perfection of which it was capable under the limitations which they imposed upon themselves. The Greek temple appeals to the aesthetic sense by the simplicity and harmony of its proportions as well as by the rational correspondence between function and decoration in its several members. On these lines there was no room for progress. It is true that the Etruscans modified the type of the Greek temple and profoundly influenced Roman construction in this respect. The Etruscan temple was not approached on all sides by a low flight of steps, but raised on a high platform {podium) with a staircase in the front; it was broad in proportion to its depth, indeed, in many cases, square; and the temple itself (cello) was faced by a deep portico, which often occupied half the platform. Moreover, as the use of marble for building was unknown in early Italy, wood was employed in construction and terra-cotta in decoration, and this change of material led to a wider spacing of the columns than was possible in Greece. But these alterations in the system of proportions were disadvantageous to aesthetic effect; and the Romans — though they soon ceased (under the influence of the western Greeks) to build

temples of purely ” Tuscan ” type — preserved certain of their features, such as the high platform and deep portico (see Architecture, fig. 26). Nor can we regard as felicitous the design of certain Roman temples, such as that of Concord overlooking the Forum, and the supposed temple of Augustus (see Rome), which have a broad front (approached in the temple of Concord by a central portico) and narrow sides. The great temples of the Empire were (in general) inspired by Greek models, and need not therefore concern us; but we may notice Hadrian’s peculiar design for the double temple of Venus and Rome, with twin cellae placed back to back. To the orders (see Order) of Greek architecture the Etruscans added the ” Tuscan,” a simplified Doric, of which an early example has been found at Pompeii, enclosed within the wall of the Casa del Fauno. 2 This column, which can scarcely be later than the 6th century B.C., has a smooth shaft with pronounced entasis, a heavy capital with a scotia between abacus and echinus, and a plain circular base. To the Romans we owe the ” Composite ” order, so called because it contains features distinctive of the Corinthian and Ionic orders (see Order, fig. 14). It is really a variety of the Corinthian, with Ionic volutes inserted in the capital; the earliest known example of its use is seen in the Arch of Titus. The Romans, moreover, made frequent use of the figured capital, which, as tRomische Mitteilungen (1902), pi. vii.

ROMAN ART

PlATE I

-DOMITIUS AHENOBARBUS (SO CALLED).

Photo, Anderson.

Fig. 2.— SCIPIO AFRICANUS (SO CALLED).

Photo, Alinari.

Fig. 3.— UNKNOWN WOMAN.

Fig. 4. VESPASIAN.

Photo, F. Bruckmann, Munich.

Fig. 5.— UNKNOWN PHYSICIAN.

Photo, Giraudon.

Fig. 6.-ANTINOt)S.

Photo F. Bruckmann, Munich.

Fig 7.— UNKNOWN ROMAN.

Photo, Giraudon.

Fig. 8.— GALLIENUS.

Photo, F. Bruckmann, Munich.

Fig. 9.— UNKNOWN MAN (4TH Century).

ROM

Photo, Gi'audfin.

Fig. i o.— ALTAR OF

AUGUSTUS AND THE ROYAL FAMILY.

CLAUDII

Figs. 11-13. — PORTIONS OF THE DECS

By permission of the Itak

termissism of Iks Italian Ministry ■ oj Public Instruction.

Fig. 14.— RELIEF FROM THE ARCH OF TITUS: TRIUMPH OF TITUS AND THE SPOILS OF JERUSALEM.

ART

Plate II.

IUS AHENOBARBUS.

,fILY.

OX OF THE ARA PACIS AUGUSTAE.

utry of Public Instruction,

THE EARTH GODDESS AND THE SPIRITS OF AIR AND WATER.

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15.— PILASTER.

By permission of tke Italian Ministry of Public Instruction.

Fig. 16.— RELIEF FROM THE ARCH OF CONST ANTINE: ROMAN CAVALRY CHARGE.

Plate III.

ROMAN ART

Photo, Anderson.

Fic 17. – caesar Arcrsrrs.

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Fig. 18.— MEDALLION, ARCH OF CONSTANTINE.

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Pltoio, Anderson.

CONSTANTINE DISTRIBUTING A DOLE.

CONSTANTINE ON THE ROSTRUM. Fig. 19.— BAS-RELIEFS ON THE ARCH OF CONSTANTINE.

ROMAN ART

ihe remains of Pompeii show, was an invention of the later Hellenistic age. Reduced copies of statues are found in the decoration of such capitals in the baths of Caracalla ; the capitals with Victories and trophies in S. Lorenzo Fuori also belonged to a building of pagan times. .

But the specific achievement of the Roman architect was the artistic application of a new set of principles — those which are expressed in the arch, the vault and the dome. The recti- linear buildings of the Greeks, with their direct vertical supports, gave place to vaulted structures in which lateral thrust was called into play. The aesthetic effect of the curves thus brought into prominence was well understood by the Romans; and they were the inventors of the decorative combination of the Greek orders with the arcade. More than this, the erection of vaults and domes of wide span, rendered possible by the use of concrete, gave to the Roman architect the opportunity of dealing artistically with internal spaces. A simple yet grandiose example of this may be found in the Pantheon of Hadrian. Circular buildings were a common feature in Italian archi- tecture; 1 the temple of Vesta, which doubtless represented the primitive hut or dwelling of the king, always had this form, and the theme was repeated with many variations, from the well-known circular temple in the Forum Boarium to the fantastic structure with broken outlines at Baalbek. But in the Pantheon the artist lays stress, not on the exterior, which possesses no special effect, but on the interior, whose proportions are carefully determined and give a most impressive result. The same may be said of the great halls of the Imperial Thermae, and as time went on more elaborate architectural schemes were devised to meet the requirements of the Christian Church.

{b) Sculpture. — It was pointed out above that in the late Republican period specifically Roman art was practically con- fined to portraiture. Of this we have many fine examples, such as the so-called Domitius Ahenobarbus of the Braccio Nuovo (Plate I. fig. i); and there is a series of busts which possess a special interest in that some of them have been claimed as portraits of Scipio Africanus. The example in the Museo Capitolino (Plate I. fig. 2), with a modern inscription, though executed in the 2nd century A.D., is clearly copied from m. famous Republican original. The baldness of the head has been thought to be derived from the technique of the waxen imagines, in which the hair was painted; the presence of a scar above the temple, which has given rise to various theories, merely betokens the unsparing realism of the Republican artist. In monumental sculpture our earliest datable example is the altar of Domitius Ahenobarbus, already referred to (Plate II. fig. 10). The ceremonial scene of the suovetaurilia fills the

centre of the composition; to the left we see the dismissal of veterans for whom diplomata are being prepared; to the right the troops on active service, both horse and foot, are represented. The artist was clearly inspired by statuary and other types of earlier date, which are grouped in a somewhat loose composition. Augustan art is adequately represented by the Prima Porta statue of the emperor, dis- covered in 1863 in the Villa of Livia and now in the Braccio Nuovo (Plate III. fig. 17). The attitude of the figure is that of an imperator addressing his army; but there is a character- istic blending of the real with the ideal, for the emperor is not only bareheaded but barefoot, and beside him is a tiny cupid riding on a dolphin, which indicates the descent of the Julian house from Venus. We note, too, how the Roman artist — ■ or the Greek artist interpreting the wishes of the Roman — is scarcely more concerned for the total effect of his work than for the significant details of the decoration. The chasings of the corselet display, as a central subject, the restoration by the Parthian in 20 B.C. of the standards taken from Crassus at Carrhae (53 B.C.). Not content with this, the artist has added a group of personifications indicating sunrise — Sol, Caelus, Aurora and the goddess of the morning dew — as well as Apollo, Diana, Mars and the earth goddess, and two figures symbolical of the western provinces, Gaul and Spain. It is also to be 1 See Altmann, t>ie italischen Rundbauten (1906).

noted that the statue shows abundant traces of its original polychrome tints — broˆra, yellow, blue, red and pink. It must have been executed later — probably not much later — ■ than 13 B.C., when Augustus returned from the West, and therefore belongs to the same period as the Ara Pacis Augustae, dedicated January 30, 9 B.C. This altar stood in a walled enclosure with two entrances, measuring n | by io| metres. The walls, with their plinth, were about 6 metres in height, and were decorated internally with a frieze of garlands and bucrania, and externally with two bands of relief, the lower consisting of conventional scrolls of acanthus varied with other floral motives, and teeming with bird and insect life, the upper showing processions (Plate II. fig. n) passing from east to west. The most interesting of these is that on the south wall, which included Augustus himself, the flamines and the imperial family. 2 On the western face, towards which the processions are directed, we find a scene of sacrifice, with a landscape background, in which the ideal figures of senate and people appear. To the east front (apparently) belongs the beautiful group of the earth goddess (Tellus) and the spirits of air and water (Plate II. fig. 13). It is impossible to deny the incongruity of this composition with the realistic procession which adjoins it, and we can only suppose that the artist bor- rowed the group from some Hellenistic precursor and

used it in that blend of the real and ideal which, as we saw, was the keynote of the new imperial art.

The lack of public monuments which can be assigned to the Julio-Claudian period is only in part supplied by those of private significance; the most important of these are the sepulchral cippi and other altars, decorated sometimes with figure-subjects, but largely with plant and animal forms rendered with the utmost naturalism. The altar with plane- leaves in the Museo delle Terme (fig. 38), though perhaps not

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Redrawn from a photo by Anderson.

Fig. 38. — Altar with Plane-leaves.

later than Augustus, is typical of the spirit in which vegetable forms were treated under the first dynasty. We may take a female portrait discovered in a ist-century house on the right bank of the Tiber (Plate I. fig. 3) as an example of the por- traiture of this period, which shows great technical merit but a touch of conventionality.

The sculpture of the Flavian period finds its best-known example in the reliefs of the Arch of Titus. This has but a single archway; the piers had no sculptured decoration, and the narrow frieze which surmounts the architrave is perfunc- torily executed. But the long panels on either side of the passage, which represent the triumph of Titus and the spoils of Jerusalem, have been deemed (by Wickhoff) worthy of a place in the history of art beside the masterpieces of Velazquez — the ” Hilanderas ” and the ” Surrender of Breda “; and

. 2 Some doubt has recently been cast on the identification of the emperor and his family.

though”” we cannot subscribe to his view that the artist calculated the effect of natural illumination upoS the relief, it remains true that they are eminently pictorial compositions in respect of their depth of focus, yet without sacrifice of plastic effect (Plate II. fig. 14). So far as bas-relief is concerned, the problem of representing form in open space is here solved. Equally admirable in technique, though of less historical importance, are the circular medallions (tondi) which now adorn the Arch of Constantine, but originally belonged (as the present writer has shown) 1 to a monument of the Flavian period, perhaps the ” temple of the Flavian house ” erected by Domitian. The one shown (Plate III. fig. 18) is remarkable in that the head of the emperor has been replaced by a portrait, not of Constantine, but (in all probability) of Claudius Gothicus (a.d. 268-70), who was the first to divert these sculptures from their original destination.

Flavian portraits, 2 of which two are here figured, — a bust of Vespasian in the Museo delle Terme (Plate I. fig. 4) and a bust, now in

the Lateran, found in the tomb of the Haterii, which, as is shown by the snake, represents a physician (Plate I. fig. 5), — must rank as the masterpieces of Roman art. Their extraordinarily lifelike character is due to the fact that the artist, without accumulating unnecessary detail, has contrived to catch the characteristic expression of his subject, and to render it with the utmost technical virtuosity. These portraits differ from the works of the Greek masters, who always subordinated the individual to the type, and therefore gave a less complete impression of reality than the Roman artists.

The same tendency has been noted in ornamental work which may be dated to the Flavian period. Wickhoff selected a pilaster from the monument of the Haterii (Plate II. fig. 15) upon which a column entwined with roses is carved. The flowers are not in fact represented with precise fidelity to nature, but the illusion of reality is no less great than in more accurately worked examples.

Roman sculpture soon passed the zenith of its achievement. We are not able to assign any historical monuments to the earlier years of Trajan's reign, but the portraits of the emperor betray a certain hardness of touch which makes them less interesting than those of the Flavian period. To the latter part of the reign belong a number of monuments which represent Trajanic art at its best. First and foremost come the reliefs, colossal in scale, which appear to have decorated the walls of Trajan's Forum. Four slabs were removed by Constantine's order and used to adorn the central passage and the shorter sides of the attic of his arch. The first of these (Plate II. fig. 16) shows the victorious charge of the Roman cavalry, with the emperor at its head, against their Dacian enemies. Other fragments of this frieze are extant in the Louvre, 3 and a much-restored relief, walled up in the garden of the Villa Medici, shows a Dacian on horseback swimming the Danube with Trajan's Bridge in the background. The composition of the battle-scene is very fine, and the heads of the Dacians are full of character; but, although details of armour, &c, are carefully and accurately reproduced, we see clear signs of technical decadence, both in the fact that the human eye is in many cases represented as though in full face on heads which are shown in profile, and also in the naive attempt to render several files of troops in perspective by means of superposed rows of heads. 4 The reliefs of the spiral

1 Papers of the British School at Rome, vol. iii. pp. 229 ff. Sieve- king (Rom. Mitth. (1907) pp. 345 ff.) believes that four of the medallions only belong to the Flavian period and the rest to Hadrian's reign.

2 On this subject see Mr Crowfoot's paper in Journal of Hellenic

Studies, xx. (1900) pp. 31 ff. A list of examples is given by Mr Wace in Papers of the British School at Rome, vol. iii. pp. 290 ff.

3 Mr Wace has recently identified the reliefs which show an emperor sacrificing before the temple of Jupiter Capitolinus as a part of the frieze (Papers of the British School at Rome, iv. pp. 229 ff.).

4 These features make it clear that the reliefs in the Villa Borghese, formerly supposed to belong to an arch of Claudius, are Trajanic; see Papers of the British School at Rome, iii. pp. 215 ff. (Stuart Jones).

column in the Basilica Ulpia tell the same tale. The designes borrowed certain motives from Hellenistic art; e.g. we find the suicide of the Dacian king Decebalus represented in precisely the same way as that of a Gallic chief on the well- known sarcophagus in the Capitoline Museum representing a battle between Greeks and Gauls; again, the symmetry oi the scene in which the fall of Sarmizegetusa (the Dacian capital) is depicted recalls that of Greek monuments — particularly the painting of the fall of Troy by Polygnotus, described by Pausanias at Delphi. But the loving care with which the arms and accoutrements of the Roman troops — both regular and irregular — are rendered 6 betrays the nationality of the artist; and his technical deficiencies, especially in the matter of perspective, point in the same direction. It seems probable, moreover, that the artistic conception of a column ornamented with a band of relief was new, and that the designer had to find his own solution for the problem. We find, in fact, that he tells his story in more than one way: (a) Considerable portions of the narrative, e.g. Trajan's march in the opening campaign, consist in a series of isolated and successive scenes; the divisions are usually marked by some conventional means, such as the insertion of a tree, or a change of direction in the action. (6) At other times the scenes unfold themselves against a continuous background, and merge almost insensibly into those which succeed them; to this form of narrative the term " continuous style," brought into use by Wickhoff, more properly applies, (c) The direct progress of the narrative is sometimes broken by passages which can only be called "panoramic"; the great composition showing the siege and fall of Sarmizegetusa falls under this head, and the " con- tinuous " narration of Trajan's journey at the outset of the second war is followed by an extensive panorama illustrating the operations in Moesia in a.d. 105.

The reliefs (as already indicated) tell the story of both of Trajan's wars with the Dacians, a formal division between the two narratives being made by a figure of Victory setting up a trophy; and the design of the second series shows a decided advance in artistic and dramatic effect

on that of the first. Clearly the artist learnt the laws of composition applicable to his problem in the course of his work.

Before leaving the Trajanic period a word must be said as to the arch erected at Benevento (see Triumphal Arch, fig. 2), from which point a new road — the Via Trajana — ran to Brun- disium. The inscription on this arch bears the date a.d. 114, but the prominence given to Hadrian has led to the supposition that the reliefs were executed after his accession. We have already noted that the use of relief as ornament is here carried to excess in the artist's desire to present a summary of Trajan's achievements at home and abroad. 6 The arrangement of the panels is calculated and significant. On the side which faces the town of Benevento the subjects have reference to Trajan's work in Rome. On the attic we see, to the left, a group of gods with the Capitoline triad — Jupiter, Juno and Minerva — in the foreground; to the right, Trajan welcomed at the entrance to the Capitol by the goddess Roma, the penates and the con- suls. He is accompanied by Hadrian, who is designated by the gesture of Roma as the emperor's successor. The two lowest panels likewise form a single picture. To the right Trajan appears at the entrance of the Forum, where he is welcomed by the praefectus urbi; to the left, with the Curia as background, we see the representatives of senate, knights and people. The central panels symbolize the military and civil aspects of Trajan's government — veterans to left, merchants to right, are the recipients of imperial favour. On the other

6 Thus Cichorius, in his publication of the reliefs, has been able to identify several of the corps which took part in the war; e.g. the " cohorts of Roman citizens " are distinguished from the bar- barian auxiliaries by the national emblems on their shields.

6 The significance of these reliefs was first demonstrated by Domaszewski (Jahreshefte des osterreichischen archaologischen Instituts, ii. 1899, pp. 173 ff.); a full account will be found in Mrs Strong's Roman Sculpture, ch. 9.

face of the arch we have a series of panels relating to Trajan's work in the provinces. On the attic the gods of the Danube provinces appear to the left, the submission of Mesopotamia on the right; the lowest panels represent negotiations with Ger- mans (left) and Parthians (right); in the centre (as on the other face) we have a military scene (recruiting

in the provinces) to left, balancing the foundation of colonies and growth of the proles Romana on the right. As the above description will show, this arch is, in respect of its significance, the most important monument of Roman historical art. Technically, the reliefs fall somewhat short of the best work of the Flavian period — the long panels of the archway, which represent a sacrifice offered by Trajan and his benefactions to the municipia of Italy, have not the verve of those from the Arch of Titus, but are at least as fine as the works executed for Trajan's Forum.

With the accession of Hadrian — the " Greekling," as he was called by his contemporaries — a short-lived renaissance of classicism set in. The eclectic modifications of Greek statuary types which it called forth do not fall within our province; but it should be noticed that in portraiture the most important work of this period was the idealized type of Antinous, here represented by a famous example (Plate I. fig. 6) in the Louvre, which invests the favourite of Hadrian with a divinity expressed in the terms of Hellenic art as well as a pathos which belongs to his own time. 1 The historical monuments of this and the following reign are few in number, and lack the preg- nancy of meaning and vigour of execution which distinguish those of the Trajanic period; mention may be made of three reliefs in the Palazzo dei Conservatori, one of which represents the apotheosis of an empress, and of the panels in the Palazzo Rondinini shown by the analogy of a medallion of Antoninus Pius to belong to his time. This is also the place to take note of the ideal figures symbolical of the subject peoples of the Empire. Under Trajan Roman sculptors had produced the fine statues of Dacian captives which now adorn the Arch of Con- stantine; to the Hadrianic period belong the idealized figures of provinces, classical in pose and motive, several of which are in the Palazzo de Conservatori. 2

We pass on to the period of Marcus Aurelius and Commodus, in which Roman art underwent a further transformation. The earliest monument of the time which calls for our attention is the base of the column (now destroyed) erected in honour of Antoninus Pius. Two of its faces are here shown (Plate IV. figs. 21 and 22), and the contrast is remarkable between the classicistic representation of the apotheosis of Antoninus and Faustina, witnessed by the ideal figures of Rome and the Campus Martius (holding an obelisk), and the realistic treatment of the decursio, a ceremony performed by detachments of the prae- torian guard on horse and foot. We note the endeavour of the Roman sculptor to express more than his medium will allow, and his inadequate grasp of the laws of proportion and per- spective. Discarding the classical standard and its conven- tions, the artist

disposes his figures like a child's toys, and, when confronted with the problem of the background, waves it aside and reduces the indication of the place of action to a few projecting ledges on which his puppets are supported. The reliefs of the Column of Marcus Aurelius suffer by comparison with those of Trajan's Column. The story which the designer had to tell was doubtless less definite in outline; we cannot trace, as in the former instance, the march of events towards a dramatic climax, and there is some reason to think that, although the two bands of relief, separated (as on Trajan's Column) by a figure of Victory, correspond generally with the " Germanic " and " Sarmatic " wars of Marcus down to a.d. 175, the narrative is not strictly chronological; thus the fall of rain ascribed by Christian tradition to the prayers of the " Thundering " Legion

1 It is in the portraits of the Hadrianic period that we first meet with the plastic rendering (in marble) of the iris and pupil of the eye; on the significance of this convention see above.

2 On these see Lucas's article in Jahrb. des k. deutschen arch. Instituts (1900), pp. 1 ff., and Mrs Strong, Roman Sculpture, pp. 243 ff.

(Plate IV. fig. 24) is represented at a very early stage, whereas our historians place it towards the close of the war. The figures are smaller and at the same time more crowded than those upon Trajan's Column, and the landscape is less intelli. gently rendered. The type of the rain-god, which is withou) doubt the creation of the Roman sculptor, is boldly conceived but scarcely artistic. Still the reliefs show that the designers of the time were making vigorous efforts to think for them- selves, and for this reason possess a higher value than the more conventional panels now distributed between the attic of the Arch of Constantine and the Palazzo dei Conservatori, which seem to have decorated a triumphal arch set up in or after a.d. 1 76.' The portraiture of the time also shows the invasion of new principles. Even before the reign of Marcus we find a tendency to emphasize the contrast between hair and flesh, the face often showing signs of high polish. In the latter half of the 2nd century the contrast is heightened by a new method of treating the hair, which is rendered as a mass of curls deeply undercut and honeycombed with drill-holes; a fine example is the Commodus of the Palazzo dei Conservatori. The aim of the sculptor is to obtain an ornamental effect by the violent contrast of light and dark — an adaptation for the purposes of plastic art of the chiaroscuro which more properly belongs to painting. This tendency may be seen at work in all branches of sculpture. The sarcophagi of the Antonine and later periods, with their crowded compositions and deep shadows, have the same pictorial effect; and in pure ornament

the vivid illusionism of Flavian art disappears, and, though plant-forms are lavishly used — from the time of Trajan onwards we note a growing distaste for pure outlines, which are hidden beneath all-pervading acanthus foliage — the interest of the sculptor comes to lie more and more in intricacy of pattern, pro- duced by the complementary effect of lights and shadows. An instance of this may be found in a pilaster now in the Lateran Museum (fig. 39), which Wickhoff justly contrasts with the rose-pillar from the monu- ment of the Haterii.' It is all-important to remember that (as Strzygowski has pointed out) 4 it is not true shadow which is contrasted with the high lights in later Roman ornament ; if so, the plastic effect of the free members would be height- ened, whereas the reverse is actually the case, for even the figures on sarco- phagi, worked in the round though they be, do not stand out from the back- ground — which indeed is practically abolished — but seem rather to form ele- ments in a pattern. The reason is that pure darkness is set off against the high lights, and the whole surface being thus broken up, there remains no impression of depth.

Under Septimius Severus and his successors, Roman art drifts steadily in its new direction. The reliefs of his arch at the entrance to the Forum represent the emperor's campaigns in the East in a compromise between bird's-eye perspective and the " continuous " style which cannot be called successful;

3 This series of panels is discussed in Papers of the British School at Rome, vol. iii. p. 251 ff.

4 Jahrbuch der preussischen Kunstsammlungen (1904), p. 271.

(Drawn from photo, Moscioni.)

Fig. 39. — Pilaster with Oak Leaf » Ornament.

a better example of the art of this period is to be seen in the relief (Plate IV. fig. 20) now in the Palazzo Sacchetti, recently published by Mr A. J. B. Wace, 1 which probably represents the presentation of Caracalla to the senate as the destined successor of his father. The squat figures of the senators, their grouping, which, though not lacking in naturalism and a certain effective- ness, is not in its main lines aesthetic, and the lavish use of deeply drilled ornament, are features which leave no doubt as to the period to which this work

should be assigned. Rome, however, could still boast a school of portrait-sculptors, whose work was of no ordinary merit. The bronze statue of Sep- timius Severus, which passed into the Somzee collection, has been pronounced by Furtwangler to be of much earlier date, except for the head of the emperor, and we cannot therefore feel confidence in using it as a measure of the artistic achieve- ments of Severus's reign; but the busts of Caracalla, which represent the tyrant in his later years, are masterly both in conception and in execution.

In the second quarter of the 3rd century A.D., when the Empire was torn by internal strife, threatened in its very existence by the inroads of barbarism, and hastening towards economic ruin, art could no longer flourish, and monuments of sculpture become scarce, if we except portraits and sar- cophagi. The busts of this period are easily distinguished by the treatment of the hair and beard, which seem to have been closely clipped, and are indicated by a multitude of fine chisel strokes on a roughened surface. But, rough as these technical methods may seem, the artists of the time used them with wonderful effect, and the portraits of the emperor Philip (a. d. 244-49) in the Braccio Nuovo, and an unknown Roman in the Capitoline Museum (Plate I. fig. 7), are hardly to be surpassed in their delineation of craft and cruelty. Amongst the sarcophagi of the 3rd century we select, in preference to those adorned with scenes of Greek mythology, the fine example in the Museo delle Terme (formerly in the Ludovisi collection) decorated with a melee of Romans and Orientals (Plate IV. fig. 23); the principal figure — whose portrait is also to be seen in the Capitoline Museum — has been identified by Mr A. H. S. Yeames as C. Furius Sabinius Aquila Timesitheus, the minister and father-in-law of Gordian III. (d. a.d. 244). Even after the middle of the century, when the Empire was for a time dismembered, portrait-sculpture put forth fresh evidences of life and vigour. Gallienus, who was himself a dilettante and doubtless largely endowed with personal vanity, seems to have called into being a naturalistic school of sculptors, who harked back to the models of the later Antonine period, so that it is not always easy to distinguish the busts of his time from those of a much earlier date. The Louvre bust of the emperor (Plate I. fig. 8) will serve as a type of these works. But this singular renaissance was as short-lived as the eclectic revival of classicism under Hadrian. It is remarkable that the portrait of Gallienus is the last which can be identified by truly individual traits. The period of storm and stress which followed his death has left little or no monumental material for the historian of sculpture; and when the curtain again rises on the art of the new monarchy founded by Diocletian and perfected by Constantine, we seem to move in a new world. The East has

triumphed over the West. Just as in Egyptian and, speaking generally, in all oriental art, before the revela- tion of true plastic principesˆ which we owe to the Greek genius, the law of ” frontality ” was universally operative, i.e. the pose of sculptured figures was rigidly symmetrical and without lateral curvature, so the portraits of Constantine and his successors are discerned at a glance by their stiff pose and fixed and stony stare. The fact is that the secret of organic structure has been lost; the bust (or statue) is no longer a true portrait, a block of marble made to pulsate with the life of the subject represented, but a monument. It was thus that the absolute monarchs of the Empire, before whom their subjects prostrated themselves in mute adoration, preferred to

1 Papers of the British School at Rome, iv. pi. xxxiv., from which fig. 15 is taken.

be portrayed; and we cannot help recalling Ammianus’s description 2 of the entry of Constantius II. into Rome (A.U 356). The emperor rode in a golden chariot, turning his head neither to the right nor to the left, but gazing impassively before him ” tanquam figmentum hominis.” The description fits such a portrait as that of an unknown personage of the 4th century in the Capitoline Museum (Plate I. fig. 9), which has found a panegyrist in Riegl. It remains to note that the narrow bands of ‘ relief on the Arch of Constantine, some of which probably date from the reign of Diocletian, 3 partake of the same monumental character as the single statues of the time. Where the nature of the subject permits, as in the case of the reliefs here represented (Plate III. fig. 19), the* frontality of the central figure, and the strict symmetry of the grouping, which imparts an almost geometrical regularity to the main lines of the composition, are calculated for architectonic rather than for plastic effect. The breath of organic life has ceased to inspire the marble.

We have confined ourselves in the above section to tracing the course of development in what we may call official Roman sculpture, represented in the main, as is natural, by the monuments of the capital. The products of local schools cannot here be treated in detail. The difficult problems which they raise are best illustrated by the case of ” Trajan’s trophy ” at Adam-Klissi in the Dobruja. Although the very name of the monument might seem to furnish sufficient evidence of its date, the late Professor Furtwangler stoutly maintained that Trajan did but restore a monument dating from 29 B.C. 4 He called attention to the uniformity in style of the grave- monuments of soldiers from north Italy, serving in the legions of the Rhine and Danube; these date from the early imperial period, and represent (according to Furtwangler) a

traditional ” legionary style.” It may be admitted that they are eminently Italian in their hard realistic character; but the tradition was not extinct in the Trajanic period, so that the analogy between these monuments and its rudely carved figures is inconclusive, and the ornament of the trophy, which is far from being homogeneous, contains, as Studniczka 5 has observed, oriental elements which could not possibly be found in sculpture of the 1st century B.C. Local tradition may also be traced, e.g. in southern France, where the Hellenic influence which penetrated by way of Massilia was still strongly felt under the Julio-Claudian dynasty, as the sculptures of the tomb of the Julii at St Remy and the triumphal arches of Orange and Carpentras suffice to prove. Gallo-Roman art, on the other hand, has a physiognomy of its own, whose outlines have been traced by M. Salomon Reinach (AntiquitSs nationales; bronzes figures de la Gaule romaine, Introduction). In the Rhineland we find, at a later period, a singular school of realistic sculptors at work; the museum at Trier contains a number of their grave-monuments decorated with scenes of daily life. 6 Nor must we omit to mention the Palmyrene sculptors of the 3rd century a.d., whose portrait-statues give us the clue to the origin of the ” frontal ” style of the Constantinian period. 7

(c) Painting and Mosaic. — The arts whose proper medium is colour enjoyed a popularity with the ancients and with the Romans, no less than with the Greeks, at least as great as that of sculpture; we need go no further for evidence of this than the statement of Pliny 8 that Julius Caesar paid eighty talents (£20,000) for the ” Ajax and Medea ” of Timomachus of Byzantium, which he placed in his newly built forum. But we are in a difficult position when we try

2 Amm. Marc. xvi. 10. 10.

3 See Mr Wace’s article in Papers of the British School at Rome, iv. pp. 270 ff.

4 His view is accepted by Mrs Strong {Roman Sculpture, p. 99).

6 ” Tropaeum Trajani ” (Abhandlungen der sacks. Gesellsch. der Wissenschaften, xxii., pp. 88 ff.).

6 Hettner, Illustrierter Fiihrer durch das National Museum zu Trier (1903), pp. 2 ff.

7 Some fine examples are in the Jacobsen collection ; see Arndt-Bruckmann, Griechische und rbmische Portraits, pis. 59, 60.

8 H.N. xxxv. 136.

ROMAN ART

Plate IV.

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Sy permission of the British School of Rome.

Fig. 20.— PRESENTATION OF CARACALLA TO THE SENATE.

Fig. 23.— MELEE OF ROMANS AND ORIENTALS, FROM A SARCOPHAGUS.

Fig. 24.— DETAIL OF THE COLUMN OF ANTONINUS.

Plate V.

ROMAN ART

From Richter &

Taylor’s Golden Aze of Classic Christian AH, by permission of trie authors aod Duckworth & Co.

Fig. 25.— MOSAIC, SHOWING CLOUD AND SKY EFFECTS.

Pkoto, Sansaini

Fig. 26— FRESCO: ODYSSEUS AMONG THE SHADES.

Fig. 27.— FRESCO FROM POMPEII: EVENING BENEDICTION IN FRONT OF THE TEMPLE OF ISIS.

Fig. 28.— FRESCO: THE MARRIAGE OF ALDOBRANDINI

ROMAN ART

to estimate the artistic value of the masterpieces of ancient painting, since time has destroyed the originals, and it is but rarely that we can even recover the outlines of a famous composition from decorative reproductions. For the history of Greek painting we have in Pliny's Natural History a fairly full literary record; but this fails us when we come to Roman times, nor do original works, worthy to be ranked with the monuments of Roman historical sculpture, supply the want.

Painting in Italy was throughout its early history dependent on Greek models, and reflected the phases through which the art passed in Greece. Thus the frescoes which adorn the walls of Etruscan chamber-tombs show an unmistakable analogy with Attic vase-paintings. The neutral background, the use of conventional flesh-tones, and the predominant interest shown by the artists in line as opposed to colour, clearly point to the source of their inspiration; and the fine sarcophagus at Florence 1 depicting a combat between Greeks and Amazons, in which we first trace the use of naturalistic flesh-tints, though it bears an Etruscan inscription, can hardly have been the handiwork of native artists.

Roman tradition tells of early wall-paintings at Ardea and Lanuvium, which existed " before the foundation of Rome"; 2 of these the Etruscan frescoes mentioned above may serve to give some impression. We also hear of Fabius Pictor, who earned his cognomen by decorating the temple of Salus on the Quirinal (302 B.C.); and a few more names are preserved by Pliny on account of the trivial anecdotes which attached to them. The chief works of specifically Roman painting in Republican times (other than the frescoes which adorned the walls of temples) were those exhibited by successful generals on the occasion of a triumph; thus we hear that in 263 B.C. M. Valerius Messalla was the first to display in the Curia Hostilia such a battle-piece, representing his victory over Hiero II. of Syracuse and the Carthaginians. 3 We may perhaps form some idea of these paintings from the fragment of a fresco discovered in a sepulchral vault on the Esquiline in 1889, 4 which appears to date from the 3rd century B.C. This painting represents scenes from a war between the Romans and an enemy who may almost certainly (from their equipment) be identified as Samnites; the names of the commanders are indicated, and amongst them is a Q. Fabius, probably Q. Fabius Maximus Rullianus, who played a part in the. third Samnite War. The scenes are superposed in tiers; the background is neutral, the colour-scale simple, and there is but little attempt at perspective; but we note the files of superposed heads in the representation of an army, which

are found at a later date in Trajanic sculpture.

We pass from this isolated example of early Roman painting to the decorative frescoes of Rome, Herculaneum and Pompeii, which introduce us to the new world conquered by Hellenistic artists. The scheme of colour is no longer conventional, but natural flesh-tints and local colour are employed; the ” artist understands,” as Wickhoff puts it, how to ” concentrate the picture in space ” instead of isolating the figures on a neutral background; he struggles (not always successfully) with the difficult problems of linear and aerial perspective, and contrives in many instances to give “atmosphere” to his scene; the modelling of his figures is often excellent ; finally, he can, when need requires, produce an effective sketch by compendious methods. It must be premised that this style of wall-decora- tion was a new thing in the Augustan period. In the Hellenistic age the walls of palaces were veneered with slabs of many- coloured marble (crustae); and in humbler dwellings these were imitated in fresco. This ” incrustation ” style is found in a few houses at Pompeii, such as the Casa di Sallustio, built in the 2nd century B.C.; but before the fall of the Republic it had given place to what is known as the ” architectural ” style. In this the painter is no longer content to reproduce in stucco

1 Journal of Hell. Stud. iv. (1883), pis. xxxvi.-xxxvlii.

2 Pliny, H.N. xxxv. 18. 3 Ibid. xxxv. 22. 4 Bullettino Comunale (1889), pis. xi. xii.

the marble decoration of more sumptuous rooms; by intro- ducing columns and other architectural elements he endeavours to give the illusion of outer space, and this is heightened by the landscapes, peopled, it may be, with figures, which form the background. We shall take as an example of such decoration one of the ” Odyssey landscapes ” discovered on the Esquiline in 1849; these may be amongst the more recent works of this school, but can scarcely, from the character of their surroundings, be later than the reign of Claudius. Amongst the remains of a large private house was a room whose walls were decorated in their upper portion with painted pilasters treated in perspective, through which the spectator appears to look out on a continuous background of land and sea, which is diversified by scenes from the voyage of Odysseus. It is clearly to such works as these that Vitruvius refers in a well-known passage (vii. 5) where, in describing the wall-paintings of his time, he speaks of a class of ” paintings on a large scale which represent images of the gods or unfold mythical

tales in due order, as well as the battles of Troy or the wanderings of Odysseus through landscapes (topia).” And it is worthy of note that in a chamber discovered in the 1 8th century below the Flavian state-rooms on the Palatine (see Rome) the tale of Troy seems to have been represented in a very similar manner; drawings of the panel on which the landing of Helen is depicted have been preserved. Of the eight scenes from the Odyssey found on the Esquiline three represent the adventure in the country of the Laestrygones; the third forms a transition from this subject to the visit of Odysseus to Circe, which occupies the fourth and fifth panels; 6 the two last depict Odysseus among the shades. The second of these, which is here reproduced (Plate V. fig. 26), is only half as wide as the others, and was probably next to a door or window. It is, however, typical in style and treatment. The artist is mainly interested in the landscape, which is sketched with great freedom and breadth of treatment. He has clearly no scientific know- ledge of perspective, and commits the natural error of placing the horizon too high. His figures are identified by Greek inscriptions, and we see that artistic considerations weigh more highly with him than close adherence to his poetical text; for the group of the Danaids in the foreground has no counterpart in the Homeric description. The conventional distinction of flesh-tints between the sexes is to be observed.

The use of landscape in decoration is expressly stated by Pliny (H.N. xxxv. 116) to have become fashionable in Rome in the time of Augustus. He attributes this to a painter named Studius, who decorated walls with ” villas, harbours, landscape gardens, groves, woods, hills, fish-ponds, canals, rivers, shores,” and so forth, diversified with figures of ” persons on foot or in boats, approaching the villas by land on donkeys or in carriages, as well as fishers and fowlers, hunters and even vintagers.” Vitruvius, too, in the passage above quoted, speaks of ” harbours, capes, shores, springs, straits, temples, groves, mountains, cattle and herdsmen “; and existing paintings fully confirm the statements of ancient writers. In the Villa of Livia at Prima Porta the walls of a room are painted in imitation of a park; from the Villa of Fannius Synistor at Bosco Reale we have a variety of landscapes and perspectives; and in the house dis- covered in the grounds of the Villa Farnesina by the Tiber we find a room decorated with black panels, upon which landscapes exactly conforming to Pliny’s description are sketched in with brush-strokes of white. While we have no reason to dispute the accuracy of Pliny’s statement, or to refuse credit to the Roman artist for the development of landscape decoration, it is to be noted that the summary methods of impressionist technique which are here employed are probably

traceable to Alexandrian influence. Petronius, who puts into the mouth of one of his characters a lament over the decline of art, attributes the de- cadence of painting to the ” audacity of the Egyptians ” and their discovery of ” a short cut to high art ” (tarn magnae artis compendiaria) . This has been thought to mean no more than the process of fresco-painting, which led to the substitution of

5 The latter of these is so badly preserved that the subject cannot be precisely identified.

mere wall-decoration for elaborate easel-paintings; but this was no new invention. It has been pointed out by Mrs Strong 1 that amongst the wall-paintings of Pompeii we can distinguish a group executed in bold dashes of colour — especially white — according to the principles of modern impressionism. The most striking example of this betrays its source of inspiration by its subject — the ceremony of the evening benediction in front of the temple of Isis (Plate V. fig. 27).

So far the paintings which we have considered can only be regarded as an extremely ingenious and, in the main, tasteful form of wall-decoration; they tell us little of that which we most wish to know— the style and treatment of substantive works of painting. The gap is in some measure filled by the central panels of Pompeian walls, which are usually adorned with subject-paintings, often mythological in subject, clearly marked off from the rest of the wall and intended to take the place of pictures, f In the Architectural style these are usually framed in a species of pavilion or aedicula, painted in per- spective; 2 but this motive gradually loses its importance. In the Third style (“ornate”) distinguished by Mau the architectural design ceases to be intelligible as the counterfeit of real construction, and becomes a purely conventional scheme of decoration; and in the Fourth or Intricate style, which again reverts to true architectural forms, however fantastic and bewildering in their complexity, the figure-subjects are plainly conceived as pictures and framed with a simple band of colour. The subjects of these frescoes are for the most part taken from Greek mythology, and it has been argued that in the main we have to deal with reproductions of Hellenistic paintings rather than of contemporary works of art. It is not to be denied that the motives of famous compositions of earlier date may have found their way into the repertory of the Pompeian artists; it is not unnatural, for example, to conjecture that the figure of Medea here reproduced

(Plate VI. fig. 30) may have been inspired by the celebrated painting of Timomachus above-mentioned. But there are reasons for thinking that the debt owed by the Pompeian artists to the Greek schools of the Hellenistic age is not so direct as was believed by Helbig, whose Untersuchungen Uber die kampan- ische W andmalerei won a general acceptance for the theory. It seems clear that in the central subjects of walls decorated in the Architectural style we are intended to see, not a picture in the strict sense, but a view of the outside landscape, gener- ally with a small shrine or cult-statue as the centre of the piece; and the importance of the figure-subject was therefore at first subordinate. These subjects are, it is true, taken from Greek mythology, but this only proves that that source of inspiration was as freely drawn upon in the art as in the litera- ture of imperial Rome. In the later styles figure-subjects without landscape are extremely common, but it has been shown that, e.g. in the triclinium of the Casa dei Vettii, which is decorated with a cycle of mythological paintings, the lighting is carefully calculated with a view to illusionistic effect under the local conditions, so that the conception of an outlook into external space is not given up. We sometimes, as in one of the rooms in the ” Farnesina ” house, find framed pictures directly imitated, and here the models were clearly of a re- latively early period; but this is exceptional. The Pompeian paintings, therefore, may fairly be used as evidence for the methods and aims of art in imperial Rome; and when allowance is made for their decorative character and hasty execution, we must admit that they give token of considerable technical skill — the modelling of figures is often excellent, the colour- scale rich, the ” values ” nicely calculated. The composition of subject-pictures is somewhat theatrical. Amongst the wall- paintings which have been preserved are some which from their classicistic style have been thought to represent Greek originals; the most famous is the ” Aldobrandini Marriage ” (Plate V. fig. 28), now in the Vatican library. As a matter

1 The Elder Pliny’s Chapters on the History of Art, p. 238.

2 The most striking example is that from the ” House of Livia ” on the Palatine.

of fact, the composition is formed by the juxtaposition of sculpturesque types, after a fashion familiar to Roman wall- painters. Mention may here be made of the combination of ornamental work in plaster with painting which is found at Pompeii, in the work of the Flavian period at Rome, and in tombs of the 2nd century a.d. In the Augustan period we find exquisitely modelled relief-work in plaster, used to ornament vaulted surfaces in the ” Farnesina ” house; it might

seem natural to treat of these under the heading of Sculpture, but in point of fact they are translations from painting into stucco. At a later time both painter and modeller worked in conjunction, with admirable effect; the results are best seen in the tombs on the Latin Way.

Little can be said as to Roman portrait-painting. We know that in this branch of art the technique generally used was that called ” encaustic.” The colours were mixed with liquefied wax and fixed by heat; whether they were applied in a molten state or not has been disputed, but it seems more likely that the pigments were laid on cold, and a hot instrument used afterwards. Several examples of such wax-paintings have been found in Egypt, where it was the custom during the 2nd and 3rd centuries a.d. to substitute panel portraits for the plastic masks with which mummy-cases were adorned; but these cannot be described as works of high art, though they sometimes have realistic merit. A good example in the Berlin Museum (Antike Denkmaler, ii. pi. 13) is executed in tempera on primed canvas. The medium used in ancient as in medieval tempera painting appears from the statements of ancient writers to have been yolk of egg mixed with fig-sap or natural gums.

To the little we know of purely Roman painting something is added by that which we learn from the remains of the sister art of mosaic, which, being less easily destroyed, have survived in large numbers to the present day. It has been estimated by Gauckler that considerably more than 2000 mosaics with figure-subjects have been discovered; and the number is steadily increasing. For the origin of the art reference may be made to the article Mosaic, where the reader will also find an explanation of the essential differences of principle between the arts of painting and mosaic. It is to the credit of the Roman artists that they were, generally speaking, alive to this distinction of method, and did not seek to produce the impres- sion of painting executed with a liquid medium by the use of solid materials. Indeed, it seems not improbable that in this respect they had a truer conception of the function of mosaic decoration than their Greek forerunners. Amongst the mosaics of Roman date which employ a large number of exceedingly minute cubes in order to produce an illusion akin to that of painting, the most conspicuous examples are the pavement in the Lateran Museum signed by the Greek Heraclitus, which appears to reproduce the ” unswept hall ” of Sosos of Per-gamum (see Mosaic), and the Mosaic of the Doves from Hadrian’s Villa, preserved in the Capitoline Museum, which may be supposed to have been inspired by the “drinking dove” of the same artist. The former of these contains about 120, the latter as many as 160 cubes to

the square inch.

As shown in the article Mosaic, a distinction must be drawn between opus tessellatum, consisting of cubes regularly disposed in geometrical patterns, and opus vermiculatum, in which a picture is produced by means of cubes irregularly placed. The two methods were commonly used in conjunction by the Romans, who recognized that a pavement should emphasize the form of the room to which it belonged by means of a geometrical border, while figure-subjects should be reserved for the central space. A good example is furnished by a mosaic pavement discovered on the Aventine in 1858, and preserved in the Museo delle Terme (Plate VI. fig. 29). Enclosed within a geometrical framework of guilloches and scroll-work, diversified with still- life subjects and scenic masks which break its monotony, we find a landscape evidently* taken from the banks of the Nile, as the hippopotamus and crocodile, as well as the papyrus and lotus, clearly show. These Egyptian scenes are likewise found

at Pompeii, and the celebrated pavement at Palestrina, with a bird's-eye view of the Nile and its surroundings, is the finest, as well as the latest, example of the class. The conclusion to be drawn is that the Roman mosaic-workers of the early Empire owed much to Alexandrian models. Their finer works, how- ever, were restricted in size, and formed small pictures isolated in geometrical pavements. Such mosaic-pictures were called emblemata, and were often transported from the great centres of production to distant provinces, where pavements were prepared for their reception. The subjects of these emblemata, like those of the wall-paintings of Pompeii, were, for the most part, taken from Greek mythology, and it is not easy to deter- mine what degree of originality is to be assigned to Roman artists. We note a certain interest in the great figures of literature and philosophy. A subject of which two somewhat different versions have been preserved, commonly known as " The Academy of Plato," shows us a group of Greek philosophers engaged in discussion. In provincial pavements it is not un- common to find portraits of poets or philosophers used to fill ornamental schemes of decoration, as in the famous mosaic at Trier signed by Monnus. And it is possible to trace the growth of interest in Roman literature at the expense of that of Greece. Fig. 31 (Plate VI.) shows a mosaic discovered in the tablinum of a villa at Sousse (Susa) in Tunis (the ancient Hadrumetum). It represents the poet Virgil seated, with a scroll on his knee, upon

which is written Aen. i. 8; beside him stand the muses of tragedy and history. In one of the side-wings (alae) of the atrium was a mosaic representing the parting of Aeneas from Dido, and this was no doubt balanced by another scene from the Aeneid. It has also been shown that the mythological scenes depicted by the mosaic-workers of the later imperial period are frequently inspired, not by Greek poetry or even Greek artistic tradition, but by the works of Ovid; and the popularity of the legend of Cupid and Psyche is doubtless to be traced to its literary treatment by Apuleius.

The mosaic shown in fig. 31 is notable for the simplicity of its composition; and it may be laid down as a general rule that the later workers in this field preferred such subjects, consisting of few figures on a neutral background, which lend themselves to broad treatment, and are best suited to the genius of mosaic. The finer pavements discovered in the villas of the landed proprietors of the African provinces, Gaul, and even Britain, are distinguished by the excellent taste with which ornament and subject are adapted to the space at the disposal of the artist. Beside a well-chosen repertory of geometrical patterns, the mosaic-workers make use ‘ of vegetable motives taken from the vine, the olive, the acanthus or the ivy, as well as conventional figures, such as the seasons, 1 the winds, the months and alle- gorical figures of all kinds, forming elements in a scheme of decoration which, though often of great richness, is never lack- ing in symmetry and sobriety.

It is much to be regretted that the destruction, partial or complete, of the great thermae and palaces of the early Empire has deprived us of the means of passing judgment on the opus musivum proper (see Mosaic), i.e. the decoration of vaults and wall-surfaces with mosaics in glass, enamel or precious materials. Effective as are the pavements constructed with tesserae of marble or coloured stone, they must have been eclipsed by the brilliant hues of the wall-mosaics. We can form but little idea of these from the decoration of fountains at Pompeii and elsewhere, and must depend chiefly on the compositions which adorn the walls and apses of early Christian basilicas. An attempt has, indeed, been made to prove that one of these — the church of S. Maria Maggiore — is nothing else than a private basilica once belonging to a Roman palace, and that its mosaics date from the period of Septimius Severus; 2 but it is impossible to accept this theory. The earliest monu- ment of the class which we are now considering is the baptistery of S. Costanza at Rome, built by Constantine in the early years

1 At least fifty examples of these have been found.

2 See Richter and Taylor, The Golden Age of Classic Christian Art

(1904).

of the 4th century a.d. Unfortunately the mosaics of the cupola were destroyed in the 16th century, and we derive our knowledge of them from drawings made by Francesco d'Olanda. The tambour was decorated with a maritime landscape diversi- fied with islands and filled with a crowd of putti fishing; and the cupola itself was divided into twelve compartments, con- taining figure-subjects, by acanthus motives and caryatids. The mosaics of the annular vault which surrounds the baptistery are extant, though much restored, and purely pagan in design, showing that the decorative schemes (Eros and Psyche, vine- patterns, medallions, &c), commonly found in pavements were also used by the musivarii. The mosaic-panels of the nave of S. Maria Maggiore already mentioned are (in the absence of earlier examples) very instructive as to the artistic quality of Roman opus musivum. Richter and Taylor's publication of some of the unrestored portions, which unfortunately form but a small fraction of the whole, serve to show that the musi- varii had an accurate conception of the true function of mosaic destined to be seen at a distance. Their effects are produced by a bold use of simple means; a few large cubes of irregular shape serve to give just the broad impression of a human face or figure which suits the monumental surroundings and subdued light. Very remarkable is the success with which the atmo- spheric backgrounds are treated. To seek delicate gradations of tint by elaborate means would be waste of labour for the mosaic-worker, but the artists of S. Maria Maggiore are able to produce sky and cloud effects (cf. Plate V. fig. 25) of great beauty, when seen from the floor of the church, with the aid of broad masses of colour. Their gamut of tones is of the richest; and it is to be remarked that no gold is used except in the restored parts. Doubtless gold was employed in decorative wall-mosaics before the Constantinian period; but the Roman musivarius knew the secret of making a true mosaic picture with natural tints alone.

(4) Work in Precious Metals. — In the article Plate the history of this branch of art in ancient times is treated, and it is there shown that it continued to be a living art, capable of producing works of the highest merit, in Roman times. The sections of Pliny's Natural History (xxxiii. 154 sqq.) which treat of caelatura deal only with the works of Greek artists, and Pliny ends with the statement that, as silver-chasing was in his time a lost art, specimens of embossed plate were valued according to their antiquity; but the extant remains of Roman plate suffice to disprove his statement, and in a previous passage (xxxiii. 139) he

names the principal ateliers where such works were produced. The famous treasure of Bosco Reale (see Plate) comprises specimens of silver-work belonging to various dates, many of which bear the inscription ” Maximae “; this doubtless gives the name of the owner of the objects, whose skeleton was found near the treasure. But some of them had passed through other hands; for example, four ” salt-cellars,” probably of pre-Roman date, are also inscribed with the name of ” Pam- philus, the freedman of Caesar.” Certain pieces, too, seem older and more worn than others; two ewers, decorated with Victories sacrificing to Athena, are probably of Alexandrian origin — the lotus-flower on their handles most probably points to their Egyptian provenance. On the other hand, the various decorative styles characteristic of Augustan art are well repre- sented, — not merely the elaborate and conventional plant- systems of the Ara Pacis Augustae, teeming with animal life, which adorn two splendid canthari, but also the naturalistic treatment of vegetable forms, of which a cup decorated with sprays of olive furnishes a good example (Plate VII. fig. 32). But the most important pieces in the collection are those which show the silversmith at work on specifically Roman subjects. Amongst the cups with emblemata (for the meaning of the term see Plate) were two which originally contained small portrait- busts of the master and mistress of the house to which the collection belonged. One of these became detached, and is now in the British Museum; the other is in the Louvre in its original setting. The lady’s coiffure resembles that of the empresses of the later Julio-Claudian period; but this is not

conclusive as to date, and the style of the male portrait (which recalls the realistic bronze busts found at Pompeii) points rather to an early Flavian date. Amongst the finest pieces of this collection is a large bowl with an emblema in high relief (Plate VII. fig. 35), which was at first taken to represent the city of Alexandria, on account of the sistrum which appears amongst the attributes of the figure. It seems, however, to be a per- sonification of the province of Africa, which was conventionally represented with a headdress formed by an elephant’s scalp with trunk and tusks. We have in this emblema the earliest example of the ideal types which the Roman artists of the Empire called into being to symbolize the subject-countries; the inexhaustible fertility of the African soil is indicated by the cornucopiae and the fruits carried in the bosom of the figure. But there is some trace of that overcharging of sym- .bolism to which we drew attention in discussing the Prima Porta statue of Augustus; and, though the bowl

was in a very fine state of preservation, there is little doubt that this was due to the care with which it had been kept — it was of course an ornament reserved for the table or sideboard — and that we should date it to the Augustan period. The same is clearly true of the most important pieces comprised in the treasure — the pair of cups reserved by Baron Edmond de Rothschild and forming part of his collection (Plate VII. figs. 33 and 34). In these we have examples of the crustae, or plaques decorated ; n repousse, which were mounted on smooth silver cups. The manufacture of these — or at least the designing thereof — was a special branch of caelatura, and Pliny mentions an artist named Teucer who achieved distinction therein; we may possibly identify him with the gem-engraver whose signature is read on an amethyst at Florence. Upon one of these (Plate VII. fig. 34), we see a seated figure of Augustus, approached by a processional group on both sides. To the left are three divinities, the foremost of whom presents a statuette of Victory to the emperor; to the right is Mars in full panoply, in whose train follow the conquered provinces, symbolized by female figures, amongst whom we recognize Africa with her elephant headgear (see above). On the other face of the cup we see Augustus again seated, receiving the homage of a group of barbarians ushered into his presence by a Roman commander. The schemes which are here found for the first time, became typical in Roman historical art, and thence passed into the service of Christianity to portray the homage of the Magi. The second cup celebrates the glories of Tiberius, whose triumphal procession appears on the one face, and a finely conceived scene of sacrifice on the other. For the occasion various dates have been suggested (13-12 or 8-7 B.C.); but it seems most likely that the return of Tiberius from Dalmatia in a.d. 9 is here commemorated.

The fortunate preservation of the Bosco Reale treasure has enabled us to appraise Roman silverwork at its true value. It also affords some confirmation of the rapid decadence of the art, which Pliny laments. Amongst the cups are two decorated with still-life subjects and signed by an artist who writes a Roman name (Sabinus) in Greek characters, which clearly belong to the last years of Pompeii, and are coarser in execution than the earlier pieces. And the simple emblemata of the classical period, which stand out against the background of the bowl in which they are framed, give place to such a crowded group as we find on a gold patera 1 found at Rennes and preserved in the Cabinet des Medailles, where the artist has surrounded the central emblema with a frieze which detracts from its effect. This and still later specimens of Roman silversmiths' work are described in the article Plate.

(5) Gem-Engraving and Minor Arts. — The art of the gem- engraver, like that of the silversmith, was naturally held in high esteem by the wealthy Romans both of the Republic and

1 Works of pure gold have but rarely survived to modern times ; but traces of gilding remain upon many of the specimens of plate described above. In the law-books we have mention of cups adorned with golden crustae.

Empire; 2 and the period of its highest excellence coincides almost precisely with that which gave birth to the masterpieces of Roman silver-chasing. By far the greater part of the ancient gems which exist in modern collections belong to the Roman period; and the great popularity of gem-engraving amongst the Romans is shown by the enormous number of imitative works cast in coloured glass paste, which reproduce the subjects represented in more precious materials. Not only were intagli thus produced to suit the popular demand, but fine cameos were at times cut (not cast) in coloured glass; the most notable example of these is a portrait of Tiberius in turquoise-coloured glass bearing the signature of Herophilus (see below).

In the style of Roman intagli we can trace each of the phases through which Roman plastic art has been shown to pass. 3 A black agate in the Hague Museum (Furtwangler, pi. xlvii. 13) supplies a characteristic portrait of the Cicer- onian age; the splendid cornelian of the Tyszkiewicz collection (Furtwangler, pi. 1. 19) with the signature IIOIIIA • AABAN ■ which portrays Augustus in the guise of Poseidon in a chariot drawn by four hippocamps, is doubtless (as Furtwangler showed) to be referred to the victory of Actium; the classicism of the early Empire is exemplified by a sardonyx in Florence (Furt- wangler, pi. lix. n), which probably displays an empress of the Julio-Claudian line with the attributes of Hera; a sardonyx in the hermitage at St Petersburg (Furtwangler, pi. lviii. 1) is noteworthy because the subject is borrowed from painting and occurs on a Pompeian fresco discovered in 1897; the portraiture of the Flavian epoch is seen at its best in the aquamarine of the Cabinet des Medailles signed by Euhodos, which represents Julia, the daughter of Titus (Furt- wangler, pi. xlviii. 8). Amongst later gems one of the finest is the ” Hunt of Commodus ” in the Cabinet des Medailles (Furt- wangler, pi. 1. 41), which is engraved in one of the stones most popular with the Roman artists — the ” Nicolo,” a sardonyx with a bluish-grey upper layer used as background and a dark brown under layer in which the design is cut.

But the masterpieces of Roman gem-cutting are to be found in the

great cameos, the finest of which no doubt belonged to the treasures of the imperial house. These were engraved in various materials, including single coloured stones such as amethyst or chalcedony; but the stone most fitted by nature for this branch of art was the sardonyx in its two chief varieties — the Indian, distinguished by the warmth and lustre of its tones, and the Arabian, with a more subdued scale of colour. As examples of these we shall take the two master- works of the art — the ” Grand camee de France ” (Plate VII. fig. 37), and the ” Gemma Augustea ” (Plate VII. fig. 36), preserved in the imperial collection at Vienna. The latter is attributed by Furtwangler to Dioscorides, the artist who, as Pliny tells us, enjoyed the exclusive privilege of portraying the features of Augustus. We possess several gems inscribed with his name, as well as with those of his sons and pupils — Eutyches, Hero- philus (see above) and Hyllos; and, though several of these are Renaissance forgeries, enough genuine material exists for an appreciation of his style. The Arabian sardonyx was amongst his favourite stones, and the Vienna cameo at least represents the work of his school. Blending the real with the ideal, the artist has represented in the upper zone Augustus and Rome enthroned. Behind them is a group of divine figures — the inhabited Earth, Time and Tellus, according to the most probable interpretation; to the left we see Tiberius descending from a chariot driven by Victory, before which stands a youth, probably Germanicus. We seem to have here, as in the Bosco Reale cup, a scene from the triumphal

2 We first hear of collections of gems in the last century of the Republic. Pompey dedicated that which had belonged to Mith- ridates the Great on the Capitol; Julius Caesar placed six collec- tions in the temple of Venus Genitrix; and Marcellus dedicated another in the temple of Apollo on the Palatine.

3 The references given in the text are to Furtwangler’s great work, Die antiken Gemtnen, in which all ancient gems of any con- siderable importance are reproduced.

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Plate VI.

e Italian Ministry of Public Instruction.

Fig. 29.— MOSAIC PAVEMENT (MUSEO DELLE TERME).

Photo, BrogL

Fig. 30— MEDEA.

xxm.484.

From Plot's iionumetiis, by permission of Ernest Leroux.

Fig. 31— THE VIRGIL MOSAIC.

Plate VII.

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Fig. 36— THE "GEMMA AUGUSTEA.

Fig. 37-— THE "GRAND CAMEE DE FRANCE."

From Furtwangler, Die AMiken Cemmen, by permission of Gieseke and Dcwfcnt

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procession of a.d. 12, in the course of which, as Suetonius tells us, Tiberius stepped down from his car and did homage to his stepfather. In the lower zone we find loosely composed groups of captives and Roman soldiers, some of whom are setting up a trophy.

But the supreme triumph of imperial jewelry is attained in the Great Cameo of the Bibliotheque Nationale. This is an Indian sardonyx cut in five layers, the largest extant example of its class. There is a marked advance on the Vienna cameo in composition; the lower zone is reduced to the proportions of an exergue, whilst heaven and earth are kept clearly apart in the main subject, yet at the same time united in a single picture. In the centre are the living members of the Julio-Claudian house — Tiberius and Livia enthroned, together with Germanicus, his mother, and the rising generation— while above them hovers the deified Augustus, together with other deceased members of the family and an ideal figure in Phrygian garb bearing a globe, probably lulus (Ascanius), or even Aeneas himself. The moment depicted is the departure of Germanicus for the East in a.d. 17, and amongst the figures of the central group we note the muse of history, bearing a scroll upon which to record the hero's deeds, and a personification of Armenia.

Engraved gems are not the only examples of Roman work in precious materials. Amongst the portraits of the first dynasty none is finer than a small head of Agrippina the younger (recently acquired by the

British Museum) in plasma (root-of- emerald),' a material much used by Roman gem-cutters. Vases, again, were carved in precious stones, such as the famous onyx vase at Brunswick (Furtwangler, Die antiken Gemmen, figs. 185-88), adorned with reliefs relating to the mysteries of Eleusis. A smaller, but finer, onyx vase in the Berlin Museum (Furtwangler, op. cit., figs. 183, 184) represents the infancy of a prince of the Julian line — a rock surmounted by a small temple recalls the sculptures of the Ara Pacis, and the work seems to be of Augustan date.

It was mentioned above that coloured glass was used as a substitute for gems, and it is to the school which produced the cameos of the early Empire that we owe the exquisite vases in white and blue glass' of which the Portland vase is the most famous example. 1 Pompeii furnishes a second in the amphora, decorated with vintage scenes, in the Naples Museum.

We must also class amongst the fine arts that of the die- sinker. Not only are the imperial portraits found on coins worthy of a place beside the works of , the sculptor, but in the " medallions " of the 2nd century a.d. we find figure- subjects, often recalling those of contemporary reliefs, treated with the utmost delicacy and finish. f.

Of the purely industrial arts it is unnecessary to speak at length. The finds made in Gaul, Germany and Britain have enabled archaeologists to trace their history— particularly that of pottery — in some detail; but the chief importance of these discoveries lies in the fact that they prove the gradual diffusion of artistic talent throughout the provinces. In the last century of the republic a flourishing manufacture of red-glazed pottery was established with its chief centre at Arretium (Arezzo); the signatures of the vases enable us to distinguish a number of workshops owned by Romans who employed Greek or Oriental workmen- The repertory of decorative types used by these humble artists reflects the cross-currents of classicism and naturalism which were contending in the decadence of Hellenistic art; but, if we cannot set a high substantive value on their works, it is important to note that in the 1st century a.d. the Italian fabrics were gradually driven out of the market by those of Gaul, where the industry took root in the Cevennes and the valleys of the Rhone and the Allier; and before long north-eastern Gaul and the Rhineland became centres of production in the various minor

1 The tradition that this was found in the well-known sarcophagus of the early 3rd century now in the Capitoline Museum, formerly supposed to contain the ashes of Severus Alexander, is without

foundation.

arts, 2 which continued to flourish until the breakdown of the imperial system in the 3rd and 4th centuries a.d.

(6) Summary: the Place of Roman Art in History. — Just as the establishment of the Roman Empire gave a political unity to the ancient world, and the acceptance of Christianity by its rulers assured the triumph of a universal religion, so the growth, of a Graeco-Roman nationality, due to the freedom of intercourse between the subjects of the emperors, led to a unity of culture which found expression in the art of the time. Yet no sooner was the fusion of the elements which contributed to the new culture complete than the process of disruption began, which issued in the final separation of the Eastern from the Western Empire. In the first, the oriental factors, which produced a gradual transformation in Graeco-Roman art, definitely triumphed; and the result is seen in Byzantine art. But in the West it was otherwise. The realism native to Italy remained alive in spite of the conventions imposed upon it; the human interest asserted itself against the decora- tive. The Christian art of the West, therefore, is the true heir of the Roman, and, through the Roman, of the classical tradition. The mosaics of S. Maria Maggiore, already referred to, show how strongly this tradition was at work in the 1st century of the Christian Empire; and monuments of the 5th century a.d. , such as the consular diptychs of ivory and the carved doors of S. Sabina at Rome, tell the same tale. As we have seen, Roman art in its specific quality was an historical art; and it was for this reason eminently fitted for the service of an historical religion. The earliest Christian art whose remains are preserved is that of the catacombs; and this is not only devoid of technical merit, but is also dominated by a single idea, which governs the selection of subjects— that of deliverance from the grave and its terrors, whether this be conveyed by scriptural types or by representa- tions of Paradise and its dwellers. 3 Not until the church's triumph was complete could she command the services of the highest art and unfold her sacred story on the walls of her basilicas; but, when the time came, the monumental art created by the demands of imperial pride was ready to minister ad majorem gloriam Dei.

Bibliography. — F. Wickhoff's Roman Art (1900), translated by Mrs Strong from the author's Wiener Genesis, is well illustrated and indispensable to the student. A. Riegl's Spdtrbmische Kunst- industrie in Osterreich-Ungarn (1901) also repays close study. The views of Strzygowski are expressed in a large number of monographs and! essays; the most important are Orient oder Rom (1901), Kleinasien, ein Neuland der Kunstgeschichte (1903), " Mschatta " (Jahrbuch der

preussischen Kunstsammlungen, 1904), Der Dom zu Aachen und seine Entstellung (1904), and articles in Byzantinische Zeitschrift, Byzantinische Denkmdler, and other periodicals. A summary of the debate raised by these writers will be found in the Quarterly Review, January 1906 (Stuart Jones). The controversy carried on by Furtwangler and Studniczka as to the date of the Trophy of Adam-Klissi is instructive. Furtwangler's articles appeared in the Transactions of the Munich Academy for 1903-4, Studniczka's (" Tropaeum Trajani ") in Abhandlungen der sdchs. Gesellschaft der Wissenschaften, xxii. (1904).

Of Roman sculpture Mrs Strong's handbook {Roman Sculpture, 1907), which has a great number of excellent illustrations, gives a general survey. Special branches are treated by E. Courbaud (Le Bas-relief romain a representations historiques, 1899), W. Altmann {Die romischen Grabaltdre. der Kaiserzeit, 1905), A. J. Wace (" The Evolution of Art in Roman Portraiture," Transactions of the British and American Archaeological Society of Rome, 1906). _ There has been much reqent discussion of historical monuments in Rome in the Papers of the British School at Rome, the Romische Mitteilungen of the German Archaeological Institute, the Jahreshefte of the Austrian Archaeological Institute, and the Neue Jahrbiicher fur Philologie. Important publications of single monuments are: O. Benndorf (and others), Das Tropaion von Adamklissi (1895); E. Petersen, Ara Pacis Augustae (1903; further discoveries since this date are discussed by the author in Jahreshefte des osterreich- ischen arch. Instituts (1906), 298 ff., and Sieveking in the same journal (1907), 175 ff.); C. Cichorius, Die Reliefs der Trajanssdule (1896-1900), criticized by E. Petersen, Trajans dakische Knege

2 For bronze-work see Willers in Rheinisches Museum (1907),

3 This principle is consistently applied by von Sybel, Christliche Antike (Marburg, 1907).

(1899-1903); E. Ferrero, L'Arc d'Auguste & Suse (1901); E. Petersen (and others), Die Marcussdule (1896).

For Roman portraits J. Bernoulli's Romische Ikonographie (4 vols., 1882-94) gives abundant material but little aesthetic criticism. Many of the finest portraits are included in Arndt- Bruckmann's series of

Griechische und rdmische Portrdts, and Brunn-Bruckmann's Denkmaler griechisch-rdmischer Skulptur con- tain reproductions of several Roman reliefs. The monuments col- lected by T. Schreiber under the title of Hellenistische Reliefbilder (1894) are largely of Roman date.

For Roman painting we have as yet no handbook; W. Helbig's Untersuchungen iiber die campanische Wandmalerei (1873) are still of great value, though the theory advanced is overstated. His Campaniens Wandgemalde (1868) gives a catalogue raisonnS of Pompeian paintings, and has been supplemented by A. Sogliano, Le pitture murali Campane (1879). Those since discovered are de- scribed in the Notizie degli Scavi. A. Mau's Geschichte der Wand- malerei is also indispensable. Hermann-Bruckmann, Denkmaler der Malerei des Alter thums (1907-), will give reproductions, partly in colour, of all important specimens of ancient painting. Le Nozze Aldobrandine, &c, by B. Nogara (1907), contains both coloured and photographic reproductions of the paintings preserved in the Vatican library. For the Fayiim portraits see G. Ebers, Antike Portrdts (Leipzig, 1893); F. Petrie, Hawara, ch. vii. ; and C. Edgar, Catalogue des antiquites du musie du Caire, " Graeco- Egyptian Coffins," p. xi. ff. On the technique of ancient painting Otto Donner von Richter's introduction to Helbig's Campaniens Wandgemalde should be consulted. P. Girard's sketch of ancient painting (La Peinture antique, n.d.) is slight. For the bibliography of mosaics see that article (especially Gauckler in Daremberg and Saglio, Dictionnaire des antiquites, s.v. " Musivum Opus ") ; for work in gold and silver see the article Plate. For gem-engraving, A. Furtwangler's Die antiken Gemmen (3 vols., 1900) is the standard work. The history of Roman pottery is summarized by H. B. Walters, History of Ancient Pottery, vol. ii. 430 ff. ; the most im- portant works are J. Dechelette, Les Vases ornis de la Gaule romaine (1904), and H. Dragendorff's articles on " Terra sigillata " in the Bonner Jahrbiicher.

Sections on Roman art will be found in general handbooks, such as Springer-Michaelis, Handbuch der Kunstgeschichte (6th ed., 1904) ; L. von Sybel, Weltgeschichte der Kunst (2nd ed., 1902); and C. Gurlitt, Geschichte der Kunst, vol. i. (1902). (H. S. J.)

ROMAN CATHOLIC CHURCH, the name generally given to that great branch of the Christian Church which acknow- ledges the pope, or bishop of Rome, as its head, and holds as an article of faith that communion with and submission to the authority of the see of Rome is essential to effective membership of the Catholic Church as founded by Christ. This belief is based upon the commission given by Christ to

Peter as “prince of the apostles,” “Feed my sheep” (John xxi. 15-17); the saying, ” Thou art Peter, and upon this rock I will build my church; and the gates of hell shall not prevail against it. And I will give unto thee the keys of the kingdom of heaven: and whatsoever thou shalt bind on earth shall be bound in heaven; and whatsoever thou shalt loose on earth shall be loosed in heaven ” (Matt. xvi. 18, 19). The authority thus conferred upon St Peter is held by Roman Catholics to be permanently vested in the bishop of Rome, as successor to Peter, first bishop of the imperial see. As such, the pope is regarded as ” vicar of Christ, head of the bishops, and supreme governor of the whole Catholic Church, of whom the whole world is the territory or diocese.” His peculiar powers as pope he exercises immediately on election. Thus he may grant indulgences, issue censures, give dispensa- tions, canonize saints, institute bishops, create cardinals — in short, perform all the acts of his jurisdiction, even though he be no more than a layman; but by custom certain of his more solemn acts are postponed till after the ceremony of his coronation, from which his pontificate is officially dated. To exercise the actus ordinis of a priest or bishop, however, he must, if not already in orders, be specially ordained and consecrated. Hence his office is a dignity, not of order, but of jurisdiction (see Papacy and Pope).

The most distinctive characteristic of the Roman Catholic Church, at least as contrasted with the various Protestant communions, is its vigorous insistence on the principle of ecclesiastical authority. Of this authority the pope is regarded as the centre and source, so far as the interpretation of the Divine Will to the world is concerned in matters of faith and morals. His pronouncements are held to be infallible when

he defines a doctrine concerning faith or morals ex cathedra to be held by the universal church (see Infallibility and Vatican Council).

The government of the Roman Catholic Church being centred at Rome, an elaborate organization has been developed there for the administration of its affairs. At the head of this is the college of cardinals, who are the princes and senators of the Church, the counsellors of the pope, and his vicars in the functions of the pontificate. By those of them who are members of the various Congregations and other offices of the Curia the greater part of the government of the Church is directed. (For accounts of the organization of the Roman Curia the reader is referred to the articles Cardinal and Curia Romana.) The characteristic note of the Roman Curia is its intense conservatism and its slowness to move, whether in approving or condemning new developments of opinion or action.

This is explained by the nature of its organization and by the tradition on which it is based. For, just as the Roman Church as a whole preserves in the spiritual sphere the spirit and much of the organization of the Roman Empire, so the administration of the Curia carries on the tradition of Roman government, with its reverence for precedent and its practice of deciding questions, not on their supposed abstract merits, but in accordance with the rules of law as defined in the codes or by previous decisions. Thus the genius of Rome remains, as it always has been, administrative rather than speculative. The great dogmas of the Christian Church were shaped by the interplay of the subtle wits of the theologians of the Oriental Churches. The new dogmas promulgated by the Holy See from time to time have been the outcome of the slow growth of ages, built up from precedent to precedent, and only defined at last when the accumulated weight of evidence in their favour, or the necessity for precise definition to meet the contradictions of heretics, seemed to demand a decision. This temper and the process in which it finds expression are well illustrated in the case of the dogma of the Immaculate Conception (q.v.) and in the authorization given to the cult of the Sacred Heart (q.v.).

This conservative spirit and extreme reverence for authority pervades the whole Roman Catholic Church in exact proportion to the degree of effective control which the see of Rome has succeeded in obtaining over its branches in various countries. To pretend to an independent judgment in questions of faith or morals is for a Roman Catholic to commit treason against his Church; and even in the wide sphere of questions lying beyond the dogmas defined as de fide a too curious discussion is dis- couraged, if not condemned. As opposed to the critical and analytital tendencies of the modern world, then, the Roman Catholic Church assumes the function of the champion of moral and intellectual discipline, an attitude defined, in its extremest expression, by Pius IX. ‘s Syllabus of 1864 (see Syllabus), and the famous encyclical Pascendi of Pius X. in 1907. The de- velopment of this attitude, known — in so far as it depends on the full pretensions of the Papacy — as Ultramontanism, since the definition of the Roman Catholic Church by the council of Trent in 1564, will be found sketched in the historical section attached to this article. The earlier history, which is that of the Latin Church of the West, will be found in the articles Papacy, Church History and Reformation.

Under the supreme authority of the pope the Roman Catholic Church is governed and served by an elaborate hierarchy. This, so far as its potestates ordinis are concerned, is divided into seven orders: the three ” major orders ” of bishops and priests, deacons, and subdeacons (bishops and priests forming two degrees of the ordo sacerdotium) ,

and the four ” minor orders ” of acolytes, exorcists, readers, and door-keepers. These various orders do not derive their potestas ordinis from the pope, but from God, in virtue of their direct ministerial succession from the apostles. 1 So far as jurisdiction is concerned, however, those

1 Thus sacraments administered by validly ordained or conse- crated priests and bishops are regarded as valid, even when those who administer them are heretics or schismatics.

members of the hierarchy known as prelates (praelati), who possess this power (potestas jurisdictionis inforo externo), whether bishops or priests, derive it from the pope.

These jurisdictions are of very varied character, and in most cases are not peculiar to the Roman Catholic Church. They include those of patriarchs, archbishops, metropolitans and bishops in the first rank of the hierarchy, with their subordinate officials, such as archdeacons, archpriests, deans and canons, &c, in the lower ranks. All of these will be found described under their proper headings (see also Ecclesiastical Jurisdiction). The basis of the organization of the Church is territorial, the world being mapped out into dioceses or, in countries where the Roman Church is not well developed — e.g. missions in nonˆ Christian lands — into Apostolic Vicariates. The dioceses are grouped in various ways; some are immediately dependent upon the Holy See; some are grouped in ecclesiastical provinces or metropolitanates, which in their turn are sometimes grouped together to form a patriarchate.

According to the official Gerarchia Cattolica, published at Rome, there were in 1909 ten patriarchates, with fourteen patriarchal sees (including those of the Oriental rite, i.e. those Eastern com- munities which, though in communion with Rome, have been al- lowed to retain their peculiar ritual discipline). Of these the four greater patriarchates are those of Alexandria (with two patriarchs, Latin and Coptic) ; Anticch (with four, Latin, Graeco-Melchite, Maronite and Syriac); Constantinople (Latin) and Jerusalem (Latin). The lesser patriarchates are those of Babylon (Chaldaic), Cilicia (Armenian), the East Indies (Latin), Lisbon (Latin), Venice (Latin) and the West Indies (Latin). (See Patriarch.)

The archiepiscopal sees number 204. Of these 21 are immedi- ately subject to the Holy See, while those of the Latin rite having

ecclesiastical provinces number 164. There are 19 of the Oriental rite : 3 with ecclesiastical provinces, viz. Armenian, Graeco- Rumanian and Graeco- Ruthenian respectively; the rest are subject to the patriarchates, viz. 2 Armenian, 3 Graeco-Melchite, 3 Syriac, 2 Syro-Chaldaic, 6 Syro- Maronite.

Of episcopal sees of the Latin rite 6 are suburbican sees of the cardinal bishops, 85 are immediately subject to the Holy See, and 662 are suffragan sees in ecclesiastical provinces. Of those of the Oriental rite one (Graeco-Ruthenian) is immediately subject to the Holy See; 9 are suffragan sees in ecclesiastical provinces, viz. 3 Graeco-Rumanian and 6 Graeco-Ruthenian; the rest are subject to the patriarchates, viz. 15 Armenian, 2 Coptic, 9 Graeco-Melchite, 5 Syriac, 9 Syro-Chaldaic, 2 Syro-Melchite.

The whole number of these residential sees, including the patri-archates, is 1023. Besides these there are 610 titular sees, formerly called sees in partibus infidelium, the archbishops and bishops of which are not bound to residence. These titles are generally assigned to bishops appointed to Apostolic Delegations, Vicariates and Prefectures, or to the office of coadjutor, auxiliary or adminis- trator of a diocese. ” (See Archbishop and Bishop.)

The dioceses are divided into parishes, variously grouped, the most usual organization being that of deaneries. In the parish the authority of the Church is brought into intimate touch with the daily life of the people. The main duties of the parish priest are to offer the sacrifice of the mass (q.v.), to hear con- fessions, to preach, to baptize and to administer extreme unction to the dying. It is true to say that in the ” cure of souls ” the confessional plays a larger part in the Church than the pulpit (see Confession and Absolution). For the official costume of the various orders of clergy see the article Vestments.

The clergy of the Roman Catholic Church are furthermore divided into regular and secular. The regular clergy are those attached to religious orders and to certain congregations (see Monasticism) . Of these the former are outside the normal organization of the Church, being exempt from the ordinary jurisdiction of the diocesan bishops, while the more recently formed congregations are either wholly or largely subject to episcopal authority. By far the most powerful of the religious orders are the Jesuits (q.v.). The secular clergy, on the other hand, are bound by no vows beyond those proper to their orders. Both regular and secular clergy (those at least in major orders) are under the obligation of celibacy, which, by cutting them off from the most intimate common interests of the people, has proved a most powerful

disciplinary force in the hands of the popes (see Celibacy). The more complete isolation of the regular clergy, however, together with their direct relation to the Holy See, has made them, not only the

more effective instruments of papal authority, but more ob- noxious to the peoples and governments of countries where they have gained any considerable power. Their privileged position, moreover, leads everywhere to a certain amount of friction between them and the secular clergy.

In doctrine the Roman Catholic Church is divided from the orthodox communions of the East mainly by the claims of the papacy, which the Orientals reject, and the question of the “Procession of the Holy Ghost” (see Church History). From the Protestant communities which were the outcome of the Reformation the divergence is more profound, though the central dogmas of the faith are common to Roman Catholics and orthodox Protestants. The difference lies essentially in the belief held as to the means by which the truths defined in these dogmas are to be made effective for the salvation of the world. It was defined in the canons of the council of Trent, as promulgated by Pope Pius IV. in 1564, in which the main theses of the Reformers as to the character of the Church, the sufficiency of Holy Scriptures, the nature of the sacra- ments, and the like were finally condemned (see Trent, Council or).

The Roman Catholic Church is by far the most widespread, numerous and powerful of all the Christian communions. It is the dominant Church in the majority of European states, in South and Central America and in Mexico; it is the largest single religious body in the United States of America, while in certain Protestant countries, e.g. Prussia and the United Kingdom, it has great religious and political influence. Any statistics of its membership, however, must necessarily be misleading. Those published are generally based on the principle of deducting the Protestant from the general popula- tion of ” Catholic ” countries and ascribing the rest to the Roman Church. This may be possible in Germany and other countries where there is a religious census; but it is, at best, a rough-and-ready method where, as in Italy or France, besides the class of ” political ” or ” non-practising ” Catholics, large numbers of the people are more or less actively hostile to Christianity itself. (For Roman Catholic missionary work see Missions.)

The Uniat or United Oriental Churches. — The overwhelming majority of the adherents of the Roman Catholic Church throughout the world belong to the Latin rite, i.e. follow the usages and traditions of the

Western Church. 1 Ever since the schism of East and West, however, it has been an ambition of the papacy to submit the Oriental Churches to its jurisdiction, and successive popes have from time to time succeeded in detaching portions of those Churches and bringing them into the obedience of the Holy See. This has only been possible owing to the temper of the Oriental mind which, while clinging tenaciously to its rites, values dogma only in so far as it is expressed in rites. The popes, then, or at least the more politic of them, have been content to lay down as the condition of reunion no more than the acceptance of the distinctive dogmas of the Roman Catholic Church, especially the supremacy and infallibility of the pope; the ritus of the Uniat Oriental Churches — liturgies and liturgical languages, ecclesiastical law and discipline, marriage of priests, beards and costume, the monastic system of St Basil — they have been content for the most part to leave untouched. The attempts of Pius IX., who in 1862 established the Congregatio de propaganda fide pro negotiis ritus orienlalis, to interfere in a Romanizing sense with the rites of the Armenians and Chaldaeans (by the bulls Reversurus of 1867 and Cum Ecclesiastica of 1869) led to a schism; and Leo XIII., who more than all his predecessors interested himself in the question of reunion, reverted to and developed the wiser

1 The Latin word ritus covers not only the ordinary meaning of the modern English word ” rite,” i.e. ” a formal procedure or act in a religious or other solemn function,” or any ” custom or practice of a formal kind,” but the sense in which it is now ob- solete in England — except in the religious connotation here used — • of ” the general or usual custom, habit or practice of a country, people, class of persons, &c.” (New English Diet. s.v.). For the liturgies of the Latin and Oriental Churches see Liturgy.

principle of. not aiming at any assimilation of rites, but only at ” tjie full and perfect union of faith ” (Encyclical Praeclara gratulationis of June 1894). This principle has even been carried to the extent of recognizing several bishops having jurisdiction over the adherents of various rites in the same see; thus there are three uniat patriarchs of Antioch (Graeco- Melchite, Maronite and Syrian).

Exact statistics of the membership of the Churches of the Oriental rite are almost impossible to obtain; the numbers of their adherents, moreover, are apt to vary suddenly with the shifting currents of

political forces in the East, for political factors have always played a considerable part in these move- ments towards reunion or the reverse. In 1908 their numbers were estimated at approximately 5,500,000. The Churches of the Oriental rite fall under four main divisions: Greek, Armenian, Syrian, Coptic; and — with the exception of the Armenian — these are again subdivided according to nationality or to peculiarities of cult or language. The Churches may be further grouped according to the character of their constitu- tion, i.e. (1) those having their own rite only in a restricted sense, since they have no hierarchy of their own but are sub- ordinate to Latin bishops, i.e. the Greeks in Italy (Italograeci) , the scattered Bulgarian Uniats, the Abyssinians, some of the Armenians and the "Christians of St Thomas"; (2) those having their own bishops and sometimes their own metro- politans, as in Austria-Hungary; (3) the Eastern patriarchates.

Geographically, the Uniat Churches may be grouped as follows: — (A) Europe, where their association with the Roman Church is at once the oldest and the most intimate.

(1) The Italograeci. These are distributed in scattered groups throughout Italy, but are most compact in Apulia and Sicily, and number in all some 50,000. They are under the jurisdiction of the Latin diocesan bishops, but their priests are ordained by bishops of their own rite specially appointed by the pope.

(2) The Uniat Churches of Austria-Hungary. With the excep- tion of the Armenian, these are all of the Greek rite, but are divided according to nationality and ritual language intothefollowinggroups: — (a) Ruthenian Church. — This, though still the most important numerically of all the Uniat Churches, is but a fragment of the Church which proclaimed its union with Rome at the synod of Brest in Lithuania in 1596, a union which, after long and bitter resistance, was completed by the submission of the dioceses of Lemberg and Luzk in 1700 and 1702. The Church was broken up by the successive partitions of Poland, and those parts of it which fell to Russia were, notably under Catherine II. and Nicholas I., forcibly absorbed into the Orthodox Church. The Church, however, still numbers some 3,000,000 adherents in Galicia, and 500,000 in Hungary. In Galicia it has an independent organization under the Greek-Catholic archbishop of Lemberg, with two suffragan sees : Przemysl, for West Galicia, and Stanislawov for East Galicia. In Hungary there are two bishoprics, Munkacz and Eperies, under the Latin primate of Hungary, the archbishop of Gran. The Serb bishopric of Kreutz in Croatia, under the Latin archbishop of Agrara, may be also grouped with the Ruthenian

Church, since the rite is identical. Its adherents number from 15,000 to 20,000. The liturgical language of the Uniat .Slav Churches is Old Slavonic, and, so far as their rite is concerned, they differ from the Orthodox Slav Churches only in using the Glagolitic instead of the Cyrillic alphabet, (b) Rumanian Church. — This numbers about 1,000,000 adherents and has its own organization under the metropolitan of Fogarasch or Alba Julia, with 'three suffragan sees: Lugos, Gross- Wardein and Szamos-Uvjan It has had its own ritual language since the 17th century, (c) Armenian Church. — This numbers in Austria-Hungary only some 4000 to 5000 members. It has an archbishopric at Lemberg, which has jurisdiction also over the Uniat Armenians at Venice.

(3) Uniat Churches in Russia and Turkey in Europe, (a) In Russia the Uniat Ruthenian Church (see above) ceased to exist with the incorporation of the little Polish diocese of Chlem in the Orthodox Russian Church under Alexander II. in 1875. The Holy See, however, has never withdrawn its claim to jurisdiction over it, nor have the Ruthenians ever been wholly reconciled to their absorption in the Russian Church. The ukaz of Nicholas II. (Easter, 1905), granting liberty of worship, produced a movement in the direction of Rome; but this appears to have been checked by the refusal of the government, even now, to recognize in Russia a Roman Catholic Church of the Greek rite. Converts to Rome have, therefore, to accept the Latin rite (see Prince Max of Saxony, Vorlesungen ilber die orientalischen Kirchenfragen, 1907). The scattered communities of the Uniat Armenian Church in Russia are subordinate to Latin vicars apostolic. The Uniat Armenian Church in the Caucasus, however, is under the jurisdiction of the patri-

archate of Cilicia. (J) In European Turkey the Uniat Churches are represented by tiny groups, scattered about the Balkan Peninsula, attached to Latin " missions." The movement in favour of the union of the Bulgarian Church with Rome, which grew up in i860, was the outcome of the national opposition to the Greeks, and with the establishment of the Bulgarian exarchate in 1872 it died away. There are not more than 10,000 to 15,000 Uniat Bulgarians, who have been ruled since 1883 by three vicars apos- tolic. The Uniat Armenians and Melchites in Constantinople belong to the Eastern patriarchates.

(B) Asia and Africa. — The Uniat Churches in Asia and Africa occupy a peculiar position in so far as Rome has recognized the traditional rights of the patriarchates (see, e.g., Leo XIII. 's en- cyclical Praeclara gratulationis of June 1894), and they therefore enjoy almost complete autonomy; thus the patriarchs nominate their own suffragans and

have the right to summon synods for specific purposes (see Patriarch).

There are six Uniat Patriarchates : —

(1) The Patriarchatus Ciliciae Armenorum. The Armenian patriarch, whose jurisdiction embraces the Catholic Armenians in the Balkan Peninsula, in Russian Armenia and in Asiatic Turkey, formerly resided in Lebanon, but has had his seat since 1867 at Constantinople. Under him are 19 dioceses, including a small one in Persia. The number of Catholic Armenians under his juris- diction is, roughly, 100,000 (see Armenian Church).

(2) The three patriarchates of Antioch. {a) The Melchite {Patri- archatus Antiochenus Graeco-Melchitarum). The patriarch resides in the monastery of Ain-Traz in the Lebanon and has jurisdiction over all the Uniats of Greek nationality in the Turkish Empire, who number about 120,000. Under him are 3 archbishops and 9 bishops (see Melchites). (b) The Maronites (Patriarchatus Antiochenus Syro-Maronitarum), whose seat is in the Lebanon. The patri- arch has jurisdiction over about 500,000 people (see Maronites). (c) The Syrian {Patriarchatus Antiochenus Syrorum). The patriarch, who resides at Mardin near Diarbekr on the upper Tigris, is obeyed by from 15,000 to 20,000 people, who represent a secession from the Jacobite Church (see Jacobite Church). He has 3 archbishoprics and 5 bishoprics under his jurisdiction.

(3) The Chaldaeans {Patriarchatus Chaldaeorum Babylonensis). The patriarch has jurisdiction over the Uniat Nestorian Church, which numbers, roughly, about 50,000 adherents, and is divided, under the patriarch, into 11 dioceses (see Nestorians).

(4) The Coptic {Patriarchatus Alexandrinus Coptorum). This was founded on the 26th of November 1895 by Pope Leo XIII. The patriarch, who was given two suffragan bishops, has his seat at Cairo. The number of Uniat Copts is nominal.

(5) The Uniat Abyssinian Church. This has scaracely any ad- herents. Such as there are are under the authority of a vicar apostolic residing at Keren.

(6) The Christians of St Thomas (Malabar coast). For these Leo XIII. established in 1887 three special vicariates apostolic {Vicariatus apostolici Syro-Malabarorum); the vicars apostolic are Latins, but have the right to pontificate and to confirm accord- ing to the Syrian rite. The number of Christians of St Thomas in the obedience of Rome is

said to be about ioo.ooo. 1 – (W. A. P.)

The Church in Europe since the Reformation.

The term ” Romish Catholique ” is as old as the days of Queen Elizabeth. 2 It is not happily chosen, for catholic means universal, and what is universal cannot be peculiar to Rome. But the term is inoffensive to Roman Catholics, since it advertises their claim that communion with the see of Rome is of the essence of Catholicity, and to Protestants, since it serves to emphasize the fact that the religion of modern Rome differs widely in many important respects from that of the undivided medieval Church. The change has brought both good and evil. Protestant controversialists have some show of reason on their side when they argue that Luther saved the Roman Church by forcing it to put an end to many intolerable abuses. On the other hand, under stress of his revolt the papacy could not but develop in a strongly anti-Protestant direction, laying exaggerated emphasis on every point he challenged. The more fiercely he denounced infallibility, the confessional, the sacramental system, the larger these things bulked in the eyes of Rome.

Not that this consequence showed itself at once. The Refor- mation was well established before it attracted any serious

1 This account of the Uniat Churches is largely condensed from the excellent article ” Unierte Orientalen,” by F. Kattenbusch in Herzog-Hauck Realencyklopadie (3rd ed., Leipzig, 1908), where numerous authorities are given.

2 It was officially adopted in the Relief Act of 1 791 in place of the designation ” Protesting Catholic Dissenters,” to which the vicars apostolic objected.

notice at Rome. The popes of the Renaissance were profoundly uninterested in theology; they were far more at home in an art gallery, or in fighting to recover their influence as temporal Italian princes; gravely shattered during the long residence of the papal court at Avignon in the 14th century. But these secular interests came to an end with the so-called sack of Rome in 1527, when Charles V. turned his arms against Clement VII., and made the pope a prisoner in his own capital. Thence- forward there was no more thought of territorial aggrandise- ment. The popes, as the phrase went, became Spanish

chap- lains, with a fixed territory guaranteed to them by Spanish arms; apart from the addition of Ferrara and one or two other petty principalities on the extinction of the reigning house, its boundaries remained unchanged till Napoleonic times. Under Clement's successor, Paul III., a new state of things began to dawn. Hitherto the way had been blocked by a horde of protonotaries, dataries and other officials — purveyors of in- dulgences, dispensations and such-like spiritual favours— to whom reform spelt ruin. Even the Reformation did not move them; if less money came in from Germany, that was all the more reason for leaving things unchanged in France and Spain. But among Paul's cardinals were three remarkable men, the Italians Contarini and Sadolet, and the Englishman Reginald Pole, afterwards archbishop of Canterbury under Mary. All three were disciples of Erasmus, the great apostle of a new, tolerant, scholarly religion very different from the grimy pedantry of the medieval doctors. It was better, he said, to be weak in Duns Scotus, but strong in St Paul — than to be crammed with all the learning of Durandus, and ignorant of the law of Christ. Men trained in this school were not likely to be tender towards vested interests in darkness, least of all when they stood in the way of a reconciliation with the Protestants: for the cardinals thought that the strength of the Reformation lay much less in the attractiveness of Luther's doctrines than in his vigorous denunciations of the vices of the clergy. Once root out abuses with a firm hand, and they believed that a few timely con- cessions on points of doctrine would tempt most Protestants back within the Roman pale. This belief was shared by The Charles V. Together they persuaded the unwilling

Council pope to call a general council. It met in December of Trent. 1545, at the Tirolese city of Trent, with Pole as one of the three presidents (see Trent, Council of).

As a means of reconciliation the council was a signal failure. The Protestants refused to attend an assembly where even the most conciliatory prelate could hardly condescend to meet them on equal terms. Nor was Pole allowed to use the only possible means of overcoming their reluctance. He had wished to begin by reforming abuses before proceeding to sit in judgment on doctrinal errors. But this arrangement was cried down as a revolutionary departure from all established precedent; and he had much ado to secure the compromise that doctrines and practical reforms should be simultaneously discussed. But in the midst of its labours the council was prorogued (March 1547) in consequence of a quarrel between the pope and emperor. In 1551 it met again, only to be again prorogued in 1552. Ten years later it met again for a third and final session,

lasting throughout 1562 and 1563. During those ten years great changes had taken place. Charles V. had followed Pole and his peace-loving colleagues to the grave; in his place stood his son, Philip II. of Spain, while the intel- lectual leadership of the council fell to Jaime Laynez, general of the newly founded Society of Jesus. There was no longer any question of reconciliation with the Protestants. North Germany, England, Scandinavia were irretrievably lost to Rome; wars of religion had broken out in France. Clearly the one hope was to enter into a desperate struggle for the possession of such countries as still hung in the balance; and that could best be done by striking at the heart of the Reforma- tion. Protestantism centred — or was by Catholics supposed to centre — in a mysterious "right of private judgment"; the council accordingly retorted by hymning the praises of obedience, of submitting to authority and never thinking for

oneself. To waverers it held up an absolutely sure and uniform Rule of Faith, contrasting impressively with the already mul- titudinous variations of the Protestant Churches. Moreover, thanks to Laynez, it accomplished this task without running the obvious danger of tying itself hand and foot to the past. When old-fashioned theologians talked about the canons and councils of antiquity, Laynez answered that the Church was not more infallible at one time than another; the Holy Ghost spoke through the decrees of Trent quite as plainly and directly as through the primitive Fathers. Thus the council's authority became at once peremptory and elastic. But the real gainer was the pope. Hitherto infallibility had been thought of as the supreme weapon of the Church's armoury, destined only for use at some extraordinary crisis; hence it was naturally con- ceived of as residing only in the extraordinary authority of a general council presided over by the pope. Since the outbreak of the Reformation, however, extraordinary crises, calling for immediate decision, might arise at any moment. It was no longer possible to wait for the assembling of a general council; stronger and stronger grew the tendency to ascribe infallibility to the pope alone, as being always on the spot.

Doctrine and discipline once settled at Trent, the work of counter-reformation could begin. Rebels were won back by force wherever force could be applied. In Spain ihe the Inquisition soon snuffed out the few Reformers. Counter- In Italy, though declared Protestants were few, there Reforma- was widespread sympathy with some of Luther's tioa ' ideas; a committee of cardinals at Rome was accordingly organized into an Inquisition, with branches at the chief Italian towns. For half a century trials were many at Venice and elsewhere, but actual executions were only common at Rome; the most illustrious victim was the philosopher Giordano Biuno, burnt in 1600. In the

imperial dominions, however, there could be no recourse to the stake. The peace of Augsburg (1555) forbade the German princes to persecute, though it recognized their right to determine to what religion their subjects should belong, and to banish nonconformists. At first this compro- mise had worked in favour of the Reformation, but presently the Catholic princes began to turn it against their Protestant subjects. ” Governments learned to oppress them wisely, depriving them of church and school, of pastor and school- master; and by those nameless arts with which the rich used to coerce the poor in the good old days. Fervent preachers came amongst thqm, widely differing in morality, education, earnestness and eloquence from the parish clergy, whose de- ficiencies gave such succour to Luther. Most of those who, having no taste for controversy, were repelled by scandals were easily reconciled. Others, who were conscious of dis- agreement with the theology of the last thousand years, had now to meet disputants of a more serious type than the adversaries of Luther, and to meet them unsupported by experts of their own. Therefore it was by honest conviction, as well as by calculated but not illegal coercion, that the Reformation was driven back ” (Acton, Lectures on Modern History, p. 123).

This system was not an unmixed success; for its .extension to Bohemia early in the 17 th century brought about the Thirty Years’ War. But it obliged the authorities to pay anew atten- tion to the training of the clergy. The ” seminary system ” came into being — that is, the custom of obliging candidates for ordination to spend several years in a theological college, whence lay influences were carefully excluded. But ecclesi- astical learning of a wider type was also promoted. Gregory XIII. (1572-85) and Sixtus V. (1585-90) dreamed of making Rome once more the capital of European culture. Gregory re- formed the Calendar, and founded the university that bears his name. Five years of power were enough for Sixtus to reform the central government of the Church and the administration of the Papal States, to set on foot the Vatican press and issue an official edition of the Vulgate. Their efforts bore fruit in many quarters. In Rome arose Cardinal Baronius, first of

modern Church historians; Spain produced Suarez, most philosophical of divines. A generation later the French Oratory- became the home of Malebranche and of Richard Simon, father of Biblical criticism. Mabillon and his Benedictines of Saint- Maur paved the way for the

systematic investigation of his- torical records. The Flemish Jesuit Bolland brought the light of criticism to bear on the legends of the saints (see Bol- landists). His French colleague, Petau, better known under his latinized surname of Petavius, opened still wider floodgates when he taught that theological dogmas, like everything else, have a history. Lastly, the Jansenist ” hermitage ” at Port Royal contributed the historian Tillemont, whose bigotry Edward Gibbon declares to be overbalanced by his erudition, veracity and scrupulous minuteness. Other such communi- ties and ” congregations “—semi-monastic bodies standing in closer touch with the world than did the medieval orders — undertook the diffusion of knowledge. Wherever they went the Jesuits opened grammar-schools, which had the double advantage of being excellent and cheap. An Italian sisterhood, the Ursulines, was founded for the higher instruction of girls; late in the 17th century a French priest started the Christian Brothers, pioneers of elementary education. Other com- munities again devoted themselves to parochial work. Such were the Oratorians of St Philip Neri, founded to evangelize the middle classes of Rome. Such, again, were the Lazarists of St Vincent de Paul, whose duty was to preach in neglected country districts. But the most interesting of all these new foundations was the Sisters of Charity, also founded by St Vincent de Paul. This admirable body represents a signifi- cant departure from medieval ideals. The old-fashioned nun had spent her time behind high walls in prayerful contempla- tion; the one object of the Sister of Charity was the service of her neighbour.

Not that medieval ideals were by any means dead; they never burned more brightly than in the Spain of St Teresa (1515-82). Her first idea had been to combat alike the heresies and the worldliness of her time by a return to the austerities of a more heroic age. With this object she founded her order of ” Discalced ” or barefooted Carmelites; it presently became the refuge of Louise de la Valliere and many another penitent of rank. But mere bodily rigours were not enough for Teresa; she felt the need of rising to a state of complete detachment from all earthly interests and ties. Her whole theology centres in the lines —

” The love of God flows just as much’

As that of ebbing self subsides;

Our hearts, their scantiness is such,

Bear not the conflict of these rival tides.”

How, then, subdue the rivalry? Teresa turned to the mystical writers,

and learnt from them how to root out the last relics of self-love from the mind by a long discipline of mystical trance and ” contemplation.” These ideas, in a very modified form, were introduced into France by the great devotional writer, St Francis of Sales; in the latter half of the 17th century they were pushed to the extravagant length known as Quietism by Fenelon, and especially by Madame Guyon and Michel de Molinos. Meanwhile, the leading conception from which St Teresa started had developed along characteristically different lines in the mind of her compatriot and contemporary, Ignatius Loyola. He quite agreed that self-will was the enemy;

but was there no quicker way of checkmating it than Jesuits. an interminable course of ecstasies and austerities?

The thoughts of the converted soldier flew back to the military virtue of obedience. In the long-run no self- imposed hardships could prove quite as disagreeable as always being under the orders of some one else. Obedience accordingly became the typical virtue of Ignatius’s society (see Jesuits). The individual Jesuit obeyed his superior, who obeyed the rector, who obeyed the provincial, who obeyed the general, who obeyed the pope, who took his orders straight from God Al- mighty. Such a theory was of untold practical value to the Church of Rome, more especially during the era of the Reforma-

tion. Laynez at the council of Trent has given one signal instance of its working, but its operations were by no means confined to the abstract field of dogma. If men were really to be made obedient, it could only be by stopping them from thinking for themselves about the everyday problems of conduct; and the best way to do this was to furnish them beforehand with a ready-made code of answers to such problems, warranted to meet all needs. Hence casuistry and the confessional _ . . loomed large on the Jesuit horizon. The casuist’s duty was to apply the general precepts of the Church to par- ticular cases. He explained, for instance, when a man was strictly bound to tell the truth; when he might avail himself of the mild licence of an equivocation; and when the Church placed at his service the greater indulgence of a mental reserva- tion. The confessor brought the casuist’s principles to bear on the conscience of his penitents, and thus saved them from the danger of acting on their own responsibility (see Casuistry).

In its origin this system was a perfectly honest attempt to widen the sphere of obedience by making morality wholly objective and independent of the vagaries of the individual conscience. But what was begun in the interest of obedience was carried on in those of laxity. Experts proverbially differ, and the casuists were no exceptions

to the rule. But when great authorities were at variance, it ill became an average priest or penitent to decide. Whatever a grave doctor said must have some solid reasons behind it — aliqua niti pro- babilitate- — and humble lay-folk could act upon it without a twinge of conscience. Thus arose lax casuists of the type of Antonio Escobar (1589-1669), the central figure of Pascal's Provincial Letters. Their whole business was to hunt through the older authorities in search of " benign " decisions. Their temptation is easy to understand. Half Europe was full of waverers between Protestantism and Catholicism tolerably certain to decide for the Church that offered them the cheapest terms of salvation; and even in wholly Catholic countries many, especially of the upper class, might easily be scared away from the confessional by severity. Thereby their money and influence would be lost to the Church, and their souls robbed of the priceless benefit of priestly absolution. On the other hand, these " Escobarine morals " by no means passed unchallenged; ever since the foundation of the society the aims and methods of the Jesuits had called forth lively opposi- tion in many parts of Catholic Europe, and not least in Loyola's native land of Spain. But the most effective protest against them was a movement which began when Michel de Bay, a professor at the Flemish university of Louvain, put forward certain theories on grace and free-will in the latter part of the 1 6th century. In 1640 a much more elaborate statement of the same ideas appeared in a posthumous treatise on the theology of St Augustine from the pen of Cor- lsm ˆ nelius Jansen, also a Louvain professor (see Jan- senism) . Into the technical detail of the controversy there is no need to enter. It is enough to say that two rival doctrines of grace and free-will were struggling for mastery in the Roman Church. One theory emphasized the necessity of grace; having been put together by St Thomas Aquinas, it was known as Thomism, and was especially championed by the Dominicans. The other laid the chief stress on free-will; it was known as Molinism from its inventor, the Jesuit Louis de Molina, and was in great favour with the society. The two orders came into violent collision at Rome between 1588 and 1606. But the quarrel, known as the controversy de auxiliis graliae, was brought to an end by Pope Paul V., who closed the debates and adjourned his decision sine die.

At first sight this abstract question seemed endlessly remote from the practical policy of Escobar; really there is a close connexion between the two. The whole system of the Jesuits rested on a basis of free-will. Their quarry was the average man; and the best way of impressing the average man is to set before him duties that he feels himself fully capable of performing. Then he will really feel morally responsible if he leaves them undone, hence the necessity of free-will. .On

the other hand, as Jansen pointed out, free-will tends to make the average man's estimate of his own powers into the supreme criterion of all that is good and right. God must perforce be satisfied with whatever common sense thinks it fair and reasonable that He should expect. Jansen accordingly de- nounced free-will as dishonouring to God, and destructive of the higher interests of morality. But, if men threw over common sense, what was to be their guide in life? Jansen answered with his doctrine of Irresistible Grace. This was simply a cumbrous way of saying that God awakens in the righteous heart an intuitive faculty of discerning right from wrong. " This holy taste or relish, " says a follower of Jansen, " distinguishes between good and evil without being at the trouble of a train of reasoning; just as the nature and tendency of a heavy body, let fall from a height, shows the way to the centre of the earth more exactly in a moment than the ablest mathematician could determine by his most accurate observa- tions in a whole day." That being so, the Jansenist obeyed his Inner Light, and paid little heed to the earth-bound standards of unregenerate common sense. Nor was he much more respectful towards the official standards of the Church. Why should he consult a casuist rather than his Inner Light? Thus the Jesuits saw themselves menaced by a grave revolt. What would become of the confessional if penitents were allowed to act on what they fondly took to be a heaven-sent inspiration? In a twinkling they would be off to some spiritual Wonderland, where no confessor could bring them to book. On the other hand, only preach to them a strong doctrine of free-will, and all these dangers vanished. They would feel bound to disregard their sporadic intuitions, and act only for reasons that would be clearly set out in black and white. Their past performances could then be checked, and their future actions forecast by the priest; and there was small danger of their straying beyond the limits marked out by authority.

Thus within the spiritual sphere free-will led up to Jesuit obedience. But in the secular world this paradox failed to obtain; there free-will was only too ready to come into conflict with the Church. The 13th and 16th centuries had seen the final break-up of the medieval system of reverence for authority and tradition. In art and learning, morals and government, the old walls came crashing down; in the general bankruptcy of authority men were forced to depend on them- selves. And the contemporaries of Machiavelli soon learned to take the fullest advantage of this liberty to pursue their own best interests in the way

that pleased them best. But if individuals might be guided by self-interest, why should that privilege be denied to associations of men? On the _. ruins of a medieval Christendom, hierarchically

Papacy organized under the pope, grew up the ” new mon- andthe archy, ” or modern state, owning no law but its Sew Moa- own w jjj yet the popes laid aside none of their medieval claims, or even their traditional weapons. In 1606 Paul V. laid Venice under an interdict, on the ground that the republic had infringed the immunities of the clergy; the doge replied by threatening with death any one who took any notice of the papal thunders. Thenceforward the thunders continued chiefly on paper. In 1625 Catholic Europe was scandalized by the De Schismate of the Jesuit Santarelli, in which he claimed for the pope an absolute right to interfere in the concerns of secular princes, whenever he chose to declare that the interests of religion were in any way concerned. He could dictate their policy at home and abroad, revise their statute-book, upset the decisions of their law-courts. If they refused to listen he could punish them in any manner he thought fit; in the last resort he could release their subjects from allegiance and head a crusade of Catholic powers against them. These pretensions roused a special burst of indignation in France. There, on the divisions of the wars of religion, had followed an irresistible reaction towards patriotism and national unity. France had suddenly grown to her full stature; like the contemporary England

Galilean-

of John Milton, she was become a ” noble and puissant nation, rousing herself like a strong man after sleep.” Even the clergy were swept away by the current, and meant to be patriots like every one else. ” Before my ordination, ” said the eminent theologian Edmond Richer, ” I was a subject of the king of France: why should that ceremony make me a subject of the pope? ” Subjection to the pope implied an Italianization of French religion; and most Frenchmen looked on the Italians as an inferior race. Why, then, should the right to decide ecclesiastical disputes be taken away from their own highly competent fellow-countrymen, and reserved for a set of incapable judges in a foreign land? Germany and Spain might let themselves be bitted and bridled if they chose, but for centuries France had prided herself that, thanks to her Gallican liberties, she stood on a different footing towards Rome.

The Liberties in question were certain ancient rights, whose origin was lost in the mists of time. One forbade papal bulls to be published in France without the consent of the crown. Another exempted French

subjects from jˆ” the jurisdiction of the Inquisition and other Roman tribunals— such as the Index of Prohibited Books. In the 17th century such immunities were all the more valuable since French statesmen found themselves in an awkward position. The great aim of Henry IV. and Richelieu was to exalt France at the expense of Vienna and Madrid. But Madrid and Vienna were the official champions of the papacy; hence to make war on them was indirectly to make war on the pope. This was enough to trouble the consciences of many excellent men; and it became necessary to devise a compromise that should set their minds at rest, by showing them that they could be at once good citizens and good Catholics. This compromise is known as Gallicanism. In the hands of Bossuet and other eminent divines it was developed along both theological and political lines. Theological Gallicanism refused to recognize papal decisions on questions of doctrine, until they had been ratified by the bishops of France. Political Gallicanism main- tained that lawful sovereigns held their power directly of God, and not mediately through the pope. Hence no amount of misgovernment, or neglect of Catholic interests, could justify Rome in interfering with them. In other words, Bossuet only answered Santarelli by setting up the divine right of kings. However, this dogma by no means scandalized the subjects of Louis XIV,, for the worship of the sovereign was one of their most cherished instincts. And Louis’s ecclesiastical policy flattered their national pride. He introduced no theological novelties; all he did was to insist that, in matters of administra- tion, he would be master in his own house. He supported pope and bishops so long as they took their marching orders from him. If they refused he was perfectly ready to make war on the one and send the others to the Bastille. It is eminently characteristic of his methods that, just at the same time as he was turning loose dragoons on his Protestant subjects after the revocation of the edict of Nantes (1685), he was employing other dragoons to invade the papal territory at Avignon, to punish Innocent XL for having refused institution to some of his nominees to bishoprics.

The revocation of the edict of Nantes owes quite as much to the dream of political absolutism, inherited from Richelieu, as to religious bigotry. In the words of Saint-Simon, the Huguenots were ” a sect that had become a state within the state, dependent on the king no more than it chose, and ready on the slightest pretext to embroil the whole country by an appeal to arms.” So long as they were powerful, the crown had treated with them; but when once their power began to dwindle, it was certain that the crown would crush them. But during Louis’s latter years, when the War of the Spanish Succession had brought a rain of disasters thickly upon him, bigotry got the upper

hand. The broken old man became feverishly anxious to propitiate offended Heaven, and save himself another Blenheim or Malplaquet, by exterminating the enemies of the Church. And his Jesuit confessors had no doubt

that the first and foremost of those enemies were the Jansenists. Not only did their doctrine of grace defy the favourite Jesuit principle of obedience to authority, but it bade fair to set aside the whole Catholic machinery of infallibility and sacraments. If God spoke directly to the individual conscience, what was the use of intermediaries ? Led by his Jesuits, Louis wrung The Bull from the unwilling Clement XL the Bull Unigenitus Uaigeal- (1713), which was intended to deprive believers in in- tus ‘ dividual inspiration of all possible foothold within the

Roman Church. The bull caused a violent uproar. Fenelon, although personally an admirer, admits that public opinion credited it with ” condemning St Augustine, St Paul, and even Jesus Christ “; and the few Jansenist bishops appealed and ” re-appealed ” against it. But the government was inexor- able; in 1730 the Unigenitus became part and parcel of the law of the land. Still, to make a law is one thing; to get it administered is quite another. The parlement of Paris was a strongly Gallican body, and had many grievances to avenge on Louis XV. and his ministers. To annoy them, it put every possible difficulty in the way of an execution of the bull. Under the fostering care of the judges, a belief sprang up that to call oneself a ” Jansenist, ” and oppose the Unigenitus, was to show oneself a lover of civil and religious liberty. This feeling was intensified by the conviction that every blow struck against the bull was a blow against the Jesuits, its authors. For the Society, as befitted the great exponent of authority and the keeper of the consciences of many kings, had always been on the side of political autocracy; and therefore it became in- creasingly unpopular, when once the tide of French intelligence began to set in the direction of revolutionary reform. Nor were the Jesuits in much better odour among other nations. Their perpetual meddling in politics, and even in speculation and finance, stank in the nostrils of every government in Europe; while their high-handedness and corporate greed in the matter of ecclesiastical privileges and patronage alienated the clergy. Their reform was more than once discussed; and death alone prevented Benedict XIV. (1740-58), the most remarkable of the 18th-century popes, from taking some very stringent measures. A year after Benedict’s death the Suppres- fi rs *- blow fell. Pombal, the great

reforming minister sioaof in Portugal, expelled them from that country on a the charge of having conspired against the life of the

Jesuits. king. Two years later the Paris parlement had its chance. La Valette, superior of the Jesuit missions in Marti J nique, had set up as a West-India merchant on a large scale. His enterprises were unsuccessful; in 1761 he became insolvent, and the Society refused to be responsible for his debts. The French courts made the consequent bankruptcy proceedings the excuse for a general inquiry into the Society's constitution, and ended by declaring its existence illegal in France, on the ground that its members were pledged to absolute obedience to a foreigner in Rome. Louis XV. now proposed that the French Jesuits should be placed under some special organiza- tion, less obnoxious to his parlement. The general only made the famous reply: " Sint ut sunt, aut non sint." Thereupon Louis let the judges have their way. In 1762 the Society was suppressed in France; in 1767 it was also declared illegal by Spain, Naples and other Italian powers. Pressure was now put on Clement XIII. to dissolve the Society altogether. He refused; but his successor, Clement XIV., was more pliable, and in 1773 the Jesuits ceased to be.

In France the philosophes and the quarrels over the Unigenitus had effectually killed the spirit of religion; nor was the Christi- anity of other countries at a much higher ebb. Spain was utterly dumb; Italian fervour could only boast the foundation of two small orders of popular preachers — the Passionists (1737), and the Redemptorists, instituted in 1732 by St Alfonso Liguori (q.v.), who also won for himself a dubious reputation 011 the unsavoury field of casuistry. German Catholicism was still in a very raw, unsophisticated state. It is character- istic that, while Paris had its Bossuets and Bourdaloues, Vienna was listening to Abraham a Sancta Clara, the punning Capuchin

whom Schiller, regardless of dates, introduces into the opening scene of his Wallenstein. However, from Germany was to come a serious attempt at reform. There the vision of a reunion with the Protestants had haunted many Catholic brains ever since Bossuet and Leibniz had corresponded on the subject. Faithful to the ancient tradition of Contarini and Pole at Trent, these good men persisted in supposing that the Reformation was nothing more than a protest against practical abuses: remove the abuses, and the rest would follow of itself. And, inasmuch as they held that most abuses were due to the slippery and procrastinating greed of Roman officials, the first step should be ruthlessly to curtail the power an i sm . ' of Rome and extend that of local Churches. Such was the theme of a book, De statu

Ecclesiae, ad reuniendos dis- sidenles in religione Christianos compositus, published by one Justinus Febronius in 1763. The author was Johann Nikolaus von Hontheim (q.v.), suffragan in partibus to the elector- archbishop of Treves. Hontheim's theories could not but prove attractive to the local Churches, more especially when they were governed by bishops who were also temporal great lords. The three ecclesiastical electors and the prince-archbishop of Salzburg met in congress at Ems in 1786, and embodied Hon- theim's proposals, though in a very modified form, in a docu- ment known as the " punctuation of Ems " (see Febronianism). Meanwhile, their overlord, the emperor Joseph II. (1780-90), was dealing with the question of a much more radical spirit, and actually abolishing abuses wholesale. The reign of " Brother Sacristan, " the nickname given to Joseph by Frederick the Great, was one continual suppression of superfluous abbeys, feast-days, pilgrimages. More dignified were his attempts to broaden the minds of the clergy. Instead of being brought up in diocesan seminaries, centres of provincial narrowness, candidates for ordination were to be collected into a few large colleges set up in university towns. Still, Joseph only touched the surface; his brother, the grand-duke Leopold of Tuscany, aspired to cut deeper, and provoke a religious revival on the lines of Jansenism. His plans, which made a great stir at the time, were outlined at a synod held at Pistoia in 1786 (see Pistoia, Synod of).

Three years later, however, the world had more important things to think of than Leopold's ecclesiastical reforms. At first the French Revolution was by no means anti- Tne Catholic — though the Constituent Assembly remem- French bered too much of the quarrels about the Unigenitus Revoiu- not to be bitterly hostile to Rome — and its great aim t,on ' was to turn the French Church into a purely national body. Hence it decreed the " civil constitution of the clergy. " Bishops and rectors were made elective, with salaries paid by the state; and all priests were required to take an oath of fidelity to the government: those who refused the oath rendered themselves liable to banishment. Three years later the triumph of the Jacobins brought with it the " abolition of Christianity," and a spell of violent persecution, which gradually slackened under the Directory (1795-99). In 1799 Napoleon became First Consul, and at once set himself to deal with the ecclesi- astical problem. There must clearly be a Church, and the small success of the Civil Constitution made clear that public opinion would not put up with a Church practically detached from Rome. On the other hand, Napoleon quite agreed with Louis XIV. in wishing to be master in his own house, and to turn the clergy into a supplementary police. Accordingly, in 1801 he

negotiated with Pius VII. a Concordat, which remained in force till 1905 (see Concordat). The state undertook to pay the bishops and parochial clergy; it was directly to Prance appoint the one, and to have a veto on the appoint- and the ment of the other. But for the religious orders no Papacy. provision was made; and Napoleon refused to tolerate the presence of unsalaried clerics on whom the government had no hold. When his fall brought about the restoration of Louis XVIII. (1815), this restriction was relaxed, and the ” congregations ” returned in large numbers to France. But the Bourbon government had no intention of encouraging them

too much; it clung as closely as Napoleon himself to the idea of a State Church, taking its orders from the government. In this way Gallicanism, which had once stood for all that was national and progressive, now came to mean subservience to a feeble autocracy already tottering to its fall. • “A free Church in a free State ” became the motto of the group of brilliant men, led by Lamennais, Montalembert and Lacordaire, who started up as soon as the July Revolution of 1830 replaced Charles X. by Louis Philippe. They felt that Catholicism was strong enough to stand alone, without artificial support. For the Revolution had not ” abolished Christianity,” even among the educated classes, quite so thoroughly as it imagined. Many were only kept back from going to church by the fear that their neighbours would think them superstitious or narrow-minded. But in 1802 Chateaubriand had published his epoch-making Genie du Christianisme, in which he declared that of all religions Christianity was ” the most poetical, the most human, the most favourable to freedom, art and letters.” If that were so, no one need be ashamed to profess it; and the younger genera- tion of Frenchmen began to gravitate back to the Church. Meanwhile, Germany was being profoundly influenced by the great aesthetic revival known as the Romantic Movement, which began with the worship of medieval art and literature, and ended with the worship of medieval religion. And even Italy and Spain presently began to play their part in the Christian reaction. Rosmini in one country, and Balmes in the other, ” brought piety to the learned, and learning to the pious.”

These writers, however, only touched the few; and the great aim of Lamennais and his friends was to reach the mass of the people. Immediately after the accession of Louis Philippe they started their famous newspaper, VAvcnir, hoping thereby to reconcile the Church

with democracy, and make the pope the leader of the party of progress. The enterprise was hazardous, since democracy had hitherto brought nothing but ill to Rome. In 1798 French troops had entered the papal states, proclaimed a republic in Rome, and kept Pius VI. a prisoner till his death (1799). In 1808 Napoleon arrested his successor, Pius VII., threw the papal states into his new Italian kingdom, and dragged Pius about from prison to prison till the eve of his own fall in 1814. When the congress of Vienna gave the pope back his dominions, the one thought of the broken old man was to restore, as far as possible, the ancient order of things. But the traditional methods of Roman ad- ministration were deplorably ineffective; on the accession of Gregory XVI. (1831-46), the powers presented a memorandum strongly urging reform. Some reforms of detail were intro- duced; but Gregory declared that to grant a constitution to the States of the Church would be incompatible with the prin- ciple of the papacy. Such a man was hardly likely to listen to the plans of Lamennais. In 1832 the Avenir was con- demned, and the disgusted Lamennais left the Roman Church. Lacordaire and Montalembert, however, continued their demo- cratic campaign, by no means without success; for the revolution of 1848, which drove Louis Philippe from the throne, was far less hostile to Catholicism than that of 1830. Under the short-lived Second Republic (1848-52) the position of the Church grew even stronger, for the introduction of universal suffrage brought to the polls great masses of new voters strongly clerical in sympathies. In 1850 was passed the Loi Falloux, which broke down the Napoleonic idea of a state-monopoly of teaching, and allowed the opening of voluntary schools. Of this concession the religious orders took full advantage.

Meanwhile in Rome things had gone from bad to worse. Gregory XVI. ‘s refusal to grant a constitution called forth a series of sporadic outbursts, inspired by Mazzini and the ” Young Italian ” party, between 1832 and 1838. These were put down by • French and Austrian arms, with the result of focusing the hatred of Young Italy on the pope. One last attempt was made to save him. In 1843 the Piedmontese priest Gioberti brought out a remarkable book, in which he

urged his countryrrjen to combine into an Italian confederation with the pope at its head. For a moment it seemed as though Gioberti’s dream were about to translate itself into reality. In 1846 Gregory died, and was succeeded by Pius IX., one of the youngest of the cardinals, and well known for his popular sympathies. He at once granted an amnesty to political prisoners, of whom the Roman gaols were full; two years later (March 1848) he issued a constitution to the papal

states, and seemed about to throw in his lot with the forces making for Italian independence. But the first step thereto was deliver- ance from the Austrian yoke; and Pius, the Italian prince, was grievously hampered by his position as head of the Church. How could a pope make war on Austria, the one power that had never faltered in its allegiance to the Church ? Accordingly Pius soon drew back, and his popularity waned. In the autumn the revolutionary fever, which had swept through all Europe earlier in the year, spread to Rome. The pope's prime minister, Count Rossi, was murdered, and Pius himself, escaping to.Gaeta, threw himself under Neapolitan protection. In Rome Mazzini proclaimed a republic. Once more France and Austria intervened; in 1850 Pius went back to Rome, and ruled there under the shadow of foreign bayonets. Meanwhile the Second Republic had come to an end in France; in 1852 the prince- president, Louis Napoleon, was elected emperor. At first he greatly needed the support of the clergy to secure him on his precarious throne. But, as he grew stronger, his desire for their good opinion paled before an overmastering propensity to meddle in the affairs of foreign nations. He allied himself with Victor Emmanuel, and marched into Italy in 1859, with the object of expelling the Austrians from the peninsula. This expedition led directly up to the unification of Italy. Two years later Victor Emmanuel was master of the whole country, except Venice and the " Patrimony of St Peter." This last- about one-third of the papal states — was all that was left to Pius; and even this was only held for him by French troops. When Napoleon withdrew his garrison in 1866, Garibaldi im- mediately raised a body of volunteers to march on Rome; and Napoleon was obliged to send back his troops. Three Bnd years later, the outbreak of the Franco -Prussian War of the (July 1870) led to their recall. In the following Temporal September, ten days after the final collapse of Louis Power – Napoleon at Sedan, the troops of Victor Emmanuel entered Rome; and the temporal power of Pius came to an end.

Pius might no longer rule over the papal states; but there was consolation in the thought that, within the realm of con- science, his power had increased by leaps and bounds, "ultra- The whole history of the 19th century is one vast montan- conspiracy to exalt the importance of the papacy. At ,sm -" its opening both the intellectual and administrative guidance of the Church was entirely in French and Italian hands; and the first instincts of those countries is to lean on an all-sufficing government. The French Revolution had supposed itself to be fighting for the " rights of man "; really it was trying to replace an autocratic kingship by an equally autocratic " general will" of the multitude. And it failed because no general will could make its voice

rise above the conflict of particular inclinations. Thankfully did men bow before Napoleon, who undertook to relieve them of the responsibility of having to make up their minds. Nor did the emperor's fall by any means entail the fall of his ideas; Count Joseph de Maistre, the great orator of ultramontanism, did little more than transplant them on to the ecclesiastical domain. Bossuet and the old-fashioned divines had believed in an elaborate system of checks and balances — popes, councils, bishops, temporal sovereigns each limiting and controlling the other — just as Montesquieu and Alexander Hamilton had believed in a careful separation of the executive from the legislative power. Napoleon swept away the checks and balances, and made the will of a single man the one and only sanction of government. In like manner de Maistre proposed to sweep away the ecclesiastical checks and balances, and vest the whole of the Church's authority in

the pope. That would bar out for ever all risk of a conflict of clerical wills. Fortune favoured his enterprise. The French bishops of the age of Bossuet had been a powerful estate of the realm, able in some degree to make their own terms with the king himself; their successors in the 19th century were a mere group of salaried public officials. Still more significant changes took place across the Rhine. An appreciable part of the Holy Roman Empire had been in the hands of clerical rulers. At their head stood the electors of Cologne, Mainz and Treves, temporal princes of no mean rank, usually chosen from the cadets of royal houses. But in 1803 electors and prince bishops came to an end. Their domains were secularized, and divided up among their lay neighbours, Prussia securing the lion's share. Thenceforward the German bishops became mere officials, as in France, and Rome had no cause to fear the opposition of another Febronius.

Still remoter was the danger of another Louis XIV. or Joseph II. The time had gone by when sovereigns could decide what particular shade of. Catholicism their subjects should assume. Everywhere there was a growing belief that a man's religious tenets were his private affair, with which the state had nothing to do; and that a government only made itself ridiculous if it attempted to lay down which creeds were true and which were false. Hence the clergy were left to do as they pleased, so long as they respected the law of the land; and most of the modern collisions between Church and State have occurred on the debateable ground where their respective spheres overlap, over

questions concerning education or the marriage-laws. Noticeable among these quarrels were the so-called Kolnische Win en of 1837-40, when the archbishop of Cologne defied the Prussian government over the question of ” mixed marriages, ” and paid for his rashness by a long imprisonment. Such conflicts did much to increase the power of the pope, by encourag- ing local Churches to turn to him as their protector. To ride rough-shod over individual bishops was nothing to Prussia; but to quarrel mortally with Rome was a serious matter for a sovereign reigning over millions of Catholic subjects. Even more successful were the papal incursions on to a more ethereal domain. Ever since the time of Kant and Goethe, the intel- lectual leadership of Europe had been slowly passing into the hands of the Germans, and Catholic theology shared the lot of other branches of learning. But the German divines were much more in touch with the world at large than were their brethren in Italy or France; and more than one interesting attempt was made to bring theology into line with modern schools of thought. Joseph von Gorres read the medieval mystics in the light of the newer mysticism of Schelling. Hermes of Bonn defended Catholicism from the standpoint of Kant Catholic anc ‘ Fichte. Continuing his work on a bolder scale, develop- the Viennese priest Giinther undertook to show that meats in the articles of the Christian creed are only a rough- ermaay. an(j_ reac jy popular statement of the conclusions of philosophy. Of more enduring value have been the researches of the historical school, founded by John Adam Mohler (1796- 1838), whose famous Symbolik (1832) was perhaps the heaviest literary blow ever dealt at the Reformation. On his early death his .mantle fell on to the shoulders of Ignatius Dollinger (1799-1890). This school claimed that its methods, unlike those of Hermes and Giinther, avoided all danger of speculative caprice. Catholicism was considered as an organic growth, developing from certain seminal principles in accordance with certain definite laws. The busmess of a sound theology was to discover and apply those laws, not to patch up fleeting com- promises with the intellectual fashions of an age. On the other hand, the Historical School found but little favour at Rome. ” Truth, ” as Malebranche quaintly says, ” always has a few Some and hairs on her chin “; and the conclusions of sound the ” His- learning must needs be slow, fragmentary and tentative. torical jj u t Italian taste was all for bold, highly-coloured,

00 ‘ slashing statements, that any one could understand; what it wanted was a method that should be at once intel-

lectually impressive, and free from the usual clouds that beset the scholar’s path. It found what it asked for, when the Jesuits, whom Pius

VII. had recalled to life (1814), revived the methods of Aquinas and the medieval Schoolmen. Under the fostering care of Pius IX., this " neo-Scholasticism " spread from Italy to the German Catholic universities, and especially the semi- naries of France. The secret of its power was that it gave scope for an immense amount of intellectual subtlety, and at the same time saved men from all danger of independent thought. Although a metaphysic, it was not, and did not pretend to be, an unbiased search for truth. It admittedly started by taking the truth of Catholicism for granted; and its only object was to make intelligible to reason the dogmas that faith already accepted. Thus the whole neo-Scholastic movement played straight into the hands of authority. So comprehensive were its methods, so self-confident its bearing, that those who had once fallen under its spell would never need to doubt or hesitate again. They knew exactly what to think on every conceivable subject; and there was small danger of their suspecting that there might be things in heaven and earth undreamed of in its philosophy.

To the learned Rome might serve up authority with a garnish of neo-Scholastic metaphysics; for average mankind authority pure and simple was enough. Terrified out of their lives at the way in which science and criticism were taking one theological citadel after another, the more militant section of the clergy declared war on thought itself. Not only was faith made independent of reason, but it was considered all the purer, the less it owed to any kind of mental process. If it was a merit to believe without evidence, it was a shining virtue to believe in the teeth of evidence. Credo, quia absurdum was applied, notably by the popular writers of the French Second Empire, in a fashion grotesquely literal enough to scandalize Tertullian himself. " There had always existed in France, as elsewhere, those who loved traditional stories of a marvellous nature, and tended to multiply the number which were presented as facts rather than legends. The existence of this school has always been inseparable from the element of pious belief which enters so much into popular devotion. But in pre-Revolution days there had also been the critical school of the Maurists, which offered an alternative to minds averse from implicit reliance on tradition. This had passed away, and was not yet replaced. The Acta sincera Martyrum by Ruinart was replaced by the thoroughly uncritical and inexact Actes des martyrs of Gueranger. Church history was allowed to be represented by such men as the Abbe Darras; and many French Catholics were ready to accept without question what the Bollandist Pere de Smedt has not hesitated to call the historical errors and lies of Charles Barte- lemy. Incredible and unsupported stories in history, and extravagances in dogma were the order of the

day. Those traditions or doctrines which were most uncongenial to the modern world were placed in strong relief; and the disparage- ment of the individual intellect was extended to the disparage- ment of scientific research itself ” (Wilfrid Ward, Life of W. G. Ward, vol. ii. p. 119). The faithful were encouraged to drown all tendency to thought in an ever-increasing flood of sensuous emotionalism. In thirty years Pius IX. canonized more saints than all his predecessors together for a century and a half. In 1854 he gave a great impulse to the cultus of the pjas lx ˆ Virgin by proclaiming her Immaculate Conception and the a dogma of the Church (see Immaculate Conception). New In the following year he imposed on Catholicism at # mas – large a special ” devotion ” to the Heart of Mary Immaculate. Next year he added a similar devotion to the Sacred Heart of Jesus (see Sacred Heart).

That these things only widened the breach between the Church and the outside world was of no account to Pius. Ever since his return from Gaeta, he had made up his mjnd to a policy of no surrender; and the curtailment of his own dominions in i860 only made him the keener to denounce the iniquities of other rulers. In 1864 appeared the encyclical Quanta Cur a,

together with a Syllabus of eighty of the most important ” errors of our time ” (see Syllabus). These two documents caused

Tne an excitement nowadays hard to understand. Apart

Syllabus from some fulminations against such modern pests of 1864. as ” socialism, communism, secret societies, Bible societies, clerico-liberal societies,” the Syllabus says nothing that the papacy had not been saying for hundreds of years. Its real object is to attack such professedly Catholic govern- ments as have fallen in with modern ideas — as for instance, by allowing freedom of worship to their Protestant subjects, or by refusing to punish brawling in Catholic churches more severely than other breaches of the peace. In other words, Pius utterly rejected the whole principle of toleration, and declared that the Church would still impose itself by force, whenever it got the chance to do so. However, any hopes he may have had of finding another Philip II. were soon dashed to the ground. Eighteen months after the publication of the Syllabus broke out the Austro-Prussian War (June 1866), when the one faith- ful ally of Rome was trampled under the feet of the arch- Protestant Hohenzollerns. But the

pope's spirit was not broken. If he could not lord it over one sphere, at least he could be master in another. In 1869 he summoned a general council at the Vatican, avowedly for the purpose of getting it Definition to declare his personal infallibility. For although of the the old rivalry between pope and council had long ago

f˜oal been practically settled in favour of the pope, no infain- council had yet formally acknowledged its defeat. biuty. Indeed, many prominent French and German divines

still denied papal infallibility altogether; and Louis Napoleon had regularly fallen back on Richelieu's old device of stirring up the embers of Gallicanism, whenever the French clergy grew restive about his alliance with Victor Emmanuel. And even the more moderate believers in the pope's infallibility maintained that it was merely negative, a heaven-sent im- munity against falling into error. But Pius and his immediate circle argued that this was not enough. The great need of the age was authority; and authority was most likely to strike the imagination of the faithful if it found a vivid concrete embodi- ment in the person of the pope. He must not simply be immune from error; truth must stream down on his head from heaven, and on his head alone. " We all know only one thing for certain," wrote the great Catholic pamphleteer, Louis Veuillot, " and that is that no one knows anything, except the man with whom God is for ever, the man who carries the thoughts of God." But this view was too extreme for the council; the most Pius could hope for was to be declared immune from error, instead of positively inspired. Even this negative in- fallibility was stoutly contested by the French and German bishops during the eight months that the council lasted (De- cember 1869 to July 1870). But they were richer in talents than numbers: out of six hundred prelates they only com- manded eighty votes. Most left Rome before the final session; only two — one from Naples, one from the United States — con- tinued their protest up to the end. On the 18th of July the pope's decrees were declared " irreformable of themselves, irrespectively of the consent of the Church," always provided that they dealt with doctrines of faith and morals, and were delivered ex cathedra — that is, with the intention of binding the consciences of all Catholics. These limitations were the work of the moderate infallibilists, but the real hero of the day was Pius. Theologians might draw their fine-spun dis- tinctions between realms where the pope was actually infallible and realms where he was not; but Pius knew well that loyal Catholic common sense would brush their technicalities aside and hold that on any conceivable question the pope was fifty times more likely to be right than any one else (see Vatican Council and Infallibility).

So absolute became the papal sovereignty over conscience that more than one government took alarm. While the council was still sitting the Bavarian minister, Prince Chlodwig zu Hohenlohe-Schillingsfiirst, suggested to Bismarck that the Powers would do well to bring its deliberations to an end; and

immediately after the publication of its decrees Austria notified the pope that so vast an extension of the Church's claims would necessitate a revision of the concordat. And when the ex-communication of Dollinger and other anti-infallibilist divines (1871) led to the formation of an independent Old old Catholic Church (see Old Catholics) Bavaria, Cathoii- Switzerland and other countries gave it a warm wel- clsm – come. So also did Berlin. The new German empire, con- solidated through wars with Catholic Germany and Catholic France, was of all countries least likely to tolerate Roman attempts to dictate to its subjects. Tension was increased by the fact that the Centre, or Catholic, party in the Reichstag was led by Windhorst, formerly prime minister to the dis- possessed king of Hanover, and thus naturally became identi- fied with the opposition of the smaller German states to the supremacy of Prussia. The quarrel began in 187 1 when the Prussian government supported some teachers in state-aided Catholic schools whom the bishops wished to dismiss on account of their anti-infallibilist opinions. A year later, under the ministry of Falk, it developed into what the great scientist, Rudolf Virchow, called a Kullurkampf, or conflict of civilizations. The famous May laws (1873) were a determined attempt The to bring the literary education, appointment and dis- Kultur- cipline of the clergy under state control, and to regulate kampt. the use of such spiritual penalties as deprivation and excom- munication. When the bishops refused to obey, Falk fell back on force. The Jesuits were banished from the German Empire, and most of the other orders from Prussia. The archbishops of Gnesen and Cologne and many minor dignitaries were im- prisoned (1874); and the so-called "Bread-basket Law" was passed to coerce the parish clergy by suspending the salaries of the disobedient. The result of these severities was exactly the opposite of what Falk intended. He had meant only to lop off a few ultramontane extremists; he succeeded in send- ing Catholics of every shade and colour pell-mell into the arms of Rome. And the effect remained long after the cause had died away. On the death of Pius IX. (February 1878) his successor, Leo XIII., at once showed himself willing to come to terms. Negotiations were long and difficult; for Bismarck would not abolish the May laws outright, and Leo had much ado to hold in check the zelanti of the Vatican. But Falk retired in 1879; various mutual concessions were made which led to a gradual abrogation of the May

laws. Yet — thanks to its organization, its press, and the elaborate network of alliances spun by Windhorst — the Ultramontane Centre still remains a powerful force in German politics.

This conciliatory policy towards Berlin was the first-fruits of a new regime; Leo XIII. was in every way a complete contrast to Pius IX. Pius had fed on inspirations; Leo was a man of calm, deliberate judgment, little likely to ˆ e xm yield to the promptings of his monsignori. He was a polished scholar of the old-fashioned type; early in his reign he threw open the Vatican Archives to the students of the world. Having spent his youth in the papal diplomatic service — he was nuncio at Brussels from 1843-46 — he had a certain knowledge of the workings of parliamentary institutions, while the years immediately before his accession had been spent as archbishop of Perugia, so that he was not closely identified with any of the Vatican parties. The results of a change of master were soon seen. Pius IX. had died at war with almost every country in Europe. He had quarrelled with Austria; Russia was persecuting its Catholic subjects; France was under the spell of Gambetta and his doctrine that clericalism was the enemy; Spain and Belgium followed France; even Switzerland was waging a Kulturkampf on a small scale. In a few years Leo had made peace with Austria, pacified Switzer- land and Belgium, opened up negotiations with Russia; while his elevation of Newman to the cardinalate (1879) made' a great impression in Great Britain. About 1886 hopes even ran high that he was on the eve of a reconciliation with King Hum- bert at the Quirinal. These hopes were vain. Leo was abso- lutely convinced that a territorial sovereignty was required to

ensure the moral independence of the papacy; and he believed that the new Italian kingdom was a mushroom growth, that might fall in pieces at any moment. Hence he followed in the steps of Pius IX. and refused to recognize the existence of the de facto government in any way whatsoever; he would not accept the subsidies it offered him, or allow Catholics to take any part in political life. During the earlier years of his reign he undoubtedly had hopes of recovering his lost dominions with the help of Germany, and Bismarck was not the man to discourage such expectations. They were suddenly blasted when Germany, Italy and Austria entered into a Triple Alliance at the end of 1887. Thereafter Leo turned to France. Already in 1884 he had warned the French clergy against meddling in royalist intrigues; in 1892 he issued a much more stringent exhortation to French Catholics

to rally to the Republic. An idea got abroad that he was looking to the time when the old dream of Lamennais and Gioberti might become a reality, and Italy would split up into a number of republics, amongst which the temporal power of the pope might find a place.

Certainly his public pronouncements took on an increasingly democratic tone. From the first he had shown great interest

in social questions; and his encyclicals deal much Socialism. ˆ ess w ‘ tn theology than with citizenship, socialism,

labour, the marriage-laws. Under his influence a Christian Socialist movement sprang up in France and Belgium, and soon spread to Italy, Germany and Austria. It had un- doubtedly done much to awaken interest in social problems, and to call forth philanthropic zeal; but the movement soon travelled far beyond the limits that Leo would have set to it. In Germany, in particular, it has grown into a political party connected with the Social Democrats; nor have the democratic socialists been slow to exploit their Christian allies for their own ends. And in other countries the attempt to bring re- ligion into politics has sometimes had the effect of lowering religion, rather than ennobling politics. In an age of universal suffrage public men cannot afford to appeal to pure reason, or even to pure sentiment. Christian socialism becomes a real force when it translates itself into anti-Semitism; and anti-Semitism is at its strongest when it is pursuing one par- ticular Jewish captain in the French artillery. Much on the same lines stands the Italian Catholic attempt to show that the Freemasons are the real founders of Italian independence, and to take the field against them with the help of Leon Taxil and ” Diana Vaughan.” And, quite apart from their political colouring, such attempts to meet the devotional tastes of the masses as the miracles of Lourdes, or the modern French religious press, lie well within the range of criticism. Nor have they even had the dubious merit of success. Dying in 1903, Leo XIII. was spared from seeing the failure of his policy of reconciliation with the French Republic; for the ” de- nunciation of the concordat ” (December 1905) and consequent

separation of Church and State took place under his

successor, Pius X. What results this measure may have on France it must be left to the future to decide. Nor is it yet possible to forecast the result of the only other sensational event that the reign of Pius X. has yet produced — his con- demnation in 1907 of the complex movement known as

Modernism. This began as an attempt to break loose ism er ”’ fr° m the neo-Scholasticism so ardently patronized

both by Pius IX. and Leo XIII., and to supplant the critical methods of the medieval doctors by those of modern scholarship; and its leaders have won special distinction in the fields of Biblical criticism and ecclesiastical history. But Modernism soon broadened into a thoroughgoing revolt against the modes of thought and methods characteristic of the latter- day Vatican; its motto is that Catholicism is the strength of popery, but popery the weakness of Catholicism. By “popery ” must here be understood the belief that spiritual doctrines always lend themselves to a precise embodiment in black and white, and can thereafter be dealt with like so many clauses of an act of parliament. Modernists deny that the spirit of religion can be thus imprisoned in an unchangeable formula;

Plus X.

they hold that it is always growing, and therefore in continual need of readjustment and restatement. On the other hand, they maintain that the present always has its roots in the past, and therefore they are opposed to any violent change; they consider, for instance, that northern Europe would have done better to listen to Erasmus than to Luther. But progress can leave little room to individual initiative, if it must always be orderly and systematic; and the Modernists accordingly show little sympathy with Protestantism. The core of their creed is a fervid belief in the infallibility of Catholic instinct, if only Catholic theology can be induced to leave it to develop in peace. Hitherto the theologians have shown small dis- position to hold their hand; and several of the leading Modern- ists have been excommunicated (see especially the article Loisy, A. F.), while the whole movement was condemned in bitter and scathing language by Pius X.‘s encyclical (Pascendi gregis) against the Modernists. But ideas are difficult to kill, and it is possible that the Modernist movement may yet prove to be the opening chapter of a mighty revolution within the Church of Rome. 1

Bibliography. — The literature on the Roman Catholic Church is, of course, vast. Many works will be found in the lists of authorities appended to the articles to which cross-reference is made above, notably Papacy. Here it is only possible to give a few outstanding books of reference. The most compendious of all works of reference on the subject, though partly antiquated, is the Encyclopedic theologique of the Abb6 Migne (1844-66), Ser. I. 50 vols., Ser. II. 52 vols., Ser. III. 66 vols. This is a series of dictionaries, and contains Fr. Perinnes’s

Dictionnaire de bibliographic catholique, 5 vols. (Paris, 1858-60). A useful systematized bibliography is also given in the Subject Index of the London Library (1909), pp. 945-51. Other encyclopaedias are Watzer and Welter's Kirchenlexikon, 13 B. (2nd ed., Hergenrother, &c, 1882-1903), Roman Catholic (there is a French translation of the 1st edition, ed. T. Goschler, 1870) ; Herzog-Hauck, Realencyklopddie fur Protestantische Theologie und Kirche (3rd ed., Leipzig, 1896-1909), Protestant, but containing articles of universally recognized scientific authority on many aspects of the Roman Catholic Church; the Catholic Encyclopaedia (London and New York, 1907 ff.), invaluable as an authoritative account of Roman Catholicism in all its phases, by eminent Catholics of all nations. All these encyclopaedias are also bibliographies.

(St C.) The Church in England.

The origin of the English Roman Catholics as a community separated from the National Church is generally held to date from the accession of Queen Elizabeth in 1558. In the following year was passed an Act of Supremacy, whereby all public officials, clerical and lay, were required to acknow- ledge the supremacy of the queen " as well in spiritual things or causes as temporal." This declaration all the existing bishops, with two exceptions, refused to make; some fled the country, some were imprisoned, others simply deprived and placed under surveillance. 2 To the parish clergy the declaration was not systematically tendered; of those deprived of their livings a large number were allowed to remain on as chaplains in private families. From laymen, unless they happened to hold some public office, no declaration was expected; and during the earlier years of Elizabeth's reign most of them continued to attend at their parish church. The line of division became much more acute when Pius V. deposed Elizabeth from her throne (1570); thenceforward her government looked on every Catholic as a potential rebel. Already it had passed a severe act against the Catholics in 1562; this was followed by other measures in 1571, 1580, 1584, 1585, 1593. During the forty-five years of Elizabeth's reign, however, only about 180 persons suffered death 3 — less than half the number of those whom the Catholic zeal

1 For a criticism of the modern tendencies of the Roman Catholic Church from an outside point of view see Ultramontanism.

2 From the Roman Catholic point of view the ancient English hierarchy came to an end with the death of Thomas Goldwell, some time bishop of St Asaph, at Rome on the 3rd of April 1585. Some six months previously Thomas Watson, formerly bishop of Lincoln, had

died in prison in England.

3 Not as heretics, by burning, but as traitors, by hanging, drawing and quartering. But, since to say or hear mass was constructive treason, the distinction was, in many cases, without a difference.

of her sister, Queen Mary, had burnt in one-ninth of the time. Under James I. an attempt was made to distinguish between the loyal and disloyal Catholics, the latter comprising all those who maintained the pope's right to depose sovereigns from their throne. This led to a violent division among the Catholics themselves. Many forswore the deposing power; the majority, acting under imperative orders from Rome, refused to deny it. The government retorted by adding several new penal laws to the statute-book, though less than thirty Catholics were brought to the scaffold during James's reign. Under Charles I. the position of the Catholics was greatly im- proved, largely owing to the king's marriage with a French princess. Although not actually repealed, the penal laws were seldom put in force, and mass was openly celebrated in London and elsewhere. On the outbreak of the Civil War the Catholics naturally sided with the king, and a great many fell fighting for the royalist cause; towards the survivors Cromwell was unexpectedly merciful. Very few were put to death, though a number of estates were confiscated. Under Charles II. came a new period of prosperity; two Catholics, Lords Arlington and Clifford, were admitted to the inner circles of the govern- ment. Protestant suspicion was excited; in 1673 was passed the Test Act, obliging all office-holders to receive the sacrament in the Established Church, and to declare their disbelief in transubstantiation. 1 Five years later (1678) popular exaspera- tion found a more savage outlet, and greedily swallowed the tales of Titus Oates about a mythical " popish plot." A number of victims were brought to the scaffold, and Catholics were declared incapable of sitting in either house of parliament. James II., however, was utterly indifferent to the feelings of his subjects. He packed the privy council, the army and the universities with Catholics, and tried to legalize the exercise of their religion by an utterly unconstitutional Declaration of Indulgence. Three years were enough to convince the nation that he was " endeavouring to subvert and extirpate the Protestant religion, and the laws and liberties of this kingdom"; and on his deposition in 1688 Roman Catholics, or persons married to Roman Catholics, were declared incapable of succeeding to the throne. A new oath of allegiance was imposed on all holders of

civil or military office; they were required to swear that no foreign prelate had, or ought to have, any jurisdiction, whether civil or ecclesiastical, within the realm. Further, a number of statutes were passed with the object of putting every possible obstacle in the way of Catholics educating their children in their own creed, or of inheriting or buying land. That they remained so long ” utterly disabled from bearing any public office or charge ” was due to the participation of many of their number in the Jacobite revolts of 1715 and 1745. After Culloden, however, it was seen that all serious danger of a Stuart restoration was passed; and in 1778 Catholics who abjured the Pretender and denied the civil authority of the pope were relieved from their most pressing disabilities. A proposal to extend this measure to Scotland led to violent agitation in that country. Feeling soon spread to England, and culminated in the Gordon riots of 1780. Meanwhile, however, strenuous efforts were being made by the Roman Catholics to obtain relief by establishing a reasonable modus vivendi with the government. Within the Catholic body itself there was even at this time a more or less pronounced anti-Roman movement, a reflection of the Gallican and Febronian tendencies on the continent of Europe, and the ” Catholic Committee,” consisting for the most part of influential laymen, which had been formed to negotiate with the government, was prepared to go a long

1 This declaration, which denounced the mass as ” idolatrous and superstitious,” was taken by all office-bearers, including bishops on taking their seats in the House of Lords, until the Relief Act of 1829. It was imposed by the Act of Settlement on the sovereign also, in order to make impossible any repetition of the policy of James II. This ” Declaration of the Sovereign ” formed the subject of heated debate on the accession of kings Edward VII. and George V., and in August 1910 parliament substituted for it a simple declaration of adhesion to the Protestant religion.

way in repudiating the extreme claims of the Holy See, some even demanding the creation of a national hierarchy in merely nominal dependence on Rome, and advocating the substitution of English for Latin in the services. This attitude led to a somewhat prolonged conflict between the Committee and the vicars apostolic, who for the most part represented the high ultramontane view. The outcome of the Committee’s work was the great Protest, signed by 1500 bishops, priests and leading laymen, in which the loyalty of Catholics to the crown and constitution was strenuously affirmed and the ultramontane point’ of view repudiated in the startling declara- tion, ” We acknowledge no infallibility in the pope.” As the result of the negotiations preceding and following this action, the government in

1791 passed a bill relieving from all their more vexatious disabilities those Roman Catholics 8 who rejected the temporal authority of the pope; and during the first quarter of the 19th century a series of attempts was made to abolish Catholic disabilities altogether. To this, however, George III. and his successors were bitterly opposed; only in 1829 did George IV. give way, and allow the passage of the Catholic Relief Act. This virtually removed all restric- tions on Catholics, except that it left them incapable of filling the offices of Regent, Lord Chancellor, or Lord Lieutenant of Ireland; and it expressly debarred their priests from sitting in the House of Commons.

Ecclesiastical Administration. — During the reign of Elizabeth this was necessarily in a chaotic state. As the Marian clergy died out, their place was taken by priests trained at theological colleges established for this purpose at Douai, Rome, Valladolid and other places. These were the ” seminary priests,” objects of great suspicion to the government. About 1580 Jesuit missionaries began to come, and soon became involved in bitter quarrels with the secular missionaries already at work. Mutual jealousies were only increased when the seculars were grouped together under an arch-priest in 1599. Nor were matters much bettered when’ the papacy took advantage of the presence of a Catholic queen in England, and sent over in 1625 a vicar- apostolic 3 — that is, a prelate in episcopal orders, but without the full authority of a diocesan bishop. He was soon compelled to withdraw, and the direction of affairs fell to an intermittent series of papal envoys accredited to Henrietta Maria or Catherine of Braganza. On the accession of James II. a new vicar- apostolic — John Leyburne, bishop of Adrumetum in partibus — was at once appointed (1685); three years later England was divided into four districts — the London, Midland, Northern and Western — each under a vicar- apostolic. This arrangement lasted till 1840, when the number of vicariates was doubled by the addition of the Welsh, Eastern, Lancashire and Yorkshire districts. In 1850 came the ” restoration of the hierarchy ” by Pope Pius IX., when England was mapped out into an arch- bishopric of Westminster 4 and twelve suffragan sees, since in- creased to fifteen (sixteen including the Welsh see of Menevia). This ” papal aggression ” caused great excitement at the time, and an Ecclesiastical Titles Act was passed in 1851, though never put in force, forbidding Roman Catholic prelates to assume territorial designations. 6

2 They were described in the first draft of the bill as ” Protesting Catholic Dissenters,” but this was changed, in deference to the strenuous remonstrances of the vicars- apostolic, into ” Roman Catholics.”

3 Richard Smith, bishop of Chalcedon in partibus (d. 1655).

4 Cardinal Wiseman (q.v.) was the first archbishop of Westminster. It was on his advice that Pope Gregory XVI. increased the number of English vicariates-apostolic in 1839, and from 1840 onward, as vicar-apostolic first of the Midland and afterwards of the London district, he was mainly instrumental in bringing the English Roman Catholic Church into closer touch with ” the spirit of Rome.” The outward sign of this was the substitution of the Roman ritual for the English pre-Reformation use hitherto followed in the ser- vices, while English Roman Catholicism became increasingly ultra- montane in temper, a tendency much strengthened under Cardinal Manning.

6 The titles of the sees could not by law be the same as those of the Established Church. In several cases, however (e.g. Birmingham, Liverpool, Southwark, Newcastle), sees have since been created by

Population. — No trustworthy figures are forthcoming as to the numbers of the English Roman Catholics at the different stages of their history. At the accession of Elizabeth they undoubtedly formed a large proportion of the population. During her reign they greatly decreased, and the decrease continued during the 17th century. A return, made with some apparent care soon after the accession of William III., estimates their total number at barely 30,000. During the 18th century they began to increase; a return presented to the House of Lords in 1780 estimates their number at nearly 70,000. Joseph Berington, himself a distinguished Catholic priest, considers that this number was above the mark; he reports that his co-religionists were most numerous in Lancashire and London; next came Yorkshire, Northumberland and Stafford- shire. In many of the southern counties there were scarcely any Catholics at all. Even in Berington’s time, however, there was a certain tendency to increase; and the great number of conversions that followed the Relief Act of 1791 was a stock argument of opponents of the act of 1829. Of late years, notably since the Oxford Movement within the Established Church, the number of converts has been much increased; for some time past it has aver- aged about 8000 souls a year. But a far more potent factor in swelling the numbers of the Catholics has been the immigration of the Irish, which began early in the 19th century, but was enormously stimulated by the famine of 1846. In 1870 Mr Ravenstein reckoned the total number of Roman Catholics in England as slightly under a

million, of whom about 750,000 were Irish, and 50,000 foreigners. By 1910 the general total is considered to have risen to about a million and a half. (St C.)

Authorities. — Alphons Bellesheim, Cardinal Allen und die Englischen Seminare (Mainz, 1885); Katholische Kirche in Schottland (Mainz, 1886; translated and enlarged by D. O. Hunter-Blair, O.S.B., Edinburgh, 1887); Katholische Kirche in Irland (1890); Charles Dodd (a pseudonym of Hugh Tootell), Church History of England (1737); edited by M. A. Tierney, London, 1839); Joseph Berington, Stale and Behaviour of the English Catholics (1780); Charles Butler, Historical Memoirs respecting the English, Irish and Scottish Catholics (London, 1819) ; T. F. Knox, The Douay Diaries (1878) and Letters of Cardinal Allen (1882); J. Morris, Catholic England in Modern Times (1892); T. Murphy, Catholic Church in England during the Last Two Centuries (1892); W. J. Amherst, History of Catholic Emancipation (2 vols., London, 1886); F. C. Husenbeth, Life of John [Bishop\Milner (Dublin, 1862) ;Wilfrid Ward, Life and Times of Cardinal Wiseman (2 vols., London, 1897); £. S. Purcell, Life of Cardinal Manning (2 vols., London, 1895); Bernard Ward, Dawn of the Catholic Revival in England, 1781-1803 (2 vols., 1909). For the sufferings under the penal laws see, for general reference, R. Stanton, A Menology of England and Wales (with supplement, London, 1892), and Bishop Challoner's Missionary Priests (1741 ff.), which still remains the standard work on the subject.

English Law relating to Roman Catholics. — The history of the old penal laws against Roman Catholics in the United Kingdom has been sketched above and in the article Ireland, History. 1 The principal English acts directed against " popish recusants" 2 will be found in the list given in the acts repealing them (7 & 8 Vict. c. 102, 1844; 9 & 10 Vict. c. 59, 1846). The principal Scottish act was 1700, c. 3; the principal Irish act, 2 Anne c. 3. Numerous decisions illustrating the practical operation of the old law in Ireland are collected in G. E. Howard's Cases on the Popery Laws (1775). The Roman Catholic Eman- cipation Act 1829 (10 Geo. iy. c. 7), although it gave Roman Catholic citizens in the main complete civil and religious liberty, at the same time left them under certain disabilities, trifling in comparison with those under which they laboured before 1829. Nor did the act affect in any way the long series of old statutes directed against the assumption of authority by the Roman see in England. The earliest of these which is still law is the Statute of Provisors of 1351 (25 Edw. III. st. 4). The effect of the Roman Catholic Charities Act 1832 is to place Roman Catholic schools, places of worship and education, and charities, and the property held therewith, under the

laws applying to Protestant nonconformists. The Toleration Act

act of parliament bearing the same titles, so that there are now often two bishops bearing the same style. From tr<". point of view of the State, that of the Roman Cathclic bishop 's, of course, only a title of courtesy, the Anglican bishop alone having the legal right to bear it.

1 See also Stephen's History of the Criminal Law, vol. ii. p. 483 ; Anstey, The Law affecting Roman Catholics (1842) ; Lilly and Wallis, Manual of the Law specially affecting Catholics (1893).

1 A recusant signified a person who refused duly to attend his parish church.

does not apply to Roman Catholics, but legislation of a similar kind, especially the Relief Act of 1791 (31 Geo. III. c. 32), exempts the priest from parochial offices, such as those of church- warden and constable, and from serving in the militia or on a jury, and enables all Roman Catholics scrupling the oaths of office to exercise the office of churchwarden and some other offices by deputy. The priest is, unlike the nonconformist minister, regarded as being in holy orders. He cannot, there- fore, sit in the House of Commons, but there is nothing to prevent a peer who is a priest from sitting and voting in the House of Lords. If a priest becomes a convert to the Church of England he need not be re-ordained. The remaining law affecting Roman Catholics may be classed under the following five heads: —

(1) Office. — There are certain offices still closed to Roman Catholics. By the Act of Settlement a papist or the husband or wife of a papist cannot be king or queen. The act of 1829 provides that nothing therein contained is to enable a Roman Catholic to hold the office of guardian and justice of the United Kingdom, or of regent of the United Kingdom; of lord chancellor, lord keeper, or lord commissioner of the great seal of Great Britain or Ireland or lord lieutenant of Ireland ; of high commissioner to the General Assembly of the Church of Scotland, or of any office in the Church of England or Scotland, the ecclesiastical courts, cathedral founda- tions and certain colleges. The disability in the case of the lord chancellor of Ireland was removed by statute in 1867, with necessary limitations as to ecclesiastical patronage. The act of 1829 pre- served the liability of Roman Catholics to take certain oaths of office, but these have been modified by later legislation (see 29 & 30 Vict. c. 19; 30 & 31 Vict. c. 75; 31 & 32 Vict. c. 72; 34 & 35 Vict. c. 48). Legislation has been in the direction of omitting words which might be supposed to give offence to Roman Catholics. The only offices which Roman Catholics are not legally capable of holding now are the lord chancellorship of England

and the lord lieutenancy of Ireland (see, however, Lilly and Wallis, pp. 36-43).

(2) Title. — The act of 1829 forbids the assumption by any person, other than the person authorized by law, of the name, style or title of an archbishop, bishop or dean of the Church of England. The Ecclesiastical Titles Act 1851 went further, and forbade the assumption by an unauthorized person of a title from any place in the United Kingdom, whether or not such place were the seat of an archbishopric, bishopric or deanery. This act was, however, repealed in 1867, but the provisions of the act of 1829 are still in force.

(3) Religious Orders. — It was enacted by the act of 1829 that " every Jesuit and every member of any other religious order, community or society of the Church of Rome bound by monastic or religious vows " was, within six months after the commencement of the act, to deliver to the clerk of the peace of the county in which he should reside a notice or statement in the form given to the schedule to the act, and that every Jesuit or member of such religious order coming into the realm after the commence- ment of the act should be guilty of a misdemeanour and should be banished from the United Kingdom for life (with an exception in favour of natural-born subjects duly registered). A secretary of state, being a Protestant, was empowered to grant licences to Jesuits, &c, to come into the United Kingdom and remain there for a period not exceeding six months. An account of these licences was to be laid annually before parliament. The admission of any person as a regular ecclesiastic by any such Jesuit, &c, was made a misdemeanour, and the person so admitted was to be banished for life. Nothing in the act was to extend to religious orders of females. These provisions exist in posse only, and have, it is believed, never been put into force.

(4) Superstitious Uses. — Gifts to superstitious uses are void both , at common law and by statute. It is not easy to determine what gifts are to be regarded as gifts to superstitious uses. Like con- tracts contrary to public policy, they depend to a great extent for their illegality upon the discretion of the court in the particular case. The act of 23 Hen. VIII. c. 10 makes void any assurance of lands to the use (to have obits perpetual) or the continual service of a priest for ever or for threescore or fourscore years. The act of 1 Edw. VI. c. 14 (specially directed to the suppression of chantries) vests in the crown all money paid by corporations and all lands appointed to the finding or maintenance of any priest, or any anniversary or obit or other like thing, or of any light or lamp in any church or chapel maintained within five years before 1547. The act may still be of value in the

construction of old grants, and in affording ex- amples of what the legislature regarded as superstitious uses. Gifts which the courts have held void on the analogy of those mentioned in the acts of Henry VIII. and Edward VI. are a devise for the good of the soul of the testator.a bequest to certain Roman Catholic priests that the testator may have the benefit of their prayers and masses,

a bequest in trust to apply a fund to circulate a book teaching the supremacy of the pope in matters of faith, a bequest to maintain a taper for evermore before the image of Our Lady. The court may

compel discovery of a secret trust for superstitious uses. Since 2 & 3 Will. IV. c. 115 gifts for the propagation of the Roman Catholic faith are not void as made to superstitious uses. It should be noticed that the doctrine of superstitious uses is not confined to the Roman Catholic religion, though the question has generally arisen in the case of gifts made by persons of that religion. The Roman Catholic Charities Act i860 enables the court to separate a lawful charitable trust from any part of the estate subject to any trust or provision deemed to be superstitious. It also provides that in the absence of any written document the usage of twenty years is to be conclusive evidence of the application of charitable trusts.

(5) Patronage. — A Roman Catholic cannot present to a benefice, prebend, or other ecclesiastical living, or collate or nominate to any free school, hospital or donative (3 Jac. I. c. 5). Such patronage is by the act vested in the universities, Oxford taking the City of London and twenty-five counties in England and Wales, mostly south of the Trent, Cambridge the remaining twenty-seven. The principle is affirmed in subsequent acts (1 Will, and Mary, sess. 1, c. 26; 12 Anne, st. 2, c. 14; 11 Geo. II. c. 17). If the right of presentation to an ecclesiastical benefice belongs to any office under the crown, and that office is held by a Roman Catholic, the archbishop of Canter- bury exercises the right for the time being (10 Geo. IV. c. 7, s. 17). No Roman Catholic may advise the crown as to the exercise of its ecclesiastical patronage (Ibid. s. 18). A Roman Catholic, if a member of a lay corporation, cannot vote in any ecclesiastical appointment (Ibid. s. 15). Grants and devises of advowsons, &c, by Roman Catholics are void, unless for valuable consideration to a Protestant purchaser (11 Geo. II. c. 17, s. 5). Where a quare impedit is pending before any court, the court may compel the patron to take an oath

that there is no secret trust for the benefit of a Roman Catholic.

(J. W.)

The Church in the United States.

The history of Roman Catholicism in the New World begins with the Norse discoveries of Greenland and Vinland the Good. In the former the bishopric of Gardar was established in 11 12, and extinguished only in 1492. To the latter (the coast of New England), the Northmen during the same period made ” temporary visits for timber and peltries, or missionary voyages to evangelize for a season the natives.” Beyond these facts, the Norse sagas and chronicles contribute little that is certain (cf. ” The Norse Hierarchy in the United States,” Amer. Cath. Quart. Review, April 1890). Although a bishop was appointed by the pope for the vaguely defined territory of Florida so early as 1528, the oldest Catholic community in what is now the United States dates from 1565, when the Spanish colony of St Augustine was founded. . Hence the aboriginal tribes of the South were evangelized. In 1582 the missions of New Mexico were undertaken, and from 1601 Catholic missionaries were at work along the Pacific coast, especially in California. Early in the 17th century trading posts and mission centres were established on the coast of Maine, and during the same century French priests laboured zealously in northern New York, along the entire coast of the Mississippi from Wisconsin to Louisiana, and around the Great Lakes. Their principal concern was for the savages, over whom they acquired an extraordinary influence. Political jealousies, human avarice and treachery arrested the progress of most of their missions.

The English colony of Maryland, planned by the Catholic George Calvert (1st Lord Baltimore), and founded (1634) by his son the Catholic Cecilius Calvert (2nd Lord Baltimore), and Pennsylvania, founded (1681) by the tolerant Quaker William Penn, first permitted the legal existence of Catholicism in English-speaking communities of the New World. It is from these centres that it spread during the 18th century. In 1784 the Rev. John Carroll was appointed prefect-apostolic for the Catholics of the English colonies hitherto dependent on the vicar-apostolic of London. In 1790 Father Carroll was made bishop of the see of Baltimore, and given charge of all the Catholic interests in the United States. There were then about 24,500 Catholics in the land, of which number 15,800 were in Maryland, and 7000 in Pennsylvania, 200 in Virginia and 1500 in New York. In 1807 they had grown to 150,000 with 80 churches. In the following year Baltimore found itself the first metropolitan see of the United States,

with New York, Philadelphia, Boston and Bardstown as suffragans. The growth of the Catholic population by decades since 1820

was calculated by a competent historian, the late John Gilmary Shea, as follows: —

1820 1830 1840 1850

244,500

361,000

1,000,000

1,726,470

i860

1870 1880 1890

3,000,000

4,685,000

7,067,000

10,627,000

The number in 1906 was 12,079,142 (U.S. Census, Special Report, 1910). The main source of this growth has been immigration. Originally the Irish and the Germans furnished the greater quota. Later the French- Canadians, Italians, Poles and Bohemians added notably to the number; an appreciable percentage of Oriental Catholics is also found, — Greeks, Syrians, Armenians, &c. Natural increase, especially among the first Catholic immigrants, and a certain per- centage of conversions from Protestantism, are contributory sources. Being under the protection of the constitution, and enjoying the advantages of the common law, Catholicism could not meet with any official opposition; such few outbursts of fanaticism as there have been were but temporary or local, and did not represent the true feelings of the country. As to the future of the Church in the United States, all Catholics feel, with their latest historian, that ” the Catholic Church is in accord with Christ’s revelation, with American liberty, and is the strongest power for the preservation of the Republic from the new social dangers that threaten the United States as well as the whole civilized world. She has not grown, she cannot grow so weak

and old that she may not maintain what she has produced — Christian civilization."

Internally, Catholicism in the United States has been free from any noteworthy schisms or heresies that might impede its development — its doctrinal history offers nothing of im- portance. The discipline differs little from that of the other churches of Catholicism. The unity of doctrine, liturgy and moral ideals is preserved by an intimate union with the see of Rome. The general canonical legislation of the Church, the legislation by papal rescript and the Congregation of the Propaganda, the decisions of the Apostolic Delegation at Washington, and a certain amount of immemorial custom and practice, form the code that governs its domestic relations. Decennially each bishop of the United States is expected to pay a visit to Rome {Ad Limina Apostolorum), and to make a report of the spiritual condition of religion within his diocese. In addition a system of synods provides for local unity among bishops, priests and laity. Thus each province or body of bishops under a metropolitan holds provincial councils, while at greater intervals a plenary or national council is held. Of these last three have taken place — their decrees, when approved at Rome, are binding on all Catholics in the United States.

In education the Catholic Church endeavours to keep abreast with the best. There are, according to Hoffmann's Directory (Milwaukee, 1907), 4364 parochial schools, in which 1,096,842 children of both sexes receive instruction. The total number of children in Catholic institutions is given as 1,266,175. There are 198 colleges for boys and 678 academies for girls. This system of education is crowned by the Catholic University of America at Washington, established by Leo XIII. and the American hierarchy, and endowed with all the privileges of the old pontifical universities of Europe. In addition there are several other schools that rank as universities. The education of the clergy is provided for by_86 seminaries, in which there are 5697 students. The chari- table institutions in the Church are very numerous. There are 255 orphan asylums, with 40,588 inmates. The other charitable institutions are 992 in- number, and include every form of public and private charity ; no diocese is without one or more such estab- lishments. The actual government of the Church in the United States is represented by one cardinal, 14 archbishops, 89 bishops, 11,135 diocesan clergymen, under the sole and immediate direction of their bishops, 3958 members of religious orders subject to epis- copal supervision — in all 15,093 clergymen. There are 8072 churches with resident priests, and 4076 mission churches — in all 12,148, to which must be added 3358 chapels. Several hundred weekly publications are printed in English and foreign tongues, to minister to the needs of the

Catholic population. There exist also several literary and academical magazines and reviews of a high order of merit.

The principal religious events in the recent history of the Church were the holding of the Third Plenary Council of Baltimore (1884),

the Catholic Congress (1889), the opening of the Catholic University (1889), the Columbian Educational Exhibit at Chicago (1893), the establishment of the Apostolic Delegation at Washington

(1893).

The Catholic Church in the United States conducts no foreign missions, but takes care of its own percentage of Indians and Negroes. Of the Indian population of the United States about 48,194 are Catholics, and they are attended by 65 priests, who look after 96 churches or chapels; there are 50 schools Conducted by members of 1.6 sisterhoods, in which 4430 children are educated. The Catholic negroes are about 138,573 in number. They have 47 churches conducted by 43 white clergymen; iia schools, in which 6294 children are educated by 31 sisterhoods, who also conduct II charitable institutions. The expenses of these missions are borne by private charity, and by a general annual collection.

Authorities. — General History: John Gilmary Shea, Life and Times of Archbishop Carroll (New York, 1888) ; The Catholic Church in Colonial Days (New York, 1886) ; The Hierarchy of the Catholic Church in the United States (New York, 1886). — Bishop O'Gorman, A History of the Catholic Church in the United States (1895). This work contains a useful bibliography. — Clarke, Lives of the Deceased Bishops (1872). Statistics: The Annual Directory of the Catholic Clergy. Of these, two are published; one by D. & J. Sadlier, New York, the other (Hoffmanns') by M. Wiltzius & Co. of Milwaukee. The Catholic general statistics of the eleventh (1890) census may be found in The Religious Forces of the United States, by H. K. Carroll (New York, 1893). See also U.S. Census, Special Report on Religious Bodies in iqo6 (1910). Legislation: Acta et Deer eta Concilii Plenarii Baltimorensis, iii. (Baltimore, 1886). This is illustrated and brought into relation with the general laws of the Church in Smith's Elements of Ecclesiastical Law (New York). In connexion with this may be read Humphrey's Urbs et Orbis (London, 1899), an account of the general

government of Roman Catholicism.

(* J. G.)

ROMANCE, originally a composition written in ” Romance ” language: that is to say, in one of the phases on which the Latin tongue entered after or during the dark ages. For some centuries by far the larger number of these compositions were narrative fictions in prose or verse; and since the special ” Romance ” language of France — the earliest so-called — was the original vehicle of nearly all such fictions, the use of the term for them became more and more accepted in a limited sense. Yet for a long time there was no definite connotation of fiction attached to it, but only of narrative story: and the French version of William of Tyre’s History of the Crusades, a very serious chronicle written towards the close of the 12th century, bears the name of Roman d’Eracle simply because the name of the emperor Heraclius occurs in the first line. But if the explanation of the name ” Romance ” is quite simple, certain and authentic, the same is by no means the case with its definition, or even with the origin of the thing to which that name came mostly to be applied. For some centuries an abstraction has been formed from the concrete examples. ” Romance,” ” romanticism,” ” the romantic character,” ” the romantic spirits,” have been used to express sometimes a quality regarded in itself, but much more frequently a differ- ence from the supposed ” classical ” character and spirit. The following article will deal chiefly with the matter of Romance, excluding or merely referring to accounts of such individual romances as are noticed elsewhere. But it will not be possible to conclude without some reference to the vaguer and more con- tentious signification.

Speculations on the origin of the peculiar kind of Story which we recognize rather than define under the name of romance have been numerous and sometimes confident; but a wary and well-informed criticism will be slow to accept most of them. It is certain that many of its characteristics are present in the Odyssey; and it is a most remarkable fact that these characteristics are singled out for reprehension — or at least for comparative disapproval — by the author of the Treatise on the Sublime. The absence of central plot, and the Romance prolongation rather than evolution of the story; la an- the intermixture of the supernatural; the presence tiqulty. an(j indeed prominence of love-affairs; the juxta- position of tragic and almost farcical incident; the variety of adventure arranged rather in the fashion of a panorama than otherwise: all these things are in the Odyssey, and they are all, in varying degrees and measures, characteristic

of romance. Nor are they absent from the few specimens of ancient prose fiction which we possess. If the Saiyricon was ever more than a mass of fragments, it was certainly a romance, though one much mixed with satire, criticism and other things; and the various Greek survivals from Longus to Eustathius always and rightly receive the name. But two things were still wanting which were to be all-powerful in the romances proper — Chivalry and Religion. They could not yet be in- cluded, for chivalry did not exist; and such religion as did exist lent itself but ill to the purpose except by providing myths for ornament and perhaps pattern.

A possible origin of the new romance into which these elements entered (though it was some time before that of chivalry de- finitely emerged) has been seen by one of the least hazardous of the speculations above referred to in the hagiology or ” Saint’s Life,” which arose at an early though uncertain period, developed itself pretty rapidly, and spreading over all Christendom (which by degrees meant all Europe and parts of Asia) provided centuries with their chief supply of what may be the called interesting literature. If the author of On “Saint’s the Sublime was actually Longinus, the minister of *” Zenobia, there is no doubt that examples both sacred and profane of the kind of “fiction ” (“imitation “or “representation”) which he deprecated were mustering and multiplying close to, perhaps in, his own time. The Alexander legend of the pseudo-Callis- thenes is supposed to have seen the light in Egypt as early as a.d. 200, and the first Greek version of that ” Vision of Saint Paul,” which is the ancestor of all the large family of legends of the life after death, is pretty certainly as old as the 4th century and may be as old as the 3rd. The development of the Alexan- dreid was to some extent checked or confined to narrow channels as long as something like traditional and continuous study of the classics was kept up. But hagiology was entirely free from criticism; its subjects were immensely numerous; and in the very nature of the case it allowed the tendencies and the folk- lore of three continents and of most of their countries to mingle with it. Especially the comparative sobriety of classical literature became affected with the Eastern appetite for marvel and “unhesitating acceptation of it; and the extraordinary beauty of many of the central stories invited and necessitated embroidery, continuation, episode. Later, no doubt, the adult romance directly reacted on the original saint’s life, as in the legends of St Mary Magdalene most of all, of St Eustace, and of many others. But there can be very little doubt that if the romance itself did not spring from the saint’s life it was fostered thereby.

Proceeding a little further in the cautious quest — not for the definite

origins which are usually delusive, but for the tendencies which avail themselves of opportunities and the opportunities which lend themselves to tendencies — we may notice two things very important to the subject. The one is that as Graeco-Roman civilization began to spread North and East it met, to appearance which approaches certainty, matter which lent itself gladly to ” romantic ” treatment. The That such matter was abundant in the literature sphering and folk-lore of the East we know: that it was even ° maften more abundant in the literatures and folk-lore of the North, if we cannot strictly be said to know, we may be reason- ably sure. On the other hand, as the various barbarian nations (using the word in the wide Greek sense), at least those of the North, became educated to literature, to ” grammar,” by classical examples, they found not a few passages in these examples which were either almost romances already or which lent themselves, with readiness that was almost insistence, to romantic treatment. Apollonius Rhodius had made almost a complete romance of the story of Jason and Medea. Virgil had imitated him by making almost a complete romance of the story of Aeneas and Dido: and Ovid, who for that very reason was to become the most popular author of the middle ages early and late, had gone some way towards romancing a great body of mythology. We do not know exactly who first applied to the legendary tale of Troy the methods which the

pseudo-Callisthenes and ” Julius Valerius ” applied to the histori- cal wars of Alexander, but there is every reason to believe that it was done fairly early. In short, during the late classical or semi-classical times and the whole of the dark ages, things were making for romance in almost every direction. ‘ It would and did follow from this that the thing evolved itself in so many different places and in so many different forms that only a person of extraordinary temerity would put his finger on any given work and say, ” This is the first romance,” even putting aside the extreme chronological uncertainty of most of the documents that could be selected for such a position. Except by the most meteoric flights of ” higher ” criticism we cannot attain to any opinion as to the age and first developed form of such a story as that of Weland and Beadohild (referred to in the Complaint of Deor), which has strong romantic pos- Uacer- sibilities and must be almost of the oldest. The tainty of much more complicated Volsung and Nibelung story, its order, though we may explore to some extent the existence backwards of its Norse and German forms, baffles us beyond

certain points in each case; yet this, with the exception of the religious element, is romance almost achieved. And the origin of the great type of the romance that is achieved — that has all elements present and brings them to absolute perfection — the Arthurian legend, despite the immense labours that have been spent upon it and the valuable additions to particular knowledge which have resulted from some of them, is, still more than its own Grail, a quest unachieved, probably a thing unachievable. The longest and the widest inquiries, provided only that they be conducted in any spirit save that which deter- mines to attain certainty and therefore concludes that certainty has been attained, will probably acquiesce most resignedly in the dictum that romance ” grew ” — that its birthplace is as unknown as the grave of its greatest representative figure.

But when it has ” grown ” to a certain stage we can find it, and in a way localize it, and more definitely still analyse and comprehend its characteristics from their concrete ex- pressions.

Approaching these concrete expressions, .then, without at first too hard and fast requirements in regard to the validation _ of the claims, we find in Europe about the nth cen-

CImsscs of

source. tur y (tne time is designedly left loose) divers classes of what we should now call imaginative or fictitious literature, nearly all (the exceptions are Scandinavian and Old English) in verse. These are: (i) The saints’ lives; (ii) the Norse sagas, roughly so-called; (iii) the French chansons de geste; (iv) the Old English and Old German stories of various kinds; (v) perhaps the beginning of the Arthurian cycle; (vi) various stories more or less based on classical legend or history from the tales of Alexander and of Troy down to things like Apollonius of Tyre, which have no classical auth- ority of either kind, but strongly resemble the Greek romances, and which were, as in the case named, pretty certainly derived from members of the class; (vii) certain fragments of Eastern story making their way first, it may be, through Spain by pil- grimages, latterly by the crusades.

Now, without attempting to fence off too rigidly the classical from the romantic, it may be laid down that these various classes possess that romantic character, to which we are, by a process of netting and tracking, slowly making our way, in rather different degrees, and a short examination of the differ- ence will forward us not a little in the hunt.

With i. (the saints' lives) we have least to do: because by the time that romance in the full sense comes largely and clearly inco view, it has for the most part separated itself off — the legend of St Eustace has become the romance of Sir Isumbras, and so forth. But the influence which it may, as has been said, have originally given must have been continually re-exerted; the romantic-dynamic suggestion of such stories as those of St Mary of Egypt, of St Margaret and the Dragon, of St Dorothea, and of scores of others, is quite unmistakable. Still, in actual result, it works rather more on drama than on narrative romance, and produces the miracle plays.

In ii. (the sagas), while a large part of their matter and even not a little of their form are strongly romantic, differences of handling and still more of temper have made some demur to their inclusion under romance, while their final ousting in their own literatures by versions of the all-conquering French romance itself is an argument on the same side. But the Volsung story, for instance, is full of what may be called " undistilled " romance —the wine is there, but it has to be passed through the still — and even in the most domestic sagas proper this characteristic is largely present.

It is somewhat less so in iii. (the chansons de geste), at least in the apparently older ones, though here again the com- parative absence of romantic characteristics has been rather exaggerated, in consequence of the habit of paying dispro- portionate and even exclusive attention to the Chanson de Roland. There is more, that is, of romance in Aliscans and others of the older class, while Amis and Amiles, which must be of this class in time, is almost a complete romance, blending war, love and religion — salus, venus, virtus — in full degree.

The other four classes, the miscellaneous stories from classical, Eastern and European sources, having less corporate or national character, lend themselves with greater ease to the conditions of romantic development; but even so in different degrees. The classical stories have to drop most of their original character and allow something very different to be superinduced before they become thoroughly romantic. The greatest success of all in this way is the story of Troilus and Cressida. For before its develop- ment through the successive hands of Benoit de Sainte-More, Boccaccio (for we may drop Guido of the Columns as a mere middleman between Benoit and Boccaccio) and Chaucer, it has next to no classical authority of any kind except the mere names. In the various Alexandreids the element of the marvellous — the Eastern element, that is to say — similarly overpowers the classical. As for the Eastern stories themselves, they are particularly difficult of certain unravelment. The large moral

division — such as Barlaam and Josaphat, the Seven Wise Masters in its various forms, &c, comes short of the strictly romantic. We do not know how much of East and how much of West there is in such things as Flore et Blanchefleur or even in Huon of Bordeaux itself. Contrariwise we ought to know, more certainly than apparently is known yet, what is the date and history of such a thing as that story of Zumurrud and Ali Shahr, which may be found partly in Lane and fully in the complete translations of the Arabian Nights, though not in the commoner editions, and which is evidently either copied from, or capable of serving as model to, a Western roman d'aventures itself.

We come, however, much closer to the actual norm itself — closer, in fact, than in any other place save one — in the various stories, English, French, and to a less extent German, 1 which gradually received in a loose kind of way the technical French term just used, a term not to be translated without danger. Nearly all these stories were drawn, by the astonishing centri- petal tendency which made France the home of all romance between the nth and the 13th centuries, into French forms;- and in most cases no older ones survive. But it is hardly possible to doubt that in such a case, for instance, as Havelok, an original story of English or Scandinavian origin got itself into existence before, and perhaps long before, the French version was retransferred to English, and so in other cases. If, once more, we take our existing English Havelok and its sister King Horn, we see that the latter is a more romanced form than the former. Havelok is more like a chanson de geste — the love interest in it is very slight; while in King Horn it is much stronger, and the increased strength is shown by the heroine being in some forms promoted into the title. If these two be studied side by side the process of transforming the mere story into the full romance is to no small extent seen in actual

1 Italian romance seems to have modelled itself early on French, and it is doubtful, rich as is the late crop of Spanish romances, whether we have any that deserve the name strictly and are really early.

operation. But neither exhibits in any considerable degree the element of the marvellous, or the religious element, and the love interest itself is, even in Horn, simple and not very dramatically or passionately worked out. In the later roman d'aventures, of which the 13th century was so prolific (such as, to give one example out of many, Amadas and Idoine), these elements appear fully, and so they do in the great

Auchinleck collection in English, which, though dating well within the 14th, evidently represents the meditation and adaptation of French examples for many years earlier.

The last of our divisions, however, exhibits the whole body of romantic elements as nothing else does. It is not our business in this place to deal with the Arthurian legend generally as regards origin, contents, &c, nor, in the present division of this actual article, to look at it except for a special purpose and in connexion with and contradistinction to the other groups just surveyed. Here, however, we at last find all the elements of romance, thoroughly mixed and thoroughly at home, with the result not merely that the actual story becomes immensely popular and widely spread; not only that it receives the greatest actual development of any romantic theme; but that, in a curious fashion, it attracts to itself great numbers of practically independent stories — in not a few cases probably quite independent at first — which seem afraid to present themselves without some tacking on (it may be of the loosest and most accidental description) to the great polycentric cycle, the stages of which gather round Merlin, the Round Table, the Grail and the Guinevere-Lancelot-Mordred catastrophe. All the elements, let it be repeated, are here present: war, love and religion; the characteristic extension of subject in desultory adventure- chronicles; the typical rather than individual character (though the strong individuality of some of the unknown or half-known contributors sometimes surmounts this); the admixture of the marvellous, not merely though mainly as part of the religious element; the presence of the chivalrous ideal. The strong dramatic interest of the central story is rather superadded to than definitely evolved from these elements; but they are still present, just as, though more powerfully than, in the weakest of miscellaneous rontons d'aventures.

A further step in the logical and historical exploration of romance may be taken by regarding the character-and-story classes round which it instinctively groups itself, story* ° an d which from the intense community of medieval literature — the habit of medieval writers not so much to plagiarize from one another as to take up each after each the materials and the instruments which were not the property of any — is here especially observable. Prominent above every- thing is the world-old motive of the quest; which, world-old as it is, here acquires a predominance that it has never held before or since. The object takes pretty various, though not quite infinitely various, forms, from the rights of the dis- inherited heir and the hand or the favour of the heroine, to individual things which may themselves vary from the Holy Grail to so many hairs of a sultan's beard. It may be a friendly

knight who is lost in adventure, or a felon knight who has to be punished for his trespasses; a spell of some kind to be laid; a monster to be exterminated; an injured virgin, or lady, or an infirm potentate, to be succoured or avenged; an evil custom to be put an end to; or simply some definite adventure or exploit to be achieved. But quest of some sort there must almost certainly be if (as in Sir Launfal, for instance) it is but the recovery of a love forfeited by misbehaviour or mishap. It is almost a sine qua non — the present writer, thinking over scores, nay hundreds, of romances, cannot at the moment remember one where it is wanting in some form or another.

It will be observed that this at once provides the amplest opportunity for the desultory concatenation or congregation of incident and episode which is of the very essence of romance. Often, nay generally, the conditions, localities and other circumstances of the quest are half known, or all but unknown, to the knight, and he is sometimes

Of Inci- dent,

intentionally led astray, always liable to be incidentally called ofi by interim adventures. In many (perhaps most) cases the love interest is directly connected with the quest, though it may be in the way of hindrance' as well as of furtherance or reward. The war interest always is so connected; and the religious interest commonly — almost universally in fact — is an in- separable accident. But everything leads up to, involves, eventuates in the fighting. The quest, if not always a directly warlike one, always involves war; and the endless battles have at all times, since they ceased to be the great attraction, continued to be the great obloquy of romance. It is possible no doubt that reports of tournaments and single combats with lance and sword, mace and battle-axe, may be as tedious to some people as reports of football matches certainly are to others. It is certain that the former were as satisfactory in former times to their own admirers as the latter are now. In fact the variety of incident is almost as remarkable as the sameness. And the same may be said, with even greater confidence, of the adventures between the fights in castle and church and monastery, in homestead or hermitage. The actual stories are not much more alike than those who have read large numbers of modern novels critically know to be the case with them. But the absence, save in rare cases, of the element of character, and the very small presence of that of conversation, show up the sameness that exists in the earlier case.

This same deficiency in individual character-drawing, and in the conversation which is one of its principal instruments, brings out in somewhat unfair relief some other cases of apparent sameness — the ”

common forms ” son ages. of story and of character itself. The disinherited heir, the unfaithful or wronged wife, the wicked stepmother, the jealous or wrongly suspected lover, are just as universal in modern fiction as they are in medieval — for the simple reason that they are common if not universal in nature. But the skeleton is more obvious because it is less clothed with flesh and garments over the flesh; the texture of the canvas shows more because it is less worked upon. Some of these common forms, however, are more peculiar to medieval times; and some, though not many, allow excursions into abnormalities which, until recently, were tabooed to the modern novelist. Among the former the wickedness of the steward is remarkable, and of course not difficult to account for. The steward or seneschal of romance, with some honour- able exceptions, is as wicked as the baronet of a novel, but here the explanation is not metaphysical. He was constantly left in charge in the absence of his lord and so was exposed to temptation. The extreme and almost Ephesian consolable- ness of the romance widow can be equally rationalized — and in fact is so in the stories themselves — by the danger of the fief being resumed or usurped in the absence of a male tenant who can maintain authority and discharge duties. While such themes as the usually ignorant incest of son with mother or the more deliberate passion of father for daughter come mostly from very popular early examples — the legend of St Gregory of the Rock or the story of Apollonius of Tyre.

The last point brings us naturally to another of considerable importance — the singular purity of the romances as a whole, if not entirely in atmosphere and situation, yet in charao language and in external treatment. It suited the ters of purposes of the Protestant controversialists of the romance Renaissance, such as our own Ascham, to throw discredit upon work so intimately connected with Catholic ceremony and belief as the Morte d’ Arthur; and it is certain that the knights of romance did not even take the benefit of that liberal doctrine of the Cursor Mundi which regards even illicit love as not mortal unless it be ” with spouse or sib.” But if in the romances such love is portrayed freely, and with a certain sympathy, it is never spoken of lightly and is always punished; nor are the pictures of it ever coarsely drawn. In a very wide reading of romance the present writer does not remember more than two or three passages of romance proper

(that is to say before the later part of the 15th century) which could be called obscene by any fair judge. And the term would have to be somewhat strained in reference even to these. The contrast with the companion divisions of fabliaux and farces is quite extraordinary; and nearly as sharp as that between Greek tragedy on the one hand and Greek comedy or satiric play on the other. It is brought out for the merely English reader in Chaucer of course, but in him it might have been studied. In the immense corpus of known or unknown French and English writers (the Germans are not quite so particular) it comes out with no possibility of deliberation and with unmistakable force.

The history of the forms in which romance presents itself follows a sufficiently normal and probable course. The oldest are always — save in the single case of part of the Arthurian division, in which we probably possess none of the actually oldest, and in some of the division of Antiquity which had a long line of predecessors in the learned languages — the shortest. They become lengthened in a way continued and exemplified to the present moment by the tend- ency of writers to add sequels and episodes to their own stories, and made still more natural by the fact that these poems were in all or almost all cases recited. " Go on " is the most natural and not the least common as well as the most complimentary form of " Bravo I" and the reciter never seems to have said " no " to the compliment. In not a few cases — Huon of Bordeaux, Ogier the Dane, Guy of Warwick, are conspicuous examples — we possess the same story in various stages ; and can see how poems, perhaps originally like King Horn of not more than a couple of thousand lines or even shorter in the 13th century, grew to thirty, forty, fifty thousand in the 15th. The transference of the story itself from verse to prose is also — save in some particular and still controverted instances — regularly traceable and part of a larger and natural literary movement. While, also naturally enough, the pieces become in time fuller of conversation (though not as yet often of conversation that advances the story or heightens its interest), of descriptive detail, &c. And in some groups (notably that of the remark- able Amadis division) a very great enlargement of the pro- portion and degradation of the character of the marvellous element appears — the wonders being no longer mystical, and magical only in the lower sense.

And so we come to the particular characteristics of the kind or kinds in individual examples. Of these the English reader Charge- has a matchless though late instance in the Morte teristic d' Arthur of Malory, a book which is at once a corpus examples. anc j a p a tt ern f

romance in gross and in detail. The fact that it is not, as has been too often hastily or ignorantly asserted, a mere compilation, but the last of a singular series of rehandlings and redactions — conducted with extra- ordinary though for the most part indistinctly traceable instinct of genius — makes it to some extent transcend any single example of older date and more isolated composition. But it displays all the best as well as some of the less good characteristics of most if not all. Of the commonest kind — the almost pure roman d'aventures itself — the Gareth-Beaumains episode (for which we have no direct original, French or English, though Lybius Disconus and Ipomedon come near to it in different ways) will give a fair example; while its presentation of the later chapters of the Grail story, and the intertwisted plot and continuing catastrophe of the love of Lancelot and Guine- vere, altogether transcend the usual scope of romance pure and simple, and introduce almost the highest possibilities of the romantic novel. The way in which Malory or his immediate authorities have extruded the tedious wars round the " Rock of the Saxons," have dropped the awkward episode of the false Guinevere, and have restrained the uninteresting exuberance of the continental wars and the preliminary struggles with the minor kings, keeps the reader from contact with the duller sides of romance only. Of the real variety which rewards a persistent reader of the class at large it would be impossible to present even a miniature hand-index here; but something may be done

by sample, which will not be mere sample, but an integral part of the exposition. No arbitrary separation need be made between French and English; because of the intimate connexion between the two. As specially and symptomatically noteworthy the famous pair — perhaps the most famous of all — Guy of Warwick and Bevis of Hampton, should not be taken. For, with the ex- ception of the separation of Guy and Felise in the first, and some things in the character of Josiane in the second, both are some- what spiritless concoctions of stock matter. Far more striking than anything in either, though not consummately supported by their context, are the bold opening of Blancandin et I'orgueilleuse d 'amour, where the hero begins by -kissing a specially proud and prudish lady; and the fine scenes of fight with a supernatural foe at a grave to be found in Amadas et Idoine. Reputation and value coincide more nearly in the charming fairy story of Parthenopex de Blois and the Christian-Saracen love romance of Flore (Florice and other forms) et Blanchcfleur. Few romances in either language, or in German, exhibit the pure adventure story better than Chrestien de Troyes's Chevalier au Lyon, especially in its English form of Ywain and Gawain; while the above-mentioned Lybius Disconus (Le Beau Deconnu) makes a good pair with this. For

originality of form and phrase as well as of spirit, if not exactly of incident, Gawain and the Green Knight stands alone; but another Gawain story (in French this time), Le Chevalieur aux deux epees, though of much less force and fire, exceeds it in length without sameness of adven- ture. Only the poorest romances — those ridiculed by Chaucer in Sir Thopas — which form a small minority, lack striking individual touches, such as the picture of the tree covered with torches and carrying on its summit a heavenly child, which illuminates the huge expanse of Durmart le Gallois. The various forms of the Seven Wise Masters in different European languages show the attitude of the Western to the Eastern fiction interestingly. The beautiful romance of Emare is about the best of several treatments of one of the exceptional subjects classed above — the unnatural love of father for daughter, while if we turn to German stories we find not merely in the German variants of Arthurian themes, but in others a double portion of the mystical element. French themes are constantly worked up afresh — as indeed they are all over Europe — but the Germans have the advantage of drawing upon not merely Scandinavian traditions like those which they wrought into the Nibelungen Lied and Gudrun, but others of their own. And both in these and in their dealings with French they some- times show an amount of story-telling power which is rare in French and English. No handling of the Tristan and Iseult story can compare with Gottfried's; while the famous Der arme Heinrich of Hartmann von Aue (the original of Longfellow's Golden Legend) is one of the greatest triumphs and most charm- ing examples of romance, displaying in almost the highest degree possible for a story of little complexity all the best characteristics of the thing.

What, then, are these characteristics? The account has now been brought to a point where a reasoned resume of it will give as definite an answer as can be given.

Even yet we may with advantage interpose a consideration of the answer that was given to this question universally (with a few dissidents) from the Renaissance to nearly the Summary end of the 18th century and not infrequently since; of opinion while it is not impossible that, in the well-attested re- aadtacl – volutions of critical thought and taste, it may be given again. This is that romance on the whole, and with some flashes of better things at times, is a jumble of incoherent and mostly ill-told stories, combining sameness with extravagance, out- raging probability and the laws of imitative form, childish as a rule in its appeal to adventure and to the supernatural, immoral in its ethics, barbarous in its aesthetics, destitute of any philo- sophy, representing at its very best (though the ages of its

lowest appreciation were hardly able even to consider this) a necessary stage in the education of half-civilized peoples, and embodying some interesting legends, much curious folk- lore and a certain amount of distorted historical evidence. On

the other hand, for the last hundred years and more, there have been some who have seen in romance almost the highest and certainly the most charming form of fictitious creation, the link between poetry and religion, the literary embodiment of men's dreams and desires, the appointed nepenthe of more sophisticated ages as it was the appointed pastime of the less sophisticated. Between these opposites there is of course room for many middle positions, but few of these will be occupied safely and inexpugnably by those who do not take heed of the following conclusions.

Romance, beyond all question, enmeshes and retains for us a vast amount of story-material to which we find 'little corre- sponding in ancient literature. It lays the foundation of modern prose fiction in such a fashion that the mere working out and building up of certain features leads to, and in fact involves, the whole structure of the modern novel (q.v.). It antiquates (by a soft of gradual " taking for granted ") the classical assump- tion that love is an inferior motive, and that women, though they " may be good sometimes " are scarcely fit for the position of principal personages. It helps to institute and ensure a new unity — the unity of interest. It admits of the most extensive variety. It gives a scope to the imagination which exceeds that of any known older literary form. At its best it embodies the new or Christian morality, if not in a Pharisaic yet in a Christian fashion, and it establishes a concordat between religion and art in more ways than this. Incapable of exacter definition, inclining (a danger doubtless as well as an advantage) towards the vague, it is nevertheless comprehensible for all its vagueness, and, informal as it is, possesses its own form of beauty — and that a precious one. These characteristics were, if perceived at all by its enemies in the period above referred to, taken at their worst; they were perceived by its champions at the turn of the tide and perhaps exaggerated. From both attitudes emerged that distinction between the " classic " and the " romantic " which was referred to at the beginning of this article as requiring notice before we conclude. The crudest, but it must be remembered the most intentionally crude (for Goethe knew the limitations of his saying), is that "Classicism is health; Romanticism is

disease." In a less question-begging proposition of single terms, classicism might be said to be method and romanticism energy. But in fact sharp distinctions of the kind do much more harm than good. It is true that the one tends to order, lucidity, proportion; the other to freedom, to fancy, to caprice. But the attempt to reimpose these qualities as absolutely distinguishing marks and labels on particular works is almost certain to lead to mistake and dis- aster, and there is more than mere irony in the person who defines romance as " Something which was written between an unknown period of the Dark Ages and the Renaissance, and which has been imitated since the later part of the 18th century." What that something really is is not well to be known except by reading more or less considerable sections of it — by exploring it like one of its own forbidden countries. But something of a sketch-map of that country has been attempted here.

To illustrate and reinforce the above, see in the first place articles on the different national literatures, especially French and Ice- landic ; as also the following : — ■

Classical or Pseudo- Classical Subjects. — Apollonius of Tyre; Longus; Heliodorus; Apuleius; Troy; Thebes; Caesar, Julius; Alexander the Great; Hercules; Jason; Oedipus; Virgil.

Arthurian Romance. — Arthur; Gawain; Perceval; Lance- lot; Merlin; Tristan; Round Table; Grail; and the articles on romance writers such as Malory, Wolfram von Eschen- bach, Chretien de Troyes, Gottfried of Strassburg, &c.

French Romance. — Charlemagne; Guillaumed'Orange; Doon de Mayence; Ogier the Dane; Roland; Renaud de Mont- auban (Quatre fils Aytnon); Huon of Bordeaux; Girart de Roussillon; AmisetAmiles; Macaire; PartonopeusdeBlois; Robert the Devil; Flore and Blanchefleur; Garin le Loherain; Raoul de Cambrai; Guillaume de Palerme; AdenesleRoi; BenoIt de Sainte-More, &c.

Anglo-Norman, Anglo-Danish, English Romance. — Bevis of Hamp- ton; Horn; Havelok; Guy of Warwick; Robin Hood; Maid Marian.

German. — Nibelungenlied ; Ortnit ; Dietrich of Bern ; Wolf-

dietrich; Heldenbuch; Waltharius; Gudrun; Hildebrand, Lay of; Ruodlieb.

Northern.— Sigurd; Wayland; Hamlet; Edda.

Spanish. — Amadis de Gaula.

Various. — Reynard; Roman de la Rose; Griselda and kindred stories; Genevieve of Brabant; Gesta Romanorum; Barlaam and Josaphat; Seven Wise Masters; Maeldune, Voyage of.

Authorities. — The first modern composition of importance on romance (putting aside the dealings of Italian critics in the 16th century with the question of romantic v. classical unity) is the very remarkable dialogue De la Lecture des vieux romans written by Chapelain in mid- 17th century (ed. Feillet, Paris, 1870), which is a surprising and thoroughgoing defence of its subjects. But for long afterwards there was little save unintelligent and mostly quite ignorant depreciation. The sequence of really important serious works almost begins with Hurd's Letters on Chivalry and Romance (1762). In succession to this may be con- sulted on the general subject (which alone can be here regarded) the dissertations of Percy, Warton and Ritson; Sir Walter Scott, " Essay on Romance " in the supplement to the Encyclopaedia Britannica (1816-24); Dunlop, History of Fiction (1816, to be usefully supplemented and completed by its latest edition, 1888, with very large additions by H. Wilson) ; Wolff, Allgemeine Geschichte des Romans (Jena, 1841-50); Ward, Catalogue of Romances in the British Museum (vol. i. 1883, vol. ii. 1893) (the most valuable single contribution to the knowledge of the subject) ; G. Saintsbury, The Flourishing of Romance and the Rise of Allegory (Edinburgh, 1897), and its companion volumes in Periods of European Literature [W. P. Ker, The Dark Ages (1904) ; Snell, The Fourteenth Century (1899); Gregory Smith, The Transition Period (1900); Hannay, The Later Renaissance (1898)]; W. P. Ker, Epic and Romance (1897). (G. Sa.)

ROMANCE LANGUAGES, the name generally adopted for the modern languages descended from the old Roman or Latin tongue, acted upon by inner decay or growth, by dialectic variety, and by outward influence, more or less marked, of all the foreign nations with which it came into contact.

During the middle ages the old Roman Empire or the Latin- speaking world was called Romania, its inhabitants Romani (adj. Romanicus), and its speech Roro/mcium, Vulgar Romancio, Italian Romanzo, from Romanice loqui— to speak Romance; in Old French nominative wmanz, objective roman{t), Modern French roman, " a novel." originally a composition in the vulgar tongue. In English some moderns use Romanic (like Germanic, Teutonic) instead of Romance; some say Neo-Latin, which is frequently used by Romance-speaking scholars. By successive changes Latin, a synthetical language, rich in in- flexions, was transformed into several cognate analytical tongues

of few inflexions, most of the old forms being replaced by separate foim-words. As the literary language of the ancient Roman civilization died out, seemingly extinguished by the barbarism 01 the middle ages, all the forms of the old classical language being confounded in the most hopeless chaos, suddenly new, vigorous and beautiful tongues sprang forth, ruled by the most regular laws, related to, yet different from, Latin. How was this wonderful change brought about? How can chaos produce regularity? The explanation of this mystery has been given by Diez, the great founder of Romance philology. The Romance languages did not spring from literary classical Latin, but from popular Latin, which, like every living speech,, had its own laws, not subject to the changing literary fashions, but only to the slow process of phonetic change and dialectic variety. It is interesting to observe that much that is handed down to us in the oldest Latin literature (notably in the voca- bulary) reappears in the most recent phase of Latin — the Romance languages. Thus, a verb nivire, ” to snow,” is known to Pacuvius, but does not again appear until the time of Venantius Fortunatus, and then with a change of conjugation — nivere, while it has now a new term of life in French and Rhaeto-Romanic dialects. It is obvious that there was no break of continuity in the vulgar language, for if in the later imperial ages a verb had been formed from nix, nivis, it must have been nivare, or niviare (Fr. neiger). Here especially the words of Horace come true : —

” Multa renascentur, quae jam cecidere, cadentque Quae nunc sunt in honore vocabula, si volet usus, Quern penes arbitrium est et jus et norma loquendi.”

ROMANCE LANGUAGES

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The present article, embracing all the Romance languages, aims at tracing on the one hand their common origin and their common development, on the other hand at pointing out the peculiarities of the individual languages and the possible explanations of the growth of these peculiarities. Their common development is mainly dealt with under Latin Lan- guage. The relation of the early vulgar Latin to the literary language, the spread of Latin following the spread of Roman rule, the prevalence of Latin over Oscan, Umbrian, Etruscan, and late Iberian and Gallic — all these matters concern rather the history of Latin than of the Romance languages. But we may say broadly that the language spoken throughout the Roman Empire at the time of Augustus was fairly uniform, and that naturally differentiations took place (varying according to regions) which were not, however,

strongly marked, and which even tended to be obliterated in later times.

The main causes of these variations were twofold. (1) The process of Romanizing the various districts took place at epochs far remote one from the other, and between the earliest and the latest of these epochs Latin itself was modified. 1 (2) We have the reaction on Latin of the languages of the pre-Roman populations.

Applying this first point of view, we should find that the oldest form of Latin (oldest, that is, for our present purposes) was intro- duced into Sardinia (238 B.C.); next comes Spain (197 B.C.), Illyria (167 B.C.), South Gaul (120 B.C.), North Gaul (50 B.C.), Raetia (15 B.C.), Dacia (a.d. 107). And we can actually trace some of the results of these differences in date, chiefly perhaps in the vocabulary and morphology of the Romance languages. When, for example, we find the dative illui (Ital., Fr., Rum. lui) missing in the Iberian peninsula, we may infer that it was unknown to the Latin intro- duced there, and conversely that Latin still used the ancient cova (Sp. cueva, ” cava “) and not the more recent cava (Ital. cava), also demagis or gumia, which we only know from Lucilius, Sp. demas, gomia.

We may be justified in assigning to these historic causes the beginnings of the divergence from the original uniformity. Neither active intercourse, nor the dislocations of tribes and populations brought about by the exigencies of military or colonizing enterprise, ever effected a complete fusion of these divergences. To this we must add, as a second element, ethnic considerations.

To begin with, we seem to find in Italy itself, among the Italic population in country districts, the survival of isolated forms which had been discarded by the literary language with its levelling tendencies, and in consequence also by what may be called ” Average Latin ” (Durchschnittslatein). In early Latin d becomes r before labials, e.g. ar me advenias occurs in Plautus; arvorsus, arger from *arfger are the ancient forms. Only arbiter has survived as a word of the official language and because in general feeling the noun was consciously connected with the verb baetere, though It was soon dis- carded. A rger, under the influence of aggerere, aggestus, became agger, and arvorsus was displaced by advorsus. In Abruz. we have arbendd, ” to repose,” beside Sicil. abbintari which suppose *arventare beside adventari ˆAbruz. armuri, “to put out the fire,” represents Lat. *armoriri instead of admoriri; arbukkd is found beside Ital. abboccare.

All these forms are only attested in Italy, and they might by reason of

their prefix be classed as Umbrian, since in Umbrian ar for ad is even commoner, cf. the place-name Arestaffele in Molise, which in Latin would be ad Stabula, save that the limitation to the cases that are in line with the Latin rule prove precisely that this is not a case of Umbrian influence, but of a preservation of ancient and popular forms. Beyond the limits of Italy arger has been preserved, e.g. Sp. arcen, and not only Ital. argine; further armissarius, ” stallion,” in the Lex Salica and in Rum. armesariu; perhaps Sp. almuerzo, ” breakfast,” for *armuerzo beside Lat. admorsus.

In the second place we have, especially in Italy, clearly Umbro- Oscan forms. Contrary to Latin use, these two dialects, the most important in ancient Italy, have / between vowels from an early bh, dh, as against Latin b, d; and Umbrian, Paelignan, &c, e, 0, from an early ei, ou, as against Latin I, u. Thus crefrat (in the glosses), as against Latin cribrat, is both by right of its vowel and consonant, an Umbrian form. And with this we must compare Ital. bifolco beside Lat. bubulcus; Ital. taffiari, “to feast,” beside tabulari; tafano, ” horsefly,” beside Lat. tabanus; bufalo, beside Lat. bubalus. Further, Neap. Otlufro, ” October,” morfende, ” eye- teeth,” Lat. mordente, &c. There is a special interest in cases like the French mandrin beside Ital. manfano. What! has come down to us is manpkur, which is not Greek, its ph notwithstanding, but which owing to its/ we must take to be Osco-Umbrian ; while the corre- sponding Latin form would be *mandar. The Latin supplies the French, the Osco-Umbrian the Italian form. As to the other

1 Cf. G. Grober, Archivfiir lat. Lexicographic, i. 35 ff.

instance, Varro points to vella beside villa as rustic, and to this we must add Ital. siegola, Sardin. isteva, Sp. and Port, esteva (*sleva for stiva), “plough tail”; Ital. elce, Sardin. elige, Fr. yeuse, “holly” (*elex for Ilex), or Ital. pommice, Fr. ponce, Sp. pomez, ” pumice- stone ” (*pomice for pumice).

It must not be overlooked that the last word denotes an object found chiefly in Sicily and near Naples, that is, in the ancient seat of the Oscans. It will be clear that we are dealing chiefly with words connected with agriculture, and it is remarkable that those of our second category spread all over the empire, while those of the first were entirely, or almost entirely, limited to Italy.

As a parallel we may cite the vocabulary of North and South Gaul, which yields a number of Gallic elements, and one may safely infer that in the first few centuries after the Roman conquest these elements

were more numerous than at a later stage, and there is in fact a definite justification for this inference. The so- called Endlichers glossary of the 5th century is a compilation, by a native of South Gaul, of Gallic words which were clearly at that time still current in the south of France. 2 And in this we have not only dunum, ” montem,” cambiare, ” pro re dare ” (Fr. changer) ; caio, ” breialo sive bigardio ” (Fr. quai); nanto ” valle,” Savoy, na, ” stream,” but also avallo, ” poma,” which was lost in later times but is preserved in its derivative amelanche, ” medlar.”

Another Gallic word recorded by ancient tradition — tegia, ” hut ” — still exists to-day with this meaning in the Venetian and Raetic Alps, and moreover plays an important part in toponomy — Fr. Arthies from Gall, are Tegias, ” at the huts,” N. Ital. Tezze; but in the oldest Gallo-Romance it may have been in use as an appel- lative, and thence have passed into Basque — e.g. Basq. tegi, ” hut.” The permeation of the Latin vocabulary by Gallic elements dates from the time of the contact of Gauls and Roman forces. Many of these elements — e.g. bracae, camisia — were widely used at so early a stage as to have penetrated into Rumania (Rum. imbracd, ” put on,” cameasd, “chemise”); others again have scarcely, if at all, passed beyond their ancient limits, even those that Roman litera- ture has preserved for us. It is true that Martial says —

” Barbara de pictis veni bascauda Britannis Sed me jam mavult dicere Roma sibi,”

but only in France has bachoue been preserved up to the present, while so far no traces of bascauda have been established for Italy.

Glancing over the Gallic contributions to the Gallo-Romance vocabulary, we see at once that they belong to a considerable extent to the sphere of agriculture, and that among the implements mentioned it is chiefly vehicles of all kinds which have Gallic names. The record of Roman times supplies us with benna, carpentum, carrum, caruca, agredum, petorritum, rheda, but carrum alone gained a firm footing; caruca in the form of charrue, ” plough,” survives in France, and benna (Fr. banne, Ital. benna) in its ancient home. Under this heading we may perhaps add taratrum, ” gimlet,” in Isidore, Fr. taribre, Engad. tareder, Sp. taladro, Port, trado; Fr. jante, ” felloe of a wheel ” (Bret. Kammed), Fr. taranche. Gall, tarinca. With caruca we may class soc, ” plough-share,” and O. Fr. raie, Mod. Fr. rayon, ” furrow,” Gallic *rica (cf. Cymr. rhych).

A further group is formed by cervoise, ” beer,” from Gall, cere- visia,

O. Fr. braiz, Mod. Fr. brai, ” malt,” brasser, ” to brew,” Gall, brace; lie, “yeast.” Among the names of plants Gallic betulla has survived wherever the tree is common. Within nairower bounds we find Fr. if, ” yew,” Gall. *ivum (cf. Ir. eo) ; probably also *cassanus, “oak,” Fr. chine, Prov. casser; Fr. verne, “alder” (cf. Ir. fern and the Gall, place-name Vernodubrum, ” alderwater “) ; beloce, ” sloe,” bulluca, and S. Fr. aranhon, ” sloe ” (Ir. airne). Pliny mentions marga, ” marl,” as being in use among the Gauls as manure for soil, from the diminutive *margila, Fr. marne. An agricultural measure was called arepennis, Fr. arpent. Fields were separated by a hedge — Prov. gorce (cf. 0. Fr. gort, “fence”); a hedged-round piece of land is called in French lande, Ir. land. Another method of demarcation was by means of hurdles, Fr. claie, Piedm. cia (cf. Ir. cliath) ; or of barricades, Fr. combre (whence the verbs encombrer, decombrer), which corresponds to a Gallic *comboros. Inside the hurdles the sheep and cows were kept whose milk yielded megues, ” whey ” (Ir. medg). The wood needed for the erection of fences was cut with the “wood-knife,” Gall, vidu- bium, Fr. vouge. We may notice further the group broga, ” en- closure,” ” preserve,” Prov. brogo and the diminutive brogilo, Fr. breuil.

In north Italy we find fruda, ” torrent ” (cf. Cymr. frwth), which is a parallel to na mentioned above; also Comasc. dren, ” black- berry,” Ir. dren, ” thorn,” and (over a large part of north Italy) bar, ” bunch,” ” tuft,” O. Ir. ban. To single out a few words, there is Prov. ban, “horn,” Cymr. ban; Piedm. vinverra, from a word that has come down to us as Latin, but is really Gallic: vi- verra, Cymr. gwywer, Gaelic feoragh, ” weasel,” and in the Rhaeto- Rom. dialect in Switzerland carmun, from a Gallic carmon, which is cognate with.O.H.G- harmo, Mod. H.G. hermelin, ” ermine.”

2 Cf. H. Zimmer Kuhn’s Zeitsch. filr vergl. Sprachforschung, 32, 230.

In this way we might amplify examples, and it should not escape notice that we have to deal chiefly with substantives, with few adjectives and hardly any verbs. 1

In precisely the same way the Spanish vocabulary must have been seamed with traces of Iberian elements. But the process of elimination took place more rapidly and thoroughly in this case, so that the number of Iberian or Celtic-Iberian words that have resisted time and change is small. On a Latin inscription from Spain we find paramus, ”

plain," and paramo occurs to this day in this sense. As the Iberian does not know the sound p, the word cannot be Iberian, and must be Celtic.

In Isidore we find baia, " bay," which should be read baia, as Sp. and Port, bahia prove — doubtless an Iberian word, since Fr. bale and Ital. baia are forms quite recently borrowed from Spanish. This baia is perhaps somehow connected with the place-name Bayona. Again, the lapides lausiae of the Lex Metalli Vipascensis are Celtic rather than Iberian (cf. Sp. losa, Port, lousa, as well as Prov. lausa, Piedm. losa). Considering our ignorance of Iberian, and the pronounced colouring of Basque by Spanish words, it is not often easy to decide on which side the indebtedness lies when we meet with a word in Spanish and Basque whose etymology is still uncertain.

Much discussion centres round the question as to how far the pre-Romanic nations influenced the phonology of the Romans in the process of their assimilation. Opinions are strongly diver- gent. While G. I. Ascoli has repeatedly assumed influences of this kind on a large scale, the present writer is very sceptical. 2 It may be well to give the essential points.

Plautus uses distennite and dispennite instead of distendite and dispendite — forms he imported from his native Umbria. And like the Umbrians, the Oscans too pronounced nn instead of nd. Later we find this same change throughout the whole of south and central Italy, and even in Rome, whereas it is not observed in Tuscany, north Italy and other Romanic countries. We may therefore confidently assume that this is due to a reaction of the Oscan-Umbrian dialects. Similarly it is in accordance with Umbrian pronunciation to convert breathed plosives into voiced after nasals, e.g. iuenga = Lat. juvenca; and similarly we have cingue in central and south Italy beside Tusc. cinque (quinque). But even in this particular the change affects not only the regions of ancient Umbria, but also those of the Oscans and Messapians, though again it must be admitted that we do not know what the pronunciation of the ancient Messapians was. And finally, we find the Latin d represented in Umbrian between vowels by a sound which has a separate sign in the national alphabets and which in Latin is reproduced as rs. And since the Paelignan alpha bet too has a sign for a modified d,. one may perhaps assume that in these districts d had a specialized sound as th, or r; and this view agrees with the fact that in the dialects of central and southern Italy d was pronounced sometimes like r, sometimes like th. And probably this sums up all we can say with certainty.

It has always been maintained that French u (pronounced as German

ii), derived from «, is due to the influence of Gallic. The u (with modern sound) is identified with the whole area of the French language except part of the Walloon, part of French Switzerland, and Piedmont, Genoa, Lombardy, the Grisons, Tirol and the northern part of the Emilia, but not Friuli, Venetia and Istria. On the other hand, the ancient ii became i in Cymric, to which u must be regarded as an intermediary step, that may there- fore have existed in Gallic. But in the first place we must observe that Greek writers always render the Gallic u by ov, never by v; that the Romans too write ii, never y; and further, that over a large part of the area ii came in comparatively recently. Secondly, in Gallic in- scriptions the combination CT is frequently replaced by XT, so that the Irish pronunciation cht (Ir. nocht, ” night “) is as old as Ancient Gallic. And since the preliminary stage of the Fr. fait from factum, nuit from node, is likewise cht, it is natural to suppose a relation between these facts, and all the more because the Iberian Peninsula on the one hand, and a large part of the western and central area of upper Italy on the other, show an identical process; but in Venetian, central and southern Italy ct became tt. Thirdly, nasalized vowels are in evidence chiefly in the ancient seats of the Celts — in northern and southern France, in Piedmont, Genoa, Lombardy and partly in Raetia, also in Portugal, but not as far as southern Emilia. At this point again evidence from the Gallic fails completely. Finally, an attempt has been made to trace back the general characteristics of the French and the Gallo-Romanic dialects of Italy to the peculi- arities of the Gallic accent. It is assumed that there was a decided stress-accent, which brought about an over-emphasis of the stressed syllable at the expense of the unaccented ones, with the result of a marked weakening of the unaccented vowels, and particularly of those following the stressed syllable. Here again we can only

1 Cf. R. Thurneysen, Keltoromanisches (Halle, 1885); W. Meyer-Liibke, Einfiihrung in die romanische Sprachwissenschaft, p. 38 ff.

2 G. I. Ascoli, Una Lettera glottologica (1880); Archivio glottologico ilaliano, x. 260; Sprachwissenschaftliche Briefe (1887; cf. H. Schuchardt, Zeitschrift fur rom. Phil. iv. 140 and elsewhere); and Meyer-Lilbke, loc. cit. 205 ff.

say that Gallic itself affords no evidence for this assumption, and that, on the contrary, this peculiar accentuation may be due to other reasons, unknown to us. To turn to morphology, the method of enumerating — as we find it, for example, in Fr. quatre-vingts, &c. — would seem to be Gallic, since it is common to all the Celts.

But even if we admit certain regional variations, all these were overlaid by an ” Average Latin ” which presents a number of essential features uniformly over the whole area, and which differed from the literary language. These characteristics (in historical sequence) are as follows: (i) Loss of final m in polysyllabic words (which we find exemplified in the very oldest inscriptions) ; (2) loss of the h- sound, a loss which outside the towns was of great antiquity (cf. anser), and at the beginning of imperial times was fairly common; (3) loss of n before s coupled with the lengthening of the vowel, for which Varro is evidence in his alternations of mensa and mesa; (4) the assimilation of rs to ss — e.g. sussum from sursum (Ital. suso, 0. Fr. sus, Mod. Fr. dessus). Toward the end of the Republic v is lost before u — e.g. vius instead of vivus, rius instead of rivus (Ital. Sp. rio), anticus instead of antiquus (Ital. antico). In the first century A.D. b became v between vowels, thus merging itself into the latter sound, so that in examining the Romance languages it is impossible to decide whether the original was v or b. And this change spreads in sentences to the initial b (as in the inscription manduca vibe lude e beni at me), which leads in some cases to some uncertainty in the use of v and b. And lastly, we have the case of cl and tl — e.g. veclus (Ital. vecchio, Fr. vieil, Sp. viejo, Port, velho, Rum. viechiu) instead of vetulus-, the reduction of di before vowels, of _;’, g before e, i, and of z to a single sound j, or rather dj, in consequence of which we have diurnum (Ital. giorno, Fr. jour) ; juvenis (ital. giovane, Fr.jeune); gener (Ital. genero, Fr. gendre) ; zelosus (Ital. geloso, Fr. jaloux), all represented by the same initial.

To turn to vowels, we must first notice that, according to Varro, ae was pronounced e in the country, but that in the cities the diphthong was maintained at first, while the simple sound was only admitted during the course of the 1st century A.D. If this is an instance of an early spreading of a rustic pronunciation, we have in another case a victory for that of the bourgeoisie and aristocracy. for au belongs to Umbrian, Volscian and vulgar Latin, which explains why Appius Claudius Pulcher changed his name to Clodius when he deserted the patricians and went over to the plebeians. And there is other evidence of this change of sound. But in the inscriptions of the Empire for au is very rare, save in proper names, and the Romance languages have partly preserved the au to this day with little or no change (cf. Rum. auzi, Prov. auzir, Port. ouvir from audire), or only changed it to o at a later stage (cf. Fr. chose, where ch could only have arisen before a, not 0), so that one may assume that the ” Average Latin ” always preserved the au.

Then, without entering into detail, we must mention the pro- thesis of i before st, sp, sc, a phenomenon which arose, judging from the

inscriptions, in the 2nd century A.D. We find it at the beginning of the sentence, and also within it after consonants, but not after vowels; e.g. ilia spata, but illas ispatas; istdre, istd, but tu istds, &c.

Most important of all are the modifications that affect the accented vowels, which give a new look to the language as- a whole. In Old Latin and even towards the end of the Republican age, vowels varied solely according to their quantity, e.g. a, was longer than d, e longer than e, but the vowel sound was the same, or at any rate the difference in quality between long and short must have*been quite insignificant, seeing that Cicero and Quintilian wished the word divisio to be avoided in speech from motives of decorum, because of the likeness in sound to vissio. Quantity was not influenced by the number of the consonants following: actus was pronounced with a, factus with a, &c. In the course of the 1st century approximately quality was differentiated in addition to quantity in all vowels except a — short vowels being pronounced with an open, long ones with a close, sound. The written language expresses this change by writing ae for e, i for e, e for i, u for 0, for ii. In addition, there are statements of the grammarians, though they mention only the double pronunciation of e and 0, not that of i and u. It was probably in the course of the 4th century that the further change took place, by which all vowels were lengthened before a single consonant, and shortened before two or more, e.g. sitis became sitis, while tectum became tectum. But the older qualitative variations were maintained so that even now sitis and iritis, or tectum and tectum did not contain the same vowel-sound, the former having a close, the latter an open, vowel. (Cf. Ital. sete, vile, Fr. soif, vis, Sp sed, vid; or Ital. U$tto and letto, Fr. toit and lit.) It is at the end of the 4th century that Augustine says: ” Afrae aures de corruptione vocalium vel productione non judicant,” and the uncertain practice of the poets in the matter of quantity points to the breaking down of the old conditions. This was not the end of the process of development; but the most important stages were already accomplished. In this, too, we are concerned with changes affecting the whole Romance region. The final step was taken when open i and close e, open u and close 0, were reduced to one sou nd which may be called close e (or o). This step was not taken by the eastern regions, excepting as to e, and Sardinia remained completely unaffected (v. infra).

The vowel-system that developed in course of time is thus as follows :

—

e e 1

4, vj,

1 u u o

V

I

o

i

“before I const

e e 1 u 6 ~bef<

ore 1 const.

i

“before 2 consts.

“before 2 consts.

I U In the department of flexion we find less radical changes. The genitive was the first case to disappear. In general its functions were usurped by the preposition de. But for the possessive sense the dative was adopted, cf. Hie Requiescunt Membra ad Duos Fratres, in an inscription from Gaul. The accusative serves for the case after prepositions under all circumstances, and therefore even in places where the older language used the ablative, e.g. magister cum suos discentes in a Pompeian inscription. Nouns of the third declension with monosyllabic nominative, e. g. lens, stirps, ars, &c, form a dissyllabic nominative, e.g. lentis, stirpis, &c. The dividing line between masculine and neuter, at all times doubtful, is frequently broken down, especially in the singular, e.g. cubitum instead of cubitus, and there are converse cases. The absorption of the fourth declension by the second is almost complete. In the declension of the pronouns the genitives ipsuius, illuius, dat. ipsui, illui, fern, illaeius, illaei, are found in several inscriptions, but do not belong to the common language, since, as we have already said, they are not at home in the Iberian peninsula. On the other hand, all the Romance languages show that *eo took the place of ego. The use of ille as

personal pronoun, and also of ipse, and of both these forms as articles, dates from ancient times. We find a par- allel to the weakening of these demonstratives in the amalgama- tion of the pronominal combinations to be found as early as Plautus with ecce, eccum, which results in new forms, e.g. ecceille (O. Fr. cil, Mod. Fr. celui) or eccuille (Ital. quegli, Sp. aquel) ; ecceiste (Fr. ce- {t)) ; eccuiste (Ital. questo, Sp. aqueste). In the verb-system, a character- istic change is the disappearance of the future and passive forms, the explanation of the phenomenon in both case,s being psychological rather than formal. Popular language is not familiar with the future, and replaces it by the present — or, more strictly speaking, the vulgar person deals only with the present or the past. The case of the passive is similar. The transposition of active into passive is too complicated a process for the simple mind. The object of the action remains the object; when the subject of the action is not known, they resorted to the indefinite third person plural, e.g. vendunt casam is the popular mode of expressing domus venditur. And further, the perfect amatus sum was replaced by amatus fui, since fui was a perfect and could now take over the function of a present. For the moment, all other tenses and moods of the verb were preserved, only of the infinite forms, the gerundive, perfect infinitive and the two supines disappeared. Of the gerund nothing remained but the ablative. In compensation, however, we soon find a form habeo cantatum springing up beside cantayi in use as perfect, e.g. litteras scriptas habeo meant in the first instance, ” I possess written letters,” with nothing implied as to who wrote the letters; ‘but later this usage is limited to cases where the owner is also the originator of the state of things expressed in the parti- ciple, and thus it attains to the force of a perfect.

There is little change in the formation of individual verb-forms. It is natural that the infinitives esse, velle, posse, being exceptional, should have been brought into line with all the rest. This was done by simply adding -re on to esse (Ital. essere, Fr. Ure), while the other two were constructed from the forms of the verb whose ending was accented, or from the perfect, e.g. volebam, potebam, volui, potui, gave rise to *volere, *potere, on the analogy of docebam, docui, monebam, monui, nocebam, nocui, &c. ; with infinitives, docere, monere, nocere, &c. (cf. Ital. volere, potere, Fr. vouloir, pouvoir, Sp. and Port, poder, Rum. vrea, putea). In other infinitives there is much confusion, especially as between -ere, and -ere verbs, noticed by the Latin grammarians themselves; we have evidence, too, that at an early stage the present forms in -io, -iam led to a confusion of the -ire and -ere conjugation, e.g. Plautus has morire (Ital. morire, Fr. mourir, Sp. morir, Rum. muri); Lucretius has cupire; Cato has fodire, &c. For the rest we may

note as important that perfect-forms without «-, such as -asti, -astis, -arunt, infected the first person singular, e.g. -at instead of -avi. A new type in -idi arose on the model of vendidi, and then affected other verbs in -ndere, e.g, descendidi (in Gellius), prendidi (in the grammarian Probus) and in general verbs of the third conjugation. But its spread was slow, so that it can scarcely be said to have been common to all the languages.

In the formation of words the popular language probably had far greater freedom than the written language. We find not only a marked preference for diminutives in -ulus and -ellus, but many other types are established, or new ones created. And as the chief ones

we must mention the post-verbalia (nouns constructed out of verbs). Thus pugnare, being itself derived from pugnum, then produces pugna (on the pattern of planta, plantar e), and these formations soon became extremely common, and not only in a- verbs, but also in eVe-verbs, cf. in particular dolus, ” grief ” (not to be confused with the ancient dolus, ” craft “), C.I.L. x. 4510 (Rum. dor, Ital. duolo, Fr. deuil, Sp. duelo). As examples of other types we have -ura beside -or, which we can trace back to ardura, a contamination of ardor and arsura, which extended to fervura; also to strictura beside strictus; directura beside directus, when the old participles had separated both in form and in meaning from the verbal-system and had become adjectives, whose /was felt to be part of the stem. Another feature of the verb is the gradual retreat of old simple formations in favour of derivatives from the participle, e.g. cantare, adjulare, ausare, &c, in place of canere, adjuvare, audere; then for denominatives -icare and the Gr. -izare (Ital. -eggiare, Fr. -oyer, Sp. -ear) which, coming in with Christianity, was soon added on to Latin stems, e.g. (in Fulgentius) citherizantium aut tibizantium.

Among points of syntax we may single out the replacing of in- finitival sentences (following verbs of feeling, seeing, hearing, wishing) by clauses with ut, quod or quia, whence Ital. che, Fr. que. The latter particle spread most rapidly, and soon took precedence over the other conjunctions, not only in the cases just mentioned, but in introducing object-, subject-and final-clauses.

It is in the vocabulary that it is most difficult to define the relations of the common and the literary language. So much of the Latin vocabulary as appears over the whole Romance area comes of course from the everyday language which was used from the mouth of the Ebro to that of the Danube, but it is by no means all. It is more interesting to inquire whether anything can be reconstructed from

Romance, and, if so, how much? The exist- ence of a form aiutare, for example, mentioned above (Ital. ajutare, Fr. aider, Sp. ayudar, Rum, aiutd) and appearing in all the Romance languages, is indisputable. Between Fr. grolle (" crow "), Lyon. grola, Gascon, agraulo, Tirol, grolo, and (with change of gender) Apul. raulu, Rum. graur, the connexion, both in form and meaning, is so close that one is led to assume a common basis for all these words. This basis is *graulus, -a, and it is safe to assume that such a word goes back to Latin, though remembering that it was not found in the western regions. Rum. afld, Sic. asciari, Sp. hallar, Port, achar, Gris. afldr, Dalm. afludr, " to find," all point to affiare, and in this case, too, the change in meaning may be safely ascribed to Latin, only in this case Gaul is not included. Rum. aripa, Fr. aube, Prov. aubo, Sp. alabe, " paddle-board," in Rum. meaning also " wing," and in Sp. also " the wickerwork on both sides of a vehicle," in Port. " the wing of a parapet," point to a form *alapa, which meant " wing " and which must have belonged to the vulgar language, even though no trace of it survives in Italy. Many other points could be enumerated, but problems are involved which have as yet hardly been taken up. 1

In dealing with the division of this common language into a number of individual languages there are still further points of view to be considered. Before we can touch upon these, we must first take a general survey of these languages. There are altogether nine — Rumanian, Dalmatian, Sardinian, Italian, Raeto-Romanic, French, Provencal, Spanish and Portuguese. Of these nine lan- guages, Dalmatian is now extinct, and even what we learn of it from the ancients is very meagre. On the one hand, Ragusa and the plains of Dalmatia never attained the degree of independence in literature which would have brought about a floruit in the language such as Provengal has to show. Neither, on the other hand, was its political independence stable enough, nor was it sufficiently remote to escape intercourse with the rest of the world, like the Raeto-Romanic dialects. The hordes of Slavs pressing forward from the inner regions of the hinterland soon put an end to the Romanic civilization, first in the country and then ir the towns. And when the Venetians, who were, both in point of culture and of commerce and of politics, on a higher level, regained their power over the Dalmatians by occasional conquests, chiefly over the cities, the result was of course all in favour of the Venetian dialect. On the island of Veglia alone there were still living about the middle of the 19th century a few people who still spoke Old Dalmatian. The last of these is now dead. Our approximate notions of this language are gleaned from the speech of these natives of Veglia, from a few more ancient notes, place-names, proper names

and from the Romance elements in the Servo-Croatian dialect of Ragusa. 2 We may begin by reducing these nine languages to seven groups — Dacian, Dalmatian, Sardinian, Italic, Raetic, Gallic and Iberian. The most striking peculiarity of the first three of these groups is the absence of Germanic words in the vocabulary. In other words, they were withdrawn from the influence of the general ” Average-Latin ” before the beginning of the more decided permeation of Latin by Germanic elements. There are other signs of their antiquity. In Central Sardinian c before e, i, and

1 Cf. G. Grober, Archiv. f. lat. Lexicographie, i. 204 ff.

2 Cf. M. G. Bartoli, ” Das Dalmatische ” (1906), (Schriften der Balkan-Kommissionder K. Akademie der Wissenschaften, linguistische Abteilung, Bd. iv. and v.).

in Dalmatian c before e are always preserved as velars, and in south Sardinian and in Rumanian the palatalization is more recent, and secondary. The preservation of the tenues between vowels as breathed fortes is peculiar to Rumano-Dalmatian, but as north Sardinian used breathed lenes in their place, while the dialect of Nuoro, in Sardinia, preserved the fortes, we have every ground for assuming that central and south Sardinia also possessed either fortes or lenes in earlier times. Moreover, south Italy, Sicily and a large part of central Italy as far as the Apennines replace the old Latin tenues either with breathed fortes or breathed lenes, in marked contrast to the regions of the Po, to Gallic and the Iberian group. All these phenomena may perhaps be explained in con- junction with two historical events. By the abandonment of the province of Dacia (in a.d. 270), Rumanian lost its close touch with the languages of . nearest affinity ; and the division of the empire under Diocletian and Constantine necessarily entailed a linguistic division. At that epoch the linguistic conditions were roughly as follows : —

The principal changes in the vowel-system, especially the development of qualitative beside quantitative variations, had been accomplished, but there was still a difference between i and e, u and q. The old future had disappeared, and no tendency to produce a substitute had as yet appeared. The Latin pluperfect subjunctive still maintained its old usage, probably also the imperfect sub- junctive and the future perfect. In declensions the type membrum, -a, had begun to spread;

but corpus, ora, was still in existence. Sardinia seems to have been, perhaps owing to its isolation, the first to have detached itself from this group. For it was not con tent with differentiating e and 1, but it also retains -s, whereas the East-Rumanian and an Italian group suppressed -s, and in consequence also the difference between the nominative and the accusative singular. This and the levelling of neuters in -us and masculines in -u made it possible for the types membra and corpora to spread at the expense of the type loci, — a possibility of which South Italian and Rumanian made the fullest use.

On the given basis the various languages carried on their various developments, influenced partly by contiguity of other idioms, partly by causes unknown to us. Among neighbouring idioms, Greek had by right of its degree of civilization and its political power great influence in giving Rumanian and South Italian a similar direction, and that at a time when every trace of a geo- graphical connexion between these two language-groups had long vanished. Thus, the replacing of the construction ” I will come ” by “I will that I come ” took its rise in Greece and was passed on to Rumania and Apulia. The rise of the new future voiu canid, ” I will sing,” in Rumanian is probably due to Greek influence. In Latin itself both tile caballus and caballus Me are found, the position depending on the accentual conditions of the sentence. Then the loss of s made room for the form caball[u] tile with a victory for the inverted order. In Rumania alone this was the actual process, under the influence of the surrounding speech — Illyrian or Bulgarian, or perhaps independently of them, in this latter case serving as prototype to these languages. Dalmatian and South Italian, on the other hand, were so closely connected with the languages that preserved J and ‘ therefore prefixed the article that in this particular they separated from Rumanian. This is not the place to show how the Rumanian vocabulary and the structure of words was permeated markedly by elements from Slav, less markedly by elements from Turkish, Mod. Greek and Hungarian, which gave the language an alien appearance in point of vocabulary.

In its consonants, and, as far as one can judge, in its morphology, Dalmatian has preserved the stamp of antiquity. But in its vowel-system there are marked changes, especially in the substitution of diphthongs for close vowels, e.g. changing a to e, u through the ii stage to oi, j to ei, to au, e to ai. Diphthongs such as they appear also in Istrian and Abruzzian, so that we must presuppose some sort of connexion.

It may be that Sardinian took another course of development because (a.d. 458) the island was rent from Rome and incorporated in the

African empire of Genseric, king of the Vandals. Therefore the sympathies of Sardinia were alienated from Italy, and turned on the one hand towards Africa (and unfortunately we have no information as to the ” latinity ” of this region), on the other to- wards the Iberian peninsula. These conditions lasted for a while, but later we find Genoa and Pisa fighting at intervals for supremacy in Sardinia, their organization being in many points identical with that of the island. On the whole, this new combination has not materially affected the language, especially in Logodoro. The vowel system (of great antiquity) , as well as the velar pronunciation of c before e, i, remained unchanged, neither did they get as far as to adopt the future-forms current on the mainland ; on the contrary, the Sardinians arrived independently and later at their usage of depo cantare or haia a cantar. But the use of ipse as an article in Sardinia, Mallorca, and in the earliest times also in the Catalanian- Gascon area, clearly proves the linguistic connexion which for a time covered this area, and we may also see some connexion in the fact that the lenes became voiced between vowels. On the whole, and in spite of everything, Sardinian is the most archaic of the

Romance languages. Owing to its retaining 5, it has failed to extend the membra-tempora types of formation, indeed it has almost re- jected them entirely. It has retained the imperfect subjunctive to this day, and as a corollary it has lost the pluperfect of that mood. And though every Romance language has a number of Latin words that are not common to the rest, yet in this language the number of these airaj \eybyLtva is greater than in others, and it is noteworthy that these have here survived such common expressions as domo, ” house,” mannu, ” great,” with other examples.

The East-Rumanian group (coupled with Sardinia) finds its counterpart in the great group based upon the Latinity of Gaul, the Iberian peninsula, and north Italy. This group contains a considerable number of fundamental peculiarities in phonology, morphology and vocabulary which prima facie lead us to assume a fairly long period of contact.

The chief of these peculiarities is the final change of the vowel- system, i.e. the loss of the distinction between e and t, between and u ; then the change of breathed plosives and fricatives between vowels into voiced plosives and fricatives respectively; the use of the pluperfect subjunctive instead of the lost imperfect subjunctive (Ital. cantasse, Fr. que je chantasse, Spy cantase, Port, cantasse), the formation of a new future from the infinitive of the verb and the present, or (as the case may be) the imperfect or perfect of habere,

e.g. Ital. cantero, canlerei, Fr. je chanterai, chanterais, Sp. cantare', cantaria. If it is safe to assume that this latter formation had its origin in places where we find it most firmly rooted, we are led to assign it to the north of France. For it is only there that both elements in the formation are inseparably connected from the beginning of our record. In the old Provencal the two constituent parts are still separable; in the oldest Spanish and Portuguese their position is not fixed (i.e. the auxiliary may follow or precede the verb). In north Italy we frequently find the form avrb cantare instead of cantarb, obviously because this formation is not properly acclimatized. But at any rate it is clear that the change of function from cantare habeo to cantabo belongs, to the time when the three great groups were still in close contact, and the evidence of the Latin texts falls into line with this view, showing this construction well established from the second half of the 4th century. 1 In the vocabulary we must note, among other things, the introduction of Germanic words, e.g. elmo, Fr. heaume, Sp. yelmo, "helmet"; harpa, " harp," Ital. arpa, Fr. harpe, Sp. and Port, arpa; medus, " meed," which is found in Antimus and Isidore, but disappears later (cf . O. Fr. mies, " meed ") ; waidanian, Ital. guadagnare, Fr. gagner, Sp. guadanar, and many more.

The further steps in the process of differentiation were con- ditioned by the breaking up of the Roman empire by the great migrations. The establishment of the rule of the Franks in north Gaul, of the Visigoths in south Gaul and the Iberian peninsula, loosened old ties, created new nations and in consequence new and independent groups of languages.

The Iberian group was marked primarily by a striking simplicity in its flexions. The three-case system was given up at an early stage, even in prehistoric times, and has left no traces whatever. Owing to the preservation of -5 the type membra was doomed to perish, and thus we find, from the beginning of our record and therefore presumably soon after the great cleavage took place, the prevalence in nouns of the following simple rule: sing, -e, -0 , -a; plur. -es, -os, as. The loss of the dative may have some connexion with the fact that the form illui for the 3rd personal pronoun had not yet established itself; and the desire for uni formity may have ousted the nominative of 0- stems. There are analogies in the conjugation. The pluperfect indicative was pre- served, and even (largely) with a Latin significance, but in the region of flexion much simplification took place, e.g. uniformity of accentuation in the three conjugations, marked reduction of the s- perfect and u- perfect forms and a great reduction in the number of u- participles.

The vocabulary is characterized by certain archaisms, and still more by the fact that a series of common ideas are rendered by new words limited in use to the Iberian peninsula. Thus we have querer (quaerere) instead of velle; quedar (quietare) instead of manere; callar (deriv. uncertain) for tacere; hablar (fabulare), “to speak”; llegar (plicare), “to arrive”; dejar (?) instead of laceare, &c. Further, we may mention the preference of tenere to habere even for the formation of perfect-forms, of which examples are to be found in Orosius, and of magis to plus for expressing comparisons, for which also we may find examples in Latin authors or the Iberian peninsula. The influence of the Goths or Suevi and Vandals on the vocabulary is inconsiderable, and when we trace it it is not easy to explain; e.g. Galician laverca, “lark,” is clearly from a western Gothic Hawerka, but it is difficult to see why the name for this bird should have been supplied by the Germanic. To sum up, one may say that the Latin of Iberia was a self-contained language, at first showing little modification by influences from Iberian, or later by those fiom Germanic; further, that its develop- ment was slow, and that it aimed at simplicity.

At the present day there are three great groups, running almost

1 See Thielmann, in Archiv f. lat. Lexikogr. ii. 48 eeq.

parallel from N.E. to S.W., e.g. Catalanian on the coast of the Mediterranean, akin to Provencal, Spanish in the centre, Galician-Portuguese on the Atlantic. From the historical point of view one part might be called Gothic-Romance, the other Suevo-Romance. But the national and linguistic history of the times and countries we are dealing with is still very obscure. The difference between the two idioms is chiefly one of phonetics, while in their morpho- logy and vocabulary they do not greatly differ. Spanish may be described as a language which favours vowels at the expense of consonants, and which therefore shows, more than other Romance languages, a weakening even of initial consonants. It changes voiced stops first to fricatives, then to mere noises or ” burrs ” which finally disappear altogether, and s before a consonant or finally, becomes h (through a middle stage s) and is finally lost. The preferential treatment of vowels, however, entailed not a single change except that e was changed to the diphthong ie, to ue; all else were preserved, e.g. diez {decern), tiempo (tempus), bueno (bonus), fuerte (fortis); but haver (habere), lid (lite), corona (corona), humo (fumus). The weakness of

the initial sound is shown in enero (januaruis) , hazer (facere), llamar (clamare with a transitional *clyamar), llaga (plaga), &c. The written language has no sign for voiced plosives between vowels, but -atho or -ao is spread over nearly the whole region.

In contrast to Spanish, Portuguese has a strong pronunciation of initial sounds, and so does not go beyond Janeiro, fazer, and changes cl (with transitional form cly, ky), and also pi (via ply, py) to ch, e.g. chamar, chaga. On the other hand, it has a careless articulation of vowels and consonants, and consequently no diphthongs. The unaccented vowels are weakened, as finals almost to vanishing point. It shows further a fusion of nasals with the preceding vowel, so as to form a nasal vowel, and this new nasality takes the colour of the preceding vowel, e.g. vina becomes vinho, but una becomes uma, otherwise before a vowel the nasal finally disappears; cheio and cheia, from plenus, plena. Similarly / was lost between vowels, e.g. ceo (caelum) ; before consonants it became I, or w, e.g. outro (alteru), caldo (calidu). Voiced plosives have a weak pronunciation between vowels, and these are sometimes made fricatives. In relation to the somewhat careless articulation we note a marked reaction on accented vowels by the final vowel (e.g. novo has a close vowel, nova an open one), and also by the following consonants: I velarizes, s palatalizes preceding sounds, hence estas pronounced istas, ” thou art,” with reduced i, but devedor (debitor), ” debtor,” with reduced e. Lastly, the division between words is not sharp — the interaction of initial sounds and finals being very striking. Devedor has a plosive d, a devedor has a fricative; istas has a breathed -s, but istas nos ceus, “thou art in heaven,” has a voiced s; seja, ” be,” has a reduced a; nome is pronounced u nome, but seja o notne is pronounced sej nome, with an open from a-o, &c.

The separation of Gaul took place likewise in the second half of the 5th century, when the Visigoths had settled down in the south, the Burgundians in the east, and the Franks in the north. The type of language that was evolved here is distinct from Spanish primarily and principally in the loss of final vowels except o, or, when the formation of the word was incompatible with this loss, in a weakening to e. On the other hand, the declension is strongly conservative. Nowhere are the old case-endings so clearly preserved as in this region, e.g. rets, ” king,” but la rei fille (regi filia), ” the king’s daughter “; veit le rei, ” videt regem “; dunet le rei, ” donat (dat) regi ” ; these are the modes of expression, and they last till far into the literary period. But at an early stage there was a breach between the Franks of the north and the Burgundians of the east on the one hand, and the Visigoths of the south on the other. For while the latter (the Visigoths) retained the old

system of accented vowels, the former changed e to a diphthong ie, became uo, ue, and moreover e and i became ei, and u became ou; a was changed to a, assuming that these vowels were long in accordance with the later Latin pronunciation, e.g. —

Lat. debere nepote pede mola pratu

North Fr. deveir nevout piet muele pret

South Fr. dever nebot pe mola prat

The northern group, moreover, weakened the consonants still further. D and g, secondary consonants from (and c, disappear like the primary ones, and thus pratellus becomes preau, S. Fr. pradel; advocatus becomes avoue, S. Fr. avogat; a secondary p (from b) becomes v, as we see by the form which replaces nepos above. If we are right in ascribing this to the effort to stress the accented vowel at the expense of the other constituents of the word, we may take this to be connected with the weakening of a where final, and between two accented syllables, e.g. N. Fr. aime from amal, as against S. Fr. anta ; or in one case armeure (Mod. Fr. armure), in the other armadura, from armatura.

Parallel to the preservation of -s on the one hand, and the close following of the old flexions on the other, we find the type membra preserved at first, though not spreading, whereas the tempora-type is abandoned. In the verb the variety in Latin perfect forms is still fairly well preserved, though there is a distinct extension of the w-perfect and the dedi-periect. As we might expect, the vocabulary seems to be strongly coloured by Germanic elements of Frankish, Burgundian and Gothic origin.

The Raetic dialects, in their prehistoric phase, are less clear than others. Their contact, at an age nearing the Carolingian, with the French of the south-east in Valais seems to have caused a similar process of growth, especially as they change e and into the diphthongs ei and ou, leaving at the same time the consonants more intact. At an early stage the inroads of the migrating nations cut off Raetia from the Po valley, and the pressure of the German tribes severed its union with the Romance-speaking nations of the west. Thus isolated it was free to follow its own course. This language also preserved at first the three cases and the type membra, the latter being developed later freely in use as a collective plural. But its further development was checked by the Lombards and Venetians.

But the most difficult problems are those that arise in Italy. Though one may say generally that the dialects of the region of the Po, and those of Liguria, belong to the types of north and western Romance, that is to say that the breathed plosives between vowels became voiced, yet they approach the typically Italian groups by their loss of s. This means that when the whole Italian peninsula was separated from Gaul as well as from Iberia (after the close of the 5th century) and became again one homogeneous whole, the forms without s found their way into the north of Italy only slowly, so that i has remained in the west, i.e. in Piedmont, in mono syllabic words to this day, e.g. as, ” thou hast,” ses, ” thou art “; the same rule prevailed in older times in the east, in Venice, and there the s was also preserved (in questions) in polysyllabic words, e.g. venis-tu, ” comest thou?”; and the old form maintained itself in Milanese in the single form sistu, ” art thou? ” To the loss of 5 we trace the extinction of declensions, but as its action began to take effect later, the membra-type gained little footing, the tempora-type none at all. In the vocabulary the Lombard elements are numerous, extending, like the supremacy of the Lombards, over the whole peninsula. It may be that s was lost under the influence of central Italy acting on the north. If so, we may surmise that a similar influence has changed cl, pi, and fl to chi, pi, fi (chiamare, pianta, fiamma). For it is precisely this point that differentiates both the Raetic dialects and Provencal from the contiguous Italian dialects, and the change certainly took place only after the latter were completely detached. On the other hand the Italian vocabulary has been strongly influenced by the north, especially in Tuscany.

The rise and development of the Romance languages, in its large outline, appeals to the imagination as a vast historical phenomenon closely bound up with the fate of nations. One other element must not be overlooked on which we have touched more than once in the above sketch, for it bears so directly on the Romance vocabulary as to deserve the triMite of a general survey: this is the Germanic.

When mercenaries of Germanic origin pervaded the Roman armies, Germanic words found their way first into the language of the camp, and thence into the vulgar language generally. And at that stage perhaps many words may actually have been im- ported which were, partly at any rate, lost again later. Roman and Greek authors admit a considerable number of Germanic words, including terms belonging to warfare, e.g. bandum, ” stan- dard,” used by Procopius, which still continues in the form of O. Fr. ban, Ital. bandiera, Sp. bandera, &c. Brutis, ” bride,” ” daughter-in-law,” which occurs frequently in inscriptions, may date from the period of camp life, but for the rest it is retained only in Fr. bru, and in Friuli and Dalmatia. On the other

hand, companio is clearly a Latinization of Gothic ga-hlaifa, the meaning of which carries us back to the same sphere. Other old words express ideas of culture, or names of animals which the Romans learned to know in the German-speaking north, e.g. ganta, ” wild goose ” (in Pliny), O. Fr. gante, Prov. ganta; or taxo, “badger,” Ital. tassone, Fr. taisson, Sp. tejon. But the impression made was not pronounced until the age of the Germanic invasions, and then we find a great variety in the various Romance countries. In Italy we have two invasions to consider — by the Goths, and by the Lombards. But the destruction of the rule of the Lombards by Charlemagne, and the introduction of Frankish elements con- sequent upon it, should not be considered under the same head, since these Franks may themselves have been a Romance-speaking tribe. Goths as well as Lombards have left a trail as noticeable in the language as elsewhere. Thus we find in several instances some uncertainty as between b and p as an initial sound in Italian words borrowed from Germanic, e.g. banca and panca, balla and palla, the forms with 6 being Gothic, those with p Lombardic. Or again recare, ” to bring up,” goes back to Gothic rikan, ” heap up,” “collect”; ricco, “rich,” to Lomb. rihhi, &c. Whereas the vocabulary shows impartially an impress of both nationalities, the Lombards have left their stamp unmistakably on the proper names. Speaking generally, Italy as well as the other Romance countries follows the rule that medieval names of persons are either ” Christian ” (in the strict sense) and therefore of Hebrew or Graeco-Roman origin, or on the other hand Germanic. Roman names that are not also Christian seem to have survived only in south Italy in any great number, while on the contrary the Germanic are not represented at all in Dalmatia. One of the characteristics

of Gothic is the change of e to i, so that it has names ending in -mir. Of these we find no trace whatever in Italy, on the contrary we find Gundimar, Ildimar, &c. Then we have abbreviated forms in izzo, e.g. Gaudizzo, Albizzo, &c, which are distinctly Lombardic; but not Gothic ones in ila. There is no parallel to all this in the Iberian peninsula. As we have already said, the Gothic con tribution to the vocabulary is very slight. But on the other hand in the nth century the great majority of proper names is Gothic; e.g. Alfonsus {Hadufonsus), Gundomirus, Recimirus, &c. ; or Recila, Fafila, or Elvira, O. Port. Gelvira, Goth. *Gailavira, and scores of others, all proving the great influence of Gothic.

And lastly, France possesses the largest number of Germanic elements in its vocabulary, Gothic in the south, Frankish in the north (though it

is often impossible to ascertain to which class they belong). But beside these there are many Old High German words, and again Anglo-Saxon and northern ones, more particu- larly those connected with shipping and the sea. These Germanic elements cover nearly all branches of human activity. Thus bdt, Fr. bdtir, ” to build,” from *bastyan, ” to bind together with bast,” ” to plait ” ; hourder, ” to cover with boards,” from hurdi, ” hurdle ” ; macon, ” the mason,” in Isidore makjo (Frankish rather than Gothic) refer to house-building; gudcher from waskyan, broder from *brusdan, point to the occupations of women, and danser from dinsan and 0. Fr. treschier, ” to dance,” from treskan, ” to thresh,” to their amusements. Women’s work is probably denoted further in rouir, rotjan, and E. Frank, naisier, natjan, “to net”; the same remark applies to the dyeing of cloths (Fr. touaille, Engl. ” towel,” from thwahila), and ribbons (bande from binda) with gubde, ” woad,” and other colouring matters, whence we have, e.g., brun, bleu, blond, blanc.

But while the vocabulary has had its accessions drawn from various races, the proper names show the same rules as in Italian, i.e. Frankish gains the sole supremacy. We find, it must be admitted, some Gothic names in -mir in the south early in the middle ages, but they were not maintained as late as the Romance period, such was the influence of the victorious northern race.

Even after political and literary independence had enabled the individual Romance languages to grow as separate units on their own basis, they retained their interconnexion and were open to mutual influence. But this influence is only partial, i.e. it affects nothing but the vocabulary, and has a certain relation to various tendencies in the developments of civilization. And under this head the most important point is the really enormous in- fluence which France (both south and north) has exercised on all the Romance countries, just as she has on the Germanic — an influence which has hitherto not been duly recognized. The first traces go back to the invasions of Charlemagne already mentioned. To instance only one, we have schiavino, ” justice, alderman,” which cannot be derived directly from the Germanic, as is shown by the v. The second important period is the age of chivalry and the literary tendencies centring round it. A word like budriere, ” baldric,” is derived from Fr. baudrier, not directly from Germanic Balderich; Ital. banda goes back to O. Fr. bande, and this again to binda; Ital. giallo is not from galbinus but from O. Fr. jalne (Mod. Fr. jaune), derived from that word, &c. But it seems that in one of the prehistoric periods the Tuscan vocabulary was strongly affected by that of the Gallo-Romanic. Whereas in the Iberian peninsula, in Sardinia, in south Italy, Rumania and Rhaetia dies survives, in O. Fr.

di has been almost completely ousted by jour, but in Tuscan and the Italian literary language we find giorno and di side by side. Thus trouver, Prov. trobar, spreading from France into Italy, drove the old afflare more and more back towards the south. The most recent layer was introduced during the reign of the house of Anjou chiefly in south Italy and Sicily, and kept its hold to the present day in spite of the Sicilian Vespers, e.g. Sic. vuccieri, ” butcher,” from Fr. boucher.

The Iberian peninsula can likewise bear witness as to French influence, e.g. O. Sp. fonta, ” shame,” is not from Goth, *haunitha, but from Fr. honte; O. Port, saluar not from Lat. salutare, but O. Fr. saluer. On the whole, Portuguese seems to possess more of these Gallicisms than Spanish, history supplying a simple explanation.

Italy too yielded its contributions, especially in the 15th and 16th centuries, many military terms (noble and ignoble), e.g. French carogne and canaille ; poignard, ” dagger,” from Ital. pugnale, instead of O. Fr. poigniel; but also panache, “plume,” from pennacchio, and many others that have become common property. But the influence of the Iberian peninsula on the contrary was not so strong as to be more than sporadic; the Sicilian and Neapolitan vocabu- laries alone are more closely akin to Spanish, and this is easily explained on the ground of their political and commercial relations.

As to the Romance languages beyond Europe we have but little to say. There is a distinction to be made between Creole and genuine Romance. Belonging to the latter we have the French of Canada, the Spanish of Central and South America, the Portu- guese of the Brazils. Speaking generally we may say that the particular languages retained the form of the language in the 1 6th and 17th centuries, that is to say that of the time of the immigra- tion, and that they developed along the lines already established.

Thus in Mexican Spanish the loss of d, g, between vowels, of s before consonants and as a final, has been carried further than in the mother-country. There are no proved traces of any noticeable influence from the languages of the natives.

Literature. — The real founder of scientific Romance philology and linguistics is Friedrich Diez, in his Grammatik der romanischen Sprachen (3 vols., Bonn, 1836-42), and Etymologisch.es Wbrterbuch der romanischen Sprachen (2 vols., 1852). AH questions concerning Romance philology and the historic grammar of the different Romance languages are treated in G. Grober’s Grundriss der roma-nischenPhilologie (2nd ed.,Strassburg, lQo6),andinW.Meyer-Lubke’s

Grammatik der romanischen Sprachen (4 vols., Leipzig, 1890-1900); Einfiihrung in die romanische Sprachwissenschaft (2nd ed., Heidelberg, 1909). The principal magazines devoted to the subject are Zeitschnft fur romanische Philologie (ed. Grober; since 1877); Zeitschrift fur neufranzosische Sprache und Literalur (ed. Behrens; since 1879); Romanische Forschungen (ed. Vollmoller; since 1885); Archiv fur das Studium der neueren Sprachen (since 1846) ; Romania (ed. G. Paris and P. Meyer; since 1812); Archivio glottologico italiano (ed. G. I. Ascoli; since 1873). The great development of Romanic philology after Diez is due principally to A. Tobler, G. Grober, W. Forster and H. Suchier in Germany; A. Mussafia (d. 1905), H. Schuchardt in Austria; G. Paris (d. 1905), P. Meyer in France; G. I. Ascoli (d. 1907), and F. d'Ovidio in Italy.

(W. M.-L.)

ROMAN DE LA ROSE, a French poem dating from the 13th century. The first part was written about 1230 by Guillaume de Lorris (q.v.), whose work formed the starting-point, about forty years later, for the more extensive section written by Jean de Meun (q.v.). Guillaume de Lorris wrote an allegory, possibly of an adventure of his own, which is an artistic and beautiful presentment of the love philosophy of the trouba- dours. In a dream the Lover visits a park to which he is admitted by Idleness. In the park he finds Pleasure, Delight, Cupid and other personages, and at length the Rose. Welcome grants him permission to kiss the Rose, but he is driven away by Danger, Shame, Scandal, and especially by Jealousy, who entrenches the Rose and imprisons Welcome, leaving the Lover disconsolate. The story, thus left incomplete by its inventor, was finished in 19,000 lines by Jean de Meun, who allows the Lover to win the Rose, but only after a long siege and much discourse from Reason, the Friend, Nature and Genius. In the second part, however, the story is entirely subsidiary to the display of the author's encyclopaedic knowledge, to pic- turesque and poetic digressions, and to violent satire in the manner of the fabliaux against the abuse of power, against women, against popular superstition, and against the celibacy of the clergy. The length of the work and its heterogeneous character proved no bar to its enormous popularity in the middle ages, attested by the 200 MSS. of it which have survived.

The Romaunt of the Rose was translated into English by Chaucer (see the prologue to the Legende of Good Women), but the English version of that, extending to about one-third of the whole work, which has come down to us (see an edition by Dr Max Kaluza, Chaucer Society, 1891), is generally admitted to be by another hand. For a list of books

on the vexed question of the authorship of the English translation see G. Korting, Grundriss der engl. Lit. (Munster, 1905, 4th ed. p. 184). A Flemish version by Hein van Aken appeared during Jean de Meun's lifetime, and at the beginning of the 14th century a free imitation, in the form of a series of sonnets, II Fiore, was written in Italian by the Tuscan poet Durante. Three editions of the Roman de la Rose were printed at Lyons between 1473 and 1490; two by Antoine Verard (Paris, 1490 ? and 1496 ?), by Jean du Pre (Paris, 1493 ?), by Nicholas Desprez for Jean Petit (Paris), by Michel le Noir (Paris, 1509 and 1519). In 1503 Jean Molinet produced a prose version. Marot altered and modernized the text (1526), and his corrections were followed in subsequent editions. Modern editions are by Meon (4 vols., 1813), by Francisque Michel (2 vols., 1864), by Croissandeau (pseudonym for Pierre Marteau), with a translation into modern French (Orleans, 5 vols., 1878-80), and a critical edition by E. Langlois, author of Origines et sources du Roman de la Rose (Paris, 1890). There is a modern English version by F. S. Ellis (Temple Classics, 3 vols., 1900).

ROMAN EMPIRE, LATER. The reign of Constantine the Great forms the most deep-reaching division in the history of Europe. The external continuity is not broken, but the principles which guided society in the Greek and Roman world are replaced by a new order of ideas. The emperor-worship, which expressed a belief in the ideal of the earthly empire of Rome, gives way to Christianity; this is the outward sign that

a mental transformation, which we can trace for 300 years before in visible processes of decay and growth, had reached a crisis.

Besides the adoption of Christianity, Constantine's reign is marked by an event only second in importance, the shifting of the centre of gravity of the Empire from the west to the east by making Byzantium a second capital, a second Rome. The foundation of Constantinople (q.v.) determined the sub- sequent history of the state; it established permanently the division between the eastern and western parts of the Empire — a principle already introduced — and soon exhibited, though not immediately, the preponderance of the eastern half. The eastern provinces were the richest and most resourceful, and only needed a Rome in their midst to proclaim this fact; and further, it was eastward that the Empire fronted, for here was the one great civilized

state with which it was in constant antagonism. Byzantium was refounded on the model of Rome, had its own senate, and presently a praefectus urbi. But its character was different in two ways: it was Christian and it was Greek. From its foundation New Rome had a Christian stamp; it had no history as the capital of a pagan empire. There was, however, no intention of depressing Rome to a secondary rank in political importance; this was brought about by the force of circumstances.

The Christian Roman Empire, from the first to the last Constantine, endured for 1130 years, and during that long period, which witnessed the births of all the great modern nations of Europe, experienced many vicissitudes of decline and revival. In the 5th century it lost all its western provinces through the expansion of the Teutons; but in the 6th asserted something of its ancient power and won back some of its losses. In the 7 th it was brought very low through the expansion of the Saracens and of the Slavs, but in consequence, of internal reforms and prudent government in the 8th century was able before the end of the 9th to initiate a new brilliant period of power and conquest. From the middle of the nth century a decline began; besides the perpetual dangers on the eastern and northern frontiers, the Empire was menaced by the political aggression of the Normans and the commercial aggression of Venice; then its capital was taken and its dominions dis- membered by Franks and Venetians in 1204. It survived the blow for 250 years, as a shadow of its former self.

During this long life its chief political role was that of acting as a defender of Europe against the great powers of western Asia. While it had to resist a continuous succession of dangerous enemies on its northern frontier in Europe — German, Slavonic, Finnic and Tatar peoples — it always considered that its front was towards the east, and that its gravest task was to face the powers which successively inherited the dominion of Cyrus and Darius. From this point of view we might divide the external history of the Empire into four great periods, each marked by a struggle with a different Asiatic power: (1) with Persia, ending c. 630 with the triumph of Rome; (2) with the Saracens, who ceased to be formidable in the nth century;

(3) with the Seljuk Turks, in the nth and 12th centuries;

(4) with the Ottoman Turks, in which the Roman power went down.

Medieval historians; concentrating their interest on the rising states of western Europe, often fail to recognize the position held by the later Empire and its European prestige. Up to the middle of the nth century

it was in actual strength the first power in Europe, except in the lifetime of Charles the Great, and under the Comneni it was still a power of the first rank. But its political strength does not express the fulness of its importance. As the heir of antiquity it was confessedly superior in civilization, and it was supreme in commerce. Throughout the whole period (to 1204) Constantinople was the first city in the world. The influence which the Empire exerted upon its neighbours, especially the Slavonic peoples, is the second great r61e which it fulfilled for Europe — a role on which perhaps the most speaking commentary is the doctrine that the Russian Tsar is the heir of the Roman Caesar.

The Empire has been called by many names- Greek, Byzantine, Lower (Bas-empire), Eastern (or East-Roman). All these have a certain justification as descriptions, but the only strictly correct name is Roman (as recognized in the title of Gibbon's work). The continuity from Augustus to Constantine XI. is unbroken; the emperor was always the Roman emperor; his subjects were always Romans ('Pujucuoi: hence Romaic — Modern Greek). "Greek Empire " expresses the fact that the state became predominantly Greek in character, owing to the loss, first of the Latin provinces, afterwards of Syria and Egypt ; and from the middle of the 6th century Greek became the official language. " Lower Empire " (Later is preferable) marks the great actual distinction in character between the development before Constantine (Haut-empire) and after his adoption of Christianity. " Byzantine " sums up in a word the unique Graeco-Roman civilization which was centred in New Rome. Eastern is a term of convenience, but it has been used in two senses, not to be confused. It has been used, loosely, to designate the eastern half of the Empire during the 80 years or so (from 395) when there were two lines of emperors, ruling formally as colleagues but practically independent, at Rome and Constanti- nople; but though there were two emperors, as often before, there was only one Empire. It has also been used, justifiably, to dis- tinguish the true Roman Empire from the new state founded by Charles the Great (800), which also claimed to be the Roman Empire; Eastern and Western Empire are from this date forward legitimate terms of distinction. But between the periods to which the legitimate and illegitimate uses of the term " Eastern Empire " apply lies a period of more than 300 years, in which there was only one Empire in any sense of the word.

A chronological table of the dynasties will assist the reader of the historical sketch which follows.

Succession of Emperors arranged in Dynasties.

1. CONSTANTINIAN DYNASTY. — A.D. 324-363.

Emperors (founder of dynasty, Constantius I., 305-306) : Constantine I. (306, sole emperor since), 324-337. In west — Constantine II., 337-340; Constans, 337-350. In east — Constantius II., 337- . Sole emperors: Constantius II., 350-361; Julian, 361-363. Inter-Dynasty. — Jovian, 363-364.

2. Valentinianean Dynasty. — a.d. 364-392.

Emperors:

In west — Valentinian I., 364-375; Gratian, 367-383;

Valentinian II., 375-392. In east — Valens, 365-378 (Theodosius I., 379-392).

3. Theodosian Dynasty. — a.d. 392-457. Emperors: Theodosius I. (379), 392-395.

In east — Arcadius, 395-408; Theodosius II., 408-450;

Marcian, 450-457. In west — Honorius, 395-423; Constantius III., 422;

Valentinian III., 425-455; (non-dynastic) Maximus,

455; Avitus, 455-456.

4. Leonine Dynasty. — a.d. 457-518. Emperors :

In east — Leo I., 457-474; Leo II., 474; Zeno, 474-491; Anastasius I., 491-518.

In west — non-dynastic, Majorian, 457-461 ; Severus, 461-465; (Leo I. sole emperor, 465-467); Anthemius, 467-472; Olybrius, 472; Glycerius, 473-474; Julius Nepos, 474-480; (usurper, Romulus Augustulus, 475-

476).

5. Justinianean Dynasty. — a.d. 518-602. Emperors: Justin I., 518-527; Justinian I., 527-565;

Justin II., 565-578; Tiberius II., 578-582; Maurice,

582-602.

Inter-Dynasty. — Phocas, 602-610

6. Heraclian Dynasty. — a.d. 610-71 i. Emperors: Heraclius, 610-641; Constantine III., 641:;

Heracleonas, 641-642; Constans II., 642-668; Con- stantine IV. (Pogonatus) 668-685; Justinian II. (Rhinotmetus), 685-695; (non-dynastic) Leontius,695- 698 and Tiberius III. (Apsimar), 698-705 ; Justinian II. (restored), 705-711. II.

Inter-Dynasty. — Philip Bardanes, 711-713; Anastasius II., 713-716; Theodosius III., 716-717.

7. Isaurian (Syrian) Dynasty. — a.d. 717-802. Emperors: Leo III., 717-740 (alias, 41); Constantine V.

(Copronymus), 740-775; Leo IV. (Khazar), 775-780; Constantine VI., 780-797; Irene, 797-802. Inter-Dynasty. — Nicephorus I., 802-8H ; Stauracius (son of Nicephorus), 811 ; Michael I. (Rhangabe, father-in-law of Stauracius), 811-813; Leo V. (Armenian), 813-820.

8. Phrygian or Amorian Dynasty — a.d. 820-867. Emperors: Michael II. (Stammerer), 820-829; Theophilus,

829-842; Michael III. (Drunkard), 842-867.

9. Macedonian Dynasty. — a.d. 867-1057. Emperors: Basil I. (Macedonian), 867-886; Leo VI. (philo- sopher) and Alexander, 886-912; Constantine VII.

(Porphyrogennetos), 912-959; Romanus I. (Lecapenus), 920-944 ; Romanus II., 959-963 ; Basil 1 1 . (Bulgaroctonus) and Constantine VIII., 963-1025; (non-dynastic) Nice- phorus II. (Phocas), 963-969, and John Zimisces, 969-976 ; Constantine VIII., alone, 1025-1028; Romanus III. (Argyros), 1028-1034; Michael IV. (Paphlagonian), 1034-1041; Michael V. (Calaphates) ; 1041-1042; Constantine IX. (Monomachus), 1042-1054; Theodora, 1054-1056; Michael VI. (Stratioticus), 1056-1057. Inter-Dynasty. — Isaac I. (Comnenus), 1057-1059 ; Constan- tine X. (Ducas), 1059-1067; Michael VII (Parapinaces), Andronicus and Constantine XI , 1067; Romanus IV. (Diogenes), 1067-1071; Michael VII., alone, 1071-1078; Nicephorus III. (Botaneiates), 1078-1081.

10. COMNENIAN DYNASTY. — A.D. IO8I-I204.

Emperors: Alexius I. (nephew of Isaac I.), 1081-1118; John II., 1118-1143; Manuel I., 1143-1180; Alexius II. j 1 1 80-1 1 83; Andronicus I., 1183-1185; IsaacII. (Angelus), 1185-1195; Alexius III. (Angelus), 1 195-1203; Isaac II. and Alexius IV., 1203-1204. Inter-Dynasty. — Alexius V. (Murtzuphlus), 1204.

Capture of Constantinople and dismemberment of the Empire by the Venetians and Franks, a.d. 1204-1205.

11. Lascarid Dynasty. — a.d. 1206-1259.

Emperors: Theodore I. (Lascaris), 1206-1222; John III. (Vatatzes or Batatzes), 1222-1254; Theodore II. (Lascaris), 1254-1259.

12. Palaeologian Dynasty. — a.d. 1259-1453.

Emperors: Michael VIII. (Palaeologus), 1259-1282; And- ronicus II. (Elder), 1282-1328; Andronicus III. (Younger), 1328-1341; John V., 1341-1391; (non-dynastic), John (Cantacuzenus), 1347-1355; Manuel II., 1391-1425; John VI., 1425-1448; Constantine XI., or XII. (Dragases), I448-I453-

Historical Sketch. — Diocletian's artificial experiment of two Augusti and two Caesars had been proved a failure, leading to twenty years of disastrous civil wars; and when Constantine the Great (q.v.) destroyed his last rival and restored domestic peace, he ruled for the rest of his life with undivided sway. But he had three sons, and this led to a new partition of the Empire after his death, and to more domestic wars, Constans first annexing the share of Constantine II. (340) and becoming sole ruler of the west, to be in turn destroyed by Constantius II., who in 350 remained sole sovereign of the Empire. Having no children, he was succeeded by his cousin, Julian the Apostate (q.v.). This period was marked by wars against the Germans, who were pressing on the Rhine and Danish frontiers, and against Persia. Julian lost his life in the eastern struggle, which was then terminated by a disadvantageous peace. But the German danger grew graver, and the battle of Adrianople, in which the Visigoths, who had crossed the Danube in conse- quence of the coming of the Huns (see Goths and Huns), won a great victory, and the emperor Valens perished (378), an- nounced that the question between Roman and Teuton had entered on a new stage. Theodosius the Great saved the situa- tion for the time by his Gothic pacification. The efforts of a series of exceptionally able and hard-working rulers preserved the

Empire intact throughout the 4th century, but the dangers which they weathered were fatal to their weaker successors. On the death of Theodosius the decisive moment came for the expansion of the Germans, and they took the tide at the flood. There were three elements in the situation. Besides the Teutonic peoples beyond the frontier there were dependent people who had settled within the Empire (as Visigoths in Moesia, Vandals in Pannonia), and further there were the semi-Romanized Germans in the service of the Empire, some of whom had risen to leading positions (like Merobaudes and Stilicho). A Germanization of the Empire, or part of it, in some shape was inevitable, but, if the rulers of the 5th century had been men of the same stamp as the rulers of the 4th, the process might have assumed a different form. The sons of Theodosius were both incapable; and in their reigns the future of the state which was divided between them was decided. The dualism between the east (under Arcadius) and the west (under Honorious) developed under the rule of these brothers into antagonism verging on hostility. The German danger was averted in the east, but it led in a few years to the loss of many of the western provinces, and at the end of ninety years the

immediate authority of the Roman Emperor did not extend west of the Adriatic. The reign of Honorius saw the abandon- ment of Britain, the establishment of the Visigothic kingdom in Aquitaine, the occupation of a great part of Spain by Vandals and Sueves (Suebi). Under Valentinian III. the Vandals founded their kingdom in North Africa, the Visigoths shared Spain with the Sueves, the Burgundian kingdom was founded in S.E. Gaul. The last Roman possession in Gaul passed to the Franks in 486 (see Goths; Vandals; Franks). It is significant that the chief defender of the Empire against the Germans who were dismembering it were men of German race. Stilicho, who defended Italy against Alaric, Aetius, whose great work was to protect the imperial possessions in Gaul, and Ricimer. It was also a German, Fravitta, who played a decisive part in suppressing a formidable Gothic movement which menaced the throne of Arcadius in 399-400. It was charac- teristic of this transformation of Europe that the Germans, who were imbued with a profound reverence for the Empire and its prestige, founded their kingdoms on Roman soil in the first instance as ” federates ” of the Emperor, on the basis of formal contracts, defining their relations to the native pro- vincials; they seized their dominions not as conquerors, but as subjects. The double position of Alaric himself, as both king of the Visigoths and a magister militum of the Empire is significant of the situation.

The development of events was complicated by the sudden growth of

the transient empire of the Huns (q.v.) in central Europe, forming a third great power, which, reaching from the Rhine to the Caucasus, from the Danube to the Baltic, might be compared in the extent of its nominal supremacy, but in nothing else, to the empires of Rome and Persia. The Huns, whose first appearance had precipitated the Germans on the Empire, now retarded for some years the process of German expansion, while they failed in their own attacks upon the Empire. On Attila's death (453) his realm collapsed, and his German vassals (Ostrogoths, &c.) founded important kingdoms on its ruins.

After the death of Valentinian III., the worst of his house, the Theodosian dynasty expired in the west, and the authority of the western emperors who succeeded him in rapid succession reached little beyond Italy. For most of this period of twenty years the general Ricimer, of German birth, held the scales of power in that peninsula, setting up and pulling down emperors. After his death the western throne was no longer tenable. First there was a usurpation; the general Orestes set up his child-son Romulus Augustulus against the legitimate Augustus, Julius Nepos, who was acknowledged by the eastern emperor; but this temporary government was overthrown (476) by a Germanic military revolution headed by Odoacer, who appro- priated part of the soil to his German soldiers and founded an Italian kingdom under the nominal supremacy of the emperor at Constantinople, who, however unwilling, recognized his position (after the death of Julius Nepos).

The escape of the eastern provinces from the fate of the western illustrates the fact that the strength of the Empire lay in the east. These provinces were more populous and presented greater obstacles to the invaders, who followed the line of least resistance. But it was of immense importance that throughout this period the Empire was able to preserve a practically unbroken peace with its great eastern rival. The struggle with Persia, terminated in 364 by the peace of Jovian, was not renewed till the beginning of the 6th century. It was of greater importance that the rulers pursued a discreet and moderate policy, both in financial administration and in foreign affairs; and the result was that at the end of a hundred years the diminished Empire was strong and consolidated. Theo- dosius II. was a weak prince, but his government was ably conducted by Anthemius, by his sister Pulcheria and by the eunuch Chrysaphius. . His reign was important for the Armenian question. Theodosius I. had committed the error of consent- ing to a division of this buffer state in the Roman and Persian spheres of influence, Persia having much the larger. The

Sassanid government tried to suppress the use of the Greek language. But the government of Theodosius II. officially supported the enterprise of translating the Bible into Armenian (Mesrob had just invented the Armenian alphabet), and this initiated the production of an abundant literature of trans- lations from the Greek, which secured the perpetual connexion of Armenia with European culture, and not with Oriental. This reign is also distinguished by the building of the great landwalls of Constantinople, by the foundation of a university there and by the collection of the imperial laws in the Codex Theodosianus, which is a mine of material for the social condition of the Empire. It reveals to us the decline of municipal liberty, the decay of the middle classes in the West, the evils of the oppressive fiscal system and an appalling paralysis of Roman administration which had once been so efficient; it shows how the best-intentioned emperors were unable to control the governors and check their corruption; and discloses a disorgan- ization which facilitated the dismemberment of the Empire by the barbarians.

In the reign of Zeno it seemed probable that an Ostrogothic kingdom would be established in the Balkan peninsula, but the danger was diverted to Italy (see Goths). The kingdom which Theodoric founded there was, in its constitutional aspect, a continuation of Odoacer's regime. He, like Odoacer and Alaric, held the double position of a German king and a Roman official. He was magister militum as well as rex. His powers were defined by capitulations which were arranged with the emperor Anastasius and loyally observed. The right of legislation was reserved to the emperor, and Theodoric never claimed it; but for all practical purposes he was independent.

In the 6th century the emperor Justinian, whose talents were equal to his ambitions, found himself, through the financial prudence of his predecessors, in a position to undertake the reconquest of some of the lost western provinces. The Vandal power had declined, and Africa was won back in one campaign by Belisarius in 533. The conquest of Italy was far more difficult. Begun by Belisarius in 535, it was not completed till 554, by Narses. A portion of southern Spain was also won from the Visigoths, so that the Romans again commanded the western straits. Justinian, possessed by large ideas and intoxicated with the majesty of Rome, aspired to be a great conqueror, a great lawgiver, a great pontiff, a great diplomatist, a great builder, and in each of these spheres his reign holds a conspicuous place in the annals of the Empire. His legal work alone, or the building of Santa Sophia was enough to ensure him immortal fame. But deep shadows balance

the splendour. The reconquest of Africa was thoroughly justified and advantage- ous, but Italy was bought at a ruinous cost. In the first place, the Persian empire was at this time ruled by one of its greatest kings, Chosroes I. (g.v.), who was far from peacefully inclined. Justinian was engaged in a long Persian and a long Gothic war at the same time, and the state was unequal to the strain. In the second place, it was all-important for his western policy to secure the goodwill of the Italian provincials and the Roman bishop, and for this purpose he involved himself in an ecclesias- tical policy (see below) which caused the final alienation of the Syrian and Egyptian provinces. The reconquest of the West was purchased by the disunion of the East. Thirdly, the enormous expenses of the Italian and Persian wars, augmented by architectural undertakings, caused a policy of financial oppression which hung as a cloud over all the brilliance of his reign, and led to the decline which ensued upon his death. Nor is it to be forgotten that he had at the same time to fulfil the task of protecting the Danube against the Germans, Slavs and Bulgarians who constantly threatened the Illyrian pro- vinces. He spared no expense in building forts and walls. Justinian's name will always be associated with that of the gifted Theodora, an actress of doubtful fame in her early life, who shared his throne. Their mosaic portraits are preserved in the contemporary church of San Vitale at Ravenna. She possessed great political influence, and the fact that she was a heretic (monophysite), while Justinian was devoted to orthodoxy, xxin. 17

did not mar their harmony, but only facilitated the policy of extending secret favour to the heretics who were publicly condemned, and enabled the left hand to act without the know- ledge of the right. The events of the half-century after Justin- ian's death exhibited the weakness to which his grandiose policy had reduced the Empire. It was attacked on the west, on the north and on the east, and at all points was unequal to coping with its enemies. (1) Italy fell a victim to the Lombards (q.v.), and in a few years more than half of the peninsula had passed under their sway. (2) The Avars, a Hunnic people who had advanced from the Caspian, took possession of Pannonia and Dacia, and formed an empire, consisting of Slavonic and Bulgarian subjects, which endured for about sixty years. Their chief occupation was to invade the Illyrian peninsula and extort tribute and ransoms from the emperors. So far as the Avars themselves were concerned, these incursions had no permanent significance, but the Slavs who overran the provinces did more than devastate. These years saw the beginning of the Slavonic settlements which changed the ethnical character of the pen- insula, and thus mark the commencement of a new period. Slavs occupied Moesia and a large

part of Macedonia, even close to Thessalonica, which they besieged; they penetrated south- ward into Greece and made large settlements in the Pelopon- nesus (see Greece, History, “Roman period,” ad fin.). They occupied the north-western provinces, which became Croatia and Servia, as well as Dalmatia (except some of the coast towns). In the northern part of the peninsula the Slavonic element remained dominant, but in Greece it was assimilated to the Greek (after the 9th century) and has left little record of itself except in place names. (3) The Empire was simul- taneously engaged in the perennial strife with Persia. A short interval of peace was secured when the emperor Maurice assisted Chosroes II. to dethrone a usurper, but after Maurice’s death (602) the final and mortal struggle began (see Persia, History, section viii. “The Sassanian Empire”). Throughout the in- competent reign of Phocas the eastern provinces were overrun by the Persians, as the Illyrian were overrun by the Slavs. The unpopular rule of this cruel usurper was terminated in 610 by the intervention of the governor of Africa, whose son Heraclius sailed to Constantinople and, welcomed by an influential party, met with little resistance. Phocas, murderer of Maurice, was murdered by the people, and the victor was crowned emperor to find himself in presence of a desperate situation. Antioch, Damascus and many other great cities were captured by the Persians; and in 614 Jerusalem was destroyed and the Holy Cross, along with the patriarch, carried off to Ctesiphon. This event produced a profound sensation in Christendom. In 616 Egypt was conquered. The army had fallen into utter disorder under Phocas, and Heraclius so deeply despaired of saving Constantinople that he thought of transferring the imperial capital to Carthage. But the extreme gravity of the situation seems to have wrought a moral change among his subjects; the patriarch Sergius was the mouthpiece of a widespread patriotic feeling, and it was not least through his influence that Heraclius performed the task of creating a capable army. His efforts were rewarded in a series of brilliant campaigns (622-28), ‘ which, in the emphasis laid on the contrast between Christianity and fire- worship and on the object of recovering the Cross, had the character of crusades. Heraclius recovered his provinces and held Persia at his mercy (decisive battle at Nineveh, end of 627). This war is remarkable for the attempt of the Persians to take Constantinople (626) in conjunction with the Avars and Slavs. Soon afterwards the Avar power began to decay, and the Slavs and Bulgarians shook off their yoke. It seemed as if the Roman government would now be able to regain the control in the Illyrian lands which it had almost entirely lost. It seems probable that Heraclius came to terms with the Slavs — Croatians and Servians — in the north-west; their position was regularized, as vassals of the Empire. But fate allowed no breathing-time to do more;

the darkest hour had hardly passed when a new storm-cloud, from an unexpected quarter, overspread the heavens.

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ROMAN EMPIRE, LATER

At this point we have to note that the Hellenic element in the state had definitely gained the upper hand before the end of the 6th century, so that henceforward the Empire might be described as Greek. Justinian's mother-tongue was Latin, and he was devoted to the Latin traditions of Rome, but even he found it necessary to publish his later laws in Greek, and from his reign Greek was the official language.

Many of the Latin official terms were already represented by Greek equivalents (inraros = consul, eirapxos = praefectus, &c), but they were preserved in great numbers, transliterated and often corrupted (e.g. Ko/*r)s, p-ayurrpos, aaTjKpiiTTjj = a secretis, KtryKeXXaptos, irpanrbaiTos, Kvkarojp — quaestor, oanpov iraXa.TLOv,6LKLov,64'lKU>v = obsequium). "Pˆir, rex, was always used of barbarian potentates, /SamXefa being reserved as = the emperor (but also applied to the Persian king). In military drill many Latin words of command continued to be used.

It is to be noted that the year 630 marks the beginning of a period of literary (and artistic) sterility in the Greek world (see Greek Literature, section Byzantine).

With the rise of Islam (see Caliphate; Mahomet) two universal religions, for the first time, stood face to face, each aspiring to win the universe. The struggle therefore which then began was not only a new phase of the " Eternal Question," the strife between Europe and Asia, but was one in which the religious element was fundamental. Fire-worship was only a national religion and did not present the danger of Islam. The creation of the political power of the Mahommedans was so sudden that it took the world by surprise. Bostra, the fortress of Roman Arabia, fell into their hands in 634, and before the death of Heraclius in 641 they had conquered Syria and all Egypt, except Alexandria, which opened its gates to them in 643. The religious alienation of the Syrian and Egyptian peoples from Constantinople, expressing as it did a national sentiment antagonistic to the Greeks, was an important political factor in the Mahommedan (as in the

previous Persian) conquest. Thus the Mahommedans definitely cut the Empire short in the East, as the Germans had cut it short in the West; Egypt was never recovered, Syria only for short periods and partially, while the integrity of Asia Minor was constantly menaced and Cilicia occupied for many generations. By their conquest of Persia the Caliphs succeeded to the position of the Sassanids; this led to the conquest of Armenia (c. 654); while, in the West, Africa was occupied in 647 (though the con- quest was not completed till the capture of Carthage and other strong places in 698). Thus within twenty years from the first attack the Empire was girt about by the new aggressive p iver from the precincts of the Caucasus to the western Mediterranean.

Fortunately Constans II., grandson of Heraclius, was a man of eminent ability and firmness. The state owed to him the preservation of Asia Minor, and the creation of a powerful fl'-et (see below) which protected the Aegean coasts and islands against the naval power which the Mahommedans created. He was responsible for completing a new, efficient military organization, which determined the lines of the administrative reforms of Leo III. (see below). In his last years he turned his eyes to Italy and Africa. He dreamed of restoring Old Rome as the centre of the Empire. But he did not succeed in recovering south Italy from the Lombards (Duchy of Beneventum), and having visited Rome he took up his residence in Syracuse, where he was assassinated, having lost two fleets which he sent against the Arabs of Africa. The strain lasted for another fifty years. Constantinople sustained two great sieges, which stand out as crises, for, if in either case the enemy had been successful, the Empire was doomed.

The first siege was in 673-77, under the caliph Moawiya; his fleet blockaded the capital for five years, but all its efforts were frustrated by the able precautions of Constantine IV.; "Greek fire " (see below) played an important part in the defence; and the armada was annihilated on the voyage back to Syria by storms and the Roman fleet. The second crisis was at the accession of Leo III., when the city was besieged by land and sea by Suleiman for a year (717-18), and Leo's brilliant defence, again aided by Greek fire, saved Europe. This crisis marks the highest point of Mahommedan aggression, which never again caused the Empire to tremble for its existence.

The Heraclian dynasty, which had fallen on evil times and rendered inestimable services to the Empire, came to an end in anarchy, which was terminated by the elevation of the Syrian . (commonly called Isaurian) Leo III., whose reign opens a new period. His reforming hand was active in every sphere of government, but the ill-fame which he won by his iconoclastic policy obscured in the memory of posterity the

capital importance of his work. His provincial organization was revolutionary, and his legislation departed from the Roman tradition (see below). From his reign to the middle of the 10th century the continuous warfare by land with the Caliphs consisted of marauding expeditions of each power into the other's territory, captures of fortresses, guerilla fight- ing, but no great conquests or decisive battles. The efficiency of the army was carefully maintained, but the neglect of the navy led to the losses of Crete (conquered by Moslem adventurers from Spain 826) and Sicily (conquered by the Saracens of Africa), Panormus taken 832, Syracuse 878 (see Sicily). |The Africans also made temporary conquests, including Bari, in south Italy. This period saw the loss of the exarchate of Ravenna to the Lombards (750), the expansion of the Frankish power under Pippin and Charlemagne in Italy, and in close connexion therewith the loss of Old Rome.

The inconoclast emperors pursued a moderate foreign policy, consolidating the Empire within its contracted limits; but under the " Macedonian " dynasty, which was of Armenian descent, it again expanded and became the strongest power in Europe. The 9th century also witnessed a revival of learning and culture which had been in eclipse for 200 years. The reign of Basil I. was marked by an energetic policy in south Italy, where his forces co-operated with the western emperor Louis II. The Saracens were expelled from their strongholds, Bari recovered, Calabria saved, and the new province (Theme) of Longibardia formed. This secured the entrance to the Adriatic, and the increase of dominion here at the expense of the Lombards was a compensation for the loss of Sicily. Leo VI. did much for reorganizing the navy, but his reign was not fortunate; Saracen pirates plundered freely in the Aegean and, under the able renegade Leo of Tripolis, captured Thessalonica and carried off countless captives (904). But a great tide of success began fifty. years later. Nicephorus Phocas won back Crete (961) as general of Romanus II., and then as emperor recovered Cilicia and North Syria (with Antioch) 968. Cyprus was also recovered. The tide flowed on under his equally able successor, John Zimisces (of Armenian race) and under Basil II.; these reigns mark the decisive victory of the Empire in the long struggle with the Saracens, whose empire had been broken up into separate states. The eastern frontier was strengthened by the active policy of Basil II. in Armenia, which was more fully incorporated in the Empire under Constantine IX.

The reign of Basil II. marks the culmination of the power of the Eastern Empire, for it also witnessed the triumphant conclusion of another conflict which had lasted almost as long. In the reign of

Constantine IV. the Bulgarians (see Bulgaria) had founded a kingdom in Lower Moesia, reducing the Slavonic tribes who had occupied the country, but less than two centuries sufficed to assimilate the conquerors to the conquered, and to give Bulgaria the character of a Slavonic state. The reign of Constantine V. was marked by continuous war with this enemy, and Nicephorus I. lost his life in a Bulgarian campaign. This disaster was followed up by Prince Krum, who besieged Constantinople in 815. His death was followed by a long peace.- Prince Boris was converted to Christianity (reign of Michael III.); a metropolitan see of Bulgaria was founded, dependent on the patriarch of Con- stantinople; and the “civilization of the Bulgarians, and beginnings of their literature, were entirely under Byzantine influence. The conversion was contemporary with the work of the two missionaries Cyril and Methodius, who (while the field of their personal activity was in Great Moravia and

Pannonia) laid the south-eastern Slavs under a deep debt bf inventing the Glagolitic (?.!>.), not the so-called ” Cyrillic ” alphabet (based on Greek cursive) and translating parts of the Scriptures into Slavonic (the dialect of the Slavs of Macedonia). The most brilliant period of the old Bulgarian kingdom was the reign of Simeon (893-927), who extended the realm west- ward to the shores of the Adriatic and took the title ” Tsar [i.e. Caesar] of Bulgaria and autocrator of the Romans.” The aggression against the Empire which marked his ambitious reign ceased under his successor Peter, who married a daughter of Romanus I., and the Bulgarian Patriarchate founded by Simeon was recognized at Byzantium. But the Byzantine rulers only waited for a favourable time to reduce this formid- able Slavonic state. At length Zimisces subjugated eastern Bulgaria and recovered the Danube frontier. But while Basil II. was engaged in contending with rivals, the heroic Samuel (of the Shishmanid family) restored the Bulgarian power and reduced the Servians. After a long and arduous war of fourteen years Basil (called the ” Bulgar-slayer “) subdued all Bulgaria western and eastern (1018). He treated the conquered people with moderation, leaving them their political institutions and their autocephalous church, and to the nobility their privileges. Some Bulgarian noble families and members of the royal house were incorporated in the Greek nobility; there was Shishmanid blood in the families of Comnenus and Ducas. Greek domination was now established in the peninsula for more than 150 years. The Slavs of Greece had in the middle of the 9th century been brought under the

control of the government.

In the reign of Basil II. the Russian question also was settled. The Russian state (see Russia) had been founded before the middle of the 9th century by Norsemen from Sweden, who were known in eastern Europe as Russians (Tcbs), with its centres at Novgorod and Kiev. They did for the eastern Slavs what the Bulgarians had done for the Slavs of Moesia. The Dnieper and Dniester gave them access to the Euxine, and the Empire was. exposed to their maritime attacks (Constantinople was in extreme danger in 860 and 941), which recall the Gothic expedi- tions of the 3rd century. In 945 a commercial treaty was concluded, and the visit of the princess Olga to Byzantium (towards the end of the reign of the learned emperor Constan- tine VII., Porphyrogennetos) and her baptism seemed a pledge of peace. But Olga's conversion had no results. Sviatoslav occupied Bulgaria and threatened the Empire, but was decisively defeated by Zimisces (971), and this was virtually the end of the struggle. In 988 Prince Vladimir captured Cherson, but restored it to the emperor Basil, who gave him his sister Anna in marriage, and he accepted Christianity for himself and his people. After this conversion and alliance, Byzantium had little to fear from Kiev, which came under its influence. One hostile expedition (1043) indeed is recorded, but" it was a failure. Much about the same time that the Russians had founded their state, the Magyars (see Hungary; the Greeks called them Turks) migrated westward and occupied the regions between the Dnieper and the Danube, while beyond them, pressing on their heels, were another new people, the Petchenegs (Patzinaks). The policy of Byzantium was to make use of the Magyars as a check on the Bulgarians, and so we find the Romans (under Leo VI.) and the Magyars co-operating against the tsar Simeon. But Simeon played the same game more effectively by using the Petchenegs against the Magyars, and the result was that the Magyars before the end of the 9th century were forced to move westward into their present country, and their place was taken by the Petchenegs. From their new seats the Magyars could invade the Empire and threatened the coast towns of Dalmatia. The conquest of Bulgaria made the Petchenegs immediate neighbours of the Empire, and during the nth century the depredations of these irreclaimable savages, who filtered into the Balkan peninsula, constantly preoccupied the government. In 1064 they were driven from the Dniester regions into Little Walachia by the Kumans (or Polovtsi), a people of the same ethnical group as themselves. They were

crushingly defeated by Alexius Comnenus in 1091, and exter- minated by John Comnenus in 1123.

In the Macedonian period a grave domestic question troubled the government. This was the growth of the large estates of the rich nobles of Asia Minor, at the expense of small properties, to an excess which was politically and economically dangerous. The legislation against the evil began under Romanus I. and was directed to the defence of the poor against the rich, and to protecting the military organization which was based on holdings of land to which the obligation of military service was attached. There was also danger in the excessive influence of rich and powerful families, from which the great military officers were drawn, and which were extensively related by alliances among themselves. The danger was realized in the struggle which Basil II. had to sustain with the families of Sclerus and Phocas. Various kinds of legislation were at- tempted. Under Romanus I. alienation of property to the large landowners was forbidden. Nicephorus Phocas, whose sympathies were with the aristocracy to which he belonged, holding that there had been enough legislation in favour of the poor, sought to meet the difficulty of maintaining a supply of military lands in the future by forbidding further acquisitions of estates by the Church. Basil II. returned to the policy of Romanus, but, with much greater severity, resorting to con- fiscation of some of the immense private estates; and he en- deavoured to keep down the aristocrats of Asia Minor by very heavy taxation. Through the recovery of the Balkan provinces he gained in Europe a certain political counterpoise to the influence of Asia Minor, which had been preponderant since the seventh century. Asia Minor meant the army, and opposition to its influence expressed itself in the nth century in a fatal anti-military policy, which is largely responsible for the conquests of a new enemy, the Seljuk Turks, who now entered into the inheritance of the Caliphs (see Caliphate ad fin. and Seljuks). Constantinople was haunted by the dread of a military usurpa- tion. An attempt of the military hero George Maniaces (who had made a remarkable effort to recover Sicily) to wrest the crown from Constantine IX. had failed; and when Isaac Comnenus, who represented the military aristocrats of Asia Minor, ascended the throne, he found himself soon compelled to abdicate, in face of the opposition. The reign of Constantine X., of the rival family of Ducas, marked the culmination of this antagonism. The senate was filled with men of the lower classes, and the military budget was ruthlessly cut down. This policy reduced the army and stopped the supply of officers, since there was no longer hope of a profitable career. The emperor thought to meet dangers from external enemies by diplomacy. The successes of the Seljuks (after the fall of the great Armenian fortress of Ani in 1064) at length awoke the government from its dream of security. The general Romanus Diogenes was

proclaimed emperor. He had to create an army and to train it; he did not spare himself, but it was too late. He was defeated and captured by Alp Arslan on the decisive field of Manzikert (1071). Released by the sultan, who honoured his bravery, he was deposed in favour of Michael Ducas, and falling into the hands of his enemies, was blinded. The east and centre of Asia Minor were thus lost; the Seljuk kingdom of Rum was founded; Nicaea was captured by the Turks in 1080. The provinces which escaped the Seljuk occupation were thoroughly disorganized, a prey to foreign and native adven- turers and usurpers (see Seljuks).

Thus in the ‘seventies of the nth century the Empire seemed through incompetence and frivolity to have been brought to the verge of dissolution. The disorder was terminated by the accession of the extraordinarily able statesman Alexius Com- nenus (1081), who effected a reconciliation with the rival family of Ducas, established a strong government and founded a dynasty. He had to deal with three great dangers — the Seljuks, the Petchenegs (see above), and in the west the Normans. The Normans had wrested from East Rome its possessions in South Italy (1041-71; see Normans) — succeeding where German emperors had failed — and throughout the Comnenian period

the Empire was threatened by their projects of conquest beyond the Adriatic, projects which aimed at Constantinople itself.

Four great attempts against the Empire were made by the Normans; they were unsuccessful, but they heralded the Western conquest of 1204. (1) Expedition of Robert Guiscard, 1081-85, repelled by Alexius with help of Venice (2) Bohemond’s ex- pedition, 1 105-7, foiled by the able strategy of Alexius; (3) the invasion of Greece by Roger of Sicily, 1 147; Venice supported Manuel Comnenus, and the Normans were driven from Corfu, 1149; (4) the expedition of William II. of Sicily, 1185, who succeeded in capturing Thessalonica ; the invaders were defeated at Demetritsa, but they gained the islands of Cephallenia and Zacynthus.

The two most important events in the reign of Alexius were the prices which he paid for help against his enemies. (1) He was obliged (1084) to grant to Venice (which had become independent of the Empire in the 9th century; see Venice), in return for her naval aid against the

Normans, commercial privileges which practically made the Empire commercially dependent on the Republic. (2) He sought auxiliary forces in western Europe to help him against the Seljuks; the answer of the pope and Latin Christendom was the First Crusade — a succour very different from that which he desired. Through his tact and discretion, the state was safely steered through the dangers with which the disorderly hosts of barbarous allies menaced it, and the immediate results were salutary; large parts of Asia Minor, including Nicaea, were restored to the Empire, which was thus greatly strengthened in the East while the Turks were weakened (see Crusades). But for this help Byzantium might not have recovered the transient strength and brilliance which it displayed under Manuel. In Asia Minor the crusaders kept the terms of their agreement to restore to the emperor what had belonged to him; but on capturing Antioch (1098) they permitted the Norman Bohemond to retain it, in flagrant violation of their oaths; for to Antioch if to any place the' emperor had a right, as it had been his a few years before. This was in itself sufficient to cause a breach between Byzantium and the Latin kingdom of Jerusalem (founded 1099). But otherwise the new political situation created by the Crusade was dangerous, ultimately fatal, to the Empire. For its lands and seas became a highway from western Europe to the Latin colonies in Syria; the Byzantine government was forced to take precautions to protect itself against the crusading expedi- tions which travelled to the Holy Land; and these precautions were regarded by the western powers as a hindrance to the sacred objects of the crusades. The bitter religious antagonism between the Greek and Latin Christians increased the mutual distrust and the danger.

The history of the new relations between East and West dating from the First Crusade is closely connected with the history of the futile attempts at bringing about a reunion between the Greek and Latin Churches, which had severed communion in 1054 (see below). To heal the schism and bring the Greek Church under the domination of Rome was a principal object of papal policy from Gregory VII. forward. The popes alternated between two methods for attaining this, as circum- stances dictated : namely, a peaceful agreement— the policy of union; or an armed occupation of the Empire by some western power (the Normans) — the policy of conquest. Their views varied according to the vicissitudes of their political situation and their struggles with the western emperors. The eastern emperors were also constantly preoccupied with the idea of reconciliation, constantly negotiating with a view to union; but they did not care about it for its own sake, but only for political advantages which it might bring, and

their subjects were bitterly opposed to it. Manuel Comnenus during the first part of his reign was the close friend and ally of the western emperor Conrad III., but after Conrad's death, he formed the ambitious plan of realizing in Europe a sovereignty like that of Justinian, and hoped to compass it in conjunction with Rome, the enemy of the Hohenstaufen. His forward policy carried war into Italy; he seized Ancona. But his strength was unequal to such designs. His Latin sympathies, no less than his financial extravagance, made him highly unpopular at

home; and the national lack of sympathy with his Western policy was exhibited — after the revolution which overthrew his son Alexius and raised his cousin Andronicus I. to the throne — by the awful massacre of the Latin residents at Constanti- nople in 1182, for which the expedition of William of Sicily (see above) and the massacre of the people of Thessalonica was the revenge. The short reign of the wicked and brilliant Andronicus was in all respects a reaction, prudent, economical and popular. His fall was due to the aristocracy against whom his policy was directed, and the reign of Isaac Angelus undid his efforts and completed the ruin of the state. Oppressive taxation caused a revolt of the Bulgarian and Walachian population in the European provinces; the work of Zimisces and Basil was undone, and a new Bulgarian kingdom was founded by John Asen — a decisive blow to the Greek predominance which the Macedonian emperors seemed to have established.

In the fatal year 1204 the perils with which the eastward expansion of western Christendom (the Crusades, and the commercial predominance and ambitions of Venice) had long menaced the Empire, culminated in its conquest and partition. It was due to a series of accidents that the cloud burst at this moment, but the conditions of such a catastrophe had long been present. Isaac Angelus was dethroned by his brother Alexius III., and his son escaped (1201) to the west, where arrangements were being made for a new crusade, which Venice undertook to transport to the Holy Land. The prince persuaded Philip of Swabia (who had married his sister) and Boniface of Montferrat to divert the expedition to Byzantium, in order to restore his father and himself to the throne, promising to furnish help to the Crusade and to reconcile the Greek Church with Rome; Venice agreed to the plan; but Pope Innocent III., the enemy of Philip, forbade it. Isaac and his son, Alexius IV., were restored without difficulty in 1203, and the crusading forces were prepared to proceed to Palestine, if Alexius had performed his promises. But the manner of this restoration, under Latin auspices, was intensely unpopular; he was not unwilling, but he was unable, to fulfil his pledges; and a few

months later he was overthrown in favour of one who, if an upstart, was a patriot, Alexius V. Then the Crusaders, who were waiting encamped outside the city, resolved to carry out the design which the Normans had repeatedly attempted, and put an end to the Greek Empire. The leaders of the Fourth Crusade must be acquitted of having formed this plan de- liberately before they started; it was not conceived before 1204. They first arranged how they would divide the Empire amongst themselves (March); then they captured the city, which had to endure the worst barbarities of war. In par- titioning the Empire, which was now to become the spoil of the conquerors, the guiding mind was the Venetian leader, the blind doge, Henry Dandolo. He looked to the interests of Venice from the narrowest point of view, and in founding the new Latin Empire, which was to replace the Greek, it was his aim that it should be feeble, so as to present no obstacles to Venetian policy. The Latin Empire of Romania was a feudal state like the kingdom of Jerusalem; the emperor was suzerain . of all the princes who established themselves on Greek territory; under his own immediate rule were Constantinople, southern Thrace, the Bithynian coast, and some islands in the Aegean. But he was hampered from the beginning by dependence on Venice, want of financial resources, and want of a fleet; the feudal princes, occupied with their separate interests, gave him little support in his conflict with Greeks and Bulgarians; at the end of ten years the worthless fabric began rapidly to decline, and the efforts of the popes, for whom it was the means of realizing Roman supremacy in the East, were unavailing to save it from the extinction to which it was doomed in its cradle.

The original Act of Partition (which gave J of the Byzantine territory to the future emperor, f to Venice, the remaining f to the Crusaders) could hardly be carried out strictly, as the territory was still to be won. The most important vassal state was the kingdom of Thessalonica, including Thessaly, which was assigned to Boniface of Montferrat. But it was conquered by the Greeks of Epirus in 1222. The chief of the territories taken by Venice

was Crete. For the Latin states in Greece and the Aegean see Greece. The first Latin emperor, Baldwin of Flanders, was cap- tured and put to death by the Bulgarians in 1205. He was suc- ceeded by his brother Henry, an able statesman, after whose death (12 1 6) the decline began.

Three Greek states emerged from the ruin of the Roman Empire. A member of the Comnenian house had founded an independent state at Trebizond, and this empire survived till 1 46 1, when it was conquered by the Ottomans. A relation of the Angeli maintained in Europe an independent Greek state known as the Despotate of Epirus. But the true representative of the imperial line was Theodore Lascaris, who collected the Byzantine aristocracy at Nicaea and was elected emperor in 1206. He and his successors advanced surely and rapidly against the Latin Empire, both in Europe and Asia. It was a question whether Constantinople would fall to the Walacho-Bulgarians or to the Greeks. But an astute diplomat and general, the emperor Michael Palaeologus, captured it in 1261. His object was to recover all the lost territory from the Latins, but he was menaced by a great danger through Charles of Anjou, who had overthrown the rule of the Hohenstaufens in the two Sicilies, and determined to restore the Latin kingdom of Romania. To avert this peril, Michael negotiated with Pope Gregory X.; he was ready to make every concession, and a formal union of the Churches was actually brought about at the council of Lyons in 1274. The emperor had the utmost difficulty in carrying through this policy in face of clerical opposition; it aroused disgust and bitterness among his subjects; and it was undone by his successor. Meanwhile the pope had with difficulty bridled Charles of Anjou; but in Martin IV. he found a more pliable instrument, and in 1282 he made vast preparations for an expedition against the Greek Empire. It was saved by the Sicilian Vespers (see Sicily), to be the prey of other powers.

The end of the 13 th century saw the rise of the Ottoman power in Asia and the Servian in Europe. The Empire was assisted by a band of Spanish mercenaries (the Catalan Grand Company; see Greece, History, “Byzantine Period”) against the advance of the Ottoman Turks in Asia Minor; they distinguished themselves by saving Philadelphia (1304). In 1326 Brusa (Prusa) became the Ottoman capital, while on the other side the Servians (crushing the Bulgarians in 1330) were gradually closing in on Byzantium. Under Stephen Dusan (133 1- 1355) Servia attained the height of her power. The enemies were strengthened by the domestic struggles within the Empire, first between Andronicus II. and his son, then between John VI. and the usurper Cantacuzenus. But before the fate of Byzantium was settled the two enemies on its flanks came face to face. In 1387 the Servian power was crushed on the field of Kossovo by the Ottomans (who had crossed the Hellespont in 1360 and taken Philippopolis in 1363). Sultan Bayezid I. won Philadelphia, the last Asiatic possession of the Empire, and conquered Trnovo, the Bulgarian

capital, in 1303. Constantinople was now sur- rounded. The Ottoman power was momentarily eclipsed, and the career of conquest checked, by the Mongol invasion of Timur and the great defeat which it sustained in the battle of Angora (1402). Mahommed I. found it necessary to ally himself with the emperor Manuel. But the pause was brief. Murad II. took Adrianople, and tried (1422) to take Constantinople.

It was small compensation that during this time the Palaeologi had been successful against the Franks in Greece. The situation was desperate. The Turks were in possession of the Balkan peninsula, threatening Hungary; there was no chance of rescue, except from western Europe. John VI. and Manuel had both visited the West in search of help. The jeopardy of the Empire was the opportunity of Rome, and the union of the Churches became the pressing question. It was taken up earnestly by Pope Eugenius IV., and the result was the Decree of Union at the council of Florence in 1439. The emperor and the higher clergy were really in earnest, but the people and the monks did not accept it, and the last agony of Byzantium was marked by ecclesiastical quarrels. Eugenius IV. preached a crusade for the rescue of the Empire, and in 1443 an army of Hungarians and Poles, led by the Hungarian king, won a victory over Murad,

which was more than avenged in the next year on the memorable field of Varna. The end came nine years later under Murad's successor, Mahommed II. An army of about 150,000 blockaded the city by land and sea, and Mahommed began the siege on the 7th of April. The emperor Constantine XL, Palaeologus, on whom the task of the forlorn defence devolved (and whose position was all the more difficult because he was alienated from his subjects, having embraced the Latin rite), can have had little more than 8000 men at his disposal; he received no help from the Western powers; but an experienced Genoese soldier of fortune, John Justiniani, arrived with two vessels and 400 cuirassiers and aided the emperor with his courage and advice. The resident foreigners, both Venetians and Genoese, loyally shared in the labours of the defence. The final storm of the land walls took place on the night of the 29th of May. All looked to Justiniani for salvation, and when he, severely wounded, retired from the wall to have his wound looked to, a panic ensued. The enemy seized the moment, and the Janissaries in a final charge rushed the stockade which had been constructed to replace a portion of the wall destroyed by the Turkish cannon. This decided the fate of the city. Constantine fell fighting heroically. Soon after sunrise (May 30) the Mahommedan army entered Con- stantinople (Stambul ='s rrjv iro\t.v, " the city "), which was in their eyes the capital of Christendom.

The ultimate responsibility for this disaster is generally im- puted to the political adventurers who dismembered the Empire in 1 204. It may indeed be said that at that time the Byzantine state seemed already stricken with paralysis and verging to dissolution, and it was menaced by the re-arisen power of Bulgaria. But more than once before (in the 7th century and in the nth) it had recovered its strength when it was weak and in dire peril; and, considering what the emperors of Nicaea and Michael VIII. accomplished, it seems probable that, if there had been no Fourth Crusade, it might have so revived and consolidated its forces in the course of the 13th century, as to be able to cope successfully with the first advances of the Ottomans. The true statement is that the Fourth Crusade was only an incident (not in itself decisive) in a world-movement which doomed the Eastern Empire to extinction — namely, the eastward movement of western Europe which began in the nth century with the rise of the Normans and the First Crusade. Henceforward the Empire was a middle state, pressed between expanding forces on the east and on the west, and its ultimate disappearance was inevitable.

Church and State. — In making the state Christian, Constantine made the Church a state institution, and therefore under imperial control. Caesaro-papism was the logical consequence. The sacerdotium was united with the imperium in the person of the monarch as in the pagan state. The Church acquiesced, and yet did not acquiesce, in this theory. When a heretical emperor sought to impose his views, champions of ecclesiastical freedom never failed to come forward. At the very beginning Athanasius fought for the independence of the Church against the emperor Constantius. But the political principle which Constantine had taken for granted, and which was an indispensable condition of his adoption of Christianity, was fully recognized under Theodosius I., and, notwithstanding protests from time to time, was permanent. It is significant that Constantinople, which had become a second Rome politically, with its senate and capitol, became then a second Rome ecclesiastically, and that the elevation of the see of Constantinople to patriarchal rank next to the Roman see was due to Theodosius (381), who gave a permanent form to the dualism of the Empire. The patriarch became a state minister for religion. The character of the Church as a state institution is expressed above all in the synods. The general councils are not only summoned by the emperor, but are presided over by him or by his lay deputies. The order of the proceedings is modelled on that of the senate. The emperor or his representative not only keeps order but conducts the deliberations and intervenes in the theological debates. It has been erroneously thought that at the council of Chalcedon (451)

the legate of Pope Leo presided; but the

acts of that assembly teach us otherwise; the privilege which the Roman legates possessed was that of voting first (the right of the princeps senalus). The first general council at which a churchman presided was the seventh (at Nicaea, 787), at which the emperor (or empress) deputed, not a layman, but the patriarch Tarasius to preside. The resolutions of these ecclesiastical state-councils did not become the law of the Empire till they were confirmed by imperial edicts.

The emperors, in their capacity as heads of the Church, did not confine themselves to controlling it by controlling the councils. They soon began to issue edicts dealing with theology, by virtue of their own authority. It has been said that the council of Chalcedon closed an epoch of ” parliamentary con- stitutionalism “; a general council was not summoned again for more than one hundred years, though the Empire during that period was seething with religious disunion and unrest. The usurper Basiliscus in his short reign set an example which his successors were not slow to follow. He issued an edict quashing the decision of Chalcedon. Zeno’s Henotikon (see below) a few years later was the second and more famous example of a method which Justinian largely used, and of which the Ecthesis of Heraclius, the Type of Constans II. and the iconoclastic edicts of Leo III. are well-known instances. It was a question of political expediency (determined by the circumstances, the intensity and nature of the opposition, &c.) whether an emperor supported his policy or not by an ecclesi- astical council.

The emperor was always able to control the election of the patriarch, and through him he directed the Church. Some- times emperor and patriarch collided; but in general the patriarchs were docile instruments, and when they were re- fractory they could be deposed. There were several means of resistance open to a patriarch, though he rarely availed himself of them. His participation in the ceremony of coronation was indispensable, and he could refuse to crown a new emperor except on certain conditions, and thus dictate a policy (instances in 812, Michael I.; 969, John Zimisces). There was the power of excommunication (Leo VI. was excommunicated on account of his fourth marriage). Another means of resistance for the Church was to invoke the support of the bishop of Rome, who embodied the principle of ecclesiastical independence and whose see admittedly

enjoyed precedence and primacy over all the sees in Christendom. Up to the end of the 8th century he was a subject of the emperor, and some emperors exerted their ecclesiastical control over Rome by drastic measures (Justinian and Constans II.). But after the conquest of Italy by Charles the Great, the pope was outside the Byzantine domination; after the coronation of Charles in 800 he was associated with a rival empire; and when ecclesiastical controversies arose in the East, the party in opposition was always ready to appeal to him as the highest authority in Christendom. Under the iconoclastic emperors the image-worshippers looked to him as the guardian of orthodoxy.

As to the ecclesiastical controversies which form a leading feature of Byzantine history, their political significance alone concerns us. After the determination of the Arian controversy in 381 new questions (as to the union of the divine and human elements in the person of Christ: one or two natures?) arose, and it may seem surprising that such points of abstruse theology should have awakened universal interest and led to serious consequences. The secret was that they masked national feelings; hence their political importance and the attention which the government was forced to bestow on them. The reviving sense of nationality (anti-Greek) in Syria and in Egypt found expression in the 5th century in passionate monophysitism (the doctrine of one nature) : theology was the only sphere in which such feelings could be uttered. The alienation and dissension which thus began had fatal consequences, smoothing the way for the Saracen conquests of those lands; the inhabi- tants were not unwilling to be severed politically from the Empire. This ultimate danger was at first hardly visible. What immediately troubled the emperors in the first half of the

5th century was the preponderant position which the see of Alexandria occupied, threatening the higher authority of Con- stantinople. The council of Chalcedon, called by Marcian, an able statesman, was as much for the purpose of ending the domination of Alexandria as of settling the theological question. The former object was effected, but the theological decision of the council was fatal, it only sealed and promoted the disunion". The recalcitrant spirit of Syria and Egypt forced Zeno, thirty years later, to issue his Henotikon, affirming the decisions of previous councils but pointedly ignoring Chalcedon. This statesman-like document secured peace in the East for a generation. Rome refused to accept the Henotikon, and when Justinian resolved to restore imperial supremacy in the Western kingdoms, conciliation with Rome became a matter of political importance. For the sake of this project, the unity of the East was sacrificed. The doctrine of Chalcedon was reasserted, the Henotikon

set aside; New Rome and Old Rome were again hand in hand. This meant the final alienation of Egypt and Syria. The national instinct which had been alive in the 5th century grew into strong national sentiment in the 6th. One of the chief anxieties of Justinian's long and busy reign was to repair the mischief. Deeply interested himself in matters of dogma, and prepared to assert to its fullest extent his authority as head of the Church, he has been called " the passionate theologian on the throne "; but in his chief ecclesi- astical measures political considerations were predominant. His wife Theodora was a monophysite, and he permitted her to extend her protection to the heretics. He sought new formulae for the purpose of reconciliation, but nothing short of repudiation of the Chalcedon acts would have been enough. The last great efforts for union were made when the Saracens invaded and conquered the dissident provinces. A new formula of union was discovered (One Will and One Energy). This doctrine of monothelism would never have been heard of but for political exigencies. The Egyptians and Syrians would perhaps have accepted this compromise; but it was repudiated by the fanatical adherents of Chalcedon. Heraclius sought to impose the doctrine by an edict (Ecthesis, 638), but the storm, especially in Italy and Africa, was so great that ten years later an edict known as the Type was issued by Constans forbidding all disputation about the number of wills and energies. Constans was a strong ruler, and maintained the Type in spite of orthodox opposition throughout his reign. But the expediency of this policy passed when the Saracens were inexpugnably settled in their conquests, and in his successor's reign it was more worth while to effect a reconciliation with Rome and the West. This was the cause of the 6th Ecumenical Council which condemned monothelism (680-681).

In the Hellenic parts of the Empire devotion to orthodoxy served as a chrysalis for the national sentiment which was to burst its shell in the 10th century. For the Greeks Christianity had been in a certain way continuous with paganism. It might be said that the old deities and heroes who had protected their cities were still their guardians, under the new form of saints (sometimes imaginary) and archangels, and performed for them the same kind of miracles. Pagan idolatry was replaced by Christian image-worship, which by the Christians of many parts of Asia Minor, as well as by the Mahommedans, was regarded as simply polytheism. Thus in the great iconoclastic controversy, which distracted the Empire for nearly 120 years, was involved, as in the monophysitic, the antagonism between different racial elements and geographical sections. Leo III., whose services as a great deliverer and reformer were obscured in the memory of posterity by the ill-fame

which he won as an iconoclast, was a native of Commagene. His first edict against the veneration of pictures evoked riots in the capital and a revolt in Greece. The opposition was everywhere voiced by the monks, and it is not to be overlooked that for many monks the painting of sacred pictures was their means of existence. Leo's son Constantine V. pursued the same policy with greater rigour, meeting the monastic resistance by systematic persecu- tion, and in his reign a general council condemned image-worship

(753). Iconoclasm was supported by the army (i.e. Asia Minor), and a considerable portion of the episcopate, but it was not destined to triumph. When the Athenian Irene, wife of Leo IV., came to power after her husband's death, as regent for her son Constantine VI., she secured the restoration of the worship of icons. The Iconoclastic Council was reversed by the 7th Ecu- menical Council of 787. The iconoclastic party, however, was not yet defeated, and (after the neutral reign of Nicephorus I.) came again to the helm in the reigns of the Armenian Leo V. and the first two Phrygian emperors, Michael II. and Theophilus. But the Empire was weary of the struggle, and on the death of Theophilus, who had been rigorous in enforcing his policy, icon- worship was finally restored by his widow Theodora (843), and the question was never reopened. This was a triumph for the Greek element in the Empire; the " Sunday of orthodoxy " on which iconoclasm was formally condemned is still a great day in the Greek Church.

The ablest champions who wielded their pens for the cause of icons, defending by theological arguments practices which really had their roots in polytheism, were in the early stage John of Damascus and in the later Theodore (abbot of the monastery of Studium at Constantinople). The writings of the iconoclasts were destroyed by the triumphant party, so that we know their case only from the works of their antagonists.

In this struggle the Greeks and Latins were of one mind; the image-worshippers had the support of the Roman see. When the pope resisted him, Leo III. confiscated the papal estates in Sicily and Calabria; and the diocese of Illyricum was withdrawn from the control of Rome and submitted to the patriarch of Constantinople. But when iconoclasm was defeated, there was no question of restoring Illyricum, nor could there be, for political reasons; since the iconoclastic schism

had, with other causes, led to the detachment of the papacy from the Empire and its association with the Frankish power. By the foundation of the rival Roman Empire in 800 the pope had definitely become a subject of another state. No sooner had the iconoclastic struggle terminated than differences and disputes arose between the Greek and Latin Churches which finally led to an abiding schism, and helped to foster the national self-consciousness of the Greeks. A strife over the patriarchal chair between Ignatius (deposed by Michael III. and supported by Rome) and Photius the learned statesman who succeeded him, strained the relations with Rome; but a graver cause of discord was the papal attempt to win Bulgaria, whose sovereign Boris had been baptized under the auspices of Michael III. (c. 865), and was inclined to play Old Rome against New Rome. Photius stood out as the champion of the Greeks against the claim of the Roman see, and his patriarchate, though it did not lead to a final breach, marks the definite emancipation of the Greeks from the spiritual headship of Rome. This is the significance of his encyclic letter (867), which formulated a number of differences in rite and doctrine between the Greek and Latin Churches, differences so small that they need never have proved a barrier to union, if on one side there had been no question of papal supremacy, and if the Greek attitude had not been the expression of a tenacious nationality. There was a reconciliation about 900, but the Churches were really estranged, and the open and ultimate breach which came in 1034, when the influence of the Cluny movement was dominant at Rome (Leo IX. was pope and Michael Cerularius patriarch), sealed a disunion which had long existed. Subsequent plans of reunion were entertained by the emperors merely for political reasons, to obtain Western support against their foes, or to avert (through papal influence) the aggressive designs of Western princes. They were doomed to futility because they were not seriously meant, and the Greek population was entirely out of sym- pathy with these political machinations of their emperors. The Union of Lyons (1274) was soon repudiated, and the last attempt, the Union of Florence in 1439, was equally hollow (though it permanently secured the union of the Rumanians and of the Ruthenians). Part of the historical significance of the relations between the Greek and Latin

Churches lies in the fact that they illustrate, and promoted by way of challenge, the persistence of Greek national self- consciousness.

The emperors legislated against paganism and against heresy, not merely under ecclesiastical pressure, but because they thought religious uniformity politically desirable. Theodosius the Great, a Spaniard, with no sympathy for Hellenic culture, set himself the task of systematically eradi- cating pagan institutions and customs. Though

his persecution accomplished much, paganism was far from being extinct either in the East or in the West in the 5th century. Not only did heathen cults survive in many remote districts, but the old gods had many worshippers among the higher classes at Rome, Constantinople, Antioch, Alexandria and Athens. The most distinguished Greek literati of that period were non-Christian. Justinian, who united theological en- thusiasm with belief in the ideal of uniformity and, like Theodosius, was cut of sympathy with Hellenism (" Hellen " now came to mean " pagan "), persecuted polytheism more earnestly and severely than his predecessors. His measures created a panic among the higher classes at Byzantium, of whom many, as he suspected, were addicted to the ancient religion. He instituted a regular inquisition, exacted oaths of orthodoxy from all officials and teachers, and closed the. philosophical schools of Athens. Missionaries (and it is remarkable that he employed monophysite heretics) were sent to abolish the old heathen worship which survived in many parts of Asia Minor where Christianity had hardly penetrated. By the end of the 6th century formal paganism had practically disappeared.

In Asia Minor, especially in the east, there were many dissident communities which asserted independence of the Church of Constantinople and of all ecclesiastical traditions, founding their doctrines directly on the Bible. Most important of these heretics were the Paulicians (q.v.), a dualistic sect whom the Church regarded as Manichaeans.

The Autocracy and its Constitutional Forms. — With Diocletian the Principate of Augustus had become undisguisedly an absolute monarchy, and this constitution prevailed to the end. There is virtually no constitutional history in the proper sense of the term in the later Roman Empire, for there was neither evolution nor revolution. The monarchical system remained in all its essential points unchanged, and presents a remarkable example of an autocracy of immense duration which perfectly satisfied the ideas of its subjects. No attempt was made to alter it,- — to introduce, for instance, a limited monarchy or a republican government; all revolts and conspiracies were aimed at the policies of particular autocrats, not at autocracy itself; generally they only repre- sented sectional antagonisms and personal ambitions. The emperors inherited a deeply rooted instinct of legality as a tradition from Old Rome; and this respect for law which marked their acts, along with the generally good administration of justice, was a palladium of the monarchy. They were supreme in legislation, as well as in the administrative and judicial spheres; but they were on the whole moderate in wielding

legislation as an instrument of policy.

There were, however, recognized constitutional principles which it would have been impossible for the emperor to over- ride.

(1) The elective principle, inherited from the Republic, was never changed. A new emperor had to be elected by the senate and acclaimed by the people. The succession never became automatic. But even Augustus had indirectly intro- duced the dynastic principle. Theodosius the Great, by causing his two sons, Arcadius and Honorius, to be elected Augusti in their infancy, practically elevated the dynastic idea into a constitutional principle; henceforward it was regarded as in the regular coarse that the son born to a reigning sovereign should in his infancy be elected Augustus. Thus the election, though always an indispensable form, was only a reality when a dynasty came to an end.

(2) When the position of Christianity was assured by the failure of Julian's reaction, it was evident that profession of that religion would henceforward be a necessary qualification for election to the throne. • This was formally and constitution- ally recognized when the coronation of the emperor by the patriarch was introduced in 457, or perhaps in 450.

(3) The sovereignty of the emperor was personal and not territorial. In this respect it always retained the character which it had inherited as the offspring of a Roman magistracy. Hence no Roman territory could be granted by the emperor to another power. For instance, the Western emperor Conrad III. could promise to hand over Italy to Manuel Comnenus as the dowry of his wife, but it would have been constitutionally illegal for Manuel to have made such a promise to any foreign prince; an Eastern emperor had no right to dispose of the territory of the state. Tendencies towards a territorial concep- tion begin indeed to appear (partly under Western influence) in the time of the Palaeologi, especially in the custom of bestowing appanages on imperial princes.

(4) While the senate of Rome generally lost its importance and at last became a mere municipal body, the new senate of Constantine preserved its position as an organ of the state till the fall of Constantinople. For the imperial elections it was constitutionally

indispensable, and it was able sometimes to play a decisive part when the throne was vacant — its only opportunity for independent action. The abolition, under Diocletian's system, of the senatorial provinces deprived the senate of the chief administrative function which it exercised under the Principate; it had no legislative powers; and it lost most of its judicial functions. It was, however, still a judicial court; it tried, for instance, political crimes. In composition it differed from the senate of the Principate. The senators in the 4th century were chiefly functionaries in the public service, divided into the three ascending ranks of clarissimi, spectabiles. illustres. The majority of the members of the senatorial order lived in the provinces, forming a provincial aristocracy, and did not sit in the senate. Then the two lower ranks ceased to have a right to sit in the senate, which was confined to the illustres and men of higher rank (Patricians). The senatorial order must therefore be distinguished from the senate in a narrower sense; the latter finally consisted mainly of high ministers of state and the chief officials of the palace. It would be a grave mistake to underrate the importance of this body, through an irrelevant contrast with the senate of the Republic or even of the Principate. Its composition ensured to it great influence as a consultative assembly; and its political weight was increased by the fact that the inner council of imperial advisers was practically a committee of the senate. The importance of the senate is illustrated by the fact that in the nth century Constantine X., in order to carry out a revolutionary, anti-military policy, found it necessary to alter the composition of the senate by introducing a number of new men from the lower classes.

(5) The memory of the power which had once belonged to the populus Romanus lingered in the part which the inhabi- tants of New Rome, and their representatives, played in ac- claiming newly elected emperors, and in such ceremonies as coronations. In the 6th century the factions (" demes ") of the circus, Blues and Greens, appear as political parties, distract the city by their quarrels, and break out in serious riots. On one occasion they shook the throne (" Nika " revolt, 532). The emperors finally quelled this element of disturb- ance by giving the factions a new organization, under " de- marchs " and " democrats," and assigning them a definite quasi-political locus standi in the public ceremonies in the palace and the capital. The duty of providing panem et cir- censes was inherited from Old Rome; but the free distribution of bread cannot be traced beyond the 6th century (had the loss of the Egyptian granary to do with its cessation?), while the spectacles of the hippodrome lasted till the end. Outside the capital the people took little interest in politics, except when theology was concerned; and it may be said generally

that it was mainly in the ecclesiastical sphere that public opinion among the masses, voiced by the clergy and monks, was an influence which made itself felt.

The court ceremonial of Constantinople, which forms such a market contrast to the ostentatiously simple establishments of Augustus and the Antonines, had in its origin a certain con- stitutional significance. It was introduced by Aurelian and Dio- cletian, not, we must suppose, from any personal love of display, but rather to dissociate the emperor from the army, at a time when the state had been shaken to its foundations by the pre- dominance of the military element and the dependence of the emperor on the soldiers. It was the object of Diocletian to make him independent of all, with no more particular relation to the army than to any other element in the state; the royal court and the inaccessibility of the ruler were calculated to promote this object. The etiquette and ceremonies were greatly elaborated by Justinian, and were diligently maintained and developed. The public functions, which included processions through the streets to various sanctuaries of the city on the great feast-days of the Church, supplied entertainment of which the populace never wearied; and it did not escape the wit of the rulers that the splendid functions and solemn etiquette of the court were an effective means of impressing the imagination of foreigners, who constantly resorted to Constantinople from neighbouring kingdoms and dependencies, with the majesty and power of the Basileus.

The imperial dignity was collegial. There could be two or more emperors (imperatores, (SauiXels) at the same time; edicts were issued, public acts performed, in their joint names. Through the period of dualism, in the 4th and 5th centuries, when the administration of the Eastern provinces was generally separate from that of the Western, the imperial authority was also collegial. But after this period the system of divided authority came to an end and was never renewed. There was frequently more than one emperor, not only in the case of a father and his sons, or of two brothers, but also in the case of a minority, when a regent is elected emperor (Romanus I. ; cf. Nicephorus II. and John Zimisces). But one colleague always exercised the sole authority, was the real monarch, the “great” or the “first” Basileus; the other or others were only sleeping partners. Under the Comneni a new nomenclature was introduced; a brother, e.g., who before could have become the formal colleague of the ruler, received the title of Sebastocrator (Sebastos was the Greek equivalent of Augustus).

Legislation. — The history of the legislation of the Eastern Empire is

distinguished by three epochs associated with the names of (1) Justinian, (2) Leo III., (3) Basil I. and Leo VI.

(1) The Justinianean legislation (see Justinian) is thoroughly Roman in spirit, and inspired by pious adhesion to the traditions of the past; but it admitted modifications of the older law in accordance with tendencies which had been long since making themselves felt: consideration is accorded to principles of humanity in the laws affecting persons, and to the principle of public interest in the laws relating to things. Justinian not only sanctioned changes which time had brought about, like the mitigation of the strict patria potestas and the greater independence of wives, but introduced a revolutionary change in the law of succession to property, abolishing inheritance by agnatio or relationship through males, and substituting inheritance by blood relationship whether through males or females.

(2) Justinian's reign was followed by a period in which juristic studies decayed. The seventh century, in which social order was profoundly disturbed, is a blank in legal history, and it would seem that the law of Justinian, though it had been rendered into Greek, almost ceased to be studied or understood. Practice at least was modified by principles in accord with the public opinion of Christian society and influenced by ecclesiastical canons. In a synod held at Constantinople in the reign of Justinian II. numerous rules – were enacted, differing from the existing laws and based on ecclesias- tical doctrine and Mosaic principles, and these were sanctioned as laws of the realm by the emperor. Thus Church influence and the decline of Roman tradition, in a state which had become predominantly Greek, determined the character of the ensuing legislative epoch under the auspices of Leo III., whose law book (A.D. 740), written in Greek, marks a new era and reflects the changed ideas of the community. Entitled a " Brief Selection of Laws " and generally known as the Ecloga, it may be described as a Christian law book. In regard to the patria potestas increased facilities are given for emancipation from paternal control when the son comes to years of discretion, and the paternal is to a certain extent replaced by a parental control over minors. The law of guardianship is considerably modified. The laws of marriage are transformed under the influence of the Christian conception of matrimony; the institution of concubinatus is abolished. Impedi- ments to marriage on account of consanguinity and of spiritual relationship are multiplied. While Justinian regarded marriage as a contract, and therefore, like any other contract, dissoluble at the pleasure of the parties, Leo III. accepted the Church view that it was an indissoluble bond. Ecclesiastical influence is written

large in the criminal law, of which a prominent feature is the substitution of mutilation of various kinds for the capital penalty. Death is retained for some crimes, such as murder and high treason ; other offences were punished by amputation (of hand, nose, &c.). This system (justified by the passage in the New Testament, ” If thine eye offend thee,” &c), though to modern notions barbaric, seemed a step in the direction of leniency; and it may be observed that the tendency to avoid capital punishment increased, and we are told that in the reign of John Comnenus it was never in- flicted. (The same spirit, it may be noted, is apparent in the usual, though by no means invariable, practice of Byzantine emperors to render dethroned rivals or members of a deposed dynasty innocuous by depriving them of eyesight or forcing them to take monastic orders, instead of putting them to death.) The Church, which had its own system of penalties, exercised a great influence on the actual operation of criminal law, especially through the privilege of asylum (recognized by Justinian, but with many reserves and restrictions), which was granted to Christian churches and is admitted without exceptions in the Ecloga.

(3) The last period of legislative activity under Basil I. and Leo VI. represents a reaction, in a certain measure, against the Ecloga and a return to Justinian. The Ecloga had met practical needs, but the Isaurian and Phrygian emperors had done nothing to revive legal study. To do so was the aim of Basil, and the revival could only be based on Justinianean law books or their Greek representatives. These books were now treated somewhat as Justinian and his lawyers had treated their own predecessors. A handbook of extracts from the Institutes, Digest and Code svas issued in 879 (A irp6x«pos vbiu>s, ” the law as it is “), to fulfil somewhat the same function as the Institutes. Then a :ollection of all the laws of the Empire was prepared by means k>f two commissions, and completed under Leo VI. It was entitled the Basilika. In many points (in civil, but not in criminal, law) the principles of the Ecloga are set aside in favour of the older jurisprudence. Thus the Justinianean ordinances on the subject of divorce were revived, and there remained henceforward a contra- diction between the civil and the canon law.

After this there was no legislation on a grand scale; but there was a great revival of legal study under Constantine IX., who founded a new law-school, and there were many learned specialists who wrote important commentaries, such as John Xiphilin (nth century),

Theodore Balsamon (12th century), Harmenopulos (14th century). The civil code of Moldavia (published 1816-17) is a codification of Byzantine law; and modern Greece, although in framing its code it took the Napoleonic for its model, professes theoretically to base its civil law on the edicts of the emperors as contained in the Hexabiblos of Harmenopulos.

Administration. — Three principles underlay the adminis- trative reform of Diocletian: the separation of civil from military functions; the formation of small provincial units; and the scalar structure which deepened on the interposition of the vicar of a diocese and the praetorian prefect between the provincial governor and the emperor. This system lasted unchanged for three and a hah centuries. The few unim- portant alterations that were made were in harmony with its spirit, until the reign of Justinian, who introduced certain reforms that pointed in a new direction. We find him com- bining some of the small provinces into large units, under- mining the scalar system by doing away with some of the dioceses and vicars, and placing in some cases military and civil authority in the same hands. The chief aim of Diocletian in his general reform had been to secure central control over the provincial governments; the object of Justinian in these particular reforms was to remedy corruption and oppression. These changes, some of which were soon cancelled, would hardly in themselves have led to a radical change; but they prepared the way for an administrative revolution, brought about by stress of external necessities. In the 7th century all the energies of the Empire, girt about by active enemies, were centred on war and defence; everything had to give way to military exigencies; and a new system was gradually intro- duced which led ultimately to the abolition of the old. The change began in Italy and Africa, at the end of the 6th century, where operations against the Lombards and the Berbers were impeded by the friction between the two co-ordinate military and civil authorities (masters of soldiers, and praetorian prefects). The military governors were made supreme with the title of exarchs, ” viceroys “; the civil authority was subordinated to them in case of collision, otherwise remaining unaltered. The change is an index of the dangerous crisis through which these provinces were passing. In the East similar circumstances

led to similar results. The Saracen danger hanging imminent over Asia Minor imposed a policy of the same kind. And so before the end of the 7th century we find the Empire divided into six great military provinces, three in Europe and three in Asia: (1) Exarchate of Africa, (2) Exarchate of Italy, (3) Strategia of Thrace, (4) County of Opsikion (= obsequium) , including Bithynia, Honorias, Paphlagonia, parts of

Helles- pontus and Phrygia, (5) Strategia of the Anatolikoi, most of west and central Asia Minor, (6) Strategia of the Armeniakoi, eastern Asia Minor. In addition to these there was a naval circumscription, (7) the Strategia of the Karabisidnoi (from Kapafios, a vessel) , including the southern coastland of Asia Minor, and the Aegean (see below under Navy).

The lands of the old prefecture of Illyricum were not included in the system, because this part of the Empire was then regarded as a lost position. On the contrary, here military powers were committed to the Prefect of Illyricum, whose actual sphere extended little beyond Thessalonica, which was surrounded by Slavonic tribes.

The Eastern changes, perhaps initiated by Heraclius, but probably due mainly to Constans II., did not interfere with the civil administration, except in so far as its heads were subordinated to the military commanders. But Leo III., who as a great administrative reformer ranks with Augustus and Diocletian, did away with the old system altogether. (1) Re- versing Diocletian's principle, he combined military and civil powers in the same hands. The strategos or military com- mander became also a civil governor; his higher officers (tur- marchs) were likewise civil functionaries. (2) The scalar principle disappeared, including both the vicars and the praetorian prefect of the East (some of whose functions were merged in those of the prefect of the city); no authority inter- posed between the strategoi and the emperor. (3) The new provinces, which were called themes (the name marks their military origin: thema = corps), resembled in- size the provinces of Augustus, each including several of the Diocletian divisions. This third and last provincial reform has, like its predecessors, its own history. The list of themes in the nth century is very different from that of the 8th. The changes were in one direction — the reduction of large provinces by cutting off parts to form smaller themes, a repetition of the process which reduced the provinces of Augustus. Hence the themes came to vary greatly in size and importance. Leo himself began the process by breaking up the Anatolic command into two themes (Anatolic and Thracesian). The principle of splitting up was carried out systematically by Leo VI. (who was also responsible for a new ecclesiastical division of the Empire).

The development will be exhibited by a list of the themes in tha middle of the 10th century. A. Asia: {(1) Opsikion, (2) Optimaton, (3) Paphlagonia, (4) Bukellarianj = old Opsikion; {(5) Anatolic, (6) Thracesian, (7) Samos (naval), (8) Cappadocia, (9) Seleuciaj = old Anatolic; j(io) Armeniac, (n) Colonea, (12) Sebastea, (13) Charsianon, (14) Chaldia, (15) Mesopotamia) = old Armeniac; (16) Cibyrrhaeot,

(17) Aegean (= Dodekanesos). B. Europe: (1) Thrace, (2) Macedonia, (3) Strymon, (4) Thessalonica, (5) Hellas, (6) Peloponnesus, (7) Nicopolis, (8) Dyrrhachium, (9) Longibardia, (10) Cephallenia, (n) Cherson.

It is interesting to note that up to Leo VI. the district between Constantinople and the wall of Anastasius formed a separate theme or government, entitled the Wall (tA t«x”>”) or the Ditch (4 riufipos) ; Leo VI. united it with the theme of Thrace.

In the central administration, the general principles seem to have remained unchanged; the heads of the great administrative bureaux in Constantinople retain the palatine character which belonged to most of them from the beginning. But there were many changes in these offices, in their nomenclature and the delimitation of their functions. There are great differences between the administrative corps in the 5th, in the 10th and in the 15th centuries. We can hardly be wrong in conjecturing that, along with his provincial reform, Leo III. made a re-arrangement of the central bureaux; the abolition of the Praetorian Prefecture of the East entailed, in itself, modifica- tions. But minor changes were continually being made, and we may note the following tendencies: (1) Increase in the number of ministers directly responsible to the emperor, (a) subordinate offices in the bureaux being raised to the rank

of independent ministries; (b) new offices being created and old ones becoming merely titular. (2) Changes in nomenclature; substitution of Greek for Latin titles. (3) Changes in the relative importance and rank of the high officials, both civil and military.

The Prefect of the City (eirapxos) controlled the police organiza- tion and administration of justice in the capital; he was vice- president of the imperial court of justice, and, when the office of Prefect of the East was abolished, he inherited the functions of that dignitary as judge of appeals from the provinces. But the praefeclus vigilum, commander of the city guards, who was subordinate to him, became an independent officer, entitled Drun- gary of the Watch, and in the nth century superseded him as vice- president of the imperial court. We are told that in the last years of the Empire the Prefect of the City had no functions at all; but his office survives in the Shehr-imaneti, ” city prefecture,” of the Ottomans, in whose organization there are

many traces of Byzantine influence.

Instead of the Quaestor of the Sacred Palace, whose duty was to draft the imperial laws and rescripts, we find in the 9th century a quaestor who possesses certain judicial and police functions and is far lower in the hierarchy of rank. It has been supposed that the later quaestor really inherited the duties of another officer, the quaesitor, who was instituted by Justinian. In the latest period the quaestor, if he still existed as a name, had no functions.

The Master of Offices, who supervised the bureaux in the palace and was master of court ceremonies, also performed many functions of a minister of foreign affairs, was head of the imperial post (cursus), and of the corps of agentes in rebus or Imperial Messengers. This ministry disappeared, probably in the 8th century, but the title was retained as a dignity at all events till the end of the 9th. The most important functions, per- taining to foreign affairs, were henceforward performed by the Logothete of the Post (\ayo0enjs tov bpbjxov). In the 12th cen- tury this minister was virtually the chancellor of the Empire ; his title was changed to that of Great Logothete by Andronicus II. The two financial ministers, comes sacrarum largitionum and comes rei privatae, continued to the end under the titles \oyo- 0£rr)s tov yevLKov (General Logothete) and 6 eirt tov ISikov (Anastasius added a third, the Count of the Sacred Patrimony, but he was afterwards suppressed). But in the 9th century we find both these ministers inferior in rank to the Sacellarius, or private pursekeeper of the emperor. Besides these there was a fourth important financial department, that of the military treasury, under a Logothete.

The employment of eunuchs as high ministers of state was a feature of the Byzantine Empire from the end of the 4th century. It is laid down as a principle (a.d. 900) that all offices are open to them, except the Prefecture of the City, the quaestor- ship, and the military posts which were held by ” Domestics.” There were then eight high posts which could only be held by eunuchs, of which the chief were the parakoimomenos and the protovestiarios (master of the wardrobe).

An emperor who had not the brains or energy to direct the affairs of the state himself, necessarily committed the task of guiding the helm to some particular minister or court dignitary who had gained his confidence. Such a position of power was outside the constitution, and was not associated with any par- ticular office; it might be held by an ecclesiastic or a eunuch; it had been held by the eunuchs Eutropius and Chrysaphius in the reigns of Arcadius and Theodosius II.

respectively. In later times, such a first minister came to be denoted by a technical term, b rapabwaaTevuv. This was the position, for instance, of Stylianus, the father-in-law of Leo VI. Most of the emperors between Basil II. and Alexius Comnenus were under the influence of such ministers.

The orders of rank (which must be distinguished from titles of office) were considerably increased in later times. In the 4th and 7th centuries there were the three great classes of the illustres, spectabiles and clarissimi; and above the illustres a small, higher class of patricians. In the 9th century we find an entirely different system; the number of classes being largely augmented, and the

nomenclature different. Instead of epithets like illustres, the names are titles which had designated offices; ” patrician ” alone sur- vives. The highest rank is now (1) the magistroi; then come the patricians in two classes : (2) proconsular patricians, (3) respectable patricians; below these (4) protospatharioi ; (5) dishypatoi (= bis consules) ; (6) spatharokandidatoi ; (7) spatharioi ; and other lower ranks. Particular ranks do not seem now to have been inalienably attached to particular offices. The strategos of the Anatolic Theme, e.g., might be a patrician or only a protospathar. Whoever was promoted to one of these ranks received its insignia from the emperor’s hand, and had to pay fixed fees to various officials, especially to the palace eunuchs

In the provinces ordinary justice was administered by judges (upa-ai) who were distinct from the governors of the themes, and inherited their functions from the old provincial governors of Diocletian’s system. In Constantinople higher and lower courts of justice sat regularly and frequently. The higher tribunals were those of the Prefect and the Quaestor, before whom different kinds of cases came. Appeals reached the emperor through the bureau of Petitions {tSiv heqa’toiv) ; he might deal with the case immediately; or might refer it to the imperial court of appeal, of which he was president; or else to the special court of the Twelve Divine Judges {dtioi biKaaral), which was instituted by Justinian.

While the administration of justice was one of the best features of the Eastern Empire, its fiscal system, likewise in- herited from the early Empire, was one of its worst. If the government had been acquainted with the principles of public economy, which have not been studied till comparatively recent times, a larger revenue might have been raised without injuring the prosperity of the inhabitants. Taxes were injudiciously imposed and oppressively collected. The commerce of the Empire was one of its great sources of strength, but the govern-

ment looked on the merchants as a class from which the utmost should be extorted. The chief source of revenue was the land. The main burdens which fell upon the landed proprietors throughout the whole period were the land tax proper and the annona. The land tax (capitalio terrena = the old tributum of the imperial, stipendium of the senatorial, provinces) was based, not on the yearly produce, but on the capital of the proprietor, the character and value of the land being taken into account. In later times this seems to have become the ko.wvi.k6v , or hearth tax. The annona was an additional im- post for supporting the army and imperial officials; it was originally paid in produce. In later times, we meet it under the name of cnrapda or crvvoivri. The province was divided into fiscal districts, and the total revenue to be derived from each was entered in a book of assessment. The assessment was in early times revised every fifteen years (the " indiction " period), but subsequently such revisions seem to have been very irregular. The collection of the taxes was managed through the curial system, while it lasted (till 7th century?). The decurions, or municipal councillors, of the chief town in each district were responsible for collecting and delivering the whole amount, and had to make good the sums owed by defaulters. This system of collective responsibility pressed very heavily on the decurions, and helped to cause their decay in the Western provinces. After the abolition of the curial organization, the principle of collective responsibility remained in the form of the errifio\rj or additional charge; that is, if a property was left without an owner, the taxes for which it was liable became an extra charge on the other members of the district (01 biwicr)v

The history of landed property and agrarian conditions in the Eastern Empire still awaits a thorough examination. It may be noted that individual hereditary proprietorship was always the rule (on crown and monastic lands as well as in other cases), and that the commonly supposed extensive existence of communities pos- sessing land in common is based on erroneous interpretation of documents. When imperial lands were granted to monasteries or as fiefs (tpSvolcu) to individuals, the position and rights of the peasant proprietors on the estates were not changed, but in many

cases the imposts were paid to the new master instead of to the fisc. In the 4th, 5th and 6th centuries the cultivators were attached to the soil (coloni, ascripticii; see Serfdom), in the interests of the fiscus; it has been supposed, on insufficient grounds, that this serfdom was

abolished for a time by Leo III., though it is probable that the condition of the peasants was largely changed by the invasions of the 7th century. In any case the system of compulsory attachment of peasants to their lands remained in force, and the class of adscripticii (iyair6ypaoi) existed till the latest times. The chief sources for agrarian conditions are, besides the imperial laws, monastic records, among which may be mentioned as specially valuable those of the Monastery of Lemboi near Smyrna.

Army and Navy. — The general principle of the military defence of the Empire in the 4th century consisted in large forces stationary on the frontiers, and reserve forces, stationed in the interior provinces, which could be moved to any point that was in danger. Thus the army was composed of (1) the limitanei, frontier-troops (under duces), and (2) reserve forces (under magistri militum) of two denominations, (a) palatini and (b) comitatenses. The limitanei were the more numerous; it has been estimated that if they numbered about 350,000, the comitatenses and palatini together amounted to less than 200,000. It is to be noted that for the old legion of 6000 men a smaller legion of 1000 had been substituted, and that the pro- portion of cavalry to infantry was small. In the 6th century the fundamental principles of the system were the same; but the cavalry had become a much more important branch of the service, and in the wars of Belisarius the foederati, barbarian mercenaries of various races, commanded by their own chiefs, played a great role. The peasants of Illyria and Thrace, the mountaineers of southern Asia Minor still supply an important part of the army, but the number of barbarians (Heruli, Van- dals, Goths, Slavs, Arabs, &c.) is much larger. Solidity and a corresponding want of mobility characterized at this time both cavalry and infantry; their great merit was straight and rapid shooting: Belisarius ascribed his success in Italy to the excellence of the archery. It is remarkable with what small forces (not more than 25,000) the first conquest of Italy was achieved, though Belisarius was far from being a military genius and the discipline in his army was flagrantly defective.

Frontier Defence. — Justinian carried out on the frontiers and in the exposed provinces a carefully devised and expensive system of defensive works. Fortified towns along the limes were connected by intervening forts, and at some distance behind was a second line of more important fortresses more strongly garrisoned, which furnished both a second barrier and places of refuge for the inhabit- ants of the open country. There was an elaborate system of signals by which the garrisons of the front stations could announce not only the imminence of a hostile invasion, but the number and character of the enemy. In North Africa there are abundant remains of the forts of the 6th and

7th centuries, displaying the military architecture of the period and the general frontier system. The typical fortress had three defences: the wall flanked by square towers of three storeys; at a few yards' distance a second wall of stone; and outside a deep foss about 20 yds. wide, with vertical sides, filled with water, and along its edge a rampart of earth.

We have already seen how the disasters and losses of the 7th century led to a radical change in the military organization, and how the Empire was divided into themes. The preponderant influence which Asia Minor won and retained till the nth century is reflected in the military establishment, which mainly depended on. the Asiatic provinces. The strategos of a large theme commanded a corps of 10,000 and the scheme of the divisions and subordinate commands has a remarkable resemblance to the organization of some of the armies of modern Europe.

The recorded scheme was probably not uniform in all the themes, and varied at different periods. The Thema (corps) consisted of 2 turmai (brigades) under turmarchai; the turma of 5 banda (regi- ments), each under a drungarios (colonel); the bandon of 5 pent- arkhiai (companies) under a kometes (captain). The pentarkhia, containing 200 men, had 5 subdivisions under pentekontarkhai (lieutenants) ; and there was a smaller unit of ten men under the dekarkhes (corporal). The total strength in the 9th century was 120,000; in Justinian's time it was reckoned at 150,000.

Distinct from the military forces (ekiiwra) of the provinces were the forces (i-d-yˆara) stationed in or near the capital. The most important of these were the Scholae and the Excubitores. The Scholarian troops were in early times under the Master of Offices, but subsequently their chief officer, the Domestic of the Schools, became the highest military commander in the Empire next to the Strategos of the Anatolic Theme. In war, when the emperor did not assume the chief command himself, he might entrust it to any

commander, and he often entrusted it to the Domestic. In the nth century, after the conquest of Bulgaria, there were two Domestics, one for the east and one for the west, and under Alexius Comnenus the Domestic of the west received the title Great Domestic. Under the Palaeologi the Great Domestic was superior in rank to all other ministers.

Besides the Scholarians, and the Excubitores (who had been organized in the 5th century), there were the regiments of the Hikanatoi, the

Arithmos and the Numeroi. The Numeroi were foot-soldiers. The Optimatoi, also infantry, properly belonged to the same category, though they were constituted as a theme. It is to be observed that the demes or corporations of Constantinople were partly organized as militia, and were available for purposes of defence.

The great difference between this Byzantine army and that of the earlier Empire is that its strength (like that of the feudal armies of the West) lay entirely in cavalry, which the successors of Hera- clius and the Isaurian emperors developed to great perfection. The few contingents of foot were quite subsidiary. The army was free from the want of discipline which was so notable in the 6th century; it was maintained in Asia Minor, which was the great recruiting ground, by a system of military holdings of land (an ex- tension of the old Roman system of assigning lands in the frontier districts to federate barbarians and to veterans). The conditions of the marauding expeditions and guerilla warfare, continuously carried on against and by the Saracens in the 8th, 9th and 10th centuries, were carefully studied by generals and tacticians, and we possess the theory of the Byzantine methods in a treatise com- posed by the emperor Nicephorus Phocas, and edited by one of his pupils. Every detail of an inroad into Saracen territory is regulated. In the 8th and 9th centuries there was a system of signals by which an approaching Saracen incursion was announced to Constantinople from the Cilician frontier. The news was flashed across Asia Minor by eight beacon fires. The first beacon was at Lulon (which com- manded the pass between Tyana and the Cilician gates), the last on Mt. Auxentius in Bithynia. When this fire' appeared, a light was kindled in the pharos of the imperial palace at Constantinople. The system was discontinued in the reign of Michael III., probably after the capture of Lulon by the enemy in 860, and was not re- newed, though Lulon was recovered in 877. It should be noted that this famous telegraphic system was only an application on a large scale of the frontier signalling referred to above.

The loss of a great part of Asia Minor to the Seljuks, and the disorganization of the provinces which they did not acquire, seriously weakened the army, and the emperors had recourse more and more to foreign mercenaries and barbarian auxiliaries. The employment of Scandinavians had begun in the 10th century, and in 988 was formed the Varangian guard, consisting chiefly of English adventurers. In the arsenal of Venice are two lions, which were transported from the Peiraeus, inscribed with obscure Runic characters, carved per- haps by Scandinavians in the army of Basil II. Under Michael IV. the famous Norwegian prince Harald Hardrada (described by a Greek writer as " Araltes, son of the king of Varangia ") fought for the Empire in Sicily

and in Bulgaria. But in the latter part of the I Ith century foreign mercenaries greatly increased in numbers and importance.

The note of the Byzantine army was efficiency, and nowhere is the immeasurable superiority of the civilization of the Eastern. Empire to the contemporary states of Europe more apparent. The theory of military science was always studied and taught; constant practice, interpreting and correcting theories, safeguarded it against pedantry; and a class of magnificent staff officers were trained, who in the 10th century were the terror of the enemy. The particular tactics of the various foes whom they had to face were critically studied. We have a series of military text-books, from the time of Anastasius I. to that of Basil II., in which we can learn their principles and methods. In this army there was plenty of courage, and distinct professional pride, but no love of fighting for fighting's sake, nor the spirit which in western Europe developed into chivalry. The Byzantines despised such ideas as character- istic of barbarians who had physical strength and no brains. The object of a good general, as Leo VI. shows in his important treatise on Tactics, was in their opinion not to win a great battle, but to attain success without the risks and losses of a great battle. The same author criticizes the military character of the Franks. Paying a tribute to their fearlessness, he points out their want of discipline, the haphazard nature of their array and order of battle, their eagerness to attack before the word was given, their want of faculty for strategy or tactical combinations, their incapacity for operations on difficult ground, the ease with which they could be deceived by simple artifices, their carelessness in pitching camps, and their lack of a proper intelligence department. These criticisms, borne out by all we know of feudal warfare, illustrate the contrast between a western host, with its three great " battles," rushing headlong at the foe, and the Byzantine army, with its large number of small units, co-operating in perfect harmony, under a commander who had been trained in military science, had a definite plan in his head, and could rely on all his subordinates for strict and intelligent obedience.

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ROMAN EMPIRE, LATER

Under the early Empire, as Rome had no rival in the Mediter- ranean, it was natural that the navy and naval theory should be neglected. When Constantine the Great decided to besiege Byzantium by sea, both he and his opponent Licinius had to create fleets for the struggle. Even when the Vandals in Africa made transmarine conquests and became a naval power, the Romans did not seriously address

themselves to building an efficient navy and securing their own thalassocracy ; the Vandals harried their coasts; their expeditions against Africa failed. And even when the Vandal power was in its decline and Belisarius set forth on his successful expedition of conquest, his fears for the safety of his squadron in case he should be attacked at sea allow us to suspect that the fleet of the enemy was superior to the Roman. The conquest of Africa secured for Justinian the undisputed command of the Mediterranean, but he did nothing for the naval establishment. It was not till the Saracens, aspiring to conquer all the Mediterranean coastlands, became a naval power that the Roman Empire was forced, in a struggle for its being, to organize an efficient fleet. This, as we saw, was the work of Constans II., and we saw what it achieved. In this first period (c. 650-720) the naval forces, designated as the Karabisianoi, were placed under the command of an admiral, with title of strategos. They consisted of two geographical divisions, each under a drungarios: the province of the Cibyrrhaeots (prob- ably named from the smaller Cibyra in Pamphylia) which included the southern coast districts of Asia Minor, and the Aegean province, which embraced the islands and part of the west coast of Asia Minor. The former was the more important; the marines of this province were the hardy descendants of the pirates, whose subjugation had taxed the resources of the Roman government in the last years of the Republic. It was a new principle to impose the burden of naval defence on the coast and island districts. Distinct from these fleets, and probably organized on a different principle, was the naval contingent stationed at Constantinople. Leo III. changed the naval administration, abolishing the supreme command, and making the Cibyrrhaeot and Aegean provinces separate independent themes under strategoi. The change was due to two motives. There was a danger lest a commander of the whole navy should become over

EDwerful (indicated in the political r&le played by the navy before eo's accession) ; but apart from this, the general reform of Leo, which united civil and military powers in the same hands, naturally placed the commanders of the two branches of the navy on a new footing, by making them provincial governors. In this and the following reigns, the tendency was to neglect the fleet ; the interest of the government was concentrated on the army. For a time this policy was prosecuted with impunity, since the Omayyad dynast)' was growing weak, and then under the Abbasids, who transferred the capital from Damascus to Bagdad, the sea-power of the caliphate declined. But the neglect of the fleet was avenged in the 9th century, when Crete and Sicily were wrested from the Empire, the loss of south Italy was imminent, and Moslem squad- rons sailed in the Adriatic, — losses and dangers

which led to a reorganization of the navy under Basil I. and Leo VI. After this reform we find the navy consisting of two main contingents: the imperial fleet (stationed at Constantinople), and the provincial fleets, three in number, of (a) Cibyrrhaeot theme, (V) Aegean theme, (e) theme of Samos. A small distinct contingent was supplied by the Mardaites who, natives of Mt. Lebanon, had been transplanted (partly to Pamphylia, partly to Epirus, the Ionian Islands, and Peloponnesus). The imperial fleet seems to have consisted of about 100 warships manned by 23,000 marines (the same men fought and rowed) ; the provincial fleets of 77 warships manned by 17,000. When the fleets acted together, the admiral in supreme command for the time was called the ” drungarios of the naval forces.” The warships (Sponwvts, “dromonds”) were mainly biremes, but there were also uniremes, built for speed, called “galleys” (70X0401). Pyrotechnic was an important department in the naval establish- ment ; the manufacture of the terrible explosive known as liquid or marine fire (see Greek Fire) was carefully guarded as a state secret.

The navy, active and efficient in the 10th century, is described by a military and therefore unprejudiced officer of the nth as the glory of Romania. But towards the end of the nth century it declined, the main cause being the disorganization of the naval provinces of Asia Minor, which, as we saw, was a result of the Seljuk conquest of the interior. This decline had important in- direct consequences; it led to the dependence of the Empire on the Venetian navy in the struggle with the Norman power, and for this help Venice exacted commercial privileges which injured Byzantine commerce and opened the door to the preponderant influences of the Venetians in eastern trade. In the period of the Palaeologi the imperial navy, though small, was active; and the importance which it possessed for the state is illustrated by the high rank at court which the admiral (who in the nth century had received the title of Great Duke, fikyas 5o6|) then occupied; the only minister who was superior to him was the Great Domestic.

Diplomacy. — In protecting the state against the barbarians who surrounded it, diplomacy was a weapon as important in the eyes of the Byzantine government as soldiers or fortifications.

The peace on the frontiers was maintained not only by strong military defences, but by more or less skilful management of the frontier peoples. In the later Empire this kind of diplomacy, which we may define as the science of managing the barbarians, was practised as a fine art; its full development was due to Justinian. Its methods fall under three general heads. (1) One people was kept in check by means of another. The imperial government fomented rivalry and hatred

among them. Thus Justinian kept the Gepidae in check by the Lombards, the Kuturgurs by the Utigurs, the Huns by the Avars. (2) Subsidies were given to the peoples on the frontiers, in return for which they undertook to defend the frontier adjacent to them, and to supply fighting men when called upon to do so. The chiefs received honours and decorations. Thus the Berber chiefs on the African border received a staff of silver, encrusted with gold, a silver diadem, white cloak, em- broidered tunic, &c. More important potentates were invested with a costlier dress. In these investitures precedence was carefully observed. The chiefs thus received a definite position in the Empire, and the rich robes, with the ceremony, appealed to their vanity. In some cases they were admitted to posts in the official hierarchy, — being created Patricians, Masters of soldiers, &c. They were extremely fond of such honours, and considered themselves half-Romans. Another mode of winning influence was to marry barbarian princes to Roman wives, and rear their sons in the luxury of the palace. Dissatisfied pre- tenders, defeated candidates for kingship, were welcomed at Constantinople. Thus there were generally some princes, thoroughly under Byzantine influence, who at a favourable opportunity could be imposed on their compatriots. Through- out Justinian's reign there was a constant influx of foreign potentates to Constantinople, and he overwhelmed them with attentions, pompous ceremonies and valuable presents. (3) Both these methods were already familiar to the Roman govern- ment, although Justinian employed them far more extensively and systematically than any of his predecessors. The third method was new and characteristic. The close connexion of religion and politics at Constantinople prepares us to find that Christian propaganda should go hand-in-hand with conquest, and that the missionary should co-operate with the soldier. The missionary proved an excellent agent. The typical procedure is as follows. In the land which he undertakes to convert, the missionary endeavours to gain the confidence of the king and influential persons, and makes it a special object to enlist the sympathies of the women. If the king hesitates, it is suggested that he should visit New Rome. The attraction of this idea is irresistible, and when he comes to the capital, the pomp of his reception, the honours shown him by the emperor, and the splendour of the religious ceremonies overcome his last scruples. Thenceforward imperial influence is predominant in his dominion; priests become his advisers; a bishop is consecrated, dependent on the patriarch of Constantinople; and the bar- barians are transformed by the penetration of Byzantine ideas. By the application of these various means, Justinian established Roman influence in Nubia, Ethiopia and South Arabia, in the Caucasian regions, and on the coast of the Euxine. The con- version of the Lazi (of Colchis) was

specially notable, and that of the Sabiri, who were politically important because they commanded the eastern pass of the Caucasus known as the Caspian Gates. It will be observed that the great prestige of the Empire was one of the conditions of the success of this policy.

The policy had, of course, its dangers, and was severely criticized by one of Justinian's contemporaries, the historian Procopius. Concessions encouraged greater demands; the riches of the Empire were revealed. It was a system, of course, which could not be permanently successful without military power behind it, and of course it was not infallible; but in principle it was well-founded, and proved of immeasurable value. Less prejudiced writers than Procopius fully admit the far-sightedness and dexterity of the emperor in his diplomatic activity. A full account of it will be found in Diehl's Justinien.

In the 10th century we have again the means of observing how the government conducted its foreign policy on carefully

thought out principles. The Empire was then exposed to constant danger from Bulgaria, to inroads of the Magyars, and to attacks of the Russians. The key to the diplomatic system, designed to meet these dangers, was the cultivation of friendly relations with the Petchenegs, who did not menace the provinces either by land or sea and could be incited to act against Russians, Bulgarians or Magyars. The system is explained in the treatise (known as De adminislrando imperio) composed by the emperor Constantine Porphyrogennetos (c. 950). The series of these northern states was completed by the kingdom of the Khazars (between the Caucasus and the Don), with which the Empire had been in relation since the time of Heraclius, who, to win its co-operation against Persia, promised his daughter in marriage to the king. Afterwards the Khazars gave two empresses to New Rome (the wives of Justinian II. and Constantine V.). Their almost civilized state steered skilfully between the contending influences of Islam and Christianity, and its kings adopted the curious means of avoiding suspicion of partiality for either creed by embracing the neutral religion of the Jews. Commercial and political relations with the Khazars were maintained through the important outpost of the Empire at Cherson in the Crimea, which had been allowed to retain its republican constitution under a president (■jrpornvuv) and municipal board (apxovres), though this free- dom was limited by the appointment of a

strategos in 833, a moment at which the Khazars were seriously threatened by the Petchenegs. The danger to be feared from the Khazars was an attack upon Cherson, and it seems probable that this was a leading consideration with Leo III. when he wedded his son Constantine V. to a Khazar princess. In the 9th century it was an object of the government to maintain the Khazars (whose army consisted mainly of mercenaries) against the Petchenegs; and hence, if it should become necessary to hold the Khazars in check, the principle was to incite against them not the Petchenegs, but other less powerful neighbours, the Alans of the Caucasus, and the people of "Black Bulgaria" on the middle Volga (a state which survived till the Mongol conquest).

For this systematic diplomacy it was necessary to collect information about the peoples whom it concerned. The ambas- sadors sent to the homes of barbarous peoples reported every- thing of interest they could discover. We owe to Priscus a famous graphic account of the embassy which he accompanied to the court of Attila. We possess an account of an embassy sent to the Turks in Central Asia in the second half of the 6th century, derived from an official report. Peter the Patrician in Justinian's reign drew up careful reports of his embassies to the Persian court. When foreign envoys came to Con- stantinople, information was elicited from them as to the history and domestic politics of their own countries. It can be shown that some of the accounts of the history and customs of neighbouring peoples, stored in the treatise of Constantine Porphyrogennetos referred to above (furnishing numerous facts not to be found anywhere else), were derived from barbarian ambassadors who visited Constantinople, and taken down by the imperial secretaries. We may conjecture with some pro- bability that the famous system of the Relazioni, which the Venetian government required from its ambassadors, goes back originally to Byzantine influence.

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(J. B. B.)

ROMANES, GEORGE JOHN (1848-1894), British biologist, was born at Kingston, Canada, on the 20th of May 1848, being the third son of the Rev. George Romanes, D.D., professor of Greek at the university of that town. He was educated in England, going in 1867 to Gonville and Caius College, Cam- bridge. He early formed an intimate friendship with Charles Darwin, whose theories he did much during his life to popularize and support. When studying under Sir J. Burdon Sanderson at University College, London, in 1874-76, he began a series of researches on the nervous and locomotor systems of the Medusae and Echinodermata, which provided him with material for his Croonian lecture in 1876. Subsequently he continued the inquiry, partly in conjunction with Professor J. Cossar Ewart, and the results were published in Jelly-fish, Star-fish, and Sea-urchins (1885). Meantime he had been also devoting his attention to broader problems of biology. In 188.1 he published Animal Intelligence, and in 1883 Mental Evolution in Animals, in which he traced the parallel development of intelligence in the animal world and in man. He followed up this line of argument in 1888 with Mental Evolution in Man, in which he maintained the essential similarity of the reasoning processes in the higher animals and in man, the highest of all. In 1892 he brought out an Examination of Weismannism, in which he upheld the theory of the hereditability of acquired characters. In 1890 he left London and settled at Oxford, where he founded a lecture similar to the " Rede " of Cam- bridge, to be delivered annually on a scientific or literary

topic. In 1893 he published the first part of Darwin and after Darwin, a work dealing with the development of the theory of organic evolution, and based on lectures, which he delivered as Fullerian professor of physiology at the Royal Institution in 1888-91; a second part appeared in 1895 after his death, which occurred at Oxford on the 23rd of May 1894.

Romanes was awarded the Burney prize at Cambridge in 1873 for an essay on ” Christian Prayer and General Laws.” Five years later, under the pseudonym ” Physicus,” he issued A Candid Examination of Theism, in which he showed himself out of accord with orthodox religious beliefs. In 1882 he published an article on the ” Fallacy of Materialism,” and in his Rede lecture of 1885 he appeared as a monist. Subset quently his views again changed in the direction of orthodoxy, as is shown by his Thoughts on Religion, written shortly before his death and published in 1895.

His Life and Letters, by his widow, appeared in 1896.

ROMANIN, SAMUELE (1808-1861), Venetian historian, was born of a poor Jewish family at Trieste. Being left an orphan at an early age, he provided for his younger brothers and sister by giving French and German lessons. In 1821 be settled in Venice, where he afterwards translated Hammer-PurgstaH’s Geschichte des osmanischen Reiches into Italian. He next pub- lished his own Storia del Popoli Europei (Venice, 1843-44). He taught in a. private school and was sworn interpreter in German to the courts of justice; on the expulsion of the Austrians in 1848 he was appointed professor of history by the provisional government, and he lectured on Venetian history at the Ateneo Veneto. In 1852 he began to publish his monumental Storia documentata di Venezia, but although he finished the work, carrying it down to the fall of the republic in 1798, he did not live to see the publication completed, as he died of apoplexy on the 9th of September 1861; among his papers were found all the documents which were to be added,

and the index. The tenth and last volume was issued in

1861.

After Romanin's death his lectures on Venetian history were published in two volumes (Florence, 1875). Among his minor works we may mention: Gli Inquisitor* di Stato di Venezia (Venice, 1858), Bajamonte Tiepolo e le sue ullime vicende (Venice, 1851), and Venezia nel 17&Q (Venice, i860).

ROMAN LAW. 1 The term " Roman law " is indefinite and ambiguous, being used in more than one sense. First, in a wide sense, it comprehends the totality of the laws of the Roman state, which were observed by its subjects during about thirteen centuries, from Romulus to Justinian. In a second and stricter meaning it indicates the law as consolidated by Justinian or, in other words, the law contained in the Corpus Juris Civilis, which is the name that has been given since the 16th century to Justinian's legislative works as a whole, and distinguishes them from the Corpus Juris Canonici. In this acceptation it is equivalent to, and is often called, " civil law " as contrasted with canon law. In a third and loose sense Roman law em- braces, in addition to the Corpus Juris, the interpretations of it after Justinian by medieval and modern courts, jurists and commentators adapting it to the customs and laws of their own countries and times. The German expression, for example, modernes (or heuliges) romisches Recht, indicates the Roman law as it was applied in Germany in modern times. Such medieval and modern interpretation, however, is also some- times expressed, in English usage at least, by the term "civil law " as contrasted with native or common law; writers in this field being usually styled civilians rather than Romanists. It is to the Roman law in the first of the above-mentioned three significations that the present article is devoted.

To give a proper sketch of Roman law it must be treated historically. Nearly all systems of positive law are the product more or less of an historic development, but the Roman tor " has tn is great advantage over other systems, that it historic was at all times a homogeneous body complete in itself. treat- jr or t ne Romans were comparatively little indebted to

me ' other peoples for their jurisprudence, and, when they did borrow legal ideas and institutions from others, they generally transformed or modified these in adapting them to their own native system, so that they became substantially Roman. Moreover, the various stages of progress of the law from its genesis to its maturity and ultimate consolidation can be traced in unbroken continuity. Beginning in 753 B.C., the traditionally accepted date of the foundation of Rome, it con- tinued its course till the death of Justinian in a.d. 565. Allow- ing for the first three centuries being without historic evidence, we have at

least an authenticated evolution of about 1000 years. Of no other system of law, ancient or modern, can anything like the same thing be said.

As to the proper method of historic treatment there have been different opinions. Without going into these, it is enough to say that the subject may be treated from two sides, viz. on the one side in relation to the external sources of the law, including therein the political and social conditions and the various constitutional changes at different periods affecting the development of the law, as well as the modes in which the law manifested itself and the legal literature from which our knowledge of it is derived; on the other side it may be treated in relation to the several departments or institutions of the law in view of their development or changes through time or circumstance, such as marriage, slavery, property, and so forth. This corresponds to what Leibnitz described as external and internal history respectively, terms which are now rather out of vogue. Of course it is possible to treat the historic sources of the law, constitutional and literary, independently of the doctrines, and this is now often done; but unless both are discussed the field of Roman law is not covered. Both the external and the

1 This article represents a recast of the article contributed to the 9th edition of the Encyclopaedia by the late Professor Muir- head. A large part of that article has been retained by the present writer, and the plan of arrangement, though altered in some respects, has been adhered to in the main.

internal history, however, may be treated together or in a measure interwoven, and it is in this way that the subject is treated in the following pages. But constitutional events affecting the law are only noticed very summarily, details about these being given in separate articles.

Modern writers on the history of the Roman law have as a rule, for the purpose of systematic treatment, divided the subject into definite historic periods. Gibbon, in the Division 44th chapter of his Decline and Fall of the Roman into Empire, seems to have been the first to suggest this historic mode of treatment, though the particular periods of epochs. division he selected (being based on an artificial symmetry of about three hundred years each) are not satisfactory. 2 In the present article, the division made by Muirhead in his article in the 9th edition of this Encyclopaedia into five historic epochs has been left unaltered. These are: (1) the regal period; (2) the jus civile, representing the period from the establishment of the Republic until

the subjugation of central and southern Italy; (3) the jus gentium and jus honorarium, representing the latter half of the Republic; (4) the jus naturale and maturity of Roman jurisprudence, representing the period of the Empire until the beginning of the reign of Diocletian; (5) the period of codifica- tion, i.e. from Diocletian to Justinian. Not that there is any sharp or fundamental division between these or, indeed, between any historic epochs. The law is a unity: it has its roots in the past and grows with the nation itself, and, like it, decays; there is no break in its continuity. The division is made merely for convenient treatment of the subject.

It must be kept in view that our knowledge of Roman customs and laws earlier than the XII. Tables and even for some time after them cannot be based on strict historical evidence; it is almost entirely traditional and conjectural, and different writers will take different views according to the relative value they place upon this or that piece of presumptive evidence.

It is only the private law that is dealt with in the present article.

I. The Regal Period i. The People and the Law.

The Beginnings of the Slate. — The early Romans were not different from other Indo-European communities in their essential characteristics. The tribe, the clan, the family, the individual: each of these appears in course, of development prior to the XII. Tables. Putting aside much of the traditional accounts of Livy, Dionysius, and other ancient historians, regarding the foundation of Rome and its early political and social life, as mythical, modern critical historians are none the less agreed that in the earliest period of their existence as a settled community the Romans were subjected to the govern- ment of a king {rex), with a council of elders (senatus) and an assembly of burghers (comitia curiata).

It used to be a somewhat common opinion that the primitive Romans were a sort of amalgam of three different races — Latin, Sabine and Etruscan. This opinion is mainly based upon the tradition that the state was originally formed by a union of three tribes called Ramnes, Tities and Luceres; the Ramnes being of the Latin race, the Tities of the Sabine and the Luceres of the Etruscan. Attempts have even been made to find in the Roman laws and institutions traces of the influence of each of these races, and especially of the first two — palria potestas and manus, for example, being attributed to the Latin or dominant race; adoption and confarreation to the Sabine; forms and cere- monial (such as lictors, fasces, &c.) to the Etruscan. 3 But this

attractive theory of a union of three races, apart from the suspicion of a symbolic trichotomy (tres tribus) due to later times, is based on no substantial evidence; 4 many of the

2 See as to historic epochs Muirhead, Hist. Introd. to the Law of Rome (2nd ed. by Goudy, 1899), p. 421.

3 See Muirhead, Historical Introduction (2nd ed., 1899), pp. 3-5, and authorities there cited.

4 Some writers deny the existence of the tribes altogether, but this goes too far. See Bruns-Lenel in Holtzendorff's Encyklo- padie d. Rechtswissenschafl, i. p. 86".

Patri- cians,

The geates.

institutions attributed to the Sabines and Etruscans were, as Mommsen and others have shown, common to all peoples of Greek-Italian stock, and could not be strange to the Latins. We must hold that the Romans were essentially a Latin race, though influenced by a considerable admixture with Sabine and, to a lesser degree, Etruscan races (see Rome).

Patricians, Clients and Plebeians. — But whatever their ethno- graphic descent, it is pretty certain that the Roman civitas Divisions was in the earliest period an organization that was 0/ the patriarchal in its essence, but in which there was to be people. distinguished, on the one hand, a dominant class enjoy- ing all the rights of citizenship, and, on the other, a semi-servile or quasi-vassal class excluded from such rights. The former class were called patricii or Quirites; 1 the latter were called clientes and (later) plebeii.

Patricians. — There was part of the law of Rome that even in the Empire was known by the name of jus Quiritium, and this in the regal period was the only law. The patricians at first were the Quirites, and prior at least to the time of Servius Tullius they alone enjoyed rights under this law. From their number the council of elders was selected; they alone could take part in the curiate comitia; they alone could

contract a lawful marriage and make a testament; in a word, all the peculiar institutions of early Rome were for their benefit alone.

But these rights and prerogatives they enjoyed as members of gentes or clans, the clans being aggregations of families bear- ing a common name and theoretically at least tracing their descent from a common ancestor. These clans, of which there were normally three hundred altogether according to a rather doubtful tradition, were organized consti- tutionally in curies. Of the curies, again, there were thirty in all, there being probably ten in each of the three tribes, organized primarily for military and secondarily for political and religious purposes. Though for the federation of the curiae and gentes Rome required a common ruler and common institutions, religious, military and political, yet it was long before such federation into a state displaced entirely the separate institu- tions of the several gentes. Every clan had its own cult peculiar to its own members. It had its common property and its common burial-place. It probably had some common council or assembly, for we read not only of special gentile customs, but of gentile statutes and decrees. Tradition records instances of wars waged by individual gentes, indicating that they had the right to require military service alike from their members and dependants. Widows and orphans of deceased clansmen were under the guardianship of the gens or of some particular member of it to whom the trust was specially confided. If a clansman left no descendants, his property passed to his fellow- gentiles. Finally, its members were always entitled to rely upon its assistance, to have maintenance when indigent, to be ransomed from captivity, and to be avenged when killed or injured.

Along with the gentiles there were in Rome from the earliest period other persons known by the name of clientes (clients). Their origin is wholly unknown. Some of them may have been the original inhabitants of Rome and their descendants, but more probably they were mostly immigrants from other communities or citizens of conquered towns whom the Romans were unable or unwilling to treat as slaves. Some may have been slaves to whom liberty de facto had been given. Following a custom familiar both to Latins and Sabines, such persons were placed under the protection of the heads of patrician families. The relationship was hereditary on both sides, and known as that of patron and client. The client 2 1 The derivation of the name is uncertain, and ancient writers differed about it. It probably comes either from quiris, a Sabine word for a spear, or from curia. The derivation from Cures is inadmissible. See Mommsen, Rom. Staatsrecht (1887, 1888), iii. 1,

2 The derivation of cliens from cluere indicates the relationship — one who is called on, who hearkens. The theory that clientage

Clients.

became a dependent member of his patron's clan— not gentilis but genlilicius. His patron had to provide him with what was necessary for his sustenance and that of his family; and, as ownership or possession of lands increased in extent, it was probably not unusual for the patron or his gens to give him during pleasure a plot of land to cultivate for himself. The patron had, moreover, to assist him in his transactions with third parties, and obtain redress for him when injured. The client, on the other hand, had to maintain his patron's interests by every means in his power. But the advantage must have been chiefly. on the side of the client, who, without becoming a citizen, obtained directly the protection of his patron and his clan, and indirectly that of the state. A large number of clients attached themselves to and received protection from the king as patron—" royal clients," as Cicero calls them.

The plebeians (plebs, from irKijdos, meaning crowd), as distinguished from the clients, must be regarded as a hetero- geneous mass of non-gentile freemen. It used to be the prevailing opinion among modern writers, following the Roman historians, that the plebeians existed as a body since the very beginning of the city. They were thought to be mainly composed of immigrants and refugees who, while being allowed personal liberty, declined to submit themselves to a patron. But recently a theory of Mommsen, based on solid philological and other grounds, has obtained wide adhesion and tends to become the dominant one. Mommsen's view is that at first there were only two classes in the community, the patricians and clients, or, in other words, that the only plebeians were the clients who, as such, possessed only quasi-liberty (Halbfreiheif), and that it was not till after a century or two that the practice of voluntary clientage began to decay and the class of plebeian freemen arose. This was partly due to gentes dying out, so that the clients attached to them were left without patrons; partly to the numbers of foreigners at Rome (through transplantation of the inhabitants of conquered cities and otherwise) having become so large that they felt themselves sufficiently powerful to do without protection; and partly to other causes. 3

However this be, it is generally admitted that, during the latter part of the present epoch at least, plebeians existed as a body composed of

individuals of mixed races not united by any gentile organizations of their own nor attached to any Roman gentes. Tradition attributes to Numa the formation of gilds or societies of craftsmen, such as potters, carpenters, gold- arid silver-smiths (collegia opificum) at Rome, eight or nine in number. This, though probably a myth as regards • Numa, may be taken as slight evidence of the creation among the plebeians of associations for trade and other purposes, that to some extent compensated them for the want of gentile organization. These gilds seem to have had a common cult and a common council to arrange disputes and consolidate customs. Between the brethren (sodales) there was a bond of close alliance and interdependence, each owing duty to the other similar to what might be claimed from a guest or a kinsman.

The Regulatives of Public and Private Order.- — It would be absurd to expect any definite system of law in those early times. What passed for it was a composite of fas, jus and boni mores, whose several limits and characteristics it is extremely difficult to define. This may to some extent be accounted for by the fact that much of what was originally within the domain of fas, once it had come to be enforced by secular tribunals, and thus had the sanction of human authority, was no longer distinguishable from jus; while it may be that others of its behests, once pontifical punishments for their contravention had gone into desuetude, sank to nothing higher than precepts of boni mores.

arose from the voluntary subjection of poorer citizens to the rich is an hypothesis supported by no satisfactory authority.

3 Mommsen, Staatsrecht, iii. 1, pp. 66 seq. and pp. 127 seq. For a different view, Karlowa, Rom. Rechtsgeschichte, i. 62. Cf. Cuq, Instil. jurid. des Romains (2nd ed., 1904-8), i. 11-12.

By fas 1 was understood the will of the gods, the laws given by heaven for men on earth, much of it regulative of ceremonial, but a by no means insignificant part embodying rules of conduct. It appears to have had a wider range than jus. It forbade that a war should be undertaken without the prescribed fetial ceremonial, and required that faith should be kept even with an enemy when a promise had been made to him under sanction of an oath. It enjoined hospitality to

foreigners, because the stranger guest was presumed, equally with his entertainer, to be an object of solicitude to a higher power. It punished murder, for it was the taking of a god- given life; the sale of a wife by her husband, for she had become his partner in all things human and divine; the lifting of a hand against a parent, for it was subversive of the first bond of society and religion, — the reverence due by a child to those to whom he owed his existence; incestuous connexions, for they denied the altar; the false oath and the broken vow, for they were an insult to the divinities invoked; the dis- placement of a boundary or a landmark, not so much because the act was provocative of feud, as because the march-stone itself, as the guarantee of peaceful neighbourhood, was under the guardianship of the gods. Some breaches of fas were expiable, usually by a peace-offering to the offended god; others were inexpiable. When an offence was inexpiable, the punishment was usually what is called sacratio capitis, excommunication and outlawry of the offender. The precepts of the fas therefore were not mere exhortations to a blameless life, but closely approached to laws, whose violation was visited with punishments none the less effective that they were religious rather than civil.

The derivation of the word jus is disputed. The usual deri- vation is from the Sanskrit, ju, to ” join, bind or unite,” from which some deduce as its signification ” that which “*’ binds,” “the bond of society,” others ” that which

is regular, orderly or fitting.” Breal identifies it with the jos or jaus of the Vedas, and the jaes or jaos of the Zend- Avesta — words whose exact meaning is controverted, but which he interprets as “divine will or power.” 2 If Breal’s definition can be adopted we obtain a very significant inter- pretation of the words addressed by the presiding magistrate to the assembled comitia in asking them whether they assented to a law proposed by him, — Velitis, jubeatis, Quirites, &c, ” Is it your pleasure, Quirites, and do you hold it as the divine will, that,” and so on. As legislation by the comitia of the curies and centuries was regarded as a divine office, and their • vote might be nullified by the fathers on the ground that there had been a defect in the auspicia, and the will of the gods consequently not clearly ascertained, this explanation of Breal’s seems not without support, — vox populi vox dei. If it be right, then the main difference between fas and jus was that the will of the gods, which both embodied, was in the one declared by inspired and in the other by merely human agency.

This/«.y might be the result either of traditional and inveter- ate custom (Jus moribus constitulum) or of statute (lex). 3 As to the

customs, it can well be believed that at the outset they were far from uniform; that not only the customs of the three original tribes but those also of the different gentes varied,

1 Breal derives fas from the Greek Bk/us. It signifies the divinely inspired word. Breal et Bailly, 101.

2 Nouv. rev. hist. (1883), p. 605. But see J. Schmidt in Mommsen, Staatsrecht, iii. 310 n.

- For the distinction between jus and lex, see Mitteis, Romisches Privatrecht (1908), i. 30 seq. There is some controversy about the etymology of the word lex. See Breal, I.e. p. 610; Schmidt in Mommsen, S.R. iii. 308 n. While lex is often used like jus to express law generally, it early acquired two distinct meanings, viz. (1) an obligation of any kind expressly incorporated in a private deed {lex privata), as in the phrases lex mancipii, lex contractus, &c. ; (2) a comitial enactment, hence occasionally called lex publico (Gaius, i. 3 and ii. 104). But by the jurists of the Republic this latter meaning was extended so as to cover all laws resulting from the will of the people, including, for example, plebiscites and even senatorial or proconsular ordinances (leges datae).

and that they only gradually approximated, and in course of time consolidated into a general jus Quiritium. Of legislation there was, so far as is known, practically almost nothing

What went by the name of boni mores (as distinct from jus moribus constitutum) must also be regarded as one of the regulatives of public and private order Part of what fell within their sphere might also be expressly mores. regulated by jas or jus; but there was much that was only gradually brought within the domain of these last, and even down to the end of the Republic not a little that remained solely under the guardianship of the family tribunal or the censor’s regimen morum. The functions of those who took charge of boni mores were twofold: sometimes they restrained by publicly condemning — though they could not prevent — the ruthless and unnecessary exercise of legal right, as, for example, that of the head of the house over his depend- ants, and sometimes they supplied deficiencies in the law by requiring observance of duties that could not be enforced by any legal process. Dutiful service, respect and obedience from inferiors to superiors, chastity, and fidelity to engagements, express or implied (fides), were among the qfficia that were thus inculcated, and whose neglect or contravention not only affected the reputation, but often

entailed punishments and disabilities, social, political or religious. It was the duty of those in avthority to enforce their observance by such animadversio as they thought proper — the paterfamilias in his family, the gens among its members, the king in relation to the citizens generally; and many a wrong was prevented not by fear of having to make reparation to the party injured but by the dread of the penalties that would follow conduct unbecoming an upright citizen.

That the bulk of the law during the regal period was customary is universally admitted, and that no laws were committed to writing prior to the XII. Tables is generally believed. Yet the jurist Pomponius, a e ** s

rcgi&c,

contemporary of Hadrian, speaks of certain laws enacted by the comitia of the curies, which he calls leges regiae and which, he says, were collected by one Sextus Papirius, a prominent citizen in the reign of Tarquinius Superbus, under the name of Jus Papirianum. 4 We are also told by Paul that this work was commented on by a certain Granius Flaccus, 6 who was, it is supposed, of the time of Julius Caesar or Augustus. No remains of this Jus Papirianum are extant, but we have a considerable number of so-called leges regiae cited by Livy, Dionysius and others, which contain rules of the private law relating.,almost entirely to matters of fas and which appear to have been enacted under the kings We are also told by Servius, the commentator on Virgil, that there was a work known to Virgil called de Ritu Sacrorum, in which leges regiae were collected. 6 The authenticity of these laws, however, is disputed, and the question is one of difficulty. Some modern writers of high authority (e.g. Mommsen hold that the Jus Papirianum is an apocryphal compilation made from ponti- fical records about the close of the Republic. 7 It has even been attributed (the suggestion was first made apparently by Gibbon) to Granius Flaccus himself. Nevertheless, the internal evidence from the character and language of the laws them- selves (apart from the weight that must be given to the testimony of Pomponius, Servius and other ancient writers) is favourable to their great antiquity, and it is best to accept the view that the leges regiae are authentic remains of laws of the regal period. This does not, however, involve the belief that they were collected by Papirius, nor that they were enactments of the comitia curiata, as Pomponius says. They seem rather to have been regulations made by the king at his own hand.

4 Dig. i. 2. 2, § 2 and § 36. In the latter passage Papirius is given the

praenomen Publius. 6 Dig. 1. 16, 144.

6 Serv.,-*» Aeneid, 12, 836, cited in Bruns, Fontes, p. 3.

7 It has been suggested that a work of the jurist Manilius men- tioned by Pomponius (Dig. i. 2. 2, § 39) is its source (Zeitsehrift d. Sav. Stift. xxiv. 420J, . .

or perhaps old-established customs formulated by the higher pontiffs and ascribed to the kings. 1

It is also stated by Dionysius that under Servius Tullius various laws, fifty in number, dealing with contracts and delicts, were enacted in the comitia of the curies. 2 But we have no corroboration of this, and recent writers are now generally agreed in regarding the statement as a legend.

ii. Reforms of Servius Tullius.

It is generally agreed that towards the end of the regal period, and connected with the king traditionally called Servius Tullius, a great reform of the constitution took place, which exercised much influence on the subsequent development of the law. No doubt there is a good deal of myth attached to the name of Servius, who seems to have been regarded by later Romans as a popular monarch, like Alfred by the English, but the main features of the traditional account of the constitutional reforms of this period may be taken as based on fair presumptive evidence. That all of them indeed were evolved from one brain is hardly credible, and that some of them were in observ- ance de facto before being made constitutionally binding is very likely.

The design attributed to Servius was that of altering the old constitution in order to promote an advance towards equality between patricians and plebeians. He is credited with having desired, on the one hand, to ameliorate the position of the plebs and, on the other, to make them bear a proportionate share of the burdens of the state — in particular, to serve in the army and contribute to the war tax (tribulum). He effected this by giving them qualified rights of citizenship, not indeed by admitting them into the gentile organizations, but by creat- ing a new political assembly of a distinctly

military character in which they as well as the gentiles could take part. The so-called Servian reforms may be roughly summarized under the following four heads, viz. (1) a division of the Roman territory within the city walls into four local wards called tribus (to which a number of tribes outside the city — tribus rusticae — were afterwards in course of time added); (2) the establishment of a register of the citizens {census) which was to contain, in addition to a record of the strength of their families, a statement of the value of their lands, with the slaves and cattle employed in their cultivation, and which was to be revised periodically; (3) a division of the people, as appearing in the census, into five classes for military purposes, determined by the value of their holdings in land and its appurtenances, with a subdivision of each class into so-called centuriae; (4) the creation of a new assembly with legislative power called comitia centuriala, in which the vote was to be taken- by centuriae. While it may be an open question how far these reforms, and particularly the institution of the centuriate comitia, were actually due to Servius, or only a result of his arrangements, the whole conception of the new constitution is obviously of early date and indicative of considerable statesmanship.

The plebeians were thereby made constitutionally part of the populus Romanus; they became citizens (Quirites). 3 They got commercium and also connubium so far that their marriages inter se were recognized as legal marriages. Rights and duties

1 See Clark, Hist, of Rom. Law (1906), i. 16-19; Kipp, Geschichte d. Quellen (1903), pp. 24-25. The most comprehensive treatise on these royal laws, which also contains references to the earlier literature, is that of Voigt, Uber die Leges Regiae (Leipzig, 1876). An exhaustive collection of them, including numerous references to royal institutions by Livy, Dionysius and others, is given in Bruns, Fontes Juris, 6th ed. i. I seq. Another collection is in Girard, Textes, 3rd ed. pp. 3 seq.

2 Dion. iv. 10, 13.

3 The view of some recent writers that the plebeians had at all times participated in the jus Quiritium and were admitted to the curiate comitia and even had gentile rights (see Lenel in Holt- zendorff's Encyklobadie d. Rechtswissenschaft, 6th ed. i. 90 nn. 1, 2, and authorities there cited), must be decidedly negatived. Not only does it render the whole tradition about the Servian reforms untrustworthy, but the accounts of the struggles between patricians and plebs in the early Republic are left largely without meaning

were so far to be measured by each citizen's position as a holder of

lands; the amount of land (including slaves and cattle appurtenant thereto) 4 held by him on quiritarian title was to determine the nature of the military service he was to render, the tribute he was to pay, and his right to take part in the new political assembly. It is indeed probable that a good while before Servius the conception of individual ownership of lands and things necessary for their cultivation had been reached, and that such ownership was recognized not only among the gentiles, but also de facto even more largely among the plebeians. The common lands of the gentes had become split up, to a considerable extent, among families and individuals. However this be, the creation of the census ensured, as far as possible, certainty of title, as it was declared that no transfers of property enrolled in it would be recognized unless made by public con- veyance with observance of certain prescribed formalities. 5 The form of conveyance thus legally sanctioned was called originally mancupium, afterwards mancipium, and at a still later period mancipatio, while the lands and other things that were to pass by it came to be known as res mancipii (or mancipi). Hence arose a distinction of great importance in the law of property (which lasted till Justinian formally abolished it), between res mancipi and res nee mancipi; the former being transferable only by mancipation or surrender in court, the latter by simple delivery (see infra, p. 541).

iii. Institutions of the Private Law.

Law of the Family* — The word familia in Roman law had at once a more extensive and a more limited meaning than it has in its English form. Husband, wife and jbe children did not necessarily constitute an independ patrician ent family among the Romans, as with us, nor were family. they all necessarily of the same one. Those formed a family who were all subject to the power — originally manus? later potestas or jus — of the same head (paterfamilias). The pater- familias was himself a member of the family only in the sense in which a king is a member of the community over which he rules. He might have a whole host dependent on him, wife and sons and daughters, and daughters-in-law and grand- children by his sons, and possibly remoter descendants related through males; so long as they remained subject to him they constituted but one family, that was split up only on his death or loss of citizenship. But if his wife had not passed in manum (a result apparently unknown among the patricians at this period), she did not become a member of his family: she remained a member of the family in which she was born, or, if its head were deceased or she had been emancipated, she constituted a family in her own person. Both sons and

4 Modern writers are not agreed as to whether movable res mancipi were included with lands in the valuation of property for fixing the classes.

5 Or else by cessio in jure, though this may not have been before the XII. Tables, and it was in any case of very limited operation.

6 On tribal family and matriarchate among the Romans in pre-historic times, consult Westermarck, History of Human Marriage (London, 1891); Post, Grundriss der ethnologischen Jurisprudenz, (1894), i. 15-160. Familia and family are used in this section solely to designate the group of free persons subject by birth, marriage or adoption to the same paterfamilias. Strictly the word familia meant the household and all belonging to it. It had also the following principal meanings: (1) a gens or branch of a gens (group of families in the stricter sense) ; (2) the whole body of agnatic kinsmen (familia communi jure) ; (3) the family estate or patrimonium, as in the provisions of the XII. Tables about intestate succession, e.g. adgnatus proximus familiam habeto; (4) the family slaves collectively, as in the phrase familia rustica. See Mommsen, Staatsr. iii. 10 n. 16 n. 22; Rivier, Precis du droit defamille romain (Paris, 1891), § I.

7 This word manus, though in progress of time used technically to express the power (hand) of a husband over his wife in familia, was originally the generic term for all the rights exercised, not only over the things belonging but also over the persons subject to the head of the house — as seen, for example, in the words ” manu- mission ” and ” emancipation.” Cf. Inst. i. 5 pr. It should be observed that among uncivilized peoples there is always a very small vocabulary, and the same word often has to do duty in several senses — e.g. familia, mancipium, nexum, caput.

daughters on emancipation ceased to be of the family of the paterfamilias who had emancipated them. A daughter’s children could never as such be members of the family of their maternal grandfather; for children born in lawful marriage followed the family of their father, while those who were illegiti- mate ranked from the moment of birth as patresfamilias and matresfamilias.

With the early Romans, as with the Hindus and the Greeks, marriage

was a religious duty a man owed alike to his ancestors Marrlare an< ˆ to himself. Believing that the happiness of the dead in another world depended on their proper burial and on the periodical renewal by their descendants of prayers and feasts and offerings for the repose of their souls, it was incumbent upon him above all things to perpetuate his race and his family cult. The Romans were always strictly monogamous. In taking to himself a wife, he was about to detach her from her father's house and make her a partner of his family mysteries. With the patrician at least this was to be done only with divine approval, ascertained by auspicia. His choice was limited to a woman with whom he had connubium (fari-fa-ida) or right of intermarriage. This was a matter of state arrangement; and in the regal period Roman citizens could have it outside their own bounds only with members of states with which they were in alliance, and with which they were connected by the bond of common religious observances. A patrician citizen, therefore, if his marriage was to be reckoned lawful (justae nuptiae), had to wed either a fellow-patrician or a woman who was a member of an allied community. In either case it was essential that she should be outside his sobrinal circle, i.e. more remote in kinship than the sixth degree. The ceremony was a religious one, conducted by the chief pontiff and the flamen of Jupiter, in presence of ten witnesses, repre- sentatives probably of the ten curies of the bridegroom's tribe, and was known as farreum or confarreatio. Its effect was to dissociate the wife entirely from her father's house, and to make her a member of her husband's; for confarreate marriage in- volved in manum conventio, the passage of the wife into her husband's " hand" or power, provided he was himself pater- familias; if he was not, then, though nominally in his hand, she was really subject like him to his family head. Any pro- perty she had of her own — which was possible only if she had been independent before marriage — passed to him as a matter of course; if she had none, her paterfamilias usually provided her a dowry (dos), which shared the same fate. In fact, so far as her patrimonial interests were concerned, she was in much the same position as her children; and on her husband's death she had a share with them in his inheritance as if she had been one of his daughters. In other respects manus conferred more limited rights than patria potestas; for Romulus is said to have ordained that, if a man put away his wife except for adultery or one or two other grave offences, he forfeited his estate half to her and half to Ceres, while if he sold her he was to be given over to the infernal gods. 1

Patria potestas was the name given to the power exercised by a father, or by his paterfamilias if he was himself in polestate,

over the issue of such justae nuptiae. The Roman potestas. jurists boasted that it was a right enjoyed by none

but Roman citizens; and it certainly was peculiar to them in this sense, that nowhere else, except perhaps among the Latin race from which they had sprung, did the paternal power attain such an intensity. The omnipotence of the paterfamilias and the condition of utter subjection to him of his children in potestate became greatly modified in the course of centuries; but originally the children, though in public

‘See Plutarch, Rom. 22; Marquardt, Rom. Altert. v. 7. The question whether a husband could in early law sell his wife is one on which modern writers are not agreed. The better opinion is that he could not do so if the marriage was by confarreation. Apart from the lex regia above mentioned, it would have been incon- sistent with her dignity as materfamilias. There is certainly no trace of its having been done. In marriages by coemption and usus, on the other hand, it is not improbable that it was allowed, though here also there is no evidence of it.

life on an equality with the house-father, in private life, and so long as the potestas lasted, were subordinated to him to such an extent as, according to the letter of the law, to be in his hands little better than his slaves. They could have nothing of their own: all they earned was his; and, though it was quite common when they grew up for him to give them peculia, ” cattle of their own,” to manage for their own benefit, these were only de facto theirs, but de jure his. For offences committed by them outside the family circle, for which he was not prepared to make amends, he had to surrender them to the injured party, just like slaves or animals that had done mischief. If his right to them was disputed, he used the same action for its vindication that he employed for asserting his ownership of his field or his house: if they were stolen, he proceeded against the thief by an ordinary action of theft; if for any reason he had to transfer them to a third party, it was by the same form of conveyance that he used for the transfer of things inanimate. Nor was this all; for, according to the old formula recited in that sort of adoption known as adrogation, he had over them the power of life and death, jus vitae necisque.

It might happen that a marriage was fruitless, or that a man saw all his sons go to the grave before him, and that the paterfamilias had thus to face the prospect of the Adroga- extinction of his family and of his own descent to tioaand the tomb without posterity to make him blessed. To ad °P tloa – obviate so dire a misfortune, he resorted to the practice of adoption, so common in India and Greece. If it was a pater-

familias that he adopted, the process was called adrogation (adrogalio) ; if it was a filiusfamilias it was simply adoptio. The latter, unknown probably in the earlier regal period, was, as we first know it, a somewhat complicated conveyance of a son by his natural parent to his adopter, the purpose of course being expressed; its effect was simply to transfer the child from the one family to the other. But the former was much more serious, for it involved the extinction of one family that another might be perpetuated. It was therefore an affair of state. It had to be approved by the pontiffs, who probably had to satisfy themselves that there were relatives of the adro- gatee to attend to the manes of the ancestors whose cult he was renouncing; and on their favourable report it had to be sanc- tioned by a vote of the curies, as it involved the deprivation of his gens of their possible right of succession to him and possible prejudice to creditors through capitis deminutio. If it was sanctioned, then the adrogaius, from being himself the head of a house, sank to the position of a filiusfamilias in the house of his adopting parent ; if he had had wife or children subject to him, they passed with him into his new family, and so did everything that belonged to him and that was capable of transmission from one person to another. The adopting parent acquired potestas over the adopted child exactly as if he were the issue of his body; while the latter enjoyed in his new family the same rights exactly that he would have had if he had been born in it.

The manus and the patria potestas represent the masterful aspects of the patrician's domestic establishment. Its conjugal- and parental ones, however, though not so prominent in the pages of the jurists, are not to be lost sight of. Dom J stlc The patrician family in the early history of the law was governed as much by fas as by jus. The husband was priest in the family, but wife and children alike assisted in its prayers, and took part in the sacrifices to its lares and penates. As the Greek called his wife the house-mistress, o&riroiva, so did the Roman speak of his as materfamilias, 2 the house-mother. She was treated as her husband's equal. As for their children, the potestas was so tempered by the natural sense of parental duty on the one side and filial affection on the other that in daily life it was rarely felt as a grievance; while the risk of an arbitrary exercise of the domestic jurisdiction, whether in the heat of passion or under the impulse of justifiable resentment, was

2 Materfamilias is used in the texts in two distinct senses — (1) as a woman sui juris, i.e. not subject to any family head; and (2) as a wife in manu mariti.

guarded against by the rule which required in grave cases the paterfamilias to consult in the first place the near kinsmen of his child, maternal as well as paternal. Even the incapacity of the children of the family to acquire property of their own cannot in those times have been regarded as any serious hardship; for, though the legal title to all their acquisitions was in the house- father during his life, yet in truth they were acquired for and belonged to the family as a whole, and he was little more than a trustee to hold and administer them for the common benefit.

The patria potestas, unless the paterfamilias voluntarily put an end to it, lasted as long as he lived and retained his status. The marriage of a son, unlike that of a daughter passing into the hand of a husband, did not release him from it, nor did his children become subject to him so long as he himself was in potestate. On the contrary, his wife passed on marriage into the power of her father-in-law, and their children as they were born fell under that of their paternal grandfather; and the latter was entitled to exercise over his daughters-in-law and grandchildren the same rights that he had over his sons and un- married daughters. But there was this difference, that, when the pater- familias died, his sons and daughters who had re- mained in potestate and his grandchildren by a predeceased son instantly became their own masters (sui juris), whereas grand- children by a surviving son simply passed from the potestas of their grandfather into that of their father.

The acquisition of domestic independence by the death of the family head frequently involved the substitution of the Guard- guardianship of tutors (tutela) for the potestas that laaship had come to an end. This was so invariably of tutors. j n tne case f f ema l es S ui juris, no matter what their age: they remained under guardianship until they had passed by marriage in manum mariii. It was only during pupillarity, however, that males required tutors, and their office came to an end when puberty was attained. It is im- probable that during the regal period a testamentary appoint- ment of tutors by a husband or parent to wife or children was known in practice. In the absence of it the office devolved upon the gens to which the deceased paterfamilias belonged.

Family Organization among the Plebeians. — If perfect identity of customs cannot be assumed to have existed amongst the patrician

gentes in the regal period of Rome, far less can it be supposed to have existed amongst the hetero- geneous population (Latins, Etruscans, Greeks, &c.) of which the plebs was constituted. Nevertheless, contiguity of residence and community of interests tend inevitably to unify customs and cause dissimilarities to disappear, and the plebeians must have not only gradually brought their own customs into unison inter se, but adapted them at the same time in many respects to those of the patricians. Even to those of non-Latin race manus over their wives and potestas over their children would become a desideratum. Though the plebeians seem to have been always excluded from con-farreation, and their matrimonial unions must have been at first informal and irregular from the point of view of the Quirites, two civil modes of acquiring marital manus were available to them after they obtained citizenship, viz. coemptio and usus. Some writers hold that neither of these modes was legally recognized prior to the XII. Tables. 1 This may be so, but it is improbable. As the plebeians obtained by the Servian constitution full capacity for quiritarian ownership, it was at once open to them to adapt the modes sanctioned for acquiring property to the acquisition of marital manus. Coemptio was just a simple adaptation of mancipation above referred to (see also infra, p. 540). It was, as we may infer from what we know of it at a later time, a sale of the woman to the man per aes el libram for a nominal price. The price being fictitious, a piece of copper (rauducculum) was used to represent it, and this was handed over to the seller, who would ordinarily be the woman's paterfamilias, or, if she were sui juris, her gentile tutor. The nuncupatory words used in the ceremony have unfortunately not been preserved; necessarily, of course, they 1 See as to coemptio, Cuq, Institutions juridiques, 2nd ed., i. p. 62.

varied from those of an ordinary mancipation of property. 2 Though called by the jurists a mode of constituting marriage, coemptio, as we know it, was strictly a mode of creating manus; for, though usually contemporaneous with, it might, as Gaius informs us, follow the marriage at any distance of time, and was not dissolved by divorce, but required a separate act of remancipation. Students of comparative law have observed that in coemptio there are clear traces of earlier bride purchase, so common even nowadays among uncivilized tribes, where a real price in cattle or sheep, and not a mere nominal one, has to be paid for the bride. Usus, on the other hand, was a mode of acquiring marital manus by possession of the woman as wife for a certain period of time — long cohabitation. 3 Whether this was recognized by the law prior to the XII. Tables depends probably upon whether usucaption, as . a mode of acquiring property, was settled by

custom earlier than the Tables. Some writers, however, think it older than coemptio, and as a de facto relation prolonged cohabitation as man and wife must have existed from very early times. Comparative historians with good reason trace in usus the relics of primitive bride capture. Both coemption and usus, from the time they were first recognized by the jus Quiritium, undoubtedly created patria potestas and agnatic rights.

Law of Property.* — The history of the early Roman com munity, like many other primitive communities, is marked by the disintegration of the gentes and the growth °1 property individual property. Yet the distribution of landfa/ an

2 One or two writers of the later Empire (e.g. Servius, in Georg. i. 31) describe coemptio as a mutual purchase, the man and woman taking alternately the position of emptor and using nuncupatory words as such; but this seems to be a misapprehension and not consistent with what Gaius says. See the arguments in favour of it in Muirhead, Historical Introduction, 2nd ed. pp. 414-415. Girard, Manuel, 4th ed. p. 150, gives a probable explanation of the mistake of these late authors.

3 It would thus cure defects in a coemption just as usucaption did defects in mancipation.

4 See Giraud, Recherches sur le droit de propriete chez les Romains (Aix, 1838); Mace, Histoire de la propriety fife, chez les Romains (Paris, 1851); Hildebrand, De antiquissimae agri Romani distri- butions fide (Jena, 1862); Cuq, Instil, jurid., 2nd ed., vol. i. pp. 72 seq. ; Beaudouin, La Limitation desfonds de terre (1894), pp. 259 seq.

individual ownership was paramount, it was still considered a disgrace for a man to alienate his heredium. But though the existence of monogamous families seems to imply private ownership to some extent, yet, as formerly indicated, a large part of the Roman territory at, and for a good while after, the foundation of the city must have been gentile lands held by the separate clans for the use of their members. The fact that the majority of the rural tribes bore the names of well- known patrician gentes favours the conclusion that even in the later regal period a good many of the clans still held lands in their

collective capacity. It was at some uncertain time before Servius that there began to be a break-up of these gentile lands and their appropriation by individual members. Under the influence of this movement lands were acquired and held by families and individuals to a large extent. A patrician's holding must have been sometimes pretty large so as to enable him to make grants (so often alluded to by ancient writers) to his clients, but we have no means of estimating the normal size. The heredia were small; even during the Republic there is some evidence (e.g. the traditional story about Cincinnatus) that seven jugera were regarded as the normal extent of a patrician's holding for his own and his family's use. On the other hand, twenty jugera are commonly supposed to have been the qualification for enrolment in the first of the Servian classes. Of course it must be kept in view that a patrician did not necessarily hold all his lands by gratuitous assignation or concession either from the state or from his gens; purchase from the former was by no means uncommon, and it may have been on his purchased lands that his clients were usually placed. Those dependants were also probably employed in large numbers upon those parts of the ager publicus which were occupied by the patricians and were in historic times known as possessiones. These, of course, were not the property of their occupants; it was the lands acquired by assignation or purchase that were alone, apart from the heredia, regarded as theirs ex jure Quiritium.

The traditional accounts of the early distribution of lands among the plebeians are even, if possible, more vague than those Property regarding the patricians. They had apparently become in land holders de facto of land in large numbers before the among Servian reforms. But they can have attained that plebeians. pos iti n only by gradual stages. While their earliest grants of land, probably from the kings, can only have been during pleasure, latterly, as they increased in number and importance, they were allowed to have permanent possession. That those who had means also acquired lands by purchase from the state may be taken for granted. The distinction between de facto possession and ownership was at best a very vague one at this period, and, like the holders of provincial lands in later times, the plebeians might have the benefits of ownership without ownership. The result of the Servian con- stitution was to convert this de facto property or permanent possession into quiritarian ownership. 1

There are some writers who maintain that in the regal period, prior to the Servian reforms, though after the collective owner- Property ship of the gentes had begun to disintegrate, there in mov was no private property in movables. This proposi- aMes. t j on can a j. m0S (-]-,£

accepted only in a qualified sense.

If it be meant that movables generally were not then recognized as objects of quiritarian dominium which could be vindicated by any real action, it may be admitted. But otherwise the distinction between meum and tuum must have been well recognized, de facto at least. Men must have been in the habit of transferring things from one to another by simple delivery in respect of barter, sale or otherwise, and any violent or ” theftuous ” appropriation of things in a man’s occupation would be punished by magisterial authority or by ordinary self-redress by the injured party. A sort of ownership in

1 On this question of land-holding among the early patricians and plebeians, consult Cuq, Institutions juridiques des Romains, 2nd ed., vol. i. pp. 73-76; Bourcart (French translation of Muir- Vead’s Historical Introduction), p, 580, and authorities there cited.

possession must at least have been recognized for movables generally. 2

But apart from this, we must believe that certain kinds of movables, viz. those which have been described as appurtenant to land and necessary for its cultivation — which with land formed the real objects, as distinct from the personal subjects, of the familia — were treated from the time of Romulus down- wards, as in manu of the patresfamilias. These were the res mancipi already referred to. Quiritarian ownership in them, as we have seen, was recognized both for patricians and plebs by the Servian constitution, periodical registration of them in the census and transference by the quasi-public act of manci- pation being probably required. Earlier even than with lands, the conception of private ownership, it has been said, connected itself with them. 3

A short explanation may now be given of the ceremony of man- cipation and the nature of res mancipi.

Mancipation is described by Gaius, with particular reference to the conveyance of movable res mancipi, as a pretended sale in presence of not less than five citizens as witnesses and a libripens holding a pair of copper scales. The transferee, iWanc ‘P a ” with one hand on the thing being transferred, and using tloa ‘ certain words of style, declared it his by purchase with a piece of copper (which he he!d in his other hand) and the scales (hoc aere aeneaque libra); and simultaneously he struck the scales with the as, which he then handed to the transferrer as figurative of the price. The principal variation when it was an

immovable that was being transferred was that the mancipation did not require to be on the spot : ‘the land was simply described by its known name in the valuation roll. Although in the time of Gaius only a fictitious sale — in fact the formal conveyance upon a relative contract — yet it was not always so. Its history is very simple. The use of the scales fixes its introduction at a time when coined money was not yet current, but raw copper nevertheless had become a standard of value and in a manner a medium of exchange. That, however, was not in the first days of Rome. Then, and for a long time, values were estimated in cattle or sheep, fines were imposed in them, and the deposits in the legis actio sacramento (infra, p. 549) took the same form. The use of copper as a substitute for them in private transactions was probably derived from Etruria. But, being only raw metal or foreign coins, it could be made available for loans or payments only when weighed in the scales: it passed by weight, not by tale. There is no reason for supposing that the weighing was a solemnity, that it had any significance beyond its obvious purpose of enabling parties to ascertain that a vendor or borrower was getting the amount of copper for which he had bargained.

It was this practice of everyday life in private transactions that Servius apparently adopted as the basis of his mancipatory con- veyance, engrafting on it one or two new features intended to give it publicity and, as it were, state sanction, and thus render it more serviceable in the transfer of censuable property. Instead of the parties themselves using the scales, an impartial balance-holder, probably an official, was required to undertake the duty, and at least five citizens were required to attend as witnesses, who were to be the vouchers to the census officials of the regularity of the procedure. Whether they were intended as representatives of the five classes in which Servius had distributed the population, and thus virtually of the state, is disputed, though the fact that, when the parties appealed to them for their testimony, they were addressed not as testes but as Quirites lends some colour to this view. 4 Servius is also credited with the introduction of rectangular pieces of copper of different but carefully adjusted weights, stamped by his authority with various devices (aes signatum), which are

2 The position of the plebeians in this respect did not differ from that of the patricians.

3 Mancipation seems to have been a very ancient mode of con- veyance. The use of the balance in barter or sale was known to the ancient Egyptians at least as early as 2000 B.C., as may be seen on reliefs in the temple of Dehr-el-Bahri in Upper Egypt. The derivation

of mancipium (mancipatio) from manu capere, to seize with the hand, is given by Gaius and is confirmed by the fact that at all times in its history the acquirer had to lay his hand on the thing being acquired, during the ceremony, if a movable. So where several things were being mancipated in a lot, this had to be done to each separately. With lands and other immovables it was different: they might be mancipated in absence, which goes some way to prove that mancipation must have been extended to them at a later period. The derivation of mancipatio given by Muirhead (Historical Introduction, 2nd ed., pp. 59 seq.) from manum capere, i.e. to acquire power (manus), is open to the objection that it places the abstract idea of power before the concrete symbol of it. Cf. Cuq, Institutions juridiques , 2nd ed., i. p. 80 n.

4 See Gai. ii. § 104.

usually supposed to have been intended to take the place of the raw metal (aes rude) formerly in use, and so facilitate the process of weighing; but there is more reason for thinking they were cast and stamped as standards to be put into one scale, while the raw metal whose weight was to be ascertained was put into the other.

Instead, therefore, of being a fictitious sale, as Gaius describes it, and as it became after the introduction of coined money in the 4th century of the city, the mancipation, as regulated by Servius, was an actual completed sale in the strictest sense of the term. What were the precise words of style addressed by the transferee to the transferrer, or what exactly the form of the ceremonial, we know not. But, as attendance during all the time that some thousands of pounds, perhaps of copper, were being weighed would have been an intolerable burden upon the five citizens convoked to discharge a public duty, it may be surmised that it early became a common practice to have the price weighed beforehand, and then to reweigh, or pretend to reweigh, before the witnesses only a single little bit of metal (rauducculum) , which the transferee then handed to the transferrer as ” the first pound and the last,” and thus representative of the whole. 1 And where no real price was in- tended, as in constituting a dos or in coemption, a rauducculum would also be employed. Whatever may have been its form, however, its effect was

instant exchange of property against a price weighed in the scales. The resulting obligation on the vendor to maintain the title of the vendee, and the qualifications that might be superinduced on the conveyance by agreement of parties — the so-called leges mancipii — -will be considered below in connexion with the provisions of the XII. Tables on the subject (infra, p. 542).

The things included in the class of res mancipi were lands and houses held on Quiritarian title, together with rights of way and aqueduct, slaves, and the following domestic beasts of draught or burden, viz. oxen, horses, mules and donkeys; all others were res nee mancipi. Many theories have been propounded mancipi. to account for the distinction between these two classes of things, and to explain the principle of selection that admitted oxen and horses into the one, but relegated such animals as sheep and swine to the other. But there is really little difficulty. Under the arrangement of Servius, what was to determine the nature and extent of a citizen's political qualifications, military duties and financial burdens was apparently the value of his heredium (and other lands, if he had any), and what may be called its appur- tenances — the slaves that worked for the household, the slaves and beasts of draught and burden that worked the farm, all of which lived and worked in common with the free members of the familia. But the cattle a man depastured on the public meadows were no more res mancipi than his sheep, a fact which, though ultimately in. the later Empire lost sight of, was still understood in the time of Gaius. 2 To say that the things classed as res mancipi were selected for that distinction by Servius because they were what were essential to a family engaged in agricultural pursuits would be to fall short of the truth. They constituted the familia in the sense of the family estate proper; whereas the herds and flocks, and everything else belonging to the paterfamilias, fell under the denomination of pecunia. So the words are to be understood perhaps in the well-known phraseology of the mancipatory testament, familia pecuniaque mea. 3

The public solemnity of mancipatio thus sanctioned as a mode of transferring a Quiritarian right of property, for which manus was probably as yet the only descriptive word in use, was not long in being adapted to and utilized for other transactions in which other kinds of manus were sought to be acquired. These new adaptations, if confined at first for the most part to plebeians, were also soon made use of by the patricians, perhaps before as well as after the XII. Tables, and became by custom part of the common law. Such were, for example, coemption (as explained above), emancipation and adoption of filiifamilias, and mortis causa aliena- tion of a familia and nexum.

Law of Succession. — The legal order of succession during the regal period was extremely simple. It was this, on the death Succe – °^ a P a t er f am iiias his patrimony devolved upon those s i oa of his descendants in potestate who by that event

amongst became sui juris, his widow (being loco filiae) taking thepatri- an e q Ua [s hare with them, and no distinction being made between movables and immovables. Such persons were styled self-heirs (sui heredes). Failing widow and children,

1 The conjecture is suggested by the words of style in the solutio per aes et libram, Gai. iii. §§ 173, 174. There were some debts from which a man could be effectually discharged only by payment (latterly fictitious) by copper and scales in the presence of a libripens and the usual five witnesses. In the words addressed to the creditor by the debtor making payment these occurred — hanc tibi libram primam postremamque expendo (" I weigh out to you this the first and the last pound "). The idea is manifestly archaic, and the words, taken strictly, are quite inappropriate to the transaction in the form it had assumed long before the time of Gaius.

a Gai. ii. 15; Ulpian, Frag. xix. I.

- Gai. ii. 104. By the time of the XII. Tables the sharp dis- tinction between these two terms is tending to disappear.

his patrimony went to his gens. The notion that between the descendants and the gens came an intermediate class under the name of agnates does not seem well founded as regards the regal period; the succession of agnates as such seems to have been first legally recognized by the XII. Tables, probably to meet the case of the plebeians, who, having no gentes, were without legal heirs in default of children. 4

The later jurists more than once refer to the perfect equality of the sexes in the matter of succession in the ancient law. 6 But it was rather nominal than real. A daughter who had passed into the hand of a husband during her father's lifetime of course could have no share in the latter's inheritance, for she had ceased to be a member of his family. One who was in potestate at his death, and thereby became sui juris, did become his heir, unless he had pre- vented such a result by testamentary arrangements; but even then it was in the hands of the gens to prevent risk of prejudice to themselves. For she could not marry, and so carry her fortune into another family, without their consent as her guardians; neither could she without their consent

alienate any of the more valuable items of it ; nor, even with their consent, could she make a testament disposing of it in prospect of death. Her inheritance, therefore, was hers in name only; in reality it was in the hands of her guardians.

Of primogeniture or legal preference of one member of the family over the others there is not the faintest trace. And yet we are told of heredia remaining in a family for many generations — a state of matters that would have been impossible had every death of a paterfamilias necessarily involved a splitting up of the family estate. It is conceivable that this was sometimes prevented by arrangement amongst the heirs themselves; and the practice of every now and then drafting the younger members of families to colonies diminished the number of those who had a claim to participate. But the simplest plan of avoiding the difficulty was for the paterfamilias to regulate his succession by testament; and this was probably had recourse to, not so much for instituting a stranger heir when a man had no issueˆaccording to patrician notions his duty then was to perpetuate his family by adopting a son — as for partitioning the succession when he had more children than one.

There were two sorts of testaments made use of by the patricians of the regal period — that made in the comitia of the curies (test, calatis comitiis) and that made in the presence of the army (probably represented for this purpose by a few comrades) on the eve of battle (test, in procinctu factum). The first at least — and the second was just a substitute for it on an emergency — was far from being an independent exercise of the testator's voluntas. For, though in course of time, and under the sanction of the uti legassit ita jus esio of the XII. Tables, the curies may have become merely the recipients of the oral declaration by the testator of his last will, in order that they might testify to it after his death, it is impossible not to see in the comitial testament what must originally have been a legislative act, whereby the testator's peers, for reasons which they and the presiding pontiffs thought sufficient, sanctioned in the par- ticular case a departure from the ordinary rules of succession. The pontiffs were there to protect the interests of religion, and the curies to protect those of the testator's gens; and it is hardly conceivable that a testament could have been sanc- tioned by them which so far set at nought old traditions as to . deprive a filiusfamilias of his birthright, at least in favour of a stranger.

4 It is quite true, however, that from the first the order of suc- cession was agnatic; for it was those only of a man's children who were agnate that had any claim to his inheritance; and the gens was,

theoretically at least, just a body of agnates. The supposed mention of agnates in a law attributed to Numa is a conjecture of P. E. Huschke's (in Analecta litteraria, Leipzig, 1826, p. 375). The law is preserved in narrative by Servius, In Virg. Eclog. iv. 43, which runs thus: " In Numae legibus cautum est, ut si quis im- prudens occidisset hominem, pro capite occisi et natis ejus in cautione (Scalig.. concione) offerret arietem." Huschke's substitution of agnatis for et natis is all but universally adopted; but, even were it necessary, it need mean nothing more than his children in potestate or his gens.

6 The Voconian law of 169 B.C. avowedly introduced something new in prohibiting a man of fortune from instituting a woman, even his only daughter, as his testamentary heir; but even it did not touch the law of intestacy. See Girard, Manuel, 4th ed. p. 816.

Testa- meats.

It may safely be assumed that by custom at all events the children of a plebeian usually took his estate on his death in- Succes- testate. But, as he was not a member of a gens, slop there was no provision for the devolution of his suc-

umoagst cession on failure of children. The want of them he *J e fc could not supply by adrogation, as he had for long, it

is thought, no access to the assembly of the curies; and it is doubtful if adoption of a filiusfamilias was known before the XII. Tables. If therefore, as seems probable, the XII. Tables first introduced the succession of agnates, a plebeian unsurvived by children was necessarily heirless, that is to say, heirless in law. But custom seems to have looked without disfavour on the appropriation of his heredium by an outsider: a brother or other near kinsman would naturally have the earliest oppor- tunity, and, if he maintained his possession of it in the character of heir for a reasonable period, fixed by the XII. Tables at a year, the law dealt with him as heir, and in course of time the pontiffs imposed upon him the duty of maintaining the family sacra. This was probably the origin, and a very innocent and laudable one, of the usucapio pro kerede, which Gaius condemns as an infamous institution, and which undoubtedly lost some of its raison d'etre once the right of succession of agnates had been introduced.

There is no trace of testamentary succession among the plebs prior to the Servian constitution, nor is it in the least degree likely that there was any such. Primitive causa communities are slow to realize the conception of convey- private testaments, and the plebeians could not at aace by this period make a public one either calatis comitiis mane pa- Qr ˆ procinctu. But not long after their admission to citizenship there is reason to conjecture that manci- pation was employed by them, not indeed to make a testament instituting an heir and taking effect only on the testator's death, but to make a conveyance of a whole patrimony mortis causa. The transaction took the form of an absolute acquisition, in exchange for a price (usually nominal), of the transferrer's familia, 1 by a friend, technically called familiae emptor, on trust to distribute, on the transferrer's death and according to his instructions, whatever the transferee was not authorized to retain for himself. The transferrer may also have had power to reserve in the mancipation a usufruct of the estate while he lived. 2 Like so many other of the transactions of the early law, it was legally unprotected so far as the third parties were concerned whom the transferrer meant to benefit; they could only trust to the fides of the transferee. This mortis causa alienation, whatever the date of its introduction, was the fore-runner of the so-called testament per aes et libram, to be afterwards described (infra, p. 543).

Contract and its Breach. — To speak of a law of obligations

in connexion with the regal period, in the sense in which the

Contract words were understood in the later jurisprudence,

ana Its would be a misapplication of language. It would

breach. ˆ e g 0m g t 00 f ar t saVj however, as is sometimes done,

that before the time of Servius Rome had no conception

of contract; for men must have bought and sold, or at least

bartered, from earliest times — must have rented houses, hired

labour, made loans, carried goods and been parties to a

variety of other transactions inevitable amongst a people

engaged to any extent in pastoral, agricultural or trading

pursuits. It is true that a patrician family with a good

establishment of clients and slaves had within itself ample machinery for supplying its ordinary wants, and was thus to a great extent independent of outside aid. But there were not many such families. There must therefore have been contracts and some customary rules to regulate them, though these were presumably very imperfect. In many cases, such as those alluded to, one of the parties at least must have trusted to the

1 The familia, as the collective name for a man's lands and mancipable appurtenances, became itself capable of mancipation. The conveyance was universal. There would be, it is thought, nothing discreditable in a man's conveying his heredium in this form.

1 For a different view cf. Maine, Ancient Law, ed. Pollock, pp. 214 seq.

good faith of the other. What was his guarantee, and what remedy had he for breach of engagement?

His reliance in the first place was on the probity of the party with whom he was dealing — on the latter's reverence for Fides, and the dread he had of the disapprobation of his fellows should he prove false, and of the penalties, social, religious or pecuniary, that might consequently be imposed on him by his gens in the case of a patrician, by his gild in the case of a craftsman, or by the king in the case of any other plebeian. 3 If the party who had to rely on the other's good faith was not satisfied with his promise and the grasp of the right hand that was its seal, 4 he might require his solemn oath (jusjurandum); and it can hardly be doubted that, whatever may have been the case at a later period, in the time of the earlier kings he who forswore himself was amenable to pontifical discipline. If he preferred a more substantial guarantee, he took something in pledge or pawn from the other contractor; and, though he had no legal title to it, and so could not recover it by judicial process if he lost possession, yet so long as he retained it he had in his own hand a de facto means of enforcing performance. Upon performance he could be forced to return it or suffer a penalty — not by reason of obligation resulting from a

contract of pledge, for the law as yet recognized none, but because, in retaining it after the purpose was served for which he had received it, he was committing theft and liable to its punishment. At this stage breach of contract, as such, does not seem to have founded any action for damages or reparation before the tribunals; but it is not improbable that, where actual loss had been sustained, the injured party was permitted to resort im- mediately to self-redress by seizure of the wrong-doer or his goods. Self-help was according to the spirit of the time — not self-defence merely in presence of imminent danger, but active measures for redress of wrongs already completed.

There was one contract, however, notorious in after years under the name of nexum, that must have received legal sanction soon after the Servian reforms, though probably, like mancipa- Contract tion of property itself, known in practice earlier. In the „ f _ XII. Tables it is apparently referred to as an existing aeset institution. In its normal character it was a loan of money, Hbram.” or rather of the raw copper that as yet was all that stood_ for money. How far in its original use it was accompanied by any formalities beyond the weighing of it in a pair of scales (which was rather substance than form) we know not; and what right it con- ferred on the creditor over his debtor who failed to repay can be only matter of speculation. Apparently the result of the Servian reforms was the regulating and ensuring the publicity of the con- tract and making the creditor’s right of self-redress by appre- hension (manus injectio) and imprisonment, &c, of .his debtor conditional on the observance of the prescribed formalities of the nexum. The character and effects, however, of this the earliest independent contract of the jus civile, are much disputed and will be explained below on p. 545 seq.

Public and Private Offences and their Punishment. — For anything like a clear line of demarcation between crimes and civil injuries we look in vain in regal Rome, offences Offences against the state itself, such as trafficking and their with an enemy for its overthrow (proditio) or treason- punish- able practices at home (perduellio) were matter of ”””»<• state prosecution and punishment from the first. But in the case of those that primarily affected an individual or his estate there was a halting between, and to some extent a confusion of, the three systems of private vengeance, sacral

3 Such as debarment from gentile or gild privileges, exclusion from right of burial in the gentile or gild sepulchre, fines in the form of cattle and sheep, &c.

4 Some of the old writers (e.g. Liv. i. 21, § 4, xxiii. 9, § 3; Plin. H.N.

xi. 45 ; Serv. in Aen. iii. 687) say that the seat of Fides was in the right hand, and that to give it (promittere dextram — is this the origin of the word ” promise “.?) in making an engagement was emphatically a pledge of faith. See a variety of texts illustrating the significance of the practice, and testifying to the regard paid to Fides before foreign influences and example had begun to corrupt men’s probity and trustworthiness, in Lasaulx, Ueber d. Eid bet d. Romern (Wurzburg, 1844), p. 5 seq.; Danz, Der sacrale Schutz im rom. Rechtsverkehr (Jena, 1857), pp. 139, 140. Cf. Pernice, Labeo, vol. ii. (2nd ed., Halle), p. 459 seq.

atonement and public or private penalty. 1 These may be said to have followed in sequence but overlapped each other. The same sequence is observable in the history of the laws of other nations, the later system gradually gaining ground upon the earlier and eventually superseding it. 2 The remark- able thing in Rome is that private vengeance should so long not only have left its traces but continued to be an active power. According to tradition it was an admitted right of the gens or kinsmen of a murdered man in the days of Numa; a law of his is said to have provided that, where a homicide was due to misadventure, the offering to them of a ram should stay their hands (supra, p. 533). And this seems to have been also prescribed in the XII. Tables (VIII., 24). To avenge the death of a kinsman was more than a right: it was a religious duty, for his manes had to be appeased; and so strongly was this idea entertained that, even long after the state had interfered and made murder a matter of public prosecution, a kinsman was so imperatively bound to set it in motion that if he failed he was not permitted to take anything of the inheritance of the deceased. The talion we read of in the XII. Tables is also redolent of the vindicta privata, although practically it had become no more than a means of enforcing reparation. And even the nexal creditor’s imprisonment of his defaulting debtor {infra, p. 551), which was not abolished until the 5th century of the city, may not unfittingly, in view of the cruelties that too often attended it, be said to have savoured more of private vengeance than either punishment or procedure in reparation.

Expiatio, supplicium, sacratio capitis, all suggest offences against the gods rather than against either an individual or the state. But it is difficult to draw the line between different classes of offences, and

pre- dicate of one that it was a sin, of another that it was a crime and of a third that it was but civil injury. They ran into each other in a way that is somewhat perplexing. Apparently the majority of those specially mentioned in the so-called leges regiae and other records of the regal period were regarded as violations of divine law, and the punishments appropriate to them determined upon that footing. Yet in many of them the prosecution was left to the state or to private individuals. It is not clear, indeed, that there was any machinery for public prosecution except in treason and murder — the former because it was essentially a state offence, the latter because it was comparatively early deemed expedient to repress the blood-feud, which was apt to lead to deplorable results when clansmen and neighbours appeared to defend the alleged assassin.

Take some of those offences whose sanction was sacratio capitis. Breach of duty resulting from the fiduciary relation between patron and client, maltreatment of a parent by his child, exposure or killing of a child by its father contrary to the Romulian rules, the ploughing up or removal of a boundary stone, the slaughter of a plough-ox — all these were capital offences; the offender, by the formula sacer esto, was devoted to the infernal gods. Festus says that, although the rules of divine law did not allow that he should be offered as a sacrifice to the deity he had especially offended (nee fas est eum immolari) , yet he was so utterly beyond the pale of the law and its protection that any one might kill him with impunity. But, as the sacratio was usually coupled with forfeiture of the offender's estate or part of it to religious uses, it is probable that steps were taken to have the outlawry or excommunication judicially declared, though whether by the pontiffs, the king or the curies does not appear; such a declaration would, besides, relieve the private avenger of the incensed god of the chance of future question as to whether or not the citizen he had slain was sacer in the eye of the .law.

That there must have been other wrongful acts that were regarded in early Rome as deserving of punishment or penalty of some sort, besides those visited with death, sacration or forfeiture of estate, total or partial, cannot be doubted; no community has ever been so happy as to know nothing of thefts, robberies and assaults. The XII. Tables contained numerous provisions in reference to them ; but it is extremely probable that, down at least to the time of Servius Tullius, the manner of dealing with them rested on custom, and was in the main self-redress, restrained by the inter- vention of the king when it appeared to him that the injured party was going beyond the bounds of fair reprisal, and frequently bought

1 See Rein, Das Criminalrecht der Romer (Leipzig, 1844), pp. 24seq. ; Clark, Early Roman Law: Regal Period (London, 1872), pp. 34 seq.; Mommsen, Strafrecht, pp. 6, 36, 900.

2 Probably every offence at first was an act attributable to the whole family or clan, and it was upon them or by them and not upon the individual wrong-doer or by the injured party that ven- geance was taken.

off with a composition. When the offence was strictly within the family or the gens, it was for those who exercised jurisdiction over those bodies to judge of the wrong and prescribe and enforce the penalty.

Jurisdiction and Procedure. — Of the course of justice, whether in criminal or civil matters, during the regal period we know little that can be relied on. Ancient writers speak of the king as _ . having been generally supreme in both. But this can be ‘ rf

accepted only with considerable reservation. For the i us tice paterfamilias, aided by a council in cases of importance, was judge within the family — his jurisdiction sometimes excluding that of the state, at other times concurring with it, and not to be stayed even by an acquittal pronounced by it. He alone was competent in any charge against a member of the family for a crime or offence against the domestic order — adultery or unchastity of wife or daughter, undutiful behaviour of children or clients, or the like. Death, slavery, banishment, expulsion from the family, im- prisonment, chains, stripes, withdrawal of peculium, were all at his command as punishments; and it may readily be assumed that in imposing them he was freer to take account of moral guilt than an outside tribunal. The indications of criminal jurisdiction on the part of the gens are slight; but its organization was such that it is difficult not to believe that it must occasionally have been called on to exercise such functions. And it must not be lost sight of that, as murder seems to have been the only crime in regard to which private revenge was absolutely excluded, the judicial office of the kings must have been considerably lightened, public opinion approv- ing and not condemning self-redress so long as it was kept within the limits set by usage and custom.

The boundary between civil and criminal jurisdiction, if it ex- isted at all, was extremely shadowy. Theft and robbery, for example, if one may conclude from the position they held in the later juris- prudence, were regarded not as public but as private wrongs; and yet when a thief was caught in the act of theft by night he might be slain, and

when by day might be scourged and thereafter sold as a slave. But in both cases it may also be assumed that a practice, afterwards formally sanctioned by the XII. Tables — that of the thief compounding for his life or freedom — was early admitted, and the right of self-redress thus made much more beneficial to the party wronged than when nothing was attained but vengeance on the wrongdoer. In assaults, non-manifest thefts, and other minor wrongs, self-interest would in like manner soon lead to the general adoption of the practice of compounding; what was originally a matter of option in time came to be regarded as a right; and with it there would be occasional difficulty in settling the amount of the composition, and consequent necessity of an appeal to a third party. Here seems to be the origin of the king's jurisdiction in matters of this sort. He was the natural person to whom * * g

to refer such a dispute; for he alone, as supreme magis- ««/'"«*• trate, had the power to use coercion to prevent the party wronged insisting on his right of self-redress, in face of a tender by the wrongdoer of what had been declared to be sufficient repara- tion. But that self-redress was not stayed if the reparation found due was withheld; as the party wronged was still entitled at a much later period to wreak his vengeance upon the wrongdoer by apprehending and imprisoning him, it cannot reasonably be doubted that such also was the practice of the regal period.

How far the kings exercised jurisdiction in questions of quiritarian right, such as disputes about property or inheritance, is by no means obvious. Within the family, of course, such questions were impossible, though between clansmen they may have been settled by the gens or its chief. The words of style used in the sacramental real action (infra, p. 548) suggest that there must have been a time when the spear was the arbiter, and when the con- tending parties, backed possibly by their clansmen or friends, were actual combatants, and victory decided the right. Such a pro- cedure could not long survive the institution of a state. In Rome there seems to have been very early substituted for it what from its general complexion one would infer was a submission of the question of right to the pontiffs as the repositories of legal lore. Their proper functions, however, being sacred, they had to bring what was a question of purely civil right within their jurisdiction, by engrafting on it a sacral element, viz. by requiring each of the parties to make oath to the verity of his contention; and the point that in form they decided was which of the two oaths was false and therefore to be made atonement for. In substance, however, it was a finding on the real question at issue; and the party in whose favour it was pronounced was free to make it

effectual if necessary by self-redress in the ordinary way.

Of Servius, Dionysius says — using, as he often does, language more appropriate to the republican than to the regal period — that he drew a line of separation between public and private judicial processes, and that, while he retained the former Se ”’ laa in his own hands, he referred the latter to private judges, reforms – and regulated the procedure to be followed in causes brought before them. 3 Something of the sort was absolutely necessary. He was enormously increasing the number of the citizens, — that is to say, of

3 Dion. Hal. iv. 25.

viral court.

those who were to enjoy in future the privileges of quiritarian right, — and multiplying the sources of future disputes that would have to be determined by the tribunals. The nature of the jurisdiction created by him, if any, to meet the new aspect of things is much controverted. He has been credited with the institution of the collegiate courts of the Centumviri and the Decemviri {stlitibus judicandis) as well as the private judge (unus judex), but the argu- ments in support of this view are not strong, and are, of course, based wholly on presumptions. However, it will be convenient to say a few words about each of these courts here.

The centumviral court 1 is often referred to by Cicero, and the range of its jurisdiction in his time seems to have included every c possible question of manus in the old sense of the word —

Leo urn- status f individuals, property and its easements, and v , inheritance whether testate or intestate. By the time

court. Q £ Q a ; us tne on i v ma tters apparently that were in practice

brought before it were questions of inheritance by the jus civile, though theoretically it was still competent in all real actions, and the lance, the emblem of quiritarian right generally, was still its ensign. During the later Republic the Centumviri formed a quasi- corporate body of private judges selected originally from the tribes (afterwards from the ordinary list of judices) annually by the urban praetors. 2 Some writers identify the centumviral court with the Romulian senate of ioo; others attribute its institution to Servius Tullius and hold that it was a plebeian court at first; others make it contemporaneous with the XII. Tables; others bring it down to the 6th century of the city; while the weight of recent authority is in favour of the view that it is not earlier than the beginning of the 7th century. The arguments in support of these several views cannot be gone into here. It is enough to say that we have no positive proof of its existence earlier than the 7th century, though presumptions are in favour of its having. been somewhat earlier. In the exercise of their office the Centumviri acted more independ- ently than private judices ventured to do, and even introduced some considerable reforms into the law.

There was a court at Rome during the Republic called the De- cemviri stlitibus judicandis. 3 These decemvirs in historic times Decern- constituted a quasi-corporate body of judicial magistrates, whose duty it was to try certain kinds of actions, especially those relating to personal liberty. During the Princi- pate, while ceasing to act as a separate court, they pre- sided over the divisions into which the centumviral court had been under Augustus divided. Their origin is quite unknown. Pom- ponius indeed says that they were originally created soon after the institution of the peregrin praetorship in 242 B.C. for this very purpose of presiding over centumviral cases, 4 but this statement is generally discredited and, if true, their practice of so presiding must quickly have gone into disuse. Those writers who attempt to trace back the centumvirs to the regal period give, as a rule, a like antiquity to the Decemviri stlitibus judicandis. On the other hand, some authorities identify them with the decemviri judices mentioned by Livy 5 as having been declared by the lex Valeria-

Horatia to be as sacrosanct as the tribunes of the plebs. But these latter judices seem to have been a purely plebeian court which early went into desuetude, and there is really no evidence of identity.

So far back as historic evidence goes we find that actions were tried and judgments pronounced by judices and arbitri. There “J dices” never was more than a single judge (unus or unicus judex) “J appointed to try a case, but there might be more than one

”” httrl” ar biter, and frequently there were three. All kinds of Br ‘ actions, even a sacramental action in rem, could be brought before the unus judex, but especially appropriate to him were all personal claims of alleged indebtedness, whether arising out of a legal or illegal act, denied either in toto or only as to the amount. Matters of that sort involved as a rule no general principle of law but rather mere disputes as to facts, which could well be decided by a single individual. There is much more reason for crediting Servius with the institution of the single judge (the arbiters may have been a creation of the XII. Tables) than with either of the collegiate courts. If we believe that in the early regal period the king acting with the pontiffs kept all jurisdiction in his own hands, it is plain that this must have become a practical impossibility after the admission of the plebeians to citizenship. For the trial of disputed facts it would be necessary to delegate jurisdiction, and

1 Literature: Huschke, Servius Tullius, pp. 585 seq.; Keller- Wach, Rom. Civil Process (1883), § 6; Bethmann-Hollweg, Ge- schichle d. C. P. i. § 23; Wlassak, Process-Gesetze, i. 125 seq. and ii. 201 seq. ; Girard, Organisation judiciaire des Remains, i. 23 n. ; Martin, Le tribunal des centumvirs (Paris, 1904). In this last-named work a succinct account of the court and the various theories about it is given.

2 On the question of their election, see Greenidge, Legal Pro- cedure in Cicero’s Time, pp. 41 and 264.

3 Girard, Organisation judiciaire, i. 159; Pauly – Wissowa, Encyklopadie, s.v. ” Decemviri.”

4 Dig. i. 2, § 29.

6 Livv, ix. 46, 5 : Karlowa, Rom. R.G. L iA.

the earliest judices may have been the king’s commissioners for such cases. If this be right, it was the beginning of a system that bore wondrous fruit in after years, and that, as will be shown in the sequel,

helped the praetors to build up, through the formulae, the whole body of equity.

Under the icings it is not improbable that several of the legis actiones, more or less undeveloped, were already in use, Civil pro- but the nature of these actions will be more conveni- cedure. ently considered later on {infra, p. 566).

II. The Jus Civile

(From the establishment of the Republic until the

subjugation of central and southern Italy.)

i. Constitutional Events affecting the Law. Jus Civile contrasted with Jus Quiritium. — The term jus civile, as used to designate this chapter, though almost synony- mous with, may be taken as somewhat more com- Nature prehensive than, jus Quiritium. It is a term of of •• Jus later origin than the latter. Jus Quiritium was clv,le -" based entirely on old custom and legislation, finding, one might say, its culmination in the XII. Tables; whereas in the jus civile, as here understood, there appears the element of doctrinal interpretation of both statute and custom — the magistrates and jurists (particularly the pontiffs) adding much to the earlier law by introducing into it this element. We can say that the jus civile in this sense is jus Quiritium as developed by interpretation. It is as yet, however, little influenced, as was the more comprehensive jus civile of later periods, by the elements of jus gentium and equity. Still nowhere, we must note, are the terms jus Quiritium and jus civile placed in contrast by the jurists; they were each jus proprium civium Romanorum. In the classical law the term jus Quiritium seems to be used principally in formulae framed in accordance with old custom.

Though our information regarding the present period is less legendary than that of the kings, it is still far from being completely authentic, as no original documents belonging to it are extant. There is little dispute evidence among critics that Rome was sacked and burned by the Gauls about 387 B.C. or a few years later, and it is probable that the original pontifical annals (annales maximi) upon which Livy and other Roman historians have presumably based their narratives of early history were destroyed at that time along with all other written records. What credence, then, we may give to the ancient historical narratives, for the period of the Republic antecedent to this event, depends largely upon how far the pontifices managed to have their lost records restored. In any case, however, there is sufficient

presumptive evidence to warrant belief in such prominent events of the early Republic as the creation of two annually elected patrician consuls, with potestas similar to that of the kings, the creation of tribunes of the plebs, the enactment of the decemviral code, and periodic struggles between patricians and plebs, the one to keep and the other to gain political power. To know the exact dates of these events is relatively of little importance.

Legislation in Favour of the Plebs. — In their uphill battle for social and political equality the plebeians conquered stage by stage. The more important of their successes may here just be mentioned, with all reserve as to credibility, in the order of their traditional dates. By the lex Valeria (de pro- vocatione) of 509 B.C. it was provided that no Roman citizen should be deprived of life, liberty or citizenship {i.e. suffer poena capitis), or be scourged, by any magistrate within the city, without an appeal {provocatio) to the comitia centuriata. This statute was often referred to by later Romans as a sort of Magna Carta; Livy calls it unicum praesidium libertatis. In 494 or 471 B.C.- the tribunes of the plebs were created with right of intercession, and about the same time plebeian aediles and judices decemviri (the latter to act as judges or arbiters in litigations); the persons of all these officials being declared inviolable during their tenure of office. About 471 B.C. the concilium plebis became legislatively recognized, the tribunes

were elected in it, and its resolutions (plebiscita) became directly binding on plebeians. The XII. Tables, twenty years later, were the fruit of the agitation of the plebeians for a revision and written embodiment of the law. In 449 plebiscita were — subject presumably to auctoritas patrum — declared by the lex Valeria-Horatia binding on the whole populus, while about the same time, or perhaps a little earlier, the patrician-plebeian comitia of the tribes was instituted. 1 By the lex Canuleia of 445 B.C. intermarriage between patricians and plebeians was sanctioned. Repeated protests by the plebeians against the monopolization of the public domain land by members of the higher order resulted in the definite admission of their right to participate in its occupation by one of the Licinian laws of 367 B.C. The long course of cruel oppression of insolvents (mainly plebeians) by their patrician creditors was put an end to by the Poetilian law

about 326 B.C., depriving nexal contract of its privileges and generally prohibiting the use of chains and fetters on persons incarcerated for purely civil debt. By the Hortensian law of about 287 B.C. plebiscita were declared binding (presumably without auctoritas patrum) on the whole body of citizens. And from 421 B.C., when one of their number first reached the regular state magistracy as quaestor, down to 252 B.C., when one was elected pontifex maximus, the plebeians gradually vindicated their right as citizens to share in all the honours of the state. There is also evidence that plebeians were early in the Republic admitted to the senate and also to the comitia curiata.

The legislative bodies during the present period were thus three in number: the comitia of the centuries, the concilium Legisia- plebis and the comitia tributa. As to the comitia of tive the curies, it seems to have hardly concerned itself

bodies. w ith general legislation, but met merely to confer imperium on the higher magistrates and to sanction testaments and adrogations of the gentiles. The legislation of the centuries dealt for the most part (though the XII. Tables were enacted by it) with questions affecting public and constitutional rather than private interests. It could be convened only by a magis- trate having military imperium, i.e. at first only the consuls, for the reason that it was theoretically a military assembly met for civil purposes (exercitus civilis). It is called in the XII. Tables comitiatus maximus. Its procedure was cumbrous and ill-adapted for legislation. As to the relation of the con- cilium plebis to the comitia tributa there is much controversy. The old opinion which identified them is now generally aban- doned. According to Mommsen 2 they differed in the following points: (1) The comitia was an assembly of the whole people voting in tribes instead of centuries, while the concilium was an assembly of the plebs alone; (2) the comitia was always convoked and presided over by a patrician magistrate (often the praetor), while the concilium had to be convoked and pre- sided over by a plebeian official (usually a tribune); (3) in the comitia auspices had to be taken beforehand, but not in the concilium; (4) an enactment of the comitia was a lex binding on all the populus, while an enactment of the concilium was a plebiscitum binding only on the plebs. It is, however, not possible to take Mommsen's view that plebiscita were not binding on the whole populus prior to the lex Hortensia, without disregarding distinct statements of Livy as to the lex Valeria- Horatia and the lex Publilia? But whatever the relation of these two legislative assemblies to each other may have been originally, it is certain that the Hortensian law equalized them so far as their effects were concerned, and, looking to the small number of patricians compared with the plebs, it would

prob- ably be a matter of indifference in which assembly the vote was taken. The greater part of the legislation dealing with the private law in the later Republic consisted of plebiscita.

1 There is diversity of opinion about this. Mommsen thinks the comitia tributa was earlier than the XII. Tables, and that the lex Valeria-Horatia applied to it. See next note.

5 Mommsen, Rom. Forschungen, i. 177 seq. ; Rom. Staatsrecht, iii. 322 seq.

- Livy, iii. 55, 3; viii. 12, 14.

ii. The XII. Tables.

Causes of their Enactment. — The change from monarchy to republic brought of itself no benefit to the plebs, but rather the reverse. One of their chief complaints was against the administration of justice. They complained that they were kept in ignorance of the laws, and that in particular the consuls used their magisterial punitive powers (coercitio) unfairly and with undue severity when a plebeian was the object of them. The state of matters gradually became so intolerable that in the year 462 B.C., according to the ancient tradition, a proposal for a statute was made by C. Terentilius Arsa, one of the tribunes, by which a commission should be appointed to draw up a code of laws in writing. He carried a rogation in the concilium plebis to this effect. The senate at first strenuously resisted, but after a few years was induced to give way, and its assent to the proposal was obtained.

Tradition records that the first practical step towards its realization was the despatch of a mission to Athens, to study the laws of Solon and collect any materials that co mD n a . might be of service in preparing the projected code, tien of On the return of the commissioners in 452 B.C. all the xii. the magistracies were suspended, and a body of ten ‘ ables ‘ patricians, called decemviri legibus scribundis, was appointed with consular powers, under the presidency of Appius Claudius, for the express purpose of putting the laws into shape. Before the end of ‘the ensuing year (451) the bulk of the code was ready and was at once passed into law by the comitia of the centuries and published on ten tables (whether of brass or wood is doubtful), which were set up in the Forum. Next year, owing to additions being found necessary, the decemvirate was renewed, with, however, a change of membership (some plebeians being chosen), and in the course of a few months it had com- pleted the supplemental

matter. On the downfall of the decemvirate, these new laws, after being duly accepted by the comitia, were published on two other tables, thus bringing the number up to twelve. The code then received the official name of Lex XII. Tabularum.

The foregoing account of the enactment of the Tables is an attempt to summarize what is stated by Livy and other Roman writers on the subject. Though inconsistent and sometimes even contradictory about details, these tkhy"' writers are on the main facts in concordance. Until a few years ago, the fact of the publication of such a code about the date above given had been accepted by modern historians, even the most iconoclastic, without question; unlike the leges regiae, the XII. Tables had always been regarded as authentic. But in his History of Rome, published in 1898, Professor Pais of Turin 4 emitted the view that the decemviral code was really a private compilation made about the year 304 B.C. by Cn. Flavius, the scribe of Appius Claudius the censor, and probably at the latter's instigation; or, in other words, that it was just the so-called Jus Flavianum which all writers had hitherto regarded as a work dealing with the styles of legis actiones and the calendar of court days. In Pais's view the annalists, in accordance with a habit of theirs, dupli- cated the same event by counterfeiting an earlier Appius Claudius, &c, in order to magnify the antiquity and authority of the laws collected by Flavius, while the whole account of the decemviral legislation was invented by them. More recently Professor Lambert of Lyons has attempted by similar arguments to prove that the XII. Tables were a private compilation of customs already in observance, and of sacerdotal and other rules already in circulation, made about 197 B.C. by the jurist Aelius Paetus, and were in fact identical with the Tripertita or Jus Aelianum, which had always heretofore been supposed to contain merely a recension of the Tables with an interpretation and commentary. 5 This is not the place to discuss these theories. Though of course incapable of positive disproof, the weight

4 Pais, Storia di Roma (Turin,, i. 566 seq.

6 Nouvelle Revue historique (1902), xxvi. 149 seq.; Revue general* du droit, nos. 5 et 6; Melanges, Appleton (1903), pp. 126 seq.

of presumptive evidence is against them; they have hitherto found little or no support from other Romanists, and they have, in our opinion, been sufficiently refuted on philological and other grounds by Girard 1 and others. 2

There were provisions in the Tables that were almost literal renderings from the legislation of Solon; and others bore a re- _ markable correspondence to laws in observance in Greece,

sources. ^^ they may have been only indirectly borrowed. 3 By far the greater proportion of them, however, were native and original, — not that they amounted to a general formularization of the hitherto floating customary law, for, notwithstanding Livy's eulogium of them as the " fountain of the whole law, both private and public," it seems clear that many branches of it were dealt with in the Tables only incidentally, or with reference to some point of detail. The institutions of the family, the fundamental rules of succession, the solemnities of such formal acts as mancipa- tion, nexum, and testaments, the main features of the order of judicial procedure, and so forth, — of all of these a general know- ledge was presumed, and the decemvirs thought it unnecessary to define them. What they had to do was to make the law equal for all, to remove every chance of arbitrary dealing by distinct specification of penalties and precise declaration of the circum- stances under which rights should be held to have arisen or been lost, and to make such amendments as were necessary to meet the complaints of the plebeians and prevent their oppression in the name of justice. Probably very little of the customary law, therefore, was introduced into the Tables, that was already univer- sally recognized, and not complained of as either unequal, defective or oppressive. Only one or two of the laws ascribed to the kings (assuming their greater antiquity) reappeared in them; yet the omission of the rest did not mean their repeal or imply denial of their validity, for a few of them continued still in force during the Empire, and are founded on by Justinian in his Digest. Neither apparently were any of the statutes of the Republic anterior to the Tables embodied in them, although for long afterwards many a man had to submit to prosecution under these laws and to suffer the penalties they imposed.

The original Tables are said to have been destroyed when Rome was sacked and burned by the Gauls. But they were probably „ . at once reproduced, and transcripts of them in more or Remains. j esg mcK j ern j ze(i language must have been abundant if, as Cicero says was still the case in his youth, the children were required to commit them to memory as an ordinary school task. This renders all the more

extraordinary the fact that the remains of them are so fragmentary and their genuineness in many cases so debateable. They were embodied, as above mentioned, in the Tripertita of Sextus Aelius Paetus in the year 197 B.C., who prob- ably republished them in somewhat modernized language and from whose work, it is thought, all later writers took their contents. They must have formed the basis of all the writings on the jus civile down to the time of Servius Sulpicius Rufus, who first took the praetor's edicts as a text; and they were the subjects of mono- graphs even by authors later than Sulpicius, amongst them by M. Antistius Labeo in the early years of the Empire, and by Gaius, probably in the reign of Antoninus Pius. Yet a couple of score or so are all that can be collected of their provisions in what pro- fess to be the ipsissima verba of the Tables, though in a form _ in most cases more modern than what we encounter in other remains of archaic Latin of the 4th century of the city. These are con- tained principally in the writings of Cicero, the Nodes Atticae of Aulus Gellius, and the treatise De verborum significatione of Festus; the two latter dealing with them rather as matters of antiquarian curiosity than as rules of positive law. There are also many allusions to particular provisions in the pages of Cicero, Varro, Gellius and the elder Pliny, as well as in those of Gaius, Paul, Ulpian and other ante-Justinian jurists; but these are not to be implicitly relied on, as we have evidence that they frequently represent the (sometimes divergent) glosses of the interpreters rather than the actual provisions of the statute. Reconstruction has therefore been a work of difficulty, and the results far from satisfactory, that of the latest editor, Voigt, departing very con- siderably from the versions generally current during the last half- century.*

1 Textes, pp. 3-4; Nouv. Rev. hist. xxvi. 381 seq.

2 Erman, Z. d. Sav. Stift. (1903), xxiii. 450; Lenel, Z. d. Sav. Stift. (1905), xxvi. 498.

3 The decemvirs may have obtained them either from Magna Graecia cr from Etruria, as the story of a mission to Athens is improbable.

4 Dirksen's Ubersicht der bisherigen Versuche zur Kritik u. Her- sleUung d. Zwolf-Tafel-Fragmente (Leipzig, 1824), supplies the basis of almost all the later work on the Tables anterior to that of Voigt. Schoell, in his Legis XII. Tab. reliquiae (Berlin, 1866), made a valu- able contribution to the literature of the subject from a philological point of view His version has been adopted substantially by Bruns in his Fontes juris, i. 16 seq. (6th ed. by Mommsen and Gradenwitz), and Girard in his Textes (3rd ed., Paris, 1903). See

General charac- teristics.

In form the laws contained in the Tables were of remarkable brevity, terseness and pregnancy, with something of a rythmical cadence that must have greatly facilitated their retention in the memory. Rarely, if ever, were the rules they embodied permissive; they were nearly all in the im- perative mood, sometimes entering into minute detail but generally running on broad lines, surmounting instead of re- moving difficulties. Their application might cause hardship in individual instances, as when a man was held to the letter of what he had declared in a nexum or mancipation, even though he had done so under error or influenced by fraudulent misrepresentations; the decemvirs admitted no exceptions, preferring a hard-and-fast rule to any qualifications that might cause uncertainty. The system as a whole is one of jus as distinguished from fas. In the royal laws execration (sacratio capitis, sacer esto) was a common sanction; but in the Tables it occurs only once pure and simple, and that with reference to an offence that could be committed only by a patrician, — material loss caused by a patron to his client (palronus, si clienti fraudem faxsit, sacer esto). In all other cases the idea that a crime was an offence against public order, for which the community was entitled in self-protection to inflict punishment on the criminal, is prominent. Hanging and beheading, flogging to death, burning at the stake, throwing from the Tarpeian rock, — such are secular penalties that are met with in the Tables; but often, though not invariably, the hanging and so forth is at the same time declared a tribute to some deity to whom the goods of the criminal are forfeited (consecratio bonorum). The Tables also recognize the system of self-help.

The manus injectio of the third Table — the execution done by a creditor against his debtor — was probably in essence the same • procedure as under the kings, but with the addition of some regula- tions intended to prevent its abuse. Against a thief taken in the act the same procedure seems to have been sanctioned ; it was lawful to kill him on the spot if the theft was nocturnal, or even when it was committed during the day if he used arms in resisting his apprehension. According to Cicero there was a provision in these words: ” si telum manu fugit magis quam jecit, arietem subicito “; this is perhaps just a re-enactment in illustrative language of the law attributed to Numa, that for homicide by misadventure — ” if the weapon have sped from the hand rather than been aimed ” — a ram was to be tendered as a peace-offering to the kinsmen of him who had been slain. The original purpose must have been to stay the blood revenge, but in the Tables it can only have been intended to stay the prosecution which it was incumbent on the kinsmen of a murdered

man to institute. So with talionic penalties: “si membrum rupit ni cum eo pacit, talio esto ” — such, according to Gellius, were the words of one of the laws of the Tables, and they undoubtedly recognize talion, ” an eye for an eye, a tooth for a tooth “; while at the same time regulating it by enabling the injured man to bring an action and sanctioning a money recompense (Wehrgeld) in lieu of it. 6

The structure of the provisions of the Tables was not such as to enable the plain citizen to apply them to concrete cases, or to know how to claim the benefit of them in the tribunals, without some sort of professional advice. Pomponius states that no sooner was the decemviral legislation published than the necessity was felt for its interpretation, and for the preparation by skilled hands of styles of actions by which its provisions might be made effectual. Both of these duties fell to the pontiffs as the only persons who, in the state of civilization of the period, were well qualified to give the assistance required ; and Pom- ponius adds that the college annually appointed one of its members to be the adviser of private parties and of the indices in those matters. The inter pretatio, commenced by the pontiffs and continued by the jurists during the Republic, which, Pomponius says, was regarded as part of the jus civile, was not confined to explanation of the words of the statute, but was in some cases their expansion, in others their

also Muirhead, Historical Introduction (2nd ed., 1899), and Words- worth, Fragments and Specimens of Early Latin (Oxford, 1874), PP- 2 53 seq. The last-named writer in a subsequent part of his volume (pp. 502-38) has added notes, historical, philological and exegetical, which constitute a valuable commentary on the Tables as a whole. Voigt’s two volumes, under the title of Geschichte und System des Civil-und-Criminal-Rechtes wie Processes, der XII. Tafeln nebsl der en Fragmenten (Leipzig, 1883), contain an exposit-on of the whole of the earlier jus civile, whether embodied in the Tables or not. The history of them occupies the first hundred pages or thereby of the first volume; his reconstruction of fragments and allusions — a good deal fuller than any earlier one and supported by an imposing array of authorities, which, however, often rest on arbitrary assumptions — is in the same volume, pp. 693-737.

6 There is little doubt that talio was actually enforced under the decemviral code, just as it was under the Jewish and Mahommedan codes, and as we see it among semi-civilized com- munities (e.g. the Abyssinians) at the present day. See Code of Khammurabi, 196 seq.; Leviticus xxiv. 20; Lane, Modern Egyptians, p. 94. Many references are given by Lenel in Z. d. Sav. Stift. xxiv.

509.

Interpre- tation otthe Tables.

and his “caput.’

limitation, and in many the deduction of new doctrines from the actual jus scriptum, and their development and exposition. An event that did much to diminish the influence of the pontiffs in con- nexion with it was the divulgement in the year 304 B.C., as already mentioned, by Cn. Flavius, of a formulary of actions and a calendar of lawful and unlawful days, which got the name of Jus Flavianum. The practice adopted in the beginning of the 6th century by Tiberius Coruncanius, the first plebeian chief pontiff, of giving advice in law in public had a still greater effect in popularizing it; and the Tripertita or Jus Aelianum, some fifty years later — a collection that included the Tables, the interpretatio and the current styles of actions — made it as much the heritage of the laity as of the ponti- fical college.

Subsequent Legislation. — Of legislation during the 4th and 5th centuries that affected the private law we have but scanty Subse- record. The best-known enactments are the Canuleian queat law of 445 B.C. above mentioned; the Genucian, legisia- Marcian and other laws about usury and the rate of tion ‘ interest; the Poetilian law of 326 B.C. abolishing imprisonment of nexal debtors by their creditors; the Silian law, probably not long afterwards, which introduced a new form of process for actions of debt; and the Aquilian law about 287 B.C., which amended the decemviral provisions for actions of damages for culpable injury to property, and continued to regulate the law on the subject even in the books of Justinian.

iii. Development of the Substantive Institutions of the Law.

The Citizen and his ” Caput.” — The early law of Rome was essentially personal, not territorial. A man enjoyed the benefit The of its institutions and of its protection, not because he

citizen happened to be within Roman territory, but because he was a citizen, — one of those by whom and for whom its law was established. The theory of the early Romans was that a man

sojourning within the bounds of a foreign state was at the mercy of the latter and its citizens, that he himself might be dealt with as a slave, and all that belonged to him appropriated by the first comer; for he was outside the pale of the law. Without some sort of alliance with Rome a stranger had no right to claim protection against maltreatment of his person or attempt to deprive him of his property; and even then, unless he belonged to a state entitled by treaty to the international judicial remedy of recuperalio, it was by an appeal to the good offices of the supreme magistrate, or through the intervention of a citizen to whom he was allied by the (frequently hereditary) bond of hospilium, and not by means of any action of the jus civile set in motion by himself. A non-citizen — originally hoslis, and afterwards usually called peregrinus' — in time came to be regarded as entitled to all the rights recognized by so-called jus gentium as belonging to a freeman, and to take part as freely as a Roman in any transaction of the jus gentium; but that was not until Rome, through contact with other nations and the growth of trade and com- merce, had found it necessary to modify her jurisprudence by the adoption of many new institutions of a more liberal and less exclusive character than those of the_/ws civile.

A citizen's civil personality was technically his caput. The extent of it depended on his family status. It was only among citizens that the supremacy of the paterfamilias and the sub- jection of those in manu, potestate or mancipio were recog- nized — only among them therefore that the position of an individual in the family was of moment. While in public life a man's supremacy or subjection in the family was immaterial, in private life it was the paterfamilias alone who enjoyed full jural capacity. Those subject to him had a more limited personality; and, so far as capacity to take part in transactions of the jus civile was concerned, it was not inherent in them but derived from their paterfamilias: they were the agents of his

1 Neither " alien " nor " foreigner " is an adequate rendering of peregrinus. For peregrini included not only citizens of other states, independent or dependent, but also 4ir6Xi5«, — men who could not call themselves citizens (cives) at all, as, for example, the dediticii whom Rome had vanquished and whose civic organization she had destroyed, offenders sent into banishment, &c, and also, until Caracalla's general grant of the franchise, the greater portion of her provincial subjects.

will, representatives of his persona in every act whereby a right was acquired by them for the family to which they be- longed.

Whenever a citizen either ceased altogether to be a member of a Roman family or passed, either permanently or temporarily, into subjection to some paterfamilias outside his own “Capitis family, 2 there was technically capitis minutio or demina- deminutio. To harmonize with the gradually estab- tt0 ‘ lished conception of jural personality in non-citizens, and perhaps also from their partiality for tripartite divisions, the jurists about the end of the Republic divided capitis deminutio into three degrees, viz. maxima, media and minima — a division unknown to lawyers of an earlier period when civitas was theoretically identified with libertas. When a citizen forfeited his freedom, his capitis deminutio was said to be maxima; he lost all capacity, whether under the jus civile or the jus gentium. When, retain- ing freedom, he went into exile or joined a Latin colony, or otherwise became a peregrin, the loss {deminutio) of his capacity was only media or minor; it was his rights and privileges under the jus civile that alone were affected. When both freedom and citizenship remained, and there was produced merely the severance of connexion with a particular family (familiae mutatio), the loss was said to be minima. Illustrations of c. d. minima present themselves in the case of a paterfamilias be- coming filiusfamilias by adrogation, or a materfamilias passing into the hand of a husband by confarreation or coemption; in both cases he or she who had been sui juris thereby became alieni juris. It was immaterial whether the change was from a higher family position to a lower, or from a lower to a higher, 3 or to the same position in the new family that had been held in the old — as when a filiusfamilias was transferred by his father into the potestas of an adopter, or when the filiifamilias of a person giving himself in adrogation passed with him into the potestas of the adrogator: in every case there was capitis minutio. It was not the change of family position that caused it, but the subjection to a new potestas. Thus the civil person- ality of Titius while a. filiusfamilias in the potestas of Sempronius, e.g. the expectancy of succession, the agnatic relationships, the derivative capacity for being a party to a mancipation or a sponsio that resulted from the relationship, all came to an end through the subjection to a new paterfamilias, temporary or permanent. He might acquire another and independent capacity on becoming sui juris by emancipation, or another derivative capacity on passing into the potestas of Maevius by adoption; but while subject to a new paterfamilias his old personality quoad civilia was extinguished. This is what some of the jurists mean when they say that capitis deminutio was civil death. 4

An important consequence of minima capitis deminutio was that it not only extinguished patria potestas where it existed, but severed the

bond of agnation between the capite minutus and all those who had previously been related to him as agnates. There was no longer any right of succession between them on intestacy; their reciprocal prospective rights of tutory were defeated, and the minutio of either tutor or ward put an end to a subsisting guardianship, assuming always that it was a tutela legitima or agnatic cura furiosi. Very remarkable, yet quite logical, was the doctrine that the minutio extinguished the claims of creditors of the minutus; their debtor, the person with whom they had contracted, was civilly dead, and dead without an heir, and therefore there was no one against whom an action of the jus civile could be directed in order to enforce payment. But equity eventually provided a remedy, by

2 This is Mommsen's theory. See Staatsrecht, iii. 1. p. 8.

3 Children who became sui juris by their parent's death, as they came under no new potestas, were not regarded as capite minuti.

4 Owing to the ill-defined views among the Roman jurists them- selves regarding the nature of cap. dem. various theories more or less divergent have been maintained about it by modern writers, of none of which can it be said that it has been generally accepted. Mommsen's theory, above adopted, seems to present fewest diffi- culties. See the subject discussed and authorities cited by Goudy in 2nd edition of Muirhead's Historical Introduction, pp. 422-27.

giving the creditors a praetorian action in which the minutio was held as rescinded, and which the new paterfamilias was bound to defend on pain of having to give up all the estate he had acquired through the adrogation or in manum conventio. In other respects also the strict effects of this capitis minutio were attenuated or done away with by the jurists of the Empire, e.g. as regards personal servitudes.

The Law of the Family Relations. — So far as appears no serious inroad was made by the XII. Tables on the law affecting husband Law of and wife, unless in the recognition of the legality of family so-called " free " marriages, i.e. entered into without relations. anv solemnity, and not involving that subjection of the wife to the husband (manus) which was a necessary consequence of the patrician confarreation and plebeian co- emption. These latter were left untouched, while on the

other hand acquisition of marital manus through usus was fully recognized. As formerly mentioned, it had become a practice with some of the plebeians to tie the marriage bond rather loosely in the first instance, possibly in consequence of objection by the women (as became quite general even among patricians at a later period) to renounce their independence and right to retain their own property and earnings, but more probably because taking a woman to be merely the mother of children (matrimonium) had been practically forced upon them before coemption had been introduced as a means of making her a lawful wife, and so they had become in a manner habituated to it. But the idea that, as a man might acquire the ownership of a thing to which his legal title was defective by prolonged possession of it, so he might acquire manus over the woman with whom he had thus informally united himself by prolonged cohabitation with her as his wife had probably matured and become customary law. The Tables accepted it; all that was needed was to define the conditions under which manus should be held to have been superinduced, and the wife converted from a doubtful uxor into a lawful materfamilias. Hence the pro- vision that, if a woman, married neither by confarreation nor coemption, desired to retain her independence, she must each year absent herself for three consecutive nights from her husband's house (trinoctialis usurpatio) — twelve months' un- interrupted cohabitation being required to give him that power over her which would have been created instantly had the marriage been accompanied by either of the recognized solem- nities.

Amongst the fragments of the Tables so industriously collected there is none that refers to a wife's marriage portion (dos) ; but it is hardly conceivable that it was as yet unknown. Justinian says that in ancient times it was regarded as a donation to the husband with his wife, rather than as a separate estate that was to be used by him while the marriage lasted but to revert to her or her repre- sentatives on its dissolution. And it is easy to see that, where there was manus, the wife becoming a member of her husband's family and everything of hers becoming his, such must originally have been its character. 1 But even then, when a man gave his daughter (filiafamilias) — who could have nothing of her own — in marriage, and promised her husband a portion with her, there must have been some process of law for compelling him to pay it; and Voigt's conjecture that an actio dictae dotis was employed for the purpose has something in its favour. 2 As regards divorce, Cicero alludes vaguely to a provision in the Tables about a man depriving his wife of the house-keys arid turning her out of doors, with some such words as " take what is thine and get thee gone." This can only refer to free or non-manus marriages, but even

for hand marriages, while repudiations by husbands (but not by wives) were competent, the statement of the historians is that they were few and far between until the 6th century of the city, and that, until the same date, any man who turned his wife away, however serious the ground, without the cognition of the family council, was liable to penalties at the hands of the censors. 3

Of the two or three provisions of the Tables, known to us that affected details of the patria potestas, which itself was assumed to be so well established by customary law as to need no statutory sanction or definition, one was in the words " si pater (familias) ter filium venum duuit, a patre filius liber esto." This came to be construed by the pontifical lawyers as meaning that so powerful

1 See Cicero, Top. iv. 23.

2 Voigt, XII. Tafeln, ii. p. 486. It has not, however, received any support from more recent writers.

3 See Esmein, Melanges, pp. 23 seq.

was the bond of the potestas over a son that it could not be completely loosed Until the father had three times gone through the process of fictitious sale by which emancipation was effected. But the conception of the law seems to indicate that its original purpose must have been rather to impose a penalty on the father and confer a benefit on a son in potestate, by declaring him ipso jure free from it on a certain event, than to place difficulties in the way of his emancipation. " If a house-father have thrice sold his Son, the latter shall be free from his father." It reads as if the intention were to rescue the son from what, by its frequent repetition, was suggestive of a total absence of parental affection rather than reluctant obedience to overwhelming necessity. May not its object have been to restrain the practice, which did not wholly disappear even in the late Empire, of men selling their sons or giving them to their creditors in security of loans — such sales or pledges, at the time of the Tables, being effected only by an actual transfer of the child per aes et libram as a free bondman (in mancipii causa) , accompanied by, in the case of a loan, a pact for reconveyance when the loan was repaid? Whatever its ratio, however, and whatever the earlier practice, it was upon this law that the inter- preting pontiffs based the rules for adoptions and emancipations of filiifamilias. The usual procedure in adoptions was as follows : The natural father mancipated his son to a friend for a nominal price and the latter then manumitted him, the son thereupon reverting into his father's potestas. This was repeated a second time

with the same result. After the third sale (patria potestas being extinguished) the purchaser remancipated to the parent. In the latter's hands the son was now in causa mancipii, and so in a position in which he could be permanently transferred to the adopter. This was effected by an in jure cessio, in which the adopter averred that the child was his filiusfamilias, and in which judgment was at once given in his favour on the natural parent's admission or tacit acquiescence. A similar method was followed in emancipation of a filius, except that of course there was no cessio in jure, but instead thereof the parent manumitted immediately after the reconveyance to him. Neither in adoption nor emancipa- tion, however, was remancipation to the paterfamilias essential, though it was usual, and in the case of emancipation carried with it important rights of succession and tutory. For daughters and grandchildren the pontifical jurists by a casuistic interpretation of the said law held one mancipation to be in all cases enough to extinguish the patria potestas.

The nature of the relation between master and slave, like that of manus and patria potestas, seems also to have been too notorious to require exposition in the Tables. We find recorded only two references to it, one dealing with the case of a slave who had a con- ditional testamentary gift of freedom (statu liber), the other with noxal surrender (noxae deditio). The provision about noxal sur- render was not limited to a slave; it was apparently to the effect that, if a member of a man's family (familiaris, i.e. a son or a daughter in potestate or a slave) committed a theft of, or did mischief to, property belonging to a third party, or a domestic animal be- longing to one man did harm to another, the father of the delin- quent child, or the owner of the slave or animal, should either surrender him or it to the person injured or make reparation in damages. In course of time the surrender came to be regarded as a means of avoiding the primary obligation of making reparation. But comparative jurisprudence recognizes in the enactment of the Tables a modified survival of the ancient right of an injured party to have the delinquent corpus — man, beast or thing — given up to him to wreak his revenge upon it privately, the modification con- sisting in the alternative of reparation offered to the owner. This noxal surrender, failing reparation, had gone out of use in the case of daughters in potestate before the time of Gaius, and in the case of sons before that of Justinian; but it was still sanctioned so far as slaves and domestic animals were concerned even in that emperor's legislation.

Guardianship and the Introduction of the Order of Agnates. — So long as Rome was patrician the gens apparently charged itself with the guardianship of a clansman's orphan pupil Gentile children and his

widow and unmarried daughters guardian- above pupillarity after his decease (tutela), as well sn,p ‘ as with that of male members of his family who were sui juris, but above the age of pupillarity, when they chanced to be lunatic, imbecile, prodigal or helplessly infirm (cura, curatio). The gens in council, in all probability, appointed one of its members to act as tutor or curator as the case might be, itself prescribed his duties, and itself called him to account for any failure in his administration.

But, as this gentile tutory could not be extended to the plebeians, among whom some law of guardianship was as much required as among their fellow-citizens of the higher order, the decemvirs found it expedient to devise a new one of universal application. The Tables contained no express authority for testamentary nomination of tutors to the widow

of the testator, or to his pupil children and grown-up unmarried daughters; but such appointment, if unknown previously, was soon held to be justified by a liberal interpretation of the very inclusive provision, ” uti legassit suae rei, ita jus esto.” In the absence of testamentary appointment the nearest male agnates of lawful age were to be tutors. This tutory of agnates was an invention of the decemvirs, just as was the agnates’ right of succession on intestacy. The plebeians had no gentes, at least until a much later period; so, to make the law equal for all, it was necessary to introduce a new order of heirs and tutors. ” Tutores … ex lege XII. Tabularum introducuntur Ouard- • • • agnati ” is the very notable language of Ulpian. iaaship And his words are very similar in speaking of their 0/ right of succession; for, while he says of testamentary

agnates, inheritances no more than that they were confirmed by the XII. Tables, he explains that the legitimae heredilates of agnates and patrons were derived from them. 1 The phrases legitima cognatio, legitima hereditas, legitimi heredes, tutela legiUma, tutores legitimi themselves proclaim the origin of ag- nation, agnatic inheritance and agnatic tutory; for, though the word legitimus might be applied to any institution based on statute, yet in the ordinary case it indicated one introduced by the XII. Tables, the law of laws.

A man's agnates, in the strict sense, were those of his collateral kinsmen who were subject to the same patria potestas as himself, or would have been had the common ancestor been still alive. A man's sons and daughters in poteslate, therefore, whether the relationship was by birth or adoption, and his wife in manu (being filiae loco) were each other's agnates. But a wife not in manu was not their agnate; nor were children who had been emancipated or otherwise capite tninuti the agnates of either their brothers and sisters or their mother in manu. A man was an agnate of his brother's children, assuming always that there had been no capitis deminutio on either side; but he was not an agnate of his sister's children, for they were not ejusdem familiae: they were agnates of their father's family, not of their mother's. In like manner, and again assuming the absence of minulio capitis, the children of brothers were each other's agnates, but not the children of a brother and a sister or of two sisters. Brothers and sisters were agnates of the second degree; a man and his brother's children were of the third, the children of two brothers (patrueles) of the fourth, and so on, — it being a condition, however, that the kinship should always result either from lawful marriage or from adoption in one or other of its forms.

When, therefore, a man died leaving pupil male descendants or unmarried female descendants who by his death became sui juris, they got their brothers of lawful age as their tutors; if he was survived by his wife, and she had been in manu, her sons, or it might be stepsons, acted for her in the same capacity; in either case they took office as the nearest qualified male agnates. If the widow had no sons or stepsons of full age, and the children conse- quently no qualified brothers, the tutory devolved on the agnates next in order, — i.e. the brothers german and consanguinean of the deceased husband and father; for they were agnates of the third degree. And so with agnates of the fourth and remoter degrees. 2 Failing agnates who could demonstrate their propin- quity, the tutory passed to the gens when the ward happened to belong to one. This is nowhere expressly stated; but Cicero gives what he represents to be an enactment of the Tables, making the fellow-gentiles of a lunatic his guardians on failure of agnates; and analogy seems to justify the extension of the same rule to the case of sane pupil and female wards. 3

The curatory of minors above pupillarity was of much later date than the Tables. The only curatories they sanctioned were those of lunatics (furiosi) and spendthrifts (prodigi). A

1 Ulp. Frag, xxvii. 5, " legitimae hereditatis jus … ex lege Duodecim Tabularum descendit." This derivation of agnatic inheritance from the

XII. Tables was specially noticed by Danz in his Gesch. d. rom. Rechts (2nd ed., Leipzig, 1871-73), ii. 95, but is generally ignored.

‘ To determine the degree of propinquity between two persons it was necessary to count the generations upwards from the first to the common ancestor and downwards from him to the second. Consequently brothers were related in the second degree, uncle and nephew in the third, first cousins in the fourth, and so on.

- See Gai. i. 165.

lunatic was committed to the care of his agnates, and, failing them, of his fellow-gentiles; and a few words in Festus seem to suggest that arrangements had to be made by them for his safe custody.

Mancipation and the Law of Property. — In the early law, as we have seen, there was no technical word for ownership of things: it was an element of the house-father’s manus. In owner- time, although it is impossible to say when, the word ship in dominium came into use, but, so far as can be dis- ” n * covered, it did not occur in the XII. Tables, and ^™ < £, s must have been of later introduction. In those days, nee when a man asserted ownership of a thing, he was man- content to say, " It is mine," or " It is mine according to C, P 1 "' the law of the Quirites." It is said by some jurists of eminence that under the law of the Tables what afterwards came to be called " dominium ex jure Quiritium " was competent only in the case of res mancipi — of a man's house and farm, and things appurtenant thereto, as slaves and animals with which he worked them. There is much to be said for this hypothesis, but it is so far contradicted by Ulpian and Paul, who tell us that tigna juncta (that is, building materials, vine stakes and the like, which undoubtedly were res nee mancipi) were exceptionally excluded from vindication. On the other hand, these texts may be explained as mere deductions by interpretation at a later time of the words " ne solvito " of the XII. Tables. 4 At any rate it is pretty certain that before the close of the present period res nee mancipi as well as res mancipi could be held in quiritarian ownership.

The modes in which these two classes of things might be acquired in property were various. But there was this important difference: that, while a natural mode of acquisi- tion sufficed in the case of res nee mancipi, some civil one was necessary for the derivative acquisition, at all events, of res mancipi. The most important were mancipation, surrender in court, usucapion and bequest as singular modes, and inheritance, in manum conventio, adrogation and purchase of a confiscated estate, as universal ones. All of these, with the exception

of mancipation, applied equally to res mancipi and res nee mancipi. But there was, in addition, for res nee mancipi, what was the commonest of all the modes of transferring things of this class, simple tradition. If the transfer of these was by the owner, with the intention of passing the property, then the simple delivery of possession (tradilio) was enough, unless indeed it was in virtue of a sale; in which latter case the ownership remained with the vendor, notwithstanding the change of possession, until the price was paid or security given for it. 5 Only mancipation, surrender in court and usucapion, however, need be noticed at present*

The origin of the distinction between mancipable and non-mancipable things, and of the form of conveyance by mancipation applicable to the first, has been explained {supra, p. 529).° „ . Originally mancipation was not the imaginary sale that . a ” pa ‘ Gaius speaks of, but as real a sale as could well be con ° ‘ ceived — the weighing in scales, held by an official, of the raw metal that was to be the consideration for the transfer of a res mancipi, and the handing of it by the transferee to the transferrer, with the. declaration that thereby and therewith the thing in question became his in quiritary right. On the introduction of coined money weigh- ing became unnecessary. The price was counted out before the ceremony, or sometimes left to be done afterwards; and though, in that spirit of conservatism that was so marked in the adhesion

4 Dig. xlvii. 3, I pr. and xlvi. 3, 98, § 8. See Cuq, Inst. Jurid. 2nd ed. i. 91 n. ; and on tignum junctum in general, Girard, Manuel de droit remain, 4th ed. p. 330.

6 Our only authority for attributing this fundamental rule to the XII. Tables is Justinian’s Institutes, ii. I, § 41, where there is clear evidence of a Tribonianism. The rule undoubtedly must have been applied to res mancipatae in the Tables, and possibly its extension to tradition of res nee mancipi may have been due to interpretation. See Girard, ut supra, p. 288; cf. Cuq, Institutions Jurid. i. p. 87.

‘Literature: Leist, Mancipation und Eigenthumstradition (Jena, 1865); Jhering, Geist. d. rom. Rechts, vol. ii. § 46; Bechmann, Der Kauf nach gemeinem Recht (Erlangen), i. pp. 47-302; Voigt, XII. Tafeln, vol. i. § 22, vol. ii. §§ 84-88; Kalowa, Rom. Rechtsgesch. ii- PP. 363-81.

to time-honoured forms after their raison d'etre was gone, the scale-bearer and the scales were still retained as indispensable elements of the mancipation, yet the scales were simply touched by the purchaser with a rauducculum or a single coin, in order that he might be able to recite the old formula: " I say that this slave is mine in quiritary right, and that by purchase (for such and such a price) with these scales and this bit of copper." And that one coin, says Gaius, was then handed by the transferee to the trans- ferrer as if it were in fact the price of the purchase {quasi prelii loco). Thus transformed, the mancipation was undoubtedly an imaginary sale; for the real price might have been paid weeks or months before, or might not be paid until weeks or months afterwards. The mancipation had become nothing more than a conveyance, and in this form it continued down to the end of the 3rd century of the Empire to be the appropriate mode of transfer of a res mancipi, or at least of conferring on the transferee of such a thing a complete legal title (dominium ex jure guiritium). After that, however, it seems gradually to have gone into disuse, being inapplicable to lands out of Italy that did not enjoy what was called jus Italicum; and long before the time of Justinian it had practically disappeared.

The effects of a mancipation, provided the price had been paid or security given for it, were that the property passed instantly to the purchaser, and that the transferrer was held to warrant the transferee against eviction from the moment the price was received. In the absence of either payment or sureties for it, the title still remained with the vendor, so that it was in his power, by means of a real action, to get back what had been mancipated, even though it had passed into the possession of the vendee. The vendor's liability to the vendee in the event of eviction is usually supposed to have arisen ipso jure — that is to say, without anything expressly said about it ; the acceptance by the transferrer of the coin with which the scales had been struck was held to have im- posed upon him an obligation to maintain the transferee in posses- sion, under a penalty of double the amount of the price, recoverable by the latter by what is usually called an actio auctoritatis. But this ipso jure obligation did not arise when the mancipation was either really or fictitiously gratuitous {nummo uno), — really, in the case of donations, &c, fictitiously, when, on purpose to exclude the warranty, the recital of the transferee was that the price was a single sesterce.

The right of a vendee to sue an actio auctoritatis arose only when eviction resulted from a decree in a regular judicial process at the instance of a third party disputing his title, and was conditional on his

having done all that was necessary on his part to bring his vendor (auctor) into the field to defend his own interests. And the duration of the auctoritas was limited by the Tables to two years in the case of lands and houses, to one year in the case of other things. As possession for those periods was sufficient to cure any defect in the vendee's title, it was but reasonable that with their expiry the vendor's liability on his warranty should be at an end.

By a provision of the Tables in the very inclusive terms, " cum nexum faciet mancipiumque, uti lingua nuncupassit, ita jus esto," the importance of mancipation was immensely increased; for any sort of qualification germane to the transaction might be super- induced upon it, and the range of its application thus greatly extended. Such qualifications were spoken of as leges mancipii, — self-imposed terms, conditions or qualifications of the conveyance and, as integral parts of the transaction per aes et libram, they partook of its binding character and were law between the parties. The matter of oral declaration might be the acreage of lands, their freedom from burdens or right to easements, reservation of a usu- fruct, undertaking to reconvey on a certain event, or what not, so long as it did not express a term or condition; the result was just so many obligations created per aes et libram, whose con- travention or denial (Cicero tells us) was punished with a twofold penalty. 1 Ordinarily the words spoken in the hearing of the witnesses fixed the beginning and the end of the liability; it was enough that they were literally complied with, however much the other party might be injured by something inconsistent with their spirit, or which he had not taken the precaution to require should be made matter of declaration. But there was an exception (although not introduced until long after the Tables) in the case of that particular mancipatory agreement which was known by the name of fiducia, i.e. where the mancipation was to a creditor in security or to a friend for safe custody, and the engagement was to return the thing mancipated, in the one case when the debt secured by it was paid and in the other on demand. In such cases the transferee took the conveyance more in the transferrer's interest than his own; he became a sort of trustee, entitled to be treated with consideration, and neither mulcted in a twofold penalty when his inability to reconvey was due to no fault of his, nor forced to reconvey until relieved of charges incurred by him in reference to

1 Cic. de Off. iii. 16, § 65. Some writers, e.g. Girard, Manuel de droit romain, p. 550, n. 5, take the view that, apart from the actio auctoritatis, it was only where the extent of the land was mis- stated {actio de modo agri) that the penalty of a duplum was ipso jure incurred. But this puts a gloss on Cicero's language.

the property. Accordingly it became the practice to import into the mancipation a reference to jides — ” fidi fiduciae causa meum esse aio,” with explanation of the purpose, conditions, &c, of the fiducia, and this explanation as a rule not in the nuncupatory words, forming a relative lex mancipii, but in a separate agreement or pactum fiduciae. This pact then became enforceable not by ordinary legis actio, as part of the mancipation, but separately on grounds of good faith alone. It gave rise to an actio fiduciae which some writers think was just an application of the legis actio per judicis postulationem, but which more probably was originally an action in factum granted by the urban praetor by virtue of his imperium. In any case it was one of the earliest instances of an action inter cives based on principles of good faith. The fiduciary clause had the effect of freeing alike the right of the vendor and the obligation of the vendee from the hard-and-fast lines of the jus strictum, and subordinating them to the principles of bona fides. 2

Of the civil modes of acquiring property on singular title ap- plicable to both res mancipi and res nee mancipi surrender in court (injure cessio) was just a rei vindicatio arrested in its initial surrea- stage. The parties, cedent and cessionary, having pre- derin viously arranged the terms of transfer — sale, donation or court otherwise — appeared before the magistrate; the cession- ary, taking the position of plaintiff, declared the thing his in quiritary right; the cedent, as defendant, was asked what he had to say in answer; and, on his admission or silence, the magistrate at once pronounced a decree (addictio) which completed the transfer, but which might be subject to a fiduciary reservation or deduction of a servitude. It was probably more resorted to for the con- stitution of servitudes, both real and personal, and transfer of such rights as patria potestas, tutory-at-law of a woman, or an agnatic inheritance that had already opened, than for conveyance of property. For it was not only inconvenient, inasmuch as it required the parties to appear before the supreme magistrate in Rome, and could not be carried through by any one under power (as mancipation might), but it had also the serious disadvantage that it did not ipso jure imply any warranty of title by the cedent in the event of eviction or give rise to an action de modo agri. Nor did it, like mancipation and tradition, make payment of the price a condition precedent of the transfer of property. The reason was that in form the right of the cessionary flowed from the magisterial decree: ” Since you say the thing is yours, and the cedent does not say it is his, I declare it yours,” and not from any act or word of the cedent’s, who was passive in the matter.

Usucapion, 3 regulated by the XII. Tables, but not improbably

recognized previously in a vague and uncertain way, converted uninterrupted possession (usus) into quiritary property by efflux of time. The provision in the Tables, as capioa. given by Cicero, was to this effect: ” usus auctoritas fundi biennium est, ceterarum rerum omnium annuus est.” The relation in which the words usus and auctoritas stand to each other has been a subject of much discussion: the pre- vailing opinion amongst modern civilians is that the two words should be taken disjunctively, the first alone referring to usucapion, and the second to the warranty of title incumbent on the vendor in a mancipation, and that both were limited to two years in the case of lands (and, by extensive interpreta- tion, houses), and to one year in the case of anything else. In the later jurisprudence the possession required to be based on a sufficient title and the possessor to be in good faith. But the decemviral code, as is now generally admitted, contained no such requirements; any citizen occupying immovables or holding movables as his own, provided they were usucaptible and he had not taken them theftuously, acquired a quiritary. right in two years or one, as the case might be, simply on the strength of his possession. Originally, therefore, it was simply the conversion of de facto possession, no matter how acquired so long as not by theft, into legal ownership when prolonged for the statutory period, — too often the maintenance of might at the cost of right. But in time it came to be regarded rather as a remedy for some defect of title, arising either from irregularity of conveyance or incapacity of the party from whom a transfer had been taken; and with the progress of

2 There is much diversity of opinion about fiducia. See Oertmann, Fiducia im rom. Privatrecht (Berlin, 1890) ; Girard, Manuel, 4th ed. pp. 519-23; Sohm, Institutionen (Eng. trans., 2nd ed.), pp. 63-65.

‘Literature: Stintzing, Das Wesen von bona fides und titulus in d. rom. Usucapionslekre (Heidelberg, 1852); Schirmer, Die Grundidee d. Usucapion im rom. Recht (Berlin, 1855ˆ; Pernice, Labeo, 2nd ed. ii. 328 seq.; Voigt, XII. Tafeln, ii. § 91, Karlowa, Rom. R.G. ii. 387 seq. ; Esmein, ” Sur l’histoire de {‘usucapion,’ Mttanges (1886), pp. 171 seq.

jurisprudence it developed into the carefully regulated positive prescription which has to a greater or less extent found a place in

every modern system.

The conception of the abstract notion of a real right in (or over) the property of another person (jus in re aliena) is not to be looked for at so early a period in the rJaiiena. history of the law as that now under consideration. The rural servitudes of way and water were no doubt very early recognized, for they ranked as res mancipi, and the XII. Tables contained various regulations in reference to the former. Usufruct, too, was probably not unknown; but the urban praedial servitudes bear the impress of a somewhat later jurisprudence. Pignorate and hypothecary rights were certainly unknown as rights protected by action. 1 Between private parties the only thing legally recognized of the nature of a real security was the fiducia that is described above. Approaching more nearly to the modern idea of a mortgage was the security praedibus praediisque required by the state from those indebted to it in assurance of their obligations. Here there was the double guarantee of sureties (praedes) and mortgages of lands of theirs (praedia subsignata); but how they were dealt with when the debtor made default is by no means clear.

Changes in the Law of Succession. — The two forms of testa- ment of the regal period, viz., that made in the comitia of Forms of the curies and that by soldiers on the eve of battle, testa- still remained in use in the early Republic; though

meuu before the end of the Republic they were displaced

by the general adoption of that executed with the copper and scales (testamenlum per aes et libram). It seems to be the general opinion that it was to the first two alone that the words applied which stood in the forefront of the provisions of the XII. Tables about inheritance: “uti legassit suae rei, ita jus esto.” Whether resort was to the comitia or to the army, the testator’s own will in the matter was henceforth to be supreme. There was to be no more reference to the pontiffs as to the expediency of the testament in view of the interests of the family sacra and of creditors of the testator’s; from legislators, sanctioning a departure from the ordinary rules of succession, the assembled Quirites became merely witnesses — recipients of the oral declaration of the testator’s will in regard to his inheritance. 2

The testament with the copper and the scales is depicted by Gaius as a written instrument. But he presents it in what Testa- might be described as the third stage of its history. meat Its probable origin has been explained (supra, p. 534).

per aes et j t was originally not a testament but only a make-

ram ‘ shift for one. A plebeian was not qualified in the regal period to make a testament in the comitia; so, instead, he transferred his estate to a friend on whom he could rely, with instructions how to distribute it on his death. The transferee was called familiae emptor, because the conveyance was in form a mancipation for a nominal price.

It is not at all unlikely that the same device may occasionally have been resorted to by a patrician who had neglected to make a regular testament, and was seized with mortal illness before he had an opportunity of appealing to the curies. 3 But such a disposition was not a testament, and may not have been so called. A testa- ment was the nomination of a person as the testator’s heir. It made the person instituted as fully the representative of the testator after his death as his heir-at-law would have been had he died

1 Hypothecary rights were unknown until near the end of the Republic. But Festus (s.v. “Nancitor”; see Bruns, Fontes, 6th ed., lii. 16) speaks of a provision in the Cassian league between Rome and the Latin states of the year 262 u.c. — ” Si quid pignoris nasciscitur, sibi habeto ” — which may suggest that the Romans at this period were not altogether unacquainted with pledge or pawn of movables as a transaction of some value de facto if not de jure.

2 See Girard, Manuel de droit romain, 4th ed. p. 800. • On the ” uti legassit ” law of the Tables see ibid. p. 782, and cf. Cuq, Institutions Juridiques, 2nd ed. pp. 124-125.

3 The comitia, Gaius tells us (ii. § 102), met only twice a year to sanction testaments. In Mornmsen’s view, Rom. Chronologie (1859), pp. 241 seq., these days were the 24th of March and the 24th of May.

intestate. The original mortis causa mancipation that opened the way for the testament per aes et libram conferred upon the familiae emptor no such character. Gaius says that he stood in place of an heir (heredis loco), inasmuch as he had such of an heir’s rights and duties as the familiae venditor had it in his power to confer and impose; but the transaction was but a conveyance of estate, with a limitation of the right of the grantee. It has been argued that, as the law did not recognize conditional mancipation, the conveyance must have operated as a complete and immediate divestiture of the grantee. But this does not follow. For it was quite competent for a man, in transferring property by mancipation, to reserve to himself a life interest; and apparently it was equally competent for him to postpone

delivery of possession, without infringing the rule that the mancipation itself could not be ex certo tempore. So far as one can see, therefore, there was nothing to prevent the grantor of the conveyance (or quasi-testator) bargaining that he was to retain the possession till his death ; and, as the familia was an aggregate of estate (universitas rerum) which retained its identity notwithstanding any change in its component elements, he must in such case have been as free to operate on it while he survived, as if he had never conveyed it by mancipation.

Cicero incidentally remarks 4 — what indeed the nature of the transaction of itself very distinctly suggests — that the true testament with the copper and the scales had its statutory warrant, not in the uti legassit suae rei of the XII. Tables, but in the provision contained in the words: ” cum nexum faciet mancipiumque, uti lingua nuncupassit, ita jus esto.” Reflec- tion on the import and comprehensiveness of these words led the pontifical interpreters to the conclusion that there was nothing in them to prevent the direct institution of an heir in the course of the verba muncupata engrafted on a mancipa- tion. From the moment this view was adopted and put in practice the familiae mancipatio ceased to be a transfer of the testator’s estate to the familiae emptor; the latter’s purchase was now for form’s sake only, though still an indispensable form, since it was it alone that, according to the letter of the statute, imparted efficacy to the nuncupatio. But it was the nuncupatio — the oral declaration addressed to the witnesses — that really contained the testamentary disposition, i.e. the institution of an heir, with such other provisions as the testator thought fit to embody in it. This was the second stage in the history of the testament per aes et libram. The third was marked by the introduction of tablets in which the testamentary provisions were set out in writing, and which the testator displayed to the witnesses, folded and tied up in the usual manner, declaring that they contained the record of his last will.

Gaius narrates the words spoken by the familiae emptor and addressed to the testator as follows: ” Your estate and belongings (familia pecuniaque tua), be they mine by purchase with this bit of copper and these copper scales, subject to your instructions, but in my keeping, that so you may lawfully make your testament according to the statute (quo tu jure testamentum facere possis secundum legem publicam).” The meaning of the words ” in my keeping (endo custodelam meam)” is not quite obvious; they are probably remnants of an older style, but may be due to a clerical error of the writer of the Verona MS. Certain it is that they no more imported a real custody than a real property in the familiae emptor; for the testator remained so entirely master of his

estate that the very next day if he pleased he might mancipate it anew to a different purchaser, and nuncupate fresh testamentary writings. The nuncu- pation by the testator was in these terms: ” As is written in these tablets so do I give, so do I legate, so do I declare my will; therefore, Quirites, grant me your testimony “; and, adds Gaius, ” whatever the testator had set down in detail in his testamentary tablets he was regarded as declaring and confirming by this general statement.” To the appeal of the testator the witnesses responded by giving their testimony in words which unfortunately are not preserved; and then the testament was sealed by testator, officials and witnesses, the seals being outside according to the early fashion. 6

Although this testament with the copper and the scales was justi- fied in the first instance by the provision of the XII. Tables as to the effect of nuncupative words annexed to a mancipation, yet in course of time it came to be subordinated to that other one which dealt directly with testamentary dispositions: uti legassit suae rei, ita jus esto. Upon the words uti legassit the widest possible meaning was put by the interpreters: not only was a testator held entitled on the strength of them to appoint tutors to wife and children, to enfranchise slaves and make bequests to legatees, but he might

4 Cic. De Oral. i. 57, § 245.

6 On the above passage of Gaius, see Sohm, Inst. § 99.

even disinherit a child in his potestas (suus heres) in favour of a stranger, so long as he did so in express terms. Institution of a stranger, without specific mention of the suus heres, however, was fatal, if the latter was a son; for without express disherison (exheredatio) his father could not deprive him of the interest he had in the family property as in a manner one of its joint owners. It can hardly be supposed that disherison was contemplated by the compilers of the Tables; it was foreign to the traditional conception of the family and the family estate. But it was a right whose concession could not be resisted when claimed as embraced in the uti legassit, although generally discountenanced, and as far as possible restrained by the strictness of the rules imposed on its exercise.

In the absence of a testament, or on its failure from any cause, the

succession opened to the heirs ab inteslato. So Intestate notoriously were the sui heredes entitled to the first succes- place — and that not so much in the character of heirs sion. as f persons now entering upon the active exercise

of rights hitherto existing, though in a manner dormant — that the compilers of the XII. Tables thought it superfluous expressly to declare it. ” If a man die intestate, leaving no suus heres, his nearest agnate shall have his estate. If the agnate also fail, his gentiles shall have it.” It has been pointed out, in dealing with the tutory of agnates, that the notion of agnation, as a bond distinct from that which connected the gentile members of a clan, was due to the decemvirs. They had to devise a law of intestate tutory and succession suitable alike to the patricians who had genles and to the plebeians who had none. To put the latter in exactly the same position as the former was beyond their power; for the fact had to be faced that the plebeians had no gentile institutions, and to create them was impossible. The difficulty was overcome by accepting the principle of agnation upon which the patrician gens was constructed, and establishing an agnatic circle of kinsmen (perhaps at first limited to the sixth degree) to which the gens as a collective body should be postponed in the case of the patricians, and which should come in place of it in the case of the plebeians. It was not perfect equalization, but the nearest approach to it that the circumstances permitted. The difference was that, when the agnates of a plebeian intestate failed, his inheritance was vacant; whereas, on failure of those of a patrician, there was devolution to his gens in its collective capacity. Two ” interpretations ” put upon the statute had an important bearing in this connexion, viz. (i) that, if the nearest agnates in existence declined the succession, those next in degree were not allowed to take it; and (2) that no female agnate could take it more remote than a sister of the deceased intestate. The division among two or more agnates was always per capita, not per stirpes.

The order of intestate succession thus established by the XII. Tables, which prevailed until amended by the praetors probably in the 8th century of the city, was first to the sui heredes of the deceased, next to his nearest agnate or agnates, and finally, if the deceased was a patrician, to his gens. 1 His sui heredes, speaking broadly, were those of his descendants in his potestas when he died who by that event (or even after it, but before his intestacy became manifest) became sui juris, together with his wife in manu (who, as regarded his succession, was reckoned as a daughter); but they did not include children whom he had emancipated or daughters who had passed in manum of a husband. Emancipated children did not even come in as agnates on

failure of sui; for emancipation severed the tie of agnation as well as that of potestas. For the same reason no kinsman who had been emancipated, and so cut off from the family tree, could claim as an agnate; for those only were agnates who were subject to the same patria potestas, or would have been had the common family head been still alive.

The opening of a succession (technically delatio hereditatis) in favour of sui heredes, whether in virtue of a testamentary institu

Position of heirs.

tion or by operation of law on intestacy, at once invested them with the character, rights and responsibilities of heirs. No acceptance was necessary, nor, according to the rules of the jus civile, was any declinature competent. They

‘This was for freeborn citizens; for freedmen, the patron (or his children in potestate) took the place of the nearest agnates.

had been all along in a manner joint owners with their parent of the family estate, which by his death had become, nominally at least, an inheritance; and, as he had not thought fit to terminate their interest in it by emancipating or disinheriting them, they were not now allowed to disown it. Hence they were spoken of as necessary heirs {heredes sui et necessarii). A slave, too whom his owner had instituted in his testament with gift of liberty was a necessary heir: he could not decline, and was invested with the character of heir the moment the testator died. Not so with stranger institutes or agnates taking on intestacy: they were free to take or reject the inheritance as they saw fit; consequently, an act of acceptance iaditio) was necessary on their part to make them heirs.

This was a formal declaration before witnesses, which got the name of crelio? It was not unusual for a testator, in instituting an heir, to require that he should make a forma! declaration of acceptance within a limited time, failing which his right should pass to a substitute, who in turn was required to enter within a certain time; and so on with any number of substitutes, the series ending with one of his slaves, who became heir without entry, and thus saved the testator from the disgrace of post mortem bankruptcy in the event of the inheritance proving insolvent. The uti legassit of the Tables, as interpreted by the pontiffs, conferred upon a testator very great latitude of testamentary disposition, even to the extent of disherison of sui heredes. This was a course, however, that was probably rarely resorted to unless when a

child had been guilty of gross ingratitude, or when the parent had reason to believe his estate was insolvent and desired to protect his children from the responsibilities of inheritance. Usually his sui, if he had any, would be his institutes, and the purpose of the testament either to apportion the estate amongst them as he thought expedient, or to give him an opportunity of appointing tutors, bequeathing legacies, or enfranchising slaves. On intestacy the sui took equally but per stirpes; that is to say, grandchildren by a son who had predeceased or been emancipated, but who themselves had been retained in their grandfather's potestas, took amongst them the share to which their father would otherwise have been entitled, instead of taking equal shares with their surviving uncles. It was by no means unusual, when the whole inheritance descended to sons, for them to hold it in common for many years as quasi partners (consortes) ; but any one of them was entitled at any moment to claim a partition which was effected judicially, by an arbitral procedure introduced by the XII. Tables, termed a judicium (or arbilrium) familiae erciscundae. Where two or more strangers were instituted testamentarily, whether to equal or unequal shares, if one of them failed either by predecease or declinature his share accrued ipso jure to the others ; for it was a rule that early became pro- verbial that a man could not die partly testate and partly in- testate. There was the same accrual among agnates on intestacy; and both they and stranger testamentary institutes had the same action for division of the inheritance that was made use of by sui heredes.

According to Gaius it was as a stimulus to heirs to enter as soon as possible to an inheritance that had opened to them, and thus make early provision alike for satisfying the claims of creditors of the deceased and attending to his family Vsacapio sacra, that the law came to recognize the somewhat re- ¥° rBtl markable institution of usucapion or prescriptive acqui- ” ereXII. Tables did not require bona fides on the part of the uscapient; he might acquire ownership by prolonged possession of what he knew did not belong to him so long as he did not appropriate it theftuously, i.e. knowing that it belonged to another. But an inheritance unappropriated by an heir who had nothing more than a right to claim it belonged in strictness to no one; and there was no theft, therefore, when a person took possession of it with a view to usucapion in the character of heir. There can be little doubt that on the completion of his possession he was regarded as heir just as fully as if he had taken under a testament or as heir-at-law on intestacy — that is to say, that he was held responsible to creditors of the deceased and required to charge himself with the family sacra. Gaius does not say as much ; but both the Coruncanian and the

Mucian edict 3 imposed the latter burden upon him who had usucapted by possession the greater part of a deceased person's estate; and it is but reasonable to suppose that the burden of debts must in like manner have fallen on the usucapient or usucapients in proportion to the shares they had taken of the deceased's property.

! Gai. ii. 164-173.

3 Cic. de leg. ii. 48, 49.

The Law of Obligations. — In his Liber Aureorum Gaius says obligations arise from either contract or delict, or miscellaneous Law of causes (varioe causarum figurae). But those arising obiiga- from contract fill a place in the later jurisprudence tioas. vastly greater than those arising from delict. In the

XII. Tables it was different. In them delicts were much more prominent than contracts — wrongs entitling the sufferer to demand the imposition of penalties upon the wrong-doer that in most cases covered both reparation and punishment. The disproportion in the formulated provisions in reference to the two sources of obligation, however, is not surprising. For, first of all, the purpose of the decemviral code was to remove uncertainties and leave as little as possible to the arbitrariness of the magistrates. In nothing was there more scope for this than in the imposition of penalties; and, as different offences required to be differently treated, the provisions in reference to them were necessarily multiplied. In the next place, the intercourse that evokes contract was as yet very limited. Agri- culture was the occupation of the great majority; of trade and commerce there was little; coined money had hardly begun to be used as a circulating medium. Lastly, the safe- guards of engagement then lay to a great extent in the sworn oath or the plighted faith, of which the law (jus) hardly yet took cognisance, but which found a protection quite as potent in the religious and moral sentiments that had so firm a hold on the people.

It may be asked — If a man purchased sheep or store cattle, a plough, a toga, a jar of wine or oil, had he no action to compel delivery, the vendor no action for payment of the price? ~°" Did the hire of a horse or the loan of a bullock create no

” . obligation? Was partnership unknown, and deposit, ” and pledge, and suretyship in any other form than that of vadimoniumt One can have no hesitation in answering that, as transactions of daily life, they must all have been more or less familiar. It does not follow, however, that they were already regu- lated by law and protected by the ordinary tribunals. Modern historical jurists are pretty well agreed that not only the real con- tracts of loan (mutuum and commodatum), deposit, and pledge, but also the consensual ones of sale, location, partnership, and mandate, and the verbal one of suretyship, were as yet barely recognized by law. The law recognized conveyance but hardly contract. Sale was the offspring of barter — of instant exchange of one thing for another. With such instant exchange there was no room for obliga- tion to deliver on either side. The substitution of coined money for the raw metal can hardly have effected any radical change: the ordinary practice of those early times must still have been ready-money transaction — an instant exchange of ware for price; and it can only have been when, for some reason or other, the arrangement was exceptionally for delivery or payment at a future date, say next market day, that obligation was held to have been created. Was that obligation enforceable by the civil tribunals?

Some jurists hold that it was — that at no time were the jus gentium contracts outside the protection of judicial remedies, although by a simpler procedure than that resorted to for enforcement of the contracts of the jus civile. But two provisions in the XII. Tables seem to prove that it was not so enforceable when they were drawn up. The first is that already referred to as recorded by Justinian — ■ that, where a thing was sold and delivered, the property, neverthe- less, was not to pass until the price had been paid or sureties (vades) for it accepted by the vendor. Far from being a recognition of the obliga- tory nature of the transaction, this provision is really a recognition of the inability of the law to enforce payment of the price by the vendee; it is a declaration that, on the latter’s failure to pay, the vendor, unprotected by any personal action, should be entitled to get back the thing sold as still his own, no matter in whose hands he found it. The second related to the case ot a person who had bought a victim for sacrifice, but had failed to pay for it. A real action for its revindication by the seller after it had been consumed on the altar was out of the question ; so he was authorized by the Tables, by the process of pij>noris ca-pio, at his own hand to appropriate in satisfaction a sufficient equivalent out of the belongings of the purchaser, against whom he had no personal action.

It was a principle of the law of Rome through the whole of its history, though in course of time subject to an increasing Kequis- number of

exceptions, that mere agreement between ites ot two persons did not give him in whose favour it was blading conceived a right to demand its enforcement. To contract ent j{i e a man to c l a ; m the intervention of the civil tribunals to compel implement of an engagement undertaken by another, it was necessary (subject to those exceptions) xxai. t8

either that it should be clothed in some form prescribed or recognized by the law, or that it should be accompanied or followed by some relative act which rendered it something more than a mere interchange of consent. Under the juris- prudence of the XII. Tables the formalities required to elevate an agreement to the rank of contract and make it civilly obli- gatory sometimes combined ceremonial act and words of style, sometimes did not go beyond words of style, but in all cases took place before witnesses. Dotis dictio, the undertaking of a parent to provide a dowry with his daughter whom he was giving in marriage, and vadimonium, the guarantee of a surety for the due fulfilment of the undertaking either of a party to a contract or a party to a litigation (some think only the latter), probably required nothing more than words of style before persons who could if necessary bear witness to them; whereas an engagement incident to a mancipation, or an undertaking to repay borrowed money, required in addition a ceremony with the copper and the scales. This undertaking to repay arose from the contract of nexum, which was, it is thought, older than the Tables; both it and the verbal contract by sponsio or stipulation, which was younger, require here further consideration.

The Nexal Contract. 1 — The tumults and seditions so frequent in Rome during the first two centuries of the Republic are as frequently attributed by ancient writers to the causes ot abuses of the law of debt as to any other cause, social plebeian or political. The circumstances of the poorer pie- borrow beians were such as to make it almost impossible to ng ‘ avoid borrowing. Their scanty means were dependent on the regular cultivation of their little acres, and on each operation of the agricultural year being performed in proper rotation and at the proper season. But this was every- now and again interfered with by wars which detained them from home at seed-time or harvest, practically rendering their farms unpro- ductive, and leaving them and their families in straits for the commonest necessaries of life.

The practice of lending per libram was doubtless of great antiquity — indeed, the intervention of the scales was a necessity when money or what passed for it had to be weighed instead of counted; and not improbably old custom contract. conceded to a lender who had thus

made an advance in the presence of witnesses some very summary and stringent remedy against a borrower who failed in repayment. How, after the Servian reforms, it was subjected to much the same formalities as were required for mancipation has been shown already. With the introduction of a coinage the transaction, instead of being per libram simply, became one per aes et libram; the scales were touched with a single piece, representing the money which had already been or was about to be paid, a formula recited whereby the obligation of repayment was imposed on the borrower, and an appeal made to the witnesses for their testimony. Unfor- tunately this formula is nowhere preserved. Huschke assuming that the lender was the only speaker, formulates it thus — ” quod ego tibi mille libras hoc aere aeneaque libra nexas dedi, eas tu mihi post annum jure nexi dare damnas esto ” — ” whereas with this coin and these copper scales I have given thee a thousand asses, be thou therefore bound jure nexi to repay them to me a year hence.” The phrase damnas esto, like the rest of the formula, is unsupported by any conclusive authority;

1 The modern literature on the subject of nexum is very large and the views taken. of it are discordant. The fundamental work is that of Huschke, Uber d. Recht des Nexum (Leipzig, 1846). Danz (Gesch. d. rbm. Rechts, ii. 2nd ed., 1873, § 146) gives a list of the more _ important writings about it and a resume of the principal theories. To this list, which comes down to 1870, may be added Bekker, Die Aktionen des rbm. Privatrechts, i. (Berlin, 1871), c. 1; Brinz, ” Der Begriff obligatio,” in Griinhut’s Zeitschr. i. (1874), 11 seq.; and Voigt, XII. Tafeln, i. §§ 63-65; Girard, Manuel, 4th ed. pp. 476-482; Schlossmann, Nexum (1904); Mitteis, ” Uber das Nexum,” Ztsch. d. Sav. Stift. xxii. 96 seq., and xxv. 282-283; Mommsen, Ztsch. d. Sav. Stift. xxiii. 348 seq.; Lenei, Z. d. S. S. xxiii. 84 seq. ; Bekker, Z. d. S. S. xxiii. 1 1-23 and 4.29-430; Kiibler, Z. d. S. S. xxv. 254 seq.; Senn. Nouv. Rev. hist.

(I9°S). PP- 49 seq-

but, as it is in harmony with the formula which is given by Gaius for dissolving an obligation of this kind, and with that most frequently

employed in the Republic for imposing by a public act liability to pay a fixed and definite sum, it may not be wide of the mark.

What was the effect of this procedure? The question is one not easily answered. Brinz expressed the opinion that the creditor was entitled in virtue of the nexum to take his debtor into custody at any time when he considered such a course necessary for his own protection, even before the conventional term of repayment — that the debtor was in bonds, virtually a pledge, from the very first, and the tightness or looseness of them a matter in the dis- cretion of his creditor. 1 Voigt holds that the nexum did not give the creditor any peculiar hold over his debtor, and that on the latter's failure to repay an ordinary action was necessary, to be followed by the usual proceedings in execution if judgment was in favour of the former. These views may be said to be the two extremes; and between them lie a good many others, more or less divergent. The difficulty of arriving at a conclusion is caused to some extent by the ambiguity of the words nexus and nexum. The transaction itself was called nexum and occasionally also nexus; the money advanced was nexum aes (hence next, i.e. aeris, datio) ; the bond was nexus (of the fourth declension) ; and the debtor on whom the bond was laid was also nexus (of the second). All this is simple enough. But we find the same word nexus employed by the historians as almost synonymous with vinctus — to denote the condition of a debtor put in fetters by his creditor. That might be the condition either of a nexal borrower or of an ordinary judgment-debtor. The former in such a case was doubly nexus; he was at once in the bonds of legal obligation and in those of physical constraint. In many passages in which Livy and others speak of the nexi it is extremely difficult, sometimes impossible, to be sure in which sense they use the word. It is therefore not sur- prising that there should be considerable diversity of opinion on the subject. 2

Since Huschke, the great majority of writers — Voigt, 3 Lenel and Mitteis are distinguished exceptions — concur in opinion that the nexal contract entitled the creditor, after expiry of thirty days from the conventional date of repayment of the loan, to proceed against his debtor by manus injectio without any antecedent action or judgment, and failing settlement to detain him, and put him to servile labour, and subject him to servile treatment, until the loan was repaid. The parallel of such a course is to be met with amongst many ancient nations — Jews, Greeks, Scandinavians, Germans, &c. 4 And it was not altogether unreasonable. If a borrower had already exhausted all available means of raising money, had sold or mortgaged everything he possessed of any value, what other course was open to him in his necessity except to impledge himself? That the creditor should have

been entitled to realize the right he had thus acquired without the judgment on it of a court of law is equally intelligible. It was just a case of regulated self-help. The nexal contract was a public act, carried out in the presence of the five citizen witnesses and libripens, who were witnesses alike of the acknowledgment of indebtedness and of the tacit engagement of the debtor. The only valid ob- jection apparently that could be stated against the creditor's appre- hension of his debtor in execution was that the indebtedness no longer existed — that the loan had been repaid. But a nexal debt

1 Brinz, in Griinhut's Zeilschr. i. 22. He likens the position of the nexus to that of a thing — land, say — mortgaged s to a creditor in security of a claim. Such security the Roman jurists con- stantly speak of as res obligata, and sometimes as res nexa. As Brinz observes, the thing was obligata from the first, and continued so as long as the debt it secured was unpaid, even though the creditor found it unnecessary to reduce it into possession or interfere with it in any way.

2 As to the use of the terms nexum and nexus by the classical jurists, see Roby, Roman Private Law (1902), vol. ii. pp. 296 seq.

5 He holds that the obligation created nexo did not impose any immediate liability on the borrower which the lender could enforce without judicial intervention, but that the latter required to proceed against the former in ordinary course, by what he calls an actio pecuniae nuncupatae. Mitteis, ut supra, supports, to a considerable extent, Voigt's views as to the necessity of further proceedings after the nexal contract, and rejects the notion of non-judicial manus injectio, but regards the actio pecuniae nuncupatae as non- existent. Cf. Mitteis, Rom. Privatrecht (1908), pp. 137 seq. Accord- ing to Lenel, Z. d. Sav. Stift. 84 seq., there never existed any nexal contract of loan, and the whole doctrine on the subject has there- fore no solid foundation.

4 See authorities in Brinz's paper in Griinhut's Zeitschr. i. 25. The Greek phrase was ewl trw/xari Savelfuv. There is a curious style in Marculfus (Form. ii. 27), in which a borrower engages that, until he shall have repaid his loan, his creditor shall have right to his services so many days a week, and shall have power to inflict corporal punishment if there be dilatoriness in rendering them.

could be legally discharged only by nexi liberatio, which also was a solemn procedure per aes et libram in the presence of five citizen witnesses. What need for a judicial inquiry in the presence of facts so notorious? A creditor would rarely be daring enough to pro- ceed to

manus injectio if his loan had been repaid ; if he did, the testimony of the witnesses to the discharge would at once procure the release of his alleged debtor. It was probably to give oppor- tunity for such proof, if there was room for it, that the XII. Tables required that a creditor who had apprehended a nexal debtor should bring him into court before carrying him off into detention.

Whether there was room for a vindex and for a magisterial addiction of the debtor after sixty days, with power to kill or sell into slavery after addiction, are disputed questions, but there seems no good reason for distinguishing a nexal from a judicatus debtor in these respects. Untenable is the notion at any rate that the nexus by the mere contract was placed in loco servi, or that by arrest he was in a worse position than one condemned for a judg- ment debt, of whom Quintilian states distinctly that he still retained his position in the census and in his tribe. Many a time when the exigencies of the state required it, were the nexi tempo- rarily released in order to obey a call to arms — to fulfil the duty incumbent on them as citizens. The nexal debtor's position after arrest in regard to his family rights is obscure. If originally they shared his nexal condition, this did not long continue to be the law. If he was a house-father he seemingly still retained his manus over his wife and potestas over his children. Their earnings legally belonged to him, and did not fall to his creditor. It was the body of his debtor that the creditor was entitled to, and too often he wreaked his vengeance on it by way of punishment; there was as yet no machinery for attaching the debtor's goods in substantial reparation for the loss caused by his breach of con- tract.

The abuses to which this system of personal execution gave rise were great. Livy tells us that in the year 428 u.c. (326 B.C.) a more than ordinarily flagrant outrage committed by a Poetlllan creditor upon one of his young nexi, who had given him- . self up as responsible for a loan contracted by his deceased father, roused the populace to such a pitch of indignation as to necessitate instant remedial legislation. The result was the Poet- ilian law (Lex Poetilia Papiria) . So far as can be gathered from the meagre accounts of it we possess, it contained at least these three provisions — (1) that fetters and neck, arm or foot blocks should in future be applied only to persons undergoing imprisonment for crime or delict; (2) that no one should ever again be the nexus of his creditor in respect of borrowed money; and (3) that all existing nexi should be released. The first was intended to prevent un- necessary restraint upon judgment-debtors formally given over to their creditors. The second did not necessarily abolish the con- tract of loan per aes et libram, but only what had hitherto been an ipso jure consequence of it — the creditor's right to incarcerate his debtor

without either the judgment of a court or the warrant of a magistrate. For the future, execution was to be done against a borrower only as a j udgment-debtor formally made over to his creditor by magisterial decree, and under the restrictions and limitations imposed by the Poetilian law itself. This very soon led to the disuse of nexal obligation; once it was deprived of its distinctive processual advantages it rapidly gave place to the simpler engage- ment by stipulation usually enforceable per condictionem. As for the release of the then existing nexi, Cicero, Livy and Dionysius say nothing of any condition annexed to the boon the statute conferred upon them; but Varro limits it to those qui bonam copiam jurarunt — those apparently who were able to declare on oath that they had done their best and could do no more to meet their creditors' claims. 6 Such a limitation can hardly be called unreasonable, even were we to assume — as probably we ought to do — that the release spoken of was only from the bonds of physical restraint, not from those of legal obligation.

Introduction of the Stipulation. 6 — Few events in the history of the private law were followed by more far-reaching conse- quences than the introduction of the stipulation. It exercised an enormous influence on the law of contract; „ pua ~ for by means of it there was created a unilateral obligation that in time became adaptable to almost every con- ceivable undertaking by one man in favour of another. By the use of certain words of style in the form of question and answer any lawful agreement could thereby be made not only

5 The meaning of these words, however, is disputed. See Green- idge, Infamia, 206, and authorities there cited.

6 Literature : Gneist, Die formellen Vertrdge d. rom. Rechts (Berlin, 1845), pp. 113 seq.; Heimbach, Die Lehre vom Creditum (Leipzig, 1849); Danz, Der sacrale Schiitz im rbm. Rechtsverkehr (Jena, 1857), pp. 102-142, 236 seq.; Schlesinger, Zur Lehre von den Formalcontracten (Leipzig, 1858), § 2; Voigt, Jus. nat., &c, d. Rom. vol. ii. § 33, vol. iv. Beilage xix. ; Bekker, Aktionen, i. 382-401; Karsten, Die Stipulation (Rostock, 1878); Voigt, Rom. Rechtsge- schichte, § 7 ; Girard, Manuel. 483 seq. ; Karlowa, Rom, RechtS- geschichte, ii. 699 seq.

morally but legally binding, so that much which previously had no other guarantee than a man's sense of honour now passed directly under the protection of the tribunals. Stipulations became the complement of engagements which without them rested simply on good faith, as when a vendor gave his stipu- latory promise to his vendee to guarantee peaceable possession of the thing sold or its freedom from faults, and the vendee in curn gave his promise for payment of the price. The question and answer in the form prescribed by law made the engagement fast and sure. Hence the generic name of the contract; for Paul's derivation of it from stipulum, " firm " (which itself comes from stipes, a staff), is to be preferred to that of Varro and Festus from slips (money), or to a later and rather fanciful one from stipula (a straw). It was round the stipulation that the jurists grouped most of their disquisitions upon the general doctrines of the law of contract — capacity of parties, requisites of consent, consequences of fraud, error and intimidation, effects of conditions and specifications of time, and so forth. It may well be said, therefore, that its introduction marked an epoch in the history of the law.

There is, however, no certainty either as to the time or as to the manner of its introduction. So far as appears, it was unknown at the time of the compilation of the XII. Tables, at least in private life; one of the first unmistakable allusions to it is in the Aquilian law of about 287 B.C. The mention of it in that enactment, however, is with regard to a phase of it which cannot have been reached for many years after it had come into use ; and the probability is that it origin- ated before the middle of the 5th century of the city, its first statu- tory recognition being in the Silian law introducing the legis actio per condictionem (infra, p. 550). In its earliest days it bore the name not of stipulatio but of sponsio, for the reason that the interrogatory of the party becoming creditor was invariably formulated with the word spondes — e.g. centum dare spondes? — while the answer was simply spondeo.

There has been much speculation as to the origin of the contract. Modern criticism has three theories: (1) that it was the verbal remnant of the nexum, after the business with the copper and the scales had gone into disuse; (2) that it was evolved out of the oathijusjurandum ox sponsio)aX the great altar of Hercules and the appeal to Fides {supra, p. 534) ; (3) that it was im- ported from Latium, which it had reached from some of the Greek settlements farther south. The last view is the most probable, though there is much to be said also in favour of the second theory. 1 Verrius Flaccus, as quoted by Festus,

connects it with the Greek aviv&tiv and a-novhr\; and Gaius incidentally observes that it was said to be of Greek origin. A libation (a-irovdij) is frequently referred to by Homer and Herodotus as an accompaniment of treaties and other solemn covenants — a common offering by the parties to the gods which imparted* sanctity to the transaction. Leist 2 is of opinion that the practice passed into Sicily and Lower Italy, but that gradually the libation and other religious features were dropped, although the word oirovdr) was retained in the sense of an engage- ment that bound parties just as if the old ritual had been observed, and that it travelled northward into Latium and thence to Rome under the name of sponsio, being. used in the first instance in public life for the conclusion of treaties, and afterwards in private life for the conclusion of contracts. The meaning of spondes as a question by a creditor to his debtor (although latterly, we may well believe, unknown to them) thus came to be: ” Do you engage as solemnly as if the old ceremonial were gone through between us?” There are many examples of such simplification of terms, none more familiar than when a man says, ‘ I give you my oath upon it,” without either himself or the individual addressed thinking it necessary that the form should be gone through.

It is not a little remarkable that the use of the words spondes and spondeo in contracting were, down at least to the time of

Gaius, confined in Rome to Roman citizens. The nature. sponsio as a form of contract was essentially juris

chilis. So at first were the later and less solemn forms of stipulation — promittisne? promitto, fideipromittisne? fidei- promitto. Gaius speaks of these latter, along with such simple forms as dabisne? dabo faciesne? faciam, as juris gentium, i.e. binding even between Romans and peregrins. Such they became eventually, but peregrins probably could not make use of the stipulation until a good while after the lex Silia. Yet although juris civilis, both the sponsio and the later forms were

1 See the arguments in favour of this theory in Girard, Manuel, 4th ed. pp. 484 sqq.

2 Graeco-Italische Rechtsgeschichte (Jena, 1884), pp. 465-70. Upon the ‘ponsionis vinculum internationally, see Livy, ix. 9.

from the first free from many of the impediments of the earlier actus legitimi. No witnesses were required to assist at them; and they were always susceptible of qualification by conditions and terms. It was

long, however, before parties had much latitude in their choice of language; spondeo was so peculiarly solemn that no equivalent could be admitted; and even the later styles may be said to have remained stereotyped until well on in the Empire. And it was the use of the words of style that made the contract. It was formal, not material; that is to say, action lay upon the promise the words embodied, apart from any consideration whether or not value had been given for it. In time this serious disadvantage was abated by prae- torian exceptions and otherwise, as will be noted below. Origin- ally the stipulation was employed only in regard to engage- ments whose terms were in every respect definite and certain, and was enforced by the legis actio per condictionem, or some- times possibly by actio Sacramento in personam. But in time it came to be employed in engagements that were from the first indefinite. This seems to have been due to the inter- vention of the praetors, and to have received special impetus after the system of the legis actiones had begun to give place to that per formulas. The remedy in such a case was not spoken of as a condiction but as an actio ex stipulatu.

iv. The Actions of the Law.

The Legis Actiones generally? — We owe to Gaius the only connected (though, owing to the state of the Verona MS., rather fragmentary) account we possess of the legis actiones, as the system of judicial procedure was called which prevailed in Rome down to the substitution of that per formulas by the Aebutian and Julian laws — the first either in the 6th or early in the 7th century of the city, and the second in the age of Augustus. He tells us that as genera agendi or generic forms of process they were five in number, each taking its name from its characteristic feature, viz. (1) sacramento, (2) per judicis postulationem, (3) per condictionem, (4) per manus injectionem, and (5) per pignoris capionem. The third was unknown in the decemviral period, and was introduced by the Silian law for- merly mentioned. The other four were all more or less regulated by the XII. Tables, but must in some form have been anterior to them. It is utterly impossible, however, to say of any one of them, apart from the condictes, at what time it was intro- duced, or what was the statute {lex) by which it was sanctioned; it may well be that they were not of statutory introduction at all, but were called legis actiones simply because recognized and indirectly confirmed by the Tables. In character and purpose each of the five had its peculiarities. The first three were directly employed for determining a question of right or liability, which, if persistently disputed, inevitably resulted in a judicial inquiry. The fourth and fifth might possibly result in judicial intervention; but primarily they were proceedings in execution, in

which the- party moving in them worked out his own remedy. As regards their comparative antiquity, there is much to be said for the opinion of Jhering and Bekker that manus injectio, as essentially nothing more than regulated self-help, must have – been the earliest of the five, and that the legis actio sacramento and the judicis postulatio must have been introduced in aid of it, and to prevent too hasty resort to it where there was room for doubt upon questions either of fact or law.

- The literature on the subject is very voluminous, great part of it in periodicals. Amongst the leading works are those of Keller, Der rom. Civilprozess u. die Actionen (6th ed. by Wach, Leipzig, 1 883), §§ 12-21; Bethmann-Hollweg, Der rom. Civilprocess (3 vols., Bonn, 1864-1866), the first volume of which is devoted to the legis actiones; Buonamici, Delle Legis Actiones nell' antico diritto romano (Pisa, 1868); Bekker, Die Aktionen d. rom. Privatrechts (2 vols., Berlin, 1871-1873), particularly vol. i. pp. 18-74; Karlowa, Der rom. Civilprozess zur Zeit d. Legisactionen (Berlin, 1872); Padeletti, " Le Legis Actiones," in the Archivio Giuridico (1875), xvii, 321 sqq.; Schultze, Privatrecht u. Prozess in ihrer Wechselbeziehung (Freiburg, 1883), i. 439-532, in which some novel and not un- important views are presented ; Jobbe-Duval, Etudes sur I'histoire de la procedure civile chez les Romains (1896), vol. i. ; Girard, Organ- isation judiciaire, i. 15-20, 56-104, 167-252.

In the three judicial legis actiones the first step was the in jus vocatio or procedure for bringing the respondent into court, minutely regulated by the provisions of the first of the XII. Tables. This was not done by any officers of the law ; there was no writ of summons of any sort ; the party moving in the contemplated litiga- tion had himself to do what was needed. If the defendant did not ap- pear, there could be no decree by default. Once before the magistrate (consul or praetor), the plaintiff stated his contention. If ad- mitted or not disputed by the defendant, the magistrate at once pronounced his decree, leaving the plaintiff to work out his remedy as the law prescribed. But, if the case presented was met either with a denial or counterclaim, the magistrate remitted it for trial either to a collegiate tribunal or to one or more private citizens as judges or arbiters. The act of remit was

technically litis contestatio or ordinatio judicii, the first so named because originally the parties called upon those present to be witnesses to the issue that was being sent for trial. This was the ordinary practice under both the system of the legis actiones and that of the formulae, and continued to exist until the time of Diocletian. In the first stage the pro- ceedings were said to be in jure, and the duties of the magistrate in reference to them were part of his jurisdictio ; in the second they were said to be in judicio, those presiding in it being styled judices. All that the judge or judges had to do was to pass judgment on the question remitted to them. They were ” right-declarers ” only, not ” right-enforcers.” If their judgment was for the plaintiff, and he failed to obtain an amicable settlement, he had himself to make it operative by subsequent proceedings by manus injectio, and that under the eye of the magistrate, not of the judge.

From an enumeration in Cicero of a variety of causes proper to the centumviral court the conclusion seems warranted that it was its peculiar province to decide questions of quiritary right in the strictest acceptation of the word. They were all apparently in his time real actions (vindicaliones) — claims of property in land or of servitudes over it, of right as heir under a testament or in opposition to it, of rights of tutory and succession ah intestato as agnate or gentile, and so forth. It was a numerous court of Quirites, determin- ing by its vote the question of quiritary right submitted to it. Many such questions in course of time, and possibly at first of express consent of parties, came to be referred to a single judge; but some, and notably claims of inheritance under or in opposition to a testament, were still frequently remitted to the centumviral court even in the classical period. Personal actions, however, do not ap- pear ever to have fallen within its cognizance: they were usually sent to a single judge — a private citizen — selected by the parties, but appointed by the magistrate, and to whom the latter adminis- tered an oath of office. But, in a few cases in which an action involved not so much a disputed question of right as the exercise of skill and discretion in determining the nature and extent of a right that in the abstract was not denied, the remit was to a plurality of private judges or arbiters, usually three.

The Legis Actio Sacramento} — The characteristic feature of this legis actio, as described by Gaius, was that the parties, after a somewhat dramatic performance before the magistrate, each challenged the other to stake a certain sum, the amount of which was fixed by the Tables, and which was to abide the issue of the inquiry by the court or judge to whom the cause was eventually remitted. This stake Gaius refers to indifferently as sacr amentum, summa sacramenti, and poena sacramenli. The formal question the court had to determine was —

whose stake had been justified, whose not (cujus sacramentum justum, cujus injustum) ; the first was returned to the staker, the second forfeited originally to sacred and afterwards to public uses. But the decision on this formal question necessarily involved a judgment on the matter actually in dispute, and, if it was for the plaintiff, entitled him, failing an amicable arrangement, to take ulterior steps for making it effectual. The procedure was still employed in the

1 To the literature in the last note may be added Asverus, Die legis actio sacramenti (Leipzig, 1837) ; Huschke (rev. Asverus), in Richter's Krit. Jahrbuch, vol. iii. (1839), pp. 665 sqq. ; Stintzing, Verhdltniss d. I. a. sacramento zum Verfahren durch sponsio praejudicialis (Heidelberg, 1853); Danz, Der sacrale Schutz, pp. 151-221; Danz, " Die 1. a. Sacram. u. d. Lex Papiria," in the Zeitschr. f. Rechtsgeschichte, vol. vi. (1867), pp. 339 sqq.; Huschke, Die Multa u. d. Sacramentum (Leipzig, 1874); Lotmar, Zur I. a. sacramento in rem (Munich, 1876); Brinz (crit. Lotmar), "Zur Contravindication in d. 1. a. sacr.," in the Festgabe zu Spengel's Doctor- Jubilaum (Munich, 1877), PP- 95-146; Miinderloh, " Ueber Schein u. Wirklichkeit an d. 1. a. sacramenti," in the Z. f. Rechlsgesch. vol. xiii. (1878), pp. 445 sqq.; E. Roth, in the Z. d. Savigny Stiftung, vol. iii. (1882), Rom. Abtheil. pp. 121 sqq.; Fioretti, Z.eg. act. sacramento (Naples, 1883); Jhering, ' Reich u. Arm im altrom. Civilprozess," in his Scherz u. Ernst in der Jurisprudenz (Leipzig, 1885), pp. 175 sqq.; Schulin, Lehrbuck, pp. 525 sqq.; Pfliiger, Die legis actio sacramento (Leipzig, 1898).

time of Gaius in the few cases that continued to be referred to the centumviral court, but otherwise it had been long in disuse.

Gaius explains that it was resorted to both in real and personal actions. Unfortunately the MS. of his Institutes is defective in the passage in which he described its application to the latter. We possess the greater part of his account of the actio in rem as employed to raise and determine a question of owner- ship; but his illustration is of vindication of a slave, and not so interesting or instructive as the proceedings for vindication of land. These, however, can be reconstructed with tolerable certainty with the aid derived from other sources, especially from Cicero, Varro and Gellius.

The parties appeared before the magistrate, each carrying a rod (festuca) representing his spear {quir or hasta), the symbol, as Gaius says, of quiritarian ownership. The first word was spoken by the raiser of the action, and addressed to his opponent: " I say that the land in

question [describing it sufficiently for identifica- tion] is mine in quiritary right (meum esse ex jure quiritium) ; where- fore I require you to go there and join issue with me in presence of the magistrate (injure manum conserere).” Thereupon, accord- ing to the earliest practice, the magistrate and the parties, accom- panied by their friends and backers, proceeded to the ground for the purpose: the court was transferred from the forum to the land itself. As distances increased, however, and the engagements of the consuls multiplied, this became inconvenient. Instead of it, the parties went to the spot without the magistrate, but on his command, and there joined issue in the presence of their seconds, who had been ordered to accompany them, and who probably made a report of the due observance of formalities on their return. Still later the procedure was further simplified by having a turf or sod brought from the place beforehand, and deposited a few yards from the magistrate’s chair; and, when he ordered the parties to go to the ground and join issue, they merely brought forward the turf and set it before him, and proceeded to make their formal vindications upon it, as representing the whole land in dispute.

The ritual was as follows: The raiser of the action, addressing his adversary, again confirmed his ownership, but this time with the significant addition: “As I have asserted my right by word of mouth, look you, so do I now with my vindicta ” ; and there- with he touched the turf with his rod, which was called vindiota when employed for this purpose. The magistrate then asked the other party whether he meant to counter-vindicate. If he replied in the negative or made no response, there was instant decree (addictio) in favour of the first party, and the proceedings were at an end. If, however, he counter-vindicated, it was by repeating the same words and going through the same form as bis adversary: ” I say that the land is mine in quiritary right, and I too lay my vindicta upon it.” The verbal and symbolical vindica- tion and counter-vindication completed what was technically the manus consertio. The parties were now in this position: each had asserted his ownership, and had figuratively had recourse to arms in maintenance of his contention. But the matter was to be settled judicially, so the magistrate once more intervened and ordered both to withdraw from the land. The dialogue was then resumed, the vindicant demanding to know from his opponent upon what pretence (causa) he had counter-vindicated. In the illustra- tion in Gaius he avoided the question and pleaded the general issue : ” I have done as is my right in laying my vindicta on the land.” But there can be little doubt that in certain circumstances the counter-vindicant would deem it expedient to disclose his title. This was very necessary where he

attributed his right to a con- veyance upon which two years' possession had not yet followed; in such a case he had to name his author (auctorem laudare) if he desired to preserve recourse against the latter on the warranty implied in the mancipation. That probably entailed a suspension of the proceedings to allow of the author's citation for his interest; and on their resumption, if he appeared and admitted his auctoritas % he was formally made a party to the action.

The proceedings had now reached the stage at which the sacra- ment came into play. The first challenge came from the vindicanti — " Since you have vindicated unrightfully, 1 challenge you with a sacrament of 500 asses," to which the counter-vindicant responded, — " And I you." This was technically the sacramento provocatio. The magistrate thereupon remitted the matter for trial to the centumviral court, or to a single judge, having declared what exactly was the question put in issue which the court or judge was to decide. The parties then called upon the bystanders to be witnesses of the magistrate's remit, this appeal to witnesses being, as is generally held, the litis contestatio? At the same time, according to Gaius's account of the procedure, the magistrate required sureties from the parties for the eventual payment by him who was unsuccessful of the sacrament he had offered to

2 But see Colassak, Die Litis contestation (1889), pp. 69 sqq., for a different view.

stake, and which became a forfeit to the exchequer. (The original practice probably was for the stake to be deposited by both parties in the hands of the pontiffs before they were heard by the judge or judges; after judgment that of the gainer was restored to him, while that of the loser was retained for religious uses.) The magis- trate also made arrangements for the interim possession of the land by one or other of the litigants (but preferably, it is thought, by the possessor), taking security from him that, if he was eventu- ally unsuccessful, it should be returned to his opponent, along with all the fruits and profits drawn in the interval. At the trial, as both parties were vindicants, there must have been a certain burden of proof upon both sides. The vindicant, one may believe, must have been required to establish in the first instance that the thing he claimed had at some

time been his; and then, but probably not till then, the counter-vindicant would have to prove a later title in his person sufficient to exclude that of his opponent. The judgment, as already observed, necessarily involved a finding on the main question; but in form it was a declaration as to the sacrament: that of the party who prevailed was declared to be just, and that of his unsuccessful opponent unjust.

Looking at this ritual as a whole, the conviction is irresistible that it could not have been so devised by one brain. It reveals and combines three distinct stages in the history of procedure — ■ appeal to arms and self-help, appeal to the gods and the spiritual power, appeal to the civil magistrate and his judicial office. As Gellius says, the real and substantial fight for might, that in olden days had been maintained at the point of the spear, had given place to a civil and festucarian combat in which words were the weapons, and which was to be settled by the interposition of the praetor. But this does not explain the sacramentum. Various theories have been proposed to account for it. According to Gaius, it was nothing more than the sum of money staked by each of the parties, which was forfeited originally to sacred and after- wards to public uses by him who was unsuccessful, as a penalty for his rashly running into litigation ; and substantially the same explanation is given by Festus in one of his definitions of the word. But this is far from satisfactory, for it involves the apparent absurdity of declaring that a penalty imposed by law. could be just in the case of the party who was in the right, and unjust in the case of him who was in the wrong. There is another definition in Festus — ” a thing is said to be done Sacramento when the sanction of an oath is interposed ” — that lends support to the opinion that there was a time when parties to a question of right were required to take an oath to the verity of their respective assertions; that they were also required concurrently to deposit five bullocks or five sheep, according to the nature or value of the thing in dispute, to abide the issue of the inquiry; 1 that the question for determina- tion was whose oath was just and whose unjust; and that he who was found to have sworn unjustly forfeited his cattle or sheep as a piamentum — a peace-offering to the outraged deity — while the other party reclaimed his from the repository in which they had been detained in the interval. 2 It was made an opportunity doubtless by the priests to get some profit for their temples.

1 It was the Lex Aternia Tarpeia of the year 454 B.C. that com- muted the five bullocks and five sheep into 500 and 50 ft> of copper respectively (Cic. De Rep. ii. 35, § 60, where the words usually printed ” de multae sacramento ” should read ” de multa et Sacra- mento “). See Festus, s.v. ” Peculatus ” (in Bruns, Fontes). As to the relative

value of oxen and sheep, it is interesting to note that, by the customs of the modern Ossetians, ten sheep are also held to be equivalent to one ox. See Kovalewsky, Coutume contem- poraine, p. 11. For the pounds' weight of raw metal the XII. Tables substituted the same number of asses, declaring that 500 should be the summa sacramenti when the cause of action was worth 1000 asses or more, 50 when worth less or the. question one of freedom or slavery (Gai. iv. 14).

2 Varro, De L. L. v. 180, says that, even after the summa sacra- menti had been converted into money, it was deposited ad pontem — some bridge, he does not say which, where there was a sacred " pound." (Curiously enough, the Irish spelling of " pound " is "pont"; Skeat's Etytn. Diet., s.v. "Pound.") A most in- genious and plausible explanation was suggested by Danz in 1867, in the Zeitschr. f. Rechtsgesch. vi. 359. Recalling the facts that there had been discovered in the Tiber Island sacella of Jupiter Jurarius and Dius Fidius, the two deities to whom solemn oaths were usually addressed, and that the island was spoken of as " inter duos pontes," because connected with both banks of the river by bridges bearing no particular names, he suggested that the island may have been the place to which disputants resorted to make their sacramenta, and that the cattle, sheep or money were deposited in a place for the purpose before the bridge was crossed. Much the same explanation was offered by Huschke two years later in his book Das alte romische Jahr (Breslau, 1869), p. 360, apparently without being aware of Danz's speculation. He adds, on the authority of the Iguvine Tables, that, while bullocks were offered to Jupiter, only sheep were offered to Dius Fidius. The island, he thinks, must have been selected as neutral ground to which all parties might have access, and which obviated intrusion into

The writers who adopt this view are far from being unanimous as to details. But there seems to be enough to render it more than probable that, at an intermediate stage between the vera solida vis of ancient times and the vis civilis et festucaria which Gellius and Gaius depict, there was a procedure by appeal to the gods through means of oaths of verity sworn by the parties, in the manner and with the consequences that have been indicated. That in time it should have dropped out of the ritual is quite in the order of things. Its tendency was to become a mere form, imposing no real restraint on reckless litigation. The restraint was rather in the dread of forfeiture of the sacramental cattle, sheep or money that would follow a verdict that an oath had been unjust. And it must have been felt besides that it was unfair to brand a man as a false- swearer, needing to expiate his offence by an offering to the gods, ' whose oath had been perfectly

honest. That he should suffer a

Eenalty for his imprudence in not having taken more care to ascertain is position, and for thus causing needless annoyance to others, was reasonable, but did not justify his being dealt with as one who had knowingly outraged the deity to whom he had appealed. So the oath — the original sacramentum — disappeared, the name pass- ing by a natural enough process to the money which had been wont to be deposited before the oath was sworn, but which now ceased to be an offering in expiation by a false-swearer, and became a mere penalty (forfeited to the state) of rash litigation (poena temere litigantis). So when praedes later took the place of actual deposits, they became bound as state debtors for the sacramentum.

It may well be assumed that in most cases the finding of the court as to the justness or unjustness of the respective sacraments of the parties was the end of the case — that it was at once accepted and loyally given effect to. If in favour of the party to whom interim possession had been given by the magistrate there could be no difficulty; he retained the object in dispute with the fruits and profits he had drawn in the interval between litis contestatio and judgment. If, however, the finding was for the other party, and amicable arrangement was not come to, it is not clear what course was followed. Gaius says that in awarding interim possession (vindicias dicere) the praetor required the grantee to give security by sureties {praedes) to his adversary for restitution to the latter in the event of his success; while Festus preserves a law of the XII. Tables which, according to Mommsen's rendering, declared that, when it turned out that interim possession had been awarded to the wrong party, it was to be in such party's power to demand the appointment of three arbiters who should ascertain the value of the object of vindication and its fruits, and assess the damages due for non-restitution at double the amount. This provision seems to have been intended to afford the wrongful interim possessor, who was not in a position to make specific restitution to his suc- cessful opponent, a means of avoiding the apprehension and im- prisonment which were the statutory consequences of failure to implement a judgment. It is probable that in time this duplicated money payment came to be regarded as the satisfaction to which the successful party in a vindication was entitled in every case in which, no matter for what reason, he was unable to obtain the thing itself and its fruits from their interim possessor; that con- sequently an arbitrium lift aestimandae, or reference to arbiters to assess their value, resulted in every such case; and that it was to assure its payment that the praetor required the party to whom the interim possession was awarded to give to his opponent the sureties {praedes litis et

vindiciarum) to whom Gaius alludes. 3

This procedure in the sacramental action for vindication of land was applicable to every kind of manus which a man could claim to have over persons or things, though necessarily with variations more or less important in the ritual. But the sacramental action was also quite common for claims in personam. As regards personal actions, the ordinarily received opinion, which rests, however, on slender foundations, is that from the first the parties met on equal terms; that, if it was a case of money debt, the creditor commenced the proceedings with the averment that the defendant owed him the . sum in question, — ” I say that you ought to pay me (dare oportere) 1000 asses “; that this was met with a denial; and that a sacra- mental challenge followed on either side. All are agreed that the remit was to a single judex after an interval of thirty days from the proceedings in jure • that where the claim was for a definite sum the plaintiff had to establish his case to the letter; and that his sacra- ment was necessarily declared unjust if he failed to prove his claim by a single penny. But there is considerable diversity of opinion as to whether by this form of process a claim of uncertain amount

the temples of the two gods on the Capitol and Quirinal respectively. And it is to its use as the scene of the sacramental procedure that he attributes its name of ” holy island,” rather than to the fact of its having been the seat of the temple of Aesculapius. Huschke recurs to and enforces this view in his Multa und Sacramentum (1874), p. 410, where he does refer to Danz’s paper.

3 Another theory is that, while the interim possessor could not be proceeded against, the praedes, who were really bound in his place and not merely as accessories, were directly subject to execution as debtors of the state. On this and other theories, see Cuenot in Nouv. Rev. hist. pp. 345 sqq. ; Girard, Manuel, pp. 328-29.

could be insisted on— as, for example, for damages for breach of a warranty of acreage of lands sold, or of their freedom from burdens. If it could, then probably the question raised and dealt with Sacra- mento was the abstract one of liability — Was the warranty given, and has it failed?— the sum due in respect of the breach being left to be

dealt with in a subsequent arbitral process (arbitrium lili aeslimandae).

The Legis Actio per Judicis Postulationem. 1 — The defects of the Verona MS. have deprived us of Gaius's account of this Per legis actio. There is little elsewhere that can with any

ludlcls certainty be said to bear upon it. The most important postuia- is a note i n Valerius Probus— T.PR.I.A.V.P.V.D., Uoaem. wn i cn is generally interpreted — te, praetor, judicem arbilrumve postulo uli des. This petition to the magistrate to appoint a judge, arbiter or arbiters (as the case might be) in all probability was part of the procedure in the action, and that from which it derived its distinctive name. Beyond this all is conjecture, alike as to the nature and form of the action and the cases to which it was applicable. Gaius says of the legis actio sacramento that it was general, and that it was the procedure that was to be resorted to where no other was prescribed by statute. There are, however, nowhere indica- tions of an express instruction that proceedings in any particular case were to be per j[udicis postulationem.

While it is impossible with certainty to trace the history of this procedure to its first beginnings, yet the impression is general that it must have originated in the regal period. It is commonly held to have been applicable to the divisory actions, and some others triable by arbiters as directed by the XII. Tables. Some eminent writers hold that it was employed in certain actions in which equitable considerations were allowed to be taken into account by the judge (e.g. the actio fiduciae), and generally in so-called jurgia as contrasted with lites. But this theory has many diffi- culties to contend with. It has no support from any ancient writer, and it leads to the result that the courts by legis actiones had power to take into consideration questions of bona fides, which is not only in contradiction with what Gaius says (iv. n), but inconsistent with their character. 2

The Legis Actio per Condiclionem? — This, the youngest " action of the law," was introduced, Gaius says, by the Silian Per law as a means of recovering a liquid money debt

condk- (certa pecunia) , and afterwards made available by the tionem. Calpurnian law for enforcing personal claims (as distinguished from real rights) for anything else definite and certain (omnis res certa), and in both its forms, there- fore, essentially an action of debt. The date of both enactments is matter of controversy, although there is, no question that the Silian was the earlier. Gaius says of it that its

purpose was far from obvious, as there was no difficulty in recovering money either by a sacramental action or one per judicis postulationem. But it is probable, as above stated, that money due under a nexal contract was recoverable by neither of these processes, but by the much more summary one of manus injectio, a procedure which would be practically put an end to by the Poetilian law of 326 B.C. We are disposed to regard the lex Silia and the new procedure it authorized as a result of the change made by this last-mentioned statute. To have put off a creditor for money lent either with a sacramental action or one per judicis postulationem, would have been to deprive him of the advantages of manus injectio to a greater extent than was called for. At any rate, it seems to have been provided by the Silian law that, when a man disputed his liability for what was called pecunia certa credita, and forced his creditor to litigation, the plaintiff was entitled, if he pleased, to require from him an engagement to pay one-third more by

1 To the literature on p. 548, note I, add Baron, ” Zur leg. act. per judicis arbitrive postulationem,” in the Festgabe fur Aug. W. Heffter (Berlin, 1873), pp. 29 sqq. ; Huschke, Multa, &c, pp. 394 sqq. ; Adolf Schmidt, ” Ueber die 1. a. per jud. post.,” in the Zeitschr. d. Sav. Stift. (1881), vol. ii., Rom. Abtheil. pp. 145 sqq.; Voigt, XII. Tafeln, vol. i. § 61.

2 See on this Mitteis, Romisches Privatrecht (1908), p. 31 and p. 44 n. ii.

3 To the literature on p. 548, note 1, add Bekker, Aktionen, vol. i. cap. 4-7; Voigt, Jus naturale, &c, d. Romer (Leipzig, 1856-75), vol. iii. §§ 98, 99; Baron, Die Condiclionem (Berlin, 1881), §§ 15, 16; Jobbe-Duval, Procedure Civile (1896), i. 61 sqq.

way of penalty in the event of judgment being against him, while the soi-disant creditor had similarly to undertake to pay as penalty the same amount in case of judgment in favour of the alleged debtor. Those engagements {sponsio et restipulatio lertiae partis) were not allowed in every case in which a definite sum of money was claimed per condiclionem, but only when it was technically pecunia credita. In Cicero’s time creditum might arise either from loan, stipulation or literal contract (expensilatio) ; but the last dated probably at soonest from the beginning of the 6th century, and stipulation apparently was a result of the Silian law itself, so that the pecunia credita of this enactment can have referred only to borrowed money. The same phrase, according to Livy, was employed in the Poetilian law; it was thereby enacted, he says, that for pecunia credita the goods, not the

body of the debtor, ought to be taken in execution. A connexion, therefore, between the Poetilian law and the disuse of the nexum on the one hand, and the Silian law and the introduction of the legis actio per condictionem on the other, can hardly be ignored, and raises a probability that the latter statute was a consequence of the former, and was passed immediately or soon after the year 326 B.C. In the action on the Calpurnian law, it is probable that there was no penalty of a third part on either side. A peculiarity of the legis actio per condictionem is that the plaintiff could when before the magistrate refer the case to the defendant's oath (Jut amentum necessarium) . Taking the oath involved absolution, refusal involved condemnation.

Little is known of the procedure in this legis actio, for, in consequence of the loss of a leaf in the Verona MS., we are without part of Gaius's account of it. It got its distinctive name, he says, from the condiciio or requisition made by the plaintiff on the defendant, whom he had brought into court in the usual way, to attend again on the expiry of thirty days to have a judge appointed. The pro- cedure on the reappearance of the parties on the thirtieth day (provided a settlement had not been arrived at in the interval) varied according as the action was (1) for a definite sum of money falling under the category of pecunia credita, or (2) for any other definite sum of money or a definite thing or quantity of things. In the action for pecunia credita the sponsio et restipulatio tertiae partis were exchanged ; and it is probable that, if either party refused on the praetor's command so to oblige himself towards the other, judgment was at once pronounced in favour of the latter without any remit to a judex. How the issue was adjusted when the sponsion and restipulation were duly given we are not informed, but, judging by analogy from the procedure in an action for breach of interdict under the formular system, and on the broader ground that there must have been machinery for a condemnation of the plaintiff on his restipulation in the event of his being found in the wrong, it may reasonably be concluded that there were in fact three concurrent issues sent to the same judex — the first on the main question, the second on the defendant's sponsion and the third on the plaintiff's restipulation. When a sum of money other than pecunia credita or a thing or quantity of things other than money was sued for, those subsidiary issues were unnecessary if the view above expressed be correct.

As Baron has demonstrated, it was not the usual practice to introduce any words explanatory of the ground of indebtedness when the action was either for money (other than pecunia credita) or for a thing or quantity of things. It might be loan, or bequest, or sale, or purchase,

or delict, or unjustifiable enrichment, or any of a hundred causae; it would have to be stated of course before the judge; but in the initial stage before the praetor and in the issue all that was necessary was the averment that the defendant was owing such a sum of money or such a thing. It was for the judge to determine whether or not the averment was established and, in certain cases, that non-delivery was due to the fault of the defendant ; the plaintiff, however, was bound to make his averment good to the letter of his claim. In the event of the plaintiff being successful in an action for certa pecunia, but delay was made by the defendant in satisfying the judgment, execution followed in ordinary form. How the matter was arranged in an action on the Calpurnian law for a certa res is not so obvious. What the plaintiff wanted was specific delivery or damages, and by some the opinion is entertained that he formulated his claim alternatively. Of this there is no evidence; and Gaius's statement that under the system of the legis actiones condemnation was always in the ipsa res, i.e. the specific thing sued for, leads to the assumption that a judgment for the plaintiff, on which specific implement failed, must have been followed by an arbitrium liti aeslimandae for assessment of the damages in money, and that execution proceeded thereon as if the judgment had been for a sum of money in the first instance. The general opinion ; however, is that the judge to whom the issue was remitted

assessed the damages himself and as a matter of course — that the instruction to him was quanti res erit, tantam pecuniam condemnato.

The Legis Actio per Manus Injectionem. 1 — This "action of the law " was ordinarily employed as a means of execution Per against the body of a judgment-debtor or one who had

manus confessed liability in the first stage of a process. But, lojec- i n certain cases, it is conjectured, it was thought

proper that a creditor should have a more summary remedy than was afforded by a sacramental action or one per judicis postulationem, and he was allowed to apprehend his debtor without any antecedent judgment or confession; in which cases, if the debtor disputed liability, the question could be tried only in proceedings at his instance, or sometimes at that of a third party on his behalf, for a stay

of execution. It will simplify matters, however, to confine our attention to it in the meantime as a means of execution against the body of a judgment-debtor.

Gaius's description of it is very general; for details we are indebted principally to the Nodes Atticae of Aulus Gellius, in an account which he gives (put into the mouth of Caecilius Africanus, a well-known jurist of about the same time as Gaius, and a contemporary of his own) of the provisions of the XII. Tables in reference to it. Africanus is made to say that accord- ing to his belief (opinor) the words of the statute were these: " For admitted money debts and in causes that have been regularly determined by judgment (aeris confessi rebusque jure judicatis) there shall be thirty days' grace. After that there may be manus injectio. The apprehending creditor shall then bring his debtor before the magistrate. If he still fail to satisfy the judgment, and no vindex come forward to relieve him, his creditor may carry him home and put him in chains. He may live at his own cost; if not, his creditor must give him daily a pound of spelt, or more if he please." Africanus continues narrativi: " There was still room for the parties to come to terms; but, if they did not, the debtor was kept in chains for sixty days. Towards the end of that time he was brought before the praetor in the comitium on three consecutive market-days, and the amount of the judgment-debt proclaimed on each occa- sion. After the third proclamation capite poenas dabat " — what these words mean will be considered in the sequel — " or else he was sent across the Tiber to be sold to a foreigner. And this capital penalty, sanctioned in the hope of deterring men from unfaithfulness to their engagements, was one to be dreaded because of its atrocity and of the new terrors with which the decemvirs thought proper to invest it. For, if it was to more creditors than one that the debtor had been adjudged, they might, if they pleased, cut up and divide his body. Here are the words of the statute — ' Tertiis nundinis partis secanto. Si plus minusve secuerunt, se fraude esto.' "

Such is Gellius's account of the provisions of the XII. Tables in reference to this legis actio, and he is to a considerable extent corroborated by Quintilian, Tertullian and Dio Cassius. But it is to be borne in mind that he does not vouch for its accuracy; the Tables were already in his time matter of antiquity, and even the jurists knew little about them beyond what was still in observ- ance. That he has reproduced them only partially seems almost beyond question; for in another chapter he himself quotes a couple of sentences that are to all appearance from the same context. We have to face, therefore, the extreme probability that the record is incomplete and the possibility besides that it is not literally accurate. There is room for error,

consequently, in two directions; but the nature and effect of the procedure in its main features may be gathered from the texts as they stand with reasonable certainty.

It was competent only after thirty days from the date of judg- ment or confession. 2 It was apprehension of the debtor by the

1 To the literature on p. 548, note 1, may be added Huschke, Nexum (1846), pp. 79 seq.; Savigny, ” Das altrom. Schuldrecht,” in his Verm. Schriften (1850), ii. 396 seq.; Hoffmann, Die Forcten u. Sanaten, nebst Anhang iiber d. altrom. Schuldrecht (Vienna, 1866), pp. 54 seq. ; Vainberg, he nexum et la contrainte par corps en droit Rom. (Paris, 1874), PP- 36 seq.; Voigt, XII. Tafeln, vol. i. §§ 63-65; Jhering (as on p. 548), pp. 196 seq., 232 seq.; Cuq, Institu- tions juridiques, 2nd ed. i. 141 seq.; Schlossmann, Altrbmisches Schuldrecht (1904) ; Kleineidam, Personalexekution der XII. Tafeln

(1904).

‘In his Historical Introduction, 2nd ed. pp. 192-193, Muirhead maintains that the ” aeris confessi ” of the Tables refers to nexal

creditor himself, — in its first stage, at least, an act of pure self-help. The debtor had at once to be brought before the magistrate, in order that his creditor might solemnly go through the required formalities before he could carry him away and provisionally confine him in the domestic lock-up. It was this appearance before the magistrate that made it a legis actio. Such a course, however, was avoided either (1) by instant payment or other implement of the judgment or arrangement with the creditor, or (2) by the inter- vention of a vindex or champion. The position taken by the latter was not that either of a surety or of an attorney for the judicatus demanding a rehearing of the case: he appeared rather as a con- troverter in his own name of the right of the creditor to proceed further with his execution, on the ground that the judgment was invalid. This might necessitate an action between the vindex and the creditor, in which the former was plaintiff, but to which the debtor was not a party. If it failed, then the vindex was liable for double the amount of the original debt, as a penalty on him for having improperly interfered with the course of justice; his inter- ference was treated as a delict, but on payment he had presumably relief against the original debtor who had been liberated through his intervention. Failing a vindex and failing payment, the creditor took his debtor home and incarcerated him, dealing with him for sixty days in the manner above described. On their expiry, without any arrangement, there was a magisterial decree

(addictio) awarding the debtor to his creditor.

What right did this addictio confer upon the creditor ? The debtor, says Gellius, ” capite poenas dabat,” which he interprets as meaning that his creditor might put him to death, the alterna- tive being his sale as a slave beyond the Tiber. There is, however, a diversity of opinion among the modern writers as to the true meaning of these words. While some hold, and rightly it is thought, that the Gellian interpretation is correct, others object to it as extravagant. It is objected to by Muirhead on the ground, inter alia, of its incredible severity in the case of petty debtors. He holds that capite poenas dabat meant simply that the debtor ” paid the penalty with his person,” in contradistinction to ” his means.” Caput is thus merely used in opposition to bona. Even more numerous are the writers who object to Gellius’s statement that the body of the addictus when killed might be cut in pieces where there were several creditors. They hold that the words partis secanto of the Tables referred not to the body but to the belongings of the debtor, — that when there were concurrent creditors they shared his familia amongst them. 3 But these views are, it is thought, somewhat fanciful refinements. Poena capitis always implies either death, slavery or deprivation of citizenship ; there is nothing more astonish- ing in a creditor’s right to kill his debtor than in a father’s right to kill his child; and comparative law gives many instances, of a parallel kind, of the harshness of primitive law to defaulting debtors. The partis secanto was probably a relic of earlier times, and Gellius admits that he never heard or read of a dissection having taken place.

The cruelties and indignities to which creditors subjected both their judgment and nexal debtors led, as above noticed, to many a commotion in the first two centuries of the Republic. The latter were probably much more numerous than the judicati, and, being in great part the victims of innocent misfortune, it was the sufferings they endured at the hands of relentless creditors that so often roused the sympathies and indignation of the populace. But the judgment-debtors had suffered along with them; and some of the provisions of the Poetilian law of 326 B.C., already mentioned, were meant to protect the former against the needless and unjustifiable severity that had characterized their treatment by their creditors. The manus injectio itself was not abolished, nor the possible intervention of a vindex; neither were the domum ductio that followed, and, the provisional imprisonment with the light chains, authorized by the Tables while it lasted; nor apparently was the formal addictio of the debtor to his creditor when the sixty days had expired without arrangement. But after addiction, if it was for nothing more than civil debt, there were

to be no more dungeons and stripes, fetters and foot-blocks; the creditor was to treat his debtor and his industry as a source of profit that would in time diminish and possibly extinguish his indebtedness, rather than as an object upon which he might perpetrate any cruelty by way of punishment. Although the edict of P. Rutilius of 107 B.C. provided a creditor with machinery for debtors, but this view has, it is thought, insurmountable objections to overcome.

3 For a fuller explanation, see Muirhead, Hist. Introduction, 2nd ed. pp. 198 seq., and authorities there cited. See also Kleineidam, Personalexekution, pp. 235 seq. Lenel must be added to those writers who think that " partis secanto," &c, refers to the goods of the debtor (Zeitschr. d. Sav. Stift. xxvi. pp. 507-509).

attaching the estate of his debtor, he had still the alternative of incarceration. This might be avoided under the Julian law of cessio bonorum by the debtor's making a complete surrender of his goods to his creditor; but, failing such surrender, incarceration continued to be resorted to even under the legis- lation of Justinian. During the Empire, of course, it was not by manus injectio that the incarceration was affected; for it went out of use with the definitive establishment of the formular system of procedure.

It was as directed against judgment and nexal debtors that manus injectio was of most importance and chiefly made its mark in history. But there were other cases in which it was resorted to under special statutory authority, where a remedy seemed advisable more sharp and summary than that by ordinary action. In some of these it was spoken of as manus injectio pro judicato {i.e. as if upon a judgment), in others as simple manus injectio {manus injectio pur a). In the first the arrestee was not allowed to dispute his alleged indebtedness in person; he could do so only through a vindex; and if no one intervened for him in that character he was carried off and dealt with by his arresting creditor as if a judgment had been obtained against him. In the second he was not required to find a vindex, but might himself dispute the verity of the charge made against him, under penalty, however, as is generally supposed (though it is disputed), of a duplication of his liability if he failed in his contention. By a lex Vallia, probably in the latter half of the 6th century of the city, this

manus injectio pura was substituted for that pro judicato in all cases in which the ground of arrest was neither judgment nor so-called depensum, i.e. payment by a surety or other party on account of the true debtor, who failed to relieve the former within six months of such payment. 1

The Legis Actio per Pignoris Capionem. 2 — In the ritual of the actio sacramenti the vis civilis et festucaria was a reminiscence Per of the vera solida vis with which men settled their

pignoris disputes about property in the earliest infancy of the “V- commonwealth. Manus injectio was a survival from

onem. times when the wronged was held entitled to lay hands upon the wrongdoer, and himself subject him to punishment; custom and legislation intervened merely to regulate the condi- tions and mode of exercise of what essentially was still self-help. In pignoris capio self-help was likewise the dominant idea. It may be fairly enough described by the English legal term distress — the taking by one man of property belonging to another in satisfaction of or in security for a debt due by the latter which he had failed to pay. The seizure, however, did not proceed upon any judgment, nor did it require the warrant of a magistrate; it might be resorted to even in the absence of the debtor, and on a dies nefastus; but it required to be accompanied by certain words of style, spoken probably in the presence of witnesses. It was only in a few exceptional cases that it was competent, in some by force of custom, in others by statute, nearly all of which seem to be given by Gaius, 3 and all of them being of a military, religious or fiscal character. What was the procedure, and what its effects, are far from certain. Jhering, founding on some expressions of Cicero’s, conjectures that, whether the debt was disputed or not, the distrainer could neither destroy nor sell nor definitely appropriate his pignus without magisterial authority, — that in every case he was bound to institute proceedings in justifica- tion of his caption, and to take in them the position of plaintiff. The idea is ingenious, and puts the pignoris capio in a new and interesting light. It makes it a summary means of raising a question of right for whose judicial arbitrament no other process of law was open, — with the additional advantage that it secured instant satisfaction to the raiser of it in the event of the question being determined in his favour. If against him, the inevitable result, in substance at least, must have been a judgment that he had no right to retain his pledge, with probably a finding

1 On manus injectio pro judicato and pura, see Gaius, iv. 22-25.

2 To the literature on p. 548, note I, add Degenkolb, Die Lex Hieronica (Berlin, 1861), pp. 95 seq.; Jhering, Geist d. rom. Rechts, vol. i. § lie; Voigt, XII. Tafeln, i. 502 seq.; Girard, Manuel, PP- 977 seq-; Wlassak, Processgesetze, i. 252 seq. For a compara- tive view, see Maine, Early Institutions, pp. 275 seq.; Jenks, Law and Politics in the Middle Ages, pp. 263 seq.

a For a case not mentioned by Gaius, see Girard, Textes, 3rded. p. 122; Brims. Fontes. 6tb ed. p. 18..

that he was further liable to its owner in the value of it, as a punishment for his precipitancy. 4

Judicial or Quasi- Judicial Procedure outside the Legis Actiones. — ■ Whatever may have been the extent of the field covered by the actions of the law, they did not altogether exclude other -^ . judicial or quasi-judicial agencies. The supreme magis- „ t M ttn trate was frequently called upon to intervene in matters .” f e brought under his cognizance by petition or complaint, Jcttones in which his aid was sought not so much to protect a vested right of property or claim as to maintain public order, 01 to prevent the occurrence or continuance of a state of matters that might prove prejudicial to family or individual interests. The process was not an action, with its stages in jure and in judicio, but an inquiry {cognitio) conducted from first to last by the magis-trate himself; and his finding, unless it was a dismissal of the complaint or petition, was embodied in an order {decretum, inter-dictum) which it was for him to enforce by such means as he thought fit, — manu militari, or by fine or imprisonment. Some jurists are disposed to give a very wide range to this magisterial inter- vention. One of its most important manifestations was in con- nexion with disputes about the occupancy of the public domain lands. These did not belong in property to the occupants, so that an action founded On ownership was out of the question. But, as the occupancy was not only recognized but sanctioned by the state, it was right, indeed necessary in the interest of public order, that it should be protected against disturbance. In the measures resorted to for its protection Niebuhr recognized the origin of the famous possessory interdict uti possidetis; and, although opinions differ as to whether protection of the better right or prevention of a breach of the peace was what primarily influenced the magis- trate’s intervention, there is, apart from .some distinguished ex- ceptions, a pretty general accord in accepting this view. Another illustration of this magisterial intervention is to be found in the interdiction of a spendthrift, — a decree depriving of his power of administration a man who was squandering his family estate and reducing his children to penury; a third presents itself in the

removal of a tutor from office on the ground of negligence or mal-administration, on complaint made to the magistrate by any third party in what was called postulatio suspecti tutoris; and a fourth in the putting of a creditor in possession of the goods of an insolvent debtor, which must have been common enough even before the general bankruptcy regulations of the Rutilian edict. These are to be taken merely as examples of this magisterial intervention, which manifested itself in very various directions; and it is eaay to see how largely such procedure might be utilized for remedying the grievances of persons who, from defect of complete legal title, want of statutory authority, or otherwise, were not in a position to avail themselves of the " actions of the law."

In one of the Valerio-Horatian laws consequent on the second secession of the plebeians there was mention of ten judges {judices decemviri), whose persons were declared as inviolable as those of the tribunes of the people and the plebeian aediles. These were, it is generally supposed, a body of judges elected to officiate on remit from a tribune or aedile in questions arising between members of the plebeian body. We are without details as to the institution of this plebeian judicatory, the questions that fell under its cog- nizance, the forms of process employed, the law administered by it and the effect of its judgments. It is not much referred to by the historians; and its decadence has been attributed to the fact that the Lex Hortensia of 287 B.C. made the nundinae lawful court-days {dies fasti), and so made it possible for the country folk coming to the city to market to carry on their processes before the praetor. It has also been identified by some writers 5 with the decemviri stlitibws judicandis, whose jurisdiction has been already noticed {supra, p. 536),

As all in a manner exercising judicial or quasi-judicial functions must also be mentioned the pontiffs, the consuls, and afterwards the censors as magistri morum, the chiefs of the gentes within the gentile corporations, and heads of families within their households. While it may be the fact that with the enactment of the XII. Tables the jurisdiction of the pontiffs 6 was materially narrowed,

4 Cf. Gaius, iv. § 32. This would be according to the spirit of the early system, which endeavoured to check reckless or unfounded litigation by penalities, — e.g. forfeiture of the summa sacramenti and duplication of the value of unrestored property and profits in the sacramental procedure; duplication of the value of the cause when judgment was against the defendant in an action upon an engagement embodied in a lex mancipii or lex nexi; dupli- cation against a vindex who interfered ineffectually in manus injectio against a judgment-

debtor; duplication against an heir who refused without judicial compulsitor to pay a legacy bequeathed per damnationem ; the addition of one-third more by way of penalty where a debtor was found liable in an actio certae creditae pecuniae (Gai. iv. 171), &c.

6 See Voigt, Rom. Rechtsgeschichte, i. Beilage i. ; contra, Wlassak, Processgesetze, i. 144 seq.

6 See Cauvet, Le droit pontifical chez les anciens Romains (Caen, 1869) ; Bouche-Leclerq, Les pontiles de I'ancienne Rome (Paris s 1871) ; Marquardt, Rom. Staatsverwalt. iii. 290 seiˆ.

it certainly did not disappear, — witness the famous case in which Cicero mad 1- before them the oration of which he was so proud, Pro domo sua. The action of the consuls and afterwards of the censors as guardians of public morals, and the social and political disqualifications and pecuniary penalties with which they visited persons who had been guilty of perjury or gross perfidy, did not a little to foster fidelity to engagements. Through the same agency the exercise of a variety of rights whose abuse could not be made matter of action — the husband's power over his wife, the father's over his children — was controlled and kept within bounds. It was not on light grounds, indeed, that the majesty of the pater- familias within the household could be called in question; it was only when he forgot that in the exercise of serious discipline within his family he was bound to act judicially. For he also was a judge — judex domesticus, as he is often called, though in all cases of gravity he was required to invoke the advice of his kinsfolk in a family council. On him lay the duty of controlling his family; if he failed to do so he was himself in danger of censorial animad- version. 1

Between citizens and foreigners with whom Rome was in alliance by a treaty (temporary or permanent) conferring reciprocal rights „ , of action, the proceedings took the form known as reci-

".. peratio or recuperation The action was probably always

p ' raised in the forum contractus. According to the common

opinion the magistrate ordinarily presiding there heard what parties

had to say in plaint and defence, and then put into a simple formula the points of fact arising on them, authorizing the recuperators to whom the matter was remitted to find for plaintiff or defendant according to circumstances. The recuperators were generally three, sometimes five, sometimes perhaps still more numerous, but always in odd number; but whether the nationality of both parties required to be represented we are not told. Expedition being in most cases a matter of importance, recuperators were required to give judgment within ten days, and the number of witnesses was usually limited to ten. How execution proceeded upon it, if it were for the plaintiff, does not clearly appear; Voigt, founding on a few words in Festus, concludes it must have been by something like pignoris capio. This recuperatory procedure in time came to be resorted to in processes de libertate and even in some litigations where both parties were citizens. There are numerous instances of the latter in Cicero; and it is remarkable that in the praetorian actions ex delicto the remit was usually not to a judex but to recuperators. The explanation may be in the com- parative summariness of the remedy.

III. The Jus Gentium and Jus Honorarium (Latter half of the Republic.)
i. Influences that operated on the Law.

Growth of Commerce and Influx of Foreigners. — While it may be admitted that commerce was beginning to take root in Influx Rome in the 5th century, yet it was not until the of for- 6th that it really became of importance. The cam- eigaers. paigns in which Rome was engaged until the end of the First Punic War absorbed all its energies. But after that time the influx of strangers, and their settlement in the city for purposes of trade, became very rapid — not only of Latins and other allies, but Greeks, Carthaginians and Asiatics. To them and the regulation of their affairs the jus civile — the law peculiar to Rome and its citizens — was applic- able only if they were members of allied states to which com- mcrcium and recuperatio were guaranteed by treaty. But many were not in this favoured position; and even those who were soon found the range of Roman modes of acquiring pro- perty and contracting obligations too narrow for their require- ments. Hence a jus gentium was gradually developed 3 which very early in its history drove treaty covenants for recuperatio out of use; its application may for a time have been limited to transactions between non-citizens or between citizens and non-citizens, but it was eventually accepted in the dealings of citizens inter se and became part and parcel of the jus

1 On Judex domesticus, see Greenidge, Legal Procedure in Cicero's Time, pp. 376 seq.

2 See Sell, Die recuperatio der Romer (Brunswick, 1837) ; Huschke (rev. Sell), in Richter's Krit. Jahrbucher, i. (1837), 868—911; Voigt, Jus naturale, &c, ii. §§ 28-32; Karlowa, Rom. Civilprocess, pp. 218-230; Girard, Organisation judiciaire des romains (1901), i. 97 seq.

3 On the Roman jus gentium, see Voigt, Das jus naturale, aequum it bonum, und jus pentium. d. Romer (4 vols., Leipzig, 1856- 1875) • Nettleship, in the Journal of Philology, (1885), xiii. 169 seq.; Kriiger, Gesch. d. Quellen, §§ 16, 17; Mommsen, Staatsrecht, iii. 604 n.

Romanorum. Gaius and Justinian speak of it as " the common law of mankind," " the law in use among all nations "; but the language must not be taken too literally. The Roman jus gentium was not built up by the adoption of one doctrine or institution after another that was found to be generally current elsewhere. In the earliest stages of its recognition it was "an independent international private law, which, as such, regulated intercourse between peregrins or between peregrins and citizens on the basis of their common libertas "; 4 during the Republic it was purely empirical and free from the influence of scientific theory, but its extensions in the early Empire were a creation of the jurists — a combination of comparative juris- prudence and rational speculation. To say that it was de facto in observance everywhere is inaccurate; on the contrary, it was Roman law, built up by Roman jurists, though called into existence through the necessities of intercourse with and among non-Romans.

It may be a little difficult for a modern jurist to say with perfect precision what were the doctrines and institutions of the jus gentium as distinguished from the jus civile. But the distinction was quite familiar to the Romans, as witness, for example, the statement of Marcian, in reference to the curoXiSes, that they enjoyed all the rights competent to a man under the former, but none of those competent to him under the latter.

Institution of the Peregrin Praetorship. — The praetorship, 5 as already mentioned, was an outcome of the Licinian laws of the year 367 B.C. (see Praetor). Down to the end of the The 5th century of the city the praetor so appointed super- peregrin intended single-handed the administration of justice, praetor. alike between citizens and foreigners. But with the altered condition of things in the beginning of the 6th century, and the influx of strangers which has already been alluded to, the work seems to have been found too onerous for a single magistrate, and a second praetor was created. The date is generally assumed to have been about the year 242 B.C.; Pompohius says distinctly that the creation of the new office was rendered

necessary by the increase of the peregrin population of Rome, and that the new magistrate got the name of praetor peregrinus because his principal duty was to dispense justice to this foreign element. After the submission of Sicily and Sardinia the number of the praetors was increased to four and after the conquest of Spain to six; Sulla raised the number to eight, and Caesar eventually to sixteen. But all the later creations were for special purposes; the ordinary administration of justice within the city was left with the representatives for the time of the two earliest, who came to be usually distinguished as praetor qui inter cives jus dicit (or urbanus) and praetor qui inter cives et peregrinos jus dicit (or peregrinus) . It would be going too far to speak of the latter as the principal author of the jus gentium; for a large proportion of the actions for en- forcing jus gentium rights were civil, not honorary — a fact which proves that the rights they were meant to protect and enforce had their origin in the jus civile, although moulded to meet new requirements by tacit consuetude and the agency of the jurists. But even in this view the peregrin praetor_ must have had a powerful influence in giving shape and con- sistency to the rising jursiprudence, by means of the formulae he adjusted for giving it practical effect.

Simplification of Procedure and Introduction of New Remedies under the Aebutian Law. — The lex Aebutia is only twice mentioned by ancient writers (once by Aulus Gellius and once by Gaius) , Deforms and we know neither its precise date nor its specific pro- at Aebu- visions. And yet, to judge by its effects, it must have tianlaw been one of the most important pieces of legislation in the latter half of the Republic, for Gellius speaks of it as having given the death-blow to many of the institutions of the XII. Tables, and Gaius couples it with two Julian laws of the time of Augustus as

4 Voigt, Jus nat. ii. 661. He distinguishes the jus civile, jus gentium and jus naturale as the systems which applied respectively to the citizen, the freeman and the man.

6 See Labatut, Histoire de la Preture (Paris, 1868); Mommsen, Staatsrecht, ii. 176 seq.; Karlowa, Rom. Rechtsgeschichte, i. 217 seq.; Girard, Organisation Judiciaire, i. 160 seq., and on the peregrin praetorship in particular, pp. 206 seq.

the statutory instrument whereby the formular system of procedure was substituted for that per legis actiones. Its date was probably about the end of the 6th or beginning of the 7th century of the city. Girard, who has examined the question with great care, places it in the first third of the 7th century, 1 and, though his reasoning is not quite conclusive, it largely refutes the arguments of older writers, who in many cases put the date a century and more earlier. It is the opinion of Wlassak 2 that it was a piece of tentative legislation, and that as regards citizens it in no wise abolished the actions of the law but merely made the formulary procedure alternative to them, according as the praetor, on the representation of the parties, might determine in each case; formulae, in his view, being first made compulsory, subject to a few exceptions, by the Julian laws. This is a probable theory and is now adopted by many recent writers. The main purpose of the statute seems to have been to empower the urban praetors to adapt existing remedies to altered circumstances, and inter alia to fashion new actions on the jus civile for the use of the peregrins, to whom the legis actiones were rarely, if at all, available. But, whatever may have been its actual provisions, the result was the adoption of a procedure

which gradually supplanted that by the actions of the law, which was much more pliant than the latter, and whose characteristic was this — that, instead of the issue being declared by word of mouth by the parties, and requiring as a rule to embody with perfect accuracy the statutory provision on which it was based, it was formulated in writing under the direc- tion of the praetor, in the shape of an instruction to the judge to inquire into the merits of the dispute, with power to condemn or acquit according to his finding. A statute was necessary for accom- plishing such an innovation, not only because the existing procedure was directly prescribed by statute, but also among other reasons because the legis actiones were favourites of the pontifical colleges (being often profitable to them), and any attempt by the magistrates to dispense with them would have been opposed by these powerful bodies. It is now the dominant opinion among modern writers, and it seems based on reasoning which cannot be gainsaid, that even prior to the lex Aebutia written formulae were employed in practice, particularly if not exclusively in the peregrin praetor's court, and that one of the objects of the statute was to legalize similar procedure in civil actions. 3 All such formulae granted by the peregrin praetor must of course have been in factum conceptae. Unless we hold this view it is difficult to see by what means the rights and obliga- tions of peregrins in their transactions inter se or with citizens could have been enforced, as civil actions, save perhaps in excep- tional cases where by treaty they enjoyed jus commercii, were not open to them. Written instructions to the recuperators or other judges for trying suits in which a peregrin was a party would be a practical necessity, for these judges would have to decide according to jus gentium, whose rules would probably be strange to them, and their instructions would therefore have to be precise and definite. Verbal instructions would have led to miscarriages of justice. From this point of view we can see how the peregrin praetor became the primary organ in developing jus gentium. But there is some reason for holding that the urban praetor had also, before the Aebutian law, occasionally exercised his imperium by granting actions in factum, and in this way perhaps enforced U. number of contracts and other obligations in which elements of equity and good faith were present and which the jus civile left remediless. Actions of this kind among cives would be in the nature of arbitria accepted voluntarily by the parties. The latter view certainly explains several apparent anomalies in the later law, for which no other good explanation can be found, as, for instance, the fact that in deposit and commodate actions in factum as well as in jus might be brought. Also the actio in factum for enforcing a con- tract of fiducia can in this way be explained. It also serves to throw light upon the development of some of the bonae fidei contracts. 4

Provincial Conquests. — The growth of commerce and the enormous increase of wealth, which made great capitalists and enabled them through the agency of f reedmen and slaves to carry on trade Effects of on a scale hitherto unknown, and which thus helped to foster Pl d 1 1 *-hzjus gentium, were no doubt due to a large extent to pro- aam a s- v ; nc ; a i conquests. But these operated also in other direc- * oa ‘ tions.Theomcialswhoproceededtotheconqueredprovinces as governors found themselves face toface with la wsand institutions in many respects differing from those of Rome. Political considerations dictated how far these were to be respected, how far subverted. In

1 Girard, Ztsch. d. Sav. Stift. xiv. 11-54 and xxix. 113 seq. ; Manuel, 4th ed. p. 993; cf. Mitteis, Rom. Privatrecht (1908), p. 52 n. ; and Wlassak, Z. d. Sav. Stift. xxv. 81 seq. and xxviii. I seq.

2 Wlassak, Rom. Processgesetze (1888), i. pp. 62-73, PP- 85 seq. and pp. 103-139.

3 See Sohm, Inslitutionen, Ledlie’s translation (2nd ed.), pp. 69, 80; Wlassak, Processgesetze, ii. 304 seq.; Cuq, Institutions jurid. (2nd ed.) i. 285-286.

4 These points are well stated by Mitteis, Rom. Privatrecht (1908), pp. 39 seq.; see authorities cited by him in note 2, p. 39. Contra, Girard, Z. d. Sav. Stift. xxix. 154-158.

some provinces, more especially the Eastern ones, it was thought unnecessary to do more than supplement the existing system by the importation of doctrines of the jus gentium and the procedure of the praetor’s edicts; while in others, in which it was deemed ex- pedient to destroy as rapidly as possible all national feeling and every national rallying point, a Romanizing of all their institutions was resorted to, even to the extent of introducing some of the formal transactions which previously had been confined to citizens. But in either case there was a reflex action. The native institution had to be studied, its advantages and disadvantages balanced, the means considered of adapting it to the praetorian procedure, and the new ideas so presented as to make them harmonize as far as possible with the old. All this was a training of no small value for those who, on their return to Rome, were to exercise an influence on legislation and the administration of the law. They brought back with them not merely an experience they could not have obtained at home, but sometimes a familiarity with foreign institutions that they were very willing to acclimatize in Italy. Rome thus enriched its law from the provinces, deriving from them its emphyteutic tenure of land, its hypothec, its

Rhodian law of general average and a variety of other features that were altogether novel. They were sanctioned by tacit recognition, by edicts of the praetors and in other ways; but, in whatever way received, they were indirectly fruits of provincial conquest.

Spread of Literature and Philosophy. — The effect on Roman civilization of the addiction of educated men in the later Republic to literature and philosophy is a matter for consideration in connexion with Rome's general history. It is not

Influence of liters-

proposed to consider here the question how far specific . .

doctrines of Roman law bear the impress of the influence D hito- of the schools, especially that of the Stoics; it is a subject soohy much too large to be disposed of in a few lines. 6 The matter is mentioned simply for the sake of noting that the spirit of critical inquiry aroused and fostered by literary and philosophical study, seriously and conscientiously undertaken, contributed greatly to promote a new departure in jurisprudence that became very marked in the time of Cicero — the desire to subordinate form to substance, the word spoken to the will it was meant to manifest, the abstract rule to the individual case to which it was proposed to apply it. This was the first effort of what then was called equity to temper and keep within the bounds the rigour of the jus strictum. The praetors, the judges and the jurisconsults all had their share in it. Although modern jurists are prone to speak of praetorian equity as if it were a thing apart, yet the same spirit was leavening the law in all directions and in the hands of all who had to deal with it, the difference being that the form and publicity of the edict gave to its applications by the praetors a more pro- minent and enduring record than was found in the decisions of private judices or the opinions of counselling jurisconsults.

Decline of Religion and Morals. — It would be equally out of place to enlarge here on the causes and manifestations of that decline in religious sentiment and public and Decline of private virtue which was fraught with such disastrous religion . results in the later days of the Republic. The private aad . law was influenced by it to a considerable extent, alike in those branches which regulated the domestic relations and those which dealt with property and contract.

The ever-increasing disregard of the sanctity of the marriage tie is one of those features in the history of the period which strikes even the most unobservant. While from the first the law had denounced

causeless separation and visited it with penalties, in principle it maintained the perfect freedom of repudiation on the part of the husband. With the simple and frugal habits of the first five centuries of Rome, and the surveillance of the consilium domesticum, the recognition of this principle produced no evil results; family misunderstandings were easily smoothed over, and divorces were of rare occurrence. But during the 6th and 7th centuries of the Republic a change to looser morals took place, and the family council lost much of its control. This was doubtless largely due to the decay of hand marriages, wives consequently remaining outside their husband's familia and often holding

5 It is one that was discussed with much greater fervour a century ago than it is now. Of the later literature may be mentioned — Van Vollenhoven, De exigua vi quam pkilosophia Graeca habuit in efformanda jurisprudentia Romana (Amsterdam, 1834); Ratjen, Hat die Stoische Phil, bedeutenden Einfluss gehabt, fife? (Kiel, 1839); Voigt, Jus. nat., &c, vol. i. §§ 49-51 ; Laferriere, De V influence du Stoicisme sur la doctrine des jurisconsultes Romains (Paris, i860) ; Hildenbrand, Gesch. u. System d. Rechts- und Staats-Philosophie (Leipzig, i860), vol. i. §§ 141, 142. The earlier literature is given in Hildenbrand, P-593-

property of their own. With increasing luxury and licentious- ness divorce became common. 1

This looseness of the marriage bond, as was naturally to be expected, had its effect on the other family relations. The right of children to take their father's inheritance began to be lightly esteemed. The law— or rather the interpretation put upon the uti legassit of the XII. Tables — had empowered him testamentarily to disinherit them, or in instituting them to limit their right to a mere fraction of the inheritance; but it was assumed that this power would be exercised with discretion and only when justified by circumstances. But in the later days of the Republic, amid the slackened ties of domestic life, paternal as well as conjugal duty seems to have often been lost sight of, and children were disinherited or cut off with a nominal share of the inheritance in order that a stranger might be enriched. This led to the recognition by the centumviral court, without apparently any

legislative enactment or praetor's edict to warrant it, of what was called the querela inojjiciosi testamenti — challenge of a testament by a child whose natural claims had been capriciously and causelessly disregarded. While the practice may for a time have been hesitating and uncertain, yet early in the empire, through means of this querela, the rule came to be established that every child was entitled, notwithstanding the terms of his father's testament, to at least a fourth (portio legitima, quarta legitima) 2 of what would have come to him had his parent died intestate, unless it appeared that the latter had had adequate grounds for excluding him or limiting him to a smaller share. A parent might in like manner challenge an undutiful testament made by his child to his prejudice; and ultimately in certain cases so might brothers and sisters inter se.

The decline of morals had an equally marked effect on the transactions of daily life, calling for precautions and remedies that had not been found requisite in the hey-day of the iricris tuiv 'Pw/j-aluiv. Men no longer relied on each other's good faith unless backed by stipulations, securities (cautiones) and guarantees. The Rutilian bankruptcy arrangements and the actio Pauliana for setting aside alienations in fraud of creditors indicate a laxity in mercantile dealings that was perhaps an inevitable consequence of the growth of trade and commerce. But, that such remedies as, for example, the exceptio rei venditae et traditae or the exceplio non numeratae pecuniae should have been found necessary — the one an answer to a vendor (with the price in his pocket) who attempted to dispossess his vendee because some of the formalities of con- veyance had been neglected, the other an answer to an action on a bond for repayment of money that by some accident had never been advanced — proves that the law had now to encounter fraud in all directions, and that Graeca fides had tc a great extent displaced the old Roman probity.

ii. Factors of the Law.

Legislation. — It cannot be said that during the period of nearly two centuries and a half embraced within the present epoch the private law owed much to legislation. The vast majority Legists- Q { t jj e enac t men t s of the time referred to by the his- °"' torians dealt with constitutional questions, municipal and

colonial government, agrarian arrangements, fiscal policy, sumptuary prohibitions, criminal and police regulations, and other matters that affected the public law rather than the private. Those of the latter class mentioned by Gaius and Ulpian in their institutional works barely exceed a score in number; and of these not above half a dozen

can be said to have exercised a permanent influence on the principles (as distinguished from the details) of the law. Most of them were enactments of the concilium plebis or of the comitia of the tribes, to which ordinary legislation had passed as

1 Voigt, Die Lex Maenia de dote (Weimar, 1866), attributes to a lex Maenia of 168 B.C. the creation of the judicium de moribus which superseded the family council as a divorce court by pro- viding a penal action on divorce. The existence, however, of a statute for this purpose has not been proved, and is discredited by most recent writers. See Czylharz, Das romisclie Dotalrecht (Giessen,

1870).

2 From this the legitim of children recognized by most continental countries nowadays is derived.

more readily convened and more easily worked than the comitia of the centuries.

Edicts of the Magistrates. 3 — The practice of propounding edicts was very ancient, and had been followed by kings and consuls long before the institution of the praetorship. It was one of the most obvious ways of exercising the imperium with Magisˆ which the supreme magistrate was invested — to lay an ‘ˆ’/ S ‘ injunction upon a citizen and enforce his obedience, or to edicts. confer upon him some advantage and maintain him in its enjoyment. It was one of the ways in which public order was protected where there had been no invasion of what the law regarded as a right, and where, consequently, there was no remedy by action. That the earlier edicts of the praetors were of this character — issued, that is to say, with reference to particular cases, and what afterwards came to be called edicta repentina or prout res incidit posita — there is little reason to doubt. In time a new class of edicts appeared which got the name of edicta perpetua (or perpetuae jurisdictionis causa pro- posita) — announcements by the praetor, published on his album (as the white boards displayed for the purpose in the forum were called), of the remedy he would be prepared to grant on the application of any one alleging that the state of facts contemplated had arisen. The next year’s praetor was free to adopt the edicts of his predecessor or not; but it was usual for him to do so if they had been found beneficial in practice, he adding to them new provisions suggested by demands made upon past praetors for edicta repentina, but which they had not generalized, or even proposing for acceptance some remedy entirely of his own devising. As each new praetor entered upon office he announced his jurisdictional

programme — his lex annua, as it was called from this particular point of view, by far the greater part of it tralaticium, i.e. transmitted from his predecessors, and only a few paragraphs, diminishing in number as time pro- gressed, representing his own contribution. And so it went on in the first years of the Empire, until the praetorian function was eclipsed by the imperial; and at last, after having, by instruction of Hadrian, been subjected to revision, and consolidated along with the Aedilian Edicts, by Salvius Julianus, it was, as will be noticed below, sanctioned as binding on the whole Empire. The term ” Edict ” is applied both to the single edicts and also to the whole body of them together.

There is some reason for supposing that the edict attained con- siderable proportions in the time of Cicero; for he mentions that, whereas in his youth the XII. Tables had been taught to the boys in school, in his later years these were neglected, and young men directed instead to the praetor’s edicts for their first lessons in law. Of a few of them the date and authorship are known with tolerable precision; but of the history of the majority, including some of the most important, such as those introducing restitutio in integrum on the ground of lesion through error, absence, minority and the like, and those revolutionizing the law of succession, we are to a great extent in the dark. It was one of the great advantages the edicts had over legislative enactments that they might be dropped, resumed or amended by a new praetor according to his judgment of public requirements. For the edict was viva vox juris civilis — intended to aid, supplement and correct it in accordance with the ever-changing estimate of public necessities; and this would have been impossible had its provisions from the first been as stereotyped as they became by the consolidation in the time of Hadrian.

The edict seems to have contained two parts — the first what may be called the edicts proper, and the second styles of actions, &c, whether derived from the jus civile or from the jus praetorium. The styles or formulae for civil actions were published without any corresponding edict; for praetorian actions styles were published appropriate to their corresponding edicts. There were also inde- pendent formulae for interdicts, processual stipulations, &c. The contents of the edicts proper were in detail very various, but all devoted to an exposition of the ways in which the praetor meant to exercise his jurisdiction during his year of office. They were not didactic or dogmatic formulations of law, but rather announce- ments of what remedy he would grant in such and such circumstances, or direct orders to do or prohibitions against doing certain things. A party claiming an action or whatever else it might be under any of them did so not of right, as

he would have done had his claim had a statutory or customary foundation, but of grace — on the strength of the praetor's promise to grant him what he claimed and make the grant effectual. That was why originally such an action had to be raised and concluded within the particular praetor's year of office — a rule which in time, by abuse, was converted into the somewhat different one that a purely praetorian action {i.e. not originally of the jus civile) had to be raised within a year of the occurrence to which it referred.

As already observed, the praetor's edicts proceeded upon lines of equity; that is to say, they were directed against the strictness and formalism of the jurisprudence of the XII. Tables. Such may be said to have been the general tendency of the edicts as a whole.

3 See Lenel, Beitrdge zur Kunde des praetorischen Edicts (Stuttgart, 1878), and the introductory chapters in his Edictum Perpetuum (Leipzig, 2nd ed., 1907); Karlowa, Rom. Rechtsgesch. vol. i. § 60; Voigt, Rom. Rechtsgesch. §§ 19, 20

But it was the tendency of the whole jurisprudence of the time, and by no means peculiar to the praetorian creation. Nowhere in the texts are the praetors spoken of as the mouthpieces of equity as distinguished from law. Such a distinction recurs frequently in Cicero ; he identifies aequitas with the spirit of a law or agreement, and jus with its letter, but it is in order to sing the praises not of the praetors but of the pleaders who maintained the former as against the latter, and of the judges who were persuaded by their arguments. Much of what was contained in the edict might quite as well have been embodied in statute, and we know that in time statute came to its aid ; witness a very remarkable provision of it — " I will give bonorum possessio as may be enjoined by statute, whether comitial enactment or senatusconsult."

Of the edicts of the peregrin praetor and their relation to that of his urban colleague little is known. That they differed in some respects there can be no doubt, for in the lex Rubria (49 B.C.) for settling the government of Cisalpine Gaul the magistrates are directed, with reference to a certain action, to formulate it in the way prescribed in the edict of the peregrin praetor. The latter, therefore, must to some

extent have been in advance of that of the urban praetor, probably in this respect, that, being prepared primarily for the regulation of questions affecting non-citizens, it more thoroughly than the other avoided formalities that were com- petent only to citizens, and thus to a greater extent simplified pro- cedure. The edicts of the provincial governors must have varied according to circumstances, being in all cases composites of pro- visions, more or less numerous, borrowed from the edicts of the praetors and additions suggested by the peculiar wants of the different provinces for which they were framed {provinciate genus edicendi). As for those of the curule aediles, who amongst other duties were charged with the supervision of markets, their range was very limited ; their most important provisions having reference to open sales of slaves, horses and cattle, and containing regulations about the duties of vendors exposing them, and their responsibility for latent faults and vices. They also had cognisance of certain delicts committed in the streets and markets. As the aediles had no imperium their restricted jus edicendi may have been conferred on them by custom or statute.

Consuetude, Professional Jurisprudence and Res Judicatae. — Great

as may be the difficulty experienced by philosophical jurists in

„ ˆ defining the ground of the authority of consuetudinary

” sue ” l aWi there is no room to dispute the importance of its

” aary contributions to every system of jurisprudence ancient

• and modern. The men who first drew, accepted and

endorsed a bill of exchange did as much for the law as any lawgiver

has ever accomplished. They may or may not have acted on the

advice of jurists; but, whether or not, they began a practice which

grew into custom, and as such was recognized by the tribunals as

a law-creating one — one conferring rights and imposing obligations.

There is much of this — far more probably than is commonly imagined

— in the history of every system of law.

In Rome the process was sometimes wonderfully expeditious; witness

what Justinian narrates of the introduction and recognition of testamentary trusts and of codicils to last wills, both in the time of Augustus. It can hardly be doubted that the literal contract per expensilationem originated in the same way, probably in the end of the 5th or the beginning of the 6th century of the city. The keeping of domestic account-books may have been enjoined and enforced by the censors; but it was custom, and neither statute nor praetor's edict, that made an entry in them to another person's debit creative of a claim against the latter for certa pecunia credita, that might be made effectual by an action under the Silian law. It must have been in exactly the same way that mutuum, formless loan of money, came to be regarded as the third variety of certa credita pecunia, and to be held recoverable under the same action. True, this could not have been attained without the co-operation of the judices. But then each case was as a rule tried by a single private citizen, whose office ended with his judgment, and who was untram- melled by the authority of any series rerum judicatarum. 1 He had simply to decide whether in his view expensilation or formless loan created such an obligation as was covered by the words pecuniam dari oportere. There may for a time have been a divergent practice, contradictory findings, as Cicero says there were in his day upon the question whether aequitas or jus strictum was to be applied to the determination of certain matters; but the eventual unanimity of judicial opinion in one direction was but the expression of the general sentiment of the citizens, of whom the judices were the representatives.

These are but examples of the way in which consuetudinary law was constructed. It required the combined action of the laity and the judices, both at times acting under professional advice ; in some cases even that of the praetors was necessary. It would have

1 It was not until the Empire that a " series rerum perpetuo similiter judicatarum," a uniform series of precedents, was held to be law. During the Republic a judge was much freer, and not only entitled but bound to decide according to his own notion of what was right, taking the risk of consequences if his judgment was knowingly tontrary to law.

been impossible, for instance, to have introduced the consensual contracts into the Roman system and determined what were the obligations they imposed on either side, without magisterial co-operation in framing the formulae that were to be submitted to the judges. Taking the action on sale as an illustration, the formula substantially was this: " It being averred that the defendant sold such or such a thing to the plaintiff, whatever, judge, it shall appear that

the defendant ought in good faith to give to or do for the plaintiff in respect thereof, in the money equivalent thereof condemn the defendant; otherwise, acquit him.” It is very manifest that the free hand here given to the judge must immensely have facilitated the reception of customary doctrine into the law. The judge was to a great extent the spokesman of the forum; his judgment was formed in accordance with current public opinion, which he had ample opportunity of gauging; it was the reflection of that general sentiment of right, which, phrase it how we may, is the real basis of all customary law. And so in an action for establishing a right of property in a res nee mancipi. The formula was very simple: ” If it appear that such or such a thing belongs to the plaintiff in quiritary right, then, judge, whatever be its value for the plaintiff, in that condemn the defendant ; should it appear otherwise, acquit him.” The primary duty of a judge on such a remit was to determine whether the title on which the plaintiff founded his pretensions gave him a right that came up to property; and it can hardly be disputed that it was by the decisions of a series of judges, in a series of such actions, that the long list of natural modes of acquiring property given by Justinian under technical names was gradually brought into view. Those decisions, whether upon the obligations of a vendor, direct or indirect, or upon the sufficiency of a title founded on by a party averring a right of property by natural acquisition, doubtless were in many cases arrived at under pro- fessional advice, and were in all cases embodied in judgments. But that does not in the least deprive the doctrine deduced from them of its character of customary law. It was not until the Empire that the opinions of the jurists submitted to a judge {responsa prudentium) were invested with binding authority. During the Republic, if a judge deferred to them, it was simply because he regarded them as in consonance with well-qualified public opinion; and what a series of consistent judgments of this sort built up was in the strictest sense a law based on consuetude.

As regards the professional jurists in particular it has already been observed that, according to the testimony of the Roman historians, the law was a monopoly of the patricians down at least to „_ the middle of the 5th century of the city. Livy goes so far y°”, , as to speak of it as in penetralibus pontificum repositum, , e *f ° — among the secrets of the pontifical college. It was so !!”

doubtless during the regal period. But after the publi- P rv ” eace ‘ cation of the XII. Tables this could be the case only in a qualified sense, the pontiffs becoming the official interpreters of that which in the letter was patent to the world. The Jus Flavianum, with its formulary of actions, about the year 304 B.C., the practice of giving

advice in law in public adopted by Tib. Coruncanius in the beginning of the 6th century, and the Tripertita (also called Jus Aelianum)', embodying the current interpretatio, some fifty years later, put an end not only to pontifical but to patrician monopoly. 2 From this time onwards there was a series of jurists (jurisconsulti, jurisperiti, jurisprudentes or prudentes, as they were styled), gradu- ally increasing in number and eminence, of whom a list is given by Pomponius, and many of whom are signalized by Cicero, particularly in his Orator and Brutus. They occupied themselves in giving advice to clients (see Patron and Client), teaching, pleading at the bar, framing styles of contracts, testaments, and various other deeds of a legal character, or writing commentaries or shorter treatises on different branches of the law. 3

iii. Substantive Changes in the Law during the Period.

The Publician Edict. — There were necessarily many changes during the period in the law of property and of minor real rights,- several of them of no mean importance. But the greatest of all was that effected by the Publician Edict, 4 indirectly recognizing the validity (1) of what Theophilus calls bonitary ownership as an actual though inferior ownership of res mancipi, and (2) of what got the name of bonae fidei possessio

2 There is some doubt whether the Jus Aelianum mentioned by Pomponius (Dig. i. 2, 2, 7) was not an independent collection of actions by Sextus Aelius different from his Tripertita mentioned {Dig. i. 2, 2, 38). See Bremer, Jurispr. Ante-Hadriana (1896), i. p. 15.

3 Sanio, Zur Geschichte derˆ rom. Rechtswissenschaft (Konigsberg, 1858) ; Grellet-Dumazeau, Etudes sur le barreau romain (2nd ed., Paris, 1858) ; Karlawo, Rom. Rechtsgesch. i. § 61 ; Roby, Introd. to Digest, chaps, vii. and viii. ; Jors, Rom. Rechtswissenschaft (1888), vol. i. ; Bremer, Jurispr. Ant.ehadriana< vol. i.

4 See Ribereau, Theorie de V in bonis habere ou de la propriete pritorienne (Paris, 1867) ; Huschke, Das Recht der Publicianischen Klage (Stuttgart, 1874); Schulin (rev. Huschke), in the Krit. Vierteljahrschrift, xviii. (1876), 526 seq.; Lenel, Beitrage zur Kunde d. praetorischen Edicts: I. Das Public. Ed. (Stuttgart,

I 1878); Appleton, Histoire de la propriete pretorienne (Paris, 1889);

Publician edict.

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as a fictitious ownership of either res mancipi or res nee mancipi, valid against all the world except the true dominus. The accounts we possess of this edict are somewhat inconsistent and even contradictory ; the explanation may be that it went through a process of amendment and expansion at the hands of successive praetors, and that eventually it may have had more than one section, without our always being able to say to which of them the criticism of a particular commentator is directed. But there is no doubt of its general tendency — of the defects it was meant to correct and of the way in which the correction was accomplished.

One of the defects was this: if a man had taken a transfer of a res mancipi from its rightful owner, but simply by tradition instead of by mancipation or cession in court, he did not Domla- acquire dominium ex jure Quiritium, and the transferrer *”” remained undivested. The result was that the latter

f°w was ‘ n ‘ aw ent ‘ t ‘ e d t° raise a rei vindicatio and oust the

tarium. transferee whose money he might have in his pocket,while if a third party had obtained possession of the thing, but in such a way as not to be amenable to an interdict, the transferee could have no effectual vindication against him, as he was not in a position to prove dominium ex jure Quiritium. The first difficulty was overcome by the exceptio rei venditae et traditae, also a praetorian remedy, and probably older than the Publician; to the transferrer’s vindication on the strength of his unextinguished quiritary right the transferee pleaded sale and delivery as an effectual praetorian defence. But, when a third party was in possession, and the transferee by simple delivery had to take the initiative, the position was more com- plicated. Such third party might be in perfect good faith; he might even have acquired from the original transferrer and fortified his acquisition with a formal conveyance. But that was no sufficient reason in equity why he should be allowed to defeat the prior right of the original transferee, who, if he had possessed for the requisite period of usucapion before the third party came upon the scene would have cured the defect of the informal delivery and ac- quired an unassailable quiritary right. So the praetor announced in his edict that, if a man came to him and represented that he had bought a res mancipi from its owner, and had had it delivered to him, but had lost possession within the period of usucapion, he (the praetor) would allow him a vindication embodying

a fiction of completed usucapion {infra), with which he might proceed either against the transferrer or any third party withholding the thing in question.

The publication of such an edict and the formula of the action based upon it (which, though of praetorian origin, was in many respects dealt with as just a variety of the rei vindicatio) had almost the same effect as if the legislature had directly enacted that in future delivery of a res mancipi in pursuance of a sale or other good cause would confer a right of ownership in it even before usucapion had been completed. Till completed, however, the transferee was not quiritary owner: the thing in question was only in bonis, ” of his belongings,” and the legal title, though an empty one — nudum jus Quiritium — remained in the transferrer; it was only with the completion of the usucapion that it became the transferee’s pleno jure. The inevitable result of the recognition of this tenure in bonis was that mancipation came to be regarded in many cases as an unnecessary formality ; and the marvel is that it continued to hold its ground at all. The explanation may be that it afforded a substratum for and gave force of law to the verba nuncupata that accompanied the negotium per aes et libram; and, although many of these might quite well be thrown into the form of stipulations, yet there were others that it may have been thought safer to leave to take effect under the provisions of the earlier law.

The second case that was met by the Publician Edict — whether

as originally published or by an amendment of it cannot be deter-

mined — was that of the bona fide transferee of a thing by

°“f e purchase or other sufficient title who, having lost possession

of it before usucapion, found to his cost that the transferrer possess o. na(j not b een ; ts owner> that no ownership therefore had been transmitted to him (the transferee), and that consequently he was not in a position to raise a vindication with its averment of dominium ex jure Quiritium. 1 As against the true owner, whose property had been disposed of by a stranger behind his back, there would be no

Lenel, Palingenesia, ii. pp. 511 seq.; Girard, Manuel, 4th ed. pp. 348 seq.; Lenel Edict. Perpet. 2nd ed. 164, and references in n. 10 there.

1 This case is the only one alluded to by Justinian {Inst. iv. 6, 4). He had abolished the distinction between quiritarian and bonitarian property, which had, he says, become in practice a mockery (Cod. vii.

25), and so it was unnecessary for him to mention the other. Lenel, in the second edition of his Edictum Perpetuum, i. p. 164, gives strong reasons for holding that there was from the beginning only one edict and one formula which was applied alike to bonitary ownership and bona fide possession. Cf. Appleton, I.e. i. p. 49. For the different theories, see Girard, Textes, 3rd ed. pp. 137-38. What was the nature of the so-called actio Publiciana recissoria in which completed usucapion was feigned not to have taken place, seems doubtful. Inst. iv. 6, §§3, 5. See Cuq. Inst. Jurid. vol. ii. 2nd ed. p. 722 n.; Lenel, Edict. Perpet. pp. 1 17-19.

equity in such an action, and the owner was given an effectual exceptio justi dominii ; but as against all the world except the true owner (and perhaps a person who also was in causa usucapiendi) , his ” better right ” was recognized by the praetor, who accorded to him a vindication proceeding on a fiction of completed usucapion, for usucapion would cure the defect of his title, just as it did that of the bonitarian owner. In this way the praetors introduced that bonae fidei possessio which was worked out with much skill by the jurists of the early Empire, and which assumed very large pro- portions in the Justinianian law when the term of prescription had been greatly extended, and the difficulty of proving property (as distinguished from bona fide possession) consequently very much increased. The Publician action was also in time made applicable in modified form to servitudes and other real rights as much as to property.

Development of the Law of Contract. 2 — It is impossible within the limits of an article such as this to indicate a tithe of the amendments that were effected on the law of obligations during the period whose distinguishing features were the rise of a Changes jus gentium and the construction of the praetor’s edict. la law of In every branch of it there was an advance not by steps contract. but by strides — in that of obligations arising from contract, of those arising from delict, and of those arising from facts and cir- cumstances, such as unjustifiable enrichment at another person’s cost. 3 The law of suretyship, in its three forms of sponsio, fide- promissio, and fidejussio, received considerable attention, and formed the subject of a series of legislative enactments for limiting a surety’s liability ; while that of agency, which was sparingly ad- mitted in Rome, had a valuable contribution from the praetorian edict in the recognition of a man’s liability, more or less qualified, for the contractual debts of his filiifamilias and slaves, as also, and without qualification, for the debts properly contracted of persons, whether domestically subject to him or not, who were managing a business on his account, or whom he had placed in charge of a ship belonging to him. The development of the

law in the matter of obligations generally was greatly facilitated by the praetorian simplification of procedure and the introduction of new forms of actions — the instruction to a judge, ” Whatever in respect thereof the defendant ought to give to or do for the plaintiff, in that condemn him,” preceded by a statement of the cause of action, giving wide scope for the recognition of new sources of liability.

The origin of the verbal contract of stipulation and its action- ability under the Silian and Calpurnian laws have already been explained. It was theoretically a formal contract, i.e. creative of obligation on the strength of the formal quesˆ Siipu-

tion and answer interchanged by the parties, even though lotion.

no substantial ground of debt might underlie it; but in time it became the practice to introduce words — the single word recte was enough — excluding liability in case of malpractice {clausula doli) ; and finally even that became unnecessary when the praetors had introduced the general exceptio doli, pleadable as an equitable defence to any personal action. And it was essentially productive only of unilateral obligation, i.e. the respondent in the interrogatory alone incurred liability; if mutual obligations were intended it was necessary that each should promise for his own part, with the result that two contracts were executed which were perfectly inde- pendent. Originally the only words that could be employed were spondes? on the one side, spondeo on the other; and in this form the contract was juris civilis and competent only to citizens (and non- citizens enjoying commercium ?) . In time the words promittis? promitto, came to be used alternatively. They were, eventually at least, competent to peregrins as well as to citizens, although that may not have been until the stipulation had become of daily use amongst the former in the still simpler phraseology dabis? dabo, facies? _ faciam. Originally competent only for the creation of an obligation to pay a definite sum of money, and afterwards one for delivery of a specific thing other than money, the contract came in time, by the simplification of the words of interrogatory and response and especially by the substitution of the conditions of the formular system for the legis actiones of the Silian and Cal- purnian laws, and the introduction of the actio ex stipulatu to meet cases of indefinite promise — to be adaptable to any sort of unilateral engagement, whether initiated by it or only confirmed. It was of immense service too outside the ordinary range of contract in what were called necessary (in contradistinction to voluntary) stipula- tions, of which a variety of illustrations are given infra, p. 569. In all directions advantage was taken of it to bind a man by formal contract either to do or to refrain from doing what in many

cases he might already be bound ipso jure to do or to abstain from doing, and that because of the simplicity of the remedy — an action on

2 See Bekker, Aktionen, i. c. 5-8, and App. D, E, F and vol. ii. c. 15, 16; Voigt, Jus naturale, &c, vol. iii. §§ 106-24, and vol. iv. App. xix., xxi.

3 Such obligations — usually imposing the duty of restitution of unjustifiable gains— filled a considerable space in the practice and doctrine of the period, and early gave rise to a variety of brocards, e.g. ” Nemo cum alterius damno lucrari debet,” ” Nemo damnum sentire debet per lucrum alterius,” &c.

his stipulation — that would lie against him in the event of his failure.

A second form of contract that came into use to a considerable extent in the latter half of the Republic is what is commonly called Literal tne ntera ‘ contract, or, as Gaius phrases it with greater contract, accuracy, the nomen transscripticium. 1 Notwithstanding the prolific literature of which it has been the subject, it must be admitted that in many points our knowledge of it is incomplete and uncertain. The prevalent opinion, formed before the discovery of the Verona MS. had made known Gaius’s description of it, and almost universally adhered to ever since, is that such contracts were created by entries in the account-books which the censors insisted that all citizens of any means should keep with scrupulous regularity. They are often alluded to by the lay writers; but the text principally relied on is what remains of Cicero’s speech for the player Roscius. From the tenor of the argument in that case, and incidental remarks elsewhere, the conclusion has been formed that a citizen who made an entry in his codex — whether of the nature of a cash-book or a ledger is much disputed — to the debit of another, thereby made the latter his debtor for a sum recoverable by an actio certae creditae pecuniae. Gaius in his description of the contract does not mention the codices; but his account is not incon- sistent with the notion that the entries (nomina) of which he speaks were made in them. He says that those entries were of two sorts, nomina arcaria and nomina transscripticia. The former were entries of cash advances; and of them he observes that

they did not create obligation, but only served as evidence of one already created by payment to and receipt of the money by the borrower. These entries were posted periodically (usually each month) from a day-book (adversaria), and there were distinct pages in the codex for what was thus paid out of the area (expensunt) and what was paid in. Of the nomina transscripticia Gaius says that there were two varieties, the entry transcribed from thing to person and that transcribed from one person to another, and that both of them were not probative merely but creative of obligation. The first was effected by a creditor (A) entering to the credit of his debtor (B) the liquidated amount of what the latter was already owing as the price of something purchased, the rent of a house leased, the value of work done, or the like, and then on the opposite page of the codex debiting him with same sum as expensum. The second was effected by A transcribing B's debt in a similar way to the debit of a third party ©, hitherto a debtor of B's, and who consented to the transaction — A at the same time crediting B with the sum thus booked against C, and B in his books both crediting C with it (acceptilatio) and marking it as paid to A (ex-pensilalio). These nomina transscripticia were purely fictitious entries so far as any passing of money was concerned, though they had to be made by the direction (jussus) of the person made chargeable as debtor. Corresponding entries in the debtor's own codex, though usual, do not seem to have been necessary.

All this at first sight seems just a series of book-keeping opera- tions. But it was much more than that for the Roman citizens who first had recourse to it. There was a time, as formerly stated, when sale, and lease and the like, so long as they stood on their own merits, created no obligation enforceable at law, however much it might be binding as a duty to Fides or (as moderns would say) in the forum of conscience; to found an action at law it required to be clothed in some form approved by the jus civile. The nexum may possibly have been one of those forms, the vendee or tenant being fictitiously dealt with as borrower of the price or rent due under his purchase or lease; the stipulation was another, the obliga- tion to pay the price or rent being made legally binding by its embodiment in formal question and answer. But stipulation was competent only between persons who were face to face, whereas expensilation was competent also as between persons at a distance from each other. This of itself gave expensilation — which, originally at least, was as much a negotium juris civilis as the sponsio — one advantage over stipulation. But it had also a further advantage, which was not affected by the subsequent recognition of the real and consensual contracts as productive of legal obligation on their own merits: it enabled

subsequent tran- scription of debts from one person to another to be effected. This last must have been of infinite convenience in commerce, not only by enabling traders to dispense with a reserve of coin, but by obviating the risks attending the transit of money over long

‘Literature: Savigny, ” Cber den Literalcontract der Romer ” (originally 1816, with additions in 1849), in his Verm. Schriften, i. 205 seq. ; Keller, in Sell’s Jahrb. f. hist. u. dogm. Bearbeit. des rbm. Rechts, i. (1841), 93 seq.; Gneist, Die formellen Vertrdge d. rbm. Rechts (Berlin, 1845), 321 seq.; Danz. Gesch. d. rbm. Rechts, ii. 42 seq. (where there is a r6sum6 of the principal of the older theories); Buonamici, in the Archivio Giuridico, xvi. (1876), 3 seq.; .G’de, Uludes sur la novation (Paris, 1879), 185, seq.; Voigt, ” Uber die Bankiers,” &c, in Abhandl. d. K. S. Gesellschaft d. Wissenschaften (1887), x. 515 seq., and adverse review of this work by Niemeyer in Z. d. Sav. Stift. (1890), xi. 312 seq.; Karlowa, Rom. R. G. ii. 746-57; Mitteis, Z. d. Sav. Stiff, xix. 230 seq.

distances. It was this that led, as Theophilus says was the case, to the conversion even of stipulatory obligations into book -debts; it was not that thereby the creditor obtained a tighter hold over his debtor, but that an obligation was obtained from him which in a sense was negotiable and therefore more valuable. But in other respects it was much more restricted than stipulation. Thus it only applied to money debts; it did not admit of conditions (though it did admit of a term) ; and it was never available to peregrins, though the Sabinians proposed that transcription a re in personam should be binding on them.

The evolution of the four purely consensual contracts — sale, location, partnership and mandate — supplies matter for one of the most interesting chapters in the whole history of the law. Con . But, as it is impossible in such an article as this to attempt sensual to mark the successive stages in’the progress of all of them, contracts. we shall confine ourselves to sale. The others did not and could not follow identically the same course: location ran most nearly parallel with sale; but partnership and mandate, from their nature, not only started at a different point from the other two, but reached the same goal with them — that of becoming productive of obligation simply on the strength of consent interchanged by the parties — by paths that were sometimes far apart. Nevertheless, a sketch of the history of the origin of the contract of sale may be sufficient to indicate generally some of the milestones that were successively passed by all four. 2

Going back as far as history carries us, we meet with it under the names of emptio and venditio, but meaning no more than barter; for emere originally signified simply “to take ” or ” acquire ” contracts (accipere). Sheep and cattle (pecus, hence pecunia) may / sa / e . for a time have been a very usual article of exchange on one side, and then came raw metal weighed in the scales. But it was still exchange, instant delivery of goods on one side against simultaneous delivery of so many pounds weight of copper on the other. With the reforms of Servius Tullius, as we have seen, came the distinction between res mancipi and res nee mancipi, and with it a regulated mancipation of the former. It was still barter; but along with it arose an obligation on the part of the transferrer of the res mancipi to warrant the transferee against eviction — a warranty that was implied in the mancipation. Whether this rule obtained from the first or was the growth of custom it is impossible to say; but it is probable that it was the XII. Tables which fixed that the measure of the transferrer’s liability to the transferee in the event of eviction should be double the amount of the price. Equally impossible is it to say when the practice arose of embodying declarations, assurances and so forth in the mancipation {leges mancipii), which were held binding on the strength of the negotium juris civilis in which they were clothed. They received statutory sanction in the Tables, in the words already referred to more than once — ” cum nexum faciet mancipiumque, uti lingua nuncupassit, ita jus esto,” which means in effect ” whatever shall by word of mouth be declared by the parties in the course of a transaction per aes et libram in definition of its terms shall be law as between them.”

The substitution, by or soon after the decemvirs, of coined money, that was to be counted, for rough metal that had been weighed, converted the object of transfer on one side into price (pretium), as distinguished from article of purchase (merx) on the other; and sale thus became distinct from barter. In contemplation of the separa- tion of the mancipation and the price-paying, and the transition of the former into a merely imaginary sale, the decemvirs enacted that, mancipation notwithstanding, the property of what was sold should not pass to the purchaser until the price had been paid or security by sureties (vades) given for it to the vendor; and it was probably by the interpretation of the pontiffs that to this was added the rule — that until the price was paid no liability for eviction should attach to the transferrer (or auctor). The reason perhaps of the provision on this point in the XII. Tables was that a vendor who had mancipated or delivered a thing sold by him before receiving the price had no action to enforce payment of the latter; and in such circumstances it was

thought but right to give him the opportunity of getting back the thing itself by a real action. It might be, however, that the price had been paid, and yet the vendor refused to mancipate. It was long, apparently, before the purchaser could in such a case compel him to do so. After the introduction of the legis actio per condictionem he (the purchaser) had undoubtedly the power to recover the money on the ground of the vendor's unjusti- fiable enrichment — that the latter had got it for a consideration which had failed (causa data, causa non secuta) ; and it is possible that before that he had a similar remedy per judicis postulationem or by an action in factum.

Down to this point, therefore, say the beginning of the 6th century, there were several obligations consequent on sale of a res mancipi; but not one of them arose directly out of the sale itself,

2 The literature on the history of the contract of sale is profuse, but mostly scattered in periodicals and much of it fragmentary. It may be enough to refer to Bechmann, Der Kauf nach Gemeinem Recht (3 vols., 1876, 1884 and 1905) ; Karlowa, Rom. R. G. ii. pp. 611-32 ; Girard, Nouv. Rev, historique (1883), pp. 539 seq., and in his Manuel, 4th ed. pp. 533 seq.

or could be enforced simply on the ground that it had taken place. The vendor was bound to support the purchaser in any action by a third party disputing his right, and to repay him the price twofold in the event of that third party's success; and he was bound, moreover, to make good to him any loss he had sustained through a deficiency of acreage he had guaranteed, non-existence of servi- tudes he had declared the lands enjoyed, existence of others from which he had stated they were free, 1 incapability of a slave for labour for which he was vouched fit, and so on. But breaches of these obligations were probably all regarded as of a delictual char- acter; the obligations were binding, not in virtue of the sale per se, but of the transaction per aes et libram superinduced upon it ; and, if the vendor had at any time to return the price on failure to manci- pate what he had sold, it was not because he had committed a breach of contract, but because he had unjustly enriched himself at the purchaser's expense.

In sales of res nee mancipi, just as in those of res maneipi, a vendor

who had been incautious enough to deliver his wares before he had been paid, or had got stipulatory security for the price, or had converted it into a book-debt, might recover them by a real action if payment was unduly delayed ; while the purchaser who had paid in advance but failed to get delivery might also get back his money from the vendor on the plea of unwarrantable enrichment. But, as mancipation was, as is generally supposed, incompetent for carrying the property, some other machinery had to be resorted to than that of the copper and the scales for imposing upon the vendor an obligation of warranty against eviction, defects and so forth. What it was is a question much controverted among modern writers. It may be that, until trade began to assume considerable pro- portions, and when a transaction was between citizens, a purchaser was content to rely partly on the honesty of his vendor, partly on the latter's knowledge that he ran the risk of an action for theft if what he sold belonged to another, 2 and partly on the maxim common in all ages and climes, caveat emptor. When it was one between a citizen and a peregrin, a different set of rules of course came into operation; for between them disputes were settled by actions in factum before recuperators, whose decisions were arrived at very much on considerations of natural equity. On the whole, while admitting it to be quite maintainable that the urban praetors, under the influence of jus gentium, granted arbitria for enforcing obligations of parties in sales inter cives even a good while prior to the lex Aebutia, the balance of evidence, we think, is in favour of the view that it was the popularization of the stipulation that facilitated the development of sale into a bonaefidei contract.

We read of a satisdatio secundum mancipium, a stipulatio habere

licere and a stipulatio duplae. The nature of the first is obscure;

it seems to have been connected with mancipatory sales,

~? a ' and probably to have been the guarantee of a sponsor for

rma ory ˆg liabilities imposed upon the vendor by the transaction

Nations P er aes et ˆ oram an ˆ tne veroa nuncupata that were covered by it. 3 The stipulation habere licere occurs in Varro, in a collection of styles of sales of sheep, cattle, &c, some of which he says were abridgments of those of M. Manilius, who was consul in the year 149 B.C. It was the guarantee of the vendor of a res nee mancipi, or even occasionally of a res mancipi sold without mancipation, that the purchaser should be maintained in possession of what he had bought;

it entitled him to reparation on eviction, measured not by any fixed standard but according to the loss he had sustained. It cannot have been introduced, therefore, until after the Lex Aebutia and the formulation by the praetor of the actio ex stipulatu. The stipulatio duplae was one binding the vendor for double the price in case of eviction, and was entered into not only where no mancipation of a res mancipi took place or one which might be challengeable for invalidity, but also where valuable res nee mancipi were sold.

The idea of the stipulatio duplae may have been borrowed from the duplum incurred by a vendor on the eviction of a purchaser acquiring a thing by mancipation; for one of its earliest manifestations was in the edict of the curule aediles, who insisted on it from persons selling slaves, probably because the dealers were for the most part foreigners, and therefore unable to complete their sales per aes et libram. Judging from Varro, it was a form of stipulation against eviction that in his time was used only in sales of slaves, although he adds that by agreement of parties it might be limited to a simplum.

There were also stipulations against vices in theobject sold. We learn from Varro — what is also indicated in various passages of Plautus — that the vendor at the same time and in the body of the same stipulatio duplae guaranteed that the sheep or cattle he was selling were healthy and of a healthy stock and free from faults,

1 Cicero says (De Off. iii. 16, § 65) that, though by the XII. Tables it was enough if a vendor per aes et libram made good his positive assurances (uti lingua nuncupassit, ita jus esto), the jurists held him responsible for reticence about burdens or defects he ought to have revealed, and liable for a poena dupli exactly as if he had guaranteed their non-existence.

2 ” In rebus mobilibus . . . qui alienam rem vendidit et tradidit furtum committit ” (Gai. ii. 50).

- See Lenel, Edict. Per pet. 2nd ed. p. 521.

and that the latter had not done any mischief for which their owner could be held liable in a noxal action ; and similarly that a slave sold was healthy and not chargeable for any theft or other offence for which the purchaser might have to answer. If any of these guarantees turned out fallacious, the purchaser had an actio ex stipulatu against the vendor: ” Whereas the plaintiff got from the defendant a stipulation that certain sheep he bought from him were healthy, &c. [repeating the words of guarantee], and that he, the plaintiff, should

be free to hold them (habere licere), whatever it shall appear that the defendant ought in respect thereof to give to or do for the plaintiff, in the value thereof, judge, condemn him; otherwise, acquit him." It is an observation of Bekker's 4 that the actio empti in its original shape was just a simplifica- orfoln of tion of the actio ex stipulatu on a vendor's guarantees; Jar a the stipulations to which we have been alluding had become ..

such unfailing accompaniments of a sale as to be matters p '

of legal presumption, the result being that the words "whereas this plaintiff bought from the defendant the sheep about which the action has arisen " were substituted in the demonstratio (as the introductory clause of the formula was called) for the detailed recital of what had been stipulated. Bekker justifies this by reference to the language of Varro, who seems to include under the words emptio, venditio not merely the agreement to buy and sell but also the stipulations that usually went with it.

The introduction of an actio empti in this shape, however, was far from the recognition of sale as a purely consensual contract. If the price was not paid at once, the purchaser gave his stipulatory promise for it, or got some one on whom the vendor placed more reliance to do so for him, or else the vendor made a book-debt of it ; and, if it had to be sued for, it was in all these cases by a condictio certae pecuniae and not by an action on the sale. If the price was paid but the thing purchased not delivered, the only remedy open to the purchaser was to get back his money by the same condiction, unless, indeed, the guarantee habere licere was held to cover delivery, in which case the purchaser might obtain damages in an actio ex stipulatu under the name of actio empti. But this actio empti, whether raised on the ground of non-delivery, eviction or breach of some other warranty, was really an action on the verbal contracts that had accompanied the sale — a strictum jus action in which the judge could not travel beyond the letter of the engagements of the purchaser. In the latter years of the Republic, and probably a little before the time of Q. Mucius Scaevola, it was a bonae jidei action. How had the change come about? A single case of hard- ship may have been sufficient to induce it, such as the defeat of a claim for damages for eviction on the ground that the stipulatory guarantee had been accidentally overlooked. Ulpian says: "As the stipulatio duplae is a thing of universal observance, action orj> the ground of eviction will lie ex empto if perchance the vendor of a slave have failed to give his stipulatory guarantee, for everything that is of general custom and practice ought to be in view of the judge in a bonae fidei judicium." 6

Very little was required to convert the stricti juris actio empti, really nothing more than an actio ex stipulatu, into a bonae fidei one — simply the addition by the praetor of the words ” on con- siderations of good faith ” (ex fide bona) to the ” whatever the defendant ought to give to or do for the plaintiff.” The effect, however, was immeasurable — not that it did away with the practice of stipulatory guarantees, for Varro wrote after the time of Q. Mucius (who speaks of the action on sale as a bonae fidei one), and references to them are abundant in the pages of the classical jurists; but it rendered them in law unnecessary. It made sale a purely consensual contract in which, in virtue of the simple agreement to buy and sell, all the obligations on either side that usually attended it were held embodied without express formulation or (still less) stipulatory or literal engagement. And, in instructing the judges to decide in every case between buyer and seller suing ex empto or ex vendito on principles of good faith, it really empowered them to go far beyond ” general custom and practice,” and to take cognisance of everything that in fairness and equity and common sense ought to influence their judgment, so as to enable them freely to do justice between the parties in any and every question that might directly or indirectly arise out of their relation as seller and buyer. 6

The history of the four nominate real contracts — mutuum (i.e. loan of money or other things returnable generically) , commodate (i.e. loan of things that had to be returned specifically), _ . deposit and pledge — is even more obscure than that of the “/—w consensual ones. 7 Down to the time of the Poetiliaii law coa s ‘ loan of money, corn, &c, was usually contracted per aes et libram; and it is probable that on the subsequent disuse of the nexum the

4 Bekker, Aklionen (187 1), i. 156 seq. and 314 seq.

6 Ulp., ” Lib. I. ad ed. aedil.,” in Dig. xxi. I, fr. 31, § 20.

6 The above view is supported in the main by_ Girard, Manuel, 524 seq. For other views see Pernice, Labeo, i. 456 seq.; Cuq, Inst. Jurid. 2nd ed. vol. i. pp. 226 sqq.

7 Demelius, in the Zeitschr. f. Rechtsgesch. (1863), ii: 217 seq.; Bekker, Aktionen, i. 306 seq.; tjbbelohde, Zur Gesch. d. benann/en Realcontracte (Marburg, 1870) ; Huschke, Lehre vom Darlehn (Leipzig, 1882) ; Girard, Manuel, 4th ed. pp. 505 sqq.

obligation on a borrower to repay the money or corn advanced to him was made actionable, under the Silian and Calpurnian laws respectively, by a stipulation contemporaneous with the loan. With the rise of jus gentium loan became actionable on its own merits — that is to say, the advance and receipt of money as a loan of itself laid the borrower under a stricti juris obligation to repay it, even though no stipulatory engagement had intervened ; the res — in this case the giving and receiving mutui causa — completed the contract. The obligation that arose from it was purely unilateral, and enforceable, where the loan was of money, by the same action — certae pecuniae creditae — as stipulation and literal contract; and so strictly was it construed that interest on the loan was not claimable llong with it, the res given and received being the full measure of the obligation of repayment. The other three — commodate, deposit and pledge — became independent real contracts much later than mutuum, possibly not all at the same time, and none of them appar- ently until very late in the Republic. All of them, of course, had been long known as transactions of daily life; the difficulty is to say when they first became actionable in the urban praetor's court (for in transactions with peregrins actions in factum would doubtless be granted), and under what guise.

It is impossible within the space at our command to criticize the various theories entertained of their vicissitudes, for they neces- sarily vary to some extent in regard to each. We must content ourselves, therefore, with the simple statement that eventually, and within the period with which we are now dealing, they came to be recognized as independent real contracts, the res by which they were completed being the delivery of a thing by one person to another for a particular purpose, on the understanding that it was to be returned when that purpose was served. And it is to be noted that, while mutuum transferred the property of the money lent, the borrower being bound to return not the identical coins but only an equal amount, in pledge it was only the possession that passes, while in commodate and deposit the lender or depositor retained both property and (legal) possession, the borrower or de- positary having nothing more than the natural detention. In all but mutuum, therefore, there was trust; the holder was bound, to an extent varying according to circumstances, to care for what he held as if it were his own, and entitled to be reimbursed for outlay on its maintenance — bound to return it, yet excused if his failure to do so was due to a cause for which in fairness he could not

be held responsible. Consequently the actions on these three contracts, differing from that on mutuum, were all bonae jidei, the judge being vested with full discretion to determine what was fair and equitable in each individual case.

Praetorian Amendments on the Law of Succession. — The most important change in the law of succession during the latter half of the Republic was due to the praetors. They introduced, under V™ e ” the technical name of bonorum possessio, 1 what was really

torlaa beneficial enjoyment of the estate of a deceased person

oossessto without the legal title of inheritance. There is much to lead to the conclusion that the series of provisions in regard to it which we find in the Julian consolidation of the Edict were the work of a succession of praetors, some of them probably not under the Republic but under the Empire; but it will be convenient to give here a general view of the subject as a whole, disregarding the consideration that some of its features may not have been given to it within the period now under notice.

Justinian, speaking of the origin of bonorum possessio, observes that in promising it to a petitioner the praetors were not always _ actuated by the same motives ; in some cases their object

tL was to facilitate the application of the rules of the jus civile, mentary. j n sorne to amenc j their application according to what they believed to be the spirit of the XII. Tables, in others, again, to set them aside as inequitable. 2 It is not unreasonable to assume that it was with the purpose of aiding the jus civile that the first step was taken in what gradually became a momentous reform; and it is probable that this first step was the announcement by some praetor that, where there was dispute as to an inheritance, and a testament was presented to him bearing not fewer seals than were required by law, he would give possession of the goods of the defunct to the heir named in it. 3 In this as it stands there is nothing but a regulation of possession of the bona of the inheritance pending the

1 For a risumt. of the principal theories (down to 1870) about the origin of bonorum possessio, see Danz, Geschichte d. rbm. Rechts, vol. ii. § 176. Of the later literature it is enough to mention Leist, in the first 4 vols, of his continuation of Gluck’s Pandecten-Commen- tar (Erlangen, 1870-1879); Sohm, in his Inst. d. r. R. (Eng. trans., 2nd ed \), pp. 580 seq.; A. Schmidt, in Z. d. Sav. Stift. xvii. 324 seq.

2 Inst. iii. 9 pr. and § 1.

3 Cic, In Verr. II. i. 45, § 117- He says (writing in 70 B.C.) that an edict to that effect was already tralaticium, i.e. had been adopted year after year by a series of praetors. Gaius (ii. 119) speaks of seven at least as the requisite number of seals; i.e. probably those of the libripens and the five citizen witnesses, and that of the antestalus, whose functions are not well understood, but whose official designation appended to his seal recurs so regularly in inscriptions as to leave no doubt that his was originally the seventh.

question of legal right. Just as between two parties contending about the ownership of a specific thing in a rei vindicatio the praetor first settled the question of interim possession, so did he promise to do here when a question was about to be tried about the right to an inheritance {si de hereditate ambigitur). It was a provisional arrangement merely, and very necessary in view of the state of the law which permitted a third party, apart from any pretence of title, to step in and complete a usucapio pro herede by a year's possession of the effects of the inheritance. Even at the time when the Edict was closed it was not necessarily more than a provisional grant; for, if heirs-at-law of the deceased appeared and proved that, although the testament bore on the outside the requisite number of seals, yet in fact some solemnity of execution, such as the familiae vendiho or testamenti nuncupatio, had been omitted, the grantee had to yield them up the possession that had been given him pending ' inquiry. It was only by a rescript of Antoninus Pius that it was declared that a plea by the heir-at-law of invalidity of a testament on the ground of defect of formalities of execution might be de- feated by an exceptio doli, on the principle that it was contrary to good faith to set aside the wishes of a testator on a technical objection that was purely formal. Thus was the bonorum possessio secundum tabulas, i.e. in accordance with a testament, from being originally one in aid of the jus civile, in course of time converted into one in contradiction of it. That the motives and purposes of the series of praetors who built up the law of bonorum possessio must have varied in progress of years is obvious; and, once th6 machinery had been invented, nothing was easier than to apply it to new ideas. The praetor could not make a man heir — that he always disclaimed; but he could give a man, whether heir or not, the substantial advantages of inheritance, and protect him in their enjoyment by praetorian remedies. He gave him possession of the goods of the deceased, with summary remedies for ingathering them, which, once in his hands, would become his in quiritarian right on the expiry of the period of usucaption ; and subsequently, by interpolation into the formula of a fiction of heirship, he gave him effectual

personal actions against debtors of the deceased, rendering him liable in the same way to the deceased's creditors.

Another variety of the bonorum possessio was that contra tabulas — ■ in opposition to the terms of a testament. If a testator had neither instituted nor expressly disinherited a son who was one of his sui heredes, then his testament was a nullity, and the child Contra- passed over had no need of a praetorian remedy. Where tabular. sui heredes other than sons were passed over the jus civile upheld the will but allowed them to participate with the instituted heirs by a sort of accrual. But the Edict went further; for, if the institute was a stranger, i.e. was not a person in the potestas of the testator with the child passed over, then, on the petition of the latter, the praetor gave him and any other sui concurring with him possession of the whole estate of the deceased as on intestacy, the institute being left with nothing more than the empty name of heir. Another application of the bonorum possessio contra tabulas was to the case of emancipated children of the testator. By the jus civile he was not required to institute or disinherit them; for by their emanci- pation they had ceased to be sui heredes, and had lost that interest in the family estate which was the reason why they had to be mentioned in the testament of their paterfamilias. The praetors — although probably not until the empire, and when the doctrines of the jus naturale were being more freely recognized— put them on the same footing as unemancipated children, requiring that they also should be either instituted or disinherited, and giving them bonorum possessio if they were not. It was contra tabulas in the sense that it displaced the instituted heirs either wholly or partially — wholly when the institutes were not children of the deceased, par- tially when they were. In the latter case, at least when sui were affected by it, the grant of bonorum possessio was under the equitable condition that the grantees should collate or bring into partition all their own acquisitions since their emancipation.

The third variety of bonorum possessio was that granted ab intestato. The rules of the jus civile in reference to succession on intestacy were, as we have seen, extremely strict and artificial. They admitted neither emancipated children Z? fato nor agnates who had undergone capitis deminutio; they es admitted no female agnate more remote than a sister; if the nearest agnate or agnates declined, the right did not pass to those of the next degree ; mere cognates, kinsmen of the deceased who were not agnates , e.g. grandchildren or others related to him through females and agnates capite minuti, were not admitted at all; while a wife had no share unless she had been in manu of the deceased and therefore filiae loco. All these rules the praetors

amended, and so far paved the way for the revolution in the law of intestate succession which was accomplished by Justinian.

They established four orders or classes of heirs. (1) Displacing the sui heredes of the jus tivile, they gave the first place to descend- ants (liberi), including in the term all those whom the deceased would have been bound either by the jus civile or the Edict to institute or disinherit had he made a will, i.e. his wife in manu, sons and daughters of his body whether in potestate at his death or emancipated, the representatives of sons who had predeceased him, and adopted children in his potestas when he died. (2) On failure

of liberi the right to petition for bonorum possessio opened to the nearest collateral agnates of the intestate, under their old name •_; of legitimi heredesi (3) Under the jus civile, on failure of

v*f” agnates (and of the gens where there was one) , the succes-

*. ° . sion was vacant and fell to the rise, unless perchance it was Intestate usucapted by a stranger possessing pro herede: The fre- Bocces- quency of such vacancies was much diminished by the s/on. recognition by the praetorˆ of the right of cognates to claim

bonorum possessio in the third place. Who they had pri- marily in view under the name of ” cognates ” it is impossible to say.” The epithet is most frequently applied by modern writers to kins- men related through females; but in its widest sense it included all kinsmen without exception, and in .a’ more limited sense all kinsmen not entitled to claim as agnates. There were included amongst them therefore — although it is very probable that the list was not made up at once, but from time to time by the action of a series of praetors— not merely kinsmen related through females {who were not agnates), but also agnates of a remoter degree Who were excluded as such because the nearest agnates in existence had declined, persons who had been agnates but by reason of capitis minutio had lost that character, female agnates more distantly related than sisters, and children of the intestate who at the time of his death were in an adoptive family. AH these took according to proximity, but not beyond the sixth degree and the children of a second cousin in the seventh. (4) Finally, the claim passed to the survivor of husband and

wife; assuming always that their marriage had not involved mantis. This list constituted the praetorian order of succession on intestacy among freeborn citizens. The praetorian order of succession -to freedmen and emancipati was necessarily different, the patron or quasi-patron taking the place of agnates; but it is too detailed and complex to be gone into here.

All these bonorum possessiones had to be formally petitioned for. In that ab intestate descendants were allowed a year for doing so, while other persons were limited to ioo days, the period for those entitled in the second place beginning when that of those entitled in the first had expired, and so on. The grant was always made at the risk of the petitioner; nothing was assured him by it; it might turn out real and substantial {cum re) Of merely nominal (sine re), according as the grantee could or could not maintain it against the heir of the jus civile. For the latter was entitled to stand on his statutory or testamentary right, without applying to bonorum possessio, although in fact he often did so for the sake of the summary procedure it supplied him for ingathering the effects of the deceased.

The Law of Procedure.— ‘The use of the formnlar system of pro cedure as alternative to that by the ” actions of the law” cora- Law 0/ ‘ mence d long before the end of the period now under oro . consideration; and we have had occasion more than

cedure. once to observe how greatly it facilitated the deyelop- ment of the institutions of property and contractual obligation. But as the change was only completed in the early Empire it will be more convenient to defer explanation of the nature of trie new procedure in the meantime.

. IV. The Jus Naturale and Maturity of Roman Jurisprudence (The Empire until the time of Diocletian.) 1. Characteristics and Formative Agencies of the Law during

the Period.

Characteristics generally and Recognition of a Jus Naturale in particular. — The first three centuries of the Empire witnessed the perfection of Roman jurisprudence and the commence- ment of its decline. During that time the history of the law presents no such great landmarks as the enactment of the XII. Tables, the commencement of a praetor’s edict, the recognition o£ simple consent as creative of a contractual bond, or the introduction of a new system of judicial pro- cedure; the establishment of st class of patented jurists speaking as in

a sense the mouthpieces of the prince, and ;the admission of all the free subjects of the Empire- to the privileges of citizenship, are about the only isolated events to which one can point as productive of great and lasting results. There were, indeed, some radical changes in particular institutions, such as the caduciary legislation of Augustus, intended to raise the tone of domestic morality and increase fruitful marriages, and the legislation of the same emperor and his immediate successor for regulation of the status of enfranchised slaves; but these, although of vast importance in themselves, and the first of them influencing the current of the law for centuries, yet left upon it no permanent impression. It was jy much less imposing efforts- that it attained the perfection

to which it reached under the sovereigns of the Severan house —a steady, advance on the lines already marked out m the latter years of the Republic. The sphere of the jus Quiritium became more and more circumscribed, and one after another of the formalities of the strict jus civile was abandoned. The manus of the husband practically disappeared; the patria potestas i of the father lost much of its significance by the recognition, notwithstanding it, of the possibility of a separate and independent estate in the child (peculium 'castrense)'; slaves might be enfranchised to a certain extent . by informal manumission; res .mancipi constantly passed by simple tradition, the right of the transferee being secured by the Publician action; servitudes and other real' rights informally constituted were maintained, as effectual tuitione praptoris; an heir's acceptance of a succession could be accomplished: by any indication of his intention, without observance of the formal cretio of the earlier law; and many of the incidental bargains incident to consensual contract, but varying their natural import, that used to be embodied in words of stipulation, came to be enforceable on the strength of formless contemporaneous agreements.

The preference accorded by the magistrates and jurists and judges to the jus gentium over the jus civile is insufficient to account for these and many other changes in the idea of same ' direction, as well as for the ever-increasing a Jus tendency evinced to subordinate word and deed natura,t ' to the voluntas from which they arose. They are rather to be attributed to the striving on the part of many after a higher ideal, to which has been given the name of jus naturale. 1 It is sometimes said that the notion of a jus naturale as distinct from the jus gentium was peculiar to Ulpian, and that it found no acceptance with the Roman jurists generally. But this is inaccurate. Justinian, indeed, has excerpted in the Digest and put in the forefront of his Institutes a passage from an elementary work of Ulpian's, in which he

speaks of a jus naturale that is common to man and the lower animals, and which is substantially instinct. This is a law of nature of which it is quite true that we find no other jurist taking account, and it may be attributed to a: habit, specially noticeable in Ulpian's writings, of making tripartite classifica- tions. But though the classical jurists are undoubtedly indistinct in their conceptions about .the matter, many j of them refer again and ' again to jus naturale in the sense of law based on natural reason; and Gaius is the only one (Justinian following him) who definitely, though not consistently, makes it synonymous with jus gentium. There can be no question that the latter was much more largely imbued with precepts of natural law than was the jus civile, but it seems incorrect to say that natural law and jus gentium were identical; it is enough to cite but one illustration, pointed out iagain and again in the texts : while the one : admitted the legality of slavery, the other denied it. While the jtis civile studied the interests only of citizens, and the jus gentium those of freemen irrespective of nationality, the law of nature had theoretically: a wider range and took all mankind within its purview, Thq doctrine of the jus gentium agreed in this respect with that of the jus civile — that a slave was nothing but' a chattel; yet' we' find the latter, when tinctured with the jus naturalˆ recognizing many : rights as competent to a slave, arid 'eyetf conceding that he might be debtor or creditor in a contract) although his obligation or claim could be' given effect to only indirectly, since he could neither sue nor be sued. 2

Voigt thus summarizes the characteristics of this speculative Roman jus naturale: — (1) its potential universal applicability to all- men, (2) among all peoples, (3) 'at all times, and (4) its charao- correspondence with the innate conviction of right (innere ˆ,ˆ1-, RechtSuberzeugung) .' Its propositions, as gathered from // us the pages of the jurists of the' period, he formulates thus ;— ' ,' aa turaie. (1) recognition of the claims of blood {sanguinis Vel cognationis ratio); (2) duty of faithfulness to engagements — is

1 See Voigt, Das Jus naturale … der Romer,. particularly voL- i. §§ 52-64, 89-96; Maine, Ancient Law, chap. iii.

2 Ulp. in Dig. xliv. 7 fr. 14. 3 Voutf. I.e. p. 304.

natura debet . . . cujus fidem secuti sumus; (3) apportionment of advantage and disadvantage, gain and loss, according to the standard of equity ; (4) supremacy of the voluntatis ratio over the words or form in which the will is manifested. 1 It was regard for the first that, probably pretty early in the principate, led the praetors to place emancipated children on a footing of equality with unemancipated in the matter of succession, and to admit to succession collateral kindred through females as well as those related through males; and that, in the reigns of Hadrian and Marcus Aurehus respectively, induced the senate to give a mother a preferred right of succession to her children, and vice versa. It was respect for the second that led to the recognition of the validity of what was called a natural obligation,—one that, because of some defect of form or something peculiar in the position of the parties, was ignored by the jus civile and incapable of being made the ground of an action for its enforcement, yet might be given effect to indirectly by other equitable remedies. Regard for the third was nothing new in the jurisprudence of the period; the Republic had already admitted it as a principle that a man was not to be unjustifiably enriched at another's cost; the jurists of the empire, however, gave it a wider application than before, and used it as a key to the solution of many a difficult question in the domain of the law of contract. As for the fourth, it was one that had to be applied with delicacy; for the voluntas could not in equity be pre- ferred to its manifestation to the prejudice of other parties who in good faith had acted upon the latter. We have many evidences of the skilful way in which the matter was handled, speculative opinion being held in check by considerations of Individual interest and general utility.

A remark of Voigt's on the subject is well worthy of being kept in view, that the risk which arose from the setting up of the pre- cepts of a speculative jus naturale, as derogating from the rules of the jus civile, was greatly diminished through the position held by the jurists of the early Empire. Their jus respondendi made them in a sense legislative organs of the state, so that, in introducing principles of the jus naturale, or of aequum et bonum, they at the same moment denned them and gave them the force of law. They were, he says, " philosophers in the sphere of law, searchers after the ultimate truth; but, while they — usually in reference to a concrete case — sought out the truth and applied what they had found, they combined with the freedom from constraint of specula- tion, the life-freshness of practice, and the power of assuring the operativeness of their abstract propositions." 2

Influence of Constitutional Changes. — The changes in the con- stitution aided not a little the current of the law. Men of foreign _ H .

descent reached the throne and recruited the senate, some-

pos on t; mes proud indeed of the history and traditions of Rome, character Y e ˆ m mos * cases Iree from prejudice in favour of institu- of Jurists tions that had nothing to recommend them but their anti- quity. Military life, for obvious reasons, had not the same attractions as during the Republic; there was no longer a tribu- nate to which men of ambition might aspire; the comitia soon ceased to afford an outlet for public eloquence; so that men of education and position had all the more inducement to devote themselves to the conscientious study and regular practice of the law. This was greatly encouraged by the action of Augustus in creating a class of, so to say, patented jurists privileged to give answers ex auctoritate principis to questions submitted to them by the magistrates and judges. It was still more so perhaps by Hadrian's reorganization of the imperial privy council, wherein a large proportion of the seats were assigned to jurists of distinction. Several of the emperors had lawyers amongst their most intimate and trusted friends. Again and again the office of praetorian pre- fect, the highest next the throne, was filled by them; Papinian, Ulpian and Paul all held it in their time. Jurisprudence, there- fore, was not merely an honourable and lucrative profession under the new arrangements, but a passport to places of eminence in the state; and till the death of Alexander the ranks of the jurists never failed to be recruited by men of position and ability.

Extension of Citizenship to the Empire generally. — It was in the year a.d. 212 that Caracalla published his Constitution conferring citizenship on all the free inhabitants of the Empire, 1 »?* °"- F ar " reacn ing as were its consequences, the primary pur- "m to"' P 086 was P ure 'y fiscal- The lex Vicesimaria, passed whole under Augustus, had imposed a tax of 5 % on testa- Emolre mentary inheritances and bequests, except where the whole " succession was worth less than a certain sum or the heir or legatee was a heres domesticus of the deceased. It was con- tinued by his successors and was very profitable, thanks to the f)ropensity of the well-to-do classes for single blessedness, fol- owed by testamentary distribution of their fortunes amongst their friends. But it affected only the successions of Roman citizens, so that the great mass of the provincials escaped it. Cara- calla, being needy, not only increased it temporarily to 10%, but widened the area of its operation by elevating all his free subjects to the rank of citizens. The words of Ulpian regarding the con- stitution are very inclusive, — " in orbe Romano qui sunt . . .

cives, Romam effecti sunt "■;*■ but there is considerable diversity of opinion as to their meaning, caused partly by the fact that peregrins

are still mentioned by some of Caracalla's successors, and there can be little doubt that among others it did not apply ,to Junian Latins or peregrini dediticii. Limit the constitution, however, as we may, there can be no question of its immense im- portance. By conferring citizenship on the provincial peregrins it subjected them in their legal relations to the law of Rome, and qualified them for taking part in many transactions both inter vivos and mortis causa which previously had been incompetent for them. It did away with the necessity for regarding jus gentium as something distinct from jus civile. The principles and doctrines of jus gentium, it is true, survived and were expanded and elaborated as freely and successfully as ever; but they were so dealt with as part and parcel of the civil law of Rome, which had ceased to be Italian and become imperial.

Legislation of Comitia and Senate. — Augustus, clinging as much as possible to the form of republican institutions, thought it ex-

f>edient not to break with the old practice of submitting egislative proposals to the vote of the comitia of the Enaet- tnbes. Some of the leges of his reign were far from ™*? s

1 Voigt, /.c. pp. 321-323.

! Voigt,7.c. p. 341.

insignificant. Besides various measures for the amend- ment of the criminal law, &c, there were three sets of en- actments of considerable importance which owed their authorship to him : the first to improve domestic morality and encourage fruitful marriage, the second to abate the evils that had arisen from the too lavish admission of liberated slaves to the privileges of citizenship, and the third to regulate procedure in public prosecutions and private litigations. .

The first set included the lex Julia de adulteriis et de fundo dotali of 18 B.C. and the lex Julia et Papia Poppaea of a.d. 9- — the latter a voluminous matrimonial code, in which an earlier aBtml lex de moritofidis ordinibus (18 B.C.) seems to have been marr i axe . incorporated, and which for two or three centuries exer- cised such an influence as to be regarded as one of the sources of Roman law almost as much as the XII. Tables or Julian's con- solidated Edict. It was often spoken of as the .toe Coducaria, one of its most remarkable provisions being that unmarried persons (within certain ages and under certain qualifications) should forfeit entirely anything to which they were

entitled under a testament, and that married but childless persons should similarly forfeit one-half, the lapsed provisions (caduca) going to the other persons named in the will who were qualified in terms of the statute, and failing them to the fisc. However well intended, the language of Juvenal and others raises doubts whether the law did not really do more harm than good. By the Christian emperors many of its provisions were repealed as inconsistent with the New Testament views of celibacy, &c, while others fell into disuse; and in the Justinian books hardly a trace is left of its distinctive features.

The second set included the Fufia-Caninian law of the year 2 B.C., the Aelia-Sentian law of the year a.d. 4, and the Junia-Norban law of the year a.d. 19 — the last it is thought passed in the -*„„* reign of Tiberius, but probably planned by Augustus. 4 maau . TheAelia-Sentianlawregulatedthematterof manumission, mtsstaA with the result that a slave might on that event, and accord- ing to circumstances minutely described, become either (1) a citizen, or (2) a freedman with the possibility of attaining citizenship by a process indicated in the statute, or (3) a freedman who, because of his having undergone certain punishments for grave offences, was forbidden to reside within a hundred miles of Rome and denied the hope of ever becoming a citizen (libertus dediticius). The Junian law was passed in order to define more precisely the status in the meantime of those freedmen who had a potentiality of citizen- ship. It did so by assimilating them, to a large extent, to the colonial Latins, denying to them the rights of a citizen proper so far as concerned family and succession, but conceding to them all the' patrimonial rights of a citizen and the fullest power of dealing with their belongings so long as not mortis causa and to the prejudice of their patrons. This was the Junian Latinity so prominent in the p,ages of Gaius, but of which our limits exclude any detailed description.

The third set of enactments referred to included the two leges Juliae judiciariae, of which we know but little. They were probably enacted in the year 17 B.C. One lex Julia seems to have j u di B i ar y dealt with judicia publica and another with procedure in 1,-^. private litigations. Gaius, however, seems to refer to two leges Juliae judiciorum privatorum, and it is the opinion of Wlassak, who had: studied the subject profoundly, that the second of these was enacted for municipalities outside Rome and was in similar terms to the first. It was these two last-mentioned judiciary statutes that, as Gaius tells us, completed the work of the Aebutian law in substituting the formular system for that

3 Ulp. in Dig. i. 5 fr. 17. As to the effects of this conslitulio Antonina,

see Mitteis, Reichsrecht und Volksr., c. vi.

4 There is a long-standing controversy as to the date of this lex Junia, some writers placing it earlier than the lex Aelia-Sentia. See Girard, Manuel, 4th ed., p. 124, and authorities cited in Muirhead. Hist. Introduction, 286 n. 7- and 317 n. 6.

Julian's Edictum.

of legis octiones. The one regulating procedure in private suits at Rome must have been a somewhat comprehensive statute, as a passage in the Vatican Fragments refers to a provision of its 27th section ; and our ignorance of its contents therefore, beyond one or two trifling details, is the more to be regretted. The opinion of Wlassak, already referred to, is that the judiciary laws made procedure by formulae compulsory, while the Aebutian law had left it optional. In all cases remitted to a unus judex or other private judges a formula was to be henceforth compulsory ; a legis actio could no longer be tried before private judges but only exceptionally by the centumviral court. 1

From the time of Tiberius onwards it was the senate that did the work of legislation, for the simple reason that the comitia Lezlsla- were no longer fit for it. And very active it seems to have Hon of been. This may have been due to some extent to the fact Senate. that so many professional j urists, aware from their practice of the points in which the law required amendment, pos- sessed seats in the imperial council, where the drafts of the senatus- consults were prepared. It was the senatusconsults that were the principal statutory factors of what was called by both emperors and jurists thejas novum — law that departed often very widely from the principles of the old jus civile, that was much more in accordance with those of the Edict, and that to a great extent might have been introduced through its means had not the authority of the praetors been overshadowed by that of the prince. In the end of the 2nd and the beginning of the 3rd century the supremacy of the latter in the senate became rather too pronounced, men quoting the oratio in which he had submitted to it a project of law instead of the resolution which gave it legislative effect. No doubt such project must have been carefully considered beforehand in the

imperial council, and rarely stood in need of further discussion; but the ignoring of the formal act that followed it tended unduly to emphasize the share borne in it by the sovereign, and made it all the easier for the emperors after Severus Alexander to dispense altogether with the time-honoured practice.

The Consolidated Edictum Perpetuum, — The edicts of the praetors, which had attained very considerable proportions before the fall of the Republic, certainly received some additions in the early Empire. But those magistrates did not long enjoy the same independence as cf old; there was a greater imperium than theirs in the state, before which they hesitated to lay hands on the law with the boldness of their predecessors. They continued as before to publish annually at entry on office the edicts that had been handed down to them through generations ; but their own additions were soon almost limited to mere amendments rendered necessary by the provisions of some senatusconsult that affected the jus honorarium. They ceased to be that'vtva vox juris civilis which they had been in the time of Cicero; the emperor, if any one, was now entitled to the epithet; the annual edict had lost its raison d'itre. Hadrian apparently was of opinion that the time had come for writing its " explicit," and giving it another and more enduring and authoritative shape, binding on all future magistrates. He accordingly, it is said, commissioned Salvius Julianus to revise it — or Julian, when urban praetor, may have done so at his own hand with the emperor's approval — and the senate gave it binding force. It did not, however, become statute law; the distinction between jus civile and jus praetorium still continued. The revised Edict unfortunately, like the XII. Tables, is no longer extant. It is only a very slight account we have of the revision — a line or two in Eutropius and Aurelius Victor, and a few lines in two of Justinian's prefaces to the Digest. We may assume from what is said there that both abridgment and rearrangement of the edicts of the urban praetor ttiok place, but the question remains how far Julian consolidated with them those of the peregrin praetor and other officials who had contributed to the jus honorarium. Those of the curule aediles, we are told, were included; Justinian says that they formed the last part of Julian's work; they formed, in fact, a sort of addendum to it. There is reason to believe that so much of the edicts of the provincial governors as differed from those of the praetors were also incorporated in it, and that the edicts of the peregrin praetors, in so far as they contained available matter not embodied in those of their urban colleagues or the provincial governors, were dealt with in the same way. 2 The consolidation got the name of Edictum Perpetuum in a sense somewhat different from that formerly imputed to edicta

perpetua as distinguished from edicta repentina; it became perpetual in the English sense of the word. Sanctioned by senatusconsult and by the emperor, it became a closed chapter so far as the praetors were concerned; for, though it continued for a time to hold its place on their album with its formularies of actions, they had no longer any power to alter

1 Wlassak, Processgesetze, i. 191 sqq., and ii. 221 sqq.

1 It may be, however, that the edicts of the peregrin praetors and provincial governors were independently codified. See Girard, Manuel elementaire, 4th ed. 53-4. An attempt recently made by von Velsen, Z. d. Sav. St. xxv. (1900), 73 sqq., to identify the edictum provinciate with that of the peregrin praetor from the time of Augustus is far from convincing and has received no support from other writers. See Kipp. Gesch. d. Quellen, p. 123 n!

or even perhaps make additions to it. Having ceased to be a mere efflux of their imperium and become a type prescribed by statute, its interpretation and amendment were no longer in their hands but in the hands of the emperor.

The Julian Edict was not divided into parts or books like Justinian's Digest but only into titles, which were perhaps numbered and certainly were rubricated. Since the publication of Lenel's great work, noted below, modern Romanists are agreed that the formularies of actions it contained were distributed in their appro- priate places throughout the work and not collected together in one place as used to be supposed. Thus a formula . based on the civil law (e.g. the rei vindicatio) appeared by itself {i.e. without any edict) as a separate head or subdivision of the title appropriate to it; while formulae based on the praetor's imperium {e.g. that of the praetorian action de dolo) were placed under their respective edicts. The general arrangement of the subject-matter is not difficult to discover, as we have documentary evidence to a certain extent in writings which have come down to us. These are principally (1) the Digest of Justinian, in the prefaces to which we are told, expressly that it followed the order of the Edict except in certain places specially noticed; (2) the Code of Justinian; (3) the extracts from divers commentaries on the Edict by the classical jurists principally preserved in the Digest. As the inscriptions of these extracts contain the name of the author, the work and the par- ticular book from which they are taken, they have proved of great help towards understanding the arrangement 1 — especially the com- mentaries of Ulpian and Paul on the urban edict and the com- mentary of Gaius on the provincial edict. Lenel has shown that Julian's plan of

arrangement was neither logical nor symmetrical, but adhered in great measure to the old order (tralatitious) of the urban praetors. The following fourfold division of the subject- rnatter is, according to Lenel (partially following Rudorff), clearly ascertainable: first, a series of titles dealing with the preliminary- steps in all actions such as jurisdiction, summons, intervention of procurators and the like; second, titles dealing mainly with matters of ordinary procedure or rather with actions granted principally in accordance with statute {judicia legitima) aspetitio hereditatis, rei vindicatio, &c. ; third, titles dealing with actions resting principally on the magistrate's imperium {judicia imperid continentia) ; fourth, execution of judgments, including bankruptcy, &c. These four parts were followed by a kind of appendix containing in three titles the separate styles of interdicts, exceptions and praetorian stipula- tions. Finally, the edicts of the curule aediles, with their formulae also consolidated, were added at the end of the work. From the fragments of the jurists preserved by Justinian (principally from the three above-mentioned commentaries, but also, to an important extent from Julian himself in his Digesta) repeated attempts have been made in modern times to reproduce the Edict in its entirety. Most of these are mere transcripts with attempted reconstructions of passages in Justinian's Digest and of little value. The only really scientific and worthy critical efforts are those of Rudorff in 1869 and, above all, of Lenel in 1883. 3

The Responses of Patented Counsel. — The right of responding under imperial authority {jus respondendi ex auctoritate principis), first granted by Augustus and continued by his successors down to about the time of Severus , Alexander, did not imply any curtailment of the right of unlicensed jurists to give advice to any one who chose to consult them. cf!ˆf/ What it did was to give an authoritative character to a ,j ar j s response, so that the judge who had asked for it and to ˆonsuUD, whom it was presented — for the judges were but private citizens, most of them unlearned in the law — was practically bound to adopt it as if it had emanated from the emperor himself. It may be that Augustus was actuated by a political motive* — that he was desirous by this concession to attach lawyers of eminence to the new regime, and prevent the recurrence of the evils experienced during the Republic from the too great influence of patrons. But, whatever may have prompted his action in the matter, its beneficial consequences for the law can hardly be over rated. For the powers with which they were invested enabled the patented counsel to influence current doctrine not speculatively merely but positively {jura condere), and so to leaven their inter- pretations of the jus civile and jus honorarium with the principles of natural law as to give a new complexion to the

system.

Instead of giving his opinion like the unlicensed jurist by word of mouth, either at the request of the judge or at the instance of one of the parties, the patented counsel, who did not require to

Responses

of

Patented

3 Rudorff, De jurisdictione edictum: edicti perpetui quae- reliqua sunt (Leipzig, 1869), and rev. by Brinz in the Krit. Vierteljahr- schrift (1870), xi. 471 sqq.; Lenel, Das Edictum Perpetuum: ein Versuch zu dessen Wiederherstellung (Leipzig, 1883), 2nd ed., 1907 (French ed. translation by Peltier, 2 vols., 1901-3). The last gained the ” Savigny Foundation Prize ” offered by the Munich Academy in 1882 for the best restitution of the formulae of Julian’s Edict, but goes far beyond the limited subject prescribed; see Brinz’s report upon it to the Academy in the Zeitschr. d. Sav. Stift. (1883), vol. iv. Rom. Abtheil, 164 sqq. See Karlowa, Rom. Rechtsgesch, i. 628-41 ; Kruger, Gesch. d. Quellen, 84 sqq.

give his reasons, reduced it to writing and sent it to, the court under seal. Augustus does not seem to have contemplated the possibility of conflicting responses being tendered from two or more jurists equally privileged. It was an awkward predicament for a judge to be placed in. Hadrian solved the difficulty by declaring that in such a case the judge should be entitled to use his own discretion. 1 That on receiving a response with which he was dis- satisfied he could go on calling for others until he got one to his mind, and then pronounce judgment in accordance with it on the ground that there was difference of opinion, is extremely unlikely. The more probable explanation of Hadrian’s rescript is, that the number of patented responding counsel was very limited; that a judge, if he desired their assistance, was required by this rescript to consult them all (quorum omnium si, &c); that, if they were unanimous, but only then, their opinion had force of statute (legis vicem optinet) ; and that when they differed the judge must decide for himself.

Constitutions of the Emperors. 2 — Gaius and Ulpian concur in holding that every imperial constitution, whether in the shape of rescript, decree or edict, had the force of statute. It may be that by the time of Ulpian that was the prevailing

Edicts of Emperors.

opinion; but modern criticism is disposed to regard the dictum of Gaius, written in the time of Antoninus Pius, as coloured by his Asiatic notions, and not quite accurate so far at least as the edicts were concerned. Apart from executive laws {leges datae), the early imperial edicts were theoretically rather part of the jus honorarium. As supreme magistrate the emperor had the same jus edicendi that consuls and praetors had had before him, and used, it as they did to indicate some course of action he meant to adopt and follow or some relief he proposed to grant. His edicts were as a rule drawn up in writing in the imperial council arid publicly notified in all parts of ; the Empire. His range, of course in respect of his imperium, was much greater than that of the praetors had been ; for his authority endured for life, and extended over the whole Empire and every department of govern- ment. But in principle, it is thought, his successor on the throne was no more bound to adopt any of his edicts than a praetor was to adopt those of his predecessors. That it was not unusual for an edict to be renewed, and that it occasionally happened that the renewal was not by the immediate successor of its original author, are manifest from various passages in the texts. Sometimes, when its utility had stood the test of years, it was transmuted into a senatus-consult ; this fact proves of itself that, an edict per se had not the effect of statute. But their adoption by a succession of two or three sovereigns, whose reigns were of average duration, may have been held sufficient to give them the character of consuetudinary law; and, by a not unnatural process, unreflecting public opinion may have come to impute force of statute to the edict itself rather than to the longa consuetudo that followed on it, thus paving the way for the assertion by the sovereigns of the later Empire of an absolute right of legislation, and for the recognition of the lex edictalis as the only form of statute.

The imperial rescripts and decrees (rescripta, decreta) appar- ently acquired force of law (legis vicem obtinent) pretty early in „ Brlmta .. the Empire, and their operation was not theoretically anilˆ limited to the lifetime of the prince from whom they Decrees na< ˆ proceeded. But they were not directly acts of legislation. In both the emperor theoretically did no more than authoritatively interpret existing law, although the boundary between interpretation and new law,

sometimes difficult to define, was not always closely adhered to. Thus the decretum Marti, penalizing procedure by self-help, and the epistula Hadridni, introducing the beneficium divisionis among co-sureties, are notable instances of authoritative interpretation. The rescript was strictly a written answer by the emperor to a petition, either by an official or a private party, for an instruction as to how the law was to be applied in any particular case to the facts set forth: when the answer was in a separate writing it was usually spoken of as an epistula; when noted at the foot of the application its technical name was subscriptio. But sometimes also general orders of the emperors addressed to some official and intended for a province or particular community were classed under the head of rescripts. The decree was the emperor's ruling, orally announced, in 'a case submitted to him judicially; it might be when it had been brought before him in the first instance extra ordinem, or when it had been rerac 'ed by supplicatio from an inferior court in its earliest stage, or when it came before him by appeal. Such decrees were duly

‘Gaius, i. 7; Justinian, Inst. 1. 2, § 8. The ‘ passages from Pomponius in Dig. i. 2, 2, §§ 48, 49 are of doubtful meaning, and different interpretations of them have been given. Cf. Sohm. Institutionen (translation by Ledlie, 2nd ed.), p. 97; Girard, Manuel, p. 70; Kipp, Geschichte d. Quellen, p. 99.

8 Gai. 1. 5; Ulp., in Dig., i. 4, fr. 1, § 1; Mommsen, Rom. Staatsrecht, ii. 843 seq.; Wlassak, Krit. Studien zur Theorie der P.echtsquellen im Zeitalier d. klass. Juristen (Gratz, 1884); A. Pernice (crit. Wlassak), in I Zeitschr. d. Sav. Stift. (1885), vi. Rom. Abtheil. 293 seq.! Karlowa, Rom. Rechtsgesch. i. § 85; Kipp, Quellen, 59 seq.

recorded and kept apyd acta. It was theoretically as a judge that the emperor pronounced his decree, though in practice he some- times went beyond the case in hand, evolving new doctrines. Pro- ceeding as it did from the fountain of authoritative interpretation, the decree had a value far beyond that of the sentence of an in- ferior court (which was law only as between the parties), and formed a precedent which governed all future cases involving the same question. Those rescripts and decrees constituted one of the; most important sources of the law during the first three centuries of the Empire, and were elaborated with the assistance of the most eminent jurists of the day, the rescripts being the special charge of the. magister libellorum. From the time of the Gordians to that of the abdication of Diocletian they were almost the only channel of the jus scriptum that remained.

A fourth class of imperial constitutions were the so-called mandata.

These, however, were mainly of the nature of instructions „ by the emperors to individual imperial officials, similar to maaaata – edicts, and dealt with public law for the most part.

Professional Jurisprudence. — The present period of legal history is by modern writers sometimes called ” the classical age of juris- prudence,” though that term is more usually and correctly restricted to the years between Hadrian and the close of ; J” Severus Alexander’s reign. It has been called ” classical,” •»”” **» on the analogy of the Augustan age of literature, from the celebrity of the jurists who flourished during it and the scientific pre-eminence of their works. For accounts of the great jurists, see articles Gaius, &c, and also H. J. Roby’s Introduction to the Study of Justinian’ s Digest ‘ and Professor Karlowa’s Rechtsgeschichte.** for an account of the extant remains of their writings, such as the Institutes of Gaius, the Rules of Ulpian, the Sentences of Paul and a variety of other works, reference may be made to Muirhead’s Historical Introduction to the Private Law of Rome, where a brief account of the jurists is also given. 6

ii. Substantive Changes in the Law.

Concession of Peculiar Privileges to Soldiers. — While the period with which we are dealing saw the substantial disappear- ance of the distinction between citizen and peregrin, it witnessed the expansion of another— that between soldiers and civilians (milites, pagani). The most remarkable effluxes of the jus militare (as it is sometimes called) were the military testament and the castrense pecuiium. The first was practically Military exempted from all the rules of the jus civile and the Tesu- praetors’ edict alike as to the form and substance of toeats. last wills. It might be in writing, by word of mouth, by the unspoken signs perhaps of a dying man; all that was. required was the voluntas so manifested as not to be mistaken. More extraordinary still— it was sustained even though its provisions ran counter to the most cherished rules of the common law. Contrary to the maxim that no man could dispense with the institution of an heir or die partly testate and partly in- testate, a soldier might dispose of part of his estate by testament with or without nomination of an heir, and. leave the rest to descend to his heirs ab intestate. Contrary also to the maxini semel heres semper heres, he might give his estate to A for life or for a term of years, or until the occurrence of some event, with remainder to B. Contrary to the general rule, a Latin or peregrin, or ah unmarried or married but childless person, might take an inheritance or a bequest from a soldier as freely as could a citizen with children. His testament, in so far as it disposed only of bona castrensia, was not affected by

capitis deminutio minima. It was not invalidated by praeterition of sui heredes, nor could they challenge it because they had less under it than their ” legitim “; nor could the instituted heir claim a Falcidian fourth, even though nine-tenths of the succession had been assigned to legatees. Finally, a later testament did not nullify an earlier one, if it appeared to be the intention of the soldier testator that they should be read together.

3 Cambridge, 1884, chaps, ix.-xv.

4 Leipzig, 1885, i. §§ 87-92. See also Kriiger, Geschichte A. Quellen, §§ 18-27, an d, for the period from Augustus to Hadrian, Bremer, Jurisprudentia Antehadriana, ii.

5 Edited by Goudy, 1889, §§ 61—65. See also Kriiger, Ge- schichte d. Quellen, §§ 18-27; Lenel, Palingenesia Juris Civilis (2 vols., Leipzig, 1888-89), a work which contains all the texts of the ante-Justinian jurists, as contained in, the Digest; and other sources, arranged systematically, with valuable critical and explana- tory, notes; but excluding the Institutes of Gaius, Paul’s Sentences and Ulpian’s Rules.

All this is remarkable, manifesting a spirit very different from that which animated the common law of testaments. True, it was a principle with the jurists of the classical period that the voluntatis ratio was to be given effect to in the interpretation of testamentary writings; but that was on the condition that the requirements of law as to form and substance had been scrupulously observed. But in the military testament positive rules were made to yield to the voluntas in all respects : the will was almost absolutely unfettered. Roman law in this matter gave place to natural law. One would have expected the influence of so great a change to have manifested itself by degrees in the ordinary law of testaments; yet it is barely visible. In a few points the legislation of Constantine, Theodosius II. and Justinian relaxed the strictness of the old rules; but there was never any approach to the recognition of the complete supre- macy of the voluntas. In the Corpus Juris the contrast between the testamentum paganum and the testamentum militare was almost as marked as in the days of Trajan. The latter was still a privileged deed, whose use was confined to a soldier actually on service, and if he received an honourable

discharge, for twelve months after his retirement.

The peculium castrense had a wider influence ; for it was the first of a series of amendments that vastly diminished the importance _^ „ of the patria potestas on its patrimonial side. It had

J^™™'™ its origin in a constitution of Augustus granting to Castrense. jiffifomiiias on service the right to dispose by testament of what they had acquired in the active exercise of their profession (quod in castris adquisierant) – 1 But it soon went much further. Confined at first to filiifamilias on actual service, the privilege was extended by Hadrian to those who had obtained honourable discharge. The same emperor allowed them not merely to test on their peculium castrense, but to manumit inter vivos slaves that formed part of it ; and by a little step further the classical jurists recognized their right to dispose of it onerously or gratuitously inter vivos. In the 3rd century the range of it was extended so as to include not only the soldier's pay and prize, but all that had come to him, directly or indirectly, in connexion with his profession — his outfit, gifts made to him during his service, legacies from comrades and so on. All this was in a high degree subversive of the doctrines of the common law. It may almost be called revolutionary; for it in volved in the first place the recognition of the right of a person alieni juris to make a testament as if he were sui juris, and in the second place the recognition of a separate estate in a filiusfami- Ifas which he might deal with independently of his paterfamilias, which could not be touched by the latter's creditors, and which he was not even bound to collate (or bring into hotch-pot) on claiming a share of his father's succession. The radical right of the parent, however, was rather suspended than extinguished; for, if the soldier son died intestate, the right of the paterfamilias revived: he took his son's belongings, not as his heir appropriating an in- heritance, but as his paterfamilias reclaiming a peculium. 2

The Family.— -The legislative efforts of Augustus to encourage marriage, to which persons of position showed a remarkable distaste

FamSy Relations.

have already been mentioned. The relation of husband and wife still in law required no more for its creation

than deliberate interchange of nuptial consent, although in certain cases some act indicative of change of life, such as the bride's home- coming to her husband's house, was regarded as the criterion of completed marriage.* But it was rarely accom- panied with manus. So

repugnant was such subjection to patrician ladies that they declined to submit to confar.reate nuptials; and so great consequently became the difficulty of finding persons qualified by confarreate birth to fill the higher priesthoods that early in the Empire it had to be decreed that confarreation should in future be productive of manus only quoad sacra, and should not make the wife a member of her husband's family. Manus by a year's unin- terrupted cohabitation was long out of date in the time of Gaius; and, although that by coemption was still in use in his time, it was almost unknown by the end of the period. Husband and wife therefore had their separate estates, the common establish- ment being maintained by the husband, with the assistance of the revenue of the wife's dowry (dos) — an institution which received much attention at the hands of the jurists, and was to some extent regulated by statute. Divorce (either of common consent or by repudium by either spouse) was unfortunately very common; it was lawful even without any assignable cause ; when blame attached to either spouse, he or she suffered deprivation to some extent of the nuptial provisions, but there were no other penal consequences.

Not only in the case of a filiusfamilias who had adopted a military career, but in all directions, there was manifested a strong tendency to place restrictions on the exercise of the patria potestas. This was due in a great degree to the hold that the principles of natural law were gaining within the Roman system, perhaps due

1 Inst. ii. 12 pr.

5 This was altered by Justinian's 118th Novel, under which a paterfamilias taking any part of a deceased son's estate did so as his heir; see infra, p. 573.

3 Some writers take the view that such act was always essential. See Girard, Manuel, 4th ed. p. 151.

to the fact that the emperors, having succeeded to the censorial regimen morum, allowed these principles freely to influence their edicts and rescripts. Exposure of an infant was still apparently allowed ; but a parent was no longer permitted, even in the character of household judge, to put his son to death or cruelly ill-treat him; in fact his prerogative was limited to moderate chastisement, the law requiring, in the case of a grave offence that merited severer punishment, that he should bring his child before the competent magistrate. His right of sale, in like manner, was permitted only when he was in great poverty and unable to maintain them, while their impignoration by him was prohibited under pain of banishment.

Except in the solitary case of a son who was a soldier, a pater- familias was still recognized as in law the owner of all the earnings and other acquisitions of his children in potestate; but the old rule still remained that for their civil debts he was not liable beyond the amount of the fund he had advanced them to deal with as de facto their own {peculium profecticium), except when he had derived advantage from their contract or had expressly or by implication authorized them to enter into it as his agents. To the party with whom he had contracted a filiusfamilias was himself liable as fully as if he had been a paterfamilias, with one exception, namely, when his debt was for borrowed money; in that case, with some very reasonable qualifications, it was declared by the well-known Mace- donian senatusconsult (of the time of Vespasian) that the lender should not be entitled to recover payment, even after his borrower had become sui juris by his father's death. Between a father and his emancipated son there was, and always had been, perfect free- dom of contract; but so was there now between a father and his soldier son in any matter relating to the peculium castrense, even though the son was in potestate. What is still more remarkable is that the new sentiment which was operating on the jus civile admitted the possibility of natural obligation between paterfamilias and filiusfamilias even in reference to the peculium profecticium, which, though incapable of direct enforcement by action, was yet to some extent recognized and given effect to indirectly.

In the matter of guardianship, while the tutory of pupils was carefully maintained and the law in regard to it materially amended during the period under review (particularly by a senatusconsult generally referred to as the Oratio divi Severi, prohibiting aliena- tion of the ward's property without judicial authority), that of women above the age of pupillarity gradually disappeared. 4 The guardianship or curatory (cura) of minors above pupillarity owed its establishment as a general doctrine to Marcus Aurelius. The Plaetorian law 6 of the middle of the 6th century of the city had indeed imposed penalties on those taking undue advantage of the inexperience of minors, i.e. persons sui juris under the age of twenty- five; and from that time the praetors were in the habit of granting restitutio in integrum in cases of lesion and appointing curators to act with such persons for the protection of their interests in particular affairs. But it was Marcus Aurelius that first made curatory a general permanent office, to endure in the ordinary case until the ward attained majority. The powers, duties and responsibilities of such curators became a matter for careful and' elaborate defini- tion and regulation by the jurists, whose exposition indeed of the law of guardianship generally,

whether by tutors or curators, has found wide acceptance in modern systems of jurisprudence.

The Law of Succession and particularly Testamentary Trusts. — There were far more positive changes in the law of succession than in either that of property or that of obligation. The rise and progress of the military testament has already been ˆf w _ explained. The testament of the common law Was still ■ U0CB *” ostensibly that per aes et libram; but the practice of “”’ granting bonorum possessio secundum tabulas to the persons named as heirs in any testamentary instrument that bore outside the requisite number of seals led, from the time of Antoninus Pius, to the frequent neglect of the time-honoured formalities of the familiae mancipatio and nuncupatio testamenti. It was his rescript, formerly mentioned, declaring that an heir-at-law should no longer be entitled to dispute the last wishes of a testator on the technical ground of non-compliance with the purely formal requirements of the law, that practically established what Justinian calls the praetorian testament.

One of the commonest provisions in the testaments of the period was the fideicommissum, — -a request by the testator to his heir to enter on the inheritance and thereafter denude wholly or partially in favour of a third party. It was introduced in the time of Augustus by (it is said by Theophilus) a testator who had married a peregrin wife, and desired thus indirectly to give to his peregrin children the succession which, as not being citizens, they could neither take ab intestato nor as his direct testamentary heirs. 6 He probably soon found imitators, and their number must have rapidly multiplied once the emperor, shocked at the perfidy of a trustee

4 Dig. xxvii. 9 fr. I, § 2.

6 Also sometimes called lex Laetoria. See, e.g. reference to a recently discovered papyrus in Z. d. Sav. Stift. xxii. 170.

6 Fideicommissa, as informal requests to heirs or legatees to hand over what they received to third parties, were known earlier than Augustus, but had no legal force.

who had failed to comply with the request of his testator, indicated

his approval of the new institution by remitting the matter to the consuls of the day, with instructions to do in the circumstances what they thought just. So quickly did it establish itself in public favour, and so numerous did the questions become as to the con- struction and fulfilment of testamentary trusts, that under Claudius it was found necessary to institute a court specially charged with their adjudication — that of the praetor fideicommissarius.

The employment of a trust as a means of benefiting those who were under disqualifications as heirs or legatees, as, for example, persons who had no testamenti {actio, women incapacitated by the Voconian law, unmarried and married but childless persons in- capacitated by the Julian and Papia-Poppaean law, and so on, was in time prohibited by statute; but that did not affect its general popularity. For, whether what was contemplated was a transfer of the universal hereditas or an aliquot part of it to the beneficiary (fideicommissum hereditatis), or only of some particular thing (fideicommissum rei singularis), a testamentary trust had various advantages over either a direct institution or a direct bequest (legatum). Still the imposition upon the heir of a trust in favour of a beneficiary, whether it required him to denude of the whole or only a part of the inheritance, did not in theory deprive him of his character of heir or relieve him of the responsibilities of the position ; and at common law therefore he was entitled to decline the suc- cession, often to the great prejudice of the beneficiary. In order to avoid such a mischance, and at the same time to regulate their relations inter se and towards debtors and creditors of the testator, it became the practice for the parties to enter into stipulatory arrangements about the matter; but these were to some extent rendered superfluous by two senatusconsults, the Trebellian in the time of Nero and the Pegasian in that of Vespasian, which not only secured the beneficiary against the trustee's {i.e. the heir's) repudia* tion of the inheritance, but also protected the latter from all risk of loss where he was trustee and nothing more, and enabled the former to treat directly with debtors and creditors of the testator and himself ingather the corporeal items of the inheritance.

It was one of the advantages of a trust-bequest, whether universal or singular, that it might be conferred in a codicil, even though unconfirmed by any relative testament. The codicil (codicilli), also fin invention of the time of Augustus, was a deed of a very simple nature. Though in the later Empire it required to be formally attested by at least five witnesses, it was at first quite informal. It was inappropriate either for disherison of sui or institution of an heir; but if confirmed by testament, either prior or posterior to its date, it might contain direct bequests, manumissions, nomina- tions of tutors, and the like,

and whether confirmed or unconfirmed might, as stated, be utilized as a vehicle for trust-gifts. Latterly it was held operative, even in the absence of a testament, the trusts contained in it being regarded as burdens on the heir-at-iaw.

The most important changes in the law of intestate succession during the period were those accomplished by the Tertullian and Orphitian senatusconsults, fruits of that respect for the precepts of natural law which in so many directions was modifying the doctrines of the jus civile. The first was passed in the reign of Hadrian, the second in the year 178, under Marcus Aurelius. Down to the time of the Tertullian senatusconsult a mother and her child by a marriage that was unaccompanied with tnanus stood related to each other only as cognates, being in law members of different families; con- sequently their chance of succession to each other was remote, being postponed to that of their respective agnates. The purpose of the senatusconsult was to prefer a mother to all agnates of her deceased child except father and brother and sister; father and brother excluded her; but with a sister of the deceased, and in the absence of father or brother, she shared equally. While there can be little doubt that it was considerations of natural law that dictated this amendment, yet its authors were too timid to justify it on the abstract principle of common humanity, and so they confined its application to women who had the jus liberorum, i.e. to women of free birth who were mothers of three children and freedwomen who were mothers of four, thus making it ostensibly a reward of fertility. The Orphitian senatusconsult was the counterpart of the Tertullian. It gave children, whether legitimate or illegitimate, a right of succession to their mother in preference to all her agnates ; and subsequent constitutions extended the principle, admitting lawful children to the inheritance not only of their maternal grand- parents but also to that of their paternal grandmother.

iii. Judicial Procedure. The Formular System. 1 — The ordinary procedure during the greater part of the first three centuries of the Empire was still two-staged; it commenced before the praetor (in jure)

and was concluded before a judge or judges (in judicio).

Formulae

system. g u) . ˆ e i e g{ s actiones had with a few exceptions given place

to praetorian formulae. Under the sacramental system parties,

1 See Keller (as on p. 547, n.), §§ ‘23-43; Bethmann-Hollweg (as in same note), vol. ii. §§ 81-87; Bekker (as in same note), vol. i. chaps. 4-7, vol. ii. chaps. 15, 19, 20; Baron, Gesch. d. rdm. Rechts (Berlin, 1884), vol. i. §§ 202-215.

and particularly the plaintiff, had themselves to formulate in statutory or traditional words of style the matter in controversy between them ; and as they formulated, so did it go for trial to centumviral court or judex, with the not infrequent result that it was then all too late discovered that the real point in the case had been missed. Under the formular system parties were free, to represent their plaint and defence to the praetor in any words they pleased, the plaintiff asking for a formula and usually indicating the style on the album that he thought would suit his purpose, and the defendant demanding when necessary an .exception, i.e. a plea in defence, either praetorian or statutory, that, without traversing the facts or law of the plaintiff’s case, avoided his demand on grounds of equity or public policy or the like. It was for the praetor to consider and determine whether the action or exception should or should not be granted, and, if granted, whether it should be accord- ing to the style exhibited on the album or according to a modification of it. The result he embodied in a written and signed appointment of a judge, whom he instructed what he had to try, and empowered to pronounce a finding either condemning or acquitting the defendant. This writing was the formula.

Although it was not until the early Empire that this system of civil procedure attained its full development, yet it had begun between one and two centuries before the fall of the Republic. Gaius ascribes its introduction and definitive establishment to the lex Aebutia and two judiciary laws of the time of Augustus, formerly mentioned (supra, pp. 98, 124). The Aebutian law, of which unfortunately we know very little, is generally supposed to have empowered the praetors (1) to devise a simpler form of procedure for causes already cognizable per legis , actionem, (2) to devise forms of action to meet cases not cognizable undertheoldersystem, and (3) themselves to formulate the issue and reduce it to writing. It was by no means «o radical a change as is sometimes supposed. There were formulae employed by the peregrin praetor before it and also perhaps something analogous thereto by the urban praetor. There were also formulae of a kind employed both in the procedure per judicis postulationem and in that per condictionem. The differ- ence between the latter and the formulae of the Aebutian system was that they were in part mere echoes of the statutory words of style uttered by the plaintiff, and that they were not written but spoken in the hearing of witnesses.

A large proportion of the personal actions of the formular system were evolved out of the legis actio per condictionem. The sequence of operations may have been something like this. Taking the simplest form of it, the action for certa pecunia under ilt^S'J' the Silian law, the first step was to drop the formal con- jw™-?/ dictioirom which it derived its character of legis actio, thus Action* avoiding a delay of thirty days ; the plaintiff stated his de- mand in informal words, and, if the defendant denied indebtedness, the praetor straightway formulated a written appointment of and instruction to a judge, embodying in it the issue in terms sub- stantially the same as those he would have employed under the earlier procedure: — " Titius be judge. Should it ', appear that N. N. ought to pay (dare oportere) 50,000 sesterces to A. A., in that sum condemn N.N. to A. A.; 2 should it so not appear, acquit him,." This was no longer the legis actio per condictionem, because "what had made it legis actio was gone, but the condictio certae pecuniae of the formular system. The condictio triticaria of the same system ran on the same lines: "Titius be judge. Should it appear that N. N. ought to give A. A. the slave Stichus, then, whatever be the value of the slave, in that condemn N. N. to A. A.," and so on. In each of these examples the formula included only two of the four principal clauses that might find place in it 3 — an " intention " and a " condemnation." The matter of claim in both cases was certain, — so much money in one, a slave in the other; but, while in the first the condemnation also was certain, in the second it was uncertain. What if the claim also was uncertain, — say a share of the profits of a joint adventure assured by stipulation? It was perhaps competent for the plaintiff to specify a definite sum, and claim that as due to him; but it was very hazardous, for unless he was able to prove the debt to the last sesterce he. lost his case. To obviate the risk of such failure the praetors devised the actio ex stipulatu, whose formula commenced with a "demon- stration " or indication of the cause of action, and whose " inten- tion " referred to it and was conceived indefinitely: "Titius be judge. Whereas A. A. stipulated with N. N. for a share of the profits of a joint adventure, whatever in respect thereof N. N. ought to give to or do for (dare facere oportet) A. A., in the money amount

2 In the typical Roman styles of actions the plaintiff was usually called Aulus Agerius and the defendant Numerius Negidius.

3 Gaius enumerates them as demonstratio, intentio, adjudicatio and condemnatio, and describes their several functions in iv. §§ 39-43. The intentio and condemnatio were much the most important, the others being employed only in certain kinds of actions. Besides these a formula might be preceded by a praescriptiq (Gai. iv. §§ 130-137),

and have incorporated in it fictions (§§ 32-38), exceptions (§§ 1 15-125), and replications, duplications.

&c. (§§ 126-129).

cation to real actions.

thereof condemn N. N.," and so on. 1 Once this point was attained further progress was comparatively easy, the way being open for the construction of formulae upon illiquid claims arising from trans- actions in which the practice of stipulation gradually dropped out of use, till at last the bonae fidei judicia were reached, marked by the presence in the " intention " of the words ex fide bona — " whatever in respect thereof N. N. ought in good faith to give to or do for A. A."

In the case of real actions the transition from the legis actiones to the formulae followed a different course. The Aebutian law, while sanctioning the competency of formulae, did not ˆJ p f ' interfere with the procedure per sacramentum when reference was to be to the centumviral court on a ques- tion of quiritarian right. In the time of Cicero that court was apparently still in full activity (supra), but by that of Gaius, owing, it is supposed, to the Julian laws having made for- mulae in most cases compulsory, it was rarely resorted to except for trial of questions of inheritance. In his time questions of property were raised either per sponsionem or per formulam peti- toriam. The procedure by sponsion may be regarded as a sort of bridge between the sacramental process and the petitory vindi- catio. In it the question of real right was determined only in- directly. The plaintiff required the defendant to give him his stipulatory promise to pay a nominal sum of twenty-five sesterces in the event of the thing in dispute being found to belong to the former; and at the same time the defendant gave sureties for its transfer to the plaintiff, with all fruits and profits, in the same event. The formula that was adjusted and remitted to a judge raised ex facie only the simple question whether the twenty-five sesterces were due or not: the action was in form a personal, not a real one, and was therefore appropriately remitted to a single judex instead of to the centumviral tribunal. But judgment on it could be reached only through means of a finding (sententia) on the question of real right; if it was for the plaintiff, he did not claim the

amount of the sponsion, but the thing which had been found to be his; and, if the defendant delayed to deliver it, with its fruits and pro- fits, the plaintiff had recourse against the latter's sureties. The petitory formula was undoubtedly of later introduction and much more straightforward. Like the condictio certae pecuniae, it con- tained only " intention " and " condemnation." It ran thus: " Titius be judge. Should it appear that the slave Stichus, about whom this action has been raised, belongs to A. A. in quiritary right, then, unless the slave be' restored, whatever be his value, in that you will condemn N. N. to A. A. ; should it not so appear, you will acquit him."

The formulae given above, whether applicable to real or personal

actions, are so many illustrations of the class known as formulae

_, . juris chilis or in jus conceptae. The characteristic of

ormua suc jj a f ormu i a was tnat ; t contained in the " intention "

la factum sucn phrases as the following — ?ejus esse ex jure Quiritium

conceptae.

praestare oportere, 2 dare oportere, dare facere oportere,

or damnum decidere oportere. 3 Such words were, em- ployed where the right to be vindicated or the obligation to be enforced had its sanction directly in the jus civile whether in the shape of statute, consuetude or interpretation. Where, on the other hand, the right or obligation had its sanction solely from the praetor's edict, special formulae had to be framed. The actions employed in such cases were actiones juris honorarii, and these either actiones utiles or actiones in factum. The first were adaptations of actions of the jus civile to cases that did not pro- perly fall within them; the second were actions entirely of prae- torian devising, for the protection of rights or redress of wrongs unknown to the jus civile.*

1 This actio ex stipulatu used to be regarded as nothing more than a variety of the condictio incerti. It is doubtful, however, whether in the condictiones incerti (e.g. the condictio furliva) there was any demonstratio. See Girard, Manuel, p. 614 n. 2 and 3 and authorities there cited.

'Employed in the divisory actions, i.e. for dividing common property, partitioning an inheritance, or settling boundaries; the demand was that the judge should adjudicate (or assign) to each of the parties such

a share as he though just. See Lenel, Edict. Perpel. 2nd ed. pp. 202, 205.

‘Employed in certain actions upon delict, where the old penalties of death, slavery or talion .had in practice, or by the praetor’s authority, been transmuted into money payments, and the de- fendant consequently called upon to pay penal damages. Accord- ing to Lenel, Ed. Perp. 2nd ed. p. 287, the form dare facere praestare oportere was probably used in actions pro socio.

4 These latter have an analogy to the English ” action on the case.” In a few instances there was both civil and praetorian remedy for the same wrong; for Gaius observes (iv. 47) that in commodate and deposit failure of the borrower or depositary to return the thing lent to or deposited with him gave rise to actions that might be formulated either in jus or in factum. In the same section he gives the styles of actiones depositi in jus and in factum conceptae ; their comparison is instructive; The formula in factum must almost certainly have been the earlier and shows, it is thought,

Ulilis actio may be translated as analogous or adapted action, i.e. analogous to a direct action. Where a direct action was in- applicable to particular cases or persons, according to . rf , the terms of a lex, edict, &c, the praetor frequently tilesˆ adapted the statute, &c, to such cases and persons by ” granting an actio utilis. He did so where he thought them to be within the spirit though not the letter of the law. He effected his object commonly by a modification of the regular formula either objectively, as by adding, or omitting, or altering words, or sub- jectively by transposing names of parties. But sometimes also the adaptation was made by the introduction of a legal fiction into the regular formula, and in this case the action was called utilis fictitia or simply fictitia. The actiones utiles might, therefore, be of two kinds, ordinary and fictitious. Those of common occurrence early became stereotyped in the Edict and even got special names.

As illustrations of an ordinary actio utilis, in which the formula was objectively modified, reference may be made to the numerous actions for wrongful damage to property under the lex Qrˆiaary, Aquilia. Thus this statute in its first chapter used the term occidere, which means killing by a physical act of violence (cor pore cor port), but to meet cases of killing without violence (e.g. by poison) the praetors simply substituted the words mortis causam praestare for occidere in the formula. As illustrations of an ordinary actio utilis with subjective transposition of names, we may mention the actio Rutiliana applicable to a purchaser of the bankrupt estate of a living debtor, the action by

an assignee of a debt against the debtor, and the action of a procurator suing for his principal. In these the names of the bankrupt, cedent and principal respectively appeared in the intentio, while the plaintiff's name was inserted in the condemnatio.

Resort to a fiction is sometimes said to be a confession of weakness, and adversely criticized accordingly. But every amendment on the law is an admission of defect in what is being amended ; Actiones and it was in sympathy with the spirit of Roman juris- HctHlae prudence, when it found an action too narrow in its de- finition, to include some new case that ought to fall within it, rather by feigning that the new case was the same as the old, to bring it within the scope of the existing and familiar action, than to cause disturbance by either altering the definition of the latter or introducing an entirely new remedy. A bonorum possessor held a position unknown to the jus civile ; he was not an heir, and therefore not entitled offhand to employ the actions competent to an heir, either for recovering the property of the defunct or proceeding against his debtors. The praetor could have had no difficulty in devising new actions to meet his case; but he preferred the simpler expedient of adapting to it an heir's actions, by intro- ducing into the formula a fiction of civil heirship ; so he did with the bonorum emptor or purchaser of a deceased bankrupt's estate at the sale of it in mass by his creditors. A peregrin could not sue or be sued for the penalties imposed for theft or culpable damage to property, for the XII. Tables and the Aquilian law applied only to citizens; but he could both sue and be sued under cover of a fiction of citizenship. A man who had acquired a res mancipi on a good title, but without taking a conveyance by mancipation or surrender in court, if he was dispossessed before he had completed his usucapion, could not sue a rei vindicatio for its recovery, for he was not in a position to affirm that he was quiritarian owner; neither, for the same reason, could a man who in good faith and on a sufficient title had acquired a thing from one who was not in a position to alienate it. But in both cases the praetor granted him what was in effect a rei vindicatio proceeding on a fiction of completed usucapion — the Publician action referred to on p. 556. These are examples of actiones fictitiae — actions of the jus civile adapted by this very simple expedient to cases to which otherwise they would have been inapplicable, and forming one of the most important varieties of the actiones utiles.

Quite different was the course of procedure in the actiones in factum, whose number and varieties were practically unlimited, . although for the most part granted in pursuance of the praetor's promise in the edict that under such and such circumstances he would make a remit

to a judex (judicium dabo) , 6 and formulated in accordance with the relative skeleton styles also published on the album. A great number of them came to be known by special names, as, for example, the actio de dolo, actio negotiorum gestorum, actio hypotliecaria, actio de pecunia constituta, actio vi bonorum raptorum, actio de super ficie, &c. — the generic name actio in factum being usually confined to the innominate ones. Their formulae, unlike those in jus conceptae, submitted no question of legal right for the

that deposit and commodate were enforced (perhaps first by the peregrin praetor) by means of edicts before being admitted into the jus civile.

'Examples: "Si quis negotia alterius … gesserit, judicium eo nomine dabo " (Dig. iii. 5, 3, pr.) ; " Quae dolo malo facta esse dicentur, si de his rebus alia actio non erit et justa causa esse videbitur, judicium dabo " (Dig. iv. 3, 1, § 1); " Nautae caupones stabularii quod cuj usque salvum fore receperint, nisi restituent, in eos judicium dabo " (Dig. iv. 9, I, pr.); " Quod quis commodasse dicetur, de eo judicium dabo " (Dig. xiii. 6. I, pr.).

Pro- cedure extra ordlaem.

consideration of the judge, but only a question of fact, proof of which was to be followed by a condemnation. That of the actio de dolo, for example, ran thus: " Titius be judge. Should it appear that, through the fraud of N. N., A. A. was induced to convey and cede possession to him of his farm (describing it), then, unless on your order N. N. restores it, you will condemn him in damages to A. A.; if it shall not so appear, you will acquit him." Actions in factum might be utiles as well as direct; e.g. actio quasi- Serviaria or hypothecaria was utilis, being based on analogy to the actio Serviana.

Our limits do not admit of any explanation of the purpose, form, or effect of the prescriptions, exceptions, replications, &c, that were engrafted on a formula when required; or of the ways in which the " condemnation " was occasionally " taxed " by the praetor, so as to prevent the award of extravagant damages; or of the consequences of defects in the formula ; or of the procedure in jure before it was adjusted, or in judicio afterwards; or of appeal for review of the

judgment by a higher tribunal; or of execution (which was against the estate of the judgment-debtor, and took the form of incarceration only when his goods could not be attached). Our main object has been to show how elastic was this procedure, and how the praetorian formulae, in conjunction with the relative announcements in the edict, supplied the vehicle for the intro- duction into the law of an immense amount of new doctrine. The system was fully developed before Julian's consolidation of the Edict ; and the statutory recognition which the latter then obtained, though it stopped the praetor's power of amending the law, did nothing to impair the efficiency of the existing procedure.

Procedure extra Ordinem.' — The two-staged procedure, first in jure and then in judicio, constituted the ordo judiciorum priva- torum. Early in the Empire, however, it became the practice in certain cases to abstain from adjusting a formula and making a remit to a judex, and to leave the cause in the hands of the magistrate from beginning to end. In these cases, speaking generally, the magistrate acted as an administrative official. Such cases did not necessarily come before the ordinary judicial praetors; on the contrary, they were committed as a rule to special officials {e.g. consuls) who were appointed to decide them by the emperors. This kind of procedure was adopted sometimes because the claim that was being made rested rather on moral than on legal right, and sometimes in order to avoid unnecessary disclosure of family misunderstandings. Thus, the earliest questions that were raised about testamentary trusts were, sent for consideration and disposal to the consuls, apparently because, in the existing state of jurisprudence, it was thought incompetent for a beneficiary to maintain in reference to the heir (who had only been requested to comply with the testator's wishes) that he was bound in law to pay him {dare oportere) his bequest. Had the difficulty arisen at an earlier period, and in the heyday of the constructive energy of the praetors, they would probably have solved it with an actio in factum. As it was, it fell to the emperors to deal with it, and they adopted the method of extraordinaria cognitio, the jurisdiction which they in the first instance conferred on the consuls being before long confided to a magistrate specially designated for it ; — the praetor fidei commissarius. Questions between tutors and their pupil wards in like manner began to be dealt with extra ordinem, the cognition being entrusted by Marcus Aurelius to a praetor tutelaris; while fiscal questions in which a private party was interested went to a praetor fisci, whose creation was due to Nerva. Claims for aliment between parent and child or patron and freedman rested on natural duty rather than on legal right; they could not therefore well be made the subject-matter of a judicium, and consequently went for disposal to the consuls or the city prefect, and in the provinces to the governor. Questions of status, especially of freedom or slavery, at least from the time of Marcus Aurelius, were also disposed of extra ordinem; and so were claims by physicians, advocates and public teachers for their honoraria, and by officials for their salaries, the Romans refusing to admit that these could be recovered by an ordinary action of location. In all those extraordinary cognitions the pro- cedure began with a complaint addressed to the magistrate, instead of an in jus vocatio of the party complained against ; it was for the magistrate to require the attendance of the latter {evocatio) if he thought the complaint

relevant. The decision was a judicatum or decretum according to circumstances.

Jural Remedies flowing directly from the Magistrate's Imperium? — Great as were the results for the law of the multiplication and simplification of judicia through the formular system, it may be questioned whether it did not benefit quite as much from the direct intervention of the praetors and other magistrates in certain cases in virtue of the impgrium with which they were invested. This manifested itself principally in the form of (i) interdicts; (2) praetorian stipulations;

Direct magis- terial Inter- vention.

Inter- dicts.

1 See Keller- Wach, Civilprocess, § 81 ; Bethmann-Hollwegi Rom. Civilprocess, vol. ii. § 122; Bekker, Aktionen, vol. ii. chap. 23; Baron, Gesch. d. rom. Rechts, vol. i. § 220.

- Keller- Wach, Rom. Civilprocess, §§ 74-80; Bethmann-Hollweg, Rom. Civilprocess, vol. ii. §§ 98, 119-121; Bekker, Akt. vol. ii.

(3) missio in possessionem; and (4) in integrum restitutio. AH these had been in common use during the Republic.

1. The interdicts 3 have already been referred to as in use under the regime of the jus civile ; but their number and scope were vastly increased under that of the jus proetorium. The char- acteristic of the developed procedure by interdict was this — that in it the praetor reversed the ordinary course of things, and, instead of waiting for an inquiry into the facts, alleged by a complaiher, provisionally assumed them to be true and pronounced an order upon the respondent, which he was bound either to obey or show to be unjustified. The order pronounced might be either restitutory, exhibitory (in both cases usually spoken of in the texts as a decretum), or prohibitory: — restitutory, when, for example, the respondent was ordained to restore something he was alleged to have taken possession of by violent means, to remove impediments he had placed in the channel of a river, and the like; exhibitory, when he was ordained to produce something he was unwarrantably detaining, e.g. the body of a freeman he was holding as his slave, or a will in which the complainer alleged that he had an interest; prohibitory, as, for example, that he should not disturb the status quo of possession as between the complainer and himself, that he should not interfere with a highway,' a

watercourse, the access to a sepulchre, and so forth. If the respondent obeyed the order pronounced in a restitutory or exhibitory decree, there was an end of the matter. But frequently, and perhaps more often than not, the interdict was only the commencement of a litigation; facilitated by sponsions and restipulations, in which' the Questions had to be tried (1) whether the interdict or injunction was justified; (2) whether there had been breach of it, and, (3) if so, what damages were due in consequence. The procedure therefore was 6ften any- thing but summary.

In the possessory interdicts uti possidetis arid, utrubi in particular it was extremely involved, due to some extent to the fact that they were double interdicts {interdicta duplicia), i.e. addressed indifferently to both parties. Gaius says, but, as' most modern writers think, erroneously, that they had been devised as ancillary to a litigation about ownership, and for the purpose of deciding which of the parties, as possessor, was to have the advantage of standing on the defensive in the rei vindication That they were so used in his time, as in that of Justinian, cannot be doubted. But it is amazing that they should have been, for they were much more cumbrous than the vindicatio to which they led up. Take the interdict uti possidetis, which applied to immovables, as utrubi did to movables. Both parties being present, the praetor addressed them to this effect: "I forbid that one of you two who does not possess the house in question to use force in order to prevent the other who is in possession, provided he is so neither by clandestine 6r violent exclusion of the first, nor in virtue of a grant from him during pleasure, from continuing ,to possess as at present," It is manifest that this decided nothing; it was no more' than a pro— hibition of disturbance of the status quo ; it left the question entirely open which of the parties it was that was in possession, and -which that was forbidden to interfere. The manner of its explication was somewhat singular. Each of the parties was bound at once to commit what in the case of one of them must have been a breach of the interdict, by a pretence of violence offered to the other {vis ex conventu) ; 5 each of them was thus in a position to say to the other : " We have both used force; but it was you alone that did it in defiance of the interdict, for it is I that am in possession." , The interim enjoyment of the house was then awarded to the Highest bidder, who gave his stipulatory promise to pay rent to his adversary in the event of the latter being successful in the long-run; penal sponsions and restipulations were exchanged upon the question which of them had committed a breach of the interdict; and on these, four in number, formulae were adjusted and sent to a judex for trial. If the procedure could not thus be explicated, because either of the parties declined to

take part in the vis ex conventu, or the bidding, or the sponsions and restipulations, he was assumed to be in the wrong, and, by what was called a secondary interdict, required to yield up his possession or detention and to abstain from disturbing the other “in all time coming.”. Whatever we may think of the action system of the Romans in the • period of the classical jurisprudence, one cannot help wondering at a

chaps. 16-18; Baron, vol. i. •§’§ 216-219. Procedure in these cases is also sometimes included under the term cognitio extraordinaria.

3 In addition to the authorities in last note, see K. A. Schmidt, Das Interdiktenverfahren d. Rom. in geschicktl. Enlwickelung (Leipzig, 1853); Machelard, ThSorie des interdits en droit romain (Paris, 1864); Karlowa, Rom. R. G. ii. pp. 313 seq. ; Ubbelohde, Die Inter- dicts d. rom Rechts, 1889-96 (in Gluck’s Pandecten Serie d. Bticher, 43 and 44); Jobb6-Duval, La Procedure civile chez les’Romaihs {1896), L pp. 207 seq.

4 If that had been their original purpose, they must have been unknown as long as a rei vindicatio proceeded pei ■ saCramentum; for in the sacramental real action both parties vindicated, and both consequently were at once plaintiffs and defendants.

6 So Gaius calls it; it was probably the same thing as the vis moribus facta referred to by Citero, Pro Caec. 1, § 2, 8, § 22. ;

procedure so cumbrous and complex as that of their possessory interdicts.

2. A praetorian stipulation l was a stipulatory engagement im- posed upon a man by a magistrate or judge, in order to secure a third party from the chance of loss or prejudice through Pr “f’ some act or omission either of him from whom the engage-

‘Jf™* ment was exacted or of some other person for whom he was

yT,”’ responsible. Although called praetorian, because the cases

lattons. j n which such stipulations were exigible were set forth in the

Edict, there can be no question that they originated in the jus civile ; in fact, they were just a means of assuring to a man in advance the benefit of an action of the jus, civile whereby he might obtain reparation for any injury suffered by him through the occurrence of the act or omission contemplated as possible. They were enforced nearly always by granting or refusing an action or by missio in possessionem. Ulpian classifies them (rather illogically) as cautionary (cautionales), judicial and common. The first were purely pre-cautionary, and quite independent of any action already in depend-ence between the party moving the magistrate to exact the stipu-lation and him on whom it was desired to impose it. There were many varieties of them, connected with all branches of the law — r for example, the cautio damni infecti, security against damage to a man's property in consequence, say, of the ruinous condition of his neighbour's house, the cautio usufructuaria that property .usufmcted should revert unimpaired to the owner on the expiry of the usu-fructuary's life interest, the aedilian stipulation against faults in a thing sold, and so forth. In all these cases the stipulation or cautio was a guarantee against future loss or injury, usually cor- roborated by sureties, and made effectual by an action on the stipu- lation in the event of loss or injury resulting. Judicial stipulations, according to Ulpian 's classification, were those imposed, by a judge in the course of and with reference to an action in dependence before him, as, for example, the cautio judicatum solvi (that the defendant would satisfy the judgment), the cautio de dolo (that a thing claimed in the action would not be fraudulently impaired in the meantime) and many others. Common were such as might either be imposed by a magistrate apart from any depending action or by a judge in the course of one, such as that taken from a tutor or curator for the faithful administration of his office, or from a procurator that his principal would ratify what he did.

3. Missio in possessionem was the putting of a person in possession provisionally in the first instance, either of the whole estate of

another {missio in bona) or of some particular thing belong- Mlssioln \fig to \iim (missio in rem). The former was by far the more possess!- important. It was resorted to as a means of execution oaem. not on j y a g amg t a judgment-debtor. but also against'a man

who .fraudulently kept out of the way and thus avoided summons in an action, or who, having been duly summoned, would not do what was expected on the part of a defendant; against the estate of a person deceased to which no heir would enter, thus leaving creditors without a debtor from whom they could enforce payment of their claims; and

also against the estate that had belonged to a person who had undergone capitis deminutio, if the family head to whom he had subjected himself refused to be responsible for his debts. Missio in rem was granted where, for example, a man refused to give cautio damni infecti; the applicant was then put in possession of the ruinous property for his own protection.

4. In integrum restitutio? reinstatement of an individual, on grounds of equity, in the position he had occupied before some occur- rence which had resulted to his prejudice and for which no

In In- other legal remedy existed was one of the most remarkable

tegrum manifestations of the exercise of magisterial imperium. It J*™” was not that the individual in question, either directly by

tuUa ‘ action or indirectly by exception, obtained a judgment that

either rendered what had happened comparatively harmless or gave him compensation in damages for the loss he had sustained from it, but that the magistrate — and it could only be the praetor, the urban or praetorian prefect, a provincial governor or the emperor himself — at his own hand pronounced a decree that as far as possible restored the status quo ante. It was not enough, however, to entitle a man to this extraordinary relief, that he was able to show that he had been taken advantage of to his hurt, and that no other adequate means of redress was open to him; he required in addition to be able to found on some subjective ground of restitution, such as minority, or, if he was of full age, intimidation which could not be resisted, mistake of fact, fraud, absence or the like. It required also to be applied for within a limited period — originally an annus utilis, but under Justinian a quadriennium — counting from the time the party was in a position to make the application. What should be held to amount to a, sufficient ground of restitution, either objective or subjective, was at first left very much to the discretion of the magistrate; but even here practice and jurisprudence in time

fixed the lines within which he ought to confine himself, and made the principles of in integrum restitutio as well settled almost as those of the actio quod metus causa or the actio de dolo.

V. The Period of Codification (Diocletian to Justinian.)

i. Historical Events that Influenced the Law. Supremacy of the Emperors as Sole Legislators. — From the time of Diocletian onwards the making of the law was exclusively in the hands of the emperors.

The senate still existed, Emperors but shorn of all its old functions alike of government sole legis- and legislation. 3 The responses of patented jurists lators – were a thing of the past. It was to the imperial consistory alone that men looked for interpretation of old law or promul- gation of new.

In the reign of Diocletian rescripts were still abundant; but the constitutions in the Theodosian and Justinianian Codes from the time of Constantine downwards are mostly of a wider scope, and of the class known as general or edictal laws (leges generates edic tales). It would be wrong, however, to infer that rescripts had ceased; for Justinian's Code contains various regulations as to their form, and the matter is dealt with again in one of his Novels. The reason why so few are preserved is that they were no longer authoritative except for the parties to whom they were addressed. This was expressly declared by the emperors Arcadius and Honorius in 398 in reference to those they issued in answer to applications for advice from officials ; and it is not unreasonable to assume that a limitation of the same sort had been put at an earlier date on the authority of those addressed to private parties. Puchta is of opinion that the enactment of Honorius and Arcadius applied equally to decreta, for the reason that during this period matters of litigation did not come under the cognisance of the emperors except on appeal, and that under the new arrangements of Constantine the judgment of affirmance or reversal was embodied in a rescript addressed to the magistrate from whom the appeal had been taken. The rule of Arcadius and Honorius was renewed in 425 by Theodosius and Valentinian, who qualified it, however, to this extent — that, if it contained any distinct indication that the doctrine it laid down was meant to be of general application, then it was to be received as an edict or lex generalis. To this Justinian adhered in so far as rescripts in the old sense of the word were concerned; but he declared that his judgments (decreta) should be received everywhere as laws of general application, and so should any interpretation given by him of a lex generalis, even though elicited by the petition of a private party. The imperial edicts, adjusted in the consistory, were usually addressed to the people, the senate or some official, civil, military or ecclesiastical, according to the nature of their subject-matter.

Influence of Christianity.* — A disposition has sometimes been manifested to credit nascent Christianity with the humaner spirit which began to operate on some of the institutions of the

1 Schirmer, Utber die prdtorischen Judicial-Stipulationen (Greifs-wald, 1853); Keller-Wach, Civilprocess, § 77; Bekker, Aktionen, ii.

chap. 16.

1 Savigny, System d. rom. Rechts. vol. vii. §§ 315-343; Karlowa, Rom. R. G. ii. pp. 1064-1104; Keller-Wach, op. cit. § 79; Bekker, Aktionen, ii. chap. 18.

Chris- tianity— As in-

law in the first century of the Empire, but which in a previous section we have ascribed to the infiltration into the jus civile of doctrines of the jus naturale, the product n U ence of the philosophy of the Stoa. The teaching of Seneca did quite as much — nay, far more — to influence it then than the lessons that were taught in the little assemblies of the early converts. It would be a bold thing to say that, had Christianity never gained its predominance, that spirit of natural right would not have continued to animate the course of legislation, and to evoke, as years pro- gressed, most of those amendments in the law of the family and the law of succession that were amongst the most valuable contributions of the imperial constitutions to the private law. It may well be that that spirit was intensified and rendered more active with the growth of Christian belief ; but not until the latter had been publicly sanctioned by Constantine, and more especially after Theodosius declared it to be the religion of the state, do we meet with incon- testable records of its influence.. We find them in enactments in favour of the church and its property, and of its fprivfleges as a legatee; in those conferring or imposing on the bishops a super- vision of charities and charitable institutions, and a power of interfering in matters of guardianship ; in the legitimation per subsequens matrimonium of children born of concubines; in the introduction of a mode of manumitting slaves in facie ecclesiae;

3 There was a senate both at Constantinople and at Rome during the later Empire. In his History, Zosimus, lii. 11, says: [‘lovKianis] iRwKt fiiv TJjTrAXei [KucirToiTiTOUirAXei] ytpovalav ?x«” &Btr*p TJ? P&jug. Both senates were addressed by the emperors on malters of legisla- tion. See Cod. Theod. vi. 2.

4 See Troplong, De V influence du christianisme sur le droit civil des Romains (Paris, 1843, and subsequently); Merivale, The Conversion of the Roman Empire (Boyle Lectures for 1864) (London, 1864), particularly lect. iv. ; Allard, Le Christianisme et V empire romain (2nd ed., Paris, 1897).

in the recognition of the efficacy of certain acts done in presence of two or three of the clergy and thereafter recorded in the church registers; in the disabilities as to marriage and succession with which heretics and apostates were visited, and in a variety of minor matters. Of greater importance were three features for which it was directly responsible — the repeal of the caduciary provisions of the Papia-Poppaean law, the penalties imposed upon divorce, and the institution of the episcopalis audientia.

The purpose of the caduciary law was to discourage celibacy and encourage fruitful marriages; but legislation in such a spirit could not possibly be maintained when celibacy had come to be inculcated as a virtue, and as the peculiar characteristic of a holy life. The penalties alike of orbitas and coelibatus were abolished by Constantine in the year 320. The legislation about divorce, from the first of Constantine's enactments on the subject down to those of Justinian, forms a miserable chapter in the history of the law. Not one of the emperors who busied himself with the matter, undoing the ill- advised work of his predecessors and substituting legislation of his own quite as complicated and futile, thought of interfering with the old principle that divorce ought to be as free as marriage and inde- pendent of the sanction or decree of a judicial tribunal. Justinian was the first who, by one of his Novels, imposed a condition on parties to a divorce of common accord (communi consensu), namely, that they should both enter a convent, otherwise it should be null; but, so distasteful was this to popular feeling, and so little conducive to improvement of the tone of morals within the conventual precincts, that it was repealed by his successor. The legislation of Justinian's predecessors and the bulk of his own were levelled at one-sided re- pudiations, imposing penalties, personal and patrimonial (1) upon the author of a repudiation on some ground the law did not recognize as sufficient — and the lawful grounds varied almost from reign to reign — and (2) upon the party whose misconduct gave rise to a repudiation that was justifiable. The bishop's court {episcopate judicium, episcopalis audientia) had its origin in the practice of the primitive Christians, in accordance with the apostolic precept, of submitting their differences to one or two of their brethren in the faith, usually a presbyter or bishop, who acted as arbiter. On the state recognition of Christianity the practice obtained legislative sanction, Constantine giving the bishop's court concurrent juris- diction with the ordinary civil courts where both parties preferred the former, and by a later enactment

(whose authenticity, however, is open to some doubt) going so far as to empower one of the parties to a suit to remove it to the ecclesiastical tribunal against the will of the other. He also declared that the judgments were to be enforced by the civil courts. 1 For various reasons, advantage was taken of this power of resorting to the bishop to an extent which seriously interfered with the proper discharge of his spiritual functions, so that in 398 Arcadius in the Eastern Empire judged it expedient to revert to Constantine's original rule, and, at least as regarded laymen, to limit the right of resort to the episcopal judicatory to cases in which both parties consented. The same thing was done by Valentinian in the Western Empire in 452. It is impossible to say with any approach to exactitude what effect this intervention of the clergy as judges in ordinary civil causes — • for they had no proper criminal jurisdiction — had on the develop- ment of the law. But it can hardly have been without some influence in still further promoting the tendency to subordinate act and word to will and intention, to deal leniently with technicalities, and to temper the rules of the jus civile with equity and considera- tions of natural right.

Abandonment of the Formular System of Procedure.* — The formular system, with its remit from the praetor to a sworn judex who was „ to try the cause, was of infinite advantage to the law; for

methods * ne judgment was as a rule that of a free and independent 0/ oro- citizen, untrammelled by officialism, fresh from some centre cedure. °^ business, chosen by, and in full sympathy with, the parties between whom he had to decide. Such a system was incompatible with the autocratic government of Diocletian and Constantine r and it is with no surprise that we find the former of these sovereigns instructing the provincial governors that in future, unless when prevented by pressure of business (or, according to a later constitution of Julian's, when the matter was of trifling importance), they were not to remit them but were themselves to hear the causes brought before them from first to last, as had previously been the practice in the extraordinariae cognitiones. ' The remit in the excepted cases was not, as formerly, to a private citizen, but to what was called a judex pedaneus, who acted as an inferior, sub- stitute of the magistrate and was probably a matriculated member of the local bar ; and for a time his delegated authority was embodied

1 The truth of this as well as the previous rule depends on the authenticity of a Sirmondian constitution. See Cuq, Inst. Jurid. ii. p. 868 n.

8 Wieding, Der Justinianeische Libellprocess (Vienna, 1865);

Bethmann-Hollweg {Gesch. d. C.P.), vol. iii. (1866); Muther (rev. Wieding), in the Krit. Vierleljahrschrift. vol. ix. (1867), pp. 161 seq., 329 seq.; Wieding, in same journal, vol. xii. (1870), pp. 228 seq.; Bekker, Aktionen, vol. ii. chaps. 23, 24; Cuq, Inst. Jurid. 2nd ed. ii. pp. 875 seq.

in a formula after the old fashion. But even this exceptional use of it did not long survive, for an enactment by the two sons of Constantine, conceived in terms the most comprehensive* declared fixed styles to be but traps for the unwary, and forbade their use in any legal act whatever, whether contentious or voluntary. The result was, not only the formal disappearance of the distinction between the proceedings in jure and in judicio (judicium receiving a more extensive meaning) but the practical (though not formal) disappearance also of the distinctions between actions in jus and in factum, and between actiones directae and actiones utiles, the con- version of the interdict into an actio ex interdicto, admission of the power of amendment of the pleadings, condemnation in the specific thing claimed, if in existence, instead of its pecuniary equivalent, and execution accordingly by the aid of officers of the law. • Under the new system a process was full from first to last of intervention by officials. The in jus vocatio of the XII. Tables — the procedure by which a plaintiff himself brought his adversary into court — became a thing of the past. So also did the vddimonium. In the earlier part of the period the proceedings commenced with the litis denuntiatio introduced in the time of Marcus Aurelius and remodelled by Constantine; but under Justinian (though probably begun before his reign) the initial step was what was called the libellus conventiortis. This was a short and precise written state- ment addressed by the plaintiff to the court, explaining (but with- out detail) the nature of the action he proposed to raise and the claim he was making, which was accompanied by a formal under- taking to proceed with the cause and follow it but to judgment; under penalty of having to pay double costs to the defendant. If the judge was satisfied of the relevancy of the libel 1 he pronounced an interlocutor (interlocutio) ordaining its service on the respondent; this was done by an officer of the court, who cited him to appear on a day named, usually at a distance of one or two months. The defendant, through the officer, had to put in an answer (libellus contradictionis), at the same time giving security for the proper maintenance of the defence and eventual satisfaction of the judg- ment. If defendant did not appear after three summonses the case Was heard and decree given in his absence. On the day ap- pointed the parties or their procurators were first heard on any dilatory pleas, such as defect of jurisdiction; if none were offered* or those stated

repelled, they then proceeded to expound their respective grounds of action and defence, each finally making oath of his good faith in the matter (jur amentum calumniae), ami their counsel doing the same.

From this point, which marked the litis contestatio or joinder of issue, the procedure was much the same as that- in judicio under the formular system. Evidence was taken and judgment given. But in all cases in which the demand was that a particular thing should be given or restored, and the plaintiff desired to have the thing itself rather than damages, execution might be specific and effected through officers of the law (manu militari). Where, on the other hand, the condemnation was pecuniary, the usual course, where performance was not made, was for the judge, through his officers, to take possession of such things belonging to the defendant as were thought sufficient to satisfy the judgment (pignus in cdusa judicati captum), and they were eventually sold judicially if the defendant still refused to pay; the missio in bona of the classical period was not resorted to except irt the case of insolvency.

The Valentinian Law of Citations. 3 — This famous enactment, the production of Theodosius (II.), tutor of the youthful Valen- tinian III., was issued from Ravenna in the year 426, , and was addressed to the Roman senate. It ran thus : — Jtajbn'* " We accord our approval of all the writings of Pa- , . pinian, Paul, Gaius, Ulpian and Modestine, conceding to cttatkm** Gaius the same authority .that is enjoyed by Paul, Ulpian. and the rest, and sanctioning the citation of all his works. We ratify also the jurisprudence (scientia) of those earlier writers' whose treatises and statements of the law the aforesaid five have im- ported into their own works, — Scaevola, for example, and Sabinus, and Julian, and Marcellus, — and of all others whom they have been in the habit of quoting as authorities (omniumque quos Mi celebrar- unt), provided always, as their antiquity makes them uncertain, that the texts of those earlier jurists are verified by collation of manuscripts. 4 If divergent dicta be adduced, that party shall prevail who has the greatest number of authorities on his side; if the number on each side be the same, that one shall prevail which has the support of Papinian; but, whilst he, most excellent of them all, is to be preferred to any other single authority, he must yield to any two. [Paul's and Ulpian's notes on his writings, however, as already enacted, are to be disregarded.] Where opinions are equal, and none entitled to preference, we leave it to the discretion of the judge which he shall adopt."

8 Theod. Cod. i. 4, 3; Puchta, in the Rhein, Museum f. Jurisprud. vol. v. (1832), pp. 141 seq., and Vera. Schriften (Leipzig, 1851), pp. 284

seq.; Karlowa, Rom. Rechtsgesch. vol. i. pp. 933 seq. ; Sohm, Inst. § 21, nn. 1 and 2, and authorities there cited.

4 There is, however, a good deal of doubt as to what is meant by the words collatione codicum in this Edict. See Sohm as in preceding note, and authorities cited by him.

This constitution has always been regarded as a signal proof of the lamentable condition into which jurisprudence had sunk in the beginning of the 5th century. Constantine, a hundred years earlier, had condemned the notes of Ulpian and Paul upon Papin- ian. There were no longer any living jurists to lay down the law {jura condere) ; and, if it was to be gathered from the writings of those who were dead, it was perhaps as well that the use of them should be regulated. The Valentinian law proceeded so far in the same direction. It made a selection of the jurisconsults of the past whose works alone were to be allowed to be cited, — Papinian, Paul, Ulpian and Modestine, the four latest patented counsel of any distinction; Gaius, of authority previously only in the schools, but whose writings were now approved universally, notwithstand- ing that he had never possessed the jus reipondendi ; and all the earlier jurists whose dicta these five had accepted. But it went yet a step further, for it declared all of them, with the sole exception of Papinian, to be ot the same authority, and degraded the function of the judge in most cases — so far at least as a question of law was con- cerned — to the purely arithmetical task of counting up the names which the industry of the advocates on either side had succeeded in adducing in support of these respective contentions. It is probable that, from the days of Hadrian down to Severus Alexander, when the emperor in his council had to frame a rescript or a decree, its tenor would be decided by the vote of the majority; but that was after argument and counter-argument, which must in many cases have modified first impressions. Taking the votes of dead men, who had not heard each other's reasons for their opinions, was a very different process. It may have been necessary; but it can have been so only because a living jurisprudence had no existence, — -because the constructive talent of the earlier Empire had entirely disappeared.

ii. Ante-Justinian Collections of Statutes and Jurisprudence.

Of cardinal importance for this period were the collections of imperial constitutions made prior to Justinian. There P~ ec ” , were three of these, viz. the Gregorian, the Hermogenian i°tJi a Theodosian Codes ; l the first two being the work of

Cndlfic*- pri vate hands, though they afterwards received statutory i . ‘ sanction from Theodosius II., the third being due to that

emperor himself. Codex Gregorianus, — This was a collection of imperial constitutions from Hadrian to Diocletian, made by a certain Gregorius about the _ . endof the3rdcentury(a.295?),who,inMommsen’sopinion 2 C?j? *” was at that time a professor at the law school of Beirut. Only fragments of it have come down to us, obtained chiefly from Alaricˆs Breviary, the Lex Romana Burgundionum, the Consultatio, the Collatio and the Vatican Fragments mentioned below ; but it was a work of considerable size, divided into books and titles. Codex Hermogenianus. 3 — This, like the Gregorian, was compiled in the Eastern Empire, apparently at the end of the 3rd century, but at any rate not later than the year 324. As, however, it contains a constitution of the year 365 there must have been subsequent additions to it. Only fragmentary remains of it are extant, obtained from the same sources as the Gregorian. Its author was a certain Hermogenianus (perhaps the jurist of that name cited in the Digest), and the work seems to have been intended as a sort of supplement to the Gregorian Code. It was a smaller work than the latter, being divided only into titles, and, unlike it, contains no pre-Diocletian constitutions. It has, however, a great number of contemporary ones, issued by Diocletian especially during the years 293 and 294. It was from this work and that of Gregorius that Justinian obtained the constitutions contained in his Code for the period prior to Constantine, and from the language he uses about the two Codes it would seem that they had been regarded in the courts before his time as the only authori- tative record of constitutions during the period covered by them.

Codex Theodosianus. — In the year 429 the emperor Theodosius nominated a commission of nine persons to collect the constitutions _. _ issued by the emperors from Constantine to his own reign.

dosian From the termsof the edict appointing them heseems to have C(. e intended to initiate the preparationof a body of law which,

if his scheme had been carried into execution, would have rendered that of Justinian unnecessary. In a constitution about ten years later he explains the motives that had actuated him: that he saw with

concern the poverty-stricken state of jurisprudence and how few men there were who, notwithstanding the prizes that awaited them, were able to make themselves familiar with the whole range of law; and that he attributed it very much to the multitude of books and

Hermo-

gealan

Code.

1 Mommsen suggests (Z. d. Sav. Stift., 1889, x. pp. 345 seq.) that the name codex (meaning a volume) was given to them because, instead of being written on papyrus rolls, they were originally written in the form of tabulae publicae and bound together as a parchment volume. Private collections of Constitutions had been made even earlier than Gregorian (e.g. by Papirius Justus).

2 Z. d. Sav. Stift. xxii. pp. 139 seq.

‘ Mommsen, Z. d. Sav. Stift. (1889), x. pp. 347 seq.; Kipp, Gesch. d. Quellen, pp. 78-79. The fragments of both this and the Gregorian Code, edited by Kriiger, are given in the Collectio Juris Antej. by K. M. and S., vol. iii. pp. 236-245.

the large mass of statutes through which the law was dispersed, and which it was next to impossible for any ordinary mortal to master. His scheme-was eventually to compile one single code from materials derived alike from the writings of the jurists, the Gregorian and Hermogenian collections of rescripts, and the constitutions from the time of Constantine downwards. His language leaves little doubt that it was his intention to have this general code carefully prepared, so as to make it a complete exponent of the existing law, which should take the place of everything, statutory or juris- prudential, of an earlier date. The collection of constitutions which he directed his commissioners meantime to prepare, and which was to contain even those that were merely of historical interest (provided only it was made clear how later enactments had affected them), was to be the first step in the execution of his project. For some reason or other nothing followed upon this enactment, and in 435 a new commission of sixteen persons was nominated to collect the constitutions, but nothing was said in their instructions about anything ulterior. They were directed, however, to deal with their material in a systematic way, as by arranging the constitutions chronologically under definite titles, separating, where necessary, any constitutions dealing with

more than one matter into parts, so as to bring each matter, under its proper title, and with power otherwise to make such omissions, additions and alterations as seemed good to them for the same object. The work was completed in less than three years and published at Constantinople early in the yeat 438, with the declaration that it should take effect from the 1st of January following, and a copy was sent to Valentinian, who notified it to the senate at Rome and ordained that it should come into force in the West from the 12th of January 439. The arrange- ment is in sixteen books, subdivided into titles with rubrics in which the constitutions are as a rule (though not consistently) placed in chronological order. They cover the whole field of law, private and public, civil and criminal, fiscal and administrative, military and ecclesiastical. The private law is contained in the first five books. This code was usually called in later documents ” Theodosianus,” without codex adjected. All constitutions since Constantine not contained in it were abrogated. The manuscripts in which it has come down to us are very defective, but many lacunae have been filled up from other sources, especially from Alaric’s Breviary. Unfortunately the lacunae are principally in the books relating to the private law. 4

Novettae Post-Theodosianae. — The imperial constitutions subse- quent to the publication of the Theodosianus got the name of Novels (novellae leges). There were three collections of these, all made in the Western Empire, and they are generally known as post-Theodosian Novels. The first collection con- taining edicts of Theodosius himself, sent by him to Valentinian III. in 447. was published by the latter emperor in the following year. The second collection contained in addition to edicts of Theodosius some edicts of Marcian and other emperors of the East, and also some of Valentinian, Majorian and other emperors of the West. The third collection was published in abridged form in Alaric’s Breviary. These collections are not extant, but from Alaric’s Breviary, with additions from manuscript sources, modern editions of the Novels have been prepared. 6 There was also a collection of constitutions, issued between the years 331 and 425, nearly all relating to church matters, first published by T. Sirrriondus in 1631, and now known as the Sirmondian Constitutions. 6

Besides the collections of statutes just mentioned there were a number of juristic works of this period, containing both , H statute law (leges) and common law (jus) in combination, .” fjK”” made by private individuals. Of these the following, „ which have come down to us in a more or less imperfect tf ons condition, are the most important : —

The Collatio Legum Mosaicarum et Romanarum 7 — or, as its title

bears, Lex Dei quam praecipit Dominus ad Moysen — is a parallel of divine and human law, especially in the matter of delicts collatio and punishments, the former drawn from the Pentateuch, and the latter from the works of Gaius, Papinian, Paul, Ulpian, and

Post- Theo- dosian Novels.

4 There have been several editions of the Theodosian Code. That of. J. Gothofredus, published after his death in 1652 (ed. with additions by Ritter in 7 vols., Leipzig, 1736-41), is a work of monumental learning and still indispensable on account of its commentary. But the latest and best edition is that of Mommsen, being the last work from the pen of that great master. It has been published at Berlin in 1905 under the title, Theodosiani libri xvi. cum conslitulioni- bus Sirmondianis et leges novellae ad Theodosianum pertinentes ediderunt Th. Mommsen et Paulus M. Meyer: I. Theodosiani libri xvi. cum constitutionibus Sirmondianis edidit, adsumpto apparatu P. Krugeri, Th. Mommsen (1905).

6 These Novels, so far as preserved, have been published as a second part of Mommsen's edition of the Theodosian Code. 77. Leges ad Theodosianum pertinentes edidit adjutore Th. Mommseno Paulus M-Meyer (1905). _

6 These are contained in the Mommsen-Meyer edition of the Theodosianus.

7 Collectio Juris Antejustiniani, by Kriiger and Mommsen, iii. pp. 107 seq. ; Girard, Textes, pp. 543 seq. ; Kriiger, Quellen, pp. 302 seq.

Modestine, rescripts from the Gregorian and Hermogenian Codes, and one later general enactment. Its date is probably soon after the year 390, but its authorship is unknown. 1

Fragmenta Vaticana? — These fragments, discovered by Cardinal Angelo Mai in a palimpsest in the Vatican in 1821, seem to have formed part of a book of practice, compiled in the Western Vatican Empire and of considerable dimensions. The extant frag- frag ” ments of the Titles into which it was divided deal with

meats ‘ sale, usufruct, dowries, donations, tutories and processional agency, and have been extracted from the writings of Papinian. Paul the Ulpian, an unknown work on interdicts, and the imperial constitutions prior to Theodosius, the latest of which is of the year 372. Its antiquity is therefore probably about the same as that of the Collatio. 3

The Consultatio. 4 — The so-called Veteris cujusdam Jurisconsultt Consultatio was first published in 1577 by Cujas, from whom it got its name. It is a collection of answers by an advocate, Consul- supported by citations of texts {consultationes) upon totlo- questions of law submitted for his opinion by a solicitor,

and is of value for the extracts it contains from Paul’s Sentences and the three above-mentioned codes. It is thought to have been written in Gaul in the end of the 5th or beginning of the 6th century. .

Syro-Roman Law-Book. 6 — This was a sort of manual of Roman law drawn up in the East, apparently in the Greek language, at an uncertain date, but some time between Theodosius and Syro-Justinian. Translations of it into Syriac, Arabic and

Roman Armenian have come down to us, and it would seem that the Law ‘ work in these translations was greatly made use of in legal

Boot. practice in the East (especially in the ecclesiastical Courts)

for several centuries, having in some places more authority attached to it than had the Digest and Code of Justinian. As a repertory of Roman law it is of little value, as it misunderstands or varies from that law in many respects, but it is of importance as showing how firmly Hellenic law and customs maintained themselves in the East during the decay of the Empire. 6

Light has also been thrown upon the ante-Justinian law by the numerous papyri documents, mostly in Greek, that have been in recent years recovered in Egypt (especially by Grenfell and Hunt) and elsewhere. 7 Mitteis, Gradenwitz and others have done much to elucidate these, by numerous publications. But to give any- thing like a consecutive account of them would occupy much space and cannot be attempted here. 8

Romano-Barbarian Codes (Leges Romanae).’ — Besides the collec- tions of statutes and juristic law mentioned in this section, there were several official collections made prior to Justinian

!* a ˆf ” ‘ n Western Europe, after it had fallen under the dominion Barbarian q{ Gotnic an(j ot h er kings. There are three of these ” which require special notice — each of them compiled from

documentary sources of ante-Justinian law. Though of consider- able use in explicating difficulties and filling up lacunae in the earlier law sources, they must be used with caution for that purpose, as they contain not a few corruptions of the original texts. They are: —

1. Edictum Theoderici. 10 — This was compiled at the instance of Theoderic, king of the Ostrogoths, not long after the year 500 (not later than 515). Theoderic after he had conquered Italy Edict of desired to be representative of the emperor and always ha-‘ acknowledged his suzerainty. He did not aim at being

an independent legislator, and his Edict is therefore of limited scope and in no proper sense a code. Its materials were

1 For opinions as to its author, see Girard, I.e. p. 543. He must have been an ecclesiastic.

2 Collectio Jur. Ante), iii. pp. 1 seq. (ed. Mommsen) ; Karlowa, Rom. R.G. i. pp. 969 seq.; Kriiger, Quellen, pp. 298-302.

- Mommsen,. however (Collectio, iii. p. 11), thinks it was compiled about the time of Constantine.

‘Collect. Jur. Antej. iii. pp. 203-20; Girard, Textes, pp. 590 seq. See Kriiger, Quellen, pp. 305-7.

6 Ed. by Bruns and Sachau under the name Syrisch-Romisches Rechtsbuch aus demfunften Jahrhundert (Leipzig, 1880). See Esmein, Milanges, pp. 403 seq.; Ferrini, Z. d. Sav. Stift. (1902), xxiii. pp. 101 seq. ; Kriiger, Quellen, pp. 320 seq.

6 The first volume of a complete collection of the versions of the Syrian Law-Book, with a translation into German by Sachau, was published at Berlin in 1907.

‘ E.g. the Amherst Papyri, by Grenfell -and Hunt. See Archiv fur Papyrusforschung (since 1900).

8 For an account of the papyri found at Sinai, containing parts of a commentary on Ulpian, ad Sabinum, supposed to have been written after A.D. 438, pee Muirhead, Hist. Introd. p. 374, and Girard, Textes, p. 578. For other papyri, see Girard, op. cit. pp.

838-44.

9 See Kriiger, Gesch. d. Quellen, § 41 ; Brunner, Deutsche Rechts-gesch. (1887), i. §§ 49, 50.

10 Ed. Bluhme in Pertz's Monumenta Germaniae, Leges, v. pp. 145 seq. (Hanover, 1875); see Savigny, Gesch. d. r. R. ii. pp. 172 seq.; Gaudenzi in Z. d. Sav. Stift. (Germ. Abtheil.), 1886, vii. pp. 29 seq.

mainly drawn, without however indication given, from the writings; of Paul, the Gregorian, Hermogenian and Theodosian Codes, and! the post-Theodosian Novels. Divided into 155 chapters, with no systematic arrangement, it touches upon all branches of the law, public and private, but especially criminal law and procedure.: Though it contains a certain infusion of Gothic law and was professedly intended to apply to all Theoderic's subjects, both Goths and Romans, it seems nevertheless generally admitted that this idea cannot have been fully realized, and that in some matters with which it deals, e.g. the law of the family, Gothic customs must still have continued to prevail for Gothic subjects.

2 The Lex Romana Wisigothorum or Breviarium Alarici or Alaricianum ll (both of these titles are modern) was a much more ambitious and important collection than the one last w . mentioned. It was compiled by a commission of lawyers a e f hlc appointed by Alaric II., king of the Western Goths, with c*L e approval of the bishops and nobles, and published at *

Aire in Gascony in the year 506. The compilers selected their material partly from the leges (imperial constitutions after Diocletian)' and partly from the vetus jus (juristic law), taking what they con- sidered appropriate, without materially altering the text of their authorities except in the way of excision of passages that were obsolete or superseded. For the leges they utilized some' 400 of the 3400 enactments (according to Haenel's estimate) of the Theodosian Code and about 30 of the Post-Theodosian Novels; for the jus they made use of Paul's Sentences, Gaius's Institutes (in a corrupt and greatly abridged Jomi in two books dating probably from, and adapted to the law of, the 5th century), the first book of Papinian's Responses (a single responsum), and the Gregorian and Hermogenian Collections (which were treated as jus). All of these, except Gaius (for the reason mentioned), were accompanied by inter pretatibnes (i.e. for the most part explanatory adaptations of the passages to the existing practice) which were largely borrowed from books in current use for purposes of instruction, and which resemble the interpretation of the XII. Tables

in that they are often not so much explanatory of the text as qualificative or corrective. The Breviary exercised great influence in western Europe; and there is no question that, until the rise of the Bologna school in the end of the 11th century, it was from it more than from the books-of Justinian that western Europe, other than Italy, acquired its scanty knowledge of Roman law.

3. The Lex Romana Burgundionum n — to which erroneously, about the 9th century, owing to a mistake of a MS. transcriber, the name Papianus (a contraction of PapinianHis) was _. „ ■ given. It is a collection which King Gundobad, when * dian

publishing his code of native law (Lex Gundoboda) for his ˆcZie native subjects, had promised should be prepared for the • ■■ * use of his Roman subjects. It was published probably before his death in 516. It deals with private law, criminal law and pro- cedure, distributed through forty-seven titles, and is arranged iiiucn in the same order as the Gundoboda, from which it has a few extracts. Its statutory Roman sources are the same as those of the Breviary; its juristic sources are Paul's Sentences and a work of Gaius of which we cannot say with certainty that it is his Institutes. It also contains some interpretationes of the same character as those in the Breviary, but whether taken directly from the latter or not is disputed. After the conquest of the Burgundian kingdom by the Franks this code ceased to have any direct authority, but was used in the courts as a sort of supplement to the Breviary, being often bound in the same volume with the latter.

iii. Justinian's Legislation.

Justinian's Collections and his own Legislation. — The history of Justinian outside his legislative achievements, and his collections in detail, are dealt with in the article Jus . Justinian I. Ambitious to carry out a reform more tiaiaa's complete even than that which Theodosius had planned codiBca- but failed to execute, he took the first step towards it iion ' little more than six months after the death of his uncle Justin, in the appointment of a commission to prepare a collection of statute law (leges), among which he included the rescripts of the Gregorian and Hermogenian Codes, which were commonly at this period described as jus. It was published in April 529; and in rapid succession there followed his Fifty Decisions

n Ed. Haenel (Leipzig, 1849); Conrat (Cohn), Brev. Alaricianum (1903). This work of Cohn is a systematic arrangement of the Breviary, with the Latin text as given by Haenel, and a translation into German of the interpretatio (or, where there is none, of the text itself),

and some explanatory notes. See Karlowa, Rdm. R.G. i- PP- 976 seq. ; Kriiger, Quellen, $ 40.

a Ed. Bluhme in Pertz's Monumenta German. Hist. Leges, iii. pp. 505 seq. (Hanover, 1863); de Salis Monum. Germ. Leg. sec. I. and ii. p. I (Hanover, 1892). See Karlowa, Rdm. R.G. i. pp. 983-985.

(529-531), his Institutes 1 (November 21, 533), his' Digest of excerpts from the writings of the jurists (December 16, 533),' and the revised edition of his Code, in which he incorporated his own legislation down to date (November 16, 534) . 3 From that time down to his death in 565 there followed a series of Novels (novettae constitutiones), mostly in Greek, which were never officially collected, and of which probably some have been lost. 4

Taking his enactments in the Code and his Novels together, we have of Justinian's own legislation not far short of 600 His own constitutions. Diocletian's contributions to the Code enact- are more than twice as numerous; but most of them meats. professed to be nothing more than short declaratory statements of pre-existing law, whereas Justinian's, apart from his Fifty Decisions, were mostly reformatory enact- ments, many of those in the Novels as long as an average act of parliament, and often dealing with diverse matters under the same rubric. They cover the whole field of law, public and private, civil and criminal, secular and ecclesiastical. It cannot be said that they afford pleasant reading: : they are 90 disfigured by redundancy of language, involved periods and nauseous self-glorification. But it cannot be denied that many of those which deal with the private law embody reforms of great moment and of most salutary tendency. The emperor sometimes loved to pose as the champion of the simplicity and even-handedness of the early law, at others to denounce it for its subtleties; sometimes he allowed himself to be in- fluenced by his own extreme asceticism, and now and again we detect traces of subservience to the imperious will of his consort; but in the main his legislation was dictated by what he was pleased to call humanitas so far as the. law of persons was concerned, and by naturalis ratio and public utility so far as concerned that of things. The result was the eradication of almost every trace of the old jus Quiritium, and the substitution for it, under the name of jus

Romanum, of that cosmopolitan body of law which has contributed so largely to almost every modern system.

Changes in the Law of the Family. — With the Christian emperors, from Constantine downwards, almost the last traces disappeared of . the old conception of the /

relations °^ lts head. Manus, the power in a husband Over his ‘ wife and her belongings, was a thing of the past; both stood now on a footing of equality before the law ; perhaps it might be more accurate to say, at least with reference to the Justinianian legislation, that the wife was the more privileged of the tw6 in respect both of the protection and the indulgence the law accorded her. With manus the old confarreation and coemptipn had ceased, marriage needing nothing more than simple interchange of consent, except as between persons of rank (illustres) or when the intention was to legitimate previous issue ; in the latter case a written marriage settlement (instrumertluni dotdle) was required, and in the former both such a settlement and a marriage in church before the bishop and at least three clerical witnesses, who granted and signed a certificate of the completed union. The legislation of the Christian emperors on the subject of divorce, largely contributed to by Justinian in his Novels, has already been referred to. In regard to the dos, many new provisions were introduced, principally for curtailing the’husband’s power of dealing with it while the marriage lasted, enlarging the right of the wife and her heirs in respect of it, and simplifying the means of recovering it frbm t’he husband or his

J The best edition.’ is that of Kriiger, which is prefixed to the stereotype edition of ‘the “Corpus Juris, by Mommsen, Kriiger and Schoell, vol. i., and also published separately. .

2 The best edition is that of Mommsen, Digesta Justiniani (2 vols., Berlin, 1866-70), and also yol- i- of the stereotype edition of the Corpus Juris mentionedˆ in preceding note. A new and handy edition, however, based on that of Mommsen, by Bonfante and several other Italian professors, is now in course of publication. Books I.-XXVIII. were published up to 1908 (Milan). A collotype facsimile of the Florentine MS. of the Digest is also in course of publication in Italy. FascicoH I.-VI. have already (1908) appeared (Rome, 1902-7).

8 The best edition is that of Kriiger, forming vol. ii. of the Corpus Juris last mentioned.

4 The best edition is that of Schoell, completed by Kroll in 1895, and

forming vol. iii. of the Corpus Juris last mentioned. It contains the Greek texts, Latin Vulgate and a Latin translation more correct than the Vulgate.

heirs when the marriage was dissolved. Between the time of Constantine and that of Theodosius and Valentinian a new form of matrimonial settlement became established. It became apparently a legally sanctioned practice for a man to make (apart from ordinary marriage presents) a settlement on his intended wife either by actual transfer or by promise of a provision which was to remain his property (though without the power of alienation) during the marriage, but to pass to her on his predecease or on divorce by his fault. This got the name of donatio ante nuptias, or sometimes, as being a sort of counterpart for the dos, antipherna. There was some important legislation about it by the two last-mentioned emperors; Leo and Justin followed suit; and Justinian, in his Code and Novels, published five or six enactments for its regulation. The general result was that, wherever a dos was given or promised on the part of the wife, there a donatio of equal amount was to be constituted on the part of the husband; that, if one was increased during the marriage, a' corresponding increase was to be made to the other; that it might be constituted or increased after the marriage without infringing the rule prohibiting donations between husband and wife, which caused Justinian to change its name to donatio, propter nuptias; that the wife might demand its transfer to her (to the same extent as she could that of the dos) on her husband's insolvency, but under obligation to apply its income to the main- tenance of the family; and that on the dissolution of the marriage by her husband's death or by a divorce for which he was in fault, she had an hypothec and other ample remedies for reducing it into possession. 6

The change in the complexion of the relations between husband and wife under the Christian emperors, however, was insignificant when compared with that which had overtaken the relation between parent and child. Justinian in his Institutes reproduces ihe boast of Gaius that nowhere else had a father such power over his children as was exercised by a Roman paterfamilias. True it is that the patria potestas in name still held a prominent place in the Justin- ianian collections ; but it had been shorn of mostof 1 the' prerogatives that had characterized it in earlier periods. To expose a newborn child was forbidden under penalties. To take the life of a grown- up one — unless it was a daughter slain with her paramour in the act of adultery — was murder; for the domestic tribunal, with the judicial power of life and death in the paterfamilias as its head, had long disappeared.

Further, a parent could no longer sell his child save only where the child was an infant and he in such extreme poverty as to be unable to support it. Even the right to make a noxal surrender of his son to a party who had suffered from the latter's delict had silently become obsolete; so greatly had altered sentiment, in sympathy with legislation, curtailed the power of the paterfamilias over those in his potestas. This noxae deditio was formally abolished by Justinian. All that remained of the patria potestas, in short, in the Justinianian law was little more than would be sanctioned -in most modern systems as natural emanations of the paternal relationship.

Thus he had right of moderate chastisement for offences (for the infliction of graver punishments he had to apply to the magistrate) , of testamentary, nomination of guardians, of pupillary substitution (enlarged by Justinian), and of withholding consent from the marriage of a child, but subject in this last case to magisterial intervention if used unreasonably.

How the right of the paterfamilias over the earnings and acquisi- tions of his children was modified by the recognition of the peculium castrense has been shown in a previous page.' But the modincatjon was carried to such an extent by the Christian emperors as finally to negative the father's ownership altogether, except as regarded acquisitions that were the outcome of funds advanced by him to his child for his separate use (peculiunt profecticium); Of some of the child's acquisitions {bona adventicia) his father had, down to the time of Justinian, the life interest and right of administration; but by his legislation even these might be excluded at the pleasure of the parties from whom the acquisitions had been derived or by maladministration of the father.

By the classical law the father's radical right in his son's peculium castrense revived on the latter's death ; for if he died intestate the former appropriated it not as his son's heir, but as an owner whose powers as such had been merely temporarily suspended. But by one of the chapters in the famous 118th Novel on< the law of intestate succession even this prerogative of the paterfamilias was abolished, and all a child's belongings except hii- peculium pro- fecticium were recognized as his own in death as welt as in life, so that if any of them should pass to his parent on> his intestacy it should only be by title of inheritance and in theiabsence of descendants.

In every other branch of the law Of the family the same reforming spirit was manifested. Adoption; of 'filiifamilias was no longer followed in all cases by a change of family for the adoptee, but only

when either the adopter was in fact one of his ancestors in whose

B See Esmein, Milanges, pp. 58-70; Mitteis, Reichsrecht und Volksrecht ind. Ostl, Provinz., deals with its history, pp. 256-312. Though beneficial on the whole, the regulations of Justinian on this matter seem rather too great an interference with the' freedom of marriage settlements.

potestas he had never been, such as a paternal or maternal grandfather, when there was a natural potestas to underlie and justify the civil one — or when an ancestor gave in adoption a grandchild who was in his potestas but would not become sui juris by his death. The mode of strict adoption also was simplified, the old procedure by sales and manumissions, which degraded the child too much to the level of a slave, was abolished. The modes of legitimation of children born of a concubine, especially that by subsequent marriage of the parents, first introduced by Constantine, were regulated, and the extent of the rights of the legitimated issue carefully defined. Emancipation was simplified in a similar way to that of strict adoption. Tutory at law was opened to the pupil's nearest kinsman, whether on the father's side or the mother's; and the mother herself, or the child's grandmother, might be allowed, under certain conditions, to act as its guardian. Slavery was often converted into the milder condition of colonate; but, even where this did not happen, the rights of owners were not allowed to be abused; for slaves were permitted to claim the protection of the magistrate, and cruelty by a master might result in his being deprived of his human property. Kinship that had arisen between two persons when one or both were slaves (servilis cognatio) was recognized as creative not only of disabilities but of rights. The modes of manumission were multiplied, and the restriction of the legislation of the early empire abolished; and a freedman invariably became a citizen, Junian Latinity and dediticiancy being no longer recognized.

Amendments on the Law of Property and Obligation.— -In the law of property the principal changes of the Christian Empire were the . . simplification of the forms of conveyance, the extension

Drooerfy °^ tne co ' onate > tne introduction and regulation of em- '

phyteusis and the remodelling of the law of prescription. Simplification of the forms of conveyance was necessary only in the case of res mancipi, for res nee mancipi had always passed by delivery. From the Theodosian Code it is apparent that movable res mancipi usually passed in the same way from very early in the period, and that for the mancipation of lands and houses — for injure cessio had dis- appeared with the formular system — a solemnis traditio, i.e. a written instrument and delivery following thereon, and both before witnesses, had been gradually substituted. Of this there is no trace in the Justinianian Code. For Justinian abolished all remains of the dis- tinction between res mancipi and res nee mancipi, between full ownership, bonitarian ownership and nudum jus Quiritium, placing movables and immovables on a footing of perfect equality so far as their direct conveyance was concerned. But, as regarded the pos- session required of an acquirer to cure any defect in the conveyance, he made a marked difference between immovables and movables. For, amalgamating the old positive usucaption of the jus civile with the negative ” prolonged possession ” {longi temporis possessio) that had been first introduced for immovables in the provinces (probably by the provincial edict), and afterwards by rescripts of Caracalla for movables, 1 he declared that possession on a sufficient title and in good faith should in future make the possessor legal owner of the thing possessed by him, provided that the possession of himself and his author had endured uninterruptedly for three years in the case of a movable, and in the case of an immovable for ten years if the party against whom he possessed was resident in the same province, or for twenty if he resided in another one.

The same causes that led to the colonate induced the introduction of emphyteusis, 2 — an institution which had already existed in some „ . of the Eastern provinces when independent, and which

teusls came to be utilized first by the emperors, then by the

church, and afterwards by municipalities and private landowners, for bringing into cultivation the large tracts of provincial land belonging to them which were unproductive and unprofitable through want of supervision on the spot. Its nature and conditions (which bore a certain similarity to the earlier jus in agro vectigali of the Western Empire, with which it was ultimately fused, and to hereditary leases sometimes granted in the early Empire) were carefully defined by Zeno and amended by Justinian. The emphyteuta, as the grantee of the right was ultimately called, did not become owner; the granter still remained dominus, all that the grantee enjoyed being a jus in re aliena, but so extensive as hardly to be distinguishable from

ownership. It conferred upon him and his heirs a perpetual right in the lands included in the grant, in con- sideration of a fixed annual payment to the lord {canon) and due observance of conventional and statutory conditions; but he was not entitled to abandon it, nor able to free himself of the obligations he had undertaken, without the lord's consent. The latter was entitled to hold the grant forfeited if the canon fell into arrear for three years (in church lands for two), or if the land-tax was in arrear for the same period, or if the emphyteuta allowed the lands to deteriorate, or if he attempted to alienate them (alienare meliora-

1 Dig. xliv. 3, 9. '

2 See Elia Lattes, Studi storici sopra il Contralto d' Enfiteusi nelle sue relazioni col Colonato (Turin, 1868), chaps. I and 3; and Francois, De I'Emphyteose (Paris, 1883); Beaudouin in Nouv. rev. hist. (1898), pp. 545 seq.; Karlowa, Rom. R. G. ii. pp. 1268 seq. The name comes from the obligation imposed upon the grantees to make plantations (ifufrmtkiv).

tiones as the text says) without observance of statutory requirements. These were that he should intimate an intended alienation and the name of the intended alienee to the lord, so that the latter, before giving his assent, might satisfy himself that he would n6t be a loser by the transaction ; and, if the alienation was to be by sale, he had to state the price fixed, so as to give the lord the opportunity of exercising his statutory right of pre-emption at the same figure. If those requirements were complied with, and the lord (himself declin- ing to purchase) stated no reasonable objection to the proposed alienee, he was not entitled to resist the alienation, provided a payment (laudemium) was made to him of 2 % of the sale price or of the value of the lands in consideration of his enforced consent.

The changes in the law of obligation were more superficial than those in the law of property, and consisted principally n*B M . in the simplification of formalities and in some cases

Changes in the Law of Succession. — The changes made in the law of succession by Justinian's Christian predecessors, especially Theodosius II. and Anastasius, were far from insignificant; _ but his own were in some directions positively revolutionary. e ~' **The testament per aes et libram of thejus civile probably meata V never obtained'any firm footing in the East ; for it was only "j!^?"** by Caracalla's constitution conferring citizenship on all his "

free subjects that provincials generally acquired testamenti f actio ; and by that time a testament bearing externally the requisite number of seals had been recognized as sufficient for a grant of bonorum possessio unchallengeable by the heirs-at-law, even though they were able to prove that neither familiae mancipatio nor testamenti nuncupatio had intervened. Hence the universal adoption of what Justinian calls the praetorian testament, which, however, underwent consider- able reform at the hands of the emperors, notably Theodosius II. and Valentinian III., in the requirement (in the ordinary case) of signature by the testator and subscription by the witnesses, thereby becoming what Justinian calls the tripartite testament. There was much hesitating legislation on the subject before the law was finally established as it stands in the Justinianian books; and even at the last we find it encumbered with many exceptions and reserva- tions in favour of testaments that were merely deeds of division by a parent among his children, testaments made in time of plague, testaments made before a magistrate and recorded in books of court, testaments entrusted to the safe keeping of the emperor, and so forth. Codicils had become deeds of such importance as, in the absence of a testament, to be dealt with as imposing a trust on the heir-at-law; it was therefore thought expedient to deny effect to them unless attested by at least five witnesses. And a most im- portant step in advance was taken by Justinian in the recognition of the validity of an oral mortis causa trust; for he declared that, if it should be represented to a competent judge that a person on his death-bed had by word of mouth directed- nis heir to give something to the complainant, the heir should be required either on his oath to deny the averment or to give or pay what was claimed. 3

In the matter of intestacy there had been long a halting between two opinions— a desire still further to amend the law in the direction taken by the praetors and by the legislature in the Ter- _.

tullian and Orphitian senatusconsults, and yet a hesitancy //*#* about breaking altogether from the time-hallowed principle No . of agnation. Justinian in his Code went far beyond his ve *

predecessors, making a mother's right of succession independent altogether of the jus liberorum ; extending that of a daughter or sister to her descendants, without any deduction in favour of ag- nates thus excluded; admitting emancipated collaterals and their descendants as freely as if there had been no capitis deminutio minima; applying to agnates the same successio graduum that the praetors had allowed to cognates, and so forth. But it was by his Novels, especially the 118th and 127th, that he revolutionized the system, by eradicating agnation

altogether (except as regards adopted children) and settling the canons of descent— which were the same for real and personal estate — solely on the basis of blood kinship, whether through males or females, and whether crossed or not by a capitis deminutio. First came descendants of the intestate, male and female alike, taking per capita if all were of the same degree, per stirpes if of different degrees. Failing descendants, the succession passed to the nearest ascendants, and, concurrently with them, to brothers and sisters of full blood (germani) and (by Nov. 127) the children of any that had predeceased. Where there were ascend- ants alone, one-half of the succession went to the paternal line and one-half to the maternal; where there were ascendants and brothers and sisters, or only brothers and sisters, the division was made equally per capita; when children of a deceased brother or sister participated it was per stirpes. In the thjrd class came brothers and sisters of half blood and their children, and grand- children of brothers and sisters german; the division here was on the same principle as in the second class. The fourth class included all other collaterals according to propinquity, apparently to the remotest degree, and without distinction between full and half blood;

3 Inst. ii. 23, § 12.

but among those the nearest in degree excluded the more remote, and when all were of the same degree they took per capita.

A reform effected by Justinian by his 115th Novel ought not to pass unnoticed ; for it rendered superfluous all the old rules about disherison and praeterition of a testator's children, practi- cally abolished bonorum possessio contra tabulas as regards f reeborn persons and established the principle that a child had, as a general rule, an inherent and indefeasible right to be one of his father's heirs in a certain share at all events of his succession, and that a parent had the same right in the succession of his child if the latter had died

without issue. The enactment enumerated certain grounds upon which alone it should be lawful for a parent to disinherit his child or a child his parent, declaring that in every case of disherison the reason of it should be stated in the testament, but giving leave to the person disinherited to dispute and disprove the facts when the testament was opened. If a child who had not been disinherited — and one improperly disinherited was eventually in the same position — was not instituted to some share, however small, of his parent's hereditas, he was entitled to have the testament declared null in so far as the institutions in it were concerned, thus opening the succession to himself and the other heirs-at-law, but without affecting accessory provisions, such as bequests, nominations of tutors, &c. ; and if the share to which he was instituted was less than his legitim (legitima or debita portio) he was entitled to an action in supplement. The legitim, which under the practice of the centumviral court had been one-fourth of the share to which the child would have been entitled ab intestato, had been raised by Justinian (by Novel 18) to one-third at least, and one-half where there were five or more entitled to participate. He did not allow challenge of the will to be excluded, as in the earlier querela inofficiosi testamenti, because the testator had made advances to his child during his life or left him a legacy which quantitatively equalled the legitim; his idea was that a child was entitled to recognition by his parent as one of his heirs, and that to deny him that position without statutory grounds was to put upon him an indignity which the law would riot permit.

Amongst the other beneficial changes effected by Justinian may be mentioned the assimilation so far as possible of hereditas and 0*/.— bonorum possessio, so that the latter might be taken like

. the former without formal petition for a grant of it; the

- equiparation of legacies and singular trust-gifts, and the application of some of their rules to mortis causa donations; the extension of the principle of " transmission " to every heir without exception, so that, if he died within the time allowed him for con- sidering whether or not he would accept (tempus deliberandi), his power of acceptance or declinature passed to his heirs, to be exercised by them within what remained of the period; the introduction of entry under inventory (cum beneficio inventarii), which limited the heir's responsibilities and rendered unnecessary the nine or twelve months of deliberation; and the application of the principle of collation to descendants generally, so that they were bound to throw into the mass of the succession before its partition every advance they had received

from their parent in anticipation of their shares.

iv. The Justinianian Law-Books.

Their Use in the Courts and in the Schools. — Although the Institutes were primarily intended to serve as a text-book in the schools, it was expressly declared that it and the Digest and the Justin- Code should be regarded as just so many parts of one great laaiaa piece of legislation and all of equal authority; and that,

r”*” although Digest and Code were but collections of common

law and legislation that had proceeded originally from many

different hands, yet they were to be treated with the same respect as if they had been the work of Justinian himself. But, while everything within them was to be held as law, nothing outside them was to be looked at, not even the volumes from which they had been collected; and so far did this go that, : after the publication in 534 of the revised Code, neither the first edition of it nor the Fifty Decisions were allowed to be referred to. If a case arose for which no precedent was to be found, the emperor was to be resorted to for his decision, as being outside his collections the only fountain of the law. To preserve the purity of the texts Justinian forbade the use of conventional abbreviations (sigla) in making transcripts, visiting an offender with the penalties of falsification (crimen falsi). Literal translations into Greek were authorized, and indeed were necessary for many of his subjects; so were indexes and TrapkrirXa, i.e. summaries of parallel passages, texts or individual titles. Com- mentaries and general summaries were forbidden under heavy penalties, as an interference with the imperial prerogative of inter- pretation. 1 But these prohibitions do not seem to have been enforced, as we have accounts and remains not only of translations but of commentaries, notes, abridgments, excerpts and general summaries even in Justinian’s lifetime. These, it is true, were mostly by professors (antecessors), and their productions may have been intended primarily for educational purposes; but they soon passed into the hands of the practitioners and were used without scruple in the courts. A Greek Paraphrase of the Institutes, usually

1 Const. Deo Auctore, § 12; Tanta, §21.

attributed to Theophilus, a professor in Constantinople and one of Justinian’s commissioners, has been supposed to have been used by him in his prelections. It embodies much • more historical matter than

is to be found in the' Institutes; but it contains a good many inaccuracies and its value has been very differently rated by different critics. Its latest editor, Ferrini, who puts a high estimate on it, is of opinion that the original of it was a reproduction in Greek of Gaius, drawn up at Beirut, which was remodelled after the plan of Justinian's Institutes, and had the new matter of this latter work subsequently incorporated in order to adapt it to the altered con- ditions; but he denies that there is any sufficient authority for ascribing it to Theophilus. If he be right in assuming that it was really based on a redaction of Gaius, its historical explanations will be received with all the more confidence. 2

Fate of the Justinianian Books in the East. — The literary work indicated in the preceding section was continued throughout the 6th century. But the next three were comparatively barren, . . *the only thing worth noting being the 'EKX0717 w vbˆuv iv . . , avvrow taiojihrri of Leo the Isaurian in 740, professedly the Bast. an abstract of the whole Justinianian law amended and rearranged; but it was repealed by Basil the Macedonian on account of its imperfections and its audacious departure from the law it pretended to summarize. The last-named emperor, followed by his son Leo the Philosopher, set themselves in the end of the 9th and beginning of the 10th centuries to the production of an authori- tative Greek version of the whole of the Justinianian collections and legislation, omitting what had since become obsolete, excising redundancies, and introducing such of the post- Justinianian legisla- tion as they thought merited preservation. The result was the Basilica (Td BaoriXutd, sc. vbmiie.), which was completed and published in the reign of Leo, though begun in the reign of Basil, who also published a sort of institutional work, entitled Upoxeipov, which 'was revised and republished by Leo under the name of 'Eiravayuyij tov vbium. The Basilica 3 consists of sixty books, subdivided into titles, following generally the plan of the Justinianian Code, but with the whole law on any particular subject arranged consecutively, whether from Institutes, Digest, Code or Novels (see article Basilica). Leo's son, Constantinus Porphyrogenitus, made an addition to it in the shape of an official commentary collected from the writings of the 6th- century jurists, the so-called Uapaypaipal tu>v irdKaiuv, which is now spoken of as the scholia to the Basilica, and has done good exegetical service for modern civilians. Later annotations by jurists of the 10th to the 12th century are also called scholia but are of less value. The Basilica retained its statutory authority until the fall of the Byzantine Empire in 1453. But long before that it had fallen into neglect in practice; and though nearly the whole of it and a great part of its scholia have come to us, yet not a* single complete copy of it exists. Its place was taken by epitomes and compendia, the last being the 'Ei|d/Si/3\os of Constantinus

Harmenopoulos about 1345, ” a miserable epitome of the epitomes of epitomes,” as Bruns calls it, which survived the vicissitudes of the centuries, and finally received statutory authority in the modern kingdom of Greece in the year 1835, in place of the Basilica, which had been sanctioned thirteen years before, in 1822. 4

Their Fate in the West. — Before the rise of the Bologna school it was to a much greater extent from the Romano-Barbarian codes than from the books of J ustinian that central’and western Europe, _.. . apart from Italy, derived their acquaintance with Roman . . r , law. Thebderic’s Edict can have had little influence after the West J ustinian’s recovery of Italy, and the Romano-Burgundian law was no doubt gradually displaced by Alaric’s Breviary after Burgundy had fallen into the hands of the Franks ; but the Breviary itself found its way in all directions in France and Germany, pene- trating even into England, mainly through the agency of the church. There must, however, have been other repertories of Roman law in circulation (and among others probably either Gaius’s Commen- taries or Ulpian’s Rules), as witness a testament made in Paris in the end of the 7th century, mentioned by Savigny as preserved by Mabillon, in which the testator uses the old formula of the jus civile, — ” ita do, ita lego, ita testor, ita vos Quirites testimonium mihi per- hibetote,” words that are not to be found either in the Visigothic or the J ustinianian collections. We know that in his pragmatic sanction of the year 554, Justinian anew accorded his imperial sanction to the jura and leges, i.e. the Digest and Code, which he says he had long before transmitted to Italy, at the same time declaring that his Novels were to be of the same authority there as in the East. iTwo years after this came Julian’s Latin epitome of the Novels (a private work by a Constantinopolitan professor), not improbably prepared by command of the emperor himself. That Justinian’s works soon came

2 Editions by Reitz, 1 75 1, and Ferrini, 1884-97.

8 Ed. Heimbach, 6 Vols, with Latin translation (and in 1846 a supplement by Zachariae a Lingenthal), Leipzig, 1833-70. A new supplement forming vol. 7, by Ferrini and Mercati, was published in 1897.

1 For the history of Byzantine law subsequent to Justinian, see Zachariae, Geschichte des Griechisch.-Rbm. Rechts (3rd ed., 1892), and Historia juris Graeco-Romani (1839); Mortreuil, Histoire du droit byzantin (3 vols., 1843-46).

to some extent into use in Italy is beyond question ;for there is preserved in Marini's collection the testament of , one Mannanes, executed at Ravenna in the reign of Justinian's immediate successor Justin II., in which the requirements of both Code and Novels are scrupu- lously observed. Of other monuments of the same period that prove their currency in Italy several are referred to by Savigny i.n the second volume of his History of the Roman Law in the Middle Ages, among which may be mentioned the Turin gloss of the Institutes, which Fitting ascribes to about the year 545, 1 and two little 'pieces known as the Dictatum de consiliariis and the Collectio de tutaribus. 2 The invasion of the Lombards, the disturbance they caused in Italy for two centuries, and the barrier they formed between it and the rest of Europe militated against the spread of the Justinianian law northwards; but it was taught (from the 6th to the nth century) without much interruption at law schools in Rome, and also at Ravenna, the seat of the exarchs, to which (but this is doubtful) the school (studium) of Rome, revived by Justinian, is said' to have been transferred in the nth century. By the, Lombards, as their savagery toned down, the Roman law was so far recognized that they allowed it to be applied to the Romans living within their territory, and it is said even to have been taught in Pavia, which they had established as their capital. Their overthrow by Charlemagne opened an outlet for it beyond Italy; and there is evidence that. in the 9th century Justinian's works, or some of them, were already circulating in the hands of the clergy in various parts of Europe. Yet there are few remains of any literature of this period indicating much acquaintance with them. The only writings worth mentioning are the so-called Summa Perusina, an abridgment of the first eight books of the Code, ascribed to the 7th century; the Lombardic Quaestiones ac Monita containing observations on the Germanic and Roman laws, with texts drawn from the Institutes, the Digest, the Code and Julian's Epitome, and supposed to have been written early in the nth century; the so-called Brachylogus,? in large part a sort of abbreviated revision of Justinian's Institutes, but with references also to his other books, which Fitting and others hold to have been written in France (perhaps Orleans), possibly by a pupil of Irnerius, about the very beginning of the 12th century; and the Petri Exceptiones legum Romanorum, a similar systematic exposition of the law in four books, probably written in the nth century earlier than Irnerius's Summa. . Both the Brachylogus and the Petrus were mainly compiled from pure Justinianian sources.

Apart from these remains a word may here be said about the work of the glossarists. 4 It was at the very end of the I Ith century that at the

law school of Bologna, then under the guidance ˆ fie of the celebrated Irnerius, the study of Roman law began

glossar- somewhat suddenly to attract students from all parts of Europe. Partly through ignorance and partly through the action of the clergy, the parts of the Justinianian legislation that had hitherto been in ordinary use were the Institutes, the Code and the Novels. The first, from its elementary character, had naturally commended itself; the Code and the Novels, with their abundant legislation on matters ecclesiastical, were in many respects charters of the church's privileges, and were prized accordingly; but the Digest, as being the work of pagan jurists, had been looked on askance and practically little used. The Code and the Novels, however, with their modicum of wheat concealed in a great quantity of chaff, offered little attraction to laymen of intelligence ; and, when under the guidance of Irnerius their attention was first con- centrated on the Digest, it must have come to them as a sort of revelation. Dogmatic and exegetic teaching of the Corpus Juris in all its parts was actively begun, and a new school arose called the glossarists (glossatores), of whom Irnerius has always been rightly regarded as the founder. This great man, who is said to have been trained both in logic and rhetoric and to have afterwards studied and taught law at Rome before coming to Bologna, was more than a glossator. He was also the first of the medievalists to treat the law in a scientific way. In his Summa Codicis (a work attributed to him by Fitting on evidence which seems almost conclusive) he produced for his contemporaries -and successors an independently planned and so far systematic manual of the subject-matter of the Code, omitting the last three books. 4 The subject 'was treated in full relation to'the other parts of the Corpus Juris, but follows in general the titles of the Code. The glossators got their name from the glossae, i.e. marginal and interlinear annotations (both grammatical and doctrinal) with which they furnished the texts of the

ˆFitting, liber die sogenannte Turiner Institutionen-glosse (Halle, 1870); cf. Conrat, Gesch. d. Quellen u. Litt. d. rbm. R. im friiheren Mittelalter, vol. i. pp. 180 seq., Leipzig, 1891.

2 Conrat ut sup. pp. 137-140. '.';■'.

- Brachylogus totius juris civilis is a fuller title given to it. It has also been called Corpus legum. It first got the name Brachylogus in the 1 6th century.

4 Savigny, Geschichte d. r. R. vols. 3-5.

6 See Summa Codicis of Irnerius by Fitting (Berlin, 1894). . Two other works attributed to Irnerius, called respectively .Quaestiones de Subtilitatibus Juris and a treatise De Aequitate, have been edited by the same author. See also Fitting, Z. d. Sav. Stift. xvi. pp. 1 seq.

Corpus Juris which were in their hands. , They also wrote summae, casus, brocarda, &.c, for use both in the courts. and the schools, and occasionally- special treatises. They confined their work entirely to the Corpus Juris, being almost wholly ignorant of the history of the law. Beginning with Irnerius, the school lasted for about a century and a half, and ended with Franciscus Accursius, who died in 1260 after having made a systematic but summarized collection of the glosses of his predecessors, which was afterwards known as the Glossa Qrdinaria or " The Great Gloss." Among the more famous representatives of the school (other than Irnerius) were, in the 12th century, Bulgarus, Martinus, Jacobus and Hugo, known as the quattuor doctofes, and Accursius himself. . To these may be added Placentinus and Vacarius of the 12th and Azo and Odofredus of the 13th century. The Digest, as used by the glossarists, was divided into three parts, known as Digestum Vetus (books 1-24, tit. 2,), Infortiatum (books 24, tit. 3-38), and Digestum Novum (books 39 to the end). The manuscripts of these, as used by the glossarists, are called the Vulgate (lectio Vulgate), to distinguish them from the Florentine Manuscript (lectio Pisana), on which, indeed (or on the same original source as it), they were probably all primarily based, but from which, as far at least as book 33, they Varied in numerous readings. The historical explanation of the cause of this just-mentioned threefold division is given by Mommsen in the preface to his larger edition of the Digest, to which it will be sufficient to refer!' The whole Corpus J wis was by the glossarists distributed into five volumes, viz. the three just named ; a fourth, containing the first nine books of 1 the Code ; and the fifth, called volu- men parvum legum, containing the Institutes; 134 of the Novels in Latin (known as the Authenticum 7); and the last three books of the Code.

The success . of the Accursian gloss was rather detrimental to scientific development of the law. It became a sort of code in itself which both in the schools and the courts tended to supersede the texts of Justinian. The intelligent study of the Sources was neglected while lawyers devoted themselves to subtle distinctions and useless divisions of subject-matter. It led to ' the application during the 14th and 15th centuries of the methods of scholasticism to the Roman law. The authors of this scholastic jurisprudence, which prevailed during the greater part of these centuries,, have been called postrglossators and scribentes or commentators. Their most noted representative was

BartoluS (1314-1357), after whom they were often called Bartolists. This school, however :(mainly Italian), did much towards developing a definite system of common law in Italy based on the Roman, and thereby facilitated the reception of Roman law in Germany and other countries. 8

In the 16th century a new start or, so to say, second renaissance was given to the Roman law. The study of classical antiquities, so active on the side of literature, extended to jurisprudence also. The juridical writings which had been handed down from' the Romans ceased to be regarded purely as positive law, binding accord- ing to the letter, but as a part of ancient tradition whose' spirit as well as form must be examined by the light of the past. Among the pioneers in this new method, to- whom the name of Humanists has been given, must be specially mentioned Alciatus (1492-1540), Cujacius (1522-1590) and Donellus (1527-1591). Medievalism has passed away, and with these jurists began what has been called the modern Roman law, to describe which, however, is entirely beyond the province of this article. (H. Go.)

ROMANOS, called 6 fie\q86s, Greek hymn-writer, "the Pindar of rhythmic poetry," was born at Emesa (Homs) in Syria. From the scanty notices of his life we learn that he resided in Constantinople during the reign of the emperor Anastasius. 9 Having officiated as a deacon in the church of the Resurrection at Berytus, he removed to Constantinople, where he was attached to the churches of Blachernae and Gyrus. According to the legend, when he was asleep in the last-named church, the Virgin appeared to him and commanded him to eat a scroll. On awaking (it was Christmas Day), lie immediately mounted the pulpit, and gave forth his -famous hymn on the Nativity. Romanos is said to have composed more than 1000 similar hymns or contakia (Gr. kcnnaKLay, " scroll ' ") celebrating the festivals of the ecclesiastical year, the lives of the saints and other sacred subjects — on the death of a monk (extremely impressive); the last judgment; the treachery of Judas; the martyrdom of St Stephen; Simeon

e Digesta Jusliniani Augusti, recognovit Th. Mommsen (Berlin,

1870).

'Or liber authenticorum. So called because it contained a more complete collection and correcter translation of the Greek Novels than the Epitome of Julian. It was the one used in the law courts in the middle ages. • 8 See Sohm, Institutionen, § 27, and authorities there cited.

9 On the question whether Anastasius I. (491ˆ518) or II. (713-716) is meant, see Krumbacher, who is in favour of the earlier date.

Stylites; paschal and Pentecostal hymns. The MS. of the hymns, written by his own hand, was said to have been preserved in the church of Cyrus, in which he was buried and celebrated as a saint on the ist of October. Prof. C. Krumbacher, who has edited the works of Romanos from the best (the Patmos) MSS., regards him as the greatest poet of the Byzantine age, and perhaps the greatest ecclesiastical poet of any age.

Editions: J. B. Pitra, Analecta Sacra, i. (1876), containing 29 poems, and Sanctus Romanus Veterum Melodorum Princeps (1888), with three additional hymns from the monastery of St John in Patmos. See also Pitra's Hymnographie de I'Uglise grecque (1867) ; C. Krumbacher, Geschichte der byzantinischen Litteratur (1897J; and Hymns.

ROMANOV, the name of the Russian imperial dynasty, regnant in the male line from 16 13 to 1730, and thenceforward in the female line. The Romanovs descended from Andrei, surnamed Kobyla, who is said to have come to Moscow from Prussia about 1341 to enter the service of the grand-duke Semen (d. 1353). His son Feodor, surnamed Koschka, was the ancestor of the families of Suchovo-Kobylin, Kalytschev and Scheremetjev, as well as of the Romanovs. Feodor's grandson, Sakhariya Ivanovich, was a boyar of Vasilii V., grand-duke of Moscow at intervals between 1425 and 1462, and the family took ijs name from his grandson Roman, whose daughter Anastasia Romanovna married the tsar Ivan the Terrible. Her brother Nikita Romanovich married the princess Eudoxia Alexandrovna, a descendant of Andrei Jaroslavovich, grand-duke of Susdal- Vladimir (d. 1264), and in this way the Romanovs were linked up with the ancient royal house of Rurik. The Romanovs suffered heavily in the disorders follow- ing on the death of Ivan. Some were executed and others exiled. Nikita's son Feodor (the archimandrite Philaret) was banished, but was recalled by the false Demetrius. In 1610 he was imprisoned by the king of Poland, but his piety and virtues led to the election of his son, Mikhail Feodorovich Romanov, to the throne of the tsars in 1613. Philaret became patriarch of Moscow in 1619, and supported his son's govern- ment until his death in 1634. Mikhail was seventeen when he began his reign, and died in 1645. He was

succeeded by his son Alexis, whose three sons, Feodor III., Ivan II. and Peter L (the Great), inherited the throne. After the two years' reign of Peter's widow, Ekaterina Aleksievna Skavronska (Catherine I,), his grandson, Peter Aleksievich (Peter II.), succeeded. He died in 1730, and the succession devolved on the family of Ivan II., on his daughter Anna (1730-40) and his great-grand- son Ivan III., and in 1741 on Elizabeth, daughter of Peter the Great. Peter's elder daughter, Anna, had married Charles Frederick of Holstein-Gottorp, and with the accession of her son, Peter III., in 1762 begins the present reigning dynasty of Holstein-Gottorp or Oldenburg-Romanov.

See R. Nisbet Bain, The First Romanovs (1905); P. V. Dolgoru- kov, Notice sur les principals families de la Russie (2nd ed., Berlin,

1858).

ROMAN RELIGION. In tracing the history of the religion of the Roman people we are not, as in the case of Greece, dealing with separate, though interacting, developments in a number of independent communities, but with a single community which won its way to the headship first of Latium, then of Italy and finally of a European empire. But this very fact of its ever-extending influence, coupled with an absence of dogmatism ' in belief, which made it at all times ready and even anxious to adopt foreign customs and ideas, gave its religion a constantly shifting and broadening character, so that it is difficult to determine the original essentials. By the time when Latin literature begins, the genuine Roman religion had already been overlaid by foreign cults and modes of thought, by the classical period it was — except in formal observance — practically buried and to a large extent fossilized. But the comparative study of religions has suggested the lines of reconstitution and the careful analysis of survivals embedded in literature and the evidence of monumental remains, and in particular xxiii. 19

of the old calendars, has enabled modern scholars to .make good progress in the task of separating the elements due to different periods and influences.

The Roman people were of Aryan stock, a section of a host of invaders from the north, who overran and settled in the Italian peninsula. They preserved traces of their original nationality not merely in the general cast of their religious thought, but in certain common features such as the worship of the hearth (Vesta) and of the sky-divinity (Jupiter) (see Greek Religion). But the development of their religion was arrested at an earlier stage than that of the Greeks: with them — at any rate in

the genuine Roman period — Animism never passed into Anthropomorphism; they stopped at the conception of the ” spirit ” without reaching that of the “god.” Their belief might be described as a polydemonism rather than a polytheism, or more correctly, to avoid altogether the intrusion of foreign’ notions, as a ” multinuminism.”

In the cult and ritual of Rome there are enshrined many sur- vivals from a very early form of religious thought prior to the de- velopment of the characteristic Roman attitude of mind. petish- Fetishism — the belief in the magic or divine power of /snit inanimate objects — is seen in the cult of stones, such as the silex of Jupiter (Iuppiter), which plays a prominent part in the ceremonial of treaty-making, and the 7aˆ>M used in the ritual of the aquaelicium, a process, probably magic in origin, designed to produce rain after a long drought. The boundary- stones between properties {termini) were also the Objects of cult at the annual festival of the Terminalia, and the ” god Terminus,” the symbolic boundary-stone, shares with Jupiter the great temple on the Capitol. Tree-worship (q.v.) again is a constantly recurring feature, seen, for instance, in the permanently sacred character of the ficus Ruminalis and the caprificus of the Campus Martius, and above all in the oak of Iuppiter Ferelrius, on which the spolia opima were hung after a victory. Nor did Roman fetishism stop short at natural objects. The household was always the centre of religious cult, and certain objects in the house — the door, the hearth, the store-cupboard (penus) — seem always to have had a sacred significance, and so became the objects and later the sites of the domestic worship. Of the’ cult of animals there is just sufficient trace to show that it must formerly have had its place in religious rite; the animals, once the objects of worship, appear in later times as the attributes of divinities, for instance, the sacred wolf and woodpecker of Mars.

But Fetishism must very early have developed into Animism, the feeling of the sacredness of the object into the sense of an indwelling spirit. In the animistic attitude we have in- xn/m- deed the true background of the genuine Roman religion; fanli but its characteristic and peculiar development is a kind of ” higher Animism,” which can associate the ” spirit ” not merely with visible and tangible objects, but with states and actions in the life of the individual and the community. No doubt the later indigitamenta (” bidding-prayers “) which give us detailed lists of the spirits which preside over the various actions of the infant, or the stages in the marriage ceremony, or the agricultural operations of the farmer, are due in a large measure to deliberate pontifical elaboration, but they are a true indication of the Roman attitude of mind, which reveals itself

continually in the analysis of the cults of the household or the festivals of the agricultural year.

The ” powers ” (numina, not dei), which thus become the objects of worship, are spirits specialized in function and limited in sphere. They are not conceived of in any anthropomorphic form, their sex even may often be indeterminate (” sive mas, sive femina ” is the constantly recurring formula of prayer), but the sphere of action of each is clearly marked and an appeal to a spirit outside his own special sphere would never even be thought of. Locality thus becomes an important point in the conception of the numen : the household spirits must be worshipped at the door, the hearth, the store-cupboard, and the external spirits of the fields and countryside have their sacred hill-tops or groves. But the numen has no form of sensuous representation, nor does he need a house to dwell in: statue and temple are alien to the spirit of Roman religion. Nor are the numina. not bein.e anthropomorphic, capable of relation

to one another: hence there is no Roman mythology. Yet, all- powerful in their individual spheres of action, they can influence the fortunes of men and can enter into relations with them. The primary attitude of man to the numina seems clearly to be one of fear, which survives prominently in the ” impish ” character of certain of the spirits of the countryside, such as Faunus and Inuus, and is always seen in the underlying conception of religio, a sense of awe in the presence of a superhuman power. But the practical mind of the Roman gives this relation a legal turn: the ius sacrum, which regulates the dealings of men with the divine powers, is an inseparable part of ius publicum, the body of civil law, and the various acts of worship, prayer and thanksgiving are conceived of under the legal aspect of a contract. The base-notion is that the spirits, if they are given their due, will make a return to man: the object of the recurring annual festivals is to propitiate them and forestall any hostile intention by putting them, as it were, in debt to man — more rarely to express gratitude for benefits received.

In such a religion exactness .of ritual must play a large part — so

large, indeed, that many modern critics have been misled into regarding the Roman religion as a mere network of formalities without any background of genuine religious feeling. This formalism shows itself in many ways.' It is necessary in the first place to make quite certain that the right deity is being addressed: hence it is well to invoke all the spirits who might be concerned, and even to add a general formula to cover omissions: here we have the ritual significance of the indigitamenta. Place, again, as we have seen, was an essential element even in the conception of the numen, and is therefore all-important in ritual. So, too, is the character of the offering: male victims must be sacrificed to male deities; female victims to goddesses: white animals are the due of the di superi, the gods of the upper world, black animals of the gods below. Special deities, moreover, will demand special victims, while the more rustic numina, such as Pales (q.v.), should be given milk and millet cakes rather than a blood-offering. All-important, too, is the order of ceremonial and the formula of prayer: a mistake or omission or an unpro- pitious interruption may vitiate the whole ritual, and though such misfortunes may occasionally be expiated by the addi- tional offering of a piaculum, in more serious cases the whole ceremony must be recommenced ab initio. Herein lies the importance of the priesthood: the priest is not, as in other religions, the mediator between god and man, but on the one hand for the purpose of state-worship the chosen representative of the whole people, on the other the repository of tradition and ritual lore.

This conception of the nature of the numina and man's relation to them is the root notion of the old Roman religion, House- and the fully-formed state cult of the di indigeles even bold at the earliest historical period, must have been the

worship, j-gguit f i on g anc i gradual development, of which we can to a certain extent trace the stages. The original settle- ment on the Palatine, like its neighbour on the Quirinal, was an agricultural community, whose unit both from the legal and religious point of view was not the individual but the house- hold. The household is thus at once the logical starting-point of religious cult, and throughout Roman history the centre of its most real and vital activity. The head of the house (pater- familias) is the natural priest and has control of the domestic worship: he is assisted by his sons as acolytes {camilli) and deputes certain portions of the ritual to his wife and daughters and even to his bailiff (vilicus) and his bailiff's wife. The worship centres round certain numina, the spirits indwelling in the sacred places of the original round hut in which the family lived. Janus, the god of the door, comes undoubtedly first, though unfortunately we

know but little of his worship in the household, except that it was the concern of the men. To the women is committed the worship of the ” blazing hearth,” Vesta, the natural centre of the family life, and it is noticeable that even to Ovid {Fast. vi. 291-92) the conception of Vesta was still material and not anthropomorphic. The Penates- {q.v.) were the numina of the store-cupboard, at first vague and animistic, but later on, as the definite deus-notion was developed, identified with certain of the other divinities of household or state religion.

Lar add

Genius.

To these numina of the sacred places must be added two other important conceptions, that of the Lar familiaris and the Genius. The Lar familiaris has been regarded 1 as the embodiment of all the family dead and his cult as a consummation of ancestor- worship, but a more probable explanation regards him as one of the Lares {q.v.; numina of the fields worshipped at the compita, the places where properties marched) who had special charge of the house or possibly of the household servants (familia) ; for it is significant that his worship was committed to the charge of the vilica. The Genius is originally the ” spirit of developed manhood,” the numen which is attached to every man and represents the sum total of his powers and faculties as the Juno does of the Woman: each individual worships his own Genius on his birthday, but the household-cult is concerned with the Genius oi the patet- familias. The established worship of the household then repre- sents the various members of the family and the central points of the domestic activity; but we find also in the Ordinary religious life of the family a more direct connexion with morality and a greater religious sense than in any other part of the Roman cult. The family meal is sanctified by the offering of a portion of the food to the household numina: the chief events in the individual life, birth, infancy, puberty, marriage, are all marked by religious ceremonial, in some cases of a distinctively primitive character. The dead, too, though it is doubtful whether in early times they were actually worshipped, at any rate have a religious commemoration as in some sense still members of the family.

The next stage in the logical development of the state religion should naturally be found in the worship of the gens, the aggregate of households belonging to one; clan, Agrl- but our information about the gentile worship is so cultural scanty and uncertain J that we cannot make practical w&fr use of it. It is more profitable to turn from the life of the household to the outdoor occupations of the- fields,

where the early Roman settler met with his neighbours to celebrate the various stages of the agricultural year in religious ceremonies which afterwards became the festivals of the state calendar. Here we have a series of celebrations representing the occupa- tions of the successive seasons, addressed sometimfes to numina who developed later on in,to the great gods of the state, such as Jupiter, Mars or Ceres, sometimes to vaguer divinities who: remained always indefinite and rustic in character, such aS Pales and Consus. Sometimes again, as in the case of the Lupercalia {q.v.), the attribution is so indefinite that it is hard to discover who was the special deity concerned; in other cases; such as those of the Robigalia and the Meditrinalia, the festival seems at first to have been addressed generally to any interested numina and only later to have developed an eponymous deity of its own. Roughly we may distinguish' three main divisions of the calendar year, the festivals of Spring, of the Harvest and of Winter, preserving on the whole their peculiar characteristics. (1) In the Spring (it must be remem- bered that the old Roman calendar began the year with March) we have ceremonials of anticipation and prayer for the crops to come: prominent among them are the Fordicidia, with its symbolic slaughter of pregnant cows, addressed to Tellus, the Cerealia, a prayer-service to Ceres for the corn-crop, and the most important of the rustic celebrations of lustration and propitiation, the Parilia, the festival of Pales. To these must be added the Ambarvalia {q.v.), the lustration of the fields, a movable feast (and therefpre not found in the calendars) addressed at first to Mars in his original agricultural character (see Mars). (2) Of the Harvest festivals the most significant are the twin celebrations on August 21st and 25th to the divinity- pair Consus and Ops, who are both concerned with the storing of the year's produce, and two mysterious vintage festivals, the Vinalia Rustica and the Meditrinalia, connected origin- ally with Jupiter. (3) The Winter festivals are less homo- geneous in character, but we may distinguish among them certain undoubtedly agricultural celebrations, the Saturnalia (at first connected with the sowing of the next year's crop, but afterwards overlaid with Greek ceremonial), and a curious repetition of the harvest festivals to Consus and Ops.

1 e.g. by De M'archi.

2 See, however, De Marchi, II Culto Privato di Roma Antica, vol. ii.

In passing to the religion of the state we are clearly entering on a later

period and a more developed form of society. The loose aggregation of agricultural households gives place rtlirloa. to l ˆ e organized community with new needs and new ideals, and at the same time in religious thought the old vague notion of the numen is almost universally superseded by the more definite conception of the deus — not even now quite anthropomorphic, but with a much more clearly realized personality. We find then two prominent notes of the state influence, firstly, the adaptation of the old ideas of the house- hold and agricultural cults to the broader needs of the com- munity, especially to the new necessities of internal justice between citizens and war against external enemies, and secondly the organization of more or less casual worship into something like a consistent system. Adaptation proceeds at first naturally enough on the lines of analogy. As Janus is in the household the numen of the door, so in the state he is the god associated with the great gate near the corner of the forum: the Penates have their analogy in the Di Penates populi Romani Quiritium by whom the magistrates take their oath on entering office, the Lax familiaris in the Lares Praestites of the community, and the Genius in the new notion of the Genius populi Romani or Genius urbis Romae. But the closest and most curious analogy is seen in the case of Vesta. The Vesta of the state is in fact the king's hearth, standing in close proximity to the Regia, the king's palace; the Vestal Virgins, who have charge of the sacred fire, are the " king's daughters," and as such even in republican times were in the manus of the pontifex maximus, who was the successor of the king on the legal side of his religious duties, as the rex sacrorum was on the sacrificial side. But adaptation meant also reflection and the widening of old con- ceptions under the influence of thought and even of abstract ideas. Thus, the simple reflection that the door is used for the double purpose of entrance and exit leads to the notion of the Janus of the state as bifrons (" two-faced "): the thought of the door as the first part of the house to which one comes, produces the more abstract idea of Janus as the " god of be- ginning," in which character he has special charge of the first beginnings of human life (Consevius) , the first hour of the day, the Calends of the month and the first month of the year in the later calendar: for the same reason his name takes the first place in the indigitamenta. But development proceeds also on broader and more important lines. Jupiter in the rustic- cult was a sky-god concerned mainly with the wine festivals and associated with the sacred oak on the Capitol. Now he develops a twofold character: as the receiver of the spolia opima he becomes associated with war, especially in the double character of the stayer of rout (Stator) and the giver of victory (Victor), in which last capacity he later gives birth to an off- shoot in the abstract conception of the goddess Victoria. As the sky-god again

he is appealed to as the witness of oaths in the special capacity of the Dius Fidius, producing once more an abstract offshoot in the goddess Fides. In these two con- ceptions, justice and war, he the germs of the later idea of Jupiter as the embodiment of the life of the Roman people both in their internal organization and in their external relations. In much the same manner Mars takes on in addition to his agricul- tural character the functions of war-god, which in time completely superseded the earlier idea. Finally, we must notice, as the sign of the synoecismus of the two settlements, the inclusion of the Colline deity, Quirinus, apparently the Mars of the originally rival community. In these three deities, Jupiter, Mars, Quirinus, we have the great triad of the earliest stage of the state religion. Organization showed itself in the fixing of the annual calendar and the development of the character and functions of the priesthood, and as we should expect, in a new conception of the legal relation of the gods to the state. In the earlier stage — whose notions of course still persist alongside of the state religion — each household has its own relations to its numina: now the state approaches the gods through its duly appointed repre- sentatives, the magistrates and priests. Their presence is typical of that of the whole people, and the private citizen is

required to do no more on festival days than a ceremonial ab- stinence from work. It is obvious that the state religion has a less direct connexion with morality and the religious sense than the worship of the household, but it has its ethical value in a sense of discipline and a consecration of the spirit of patriotism. The later stages represent not the spontaneous development of the genuine Roman religion, but its alteration and super- session by new cults and ideas introduced from foreign External sources. Authorities are generally agreed in recog- toflu- nizing three periods: — ;(i) from the end of the Regal « aces – epoch to the second Punic War, when Rome was influenced by other peoples in Italy, with whom she was brought into contact by commerce or war; (2) from the second Punic War to the end of the Republic, when contact with Greek and oriental sources and the growth of literature revolutionized religious notions and led to a philosophic scepticism; (3) the Imperial epoch, opening with a revival of old religious notions and later marked by the official worship of the deified emperors and the wide influence of oriental cults.

(1) By the end of the regal period Rome had ceased to be a mere agricultural community and had developed into a city-state. There had consequently grown up within the state a large artisan class, excluded from the old patrician ‘gentes and therefore from the state cult : at the same time the beginnings of commerce had opened relations with

neighbouring peoples. The consequence was the introduction of certain new deities, the di novensides, from external sources, and the birth of new conceptions of the gods and their worship. We may distinguish three main influences, to a certain extent historically successive, (a) Tradition always assigned to the last three kings of Rome a connexion with the mysterious people of Etruria, and their influence at this period though not very definite was certainly extensive. To them, possibly • o truri – through the mediation of Falerii, a Latin town on the Etruscan border, was due the introduction of Minerva, who, as the goddess of handicraft and protectress of the artisan gilds, was established in a temple on the Aventine. Soon, however, she found her way on to the Capitol, and there a new Etruscan triad, Jupiter, Juno and Minerva, possibly going back from Etruria to Greece, was enshrined in a magnificent new temple built by Etruscan workmen and decorated in the Etruscan manner. In this temple the deities were represented by images, and on its dedication day, September 13th, at the novel festival of the epulum Jovis, the images were adorned and set out as partakers of the feast, a proceeding wholly foreign . to the native Roman religion (see further Etruria, § Religion), (b) Secondly, in war and peace Rome formed relations with her neighbours of Latium, and, as a sign of the Latin league which resulted, the cult of Diana was brought from Aricia and established on the Aventine in the ” commune Latinorum . .. Dianae templum ” (Varro, Ling. Lat. v. 43): about the “*””

same time was built the temple of Jupiter Latiaris on the Alban mount, its resemblance in style to the new Capitoline temple pointing to Rome’s hegemony. So great was Rome’s sense of kinship to the Latins that in two cases Latin cults were introduced inside the pomoerium: the worship of Hercules, which came from Tibur in connexion with commerce, was established at the ara maxima in the forum boarium, and the Tusculan cult of Castor as the patron of cavalry found a home close to the forum Romanum : it is a strange irony that both these deities should in reality have been in their origin Greek. Other Italian cults introduced at this period were those of Juno Sospes and Juno Regina, Venus and Fortuna Primigenia, a goddess of childbirth who came from Praeneste. (c) Later on in the same period contact with the cities of Magna Graecia brought about the wide-reaching introduction of the Sibylline books. Whatever may be their origin — and they came from Cumae — they were placed in the Capitoline temple under the care of a „ special commission of two {duoviri sacris faciundis, later nraecle decemviri and quindecimviri) , and their “•■ oracles,” which were referred to in times of great national stress, recommended the introduction of foreign cults. In 493

B.C., at a time of serious famine, they ordered the building of a temple to the Greek triad Demeter, Dionysus and Persephone, who were identified with the old Roman divinities Ceres, Liber and Libera: Apollo must have come with or before the books themselves, though his temple was not built till 433 B.C.: Mercury followed, the representative of ‘Epjurjs ‘EixiroXatos, Asclepius was brought from Epidaurus to the Tiber island in 293 B.C., and Dis and Proserpina, with their strange chthonic associations and night ritual, probably from Tarentum in 249 B.C. With new deities came new modes of worship: the graecus ritus, in which, contrary to Roman usage, the worshipper’s head was unveiled, and the lectisternium (q.v.), an elaborate form of the ” banquet of the gods.” In this period, then, we find first a legitimate extension of cults corresponding to the needs of the growing community, and secondly a religious restlessness and a consequent tendency to more dramatic forms of worship.

(2) The two chief notes of the next period are superstition and scepticism : both the populace and the educated classes lose faith Qf^ek in the old religion, but they supply its place in different

deities ways. The disasters of the early part of the second Punic War revealed an unparalleled religious nervousness : portents and prodigies were announced from all quarters, it was felt that the divine anger was on the state, yet there was no belief in the efficacy of the old methods for restoring the pax deum. Accordingly recourse is had, under the direction of the Sibylline books, to new forms of appeal for the divine help, the general vowing of the ver sacrum and the elaborate Greek lectistemium after Trasimene in 217 B.C., and the human sacrifice in the forum after Cannae in the following year. The same spirit continues to show itself in the almost reckless introduction of Greek deities even within the walls of the pomoerium and their ready identification with gods of the old religion, whose cult they in reality superseded. Thus we hear of temples dedicated to Juventas = Hebe (191 B.C.), Diana = Artemis (179 B.C.), Mars = Ares (138 B.C.), and find even such unexpected identifications as that of the Bona Dea (q.v.) — a cult title of the ancient Fauna, the female counterpart of the countryside numen Faunus^vfith a Greek goddess of women, Damia. At the same time the new acquaintance with Greek art introduces the making of cult statues, in which the identified Greek type is usually adopted without change, with such curious results as the representation of the Penates under the form of the

Dioscuri. But more significant still was the order of the Sibylline books in 206 B.C. for the introduction of the worship of the Magna Mater(see Great Mother of the Gods) from Pessinus and her ultimate installation on the Palatine in 191 B.C. : the door was thus opened to the wilder and more orgiastic cults of Greece and the Orient, which at once laid hold on the popular mind. In the train of the Magna Mater came the secret Oriental cu ‘ t °^ Bacchus, which grew to such proportions in deities. private worship that it had to be suppressed by decree of the Senate in 186 B.C., and later on were established the cults of Ma of Phrygia, introduced by Sulla and identified with Bellona, the Egyptian Isis, and, after Pompey’s war with the pirates, even the Persian Mithras {q.v.). In all these more emotional rituals, the populace sought expression for the religious emotions which were not satisfied by the cold worship of the older deities.

Meanwhile a corresponding change was taking place in the attitude of the educated classes owing to the spread of Greek literature. The knowledge of Greek mythology, to which they were thus introduced, set poets and antiquarians at work in a field wholly foreign to the Roman religious spirit, the task of creating a Roman anthropomorphic mythology. This they accomplished partly by the popular process of adoption and identification, partly by imi- tative creation. In this way grew up the ” religion of the poets,” whose falseness and shallowness was patent even to contemporary thinkers. But more important was the influence of philosophy, which led soon enough to a general scepticism among the upper classes. Its first note is struck by Ennius in his translation of the Sceptl- Sicilian rationalist Euhemerus, who explained the genesis clsm. °f tne &°d s as apotheosized mortals. In the last century

of the Republic the two later Greek schools of Epicurean- ism and Stoicism laid hold on Roman society. The influence of Epicureanism was wholly destructive to religion, but not perhaps very widespread : Stoicism became the creed of the educated classes and produced several attempts, notably those of Scaevola and Varro, at a reconciliation of philosophy and popular religion, in which it was maintained that the latter was in itself untrue, but a presentation of a higher truth suited to the capacity of the popular mind. Such a theory was bound to be fatal, as it makes religion at once a mere instrument of statecraft.

The result on the old religion was twofold. On the one hand, worship passed into formalism and formalism into disuse. Some of the old cults passed away altogether, others survived in name and form, but were so wholly devoid of inner meaning that even the learning of a Varro

could not tell their intention or the character of the deity with whom they were concerned. The old priesthood, and in particular the flaminia, came to be regarded as tiresome restric- tions on political life and were neglected : from 87 to 1 1 B.C. the office of flamen Dialis was vacant. On the other hand, as the result in part of the theory of Stoicism, religion passed into the hands of the politicians : cults were encouraged or suppressed from political motives, the membership of the colleges of pontifices and augurs, now conferred by popular vote, was sought for its social and political advantages, and augury was debased till it became the meanest tool of the politician. In the general wreck of the old religion, little survived but the household cult, protected by its own genuineness and vitality.

(3) The revival of Augustus, which marks the opening of the last stage, was perhaps the most remarkable phenomenon in the whole story. It was no doubt very largely political, a part of his plan for the general renaissance of Roman life, which was to centre no longer Tound the abstract notion of the state, but round the persons Imperial °f an imperial house. But it was genuinely religious, in religion. tnat ne sav! tnat n0 revival could be effective which did not appeal to the deeper sentiments of the populace. It was thus his business to revitalize the old forms with a new and

more vigorous content. His new palace on the Palatine he intended to be primarily the seat of the Julian family and the cults associated with it, and secondarily the centre of the new popular religion. With this object he consecrated there his new temple of Apollo (28 B.C.), associated for long with the Julianhouse, and adopted by Augustus as his special patron at Actium, and transferred to its keeping the Sibylline books, thus marking the new headquarters of the Graeco-Roman religion. Similar in purpose was his institution of the ludi saeculares in 17 B.C., in which a day celebration was added to the old icavvvxU, and Apollo and Diana deliberately set up as a counterpart to the Capitoline Jupiter and Juno: Horace's hymn written for the festival is a good epitome of Augustus's religious intentions. In the same spirit he established a new shrine of Vesta Augusta within the palace, a private cult at first, but destined to be a serious rival of the ancient worship in the forum. A still more marked action was the building of a great temple at the end of his own new forum to Mars Ultor, — Mars, the ancestor of the Julian gens, as of the Roman people itself, and now to be worshipped as the avenger of Caesar's murderers. Nor did he hesitate to avail himself of the popular outburst, which immediately after the murder had consecrated the site of Caesar's cremation with a bustum, to erect on the spot a permanent temple to his adopted father, under the definitely religious title of divus Julius.

No doubt he also did much generally to revive the ancient cults: he rebuilt, as he tells us himself, eighty-two temples which had fallen into disrepair, he re-established the old priesthoods, filling once more the office of flamen Dialis and reviving such bodies as the Sodales Titii (see Titus Tatius) and the Arval Brothers (q.v.); but the new revival attached itself primarily to these four cults, and their tendency was unmistakable. Originally, no doubt, Augustus designed to attract religious feeling generally to the reigning house, but it was inevitable that the more personal note should be given to it. The deification of Julius Caesar was one important step: another was the natural prominence in the palace of the cult of the Genius of the emperor himself. As the palace cults became national, the worship of the Genius was bound to spread, and ultimately Augustus sanctioned its celebration 'at the compita together with the worship of the old Lares. But here he and the wiser of his successors drew the line, and though under oriental influence divine honours were paid to the living emperor outside Italy, they were never permitted officially in Rome. In the succeeding centuries Augustus's intentions were realized with a fullness which he would hardly have wished, and the cult of the imperial house practically superseded the state religion as the official form of worship.

With this last period the story of Roman religion really draws to a close. For, though the form of the old cults was long preserved and even Antoninus Pius was honoured in an in- scription, for his care of the ancient rites of religion, the vital spirit was almost gone. In the popular mind the hosts of exciting oriental cults, which in the 3rd and 4th centuries of the Empire filled Rome with the rites of mysticism and initia- tion, held undisputed sway; and with the more educated a revived philosophy, less accurate perhaps in thought, but more satisfying to the religious conscience, gave men a clearer monotheistic conception, and a notion of individual relations with the divine in prayer and even pf consecration. It was with these elements — fiercely antagonistic because so closely allied in character — that the battle of Christianity: was really fought, and though, after its official adoption, the old religion lingered on as " paganism " and died hard at the end, it was really doomed from the moment when the Augustan revival had taken its irrecoverable bias in the direction of the emperor- worship.

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ROMANS, a town of south-eastern France, in the department of Dr6me, 12J m. N.E. of Valence on the railway to Grenoble. Pop. (1906) town, 13,304; commune, 17,622. Romans stands on an eminence on the right bank of the Isere, a fine stone

bridge uniting it with Bourg-de-Peage (pop. 4668) on the other side of the river. Both towns owe their prosperity to their situa- tion in the most fertile part of the valley of the Isere. The present parish church belonged to an abbey founded in 837 by St Bernard, bishop of Vienne. The principal portal is a fine specimen of 12th-century Romanesque, and the lower part of the nave is of the same period; the choir and the transept are striking examples of the style of the 13th century.

Romans has a tribunal of commerce and a communal college. Its industries include tanning, leather-dressing and shoe-making, silk-spinning, hat-making, absinthe-distilling and oil-refining. There is trade in walnuts, walnut-oil, silk, cattle, &c.

ROMANS, EPISTLE TO THE. In this book of the New Testament, the apostle Paul begins, after a brief pregnant introduction (i. 1-7), by explaining that he had hitherto been prevented from carrying out his cherished project of visiting the church of Rome, whose faith was world-wide (i. 8 f.). Mean- while, he outlines the gospel which he preached as an exhibition of God's righteousness, «k irioTecos els irlariv. This forms the leading theme of the epistle. ■ ■ •

Both Gentile (i. 18-32) and Jew (ii. I, iii. 20) 1 alike have missed this righteousness up till now, but the revelation of God in Jesus Christ (iii. 21-31) had brought the divine boon within reach of all. The condition of its reception was not. nationality but faith. Hence, as Paul stops for a moment to argue (iv. 1-25), the Jew cannot claim any preference;

Abraham himself, before circumcision and the law came into force, was a man of faith, and consequently all believers (not all legal Jews, iv. 16) are true descendants of Abraham. 2 Returning to the blissful results of this Swaioavvr) revealed in Jesus Christ (v. i-ii), Paul proceeds to contrast these with the sombre effects produced in humanity by the fall of Adam. Life had now triumphed over death, grace over sin (v. 12 f.). But the super- session of the law, which was bound up with the regime of sin and death, does not mean the relaxation of the morˆl bond. On the contrary (vi. 1 f.), the reception of God's grace and spirit implies the death of the believing man to sin. The struggle of the soul 3 between the thwarting power of sin and the ethical demands of the law (vii. I f.) cannot be ended happily save by the interposition of Jesus Christ, whose Spirit guarantees a sound life in this world and life eternal in the world to come (viii. 12 f.).

The splendid and unfettered 4 prospects of faith, which thus break on the apostle's vision, only serve to deepen his distress in one direction. 5 As a theologian and as a patriot, he is confronted with the problem of Israel's collective repudiation of a boon to which their own history, as he read it, clearly pointed. Reverting to the thought of ii. 17 f. and iv. I, Paul now essays, in ix.-xi., to show how this unbelief of Israel is to be reconciled with the justice and the promises of God. He begins by showing, as in Gal. iv. 7 f. (cf. Rom. ii. 28-29), that mere physical descent could not entitle a Jew to the promises. Besides (ix. 14-29), no Jew has the right to challenge God's sovereign freedom. If God determines to extend the promise of faith to the Gentiles, who shall accuse Him of injustice? The rejection of the Jews is their own fault, due to their obstinacy and legalism (ix. 30-x. 21). Finally, Paul tries to see this fact of Israel's unbelief in the light of a wide religious philosophy of history ; it (xi. 1-10) cannot be anything but a temporary 1 and partial (xi. 11-24) 6 phase; the future will clear up the present; the final

1 On iii. cf. G. W. Matthias's Exegetischer Versuch (Cassel, 1857).

2 " Paul here unconsciously changes the conception of law. By introducing the example of Abraham he shows that the book of the law contains the doctrine of justification by faith, and through the latter, therefore, is not made of none effect. This proof rests, objectively regarded, on a fallacy; for the law, of which the validity is threatened by the doctrine of justification, is that part of the book of the law which demands the observance of all commands, not that which relates anything about Abraham. But this error of thought would be easily concealed from a mind with the rabbinical training of Paul's" (Schmiedel, in Hibbert Journal, 1902, pp. 548-

549)-

3 Cf. Engel's exhaustive monograph, Der Kampf um Rbmer vii. (1902), and, for the ideas of i.-viii., Du Bose's The Gospel accbrding to St Paul (1907), and Titius, Der Paulinismus (1900), pp. 159 ff.

4 The word all, as Matthew Arnold observes (St Paul and Protest-antism, ch. i.), is " in some sense the governing word of the Epistle to the Romans."

6 As arranged in the canonical edition, ix.-xi. are closely interwoven with i.-viii., and xi. 32-36 concludes not simply ix.-xi. but i.-xi. (cf. Buhl in Studien und Kritiken, 1887, 295-320). Certainly what Paul has in mind throughout the epistle is not a Judaizing tendency among the Jewish Christians at Rome, but the general and perplexing question of Judaism in relation to the new faith. Cf. Hoennicke's Das Judenchristentum (1908), pp. 160 f.

- In this passage Paul has generally been held to have erred

result will be the inclusion of all Israel in the heritage of the messianic kingdom of Christ. The, prospect of this consummation stirs him to an outburst of adoration, with which the whole section ends (xi. 33-36).'

Applying the thought of God's mercy to the obligations of believing men (xii. 1-2), Paul proceeds now to sketch, the ethical duties of Christians in the church (xii. 3-21), in society, and in the state (xiii. 1-7); love is the supreme law (xiii. 8-10), and the nearness of the end the supreme thotive to morality (xiii. 11-14). These considerations are still before Paul's mind' as he descends from general counsels to a special problem of practical ethics, raised by the varying attitude of Christians at Rome towards food offered to idols_ (xiv. I f.). After laying down the principle of individual responsibility, he appeals for charity and mutual consideration (xiv. 13-xv. 6),. and for Christian forbearance. 8 Finally, he exhorts all, Gentile and Jewish Christians alike (xv. 8-13),' to unite in thanksgiving for God's mercy to them in Christ.

In a brief epilogue, the apostle justifies himself for having thiis addressed the Roman Christians. He alleges (xv. 14 f.) his apostolic vocation and informs them of his future movements. With ah appeal for their prayers and a brief benediction, the epistle then closes (xv. 30-33). _ It ends as it began (i. 8 f.) with the apostle's hope and plan of visiting Rome ori a subsequent missionary tour. 9

Rom. xvi. contains a separate note (1-23), together with a doxology

(25-27). The former came from Paul's pen, but it did not belong originally to this epist}e« 10 In all likelihood it is a letter of commendation for pˆbuLs. Phoebe 11 which includes vers. 1-23 (so e.g. Weizsacker, McGiffert and Jiilicher), though most break it off at ver. 20 (so Eichhorn, Ewald, Schulz, Renan, Weiss, Lipsius, von Soden, &c), while others do not begin it until ver. 3 (so -e.g. Ewald, Schurer, Reuss and Mangold: Der Romerbrief, pp. 136 f.). Vers. 21-23 might indeed follow xv. 33, but it is not, Paul's way to add salutations after a final Amen, and the passage connects as well with xvi. 20, though it may have lain, originally (Jiilicher) between 16 and 17. The main reasons n for conjecturing that this section was addressed separately, not to Rome but to a city like Ephesus, lie in its contents. Paul was as yet a stranger to Romej and it is extremely difficult to suppose that he already knew so many individuals there. The earlier tone of Romans shows that he was writing as a comparative stranger to strangers. Any touches of familiarity with the local circumstances (as in xiv.-xv.) are no more than might have percolated to him through hearing and

botanically in his allegory. For a defence of his accuracy, see W. M. Ramsay's Pauline and other Studies (1907), 219 f.

' On the method of dialectic in this section, see Bishop Gore's paper in Studia Biblica (vol. iii.). The literature up to 1907 is summarized in H. J. Holtzmann's Neutest. Theologie, ii. pp. 171 f., one of the most significant essays being that of Beyschlag on Die paulin. Theodicee (1868). Wernle (Beginnings of Christianity, i. pp. 3i5_f.) sums up his discussion by pointing out that " the Jesus of history is simply non-existent for St Paul when he treats apologetic problems of this nature. No mention whatever is made of him in the three chapters of Romans which, treat of Israel's fate. The literal text of the Septuagint seems to be the only decisive authority, and_ that is so sacred and almighty, that, whenever it comes into collision with the human conscience, the latter is silenced when the voice of revelation speaks."

8 The weaker minority probably were a Jewish-Christian circle (cf. Riggenbach in Studien und Kritiken, 1893, pp. 649-678). For the religious aspect of vegetarianism in these and other circles, see von Dobschiitz's Christian Life in the Primitive Church (1904), pp. ˆsf., 396 f. '

•'"It was a sufficient reason for writing to the Romans that Paul was expecting to visit them, but was obliged one; more to postpone an event to which he had long looked forward. There was nothing in the circumstances of the church that required his intervention, and, as he was therefore free to choose his subject, he wrote out of the fullness of

his heart that grand defence of the gospel which, though shaped by the conditions of the times, is ani- mated by the timeless Spirit, and has proved to be a possession for ever ” (Drummond, p. 246).

10 For the literature, cf. the present writer’s Historical New Testa- ment (1901), pp. 209-213. The hypothesis has won very wide acceptance, but several editors and critics (including Harnack, Zahn. and Clemen) remain unconvinced. Cf. also Wabnitz in Revue de theologie et des quest, religieuses (1900), 461-469.

11 On her functions, see Zscharnack’s der Dienst der Frau in den ersten Jahrhunderten der christlichen Kirche (1902), pp. 45 f.

12 Cf. Lucht [fiber die beiden letzten Kapitel des Romerbrief es- 1871. pp. 126 f.), with Weizsacker’s brilliant pages in his Apostolic Age, i- PP- 3^9 f-)-

report; they do not imply the presence of friends upon the spot who kept him supplied with information. On the other hand, the circle of people addressed in xvi. 1-23, with its wealth of individual colour and personal detail, presupposes a sphere where Paul had worked for long. He can appeal to these Christians. He can speak sharply with authority to them. Now, as he wrote from Corinth, the only other city which answers to this description is Ephesus, the centre of Paul’s long Asiatic mission. With that city and district several of the names in xvi. 1-23 are more or less directly connected, e.g. Epaenetus (5), Aquila and Priscilla (3), who were at Ephesus immediately before Romans was written (Acts xviii. 18, 26; cf.

1 Cor. xvi. 19), and apparently were there (cf. 2 Tim. iv. 19) not long afterwards. These are the first people mentioned in the note, nor is there any likelihood that they or the rest of Paul’s friends ‘ had made a sudden migration to the capital. Doubt- less, there was fairly constant communication between Rome and the provinces, and in the course of time these friends may have gradually followed the apostle thither. Hence it is not remarkable that almost all the names mentioned in this note have been found by archaeologists (cf. Lightfoot’s Philippians, pp. 171 f.) within the Roman Corpus Inscriptionum. Most of them, anyhow, are fairly common throughout the Roman world (cf. Lietzmann, p. 73), whilst half are to be found in the Greek Corpus Inscriptionum for Asia Minor {e.g. Epaenetus, Hermes, Hermas). 2

Furthermore, the sharp warning against errorists and heretics (xvi. 17-20) suits Rome at this period much less aptly than Ephesus (cf. 1 Cor. xvi. 8-9; Acts xx. 29 f.; Rev. ii.

2 f.), where trouble of this kind was in the air. Controversy against false teachers is conspicuously absent from Romans. Nor is it possible to regard (with Zahn) such counsels as merely prophylactic; they are too definite and pointed. They imply the existence of a community with which Paul was personally acquainted, and to which he felt himself bound and free to address keen, authoritative reproaches.

The textual phenomena of the doxology (xvi. 25-27), which occurs in some MSS. after xiv. 23, are sufficiently strange; they suggest that the epistle must have passed through a certain process of editing, during the 2nd century, previous to its final incorporation in the canon of the epistles. 3 It may further be conjectured that the epistle does not lie before the modern reader in the precise shape in which it left Paul and his amanuensis at Corinth. Opinions, indeed, vary on the doxology. Either it is authentic but irrelevant, added by Paul as a post- script, or it is unauthentic, 4 due to some copyist who added it as

1 Erbes {Zeitschrift fiir Kirchengeschichte , 1901, 224-231) makes xvi. i-i6a a note forwarded by Paul to Rome during his last voyage thither, in order to advise some of the local Christians of his arrival (Acts xxviii. 15), but this theory is no improvement upon that of Semler, who regarded xvi. 3-16 as designed for Paul's friends outside Rome, to introduce the bearers of the larger epistle. The point of such hypotheses is to explain how the note came to be attached to Romans, but this can be shown otherwise (cf. Deissmann's Licht vom Osten, 1908, pp. 164, 201). Eichhorn (Einleit. in das N.T. iii. 243 f.) regarded xvi. 1-20 as addressed to Corinth, while Schenkel viewed it as designed for all the churches which Phoebe was to visit.

2 In the Ephesian Acta Johannis (c. a.d. 160) the house of Andronicus (Rom. xvi. 7 ?) is one centre of Christian activity. E. H. Gifford (pp. 27-30) evades the difficulty by taking xvi. 3-20 as part of a second letter written by Paul after, not before, his release from imprisonment.

3 The most recent and radical analyses are those of Spitta {Urchristentum, iii. 1902) and Volter (Paulus u. seine Briefe, 1905). The former detects a short letter written (xii.-xv. 7, xvi. 1-20) after Acts xxviii. 30, during a tour of the Gentile churches (A. D. 63-64), and another (i.-xi. io, xv. 14-33) written to believing Jews in order to justify the Gentile mission and afterwards edited for Gentile readers with the addition of xi. 1 1 f ., xv. 8-13, &c, Volter (pp. 135 f .)

distinguishes an original letter (in i. I, 56-7, 8-17, v. 1-12, 15-19, 21, vi. 1-13, 16-23, xii.-xv. 6, xv. 14-16, 236-33, xvi. 21-24) from editorial additions, and also from still later accretions in ii. 14-15, iii. 23-26, vii. 256, xi. 1 1 f., xv. 7-13, 17-230, xvi. 17 f., 25 f. Spitta's views are properly set aside by Feine and Bahnsen {Protest. Monat- shefte, 1902, 331 f.) amongst others.

4 It suggests a stereotyped form (cf. Mangold, Der Romerbrief, 44-81, and Holtzmann, Ephes. Col. Brief, 307-310). "In spite of the vindication of the style word by word, the impression it bears upon the mind is hardly Pauline. It seems artificial rather than

a suitable finale at the close. In the Pauline canon Romans originally occupied the last place. It would therefore be natural that a note like that of xvi. 1-23 should be put in here, especially if this canon was drawn up at Rome, whither Phoebe probably travelled eventually. The doxology would then be shifted from after xiv. 23 or inserted for the first time for ecclesi- astical purposes. The material conditions of such a process are lucidly stated by Dr C. R. Gregory in his Canon and Text of the New Testament (1907), pp. 319 f.

The problems presented by the structure of these chapters 6 cannot be solved adequately by the mere hypothesis, worked out variously by critics like Paulus, Griesbach {Curarum in historiam textus Graeci epistolarum Pauli spec. i. pp. 45 f.), Eichhorn and Flatt, that they are a series of postscripts or afterthoughts, much less by the conjecture that, in whole or in part, they are unauthentic (Baur, Volkmar, &c). The only tenable line of argument, in the present state of criticism, is to regard their phenomena as due to compilation, at the time when the canon (perhaps of Paul's epistles) was first formed. If the hypothesis already outlined is set aside, it is open to the critic to regard large portions of the canonical Romans as having originally occupied a separate setting, or to ascribe the textual variations to the exigencies of church reading after the formation of the canon (which might explain the absence of kv Twjug in i. 7, 15, and the duplicate position of the doxology). 7

The uncertainty as to the literary structure of the epistle naturally renders it hazardous to infer the character of the Christians who are addressed, but it may be said that the results of the long debate on this point are converging upon the belief that the predominant class in the local church or churches were Gentile Christians, while proselytes must have swelled the ranks to no inconsiderable degree. Since Weiz- sacker wrote, the older view of Baur (cf. his Paul, Eng. tr. i. pp. 321 f.) has steadily lost ground. Zahn is now its main supporter, and his

contentions are not convincing. Even were ix.-xi. taken as the kernel of the epistle, its obvious motive is to be found in the need of explaining to Gentile Christians the reasons for Israel's apparent rejection, and passages like i. 5 f., 13, xi. 13, xv. 15 f., are, if not decisive, at any rate superior to any references which can be urged fairly on the opposite side. To a church of this kind, in the capital of the Empire, Paul writes out his gospel more fully than in any other of his extant epistles. It is the essence of the gospel that he treats, and that is the revelation of God's righteousness to man by faith in Jesus Christ. Neither sacraments nor organization come within his purview. Even eschatology lies quite in the background. Paul writes of the

inspired " (Denney, p. 582). Proofs of its Pauline authorship are led fully by Zahn {Einleitung in das N.T. § 21 f.) and Jacquier {Histoire des livres du N.T., 1903, pp. 271 f.) ; cf. also Bacon in Journal of Biblical Literature (1899), pp. 184 f. The entire data of xv.-xvi. are discussed fully by Lightfoot and Hort, in the former's Biblical Essays (pp. 287 f.) and in the latter's admirable volume {Romans and EpKesians), as well as in Sanday and Headlam's edition (pp. lxxxv. f.).

6 Ryder {Journal of Biblical Literature, 1898, pp. 184 f.) suggests that xv.-xvi. 24 form a letter or part of a letter written not by Paul but by his amanuensis, Tertius, to his friends at Rome, c. A.D. 64, previous to the Neronic persecution.

6 So J. Weiss (in Theologische Studien, 1897, pp. 182 f.), as well as those who, like Renan {S. Paul, lxiii-lxxv), find different editions in the canonical epistle, one meant for Thessalonica (i.-xiv. 33, xvi. 25-27), one for Ephesus (i.-xiv., xvi. 1-20) and one for Rome (i.-xi., xv.), or who, like Lightfoot {Biblical Essays), see a double recension, the original draft having been meant for Rome (i.-xvi. 23), the later being, like Ephesians, a circular epistle.

7 The epistle was so systematic in treatment and wide in scope that it lent itself readily to this "catholicizing" manipulation; thus the fact that xv.-xvi. are very rarely quoted in primitive tradition may be due to their fullness of local detail, which would have less interest for the later church. But the question of course arises, May not the epistle, in whole or in part, have originally been more of a treatise in epistolary form than at first sight appears? For various suggestions as to the problem of i. 7 see Harnack in Zeitschrift fiir die neutest. Wissenschaft (1902), 83-86; R. Steinmetz {ibid., 1908, 177 f.) ; and Schmiedel in Hibbert Journal (1903), pp. 537 f.

heart of the gospel with all his heart, and while a certain controversial 1 element inevitably enters into his exposition— since he is writing with his eye on the Roman Church — any such considerations are quite subordinate to his dominating aim.

The epistle dates itself. Paul is on his way to Jerusalem with the moneys collected from the Macedonian and Achaian churches (xv. 19-32), and, after his visit to the Jewish capital, he proposes to visit the church of Rome en route for a mission in Spain. The situation corresponds to that outlined in Acts xx. 2-3. Paul probably despatched the epistle from Corinth. This conclusion would be put almost beyond doubt were Rom. xvi. regarded as an integral part of the original epistle, since in that case Timothy and Sosipater (xvi. 21) would be with Paul as in Acts xx. 4, like Gaius (xvi. 23) and Erastus, both of whom were Corinthians (1 Cor. i. 14; 2 Tim. iv. 20). Phoebe of Cenchreae, the seaport of Corinth, would also be the bearer of the epistle (xvi. 1). But even apart from the evidence of ch. xvi., the tone of the epistle (especially of xv. 19 f.) indicates that Paul regards his work in the eastern provinces as done, and now turns to the West. It is just possible, of course, that the epistle was written from some other town, perhaps in Illyricum (so H. E. G. Paulus), but the facilities of communication point to Corinth. 2

Literature. — The ablest recent editions of the Greek text have been those of B. Weiss (in Meyer's commentary, 9th ed. 1899, thorough and all-round), R. A. Lipsius (Hand-Commentar, 2nd ed. 1892), H. Oltramare (Paris, 1881-82), Sanday and Headlam (Internal. Crit. Comm. 5th ed. 1905, strong in philology and external criticism), and Denney (Expositor's Greek Testament, 1901, a masterpiece of theological exposition), to which the Roman Catholic commentaries of A. Schafer (Munster, 1891) and Comely (Paris, 1896) may be added. The patristic and medieval literature is summarized by Sanday and Headlam (op. cit. pp. xcviii. f.), and a conspectus of the vast later work may be found in W. P. Dickson's translation of Meyer (Edinburgh, 1873-74). The editions of Tholuck (1842), Moses Stuart (3rd ed. 1876), Godet (1879-80, Eng. trans. 1888), E. H. Gifford (Speaker's Commentary, 1881) and Philippi (4th ed. Frankfort, 1896) are of special theo- logical value, Godet's for its delicate exegesis and Gifford's for its ade- quacy of treatment; so, from its own point of view, is F. Delitzsch's Brief an die Romer aus dem griech. Urtext in das Hebraische iibersetzt, und aus Talmud und Midrasch erlautert (1870); with which may be classed the earlier works of Reiche (Versuch einer ausfiihrl. Erkldrung, &c , 1833-34) a "d C. F. A. Fritzsche (1836-43).

Since Dean Alford (1852), the freshest English editors have been Dr David Brown (Glasgow, i860), Moule (Cambridge Bible, 1879), C. J. Vaughan (7th ed. 1890), B. Jowett (3rd ed. 1894), J. Agar Beet (9th ed. 1901) and Garvie (Century Bible, 1901). Jiilicher's notes in Die Schriften des N T. (1907), though written from a different standpoint, resemble Denney's in their conciseness and penetration. Lietz- mann's edition, again, is slight and philological (Handbuch zum Neuen Testament, 1907). Lightfoot's posthumous fragment (Notes on Epistles of St Paul, 1895, pp. 237-305) unfortunately breaks off at vii. 25. In addition to the special monographs already noted in the course of this article, the essays of H. E. G. Paulus (De originibus Pauli epist. ad Rom., Jena, 1801), Lorenz (Der Romerbnef, 1884), Grafe (Uber Veranlassung und Zweck des R., 1881), G. B. Stevens (The Pauline Theology, 1894), Feine (Der Romerbrief, 1903) and A. Robertson (Hastings' Diet, of Bible, iv. 295-306) may be specially mentioned out of a large crowd, together with G. Semeria's monograph, // pensiero di S. Paolo nella lettera ai Romani (Rome, 1903). Holsten's position is stated in a series of articles in the Jahrbuch fiir protest. Theologie (1879), pp. 95 f., 314 f., 680 f., Pfleiderer's in Das Urchristentum (2nd ed. i. 149 f., Eng. tr. Primitive Christianity, i. pp. 211 f.) and Hilgenfeld's in his own Zeitschrift fur die wissensch. Theologie (1892), pp. 296-347. The recent literary and historical discussions are chronicled in C. Clemen's Paulus, i. 85 f., ii. 238 f., with which the English reader may compare R. J. Knowling's The Testimony of St Paul to Christ (1905), pp. 60 f.,

1 Not, however, in the sections bearing on the Law. " It has been customary to explain this feature of the epistle by the fact of its having been written to a church with which Paul had no personal relations, and this may count for something. But there is a deeper and a worthier reason for the contrast in tone between this epistle and those written to the Galatian and Corinthian churches. The whole~ situation is changed. Then Paul was fighting for existence with his back to the wall ; now he writes as one conscious that the cause of Gentile Christianity is safe " (A. B. Bruce, St Paul's Conception of Christianity, 1894, p. 96).

- This is carefully worked out by Paley in his Horae Paulinae (ed. Birks, 1825), pp. 8 f.

311 f., 465 f. On Marcion's text of the epistle cf. Zahn'a Geschichte des N,T. Kanons, ii. pp. 515-521; on the early reception of the epistle in the church, Gregory's Canon and Text of the N.T. (1907), pp. 192 f., and Leipoldt's Geschichte des neut. Kanons (1907), i. pp. 77 f., 188 f., 192 f., 209 f. (J. Ml.)

ROMANSHORN, an important commercial town in the Swiss canton of Thurgau. It is situated on the west shore of the lake of Constance, and by rail is 51 j m. N.E. of Zurich, 125 m. S.E. of Constance, and 10 m. N.W. of Rorschach. In 1900 its population was 4577, mostly German-speaking, while there were 3093 Protestants to 1478 Romanists. Originally a small fishing village, it belonged to the abbot of St Gall from 1432 to 1798, when it became part of the canton of Thurgau. In 1856 the railway from Romanshorn to Zurich was opened, and this vastly increased the commercial import- ance of Romanshorn. Nowadays it is the centre of a great transit trade, as it communicates, by means of the lake, with the principal towns on its shores. The corn trade and that in timber are among the most important, while there are many industrial establishments. It is essentially a modern commercial centre.

ROMANUS, the name of four East Roman emperors.

Romanus I. (Lecapenus), who shared the imperial throne with Constantine VII. (q.v.) and exercised all the real power from 919 to 944, was admiral of the Byzantine fleet on the Danube when, hearing of the defeat of the army at Achelous (917), he resolved to sail for Constantinople. After the marriage of his daughter Helena to Constantine he was first proclaimed ” basileopater ” in 919 and soon after crowned colleague of his son-in-law. His reign, which was uneventful, except for an attempt to check the accumulation of landed property, was terminated by his own sons, Stephen and Constantine, who in 944 carried him off to the island of Prote and compelled him to become a monk. He died in 948.

Romanus II. succeeded his father Constantine VII. in 959 at the age of twenty-one, and died — poisoned, it was believed, by his wife, Theophano — in 963. He was a pleasure-loving sovereign, but showed judgment in the selection of his ministers. The great event of his reign was the conquest of Crete by Nicephorus Phocas.

Romanus III. (Argyrus), emperor 1028-1034, was an un- distinguished Byzantine patrician, who was compelled by the dying emperor Constantine IX. to marry his daughter Zoe and to become his successor. He showed great eagerness to make his mark as a ruler, but was mostly unfortunate in his enterprises. He spent large sums upon new buildings and in endowing the monks, and in his endeavour to relieve the pressure of taxation disorganized the finances of the state. In 1030 he ; resolved to retaliate upon the incursions of the Moslems on the eastern frontier by leading a large army in person against Aleppo, but by allowing himself to be surprised on the march sustained a serious defeat at Azaz near Antioch. Though this disaster was retrieved by the successful defence of Edessa by George Maniakes and by the defeat of a Saracen fleet in the Adriatic, Romanus never recovered his popularity. His early death was supposed to have been due to poison administered by his wife.

See J. B. Bury in the English Historical Review (1889), pp. 53-57; G. Schlumberger, L'&popee byzantine (Paris, 1905), iii. pp. 56-158.

Romanus IV. (Diogenes), emperor 1068-107 1, was a member of a distinguished Cappadocian family, and had risen to distinction in the army, when he was convicted of treason against the sons of Constantine X. While waiting execution he was summoned into the presence of the empress regent, Eudocia Macrembolitissa, whom he so fascinated that she granted him a free pardon and shortly afterwards married him. After his coronation he carried on three successful campaigns against the Saracens and Seliuk Turks, whom he drove beyond the Euphrates; in a fourth he was disastrously defeated by Alp Arslan on the banks of the Araxes and taken prisoner. After releasing himself by the promise of a large ransom and the conclusion of a peace, he turned his arms against the

pretender Michael VII., but was compelled after a deifeat to resign the

empire and retire to the island of Prote, where he soon died in great misery. It was during this reign that, by the surrender of Bari (1071), the Byzantine empire lost its last hold upon Italy.

See J. G. C. Anderson in the Journal of Hellenic Studies (1897), pp. 36-39. On all the above see also J. B. Bury's edition of Gibbon's Decline and Fall. ■ • (M. O. B. C:)

ROME (Roma), the capital of the modern kingdom of Italy, in' the province of Rome, on the river Tiber, 17 miles N.E. from its mouth on the Mediterranean. As formerly the centre of the ancient Roman republic and of the Roman empire, and the headquarters of the Christian Church, Rome is unique arnong historical cities, and its antiquarian interest far Surpasses that of any other locality in the world. In the following account the general subject of Rome is treated broadly under two aspects, themselves subdivided. These are:— (1) the topo- graphy and growth of the city of Rome, the evolution of which is traced from the earliest times to the present, and (2) Romaii history, i.e. the political and social history of the Roman republic, empire and medieval commune. .'...'"

The nine or ten hills and ridges on which the city stands are formed of masses of tufa ox conglomerated sand and ashes thrown out by neighbouring volcanoes now extinct, but active down to a very recent period. One group of these volcanoes is, that around Lago Bracciano, while another, stillnearer to Rome, composes the Alban Hills. That some at least of these craters have been in a state of activity at no very distant period has been shown by he discovery at many places of broken ; pottery and bronze imp) :ments below the strata of tufa or other volcanic deposits. Traces of human life have even been found below that great flood of lava which, issuing from the Alban Hills, flowed towards the site of Rome, only stopping about '3 miles short, by the tomb of Cecilia Metella.

The superficial strata on which Rome is built are of three main kinds: (1) the plains and valleys oh the left bank of the Tiber are covered, as it were, by a sea of aEuvial deposits, in the midst of which (2) the hills of volcanic origin rise like so many islands; and (3) on the right bank of the Tiber, around' trie" Janiculan and Vatican Hills, are extensive remains of ' an ancient sea- beach, conspicuous in parts by its fine golden sand and its de- posits of greyish white potter's clay. From its yellow sand the Janiculan has been sometimes known as the Golden Hill, a name which survives in the church on its summit called S. Piefro in Montorio (Monte d'Oro). In addition to these three chief deposits, at a few places, especially in the Avehtine and Pincian Hills,

under-strata of travertine crop out — a hard limestone rock, once in solution in running water, and deposited gradually as the water lost its cafbonic-acid solvent, a. process still rapidly going on at Terni, Tivoli and Other places in the neighbourhood. The conditions under which the tufa hills were formed have'been very various, as is clearly seen by an examination of the rock at different places. The volcanic ashes and sand of which the tufa is composed appear in parts to lie just as they were Showered down from the crater; in that case it shows but little sign of. stratification, and consists wholly of igneous products. In parts time and pressure have bound together these scoriae into a soft and friable rock; in other places they still lie in loose sandy beds and can be dug out with the spade. Other masses of tufa again show signs either of having been deposited in water, or else washed away from their first resting-place and redeposited with visible stratifications; this is shown by the watef-worn pebbles and chips of limestone rock, which form a conglomerate bound together by the volcanic ashes into a sort of natural cement. A third variety is that which exists on the Palatine Hill. Here the shower of red-hot ashes has evidently fallen on a thickly growing forest, and the burning wood, partly smothered by the ashes, has been converted into charcoal, large masses of which are embedded in the tufa rock. In some places charred branches of trees, their form well preserved, can be easily distinguished. The so-called " wall of Romulus " is built of this conglomerate of tufa and charred wood; a very

perfect section of the branch df a tree is visible on One of the blocks bythe Scalae Caci.

So great have been the physical changes in the site of Ronie since the first dawn of the historic period that it is difficult now to realize what its aspect once was. The Forum Romanum, the Velabrum, the great Campus Martius (now the most crowded part of modern Rome), and other valleys were once almost impassable marshes or pools of water (Ov. Fasti, vi. 401; Dionys. ii. 50). The draining of these valleys was effected by means of the great cloacae, which were among the earliest important architectural works of Rome (Varro, Ling. Lat. iv. 149). Again, the various hills and ridges were once more numerous and Very much more abrupt than they are now. At an early period, when each hill was crowned by a separate village fort, the great object of the inhabitants was to increase the steepness of its cliffs and render access difficult. At a later time, when Rome was united under one govern- ment, the very physical peculiarities which had originally made its hills so populous, through their natural adaptability for defence, became extremely inconvenient in a united city. where architectural symmetry and splendour were above all things aimed at.

Hence the most gigantic engineering works* were undertaken: tops of hills were levelled, whole ridges cut away, and gentle slopes formed in the place of abrupt cliffs. The levelling of the Velia and the excavation of the site for Trajan's forum are instances of this. The same works were 'continued in the middle ages, as when in the 14th century an access was made to the Capitoline Arx 1 from the side of the Campus Martius; up to that time a steep cliff had prevented all approach except from the side of the Forum.

Filially, after Rome had become the capital of united Italy, in the last quarter of the 19th century, an extensive govern- ment plan {piano regulatore) was gradually carried out, with the object of reducing hills and valley to a uniform level and constructing wide boulevards on the chessboard method of a modern American city. The constant fires which have at times devastated Rome have been a powerful agent in obliter- ating the natural contour of the ground; and the accumulated rubbish from this and other causes has in some places overlaid' the ground to a depth of 40 ft., notably in the valleys.

The Ancient City

The chief building materials used in ancient Rome may be enumerated as follows: (1) Tufa, the "ruber et niger tophus" of Vitruvius (ii. 7), varying in colour from Building warm brown to yellow or greyish green (called matert- capellaccio). The Aventine, Palatine and Capitoline "'*• Hills contained quarries of the tufa, much worked at an early period (see Liv. xxyi. 27, xxxix. 44, and Varro, L.L.iv. 151). It is a very bad " weather-stone," but stands well if protected with stucco (Plin. H.N. xxxvi. 166). (2) Lapis Albanus, from Alba Longa, of volcanic origin, a conglomerate of ashes, gravel and fragments of stone; its quarries are still worked at Albano and Marino- This is now < called peperino, from the black scoriae, like peppercorns, with which the brown conglomerate mass is studded. (3) Lapis Gabinus, from Gabii, very similar to the last, but harder and a better weather-stone; it contains large lumps of broken lava, products of an earlier eruption, and small pieces of limestone. According to Tacitus (Ann. xv. 43), it is fire-proof, and this is also the case with the Alban stone. Lapis Gabinus is now called sperone. (4) Silex (mod. selce), a lava from the now extinct volcanoes in the Alban Hills, used for paving roads; when broken into small pieces and mixed with lime and pozzolana it formed an immensely durable concrete. It is dark grey, very hard and breaks with a slightly conchoidal fracture (Plin. H.N. xxxvi. 135; Vitr. ii. 7), but does not resemble what is now called silex or flint. (5) Lapis Tiburtinus (travertine), the chief quarries of which are at Tibur (Tivoli) and other plades along the river Anio; a hard

pure carbonate of lime, of a creamy white colour, deposited from running or dripping water in a highly

1 By the great flight of marble steps up to S. Maria in Ara Coeli.

stratified form, with frequent cavities and fissures lined with crystals. As Vitruvius (ii. 5) says, it is a good weather-stone, but is soon calcined by fire. If laid horizontally it is very strong, but if set on end its crystalline structure is a great source of weakness, and it splits from end to end. Neglect on the part of Roman builders of this important precaution in many cases caused a complete failure in the structure. This was notably the case in the rostra. (6) Pulvis. Puteolanus (pozzolana), so called from extensive beds of it at Puteoli — a volcanic pro- duct, which looks like red sandy earth, and lies in enormous beds under and round the city of Rome. When mixed with lime it forms a very strong hydraulic cement, of equal use. in concrete, mortar or undercoats of stucco. It is to this material that the concrete walls of Rome owe their enormous strength and durability, in many cases far exceeding those of the most massive stone masonry. Vitruvius devotes a chapter (bk. ii. ch. 6) to this very important mate- rial.

Bricks were either sun-dried (lateres crudi) or kiln-baked (lateres cocti, testae). .The remarks of Vitruvius (ii. 3), seem to refer wholly to sun-dried bricks, of which no examples now exist in Rome. It is important to recognize the fact that among the existing ancient buildings of Rome there is no such thing as a brick wall or a brick arch in the true sense of the word ; bricks were merely used as a facing to concrete walls and arches and have no constructional importance. 1 Concrete {opus caemeii- ticium, Vitr. ii. 4, 6, 8), the most important of all the materials used, is made of rough pieces of stone, or of fragments of marble, brick,. &c, averaging from about the size of a man's fist and embedded in cement made of lime and pozzolana — forming one solid mass of enormous strength and coherence. Stucco, cement and iˆiortar (tectorium, opus albdrium and other names) are of many kinds; the ancient Romans especially excelled in their manufacture. The cement used for lining the channels of aqueducts {opus signinum) was made of lime mixed with pounded brick or .potsherds and -pozzolana; the same ; mixture was used for

floors under the “nucleus” or finer cement on which the mosaic or marble paving-slabs were bedded, and was called caementum. ex testis tunsis. For walls, three or four coats of stucco were used, often as much as 5 in. thick. altogether; the lower coats were of lime and pozzolana, the finishing coats of powdered white marble (opus albarium) suit- able to receive painting. Even marble’ Ijuildings were usually coated with a thin layer of this fine whiter stucco, nearly as hard and durable as the marble itself — a practice also employed in the finest buildings of the Greeks — probably because it formed a more absorbent ground for coloured decoration; stone columns coated in this way were called ” columnae dealbatae ” (Cic. In Verr. ii. 1, 52 seq.). For the kinds of sand used in mortar and stucco, Vitruvius (ii. 4) mentions sea, pit and river sand, saying that pit sand is to be preferred.

Marble appears to have come into use about the beginning of the 1st century B.C. Its introduction- was at first viewed with great Decora- jealousy, as savouring of Greek luxury. The orator y ve Crassus was the first to use it in his house on the Palatine,

materials, built about 92 B.C. ; and, though he had only six small columns of Hymettian marble, he was for this luxury nicknamed the ” Palatine Venus ” by the stern republican M. Brutus (Plin. H.N. xxxvi. 7). The temporary wooden theatre of the aedile M. Aemilius Scaurus, built in 58 B.C., appears to have been the first building in which marble was more largely used; its 360 columns and the lower order of its scena were of Greek marble (see Plin. H.N. xxxvi. 5, 50). In a very few years, under the rule of Augustus, marble became very common. 2

Of white statuary marble four principal varieties Were used. (1) Marmor Lunense, fronvLuna, near the modern Carrara (Strabo, v. p. 222), is of many qualities, from the purest creamy White and the finest grain to the coarser sorts disfigured with bluish grey streaks.

1 In less solid constructions than those which have survived until modern times bricks Were doubtless used by themselves.

2 The oft-quoted boast of Augustus (Suet. Aug. 29) that he ” found Rome of brick and left it of marble ” has probably much truth in it, if for ” brick ” we read ” peperino and tufa.” In the time of Augustus burnt brick was very little used, the usual wall- facings being opus quadratum of tufa or peperina, and opus relicu- Uitum of tufa only.

(Ex., the eleven Corinthian columns in the Borsa.) . (2.) Marmor Hymettium, from Mount Hymettus, near Athens, is , coarser in grain;

than the best Luna marble and is usually marked with gjsev or blue striations (Strabo ix. p. 399). (Ex., the forty-two columns in the nave of S. Maria Maggiore and the columns in S. Pietro in Vincoli.) (3) Marmor Pentelicum, from Mount Pentelicus, also hear Athens, is very fine in grain and of a pure white; it was more used for architectural purposes than fpr statues, though some sculptors preferred it above all others, especially Pheidias and Praxiteles. (Ex., the bust of the young Augustus in the Vatican.) (4) Marmor Parium, from the Isle of Paros, is very beautiful, though coarse in texture, having a very crystalline structure. (Ex., the nineteen columns of the round; temple in the Forum Boarium:)

Nine chief varieties of coloured marbles were used in Rome. (1) Marmor Numidicum (mod. giallo antico; Plin. H.N. v. 22), from Numidia and Libya, hence also called Libycum, is of a . rich yellow, deepening to orange and even pink. Coloured Enormous quantitiesof it were used, especiallyfor columns, marwes – wall-linings and pavements. (Ex., seven columns on the arch of Coristantirie, taken from the arch of Trajan; the eighth column is in the Lateran basilica.) (2) Marmor Carystium (mod. cipollino), from Carystus in Euboea (Strabo x. p. 446), has alternate wavy strata of white and pale green — the “undosa Carystos” of Statius (Silv. [. 5, 34). From its well-defined layers like an onion (cipolla) is derived its modern name. (Ex., columns of temple of AntoniriUs and Faustina.) ■ (3) Marmor Phrygium or Synnadicum (mod. pavonazzetto), from’ Synnada in Phrygia : (Strabo, xii. p. 577; Juv, xiv. 307; Tibull. iii. 3, 13), ‘is a slightly translucent marble, with rich purple markings, violet verging on red. It was fabled to be stained with the blood of Atys : (Stat. Silv. i. 5, 37). (Ex., twelve fluted columns in S. Lorenzo fuori le Mura, and four columns in the apse o.f.S. Paolo fuori, saved from the ancient nave of the basilica, burnt in, 1823.) (4) Marmor Iasium (probably the modern porta santa), frpm Iasus, is mottled with large patches of dull red, OliVe green arid white. The ” holy doors •’■’ of the four great basilicas are framed with it, hence its modern name. (Ex., the slabs in front of the hemicyele of the Rostra and four columns in, S. Agnese fuori le Mura). (5) Marmor Chium, (probably the modern Africano)-, from Chios, is similar in the variety of its markings to the portasanta, but more brilliant in tint. ‘ (Ex., a great part of the paving of the Basilica Julia andtwo large’ columns in the centre of the fagade of St Peter’s.)_ (6) Marmor Taenarium (mod. rosso antico), from Taenarum in Laconia (Strabo viii. p. 367; Pliny, H.N. Xxxvi. 158), is a very close-grained marble, of a rich deep red, like blood. As a rule it does not occur in large pieces, but was much used for small cornices and other mouldings in interiors of .buildings/ Its quarries in Greece are still

worked. (The; largest pieces known are the fourteen steps to the high altar of S. Prassede and two columns nearly 12 ft.' high in the Rospigliosi Casino dell' Aurora.) (7) The name Marmor TaenaHum is also applied by the ancients to a black marble (nero antico) now no longer quarried. It is mentioned by Tibullus (iii. 3, 14) in conjunction with Phrygian 3.nd Carystian marbles; see also Prop. iii. 2, 9, and Plin. H.N. xxxvi. 135. {Ex., two columns in the choir of S. Giovanni in Laterano.) (g) Lapis AtrdtiUs (verde antico), found at Atrax in Thfessaly, was One of the favourite materials for decorative architecture ; it is not strictly ■ a marble (i.e. a calcareous stone) but a variety of " precious serpentine," with patches of white and brown on a brilliant green ground. It seldom occurs in large masses. (The finest known specimens are the twenty-four columns beside the niches in the nave of the Lateran basilica.) (9) The hard oriental alabaster, the " onyx " or " alabas- trites " of Pliny (H.N. xxxvi. 59, xxxvii. 109) ; its chief quarries were on theNile near Thebes, 3 in Arabia and near Damascus. In Pliny's age it was a great rarity ; but in later times it was introduced in large quantities, and fragments of a great many columns have been found on the Palatine, in the baths of Caracalla and elsewhere: It is semi-transparent and beautifully marked with concentric nodules and wavy strata. An immense number of other less common marbles have been found, including many varieties of breccia, whose ancient names are unknown. 4

From the latter part of the 1st century B.C. hard stone*— granites and basalts— were introduced in great quantities. The basalts— * ," basanites "of Pliny .(xxxvi. 58) — are very refractory, and _ ■ '• can only be worked by the help of emery or diamond dust. or "™ The former was obtained largely at Naxos; diamond- t alt dust drills are mentioned by Pliny (H.N. xxxvii. 200). *■

The basalts are black, green and brown, and are usually free frorif spots or markings ; examples of all three exist, but are coriu paratively rare. The red variety called " porphyry " was used in enormous quantities. It is the " porphyrites " of Pliny (H.N.

3 These Nile quarries were worked during the 19th century, and many blocks were imported into Rome for the rebuilding of S. Paolo fuori le Mura. '

4 On the subject of Roman marbles, see iCorsi, Dette pietre antiche (ed. 3, 1845), and Pullen, Handbook of Roman Marbles (London^ 1894); also Brindley in Transactions of the Royal Institute of British Architects (,1:887). A collection of 1000 specimens,, originally formed by Corsi, is preserved in the museum at Oxford.

xxxvi. 57), and was brought from Egypt. It has a rich red ground, covered with small specks of white felspar; hence it was also called ” leptopsephos.” A large number of columns of it exist, and it was much used for pavements of opus Alexandrinum. A rich green porphyry or basalt was also largely used, but not in such great masses as the red porphyry. It has a brilliant green ground covered with rectangular light green crystals of felspar. This is the lapis Lacedaemonius (wrongly called by the modern Romans ” serpent- ino “), so named from its quarries in Mount Taygetus in Lace- daemonia (Paus. iii. 21, 4; Plin. H.N. xxxvi. 55; Juv. xi. 175). It appears to have been mostly used for pavements and panels of wall linings. The granites used in Rome came mostly from near Philae on the Nile (Plin. H.N. xxxvi. 63). The red sort was called lapis pyrrhopoecilus and the grey lapis psaronius. The columns in the Basilica Ulpia are a fine example of the latter; both sorts are used for the columns of the Pantheon and those of the temple of Saturn in the Forum. Gigantic ships were specially made to carry the obelisks and other great monoliths (Plin. H.N. xxxvi. 2, 67).

The style of architecture employed in ancient Rome (see Architecture, section Roman, and Roman Art) may be Archl- sa id to have passed through three stages — the tectum Etruscan, the Greek and the Roman. During the styles. fi rs t few centuries of the existence of the city, both the methods of construction and the designs employed appear to have been purely Etruscan. The earliest temples were either simple cellae without columns, or else, in the case of the grander temples, such as that of Capitoline Jupiter, the columns were very widely spaced (araeostyle) , and consequently had entablatures of wooden beams. The architectural decora- tions were more generally in gilt bronze or painted terra-cotta than in stone, and the paintings or statues which decorated the buildings were usually the work of Etruscan artists. 1 The Greek influence is more obvious; it is found in the period following the Second Punic or Hannibalic War, and almost all the temples of the earlier imperial age are Greek, with certain modifications, not only in general design but in details and ornaments. Greek architects were largely employed, such as Apollodorus of Damascus, who designed Trajan’s forum and other buildings; on the other hand, a Roman, Cossutius, was employed on the building of the Olympieum at Athens, in the 2nd century B.C. Roman architects such

as Vitruvius and C. Mucius in the 1st century B.C., Severus and Celer under Nero, and Rabirius under Domitian, were Greek by education, and probably studied at Athens (see Vitr. vii. Praef.; Hirt, Gesch. d. Baukunst, ii. p. 257). 2 The Romans, however, though far below the Greeks in artistic originality, were very able engineers, and this led to the development of a new and more purely Roman style, in which the restrictions imposed by the use of the stone lintel were put aside and large spaces were covered with vaults and domes cast in semi-fluid concrete, a method which had the enormous advantage of giving the arched form without the constant thrust at the springing which makes true arches or vaults of wide span so difficult to deal with. The enormous vaults of the great thermae, the basilica of Con- stantine, and the like, cover their spaces with one solid mass like a metal lid, giving the form but not the principle of the arch, and thus allowing the vault to be set on walls which would at once have been thrust apart had they been subjected to the immense leverage which a true arched vault constantly exerts on its imposts. 3 This is a very important point, and one which is usually overlooked, mainly owing to the Roman practice of facing their concrete with bricks, which (from an examination

1 Pliny {H.N. xxxv. 154), quoting Varro, says that the decorations in painting and sculpture of the temple of Ceres near the Circus Maximus were the work of the first Greek artists employed in Rome, and that before that (c. 493 B.C.) “all things in temples were Etruscan.” Vitruvius (iii. 3) says, ” Ornantque signis fictilibus aut aereis inauratis eorum fastigia Tuscanico more, uti est ad Circum Maximum Cereris, et Herculis Pompeiani, item Capitolii ” (cf. iv. 7, vi. 3).

- The frequent use of engaged columns is a peculiarity of Roman architecture, but it is not without precedent in Greek buildings of the best period, e.g. in the temple of Zeus at Agrigentum. Surface enrichments over the mouldings were used far more largely by the Romans than by the Greeks.

• In the beautiful drawings of Choisy (L’Art de bdtir chez les Remains, Paris, 1873) the structural importance of the brick used in vaults and arches is very much exaggerated.

Opus quad- ratum.

of the surface only) appear to be a principal item in the con- struction. The walls of the Pantheon, for example, are covered with tiers of brick arches, and many theories have been invented as to their use in distributing the weight of the walls. But a recognition of the fact that

these walls are of concrete about 20 ft. thick, while the brick facing averages scarcely 6 in. in thickness, clearly shows that these ” relieving arches ” have no more constructional use as far as concerns the pressure than if they were painted on the surface of the walls. The same applies to the superficial use of brick in all arches and vaults. Although, however, the setting of the concrete rendered the brick facing superfluous, it played its part in sustaining the fluid mass on its centring during the process of solidification.

At first tufa only was used in opus quadratum, as we see in the so-called wall of Romulus. Next the harder peperino began to be worked: it is used, though sparingly, in the ” Servian ” wall, and during the later Republic appears to have been largely employed for exterior walls or points where there was heavy pressure, while other parts were built of tuta. Thirdly, travertine appears to have been introduced about the 2nd century B.C., but was used at first for merely ornamental purposes, very much as marble was under the Empire ; after about the middle of the 1st century a.d. travertine began to be largely used for the solid mass of walls, as in the temple of Vespasian and the Colosseum. The tufa or peperino blocks were roughly 2 (Roman) ft. thick in regular courses (the ’” isodomum ” of Vitruvius) by 2 ft. across the end, and under the Republic often exactly 4 ft. long, so that two blocks set endways ranged with one set lengthways. They were arranged in alternate courses of headers and stretchers, so as to make a good bond ; this is the ” em- plecton ” of Vit- ruvius (ii. 8). The so-called Tabular- ium of the Capitol is a good example of this. The harder and more valuable travertine was not cut in this regular way, but pieces of all sizes were used, just as they hap- pened to come from the quarry, in order to avoid waste : blocks as much as 15 by 8 ft. were used, and the courses varied in thickness — t h e ” pseudisodomum ” of Vitruvius. When

tufa or peperino

was mixed with the FlG x —Example of Construction in which

travertine, it cut so as to range with the irregular courses of the latter.

It is interesting to note the manner in which the Roman builders mixed their different materials according to the weight they had to carry. While tufa was frequently used for the main walls, peperino (e.g. in the

Servian ” wall on the Aventine) or travertine (e.g. in the forum of Au-

many materials are used ; upper part of one of the inner radiating walls under the cunei of the Colosseum. A, A. Marble seats on brick and concrete core, supported on vault made of pumice-stone concrete ©. B. Travertine arch at end of raking vault ©.

D. One of the travertine piers built in flush with the tufa wall to give it extra strength.

E, E. Wall of tufa concrete faced with triangular bricks, carrying the vaults of pumice concrete which support the marble seats. F. Travertine pier at end of radia- ting wall. G. Brick-faced arch of concrete to carry floor of passage. H, H. Tufa wall, opus quadratum. J, J, J. Line of steps in next bay. K, K. Surface arches of brick, too shallow to be of any constructional use, and not meant for ornament, as the whole was stuccoed ; they only face the wall (which is about 4 ft. thick) to the average depth of 4 in.

gustus and the

temple of Fortuna

Virilis, so called) was inserted at points of special pressure, such

as. piers or arches (see fig.). The Colosseum is a particularly

elaborate example of this mixed construction with three degrees

of pressure supported by three different materials.

Fig. 7.— PLAN OF ANCIENT ROME.

The use of mortar with opus quadratum is a sign of a comparatively early date. It occurs, e.g. in the ” Servian ” wall on the Aventine m ri — and in the Tabularium. Under the Empire massive blocks, * whether of tufa, travertine or marble, are set without any mortar. It must, however, be observed that in these early instances the ” mortar ” is but a thin stratum of lime, little thicker than stout paper, used not as a cement to bind the blocks together, but simply _. to give the joints a smoothly fitting surface. The actual

amps. binding together was done by clamps and dowels, as well as by

the mass and weight of the great blocks used. Except in the earliest masonry, each block was very carefully fastened, not only to the next blocks on the same course, which was done with double dove-tailed dowels of wood, but also to those above and below with stout iron clamps, run with lead (Vitr. ii. 8). 1 In more ornamental marble work bronze clamps were often used. Concrete is rarely found in connexion with opus quadratum; part of the ” Servian ” wall on the Aventine received a backing of concrete at a relatively late period Up to the 1st century B.C. it was faced with opus incertum — small irregularly shaped blocks of tufa, 3 to 6 in. across, with pointed ends driven into the concrete while it was soft, and worked smooth on the face only (see fig. 2). From the beginning of the 1st century B.C. opus reticulatum? formed of °i”” rectangular tufa prisms laid in a regula. pattern like a

net (whence the name), is found. It is very neat in appearance, and is often fitted with great care.though it was generally covered with stucco. The so-called ” house of Livia ” on the Palatine is a good example of the earlier sort, when the quoins

were made of small rectangular blocks of tufa. Under the Empire brick p quoins came into use (as may be seen, e.g. in the so-called palace of Caligula). Though in Rome opus reticulatum was almost always made of tufa, in the neighbourhood of the city it was sometimes of peperino or even lava, where these materials were found on the spot.

reticu- latum.

-x— a-— x—*-m£- — *’

Section of Angue Fig. 2. — Concrete Wall Fig. 3. — Section of Concrete Wall, show- faced with (A) Opus In- ing the use of bricks merely as a certum and (B)Opus Re- facing, ticulatum. C shows the section, similar in both.

Of concrete walls faced with burnt bricks no dated example earlier than the middle of the 1st century B.C. is known. The facing consisted at first of triangular fragments of tiles (tegulae), ii broken for the purpose and more or less irregular in shape

facing. anf j s j ZC| k u t from the latter part of the 1st century A.D. onwards triangular bricks were specially manufactured for wall-facings. This shape was adopted in order to present a large surface on the face with little expenditure of brick, and also to improve the bond wkh the concrete behind (see fig. 4). Even party walls of small rooms

are not built solid, but have a concrete core faced with brick triangles about 3 in. long. In order to support the facing until the concrete was set, the Roman builders used a wooden framing covered with planks on the inside. Sometimes the planks were nailed outside the wooden uprights, as was done with unfaced concrete walls, and then a series of grooves appear in the face of the brickwork. Walls faced with opus reticulatum must have been supported temporarily in the same way.

The character of the brick facing is a great help towards deter- mining the date of Roman buildings. In early work the bricks are thick and the joints thin, while in later times the reverse is the case, so that brickwork of the time of Severus and later has more bricks to the foot than that of the Flavian period.

The length of the bricks as it appears on the face is no guide to the date, since one or more of the sharp points of the brick triangles were frequently broken off before they were used. Moreover,

1 The expansion of the iron through rust, which caused the stone to split, has frequently been a great source of injury to Roman walls, as well as the practice, common in the middle ages, of breaking into the stones in order to extract the metal.

2 These two kinds of stone facings are mentioned thus by Vitruvius (ii. 8), ” reticulatum, quo nunc [reign of Augustus] omnes utuntur, et antiquum, quod incertum dicitur. ‘

varieties both in quality of workmanship and size of the bricks often occur in work of the same date. In the remains of Nero’s Golden House great varieties appear, and some of the walls in the inferior rooms are faced with very irregular and careless brickwork. 3 Special care and neatness were employed in the rare cases when the wall was not to be covered with stucco, which in the absence of marble was usually spread over both inside and outside walls. All these circum- stances make great caution necessary in judging of dates; fortunately after the 1st century A.D., and in some cases even earlier, stamps impressed on bricks, and especially on the large tiles used for arches, give clearer indications. The reason of the almost universal use of smooth facings either of opus reticulatum or of brick over concrete walls is a very puzzling question; for concrete itself forms an excellent ground for the stucco coating or backing to the marble slabs, while the stucco adheres with difficulty to a smooth facing, and is very liable to fall away. The modern practice of raking out the joints to form a key was not employed by the Romans, but before the mortar was hard they studded the face of the wall with marble plugs and iron or bronze

nails driven into the joints, so as to give a hold for the stucco — a great waste both of labour and material. 4 The quality of the mortar varies according to its date: during the 1st and 2nd centuries it is of remarkable hardness — made of lime with a mixture of coarse pozzolana of a bright red colour; in the 3rd century it began to be inferior in quality; and the pozzolana used under the later Empire is brown instead of red.

Concrete was at first always made of lumps of tufa; then traver- tine, lava, broken bricks and even marble were used, in fact all the chips and fragments of the mason's yard. Under concrete the Empire the concrete used was made with travertine wa ils ana or lava for foundations, with tufa or broken bricks for vau / (s- walls, and with tufa or pumice-stone (for the sake of lightness) for vaults. Massive walls were cast in a mould; upright timbers, about 6 by 7 in. thick and 10 to 14 ft. long, were set in rows on each face of the future wall; planks 9 to 10 in. wide were nailed to them, so as to form a case, into which the semi- fluid mass of stones, lime and pozzolana was poured. When this was set the timbers were re- moved and refixed on the top of the concrete wall; then fresh concrete was poured in ; and this pro- cess was repeated till the wall was raised to the re- quired height. Usually such cast-work was only used for foundations and cella walls, the upper parts being faced with brick; but in some cases the whole wall to the top was cast in this way and the brick facing omitted. In strength and dura- bility no masonry, how- ever hard the stone or large the blocks, could ever equal these walls of concrete when made with hard lava or travertine, for each wall was one perfectly coherent mass, and could only be de- stroyed by a laborious process like that of

Fig. 4. — Example of Marble Lining, from the Cella of the Temple of Concord. A. Slabs of Phrygian marble. B. Plinth moulding of Numidian " giallo." C. Slab of cipollino (Carystian marble). D. Paving of; porta santa. E and F. " nucleus " and " rudus " of concrete bedding. G, G. Iron clamps run with lead to fix marble lining. H. Bronze clamp. J. Cement backing.

quarrying hard stone from its native bed. Owing to this method of building the progress of the work from day to day can often be traced by a change in the look of the concrete. About 3 ft. appears to have been the average amount of wall raised in a day.

Marble linings were fixed very firmly to the walls with long clamps of metal, hooked at the end so as to hold in a hole made in the marble slab. Fig. 4 gives an example, of the time of Marn i e Augustus, fixed against a stone wall. The blocks were //„/_„. usually marked in the

quarry with a number, and often ˆ ‘ with the names of the reigning emperor and the overseer of the quarry. These quarry-marks are often of great value as indications of the date of a building or statue. 5 Metropolitan

3 Some of the bricks are as much as 2§ in. thick, while ij in. is the usual maximum for Roman bricks.

4 The Roman method of applying stucco to walls with a wooden ” float ” exactly as is done now, is shown in a painting from Pompeii (see Ann. Inst., 1881, pi. H.).

5 See Bruzza, in Ann. Inst. (1870), pp. 106-204; Hirschfeld, Die kaiserlichen Verwaltungsbeamten (1905), pp. 162 ff.

Roads.

building acts, not unlike those of modern London, were enacted by several of the emperors. These fixed the materials to be used, thickness of walls, minimum width of streets, maximum height allowed for houses, &c. After the great fire in Nero’s reign, a.d. 64, an act was passed requiring the lower storeys of houses to be built with fire-proof materials, such as peperino or burnt brick.

Enormous accumulations of statues and pictures enriched Rome during its period of greatest splendour. In the first place, the numerous statues of the republican and even of the regal Ancient period were religiously preserved at a time when, from works of their archaic character, they must have been regarded art ” rather as objects of sacred or archaeological interest than

as works of art (Plin. H.N. xxxiv. 15 ff., xxxv. 19 ff.). Secondly came the large Graeco-Roman class, mostly copies of earlier Greek works, executed in Rome by Greek artists. To this class belongs most of the finest existing sculpture preserved in the Vatican and other museums. Thirdly, countless statues and pictures were stolen from almost every important city in Greece, Magna Graecia, Sicily and western Asia Minor. These robberies began early, and were carried on for many centuries. The importations included works of art by all the chief artists from the 5th century downwards. Long lists are given by Pliny

(H.N. xxxiii.-xxxvi.), and pedestals exist with the names of Praxiteles, Timarchus, Polyclitus, Bryaxis and others. These accumulated works of sculpture were of all materials — gold and ivory (Suet. Tit. 2), of which seventy-four are mentioned in the catalogue of the Breviarium, many hundreds or even thousands of silver 1 (Plin. H.N. xxxiii. 151 f.), while those of gilt bronze and marble must have existed in almost untold numbers (Paus. viii. 46). Nor were the accumulated stores of Greek paintings much inferior in number; not only were easel pictures by Zeuxis, Apelles, Timanthes and other Greek artists taken, but even mural paintings were carefully cut off their walls and brought to Rome secured in wooden frames (Plin. H.N. xxxv. 173, and compare ibid. 154).

The roads were made of polygonal blocks of lava (silex), neatly fitted together and laid on a carefully prepared bed, similar to that used for mosaic paving (see Mosaic and Roads). Roads thus made were called viae stratae. A good specimen of Roman road-making, in which thet>locks were fitted together with the utmost accuracy, is to

be seen in a portion of the Clivus Capi- tolinus in front of the temple of Saturn (see fig. 5, which also shows the massive travertine curb which bordered the road; sometimes the curb was of lava) . In 1 90 1 the late and badly laid pavement of the Sacra Via on the ascent of the Velia was removed, and the earlier paving laid bare at a lower level. The original pavement of the Nova Via was ex- posed in 1904. Other well-preserved viae Fig. 5. — Example of Early Basalt Road by stratae are those leading the Temple of Saturn on the Clivus up to the Palatine from

Polygonal £J&° £%&...** Summa Sacra Via crete bedding. D. Rain- water gutter. and that which follows The curb shown is taken from another the curved line of shops part of the road. in Trajan's forum.

The following is a list of the chief roads which radiated from Rome : — (1) Via Appia issued from the Servian Porta Capena and the Aurelian P. Appia; from it diverged (2) Via Latina, which issued from the Aurelian P. Latina ; (3) Via Labicana and (4) Via Tiburtina issued from the Servian P. Esquilina; from (3) diverged (5) Via Praenestina at the double arch of the Claudian aqueduct, now P. Maggiore, while (4) passed through the Aurelian P. Tiburtina; (6) Via Nomentana and (7) Via Salaria issued from the Servian P. Collina and passed respectively through the Aurelian P. Nomen- tana and P. Salaria; (8) Via Flaminia issued from the Servian P. Fontinalis, and was called Via Lata for the first half-mile or more,

1 Eighty silver statues of Augustus, some equestrian and some in quadrigae, are mentioned in the Mon. Anc. 4, 51.

then passed through the Aurelian P. Flaminia; (9) Via Aurelia, from the Transtiberine P. Aurelia; (10) Via Portuensis, from the Transtiberine P. Portuensis; (11) Via Ostiensis, from the Servian P. Trigeminy and the Aurelian P. Ostiensis; (12) Via Ardeatina, from the Servian P. Naevia and the Aurelian P. Ardeatina.

Remains of. Prehistoric Rome.

It is evident from recent discoveries that the site of Rome was inhabited at a very early period. 2 Flint implements and remains of the Bronze Age have been found on the Ave'ntine and elsewhere; and from the Early Iron Age onwards we have a continuous archaeological record, owing to the discovery of ancient burial-places. In 1902 a very early necropolis was brought to light at the S.E. corner of the temple of Antoninus and Faustina, some 17 ft. below the level of the Forum. The graves contain either the ashes of cremated bodies placed in a large vessel (dolio), or skeletons buried either in a simple trench (fossa), a tufa sarcophagus or a tree-trunk. The cremation graves are the earlier, and none are later than the 6th century, while the oldest may be of the 9th; the pottery and other objects placed in the graves belong to the Early Iron Age. It is clear that this cemetery is earlier than the union of the Palatine and Quirinal settlements in one city (see below, p. 759). Other early cemeteries have been discovered on the Quirinal and Esquiline, which were in use from the beginning of the Iron Age down to the beginning of the historic period. The large necropolis on the Esquiline is cut in two by the " Servian " wall, which is evidently of later date. The later tombs contain objects of Etruscan, Phoenician and Greek manufacture.

There is no doubt that the earliest settlement bearing the name of Rome was on the Palatine hill, 3 which was both easy of defence and possessed the means of communica- The . tion with its neighbours in the proximity of the Palatine Tiber. The name Roma is said to mean "river," ciiy ' but this is uncertain. The Palatine is roughly square in out- line, and the Roman antiquarians sometimes applied the name Rorfla *Quidrata to the earliest settlement; but the term seems more properly to have applied to a sanctuary connected with the foundation of the city. The ideal boundary of the city was formed by the Pomerium (see Varro, L.L. , vˆ 143 j ; Liv. i. 44; Dionys. i. 88), whose original course is traced by Tacitus (A tin. xii. 24). It passed along the foot of the hill (per ima montis Palatini), the angle-points being given by the Ara Maxima in the Forum Boarium, the Ara Consi in the Circus

Maximus, the Curiae Veteres (near the arch of Constantine) and the Sacellum Larum (at the N. angle). But this was of course not a defensible site, and the extent of the fortified city can only be determined by the traces of its early walls. These enable us to fix its line along the whole valley of the Velabrum, on the west of the hill, and along the valley of the Circus Maximus as far as the so-called Paedagogium, about half-way on the south side.

Considerable remains of this fortification exist near the west angle of the hill. These show that the natural strength given by the cliff was increased by artificial means. The wall was set neither at the top nor at the foot of the hill, but more A n ˆf. n t than half-way up, a level terrace or shelf all round being tortlfl- cut in the rock on which the base of the wall stood. Above cations. that the hill was cut away into a cliff, not quite perpendicular but slightly “battering” inwards, to give greater stability to the wall, which was built up against it, like a retaining wall, reaching to the ‘ top of the cliff, and probably a few feet higher. The stones used in this wall are soft tufa, a warm brown in colour, and full of masses of charred wood. The cutting to form the steep cliff probably supplied part of the material for the wall; and ancient quarries, afterwards used as reservoirs for water, exist in the mass of rock on which the so-called temple of Jupiter Victor stands. It has been asserted that these tufa blocks are not cut but split with wedges; this, however, is not the case. Tufa does not split into rectangular masses, but

2 On the prehistoric remains of Rome and Latium, see Pinza in Monumenti antichi pubblicati per cura delta reale Accademia dei Lincei, vol. xv., 1905; also Comm. Boni’s reports on the necro- polis adjoining the Forum in the Notizie degli scavi, and Modestor, Introduction a I’histoire romaine (Paris, 1907).

3 The ” primacy of the Palatine ” has been disputed by Carter (Amer. Jour. Arch., 1908, p. 181), who thinks that the first city was that of the Four Regions (see below) formed by the Etruscan kings.

would be shattered to pieces by a wedge; moreover, distinct tool-marks can be seen on all the blocks whose surface is well pre- served and in the quarries themselves. Chisels from one-fourth to three-

fourths of an inch in width were used, and also a sharp-pointed pick or hammer. The wall is about 10 ft. thick at the bottom, and increases in thickness above as the scarped cliff against which it is built recedes. It is built of blocks laid in alternate courses of headers and stretchers, varying in thickness from 22 to 24 in., in length from 3 to 5 ft. and in width from 19 to 22 in. These blocks are carefully worked on their beds, but the face is left rough, and the vertical joints are in some cases open, spaces of nearly 2 in. being left between block and block; in other cases the vertical joints are worked true and close like the beds. No mortar was used. At two points on the side of the Velabrum winding passages are excavated in the tufa cliff, the entrance to which was once closed by the ancient wall. One of these in early times (before water in abundance was brought to the Palatine on aqueducts) was used as a reservoir to collect surface water, probably for use in case of siege ; circular shafts for buckets are cut downwards through the rock from the top of the hill. A similar rock-cut cistern with vertical shafts, of very early date, exists at Alba Longa. Opposite the church of S. Teodoro a series of buttresses belonging to the early wall exists, partly concealed by a long line of buildings of the later years of the Republic and the early Empire, to make room for which the greater part of the then useless wall was pulled down, and only fragments left here and there, where they could be worked into the walls of the later houses.

The age of the walls here described cannot be determined with certainty, but their resemblance to the remains of the ” Servian ” wall, especially in the system of ” headers and stretchers ” and the dimensions of the blocks, makes it certain that they do not differ greatly in date from that work. The chief technical difference lies in the open vertical joints found in some cases; but too much stress should not be laid on this feature. There are, however, at the western angle of the hill some remains of an earlier fortification, constructed with blocks of grey-green tufa, smaller in size than those of the main wall. A few courses have been preserved, owing to the fact that at the angle of the hill this wall was encased first of all by that described above and afterwards by concrete substructures of imperial date. The technique is primitive, as the blocks are of irregular size and are not laid in courses of ” headers and stretchers ” ; the nearest parallel is supplied by the foundations of the temple of Jupiter Capitolinus. These remains are shown by Delbruck, Der Apollotempel auf dent Marsfelde, pi. iii., cf. p. 13 t.

Pliny (H.N. iii. 66) tells us that the city of Romulus had three gates (cf. Serv. Ad. Aen. i. 222); and three approaches to the . Palatine city can be traced. One is the so-called Scalae Uatcso Cacˆ a long sloping

ascent cut through the rock (see n““d t n & – J 7) from the side of the Circus Maximus; some Quadrats. rema j ns f tne ear iy wa n still exist along the sides of this steep ascent or staircase. The upper part of this has remains of a basalt pavement, added in later times, probably covering the more ancient rock-cut steps. The name of the gate which led at this point into the Palatine city is unknown. The only two gates whose name and position can be (with any degree of probability) identified are the Porta Romanula and the Porta Mugonia. The former of these is called Porta Romana by Festus (ed. Miiller, p. 262), who states that it was at the foot of the Clivus Victoriae (see fig. 17) and was so called by the Sabines of the Capitol because it was their natural entrance to Roma Quadrata (see also Varro, L.L. v. 164 (who only mentions the two gates named above), vi. 24). It would thus have been at the foot of the hill in the Velabrum (see below, p. 600) ; but Varro says that it was approached by steps from the Nova Via, l which would place it at the N. angle of the Palatine. The stairs connecting the Nova Via with the Clivus Victoriae still exist. Doubtful traces of the Porta Mugonia (see Sol. i. 24) have been discovered where a basalt paved road leads up into the Palatine from the Sumrna Sacra Via and the Summa Nova Via, which join near the arch of Titus; exposure to weather has now destroyed the soft tufa blocks of which this gate was built. This is probably the ” vetus porta Palatii ” of Liyy (i. 12), through which the Romans fled when defeated by the Sabines.

The Palatine settlement was the nucleus around which, by a series of expansions, the historical city of Rome grew up. The first step ^^ . was the amalgamation of Roma Quadrata with the villages ^°T, on the neighbouring spurs of the Esquiline and Caelian. p e y This gave birth to the community of the Seven Hills, whose m ‘ existence is proved by the survival of the festival known as the Septimontium, celebrated on the nth of December (Fest. 340; Macrpb. i. 16, 6). The seven hills were not those familiar in later nomenclature, but the following: — (1) Palatium and (2) Cermalus, the two summits of the Palatine; (3) Velia, the saddle between the Palatine and Esquiline; (4) Oppius and (5) Cispius, the two westernmost spurs of the Esquiline, together with (6) Fagutal, the extreme crest of the Oppius; (7) Sucusa (confused by later writers with Subura), the eastern spur of the Caelian. Varro (L.L. v. 48) mentions the murus terreus Carinarum, which may have belonged

1 ” Novalia,” MSS. • ” Navalia ” has been conjectured.

to the defences of this community, since the N.W. slope of the Oppius bore the name Carinae ; but there is no proof that the Septimontium was a walled city.

The next stage in the development of Rome was marked by the division of the city into four regions, ascribed by tradition to Servius Tullius, 2 who was said to have formed the four city tribes, corresponding with the regions: (1) Suburana, including the Caelian and the valley between that hill and the Esquiline; {2) Esquilina, the Oppius and Cispius; (3) Collina, the Quirinal and Viminal; (4) Palatina, including the Palatine and Velia. The third region was an addition to the City of the Seven Hills; the new city was, in fact, formed by the union of the old Latin settlement with a Sabine community on the Quirinal. The Capitol was the citadel, but was not included in the city (hence the phrase urbs et Capitolium). Tradition likewise assigned to Servius Tullius 3 the construction of the great wall which embraced not merely the four regions but a considerably extended area, including the Aventine. .. > Excavations have done much to determine the line of the „ "'jln Servian wall, especially thegreatworksundertaken inlaying er T.

out a new quarter of the city on the Quirinal, Esquiline and w Viminal, which have laid bare and then mo r t ly destroyed long lines of wall, especially along the agger. Beginning from the Tiber, which the Servian wall touched at a point near the present Ponte Rottp, and separating the Forum Holitorium (outside) from the ForUm Boarium (inside), it ran in a straight line to the Capitoline hill, the two crests of which, the Capitolium and the Arx, with the intermediate valley the Asylum, were surrounded by an earlier fortification, set (Dionys. ix. 68) iiri X60o« . . . xal rirpais iiroTdpots In this space there were two gates, the Porta Flumentana, next the river (see Cic. Ad Alt. vii. 3; Liv. xxxv. 19, 21); and the Porta Carmentalis close to the Capitolium. 4 From the Capitoline hill the wall passed to the Quirinal along a spur of elevated ground, after- wards completely cut away by Trajan. Close to the Capitol was the Porta Fontinalis, whence issued the Via Lata. Remains of the wall and foundations of the gate exist in Via di Marforio. After passing Trajan's forum, we find remains of the walls on the slope of the Quirinal. A piece of the wall has been exposed in the new Via Nazionale, and also an archway under the Palazzo Antonelli, which may represent the Porta Sanqualis (see Festus, ed. Miiller, p. 343). The Porta Salutaris (Festus, pp. 326ˆ327) was also on the Quirinal, probably on the slope between the Trevi fountain and the royal palace. Its position is indicated by the existence of some tombs which give the line of the road. On the north- west of the Quirinal was the Porta Quirinalis (Festus, p. 254), probably near the " Quattro Fontane." In the Barberini palace gardens, and especi- ally in those of the Villa Barberini (Horti Sallustiani), extensive remains of the wall have been recently exposed and destroyed ,— which was also

the fate of that fine piece of wall that passed under the new office of finance, with the Porta Collina, which was not on the line of the present road, but about 50 yds. to the south (see Dionys. ix. 68; Strabo iv. p. 234). Thus far in its course from the Capitol the wall skirted the slopes of hills, which were once much more abrupt than they are now; but from the Porta Collina to the Porta Esquilina it crossed a large tract of level ground ; and here its place was taken by the great agger described below. About the middle of it the Porta Viminalis was found iii 1872; it stood, as Strabo (iv. p. 234) says, ivi inkatf r from it led a road which passed through the Porta Chiusa (ancient name unknown) in Aurelian's wall. Foundations of the Porta Esquilina were found in 1875 close behind the arch of Gallienus. The, further course of the wall across the valley of the Colosseum is the least known part of the circuit. Hence the wall skirts the slopes- of the Caelian (where, as is probable, it was pierced by the Porta Caelemontana and Porta Querquetulana) to the valley along Which the Via Appia passed through the Porta Capena, hear the church of S. Gregorio. Its line along the Aventine is fairly distinct, and near S. Balbina and in the Vigna Torlonia are two of the best-preserved pieces (see below). There were three gates on the Aventine,— the Porta Naevia on the southern height, P. Rauducsulana in the central depression, and P. Lavernalis on the northern summit. Under the Aventine it appears to have touched the river near the existing foundations supposed to be those of the Pons Sublicius. The Porta Trigemina was close by the bank. Hence to our starting-point the river formed the defence of the city, with its massive quay wall.

The wall is built of blocks of tufa, usually thfe softer kinds, but varying according to its position, as in most cases the stone used was that quarried on the spot. In restorations a good „ deal of peperino is used. The blocks average from 23 to s ˆ.˚fjl n 24 in. in thickness — roughly 2 Roman feet — and are c

laid in alternate courses of headers and stretchers. The method of construction varied according to the nature of the ground

! Varro, L.L. v. 46-54.

3 Livy i. 44; Dion. Hal. iv. 13. The wall is, however, said to have been planned and partly executed by Tarquinius Priscus (Liv. i. 36, 38; Dion. Hal. iii. 37); and the fortification of the Aventine is ascribed to Ancus Martius (Dion. Hal. iii. 43).

4 See Sol. i. 13; Liv. ii. 49, xxiv. 47, xxv. 7. xxvii. 37; Ascon. Ad. Cic. in Toga, p. 81.

traversed by the fortification. Where the wall followed the face of the cliffs, as for instance on the Capitol and Quirinal, it was raised on an artificial shelf after the fashion employed on the Palatine (vide supra). In other places, where the slope was gentler, the wall was formed of rubble with revetments of opus quadratum, e.g. on the Aventine; finally, where the ground was flat, as on the plateau of the Esquiline, a ditch was dug and an embankment formed by the upcast; this agger, as it was called, was then faced with retaining walls of opus quadratum. The length of the agger on the Esquiline is put by Dionysius (ix. 68) at 7 stadia, which agrees, roughly speaking, with the discoveries made in 1876-1879, when the railway station was built and the new quarters laid out. The total length was about 4225 ft., the thickness of wall and agger about 50 it., while the ditch was 100 Roman ft. in width and 30 in depth. There is, however, a difference in technique between the inner and outer retaining walls of the agger. The inner wall is built of greenish tufa in blocks of irregular size, while in the outer brown tufa is employed and the blocks are of standard size, two headers ranging with each stretcher. Between the railway station and the Dogana a fine lofty piece of the front wall remains, with traces of the Porta Viminalis and of the lever back wall. Unfortunately the whole of the bank or agger proper has been removed, and the rough back of the great retaining wall exposed. Both tufa and peperino are used, the latter in restored parts; the blocks vary in length, but average in depth the usual 2 Roman ft. The railway cutting, which has destroyed a great part of the agger, showed clearly the section ot the whole work : the strata of different kinds of soil which appeared on the sides of the foss appeared again in the agger, but reversed as they naturally would be in the process of digging out and heaping up. Dionysius (ix. 68) states the length of the agger to have been 7 stadia— that is, about 1400 yds. — which agrees (roughly speaking) with the actual discoveries. Originally one road ran along the bottom of the foss and another along its edge ; the latter existed in imperial times. But the whole foss appears to have been filled up, probably in the time of Augustus, and afterwards built upon; houses of mixed brick and opus reticulatum still exist against the outside of the great wall; which was itself use! as the back wall of these houses, so that We now see painted stucco of the time of Hadrian covering parts of the wall of the kings. Another row of houses seems to have faced the road mentioned above as running along the upper edge of the foss, thus forming a long street. As early as the time of Augustus a very large part of the wall of the kings bad been pulled

down and built over, so that even then its circuit was difficult to trace (Dionys. iv. 13). A very curious series Masons' of , masons ' marks exists on stones of the agger wall (as marks wel1 as on tnose of some other early buildings). They are

deeply incised, usually on the ends of the blocks, and average from 10 to 14 in. in length: some are single letters or monograms; others are numbers, e.g. J, the numeral 50. Fig. 6

shows the chief forms from the Palatine and Esquiline. 1

There are also ex- tensive remains of the " Servian " wall on the Aventine, in the Via di Porta S. Paolo. Here the wall has a backing of concrete and the upper portion is built with blocks ; ˆ__— . f peperino, set in

Fig. 6.— Masons' Marks on Early Walls. mort ; ar a , nd bevelled . ,,,.', . at the edges. These

are unmistakable signs that the wall has undergone restoration This portion is pierced by an arch about 9 J ft. high, which probably served as an embrasure for a military engine. Finally, where the wall skirts the bank of the Tiber it is built in two sections— a founda- tion about 2 metres in height and 3 in width, which forms a landing-stage, and an upper wall, 6 metres high, which retains the bank. It is built of peperino, and is probably later than the rest of the fortification.

The age of this wall is uncertain, but it has been rendered exceed- ingly probable that it belongs to the 4th century B.C. The evidence lor this is derived from the comparison of other fortifications in central Italy, from the measurements of the blocks employed, which presuppose the later Roman foot of 296 millimetres, and from the character of the alphabet from which the masons' marks are taken. Livy (vi. 32) speaks of a contract entered into by the censors of 378 B.C. for the construction of a wall of opus quadratum and this probably refers to the older portions of the existing wall which was built owing to the fear of a second Gallic invasion 3

•See Bruzza, Ann. Inst. (1876), 72; Jordan, Topographie. i. 2S0; Kichter, Uber anhke Stemmetzzeicheri (1885).

- Sˆ Rˆ.taerin the work quoted above, and Beitrage zur romischen Topographie (Berlin, 1903) ; also Delbruck, Der Apollotempel auf dem Marsfelde in Rom, pp. 14 ff. J

' For earlier studies of the Servian wall consult Nibby and Gell, Le

ON THE. AGG ER WALL.

\l/ X.3Z.TS

“? vMivHNK

[PREHISTORIC REMAINS

The Servian city did not include what is now the most crowded part of Rome, and which under the Empire was the most architectur- ally magnificent, namely, the Campus Martius, which was probably to a great extent a marsh. It was once called Ager Tarquiniorum but after the expulsion of the Tarquins was named Campus Martius from an altar to Mars, dating from prehistoric times (Liv. ii. 5).

Of that wonderful system of massive arched sewers * by which a f D ‘?“y slus (“!• 68 > s ays, every street of Rome was drained into the liber, considerable remains exist, especially of the Cloaca Maxima, which runs from the Valley of the Subura, cloacae – under the Forum along the Velabrum, and so into the Tiber by the round temple in the Forum Boarium; it is still in use, and well preserved at most places. Its mouth, an archway in the great quay wall nearly 11 ft. wide by 12 high, consists of three rings of peperino voussoirs,” most neatly fitted. The rest of the vault and walls is built of mixed tufa and peperino. 5 Pliny (H.N, xxxvi. 104) gives an interesting account of what is probably this great sewer, big enough (he says) for a loaded . hay-cart to pass al ° n S\ Hie mouths of two other similar but smaller cloacae are still visible in the great quay wall near the Cloaca Maxima and a whole network of sewers exists under a great patt of the Servian city. Some of these are not built with arched vaults, but have triangular tops formed of courses ol stone on level beds, each projecting over the one below — a primitive method of construc- tion, employed in the Tullianum The great quay wall of tufa and peperino which lined the Tiber at the mouth of the Cloaca Maxima is also of early date. In later 0reat times this massive wall was extended, as the city grew, quay walL all along the bank of the Campus Martius, and, having lost its importance as a line of defence, had frequent flights of stairs built against it, descending to the river. Some of these are shown in one ot the fragments of the marble plan (see Jordan, F. U.R. Frag. 169). In 1879 a travertine block was dredged up inscribed P. BARRONIVS . BARBA . AED CVR . GRADOS . REFECIT, dating from the 1st century B.C. This records the repair of one of these river stairs.”

Ihe lullianum is the earliest of the existing buildings of Rome. Imprisonment as a punishment was unknown to Roman law, and hence the Career, where criminals were detained pending trial, was of small dimensions. Its remains are pre- ‘”’”” served beneath the ch urch of S Giuseppe dei Falegnami and ”’”” ” nd below them is the Tullianum, a dungeon where executions Career – took place It is partly cut in the tufa rock of the Capitoline hill and partly built of 2-ft. blocks of tufa, set with thin beds of pure lime mortar, in courses projecting one over the other. Its name is derived, not from Servius Tullius, as Varro (v. 151) asserts, but from an early Latin word, tullus, a spring of water; its original use was probably that of a cistern or well. It was closed by a conical vault arched m shape, but not constructionally an arch— ve/y like the so-called treasury of Atreus ” at Mycenae, and many early Etruscan tombs. When the upper room with its arched vault, also of tufa was built the upper part of the cone seems to have been removed’ and a flat stone floor (a flat arch in construction) substituted ‘ 1 hat its use as a cistern was abandoned is shown by the cloaca which leads from it, through the rock, to a branch of the Cloaca Maxima. This horrible place was used as a dungeon, prisoners being lowered through a hole in the stone floor— the only access Ihe present stairs are modern. The two chambers are vividly described by Sallust (Cat. 55). The entrance to the upper prison was on the left of the stairs leading up from the Forum to the Clivus Argentanus, the road tc the Porta Fontinalis (see fig. 7, General Plan of Ancient Rome). Lentulus and the Catiline conspirators, as well as Tugurtha, Vercingetorix and other prisoners of import- ance, were killed or starved to death in this fearful dungeon, which is called to ghpaBpov by Plutarch (Marius, xii.). According to a doubtful tradition of the Catholic Church, St Peter was imprisoned ln . ™ e Tullianum. The name Mamertine prison is of medieval origin. Ihe front wall of the prison was restored in the reign of libenus a.d. 22, and bears this inscription on a projecting string- course— C . VIBI VS . C . F . RVFIN VS . M . COCCEIVfS M F

ˆ VJ t]COS C ˆ X -, S -, C V l he floor of the uPPer prison is about i6.ft. above the level of the Forum. The Capitol was approached from the Career by a flight of steps— Scalae Gemoniae— on which

Mura diRoma (1820); Piale, Porte del Recinto di Servio (1833) • Becker, De Romae Muris (Leipzig, 1842); Lanciani, Ann. Inst. (1871), p 40, Man. Inst ix p . xxvii.; Borsari, ” Le mura e porte di Servio,’ Bull. Conim. Arch. (1888), pp. 12 ff.

4 See Liv. i. 38, 56 ; Dionys. iv. 44. . 6 In the upper part of its course the Cloaca Maxima was restored in some places, under the Empire,

with a vault of brick-faced concrete • at the entrance to the Forum a large bend was made when the Uasilica Aemilia was extended westwards in 34 B C . 6 A great quay wall with arched cloaca, similar ‘in style to those in Rome, exists at the mouth of the river Marta near Tarquinii and similar constructions are found in other Etruscan Cities

Livy (1. 33) mentions the ” career . . . media Urbe imminens toro, and also speaks (xxxiv. 44) of an ” inferiorem carcerem,” and at xxix. 22 of a criminal being put in the Tullianum.

8 Consules suffecti for a.d. 22.

the bodies of criminals were exposed; 1 Pliny (H.N. viii. 145) calls it the ” stairs of sighs ” (gradus gemitorii).

Forum Rotnanum and Adjacent Buildings. The Forum Romanum or Magnum, as it was called in late times to distinguish it from the imperial fora, occupies a valley which extends from the foot of the Capitoline hill to the north-west part of the Palatine. Till the construction of the great cloacae it was, at least in wet seasons, marshy ground, in which were several pools of water. In early times it- was bounded on two sides by rows of shops and houses, dating from the time of the first Tarquin (Liv. i. 35). The shops on the south-west side facing the Sacra Via, where the Basilica Julia afterwards was built, were occupied by the Tabernae Veteres. 2 The shops on the northern side, being occupied by silversmiths, were called Tabernae Argentariae, and in later times, when rebuilt after a fire, were called Tabernae Novae (see Liv. xxvi. 27, xl. 51). 3 An altar to Saturn (Dionys. i. 34, vi. 1), traditionally set up by the companions of Hercules, and an altar to Vulcan, both at the end towards the Capitol, with the temple of Vesta and the Regia at the opposite end, were among the earliest monuments grouped around the Forum. The Lacus Curtius vanished, as Varro says (L.L. v. 148-49), probably with other stagnant pools, when the cloacae were constructed (Liv. i. 38, 56).* Another pool, the Lacus Servilius, near the Basilica Julia, was preserved in some form or other till the imperial period. Under Sulla it was used as a place to expose the heads of many senators murdered in his proscriptions (Cic. Rose. Am. 32, 89; Seneca, De Prov. 3, 7). The Volcanal was an open area, so called from the early altar to Vulcan,

and was (like the Comitium) a place of public meeting, at least during the regal period. 5 It was raised above the Comitium, and was a space levelled on the lower slope of the Capitoline hill behind the arch of Severus; the foundations of the altar were discovered in 1898. It was probably much en- croached upon when the temple of Concord was enlarged in the reign of Augustus. Fig. 8 gives a carefully measured plan of the Forum, showing the most recent discoveries.

Unlike the fora of the emperors, . each of which was surrounded by a lofty wall and built at one time from one design, the archi- tectural form of the Forum Romanum was a slow growth. The marshy battlefield of the early inhabitants of the Capitol and Palatine became, when the ground was drained by the great cloacae, under a united rule the most convenient site for political meetings, for commercial transactions, and for the pageants of rich men's funerals, ludi scenici, and gladiatorial games. 6 For these purposes a central space, though but a small one, was kept clear of buildings; but it was gradually occupied in a somewhat inconvenient manner by an ever-accumulating crowd of statues and other honorary monu- ments. On three sides the limits of this open space are marked by paved roads, faced by the stately buildings which gradually took the place of the simple wooden tabernae and porticus of early times. The Comitium 7 was a level space in front of the Curia ; the construc- tion of both is ascribed to Tullus Hostilius. For the position of the Comitium and the Curia 8 see plan of Forum (fig. 8). Varro {L.L. v – I55-56) gives the following account of the buildings which were grouped along the northern angle of the Forum : —

" Comitium ab eo quod coibant eo comitiis curiatis et litium causa. Curiae duorum generum, nam et ubi curarent sacerdotes res

1 See Tac. Hist. iii. 74, 85; Suet. Vit. 17.

2 See Livy (xliv. 16), who mentions a house of P. Africanus, " pone veteres ad Vortumni signum," which was bought by T. Sempronius to clear the site for the Basilica Sempronia in 169 B.C. This basilica was afterwards absorbed in the Basilica Julia.

• Hence these two sides of the Forum are frequently referred to in classical writings as " sub veteribus " and " sub novis."

- In later times it was an enclosed space containing an altar; it is described by Ovid (Fast. vi. 403); according to one tradition it marked the spot where Curtius's self-immolation filled up the chasm which had opened in the Forum (see Dionys. ii. 41). (See

below.)

6 See Dionys. ii. 50, vi. 67; Plin. H.N. xvi. 236; Plut. Quaes. Rom. 47.

6 The first gladiatorial show in Rome was given in 264 B.C. in the Forum Boarium by D. Junius Brutus at his father's funeral (Liv. Epit. xvi.), the first in the Forum Romanum in 216 B.C. (Liv. xxiii. 30). See also Liv. xxxi. 50, xli. 28; and Suet. Caes. 39; Aug. 43; and Tib. 7.

7 On the Comitium see Detlefsen, Ann. Inst, (i860), pp. 128 ff., and the works mentioned below, note 11.

8 Livy (xlv. 24) ind'eates their relative positions by the phrase " comitium vestibulum Curiae."

divinas, ut Curiae Veteres, et ubi senatus humanas, tit Curia Hostilia, quod primum aedificavit Hostilius rex. Ante hanc Rostra; quojus loci id vocabulum, quod ex hostibus capta fixa sunt rostra. Sub dextra hujus a Comitio locus substructus, ubi nationum subsisterent legati qui ad senatum essent missi. Is Graecostasis appellatus a parte ut multa. Senaculum supra Graecostasim, ubi Aedis Con- cordiae et Basilica Opimia. Senaculum vocatum, ubi senatus, aut ubi seniores consisterent."

The curia or senate-house passed through many vicissitudes. 8 At first called Curia Hostilia, from its founder Tullus Hostilius (Liv. i. 30), it lasted till 52 B.C., when it was burnt at the Curia

funeral of Clodius, and was then rebuilt by Faustus Sulla, and from his gens called Curia Cornelia (Dio Cass. xl. 50). It was again rebuilt by Julius Caesar, and dedicated by Augustus (29 B.C..) under the name of the Curia Julia, as recorded in the inscription of Ancyra (q.v.)—CVRIAM . ET . CONTINENS . EI . CHALCIDICVM ... . FECI. Little is known about the adjoining buildings called the Athenaeum and Chalcidicum; Dion Cassius (li. 22) mentions the group. In the reign of Domitian the Curia Julia was restored (Prosp. Aquit. p. 571), and it was finally rebuilt by Diocletian. The existing church of S.Adriano is the Curia of Diocletian, though of course much altered, and with its floor raised about 20 ft. above the old level. The level of the entrance was raised in the middle ages, and again in 1654. Sixteenth-century drawings and engrav- ings show the lower level. The ancient bronze doors now at the end of the nave of the Lateran basilica originally belonged to this building, and were removed thence by Alexander VII. The brick cornice and marble consoles, covered with enriched mouldings in stucco, and the sham marble facing, also of stucco, if

compared with similar details in the baths of Diocletian, leave no doubt as to this being a work of his time, and not, as was at one time assumed, the work of Pope Honorius I. (a.d. 625-38) who consecrated it as the church of S. Adriano.

From the Curia a flight of steps led down to the Comitium (Liv. i. 36), a space consecrated as a templum according to the rules of augury (Cic. De Or. iii. 3) and used for the meetings of the Comitia Coml-

Curiata, and for certain religious ceremonies performed, tium

after the fall of the monarchy, by the rex sacrificulus. It contained ancient monuments, relics, such as the.fi.cus ruminalis, and the supposed tomb of Romulus, whose site was marked in later times by a ” black stone ‘ ‘ (lapis niger) . Facing the Curia stood the platform from which speakers addressed the people, adorned in 338 B.C. with the beaks of the ships captured from the Latins at the naval victory of Antium and hence called the rostra. Caesar determined to remove the rostra from the Comitium to the Forum, and this plan was carried out after his murder. From the original rostra Cicero delivered his Second and Third Catiline Orations, and they were the scene of some of the most important political struggles of Rome, such as the enunciation of their laws by the Gracchi. Beside the Comitium another monument was erected, also adorned with beaks of ships, to commemorate the same victory at Antium. This was the Columna Maeniana, so called in honour of Maenius (Plin. H-N. xxxiv. 20, vii. 212). The Columna Duilia was a similar monument, erected in honour of the victory of C. Duilius over the Punic fleet in 260 B.C.; a fragment of it with inscription (restored in imperial times) is preserved in the Capitoline Museum. 10 Columns such as these were called columnae rostratae.

In 1899-1900 the site of the Comitium — which was considerably reduced in extent by the building of the later Curia — was excavated by Commendatore Boni, in some parts as far as the virgin soil. 11 Remains of walls and pavements of various periods (some very early) were discovered; some of the walls, there is no doubt, supported the platform of the early rostra, which appears to have been at first rectangular and at a later time curved. Opposite to the Curia is a square paved with black marble slabs, which it is natural to identify with the lapis niger of tradition. Beneath this pavement was found a group of early monuments, which were at some time destroyed and afterwards covered over. We are told on the authority of Varro that Romulus was buried in front of (or behind) the rostra, and that two lions were sculptured as guardians of his tomb; and we find in fact a foundation (D, fig. 9) from which project two moulded bases of tufa

(A, B) on which the lions may well have stood, on either side of a block © which might serve as an altar. Beside this tomb (if such it be) stood the trunk of a tufa column (E) and a rectangular stele (F) which bears on all its faces an inscription written alternately upwards and downwards, so that only the ends of the lines can be read. That it is the earliest specimen of the Latin language is undoubted; and it certainly mentions the rex. But after the expulsion of the kings the rex

9 On the Curia and its vicissitudes see Lanciani, V Aula e gli Uffici del Senato Romano (1883).

10 The column itself is a copy made by Michelangelo; it is at the foot of the stairs of the Palazzo dei Conservatori.

11 The discoveries of Comm. Boni have given rise to much discussion. Of the numerous articles, &c, which have appeared it will suffice to name Petersen, Comitium, Rostra, Grab des Romulus (1904), and Pinza, // Comizio romano nelV eld repubblicana (1905) ; see Huelsen, The Roman Forum, pp. 1 10 ff.

Original rostra.

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sacrificulus performed his functions in the Comitium, and the inscription may refer to him. This may be the stele to which Dionysius of Halicarnassus refers as marking the tomb of Hostus Hostilius (father of Tullus Hostilius) whose site (according to those who believed in the translation of Romulus to heaven) was marked .y the lapis niger.

Fig. 9. — Early Monuments in the Comitium. A, B. Moulded tufa bases.

C. Base of altar (?).

D. Rectangular foundation.

E. Truncated column.

F. Stele with inscription.

G. Steps leading to platform of rostra.

The dotted line shows the position of the lapis niger.

The Senaculum appears to have been a place of preliminary meeting for the senate before entering the Curia (Liv. xli. 27 ; gggj,. Val. Max. ii. 2, 6); it adjoined the temple of Concord, „j„„J and when this was rebuilt on an enlarged scale in the

reign of Augustus it appears probable that its large projecting portico became the Senaculum.

Fig. 8. — The Roman Forum

A great part of the north-east side of the Fcrum was occupied by two basilicae, which were more than once rebuilt under different names. The first of these appears to have been adjacent a as m ca g to the Curia, on its west side; it was called the Basilica ht Forum Porcia, and was founded by the elder Cato in 185 B.C. (see Liv. xxxix. 44, and Plut. Cato Major, 19) ; it was burnt with the Curia at Clodius's funeral. On the north side of the Forum another basilica, called Aemilia et Fulvia (Varro vi. 4), was built in 179 B.C. by the censors M. Fulvius and M. Aemilius Lepidus ; l it stood, according to Livy (xl. 51), " post argentarias novas;" the line of silversmiths' shops along the north-east side of the Forum. In 50 B.C. it was rebuilt by L. Aemilius Paulus with Caesar's money (Plut. Caes. 29; Appian, Bell. Civ. ii. 26), and was more than once restored within the few subsequent years by members of the same family. Its later name was the Basilica Pauli, and it was remark- able for its magnificent columns of Phrygian marble (Plin. H.N. xxxvi. 102) or pavonazzetto. Part of the western end was still standing in the 16th century, and was drawn by Giuliano da Sangallo (Huelsen, The Roman Forum, fig. 61). Recent excavations nave shown that it was approached from the Forum by a flight of steps leading to a two-storeyed colonnade. Behind this was a row of tabernae in the middle of which was the entrance to the main hall, consisting in a nave and three aisles (two on the north side).

Near the middle of the north-east side of the Forum stood also the small bronze temple of Janus, 2 the doors of which were shut on those rare occasions when Rome was at peace. 3 A Temole first brass of Nero shows it as a small cella, with richly fjJL as ornamented frieze and cornice. Another aedicula near that of Janus was the shrine of Venus Cloacina (or the Purifier), on the line of the cloaca which runs

under the Basilica Aemilia;

1 The Forum Piscatorium or fish-market appears to have been at the back of this basilica (see Liv. xl. 51).

2 The original temple was one of the prehistoric buildings attri- buted to Romulus and Tatius (Serv. Ad Aen. i. 291), or by Livy (i. 19) to Numa.

‘See Mon. Anc. 2, 42; Procop. Bell. Goth. i. 25; Liv. i. 19; Suet. Aug. 22.

and the Sacra Via.

its foundations and plinth were brought to light in 1899 (Liv. iii. 48; Plin. H.N. xv. 119).

Fig. 8 shows plan of the rostra as they existed under the Empire. We see an oblong platform about 78 ft. long and 1 1 ft. high above the level of the Forum; its ground floor, paved with Existing herring-bone bricks, is 2 ft. 6 in. below the Forum paving. rostra. j ts en(j an(j s j(j e wa u s are f tu f a blocks, 2 ft. thick and

2 ft. wide, each carefully clamped to the next with wooden dovetail dowels. Its floor was supported by a series of travertine piers, carrying travertine lintels, on which the floor slabs rested. Outside it was completely lined with Greek marble and hada richly moulded plinth and cornice; the front wall was restored in 1904, and the fragments of the cornice replaced. A groove cut in the top of the cornice shows the place where marble cancelli were fixed; one of the cornice blocks is partly without this groove, showing that the screen did not extend along the whole front of the rostra. This agrees with a relief on the arch of Constantirie, representing the emperor making an oration from the rostra, with other buildings at this end of the Forum shown behind. In this relief the screen is shown with a. break in the middle, so that the orator, standing in the centre, was visible from head to foot. Two tiers of large holes to hold the bronze rostra are drilled right through the tufa wall, and even through the travertine pilasters where one happens to come in the way; these holes show that there were nineteen rostra in the lower tier, and twenty above set over the

intermediate spaces of the lower row. The back wall of the rostra is of concrete faced with brick. The inside space, under the main floor of the rostra, is coated thickly with stucco — the brick wall being studded in the usual way with iron nails to form a key for the .plaster.

Immediately behind the rostra is a curved platform approached by steps from the side facing the Capitol. It has been much disputed whether this platform is earlier or later than the rostra ; but Curved t ˆ e ev y ence { t h e construction at the point of juncture platform. seems to s how that the hemicycle is the earlier. When the arch of Severus was built, part of the platform of the rostra was cut away and a court of irregular shape was thus formed, from which the rostra was approached by steps. The front wall of the hemicycle was now exposed in its eastern half; this was faced with slabs of porta santa marble, pilasters of africano, and a moulded

mscryVaJkctaˆ’

plinth of white marble, whose blocks bear the Greek characters T, A, E, Z, H, 6, K; the omissions make it clear that the blocks were removed from some other building. A number of holes in the marble, some of which contain fragments of metal pins, show that bronze ornaments were at one time attached to the facing. The hemicycle has been identified (without sufficient reason) with the Graecostasis, a platform near the rostra reserved for foreign embassies (Varro, L.L. v. 155; Cic. Q.F. ii. 1), which continued to exist throughout the imperial period and was restored by Antoninus Pius (Vita 9, 2). It is, however, far more likely that it represents the original form of the rostra as removed to the Forum according to Caesar’s design. 1 When the oblong platform was built (perhaps by Trajan) it was approached from the back by the hemicycle. The bronze rostra on the imperial structure were believed to be the original beaks from Antium, moved from the old rostra (Floras, i. II). On its marble platform stood many statues, 2 e.g. of Sulla, Pompey, two of Julius Caesar, and others (Dio Cass. xlii. 18 and xliv. 4); these are represented on a bas-relief from the arch of Constantine. It is further commonly believed that the marble ptutei which now stand in the centre of the Forum once decorated the rostra: Owing probably to the weight of _ the many statues proving too much for the travertine piers, which are not set on their natural beds but endways, and therefore are very weak, the structure seems to have given way at more than one time, and the floor has been supported by piers and arches of brick-faced concrete,

1 See Mau in Rom. Mitt. 1906, pp. 230 ff .

2 The original rostra had specially honorary statues to those Roman ambassadors who had been ‘killed while on foreign service (Liv. iv. 17); these were probably removed during Cicero s lifetime (Cic. Phil. ix. 2, 4; see also Dio Cass, xliii. 49; and Plin. H.N. xxxiv. 23, 24). Ghastly ornaments fixed to these rostra in the year 43 B.C., shortly after they were built, were the head and hands of the murdered Cicero (Appian, Bell. Civ. iv. 20; Dio Cass, xlvii. 8 ; Juv. x. J20), as on the original rostra had been fixed many heads of the chief victims of the proscriptions of Marius and Sulla (see Appian, Bell. Civ. i. 71, 94; Floras iii. 21). The denarius of the sens Lollia with the legend PALIKANVS represents the rostra of the late republican period.

Temple of Saturn.

inserted either in place of or at the sides of the shattered piers. These later additions, apparently of the 3rd and 4th centuries, are omitted in fig. 8 for the sake of clearness. In or about A.D. 470 the facade of the rostra was prolonged northwards by an addition in Very poor brickwork, apparently to celebrate a naval victory over the Vandals. At the northern end of the curved platform there is a cylindrical structure of concrete faced with brick and lined with thin marble

slabs ; it is in three stages, each diminishing in size, and

” appears to be an addition of about the time of Severus.

MMfff This is usually identified with the Umbilicus Romae, or

. “~ central point of the city, mentioned in the Notitia and the

Einsiedeln MS. (Jordan, Topographie der Stadt Rom, ii.6ˆ5). Near the rostra, below the temple of Saturn, stood the Millianum Aureum, a marble column sheathed in gilt bronze and inscribed with the names and distances of the chief towns on the roads which radiated from the thirty seven gates of Rome (Plin. H.N. iii. 66). It was set up by Augustus in 20 B.C., and its position ” sub aede Saturni ” is indicated by Tacitus (Hist. i. 27; see schol. on Suet. Otho. 6, and Plut. Galba, 24). The Miliarium is mentioned in the Notitia (Reg. viii.) as being near the Vicus Jugarius. Its pre cise position cannot be determined. Fragments of a marble cylinder and cornice with floriated reliefs, now

lying in front of the temple of Saturn, probably belonged to this monument; they were found in 1835 near the supposed site.

The position of the temple of Saturn is indicated in Mon. Anc. (see below, n. 6) and shown on the marble plan, and is also identified

by various passages in ancient writers. Varro (L.L. v. 42)

speaks of it as being infaucibus Capitolii ; Servius (Ad Aen.

ii. 115) says that it is in front of the Clivus Capitolinus, and near the temple of Concord (see Plate VIII.). It was built against a steep slope or outlying part of the Capitoline hill 1 (cf. Dionys. i. 34) on the site of a prehistoric altar to Saturn, after whom the Capitoline hill was originally called Mons Saturnius. The public treasury was part of this temple (Serv. Ad Aen. ii. 116, and Macrob. Sat. i. 8). The original temple is said by Varro (ap. Macrob. i. 8) to have been begun by the last Tarquin, and dedicated by T. Larcius, the first dictator, 498 B.C.; but Dionysius (vi. 1) and Livy (ii. 21) attribute it to the consuls A. Sempronius and M. Minucius in 497 B.C. It was rebuilt on a larger scale by L. Munatius Plancus in 42 B.C. (Suet. Aug. 29). The only part remaining of this date is the very lofty podium of massive travertine blocks, and part of the lower course of Athenian marble, with which the whole was faced. In the 16th century a piece of the marble frieze was found, inscribed I. . PLANCVS . L . F . COS . IMPER . ITER . DE . MAN1B . (C.I.L.

vi. 13 16). The erection of the six granite columns in the front and two at the sides, with .their clumsily patched entablature, bearing the inscription SENATVS . PQPVLVSQVE . ROMANVS . INCENDIO . CONSVMTVM . RESTITVIT, belongs to the last rebuilding in the time of Diocletian. Some of these fine columns are evidently earlier than this rebuilding, but were refixed with rude caps and bases. One of the columns is set wrong way up, and the whole work is of the most careless sort. Part of the inscription, once inlaid with bronze, recording this latest rebuilding, still exists on the entablature. On the Forum side the temple is flanked by the Vicus Jugarius, while the steep Clivus Capitolinus winds round the front of the great flight of steps leading up to the cella, and then turns along the north-west side of the temple. 2 The v Vicus Jugarius (see fig. 8), part of the basalt paving of

J ‘aw s which is now exposed, was so called (see Festus, ed. Miiller, “* ” ‘ p. 104) from an altar to Juno Juga, the guardian of marriage. Starting from the Forum, it passed between the temple of Saturn and

the Basilica Julia, then close under the cliff of the Capitolium (see Liv. xxxv. 21) and on to the Porta Carmen- talis. It was spanned at its commencement by a brick-faced arch lined with marble, the lower part of which exists, and is not earlier than the 3rd or 4th century. 3 At this end of the Forum the arch of Tiberius was built beside the Sacra Via. It was erected in A.D. 17, to commemorate the recovery of the standards lost by Varus. 4 The concrete foundation has recently been exposed.

The Basilica Julia 6 occupies a great part of the south-west side

Basilica °' tne Forum, along the line of the Sacra Via; its ends

Julia are bounded by the Vicus Jugarius and the Vicus

Tuscus. It was begun by Julius Caesar, who dedicated it

-vhen still unfinished, on the 26th of September 46 b.c , completed

1 Below the temple of Saturn the Clivus Capitolinus is carried on an arched substructure of somewhat irregular opus reticulatum. This has been described (but without much probability) as the rostra of Caesar.

2 A portion of these streets with part of the temple of Saturn and the Basilica Julia is shown on fragments of the marble plan (see Plate VIII.).

3 One side of this gate was built against one of the marble piers of the Basilica Julia, a perfect print of which still exists in the concrete of the gate, though the marble pier itself has disappeared. The other side of the gate abutted against the marble-lined podium of the temple of Saturn.

4 See Tac. Ann. ii. 41, who says it was propter aedem Saturni.

6 See Suet. Aug. 29; Gerhard, Bas. Giulia, &c. (1823); and Visconti, Escavazione delta Bas. Giulia (1872).

by Augustus, and again rebuilt by him after a fire, as is recorded in Mon. Anc. 4, 13, 6 in an important passage which gives its complete early history. It consisted of a central hall with aisles, galleries and clerestory, surrounded on three sides by a colonnade in two storeys approached by steps; on the S.W. a row of rooms or tabernae took the place of the colonnade. The central nave was paved with richly coloured oriental marbles, namely pavonazzetto, cipollino, giallo and africano. The covered aisles are paved with large slabs of white

marble. 7 Many tabulae lusoriae, or gambling boards, are scratched on this marble paving (cf. Cic. Phil. ii. 23). 8 Low marble cancelli, with moulded plinth, closed the otherwise open arches of the basilica; many fragments exist, and one piece of the subplinth is still in situ. This basilica held four law-courts, which in ifnportant cases held joint sessions. Trajan and other emperors held law- courts there (Dio Cass, lxxxviii. 10). An inscription found near it (C.I.L. vi. 1658) records its restoration by Septimius Severus in A.D. 199, after a fire; it was again burnt in 283 and restored by Diocletian. These fires had destroyed nearly all the fine marble arches of Augustus; and Diocletian rebuilt it mostly with brick or travertine piers, portions of which remain. 9 A final restoration is recorded in inscriptions discovered at various times from the 1 6th century onwards, as being carried out by Gabinius Vettius Probianus, praefect of the city in 377; one of these is on a pedestalwhich now stands in the Vicus Jugarius. Suetonius (Cal. 37) mentions that it was one of Caligula's amusements to throw money to the people below from the roof of this basilica, which formed a link in the bridge by which this maniac connected the Palatine with the Capitolium.

The Vicus Tuscus passes from the Sacra Via between the Basilica Julia and the temple of Castor to the Velabrum and Circus Maxi- mus; its basalt paving has been exposed at many points along its whole line. A very early statue of Vortumnus Y. s stood in this street, a little to the south-west of the luscus. Basilica Julia, where part of its pedestal was found in 1549 inscribed VORTVMNVS TEMPORIBVS DIOCLETIANI . ET . MAXIMIANI . . . (C.I.L. vi. 804 ; 10 see also Pseudo-Ascon, Ad Cic. Verr. ii. I, 59). The Vicus Tuscus was also called Thurarius, from shops of perfume- sellers (see Schol. ad Hor. Sal. ii. 3, 228, and Ep. ii. 1, 269). It is the street along which processions passed, mentioned by Cicero (Verr. ii. I, 59) as extending a signo Vertumni in Circum Maximum.

The temple of Castor 11 — or, more properly, of " the Castores," i.e. Castor and Pollux — on the south-east side of the Vicus Tuscus was founded to commemorate the apparition in the Forum Temnle of the Dioscuri, announcing the victory of Aulus Postumius t Castor at Lake Regillus, 496 B.C., and was dedicated in 484 B.C. by the son of A. Postumius (Liv. ii. 20, 42; Dionys. vi. 13; 0,v. Fast. i. 706). In 119 B.C. it was restored by the consul L. Caecilius Metellus Dalmaticus (Ascon. In. Cic. Pro Scaur. 46), and finally rebuilt in the reign of Augustus by Tiberius atid Drusus, A.D. 6 (Suet. Tib. 20; Ov. Fast. i. 705; Dio Cass. lv. 8, 27); the three existing Corinthian columns and piece of entablature, all very delicate and graceful in detail, and of the finest workmanship, in Pentelic marble, belong to a still later restoration

under Trajan or Hadrian. One point shows Roman timidity in the use of a lintel: the frieze is jointed so as to form a flat arch, quite needlessly, with the object of relieving the weight on the architrave. Its plan, hexastyle, with only eleven columns on the sides, is shown in fig. 8. It had a lofty podium, faced with marble and decorated with a heavy cornice and pilasters, one under each column. The

C odium is an interesting example of the enormous solidity of Roman uildings of the best period. Solid tufa walls, 8 ft. thick, are built under the whole of the cella and the front row of columns, while the columns of the sides rest on spurs of similar walling, projecting at right angles from that under the cella; the part immediately under the columns is of travertine, and the spurs are united and strengthened laterally by massive flat arches, also of travertine. Between the foundations of the columns were chambers used as offices, &c. With the exception of a small chamber under the steps, entered from the Vicus Tuscus, the entire podium is filled up by a solid mass of concrete, made of broken tufa, pozzolana and lime, the whole forming a lofty platform, about 22 ft. high, solid as a rock, on which the columns and upper structure are erected. The podium contains

6 ” Forvm . Ivlivm . et . basilicam . qvae . fvit . inter . aedem . Castoris . et . aedem . Satvrni . coepta . profligataqve . opera . a . patre. meo. perfeci. et. eandem. basilicam. consvmptam. incendio . amDliato . eivs . solo . svb . titvlo . nominis . filiorvm . inchoavi . et . si . viws . non . perfecissem . perfici . ab . haeredibvs . [meis . ivssil].” The filii here referred to are Augustus’s grandsons, Gaius and Lucius, adopted by him in 17 B.C. (see Dio Cass. lvi. 27).

7 Three medieval lime-kilns were found by Canina within this basilica, which accounts for the scantiness of the existing remains.

8 A few have inscriptions, e.g. ” Vinces . gaudes: perdes . plangis.” ‘ The whole building has unhappily been much falsified by need- less restoration.

10 A drawing of this pedestal, which is now lost,, with MS. note by Ligorio, exists in Cod. Vat. 3439, fol. 46.

11 The temple of Castor is shown on two fragments of the marble plan, and its position is also indicated by the passage in the Mon. Anc. quoted above (note 6).

FORUM ROMANUMJ

ROME

a few remains 1 of the earliest temple, built of blocks of grey-green tufa. Two fragments of mosaic, with simple lozenge pattern in white marble and basalt, still exist in the cella of this temple. The level of the mosaic, which probably belongs to the rebuilding of Tiberius, lies considerably below that of the later floor, which seems to date from Hadrian's reign. It has all the characteristics of early mosaic — very small tesserae fitted with great accuracy, like the early mosaic in the Regia. The temple of Castor was often used as a meeting-place for the senate, and its lofty podium formed a tribunal for orations. 2 The Fons or Lacus Juturnae (see Ov. Fast. i. 705, and Dionys. vi. 13), at which the Dioscuri were fabled to have watered their horses, was beside their temple ; the precinct was discovered in 1900-1. The Lacus itself, a basin 16J ft. square and 6j ft. deep, is immediately opposite the three standing columns of the temple; in the centre is a base of ,opus reticulatum, which supported statues of the Dioscuri; an altar with reliefs, together with other sculptures, has been found close by, and a few yards off is a small chapel or aedicula, intended for a statue of Juturna, and in front of it a well-curb (puteal) of white marble, set up by the aedile M. Barbatius Pollio in the reign of Augustus.

Close to the temple of Castor, at the angle of the Forum, stood

the arch of Augustus, set up in 20 B.C. to commemorate the recovery

of the standards taken from Crassus by the Parthians.

Archot j ts f ounc j a tions were discovered in 1888; it had three

agus us. jˆays, an(j j-gsted on the pavement of a street which before

the time of Augustus formed the E. boundary of the Forum.

On the other side of the Sacra Via stand the remains of the temple of Divus Julius, erected by Augustus. Though little beyond its _ . concrete core is left, its plan can be fairly well made out t n? * from the voids in the concrete, which show the position j .. vus of the tufa foundations under the walls and columns (as " us ' in the temple of Castor). The temple itself, a hexastyle

prostyle building, with close intercolumniation (Vitr. iii. 2), stood on a lofty podium with a curved recess in the front between two flights of stairs (see Plate VIII.). The wall which now fills up the recess is a late addition. In 1898 the base of a large altar was discovered in the niche, doubtless that mentioned by Appian (Bell. Civ. ii. 148). The podium,

which projects in front of the temple itself, was adorned with beaks from the ships taken at Actium (Dio Cass. Ii. 19), and hence it was called the Rostra Julia, to distinguish it from the other rostra described above. Both were used for the funeral orations in honour of Augustus (Suet. Aug. 100; see also Dio Cass. liv. 35). Besides the concrete core and the curved tufa wall of the recess, little now exists except a small bit of the mosaic of the cella floor and some fragments of the cornice and pediment, of fine Greek marble. This temple is represented on coins of Augustus and Hadrian.

The temple of Vesta, founded according to tradition by Numa, 3 stands at the southern angle of the Forum on the ancient line of . the Sacra Via (Ov. Trist. iii. I, 28). No shrine in Rome *™ p * was equal in sanctity to this little circular building, which es a ‘ contained the sacred fire and the relics on which the welfare and even the existence of Rome depended. The original building was destroyed in 390 B.C. by the Gauls; it was burnt again in 241 B.C., again in the great fire of Nero’s reign, and then in the reign of Commodus; after this it was rebuilt by Severus, to whose age belong the fragments of columns, cornice and other architectural features now lying around the ruined podium. With the aid of coins 4 and a relief preserved in the Uffizi at Florence 5 it is possible to make a sufficiently accurate restoration of the temple. 6 It con- sisted of a circular cella, surrounded by eighteen columns, with screens between them; the circular podium, about 10 ft. high, still exists, mainly of concrete with some foundations of tufa blocks, which may belong to the original structure. Recent excavations have disclosed a pit (favissa) in the middle of the podium, where the ashes of the sacred fire were temporarily stored. In the time of Pliny (H.N. xxxiv. 7) the tholus or dome over the cella — symbol- izing the canopy of heaven (Ov. Fast. vi. 276) — was covered with Syracusan bronze. Its position near the temple of Castor is mentioned by Martial (i. 71-73). 7

The Regia, or office of the pontifex maximus, was on the Sacra Via, close by the temple of Vesta. It [also was traditionally „ . founded by Numa, and used as his dwelling-house; it

” was destroyed in 390 B.C. by the Gauls, and was again

burnt in 210 B.C. (Liv. xxvi. 27), when the temple of Vesta narrowly

1 On these see Delbriick, Das Capitolium von Signia (1903), p. 22 ; Der Apollotempel auf dem Marsfelde (1903), p. 14; van Buren in Class. Rev. xx. pp. 77 ff.

2 The front of the podium was decorated with ships' beaks. One of the mad acts of Caligula was to make the temple of Castor into the vestibule of his palace by breaking a door through the back of the cella (Suet. Cal. 22).

5 Another legend attributes its founding to Romulus.

4 On the coins see Dressel, Zeitschr. fur Numismatik (1899), 20 ff.

6 Lanciani, L'Atrio di Vesta (1884), pi. xix.

6 See Huelsen, The Roman Forum, p. 190, fig. 108. 'See Jordan, Vesta und die Laren (Berlin, 1865); and Auer in the Denkschriften der Wiener Akademie (1888), ii. 209 ff.

escaped. Ovid (Trist. iii. I, 28) describes this end of the Forum thus : —

" Haec est a sacris quae via nomen habet, Hie locus est Vestae, qui Pallada servat et ignem, Hie fuit antiqui Regia parva Numae."

It was again damaged by fire in 148 B.C. and 36 B.C., after which it was rebuilt in marble by Cn. Domitius Calvinus, and its outer walls inscribed with the lists of consuls and triumphs (fasti consulares et triumphales) of which many fragments have been recovered. Recent excavations have brought to light the tufa foundations of the republican building, including a round substructure, which may have supported the sacrarium Martis, in which were preserved the ancilia or sacred shields and spears (Gell. iv. 6), and an under- ground cistern, which has been brought into connexion with the shrine of Ops Consiva (Varro, L.L. vi. 21). The official residence of the pontifex maximus was not the Regia, but the domus publica; when Augustus succeeded to the office, he conveyed a part of his residence on the Palatine to the state in order to satisfy the claims of tradition, and presented the domus publica to the vestals.

The excavations of 1883-84 laid bare remains of this very interesting building, and showed that it was a large house extending close up to the Atrium Vestae; its orientation corresponded with that ol the Regia. The existing remains are of several dates — first, walls of soft tufa, part possibly of the earliest building; second, walls of hard tufa, of rather later date; and lastly, concrete walls faced with brick, decorated with painted stucco, and columns of travertine, also stuccoed and painted, 8 with a large quantity of fine mosaic of that early sort which has very small tesserae put together with great accuracy. These valuable remains were preserved in spite of the erection of later

buildings over them, because the levels of the later floors were higher than those of the Regia, and thus covered and protected the mosaics and lower parts of the walls and columns.

The Atrium Vestae, or house of the vestals, like the temple, was many times burnt and rebuilt; the existing building, which was excavated in 1883-84 and more completely in 1901, seems . . to have been built after the great fire of a.d. 64, and to •*”””» **have been restored or enlarged several times — by the es “‘**

Flavianˆ emperors, who added the colonnade; Hadrian, who built the tablinum and other rooms at the end ;the Antonines, and Septimius Severus, who restored the whole after the fire of a.d. 192. 9 It consists of a large atrium or quadrangle with columns of cipollino. At one end is the tablinum, with three small rooms on each side of it — probably for the six vestals. A bathroom, bakehouse, servants’ offices, and some rooms lined with rich marbles extend along the south-west side. This extensive building is set against the side of the Palatine, which is cut away to admit the lower storey. Thus the level of the first upper floor is nearly the same as that of the Nova Via, on which it faces, about 23 ft. above the ground floor. The upper floor is in part well preserved; it contains a large suite of bath and other rooms, which were probably the sleeping apartments of the vestals. All the better rooms and the baths are lined with polished marbles, many of great beauty and rarity; the floors are mostly mosaic of tessellated work. The paving of the tablinum was a beautiful specimen of inlay in porphyry and marble. In many places alterations and clumsy patchings of the 4th and 5th centuries are apparent. A number of statues of the chief vestal, or virgo vestahs maxima, with inscribed pedestals, were found in the atrium, mostly of the 3rd century, though a few are earlier; these are of especial interest as illustrating the sacerdotal dress of the vestals. 10 Nothing but the Nova Via separates the Atrium Vestae from the imperial palace (see Plin. Ep. vii. 19; Aul. Gell. . i. 12), which extends over the site of the Lucus Vestae — ” qui a Palatii radice in Novam Viam devexus est ” (Cic. De Div. i. 45). A curious octagonal structure in the middle of the atrium looks very much like a border for flower-beds ; and it is possible that this miniature garden was made by the vestals when the Lucus Vestae ceased to exist. By the main entrance from the Forum stood a small aedicula — a large pedestal, at the angles of which were columns supporting an entablature. 11 It no doubt contained a statue of Vesta, there being none within the temple. It is of the time of Hadrian. Gratian confiscated the house and endowments of the vestals in a.d. 382, but the atrium continued to be partly inhabited for many centuries later by imperial or papal officials. 12 In September 1884 a road was

8 The columns were crimson, the travertine rain-water gutter bright blue, and the inner walls had. simple designs in panels of leaf ornament and wreaths.

9 A full account of the Atrium Vestae and its successive restora- tions is given in Miss E. B. Van Deman's Atrium Vestae ˆ1909).

10 The most important of these have been removed to the Museo delle Terme.

11 The front is inscribed SENATVS . POPVLVSQVE . ROMANVS . PECVNIA . PVBLICA . FACIENDAM . CVRAVIT.

12 In the excavations of December 1883 a pot was found in the north corner containing 830 silver pennies of English kings of the 9th and 10th centuries — Alfred the Great ,_ Edward I., Aethelstan, Eadmund I., and others. A list of these is given by De Rossi in Lanciani's work, L'Atrio di Vesta (Rome, 1884). None are later

discovered leading up past the tablinum end of the atrium'from the Sacra Via to the Nova Via. In about the 4th century this road appears to have been blocked up at the Nova Via end by a building which adjoined the Atrium Vestae.

At the north-east corner of the Forum stood the arch of Q,. Fabius Maximus, consul in 121 B.C., called Allobrogicus from his victory. Arcbot over tne Allobroges (Schol. on Cic, In Verr., Actio i. 7); Fabius. Liv. Ep. lvi. ; Plin. H.N. vii. 166). It marked the extreme limit of the Forum in this direction (Cic. Pro Plane, 7, 17), as the rostra did at the other end. Remains of this arch were dug up and mostly destroyed in 1546, near the temple of Faustina; on one of the fragments then discovered was inscribed Q.FABIVS.Q. F. MAXSVMVS.AED.CVR.REST. (Dessau, Inscr. Lat. Sel. 43d). About twenty-five other fragments were found in 1882. 1

The temple of Faustina the elder stands at the east angle of the Forum, facing the later line of the Sacra Via. It is prostyle hexa- _ style, and has monolithic columns of cipollino and a rich

Temple or en t a blature of Greek marble, with graceful reliefs of

Faustina, g r ;ffi ns an(j candelabra on the frieze. 2 The walls are of massive peperino, once lined with marble. On the front is in- scribed DIVO. ANTONINO. ET. DIVAE. FAVSTINAE. EX. S. C. This temple, built by Antoninus Pius in memory of his wife, who died in 141, was after his death dedicated [also to him, and the first line was then added {Vita Ant. Pii, 6). In the Middle Ages it was consecrated as the church of S. Lorenzo in Miranda, and a great part of its cella has been destroyed. The front is now excavated to the original level. This temple is shown on the reverse of several coins of Antoninus Pius; some have the legend DEDICATIO. AEDIS.

The space between the north-west end of the Forum and the Tabularium is occupied by a range of important buildings (see Temple ot Plate VIII.). The chief of these is the temple of Concord Concord. (see Festus, ed. Miiller, p. 347) shown on a fragment of the marble plan, founded by Camillus in 366 B.C. (Plut. Cam. 42), and restored by Opimius after the death of C. Gracchus (121 B.C.). It was afterwards rebuilt by Tiberius out of the spoils gained in Germany; it was rededicated by Tiberius in a.d. 10 in his own name and that of his brother Drusus (who had died in B.C. 9) [Suet. Tib. 20; Dio. Cass. lv. 25]. It is shown with unusual minuteness on the reverse of a first brass of Tiberius. The existing remains 3 are of the rebuilding by Tiberius, and show that it was unusual jn plan, having a large cella much wider than its depth, and a very large projecting portico. Its construction is an interesting example of the Roman use of many different materials. The lower part of the walls was of massive tufa blocks, the upper part of the cella of travertine ; and the inner low wall, which sup- ported ranges of internal columns, was of mixed concrete, tufa and travertine. The whole was lined with marble, white outside, and rich oriental marbles inside (see fig. 4), which were also used for the pavement. The door-sill is made of enormous blocks of porta santa marble, in which a bronze caduceus (emblem of Mercury) was inlaid. Between the internal columns of the cella stood rows of statues; and the temple also contained a large collection of pictures, engraved gems, gold and silver plate, and other works of art, mostly the work of ancient Greek artists (see Plin. H-N. xxxiv. 19; xxxv. 36, 40, xxxvi. 67, xxxvii. 2). **On the apex of the pediment was a group of three figures embracing; the tympanum was filled with sculpture; and statues were set in the open porch. Though now only the podium and the lower part of the cella wall exist, with foundations of the great flight of steps, many rich fragments both of the Corinthian entablature and of the internal caps and bases are preserved in the Tabularium; and some of the marble lining is still in situ. The Einsiedeltt MS. gives part of the inscription of the front—**

S.P.Q.R.AEDEM.CONCORDIAE. VETVSTATE. COLLAPSAM . IN.MELIOREM . FACIEM. OPERE . ET.CVLTV. SPLENDIDIORE . RESTITVERVNT (C.I.L. vi. 89).

than 946, and a bronze fibula inlaid with silver with the name of Pope Marinus II. (942-46) makes it seem probable that this hoard was concealed during his pontificate.

1 Not. degli Scavi (1882), p. 225.

, » This finely sculptured frieze is almost an exact copy of that on the temple of Apollo at Miletus.

- The size of the earlier and smaller temple is indicated by the rough blocks on the face of the wall of the Tabularium, close against which the temple stands. When the Tabularium was built it was not thought worth while to dress to a smooth face that part of its wall which was concealed by the then existing temple of Concord.

4 Little is known of the Basilica Opimia, which probably adjoined the earlier temple of Concord, and the existing building appears also to have occupied the site of the Senaculum (see Festus, ed. Mflller, p. 347). For various exciting scenes which took place in the temple of Concord and on its steps, see Cic. Phil. vii. 8; Sallust, BeU. Cat. 49. Another temple of Concord, built in 216 B.C., stood on the Capitoline Arx (Liv. xxii. 33, xxiii. 21); and a bronze aedicula of Concord in the Area Vulcani, which must have been clo.se by the great temple. This was dedicated by Cn. Flavius, 305 B.C. (see Lir. ix. 46); according to Pliny {H.N. xxxiii. 19) it stood ” in

The temple of Vespasian stands close by that of Concord, abutting on the Tabularium in a similar way, and blocking up a doorway at the foot of a long flight of steps (see fig. 1). It consists of a nearly square cella with prostyle hexastyle portico of “‘J 1 * the Corinthian order ; three of the columns are _ still *fJjL* standing, with their rich entablature, the frieze of which is p ‘ sculptured with sacred instruments. The walls are of enormous blocks of travertine with strong iron clamps; the whole was lined with white Pentelic marble outside, and inside with coloured oriental marbles. There was an internal range of columns, as in the* temple of Concdrd. This temple was begun by Titus in a.d. 80, in honour of his father Vespasian, and finished by Domitian, who dedicated it to Vespasian and Titus. The inscription on the entablature, given in the Einsiedeln MS., records a restoration by Severusand Caracalla— DI VO. VESPASIANO.

AVGVSTO.S.P.Q.R. 1MPP. CAESS. SEVERVS.ET. ANTONINVS. PII. FELIC. AVGQ. RESTITVERVNT; part of the last word only now exists.

In the narrow space between the temples of Concord and Vespasian (only about 7 ft.' in width) a small brick and concrete edifice stands against the Tabularium. In it was found an inscribed base dedicated to Faustina the younger by one of the viatores (messengers) of the quaestors, who probably had their office here.

The next building is the Porticus Deorum Consentium, a colonnade in two wings which join at the obtuse angle, with a row of small rooms or shrines partly cut into the tufa rock of the hill pnrtkm behind. This conjunction of twelve deities was of Vˆ S Etruscan origin; they were six of each sex and were cˆ™”* called Senatus Deorum (Varro, L.L. viii. 70, and De Re senthtm. Rust, i. i). 6 The columns are of cipollino with Corinthian caps; on the frieze is an inscription recording a restoration by Vettius Agorius P r aetextatus, praefect of the city in a.d. 367. Under the marble platform is a row of seven small rooms, the brick facing of which is perhaps of the Flavian period.

The arch of Severus stands by the rostra, across the road on the north-east side of the Forum; the remains of the ancient travertine curb show that originally the road went along a rather different line, and was probably altered to make room ˆ for this great arch, which was accessible only by steps, Severus. and was not used for ordinary traffic. It was built in a.d. 203, after victories in Parthia, and was originally set up in honour of Severus and his two sons M. Aurelius Antoninus (Caracalla) and Geta. Caracalla, after murdering Geta, erased his name from all monuments to his honour in Rome. Representations of the arch on coins of Severus show that its attic was surmounted by a chariot of bronze drawn by six horses, in which stood Severus crowned by Victory; at the sides were statues of Caracalla and Geta, with an equestrian statue at each angle. The arch, except the base, which is of marble-lined travertine, is built of massive blocks of Pentelic marble, and has large crowded reliefs of victories in the East, showing much decadence from the best period of Roman art.

The central space of the Forum is paved with slabs of travertine, much. patched at various dates; it appears to have been marked out into compartments with incised lines (see Plate VIII.), the use of which is not known. There are also square Central holes which probably held masts on which awnings could space or be spread. Numerous clamp-holes all over the paving rorum, show where statues and other ornaments once stood. The recorded number of these is very great, and they must once have thickly crowded a great part of the central

area. Two short marble walls or plutei covered with reliefs, discovered in 1872, stand on the north side. The rough travertine plinth on which they have been set is evidently of late date. Each of these marble screens has (on the inside) reliefs of a fat bull, boar and ram, decked out with sacrificial wreaths and vittae — the suovetaurilia. On the outside arte scenes in the life of Trajan: in both cases the emperor is speaking from the rostra. On one we also see him seated oh a suggestus instituting a charity for destitute children in a.d. ioi — a scene similar to one shown in one of his first brasses with the legend AUM[ENTA). ITALIAE; 6 at the other end the emperor stands on the rostra, on which the two tiers of beaks are shown; he is addressing a crowd of citizens. In the background is shown the long line of arches of the Basilica Julia, with (on the left) what is probably the temple of Castor and the arch of Augustus. On the right are the statue of, Marsyas and the sacred fig-tree. 7 On the other slab a crowd of officials are bringing tablets and piling them in a heap to be burnt. This records the remission by Trajan of some arrears of debt due to the imperial treasury (Auson. Grat. Act. 32). The background here represents again the Basilica Julia, with (on the right) the Ionic temple of Saturn and the Corinthian temple of Vespasian. Between them is an arch, which may be that of Tiberius. 8 On the left the

Graecostasi, quae tunc> supra Comitium erat." Both these were probably only small shrines.

6 Twelve gilt statues are mentioned by Varro.

6 Cohen, vol. ii. 303-5.

7 This is not the ficus ruminalis in the Comitium, but another mentioned by Pliny {H.N. xv. 20) in the middle of the Forum.

8 As it seems to be on a higher level, it may indicate the Tabularium. !

fig-tree and the statue of Marsyas are repeated. Other explanations of these reliefs have been given, but the above appears the most probable. Towards the other end of the Forum are remains of a large concrete pedestal. It may possibly have supported an equestrian statue of Constantine, which was still standing in the 8th century. A smaller foundation, laid bare by Comm. Boni's excavations in 1905, is thought by him to have supported the equestrian statue of Q. Marcius Tremulus, the conqueror of the Hernici, set up before the temple of Castor in B.C. 305 (Liv. ix. 43).

The seven cubical brick and concrete structures, once faced with marble, which line the Sacra Via are not earlier than the time of Diocletian. They are probably the pedestals of honorary columns such as those shown in the relief on Constantine's arch, mentioned above. The column erected in honour of the tyrant Phocas by Smaragdus in the eleventh year of his exarchate (608) is still stand- ing. It is a fine marble Corinthian column, stolen from some earlier building; it stands on rude steps of marble and tufa. The name of Phocas is erased from the inscription; but the date shows that this monument was to his honour. In the 4th century, or perhaps even later, a long brick and concrete building faced with marble was built along the whole south-east end of the Forum, probably a row of shops. They were destroyed by Comm. Rosa's order. Two columns — one of pavonazzetto, the other of grey granite — were set up on two of the brick bases in 1899.

In 1902 a network of passages (cuniculi) was discovered about 3 ft. beneath the pavement of the Forum. These have tufa walls and concrete vaults; they are about 8 ft. high and 5 ft. broad. At the intersections of the passages are square chambers, in the centre of which are travertine blocks with sockets for windlasses. The construction of the passages seems to date from the time of Julius Caesar, and it is thought that they were used for scenic purposes when games were given in the Forum.

In 1903 a large concrete foundation was found, partly blocking the E. end of one of the cuniculi. There can be no doubt that this once supported the colossal equestrian statue of Domitian described by Statius (Silv. i. 1, 21 ff.) which was destroyed after his murder.

Embedded in the concrete was a cist of massive travertine blocks which was found to contain five archaic vases similar to those from the early necropolis (above, as init.). One held a nugget of quartz containing pure gold. It is uncertain whether these were buried here for ritual purposes or were the contents of an early tomb found in digging the foundations. Near this monument there were found in 1 904 remains of an enclosure of irregular shape which once contained an altar. This must have been the altar which in imperial times represented the Lacus Curtius (Ov. Fast. vi. 403). Beside this were found some remains of a structure of imperial date which Comm. Boni identified with the Tribunal at which justice was administered by the emperors. 1

Palatine Hill or Palatium.

In addition to the early walls described above, only a few re- mains now exist earlier in date than the later years of the republic; these are mostly grouped near the Scalae Caci (see fig. 10, in Plan), and consist of small cellae and other structures of unknown use. 2 They are partly built of the soft tufa used in the ” wall of Romulus,” and partly of hard granulated tufa so called. Various names, such as the ” hut of Faustulus ” and the ” Augur- atorium,” have been given to these very ancient remains, but with little reason. On thing is certain, that the buildings were respected and preserved even under the empire, and were prob- ably regarded as sacred relics of the earliest times.

‘Authorities on the Forum; For the earlier literature of the subject it will suffice to refer to Jordan, Topographic der Stadt Rom, i. 2, 195-429, and, in English, to Nichols, The Roman Forum (1877). By far the best account based on the recent discoveries of Comm. Boni is Huelsen, The Roman Forum (Eng. trans, from the 2nd German edition, by J. B. Carter, 1906), in which full references are given. The official reports of excavations by Comm. Boni appear at intervals in the Notizie degli Scavi, and are largely con- cerned with the ancient necropolis. Huelsen publishes reports in the Romische Mitteilungen which are of great value.

2 Our- knowledge of these remains has been considerably increased by excavations in this region begun in 1907, which form the subject of a scries of reports in the Notizie degli Scavi; their significance is discussed by Pinza in the Annali della Societa degli ingegneri ed architetti lialiani for that year, cf. Ashby in Classical Quarterly (1908), p. 145 ff. It is almost too much to hope that the difficult problems raised by these discoveries will ever be solved ; meanwhile it may be noted (i) that abundant traces of a primitive settlement (pottery,

foundations of huts, &c.) have come to light near the W. angle of the hill ; (ii) that walls of various epochs have been found which may have belonged to a system of fortification, though this cannot be demonstrated ; (iii) that beneath a piece of walling built with regularly laid tufa blocks was found an inhumation-grave con- taining pottery of the 4th century B.C.

Remains of more than one temple of the republican period exist near this west angle of the Palatine. The larger of these (see Plan) has been called conjecturally the temple of Jupiter Victor (Liv. x. 29; Ov. Fast. iv. 621). 3 It stands on a levelled Temple of platform of tufa rock, the lower part of which is excavated Jupiter into quarry chambers, used in later times as water Victor. : reservoirs. Two ancient well-shafts lined with tufa communicate with these subterranean hollows. Extensive foundations of hard: tufa exist in the valley afterwards covered by the Flavian palace (see r>i~- " Foundations of the Domus Augustana "). The masonry is in

Plan,

Statue of Cybeie.

parts of republican date, and was used to support the Flavian palace. Not far from the top of the Scalae Caci are the massive remains of a large cella, nothing of which now exists except the concrete core faced with opus incertum in alternate layers of tufa and peperino. It was probably once lined with marble. By it a noble colossal seated figure of a goddess was found, in Greek marble, well modelled, a work of the 1st century A.D. The head and arms are missing, but the figure is probably rightly called a statue of Cybeie; and inscriptions dedi- cated to Magna Mater have been found close to the temple. Augustus in the Monumentum Ancyranum (4, 8) records aedem. MATRIS . MAGNAE . IN . PAL ATIO . FECI ; and there can be little doubt that this is the temple in question. Some interesting early architectural fragments are lying near this temple ; they consist of drums and capitals of Corinthian columns, and part of the cornice of the pediment, cut in peperino, and thickly coated with hard white stucco to imitate marble. Between this and the temple Of Jupiter Victor are extensive remains of a large porticus, with tufa walls and travertine piers, also republican in date. The use and name of this building are unknown.

Remains of extensive lines of buildings in early opus reticulatum exist on the upper slopes of the Palatine, all along the Velabrum side, and on the south-west side as far as the so-called Paedagogium. These buildings are constructed on the ruins of the wall of Romulus, a great

part of which has been cut away to make room for them; their base is at the foot of the ancient wall, on the shelf cut midway in the side of the hill; their top reached originally above the upper level of the summit. They are of various dates, and cannot be identified with any known buildings. Part is apparently of Domus the time of the emperor Tiberius, and no doubt belongs to • riberi- the Domus Tiberiana mentioned by Suetonius (Tib. 5; Tac. aaa Hist. i. 27j iii. 71) ; this palace covered a great part of the west corner of the hill. Of about the same date is a very interesting and well-preserved private house built wholly of opus House oi reticulatum, which formed part of the imperial property, Livla and was respected when the later palaces were built. The discovery of lead-pipes bearing the inscription IVLIAE . AVQ (C.I.L. xv. 7264) has led to the conjecture that the house was that bequeathed to Livia by her first husband, Tib. Claudius Nero. At the north-west end is a small atrium, Out of which open three rooms commonly called the tablinum and alae, as well as a triclinium, all decorated with good paintings of mythological and domestic scenes, probably the work of Greek artists, as inscriptions in Greek occur, e.g. EPMHC, under the figure of Hermes, in a picture representing his deliverance of Io from Argus.* This suite of rooms was a later addition to the house. The south-east portion was three storeys high, and is divided into a great number of very small rooms, mostly bedrooms. The house is built in a sort of hole against the side of an elevation, so that the upper floor behind is level with an ancient paved road. The dampness caused by this is counteracted and kept off the paintings by a lining of flange-tiles over the external walls, under the stucco, thus forming an air-cavity all over the surface. From the back of the house,' at the upper level, a long subterranean passage leads towards the Flavian palace, and then, turning at right angles and passing by the founda- tions of the so-called temple of Jupiter Victor, issues in the ancient tufa building mentioned above. Another crypto-porticus starts near this house and communicates with the long semi-subterranean passage by which the palaces of Caligula a: id Domitian are Connected. It is ornamented with very beautiful stucco reliefs of cupids, beasts and foliage, once painted and gilt. Some hold that the house was that of Germanicus, into which the soldiers who killed Caligula in the long crypto-porticus escaped, as described by Josephus (Ant. Jud. xix. 1; see also Suet. Cal. 58).

From the Summa Sacra Via a road led to the Area Palatina in the centre of the hill. Here was the sanctuary called Roma quadrata, containing the mundus, a pit in which' the instruments used in the founding of the city were deposited. To the east was the Area Apollinis, the entrance of which led through lofty propylaea into a

yery extensive peristyle or porticus, with columns of Numidian giallo; the temple was of white Luna marhle. In the centre of this enclosure stood the great octostyle peripteral temple of Apollo Palatinus. The splendour of its architecture and the countless works of art in gold,

3 It has recently been argued by Pinza that this is the temple of Apollo built by Augustus.

4 See Mon. Inst. xi. pis. xxii., xxiii.; Mau, Geschichte der Wandmalerei, pL ix. ;, Renier, Les Peintures du Palatin (Paris,

1870).

silver, ivory, bronze and marble, mostly the production of the best Greek artists, which adorned this magnificent group of buildings, must have made it the chief glory of this splendid city. This temple was begun by Augustus in 36 B.C., 1 after his Sicilian victory over Sextus Pompeius, and dedicated on the 9th of October 28 B.C. 8 A glowing account of the splendours of these buildings is given by Propertius (ii. 2, iii. 31). Inside the cella were statues of Apollo between Latona and Diana by Scopas, Cephisodotus and Timotheus respectively (Plin. H.N. xxxvi. 24, 25, 32) ; beneath the base of the group were preserved the Sibylline books. The pediment had sculpture by Bupalus and Archermus of Chios (Plin. H.N. xxxvi. 13), and on the apex was Apollo in a quadriga of gilt bronze. The double door was covered with ivory reliefs of the death of the Niobids and the defeat of the Gauls at Delphi. The Ancyran inscription records that Augustus melted down eighty silver statues of himself and with the money ” offered golden gifts ” to this temple, dedicat- ing them both in his own name and in the names of the original donors of the statues. 3 The Sibylline books were preserved under the statue of Apollo (Suet. Aug. 31); and within the cella were vases, tripods and statues of gold and silver, with a collection of engraved gems dedicated by Marcellus (see Plin. H.N. xxxvii. II, xxxiv. 14). In the porticus was a large library, with separate departments for Latin and Greek literature, 4 and a iarge hall where the senate occasionally met (Tac. Ann. ii. 37). Round the porticus,

between the Numidian marble columns, were statues of the fifty Danaids, and opposite them their fifty bridegrooms on horseback (see Schol. on Pers. ii. 56). In the centre, before the steps of the temple, stood an altar surrounded by four oxen, the work of Myron (Prop. iii. 31, 5). In the centre of the Palatine stood the palace of Augustus, built in the years following 36 B.C., and renewed after a fire in A.D. 3. It contained a small temple of Vesta (C.I.L. i. 2 p. 317), dedicated on the 28th of April 12 B.C., when Augustus was elected pontifex maximus. Augustus's building was completely transformed by later emperors, but the name domus Augustana was retained in official use. The Area Apollinis and its group of buildings suffered in the fire of Nero, and were restored by Domitian. The whole was finally destroyed in the great fire of 363 (Ammian. xxiii. 3, 3), but the Sibylline books were saved.

To the north-west of the Area Palatina stood the Domus Tiberiana, a palace built by Tiberius on substructures of concrete which crown the north-west slope of the hill and forma platform now occu pied by the Farnese gardens, overlooking the Clivus Victoriae. Caligula is said to have added to this palace on the side towards the Forum, making the temple of Castor into a vestibule, and to have connected it with the Capitol by a bridge whose piers were found by the temple of Augustus and the Basilica Julia; but this was destroyed after his death. At a later time the palace was extended so as to include the northern angle of the Palatine, which had once been covered with private houses. Among these were the dwellings of Q. Lutatius Catulus, Q. Hortensius, Scaurus, Crassus (Plin. H.N. xxxvi. 3, 24), whose house was afterwards bought by Cicero. 6 Many other wealthy Romans had houses on this part of the Palatine. The part now existing is little more than the gigantic substructure built to raise the principal rooms to the level of the top of the hill. The lowest parts of these face the Nova Via, opposite the Atrium Vestae, and many storeys of small vaulted rooms built in mixed brick and opus reticulatum rise one above the other to the higher levels. 6 The palace extends over the Clivus Victoriae, supported on lofty arches so as to leave the road un- blocked ; many travertine or marble stairs lead to the upper rooms, some starting from the Nova Via, others from the Clivus Victoriae. A large proportion of these substructures consist of dark rooms, some with no means of lighting, others with scanty borrowed light. Many small rooms and stairs scarcely 2 ft. wide can only have been used by slaves. The ground floors on the Nova Via and the Clivus Victoriae appear to have been shops, judging from their wide openings, with travertine sills, grooved for the wooden fronts with narrow doors, which Roman shops seem always to have had — very like those now used in the East. The

upper and principal rooms were once richly decorated with marble linings, columns and mosaics; but little of these now remains. The upper part of the palace, that above the Clivus Victoriae, is faced wholly with brickwork, no opus reticulatum being used as in the lower portions by the Nova Via. This marks a difference of date, and this is confirmed by the occurrence of brick stamps of the 2nd century A.D.

1 TEMPLVM . APOLLINIS . IN . SOLO . MAGNAM . PARTEM . EMPTO . FECI (Mon. Anc. 4, 1).

- See Dio Cass. xlix. 15, liii. 1, and C.I.L. i. 2 p. 331.

3 See also Suet. Aug. 52, whose account is rather different.

4 Schol. to Juv. i. 128, and Suet. Aug. 29.

6 Cic. Pro Domo, 43; Val. Max. vi. 3, 1 ; and see Becker, Handb.

1 P- 4 2 3-. . ...

6 At this point the Palatine is cut away into four stages like gigantic steps; the lowest is the floor of the Atrium Vestae, the second the Nova Via, the third the Clivus Victoriae, and the top of the hill forms the fourth.

The next great addition to the buildings of the Palatine was the magnificent suite of state apartments built by Domitian, over a deep natural valley running across the hill (see Plan). The valley was filled up and the level of the new palace Fl'vlao raised to a considerable height above the natural soil. «***• Remains of a house, decorated with painting and rich marbles, exist under Domitian's peristyle, partly destroyed by the foundations of cast concrete which cut right through it. The floor of this house shows the original level, far below that of the !• (avian palace. This building is connected with the palace of Caligula by a branch subterranean passage leading into the earlier crypto-porticus. It consists of a block of state-rooms, in the centre of which is a large open peristyle, with columns of oriental marble, at one end of which is the grand triclinium with magnificent paving of opus sectile in red and green basalt and coloured marbles, a piece of which is well preserved; next to the triclinium, on to which it opens with large windows, is a nymphaeum or room with marble-lined fountain and recesses for plants and statues. On the opposite side of the peristyle is a large throne-room, the walls of which were adorned with rows of pavonazzetto and giallo columns and large marble niches, in which were colossal statues of porphyry and basalt; at one

side of this is the basilica, with central nave and apse and narrow aisles, over which were galleries. The apse, in which was the emperor's throne, is screened off by open marble cancelli, a part of which still exists. It is of great interest as showing the origin of the Christian basilica (see Basilica). 7 On the other side of the throne-room is the lararium, with altar and pedestal for a statue; next to this is the grand staircase, which led to the upper rooms, now destroyed. The whole building, both floor and walls, was covered with the richest oriental marbles. Outside were colonnades or porticus, — on one side of cipollino, on the other of travertine, the latter stuccoed and painted. The magnificence of the whole, crowded with fine Greek sculpture and covered with polished marbles of the most brilliant colours, is difficult now to realize; a glowing description is given by Statius (Silv. iv. 11, 18; see also Plut. Poplic. 15, and Mart. viii. 36). Doors were arranged in the throne-room and basilica so that the emperor could slip out unobserved and reach by a staircase (g on Plan) the crypto-porticus which communicates with Caligula's palace. The vault of this passage was covered with mosaic of mixed marble and glass, a few fragments of which still remain; its walls were lined with rich marbles; it was lighted by a series of windows in the springing of the vault. This, as well as the Flavian palace, appears to have suffered more than once from fire, and in many places important restorations of the time of Severus, and some as late as the 4th century, are evident. , In 1720-28 extensive excavations were made here for the Farnese duke of Parma, and an immense quantity of statues and marble architectural fragments were dis- covered, many of which are now at Naples and elsewhere. Among them were sixteen beautiful fluted columns of pavonazzetto and giallo, fragments of the basalt statues, and an immense door-sill of Pentelic marble, now used for the high altar of the Pantheon; these all came from the throne-room. The excavations were carried on by Bianchini, who published a book on the subject. 8

In the middle of the slopes of the Palatine, towards the Circus Maximus, are considerable remains of buildings set against the early wall and covering one of its projecting spurs, consisting in a series of rooms with a long Corinthian colonnade. • g? 1 ˆ,* The rooms were partly marble-lined and partly decorated with painted stucco, on which are incised a number of "' interesting inscriptions and rude drawings. Here,_ in 1856, was found the celebrated caricature of the Crucified Christ, now in the Museo Kircheriano. 9 The inscription CORINTHVS . EXIT . DE . PEDAGOGIO suggests that this building was at one time used as a school, perhaps for the imperial slaves. 10 A number of soldiers' names also occur, e.g. HILARVS . MI . V . D . N .

(Hilarus miles veslitor domini nostri ?) ; some are in mixed Latin and Greek characters. After one pair of names is inscribed PEREG, showing . that they belonged to the corps called frumentarii stationed in the Castra Peregrinorum on the Caelian. Most of these inscriptions appear to be as early as the 1st century a.d. u These interesting graffiti have in great part perished during the last few years. Some inscriptions found in the larger rooms seem to indicate that the imperial wardrobe found a place in them.

To the south of the Flavian state-rooms, on the side of the hill overlooking the Circus, was a building with a central peristyle (" Palace of Domitian " on Plan), which was excavated in 1775 and

7 The brick stamps on the tiles laid under the marble paving of the basilica have CN.DOMITI.AMANDI.VALEAT.QVI.FECIT.,- the last three words a common augury of good luck stamped on bricks or amphorae.

8 Pal. dei Cesari (Verona, 1738); see Guattani, Not. di Antich.

(1798).

9 See Kraus, Das Spottcrucifix vom Palatin (Freiburg, 1872), and Becker, Das Spottcrucifix, &c. (Breslau, 1866).

10 The paedagogium was, however, on the Caelian. Huelsen suggests that it is here used as a siang term for a prison.

11 See Henzen, in the Bull. Inst.. 1863, p. 72, and 1867, p. 113.

Fig. io. — Plan of the Palatine.

again partly laid bare in 1869 and the following years. This has often, but wrongly, been called the palace of Augustus; we should rather see in it the dwelling-rooms of the Flavian palace. Adjoining it is the so-called stadium of the Palatine (" Hippodromus" on Plan), begun by Domitian, enlarged by Hadrian, and much altered or restored by Severus. The greater part of the outer walls and the large exedra or apse at the side, with upper floor for the emperor's seat, are of the time of Hadrian, as is shown by the brick stamps, and the character of the brick facing, which much* resembles that of the Flavian time

(bricks i| in. and joints J in. thick). 1 The stadium is surrounded with a colonnade of engaged shafts, forming a sort of aisle with gallery over it. Except those at the curved end, which are of Hadrian's time, these piers are of the time of Severus, as are also all the flat piers along the outer wall, — one opposite each of those in the inner line. Severus restored the galleries after the great fire of a.d. 191. This building was the hippodromus Palatii; the word here means, not a racecourse, but a garden (Plin. Epp. 5,6,19). In addition to the stadium, Hadrian built a number of very

1 In parts of the outer wall brick stamps of the Flavian period appear, e.g. FLAVI . AVG . L . CLONI — " [A brick] of Flavius Clonus, freedman of Augustus" (C.I.L. xv. 1149).

handsome rooms, forming a palace on the south-east side and at the south-west end of the stadium. These rooms were partly destroyed and partly hidden by the later palace of Severus, the Hadrian's foundations of which in many places cut through and paˆce. render useless the highly decorated rooms of Hadrian. The finest Of these which is now visible is a room with a large window opening into the stadium near the south angle; it has intersecting barrel vaults, with deep coffers, richly ornamented in stucco. The oval structure shown in the plan (fig. 10), with other still later additions, belongs to the 6th century; in its walls, of opus mixtum, are found brick stamps of the reign of Theodoric, c. 500.

The palace of Septimius Severus was very extensive and of enormous height; it extends not only all over the south angle of the Palatine but also a long way into the valley of the Circus p a i aC e „/ Maximus and towards the Coelian. This part (like Severn*. Caligula's palace) is carried on very lofty arched sub- structures, so as to form a level, uniform with the top of the hill, on which the grand apartments stood. The whole height from the base of the Palatine to several storeys above its summit must have been enormous. Little now remains of the highest storeys, except part of a grand staircase which led to them. Extensive baths, originally decorated with marble linings and mosaics in glass and

marble, cover a great part of the top of the hill. : These and other

Carts of the Palatine were supplied with water by an aqueduct built y' Nero, in continuation of the Claudian aqueduat, some arches of which' still exist on the slope of the Palatine ("Aqua Claudia " on Plan) (see Spart. Sept. Sev. '24). One of, the main roads up to the Palatine passes under the arched substructures of Severus, and near this, at the foot of the hill, at the south angle, Septimius .. Severus built an outlying . part of his palace, a building of great splendour called the Septizodium, 1 or Hbuse of the Seven Planets. Part of the Septizodium existed as late as the reign of Sixtus V. 1(1585-90), who destrdyed it in order to use its', marble decorations and columns in the new basilica of St Peter;* drawings of it are given by Du Perac, Vestigj di Roma (1573), pi. 13, and in other works of that century; 2 . "- ' '

The name Palatium seems to have originally denoted the southern' height of the' Palatine hill, while the summit overlooking .the Vela-brum was called Cermalus, and the saddle connecting the 1 Velia ana p a i atme ant i tne Esquiline on which the temple of Venus Cermalus. and R ome and t ˆ arc h of Titus now stand bore the name Velia. 3 It is evident that this was once higher than it is now; a great part of it was cut away when the level platform for the temple of Venus and Rome Was formed. The foundations of part of Nero's palace along the road between this temple and_ the Esquiline are exposed for about 20 to 30 ft. in height, showing a corresponding lowering of the level here, and the bare tufa rock, cut to a flat surface, is visible on the site of Hadrian's great temple; that the Velia was once much loftier is also indicated by the story of the removal of Valerius Publicola's dwelling. * ■ The arch of Titus, erected in memory of that emperor's sub-jugation of the Jews, but not completed until after, his,, death, stands at the point where the Sacra Via crosses the Velia; it is possible that it once stood farther to the,«ast and was removed to itspresent position when the 'temple of iVenus and Rome was built. The well-known reliefs of the ! archway depict the Jewish triumph and the spoils of the Temple. In the middle ages the arch was converted into a fortress by the Frangipani ; their additions were removed and the arch restored in its present jshape in 1821.

On the Velia and the adjoining Summa Sacra Via were the temples of the Lares and Penates which Augustus rebuilt. 5 The " Aedes Larum " is probably distindt from the " Sacellum Larum " mentioned by Tacitus (Ann- xii. 24) as one of the points in the line of the original pomerium. The temple of Jupiter Stator, traditionally vowed by Romulus during his repulse remote 0/ ˆ v t ' ie Sabines (Liv. i. 12), stood near the Porta Mugonia, Juolier anc * therefore neat the road leading up to the Palatine stltnr Sacra Via. 6 To the south-east of the, arch of Titus (see I ' Plan) are the remains of a concrete podium which

may Shave belonged to this temple in its latest form; and Comm. Boni discovered (in 1907) some early tufa walling close ˆto the above-named arch in which he recognized the foumJa.tio.nS_ of the -early' Temple of temple. Augustus rebuilt the temple of Victory, which gave its name to the Clivus Victoriae; this temple stood

Arch of Thus.

'Sacra Via.

on the site of a prehistoric altar (Dionys. i. 32), and, was

Victory.

more than once rebuilt, — e.g. by L. Postumius, 294 B.C. (Liv. H. 33) In 193 b.c. an aedicula to Victory was built near it by MC Porcius Cato (Liv. xxxv. 9). Remains of the temple and a dedicatory inscription were found in 1728" not far froth the church of S. Teodoro ; the temple was of Parian marble, with Corinthian columns of Numidian giallo antico. The Sacra Via started at the Sacellum Streniae, 'an unknown point on the Esquiline, probably in the valley of the Colosseum (Varro, i.Z,. v. 47), in the quarter called Cerolia. , Thence it probably (in later times) passed round part of the Colpsseum to the slope leading up to the arch of Titus on the Velia ; this piece of its course is lined on one side by remains of private houses, and farther back, against the cliff of the Palatine, are the substructures of the Area Apollinis. From the arch of Titus or Summa Sacra Via the original line of the road has been altered, probably when the temple of Venus and Rome was built by Hadrian. Its later course passed at a sharp angle from the arch '

1 The form Septizonium is also found.

2 See Huelsen, Das Septizonium des Septimius Severus (Berlin, 1886); Maass, Die Tagesgotter in Rom una den Provinzen (Berlin,

1902).

3 " Huic (Palatio) Germalum et Velias conjunxerunt . ._ . ' Germalum ' a germanis Romulo et Remo, quod ad ficum Rumin- alem ibi inventi " (Varro, L.L. v. 54).

4 Liv. ii. 7; Cic. Rep. ii. 31 ; see also Ascon. Ad Cic. in Pis. 52.

6 AEDEM.LARVM.IN.SVMMA. SACRA. VIA- AEDEM.DEVM. PEN ATI VM. IN. VELIA... FECI (Mon. Anc.).

•Dionys. ii. 50; see also Plut. Cic, 16; Ov. Fast. vi. 793, and Trist. iii. i, 131 . Near this temple, and also near the Porta Mugqnia, was the house of Tarquinius Priscus (Liv. i. 41 ; Solin. i. 24). Owing to the strength of its position this temple was more than once .selected during troubled times as a safe meeting-place for the Senate; it was here, as being a ” locus munitissimus,” that Cicero delivered his First Catiline Oration (see Cic. Jn Cat. i. 1).

7 See Bianchini. Pal. dei Cesari (1732), p. 236, pi. vitf-

of Titus to the front’ of Constantihe’s basilica, and on past the temple of Faustina.; It is uncertain whether the continuation of this road to the arch of Severus was in later times called the Sacra Via or whether it rejoined its old line along the Basilica Julia by the cross-road in front of the Aedes Julii. Its original line past the temple of Vesta was completely built over in the 3rd and ˆth centuries, and clumsily fitted pavements of marble and travertine occupy the place of the old basalt blocks. 8 The course of the Nova Via 9 (see Plan) along the north-east slope of the Palatine 10 was exposed in 1882-84. According to Varro (L.L. vi. 59) it was a very old ‘road. It led up from the Velabrum, probably winding along the, slope of the Palatine, round the north angle above the .church of S. Maria Antiqua. The rest of its course, gently ascending towards the arch of Titus, is now exposed, as are also the stairs ■which connected it with the Clivus Victoriae at the northern angle of the Palatine ; a continuation of these stairs led down to the Forum. 11

The extent of the once marshy Velabrum (Gr. Fk\os) is not known, though part of its site is indicated by the church of S. Giorgio in Velabro; Varro (L.L. vi. 24) says, ” extra urbem antiquam Ve/a-

fuit, non longe a porta Romanula.” It was a district full of . ;

shops (Plaut. Capt. 489; Hor. Sat. ii. 3, 30). The Vicus _ •

Tuscus on its course from the Forum to the Circus skirted the Velabrum (Dionys. v. 26), from which the goldsmiths’ arch was an entrance into the Forum Boarium.

From the S.W. end of the Velabrum the Clivus Victoriae rose in a gradual ascent along the slope of the Palatine and ultimately wound round the northern angle.

Capitoline Hill 11 … ‘

The Capitoline hill, once called Mons Saturnius (Varro, L.L. v. 42),

consists of two peaks, the Capitolium and the Arx, 13 with an intermediate valley (Asylum). The older name of the Capi- tolium was Mons Tarpeius (Varro, L.L. v. 41). Livy (i. 10) mentions the founding of a shrine to Jupiter Feretrius on .the Capitolium by Romulus; 14 this summit was afterwards occupied by the great triple temple dedicated to Jupiter, Juno Temple of and Minerva, a triad of deities worshipped under the Jupiter names of Tinia, Thalna and Menerva in every Etruscan Capa- city. This great temple was (Liv. i. 38, 53) founded ” s ” by Tarquin I., built by his son Tarquin II., and dedicated by M. Horatius Pulvillus, consul suffectus in 509 B.C. 16 It was built in the Etruscan style, of peperino stuccoed and painted (Vitr. iii. 3), with wooden architraves, wide intercolumniatioiis and painted terra-cotta statues. 16 It was rebuilt many time’s; the original temple lasted till it was burnt in- 83 B.C.; it was then refounrjed in marble by Sulla, with’ Corinthian columns stolen from the temple of Olympian Zeus in Athens (Plin. *3?xvi. 4, 5), and was completed and dedicated by Q: Lutatius Catulus,: whose name appeared on the front. Augustus, although he restored it at great expense (Mon. Anc. 4, g), did not intro- duce his name by the side of that of Catulus. It was agajp burnt by the Vitellian rioters in a.d. 70, and rebuilt by Vespasian in 7 1. 17 Lastly, it was burnt in the three days’ fire of TitusJs reign 18 and rebuilt with columns of Pentelic marble by Domitian; the gilding alone of this last rebuilding is said to have cost 25 millions sterling (Plut. Publ. 15). Extensive substructures of tufa have been exposed on the eastern peak; in 1875 a fragment of a fluted column was found, of such great size that it could only have belonged to the temple of Jupiter; and a few other architectural fragments have been discovered at different times. The western limit of the temple was determined in 1865, its eastern limit in 1875, and the S.E. angle in 1896.

8 See Jordan, Topographie der Stadt Rom. i. 2. 274-91.

9 See Solinus (i. 24) and Varro (ap. Gell. xvi. 17), who mention its two ends, summa and inftma (cf. Liv. v. 32).

10 See Not. d. Scavi (1882), p. 234. Original level laid bare, 1904.

11 See marble plan on Plate VII. and cf. Ov. Fast. vi. 395.

12 See Rodocanachi, Le Capitole remain (1903; Eng. trans., 1906).

13 The first-named was the southern, the second the northern summit.

14 This is the earliest temple mentioned in Roman history. It was rebuilt by Augustus (Mon. Anc. 4, 5).

15 See Plut. Publ. 14; C.I.L. i. p. 487; Liv. ii. 8. Dionys. v. 35 wrongly gives 507 B.C.

16 Plin. xxxv. 157; see Tac. Hist. iii. 72; Val. Max. v. 10.

17 Suet. Vit. 15, and Vesp. 8; cf. Tac. Hist. iv. 53, and Dio Cass. lxvi. 10.

18 Suet. Dom. 5 ; Dio Cass. lxvi. 24.

It appears that the figures given by Dionysius (iv. 61) for the area are slightly too large. The true measurements were 188 X 204 Roman ft. 1 The temple is represented on many coins, both republican and imperial; these show that the central cella was that of Jupiter, that of Minerva on his right and of Juno on his left. The door was covered with gold reliefs, which were stolen by Stilicho (c. 400; Zosim. v. 38), and the gilt bronze tiles (cf. Plin. xxxiii. 57) on the roof were partly stripped off by Geiseric in 455 (Procop. Bell. Vand. i. 5), and the rest by Pope Honorius I. in 630 (Marliani, Topogr. ii. i). 2 Till 1348, when the steps up to Ara Coeli were built, thete was no access to the Capitol from the back; hence the three ascents to it mentioned by Livy (iii. 7, v. 26-28) and Tacitus (Hist. iii. 71-72) were all from the inside of the Servian circuit. Even on this inner side it was defended by a wall, the gates in which are called ” Capitolii fores ” by Tacitus. Part of the outer wall at the top of the tufa rock, which is cut into a smooth cliff, is visible from the modern Vicolo della Rupe Tarpeia; this cliff is traditionally called the Tarpeian rock, but that must have been on the other side towards the Forum, from whence it was visible, as is clearly stated by Dionysius (vii. 35, viii. 78).’ Another piece of the ancient wall has been exposed, about half-way up the slope from the Forum to the Arx. It is built of soft yellow tufa blocks, five courses of which still remain in the existing fragment. The large temple of Juno Moneta (” the Adviser “) on the Arx, built by Camillas in 384 B.C., was used as the mint; hence monela = ” money ” (Liv. vi. 20).

A large number of other temples and smaller shrines stood on the Capitoline hill, ‘a word used broadly to include both the Capitolium and the Arx. 4 Among these were the temple of Honos and Virtus, built by Marius, and the temple of Fides, founded by Numa, and rebuilt during the First Punic war. Both these were large enough to

hold meetings of the senate. The temples of Mars Ultor (Mon. Anc. 4, 5) and Jupiter Tonans (Suet. Aug. 29; Mon. Anc. 4, 3) were built by Augustus. Other shrines existed to Venus Victrix Ops, Jupiter Custos, and Concord — the last under the Arx (Liv. xxii. 33) — and many others, as well as a triumphal ,arch in honour of Nero, and a crowd of statues and other works of art (see Plin. H.N. xxxiii. 9, xxxiv. 38, 39, 40, 43, 44, 79, xxxv. 69, 100, 108, 157), so that the whole hill must have been a mass of architectural arid artistic magnificence.

The so-called Tabularium 5 occupies the central part of the side towards the Forum ; it is set on the tufa rock, which is cut away Tabu-*° rece ‘ ve i ts lower storey. It derives its name from an

lariu inscription which remained in situ until the 15th century

(C.I.L. vi. 1314); whilst all public departments had their tabularia, this was a central Record Office, where copies of laws, treaties, &c, were preserved. It was built by Catulus, who was also the dedicator of the great temple of Jupiter (Tac. Hist, iii: 72; Dio Cass, xliii. 14), consul in 78 B.C. Its outer walls are of sperone, its inner ones of tufa; the Doric arcade has capitals, imposts and entablature of travertine. Above the arcade was a gallery or porticus, faced with a Corinthian colonnade, of which a few architectural members have been found. The columns appear to have belonged to the 1st century A.D. A road paved with basalt passes through the building along this arcade, entered at one end from the Clivus Capitolinus, and at the other probably from the Gradus Monetae, a flight of steps leading from the temple of Concord and the Forum up to the temple of Juno Moneta on the Arx. The entrance from the Clivus Capitolinus is by a wide flat arch of peperino beautifully jointed ; the other end 1 wall has been mostly destroyed. The back of this building overlooked the Asylum

1 See Bull. Comm. Arch. iii. (1875), p. 165 ; Mon. Inst. v. pi. xxxvi., x. pi. xxxa; Jordan, Topographie der Stadt Rom, i. 2, 69; Notizie degli Scavi, 1896, p. 161, 1897, p. 30; Richter, ” Der kapitolinische Jupitertempel und der italische Fuss,” in Hermes (1887), p. 17.

2 The pediment is shown on a relief novv lost, but extant in the 1 6th century and reproduced in drawings of that date. It has been recently proved to have decorated the Forum of Trajan (Wace in Papers of the B.S.R. iv. p. 240, pi. xx.). The front of the temple is shown on one of the reliefs of Marcus Aurelius now in the Palazzo dei Conservatori (Papers of the B.S.R. iii. pi. xxvi.).

3 See Rodocanachi, The Roman Capitol, p. 50. A graceful account of

the legend of Tarpeia is given by Propertius, Eleg. iv. 4.

4 A structure of great sanctity, dating from prehistoric Etruscan times, was the Auguraculum, an elevated platform upon the Arx, from which the signs in the heavens were observed by the augurs (see Festus, ed. Miiller, p. 18).

5 On the Tabularium see Delbriick, Hellenistische Bauten in Latium, i- (1907), pp. 23-46.

or depression between the two peaks. From this higher level a long steep staircase of sixty-seven steps descends towards the Forum ; the doorway at the foot of these stairs has a flat arch, with a circular relieving arch over it; it was blocked up by the temple of Vespasian. Great damage was done to th ; s building by the additions of Boniface VIII. and Nicholas V., as well as by its being used as a salt store, by which the walls were much corroded. 6 ,-

The Imperial Pora.

The Forum Julium (see fig. 11, Plan) u with its central temple of Venus Genetrix, was begun, about 54 B.C., by Julius (who dedicated it in an unfinished state in 46 B.C.) and completed by p _ Augustus. 7 Being built'on a crowded site it was some- ... _ what cramped, and the ground cost nearly a hundred " " '

million sesterces. 8 Part of its circuit Wall, with remains of five arches, exists in the Via delle Marmorelle; and behind is a row of small vaulted rooms, probably shops or offices. The arches are slightly cambered with travertine springers, and keys; the rest, with the circular relieving arch over, is of tufa; it was once lined with slabs of marble, the holes for which exist. Foundations of the circuit wall exist under the houses towards S. Adriano, but the whole plan has not been made out. In the centre of the Forum stood the temple of Venus Genetrix, whose remains were seen and described by Palladio (Arch. iv. 31). This temple was vowed by Caesar at the battle of Pharsalus. 9

The forum of Augustus (see fig. 11) adjoined that of Julius on its north-east side; it contained the temple of Mars Ultor, built to commemorate the vengeance taken on Caesar's murderers _ ,

at Philippi, 42 B.C. (Oy. Past. v. 575 seq.). 10 It. was ™" -u ™° / surrounded with a massive wall of 'peperino, over 100. ft. ugus us ' high, with travertine string-courses and cornice; a large piece of this wall still exists, and is one of the most imposing relics of ancient Rome. Against it are remains of the temple of Mars, three columns, of

which, with their entablature and marble ceiling' of the peristyle, are still standing; it is Corinthian in style, very richly decorated, and built of fine Luna marble. The cella is of peperino, lined with marble; and the lower part of the lofty circuit wall seems also to have been lined with marble on the inside of the forum. The large archway by the temple (Arco dei Pantani) is of travertine. Palladio (Arch, iv.) and other writers of the 1 6th century give plans of the temple and circuit wall, showing much more than now exists. The temple, which was octastyle, with nine columns and a pilaster on the sides, occupied the centre, and on each side the circuit wall formed two large semicircular apses, decorated with tiers of niches for statues. 11

The Forum Pacis, built by Vespasian, was farther t,o the south- east; the only _ existing piece, a massive and lofty wall of mixed tufa and peperino, with a travertine archway, is opposite _ the end of the basilica of Constantine. The arch opened p"^- into the so-called Templum Sacrae Urbis, a rectangular P* cls – building entered by a portico on its west side, whose north wall was decorated with a marble plan of the city of Rome (see below, p. 608). The original plan was probably burnt with the whole group of buildings in this forum in 191, in the reign of Commodus (Dio Cass. lxxii. 24) ; but a new plan was made, and the building restored in concrete and brick by Severus. The north end wall, with the clamps for fixing the marble plan, still exists, as does also the other (rescored) end wall with its arched windows towards the forum; one hundred and sixty-seven fragments of this plan were found c. 1563 at the foot of the wall to which they were fixed, and are now preserved in the Capitoline Museum; drawings of seventy-four pieces now krar are preserved in the Vatican 12 (Cod. Vat. 3439). The whole of these fragments were published by Jordan, Forma Urbis Romae (Berlin, 1874). Other fragments have since been brought to light, and the whole series was rearranged in the Palazzo dei Conservatori in 1903. The circular building at the end facing on the Sacra Via is an addition built by Maxentius in honour of his deified son Romulus; like the other buildings of Maxen- tius, it was rededicated and inscribed with the name of his conqueror

6 The Porta Pandana ("ever-open gate") gave access from the Area Capitolina, upon which the temple of Jupiter, stood, to the Tarpeian rock.

7 See. If ore. Anc. (quoted above); Plin. Hist. . Nat. xxxv. 156, xxxvi. 103.

8 Cic. Pp. ad Att. iv. 16; Suet,. Caes. 26; Plin. H.N. xxxvi. 103.

9 See Dio Cass, xiiii. 22; Appian, Bell. Civ. ii. 102; Vitr. iii. 3; Plut. Caes. 60.

10 The Ancyran inscription records — IN.PRI VATO.SOLO.[EMP]TO. M ARTIS.ULTORIS.TEMPL VM . FORVMQVE.AVG VSTVM.EX. [MANI]BIIS.FECI., See Suet. Aug. 29, 56; Dio Cass. lvi. 27; Plin. H.N. xxxvi. 102, xxxy. 94, xxxiv. 48, vii. 183, where many fine Greek works of art are mentioned as being in the forum of Augustus.

11 Those of Roman leaders and generals, from Aeneas and Romulus to Augustus. See Borsari, Foro d'Augusto, &c; (1884),

12 An interesting description of this discovery is given by Vaeca, writing in 1594 (see Schreiber in Berichte der sacks. Gesellsch. der Wissenschaften, 1881). The scale is roughly I to 250.

Scale of Yards

3P 4S > S°

Mi

Inn RKMer's Topographic der Stsdt Rom. of permission ol C'i. E

Fig. ii. — Imperial Fora.

Constantine. 1 The original building of Vespasian was probably an archive and record office; it was certainly not a temple. The fine bronze doors at the entrance to the temple of Romulus are much earlier than the building itself, as are also the porphyry columns and very rich entablature which ornament this doorway. Pope Felix IV. (526-30) made the double building into the church of SS. Cosmo e Damiano, using the circular domed temple of Romulus as a porch. 2 The chief building of Vespasian's forum was the Tem- plum Paris, 3 dedicated in 75, one of the most magnificent in Rome, which contained a very large collection of works of art.

The forum of Nerva (see fig. 11) occupied the narrow strip left between the fora of Augustus and Vespasian; being little more than a richly decorated street, it was called the Forum Forum of Xransitorium

or Forum Palladium, from the temple to Nerva. Minerva which it contained. It was begun by Domitian, and dedicated by Nerva in 97 (see Suet. Dom. 5; Mart. i. 2, 8). Like the other imperial fora, it was surrounded by a peperino wall, not only lined with marble but also decorated with rows of Corinthian columns supporting a rich entablature with sculptured frieze. Two columns and part of this wall still exist; on the frieze are reliefs of weaving, fulling and various arts which were under the protection of Minerva. A great part of the temple existed till the time of Paul V., who in 1606 destroyed it to use the remains for the building of the Acqua Paola. 4 In the reign of Severus Alexander a series of colossal bronze statues, some equestrian, were set round this forum ; they represented all the previous emperors who had been deified, and by each was a bronze column inscribed with his res gestae (Hist. Aug.; Sev. Alex. 28).

The forum of Trajan with its adjacent buildings was the last and, at least in size, the most magnificent of all ; it was in progress from 1 13 to 1 17, at least. A great spur of hill, which connected Foroni of t j, e Capitoline with the Quirinal, was cut away to make a Trajan. j CV el site for this enormous group of buildings. It con- sisted (see fig. 11) of a large dipteral peristyle, with curved projections, lined with shops on the side. That against the slope of the Quirinal, three storeys high, still partly exists. The main entrance was through a triumphal arch (Dio Cass, lxviii. 29). Aurei of Trajan show this arch and other parts of his forum. 6 The opposite side was occupied by the Basilica Ulpia (Jordan, F. U.R. iii. 25, 26), part of which, with the column of Trajan, is now visible; none of the columns, which are of grey granite, are in situ, and the whole restoration is misleading. Part of the rich paving in oriental marble is genuine. This basilica contained two large libraries (Dio Cass, lxviii. 16; Aul. Gell. xi. 17).

For accounts of this group of buildings, seeDe Rossi, Bull. ” ■ – - – 66 ff. ; and Lanciani,

Arch. Crist. (1867), pp

Bull. Comm. Arch. Rom. (1882), pp. 29

2 ” Hie (Felix) fecit basilicam SS. Cosmae et Damiani … in Via Sacra, juxta Templum Urbis Romae ” {Lib. Pont., Vita S. Velicis IV.). By the last words the basilica of Constantine is meant.

3 Statues by Pheidias and Lysippus existed in the Forum Pacis as late as the 6th century (Procop. Bell. Goth. iv. 21).

- Drawings of it are given by Du Perac and Palladio (Arch. iv. 8). 6 See Aul. Gell. xiii. 25, 2; and Amm. Marc. xvi. 10, 15.

The Columna Cochlis (so called from its spiral stairs) is,, including capital and base, 97 ft 9 in. high, 6 i.e. 100 Roman ft. ; its pedestal has reliefs of trophies of Dacian arms, and winged Victories. Tralan's On the shaft are reliefs arranged spirally in twenty-three co i um n. tiers, scenes of Trajan's victories, containing about 2500 figures. Trajan's ashes were buried in a gold urn under this column (Dio Cass, lxviii. 16); and on the summit was a colossal gilt bronze statue of the emperor, now replaced by a poor' figure of St Peter, set there by Sixtus V. r Beyond the column stood the temple of Trajan completed by Hadrian; its foundations exist under the buildings at the north-east side of the modern female of piazza, and many of its granite columns have been found, xraiaa. This temple is shown on coins of Hadrian. 8 The architect of this magnificent group of buildings was Apollodorus of Damascus (Dio Cass. lxix. 4), who also designed many buildings in Rome during Hadrian's reign. 9 In addition to the five imperial fora, and the Forum Magnum, Holitorium and Boarium, mentioned above, there were also smaller markets for pigs (Forum Suarium), bread (Forum Pistorium) and fish (Forum Piscarium), all of which, with some others, popularly but wrongly called fora, are given in the regionary catalogues.

Other Temples, &c.

Besides the temples mentioned in previous sections remains of many others still exist in Rome. The circular temple by the Tiber, in the Forum Boarium (Plan, No. 5), formerly thought niher to be that of Vesta, is possibly that of Portunus, the god females of the harbour (Varro, L.L. vi. 19). Its design is similar p '

to that of the temple of Vesta in the forum (fig. 8), and, except the entablature and upper part of the cella, which are gone, it is well

6 Its pedestal is inscribed, " Senatus Popiilusque Romanus Imp, Caesari Divi Nervae F. Nervae Trajano Aug. Germ. Dacico Pontif. Maximo Trib. Pot. XVII. [i.e. a.d. 113] Imp. VI. Cos. VI. P. P. ad declarandum quantae altitudinis mons et locus tantis operibus sit egestus." This would seem to indicate the height of the hill removed to form the site, and is so explained by Dion Cass, (lxviii. 16). It is impossible that the saddle connecting the Quirinal with the Capitoline hill can have been 100 ft. in height (Brocchi, Suolo di Roma, p. 133), but it may be that the cliff of the Quirinal was cut back to a slope reaching to a point about 72 ft. high ; thus the state- ment of the

inscription is much exaggerated. Comm. Boni has found the remains of a road beneath the pavement of the Forum, near the column, and believes that the inscription refers to the height of the buildings. Comparetti refers mons to the mass of marble quarried to build the Forum; Sogliano to the mass of ruins and rubbish carted away; Mau to the Servian agger between the Capitol and Quirinal (see Rom. Mitth., 1907, 187 ff.).

7 For the reliefs, see Cichorius, Die Reliefs der Trajanssaule (1896-1900); Petersen, Trajans dakische Kriege (1899-1903) ; Stuart Jones, Papers of the B. R. S., vol. v. From their lofty position they are now difficult to see, but originally must have been very fairly visible from the galleries on the colonnades which once surrounded the column.

•See Aul. Gell. xi. 17, 1; Hist. Aug. Hadr. 19; and compare Pausanias (v. 12, 6; x. 5, 11), who mentions the gilt bronze roofs of Trajan's forum.

‘ See Richter and Grifi, Ristauro del Foro Trajano (1839).

preserved. It may date from the 2nd century B.C. The neighbour- ing Ionic temple, popularly called of Fortuna Virilis, is of special interest from its early date, probably the end of the 3rd century B.C. The complete absence of marble and the very sparing use of traver- tine, combined with the simple purity of its design, indicate an early date. 1 It has a prostyle tetrastyle portico of travertine, and a short cella of tufa with engaged columns; the bases of these and of the angle columns are of travertine. The frieze has reliefs of ox skulls and garlands. The whole was originally stuccoed and painted so that the different stones used would not show. Fig. 12 gives the plan, showing the hard travertine used at the points of greatest pressure, while the main walls with the half columns are

of the weaker and softer tufa. The dedication of this temple is doubtful; but it is probably either that of For- tuna or of Mater Matuta, both of which were de- stroyed by fire in 213 B.C. and re-

Fig. 12.— So-called Temple of Fortuna Virilis. f tor . ed in the *<£-

The black shows tufa ; the shading travertine. lowln g X e * r – , rh . e

church of S. Maria

in Cosmedin contains some remains of a temple (Plan, No. 4) which has been identified wil;h that of Hercules built by Pompey ad Circum Maximum (Vitr. iii. 2, 5; Plin. H.N. xxxiv. 57). The temple stands close to the carceres of the Circus Maxi- mus, in the Forum Boarium. The columns built up in the church did not, however, belong to a temple, but to a porticus. Within the walls of S. Niccolo in Cafcere in the Forum Holitorium (Plan, No. 18) are preserved remains of three small hexastyle peripteral temples, two Ionic and one Tuscan, set close side by side. 2 A fragment of the marble plan includes part of this group. The Tuscan temple is built of travertine, the others of tufa and peperino, with travertine at the points of greatest pressure. They are probably those of Janus ad Theatrum Marcelli, dedicated by C. Duilius in the First Punic War (Tac. Ann. ii. 49) ; of Spes, built by A. Atilius Calatinus, of about the same date (Tac. Ann. ii. 49); and of Juno Sospita, dedicated by C. Cornelius Cethegus in 197 B.C. (Liv. xxxiv. 53). Near the Forum Holitorium are extensive remains of the large group of buildings included in the Porticus Octaviae (Plan, No. 16), two of which, dedicated to Juno Regina and Jupiter Stator, with part of the enclosing porticus and the adjoining temple of Hercules Musarum, are shown on a fragment Porticus tne mar ble P' an – The Porticus Octaviae, a large

Octaviae rectangular space enclosed by a double line of columns, was built in honour of Octavia by her brother Augustus on the site of the Porticus Metelli, founded in 146 B.C. This must not be confounded with the neighbouring Porticus Octavia founded by Cn. Octavius, the conqueror of Perseus (Liv. xlv. 6, 42), in 168 B.C., and rebuilt under the same name by Augustus, as is re- corded in the Ancyran inscription. The whole group was one of the most magnificent in Rome, and contained a large number of works of art by Pheidias and other Greek sculptors. The existing portico, which was the main entrance into the porticus, is a restora- tion of the time of Severus in 203. The church of S. Angelo in Pescheria and the houses behind it conceal extensive remains of the porticus and its temples (see Ann. Inst., 1861, p. 241, 1868, p. 108; and Contigliozzi, /. Portici di Ottavia, 1861). 8

Remains of a large peripteral Corinthian temple are built into the side of the Borsa (formerly the Custom House). Eleven Temole ot mar ^' e columns and their rich entablature are still in Neptune s ' tu ' witn tne corresponding part of the cella wall of peperino; in 1878 a piece of the end wall of the cella was discovered, and, under the houses near, part of a large peri- bolus wall, also of peperino, forming an enclosure with

columns all round the temple nearly 330 ft. square (see Bull. Comm. Arch. Rom. vi. pi. iv., 1878). This temple has commonly been identified with that of Neptune (Dio Cass. lxvi. 24), built by Agrippa, and surrounded by the Porticus Argonautarum (Dio Cass. liii. 27; Mart. iii. 20, 11); but it clearly dates, at least in its present form, from the 2nd century A.D., and is not improbably the temple of Hadrian, mentioned in the Notitia as being near this spot.

The temple of Venus and Rome on the Velia (see fig. 8) was the Temple of ‘ ar .K est in Rome; it was pseudo-dipteral, with ten Corin- Veousand tn ‘ an columns of Greek marble at the ends, and prob- Rome. aol y tw enty at the sides; it had an outer colonnade

round the peribolus of about 180 columns of polished granite. O f these only a few fragments now exist ; for several centuries

1 Fiechter (Rom. Mitth., 1906, pp. 220 ff.) has endeavoured to show that the temple in its present form dates from the 1st century B.C.

2 For drawings of them, see the list given by Huelsen in Jordan, Topographic, i. 3, 511, note 11.

‘ The remains of the Porticus Octaviae have been more com- pletely exposed by the demolition of the Ghetto.

the whole area of this building was used as a quarry, while the residue of the marble was burnt into lime on the spot in kilns built of broken fragments of the porphyry columns. A considerable part of the two cellae with their apses, set back to back, still exists; in each apse was a colossal seated figure of the deity, and along the side walls of the cellae were rows of porphyry columns and statues in niches. The vault is deeply coffered with stucco enrichments once painted and gilt. The roof was covered with tiles of gilt bronze, which were taken by Pope Honorius I. (625-38) to cover the basilica of St Peter’s. These were stolen by the Saracens during their sack of the Leonine city in 846. The emperor Hadrian himself designed this magnificent temple, which was partially completed in 135; the design was criticized severely by the architect Apollo- dorus (Dio Cass. lxix. 4; Vita Hadr. 19). The temple was probably finished by Antoninus Pius; it was partly burned in the reign of Maxentius, who began its restoration, which was carried on by Constantine. The existing remains of the two cellae are mainly of Hadrian’s time, but contain patches of the later restorations. Between the south angle of this temple and the arch of Constantine stand the remains of a fountain, usually known as the Meta Sudans. This was a tall conical structure in a large circular basin, all lined with

marble. From its brick facing it appears to be a work of the Flavian period.

That part of the Caelian hill which is near the Colosseum is covered with very extensive remains — a great peribolus of brick- faced concrete, apparently of Flavian date, and part of a BuBdlats massive travertine arcade in two storeys, similar to that oa tBe of the Colosseum; most of the latter has been removed caelian for the sake of the stone, but a portion still exists under BsqulllDe the monastery and campanile of SS. Giovanni e Paolo. an(j There can be no reasonable doubt that these substruc- Qulrlnal. tures carried the temple of. Claudius, built by Vespasian (Suet. Vesp. 9).

The so-called temple of Minerva Medica (" Nympheum " on Plan) on the eastern slope of the Esquiline (so named from a statue found in it), a curiously planned building, with central decagonal domed hall, probably belonged to the palace of Gallienus (263-68). Some- what similar ruins beside the neighbouring basilica of S. Croce formed part of the Sessorium, a palace on the Esquiline. The remains on the Quirinal, in the Colonna gardens, of massive marble entablatures richly sculptured were formerly thought to belong to Aurelian's great temple of the Sun, but it now appears certain that they belong to the very extensive thermae of Constantine, part of the site of which is now occupied by the Quirinal palace and neigh- bouring buildings. 4

The excavations of recent years have brought to light, and in many cases destroyed, a large number of domestic buildings; these discoveries are recorded in the Notizie degli Scavi and the Bull. Comm. Arch. Rom. The extensive cutting

Private houses.

away of the Tiber bank for the new embankment exposed some very ornate houses near the Villa Farnesina, richly decorated with marble, fine wall-paintings, and stucco reliefs, equal in beauty to any works of the kind that have ever been found. These are now exhibited in the Museo delle Terme, but the houses themselves have been destroyed. The laying out of the new Quirinal and Esquiline quarters has also exposed many fine buildings. Some remains on the Esquiline have been supposed (without much probability) to belong to the villa of Maecenas. A very remarkable vaulted room, decorated with paintings of plants and landscapes, has been shown to be a greenhouse; 5 at one end is an apse with a series of step-like stages for flowers. This one room has been preserved, though the rest of the villa has been destroyed; it is on the road leading from S. Maria Maggiore to the

Lateran. The walls are a very fine speci- men of tufa opus reticulatum, unmixed with brick, evidently of the early imperial period. Among the numerous buildings discovered in the Horti Sallustiani near the Quirinal was a very fine house of the 1st century A.D., in concrete faced with brick and opus reticu- latum. It had a central circular domed hall, with many rooms and staircases round it, rising four storeys high. This house was set in the valley against a cliff of the Quirinal, so that the third floor is level with the upper part of the hill. It is nearly on the line of the Servian wall, which stood here at a higher level on the edge of the cliff. This park was laid out by the historian Sallust, and remained in the possession of his family until the reign of Tiberius, when it became imperial property; it was used as a residence by Nero (Tac. Ann. xiii. 47) and other emperors till the 4th century.' In 1884, near the Porta S. Lorenzo, a long line of houses was discovered during the making of a new road. Some of these were of opus reticulatum of the 1st century B.C.; others had the finest kind of

- See Palladio (Terme dei Romani, London, 1732), who gives the plan of this enormous building, now wholly hidden or destroyed.

6 Bull. Inst. (1875), 89-96; see also Bull. Comm. Arch. (1874), 137 ff., pis. xi.-xviii.

6 During excavations made here in 1876, lead pipes were found inscribed with the name of the estate, the imperial owner (Severus Alexander) , and the plumber who made them — ORTORVM

SALLVSTIANOR . IMP . SEVER . ALEXANDRI . AVQ . NAEVIVS . MANES . FECIT . (C.I.L. XV. 7249).

brick-facing, probably of the time of Nero; all had been richly decorated with marble linings and mosaics. The line of the street was parallel to that of the later Aurelian wall, which at this part was built against the back of this row of houses. At the same time, behind the line of houses were uncovered fine peperino and tufa piers of the aqueduct rebuilt by Augustus, one arch of which forms the Porta S. Lorenzo. These interesting remains have all been completely destroyed. A fine house of the end of the 1st century A.D., with richly decorated walls, was exposed in June 1884 against the slope of the

Quirinal, near the Palazzo Colonna; it was immediately destroyed to make room for new buildings.

The praetorian camp was first made permanent and surrounded with a strong wall by the emperor Tiberius (Suet. Tib. 37). Owing Praetor- *° t ˆ le cam P being included in the line of the Aurelian Ian canto. wa ˆ; a great part of it still exists; it is a very interesting specimen of early imperial brick-facing. The wall is only 12 to 14 ft. high, and has thinly scattered battlements, at intervals of 20 ft. The north-east gate (Porta Principalis Dextra) is well preserved; it had a tower on each side, now greatly reduced in height, in which are small windows with arched heads moulded in one slab of terra-cotta. The brick-facing is very neat and regular, — the bricks being about 1 3 in. thick, with ˆ-in. joints. On the inside of the wall are rows of small rooms for the guards. Part of the Porta Praetoria also remains. This camp was dismantled by Constantine, who removed its inner walls; the outer ones were left because they formed part of the Aurelian circuit. The present wall is nearly three times the height of the original camp wall. The upper part was added when Aurelian included it in his general circuit wall round Rome. The superior neatness and beauty of Tiberius's brick-facing make it easy to distinguish where his work .ends and that of the later emperors begins. Owing to the addition of the later wall it requires some care to trace the rows of battlements which belong to the camp.

The Pantheon is the most perfect among existing classical build- ings in Rome. The inscription on the frieze of the portico (m … Pantheon AGMPPA . L . F . COS . TERTIVM . FECIT) ref ers to a build- ' ing erected by Agrippa in 27 B.C., consecrated to the divinities of the Julian house (Mars, Venus, etc.) under the name Pantheum (" all-holy ") ; cf. Dio Cass. liii. 27; Plin. H.N. xxxvi. 43. It was sometimes used as the meeting-place of the Fratres Arvales before they began to meet in the temple of Concord (C.I.L. V. 2041). Pliny mentions the sculpture by the Athenian Diogenes which adorned it, and its capitals and dome covering of Syracusan bronze (xxxiv. 7). It was long supposed that the present rotunda was the Pantheon of Agrippa; but this was destroyed in the great fire of A.D. 80 (Oros. 7, 12; Hieron. Abr. 2127);. and recent investiga- tions have shown that the rotunda is a work of Hadrian's reign, bricks of that period having been found in all parts of the building. Excavations have made it probable that the site of the rotunda was previously occupied by an open piazza, whose pavement of coloured marbles has been discovered beneath the flooring, and that Agrippa's Pantheon covered the present piazza and faced southward. The present portico has been reconstructed; it is probable that Agrippa's portico had ten columns in the front. The ceiling of the

portico too was of bronze, supported by hollow bronze girders, 1 which remained till Urban VIII. melted them to make cannon for S. Angelo; the bronze weighed 450,000 ft). The bronze tiles of the dome were stolen long before by Constans II., in 663, but on their way to Constantinople they were seized by the Saracens. The portico has eight columns on the front and three on the sides, all granite monoliths except the restored ones on the east side,— sixteen in all. The capitals are Corinthian, of white marble; the tympanum (&«t6s) of the pediment was filled with bronze reliefs of the battle of the gods and the giants. 2 The walls of the circular part, nearly 20 ft. thick, are of solid tufa concrete, thinly faced with brick. The enormous dome, 142 ft. 6 in. in span, is cast in concrete made of pumice-stone, pozzolana and lime; being one solid mass, it covers the build- ing like a shell, free from any lateral thrust at the haunches. On the face of the concrete is a system of superimposed relieving arches in brick. These no longer possess any constructive value, but were designed to preserve the stability of the dome whilst the concrete became firmly set. Round the central opening or hypae- thrum still remains a ring of enriched mouldings in gilt bronze, the only bit left of the bronze which once covered the whole dome. The lower storey of the circular part and the walls of the projecting portico were covered with slabs of Greek marble ; a great part of the latter still remains, enriched with Corinthian pilasters and bands of sculptured ornament. The two upper storeys of the drum were covered outside with hard stucco of pounded marble. Inside the whole was lined with a great variety of rich oriental marbles. This magnificent interior, divided into two orders by an entablature supported on columns and pilasters, has been much injured by

1 A- drawing of this interesting bronze work, by G. A. Dosio, is preserved in.the Uffizi at Florence (No. 1021).

2 On the architrave is cut an inscription recording the restoration of the Pantheon by Severus in 202.

alteration. 3 About 608 the Pantheon was given by Phocas to Boniface IV., who consecrated it as the church of S. Maria ad Martyres. In 1881-82 the destruction of a row of houses behind the Pantheon exposed remains of a grand hall with

Thermae of

richly sculptured entablature on Corinthian columns, part A~rktna of the great thermae of Agrippa, which extend beyond the * ‘ Via della Ciambella. A great part of the thermae appears from the brick stamps

to belong to an extensive reconstruction in the reign of Hadrian 4 (see Baths).

Close by the Pantheon is the church of S. Maria sopra Minerva, which stands (as its name records) on or near the site of a temple to Minerva Chalcidica (Plan, No. 12), probably founded by Pompey the Great, c. 60 B.C. (Plin. H.N. vii. 97), and restored by Domitian. Adjoining this were temples to Isis and Serapis, a cult which became, very popular in Rome in the time of Hadrian; large quantities of sculpture, Egypto-Roman in style, have been found on this site at many different times. 6

Several of the barracks (excubitoria) of the various cohorts of the vigiles or firemen have been discovered in various parts of Rome. That of the first cohort (Plan, No. 29) is buried under the „, ,

Palazzo Savorelli; that of the second (Plan, No. 30) was V “££.” on the Esquiline, near the so-called temple of Minerva arra V KS ‘ Medica; that of the third (Plan, No. 31) was near the baths of Diocletian. The most perfect is that of the seventh cohort (Plan, No. 34), near S. Crisogono in Trastevere, a handsome house of the 2nd century, decorated with mosaic floors, wall-paiiitings, &c. 6

The excavations made in exposing the ancient church of S. Clemente brought to light interesting remains of different periods; drawings are given by Mullooly, St Clement and his Basilica (1869), and De Rossi, Bull. Arch. Crist. (1863),. 28.

Some remains exist of the Golden House of Nero, which, including its parks, lakes, &c, covered an incredibly large space of groundˆ extending from the Palatine, over the Velia and the site .

of the temple of Venus and Rome, to the Esquiline, filling Oolaen the great valley between the Caelian and the Esquiline Afe«f * ° where the Colosseum stands, and reaching far over the Esquiline to the great reservoir now called the ” Sette Sale.” No other extravagances or cruelties of Nero appear to have offended the Roman people so much as the erection of this enormous palace, which must have blocked up many important roads and occu- pied the site of a whole populpus quarter. It was partly to make restitution for this enormous theft of land that Vespasian and Titus destroyed the Golden House and built the Colosseum and Thermae of Titus on part of its site. Adjoining the baths of Titus were those built on a much larger scale by Trajan. Under the substructions of these extensive remains of the Golden House still exist; 7 and at one point, at a lower level still, pavements

and foundations remain of one of the numerous houses destroyed by Nero to clear the site. The great bronze colossus of Nero, 120 ft. high (Suet. Nero, 31), which stood in one of the porticus of the Golden House, was moved by Vespasian, with head and attributes altered to those of Apollo (Helios), on to the Velia; and it was moved again by Hadrian, when the temple of Rome was built, on to the base which still exists near the Colosseum. Several coins show this colossus by the side of the Colosseum.

Under the Palazzo Doria, the church of S. Maria in Via Lata, and other neighbouring buildings extensive remains exist of a great porticus, with long rows of travertine piers; this building is designated on fragments of the marble plan . a f. p

with the words SAEPT . . . LIA. This must be the Ju ” a r Saepta Julia, begun by Julius Caesar, and completed by Agrippa in 27 B.C., as the voting place for the Comitia Ceftturiata, divided into compartments, one for each century. The building contained rostra, and was also used for gladiatorial shows. Under the later empire it became a bazaar and resort of slave-dealers.

That curiously planned building on the Esquiline, in the new Piazza Vit. Emmahuele, where the so-called trophies of Marius once were placed (see Du Perac, Vestigj, pi. 27), is one of the numerous castella or reservoirs from which the water of the various aqueducts was distributed in the quarters they were meant to supply, and may perhaps be identified with the Nymphaeum Alexandri built

s The bronze door is not in its present form antique, having been recast by order of Pius IV.

4 The plan of the whole group, including the Pantheon, is given by Palladio (op. cit.). The recent discoveries are given by Lanciani, Not.d. Scavi (1882), p. 357, with a valuable plan. See also Geymuller, Documents inidits sur les Thermes d’ Agrippa (Lausanne, 1883); Beltrami and Armanini, II Panteon (1898); Durm, Baukunst der Romer, ed. 2, pp. 550 ff. ; Rivoira, Rivista di Roma (1910), p. 412.

6 See Lanciani in Bull. Comm. Arch. Rom. (1883), and Marucchi, ibid. (1896) ; Fea, Miscell. ccliv. 112. Part of the Serapeum is shown on fragments of the marble plan, which have been pieced together by Huelsen (Jordan, Topographie der Stadt Rom. i. 3, pi. x.).

6 See Visconti, La stazione della Coorte VII. de’ Vigih (1867).

7 See De Romanis, Le antiche camere esquiline (1822). It should be

noted that the paintings said to have belonged to, the baths of Titus really decorated the Golden House, over which the baths of Titus and Trajan were built.

by Severus Alexander at the termination of his Alexandrine aque- duct, opened in 225 (see Hist. Aug. Sev. Alex. 25). But the marble trophies now set at the top of the Capitoline steps bear a quarry mark which shows them to be of the time of Domitian : it consists of the following inscription, now not visible, as it is cut on the under part — IMP . DOM . AVG . GERM . PER . CHREZ . LIB . * Ci .»

Places of Amusement. The Circus Maximus (see Circus) occupied the Vallis Murcia 2 between the Palatine and the Aventine. Its first rows of seats, Circuses, which were of wood, are said to have been made under the' Tarquins (Liv. i. 26, 35; Dionys. iii. 68). Per- manent carceres were set up in 329 B.C. and restored in 174 B.C. (Liv. viii. 20, xli. 27). In the reign of Julius Caesar it was rebuilt with (for the first time) lower seats of stone (Plin. H.N. xxxvi. 102), the upper being still of wood (Suet. Caes. 39) ; Dionysius (iii. 68) describes it as it was after this rebuilding. It was further ornamented with marble by Augustus, Claudius and other emperors. The wooden part was burnt in the great fire of Nero, and again under Domitian; it was considerably enlarged by Trajan, and lastly it was restored by Constantine. In its later state it had a marble facade with three external tiers of arches with engaged columns, and (inside) sloping tiers of marble seats, supported on concrete raking vaults (Plin. Paneg. 51). A great part of these vaults existed in the 16th century, and is shown by Du Perac. It is said by Pliny (H.N. xxxvi. 102) — if the text be not corrupt- — to have held 250,000 spectators, while the Regionary Catalogues give the number of seats as 485,000; but Huelsen has shown (Bull. Comm. Arch., 1894, 4 21 ff-) that the figures are much exaggerated and must, moreover, be interpreted, not of the number of spectators, but of the length of the tiers expressed in feet. The end with the carceres was near the church of S. Maria in Cosmedin. 3 Some of its sub- structures, with remains of very early tufa structures on the Palatine side, still exist below the church of S. Anastasia (see Plan of Palatine). The obelisk now in the Piazza del Popolo was set on the spina by Augustus, and that now in the Lateran piazza by Constantius II. The Circus Flaminius in the Campus Martius was built in 221 B.C. by the C. Flaminius

Nepos who was killed at the Trasimene Lake in 217 B.C.; remains of the structure existed until the 16th century, when they were destroyed to build the Palazzo Mattei. In the middle ages its long open space was used as a rope-walk, hence the name of the church called S. Caterina dei Funari, which occupies part of its site. 4 The circus of Caligula and Nero was at the foot of the Vatican Hill (Plin. H.N. xxxvi. 74). The modern s&cristy of St Peter's stands over part of its site. The obelisk on its spina re- mained standing in situ till it was moved by Fontana 6 for Sixtus V. to its present site in the centre of the piazza. The great stadium, foundations of which exist under most of the houses of the Piazza Navona (Agonalis), and especially below S. Agnese, is that built by Domitian and restored by Severus Alexander. That it was a s.tadium and not a circus is shown by the fact that its starting end is at right angles to the sides and not set diagonally, as was always the case with the carceres of a circus; nor is there any trace of foundations of a spina. The best preserved circus is that built by Maxentius in honour of his deified son Romulus, by the Via Appia, 2 m. outside the walls - of Rome. It was attributed to Caracalla till 1825, when an inscription recording its true dedication was found. 6

The first permanent naumachia was that constructed by Augustus between the foot of the Janiculan hill and the Tiber. The naumachia of Domitian was pulled down and the materials used to restore the Circus Maximus (Suet. Dom. 5) ; it was perhaps restored by Trajan, for the remains of a naumachia built of opus reticulatum mixed with brick have been discovered near the mausoleum of Hadrian.

The first stone theatre in Rome was that built by Pompey in 55-52 B.C. (see Theatre: Roman); it contained a temple to Venus Theatres. Victrix, and in front of it was a great porticus, called Hecatostylum from its hundred columns. This is shown on the marble plan. 7 Considerable remains of the foundations exist between the Piazza dei Satiri, which occupies the site of the

'See Bruzza, in Ann. Inst. (1870), and Lenormant, Trophies de Marius, Blois (1842). This once magnificent building, with the marble trophies in their place, is shown with much minuteness on a bronze medallion of Severus Alexander (see Froehner, Midaillons de I'empire, Paris, 1878, p. 169).

2 So called from a, prehistoric altar to the Dea Murcia (Venus) ; Varro, L.L.v. 154.

3 Part of it is shown on a fragment of the marble plan (see Jordan, F.U.R.); it is represented on a bronze medallion of Gordian III., with

an obelisk on the spina and three metae at each end ; in front are groups of wrestlers and boxers (see Grueber, Rom- Med. pi. xli., London, 1874). _ .

- The remains extant in the 1 6th century were described by Ligorio, Libra delle Antichitd (1553), p. 17.

5 See his Trasportazione dell' Obelisco Vat. (1590).

6 Nibby, Circo di Caracalla (1825); Canina, Edifizj di Roma, iv. pis. 194-96.

7 Plut. Pomp. 52; Dion Cass, xxxix. 38; Tac. Ann. xiv. 20.

scena, and the Via de' Giubbonari and Via del Paradise Adjoining this was the porticus Ppmpeiana, which contained the curia of Pompey, where Caesar was murdered, after which it was walled up. The colossal statue, popularly supposed to be that of Pompey, at the feet of which Caesar died, 8 now in the Palazzo Spada, was found in !553 near the theatre. This theatre was restored by Augustus (Mon. Anc. 4, 9); in the reign of Tiberius it was burnt, and its rebuilding was completed by Caligula. The scena was again burnt in a.d. 80, and restored by Titus. According to Pliny (H.N. xxxvi. 115), it held 40,000 spectators; the Regionary Catalogues give the number 17,580. Huelsen estimates its capacity at 9000- 10,000 spectators. In 1864 the colossal gilt bronze statue of Hercules, now in the Vatican, was found near the site of the theatre of Pompey, carefully concealed underground. The theatre of Marcellus is much more perfect; complete foundations of the cunei exist under the Palazzo Savelli, and part of the external arcade is well preserved. This is built of travertine in two orders, Tuscan and Ionic, with delicate details, very superior to those of the Colosseum, the arcade of which is very similar to this in general design. This theatre was begun by J. Caesar, and finished by Augustus in 13 B.C., who dedicated it in the name of his nephew Marcellus. 9 It was restored by Vespasian (Suet. Vesp. 19). Foundations also of the theatre dedicated by Cornelius Balbus in 13 B.C. (Suet. Aug. 29; Dio Cass. liv. 25) exist under the Monte dei Cenci; and in the Via dei Calderari there is a small portion of the external arcade of a porticus (Plan, No. 42) ; the lower storey has travertine arches with engaged columns, and the upper has brick-faced pilasters. This has been supposed to be the Crypta Balbi mentioned in the Regionary Catalogues, but is more probably the Porticus Minucia, built in no b.c An interesting account of the temporary theatre of M, Aemilius Scaurus, erected in 58 B.C., is given by Pliny (H.N. xxxvi. 5, 1 13). The same writer mentions an almost incredible building, which consisted of two

wooden theatres made to revolve on pivots, so that the two together made an amphitheatre; this was erected by C. Curio in 50 b.c. (H.N. xxxvi. 116).

The first stone amphitheatre in Rome was that built by Statilius Taurus , in the reign of Augustus. (For the Colosseum and Amphl- the Amphitheatrum Castrense, see Amphitheatre; for theatres. the Baths, see that article.)

Arches, Columns, Tombs and Bridges.

The earliest triumphal arches were the two erected by L. Stertinius (196 b.c.) in the Forum Boarium and in the Circus Maximus, out of spoils gained in Spain. 10 In the later years of the Arches. empire there were nearly forty in Rome. The arch of Titus and Vespasian on the Summa Sacra Via was erected by Domitian to commemorate the conquest of Judaea by Titus in his father's reign. Reliefs inside the arch represent the triumphal procession-ˆTitus in a chariot, and on the other side soldiers bearing the golden candlestick, trumpets and table of prothesis, taken from the Jewish temple. The central part only of this monument is original; the sides were restored in 1823. 11 Another arch in honour of Titus had previously been built (a.D. 80) in the Circus Maximus; its inscription is given in the Einsiedeln MS. (C.I.L. vi. 944). A plain travertine arch near the supposed palace of Commodus on the Caelian is inscribed with the names of the Consul Publius Cornelius Dolabella (a.d. 10) and of the flamen martialis, C. Junius Silanus. It may have originally been used to carry the Aqua Marcia; in later times the Aqua Claudia passed oyer it. The so- called arch of Drusus by the Porta Appia also carries the spscus of an aqueduct — that built by Caracalla to supply his great thermae. Its composite capitals show, however, that it is later than the time of Drusus, and it was very possibly the work of Trajan. Adjoining the church of S. Giorgio in Velabro a rich though coarsely decorated marble gateway with flat lintel still exists — built, as its inscription records, in honour of Severus and his sons by the argentarii (bankers and silversmiths) and other merchants of the Forum Boarium in 204. It formed an entrance from the Forum Boarium into the Velabrum. The figure of Geta in the reliefs and his name have been erased by Caracalla; the sculpture is poor both in design and execution (see Bull. Inst., 1867, p. 217, and 1871, p. 233). Close by is a quadruple arch, set at the intersection of two roads, such as was called by the

8 See Fea, Rom. Ant. lxviii. 57, for an account of its discovery.

9 Suet. Aug. 29. See Mon. Anc. 4, 22 : " Theatrviri . ad . aedem.

Apollinis . in . solo . magna . ex . parte . a . [privatis .] empto . feci . qvod . svb . nomine . M . Marcelli . generi . [me]i . esset." The temple of Apollo here named was one of the most ancient and highly venerated in Rome; it was dedicated to the Delphic Apollo in 431 B.C. by Cn. Julius (Liv. iv. 25); meetings of the Senate were held in it; and it contained many fine works of art — an ancient cedar- wood statue of Apollo (Plin. H.N. xiii. n) and the celebrated statues of the slaughter of the Niobids by Praxiteles or Scopa6 (Plin. H.N. xxxvi. 28), of which many ancient copies exist.

10 Liv. xxxiii. 27.

11 This arch is the earliest known example of the so-called Composite order, a modification of Corinthian in which the capitals combine Ionic volutes with Corinthian acanthus leaves; in other respects it follows the Corinthian order.

Romans an arch of Janus Quadrifrons. Though partly built of earlier fragments, it is late in style, and may be the Arcus Con- stantini mentioned in the Xlth region. The finest existing arch is that by the Colosseum erected by Constantine. It pwes, however, little of its beauty to that artistically degraded period. Not only most of its reliefs but its whole design and many of its architectural features were stolen from an earlier arch erected by Trajan as an entrance to his forum (see above). The arch of Claudius, built in 43 to commemorate his supposed victories in Britain, stood across the Via Lata (modern Corso) in the Piazza Sciarra. Its exact position is shown in Bull. Comm. Arch. Rom., 1878, pi. iv. Its remains were removed in the middle of the 16th century, 1 and nothing now is left but half its inscription, preserved in the garden of the Barberini palace. It is shown on both aurei and denarii of Claudius, with an attic inscribed DE BRITANNIS, and surmounted by a quadriga and trophies. A little to the N. of the Piazza Colonna was an arch popularly called the Arco di Portogallo, destroyed in 1665, whose reliefs are now in the Palazzo dei Conservatori. They appear to date from the reign of Hadrian, but may have been used at a later time to decorate this arch. An arch also stood opposite S. Maria in Via Lata until 1498, which was probably erected by Diocletian in a.d. 303. The central part of the once triple arch of Gallienus still exists on the Esquiline; it took the place of the

ancient Porta Esquilina of the Servian wall. It is built of travertine, is simple in design, with coarse details, and has an inscription on its attic. The two side arches and pediment over the centre existed in the 16th century, and are shown in the Mantuan oil-painting ji Rome, 2 and in several antiquarian works of the 16th century. The inscription {C.I.L. vi. 1 106) records that it was erected in honour of Gallienus and his wife Salonina by Aurelius Victor. 3

The column of Antoninus Pius was a monolith of red granite, erected after his death by his adopted sons M. Aurelius and L. _ Verus. One fragment of it is preserved in the Vatican

Columns. w ; t [1 an interesting quarry incription, recording that it was cut in the ninth year of Trajan's reign, under the supervision of Dioscurus and the architect Aristides. The rest of its fragments were used by Pius VI. to repair the obelisk of Monte Citorio, set up by Augustus in the Campus Martius as the gnomon of a sundial (Plin. H.N. xxxvi. 72). The marble pedestal of the Antonine column is now in the Vatican; it has reliefs representing the apotheosis of Faustina and Antoninus Pius, and the decursio equitum which formed part of the funeral ceremony. This and the column of M. Aurelius were both surmounted by colossal portrait statues of gilt bronze. The column of M. Aurelius is very similar in size and design to that of Trajan. Its spiral reliefs represent victories in Germany from 1 71-175, arranged in twenty tiers. Like the column of Trajan, it is exactly 100 Roman ft. high, without the pedestal. The pedestal was originally much higher than at present, but is now partly buried; it is shown by Gamucci, Du Perac and other 16th-century writers. This column stood in front of a temple to M. Aurelius, and within a great peribolus, forming a forum similar to that of Trajan, though much smaller; the remains of this temple, amongst other buildings, probably form the elevation now called Monte Citorio. 4

For the catacombs, see Catacombs; for obelisks, see Obelisk and Egypt.

The prehistoric cemeteries of Rome are described above {Prehistoric Rome). Few tombs exist of the Roman period earlier than the jst _ . century B.C., — probably owing to the great extension of the

city beyond the Servian limits, which thus obliterated the earlier burial-places. The tomb of the Cornelii Scipiones is the most important of early date which still exists. It is excavated in the tufa rock at the side of the Via Appia, outside the Porta Capena. Interments of the Scipio family went on here for about 400 years, additional chambers and passages being excavated from time to time. The peperino

sarcophagus of Lucius Cornelius Scipio Barbatus (Liv. x. 12, 13), consul in 298 B.C., is now in the Vatican; its inscrip- tion, in rude Saturnian verse, is one of the most important existing specimens of early Latin epigraphy. Many other inscribed slabs were found in the 17th century, covering the loculi in which lay the bodies of later members of the family. Those now existing in the tomb are modern copies. 6 This burial-place of the Scipios is unlike those of other families, owing to the gens Cornelia keeping up the early custom of interment without burning; thus stone sarcophagi or loculi (rock-cut recesses) were required instead of mere pigeon- holes to hold the cinerary urns. The tomb of M. Bibulus, a few yards outside the Porta Fontinalis, and remains of two recently

1 See Vacca, ap. Fea, Misc, p. 67.

- Reproduced by De Rossi in his Piante di Roma Anteriori al Sec. XVI. (1879).
- See Bellori, Veteres Arcus (1690), showing some now destroyed : and Rossini, Archi Trionfali (1832).
- On the Antonine column see Petersen in Amelung's Katalog der vaticanischen Sculpturen, i. p. 883; on that of M. Aurelius see Die Marcussdule, by Petersen, v. Domaszewski and Calderini (Munich, 1896).

‘ The inscriptions are given in C.I.L. i. 29-39 — vi. 1284-94. On the earlier ones see Woelfflin, Milnchener Sitzungsberichte (1892), 188 ff.

discovered during the destruction of the Aurelian towers at the Porta Salara, date from about the middle of the 1st century B.C., as does also the curious tomb of the baker Eurysaces outside the Porta Maggiore. In 1863 an interesting tomb of the Sempronia gens 6 was discovered on the Quirinal, below the royal palace, near the site of the Porta Salutaris. It is of travertine, with a rich entablature and frieze sculptured with the Greek honeysuckle ornament (see Bull. Comm. Arch., 1876, 126, pi. xii.). This also isof the last years of the republic.

The mausoleum of Augustus, built 28 B.C., stood in the north part of the Campus Martius, between the Tiber and the Via Flaminia. It is a massive cylindrical structure of concrete, faced with opus reticulatum ; according to Strabo, this was faced with Maasolea – ” white stone,” i.e. travertine; inside was a series of radiating chambers, in plan like a wheel. On the top was a great mound of earth, planted with trees and flowers (Tac. Ann. iii. 9). In the middle ages it was converted into a

fortess by the Colonna, which was destroyed in 1167. In the 16th century the central portion was occupied by a garden. 7 Only the bare core exists now, with its fine opus reticulatum, best seen in the court of the Palazzo Valdam- brini. The inside is concealed by modern seats, being now used as a concert-hall (Anfiteatro Chorea). The sepulchral inscription in honour of Augustus, engraved on two bronze columns at the entrance, is preserved to us by its copy at Ancyra (a.v.). It records an almost incredible amount of building: in addition to the long list of build- ing mentioned by name Augustus says, DVO. ET. OCTAGINTA. TEMPLA . DE VM . IN . VRBE . CONSVL . SEXTVM . REFE CI . The first burial in the mausoleum of Augustus was that of M. Claudius Marcellus (died 23 B.C.), and it continued to be the imperial tomb till the death of Nerva, a.d. 98, after whose interment there was no more room.

The mausoleum of Hadrian, built by that emperor as a substitute for that built by Augustus, and dedicated in a.d. 138 by his successor, was a large circular building on a square podium ; its walls, of enormous thickness, were of tufa faced with Parian marble and surrounded by a colonnade with rows of statues,ˆ-a work of the greatest magnificence. The splendour of the whole is described by Procopius (Bell. Goth. i. 22), who mentions its siege by the Goths, when the defenders hurled statues on to the heads of the enemy. In the 7th century the church of S. Angelus inter Nubes was built on its summit, and all through the middle ages it served as a papal fortress. The interior chambers are still well preserved, but its outside has been so often wrecked and refaced that little of the original masonry is visible. 8

Several of the grander sepulchral monuments of Rome were built in the form of pyramids. One of these still exists, included in the Aurelian wall, by the Porta Ostiensis. It is a pyramid of concrete, 1 18 feet high, faced with blocks of white marble, Se P ut ‘ and contains a small chamber decorated with painted cftra ‘ stucco. An inscription in large letters on the marble Py ramUs – facing records that it was built as a tomb for C. Cestius, a praetor, tribune of the people, and septemvir of the epulones (officials who supervised banquets in honour of the gods). It was erected, according to Cestius’s will, by his executors, in the space of 330 days. It dates from the time of Augustus 9 (see Falconieri, in Nardini, Roma Antica, iv. p. 1, ed. 1818-20). Another similar pyramid, popularly known as the tomb of Romulus, stood between the mau- soleum of Hadrian and the basilica of St Peter. It was destroyed at the close of the 15th century, during the rebuilding of the long bridge which connects the former building with the Vatican.

The earliest bridge was a wooden drawbridge called the Pons Sublicius from the piles (sublicae) on which it was built. The river being an important part of the defence of Rome from _ Ha the Aventine to the Porta Flumentana (see plan of Servian onages. wall, fig. 8), no permanent bridges were made till the Romans were strong enough not to fear attacks from without. The Pons Sublicius had a sacred character, and was always restored in wood, even in the imperial period. 10 Its exact site is doubtful, but it must be placed, some distance below the Ponte Rotto. The first stone bridge was begun in 179 B.C. and completed in 142 B.C., when the conquest of Etruria and the defeat of Hannibal had put an end to fears of invasion; it was called the Pons Aemilius, after the pontifex maxi- mus 11 M. Aemilius Lepidus, its founder. It was also called Pons

6 This is shown by an inscription (C.I.L. vi. 26152) found on the site in the 17th century.

7 See Du Perac's Vestigj, pi. 36, which shows the garden on the top.

8 On the mausoleum of Hadrian, see Borgatti, Castel S. Angelo

(1890).

9 Near the tomb of Cestius is that extraordinary mound of pot- sherds called Monte Testaccio. These are mostly fragments of large amphorae, not piled up at random, but carefully stacked, with apertures at intervals for ventilation. It has been shown by Dressel (Ann. dell' Inst., 1878, 118 ff. ; C.I.L. xv. p. 492) that damaged or imperfect vessels were thus disposed of.

10 See Varro, L.L. v. 83; Ov. Fast. v. 622; Tac. Hist. i. 86; Vita Antonini Pii, 8.

11 The bridges were specially under the care of the pontifex maxi- mus, at least till the later years of the republic (Varro, I L. v. 83).

Lapideus, to distinguish it from the wooden Sublician bridge. The modern Ponte Rotto represents this bridge ; but the existing arches are mainly medieval. An ancient basalt-paved road still exists, leading to the bridge from the Forum Boarium. The Pons Fabricius united the

city and the island (Insula Tiberina). 1 The bridge derived its name from L. Fabricius, a curator viarum in 62 B.c; its inscription, twice repeated, is t, . FABRICIVS . C . F . CVR . VIAR . FACIVNDVM . COERAVIT. Like the other existing bridges, it is built of great blocks of peperino and tufa, with a massive facing of travertine on both sides. Corbels to support centering were built in near the springing of the arches, so that they could be repaired or even rebuilt without a scaffolding erected in the river-bed. The well-preserved Pons Cestius, probably named after L. Cestius, praefectus urbi in 46 B.C., unites the island and the Janiculan side ; on the marble parapet is a long inscription re- cording its restoration in 370 by Gratian, Valentinian, and Valens. 2 The next bridge, Ponte Sisto, is probably on the site of an ancient bridge called in the Notitia Pons Aurelius. Marliano gives an inscription (now lost) which recorded its restoration in the time of Hadrian. About 100 yards above this bridge have been found the remains of sunken piers, which are proved by an inscription (C.I.L. V1 – 3 I 545) to have belonged to the Pons Agrippae, not otherwise known. The Pons Aelius was built in 134 by Hadrian, to connect his mausoleum with the Campus Martius; it is still well preserved, and is now called the Ponte S. Angelo (see Dante, Inferno, xviii. 28-33). It had eight arches, of which the three in the centre were higher than the rest, so that the road sloped on both sides. The material is peperino, with travertine facings. Its inscription, now lost, is given in the Einsiedeln MS. — IMP , CAESAR . Divi . TRAIANI . PARTHICI . FILIVS – DIVI- NERVAE- NEPOS – TRAIANVS . HADRI- ANVS 1 AVG . PONT . MAX ..TRIB . POT . XVIIII . COS : III . P . P . FECIT. The Pons Aelius is shown on coins of Hadrian. A little below it are the foundations of another bridge, probably the Pons Neronianus of the Mirabilia, called also Vaticanus, built probably by Nero as a way to his Vatican circus and the Horti Agrippinae. At the foot of the Aventine, near the Marmorata, are the remains of piers which seem to have belonged to the Pons Probi, mentioned in the Notitia. It is uncertain whether this bridge is to be identified with the Pons Theodosii, which was built in A.D. 381-387 (Symm. Ep. 4, 70, 2; 5, 76, 3), and is mentioned in the Mirabilia.'

Regiones of Augustus. In spite of the extensive growth of the city under the republic no addition was made to the four regiones of Servius till the

reign of Augustus, who divided the city and its suburbs nSoaes. i nt0 fourteen regiones. The lists in the Notitia and

Curiosum are the chief aids in determining the limits of each, which in many cases cannot be done with any exact- ness (see Preller, Die

Regionen der Sladt Rom (1846) and Urlich's Codex Topographicus (Wiirzburg, 187 1)). Each regio was divided into vici or parishes, each of which formed a religious body, with its aedicula larum, and had magistri victorum. The smallest regio (No. II.) contained seven vici, the largest (No. XIV.) seventy-eight.

The list is as follows : —

I. Porta Capena, a narrow strip traversed by the Appian Way; it extended beyond the walls of Aurelian to the brook Almo. II. Caelemonlium, the Caelian Hill.

III. Isis et Serapts, included the valley of the Colosseum and the

adjoining part of the Esquiline.

IV. Templum Pads, included the Velia, part of the Cispius, most

of the Subura, the fora of Nerva and Vespasian, the Sacra Via, and also buildings along the north-east side of the Forum Magnum. V. Esquiliae, north part of the Esquiline and the Viminal. VI. Alta Semita, the Quirinal as far as the praetorian camp. VII. Via Lata, the valley bounded on the west by the Via Lata,

and by the neighbouring hills on the east. VIII. Forum Romanum, also included the imperial fora and the Capitoline hill. IX. Circus Flaminius, between the Tiber, the Capitol, and the

Via Flaminia. X. Palatium, the Palatine hill. XI. Circus Maximus, the valley between the Palatine and the

Aventine, with the Velabrum and Forum Boarium. XII. Piscina Publica, the eastern part of the Aventine, and the districts south of and beyond the Via Appia, including the site of Caracalla's thermae.

1 Livy (ii. 5) gives the fable of the formation of this island from the Tarquins' corn, cut from the Campus Martius and thrown into the river.

- The two stone bridges connecting the island with the right and left banks took the place of earlier wooden structures.

- See Mayerhofer, Die Briicken im alien Rom, 1883.

XIII. Aventinus, the hill, and the bank of the Tiber below it.

XIV. Trans Tiberim, the whole district across the river and the

Tiber Island. 4 The walls of Aurelian (see fig. 7), more than 12 m, in circuit, enclosed almost the whole of the regiones of Augustus, the greater part of which were then thickly inhabited. This enormous A .. work was begun in 271, to defend Rome against sudden ur ?. ”” attacks of the Germans and other northern races when the ws ‘ great armies of Rome were fighting in distant countries. 6 After the death of Aurelian the walls were completed by Probus in 280, and about a century later they were restored and strengthened by the addition of gate-towers under Arcadius and Honorius (a.d. 403), in place of the earlier gateways of Aurelian; this is recorded by existing inscriptions on three of the gates. 6 At many periods these walls suffered much more from the attacks of the Goths (Procop. Bell. Goth. iii. 22, 24), and were restored successively by Theodoric (about 500), by Belisarius (about 560), and by various popes during the 8th and 9th centuries, and in fact all through the middle ages. A great part of the Aurelian wall still exists in a more or less perfect state; but it has wholly vanished where it skirted the river, and a great part of its trans-Tiberine course is gone. The best-preserved pieces are between Porta Pinciana and Porta Salaria (in which breaches have iately been made for streets), and between the Lateran and the Amphitheatrum Castrense. The wall, pf concrete, has the usual brick-facing and is about 12 ft. thick, with a guard’s passage formed in its thickness. Fig. 13 shows its plan: on the inside the

THRCC WINDOWS .

SIX OF THESE OPEN ARCHKft OETWEEN EACH PAIIt or TOVEftS .

Fig. 13. — Aurelian’s Wall; plan showing one of the towers and the passage in thickness of wall.

passage has tall open arches, which look like those of an aqueduct, and at regular intervals of about 45 ft. massive square towers are built, projecting on the outside of the wall, in three storeys, the top storey rising above the top of the wall. The height of the wall varies according to the contour of the ground ; in’ parts it was about 60 ft. high outside and 40 inside. Necessaria, supported on two travertine corbels, projected from the top of the wall on the outside beside most of the towers. The Einsiedeln MS. gives a description of the complete circuit, counting fourteen gates, as follows: —

Porta S. Petri (at the Pons Aelius, destroyed) ; P. Flaminia (replaced by P. del Popolo) ; P. Pinciana (in use) ; P. Salaria (now P. Salara) ; P. Nomentana (replaced by P. Pia) ; P. Tiburtina (now P. S. Lorenzo) ; P. Praenestina (now P. Maggiore) ; P. Asinaria (replaced by P. San

Giovanni) ; P. Metrovia or Metroni (closed) ; P. Latina (closed) ; P. Appia (now P. S. Sebastiano) ; P. Ostiensis (now P. S. Paolo). On the Janiculan side, P. Portuensis (de- stroyed) ; P. Aurelia (now Porta San Pancrazio). Besides these there was a gate, now closed (Porta Chiusa), to the south of the Castra Praetoria ; and in all probability a gate on the right bank of the Tiber, replaced by the modern Porta Settimiana.

These existing gates are mostly of the time of Honorius; each is flanked by a projecting tower, and some are double, with a second pair of towers inside. Several have grooves for a portcullis (cata-racta) in the outer arch. The handsomest gate is the P. Appia, with two massive outer towers, three stages high, the upper semi- circular in plan. Many of the gates of Honorius have Christian symbols or inscriptions. The general design of all these gates is much the same — a central archway, with a row of windows over it and two flanking towers, some square, others semicircular in plan. In many of the gates older materials are used, blocks of tufa, travertine, or marble. The doors themselves swung on pivots, the bottom ones let into a hole in the threshold, the upper into projecting corbels.

At many points along the line of the Aurelian wall older buildings form part of the circuit — near the Porta Asinaria a large piece of

4 The text of the Regionary Catalogues is printed by Richter, Topographie der Stadt Rom? pp. 371 ff.

6 Vila Aurel. 21, 39; Zosimus, i. 37, 49; Eutrop. ix. 15.

6 The inscriptions run thus : s. P. Q. R. IMPP . CAESS . D. 0. m-VICTISSIMIS . PRINCIPIBVS . ARCADIO . ET . HONORIO . VICTOR-IBVS . AC . TRIVMPHATORIBVS . SEMPER . AVGG . OB . INSTAVRA-TOS . VRBIS . AETERNAE . MVROS . PORT AS . AC . TVRRES . EGES-

tis . IMMENSis . rvderibvs — the rest refers to honorary statues erected to commemorate this work.

the Domufe Lateranorum, a house of the 3rd century which gave its name to the Lateran basilica, and a little farther on, by S. Croce in Gerusalemme, the Amphitheatrum Castrense; the latter, of about the end of the ist century A.D.,hastwo tiers of arches and engaged

columns of moulded brick on the outside. Between the P. Praenes- tina and the P. Tiburtina comes a large castellum of the Aqua Tepula. The Praetorian Gamp forms a great projection near the P. Nomentana. Lastly, the angle near the Porta Flaminia, at the foot of the Pincian Hill, is formed by remains of a lofty and enor- mously massive building, faced with fine opus reticulalum of the ist century B.C. Owing to the sinking of the foundation this is very much out of the perpendicular, and was known as the ” murus tortus ” at a very early time. 1 What this once important building was is uncertain. Two archways which form gates in the Aurelian wall are of much earlier date. The Porta Maggiore consists of a grand double arch of the aqueducts Anio Novus and Claudia built in travertine. The Porta S. Lorenzo enclosed a single travertine arch, built by Augustus where the aqueduct carrying the Aqua Marcia, Tepula, and Julia crossed the Via Tiburtina. The inner gateway, built of massive travertine blocks by Honorius, was pulled down by Pius IX., in 1868. 2

Bibliography of Ancient Roman Topography. — Amongst ancient writers special mention is due to Varro (De Lingua Latina), Dionysius of Halicarnassus (Antiquitates Romanae) , Ovid {Fasti) , Vitruvius (De Architectura) , Pliny the Elder (Naturalis Historia), Frontinus {De Aquis) and the remains of ancient commentaries on Virgil, Horace, &c. The inscriptions found in the city of Rome are contained in vol. VI. of the Corpus Inscriptionum Latinaruin. Many of them are of the highest importance for Roman topography, e.g. the Basis Capitolina, preserved in the Palazzo dei Conservatori, a pedestal which once supported a statue of Hadrian, dedicated in a.d. 136 by the vicomagistri of five regions; on the sides are inscribed the names of the vici and their officials. Vol.’ XV. of the C.I.L. contains^the inscriptions stamped on tiles and water-pipeS;Mii?:hich are likewise of great importance. The Monumentum Ancyraftum (Res gestae divi Augusti, ed. 2 Mommsen, 1883) reproduces the bronze tablets set up Dy_ Augustus on his mausoleum at Rome, and contains a list of the buildings which he erected or restored. The marble plan of Rome (Forma ufbis Romae, ed- Jordan, 1874; the more recently discovered fragments have only been published in periodicals) dates from the reign of Septirruus Severus, who restored the building to which it belonged after the fire of 191 B.C. The plan which it replaced was executed by order of Vespasian. The scale was gener- ally 1: 250; it was oriented with S.E. at the top, N.W. at the bottom. Buildings are of course frequently represented on coins and works of art, and these may often be identified with existing remains.

In the reign of Constantine the Great there was compiled a cata- logue of the principal buildings of Rome, arranged according to the fourteen

regions of Augustus. This has been preserved in two recensions, one made in A.D. 334 and known as the Notitia, the second in or about a.d. 357, and known as the Curiosum urbis Romae. These are called the Regionary Catalogues, and contain, besides lists of buildings, statistics as to the number of vici, domus, insulae, Sec., in each region, which are of great value. (See Preller, Regionen der Stadt Rom, Jena, 1846.)

In the middle ages, guide-books were written for the use of pilgrims visiting Rome. Besides giving the routes for the principal churches and cemeteries, they mention ancient buildings and give current legends regarding them. The earliest is the Itinerary of Einsiedeln, a MS. of the 8th century preserved in the monastery of Einsiedeln in Switzerland (see C. Huelsen, V Itinerario di Einsiedeln, 1908). In the 1 2th century was compiled the Mirabilia urbis Romae, which became the foundation of later guide-books. The last recension is contained in a MS. of the early 15th century. These and other medieval documents are printed in Urlichs' Codex Topographicus urbis Romae (1871). The Or do Benedicti Canonici (see Jordan, Topographie, II. 1, 646, and Lanciani, Monumenti Antichi, I. 437), which gives the route of papal processions, belongs also to the 12th century, and was perhaps written by the author of the Mirabilia- .The Liber Pontificalis (ed. Duchesne, Paris, 1886; ed. Mommsen, in Monumenta Germaniae historica, vol. i.), which gives the biographies of the early popes and was continued throughout the middle ages, is of value as illustrating the transition from pagan to Christian Rome.

1 Several early views and plans of Rome exist, beginning with the painting by Cimabue in the upper church of S. Francesco at Assisi (1275). A collection of these was published by De Rossi, Piante icnografiche e prospettiche di Roma anteriori al secolo XVI. (1879). Many others have since come to light. (See Huelsen in Bull. Comm. Arch., 1892, p. 38).

In Italian and other libraries are preserved large numbers of

1 Cf. Procop. Bell. Goth. i. 23.

- On the walls of Aurelian, see (in addition to the general works mentioned in the bibliography) Nibby and Gell, Le Mura di Roma (1826); Quarenghi, Le Mura di Roma (1880); and especially Homo, Essai sur le rigne de I'empereur Aurelien (Paris, 1904), IV." partie, ch. ii. f " L'Enceinte de Rome."

plans and drawings from ancient remains by the architects, of the 15th

and later centuries, e.g. Bramantino, Fra Giocondo, the members of the families of Sangallo and Peruzzi, Pirro, Ligorio. Palladio, &c. These are of immense value, since the monuments which they drew have to a large extent been destroyed. Un- fortunately they are not always trustworthy, especially those of Ligorio. The drawings at Florence have been indexed by Ferri; amongst recent publications may be noted those of the Codex Esconalensis by Egger (Vienna, 1905), and of a sketch-book, pro- bably by A. Coner, in the Soane Museum by Dr Ashby, in Papers of the British School at Rome, vol. ii. (1903). Amongst the printed works of the early Italian architects may be named Palladio, A rchitettura (Venice, 1542), and Terme dei Romani (London, 1732), Serlio, Ar'chitetturh; (Venice, 1545), and Labacco, Architettura ed Antichita, (Rome 1557). Engravings of ancient remains in Rome have been published in great numbers since the 16th century; the most important of the earlier collections are the Speculum Romanae Magnificentiae,a. series extending over many years in the 16th century, and Du Perac's Vestigj di Roma (1575). To the 1 8th century belong the* etchings of Piranesi,' published in several volumes, and still reproduced from the copper-plates by the Calcografia.

The literature of Roman topography would in itself form a large library; the best bibliographical guide is Mau's Katalog der Biblio* thek" desk. deUtschen arch&ologischen Instituts in Rom (1900). The earliest modern work which can be called scientific is Flavio Biondo's Roma 'instaurata, Written under Eugenius IV. (.1431-1447), first dated edition, 1479. Biondo's work was based on the study of ancient' literary authorities; he was followed in his method and results" by the scholars of the 15th and early 16th centuries, e.g. Pozzo, Leo Battista Alberti and Andrea Fulvio.. In the 16th century the- study of ancient remains took its place beside that of ancient literature. Marliani, who had followed Biondb in the first edition of his' Arttiquae urbis, Romae toppgraphia (1538), issued a second edition in 1544, which contained, plans and illustrations. For more than a century, his book formed the foundation upon which such writers as Fauno, G. Fabricius, Mauro, Panvinius, &c, raised their works. Unfortunately the Regionary Catalogues were largely interpolated' during this period, and published in this form by Panvinius. In 1666 Famiano Nardini's Roma antica appeared, based upon the interpolated version of the Regionary Catalogues'; this was productive of disastrous errors, many of which remained uncorrected until our own time. Nardini was followed in the 18th century by such writers as Ficoroni and Venuti; the most im- portant works of this period were those produced by excavators such. as Bianchini (// palazzo dei Cesari, 1738), or independent Students of

the monuments such as Raphael Fabretti (De Columna Trdjana, 1683; De Aquis et Aquaeductibus,_ 1680). In the 18th century Winckelmann revived interest in ancient, including Roman, art (especially by his Geschichte der Kunst des Alterihums, 1764), and his follower, Carlo Fea, inaugurated the era of systematic and' scientific excavation, especially in the Forum. In 1829 there was founded the international Instituto di Corrispondenza A rcheologica (which in 1874 became the Kaiserlich deutsches archdologisches Institufj; in 1830-42 was issued the Beschreibung der Stadt Rom, by Bunsen and others, in which the grosser errors which had passed current since Nardini's time were corrected. To the same period belong the magnificently illustrated works of Luigi Canina (Indica- zione di Roma antica, 1830; Esposizione topografica, 1842; Archi- tettura antica, 1834-44; Foro Romano, 1845; Edifizj di Roma antica, 1848-56), the value of which is impaired by their inaccuracy and the imaginative character of the restorations.

The books on Roman topography written in the early 19th century; such as those of Antonio Nibby, still pursued the uncritical methods of Nardini; from 1830 onwards, however, we find a series of writers whose work shows the influence of the new criticism. Such were Becker (Topographie der Stadt Rom, 1843), Sir Wm. Gell (Rome and its Vicinity, 1834; rev. ed. E. H. Bunbury, 1846), Braun (Ruinen und Museen Roms, 1854), Reber (Die Ruinen Roms, 1862) and T. H. Dyer (The City of Rome, 1 864).

Since 186 1, when excavations were begun on the Palatine at the instance of Napoleon III., under the direction of P. Rosa, the discovery of ancient remains has made constant progress, and the results have been incorporated in a number of works, of which only the most important can be named here. These are: Jordan, Topographie der Stadt Rom im Alterthum, of which three vols. (Ii, 12, and II.) appeared in 1871-85, and a third (I3) was written after Jordan's death by C. Huelsen and published in 1907 ; Gilbert, Geschichte und Topographie der Stadt Rom im Alterthum (3 vols., 1883-90); the works of Lanciani, especially Ruins and Excavations of Ancient Rome (1897) and Storia degli Scavi (in pro- gress*); O. Richter, Topographie der Stadt Rom (ed. 2, 1901); Middleton, The Remains of Ancient Rome (2 vols., 1892). A short handbook may be found in S. B. Platner's Topography and Monu- ments of Ancient Rome (Boston, 1904). For the study of recent discoveries (besides the special works referred to in the course of this article) the following periodicals are the most important:— Nqtizie degli Scavi, ; published by the Accademia dei Lincei since 1876; Bullettino della Commissione Archeologica comunale di Roma (from 1872) ; Mittheilungen des k. deutschen archdologischen

(from 1886); Papers of the British School at Rome (horn 1903). Brief reports of discoveries are published by Dr T. Ashby in the Classical Review.

All previous archaeological maps of Rome have been superseded by Lanciani's Formae urbis Romae, in 46 sheets (Milan, 1893-1902). The best recent maps are those in Kiepert's Formae orbisantiqui, sheets 21 and 22. Kiepert and Huelsen's Formae urbis Romae antiquae date from 1896; they are accompanied, by a Nomenclator topographicus. Homo, Lexique de topographie romaine (1900), is also useful. (J- H. M. ; H. S, J.)

Christian Rome From the 4th to the 12th Century

The era of church building in Rome may be said to begin with the reign of Constantine and the peace of the church. Before then Christian worship was conducted with various degrees of secrecy either in private houses or in the catacombs (q.v.), according as the reigning emperor viewed the sect with tolerance or dislike. The type of church which in the beginning of the 4th century was adopted with certain modifications from the pagan basilica, though varying much in size, had little or no variety in its general form and arrangement. One fixed model was strictly adhered to for many centuries, and, in spite of numberless alterations and additions, can be traced in nearly all the ancient churches of Rome. It is fully described and illustrated in the article Basilica.

The walls of these early churches were mostly built of concrete,

faced with brick, left structurally quite plain, and decorated only

with painted stucco or glass mosaics— especially (intern-

Coastrac- al)y j j n the apse anf j on t £ e f ace of ; ts arc j„ anc] (externally)

” oa – on the east or entrance wall, the top of which was often

built in an overhanging curve to keep off the rain. The windows were plain, with semicircular arches, and were filled with pierced marble screens, or in some cases with slabs of translucent alabaster; the latter was the case at S. Lorenzo fuori le Mura, and examples of the former still exist in the very early church formed in the rooms of some thermae on the Esquiline (possibly those of Trajan), below the 6th-century church of S. Martino ai Monti. Almost the only bit of external architectural ornament was the eaves cornice, frequently (as at the last-named church) formed, pf marble cprmces stolen from earlier classical buildings. Internally the nave columns, with their capitals and bases, were usually taken from some classical

is one of the domed halls of Diocletian's thermae, consecrated as a church in 1598ˆ . .

Space will not allow any individual description of the very numerous and important churches in Rome which are built on the basilican plan. The prin- cipal examples are these: — • S. Pudentiana, traditionally the oldest in Rome, restored in 398 ; S. Clemente, restored under Siricius . (384-399). now . forming the crypt of an upper church built in the 1 2th century; S, Sabina, 5th century; S. Vitale, 5th century, founded by Inno- cent I. (401-41 7); S. Martino ai Monti, c. 500; S.Balbina, 6th century; : church of Ara Coeli, founded by Gregory the Great (590-604) as S, Maria in Capitolio; S. Giorgio in Velabro, rebuilt by Leo II. (682-683) ; S. Cesareo, 8th century; S. Maria in Via Lata, restored by Sergius I. (687-701); S. Crisogono, re- built ,in 731 by Gregory III. ; S, Maria, in. Gosmedin; S. Pietro in Vincoli, and S. Giovanni ad Portam Latinam, rebuilt c. 772 by Adrian I.; S. Maria in Dominica, rebuilt by Paschal I. (817-824), who also rebuilt S. Cecilia in Trastevere and S. Prassede; S. Marco, rebuilt by Gregory

building, and some churches are perfect museums of fine sculptured caps and rich marble shafts of every material and design. 1 At first the nave had no arches, the columns supporting a horizontal entablature, as in old St Peter's, S. Clemente, and S. Maria Maggiore, but afterwards, in order to widen the interColumniation, simple round arches of narrow span were introduced, thus requiring fewer columns. The roof was of the simple tie-beam and kingpost con- struction, left open, but decorated with painting or metal plates. The floor was paved either with coarse mosaic of large tesserae (as at S. Pudentiana)

or With slabs of marble stripped from ancient buildings. A later development of this plan added a small apse containing an altar at the end of each aisle, as in S. Maria in Cosmedin and S. Pietro in Vincoli. 2

The type of church above described was used as a model tor by far the majority of early churches not only in Rome, but also in /-i_~ England, France, Germany, and other Western countries.

C T~" Another form was, however, occasionally used in Rome; churches. whi(;n ap pe ars to have been derived from the round temple of pagan times. This is a circular building, usually domed and surrounded with one or more rings of pillared aisles. To this class belong thecombined church and mausoleum of Costanza (see fig. 14) and that of SS. Marcellinus and Petrus, both built by Constantine, the former to hold the tomb of his daughters Constantia (or Con- stantina) and Helena, the latter that of his mother Helena. The latter is on the Via Labicana, about 2 m. outside Rome; it is a circular domed building, now known as the Torre Pignattara, from the pignatte or amphorae built into the concrete dome to lighten it. The mausoleum of S. Costanza, close by S. Agnese fuori, is also domed, with circular aisle, or rather ambulatory, the vault of the latter decorated with mosaic of classical style (see Mosaic, vol. xviii. p. 885). The red porphyry sarcophagi, sculptured richly with reliefs, from these mausolea are now in the Vatican. On a much larger scale is the church of S. Stefano Rotondo on the Coelian, built by Pope Simplicius (468-482), with a double ring of pillared aisles, the outer one of which was pulled down and a new enclosure wall built by Nicholas V. Other round churches are S. Teodoro (by the Vicus Tuscus), restored in the 8th century, and S. Bernardo, which

'S. Lorenzo and S. Agnese fuori, S. Maria in Trastevere, Ara Coeli, and numberless other churches are very rich in this respect.

8 See Heinrich Holtzinger, Die altchristUche Architectur (Stuttgart, 1889-99); Dehio and von Bezold, Die kirchliche Baukunst des Abendlandes (Stuttgart, 1884-99). xxiii. 20

Fig. 14. — Church and Mausoleum of Costanza. A, Recess for altar.

. B, Porphyry slab in floor where the tomb stood. C, Modern altar. D, D, Slabs of white marble, part of ancient paving. Ej E, Recesses with mosaics. F, F, Ambulatory with mosaic vault.

3, 1V1MCO, ;1CUU1H. Uy vjitguiy ._ _

IV in 833; S. Maria Nuova, rebuilt by Nicholas I. (858-867), now called S. Francesca Romana ; the church of the SS. Quattro Coronati, rebuilt by Paschal II. about 11 13; and S. Maria in Trastevere, rebuilt, by Innocent II. in 1 130. 3 ,

Though the apses'and classical columns of the naves in these churches were built at the dates indicated, yet in many cases it is difficult to trace the existence of the ancient walls; the alterations and additions of many centuries have frequently almost wholly concealed the original structure. Except at S, Clemente, the early choir, placed as shown in fig. 26, has invariably been destroyed ; the side walls have often been broken through by the addition of rows of chapels; and the whole church, both within and without, has been overlaid with the most incongruous architectural features in stucco or stone. The open roof is usually conpealed either by a wooden panelled ceiling or by a stucco vault. The throne «. and marble, benches in the apse have usually given place to more modern woqden fittings, to suit the later position of the, choir, which has always been transferred from the nave to the apse. In many cases the mosaics of the apse and the columns of the nave are the only visible remains of the once simple and stately original church. 5

From 1200 to 1450; and the Papal Palaces The 10th and nth centuries in Rome were extraordinarily barren in the production of all branches of the fine arts, even that of architecture; and it was hot till the end of Braoftht the 12th that any important revival began. ; The 13th cosmatl. century was, however, one of great artistic activity, when an immense number of beautiful works, especially in marble enriched with mosaic, were produced in Rome. This revival, though on different lines, was very similar to the rather later one which took place at Pisa (see Pisano), and, like that, wˆs in- great part due. to the great artistic talents of one family,— the Cosmati, 6 which, for four or five generations, produced skilful architects, sculptors and mosaicists.

. 'This list does not include the great basilicas of Rome, for which see Basilica. On the churches of Rome see Armellini, Le chiese di Roma (2nd ed. 1891) ; Tuker and Malleson, Handbook to Christian and Ecclesiastical Rome (1900); Marucchi, Basiliques el eghses dt Rome (1902); Frothingham, Monuments ,of Christian Rome (1910).

1 Some of these marble thrones which still exist are very interesting relics of Hellenic art, much resembling the existing seats in the theatre of Dionysius at Athens. Examples of these thrones exist at S. Pietro in Vincoli, S. Stefano Rotondo, and in the Lateran cloister.

6 The interior of S. Maria in Cosmedin has in recent years been restored according to primitive tradition. .

6 On the Cosmati see Boito, Architetlura del Medio hvo (Milan. 1880 pp 1 1 7-182); Claiisse, Les Marbriers romairis et le mobilier presbyt&r'al (Paris, 1897) ; Crowe and Cavalcaselle, History ofPatnlint in Italy (ed. Douglas, 1903), ch. iii.

The first member of the family of whom we have knowledge was Lorenzo, who, with his son Jacopo, made the ambones of S. Maria in Ara Coeli and an altar-canopy (ciborium) in SS. Apostoli. Jacopo decorated the door of S. Saba in 1205 and, together with his son Cosma (who gave his name to the family), that of S. Tommasoin Formis; the father and son worked together at Civita Castellana in 1210. Cosma made a ciborium for SS. Giovanni e Paolo in 1235, and worked with his sons Luca and Jacopo at Anagni and Subiaco during the first half of the 13th century. So far the inscriptions enable us to trace the relationships of the Cosmati with certainty; it is not so clear whether the Cosma above mentioned is to be identified with the master who decorated the chapel of the Sancta Sanctorum belonging to the old Lateran palace which was rebuilt by Nicholas III. (1277-1280). This Cosma was, however, almost certainly the father of Giovanni, the last of the family, who made the tombs of Cardinal Durand (died 1299) in S. Maria sopra Minerva, Cardinal Rodriguez in S. Maria. Maggiore, and Stefano de' Surdi in S, Balbina. Another artist w}fo seems to have belonged to this family, Deodato, made the cibo'ria of S. Maria in Cosmedin and (probably) of S. John Lateran; he is probably identical with the Deodatus filyus Cosmati who, together with another Jacopo, executed a pavement at S. Jacopo alia Lungara. A large number of other works of this school, but unsigned, exist in Rome. These are mainly altars and baldacchini-, choir-screens, paschal candlesticks, Unbones, tombs, and the like, all enriched with sculpture and glass mosaic of great brilliance and decorative effect.

Besides the more mechanical sort of work, such as mosaic patterns and architectural decoration, they also produced mosaic pictures and sculpture of very high merit, especially the recumbent effigies, with

angels standing at the head and foot, in the tombs of Ara Coeli, S. Maria Maggiore, and elsewhere. One of their finest works is in S. Cesareo; this is a marble altar richly decorated with mosaic in sculptured panels, and (below) two angels drawing back a curtain (all in marble) so as to expose the open grating of the confessio.

Besides the Cosmati, other artists, such as Paulus Romanus and his sons in the 12th century, and Petrus Vassallectus in the 13th, contributed to the ; revival of art. The beautiful cloisters of S. Paolo fuori le Mura, begun by ” Magister Petrus,” and those of S. John Lateran, the work of Vassallectus, are the finest architectural works of this school. In the latter part of the 13th century we find the sculptor Arnolfo del Cambio at work in Rome. His altar- canopy at S. Paolo fuori le Mura ; (1285) seems to have been imitated by the Cosmati in their latest works; his tomb of Cardinal de Braye (d. 1282) at Orvieto also shows his intimate connexion with that school. Another artist of the same period, Petrus Oderisius, worked in England; the shrine of the Confessor at Westminster (1269) was made by him.

The earlier works of the Cosmati are Romanesque in style, but in the 13th century Gothic elements were introduced, especially in the elaborate altar-canopies, with their geometrical tracery. In detail, however, they differ widely from the purer Gothic of northern countries. The richness of effect which the English or French architect obtained by elaborate and carefully worked mouldings was produced in Italy by the beauty of polished marbles and jewel- like mosaics,—the details being mostly rather coarse and often carelessly executed.

Chiefly to the 13th century belong the large number of beautiful campanili, which are the most conspicuous relics of the medieval period in Rome. The finest of these are pJjfiiL attached to the churches of S. Francesca Romana, SS. Giovanni e Paolo, and S. Maria Maggiore. Others belong to the basilicas of S. Lorenzo fuori and S. Croce in Geru- salemme, and to S. Giorgio in Velabro, S. Maria in Cosmedin, S. Alessio, S. Giovanni ad Portam Latinam, S. Cecilia, S. Crisogono, and S. Pudentiana. They occupy various positions with regard to the church, being all later additions’, that of SS. Giovanni e Paolo stands at some distance from it. In design they are very similar,, consisting of many stages, divided by brick and marble cornices; in the upper storeys are from two to four windows on each side, with round arches supported on slender marble columns. They are ! decorated with brilliantly coloured ciotole or disks of earthenwareˆ en- amelled and painted in green or turquoise blue, among the earliest existing specimens of the so-called majolica (see Ceramics). Sometimes disks or crosses made of red or green porphyry are inlaid

in the walls. In most cases on one face of the top storey is a projecting canopied niche, which once con- tained a statue or mosaic picture. The walls are built of fine neat brickwork. The largest and once the handsomest of all, that of S. Maria Maggiore, has string-courses of enamelled and coloured terra-cotta. 1 The slender columns of the windows

1 This campanile was restored and enriched in 1376.

have often' proved insufficient to support the weight, and so many of the arches are built upi 2

Though but little used for churches, the Gothic style, in its modified Italian form, was almost universally employed for domestic architecture in Rome during the 13th and Domestic 14th centuries. Tufa 3 or brick was used for the archltec- main walls, the lowest storey being often supported *""*• on an arcade of pointed arches and marble columns. The windows were usually formed of large marble slabs with trefoil- shaped heads or cusped arches. As a rule the upper storeys projected slightly over the lower wall, and were supported on small ornamental machicolations. The top storey frequently had an open loggia, with rows of pointed arches. When vaulting was used it also was of the pointed form, usually in simple quadripartite bays, with slightly moulded groin-ribs. The finest existing specimen of this style is the palace built about 1300 by Boniface VIII. (Benedetto Gaetani), enclosing the tomb of Cecilia Metella on the Via Appia, with a graceful little chapel within the precincts of the- castle. This building is well worthy of study; the remaining part is well preserved. Many houses of this period, though generally much injured by altera- tions, still exist in Rome. They are mostly in out-of-the-way alleys, and, not being mentioned in any books, are seldom examined. The Ghetto (now destroyed) and the quarter near the Ponte Rotto contained many of these interesting buildings, as well as some of the most crowded parts of the Trastevere district, but most have disappeared owing to the wholesale destruction of old streets. Among' those which may possibly escape for a while is the 13th-century house where Giulio Romano lived, near the Palazzo di Venezia, and the Albergo del Orso, at the entf. of the Via di Tordinona, of the same period, which was an inn in the 16th century and is one still; this has remains of a fine upper loggia, with rich cornices in moulded terra-cotta; the lowest storey has pointed vaulting resting on many pillars. Another graceful but less stately house exists, though Sadly mutilated, opposite the entrance to the atrium of S. Cecilia in Trastevere. 4 Few now remain of the once numerous lofty towers built by the turbulent Roman barons for purposes of defence. The finest, the Torre delle Milizie on the Viminal,

was built in the 13th century by the sons of Petrus Alexius; of about the same date is the Torre dei Cpnti, near the forum of Augustus, built by Marchione of Arezzo; both these were once much higher than they are now; they are very simple and nohle in design, with massive walls faced with neat brickwork.

Till the 14th century the Lateran was the usual residence of the pope; this was once a very extensive building, covering four times its present area. The original house is said to have belonged to the senator Plautius Lateranus in p a j afXm the reign of Nero; but the existing part on the line of the Aureljan wall is of the 3rd century. , This house, which had become the property of the emperors, was given by Coh- stantineas a residence for S. Sylvester; it was very much enlarged at many periods during the next ten centuries; in 1393 a great part was burnt, and in 1586 the ancient palace was completely destroyed by Sixtus V., and the present palace built by Domehico Fontana. The Cappella Sancta Sanctorum (see list oi Cosmati works) is the only relic of the older palace.*

‘ 2 See De Montault, Les Cloches de Rome (Arras, 1874). –

‘For many centuries wall-facing of small tufa stones was used; e.g. in the medieval part of the Capitol; this was called “opera saracinesca ” from its supposed adoption from the Saracens; it is largely employed in the walls and towers of the Leonine city; built by Leo IV. (847-855) to defend the Vatican basilica and palace against the inroads of the Moslem invaders. The greater part_ of this wall is now destroyed and built over, but a long piece with massive circular towers well preserved exists in the gardens of the Vatican.

4 The house of Crescen this, popularly called the ” house of Rienzi,” near the Ponte Rotto, is perhaps the sole relic of the domestic architecture of an earlier period — the 12th century. Its archi- tectural decorations are an extraordinary mixture of marble frag- ments of the most miscellaneous sort, all taken from classical buildings; it has an inscription over the doorway, from which we learn that it was the property of ” Crescentius, son of Nicolaus.” I 6 See Rohault de Fleury, Le Lalran au moyen dge (Paris, 1877).

Ecclesi- astical Got hie.

The present palace has never been used as a papal residence; in the 18th century it was an orphan asylum, and is now a museum of classical sculpture and early Christian remains.

The Vatican palace originated in a residence built by Sym- machus (498-514) adjoining the basilica of S. Peter. This was

rebuilt by Innocent III. (c. 1200) and enlarged by Vatican. Nicholas III. (1277-80). It did not, however, become

the fixed residence of the popes till after the return from Avignon in 1377. In 141 5 John XXIII. connected the Vatican and the castle of S. Angelo by a covered passage carried on arches. But little of the existing palace is older than the 15th century; Nicholas V. in 1447 began its reconstruction on a magnificent scale, and this was carried on by Sixtus IV. (Sistine chapel), Alexander VI. (Torre Borgia), Julius II. and Leo X. (Bramante's cortile and Raphael's Loggie and Stanze), and Paul III. (Sala Regia and Cappella Paolina by Antonio da Sangallo). Sixtus V. and his successors built the lofty part of the palace on the east of Bramante's cortile. The Scala Regia was built by Bernini for Urban VIII. and Alexander VII., the Museo Pio-Clementino under Clement XIV. and Pius VI., the Braccio Nuovo under Pius VII., and lastly the grand stairs up to the cortile were added by Pius IX. 1

The Quirinal palace, now occupied by the king of Italy, is devoid of architectural merit. It stands on the highest part of

the hill, near the site of the baths of Constantine. QuMaal. This palace was begun in 1574, under Gregory XIII.,

by Flaminio Ponzio, and was completed by Fontana and Maderna under subsequent popes.

The only important church in Rome which is wholly Gothic in style is S. Maria sopra Minerva, the chief church of the Dominican order. This was not the work of a Roman architect, but was designed by two Dominican friars from Florence — Fra Ristori and Fra Sisto — about 1289, who were also the architects of their own church of S. Maria Novella. It much resembles the contemporary churches of the same order in Florence, having wide-spanned pointed arches on clustered piers and simple quadripartite vaulting. Its details resemble the early French in character. 2 It contains a large number of fine tombs; among them that of Durandus, bishop of Mende (the author of the celebrated Rationale divinorum officiorum), by Giovanni Cosma, c. 1300, and the tomb of Fra Angelico, the great Dominican painter, who died in Rome,

1455. The most elaborate specimen of ecclesiastical Gothic in Rome is that part of S. Maria in Ara Coeli which was rebuilt about 1300, probably by one of the Cosmati, namely, the south aisle and transept. During the 14th century (chiefly owing to the absence of the popes at Avignon) the arts were neglected at Rome, and a period of decadence set in. The sculptured effigy and reredos of Cardinal d'Alengon (d. 1403) in S. Maria in Trastevere, executed by a certain Paulus Romanus, is a fair example of the works produced during this period ; the effigy is a very clumsy and feeble copy of the fine recumbent figures of the Cosmati.

Florentine Period, c. 1450-1550.

The long period of almost complete artistic inactivity in Rome was broken in the 15th century by the introduction of a number of foreign artists, chiefly Florentines, who during this and the succeeding century enriched Rome with an immense number of magnificent works of art. The dawn of this brilliant epoch may be said to have begun with the arrival of Fra Angelico (see Fiesole) in 1447, invited by Nicholas V. to paint the walls of his small private chapel in the Vatican dedicated to S. Lorenzo.

In the latter half of the 15th century a large number of sculptured tombs (as well as tabernacles, altar frontals, rere- Fiorea- doses and the like) were made for Roman churches by tine and sculptors from Tuscany and north Italy. The earliest Lombard f these tombs is that of Eugenius IV. (d. 1447) in SCUDO • g. Salvatpre in Lauro, by Isaia da Pisa. It presents the typical form of a life-sized recumbent effigy resting on a richly ornamented sarcophagus over which is a canopy decorated with reliefs and statuettes. The type was brought to perfection by the Florentine Mino da Fiesole (see Mino di Giovanni),

1 See Letarouilly, Le Vatican et le basilique de St Pierre & Rome (Paris, 1882).

- The absence of a triforium is one of the chief reasons why the large Gothic churches of Italy are so inferior in effect to the cathe- drals of France and England.

who worked in Rome under Pius II. and succeeding popes,, being assisted in some cases by another artist of almost equal skill, Giovanni Dalmata. A Lombard sculptor, Andrea Bregno, came to Rome under Paul II. and worked there until the closing years of the century; his tomb is in S. Maria Sopra Minerva. The works of these artists and their followers are to be found in a great number of churches, notably S.

Maria del Popolo.'

The architecture no less than the sculpture of the latter part of the 15th century was mainly the work of Florentines, especially of Baccio Pontelli, who is said by Vasari to have built S. Maria del Popolo, S. Agostino, 4 and S. Cosimato in Trastevere. He also was the architect of S. Pietro in Montoric, erected in 1500 for Ferdinand and Isabella of Spain. Other buildings were carried out by another Florentine, Giuliano' da Majano. The Palazzo di Venezia, begun for Cardinal Barbo; afterwards Paul II., about 1-455, a verv massive and stately building of medieval character, was built by Giuliano da Sangallo and Francesco di Borgo San Sepolcro.

During the latter part of the 15th and the first few years of thˆe succeeding century Rome was enriched with a number of buildings' by Bramante (g.iO, one of the greatest architects the world has ever seen. He combined the delicacy of detail Bra- and the graceful lightness of the Gothic style with the fantt. measured stateliriess and rhythmical proportions of classic archi- tecture. Though he invariably used the round arch and took his mouldings from antique sources, his beautiful cloisters and loggie are Gothic in their general conception. Moreover, he never committed the prevalent blunder of the 1 6th century, which was a fruitless attempt to obtain magnificence by mere size in a building, without multiplying its parts. His principal Works in Rome are the Palazzo della Cancelleria, built for Cardinal Riario - (1495-1505), with its stately church of S. Lorenzo in Damaso; the so-called Palazzo di Bramante in the Governo Vecchio, built in 1500; and the Palazzo Giraud, near St Peter's, once the residence of Cardinal Wolsey, built in 1503. He also built the cortile of S. Damaso in the Vatican, the toy-like tempietto in the cloister of S. Pietro in Montorio (1502), and the cloisters of S. Maria della Pace (1504). 5 In 1503 Bramante was appointed architect to St Peter's, and made complete designs for it, with a plan in the form of a Greek cross. The piers and arches of the central dome were the only "parts completed at the time of his death in 1514, and subsequent architects did not carry out his designˆ

Baldassare Peruzzi (q.v.) of Siena was one of the most talented architects of the first part of the 16th century; the Villa Farnesina and the Palazzo Massimi alle Colonne are from his designs. Peruzzi. His later works bear traces of that decadence in taste which so soon began, owing mainly to the rapidly growing love for the dull magnificence of the pseudo-classic style. This falling off in architectural taste was due to Michelangelo (q.v.) more than to any other one man. His cortile of the Farnese palace, though a work of

much stately beauty, was one of the first stages towards that lifeless scholasticism and blind following of antique forms which were the destruction of architecture as a real living art, and in the succeeding century produced so much that is almost brutal in its coarseness and neglect of all true canons of proportion and scale. During the earlier stage, however, of this decadence, and throughout the 16th century, a large number of fine palaces and churches were built in and near Rome by various able artists, such as the Villa Madama by Raphael, part of the Palazzo Farnese by Antonio da Sangallo the younger, S. Giovanni de' Fiorentini by J. Sansovino, and many others. 7 (J. H. M. ; H. S. J.)

Later Development

The transformation of Roman architecture after the i6th century was marked by the abandonment of classical models. The works of Michelangelo were too grand to be accused of exceeding the extreme limits of good taste, but his scholars and imitators exaggerated his manner, and the barocco style,

3 On Mino da Fiesole, see Gnoli in Archivio Storico dell' Arte (1890-91) ; on Giovanni Dalmata, Fabriczy in Jahrb. der preuss-Kunstammlungen (1901) ; on Andrea Bregno, Steinmann in the same periodical, vol. xx.; many of the monuments are drawn in Tcsi, Raccolta di monumenti sacri e sepolcrati scolpiti a Roma (1853). ■

4 These two churches were the first in Rome built with domes after the classical period. ,

6 The upper storey of the latter is varied by having horizontal lintels instead of arches on the columns.

6 See Geymuller,. Projets primitifs pour le basilique de St Pierre & Rome (Paris, 1875-85).

7 A valuable account of Raphael's architectural works is given by Geymuller, Raffaello come Architetto (Milan, 1882). Drawings of many of the finest palaces of Rome are given in the fine work by Letarouilly, Edifices de Rome moderne (Brussels, 1856-66).

which had its cradle Ja.jRome, was soon adopted throughout Italy. Vignol% X5507-1573) had done his best to bind the : x&tpi«f building to strictly classic rules, but in spite , ,,i of his efforts the degeneration made progress during his own lifetime and under Carlo Maderna (1556-1639), and proceeded still more rapidly under Bernini (1 598-1680). The characteristics of the barocco are the reckless abuse of curves and extravagantly broken lines, of- contorted columns, twisted tympanums and highly exaggerated ornaments; yet we must confess that many monuments of this period of art exhibit such exuberant life, such contrasts of relief and shadow, and such a wonderful combination of variety and solidity as camaot fail to please the many, even now, by the magnificence of, their general effect. In Rome, the numerous works of Bernini,, Borromini, Maderna, Rainaldi, Salvi, Fuga, Longhi and others bear witness to the gifted activity; of Italian architects during that period, if genius necessarily creates, those men showed more of it than their predecessors ‘ Who adhered to the classic and revered the teachings of Vitruvius. Degeneration is tolerated and sometimes even pleases, under the name of transformation, but there is nothing to be said for the real decay which marks the 18th century. It was not universal at first, for it is by nature a slow process; such men as A. Galilei, Specchi, Peparelli, Marchionni, Morelli, Camporese and Piranesi left works not altogether without value; but the outrageous abuse of ornament increased with every year, and was made more and more evident by the clumsy heaviness of. the pillars and pilasters that supported the whole. The refined purity of the Renaissance disappeared as completely as the delicate grace and exquisite ornamentation of the Cosmatesque period. Many works of the greatest beauty were destroyed outright, and many more were disfigured and often wholly hidden by horrible stucco constructions and decorations; or, on a larger scale, by the application of hideous stone facades to churches of which the simple good taste had delighted generations 6i mankind. The deformation of the noble old Lateran basilica is a conspicuous instance of such deeds; another is Santa Maria Maggiore, and the false fronts plastered upon San Marcello and Santa Maria in Via Lata, both in the Corso, give a very clear idea of what was generally done. The interiors of old churches suffered quite as much, and even the frescoes of early masters were not spared; those by Pinturicchio in the third chapel (south) of S. Maria del Popolo were covered with wretched stucco ornaments, only removed in 1850, and numberless works of art by Giotto and other early painters were wilfully destroyed.

The decline of architecture continued in the 19th century,

notwithstanding the laudable efforts of Valadier and a few other painstaking imitators, who produced the so-called “academic neo-dassic’ ” reaction; among them may be noted the names of Canina, Poletti, Sarti and Azzurri. The futility of their works invited the feeble eclecticism which soon after- wards became so general that the architecture of the period is wholly without individuality, good or bad. The chief architectural work of the 19th century was the. rebuilding of the great basilica of S. Paolo fuori le Mura, burnt in 1823, in a style of cold splendour which is anything but devotional in its general effect. The pillars are huge monoliths of grey granite from the Alps; the confessio and transepts are lined with rosso and verde antico from quarries then recently re- discovered in Greece, and with Egyptian alabaster and lapis lazuli and malachite adorn the bases of the columns round the high altar in lavish profusion. Thirty years were required for the rebuilding of the frigidly magnificent edifice, which was reconsecrated in 1854. ■ The east facade displays a quantity of gaudy mosaics, and the projected quadriportico is wanting. The belfry is nothing but a steeple, and has an unfortunate resemblance to a lighthouse. In extenuation of the result it must be admitted that the original building had been totally destroyed by fire, but no such excuse can be found for the barbarous assault on Christian art which was perpetrated by Francesco Vespignani in the extension of the Lateran basilica.

This work was begun under Pius IX. and finished under Leo XIII. ; it involved the destruction of the ancient tribune and its ambulatory, the only parts of the church which had so far escaped complete disfigurement, and the priceless mosaics (1290), among the most beautiful in Rome, were taken down and replaced in the new apse in a sadly mutilated and restored form. (For the interesting discoveries made in excavating for the new foundations, see Ann. 1st. 1877, P- 33 2 -)

The Vatican contains the largest collection in the world of Greco-Roman and Roman sculpture, with a few specimens of true Hellenic art. It is also very rich in Greek vases and in objects naileries from Etruscan tombs; this latter division is called the ant col- MuseO Gregoriano. There is also an Egyptian museum lections. which contains a few important curiosities. In the great library are preserved a number of early glass chalices and other rare objects from the catacombs, as well as many fine speci- mens of later Christian art — church plate and jewels. The picture gallery, though not as large as some of the private collections in Rome, contains few inferior pictures. The Lateran palace, still, like the Vatican, in the possession of the pope, contains a fine collection of classical sculpture, but is most

remarkable as a museum of Christian antiquities, The two capitoline museums are very rich in classical sculpture, bronzes, coins, pottery and the contents of early Etruscan and Latin tombs. A large hall has been added, and is filled with sculptures found in Rome since 1870, of which the arrangement was completed on the occasion of King Edward VI I. ‘s visit. The picture gallery contains a few masterpieces and a large number of inferior works. The new Museo delle Terme has been formed in the great cloister of S. Maria degli Angeli, to hold the numerous fine examples of classical painting arid sculpture found along the Tiber during the excavations for the neW embankment, and in other places in Rome. The university of Rome possesses fine collections of minerals, fossils and other geological specimens, and examples of ancient marbles used in the buildings of Rome. A Museo Artistico Industriak has been formed in a monastery in the Capo le Case, to contain medieval works of art. It is, however^ a matter for regret that the few medieval works which Rorne possesses should be scattered in three small collections, namely, the one last mentioned, the Capitol and the Castle of S., Angelo, where aft attempt is being made to form a real medieval museum; many objects, too, are dispersed throughout the city, and will doubtless disappear unless they are better protected. The Museo Kircheriano contains an unrivalled collection of prehistoric objects of stone, bronze, iron and pottery, found in Italy and the Italian islands, and more particularly a number of ancient Latian urns, capanne and the like. The collection of aes grave is the finest yet made; and the museum also contains a large quantity of interesting classical antiquities of various kinds. Another branch is the Ethnological Museum. Unfortunately all these museums are badly adapted for purposes of study, being neither well arranged nor well catalogued. The. Museo Baracco, presented to the city in 1905 by the senator of that name, contains some ancient sculptures of great value. The Museum of Etruscan and Fahscan antiquities in the Villa Giulia, near Porta del Popolo, is of considerable importance, as is also the Borgia Museum in the Propaganda palace, the latter for its ancient geographical curiosities. The museum of plaster casts in the Testaccio quarter contains reproductions of the principal ancient sculptures possessed by foreign museums.

Among the private collections of pictures the Borghese is un- rivalled. The next in importance is that in the Doria palace, which, however, like most Italian collections, contains a —b^, large proportion of very inferior works. The Corsini Private picture gallery, bought by the government, is chiefly collec- rich in the works of the Bolognese and other third-rate »**w**. painters, but also possesses a fine collection of engravings, and etchings. There are a few fine paintings in the

Barberini palace, but the Sciarra gallery no longer exists. There are some good pictures by Raphael and Guido Reni in the Academy of St Luke; ! the Galleria d'Arte Moderna is a collection of modern paintings acquired by the government.

The largest private collection of sculpture is that of the Villa Albani, which, among a large mass of inferior Roman sculpture, contains a few gems of Greek art. The original Albani collection was stolen and brought to Paris by Napoleon I., and was there dispersed; one relief, the celebrated Antinous, is the only piece of sculpture from the original collection which was sent back from Pans. This is in the collection of Prince Torlonia, which contains several very fine works, but unfortunately the greater number are much injured and falsified by restorations. The casino in the Borghese gardens possesses a great quantity of sculpture, mostly third-rate Roman works, the most important of which, however, are executed in precious marbles. The small collection which formerly existed in the Villa Ludoyici has been bought by the government and removed to the Museo delle Terme; it contained a few works of Greek sculpture of great value, the most important being the Pergamean group representing the suicide of a Gaulish chief, a Medusa's head in relief and a male terminal figure; The

Giustiniani collection, which was considerable, is now dispersed, but many private residences, such as the Colonna palace, still contain collections of sculpture and painting of a secondary order.

The principal libraries in Rome are, for old and modern works, the Biblioteca Vittorio Emanuele and the library of the German Libraries Archaeological Institute; for manuscripts and early books, the Angelica, the Casanatense, the Alessandrina and the Chigi libraries; but none of them can be compared with that of the Vatican, which now contains also the former library of the Barberini. Mention must also be made of the Corsiniana, now belonging to the Accademia dei Lincei. The Biblioteca Sarti, beside the Academy of S. Luke, contains works on art*

The Modern City .

Great changes in the municipal and social conditions of Rome

followed the occupation of the city by the Italians (20th September 1870), and the rapid increase of population due to immigration from other parts of Italy. It is a mistake, however, to attribute all the works undertaken and executed since 1870 to the initiative of the new government. The first plan for modernizing and improving Rome was that of Pope Julius II., who aimed at the enlargement of the lower city on both-sides of the' Tiber. The modern Via Giulia shows in part what he meant to do. Following him, Sixtus V. did his best to develop the upper part of the city by laying out the Via Sistina, from the Trinita dei Monti to S. Maria Maggiore and Porta S. Giovanni. Almost in our own time a plan for the improvement of the city was made, under the direction of Mgr. de Merode, during the reign of Pius IX.; and although but a small portion of the projected changes were carried out under the pope, the general scheme was in most respects satisfactory, and proved a good foundation for further extensive developments. He was able to complete the construction of the beautiful ascent to S. Pietro in Montorio, as well as that which leads up to the Quirinal Palace; and the Via Nazionale, which was to haVe been called Via De Merode, was also begun. His plan did not include, however, the destruction of villas such as the Ludovisi, nor the wholesale removal of trees, which is so greatly to be deplored. These acts of barbarism were the consequences of the reckless speculations in land and buildings that accompanied and followed the active and excellent work done by the municipality, and might have been checked by vigorous and timely action of the government. As it was, a number of the most important Roman families were ruined. At the outset, and as soon as political circumstances admitted the consideration of such matters, the municipality set to work; and though a comprehensible love of the picturesque has caused many persons to regret the result, altogether or in part, it is not to be denied that the improvements carried out have been of the highest advantage to the city, and that the work is in many instances of creditable solidity

Two principal problems presented themselves. The more important was the confinement of the Tiber in such a manner as to render impossible the serious floods which had from time to time inundated the city, often causing great damage to pro- perty and rendering the lower streets more or less impassable. There were floods which almost reached the level of the first storey near San Carlo in the Corso, and it was common to see the great Piazza Navona and the neighbourhood of the Pan- theon full of water for days together during the winter. The interruption of traffic can be imagined, and the damage to property was serious. The other urgent matter was one of which the government of Pius IX. had been partially aware, namely, the

necessity for opening better thoroughfares between different parts of the city. In the middle ages the population of Rome had dwindled to twenty or thirty thousand inhabitants, who lived huddled together about the strongholds of the barons, and the modern city had slowly grown again upon the exiguous foundation of a medieval town. The need for changing this condition of things, which had been felt under Pius IX., became overwhelmingly apparent as the population rapidly increased. That which under a continuance of the old government might have been done by degrees during a long period, had to be accomplished in the shortest possible time, with means which,

though considerable, were far from adequate, and ih the face of opposition by many holders of real estate, the most important of whom were conservatively attached to the papal govern- ment, and resisted change for no other reason. In what was now done it is necessary to distinguish clearly between the work undertaken and carried out by the municipality, under con- siderable pressure of circumstances, and that which was done in the way of private speculation. The first was on the whole good, and has proved enduring; the second was in many cases bad, and resulted in great loss. As soon as the opening of such streets as the Via Nazionale and the Via Cavoiiny the widening and straightening of the Via dell' Angelo Custode, now the Via del Tritone Nuovo, and similar improvements, such as the con- struction of new bridges over the Tiber, had demonstrated that the value of property could be doubled and quadrupled in a short time, and as soon as the increase of population had caused a general rise in rents, owners of property awoke to the situation of affairs, and became as anxious as they had at first been disin- clined to improve their estates by wholesale building.

The most important and expensive work executed by the government with the assistance of the municipality was the construction of the embankments along the Tiber. Though damaged by the great flood of December 1900, their truly Roman solidity saved the city ffom the disastrous consequences of a wide inundation. It is impossible not- to admire them, and not to feel respect for a people able to carry out such a plan in such a manner and in so short a time, in the face of such great diffi- culties. But so far as the life of the city was concerned, the cutting of new streets and the widening of old ones produced a mote apparent immediate result. The opening of such a thoroughfare as the Via Nazionale could not but prove to be of the greatest value. It begins at the Piazza delle Terme, in which the principal railway station is situated, and connects the upper part of the' city by a broad Straight road, and then, by easy gradients, with the Forum of Trajan, the Piazza dei Santi Apostoli and the Piazza di

Vehezia, whence, as the Corso Vittorio Emanuele, it runs through the heart of the old city, being designed to reach St Peter's by a new bridge of the same name, hear the .bridge of S. Angelo; It is true that, in order to accomplish this, the Villa Aldobrandini had to be partially de- stroyed, but this is almost the only point which lovers of beauty can regret, and in compensation it opened to 1 full view the famous palace of the Massimo family, the imposing church of S. Andrea della Valle, arid the noble pile of the.Cancelleria, one of the best pieces of architecture in Rome. Another great artery is the Via Cavdur, which was intended to connect the railway station with the south-western part of Rome, descending to the Forum-, and thence turning northwards to reach the Piazza di Veiiezia on the east side of the monument to Victor Emanuel II. These are only examples of What was done, for it would be impossible to give a just idea of the transformation of the city. Rome is now divided clearly into two parts, the old and the new, of wHich the old is incomparably the more artistic and the more beautiful, as it will always remain the more inter- esting. Among the works carried out by the government and municipality the fine tunnel under the Quirinal Hill (completed in 1902) deserves mention; it forms a connecting channel for the traffic between the streets at the north end of the old city, the Corso, Babuino, &c, and the upper part of Rome, including the Via Nazionale and the Esquilirie. Another difficult under- taking, successfully completed in April 1968; was the construc- tion of the enormous causeway and bridge which now unite the Pincio with the Villa Borghese, or, as it is now called, the Villa Umberto Primo, to the immense advantage of the public. In the same year the building for the new law courts was finished; it stands near S. Angelo, and presents, on the whole, an imposing appearance, though overloaded with clumsy stone ornamentation.

It is unnecessary to mention a number of public buildings and government offices which have little architectural merit, but we cannot overlook such a magnificent group of buildings devoted to scientific purposes as the Pblicliriico, on the Macas, which is admittedly one of the finest hospitals in Europe, and the military

hospital on the Coelian. The rebuilding of the Palazzo del Parlamento is only second to the enormous monument of Victor Emanuel II. The

majority of the buildings erected by individ- uals and corporations since 1870 present no original or charac- teristic features, and the best of them are copies or imitations of well-known models. The Cassa del Risparmio, in the Corso, reproduces a Florentine palace; the Palazzo Negroni, near the Piazza Nicotia, is modelled on the Cancelleria and the Palazzo Giraud; many of the large residences in the new quarters beyond the Tiber are fairly good copies of palaces in the Floren- tine style, though the magnificent carved stone of earlier centuries is disadvantageousˆ replaced by stucco, a material which lasts tolerably well in the mild climate of Rome. Opposite the beautiful and severe Palazzo di Venezia, what might have been a faultless reproduction of it is marred by tasteless orna- ment. Finally, so far as the construction of new streets is con- cerned, which lovers of the picturesque so greatly deplore, it must be admitted that they have been rendered necessary by the great increase of traffic and population, and it should be re- membered that after the 16th century the wisest of the popes did their best to open up the city by widening and straightening the thoroughfares.

Municipal Administration. Aiter the taking of Rome, those persons who remained loyal to Pius IX. took no part whatever in public affairs, and the municipal administration was entirely in the hands of the monarchists, : The expression ” ne eletti ne elettori,” meaning that Catholics are to be neither voters nor candidates, which came to be regarded as a sort of rule of the party, was invented at that time by an epigrammatic journalist, and it seems at first to have been applied also to municipal matters, whereas it was later understood to refer only to parliamentary elections. Leo XIII. encouraged the formation of a Catholic party in the municipal administration, and the municipal government drifted largely into the hands of Catholics, though circumstances make it necessary that the Syndic (Mayor) should always , be a’ royalist. Between 1870 and the end of the century the socialist party had no great influence in Rome, which can never be a city of manu facturing interests. For purposes of municipal government the division of the city into districts has been modified’, but the old division into fourteen rioni is adhered to in principle, the new quarters of Castro Pretorio and the Esquiline having been included in the first Rione, which still bears the name of ” Monti.” The municipality consists of a mayor and eighty communal councillors, of whom a large proportion were for many years mem bers of the aristocracy. Later, however, the three democratic parties, known as the monarchist, socialist and republican, united to form a popular coalition, and succeeded in completely excluding the conservative, aristocratic and Catholic elements.

Population. — The population in 1870 was 22,6,022, as against 462,743 in 1001 (communal population). It therefore more than doubled in thirty years. The increase, however, did not take place at a regular rate, owing to the changes in the rates of immigration and emigration. The largest increase was in 1870, reaching 22,186; the next most important in 1884, 1885, 1886, 1887, in which years it-

constantly remained near 20,000. The least increase in later years .was 4417 in 1 891. The garrison of Rome is about 10,000 men. Careful inquiry has placed it beyond doubt that there are in Rome about the same number of ecclesiastics of all orders, including about 1500 students in the theological seminaries. The average birth-rate is lower in Rome than in the majority of great cities. The number of births increased after 1870 very nearly in proportion with the increase of population.

Climate and Hygiene. — The climate of Rome is mild and sunny, but the variation in temperature between day and night is very great. December and February appear to be the coldest months, the thermometer then averaging 47° F. ; the greatest heat, which averages ,75°, is felt in July and August. Th« sur- rounding Campagna is still not all habitable during the summer, though the dangerous malaria has been checked by the planting of numerous eucalyptus trees. A remarkable instance of the

effect produced upon the marshy soil by these plantations may be studied at the Trappist monastery of the Tre Fontane, situated on the Via Ardeatina, about 4 m. from Rome. Whereas in former times it was almost always fatal to spend the whole summer there, the monks have so far dried the soil by means of the eucalyptus that they reside in the monastery throughout the year. The municipality has everywhere made strenuous efforts to reduce the mortality due to malaria; in 1890, 14% of all the deaths in Rome arid the Campagna were attributed to this cause; in 1905 the proportion had dropped to 3%. Very large sums have been expended in a scientific system of drainage and sub-drainage on both sides of the Tiber, and the use of wire gauze mosquito nets for the doors and windows of the humblest habitations in the Campagna has contributed much to the present satisfactory result. The hygienic con- ditions of Rome itself have greatly improved, largely through the ceaseless efforts of Commendatore Baccelli, a distinguished man of science, who repeatedly held office in the Italian Ministry. 1 The publication of exceedingly accurate graphic tables in February 1900 shows the following facts. Ninety per 1000 deaths occurred in 1871 from typhoid (the so-called ” Roman fever”), and the average has now fallen to a low constant. Deaths from small-pox, formerly of alarming frequency, cari be said not to occur at all, and their numbers diminished suddenly after the introduction of compulsory vaccination.

Charities and Education. — A great number of small charitable institutions for children and old people have been founded, which are organized on the most modern principles, and in many of these

charitable persons of the upper classes give their individual assist- ance to the poor. There are also private hospitals for diseases of the eye, in which poor patients are lodged and treated without payment. There are two hospitals entirely maintained by private resources, where infants are treated whose mothers fear to send them to a public hospital, or in cases refused by the latter as not being serious enough for admission. Of course, the numbers of the poor greatly increased with the growth of population, especially after the failure of building speculations between 1888 and 1890, though great efforts were made by the municipality to send all persons then thrown out of employment back to their homes. One of the diffi- culties under which Rome labours is that while it attracts the population of the country, as other capitals do, it possesses no great mechanical industries in which the newcomers can be employed. Efforts to create small industries in the populous quarters of the poor met with little success. Before 1870 a society was formed, which has since greatly developed as an intelligent private enterprise, to

Erovide the poor with sanitary tenements.; but its success is much ampered by the absence of employment, which again is partly due to the heavy taxation of small industries. A number of trade schools are also maintained by private funds, such as the Instituto degli Artigianelli, managed by the Fratelli della Dottrina Cristiana, and the Ricovero pei Fanciulli Abbandonati (home for friendless children), which is under lay management and has flourishing work- shops. The character of official charities has certainly improved in principle, so far as their educational and moral scope are concerned ; for whereas in former times the limited number of the poor made individual and almost paternal relief possible, that form of charity had a pauperizing influence. If anything, the present tendency is to, go too far in the opposite direction, and to require too many formalities before any relief is granted; and while the union of the principal charities under a central management on advanced theories improved the methods of administration, it destroyed numerous small sources of immediate relief on which the poor had a traditional right to count, and was in that way productive of hardship. At the same time, however, mutual benefit societies (societd, di mutuo soccorso) have been organized in great numbers by the different crafts and professions, and are chiefly distinguish- able by the political parties to which they belong. It is character- istic of the modern Roman people that the most widely different elements subsist without showing any signs of amalgamating, yet without attacking each other. Some of these societies have an exclusively clerical character, Others are merely conservative, some consist of monarchists, and some of avowed republicans.

Popular education is principally in the hands of the municipality, but besides the public schools there are numerous religious institu- tions attended by the children of the lower classes ; they follow the curriculum prescribed by the government, and are under the constant supervision of municipal inspectors, both as regards their teaching and their hygiene. The pope also expends large sums In the maintenance of the people's schools, managed entirely by lay- men, arid also under government inspection. For education of the higher grade, besides the regular lyceums and gymnasiums, there are many private schools similarly designated from which pupils can present themselves for the regular government examinations,

the privilege of conferring certificates and degrees having been allowed only to very few private institutions.

Society. — After 1870 both the aristocracy and the middle classes were divided into hostile factions, each of which maintained a press of its own and rallied round representative individuals. So far as the middle classes were concerned, the common interest of commercial operations soon concentrated political differences. The aristocracy, however, kept rigidly aloof from all speculations for a time, and maintained its traditional attitude of contemptuous superiority, to which the middle class answered with its profound hatred. This state of things lasted about ten years, until the time of the great building speculations, in which a number of noble families were tempted, and in which they soon found themselves hopelessly involved, and brought into close contact with the middle class. The two classes thus became necessary to each other, and the result was a notable and salutary diminution of prejudice, soon leading to alliances by marriage, which would formerly have seemed im- possible, but which the redistribution of wealth rendered mutually advantageous. The appearance at social gatherings of an official element, almost exclusively taken from the middle class, also tended to reduce inequalities of caste. Yet it must be admitted that the parties composing Roman society were drawn together mechanically, rather than fused into anything really homogeneous. It is worth mentioning that the Jewish element, which is very strong in business, in journalism, and in the administrations, had made no attempt to enter Roman society. Rome and Genoa are practically the only Italian cities

in which Israelites are rigidly excluded from social intimacy, and are only met on official occasions. (M. Cr.)

Ancient History I. The Beginnings of Rome and the Monarchy. Both the city and the state of Rome are represented in tradition as having been gradually formed by the fusion of separate com- munities. The original settlement of Romulus is said to have been limited to the Palatine Mount. With this were united before the end of his reign the Capitoline and the Quirinal; Tullus Hostilius added the Caelian, Ancus Martius the Aventine; and finally Servius Tullius included the Esquiline and Viminal, and enclosed the whole seven hills with a stone wall. The growth of the state closely followed that of the city. To the original Romans on the Palatine were added successively the Sabine followers of King Tatius, Albans transplanted by Tullus, Latins by Ancus, and lastly the Etruscan comrades of Caeles Vibenna. This tradition is supported by other and more positive evidence. The race of the Luperci on February 15 was in fact a purification of the boundaries of the ” ancient Palatine town,” 1 the ” square Rome ” of Ennius ; 2 and the course taken is that described by Tacitus as the ” pomoerium ” of the city founded by Romulus. 3 On the Esquiline, Varro mentions an ” ancient city ” and an ” earthen rampart,” 4 and the festival of the Septimontium is evidence of a union between this settlement and that on the Palatine. 5 The fusion of these ” Mounts ” with a settlement on the Quirinal ” Hill ” is also attested by trustworthy evidence; 6 and in. particular the line taken by the procession of the Argei represents the enlarged boundaries of these united communities. 7 Lastly, the Servian agger still remains as a witness to the final enclosure of the various settlements within a single ring-wall. The united com- munity thus formed was largely of Latin descent. Indications of this are not wanting even in the traditions themselves : King Faunus, who rules the Aborigines on the Palatine, is Latin; ” Latini ” is the name ascribed to the united Aborigines and Trojans; the immediate progenitors of Rome are the Latin Lavinium and the Latin Alba. Much evidence in the language, the religion, the institutions and the civilization of early Rome points to the same conclusion. The speech of the Romans is from the first Latin, 8 though showing many traces of contact

1 Varro, L.L. yi. 34. 5 Fest. 258; Varro ap. Solinus i. 17.

- Tac. Ann. xii. 24. For a full discussion of the exact limits of the Palatine city see Smith, Diet. Geog., s.v. ” Roma”; Jordan, Topog. d. Stadt Rom, i. cap. 2; Gilbert, Topog. u. Gesch. a. Stadt Rom, i. caps. 1,2; and ” Topography ” below.

4 L.L. v. 48; cf. ibid. 50.

6 Festus 348; Jordan i. 199; Gilbert i. 161. The seven ” montes ” are the Palatine with the Velia and Germalus, the Subura, and the three points of the Esquiline (Fagutal, Oppius and Cispius).

•See Mommsen, R.G. (7th ed.), i. 51.

7 Varro, L.L. v. 45, vii. 44; Jordan ii. 237.

• See Latin Language.

with the neighbouring dialects of the Sabines and Volscians and also of Etruscans; the oldest gods of Rome— Saturn, Jupiter, Juno, Diana — are all Latin; “rex,” ” praetor,” . ” dictator,” “curia,” are Latin titles and institutions. 9 The primitive settlements, with their earthen ramparts and wooden palisades planted Upon’ them out of reach both of human foes and of the malaria of the swampy low grounds, are only typical of the mode of settlement which the conditions of life dictated through- out the Latian plain. 10 But tradition insists on the admixture of at least two non-Latin elements, a Sabine and an Etruscan. The question as regards the latter will be more fully discussed hereafter; it is enough to say here that while the evidence of nomenclature (Schulze, Geschichte der Lot-. Eigennamen, Leipzig, 1904, p. 579, with the modifications suggested in the Classical Review, December 1907) shows that many Etruscan gentes were settled within the bounds of the early city, there is no satisfactory evidence that there was any large Etruscan strain in the Roman blood. 11 With the Sabines it is otherwise. The That union of the Palatine and Quirinal settlements Sabines which constituted so decisive a stage in the growth ’” Rome – of Rome is represented as having been in reality a union of the original Latins with a band of Sabine invaders who had seized and held not only the Quirinal Hill, but the northern and nearest peak of the Capitoline Mount. The tradition was evidently deeply rooted. The name of the god Quirinus, from which that of the Quirinal Hill itself presumably sprang, was popularly connected with the Sabine town of Cures, 12 The ancient worships connected with it were said to be Sabine. 13 One of the three old tribes, the Tities, was believed to represent the Sabine element; 14 the second and the fourth kings are both of Sabine descent. By the great majority of modern writers the substance of the tradition, the fusion of a body of Sabine invaders with the original Latins, is accepted as historical; and even Mommsen allowed its possibility, though he threw back the time of its occurrence to an earlier period than that of the union of the two settlements. 15 We cannot here enter into the question at length, but

some fairly certain points may be mentioned. The probability of Sabine raids and a Sabine settlement, possibly on the Quirinal Hill, in very early times may be admitted. The incursions of the highland Apennine tribes into the lowlands fill a large place in early Italian history. The Latins were said to have originally descended from the mountain glens near Reate. 16 . The invasions of Campania and of Magna Graecia by Sabine (more correctly Saline) tribes are matter of history (see Samnites), and the Sabines themselves are represented as a restless highland people, ever seeking! new homes in richer lands. 17 In very early days they appear on the borders of Latium, in close proximity to Rome, and Sabine forays are familiar and frequent occurrences in the old legends. But beyond these general considerations recent inquiry enables us to advance to some few definite conclusions. (1) It may now be regarded as established beyond question that the patrician class at Rome sprang from a race other than that of the plebeians.

9 The title ” rex ” occurs on inscriptions at Lanuvium, TusculumJ Bovillae; Henzen, Bullettino dell Inst. (1868), p. 159; Orelli, 2279-; Corp. I. Lat. vi. 2125. For ” dictator ” and ” praetor,” see Liyy i. 23, viii. 3; cf. Marquardt, Rom. Slaatsverwaltung, i. 475: for ” curia,” Serv. on Aen. i. 17; Marquardt i. 467. ” .

10 B. Modes’tov, Introduction a I’histoire romaine (translated from the Russian by M. Delines), Paris, 1907, supersedes other authorities such .as Helbig, Die Italiker in d. Poebene; Pohlmann,; Anjange Roms, 40; Abeken, Mittel-Italien, 61 seq.

11 The existence of a Tuscan quarter (Tuscus vicus) in early Rome may point to nothing more than the presence in Rome of Etruscan artisans and craftsmen. But see Etruria, § Language.

n Varro, L.L. v. 51.

13 Ibid. v. 74; Schwegler i. 248 seq. 14 Ibid. v. 55; Livy i. 13.

15 Mommsen, R.G. i. 43. Schwegler (R.G. i. 478) accepted the tradition of a Sabine settlement on the Quirinal, and considered that in the united state the Sabine element predominated. Volquardsen (Rhein. Mus. xxxiii. 559) believed in a complete Sabine conquest; and so did Zoller (Latium u. Rom, Leipzig, 1878), who, however, placed it after the expulsion of the Tarquins.

18 Cato ap. Dionys. ii. 48, 49.

17 Ibid. ii. 48; 49. For the institution of the” ver sacrum ” see

Schwegler, Rom. Gesch. i. 240; Nissen, Templumiv-.

This was long ago recognized by Schwegler (see his RSmische Geschichte, passim) on the sufficient ground of the great religious cleavage between the two orders. Such jealousy of mutual contact in religious matters as is apparent all through the history of the city very rarely, if ever, springs from any other source than a real difference of race. This point Was developed by Professor W. Ridgeway in his Who were the Romans? (London, 1908), where he points out (a) that the deities tended by the three greater or patrician flamens, namely, DJalis, Martialis, Quirinalis, were all closely connected with the Sabines; (i) further, that the patrician form of marriage, the highly religious ceremony called Confarreatio, differed entirely from the other forms, Usus and Coemptio, which there is reason to attribute to a plebeian origin; (c) that the arms, especially the round shield, carried by the first class in the originally military con- stitution of Servius Tullius (see below), are characteristic of the warriors of Central Europe in the Early Iron and Bronze Age, whereas those of the remaining classes can be shown to have been in general use during the immediately preceding period in the Mediterranean lands.

For other archaeological evidence separating the patricians from the plebeians, and connecting the patricians closely with the Sabines the reader must be referred to Ridgeway's essay. It is, however, well to make special mention here of the tradition, which is given by Livy (ii. 16. 4), and is undated but not the less probable for being a non-annalistic tradition, preserved in the gens itself, of the prompt welcome given to the Sabine Appius Claudius, the founder of the haughtiest of all the Roman noble families, by the patricians of Rome and his immediate admission to all their political privileges. Ridgeway points out that this implies, at that early time, a substantial identity of race.

On the linguistic side of the question it is well to mention for clearness' sake that this. Safine or patrician class marked its ascendancy all over Central and Southern Italy, from the 6th century B.C. onwards, by its preference for forming ethnic names with the suffix no which it frequently imposed also upon the communities whom it brought under its influence. Sabini (earlier Safini), Romani,

Latini, Sidicini, Aricini, Marrucini, and the like are all names formed in this way (see further Sabini).

2. It may also now be regarded as certain that what we may call the Lower or Earlier Stratum (or Strata) of population, in Rome, themselves spoke a language which was as truly Indo- European as the language of their Safine conquerors. In the article Volsci will be found evidence for the conclusion that the language of what has been- there entitled the Co-Folk was not less certainly Indo-European, and in some respects probably a less modified form of Indo-European, than that of the Safines. A number of the names formed with the co suffix and with the ati suffix (which is frequent in the same districts) contain unmistakably Indo-European words such as Graviscae, Marica, dea Marica, Volsci, Casinates, Soracte, Interamnites, Auxumates. The fusion of this earlier population with the patricians is far easier to imagine when it is recognized that the two parties spoke kindred though by no means identical languages. It is the essentially Indo-European character of the early inhabitants of the Latin plain which has led many scholars to doubt that there was any racial distinction at all between patricians and plebeians* but the increase of knowledge of the dialects spoken in the different regions of Italy has now enabled us to judge this question with very much fuller evidence. . 3. There arises, however, the important question or questions as to the origin, or at least the ethnic connexions of this earlier stratum. The task of the historic inquirer will not be completely performed until at least some further progress has been made in connecting this earlier population of the western coast of Italy, on the one hand, with one or more of the early races (see Siculi, Veneti, Liguria, Pelasgians) whom tradition declares to have once inhabited the soil of Latium; and on the other, with the people or peoples whom archaeological research reyeajs to us as having left behind them different strata of remains, all earlier than the Iron or Roman Age, both in

Latium and in other parts of Italy. Professor Ridgeway has taken a short way with these problems which may prove to be the true one; he classes together as Ligurian all pre-Safine inhabitants of Italy save such elements as, like the Etruscans, can be shown to have invaded it over sea (see Etruria, § Language). This is one of the most promising fields of investi- gation now open to scholars, but in view of the confused and mutilated shape in which the traditions current in ancient times have come down to us, it demands an exceedingly careful scrutiny of the archaeological and the linguistic evidence, and exceedingly cautious judgment in combining them. The point of outstanding importance is to determine whether the earlier Indo-European population is to be regarded as having been in Italy from

the beginning of human habitation. Archae- ologists generally like W. Helbig {Die Italiker der Poebene) and more recently B. Modesto v (Introduction d, ,1'histoire romaine,. Paris, 1907) have been inclined to regard the Ligtirians as the most primitive population of Italy, but to distinguish them sharply from the people who 1 built the Lake Settlement and Pile Dwellings, which appear (with, important variations of type): — (1) in the western half of the valley of the Po; (2) in the eastern half of the same; (3) in Pieenum; (4) in Latium; and (5) as far south' as Tarentum. One of the most import ant points in the identification is the question of the method of burial employed at different epochs by the different communities. (See the works already cited, with that of O. Montelius, La Civilisation primitive en Italic.)

The populus Romanus was, we are told, divided into three tribes, Ramnes, Tities and Luceres, 1 and into thirty curiae. The three names, as Schulze has- shown (Lat. Eigennamen, p. 580), are neither more nor less people. than the names of three Etruscan gentes (whether or not derived from Safine or Latin originals), and the tradition is a striking result of the Etruscan domination in the 6th century B.C., 2 which we shall shortly consider. ■

Of far greater importance is the division into curiae. In Cicero's time there were still curies, curia! festivals and curiate assemblies, and modern authors are unquestionably right in regarding the curia as the keystone of the primitive political system. It was a primitive association held together by par- ticipation in common sacra, and possessing common festivals, common priests and a common chapel, hall and hearth. As separate associations the curiae were probably older than the Roman state, but, 8 however this maybe, itis certain that of this state when formed they constituted the only effective political subdivisions. The members of the thirty curiae form the populus Romanus, and the earliest known condition of Roman citizenship is the communio sacrorum, partnership in the curial sacra. Below the curia there was no further political division, for there is no reason to believe that the curia was ever formally subdivided into a fixed number of gentes and families. 4

At their head was the rex, the ruler of the united people. The Roman "king" is not simply either the hereditary and patriarchal chief of a clan, the priestly head of a The.

community bound together by common sacra, but the M»z-

elected magistrate of a state, but a mixture of all three. 5 In

1 The tradition connecting the Ramnes with Romulus and the Tities with Tatius is as old as Ennius (Varro, L.L. v. 55). The best authorities on the question, earlier than Schulze's epoch-making treatise, are Schwegler i. 505, and Volquardsen, Rhein. Mus, xxxiii. 538.

2 They are traditionally connected only with the senate of 300 patres, with the primitive legion of 3000, with the vestal virgins, and with the augurs (Varro, L.L. v. 81, 89, 91; Livy x, 6; Festus 344; Mommsen i. 41, 74, 75; Genz, Patricisch. Rom, 90).

3 It is possible that the curiae were originally connected with separate localities; cf. such names as Foriensis, Veliensis (Fest. 174; Gilbert i. 213).

4 Niebuhr's supposition of ten gentes in each curia has nothing in its favour but the confused statement of Dionysius as to the purely military Shades (Dionys. ii. 7 ; cf . Mtiller, Philologus, xxxiv.

6 Rubino, Genz and Lange insisted on the hereditary patriarchal character of the kingship, Ihne on its priestly side, Schwegler on its elective. Mommsen came nearest to the view taken in the text, but

later times, when no "patrician magistrates " were forthcoming to hold the elections for their successors, a procedure was adopted which was believed to represent the manner in which the early kings had been appointed. 1 In this procedure the ancient privileges of the old gentes and their elders, the importance of maintaining unbroken the continuity of the sacra, on the transmission and observance of which the Wel- fare of the community depended, and thirdly the rights of the freemen, are all recognized. On the death of a king, the auspicia, and with them the supreme authority, revert to the council of elders, the patres, as representing the gentes. By the patres an interrex is appointed, who in turn nominates a second; by him, or even by a third or fourth interrex, a new king is selected in consultation with the patres. The king-designate is then proposed to the freemen assembled by their curiae for their acceptance, and finally their formal acceptance is ratified by the patres, as a security that the sacra of which they are the guardians have been respected. 2 Thus the king is in the first instance selected by the representa- tives of the old gentes, and they ratify his appointment. In form he is nominated directly by a

predecessor from whose hands he receives the auspicia. But it is necessary also that the choice of the patres and the nomination of the interrex should be confirmed by a solemn vote of the community.

It is useless to attempt a precise definition of the prerogatives of the king when once installed in office. Tradition ascribes to him a position and powers closely resembling those of the heroic kings of Greece. He rules for life, and he is the sole ruler, unfettered by written statutes. He is the supreme judge, settling all disputes and punishing wrongdoers even with death. All other officials are appointed by him. He imposes taxes; distributes lands and erects buildings. Senate and assembly meet only when he convenes them, and meet for little else than to receive communications from him. In war he is absolute leader,* and finally he is also the religious head of the community. It is his business to consult the gods on its behalf, to offer the solemn sacrifices and to announce the days 'of the public festivals. Hard by his house was the common hearth of the state, where the vestal virgins cherished' the sacred fire.

By the side of the king stood the Senate, or council of elders. In the descriptions left us of the primitive Senate, as in those of the rex, we can dfscover traces of a transition from senate. an earner state of things when Rome was only an as- semblage of clans or village communities, allied indeed, but each still ruled by its own chiefs and headmen, to one in which these groups have been fused into a single state under a common ruler. On the one hand the senate appears as a representative council of chiefs, with inalienable prerogatives of its own, and claiming to be the ultimate depositary of the supreme authority and of the sacra connected with it. The senators are the patres; they are taken from the leading gentes; they hold their seats for life; to them the auspicia revert on the. death of a king; they appoint the interrex horn their own body, are consulted in the choice of the new king, 4 and their sanction is necessary to ratify the vote of the assembled freemen. On the other hand, they are no longer supreme,

failed to bring out the nature of the compromise on which the kingship rests.

1 Cic. De Legg. iii. 3; Liyy iv. 7.

2 " Patres auctores facti," Livy i. 22; " patres fuere auctores," ibid. i. 32. In 336 B.C. (Livy viii. 12) the Publilian law directed that this sanction should be given beforehand, " ante initum suffragium," and thus reduced it to a meaningless form (Livy i. II). It is wrongly

identified by Schwegler with the ” lex curiata de imperio,” which in Cicero’s day followed and did not precede election. Accord- ing to Cicero (De Rep. ii. 13, 21), the proceedings included, in addition to the ” creation ” by the comitia curiata and the sanction of the patres, the introduction by the king himself of a lex curiata confer- ring the impetium and auspicia; but this theory, though generally accepted, is probably an inference from the practice of a later time, when the crealio had been transferred to the comitia centuriata.

• For the references, see Schwegler i. 646 seq t

- If the analogy of the rex sacrorum is to be trusted, the ” king ” could only be chosen from the ranks of the patricii. Cic. Pro Domo, 14; Gaius i. 122.

They cannot appoint a king but with the consent of the com- munity, and their relation to the king when appointed is one of subordination. Vacancies in their ranks are filled up by him, and they can but give him advice and counsel when he chooses to consult them.

The popular assembly of united Rome in its earliest days was that in which the freemen met and voted by their curiae {comitia curiata 1). The place of assembly was in the Comitium at the north-east end of the Forum, 8 jˆ’ eillW .at the summons and under the presidency of the’ king or, failing him, of the interrex. By the rex or the interrex the question was put, and the voting took place curiatirn, the curiae being called up in turn. The vote of each curia was decided by the majority of individual votes, and a majority of the votes of the curiae determined the final result. But the occasions on which the assembly could exercise its power must have been few. Their right to elect magistrates was apparently limited to the acceptance or rejection of the king proposed by the interrex. Of the passing of laws, in the later’ sense of the term, there is no trace in the kingly period. Didnysius’s state ment 7 that they voted on questions of war and peace is im- probable in itself and unsupported by’ tradition. They ‘are indeed represented, in one instance, as deciding a capital case, but it is by the express permission of the king and not of right. 8 Assemblies of the people were also, and probably more frequently, convened for other purposes. Not only did they meet to hear from the king the announcement of the high days and holidays for each month, and to witness such solemn religious rites as the inauguration of a priest, but their presence (and sometimes their vote) was further required to authorize and attest certain acts, which in a later age assumed a more private character. TW disposal of property by will 9 and the solemn renunciation Of family or gentile sacra 10 could only take place in ‘the

presence of the assembled freemen, while for adoption 11 {adrogatio) not only their presence but their formal consent was necessary.

A history of this early Roman state is out of the question. The names, dates and achievements of the first four kings are all too unsubstantial to form the basis of a sober Rome narrative; 12 a few points only can be considered as under the fairly well established. If we except the long event- **”•*”• less reign ascribed to King Numa, tradition represents the first kings as incessantly at war .with their immediate neighbours. The details of these wars are no doubt mythical; but the implied condition of continual struggle, and the narrow range within which the struggle is confined, may be accepted as true. The picture drawn is that of a small community, with a few square miles of territory, at deadly feud with its nearest neigh- bours, within a radius of some 12 m. round Rome. Nor, in spite of the repeated victories with which tradition credits Romulus, Ancus and Tullus, does there seem to have been any real extension of Roman territory except towards the sea. Fidenae remains Etruscan;’ the Sabines continue masters up to the Anio; Praeneste, Gabii and Tusculum are still untouched; and on this side it is doubtful if Roman territory, in spite of the possible destruction of Alba, extended to a greater’ distance than the sixth milestone from Rome. 13 But along the course

6 Cic. DeRep. ii. 13; Dionys. ii. 14, &c. ‘ ■■;

6 Varro, L.L. y. 155. For the position of the Comitium, sep Smith, Diet. Geog., s.v. ” Roma,” and Jordan, Topog. d.Stadl Rom. (Petersen).

7 Dionys. I.e. 8 Livy i. *6> Dionys. iii. 22.

9 Gatus ii. 101. _ 10 Gell. ;xv.; 27. ■ ”’

11 Gell. v. 19, ” Comitia praebentur, quae curiata appellantur.” Cf. Cic. Pro Domo, 13, 14; and see Roman Law.

u By far the most complete criticism of the traditional accounts of the first four kings will be found in Schwegler’s Rom. Geschichte, vol. i.; compare also Ihrie’s Early Rome and Sir G. C- Lewis’p Credibility’ of Early Rqman History. More recently, E. Pais (Slor’ia d’ Italia) has subjected) the early legends to learned and often sug- gestive criticism, but without attaining very solid results.

13 The fossa Cluilia,,5 xa,. from Rome (Livy ii. 39), is, regarded by Schwegler (i. 585) and by Mommsen (i. 45) as marking the Roman frontier towards Latium. Cf. Ovid. Fast. ii. 681

230, ” tural-b yovi > tou irkfiirTov kcli rod (ktov XlBov , opwv rijs r6re ‘Punalwv 77JS.”

of the Tiber below the city there was a decided advance. The fortification of the Janiculum, the building of the pons sub licius, the foundation of Ostia and the acquisition of the salt- works near the sea may all be safely ascribed to this early period; Closely connected, too, with the control of the Tiber from Rome to the sea was the subjugation of the petty Latin com- munities lying south of the river; and the tradition of the conquest and destruction of Politorium, Tellenae and Ficana is confirmed by the absence in historical, times of any Latin communities in this district.

With the reign of the fifth king Tarquinius Priscus a marked change takes place. The traditional accounts of the last three kings not only wear a more historical air than those of Tarqahs. tne nrst f° ur > Dut tnev describe something like a trans- formation of the Roman city and state. Under the rule of these latter kings the separate settlements are for the first time enclosed with a rampart of colossal size and extent. 1 The low grounds are drained, and a forum and circus elaborately laid out; on the Capitoline Mount a temple, is erected, the massive foundations of which were an object of wonder even to Pliny. 2 To the same period are assigned the redi vision of the city area into four new districts and the introduction of a new military system. The kings increase in power and surround themselves with new splendour. Abroad, too, Rome suddenly appears as a powerful state ruling far and wˆde over southern Etruria and Latium. These startling changes are, moreover, ascribed to kings of alien descent, who one and all ascend the throne in the teeth of established constitutional forms. Finally, with the expulsion of the last of them — the younger Tarquin— comes a sudden shrinkage of power. At the commencement of the Republic Rome is once more a comparatively- small state, with hostile and independent neighbours at her very doors. It is impossible to doubt the conviction that the true explanation of this pheno- menon is to be found in the supposition that Rome during this period passed under the rule of powerful Etruscan lords. 3 In the 7th and 6th centuries B.C., and probably earlier still, the Etruscans appear as ruling widely

outside the limits of Etruria proper. They were supreme in the valley of the Po until their power there was broken by the irruption of Celtic tribes from beyond the Alps, and while still mastersof the plains of Lombardy they established themselves in the rich ;lowlands of Campania, where they held their ground until the : capture of Capua by the Samnite highlanders in 423 B.C. It is on the face of it improbable that a power which had extended its sway from the Alps to the Tiber, and from the Liris to, Surrentum, should have left untouched the intervening stretch qf country between the Tiber and the Liris. And there is abundant evidence, of Etruscan rule in Latium. 4 According, to Dionysius there was a time when the Latins were known to the Greeks as Tyrrhen- ians, and Rome as a Tyrrhenian city.!" When Aeneas landed in Italy the Latins were at feud with Turnus (Turrhenos? Dionys. i.64) of Ardea, whose close ally was the rutnlessMezentius; prince of Caere, to whom the Latins had been forced to pay a tribute of wine. 6 Cato declared the Volsci to have been once subject to Etruscan ; rule, 7 and Etruscan remains found at Velitrae, 8 as well as; the second, name of the Volscian Anxur, Tarracina (the city of Tarchon), confirm his statement. Nearer still to Rome is Tusculum, with its significant name, at Praeneste we have a great number of Etruscan inscriptions and bronzes, and at Alba we hear of a prince Tapxˆrios, 9 lawless and cruel like Mezentius, who consults the " oracle of Tethys in Tyrrhenia." Thus we find the Etruscan power encircling Rome on all sides, and in Rome itself a tradition of the rule of princes of Etruscan

x Livyi. 36. ! Ibid.i. 38, 55; Plin. N.ff.xxxyi. 15.

'This was the view of O. Muller, and more recently of Deecke, Gardthausen and Zoller. .

4 W. Schulze, Gesch. d. Lai. Eigennanien, passim (esp. pp. 579 ff.) ; Zdller, Latium u. Rom, 166, 189; Gardthausen, Mastarna (Leipzig,

.1882).

5 Dionys. i. 29. • Livy i. 2; Dionys. i. 64, 65; PLut. Q.R. 18. 7 Cato ap. Serv. Aen. xi. 567. 8 Helbig, Ann. d. Inst. (1865). *Plut. Rom. 2. irapoi>oˆ

•Tarquitius, Virg. Aen. x. 550.

origin. The Tarquinii come from south Etruria; their name can hardly be any thing, else than the Latin equivalent of the Etruscan Tarchon, and is therefore possibly a title (= " lord " or " prince ") rather than

a proper name. 10 Even Servius Tullius was identified by Tuscan chroniclers with an Etruscan ” Mast- arna.” 11 Again, what we are told of Etruscan conquests does not represent them as moving, like the Sabellian trihes, in large bodies and settling down en masse in the, conquered districts. We hear rather of military raids led by ambitious chiefs who carve out principalities for themselves with their own good swords, and with their followers rule oppressively over alien and subject peoples. 12 And so at Rome the story of the Tarquins implies not a wave of Etruscan immigration so much as a rule of Etruscan princes over conquered Latins.

The achievements ascribed to the Tarquins are not less char- acteristic. Their despotic rule and splendour contrast with the primitive simplicity of the native kings.. Only Etruscan builders, under the direction of wealthy and powerful Etruscan lords, could have built the great cloaca, the Servian wall, or the Capitoline temple, — monuments which challenged comparison with those of the emperors themselves. Nor do the; traces of Greek influence upon Rome during this period a conflict with the theory of an Etruscan supremacy; on the contrary, it is at least possible that it was thanks to the extended rule and wide connexions of her Etruscan rulers that Rome was first brought into direct contact with the Greeks, who had long traded with the Etruscan ports and influenced Etruscan culture, 14

The Etruscan princes are represented, not only as having raised Rome for the time to acommandingpositioninLatium andlavished upon the city itself the resources of Etruscan civilization, The but ,also as the authors of important internal changes. Servian: They are representedas favouring new men at the expense reforms – of the old patrician families, and as reorganizing the Roman army on a new footing, a policy natural enough in military princes of alien birth, and rendered possible by the additions which conquest had made to the original community. From among the leading families of the, conquered Latin states a hundred new members were admitted to the senate, and these gentes thenceforth ranked as patrician, and became known as gentes, minpres. u The changes in the army begun, it is said, by the elder Tarquin and completed, by Serous Tullius were more important. The basis of the primitive military system had been three tribes, eachi of which furnished 1900 men to the legion and 100 tq the cavalry. 16 Tarquinius Priscus, we are told, contemplated the creation of three fresh tribes and three addi- tional centuries of horsemen with new names, 17 though in face, of the opposition offered by the old families he contented himself with simply doubling the strength without altering the names of the old divisions. 18 But the change attributed tp Servius Tullius went far beyond this. His

famous distribution of all freeholders (assidui) into tribes, classes and centuries, 19 though subsequently adopted, with modifications as the basis of the

10 Miiller-Deecke, i. 69, 70; Zoller, Latium «. Rom, 168; cf. Strabo, p. ,219; Serv. on Aen. x. 179, 198. The existence of an independent -" gens Tarquinia " of Roman extraction (Schwegler, i. 678) is unproven and ynlikely. See now Schulze, Lat. Eigennamen, pp. 95 and 402 n. 6.

u See speech of Claudius, Tab. Lugd. App. to Nipperdey's edition of the Annals of Tacitus, " Tiisce Mastarna ei nomen erat." For the painting in the Frangois tomb at Vulci, see Gardthausen, Mastarna, 29 seq.; Annali dell. Instit., (Rome, 1859).

n Cf . the traditions of Mezentius, of Caeles Vibenna, Porsena, &c.

» Schwegler, R.G. i. 679 seq. ' ' ,

u Ibid. 1. 791, 792. He accepts as genuine, and as represent- ing the extent of Roman rule and connexions under the Tarquins, the first treaty between Rome and Carthage mentioned by Polybius (iii. 22); see, for a discussion of the question, Vollmer, Rhein. Mus. xxxii. 614 seq.; Mommsen, Rom. Chronologie, 20; Dyer, Journ. of Philbl. ix. 238.

16 Livy i. 35; Dionys. iii. 67; Cic. De Rep. ii. 20.

16 Varro, L.L. v. 89. 17 Livy i. 36; Dionys. iii. 71.

18 The six centuries of horsemen were thenceforward known as " primi secundique Ramnes " (Fest. 344; cf. Schwegler, i.685 seq.). It is possible that the reforms of Tarquinius Priscus were limited to the cavalry.

19 Cic. De Rep. ii. 22 ; Livy ' i. 42 ; Dionys. iv. 16.

political system, was at- first exclusively military in its nature and objects. 1 It amounted, in fact, to the formation of a new and enlarged army on a new footing. In this force, excepting in the case of the centuries of the horsemen, no regard was paid either to the old clan divisions or to the semi-religious, semi- political curiae. In its ranks

were included all freeholders within the Roman territory, whether members or not of any of the old divisions, and the organization of this new army of assidui was not less independent of the old system with its clannish and religious traditions and forms. The unit was the centuria or company of 100 men; the centuriae were grouped in ” classes ” and drawn up in the order of the phalanx. 2 The centuries in front were composed of the wealthier citizens, whose means enabled them to bear the cost of the complete equipments necessary for those who were to bear the brunt of the onset. These centuries formed the first class. Behind them stood the centuries of the second and third classes, less completely armed, but making up together with those of the first class the heavy- armed infantry. 3 In the rear were the centuries of the fourth and fifth classes, recruited from the poorer freeholders, and serving only as light-armed troops. The entire available body of freeholders was divided into two equal portions, a reserve corps of senior es and a corps of junior es for active ser- vice. Each of these corps consisted- of 85 centuries or 8500 men, i.e. of two legions of about 4200 men each, the : normal strength of a consular legion under the early Republic. 4 ! It is noticeable also that the heavˆr-armed centuries of the three first classes in each of these legions represented a total of 3000 men, a number which agrees exactly with the number of heavy-armed troops in the legion as described by Polybius. Attached to the legions, but not included in them, were the 1 companies of sappers and trumpeters. Lastly, to the six centuries of horsemen, which still retained the old tribal names, twelve more were added as a distinct body, and recruited from the wealthiest class of citizens. 6 The four ” tribes ” also instituted by Servius were probably intended to serve as the bases for the levy of freeholders for the new army. 6 As their names show, they corresponded with the natural local divisions of the city territory. 7

The last of these Etruscan lords to rule in Rome was Tarquin the Proud. He is described as a splendid and despotic monarch. PaU of His sway extended over Latium as far south as Circeii. themon- Aristodemus, tyrant of Cumae, was his ally, and arch y- kinsmen of his own were princes at Collatia, at Gabiij and at Tusculum. The Volscian highlanders were chastised, and Signia with its massive walls was built to hold them in check. In Rome itself the Capitoline temple and the great cloaca bore witness to his power. But his rule pressed heavily upon the Romans, and at the last, on the news of the foul wrong done by his son Sextus to a noble Roman matron, Lucretia, the indignant people rose in revolt. Tarquin, who was away besieging Ardea, was deposed; sentence of exile was passed upon him : and upon all his race; and the

l This is recognized by Mommsen, Genz and Soltau, as against Niebuhr, Schwegler and Ihne. Even in the later comitia centuriata the traces of the originally military character of the organization are unmistakable.

5 The century ceased to represent companies of one hundred when the whole organization ceased to be military and became exclusively political.

- The property qualification for service in the first class is given at 100,000 asses (Livy), for the second at 70,000, third 50,000, fourth 25,000, fifth 11,000. It was probably originally a certain number of cows, afterwards translated into terms of money; cf. W. Ridgeway, The Origin of Coinage and Metallic Currency (Cambridge, 1892), p. 391. The same scholar, in his Who were the Romans? p. 17, has pointed out the ethnical meaning of the varieties of armature in the early army.

4 Polyb. vi. 20; Mommsen, Rom. Trib. 132 seq.

6 Livy i. 43. Dionys. (iv. 18) and Cic. (De Rep. ii. 22) ascribe the whole eighteen to Servius. But the six older centuries remained distinct, as the “sex suffragia ” of the comitia centuriata; Cic. De Rep. ii. 22.

8 Dionys. iv. 14, els tAs KaTtt.ypd.s took o-tpcitiomw.

7 Livy i. 43. The four were Palatina, Suburana, Exquilina, Collina.

people swore that never again should a king rule in Rome. Freed from the tyrant, they chose for themselves two yearly magistrates who should exercise the supreme authority, and thus the Republic of Rome was founded. Three times the banished Tarquin strove desperately to recover the throne he had lost. First of all the men of Veii and Tarquinii marched to his aid, but were defeated in a pitched battle on the Roman frontier. A year later Lars Porsena, prince of Clusium, at the head of all the powers. of Etruria, appeared before the gates of Rome, and closely besieged the city, until, moved by the valour of his foe, he granted honourable terms of peace and withdrew. 8 Once again, by Lake Regillus, the Romans fought victoriously for their liberty 1 against Tarquin’s son-in-law Mamilius, prince of Tusculum, and chief of the Latin name. Mamilius was slain; Tarquin in despair found a refuge at Cumae, and there soon afterwards died. .....

So, in brief,- ran the story of the flight of the kings, as it was told by the chroniclers whose story Livy reports, though with explicit and

repeated notes of reserve. Its details are most of them fabulous; it is crowded with inconsistencies and improbabilities; there are no trustworthy dates; the names even of the chief actors are probably fictitious; and the hand of the improver, Greek or Roman, is traceable throughout.' But there is no room.for doubting the main facts of the emancipa- tion of Rome from the rule of alien princes and tihe final abolition of the kingly office. (H. F. P. ; R. S. C.)

II. The Republic. ,.

Period A: 509-265 B.C. 10 — (a) The Struggle between the Orders. -r- It is characteristic of Rome that the change from monarchy to republic 11 should have been made with the least pos- sible disturbance of existing forms. The title of king . v c was retained, though only as that of a priestly officer ,”.'.' ‘ (rex sacrorum) to whom some of the religious functions of the former kings were transferred. The two annually elected consuls, or praetores,” were regarded as joint heirs of the full kingly authority, and as holding the imperium, and the correlative right of taking the auspices, by direct transmission from the founder of the city. They were, it is true, elected or designated by a new assembly, by the army of landholders voting by their classes and centuries (comitia centuriata), and to this body was given also the right of, passing laws; nevertheless it was still by a vote of the thirty curiae (lex curiata) that the supreme authority was formally conferred, on the magistrates chosen by the centuries of land- holders, and both the choice of magistrates and the passing of laws still required the sanction of the patrician senators (patrum amtoritas)P Nor,, lastly, were the legal prerogatives of the senate altered, although it is probable that before long plebeians were admitted to seats, if not to votes, and though its importance was gradually increased by the substitution: of an annual magistracy for the lifelong rule of a single king. But the

8 Livy ii. 9-14. Pliny (N:H. 34, 14) and Tacitus (Ann. iii. 72) imply the existence of a tradition, possibly that of ” Tuscan annalists,” according to which Porsena actually made himself master of Rome. The whole story is fully criticized by Schwegler (ii. 181 seq.) and Zoller (Latium u. Rom, p. 180).

9 See the exhaustive criticism in Schwegler (ii. pp. 66-203).

10 The traditional account of early republican history, given in annalistic form by Livy, has been subjected to severe criticism in recent times, notably by Pais in his Storia di Roma, vols. i. and ii. It is true that the dearth of contemporary documents, especially' for the

period before the sack of Rome by the Gauls (390 B.C.), must have led |o the filling of gaps by episodes drawn mainly from popular traditions, and it is therefore impossible to guarantee the accuracy of the narrative in details. Nevertheless, the general truth of the story of Rome's early wars and constitutional growth cannot be seriously impugned.

11 Schwegler (ii. 92) suggests that the dictatorship formed an intermediate step between the monarchy and the consulate; cf. Ihne, Rom. Forsch. 42.

12 That the consuls were originally styled praetores is stated by Varro, ap. Non. p. 23, and Liv. iii. 55; cf. Cic. Legg. viii. 3, 8. When additional praetors were created, the two originally appointed were called j>raetores maximi and hence aTparqyoi Cxatot or simply v'kotoi in Greek.

18 The view of the patrum auctoritas here adopted is that taken by T. Mommsen (Forsch. L).

abolition of the monarchy brought with it a change of the utmost importance in the actual working of the constitution. Though the distinction between patricians and plebeians was at least as old as the state itself, it is not until the establish- ment of the Republic that it plays any part in the history of Rome. No sooner, however, was the overshadowing authority of the king removed than a struggle commenced between the two orders which lasted for more than two centuries. It was in no sense a struggle between a conquering and a conquered class, or between an exclusive citizen body and an unenfranchised mass outside its pale. Patricians and plebeians were equally citizens of Rome, sprung of the same race and Speaking the same tongue (but see above). 1 The ; former were the members of those ancient gentes which had possibly been once the "chiefly" families in the small communities which preceded the united state, and which claimed by hereditary right a privileged position in the community. Only patricians could sit in the council oi. patres, and hence probably the name given to their order. 2 To their representatives the supreme authority reverted on the death. of the king; the due trans- mission of the auspicia and the public worship o£j

the state gods were : their special care; and to them alone were known the traditional 1 usages and forma which regulated the life of the people from day to day. To the plebs (the multitude, rkrjOos) belonged, all who were not members. of some patrician gen s, whether independent freemen or attached as ” clients ” 3 to one of the great houses. The plebeian was a citizen, with civil rights and a vote in the assembly of the curies, but he was excluded by ancient custom from all share in’ the higher honours of the state, and intermarriage with a patrician was not recog- nized as a properly legal union 4 (see Patricians).

The ” revolution which expelled the Tarquins gave the patricians, who had mainly assisted in bringing it about, an overwhelming ascendancy in the state. The plebs had indeed gained something. Not only is it probable that the strictness of the old tie of clientship had somewhat relaxed, and that the number of the clientes was smaller and their dependence on patrician patrons less complete, but the ranks of the plebs had, under the later kings, been swelled by the admission of conquered Latins, and the freeholders among these had with others been enrolled in the Servian tribes, classes and centuries. The establishment of the Republic invested this military levy of landholders with political rights as an assembly, for by their votes the consuls were chosen and laws passed, and it was the plebeian landholders who formed the main strength of the plebs in the struggle that followed. But these gains were greater in appearance than in reality. The plebeian land- holders commanded only a minority of votes in the comitia centuriata. In their choice of magistrates they were limited to the patrician candidates nominated by patrician presiding magistrates, arid their choice required confirmation not only by the older and smaller assembly of the curiae, in which the patricians and their clients predominated, but also by the patrician patres. They could only vote on laws proposed by patrician consuls, and here again the subsequent sanction of the patres was necessary. The whole procedure of the comitia was in short absolutely in the hands of their patrician pre- sidents, and liable to every sort of interruption and suspension from patrician pontiffs and augurs (for details see further Comitia and Senate).

But these political disabilities did not constitute the main grievance of the plibs in the early years of the Republic. What they fought for was protection for their lives and liberties, and the object of attack was the despotic authority of the

1 This is the view taken by the present writer, as against Schwegler and others. For Ridgeway’s theory, see above.

‘ Cf. aedilis, aediltcius, &c. ; Cic. De Rep. ii. 12 ; Livy i. 8 ; for a full discussion of other views, see Soltau 179 seq. ; Christensen, Hermest ix. 196.

. * For, the clientela, see Mommsen (Forsch. i. 355 sqq.; Staatsr. iii. 54 sqq.) ; Schwegler (i. 638 sqq.) ; Pauly-Wissowa, Realencyklo- padie, iv. 23 sqq. (von Premerstein).

4 The offspring of such a union ranked as plebeians. ,

patrician magistrates. The consuls wielded the full imperium of the kings, and against this ” consular authority ” the plebeian, though a citizen, had no protection and no appeal, nor were matters improved when for the two consuls was substituted in some emergency a single, all-powerful, irresponsible dictator.

The history of this struggle between the orders opens with a concession made to the plebs by one of the consuls themselves, a concession possibly due to a desire to secure the iex allegiance of the plebeian landholders, who formed Valeria the backbone of the army. In the first year of deprovor the Republic, according to the received chronology, catlone – P. Valerius Publicola or Poplicola carried in the comitia centuriata his famous law of appeal. 6 It enacted that no magistrate, saving only a dictator, should execute a capital sentence upon any Roman citizen unless the sentence had been confirmed on appeal by the assembly of the centuries. But, though the “right of appeal ” granted by this law was justly regarded in later times as the greatest safeguard of a Roman’s liberties, it was by no means at first so effective a protection as it after- wards became. For not only was the operation of the law limited to the bounds of the city, so that the consul in the field or on the march was left as absolute as before, but no security was provided for its observance even within the city by consuls resolved to disregard it. 6

It was by their own efforts that the plebeians first obtained any real protection against; magisterial despotism. The tradi- tional accounts of the first secession are confused The first and contradictory, 7 but its causes and results • are secession tolerably clear. The seceders were the plebeian end the legionaries recently returned from a victorious cam- ‘ ri * *’ ate * paign. Indignant at the delay of the promised reforms, they ignored the order given them to march afresh against Volsci and Aequi, and instead entrenched themselves on a hill across the Anio, some 3 m. from Rome, and known afterwards as the Mons Sacer. The frightened patricians came to terms, and a solemn agreement {lex sacrata) 8 was concluded between the orders, by

which it was provided that henceforth the plebeians should have annual magistrates of their own called tribunes (tribuni plebis), members of their own order, who should be authorized to protect them against the consuls, 9 and a curse was invoked upon the man who should injure or impede the tribune in the performance of his duties. 10 The number of tribunes was possibly at first two, then five; before 449 B.C. it had been raised to ten.

The tribunate is an institution which has no parallel in history. The tribune was not, and, strictly speaking, never became, a magistrate of the Roman people. His one proper prerogative was that of granting protection to the oppressed plebeian against a patrician officer. This prerogative (jus auxilii) was secured to him, not by the ordinary constitution, but by a special compact between the orders, and was protected by the ancient oath (vetus jusjurandum), 11 which invoked a curse upon the violator of a tribune. This exceptional and anomalous right the tribunes could only exercise in person, within the limits of the ” pomoerium,” and against individual acts of magisterial oppression. 12 It was only gradually that it expanded into a wide power of interference with the whole machinery of government, and was supplemented by the legislative powers which ren- dered the tribunate of the last century B.C. so formidable (see Tribune).

But from the first the tribunes were for the plebs not only protectors but leaders* under whom they organized themselves in opposition to the patricians. The tribunes convened Lex ‘ assemblies of the plebs {concilia plebis), and carried Publllla. resolutions on questions of interest to the order. This incipient

- Livy ii. 8, lex Valeria de provocatione; Cic. De Rep. ii.31; cf. Livy iii. 20.

e Greenidge, Legal Procedure of Cicero 1 s Time, pp. 344 sqq.

7 Schwegler ii. 226 seq. 8 Ibid. ii. 251 n. ; Livy i.33.

9 Cic. De Rep. ii. 34, ” contra consulare imperium creati.” 10 Livy iii. 55. « Festus 318.

w Gell. xiii. 12, ” ut injuria quae coram fieret arceretur.”

plebeian organisation was materially advanced by the Publilian law of 471 BwC., 1 which appears to have formally re- cognized as lawful the plebeian concilia, and established also, the tribune's right cum plebe agere, i.e. to propose and carry resolutions in them. These assemblies were Iributa, or, in other words, the voting in them took place not by curies or centuries but by tribes. In them, lastly, after the Publilian law, if not before, the tribunes were annually elected.? By this law the foundations were laid both of the powerful concilia plebis of feter days and also of the legislative and judicial prerogatives of the tribunes. The patricians maintained indeed that resolutions (plebiscita) carried by tribunes in the concilia plebis were not binding on their order, but the moral weight of such resolutions, whether they affirmed a general principle or pronounced sentence of condemnation on some single patrician, was no doubt con- siderable.

The next stage in the struggle is marked by the attempt to substitute a public written law for unwritten usage.

The proposal of C. Terentilius Arsa (462 B.C.) to ap- point a plebeian commission to draw up laws restricting the powers of the consuls' was resolutely opposed by the patricians, but after ten years of bitter party strife a compromise was effected. A commission of ten patricians was appointed, who Tae should frame and publish a code of law binding equally

Decent' on both the orders. These decemviri were to be the vinte. so i e an(j su p r eme magistrates for the year, and the law of appeal was suspended in their favour. 4 The code which they promulgated, the famous XII. Tables, owed little of its importance to , any novelties or improvements contained m its provisions. For the most part it seems merely to have reaffirmed existing usages and laws (see Roman Law). But it imposed, a$it,was intend- ed to do, a check on the arbitrary administration of justice by the magistrates. With the publication of the code the proper work of the decemvirs was finished; nevertheless, for the next year a fresh decemvirate was elected, and it is conceivable that the intention was permanently to substitute government by an irresponsible patrician " council of ten " for the old consti- tution. 5 However this may have been, the tyranny of the decemvirs themselves was fatal to the continuance of their power. We are told of a second secession of the plebs, this time to the Janiculum, and of negotiations with the senate, the result of which was the enforced abdication of the

decemvirs. The plebs joyfully chose for themselves tribunes, and in the comitia centuriala two consuls were created. But this restora- tion of the old regime was accompanied by legislation which Vaierio- made it an important crisis in the history of the Homtiaa struggle between the orders. With the fall of the *’ decemvirate this struggle enters upon a new phase.

The tribunes appear as at once more powerful and more strictly constitutional magistrates; the , plebeian concilia take their place by the side of the older assemblies;, and finally this im- proved machinery is used not simply in self-defence against patrician oppression but to obtain complete political equality. This change was no doubt due in part to circumstances outside legislation, above all to the expansion; of .. the Roman state, which swelled the numbers and added to the social importance of; the plebs as compared with the dwindling forces of the close corporation of patrician gentes. Still the legislation of 449 clearly involved more than a restoration of the old form of government. The Valerio-Horatian laws, besides, reaffirming the right of appeal and the inviolability of the tribunes, im- proved the position of the plebeian assemblies by enacting that plebiscita passed in them, and, as seems probable, approved by the palres, should bq binding on patricians as well asplebeians. 6

1 Livy ii. 56, 60; Dionys. ix. 41; Schwegler ii. 541; Soltau

493-

a For theories as to the original mode of appointing tribunes see Mommsen, Forsch. i. 185, Staatsr. ii. 274 sqq.

8 Livy iii. 9. 4 Ibid. iii. 32.

6 On the disputed question of the date of the XII. Tables see Pais, Storia di Roma, vol. i. chap, iv., and Greenidge, Eng. Hist. Review (1905), pp. 1 sqq.

6 Livy iii. 55, quum veluti in controverso jure esset, tenerenturne

By this law the tribunes obtained a recognized initiative in legislation. Henceforth the desired reforms were introduced and carried by tribunes in what were now styled comitia tributa,: and, if sanctioned by the patres, became laws of the state. From this period, too, must be dated the legalization at any rate of the tribune’s right to impeach any citizen before the assembly of the tribes. 7 Henceforward there is no question of the tribune’s right to propose to the plebs to impose a fine, or of the validity of the sentence when passed. The efficiency of these.

new weapons of attack was amply proved by the subse- quent course of the struggle. Only a few years after the Valerio- Horatian legislation came the lex Canuleia, itself a plebiscitum (445 B.C.), by which mixed marriages between patricians L ex and plebeians were declared lawful, and the social Canuleia. exclusiveness of the patriciate broken down. In the • 309 ‘ same year with this measure, and. like it in the interests primarily of the wealthier plebeians, a vigorous attack commenced on the patrician monopoly of the consulate, and round this teres stronghold of patrician ascendancy the conflict raged lˆkiaiae until the passing .‘of the Licinian laws in 367. The Sextiae.

original proposal of the tribune Gaius Canuleius, in

445, that the people should be allowed to elect a plebeian consul was> evaded by a compromiseˆ The senate resolved that for the next year, in the stead of consuls, six military tribunes with • consular powers should be elepted, 8 and that the new office should be open to patricians and plebeians alike. The consulship was thus for the time saved from pollution, as the patricians phrased it, but the growing strength ©f the plebs is shown by the fact that in fifty years out of the seventy-eight bet ween 444 and 366 they succeeded in obtaining the election of consular tribunes rather than of consuls. ˆw”™ 8. Despite, however, these discouragements, the patricians fought on. Each year they strove to secure the creation of consuls rather than consular tribunes, and failing this strained every nerve to secure for their own order at least a majority among the latter. Even the institution of the censorship (435), though rendered desirable by the increasing importance and complexity of the census, was, it is probable, due in part to their desire to discount beforehand the threatened loss of the consul- ship by diminishing its powers. 9 Other causes, too, helped to protract the struggle. Between the wealthier plebeians, who were ambitious of high office, and the poorer, whose minds were set rather on allotments of land, there was a division of interest of which the patricians were not slow to take advantage, and to this must be added the pressure of War. The death Struggle with Veii and the sack of Rome by the Gauls absorbed for the time all the energies of the community. In 377, how- ■

ever, two of the tribunes, G. Licinius Stolo (see LicintuS Stolo, Gaius) and L. Sextius, came forward with proposals which united all sections of the plebs in their support. Their proposals were as follows: 10 (1) that consuls and not consular tribunes be elected; (2) that one consul at least should be a plebeian;

(5) that the priestly college, which had the charge of the Sibylline

books, should consist of ten members instead of two, and that of these half should be plebeians; (4) that no single citizen should hold in occupation more than 500 acres of the common lands, or pasture upon them more than 100 head of cattle and 500 sheep; (5) that all landowners should employ a certain amount of free as well as slave labour on their estates;

(6) that interest already paid on debts should be deducted from the principal, and the remainder paid off in three' years. The three last proposals were obviously intended to meet the patres plebiscitis legem comitiis centuriatis trulere, ut quod tributrm plebs jussisset populum teneret, qua lege tribuniciis rogationibus telum acerrimum datum est." What were the precise conditions under which a plebiscitum became law can only be conjectured. The control of the patres over legislation certainly remained effective until 287 B.C. . (See below.)

7 After the decemvirate, the tribunes no longer pronounce capital sentences. ;They propose fines, which are confirmed by the comttia tributa. ,

8 Livy iv. 6; c£. Mommsen, Staatsrecht, ii. 181.

9 Mommsen, Staatsrecht, ii. ,331.

10 Livy vi. 35, 42 ; Appian, B.C. i. 8.

magis- tracies,

demands of the poorer plebeians, and to secure their support for the first half of the scheme. Ten years of bitter conflict followed, but at last; in 367 B.C., the Licinian rogations became law, and one of their authors, L. Sextius, was created the first plebeian consul. For the moment it was some consolation to the patricians that they not only succeeded in detaching from the consulship the administration of civil law, which was entrusted to a separate officer, praetor urbanus, to be elected by the comitia of the centuries, with an understand- ing

apparently that he should be a patrician, but also obtained the institution of two additional aediles (aediles curules), who were in like manner to be members of their own order. 1 With the opening of the consulship, however, the issue of the long con- test was virtually decided, and the next eighty years witnessed a rapid succession of plebeian victories. Now that a plebeian consul might preside at the elections, the main difficulty Opening in the way of the nomination and election of plebeian of the candidates was removed. The proposed patrician monopoly of the new curule aedileship was almost instantly abandoned. In 356 the first plebeian was made dictator; in 350 the censorship, and in 417 ‘ 337 the praetorship were filled for the first time by

454. plebeians; and lastly, in 300, by the lex Ogulnia, even

the sacred colleges of the pontiffs and augurs, the old strongholds of patrician supremacy, were thrown open to the plebs. 1 The patricians lost also the control they had exercised so long over the action of the people in assembly. The patrum auctoritas, the sanction given or refused by the patrician senators to laws and to elections, had hitherto been a powerful 41s. weapon, in their hands. But in 339 a law of Q. Publilius

fublllian Philo, a plebeian dictator, enacted that this sanction laws. should be given beforehand to laws enacted in the

comitia centuriata, 3 and a lex Maenia of uncertain date extended the rule to elections in the same assembly. Livy ascribes to the same Publilius a law emancipating the concilium plebis Lex from the control of the patres; but this seems in reality

Hortensia, to have been effected by the famous lex Hortensia, 467 ~ carried by another plebeian dictator. 4 Henceforward

the patrum auctoritas sank into a meaningless form, though as such it still survived in the time of Livy. From 287 onwards it is certain that measures passed by the plebs, voting by their tribes, had the full force of laws without any further conditions whatsoever. The legislative independence of the plebeian assembly was secured, and with this crowning victory ended the long struggle between the orders.

(6) Conquest of Italy. — Twelve years after the passing of the lex Hortensia, King Pyrrhus, beaten at Beneventum, withdrew from Italy, and Rome was left mistress of the peninsula. The steps by which this supremacy had been won have now to be traced. 6

The expulsion of the Tarquins from Rome, followed as it seems to have been by the emancipation from Etruscan suprem- acy of all the country between the Tiber and the Liris, entirely altered the aspect of affairs. North of the Tiber the powerful Etruscan city of Veii, after a vain attempt to restore the Tar- quins, relapsed into an attitude of sullen hostility towards Rome, which, down to the outbreak of the final struggle in 407, found vent in constant and harassing border forays. The Sabines recommenced their raids across the Anio; from their hills to the south-east the Aequi pressed forward as far as the eastern spurs of the Alban range, and ravaged the low country between that range and the Sabine mountains; the Volsci overran the coast-lands as far as Antium, established them-

1 Livy vi. 42.

- Ibid. vii. 17, 22; viii. 15; x. 6.
- Ibid. viii. 12, ” ut . . . ante initum suffragium patres auctores fierent,” cf. Livy. i. 17. For the lex Maenia, see Cic. Brut. 14, 55; Soltau 112.
- Plin. N.H. xvi. 10; Gell. xv. 27; Gaius i. 3, ” plebiscite lege Hortensia non minus valere quam leges.”

‘ For details of these wars see articles on the various cities, districts and tribes. For ethnographic and philological evidence see Italy, Ancient Peoples.

selves at Velitrae and even wasted the fields within a few miles of Rome. But the good fortune of Rome did not leave her to face these foes single-handed, and it is a significant League fact that the history of the Roman advance begins, *** <*e not with a brilliant victory, but with a timely alliance. ia ˆ? According to Livy, it was in 493, only a few years after nicans. the defeat of the prince of Tusculum at Lake Regillus, 261.

that a treaty was concluded between Rome and the Latin com- munities of the Campagna. 6 The alliance was in every respect natural. The Latins were the near neighbours and kinsmen of the Romans, and both Romans and Latins were just freed from Etruscan rule to find themselves as lowlanders and dwellers in towns face to face with a common foe in the ruder hill tribes on their borders. The exact terms of the treaty cannot, any more than the precise circumstances under which it was concluded, be stated with certainty

(see Latium), but two points seem clear. There was at first a genuine equality in the relations between the allies; Romans and Latins, though combining for defence and offence, did so without sacrificing their separate freedom of action, even in the matter of waging wars indepen- dently of each other. 7 But, secondly, Rome enjoyed from the first one inestimable advantage. The Latins lay between her and the most active of her foes, the Aequi and Volsci, and served to protect her territories at the expense of their own. Behind this barrier Rome grew strong, and the close of the Aequian and Volscian wars left the Latins her dependents rather thaii her allies. Beyond the limits of the Campagna Rome found a second ally, hardly less useful than the Latins, in the tribe of the Hernici (" the men of the rocks "), in the valley of the Trerus, who had equal reason with the Romans and Latins to dread the Volsci and Aequi, while their position midway between the two latter peoples made them valuable auxiliaries to the lowlanders of the Campagna.

The treaty with the Hernici is said to have been concluded in 486,* and the confederacy of the three peoples — Romans, Latins and Hernicans — lasted down to the 2 68

great Latin war in 340. Confused and untrustworthy as are the chronicles of the early wars of Rome, it is clear that, notwithstanding the acquisition of these allies, Rome made but little way against her foes during the first fifty years of the existence of the Republic. In 474, it is true, an end was put for a time to the harassing border feud with Veii by a forty years' peace, an advantage due not so much to Roman valour as to the increasing dangers from other quarters which were threatening the Etruscan states. 9 But this partial success stands alone, and down to 449 the raids of Sabines, Aequi and Volsci continue without intermission, and are occasionally carried up to the very walls of Rome.

Very different is the impression left by the annals of the next sixty years (440-390). During this period there is an ,

unmistakable development of Roman power on all sides. In southern Etruria the capture of Veii (396) Capture virtually gave Rome the mastery as far as the Ciminian of Veil. forest. Sutrium and Nepete, " the gates of Etruria," became her allies and guarded her interests against any attack from the Etruscan communities to the north, while along the Tiber valley her suzerainty was acknowledged as far as Capena and Falerii. On the Anio frontier we hear of no disturbances from 449 until some ten years after the sack of Rome by the Gauls. In 446 the Aequi appear for the last- time before the gates of Rome. After

418 they disappear from Mount Algidus, and in the same 33s.

year the communications of Rome and Latium with the Hernici in the Trerus valley were secured by the capture and colonization of Labicum. Successive invasions, too, broke the strength of the Volsci, and in 393 a Latin colony was founded as far south as Circeii: In part, no doubt, these Roman successes were due to the improved condition of

280,

305.

358.

308.

361.

6 Livy u. 33 ; Cic. Pro Balbo, : 23.

7 Livy viii. 2.

9 From the Celts in the north especially.

8 Ibid. ii. 41.

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affairs in Rome itself, consequent upon the great reforms carried MU , 1 . between 450 and 44.2; but it is equally certain that now, as often afterwards, fortune befriended Rome by weakening, or by diverting the attention of, her opponents. In particular, her rapid advance in southern Etruria was 2ˆ*“tf’ facilitated by the heavy blows inflicted upon the Etruscans during the 5th century B.C. by Celts, Greeks and Samnites. By the close of this century the Celts had expelled them from the rich plains of what was afterwards known as Cisalpine Gaul, and were even threatening to advance across the Apennines into Etruria proper. The Sicilian Greeks, headed by the tyrants of Syracuse, wrested from them their mastery of the seas, and finally, on the capture of Capua by the Samnites in 423, they lost their possessions in

the fertile Campanian plain. These conquests of the Samnites were part of a great southward movement of the highland Sabellian peoples, the immediate effects of which upon the fortunes of Rome were not confined to the weakening of the Etruscan power. It is probable that the cessation of the Sabine raids across the Anio was partly due to the new outlets which were opened southwards for the restless and populous hill tribes which had so long disturbed the peace of the Latin lowlands. We may conjecture, also, that the growing feebleness exhibited by Volsci and Aequi was in some measure caused by the pressure upon their rear of the Sabellian clans which at this time established themselves near the Fucine lake and along the course of the Liris. But in 390,

ing the Apennines into Etruria, laid siege to the Etruscan city of Clusium (Chiusi). Thence, provoked, it is said, by the conduct of the Roman ambassadors, who, forgetting their sacred character, had fought in the ranks of Clusium and slain a Celtic chief, the barbarians marched upon Rome. On July the 18th of 390 B.C., only a few miles from Rome, was fought the disastrous battle of the Allia. The defeat of the Romans was complete, and Rome lay at the mercy of her foe. But in characteristic fashion the Celts halted three days' to enjoy the fruits of victory, and time was thus given to put the Capitol at least in a state of defence. The arrival of the bar- barians was followed by the sack of the city, but the Capitol remained impregnable. For seven months they besieged it, and then in as sudden a fashion as they had come they dis- appeared. The Roman chroniclers explain their retreat in their own way, by the fortunate appearance of M. Furius Camillus with the troops which he had collected, at the very moment when famine had forced the garrison on the Capitol to accept terms. More probably the news that their lands across the Apennines were threatened by. the Veneti, coupled with the unaccustomed tedium of a long siege and the difficulty of obtain- ing supplies, inclined the Celts to accept readily a heavy ransom as the price of their withdrawal. But, whatever the reason, it. is certain that they retreated, and, though during the next fifty years marauding bands appeared at intervals in the neigh- bourhood of Rome, and even once penetrated as far south as Campania (361-60), the Celts never obtained any footing in Italy outside the plains in the north which they had made their own.

Nor, in spite of the defeat on the Allia and the sack of the city, was Rome weakened except for the moment by the Celtic Annexa- attack. The storm passed away as rapidly as it had tioa of come on. The city was hastily rebuilt, and Rome dis- toathern m ayed the enemies who hastened to take advantage Btru a. Q £ kg,- misfortunes by her undiminished vigour. Her conquests in southern Etruria were

successfully defended against repeated attacks from the Etruscans to the north. The creation in 387 of four new tribes (Stellatina, Sabatina, Tromentina, Arnensis) marked the final annexation of the territory of Veii and of the lands lying along the Tiber valley.

401.

364.

393-94.

36T.

406, 396.

A few years later -Latin colonies were established at Sutrium and Nepete for the more effectual defence of the frontier, and finally, in 353, the subjugation of South Etruria was completed by the submission of Caere (q.v.) and its partial incorporation with the Roman state as a ” municipium sine siiffragio “—the first, it is said, of its kind. 1

Next to the settlement of southern Etruria, the most im- portant of the successes gained by Rome between 390 and 343 B.C. were those won against her old foes the Aequi and Volsci, and her old allies the Latins and Hernicans. a !ˆ” e * The Aequi indeed, already weakened by their long Aequi and feud with Rome, and hard pressed by the Sabellian Voiaci. tribes in their rear, were easily dealt with, and after 364ˆ411. the campaign of 389 we have no further mention of ,,,*

an Aequian war until the last Aequian rising in 304. ■ ■■£

The Volsci, who in 389 had advanced to Lanuvium, were met and utterly defeated by Camillus, the conqueror of Veii, and this victory was followed up by the gradual sub- jugation to Rome of all the lowland country lying between the hills and the sea as far south as Tarracina. Latin colonies were established at Satricum (385), at Setia (379), and 36g 375 at Antium and Tarracina some time before 348. In 358 two fresh Roman tribes (Pomptina and Publilia) were formed in the same district. 2

Rome had now nothing more to fear from the foes who a century ago had threatened her very existence. The lowland country, of which she was the natural centre, from n e . the Ciminian forest to Tarracina, was quiet, and orgaalza- within its limits Rome was by far the strongest power. <*•« •' But she had now to reckon with the old and

faithful tbe Latin allies to whose loyal aid her present position was !

largely due. The Latini and Hernici had suffered severely in the Aequian and Volscian wars; it is prehable that not a few of the smaller communities included in the league had either been destroyed or been absorbed by larger states, and the independence of all alike was threatened by the growing power of Rome. The sack of Rome by the Celts gave them an oppor- tunity of reasserting their independence, and we are conse- quently told that this disaster was immediately followed by the temporary dissolution of the confederacy, and this again a few years later by a series of actual conflicts between Rome and her former allies. Between 383 and 358 we hear of wars with Tibur, Praeneste, Tusculum, Lanuvium, Circeii and the Hernici. But in all Rome was successful. In 382 Tusculum was fully incorporated with the Roman 372%

state by the bestowal of the full franchise; 3 in 358, 396

according to both Livy and Polybius, the old alliance was formally renewed with Latini and Hernici. We cannot, however, be wrong in assuming that the position of the allies under the new league was far inferior to that accorded them : by the treaty of Spurius Cassius. 4 Henceforth they were the subjects rather than the equals of- Rome, a position which it is evident that they accepted much against their will, and from which they were yet to make one last effort to escape.

We have now reached the close of the first stage in Rome's advance towards supremacy in Italy. By 343 B.C. she was already mistress both of the low country stretching from the Ciminian forest to Tarracina and Circeii and of the bordering highlands. Her own territory had largely increased. Across the Tiber the lands of Veii, Gapeh'a and Caere were nearly all Roman, while in Latium :she had carried her frontiers to Tusculum on the Alban' range and to the southernmost limits of the Pomptirie district. And this territory was protected by a circle of dependent; allies and colonies reach- ing northward to Sutrium and Nepete, and southward to Sora oh the upper Liris, and to Circeii on the coast. Already, too, she was beginning to be recognized as a power outside the

1 For the status of Caere and the " Caerite franchise," see Marquardt, Staatsverw. i. 28-seq, ; Madvig, R. Verf. i. 39; Beloch, Ital. Bund, 120; Mommsen, Staatsr. iii. 583 sqq.

2 Livy vii. 15. 3 Ibid. vi. 26. 4 Mommsen, R.G. i. 347 n. ; Beloch, Ital. Bund, cap. ix.

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limits of the Latin lowlands. The fame of the capture of Rome by the Celts had reached Athens, and her subsequent victories over marauding Celtic bands had given her prestige in South Italy as a bulwark against northern barbarians. In 354 she had formed her first connexions beyond the Liris by a treaty with the Samnites, and in 348 followed a far more important treaty with the great maritime state of Carthage. 1 > •

Rome had won her supremacy from the Ciminian forest to the Liris as the champion of the comparatively civilized com- Advaace munities of the lowlands against the rude highland beyond , tribes which threatened to overrun them, and so, when ˆnaJ'tHe' ner legions 'first crossed the Liris, it was in answer to Saamite an appeal from a lowland city against invaders from Wan. the hills. While she was engaged in clearing Latium of Volsci and Aequi, the Sabellian tribes of the central Apennines had rapidly spread over the southern half of the peninsula. Foremost among these tribes were the Samnites, a portion of whom had captured the Etruscan city of Capua in 331 334. 42 3> the Greek Cumae in 420, and had since then ruled as masters over the fertile Campanian' territory. But in their new homes the conquerors soon lost all sense of re- lationship and sympathy with their highland brethren; They dwelt in cities, amassed wealth, and inherited the civilization of the Greeks and Etruscans whom they had dispossessed; 2 above all, they had before long to defend themselves in their turn against the attacks of their ruder kinsmen from the hills, and it was for aid against these that the Samnites of Campania appealed to the rising state which had already made herself known as the bulwark of the lowlands north of the Liris, and which with her Latin and Hernican allies had scarcely less interest than the Campanian cities themselves in checking the raids of the highland Samnite tribes.

The Campanian appeal was listened to. Rome with her confederates entered into alliance with Capua and the neigh- Fint bouring Campanian towns, and war was formally

SamaHe declared (343) against the Samnites. 3 While to the Latins and Hernicans was entrusted apparently the defence of Latium and the Hernican valley against the northerly members of the Samnite confederacy, the Romans themselves undertook the task of driving the invaders out of Campania. After two campaigns the war was ended in 341 by a treaty, and the Samnites withdrew from the lowlands, leaving Rome the recognized suzerain of the Campanian cities which had sought her aid. 4

There is no doubt that the check thus given by Rome to the advance of the hitherto invincible Sabellian highlartders not only made her the natural head arid champion of the low countries, south as well as north of the Liris, but alsd consider- ably added to her prestige. Carthage sent her congratulations; and the Etruscan city of Falerii voluntarily enrolled herself among the allies of Rome.' Of even greater service, however, was the fact that for fifteen years the Samnites remained quiet, for this inactivity, whatever its cause, enabled Rome triumph- antly to surmount a danger which threatened for the moment to wreck her whole position. This danger was nothing less than a desperate effort on the part'ttf nearly all her allies and dependants south of the Tiber to throw off the yoke of her supre- The Latin macv – The way was led by her-ancient confederates War, the Latini, whose smouldering discontent broke into

open flame directly the fear of a Samnite attack was removed. From the Latin Campagna and the Sabine hills the revolt spread westward and southward to Antium and Tarracina, and even to the towns of the Campanian plain,

1 Livy vii. 27. For the whole question of the early treaties with Carthage, see Polybius iii. 22 ; Mommsen, vol. ii. Appendix (p. 523) ; Strachan-Davidson, Polybius, pp. 50 ff. ; Pais, Storia di Roma, i. 2, 305, n. 1 ; also article Carthage. , * For the Samnites in Campania, see Mommsen, Hist, of Rome, i. 453 ; Schwegler-Clason, R.G. v. 98 seq. ; Beloch, Campanien (Berlin, 1879).

- Livy vii. 32.

4 For the difficulties in the traditional accounts of this war, see Mommsen, Hist, of Rime, i. 459 n. ; Schwegler-Clason, R.G. v. 14 seq.

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where the mass of- the inhabitants at once repudiated the alliance formed with Rome by the ruling class. The struggle was sharp but short. In two pitched battles* the strength of the insurrection Was broken, and two more campaigns sufficed for the complete reduction of such of the insurgent communities as still held but. The revolt crushed, Rome set herself de- liberately to the task of re-establishing on a new and firmer basis her supremacy over the lowlands, and in doing settle- so laid the foundations of that marvellous organization meat ot which was destined to spread rapidly over Italy, Latiumt and to withstand the attacks even of Hannibal. The old historic Latin league ceased to exist, though its memory was still preserved by the yearly Latin festival on the Alban Mount. Most if not all of the common land of the league became Roman territory; 6 five at least of the old Latin cities were compelled to 1 accept the Roman franchise 7 and enter the pale of the Roman state. The rest, with the Latin colonies, were ranked as Latin allies of Rome, but on terms which secured their complete dependence upon the sovereign city. The policy of isolation, which became so cardinal a principle of Roman rule, was now first systematically applied. No rights of conubium or com- toerciutn were any longer to exist between these communities. Their federal councils were prohibited, arid ‘ all federal action independent of Rome forbidden. 8

In Campania and the coast-lands connecting Campania with Rome, a policy of annexation was considered safer than that of alliance. Of the two frontier posts of the Volsci, and of Antium and Velitrae, the former was constituted a Cam’ Roma.n colony, its long galleys burnt and their papla- prows ‘ set up in the Forum at Rome, while the walls of Velitrae were razed to the ground, its leading men banished beyond the Tiber, and their lands given to Roman settlers. Farther south on the route to Campania, Fundi and Formiae were, after the precedent set in the case- of Caere’, declared Roman and granted the civil rights of Roman citizenship, while lastly in Campania itself the same status was given to Capua, Cumae, and the smaller communities dependent upon them.’ During the ten years from 338 to 328 the work of 416&8. settlement was steadily continued. Tarracina, like Antium, was made a Roman colony. PriVernum, the last Volscian town to offer resistance to Rome, was subdued in 330, part of its tetritory allotted to Rornan Citizens, and the state itself forced to accept the Roman franchise. Lastly, to strengthen the lines of defence against the Sabellian tribes, two colonies with the rights of Latin allies were estab- lished at Cales (334) and at Fregellae (328). The 420426 settlement of the lowlands was accomplished. As a single powerful and compact state with an outer Circle of closely dependent allies, Rome now stood in sharp

contrast with the disunited and degenerate cities of northern Etruria, the loosely organized tribes of the Apennines, arid the decaying and disorderly Greek towns of the south.

The strength of this system was now to be tried by a struggle with the one Italian people who were still ready and ablet6 contest with Rome the supremacy of the peninsula. Second' The passive attitude of the Samnites between 342 and Samnite 327 was no doubt largely due to the dangers which \£ r ' a4 had suddenly threatened them hi South Italy. But 427-soT the death of Alexander of Epirus, in 33 2, w removed 412-27, their only formidable opponent there, and left them 422 –

free to turn their attention to the necessity of checking the steady advance of Rome. In 327, the year after the ominous foundation of a Roman colony at Fregellae, a pretext for renewing the struggle was offered them. The

6 At the foot of Mount Vesuvius, Livy viii. 9; at Trifanutn, ibid.

viii. II. 6 Livy viii. 11 •

1 Livy viii. 14; Lanuvium, Aricia, Nomentum, Pedum, Tusculum.

8 Ibid., loc. cit., " ceteris Latinis populis conubia corrimerciaque et concilia inter se ademerunt."

9 For the controversy as to the precise status of Capua and the " equites Campani " (Livy viii. 14), see Beloch, Ital. Bund, 122 seq., idem, Campamen, 317; Mommsen, Staatsr. iii. 574.

10 Livy viii. 3, 17, 24.

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Cumaean colony of Palaepolis 1 had incurred the wrath of Rome by its raids into her territory in Campania. The Samnites sent a force to defend it, and Rome replied by a declaration of war. The two opponents were not at first sight unequally matched, and had the Sabellian tribes held firmly together the issue of the struggle might have been different. As it was, however, the Lucanians to the south actually joined Rome from the first, while the northern clans, Marsi, Vestini, Paeligni, Frentani, after a feeble and lukewarm resistance, subsided into a neutrality which was exchanged in 304 for a formal alliance with Rome. An even greater advantage to Rome from the outset was the enmity existing between the Samnites and the Apulians, the latter of whom from the first joined Rome and thus gave her a position in the rear of her enemy and in a country eminently well fitted for maintaining a large military force. These weaknesses on the Samnite side were amply illustrated by the events of the war.

The first seven or eight years were marked by one serious disaster to the Roman arms, the defeat at the Caudine Forks (321), but, when in 318 the Samnites asked for and obtained a two years' truce, Rome had suc- ceeded not only in inflicting several severe blows upon her enemies but in isolating them from outside help. The Lucanians to the south were her allies. To the east, in the rear of Samnium, Apulia acknowledged the suzerainty of Rome, and Luceria, captured in 320, had been established as a base of Roman operations. Finally to thenorth the Romans had easily overcome the feeble resistance of the Vestini and Frentani, and secured through their territories a safe passage for their legions to Apulia. On the renewal of hostilities in 316, the Samnites, bent on escaping from the net which was being slowly drawn round them, made a series of desperate efforts to break through the lines of defence which protected Latium and Campania. Sora and Fregellae on the upper Liris were captured by a sudden attack; the Ausones in the low country near the mouth of the same river were encouraged to revolt by the appearance of the Samnite army; and in Campania another army, attracted by rumours of dis- turbance, all but defeated the Roman consuls under the very walls of Capua. But these efforts were unavailing. Sora and Fregellae were recovered as quickly as they had been lost, and the frontier there was strengthened by the establishment of a colony at Interamna. The Ausones were punished by the confiscation of their territory, and Roman supremacy further secured by the two colonies of Suessa and Pontia (312). The construction of the famous Via Appia, 2 the work of

the censor Appius Claudius Caecus, opened a safe and direct route to Campania, while the capture of Nola deprived the Samnites of their last important stronghold in the Campanian lowlands. The failure of these attempts broke the courage even of the Sam- nites. Their hopes were indeed raised for a moment by the news that Etruria had risen against Rome (310), but their daring scheme of effecting a union with the Etruscans was frustrated by the energy of the Roman generals. Five years later (305) the Romans revenged a Samnite raid into Campania by an invasion of Samnium itself. Arpinum on the frontier was taken, and at last, after a twenty-two years' struggle, the Second Samnite War was closed by a renewal of the ancient treaty with Rome (304) . 3

The six years of peace which followed (304-298) were employed by Rome in still further strengthening her position. Already, two years before the peace, a rash revolt of the Hernici 4 had given Rome a pretext for finally annexing the territory of her ancient allies. The tribal con- federacy was broken up, and all the Hernican communities, with the exception of three which had not joined the revolt, were incorporated with the Roman state as municipia, with the civil rights of the Roman franchise. Between the Hernican

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1 Livy viii. 22. 3 Ibid. ix. 45.

s Ibid. ix. 29 ; see Appia, Via. 1 Ibid. ix. 43.

valley and the frontiers of the nearest Sabellian tribes lay what remained of the once formidable people of the Aequi. In their case, too, a revolt (304) was followed by the annexation of their territory, which was marked in this case by the formation there (301) of two Roman tribes (Aniensis and Teretina). 5 Not content with thus carrying the borders of their own territory up to the very frontiers of the Sabellian country, Rome succeeded (304) in finally detaching from the Sabellian confederacy all the tribes lying 6 between the north-east frontier of Latium and the Adriatic Sea. Henceforward the Marsi, Paeligni, Vestini, Marrucini and Frentani were enrolled among the

allies of Rome, and not only swelled her forces in the field but interposed a useful barrier between her enemies to the north in Etruria and Umbria and those to the south in Samnium, while they connected her directly with the friendly Apulians. Lastly, as a security for the fidelity at least of the nearest of these allies, colonies were planted in the Marsian territories at Alba Fucentia (3 3) and at Carsioli (298). A significant indication of the widening range of Rome's influence in Italy, and of the new responsibilities rapidly pressing upon her, is the fact that when in 302 the Spartan Cleonymus landed in the territory of the Sallentini, far away in the south-east, he was met and repulsed by a Roman force. 7

"Six years after the conclusion of the treaty which ended the Second Samnite War, news arrived that the Samnites were harassing the Lucanians. Rome at once interfered to third protect her allies. Samnium was invaded in force, Samnite the country ravaged and one stronghold after another War, captured. Unable any longer to hold their own in a 298-90= position where they were hedged round by enemies, the Samnite leaders turned as a last hope to the com- munities of northern Etruria, to the free tribes of Umbria and to the once dreaded Celts. With a splendid daring they formed the scheme of uniting all these peoples with them- selves in a last desperate effort to break the power of Rome.

For some forty years after the final annexation of southern Etruria (351 B.C.) matters had remained unchanged in that quarter. Sutrium and Nepete still guarded Romans the Roman frontier; the natural boundary of the >" N. Ciminian forest was still intact; and up the valley of Etruria. the Tiber Rome had not advanced beyond Falerii, a 403 '

few miles short of the most southerly Umbrian town Ocriculum. But in 311, on the expiry, apparently of the long truce with Rome, concluded in 351, the northern Etruscans, alarmed no doubt by the rapid advances which Rome was making farther south, rose in arms and attacked Sutrium. The attack, however, recoiled disastrously upon the heads of the assailants. A Roman force promptly relieved Sutrium, and its leader, Q. Fabius Rullianus, without awaiting orders from home, boldly plunged into the wilds of the Ciminian forest, and crossing them safely swept with fire and sword over the rich lands to the north. Then turning southward he met and utterly defeated the forces which the Etruscans had hastily raised in the hopes of intercepting him at the Vadimonian Lake. 8 This decisive victory ended the war. The Etruscan cities, dis- united among themselves, and enervated by long years of peace, abandoned the struggle for the time, paid a heavy indemnity

and concluded a truce with Rome (309-8). In the aa-ˆah, same year the promptitude of Fabius easily averted a threatened attack by the Umbrians, but Rome proceeded nevertheless to fortify herself in her invariable fashion against future dangers on this side, by an alliance with Ocriculum, which was followed ten years later (299) by a colony at Nequinum, 9 and an alliance with the Picentes, whose position in the rear

6 Livy x. 9. 6 Ibid. ix. 45. 7 Ibid. x. 2.

8 Ibid. ix. 39. Ihne (Romische Geschichte, i. 2 394 seq.) throws some doubts on the traditional accounts of this war and of that in 296.

9 It received the name of Narnia (Livy x. 10).

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of Umbria rendered them as valuable to Rome as the Apulians had proved farther south.

Fourteen years had passed since the battle on the Vadimonian Lake, when the Samnites appeared on the borders of Etruria and battle ot called on the peoples of northern Italy to rise against Sen the common enemy. Their appeal, backed by the

tinum, presence of their troops, was successful. The Etruscans 295 = 459. j oun(j coura g e to face the Roman legions once more; a few of the Umbrians joined them; but the most valuable allies to the Samnites were the Celts, who had for some time threatened a raid across the Apennines, and who now marched eagerly into Umbria and joined the coalition. The news that the Celts were in motion produced a startling effect at Rome, and every nerve was strained to meet this new danger. While two armies were left in southern Etruria as reserves, the two consuls, Q. Fabius Maximus Rullianus and P. Decius Mus the younger, both tried soldiers, marched northwards up the valley of the Tiber and into Umbria at the head of four Roman legions and a still larger force of Italian allies. At Sentinum, on the further side of the Apennines, they encountered the united forces of the Celts and Samnites, the Etruscans and Umbrians having, it is said, been withdrawn for the defence of their own homes. The battle that

followed was desperate, and the Romans lost one of their consuls, Decius, and more than 8000 men. 1 But the Roman victory was decisive. The Celts were annihilated, and the fear of a second Celtic attack on Rome removed. All danger from the coalition was over. The Etruscan communities gladly purchased peace by the payment of indemnities. The rising in Umbria, never formidable, died away, and the Samnites were left single-handed to bear the whole weight of the wrath of Rome. During four years more, however, they desperately defended their highland homes, and twice at least, in 293 and 292, they 461, 462. mana g ec i to place in the field a force sufficient to 464, meet the Roman legions on equal terms. At last,

in 290, the consul M'.Curius Dentatus finally ex- hausted their power of resistance. Peace was concluded, and it is significant of the respect inspired at Rome by their indomitable courage that they were allowed to become the allies of Rome, on equal terms and without any sacrifice of independence. 2

Between the close of the Third Samnite War and the land- ing of Pyrrhus in 281 b.c. we find Rome engaged, as her wont was, in quietly extending and consolidating her power. In southern Italy she strengthened her hold on Apulia by planting on the borders of Apulia and Lucania the strong colony of Venusia. 3 In central Italy the annexation of the Sabine country (290) carried her frontiers eastward to the borders of her Picentine allies on the Adriatic. 4 Farther east, in the territory of the Picentes them- selves, she established colonies on the Adriatic coast at Hadria and Castrum (285-83). 5 North of the Picentes lay the territories of the Celtic Senones stretching inland to the north-east borders of Etruria, and these too now fell into her hands. Ten years after their defeat at Sentinum (285-84) a Celtic force descended into Etruria, besieged Arretium and defeated the relieving force despatched by Rome. In 283 the consul L. Cornelius Dolabella was sent to avenge the insult. He completely routed the Senones. Their lands were annexed by Rome, and a colony established at Sena on the coast. This success, followed as it was by the decisive defeat of the neighbouring tribe of the Boii, who had invaded Etruria and penetrated as far south as the Vadimonian Lake, awed the Celts into quiet, and for more than forty years there was comparative tranquillity in northern Italy. 6

In the south, however, the claims of Rome to supremacy

1 Livy x. 27.

2 Livy, Epit. xi., " pacem petentibus Samnitibus foedus quarto

renovatum est.”

3 Dion. Hal. Exc. xvi. xvii. 5; Veil. Pat. i. 14.

4 Livy, Epit. xi.; Veil. Pat. i. 14.

5 Livy, Epit. x. 6 Ibid. xii. ; Polyb. ii. 20.

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were now to be disputed by a new and formidable foe. At the close of the Third Samnite War the Greek cities War wlth on the southern coast of Italy found themselves once Pyrrhus, more harassed by the Sabellian tribes on their borders, 281-75 = whose energies, no longer absorbed by the long struggles 473 ~ 79 – in central Italy, now found an attractive opening southward. Naturally enough the Greeks, like the Capuans sixty years before, appealed for aid to Rome (283-82), and like the Capuans they offered in return to recognize the suzerainty of the great Latin Republic. In reply a Roman force under C. Fabricius Luscinus marched into south Italy, easily routed the marauding bands of Lucanians, Bruttians and Samnites, and established Roman garrisons in Locri, Croton, Rhegium and Thurii. At Tarentum, the most powerful and flourishing of the Greek seaports, this sudden and rapid advance of Rome excited the greatest anxiety. Tarentum was already allied by treaty (301) with Rome, and she had now to decide whether this treaty should be exchanged for one which would place her, like the other Greek communities, under the protectorate of Rome, or whether she should find some ally able and willing to assist in making a last stand for independence. The former course, in Tarentum, as before at Capua, was the one favoured by the aristocratic party ; the latter was eagerly supported by the mass of the people and their leaders. While matters were still in suspense, the appearance, contrary to the treaty, of a Roman squadron off the harbour decided the controversy. The Tarentines, indignant at the insult, attacked the hostile fleet, killed the admiral and sunk most of the ships. Still Rome, relying probably on her partisans in the city, tried negotiation, and an alliance appeared likely after all, when suddenly the help for which the Tarentine demo- crats had been looking appeared, and war with

Rome 473-74 was resolved upon (281-80) .'

King Pyrrhus, 8 whose timely appearance seemed for the moment to have saved the independence of Tarentum, was the most brilliant of the military adventurers whom the disturbed times following the death of Alexander the Great had brought into prominence. High-spirited, generous and ambitious, he had formed the scheme of rivalling Alexander's achievements in the East, by winning for himself an empire in the West. He aspired not only to unite under his rule the Greek communities of Italy and Sicily, but to overthrow the great Phoenician state of Carthage — the natural enemy of Greeks in the West, as Persia had been in the East. Of Rome it is clear that he knew little or nothing; the task of ridding the Greek seaports of their barbarian foes he no doubt regarded as an easy one; and the splendid force he brought with him was intended rather for the conquest of the West than for the preliminary work of chastising a few Italian tribes, or securing the sub- mission of the unwarlike Italian Greeks. He defeated the Roman consul, M. Valerius Laevinus, on the banks of the Liris (280), and gained the support of the Greek cities as well as that of numerous bands of Samnites, Lucanians and Bruttians. But, to the disappointment of his new allies, Pyrrhus showed no anxiety to follow up his advan- tage. His heart was set on Sicily and Africa, and his imme- diate object was to come to terms with Rome. But though he advanced as near Rome as Anagnia (279), nothing could shake the resolution of the senate, and in the next year (278) he again routed the legions at Asculum (Ascoli), but only to find that the indomitable resolution of the enemy was strength- ened by defeat. He now crossed into Sicily, where, though at first successful, he was unable to achieve any lasting result. Soured and disappointed, Pyrrhus returned to Italy (276) to find the Roman legions steadily moving southwards, and his Italian allies disgusted by his desertion of their cause. In 275 the decisive battle of the war was fought at Beneventum. The consul, M'. Curius Dentatus, the conqueror of Samnium, gained a complete victory,

7 Livy, Epit. xii.; Plut. Pyrrh. 13.

8 For his career and for the story of his wars with Rome, see the article Pyrrhus.

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and Pyrrhus, unable any longer te face his opponents in the field, and disappointed of all assistance from his allies, retreated to disgust to Tarentum and thence crossed into Greece. 1

A few years later (272) Tarentum was surrendered to Rome by its Epirot garrison; it was granted a treaty of alliance, but its walls were razed and its fleet handed over to Rome. In 270 Rhegium also entered the ranks of Roman allies, and finally in 269 a single campaign crushed the last efforts at resistance in Samnium. Rome was now at leisure to consolidate the position she had won. Between 273 and 263 three new colonies

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were founded in Samnium and Lucania — Paestum ‘ ‘ in 273, Beneventum in 268, Aesernia in 263. In ‘ central Italy the area of Roman territory was increased

by the full enfranchisement (268) of the Sabines, 2 and of their neighbours to the east, the people of Picenum.

To guard the Adriatic coast colonies were established

at Ariminum (268), at Firmum and at Castrum

Novum (264), while to the already numerous maritime colonies was added that of Cosa in Etruria. 3

Rome was now the undisputed mistress of Italy. The limits of her supremacy to the north were represented roughly by a Rome the line drawn across the peninsula from the mouth of mistress the Arno on

the west to that of the Aesis on the east. 4 of Italy. Beyond this line lay the Ligurians and the Celts; all south of it was now united as “Italy” under the rule of Rome. But the rule of Rome over Italy, like her wider rule over the Mediterranean coasts, was not an absolute dominion over conquered subjects. It was in form at least a confederacy under Roman protection and guidance; and the Italians, like the provincials, were not the subjects, but the ” allies and friends ” of the Roman people. 6 In the treatment of these allies Rome con- sistently followed the maxim, divide el impera. In every possible way she strove to isolate them from each other, while binding them closely to herself. The old federal groups were in most cases broken up, and each of the members united with Rome by a special treaty of alliance. In Etruria, Latium, Campania and Magna Graecia the city state was taken as the unit ; in central Italy where urban life was non-existent, the unit was the tribe. The northern Sabellian peoples, for instance — the Marsi, Paeligni, Yestini, Marrucini, Frentani — were now constituted as separate communities in alliance with Rome. In many cases, too, no freedom of trade or intermarriage was allowed between the allies themselves, a policy afterwards systematically pursued in the provinces. Nor were all these numerous allied communities placed on the same footing as regarded their relations with Rome herself. To begin with, a sharp distinction was drawn between

the” Latini” and the general mass of Italian allies. The Latins. ” Latins ” of this period had little more than the name

in common with the old thirty Latin peoples of the days of Spurius Cassius. With a few exceptions, such as Tibur and Praeneste, the latter had either disappeared or had been incorporated with the Roman state, and the Latins of 268 B.C. were almost exclusively the ” Latin colonies,” that is to say, communities founded by Rome, composed of men of Roman blood, and whose only claim to the title ” Latin ” lay in the fact that Rome granted to them some portion of the rights and privileges formerly enjoyed by the old Latin cities under the Cassian treaty. 6 Though nominally allies, they were in fact offshoots of Rome herself, bound to her by community of race, language and interest, and planted as Roman garrisons among alien and conquered peoples. The Roman citizen who joined a Latin colony lost his citizenship — to have allowed him to retain it would no doubt have been regarded as enlarging too rapidly the limits of the citizen body; but he received in

1 Livy, Epit. xiv. ; Plut. Pyrrh. 26.

2 Veil. Pat. i. 14, ” suffragii ferendi jus Sabinis datum.”

3 Ibid. ; Livy, Epit. xv.

4 Mommsen, Hist, of Rome, ii. 60, note 1 ; Nissen, Ital. Landeskunde, i. p. 71.

5 Beioch, Ital. Bund, 203; Mommsen, Hist, of Rome, ii. 60, note 2.

6 For the coloniae Latinae founded before the First Punic War, see Beioch, 136 seq.

exchange the status of a favoured ally. The member of a Latin colony had the right of mwmckww and down to 268 7 of conubium also with Roman citizens. Provided they left sons and property to represent them at home, they were free to migrate to Rome and acquire the Roman franchise. In war-time they not only shared in the booty, but claimed a portion of any land confiscated by Rome and declared "public." These privileges, coupled with their close natural affinities with Rome, successfully secured the fidelity of the Latin colonies, which became not only the most efficient props of Roman supremacy, but powerful agents in the work of Romanizing Italy. Below the privileged Latins stood the Italian The allies; and here again we know generally that there Italian were considerable differences of status, determined allies. in each case by the terms of their respective treaties with Rome. We are told that the Greek cities of Neapolis and Heraclea were among the most favoured; 8 the Bruttii, on the other hand, seem, even before the Hannibalic War, to have been less gener- ously treated. But beyond this we have no detailed information.

Rome, however, did not rely only on this policy of isolation. Her allies were attached as closely to herself as they were clearly separated from each other, and from the first she took every security for the maintenance of her own paramount authority. Within its own borders, each ally was left to manage its own affairs as an independent state. 9 The badges which marked subjection to Rome in the provinces — the resident magistrate and the tribute — were unknown in Italy. But in all points affecting the relations of one ally with another, in all questions of the general interests of Italy and of foreign policy, the decision rested solely with Rome. The place of a federal constitution, of a federal council, of federal officers, was filled by the Roman senate, assembly and magistrates. The main- tenance of peace and order in Italy, the defence of the coasts and frontiers, the making of war or peace with foreign powers, were matters the settlement of which Rome kept entirely in her own hands. Each allied state, in time

of war, was called upon for a certain contingent of men, but, though its contingent usually formed a distinct corps under officers of its own, its numerical strength was fixed by Rome, it was brigaded with the Roman legions, and was under the orders of the Roman consul. 10

This paramount authority of Rome throughout the peninsula was confirmed and justified by the fact that Rome herself was now infinitely more powerful than any one of her The numerous allies. Her territory, as distinct from that Roman of the allied states, covered something like one-third state. of the peninsula south of the Aesis. Along the west coast it stretched from Caere to the southern borders of Campania. Inland, it included the former territories of the Aequi and Hernici, the Sabine country, and even extended eastward into Picenum, while beyond these limits were outlying districts, such as the lands of the Senonian Celts, with the Roman colony of Sena, and others elsewhere in Italy, which had been con- fiscated by Rome and given over to Roman settlers. Since the first important annexation of territory after the capture of Veii (396), twelve new tribes had been formed, 11 and the number of male citizens registered at the census had risen from 152,000 to 29o,ooo. 12 Within this enlarged Roman

7 The year of the foundation of Ariminum, the first Latin colony with the restricted rights; Cic. Pro Caec. 35, 202; Mommsen, Hist, of Rome, ii. 52 n. ; Staatsr. iii. 624 ; Marquardt, Staatsverw. i. 54; Beioch, 155-58, takes a different view.

8 Beioch, Camp. 39; Cic. Pro Balbo, 8, 21, 22, 50:

9 For the relation of the socii Italici to Rome, see Mommsen, Hist, of Rome, ii. 53 ff. ; Beioch, Ital. Bund, cap. x.

10 Beioch, 203. The importance of this duty of the allies is ex- pressed in the phrase, ” socii nominisve Latini quibus ex formula togatorum milites in terra Italia imperare solent.”

11 Four in South Etruria (387), two in the Pomptine territory (358), two in Latium (332), two in the territory of the southern Volsci and the Ager Falernus (313), two in the Aequian and Hernican territory (299). The total of thirty-five was completed in 241 by formation of the Velina and Quirina, probably in the Sabine and Picentine dis- tricts, enfranchised in 268. See Beioch, 32.

12 Livy, Epit. xvi. ; Eutrop. ii. 18; Mommsen, Hist, of Rome, ii. 55 n. ; Beioch, cap. iv. pp. 77 seq.

state were now included numerous communities with local Colonies institutions and government. At their head stood and the Roman colonies (coloniae civium Romanorum),

‘ciofa founded to guard especially the coasts of Latium and

Campania. 1 Next to these eldest children of Rome came those communities which had been invested with the full Roman franchise, such, for instance, as the old Latin towns of Aricia, Lanuvium, Tusculum, Nomentum and Pedum. Lowest in the scale were those which had not been considered ripe for the full franchise, but had, like Caere, received instead the civitas sine suffragio, the civil without the political rights. 2 Their members, though Roman citizens, were not enrolled in the tribes, and in time of war served not in the ranks of the Roman legions but in separate contingents. In addition to these organized town communities, there were also the groups of Roman settlers on the public lands, and the dwellers in the village communities of the enfranchised highland districts in central Italy.

The administrative needs of this enlarged Rome were obviously such as could not be adequately satisfied by the system which had done well enough for a small city state with a few square miles of territory. The old centralization of all government in Rome itself had become an impossibility, and the Roman states- men did their best to meet the altered requirements of the time. The urban communities within the Roman pale, colonies and municipia, were allowed a large measure of local self-govern- ment. In all we find local assemblies, senates and magistrates, to whose hands the ordinary routine of local administration was confided, and, in spite of differences in detail, e.g. in the titles and numbers of the magistrates, the same type of consti- tution prevailed throughout. 3 But these local authorities were carefully subordinated to the higher powers in Rome. The local constitution could be modified or revoked by the Roman senate and assembly, and the local magistrates, no less than the ordinary members of the community, were subject to the para- mount authority of the Roman consuls, praetors and censors. In particular, care was taken to keep the administration of justice well under central control. The Roman citizen in a colony or municipium enjoyed, of course, the right of appeal to the Roman people in a capital case. We may also

assume that from the first some limit was placed to the jurisdiction of the local magistrate, and that cases falling outside it came before the central authorities. But an additional safeguard for the „ . . equitable and uniform administration of Roman law, in communities to many of which the Roman code was new and unfamiliar, was provided by the institution of prefects (praefecti juri dicundo), 4 who were sent out annually, as representatives of the Roman praetor, to administer justice in the colonies and municipia. To prefects was, moreover, assigned the charge of those districts within the Roman pale where no urban communities, and consequently no organized local government, existed. In these two institutions, that of municipal government and that of prefectures, we have already two of the cardinal points of the later imperial system of government.

Lastly, the changes which the altered position and increased responsibilities of Rome had effected in her military system 6 The tended to weaken the intimate connexion between

military the Roman army in the field and the Roman people system. at home, and thus prepared the way for that com- plete breach between the two which in the end proved fatal to the Republic. It is true that service in the legion was still the first duty and the highest privilege of the fully qualified citizen. But this service was gradually altering in character. Though new legions were still raised each year for the summer

1 Ostia, Antium, Tarracina, Minturnae, Sinuessa, and, on the Adriatic, Sena and Castrum Novum.

2 To both these classes the term municipia was applied.

3 For details, see Beloch, Hal. Bund, caps, v., vi., vii. The enfranchised communities in most cases retained the old titles for their magistrates, and hence the variety in their designations.

4 For the praefecti, see Mommsen, Hist, of Rome, ii. 49, 67, and Staatsr. ii. 608; Beloch, 130-35.

6 Mommsen, Hist, of Rome, ii. 72 seq. ; Livy viii. 8 ; Polyb. vi. 17-42.

427-90.

campaigns, this was by no means always accompanied, as formerly, by the disbandment of those already on foot, and this increase in the length of time during which the citizen was kept with the standards had, as early as the siege of Veii, necessitated a further deviation from

the old theory of military service — the introduction of pay. 6 Moreover, while in the early days of the Republic the same divisions served for the soldier in the legion and the citizen in the assembly, in the new manipular system, 7 with its three lines, no regard was paid to civic distinctions, but only to length of service and military efficiency, while at the same time the more open order of fighting which it involved demanded of each soldier greater skill, and therefore a more thorough training in arms than the old phalanx. One other change resulted from the new military Rr _

necessities of the time, which was as fruitful of results consu/ate . as the incipient separation between the citizen and the soldier. Under the early Republic, the chief command of the legions rested with the consuls of the year. But, as Rome's military operations increased in area and in distance from Rome, a larger staff became necessary, and the inconvenience of summoning home a consul in the field from an unfinished campaign became intolerable. The remedy found, that of prolonging for a further period the imperium of the consul, was first applied in 327 B.C. in the case of Q. Publilius Philo, 8 and between 327 and 264 instances of this prorogatio imperii became increasingly common. This proconsular authority, originally an occasional and subordinate one, was destined to become first of all the strongest force in the Republic, and ultimately the chief prop of the power of the Caesars.

Period B: Rome and the Mediterranean States, 265- 146 B.C. — (a) Conquest of the West. — Though marked out by her geographical position as the natural centre of the Mediterranean, Italy had hitherto played no active part in Mediterranean politics, but, now that she was for the first time united, it was felt throughout the Mediterranean world that a new power had arisen, and Rome, as the head and representative of Italy, found herself irresistibly drawn into the vortex of Mediterranean affairs. Egypt sought her alliance, and Greek scholars began to interest themselves keenly in the history, constitution, and character of the Latin Republic which had so suddenly become famous. But Rome looked naturally westward rather than eastward. The western coasts of the peninsula were the most fertile and populous and wealthy; and it was in this direction that the natural openings for Italian commerce were to be found. It was, however, precisely on this side that Rome had serious ground for anxiety. Carthage was now at the height of her power. Her outposts were threateningly near to Italy in Sardinia and in Sicily, while her fleets swept the seas and jealously guarded for the benefit of Carthage alone the hidden treasures of the West. In the east of Sicily, Syracuse still upheld the cause of Greek independence against the hereditary

foe of the Greek race; but Syracuse stood alone, and her resources were comparatively small. What Rome had to fear was the establishment, and that at no distant date, of an absolute Carthaginian domination over the Western seas — a domination which would not only be fatal to Italian commerce, but would be a standing menace to the safety of the Italian coasts.

It was above all things essential for Rome that the Cartha- ginians should advance no farther eastward. But already in 272 Tarentum had almost fallen into their grasp, Plrst and seven years later Rome was threatened with the p„nic establishment of Carthaginian rule at Messana, within War, sight of the Italian coast. The intervention of both ffolˆj powers in a quarrel between the Mamertines, a body of Campanian mercenaries who had occupied Messana, and Hiero II.

6 Livy iv. 59.

7 This system was probably introduced in order to meet the charge of the Celtic swordsmen, but it was perfected during the Samnite wars. See Marquardt, Staatsverw. iii. 350 seq. ; Daremberg-Saglio, Dictionnaire des antiquites, s.v. ” Legio ” (Cagnat).

8 Livy viii. 23, ” ut pro consule rem gereret quoad debellatum esset.”

of Syracuse, led to the outbreak of war between Rome and Carthage in 264 B.C. The military history of the struggle which followed is treated in the article Punic Wars; it will suffice to note here that the war lasted until 241 B.C., when the Carthaginians were compelled to cede Sicily and the Lipari islands to Rome, and to pay an indemnity of 3200 talents (about £800,000).

The struggle was one in which both Rome and Carthage were serving an apprenticeship in a warfare the conditions of which were unfamiliar to both. The Roman legions were foes very unlike any against which the Carthaginian leaders had ever led their motley array of mercenaries, while Rome was called upon for the first time to fight a war across the sea, and to fight with ships against the greatest naval power of the age. The novelty of these conditions accounts for much

of the vacillating and uncertain action observable on both sides. It is possible that Hamilcar had already made up his mind that Rome must be attacked and crushed in Italy, but his government attempted nothing more than raids upon the coast. There are indications also that some in the Roman senate saw no end to the struggle but in the destruction of Carthage; yet an invasion of Africa was only once seriously attempted, and then only a half-hearted support was given to the expedition. But these peculiarities in the war served to bring out in the clearest relief the strength and the weakness of the two contending states. The chief dangers for Carthage lay obviously in the jealousy exhibited at home of her officers abroad, in the difficulty of controlling her mercenary troops, and in the ever-present possibility of dis- affection among her subjects in Libya — dangers which even the genius of Hannibal failed finally to surmount. Rome, on the other hand, was strong in the public spirit of her citizens, the fidelity of her allies, the valour and discipline of her legions. What she needed was a system which should make a better use of her splendid materials than one under which her plans were shaped from day to day by a divided senate, and executed by officers who were changed every year, and by soldiers most of whom returned home at the close of each summer's campaign.

The interval between the First and Second Punic Wars was employed by both Rome and Carthage in strengthening their respective positions. The eastern end of Sicily was still left under the rule of Hiero as the ally of Rome, but the larger western portion of the island became directly subject to Rome, and a temporary arrangement seems to have been made for its government, either by one of the two praetors, or possibly by a quaestor. 1 Sardinia and Corsica had not been surrendered to Rome by the treaty of 241, but three years later (239)* on the invitation of the Carthaginian mercenaries stationed in the islands, a Roman force occupied them; Carth- age protested, but, on the Romans threatening war, she gave way, and Sardinia and Corsica were formally ceded to Rome, though it was some seven or eight years before all resistance on the part of the natives themselves was crushed. In 227, however, the senate considered matters ripe for the establishment of a separate administration in her oversea possessions. In that year two additional praetors were elected; to one was assigned the charge of western Sicily, to the other that of Sardinia and Corsica, 2 and thus the first stones of the Roman provincial system were laid. Of at least equal importance for the security of the peninsula was the subjugation of the Celtic tribes in the valley of the Po. These, headed by the Boii and Insubres and assisted by levies from the Celts to the westward, had in 225 alarmed the whole of Italy by

invading Etruria and penetrating to Clusium, only three days' journey from Rome. Here, however, their courage seems to have failed them. They retreated northward along the Etruscan coast, until at Telamon their way was barred by the Roman legions, returning from Sardinia to the defence of Rome, while a second consular army hung upon their rear. Thus hemmed in, the Celts fought desperately,

1 Marquardt, Staatsverw. i. 243; Mommsen, Hist, of Rome, ii. 209; Appian, Sic. 2.

2 Livy, Epit. xx.

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but were completely defeated and the flower of their tribesmen slain. The Romans followed up their success by invading the Celtic territory. The Boii were easily reduced to submission. The Insubres, north of the Po, resisted more obstinately, but by 222 the war was over, and all the tribes in the rich Po valley acknowledged the supremacy of Rome. The conquered Celts were not enrolled among the Italian allies of Rome, but were treated as subjects beyond the frontier. Three colonies were founded to hold them in check — Placentia (218) and Cremona in the territory of the Insubres, Mutina (183) in that of the Boii; and the great northern road (Via Flaminia) was completed as far as the Celtic border at Ariminum.

On the Adriatic coast the immediate interests of Rome were limited to rendering the sea safe for Italian trade. It was with this object that, in 229, the first Roman expedition crossed the Adriatic, and inflicted severe chastisement on the Illyrian pirates of the opposite coast. 3 This expedition was the means of establishing for the first time direct political relations between Rome and the states of Greece proper, to many of which the suppression of piracy in the Adriatic was of as much importance as to Rome herself. Alliances were con- cluded with Corcyra, Epidamnus, and Apollonia; and em- bassies explaining the reasons which had brought Roman troops into Greece were sent to the

Aetolians, the Achaeans, and even to Athens and Corinth. Everywhere they were well received, and the admission of the Romans to the Isthmian games 4 (228) formally acknowledged them as the natural allies of the free Greek states against both barbarian tribes and foreign despots. Meanwhile Carthage had acquired a possession which promised to compensate her for the loss of Sicily, Sardinia and Corsica. The genius of her greatest citizen and soldier, Hamilcar Barca, had appreciated the enormous value of the Spanish peninsula, and conceived the scheme of founding there a Carthaginian dominion which should not only add to the wealth of Carthage, but supply her with a base of operations for a war of revenge with Rome. The conquest of southern and eastern Spain, begun 518-26. by Hamilcar (236-28) and carried on by his kinsman Hasdrubal (228-21), was completed by his son Hannibal, who, with all his father's genius, inherited also his father's hatred of Rome, and by 219 the authority ^^

of Carthage had been extended as far as the Ebro (see Spain, History). Rome had not watched this rapid ad- vance without anxiety, but, probably owing to her troubles with the Celts, she had contented herself with stipu- „„

lating (226) that Carthage should not carry her arms beyond the Ebro, so as to threaten Rome's ancient ally, the Greek Massilia (mod. Marseilles), and with securing the inde- pendence of the two nominally Greek communities, Emporiae and Saguntum, 6 on the east coast.

But these precautions were of no avail against the resolute determination of Hannibal, with whom the conquest of Spain was only preliminary to an attack upon Italy, and who could not afford to leave behind him in Spain a state allied to Rome. In 219, therefore, disregarding the protests of a Roman embassy, he attacked and took Saguntum, an act which, as he had fore- seen, rendered a rupture with Rome inevitable, while it set his own hands free for a further advance.

For the details of the war which followed, the reader may be referred to the articles Punic Wars, Hannibal, and Scipio. From the outbreak of hostilities until the crowning second victory of Cannae in 216 Hannibal's career of success Punic was unchecked; and the annihilation of the Roman War, army in that battle was followed by the defection ***-'=■ of almost the whole of southern Italy, with the ex- ception of the Latin colonies and the Greek coast towns. In 215, moreover, Philip V. of Macedon formed an alliance 538.

with Hannibal and threatened to invade Italy; in 539.

214 Syracuse revolted, and in 212 the Greek cities S4 °-

in S. Italy went over to Hannibal. But the indomitable spirit 3 Polyb. ii. 8 seq. 4 Ibid. ii. 12.

6 Livy x»- 2. s: Polyb. iii. 15, 31.

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of the Romans asserted itself in the face of these crushing misfortunes. In 212 Syracuse was recovered; in 211 ‘ ‘ Capua fell after a long siege which Hannibal failed to raise, even by his famous march up to the gates of Rome, and in the same year a coalition was formed in Greece against Philip V. of Macedon, which effectually paralysed his offensive action. Hannibal was now confined to Lucania and Bruttium; and his brother Hasdrubal, marching from Spain to join him, was defeated and slain on the river Metaurus (207). The war in Italy was now virtually ended, for, though during four years more Hannibal stood at bay in a corner of Bruttium, he was powerless to prevent the restoration of Roman authority throughout the peninsula. Sicily was once more secure; and finally in 206, the year after the victory on the Metaurus, the successes of the young P. Scipio in Spain (211-6) were crowned by the complete expulsion of the Carthaginians, from the peninsula. On his return from Spain Scipio eagerly urged an immediate invasion of Africa. The senate hesitated; but Scipio gained the day. He was elected consul for 205, and given the province of Sicily, with permission to cross into Africa if he thought fit. Voluntary contributions of men, money, and supplies poured in to the support of the popular hero; and by the end of 205 Scipio had collected in Sicily a sufficient ggg^ force for his purpose. In 204 he crossed to Africa,

where he was welcomed by the Numidian prince Massinissa, whose friendship he had made in Spain. In 203 he twice defeated the Carthaginian forces, and a large party at Carthage were anxious to

accept his offer of negotiations. But the advocates of resistance triumphed.

Hannibal was recalled from Italy, and returned to fight his last battle against Rome at Zama, where Scipio, who had „, been continued in command as proconsul for 202 by a

special vote of the people, won a complete victory. The war was over. The Roman assembly voted that the Carthaginian request for peace should be granted, and en- trusted the settlement of the terms to Scipio and a com- mission of ten senators. Carthage was allowed to retain her territory in Africa; but she undertook to wage no wars outside Africa, and none inside without the consent of Rome. She surrendered all her ships but ten triremes, her elephants, and all prisoners of war, and agreed to pay an indemnity of 10,000 talents in fifty years. The Numidian Massinissa (5.11.) was rewarded by an increase of territory, and was enrolled among the ” allies and friends ” of the Roman people.

The battle of Zama decided the fate of the West. The power of Carthage was broken and her supremacy passed to Rome. The West Henceforth Rome had no rival to fear westward of under Italy, and it rested with herself to settle within what Roman limits her supremacy should be confined and what form it should take. For the next fifty years, however, Rome was too deeply involved in the affairs of the East to think of extending her rule far beyond the limits of the rich inheritance which had fallen to her by the defeat of Carthage; but within this area considerable advance was made in the organization and consolidation of her rule. In Sicily and Spain, the immediate establishment of a Roman Sicily government was imperatively necessary, if these

and possessions were not either to fall a prey to internal

pa “• anarchy, or be recovered for Carthage by some second Hamilcar. Accordingly, we find that in Sicily the former dominions of Hiero were at once united with the western half of the island as a single province, 1 and that in Spain, 553. a ˆ ter nme years of a provisional government (206-197),

548-J7. two P rovmces were in 197 2 definitely established, and each, like Sicily, assigned to one of the praetors for the year, two- additional praetors being elected for the

1 Liyy xxvi. 40. The union was apparently effected in 210.

2 Ibid, xxxii. 27; cf. Marquardt, Stoatsverw. i. 252, and Hiibner in Hermes, i. 105 seq.

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purpose. But here the resemblance between the two cases ends. From 201 down to the outbreak of the Slave War in 136 there was unbroken peace in Sicily, and its part in the history is limited to its important functions in supplying Rome with corn and in provisioning and clothing the Roman legions. 3 It became every year a more integral part of Italy; and a large proportion even of the land itself passed gradually into the hands of enterprising Roman speculators. The governors of the two Spains had very different work to do from that which fell to the lot of the Sicilian praetors. The condition of Spain required that year after year the praetors should be armed with the consular authority, and backed by a standing force of four legions, while more than once the presence of the consuls themselves was found necessary. Still, in spite of all difficulties, the work of pacification proceeded. To M. Porcius Cato, the censor, and to Tiberius Sempronius Gracchus (praetor and pro- praetor, 180-79), father of the two tribunes, is mainly due the credit of quieting the Celtiberian tribes of central Spain, and the government of Gracchus was followed by thirty years of comparative tranquillity. The insurrection headed by Viriathus in 149 was largely caused by exac- tions of the Roman magistrates themselves, while its obstinate continuance down to the capture of Numantia, in 133, was almost as much the result of the incapacity of the Roman commanders. 4 But the re-settlement of the country by Scipio Africanus the younger in that year left all Spain, with the exception of the highland Astures and Cantabri in the north-west, finally and tranquilly subject to Rome. Roman traders and speculators flocked to the sea- port towns and spread inland. The mines became centres of Roman industry; the Roman legionaries quartered in Spain year after year married Spanish wives, and when their service was over gladly settled down in Spain in pre- ference to returning to Italy. The first Roman com- munities established outside Italy were both planted in Spain, and both owed their existence _.t” the Roman legions. 6

In Africa there was no question at first of the introduction of Roman government by the formation of a province (see Africa, Roman). Carthage, bound hand and foot by Africa— the treaty of 201, was placed under the jealous watch Third of the loyal prince of Numidia, who himself willingly w ” r acknowledged the suzerainty of Rome. But it was 153-46 = impossible for this arrangement to be permanent. 605-8. Every symptom of reviving prosperity at Carthage was regarded at Rome with feverish anxiety, and neither the expulsion of Hannibal in 195 nor his death in 183 did „„ „ much to check the growing conviction that Rome would never be secure while her rival existed. It was therefore with grim satisfaction that many in the Roman senate watched the increasing irritation of the Carthaginians under the harassing raids and encroachments of their favoured neighbour Massinissa, and waited for the moment when Carthage should, by some breach of the conditions imposed upon her, supply Rome with a pretext for interference. At last in 151 came the news that Carthage, in defiance of treaty obligations, was actually at war with Massinissa. The anti- Carthaginan party in the senate, headed by M. Porcius Cato, eagerly seized the opportunity, and war was declared, and nothing short of the destruction of their city itself was demanded from the despairing Carthaginians. The demand was refused, and in 149 the siege of Carthage begun. During the next two years little progress was made, but in 147 P. Cornelius Scipio Aemilianus, grandson by adoption of the con- queror of Hannibal, was, at the age of thirty-seven, and though

3 Liyy xxvii. 5, ” pace ac bello fidissimum annonae subsidium “; cf. xxxii. 27.

4 Some fresh light has been thrown upon the later campaigns in Spain by the recently discovered fragment of an epitome of Livy (Oxyrhynchus Papyri, iv. 668; Kornemann, Die neue Liviusepitome aus Oxyrhynchos (1904).

6 Italica (206), Appian, Iber. 38; Carteia (171), Livy xliii. 3.

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only a candidate for the aedileship, elected consul, and given the command in Africa. In the next year (146) Carthage was taken and razed to the ground. Its territory became the Roman province of Africa, while Numidia, now ruled by the three sons of Massinissa, remained as an allied state under Roman suzerainty, and served to protect the new province against the raids of the desert tribes (see Carthage).

In Italy itself the Hannibalic war had been followed by im- portant changes. In the north the Celtic tribes paid for their sympathy with Hannibal by the final loss of all separ- ate political existence. Cispadane Gaul, studded with colonies and flooded with Roman settlers, was rapidly Romanized. Beyond the Padus (Po) in Polybius's time Roman civilization was already widely spread. In the extreme north- east the Latin colony of Aquileia, the last of its kind, was founded in 181, to control the Alpine tribes, while in S73, the north-west the Ligurians were held in check by

the colony of Luna (180), and by the extensive settle- ments of Roman citizens and Latins made on Ligurian 581. territory in 173. 1 In southern Italy the depression of

the Greek cities on the coast, begun by the raids of the Sabellian tribes, was completed by the repeated blows inflicted upon them during the Hannibalic struggle Some of them lost territory; 2 all suffered from a decline of population and loss of trade; and their place was taken by such new Roman settle- ments as Brundusium (Brindisi) and Puteoli (Pozzuoli). 3 In the interior the southern Sabellian tribes suffered scarcely less severely. The Bruttii were struck off the list of Roman allies, and nearly all their territory was confiscated. 4 To the Apulians and Lucanians no such hard measure was meted out; but their strength had been broken by the war, and their numbers dwindled ; large tracts of land in their territories were seized by Rome, and allotted to Roman settlers, or occu- pied by Roman speculators. That Etruria also suffered from declining energy, a dwindling population, and the spread of large estates is clear from the state of things existing there in 133. It was indeed in central Italy, the home of the Latins and their nearest kinsmen, and in the new Latin and Roman settlements throughout the peninsula that progress and

activity were henceforth concentrated.

(b) Rome in the East, 200-133. — Ever since the repulse of Pyrrhus from Italy, Rome had been slowly drifting into closer contact with the Eastern states. With one of the three great powers which had divided between them the empire of Alexander, with Egypt, she had formed an alliance in 273, and the alliance had been cemented by the growth of commercial intercourse between the two countries. 6 In 228 her chastisement of the Illyrian pirates had led naturally enough to the establishment of friendly re- lations with some of the states of Greece proper. In 2 14 the alliance between Philip V. and Hannibal, and the former's threatened attack on Italy, forced her into war with Macedon, at the head of a coalition of the Greek states against him, which effectually frustrated his designs against herself; at the first opportunity; however (205), she ended the war by a peace which left the position unchanged. The results of the war were not only to draw closer the ties which bound Rome to the Greek states, but to inspire the senate with a genuine dread of Philip's restless ambition, and with a bitter resentment against him for . his union with Hannibal. The

1 Livy xlii. 4. .

2 E.g. Tarentum, Livy xliv. 16. A Roman colony was established at Croton in 194, and a Latin colony (Copia) at Thurii in 193 (Livv xxxiv. 45, 53).

3 Brundusium was established in 246 (Liv. Epit. xix.) or 245 (Veil. i. 14). Puteoli was fortified during the Second Punic War and became a Roman colony in 194 (Livy xxxiv.

45).

4 Appian, Harm. 61 ; Aul. Gell. x. 3 ; cf . Beloch, Ital. Bund.

6 Egypt had supplied corn to Italy during the Second Punic War (Polyb. ix. 44).

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events of the next four years served to deepen both these feelings. In 205 Philip entered into a compact with Antiochus III. of Syria for the partition between them of the dominions of Egypt, 6 now left by the death of Ptolemy Philopator to the rule of a boy-king. Antiochus was to take Coele-Syria and Phoenicia, while Philip claimed for his share the districts subject to Egypt on the coasts of the Aegean and the Greek islands. Philip no doubt hoped to be able to secure these unlawful acquisitions before the close of the Second Punic War should set Rome free to interfere with his plans. But the obstinate resistance offered by Attalus of Pergamum and the Rhodians upset his calculations. In 201 Rome made peace with Carthage, and the senate had leisure to listen to the urgent appeal for assistance which reached her from her Eastern allies. With Antiochus indeed the senate was not yet prepared to quarrel; but with Philip the senate had no thoughts of a peaceful settlement. Their animosity against him has been deepened by the assistance he had recently rendered to Carthage. Always an unsafe and turbulent neighbour, he would, if allowed to become supreme in the Aegean, prove as dangerous to her interests in the East as Carthage had been in the West. To cripple or at least to stay the growth of Philip's power was in the eyes of the senate a necessity; but it was only by representing a Macedonian invasion of Italy as imminent that they persuaded the assembly, which was longing for peace, to pass a declaration of war 7 (200).

The war began in the summer of 200 B.C., and, though the landing of the Roman legions in Epirus was not followed, as had been hoped, by any general rising against Philip, Second yet the latter had soon to discover that, if they were M* < *- not enthusiastic for Rome, they were still less inclined War actively to assist himself. Neither by force nor 200-197— by diplomacy could he make any progress south of 554-57. Boeotia. The fleets of Pergamum and Rhodes, now the zealous allies of Rome, protected Attica and watched the eastern coasts. The Achaeans and Nabis of Sparta were obstinately neutral, while nearer home in the north the Epirots and Aetolians threatened Thessaly and Macedonia. His own resources both in men and in money had been severely strained by his constant wars, 8 and the only ally who could have given him 'effective assistance, Antiochus, was fully occupied with the conquest of Coele-Syria. It is no wonder then that, in spite of his dashing generalship and high courage, he made but a brief stand. T. Quinctius Flamininus (consul 198), in his first year of command, defeated him on the Aous, drove him back to the pass of Tempe, and in the next year utterly routed him at Cynoscephalae. Almost at the same moment the Achaeans, who had now joined Rome, took Corinth,

and the Rhodians defeated his troops in Caria. 9 Further resistance was impossible; Philip submitted, and early the next year a Roman commission reached Greece with instruc- tions to arrange terms of peace. These were such as effectually secured Rome's main object in the war, the removal of all danger to herself and her allies from Macedonian aggression. 10 Philip was left in possession of his kingdom, but was degraded to the rank of a second-rate power, deprived of all possessions in Greece, Thrace and Asia Minor, and forbidden, as Carthage had been in 201, to wage war without the consent of Rome, whose ally and friend he now became.

The second point in the settlement now effected by Rome was the liberation of the Greeks. The ” freedom of Greece ” was proclaimed at the Isthmian games amid a scene of Tbe wild enthusiasm, 11 which reached its height when two liberation years later (194) Flamininus withdrew his troops even ° /Gre ff!’ from the “three fetters of Greece” — Chalcis, Demetrias and Corinth. 12 There is no reason to doubt that, in acting thus, not only Flamininus himself, but the senate and people at home were influenced, partly at any rate, by feelings of genuine

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‘? Polyb. iii. 2, xv. 20; Livy xxxi. 14.,

7 Ibid. xxxi. 6, 7. 8 Ibid, xxxiii. 3. 9

10 Polyb. xviii. 44-47 ; Livy xxxiii. 30-34.

11 Ibid, xxxiii. 32, 33. a Ibid, xxxiv. 48-52,

Ibid. 18.

sympathy with the Greeks and reverence for their past. It is equally clear that no other course was open to them. For Rome to have

annexed Greece, as she had annexed Sicily and Spain, would have been a flagrant violation of the pledges she had repeatedly given both before and during the war; the attempt would have excited the fiercest opposition, and would probably have thrown the Asiatic as well as the European Greeks into the arms of Antiochus. But a friendly and independent Greece would be at once a check on Macedon, a barrier against aggression from the East, and a promising field for Roman commerce. Nor while liberating the Greeks did Rome abstain from such arrangements as seemed necessary to secure the predominance of her own influence. In the Peloponnese, for instance, the Achaeans were rewarded by considerable accessions of territory; and it is possible that the Greek states, as allies of Rome, were expected to refrain from war upon each other without her consent. 1

Antiochus III. of Syria, Philip's accomplice in the proposed partition of the dominions of their common rival, Egypt, War with re t ur ned from the conquest of Coele-Syria (1 98) to learn Anti- first of all that Philip was hard pressed by the Romans,

ochus, and shortly afterwards that he had been decisively beaten at Cynoscephalae. It was already too late to assist his former ally, but Antiochus resolved at any rate to lose no time in securing for himself the possessions of the Ptolemies in Asia Minor and in eastern Thrace, which Philip had claimed, and which Rome now pronounced free and inde- 557-58. pendent. In 197-96 he overran Asia Minorand crossed into Thrace. 2 But Antiochus was pleasure-loving, irresolute, and no general, and it was not until 192 that the urgent entreaties of the Aetolians, and the withdrawal of the Roman troops from Greece, nerved him to the decisive step of crossing the Aegean; even then the force he took with him was so small as to show that he completely failed to appre- ciate the nature of the task before him. 3 At Rome the prospect of a conflict with Antiochus excited great anxiety, and it was not until every resource of diplomacy had been exhausted that war was declared, 4 and the real weakness which lay behind the once magnificent pretensions of the " king of kings " was revealed. Had Antiochus acted with energy when in 192 he landed in Greece, he might have won the day before the Roman legions appeared. As it was, in spite of the warnings of Hannibal, 5 who was now in his camp, and of the Aetolians, he frittered away valuable time between his pleasures at Chalcis and useless attacks on petty Thessalian towns. In 191 Glabrio landed at the head of an imposing force; and a single battle at Thermopylae broke the courage of Antiochus, who hastily recrossed the sea to Ephesus, leaving his Aetolian allies to their fate. But Rome could not pause here. The safety of her faithful allies, the Pergamenes and Rhodians, and of the Greek cities in Asia Minor, as

well as the necessity of chastising Antiochus, demanded an invasion of Asia. A Roman fleet had already (191) crossed the Aegean, and in concert with the fleets of Pergamum and Rhodes worsted the navy of Antiochus. In 190 the new consul L. Scipio, accompanied by his famous brother, the conqueror of Africa, led the Roman legion for the first time into Asia. At Magnesia ad Sipylum, in Lydia, he met and defeated the motley and ill-disciplined hosts of the great king. 6 For the first time the West, under Roman leader- ship, successfully encountered the forces of the East, and the struggle began which lasted far on into the days of the Settle- emperors. The terms of the peace which followed meat of the victory at Magnesia tell their own story clearly western enough. There is no question, any more than in • Greece, of annexation; the main object in view is that

of securing the predominance of Roman interests and influence

1 For the conflicting views of moderns on the action of Rome, see Mommsen, Hist, of Rome, ii. 442 ; Holm, Hist, of Greece, iv. 349 ; and on the other side Ihne, Hist, of Rome, iii. 76 ff ., and C. Peter, Studien zur rom. Gesch. (Halle, 1863), pp. 158 seq.

2 Livy xxxiii. 38 ; Polyb. xviii. 50.

3 Livy xxxv. 43. 4 Ibid. xxxv. 20, xxxvi. I. 5 Ibid, xxxvi. 7. 6 Livy (xxxvii. 40) describes the composition of Antiochus's army.

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throughout the peninsula of Asia Minor, and removing to a safe distance the only eastern power which could be considered dangerous. 7 The line of the Halys and the Taurus range, the natural boundary of the peninsula eastward, was established as the boundary between Antiochus and the kingdoms, cities and peoples now enrolled as the allies and friends of Rome. This line Antiochus was forbidden to cross; nor was he to send ships of war farther west than Cape Sarpedon in Cilicia. Immediately to the west of this frontier lay Bithynia, Paphlagonia and the immigrant Celtic Galatae, and these frontier states, now the allies of Rome, served as a second line of defence against attacks from the east. The area lying between these " buffer states " and the Aegean was organized by Rome in such a way as

should at once reward the fidelity of her allies and secure both her own paramount authority and safety from foreign attack. Pergamum and Rhodes were so strengthened — the former by the gift of the Chersonese, Lycaonia,Phrygia,Mysia and Lydia, thelatter by that of Lycia and Caria — as not only amply to reward their loyalty, but to constitute them effective props of Roman interests and effective barriers alike against Thracian and Celtic raids in the north and Syrian aggression in the south. Lastly, the Greek cities on the coast, except those already tributary to Pergamum, were declared free, and established as independent allies of Rome.

In a space of little over eleven years (200-189) Rome had broken the power of Alexander's successors and established throughout the eastern Mediterranean a Roman protectorate.

It was in the western half of this protectorate that the first steps in the direction of annexation were taken, The enthusiasm provoked by the liberation of the Greeks had died Thlrd away, and its place had been taken by feelings of dis- ˆface- satisfied ambition or sullen resentment. Internecine doniaa feuds and economic distress had brought many parts Jˆf5._ of Greece to the verge of anarchy, and, above all, the 583-86~ very foundations of the settlement effected in 197 were threatened by the reviving power and aspirations of Macedon. Loyally as Philip had aided Rome in the war with Antiochus, the peace of Magnesia brought him nothing but fresh humiliation. He was forced to abandon all hopes of recovering Thessaly, and he had the mortification to see the hated king of Pergamum installed almost on his borders as master of the Thracian Chersonese. Resistance at the time was unavailing, but from 189 until his death (179) he laboured patiently and quietly to increase the internal re- sources of his own kingdom, 8 and to foment, by dexterous intrigue, feelings of hostility to Rome among his Greek and barbarian neighbours. His successor, Perseus, his son by a left-handed alliance, continued his father's work. He made friends among the Illyrian and Thracian princes, connected himself by mar- riage with Antiochus IV. of Syria and with Prusias of Bithynia, and, among the Greek peoples, strove, not without success, to revive the memories of the past glories of Greece under the Macedonian leadership of the great Alexander. 9 The senate could no longer hesitate. They were well aware of the rest- lessness and discontent in Greece; and after hearing from Eumenes of Pergamum, and from their own officers, all details of Perseus's intrigues and preparations, they declared war. 10 The struggle, in spite of Perseus's courage and the incapacity at the outset of the Roman commanders, was short and decisive. The sympathy of the Greeks with Perseus, which had been encouraged by the hitherto passive attitude, assumed

by Rome, instantly evaporated on the news that the Roman legions were on their way to Greece. No assistance came from Prusias or Antiochus, and Perseus's only allies were the Thracian king Cotys and the Illyrian Genthius. The victory gained by L. Aemilius Paulus at Pydna (168) ended the war. 11 Perseus became the prisoner of Rome, and as such died in Italy a few years later. 12 Rome had begun the war with the

7 Livy xxxvii. 55, xxxviii. 38; Polyb. xxi. 17.

8 Liyy xxxix. 24 seq. • Ibid. xlii. 5. 10 Ibid. xlii. 19, 36.

11 Ibid. xliv. 36-41 ; Plut. Aemil. 15 seq.

12 Diod. xxxi. 9; Livy xlv. 42 ; Polyb. xxxvii. 16.

fixed resolution no longer of crippling but of destroying the Macedonian state. Perseus's repeated proposals for peace during the war had been rejected; and his defeat was followed by the final extinction of the kingdom of Philip and Alexander. 1 Macedonia, though it ceased to exist as a single state, was not, however, definitely constituted a Roman province. 2 On the contrary, the mistake was made of introducing some of the main principles of the provincial system — taxation, disarma- ment and the isolation of the separate communities — without the addition of the element most essential for the maintenance of order — that of a resident Roman governor. The four petty republics now created were each autonomous, and each separated from the rest by the prohibition of commercium and conubium, but no central controlling authority was substituted for that of the Macedonian king. The inevitable result was confusion 605-8. an d disorder, resulting finally (149-48) in the attempt Mace- °f a pretender, Andriscus, who claimed to be a son doniaa of Perseus, to resuscitate the ancient monarchy. 3 Roman On his defeat in 148 the senate declared Macedonia prov nee. a R oman province, and placed a Roman magis- trate at its head. 4

From 189 to the defeat of Perseus in i68no formal change of importance in the status of the Greek states had been made by Affairs in Rome. The senate, though forced year after year to Greece, listen to the mutual recriminations and complaints of S65S7. r i va i

communities and factions, contented itself as a rule with intervening just enough to remind the Greeks that their freedom was limited by its own paramount authority, and to prevent any single state or confederacy from raising itself too far above the level of general weakness which it was the interest of Rome to maintain. After the victory at Pydna, however, the sympathy shown for Perseus, exaggerated as it seems to have been by the interested representations of the romanizing factions in the various states, was made the pre- text for a more emphatic assertion of Roman ascendancy. All those suspected of Macedonian leanings were removed to Italy, as hostages for the loyalty of their several communities, 6 and the real motive for the step was made clear by the excep- tionally severe treatment of the Achaeans, whose loyalty was not really doubtful, but whose growing power in the Pelopon- nese and independence of language had awakened alarm at Rome. A thousand of their leading men, among them the historian Polybius, were carried off to Italy (see Polybius). In Aetolia the Romans connived at the massacre by their so- called friends of five hundred of the opposite party. Acarnania was weakened by the loss of Leucas, while Athens was re- warded for her unambitious loyalty by the gift of Delos and Samos.

But this somewhat violent experiment only answered for a time. In 148 the Achaeans rashly persisted, in spite of warn- Settie- m 8 s > in attempting to compel Sparta by force of meat of arms to submit to the league. When threatened by Greece, Rome with the loss of all that they had gained since = ‘ Cynoscephalae, they madly rushed into war. 6 They were easily defeated, and a ” commission of ten,” under the presi- dency of L. Mummius, was appointed by the senate thoroughly to resettle the affairs of Greece. 7 Corinth, by orders of the senate, was burnt to the ground and its territory confiscated. Thebes and Chalcis were destroyed, and the walls of all towns which had shared in the last desperate outbreak were razed to the ground. All the existing confederacies were dissolved; no commercium was allowed between one community and another. Everywhere an aristocratic type of constitution, according to the invariable Roman practice, was established, and the pay-

1 Livy xlv. 9.

2 Ibid. xlv. 17, 29; Plut. Aemil. 28; Mommsen, Hist, of Rome, ii. 508; Ihne, Hist, of Rome, iii. 258; Marquardt, Staatsverw. i. 316.

3 Polyb. xxxvii. 2; Livy, Epit. 1.

4 For the boundaries of the province, see Ptolemy iii. 13 ; Mar- quardt,

loc. cit, 318 f.

s Livy xlv. 31. « ibid. Epit. Ii., Hi.

7 Ibid. Epit. Iii.; Polyb. xl. 9 seq.; Pausanias vii. 16; Momm- sen, Hist, of Rome, iii. 270.

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ment of a tribute imposed. Into Greece, as into Macedonia in 167, the now familiar features of the provincial system were introduced — disarmament, isolation and taxation. The Greeks were still nominally free, and no separate province with a governor of its own 8 was established, but the needed central control was provided by assigning to the neigh- bouring governor of Macedonia a general supervision over the affairs of Greece. From the Adriatic to the Aegean, and as far north as the river Drilo and Mount Scardus, the whole penin- sula was now under direct Roman rule. 9

Beyond the Aegean the Roman protectorate worked no better than in Macedonia and Greece, and the quarrels and disorders which flourished under its shadow were aggravated by The its longer duration and by the still more selfish view Roman taken by Rome of her responsibilities. 10 At one period £”*” indeed, after the battle of Pydna, it seemed as if in Asia the more vigorous, if harsh, system then initiated 189-46 = in Macedon and Greece was to be adopted farther 565-608. east also. The levelling policy pursued towards Macedon and the Achaeans was applied with less justice to Rome’s two faithful and favoured allies, Rhodes and Pergamum. The former had rendered themselves obnoxious to Rome by their independent tone and still more by their power and commercial prosperity. On a charge of complicity with Perseus they were threatened with war, and though this danger was averted u they were forced to exchange their equal alliance with Rome for one which placed them in close dependence upon her, and to resign the lucrative possessions in Lycia and Caria given them in 189. Finally, their commercial pros- perity was ruined by the establishment of a free port at Delos, 12 and by the short-sighted acquiescence of Rome in the raids of the Cretan pirates. With Eumenes of Pergamum no other fault could be found than that he was strong and success- ful; but this was enough. His brother Attalus was invited, but in vain, to become his rival. His turbulent neighbours, the Galatae, were encouraged to harass him by raids. Pam- phylia was declared independent, and favours were heaped upon Prusias of

Bithynia. These and other annoyances and humilia- tions had the desired effect. Eumenes and his two successors — his brother and son, Attalus II. and Attalus III.— contrived indeed by studious humility and dexterous flattery to retain their thrones, but Pergamum (q.v.) ceased to be a powerful state, and its weakness, added to that of Rhodes, increased the pre- valent disorder in Asia Minor. During the same period we have other indications of a temporary activity on the part of Rome. The frontier of the protectorate was pushed forward to the confines of Armenia by alliances with the kings of Pontus and Cappadocia beyond the Halys. In Syria, on the death of Antiochus Epiphanes (164), Rome intervened to place a minor, Antiochus Eupator, on the throne, under ‘

Roman guardianship. 13 In 168 Egypt formally ac- s9l [

knowledged the suzerainty of Rome, 14 and in 163 the senate, in the exercise of this new authority, restored Ptolemy Philometor to his throne, but at the same time weakened his position by handing over Cyrene and Cyprus to his brother Euegertes. 15

But this display of energy was shortlived. From the death of Eumenes in 159 down to 133 Rome, secure in the me-621 absence of any formidable power in the East, and busy with affairs in Macedonia, Africa and Spain, relapsed into an

8 Mommsen, loc. cit. note; Marquardt, Staatsverw. i. 321 seq.; Niese, Gesckichte der griechischen und makedonischen Staat&n, iii. 358.

9 North of the Drilo the former kingdom of Perseus’s ally Genthius had been treated as Macedon was in 167 (Livy xlv. 26); cf. Zippel, Rom. Herrschaft in Illyrien (Leipzig, 1877). Epirus, which had been desolated after Pydna (Livy xlv. 34) , went with Greece ; Marquardt i. 319.

10 Mommsen, Hist, of Rome, ii. 510 ff., iii. 274 ff.

11 Livy xiv. 20; Polyb. xxx. 5.

12 Polyb. xxxi. 7. The Rhodian harbour dues suffered severely.

13 Rome had already intervened between Syria and Egypt : Livy xlv. 12; Polyb. xxix. 11, xxxi. 12.

14 Livy xlv. 13, ” Regni maximum praesidium in fide populi Romani.”
16 Ibid. Epit. xlvi., xlvii.

inactivity the disastrous results of which revealed themselves in the next period, in the rise of Mithradates of Pontus, the spread of Cretan and Cilician piracy, and the advance of Parthia.

Both the western and eastern Mediterranean now acknow- ledged the suzerainty of Rome, but her relations with the two were from the first different. The West fell to her as the prize of victory over Carthage, and, the Carthaginian power broken, there was no hindrance to the immediate establishment in Sicily, Sardinia, Spain, and finally in Africa, of direct Roman rule. To the majority, moreover, of her western subjects she brought a civilization as well as a government of a higher type than any before known to them. And so in the West she not only formed provinces but created a new and wider Roman world. To the East, on the contrary, she came as the liberator of the Greeks; and it was only slowly that in this part of the Empire her provincial system made way. In the East, moreover, the older civilization she found there obstinately held its ground. Her proconsuls governed and her legions protected the Greek communities, but to the last the East remained in language, manners and thought Greek and not Roman.

Period C: The Period of the Revolution (146-49 B.c.).~In the course of little more than a century, Rome had become the supreme power in the civilized world. By all men, says Polybius, it was taken for granted that nothing remained but to obey the commands of the Romans. 1 For the future the interest of Roman history centres in her attempts to perform the two Herculean tasks which this unique position laid upon her, — the efficient government of the subject peoples, and their defence against the barbarian races which swarmed around them on all sides. They were tasks under which the old republican constitution broke down, and which finally overtaxed the strength even of the marvellous organiza tion framed and elaborated by Augustus and his successors.

Although in its outward form the old constitution had under- gone little change during the age of war and conquest from c ., 265 to 146, 2 the causes, both internal and external, tutioaal which brought about its fall had been silently at work changes, throughout. Its form was in strictness that of a moderate democracy. The patriciate had ceased to exist as a privileged caste, 3 and there was no longer any order of nobility recognized by the constitution. The senate and the offices of state were in law open to all, 4 and the will of the people in assembly had been in the most explicit and unqualified manner declared to be supreme alike in the election of magistrates, in the passing of laws, and in all matters touching the caput of a Roman citizen. But in

practice the Ascend- constitution had become an oligarchy. The senate, ancy not the assembly, ruled Rome, and both the senate

of the and the magistracies were in the hands of a class senate. w hich, in defiance of the law, arrogated to itself the title and the privileges of a nobility. 6 The ascendancy of the senate is too obvious and familiar a fact to need much illustra- tion here. It was but rarely that the assembly was called upon to decide questions of policy, and then the proposal was usually made by the magistrate in obedience to the express directions of the senate. 6 In the enormous majority of cases the matter was settled by a senatus consultum, without any reference to

1 Polyb. iii. 4.

2 The most important change was the assimilation of the division £jˆ by classes and centuries with that by tribes, a change

possibly due to the censorship of Gaius Flaminius in 220 (Mommsen, Staatsr. iii. 270). On this point see Comitia.

3 A few offices of a more or less priestly character were still filled r 4S only by patricians, e.g. rex sacrorum, flamen Dialis. A

plebeian first became curio maximus in 209 (Livy xxvii. 8).

4 The lectio senatus was \H the hands of the censors, but whether before Sulla's time their choice was subject to legal restrictions is doubtful (see Senate).

5 Mommsen, Hist, of Rome, iii. 7; Lange, Rom. Allerth. ii. 1 ff.

e " Ex auctoritate senatus." The lex Flaminia agraria of 232 was an exception (Cic. De senect. 4; Polyb. ii. 21). In 167 B.C. a praetor brought the question of war with Rhodes directly before the assembly, but this was condemned as unprecedented (novo maloque exemplo, Liv. xlv. 21).

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the people at all. The assembly decides for war or peace, 7 but the conduct of the war and the conditions of peace are matters left to the senate (q.v.). Now and then the assembly confers a command upon the man of its choice, or prolongs the imperium of a magistrate, 8 but,

as a rule, these and all questions connected with foreign affairs are settled within the walls of the senate-house. 9 It is the senate which year after year assigns the commands and fixes the number and disposition of the military forces, 10 directs the organization of a new province, 11 conducts negotiations, and forms alliances. Within Italy, though its control of affairs was less exclusive, we find that, besides supervising the ordinary current business of administra- tion, the senate decides questions connected with the Italian allies, sends out colonies, allots lands, and directs the suppres- sion of disorders. Lastly, both in Italy and abroad it managed the finances. 12 Inseparably connected with this monopoly of affairs to the exclusion of the assembly was the control which in practice, if not in theory, the senate exercised over the magistrates. The latter had become what Cicero wrongly declares they were always meant to be, merely the subordinate ministers of the supreme council, 13 which assigned them their departments, provided them with the necessary equipment, claimed to direct their conduct, prolonged their commands, and rewarded them with triumphs. It was now at once the duty and the interest of a magistrate to be in auctoritate senatus, ” subject to the authority of the senate,” and even the once formidable tribuni plebis are found during this period actively and loyally supporting the senate, and acting as its spokesmen in the assembly. 14

The causes of this ascendancy of the senate are to be found firstly in the fact that the senate was the only body capable of conducting affairs in an age of incessant war. The voters in the assembly, a numerous, widely scattered body, could not readily be called together, and when assembled were very imperfectly qualified to decide momentous questions of military strategy and foreign policy. The senate, on the contrary, could be summoned in a moment, 16 and included in its ranks all the skilled statesmen and soldiers of the common- wealth. The subordination of the magistrates was equally the result of circumstances, for, as the numbers of the magis- trates, and also the area of government, increased, some central controlling power became absolutely necessary to prevent collisions between rival authorities, and to secure a proper division of labour, as well as to enforce the necessary concert and co-operation. 16 No such power could be found anywhere in the republican system but in the senate, standing as it necessarily did in the closest relations with the magistrate, and composed as it was increasingly of men who were or had been in office.

Once more, behind both senate and magistrates, lay the whole power and influence of the new nobility. 17 These nobiles were essentially distinct from the older and more legiti- The mate patrician aristocracy.

Every patrician was of nobiles. course noble, but the majority of the ” noble families ” in 146 were not patrician but plebeian. 18 The title had been gradually appropriated, since the opening of the magistracies, by those families whose members had held curule office, and had thereby acquired the ius imaginum. It was thus in theory within the reach of any citizen who could win election even to the curule aedileship, and, moreover, it carried with it no legal privileges whatsoever. Gradually,

7 Livy xxxi. 5, xxxiii. 25, xxxvii. 55. 8 Ibid. xxx. 27, &c.

9 Polyb. (vi. 15) expressly includes the prorogation of a command among the prerogatives of the senate.

10 Livy xxvi. I, ” consules de republica, de administratione belli, de provinciis exercitibusque patres consuluerunt.”

11 Ibid. xlv. 18. ” Ihne, Hist, of Rome, iv. 43; Polyb. vi. 13.

13 Pro Seslio 65, ” quasi ministros gravissimi consilii’.”

14 Livy xxvii. 5, xxviii. 45.

16 Ibid. xxii. 7. In 191 the senators were forbidden to leave Rome for more than a day, nor were more than five to be absent at once (Livy xxxvi. 3).

18 Ibid, xxvii. 35. ” Mommsen, Hist, of Rome, iii. 7 ff.

18 E.g. Livii, Sempronii, Caecilii, Licinii, &c.

however, the ennobled plebeian families drew together, and combined with the older patrician gentes to form a distinct order. Office brought wealth and prestige, and both wealth and prestige were liberally employed in securing for this select circle a monopoly of political power, and excluding new men. 1 Already by the close of the period it was rare for any one but a noble to find his way into high office or into the senate. The senate and magistrates are the mouthpieces of this order, and identified with it in policy and interest. Lastly, it must

be allowed that both the senate and the nobility had to some extent justified their power by the use they made of it. It was their tenacity of purpose and devoted patriotism which had carried Rome through the dark days of the Hannibalic War. The heroes of the struggle with Carthage belonged to the leading families; the disasters at the Trasimene Lake and at Cannae were associated with the blunders of popular favourites.

From the first, however, there was an inherent weakness in this senatorial government. It had no sound constitutional Weakness Das ‘ s > an ˆ with the removal of its accidental supports of the it fell to the ground. Legally the senate had no senatorial positive authority. It could merely advise the magis- govern- trate when asked to do so, and its decrees were strictly ment – only suggestions to the magistrate, which he was at

liberty to accept or reject as he chose. 2 It had, it is true, become customary for the magistrate not only to ask the senate’s advice on all important points, but to follow it when given. But it was obvious that if this custom were weakened, and the magistrates chose to act independently, the senate was powerless. It might indeed anathematize* the refractory official, or hamper him if it could by setting in motion against him a colleague or the tribunes, but it could do no more, and these measures failed just where the senate’s control was most needed and most difficult to maintain — in its relations with the generals and governors of provinces abroad. The virtual in- 00 Si dependence of the proconsul was before 146 already

exciting the jealousy of the senate and endangering its supremacy. 4 Nor again had the senate any legal hold over the assembly. Except in certain specified cases, it rested with the magistrate to decide whether any question should be settled by a decree of the senate or a vote of the assembly. 6 If he decided to make a proposal to the assembly, he was not bound except by custom to obtain the previous approval of the senate, 6 and the constitution set no limits to the power of the assembly to decide any question whatsoever that was laid before it.

From 167, at least, onwards, there were increasing indications that both the acquiescence of the people in senatorial government and the loyalty of the magistrates to the senate were failing. The absorbing excitement of the great wars had died away; the economic and social disturbance and dis- tress which they produced were creating a growing feeling of discontent; and at the same time the senate provoked inquiries into its title to govern by its failure any longer to govern well. In the East there was confusion; in the West a single

native chieftain defied the power which had crushed Carthage. At

1 Livy xxii. 34, ” plebeios nobiles . . . contemnere plebem, ex quo contemni a patnbus desierint, coepisse”; cf. Sail, Jug. 41, ” paucorum arbitrio belli domique agitabatur ; penes eosdem aerarium, provinciae, magistratus.” Mommsen, Hist, of Rome, iii. 15 n. The number of new families ennobled dwindles rapidly after 200 B.C.; Willems, Le Senot de la ripublique romaine, i. 366 seq. (Paris, 1878).

1 The senators’ whole duty is ” sententiam dicere.” The senator was asked ” quid censes?” the assembly “quid velitis jubeatis?” Cf. also the saving clause, ” Si eis videretur ” (sc. consulibus, Sec.) in Seta., e.g. Cic. Phil. v. 19, 53.

3 By declaring his action to be ” contra rempublicam.” The force of this anathema varied with circumstances. It had no legal value.

4 Livy xxxviii. 42, of Cn. Manlius Vulso in Asia, 189 B.C.; cf. also the position of the two Scipios.

5 Hence the same things, e.g. founding of colonies, are done in one year by a Sctum., in another by a lex; cf. Cic. De rep. ii. 32, 56; Phil, i 2, 6,of Antony as consul,” mutata omnia, nihil per senatum, omnia per populum.”

•There was no legal necessity, before Sulla’s time, for getting the senatus auctoritas for a proposal to the assembly.

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home the senate was becoming more and more simply an organ of the nobility, and the nobility were becoming every year more exclusive, more selfish, and less capable and unanimous. 7

But if the senate was not to govern, the difficulty arose of find- ing an efficient substitute, and it was this difficulty that mainly determined the issue of the struggles which convulsed Rome from 133 to 49. As the event showed, neither the assembly nor the numerous and disorganized magistracy was equal to the work; the magistrates were gradually pushed aside in favour of a more centralized authority, and the former became only the means by which this new authority was first encouraged in opposition to the senate and finally established in a position of impregnable strength. The assembly which made Pompey and Caesar found out too late that it could not unmake them.

It is possible that these constitutional and administrative difficulties would not have proved so rapidly fatal to the Etfect ot Republic had not its very foundations been sapped conquest by the changes which followed more or less directly on on Roman the conquests of the 3rd and 2nd centuries B.C. For society: the opening of the world to Rome, and of Rome to tnene ” r the world, produced a radical change in the structure of Roman society. The subjugation of the Mediterranean countries, by placing at the disposal of Rome the vast natural resources of the West and the accumulated treasures of the East, caused a rapid rise in the standard of wealth and a marked change in its distribution. The Roman state was enabled to dispense with the direct taxation of its citizens, 8 since it derived all the revenue which it needed from the subject countries. But the wealth drawn from the provinces by the state was trifling in amount compared with that which flowed into the pockets of individual citizens. Not only was the booty taken in war largely appropriated by the Roman commanders and their men, but a host of money-makers settled upon the conquered provinces and exploited them for their profit. The nobles engaged in the task of administration, the contractors (publicani) who farmed the revenues, and the ” men of business ” (negotia- tores) who, as money-lenders, merchants or speculators, pene- trated to every corner of the Empire, reaped a rich harvest at the expense of the provincials. Farming in Italy on the old lines became increasingly laborious and unprofitable owing to the importation of foreign corn and foreign slaves, 9 and capi- talists sought easier methods of acquiring wealth. If this had meant that capital was expended in developing the natural re- sources of the provinces, the result would have been to increase the prosperity of the countries subject to Rome; but it was not so. The Roman negotiator es, who were often merely the agents of the great families of Rome, drained the accumulated wealth of the provinces by lending money to the subject com munities at exorbitant rates of interest. Cicero, for example, found when governor of Cilicia that M. Junius Brutus had lent a large sum to the people of Salamis in Cyprus at 48% com- pound interest; and we cannot suppose that this was an exceptional case. Such practices as these, together with the wasteful and oppressive system of tax-farming, and the de- liberate extortions carried on by senatorial governors, reduced the flourishing cities of the Greek East, within the space of two generations, to utter economic exhaustion.

But the reaction of the same process on Rome herself had far more important consequences.’ The whole structure of Roman society was altered, and the equality and homogeneity Accent- which had once been its chief characteristics were nation ot destroyed. The Roman

nobles had not merely ceased, class als ” as in old days, to till their own farms; they had found Uact,oas – a means of enriching themselves beyond the dreams of avarice,

7 See generally Mommsen, Hist, of Rome, i.bk. iii. cap. 6;Lange, Rom. Alterth. vol. ii.; Ihne, bk. v. cap. i. The first law against bribery at elections was passed in 181 B.C. (Livy xl. 19), and against magisterial extortion in the provinces in 149 {Lex Calpurnia de pecuniis repetundis). The senators had special seats allotted to them in the theatre in 194 B.C. ; Livy xxxiv. 44, 54.

8 The tributum was no longer levied after 167 B.C. (Cic. Off. a. 22; Plin. H.N. xxxiii. 56).

9 See, however, p. 637, note 1 and reff.

and when they returned from the government of a province it was to build sumptuous villas, filled with the spoils of Greece and Asia, to surround themselves with troops of slaves and dependents, and to live rather as princes than as citizens of a republic. The publicum and negotialores formed a second order in the state, which rivalled the first in wealth and coveted a share in its political supremacy; while the third estate, the plebs urbana, was constantly increasing in numbers and at the same time sinking into the condition of an idle proletariat. The accentuation of class distinctions is indeed inevitable in a capitalist society, such as that of Rome was now becoming. But the process was fraught with grave political danger owing to the peculiarities of the Roman constitution, which rested in theory on the ultimate sovereignty of the people, who were in practice represented by the city mob. To win the support of the plebs became a necessity for ambitious politicians, and the means employed for this end poisoned the political life of Rome. The wealth derived from the provinces was freely spent in bribery, 1 and the populace of Rome was encouraged to claim as the price of its support a share in the spoils of empire.

It was not only the structure and composition of Roman society that underwent a transformation. The victory of The new Rome in her struggle for supremacy in the Medi- learaiag terranean basin had been largely due to the powerful “> a conservative forces by which her

institutions were

manners. p reserve(j from decay. Respect for the mos majorum, or ancestral custom, imposed an effective check on the desire for innovation. Though personal religion, in the deeper sense, was foreign to the Roman temperament, there was a genuine belief in the gods whose favour had made Rome great in the past and would uphold her in the future so long as she trod in the old paths of loyalty and devotion. Above all, the healthy moral traditions of early Rome were maintained by the discipline of the family, resting on the supreme authority of the father — the patria poteslas — and the powerful influence of the mother, to whom the early training of the child was entrusted. 2 Finally, the institution of the censorship, backed as it was by the mighty force of public opinion, provided a deterrent which prevented any flagrant deviation from the accepted standard of morals. All this was changed by the influence of Greek civilization, with which Rome was first brought face to face in the 3rd century B.C. owing to her relations with Magna Graecia. At first the results of contact with the older and more brilliant culture of Hellas were on the whole good. In the 2nd century B.C., when constant intercourse was established with the communities of Greece proper and of Asia Minor, ” philhellenism ” became a passion, which was strongest in the best minds of the day and resulted in a quickened intellectual activity, wider sympathies and a more humane life. But at the same time the ” new learning ” was a disturb- ing and unsettling force. The Roman citizen was confronted with new doctrines in politics and religion, and initiated into the speculations of critical philosophy. 3 Under the influence of this powerful solvent the fabric of tradition embodied in the mos majorum fell to pieces; a revolt set in against Roman discipline and Roman traditions of self-effacement, and the craving for individual distinction asserted itself with irresistible vehemence. As it had been in the days of the ” Sophistic ” movement at Athens, so it was now with Rome; a higher education, which, owing to its expense, was necessarily confined to the wealthier classes, interposed between the upper and lower ranks of society a barrier even more effectual than that set up by differences of material condition, and by releasing the indi- vidual from the trammels of traditional morality, gave his ambition free course. The effect on private morals may be gauged by the vehemence with which the reactionary opposi-

1 From 181 B.C. onwards a succession of laws de ambitu were passed to prevent bribery, but without effect.

2 Cf . Tacitus’s account of Cornelia, the mother of the Gracchi, and Aurelia, the mother of Julius Caesar, in the dialogue De oratoribus, c.

4 It is to be noted that these subjects were, generally speaking, taught by freedmen or slaves.

tion, headed by M. Porcius Cato (consul, 195 B.C.; censor, 184 B.C.), inveighed against the new fashions, and by the list of measures passed to check the growth of luxury ‘

and licence, and to exclude the foreign ‘ teachers of the new learning. 4 It was all in vain. The art of rhetoric, which was studied through the medium of Greek treatises and Greek models, furnished the Roman noble with weapons of attack and defence of which he was not slow to avail himself in the forum and the senate-house. In the science of money-making, which had been elaborated under the Hellenistic monarchies, the Roman capitalists proved apt pupils of their Greek teachers. Among the lower classes, contact with foreign slaves and freed- men, with foreign worships and foreign vices, produced a love of novelty which no legislation could check. Even amongst women there were symptoms of revolt against the old order, which showed itself in a growing freedom of manners and im- patience of control, 6 the marriage tie was relaxed, 6 and the respect for mother and wife, which had been so powerful a factor in the maintenance of the Roman standard of morals, was grievously diminished. Thus. Rome was at length brought face to face with a moral and economic crisis which a modern historian has described in the words: ” Italy was living through the fever of moral disintegration and incoherence which assails all civilized societies that are rich in the manifold resources of culture and enjoyment, but tolerate few or no restraints on the feverish struggle of contending appetites.” In this struggle the Roman Republic perished, and personal government took its place. The world had outgrown the city-state and its political machinery, and as the notions of federalism (on any large scale) and representative government had not yet come into being, no solution of the problem was possible save that of absolutism. But a far stronger resistance would have been opposed to political revolution by the republican system had not public morals been sapped by the influences above described. Political corruption was reduced to a science 7 for the benefit of individuals who were often faced with the alternatives of ruin or revolution; 8 there was no longer any body of sound public opinion to which, in the last resort, appeal could be made ; and, long before the final catastrophe took place, Roman society itself had become, in structure and temper, thoroughly un- republican.

The first systematic attack upon the senatorial government is

connected with the names of Tiberius and Gaius Gracchus (q.v\ and its immediate occasion was an attempt to The deal with no less a danger than the threatened dis- Oracchl, appearance of the class to which of all others Rome 133-21″ owed most in the past. 9 The small landholders 621-33. throughout the greater part of Italy were sinking deeper into ruin under the pressure of accumulated difficulties. The Hannibalic war had laid waste their fields and thinned their numbers, nor when peace returned to Italy did it bring with it any revival of prosperity. The heavy burden of military service still pressed ruinously upon them, 10 and in addition they were called upon to compete with the foreign corn

4 In 161 B.C. a decree of the senate was passed against ” philosophi- et rhetores Latini, uti Romae ne essent ” (Gell. xv. n). In 155 B.C. the philosopher Carneades was expelled from Rome (Plut. Cato. 22).

6 The elder Cato complained of this as early as 195 b.Cs (Liv. xxxiv. 2).

6 Divorce was unknown at Rome until 231 B.C. (Dionys. ii. 25). In the last century of the Republic it was of daily occurrence.

7 In the Ciceronian period the lower classes of Rome, with whom the voting power in the comitia rested, were openly organized for purposes of bribery by means of collegia and sodalicia, nominally religious bodies.

8 Caesar had accumulated debts amounting to £800,000 by the time of his praetorship. Catiline and his fellow-bankrupts, amongst whom were several women, including a certain Sempronia who, as we are told by Sallust, ” danced and played better than an honest woman need do,” hoped to bring about a cancelling of debts (novae tabulae).

” For authorities, see under Gracchus.

10 To Spain alone more than 150,000 men were sent between 196 and 169 (Ihne iii. 319) ; compare the reluctance of the people to declare war against Macedon in 200 B.C., and also the case of Spurius Ligustinus in 171 (Livy, xlii. 34).

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imported from beyond the sea, and with the foreign slave-labour purchased by the capital of wealthier men. 1 Farming became unprofitable, and the hard laborious life with its scanty returns was thrown into still darker relief when compared with the stirring life of the camps with its opportunities of booty, or with the cheap provisions, frequent largesses and gay spectacles to be had in the large towns. The small holders went off to follow the eagles or swell the proletariat of the cities, and their holdings were left to run waste or merged in the vineyards, oliveyards and above all in the great cattlefarms of the rich, and their own place was taken by slaves. The evil was worst in Etruria and in southern Italy; but everywhere it was serious enough to demand the earnest attention of Roman statesmen. Of its existence the government had received plenty of warning in the declining numbers of able-bodied males returned at the census, 2 in the increasing difficulties of recruiting for the legions, 3 in servile outbreaks in Etruria and Apulia, 4 and SS4-94 between 200 and 160 a good deal was attempted by way of remedy. In addition to the foundation of twenty colonies, 5 there were frequent allotments of land to veteran soldiers, especially in Apulia and Samnium. 6 In 180, 40,000 Ligurians were removed from their homes and settled on vacant lands once the property of a Samnite tribe, 7 and in 160 the Pomptine marshes were drained for the purpose of cultivation. 8 But these efforts were only partially successful. The colonies planted in Cisalpine Gaul and in Picenum flourished, but of the others the majority slowly dwindled away, and two required re- colonizing only eight years after their foundation. 9 The veterans who received land were unfitted to make good farmers; and large numbers, on the first opportunity, gladly returned as volunteers to a soldier's life. Moreover, after 160 even these efforts ceased, and with the single exception of the colony of Auximum in Picenum (157) nothing was done to check the spread of the evil, until in 133 Tiberius Gracchus, on his election to the tribunate, set his hand to the work.

The remedy proposed by Gracchus 10 amounted in effect to the resumption by the state of as much of the " common land " as was not held in occupation by authorized persons Qracchus, an(ˆ conformably to the provisions of the Licinian law, 11 and the distribution in

allotments of the land thus rescued for the community from the monopoly of a few. It was a scheme which could quote in its- favour ancient pre- cedent as well as urgent necessity. Of the causes which led to its ultimate failure something will be said later on; for the present we must turn to the constitutional conflict which it provoked. The senate from the first identified itself with the interests of the wealthy occupiers, and Tiberius found himself forced into a struggle with that body, which had been no part of his original plan. He fell back on the legislative sovereignty of the assembly; he resuscitated the half-forgotten powers of interference vested in the tribunate in order to paralyse the action of the senatorial magistrates, and finally lost his life in an attempt to make good one of the weak points in the tribune's position by securing his own re-election for a second year. But the conflict did not end with his death. It was

1 Mommsen, Hist, of Rome, iii. 75 seq. Ihne, Hist, of Rome, iv. 364, argues that Mommsen has exaggerated the depressing effects of foreign competition: cf. Salvioli, Le Capitalisme dans le monde antique, chaps, v.-vii.

2 Beloch, Ital. Bund. 80 seq.

3 Livy xliii. 14; Epit. xlviii., Iv. During the period the minimum qualification for service in the legion was reduced from 1 1 ,ooo to 4000 asses.

4 Livy xxxii. 26, xxxiii. 36, xxxix. 29, 41.

6 Sixteen Roman and four Latin colonies. See Marquardt, Staatsvenv, i. e E.g. Livy xxxi. 4, 49, xxxii. I.

7 Livy xl. 38. s Livy, Epit. xlvi. 9 Sipontum and Buxentum in 186; Livy xxxix. 23.

10 Plut. T.G. 9-14; Appian, B.C. i-9-13; Livy, Epit. lviii. Compare also Mommsen, Hist, of Rome, iii. 320 seq.; Lange, Rom. Alterth. iii. 8 seq.; Nitzsch, Gracchen, 294; G re enidge, Hist, of Rome, i. (1904), pp. no seq.

11 For the details, see the article Agrarian Laws.

renewed on a wider scale, and with a more deliberate aim by his brother Gaius,who on his election to the tribunate (1 23) aaius at once came forward as the avowed enemy of the Gracchus. senate. 12 The latter suddenly found its control of 63h

the administration threatened at a variety of points. On the invitation of the popular tribune the assembly proceeded to restrict the senate's freedom of action in assigning the pro- vinces. 13 It regulated the taxation of the province of Asia 14 and altered the conditions of military service. 15 In home affairs it inflicted two serious blows on the senate's authority by declaring the summary punishment of Roman citizens by the consuls on the strength of a senatus consultum to be a violation of the law of appeal, 16 and by taking out of the senate's hands the control of the newly established court for the trial of cases of magisterial misgovernment in the provinces. 17 Tiberius had committed the mistake of relying too exclusively on the support of one section only of the community; his brother endeavoured to enlist on the popular side every avail- able ally. The Latins and Italians had opposed an agrarian scheme which took from them land which they had come to regard as rightfully theirs, and gave them no share in the benefit of the allotments. 18 Gaius not only removed this latter grievance, 19 but ardently supported and himself brought forward the first proposals made in Rome for their enfranchisement. 20 The indifference of the city populace, to whom the prospect of small holdings in a remote district of Italy was not a tempting one, was overcome by the establishment of regular monthly doles of corn at a low price. 21 Finally, the men of business — the publicans, merchants and money-lenders — were conciliated by the privilege granted to them of collecting the tithes of the new province of Asia, and placed in direct rivalry with the senate by the substitution of men of their own class as judges in the " quaestio de repetundis," in place of senators. 22 The organizer of this concerted attack upon the position of the senate fell, like his brother, in a riot.

The agrarian reforms of the two Gracchi had little permanent effect. 23 Even in the lifetime of Gaius the clause in his brother's law rendering the new holdings inalienable was re- pealed, and the process of absorption recommenced. . f . . In 118 a stop was put to further allotment of occupied tempt at lands, and finally, in in, the whole position of the agrarian agrarian question was altered by a law which con- retorm J 1li verted all land still held in occupation into private 643 \

land. 24 The old controversy as to the proper use of the lands of the community was closed by this act of alienation. The controversy in future turns, not on the right of the poor

12 On the legislation of C. Gracchus, see Warde Fowler in Eng. Hist. Review (1905), pp. 209 seq., 417 seq.

13 Lex Sempronia de provinciis consularibus ; Cic. Pro doino, 9, 24; De Prov. Cons. 2, 3; Sallust, Jug. 27.

14 Lex de provincia Asia; Cic. Verr. 3, 6, 12; Fronto, Ad Ver. ii. 125.

16 Plut. C.G. 5 ; Diod. xxxiv. 25.

16 Plut. C.G. 4; Cic. Pro domo, 31, 82; Pro Rab. Perd. 4, 12.

17 Quaestio de repetundis, est. 149 B.C. See Plut. C.G. 5; Livy, Epit. lx. ; Tac. Ann. xii. 60; App. B.C. i. 22. For the lex Acilia, see C.I.L. i. 189; Wordsworth, Fragm. 424; Bruns, . Pontes juris Romani, ed. 6, pp. 56 seq.

18 They had succeeded in 129 in suspending the operations of the agrarian commission. App. B.C. i. 18; Livy, Epit. lix. ; Cic. De Rep. iii. 29, 41.

19 Lange, R.A. iii. 32; Lex Agr. line 21.

20 The rogatio Fulvia, 125 B.C.; Val. Max. ix. 5, 1; App. B.C. i. 21.

21 Plut. C.G. 5; App. i. 21; Livy, Epit. lx. ; Festus, 290.

22 Hence Gaius ranked as the founder of the equestrian order. Plin. N.H. xxxiii. 34, ” judicum appellatione separare eum ordinem . . . instituere Gracchi “; Varro ap. Non. 454, “bicipitem civitatem fecit.”

23 Traces of the work of the commission survive in the Miliarium Popilianum, C.I.L. i. 551, in a few Gracchan ” termini,” ib. 552, 553, 554, 555, in the ” limites Gracchani,” Liber Colon., ed. Lachmann, pp. 209, 210, 211, 229, &c. Compare also the rise in the numbers of the census of 125 B.C.; Livy, Epit. lx.

24 See App. i. 27. The lex agraria, still extant in a fragmentary condition in the museum at Naples, is that of in. See Mommsen, C.I.L. i. 200; Wordsworth, 441 seq.; Bruns, Pontes juris Rom. ed. 6, pp. 74 seq., and cf. the article Agrarian Laws.

citizens to the state lands, but on the expediency of purchasing other lands for distribution at the cost of the treasury. 1

But, though the agrarian reform failed, the political conflict it had provoked continued, and the lines on which it was waged were in the main those laid down by Gaius Gracchus. The sovereignty of the assembly continued to be the watchword of the popular party, and a free use of the tribunician powers of interference and of legislation remained the most effective means of accomplishing their aims.

Ten years after the death of Gaius the populares once more summoned up courage to challenge the supremacy of the Marias senate; but it was on a question of foreign administra- im-ioo= tion that the conflict was renewed. The course of 636-54. affairs in the client state of Numidia since Micipsa's

government than that of the senate. 2 In defiance of Roman authority, and relying on the influence of his own well-spent gold, Jugurtha had murdered both his legitimate rivals, Hiemp- sal and Adherbal, and made himself master of Numidia. The declaration of war wrung from the senate (112) by popular indignation had been followed by the corrup- tion of a consul 3 (in) and the crushing defeat of the proconsul Albinus. 4 On the news of this crowning dis- grace the storm burst, and on the proposal of the tribunes a commission of inquiry was appointed into the conduct of the war. 5 But the popular leaders did not stop here. Q. Caecilius Metellus, who as consul (109) had succeeded to the com- mand in Numidia, was an able soldier but a rigid aristocrat; and they now resolved to improve their success by entrusting the command instead to a genuine son of the people. Their choice fell on Gaius Marius (see Marius), an experienced officer and administrator, but a man of humble birth, wholly illiterate, and one who, though no politician, was by tempera- ment and training a hater of the polished and effeminate nobles who filled the senate. 6 He was triumphantly elected, and, in spite of a decree of the senate continuing Metellus as proconsul, he was entrusted by a vote of the assembly with the charge of the war against Jugurtha (q.v.). 7

Jugurtha was vanquished; and Marius, who had been a second time elected consul in his absence, arrived at Rome in January 104, bringing the captive prince with him in chains. 8 But further triumphs awaited the popular hero. The Cimbri and Teutones were at the gates of Italy; they had four times defeated the senatorial generals, and Marius was called upon to save Rome from a second invasion of the

barbarians. 9 After two years of suspense the victory at Aquae Sextiae (102), followed by that on the Raudine plain (101), put an end to the danger by the annihilation of the invading hordes; and Marius, now consul for the fifth time, returned to Rome in triumph. There the popular party welcomed him as a leader with all the prestige of a success- ful general. Once more, however, they were destined to a brief success followed by disastrous defeat. Marius became for the sixth time consul; 10 of the two popular leaders Glaucia became Satur- praetor and Saturninus tribune. But Marius and his niaus allies were not statesmen of the stamp of the Gracchi;

and the atl(j the laws proposed by Saturninus had evidently Appu e an no ser ; ous a ; m j n v j ew other than that of harassing the senate. His corn law merely reduced the price 63,1 fixed in 123 for the monthly dole of corn, and the

main point of his agrarian law lay in the clause appended to it requiring all senators to swear to observe its pro-

1 Cic. Agr. ii. 25, 65. 2 Sallust, Jug. 5 seq.; Livy, Epit. lxii., lxiv.

3 L. Calpurnius Bestia, tribune 121 ; Sail. Jug. 28.

4 Ibid. 38, 39. 6 Ibid. 40.

6 Sallust, Jug. 63; Plut. Marius, 2, 3. For the question as to the position of his parents, see Madvig, Verf. i. 170; Diod. xxxiv. 38.

7 Sallust, Jug. 73.

8 Ibid. 114. For the chronology of the Jugurthine war, see Mommsen, Hist, of Rome, iii. 398; Pelham, Journ. of Phil. vii. 91 ; Meinel, Zur Chronologic des jugurthinischen Kriegs (1883).

9 Livy, Epit. lxvii.; Plut. Mar. 12; Mommsen, Hist, of Rome, iii. 414 seq.

10 Livy, Epit. lxix. ; Appian, B.C. i. 28 seq.

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visions. 11 The laws were carried, but the triumph of the popular leaders was short-lived. Their recklessness and violence had alienated all classes in Rome; and their period of office was drawing to a close.

At the elections fresh rioting took place, and Marius as consul was called upon by the senate to protect the state against his own partisans. Saturninus and Glaucia surrendered, but while the senate was discussing their fate they were surrounded and murdered by their opponents.

The popular party had been worsted once more in their struggle with the senate, but none the less their alliance with Marius, and the position in which their votes placed him, marked an epoch in the history of the revolution. The transference of the political leadership to a consul who was nothing if not a soldier was at once a confession of the insufficiency of the purely civil authority of the tribunate and a dangerous en- couragement of military interference in political controversies. The consequences were already foreshadowed by the special provisions made by Saturninus for Marius's veterans, and in the active part taken by them in the passing of his laws. Indirectly, too, Marius, though no politician, played an important part in this new departure. His military Military reforms 12 at once democratized the army and attached reforms it more closely to its leader for the time being. He of swept away the last traces of civil distinctions of rank Marius. or wealth within the legion, admitted to its ranks all classes, and substituted voluntary enlistment under a popular general for the old-fashioned compulsory levy. The efficiency of the legion was increased at the cost of a complete severance of the ties which bound it to the civil community and to the civil authorities. The next important crisis was due partly to the rivalry which had been growing more bitter each year between the senate and the commercial class, and partly to the long-impending question of the enfranchisement of the Italian allies. The publicani, negotiatores and others, who constituted what was now becoming known as the equestrian order (see Equites), had made un- scrupulous use of their control of the courts and especially of the quaestio de repetundis against their natural rivals, the official class in the provinces. The threat of prosecution before a hostile jury was held over the head of every governor, legate and quaestor who ventured to interfere with their operations in the provinces. The average official preferred to connive at their exactions; the bolder ones paid with fines and even exile for their courage. In 92 the necessity for a reform was 662.

proved beyond a doubt by the scandalous condemnation „. of P.Rutilius Rufus, 13 ostensibly on a charge of extortion, teat „/ in reality as the reward of his efforts to check the the extortions of the Roman equites in Asia. The diffi- Italian culties of the Italian question were more serious. That allies – the Italian allies were discontented was notorious. After nearly two centuries of close alliance, of common

dangers and victories, they now eagerly coveted as a boon that complete amalgamation with Rome which they had at first resented as a dishonour. But, unfortunately, Rome had grown more ex- clusive in proportion as the value set upon Roman citizenship increased. During the last forty years feelings of hope and disappointment had rapidly succeeded each other; Marcus Fulvius Flaccus, Gaius Gracchus, Saturninus, had all held out promises of relief — and nothing had yet been done. On each occasion they had crowded to Rome, full of eager expectation, only to be harshly ejected from the city by the consul's orders. 14 The justice of their claims could hardly be denied, the danger of continuing to ignore them was obvious — yet the difficulties in the way of granting them were formidable in the extreme, and from a higher than a merely selfish point of view there was much

11 For the leges Appuleiae, see Saturninus, L. Appuleius, and authorities there quoted.

12 Sallust, Jug. 86, " ipse interea milites scribere, non more majorum neque ex classibus, sed uti cujusque cupido erat, capite censos plerosque." For details, cf. Mommsen, Hist, of Rome, iii. 456 seq.; Madvig, Verf. ii. 468, 493; Marquardt, Staatsv. iii. 430 seq.

13 Livy, Epit. lxx..; Veil. ii. 13.

14 Lex Junia, Cic. De Off. iii. 11, 47; lex Licinia Mucia, Cic. Pro Corn. fr. 10; Ascon. p. 60.

to be said against the revolution involved in so sudden and enormous an enlargement of the citizen body.

Marcus Livius Drusus (q.v.), who as tribune gallantly took up the task of reform, is claimed by Cicero 1 as a member of that Marcus party of the centre to which he belonged himself. Livius Noble, wealthy and popular, he seems to have hoped Drusus, t b e a ble by the weight of his position and character 91 = 663. £ rescue tn e burning questions of the day from the grasp of extreme partisans and to settle them peacefully and equitably. But he, like Cicero after him, had to find to his cost that there was no room in the fierce strife of Roman politics

for moderate counsels. His proposal to reform the law courts excited the equestrian order and their friends in the senate to fury. The agrarian and corn laws which he coupled with it 2 alienated many more in the senate, and roused the old anti- popular party feeling; finally, his known negotiations with the Italians were eagerly misrepresented to the jealous and excited people as evidence of complicity with a widespread conspiracy against Rome. His laws were carried, but the senate pronounced _. them null and void. 3 Drusus was denounced in the

Social senate house as a traitor, and on his way home was War, struck down by the hand of an unknown assassin. His

assassination was the signal for an outbreak which had been secretly prepared for some time before. Throughout the highlands of central and southern Italy the flower of the Italian peoples rose as one man. 4 Etruria and Umbria held aloof; the isolated Latin colonies stood firm; but the Sabellian clans, north and south, the Latinized Marsi and Paeligni, as well as the Oscan-speaking Samnites and Lucanians, rushed to arms. No time was lost in proclaiming their plans for the future. A new Italian state was to be formed. The Paelignian town of Corfinium was selected as its capital and re- christened with the proud name of Italica. All Italians were to be citizens of this new metropolis, and here were to be the place of assembly and the senate house. A senate of 500 members and a magistracy resembling that of Rome completed a constitu- tion which adhered closely to the very political traditions which its authors had most reason to abjure.

Now, as always in the face of serious danger, the action of Rome was prompt and resolute. Both consuls took the field; 5 with each were five legates, among them the veteran Marius and his destined rival L. Cornelius Sulla, and even freedmen were pressed into service with the legions. But the first year's campaign opened disastrously. In central Italy the northern Sabellians, and in the south the Samnites, defeated the forces opposed to them. And though before the end of the year Marius and Sulla in the north, and the consul Caesar himself in Cam- pania, succeeded in inflicting severe blows on the enemy, and on the Marsi especially, it is not surprising that, with an empty treasury, with the insurgents' strength still unbroken, and with rumours of disaffection in the loyal districts, opinion in Rome should have turned in the direction of the more liberal policy which had been so often scornfully rejected and in favour of some compromise which should check the spread of the revolt, and possibly sow discord among their enemies. Towards the close of the year 00 the consul L. Julius Caesar (killed Lex Julia by Fimbria in 87) carried the lex Julia? by which

Piautia tne R° man franchise was offered to all communities Papiria. which had not as yet revolted; early in the next year (89) the Julian law was supplemented by the lex Piautia Papiria, introduced by two of the tribunes, M. Plautius Silvanus and C. Papirius Carbo Arvina, which

1 Cic. De oral. i. 7, 24 f., and De domo, 19, 50; Appian, B.C. i. 35; Diod. Sic. xxxvii. 10; Ihne, bk. vii. cap. xiii.

2 For the provisions of the leges Liviae, see App. B.C. i. 35; Livy, Epit. lxxi. They included, according to Pliny, N.H. xxxiii. 3, a proposal for the debasement of the coinage.

3 Cic. Pro domo, 16, 41.

4 For the Social War, see, besides Mommsen, Ihne and Lange, Kiene, Der romische Bundesgenossenkrieg (Leipzig, 1845).

5 App. B.C. i. 39-49; Livy, Epit. lxxii.-lxxvi.

6 For the lex Julia, see Cicero, Pro Balbo, 8, 21 ; Gell. iv. 4; App. B.C i. 49. For the lex Piautia Papiria, see Cic. Pro Arcfna, 4, 7, and Schol. Bob. p. 353.

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enacted that any citizen of an allied community then domiciled in Italy might obtain the franchise by giving in his name to a praetor in Rome within sixty days. A third law {lex Calpumia) , apparently passed at the same time, empowered Roman magis- trates in the field to bestow the franchise there and then upon all who were willing to receive it. This sudden opening of the closed gates of Roman citizenship was completely successful, and its effects were at once visible in the diminished vigour of the insurgents. By the end of 89 the Samnites and Lucanians were left alone in their obstinate hostility to Rome, and neither, thanks to Sulla's brilliant campaign in Samnium, had for the moment any strength left for active aggression. ; ,

The termination of the Social War brought with it no peace in Rome. The old quarrels were renewed with increased bitterness, and the newly enfranchised Italians themselves complained as bitterly of the restriction 7 which robbed them of their due share of political influence by allowing them to vote only in a specified number of

tribes. The senate itself was dis- tracted by violent personal rivalries — and all these feuds, ani- mosities and grievances were aggravated by the widespread economic distress and ruin which affected all classes. 8 Lastly, war with Mithradates VI. had been declared; it was notorious that the privilege of commanding the force to be sent against him would be keenly contested, and that the contest would lie between the veteran Marius and L. Cornelius Sulla. 9

It was in an atmosphere thus charged with the elements of disturbance that P. Sulpicius Rufus as tribune 10 brought forward his laws. He proposed — (1) that the com- p. sui- mand of the Mithradatic war should be given to picius Marius, (2) that the new citizens should be distributed Rufus, through all the tribes, (3) that the freedmen should no longer be confined to the four city tribes, (4) that any senator owing more than 2000 denarii should lose his seat, (5) that those exiled on suspicion of complicity with the Italian revolt should be recalled. These proposals inevitably provoked a storm, and both sides were ominously ready for violent measures. The consuls, in order to prevent legislation, pro- claimed a public holiday. Sulpicius replied by arming his followers and driving the consuls from the forum. The pro- clamation was withdrawn and the laws carried, but Sulpicius's triumph was short-lived. From Nola in Campania, where lay the legions commanded by him in the Social War, Sulla advanced on Rome, and for the first time a Roman consul entered the city at the head of the legions of the Republic. Resistance was hopeless. Marius and Sulpicius fled, 11 and Sulla, summoning the assembly of the centuries, proposed the measures he con- sidered necessary for the public security, the most important being a provision that the sanction of the senate should be necessary before any proposal was introduced to the assembly. 12 Then, after waiting in Rome long enough to hold the consular elections, he left for Asia early in 87.

Sulla had conquered, but his victory cost the Republic dear. He had first taught political partisans to look for final success, not to a majority of votes in the forum or campus, Marius but to the swords of the soldiery. The lesson was well and learnt. Shortly after his departure L. Cornelius Cinna. Cinna as consul revived the proposals of Sulpicius; 13 his colleague, Gnaeus Octavius, at the head of an armed force fell upon the new citizens who had collected in crowds to vote,

7 Veil. ii. 20; App. B.C. i. 49, 53. It is impossible to reconcile in detail the statements of these authors.

8 App. B.C. i. 54, and Mithr. 22; Oros. v. 18; Livy, Epit. lxxiv.

9 It had been already declared a consular province for 87, and early in 88 seems to have been assigned to Sulla by decree of the senate.

10 See Sulpicius Rufus, P.

11 Marius finally escaped to Africa (see Marius); Sulpicius was taken and killed ; App. i. 60.

12 App. B.C. i. 59, lir/Siv in &irpof}ov\evTov is tbv SrjfioP ex< £Jpeff9ai. For the other laws mentioned by Appian, see Mommsen, Hist, of Rome, iii. 541 f.

” Livy, Epit. lxxix. ; Veil. ii. 20.

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668. 669, 670.

and the forum was heaped high with the bodies of the slain. 1 Cinna fled, but fled, like Sulla, to the legions. When the senate declared him deposed from his consulship, he replied by invoking the aid of the soldiers in Campania in behalf of the violated rights of the people and the injured dignity of the consulship, and, like Sulla, found them ready to follow where he led. The neighbouring Italian communities, who had lost many citizens in the recent massacre, sent their new champion men and money; 2 while from Africa, whither he had escaped after Sulla’s entry into Rome, came Marius with 1000 Numidian horsemen. The senate had prepared for a desperate defence, but fortune was adverse, and after a brief resistance they gave way. Cinna was acknowledged as consul, the sentence of out- lawry passed on Marius was revoked and Cinna and Marius entered Rome with their troops. Marius’s thirst for revenge was gratified by a frightful massacre, and he lived long enough to be nominated consul for the seventh time. But he held his consulship only a few weeks. Early in 86 he died, and for the next three years Cinna ruled Rome. Constitu- tional government was virtually suspended. For 8 5 and 84 Cinna nominated himself and a trusted colleague as consuls. 3 The state was, as Cicero 4 says, without lawful authority. 5 One important matter was carried through— the registration in all the tribes of the newly enfranchised Italians, 6 but beyond this little was done. The attention

of Cinna and his friends was in truth engrossed by the ever-present dread of Sulla's return from Asia. The consul of 86, L. Valerius Flaccus (who had been consul with Marius in roo B.C.), sent out to supersede him, was murdered by his own soldiers at Nicomedia. 7 „ 9 In 85 Sulla, though disowned by his government, con-

cluded a peace with Mithradates. 8 In 84, after settling affairs in Asia and crushing Flaccus's successor, C. Flavius The Fimbria, he crossed into Greece, and in the spring of

return of 83 landed at Brundusium with 40,000 soldiers and a Sulla, large following of emigre nobles. Cinna was dead, 9

- , ~ ■ murdered like Flaccus by his mutinous soldiers; his most trusted colleague, Cn. Papirius Carbo, was commanding as proconsul in Cisalpine Gaul; and the resistance offered to Sulla's advance was slight. At Capua, Sulla routed the forces of one consul, Gaius Norbanus; at Teanum the troops of the other went over in a body to the side of the outlawed proconsul. After a winter spent in Campania he pressed forward to Rome, defeated the younger Marius (consul, 82) near Praeneste, and entered the city without further opposition. In north Italy the successof his lieutenants,Q.CaeciliusMetellus Pius (son of Metellus Numidicus), Cn. Pompeius and Marcus Crassus, had been fully as decisive. Cisalpine Gaul, Umbria and Etruria had all been won for Sulla, and the two principal leaders on the other side, Carbo and Norbanus, had each fled, one to Rhodes, the other to Africa. Only one foe remained to be conquered. The Samnites and Lucanians whom Cinna had conciliated, and who saw in Sulla their bitterest foe, were for the last time in arms, and had already joined forces with the remains of the Marian army close to Rome. The decisive battle was fought under the walls of the city, and ended in the complete defeat of the Marians and Italians (battle of the Colline Gate). 10 For a period of nearly ten years Rome and Italy had been distracted by civil war. Sulla was now called upon to heal

1 Cic. Pro Sestio, 36, 77; Colli, iii. 10, 24.

2 Tibur and Praeneste especially.

3 The consuls of 86, 85, 84 were all nominated without election. Livy, Epit. lxxx. lxxxiii.; App. i. 75.

4 Brut. 227.

5 The nobles had fled to Sulla in large numbers; Veil. ii. 23.

6 This work was accomplished apparently by the censors of 86 ; but cf. Lange iii. 133; Mommsen, Hist, of Rome, iv. 70; Livy, Epit. lxxxiv.

7 Livy, Epit. lxxxii ; Appian, Mithr. 52 ; Plut. Sulla, 23.

8 Livy, Epit. lxxxiii.; Veil. ii. 23; Plut. Sulla, 24. 3 In 84; App. B.C. i. 78; Livy, Epit. lxxxiii.

10 Livy, Epit. lxxxviii., ” cum Samnitibus ante portam Collinam debellavit ” ; Plut. Sulla, 29, and Crassus, 6. According to App. i. 93, and Livy, loc cit., 8000 captives were massacred. Florus, iii. 21, gives 4000. Praeneste surrendered, was razed to the ground, and its population put to the sword.

672.

81 = 673.

the divisions which rent the state asunder, to set in working again the machinery of civil government and above guiia’s all so to modify it as to meet the altered conditions, dictator- arid to fortify it against the dangers which visibly **4fc, threatened it in the future. The real charge against Sulla 11 is not that he failed to accomplish all this, for to do so was beyond the powers even of a man so able, resolute and self-confident as Sulla, armed though he was with absolute authority and backed by overwhelming military strength and the prestige of unbroken success. He stands convicted rather of deliberately aggravating some and culpably ignoring others of the evils he should have tried to cure, and of contenting himself with a party triumph when he should have aimed at the regeneration and confirmation of the whole state. His victory was instantly followed, not by any measures of con- ciliation, but by a series of massacres, proscriptions and con- fiscations, of which almost the least serious consequence was the immediate loss of life which they entailed. 12 From this time forward the fear of proscription and confiscation recurred as a possible consequence of every political f ta e crisis, and it was with difficulty that Caesar himself Suiian dissipated the belief that his victory would be followed prosoip- by a Sullan reign of terror. The legacy of hatred and tloas – discontent which Sulla left behind him was a constant source of disquiet and danger. In the children of the proscribed, whom he excluded from holding office, and the dispossessed owners of the confiscated lands, every agitator found ready and willing allies. 13 The moneyed men of the equestrian order

were more than ever hostile to the senatorial government, which they now identified with the man who cherished towards them a peculiar hatred, 14 and whose creatures had hunted them down like dogs. The attachment which the new Italian citizens might in time have learnt to feel for the old republican con- stitution was nipped in the bud by the massacres at Praeneste and Norba, by the harsh treatment of the ancient towns of Etruria, and by the ruthless desolation of Samnium and Lucania. 15 Quite as fatal were the results to the economic prosperity of the peninsula. Sulla's confiscations, following on the civil and social wars, opened the doors wide for a long train of evils. The veterans whom he planted on the lands he had seized 16 did nothing for agriculture, and swelled the growing numbers of the turbulent and discontented. 17 The " Sullan men " became as great an object of fear and dislike as the "Sullan reign." 18 The latifundia increased with startling rapidity — whole territories passing into the hands of greedy partisans. 19 Wide tracts of land, confiscated but never allotted, ran to waste. 20 In all but a few districts of Italy the free popula- tion finally and completely disappeared from the open country; and life and property were rendered insecure by the brigandage which now developed unchecked, and in which the herdsmen slaves played a prominent part. The outbreaks of Spartacus in 73, and of Catiline ten years later, were significant 6Sl

commentaries on this part of Sulla's work. 21 His con- stitutional legislation, while it included many useful tuUonai administrative reforms, is marked by as violent a legista- spirit of partisanship, and as apparently wilful a tlon ot blindness to the future. The re-establishment on a legal Sul1 "- basis of the ascendancy which custom had so long accorded to the

11 Compare especially Mommsen's brilliant chapter, which is, however, too favourable (bk. iv. cap. x.),and also Lange (iii. 146 seq.). Further references will be found in the article Sulla (q.v.).

12 App. i. 95 seq.; Dio Cassius, fr. 109; Plut. Sulla, 31. The number of the proscribed is given as 4700 (Val. Max.), including, according to Appian, 2600 members of the equestrian order.

13 E.g. Catiline, in 63. Sail. Cat. 21, 37. For the liberi pro- scriptorum, see Veil. ii. 28. 14 Cic. Pro. Cluent. 55, 151.

15 Cic. Phil. v. 16, 43, " tot municipiorum maximae calamitates." Cic. Pro Domo, 30, 79; Cic. Ad Alt. i. 19; Florus iii. 21; Strabo,

223, 254.

16 Livy, Epit. lxxxix. ; App. B.C. i. 100; Cicero, Catil. ii. 79. 20.

17 Sail. Cat. 28. ” Cic. Agr. ii. 269.

19 Cic. Agr. ii. 26, 69 seq.; 28, 78; iii. 2, 8 — the territories of Praeneste and of the Hirpini. 20 Ibid. iii. 4, 14.

21 See especially Cicero’s oration Pro Tullio. For the pastores of Apulia, Sail. Cat. 28.

senate was his main object. With this purpose he had already, when consul in 88, made the senatus auctoritas legally necessary for proposals to the assembly. He now as dictator 1 followed this up by crippling the power of the magis- tracy, which had been the most effective weapon in the hands of the senate’s opponents. The legislative freedom of the tribunes was already hampered by the necessity of obtaining the senate’s sanction; in addition, Sulla restricted their wide powers of interference (intercessio) to their original purpose of protecting individual plebeians, 2 and discredited the office by prohibiting a tribune from holding any subsequent office in the state. 3 The control of the courts (quaesliones perpetuae) was taken from the equestrian order and restored to the senate. 4 To prevent the people irom suddenly installing and keeping in high office a second Marius, he re-enacted the old law against re-election, 5 and made legally binding the custom which required a man to mount up gradually to the consulship through the lower offices. 6 His increase of the number of praetors from six to eight, 7 and of quaestors to twenty, 8 though required by adminis- trative necessities, tended, by enlarging the numbers and further dividing the authority of the magistrates, to render them still more dependent upon the central direction of the senate. Lastly, he replaced the pontifical and augural colleges in the hands of the senatorial nobles, by enacting that vacancies in them should, as before the lex Domitia (104), be filled up by co-optation. 9 It cannot be said that Sulla was successful in fortifying the republican system against the dangers which menaced it from without. He accepted as an accomplished fact the enfranchisement of the Italians,

10 but he made no provision to guard against the con- sequent reduction of the comitia to an absurdity, 11 and with them of the civic government which rested upon them, or to organize an effective administrative system for the Italian communities. 12 Of all men, too, Sulla had the best reason to appreciate the dangers to be feared from the growing independence of governors and generals in the provinces, and from the transformation of the old civic militia into a group of professional armies, devoted

1 For Sulla's dictatorship as in itself a novelty, see App. i. 98 ; Plut. Sulla, 33; Cic. Ad Alt. 9, 15; Cic. De Legg. i. 15, 42.

2 Cic. De Legg. iii. 9, 22, " injuriae faciendae potestatem ademit, auxilii ferendi reliquit." Cf. Cic. Verr. i. 60, 155; Livy, Epit. lxxxix.

3 Cic. Pro Cornel, fr. 78 ; Ascon. In Corn. pp. 59, 70 ; Appian i. 100.

4 Veil. ii. 32; Tac. Ann. xi. 22; Cic. Verr. Act. i. 13, 37.

6 App. B.C. i. 100; cf. Livy vii. 42 (342 B.C.), " ne quis eundem magistratum intra decern annos caperet.'

6 The custom had gradually established itself. Cf. Livy xxxii. 7. The " certus ordo magistratuum " legalized by Sulla was — quaestor- ship, praetorship, consulate; App. i. 100.

7 Pompon. De orig. juris {Dig. i. 2, 2, 32); Veil. ii. 89. Com- pare also Cicero, In Pison. 15, 35 with Cic. Pro Milone, 15, 39. The increase was connected with his extension of the system of quaesliones perpetuae, which threw more work on the praetors as the magistrates in charge of the courts.

8 Tac. Ann. xi. 22. The quaestorship henceforward carried with it the right to be called up to the senate. By increasing the number of quaestors, Sulla provided for the supply of ordinary vacancies in the senate and restricted the censors' freedom of choice in filling them up. Fragments of the lex Cornelia de XX quaestoribus survive. See C.I.L. i. 108; Bruns, Fontes juris Romani (ed. 6), p. 91.

9 Dio xxxvii. 37; Ps. Ascon. 102 (Orelli). He also increased their numbers; Livy, Epit. lxxxix.

10 He did propose to deprive several communities which had joined Cinna of the franchise, but the deprivation was not carried into effect; Cic. Pro domo, 30, 79.

11 The inadequacy of the comitia as a representative body was increased by the unequal distribution of the new citizens amongst the thirty-five tribes, each of which formed a single voting unit. Some tribes represented only a thinly populated district in the Campagna with one or two outlying communities, others included large and populous territories. See Mommsen, Staatsr. iii. 187; Hermes, xxii. 101 sqq.

12 Sulla does not appear to have passed any general municipal law; the necessary resettlement of the local constitutions after the Social War was seemingly carried out by commissioners. The fragment of a municipal charter found at Tarentum (Ephem. epigr. ix. I, Dessau, Inscr. Lat. sel. 6086) is probably a specimen of such leges datae.

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only to a successful leader, and with the weakest possible sense of allegiance to the state. He had himself, as proconsul of Asia, contemptuously and successfully defied the home govern- ment, and he, more than any other Roman general, had taught his soldiers to look only to their leader, and to think only of booty. 13 Yet, beyond a few inadequate regulations, there is no evidence that Sulla dealt with these burning questions, the settlement of which was among the greatest of the achievements of Augustus. 14 One administrative reform of real importance must, lastly, be set down to his credit. The judicial procedure first established in 149 for the trial of cases of magisterial extortion in the provinces, and applied between 149 605-673 and 81 to cases of treason and bribery, Sulla extended so as to bring under it the chief criminal offences, and thus laid the foundations of the Roman criminal law. 15

The Sullan system stood for nine years, and was then over- thrown — as it had been established — by a successful soldier. It was the fortune of Cn. Pompeius, a favourite officer orer- of Sulla, first of all to violate in his own person throw the fundamental principles of the constitution re- of the established by his old chief, and then to overturn it. c ” n s”itu- In Spain the Marian governor Q. Sertorius (see tion. Sertorius) had defeated one after another of the pro- 70 = 684. consuls sent out by the senate, and was already in 77 master of all Hither Spain. To meet the crisis, Pompey, who was not yet thirty, and had never held even the quaestorship, was sent out to Spain with proconsular authority. 16 Still Sertorius held out, until in 73 he was foully murdered by his own officers. The native tribes ggi.

who had loyally stood by him submitted, and Pompey „,

early in 71 returned with his troops to Italy, where, during his absence in Spain, an event had occurred which had shown Roman society with startling plainness how near it stood to revolution. In 73 Spartacus, 17 a Thracian slave, ggˆ

escaped with seventy others from a gladiators' training school at Capua. In an incredibly short time he found himself at the head of 70,000 runaway slaves, outlaws, brigands and impoverished peasants, and for two years terrorized Italy, routed the legions sent against him, and even threatened Rome. He was at length defeated and slain by the praetor, M. Licinius Crassus, in Apulia. In Rome itself the various classes and parties hostile to the Sullan system had, ever since Sulla's death in 78, been incessantly agi tating for the repeal of his most obnoxious laws, and needed only

13 Sail. Cat. n. " L. Sulla exercitum, quo sibi fidum faceret, contra morem majorum luxuriose nimisque liberaliter habuerat."

14 There was a lex Cornelia de provinciis ordinandis, but only two of its provisions are known; (1) that a magistrate sent out with the imperium should retain it till he re-entered the city (Cic. Ad Fam. i. 9, 25), a provision which increased rather than diminished his freedom of action; (2) that an outgoing governor should leave his province within thirty days after his successor's arrival (Cic. Ad Fam. iii. 6. 3). A lex Cornelia de majestate contained, it is true, a definition of treason evidently framed in the light of recent experience. The magistrate was forbidden " exire de provincia, educere exercitum, bellum sua sponte gerere, in regnum injussu populi ac senatus accedere," Cic. Pis. 21, 50. Sulla also added one to the long list of laws dealing with extortion in the provinces. But the danger lay, not in the want of laws, but in the want of security for their observance by an absolutely autocratic proconsul. The present writer cannot agree with those who would include among Sulla's laws one retaining consuls and praetors in Rome for their year of office and then sending them out to a province.ˆ This was becoming the common practice before 81. After 81 it is invari- able for praetors, as needed for the judicial work, and invariable but for two exceptions in the case of consuls; but nowhere is there a hint that there had been any legislation on the subject, and there are indications that it was convenience and not law which maintained the arrangement. Mommsen, Hist, of Rome, iv. 118 sqq.; Marquardt, Staatsverw. i. 518; cf. also Cic. Alt. 8, 15; " consules, quibus more majorum concessum est vel omnes adire proviiicias."

15 For this, the most lasting of Sulla's reforms, see Mommsen, Hist, of Rome, iv. 127 sqq.; Rein, Criminal-Recht; Zumpt, Criminal-Prozess d.

Rbmer; Greenidge, Legal Procedure of Ocero's Time, p. 415 sqq ;

16 Plut. Pomp. 17; Livy, Epit. xci. For Pompey's earlier life, see Pompey.

17 For the Slave War, see Spartacus.

a leader in order succcisfully to attack a government discredited by failure at home and abroad. With the return of Pompey Pompey ˆ rom Spain their opportunity came. Pompey, who as consul, understood politics as little as Marius, was anxious to obtain a triumph, the consulship for the next year (70), and as the natural consequence of this an important command in the East. The opposition wanted his name and support, and a bargain was soon struck. Pompey and with him Marcus Licinius Crassus, the real conqueror of Spartacus, were elected consuls, almost in the presence of their troops, which lay encamped outside the gates in readiness to assist at the triumph and ovation granted to their respective leaders. Pompey lost no time in performing his part of the agreement. The tribunes regained their prerogatives. 1 The " perpetual courts " (quaestiones perpetuae) were taken out of the hands of the senatorial judices, who had outdone the equestrian order in scandalous corruption, 2 and finally the censors, the first since 86 B.C., purged the senate of the more worthless and disreputable of Sulla's partisans. 3 The victory was complete; but for the future its chief signifi- cance lay in the clearness with which it showed that the final decision in matters political lay with neither of the two great parties in Rome, but with the holder of the military authority. The tribunes ceased to be political leaders and became lieutenants of the military commanders, and the change was fatal to the dignity of politics in the city. Men became conscious of the unreality of the old constitutional controversies, in- different to the questions which agitated the forum and the curia, and contemptuously ready to alter or disregard the constitution itself when it stood in the way of interests nearer to their hearts.

When his consulship ended, Pompey impatiently awaited at the hands

of the politicians he had befriended the further Qablaiaa gift of a foreign command. He declined an ordinary and province, and from the end of 70 to 67 he remained

Maniiian at R ome j n a somewhat affectedly dignified seclusion. 4 But in 67 and 66 the laws of Gabinius and Manilius gave him all and more than all that he expected (see

‘ ***” Pompey). By the former he obtained the sole com- mand for three years against the Mediterranean pirates. 5 He was to have supreme authority over all Roman magistrates in the provinces throughout the Mediterranean and over the coasts for 50 miles inland. Fifteen legati, all of praetorian rank, were assigned to him, with two hundred ships, and as many troops as he thought desirable. The Maniiian law trans- ferred from Lucullus and Glabrio to Pompey the conduct of the Mithradatic War in Asia, and with it the entire control of Roman policy and interests in the East. 6 The unrepublican character of the position thus granted to Pompey, and the dangers of the precedent established, were clearly enough pointed out by such moderate men as Q. Lutatius Catulus, the ” father of the senate,” and by the orator Hortensius — but in vain. Both laws were supported, not only by the tribunes and the populace, but by the whole influence of the publicani and negotiatores, whose interests in the East were at stake.

Pompey left Rome in 67. In a marvellously short space of time he freed the Mediterranean from the Cilician pirates and established Roman authority in Cilicia itself. He then crushed Mithradates, added Syria to the list of Roman provinces,

1 The exact provisions of Pompey’s law are nowhere given ; Livy, Epit. xcvii., ” tribuniciam potestatem restituerunt.” Cf. Veil. ii. 30. A lex Aurelia, in 75, had already repealed the law disqualifying a tribune for further office; Cic. Corn. fr. 78.

8 This was the work of L. Aurelius Cotta, praetor in this year. The judices were to be taken in equal proportions from senators, equites and tribuni aerarii. For the latter and for the law generally, see Lange, R. Alt. iii. 193; Greenidge, Legal Procedure of Cicero’s Time, pp. 443 sqq. ; and article Aerarium. Compare also Cicero’s language, In Verr., Act. i. 1. The prosecution of Verres shortly preceded the lex Aurelia.

3 Livy, Epit. xcviii. Sixty-four senators were expelled. Cf. Plut. Pomp. 22.

4 Veil. ii. 31 ; Plut. Pomp. 23.

6 Plut. Pomp. 25 ; Dio xxxvi. 6 ; Livy, Epit. c.

6 Cic. Pro Lege Manilla; Dio xxxvi. 25; Plut. Pomp. 30.

687, 692.

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and led the Roman legions to the Euphrates and the Caspian, leaving no power capable of disputing with Rome the sovereignty of western Asia. 7 He did not return to Italy till towards the end of 62. The interval was marked in Rome by the rise to political importance of Caesar and Cicero, and by Catiline's attempt at revolution. As Caesar. the nephew of Marius and the son-in-law of Cinna, Caesar possessed a strong hereditary claim to the leadership of the popular and Marian party. 8 He had already taken part in the agitation for the restoration of the tribunate; he had supported the Maniiian law; and, when Pompey's withdrawal left the field clear for other competitors, he stepped at once into the front rank on the popular side. 9 He took upon himself, as their nearest representative, the task of clearing the memory and avenging the wrongs of the great popular leaders, Marius, Cinna and Saturninus. He publicly reminded the people of Marius's services, and set up again upon the Capitol the trophies of the Cimbric War. He endeavoured to bring to justice, not only the ringleaders in Sulla's bloody work of proscription, but even the murderers of Saturninus, and vehe- mently pleaded the cause of the children of the proscribed. While thus carrying on in genuine Roman fashion the feud of his family, he attracted the sympathies of the Italians by his efforts to procure the Roman franchise for the Latin communities beyond the Po, and won the affections of the populace in Rome and its immediate neighbourhood by the splendour of the games which he gave as curule aedile (65), and by his lavish expenditure upon the improvement of the Appian Way. But these measures were with him only means to the further end of creating for himself a position such as that which Pompey had already won; and this ulterior aim he pursued with an audacious indifference to constitutional forms and usages. His coalition with Crassus, soon after Pompey's departure, secured him an ally whose colossal wealth and wide financial connexions were of inestimable value, and whose vanity and inferiority of intellect rendered him a willing tool. The story of his attempted coup d'itat in January 65 is 6gg

probably false, 10 but it is evident that by the beginning of 63 he was bent on reaping the reward of his exertions by obtaining from the people an extraordinary command abroad, which should secure his position before Pompey's return; and the agrarian law proposed early that year by the tribune P. Servilius Rullus had for its object the creation, in favour of Caesar and Crassus, of a commission with powers so wide as to place its members almost on a level with Pompey himself. 11 It was at this moment when all seemed going well, that Caesar's hopes were dashed to the ground by Catiline's desperate outbreak, which not only discredited every one connected with the popular party, but directed the suspicions of the well-to-do classes against Caesar himself, as a possible accomplice in Catiline's revolutionary schemes. 12

The same wave of indignation and suspicion which for the moment checked Caesar's rise carried Marcus Tullius Cicero to the height of his fortunes. Cicero, as a politician, has been equally misjudged by friends and foes. That he was deficient in courage, that he was vain, and that he attempted the impossible, may be admitted at once. But he was neither a brilliant and unscrupulous adventurer nor an aimless trimmer, nor yet a devoted champion merely of senatorial

7 See Pompey and Mithradates.

8 For his early life, see Caesar.

9 Prof. Beesly has vainly endeavoured to show that Catiline and not Caesar was the popular leader from 67 to 63. That this is the inference intentionally conveyed by Sallust, in order to screen Caesar, is true, but the inference is a false one.

10 The story is so told by Suetonius, Jul. 8. In Sallust, Cat. 18, it appears as an intrigue originating with Catiline, and Caesar's name is omitted.

11 Cic. Agr. ii. 6, 15, " nihil aliud actum nisi ut decern reges constituerentur. ' '

12 That Caesar and Crassus had supported Catiline for the consul- ship in 65 is certain, and they were suspected naturally enough of favouring his designs in 63, but their complicity is in the highest degree improbable.

ascendancy. 1 He was a representative man, with a numerous following, and a policy which was naturally suggested to him by the circumstances of his birth, connexions and profession, and which, impracticable as it proved to be, was yet consistent, intelligible and high-minded. Born at Arpinum, he cherished like all Arpinates the memory of his great fellow-townsman Marius, the friend of the Italians, the saviour of Italy and the irreconcilable foe of Sulla and the nobles. A ” municipal ” himself, his chosen friends and his warmest supporters were found among the well-to-do classes in the Italian towns. 2 Un- popular with the Roman aristocracy, who despised him as a peregrinus, 3 and with the Roman populace, he was the trusted leader of the Italian middle class, ” the true Roman people,” as he proudly styles them. It was they who carried his election 691 696. f° r t ˆ le consulship 4 (63), who in 58 insisted on his recall from exile, 5 and it was his influence with them which made Caesar so anxious to win him over in 49. He represented their antipathy alike to socialistic schemes and to aristocratic exclusiveness, and their old-fashioned simplicity of life in contrast with the cosmopolitan luxury of the capital. 6 By birth, too, he belonged to the equestrian order, the foremost representatives of which were indeed still the publicani and negotiatores, but which since the enfranchisement of Italy included also the substantial burgesses of the Italian towns and the smaller ” squires ” of the country districts. With them, too, Cicero was at one in their dread of democratic excesses and their social and political jealousy of the nobiles? Lastly, as a lawyer and a scholar, he was passionately attached to the ancient constitution. His political ideal was the natural outcome of these circumstances. He advocated the mainten- ance of the old constitution, but not as it was understood by the extreme politicians of the right and left. The senate was to be the supreme directing council, 8 but the senate of Cicero’s dreams was not an oligarchic assemblage of nobles, but a body freely open to all citizens, and representing the worth of the community. 9 The magistrates, while deferring to the senate’s authority, were to be at once vigorous and public-spirited; and the assembly itself which elected the magistrates and passed the laws was to consist, not of the ” mob of the forum,” but of the true Roman people throughout Italy. 10 For the realiza- tion of this ideal he looked, above all things, to the establishment of cordial relations between the senate and nobles in Rome and the great middle class of Italy represented by the equestrian

order, between the capital and the country towns and districts. This was the concordia ordinum, the consensus Italiae, for which he laboured. 11

Cicero's election to the consulship for 63 over the heads of Caesar's nominees, Antonius and Catiline, was mainly the work of the Italian middle class, already rendered uneasy both by the rumours which were. iplracy ot rife of revolutionary schemes and of Caesar's boundless C ?}™?q.' ambition, and by the numerous disquieting signs of dis- turbance noticeable in Italy. The new consul vigorously set himself to discharge the trust placed in him. He defeated the insidious proposals of Rullus for Caesar's aggrandizement and assisted in quashing the prosecution of Gaius Rabirius (q.v.). But with the consular elections in the autumn of 63 a fresh danger arose from a different quarter. The " conspiracy of Catiline " (see Catiline) was not the work of the popular

1 Mommsen is throughout unfair to Cicero, as also are Drumann and Professor Beesly. The best estimates of Cicero's political position are those given by Mr Strachan-Davidson in his Cicero (1894), and by Professor Tyrrell in his Introductions to his edition of Cicero's Letters.

2 Cic. Ad Att. i. 19, 4, " noster exercitus . . . locupletium."

3 Cic. Pro Sulla, 7, 22; Sail. Cat. 31, " inquilinus urbis Romae."

4 See the De petitione consulatus, passim.

5 De Domo, 28, 75; Pro Plancio, 41, 97.

6 Cic. Pro Quinctio, 8, 31 ; Pro Cluentio, 46, 153.

7 Cic. In Verr. ii. 73 ; De Pet. Cons. i. He shared with them their dislike of Sulla, as the foe of their order; Pro Cluentio, 55,

8 De Legg. iii. 12. 9 Pro Sestio, 65, 136; De Legg. iii. 4. 10 Pro Sestio, 45. u Ad Att. i. 18.

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party, and still] less was it an unselfish attempt at reform; Catiline himself was a patrician, who had held high office, and possessed considerable ability and courage; but he was bank- rupt in character and in purse, and two successive defeats in the consular elections had

rendered him desperate. To retrieve his broken fortunes by violence was a course which was only too readily suggested by the history of the last forty years, and materials for a conflagration abounded on all sides. The danger to be feared from his intrigues lay in the state of Italy, which made a revolt against society and the established government only too likely if once a leader presented himself, and it was such a revolt that Catiline endeavoured to organize. Bank- rupt nobles like himself, Sullan veterans and the starving peasants whom they had dispossessed of their holdings, outlaws of every description, the slave population of Rome, and the wilder herdsmen-slaves of the Apulian pastures, were all enlisted under his banner, and attempts were even made to excite disaffection among the newly conquered people of southern Gaul and the warlike tribes who still cherished the memory of Sertorius in Spain. In Etruria, the seat and centre of agrarian distress and discontent, a rising actually took place headed by a Sullan centurion, but the spread of the revolt was checked by Cicero's vigorous measures. Catiline fled from Rome, and died fighting with desperate courage at the head of his motley force of old soldiers, peasants and slaves. His accomplices in Rome were arrested, and, after an unavailing protest from Caesar, the senate authorized the consuls summarily to put them to death.

The Catilinarian outbreak had been a blow to Caesar, whose schemes it interrupted, but to Cicero it brought not only popu- larity and honour, but, as he believed, the realization of his political ideal. But Pompey was now on his way home, 12 and again as in 70 the political future seemed to depend Return of on the attitude which the successful general would Pompey assume; Pompey himself looked simply to the attain- **»”» ment by the help of one political party or another of Asla ” his immediate aims, which at present were the ratification of his arrangements in Asia and a grant of land for his troops. It was the impracticable jealousy of his personal rivals in the senate, aided by the versatility of Caesar, who presented himself not as his rival but as his ally, which drove Pompey once more, in spite of Cicero's efforts, into the camp of what was still nominally the popular party. In 60, f, “”** on Caesar's return from his propraetorship in Spain, the Pompey, coalition was formed which is known by the somewhat Caesar misleading title of the First Triumvirate. 13 Pompey aad was ostensibly the head of this new alliance, and in 60 < -694. return for the satisfaction of his own demands he under- took to support Caesar's candidature for the consulship. The wealth and influence of Crassus were enlisted in the same cause, and the publicani were secured by a promise of release from their bargain for collecting the taxes of Asia. Cicero was under

no illusions as to the significance of this coalition. It scattered to the winds his dreams of a stable and conservative republic. The year 59 saw the republic powerless in the hands of three citizens. Caesar as consul pro- cured the ratification of Pompey's acts in Asia, granted to the publicani the relief refused by the senate, and carried an agrarian law of the new type, which provided for the purchase of lands for allotment at the cost of the treasury and for the assign- ment of the rich ager Campanus. 14 But Caesar aimed at more than the carrying of laws in the teeth of the senate or any party victory in the forum. An important mili tary command Caesar's was essential to him. An obedient tribune, P. Vatinius, command was found, and by the lex Valinia he was given for ° a «"- five years the command of Cisalpine Gaul and Illyricum, to which

12 For the history of the next eighteen years, the most important ancient authority is Cicero in his letters and speeches.

13 Misleading, because the coalition was unofficial. The “triumvirs” of 43 were actual magistrates, ” Illviri reipublicae constituendae causa.”

14 For the lex Julia Agraria and the lex Campana, see Dio Cass, xxxviii. 1; App. B.C. ii. 10; Suet. Jul. 20; Cic. Ad Att. ii.

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was added by a decree of the senate Transalpine Gaul also. 1 This command not only opened to him a great military career, but enabled him, as the master of the valley of the Po, to keep an effective watch on the course of affairs in Italy.

Early the next year the attack upon himself which Cicero had foreseen was made. P. Clodius (q.v.) as tribune brought Banish- forward a law enacting that any one who had put a meat and Roman citizen to death without trial by the people 2?*” ot should be interdicted from fire and water. Cicero, s&-s7= finding himself deserted even by Pompey, left Rome in 696-97. a panic, and by a second Clodian law he was declared to be outlawed. 2 With Caesar away in his province, and Cicero banished, Clodius was for the time master in Rome. But,

absolute as he was in the streets, and recklessly as he parodied the policy of the Gracchi by violent attacks on the senate, his tribunate merely illustrated the anarchy which now inevitably followed the withdrawal of a strong controlling hand. A reaction speedily followed. Pompey, bewildered and alarmed by Clodius's violence, at last bestirred himself. Cicero's recall was decreed by the senate, and early in August 57 in the comitia centuriata, to which his Italian supporters flocked in crowds, a law was passed revoking the sentence of outlawry passed upon him.

Intoxicated by the acclamations which greeted him, and encouraged by Pompey's support, and by the salutary effects _ . of Clodius's excesses, Cicero's hopes rose high. 3 With

ofthe indefatigable energy he strove to reconstruct a solid

coalition, constitutional party, but only to fail once more. 65*-698. Pompey was irritated by the hostility of a powerful section in the senate, who thwarted his desires for a fresh command and even encouraged Clodius in insulting the con- queror of the East. Caesar became alarmed at the reports which reached him that the repeal of his agrarian law was threatened and that the feeling against the coalition was grow- ing in strength; above all, he was anxious for a renewal of his five years' command. He acted at once, and in the celebrated conference at Luca (36) the alliance of the three self-constituted rulers of Rome was renewed. Cicero suc- cumbed to the inevitable and withdrew in despair from public life. Pompey and Crassus became consuls for 55. Caesar's command was renewed for another five years, and to each of his two allies important provinces were assigned for a similar period — Pompey receiving the two Spains and Africa, and Crassus Syria. 4 The coalition now divided between them the control of the empire. For the future the question was, how long the coalition itself would last. Its duration proved to be short. In 53 Crassus was defeated and slain by the Crassus Parthians at Carrhae, and in Rome the course of S3- 701.' events slowly forced Pompey into an attitude of hostility to Caesar. The year 54 brought with it a renewal of the riotous anarchy which had disgraced Rome in 58-57. Conscious of its own helplessness, the senate, with the eager assent of all respectable citizens, dissuaded Pompey from leaving Italy; and he accordingly left his pro- vinces to be governed by his legates. But the anarchy and confusion only grew worse, and even strict constitutionalists like Cicero talked of the necessity of investing Pompey with some extraordinary powers for the preservation of order. 5 At last

ˆuet. Jul. 22; Dio Cass, xxxviii. 8; App. B.C. ii. 13; Plut. Caes. 14.

2 Both laws were carried in the concilium plebis. The first merely reaffirmed the right of appeal, as the law of Gaius Gracchus had done. The second declared Cicero to be already by his own act in leaving Rome ” interdicted from fire and water ” — a procedure for which precedents could be quoted. Clodius kept within the letter of the law.

3 Cicero’s speech Pro Sestio gives expression to these feelings; it contains a passionate appeal to all good citizens to rally round the old constitution. The acquittal of Sestius confirmed his hopes. See Ad Q. Fr. ii. 4.

4 Livy, Epit. cv. ; Dio Cass, xxxix. 33. For Cicero’s views, see Ep. ad Fam. i. 9; Ad Alt. iv. 5.

‘A dictatorship was talked of in Rome; Plut. Pomp. 54; Cic. Ad Q. Fr. iii. 8. Cicero himself anticipated Augustus in his picture of a princeps civitatis sketched in a lost book of the De republica,

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in 52 he was elected sole consul, and not only so, but his provincial command was prolonged for five years – more, and fresh troops were assigned him. 6 The role sole of ” saviour of society ” thus thrust upon Pompey was consul, one which flattered his vanity, but it entailed conse- 52 = 702. quences which it is probable he did not foresee, for it brought him into close alliance with the senate, and in the senate there was a powerful party who were resolved to force him into heading the attack they could not successfully make without him upon Caesar. It was known that the latter, whose command expired in March 49, but who in the ordinary course of things would not have been replaced by his successor until January 48, was anxious to be allowed to stand for his second consulship in the autumn of 49 without coming in person to Rome. 7 His opponents in the senate Proposed were equally bent on bringing his command to an end recall of at the legal time, and so obliging him to disband his Caesar – troops and stand for the consulship as a private person, or, if he kept his command, on preventing his standing for the consulship. Through 51 and 50 the discussions in the senate and the negotiations with Caesar

tinued, but with no result. On 1st January 49 Caesar made a last offer of compromise. The senate replied by requir- ing him on pain of outlawry to disband his legions. Two tribunes who supported him were ejected from the senate-house, and the magistrates with Pompey were authorized to take measures to protect the republic. Caesar hesitated no longer; he crossed the Rubicon and invaded Italy. The Caesar rapidity of his advance astounded and bewildered crosses his foes. Pompey, followed by the consuls, by the the majority of the senate and a long train of nobles, J”’^’ abandoned Italy as untenable, and crossed into Greece. 8 At the end of March Caesar entered Rome as the master of Italy. Four years later, after the final victory of Munda (45), he became the undisputed master of-the Roman world. 9

The task which Caesar had to perform was no easy one. It came upon him suddenly; for there is no sufficient reason

to believe that Caesar had long premeditated revolu- _, , .

tion, or that he had previously aspired to anything snlp ot

more than such a position as that which Pompey had Caesar, already won, a position unrepublican indeed, but 4 j 4 · accepted by republicans as inevitable. 10 War was forced upon him as the alternative to political suicide, but success in war brought the responsibilities of nearly absolute power, and Caesar’s genius must be held to have shown itself in the masterly fashion in which he grasped the situa- tion, rather than in the supposed sagacity with which he is said to have foreseen and prepared for it. In so far as he failed, his failure was mainly due to the fact that his tenure of power was too short for the work which he was required to perform. From the very first moment when Pompey’s ignominious retreat left him master of Italy, he made it clear that he was neither a second Sulla nor even the reckless anarchist which many believed him to be. 11 The Roman and Italian public were, written about this time, which was based upon his hopes of what Pompey might prove to be; Ad Alt. viii. 11 ; August. Deciv. Dei, v. 13.

6 Plut. Pomp. 54; App. B.C. ii. 24.

7 For the rights of the question involved in the controversy between Caesar and the senate, see Mommsen, Rechtsfrage ziv. Caesar und d. Senat; Guiraud, Le Differend entre Cesar et le Senat (Paris, 1878), and

the article Cassar.

8 Cicero severely censures Pompey for abandoning Italy, but strategically the move was justified by the fact that Pompey's strength lay in the East, where his name was a power, and in his control of the sea. Politically, however, it was a blunder, as it enabled Caesar to pose as the defender of Italy.

9 For the Civil Wars, see Caesar; Cicero; andPoMPEY.

10 On this, as on many other points connected with Caesar, divergence has here been ventured on from the views expressed by Mommsen in his brilliant chapter on Caesar (Hist, of Rome, bk. v. cap. xi.). Too much stress must not be laid on the gossip retailed by Suetonius as to Caesar's early intentions.

11 Cicero vividly expresses the revulsion of feeling produced by Caesar's energy, humanity and moderation on his first appearance in Italy. Compare Ad Alt. vii. 11, with Ad Att. viii. 13.

first startled by the masterly rapidity and energy of his move- ments, and then agreeably surprised by his lenity and modera- tion. No proscriptions or confiscations followed his victories, and all his acts evinced an unmistakable desire to effect a sober and reasonable settlement of the pressing questions of the hour; of this, and of his almost superhuman energy, the long list of measures he carried out or planned is sufficient proof. The " children of the proscribed " were at length restored to their rights, 1 and with them many of the refugees 2 who had found shelter in Caesar's camp during the two or three years immediately preceding the war; but the extreme men among his supporters soon realized that their hopes of novae tabulae and grants of land were illusory. In allotting lands to his veterans, Caesar carefully avoided any disturbance of existing owners and occupiers, 3 and the mode in which he dealt with the economic crisis produced by the war seems to have satisfied all reason- able men. 4 It had been a common charge against Caesar in former days that he paid excessive court to the populace of Rome, and now that he was master he still' dazzled and delighted them by the splendour of the spectacles he provided, and by the liberality of his largesses. But he was no indiscriminate flatterer of the mob. The popular clubs and gilds which

had helped to organize the anarchy of the last few years were dissolved. 5 A strict inquiry wast made into the distribution of the monthly doles of corn, and the number of recipients was reduced by one-half; 6 finally, the position of the courts of justice was raised by the abolition of the popular element among the judices. 7 Nor did Caesar shrink from the attempt, in which so many had failed before him, to mitigate the twin evils which were ruining the prosperity of Italy — the concentration of a pauper population in the towns, and the denudation and desola- tion of the country districts. His strong hand carried out the scheme so often proposed by the popular leaders since the days of Gaius Gracchus, the colonization of Carthage and Corinth. Allotments of land on a large scale were made in Italy; decaying towns were reinforced by fresh drafts of settlers; on the large estates and cattle farms the owners were required to find employment for a certain amount of free labour; and a slight and temporary stimulus was given to Italian industry by the reimposition of harbour dues upon foreign goods. 8

The reform of the calendar, which is described elsewhere, 9 completes a record of administrative reform which entitles Caesar to the praise of having governed well, whatever may be thought of the validity of his title to govern at all. But how did Caesar deal with what was after all the greatest problem which he was called upon to solve, the establishment of a satisfactory government for the Empire? One point indeed was already settled. Some centralization of the executive authority was indispensable, and this part of his work Caesar thoroughly performed. From the moment when he seized the moneys in the treasury on his first entry into Rome 10 down to the day of his death, he recognized no other authority but his throughout the Empire. He alone directed the policy of Rome in foreign affairs; the legions were led, and the provinces governed, not by independent magistrates, but by his “legates”; 11 and the title Imperator which he adopted was intended to express the absolute and unlimited nature of the imperium he claimed, as distinct from the limited spheres of authority possessed by republican magistrates. 12 In so centralizing the executive authority over the Empire at large, Caesar was but

1 Dio xli. 18. 2 App. ii. 48; Dio xli. 36.

3 Plut. Caes. 51; Suet. 38, ” adsignavit agros, sed non continuos, ne quis possessorum expelleretur.” Cf. App. ii. 94.

4 For the lex Julia de pecuniis mutuis, see Suet. Jul. 42 ; Caesar, B.C. iii. 1; Dio xli. 37; App. ii. 48. The faeneratores were satisfied; Cic. Ad Fam. viii. 17. But the law displeased anarchists like M. Caelius Rufus

and P. Cornelius Dolabella.

6 Suet. Jul. 42. 6 Ibid. 41 ; Dio xliii. 21.

7 Suet. Jul. 41 ; Dio xliii. 25. 8 Suet. Jul. 42, 43.

9 See Calendar ; Mommsen, Hist, of Rome, v. 438, and Fischer, Rom. Zeittafeln, 292 seq.

10 Plut. Caes. 35. n Dio xliii. 47.

12 Dio xliii. 44. For this use of the title Imperator, see Mommsen, Hist of Rome. v. 332, and note.

developing the policy implied in the Gabinian and Manilian laws, and the precedent he established was closely followed by his successors. It was otherwise with the more difficult ques- • tion of the form under which this new executive authority should be exercised and the relation it should hold to the republican constitution. We must be content to remain in ignorance of the precise shape which Caesar intended ultimately to give to the new system. The theory that he contemplated a revival of the old Roman kingship 13 is supported by little more than the popular gossip of the day, and the form under which he actually wielded his authority can hardly have been regarded by so sagacious a statesman as more than a provisional arrangement. This form was that of the dictatorship; and in favour of the choice it might have been urged that the dictatorship was the office naturally marked out by republican tradition as the one best suited to carry the state safely through a serious crisis, that the powers it conveyed were wide, that it was as dictator that Sulla had reorganized the state, and that a dictatorship had been spoken of as the readiest means of legalizing Pompey's protectorate of the Republic in 53- roi-2. 52. The choice nevertheless was a bad one. It was associated with those very Sullan traditions from which Caesar was most anxious to sever himself; it implied necessarily the suspension for the time of all constitutional government; and, lastly, the dictatorship as held by Caesar could not even plead that it conformed to the old rules and traditions of the office. The " perpetual dictatorship " granted him after his crowning victory at Munda (45) was a contradiction in terms 709> and a repudiation of constitutional government which excited the bitterest animosity. 14

A second question, hardly less important, was that of the position to be assigned to the old constitution. So far as Caesar himself was concerned, the answer was for the time sufficiently clear. The old

constitution was not formally abrogated. The senate met and deliberated; the assembly passed laws and elected magistrates; there were still consuls, praetors, aediles, quaestors and tribunes; and Caesar himself, like his successors, professed to hold his authority by the will of the people. But senate, assembly and magistrates were all alike subordinated to the paramount authority of the dictator; and this subordination was, in appearance at least, more direct and complete under the rule of Caesar than under that of Augustus. Caesar was by nature as impatient as Augustus was tolerant of established forms; and, dazzled by the splendour of his career of victory and by his ubiquitous energy and versatility, the Roman public, high and low, pros- trated themselves before him and heaped honours upon him with a reckless profusion which made the existence of any authority by the side of his own an absurdity. 15 Hence under Caesar the old constitution was repeatedly disregarded, or suspended in a way which contrasted unfavourably with the more respectful attitude assumed by Augustus. For months together Rome was left without any regular magistrates, and was governed like a subject town by Caesar's prefects. 16 At another time a tribune was seen exercising authority outside the city bounds and invested with the imperium of a praetor. 17 At the elections, candidates appeared before the people backed by a written recommendation from the dictator, which was equivalent to a command. 18 Finally, the senate itself was

13 See Mommsen, Hist, of Rome, v. 333, and Ranke, Weltgcschickte, ii. 319 seq. According to Appian ii. no, and Plutarch, Caes. 64, the title rex was only to be used abroad in the East, as likely to strengthen Caesar's position against the Parthians.

14 Cicero, Phil. i. 2, 4, praises Antony, " quum dictatoris nomen . . . propter perpetuae dictaturae recentem memoriam funditus ex republica sustulisset."

15 For the long list of these, see Appian ii. 106; Dio xliii. 43-45; Plut. Caes. 57 ; Suet. Jul. 76. Cf. also Mommsen, Hist, of Rome, v. 329 ff. ; Watson, Cicero's Letters, App. x. ; Zumpt, Studia Romana, 199 seq. (Berlin, 1859).

16 Zumpt, Stud. Rom. 241 ; Suet. Jul. 76.

17 Cic. Ad Att. x. 80. ■

18 Suet. Jul. 41, " Caesar dictator . . . commendo vobis ilium et ilium, ut vestro suffragio suam dignitatem teneant."

transformed out of all likeness to its former self by the raising of its numbers to 900, and by the admission of old soldiers, sons of freedmen and even ” semi-barbarous Gauls.” 1 But, though Caesar’s high-handed conduct in this respect was not imitated by his immediate successors, yet the main lines of their policy were laid down by him. These were — (1) the muni- cipalization of the old republican constitution, and (2) its subordination to the paramount authority of the master of the legions and the provinces. In the first case he only carried further a change already in progress. Of late years the senate had been rapidly losing its hold over the Empire at large. Even the ordinary proconsuls were virtually independent potentates, ruling their provinces as they chose, and disposing absolutely of legions which recognized no authority but theirs. The consuls and praetors of each year had since 81 been stationed in Rome, and immersed in purely municipal business; and, lastly, since the enfranchisement of Italy, the comitia, though still recognized as the ultimate source of all authority, had become little more than assemblies of the city populace, and their claim to represent the true Roman people was indignantly questioned, even by republicans like Cicero. The concentration in Caesar’s hands of all authority outside Rome completely and finally severed all real connexion between the old institutions of the Republic of Rome and the government of the Roman Empire. But the institutions of the Republic not merely became, what they had originally been, the local institutions of the city of Rome; they were also subordinated even within these narrow limits to the para- mount authority of the man who held in his hands the army and the provinces. Autocratic abroad, at home he was the chief magistrate of the commonwealth; and this position was marked, in his case as in that of those who followed him, by a combination in his person of various powers, and by a general right of precedence which left no limits to his authority but such as he chose to impose upon himself. During the greater part of his reign he was consul as well as dictator. In 48, after his victory at Pharsalia, he was given the tribunicia potestas for life, 2 and after his second success at Thapsus the praefectura morum for three years. 3 As chief magistrate he convenes and presides in the senate, nominates candidates, conducts elections, carries laws in the assembly and administers justice in court.

4 Finally, as a reminder that the chief magistrate of Rome was also the autocratic ruler of the Empire, he wore even in Rome the laurel wreath and triumphal dress, and carried the sceptre of the victorious imperator. 5

Nor are we without some clue as to the policy which Caesar had sketched out for himself in the administration of the Empire, the government of which he had centralized in his own hands. The much-needed work of rectifying the frontiers 6 he was forced, by his premature death, to leave to other hands, but within the frontiers he anticipated Augustus in lightening the financial burdens of the provincials, 7 and in establishing a stricter control over the provincial governors, 8 while he went beyond him in his desire to consolidate the Empire by extending the Roman franchise 9 and admitting provincials to a share in the government. 10 He completed the Romanization of Italy by his enfranchisement of the Transpadane Gauls, 11 and by establishing throughout the peninsula a uniform system of municipal government, which under his successors was gradu- ally extended to the provinces. 12

1 Suet. Jul. 41, 76; Dio xliii. 47. 2 Dio xlii. 20.

3 Dio xliii. 14; Suet. Jul. 76. The statement is rejected by Mommsen; see Caesar.

4 Suet. Jul. 43, ” jus laboriosissime ac severissime dixit.” 6 App. ii. 106; Dio xliii. 43.

6 Plut. Caes. 58, ” awa.\j/ai rip k{ik\ov rrjs fiyiiiovlas” ; Suet. Jul. 44; Dio xliii. 51.

7 Plut. Caes. 48; App. v. 4.

8 He limited the term of command to two years in consular and one year in praetorian provinces; Cicero, Phil. i. 8, 19; Dio xliii. 25.

9 Suet. Jul. 42; Cic. Ad. Alt. xiv. 12.

10 Suet. Jul. 76. u Dio xli. 36; Tac. Ann. xi. 24.

12 Lex Julia municipalis; see Caesar.

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714.

On the eve of his departure for the East, to avenge tht death of Crassus and humble the power of Parthia, Attempted Caesar fell a victim to the wounded pride of the re- restom- publican nobles; and between the day of his death tioa ° fthe (March 15, 44) and that on which Octavian defeated 44-43 = ,' Antony at Actium (September 2, 31) lies a dreary 710-u. period of anarchy and bloodshed. 13 7l0,

For a moment, in spite of the menacing attitude of 723.

Caesar's self-constituted representative Marcus Antonius (Mark Antony), it seemed to one man at least as if the restoration of republican government was possible. With indefatigable energy Cicero strove to enlist the senate, the people, and above all the provincial governors in support of the old constitution. But, though his eloquence now and again carried all before it in senate-house and forum, it was powerless to alter the course of events. By the beginning of 43 civil war had re- commenced; in the autumn Antony was already threatening an invasion of Italy at the head of seventeen legions. Towards the end of October Antony and his ally M. Aemilius Lepidus coalesced with the young Octavian, who had been recently elected consul at the age of twenty, in spite of senatorial opposition; and the coalition was legalized The by the creation of the extraordinary commission for the second " reorganization of the commonwealth" known as the trium- " Second Triumvirate." 14 It was appointed for a ^^|L period of five years, and was continued in 37 for five 711-26. years more. 15 The rule of the triumvirs was inaugur- ated in the Sullan fashion by a proscription, foremost among the victims of which was Cicero himself. 16 In the next year the defeat of M. Junius Brutus and C. Cassius Longinus at Philippi, by the combined forces of Octavian and Antony, destroyed the last hopes of the republican party. 17 In 40 a threatened rupture between the two victors was avoided by the treaty concluded at Brundusium. Antony married Octavian's sister Octavia, and took command of the eastern half of the empire; Octavian appropriated Italy and the West; while Lepidus was forced to content himself with Africa. 18 For the next twelve years, while Antony was indulging in dreams of founding for himself and Cleopatra an empire in the East, and shocking Roman feeling by his wild excesses and his affectation of oriental magnificence, 19 Octavian was patiently consolidating his power. Lepidus his fellow-triumvir was in 36 ejected from Africa and banished to Circeii, while Sextus Pompeius, who had since his defeat at Munda maintained a semi-

piratical ascendancy in the western Medi- terranean, was decisively defeated in the same year, and his death in 35 left Octavian sole master of the West. The inevitable trial of strength between himself and Antony was not long delayed. In 32 Antony openly challenged the hostility of Octavian by divorcing Octavia in favour of the beautiful and daring Egyptian princess, with whom, as the heiress of the Ptolemies, he aspired to share the empire of the Eastern world. By a decree of the senate Antony was declared deposed from his command, and war was declared against Queen Cleopatra. 20 On the 2nd of September 31 was fought the battle of Actium. 21 Octavian's victory was complete. Antony and Cleopatra committed 724,

suicide (30), and the Eastern provinces submitted in 72s,

29. Octavian returned to Rome to celebrate his triumph and mark the end of the long-continued anarchy

13 For this period see Merivale, Romans under the Empire, vol. iii. ; Lange, Rom. Alterth. iii. 506 seq. ; Gardthausen, Augustus, bk. i.

14 The triumvirate was formally constituted in Rome (Nov. 27th) by a plebiscitum ; App. iv. 7; Dio xlvi, 56, xlvii. 2; Livy, Epit. cxx., " ut Illviri reipublicae constituendae per quinquennium essent."

16 Dio xlviii. 54; App. v. 95. For the date, cf., Mommsen, Staatsr. ii. 718. 16 Livy, Epit. cxx. ; App. iv. 7; and article Cicero.

17 Dio xlvii. 35-49; App. iv. 87-138.

18 Veil. ii. 76; Dio xlviii, 28; App. v. 65.

19 For Antony's policy and schemes in the East, see Ranke, Weltgeschichte, ii. 381-85; Mommsen, Provinces of the Roman Empire, ii. p. 24 sqq. ; Lange, Rom. Alterth. iii. 573 sqq.

20 Suet. Aug. 17; Dio 1. 1-8; Plutarch, Anton. 53.

21 Dio li. I ; Zonaras x. 30.

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EMPIRE: 27 b.c.-a.D. 284]

by closing the temple of Janus; 1 at the end of the next year he formally laid down the extraordinary powers which

he had held since 43, and a regular government was

established.

711.

III. The Empire.

Period I.: The Principate, 27 b.c.-a.d. 284 — (a) The Constitution of the Principate. — The conqueror of Antonius at Actium, the great-nephew and heir of the dictator Caesar, was now summoned, by the general consent of a world wearied out with twenty years of war and anarchy, 2 to the task of establish- ing a government which should as far as possible respect the forms and traditions of the Republic, without sacrificing that centralization of authority which experience had shown to be necessary for the integrity and stability of the Empire. It was a task for which Octavian was admirably fitted. To great administrative capacity and a quiet tenacity of purpose he united deliberate caution and unfailing tact; while his bourgeois birth 3 and genuinely Italian sympathies enabled him to win the confidence of the Roman community to an extent impos- sible for Caesar, with his dazzling pre-eminence of patrician descent, his daring disregard of forms and his cosmopolitan tastes.

The new system which was formally inaugurated by Octavian in 28-27 B.C. 4 assumed the shape of a restoration of the republic Th under the leadership of a princeps* Octavian volun-

Augustaa tarily resigned the extraordinary powers which he had system, held since 43, and, to quote his own words, ” handed 28-27 = over the republic to the control of the senate and 726-27. people of Rome.” 6 The old constitutional machinery was once more set in motion; the senate, assembly and magis- trates resumed their functions; 7 and Octavian himself was hailed as the ” restorer of the commonwealth and the champion of freedom.” 8 It was not so easy to determine what relation he himself, the actual master of the Roman world, should occupy towards this revived republic. His abdication, in any real sense of the word, would have simply thrown everything back into confusion. The interests of peace and order required that he

should retain at least the substantial part of his authority; 9 and this object was in fact accomplished, and the rule of the emperors founded, in a manner which has no parallel in history. Any revival of the kingly title was out of the question, and Octavian himself expressly refused the dictatorship. 10 Nor was any new office created or any new official title invented for his benefit. But by senate and people he was invested according to the old constitutional forms with certain powers, as many citizens had been before him, and so took his place by the side of the lawfully appointed magistrates of the republic; — only, to mark his pre-eminent dignity, as the first of them all, the senate decreed that he should take as an additional cognomen that of "Augustus," 11 while in common parlance he was hence- forth styled princeps, a simple title of courtesy, familiar to re- publican usage, and conveying no other idea than that of a

1 He celebrated his triumph on the 13th, 14th and 15th of August; Dio li. 21 ; Livy, Epit. cxxxiii. For the closing of the temple of Janus, see Livy i. 19; Veil. ii. 38; Suet. Aug. 22.

2 Tac. Ann. i. 2, " cunctos dulcedine otii pellexit."

3 Suet. Aug. i. His grandfather was a citizen of Velitrae; " municipalibus magisteriis contentus."

4 Mommsen, Staatsrecht, ii. 745 ff. ; Mon. Ancyranum (ed. Mommsen, Berlin, 1883), vi. 13-23, pp. I44~53; Herzog, Gesch. u. System d. rom. Verfassung, ii. p. 126 sqq.

5 Tac. Ann. iii. 28, " sexto demum consulatu . . . quae Illviratu jusserat abolevit, deditque jura quis pace et principe uteremur " ; Ibid. i. 9, " non regno neque dictatura sed principis nomine con- stitutam rempublicam."

6 Mon. Anc. vi. 13.

7 Veil. ii. 89, " prisca et antiqua reipublicae forma revocata."

8 Ovid, Fasti, i. 589. On a coin of Asia Minor Augustus is styled " libertatis P. R. vindex." The 13th of January, 27 B.C., was marked in the calendar as the day on which the republic was restored (C.I.L. i. p. 384). , , . LJ .

9 Dio Cassius describes Augustus as seriously contemplating abdica- tion (Hi. 1; liii. i-u); cf. Suet. Aug. 28.

10 Suet. Aug. 52; Mon. Anc. i. 31.

11 Mon. Anc. vi. 16, 21-23.

recognized primacy and precedence over his fellow-citizens. 12 The ideal sketched by Cicero in his De Republica, of a constitu- tional president of a free republic, was apparently realized; but it was only in appearance. For in fact the special prero- gatives conferred upon Octavian gave him back in substance the autocratic authority he had resigned, and as between the restored republic and its new princeps the balance of power was overwhelmingly on the side of the latter.

Octavian had held the imperium since 43; in 33, it rl1, 721 – is true, the powers of the triumvirate had legally se ui e . expired, but he had continued to wield his authority, meat „f as he himself puts it, 13 ” by universal consent.” In 27 27 = 727. he received a formal grant of the imperium from the ?27.

senate and people for the term of ten years, and his provincia was defined as including all the provinces in which military authority was required and legions were stationed. 14 He was declared commander-in-chief of the Roman army, and granted the exclusive right of levying troops, of making war and peace, and of concluding treaties. 15 As consul, moreover, he not only continued to be the chief magistrate of the state at home, but took precedence, in virtue of his majus imperium, over the governors of the ” unarmed provinces,” which were still nomin- ally under the control of the senate. Thus the so-called ” re- storation of the republic ” was in essence the recognition by law of the personal supremacy of Octavian, or Augustus, as he must henceforth be called.

In 23 an important, change was made in the formal basis of Augustus’s authority. In that year he laid down the consul- ship which he had held each year since 31, and could yi, e therefore only exert his imperium pro consule, like re-settle- the ordinary governor of a province. He lost his meat of authority as chief magistrate in Rome and his 23-731. precedence over the governors of senatorial pro- 723 –

vinces. To remedy these defects a series of extraordinary offices were pressed upon his acceptance; but he refused them all, 16 and caused a number of enactments to be passed which determined the character of the principate for the next three centuries. 17 Firstly, he was exempted from the disability attaching to the tenure of the imperium by one who was not an actual magistrate, and permitted to retain and exercise it in Rome. Secondly, his imperium was declared to be equal with that of the consuls, and therefore superior to that of all other

holders of that power. Thirdly, he was granted equal rights with the consuls of convening the senate and introducing business, of nominating candidates at elections, 18 and of issuing edicts. 19 Lastly, he was placed on a level with the consuls in outward rank. Twelve lictors were assigned to him and an official seat between those of the consuls themselves (Dio liv. 10).

Thus the proconsular authority 20 was for the first time admitted e within the walls of Rome; but Augustus was too cautious a statesman to proclaim openly the fact that Tribun- the power which he wielded in the city was the same lcl * as that exercised in camps and provinces by a Roman P° testas – military commander. Hence he sought for a title which should disguise the nature of his authority, and found it in the

12 The explanation of princeps as an abbreviated form of princeps senatus is quite untenable. For its real significance, see Mommsen, Staatsrecht, ii. 774; Pelham, Journ. of Phil. vol. viii. It is not an official title.

13 Mon. Anc. 6, 14, ” per consensum universorum.”

14 Dio liii. 12 ; Suet. Aug. 47. 15 Dio, I.e.

16 He was offered the dictatorship, a life-consulship, a ” cura legum et morum.” It is stated by Suetonius (Aug. 53) and Dio (liv. 10) that he accepted the last named; but this is disproved by his own language in the Mon. Anc. (i. 31); cf. Pelham, Journ. of Philol. xvii. 47.

17 Dio liii. 32. Part of the law by which the rights essential to the principate were conferred upon Vespasian is extant; see Rushforth, Latin Historical Inscriptions, No. 70 (the Lex de imperio Vespasiani).

18 Tac. Ann. i. 81. 19 Lex de imperio, 11. 17-21.

20 The term proconsular imperium, which we find used, e.g., by Tacitus, was not employed in republican times, and Augustus himself speaks of his consulare imperium {Mon. Anc. 2, 5, 8).

731,

731. 749, 752.

742.

732.

” tribunician power,” which had been conferred upon him for life in 36, and was well suited, from its urban and demo- cratic traditions, to serve in Rome as ” a term to ex- press his supreme position.” l From 23 onwards the tribunicia potestas appears after his name in official inscriptions, together with the number indicating the period during which it had been held (also reckoned from 23) ; it was in virtue of this power that Augustus introduced the social re- forms which the times demanded; 2 and, though far inferior to the imperium in actual importance, it ranked with or even above it as a distinctive prerogative of the emperor or his chosen colleague. 3 The imperium and the tribunicia potestas were the two pillars upon which the authority of Augustus rested, and the other offices and privileges conferred upon him were of secondary importance. After 23 he never held the consulship save in 5 and 2 B.C., when he became the colleague of his grandsons on their introduction to public life. He permitted the triumvir Lepidus to retain the chief ponti- ficate until his death, when Augustus naturally became ponlifex maximus (12 B.C.). 4 He proceeded with the like caution in reorganizing the chief departments of the public service in Rome and Italy. The cura annonae, i.e. the supervision of the corn supply of Rome, was entrusted to him in 22 B.C., 5 and this important branch of administration thus came under his personal control; but the other boards (curae), created during his reign to take charge of the roads, the water-supply, the regulation of the Tiber and the public buildings, were composed of senators of high rank, and regarded in theory as deriving their authority from the senate. 6

Such was the ingenious compromise by which room was found for the master of the legions within the narrow limits of the old Roman constitution. Augustus could say with truth that he had accepted no office which was ” contrary to the usage of our ancestors,” and that it was only in dignity that he took precedence of his colleagues. Nevertheless, as every thinking man must have realized, the compromise was unreal, and its significance was ambiguous. It was an arrangement avowedly of an exceptional and temporary character, yet no one could suppose that it would in effect be otherwise than permanent. The powers voted to Augustus were (like those conferred

upon Pompey in 67 B.C.) voted only to him, and (save the tribunicia potestas) voted only for a limited time; in 27 he received the imperium for ten years, and it was afterwards renewed for successive periods of five, five, ten and ten years. 7 In this way the powers of the principate were made coextensive in time with the life of Augustus, but there was absolutely no provision for hereditary or any other form of succession, and various expedients were devised in order to indicate the destined successor of the princeps and to bridge the gap created by his death. Ultimately Augustus associated his stepson Tiberius with himself as co-regent. The imperium and the tribunicia potestas were conferred upon him, and he was thus marked out as the person upon whom the remaining powers of the principate would naturally be bestowed after the death of his stepfather. But succeeding emperors did not always indicate their successors so clearly, and, in direct contrast to the maxim that ” the king never dies,” it has been well said that the Roman principate died with the death of the princeps?

In theory, at least, the Roman world was governed according to the ” maxims of Augustus” (Suet. Ner. 10), down to the Changes time of Diocletian. Even in the 3rd century there is in the gt ;jj m name at i eas t a republic, of which the emperor

constitu- . , . . 1,11.1- • 1 . ■

Hon of the 1S m strictness only the chief magistrate, deriving priacl- his authority from the senate and people, and with pate. prerogatives limited and defined by law. The case

is quite different when we turn from theory to practice. The

1 Tac. Ann. iii. 56; ” summi fastigii vocabulum.”

2 Mon. Anc. Grace. 3, 19.

3 Tac. Ann. i. 3 (of Tiberius), “collega imperii, consors tribuniciae potestatis “; cf. Mommsen, Staatsr. ii. 1160.

4 Suet. Aug. 31. 6 Mon. Anc. 1, 32; Dio liv. 1. 6 See Hirschfeld, Verwaltungsgesch. i. 173.

‘ Dio liii. 13, 16. s Mommsen, Staatsr. ii. 1 143.

687. 727.

division of authority between the republic and its chief magis- trate became increasingly unequal. Over the provinces the princeps from

the first ruled autocratically; and this autocracy reacted upon his position in Rome, so that it became every year more difficult for a ruler so absolute abroad to maintain even the fiction of republican government at home. The republican institutions, with the partial exception of the senate, lose all semblance of authority outside Rome, and even as the municipal institutions of the chief city of the empire they retain but little actual power. The real government even of Rome passes gradually into the hands of imperial prefects and com- missioners, and the old magistracies become merely decorations which the emperor bestows at his pleasure. At the same time the rule of the princeps assumes an increasingly personal char- acter, and the whole work of government is silently concen- trated in his hands and in those of his own subordinates. Closely connected with this change is the different aspect presented by the history of the empire in Rome and Italy on the one hand and in the provinces on the other. Rome and Italy share in the decline of the republic. Political independence and activity die out ; their old pre-eminence and exclusive privileges gradually disappear; and at the same time the weight of the overwhelm- ing power of the princeps, and the abuses of their power by individual principes, press most heavily upon them. On the other hand, in the provinces and on the frontiers, where the imperial system was most needed, and where from the first it had full play, it is seen at its best as developing or protecting an orderly civilization and maintaining the peace of the world.

The decay of the republican institutions had commenced before the revolutionary crisis of 49. It was accelerated by the virtual suspension of regular government between Decay 49 and 28; and not even the diplomatic deference ‘rj£~a towards ancient forms which Augustus displayed institu- availed to conceal the unreality of his work of tions. restoration. The comitia received back from him 70S < 726 ' "their ancient rights" (Suet. Aug. 40), and during his lifetime they continued to pass laws and to elect magistrates. But after the end of the reign of Tiberius comma. we have only two instances of legislation by the assembly in the ordinary way, 9 and the law-making of the empire is performed either by decrees of the senate or by imperial edicts and constitutions. Their prerogative of electing magistrates was, even under Augustus, robbed of most of its importance by the control which the princeps exercised over their choice by means of his rights of nomination and commendation, which effectually secured the election of his own nominees. 10 By Tiberius this restricted prerogative was still further curtailed. The candidates for all magistracies except the consulship were thenceforward nominated and voted for in the senate-house and by the senators, 11 and only the

formal return of the result (renuntiatio) took place in the assembly (Dio lviii. 20). And, though the election of consuls was never thus transferred to the senate, the process of voting seems to have been silently abandoned. In the time of the younger Pliny we hear only of the nomination of the candidates and of their formal re- nuntiatio in the Campus Martius. 12 The princeps . himself as long as the Principate lasted, continued to receive the tribunicia potestas by a vote of the assembly, and was thus held to derive his authority from the people. 13

9 The plebiscita of Claudius, Tac. Ann. xi. 13, 14, and the lex agraria of Nerva; Digest, xlvii. 21, 3; Dio lxviii. 2; Plin. Epp. vii. 31.

10 On these rights, the latter of which was not exercised in the case of the consulship until the close of Nero's reign, see Mommsen, Staatsr. ii. 916-28; Tac. Ann. i. 14, 15, 81; Suet. Aug. 56; Dio lviii. 20.

11 Tac. Ann. i. 15, "comitia e campo ad patres translata sunt"; compare Ann. xiv. 28. The magistracy directly referred to is the praetorship, but that the change affected the lower magistracies also is certain; see, e.g., Pliny's Letters, passim, especially iii. 20, vi. 19.

12 Plin. Paneg. 92.

13 Gaius i. 5, " cum ipse imperator per legem imperium accipint."

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This almost complete effacement of the comitia was largely due to the fact that they had ceased to represent anything but The the populace of Rome, and the comparatively greater

magis- vitality shown by the old magistracies is mainly trades. attributable to the value they continued to possess in the eyes of the Roman upper class. But, though they were eagerly sought (Plin. Epp. ii. 9, vi. 6), and conferred on their holders considerable social distinction, the magistrates ceased, except in name, to be the popularly chosen executive officers of the Roman state. In the administration of the empire at large they had no share, if we except the subordinate duties still assigned to the quaestor in a province. In Rome, to which their sphere of work was limited, they were over-

shadowed by the dominant authority of the princeps, while their range of duties was increasingly circumscribed by the gradual transference of administrative authority, even within the city, to the emperor and his subordinate officials. And their de- pendence on the princeps was confirmed by the control he exercised over their appointment. For all candidates the approval, if not the commendation, of the princeps became the indispensable condition of success, and the princeps on his side treated these ancient offices as pieces of preferment with which to reward his adherents or gratify the ambition of Roman nobles. The dignity of the office, too, was impaired by the practice, begun by Caesar and continued by Augustus and his Consul- successors, of granting the insignia to men who had not ship. held the actual magistracy itself. 1 The consulship was

still the highest post open to the private citizen, and consular rank a necessary qualification for high office in the provinces; 2 but the actual consuls have scarcely any other duties than those of presiding in the senate and occasionally executing its decrees, while their term of office dwindles from a year to six and finally to two months. 3 In the age of Tacitus and the younger Pliny, the contrast is striking between the high estimate set on the dignity of the office and the frankness with which its limited _ powers and its dependence on the emperor are ship. acknowledged. 4 The praetors continued to exercise

their old jurisdiction with little formal change down at least to the latter half of the second century, but only as subordinate to the higher judicial authority of the ship. ‘ emperor. 6 The aediles retained only such petty police duties as did not pass to one or another of the imperial prefects and commissioners. The tribunat; fared still worse, for, by the side of the tribunicia potestas wielded by the princeps, it sank into insignificance. 6 The quaestorship suffered less change than any other of the old offices. It kept its place as the first step on the ladder sh’p* ° r ‘ °f promotion, and there was still a quaestor attached to each governor of a senatorial province, to the consuls in Rome, and to the princeps himself. 7

The senate alone among republican institutions retained some importance and influence, and it thus came to be regarded The as sharing the government of the Empire with the

Senate. princeps himself. It nominally controlled the adminis- tration of Italy and of the ” public provinces,” whose governors

1 On the permission to use the ornamenta consularia, praetoria, &c, see Mommsen, Staatsr. i. 455 sqq.; Suet. Jul. 76; Claud, v. 24; Tac.

Ann. xii. 21, xv. 72 ; Dio Cass. lx. 8. Cf. also Friedlander, i. 691.

2 For a consular senatorial province and for the more important of the imperial legateships.

5 Mommsen, Stoater. ii. 82 sqq. Six months was the usual term down to the death of Nero; we have then four or two months; in the 3rd century two is the rule. The consuls who entered on office on the 1st of January were styled consults ordinarii, and gave their name to the year, whilst the others were distinguished as consules suffecti or minores ; Dio Cass, xlviii. 35.

4 Plin. Paneg. 92; Tac. Hist. i. I, Agric. 44.

s Mommsen, Staatsr. ii. 225.

- Plin. Epp. i. 23, ” inanem umbram et sine honore nomen.” There are a few instances of the exercise by the tribunes of their power of interference within the senate; Tac. Ann. i. 77, vi. 47, xvi. 26; Plin. Epp. ix. 13.

7 Mommsen, Staatsrecht, ii. 567-69. Pliny was himself ” quaestor Caesaris,” Epp. vii. 16.

Trlbu-

it appointed. It is to the senate, in theory, that the supreme power reverts in the absence of a princeps. It is by decree of the senate that the new princeps immediately receives his powers and privileges, 8 though he is still supposed to derive them ultimately from the people. After the cessation of all legislation by the comitia, the only law-makii;g authority, other than that of the princeps by his edicts, was that of the senate by its decrees. 9 Its judicial authority was co-ordinate with that of the emperor, and at the close of the 1st century we find the senators claiming, as the emperor’s ” peers,” to be exempt from his jurisdiction. 10 But in spite of the outward dignity of its position, and of the deference with which it was frequently treated, the senate became gradually almost as powerless in reality as the comitia and the magistracies. The senators continued indeed to be taken as a rule from the ranks of the wealthy, and a high property qualification was established by Augustus as a condition of membership; but this merely enabled the emperors to secure their own ascendancy by sub- sidizing those whose property fell short of the required standard, and who thus became simply the paid creatures of their imperial patrons. 11 Admission to the senate was possible only by favour of the emperor, both as controlling the elections to the

magis- tracies, which still gave entrance to the curia, and as invested with the power of directly creating senators by adlectio, a power which from the time of Vespasian onwards was freely used. 12 As the result, the composition of the senate rapidly altered. Under Augustus and Tiberius it still contained many represen- tatives of the old republican families, whose prestige and ancestral traditions were some guarantee for their independence. But this element soon disappeared. The ranks of the old nobility were thinned by natural decay and by the jealous fears of the last three Claudian emperors. Vespasian 13 flooded the senate with new men from the municipal towns of Italy and the Latinized provinces of the West. Trajan and Hadrian, both provincials themselves, carried on the same policy, and by the close of the 2nd century even the Greek provinces of the East had their representatives in the senate. Some, no doubt, of these provincials, who constituted the great majority of the senate in the 3rd century, were men of wealth and mark, but many more were of low birth, on some rested the stain of a servile descent, and all owed alike their present position and their chances of further promotion to the emperor. 14 The pro- cedure of the senate was as completely at the mercy of the princeps as its composition. He was himself a senator and the first of senators; 15 he possessed the magisterial prerogatives of convening the senate, of laying business before it, and of carrying senatus consulta; 1 * above all, his tribunician power enabled him to interfere at any stage, and to modify or reverse its decisions. The share of the senate in the government was in fact determined by the amount of administrative activity which each princeps saw fit to allow it to exercise, and this share became steadily smaller. The jurisdiction assigned it by Augustus and Tiberius was in the 3rd century limited to the hearing of such cases as the emperor thought fit to send for trial, and these became steadily fewer in number. Its control of the state treasury, as distinct from the imperial fiscus, was in fact little more than nominal, and became increas- ingly unimportant as the great bulk of the revenue passed

8 Mommsen, Staatsrecht, ii. 842; Tac. Ann. xii. 69, Hist. i. 47. In the 3rd century the honours, titles and powers were conferred en bloc by a single decree; Vit. Sev. Alex. I.

9 Gaius i. 4; Ulpian, Dig. i. 3, 9.

10 Under Domitian ; Dio Cass, lxvii. 2. Even Septimius Severus caused a decree to be passed ” ne liceret imperatori inconsulto senatu occidere senatorem “; Vita Severi, 7.

11 Suet. Nero, 10, Vesp. 17.

n Mommsen, Staatsrecht, ii. 939 sqq. The power was derived from the censorial authority. Domitian was censor for life; Suet. Dotn. 8. After Nerva it was exercised as falling within the general authority vested in the princeps; Dio liii. 17.

13 Suet. Vesp. 90; Tac. Ann. iii. 55.

14 See on this point Friedlander, Sittengeschichte Roms, i. 237 sqq. 16 Mon. Ancyr. Gr. iv. 3, irpwrov 6£iiiy.a.Tos t6tov.

16 Lex de imp. Vesp., C.I.L. vi. 930: ” Senatum habere, relationem facere, remittere; Seta, per relationem discessionemque facere. ”

izatloa 0/ author- ity: the Imperial

service.

into the hands of the emperor. Even in Rome and Italy its control of the administration was gradually transferred to the prefect of the city, and after the reign of Hadrian to imperial officers (juridici) charged with the civil administration. 1 The part still played by its decrees in the modification of Roman law has been dealt with elsewhere (see Senate), but it is clear that these decrees did little else than register the expressed wishes of the emperor and his personal advisers.

The process by which all authority became centralized in the hands of the princeps and in practice exercised by an organ- Centra/- ized bureaucracy 2 was of necessity gradual; but it had its beginnings under Augustus, who formed the equestrian order (admission to which was henceforth granted only by him) into an imperial service, partly civil and partly military, whose members, being im- mediately dependent on the emperor, could be employed on tasks which it would have been impossible to assign to senators (see Equites). From this order were drawn the armies of ” procurators ” — the term was derived from the practice of the great business houses of Rome — who ad- ministered the imperial revenues and properties in all parts of the empire. Merit was rewarded by independent governor- ships such as those of Raetia and Noricum, or the com- mand of the naval squadrons at Misenum and Ravenna; and the prizes of the knight’s career were the prefectures of the praetorian guard, the corn-supply

and the city police, and the governorship of Egypt. The household offices and imperial secretaryships were held by freedmen, almost always of Greek origin, whose influence became all-powerful under such emperors as Claudius. 3 The financial secretary (a rationibus) and those who dealt with the emperor's correspondence (ab epistulis) and with petitions {a libellis) were the most important of these.

This increase of power was accompanied by a corresponding elevation of the princeps himself above the level of all other Outward citizens. The comparatively modest household and spien- simple life of Augustus were replaced by a more than dour. regal splendour, and under Nero we find all the out-

ward accessories of monarchy present, the palace, the palace guards, the crowds of courtiers, and a court ceremonial. In direct opposition to the republican theory of the principate, members of the family of the princeps share the dignities of his position. The males bear the cognomen of Caesar, and are in- vested, as youths, with high office; their names and even those of the females are included in the yearly prayers for the safety of the princeps; 4 their birthdays are kept as festivals; the praetorian guards take the oath to them as well as to the princeps himself. The logical conclusion was reached in the practice of Caesar- worship, 5 which was in origin the natural expression of a wide- spread sentiment of homage, which varied in form in different parts of the empire and in different classes of society, but was turned to account by the statecraft of Augustus to develop something like an imperial patriotism. The official worship of the deified Caesar, starting from that of the " divine Julius," gave a certain sanctity and continuity to the regular succession of the emperors, but it was of less importance politically than the worship of " Rome and Augustus," first instituted in Asia Minor in 29 B.C., and gradually diffused throughout the provinces, as a symbol of imperial unity. It must be observed that living emperors were not officially worshipped by Roman citizens; yet we find that even in Italy an unauthorized worship of Augustus sprang up during his lifetime in the country towns. 6

1 Vit. Hodr. 22 ; " Juridici " were appointed by Marcus Aurelius, Vit. Ant. 11 ; Marquardt i. 224.

2 On the growth of the imperial bureaucracy see Hirschfeld, Die kaiserlichen Verwaltungsbeamten bis auf Diocletian (1905).

3 For the position of the imperial freedmen under Claudius, see Friedlander i. 88 sqq.; Tac. Ann. xii. 60, xiv. 39, Hist. ii. 57, 95.

4 Acta Vr. Arval. (ed. Henzen), 33, 98, 99.

5 For Caesar-worship, see Mommsen, Staatsr. ii. 755 sqq. ; Wissowa, Religion und Kultus der Romer , p. 283 sqq., and Kornemann in Beitrdge zur alien Geschichte, i.

6 See Rushforth, Roman Historical Inscriptions, Nos. 38 sqq. and notes.

On the accession of Augustus, there could be little doubt as to the nature of the work that was necessary, if peace and pros- perity were to be secured for the Roman world. He was called upon to justify his position by rectifying the frontiers and strengthening their defences, by reforming the system of pro- vincial government, and by reorganizing the finance; and his success in dealing with these three difficult problems is sufficiently proved by the prosperous condition of the empire for a century and a half after his death. To secure peace it was necessary to establish on all sides of the empire really defensible frontiers; and this became possible now that for the . e «._ first time the direction of the foreign policy of the state and of its military forces was concentrated in the hands of a single magistrate. To the south and west the generals of the re- public, and Caesar himself, had extended the authority of Rome to the natural boundaries formed by the African deserts and the Atlantic Ocean, and in these two directions Augustus's task was in the main confined to the organization of a settled Roman government within these limits. In Africa the client state of Egypt was ruled by Augustus as the successor of the Ptolemies, and administered by his deputies {praefecti) , and the kingdom of Numidia (25 B.C.) was incorporated with the old province of Africa. In Spain the hill-tribes of the north-west were finally subdued and a third province, Lusitania, established. 7 In Gaul Augustus (27 B.C.) established in addition to the " old province " the three new ones of Aquitania, Lugdunensis and Belgica, 8 which included the territories conquered by Julius Caesar. Towards the north the republic had left the civilized countries bordering on the Mediterranean with only a North very imperfect defence against the threatening mass of barbarian tribes beyond them. The result 9 of Augustus's policy was to establish a protecting line of provinces running from the Euxine to the North Sea, and covering the peaceful districts to the south, — Moesia (a.d. 6), Pannonia (a.d. 9), Noricum (15 b.c), Raetia (15 B.C.) and Gallia Belgica. Roman rule was thus carried up to the natural frontier lines of the Rhine and the Danube. It was originally intended to make the Elbe the frontier of the empire; but after the defeat of P. Quintilius Varus (a.d. 9) the forward policy was abandoned. Tiberius recalled Germanicus as soon as Varus had been avenged; and after the peace

with Maroboduus, the chief of the Marcomanni on the upper Danube, in the next year (a.d. 17), the defensive policy recommended by Augustus was adopted along the whole of the northern frontier. The line of the great rivers was held by an imposing mass of troops. Along the Rhine lay the armies of Upper and Lower Germany, consisting of four legions each; eight more guarded the Danube and the frontiers of Pannonia and Moesia. At frequent intervals along the frontier were the military colonies, the permanent camps and the smaller inter- vening castetta. Flotillas of galleys cruised up and down the rivers, and Roman roads opened communication both along the frontiers and with the seat of government in Italy.

In the East, Rome was confronted with a well-organized and powerful state whose claims to empire were second only to her own. The victory of Carrhae (53 B.C.) had encouraged among the Parthians the idea of an invasion of Syria and East

Asia Minor, while it had awakened in Rome a genuine fear of the formidable power which had so suddenly arisen in the East. Caesar was at the moment of his death preparing to avenge the death of Crassus by an invasion of Parthia, and Antony's schemes of founding an Eastern empire which should rival that of Alexander included the conquest of the kingdom beyond the Euphrates. Augustus, however, adhered to the policy which he recommended to his successors of " keeping the empire within its bounds "; and the Parthians, weakened by internal feuds and dynastic quarrels, were in no mood for vigorous action. Roman pride was satisfied by the restoration of the standards taken at Carrhae. Four legions guarded the line of the Euphrates, and, beyond the frontiers of Pontus and

7 Marquardt i. 257 ; Mommsen, Provinces, i. 64.

8 Marquardt i. 264; Mommsen, Provinces, i. 84 seq.

9 See especially Mommsen, Provinces, i. caps. 4 and 6.

Cappadocia, Armenia was established as a " friendly and independent ally." 1

Next in importance to the rectification and defence of the frontiers

was the reformation of the administration, and the . , restoration of prosperity to the distracted and exhausted trative provinces. The most serious defect of the republican reforms system had been the absence of any effective control in the over t jj e R oman officials outside Italy. This was viaces. now supplied by the general proconsular authority vested in the emperor. The provinces were for the first time treated as departments of a single state, while their governors, from being independent and virtually irre- sponsible rulers, became the subordinate officials of a higher authority. 2 Over the legati of the imperial provinces the control of the emperor was as complete as that of the republican proconsul over his staff in his own province. They were ap- pointed by him, held office at his good pleasure, and were directly responsible to him for their conduct. The proconsuls of the senatorial provinces were in law magistrates equally with the princeps, though inferior to him in rank; it was to the senate that they were as of old responsible; they were still selected by lot from among the senators of consular and praetorian rank. But the distinction did not seriously interfere with the paramount authority of the emperor. The provinces left nominally to the senate were the more peaceful and settled districts in the heart of the empire, where only the routine work of civil administration was needed, and where the local municipal governments were as yet comparatively vigorous. The sena- torial proconsuls themselves were indirectly nominated by the emperor through his control of the praetorship and consulship. They wielded no military and only a strictly subordinate financial authority, and, though Augustus and Tiberius, at any rate, encouraged the fiction of the responsibility of the senatorial governors to the senate, it was in reality to the emperor that they looked for direction and advice, and to him that they were held accountable. Moreover, in the case of all governors this accountability became under the empire a reality. Prose- cutions for extortion (de pecuniis repetundis) , which were now transferred to the hearing of the senate, are tolerably frequent during the first century of the empire; but a more effective check on maladministration lay in the appeal to Caesar from the decisions of any governor, which was open to every provincial, and in the right of petition. Finally, the authority both of the legate and the proconsul was weakened by the presence of the imperial procurator, to whom was entrusted the administration of the fiscal revenues; while both legate and proconsul were deprived of that right of requisitioning – supplies which, in spite of a long series of restrictive laws, had been the most powerful instrument of oppression in the hands of republican governors. The financial reforms of Augustus 3 are marked by the same desire to establish an equitable, orderly and economical system, and by the same centralization of authority in the emperor's hands.

The institution of an imperial census, or valuation of all land throughout the empire, and the assessment upon this basis of a uniform land tax, in place of the heterogeneous and irregular payments made under the republic, were the work of Augustus, though the system was developed and perfected by the emperors of the 2nd century and by Diocletian. The land tax itself was directly collected, either by imperial officials or by local authorities responsible to them, and the old wasteful plan of selling the privilege of collection to publicani was henceforward applied only to such indirect taxes as the customs duties. The rate of the land tax was fixed by the emperor, and with him rested the power of remission even in senatorial provinces. 4 The effect of these reforms is clearly visible in the improved financial condition of

‘- Mommsen, Provinces, cap. 9. Armenia, however, long continued to be a debatable ground between Rome and Parthia — passing alternately under the influence of one or the other.

2 For the provincial reforms of Augustus, see Marquardt, Staats-verw., i. 544 sqq.

3 Marquardt, ii. 204 sqq.; Hirschfeld, Verwaltungsbeamten, 55 sqq.

4 Tac. Ann. ii. 47.

Financial reforms.

the empire. Under the republic the treasury had been nearly always in difficulties, and the provinces exhausted and im- poverished. Under the emperors, at least throughout the 1st century, in spite of a largely increased expenditure on the army, on public works, on shows and largesses, and on the machinery of government itself, the better emperors, such as Tiberius and Vespasian, were able to accumulate large sums, while the provinces show but few signs of distress. Moreover, while the republic had almost entirely neglected to liberal develop the internal resources of the provinces, policy Augustus set the example of a liberal expenditure towards on public works, in the construction of harbours, tb . e pro ‘ roads and bridges, the reclamation of waste lands, and the erection of public buildings. 6 The crippling re- strictions which the republic had placed on freedom of inter- course and trade, even between the separate districts of a single province, disappeared under the empire. In the eyes of the republican statesmen the provinces were merely the Italy and estates of the Roman people, but from the reign of the pro- Augustus dates the gradual disappearance of the old vinces

pre-eminence of Rome and Italy. It was from the >”” ierthe

• iii. ■ • , , empire.

provinces that the legions were increasingly recruited;

provincials rose to high rank as soldiers, statesmen and men of letters; 6 and the methods of administration, formerly distinctive of the provinces, were adopted even in Rome and Italy. From Augustus himself, jealous as he was of the tradi- tions and privileges of the ruling Roman people, date the rule of an imperial prefect 7 in the city of Rome, the division of Italy into regiones in the provincial fashion, and the permanent quartering there of armed troops. 8

Augustus founded a dynasty which occupied the throne for more than half a century after his death. The first and by. far the ablest of its members was Tiberius (a.d. 14-37). The Julio- He was undoubtedly a capable and vigorous ruler, ciaudian who enforced justice in the government of the pro- Une ‘ vinces, maintained the integrity of the frontiers and husbanded the finances of the empire, but he became intensely unpopular in Roman society, and was painted as a cruel and odious tyrant. His successor, Gaius (a.d. 37-41), generally known as Caligula, was the slave of his wild caprices and uncontrolled passions, which issued in manifest insanity. He was followed by his uncle, Claudius (a.d. 41-54), whose personal uncouthness made him an object of derision to his contemporaries, but who was by no means devoid of statesmanlike faculties. His reign left an abiding mark on the history of the empire, for he carried forward its development on the lines intended by Augustus. Client-states were absorbed, southern Britain was conquered, the Romanization of the West received a powerful impulse, public works were executed in Rome and Italy, and the organ- ization of the imperial bureaucracy made rapid strides. Nero (a.d. 54-68), the last of the Julio-Claudian line, has been handed down to posterity as the incarnation of monstrous vice and fantastic luxury. But his wild excesses scarcely affected the prosperity of the empire at large; the provinces were well governed, and the war with Parthia led to a compromise in the . matter of Armenia which secured peace for half a century. 9

6 Suet. Aug. 18, 47. „_

6 Jung, Die romanischen Landschaften (Innsbruck, 1881); Budin- sky, Die Ausbreitung d. lateinischen Sprache (Berlin, 1881).

7 The praefectus urbi, unlike the other imperial prefects, was always a

senator. He commanded the three cohortes urbanae, which pre- served order in the city, and possessed a power of jurisdiction which tended to increase in importance. The office, which was only tem- porary under Augustus, became a permanent one under his successor.

8 Besides the cohortes urbanae mentioned above, the nine regiments of the imperial guard (cohortes praetorianae) were quartered in Rome. The guards were not at first concentrated but billeted in Rome and the neighbouring towns ; the praetorian barracks on the Esquiline were built under Tiberius (Tac. Ann. iv. 2). Augustus also formed the quasi-military police force of the vigiles (in seven cohorts), which performed the duties of a fire brigade and night watch. Police duties in those parts of Italy which were subject to brigandage were performed by stationes militum (Suet. Aug. 32).

9 For an estimate of the Julio-Claudian Caesars, based on the 1 results of recent research, see Pelham in Quarterly Review (April

The fall of Nero and the extinction of the ” progeny of the Caesars ” was followed by a war of succession which revealed the military basis of the Principate and the weakness of the tie connecting the emperor with Rome. Galba, Otho, Vitellius and Vespasian represented in turn the legions of Spain, the household troops, the army of the Rhine, and a coalition of the armies of the Danube and the Euphrates; and all except Otho were already de facto emperors when they entered Rome. The final survivor in the struggle, Vespasian (a.d. 69-79), was a man of comparatively humble origin, and as the Principate ceased to possess the prestige of high descent it became imperatively Tne necessary to remove, as far as possible, the anomalies

Flavian of the office and to give it a legitimate and permanent aad form. Thus we find an elaborate and formal system

Anton ne Q f t j t j es substituted for the personal names of the ‘ Julio-Claudian emperors, an increasing tendency to insist on the inherent prerogatives of the Principate (such as the censorial power), and an attempt to invest Caesarism with an hereditary character, either by natural descent or by adop- tion, while the worship of the Divi, or deified Caesars, was made the symbol of its continuity and legitimacy. The dynasty of Vespasian and his sons (Titus, A. d. 79-81, Domitian,

a.d. 81-96) became extinct on the murder of the last named, whose high- handed treatment of the senate earned him the name of a tyrant; his successor, Nerva (a.d. 96-98), opened the series of ” adop- tive ” emperors (Trajan, a.d. 98-117, Hadrian, 117-38, Antoninus Pius, 138-61, Marcus Aurelius, 161-80) under whose rule the empire enjoyed a period of internal tranquillity and good government. Its boundaries were extended by the subjugation of northern Britain (by Agricola, a.d. 78-84; see Britain, § Roman), by the annexation of the districts included in the angle of the Rhine and Danube under the Flavian emperors, and by the conquest of Dacia (the modern Transyl- vania) under Trajan (completed in a.d. 106). Trajan also annexed Arabia Petraea and in his closing years invaded Parthia and formed provinces of Armenia, Mesopotamia and Assyria; but these conquests were surrendered by his successor, Hadrian, who set himself to the task of consoli- dating the empire and perfecting its defences. To him is due the system of permanent limites or frontier fortifications, such as the wall which protected northern Britain and the palisade which replaced the chain of forts established by the Flavian emperors from the Rhine to the Danube. 1 The construction of these defences showed that the limit of expansion had been reached, and under M. Aurelius the tide began to turn. A great part of his reign was occupied with wars against the Marcomanni, Quadi, Sarmatians, &c, whose irruptions seriously threatened the security of Italy. Henceforth Rome never ceased to be on the defensive. Con- Within the frontiers the levelling and unifying

anion of process commenced by Augustus had steadily pro- theproceeded. A tolerably uniform provincial system rinces. covered the whole area of the empire. The client states had one by one been reconstituted as provinces, and even the government of Italy had been in many respects assimilated to the provincial type. The municipal system had of the spread widely ; the period from Vespasian to Aurelius

muni- witnessed the elevation to municipal rank of an im- cip’i mense number of communities, ‘ not only in the old

sys em. p rov j nce s of the West, in Africa, Spain ancf Gaul, but in the newer provinces of the North, and along the line of the northern frontier; and everywhere under the influence of the central imperial authority there was an increasing uniformity

1905). It is now generally admitted that Tacitus’s picture is over- drawn.

1 On the limes imperii, see Pelham, ” A Problem of Roman Frontier Policy ” (Transactions of the Royal Historical Society, 1906), and Kornemann, ” Die neueste Limesforschung ” (Klio, 1907, pp. 73 ft.). The limes connecting the Rhine with the Danube has been systematically excavated in recent years; for the results see Der vbergermanisch-rdtische Limes (Heidelberg, 1894-), and Der romische Limes in Osterreich (Vienna, 1900-).

in the form of the local constitutions, framed and granted as they all were by imperial edict. 2 Throughout the Extens i on empire again the extension of the Roman franchise of the was preparing the way for the final act by which Roman Caracalla assimilated the legal status of all free-born traacn,se – inhabitants of the empire, 3 and in the west and north this was preceded and accompanied by the complete Romanizing of the people in language and civilization. Yet, in spite of the internal tranquillity and the good government which have made the age of the Antonines famous, we can detect signs of weakness. It was in this period that the centralization of authority in the hands of the princeps was completed; the ” dual control ” established by Augustus, which had been unreal enough in the 1st century, was now, though not formally abolished, systematically ignored in practice. The senate ceased to be an instrument of government, and became an imperial peerage, largely composed of men not qualified by election to the quaestorship but directly ennobled by the emperor. 4 The restricted sphere of administration left by Augustus to the old magistracies was still further narrowed; their jurisdiction, for example, tended to pass into the hands of the Greek officers appointed by Caesar — the prefect of the city and the prefect of the guards. The complete organization of Caesar’s own administrative service, and its recognition as a state bureaucracy, was chiefly the work of Hadrian, who took the secretaryships out of the hands of freedmen and entrusted them to procurators of equestrian rank. 5 All these changes, inevitable, and in some degree beneficial, as they were, brought with them the attendant evils of excessive centralization. Though these were hardly felt while the central authority was wielded by vigorous rulers, yet even under Trajan, Hadrian and the Antonines we notice a failure of strength in the empire as a whole, and a corresponding increase of pressure on the imperial government itself. The reforms of Augustus had given free play to powers still fresh and vigorous. The ceaseless labours of Hadrian were directed mainly to the careful husbanding of such strength as still remained, or to attempts at reviving it by the sheer force of imperial authority. Among the symptoms of incipient decline were the growing depopulation, especially of the central districts of the empire, the constant financial difficulties, the deterioration in

character of the local governments in the provincial communities, 6 and the increasing reluctance ex- hibited by all classes to undertake the now onerous burden of municipal office.

It is to such facts as these that we must look in passing a final judgment on the imperial government, which is admittedly seen in its best and most perfect form in the Antonine period. In our review of the conditions which brought about the fall of the Roman Republic, we saw that the collapse of the city- state made Caesarism inevitable, since the extension of federal and representative institutions to a world-empire lay beyond the horizon of ancient thought. The benefits which Caesarism conferred upon mankind are plain. In the first place, the Roman world, which had hitherto not been governed in the true sense of the word, but exploited in the interests of a dominant clique, now received an orderly and efficient govern- ment, under which the frightful ravages of misrule and civil strife were repaired. The financial resources of the empire were husbanded by skilled and, above all, trained administrators, to whom the imperial service offered a carriere ouverte aux talents; many of these were Greeks, or half-Greek Orientals, whose business capacity formed an invaluable asset hitherto

2 Marquardt, i. 132 ff. ; cf. especially the leges Salpensanae et Malacitanae\ Bruns, Fontes Juris Romani (ed. 6, p. 142).

3 Dio lxxvii. 9 (a.d. 212).

4 For the use of adlecUo see Mommsen, Staatsr. ii. 877.

5 Vit. Hadr. 21. Besides Hirschfeld's Verwaltungsbeamten reference may be made to Liebenam, Die Laufbahn der Procuratoren (Jena, 1886), and Schurz, De mutationibus in imperio Romano ordinando ab imperatore Hadriano factis (Bonn, 1883).

6 This led to the appointment of the curatores and correctores in the 2nd century. The younger Pliny was one of these imperial com- missioners, and his correspondence with Trajan throws much light on the condition of the provinces.

neglected. Augustus caused an official survey of the empire to be

made, and a scientific census of its resources was gradually- carried out and from time to time revised; thus the balance oi revenue and expenditure could be accurately estimated and adjusted, and financial stability was established. The system of tax-farming was gradually abolished and direct collection substituted; commerce was freed from vexatious restrictions, and large customs-districts were formed, on whose borders duties were levied for revenue only. The government took even more direct measures for the encouragement of industry and especially of agriculture. The most remarkable of these were the ” alimentary ” institutions, originally due to Nerva and developed by succeeding emperors. Capital was advanced at moderate rates of interest to Italian landowners on the security of their estates, and the profits of this system of land- banks were devoted to the maintenance and education of poor children. The foundation of colonies for time-expired soldiers, who received grants of land on their discharge, contributed something to the formation of a well-to-do agricultural class; and although the system was not successful in lower Italy, where economic decline could not be arrested, there can be no doubt that central and northern Italy, where the vine and olive were largely cultivated, and manufacturing industries sprang up, enjoyed a considerable measure of prosperity. The extension of the Roman municipal system to the provinces, and the watchful care exercised by the imperial government over the communities, together with the profuse liberality of the emperors, which was imitated by the wealthier citizens of the towns, led to the creation of a flourishing municipal life still evidenced by the remains which in districts such as Asia Minor or Tunis stand in significant contrast with the desolation brought about by centuries of barbaric rule. Mommsen 1 has, indeed, expressed the opinion that ” if an angel of the Lord were to strike the balance whether the domain ruled by Severus Antoninus were governed with the greater intelligence and the greater humanity at that time or in the present day, whether civilization and national prosperity generally had since that time advanced or retrograded, it is very doubtful whether the decision would prove in favour of the present.”

But there is another side to the picture. The empire brought into being a new society and a new nationality, due to the fusion of Roman ideas with Hellenic culture, beside which other elements, saving only, as we shall see, those contributed by the Oriental religions, were insignificant. This new nation- ality grew in definition through the gradual disappearance of distinctions of language and manners, the assimilating influence of commercial and social intercourse, and the extinction of national jealousies and aspirations. But the cosmopolitan

society thus formed was compacted of so many disparate elements that a common patriotism was hard to foster, and doubly hard when the autocratic system of government pre- vented men from aspiring to that true political distinction which is attainable only in a self-governing community. It is true that there was much good work to be done, and that much good work was done, in the service of the emperors; true, also, that the carrier e ouverte aux talents was in large measure realized. Distinctions of race were slowly but steadily effaced by the grant of citizen rights to provincials and by the manumission of slaves; and the career open to the Romanized provincial or the liberated slave might culminate in the highest distinctions which the emperor could bestow. In the hierarchy of social orders — senate, equites and plebs — ascent was easy and regular from the lower grade to the higher; and the more enlightened of the emperors — especially Hadrian — made a genuine endeavour to give a due share in the work of government to the various subject races. But nothing could compensate for the lack of self-determination, and although during the first century and a half of imperial rule a flourishing local patriotism in some degree filled the place of the wider sentiment, this gradually sank into decay and became a pretext under cover of which the lower classes in the several communities 1 Provinces, i. p. ,5.

took toll of their wealthier fellow-citizens in the shape of public works, largesses, amusements, &c, until the resources at the disposal of the rich ran dry, the communities themselves in many cases became insolvent, and the inexorable claims of the central government were satisfied only by the surrender of financial control to an imperial commissioner. Then the organs of civic life became atrophied, political interest died out, and the whole burden of administration, as well as that of defence, fell upon the shoulders of the bureaucracy, which proved unequal to the task.

In a world thus governed the individual was thrown more and more upon his own resources — the pursuit of wealth 2 and pleasure, or the satisfaction of intellectual interests. Under the rule of the Caesars much was done for education. Julius Caesar bestowed Roman citizenship on ” teachers of the liberal arts “; Vespasian endowed professorships of Greek and Latin oratory at Rome; 3 and later emperors, especially Antoninus Pius, extended the same benefits to the provinces. Local enterprise and munificence were also devoted to the cause of education; we learn from the correspondence of the younger Pliny that public schools were founded in the towns of northern Italy. But though there was a wide diffusion of knowledge under the empire, there was no true intellectual progress. Augustus, it is true, gathered about him the most brilliant writers of his time, and the debut of the

new monarchy coincided with the Golden Age of Roman literature; but this was of brief duration, and the beginning of the Christian era saw the triumph of classicism and the first steps in the decline which awaits all literary movements which look to the past rather than the future. Political oratory could not exist under an absolute ruler; public life furnished no inspiring theme to poet or historian; and literature became didactic or imitative, while rhetoric degenerated into declamation. It is true that for some time both literature and philosophy maintained an alliance with the old republican aristocracy and voiced the undercurrent of opposition to the empire; but both had ceased to be irre- concilable before the time of Hadrian. Under his rule classicism gave way to the archaism of which Fronto and Apuleius furnish the most notable examples, and which preferred Cato and Ennius to Cicero and Virgil. But this return to the past was not followed by any renewed creative energy. It was a con- fession of weakness and little more; and the widely diffused culture of the Antonine period, though outwardly brilliant, had no progressive energy and presented but a feeble resistance to the dissolving forces of barbarism.

To strike the balance of loss and gain in the field of morals is an exceedingly difficult task. The denunciations of the satirists, especially of Juvenal, might lead us to believe that an appalling state of depravity existed in the society of the early empire; but satirists notoriously paint in glaring colours for literary effect, and whatever may be said of the morality of Rome — which was probably no better and no worse than that of any cosmopolitan capital — there were sound and healthy elements in plenty amongst the population of Italy and the provinces. Doubtless the craving for amusement- — especially for the shows of the amphitheatre and the chariot- races of the circus — infected the idle masses of the populace in Rome and the larger towns, and was fostered by the policy of despotism, which always aims at securing cheap popularity with the proletariat; but the tendency of the time, not only in the higher ranks, but also amongst humbler folk, was towards a broader humanity and a more serious view of life and its problems. Greek philosophy, especially the Stoic system, in order to appeal to the practical Roman intelligence, found itself obliged to elaborate a rule of conduct, and in many

2 Immense fortunes were accumulated under the early empire, especially by imperial freedmen, such as Pallas, who is said to have possessed the equivalent of £3,000,000 sterling; and there were instances of extravagant luxury, which was encouraged by Nero. But we are told that there was a return to simpler habits of life under the Flavian dynasty.

- Quintilian occupied the chair of Latin rhetoric, and received the drnarrienta consularia.

households the philosopher, generally a Greek, played the part of a director of consciences. The influence of these doctrines is shown in the humane provisions of the civil law as elaborated in the Antonine period, which did much to mitigate the lot of the slave and to smooth the process by which freedom might be attained. 1 Above all, a religious movement which drew its motive power not from Greek philosophy, but from Oriental mysticism, carried the human race far from its old moorings, and culminated in the triumph of Christianity. All the Eastern cults — whether of Cybele, of Isis, of the Syrian Baalim or of the Persian Mithras — had this in common, that they promised to their adherents redemption from the curse of the flesh and a glorious immortality after death; and this fact gave them an irresistible attraction for the disillusioned and overburdened subjects of the emperors. The religion of Mithras, whose doctrines were specially suited to the military temperament, made its way wherever the armies of the empire were stationed, and seemed likely at one moment to become universal; but it was forced to yield to Christianity, which refused to tolerate any rival, faced the empire with a claim to absolute dominion in the spiritual sphere, and at length made that claim good (see Roman Religion; Mithras; Great Mother of the Gods).

Marcus Aurelius died in 180, and the reign of his worthless son, Commodus (a.d. 180-93), was followed by a century of war The and disorder, during which nothing but the stern rule

empire of soldier emperors saved the empire from dissolution. from The first and ablest of these was Septimius Severus

180-284. (193-2 11), whose claims were disputed by Clodius Albinus in the West, and by Pescennius Niger in the East; in these struggles rival Roman forces, for the first time since the accession of Vespasian, exhausted each other in civil war. 2 Severus emphasized strongly the military character of the Principate; he abstained from seeking confirmation for his authority from the senate, and deprived that body of most of the share in the government which it still retained; he

assumed the title of proconsul in Rome itself, made the prefect of the guard the vicegerent of his authority, and heaped privileges upon the army, which, although they secured its entire devotion to his family, impaired its efficiency as a fighting force and thus weakened Rome in face of the barbarian invader. 3 He succeeded in founding a short-lived dynasty, which ended with the attempt of the virtuous but weak Alexander (222-35) to restore the independence of the senate. This led to a military reaction, and the elevation of the brutal Maximinus, a Thracian peasant, to the throne. The disintegration of the empire was the natural result ; for the various provincial armies put forward their commanders as claimants to the purple. A hundred ties bound them closely to the districts in which they were stationed; their permanent camps had grown into towns, they had families and farms; the unarmed provincials looked to them as their natural protectors, and were attached to them by bonds of intermarriage and by long intercourse. Now that they found themselves left to repel by their own efforts the invaders from without, they reasonably enough claimed the right to ignore the central authority which was powerless to aid them, and to choose for themselves imperatores whom they knew and trusted. These ” tyrants, ” as they were called when unsuccessful, sprang up in ever-increasing numbers, and weakened Rome’s power of resistance to the new enemies who were threatening her frontiers — the Alamanni and Franks, who broke through the German limes in 236; the Goths, who crossed the Danube in 247, raided the Balkan provinces, and defeated and slew the emperor, Decius, in 251, and the restored Persian kingdom of

1 The massacre of the slaves of Pedanius Secundus, who had been murdered by some person unknown (Tac. Ann. xiv. 42), was, it is true, decreed by the senate ; but it was a highly unpopular act, and is chiefly significant as showing that the senatorial aristocracy was out of harmony with the spirit of the time.

8 Gibbon (ed. Bury), i. chap, v.; Schiller, Gesch. d. Kaiserzeit, i.

(2) 660.

- The common soldier was now permitted to marry, and ceased to live in camp (Herodian iii. 8. 5).

the Sassanidae (see Persia), whose rulers laid claim to al’ the Asiatic possessions of Rome and in 260 captured Antioch and made the emperor, Valerian, a prisoner. During the reign of Gallienus, the son of Valerian (260-68), the evil reached its height. The central authority was para- Reign of lysed; the Romanized districts beyond the Rhine

Gallienus, were irrevocably lost; the Persians were threatening to overrun the Eastern provinces; the Goths had jformed a fleet of 500 sail which harried Asia Minor and even Greece itself, where Athens, Corinth, Sparta and Argos were sacked; and the legions on the frontiers were left to repel the enemies of Rome as best they could. A provincial empire was established by M. Cassianius Latinius Postumus in Gaul and maintained by his successors, M. Piavonius Victorinus and C. Pius Esuvius Tetricus. 4 Their authority was acknowledged, not only in Gaul and by the troops on the Rhine, but by the legions of Britain and Spain; and under Postumus at any rate (259-69) the existence of the Gallic Empire was justified by the repulse of the barbarians and by the restoration of peace and security to the provinces of Gaul. On the Danube, in Greece and in Asia Minor none of the ” pretenders ” enjoyed more than a passing success. In the Far East, the Syrian Odaenathus, prince of Palmyra 5 (q.v.), though officially only the governor of the East (dux Orientis) under Gallienus, _ . drove the Persians out of Asia Minor and Syria, taus aaa – recovered Mesopotamia, and ruled Syria, Arabia, Zeaobia Armenia, Cappadocia and Cilicia with all the inde- *’ pendence of a sovereign. Odaenathus was murdered a myr ‘ in 266. His young son Vaballathus (Wahab-allath) succeeded him in his titles, but the real power was vested in his widow Zenobia, under whom not only the greater part of Asia Minor but even the province of Egypt was forcibly added to the dominions governed by the Palmyrene prince, who ceased to acknowledge the supremacy of Rome.

Gallienus was murdered at Milan in 268, and after the brief reign of Claudius II. (a.d. 268-70), who checked the advance of the Goths, Aurelian (270-75) restored unity to R es t ora „ the distracted empire. Palmyra was destroyed and tion of Zenobia led a prisoner to Rome (in 273) and in the next unity by year the Gallic empire came to an end by the surrender ˆji el>aa ‘ of Tetricus. Aurelian, it is true, abandoned the pro- vince of Dacia, but the defences of the Danube were strengthened, and in 276 Probus repulsed the Franks and Alamanni, who had been pressing on the Rhine frontier for some forty years. Finally, Carus (282) recovered Armenia and Mesopotamia from the Persians and restored the frontier fixed by Septimius Severus.

Although any serious loss of territory had been avoided, the storms of the 3rd century had told with fatal effect upon the general condition of the empire. The ” Roman state peace ” had vanished; not only the frontier terri- of the tories, but the central districts of Greece, Asia Minor, Jjjjfjjjjˆ* and even Italy itself, had suffered from the ravages of the 3rd of war, and the fortification of Rome by Aurelian century. was a significant testimony to the altered condition of affairs. War, plague

and famine had thinned the population and crippled the resources of the provinces. On all sides land was running waste, cities and towns were decaying, and commerce was paralysed. Only with the greatest difficulty were sufficient funds squeezed from the exhausted taxpayers to meet the increasing cost of the defence of the frontiers. The old established culture and civilization of the Mediterranean world rapidly declined, and the mixture of barbaric rudeness with Oriental pomp and luxury which marked the court, even of the better emperors, such as Aurelian, was typical of the general deterioration, which was accelerated by the growing practice of settling barbarians on lands within the empire, and of admitting them freely to service in the Roman army.

4 Gibbon, i. chap. x. ; Mommsen, Provinces, . 164; Schiller, i.

(2) 827.

6 Gibbon, i. chap. x. ; Mommsen, Provinces, ii. 103 ; qf. Paxmyra…

Period II.: The Dominate, a.d. 284-476. — (a) From the Accession of Diocletian to the Death of Theodosius (a.d. 284-395). Tb The work of fortifying the empire alike against internal

reforms of sedition and foreign invasion, begun by Aurelian and Diocletian Probus, was completed by Diocletian and Constantine and Coo- tne Great, w hose system of government, novel as it appears at first sight, was in reality the natural and inevitable outcome of the history of the previous century. 1 Its object was twofold, to give increased stability to the imperial authority itself, and to organize an efficient administrative August! machinery throughout the empire. In the second year and of his reign Diocletian associated Maximian with him-

Caesares. se jf as colleague, and six years later (293) the hands of the two ” Augusti ” were further strengthened by the pro- clamation of Constantius and Galerius as ” Caesares.” Prece- dents for such an arrangement were to be found in the earlier history of the Principate 2 ; and it divided the burdens and responsibilities of government, without sacrificing the unity of the empire; for, although to each of the Augusti and Caesars a separate sphere was assigned, the Caesars were subordinate to the higher authority of the Augusti, and over all his three colleagues Diocletian claimed to exercise a paramount control. It also reduced the risk of a disputed succession by establishing in the two Caesars the natural successors to the Augusti, and it satisfied the jealous pride of the rival armies by giving them imperatores of their own. The distribution of power between Diocletian and his colleagues followed those lines of division which the feuds of the previous century had marked out. The armies of the Rhine, the Danube and of Syria fell to the lot respectively of Constantius, Galerius and Diocletian, the central districts of Italy and Africa to Maximian. 3

In the new system the imperial authority was finally emancipated from all constitutional limitation and control and the last traces of its republican origin disappeared. character The emperors from Diocletian onwards were autocrats of the in theory as well as in practice. This avowed imperial despotism Diocletian, following in the steps of Aurelian, y. jjgˆggjj rounc j w ith a u the pomp and majesty of Oriental monarchy. The final adoption of the title dominus, the

diadem on the head, the robes of silk and gold, the replace- ment of the republican salutation of a fellow-citizen by the adoring prostration even of the highest in rank before their lord and master, were all significant marks of the new regime. 4 In Levelling the hands of this absolute ruler was placed the entire policy of control of an elaborate administrative machinery. Diocie- Most of the old local and national distinctions, privi- leges and liberties which had once flourished within the empire had already disappeared under the levelling influence of imperial rule, and the process was now completed. Degrada- Roman citizenship had, since the edict of Caracalla, Hon of ceased to be the privilege of a minority. Diocletian Italy and finally reduced Italy and Rome to the level of the provinces: the provincial land-tax and provincial government were introduced into Italy, 5 while Rome ceased to

‘See Gibbon (ed. Bury), ii. chap. xvii. 158 ff. ; Marquardt, Staatsverw. i. pp. 81, 336, 337, ii. 217 seq,; Madvig, Verf. d. Rom. Reichs, i. 585; Booking, Notitia dignitatum (Bonn, 1853); Hodgkin, Italy and her Invaders (ed. 2), bk. i. chap, xii.; Preuss, Diocletian (Leipzig, 1869) ; Seeck, Untergang der antiken Welt, vols, i., ii. (1897-

1902).

2 Mommsen, Staatsrecht, ii. 1 168 seq. Verus was associated with Marcus Aurelius as Augustus; Severus gave the title to his two sons. The bestowal of the title ” Caesar ” on the destined successor dates from Hadrian. Mommsen, op. cit. 1 139.

3 The division was as follows: — (1) Diocletian — Thrace, Egypt, Syria, Asia Minor; (2) Maximian — Italy and Africa; (3) Galerius; — Illyricum and the Danube; (4) Constantius — Britain, Gaul, Spain. See Gibbon, i. 354; Aurelius Victor, c. 39.

4 Aurel. Victor, 39 ; Eutrop. ix. 26.

6 Marquardt, Staatsverw. i. 233 ff. Italy, together with Sicily, Sardinia and Corsica, was divided into 17 provinciae. Each had its own governor; the governors were subject to the two vicarii (vie. urbis, vie. Italiae), and they in turn to the prefect of Italv, whose prefecture, however, included as well Africa and Western Illyricum.

be even in name the seat of imperial authority. 6 Throughout the whole area of the empire a uniform system of The new administration was established, the control of which adminis- was centred in the imperial palace. 7 Between the civil trattve and military departments

the separation was com- s y stem – plete. At the head of the former were the praetorian prefects, 8 next below them the vicarii, who had charge of the dioceses; below these again the governors of the separate provinces (praesides, correctores, consulares) ,' under each cf whom was a host of minor officials. Parallel with this civil hierarchy was the series of military officers, from the magistri militum, the duces, and comites downwards. 10 In both there is the utmost possible subordination and division of authority. The subdivision of provinces, begun by the emperors of the 2nd century, was systematically carried out by Diocletian, and each official, civil or military, was placed directly under the orders of a superior; thus a continuous chain of authority con- nected the emperor with the meanest official in his service. Finally, the various grades in these two imperial services were carefully marked by the appropriation to each of distinctive titles, the highest being that of illustris, which was confined to the prefects and to the military magistri and comites, and to the chief ministers. 11

There can be little doubt that on the whole these reforms prolonged the existence of the empire, by creating a machinery which enabled the stronger emperors to utilize effect- Effects ively all its available resources, and which even to some of these extent made good the deficiencies of weaker rulers, reforms. But in many points they failed to attain their object. Diocletian's division of the imperial authority among colleagues, subject to the general control of the senior Augustus, was effectu- ally discredited by the twenty years of almost constant conflict which followed his own abdication (305-23). Constantine's partition of the empire among his three sons was not more successful in ensuring tranquillity, and in the final division of the East and West between Valens and Valentinian (364) the essential principle of Diocletian's scheme, the maintenance of a single central authority, was abandoned. The " tyrants," the curse of the 3rd century, were far from unknown in the 4th. The system, moreover, while it failed altogether to remove some of the existing evils, aggravated others. The already over- burdened financial resources of the empire were strained still further by the increased expenditure necessitated by the substi- tution of four imperial courts for one, and by the multiplication in every direction of paid officials. The gigantic bureaucracy of the 4th century proved, in spite of its undoubted services, an intolerable weight upon the energies of the empire.

Diocletian and Maximian formally abdicated their high office in 305. Nineteen years later Constantine I., the Great, the sole survivor of six rival emperors, united the whole Coastan- empire under his own rule. His reign of fourteen tine the years was marked by two events of first-rate import- Great ance, — the recognition of Christianity as the

religion of the

6 The seats of government for Diocletian and his three colleagues were Mediolanum, Augusta Trevirorum, Sirmium, Nicomedia.

7 For these last, see Gibbon, ii. chap. xvii. p. 188; cf. also Notitia Dignitatum and Booking's notes.

8 At first the number of these varied and there was no fixed division of provinces between them ; but by the close of the 4th century there were four prefectures, viz. Oriens, Illyricum, Italia, Gallia, to which must be added the prefectures of Rome and Constantinople. See Mommsen in Hermes, xxxvi. 204 ff.

9 There were 12 dioceses and 101 provinces; cf., in addition to the authorities mentioned above, Bethmann-Hollweg, Civil-Prozess, iii. ; Kuhn, Die stadtische und biirgerliche Verfassung des romischen Reichs (1877).

10 The army was completely remodelled, and the old frontier garrisons (now called Limitanei) were supplemented by a field force attached to the persons of the Augusti and Caesares, and hence called Comitatenses. The change was accompanied by the subdivision of the old legions into units of about 2000 men. For these reforms see Seeck, Untergang der antiken Welt, bk. iii. chap. v. ; Mommsen in Hermes, xxiv. 225 ff.

11 The grades were as follows : illustres, spectabiles, clarissimi, perfectissimi, egregii. For the other insignia, see Madvig, ii. 59°. and the Notitia Dignitatum.

Julian,

361 63,

empire, and the building of the new capital at Byzantium. Recogol- The alliance which Constantine inaugurated between tionot the Christian church and the imperial government, Christl- while it enlisted on the side of the state one of the most *""?• powerful of the new forces with which it had to reckon, imposed a check, which was

in time to become a powerful one, on the imperial authority. The establishment of the new ” City of Constantine ” as a second Rome paved the tinooie ‘ wav ˆ or tne ˆ na ˆ separation of East and West by providing the former for the first time with a suitable seat of government on the Bosphorus. The death of Constantine in 337 was followed, as the abdication of Diocletian had been, by the outbreak of quarrels among rival Caesars. Of the three sons of Constantine who in 337 divided the empire between them, Constantine the eldest fell in civil war against his brother Constans ; Con- stans himself was, ten years afterwards, defeated and slain by Magnentius; and the latter in his turn was in 353 van- quished by Constantine’s only surviving son Constantius. Consian- Thus for the second time the whole empire was united Has 11., under the rule of a member of the house of Constantine. 351-63. g ut m 3 ˆj Constantius granted the title of Caesar to his cousin Julian and placed him in charge of Gaul, where the momentary elevation of a tyrant, Silvanus, and still more the inroads of Franks and Alamanni, had excited alarm. But Julian’s successes during the next five years were such as to arouse the jealous fears of Constantius. In order to weaken his suspected rival the legions under Julian in Gaul were suddenly ordered to march eastward against the Persians (360). They refused; and when the order was re- peated, replied by proclaiming Julian himself emperor and Augustus. Julian, with probably sincere reluc- tance, accepted the position, but the death of Constantius in 361 saved the empire from the threatened civil war. Julian’s attempted restoration of pagan and in especial of Hellenic worships had no more permanent effect than the war which he courageously waged against the multitudinous abuses which had grown up in the luxurious court of Constantius. 1 But his vigorous administration in Gaul undoubtedly checked the barbarian advance across the Rhine, and postponed the loss of the Western provinces; on the contrary, his campaign in Persia, brilliantly successful at first, ended in his own death (363), and his successor, Jovian, immediately sur- rendered the territories beyond the Tigris won by Diocletian seventy years before. Jovian died on the 17 th of February 364; and on the 26th of February Valentinian Valea- was acknowledged as emperor of the army at Nicaea. tiniaa 1., In obedience to the wish of the soldiers that he should 364-75. associate a colleague with himself, he conferred the Division title of Augustus upon his brother Valens, and the ot the division of the empire was at last effected, — Valen- cmpire, tinian became emperor of the West, Valens of the East. 364 ~ Valentinian maintained the integrity of the empire

until his death (in 375), which deprived the weaker Valens of Vaieas, a trusted counsellor and ally, and was followed by a 364-78. serious

crisis on the Danube. In 376 the Goths, Revolt of hard pressed by their new foes from the eastward, the the aoths. Huns, sought and obtained the protection of the Roman Empire. They were transported across the Danube and settled in Moesia, but, indignant at the treatment they received, they rose in arms against their protectors. In 378 at Adrianople Valens was defeated and killed, and the victorious Goths ad- vanced eastward to the very walls of Constantinople. Once more, however, the danger passed away. The skill and tact Tbeo- of Theodosius, who had been proclaimed emperor of dosiusi., the East by Gratian, 2 conciliated the Goths; they 378-95. W ere granted an allowance, and in large numbers entered the service of the Roman emperor. The remaining

1 In especial against the overweening influence of the eunuchs, an influence at once greater and more pernicious than even that of the imperial freedmen in the days of Claudius.

2 The son of Valentinian and ruler of the West.

Jovian,

363-64.

years of Theodosius's reign (382-95) were mainly engrossed by the duty of upholding the increasingly feeble authority of his western colleague against the attacks of pretenders. Maxi- mus, the murderer of Gratian (383), was at first recognized by Theodosius as Caesar, and left in undisturbed command of Gaul, Spain and Britain; but, when in 386 he proceeded to oust Valentinian II. from Italy and Africa, Theodosius marched westward, crushed him, and installed Valentinian as emperor of the West. In the very next year, however, the murder of Valentinian (392) by Arbogast, a Frank, was followed by the appearance of a fresh tyrant in the person of Eugenius, a domestic officer and nominee of Arbogast himself. Division Once more Theodosius marched westward, and near °"*e Aquileia decisively defeated his opponents. But V" t P his victory was quickly followed by his own illness Arcadlua and death (395), and the fortunes of East and West and passed into the care of his two sons Arcadius and Honorius. Honorius.

(b) From the Death of Theodosius to the Extinction of the Western Empire (395-476). — Through more than a century from the accession of Diocletian the Roman Empire Fall of the had succeeded in holding at bay the swarming hordes Western of barbarians. But, though no province had yet Empire. been lost, as Dacia had been lost in the

century before, and though the frontier lines of the Rhine and the Danube were still guarded by Roman forts and troops, there were signs in plenty that a catastrophe was at hand.

From all the writers who deal with the 4th century we have one long series of laments over the depression and misery of the provinces. 3 To meet the increased expenditure o/ s(ress necessary to maintain the legions, to pay the hosts of of the officials, and to keep up the luxurious splendour of provinces the imperial courts, not only were the taxes raised in tne 4th in amount, but the most oppressive and inquisitorial ceatuc y- methods were adopted in order to secure for the imperial treasury every penny that could be wrung from the wretched taxpayer. The results are seen in such pictures as that which the panegyrist Eumenius 4 draws of the state of Gaul (306-12) under Constantine, in the accounts of the same province under Julian fifty years later, in those given by Zosimus early in the 5th century, and in the stringent regulations of the Theodosian code, dealing with the assessment and collection of the taxes. Among the graver symptoms of economic ruin were the decrease of popu- lation, which seriously diminished not only the number of taxpayers, but the supply of soldiers for the legions; 5 the spread of infanticide; the increase of waste lands whose owners and cultivators had fled to escape the tax collector; the de- clining prosperity of the towns; and the constantly recurring riots and insurrections, both among starving peasants, as in Gaul, 6 and in populous cities like Antioch. 7 The distress was aggravated by the civil wars, by the rapacity of tyrants, such as Maxentius and Maximus, but above all by the raids of the barbarians, who seized every opportunity afforded by the dissensions or incapacity of the emperors to cross the frontiers and harry the lands of the provincials. Constantine (306-12), Julian (356-60) and Valentinian I. (364-75) had each to give a temporary breathing-space to Gaul by repelling the Franks and Alamanni. Britain was harassed by Picts and Scots from the north (367-70), while the Saxon pirates swept the northern seas and the coasts both of Britain and Gaul. On the Danube the Quadi, Sarmatae, and above all the Goths, poured at intervals into the provinces of Pannonia and Moesia, and penetrated to Macedon and Thrace. In the East, in addition to the constant border feud with Persia, we hear of ravages by the Isaurian mountaineers, and by a new enemy, the Saracens. 8

3 F. Dill, Roman Society in the Last Century of the Western Empire (2nd ed., 1899).

4 Eumenius, Paneg. Vet. vii. 6 Gibbon ii. 179.

6 For the Bagaudae, see Jung, Die romanischen Landschaften, p. 264, where the authorities are given.

7 In 387 ; Hodgkin i. 483. 8 Amm. Marc. xiv. 4.

the empire.

Even more ominous of coming danger was the extent to which the European half of the empire was becoming barbarized. The policy which had been inaugurated by Augustus bariaas himself of settling barbarians within the frontiers within had been taken up on a larger scale and in a more systematic way by the Illyrian emperors of the 3rd century, and was continued by their successors in the 4th. In Gaul, in the provinces south of the Danube, even in Macedon and Italy, large barbarian settlements had been made — Theodosius in particular distinguishing himself by his liber- ality in this respect. Nor did the barbarians admitted during the 4th century merely swell the class of half- servile coloni. On the contrary, they not only constituted to an increasing extent the strength of the imperial forces, but won their way in ever-growing numbers to posts of dignity and importance in the imperial service. Under Constantine the palace was crowded with Franks. 1 Julian led Gothic troops against Persia, and the army with which Theodosius defeated the tyrant Maximus (388) contained large numbers of Huns,, and Alans, as well as of Goths. The names of Arbogast, Stilicho and Rufinus are sufficient proof of the place held by barbarians near the emperor's person and in the control of the provinces and legions of Rome; and the relations of Arbogast to his nominee for the purple, Eugenius, were an anticipation of those which existed between Ricimer and the emperors of the latter half of the 5 th century.

It was by barbarians already settled within the empire that the first of the series of attacks which finally separated the western provinces from the empire and set up a bar- invasions. baric ruler in Italy were made, and it was in men of barbarian birth that Rome found her ablest and most successful defenders. The Visigoths whom Alaric led into Alaric Italy had been settled south of the Danube as the and the allies of the empire since the accession of Theodosius. Visigoths. j5 ut) ii]j. e t] le Germans of the days of Caesar, they wanted land for their

own, and Alaric himself aspired to raise himself to the heights which had been reached before him by the Vandal Stilicho at Ravenna and the Goth Rufinus at Constantinople. The jealousy which existed between the rulers of the western and eastern empires furthered his plans. In the name of Arcadius, the emperor of the east, or at least with the connivance of Arcadius's minister Rufinus, he occupied the province of Illyricum, and from thence ravaged Greece, which, according to the existing division of provinces, belonged to the western empire. Thence in 396 he retreated before Stilicho to Illyricum, with the command of which he was now formally invested by Arcadius; he thus gained a base of opera- tions against Italy. 2 In 400 he led his people, with their wives and families, their wagons and treasure, to seek lands for themselves south of the Alps. But in this first invasion he penetrated no farther than the plains of Lombardy, and after the desperate battle of Pollentia (402 or 403) he slowly with- drew from Italy, his retreat being hastened by the promises of gold freely made to him by the imperial government. Not until the autumn of 408 did Alaric again cross the Alps. Stilicho was dead; the barbarian troops in Honorius's service had been provoked into joining Alaric by the anti-Teutonic policy of Honorius and his ministers, and Alaric marched un- opposed to Rome. The payment of a heavy ransom, however, saved the city. Negotiations followed between Alaric and the court of Ravenna. Alaric's demands were moderate, but Honorius would grant neither lands for his people nor the honourable post in the imperial service which he asked for him- self. Once more Alaric sat down before Rome, and the citizens were forced to agree to his terms. Attalus, a Greek, the prefect of the city, was declared Augustus, and Alaric accepted the post of commander-in-chief. But after a few months Alaric formally deposed Attalus, on account of his incapacity, and renewed his offers to Honorius. Again they were declined,

1 Amm. Marc. xv. 5.

2 Hodgkin op. cit. i. 661.

and Alaric marched to the siege and sack of Rome (410). 3 His death followed hard on his capture of Rome. Two years later (412) his successor Ataulf led the Visi- Tne goths to find in Gaul the lands which Alaric had Visigoths sought in Italy. It is characteristic of the anarchical ’” ° auL condition of the west that Ataulf and his Goths should have fought for Honorius in Gaul against the tyrants, 4 and in Spain against the Vandals, Suebi and Alani; and it was with the consent of Honorius that in 419 Wallia, who had followed Ataulf as king of the Visigoths, finally settled with his people in south-western

Gaul and founded the Visigothic monarchy. 5

It was about the same period that the accomplished fact of the division of Spain between the three barbarian tribes of Vandals, Suebi and Alani was in a similar manner vandals recognized by the paramount authority of the emperor Suebi of the west. 6 These peoples had crossed the Rhine and Alani at the time when Alaric was making his first attempt ”’ Soala – on Italy. A portion of the host led by Radagaisus 7 actually invaded Italy, but was cut to pieces by Stilicho near Florence (405); the rest pressed on through Gaul, crossed the Pyrenees, and entered the as yet untouched province of Spain.

Honorius died in 423. With the single exception of Britain, 8 no province had yet formally broken loose from the empire. But over a great part of the west the authority of the r) eatn t emperors was now little more than nominal; through- Honorius, out the major part of Gaul and in Spain the barbarians 42 “* – had settled, and barbarian states were growing up which recognized the supremacy of the emperor, but were in all essentials independent of his control.

The long reign of Valentinian III. (423-55) is marked by two events of first-rate importance — the conquest of Africa by the Vandals 9 and the invasion of Gaul and Italy by yaien- Attila. The Vandal settlement in Africa was closely tinian ///., akin in its origin and results to those of the Visi- ^^ss. goths and of the Vandals themselves in Gaul and vandal Spain. Here, as there, the occasion was given by conquest the jealous quarrels of powerful imperial ministers. °t Africa. The feud between Boniface, count of Africa, and Aetius, the ” master-general ” or ” count of Italy,” opened the way to Africa for the Vandal king Gaiseric (Genseric), as that between Stilicho and Rufinus had before set Alaric in motion west- ward, and as the quarrel between the tyrant Constantine and the ministers of Honorius had paved the way for the Vandals, Suebes and Alans into Spain. In this case, too, land-hunger was the impelling motive with the barbarian invader, and in Africa, as in Gaul and Spain, the invaders’ acquisitions were confirmed by the imperial authority which they still professed to recognize. In 429 Gaiseric, king of the Vandals, crossed with his warriors, their families and goods, to the province of Africa, hitherto almost untouched by the ravages of war. Thanks to the quarrels of Boniface and Aetius, their task was an easy one. The province was quickly overrun. In 435 10 a formal treaty secured them in the possession of a large portion of the rich lands which were the granary of Rome, in exchange for a payment probably of corn and oil. Carthage was taken in 439, and by 440 the Vandal kingdom was firmly established.

3 For the treatment of Rome by Alaric, see Hodgkin i. 798 ; Gibbon iii. 321 sqq. ; Ranke iv. 246. Allowance must be made for the exaggerations of the ecclesiastical writers.

4 For these tyrants, see Freeman in the Eng. Hist. Rev. i. 53-86.

5 The capital of the new state was Tolosa (Toulouse).

6 Jung, Die Romanischen Landschaften, 73 seq.

7 For the connexion between his movement and those of Alaric and of the Vandals, see Hodgkin i. 711; Gibbon iii. 262 seq.

8 The Roman troops were withdrawn from Britain by Constantine in 407; Mommsen, Chron. min. i. 465.

9 Hodgkin vol. ii. bk. iii. chap, ii.; Gibbon ii. 400 sqq.; Jung, 183. The leading ancient authority is Procopius. See Ranke iv. (2) 285; Papencordt, Gesch. d. Vandal. Herrschaft in Africa.

10 Prosper 659; Ranke iv. (1) 282.

Sack of Rome by the Vandals.

Ricimer supreme in Italy,

Orestes, the Pan- nonian.

Eleven years later (451) Attila invaded Gaul, but this Hunnish movement was in a variety of ways different from those of the Attila Visigoths and Vandals. Nearly a century had passed

and the since the Huns first appeared in Europe, and drove the Huns. Goths to seek shelter within the Roman lines. Attila

was now the ruler of a great empire in central and northern Europe and, in addition to his own Huns, the German tribes along the Rhine and Danube and far away to the north owned him as king. He confronted the Roman power as an equal; and, unlike the Gothic and Vandal chieftains, he treated with the emperors of east and west as an independent sovereign. His advance on Gaul and Italy threatened, not

the establishment of one more barbaric chieftain on Roman soil, but the sub- jugation of the civilized and Christian West to the rule of a heathen and semi-barbarous conqueror. But the Visigoths in Gaul, Christian and already half Romanized, rallied to the aid of the empire against a common foe. Attila, Chaioa*. defeated at Chalons 1 by Aetius, withdrew into Pannonia (451). In the next year he overran Lombardy, but penetrated no farther south, and in 453 he died. With the murder of Valentinian III. (455) the western branch of the house of Theodosius came to an end, and the next twenty years witnessed the accession and deposition of nine em- perors.

Under the three-months' rule of Maximus, the Vandals under Gaiseric invaded Italy and sacked Rome. From 456-7 2 the actual ruler of Italy was Ricimer, the Suebe. Of the four emperors whom he placed on the throne, Majorian (457-61) alone played any imperial part outside Italy. 2 Ricimer died in 472, and two years later a Pannonian, Orestes, attempted to fill his place. He deposed Julius Nepos and proclaimed as Augustus his own son Romulus. But the barbarian mercenaries in Italy determined to secure for themselves a position there such as that which their kinsfolk had won in Gaul and Spain and Africa. Their demand for a third of the lands of Italy was refused by Orestes, 3 and they instantly rose in revolt. On the defeat and death of Orestes they pro- claimed their leader, Odoacer the Rugian, 4 king of Italy. Rom- Romuius ulus Augustulus laid down his imperial dignity, and Augus- the court at Constantinople was informed that there tuius. was no i on g er an emperor of the West. 6

The installation of a barbarian king in Italy was the natural climax of the changes which had been taking place in the West throughout the 5th century. In Spain, Odoacer. Gaul and Africa barbarian chieftains were already established as kings. In Italy, for the last twenty years, the real power had been wielded by a barbarian officer. Odoacer, when he decided to dispense with the nominal authority of an emperor of the West, placed Italy on the same level of independence with the neighbouring provinces. But the old ties with Rome were not severed. The new king of Italy formally recognized the supremacy of the one Roman emperor at Constantinople, and was invested in return with the rank of " patrician," which had been held before him by Aetius and Ricimer. In Italy too, as in Spain and Gaul, the laws, the administrative system and the language remained Roman. 6 But the emancipation of Italy and the Western provinces from direct imperial control, which is signalized by Odoacer's acces- sion, has rightly been regarded as marking the opening of a new epoch. It made possible in the West the development of a Romano-German civilization; it facilitated the growth of new and distinct states and nationalities; it

gave a new impulse

1 For the battle of Chalons, see Gibbon iv. 464; Hodgkin ii. 124 n. 6, 143, where the topography is discussed.

2 Majorian was the last Roman emperor who appeared in person in Spain and Gaul.

3 Hodgkin ii. 520.

4 The nationality of Odoacer is a disputed point. Hodgkin ii. 516; Ranke iv. (1) 372.

6 Gibbon iv. 50 seq. The authority for the embassy to Zeno is Maichus (Miiller, Fragm. Hist. Gr. iv. 119).

c Gibbon iv. 54 seq. ; Jung 66 seq. ; Bryce, Holy Roman Empire, 2 4 – 33- See also Roman Law.

to the influence of the Christian church, and laid the foundations of the power of the bishops of Rome.

Chronological Table of the Roman Emperors

B.C.

27. Augustus.

A.D.

14. Tiberius.

37. Gaius.

41. Claudius.

54. Nero.

fGalba. 68, 69. i Otho.

[Vitellius.

69. Vespasian.

79. Titus.

81. Domitian.

96. Nerva.

98. Trajan. 117. Hadrian. 138. Antoninus Pius. 161. Marcus Aurelius. 180. Commodus. (Pertinax. 193. -J Didius Julianus.

ISeptimius Severus. an. Caracalla.

217. Macrinus.

218. Elagabalus. 222. Alexander Severus. 235. Maximinus.

(The two Gordiani. 238. J. Pupienus and Balbinus.

iGordian III. 1

Division of the Empire. a.d. West. I A.D.

364. Valentinian I. 364. Valens.

375. Gratian and Valentinian II. 379. Theodosius I

383. Valentinian II. |

A.d.

244. 249. 251- 253- 260. 268. 270.

275- 276. 282. 283.

3°5-

3”-

324-

337-

350.

361. 363

Philip. Decius. Gallus. Aemilianus. \ Valerian.) Gallienus. Claudius. \ Quintillus. I Aurelian. Tacitus. Probus. Carus. Carinus and Numerian.

(“Diocletian (Maximian -i associated with him,

I 286).

Constantius and Galerius. { Licinius. \ Constantine I. Constantine I.

(“Constantine II. J Constantius II.

l_Constans.

Constantius II., sole em- peror. Julian. Jovian.

East.

392.

Theod

osius I

395. Honorius.

423. Valentinian III.

395- 408.

Arcadius. Theodosius II

455. Maximus. 455. Avitus. 457. Majorian. 461. Severus. \ 467. Anthemius.

45o.

457-

Marcian. Leo I.

472. Olybrius.

473. Glycerius.

474. Julius Nepos.

475. Romulus Augustulus.

474-

Leo II.

(H. F. P.; H.S. J.) Authorities. — I. Republican Period: Ancient Sources. — The writing of history, like other branches of literature, was a late growth amongst the Romans, and it is very difficult to

determine how far authentic records were preserved of the earlier republican period. It seems that the calendars issued yearly by the ponrinces and posted on the walls of the Regia were inscribed with brief notices of important events (" digna memoratu . . . domi militiaeque terra marique gesta per singulos dies," Serv. Ad Aen. i. 373); these tabulae were preserved and edited in 80 books by P. Mucius Scaevola (pontifex maximus, I30-?H4 B.C.) under the name of Annates Maximi. The Commentarii preserved in the archives of the various priestly colleges and official boards (e.g. consuls and censors), which appear to have consisted mainly of instructions as to official procedure, doubtless furnished historical material in the shape of precedents and decisions. It is hard to say how much of this documentary evidence survived the burning of Rome by the Gauls; the fact that the earliest solar eclipse mentioned in the Annates Maximi was that of the 5th of June, 351 B.C., casts doubt on the completeness of the earlier records.

Many modern scholars have supposed that these meagre official records were supplemented by — (a) popular poetry, more or less legendary in content; (b) family chronicles, the substance of which was worked up into the funeral orations {laudationes funebres) pronounced at the grave of distinguished Romans. The existence of the former class of documents is, however, quite unsupported by evidence; as to family tradition, we cannot say more than that it has probably left a deposit in the accounts of republican history handed down to us, and caused the exploits of the members of illustrious houses to be exaggerated in importance.

Setting aside the works of Greek historians who incidentally touched on Roman affairs, such as Hieronymus of Cardia, who wrote of the wars of Pyrrhus as a contemporary, and Timaeus of Tauromenium (c. 345-250 B.C.), who treated of the history of Sicily and the West down to 272 B.C., the earliest writers on Roman history

were Q. Fabius Pictor ' and L. Cincius Alimentus, who lived during the Second Punic War and wrote in Greek. We are told by Dionysius that they treated the earlier history summarily, but wrote more fully of their own times. They were followed in their use of the Greek language by C. Acilius (introduced a Greek embassy to the senate, 155

B.C.) and A. Postumius Albinus (consul, 151 B.C.). In the meantime, however, M. Porcius Cato the Elder (234-149 B.C.), the leader of the national party at Rome and a vigorous opponent of Greek influence, had treated of Roman antiquities in his Origines. This work was not purely annalistic, but treated of the ethnography and customs of the Italian peoples, &c. Cato founded no school of antiquarian research, but his use of the Latin language as the medium of historical writing was followed by the annalists of the Gracchan period, L. Cassius Hemina, L. Calpurnius Piso (consul, 133 B.C.), C. Sempronius Tuditanus (consul, 129 B.C.), Cn. Gellius, Vennonius, C. Fannius (consul, 122 B.C.), and L. Caelius Antipater. 2 By these writers some attempt was made to apply canons of criticism to the traditional accounts of early Roman history, but they did little more than rationalize the more obviously mythical narratives ; they also followed Greek literary models and introduced speeches, &c, for artistic effect. Where they wrote as contemporaries, however, e.g. Fannius in his account of the Gracchan movement, their works were of the highest value. About the beginning of this period Polybius (q.v.) had published his history, which originally embraced the period of the Punic wars, and was afterwards con- tinued to 146 B.C. His influence was not fully exerted upon Roman historians until the close of the 2nd and early part of the 1st century B.C., when a school of writers arose who treated history with a practical purpose, endeavouring to trace the motives of action and to point a moral for the edification of their readers. To this school belonged Sempronius Asellio, Claudius Quadrigarius, Valerius Antias and C. Licinius Macer (d. 66 B.C.). Their writings were diffuse, rhetorical and inaccurate; Livy complains of the gross exaggerations of Valerius (whom he followed blindly in his earlier books), and Macer seems to have drawn much of his material from sources of very doubtful authenticity. Contemporary history was written by Cornelius Sisenna (1 19-67 B.C.), and the work of Polybius was continued to 86 B.C. by the Stoic Posidonius (c. 135-45 B.C.), a man of encyclopaedic knowledge. From the Gracchan period onwards the memoirs, speeches and correspondence of distinguished statesmen were often published; of these no specimens are extant until we come to the Ciceronian period, when the Speeches and Letters of Cicero (q.v.) and the Commentaries of Julius Caesar (q.v.) — the latter continued to the close of the Civil War by other hands — furnish invaluable evidence for the history of their times. We possess examples of historical pamphlets with a strong party colouring in Sallust's tracts on the Jugurthine War and the conspiracy of Catiline. During the same period Roman antiquities, genealogy, chronology, &c, were exhaustively treated by M. Terentius Varro (116-27 B.C.) (q.v.) in his Antiquitates (in 41 books) and other works. Cicero's friend, M.

Pomponius Atticus, also compiled a chronological table which was widely used, and Cornelius Nepos (q.v.) wrote a series of historical biographies which have come down to us.

In the Augustan age the materials accumulated by previous generations were worked up by compilers whose works are in some cases preserved. The work of Livy (q.v.) covered the history of Rome from its foundation to 9 B.C. in 142 books; of these only 35 are preserved in their entirety, while the contents of the rest are known in outline from an epitome (periochae) and from the compendia of Florus and later authors. Diodorus Siculus (q.v.) of Agyrium in Sicily followed the earlier annalists in the sections of his Universal History (down to Caesar) which dealt with Roman affairs; Dionysius of Halicarnassus (q.v.), in his Roman Archaeology (published in 7 B.C.), treated early Roman history in a more ambitious and rhetorical style, with greater fulness than Livy, whose work he seems to have used. Universal histories were also written in the Augustan age by Nicolaus of Damascus, a protSge of Herod the Great, and Trogus Pompeius, whose work is known to us from the epitome of Justin (2nd century A.D.). Juba, the learned king of Mauretania installed by Augustus, wrote a History of Rome as well as antiquarian works. Strabo (q.v.), whose Geography is extant, was the author of a continuation of Polybius's history (to 27 B.C.). The learning of the time was enshrined in the encyclopaedia of Verrius Flaccus, of which we possess part of Festus's abridgment (2nd century A.D.), together with an Epitome of Festus by Paulus Diaconus (temp. Charlemagne). An official list of the consuls and other chief magis- trates of the republic was inscribed on the walls of the Regia (rebuilt 36 B.C.), followed somewhat later by a similar list of trium- phatores; the former of these is known as the Fasti Capitolini, (C./.L./. 2 , 1 sqq.), since the fragments which have been recovered are preserved in the Palace of the Conservatori on the Capitol. The Forum of Augustus (see Rome, section A rchaeology) was decorated with statues of famous Romans, on the bases of which were inscribed short accounts of their exploits; some of these elogia are preserved (cf. Dessau, Inscr. hat. sel. 50 sqq.).

Amongst writers of the imperial period who dealt with republican

1 For these writers see further under Annalists and Livv. * Caelius's work dealt only with the Second Punic War.

history the most important are Velleius Paterculus, whose com- pendium of Roman history was published in A.D. 30; Plutarch (c. A.D. 45-125), in whose biographies much contemporary material was worked up; Appian, who wrote under the Antonines and described the

wars of the republic under geographical^ headings (partly preserved) and the civil wars in five books, and Dio Cassius (v. infra), of whose history only that portion which deals with events from 69 B.C. onwards is extant. The date of Granius Licinianus, whose fragments throw light on the earlier civil wars, is not certain. The evidence of inscriptions (q.v.) and coins (q.v.) begins to be of value during the 150 years of the republic. A series of laws and Senatus consulta (beginning with the Senatus consultum de Bacchana- libus, 189 B.C.) throws light on constitutional questions, while the coins struck from about 150 B.C. onwards bear types illustrative of the traditions preserved by the families to which the masters of the mint (III viri monetales) belonged.

Modern Authorities. — The principles of historical criticism may be said to have been formulated by Giambattista Vico (q.v.), whose principi di scienza ntiova were published in 1725. The credibility of the traditional account of Roman republican history was called in question by Louis de Beaufort (Dissertation sur V incertitude des cinq premiers siecles de I'histoire romaine, 1738); but the modern critical movement dates from Niebuhr, two volumes of whose Rbmische Geschichte appeared in 1811-12 (the third was published after his death in 1832, his lectures in 1846). The early history of Rome was fully treated by Niebuhr's follower, F. C. A. Schwegler, whose Rbmische Geschichte in 3 vols. (1853-58) was continued to 327 B.C. by O. Clason (vols. 4 and 5, 1873-76). A reaction against the negative criticism of Niebuhr was headed by J . Rubino, who showed in his Untersuchungen uber rbmische Verfassung und Geschichte (1839) that the growth of the Roman constitution might be traced with some approach to certainty by the analysis of institutions. It was left for Theodor Mommsen (Rbmische Geschichte, 1st ed., 1854-56; Eng. trans, new ed. in 5 vols., 1894; Rbmische Forschungen, 1864-79; Rbmisches Staatsrecht, 1st ed., 1872-75 [in the Hand- buch der rbmischen Alter thiimer , begun by Becker in 1843 and con- tinued under the supervision of J. Marquardt] ; Rbmisches Strafrecht, 1899, and many other works) to reduce Roman constitutional history to a science. Mommsen substituted for the detailed criticism of the traditional narrative a picture of the growth of Italian civilization based on linguistic, literary and monumental evidence. W. Ihne (Rbmische Geschichte, 8 vols., 1868-90) dealt more fully with the course of events as related by ancient historians. L. Lange's Rbmische Alterthiimer (1856-71), 3 vols., treated con- stitutional history in a narrative form. In more recent times Eduard Meyer has treated of early Italian history in his Geschichte des Alterthums, vols, ii.-v. (1893-1902); and Ettore Pais, in his Storia di Roma, vols, i.-ii.

(1898-99), has subjected the narratives of Roman history down to the Samnite wars to a searching and in many cases exaggerated criticism. De Sanctis, in his Storia dei Romani (2 vols., 1907) (down to the establishment of the Roman hegemony in Italy), combines radical criticism of tradition with a constructive use of archaeological and other evidence. Heitland's Roman Republic (3 vols., 1909) is a fresh and independent work. The last century of the republic has been the subject of many works (see reff. in text and biographical articles). W. Drumann (Geschichte . Roms, 1834-44; new e d- by Groebe in progress) gave an exhaustive biographical account of the contemporaries of Caesar and Cicero; A. H. J. Greenidge's History of Rome from 133 B.C. to A.D. 70 (vol. i. 1904) was unfortunately cut short by the author's early death in 1906 ; G. Ferrero's Grandezza e Decadenza di Roma (in progress, Eng. trans, of vols, i., ii., 1907; iii.-v., 1909) is ambitious but unsound.

II. Imperial Period -.Ancient Sources. — The memoirs of Augustus as well as those of his contemporaries (Messalla, Agrippa, Maecenas, &c.) and successors (Tiberius, Agrippina the younger, &c.) have perished, but we possess the Res gestae divi Augusti inscribed on the walls of his temple at Ancyra (ed. Mommsen, 1883). Few historical works were produced undei the earlier Julio-Claudian emperors; Cremutius Cordus lost his life under Tiberius for the freedom with which his opinion of the triumvirs was expressed. Aufidius Bassus wrote the history of the civil wars and early empire, perhaps to A.D. 49, and this was continued by Pliny the Elder (q.v.) in 31 books, probably to the accession of Vespasian. 3 These works, together with those of Fabius Rusticus, a friend of Seneca, and Cluvius Rufus, a courtier under Nero, were amongst the authorities used by Tacitus (q.v.), whose Annals (properly called ab excessu divi Augusti) and Histories, when complete, carried the story of the empire down to A.D. 96.* Tacitus wrote under Trajan, upon whom the younger Pliny pronounced his Panegyric; Pliny's correspondence with Trajan about the affairs of Bithynia, which he administered in A.D. m-13, is of great historical value. Suetonius (q.v.), who was for some time secretary of state to Hadrian, wrote biographies of the emperors from Julius Caesar to Domitian, which contain much interesting gossip. Arrian, a Bithynian Greek promoted by Hadrian

3 The Jewish Antiquities and Jewish War of Josephus (q.v.), composed under the Flavian dynasty, are of great value for the events of the writer's time.

4 The Histories (a.d. 69-96) were written before the Annals.

to important posts, wrote on Rome's policy and wars in the East. Appian {v. supra) dealt with the wars waged under the early empire in the closing books of his work, which have not been preserved. Dio Cassius, a Bithynian who attained to the dignity of a second consulship as the colleague of Severus Alexander, wrote a history of Rome to the death of Elagabalus in 80 books. We possess only epitomes and excerpts of the portion dealing with events from A.D. 46 onwards, except for parts of the 78th and 79th books, in which Dio's narrative of contemporary events is especially valuable. Herodian, a Syrian employed in the imperial service, wrote a history of the emperors from Commodus to Gordian III., which as the work of a contemporary is not without value, although the author had no historical insight. L. Marius Maximus compiled biographies of the emperors from Nerva to Elagabalus which, like those of Suetonius, contained much worthless gossip. His work was amongst the sources used in the compilation of the Historia Augusta (see further Augustan History), upon which we are obliged to rely for the history of the 3rd century A.D. This work consists in a series of lives of the emperors (including most of the pretenders to that title) from Hadrian to Carinus, professedly written by six authors, Spartianus, Vulcacius Gallicanus, Capitolinus, Lampridius, Trebellius Pollio, and Vopiscus, under Diocletian and Constantine. Modern criticism has shown that (at least in its present form) it is a com- pilation made towards the close of the 4th century; it is not even certain that any of the above-named writers really existed, and the documents inserted in the text are palpable forgeries. The earlier biographies, however, contain much authentic information, which seems to have been derived from a good contemporary source. The fragments of Dexippus, an Athenian who successfully defended his native town against the Goths, throw much light on the barbaric invasions of the 3rd century. Under Diocletian and his successors (a.d. 289-321) were delivered twelve Panegyrics by Eumenius and other court rhetoricians which possess slight historical value. The history of the final struggle between church and empire is told from the Christian point of view by the author of the De mortibus per- seculorum — perhaps Lactantius, the tutor of Crispus. Eusebius's Ecclesiastical History and Life of Constantine give an ex parte version of the events which they relate; the first of two tracts published under the name of the Anonymus Valesianus furnishes a brief contemporary narrative of the period 305-37, without Christian prepossessions;

while the lost work of Praxagoras treated the history of Constantine from the pagan standpoint. The most important historian of the 4th century was Ammianus Marcellinus, a native of Antioch and an officer in the imperial guard, who con- tinued the work of Tacitus (in Latin) to the death of Valens. We possess the last eighteen books of his history which cover the years A – D – 353~78- Two compendia of imperial history pass under the name of Aurelius Victor, the Caesares, or lives of the emperors from Augustus to Julian, and the Epitome de Caesaribus (not by the same author,) which goes down to Theodosius I. Similar works are the Breviarum of Eutropius (secretary of state under Valens) and the still more brief epitome of Festus. The writings of the Emperor Julian and of the rhetoricians Libanius, Themistius and Eunapius — the last-named continued the history of Dexippus to A.D. 404 — are of great value for the latter part of the 4th century A.D. They wrote as pagans, while the Christian version of events is given by the three orthodox historians Socrates, Sozomen and Theodoret, and the Arian Philostorgius, all of whom wrote in the 5th century. An imperial official, Zosimus, writing in the latter half of that century, gave a sketch of imperial history to A.D. 410; the latter part is valuable, being based on contemporary writings, e.g. those of the Egyptian Olympiodorus, of whose work some fragments are pre- served. The bishops Synesius and Palladius, who lived under Arcadius and Theodosius II., furnish valuable information as to their own times; while the fragments of Priscustell us much of Attila and the Hunnish invasions. Mention must also be made of the poets and letter-writers of the 4th and 5th centuries — Ausonius, Claudian, Symmachus, Paulinus of Nola, Sidonius Apollinaris, Prudentius, Merobaudes and others — from whose writings much historical information is derived. Cassiodorus, the minister of Theodoric, wrote a history of the Goths, transmitted to us in the Historia Gothorum of Jordanes (c. A.D. 550), which gives an account of the earlier barbaric invasions. ,

Several chronological works were compiled in the 4th and 5th centuries. It will suffice to name the Chronology of Eusebius (to A.D. 324), translated by Jerome and carried down to A.D. 378; the Chronicle of Prosper Tiro, based on Jerome and continued to a.d. 455; the Chronography of a.d. 354, an illustrated calendar containing miscellaneous information; and the works based on the so-called Chronica Constantinopolitana (not preserved), such as the Fasti of Hydatius (containing valuable notices of the period A.D. 379-468). Some minor chronological works such as the Chronicon Ravennae are published in Mommsen's Chronica Minora. The Chronicon Paschale, primarily a table giving the cyle of Easter celebrations, was compiled in the 7th century A.D.

The Codes of Law, especially the Codex Theodosianus (a.d. 438) and the Code of Justinian, as well as the Army List of the early 5th century, known as the Notitia Dignitatum, possess great historical value. For the inscriptions of the empire, which are of incalculable

importance as showing the working of the imperial system in its details, see Inscriptions; the coins (q.v.) also throw much light on the dark places of history in the lack of other authorities. Egyptian papyri are not only instructive as to legal, economic and adminis- trative history, but also (by the formulae employed in their dating) contribute to our general knowledge of events. The Zeitschrift fur Papyrusforschung, edited by U. Wilcken, gives an account of pro- gress in this branch of study.

Modern Authorities. — Til\emont'sHistoiredesempereurs(6 vols., 1690-1738), supplemented by his MSmoires four servir a I'histoire eccUsiastique, a laborious and erudite compilation, furnished Gibbon with material for his Decline and Fall of the Roman Empire (1776-1788), which has never been superseded as a history of the entire imperial period, and has been rendered adequate for the purposes of the modern reader by Professor J. B. Bury s edition (1897-1900). The history of the empire has yet to be written in the light of recent discoveries. Mommsen's fifth volume (Eng. tr., as Provinces of the Roman Empire, 1886) is not a narrative, but an account of Roman culture in the various provinces. C. Merivale's History of the Romans under the Empire (8 vols., 1850-ˆ62, to Marcus Aurelius) is literary rather than scientific. H. Schiller's Geschichte der romischen Kaiserzeit (1883-88) is a useful handbook. For the later period we have Bury's History of the Later Roman Empire (1889), beginning from a.d. 395, and T. Hodgkin's Italy and her Invaders (8 vols., 1880-99), which tells the story of the barbaric invasions at great length. The imperial constitution is described by Mommsen in the second volume of his Staatsrecht {v. supra) ; divergent views will be found in Herzog's Geschichte und System der romischen Staatsver- fassung (1884-91); the working of the imperial bureaucracy is treated by O. Hirschfeld, Die romischen Verwaltungsbeamten (1905). The Prosopographia Imperii Romani, compiled by Dessau and Klebs (1897-98), is a mine of information, as is the new edition of Pauly's Realencyklopadie der classischen Alterthumswissenschaft (in progress). Von Domaszewski's Geschichte der romischen Kaiser (2 vols., 1909) is popularly written and gives no references to authorities. See further the articles on individual emperors and provinces.

A general history of Rome to the barbarian invasions, popular in character and richly illustrated, was written in French by Victor Duruy

(Eng. tr. in 6 vols., 1883-86). The 2nd, 3rd and 4th vols, of Leopold von Ranke's Weltgeschichte deal with Roman history. An outline of Roman history is given by B. Niese in the 3rd vol. of Miiller's Handbuch der Hassischen Alterthumswissenschaft (3rd ed., 1906). A. H. J. Greenidge's Roman Public Life (1901) is an excel- lent guide to Roman institutions. The principal authorities on Roman chronology are: Ideler, Handbuch der maihemalischen und technischen Chronologie (1825-26) ; Fynes-Clinton, Fasti Romani (1845) (a continuation of the same author's Fasti Hellenici, 1830-41, which goes down to A.D. 14); Fischer, Romische Zeittafeln (1846); Mommsen, Romische Chronologie (2nd ed., 1859); Matzat, Romische Chronologie (1883-84) and Romische Zeittafeln (1889); Holzapfel, Romische Chronologie (1885); Soltau, Romische Chronologie (1889); Unger, " Romische Zeitrechnung " in the 1st vol. of Miiller's Hand- buck der klassischen Alterthumswissenschaft {2nd ed., 1892). Goyau's Chronologie de I'empire romain (Paris, 1891) is a useful handbook.

(H. S. J.)

IV. The Roman Republic in the Middle Ages

The history of the Roman commune as distinguished from the papacy during the middle ages has yet to be written, and only by the discovery of new documents can the difficulties of the task be completely overcome. Although very different in its origin, the Roman Republic gradually assumed the same form as the other Italian communes, and with almost identical institutions. But, owing to the special local conditions amid which it arose, it maintained a distinct physiognomy and . character. The deserted Campagna surrounding the city checked any notable increase of trade or industry, and prevented the establishment of the gilds on the solid footing that elsewhere made them the basis and support of the commune. There was also the continual and oppressive influence of the empire, and, above all, the presence of the papacy, which often appeared to absorb the political vitality of the city. At such moments the commune seemed annihilated, but it speedily revived and reasserted itself. Consequently there are many apparent gaps in its history, and we have often extreme difficulty in discovering the invisible links connecting the visible fragments.

Even the aristocracy of Rome had a special stamp. In the other republics, with the exception of Venice, it was feudal, of German origin, and in perpetual conflict with the popular and commercial elements which sought its destruction. The history of municipal freedom iii Italy lay in this struggle. But the infiltration of Teutonic

and feudal elements broke up the

The Qoths,

ancient aristocracy of Rome, gave it a special character and left it at the mercy of the people. Then the popes, by the bestowal of lucrative offices, rich benefices and vast estates, and, above all, by raising many nobles to the purple, introduced new blood into the Roman aristocracy, and endued it with increasing strength and vitality. Always divided, always turbulent, this irrepressible body was a continual source of discord and civil war, of permanent confusion and turmoil. Amidst all these difficulties the commune struggled on, but never succeeded in preserving a regular course or administration for long. What with continual warfare, attacks on the Capitol and consequent slaughter, pillage and incendiarism, it is no wonder that so few original documents are left to illustrate the history of the Roman Republic. Nor have chroniclers and his- torians done much to supply this want, since, in treating of Roman affairs, their attention is mainly devoted to the pope and the emperor. Nevertheless, we will attempt to connect in due order all the facts gleaned from former writers and pub- lished records.

The removal of the seat of the empire to Constantinople effected a radical change in the political situation of Rome; nor was this change neutralized by the formation of the weak Western empire soon to be shattered by the Germanic invasions. But we still find Roman laws and institutions; and no sign is yet manifest of the rise of a medieval municipality. The earliest germ of this new type of municipality is seen during the barbarian invasions. Of these we need only enumerate the four most important — those of the Goths, Byzantines (who, however, were not mere barbarians but civilized and corrupt), Lombards and Franks. The Gothic rule merely superimposed upon the Roman social order a Teutonic stratum, that never penetrated beneath its surface. The Goths always remained a conquering army; according to the German custom, they took possession of one-third of the vanquished territory, but, while forbidding the Romans to bear arms, left their local administration intact. The senate, the curiae, the principal magistrates, both provincial and municipal, the prefect of the city, and the Roman judges enforcing the enactments of the

Roman law, were all preserved. Already, under the empire, the civil power had been separated from the military, and this separation was maintained. Hence there was no visible change in the constitution of the state. Only, now there were conquered and conquerors. All real and effective power was on the side of brute force, and the Goths alone bore arms. In every province they had their comites, or heads of the army, who had judicial power over their country- men, especially in criminal cases. Here, then, was a combina- tion of civil and military jurisdiction altogether contrary to Roman ideas. Nor can it be denied that the comites, as chiefs of the armed force, necessarily exerted a direct or indirect influence on the civil and administrative power of the provinces, and especially upon the collection of the imposts. The civil arm, being virtually subordinate to the military, suffered un- avoidable change. Notwithstanding the praise lavished on Theodoric, the kingdom founded by him in Italy had no solid basis. It was composed of two nations differing in race and traditions and even in religion, since the Goths were Arians and the Romans Catholics. The latter were sunk in degeneracy and corruption; their institutions were old and decrepit. It was necessary to infuse new life into the worn-out body. This was difficult, perhaps impossible; and at any rate Theodoric never attempted the task. Little wonder then if the Gothic kingdom succumbed to the Byzantine armies from Constanti- nople.

The wars of Belisarius and Narses against the Goths lasted twenty years (535—55 A.D.), caused terrible slaughter and the devastation in Italy, and finally subjected her to

Byzantine Constantinople. In place of a Gothic king she was rule ‘ now ruled by a Greek patrician, afterwards entitled

the exarch, who had his seat of government at Ravenna as lieutenant of the empire. In the chief provincial cities the ruling counts were replaced by dukes, sub-

ordinate to the exarch; and the smaller towns were governed by military tribunes. Instead of dukes, we sometimes find magistri militum, apparently of higher rank. The praefeclus praetorio of Italy, likewise a dependent of the exarch, was at the head of the civil administration. The pragmatic sanction (554), promulgating the Justinian code, again separated the civil from the military power, which was no longer allowed to intervene in the settlement of private disputes, and, by conferring on the bishops the superintendence of and authority over the provincial and municipal government, soon led to the increase of the power of the church, which had already considerable influence.

The new organization outwardly resembled that of the Goths: one army had been replaced by another, the counts by dukes; there was an exarch instead of a king; the civil and military jurisdictions were more exactly defined. But the army was not, like that of the Goths, a conquering nation in arms; it was a Graeco-Roman army, and did not hold a third of the territory which was now probably added to the possessions of the state (fisc). The soldiery took its pay from Constantinople, whence all instructions and appointments of superior officers likewise proceeded. In Rome we find a magister militum at the head of the troops. The Roman senate still existed, but was reduced to a shadow. Theodoric had left it intact until he suspected it of hostile designs and dealings with the Byzantines, but then began to persecute it, as was proved by the wretched fate of Boetius and Symmachus. Nevertheless the senate survived, added the functions of a curia or municipal council to those of a governmental assembly, and took part in the election of the pope — already one of the chief affairs of Rome. So many senators, however, were slaughtered during the Byzantine War that it was commonly believed to be extinct. The pragmatic sanction, conferring on senate and pope the superintendence of weights and measures in Italy, might seem a convincing proof to the contrary, although, in the general chaos, now that Rome was a mere provincial city, constantly exposed to attack, we may imagine to what the senate was reduced.

All Roman institutions were altered and decayed; but their original features were still to be traced, and no heterogeneous element had been introduced into them. The first dawn of a completely new epoch can only be dated from the invasion of the Lombards (568-72). Their conquest of a large portion of Italy was accompanied by the harshest bards. oppression. They abolished all ancient laws and institutions, and not only seized a third of the land, but reduced the inhabitants almost to slavery. But, in the unsubdued parts of the country — namely, in Ravenna, Rome and the maritime cities — a very different state of things pre- vailed. The necessity for self-defence and the distance of the empire, now too worn out to render any assistance, compelled the inhabitants to depend solely on their own strength. Thus, certain maritime cities, such as Naples, Amalfi, Pisa and Venice, soon attained to a greater or less degree of liberty and inde- pendence.

This is the moment in which ancient society seems to disappear completely and a new one begins to rise. Ancient customs disappear, Christian processions take the place of the ancient games, ancient temples are transformed into churches and dedicated to new saints. If Roman tradition in Italy can ever be said to have been completely broken, this could only be during the Longobard domination. It is

certain, however, that soon the elements of ancient culture began to revive once more. A special state of things now arose in Rome. We behold the rapid growth of the papal power and the continual increase of its moral and political influence. This had already begun under Leo I., and been further promoted by the popes. pragmatic sanction. Not only the superintendence but often the nomination of public functionaries and judges was now in the hands of the popes. And the accession to St Peter's chair of a man of real genius in the person of Gregory I., surnamed the Great, marked the beginning of a new '

era. By force of individual character, as well as by historic

necessity, this pope became the most potent personage in Rome. Power fell naturally into his hands; he was the true representa- tive of the city, the born defender of church and state. His ecclesiastical authority, already great throughout Italy, was specially great in the Roman diocese and in southern Italy. The continual offerings of the faithful had previously endowed the church with enormous possessions in the province of Rome, in Sicily, Sardinia and other parts. The administration of all this property soon assumed the shape of a small government council in Rome. In the middle ages the owner of the land was also master of the men who cultivated it, and exercised political authority as well; these administrators therefore protected and succoured the oppressed, settled disputes, nomin- ated judges and controlled the ecclesiastical authorities. The use made by the pope of his revenues greatly contributed to the increase of his moral and political authority. When the city was besieged by the Lombards, and the emperor left his army unpaid, Gregory supplied the required funds and thus made resistance possible. And, when the defence could be no longer maintained, he alone, by the weight of his personal influence and the payment of large sums, induced the Lom- bards to raise the siege. He negotiated in person with Agilulph, and was recognized by him as the true representative of the city. Thus Rome, after being five times taken and sacked by the barbarians, was, on this occasion, saved by its bishop. The exarch, although unable to give any help, protested against the assumption of so much authority by the pope; but Gregory was no usurper; his attitude was the natural result of events. " For twenty-seven years " — so wrote this pontiff to the im- perial government of Constantinople — " we lived in terror of

the Longobards, nor can I say what sums we had to pay them. There is an imperial treasurer with the army at Ravenna; but here it is I who am treasurer. Likewise I have to provide for the clergy, the poor and the people, and even to succour the distress of other churches."

It was at this moment that the new Roman commune began to take shape and acquire increasing vigour owing to its dis- The tance from the seat of the empire and its resistance

Roman to the Lombard besiegers. Its special character commune. wag now t0 ˆ e traced in the preponderance of the military over the civil power. A Roman element had pene- trated into the army, which was already possessed of con- siderable political importance. The prefect of Rome loses authority and seems almost a nullity compared with the magister ntili turn. Hardly anything is heard of the senate. " Quia enim Senatus deest, populus interiit," exclaims Gregory in a moment of despair. The popes now make common cause with the people against the Lombards on the one hand and the emperor on the other. But they avoid an absolute rupture with the empire, lest they should have to face the Lombard power without any prospect of help. Later, when the growing strength of the commune becomes menacing, they remain faithful to the empire in order not to be at the mercy of the people. It was a permanent feature of their policy never to allow the complete independence of the city until they should be its sole and absolute masters. But that time was still in the future. Meanwhile pope and people joined in the defence of their common interests.

This alliance was cemented by the religious disputes of the East and the West. First came the Monothelite controversy regarding the twofold nature of Christ. Later a long and violent struggle ensued, in which the people of Rome and of other Italian cities sided so vigorously with the popes that John VI. (701-5) had to interpose in order to release the exarch from captivity and prevent a definitive rupture with the empire. Then (710-n) Ravenna revolted against the emperor, organized its armed population under twelve flags, and almost all the cities of the exarchate joined in a resistance that was the first step towards the independence of the Italian communes. A still fiercer religious quarrel then broke out concerning images. Pope Gregory II. (715-31) opposed the celebrated edict of the iconoclastic emperor Leo the Isaurian.

Venice and the Pentapolis took up arms in favour of the pope, and elected dukes of their own without applying to the emperor. Again public disorder rose to such a pitch that the pope was obliged to check it lest it should go too far.

In the midst of these warlike tumults a new constitution, almost a new state, was being set up in Rome. During the conflict with Philippicus, the Monothelite and heretical emperor who ascended the throne in 711, the Liber ot g om c e f Pontificalis makes the first mention of the duchy of Rome (ducatus Romanae urbis), and we find the people struggling to elect a duke of their own. In the early days of the Byzantine rule the territory appertaining to the city was no greater than under the Roman Empire. But, partly through the weakness of the government of Constanti- nople, and above all through the decomposition of the Italian provinces under the Lombards, who destroyed all unity of government in the peninsula, this dukedom was widely ex- tended, and its limits were always changing in accordance with the course of events. It was watered by the Tiber, and stretched into Tuscia to the right, starting from the mouth of the Marta, by Tolfa and Bleda, and reaching as far as Orte. Viterbo was a frontier city of the Lombards. On the left the duchy extended into Latium as far as the Garigliano. It spread very little to the north-east and was badly defended on that side, inasmuch as the duchy of Spoleto reached to within fourteen miles of the Salara gate. On the other side, towards Umbria, the river Nera was its boundary line.

The constitution of the city now begins to show the results of the conditions amid which it took shape. The separation of the civil from the military power has entirely dis- _. .. t appeared. This is proved by the fact that, after the constita- year 600, there is no further mention of the prefect, tloa of His office still survived, but with a gradual change thc com ~ of functions, until, in the 8th century, he once more appears as president of a criminal tribunal. The con- stitution of the duchy and of the new republic formed during the wars with the Lombards and the exarch was substantially of an aristocratico-military nature. At its head was the duke, first appointed by the emperor, then by the pope and the people, and, as his strength and influence grew with those of the commune, he gradually became the most respected and powerful personage in Rome. The duke inhabited the palace of the Caesars on the Palatine Hill, and had both the civil and the military power in his hands; he was at the head of the army, which, being composed of the best citizens and highest nobility of Rome, was a truly national force. This army was styled the Jelicissimus or florens exercitus Romanus or also the militia Romana. Its members never lost their citizen stamp; on the contrary they formed the true body of the citizens. We find mention of other duces in Rome, but these were probably other leaders or superior officers of the army. Counts and tribunes are found in the subject cities bound to furnish aid to the capital. In fact during the pontificate of Sergius II. (844), when the

duchy was threatened by a Saracenic invasion, they were requested to send troops to defend the coast, and as many soldiers as possible to the city.

At that time the inhabitants of Rome were divided into four principal classes — clergy, nobles, soldiers and simple citizens. The nobles were divided into two categories, first the The genuine optimates, i.e. members of old and wealthy different families with large estates, and filling high, and often classes of hereditary, offices in the state, the church and the s °< > let y army. These were styled proceres and primates. The ” Kome ‘ second category comprised landed proprietors, of moderate means but exalted position, mentioned as nobiles by Gregory I., and constituting in fact a numerous petty nobility and the bulk of the army. Next followed the citizens, i.e. the commercial class, merchants and craftsmen, who, having as yet no fixed organization and but little influence, were simply designated as honesti cives. These, however, were quite distinct from the plebeians, plebs, vulgus populi, viri humiles, who in their turn ranked above bondsmen and slaves. The honesti cives did not

usually form part of the army, and were only enrolled in it in seasons of emergency. Nevertheless the army was not only national, but became increasingly democratic, so that in the 10th century it included every class of inhabitants except churchmen and slaves. At that period we sometimes find the whole people designated as the exercitus, those actually under arms being distinguished as the militia exercitus Ro- miiitum. mani. This again was divided into bands or “numbers,” i.e. regiments, and also, in a manner peculiar to Rome, into scholae militum. These scholae were associations derived from antiquity, gaining strength and becoming more general in the middle ages as the central power of the state declined. There were scholae of notaries, of church singers, and of nearly every leading employment; there were scholae of foreigners of diverse nationalities, of Franks, Lombards, Greeks, Saxons, &c. Even the trades and crafts began to form scholae. These were at first very feeble institutions, and only later gained importance and became gilds. As early as the 8th century there were scholae militum in the army, which was thus doubly divided. But we have no precise definition of their functions. They were de facto corporations with separate property, churches and

magistrates of their own. The latter were always optimales, and guarded the interests of the army. But the real chiefs of the bands or numeri were the duces or tribunes, and under the Franks the latter became comites. These chiefs were styled mapiifici consulcs, optimates de militia, often too judices de militia, since, as was the custom of the middle ages, they wielded political and judicial as well as military authority. The title of consul was now generally given to superior officers, whether civil or military. The importance of the scholae militum began to decline in the 10th century; towards the middle of the 1 2th they disappeared altogether, and, according to Felix Papencordt, were last mentioned in 1145. It is probable that the scholae militum signified local divisions of the army, corresponding with the city wards, which were twelve in number during the 10th and nth centuries, then increased to thirteen, and occasionally to fourteen. It is certain that from the be- ginning the army was distributed under twelve flags; after the scholae had disappeared, we find it classified in districts, which were subdivided into companies. The division of cities into quarters, sestieri or rioni, corresponding with that of the army, and also with that of the municipal government, was the common practice of Florence, Siena and almost all the Italian communes. But, while usually losing importance as the gilds acquired power, in Rome the insignificance of the gilds added to the strength of the regioni or rioni, which not only became part of the army but finally grasped the reins of government. This was a special characteristic of the political constitution of the Roman commune.

We now come to a question of weightier import for all desiring to form a clear idea of the Roman government at that period. What had become of the senate? It. had undoubtedly lost its original character now that the empire was extinct. But, after much learned discussion, historical authorities are still divided upon the subject. Certain Italian writers of the 18th century — Vendettini, for example — asserted with scanty critical insight that the Roman senate did not disappear in the middle ages. The same opinion backed by much learned research was maintained by the great German historian Savigny. And Leo, while denying the persistence of the curia in Lombard Italy, adhered to Savigny's views as regarded Rome. Papencordt did the same, but held the Roman senate to be no more than a curia. This judgment was vigorously contested, first by Hegel and Giesebrecht, then by Gregorovius. These writers believe that after the middle of the 6th century the senate had a merely nominal existence. According to Gregorovius its last appear- ance was in the year 579. After that date it is mentioned in no documents, and the chroniclers are either equally silent or merely allude to its decay and extinction. In the 8th

century, however, the terms senator, senatores, senatus again reappear. We find letters addressed to Pippin, beginning thus: Omnis

senatus atque universi populi generalitas. When Leo III. re- turned from Germany he was met by tarn proceres clericorum cum omnibus clericis, quamque optimates et senatus, cunctaque militia (see Anastasius, in Muratori, vol. iii. 198c). But it has been noted that the senate was never found to act as a political assembly; on occasions when it might have been mentioned in that capacity we hear nothing of it, and only meet with it in ceremonials and purely formal functions. Hence the conclusion that the term senator was used in the sense of noble, senatus of nobility, and no longer referred to an institution but only to a class of the citizens. Even when we find that the emperor Otto III. (who sought to revive all the ancient institutions of Rome) addressed an edict to the " consuls and senate of Rome," and read that the laws of St Stephen were issued senatus decreto, the learned Giesebrecht merely remarks that no important changes in the Roman constitution are to be attributed to the consuls and senate introduced by Otto III. Thus for the next glimpse of the senate we must pass to the 12th century, when it was not only reformed, as some writers believe, but entirely reconstituted.

But in this case a serious difficulty remains to be disposed of. Gregorovius firmly asserts that the nobles acquired great power between the 7th and 10th centuries, not only filling the highest military, judicial and ecclesiastical offices, " but also directing the municipal government, presumably with the prefect at their head." He further adds: " Notwithstanding the disappearance of the senate, it is difficult to suppose that the city was without governing magistrates, or without a council." Thus, after the 7th century, the optimates at the head of the army were also at the head of the citizens, and " formed a communal council in the same manner in which it was afterwards formed by the banderesi." 1 Now, if the nobles were called senatores and the nobility senatus, and if this body of nobles met in council to administer the affairs of the republic, there is no matter for dispute, inasmuch as all are agreed that the original senate must have had a different character from the senate of the middle ages. And, since the absence of all mention of a prefect after the 7th century is not accepted as a proof of his non-existence, and we find him reappear under another form in the 8th century, so the silence as to the senate after the year 579, the fresh mention of it in the 8th century, and its reappearance in the 12th as a firmly reconstituted body reasonably lead to the inference that, during that time, the ancient senate had

been gradually transformed into the new council. Its meetings must have been held very irregularly, and probably only in emergencies when important affairs had to be discussed, previously to bringing them before the parlia- ment or general assembly of the people. Historians _ are better agreed as to the significance of the term consols consul. At first this was simply a title of honour bestowed on superior magistrates, and retained that meaning from the 7th to the nth century, but then became — as in other Italian cities — a special title of the chief officers of the state. ■

During this period the Roman constitution was very simple. The duke, commanding the army, and the prefect, presiding over the criminal court, were the chiefs of the republic; the armed nobility constituted the forces, filled all of superior offices, and occasionally met in a council called the senate, although it had, as we have said, no resemblance to the senate of older times. In moments of emergency a general parliament of the people was convoked. This constitution differed little from that of the other Italian communes, where, in the same way, we find all the leading citizens under arms, a parliament, a council, and one or more chiefs at the head of the government.

But Rome had an element that was lacking elsewhere. We have already noted that, in the provinces, the administrators of church lands were important personages, and exercised during the middle ages, when there was no exact division of power, both judicial and political functions. It was very natural that the heads of this vast administration resident in Rome should have a still higher standing, and in fact, from the

1 Gregorovius, Geschichte, vol. ii. pp. 427-28 and note (2nd ed.).

6th century, their power increased to such an extent that in the times of the Franks they already formed a species of papal

cabinet with a share and sometimes a predominance “decJero. m tne affairs of the republic. There were seven principal

administrators, but two of them held the chief power — the primicerius notariorum and the secundicerius, i.e. the first and under secretaries of state. When, on the constitution of the new empire,

these ministers were declared to be palatine or imperial as well as papal officials, the primicerius and the secundicerius were also in waiting on the emperor, who sat in council with them when in Rome. Next came the arcarius, or treasurer ; the sacellarius, or cashier ; the protoscriniarius, who was at the head of the papal chancery; the primus defensor, who was the advocate of the church and administered its possessions. Seventh and last came the nomenclator, or adminiculateˆ, who pleaded the cause of widows, orphans and paupers. There were also some other officials, such as the vestiarius, the vicedominus or steward, the cubicularius or major-domo, but these were of inferior importance. They were ecclesiastics, but not bound to be in priest's orders. The first seven were those specially known as proceres clericorum and oftener still as judices de clero, since they speedily assumed judicial functions and ranked among the chief judges of Rome. But as ecclesiastics they did not give decisions in criminal cases. Thus Rome had two tribunals, that of the judices de clero, or ordinarii, presided over by the pope, and that of the judices de militia, leaders of the army, dukes and tribunes, also bearing the generic title of consuls. First appointed by the exarch and then frequently by the pope, these decided both civil and criminal cases. In the latter they were sole judges under the presidency of the prefect.

The pope was thus at the head of a large administrative body with judicial and civil powers that were continually on

the increase, and, in addition to his moral authority and the 6 over Christendom, was possessed of enormous revenues. oower ^° * n course °f ti m e he considered himself the real

representative of the Roman Republic. Gregory II. (7 ! 5 _ 3i) accepted in the name of the republic the sub- mission of other cities, and protested against the conquest by the Lombards of those already belonging to Rome. He seemed indeed to regard the territory of the duchy as the patri- mony of the church. The duke was always at the head of the army, and, officially, was always held to be an imperial magistrate. But the empire was now powerless in Italy. Meanwhile the advance of the Lombards was becoming more and more threatening; they seized Ravenna in 751, thus putting an end to the exarchate, and next marched towards Rome, which had only its own forces and the aid of neighbouring cities to rely upon. To avoid being crushed by the brute force of a foreign nation unfit to rule, and only capable of oppression and pillage, it was necessary to make an energetic stand.

Accordingly, the reigning pope, Stephen II. (752-57), ap- pealed to Pippin, king of the Franks, and concluded with that

monarch an alliance destined to inaugurate a new Jp/fea/ peS e P ocn 0I the world's history. The pope consecrated to the Pippin king of the Franks, and named him patricius lot aid. Romanorum. This title, as introduced by Constantine,

hadno longer the ancient meaning,but nowbecame asign of lofty social rank. When, however, it was afterwards conferred on barbarian chieftains such as Odoacer and Theodoric, and then on the representative of the Byzantine empire in Italy, it ac- quired the meaning of a definite dignity or office. In fact, the title was now given to Pippin as defender of the church, for the pope styled him at the same time patricius Romanorum and defensor or protector ecclesiae. And the king pledged himself not only to defend the church but also to wrest the exarchate and the Pentapolis from the Lombards and give them to Rome, or rather to the pope, which came to the same thing. This was considered as a restitution made to the head of the church, who was also the representative of the republic and the empire. And, to preserve the character

of a restitution, the famous " donation of Constantine " was

invented during this period (752-77). Pippin brought his

army to the rescue (754-55) and fulfilled his promise.

The pope accepted the donation in the name of St ofpfppin.

Peter, and as the visible head of the church. Thus

in 755 central Italy broke its connexion with the empire and

became independent; thus was inaugurated the temporal

power of the papacy, the cause of so much subsequent warfare

and revolution in Rome.

Its first consequences were speedily seen. In 767 the death of Paul I. was followed by a fierce revolt of the nobles under Duke Toto (Theodoro) of Nepi, who by violent means raised his brother Constantine to the chair of St Peter, although Constantine was a layman and had first to be ordained. For more than a year the new pontiff was a pliable tool in the hands of Toto and of the nobles. But the genuine papal faction, headed by a few judices de clero, asked the aid of the Lombards and made a formidable resistance. Their adversaries were defeated, tortured and put to death. Toto was

treacherously slain during a fight. The pope was blinded and left half dead on the highway. Fresh and no less violent riots ensued, owing to the public dread lest the new pope, Stephen III. (768-72), elected by favour of the Lombards, should give them the city in return. But Stephen went over to the Franks, whom he had previously deserted, and his successor, Adrian I. (772-95), likewise adhered to their cause, called the city to arms to resist King Desiderius and his Lombard hordes, and besought the assistance of Charlemagne. This monarch accordingly made a descent into Italy in 773, and not only gained an charle- easy victory over Desiderius, but destroyed the magneto Lombard kingdom and seized the iron crown. Entering y ‘ Rome for the first time in 774, he confirmed and augmented the donation of Pippin by the addition of the dukedom of Spoleto. He returned several times to Italy and Rome, making new conquests and fresh concessions to Adrian I., until the death of the latter in 795.

The position of Rome and of the pope is now substantially changed. Duke, prefect, militia and the people exist as heretofore, but are all subordinate to the head of the church, who, by the donations of Pippin and Charlemagne, has been converted into a powerful temporal sovereign. Henceforth all connexion with Byzantium is broken off, but Rome is still the mainspring of the empire, the Roman duchy its sole sur- viving fragment in Italy, and the pope stands before the world as representative of both. And, although it is difficult to determine how this came about, the pope is now regarded and regards himself as master of Rome. In the year 772 he entrusts the vestiarius with judicial powers over the laity, ecclesiastics, freemen and slaves nostrae Romanae reipublicae. He writes to Charlemagne that he has issued orders for the burning of the Greek ships employed in the slave trade, ” in our city of Civita Vecchia ” (Centumcellae), and he always speaks of Rome and the Romans as ” our city,” ” our republic,” ” our people.” The donations of Pippin and Charlemagne are restitutions made to St Peter, the holy church and the re- public at the same time. It is true that Charlemagne held the supreme power, had an immensely increased authority and actively fulfilled his duties as patricius. But his power was only occasionally exercised in Rome; it was the result of ser- vices rendered to the church, and of the church’s continual need of his help; it was, as it were, the power of a mighty and indispensable ally. The pope, however, was most tenacious of his own authority in Rome, made vigorous protest whenever rebels fled to Charlemagne or appealed to that monarch’s arbitration, and contested the supremacy of the imperial officials in Rome. Yet the pope was no absolute sovereign, nor, in the modern sense of the term, did any then exist. He asserted supremacy over many lands which continually

rebelled against him, and which, for want of an army of his own, he was unable to reduce to obedience without others' help. Neither did the republic acknowledge him as its head. It profited by

The papacy, the re- public and the Franks.

the growing power of the pope, could not exist without him, respected his moral authority, but considered that he usurped undue power in Rome. This was specially the feeling of the nobles, who had hitherto held the chief authority in the republic, and, being still the leaders of the army, were by no means willing to relinquish it. The Roman nobles were very different from other aristocratic bodies elsewhere. They were not as they pretended, descendants of the Camilli and the-Scipios, but neither were they a feudal aristocracy, inasmuch as the Teutonic element had as yet made small way among them. They were a mixture of different elements, national and foreign, formed by the special conditions of Rome. Their power was chiefly derived from the high offices and large grants of money and land conferred on them by the popes; but, as no dynasty existed, they could not be dynastic. Every pope aggrandized his own kindred and friends, and these were the natural and often open adversaries of the next pontiff and his favourites. Thus the Roman nobility was powerful, divided, restless and turbulent; it was continually plotting against the pope, threatening not only his power, but even his life; it continually appealed to the people for assistance, stirred the militia to revolt and rendered government an impossibility. Hence, notwithstanding his immense moral authority, the pope was the effective head neither of the aristocracy, the army nor of the as yet unorganized lower classes. The lord of vast but often insubordinate territories, the recognized master of a capital city torn by internecine feud and plots against himself, he needed the support of an effective force for his own preserva- tion and the maintenance of the authority proffered him from all quarters. Hence the necessity of creating an empire of the West, after having snapped every link with that of the East. Thus the history of Rome is still, as in the past, a history of continual strife between pope, emperor and republic; and the city, while imbibing strength from all three, keeps them in perpetual tumult and confusion.

Leo III. (706-816) further strengthened the ties between Charlemagne

and the church by sending the former a letter with the keys of the shrine of St Peter and the banner of Rome. Charlemagne had already joined to his office of patrician the function of high justice. The new symbols now sent constituted him miles of Rome and general of the church. The pope urged him to despatch an envoy to receive the oath of fealty, thus placing himself, the representative of the republic, in the subordinate position of one of the bishops who had received the immunities of counts. And all these arrangements took place without the slightest reference to the senate, the army or the people. Much resentment was felt, especially by the nobles, and a revolution ensued headed by the primicerius Paschalis and the secundicerius Campulus, and backed by all who wished to liberate the city from the papal rule. During a solemn procession the pope was attacked and barbarously maltreated by his assailants, who tried to tear out his eyes and tongue (709). He was thrown into prison, escaped and overtook Charlemagne at Paderborn, and returned guarded by ten of the monarch's envoys, who con- demned to death the leaders of the revolt, reserving, however, to their sovereign the right of final judgment. Charlemagne arrived in December 800, and as high justice assembled a tribunal of the clergy, nobles, citizens and Franks; he pro- nounced Leo to be innocent, and confirmed the capital sentence passed on the rebels. But through the intercession of the pope, who dreaded the wrath of the nobles, this was presently Cb le- commuted into perpetual exile. And finally On magae Christmas day, in St Peter's, before an assemblage %ZJ?£i. oi Roman and Frankish lords, the clergy and the people, the pontiff placed the imperial crown on Charlemagne's head and all proclaimed him emperor.

Thus the new emperor was elected by the Romans and consecrated by the pope. But he was their real master and supreme judge. The pope existed only by his will, since he alone supplied the means for the maintenance of the temporal power, and already pretended to the right of controlling the

papal elections. Yet Charlemagne was not sovereign of Rome; he possessed scarcely any regalia there, and was not in command of the army; he mainly represented a principle, but this principle was the law which is the basis of the state. The pope still nominated the Roman judges, but the emperor or his missi presided over them, together with those of the pope, and his decision was appealed to in last resort. During the Carolingian times no mention is found of the prefect, and it would seem that his office was filled by the imperial missus, or legate, the judices de clero and judices de militia. The power of the pope was now entangled with that of the republic on the one hand and that of the empire on the other. The con- sequent

confusion of sacred and secular functions naturally led to infinite complications and disputes.

The death of Charlemagne in 814 was the signal for a fresh conspiracy of the nobles against the pope, who, discovering their design, instantly put the ringleaders to death, and was severely blamed by Louis for this violation of the imperial prerogative. While the matter was under discussion the nobles broke out in fiercer tumults, both in Rome and the Campagna. At last, in 824, the emperor Lothair came to re-establish order in Rome, and proclaimed a new and note- worthy constitution, to which Pope Eugenius II. (824-27) gave his oath of adherence. By this the partnership of pope and emperor in the temporal rule of Rome and the states of the church was again confirmed. The more direct power appertained to the pope; the supreme authority, presidence of the tribunals, and final judgment on appeal to the emperor. The new constitution also established the right of contending parties to select either the Roman or the Teutonic code for the settlement of their disputes. During the Carolingian period it is not surprising that the commune should have been, as it were, absorbed by the church and the empire. In fact, it is scarcely mentioned in history throughout that time. And when, no longer sustained by the genius of its Decline founder, the Frankish empire began to show signs of the of dissolution, the popes, finding their power thereby emp ‘ strengthened, began to assume many of the imperial attri- butes. Soon, however, as a natural consequence of the loss of the main support of the papacy, the nobles regained vigour and were once more masters of the city. Teutonic and feudal elements had now largely penetrated into their organiza- tion. The system of granting lands, and even churches and convents, as benefices according to feudal forms, became more and more general. It was vain for the popes to offer opposition, and they ended by yielding to the current. The fall of the Frankish empire left all Italy a prey to anarchy, and torn by the faction fights of Berengar of Friuli and Guido of Spoleto, the rival claimants to the crowns of Italy and the empire. The Saracens were advancing from the south, the Huns from the north; the popes had lost all power; and in the midst of this frightful chaos a way was opened for the rise of the republics. Anarchy was at its climax in Rome, but the laity began to overpower the clergy to such an extent that the judices de militia prevailed over the judices de clero. For a long time no imperial missi or legates had been seen, and the papacy was incredibly lowered. The election of the popes had positively fallen into the hands of certain beautiful women notorious for their evil life and depravity. The aristocracy alone gained strength; now freed from the domination of the emperor, it continually wrested fresh privileges

from the impotent pontiffs, and became organized as the ruling force of the republic. Gregorovius, notwithstanding his denial of the continuation of the senate after the 6th century, is obliged to acknowledge that it appeared to have returned to life in the power of this new baronage. And, although this body was now permeated with the feudal principle, it did not discard its ancient traditions. The nobles claimed to be the main source of the empire; they wished to regain the dignity and office of patricius, and to make it, if possible, hereditary in some of their families. Nothing is known of their system of organization, but it seems

Renewed power of the aristoc- racy.

that they elected a chief bearing the title of consul, senator, princeps Romanorum, who was officially recognized by the pope, as a patricius presided over the tribunals, and was the head of the commune.

Theophylact was one of the first to assume this dignity. His wife Theodora, known as the senatrix, was one of the women then dominating Rome by force of their charms and licentious- ness. She was supposed to be the concubine of Pope John X. (914-28), whose election was due to her influence. Her daughter Marozia, in all things her worthy rival, was married to Alberic, a foreign mercenary of uncertain birth who rose to a position of great influence, and, although an alien, played a leading part in the affairs of the city. He helped to increase the power of Theophylact, who seemingly shared the rule of the city with the pope. In the bloody war that had to be waged against the Saracens of southern Italy, and at the defeat of the latter on the Garigliano (916), Theophylact and Alberic were the Roman leaders, and distinguished themselves by their valour. They disappeared from the scene after this victory, but Marozia retained her power, and bore a son, Alberic, who was destined to greater deeds. The pope found himself caught in this woman's toils, and struggled to escape, but Marozia, gaining fresh influence by her marriage with Hugo, margrave of Tuscany, imprisoned the pontiff himself in the castle of St Angelo (928). This fortress was the property of Marozia and the basis of her strength. The unfortunate John died within its walls. Raised to the chair by Theodora, he was deposed and killed by her daughter. The authority of the latter reached its culminating point

in 931, when she succeeded in placing her son John XI. on the papal throne. On the death of her second husband she espoused Hugh of Provence, the same who in 928 had seized the iron crown at Pavia, and now aspired to the empire. Dissolute, ambitious and despotic, he came to Rome in 932, and, leaving his army outside the walls, entered the castle of St Angelo with his knights, instantly began to play the tyrant, and gave a blow to Alberic his stepson, who detested The him as a foreign intruder. This blow proved the

revolt cause of a memorable revolution; for Alberic rushed of the from the castle and harangued the people, crying that *°’ n *’ ,s • the time was come to shake off the tyrannous yoke of at the a woman and of barbarians who were once the slaves bead of Rome. Then, putting himself at the head of the

populace, he closed the city gates to prevent Hugh’s troops from coming to the rescue, and attacked the castle. The king fled; Marozia was imprisoned, Alberic pro- claimed lord of the Romans, and the pope confined to the Lateran in the custody of his own brother. Rome was again an independent state, a republic of nobles. Rid of the temporal dominion of emperor and pope, and having expelled the foreigners with great energy and courage, it chose Alberic for its chief with the title of princeps atque omnium Romanorum senator. The tendencyof the Roman Republic to elect asupreme author- ity, first manifested in the case of Theophylact, was repeated in those of Alberic, Brancaleone, Crescenzio, Cola di Rienzo and others. One of the many causes of this tendency may be traced to the conception of the new empire of which Rome was the original and enduring fountainhead. As Rome had once transferred the empire from Byzantium to the Franks, so Rome was surely entitled to reclaim it. The imperial authority was represented by the office of patrician, now virtually assumed by Alberic. That he gave the name of Octavian to his son is an additional proof of this fact. In the Eternal City the medieval political idea has always the aspect of a resurrection or trans- formation of classic antiquity. This is another characteristic of the history of the Roman commune.

Alberic’s strength was due to his connexion with the nobility, to his father’s valiant service against the Saracens at the battle of Garigliano, and to the militia under his command, on which everything depended amid the internal and external dangers now threatening the new state. As yet no genuine municipal constitution was possible in Rome, where neither the people nor the wealthy burghers engaged in industry and commerce

of the commune.

had any fixed organization. All was in the hands of the nobles, and Alberic, as their chief, frequently convened them in council, although obliged to use pressure to keep them united and avoid failing a prey to their disputes. Hence the whole power was concentrated in his grasp; he was at the head of the tribunals as well as of the army. The judices de clero and judices de militia still existed, but no longer met in the Lateran or the Vatican, under the presidency of emperor and pope or their missi. Alberic himself was their president; and, a still more significant fact, their sittings were often held in his private dwelling. There is no longer any mention of prefect or patricius. The papal coinage was inscribed with Alberic's name instead of the emperor's. His chief attention was given to the militia, which was still arranged in scholae, and it is highly probable that he was the author of the new division of the city into twelve regions, with a corresponding classification of the army in as many regiments under twelve flags and twelve banderesi, one for every region. The organization of the scholae could not have been very dissimilar, but doubtless Alberic had some important motive for altering the old method of classification. By means of the armed regions he included the people in the forces. It is certain that after his time we find the army much changed and far more democratic. It was only natural that so excellent a statesman should seek the aid of the popular element as a defence against the arrogance of the nobles, and it was requisite to reinforce the army in order to be prepared for the attacks threatened from abroad. This change effected, Alberic felt prepared for the worst, and began to rule with energy, moderation and justice. His contemporaries award him high praise, and he seems to have been exempt from the vices of his mother and grandmother.

In 933 Hugh made his first attack upon the city, and was repulsed. A second attempt in 936 proved still more unfortu- nate, for his army was decimated by a pestilence. Thoroughly disheartened, he not only made peace, but gave his daughter in marriage to Alberic, thus satisfying the latter's desire to ally himself with a royal house. But this union led to no conciliation with Hugh. For Alberic, finding his power increased, marched at the head of his troops to consolidate his rule in the Cam- pagna and the Sabine land. On the death of his brother, Pope John XL, in 936, he controlled the election of several successive popes, quelled a conspiracy formed against him by the clergy and certain nobles instigated by Hugh, and brilliantly repulsed, in 941, another attack by that potentate. At last, however, this inveterate foe withdrew from Rome, being summoned to the north by the victories of his rival Berengarius. But Alberic, after procuring the election of

various popes who were docile instruments of his will, experienced a check when Agapetus II. (946-55), a man of firmness and resource, was raised to the papal throne. The fortunes of Berengarius were now in the ascendant. In 950 he had seized the iron crown, and ruled in the Pentapolis and the exarchate. This being singularly painful to the pope, he proceeded to make alliance with all those enemies of Berengarius preferring a distant emperor to a neighbouring and effective sovereign, with the Roman nobles who were discontented with Alberic, and with all who foresaw danger, even to Rome, from the extended power of Berengarius. And Agapetus recurred to the old papal policy, by making appeal to Otto I., whose rule in Germany was distinguished by a prestige almost comparable with that of Charlemagne.

Otto immediately responded to the appeal and descended into Italy; but his envoys were indignantly repulsed by Alberic, and, being prudent as well as firm, he decided to wait a more opportune moment for the accomplishment of his designs. Meanwhile Alberic died in 954, and the curtain fell on the first great drama of the Roman Republic. He had reigned for twenty-two years with justice, energy and prudence; he had repelled foreign invaders, maintained order and authority. He seems, however, to have realized that the aspect of affairs was about to change, that the work he had accomplished would be exposed to new dangers. These dangers, in fact, had already begun with the accession of an enterprising pope to the Holy

See. The name of Octavian given by Alberic to his son leads to the inference that he meant to make his power hereditary. But, suddenly, he began to educate this son for the priesthood, and, assembling the nobles in St Peter's shortly before his death, he made them swear to elect Octavian as pope on the decease of Agapetus II. They kept their word, for in this way they freed themselves from a ruler. Possibly Alberic trusted that both offices might be united, and that his son would be head of the state as well as the church. But the nobles knew this to be a delusion, especially in the case of a nature such as Octavian's. The lad was sixteen years old when his father died, received princely honours until the death of Agapetus, and was then elected pope with the name of John XII. He had inherited the ungoverned passions of his grandmother Marozia and great-

grandmother Theodora, but without their intelligence and cunning. His palace was the scene of the most scandalous licence, while his public acts were those of a baby tyrant. He conferred a bishopric on a child of ten, consecrated a deacon in a stable, invoked Venus and Jupiter in his games, and drank to the devil's health. He desired to be both pope and prince, but utterly failed to be either. Before long, realizing the impossibility of holding in check Berengarius, who still ruled over the exarchate, he sought in 960 the aid of Otto I., and promised him the imperial crown. Thus the new ruler was summoned by the son of the man by whom he had otto 1. been repulsed. Otto vowed to defend the church, to crowned restore her territories, to refrain from usurping the emperor. p 0we r of the pope or the republic, and was crowned on the 2nd of February 962 with unheard-of pomp and display. Accordingly, after being extinct for thirty-seven years, the empire was revived under different but no less difficult conditions. The politico-religious unity founded by Charlemagne had been dissolved, partly on account of the heteroponeous elements of which it was composed, and partly because other nations were in course of formation. Now too the feudal system was converting the officers of the empire into inde- pendent princes, and the new spirit of communal liberty was giving freedom to the cities. Otto once more united the empire and the church, Italy and Germany, in order to combat these new foes. But the difficulties of the enterprise at once came to light. John XII., finding a master in the protector he had invoked, now joined the discontented nobles who were conspiring with Berengarius against the emperor. But the latter hastened to Rome in November 963, assembled the clergy, nobles and heads of the people, and made them take an oath never again to elect a pope without his consent and that of his son. He also convoked a synod presided over by himself in St Peter's, which judged, condemned and deposed Pope John and elected Leo VIII. (863-65), a Roman noble, in his stead. All this was done at the direct bidding of the emperor, who thus deprived the Romans of their most valued privilege, the right of choosing „. . their own pope. But the people had now risen to

import- considerable importance, and, for the first time, we aace find it officially represented in the synod by the

plebeian Pietro, surnamed Imperiola, together with the leaders of the militia, which had also become a popular institution since Alberic's reign. It was no longer easy to keep the lower orders in subjection, and by their junction with the malcontent nobles they formed a very respectable force. On the 3rd of January 964 they sounded the battle-peal and attacked the Vatican, where the emperor was lodged. The German knights repulsed them with much slaughter, and this

bloodshed proved the beginning of an endless feud. Otto departed in February, and John XII., as the chosen pope of the Romans, returned with an army of followers and com- pelled the defenceless Leo VIII. to seek safety in flight. Soon afterwards Leo was deposed and excommunicated by a new synod, and many of his adherents were cruelly murdered. But on the 14th of May 964 John suddenly expired; the Romans, amid violent struggles and tumults, resumed their rights, elected Benedict V., and procured his consecration in spite of the emperor's veto. Otto now appeared at the head

of the people.

of an army, committed fresh slaughter, besieged the city, re- duced it by famine, and, after holding a council which deposed Benedict and sent him a prisoner to Hamburg, restored Leo VIII. to the papal throne.

But, although the emperor thus disposed of the papacy at his will, his arbitrary exercise of power roused a long and obstinate resistance, which had no slight effect upon Another the history of the commune. Leo VIII. died in 965, revoia- and the imperial party elected John XIII. (965-72). tloa – Upon this the nobles of the national party joined the people and there was a general revolt. The nobles were led by Pietro, prefect of Rome. As we have noted, this office seemed to be extinct during the Carolingian rule, but we again meet with it in 955, after an interval of a century and a half. The leaders of the people were twelve decarconi, a term of unknown derivation, but probably indicating chiefs of the twelve regions (dodecarchi, dodecarconi, decarconi). The new pope was seized and confined, first in the castle of St Angelo, then in a fortress in the Campagna. But the emperor quickly marched an army against Rome, and this sufficed to produce a reaction which recalled the pope (November 966), sent the prefect into exile, and put several of the rebellious nobles to death. And shortly after the emperor sacked the city. Many Romans were exiled, some tortured, others, including the twelve decarconi, killed. John XIII. died in 972 and Otto in 973.

All these events clearly prove how great a change had now taken place in the conditions of Rome. The people (plebs) had made its appearance upon the stage; the army had become democratic; the twelve regions were regularly organized under leaders. Opposed to them stood the nobles, headed by the prefect, also a noble, precisely as in Florence the nobles and the podesta. were later opposed to the gilds and the people. So far, it is true, nobles and people had made common cause in Rome; but this harmony was soon to be interrupted.

The feudal spirit had made its way among the Roman aristocrats, had split them into two parties and diminished their strength. It was now destined to spread, and, as it was always vigorously detested and opposed by the people elsewhere in Italy, so the same consequence was inevitable in Rome. Another notable change, and a subject of unending controversy, had ako occurred in the administration of justice. So aattvL far there were the judices de clero, also known as ordinary or palatine judges, and the judices de militia, also “tyled consules or duces. These judges generally formed a court of seven, three being de clero, four de militia, or vice versa, under the presidency of the papal or imperial missi. In criminal cases the judices de militia had the prefect or the imperial missus for their president. But there was a third order of judges called pedanei, a consulibus creali. It seems clear that the duces, being distribuli per judicatus, found them- selves isolated in the provinces, and to obtain assistance nomin- ated these pedanei, who were legal experts. In Rome, with its courts of law, they were less needed, but possibly in those sections of the city where cases of minor importance were submitted to a single magistrate reference was made to the pedanei. But many changes were made under the Franks, and when the edict of Lothair (824) granted free choice of either the Roman or Germanic law, and the duces were replaced by comites and gastaldiones, chiefly of German origin, the use of legal experts became increasingly necessary. And the custom of employing them was the more easily diffused by being already common among the Franks, whose scabini were legal experts acting as judges, though not qualified to pass sentence. Thus the pedanei multiplied, came to resemble the scabini, and were designated judices dalivi (a magistratu dati) or simply dativi. These were to be found in the exarchate in 838, but not in Rome until 961, when the judices de militia had ceased to exist. The great progress of the German legal procedure may then have contributed to the formation of the new office.

Meanwhile Pope John XIII. had been succeeded by Bene- dict VI. (973-74) and Otto I. by his son Otto II., a youth

of eighteen married to the Byzantine princess Theophano. Thereupon the Romans, who had supported the election of another pope, and were in no awe of the new emperor, rose to arms under the command

of Crescenzio, a rich and power- ful noble. They not only seized Benedict VI. by force, but strangled him in the castle of St Angelo. The national and imperial parties then elected several popes who were either exiled or persecuted, and one of them was said to be murdered. In 985 John XV. was elected (985-96). During this turmoil, Giovanni the national party, composed of nobles and people, Cres- led by Giovanni Crescenzio, son of the other Crescenzio

cemio, mentioned above, had taken complete possession of the government. This Crescenzio assumed the title of patrician, and sought to imitate Alberic, although far his inferior in capacity. Fortunately for him, the reigning pope was a detested tyrant, and the emperor a child entirely guided by his mother. But the new emperor Otto III. was backed by a powerful party, and on coming to Rome in 996 was able, although only aged fifteen, to quell the rebellion, oust Crescenzio from public life, and elect as successor to John XV. his own cousin, Pope Gregory V. (996-99). But this first German pope surrounded himself with compatriots, and by raising them to lofty posts even in the tribunals excited a revolt that drove him from the throne (29th September 999). Crescenzio, being master of the castle of St Angelo, resumed the title of patrician or consul of the Romans, expelled the German judges, recon- stituted the government, prepared his troops for defence, and created a new pope. But the following year Otto III. came to Rome, and his party opened the gates to him. Although deserted by nearly all his adherents, Crescenzio held the castle valiantly against its besiegers. At last, on the 29th of April 998, he was forced to make terms, and the imperialists, violating their pledges, first put him to torture and then hurled him from the battlements. Gregory V. dying shortly after these events, Sylvester II., another native of southern France, who had been tutor to the emperor Otto III., was raised to the papacy (999-1003).

Thus Otto III. was enabled to establish his mastery of Rome. But, as the son of a Greek mother, trained amid Greek influ- ences, his fantastic and contradictory nature seemed only to grasp the void. He wished to reconstitute a Romano-Byzantine empire with Rome for his capital. His discourse always turned on the ancient republic, on consuls and senate, on the might and grandeur of the Roman people; and his edicts were addressed to the senate and the people. The senate is now constantly mentioned, and its heads bear the title of consuls. The emperor also gave renewed honour to the title of patrician, surrounded himself with officials bearing Greek and Roman designations, and raised the prestige of the prefect, who, having now almost the functions of an imperial vicar, bore the eagle and the sword as his insignia. Neverthe- less Otto III. was thoroughly German,

and during his reign all Germanic institutions made progress in Rome. This was particularly the case with feudalism, and Sylvester II. was the first pope to treat it with favour. Many families of real feudal barons now arose. The Crescenzii held sway in the Sabine hills, and Praeneste and Tusculum were great centres of feudalism in the nth century. The system of feudal bene- fices was recognized by the church, which made grants of lands, cities and provinces in the feudal manner. The bishops, like feudal barons, became actual counts. And, in consequence of these changes, when the emperor, as head of the feudal system, seeks to impose his will upon the church (which has also become feudal) and control the papal elections, he is met by the great question of the investitures, a question destined to disturb the whole world. Meanwhile the Roman barons were growing more and more powerful, and were neither submissive nor faithful to the emperor. On the contrary, they resented his attitude as a master of Rome, and, when he subjected Tivoli to the Holy See, attacked both him and the pope with so much vigour as to put both to flight (16th February 1001). There- upon Rome again became a republic, headed by Gregory of

Otto 111.

Giovanni Cres- cenzio.

Tusculum, a man of a powerful family claiming descent from Alberic.

By the emperor's death in January 1002 the race of the Ottos became extinct, the papacy began to decline, as at the end of the Carolingian period, and the nobles, divided into an imperial and a national party, were again predominant. They reserved to themselves the office of patrician, and, electing popes from their own ranks, obtained enlarged privileges and power. At the time when Ardoin, marquis of Ivrea, profiting by the extinction of the Ottos and the anarchy of Germany, was stirring Italy in the vain hope of constituting a national kingdom, the Roman Republic was being consolidated The under another Giovanni Crescenzio, of the national second faction. He was now elected patrician; one of his kinsmen was invested with the office of prefect, and the new pope John XVIII. (1003-9) was one of his creatures. Although the power of Henry of Bavaria was then gaining ascendancy in Germany, and giving strength to the imperialist nobles, Crescenzio still remained supreme ruler of the city and the Campagna. Surrounded by his judges, the senators and his kinsman the prefect, he continued to dispense justice in his own palace until his death in 1012, after ten years' rule. And, Pope Sergius IV. having died the same year, the counts of Tusculum compassed the election of Benedict VIII.

(1012-24), one of their own kin. This pope expelled the Crescenzii, changed the prefect and reserved the title of patrician for Henry II., whom he con- secrated emperor" on the 14th February 1014. A second Alberic, bearing the title of " eminentissimus consul et dux," was now at the head of the republic and dispensed placita in the palace of his great ancestor, from whom the counts of Tusculum were also descended.

The new emperor endeavoured to re-establish order in Rome, and strengthen his own authority together with that of the pope. But the nobles had in all things the upper hand. They were regularly organized under leaders, held meetings, asserted their right to nominate both pope and emperor, and in fact often succeeded in so doing. Even Henry II. himself was obliged to secure their votes before his coronation. The terms senate and senator now recur still more frequently in history. Nevertheless, Benedict VIII. succeeded in placing his own brother, Romano, at the head of the republic with the title of " consul, dux and senator," thus making him leader of the nobles, who met at his bidding, and chief of the militia and the tribunals. The prefect still retained his authority, and the emperor was by right supreme judge. But, a violent revolt breaking out, the emperor only stayed to suppress it and then went to Germany in disgust. The pope, aided by his brother, conducted the government with energy; he awed the party of Crescenzio, and waged war against the Saracens in the south. But he died in 1024, and in the same year Henry II. was succeeded by Conrad II. There was now beheld a repetition of the same strange event that had followed the death of Alberic, and with no less fatal consequences. Benedict's brother Romano, head of the republic, and still retaining office, was, although a layman, elected pope. He took the name of John XIX. (1024-33), and in 1027 conferred the imperial crown on Conrad the Salic, who, abolishing the Lothairian edict of 824, decreed that throughout Rome and its territory justice should be henceforth administered solely by the Justinian code. Thus, notwith- standing the spread of feudalism and Germanic procedure, the Roman law triumphed through the irresistible force of the national character, which was already manifested in many other ways.

Meanwhile John XIX. was succeeded by his nephew, Benedict IX. (1033-45), a lad of twelve, who placed his own brother at the head of the republic. Thus church and state assumed the aspect of hereditary possessions in the powerful house of the counts of Tusculum. But the vices and excesses of Benedict were so monstrous ■ that the papacy sank to the lowest depth of corruption; there followed a series of tumults

and reactionary attempts, and so many conflicting elections that in 1045 three popes were struggling for the tiara in the midst of scandal and anarchy. The streets and neighbourhood of Rome swarmed with thieves and assassins; pilgrims were plundered; citizens trembled for their lives; and a hundred petty barons threatened the rival popes, who were obliged to defend themselves by force. This state of things lasted until Henry III. came to re-establish order. He appointed a synod to depose the three popes, and then, with the consent of the wearied and anarchy-stricken Romans, assuming the right of election, proposed a German, Clement II., who was con- secrated at Christmas 1046. Henry III. was then crowned, and also took the title of patrician. Thus the emperor was lord over church and state. This, however, stirred both people and pope against him, and led to the terrible contest of the investitures, although for the moment the Romans, being exhausted by past calamities, seemed not only resigned but contented.

In fact, the idea of reform and independence was already germiijating in the church and was soon to become tenacious tilide- and irresistible. Hildebrand was the prompter and brand nero f this idea. He sought to abolish the simony question anc ˆ concubinage of the priesthood, to give the papal of laves- elections into the hands of the higher ecclesiastics, titure. and to emancipate the church from all dependence on the empire. Henry III. procured the election of four German popes in succession, and Hildebrand was always at hand to inspire their actions and dominate them by his strength of intellect and still greater strength of will. But the fourth German pope, Victor II., died in 1057, and Henry III. had been succeeded in 1056 by the young Henry IV. under the regency of a weak woman, the empress Agnes. Hildebrand seized this favourable moment for trying his strength and procured the election of Stephen IX. (1057-58), a candidate he had long had in view. Stephen, however, died in 1058; the nobles instantly rose in rebellion; and Gregory of Tusculum, who had assumed the patriciate, caused an incapable cousin to be named pope (Benedict X.). Upon this Hildebrand postponed his design of maintaining the papacy by the help of Italian potentates and had recourse to the empress. In a synod held at Siena with her consent Benedict was deposed and Nicholas II. (1050-61) elected in his stead. This pope entered Rome escorted by the troops of Godfrey of Tuscany,

and, when also assured of help from Naples, assembled a council of one hundred and thirteen bishops (1059), who con- demned the deposed pontiff and renewed the prohibition of simony and concubinage among the priesthood. Finally Nicholas instituted the college of cardinals, entrusting it with the election of the pope, who was in future to be chosen from its ranks. The assent of the clergy and people was left purely formal. The decree also contained the proviso — ” saving the honour and reverence due to the emperor “;. but this too was an empty expression.

The new decree was a master-stroke of Hildebrand’s genius, for by means of it he placed the papal election in the hands of a genuine ecclesiastical senate and gave a monarchical form to the church. Backed by the Normans who were in Rome, and whose commander, Richard of Capua, did not scruple to strike off the heads of many recalcitrant nobles, Hildebrand and the pope could now pursue their work of reform. Never- theless the nobles again revolted on the death of Nicholas II. in 1 06 1, and declared their purpose of restoring to Henry IV. the patriciate and right of election; but Hildebrand, by speedily convoking the cardinals, procured the election of Alexander H. (1061-73). This pope, although friendly to the empire, did not await the imperial sanction, but, protected by the Romans, at once entered the Lateran and put some other riotous nobles to death. The German bishops, however, elected Honorius II., who had the support of the barons. Thus the city was split into two camps and a deadly civil war ensued, terminating, despite the vigorous resistance of the nobility, in the defeat of Honorius II. But the nobles persevered in

the contest and were the real masters of Rome. By conferring the patriciate on the emperor, as their feudal chief, they hoped to organize themselves under the prefect, who now, with greatly increased authority, presided over both the civil and criminal courts in the absence of the pope’s representative. In a general assembly the Romans elected their prefect, whose investiture was granted by the emperor, while the pope elected another. Thus disorder was brought to a climax.

Alexander died on the 21st April 1073, and thereupon Hilde- brand was at last raised to the chair as pope Gregory VII. (1073-85). He reconfirmed his predecessors’ decrees, dismissed all simoniacal and non-celibate priests, vii and then in a second council (1075) forbade the clergy to receive investiture at the hands of laymen. No bishop nor abbot was again to accept ring or crozier from king or emperor. Now, as ecclesiastical dignities included the possession of extensive benefices, privileges and feudal rights, this decree gave rise to

tremendous dispute and to fierce contest between the empire and the church. The nobles took a very decided part in the struggle. With Cenci, their former prefect, at their head, they rose in revolt, assailed the pope on Christmas day 1075, and threw him into prison. But their fear of the popular wrath compelled his speedy release; and he then decreed the excommunication and deposition of the emperor who had declared him deposed. That monarch afterwards made submission to Gregory at Canossa (1077), but, again turning against him, was again excommunicated. And in 1081 he returned to Italy bringing the antipope Clement III., and besieged Rome for forty days. Assembling the nobles in his camp, he there arranged a new government of the city with prefect and senate, palatine judges and other magistrates, exactly similar to the existing government within the walls. He then took his departure, returned several times in vain, but at last forced his way into the city (March 1084) and compelled Gregory VII. to seek refuge in the castle of St Angelo. The emperor was then master of Rome, established the government he had previously arranged and, calling a parliament of nobles and bishops, procured the deposition of Gregory and the consecration of Clement III., by whom he was crowned in 1084. He then attacked and seized the Capitol, and assaulted the castle in order to capture the pope. But Robert Guiscard brought his army to the rescue. Emperor and antipope fled; the city was taken, the pope liberated and Rome reduced to ruin by fire and pillage. Upon this Gregory VII., broken with grief, went away with the Normans, and died at Salerno on the 25th May 1085. He had separated the church from the people and the empire by a struggle that, as Gregorovius says, disturbed the deep sleep of the middle ages.

Pope Paschal II. (1009-1118) found himself entirely at the mercy of the tyrannous nobles who were alike masters of Rome, of its government, and its spiritual lord. As they paschal were divided among themselves, all the pope could //• and the do was to side with one party in order to overcome nobtes ‘ the other. With the help of his own nephew Gualfredo, the prefect Pietro Pierleone, and the Frangipani, he was able to keep down the Corsi, and hold the Colonna in check. Being compelled to repair to Benevento in 1108, he left Gualfredo to command the militia, Tolomeo of Tusculum to guard the Campagna, and the consuls Pierleone and Leone Frangipani, together with the prefect, in charge of the government. The consulship was no longer a mere title of honour. The consuls seem to have been elected, as at Ravenna, in imitation of those of the Lombard cities, and were at the head of the nobles and senate. The expressions ” praefectus et consules,” ” de sena- toribus et consulibus,” are now of frequent occurrence. We have no precise knowledge of the political

organization of the city at this moment; but it was an aristocratic government, similar to that originally formed in Florence, as Villani tells us, with a senate and consuls. The nobles were so completely the masters that the pope, in spite of having trusted them

of the people.

with the government, could only return to Rome with the aid of the Normans. Being now absorbed in the great investiture question, he had recourse to a daring plan. He proposed to Henry V. that the bishops should resign all property derived from the crown and depend solely on tithes and donations, while the empire should resign the right of investiture. Henry seemed disposed to accept the suggestion, but, suddenly chang- ing his mind, took the pope prisoner and forced him to yield the right of investiture and to give him the crown (11 n). But the following year the party of reform annulled in council this concession, which the pope declared to have been extorted by force. By the death of Countess Matilda in n 15 and the bequest of her vast possessions to the Holy See, the pope's dominions were greatly enlarged, but his authority as a ruler was nowise increased. Deeds of violence still continued in Rome; and then followed the death of the prefect Pietro. The nobles of the imperial party, joined with the people, wished to elect Pietro's son, also nephew to Tolomeo of Tusculum, who then held the position of a potent imperial margrave, had territories stretching from the Sabine mountains to the sea, was the dictator of Tusculum, master of Latium and consul of the Romans. The pope opposed this election to the best of his strength; but the nobles carried the day, and their new prefect received investiture from the emperor. Upon this the pope again quitted Rome, and on his return, two years later, was compelled to shut himself up in the castle of St Angelo, where he died in 1118.

The popes were now the sport of the nobles whom they had aggrandized by continual concessions for the sake of peace. N ew And peace seemed at hand when Innocent II. (1130-43),

power after triumphing over two antipopes, came to terms with Roger I., recognized him as king of Sicily, and gained his friendship and protection. But now still graver tumults took place. In consequence of

the division of the nobles neither party could overcome its foes without the aid of the people, which thus became increasingly powerful. Throughout upper and central Italy the cities were being organized as free and independent communes on a democratic basis. Their example soon followed in the ancient duchy of Rome and almost in the immediate neighbourhood of the city. Even Tivoli was converted into a republic. This excited the deepest jealousy in the Romans, and they became furious when this little city, profiting by its strong position in the Tever- one valley, not only sought to annex Roman territory, but dared to offer successful resistance to the descendants of the conquerors of the world. In 1141 Tivoli openly rebelled against the mother city, and the pope sent the Romans to subdue it. They were not only repulsed, but ignominiously pursued to their own gates. Afterwards, returning to the assault in greater numbers, they conquered the hostile town. Its defenders surrendered to the pope, and he immediately concluded a treaty of peace without consulting either the people or the republic. The soldiery, still flushed with victory, were furious at this slight. They demanded not only sub- mission of Tivoli to the Roman people, but also permission to demolish its walls and dwellings and expel its population. Innocent II. refused consent to these excesses, and a memorable revolution ensued by which the temporal power of the papacy was entirely overthrown.

In 1 143 the rebellious people rushed to the Capitol, pro- claimed the republic, reconstituted the senate, to the almost Popular entire exclusion of the nobles, declared the abolition revoiu- of the temporal power, issued coin inscribed to the ˆ 00- senate, the people and St Peter, and began to reckon

structioB t' me Irom the day of the restoration of liberty. Arnold of senate of Brescia was not, as has been incorrectly stated, the and author of this revolution, for he had not yet arrived in

republic. R ome . it was t he outcome of an historic necessity — above all, of the renewed vigour of the people and its detesta- tion of the feudal aristocracy. This body, besides being divided into an imperial and a national party, had almost excluded from the government the powerful baronage of the Campagna

and the provinces. Also, as we have before noted, the Roman aristocracy was by no means an exclusive caste. Between the great aristocrats and the people there stood a middle or new nobility, which made common cause with the people, whose chief strength now lay in the army. This, divided into twelve and then into thirteen or fourteen regions, assembled under its banners all arm-bearing citizens. Thus the

exercitus was also the real populus Romanics, now bent on the destruction of the temporal power. This purpose, originating in the struggle of the investitures, was the logical and inevitable result of the proposals of Paschal II., which, despite their rejection, found a loud echo in Italy. Lucius II. (1144-45) tried to withstand the revolution by seeking Norman aid and throwing himself into the arms of the feudal party, but this only precipitated the course of events. The people, after having excluded nearly all aristocrats from the senate, now placed at its head the noble Giordano dei Pierleoni, who had joined the revolutionary party. They named him patrician, but without prejudice to the authority of the empire, still held by them in respect, and also conferred on him the judicial powers appertaining to the- aristo- cratic and imperial office of prefect. The pope was requested to resign the temporal power, the regalia and every other possession, and content himself with the tithes and offerings of the faithful according to the scheme of Paschal II. He indig- nantly refused, marched at the head of the nobles against the Capitol, but was violently repulsed, and received a blow on the head from a stone, which is supposed to have occasioned his speedy death on the 15th February 1145. Eugenius III. was then elected (1145-53), but soon had to fly to Viterbo in quest of armed assistance, in consequence of the senate's resolve to prevent his consecration by force until he recognized the new state of things in the Eternal City.

It was at this moment that Arnold of Brescia arrived in Rome. His ideas, already well known in Italy, had inspired and promoted the Roman revolution, and he now came to determine its method and direction. Born Brescia. at Brescia in the beginning of the 12th century, Arnold had studied in France under the celebrated Abelard, who had instructed him in theology and philosophy, inspired him with a great love for antiquity, and stimulated his natural independ- ence of mind. On returning to his native land he assumed the monkish habit, and proved the force and fervour of his character by taking part in all struggles for liberty. And, together with political reform, he preached his favourite doctrine of the necessary renunciation by the clergy of all temporal wealth. Expounded with singular eloquence, these doctrines had a stirring effect on men's minds, spread throughout the cities of northern Italy, and were echoed on all sides. It seems un- doubted that they penetrated to Rome and helped to promote the revolution, so that Arnold was already present in spirit before he arrived there in person. It is known that at the Lateran council of 1139 Innocent II. had declared these doctrines to be inimical to the church and enjoined silence on their author. And, as at that time the party hostile to liberty was triumphant in Brescia,

Arnold left his native place, crossed the Alps and returned to France, where other struggles awaited him. He professed no anti-Catholic dogmas, — only maintaining that when the pope and the prelacy deviated from the gospel rule of poverty they should not be obeyed, but fearlessly opposed. In France, finding his master, Abelard, exposed to the per- secutions of St Bernard, he assumed his defence with so much ardour that St Bernard directed the thunders of his eloquence against the disciple as well as the master, saying of the former, ” He neither eats nor drinks, suffers hunger, and, being leagued with the devil, only thirsts for the blood of souls.” In 1142 we find Arnold a wanderer in Switzerland, and then, suddenly reappearing in Italy, he arrived in Rome.

Three different elements entered into his nature and inspired his eloquence — an exalted and mystic temperament, a great and candid admiration for classic antiquity added to an equal admiration for republican freedom independent of the church

and the empire, and a profound conviction, derived from the Vaudois and Paterine doctrines, that the church could only be purified by the renunciation of temporal wealth. Finding Rome already revolutionized in accordance with his own ideas, he immediately began to preach there. His mystic exhorta- tions against the riches of the church had an inflammatory effect, while his classical reminiscences aroused the enthusi- asm of the Romans, and his suggestion that they should imitate the republican institutions of upper Italy met the necessities of the time that had created the revolution. He urged the reconstitution of the ancient senate and senatorial order, which indeed was already partially accomplished, and of the ancient equestrian order, and the reconstruction and fortification of the Capitol. His proposed senate was a body somewhat resembling the communal councils of upper Italy, his equestrian order a mounted force composed of the lesser nobility, since at Rome, as elsewhere, the lower classes had neither time nor means to form part of it. All his suggestions were accepted; the citizens laboured strenuously on the fortification of the Capitol. The pope soon beheld the revolution spread beyond the walls, and several cities of the state proclaimed their independence. The barons of the Campagna profited by the opportunity to act as independent sovereigns. Thus the whole domain of the church was threatened with dissolution. The pope marched towards Rome with his newly gathered army, but hoped to come to terms. The Romans in fact recognized his authority, and he in his turn recognized the republic. The office of patrician was abolished, and seems to have been replaced by that of gonfalonier, and the prefect, answering to the podesta of the other republics, was revived. The senators received investiture from the pope, who returned to Rome at Christmas

H45-

There public now seems to have been fully constituted. The senate was drawn from the lower classes and the petty nobility, and this was the special characteristic of the new revolution. In 1 144 there were fifty-six senators, probably four to each of the fourteen regions, but the number often varied. By the few existing documents of the period we notice that the senators were divided into senatores consiliarii and ordinary senators. The former constituted a smaller council, which, like the credenza or lesser council found in other cities, consulted with the head or heads of the republic on the more urgent and secret affairs

of the state. And, conjointly with the rest of the senators, it formed the greater council. Thus classic traditions were identified with new republican usages, and the common- wealth of Rome resembled those in other parts of Italy. But, of course, every republic had special local customs of its own. So the Roman senate had judicial as well as political attributes, and there was a curia senatus composed of senators and legal experts.

As was easily to be foreseen, the agreement with the pope was of short duration. The revolution could not be checked; the Romans desired independence, and their spiritual lord fled to France, whence, in 1147, he proclaimed a new crusade, while the Romans were employed in demolishing Tivoli, banishing its inhabitants, and waging war on other cities. Giordano Pier- leone was gonfalonier and head of the republic, and Arnold, supported by the popular favour and the enthusiasm of the lower clergy, was preaching with even greater fervour than before. But the pope now re-entered Italy, proclaimed Arnold a schismatic, and then advancing to Tusculum assembled an army in order to attack Rome. In this emergency the Romans applied to Conrad III., the first emperor of the house of Hohen- staufen; and their urgent letters are clearly expressive of Arnold's theories and his medley on ancient and modern, sacred and profane, ideas. " Rome," so they said, " is the fountain of the empire confided to you by the Almighty, and we seek to restore to Rome the power possessed by her under Constantine and Justinian. For this end we conquered and destroyed the strongholds of the barons who, together with the pope and the Normans, sought to resist us. These are now attacking us on all sides. Haste to Rome, the capital of the world, thus to

establish thy imperial sway over the Italian and German lands."

After long hesitation the king of the Romans at last replied to these appeals, stating that he would come " to re-establish order, reward the faithful, and punish the rebellious." These words promised ill. In fact Conrad had already arranged terms with the pope; but his life came to an end on the 15th of February 1152.

He was succeeded by Frederick I. surnamed Barbarossa, who took no notice of the numerous letters urging him to come and receive the empire from the Roman people, which alone had the right of conferring it. In accordance P r ederlck with his design of subduing all the independent cities, he made an agreement with the pope, in which he vowed to give no truce to the Romans, but subject them to their spiritual lord, whose temporal power should be restored. The pope, on his side, promised to crown him emperor. Thereupon the people again

rose to arms, and Arnold broke off all negotiations with Eugenius III. The senate was reorganized, formed of one hundred members, and, according to the old Roman pre- cedent, had two consuls, one for internal and the other for external affairs. Frederick was a daring statesman, a valiant soldier in command of a powerful army, and was no friend of half measures. Accordingly the nobles ventured on reaction. Finally, to increase the gravity of the situation, an English pope, Adrian IV., was elected (1154-59), who was also a man of strong and resolute temper. In fact, even before being able to take possession of the Lateran, he requested the Romans to banish Arnold, who, with greater eloquence than ever, was directing his thunders against the papacy. These utterances increased the wrath of Adrian, who, encouraged by the knowledge that Frederick and his host were already in Italy, at last launched an interdict against Rome. It was the first time that a pope had ventured to curse the Eternal City. The interdict put a sum- mary stop to the religious life of the inhabitants. Men's minds were seized with a sudden terror, and a fierce tumult broke out. Thereupon the senators, whose opposition to the pope was less courageous than that of the fallen magnates, prostrated them- selves at his feet and implored pardon. But Adrian demanded the expulsion of Arnold before consenting to raise the interdict. Arnold was therefore obliged to leave Rome. After having for nine years preached successfully in favour of liberty, after having been the moving spirit of the new revolution, the new con- stitution, he was now abandoned by all, and forced to wander from castle to castle, in the hope of reaching some independent city capable of shielding him from the fierce enmity of the pope. Meanwhile Frederick I. had achieved his first victories in Lom- bardy, and, leaving ruined cities and bloodshed in his track, was rapidly advancing towards central Italy. The pope sent three cardinals to him, with a request for the capture and con- signment of Arnold, who had taken refuge in the castle of the Visconti of Campagnatico. Frederick without delay caused one of the Visconti to be seized and kept prisoner until Arnold was given up, and then consigned the latter to the papal legates. The pope in his turn gave the reformer into the hands of the prefect, Pietro di Vico, who immediately hanged his Arnold's prisoner, burnt his body at the stake and cast his ashes into the Tiber. The execution took place in June 1 1 55. The exact date and place of it are unknown ; we only know that Arnold met his fate with great serenity and firmness.

But the Romans who had so basely deserted their champion would not give up their republic. Their envoys went to meet Frederick near Sutri, and made an address in the usual fantastic style on the privileges of the Roman people and its sole right to confer the imperial crown. But

Frederick indignantly cut short their harangue, and they had to depart full of rage. He then continued his march, and, entering Rome on the 18th of June ri55, was forthwith crowned in St Peter's by the pope. There- upon the Romans rushed to arms, and made a furious attack on the Leonine city and the imperial camp. A desperate battle went on throughout the day; and the knights proved that the I equestrian order instituted at Arnold's suggestion was no empty

execu- tion.

sham. About a thousand Romans perished by the sword or by drowning, but their fellow-citizens made such determined pre- parations to continue the struggle that Frederick, on the 19th of June, hastily retreated, or rather fled, and was escorted as far as Tivoli by the pope and the cardinals. After all, the temporal power of the papacy was not restored, and the republic still sur- The vived in the form bestowed on it by Arnold of Brescia.

republic Its existence was in truth favourable rather than *"" injurious to Frederick, whose aim was to rule over

remains. R ome alK j treat the bishops as his vassals. He had not yet discerned that his best policy would have been to use the republic as a lever against the pope. The latter, with keener acumen, while remaining faithful to the feudal party in Rome, made alliance with the communes of Lombardy and en- couraged them in their resistance to the emperor. Adrian IV. died in 11 59, and the national party elected Alexander III. (1159-81), who energetically opposed the pretensions of Frederick, but, having to struggle with three antipopes success- ively raised against him by the imperial party, was repeatedly driven into exile. During these schisms the senate quietly carried on the government, administered justice, and made war on some neighbouring cities and barons. An army comprising many nobles of the national party marched against Tusculum, but found it defended by several valiant officers and a strong band of German soldiery, who, on the 29th of May 1167, inflicted on the Romans so severe a defeat that it is styled by Gregorovius the Cannae of the middle ages. Shortly afterwards the emperor arrived in Rome with his antipope Paschal III., and Alexander had to fly before him to Benevento. Then, at last,

Frederick came to terms with the republic, recognized the senate, which accepted investiture at his hands, re-established the prefecture as an imperial office, and bestowed it on Giovanni, son of Pietro di Vico. He then hastily departed, without having advanced outside the Leonine city.

Meanwhile Pope Alexander continued the crafty policy of Adrian and with better success, for the Lombard cities had Agree- now formed a league and inflicted a signal defeat on meat be- the emperor at Legnano on the 29th of May 1176. One twee JlJ of the results of this battle was the conclusion of and the an agreement between the pope and the emperor, the pope. latter resigning his pretensions on Rome and yielding

all that he had denied to Adrian. And by the treaty of Venice (1st of August 1177) the antipope was forsaken, Alexander III. recognized and hailed as the legitimate pontiff, and the prefect of Rome again nominated by the pope, to whom the emperor restored the temporal power, acknowledging him the in- dependent sovereign of Rome and of the ecclesiastical state, from Acquapendente to Ceprano. Frederick's troops accom- panied the pope to Rome, where the republic was forced to make submission to him. But, proudly conscious as it still was of its strength, its surrender wore the aspect of a voluntary concession, and its terms began with these words: " Totius populi Romani consilio et deliberatione statutum est," &c. The senators, elected yearly in September, had to swear fealty to the pope, and a certain proportion of nobles was in- cluded in their number. On his return to Rome, Alexander received a solemn welcome from all, but he had neither ex- tinguished nor really subdued the republic. On the contrary, men's minds were more and more inflamed by the example of freedom displayed in the north of Italy. He died on the 30th of August n8r. The fact that between 1181 and 1187 there were three popes always living in exile proves that the republic was by no means crushed. During the same period another blow was inflicted on the papacy by the marriage of Henry VI., son and successor to Frederick I., with Constance, sole heiress of the Norman line in Naples. For thus the kingdom was joined to the empire, and the popes were more than ever in the latter's power. On the 20th of December 1187 Clement III. (1187-91), being raised to the pontificate, made a solemn agree- ment with the government of the Capitol before coming to Rome. And this peace or concordia had the air of a treaty between potentates of equal importance. Rome confronted

the pope from the same standpoint from which the Lombard cities had confronted the emperor after Legnano. This treaty, the basis of the

new constitution, was confirmed on the last day of May 1 188 (Anno XLIV. of the senate). It begins with these words: ” Concordia inter Dominum Papam Clementem III. et senatores populumque Romanum super regalibus et aliis dignitatibus urbis.” The pope was recognized as supreme lord, and invested the senators with their dignity. He resumed the privilege of coinage, but allowed one-third of the issue to be made by the senate. Almost all the old pontifical rights and prerogatives were restored to him. The pope might employ the Roman militia for the defence of his patrimony, but was to furnish its pay. The rights of the church over Tivoli and Tusculum were confirmed; but the republic reserved to itself the right of making war on those cities, and declared its resolve to dismantle and destroy the walls and castle of Tusculum. In this undertaking the pope was to co-operate with the Romans, even should the unhappy city make surrender to him alone.

From all this it is clear, that the church had been made inde- pendent of the empire, and that the republic, despite its numerous concessions, was by no means subject to the church. # ome /„, The pope, in fact, had obtained liberty of election, and dependent Frederick I., by resigning the investiture of the pre- oftae feet, had virtually renounced his claim to imperial empre ‘ power in Rome. The republic had no patrician nor any other imperial magistrate, and preserved its independence even as regarded the pope, who merely granted investiture to magistrates freely chosen by the people, and had no legislative nor administrative power in the city. His temporal dominion was limited to his great possessions, to his regalia, to a supreme authority that was very indefinite, and to a feudal authority over the barons of the Campagna and many cities of a state that seemed ever on the point of dissolution. The senate continued to frame laws, to govern, and to administer justice. The army carried on the wars of the republic, as we see by the tragic fate of Tusculum, which was razed to the ground on the 19th of April 1191. Thus the powerful counts of Tusculum disappeared; they sought refuge in the Campagna, and according to all probability the no less potent family of the Colonna sprang from their line. In consequence of these events, the nobles realized that the papacy sought to reduce them to vassalage. And, seeing that the _. republic remained firmly established arid able to help nobles them, they began to adhere to it and succeeded in re-enter obtaining admission to the new senate. In fact, tne . whereas since 1143 plebeians and petty nobles had prevailed in its ranks, nobles of ancient descent are now found outnumbering the knights and burghers. But in 1 191 this state of things caused a sudden popular outbreak which abolished the aristocratic senate Popular and

gave the headship of the republic to a single revoiu- senator, summus senator, named Benedetto ” Carissi- t,oa anif mus ” or ” Carus Homo ” or ” Carosomo,” of un- re” fof” known, but undoubtedly plebeian, origin. During tion of the two years he remained in office this personage tne srfs ” stripped the pope of his revenues, despatched tocrac y’ justitiarii even to the provinces, and with the aid of the parlia- ment and other popular assemblies promulgated laws and statutes. But he was overthrown by a counter-revolution, and Giovanni Capoccio of the party of the nobles became senator for two years, and had been succeeded by one of the Pierleoni when, in 1197, a fresh revolution re-established a senate of fifty-six members, chiefly consisting of feudal barons in high favour with Henry VI., who had revived the imperial faction in Rome. But this emperor’s life ended the same year as the pope’s, in 1198, and the new pontiff, Innocent III. (1 198-12 16), began to make war on the nobles, who were again masters of the republic. Their leader was the prefect Pietro di Vico. Owing to the revolution of n 43, most of the prefectorial attri- butes were now vested in the senate; nevertheless, Pietro still retained a tribunal of police both within and without the

city. But his main strength was derived from the vast posses- The sions of the Vico family, in which the office of prefect

office of now became hereditary. Very soon, however, these becomes prefects of Vico were chiefly regarded as the great heredi- feudal lords of Tuscia, and the independent municipal tary. office lost its true character. Then the popes made a

point of according great pomp and dignity to this nominal prefect, in order to overshadow the senator, who still re- presented the independence of the republic and had assumed many of the attributes wrested from the prefect.

But Innocent III., dissatisfied with this state of things, contrived by bribing the people to arrogate to himself the innocent right of electing the senator, who had now to swear ///, elects fealty and submission to the pope, and also that of tne nominating the provincial justitiarii, formerly chosen

senate. ˆy tng government f the Capitol. This was a deadly blow to the

republic, for the principal rights of the people — i.e. the election of pope and emperor, prefect and senate — were now lost. The general discontent provoked fresh revolutions, and Innocent III. employed all his political dexterity to ward off their effects. But shortly afterwards the people made a loud outcry for a senate of fifty-six members ; and the pope, again making a virtue of necessity, caused that number to be chosen by twelve mediant specially named by him for the purpose. Even this did not calm the popular discontent, which was also stirred by other disputes. The consequence was that when, six months later, the pope again elected a single senator the Romans rose to arms, and in 1204 formed a government of Buoni Uomini in opposition to that created by the pope. But an amicable arrangement being con- cluded, the pope once more nominated fifty-six senators; and when, soon after, he again reduced them to one, the people were too weary to resist (1205). Thus the Capitol was subdued, and Innocent III. spent his last years in tranquillity.

On the 22nd of November 1220 Honorius III. (1216-27) conferred the imperial crown on Frederick II., who confirmed to the church the possession of her former states, of those bequeathed to her by Countess Matilda, and even of the March of Ancona. But it was soon seen that he sought to dominate all Italy, and was therefore a foe to be dreaded. The suc- Tfce cessor of Honorius, Pope Gregory IX. (1227-41), was

republic speedily insulted and put to flight by the Ghibelline regains nobles, whose courage had revived, and the republic indepen- began to subdue the Latian cities on its own account. Peace was several times made and unmade by pope and people; but no enduring harmony was possible between them, since the former wished to subject the entire state to the church, and the latter to escape from the rule of the church and hold sway over ” the universal land from Ceprano to Radicofani ” formerly belonging to the duchy. Accordingly, the Roman people now appointed judges, imposed taxes, issued coin, and made the clergy amenable to secular tribunals. In 1234 the senator Luca Savelli published an edict declaring Tuscia and Campania territories of the republic, and sent judges thither to exact an oath of obedience. He also despatched the militia to the coast, where it occupied several cities and erected fortresses; and columns were raised everywhere in- scribed with the initials S. P. Q. R. The pope, unable to prevent but equally unable to tolerate these acts, fled from Rome, hurling his anathema against Savelli, ” et omnes illos consiliarios urbis quorum consilio,” &c. The Romans sacked the Lateran and the houses of many cardinals, and marched The on Viterbo, but were driven back by the papal troops.

republic When Savelli left office and Angelo Malabranca was submits elected in his stead, the people made peace and sub- to the mission in 1235, and were obliged to give up their pretensions of subjecting the clergy to ordinary tribu- nals and the urban territory to the republic. Thus matters were virtually settled on the footing established by Innocent III., thanks to the aid given to the pope by Frederick II., who had been one of the promoters of the rebellion, xxiii. 22

It may appear strange that, at this period of their history, the Romans, after showing such tenacious adherence to the republic and senate, should have accepted the rule of a single senator without rushing to arms, and passed and repassed from one form of government to another with such surprising indifference. But on closer examination it is plain that these changes were greater in appearance than reality. We have already seen, in treating of Carosomo, how the single senator convoked the people in parliament to pass sanction Forma- on the laws. But, whenever there is only one senator, t,oa we also continually meet with the expression ” con- grea ter silium vel consilia urbis.” It is evident that when, and lesser instead of laws to be approved in parliament by a councils. simple placet or rejected by a non-placet, matters requiring consideration had to be discussed, the senator convoked a much smaller council, consisting only of the leaders of the people. These leaders were the heads of the twelve or thirteen regions of the guilds, now becoming organized and soon to be also thirteen in number, and of the militia. As in the other Italian republics, all these associations had been formed in Rome.

The senator therefore held consultation with the leading men of the city; and, although, especially at first, these meet- ings were rather loosely organized, it is clear that they took the form of two councils — one numerous (consiglio maggiore), the other limited {consiglio minore or speciale), co-operating with and forming part of the first. Such was the prevailing custom throughout Italy at the time when Roman institutions most nearly resembled those of the other republics. We already know that, from the date of Arnold’s reforms, the senate, with its junta of counsellors, had been divided into two parts, forming when united a species of greater council. Therefore the transition from a senate divided into two parts to the greater and lesser councils must have been very easy and natural. And, seeing that later, when the nomination of a single senator had become a constant practice, the meetings of the two councils are frequently mentioned without the slightest remark or hint as to their origin, it is clear that they had been gradually formed and long established. Not long after the revolution of 1143 the grandees sought to re-enter the senate; and the popes themselves, partly from dread of the people and partly to aggrandize

their own kindred, con- tributed to build up the power of a new and no less turbulent nobility. This class, arising between the 12th and 13th centuries, was composed of families newly created by the popes, together with remnants of the old aristocracy, such as the Frangipani, Colonna, &c. These nobles, regaining possession of the senate, so completely eliminated the popular element that, when the popes again opposed them, and, obtaining from the parlia- ment the right of electing the senators, adopted the expedient of appointing one only, the senator was always chosen from the ranks of the nobles. And then the people, unable and unwilling to renounce republican forms, replaced their sup- pressed senate by a greater and a lesser council. This was an easy task — a natural consequence of the fact that the people now began to constitute the real strength of the republic. Later, with an increasing detestation for their nobility, the Romans decreed that the single senator should be of foreign birth, and, as we shall see, chose Brancaleone in the middle of the 13th century.

Thus, after a long series of frequent changes and revolutions, the Roman republic became a commonwealth, with an in- creasing resemblance to those of the other Italian cities. The people were organized and armed, the gilds almost established, the two councils gradually constituted, and the aristocracy, while retaining special local characteristics, assumed its definitive shape. It is not surprising to find that rbe Rome, like other Italian cities, now possessed statutes Roman of its own. There has been much controversy on statutes. this point. Certain writers had alluded to a statute of 1246. As no one, however, could discover any statute of that date, others decided that it had never existed. A statute of 1363

was recently published by Professor Camillo Re, who asserted it to be the first and most ancient that Rome had possessed. But the still more recent researches of Messrs La Mantia and Levi prove that Professor Re's assertions were somewhat too bold. There is certain evidence of a statutum senatus existing between 1212 and 1227, of a statutum vel capitulate senatoris vcl senatus of 1235, followed in 1241 by a statutum urbis. This brings us very near to the statute of 1246 mentioned by Vitale and others. So it is well ascertained that, in the

first half of the 13 th century, Rome possessed statutes at large composed of older Limited statutes. The consuls of the trade gilds were from 1267 regular members of the councils; and the merchants' gild held general meetings in 1255. Its statutes were confirmed in 1296 by the senator Pandolfo Savelli, and the compila- tion of these, published in 1880 by Signor Gatti, refers to

1317-

Meanwhile the struggle between Frederick II. and the pope was once more renewed. The former sought to dominate Frederick Italy, separate the state from the church, and repress //. the republics. The latter, although really hostile to

and the t ne Roman free government, joined it against the pope – emperor, who on his side favoured the republic of

Rome and the nobles most adverse to the pope. Thus the new nobility, composed, as we have seen, of two different elements, was again split into a Guelph party headed by the Orsini and a Ghibelline party under the Colonna. And in 1238 it was deemed advisable to elect two senators instead of one, in the hope of conciliating both factions by simultaneously raising them to power. Afterwards one only was elected, alternately an Orsini and a Colonna, then again two, and so on. But all these changes failed in their aims, since the struggle between emperor and pope exasperated party feeling in Rome. Fred- erick was king of southern Italy and emperor; had he been able to enforce the whole of his authority he would have been absolute master of all Italy, a state of things which the popes could not in any way tolerate. Hence the obstinate and unin- terrupted struggle which proved injurious both to the papacy and the empire. The political genius of Frederick might have wrought great harm to the city had not his mind teemed with contradictory ideas. Although desirous to emancipate the state from the church, he was opposed to the communal democracy, which was then the chief strength of the secular state in Italy. While combating the church and persecuting her defenders, he yet sent heretics to the stake; although excommunicated, he undertook a crusade; he feasted at his table philosophers, sceptic and atheist poets, bishops and Mussulmans; he proclaimed anti-Christian the possession of wealth by the church, yet made lavish gifts to altar and mon- astery. Thus, although he had a strong party in Rome, it seemed to dissolve at his approach, inasmuch as all feared that he might abolish the statutes and liberties of the commune. In fact, when he advanced towards Rome on the death of Gregory IX. in 1241 he was energetically repulsed by the people, and later even by

Viterbo, a city that had always been faithful to him. But after he had withdrawn, his adherents gained strength and put to flight his opponent, Innocent IV. (1243-54), the newly elected pope, who then from his asylum at Lyons hurled an excommunication against him. Frederick's death in December 1250 determined the fall of the Ghibelline party and the close of the imperial epoch in Italy. The pope instantly returned to Rome with the set purpose of destroying the power of the Hohenstaufens. This was no longer difficult when, by the decease of Conrad IV. (1254), the child Conradin became the last legitimate representative of that line, and negotiations were already on foot for placing the Angevins on the Neapolitan throne.

The republic meanwhile preserved its independence against the pope, who, among other concessions, had entirely given up to it the right of coinage. Nevertheless, being much harassed by the factiousness of the nobility, it was obliged in 1252 to decide on the election of an alien senator armed with ample powers, precisely as other communes gave the government into

the hands of a podesta. Accordingly a Bolognese noble, Brancaleone degli Andalo, count of Casalecchio, and Branca- a Ghibelline of much energy and talent, was invited leone to Rome. But before accepting office he insisted on **? '.. making definite terms. He desired to hold the the first government for three years; and this, although con- foreign trary to the statutes, was granted. Further, to en- senator. sure his personal safety, he demanded that many scions of the noblest Roman houses should be sent as hostages to Bologna; and to this also the republic consented. Then, in August 1252, he came with his judges and notaries, made oath to observe justice and the laws, and began to govern. He was head of the republic in peace and in war, supreme judge and captain in chief. He nominated the podestas of subject terri- tories, despatched ambassadors, issued coin, concluded treaties and received oaths of obedience. The pope, who was then at Perugia, was greatly afflicted by the arrival of this new master, but, despairing of aid from any quarter, was forced to make a virtue of necessity. Thus Brancaleone was able to seize the reins of power with a firm grasp. The parliament still met in the square of the Capitol, and the greater and lesser councils in the church of Ara Coeli. There were besides frequent as- semblies of the college of Capitoline judges or assectamentum. Unfortunately, no records having been preserved of the proceed- ings of the Roman councils and parliament, little can be said of the manner in which affairs were conducted. Certainly Brancaleone's government was not very parliamentary. He convoked the councils as seldom as was possible, although he frequently assembled the people in parliament. The chief complaint made against

him was of undue severity in the adminis- tration of justice. He rendered the clergy amenable to secular tribunals, subdued the neighbouring cities of Tivoli, Palestrina, &c, and commanded in person the attacking force. But his greatest energy was directed to the repression of the more turbulent nobles who were opposed to him ; and he soon made them feel the weight of his hand by hanging some, banishing others, and persecuting several more. But he too recognized the expediency of winning the popular favour. He was the first senator to add to his title that of captain of the people (" Almae Urbis Senator 111: et Romani Populi Capitaneus "). He befriended the people by promoting the organization of gilds after the manner of those of his native Bologna. There were already a few in Rome, such as the merchants' gild and that of the agriculturists, Bobacteriorum or Bovattari, who must have resembled the so-called mercanti di campagna or graziers of the present day, since no peasant gild existed in Italian republics. The merchants' gild, definitely estab- lished in 1255 under Brancaleone's rule, had four consuls and twelve councillors, held meetings and made laws. The other gilds, thirteen in all, were organized much on the same plan. The admission of their heads into the councils of the republic in 1267 shows how efficaciously their interests had been promoted by Brancaleone.

The death of Innocent IV. and the election of Alexander IV. (1254-61), who was milder and less shrewd than his predecessor, were favourable events for Brancaleone; but he failed to check the growing discontent of the clergy and the more powerful nobles, who had received deadly injuries at his hands. And when, on the expiration of his three years' term of office, his re-election was proposed, his enemies rose against him, accused him before the sindacato, threw him into prison, and vehem- ently protested against the continuance of " foreign tyranny." His life was only spared on account of the hostages sent to Bologna. The next senator chosen was a Brescian Guelph, Emanuele de Madio, a tool of the nobles, who were now masters of the situation. But soon afterwards, in 1257, the gilds rose in revolt, drove the noblesfrom power, put the pope to flight, and recalled Brancaleone for another three years' term. He ruled more sternly than before, hung several nobles, and made alliance with Manfred, the representative of the Swabian party in Italy. This rendered him increasingly odious to the pope and procured his excommunication. But, disregarding the

thunders of the church, he marched against Anagni, the pope's birthplace, and Alexander was quickly obliged to humiliate himself before the senator of Rome. Brancaleone next set to work to destroy the fortified towers of the nobility, and in razing them to the ground ruined many of the adjacent dwellings. Accordingly, a considerable number of nobles became homeless exiles. In 1258, while engaged on the siege of Corneto, Branca- leone was attacked by a violent fever, and, being carried back to Rome, died on the Capitoline Hill. Thus ended the career of a truly remarkable statesman. He was succeeded by his uncle, Castellano degli Andalo, who, lacking the political genius of his nephew, only retained office until the following spring (1259), in the midst of fierce and perpetual disturbances. Then the people, being bribed by the pope, joined with the nobles and drove him away. His life too was saved by having followed his nephew's shrewd plan of sending hostages to Bologna. Two senators of Roman birth were next elected; and on the death of Alexander IV. a French pope was chosen, UrbanlV. (1261-64), thus giving fresh predominance in the church to the anti- Swabian policy. But the internal disturbances of the city soon drove Urban to flight.

At this period the fall of the empire had induced many Italian republics to seek strength by placing their governments in the hands of some prince willing to swear respect to their laws and to undertake their defence against neighbouring states and the pope. In Rome the Guelphs and Ghibellines proposed various candidates for this office, and after many fierce quarrels ended by electing a committee of boni homines, charged with the revision of the statutes, reorganization of the city, and choice of a senator. This committee sat for more than a year without nominating any one, so, the Guelph party being now predominant, and all being wearied of this provisional state of things, the majority agreed on the election as senator of Charles of Anjou, who, at Charles the pope's summons, was already preparing for the ofAajou conquest of Naples. The Romans thought that he senator. wou i,j defend Rome against the pope, and the pope would defend Rome against him; and by thus taking advantage of either's jealousy the citizens hoped to keep their republic intact. In fact, although Urban IV. had incited Charles to attack Naples, he was by no means willing to see him established as master in Rome. He accordingly declared that, if Charles really wished to obtain the Neapolitan crown, he must only accept the offered dignity pending the conquest of that kingdom. And he must likewise promise to recognize the supremacy of the pope over the senate. Charles soothed him with the amplest verbal promises, but in fact accepted the senatorship for life. In 1265, when Urban was succeeded by Clement IV. (1265-68), who as a Provencal

was a subject of Charles, the latter entered Rome and was immediately made senator. Seven days later (28th of June) he received the investiture of the Neapolitan kingdom, and in the following January its crown. On the 26th of February 1266 the battle of Benevento was fought, and, the valiant Manfred being killed, the triumph of the Guelph Angevins in Italy was assured. Then, at the urgent command of the pope, Charles was forced to resign the senatorship in the May of the same year. Two Romans were elected in his stead, but soon fell out with the pope, because the Guelph nobles again tried to exercise tyranny. The people, however, profited by these disturbances to rise on its own account, and formed a democratic government of twenty-six boni homines with Angelo Capocci, Don a Ghibelline, as its captain. By this government Don

Henry of Henry, son of Ferdinand III. of Castile, was elected Castile senator; and he came to Rome for the purpose of pro- seaator. mo ting a Ghibelline and Swabian policy in favour of Conradin, who was preparing for conflict. The rule of the new senator was very energetic, for he kept down the clergy, subdued the Campagna, persecuted the Guelph nobles, made alliance with the Tuscan Ghibellines, forcibly drove back the troops of King Charles, who was advancing towards Rome, and gave a splendid reception to Conradin. But the battle of Tagliacozzo (23rd of August 1268), followed by the murder of Conradin, proved fatal to the Ghibelline party. Charles was re-elected senator imme-

diately after the battle, and the pope confirmed his powers for a term of ten years, after having already named him imperial vicar in Tuscany. On the 16th of September Charles for the second time took possession of the Capitol, and ruled Rome firmly by means of vice-governors or vicars.

The Swabian line was now extinct, and in Charles's hands the Neapolitan kingdom had become a fief of the church. The empire had fallen so low as to be no longer formidable. Now therefore was the moment for treating with it in order to restrain Charles, and also for making use of the French king to keep the empire in check. And this was the policy of Nicholas III. (1277-80), who hastened to extract advantageous promises from Rudolph of Habsburg, the new candidate for the imperial crown. In 1278, the ten years' term having expired, he deprived Charles of the senatorship and appointed Rudolph vicar of Tuscany. After declaring that he left to the people the right of electing the senator, he promulgated a new constitution (18th of July 1278) which, while confirming the rights of the church over the city, prohibited the election of any foreign emperor, prince, marquis, count

or baron as senator of Rome. Thus the Colonna, Savelli, Orsini, Annibaldi and other Roman nobles again rose to power, and the republic was again endangered and plunged in disorder. The Romans then gave the The reconstitution of the city into the pope's hands by f ei Jt te yielding to him the right of nominating senators, de- bands claring, however, that this was a personal concession of the to himself, and not to the popes in general. So popes. Nicholas proceeded to name senators, alternating a Colonna with an Orsini, or simultaneously choosing one of each fac- tion. The same power over the senate was granted with the same restriction to Martin IV. (1281-85), and he at once re- elected Charles of Anjou. Thus, greatly to the disgust of the Romans, the Capitol was again invaded by French vicars, notaries, judges and soldiery. But the terrible blow dealt at Charles's power by the Sicilian Vespers (31st of March 1282) resounded even in Rome. The Orsini, backed by the people, rose to arms, massacred the French garrison, and quickly re-established a popular government. Giovanni Cencio, a kinsman of the Orsini, was elected captain and defender of the people, and ruled the city with the co-operation of the senator and a council of priors of the gilds. This government was of brief duration, for, although the pope had professed his willing- ness to tolerate the experiment, he quickly arranged fresh terms, and, forsaking Charles of Anjou, again nominated two Roman senators. Pope and king both died in 1285, and Nicholas IV. (1288-92), also holding sway over the senate, favoured the Colonna in order to curb the growing mastery of the Orsini. But thus there were two powerful houses instead of one. In fact, Giovanni Colonna, when elected senator, ruled from the Capitol as an independent sovereign, conducted in person the campaign against Viterbo, and subjected that city to the republic on the 3rd of May 1291.

When one of the Gaetani, Boniface VIII. (1294-1303), was raised to the papal chair, the extent of the Colonnas' power became evident to all. Boniface opposed them in order to aggrandize his own kin, and they showed Y ul equal virulence in return. The Cardinals Colonna refused to acknowledge him as the legitimate pope, and he excommunicated them and proclaimed a crusade against their house. Even after he had subdued them and destroyed Palestrina, their principal fief, the drama did not yet come to an end. Boniface had a very lofty conception of the church, and desired to establish her supremacy over the state. The king of France (Philip the Fair) believed, on the contrary, that the Angevin successes entitled him to fill the place in Italy vacated by the Swabians, and to play the master there. This led to a tremendous contest in which all the French sided with their king. And shortly afterwards a plot was hatched against the

pope by the agents of France and the Colonna. These determined enemies of the pope met with much favour in Rome, on account of the general irritation against the Gaetani and the enormous power conferred on them by Boniface.

Suffice it to say that they were now lords of the whole of lower Latium, from Capo Circeo to Ninfa, from Ceprano to Subiaco. Thus Sciarra Colonna and a Frenchman named Nogaret were able to fall on the pope at Anagni, insult him, and take him prisoner. The people rising to his rescue, the conspirators were put to flight. But when Boniface returned to Rome with the escort and protection of the Orsini, who had made themselves masters of the city, he found that he was virtually a captive in their hands. He felt this so keenly that he died of rage and exhaustion on the nth of October 1303. The brief pontificate of his successor Benedict XL was followed by that of Clement V. (1305-14), a Frenchman, who, instead of coming to Rome, summoned the cardinals to France. This was the beginning of the church's so called exile in Avignon, which, although depriving Rome of a scource of wealth and influence, left the republic to pursue its own course. It employed this The freedom in trying to hold its own against the nobles,

republic whose power was much lessened by the absence of again t jj e p p e) an(j endeavoured to gain fresh strength demo- by organizing the thirteen regions, which, as we cratic have shown, were associations of a much firmer

form. nature in Rome than the gilds. Accordingly, in 1305, a captain of the people was elected with thirteen elders and a senator, Paganino della Torre, who governed for one year. The pope was opposed to these changes at first, but in 13 10 he issued a brief granting Rome full permission to select its own form of government. Thus, the first pope in Avignon restored the rights of the Romans. But the latter, even with church and empire so far removed, still considered Rome the Eternal City, the source of all law, and the only natural seat of the spiritual and temporal government of the world. To their republic, they thought, appertained a new and lofty destiny, nor could it ever be content to descend to the level of other Italian municipalities.

On the 6th of January 1309 Henry VII. was crowned king of the Romans at Aix-la-Chapelle; and so greatly were men's

minds changed in Italy that, throughout the land, he vi" ry was hailed as a deliverer. He wished to restore the

grandeur of the empire, and the Italians, above all Dante Alighieri, beheld in him the champion of the state against the church, who, after becoming the foe of communal liberty, had forsaken Italy and withdrawn to France. The Roman people shared these ideas, and awaited Henry with equal impatience, but the nobles rose in opposition. The Orsini, leaders of the Guelphs, and allied with Robert of Naples, took possession of the castle of St Angelo and the Trastevere. Hence, when Henry reached Rome in May 1312, after seizing the iron crown at Milan, he was obliged to act on the offensive. He took the Capitol by assault, but, failing in his attack on the castle of St Angelo, was pursued by its Neapolitan garrison. Forsaken by many discouraged adherents, he was forced to recognize the expediency of departure. First, however, he desired to be crowned at the Lateran, St Peter's being held by his foes. The cardinals refused his request, but were com- pelled to yield by the threats of the people, who, reasserting their ancient rights, insisted that the coronation should take place without delay. And the ceremony was performed on the 29th of June 13 12. The emperor then resolved to depart in spite of the popular protest against his leaving the natural seat of the empire, and on the 20th of August started for Tuscany, where worse fortune awaited him.

Their differences settled, the nobles expelled the captain of the people left by Henry, and elected as senators Sciarra Jacooo Colonna and Francesco Orsini. But this was the Ariotti, signal for a popular revolt. The Capitol was aaptalB attacked, the senators put to flight, and Jacopo

Ariotti elected captain with a council of twenty-six

worthies (buoni homini). The new leader instantly summoned the chief nobles before his tribunal, had them chained and cast into prison, and demolished many of their houses and strongholds. But, having thus humiliated their pride, Ariotti dared not put them to death, and, releasing them

of the people.

from confinement, banished them to their estates, where they plunged

into hostile preparations. Meanwhile the victorious people convoked a parliament and decreed that, the aristocracy being now overthrown, the tribunitia potestas alone should invite the emperor to make his triumphal entry into the Capitol, and receive his authority from the people of Rome. This conception of the Roman power will now be seen to become more and more definite until finding its last expression in Cola di Rienzi. Pope Clement, resigning himself to necessity, acknowledged the new government under the energetic rule of Ariotti. The latter now joined the Ghibellines of the Campagna against the Orsini and the Neapolitans, subdued Velletri, and gave it a podest?,. But then the Gaetani, who were Guelphs, united with the Orsini and the Neapolitans, and, giving battle to the Ghibellines in the Campagna, routed them in such wise as to put an end to the popular government. The nobles forced their way into the city, attacked the Capitol, made Ariotti their prisoner, and re-elected the senators Sciarra Colonna and Francesco Orsini. Close upon these reverses came the death of Henry VII. (24th of August 1313) at Buonconvento near Siena, which put an end to the Ghibelline party in Italy. Thereupon King Robert of Naples, being named senator by the pope, immediately appointed a vicar in Rome. Clement likewise profited by the vacancy of the imperial throne to name the king imperial vicar in Tuscany. And he died on the 20th of April 13 14, well content to have witnessed the triumphs of the Guelphs in Italy.

Affairs took a fresh turn under Pope John XXII. (1316-34). Rome was still ruled by the vicars of King Robert; but, owing to the continued absence of the popes, matters grew daily worse. Trade and industry declined, revenue diminished, the impoverished nobles were exceedingly turbulent, deeds of murder and violence occurred on all sides; even by day the streets of the city were unsafe. Hence there was universal discontent. Meanwhile Louis the Bavarian, who in 1314 had been crowned king of the Romans, having overcome his German enemies at Miihldorf in 1322, turned against the pope, one of his fiercest opponents. Louis was surrounded by Minorite friars, supporters of the poverty of the church, and consequently enemies to the temporal power. They were men of the stamp of William of Occam, Marsilio of Padua, Giovanni Janduno, and other philosophers favourable to the rights of the empire and the people. Accordingly the Italian Ghibellines hailed Louis as they had previously hailed Henry. Even the Roman people were roused to action, and, driving out the representa- tives and partisans of King Robert, in the spring of 1327, seized on the castle of St Angelo, and again established a democratic government. ” Nearly all Italy was stirred to new deeds,” says G. Villani, ” and the Romans rose to arms and organized the people ” (bk.

x. c. 20). Regardless of the reproofs of the pope, they elected a haughty Ghibelline, sciarra Sciarra Colonna, captain of the people and general Colonna, of the militia, with a council of fifty-two popolatf', captain four to each region. Then, ranged under the standards ot '*£, of the militia, the Romans gave chase to the foes of the republic, and Sciarra, returning victorious, ascended to the Capitol and invited Louis the Bavarian to Rome. The summons was obeyed; on the 7th of January Bavarian. 1328 the king was already encamped in the Neronian Fields with five thousand horse and a considerable number of foot soldiers, and, with better fortune than Henry VII., was able to enter the Vatican at once.

Encircled by a crowd of heretics, reformers and Minorite brethren, he convoked a parliament on the Capitol, asking that the imperial crown might be conferred upon him by the people, from whom alone he wished to receive it. And the people proclaimed him their captain, senator and emperor. On the 17th of January his coronation took place in St Peter's. But, as he had neither money nor practical sense, his method of taxation and the excesses committed by himself and his over-excited philosophers speedily aroused the popular dis- content. His ecclesiastical vicar, Marsilio of Padua, and

Giovanni Janduno placarded the walls with insulting manifestoes against the pope, whom the Minorites stigmatized as a heretic and wished to depose. In April Louis twice assembled the parliament in St Peter's Square, and, after obtaining its sanction to several anti-papal edicts, declared John XXII. degraded and deposed as a heretic. This was a very strange and novel spectacle, the more so that, as was speedily proved, the Romans were stirr.ed by no anti-Catholic spirit, no yearning for religious reform. Jacopo Colonna, a canon of the Lateran, was able to make his way into Rome with four masked companions, to publicly read, at the top of his voice and before a great multitude, the excommunication launched against the emperor by the deposed pope, to traverse the entire city, and to withdraw un- molested to Palestrina. Meanwhile the emperor contented himself with decreeing that henceforth the popes must reside in Rome, — that if, when invited, they should fail to come they would be thereby held deposed from the throne. As a logical consequence, proceedings were immediately begun for the election of the new pope, Nicholas V., who

on the 12th of May was proclaimed by the popular voice in St Peter's Square, and received the imperial sanction. But this ephemeral drama came to an end when the emperor departed with his antipope on the 4th of August. This caused the immediate downfall of the democratic government. Bertoldo Orsini, who had returned to Rome with his Guelphs, and Stefano Colonna were elected senators, and confirmed in the office by Cardinal Giovanni Orsini in the name of the pope. A new parliament cancelled the emperor's edicts, and had them burnt by the public executioner. Later, Nicholas, the antipope, went with a rope about his neck to make submission to John XXII., and Louis promised to disavow and retract all that he had done against the church, provided the sentence of excommunication were withdrawn. This, however, was refused. Never had the empire fallen so low. Meanwhile King Robert was again supreme in Rome, and, being re-elected senator, appointed vicars there as before. Anarchy reigned. The city was torn by factions, and the provinces rebelled against the French representatives of the pope, who, in their ignorance of Italian affairs, were at a loss how to act.

And after the election of Benedict XII. (1334-42) confusion reached so great a pitch that, on the expiration of Robert's senatorial term, the Romans named thirteen heads of regions to carry on the government with two senators, while the king still sent vicars as before. The people, for the sake of peace, once more granted the supremacy of the senate to the pope, and he nominated two knights of Gubbio, Giacomo di Cante dei Gabrielli and Bosone Novello dei Gabrielli, who were succeeded by two other senators the following year. But in Recoastl- I 33° tne Romans attacked the Capitol, named two tutioa senators of their own choice, re-established a demo-

of the cratic government, and sent ambassadors to Florence republic iQ ^^ £ Qr t j le orc Ji nances f justice (ordinaMenti

delta giustizia), by which that city had broken the power of the nobles, and also that a few skilled citizens should lend their help in the reconstitution of Rome. Accordingly some Florentines came with the ordinamenti, some portions of which may be recognized in the Roman statutes, and, after first re- arranging the taxes, elected thirteen priors of the gilds, a gonfa- lonier of justice, and a captain of the people after the Florentine manner. But there was a dissimilarity in the conditions 01 the two cities. The gilds having little influence in Rome, the projected reform failed, and the pope, who was opposed to it, re- elected the senators. Thereupon public discontent swelled, and especially when, by the foundation of the papal palace of Avignon, it was evident that Benedict XII. had no intention of restoring the Holy

See to Italy. This pope was succeeded in 1342 by Clement VI. (1342-52), and King Robert in 1343 by his niece Joanna; and the latter event, while plunging the kingdom in anarchy, likewise aggravated the condition of Rome. For not only were the Neapolitan sovereigns still very powerful there, but the principal Roman nobles held large fiefs across the Neapolitan borders.

Shortly before this anotner revolution in Rome had re- established the government of the thirteen elders and the two senators. The people, being anxious to show their intention of respecting the papal authority, had j; 0/a * despatched to Avignon as ambassador of the republic, in 1343, a man destined to make much noise in the world. This was Cola di Rienzi, son of a Roman innkeeper, a notary, and an impassioned student of the Bible, the fathers, Livy, Seneca, Cicero, and Valerius Maximus. Thoroughly imbued with a half pagan, half Christian spirit, he believed that he had a divinely inspired mission to revive the ancient glories of Rome. Of handsome presence, full of fantastic eloquence, and stirred to enthusiasm by contemplation of the ruined monuments of Rome, he harangued the people with a stilted oratory that en- chanted their ears. He hated the nobles, because one of his brothers had been killed by them; he loved the republic, and in its name addressed a stately Latin speech to the astonished pope, and, offering him the supreme power, besought his instant return to Rome. He also begged him to allow the city to cele- brate a jubilee every fifty years, and then, as a personal request, asked to be nominated notary to the urban chamber. The pope consented to everything, and Rienzi communicated this good news to Rome in an emphatically worded epistle. After Easter, in 1344, he returned to Rome, and found to his grief that the city was a prey to the nobles. He immediately began to admonish the latter, and then, draped in a toga adorned with symbols, exhibited and explained allegorical designs to the people, and announced the speedy restoration of the past grandeur of Rome. Finally he and a few burghers and merchants, whom he had secretly inflamed by his discourses, made a solemn vow to overthrow the nobility and consolidate the republic. The moment was favourable, owing to the anarchy of Naples, the absence of the pope, the weakness of the empire and the disputes of the barons, although the latter were still very potent and constituted, as it were, a separate government opposed to that of the people. Rienzi, having gained the pope's ecclesiastical vicar to his side, passed in prayer the night of the 19th of May 1347, placing his enterprise under the protection of the Holy Spirit, and the following day marched to the Capitol, surrounded by his adherents, convoked a parliament of the people, and obtained its sanction for the following pro- posals: — that all pending lawsuits

should be at once decided; that justice should be equally administered to all; that every region should equip one hundred foot soldiers and twenty-five horse; that the dues and taxes should be rearranged; that the forts, bridges and gates of the city should be held by the rector of the people instead of by the nobility; and that granaries should be opened for the public use. On the same day, amid general homage and applause, Rienzi was proclaimed head of the republic, with the title of tribune and liberator of the Holy Roman Republic, ” by authority of the most merciful Lord Jesus Christ.” The nobles withdrew scoffing but alarmed. Rienzi engaged a body-guard of one hundred men, and assumed the command of thirteen hundred infantry and three hundred and ninety light horse; he abolished the senators, retained the Thirteen and the general and special councils, and set the administration on a new footing. These measures and the prompt submission of the other cities of the state brought an instant increase of revenue to Rome.

This revolution, as will be noted, was of an entirely novel stamp. For its leader despatched envoys to all the cities of Italy, exhorting them to shake off the yoke of their tyrants, and send representatives to the parliament convoked for the 1st of August, inasmuch as the liberation of Rome also implied the ” liberation of the sacred land of Italy.” In Rienzi’s judgment the Roman revolution must be, not municipal, but national, and even in some points universal. And this idea was welcomed with general enthusiasm throughout the peninsula. Solemn festivals and processions were held in Rome; and, when the tribune went in state to St Peter’s, the canons met him on the steps chanting the Veni, Creator Spiritus. Even the pope, willingly or unwillingly, accorded his approval to

Rienzi’s deeds. The provincial cities did homage to Rome and her tribune, and almost all the rest of Italy gave him its enthusiastic adherence. The ancient sovereign people seemed on the point of resuscitation. And others besides the multitude were fascinated and carried off their feet. Great men like Petrarch were transported with joy. The poet lauded Cola di Rienzi as a sublime and supernatural being, the greatest of ancient and modern men. But it was soon evident that all this enthusiasm was mainly factitious. On the 26th of July a new parliament was called, and this decreed that all the rights

and privileges granted to the empire and church must now be vested in the Roman people, from whom they had first emanated. But on the convocation of the national parliament few repre- sentatives obeyed the summons and the scheme was a failure. All had gone well so long as principles only were proclaimed, but when words had to be followed by deeds the municipal feeling awoke and distrust began to prevail. Nevertheless, on the 1st of August Rienzi assumed the spurs of knighthood and passed a decree declaring that Rome would now resume her old jurisdic- tion over the world, invoking the Holy Spirit upon Italy, grant- ing the Roman citizenship to all her cities, and proclaiming them free in virtue of the freedom of Rome. This was a strange jumble of the ancient Roman idea combined with the medieval. It was a dream of Rienzi's brain, but it was also the dream of Dante and Petrarch. The conception of the empire and the history of Italy, particularly that of ancient and medieval Rome, were inevitably preparing the way for the national idea. This Rienzi foresaw, and this constitutes the true grandeur of his character, which in other respects was not exempt from pettiness and infirmity. He pursued his course, therefore, un- dismayed, and had indeed gone too far to draw back. On the 15th of August he caused himself to be crowned tribune with great pomp, and confirmed the rights of Roman citizenship to all natives of Italy. But practical matters had also to be taken into account, and it was here that his weakness and lack of judgment were shown. The nobles remained steadily hostile, and refused to yield to the charm of his words. Hence conflict was unavoidable; and at first Rienzi succeeded in vanquishing the Gaetani by means of Giovanni Colonna. He next endeavoured to suppress the Guelph and Ghibelline factions, and to restore Italy to " holy union " by raising her from her present abase- ment.

The pope, however, was weary of toleration, and, coming to terms with the nobles, incited them to war. They accord- ingly moved from Palestrina, and on the 30th of November were encamped before Rome. Rienzi now put forth his energy. He had already called the militia to arms, and a genuine battle took place in which eighty nobles, chiefly of the Colonna clan, were left dead. This was a real catastrophe to them, and the aristocracy never again achieved the rule of the republic. But Rienzi's head was turned by this sudden success. In great need of money, he began to play the tyrant by levying taxes and exacting instant obedience. The papal legate saw his opportunity and seized it, by threatening to bring a charge of heresy against the tribune. Rienzi was dismayed. He declared himself friendly to the pope and willing to respect his authority; and he even sought to conciliate the nobles. At this moment certain Neapolitan and

Hungarian captains, after levying soldiers with the tribune's consent, joined the nobles and broke out in revolt. On their proving victorious in a pre- liminary encounter with some of Rienzi's guards, the tribune suddenly lost heart, resigned the power he had held for seven months, and took refuge with a few trusty adherents in the castle of St Angelo on the 15th December 1347. Thence he presently fled to Naples, vainly hoping to find aid, and after- wards disappeared for some time from the scene.

Meanwhile the Romans remained tranquil, intent on making money by the jubilee; but no sooner was this over than dis- orders broke out and the tyranny of the baronage recommenced. To remedy this state of things, application was made to the pope. He consulted with a committee of cardinals, who sought the advice of Petrarch, and the poet suggested a popular govern-

ment, to the complete exclusion of the nobles, since these, he said, were strangers who ruined the city. The people had already elected the Thirteen, and now, encouraged by these counsels, on the 26th of December 1351 chose Giovanni Perrone as head of the republic. But the new leader was unable to with- stand the hostilities of the nobles; and in September 1353 Francesco Baroncelli was elected tribune. He was a follower of Rienzi, had been his ambassador to Florence and did little beyond imitating his mode of government and smoothing the way for his return.

Rienzi had spent two years in the Abruzzi, leading a life of mystic contemplation on Monte Maiella. Then, in 1350, he had gone to Prague and endeavoured to convert to his ideas the yet uncrowned emperor Charles IV. When apparently on the point of success, he was sent under arrest to the new pope, Innocent VI. (1352-62), a man of great shrewdness and practical sense. On Rienzi's arrival at Avignon it became evident that his popularity was still very great, and that it would be no easy task to dispose of him. The Romans were imploring his return; Petrarch lauded him as a modern Gracchus or Scipio; and the pope finally released him from confinement. Innocent had decided to send to Italy, in order to settle affairs and bring the state into subjection to the church, that valiant captain and skilled politician, Cardinal Albornoz. And, having no fear that the latter's hand would be forced, he further decided that Rienzi should be sent to give him the support of his own popularity in Rome. In fact, directly the pair arrived Baroncelli was over- thrown, the supremacy of the senate granted to the pope and the government confided to Albornoz, who, without concerning himself with Rienzi, nominated Guido Patrizi as senator. He then marched at the head of his troops against Giovanni,

prefect of Vico, and forced him to render submission at Montefiascone on the 5th of June 1354. With the same promptitude and skill he reduced Umbria and the Tuscan and Sabine districts, con- sented to leave the privileges of the cities intact in return for their recognition of the papal authority and planted fortresses in suitable positions. In the meantime Rienzi's popularity was increasing in Rome; without either money or arms, the ex- tribune succeeded by his eloquence in winning over the two Provencal leaders, brothers of the famous free captain Fra Monreale; and, seduced by his promises and hopes, they supplied him with funds. Then, profiting by his prestige, the apparent favour of the pope, and the sums received, he was able to collect a band of five hundred soldiers of mixed nationalities and returned towards Rome. On Monte Mario he was met by the cavallerotti. On the 1st of August 1354 he entered the Castello gate, took possession of the government, named Mon- reale's two brothers his captains, and sent them to lay siege to Palestrina, which was still the headquarters of the Colonna. But then money ran short, and he again lost his head. Inviting Fra Monreale to a banquet, he put him to death for the sake of his wealth, and kept the two brothers in confinement. This act excited general indignation. And when, after his ill-gotten gains were spent, he again recurred to violence to fill his purse, the public discontent was vented in a sudden revolt on the 8th of October. The people stormed the Capitol with cries of " Death to the traitor." Rienzi presented himself at a window waving the flag of Rome. But the charm was finally broken. Missiles were hurled at him; the palace was fired. He hid himself in the courtyard, shaved his beard and, disguised as a shepherd with a cloth over his head, slipped into the crowd and joined in their cries against himself. Being recognized, however, by the golden bracelets he had forgotten to remove, he was instantly stabbed. For two days his corpse was left exposed to the insults of the mob, and was then burned. Such was the wretched end of the man who, at one moment, seemed destined to fill the world with his name as the regenerator of Rome and of Italy.

In all the Italian cities the overthrow of the aristocracy had led to military impotence and pressing danger of tyranny. The same thing had happened in Rome when the nobility, weakened by the absence of church and empire, received its death-blow

from Rienzi. But, whereas elsewhere tyrants were gradually arising in the citizen class, Rome was always in danger of oppression by the pope. Nor was any aid available from the empire, which had never recovered from its abasement under Louis the Bavarian. In fact, when Charles of Luxemburg came to Rome to be crowned, he was obliged to promise the pope that he would not enter the city. On Easter day 1355 The popes he received the crown, and departed after counselling seek to the Romans to obey the pope. And the pontiffs had Uttea' greater need than ever of an established kingdom. temporal Their position in France was much endangered by kingdom, that country's disorder. New states were being formed on all sides; the medieval unity was shattered; and the shrunken spiritual authority of the church increased her need of material strength. As Italian affairs stood, it would be easy for the popes to found a kingdom, but their presence was required in Rome before it could be firmly estab- lished. The blood-stained sword of Albornoz had prepared the way before them. In 1355-56 he vanquished the lords or tyrants of Rimini, Fano, Fossombrone, Pesaro, Urbino and other cities. And all these places had been so rudely oppressed that the cardinal was often hailed as a liberator after subduing their masters by fire and sword. But everywhere he had been obliged to leave existing governments and rulers in statu quo after exacting their oaths of fealty. Thus the state was still dissevered, and it was impossible to bind it together with the pope at Avignon and Rome a republic. Bologna was still in- dependent, Ordelaffi still lord of Forli; Cesena and other cities were still rebellious; and the Campagna was still in the hands of the barons. Some places were ruled by rectors nominated by the pope; at Montefiascone there was an ecclesiastical rector, with a bench of judges, and a captain commanding a mixed band of adventurers. Rome had submitted to the haughty cardinal, but hated him mortally, and, on his departure for Avignon in 1357 to assist the threatened pontiff, immediately conceded to the latter the supremacy of the senate. And the pope, instead of two senators, hastened to name a single one of foreign birth. This was a shrewd device of Albornoz and another blow to the nobles, with whom he was still at war. Thus was inaugurated, by the nomination of Raimondo de' Tolomei in 1358, a series of foreign senators, fulfilling Fore ga t ˆ g f unc ti ons f a podesta, and changed every six months, together with their staff of judges, notaries and knights. The people approved of this reform as being inimical to the nobles and favourable to the preservation of liberty. Hitherto the senators had been assisted, or rather kept in check, by the thirteen representatives of the regions. These were now replaced by seven reformers, in imitation of the priors of Florence, the better to follow that city's example. The reformers were soon the veritable chiefs of the republic. They first

appeared in 1360, were either popolani or cavallerotti, and were elected by ballot every three months. When Albornoz returned to Italy, although desirous to keep Rome in the same subjection as the other cities, he had first to vanquish Ordelaffi and reduce Bologna. The latter enterprise was the more difficult task, and provoked a lengthy war with Matteo Visconti of Milan. Thus Rome, being left to herself, continued to be governed by her reformers; and the nobles, already shut out from power, were also excluded from the militia, which had been reorganized, like that of Florence, on the democratic system. Three thousand men, mostly archers, were enrolled ere * / ” ‘ under the command of two bander est, “in the like- ness,” says M. Villani, ” of our gonfaloniers of the com- panies, ” with four antepositi constituting a supreme council of war. And the whole body was styled the ” Felix Societas Balestrariorum et Pavesatorum. ” It was instituted to support the reformers and re-establish order in the city and Campagna, to keep down the nobles and defend the republic. It fulfilled these duties with much, and sometimes excessive, severity. Banderesi and antepositi had seats in the special council beside those of the reformers, as, in Florence, the gonfaloniers of the companies were seated beside the priors. Later these officials

constituted the so-called signoria dei banderesi. In 1362, the Romans having subjected Velletri, which was defended by the nobles, the latter made a riot in ‘Rome. Thereupon the banderesi drove them all from the city, killed some of their kindred, and did not even spare the cavallerotti. The fight became so furious that from gate to gate all Rome was in arms, and even mercen- aries were hired. But in the end renewed submission was made to the pope.

On the death of Innocent VI. in 1362, an agreement was concluded with his successor, Urban V. (1362-70), also a French- man, who was obliged to give his sanction to the government of the reformers and banderesi. And then, Albornoz being recalled in disgrace to Avignon, and afterwards sent as legate to Naples, these Roman magistrates were able, with or without the co-operation of the foreign senator, to rule in their own way. They did justice on the nobles by hanging a few more; and they defended the city from the threatening attacks of the mercenaries, who had now become Italy’s worst foes. It was at this period that the Roman statutes were revised and rearranged in the compilation erroneously attributed by some writers to Albornoz, which has come down to us supplemented by alterations of a later date.

But now the popes, being no longer in safety at Avignon, really decided to return to Italy. Even Urban V. had to pay ransom to escape

from the threatened attacks of the free com- panies. The Romans implored his return, and he was further urged to it by the Italian literati, with Petrarch at their head. In April 1367 he finally quitted Avignon, and, entering Rome on the 1 6th of October, was given the lordship of the city. Cardinal Albornoz had fallen mortally ill at Viterbo, but, though unable to accompany the pope to Rome, had, before dying, suggested his course of action. Certainly Urban showed much //,.*_ Y acumen in profiting by the first burst of popular begins to enthusiasm to effect quick and dexterous changes in destroy the constitution of the republic. After naming a the senator, he abolished the posts of reformers and re /> uW * ; – banderesi, substituting three conservators, or rather a species of municipal council, alone charged with judicial and adminis- trative powers, which has lasted to the present day. The thirteen leaders of the regions and the consuls of the gilds still sat in the councils, which were left unsuppressed. But all real power was in the hands of the pope, who, in Rome, as in his other cities, nominated the principal magistrates. Thus, by transforming political into civil institutions and concentrating the supreme authority in his own grasp, Urban V. dealt a mortal blow to the liberties of Rome. Yet he felt no sense of security among a people who, after the first rejoicings over the return of the Holy See, were always on the brink of revolt. Besides, he felt himself a stranger in Italy, and was so regarded. Accordingly, in April 1370 he decided to return to France; on the 20th of that month he wrote from Viterbo that no change was to be made in the government; and he died in Avignon on the 19th of December.

The Romans retained the conservators, conferring on them the political power of the reformers; they re-established the banderesi with the Florentine title of executores jus- Re-estab- titiae and the four antepositi with that of consiliarii. Hshment Thus the ” Felix Societas Balestrariorum et Pave- Z fth tji c satorum Urbis ” was restored, and the two councils and the met as before. The new French pope, Gregory XI. band- (1370-78), had to be content with obtaining supremacy over the senate and the possession of the castle of St Angelo. It was a difficult moment for him. The Florentines had come to an open rupture with his legates, and had adopted the expedient of inviting all the cities of the Roman state to redeem their lost freedom. Accordingly, in 1375 many of them rose against the legates, who were mostly French and regarded with dislike as foreigners. Florentine despatches, full of classical allusions and chiefly composed by the famous scholar Secretary Coluccio Salutati, were rapidly sent in all directions. Those addressed to the Romans were specially fervid, and emphatically appealed to their patriotism and memories of

the past. But the Romans received them with doubt and mistrust, for they saw that the revolution threatened to dis- member the state, by promoting the independence of every separate city. Besides, while maintaining their republic, they also desired the pope's presence in Rome. Nevertheless, they went with the current to the extent of reforming their constitu- tion. In February 1376 they nominated Giovanni Cenci captain of the people, and gave him uncontrolled power over the towns of the patrimony and the Sabine land. The con- servators, with their new political authority, the executores, the antepositi and the two councils were all preserved, and a new magistracy was created, the " Tres Gubernatores Pacis et Libertatis Reipublicae Romanae." This answered to the Eight (afterwards Ten) of War in Florence, likewise frequently called the Eight of Liberty and Peace. It was this Council of Eight that was now directing the war against the pope and braving his sentence of excommunication; and their fiery zeal had won them the title of the Holy Eight from the Florentines.

Realizing that further absence would cost him his state, Gregory XI. quitted Avignon on the 13th of September 1376, and, reaching Corneto in December, despatched to Rome three legates, who, on the 21st of the month, concluded an agree- ment with the parliament. The people gave up the gates, the fortresses and the Trastevere, and promised that if the pope returned to Rome he should have the same powers which had been granted to Urban V. But, on his side, he must pledge himself to maintain the executores and their council, and allow the Romans the right of reforming the banderesi, who would then swear fealty to him. The terms of this peace and the pope's epistles clearly prove that the two councils still exercised their functions, that the banderesi were still the virtual heads of the government, and that their suppression was not con- templated. In fact, when the pope made his entry on the 17th of January 1377, accompanied by two thousand armed men, he perceived that there was much public agitation, that the Romans did not intend to fulfil their agreement, and that the government of the banderesi went on as before. Accordingly, after naming Gomez Albornoz, a nephew of the deceased cardinal, to the office of senator, he retired to Anagni, and remained there until November 1377. The Romans presently waited on him with conciliating offers, and begged him to negotiate a peace for them

with the prefect of Vico. In fact, the treaty was concluded at Anagni in October, and on the 10th of November confirmed in Rome by the general council. The meeting was held in the great hall of the Capitol, ubi consilia generalia urbis fieri solent, in the presence of all the members of the republican government. But the pope was enraged by the survival of this government, and, being worn out by the persistent hostility of the Florentines, which reduced his power to a low ebb, had determined to make peace, when surprised by death on the 27th of March

1378.

The next pope, Urban VI. (1378-80), a Neapolitan, was the spirit of discord incarnate. His election was not altogether regular: the French party among the cardinals was against him; and the people were ripe for insurrection. But, regardless of all this, Urban threatened the cardinals in his first con- sistory, saying that church reform must begin with them; and he used the same tone with the people, reproving them for failing to suppress the banderesi. In consequence of this the cardinals of the French party, assembling at Fondi, elected the antipope Clement VII. (1378-94) and started a long and painful schism in the church. Clement resided in Avignon, while Urban in Rome was engaged in opposing Queen Joanna I. of Naples and favouring Charles of Durazzo, who, on conquering the Neapolitan kingdom, was made gonfalonier of the church and senator of Rome, where he left a vicar as his deputy. Shortly afterwards the pope went to Naples, and made fierce war on the king. Then, after many adventures, during which he tortured and put to death several cardinals whom he suspected of hostile intentions, he returned to Rome,

where the utmost disorder prevailed. The conservators and the banderesi were still at the head of the govern- urban vi. ment, and, the pope speedily falling out with them, under- a riot ensued, after which he excommunicated the tfkesthe banderesi. These at last made submission to him, tlon and Urban VI. became master of Rome before his of the death in 1389. He was succeeded by Boniface IX. republic (1389-1404), another Neapolitan, but a man of greater shrewd- ness and capacity. His first act was to crown Ladislaus king of Naples, and secure the friendship and protection of this ambitious and powerful prince. In all the principal cities of the state he chose the reigning lords for his vicars. But he allowed Fermo, Ascoli and Bologna the privilege of assuming their own vicariate for twenty-five years. And, as these different potentates and governments had only to pay him an annual tribute, all parties were satisfied, and the pope was able to bestow at least an appearance of order and unity on his state. But

fresh tumults soon arose, partly because the conservators and banderesi sought to govern on their own account, and especially because the pope seems for a time to have omitted naming the senator. Boniface was a prudent man; he saw that events were turning in his favour, now that throughout Italy liberty was tottering to its fall, and bided his time. He was satisfied for the moment by obtaining a recognition of the immunities of the clergy, rendering them solely amenable to ecclesiastical tribunals, and thus distinguish- ing the powers of the church from those of the state in Rome. The republic also pledged itself neither to molest the prelates nor to levy fresh contributions on them towards repairing the walls, to aid in recovering the estates of the church in Tuscia, and to try to conciliate the baronage. This concordat, concluded with the conservators and banderesi on the nth of September 1391, was also confirmed on the 5th of March 1392 by the heads of the regions, together with a fresh treaty binding both parties to furnish a certain number of armed men to combat the prefect, of Vico and the adherents of the antipope at Viterbo. With the exception of this city, Orchi and Civita Vecchia, all other conquered territory was to belong to the republic. But the Romans soon discovered that they were playing into the hands of the pope, who kept everything for himself, without even paying the troops. Upon this a riot broke out; Boniface fled to Perugia in October 1392, and resolved to exact better terms when next recalled to Rome. Meanwhile the Romans subdued the prefect, captured Viterbo, and, being already repentant, handed it over to the pope and implored his return. He then proposed his own terms, which were approved, not only by the conservators, banderesi Boniface and four councillors, but also by the special council ,x – co ” m and by the unanimous vote of a general assembly, ^“tnic- 6 composed of the above-mentioned authorities, heads tlon of regions, other officials and a hundred citizens of the (8th August 1393). These terms prescribed that the w»Mte pope was to elect the senator, and that, on his failing so to do, the conservators would carry on the government after swearing fealty to him. The senatorial function was to be neither controlled nor hampered by the banderesi. The immunities of the clergy were to be preserved, and all church property was to be respected by the magistrates. The expenses of the pope’s journey were to be paid, and he was to be escorted to Rome in state. Boniface tried to complete his work by abolishing the banderesi, the last bulwarks of freedom; but the people, although weakened and weary, made efforts to preserve them and, although their fall was inevitable, the struggle went on for some time.

During the spring of 1394 the banderesi provoked an insurrec- tion in

which the pope's life was endangered; it was only saved by the arrival of King Ladislaus, who came from Naples with a large force in the early autumn. But for the Neapolitan soldiery Boniface could, not have withstood the long series of revolts that continually exposed him to fresh perils and the anxiety caused by the persistent schism of the church. The death of Clement VII. in 1394 was followed by the election of

of the republic.

another antipope, Benedict XIII. But a new jubilee was in prospect for the year 1400, and this was always an efficacious Fall of means of bending the will of the Romans. Depending the band- upon this and the assistance of Ladislaus, Boniface eresland not only demanded full powers to nominate senators (none having been recently elected), but insisted on the suppression of the banderesi. Both requests were granted; but, directly Angelo Alaleoni was made senator, a conspiracy was hatched for the re-establishment of the banderesi. However, the pope felt sure of his strength; the plot was discovered and the conspirators were beheaded on the stairs of the Capitol. This proved the end of the banderesi and of the liberties of Rome. The government was again directed by an alien senator together with three conservators; but the latter were gradually deprived of their political attributes, and became mere civil officers. The militia, regions, gilds and other associations now rapidly lost all political importance, and before long were little more than empty names. Thus in 1398 the Romans submitted to the complete sway of the pope, and in July of the same year the senator chosen by him was Malatesta dei Malatesti of Rimini, one of a line of tyrants, a valiant soldier, who was also temporal vicar and captain-general of the church. Boniface continued to appoint foreign senators during the rest of his life; he fortified the castle of St Angelo, the Vatican and the Capitol; he stationed galleys at the mouth of the Tiber, and proved himself in all things a thoroughly temporal prince. He aggrandized all his kindred, especially his brother, and, with the aid of his senator, his armed force and the protection of Ladislaus, succeeded in keeping down all the surviving nobles. In 1400, however, these made an attempt to upset the government. Niccolo Colonna forced his way into the city with cries of " Popolo, popolo! death to Boniface!" But the Romans had grown deaf

to the voice of liberty; they refused to rise, and the senator, a Venetian named Zaccaria Trevisan, behaved with much energy. Colonna and his men had to beat a swift retreat to Palestrina. A charge of high treason was immediately instituted against him, and thirty-one rebels were beheaded. The pope then proclaimed a crusade against all the Colonna, and sent a body of two thousand men and some of the Neapolitan soldiery to attack them. Several of their estates were seized and devastated, but Palestrina continued to hold out, and on the 7th of January 1401 the Colonna finally made submission to the pope. Nevertheless, they obtained advantageous terms, for Boniface left them their lands, appointed them vicars of other territories, and made similar agreements with the Gaetani and Orsini. In this way he became absolute master of Rome. One chronicler remarks that " Romanis tanquam rigidus imperator dominabatur," and the same tone is taken by others. But he did not succeed in putting an end to the schism of the church, which was still going on when he died in the Vatican on the 1st of October 1404.

Innocent VII. (1404-6) was the next pope. He too was a Neapolitan, and on his election the people again rose in revolt and refused to acknowledge him unless he consented to resign the temporal power. But Ladislaus of Naples hastened to his help, and an agreement was made which, under the cover of ap- parent concessions, really riveted the people's chains. Rome was recognized as the seat of the temporal and spiritual sovereignty of the pope, and the pope continued to appoint the senator. The people were to elect seven governors of the city, who were to swear fealty to the pope and carry on the government in conjunction with three other governors chosen by the pontiff or Ladislaus. The stipulations of Boniface IX. concerning ecclesiastical immunities were again confirmed. The barons were forbidden to place more than five lances each at the service of the people, and — which was the real gist of the covenant — the people were henceforth forbidden to make laws or statutes without the permission of the pope. The captain of the people, deprived of his political and judicial functions and reduced to a simple judge, was also to be chosen by the pope. But this treaty, drawn up on the 27th of October 1404, was not signed

at the time, and many difficulties and disturbances arose when its terms were to be put into effect. The Romans nominated the seven governors, but, without waiting until the pope had chosen three more, placed the state in their hands, and styled them " governors of the liberty of the Roman Republic." They were, in fact, banderesi or reformatori under a new name. But the attempt proved inefficacious, for, at the pope's first threat of departure, the Romans made their

submission, and the treaty of October was subscribed on the 15th of May 1405. Never- theless, as it only bears the signatures of the ” seven governors of the liberty of the Roman Republic,” the pope would seem to have made some concessions. His position was by no means assured. Ladislaus was known to aspire to absolute dominion in Italy, and, although willing to aid in suppressing the republic, tried to prepare the way for his own designs, and frequently held out a helping hand to the vanquished. On the 6th of August fourteen influential citizens of Rome boldly presented themselves at the Vatican, and in a threatening manner called the pope to account for giving his whole attention to worldly things, instead of endeavouring to put a stop to the schisms of the church. But, on leaving his presence, they were attacked by Luigi Migliorati, the pope’s nephew, and notorious for his violence, who killed eleven of their number, including several heads of the regions and two of the governors. An insurrection ensued, and the pope and his nephew fled to Viterbo. The Colonna tried to profit by these events, and applied to Ladis- laus, who, hoping that the moment had come to make himself master of Rome, sent the count of Troia thither with a troop of three thousand horse. But the people, enraged by this treachery, and determined not to fall under the yoke of Naples, awoke for an instant to the memory of their past glories, and bravely repulsed the Colonna and the Neapolitans. And, on the speedy arrival of the Orsini with some of the papal troops, the people voluntarily restored the papal government, and, assembling the parliament, besought the pope to return on his own terms. Accordingly, after first naming Francesco Pancia- tichi of Pistoia to the senatorship, the pope came back on the 13th of March 1406, bringing his whole curia with him, and also the murderer Migliorati, who, triumphing in impunity, became more arrogant than before. Here indeed was a proof that the Romans were no longer worthy of liberty! And now, by means of the Orsini, Innocent had only to reduce the Colonna and other nobles raised to power by Ladislaus; nor was this very difficult, seeing that the king, in his usual fashion, abandoned them to their fate, and, making terms with the pope, was named gonfalonier of the church and again protected her cause.

Innocent, dying in 1406, was succeeded by Gregory XII., a Venetian, who, as we shall presently see, resigned the chair in 141 5. On his accession, finding his state firmly established, he seemed to be seriously bent on putting an end to the Great Schism, and for that purpose arranged a meeting with the antipope Benedict XIII. at the congress of Savona in 1408. But Gregory and Benedict only used the congress as a pretext for making war upon each other, and were urged on by Ladis- laus, who hoped by weakening both to gain possession of

Rome, where, although opposed by the Orsini, he had the support of the Colonna. Gregory, who had then fled from Rome, made a momentary attempt to win the popular favour by restoring the government of the banderesi; but Ladislaus marched into Rome in June 1408 and established a senator of his Ladislaus own. Meanwhile the two popes were continuing master of their shameful struggle, and the council of Pisa (March * ome ‘ 1409), in attempting to check it, only succeeded in raising up a third pontiff, first in the person of Alexander V. (1409-10), and then in the turbulent Baldassare Cossa, who assumed the name of John XXIII. The latter began by sending a large contingent to assist Louis of Anjou against Ladislaus. But the enterprise failed, and, seeing himself deserted by all, Pope John next embraced the cause of his foe by naming him gonfalonier of the church. Thereupon Ladislaus concluded a sham peace, and then, seizing Rome, put it to the sack and established his own government there. Thus John, like the other two popes,

became a wanderer in Italy. In August 1414 Ladislaus died, and was succeeded by the scandalous Queen Joanna II. The Roman people promptly expelled the Neapolitans, and Cardinal Isolani, John’s legate, succeeding in rousing a reaction in favour of the church, constituted a government of thirteen ” conser- vators” on the 19th of October.

In November 1414 the council of Constance assembled, and at last ended the schism by deposing all the popes Bad and incarcerating John XXIII., the most turbulent

of the f the three. On the nth of November 141 7 Oddo ‘andelec- Colonna was unanimously elected to the papal chair; tioa of he was consecrated in the cathedral on the 27th as Martin v. Pope Martin V., and, being acknowledged by all, hastened without delay to take possession of his see. Mean- while disorder was at its height in Rome. The cardinal legate Rome In Isolani governed as he best could, while the castle a state of of St Angelo remained in the hands of the Nea- anarchy. p litans, who still had a party in the city. In this divided state of affairs, Braccio, a daring captain of adventurers, nicknamed Fortebraccio, was inspired with the idea of making himself master of Rome. Overcoming the feeble resistance opposed to him, he succeeded in this on the 16th of June 1416, and assumed the title of ” Defensor

Urbis.” But Joanna of Naples despatched Sforza, an equally valiant captain, against him, and, without offering battle, Fortebraccio withdrew on the 26th of August, after having been absolute master of the Eternal City for seventy days. Sforza marched in on the 27th and took possession of the city in the name of Joanna. Martin V. instantly proved himself a good states- man. He confirmed the legate Isolani as his vicar and Giovanni Savelli as senator. Leaving Constance on the 16th of May 1418, he reached Milan on the 12th of October, and slowly proceeded on his journey. While in Florence he despatched his brother and nephew to Naples to make alliance with Joanna, and caused her to be crowned on the 28th of October 1419 by his legate Morosini. Upon this she promised to give up Rome to the pope. Her general, Sforza, then entered the service of Martin V., and compelled Fortebraccio, who was lingering in a threatening attitude at Perugia, to make peace with the pope. The latter entrusted Fortebraccio with the conduct of the campaign against Bologna, and that city was reduced to submission on the 15th of July 1420. The Romans had already yielded to Martin’s brother the legate, and now earnestly besought the arrival of their pope. Accordingly, he left Florence on the 19th of September 1420, and entered the Vatican on the 28th. Rome was in ruins; nobility and burghers were equally disorganized, the people unable to bear arms and careless of their rights, while the battered walls of the Capitol recorded the fall of two republics.

Martin V. had now to fulfil a far more difficult task than that of taking possession of Rome. Throughout Italy municipal The popes freedom was overthrown, and the Roman Republic of the had ceased to exist. The Middle Ages were ended; Renais- the Renaissance was beginning. The universal unity sance. both of church and of empire was dissolved; the empire was now Germanic, and derived its principal strength from direct dominion over a few provinces. Independent and national states were already formed or forming on all sides. The papacy itself had ceased to claim universal supremacy over the world’s governments, and the possession of a temporal state had become essential to its existence. In fact, Martin V. was the first of the series of popes who were real sovereigns, and more occupied with politics than religion. Involved in all the foreign intrigues, falsehoods and treacheries of Italian diplomacy in the 1 5th century, their internal policy was imbued with all the arts practised by the tyrants of the Renaissance, and nepotism became necessarily the basis of their strength. It was natural that men suddenly elected sovereigns of a new country where they had no ties, and of which they had often no knowledge, should seek to strengthen their position by aggrandizing so-called nephews who were not unfrequently their sons.

Martin V. reduced the remains of the free Roman govern ment to a mere civil municipality. Following the method of the other despots of Italy, the old republican Tbe institutions were allowed to retain their names temporal and forms, their administrative and some of their kingdom judicial attributes, while all their political functions “£’* e were transferred to the new government. Order raised on was re-established, and justice rigidly observed, the ruins Many rebellious places were subdued by the sword, otth f lh . and many leaders of armed bands were hanged. The repu pope, however, was forced to lean on his kinsmen the Colonna and again raise them to power by grants of vast fiefs both in his own state and the Neapolitan territory. And, after first supporting Joanna II., who had assisted his entry into Rome, he next sided with her adversary, Louis of Anjou, and then with Alphonso of Aragon, the conqueror of both and the constant friend of the pope, who at last felt safe on his throne. Rome now enjoyed order, peace and security, but had lost all hope of liberty. And when Martin died (20th February 143 1) these words were inscribed on his tomb, ” Temporum suorum felicitas. ”

Eugenius IV. (1431-47) leant on the Orsini, and was fiercely opposed by the Colonna, who excited the people against him. Accordingly on the 29th of May 1434 the Romans rose A reyoh,. in revolt to the old cry of ” Popolo e popolo, ” and tton again constituted the rule of the seven governors expels the of liberty. The pope fled by boat down the Tiber, pope ‘ and, being pursued with stones and shots, narrowly escaped with his life. On reaching Florence, he turned his energies to the recovery of the state. It was necessary to quell the people; but, first of all, the Colonna and the clan of the prefects of Vico, with their renewed princely power, had to be overthrown. The Orsini were still his friends. Eugenius entrusted the campaign to Patriarch (afterwards Cardinal) Vitelleschi, a worthy successor of Albornoz, and of greater ferocity if less talent. This leader marched his army towards Rome, and, instantly attacking Giovanni, prefect of Vico, captured and beheaded him. The family was now extinguished; and its possessions reverting to the church, the greater part of them were sold or given to Count Everso d’Anguillara, of the house of Orsini. The prefecture, now little more than an honorary title, was bestowed at will by the popes. Eugenius gave it to Francesco, founder of the powerfulline of the Gravina- Orsini. Thus one noble family was raised to greatness while another perished by the sword. Vitelleschi had already begun to persecute the Colonna and the Savelli, and committed terrible slaughter among them. Many castles were demolished, many towns destroyed; and their inhabitants, driven to wander famine-stricken over the Campagna, had to sell themselves as slaves for the sake of

bread. Finally the arrogant patriarch marched into Rome, as into a conquered city, at the head of his men, and the Romans crouched at his feet. The pope now began to distrust him, and sent Scarampo, another prelate of the same stamp, to take his place. This new commander soon arrived, and, perceiving that Vitelleschi proposed to resist, had him surrounded by his soldiers, Eugenius who were obliged to use force to compel his surrender, resumes Vitelleschi was carried bleeding to the castle of St f/£ˆf. es ” Angelo, where he soon afterwards died. The pope at last returned to Rome in 1443, an< i remained there quietly till his death in 1447.

His successor Nicholas V. (1447-55) was a scholar solely devoted to the patronage of literati and artists. During his reign there was a fresh attempt to restore the republic, but it was rather prompted by literary and classical enthusiasm than by any genuine patriotic ardour. Political passions and interests had ceased to exist. The conspiracy Conm was headed by Stefano Porcari, a man of the people, sph-acyot who claimed to be descended from Cato. He had pfrcari. once been captain of the people in Florence, and was made podesta of Bologna by Eugenius IV. He was a I caricature of Cola di Rienzi, and extravagantly proud of his

Latin speeches in honour of ancient republican liberty. The admiration of antiquity ,was then at its height, and Porcari found many enthusiastic hearers. Directly after the death of Eugenius IV. he made a first and unsuccessful attempt to pro- claim the republic. Nevertheless Nicholas V., with the same indulgence for scholars that had prompted him to pardon Valla for denying the temporal power of the papacy and laughing to scorn the pretended donation of Constantine, freely pardoned Porcari and named him podesta of Anagni. He filled this office with credit, but on his return to Rome again began to play the agitator, and was banished to Bologna with a pension from the pope. Nicholas V. had conferred all the state offices upon priests and abbots, and had erected numerous fortresses. Hence there were many malcontents in Rome, in communica- tion with Porcari at Bologna, and ready to join in his plot. Arms were collected, and on the day fixed he presented himself to his fellow-conspirators adorned with rich robes and a gold chain, and harangued them in Latin on the duty of freeing their country from the yoke of the priests.

His design was to set fire to the Vatican on the 6th of January 1453, the feast of the Epiphany; he and his •followers were to seize the pope, the cardinals and the castle of St Angelo. But Nicholas received timely warning; the conspirators' house was sur- rounded; and Porcari himself was seized while trying to escape, confined in the castle of St Angelo, and put to death with nine of his companions on the 9th of January. Others shortly suffered the same fate.

Under Calixtus III. and Pius II. affairs went on quietly enough, but Paul II. (1464-71) had a somewhat troubled reign. Yet he was a skilled politician. He re-ordered the finances and the courts of justice, punished crime with severity, was an energetic foe to the Malatesta of Rimini, put an end to the oppression exercised in Rome by the wealthy and arrogant house of Anguillara, and kept the people in good humour with continual festivities. But — and this was a grave defect at that period — he extended no favour to learning, and, by driving many scholars from the curia to make room for his own kinsmen, brought a storm about his ears. At that time the house of Pomponio Leto was the rendezvous of learned men and the seat of the Roman Academy. Leto was an enthusiast of antiquity; and, as the members of the Academy all assumed old Latin names, they were suspected of a design Mea ot t0 r e-establish paganism and the republican govern- learatag ment. It is certain that they all inveighed against perse- the pope; and, as the latter was no man of half C " ' soicion measures > during the carnival of 1468 he suddenly ot re-imprisoned twenty Academicians, and even subjected

publican a few of them to torture. Pomponio Leto, although ten ~ absent in Venice, was also arrested and tried; but he

exculpated himself, craved forgiveness, and was set at liberty. His friends were also released, for the charge of conspiracy proved to be unfounded. Certain members of the Academy, and notably Platina in his Lives of the Popes, afterwards revenged themselves by stigmatizing Paul II. as the persecutor of philosophy and letters. But he was no more a persecutor than a patron of learning; he was a politician, the author of some useful reforms, and solely intent on the consolidation of his absolute power. Among his reforms may be classed the revision of the Roman statutes in 1469, for the purpose of destroying the substance while preserving the form of the old Roman legislation, and entirely stripping it of all political significance. In fact the pope's will was now ab- solute, and even in criminal cases he could trample unhindered on the common law.

There was still a senator of Rome, whose nomination was entirely in

the hands of the pope, still three conservators, the heads of the rioni, and an elected council of twenty-six citizens. Now and then also a shadowy semblance of a popular assembly was held to cast dust in the eyes of the public, but even this was not for long. All these officials, together with the judges of the Capitol, retained various attributes of different kinds. They administered justice and gave sentence. There were numerous

tribunals all with undefined modes of procedure, so that it was very difficult for the citizens to ascertain in which court justice should be sought. But in last resort there was always the supreme decision of the pope. Thus matters remained to the time of the French Revolution.

For the completion of this system a final blow had to be dealt to the aristocracy, whose power had been increased by nepotism; and it was dealt by bloodshed under the three following popes — Sixtus IV. (1471-84), Innocent VIII. (1484-92) and Alexander VI. (1492-1503) — each of whom was worse than his predecessor. The first, by means of his nephews, continued the slaughter of the Colonna, sending an army against them, devastating their estates at Marino, and beheading the protonotary Lorenzo Colonna. Innocent VIII. was confronted by the power of the Orsini, who so greatly endangered his life by their disturbances in the city that he was only saved by an alliance with Naples. Neither peace nor order could be lastingly established until these arrogant barons were overthrown. This task was accom- plished by the worst of the three pontiffs, Alexander VI. All know how the massacre of the Orsini was compassed, almost simultaneously, by the pope in Rome and his equally iniquitous son, Caesar Borgia, at Sinigaglia (1502). This pair dealt the last blow to the Roman aristocracy and the tyrants of Romagna, and thus the temporal dominion of the papacy was finally assured. The republic was now at an end; it had shrivelled to a civil municipality. Its institutions, deprived of all practical value, lingered on like ghosts of the past, subject from century to century to unimportant changes. The history of Rome is henceforth absorbed in that of the papacy.

Nevertheless the republic twice attempted to rise from its grave, and on the second occasion gave proofs of heroism worthy of its most glorious past- It was first resus- p os t- citated in February 1798, by the influence of the medieval French Revolution, and the French constitution of Rome. the year III. was rapidly imitated. Rome had again two councils — the tribunate and the senate, with five consuls con- stituting the executive power. But in the following year, owing to the military reverses of the French, the government of the popes was restored until 1809, when Napoleon I. annexed to his empire the

States of the Church. Rome was then governed by a consulta straordinaria — a special commission — with the municipal and provincial institutions of France.. In 1 814 the papal government was again reinstated, and the old institutions, somewhat modified on the French system, were recalled to life. Pius IX. (1846-77) tried to introduce political reforms, and to improve and simplify the old machineiy of state; bat the advancing tide of the Italian revolution of 1848 drove him from Rome; the republic was once more proclaimed, and had a brief but glorious existence. Its programme was dictated by Giuseppe Mazzini, who with Saffi and Armellini formed the triumvirate at the head of the government. United Italy was to be a republic with Rome for her capital. The rhetorical idea .of Cola di Rienzi became heroic in 1849. The constituent assembly (9th February 1849) proclaimed the fall of the tem- poral power of the popes, and the establishment of a republic which was to be not only of Rome but of all Italy. France, although then herself a republic, assumed the unenviable task of re-establishing the temporal power by force of arms. But the gallant defence of Rome by Garibaldi covered the republic with glory. The enemy was repulsed, and the army of the Neapolitan king, sent to restore the pope, was also driven off. Then, however, France despatched a fresh and more powerful force; Rome was vigorously besieged, and at last compelled to surrender. On the 2nd of July 1849 the heroic general departed from the city with some thousands of his followers. Almost at the same time the constituent assembly proclaimed in the Capitol the constitution of the Roman Republic. Immedi- ately afterwards the French restored the government of Pius IX., whose reign down to 1870 was that of an absolute sovereign. Then the Italian government entered Rome (20th September 1870), proclaimed the national constitution (9th October 1870), and the Eternal City became the capital of Italy. Thus the

scheme of national unity, the natural outcome of the history of Rome and of Italy, impossible of accomplishment under the rule of the popes, was finally achieved by the monarchy of Savoy, which, as the representative and personification of Italian interests, abolished the temporal power of the papacy and made Rome the seat of government of the united country (see Italy).

Authorities. — The history of the commune of Rome in the middle ages has to be collected from the scattered materials in special treatises, or from the general histories of the papacy. The greater part

of the facts are to be found in the Liber Pontificalis, edited by the Abbe Duchesne (2 vols., Paris, 1886-92), and in the excellent histories of Rome by Felix Papencordt and Gregorovius (see below). Vitale, Storia diplomatica de' Senatori di Roma (2 vols., Rome, 1791); Galletti, Del primicerio delta Santa Seda Apostolica e di altri umciali maggiori del sagro palazzo Lateranense (Rome, 1776); Vendettini, Del Senato Romano (Rome, 1782); Baronius, Annates Ecclesiastici, continued by Raynaldus (42 vols, fol., 1738-56), and the recent continuations of Theiner relating to the years 1572-85; J. Ficker, Forschungen zur Reichs- und Rechtsgeschichte Italiens (4 vols., Innsbruck, 1868-74); Savigny, Geschichte des romischen Rechts im Mittelalter (frequently reprinted and translated into all the principal languages) ; Leo, Entwickelung der Verfassung der lom- bardischen Stadte (Hamburg, 1824) ; M. A. von Bethmann-Hollweg, Ursprung der lombardischen Stddtefreiheit (Anhang: Schicksale der romischen Stadtverfassung im Exarchat und in Rom) (Bonn, 1846); Hegel, Geschichte der Stadteverfassung von Italien (Leipzig, 1847); Giesebrecht, " Ueber die stadtischen Verhaltnisse im X. Jahrhun- dert, " at end of vol. i. of Geschichte der deutschen Kaiserzeit (Brunswick, 1863); " Studi e documenti di Storia e Diritto," in Annuario di Conferenze storico-giuridiche (Rome, 1880 seq.); Archivio delta Reale Societa Romana di Storia Patria (the other publications of the same society, as. e.g. the Regesto di Farfa, may also be consulted with advantage) ; F. Papencordt, Geschichte der Stadt Rom (Paderborn, 1857); Id. Coladi Rienzo (Hamburg, 1841); Gregorovius, Geschichte der Stadt Rom (8 vols., Stuttgart, finished in 1872; 3rd ed., Stuttgart, 1875-81); A. von Reumont, Geschichte der Stadt Rom (3 vols., Berlin, 1867-68).

Among more recent works see especially M. Creighton, History of the Papacy (London, 1897) ; L. Pastor, Geschichte der Papste seit dem Ausgang des Mittelalters (Freiburg i/B., 1886, &c), a learned work, but written in an extremely clerical spirit; more impartial, although written by a Jesuit, is P. H. Grisar's Storia di Roma e dei Papi nel Medio Evo (Italian edition, Rome, 1899, &c, not yet completed). For the history of the republic in 1849 accounts will be found in all the histories of the Italian Risorgimento (see under Italy). A very important and complete work on the events of Rome in 1848-49 is G. Trevelyan's Garibaldi's Defence of the Roman Republic (London, 1907), which contains a full bibliography. (P. V.)

ROME, a province of modern Italy, co-extensive with the compartimento of Lazio, but really covering a considerably larger area than the ancient Latium, even including Latium adjectum. On the S.E. and E. alone it does not extend so far, the boundary being that

between the former papal states and the kingdom of Naples, running from a point S.E. of Ter- racina along the eastern edge of the Volscian mountains to Ceprano, and thence along the Liris valley. It then runs N.E. through the mountains to Carsoli, being conterminous with the Abruzzi; it then includes part of the ancient Sabine country, reaching the Tiber near the railway station of Fara Sabina, 25 m. N. of Rome. It follows the river for some dis- tance, where it is conterminous with Umbria, and then runs S.W. to the coast, r where it is conterminous with the province of Grosseto (Tuscany), thus including a considerable portion of the ancient Etruria. The resident population in 1901 was estimated at 1,196,909 (including Rome itself, 520,196), and the floating population, Italian and foreign, 54,383. In 1907 the total number was calculated at 1,278,000. In 1871 the aggregate population was only 836,704. Emigration rose from 2222 in 1896 to 18,507 in 1906, there being a great rise in 1905, as over all Italy. The economic crisis in the United States in 1907, led, however, to a set-back, many emigrants being obliged to return to Italy for lack of work. Alum is extracted from the mines principally near Tolfa. At Filettino above Subiaco asphaltic rock is obtained, and salt from a rocksalt mine ‘near Corneto Tarquinia. Chemical fertilizers are manufactured by several firms. The main industries of the district are, however, agricultural (see Latium).

ROME, a citv and the county-seat of Floyd county, in the N.W. part of Georgia, U.S.A., at the junction of the Etowah and

Oostanaula rivers, which here form the Coosa. Pop. (1900) 7291, of whom 2830 were negroes; (1910) 12,099. It is served by the Central of Georgia, the Western & Atlantic (leased by the Nashville, Chattanooga & St Louis), the Southern and the Rome & Northern railways, and the Coosa river is navigable from this point to the falls of the river in Alabama. The city is the seat of Shorter College (for women), which was established in 1873 as the Cherokee Female College, and received its present name in 1877, when it was rebuilt and endowed by Colonel Alfred Shorter; and of the Berry Industrial School (1902), for mountain boys. Rome is situated in a rich agricultural region producing cotton, cereals, vegetables and fruits, for which it is a trading centre, and is a shipping point for bauxite, mined in the vicinity. Other mineral products of this region are iron, limestone, cement rock, fire-brick clay, coal, slate and marble. Rome’s principal manufactures are cotton, cotton-seed oil, lumber, foundry and machine-shop products, bricks and agricultural implements. Its site was originally within the territory of the Cherokee, and on the other side of the Oostanaula river there is said to have been at one time an Indian village, which, like several other Creek villages, was

called Chiaha (or Chehaw). Here, in October 1793, in his Etowah campaign, John Sevier, with militia from Tennessee, crushed a party of marauding Indians; the battle is commemorated by a monument in Myrtle Hill cemetery. Floyd county was erected in 1833. The first settlement of Rome was made in 1834, and immedi- ately afterwards it became the county-seat. Rome was first chartered as a city in 1847. In 1863 there were brilliant cavalry manoeuvres in its vicinity, which resulted in the capture (May 3) of Colonel Abel D. Streight (Federal) with 1800 men by General Nathan B. Forrest (Confederate), with a force one-third the size of that of his opponent. On the 19th of May 1864 the city was captured by a detachment of the Federal Army of General William T. Sherman, then conducting his Atlanta campaign. In 1848-75 Rome was the home'of Charles Henry Smith (1826- 1903), a popular humorist, who wrote under the name " Bill Arp." In 1906 East Rome (pop. 671 in 1900) and North Rome (pop. 960 in 1900), which was formerly called Forestville, were annexed to the city.

ROME, a city of Oneida county, New York, U.S.A., on the Mohawk river and Wood Creek, and the Erie and the Black river canals, 14 m. W.N.W. of Utica. Pop. (1890) 14,991; (1900) I S,343> 0I whom 2527 were foreign-born; (1910, census) 20,497. Rome is served by the New York Central & Hudson River, the Rome, Watertown & Ogdensburg (controlled by the New York Central), the New York, Ontario & Western, and the Utica & Mohawk Valley (electric) railways. It is about 450 ft. above sea-level. The city is the seat of the Academy of the Holy Names (opened in 1865 as St Peter's Academy), of the State Custodial Asylum for unteachable idiots, of the Central New York Institution for Deaf Mutes (1875), and of the Oneida County Home. The Jervis Public Library (1895), founded by John Bloomfield Jervis (1795-1885), a famous railway engineer, had in 1909 about 15,000 volumes. The surrounding country is devoted largely to farming, especially vegetable gardening, and to dairying. Among the manufactures are brass and copper work, wire for electrical uses, foundry and machine-shop products, locomotives, knit goods, tin cans and canned goods (especially vegetables). In 1905 the value of the factory products was $8,631,427 (55-6% more than in

1900).

The portage at this place between the Mohawk river and Wood Creek, which are about 1 m. apart, gave the site its Indian name, De-o-wain-sta, " place where canoes are carried from one stream to another," and its earliest English name, " The Great (or Oneida) Carrying-Place," and gave it strategic value as a key between the Mohawk Valley and Lake Ontario. About 1725 there were built, to protect the carrying-place

here, Fort Bull, on Wood Creek, which was surprised and taken by French and Indians in March 1756, and Fort Williams, on the Mohawk, which, like Fort Craven, also on the Mohawk, was destroyed by Colonel Daniel Webb after the reduction of Oswego by the French

in August 1756. General John Stanwix built Fort Stanwix here at an expense of £60,000, and the first permanent settlement dates from about this time. In October-November 1768, Sir William Johnson and representatives of Virginia and Pennsyl- vania met 3200 Indians of the Six Nations here and made a treaty with them, under which, for £10,460 in money and provisions, they surrendered to the crown their claims to what is now Kentucky and West Virginia and the western part of Pennsylvania. Of this cession the part which lay in Pennsyl- vania was secured by purchase from the Indians for the pro- prietors Richard and Thomas Penn (see Pittsburg). The fort was dismantled immediately afterward. After 1776, when it was partly repaired by Colonel Elias Dayton, it was called by the continentals Fort Schuyler, in honour of General Philip Schuyler, and so is sometimes confused with (old) Fort Schuyler at Utica. The third regiment of the New York line under Colonel Peter Gansevoort occupied the fort in April 1777 and completed the repairs begun in 1776; on the 3rd of August in the same year (one month before the official announcement by Congress of the design of the flag) the first flag of the United States, made according to the enactment of the 14th of June and used in battle, was raised here: it was made from various pieces of cloth. On the 2nd of August an advance party of Colonel Barry St Leger's forces coming from the west arrived before the fort, and the main body (altogether about 650 whites, including loyalists — the Royal Greens — under Sir John Johnson, and more than 800 Indians, some led by Joseph Brant) arrived soon afterwards. The fort then contained about 750 men under Colonel Gansevoort, with Lieut.Colonel Marinus Willett as second in command. The danger to the fort roused General Nicholas Herkimer to gather a force of between 700 and 1000 men (including some Oneida Indians), who during their advance on the 6th of August were ambuscaded in a ravine near Oriskany (g.v.), about 8 m. E. of the fort; after heavy losses to both sides, about 250 men from the fort under Willett attacked the camp of the Indians who were supporting St Leger, thus relieved Herkimer through the falling back of the British and Indians to save their supplies, captured five ensigns of the Royal Greens, and seized large quantities of stores from the enemy's camp. The siege now lost force, the Indians straggled away after the loss of

their camp supplies, and on the 23rd of August, St Leger, hearing ex aggerated reports of the immediate approach of large re- inforcements under General Benedict Arnold, withdrew, abandoning his camp and stores. The successful resistance here to St Leger contributed greatly to the American success at Saratoga. Fort Stanwix was the headquarters of Colonel Gozen Van Schaick (1736-1789) in 1779 when he destroyed the Onondaga villages. At the fort, on the 22nd of October 1784, a treaty was made by Oliver Wolcott, Richard Butler and Arthur Lee, commissioners for the United States, with the chiefs of the Six Nations. In 1796 a canal was built across the old portage between Wood Creek and the Mohawk river. In 1 796 the township of Rome was formed, receiving its name, says Schoolcraft, ” from the heroic defence of the republic made here.” The village of Rome, in the centre of the township, was incorporated in 1819; and Rome was chartered as a city in 1870.

See Pomroy Jones, Annals and Recollections of Oneida County (Rome, 1851); W. M. Willett, A Narrative of the Military Actions of Col. Marinus Willett (New York, 1831); and Orderly Book of Sir John Johnson during the Oriskany Campaign (Albany, 1882), with notes by W. L. Stone and J W. de Peyster.

ROME DE L’ISLE, JEAN BAPTISTE LOUIS (1736-1790), French mineralogist, was born on the 26th of August 1736 at Gray, in Haute-Saone. As secretary of a company of artillery he visited the East Indies, and was taken prisoner by the English in 1761 and held in captivity for three years. Subse- quently he became distinguished for h’s researches on mineralogy and crystallography. He was the author of Essai de Cristatto- graphie (1772), the second edition of which, regarded as his principal work, was published as Cristallographie (3 vols, and atlas, 1783). He died at Paris on the 7th of March 1790.

ROMESH CHANDRA MITRA, Sir (1840-1899), Indian judge, was born in 1840. When the East India Company’s charter was renewed in 1853, the old supreme courts and sadr courts in the presidency towns were changed into high courts, and Roma Prasad Roy, son of the great reformer Raja Ram Mohan Roy, was the first Indian who was appointed a judge of the new high court of Calcutta. He did not live, however, to take his seat on the bench, and was succeeded by Sambhu Nath Pandit, and then by Dwarka Nath Mitra, perhaps the most talented judge that India produced in the 19th century. Dwarka Nath’s great ability and thorough insight into cases were universally recognized in India; his decisions were valued and often quoted; and his name was often mentioned as an illustration of the judicial capacity of the natives of India. Anukul Chandra Mukerji also sat on

the bench for a time; and on his death in 1871, Romesh Chandra Mitra was appointed judge in his place. He maintained the high reputation of his predecessors, and for a period of nearly twenty years, down to 1890, he performed his judicial duties with credit and distinction. When the post of chief justice was temporarily vacant in 1882, the marquis of Ripon, then viceroy of India, appointed Romesh Chandra to officiate in that post — the highest judicial position in the Indian empire. Lord Dufferin, who succeeded Lord Ripon as viceroy of India, appointed Romesh Chandra a member of the Public Service Commission, and in this capacity he did valuable work. Failing health compelled him to retire from the high court in 1890, and he was then knighted and appointed a member of the viceroy's legislative council. Till he died in 1899, he continued to take interest in all social, educational and political reforms in India.

ROMFORD, a market town in the Romford parliamentary division of Essex, England; on the small river Rom, which flows into the Thames; i2§ m. E.N.E. from London by the Great Eastern railway. Pop. of urban district (1901) 13,656. The ancient church of St Edward the Confessor was replaced in 1850 by a structure in Decorated style. There is a large brewery in the town, and extensive market gardens in the neighbourhood. A grant of a market was obtained in 1247, and this is still of importance as regards both cattle and corn. Romford was included in the liberty of Havering-atte-Bower, which until 1892 had a jurisdiction of its own distinct from that of the county, with a high steward, magistrates, clerk of the peace, coroner and quarter sessions. The name of Bower was derived from a queen's residence attached to the ancient royal hunting-lodge in the vicinity.

The fact that Romford (Rumford, Rompford) lies on the high road between Colchester and London has determined its history. Bronze implements have been found here, but no notice of Romford occurs till the 12th century. It was in- cluded in the liberty of Havering, and the chief business of the liberty was conducted there. But the corporation which is mentioned in medieval records is not that of the town of Rom- ford, but of the liberty of Havering. Romford has only had a separate constitution since a local board of health was formed in 1894, under the act of 1875, after the abolition of the liberty in 1892. In the middle ages Romford was rather a meeting- place for merchants than an industrial centre. Brewing, however, is mentioned in 1331, and one tanner at least carried on business in Hare Street in 1467.

ROMILLY, JOHN ROMILLY, ist Baron (1802-1874), English judge, was the second son of Sir Samuel Romilly, and was born on the 10th of January 1802. He was educated at Trinity College, Cambridge, and

was called to the bar at Gray's Inn in 1827. He first entered parliament in 1832 as member for Bridport, and in 1843 he became a queen's counsel. He was elected M.P. for Devonport in 1847, and was appointed solicitor-general in 1848 in Lord John Russell's administration and attorney-general in 1850. In 1851 he was appointed master of the rolls, and continued to sit for Devonport till the general election in 1852, when he was defeated. He was the last master of the rolls to sit in parliament. Romilly was raised to the peerage as Baron Romilly of Barry in 1866, and

retired from the mastership of the rolls in 1873. He did much to remove the restrictions which had long hampered research among the public records and state papers. Lord Romilly died in London on the 23rd of December 1874.

ROMILLY, SIR SAMUEL (1757-1818), English legal reformer, was the second son of Peter Romilly, a watchmaker and jeweller in London, whose father had emigrated from Montpellier after the revocation of the edict of Nantes, and who had married Margaret Garnault, a Huguenot refugee like himself, but of a far wealthier family. Samuel Romilly was born in Frith Street, Soho, on the 1st of March 1757. He served for a time in his father's shop; but his education was not neglected, and he became a good classical scholar and particularly conversant with French literature. A legacy of £2000 from one of his mother's relations led to his being, articled to a solicitor and clerk in chancery with the idea of qualifying himself to pur- chase the office of one of the six clerks in chancery. In 1778, however, he determined to go to the bar, and entered himself at Gray's Inn. He went to Geneva in 1781, where he made the acquaintance of the chief democratic leaders, including Etienne Dumont. Called to the bar in 1783, he went the mid- land circuit, but was chiefly occupied with chancery practice. On the publication of Madan's Thoughts on Executive Justice, advocating the increase of capital punishments, he at once wrote and published in 1786 Observations on Madan's book. Of more general interest is his intimacy with the great Mirabeau, to whom he was introduced in 1784. Mirabeau saw him daily for a long time and introduced him to Lord Lansdowne, who highly appreciated him, and, when Mirabeau became a political leader, it was to Romilly that he applied for an account of the procedure used in the English House of Commons. He visited Paris in 1789, and studied the course of the Revolution there; and in 1790 he published his Thoughts on the

Probable Influ- ence of the Late Revolution in France upon Great Britain, a work of great power. His practice at the chancery bar continued largely to increase, and in 1800 he was made a K.C. In 1798 he married Anne, daughter of Francis Garbett of Knill Court, Herefordshire; and in 1805 he was appointed chancellor of the county palatine of Durham. His great abilities were thoroughly recognized by the Whig party, to which he attached himself; and in 1806, on the accession of the ministry of " All the Talents " to office, he was offered the post of solicitor- general, although he had never sat in the House of Commons. He accepted the office, and was knighted and brought into parlia- ment for Queenborough. He went out of office with the government, but remained in the House of Commons, sitting successively for Horsham, Wareham and Arundel. It was now that Sir Samuel Romilly commenced the greatest labour of his life, his attempt to reform the criminal law of England, then at once cruel and illogical. By statute law innumerable offences were punished by death, but, as such wholesale executions would be impossible, the larger number of those convicted and sentenced to death at every assizes were respited, after having heard the sentence of death solemnly passed upon them. This led to many acts of injustice, as the lives of the convicts de- pended on the caprice of the judges, while at the same time it made the whole system of punishments and of the criminal law ridiculous. Romilly saw this, and in 1808 he managed to repeal the Elizabethan statute, which made it a capital offence to steal from the person. This success, however, raised opposition, and in the following year three bills repealing equally sanguinary statutes were thrown out by the House of Lords under the influence of Lord Ellenborough. Year after year the same influence prevailed, and Romilly saw his bills rejected; but his patient efforts and his eloquence ensured victory eventually for his cause by open- ing the eyes of Englishmen to the barbarity of their criminal law. The only success he had was in securing the repeal, in 181 2, of a statute of Elizabeth making it a capital offence for a soldier or a mariner to beg without a pass from a magistrate or his commanding officer. Sir Samuel Romilly's efforts made his name famous not only in England but all over Europe, and in 18 1 8 he had the honour of being returned at the head of the

poll for the city of Westminster. He did not long survive his triumph. On the 29th of October 1818 Lady Romilly died in the Isle of Wight. Her husband's grief was intense, and he committed suicide in a fit of temporary insanity on the 2nd of November. No man of his time was more loved than Sir Samuel Romilly; his singularly sweet nature, his upright manli- ness, his eloquence and his great efforts on behalf of humanity secured him permanent fame.

See the Memoirs of the Life of Sir Samuel Romilly written by himself, with a selection from his Correspondence, edited by his Sons (3 vols., 1840) ; The Speeches of Sir Samuel Romilly in the House of Commons (2 vols., 1820); ” Life and Work of Sir Samuel Romilly,” by Sir W. J. Collins, in Trans, of the Huguenot Society (1908).

ROMILLY-SUR-SEINE, a town of north-central France, in the department of Aube, a mile from the left bank of the Seine and 24 m. N.W. of Troyes, on the Paris-Belfort line. Pop.

(1906) 9777.

Romilly is an important industrial town, with extensive manufactures of cotton and woollen hosiery, and of the special machinery and appliances required for the industry. The Eastern Railway Company has large workshops here.

ROMINTEN, a village of Germany, in the province of East Prussia, 12 m. N.E. from Goldap, situated in the Rominter Heide, a fine tract of heath and forest country, 90 sq. m. in extent, well stocked with game and affording excellent sport. Here is a favourite hunting-box of the German emperor, with a church adjacent, both in the Norwegian style. Pop. 1 200.

See K. E. Schmidt, Die Rominter Heide (Danzig, 1898).

ROMNEY, GEORGE (1 734-1802), English historical and portrait painter, was born at Dalton-in-Furness, Lancashire, on the 26th of December 1734. His father was a builder and cabinet-maker of the place, and the son, having manifested a turn for mechanics, was instructed in the latter craft, showing considerable dexterity with his fingers, executing carvings of figures in wood, and constructing a violin, which he spent much time in playing. He was also busy with his pencil; and some of his sketches of the neighbouring rustics having attracted attention, his father was at length induced to apprentice the boy, at the age of nineteen, to an itinerant painter of portraits and domestic subjects named Steele, an artist who had studied in Paris under Vanloo; but the erratic habits of his instructor prevented Romney from making great progress in his art. In 1756 he impulsively married a young woman who had nursed him through a fever, and started as a portrait painter on his own account, travelling through the northern counties, executing likenesses at a couple of guineas, and producing a series of some twenty figure compositions, which were exhibited in Kendal, and afterwards disposed of by means of a lottery.

Having, at the age of twenty-seven, saved about £100, he left a portion of the sum with his wife and family, and started to seek his fortune in London, never returning, except for brief visits, till he came, a broken-down and aged man, to die. Credit must, however, be given him*for recognizing to some extent his family responsibilities. He did not allow his wife and children to fall into poverty, and he gave help to his brothers, who seem to have resembled him in a kind of shiftlessness of temperament. In London he rapidly rose into popular favour. His ” Death of General Wolfe ” was judged worthy of the second prize at the Society of Arts, but a word from Reynolds in praise of Mortimer’s ” Edward the Confessor ” led to the premium being awarded to that painter, while Romney had to content himself with a donation of £50, an incident which led to the subsequent coldness between him and the president which prevented him from exhibiting at the Academy or pre- senting himself for its honours.

In 1764 he paid a brief visit to Paris, where he was befriended by Joseph Vernet; and his portrait of Sir Joseph Yates, painted on his return, bears distinct traces of his study of the works of Rubens then in the Luxembourg Gallery. In 1766 he became a member of the Incorporated Society of Artists, and three years later he seems to have studied in their schools.

Soon he was in the full tide of prosperity. He removed to Great Newport Street, near the residence of Sir Joshua, whose fame in portraiture he began to rival in such works as ” Sir George and Lady Warren ” and ” Mrs Yates as the Tragic Muse”; and his professional income rose to £1200 a year. But this marked increase in his popularity had the effect of enlarging his ambitions, and he became anxious to attempt subjects which required more experience than he possessed. Realizing as he did the need for more thorough knowledge, he was seized with a longing to study in Italy; and in the begin- ning of 1773 he started for Rome in company with Ozias Humphrey, the miniature painter. On his arrival he separated himself from his fellow-traveller and his countrymen, and devoted himself to solitary study, raising a scaffold to examine the paintings in the Vatican, and giving much- time to work from the undraped model, of which his painting of a ” Wood Nymph ” was a fine and graceful result. At Parma he con- centrated himself upon the productions of Correggio, which fascinated him and greatly influenced his practice.

In 177s Romney returned to London, establishing himself in Cavendish Square, and resuming his extensive and lucrative employment as a portrait painter, which in 1785, according to the estimate of his pupil Robinson, yielded him an income of over £3600. The admiration of the town was divided between him and Reynolds. ” There are two factions in art,” said Lord Thurlow, ” and I am of the Romney faction ” — and the remark, and the rivalry which it implied, caused much annoy- ance to Sir Joshua, who was accustomed to refer contemptu- ously to the younger painter as “the man in Cavendish Square.” After his return from Italy Romney formed two friendships which powerfully influenced his life. He became acquainted with Hayley, his future biographer, then in the zenith of his little-merited popularity as a poet. His influence on the painter seems to have been far from salutary. Weak himself, he flattered the weaknesses of Romney, encouraged his ex- cessive and morbid sensibility, disturbed him with amateurish fancies and suggestions, and tempted him to expend on slight rapid sketches, and ill-considered, seldom-completed paintings of ideal and poetical subjects, talents which would have found fitter exercise in the steady pursuit of portraiture. About 1783 Romney was introduced to Emma Hart, afterwards celebrated as Lady Hamilton, and she became the model from whom he worked incessantly. Her bewitching face smiles from numerous canvases; he painted her as a Magdalene and as a Joan of Arc, as a Circe, a Bacchante, a Cassandra; and he has himself con- fessed that she was the inspirer of what was most beautiful in his art. But her fascinations seem to have been too much for the more than middle-aged painter, and they had their own share in aggravating that nervous restlessness and instability, inherent in his nature, which finally ruined both health and mind.

In 1786 Alderman Boydell started his great scheme of the Shakespeare Gallery, apparently at the suggestion of Romney. The painter at least entered heartily into the plan, and con- tributed his scene from the Tempest, and his ” Infant Shake- speare attended by the Passions,” the latter characterized by the Redgraves as one of the best of his subject pictures. Gradu- ally he began to withdraw from portrait painting, to limit the hours devoted to sitters, and to turn his thoughts to mighty schemes of the ideal subjects which he would execute. Already, in 1792, he had painted “Milton and his Daughters,” which was followed by ” Newton making Experiments with the Prism.” He was to paint the Seven Ages, Visions of Adam with the Angel, ” six other subjects from Milton — three where Satan is the hero, and three from Adam and Eve, — perhaps six of each.” Having planned and erected a large studio in Hamsptead, he removed thither in 1797, with the fine

collection of casts from the antique which his friend Flaxman had gathered for him in Italy. But his health was now irremediably shattered, and the man was near his end. In the summer of 1799, suffering from great weakness of body and the profoundest depression of mind, he returned to the north, to Kendal, where

his deserted but faithful and long-suffering wife received and tended him. He died on the 15th of November 1802.

The art of Romney, especially his figure subjects, suffered greatly from the waywardness and instability of the painter's disposition, from his want of fixed purpose and sustained energy. He lacked the steadfast perseverance needful to the accomplish- ment of a great picture. Afflicted as he was throughout his life by an unreasonable timidity and by a self-consciousness which led him at one moment into assertive affectations and at another into exaggerated humility, he avoided the society of his brother artists and lost many opportunities of receiving that frank professional criticism which might have stimulated him to more serious effort. In unwholesome surroundings he steadily deteriorated. His imagination flashed and flickered fitfully upon him, like April sunshine. His fancy would be captivated by a subject, which was presently embodied in a sketch, but the toil of elaborating it into the finished complete- ness of a painting too frequently overtaxed his powers; he became embarrassed by technical difficulties which, through defective early training, he was unable to surmount, and the half-covered canvas would be turned to the wall. Even in the pictures he finished he was unable to keep to any consistent level of achievement. He produced some fine things, very personal in style and very skilful in handling; but much that he did seems too tentative and too plainly deficient in shrewd- ness of insight to deserve serious consideration. His colour, too, was often unpleasant, hot and monotonous, and his com- position was apt to be stilted and artificial. It is in the best of his portraits that we feel the painter's real ability. These, especially his female portraits, are full of grace, charm, dis- tinction, and sweetness. When we examine his heads of Cowper and Wilkes, his delicate and dignified full-length of William Beckford, his " Parson's Daughter " in the National Gallery, and his group of the Duchess of Gordon and her Son, we can- not deny his claim to rank as one of the notable portrait painters of 1 8th-century England.

See the Memoirs by William Hayley (1809) and by the artist'* son, the Rev. John Romney (1830); Cunningham's Lives of the Painters; George Romney and his Art, by Hilda Gamlin (1894). In the fully illustrated George Romney, by Lord Ronald Suther- land Gower

(1904), pictures, mainly studies, are reproduced not elsewhere to be found. But the great work upon the artist is Romney, by Humphry Ward and W. Roberts (1904), a monograph of real importance, containing 70 illustrations, a biographical and critical essay, and a catalogue raisonne of the painter's works. Arthur B. Chamberlain's Romney (1910) has 73 plates.

ROMNEY, HENRY SIDNEY, Earl of (1641-1704), fourth son of Robert, 2nd earl of Leicester, was born in Paris in 1641. He and his nephew, Robert Spencer, afterwards 2nd earl of Sunderland, his senior by a few months, were sent to travel on the continent of Europe in charge of a Calvinist divine, Dr Thomas Pierce. Sidney's handsome face helped his advance- ment at court, but the favour in which he was held by the duchess of York, to whom he was master of the robes, led to his dismissal in 1666. His disgrace, however, was short-lived. He was promoted captain in 1667, and colonel in 1678. In 1672 he was sent on a mission of congratulation to Louis XIV., and in 1677 became master of the robes to Charles II. He entered parliament as member for Bramber in 1679, and became a close political ally of his nephew Sunderland, with whose wife he carried on an intrigue which caused considerable scandal. Sunderland made this intimacy a means to further his political ends, while Sidney's social reputation and his apparent frivolity partly concealed his real capacity for intrigue. Sidney was sent by Sunderland and others in 1679 on a special mission to urge William of Orange to visit England, a task that he was able to discharge while acting as the official envoy of Charles II. at the Hague. He was recalled in 1682, but was again sent on a special mission to Holland in the year of the accession of James II. He returned to England in the spring of 1688, and set to work, at William's desire, to obtain promises of support for the prince of Orange in the event of his landing. He was presently allowed to leave England on giving his word not to visit the

Hague, but he broke his promise on getting clear of England, and conveyed to William a duplicate of the invitation addressed to him by the English nobility, together with intelligence of affairs of state obtained through the countess of Sunderland. He landed with William at Torbay, and received substantial rewards for his undoubted services. Sworn of the privy council in 1689, Sidney was made gentleman of the bedchamber and colonel of the king's regiment of footguards, and received the titles of Baron Milton and Viscount

Sidney of Sheppey. In 1690 he received considerable grants of land from the confiscated estates of the Irish supporters of James II., much of which he lost, however, on the parliamentary investigation in 1699 into the distribution of the Irish lands. William made him secretary of state in 1690, pending the discovery of a better person. He was soon asked to resign, but was compensated by his appointment, in 1692, as lord-lieutenant of Ireland. His inability to cope with the difficulties of this position led to his recall in the next year, when he became master-general of the ordnance. He was created earl of Romney in May 1694, and he retained William's confidence to the last, but on Anne's accession he was dismissed from his various offices. He never married, and his titles became extinct on his death on the 8th of April 1704.

In 1801 the title of earl of Romney was revived in the family of Marsham. Sir Robert Marsham, Bart. (1685-1724), of Cuxton in Kent, was a member of parliament from 1708 to 1 7 16, when he was created Baron of Romney. His grandson Charles, the 3rd Baron (1774-1811), was created earl of Romney in 1801, and from him the present earl is descended.

ROMNEY (New Romney), a municipal borough and one of the Cinque Ports in the Ashford parliamentary division of Kent, England, 75 m. S.E. by E. of London by the South-Eastern & Chatham railway. Pop. (1901) 1328. It lies in the open, flat and low tract of Romney Marsh, part of a level extending from Winchelsea in the south-west to Hythe in the north-east, which was within historic times in great part covered by an estuarine inlet of the sea. The river Rother, which now has its mouth at Rye Harbour, formerly entered the sea here, but had its course wholly changed during a great storm in 1287, and the gradual accretion of land led to the decay, not only of Romney, but of Winchelsea and Rye as seaports. Romney Marsh itself, which extends north of New Romney, is protected by a seawall of great thickness, and its guardianship and drainage is in the hands of a special ancient corporation. The level affords pasturage for vast flocks of sheep. New Romney, which is now over a mile from the sea, has large sheep fairs, but little other trade. Of the five churches mentioned here in the Domesday Survey only one remains, but this, dedicated to St Nicholas, is a rich Norman building with later additions. Its Norman west tower is among the finest in England, and it has a beautiful Decorated east window with reticulated tracery. New Romney, the name of which distinguishes it from the decayed village of Old Romney, 2 m. W., is governed by a mayor, 4 aldermen and twelve councillors. Area, 1351 acres. Littlestone-on-Sea, on the coast E. of New Romney, is in some favour as a seaside resort and has excellent golf-links.

Its fine harbour was the cause of the early importance of Romney (Romenal, Romenhall). The annual assembly of the Cinque Ports, called the Brodhull, was held here owing to its central position. At the time of Domesday the archbishop of Canterbury and the bishop of Bayeux were joint lords. Romney also owed maritime service to the king, which consisted of sup- plying five ships to serve for fifteen days in the year. A con- firmation of liberties was granted by John in 1205. The town, which was a borough by prescription, was governed ” from time immemorial ” by twelve jurats; a bailiff was appointed by the archbishop, but the rights of the overlord seem to have been small, and in 1521 the inhabitants denied the bailiff the right of presiding with the jurats over their court. Elizabeth changed the style of incorporation to the mayor, jurats and commonalty, and another charter was granted by James II. in 1686, which remained the governing charter until 1835. The Cinque Ports

were first summoned to parliament in 1265; the first returns for Romney are for 1266; it returned two members until it was disfranchised in 1832.

ROMORANTIN, a town of central France, capital of an arrondissement in the department of Loir-et-Cher, 31 m. S.E. of Blois by rail. Pop. (1906) town, 6836; commune, 8374. The town is situated on the Sauldre at its confluence with the Morantin, whence its name (Rivus Morantini). A church dating mainly from the 12th century, a gateway of the 16th century and some old houses are the chief objects of interest. The remains of a chateau rebuilt by Francis I. in the Renaissance style are used as the sub-prefecture. Tribunals of first instance and of commerce, and a communal college are among the public institutions. The manufacture of flannel and cloth especially for army clothing is carried on, together with trade in wine, live stock, agricultural produce and the asparagus of the vicinity.

In 1560 Romorantin gave its name to an edict which prevented the introduction of the Inquisition into France. The industrial importance of the town dates from the later middle ages.

ROMSDAL, the valley of the river Rauma, in Norway. The Rauma is a torrent descending from Lake Lesjekogen to the Romsdal Fjord on the west coast (62 30′ N.). The nearest port is Molde, from which steamers run to Veblungsnaes (30 m.) at the foot of the valley. A good road traverses the valley, which is one of the finest in southern Norway, flanked by steep mountains terminating in abrupt peaks — Vengetinder (5960 ft.), Romsdalshorn (5105), Troldtinder (” witch-peaks,” 6010) and others. Several waterfalls are seen, such as the

Mongefos, the Vaermofos, falling nearly 1000 ft., and the Slettafos. Lake Lesjekogen also drains from the opposite end by the Laagen or Lougen river to the Glommen, and so to the Skagerrack, and the road follows its valley, the Gudbrandsdal. The Romsdal gives if s name to an ami (county) extending from the promontory of Stadt in the south to Ram Fjord in the north, including the Stor, Molde, Halse and their branch fjords, the ports of Aale- sund, Molde and Christiansund, and reaching inland to the Dovrefjeld.

ROMSEY, a market town and municipal borough in the New Forest parliamentary division of Hampshire, England, 7 m. N.W. of Southampton by the London & South-Western railway. Pop. (1901) 4365. It is pleasantly situated in the rich valley of the Test. The abbey church of SS. Mary and Elfleda is one of the finest examples in England of a great Norman church little altered by later builders. Its history is not clear, but a house was founded here by Edward the elder (c. 910), and became a Benedictine nunnery. The church, which is the only important relic of the foundation, is cruciform, with a low central tower. Building evidently began in the first half of the 12th century, and continued through it, as the western part of the nave shows the transition to the Early English style, which appears very finely in the west front. Decorated windows occur in the east end, beyond which a chapel in this style formerly extended. Perpendicular insertions are insignificant. The nave and choir have aisles, triforium and clerestory. The transepts have eastern apsidal chapels, as have the choir aisles, though the walls of these last are square without. Foundations of the apse of a large pre- Norman church have been discovered below the present build- ing. In Romsey there are tanyards, ironworks and works of the Berthon Boat Company. The borough is under a mayor, 4 aldermen and 12 councillors. Area, 533 acres.

Romsey (Romesyg, Romeseie) probably owed its origin, as it did its early importance, to the abbey. At the time of the Domesday Survey it was owned by the abbey, which continued to be the overlord until the dissolution. There is no evidence to show that Romsey was a borough before the charter of incorporation granted by James I. in 1608. This was con- firmed by William III. in 1692, and the corporation was reformed in 1835. Romsey has never been represented in parliament. The right to hold a fair was granted to the abbey by Henry III.

in 1271, and fairs were held on Easter Monday, on August 26 and

November 8. The market now held on Thursday, formerly on Saturday, dates from 1272. Every alternate Thursday is a great market. In medieval times Romsey had a considerable share of the woollen trade of Hampshire, but by the end of the 17th century this manufacture began to decline, and the in- troduction of machinery and the adoption of steam led to its subsequent transference to the northern coal centres. The clothing trade was replaced by the manufacture of paper, an industry which still exists.

ROMULUS, the legendary eponymous founder and first king (753-716?) of Rome, represented as the son of Mars by the Vestal Rhea Silvia or Ilia, daughter of Numitor, who had been dispossessed of the throne of Alba by his younger brother Amulius. Romulus and Remus, the twin sons of Silvia, were placed in a trough and cast into the Tiber by their granduncle. The trough grounded in the marshes where Rome afterwards stood, under the wild fig tree (ficus ruminalis), which was still holy in later days. The babes were suckled by a she-wolf and fed by a woodpecker, and then fostered by Acca Larentia, wife of the shepherd Faustulus. They became leaders of a warlike band of shepherds on the Palatine, and in course of time were recognized by their grandfather, whom they restored to his throne, slaying the usurper Amulius. They now proposed to found a city on the site where they had been nurtured; but a quarrel for precedence broke out and Remus was slain. Romulus strengthened his band by offering an ” asylum ” to outcasts and fugitives, found wives for them by capture and waged war with their kinsmen. His most formidable foe was Titus Tatius (17. v.), king of the Sabines, but after an obstinate struggle he and Romulus united their forces and reigned side by side till Tatius was slain at Lavinium in the course of a blood-feud with Laurentum. Romulus then reigned alone till he suddenly disappeared in a storm. He was thereafter worshipped as a god under the name of Quirinus, which, however, is really a Sabine form of Mars. The story of Romulus, best preserved in the first book of Livy (see also Dion. Halic. i. 75— ii. 56; Plutarch, Romulus; Cicero, de Republica, ii. 2-10), belongs throughout to legend. This was felt in later times by the Romans themselves, who gave a rationalistic explanation of the miraculous incidents. Thus, Mars was converted into a stranger disguised as the god of war, and the she-wolf into a woman of ill-fame (lupa); Romulus was not taken up into heaven, but put to death and carried away piecemeal by the patricians under their cloaks.

The whole story, probably first given by the annalists Fabius Pictor and Cincius Alimentus, contains religious and aetiological elements. The foundation of the city by twins may be ex- plained by the worship

of the Lares, who are generally represented as a pair of brothers, especially as the mother of Romulus and Remus was connected with the worship of the hearth of the state. The introduction of the wolf may be of Greek or eastern origin; it may have a totemistic significance; or may be due to the ficus ruminalis, the fig tree near the Lupercal on the Palatine, where the twins were first exposed. This tree was sacred to a goddess Rumina (ruma, ” breast,” whence the suckling incident), and the resemblance between Romulus and ruminalis led to the fig tree and the founder of the city being subsequently connected by the Roman antiquarians. The wolf would then be suggested by the proximity of the Lupercal, the grotto of Faunus Lupercus, with whom the shepherd Faustulus is identical. According to Professor Ducati of Bologna, in a paper on an old Etruscan stele, on which a she-wolf is represented suckling a child, the wolf legend is an importation from Etruria, the original home of which was Crete. Miletus, son of Apollo and a daughter of Minos, having been exposed by his mother, was suckled by she-wolves, being afterwards found and brought up by shepherds. To escape the designs of Minos, Miletus fled to Asia Minor, and founded the city called after him, where the Etruscans first became acquainted with the legend. The opening of the ” asylum ” is a Greek addition (as the name itself suggests). Down to imperial times, the Romans seem to have

been ignorant of the Greek custom of taking sanctuary; further, the idea was entirely opposed to the exclusive spirit of the ancient Italians. The story was probably invented to give an explana- tion of the sacred spot named ” Inter duos lucos ” between the arx and the Capitol. Another Greek touch is the deification of an eponymous hero. The rape of the Sabine women is clearly aetiological, invented to account for the custom of marriage by capture. Consus, at whose festival the rape took place, was a god of the earth and crops, the giver of fruitfulness in plants and animals. It is generally agreed that the capture of the Capitol by Titus Tatius may contain an historical element, pointing to an early conquest of Rome by the Sabines, of which there are some indications. Subsequently, to efface the recol lection of an event so distasteful to Roman vanity and national pride, Sabine names and customs were accounted for by a supposed union of Romans and Sabines during the regal period, the result of a friendly league concluded between Romulus and Tatius. According to E. Pais, Romulus is merely the eponym of Roma; his life is nothing but the course of the sun, and the institutions ascribed to him are the result of long historical development.

Romulus, like his double Tullus Hostilius, is regarded as the founder of the military and political (see Rome) , as Numa and his counterpart

Ancus Marcius of the religious institutions of Rome.

For a critical examination of the story, see Schwegler, Romische Geschichte, bks. viii.-x. ; Sir George Cornewall Lewis, Credibility of early Roman History, chap. II ; W. Ihne, History of Rome, i.; Sir J. Seeley, Introduction to his edition of Livy, bk. i.; E. Pais, Storia di Roma (1898), i. pt. 1, and Ancient Legends of Roman History (Eng. trans., 1906) ; also O. Gilbert, Geschichte und Topographie der Sladt Rom im Altertum (1883-1885).

RONCESVALLES (Fr. Roncevaux), a village of northern Spain, in the province of Navarre; situated on the small river Urrobi, at an altitude of 3220 ft. among the Pyrenees, and within 5 m. from the French frontier. Pop. (1900) 152. Roncesvalles is famous in history and legend for the defeat of Chajrlemagne and the death of Roland (q.v.) in 778. The small collegiate church contains several curious relics associated with Roland, and is a favourite place of pilgrimage. The battle is said to have been fought in the picturesque valley known as Val Carlos, which is now occupied by a hamlet bearing the same name, and in the adjoining defile of Ibaneta. Both of these are traversed by the main road leading north from Roncesvalles to St Jean Pied de Port, in France.

RONCONI, GIORGIO (1810-1890), Italian baritone vocalist, was born in 18 10. He learnt singing from his father Domenico, who had been a celebrated tenor in his time, and made his debut in 183 1 at Pavia. After singing in Italy for some years with ever-growing success, he appeared for the first time in England, in 1842, as Henry Ashton in Lucia di Lammermoor. His success was immediate, and he continued to be one of the most popular artists on the lyric stage until his retirement in 1866. His voice was neither extensive in compass nor fine in quality, but the genius of his acting and the strength of his personality fully atoned for his vocal defects. He was equally at home in comedy and tragedy, and the two parts by which he is best remembered, Rigoletto and Figaro, show conclusively the range of his talent. In his later years Ronconi founded a school of singing at Granada, and he also accepted the post of professor of singing at the Madrid Conservatoire. He died in 1890.

RONDA, a town of southern Spain, in the province of Malaga; on the river Guadiaro and on the Algeciras-Bobadilla railway. Pop. (1900) 20,995. Ronda is built on a high rock nearly surrounded by the Guadiaro, which flows through an abrupt chasm 530 ft. deep and 300 ft. wide, by which the old town is separated from the new. Of the three bridges, one is said to have been built by the Romans, another

by the Moors; the most modern (1761) spans the stream in a single arch at a height of about 255 ft. On the edge of the chasm is the alameda or public promenade, commanding a wide and beautiful prospect of the fertile valley or vega and the sierras beyond. The old

part of the town has a Moorish aspect, with narrow, steep and crooked lanes, and still retains some Moorish towers and other medieval buildings. The Ronda bull-ring is one of the finest in Spain, and can accommodate 10,000 spectators. Ronda has a considerable trade in leather, saddlery, horses, soap, flour, chocolate, wine and hats.

Some remains of an aqueduct and theatre, about 7 m. N. of Ronda, are supposed to represent the Acinipo or Arunda of ancient geographers. Ronda was taken from the Moors in 1485. It gives its name to the Sierra or Serrania de Ronda, one of the main sections of the coast mountains which rise between the great plain of Andalusia and the Mediterranean.

RONDEAU (Ital. Rondo), a structural form in poetry and (in the form of ” rondo “) in music. In poetry the rondeau is a short metrical structure which in its perfect form consists of thirteen eight- or ten-syllabled verses divided into three strophes of unequal length, and knit together by two rhymes and a refrain. In Clement Marot’s time the laws of the rondeau were laid down, and, according to Voiture, in the 17th century, the following was the type of the approved form of the rondeau: —

” Ma foy, c’est fait de moy, car Isabeau M’a conjure de luy faire un Rondeau: Cela me met en une peine extreme. Quoy treize vers, huit en eau, cinq en erne. Je luy ferois aussi-t6t un bateau !

En voila cinq pourtant en un monceau : Faisons en huict, en invoquant Brodeau,

En puis mettons, par quelque stratageme, Ma foy, c’est fait !

Si je pouvois encore de mon cerveau Tirer cinq vers, l’ouvrage seroit beau ;

Mais cependant, je suis dedans 1’onziSme,

Et si je croy que je fais le douzieme En voila treize ajustez au niveau.

Ma foy, c’est fait !”

All forms of the rondeau, however, are alike in this, that the distinguishing metrical emphasis is achieved by a peculiar use of the refrain. Though we have a set of rondeaux in the Rolliad (written by Dr. Lawrence the friend of Burke, according to Edmund Gosse, who has given us an admirable essay upon exotic forms of verse) , it was not till recent years that the form had any real vogue in England. Considerable attention, how- ever, has lately been given in England to the form. Some English rondeaux are as bright and graceful as Voiture’s own. Swinburne, who in his Century of Roundels was perhaps the first to make the refrain rhyme with the second verse of the first strophe, has brought the form into high poetry. In German, rondeaux have been composed with perfect correct- ness by Weckherlin, and tvith certain divergences from the French type by Gotz and FIschart; the German name for the form is rundum or ringel-gedicht.

Although the origin of the retrain in all poetry was no doubt the improvisatore’s need of a rest, a time in which to focus his forces and recover breath for future flights, the refrain has a distinct metrical value of its own; it knits the structure together, and so intensifies the emotional energy, as we see in the Border ballads, in the Oriana of Lord Tennyson, and in the Sister Helen of Rossetti. The suggestion of extreme arti- ficiality — of ” difficulty overcome ” — which is one great fault of the rondeau as a vehicle for deep emotion, does not therefore spring from the use of the refrain, but from the too frequent recurrence of the rhymes in the strophes — for which there is no metrical necessity as in the case of the Petrarchan sonnet. The rondeau is, however, an inimitable instrument of gaiety and grace in the hands of a skilful poet.

RONDEL, a form of verse closely allied to the rondeau (q.v.) but distinguished from it by containing fourteen instead of thirteen lines, and by demanding a slightly different arrange- ment of rhymes. Moreover, the initial couplet is repeated in the middle and again at the close. The arrangement of rhymes is as follows: a, b b, a; a b, a b; a, b, b, a, a, b. This form, which was invented in the 14th century, was largely used in

later medieval French poetry, but particularly by Charles d’Orleans (1301-1465), the very best of whose graceful creations are all rondels. One of the most famous of this prince’s rondels may be given here as a type of their correct construction: —

” Le temps a laissie son manteau De vent, de froidure et de pluye, Et s’est vestu de brouderie De souleil luisant, cler et beau. II n’y a beste ne oyseau Qu’en son jargon ne chante ou crie: Le temps a laissi6 son manteau De vent, de froidure et de pluye. Riviere, fontaine et ruisseau Portent, en livree jolie, Gouttes d’argent d’or faverie ; Chascun s’abille de nouveau ; Le temps a laissie son manteau De vent, de froidure et de pluye.”

The rondel, in French, may begin with either a masculine or a feminine rhyme, but its solitary other rhyme must be of the opposite kind. The rondel was introduced into English in the 15th century, but the early specimens of it are very clumsy. It was revised in the 19th century, but it appears to suit the French better than any other language. Correct examples are found in the poems of Robert Bridges, Dobson, Gosse and Henley. The following, by Austin Dobson, gives an exact impression of what an English rondel should be in all technical respects : —

” Love comes back to his vacant dwelling, — The old, old Love that we knew of yore ! We see him stand by the open door, With his great eyes sad, and his bosom swelling. He makes as though in our arms repelling He fain would lie as he lay before ; — Love comes back to his vacant dwelling, — The old, old Love that we knew of yore ! Ah ! who shall help us from over-spelling That sweet, forgotten, forbidden lore ? E’en as we doubt, in our hearts once more, With a rush of tears to our eyelids welling, Love comes back to his vacant dwelling, The old, old Love that we knew of yore !”

Theodore de Banville remarks that the art of the rondel consists in the gay and natural reintroduction of the refrain, which should always seem inevitable, while slightly changing the point of view of the reader. If this is not successfully achieved, “on ne fera que de la marqueterie et du placage, c’est-a-dire, en fait de poesie, — rien ! ” In Germany, the rondel was intro- duced, in the 18th century, under the name of ringel-gedicht, by Johann Nikolaus Gotz (1731-1781), and was occasionally used, in the course of the 19th century, by German poets.

RONDO, a musical form originally derived from the rondel in verse; as may be seen, long before the development of in- strumental forms, in some of the chansons of Orlando di Lasso. The rondeau en couplets of Couperin and his contemporaries shows both in name and form the same connexion with verse. It consists of the alternation between a single neatly rounded phrase and several slightly contrasted episodes (the couplets) without any important change of key. Bach enriched it

with his wealth of epigram, but did not expand its range.

The later sense of the term covers an important series of the sonata forms (q.v.), chiefly found in finales; but rondo-form sometimes occurs in slow movements (e.g. Mozart, Haffner Serenade, String Quintet in E flat; Beethoven, Fourth Symphony; Quartet, Op. 74, &c). The single-phrase ritornello and short couplets of the old form are in the sonata style replaced by a broadly designed melody and well-contrasted episodes in different keys.

If the form of a Bach or Couperin rondo may be represented by A B AC A D A, &c, the various forms of the later rondo may be represented somewhat as follows: placing on a horizontal line those parts that are in the main key, and representing other keys by differences of level: —

(i) Sectional rondos; i.e. with little or no development or

transition between episode and main theme; very character- istic of Haydn, who, however, often gives it more organization

B than appears on the surface — AAA coda; very rarely

C with no change of key except between tonic major and minor, as in Haydn's famous Gipsy Rondo. Frequently the episodes are increased in number or made to recur. Beethoven most clearly shows the influence of Haydn in his frequent use of modifications of this type of rondo in his earlier works, e.g. finales of Sonatas, Op. 10, No. 3, Op. 14, Nos. 1 and 2. He also applied it very successfully to his early slow movements, as in the Sonatas, Op. 2, No. 2, and Op. 13 (Pathetique). The sectional rondo was modernized on a gigantic scale by Brahms in the finale of his G minor Pianoforte Quartet, Op. 25; and Schumann's favourite art-forms are various compounds between it and the cognate idea of the dance-tune with one or more " trios," as in the Novellettes, the Arabeske, and the Romance in B major.

(ii) Rondos influenced by the form of a first movement (for which see Sonata Forms). The normal scheme for this, which

B

is Mozart's favourite rondo-form, is A

ABA coda,

and it is easy to see how it may be applied to sectional rondos, as in the finale of Beethoven's Sonata, Op. 13. But it normally implies longer and weightier themes and a higher degree of organization. If the second episode © is transformed into an elaborate development of previous material in various keys, the resemblance to first-movement form is increased; the only external difference being the recurrence of A in full after the first episode B (which is treated exactly like the' " second subject " of a first movement). As, however, many first movements that do not repeat their exposition (corresponding to A + B in the above rondo-scheme) make a feint of so doing before beginning the development, it is obvious that the blend- ing of rondo and first-movement form may become very, com- plete. In fact, the true criterion of a rondo is, as with all real art-forms, a matter of style rather than of external shape. The well rounded-off, self-repeating, tune-like character of the main theme, and a sense of pleasure and importance in the mere fact of its return (without absolute necessity for dramatic effect) are the distinctive evidences of rondo form and style. This rule is well proved by the case most frequently cited as an exception, the rondo of Beethoven's Sonata in D, Op. 10, No. 3; for nothing can be more significant than the way in which its fragmentary opening figure is built up into a self-contained musical epigram and ended with a full close, as contrasted with the way in which the most tuneful of first-movement beginnings (e.g. Beethoven's Quartet in F major, Op. 59, No. 1, Trio in B flat, Op. 97; Brahms's String Quintet in F major, Op. 88) expand gradually into their further course.

The following are some of the more important of many modifica- tions and applications of this form : —

(a) Omission of return of main theme before recapitulation of B episode — A A development ,»n various keys, B A coda — as in Beethoven's G major Concerto, where, however, much happens between the recapitulation of B and the following return of A, and the coda is nearly as long as all that has gone before. B

(ft) A A B (A) like a first movement without a development. Here A will be very large and the transition to B important, while B will consist of a considerable number of themes. See the finales of Mozart's E flat String Quartet and C major Quintet, most of his greater slow movements, and many of Beethoven's.

In concertos the only modifying influence the balance between solo and orchestra shows in rondo-form is in the tendency to give the

orchestra a large number of subsidiary themes at the outset, which perhaps do not reappear until the coda, where, with the aid of the solo, they can round off the design very effectively. Mozart's use of this device is not confined to concertos. (D. F. T.)

RONSARD, PIERRE DE (1524-1585), French poet and " prince of poets " (as his own generation in France called him), was born at the Chateau de la Poissonniere, near the village of

Couture in the province of Vend6mois (department of Loir-et- Cher), on the nth of September 1524. His family are said to have come from the Slav provinces to the south of the Danube (provinces with which the crusades had given France much intercourse) in the first half of the 14th century. Baudouin de Ronsard or Rossart was the founder of the French branch of the house, and made his mark in the early stages of the Hundred Years' War. The poet's father was named Loys, and his mother was Jeanne de Chaudrier, of a family not only noble in itself but well connected. Pierre was the youngest son. Loys de Ronsard was maltre d' hotel du roi to Francis I., whose captivity after Pavia had just been softened by treaty, and he had to quit his home shortly after Pierre's birth. The future Prince of Poets was educated at home for some years and sent to the College de Navarre at Paris when he was nine years old. It is said that the rough life of a medieval school did not suit him. He had, however, no long experience of it, being quickly appointed page, first to the king's eldest son Francois, and then to his brother the duke of Orleans. When Madeleine of France was married to James V. of Scotland, Ronsard was attached to the king's service, and he spent three years in Great Britain. The latter part of this time seems to have been passed in England, though he had, strictly speaking, no business there. On returning to France in 1540 he was again taken into the service of the duke of Orleans. In this service he had other opportunities of travel, being sent to Flanders and again to Scotland. After a time a more important employment fell to his lot, and he was attached as secretary to the suite of Lazare de Baiif, the father of his future colleague in the Pleiade and his companion on this occasion, Antoine de Baif, at the diet of Spires. Afterwards he was attached in the same way to the suite of the cardinal du Bellay-Langey, and his mythical quarrel with Rabelais dates mythically from this period. His apparently promising diplo- matic career was, however, cut short by an attack of deafness which no physician could cure, and he determined to devote himself to study. The institution which he chose for the pur- pose among the numerous schools and colleges of Paris was the College Coqueret, the principal of which was Daurat — afterwards the " dark star " (as he has been called from his silence in French) of the Pleiade, and already an acquaintance of Ron-

sard's from his having held the office of tutor in the Baif house- hold. Antoine de Baif, Daurat 's pupil, accompanied Ronsard; Belleau shortly followed; Joachim du Bellay, the second of the seven, joined not much later. Muretus (Jean Antoine de Muret), a great scholar and by means of his Latin plays a great influence in the creation of French tragedy, was also a student here.

Ronsard's period of study occupied seven years, and the first manifesto of the new literary movement, which was to apply to the vernacular the principles of criticism and scholarship learnt from the classics, came not from him but from Du Bellay. The Defense et illustration de la langue francaise of the latter appeared in 1549, and the Pleiade (or Brigade, as it was first called) may be said to have been then launched. It consisted, as its name implies, of seven writers whose names are some- times differently enumerated, though the orthodox canon is beyond doubt composed of Ronsard, Du Bellay, Baif, Belleau, Pontus de Tyard (a man of rank and position who had exempli- fied the principles of the friends earlier), Jodelle the dramatist, and Daurat. Ronsard's own work came a little later, and a rather idle story is told of a trick of Du Bellay 's which at last determined him to publish. Some single and minor pieces, an epithalamium on Antoine de Bourbon and Jeanne de Navarre (1550), a " Hymne de la France " (1549), an " Ode a la Paix," preceded the publication in 1550 of the four first books (" first " is characteristic and noteworthy) of the Odes of Pierre de Ronsard. This was followed in 1552 by the publication of his Amours de Cassandre with the fifth book of Odes. These books excited a violent literary quarrel. Marot was dead, but he left a numerous school, some of whom saw in the stricter literary critique of the Pleiade, in its outspoken contempt of merely vernacular and medieval forms, in its strenuous advice

to French poetry to " follow the ancients," and so forth, an insult to the author of the Adolescence Clementine and his followers. The French court, and indeed all French society, was just then much interested in literary questions, and a curious story is told of the rivalry that ensued. Mellin de Saint Gelais, it is said, the chief of the " Ecole Marotique " and a poet of no small merit, took up Ronsard's book and read part of it in a more or less designedly burlesque fashion before the king. It may be observed that if he did so it was a dis tinctly rash and uncourtier-like act, inasmuch as, from Ron- sard's father's position in the royal household, the poet was personally known and

liked both by Henry and by his family. At any rate, Marguerite de Valois, the king's sister, after- wards duchess of Savoy, is said to have snatched the book from Saint-Gelais and insisted on reading it herself, with the result of general applause. Henceforward, if not before, his acceptance as a poet was not doubtful, and indeed the tradition of his having to fight his way against cabals is almost entirely unsupported. His popularity in his own time was overwhelm- ing and immediate, and his prosperity was unbroken. He published his Hymns, dedicated to Marguerite de Savoie, in 1555; the conclusion of the Amours, addressed to another heroine, in 1556; and then a collection of CEuvres completes, said to be due to the invitation of Mary Stuart, queen of Francis II., in 1560; with Elegies, mascarades et bergeries in 1565. To this same year belongs his most important and interesting AbregS de I'art poetique franqais.

The rapid change of sovereigns did Ronsard no harm. Charles IX., who succeeded his brother after a very short time, was even better inclined to him than Henry and Francis. He gave him rooms in the palace; he bestowed upon him divers abbacies and priories; and he called him and regarded him constantly as his master in poetry. Neither was Charles IX. a bad poet. This royal patronage, however, had its disagree- able side. It excited violent dislike to Ronsard on the part of the Huguenots, who wrote constant pasquinades against him, strove (by a ridiculous exaggeration of the Dionysiac festival at Arcueil, in which the friends had indulged to celebrate the success of the first French tragedy, Jodelle's CUopatre) to repre- sent him as a libertine and an atheist, and (which seems to have annoyed him more than anything else) set up his follower Du Bartas as his rival. According to some words of his own, which are quite credible considering the ways of the time, they were not contented with this variety of argument, but attempted to have him assassinated. During this period Ronsard's work was considerable but mostly occasional, and the one work of magnitude upon which Charles put him, the Franciade (1572), has never been ranked, even by his most devoted admirers, as a chief title to fame. The metre (the decasyllable) which the king chose could not but contrast unfavourably with the magnificent alexandrines which Du Bartas and Agrippa d'Aubigne were shortly to produce; the general plan is feebly classical, and the very language has little or nothing of that racy mixture of scholarliness and love of natural beauty which distinguishes the best work of the Pleiade. The poem could never have had an abiding success, but at its appearance it had the singular bad luck almost to coincide with the massacre of St Bartholomew, which had occurred about a fortnight before its publication. One party in the state were certain to look coldly on the work of a minion of the court

at such a juncture, the other had something else to think of. The death of Charles made, indeed, little difference in the court favour which Ron- sard enjoyed, but, combined with his increasing infirmities, it seems to have determined him to quit court life. During his last days he lived chiefly at a house which he possessed in Vendome, the capital of his native province, at his abbey at Croix- Val in the same neighbourhood, or else at Paris, where he was usually the guest of Jean Galland, well known as a scholar, at the College de Boncourt. It seems also that he had a town house of his own in the Faubourg Saint-Marcel. At any rate his preferments made him in perfectly easy circumstances, and he seems neither to have derived nor wished for any profit

from his books. A half-jocular suggestion that his publishei should give him money to buy ” du bois pour se chauffer ” in return for his last revision of his CEuvres completes is the only trace of any desire of the kind. On the other hand, he received not merely gifts and endowments from his own sovereign bur. presents from many others, including Elizabeth of England. Mary, queen of Scots, who had known him earlier, addressed him from her prison; and Tasso consulted him on the Gerusalemme. His last years were, however, saddened not merely by the death of many of his most intimate friends, but by constant and increasing ill-health. This did not interfere with his literary work in point of quality, for he was rarely idle, and some of his latest work is among his best. But he indulged (what few poets have wisely indulged) the temptation of constantly altering his work, and many of his later alterations are by no means for the better. Towards the end of 1585 his con- dition of health grew worse and worse, and he seems to have moved restlessly from one of his houses to another for some months. When the end came, which, though in great pain, he met in a resolute and religious manner, he was at his priory of Saint-Cosme at Tours, and he was buried in the church of that name on Friday, December 27.

The character and fortunes of Ronsard’s works are among the most remarkable in literary history, and supply in themselves a kind of illustration of the progress of French literature during the last three centuries. It was long his fortune to be almost always extravagantly admired or violently attacked. At first, as . has been said, the enmity, not altogether unprovoked, of the friends and followers of Marot fell to his lot, then the still fiercer antagonism of the Huguenot faction, who, happening to possess a poet of great merit in Du Bartas, were able to attack Ronsard in his tenderest point. But fate had by no means done its worst with him in his lifetime. After his death the classical reaction set in under the auspices of Malherbe, who seems to

have been animated with a sort of personal hatred of Ronsard, though it is not clear that they ever met. After Malherbe the rising glory of Corneille and his con- temporaries obscured the tentative and unequal work of the P16iade, which was, moreover, directly attacked by Boileau himself, the dictator of French criticism in the last half of the 17th century. Then Ronsard was, except by a few men of taste, like La Bruyere and Fehelon, forgotten when he was not sneered at. In this con- dition he remained during the whole 1 8th century and the first quarter of the 19th. The Romantic revival, seeing in him a victim of its special bete noire Boileau, and attracted by his splendid diction, rich metrical faculty, and combination of classical and medieval peculiarities, adopted his name as a kind of battle-cry, and for the moment exaggerated his merits somewhat. The critical work, however, first of Sainte-Beuve in his Tableau de la litterature francaise au i6eme siecle, and since of others, has established Ronsard pretty securely in his right place, a place which may be defined in a few sentences.

For the general position of the Pleiade, see French Literature. Ronsard, its acknowledged chief and its most voluminous poet, was probably also its best, though a few isolated pieces of Belleau excel him in airy lightness of touch. Several sonnets of Du Bellay exhibit what may be called the intense and voluptuous melancholy of the Renaissance more perfectly than anything of his, and the finest passages of the Tragiques and the Divine Sepmaine surpass his work in command of the alexandrine and in power of turning it to the purposes of satirical invective and descriptive narration. But that work is, as has been said, very extensive (we possess at a rough guess not much short of a hundred thousand lines of his), . and it is extraordinarily varied in form. He did not introduce the sonnet into France, but he practised it very soon after its introduc- tion and with admirable skill — the famous ” Quand vous serez bien vieille ” being one of the acknowledged gems of French literature. His odes, which are very numerous, are also very interesting and in their best shape very perfect compositions. He began by imitating the strophic arrangement of the ancients, but very soon had the wisdom to desert this for a kind of adj ustment of the Horatian ode to rhyme, instead of exact quantitative metre. In this latter kind he devised some exquisitely melodious rhythms of which, till our own day, the secret died with the 17th century. His more sustained work sometimes displays a bad selection of measure; and his occasional poetry — epistles, eclogues, elegies, &c. — is injured by its vast volume. But the preface to the Franciade is a very fine piece of verse, far superior (it is in alexandrines) to the poem itself. Generally speaking, Ronsard is best

in his amatory verse (the long series of sonnets and odes to Cassandre, Marie, GenSvre, H616ne — H6l4ne de Surgeres, a later and mainly ” literary ” love — &c), and in his descriptions of the country (the famous ” Mignonne allons voir si la rose,” the ” Fontaine Bellerie,” the ” Foret de Gastine,” and so forth), which have an extraordinary grace and freshness. No one used with more art than he the graceful diminutives which

his school set in fashion. He knew well too how to manage the gorgeous adjectives (” marbrine,” ” cinabrine,” ” ivoirine ” and the like) which were another fancy of the P16iade, and in his hands they rarely become stiff or cumbrous. In short, Ronsard shows eminently the two great attractions of French 16th-century poetry as compared with that of the two following ages — magnificence of language and imagery and graceful variety of metre.

Bibliography. — The chief separately published works of Ronsard are noted above. He produced, however, during his life a vast number of separate publications, some of them mere pamphlets or broadsheets, which from time to time he collected, often striking out others at the same time, in the successive editions of his works. Of these he himself published seven — the first in 1560, the last in 1584. Between his death and the year 1630 ten more complete editions were published, the most famous of which is the folio of 1609. A copy of this presented by Sainte-Beuve to Victor Hugo, and later in the possession of M. Maxime du Camp, has a place of its own in French literary history. The work of C. Binet in 1586, Discours de la vie de Pierre de Ronsard, is very important for early information, and the author seems to have revised some of Ronsard’s work under the poet’s own direction. From 1630 Ronsard was not again reprinted for more than two centuries. Just before the close of the second, however, Sainte-Beuve printed a selection of his poems to accompany the above-mentioned Tableau (1828). There are also selections by M. Noel (in the Collection Didot) and Becq de FouquieSres. In 1857 M. Prosper Blanchemain, who had previously published a volume of CEuvres inedites de Ronsard, undertook a complete edition for the Bibliotheque Elzevirienne. The eighth and last volume of this appeared ten years later. It is practically complete; a few pieces of a somewhat free character which are ascribed with some certainty to the poet are, however, excluded. A later and better edition still is that of Marty-Laveaux (1887-1893), and another that of B. Pifteau (1891).

As for criticism, Sainte-Beuve followed up his early work by articles in the Causeries du lundi, and the chief later critics have dealt with him in their collected works. Of books may be mentioned those of E. Gandar (Metz, 1 854) , which considers him chiefly in his relation to the ancients, Ronsard, imitateur d'Hotnere et de Pindare; the marquis de Rocham- beau, La Famille de Ronsard (1868) ; G. Scheffler, Ronsard et sa riforme litteraire (1874); G. Bizos, Ronsard (1891); the Abb6 Froger, Les Premieres poesies de Ronsard (1892); L. Mellerio, Lexique de Ron- sard (1895); P. Perdrizet, Ronsard et la reforme (1902), with a still more recent series of articles in different publications by M. Paul Lemonnier. In English Mr A. Tilley's Literature of the French Renaissance (1904) may be consulted, and on Ronsard's critical standpoint Saintsbury's History of Criticism, vol. ii. (G. Sa.)

RONSDORF, • a town of , Germany, in the Prussian Rhine province, situated on the Morsbach, a small affluent of the Rhine, 18 m. E. of Diisseldorf and 5 m. S. of Elberf eld-Barmen by rail. Pop. (1905) 14,005. It is the seat of iron, steel and copper industries, besides carrying on extensive manufactures of ribbons, trimmings and silk goods generally. It has also breweries, distilleries and electrical works.

Founded in 1737 by the followers of Elias Eller, a religious enthusiast, Ronsdorf received civic rights in 1745. The Rons- dorf sect, the members of which called themselves Zionites, is now extinct.

RONTGEN, DAVID, sometimes called David de Ltjnevixle (1743-1807), German cabinet-maker, eldest son of Abraham Rontgen, was born at Herrenhag. In 1753 his father migrated to the Moravian settlement at Neuwied, near Coblenz, where he established a furniture factory. He learned his trade in his father's workshop, and succeeded to the paternal business in 1772, when he entered into some kind of partnership with the clock-maker Kintzing. At that time the name of the firm appears already to have been well known, at all events in France; but it is a curious circumstance that although he is always reckoned as one of the little band of foreign cabinet- makers and workers in marquetry who, like Oeben and Riesener, achieved distinction in France during the superb floraison of the Louis Seize style, he never ceased to live at Neuwied, where apparently the whole of his furniture was made, and merely had a shop, or show-room, in Paris. We have, as it happens, a record of his first appearance there. The engraver Wille enters in his journal of August 30, 1774, that " M. Rontgen, celebre ebeniste, etabli a. Nieuwied, pres de Coblenz, m'est venu voir, en m'apportant une lettre de recommandation de M. Zick, peintre a. CoDlenz . . . Comme M. Rontgen con- naissait personne a Paris, je lui fus utile en lui enseignant quelques sculpteurs et

dessinateurs dont il avait besoin.”

Rontgen was first and foremost an astute man of business and it is not improbable that the moving cause of this opening up of relations with Paris was the accession to the throne of Marie Antoinette, whose Teutonic sympathies were only too well known. Before very long she appointed him her tbeniste- mechanicien. He appears, indeed, to have acquired con- siderable favour with the queen, for on several occasions she took advantage of his journeys through Europe to charge him with the delivery of presents and of dolls dressed in the Paris fashions of the moment — they were intended to serve as patterns for the dressmakers — to her mother and her sisters. He appears at once to have opened a shop in Paris, but despite, and perhaps because of, the favour in which he was held at court, all was not plain sailing. The powerful trade corporation of the maUres-ebenistes disputed his right to sell in Paris furniture of foreign manufacture, and in 1780 he found that the most satisfactory way out of the difficulty was to get himself admitted a member of the corporation to which all his great rivals belonged. By this time he had attracted a good deal of attention by the introduction of a new style of marquetry, in which light and shade, instead of being represented as hitherto by burning, smoking or engraving the materials, were indicated by small pieces of wood so arranged as to create the impression of pietra dura. We have seen that Rontgen had been appointed ebeniste-mechanicien to Marie Antoinette, and the appoint- ment is explained by his fondness for and proficiency in con- structing furniture in which mechanical devices played a great part. The English cabinet-makers of the later eighteenth century often made what was called, with obvious allusion to its character, ” harlequin furniture,” especially little dressing- tables and washstands which converted into something else or held their essentials in concealment until a spring was touched. David was a past master in this kind of work, and unquestion- ably much of the otherwise inexplicable reputation he enjoyed among contemporaries who were head and shoulders above him is explained by his mechanical genius. The extent of his fame in this direction is sufficiently indicated by the fact that Goethe mentions him in Wilhelm Meister. He compares the box inhabited by the fairy during her travels with her mortal lover to one of Rontgen’s desks, in which ” at a pull a multitude of springs and latches are set in motion.” For a desk of this kind Louis XVI. paid him 80,000 livres. Outwardly it was in the form of a commode, its marquetry panels symbolizing the liberal arts. A personification of sculpture was in the act of engraving the name of Marie Antoinette upon a column to which Minerva was hanging her portrait. Above a riot of architectural orders was a

musical clock (the work of the partner Kintzing), surmounted by a cupola representing Par- nassus. The interior of this monumental effort, n ft. high, was a marvel of mechanical precision; it disappeared during the First Empire. Rontgen did not confine his activities to Paris, or even to France. It has been said that he travelled about Europe accompanied by furniture vans, and undoubtedly his aptitude as a commercial traveller was remarkable. He had shops in Berlin and St Petersburg, and himself apparently twice went to Russia. On one of these visits he sold to the Empress Catherine furniture to the value of 20,000 roubles, to which she added a personal present of 5000 roubles and a gold snuff-box — in recognition, it would seem, of his readiness and ingenuity in surmounting a secretaire with a clock indicating the date of the Russian naval victory over the Turks at Cheshme, news of which had arrived on the previous evening. This suite of furniture is believed still to be in the Palace of the Hermitage, the hiding-place of so much remarkable and forgotten art. To the protection of the queen of France and the empress of Russia David added that of the king of Prussia, Frederick William IL, who in 1792 made him a Commerzienrath and commercial agent for the Lower Rhine district. The French Revolution and the Napoleonic Wars which so speedily followed, eclipsed Rontgen's star as they eclipsed those of so many other great cabinet-makers of the period. In 1793 the Revolutionary government, regarding him as an emigre, seized the contents

of his show-rooms and his personal belongings, and after that date he appears neither to have done business in Paris nor to have visited it. Five years later the invasion of Neuwied led to the closing of his workshops; prosperity never returned, and he died half ruined at Wiesbaden on the 12 th of February 1807.

Rontgen was not a great cabinet-maker. His forms were often clumsy, ungraceful and commonplace; his furniture lacked the art- istry of the French and the English cabinet-makers of the great period which came to an end about 1790. His bronzes were poor in design and coarse in execution — his work, in short, is tainted by com- mercialism. As a marqueteur, however, he holds a position of high distinction. His marquetry is bolder and more vigorous than that of Riesener, who in other respects soared far above him. As an adroit deviser of mechanism he fully earned a reputation which former generations rated more highly than the modern critic, with his facilities for comparison, is prepared to accept. On the mechanical side he

produced, with the help of Kintzing, many long-cased and other clocks with ingenious indicating and register- ing apparatus. Rontgen delighted in architectural forms, and his marquetry more often than not represents those scenes from classical mythology which were the dear delight of the 18th century. He is well represented at South Kensington.

RONTGEN, WILHELM KONRAD (1845-), German physicist, was born at Lennep on the 27th of March 1845. He received his early education in Holland, and then went to study at Zurich, where he took his doctor's degree in 1869. He then became assistant to Kundt at Wurzburg and after- wards at Strassburg, becoming privat-docent at the latter uni- versity in 1874. Next year he was appointed professor of mathematics and physics at the Agricultural Academy of Hohenheim, and in 1876 he returned to Strassburg as extra- ordinary professor. In 1879 ne was chosen ordinary professor of physics and director of the Physical Institute at Giessen, whence in 1885 he removed in the same capacity to Wurzburg. It was at the latter place that he made the discovery for which his name is chiefly known, the Rontgen rays. In 1895, while experimenting with a highly exhausted vacuum tube on the conduction of electricity through gases, he noticed that a paper screen covered with barium platinocyanide, which happened to be lying near, became fluorescent under the action of some radiation emitted from the tube, which at the time was enclosed in a box of black cardboard. Further investigation showed that this radiation had the power of passing through various substances which are opaque to ordinary light, and also of affecting a photographic plate. Its behaviour being curious in several respects, particularly in regard to reflection and refraction, doubt arose in his mind whether it was to be looked upon as light or not, and he was led to put forward the hypo- thesis that it was due to longitudinal vibrations in the ether, not to transverse ones like ordinary light; but in view of the uncertainty existing as to its nature, he called it X-rays. For this discovery he received the Rumford medal of the Royal Society in 1896, jointly with Philip Leriard, who had already shown, as also had Hertz, that a portion of the cathode rays could pass through a thin film of a metal such as aluminium. Rontgen also conducted researches in various other branches of physics, including elasticity, capillarity, the conduction of heat in crystals, the absorption of heat-rays by different gases, piezo-electricity, the electromagnetic rotation of polarized light, &c.

RONTGEN RAYS, W. K. Rontgen discovered in 1895 (Wied. Ann. 64, p. 1) that when the electric discharge passes through a tube exhausted so that the glass of the tube is brightly phosphorescent,

phosphorescent substances such as potassium platinocyanide became luminous when brought near to the tube. He found that if a thick piece of metal, a coin for example, were placed between the tube and a plate covered with the phosphorescent substance a sharp shadow of the metal was cast upon the plate; pieces of wood or thin plates of aluminium cast, however, only partial shadows, thus showing that the agent which produced the phosphorescence could traverse with considerable freedom bodies opaque to ordinary light. He found that as a general rule the greater the density of the substance the greater its opacity to this agent. Thus while this effect could pass through the flesh

it was stopped by the bones, so that if the hand were held between the discharge tube and a phosphorescent screen the outline of the bones was distinctly visible as a shadow cast upon the screen, or if a purse containing coins were placed between the tube and the screen the purse itself cast but little shadow while the coins cast a very dark one. Rontgen showed that the cause of the phosphorescence, now called Rontgen rays, is propagated in straight lines starting from places where the cathode rays strike against a solid obstacle, and the direction of propagation is not bent when the rays pass from one medium to another, i.e. there is no refraction of the rays. These rays, unlike cathode rays or Canalslrahlen, are not deflected by magnetic force; Rontgen could not detect any deflection with the strongest magnets at his disposal, and later experiments made with stronger magnetic fields have failed to reveal any effect of the magnet on the rays. The rays affect a photographic plate as well as a phosphorescent screen, and shadow photographs can be readily taken. The time of ex- posure required depends upon the intensity of the rays, and this depends upon the state of the tube, and the electric current going through it, as well as upon the substances traversed by the rays on their journey to the photographic plate. In some cases an exposure of a few seconds is sufficient, in others hours may be required. The rays coming from different discharge tubes have very different powers of penetration. If the pressure in the tube is fairly high, so that the potential difference between its electrodes is small, and the velocity of the cathode rays in consequence small, the Rontgen rays coming from the tube will be very easily absorbed; such rays are called ” soft rays.” If the exhaustion of the tube is carried further, so that there is a consid arable increase in the potential differences between the cathode and the anode in the tube and therefore in the velocity of the cathode rays, the Rontgen rays have much greater penetrating power and aie called ” hard rays.” With a highly exhausted tube and a powerful induction coil it is possible to get appreciable effects from rays which have

passed through sheets of brass or iron several millimetres thick. The penetrating power of the rays thus varies with the pressure in the tube ; as this pressure gradually diminishes when the dis- charge is kept running through the tube, the type of Rontgen ray coming from the tube is continually changing. The lower- ing of pressure due to the current through the tube finally leads to such a high degree of exhaustion that the discharge has great difficulty in passing, and the emission of the rays becomes very irregular. Heating the walls of the tube causes some gas to come off the sides, and by thus increasing the pressure creates a temporary improvement. A thin-walled platinum tube is sometimes fused on to the discharge tube to remedy this defect; red-hot platinum allows hydrogen to pass through it, so that if the platinum tube is heated, hydrogen from the flame will pass into the discharge tube and increase the pressure. In this way hydrogen may be introduced into the tube when the pressure gets too low. When liquid air is available the pressure in the tube may be kept constant by fusing on to the discharge tube a tube containing charcoal; this dips into a vessel containing liquid air, and the charcoal is saturated with air at the pressure which it is desired to maintain in the tube. Not only do bulbs emit different types of rays at different times, but the same bulb emits at the same time rays of different kinds. The property by which it is most convenient to identify a ray is the absorption it suffers when it passes through a given thicknecs of aluminium or tin-foil. Experiments made by McClelland and Sir J. J. Thomson on the absorption of the rays produced by sheets of tin-foil showed that the absorption by the first sheets of tin-foil traversed by the rays was much greater than that by the same number of sheets when the rays had already passed through several sheets of the foil. The effect is just what would occur if some of the rays were much more readily absorbed by the tin-foil than others, for the first few layers would stop all the easily absorbable rays while the ones left would be those that were but little absorbed by tin-foil.

The fact that the rays when they pass through a gas ionize it and make it a conductor of electricity furnishes the best means of measuring their intensity, as the measurement of the amount of conductivity they produce in a gas is both more accurate and more convenient than measurements of photographic or phosphorescent effects. Rontgen rays when they pass through matter produce — as Perrin (Comptes renins, 124, p. 455), Sagnac (Jour, de Phys., 1899, (3), 8, and J. Townsend (Proc. Camb. Phil. Soc, 1899, 10, p. 217, have shown —

secondary Rontgen rays as well as cathodic rays. A very complete investigation of this subject has been made by Barkla and Sadler (Barkla, Phil. Mag., June 1906, pp. 812-828; Barkla and Sadler, Phil. Mag., October 1908, pp. 550-584; Sadler, Phil. Mag., July 1909, p. 107; Sadler, Phil. Mag., March 1910, p. 337). They have shown that the secondary Rontgen rays are of two kinds: one kind is of the same type as the primary incident ray and may be regarded as scattered primary rays, the other kind depends only on the matter struck by the rays — their quality is independent of that of the incident ray. When the atomic weight of the element exposed to the primary rays was less than that of calcium, Barkla and Sadler could only detect the first type of ray, i.e. the second- ary radiation consisted entirely of scattered primary radiation; elements with atomic weights greater than that of calcium gave out, in addition to the scattered primary radiation, Rontgen rays characteristic of the element and independent of the quality of the primary rays. The higher the atomic weight of the metal the more penetrating are the characteristic rays it gives out. This is shown in the table, which gives for the different elements the reciprocal of the distance, measured in centimetres, through which the rays from the element can pass through aluminium before their energy sinks to 1/2-7 of the value it had when entering the aluminium; this quantity is denoted in the table by X.

Element. Atomic weight. X.

Chromium 52 367

Iron 55-9 239

Cobalt 59-0 I93-2

Nickel 58-7? (61-3) 159-5

Copper 63-6 128-9

Zinc 65-4 106-3

Arsenic 750 60-7

Selenium 79-2 51-0

Strontium 87-6 35-2

Molybdenum …. 96-0 12-7

Rhodium ‘. 103-0 8-44

Silver 107-9 6- 75

Tin 119-0 4-33

The radiation from chromium cannot pass through more than a few centimetres of air without being absorbed, while that from tin is as penetrating as that given out by a fairly efficient Rontgen tube. Barkla and Sadler found that the radiation characteristic of the metal is not excited unless the primary radiation is more penetrating than the characteristic radiation. Thus the characteristic radiation from silver can excite the characteristic radiation from iron, but the characteristic radiation from iron cannot excite that from silver. We may compare this result with Stokes's rule for phosphorescence, that the phosphorescent light is of longer wave-length than the light which excites it.

The discovery that each element gives out a characteristic radia- tion (or, as still more recent work indicates, a line spectrum of char- acteristic radiation) is one of the utmost importance. It gives us, for example, the means of getting homogeneous Rontgen radiation of a perfectly definite type : it is also of fundamental importance in connexion with any theory of the Rontgen rays. We have seen that there is no evidence ol refraction of the Rontgen rays; it would be interesting to try if this were the case when the rays passing through the refracting substance are those characteristic of the substance.

Secondary Cathodic Rays. — The incidence of Rontgen rays on matter causes the matter to emit cathodic rays. The velocity of these rays is independent of the intensity of the primary Rontgen rays, but depends upon the "hardness" of the rays; it seems also to be independent of the nature of the matter exposed to the primary rays. The velocity of the cathodic rays increases as the hardness of the primary Rontgen rays increases. Innes (Proc. Roy. Soc. 79, p. 442) measured the velocity of the cathodic radiation excited by the rays from Rontgen tubes, and found velocities varying from 6- 2 X io 9 cm./sec. to 8-3 X io 9 cm. / sec. according to the hardness of the rays given out by the tube. The cathodic rays given out under the action of the homogeneous secondary Rontgen radiation characteristic of the different elements have been studied by Sadler (Phil. Mag., March 1910) and Beatty (Phil. Mag., August 1910). The following table giving the properties of the cathode rays excited by the radiation from various elements is taken from Beatty's paper; h is the thickness of air at atmospheric pressure and

temperature required to absorb one-half of the energy of the cathode

particles, h is the corresponding quantity for hydrogen. Radiator. k h

Iron -00804 -0410

Copper -0135 -0733

Zinc -0164 -0909

Arsenic • 02 55

Tin -1672 1-37

The properties of the cathode rays excited by the radiation from tin correspond very closely with those produced in a discharge tube when the potential difference between the anode and cathode is about 30,000 volts. When Rontgen rays pass through a thin plate the cathodic radiation on the side the rays emerge is more intense than on the side they enter. Kaye (Phil. Trans. 209, p. 123) has shown that when cathode rays fall upon a metal two kinds of Rontgen rays are excited, one being the characteristic radiation of the metal and the other a kind independent of the nature of the metal and dependent only upon the velocity of the cathode rays. The faster the cathode rays the harder the Rontgen rays they pro- duce. It would be interesting to see if there is any connexion between the velocity of the cathode rays required to excite Rontgen rays as hard as those given out say by tin and the velocity of the cathode rays which the radiation from tin produces when it falls upon any metal. Sadler has shown that metals can give off cathodic radiation even when the incident Rontgen rays are too soft to excite the characteristic Rontgen radiation of the metal, but that there is a large increase in the cathodic radiation as soon as the characteristic Rontgen radiation is excited. It is possible that the shock produced by the emission of these cathode particles starts the vibrations which give rise to the characteristic rays; the cathode particles emitted when the incident rays are too soft to excite the characteristic radiation coming from a different source from those tapped by the hard rays.

Absorption of Rontgen Rays. — The wide variations in the penetrating power of Rontgen rays from different sources is shown by the above table of the penetrating power of the characteristic rays of the different elements. Many experi- ments have been made on the penetration of the same rays for different substances. It is a rule to which there is no well- established exception that the greater the density of the sub- stance the greater is its power of absorbing the rays. The connexion, however, between the absorption and the density of the substance is not in general a simple one, though there is evidence that for exceedingly hard rays the absorption is pro- portional to the density.

The power of any material to absorb rays is usually measured by a coefficient X, the definition of which is that a plate l/X centimetres thick reduces the energy of the rays when they pass through it normally to l/e of their original value, where e is the base of the Napierian logarithms and equal to 2-7128. It has been shown that however the physical state of a substance may alter, — if, for example, it changes from the liquid to the gaseous, — X/D, where D is

the density of the substance, remains constant. It has also been shown that if we have a mass M made up of masses Mi, M2, M3, . . . of substances having coefficients of absorption Xi, X 2 , X3, ... and densities Di, D 2 , D 3 , . . . then if X/D for the mixture is given by the equation

MX/D = MiX 1 /D 1 -l-M 2 X 2 /D2+M 3 X 3 /D 3 + . . . this equation is true whether the substances are chemically com- bined or chemically mixed. From this equation, when we know X/D for a binary compound and for one of its constituents, we can find the value of X/D for the other constituent. By the use of this principle we can find the value of X/D for the elements which cannot be obtained in a free state. Benoist (Jour, de Phys. (7), 28, p. 289) has shown that if the values of X/D are plotted against the atomic weight we get a smooth curve; if we draw this curve it is evident that we have the means of determining the atomic weight of an element by measuring its transparency to Rontgen rays when in combination, with elements whose transparency is known. Benoist has applied this method to determine the atomic weight of indium.

The value of X/D for any one substance depends upon the type of ray used, and the ratio of the values of X/D for two substances may vary very greatly with the type of ray; this is especially the case when one of the substances is hydrogen. Thus Crowther (Proc. Roy. Soc, March 1909) has shown that the ratio of X for air to X for hydrogen varied from 100 for rays given out by a Rontgen tube at a comparatively high pressure when the rays were very soft to 5-56 when the pressure in the bulb was very low and the rays very hard. Beatty (Phil. Mag., August 1910) found that this ratio was as large as 175 for the characteristic rays given out by iron, copper, zinc and arsenic, but fell to 25-0 for the rays from tin.

Polarization of Rontgen Rays. — A great deal of attention has been paid to a phenomenon called the polarization of the

J>*

Fig. i.

Rontgen rays. The nature of this effect may be illustrated by fig. i. Suppose that AB is a stream of cathode rays striking

_ against a solid obstacle B and giving rise to Rontgen rays, let these rays impinge on a small body P, P under these condi- tions will emit secondary rays in all directions. Barkla {Phil. Trans., 1905, A, 204, p. 467; Proc. Roy. Soc. 77, p. 247) found that the intensity of the secondary rays, tested by the ionization they produced in air, was less intense in the plane ABP than in a plane through PB at right angles to this plane, the distances from P being the same in the two cases; the difference in the intensities amounting to about 15%. Haga {Ann. d. Phys. 28, p. 439), who tried a similar ex- periment but used a photographic method to measure the intensity of the secondary rays, could not detect any difference of intensity in the two planes, but experiments by Bassler {Ann. der Phys. 28, p. 808) and Vegard {Proc. Roy. Soc. 83, p. 379) have confirmed Barkla's original observations.

The " polarization " is much more marked if instead of exciting the secondary radiation in P by the Rontgen rays from a discharge tube we do so by means of secondary rays. If, for example, in the case illustrated by fig. I we allow a beam of Rontgen rays to fall upon B instead of the cathode rays, the difference between the intensities in the plane ABP and in the plane at right angles to it are very much increased. It is only the scattered secondary radiation which shows this "polarization"; the characteristic secondary radiation emitted by the body at P is quite unpolarized. The existence of this effect has a very important bearing on the nature of Rontgen rays. Whether Rontgen rays are or are not a form of light, i.e. are some form of electromagnetic disturbance propagated through the aether, is a question on which opinion is not unanimous. They resemble light in theirrectilinearpropagation ; they affect a photographic plate and, Brandes and Dorn have shown, they produce an effect, though a small one, on the retina, giving rise to a very faint illumination of the whole field of view. They resemble light in not being deflected by either electric or magnetic forces, while the characteristic secondary radiation may be compared with the phosphorescence produced by ultra-violet light, and the cathodic secondary rays with the photo-electric effect. _ The absence of refraction is not an argument against the rays being a kind of light, for all theories of refraction make this property depend upon the relation between the natural time of vibration T of the refracting substance and the period / of the light vibrations, the refraction vanishing when tjT is very small. Thus there would be no refraction for light of a very small period, and this would also be true if instead of regular periodic undulations we had a pulse of electromagnetic disturbance, provided the time taken by the light to travel over the thickness of the pulse is small compared with the periods of vibration of the molecules of the refracting substance.

Experiments on the diffraction of Rontgen rays are very difficult, for, in addition to the difficulties caused by the smallness of the wave-length or the thinness of the pulse, the secondary radiation produced when the rays strike against a photographic plate or pass through air might give rise to what might easily be mistaken for diffraction effects. Rontgen has never succeeded in observing effects which prove the existence of diffraction. Fomm {Wied. Ann. 59, p. 50) observed in the photograph of a narrow slit light and dark bands which looked like diffraction bands; but observation with slits of different sizes showed that they were not of this nature, and Haga and Wind {Wied. Ann. 68, p. 884) have explained them as contrast effects. These observers, however, noticed with a very narrow wedge-shaped slit a broadening of the image of the narrow part which they are satisfied could not be explained by the causes. Walter and Pohl {Ann. der Phys. 29, p. 331) could not observe any diffraction effects, though their arrangement would have enabled them to do so if the wave-length had not been smaller than l-5Xio- 9 cm. Sir George Stokes {Proc. Manchester Lit. and Phil. Soc, 1898) put forward the view that the disturbances which constitute the rays are not regular periodic undulations but very thin pulses. Thomson {Phil. Mag. 45, p. 172) has shown that when charged particles are suddenly stopped, pulses of very intense electric and magnetic disturbances are started. As the cathode rays consist of negatively electrified particles, the impact of these on a solid would give rise to these intense pulses. The electromagnetic theory therefore shows that effects resembling light, inasmuch as they are electromagnetic disturbances propagated through _ the aether, must be produced when the cathode rays strike against an obstacle. Since under these circumstances Rontgen rays are produced, it

seems natural, unless direct evidence to the contrary is obtained, to connect the Rontgen rays with these pulses. This view explains very simply the ” polarization ” of the rays; for, suppose the cathode particle moving from A to B were stopped at its first impact with the plate B (fig. 1), the electric force transmitted along BP would be in the plane ABP at right angles to BP. When this electric force reached the body at P it would accelerate any electrified particles in that body, the acceleration being parallel to AB. Each of these accelerated particles would start electric waves. The theory of such waves shows that their intensity vanishes along a line through the particle parallel to the direction of acceleration, while it is a maximum at right angles to this line; thus the intensity of the rays along a horizontal line through P would vanish, while it would be a maximum in the plane at right angles to this line. In this case there would be complete polarization.

In reality the cathode particle is not stopped at its first encounter, but makes many collisions, changing its direction between each; and these collisions will send out electric disturbances which when they fall on P are able to excite waves which send some energy along PC. The polarization will therefore be only partial and will be of the kind found by Barkla.

The velocity with which the waves travel has not yet been definitely settled. Marx (Ann. der Phys. 20, p. 677) by an ingenious but elaborate method came to the conclusion that they travelled with the velocity of light ; his interpretation of his experiments has, however, been criticized by Franck and Pohl (Verh. d. D. Physik Ges. 10, p. 489).

Another view of the nature of Rontgen rays has been advocated by Bragg (Phil. Mag. 14, p. 429); he regards them as neutral electric doublets consisting of a negative and a positive charge of electricity which are usually held together by the attraction between them, but which may be knocked asunder when the rays strike against matter and turned into cathodic rays. On this view when the rays pass' through a gas only a few of the molecules of the gas are struck by the rays and so we can easily understand why so few of the molecules are ionized. On the ordinary view of an electric wave all the molecules would be affected by the wave when it passed through a gas, and to explain the small fraction ionized we must either suppose that systems sensitive to the Rontgen rays are at any time present only in a very small fraction of the molecule or else that the front of an electric or light wave is not continuous but that the energy is concentrated in patches which only occupy a fraction of the wave front.

Apparatus for producing Rontgen Rays. — The tube now used most frequently for producing Rontgen rays is of the kind introduced by Porter and known as a focus tube (fig. 2). The cathode is a portion of a hollow sphere, and the cathode rays come to a point on or near a metal plate A, called the anti-cathode, connected with the anode; this plate is the source of the rays. This ought to be made of a very unfusible metal such as platinum or, still better, tantalum, and kept cool by a water-cooling arrangement. The anti-cathode is generally set at an angle of 45° to the rays; it is probable that the action of the tube would be improved by putting the anti-cathode at right angles to the cathode rays. The walls of the tube get strongly elec- trified. This electrification affects the working of the tube, and the production of rays can often be improved by having an earth-connected piece of tin-foil on the outside of the bulb, and moving it about until the best position is attained. To produce the discharge an induction coil is

generally employed with a mercury interrupter. Excellent results have been obtained by using an electrostatic induction machine to produce the current, the emission of rays is more uniform than when an induction coil is used. The rays are emitted pretty uniformly in all directions until the plane of the anti-cathode is approached; in the neighbourhood of this plane there is a rapid falling off in the intensity of the rays. After long use the glass of the bulb often becomes distinctly purple. This is believed to be due to the presence of manganese compounds in the glass. (J- J- T.)

ROOD (O.E. rdd, a stick, another form of “rod,” O.E. rodd, possibly cognate with Lat. rudis, a staff), properly a rod or pole, and so used as the name of a surface measure of land. The rood varies locally but is generally taken as = 40 square rods, poles or perches; 4 roods =1 acre. The term was, however, particularly applied, in O.E., to a gallows or cross, especially to the Holy Cross on which Christ was crucified, the sense in which the word survives. A crucifix, often accompanied by figures of St John and the Virgin Mary, was usually placed in churches above the screen, hence known as ” rood screen ”

Fig. 2.

(see Screen), which divides the chancel or the choir from the nave. The rood was carried either on a transverse beam, the ” rood beam,” or by a gallery, the ” rood loft.” Such a gallery was also used as a place from which to read portions of the service (see Jube). It was reached by the ” rood stair,” a small winding stair or ” vice.” In English churches these stairs generally run up in a small turret in the wall at the west end of the chancel; often this also leads out on to the roof. On the continent of Europe they often lead out of the interior of the church and are enclosed with tracery, as at Rouen or Strassburg. ” Rood stairs ” remain in many English churches where the rood loft has been destroyed. A fine example of a rood loft is at Charlton-on-Otmoor, Oxfordshire. The screen might be separate from the rood beam or rood loft. The general construction of wooden screens is close panelling be- neath, on which stands screen- work composed of slender turned balusters or regular wooden mullions, supporting tracery more or less rich with cornices, crestings, &c, and often painted in brilliant colours and gilded. The central tower of a church over the intersection of the nave and chancel with the transepts is sometimes called the ” rood tower “; an example is that at Notre Dame

at Paris. In England rood lofts do not appear to have been introduced before the 14th century, and were not common till the 15th. The “roods” themselves were not

Forms of roof.

The simplest form is the ” flat roof ” consisting of horizontal wood joists laid from wall to wall as in floor construction. The roof must not be quite flat, for a slight fall is necessary in its upper surface to allow water to drain away into gutters placed at convenient points. The joists are covered with a waterproof material such as asphalt, lead, zinc or copper, the three last materials being usually laid upon boarding, which stiffens the structure and forms a good surface to fix the weatherproof covering upon. Such roofs are not suitable for cold climates, for accumulations of snow might overburden the structure and would also cause the wet to penetrate through any small crevices and under flashings. With flat roofs the pressure exerted upon the supports is directly vertical.

” Lean-to,” ” shed,” or ” pent ” roofs are practically develop- ments of the flat roof, one end of the joists (which are now called ” rafters “) being tipped up to form a decided slope, which enables slates, tiles, corrugated iron and other materials to be employed which cannot be used upon a ” flat ” roof.

Simple roofs in general use with a double slope are the ” coupled rafter roofs,” the rafters meeting at the highest point upon a horizontal ridge-piece which stiffens the framework and gives a level ridge-line. In some old roofs the rafters are connected without any intervening ridge-plate, with the result that after

Half elevation; 25′ o* span

Sectional elevation on AA.

Figs, i and 2. — King-post Roof Truss.

disturbed in Henry VIII. ‘s reign, but were generally removed under Edward VI. and Elizabeth.

The legality of rood screens or rood lofts in the Church of England depends on the law of the Church with regard to images, i.e. ” whether they do or do not, or will or will not, encourage or lead to idolatrous or superstitious worship in the place where they are, or are to be put ” (Lindley, L. 7. in R. v. Bishop of London, 1889, 24 Q.B.D. 213, 237; see also St John Timberhill, Norwich, case, 1889 Prob. 71,

and article Image).

ROOFS. A roof is a construction placed as a covering over the upper portion of a building to exclude the weather and preserve the contents dry and uninjured. Roofs are designed to throw off rain and snow, and their slope or ” pitch,” as it is generally termed, is governed to a great extent by the climate, as well as by the material used and manner of laying. The pitch may vary from an almost horizontal surface (as largely adopted in dry countries and also in temperate climates for roofs of metal or asphalt) to the steeply pitched roofs required for the ordinary flat tiles which to be weatherproof must be laid at an angle of from 45 to 8o° with the horizon. Besides serving the useful purpose of protection against inclement weather the roof, both externally and internally, may be designed to form an architectural feature in keeping with the character of he building.

a time the ridge instead of remaining level takes on a wavy out- line, due to the fact that some of the timbers have settled slightly owing to decay or other causes, whilst others have remained firm in their places. The lower ends of the rafters should pitch on a wood plate bedded on the top of the wall; this, as described under Carpentry, assists in spreading the weight over a large area of the wall, and provides good fixing for the timbers. The simple ” couple roof ” consists merely of two sets of rafters pitched from plates on the walls on either side of the building and sloping upwards to rest against a common ridge-piece. There are no ties between the feet of the rafters, which therefore exert a considerable thrust against the support- ing walls. On account of this and of the lack of rigidity of the framing this form of roof should only be used to cover small spans of 10 to 12 ft. Generally the ends of the rafters are con- nected by ceiling joists which form a level ceiling and at the same time prevent any outward thrust on the supports. When used for spans between 12 ft. and 18 ft. a binder supported by an iron or wood ” king ” tie every 5 or 6 ft. should be run along across the centres of the ceiling joists and the latter spiked to it. Such roofs with the wood tie across the feet of the rafters are termed ” couple close roofs.” When the ties are fixed about half-way up the rafters it is called a ” collar roof,” and may be used for spans up to 16 ft. These are the type of roof commonly used in ordinary dwelling-houses where the

framing, usually of rough northern pine or spruce, is generally I In

such large spans the straining beam often becomes of such hidden from view by the ceilings. The spans usually are not | a length as to require support and this is effected by con-

great, and extra support is obtained at various points from partitions and cross walls. Where the span is large, that is, above 20 ft. without intermediate support, it is necessary to employ roofs with ” principals ” and ” purlins,” sometimes called ” double rafter roofs.” Principals are strong trusses of timber rigidly framed together and placed at intervals of about 10 ft. to support the weight of the roof covering. Purlins — stout timbers running longitudinally — are

Ck^i toll.

Fig. 3. — Queen-post Roof Truss; half elevation, 38′ o” span.

fixed on the principal rafters with intervals of about 8 ft., and on these the common rafters are fastened. Principals, or ” roof trusses ” as they are more often called, are framed together in various ways, and the members may be entirely of wood or reinforced by ties of iron rods or bars; the latter are called ” composite trusses.”

The ” king-post truss ” may be used for spans up to 30 ft. and is constructed as shown in figs. 1 and 2. It has a central post sustaining the ” tie-beam ” in the centre with struts pro- jecting from its base to support the principal rafters at their centres at a point where the weight of the purlins renders strutting necessary. The members are connected by wrought- iron straps and bolts; the strap connects the king-post and tie-beam and is often fitted with a gib-and-cotter arrangement (really a pair of iron folding wedges) which allows the whole truss to be tightened up should any settlement or shrinkage occur. ” Queen-post trusses ” have, in place of the king-post dividing the tie-beam into two, two queen-posts supporting it at two points (fig. 3). The joints between the members are made in a similar manner to those of the king- post principal with wrought-iron straps. The purlins are two in number on each slope, one supported at the top of each ” queen,” the other half-way between that point and the wall-plate and resting upon the principal rafter at a point where strutted from the base of the queen- post. A stout straining beam connects the heads of the queens. In fig. 4, a and b are details at the foot of the queen-post, and c at the head. Trusses of this type are suitable for spans up to 45 ft. In roofs of a larger span than this and up to 60 ft. the tie-beam requires to be upheld at more than two points, and additional posts called ” princesses ” are introduced for this purpose. This also entails extra struts and purlins.

tinuing the principal rafters up to the ridge and introducing a short king-post to sustain the beam in the middle of its length.

Open timber roofs of various types but principally opea of ” ham-Umber mer – beam ” roo,s – construction were used in the middle ages where stone vault- ing was not em- ployed. Many of these old roofs still exist in good pre- servation and exhibit the great skill of the medieval carpenters who designed and erected them. Such forms are still used, chiefly for ecclesi- astical buildings and the roofs over large halls. In the best periods of Gothic architecture the pitch of these roofs was made very steep, sometimes as much as 60° with the horizon. In the hammer-beam type of roof the tie-beam at the foot of the rafters is omitted, a collar being thrown across connecting the principal rafters at a point about half-way in their length, the lower portion of the principal consisting of a number of struts and braces rigidly connected in such a manner as to throw as little thrust as possible upon the walls serving as abutments. There are two kinds of • hammer beams, the arched and the bracketed; the chief examples are Westminster Hall and Middle Temple Hall (Plate I. figs. 24 and 25). The ” hammer beam ” projects from the top of the wall and is bracketed from a corbel projecting from the wall some distance below. This form of roof has a style and dignity of its own, and gives greater height in the upper part of the building as well as being more ornamental and lighter in effect than tie-beam trusses, which have a rather heavy effect.

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Fig. 4. — a. Detail of queen-post truss at b.

b. Vertical section through queen-post.

c. Detail of queen-post truss at head ; purlin and wrought-iron straps are omitted for the sake of clearness.

ROOF

Plate I.

Phch.G. II’. Wilton & Co.

Fig. 24.— WESTMINSTER HALL.

XXIII. 6gS.

Fig. 25.— HALL OF THE MIDDLE TEMPLE.

The Mansard roof (fig. 5) is a useful form of construction which obtains its name from Francois Mansard, a distinguished Mansard FrencJl architect who lived in the 17th century. This root. kˆd °f ro °f nas been largely used, especially in France

and other European countries, as well as in America in the old colonial days. It adapts itself well to some styles of architecture, but should be very carefully applied, since it

Fig. 5. — Mansard Roof Truss: detail of outline as A; other outlines at B, C, D and E.

is apt to appear ungainly in some situations. By the use of a Mansard roof extra rooms can be obtained at a small expense without adding an additional storey to the building proper. The outward thrust upon the supporting walls is not so great as with an ordinary pitched roof, the load coming practically vertically upon them. There is no recognized rule for the proportion or pitch of a roof of this description, which should be designed to suit the particular building it is intended to cover. Fig. 5, A, B, C, D and E show various forms. A similar type of curb roof is often used having a flat lead- or zinc-covered top in place of the pitched slate- or tile-covered top of the ordinary Mansard roof.

Composite roof trusses of wood and iron are frequently used for all classes of buildings, and have proved very satisfactory. They are built upon the same principles as wooden types of roof trusses. The struts — that is, those members subjected to compressional stress — are of wood, and iron bars or rods are used for the ties, which have to withstand tensile forces. When any shrinkage occurs to loosen the joints of the framing, as usually happens in large trusses, the tie-rods are tightened up by the bolts attached to them. Figs. 6, 7 and 8 are the sections and plan of a simple method of constructing the roof for an ordinary domestic building with plaster ceilings to the

top rooms. It is a simple construction of the couple close order with the addition of a collar and struts and king-rod to every fourth rafter. Trimming is necessary for openings and where portions of the

structure, such as chimney stacks, cut into the roof. The trimming rafters are made an inch thicker than the others. The dragon tie is framed in connexion with the wall-plate at the hipped corners to take the thrust of the hip rafters.

Steel and iron trusses in many cases follow the wood models already described. The struts and principal rafters are usually of T section, the tensional members being rods or flat bars. ,ro “. Flat plates and bolts or rivets are used to form the connexions between the members, and a means is provided in the tie-rod for tightening up the truss should any of the members ” give ” slightly under their load. Large trusses for very spans are specially designed for their work and . be of many different types of design. Big roofs on the tie-rod principle are now being discarded as being more liable to failure, through deterioration or defect, than those built on the girder principle in one form or another. Fig. 9 is a queen-rod roof principal for a span of 50 ft., and shows the sizes of the different members, a line diagram of the truss and large details of the joints. Fig. 10 in a similar manner shows the roof at Cardiff railway station, which has a span of 43 ft.

The steel roof covering the great hall at Olympia, London, is an example of a carefully designed and well-built roof which combines with strength an extremely light and elegant appear- ance. This is due to the fact that every member of the roof is adapted to meet the particular stresses found by calculation to affect it. By careful study of conditions the sections of steelwork used for the various members have been reduced

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Section on BB.

Figs. 6 and 7. — Roof for Domestic Building.

to the smallest size compatible with safety. In this way any unnecessary surplus of material is avoided, and so is the heavy, overwhelming effect noticeable in many roofs of large span. There is an entire absence of long wide plates and webs; the various members are composed wholly of flat bars and angle irons riveted together, and plates are introduced only where re- quired to cover joints. Some notes on its size and construction

aˆSB

A. Angle tie.

B. Boarding. B.B. Barge board.

C. Collar.

C.T. Ceiling joist. C.R. Common rafter

D. Drip.

D.P. Dragon-piece.

F. Flue.

G. Gutter.

G.B. Gutter bearer. H.R. Hip rafter.

J.R. Jack rafter. K.B. King-bolt. P. Purlin. P.W. Parapet wall. P.E. Projecting eaves. R. Ridge. S. Strut. T. Trimmer. T.F. Tilting fillet. T.R. Trimming rafter. V. Valley. W.P. Wall-plate.

will be interesting. The dimensions of the great hall are 440 ft. | long by 250 ft. wide, the height to the crown of the roof being about 100 ft. The main ribs of the roof have a clear span of 170 ft. and are placed 34 ft. apart. They are of box- girder form and measure 7 ft. deep and 2 ft. wide. The gallery around the hall is 40 ft. wide on three sides and 26 ft. wide on the remaining side. It is covered by a lean-to roof which abuts against the curved ribs on the north and south sides, and is attached to horizontal members of the screens on the east and west sides. The bricks walls of the building are not called upon to resist any portion of the thrust from the roof, as the side frames through which the gallery floor passes form a self-contained system of steelwork in which the thrust is ultimately conveyed to the ground. The screens which close the semicircular ends of the roof are of vertical ridge and furrow construction, as can be clearly seen in the illustrations, this form offering great resistance to wind pressure while at the same time requiring a minimum amount of material. Of the two illustrations, fig. 11 is a detailed cross-section showing fully the method of construction of the foot of the main rib and column, and the arrangement of the side frames above referred to is shown in fig. 12, which is a com- plete cross-section view, and will convey to the reader some idea of the vast size of the building and its general pro- portions.

The following five roofs are examples of large span: Crystal Palace (104 ft.); Olympia, London (170 ft.); St Enoch station, Glasgow (198 ft.); Central station, Manchester (210 ft.); St Pancras station, London (240 ft.).

Domes may be framed up with wood rafters cut to shape. For small spans this construction is satisfactory, but when the dome is of considerable size it is often framed in steel as being stronger and more rigid than wood, ro f s . and therefore not exerting so great a thrust upon the supporting walls. The outer dome of St Paul's cathedral in London is of lead-covered wood, framed upon and supported by a conical structure of brickwork which is raised above the inner dome of brick. Concrete is a very suitable material for use in the construction of domes, and may be employed simply or with iron or steel reinforcement in the shape of wires, bars or perforated plates. One of the best modern examples of concrete vaulting and domical roofing without metal rein- forcement occurs in the Roman Catholic cathedral at West- minster, a remarkable building designed by Mr J. F. Bentley. A few details of the roofs will be interesting. The circle developed by the pendentives of the nave domes is 60 ft. in diameter. The thickness of the domes at the springing is 3 ft. gradually reduced to 13 in. at the crown; the curve of equi- librium is therefore well within the material.

The domes were turned on closely boarded centring in a series of superimposed rings of concrete averaging 4 ft. in width. The concrete is not reinforced in any way. The independent external covering of the domes is formed of 3 in. artificial stone slabs cast to the curve. They rest on radiating ribs 5 in. deep of similar material fixed on the concrete and rebated to receive the slabs; thus an air space of 2 in. is left between the inner shell and the outer covering, the object being to render the temperature of the interior more uniform. At the springing and at the

ROOFS

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Fig. 9. — Queen-rod Roof Truss.

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_ Roofing felt is an inexpen- sive fabric of animal or vege- table fibre treated _ ., with asphalt to make e ‘ it capable of resisting the weather. It is largely used as a roofing material for tem- porary buildings. When ex- posed to the weather it should be treated with an application of a compound of tar and slaked lime well boiled and applied hot, the surface being sprinkled with sand before it becomes hard. Felt is also used ■ on permanent buildings as a good non-conductor of heat under slating and other roof – covering materials. In this case it is not tarred and sanded. It is supplied in rolls containing from 25 to 35 yds. 30 in. wide. The sheets should be laid with a lap of 2 in. at the joints and secured to the boarding beneath by large- headed clout-nails driven in about 2 in. apart.

Corrugated iron is supplied either black or galvanized. It is especially suited for the roofs of out- buildings and build- ings of a more or less temporary character, to a large extent self-support” ing, it requires a specially de signed roof framework of light construction. If, as is usually the case, the sheets are laid with the corrugations running with the slope of the roof, they can be fixed directly on purlins spaced 5 ft. to 10 ft. apart according to the stiffness and length of the sheets. In

Cor- rugated iron.

Being

crown the spaces between the ribs are left open for ventilation. The sanctuary dome differs in several respects from those of the nave.

Unlike the latter, which seem to rest on the flat roofing of the church, the dome of the sanctuary emerges gradually out of the sub- structure, the supporting walls on the north and south being kept down so as to give greater elegance to the eastern turrets. The apsidal ter- mination of the choir in the east is covered in with a concrete vault surmounted by a timber roof, in striking contrast to the domes cover- ing the other portions of the struc- ture. Fig. 13 is a section through the nave showing how the domes are buttressed, fig. 14 is a section through the sanctuary dome, and figs. 15 and 16 a section and part plan of the vaulting of the choir with its wood span roof above the con- crete vault.

Covering Materials for Roofs. — There are a large number of different roof- covering materials in common use, of which short descriptions, giving the principal characteristics, may be useful. The nature of the material employed as the outer covering affects the details of roof construction very considerably. A light covering such as felt or corru- gated iron can be safely laid upon a much fighter timber framing than is necessary tor a heavy covering of tiles or slates.

EtenˆiLˆ or shoes.

Fig. 10.— Roof at Cardiff Station.

MAIN RIB

\12mfuntntcanlrt ofcolumnt ‘

Fig. ii. — Detail of Main Rib and Column, Olympia.

pure air zinc coating of the galvanized sheets is durable for many years, but in large cities and manufacturing towns its life is short unless protected by painting. In such districts it has often been found that plain un- galvanized sheets well coated with paint will last longer than those galvanized, for the latter are attacked by corrosive influences through minute flaws in the zinc coating developed in the process of corrugation or resulting from some defect in the coating. The stock sizes of corrugated sheets vary from 5 ft. to 10 ft. long, and from 2 ft. to 2 ft. 9 in. wide with corrugations mea- suring 3 in. to 5 in. from centre to centre. For roofing purposes the sheets are supplied in several thick- nesses ranging from No. 16 to No. 22 Standard Wire Gauge. No. 16 is for excep- tionally strong work, No. 18 and No. 20

are used for good- class work, and No. 22 for the roofs of temporary build- ings. The sheets when laid should lap about 3 in. at their sides and from 3 in. to 6 in. at the ends. Rivet- ing is the best method of connecting the sheets, al- though galvanized bolts, which are not so satisfac- tory, are frequently em- ployed. The joints should be made along the raised corrugations to lessen the risk of leakage. Holes can be punched during the erec- tion of the roof; their posi- tions should first be deter- mined by placing the sheets in position and marking the

necessary point of fixing. Sheets are usually attached to timber framework with galvanized screws, or nails with domed washers placed under their heads. Fixing to a steel frame- work is effected by means of galvanized hooked bolts clipping the purlins passed through the sheet and held tight by nuts

Fig. 13. — Westminster Cathedral : section through nave.

on the outside. Sheets corrugated in the Italian pattern have raised half-rounds every 15 in. or so, the portions be- tween being flat. Such sheets have a very neat appearance and give a better effect in some positions than the ordinary cor- rugations-

Fig. 12. — Cross-Section of Olympia from the Drawings of the architect, A. T. Walmisley, Esq.

ROOFS

7°3

Zinc in sheets is a material largely used as a roof covering, and if care be taken to ensure metal of good quality, it proves itself light, _. strong and durable, as well as inexpensive. Zinc is

stronger weight for weight than lead, slate, tile and glass, but weaker than copper, wrought-iron and steel, although with the exception of the two last mentioned it is not so durable when exposed to the weather. It is not liable to easy breakage as are slate, tile and glass. It is usually supplied in flat sheets, although it can also be had in the rugated form similar to corru- gated sheet-iron. When exposed, a thin coating of oxide is formed on the surface which

Figs. 15 and 16. — Westminster Cathedral : choir-vaulting.

10

II

12 13

14 15 16

Fig. 14. — Westminster Cathe- dral : diagonal section through sanctuary dome.

protects the metal beneath from any further change, and obviates the necessity of painting. In laying the sheets, the use of solder and nails should be avoided entirely except for fixing clips and tacks which do not interfere with the free expansion and con- traction of the sheets. The reason for this is that zinc expands freely, and sheets laid with soldered seams or fixed with nails are liable to buckle and probably break away owing to movements set up by changes of temperature. The usual sizes of zinc sheets are 7 ft. or 8 ft. long by 3 ft. wide. The thickness and weights of zinc are shown in the following table, which compares the Vieille Mon- tagne Gauge with the Old Belgian Gauge and the British Imperial Standard Wire Gauge.

O.B.G. S.W.G.

V.M.G. approximately, approximately. Weight per sq. ft. 9 25 nioz.

10 24 13J „

11 23 15 „

12 22 17 ,,

13 21 i8f „

14 20 2lf ,,

15 ‘9 24l ..

The best method of laying a zinc flat roof is with the aid of wood ” rolls ” of about 2 in.X2 in. in section, splayed at sides and spaced 2 ft. 8 in. apart and fixed to the roof boarding with zinc nails. Iron nails should not be used as this metal affects the zinc. The sheets of zinc are laid between the rolls with their sides bent up l| in. or 2 in. against them, and held firmly in position by clips of zinc attached to the rolls. A cap of the same metal is then slipped over each roll and fastened down by tacks about 3 in. long soldered inside it so as to hook under the same clips that hold the sheet down. Drips of about 2| in. are made in the slope at intervals of 6 ft. or 7 ft. — that is, the length of a sheet — and special care must be taken at these points to keep the

work waterproof. The lower sheet is bent up the face of the drip and under the projecting portion of the upper sheet, which is finished with a roll edge to turn off the water. The end of the roll has a specially folded cap which also finishes with a curved or beaded water check, and this in conjunction with the saddle piece of the roll beneath forms a weather-proof joint (figs. 17 and 18). The fall between the drips is usually made about ij in.,

Ziivc rolU

17 18

Figs. 17 and 18. — Details of Zinc Flats.

but where necessary it may be less, the least permissible fall being about I in 80. Felt laid beneath zinc has the effect of lengthening

the life of the roof and should always be used, as the edges of the boarding upon which it is laid are, when the latter warps, apt to cut the sheets. It also forms a cushion protecting the zinc if there is traffic across the roof.

Sheet-lead forms a much heavier roof covering than zinc, but it lasts a great deal longer and more easily withstands the attacks of impure air. Lead must be laid on a close boarding, for Lead

its great ductility prevents it from spanning even the smallest spaces without bending and giving way. This character- istic of the metal, however, conduces largely to its usefulness, and enables it to be dressed and bossed into awkward corners without the necessity of jointing. The coefficient of expansion for lead is nearly as great as that for zinc and much higher than in the case of iron, and this fact requires precautions similar to those affecting zinc to be taken when laying the roofing. The manner of laying is with rolls and drips as in the case of zinc, the details of the work differing somewhat to suit the character of the material (see figs. 19, 20 and 21). Allowances must be made for expansion

3olid ISfliCoU-SdnK Hollou) lsgd roll.

SH

19 20

Figs. 19, 20 and 21.-

and contraction, and the use of nails and solder avoided as far as possible. Contact with iron sets up corrosion in lead, and when nails are necessary they should be of copper; screws should be of brass. Lead is supplied in rolls of 25 to 35 ft. long and 6 ft. to 7 ft. 6 in. wide. That in general use varies from one-fourteenth to one- seventh of an inch in thickness. The weights most suitable for employment in roofing work are 7 or 8 lb per square foot for flats and gutters, 6 lb for ridges and hips, and 5 lb for flashings.

As a roof covering copper is lighter, stronger and more durable than either zinc or lead. It expands and contracts much less than these metals, and although not so strong as wrought-iron coooer and steel it is much more durable. From a structural pp ‘

point of view these qualities enable it to be classed as the best available metal for roof covering, although its heat-conducting properties require it to be well insulated by layers of felt and other non-conducting material placed beneath the metal. On exposure to the air copper develops a feature of great beauty in the coating of green carbonate which forms upon its surface protecting it from further decomposition. Perhaps the chief disadvantage in the use of copper lies in its first cost, but against this must be set the almost imperishable nature of the metal and the fact that by reason of its light weight less substantial framework is required for its support. Copper roofing should be laid in a similar manner to zinc, with wood rolls at intervals of about 2 ft. 4 in. It is, however, often laid with welted seams. The general stock sizes of sheets are from 4 ft. to 5 ft. 3 in. long and 2 ft. to 3 ft. 6 in. wide. The thickness almost invariably used is known as 24 S.W.G. and weighs 16 oz. per square foot. Thinner metal would suffice, but owing to the increased cost of rolling very little would be gained by adopting the thinner gauges.

In the United States of America ” tin ” roofs are quite commonly used. Sheets of wrought-iron coated either with tin or zinc are used of a size usually 14 in. by 20 in., though they may American be had double this size. Preparation for laying is made „ mots by fixing an insulating foundation of somewhat stout paper or felt ; this must be dry, else it is apt to spoil the impermeable covering laid upon it by causing it to rust. Junctions between the sheets are made by welted seams in which the fouredges of the sheets are turned over so as to lock together, thus forming one large sheet of tin covering the roof. In high-class work of

a permanent nature the seams in addition are soldered, rosin only being used as a flux. Each sheet also is secured to the roof with two or three tin cleats. The life of such roofs may be practically doubled by the application of a good coat of paint, which, however, adds consider- ably to the cost.

Slate is a strong and very impermeable material, and these qualities and the fact that it is easily split into thin plates suitable for laying, as well as its low cost, cause it to be by far the Slate

most generally used of all materials for roof covering. Some of the best known varieties of slates, classed according to their colour, are as follows: —

Blue . . North Wales (Penrhyn, Festiniog, Dinorwic, &c),

France, Norway, Germany. Blue-grey . Cornwall (Delabole). Grey . . North Wales (Penrhyn, Dinorwic).

7°4

Purple

Green

ROOFS

North Wales (Bangor, Penrhyn, Dinorwic), New- foundland, Germany. South Wales (Precelly), Cumberland, Westmorland, Lancashire, Ireland, Newfoundland, Norway, United States and Germany.

Slates are cut to many different sizes varying in length from 10 in. to 36 in. and in width from 5 in. to 24 in. There are perhaps thirty or more recognized sizes, each distinguished by a different name. In common practice those generally used are “large ladies,” 16 in. by 8 in.; “countesses,” 20 in. by 10 in.; and ” duchesses,” 24 in. by 12 in. Generally speaking, the rule governing the use of the different sorts is that the steeper the pitch the smaller the slate, and vice versa. Buildings in very exposed positions naturally require steeply pitched roofs.

Some of the technical terms used by the slater are as follows: — –

Bed, the under surface of a slab when laid.

Back, the upper surface of the slate.

Gauge, the distance between the lines of nailing. This depends on the length of the slate and equals half the length of the slate after the lap plus an inch for the nail-hole has been deducted. This is for slates nailed near the top edge; for those fixed near the middle the gauge would be half an inch more, as no allowance for nail-holes is required.

Margin, the width of the exposed portion of each course which equals the width apart of the nailing.

Head and tail, the top and bottom edges of the slate.

Lap, the lap of the tail of one course of slates over the head of the second course below it. The lap is made from 2\ in. to 4 in. (usually 3 in.), and for this distance there are three thicknesses of slate, namely, the tail of the top course, the middle of the next and the head of the third course.

Slates may be fixed by nailing at the head (see fig. 22) or at about the middle. The latter method is the stronger, as the levering effect of the wind cannot attain so great a strength. There is a small economy effected by centre nailing, as the margin is slightly larger and fewer slates are required to cover a given space; longer nails, however, are required, for as slates are laid at an angle with the pitch of the roof their centres cannot be made to approach so near

TSscia

Fig. 22. — Detail of a Slated Roof.

to the slating battens or boarding as the head, which lies close on the surface to which it is fixed. Another point worth noticing is that the nail-holes in the centre nailed slating are only covered by 3 in. of the tail (the amount of the ” lap “) of the course of slates above, and rain is very liable to be forced under by the wind and cause the wood battens or other woodwork to rot. Head-nailed slates, on the other hand, have their holes covered by two layers of slate, and are removed from exposure by the length of the gauge plus the lap, which in the case of ” countess ” slating equals 11 in.

” Open slating ” is an economical method of laying slates that is often adopted for the roofs of sheds and temporary buildings. The slates in the same course are not laid edge to edge as in close slating, but at a distance of two or more inches apart. This forms a roof covering light in weight and inexpensive, which, although not strictly weather-proof, is sufficiently so for the buildings upon which it is used.

Slates are laid upon open battens fixed upon the rafters or upon close boarding or upon battens fixed upon boarding. The battens are \ in. or 1 in. thick and ij in. to 3 in. wide, and are spaced to suit the gauge of the slates. When close boarding is used it is often covered with inodorous asphalted felt. While taking these pre- cautions to make the roof sound and tight it should be borne in mind that slate is liable to decay if not ventilated, and to effect this the battens are sometimes fixed vertically, ridge ventilators introduced and air inlets arranged at the eaves. The bed of slates

laid without provision for the admission of air will be found on removal after some time to have rotted so as to scale off and easily crumble into powder.

The nails used in slating are a very important item, and the durability of the work depends to a large extent upon them. They should have large flat heads. The most satisfactory are those made of a composition of copper and zinc, but others of copper, zinc, galvanized iron and plain iron are used. Those of copper are most durable, but are soft and expensive. Zinc nails are soft and not very durable; they will last about twenty years. Iron nails even if galvanized are objectionable in permanent work, though they may be used for temporary roofs. When the plain-iron nails are employed they should be heated and plunged in boiled linseed oil. The pitch of a roof intended for slating should not incline less than 25 with the horizontal, while 30° is a safer angle to adopt.

Tiles for roofing purposes are made from clay and burned in a manner similar to bricks. The clay from which they are made is, however, of a specially tenacious nature and prepared _,..

with great care so as to obtain a result as strong and as nearly non-porous as possible. Tiles are obtainable in many different colours, and some of these have a very beautiful effect when fixed and improve with age. They comprise a large number of tints from yellowish red, red and brown to dark blue. As with bricks the quality depends to a large extent upon the burning; underburnt tiles are weak and porous, liable to early decay, while overburning, though improving the tiles as regards durability, will cause them to warp and will spoil colour. The usual shape is the ” plain tile,” but they are made in various other shapes with a view both to easier fixing and lighter weight, and to ornamental effect. There are also several patented forms on the market for which the makers claim special advantages. The ordinary tiles are slightly curved in shape to enable them to lie close one upon the other. Some of them have small ” nibs ” moulded on at the head

by which they may be hung upon the battens and nailing avoided (see fig. 23). Nail-holes are provided, and upon steep slopes it is ad- visable to make use of them. Others are made without the nibs, and are fixed either by nailing to the battens or boarding or hung by means of oaken pegs wedged in the holes to the bat- tens, the pegs in the latter case acting in the same way as the above-mentioned nibs. Plain tiles are of rec- tangular form, the standard dimensions are ioj in. long by 6J in. wide. They are usually 5 in. thick- and weigh about 2§ lb each.

There are many forms of ornamental tiles, which are plain tiles having their tails cut to various shapes instead of moulded square. A number of patented forms of tiles also are on the market, some of which possess considerable merit. Pantiles are suitable for tem- porary and inferior buildings such as sheds and outhouses. They are laid on a different principle from plain tiles, merely overlapping each other at the edges, and this necessitates bedding in mortar and pointing inside and sometimes outside with mortar or cement. This pointing plays an important part in keeping the interior of the building free from the penetration of wind and water. Pantiles are generally made to measure 13I in. long by 9.5 in. wide, and weigh from 5 lb to 5J lb each. Moulded on at the head of each tile is a small projecting nib which serves for the purpose of hanging the tile to the lath or batten. They are laid with a lap of 3! in., 2J in. or 15 in., giving a gauge (and margin) of 10 in., II in. and 12 in., respectively. The side lap is generally i£ in., leaving a width of 8 in. exposed face. There are many other forms based upon the shape of the pantile, some of which are patented and claim to have advantages which the original form does not possess. Among such are “corrugated tiles,” of the ordinary shape or with angular flutes, and also the Italian pattern ” double roll tiles,” ” Foster’s lock-wing tiles.” Poole’s bonding roll tiles are a development of the Italian pattern tile.

Glass as a roof covering and the different methods of fixing it are dealt with in the article Glazing.

There are many other materials used for roof covering besides those already described, many of them of considerable value. Some have in the past enjoyed considerable vogue, but have „. practically died out of use owing to the development and »” e cheapening of other forms of roofing. Among these may ~. te -iffe S be included thatch and wood shingles, the use of which in these days is practically reduced to special cases. Other, little used roofing materials are those of recent invention, seme of T vhi < h perhaps

Fig. 23.— Detail of a Tiled Roof.

have a great future before them. Plates of asbestos used as slates or tiles make a light, strong and fireproof covering. Large terra- cotta tiles or slabs are much used in the United States of America. A good form of flat roof is that in which concrete is used as a founda- tion for a waterproof layer of asphalt, laid to slight falls to allow the water to run off easily. This is the usual method adopted when a roof garden is required. Shingles or thatch look extremely well on a roof, but their use is debarred in a great many districts owing to the danger of fire. Galvanized iron tiles, zinc tiles and copper tiles may be employed on small areas with good effect. ” Willesden paper,” often used as an insulating layer beneath slates and tiles, is also at times used as a roof covering. It is cardboard chemically treated to render it tough, waterproof and fire-resisting.

The weights of some of the various materials used in the con- struction and covering of roofs are given in the following table. The Welzht weights which are approximate are for a square foot of ‘ roofing. Thereof trusses are taken to be spaced 10 ft. apart and include the necessary purlins.

King-post wood truss 20 ft. to 30 ft. span . . 2 to 2 § lb Queen-post „ 30 ft. to 50 ft. . . . 3 to 3$ „

Wood rafters 2\ ,,

Ceiling joists and ceiling 11 ,,

j-in. boarding for roof covering 2§ ,,

i-in. „ „ 3§ „

ii-in. „ „ 4l »

2j-in. Xi in. slate battens for 8|-in. gauge . . . If ,,

Felt h .,

Thatch 6| „

Slates (ordinary laid with 3-in. lap) . . . . 9 ,,

Tiles, plain flat 18 „

Pantiles . . II ,,

Zinc 12 to 16 gauge laid complete including rolls i\ to if „ Copper 25 to 19 gauge laid complete including rolls I J to 2 J ,, Lead weighing 6 lb per square foot laid complete

including rolls 6J „

Corrugated iron 20 S.W. gauge 2 ,,

Wind pressure is usually calculated at 22 to 25 lb on a roof with pitch of 30 , and 27 to 30 lb on a roof of 45 pitch.

From these particulars it is easy to calculate the weight of a square (100 superficial ft.) of roofing material, this being the usual standard of measurement for many roofing materials.

The London Building Act of 1894 and its amendments set forth with regard to roofs erected in the London district that every „ , structure on a roof is to be covered with slate, tile, metal

eˆua- or otner incombustible material, except wooden cornices oas ‘ and barge boards to dormers not exceeding 12 in. in depth,

and doors and windows and their frames. Every dwelling-house or factory above 30 ft. in height and having a parapet must have means of access to the roof. The pitch of the roofs of warehouse buildings must not exceed 47 , and those of other buildings must not exceed 75 , but towers, turrets and spires are excepted. In domestic buildings not more than two storeys are to be formed in the roof, and if the floor is more than 60 ft. above the street level fireproof materials must be used throughout and a sufficient means of escape provided. The building by-laws of the municipality of Johannesburg contain several clauses affecting the designing of roofs and their method of construction. In the designing of build- ings roof-slopes must be within a line drawn and produced from the ground level at the opposite side of the street to the top of the eaves, gutter or parapet. No roof in the municipal fire limit may be constructed of thatch, reed or other inflammable material. With- out the fire area they may be so constructed if the building stands at least 20 ft. from the boundary of its site. Roofs having a pitch of less than 223* must be constructed to bear safely a load of at least 28 lb per square foot of surface. Roofs of steeper pitch must be able to support a live load of 21 lb per square foot. The framing of Mansard or other roofs of more than 6o° pitch on

a building exceeding 45 ft. high must be constructed of approved fireproof material at least 2 in. thick. No roofs except those of towers, turrets or spires shall exceed 70 pitch for a Mansard or 6o° for an ordinary roof. Every fireproof roof, in addition to a door or scuttle for access from below, must have a skylight or skylights with metallic framing, having an area equal to at least one-sixtieth the area of the roof. Skylights placed over rooms or areas to which the public have access must be protected by wire netting below or be glazed with wire-wove glass.

The Building and Health Laws and Regulations and Amendments of 1905 affecting the city of New York are based, so far as the construction of roofs goes, upon the same lines as those of London, the principal exceptions being that they give very full working details, under part 24, as to the strengths of materials required to be used and the wind pressure to be provided against. In part 17 they provide that where a building exceeds three storeys or 40 ft. in height and the roof has a pitch of over 6o c , it shall be constructed of iron rafters and be lathed with iron or steel on the inside and plastered or be filled in with fireproof material not less than 3 in. thick and covered with metal, slate or tile. The provision as to access to roof and fire escapes therefrom adopted by the London xxiii. 23

County Council in 1907 under the London Building Act Amendment Act 1905 were in operation in New York in 1899.

Literature. — The principal reference books on this subject are the following: — Thomas Tredgold, Elementary Principles of Carpentry; J. Newland, Carpenter and Joiner's Assistant; G. L. Sutcliffe, The Modern Carpenter, Joiner and Cabinet Maker; J. Griffiths, Trusses in Wood and Iron; F. Bond, Gothic Architecture; J. Gwilt, Encyclopaedia of Architecture; F. E. Kidder, Trussed Roofs and Roof Trusses; J. Brandon, Analysis of Gothic Architecture; A. Pugin, Ornamental Gables; M. Emy, L'Art de la charpenterie ; Viollet le Due, Dictionnaire; J. K. Colling, Details of Gothic Archi- tecture. (J. Bt.)

ROOK (O.E. Hrdc, Icel. Hrdkr, 1 Swed. Raka, Du. Roek, Gael. Rocas) , the Corvus frugilegus of ornithology, and through- out a great part of Europe the commonest and best-known of the crow-tribe, belonging to the Passerine family Corvidae. Besides its pre-eminently gregarious habits, which did not escape the notice of Virgil (Georg. i. 382) 2 and are so unlike those of nearly every other member of the Corvidae, the rook is at once distinguished from the rest by commonly losing at an early age the feathers from its face, leaving a bare, scabrous and greyish-white skin that is sufficiently visible at some distance. In the

comparatively rare cases in which these feathers persist, the rook may be readily known from the black form of crow (q.v.) by the rich purple gloss of its black plumage, especially on the head and neck, the feathers of which are soft and not pointed. In a general way the appearance and manners of the rook are well known, and particularly its habit of forming communities in the breeding-season, which it possesses in a measure beyond that of any other land bird of the northern hemisphere. Yet each of these communities, or rookeries, seems to have some custom intrinsically its own. In a general way the least-known parts of the rook's mode of life are facts relating to its migration and geographical distribution. Though the great majority of rooks in Britain are sedentary or only change their abode to a very limited extent, it is now certain that a very considerable number arrive in or towards autumn, not necessarily to abide, but merely to pass onward, like most other kinds of birds, to winter farther southwards; and, at the same season or even a little earlier, it cannot be doubted that a large proportion of the young of the year migrate in the same direction. As a species the rook on the European continent only resides during the whole year throughout the middle tract of its ordinary range. Farther to the northward, as in Sweden and northern Russia, it is a regular summer- immigrant, while farther to the southward, as in southern France, Spain and most parts of Italy, it is, on the contrary, a regular winter-immigrant. The same is found to be the case in Asia, where it extends eastward as far as the upper Irtish and the Ob. It breeds throughout Turkestan, in the cold weather visiting Afghanistan, Cashmere and the Punjab, and Sir Oliver St John found a rookery of considerable size at Casbin in Persia. In Palestine and in lower Egypt it is only a winter- visitant, and H. B. Tristram noticed that it congregates in great numbers about the mosque of Omar in Jerusalem. The same writer (Proc. Zool. Soc, 1864, p. 444; Ibis, 1866, pp. 68, 69) considered the Palestine rook entitled to specific distinction as Corvus Agricola. The rook of Chins has also been described as a distinct species, C. pastinator {Proc. Zool. Soc, 1845, p. 1) from having the feathers of its face only partially deciduous.

ROOKE, SIR GEORGE (1650-1709), English naval com- mander, was born near Canterbury in 1650. Entering the navy as a volunteer, he served in the Dutch Wars and became post- captain in 1673. After the Revolution of 1688, he commanded

1 The bird, however, does not inhabit Iceland, and the language to which the name belongs would perhaps be mere correctly termed Old Teutonic. From this word is said to come the French Freux. There are many local German names of the same origin, such as Rooke, Rouch,

Ruch and others, but the bird is generally known in Germany as the Saat-Krdhe, i.e. seed-(= corn-)crow.

2 This is the more noteworthy as the district in which he was born and educated is almost the only part of Italy in which the rook breeds. Shelley also very truly speaks of the “legioned rooks” to which he stood listening ” mid the mountains Euganean.”

II

the squadron which raised the siege of Londonderry in 1689. He became rear-admiral in 1690, and fought at the battle of Beachy Head. In May of 1692 he served under Russell at the battle of Barfleur, and he greatly distinguished himself in a night attack on the French fleet at La Hogue, when he suc- ceeded in burning six of their ships. Shortly afterwards he received the honour of knighthood and a reward of £1000. In 1693 he commanded the Smyrna convoy, which was scattered and partly taken by the French admiral Tourville near Lagos Bay. Till the peace of Nymwegen(i697),he continued to serve in the Channel and Mediterranean. In 1702 he commanded the expedition against Cadiz, and on the passage home destroyed the Plate fleet in Vigo. With Sir Cloudesley Shovel he took part in the capture of Gibraltar on the 21st of July 1704. On the 13th of August of the same year he attacked the French fleet off Malaga, the battle being drawn. On account of the dissatisfaction expressed indirectly at the result of the contest, he retired from the service in February 1705. He died on the 24th of January 1709.

Rooke’s Journal for 1700-2 has been printed by the Navy Record Society.

ROOM, originally a word meaning space or accommodation; the ordinary meaning of an apartment in a building, one of the interior divisions of a house, dates from the 15th century. The word is common to Teutonic languages, cf. Du. ruim, Ger. Rautn, Swed. and Dan. rum, with the original meaning of space. Skeat connects the word with the root seen in Lat. rus, open country.

ROON, ALBRECHT THEODOR EMIL, Count von (1803- 1879), Prussian general field-marshal, was born at Pleushagen, near Colberg, in Pomerania, on the 30th of April 1803. His family was of Flemish origin, and was settled in Pomerania. His father, an officer of the

Prussian army, died in poverty during the French occupation, and young von Roon was brought up, in a country ravaged in the War of Liberation and in straitened circumstances, by his maternal grandmother. He entered the corps of cadets at Kulm in 1816, whence in 1818 he proceeded to the military school at Berlin, and in January 1821 received a commission in the 14th (3rd Pomeranian) regiment quartered at Stargard in Pomerania. In 1824 he went through the three years' higher course of study at the war school in Berlin, where he also applied himself with the greatest energy to improving his general education. In 1826 he was transferred to the 15th regiment at Minden, but in the same year was appointed an instructor in the military cadet school at Berlin, where he devoted himself especially to the subject of military geography. He published in 1832 the well-known Principles of Physical, National and Political Geography, in three volumes (Grundziige der Erd-, V biker- und Staaten-Kunde) , which gained him a great reputation, and of which over 40,000 copies were sold in a few years. This work was followed in 1834 by Elements of Geography (Anfangs- grilnde der Erdkunde), in 1837 by Military Geography of Europe (M iliiarische Ldnderbeschreibung von Europa), and in 1839 by The Iberian Peninsula {Die Iberische Halbinsel).

Meantime, in 1832, he rejoined his regiment, and was after- wards attached to the headquarters of General von Muffling's corps of observation at Crefeld, when he first became alive to the very inefficient state of the Prussian army. In 1833 he was appointed to the Topographical Bureau at Berlin, in 1835 he entered the General Staff, and in the following year was pro- moted captain and became instructor and examiner in the military academy at Berlin. In 1842, after an illness of two years brought on by overwork, he was promoted to' be major and attached to the staff of the VII. corps, in which post he was again impressed with the inefficiency of the organization of the army, and occupied himself with schemes for its reform. Two years later, as tutor to Prince Frederick Charles, he attended him at Bonn university and in his European travels. In 1848 he was appointed chief of the staff of the VIII. Army Corps at Coblenz. During the disturbances of that year he served under the Crown Prince William (afterwards German emperor) in the suppression of the insurrection at Baden, and distinguished

himself by his energy and bravery, receiving the 3rd class of the order of the Red Eagle in recognition of his services. While attached to the Crown Prince's staff at that time he broached to him the subject of his schemes of army reform. In 1850 came the revelation of defective organization- and efficiency which led to the humiliating treaty of Olmtitz. In the same year Roon was made a lieutenant-colonel, and in

1851 full colonel. He now enjoyed the confidence of Prince William, and began active work as reorganizer of the army.

Promoted to be major-general in 1856 and lieutenant-general in 1859, Roon had held since 1850 several commands and had been employed on important missions. Prince William became regent in 1857, and in 1859 he appointed Roon a member of a commission to report on the reorganization of the army. Sup- ported by Manteuffel and Moltke, Roon was able to get his plans seriously considered and generally adopted. His aim was to create an armed nation, to extend Scharnhorst's system and to adapt it to Prussia's altered circumstances. To attain this he proposed a universal three years' service, and a reserve (Landwehr) for the defence of the country when the army was actively engaged. During the Italian War he was charged with the mobilization of a division. At the end of 1859, though the junior lieutenant-general in the army, he succeeded von Bonin as war minister, and two years later the ministry of marine was also entrusted to him. His proposals of army reorganization met with the bitterest opposition, and it was not until after long fighting against a hostile majority in the chambers that, with Bismarck's aid, he carried the day. Even the Danish campaign of 1864 did not wholly convince the country of the necessity of his measures, and it required the war with Austria of 1866 to convert obstinate opposition into enthusiastic support. After that von Roon, from being the best-hated man in Prussia, became the most popular, and his reforms were ultimately copied throughout continental Europe. He was promoted general of infantry at the outbreak of this war, was present at the brilliant and decisive victory of Koniggratz, and received the Black Eagle at Nikolsburg on the road to Vienna. His system, adopted after 1866 by the whole North German Con- federation, produced its inevitable result in the victorious war with France 1870-71, throughout which von Roon was in attendance on the German emperor. The fiftieth anniversary of his entrance into the army was celebrated at Versailles on the 19th of January 1871, when the emperor expressed his grati- tude for the great services he had rendered. He was created a count, and in December 1871, having resigned the ministries of war and marine, he succeeded Bismarck as president of the Prussian ministry Ill-health compelled him to resign in the following year. He was promoted to be field-marshal on the 1st of January 1873. He died at Berlin on the 23rd of February 1879.

After his death his son published the valuable Denkwurdigkeiten aus dem Leben des Generalfeldmarschalls Kriegsministers Grafen Roon (2 vols., Breslau, 1892), and Kriegsminister von Roon als Redner politisch und militdrisch erldutert (Breslau, 1895). His correspond-

ence with his friend Professor CI. Perthes, 1864-67, was also published at Breslau in 1895.

ROORKEE, or Rtjrki, a town of British India, in the Saharan- pur district of the United Provinces, on the Oudh & Rohilkhand railway, 22 m. E. of Saharanpur. Pop. (1901) 17,197. It is the headquarters of the workshops of the Ganges canal, and also of the Bengal Sappers and Miners. Two heavy batteries of artillery are usually stationed in the cantonment. The Thomason Civil Engineering College, founded in 1848, was transferred from the Public Works to the Education Department in 1895 and reorganized. It was instituted in order to train natives in engineering, and students originally received stipends. After 1875 the emoluments were limited, and became in the nature of scholarships, but the education of all students remained practically free till 1896, when fees began to be charged. The college works in co-operation with the workshops and foundry of the canal, and also trains in surveying, photo- graphy and other subjects, having chemical, physical, electrical and mechanical laboratories and workshops.

ROOSEVELT, THEODORE (1858-), twenty-sixth presi- dent of the United States, was born in New York City on the 27th of October 1858. The Roosevelt family 1 has been prominent in the life of New York for many generations, and is of Dutch origin. Mr Roosevelt's mother, Martha Bullock, came from a family of Scotch-Irish and Huguenot origin equally prominent in Georgia. Each family may lay just claims to a history of more than ordinary social and political distinction. Although born in New York, Mr Roosevelt spent much of his boyhood at Oyster Bay, the country home of his father, on Long Island Sound, where he began with a distinct purpose, unusual among boys of his age, to build up a naturally frail physique by rowing and swimming in the waters of Long Island Sound, and by riding over the hills and tramping through the woods of Long Island. That his early outdoor life furnished a definite training for his after career is indicated by the fact that when he was about fourteen years of age he went with his father on a tour up the Nile as far as Luxor, and on this journey he made a collection of Egyptian birds found in the Nile valley, which is now in the Smithsonian Museum in Washington, D.C. Mr Roosevelt was educated at Harvard University, where he graduated in the class of 1880; 2 his record for scholarship was creditable, and his interest in sports and athletics was especially manifest in his skill

as a boxer. On leaving college he made a short visit to Europe, was elected to the London Alpine Club for climbing the Jungfrau and the Matterhorn, and returning to New York studied law for a brief period in the Law School of Columbia University and in the office of his uncle Robert B. Roosevelt. Determining to enter active politics, he gave up his legal studies without qualifying for the bar, and in 1881 was elected to the New York legis- lature as a regular Republican, although in opposition to the ” boss” of the assembly district for which he was a candidate. He was elected again in 1882 and in 1883, and at the age of twenty-four was his party’s candidate for Speaker of the Assembly. In 1884 he was a delegate of the Republican party to the convention in Chicago which nominated James G. Blaine for president. In the convention he opposed the nomination of Mr Blaine, and in a speech which attracted considerable

1 Claas Martenszen van Roosevelt (or Rosenvelt) settled in New Amsterdam in 1649; his son Claas (or Nicholas) in 1700-1 was a New York alderman of the Leislerian party; in the next three generations, Johannes, Cornelius and Jacobus (James) were merchants and (in 1748-67, 1785-1801 and 1797-99 an d 1809, respectively) aldermen of New York; in the third generation the family became allied with the Schuylers. Isaac Roosevelt was a member of the Provincial Congress in 1775-77 an d of the state Senate in 1777-86 and in 1788-92; in the state Assembly were James Roosevelt (1796-97), Cornelius C. Roosevelt (1803), James I. Roosevelt, jun. (1835-40), and Clinton Roosevelt (1837- 40). James I. Roosevelt, jun. (1795-1875), was a Democratic member of the national House of Representatives in 1841-43, and a justice of the state Supreme Court in 1851-59. Nicholas J. Roosevelt (1767-1854), with John Stevens, Robert R. Living- stone and Robert Fulton, was prominent in the development of steam navigation. His brother, Cornelius van Schaik Roosevelt (1794-1871), was a founder of the Chemical National Bank of New York, and the grandfather of the president. The president’s uncle, Robert Barnweil Roosevelt (1829-1906), was a New York lawyer, New York state fish commissioner in 1866-68, a member of the Committee of Seventy which exposed the corruption of Tammany in New York City, a Democratic member of the national House of Representatives in 1871-73, U.S. minister to the Netherlands in 1888, and author of works on American game birds and fish. R. B. Roosevelt’s brother, the president’s father, Theodore Roosevelt (1 831-1878), was a glass importer, prominent in city charities, an organizer of the Union League Club, and the founder of the Ortho- paedic Hospital. A cousin, James Henry Roosevelt (1800-1863), was founder of the Roosevelt Hospital in New York City. The president’s mother, Martha Bullock,

was of an old Georgia family of Scotch-Irish and Huguenot extraction; her grandfather was Archibald Bullock (1730-1777), first president (1776-77) of Georgia; and her brother, James Dunwoody Bullock, often com- pared by Theodore Roosevelt to Colonel Newcome, was in the Confederate navy, and equipped in England vessels (including the ” Alabama “) as Confederate cruisers.

2 In the same year he married Alice Hathaway Lee of Boston, who died in 1884 leaving one daughter. Later (in 1886) he married Edith Kermit Carow of New York City, and by this marriage had four sons and one daughter.

attention for its vigour and courage advocated the nomination of Senator George F. Edmunds. After Mr Blaine’s nomina- tion, however, he supported him in the campaign as the chosen candidate of the party, in spite of the fact that an important wing of the Republican party ” bolted ” the nomination and espoused the candidacy of Grover Cleveland, who was elected president. In 1884, partly because his political life seemed at least for the immediate present to be at an end, partly on account of the freedom and activity of out-of-door life, he bought two cattle ranches near Medora on the Little Missouri river in North Dakota, where he lived for two years, becoming inti- mately associated with the life and spirit of the western portion of the United States.

In 1886 he was the Republican candidate for mayor of New York City, but was defeated by Abram F. Hewitt, the Tammany candidate, and received a smaller vote than Henry George, the candidate of the United Labor party. Mr Roosevelt, however, received a larger proportion of the total vote cast than any mayoralty candidate of the Republican party had previously received in New York City. In April 1889, on the accession to the presidency of Benjamin Harrison, Mr Roose- velt, then closely identified with the work of Civil Service reform, was appointed a member of the United States Civil Service Commission. In this office, until then one of minor importance, he served for six years. He made it not only nationally prominent, but instrumental in shaping the course of legislative and executive action by introducing into the work of the Commission an entirely new spirit and new methods. The annual reports, of which he was the chief author, became controversial pamphlets; he published bold replies to criticisms upon the work of the Commission; he explained its purposes to newspaper correspondents; when Congress refused to appro- priate the amount which he believed essential for the work, he made the necessary economies by abandoning examinations of candidates for the Civil Service in those districts whose representatives in Congress

had voted to reduce the appropria- tion, thus very shrewdly bringing their adverse vote into dis- favour among their own constituents; and during the six years of his commissionership more than twenty thousand positions for government employis were taken out of the realm of merely political appointment and added to the classified service to be obtained and retained for merit only. In 1895 he resigned from the Civil Service Commission and became President of the Board of Police Commissioners for the City of New York. After a strenuous two years in this office, he was appointed by President McKinley in 1897 assistant-secretary of the navy. He was certain that war with Spain was inevitable, and he did much to prepare the navy for hostilities, framing an important personnel bill, collecting ammunition, getting large appropriations for powder and ammunition used in improving the marksmanship of the navy by gunnery practice, buying transports and securing the distribution of ships and supplies (especially in the Pacific) in such a way that, when hostilities were declared, American naval victories would be assured. He urged upon the administration the bold policy of protesting against the sailing of Cervera's fleet, on the ground that it would be regarded as a warlike measure not against the Cuban revolutionaries, who had no navy, but against the United States; and he advised that, if Cervera sailed, an Ameri- can squadron be sent to meet him and to prevent his approach to America. At the outbreak of the war with Spain he resigned from the Navy Department and raised the first volunteer regiment of cavalry, popularly known as the " Rough Riders," because many of its members were Western cowboys and ranchmen expert in the handling of the rough and often un- broken horses of the Western frontier. The regiment also included college athletes, city clubmen and members of the New York police force, every man possessing some special qualification for the work in view. Mr Roosevelt declined the colonelcy of the regiment, preferring to take the post of lieutenant-colonel under his intimate friend Dr Leonard Wood, who, while a surgeon in the United States army, had served

in action with gallantry and skill against the Indians. On the promotion of Colonel Wood to the command of the brigade, Mr Roosevelt became colonel of the regiment, which took an especially prominent part in the storming of San Juan Hill. In this battle Colonel Roosevelt became the ranking officer and, abandoning his horse, led the charge up the hill on foot under severe fire at the head of his troops. This charge, in which many of the " Rough Riders " were

killed or wounded, drove the Spaniards from the trenches and opened the way to the surrender of Santiago. At the conclusion of the war, while the troops were still in camp in the South, Mr Roosevelt joined in a ” round robin ” of protest against the mismanagement in the War Department, which had resulted in widespread suffering among the troops from wretched food and bad sanitary arrangements. This ” round robin ” created a sensation which aroused public opinion and was instrumental in bringing about some desirable reforms in the War Department.

When his regiment was mustered out of service in September 1898, Mr Roosevelt was nominated by the Republican party for the governorship of New York State and was elected in November by a substantial plurality. He was governor for two years. He reformed the administration of the state canals, making the Canal Commission non-partisan; he introduced the merit system into many of the subordinate offices of the state; and he vigorously urged the passage of and signed the Ford Franchise Act (1899), taxing corporation franchises. In various contests, in which he was almost uniformly victorious, he showed himself to be independent of ” boss ” control. In 1900, although he wished to serve another term as governor in order to complete and establish certain policies within the state, he was nominated for the vice-presidency of the United States on the ticket with President McKinley by the Republican National Convention in Philadelphia in spite of his protest. It was very commonly believed at the time that this nomination for the vice-presidency was participated in and heartily approved of by the machine politicians or ” bosses ” of the State of New York in their belief that it would result in his elimination from active political life. The office of vice-president of the United States had so far in the history of the country been almost purely a perfunctory one, and has rarely, if ever, led to political promotion. The vice-president is ex officio president of the Senate, but has little voice or part in shaping either legislation or the affairs of the party. Mr Roosevelt never, however, presided over the deliberations of the Senate, because before the session following his inauguration convened he had ceased to be vice-president.

Upon the assassination of McKinley, on the 14th of Sep- tember 1901, he succeeded to the presidency. No previous president had entered the office at so early an age as forty-three. It was his frankly expressed wish to be nominated and elected president in 1904, and he was nominated unani- mously by the Republican National Convention at Chicago, and was elected in November of that year by the largest popular majority ever given to any candidate in any presi- dential election. He received 7,623,486 popular votes and 336 electoral votes

to 5,077,971 popular votes and 140 electoral votes cast for Judge Alton B. Parker, the nominee of the Democratic party. Immediately after his election he publicly declared that he would not accept the nomination for the presidency in 1908, and he adhered to that pledge in spite of great popular pressure brought to bear upon him to accept the nomination of the party for another term. The nomination and election of President Taft, who had been a member of Mr Roosevelt's cabinet, was very largely due to the latter's great influence in the party. On March 23rd, two weeks after he ceased to be president, Mr Roosevelt sailed for Africa, to carry out a long-cherished plan of conducting an expedition for the purpose of making a scientific collection of the fauna and flora of the tropical regions of that continent. Expert naturalists accompanied the party, which did not emerge from the wilderness until the middle of the following March, bringing with it a collection which scientists

pronounce of unusual value for students of natural history. Most of the specimens were sent to the National Museum of the Smithsonian Institution at Washington. The experiences of his African journey were recorded by Mr Roosevelt in a volume entitled African Game Trails: The Wanderings of an American Hunter Naturalist. The spring and early summer of 1 9 10 were spent by Mr Roosevelt in travelling through Egypt, the continent of Europe, and England, in acceptance of invitations which he had received to make various public speeches in these countries. Honorary academic degrees were conferred upon him by the universities of Cairo, Christiania, Berlin, Cambridge and Oxford, and he was given both popular and official ovations of almost royal distinction — ovations which were repeated by his own countrymen on his return to America. It may be said without exaggeration that no American public man in the history of the country has achieved such extraordinary popularity during his lifetime as Mr Roosevelt had attained at fifty years of age, both at home and abroad. Great popularity necessarily brings with it bitter enmity and genuine criticism. To understand clearly his career as a public man, and to appreciate the forces at work which caused both the popularity and the enmity, two facts must be kept dis- tinctly in mind: first, that at twenty-two years of age he deliberately decided to make politics his life-work at a time when in the United States the word " politics " had a sinister sound in the ears of almost all of the so-called cultivated classes; and secondly, that in making this deliberate choice he recognized that the government of the United States is. primarily a party government. He therefore allied himself with the Republican party, to which by tradition, by family association, and by political principles he was naturally drawn.

In the history of the United States the politician has been too often the man who, in connexion with some other trade or profession, has taken up politics as a tool to carve out some personal ambition or manufacture a financial profit. Mr Roosevelt from the beginning apparently believed with the lexicographers that politics is the science and practice of government. He has himself told the story of an early experience that illustrates his point of view. When in 1881 he decided to join the Republican Association of his assembly district in New York City, members of his family were shocked. ” You will find at the meetings, ” they said, ” nobody but grooms, liquor dealers and low politicians.” ” Well, ” said Mr Roosevelt in reply, ” if that is so, they belong to the governing class, and you do not. I mean if I can to be one of the governing class. ” He forthwith became an active member of the political organization of his district. He also early determined to work with his party as being the only way in which a legislator can work. A free lance, an independent, a journalist, or a preacher, without definite political affiliations, may create public opinion, but a legislator or an administrator must belong to a party. Mr Roosevelt was severely criticized by many “independent Republicans” for having supported the presidential candidacy of James G. Blaine in 1884, when he had vigorously opposed his nomination in the convention on moral grounds. The reply to this criticism is that Mr Blaine was the choice of the majority of the party, and that while Mr Roosevelt felt free to fight within the party vigorously for reform, he did not feel that the nomination justified a schism like that which occurred in the Democratic party over the free silver issue in 1896 — a schism which remained after- wards a hopeless weakness in that party. His position in the Blaine campaign, his attitude in tariff discussions and legisla- tion, his relations with United States senators, congressional representatives, and other party leaders, his methods in making official appointments, were entirely consistent with his con- stantly reiterated conviction that in politics permanent good is achieved not by guerilla warfare, but by working through and within the party. He was so often accused by political purists for associating politically with men of discredited reputation that his own picturesque statement of his con- version to a belief that in legislative or administrative politics

one must work with all sorts and conditions of men is illuminating. This statement is related by his intimate friend Jacob A. Riis, 1 to whom Mr Roosevelt made it in commenting upon his first political

success in the New York legislature.

” I suppose that my head was swelled. It would not be strange if it was. I stood out for my own opinion alone. I took the best ‘ mugwump ‘ stand — my own conscience, my own judgment were to decide in all things. I would listen to no argument, no advice. I took the isolated peak on every issue, and my associates left me. When I looked around, before the session was well under way, I found myself alone. I was absolutely deserted. The people didn’t understand. The men from Erie, from Suffolk, from any- where, would not work with me. ‘ He won’t listen to anybody,’ they said, and I would not. My isolated peak had become a valley ; every bit of influence I had was gone. The things I wanted to do I was powerless to accomplish. I looked the ground over, and made up my mind that there were several other excellent people there, with honest opinions of the right, even though they differed from me. I turned in to help them, and they turned to and gave me a hand. And so we were able to get things done. We did not agree in all things; but we did in some, and those we pulled at together. That was my first lesson in real politics. It is just this: if you are cast on a desert island with only a screw-driver, a hatchet and a chisel to make a boat with, why, go make the best one you can. It would be better if you had a saw, but you haven’t. So with men. Here is my friend in Congress who is a good man, a strong man, but cannot be made to believe in some things in which I trust. It is too bad that he doesn’t look at it as I do, but he does not, and we have to work together as we can. There is a point, of course, where a man must take the isolated peak and break with all his associates for clear principle: but until that time comes he must work, if he would be of use, with men as they are. As long as the good in them overbalances the evil, let him work with them for the best that can be obtained.”

In his successive offices Mr Roosevelt not merely exerted a strong influence upon the immediate community, whose official representative he was at the time being, but by reason both of his forceful personality and of the often unconventional, although always effective, methods of work which he employed he achieved a national prominence out of ordinary proportion to the importance of his official position. His record in the Assembly was such that his party nominated him for the mayoralty of the city of New York when he was absent on his ranch in Dakota. Although defeated in the mayoralty election, his work on behalf of the merit system, as opposed to the spoils system of politics, was such that he was made a Civil Service commissioner — probably the last office a politician would wish to hold who desired further promotion, for the conflict which a Civil Service commissioner must have with members of Congress and

other party leaders on questions of patronage is usually, or, at any rate, has been in the past history of American politics, inevitably detrimental to further official advancement. He was taken from the Federal service in Washington to New York City by a reform mayor and put in charge of the police, because he had shown both physical and moral courage in fighting corruption of all sorts; and the New York police force at that time was thoroughly tainted with corruption, not in its rank and file, but among its superior officers, who used the power in their hands to extort money bribes chiefly from saloon-keepers, liquor-dealers, gamblers and prostitutes. As police commissioner Mr Roosevelt brought to his side every honest man on the force. By personal detective work, that is, by visiting police stations at unexpected times and by making the rounds at night of disorderly places which were suspected of violating the law, he not only displayed personal courage in positions of some danger, but aroused public opinion. The very sensation created by the novelty of his methods set standards and started reforms which have greatly improved the morale of the entire force. The hopelessly vicious policemen hated him, but no man ever had a stronger personal hold upon the great body of the honest officers — a hold which existed long after he left the police department , and was frequently expressed by members of the force as he passed through the city streets. When he became assistant- secretary of the navy, his work was not so publicly conspicuous,

1 In a volume entitled Roosevelt the Citizen, which, while it is frankly written as the enthusiastic tribute of a personal admirer, may be relied upon for accuracy in its, statement of historical or biographical facts.

but in this office he gained an experience which was of great value in his administration of naval affairs during his presidency. It is doubtful if, without the experience of this secretaryship, he could have successfully originated and carried out the plan of sending the United States navy around the world in 1907. He went to the Spanish War as a volunteer against the urgent wishes of his political advisers, and in spite of the protests of some of his best and most intimate friends. The conditions in Cuba had long convinced him that war with Spain was inevit- able, and that, for humane reasons alone, it was both right and necessary to drive the Spanish power out from the Carribean Sea. Having urged this view upon the country, when war was declared he felt that it would be inconsistent for him not to share personally in the perils of a conflict which he believed to be a just one, and which he had done as much as he could to bring about. His record in the war for efficiency and personal gallantry no doubt contributed largely to his nomination and election as governor of the state of New York; but

he attained the governorship not on this ground alone. There are many instances in American politics of nominations made solely on a war record which have led to hopeless defeat in election. His work in the governorship brought him still more into prominence as a national leader. His uncompromising antagonism to political blackmail and bribery, and his determination to pursue the right, as he saw the right, only in a common-sense fashion, made bitter enemies on the one hand among the corrupt politicians, and, on the other hand, among theoretical reformers, and discussions raged in the newspapers about his executive acts, his speeches, and his official messages much as they raged during his seven years in the White House. If he had never reached the presidency he would probably have been a figure long remembered in American political life. But it was his course in the presidency that gave him his international reputation, and it is as President Roosevelt that future historians of American political life must chiefly discuss him.

Mr Roosevelt entered the presidency definitely committed to two principles which profoundly affected his course as chief executive of the United States. He had a well wrought-out belief in centralized authority in government and a passionate hatred of political and commercial corruption. He believed the United States to be a unified republic, a sovereign nation, and not a federation of independent states united only for mutual benefit and protection. He not only hated corruption per se, but he clearly saw that as efficiency has a greater power for good, so corruption has a greater power for evil in a strongly centralized government. He understood that political materialism, selfishness and corruption in federal administration afford the strongest possible argument for those who advocate strengthening the independent power of the separate states at the expense of nationalism. At the very outset of his administration he therefore set himself to work, not only to improve the personnel of the government service, but by exhortations in his messages and public speeches to arouse a sense of civic responsibility both among office-holders and among all the citizens. His official messages to Congress, probably more frequent, certainly much longer than those of any of his predecessors, were quite as often treatises on the moral principles of government as they were recommendations of specific legis- lative or administrative policies. The effect of his exhortations, as well as of his personal character and public acts, upon the standards and spirit of official life in the United States, was a pronounced one in attracting to the federal service a group of men who took up their work of public office with the same spirit of enthusiasm and self-sacrifice that actuates the military volunteer in time of war. No American president

has done so much to discredit and destroy the old Jacksonian theory of party government that ” to the victors belong the spoils,” and to create confidence in the practical success as well as the moral desirability of a system of appointments to office which rests upon efficiency and merit only. Mr Roosevelt not only attacked dishonesty in public affairs but in private business as well, asserting that ” malefactors of great wealth ” endeavour to

control legislation so as to increase the profits of monopolies or ” trusts,” and that to prevent such control it is necessary to extend the powers of the federal government. In carrying out this policy of government regulation and supervision of cor- porations he became involved in a great struggle with the powerful financial interests whose profits were threatened, and with those legislators who sincerely believed that government should solely concern itself with protecting life and property, and should leave questions of individual and social relations in trade and finance to be settled by the operation of so-called natural economic laws. In the struggle, although he was bitterly accused of violating the written constitution, of arrest- ing and destroying business prosperity and of attempting a radical departure from the accepted social system of the country, he was remarkably successful. By his speeches and messages, and by his frank use of one of the greatest of modern social engines — the newspaper press — he created a public opinion which heartily supported him. Under his effective influence laws were framed which were not merely in them- selves measures of stringent regulation of business and the accumulation of wealth, but which established precedents, that as time goes on will inevitably make the doctrine of federal control permanent and of wider application. The struggle against some of the most powerful financial and political influences of the time not unnaturally gave rise to the idea that his work as president was destructive — perhaps the necessarily destructive work of the reformer— but not essentially con- structive. Even those friendly to him sometimes felt it necessary to defend his political course by saying that he was compelled to raze the old buildings and prepare the ground on which his successors might build new and better structures. A brief consideration of some of the constructive achievements of his administration will show that the ” destructive” theory of his political activities is not sustained by the facts. ,

Civil Service Reform. — Some reference has already been made to the

fact that in every office which Mr Roosevelt held he constantly dwelt upon the truism, often forgotten or ignored, that no govern- ment can accomplish any permanent good unless its administrative and legislative officers are chosen and maintained for merit only. As assemblyman, as police commissioner, as naval secretary and as president, he advocated this fundamental doctrine. When Federal Civil Service commissioner he did more than any other single public man in the United States has had either the ability or the oppor- tunity to do, to promote the doctrine of service for merit only out of the realm of theory into the realm of governmental practice. While he was criticized by the friends of Civil Service Reform for not going far enough during his presidency to protect the encroach- ments of those who desire to have the offices distributed as political rewards or for partisan ends, such specific acts as his transference to the classified service of ail fourth-class postmasters east of the Mississippi and north of the Ohio rivers, his insistence upon a thorough investigation of the scandals in the Post Office department, and his order forbidding federal employes to use their offices for political purposes in the campaign of 1908 are typical of his vigorous support of the merit system.

Conservation of National Resources. — If Mr Roosevelt did not invent this term he literally created as well as led the movement which made Conservation in 1910 the foremost political and social question in the United States. The old theory was that the general prosperity of the country depends upon the development of its natural resources — a development which can best be achieved by private capital, acting under the natural incentive of financial profits. Upon this theory public land was either given away or sold for a trifle by the nation to individual holders. While it is true that the building of railways, the opening of mines, the growth of the lumber industry and the settlement of frontier lands by hardy pioneers was rapidly promoted by this policy, it also resulted naturally in the accumulation of great wealth in the hands of a comparatively few men who were controlling lumber, coal, oil and railway transportation in a way that was believed to be a menace to the public welfare. Nor was the concentration of wealth the only danger of this policy; it led to the destruction of forests, the exhaustion of farming soils and the wasteful mining of coal and minerals, since the desire for quick profits, even when they entail risk to permanency of capital, is always a powerful human motive. Mr Roosevelt not only framed legislation to regulate this concentration of wealth and to preserve forests, water power, mines and arable soil, but organized departments in his administra- tion for carrying his legislation into effect (see Irrigation: United

States). His official acts and the influence of his speeches and

messages led to the adoption by both citizens and government of a new theory regarding natural resources. It is that the government acting for the people, who are the real owners of all public property, shall permanently retain the fee in public lands, leaving their products to be developed by private capital under leases which are limited in their duration and which give the government complete power to regulate the industrial operations of the lessees.

Government Regulation of Corporations. — The growth of the corporation as an industrial machine had in recent years been very rapid in the United States. The industrial and financial corpora- tions had grown so powerful as to venture to contend for the first place with the authority of the government itself. As Mr Roose- velt often pointed out, no nation will live long in which the authority of government — especially in a democracy — is supplanted by the private interest of a real money power. Early in his political career, Mr Roosevelt foresaw this conflict, and as president he aroused public opinion so that the people understood it, and threw his effective influence into the framing of legislation under which the Federal government is now successfully combating the illegal acts of the powerful trusts. He established the Federal Department of Commerce and Labor, the secretary of which has a seat in the cabinet, and in which there exists a bureau of corporations possessing the specific function of inspecting and supervising interstate cor- porations — an entirely new feature in American government. He strengthened the interstate commission for the regulation of railroads, inaugurated successful suits against monopolies — notably the Standard Oil Company and the so-called Sugar Trust, — and achieved distinct practical results in favour of a system of ” industrial democracy ” where all men shall have equal rights under the law and where there shall be no privileged interests exempt from the operation of the law. Both his friends and his enemies agree that he did more than any other public man to effect these changed relations of government and industry. There is, however, a violent disagreement regarding the desirability and the results of his course. His critics assert that he simply interrupted the orderly course of business, inspired panic and dangerously arrested prosperity. Mr Roosevelt and his supporters were convinced that his policy was necessary to save the country from the social and political dangers of plutocracy, and that in establishing a definite system of government regulation not only were popular rights preserved and justice promoted but industrialism and finance were placed upon a basis of regularity and honesty that paved the way for an era of general prosperity in the United States, un hampered by feverish

speculation and shrewd scheming, such as the country had so far in its history been unable to enjoy.

The Army and Navy. — Mr Roosevelt was a pronounced advocate of international peace but also an advocate of law and order. He believed that international controversies would ultimately be settled by judicial procedure, and in the Russo-Japanese War and the establishment of the Hague Court he took an active part in pro- moting the judicial settlement of disputes between nations. For his efforts leading to the settlement of the Russo-Japanese War he received the Nobel Peace Prize, and in May 1910 he delivered an address on ” International Peace ” before the Nobel committee in Christiania. But, with this advocacy of international peace, he also advocated the maintenance by the United States of an efficient and thoroughly equipped army and navy. To some of his critics these two positions seem inconsistent. Mr Roosevelt argued not only that they were consistent but that the one logically followed the other. In his Nobel address he said: ” In any community of any size the authority of the courts rests upon actual potential force; on the existence of a police or on the knowledge that the able-bodied men of the country are both ready and willing to see that the decrees of judicial and legislative bodies are put into effect;” and he expressed the opinion that until a recognized international supreme court was firmly established, every nation must be prepared to defend itself, and when it was established all the nations must be prepared to maintain its decrees against any recalcitrant nation. On this ground during his presidential administration Mr Roosevelt was deeply concerned in many measures for improving the admini- strative side of the War Department and educating, training and strengthening the army. Although he himself served in the army during the Spanish War his special interest was in the navy, springing probably from his relationship with the navy during his brief term as assistant secretary. The successful and dramatic voyage of the American fleet around the world, undertaken in spite of pre- dictions of disaster made by naval experts in Europe and the United States, was conceived and inspired by him, and this single feat would alone justify the statement that no American public man had done so much since the Civil War as he to strengthen the physical power and the moral character of the United States navy.

The Panama Canal. — The greatest single material achievement of Mr Roosevelt’s presidency was the taking over by the United States of the project to build a Panama Canal. The project itself is nearly four centuries old; for a century Great Britain and the United States had been sometimes in friendly, sometimes in acrimonious dispute as to how this was to be accomplished ; the French undertook the work and

failed. Mr Roosevelt recognized the new republic of Panama, and obtained from it for

the United States, in return for &■ commercial and military protection advantageous to Panama, the right to build a canal and control it in perpetuity. His critics said that his course in this matter was unconstitutional, although the question of constitution- ality has never been raised before any national or international tribunal. The fact remains that the construction of the Panama Canal was undertaken to the practical satisfaction to the civilized world. But for Mr Roosevelt's vigorous official action and his characteristic ability to inspire associates with enthusiasm the canal would still be a subject of diplomatic discussion instead of a physical actuality.

Colonial Policy. — Strictly speaking, the United States has no colonial policy, for the Philippine Islands and Porto Rico can scarcely be called colonies. It has, however, a policy of territorial expansion. Although this policy was entered upon at the conclusion of the Spanish War under the presidency of Mr McKinley it has been very largely shaped by Mr Roosevelt. He determined that Cuba should not be taken over by the United States, as all Europe expected it would be, and an influential section of his own party hoped it would be, but should be given every opportunity to govern itself as an independent republic; by assuming supervision of the finances of San Domingo, he put an end to controversies in that unstable republic, which threatened to disturb the peace of Europe ; and he personally inspired the body of administrative officials in the Philippines, in Porto Rico and (during American occupancy) in Cuba, who for efficiency and unselfish devotion to duty compare favourably with any similar body in the world. In numerous speeches and addresses he expressed his belief in a strong colonial government, but a government administered for the benefit of the people under its control and not for the profit of the people at home. In this respect, for the seven years of his administration at Washing- ton, he developed a policy of statesmanship quite new in the history of the United States.

No account of Mr Roosevelt's career is complete without a reference to his literary work, which has been somewhat overshadowed by his reputation as a man of public affairs. He was all his life an omnivorous reader of the best books in very varied fields of literature, and he developed to an unusual degree the faculty of digesting and

remembering what he has read. His history of the War of 181 2 between the United States and Great Britain, written when he was twenty- four years old, is still the standard history of that conflict, and his Winning of the West is probably the best work which has been written on American frontier life of the 19th century, a life that developed certain fundamental and distinctive Ameri- can social and political traits. His African Game Trails, the record of his scientific hunting expedition in Africa in 1909-10, is much more than a narrative of adventures on a wild continent. It is a study of social and ethnological conditions, and contains many passages of literary charm, describing bird life, animal life and natural scenery. An appendix that gives some account of the " Pigskin Library" which he carried with him for daily reading in the heart of Africa is a surprising exposition of the wide range of his reading. As a public speaker his style was incisive, forceful and often eloquent, although he made no effort to practise oratory as an art. The volume of his African and European addresses, published in the autumn of 1910, not only presents an epitome of his political philosophy, but discloses the wide range of his interest in life and the methods by which he had striven to bring public opinion to his point of view.

Personally of great physical and mental vigour, his work was done at high pressure and he had the faculty of inspiring his colleagues or his subordinates with his own, enthusiasm for doing things. The volume of his letters and his writings in books, articles for the press and speeches and official messages, is enormous, and yet this work was done in the midst of the executive labours of a long political career. Besides being famous as a hunter of big game, he was a skilful horseman and a good tennis player. Regular physical exercise in the open air contributed much to his abounding vitality. A man of decisive action when his mind was made up on any given question, his very decisiveness sometimes gave the impression that his judgments were hasty. On the contrary, few men were more deliberate in considering all sides of an important problem. His long experience, his wide reading and his thorough knowledge of all sorts and conditions of men, enabled him to act quickly at a time of crisis, but his important speeches,

or a course of political action that might be far-reaching in its effect, were not cast into their final form without careful con- sultation with the best advisers he could obtain. The first form of his written speeches was always painstakingly edited and revised, and not infrequently entirely rewritten. He ex- pressed his own judgment of his success as a public man by say- ing that it was not due to any special gifts or genius, but to the fact that by patience and laborious

persistence he had developed ordinary qualities to a more than ordinary degree. (L. F. A.)

The following is a list of his principal works: — The Naval Operations of the War between Great Britain and the United States — 1812-1815 (1882), written to correct the history of James; Thomas Hart Benton (1887) and Gouverneur Morris (1888), both in the American Statesmen Series; New York City (1891; revised 1895) i n the Historic Towns Series; Hero Tales, from American History (1895) with H. C. Lodge; Winning of the West (4 vols., 1889-96); a part of the sixth volume of the History of the Royal Navy of England (1898) by W. L. Clowes; The Rough Riders (1899); Oliver Crom- well (1901); the following works on hunting and natural history, Hunting Trips of a Ranchman (1886), Ranch Life and Hunting Trail (1888), The Wilderness Hunter (1893), Big Game Hunting in the Rockies and on the Plains (1899; a republication of Hunting Trips of a Ranchman and The Wilderness Hunter), The Deer Family (1902), with other authors, and African Game Trails (1910) ; and the essays, American Ideals (2 vols., 1897) and The Strenuous Life (1900) ; and State Papers and Addresses (1905) and African and European Ad- dresses (1910). Several of his works have been translated into French and German. Uniform editions were published in 1900 and 1903. Early in 1909 he became a “contributing editor” of the Outlook.

The biographical sketches by Jacob A. Riis (New York, 1904), F. E. Leupp (ibid., 1904), G. W. Douglas (ibid., 1907), James Morgan (ibid., 1907), and Murat Halstead (Akron, 1902) are personal or political eulogies. John Burroughs’s Camping and Tramping with Roosevelt (Boston, 1907) is an appreciation of Roosevelt as a naturalist. J. W. Bennett, Roosevelt and the Republic (New York, 1908), is bitterly hostile. There is a sketch by F. V. Greene in Roosevelt’s American Ideals.

ROOT, ELIHU (1845-), American lawyer and political leader, was born at Clinton, New York, on the 15th of February 1845, the son of Oren Root (d. 1885), professor of mathe- matics at Hamilton College from 1840-81. He graduated at Hamilton College in 1864, taught at the Rome (N.Y.) Academy in 1865, and graduated at the University Law School, New York City, in 1867. As a corporation lawyer he soon attained high rank and was counsel in many famous cases. Politically, he became identified with the reform element of the Republican party. He was United States attorney for the Southern District of New York (1883-85), and a delegate to the State Constitutional Convention of 1894, acting as chairman of its judiciary committee. From August 1899 unt il February 1904 he was secretary of war in the cabinets of

Presidents McKinley and Roosevelt, and in this position reorganized the army and created a general staff, and in general administered his depart- ment with great ability during a period marked by the Boxer uprising in China, whither troops were sent under General A. R. Chaffee, the insurrection of the Filipinos, the withdrawal of the United States troops from Cuba, and the establishment of a government for the Philippines under a Philippine Com- mission, for which he drew up the " instructions," in reality comprising a constitution, a judicial code and a system of laws. In 1903 he was a member of the Alaskan Boundary Tribunal. In July 1905 he re-entered President Roosevelt's cabinet as secretary of state. In the summer of 1906, during a visit to the Pan-American Conference at Rio de Janeiro, he was elected its honorary president, and during a tour through the Latin- American republics, brought about a better understanding between the United States and these republics. In general he did much to further the cause of international peace, and he concluded treaties of arbitration with Japan, Great Britain, France, Italy, Spain, Portugal, Austria-Hungary, Switzerland, Norway, Sweden, Denmark, Holland and other countries. Upon his resignation from the cabinet he was elected, in January 1909, as United States senator from New York. In 1910 he was chief counsel for the United States before the Hague tribunal for the arbitration of the long-standing dispute con- cerning fisheries between his country and Great Britain (see Newfoundland). He received the degree of LL.D. from

Hamilton, 1896; Yale, 1900; Columbia, 1904; New York University, 1904; Williams, 1905; Princeton, 1906; Uni- versity of Buenos Aires, 1906; University of San Marcos, of Lima, 1906; and Harvard, 1907.

ROOT (late O.E. rot, adopted from Scand., cf. Norw. and Swed. rot, Dan. rod; the true O.E. word was wyrt, plant, repre- sented in Ger. Wurz or Wurzel; the ultimate root is the same in both words, and is seen in Lat. radix), the underground part of a plant. This is the popular meaning of the word. In its botanical use the term is more restricted (see below). The various other meanings have all developed from this, its primary, significance. Of these the principal are: the source or origin of a condition, state, quality, &c. ; the base or embedded part of a structure of the body, such as a nail, tooth, the hair, &c; in mathematics, a number, quantity or dimension which produces a given expression when multiplied by itself a requisite number of times; and in philology an ultimate element of language,

incapable of further analysis. A par- ticular extension of the primary meaning is that which applies the word generally to a class of plants, such as the turnip or carrot, whose root is fleshy, and edible either by man or domestic animals.

The embryo of a. typical plant, for instance a pea plant (fig. 1), has an ascending axis which will grow into the shoot, and a descending axis or radicle which will grow into the root.

When the seed germinates, the radicle is the first to appear; it grows downwards, and its primary function is to act as a holdfast for the plant; its most important function, however, is the absorption of water and „ „„ _. , . dissolved nutrient substances

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c, c, the two fleshy coty- quently serves for storage of food-

ledons, or seed-lobes, which stuffs. The root is distinguished

remain under ground when f rom underground shoots by not

SSicSTeSS of Z faring leaves and by having

axis which develops into its apex (growing point) pro-

the root; /, the axis bearing tected by a cap (root-cap), which

the young stalk and leaves can t, e clearly seen by mak-

& ThJ’tt f Jo„t f depresslon ing a median vertical section 01 the cotyledons/. , , , . ,

through the root-tip; the cap

protects it in its passage through the soil. The root also generally bears root-hairs, slender unicellular outgrowths of

the outer layer, borne in the region a little behind the root- tip. It is by means of the root – hairs especially that the root is brought into close rela- tion with the soil particles and absorbs the nutrient materials in solution in the water which sur- rounds these particles. The older root-hairs are continually dying off, so that they are borne only on a small part of the area behind the apex. Branches of the root, which repeat the form and structure of the main root, are developed in regular succes- sion from above downwards (acropetal), and owing to the fact that they originate in a definite position in the interior of the root

(endogenous) they develop in longitudinal rows and have to break through the overlying tissue of the parent root (fig. 2). True forking of the root (dichotomy) occurs in the Lycopodiaceae (the shoots of which also branch dichotomously), but is unknown in the higher plants.

From Vines's Student's Botany, by permission.

Fig. 2. — Lateral Roots n aris- ing endogenously from the pericycle of the Tap-Root of Vicia Faba (longitudinal section. /, axial cylinder (stele); r, cortex of main root; h, root-cap of lateral root.'

Roots which originate elsewhere than as acropetal out- growths of a main root are known as adventitious, and may

From Green's Vegetable Physiology, by permission.

Fig. 3 a and b. Root-hair in contact with par- I Ultimate root-branches, showing tides of soil (highly magnified). I position of root-hairs.

arise on any part of a plant. They are especially numerous on underground stems, such as the under side of rhizomes, and also develop from stem nodes under favourable conditions, such as moisture and absence of light ; a young shoot or a cutting placed in moist soil quickly forms adventitious roots. They may also arise from leaves under similar conditions, as, for instance, from begonia leaves when planted in soil.

The forms of roots depend on their shape and mode of branching. When the central axis goes deep into the ground in a tapering manner, without dividing, a tap-root is produced. This kind of root is sometimes shortened, and becomes swollen by storage of food-stuffs, forming the conical root of carrot, or the fusiform or spindle-shaped root of radish, or the napiform root of turnip. In ordinary forest trees the first root protruded continues to elongate and forms a long primary root-axis, whence secondary axes come off. In primary plants, especially Monocotyledons, the primary axis soon dies and the secondary axes take its place. When the descending axis is very short, and at once divides into thin, nearly equal fibrils, the root is called fibrous, as in many grasses (fig. 4) ; when the fibrils are thick and succulent, the root is fasciculated, as in Ranunculus Ficaria, Asphodelus luteus, and Oenanthe crocata; when some of the fibrils are developed in the form of tubercules, the root is tubercular, as in dahlia (fig. 5) ; when the fibrils enlarge in certain

Fig. 4. — Fibrous Root of a Grass. Numerous fibrils coming off from one point.

From Strasburger's Lehrbuch der Botanik, mission of Gustav Fischer.

Fig. 5.— Root-Tubers of Dahlia variabilis, s, the lower portions of the cut stems.

parts only, the root is" 'nodulose, as in Spiraea Filipendula, or moniliform, as in Pelargonium triste, or annulated, as in Ipecacuanha. Some of these so-called roots are formed of a stem and root combined, as in Orchis (fig. 6), where the tuber consists of a fleshy swollen

root bearing at the apex a stem bud. As in the case of the stem, growth in length occurs only for a short distance behind the apex, but in long-lived roots increase in diameter occurs continually in a similar . manner to growth in thickness in the stem.

Roots are usually underground and colour- less, but in some cases where they arise from the stem they pass for some distance through the air before reaching the soil. Such roots are called aerial. They are well seen in the screw-pine {Pandanus), the Banyan {Ficus indica, fig. 7), and many other species of Ficus, where they assist in supporting the stem and branches. In the mangrove they often form the entire support of the stem, which has decayed at its lower part. In tree- ferns they form a dense coating around, and completely concealing, the stem; such is also the case in some Dracaenas and palms. In. Epiphytes, or plants growing in the air, attached to the trunks of trees, such as orchids of warm climates, the aerial roots produced uaot Q f do not reach the soil; they continue always piant oˆOrchis aer '?' arK * greenish, and they possess stomata. showing tuber- Delicate hairs are often seen on these epi- cules or tuberous P n y ta ' roots, as well as a peculiar spongy roots investment formed by the cells of the epi-

dermis which have lost their succulent con- tents and are now filled with air. This layer is called the velamen, and serves to condense the moisture contained in the air, on which

Fig. 7. — Ficus indica, the Banyan tree, sending out numerous aerial roots, which reach the soil, and prop the branches.

the plant is dependent for its water-supply. The aerial roots of the ivy are not the nutritive roots of the plant, but are only intended for mechanical support. The climbing roots of many orchids, aroids and epiphytic ferns branch and form places of lodgment for humus into

which absorbent branches of the climbing roots penetrate. Some leafless epiphytic orchids, such as species of Angraecum, depend entirely upon their aerial roots for nourishment; the roots, which are green, perform the functions both of leaves and roots. A respiratory or aerating function is performed by roots of certain mangroves growing in swampy soil or water and sending vertical roots up into the air which are provided with aerating passages by which the root system below can communicate with true outside air. Parasitic plants, as the mistletoe (Viscum) , broom-rape (Orobanche) and Rafflesia, send root-like processes into the substance of the plants whence they derive nourishment. In the dodder (Cuscuta), the tissue around the root swells into a kind of sucker (haustorium), which is applied flat upon the other plant, and ultimately becomes concave, so as to attach the plant by a vacuum. From the bottom of the sucker the root protrudes, and penetrates the tissue of the host plant. Leaf-buds are sometimes formed on roots, as in plum, cherry and other fruit trees; the common elm affords an excellent example, the young shoots which grow up in the neighbourhood of a tree arising from the roots beneath the soil. In some plants no roots are formed at all; thus in the orchid Corallorhiza, known as coral-root, a stem-structure, the shortly branched underground rhizome, performs all the functions of a true root which is absent. In aquatic plants the root acts merely as a holdfast or is altogether absent as in Salvinia, Utricularia and others.

ROPE and ROPE-MAKING. All varieties of cordage having a circumference of an inch or more are known by the general name of ” rope.” Twisted cordages of smaller dimensions are called cords, twines and lines, and when the sectional area is still smaller, the article is known as thread or doubled yarn. All these varieties of cordage are composed of a number of separate yarns, each of which is made from some kind of textile fibre by preparing and spinning machinery. The number of separate yarns which ultimately form the rope or cord depends upon the fineness of the yarn, and also upon the circumference of the finished article. From thread and fine twine upwards the whole art of manufacture is that of twisting together fibres and yarns; but the comparative heaviness and coarseness of the materials operated on in rope-making render necessary the adoption of heavy machinery and modified processes which clearly define this manufacture as a distinct calling. The modern trade of rope-making is again divided into two distinct branches dealing with vegetable fibres and metallic wire.

Many different vegetable fibres are used for rope-making, but for the combined qualities of strength, flexibility and durability, none can compete with the common hemp, which is consequently the staple of

the rope-maker. Cotton ropes are, however, much more flexible, and in addition are strong and durable; they are, therefore, much preferred for power transmission in textile and other works. Manila hemp is a fibre of remarkable tenacity, of unapproached value for heavy cordage, but too stiff for small cords and twines. After these in utility come Sisal hemp of Central America {Agava Sisalana), Phormium hemp of New Zealand {Phormium tenax) and Sunn hemp of the East Indies {Crotalaria juncea) — all fibres of great strength, and largely used by rope-makers. Jute (q.v.) of India {Corchorus capsularis and C. olitorus) is now largely used by rope-makers on account of its cheapness. When used alone it is deficient in strength and durability, but when used in conjunction with proper proportions of hemp it makes a very satisfactory and useful rope. Among fibres more rarely seen in rope-works are Jubbulpore hemp {Crotalaria tenuifolia), boxstring hemp {Sanseviera zeylanica), and other hemps of the East Indies, plantain fibre {Musa paradisica), and agave fibre {Agave americana) of America. Coir and many other fibres are used, but principally in the localities of their production.

A rope is composed of a certain number of ” strands,” the strand itself being made up of a number of single threads or yarns. Three strands laid or twisted together form a ” hawser- laid ” rope, and three such hawsers similarly laid make a ” cable-laid ” rope or ” cable.” A ” shroud-laid ” rope usually consists of four strands laid around a central strand or core. The prepared fibre is twisted or spun to the right hand to form yarn; the required number of yarns receive a left-hand twist to make a strand; three strands twisted to the right make a hawser; and three hawsers twisted to the left form a cable. Thus the twist in each operation is in a different direction from that of the preceding one, and this alternation of direction serves, to some extent, to preserve the parallelism of the fibres.

The primary object of twisting fibres together in a rope is that by mutual friction they may be held together when a strain is applied to the whole. Hard twisting has the further advantage of compacting the fibres and preventing, to some extent, the penetration of moisture when the ropes are exposed to water; but the yield of rope from a given length of yarn diminishes in proportion to the increase of twist. The proper degree of twist given to ropes is generally such that the rope is from three-fourths to two-thirds the length of yarn composing it.

Rope-walk Spinning. — The sequence of operations in this method of working is as follows: (1) hackling the fibre; (2) spinning the yarn; (3) tarring the yarn when necessary; (4) forming the strands; (5) laying

the strands into ropes.

Hackling differs but slightly from the hand-hackling process used in the preparation of flax. The hackle board consists of a wooden block studded with strong, tapered and sharp- pointed steel prongs. A series of such hackle boards is used in the progressive hackling operation, the prongs diminishing

in size and being more closely set together. For the commoner kinds of ropes, however, hackling through the coarsest board is found to be sufficient, while in most other cases two hacklings are adopted.

The hackler takes up a handful or ” streak ” 1 of hemp from the bundle, wraps one end firmly round his hand, and with his fingers distributes a little oil over the hemp. The oil softens the material, keeps the hackle pins in good condition, and facilitates generally the splitting up of the fibre as the streak is drawn through the pins. In the first place, only the ends of the streak are hackled; they are dashed into the pins and drawn through them in order to separate the fibres and to lay them parallel; but as the operation proceeds a gradually increasing length of the streak is thrown on and drawn through the pins. The process is indeed very similar to the combing out of a head of human hair. When half the length of the streak is thoroughly combed, the other half is treated in pre- cisely the same manner. The hackled streak is then weighed, doubled up to prevent any entanglement, and laid aside for the process of spinning. During the hackling process a large quantity of comparatively short fibres are retained in the pins; the longest of these are separated, and the remainder used for tow yarns. The above description refers entirely to hand hackling; machine hackling of hemp is very similar to flax hackling.

The spinning is done in what is termed the ” rope-walk,” and from the nature of hand-spinning, and the length of the rope required, it is necessary that this walk should be from 300 to 400 yds. in length. It is sometimes completely covered in with walls and roof; at other times only a roof is built; while in exceptional cases the whole of the walk, with the exception of a small hut at each end, is without shelter of any kind. The operation of spinning is very important, as the weight of the yarn and the appearance of the finished product depend upon it. A description of spinning and laying as per- formed by the aid of the

hand-wheel will perhaps be the best means of giving an idea of this useful branch of manufacture.

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Fig. 1.

Fig. 2.

The front and end elevations of one variety of spinning-wheel are shown in figs. 1 and 2. The apparatus is fixed to some convenient part of the 1 building, or to special supports. The wheel A, which is turned by hand, and always in the same direction, communicates motion to the rotating hooks or ” whirls ” B, C, D and E by means of a listing band or strap F. The arrangement of the listing shows clearly that the hook E will revolve in the opposite direction to hooks B, C, and D. The spinner takes two streaks of the hackled hemp, wraps them round his waist with the ends at his back, and keeps the fibre in position by adjusting his apron partly round it. From the middle of the streak — that is, midway between the two ends — he takes hold of a quantity of fibre and hangs it on to one of the

1 See note in the article on Jute for variations of spelling.

hooks B, C or D ; the assistant at the wheel begins to turn, and thus a certain amount of twist is imparted to the material between the spinner and the hook. The spinner now walks backwards down the walk, drawing out the fibre with his left hand and adjusting it with his right. A piece of flannel or woollen cloth held in his right hand aids in the formation of the thread and protects his fingers from the rough fibre. In some cases two threads are spun simultaneously; when this is done, two of the hooks, say B and C, are used at the same time. Since the revolutions of the hook divided by the length of yarn spun give the amount of twist per inch or foot, it follows that the ratio of the walking pace of the spinner to the revolutions of the wheel A should be constant, otherwise the yarn will not be uniform. The spinner calls to the assistant when there is any irregularity in speed, or when, from any cause, he is obliged to stop walking.

At convenient intervals in the length of the walk, and projecting from posts, are short horizontal bars ; the top of each bar is provided with wires or pegs to form a number of vertical partitions something like a

very coarse comb. As the spinner proceeds down the walk, he throws the spun yarn into one of these partitions, thus relieving himself of the weight and keeping the yarn off the ground. When a sufficient length of yarn has been spun, he breaks off the fibres and fastens the yarn to a convenient peg or hook until he has spun a sufficient number (usually three) to form a small rope or cord. The person at the wheel hangs these three yarns one on each of the three hooks B, C and D, while the spinner attaches the other ends to a revolving hook termed a ” looper.” All is now ready for ” laying ” the yarns. For small cords, this may be done, with or without a ” top.” This top is a conical-shaped piece of hard wood provided with three equidistant grooves which merge towards each other at the thin end, and into which the yarns are laid. The thick end of the top is nearest the wheel, so that the yarns may be kept separate on that side. As the hooks twist the three threads, the spinner goes up the walk with the top; the twist in the yarns causes the looping hook to revolve in the opposite direction to the other hooks, and thus it twists the three threads in the opposite direction to the original twist.

Fig. 3.

Fig. 3 shows one form of top, the three yarns being shown in distinctive marks so that the path of each may be more easily followed by the reader ; a plan of the thick end of the top appears to the left of the figure. If four yarns of strands are required, the top would contain four grooves, as well as a hole through the centre to admit of a core when such a thing is required. As soon as the spinner, who carries the top, arrives at the wheel, the assistant takes the yarns off hooks B, C and D (figs. 1 and 2), and puts them all on hook E. The other ends of the strands are removed from the looper and attached to a block of wood called a ” drag.” The wheel is then rotated as before, which puts more twist into the cord. While this operation, which is termed hardening, proceeds, a shrinkage in the length of the cord takes place, and the drag is consequently drawn up the walk. The drag, however, holds the cord taut, and serves to retain the twist which is imparted by the hook E.

If the strands require tarring before they are laid, they are separately taken off the hooks, after they have been spun, and tied at both ends to pegs to keep them taut until a sufficient number has collected to be conveniently handled at the tarring tank. The tar is heated to about 220° F., and the strands are then passed through it at a speed not greater than 15 ft. per minute. Before emerging from the tank, the strands pass between squeezing rollers which remove all superfluous tar. In a short time the strands are dry, while in the space of a few

days the tar is hard enough to allow the strands to be formed into ropes.

Such is, in general, the hand process of forming ropes when they are composed of only three or four single yarns. It very often happens, however, that a number of single yarns are required to form each strand of the rope. The single yarns may be spun by hand, as described above, or by machinery. In the former case a group of yarns is usually termed a ■" haul," while the machine-spun yarns are formed into what is known as a " warp " or " chain." In any case, the group of yarns is stretched down the rope-walk, at each end of which is a " jack " twister. A few of the yarns taken from the group — the number depending upon the size of the yarn and also upon the required diameter of the strand — are then placed on a hook of the jack twister and twisted together. When three such strands are made they are laid into a rope in a similar manner to that explained above. A simple form of hand jack twister is illustrated in figs. 4 and 5. The wheel A gears with pinions B on the shafts of the hooks or whirls, and this imparts the necessary motion to the latter. At the other end of the walk is a similar machine which moves upon rails as the twist is put into the strands. When the hooks are empty, pinions B and wheel A (fig. 4) are out of gear, but those hooks carrying yarn are drawn out, as shown at C, until the pinion B gears with wheel A, when the hooks are rotated. The

ROPE AND ROPE-MAKING

Plate I.

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Fig. io.— MANILA ROPE YARN PREPARING, POTTINGER MILL, OF THE BELFAST ROPEWORK CO. LTD.

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Plate IL

ROPE AND ROPE-MAKING

Fig. ii.— GOOD'S HACKLING AND SPREADING MACHINE.

Fig. I2.-HEAVY SPIRAL OR SCREW-GILL DRAWING FRAME; ONE HEAD, SIX GILLS.

Fig. 13.— SPINNER OR JENNY.

sequence of operations is very similar to that described for the simple hand-wheel.

Figs. 4 and 5.

Machine or Factory Rope-Making. — The most modern methods of rope-making are far superior to the foregoing, which, as stated, have been introduced to show the principle. One of the greatest drawbacks in the formation of a strand from a haul or chain, even for a small number of yarns, is the irregularity of the tension of the yarns at different parts of the strand. If a large number of yarns be required for each strand, it would be almost impossible to make a satisfactory rope by the above system. If, however, the strand be made from bobbins, each yarn bears its proper share of the tension, and an almost perfect rope is obtained.

Two mechanical methods are in use for the spinning of long vegetable fibres — the ordinary and the special. When flax or jute yarns are required, they are almost invariably spun on the ordinary spinning frames, and the yarn rewound from the spinning bobbins on warping bobbins, or else rewound in the shape of rolls or cheeses. Hemp yarns, especially the finer kinds, are sometimes treated in the same manner, but Manila- hemp, New Zealand hemp (Phormium), and similar fibres, are invariably spun on bobbins by special machinery. The strands for light ropes may then be made on the twisting frames, and the rope finished on what is called a ” house machine.” When a large rope is desired, a slightly different method is usually employed. The bobbins from the automatic spinner, or the rolls from the winding frame, are placed upon pegs in a frame which answers the same purpose as a bank or creel used in conjunction with a warping machine. If the rope is to be say 3 5 in. in circumference, there may be, with fine yarns, 300 or more individual threads in its composition. Suppose that 300 threads are to be used, then 300 bobbins would be placed on the pegs of the bobbin bank or creel, and divided into three sets of 100 threads each for a three-strand rope. The threads are passed separately through a register plate, which is simply a plate containing a sufficient

number of holes for the maximum quantity required, and arranged in a series of concentric circles. There are three sets of concentric rings used in the plate for a three-strand rope, and four sets for one of four strands. As the threads emerge from the register plate they are grouped together and passed through a tapered tube, the sectional area of the smaller end of the tube being equal to the sectional area of the strand. This operation is done for each group of 100 threads, and finally the three or four groups are attached to separate rotating hooks of the forming machine or ” traveller.” As the latter moves down the walk on rails, it draws the threads from the bobbins in the bank, and through

the register plate and tubes, while the hooks put in the twist. A perfectly circular strand, without slack threads, is thus formed; and, at the same time, a uniform strand is obtained, since the ratio of the speed of the traveller to the number of turns per inch of the hooks is constant. The process is con- tinued until the desired length of strand is made — about 150 fathoms (300 yds.) of each of the three strands are required for 100 to 120 fathoms of rope — then a little more twist is introduced. Afterwards, all three strands are placed on one hook of the traveller, and the ends from the shaping tubes are cut off and put on the hooks of the fixed machine, called the ” fore-turn.” The carriage containing the ” top ” is now brought close to the traveller, and the strands are placed in the grooves of the top as explained under hand-laying. Similar means to those used in hand-spinning are adopted for keeping the rope off the ground. The two machines are now started, the three hooks of the fore-turn machine revolving in one direc- tion and the single hook of the traveller revolving in the opposite direction. Simultaneously the carriage with the laying top moves forward towards the head of the walk.

Fig. 9, Plate I., shows many stages in the process of rope-making. The most prominent part shows the carriage with the top in position approaching the fore-turn machine at the head of the walk. The person on the right of the carriage is holding a top in his left hand, while the top in the carriage is laying a rope of four strands. At other parts of the figure appear three or four travellers, some twist- ing the strands, others moving up the walk as the laying proceeds, while on the extreme right one machine is laying two ropes, of three strands each, at the same time.

We have already stated that the yarns for the above machine may be prepared by two systems. When the hemp fibre is spun on the ordinary frame, the method of preparation for such a frame is some- what similar to that employed for flax, but since the fibre is harsher

than flax, it invariably requires softening. The softening machines crush the streaks as in the case of jute, but the fluted rollers are arranged to form part of a circle. The coarser fibres receive a somewhat different treatment ; the first process in the preparation of Manila hemp and similar fibres used for rope yarn is illustrated in fig. 10, Plate I. The streaks are clearly shown as being led between fluted rollers on to the pins of the hackling and spreading machine ; the lanterns or skeleton rollers, seen on the extreme right, press the fibres into the pins. A little oil is made to drop on to the fibre in order to soften it and to facilitate the operation. The oiling ap- paratus is usually of a simple character, and consists of a revolving roller partly immersed in an oil bath. The roller is driven as shown in the figure, and the oil which it draws up is scraped off its surface by a knife-edge, and led, by means of a sheet, upon the fibre between the fluted rollers and the gill-pins. A view of a similar machine is shown in fig. II, Plate II., from which it will be seen that there are two sheets of revolving gill-pins. The sheet nearest the feed-cloth revolves slightly quicker than the surface speed of the fluted feed rollers, while the second sheet moves at a much higher rate. The difference in the speeds of the gill-pins results in the fibre being combed out and straightened, while the delivery rollers, the surface speed of which is slightly greater than that of the second sheet of gill-pins, help further to complete the process, and finally deliver the fibre in the form of a broad ribbon, termed a sliver.

In general, three such machines are used for the process; the pins in the gill-sheets are graded, those in the second machine being finer and more closely set than those in the first machine, while a still finer and closer arrangement obtains in the third machine. The slivers from the third hackling and spreading machine are now placed at the back of the first drawing frame, one type of which appears in fig. 12, Plate II. Each sliver is passed separately over a guide pulley, led upon the pins, drawn out and joined by others, and finally delivered as a sliver ready for the second drawing frame. A similar process is carried on in this machine, from which the sliver emerges ready for the spinning frame. It will thus be seen that a system of doubling, as well as of drawing, obtains in these processes as in flax- preparing; such a system is adopted in order to obtain uniformity of sliver and the correct weight.

The slivers are taken from the drawing frame to the automatic spinner — a beautiful piece of mechanism. Fig. 13, Plate II., illustrates the machine as it leaves the makers. Two sliver cans from the second drawing frame are placed behind the machine, and the slivers passed between the rollers. They are then deflected and made to enter a trumpet-mouthed conductor which guides them on to the pins of the

chain-sheet. As the two slivers emerge from these pins, each enters a separate self-feeding and adjusting apparatus, the function of which is, as its name implies, to regulate the delivery of the sliver to the nippers. The delivery is increased or decreased according as the sliver is thin or thick. Consequently, a very even yarn results; indeed, it is claimed that for uniformity of yarn this system of spinning has no equal. The bobbins, which

are placed in a horizontal position, have a lateral movement, so that the finished yarn may be wound on evenly. This machine is made for ordinary rope yarn, and for binder twine for self-reaping machines. When all three spreading machines are used in con- junction with the spiral drawing frames, the automatic feeding arrangement is sometimes considered unnecessary, because of the uniformity of the slivers when delivered from the finishing drawing frame.

Figs. 14 and 15, Plate III., show two sheds filled with preparing machinery for the manufacture of binder twine. A complete system of Manila machinery, as recommended by Messrs Lawsons, Leeds, would consist of the following: —

1 No. 1 spreading and hackling machine.

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I M 3 »t l» »» ‘»

1 spiral 1st drawing frame, 1 head, 88 in. reach, 4 slivers per head. 1 ,, 2nd „ 2 heads, 88 in. ,, 6 „ „

20 improved automatic spinners or jennies of 2 spindles each. The length of sliver from a given length of fibre is proportional to the drafts and inversely proportional to the doublings. Thus, if

d\, d i} d 3 , d it d h , d„, =the drafts,

Si, S2, s s , s t , s b , Se, =the number of slivers,

/ = the feet per lb on the feed-table of No. I spreading machine,

L = the feet per lb delivered at the automatic spinner, then : —

/ X

dx

X

H

X

S3

X

ˆ4

X

So

X

7 = L.

No. I. No. 2. No. 3. No. 1. No. 2. Auto- Spreading Drawing matic machines. frames. spinner. A numerical example, showing the drafts, slivers, &c, used for the production of No. 22 s rope yarn of 330 ft. per lb appears below :

12 ‘ N 12 ˆ 4 ‘ N 4

/ X l -& Xlˆ

xˆ 7 × 5 -? = 330 ft.

Spreading Drawing Automatic

machines. frames. spinner.

Whence / = -536 ft., say 54 ft. per lb; that is to say, 1 ft of Manila fibre, approximately 6 in. in length, spread on the feed table of No. 1 spreading and hackling machine, and subjected to the above drafts and doublings, would produce yarn No. 22 s of 330 ft. per lb from the automatic spinner.

The bobbins from these automatic spinners may be used in the bank at the rope-walk as already indicated, or they may be taken to what is termed a ” house machine.” These machines are of two distinct kinds — vertical and horizontal. They perform the same work as the

machines in the rope-walk, but take up much less space.

Figs. 16 and 17, Plate IV., illustrate two types of horizontal machines, each of which is capable of completing a rope in one operation. The process is pretty clear in fig. 17, which shows that eighteen threads are treated at once. On the right, and driven by spur gearing, are three revolving carriages or creels, each containing six bobbins. Each group revolves as the yarns are drawn off the bobbins, and thus the threads are formed into three strands. As the strands emerge from the guides, they converge towards three other guides, are laid together, and finally the finished rope is wound on to the reel.

In principle the vertical machine is the same as the horizontal machine, and the rope is, consequently, made in one operation. Any number of bobbins, from 24 to 128, may be twisted at the same time; the machine in fig. 18, Plate IV., is for making a rope of three strands, each with 12 threads, or 36 threads in all. These machines are also made to make ropes of four strands. The strands are formed by the rotation of the carriages, from the top of which each strand passes. The three strands then converge to, and pass through, the top of the machine, where they are laid into a rope. The latter passes over a series of guide pulleys, and is ultimately wound on the large drum shown in front of the machine. Such “a machine for making a 128-thread, four-strand rope, occupies only about 125 sq. ft. — 8 ft. 9 in.Xi4 ft. 4 in.

In addition to the heavy rope there are many varieties of cord and twine made by means of the preparing, spinning and doubling machines. The fishing industry takes many different types for lines and nets, while the variety of cord and twine for other industrial and for household purposes is almost un- limited. All yarn from long vegetable fibre is more or less rough as it leaves the spinning frame, even after two or more threads have been twisted together. It is therefore necessary, for many uses, to impart a polish to the cord or twine. Special machines arc used for this purpose. A certain number of bobbins, depending upon the capacity of the machine, are placed in a bank, and the ends are collected and passed under a roller which is immersed in hot starch. The yarns become saturated

with this starch, but, as they emerge from the starch-boj;, the superfluous starch is removed by passing the yarns between two rollers. The yarns now pass over a series of drying cylinders and polishing rollers, and are finally rewound by the same machine on bobbins. These machines are termed bobbin-to- bobbin polishing machines. In some cases the hot drying cylinders are replaced by a

system of hot air drying. The finished yarns are now made up by machinery into hanks, balls or cheeses, according to which happens to be the best state for future use and for transport.

Driving Ropes. — It has already been stated that cotton driving ropes are extensively applied in the transmission of motive power. Although the mechanical efficiency of transmission by ropes is less than that obtained by wheel gearing, rope driving has several compensating advantages : —

1. It is practically noiseless.

2. It occupies less space than belt driving, and the slip is not

so great.

3. The turning movement is better; machines therefore run more

steadily and production is increased.

4. Shafts may be run at higher speeds.

5. Greater range of drives; anything from 10 ft. to over 80 ft.,

and much greater distances when carrier pulleys are used.

6. The drive is usually obtained by a number of ropes; if one

should break, the rope may be removed and the machinery

run, in most cases, until stopping-time. The number of ropes to be used depends upon the power to be transmitted and upon the surface speed of the driving pulley. The speed of the rope may vary from 2000 ft. to 6000 ft. or over per minute. In some few exceptional cases 60 ropes have been used on one pulley; the number usually varies between 15 and 40. (See also Power Transmission, § Mechanical.) Fig. 6 shows the

Fig. 6.- — Rope Race of a Lancashire Cotton-Spinning Mill, with 38 Lambeth Cotton Driving Ropes, if in. diameter; engine, 1700 H.P.

application of these ropes, which pass direct from the main driving pulley to the different flats of the mill. Fig. 7 shows the construc- tion of the Lambeth four – strand cotton rope. There are two distinct systems of ar- ranging the ropes on the driver and the driven pulleys. In the United Kingdom each rope is independent of all the others, and, as it is unlikely ■ for more ‘ Fig. 7-— Lambeth Cotton Rope.

than one rope to break at a time, the stoppages are reduced to a minimum. In America, where hemp ropes are largely employed,

Plate III.

Fig. 14.— BINDER TWINE PREPARING, CONNSWATER MILL, OF THE BELFAST ROPEWORK CO. LTD.

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Fio. 15.— BINDER TWINE SPINNING, CONNSWATER MILL.

Plate IV.

ROPE AND ROPE-MAKING

the continuous system is mostly used; here the rope is wound round and round over driver and driven, and, except in rare cases, is joined only at one place. Although the system has the great advantage of the minimum number of joinings, it requires tension pulleys to keep the ropes taut. It is also clear that when the rope breaks at any point the machinery must stand until the repair is completed.

Wire Ropes. — Although the manufacture of ropes is of ancient origin, the practice of making ropes from wire on a large scale is of comparatively recent date. Since 1874, however, great develop- ments have taken place in the manufacture of ropes from different kinds of wire, and the uses to which they can be put have enormously increased. This is owing almost entirely to the introduction of flexible wire ropes which were invented about this time by Messrs Bullivant & Co. Ltd., of 72 Mark Lane, London, E.C. Prior to that date the uses at which wire ropes were put were limited to winding ropes for collieries and hauling, and to cases in which flexibility was not a great desideratum. The introduction of flexibility, however, made possible the use of wire rope for ships' hawsers and rigging, for cranes, derricks and other purposes for which hempen ropes were formerly employed — indeed it has almost entirely superseded hemp for marine uses. The reason is that it is much stronger for the same size than rope made from any other material, whilst for the same strength its size and weight are only about one-third that of hempen rope. Consequently,

the required power may be obtained with a wire rope of comparatively small bulk.

Wire rope is specially suited for aerial' ropeways which provide a means of conveying ore, metals, merchandise, &c, over ground where it would be difficult to arrange transport by ordinary means. Messrs Bullivant & Co. Ltd., to whom we are indebted for the table of strengths and other particulars, as well as for the sectional illustration of wire ropes, construct seven different systems of aeriai ropeways: —

i. The endless running rope, with carriers hanging therefrom and moving with it through frictional contact.

2. An endless rope, with the carriers hanging therefrom and

moving with it, being rigidly fixed in position on the rope.

3. The fixed rope, in which the carriers are drawn along and

hang from a fixed rope which acts also as a rail, returning on a parallel rope.

4. The single fixed rope, in which one carrier, hanging from a

fixed rope, is drawn to and fro by means of an endless hauling rope.

5. The use of two fixed ropes "with an endless hauling rope, in

which one carrier travels in one direction, while the other travels on a parallel rope in the opposite direction. This is a serviceable type of ropeway, capable of being used over extremely long spans, and of carrying loads up to 5 tons.

6. The use of one fixed rope placed on an incline, on which the

carriers (uncontrolled by hauling ropes) with their suspended loads are allowed to run down at a high speed. This is generally called a " shoot."

7. Bullivant's system of aerial ropeway for raising, lowering,

and transporting heavy loads, by means of which a load can be hoisted, traversed in either direction and deposited at one operation. The flexibility of a wire rope depends upon the number of wires of which it is formed; consequently the use to which a rope is to be put will partly determine the number of wires used in its con- struction. In some cases nearly 400 individual wires are employed in making one

rope. Fig. 8 shows in section ten different types of construction, the particulars of which appear below: —

1. Laid rope made of 6 strands of 7 wires each. This is the

class of rope most frequently used for hauling ropes where the size of the barrel and sheave will permit ; it is also the make of rope in general use for standing rigging, and is such as is required by Lloyd's regulations.

2. Hauling rope made of 6 strands, each strand being of 7 wires

covering 7 smaller ones.

3. Hauling rope made of 6 strands, each of 8 wires covering

7 smaller ones.

4. Hauling rope made of 6 strands, each of 10 wires covering

7 smaller ones.

5. Formed rope made of 6 strands of 19 wires each. In larger

sizes this make, of rope is used for standing rigging on vessels. In smaller sizes it is sometimes used for running rigging, and it is the usual make of rope for trawl warps.

6. Flexible steel wire rope, made of 6 strands each of 12 wires,

with hemp heart and hemp centre in each strand. This is the usual make of flexible steel wire rope, 4* in. in circum- ference and smaller; used for hawsers, running lifts, hoists, &c.

7. Extra flexible steel wire rope made of 6 strands each of

24 wires.

8. Special extra flexible steel wire rope made of 6 strands each of

37 wires.

Special extra flexible steel wire rope made of 6 strands each of 61 wires. This is the make of rope usually adopted for large ropes — say over 10 in. in circumference — which are largely used for slipway and salvage purposes. >. Cable-laid rope. This is an obsolete form of rope, which is composed of six complete ropes twisted together.

8

9

Fig. 8.

10

The following table supplies particulars about wire

ropes which

are used for general hauling purposes: —

Breaking Strain in Tons.

Approxi- mate Weight

Circum-

Dia- meter.

“Cruci-

Best Selected

Best Selected

Best Selected

ference.

ble ”

Improved

” Mild

” Extra

per

Steel.

” Cruci- ble” Steel.

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if „

52*

56

61*

67

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iA»

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6l

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73

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4f .,

ii „

65

69

76

83

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5 M

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72

76

83

92

25 .

The diameter of drums and sheaves should be about thirty times the circumference of the rope.

For shaft winding at high speed one-tenth of the breaking strain of a rope is sometimes taken as a fair working load. For inclines, the proportion of load to breaking strain varies according to gradient conditions, and friction should be allowed for.

The first requisite in the manufacture of wire ropes is the selection and blending of the different iron ores. The different processes through which the metal passes, and the hammering and drawing into rods, require great experience, and give to it the peculiar pro- perties that are essential for the finished article. The same remarks apply to the annealing and hardening processes, during which the rods are drawn through dies to the required gauge. The wire is now subjected to special processes of galvanizing in order to make it proof against atmospheric and other influences. Afterwards it is wound on bobbins of suitable size, a definite number of which are mounted on the forks or frames of the stranding machine. These forks are swung or pivoted between disks, which are keyed on a I hollow main shaft, through which the wires or other material

intended for the core pass. This core is of such a size that the aggregate number of wires that are mounted in the machine exactly cover it in a spiral direction.

All the wires, including the centre core, are passed through their individual hollow spindles, then led to the nose or head of the machine, and finally passed through a stationary compression block to draw- off wheels. The speed of these wheels is regulated in proportion to the speed of the machine by means of suitable gearing. During the revolutions of the machine each bobbin and fork is kept in a vertical position, and floats thus, by means of an eccentric ring behind the back disk. This ring is connected to the spindles of the bobbin forks by means of small cranks, thus preventing any torsional movement that would otherwise be imparted to the individual wires.

Each bobbin is controlled by a brake which acts as a tensioning device so that equal strain can be applied to each, allowing the wires to unwind uniformly. The finished strands are wound in turn upon large bobbins, and mounted in the flyers or disks of the rope closing machine. These machines are similar in design to the stranding machine, but are naturally much heavier in construc- tion, and therefore revolve at a proportionate speed. The speed of the machines varies according to the weight of material, the size of the strands and the construction of the finished rope. The modern machine, or the type most generally used, makes about fifty revolutions per minute, whilst three times this speed is often obtained when spinning the strands.

The rapid strides made by electricity have furnished another large branch of what may be termed wire rope manufacture. The ropes used for electrical purposes are almost invariably termed cables, and there are many different kinds and sizes of them. The wire must necessarily possess good conducting power, and be com- paratively cheap. Up to the present copper has proved to be the chief material possessing these two important properties in com- bination; hence it is the metal par excellence for electrical conduction. Aluminium and alloys have been tried with varying degrees of success.

The conductor itself consists of a strand of soft copper wires, around which the dielectric or non-conducting material is placed. The methods of forming the strands do not differ essentially from those described above. The dielectric is usually paper, spun jute fibre, vulcanized india-rubber or vulcanized bitumen. If the first two

dielectrics are used, a lead sheath is necessary to enclose the insulated strand and so exclude moisture; if the cable is likely to get damaged, it is further enclosed by steel tapes or steel wires, and finally covered with yarn or braid. Vulcanized bitumen is not only a dielectric, but is also absolutely impervious to moisture. Hence in many instances where paper or fibre is employed as the principal dielectric, a sheath of vulcanized bitumen is used instead of lead to exclude moisture. Cables are also made with a single central stand of copper wires in addition to one or more concentric layers of copper wires, the layers being separated by some dielectric material; or there may be two or more strands, separately insulated, and more or less elaborately clothed with the above-mentioned substances. (T. Wo.)

ROPES, JOHN CODMAN (1836-1899), American military historian and lawyer, was born at St Petersburg on the 28th of April 1836, the son of a leading merchant of Boston who was engaged in business in Russia. At the age of fourteen, his family having meantime returned to Massachusetts, he developed an affection of the spine which eventually became a permanent deformity. His courage and energy, however, did not allow him to yield to his affliction. He entered Harvard in 1853, and graduated in 1857. His interests as a young man were chiefly religious, legal and historical, and these remained with him throughout life, his career as a lawyer being conspicuous and successful. But it was the outbreak of the Civil War in 1861 which fixed his attention principally on military history. He ceaselessly assisted with business and personal help and friend- ship the officers and men of the 20th Massachusetts regiment, in which his brother, Henry Ropes, served up to his death at Gettysburg, and after the war he devoted himself to the collec- tion and elucidation of all obtainable evidence as to its incidents and events. In this work his clear and unprejudiced legal mind enabled him to sift the truth from the innumerable public and private controversies, and the ill-informed allotment of praise and blame by the popular historians and biographers. The focus of his work was the Military Historical Society of Massachusetts, which he founded in 1876. The work of this society was the collection and discussion of evidence relating to the great conflict. Although practically every member of this society except himself had fought through the war, and nany, such as Hancock and W. F. Smith, were general officers

of great distinction, it was from first to last maintained and guided by Ropes, who presented to it his military library and his collection of prints and medals. He died at Boston on the 28th of October 1899. His principal work is an unfinished Story of the Civil War, to which he devoted most of his later years; this covers the years 1861-62. The

Army under Pope is a detailed narration of the Virginia campaign of August-September 1862, which played a great part in reversing contemporary judgment on the events of those operations, notably as regards the unjustly-condemned General Fitz John Porter. Outside America, Ropes is known chiefly as the author of The Campaign of Waterloo, which is one of the standard works on the subject.

The greater part of his studies of the Civil War appears in the Military Historical Society's publications. Papers on the Waterloo campaign appeared in the Atlantic Monthly of June 1881, and in Scribner's Magazine of March and April 1888. Amongst his mis- cellaneous works is a paper on " The Likenesses of Julius Caesar " in Scribner's Magazine (February 1887).

See Memoir of John Codman Ropes (Boston, privately printed,

1901).

ROPE-WALKING, the art of walking, dancing and perform- ing tricks of equilibrium on a rope or wire stretched between two supports. It has been popular with most Asiatic and European peoples from the beginning of history. Before the middle of the 19th century a rope was invariably used, and was stretched as tightly as possible, on which account the art was called Tight-rope Walking. About the year 1875 the slack wire, stretched loosely from support to support, was introduced, and is now more commonly used. The performer is often aided in keeping his balance by a Chinese umbrella or a long pole.

ROPS, F6LICIEN (1833-1898), Belgian painter,. designer and engraver, was born at Namur, in Belgium, on the 7th of July 1833; he spent his childhood in that town, and afterwards in Brussels, where he composed in 1856, for his friends at the university, the Almanack Crocodilien, his first piece of work. He also biought out two Salons Illustres, and collaborated on the Crocodile, a magazine produced by the students. The humour shown in his contributions attracted the attention of publishers, who offered him work. He designed, among other things, frontispieces for Poulet-Malassis, and afterwards for Gay and Douce. In 1859 he began to contribute to a satirical journal in Brussels called Uylenspiegel, a sort of Charivari. The issue, limited unfortunately to two years, included his finest litho- graphs. About 1862 be went to Paris and worked at Jacque- mart's. He subsequently returned to Brussels, where he founded the short-lived International Society of Etchers. In 1865 he brought out his famous " Buveuse d'Absinthe," which placed him in the foremost rank of Belgian engravers; and in 1871 the " Dame au Pantin." After 1874 Rops

resided in Paris. His talent, which commanded attention by its novel methods of expression, and had been stimulated by travels in Hungary, Holland and Norway, whence he brought back characteristic sketches, now took a soaring flight. To say nothing of the six hundred original engravings enumerated in Ramiro's Catalogue of Rops' Engraved Work (Paris, Conquet, 1887), and one hundred and eighty from lithographs (Ramiro's Catalogue of Rops' Lithographs, Paris, Conquet, 1891), besides a large number of oil-paintings in the manner of Courbet, and of pencil or pen-and-ink drawings, he executed several very re- markable water-colour pictures, among which are " Le Scandale," 1876; " Une Attrapade," 1877 (now in the Brussels Museum); a " Tentation de St Antoine," 1878; and " Pornocrates," 1878. Most of these have been engraved and printed in colours by Bertrand. From 1880 to 1890 he devoted himself principally to illustrating books: Les Rimes de joie, by Theo Hannon; Le Vice supreme and Curieuse, by J. Peladan; and Les Dia- boliques, by Barbey d'Aurevilly; L'Amante du Christ, by R. Darzens; and Zadig, by Voltaire; and the poems of Stephane Mallarme have frontispieces due to his fertile and powerful imagination. Before this he had illustrated the Ligendes Flamandes, by Ch. Decoster; Jeune France, by Th. Gautier;

and brought out a volume of Cent Croquis pour rejouir les Honnetes Gens. His last piece of work, an advertisement of an exhibition, was done in November 1896. Rops died on the 23rd of August 1898, at Essonnes, Seine-et-Oise, on the estate he had purchased, where he lived in complete retirement with his family. Scorning display, Rops almost always opposed any exhibition of his works. However, he consented to join the Art Society of the " XX.," formed at Brussels in 1884, as their revolutionary views were in harmony with the independence of his spirit. After his death, in 1899, the Libre Esthetique, which in 1894 had succeeded the "XX.," arranged a retro- spective exhibition, which included about fifty paintings and drawings by Rops. Rops was a Chevalier of the Legion of Honour. He excelled in these three methods of artistic expression; but his engraved work is the most important, both as to mastery of technique and originality of ideas, though in all his talent was exceedingly versatile. Hardly any artist of the 19th century equalled him in the use of the dry-point and soft varnish. By his assured handling and admirable draughts- manship, as well as the variety of his sometimes wildly fantastic conceptions, he made his place among the great artists of his time. "

Giving his figures a character of grace which never lapses into limpness," says his biographer, E. Ramiro, " he has analysed and perpetuated the human form in all the elegance and development impressed on it by modern civilization."

In 1896 La Plume (Paris) devoted a special number to this artist, fully illustrated, by which the public were made aware how many of his works are unsuitable for display in the drawing-room or boudoir. E. Deman, the publisher at Brussels, brought out a volume in 1897 with the title, Felicien Rops et son oeuvre — papers by various writers. We may also mention a study of Felicien Rops, by Eugene Demolder (Paris, Princebourde, 1894), and another by the same writer in Trois Contemporains (E Deman, 1901); Les Ropsiaques, by Pierre Gaume, brought out in London, 1898; and the admirable notice by T. K. Huysmans in his volume called Certains. (O. M.*)

ROQUELAURE, a title derived from a small commune in France (dep. of Gers), and borne by a French family of Armagnac, one member of which was Antoine, baron de Roquelaure (1544- 1625), who was in the service of Henry IV. before he became king, and after his accession was made master of the wardrobe, lieutenant-general in Auvergne (1576) and Guienne (1610), and marshal of France in 1614. His son, Gaston Jean Baptiste de Roquelaure (1617-1683), a celebrated wit, was created duke and peer of France in 1652, and was appointed governor of Guienne in 1679. Gaston's son, Antoine Gaston Jean Baptiste de Roquelaure (1656-1738), carried on the family reputation for wit, and, in spite of his military incapacity, received the marshal's baton in 1724.

RORQUAL, a whale of a long and elongated shape, with a small back-fin and a number of longitudinal pleatings or folds on the throat (see Cetacea). The name rorqual refers to these folds, while the alternative title of finner, or fin-whale, marks an important difference between these whales (for there are several species) and right-whales. The furrows on the throat are numerous and close-set, the flipper is comparatively small, and the dorsal fin distinct. The head is relatively small, flat and pointed in front, the whalebone short and coarse, the body long and slender, and the tail much compressed before it expands into the "flukes." Rorquals are the most abundant and widely distributed of all whales, being found in all seas, except the extreme Arctic and Antarctic regions. There are four distinct species of this genus in British seas. Firstly, Sibbald's rorqual, or blue whale (Balaenoptera sibbaldi), the largest of all animals, attaining a length of 80 or even sometimes 85 ft. Its colour is dark bluish grey, with small whitish spots on the breast; the whalebone is black; the flippers are

larger proportionally than in other rorquals, measuring one-seventh of the total length of the body; and the dorsal fin is small and placed far back. This whale has usually 64 vertebrae, of which 16 bear ribs. Like the others, this species seems to pass the

winter in the open seas, and approaches the coast of Norway at the end of April or beginning of May. At this time its sole food is a small crustacean {Euphausia inermis), which swarms in the fjords. Secondly, we have the common rorqual (B. tnus- culus, or B. physalus) with a length of from 65 ft. to 70 ft., and of a greyish slate-colour above and white underneath, and the whalebone slate-colour, variegated with yellow or brown. It has usually 62 vertebrae, of which 15 bear libs. This is the commonest of all the large whales on the British coasts; scarcely a winter passing without the body of one being washed ashore, usually after stormy weather, and frequently on the south coast, as this species has a more southern range than the last, and enters the Mediterranean. It feeds largely on fish, and is frequently

Common Rorqual {Balaenoptera musculus).

seen feasting among shoals of herrings. Thirdly comes Rudolphi's rorqual (B. borealis), a smaller species, scarcely attaining a length of 50 ft. It is bluish black above, with oblong light- coloured spots, whilst the under-parts are more or less white; the whole of the tail and both sides of the flippers are black; the whalebone is black, and the bristly ends fine, curling and white; the flippers are very small, measuring one-eleventh of the total length of the body. There are 56 vertebrae, with 14 pairs of ribs. This species, according to Dr. C. Collett, feeds chiefly on minute crustaceans, mainly Calanus finmarchicus and Euphausia inermis, and not on fish. Down to the last quarter of the 19th century it was considered the rarest of the whales of European seas, and was only known from a few individuals stranded on the coasts of northern Europe at long intervals. The most southern point at which it has been met with is Biarritz. Since the establishment of the whaling station near the North Cape it has been shown to be a regular summer visitor. Lastly, the lesser rorqual, B. rostrata, the sharp-nosed finner of American whalers, is the smallest species found in the northern seas, rarely exceeding 30 ft. in length. Its colour is greyish black above, whilst the under-side is white, including the whole of the lower side of the tail; the inner side of the flippers is also white, and there is a broad white band across the outer side, which is a very characteristic mark of the species; the whalebone is yellowish white. The dorsal fin in this and the preceding species is comparatively high, and placed far forwards on the body. This whale has usually 48 vertebrae, of which 1 1 bear ribs. It is common in

summer in the fjords of Norway, and is often seen around the British Isles. It has been taken, though rarely, in the Mediterranean, and ranges as far north as Davis Strait.

Rorquals are met with in almost all seas, and nearly all the individuals carefully examined, whether from the North Pacific, the Australian seas or the Indian Ocean, come very near in structure to one or the other of the Atlantic forms described above, so much so that some zoologists believe that there are but four species, with an almost cosmopolitan range. Other naturalists, on the contrary, have described and named almost every individual specimen captured as belonging to a different species. See Whale and Hump-back Whale. (R. L.*)

RORSCHACH, a busy commercial town in the Swiss canton of St Gall, situated on the south-west shore of the Lake of Con- stance, and by rail 62 m. N.E. of Zurich, 10 m. S.E. of Romans- horn and 57 m. N. of Coire. In 1900 its population was 9140, mostly German-speaking, while there were 5935 Romanists to 3139 Protestants. From 1408 to 1798 it belonged to the abbot of St Gall, and then to the canton Santis (named canton of St Gall in 1803) of the Helvetic Republic. It has always been a great commercial centre, though now superseded by Romanshorn as regards the corn trade. It has many industrial establish- ments, of which the chief is one for the manufacture of lace and

muslin. Above the town is the old convent of Mariaberg, originally built in the 1 5th century as a refuge for the monks of St Gall against the turbulent citizens of that town, but now a seminary for teachers. From Rorschach a cogwheel railway runs south-east in 4j m. up to Heiden, a village in the canton of Appen- zell well known for its goats' whey cure. (W. A. B. C.)

ROS, or De Ros, the name of a noble English family. Robert de Ros (d. 1227), a son of Everard de Ros (d. 1191) of Helmsley, or Hamlake, in Yorkshire, possessed lands in Yorkshire, in- cluding Ros, or Ross, in Holderness, and also in Normandy. He served King John in several ways, both in England and abroad, and obtained lands in Northumberland, where he built a castle at Wark, or Werke. About 121 5, however, he deserted the king and became one of the leaders of the baronial party, being one of the twenty-five executors of Magna Carta and fighting against John when he repudiated this engagement.

He submitted to Henry III. and became a monk before he died in 1227. His wife was Isabella, daughter of William the Lion, king of Scotland, by whom he had two sons, William and Robert. Robert de Ros the younger (d. 1274), was an itinerant justice under Henry III., but later he was one of the barons who fought against this king. He passed much of his time, however, in Scotland, where he held a barony and where he was one of the guardians of Margaret, the English bride of King Alexander III. His son Robert was summoned to parlia- ment as Lord Ros de Werke in 1295; just afterwards he revolted against Edward I. and his lands were forfeited. William de Ros (d. 1258), the elder son of the executor of Magna Carta, had a son Robert (d. 1285), who was summoned to parliament as a baron by Simon de Montfort in 1264; he was also summoned to parliament by Edward I. His son William, 2nd baron Ros of Helmsley, or Hamlake (d. 13 17), obtained Belvoir Castle in Leicestershire through his mother Isabel, daughter of William d'Albini. He was one of the minor claimants for the crown of Scotland in 1292, and soon afterwards he obtained the lands in Northumberland which had been taken from his traitorous cousin Robert de Ros. His second son, John de Ros (d. 1338), was a courtier under Edward II. Later he joined Edward's queen, Isabella, was summoned to parliament by Edward III., and distinguished himself on the sea. Another John de Ros (d. 1332), bishop of Carlisle from 1325 to 1332, was doubtless a member of this family.

The second baron's descendants letained the barony of Ros until the death of Edmund de Ros, the nth baron, in October 1508. Edmund's nephew Sir George Manners (d. 1513), of Belvoir and Helmsley, then claimed it, and was called Lord Ros, or Roos. His son, Thomas Manners, the 13th baron (d. 1543), was created earl of Rutland in 1525, but the barony was separated from the earldom when Thomas's grandson Edward died in 1587, leaving an only child, Elizabeth (d. 1591), who, as heir general of the family, became Baroness Ros, or Roos. Elizabeth married into the Cecil family, and when her only child, William Cecil, died in 1618, the barony reverted to the Manners family, Francis Manners, 6th earl of Rutland (1578-1632), becoming the 18th baron. On his death the barony again passed to a female, his daughter Katherine, through whom it came to the family of Villiers. Then in 1806, after a long abeyance, Charlotte (1769-1831), daughter of the Hon. Robert Boyle, and a descendant of the Manners family, was declared Baroness Ros, or Roos. She married' Lord Henry Fitzgerald, and their son, Henry William Fitzgerald-de-Ros (1793-1839), became the 22nd baron on his mother's death. In 1907, on her father's death, Mary Frances, wife of the Hon. Anthony

Dawson, became Baroness Ros, or rather, De Ros, which is the present form of the title. For a long time after they had ceased to hold the barony the earls and dukes of Rutland continued to style themselves Lords Roos.

ROS, SIR RICHARD (b. 1429), English poet, son of Sir Thomas Ros, lord of Hamlake (Helmsley) in Yorkshire and of Belvoir in Leicestershire, was born on the 8th of March 1429. In Harl. MS. 372 the poem of ” La Belle Dame sanz Mercy, ” first printed in W. Thynne’s Chaucer (1532), has the ascription

” Translatid out of Frenche by Sir Richard Ros.” ” La Belle Dame sanz Mercy ” is a long and rather dull poem from the French of Alain Chartier, and dates from about the middle of the 15th century. It is written in the Midland dialect, and is surprisingly modern in diction. The opening lines — • ” Half in a dreme, not fully wel awaked, The golden sleep me wrapped under his wing,”

have often been quoted, but the dialogue between the very long-suffering lover and the cruel lady does not maintain this high level.

See W. W. Skeat, Chaucerian and Other Pieces (1897) ; and Dr. H. Grohler, Ueber Richard Ros’ mittelenglische Uebersetzung . . . (Breslau, 1886).

ROSA, CARL AUGUST NICHOLAS (1843-1889), English musical impresario, was born at Hamburg, his family name (which he subsequently changed) being Rose. He started as a solo violinist, studying at Leipzig and Paris, and also had considerable success as a conductor both in England and America; and it was at New York in 1867 that he met and married the famous operatic soprano Madame Parepa (1836- 1874), at whose death he afterwards endowed a Parepa-Rosa scholarship at the Royal Academy of Music in London. In 1875 he started the Carl Rosa Opera Company, for producing the best operas in English versions, and both during his own life and after bis death this company had much to do with popularizing good music in England, encouraging native com- posers and training a number of excellent singers. Carl Rosa married a second time in 1881, and died in Paris on the 30th of April 1889.

ROSA, MONTE, the name of a great glacier-clad mountain mass (the name comes from the Aostan patois word roese, meaning a glacier) which rises S.E. of Zermatt, and on the frontier between Switzerland (canton of the Valais) and Italy. Ten summits in this huge mass are distinguished by name, of which four (the Nordend, 15,132 ft., the

Zumsteinspitze, 15,004 ft., the Signalkuppe or Punta Gnifetti, 14,965 ft., and the Parrotspitze, 14,643 ft.) rise on the frontier. The five lower summits are on the Italian slope, but the highest of all, the Dufourspitze, 15,217 ft. (so named by the Swiss government in honour of General Dufour, the head of the great survey which first accurately fixed the position of these points), rises W. of the frontier ridge, on a buttress, and is thus entirely in Switzer- land, of which it is the culminating peak (and not, as often stated, the Dom, 14,942 ft., in the Mischabel group). The loftiest point of the Dufourspitze was first attained in 1855 by a large English party, which included Messrs G. and C. Smyth, C. Hudson, Birkbeck and Stevenson. The Zumsteinspitze was first climbed in 1820, the Signalkuppe (on top of which there is now a club hut) in 1842, the Nordend in i86iandthe Parrotspitze in 1863. The ascent of all the points named is not difficult from the Swiss side, but excessively dangerous on the east or Italian side. (W. A. B. C.)

ROSA, SALVATOR (1615-1673), Italian painter of the Nea- politan school, was born in Arenella, in the outskirts of Naples, in 1615: the precise day is given as the 20th of June, and also as the 21st of July. His father, Vito Antonio de Rosa, a land surveyor, was bent upon making the youth a lawyer, or else a priest, and sent him to study in the convent of the Somaschi fathers. Here Salvator began showing a turn for art: he went in secret to his maternal uncle Paolo Greco to learn the practice of painting, but soon found that Greco had little pictorial lore to impart, so he transferred himself to his own brother-in-law Francesco Fracanzaro, a pupil of Ribera, and afterwards had some practice under Ribera himself. Above all he went to nature, frequenting the Neapolitan coast, and keeping his eyes open and his hand busy. At the age of seventeen he lost his father; the widow was left unprovided for, with at least five children, and Salvator found himself immersed in a sea of troubles and perplexities, with nothing for the while to stem them except a buoyant and adventurous temperament. He obtained some instruction under the battle-painter Aniello Falcone, but chiefly painted in solitude, haunting romantic

and desolate spots, beaches, mountains, caverns, verdure-clad recesses. Hence he became in process of time the initiator of romantic landscape, with a special turn for scenes of strange or picturesque aspect — often turbulent and rugged, at times grand, and with suggestions of the sublime. He picked up scanty doles when he could

get them, and his early landscapes sold for a few pence to petty dealers. The first person to discover that Rosa's work was not as trumpery as it was cheap was the painter Lanfranco, who bought some of the paintings, and advised the youth to go to Rome. Hither in 1635, at the age of twenty, Rosa betook himself; he studied with enthusiasm, but, catching fever, he returned to Naples and Falcone, and for a while painted nothing but battlepieces, and these without exciting any attention. This class of work was succeeded by the landscape art peculiarly characteristic of him — wild scenes wildly peopled with shepherds, seamen or especially soldiers. He then revisited Rome, and was housed by Cardinal Bran- caccio; this prelate being made bishop of Viterbo, Rosa painted for the Chiesa della Morte a large and noticeable picture of the " Incredulity of Thomas " — the first work of sacred art which we find recorded from his hand. At Viterbo he made acquaintance with a mediocre poet named Abati, and was hence incited to try his own faculty in verse. He then returned to Naples. Here the monopolizing triumvirate— Ribera, Caracciolo and Corenzio — were still powerful. Rosa was as yet too obscure to suffer from their machinations; but, having painted a picture of " Tityus Torn by the Vulture," which went to Rome and there produced a great sensation, he found it politic to follow in the footsteps of his fame, and once more, in 1638, resought the papal city.

Rosa was a man of facile and versatile genius, and had by this time several strings to his bow. It is said that, still keeping painting steadily in view as his real objective, he resolved to secure attention first as a musician, poet, improvisatore and actor — his mother-wit and broad Neapolitan dialect (which appears to have stuck to him through life) standing him power- fully in stead. In the carnival he masqued as Formica and Capitan Coviello, and bustled about Rome distributing satirical prescriptions for diseases of the body and more particularly of the mind. As Formica he inveighed against the farcical comedies acted in the Trastevere under the direction of the celebrated Bernini. Some of the actors, in one of their per- formances, retaliated by insulting Rosa, but the public was with him, and he now enjoyed every form of success — social prestige, abundant commissions and any amount of money, which he was wont to throw about broadcast to the populace. In 1646 he returned to Naples, and is said to have taken an active part in the insurrection of Masaniello; certain it is that he sympathized with and admired the fisherman autocrat, for a passage in one of his satires proves this. His actual share in the insurrection is, however, dubious; it appears only in recent narratives, and the same is the case with the well-known story that at one time he herded with a band of brigands in the Abruzzi — an incident which cannot be conveniently

dove-tailed into any of the known dates of his career. As regards the popular revolt against Spanish tyranny, it is alleged that Rosa, along with other painters — Coppola, Porpora, Domenico Gar- giuolo, Dal Po, Masturzo, the two Vaccari and Cadogna — all under the captaincy of Aniello Falcone, formed the Compagnia della Morte, whose mission it was to hunt up Spaniards in the streets and despatch them, not sparing even those who had sought some place of religious asylum. He painted a portrait of Masaniello — probably from reminiscence rather than from life: indeed, it is said that he painted him several times over in less than life size. On the approach of Don John of Austria the blood-stained Compagnia dispersed, Rosa escaping or at any rate returning to Rome. Here he painted some important subjects, showing the uncommon bent of his mind as it passed from landscape into history — " Democritus amid Tombs," the '" Death of Socrates," " Regulus in the Spiked Cask " (these two are now in England), "Justice Quitting the Earth," and the " Wheel of Fortune." This last work, the tendency of which was bitingly satirical, raised a storm of ire and remonstrance.

Rosa, endeavouring at conciliation, published a description of its meaning (probably softened down not a lktle from the real facts); none the less an order for his imprisonment was issued, but ultimately withheld at the instance of some powerful friends. It was about this time that Rosa wrote his satire named Babylon, under which name Rome was of course indicated.

Cardinal Giancarlo de' Medici now invited the painter to leave Rome — which had indeed become too hot to hold him — for Florence. Salvator gladly assented, and remained in the Tuscan capital for the better part of nine years, introducing there the new style of landscape; he had no pupils, but various imitators. Lorenzo Lippi the painter poet, and other beaux esprits shared with Rosa the hospitalities of the cardinal, and they formed an academy named / Percossi (the Stricken), indulging in a deal of ingenious jollity — Rosa being alike ap- plauded as painter, , poet and musician. His chief intimate at this time was Lippi, whom he encouraged to proceed with the poem II Malmantile Racquistato. He was well acquainted also with Ugo and Giulio Maffei, and housed with them more than once in Volterra, where he wrote other four satires — Music, Poetry, Painting and War. About the same time he painted his own portrait, now in the Uffizi Gallery of Florence. Finally he reverted once more to Rome, and hardly left that city again. Much enmity still brooded there against him, taking the form more especially of an allegation that the satires which he zealously read and diffused in MS. were not his own pro- duction, but filched from some one else. Rosa indignantly repelled this

charge, which remains indeed quite unsubstan- tiated, although it is true that the satires deal so extensively and with such ready manipulation in classical names, allusions and anecdotes, that one is rather at a loss to fix upon the period of his busy career at which Rosa could possibly have imbued his mind with such a multitude of semi-erudite details. It may perhaps be legitimate to suppose that his literary friends in Florence and Volterra had coached him up to a large extent— the satires, as compositions, remaining none the less strictly and fully his own. To confute his detractors he now wrote the last of the series, entitled Envy. Among the pictures of his closing years were the admired ” Battlepiece ” now in *he Louvre, painted in the short space of forty days, full of long- drawn carnage, with ships burning in the offing; ” Pythagoras and the Fishermen; ” the ” Oath of Catiline” (Pitti Gallery); and the very celebrated ” Saul and the Witch of Endor ” (Louvre), which is almost his latest work. He undertook a series of satirical portraits, to be closed by one of himself; but while occupied with this project he was assailed by dropsy, which, after lasting fully half a year, brought his life to a close on the 15th of March 1673. In his last moments he married a Florentine named Lucrezia, who kept his house and had borne him two sons, one of them surviving him, and he died in a con- trite frame of mind. He lies buried in the Chiesa degli Angeli, where a portrait of him has been set up. Salvator Rosa, after the hard struggles of his early youth, had always been a success-ful man, and he left a handsome fortune.

Rosa was indisputably a great leader in that modern tendency of fine art towards the romantic and picturesque which, developing in various directions and by diversified processes, has at last almost totally differentiated modern from olden art. He saw appearances with a new eye, and presented new images of them on his canvases, and deserves therefore all the credit due to a vigorous innovator, even if we contest the absolute value of his product. He himself courted reputation for his historical works, laying comparatively little stress on his landscapes; in portraits he was forcible. In chiaroscuro he is simple and effective; his design has energy and a certain grandeur, without any high type of form or any superior measure of correctness. His colour is too constantly of a sandy or yellowish-grey tone. Personally he was a man of high spirit, and he sold his pictures at large prices, more (it is said) to assert the honour of his art than from love of money ; rather than sell them cheap he destroyed them. In his later Florentine period he etched several of his works, subjects of mythology, soldiering, &c. He was choleric, but kind and generous. Though a man of gaiety and pleasure, and a jovial boon companion, he does not appear to have been vicious in any serious degree. He was

talkative, very sharp-tongued and an unblushing encomiast of his own performances. Among his pictures not already mentioned we may name, iri the National

Gallery, London, “Mercury and the Dishonest Woodman,” and three others; in Raynham Hall, ” Belisarius ” ; in the Grosvenor Gallery, ” Diogenes ” ; in the Pitti Gallery, a grand portrait of a man in armour, and the “Temptation of St Anthony,” which contains his own portrait. This last subject appears also in St Petersburg, and in the Berlin Gallery.

The satires of Salvator Rosa deserve more attention than they have generally received. There are, however, two recent books taking account of them — by Cesareo, 1892, and Cartelli, 1899. The satires, though considerably spread abroad during his lifetime, were not published until 17 19. They are all in terza rima, written without much literary correctness, but remarkably spirited, pointed and even brilliant. They are slashingly denunciatory, and from this point of view too monotonous in treatment. Rosa here appears as a very severe castigator of all ranks and conditions of men, not sparing the highest, and as a champion of the poor and down-trodden, and of moral virtue and Catholic faith. It seems odd that a man who took so free a part in the pleasures and diversions of life should be so ruthless to the ministers of these. The satire on Music exposes the insolence and profligacy of musicians, and the shame of courts and churches in encouraging them. Poetry dwells on the pedantry, imitativeness, adulation, affectation and indecency of poets — also their poverty, and the neglect with which they were treated; and there is a very vigorous sortie against oppressive governors and aristocrats. Tasso’s glory is upheld; Dante is spoken of as obsolete, and Ariosto as corrupting. Painting inveighs against the pictorial treatment of squalid subjects, such as beggars (though Rosa must surely himself have been partly responsible for this mis- direction of the art), against the ignorance and lewd- ness of painters, and their tricks of trade, and the gross indecorum of painting sprawling half-naked saints of both sexes. War (which contains the eulogy of Masaniello) derides the folly of hireling soldiers, who fight and perish while kings stay at home; the vile morals of kings and lords, heresy and unbelief also come in for a flagellation. In Babylon Rosa represents himself as a fisherman,

Tirreno, con- stantly unlucky in his net-hauls on the Euphrates; he converses with a native of the country, Ergasto (Rome) is very severely treated, and Naples much the same. Envy (the last of the satires, and generally accounted the best, although without strong apparent reason) represents Rosa dreaming that, as he is about to inscribe in all modesty his name upon the threshold of the temple of glory, the goddess or fiend of Envy obstructs him, and a long interchange of reciprocal objurga- tions ensues. Here occurs the highly charged portrait of the chief Roman detractor of Salvator (we are not aware that he has ever been identified by name) ; and the painter protests that he would never condescend to do any of the lascivious work in painting so shamefully in vogue.

As authorities for the life of Salvator Rosa, Passeri, Vite de' Pittori, may be consulted, and Salvini, Satire e Vita di Salvator Rosa; also BaHinucci and Dominici. The Life by Lady Morgan is a romantic treatment, mingling tradition or mere fiction with fact. The novel, A Company of Death, by Albert Cotton, 1904, gives an interesting picture of Salvator Rosa at Naples. (W. M. R.)

ROSACEAE, in botany, a large cosmopolitan family of seed- bearing plants belonging to the subclass Polypetalae of Dicoty- ledons and containing about 90 genera with 2000 species. The plants vary widely in manner of growth. Many are herbaceous, growing erect, as Geum, or with slender creeping stem, as in species of Potentilla, sometimes sending out long runners, as in strawberry; others are shrubby, as raspberry, often associ- ated with a scrambling habit, as in the brambles and roses, while apple, cherry, pear, plum and other British fruit trees represent the arborescent habit. Vegetative propagation takes place by means of runners, which root at the apex and form a new plant, as in strawberry; by suckers springing from the base of the shoot and rising to form new leafy shoots after running for some distance beneath the soil, as in raspberry; or by shoots produced from the roots, as in cherry or plum. The scrambling of the brambles and roses is effected by means of prickles on the branches and leaf-stalks.

The leaves, which are arranged alternately, are simple, as in apple, cherry, &c, but more often compound, with leaflets palmately arranged, as in strawberry and species of Potentilla, or pinnately arranged, as in the brambles, roses, mountain ash, &c. A difference in this respect often occurs in one and the same genus, as in Pyrus, where apple (P. Malus), and pear {P. communis) have simple leaves, whereas mountain ash or rowan (P. aucuparia) has pinnately compound leaves. In

warm climates the leaves are often leathery and evergreen. The leaves are stipulate, the stipules being sometimes small and shortlived, as in Pyrus and Prunus (cherry, plum, &c), or more important structures adnate to the base of the leaf-stalk, as in roses, brambles, &c. The flowers, which are regular, generally bisexual, and often showy, are sometimes borne singly, as in some species of rose, or of the cloudberry (Rubus chamaemorus) , or few or more together in a corymbose manner, as in some roses, hawthorn and others. The inflorescence in agrimony is a raceme, in Poterium a dense-flowered spike, in Spiraea a number of cymes arranged in a corymb. The parts of the flowers are arranged on a 5-merous plan, with generally considerable increase in the number of stamens and carpels. The shape of the thalamus or floral receptacle, and the relative position and number of the stamens and carpels and the character of the fruit, vary widely and form distinguishing

After Focke in Natiirl. Pjianzenfamilien. from Strasburger's Lehrbuch der Bolanik, by permission of Gustav Fischer.

Fig. 1. — Three flowers cut through longitudinally to show different forms of receptacles in the Rosaceae: 1, Comarum palustre; 2, Alchemilla alpina; 3, Pyrus Malus.

features of the different suborders, six of which may be recognized.

Suborder I. Spiraeoideae is characterized by a flat or slightly concave receptacle on which the carpels, frequently five in number, form a central whorl; each ovary contains several ovules, and the fruit is a follicle. There are five sepals, five petals and the stamens vary from ten to indefinite. The plants are generally shrubs with simple or compound leaves and racemes or panicles of numerous small white, rose or purple flowers. This suborder, which is nearly allied to the order Saxifragaceae, contains 17 genera, chiefly north temperate in distribution. The largest is Spiraea, numerous species of which are cultivated in gardens; S. salicifolia occurs in Britain apparently wild in plantations, but is not indigenous. The native British meadow-sweet (S. Ulmaria) and dropwort {S. Filipendula) have been placed in a separate genus, Ulmaria, and included in the Rosoideae on account of their one-seeded fruit. Quillaja sapon'aria is the Chilean soap tree; the bark contains saponin.

Suborder II. Pomoideae is characterized by a deep cup-shaped receptacle with the inner wall of which the five or fewer carpels are united (fig. 1, 3); the carpels are also united with each other, and each contains generally two ovules. The fruit is made up of the large fleshy

receptacle surrounding the ripe ovaries, the endocarp of which is leathery or stony and contains one seed. The plants are shrubs or trees with simple or pinnately compound leaves and white or rose-coloured often showy flowers, with five sepals and petals and indefinite stamens. The 14 genera are distributed through the north temperate zone, extending southwards in the New World to the Andes of Peru and Chile. The largest genus, Pyrus, with about 50 species, includes apple (P. Malus), pear (P. communis) (fig. 2), wild service (P. torminalis), rowan or mountain-ash (P. aucuparia), and white beam (P. Aria). Mespilus (medlar) and Cotoneaster are also included. (See separate articles for most of the above.)

Suborder III. Rosoideae is characterized by the receptacle being convex and swollen (fig. I, 1), as in strawberry, or – cup-shaped, as in rose (fig. 4), and bearing numerous carpels, each of which con- tains one or two ovules, while the fruit is one-seeded and inde- hiscent. The 39 genera are grouped in tribes according to the form of the receptacle and of the fruit. The Potentilleae bear the carpels on a large, rounded or convex outgrowth of the receptacle. In the large genus Rubus (fig. 3) the ripe ovaries form drupels upon the dry receptacle; the genus is almost cosmopolitan, but the majority of species occur in the forest region of the north temperate zone and in the mountains of tropical America. R. fruticosus is blackberry, R. Idaeus, raspberry, and R. Chamae- morus, cloudberry. In the flower of Potentilla, Fragaria (straw- berry) and a few allied genera an epicalyx is formed by stipular structures arising at the base of the sepals. The fruits consist of numerous dry achenes borne in Fragaria on the much-enlarged

succulent torus, which in the other genera is dry. In Geum (avens) and Dryas (an arctic and alpine genus) the style is persistent in the

Fig.

After Wossidlo, from Strasburger's Lehrbuch der Botanik , by permission of Gustav Fischer.

2. — Pyrus communis (pear), cut through longitudinally; 3, 4, floral diagram.

I, flowering branch; 2, a flower longitudinal section of fruit;

fruit, forming a feathery appendage (Dryas) or a barbed awn (avens), either of which is of service in distributing the fruit. The Poten- tilleae are chiefly north temperate, arctic and alpine plants.

After Wossidlo, from Strasburger's Lehrbuch der Botanik, by permission of Gustav Fischer.

Fig. 3. — Rubus fruticosus (blackberry). , flowering branch; 2, longitudinal section of a flower; 3, fruit; 4, floral diagram.

The Roseae comprise the large genus Rosa, characterized by a more or less urn-shaped torus (fig. 4) enclosing the numerous carpels which form dry one-seeded fruits enveloped in the bright- coloured fleshy torus. The numerous stamens surround the mouth of the torus. The plants are shrubs bearing prickles on the stems and leaves; many species have a scrambling habit resembling the brambles. The species of Rosa, like those of Rubus, are extremely variable, and a great number of subspecies, varieties and forms have been described. The Sanguisorbeae are a reduced form of Rosoideae. The dry one-seeded fruit is enclosed in the urn-shaped

torus, which, however, is dry and inconspicuous, and the number of carpels is much reduced, sometimes to one (figs. 2, 5, 6). Petals are often wanting, as in Alchemilla (lady's mantle) and Polerium, and the flowers are often unisexual and frequently wind- pollinated, as in salad burnet (Polerium Sanguisorba), where the small flowers are crowded in heads, the upper pistil- late, with protruding feathery stigmas, and the lower staminate (or bisexual), with exserted stamens. Agrimonia (agrimony) has a long spike of small honeyless flowers with yellow petals; in the fruit the torus becomes hard and crowned by hooked bristles which ensure the distribution of the enclosed achenes.

Suborder IV. Neuradoideae contains only two genera of desert-inhabiting herbs with yellow flowers; and the five to ten carpels are united together and with the base of the cup-shaped torus, which enlarges to form a dry covering round the one-seeded fruits.

Suborder V. Prunoideae (fig. 7) is characterized by a free solitary carpel with a terminal style and two pendulous ovules, and the fruit a one-seeded drupe. The torus forms a cup from the edge of which spring the five sepals, five alter- nating petals and the ten to indefinite stamens. The plants are deciduous or evergreen trees or shrubs with simple leaves, often

After Duchartre, from Stras- burger's Lehrbuch der Botanik, by permission of Gustav Fischer.

Fig. 4. — Fruit of Rose, consisting of the fleshy hollowed axis, s', the persistent sepals s, and the carpels jr. The stamens e have withered.

Fig. 5. — Carpel of Lady's Mantle (Alchemilla) with lateral style s ; o, ovary; st, stigma, enlarged.

Fig. 6.— Floral Dia- gram of Sanguisorba. b, bract; a',/3 , bracte- oles; d, disk.

with small caducous stipules, and racemes or umbels of generally showy, white or pink flowers. There are five genera, the chief of which is Prunus, to which belong the plum (Prunus com- munis), with several well-marked subspecies — P. spinosa (sloe or blackthorn), P. insititia (bullace), P. domestica (wild plum), the almond (P. Amygdalus), with the nearly allied peach (P. persica), cherry (P. Cerasus), birdcherry (P. Padus) and cherry

After Wossidlo from Strasburger's Lehrbuch der Botanik, by permission of Gustav Fischer.

Fig. 7. — Prunus Cerasus. through longitudinally ;

1, flowering branch: 2, a flower cut 3, fruit in longitudinal section.

laurel (P. Laurocerasus) . The tribe is distributed through the north temperate zone, passing into the tropics. _ Suborder VI. Chrysobalanoideae resembles the last in having a single free carpel and the fruit a drupe, but differs in having the style basal, not terminal, and the ovules ascending, not pendulous; the flowers are also frequently zygomorphic. The 12 genera are tropical evergreen trees or shrubs, the great majority being South American. The zygomorphic flowers indicate an affinity with the closely allied order Leguminosae.

ROSAMOND, known as "The Fair" (d. c. 1176), mistress of Henry II., king of England, is believed to have been the daughter of Walter de Clifford of the family of Fitz-Ponce. The evidence for the paternity is, however, only an entry of a statement made by the jurors of the manor of Corfham in a Hundred Roll of the second year of the reign of

Edward I. (1274), great grandson of Henry II. Rosamond is said to have been Henry's mistress secretly for several years, but was openly acknowledged by him only when he imprisoned his wife Eleanor of Acquitaine as a punishment for her encouragement of her sons in the rebellion of 1173-74. She died in or about n 76, and was buried in the nunnery church of Godstow before the high altar. The body was removed by order of St Hugh, bishop of Lincoln, in 1101, and was, seemingly, reinterred in the chapter house. The story that she was poisoned by Queen Eleanor first appears in the French Chronicle of London in the 14th century. The romantic details of the labyrinth at Wood- stock, and the clue which guided King Henry II. to her bower, were the inventions of story-writers of later times. There is no evidence for the belief that she was the mother of Henry's natural son William Longsword, earl of Salisbury.

ROSARIO, a city and river port of Argentina, in the province of Santa Fe, on the W. bank of the Parana, 186 m. by rail N.W. of Buenos Aires. Pop. (1904, estimate) 120,000. It is acces- sible to ocean-going steamers of medium draught. The city stands on the eastern margin of the great pampean plain, 65 to 75 ft. above the wide river-bed washed out by the Parana. It extends back a considerable distance from the river, and there are country residences and gardens of the better class along the line of the Central Argentine railway and northward toward San Lorenzo. The city is laid out with chessboard regularity, and the streets are paved (in great part with cobble- stones), lighted with gas and electricity, traversed by tramway lines, and provided with sewers and water mains. The Boule- vard El Santafecino is an attractive residence street with double driveways separated by a strip of garden and bordered by fine shade trees. The chief edifices of an official character are the custom house, post office, municipal hall and law courts. There is a large charity hospital, and the English and German colonies maintain a well -equipped infirmary. The largest sugar refinery in Argentina is here, and there are flour-mills, breweries and some smaller manufactures. The city is chiefly commercial, being the shipping port for a large part of northern Argentina, among its exports being wheat, flour, baled hay, linseed, Indian corn, sugar, rum, cattle, hides, meats, wool, quebracho extract, &c. The railway connexions are good, including the Buenos Aires and Rosario and the Central Argen- tine lines to the national capital, the Buenos Aires and Rosario line northward to Tucuman, where it connects with the govern- ment line to Salta, Jujuy and the Bolivian frontier, the Central Argentine line westward to Cordoba, with connexions at Villa Maria for Mendoza and the Chilean frontier, and two narrow- gauge lines, one running to Santa Fe and the other to Cordoba. The port of Rosario has hitherto

consisted of a deep river anchorage and wooden wharves on the lower bank for the accommodation of steamers. Since 1902 work has been in progress under a contract with a French company for the construction of 12,697 ft. of quays, 23 m. of railway tracks along the quays to connect with the several railways entering the city, drawbridges, roadways, sheds, depots, elevator, offices, electric plant, fixed and movable cranes, and other appliances, &c, for the handling of produce and merchandise. The trade of the port was officially valued at 21,276,672 Arg. gold dollars imports, and 68,503,231 gold dollars exports in

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Rosario was founded in 1730 by Francisco Godoy, but it grew so slowly that it was still a small village up to the middle of the 19th century. In 1854 General Justo Jose de Urquiza, then at the head of the ■ Argentine Confederation, made it the port of the ten inland provinces then at war with Buenos Aires, and in 1857 imposed differential duties on the cargoes of vessels first breaking bulk at the southern port. This gave Rosario

a start, and its trade and population have grown since then with great rapidity.

ROSARY (Lat. rosarium), a popular devotion of the Roman Catholic Church, consisting of 15 Paternosters and Glorias and 1 50 Aves, recited on beads. It is divided into three parts, each containing five decades, a decade comprising 1 Pater, 10 Aves and a Gloria, in addition to a subject for meditation selected from the ” mysteries ” of the life of Christ and of the Blessed Virgin. The Christian practice of repeating prayers is traceable to early times: Sozomen mentions (H.E. v. 29) the hermit Paul of the 4th century who threw away a pebble as he recited each of his 300 daily prayers; and a canon of the English synod of Cealcythe in 816 (Mansi xiv. 360) directed septem beltidum Paternoster to be said for a deceased bishop. In many orders the lay brothers daily said a large number of Paternosters instead of reading the breviary; it was natural that the Pater- noster should be the prayer most often repeated. The Ave Maria is first mentioned as a form of prayer in the second half of the nth century, but it was not until the 16th century that it became general in its present form. It is not known precisely when the mechanical device of the rosary was first used. William of Malmesbury (De gest. pont. Angl. iv. 4) says that Godiva, who founded a religious house at Coventry in 1040, left a string of jewels, on which she had told her prayers, that it might be hung on the statue of the Blessed Virgin. Thomas of Chantimpre, who

wrote about the middle of the 13th century, first men- tions the word ” rosary ” (De apibus, ii. 13), using it apparently in a mystical sense as Mary’s rose-garden. There is no con- temporary confirmation of the story that the rosary was given to St Dominic through revelation of the Blessed Virgin and was employed during the crusade against the Albigenses, although the story was later accepted by Leo X., Pius V., Gregory XIII., Sixtus V., Alexander VII., Innocent XL and Clement XL According to Benedict XIV. (De Fest. 160), the belief rests on the tradition of the Dominican order. Whatever may have been the origin of the rosary, the Dominicans did much to propagate the devotion. The practice of meditating on the mysteries doubtless began with a Dominican, Alanus de Rupe (born 1428), and another Dominican, Jacob Sprenger (d. 1495), grand-inquisitor in Germany, founded the first con- fraternity of the rosary at Cologne in 1475. This society spread rapidly, and was specially privileged by Sixtus IV., Innocent VIII. and Leo. X. After the battle of Lepanto (1st Sunday in October 1571), which was won while the members of the confraternity at Rome were making supplication for Christian success, Pius V. ordered an annual commemoration of ” St Mary of Victory,” and Gregory XIII., by bull of the 1st of April 1583, set aside the 1st Sunday in October as the feast of the Rosary of the Blessed Virgin Mary, to be observed in such churches as maintained an altar in honour of the rosary. Clement XL, by bull of the 3rd of October 1716, directed the observance of the feast by all Christendom. The devotion has been particularly fostered by the Jesuits, St Ignatius Loyola having expressly ordered its use. It has been repeatedly indulgenced by various popes. Leo XIII. issued eight encyclicals on the devotion; he urged its recitation throughout October, and directed (1883) the insertion of the title regina sacratissimi rosarii in the Litany. There are several varieties of the rosary more or less in use by Roman Catholics: the Passionists, or rosary of the five wounds, approved by Leo XII. in 1823; the Crown of Our Lord, attributed to Michael of Florence, a Camaldolese monk (c. 1516), and consisting of 33 Paters, S Aves and a Credo; St Bridget’s, 7 Paters and 63 Aves, in honour of the joys and sorrows of the Blessed Virgin and the 63 years of her life. The Living Rosary, in which 15 persons unite to say the rosary every month, was approved by Gregory XVI. (1832) and placed in charge of the Dominican order by Pius IX. (1877).

Similar expedients to assist the memory in repetitions of prayers occur among Buddhists and Mahommedans: in the former case the prayers are said on a string of some hundred beads, called the tibet-pren-ba or the ten-wa; in the latter case,

the so-called tasbih has 33, 66 or 99 beads, and is used for the repetition of the 99 names which express the attributes of God.

See the critical dissertation in the Acta sanctorum, Aug. I, 422 sqq ; Quetif and Echard, Script. Ord. Praed. i. 411 sqq. ; Benedict XIV olim Prospero de Lambertini, De festis B.V.M- i. 170 sqq.; H. Holzapfel, O.F.M., St Dominikus u. der Rosenkranz (Munich, 1903) ; Pradel, Rosenkranz-Biichel (Trier, 1885) ; D. Dahm, Die Bruderschaft vom hi. Rosenkranz (Trier, 1902). For the indulgences attached to the devotion consult Beringer, S.J., Die Abldsse, nth ed. 292 ff., 354 ff. (Paderborn, 1895). For the corresponding devotion among Buddhists, consult Waddell, The Buddhism of Tibet, or Lamaism (London, 1895), and an article by Monier Williams in the Athenaeum, 9th of Feb. 1878; for that of the Mahommedans, see L Petit, Les Confreres musulmanes (Paris, 1899), and E. Arnold, Pearls of the Faith, or Islam's Rosary (London, 1882). There is an excellent article, " Rosenkranz," by Zockler in Herzog-Hauck, Realency- klopddie, 3rd ed. vol. 17, pp. 144-50. (C. H. Ha.)

ROSAS, JUAN MANUEL (1793-1877), tyrant of Buenos Aires, was born on the 30th of March 1793, in the city of that name. His father, Leon Ortiz de Rosas, was an owner of cattle runs (estancias) and a trader in hides, who took an active part in defeating the English attack on the city in 1807. Juan Rosas received so little education that he had to learn to read and write when he was already a married man and a successful cattle breeder. From a very early age he was left in charge of one of his father's establishments. When he was eighteen he married Maria de la Encarnacion Escurra. His mother having suspected him of appropriating money, he left his parents, and for some time subsisted by working as a vaquero or cowboy, and then as overseer on the estates of other owners; but he accumulated money, and by the help of a loan from a friend he became possessed of a cattle run of his own, Los Cerrillos. The anarchical state of the country since its independence of Spain had favoured the Indians, who had taken the offensive and raided up to within forty miles of Buenos Aires. Rosas ob- tained leave to arm his cowboys. Under his management Los Cerrillos became a refuge for adventurers, whom he paid and fed well, but from whom he exacted implicit obedience. His followers became a fighting force of acknowledged efficiency, and Rosas took practically the position of an independent ruler whose help was sought by contending political parties. By attending to his own interest only, and by astute intrigue, or savage fighting when necessary, he grew in power from 1820 onwards, and from 1835 to

1852 ruled as dictator (see Argentina). It is probable that he would have continued to govern in Buenos Aires till his death if his ambition had not led him into wars with all his neighbours. He wished to extend the authority of the Republic over all the territory which had belonged to the Spanish viceroyalty of Buenos. This led him directly into wars with Uruguay, Paraguay and Chile, and into ” warlike operations ” with England and France, with whom he had other causes of quarrel arising out of the complaints of traders and bondholders. His government was overthrown in 1852 by a coalition of his neighbours and the defection of several of his generals, and even members of his own family who lived in fear of his suspicions and violence. He took refuge in England, and lived at Swaythling, near Southampton, till his death on the 14th of March 1877. A portrait taken in 1834 and reproduced by Sir Woodbine Parish in his Buenos Ayres and Provinces of the Rio de la Plata (London, 1852) represents Rosas as a fine-looking man of the handsome Spanish type.

See O. Martens, Ein Caligula unseres Jahrhunderts (Berlin, 1896), which contains a full bibliography.

ROSCELLINUS (Rucelinus, or Rousselin) (c. 1050-c. n 22), often called the founder of Nominalism (see Scholasticism), was born at Compiegne (Compendium). Little is known of his life, and our knowledge of his doctrines is mainly derived from Anselm, Abelard and John of Salisbury. He studied at Soissons and Reims, was afterwards attached to the cathedral of Chartres, and became canon of Compiegne. It seems most probable that Roscellinus was not strictly the first to promulgate nominalistic doctrines; but in his exposition they received more definite expression, and, being applied to the dogma of the Trinity, attracted universal attention. Roscellinus maintained that it

is merely a habit of speech which prevents our speaking of the three persons as three substances or three Gods. If it were otherwise, and the three persons were really one substance or thing (una res), we should be forced to admit that the Father and the Holy Spirit became incarnate along with the Son. Roscellinus seems to have put forward this doctrine in perfect good faith, and to have claimed for it at first the authority of Lanfranc and Anselm. In 1092, however, a council con- voked by the archbishop of Reims condemned his interpretation, and Roscellinus, who was in danger of being stoned to death by the orthodox populace, recanted his error. He fled to England, but having made himself unpopular by an attack on the doctrines of Anselm, he left the country and repaired to Rome, where he was well received and became reconciled to the Church. He then returned to France,

taught at Tours and Loc-menach (Loches) in Brittany (where he had Abelard as a pupil), and finally became canon of Besancon. He is heard of as late as 11 21, when he came forward to oppose Abelard's views on the Trinity.

Of the writings of Roscellinus, nothing is preserved except a letter to Abelard, mainly concerned with the doctrine of the Trinity (ed. J. A. Schmeller, Munich, 1850). See F. Picaret, Rosselin, philosophe et theologien (1896), and authorities quoted under Scholasticism.

ROSCHER, WILHELM GEORG FRIEDRICH (1817-1894),

German economist, was born at Hanover on the 21st of October 1817. He studied at Gottingen and Berlin, and obtained a professorship at Gottingen in 1844 and subsequently at Leipzig in 1848. Omitting preparatory indications and undeveloped germs of doctrine, the origin of the " historical " school of political economy may be traced to Roscher. Its fundamental principles are dated, though with some hesitation, and with an unfortunate contrast of the historical with the philosophical method, in his Grundriss zu Vorlesungen iiber die Staatswirth- schaft nach geschichtlicher Methode (1843). This short study was afterwards expanded into his great System der Volkswirth-schaft, published in five volumes between 1854 and 1894, and arranged as follows: vol. i., Die Grundlagen der National- okonomie, 1854 (trans, by J. J. Lajor, Principles of Political Economy, Chicago, 1878); vol. ii., Die Nationalokonomie des Ackerbaues und der verwandten Urproduktionszweige, 1859; vol. iii., Die Nationalokonomie des Handels und Gewerbfleisses, 1881; vol. iv., System der Finanzwissenschaft, 1886; vol. v., System der Armenpflege und Armenpolitik, 1894. His Geschichte der Nationalokonomie in Deutschland (1874) is a monumental work. He also published in 1842 an excellent commentary on the life and works of Thucydides. He died at Leipzig on the 4th of June 1894.

See T. Roscher, Zur Geschichte der Familie Roscher in Nieder- sachsen (Hanover, 1892); Brasch, Wilhelm Roscher und die sozial-wissenschaftlichen Strbmungen der Gegenwart (Leipzig, 1895).

ROSCIUS GALLUS, QUINTUS (c. 126-62 B.C.), Roman actor, was born, a slave, at Solonium, near Lanuvium. Endowed with a handsome face and manly figure, he studied the delivery and gestures of the most distinguished advocates in the Forum, especially Q. Hortensius, and won universal praise for his grace and elegance on the stage. He especially excelled in comedy. Cicero took lessons from him. The two often engaged in friendly rivalry to try whether the orator or the actor

could express a thought or emotion with the greater effect, and Roscius wrote a treatise in which he compared acting and oratory. Q. Lutatius Catulus composed a quatrain in his honour, and the dictator Sulla presented him with a gold ring, the badge of the equestrian order, a remarkable distinction for an actor in Rome, where the profession was held in contempt. Like his contemporary Aesopus, Roscius amassed a large fortune, and he appears to have retired from the stage some time before his death. In 76 B.C. he was sued by C. Fannius Chaerea for 50,000 sesterces (about £400), and was defended by Cicero in a famous speech.

See H. H. Pfliiger, Cicero's Rede pro Q. Roscio Comoedo (1904).

ROSCOE, SIR HENRY ENFIELD (1833-), English chemist, was born in London on the 7th of January 1833. After

studying at Liverpool High School and University College, London, he went to Heidelberg to work under R. W. Bunsen, of whom he became a lifelong friend. In 1857 he was appointed to the chair of chemistry at Owens College, Manchester, where he remained for thirty years, and from 1885 to 1805 he was M.P. for the south division of Manchester. He served on several royal commissions appointed to consider educational questions, in which he was keenly interested, and from 1896 to 1902 was vice-chancellor of London University. He was knighted in 1884. His scientific work includes a memorable series of re- searches carried out with Bunsen between 1855 and 1862, in which they laid the foundations of comparative photochemistry. In 1867 he began an elaborate investigation of vanadium and its compounds, and devised a process for preparing it pure in the metallic state, at the same time showing that the substance which had previously passed for the metal was contaminated with oxygen and nitrogen. He was also the author of researches on niobium, tungsten, uranium, perchloric acid, the solubility of ammonia, &c. His publications include, besides several elementary books on chemistry which have had a wide circula- tion and been translated into many foreign languages, Lectures on Spectrum Analysis (1869); a Treatise on Chemistry (the first edition of which appeared in 1877-1892); A New View of Dalton's Atomic Theory, with Dr A. Harden (1896); and an Autobio- graphy (1906). The Treatise on Chemistry, written in colla- boration with Carl Schorlemmer (1834-1892), who was appointed his private assistant at Manchester in 1859, official assistant

in the laboratory in 1861, and professor of organic chemistry in 1874, is a standard work.

ROSCOE, WILLIAM (1753-1831), English historian and miscellaneous writer, was born on the 8th of March 1753 at Liverpool, where his father, who was a market gardener, kept a publichouse known as the Bowling Green at Mount Pleasant. Roscoe was eager in the acquisition of knowledge, and at twelve he left school, having learned all that his schoolmaster could teach. He now assisted his father in the work of the garden, and gave his leisure hours to reading and study. ” This mode of life,” he says, ” gave health and vigour to my body, and amusement and instruction to my mind; and to this day I well remember the delicious sleep which succeeded my labours, from which I was again called at an early hour. If I were now asked whom I consider to be the happiest of the human race, I should answer, those who cultivate the earth by their own hands.” At fifteen it was necessary to decide upon a path in life. A month’s trial of bookselling sufficed to disgust him, and in 1769 he was articled to a solicitor. Although a diligent student of law, he did not bid farewell to the Muses, but continued to read the classics, and made that acquaintance with the language and literature of Italy which became the instrument of his distinction in after life. He wrote many verses: his Mount Pleasant was composed when he was sixteen, and this and other verses, though now forgotten, won the esteem of good critics. In 1774 he commenced business as an attorney, and as soon as his professional gains warranted he married (1781) Jane, second daughter of William Griffies, a Liverpool tradesman, and had seven sons and three daughters. He had the courage to denounce the African slave trade in his native town, where not a little of the wealth came from this source. He wrote the Wrongs of Africa (1787-1788), and entered into a controversy with an ex-Roman Catholic priest, who undertook to prove the ” licitness of the slave trade ” from the Bible. Roscoe was also a political pamphleteer, and like many other Liberals of the day hailed the promise of liberty in the French Revolution.

Meanwhile he had steadily pursued his Italian studies, and had made extensive collections relating to the great ruler of Florence. The result was his Life of Lorenzo de’ Medici, which appeared in 1796, and at once placed him in the front rank of contemporary historians. The work has often been reprinted, and translations in French, German and other languages show that its popularity was not confined to its author’s native land. Perhaps the most gratifying testimony was that of Fabroni,

who had intended to translate his own Latin life of Lorenzo, but

abandoned the design and induced Gaetano Mecherini to undertake an Italian version of Roscoe. In 1796 Roscoe gave up practice as an attorney, and had some thought of going to the bar, but relinquished the idea after keeping a single term. Between 1793 and 1800 he paid much attention to agriculture, and helped to reclaim Chat Moss, near Man- chester. He also succeeded in restoring to good order the affairs of a banking house in which his friend William Clark, then resident in Italy, was a partner. This task led to his introduction to the business, which eventually proved dis- astrous. His translation of Tansillo's Nurse appeared in 1798, and went through several editions. It is dedicated in a sonnet to his wife, who had practised the precepts of the Italian poet.

The Life and Pontificate of Leo the Tenth appeared in 1805, and was a natural sequel to that by which he had made his reputation. The work, whilst it maintained its author's fame, did not, on the whole, meet with so favourable a reception as the Life of Lorenzo. It has been frequently reprinted, and the insertion of the Italian translation in the Index did not prevent its circulation even in the papal states. Roscoe was elected member of parliament for Liverpool in 1806, but the House of Commons was not a congenial place, and at the dis- solution in the following year he declined to be again a candi- date. The commercial troubles of 1816 brought into difficulties the banking house with which he was connected, and forced the sale of his collection of books and pictures. It was on this occasion that he wrote the fine ' ' Sonnet on Parting with his Books. " Dr S. H. Spiker, the king of Prussia's librarian, gives an inter- esting account of a visit to Roscoe at this period of trouble. Roscoe said he still desired to write a biography of Erasmus but " wanted both leisure and youth." This project was not executed (Spiker's Travels through England, &c, 18 16). After a five years' struggle to discharge the liabilities of the bank, the action of a small number of creditors forced the partners into bankruptcy in 1820. For a time Roscoe was in danger of arrest, but ultimately he received honourable discharge. On the dispersal of his library, the volumes most useful to him were secured by friends and placed in the Liverpool Athenaeum. The sum of £2500 was also invested for his benefit. The inde- pendent and sensitive nature of Roscoe made both these opera- tions difficult. Having now resigned commercial pursuits entirely, he found a pleasant task in the arrangement of the great library at Holkham, the property of his friend Coke. In 1822 he issued an appendix of illustrations to his Lorenzo and also a Memoir of Richard Robert Jones of Aberdaron, a remarkable self-taught linguist. The year 1824 was memorable for the death of his wife and the publication of his edition of the works of

Pope, which involved him in a controversy with Bowles. His versatility was shown by the appearance of a folio monograph on-the Monandrian Plants, which was published in 1828. It appeared first in numbers, and the last part came out after his recovery from a paralytic attack. He died on the 30th of June 1831.

Roscoe's character was a fine one. Under circumstances uncongenial and discouraging he steadfastly maintained the ideal of the intellectual life. Sensitive and conscientious, he sacrificed his possessions to a punctilious sense of duty. He had the courage of unpopular opinions, and, whilst pro- moting every good object in his native town, did not hesitate to speak out where plain dealing, as in the matter of slavery, was required. He was a sincere friend and exemplary in his domestic relations. Posterity is not likely to endorse the verdict of Horace Walpole, who thought Roscoe " by far the best of our historians," but in spite of newer lights and of some changes of fashion in the world of letters, his books on Lorenzo de' Medici and Leo X. remain important contributions to historical literature.

In addition to the writings already named, Roscoe wrote tracts on penal jurisprudence, and contributed to the Transactions of the Royal Society of Literature and of the Linnean Society. The first collected edition of his Poetical Works was published in 1857, and

is sadly incomplete, omitting, with other verses known to be from his pen, the Butterfly's Ball, a fantasy, which has charmed thousands of children since it appeared in 1807. Other verses are in Poems for Youth, by a Family Circle (1820).

The Life by his son Henry Roscoe (2 vols., London, 1833) contains full details of Roscoe's career, and there are references to him in the Autobiographical Sketches of De Quincey, and in Washington Irving's Sketch Book. (W. E. A. A.)

ROSCOFF, a maritime town and watering-place of north- western France, in the department of Finistere, on the English Channel, 17! m. N.N.W. of Morlaix by rail. Pop. (1906) town, 1984; commune, 5054. Roscoff, separated from the He de Batz by a narrow channel, has a tidal port used by fishing and coasting vessels. Many of the inhabitants are engaged in the cultivation of early vegetables, to the growth of which the mild climate and fertile soil is eminently

favourable. The church of Roscoff (16th century) has a fine Renaissance tower and contains inter- esting alabaster bas-reliefs. The ruined chapel of St Ninian commemorates the landing at Roscoff in 1548 of Mary Stuart, previous to her betrothal with the dauphin, son of Henry II. In 1746 Charles Edward, the young Pretender, landed at the port after his defeat at Culloden.

ROSCOMMON, WENTWORTH DILLON, 4TH Earl of (c. 1630-1685), English poet, was born in Ireland about 1630. He was a nephew of Thomas Wentworth, earl of Strafford, and was educated partly under a tutor at his uncle's seat in Yorkshire, partly at Caen in Normandy and partly at Rome. After the Restoration he returned to England, and was well received at court. In 1649 he had succeeded to the earldom of Ros- common, which had been created in 1622 for his great-grand-father, James Dillon; and he was now put in possession by act of parliament of all the lands possessed by his family before the Civil War. As captain of the Gentleman Pensioners he found abundant opportunity to indulge the love of gambling, which appears to have been his only vice. Disputes with the Lord Privy Seal about his Irish estates necessitated his presence in Ireland, where he gave proof of some business capacity. On his return to London he was made master of the horse to the duchess of York. He was twice married, in 1662 to Lady Frances Boyle, widow of Colonel Francis Courtenay, and in 1674 to Isabella Boynton.

His reputation as a didactic writer and critic rests on his blank verse translation of the Ars Poetica (1680) and his Essay on Translated Verse (1684). The essay contained the first definite enunciation of the principles of " poetic diction," which were to be fully developed in the reign of Queen Anne. Roscommon, who was fastidious in his notions of " dignified writing," was himself a very correct writer, and quite free from the indecencies of his contemporaries. Alexander Pope, who seems to have learnt something from his carefully balanced phrases and the regular cadence of his verse, says that " In all Charles's days, Roscommon only boasts unspotted bays." He saw clearly that a low code of morals was necessarily followed by a corresponding degradation in literature, and he insists that sincerity and sympathy with the subject in hand are essential qualities in the poet. This elevated conception of his art is in itself no small merit. He has, moreover, the dis- tinction of having been the first critic to avow his admiration for Paradise Lost. Roscommon formed a small literary society which he hoped to develop into an academy with authority to formulate rules on language and style, but its influence only extended to a limited circle, and the scheme fell through after its promoter's death. He was buried in Westminster Abbey on tne 21st of January

1685.

The title passed to his uncle, Carey Dillon (1627-1689). In 1746, on the death of James, the 8th earl, it passed to Robert Dillon (d. 1770), a descendant of the first earl. His family became extinct in 1816, and in 1828 Michael James Robert Dillon, another descend- ant of the 1st earl, established his title to the earldom before the House of Lords. When he died in May 1850 it became extinct.

Roscommon's poems were collected in 1701, and are included in Anderson's and other collections of the British poets. He also translated into French from the English of Dr W. Sherlock, Traitte touchant I'obeissance passive (1686).

ROSCOMMON, a county of Ireland in the province of Con- naught, bounded N.E. by Leitrim, N.W. by Sligo, W. by Mayo, W. and S. by Galway, E. by Longford and E. and S. by West- meath and King's County. The area is 629, 633 acres, or about 985 sq. m. The greater part of the county belongs to the great limestone plain of central Ireland, and is either flat or very slightly undulating. In the north-east, on the Leitrim border, the Braulieve Mountains, consisting of rugged and precipitous ridges with flattened summits, attain an elevation in Cashel Mountain of 1377 ft.; and in the north-west the Curlew Moun- tains, of similar formation, between Roscommon and Sligo, rise abruptly to a height over 800 ft. In the east the Slieve- bawn range, formed of sandstone, have a similar elevation. The Shannon with its expansions forms nearly the whole eastern boundary of the county, and on the west the Suck from Mayo forms for over 50 m. the boundary with Galway till it unites with the Shannon at Shannon Bridge. The other tributaries of the Shannon within the county are the Arigna, the Feorish and the Boyle. The lakes formed by expansions of the Shannon on the borders of Co. Roscommon are Loughs Allen, Boderg, Boffin, Forbes and Ree. Of the numerous other lakes within the county the most important are Lough Key in the north, very picturesquely situated with finely wooded banks, and Lough Gara (mostly in Co. Sligo) in the north-west.

In this long county one may travel fifty miles across the Carboniferous Limestone plain, with the grey rock cropping out here and there, and long grass-covered esker-ridges forming the only obstacle to the roads. Lough Ree is a typical lake of the plain. Two inliers of Silurian rocks have been thrust up, form- ing hills between Lough Ree and Lough Boffin. At Boyle, however, higher Old Red Sandstone country is encountered, and farther north the Millstone Grit and Coal-Measure series cap the mountains almost horizontally at Arigna near Lough

Allen. The nodules of clay-ironstone here were formerly smelted, and the seams of bituminous coal, mostly on Millstone Grit horizons, are worked successfully on a high level of the mountains.

The subsoil is principally limestone, but there is some light, sandy soil in the south. In the level parts the land when drained and properly cultivated is very fertile, especially in the district known as the plains of Boyle, which includes some of the richest grazing land in Ireland. Along the banks of the Suck and Shannon there is, however, a large extent of bog and marsh. The proportion of tillage to pasture is roughly as one to three. Oats and potatoes are the principal crops, but the acreage devoted to them decreases; the numbers of cattle, sheep, pigs, goats and poultry, on the other hand, are proportionately large and increasing. Communications are afforded by the Midland Great Western railway, the Sligo line of that system crossing the northern part of the county by Boyle, the Athlone and Mayo line passing from S.E. to N.W. by the towns of Roscommon and Castlerea, and the Athlone and Galway line crossing the southern part.

The population was 116,552 in 1891, and 101,791 in 1901; 97% are Roman Catholics, and nearly the whole popula- tion is rural. The chief towns are Boyle, Roscommon, Elphin and Castlerea; and a small portion of Carrick-on-Shannon, including the railway station, is in this county, the major portion being in Co. Leitrim. The county is divided into ten baronies. Ecclesiastically it belongs to the Protestant dioceses of Elphin and Ardagh (united with Kilmore and Tuam), and to the Roman Catholic dioceses of Tuam, Clonfert, Achonry, Elphin and Ardagh. Assizes are held at Roscommon and quarter sessions at Boyle, Strokestown and Roscommon. The county returns two members to parliament. To the Irish parliament before the Union of 1800 two members were re- turned for the county, and two each for the boroughs of Boyle, Roscommon and Tulsk.

The district was granted by Henry III. to Richard de Burgo, but remained almost wholly in the possession of the native septs. Until the time of Elizabeth Connaught was included in the two districts of Roscommon and Clare, but in 1579 it

was further subdivided by Sir Henry Sydney, and was assigned its present limits. All the old proprietors were dispossessed at the Cromwellian settlement, except the O'Conor family headed by the

O'Conor Don. The most interesting antiquarian remains within the county are the ruins of Crogan, the ancient palace of the kings of Connaught. The principal ancient castles are the old stronghold of the M'Dermotts on Castle Island, Lough Key, the dismantled castle of the M'Donoughs at Ballinafad, and the extensive fortress at Roscommon rebuilt by John d'Ufford, justiciary of Ireland in 1268. There are fragments of a round tower at Oran. The abbey of Boyle is in remarkably good preservation, and exhibits fine specimens of the Norman arch. The other monastic remains within the county, with the exception of the abbey of Roscommon, are of comparatively small importance. The Irish bard Carblan, who died in 1738, is buried by the ruined church of Kilronan, in the extreme north of the county. The bishopric of Elphin was united with Kilmore and Ardagh in 1833, and the former cathedral and episcopal buildings are largely modernized.

ROSCOMMON, a market town and the county town of Co. Roscommon, Ireland, situated on rising ground in a bare plain in the centre of the county, on the Mayo line of the Midland Great Western railway, 18; m. N.W. by N. from Athlone. Pop. (1901) 1 89 1. It contains the county buildings, and has Protestant and Roman Catholic churches, the latter of which is a fine building completed in 1903. An extensive trade is carried on in agricultural produce and live stock. A castle, dating from 1268, when it was founded by John d'Ufford, justiciary of Ireland, stands, an imposing mass of ruins, but far gone in decay, overlooking the plain. It fell to besiegers in 1566, 1642 and 1652, and was partially burned after the battle of Aughrim in 1691. There are also remains of a Dominican priory of the middle of the 13th century, founded by Felim O'Conor, king of Connaught, and exhibiting fine, though mutilated, details of the style of that period. The name of the town, signifying St Coman's wood, is derived from the saint who founded the monastery of Canons Regular here in the 6th century. The town received charters from Edward I. and James I. Two m. N.E. are small remains of the abbey of Deerane.

ROSCREA, a market town near the north-western border of Co. Tipperary, Ireland, pleasantly situated on undulating ground connecting the Devil's Bit and the Slieve Bloom moun- tains. Pop. (1901) 2325. It is 77 m. W.S.W. from Dublin on the Ballybrophy and Limerick branch of the Great Southern & Western railway. A branch line runs northward to Birr or Parsonstown. Flour-milling and tanning are industries, and monthly cattle fairs are held. There is a branch here of the Trappist Monastery of Mount Melleray in Co. Waterford. The antiquarian remains are of interest. These include portions of an Augustinian abbey, founded by St Cronan, early in the 7th century, which are incorporated into the church. Out of this abbey a diocese

grew, to be united with that of Killaloe in the 12th century. Here also was produced the Book of, Dimma, consisting of the gospels and accompanied by a brazen shrine, ornamented with silver and tracery, and preserved in the library of Trinity College, Dublin. A cross and a shrine of St Cronan are in the churchyard. There are also a round tower, 80 ft. in height, but lacking the upper storeys, and a Franciscan friary (1490); while a circular tower, and a square keep (occupied as barracks), mark strongholds, the one built by King John and the other by the Ormondes, and testify to the former importance of the town, which was doubtless accen- tuated by its physical position in a passway between the neighbouring mountain ranges. Leap Castle, about 4 m. N., is another fortified mansion, which is still inhabited.

ROSE, the name of a distinguished family of German chemists. Valentine Rose the elder was born on the 16th of August 1736 at Neu-Ruppin, and died on the 28th of April 1771 at Berlin, where he was an apothecary and for a short time before his death assessor of the Ober Collegium Medicum. He was the discoverer of “Rose’s fusible metal” (see Fusible Metal). His son, Valentine Rose the younger, born on the 31st of

October 1762 at Berlin, was also an apothecary in that city at«d assessor of the Ober Collegium Medicum from 1797. It was he who in 1800 proved that sulphuric ether contains no sulphur. He died in Berlin on the 10th of August 1807, leaving four sons, one of whom, Heinrich, was a distinguished chemist, and another, Gustav, a crystallographer and mineralogist. Hein- rich Rose, born at Berlin on the 6th of August 1795, began to learn pharmacy in Danzig, where, during the siege of 1807, he nearly lost his life from typhus. Like his brother he served in the campaign of 181 5. During the summer of the following year he studied at Berlin under M. H. Klaproth, a devoted friend of the family, and in the autumn entered a pharmacy at Mitau. In 1 819 he went to Stockholm, where he spent a year and a half with J. J. Berzelius, and in 1821 he graduated at Kiel. Returning to Berlin he became a Privatdozent in the university in 1822, extraordinary professor of chemistry in 1823 and ordinary professor in 1835, and there he died on the 27th of January 1864. He devoted himself especially to inorganic chemistry and the development of analytical methods, and the results of his work are summed up in the successive issues of his classical work, Ausfiihrliches Handbuch der analytischen Chemie, of which he published the first edition at Berlin in 1829, and the sixth, practically a new work in French, at Paris in 1861. He was the discoverer of antimony pentachloride, and mention may also be made of his researches on the influence of the mass-action of water in many reactions, carried out before the investigations of Guldberg and

Waage in 1867. Gustav Rose, born at Berlin on the 18th of March 1798, began his career as a mining engineer, but soon turned his attention to theoretical studies. A pupil of Berzelius like his brother, he graduated in 1820 at Berlin University where he became successively Privatdozent (1823), extraordinary professor of mineralogy (1826) and ordinary professor (1839). In 1856 he succeeded to the directorship of the Royal Mineralogical Museum at Berlin, and he helped to found the German Geological Society, of which he was president from 1863 until the end of his life. He made many journeys in different parts of Europe for the sake of mineralogical study, and in 1829 with A. von Humboldt and C. G, Ehrenberg (1795-1876), professor of medicine at Berlin, took part in an expedition to the Ural and Altai moun- tains and the Caspian Sea, which yielded information of primary importance concerning the mineralogy of the Russian Empire. His Work covered every branch of mineralogy, including crys- tallography and the artificial formation of minerals. The science of petrography, according to Gerhard vom Rath, originated with him. He was the first in his own country to use the reflect- ing goniometer for the measurement of the angles of crystals, and to teach the method of studying rocks by means of micro- scopic sections. He also devoted special attention to meteorites and to the problem presented by the different structure of the stony matter in them and in the crust of the earth, and just before his death, which took place at Berlin on the 15th of July 1873, he was engaged in investigating the formation of the diamond. In addition to many scientific memoirs he published Elemente der Krystallographie (1830); Mineralogischgeognostische Reise nach dem Ural, dem Altai und dem Kaspische Meere (1837) vol. i.; (1842) vol. ii.; Das Krystallo- chemische Mineral- system (1852); and Beschreibung und Eintheilung der Meteoriten

(1863).

ROSE, GEORGE (1 744-1818), British politician, was born on the 17th of June 1744, and was educated at Westminster school, afterwards entering the navy, a service which he left in 1762 after he had taken part in some fighting in the West Indies. He then obtained a position in the Civil Service, becoming joint keeper of the records in 1772 and secretary to the board of taxes in 1777. In 1782 he gave up the latter appointment to become one of the secretaries to the treasury under Lord Shelburne, though he did not enter parliament. He left office with his colleagues in April 1783, but in the following December he returned to his former position at the treasury in Pitt’s ministry, being henceforward one of this minister’s most steadfast supporters. He entered parliament as member for Launceston

early in 1784, and his fidelity and friendship were rewarded by Pitt, who gave him a lucrative post in the court of exchequer; in 1788 he became clerk of the parliaments. In 1801 Rose left office with Pitt, but returned with him to power in 1804, when he was made vice-president of the committee on trade and joint paymaster-general. He resigned these offices a few days after Pitt's death in 1806, but he served as vice-president of the committee on trade and treasurer of the navy under the duke of Portland and Spencer Perceval from 1807 to 181 2. He was again treasurer of the navy under Lord Liverpool, and he was still member of parliament for Christchurch, a seat which he had held since 1790, when he died at Cuffnells, in Hampshire, on the 13th of January 1818. Rose was an able and conscientious public servant, although he and his two sons d rew a large amount of money from sinecures, a fact referred to by William Cobbett in his " A New Year's Gift to old George Rose." He wrote several books on economic subjects, and his Diaries and Correspondence, edited by the Rev. L. V. Harcourt, was published in i860.

His elder son, Sir George Henry Rose (1771-1855), was in parliament from 1794 to 1813, and again from 1818 to 1844, and in the meantime he was British minister at Munich and at Berlin; in 18 18 he succeeded his father as clerk of the parlia- ments. He was the father of Baron Strathnairn (q.v.). The second son was the poet William Stewart Rose (q.v.).

ROSE, HUGH JAMES (1795-1838), English divine, was born at Little Horsted in Sussex on the 9th of June 1795, and was educated at Uckfield school and at Trinity College, Cam- bridge, where he graduated B.A. in 1817, but missed a fellow- ship. Taking orders, he was appointed to Buxted, Sussex, in 1819, and to the vicarage of Horsham in 1821. He had already attained some repute as a critic, which was enhanced when, after travelling in Germany, he delivered as select preacher at Cambridge, four addresses against rationalism, published in 1825 as The State of the Protestant Religion in Germany. The book was severely criticized in Germany, and in England by E. B. Pusey. In 1827 Rose was collated to the prebend of Middleton; in 1830 he accepted the rectory of Hadleigh, Suffolk, and in 1833 that of Fairsted, Essex, and in 1835 the perpetual curacy of St Thomas's, Southwark. In 1 833-1 834 he was professor of divinity at Durham, a post which ill-health forced him to resign. In 1836 he became editor of the Encyclopaedia Metropolitana, and he projected the New

General Biographical Dictionary, a scheme carried through by his brother Henry John Rose (1800-18 73). He was appointed principal of King's College, London, in October 1836, but he was attacked by influenza, and after two years of ill-health he died at Florence on the 22nd of December 1838. Rose was a high- churchman, who to propagate his views in 1832 founded the British Magazine and so came into touch with the leaders of the Oxford movement. Out of a conference at his rectory in Hadleigh came the Association of Friends of the Church, formed by R. H. Froude and Wm. Palmer.

See J. W. Burgon, Lives of Twelve Good Men (1891).

ROSE, WILLIAM STEWART (1775-1843), English poet and translator, second son of George Rose (q.v.), was born in 1775. He was educated at Eton College, and in 1796 was returned to parliament for the borough of Christchurch. In 1800 he accepted the Chiltern Hundreds on his appointment as reading clerk of the House of Lords and clerk of the private committees. His first work, A Naval History of the Late War, was undertaken at his father's wish, but he only completed one volume. He produced a free version of the Amadis de Gaul from the French text of Herberay des Essarts in 1803, followed by a translation of the Partinopex de Blois (1807) after Le Grand d'Aussy. With Partenopex he printed his ballad of " The Red King," and in 18 10 appeared The Crusade of King Louis and King Edward the Martyr. In 1814 he made a prolonged journey through Italy and eastern Europe, spending the year 1817 at Venice, where he married a Venetian lady. The Court and Parliament of Bees, a translation of the Animali Parlanti of Casti, and Letters from the North of Italy, addressed to Henry

Hallam, Esq., appeared in 1819. In the same year the publisher Murray offered him £2000 for a translation of Ariosto (T. Moore, Diary, 14th of April 1819). He had already written an abridged version of Berni's rifacimento of the Orlando Inamorato of Boiardo, and had begun his Orlando Furioso translated into English Verse which appeared in two parts in 1823 and 1831. This, which has become the standard English version, is a close rendering in the ottava rima of the original. Rose retired from his official position in 1824. He suffered from paralysis in his later years, and at Abbotsford, where he was an honoured guest, rooms were specially fitted up on the ground floor for his use. His last works were An Epistle to the Right Honourable John Hookham Frere (1834), in verse, and a volume of Rhymes (1837) (see Quarterly Review, July 1836 and April 1837). He { died on the 30th of April 1843.

ROSE (Rosa). The rose has for all ages been the favourite flower, and as such it has a place in general literature that no other plant can rival. In most cases the rose of the poets and the rose of the botanist are one and the same in kind, but popular usage has attached the name rose to a variety of plants whose kinship to the true plant no botanist would for a moment admit. In this place we shall employ the word in its strict botanical significance, and in commenting on it treat it solely from the botanical point of view. The rose gives its name to the order Rosaceae, of which it may be considered the type. The genus consists of species varying in number, according to the diverse opinions of botanists of opposite schools, from thirty to one hundred and eighty, or even two hundred and fifty, exclusive of the many hundreds of mere garden varieties. While the lowest estimate is doubtless too low, the highest is enormously too large, but in any case the wide discrepancies above alluded to illustrate very forcibly the extreme variability of the plants, their adaptability to various conditions, and conse- quently their wide dispersion over the globe, the facility with which they are cultivated, and the readiness with which new varieties are continually being produced in gardens by the art of the hybridizer or the careful selection of the raiser. The species are natives of all parts of the northern hemisphere, but are scantily represented in the tropics unless at considerable elevations.

They are erect or climbing shrubs, never herbs or trees, generally more or less copiously provided with straight or hooked prickles of various shapes and with glandular hairs, as in the sweet-brier or in the moss-rose of gardens. The prickles serve the purpose of enabling the shrub to sustain itself amid other vegetation.. The viscid hairs which are specially frequent on the flower stalks or in the neighbourhood of the flower serve to arrest the progress of undesirable visitants, while the perfume emitted by the glands in question may co-operate with the fragrance and colour of the flower to attract those insects whose presence is desirable. The leaves are invariably alternate, provided with stipules, and unequally pinnate, the leaflets varying in number from one (as in R. simplici- folia or berberi folia) to 11 and even 15, the odd leaflet always being at the apex, the others in pairs. The flowers are solitary or in loose cymes (cluster-roses) produced on the ends of the shoots. The flower-stalk expands into a vase- or urn-shaped dilatation, called the receptacle or receptacular tube, which ultimately becomes fleshy and encloses in its cavity the numerous carpels or fruits. From the edge of the urn or ” hip ” proceed five sepals, often more or less compound like the leaves and overlapping in the bud. Within the sepals are five petals, generally broad or roundish in out- line, with a very short stalk or none at all, and of very various

shades of white, yellow or red. The very numerous stamens originate slightly above the sepals and petals ; each has a slender filament and a small two-celled anther. The inner portion of the receptacular tube whence the stamens spring is thick and fleshy, and is occasionally spoken of as the ” disk “; but, as in this case it does not represent any separate organ, it is better to avoid the use of the term. The carpels are very numerous, ultimately hard in texture, covered with hairs, and each provided with a long style and button-like stigma. The car- pels are concealed within the receptacular tube and only the stigmas as a rule protrude from its mouth. Each carpel contains one ovule. The so-called fruit is merely the receptacular tube, which, as previously mentioned, becomes fleshy and brightly coloured as an attraction to birds, which devour the hips and thus secure the dispersion of the seed. The dry one-seeded fruits (achenes) are densely packed inside the hip, and are covered with stiff hairs which cling to the bird’s beak. The stamens are in whorls, and, according to Payer, they originate in pairs one on each side of the base of

each petal so that there are ten in each row; a second row of ten alternates with the first, a third with the second, and so on. By repeated radial and tangential branching a vast number of stamens are ultimately produced, and when these stamens assume a petaloid aspect we have as a consequence the double flowers which are so much admired. The carpels are much less subject to this petaloid change, and, as it generally happens in the most double of roses that some few at least of the anthers are formed with pollen, the production of seed and the possibility of cross-breeding become intelligible. Under natural circumstances rose flowers do not secrete honey, the attraction for insects being provided by the colour and perfume and the abundance of pollen for food. The stigmas and anthers come to maturity at the same time, and thus, while cross-fertilization by insect agency is doubtless most common, self-fertilization is not prevented.

The large number of species, subspecies, varieties and forms described as British may be included under about a dozen species. Among them may be mentioned R. spinosissima, the Scotch rose, much less variable than the others; R. rubi- ginosa (or R. eglanteria), the sweet-brier, represented by several varieties; R. canina, the dog rose (see fig.), including

Dog Rose {Rosa canina) in flower and fruit.

numerous subspecies and varieties; the large- fruited apple rose, R. pomifera; and R. arvensis, the parent of the Ayrshire roses. Cultivated roses are frequently ” budded ” or worked upon the stems of the brier or R. canina, or upon young seedling plants of the same species; and upon stems of an Italian rose called the Manetti, raised in the Milan Botanic Gardens about 1837. Other species, notably R. polyantha, also are used for stocks.

Roses have been grown for so many centuries and have been crossed and recrossed so often that it is difficult to refer the cultivated forms to their wild prototypes. The older roses doubtless originated from R. gallica, a native of central and southern Europe. R. centifolia (the cabbage rose), a native of the Caucasus, contributed its share. A cross between the two species named may have been the source whence originated the Bourbon roses. The yellow-flowered Austrian and Persian brier originated from R. lulea, a native of Austria and the East. The monthly or China roses sprang from the Chinese R. indica, and these, crossed with others of the R. centifolia or gallica type, are the source of the ” hybrid perpetuals ” so commonly grown nowadays, because, in addition to their other attractions, their blooming season is relatively prolonged, and, moreover, is repeated in the autumn. Tea roses and noisettes, it is to be presumed, also acknowledge R. indica as one of their pro- genitors. A magnificent race called ” hybrid teas ” have been evolved of late years, by crossing the tea roses and hybrid perpetuals. They are much more vigorous in constitution than the true tea roses, while quite as beautiful in blossom and more perpetual in bloom than the hybrid perpetuals. Recently, by crossing the Japanese R. Wichuraiana with hybrid perpetuals,

a beautiful and vigorous race of climbers has been produced. The Banksian rose is a Chinese climbing species, with small white or fawn-coloured flowers of great beauty, but rarely seen; the Macartney rose (R. bracteata) is also of Chinese origin. Its nearly evergreen deep green leaves and large white flowers arc very striking. The Japanese R. rugosa is also a remarkable species, notable for its bold rugose foliage, its large white or pink flowers, and its conspicuous globular fruit. R. damascena is cultivated in some parts of the Balkans for the purpose of making attar of roses. In Germany the same variety of rose is used, while at Grasse a strain of the Provence rose is cultivated for the same purpose. In India R. damascena is grown largely near Ghazipur for the purpose of procuring attar of roses and rose water.

Rose water is chiefly produced in Europe from the Provence or

cabbage rose, R. centifolia, grown for the purpose at Mitcham and much more abundantly in the south of France. Conserve of roses and infusion of roses, two medicinal preparations re- tained for their agreeable qualities rather than for any special virtue, are prepared from the petals of R. gallica, one variety of which was formerly grown for the purpose near the town of Provins. Conserve of dog rose is made from the ripe hips of the dog rose, R. canina. Its only use is in the manufacture of pills.

The rose is so universal a favourite that some portion of the garden must necessarily be devoted to it, if the situation be at all favourable. Many choice roses will not, however, thrive in the vicinity of large towns, since they require a pure air, and do not endure a smoky atmosphere. The best soil for them is a deep rich strong loam free from stagnant moisture. Very light sandy or gravelly soils, or soils which are clayey and badly drained, are not suitable, and both must be greatly improved if rose-growing on them is attempted. Light soils would be improved by a dressing of strong loam in conjunction with cow-dung or nightsoil ; the latter, provided it is properly prepared and not too fresh, is indeed the very best manure for roses in all but soils which are naturally very rich. Heavy soils are improved by adding burned earth or gritty refuse,- with stable manure and leaf-mould, peat moss litter, &c. ; and damp soils must necessarily be drained by trenching. Tea roses may, however, be grown to perfection in a gravel soil, provided it be well manured, cow manure being best. Roses generally require a constant annual supply of manure, and, if this is given as a mulching in autumn, it serves to protect their roots through the winter. They also require liberal supplies of water during the growing season, unless the surface is mulched or top-dressed from time to time with well-rotted manure. Aphides and caterpillars of all kinds may be checked by syringing with dilute tobacco water or some of the many insecticides now provided to facilitate this rather troublesome task.

Some growers prefer roses grown on their own roots, some on the Manetti and others on the brier stock. There is this to be said in favour of their own roots that, if the tops are killed down by accident or by severe weather, the roots will usually throw up new shoots true to their kind, which cannot be looked for if they are worked ; though it is sometimes recommended to plant deep in order that the rose itself may learn to do without its foster parent the stock. Too often, however, in the case of persons unfamiliar with roses, the choice rose dies, and the stock usurps its place. This is especially true of the Manetti stock, as its foliage is more like that of many cultivated forms than the brier, and therefore more easily overlooked. Where standards

or half-standards are required, the brier stock from the hedges is always used. It forms the most reliable stock for dwarfs of all kinds, and especially for tea roses, most of which fail on the Manetti stock.

An open situation, not shaded but sheltered from strong winds, is what the rose prefers. October and November are the best months for planting roses, but if the weather be wet or frosty and the soil sticky, the plants should be placed in a sheltered place and protected by green boughs or matting until suitable conditions pre- vail. The planting should never be deep, the uppermost layer of roots being about 2 or 3 in. below the general level of the surface, and the soil should always be kept stirred with the hoe during the summer months. In regard to pruning, roses vary considerably, some requiring close cutting and others only thinning out; some again, such as strong growing climbers, may be safely pruned in autumn, and others are better left till spring. Instructions on this point as to the several groups of varieties will be found in most rose catalogues, and may be followed, provided the variety is true to name. It may be laid down as a general rule that the more strongly growing varieties should be less severely cut back than the weakly varieties; and, again, the more tender the variety, the later in the spring snould the pruning be done, April being the best month for pruning teas and noisettes. It should be remembered also that no

amount of correct pruning will improve a rose bush that has been badly planted or placed in a quite unsuitable position.

Where dwarf beds of roses are required, a good plan is to peg down to within about 6 in. from the ground the strong one-year- old shoots from the root. In due time blooming shoots break out from nearly every eye, and masses of flowers are secured, while strong young shoots are thrown up from the centre, the plant being on its own roots. Before winter sets in, the old shoots which have thus flowered and exhausted themselves are cut away, and three or four or more of the strongest and best ripened young shoots are reserved for pegging down the following season, which should be done about February. In the meantime, after the pruning has been effected, plenty of good manure should have been dug in lightly about the roots. Thus treated, the plants never fail to produce plenty of strong wood for pegging down each succeeding season.

The most troublesome fungoid pest of the rose is undoubtedly the mildew (Sphaerotheca pannosa). The young shoots, leaves and flower-buds frequently become covered with a delicate white mycelium, which by means of the suckers it sends into the under- lying cells robs its host of considerable amounts of food, and causes the leaves to curl and fall early. The spores are produced in great abundance and carried by animals and the wind to other plants, and so the disease is rapidly spread. Later the mycelium increases and forms a thick velvety coating on the young snoots, and in this the winter state of the fungus is produced. Spraying with potassium sulphide (i oz. to 2 to 3 gallons of water) is the best means of check- ing the spread of the disease. The rose rust (Phragmidium sub- corticatum) appears on both cultivated and wild roses in the spring, bursting through the bark in the form of copious masses of orange powder consisting of the spores of the fungus. These spores infect the leaves, and produce on them in the summer small dots of an orange colour and, later, groups of spores that are able to live through the winter. The last, the teleutospores, are of a dark colour, and it is by these that the disease is started in the spring. It is therefore important that all the affected leaves should be destroyed in the autumn, and the bushes should be sprayed with Bordeaux mixture or ammoniacal copper carbonate in the spring to prevent the infection of the leaves by spores brought from a distance. Many other fungi attack the rose, but perhaps the only other one. that merits mention here is Actinonema Rosae. This attacks the leaves, forming large dark blotches upon them and frequently causing them to fall prematurely.

A very large number of insect pests are found upon the rose, but the best known and most formidable on account of their great powers of reproduction are the aphides. More than one species is found upon the rose, though Aphis Rosae is the commonest. Their attack should be checked by the use of a spray made by boiling 4 oz. quassia chips for an hour or so in a gallon of soft water, straining off the solution and dissolving therein 4 oz. of soft soap while it is still warm, afterwards adding I or 2 gallons of soft water according to the age of the rose leaves that are to be sprayed. Any delay in dealing with the pest gives the opportunity for its increase, even a day being sufficient materially to augment their numbers. The larvae of some of the Tortrix moths fold the leaves almost as soon as they are developed from the bud, and do considerable damage in this way and by devouring the leaves, while several ” looper ” caterpillars are also found feeding on the foliage. Many species of saw-fly larvae are also known to attack the rose, feeding either upon the leaves or devouring the young shoot. These larvae should be carefully searched for and destroyed whenever

found. One of the leaf-cutting bees, Megachile, cuts pieces out of the leaves with which to line its nest, materially reducing their effective surface. The bees may be caught in a butterfly net or traced to their nests, which should be destroyed.

For further information see the late Dean Hole's Book about Roses (1894); Book of the Rose, by Rev. A. Foster Mellias (1905); Beautiful Roses for Garden and Greenhouse, by J. Weathers (1903) ; and Roses, their History, Development and Cultivation, by the Rev. J. H. Pemberton (1908).

ROSEBERY, ARCHIBALD PHILIP PRIMROSE, 5 th Earl of (1847-), British statesman, born in London on the 7th of May 1847, was the grandson and successor to the title of Archibald John Primrose, 4th earl of Rosebery (1783-1868), a representative peer of Scotland, who was in 1828 created a peer of the United Kingdom as Baron Rosebery, and was an active supporter of the Reform Bill. The Scottish earldom was first conferred in 1703 upon the 4th earl's great-grandfather, Archibald Primrose of Dalmeny (1664-1723), a staunch Whig and a commissioner for the Union. The 5th earl's mother was Catherine Lucy Wilhelmina, only daughter of Philip Henry, 4th Earl Stanhope; she was thus a sister of Earl Stanhope, the historian, and a niece of Lady Hester Stanhope, who was the niece of William Pitt. A celebrated beauty, a maid of honour and bridesmaid of Queen Victoria, she married, on the 20th of December 1843, Archibald, Lord Dalmeny (1809-1851),

member for the Stirling Burghs, who became a lord of the admiralty under Melbourne. After his death she became the wife of Harry George Vane, 4th duke of Cleveland, and diei in 1 901.

The young Lord Dalmeny was educated at Brighton and at Eton, where he had as slightly junior contemporaries Mr A. J. Balfour and Lord Randolph Churchill. He was described by the most brilliant Eton tutor of his day, William Johnson Cory (author of Ionica), as a "portentously wise youth, not, how- ever, deficient in fun." He added that Dalmeny " desired the palm without the dust." In 1866 he matriculated at Christ Church, Oxford, but went down in 1868, by the request of the dean, rather than abandon the possession of a small racing stud. In the same year he succeeded to the earldom and to the family estates. In February 187 1 he seconded the Address in the House of Lords; a more original effort followed in November 1871, when he delivered a remarkable essay on the Union of Scotland and England at the Edinburgh Philosophical Institution. Three years later he was elected president of the Social Science Congress at Glasgow,

where, on the 30th of September, he gave a striking address upon the discovery of means for raising the condition of the working class as the ” true leverage of empire.” In the meantime he travelled in the south of Europe and in North America. On his return he acquired an English country house called The Durdans, Epsom, which he largely rebuilt and adorned with some of the finest turf portraits of George Stubbs. Following the example, as he declared, of Oliver Cromwell (for whom he showed an admiration in other respects — culminating in 1900 in the erection of a statue outside Westminster Hall, which was not appreciated either by the Irish Nationalist party or by others among his political associates) , he took a pride in owning racehorses, and afterwards won the Derby three times, in 1894, 1895 and 1905. He was the first man to enjoy the distinction of winning the Derby while prime minister; but though this was popular enough among many classes, it did not please the Liberal Non- conformists so much, who considered a racehorse a mere gambling-machine. On the 20th of March 1878 Lord Rosebery married Hannah, only child of Baron Meyer Amschel de Roths- child, of Mentmore, Bucks. The newly married couple took a lease of Lansdowne House, which for several years was a salon for the Liberal party and a centre of hospitality for a much wider circle.

Though impeded in his political career by his exclusion from the House of Commons, Lord Rosebery’s reputation as a social reformer and orator was steadily growing. In 1878 he was elected Lord Rector of Aberdeen and in 1880 of Edinburgh University, where he gave an eloquent address upon Patriotism. In 1880 he entertained Mr Gladstone at Dalmeny, and during the ” Mid Lothian campaign ” he had much to do with the stage management of the demonstrations. As was shown later, he imported into his view of politics a warm sentiment and an imaginative outlook; and he was an enthusiastic student of Lord Beaconsfield’s political novels, more par ticularly of Sybil, after the heroine in which he named one of his daughters. In August 1881 he became under- secretary at the Home Office, his immediate chief being Sir William Harcourt. His work was practically confined to the direction of the Scottish department of the Office. A clamour was nevertheless raised in regard to the incom- patibility of the under-secretaryship with a position in the House of Lords, and Lord Rosebery resigned the post in June 1883. He and his wife utilized the interval to make a trip round the world, being most warmly received in Australia, and returning by way of India. At the close of 1884 he resumed office as first commissioner of works with a seat in the cabinet, and his adherence carried with it a distinct accession of strength to the Liberal ministry, which was much

discredited by the tragedy attached to the fate of Gordon. The attitude of the government on the Afghan question and generally in regard to Russia was held by many to have been perceptibly stiffened I owing to Lord Rosebery's influence.

In June 1885 the Liberal administration broke up, but Lord Salisbury's ministry, which succeeded, was beaten early in February 1886, and when Mr Gladstone adopted Home Rule, Lord Rosebery threw in his lot with the old leader, and was made secretary of state for foreign affairs during the brief Liberal ministry which followed. He rather distinguished himself in the Lucia Bay negotiations then being carried on with Germany. If Busch is to be believed, Prince Bismarck's view was that Lord Rosebery had " quite mesmerized " Count Herbert Bismarck; and the latter, from his father's standpoint, conceded too much to Lord Rosebery, who proved himself to be, in Bismarck's language, " very sharp." His views on foreign policy differed materially from those of Granville and Gladstone. His mind was dwelling constantly upon the political legacy of the two Pitts; he was a reader of Sir John Seeley; he had him- self visited the colonies; had predicted that a war would not, as was commonly said, disintegrate the empire, but rather the reverse; had magnified the importance of taking colonial opinion; and had always been a convinced advocate of some form of Imperial Federation. He was already taunted with being an Imperialist, but his independent attitude won public approval. Cambridge gave him the degree of LL.D. in 1888; in January 1889 he was elected a member of the first county council of London, and on the 1 2th of February he was elected chairman of that body by 104 votes to 17. The tact, assiduity and dignity with which he guided the deliberations of the council made him exceedingly popular with its members. In the spring of 1890 he presided over the Co-operative Congress, but with a view to the impending political campaign he found it necessary to resign the chairmanship of the county council in June. In November of this year, however, Lady Rosebery died, and he withdrew for a period from public business. In 1891 he made some brief continental visits, one to Madrid, and in October he saw through the press his little monograph upon William Pitt, in the Twelve English Statesmen Series, of which it may be said that it competes in interest with Viscount Morley's Walpole. In January 1892, upon a new election, he again for a few months became chairman of the county council. It was already recognized that in him the country possessed not only a public man of exceptionally attractive personality, but one

whose literary tastes were combined with a gift for expression which was at once original and fluent. In October the Garter was conferred upon him by Queen Victoria.

Meanwhile, in August, upon the return of Gladstone to power, he was induced with some difficulty (for he was suffering at the time from insomnia) to resume his position as foreign minister. His acceptance was construed as a security against the suspicion of weakness abroad which the Liberal party had incurred by their foreign policy during the ‘eighties. He strongly opposed the evacuation of Egypt; he insisted upon the exclusive control by Great Britain of the Upper Nile Valley, and also upon the retention of Uganda. In 1893 the question of Siam came near to causing serious trouble with France, but by the exercise of a combination of firmness and forbearance on Lord Rosebery’s part the crisis was averted, and the lines were laid down for pre- serving Siam, if possible, as a buffer state between the English and French frontiers in Indo-China. In the spring of 1895 he was clear-sighted enough to refuse to join the anti-Japanese League of Russia, France and Germany at the end of the China- Japan War.

Lord Rosebery’s personal popularity had been increased at home by his successful intervention in the coal strike of December 1893, and when in March 1894 the resignation of Gladstone was announced, his selection by Queen Victoria for the premiership was welcomed by the public at large and by the majority of his own party. On all hands he was then considered dignus im- perio — it was only as the new administration went to pieces that people began to add nisi imperasset. The conditions he had to face were by no means hopeful. The Liberal majority of 44 was already dwindling away, and the malcontents, who considered ‘ that Sir William Harcourt should have been the prime minister, or who were perpetually intriguing against a

leader who did not satisfy their idea of Radicalism, made Lord Rosebery’s personal position no easy one. A systematic policy of detraction was pursued by the small section of the Radical party who objected to a peer premier as such, and a great deal of adverse criticism was also aroused by a speech in which the prime minister, taunted for not again bringing forward a Home Rule measure, insisted upon the truism that the conversion of England, the “predominant partner,” was a necessary condition of success. The support of the Irish Nationalists was by no means secure. Lord Rosebery’s foreign policy, moreover, was too Tory for his Radical followers; he insisted upon ” continuity of policy in foreign affairs,” which meant carrying on the Conservative policy and not upsetting it. The premier was thought to have shown a restlessness and a rawness at the touch of

censure which did not increase his reputation for reserve power or strength, but this was undoubtedly due in large measure to the recrudescence of the insomnia from which he had suffered in 1891. The government effected little. In Mr Asquith's phrase, it was " ploughing the sands." The Parish Councils Act was only passed by compromising with the Opposition. Local Veto and Disestablishment of the Welsh Church were put in the forefront of the party programme, but the government was already to all appearances riding for a fall, when on the 24th of June 1895 it was beaten upon an adverse vote in the Commons in regard to a question of the supply and reserve of small arms ammunition.

The general election which followed after Lord Salisbury had formed his new ministry was remarkable for the undis- ciplined state of the Liberal party. At the Eighty Club and the Albert Hall Lord Rosebery advised them to concentrate upon the reform of the House of Lords, that assembly being, as he said, a foremost obstacle to the passing of legislation on the lines of the Newcastle programme; but he was unable to suggest in what direction it should be reformed. Sir William Harcourt and Mr John Morley, on the other hand, concentrated respec- tively upon Local Option and Home Rule. The Liberals were quarrelling among themselves, and the result was an over- whelming defeat. In Opposition Lord Rosebery was now at a serious disadvantage as head of a parliamentary party; for in any case he could not rally them as a loyally followed leader in the House of Commons might have done. But his followers were not all loyal, and his rivals in leadership were themselves in the House of Commons. Added to this there was still in the background the veteran statesman to whom Liberalism owed an unequalled obligation. When the " Armenian atrocities " became a burning question in the country in 1896, and Mr Gladstone himself emerged from his retirement to advocate intervention, Lord Rosebery's difficulties had taken their final form. He declined to support this demand at the risk of a European war, and on the 8th of October 1896 he announced to the Liberal whip, Mr Thomas Ellis, his resignation of the Liberal leadership. On the following day he made a farewell speech at the Empire Theatre, Edinburgh, to over four thousand people, and for some time he held aloof from party politics, " ploughing his furrow alone," as he afterwards phrased it.

In 1898, on the death of Mr Gladstone, he paid a noble and eloquent tribute in the House of Lords to the life and public services of his old leader. He was a pall-bearer at his funeral on the 28th of May, as he had previously been at the burials of Tennyson and Millais. His influence in the country was still a strong one on personal grounds,

and he came forward now and again to give expression independently to popular feeling. In the autumn of 1898 he gave valuable support to the attitude taken up by Lord Salisbury upon the Fashoda question. He was indeed bound by consistency to withstand what his own government, by the words of Sir Edward Grey, had declared would be an unfriendly act on the part of France. Again, after Mr Kruger's ultimatum in October 1899, Lord Rosebery spoke upon the necessity of the nation closing its ranks and supporting the government in the prosecution of war in South Africa. After Nicholson's Nek he reiterated the resolution of the country " to see this thing through." Nevertheless, in a letter to Captain

Lambton, an unsuccessful Liberal candidate for Newcastle, in September 1900, he condemned the general conduct of affairs by Lord Salisbury's government, while in several speeches in the House of Lords he strongly urged the necessity of army reform. Since his abandonment of the leadership in 1896, the lack of coherence in the Liberal party had become more and more manifest. The war had brought to the front a pro-Boer section, who seemed gradually to be compromising the whole party, and had apparently succeeded in winning the support of Sir Henry Campbell-Bannerman, the leader in the House of Commons. Lord Rosebery maintained for the most part a sphinx-like seclusion, but in July 1901 he at last came forward strongly as the champion of the Liberal Imperialist section.

In deference to the wishes of supporters such as Mr Asquith, Sir Henry Fowler and Sir Edward Grey he determined to " put his views into the common stock " at a representative meeting of Liberals held at Chesterfield in December 1901. There he advised the Liberal party that " its slate must be cleaned," and, as he subsequently explained, this cleansing must involve the elimination of Home Rule for Ireland. His appeal for " spade work " resulted in the formation of the Liberal League, inside the Liberal Opposition; and what Lord Rosebery himself described as his " definite separation " from Sir Henry Campbell-Bannerman's " tabernacle " took place. This announcement, however, was no sooner made than it was explained away by the supporters of both, and early in 1902 Lord Rosebery spoke at the National Liberal Club in a way which indicated that an understanding might still be arrived at. But though Mr Asquith and Sir Edward Grey adhered to the Liberal League, Sir Henry Campbell- Bannerman retained the loyalty of the majority of the Liberal party, and Lord Spencer threw his

weight on the same side; and in a speech at the Liberal League dinner on the 31st of July Lord Rosebery had to admit that their principles had not yet prevailed, and that, until they did, a reconciliation between the two wings of the party would be impossible. In January 1903 he addressed a Liberal meeting at Plymouth, and appeared to be attempting to concentrate Opposition criticism upon the points in the government policy which did not involve the Imperialist difference; and in discussing War Office reform he advocated the appointment of Lord Kitchener as secretary of state for war.

When Mr Chamberlain started his new fiscal programme, combining Tariff Reform with Colonial Preference, Lord Rosebery at first seemed inclined to treat it as non-political, and on the 19th of May 1903 he declared in an address to the Burnley Chamber of Commerce that he was not one of those who regarded Free Trade as part of the Sermon on the Mount. This utterance led to an idea that he was inclined to consider favourably the proposal for a preferential tariff, his earlier enthusiasm for Imperial Federation making his support an interesting political possibility. But this idea was quickly dispelled; on the 22nd he expressed his surprise that anybody should have thought he intended to approve of Mr Chamberlain's plan; he was not prepared to dismiss in advance a proposal for the consolidation of the empire made by the responsible government, but he believed that the objections to a policy of preference were insurmountable. The fact, no doubt, was that Mr Asquith, Lord Rosebery's chief lieutenant in the Liberal League, made himself from the outset a determined champion of free trade in opposition to Mr Chamberlain; and Lord Rosebery quickly came into line with the rest of the Liberal party on this question. On the 1 2th of June, addressing the Liberal League, he admitted that as a lifelong Imperialist it was with pain and grief that he could not support Mr Chamber- lain's scheme, but the empire had been built upon free trade, and he only saw danger to the empire in these new proposals. Speaking at Sheffield on the 13th of October he criticized the scheme in more detail, and, as an Imperialist* warned the country against it, emphasizing his own ideal of the future of the empire — " a strong mother with strong children, each working out his own political and fiscal salvation." His

attitude on the new issue undoubtedly affected public opinion, and helped to draw him closer to the great body of the Liberal party, who saw that their identification with the cause of free trade was doing much to remove the public distrust associated with their support of Home Rule. On the 7th of November at Leicester Lord Rosebery insisted that what the country wanted was not fiscal reform but commercial reform, and h. appealed to the free-trade section of the

Unionist party t join the Liberals in a united defence, — an appeal incidentally for Liberal unity which was warmly seconded ten days later by Sir Henry Campbell-Bannerman. On the 26th of November Lord Rosebery's speech on the same lines at a meeting in South London resulted in a powerful demonstration in favour of his resuming the Liberal leadership, but he made no public response. On the 10th of June 1904 he addressed a meeting of the Liberal League at the Queen's Hall, London, and sketched a programme of "sane and practical Imperialism"; but he irritated the Home Rulers by again repudiating a parliament in Dublin, and he perplexed the public generally by his adverse criticism on the popular Anglo-French Agreement, which he was the only English statesman to oppose, on the ground of its handing over Morocco to France.

At Glasgow on the 5th of December he again outlined a Liberal programme, this and other speeches all leading to the assumption that his return to active co-operation with the Liberal party in the general election — which could not be long delayed — was fairly certain. Early in 1905 this impression gained such strength and such polite references were made to one another in public by Lord Rosebery and Sir Henry Campbell-Bannerman, that his assumption of office in a Liberal ministry, possibly presided over by Earl Spencer, was confidently anticipated. But these forecasts were ultimately upset, not only by Lord Spencer's illness and his removal from the list of possible Liberal prime ministers, but by Sir Henry Campbell-Bannerman's pronouncement at Stirling in November on the subject of Irish Home Rule. Lord Rosebery had just gone down to Cornwall to make a series of speeches in support of the Liberal programme, now fairly well mapped out as regards those items which represented the strong public opposition to what had been done by the Unionist government. It was believed that an understanding had been come to be- tween his Liberal League henchmen (Mr Asquith, Sir E. Grey and Mr Haldane) and Sir Henry Campbell-Bannerman, and that Lord Rosebery's co-operation was to be secured by the adoption of some formula which would temporarily take Home Rule out of the official programme as a question of practical politics. But to the general surprise and Lord Rosebery's own very evident mortification Sir Henry went a long way in his Stirling speech to nail the Home Rule colour to the mast; he did not indeed propose to introduce a Home Rule Bill, but he declared his determination to proceed in Irish legislation on lines which would lead up to the same result. Lord Rose- bery abruptly broke off his campaign, declaring at Bodmin (26th of November) that he would never " fight under that banner. " From the moment the apparent recrudescence of the Liberal split over this question seemed to have

misled Mr Balfour, who resigned office on the 4th of December, into think- ing that difficulties would arise over the formation of a Liberal cabinet; but, whether or not the rumour was correct that a blunder had been made at Stirling and that explanations had ensued which satisfied Mr Asquith and Sir Edward Grey, this anticipation proved unjustified. Lord Rosebery himself, it is true, held aloof; his protest had been publicly made and he adhered to it in the absence of any public withdrawal by Sir Henry Campbell-Bannerman; but he encouraged his Liberal League supporters to be loyal to the new prime minister, and Mr Asquith, Sir E. Grey and Mr Haldane were included in the Liberal cabinet. The overwhelming Liberal and Labour victory at the general election of 1906 began a new era in the fortunes of the party, and Lord Rosebery's individuality once more sank back from any position of prominence in regard to I its new programme. He remaired outside party politics,

emerging only in 1909, first to attack Mr Lloyd George's budget in the country as a " revolution," and then — to the general surprise — to condemn the House of Lords in debate for rejecting it; and in 1910 (see Parliament) he appeared once more to be coming to the front, by the resolutions he carried in regard to the remodelling of the Upper Chamber, when the death of King Edward VII. caused a temporary postponement of the constitutional crisis. In September 1910 he acted as head of the special mission sent to the Austrian court by George V. to announce his accession to the throne, — a selection peculiarly appropriate, and cordially welcomed as such, because of his well-known Austrian sympathies. Indeed, in the East Euro- pean crisis of 1909 Lord Rosebery had taken a somewhat isolated part in vindicating the attitude of Austria and her right to annex Bosnia-Herzegovina, in opposition to the criticisms generally passed in the English press.

After his retirement from active politics Lord Rosebery continually displayed his great qualities as a public speaker by eloquent and witty addresses on miscellaneous subjects. No public man of his time was more fitted to act as unofficial national orator; none more happy in the touches with which he could adorn a social or literary topic and charm a non- political audience; and on occasion he wrote as well as he spoke. His Pitt has already been mentioned; his Apprecia- tions and Addresses and his Peel (containing a remarkable comment on the position of an English prime minister) were published in 1899; his Napoleon: the Last Phase— an ingenious, if paradoxical, attempt to

justify Napoleon's conduct in exile at St Helena — in 1900; his Cromwell in the same year. In 1906 he published an appreciation of his old friend Lord Randolph Churchill, inspired by the publication of Mr Winston Churchill's Life of his father. In its detached yet intimate way, this is a model of the art by which a good judge of men, possessed at the same time of a just historical sense, may, from the point of view of a contemporary on the opposite side in politics, correct the perspective of an official biography written under the limitations of filial obligation, and give tone and value to the picture of an interesting personality.

Lord Rosebery's family consisted of two sons and two daughters. His eldest son, Lord Dalmeny (b. Jan. 1882), who in 1909 married a daughter of Lord Henry Grosvenor, 3rd son of the 1st duke of Westminster, entered parliament in 1906 as Liberal member for Mid Lothian, but retired in 1910; he was well known as a cricketer, captaining the Surrey eleven in 1905 and 1906. The younger son, the Hon. Neil Primrose (b. Dec. 1882), took more actively than his brother to a political career, and in January 1910 was returned as a Liberal for the Wisbech division of Cambridgeshire. The elder daughter, Lady Sybil, in 1903 married Captain Charles Grant; the younger, Lady Margaret, in 1899 married the 1st earl of Crewe. (H. Ch.)

ROSECRANS, WILLIAM STARKE (1819-1898), American soldier, was born in Kingston, Ohio, on the 6th of September 1819, and graduated in 1842 from the U.S. Military Academy, being appointed to the engineers. After serving (1843-47) as assistant professor at West Point, and in fort construction, he resigned (April 1854) from the army and went into business in Cincinnati. On the outbreak of the Civil War Rosecrans volunteered for service under McClellan and helped raise the Ohio "Home Guards," with which he served in the West Virginian opera- tions of 1861 in the rank of brigadier-general. He was second in command to McClellan during this campaign, and succeeded to the command when that officer was called to Washington. In the latter part of 1861 Rosecrans conducted further opera- tions in the same region with great skill and success, and early in 1862 he was transferred to the West as a major-general of volunteers. He took part in the operations against Corinth, and when General John Pope was ordered to Virginia, Rosecrans took over command of the Army of the Mississippi with which he fought the successful battles of Iuka and Corinth. Soon after- wards he was ordered to replace D. C. Buell in command of the forces, renamed the Army of the Cumberland about the same time.

In December he advanced against General Braxton Bragg, and on the

31st of December to the 3rd of January was fought the bloody and indecisive battle of Stone River (Murfreesboro), after which Bragg withdrew his army to the southward. In 1863 Rosecrans, refusing to advance until the isolation of Vicksburg (farther west) was assured, did not take the offensive until late in June. The operations thus begun were most skilfully conducted, and Bragg was forced back to Chattanooga (q.v.), whence he had to retire on being once more outmanoeuvred. But Rosecrans sustained a great defeat at the battle of Chicka- mauga (q.v.), and was soon besieged in Chattanooga. He was then relieved from his command. Later he did good service in Missouri, and in March 1865 he was made brevet major- general U.S.A. He resigned in 1867, and in the following year became minister to Mexico. Subsequently he was engaged in many railway and industrial enterprises in that country, as also in California. He was a representative in Congress from California, 1881-85, an d register of the treasury, 1885-93. Under an act of Congress he was on the 2nd of March 1889 restored to the rank of brigadier-general, and retired. He died near Redondo, Cal., on the nth of March 1898. On the 17th of May 1902 his body was reinterred with military honours in the National Cemetery at Arlington, in the presence of President Roosevelt, members of the cabinet and many of his campaigning comrades.

ROSEGGER, PETER (1843-), Austrian poet and novelist, known down to 1894 under the pseudonym Petri Kettenfeier, was born at Alpl near Krieglach in Upper Styria, on the 31st of July 1843, the son of a peasant. Until his seventeenth year he was employed as a farm hand and received no regular school education, though he learnt reading and writing from a retired schoolmaster who lived near. Unfit, owing to physical weak- ness, for the hard labour of agriculture, he was apprenticed to a journeyman tailor, and on his wanderings employed his leisure hours in educating himself. He soon composed poems and wrote stories. Some of these productions he sent in 1864 to Dr Svoboda, the editor of the Graz Tagespost, who, recognizing Rosegger's extraordinary talent, interested himself in the young author, and with the assistance of friends enabled him to study (from 1865-69) at the Handelsakademie of Graz. In 1869, encouraged by Robert Hamerling, Rosegger published his first work, a volume of poems in Styrian dialect, Zither und Hackbrett, which immediately established his reputation. As a result, the provincial diet of Styria accorded him a substantial stipendium (scholarship) for three years, which enabled him to supplement his studies by foreign travel. He now devoted himself entirely to authorship, and in 1876 founded the monthly periodical Der Heimgarten. On the occasion of the centenary

of its reorganization the University of Heidelberg conferred upon him, in 1903, the honorary degree of doctor of philosophy.

Rosegger is one of the most fertile authors of recent times. His fresh natural style, sound judgment and his fascinating descriptions of Alpine scenery and the life of its inhabitants have made him one of the most popular authors of Austria and Germany. These characteristics are displayed to great advantage in Die Schriften des Waldschulmeisters (1875), Aus meinem Handwerkerleben (1880), Alpengeschichten (1896), Als ich nochjung war (1895), and in the love- story Mann und Weib (1879), while his simple religious mind is shown in Mein Himmelreich (1901), Erdsegen (1900) and Das ewige Licht (1897), and his attachment to friends in Gute Kameraden (1893) and Personliche Erinnerungen an Robert Hamerling (1891). Among his other works may be mentioned a volume of poems, Gedichte (1891), a popular play, Am Tage des Gerichts (1892), two books for boys, Waldferien (1887) and Waldjugend (1900), and the stories Das Silnderglockl (1904), Wildlinge (1906) and I. N.R.I. Frohe Botschaft eines armen Sunders (1905), which has also been translated into English. He has also written several works which are autobiographical in character, such as Waldheimat (1873) and Mein Weltleben (1898).

Rosegger's Ausgewdhlte Schriften appeared in thirty volumes (1881-94) ; a popular edition (1895-1900) ; his Schriften in steirischer Mundart (3 vols., 1894-96). See also A. V. Svoboda, P. K. Rosegger (1886); A. Stern, Studien zur Literatur der Gegenwart (1895); and H. Mobius, P. Rosegger (1903).

ROSELLINI, IPPOLITO (1800-1843), Italian Egyptologist, was born at Pisa. He studied under Mezzofanti at Bologna, and

in 1824 became professor of oriental languages at Pisa Univer- sity. He is best known as the associate of J. F. Champollion (q.v.), whose studies he shared and whom he accompanied in his Egyptian explorations (1828). On the death of Champollion the publication of the results of their expedition fell to Rosel- lini (Monumenti dell' Egitto e delta Nubia, Florence, 1832-40, 10 vols. fol.).

ROSEMARY, botanically Rosmarinus, a Labiate plant, the only representative of the genus and a native of the Mediter- ranean region. It is a low shrub with linear leaves, dark green above, white beneath,

and with margins rolled back on to the under face. The flowers are in small axillary clusters. Each has a two-lipped calyx, from which projects a bluish two-lipped corolla enclosing two stamens, the other two, which are generally present in the family, being deficient. The fruit consists of four smooth nutlets. Botanically the genus is near to Salvia, but it differs in the shorter connective to the anther. Rosemary was highly esteemed by the ancients for its aromatic fragrance and medicinal uses. In modern times it is valued mainly as a per- fume, for which purpose the oil is obtained by distillation. It doubtless has slight stimulant properties, such as are common to all volatile oils, which may account for the general belief in the efficacy of the plant in promoting the growth of the hair. Rosemary plays no unimportant part in literature and folk-lore, being esteemed as an emblem of remembrance. ” There’s rosemary, that’s for remembrance,” says Ophelia. Its use in connexion with funeral ceremonies is not extinct in country places to this day, and it was formerly much valued at wed- ding festivities. The name ” ros marinus ” or ” ros maris,” literally ” sea-dew,” was probably given in allusion to its native habitat in the neighbourhood of the sea.

ROSENHEIM, a town and watering-place of Germany, in the kingdom of Bavaria, situated at the confluence of the Mangfall and the Inn, 40 m. by rail S.E. of Munich. Pop. (1905) 15,403. It is an interesting town, with many medieval houses. Among its seven churches the Roman Catholic parish church, with a curious cupola and containing numerous old tombs and effigies, and that of the Holy Ghost (15th century), are remarkable. There are a monastery, two convents, several schools and a hospital. Rosenheim is frequented for its saline and sulphur baths, and there are important saltworks, the brine being conveyed from Reichenhall in pipes; it has also machine factories, metalworks and breweries. Cordage is manufactured, and there is a trade in cattle and grain. Although founded in the 1 2th century Rosenheim did not become a town until

1864.

See Ditterich, Rosenheim in Oberbayern (Munich, 1870), and Eid, Aus Altrosenheim (Rosenheim, 1906).

ROSENKRANZ, JOHANN KARL FRIEDRICH (1805-1879), German philosopher, was born at Magdeburg on the 23rd of April 1805. He read philosophy at Berlin, Halle and Heidel- berg, devoting himself mainly to the doctrines of Hegel and Schleiermacher. After holding the chair of philosophy at Halle for two years, he became, in 1833, professor at the univer- sity of Konigsberg, where he remained till his

death on the 14th of July 1879. In his last years he was quite blind. Through- out his long professorial career, and in all his numerous publica- tions he remained, in spite of occasional deviations on particular points, loyal to the Hegelian tradition as a whole. In the great division of the Hegelian school, he, in company with Michelet and others, formed the ” centre,” midway between Erdmann and Gabler on the one hand, and the ” extreme left ” represented by Strauss, Feuerbach and Bruno Bauer.

Of his numerous writings, the following may be mentioned: — I. Philosophical: Kritik der Schleiermacher schen Glaubenslehre (1836); Psychologie oder Wissenschaft vom subjektiven Geist (1837 ; 3rd ed., 1863); Kritische Erlauterungen des Hegelschen Systems (1840); Vorlesungen iiber Schelling (1842); System der Wissenschaft (1850); Meine Reform der Hegelschen Philosophie (1852); Wissen- schaft der logischen Idee (1858-59), with a supplement (Epilegomena, 1862); Hegels Naturphilosophie und die Bearbeitung derselben durch Vera (1868); Erlauterungen zu Hegels Encyklopadie der philoso- phischen Wissenschaften (1871). Two other of his works on Hegel are important, the Leben Hegels (1844) and the Hegel als deutscher

Nationalphilosoph (1870). Between 1838 and 1840 in conjunction with F. W. Schubert, he published an edition of the works of Kant, to which he appended a history of the Kantian doctrine. 2. Literary and General : Geschichte der deutschen Poesie im Mittelalter (1830); Handbuch einer allgemeinen Geschichte der Poesie (1832-33); Die Padogogik als System (1848); Aesthetik des Hdsslichen (1853); Die Poesie und ihre Geschichte (1885); Studien (1839-47) and Neue Studien (1875-78). He published also an autobiography entitled Von Magdeburg nach Konigsberg (1873), which deals with his life up to the time of his settlement at Konigsberg.

See Quabicker, Karl Rosenkranz (1899), and J. Hutchison Stirling, The Secret of Hegel, part 6.

ROSENTHAL, TOBY EDWARD (1848-), American artist, was born at New Haven, Connecticut, on the 15th of March 1848. Removing to San Francisco with his parents in 1855, he there studied painting under Fortunato Arriola. In 1865 he went to Munich, where he was a pupil of the Royal Academy under Strachuber, Raupp and Piloty. Among his more important works are: ” Morning Prayers ” (Leipzig Museum), ” Elaine,” ” Trial of Constance de Beverley,” ” Dancing Lesson During the Empire ” and ” Departure from the Family.”

ROSES, WARS OF THE, a name given to a series of civil wars in

England during the reigns of Henry VI., Edward IV. and Richard III. Their importance in the general history of England is dealt with elsewhere, and their significance in the history of the art and practice of war is small. They were marked by a ferocity and brutality which are practically un- known in the history of English wars before and since. The honest yeoman of Edward III.'s time had evolved into a pro- fessional soldier of fortune, and had been demoralized by the prolonged and dismal Hundred Years' War, at the close of which many thousands of ruffians, whose occupation had gone, had been let loose in England. At the same time the power of feudalism had become concentrated in the hands of a few great lords, who were wealthy enough and powerful enough to become king-makers. The disbanded mercenaries enlisted indifferently on either side, corrupting the ordinary feudal tenantry with the evil habits of the French wars, and pillaged the countryside, with accompaniments of murder and violence, wherever they went. It is true that the sympathies of the people at large were to some extent enlisted: London and, generally, the trading towns being Yorkist, the country people Lan- castrian — a division of factions which roughly corresponded to that of the early part of the Great Rebellion, two centuries later, and similarly in a measure indicative of the opposition of hereditary loyalty and desire for sound and effective govern- ment. But there was this difference, that in the 1 5th century the feeling of loyalty was to a great extent focused upon the great lords. Each lord could depend on his own tenantry, and he could, further, pay large bands of retainers. Hence, much as the citizen desired a settlement, the issue was in the hands of the magnates; and as accessions to and defections from one party and the other constantly shifted the balance of power, the war dragged on, becoming more and more brutal with every campaign.

It is from the Wars of the Roses that there originated the deep-rooted dislike of the professional soldier which was for nearly four centuries a conspicuous feature of the English social and governmental system, and it is therefore in their results rather than their incidents that they have affected the evolution of war. They withdrew the English army system from European battlefields precisely at the moment of transition when the regimental and technical organization of armies was becoming a science and seeking models, and the all-powerful English longbow at the moment when the early, scarcely effective firearms were, so to speak, struggling for recognition as army weapons. On the other hand, they destroyed the British military organization. The national army, aloof from the main streams of military progress, remained for 150 years an aggregation of county levies armed with bills and bows. In so far as the king was permitted

or able to raise armies, they were small mercenary forces formed, on a basis of unemployed professionals, from pressed men and criminals, and they were

disbanded as soon as the brief occasion for their services had passed.

The first campaign, or rather episode, of these wars 1 began with an armed demand of the Yorkist lords for the dismissal of the Lancastrian element in the king's council, Henry VI. himself being incapable of governing. The Lancastrians, and the king with them, marched out of London to meet them, and the two small armies (3000 Yorkists, 2000 Lancastrians) met at St Albans (May 22, 145s)- The encounter ended with the dispersion of the weaker force, and the king fell into the hands of the Yorkists. Four years passed before the next important battle, Blore Heath, was fought (Sept. 23, 1459). In this the earl of Salisbury trapped a Lancastrian army in unfavourable ground near Market Drayton, and destroyed it; but new political combinations rendered the Yoikist victory useless and sent the leaders of the party into exile. They made a fresh attempt in 1460, and, thanks partly to treason in the Lancastrian camp, partly to the generalship of Warwick, won an important success and for the second time seized the king at Northampton (July 10, 1460). Shortly afterwards, after a period of negotiation and threats, there was a fresh conflict. Richard duke of York went north to fight the hostile army which gathered at York and consisted of Lancashire and Midland Royalists, while his son Edward, earl of March, went into the west. The father was ambushed and killed at Wakefield (Dec. 30, 1460), and the Lancastrians, inspired as always by Queen Margaret of Anjou, moved south on London, defeated Warwick at St Albans (Feb. 17, 1461), and regained possession of the king's person. But the young earl of March, now duke of York, having raised an army in the west, defeated the earl of Pembroke (Feb. 2, 1461) at Mortimer's Cross (5 m. W. of Leominster). This was the first battle of the war which was characterized by the massacre of the common folk and beheading of the captive gentlemen — invariable accompaniments of Edward's victories, and con- spicuously absent in Warwick's. Edward then pressed on, joined Warwick, and entered London, the army of Margaret retreating before them. The excesses of the northern Lan- castrians in their advance produced bitter fruit on the retreat, for men flocked to Edward's standard. Marching north in pursuit, the Yorkists brought their enemy to bay at Towton (q.v.), 3 in. S. of Tadcaster, and utterly destroyed them (March 29, 1461). For

three years after Towton the war consisted merely of desultory local struggles of small bodies of Lancastrians against the inevitable. The duke of York had become King Edward IV., and had established himself firmly. But in 1464, in the far north of England, the Red Rose was again in the field. Edward acted with his usual decision. His lieutenant Montagu (Warwick's brother) defeated and slew Sir Ralph Percy at Hedgley Moor, near Wooler (April 25, 1464), and immediately afterwards destroyed another Lancastrian army, with which were both Henry VI. and Queen Margaret, at Hexham (May 8, 1464). The massacres and executions which followed effectively crushed the revolt. For some years thereafter Edward reigned peacefully, but Warwick the king-maker and all the Neville following having turned against him (1470), he was driven into exile. But at a favour- able moment he sailed from Flushing with 1500 retainers and Burgundian mercenaries, and eluding the Lancastrian fleet and the coast defence troops, landed at Ravenspur (Spurn Head) in Yorkshire in March 1471. His force was hardly more than a bodyguard; the gates of the towns were shut against him, and the country people fled. But by his personal charm, diplomacy, fair promises and an oath of allegiance to King Henry VI., sworn solemnly at York, he disarmed hostility and, eluding Montagu's army, reached his own estates in the Wake- field district, where many of his old retainers joined him. As

1 The name, as is well known, comes from the " white rose of York " and the " red rose of Lancaster " ; but these badges, though more or less recognized as party distinctions, by no means superseded the private devices of the various great lords, such as the " falcon and fetterlock " of Richard duke of York, the " rose in sun " of Edward IV., the " crowned swan " of Margaret, the Vere star, and even the revived " white hart " of Richard II.

he advanced south, a few Yorkist nobles with their following rallied to him, but it was far more the disunion of the Warwick and the real Lancastrian parties than his own strength which enabled him to meet Warwick's forces in a pitched battle. At Barnet, on Easter Eve, April 14, 1471. the decisive engagement was fought. But in the midst of the battle reinforcements coming up under the earl of Oxford to join Warwick came into conflict with their own party, the badge of the Vere star being mistaken for Edward's Rose-en-soleil. From that point all the mutually distrustful elements of Warwick's army fell apart, and Warwick himself, with his brother Montagu, was slain. For the last time the unhappy Henry VI. fell into the hands of his enemies. He was relegated to the Tower, and Edward, disbanding his army, reoccupied the throne. But Margaret of Anjou, his untiring opponent, who had been in France while her cause and Warwick's was being lost, had

landed in the west shortly after Barnet, and Edward had to take the field at once. Assembling a fresh army at Windsor, whence he could march to interpose between Margaret and her north Welsh allies, or directly bar her road to London, he marched into the west on the 24th of April. On the 29th he was at Cirencester, Margaret, engaged chiefly in recruiting an army, near Bath. Edward hurried on, but Margaret eluded him and marched for Gloucester. At that place the governor refused the Lancastrians admittance, and seeking to cross the Severn out of reach of the Yorkists, they pushed on by forced marches to Tewkesbury. But Edward too knew how to march, and caught them up. The battle of Tewkesbury (May 4, 147 1) ended with the destruction of Margaret's force, the captivity of Margaret, the death of her son Edward (who, it is sometimes said, was stabbed by Edward IV. himself after the battle) and the execution of sixteen of the principal Lancastrians.

This was Edward's last battle. The rest of his eventful reign was similar in many ways to that of his contemporary Louis XL, being devoted to the consolidation of his power, by fair means and foul, at the expense of the great feudatories. But the Wars of the Roses were not yet at an end. For fourteen years, except for local outbreaks, the land had peace, and then Richard III.'s crown, struck from his head on Bosworth Field (Aug. 22, 1485), was presented to Henry earl of Richmond, who, as Henry VII., established the kingship on a secure foundation. A last feeble attempt to renew the war, made by an army gathered to uphold the pretender Lambert Simnel, was crushed by Henry VII. at Stoke Field (4 m. S.W. of Newark) on the 16th of June 1487.

ROSETTA (Coptic Rashit, Arabic Rashid), a town situated at the western or " Rosetta " mouth of the Nile on the west bank. It was called Bolbitine by the Greeks, but according to Herodotus the Bolbitine mouth was artificial, and it was evidently of little importance compared with the Canopic, Sebennytic and Pelusiac mouths. When the other branches and the Alexandria canal silted up, Rosetta prospered like its sister port of Damietta on the eastern branch; the main trade of the overland route to India passed through it until Mehemet Ali cut a new canal joining Alexandria to the Nile. Rosetta is now much decayed. Its population in 1907 was 16,810, almost entirely Mussulman. A railway joins it to Alexandria. The celebrated Rosetta Stone which supplied Champollion with the key for the decipherment of the ancient monuments of Egypt was found near Fort St Julien, 4 m. N. of the town, in 1799, by Boussard, a French officer. It is a basalt stele inscribed in hieroglyphic, demotic and Greek with a decree of the priests assembled at Memphis in favour of

Ptolemy V. Epiphanes. It was ceded to the English at the capitulation of Alexandria (1801) and is now in the British Museum. See Egypt: II. Ancient Egypt, section D. ” Writing.” (F. Ll. G.)

ROSEWOOD, the name given to several distinct kinds of ornamental timber. That, however, so called in the United Kingdom is Brazilian rosewood, the palissandre of the French, the finest qualities of which, coming from the provinces of Rio de Janeiro and Bahia, are believed to be the produce prin- cipally of Dalbergia nigra, a leguminous tree of large dimensions,

called cabiuna and jacaranda by the Brazilians. The same name, jacaranda, is applied to several species of Machaerium, also trees belonging to the natural order Leguminosae; and there can be no doubt that a certain proportion of the rosewood of commerce is drawn from these sources. Rosewood comes to the United Kingdom from Rio de Janeiro, Bahia, Jamaica and Honduras. The heartwood attains large dimensions, but as it begins to decay before the tree arrives at maturity it is always faulty and hollow in the centre. On this account squared logs or planks of rosewood are never seen, the wood being imported in half-round flitches 10 to 20 ft. in length and from 5 to 12 in. in their thickest part. Owing to its irregular form, the wood is sold by weight, and its value varies within wide limits according to the richness of colour. Rosewood has a deep ruddy brown colour, richly streaked and grained with black resinous layers. It takes a fine polish, but, on account of its resinous nature, it is somewhat difficult to work. The wood is very much in demand both by cabinet-makers and pianoforte-makers, by whom it is used both solid and in veneer. The wood of Dalbergia latifolia, a native of the East Indies, used for ornamental furniture and carvings under the name of black wood, is frequently termed East Indian Rosewood. The Bois de Rose of the French, the Portuguese Pao de Rosa, and the German Rosenholz is a Brazilian wood, the produce of Physocalymma ftoribundum, called in the United Kingdom tulip wood, and very highly esteemed on account of its beautiful rose colour and grain.

ROSICRUCIANISM. What is known as the Society of Rosicrucians (Rosenkreuzer) was really a number of isolated individuals who early in the 17th century held certain views in common (which apparently was their only bond of union); for of a society holding meetings, and having officers, there is no trace. So far as the numerous works are

concerned it is evident that the writers who posed as Rosicrucians were moral and religious reformers, and utilized the technicalities of chemistry (alchemy), and the sciences generally, as media through which to make known their opinions, there being a flavour of mysticism or occultism promotive of inquiry and suggestive of hidden meanings discernible or discoverable only by adepts.

The publication of the Allgemeine und General- Reformation der ganzen weiten Welt (Cassel, 1614), and the Fama Frater- nitatis (Cassel, 1615) by the theologian Johann Valentin Andrea (1586-1654), caused immense excitement throughout Europe, and they not only led to many re-issues, but were followed by numerous pamphlets, favourable and otherwise, whose authors generally knew little, if anything, of the real aims of the original author, and doubtless in not a few cases amused themselves at the expense of the public. It is probable that the first work was circulated in MS. about 1610, for it is said that a reply was written in 161 2 (according to Herder), but if so, there was no mention of the cult before that decade. The authors generally favoured Lutheranism as opposed to Roman Catholicism. Others, like John Heydon, admitted they were not Rosicrucians, but under attractive and sug- gestive titles to their works sought to make Hermeticism and other curious studies more useful and popular, and succeeded, for a time at least.

The curious legend, in which the fabulous origin of the so-called society was enshrined (that a certain Christian Rosen- kreuz had discovered the secret wisdom of the East on a pilgrim- age in the 15th century), was so improbable, though ingenious, that the genesis of the Rosicrucians was generally overlooked or ignored, but the worthy objects of the fratres were soon discovered and supported by several able men; the result being a mass of literature on the subject, which absorbs some 80 pages of Gardner's Catalogue Raisonne of Works on the Occult Sciences (London, 1903).

The influence that Rosicrucianism had in the modernizing of ancient Freemasonry early in the 1 8th century must have been slight, if any, though it is likely that as the century advanced, and additional ceremonies were grafted on to the first three degrees, Rosicrucian tenets were occasionally introduced into the later rituals. So far, however, as the real foundation ceremonies of Craft XXIII. 24

Masonry are concerned, whether before or after the premier Grand Lodge was formed, it is most unlikely that such a society as the Freemasons wouid adopt anything of a really distinctive character from any other organization.

In The Muses' Threnodie by H. Adamson (Perth, 1638) are the lines —

" For what we do presage is riot in grosse, For we are brethren of the Rosie Crosse ; We have the Mason Word and second sight, Things for to come we can fortell aright."

Dr Begemann considers that possibly during the decade from 1720 to 1730 a kind of Rosicrucian or Hermetic influence took place in the lodges of London, some additions to the ritual of that period not having been derived from operative masonry; but in the previous century no such influence is traceable. Several modern societies have been formed from time to time (some of which are still flourishing in Great Britain) for the study of Rosicrucianism and allied subjects, but in no sense are they directly derived from the " Brethren of the Rosy Cross " of the 17th century, though keen followers thereof. By far the most important of these is the " Societas Rosicruciana in Anglia," with headquarters in London. The Supreme Magus, Dr William Wynn Westcott, has written its History (1900), with other important works on the subject, and the published Transactions of the Society are most valuable.

The Rosicrucians, their Rites and Mysteries, by Hargrave Jennings (three editions, 1870-87); The Real History of the Rosicrucians, founded on their own Manifestoes and on Facts and Documents collected from the Writings of Initiated Brethren, by A. E. Waite (1887); and The Arcane Schools, by John Yarker (1909), may be consulted with advantage, though not authorized publications of the Society. (W. J. H.*)

ROSIN (a later variant of " resin," q.v.) or Colophony (Colo- phonia resina, resin from Colophon in Lydia), the resinous constituent of the oleo-resin exuded by various species of pine, known in commerce as crude turpentine. The separation of the oleo-resin into the essential oil-spirit of turpentine and common rosin is effected by distillation in large copper stills. The essential oil is carried off at a heat of between 212 and 316° F., leaving fluid rosin, which is run off through a tap at the bottom of the still, and purified by passing through a straining wadding. Rosin varies in colour, according to the age of the tree whence the turpentine is drawn and the amount of heat applied in distillation, from an opaque almost pitchy black substance through grades of brown and yellow to an almost perfectly transparent colourless glassy mass. The commercial grades are numerous, ranging by letters from A, the darkest, to N, extra pale, — superior to which are W, " window glass," and WW, " water white " varieties, the latter having about three times the value of the common quali- ties. Rosin is

a brittle and friable resin, with a faint piny odour; the melting-point varies with different specimens, some being semi-fluid at the temperature of boiling water, while others do not melt till 220 or 250° F. It is soluble in alcohol, ether, benzene and chloroform. Rosin consists mainly of abietic acid, and combines with caustic alkalis to form salts (rosinates or pinates) that are known as ” rosin soaps.” In addition to its extensive use in soap-making, rosin is largely employed in making inferior varnishes, sealing-wax and various cements. It is also used for preparing shoemaker’s wax, as a flux for soldering metals, for pitching lager beer casks, for rosining the bows of musical instruments and numerous minor purposes. In pharmacy it forms an ingredient in several plasters and ointments. On a large scale it is treated by destructive distillation for the production of rosin spirit, pinoline and rosin oil. The last enters into the composition of some of the solid lubricating greases, and is also used as an adulterant of other oils.

The chief region of rosin production is the South Atlantic and Eastern Gulf states of the United States. American rosin is obtained from the turpentine of the swamp pine, Pinus australis, and of the loblolly pine, P. Taeda. The main source of supply in Europe is the ” landes ” of the departments of Gironde and Landes in France, where the cluster pine, P. Pinaster, is extensively cultivated. In the north of Europe rosin is obtained from the Scotch fir, P. sylvestris, and through- out European countries local supplies are obtained from other species of pine.

ROSKILDE, or Roeskilde, a town of Denmark in the amt (county) of Kjobenhavn (Copenhagen), 20 m. by rail W. of Copenhagen, on the great lagoon-like inlet named Roskilde Fjord. Pop. (1901) 8368. It has a small port, and is an important railway junction, from which lines diverge W., S.W. and S. through the island of Zealand. Its interest, however, is historical. It was the capital of the kingdom until 1443, and the residence of the bishops of Zealand until the Reformation. The cathedral, a beautiful church, was con- secrated in 1084, but of this early building only foundation walls remain; the present structure of brick was begun in 121 5, and enlarged and restored at various later dates. It stands in relation to Danish history somewhat as Westminster Abbey does to English, containing the tombs of most of the Danish kings from Harold I. (987). The most noteworthy architectural details are the Chapel of the Trinity (15th century) and that of Christian IV. (Renaissance, 1617), carved choir- stalls, and an altar-piece of the

16th century. Other old build- ings are a church of Our Lady, dating as it stands from 1242, a diocesan library (partly of the 15th century), royal palace (1733) and institute for daughters of noblemen (1670).

ROSMEAD, HERCULES GEORGE ROBERT ROBINSON, ist Baron (1824-1897), British colonial administrator, was born on the 19th of December 1824. He was of Irish descent on both sides; his father was Admiral Hercules Robinson, his mother a Miss Wood of Rosmead, County Westmeath, from which he afterwards took his title. Passing from Sandhurst into the 87th Foot, he attained the rank of captain; but in 1846, through the influence of Lord Naas, he obtained a post in the Board of Public Works in Ireland, and subsequently became chief commissioner of fairs and markets. His energy in these positions, notably during the famine of 1848, and the clearness and vigour of his reports, secured for him at the age of thirty the office of president of the island of Montserrat. Subsequently he was governor of St Christopher, from 1855 to 1859, when he was knighted in recognition of his services in introducing coolie labour into the island; of Hong-Kong; of Ceylon (K.C.M.G. in 1869); and in 1872 of New South Wales. It fell to his lot to annex the Fiji Islands to the British Empire, and his services were rewarded in 1875 by promotion to G.C.M.G. In 1870 he was transferred to New Zealand, and in 1880 he succeeded Sir Bartle Frere as high commissioner of South Africa. He arrived in South Africa shortly before the disaster of Majuba, and was one of the commissioners for negotiating a peace which was personally distasteful to him. It left him with the task of conciliating on the one hand a Dutch party elated with victory, and on the other hand a British party almost ready to despair of the British connexion. He was called home in 1883 to advise the government on the terms of the new convention concluded with the Transvaal Boers in February 1884. On his return to South Africa he found that a critical situation had arisen in Bechuanaland, where Boer commandoes had seized large tracts of territory and proclaimed the ” republics ” of Stella and Goshen. They refused to retire within the limits of the Transvaal as defined by the new con- vention, and Robinson, alive to the necessity of preserving this country — the main road to the north — for Great Britain, deter- mined on vigorous action. John Mackenzie and later Cecil Rhodes were sent to secure the peaceful submission of the Boers, but without immediate result, partly owing to the atti- tude of the Cape ministry. Robinson’s declaration that the advice of his ministers to patch up a settlement with the fili- bustering Boers was equivalent to a condonation of crime, led to the expedition of Sir Charles Warren and the annexation of Bechuanaland early in 1885. The difficulties of Robinson’s position were illustrated by the dispute which arose

between him and Warren, who declared that the high commissioner's duties to the home government were at times in conflict with the action which, as governor of Cape Colony, he was bound to take on the advice of his ministers in the interests of the colony. Sir Hercules Robinson succeeded in winning the confidence of President Kruger by his fair-mindedness, while he seconded

Rhodes's efforts to unite the British and Dutch parties in Cape Colony. His mind, however, was that of the administrator as distinguished from the statesman, and he was content to settle difficulties as they arose. In 1886 he investigated the charges brought against Sir John Pope-Hennessy, governor of Mauritius, and decreed his suspension pending the decision of the home authorities, who eventually reinstated Pope-Hennessy. In 1887 Robinson was induced by Rhodes to give his consent to the conclusion of a treaty with Lobengula which secured British rights in Matabele and Mashona lands. In May 1889 Robinson retired. In his farewell speech he declared that there was no permanent place in South Africa for direct Imperial rule. This was interpreted to mean that South Africa must ultimately become independent — an idea repugnant to him. He explained in a letter to The Times in 1895 that he had referred to the " direct rule of Downing Street over the crown colonies, as contrasted with responsible colonial government." He was made a baronet in 1891. Early in 1895, when he had entered his 71st year and was not in robust health, he yielded to the entreaties of Lord Rosebery's cabinet, and went out again to South Africa, in succession to Sir H. Loch. His second term of office was not fortunate. The Jameson Raid produced a permanent estrangement between him and Cecil Rhodes, and he was out of sympathy with the new colonial secretary, Mr Cham- berlain, who had criticized his appointment, and now desired Robinson to take this opportunity of settling the whole question of the position of the Uitlanders in the Transvaal. Robinson answered that the moment was inopportune, and that he must be left to choose his own time. Alarmed at the imminent danger of war, he confined his efforts to inducing the Johannes- burgers to lay down their arms on condition that the raiders' lives were spared, not knowing that these terms had already been granted to Jameson. He came home to confer with the government, and was raised to the peerage as Baron Rosmead. He returned to South Africa later in the year, but was compelled by ill-health, in April 1897, to quit his post, and died in London on the 28th of October 1897, being succeeded in the title by his son.

ROSMINI-SERBATI, ANTONIO (1797-1855), Italian philo- sopher, was born at Rovereto in Italian Tirol on the 25th of March 1797. He belonged to a noble and wealthy family, but at an early age decided to

enter the priesthood. After studying at Pavia and Padua, he took orders in 1821. In 1828 he founded a new religious order, the Institute of the Brethren of Charity, known in Italy generally as the Rosminians. The members might be priests or laymen, who devoted themselves to preach- ing, the education of youth, and works of charity — material, moral and intellectual. They have branches in Italy, England, Ireland, France and America. In London they are attached to the church of St Etheldreda, Ely Place, Holborn, where the English translation of Rosmini's works is edited. His works, The Five Wounds of the Holy Church and The Constitution of Social Justice, aroused great opposition, especially among the Jesuits, and in 1849 they were placed upon the Index. Rosmini at once declared his submission and retired to Stresa on Lago Maggiore, where he died on the ist of July 1855. Before his death he had the satisfaction of learning that the works in question were dismissed, that is, proclaimed free from censure by the Congregation of the Index. Twenty years later, the word " dismissed " (dimittantur) became the subject of con- troversy, some maintaining that it amounted to a direct approval, others that it was purely negative and did not imply that the books were free from error. The controversy continued till 1887, when Leo XIII. finally condemned forty of his pro- positions and forbade their being taught.

In 1848 Rosmini took part in the struggle which had for its object emancipation from Austria, but he was not an initiator of the movement which ended in the freedom and unity of Italy. In fact, while eager for the deliverance of Italy from Austria, his aim was to bring about a confederation of the states of the country, which was to be under the control of the pope.

The most comprehensive view of Rosmini's philosophical stand- point is to be found in his Sistema filosofico, in which he set forth the conception of a complete encyclopaedia of the human knowable, synthetically conjoined, according to the order of ideas, in a perfectly harmonious whole. Contemplating the position of recent philosophy from Locke to Hegel, and having his eye directed to the ancient and fundamental problem of the origin, truth and certainty of our ideas, he wrote: " If philosophy is to be restored to love and respect, I think it will be necessary, in part, to return to the teachings of the ancients, and in part to give those teachings the benefit of modern methods " (Theodicy, n. 148). He examined and analysed the fact of human knowledge, and obtained the following results: (1) that the notion or

idea of being or existence in general enters into, and is presupposed by, all our acquired cognitions, so that, without it, they would be impossible ; (2) that this idea is essentially objective, inasmuch as what is seen in it is as distinct from and opposed to the mind that sees it as the light is from the eye that looks at it ; (3) that it is essentially true, because ” being ” and ” truth ” are convertible terms, and because in the vision of it the mind cannot err, since error could only be committed by a judgment, and here there is no judgment, but a pure intuition affirming nothing and denying nothing; (4) that by the application of this essentially objective and true idea the human being intellectually perceives, first, the animal body individually conjoined with him, and then, on occasion of the sensations produced in him not by himself, the causes of those sensations, that is, from the action felt he perceives and affirms an agent, a being, and therefore a true thing, that acts on him, and he thus gets at the external world, — these are the true primitive judgments, containing (a) the subsistence of the particular being (subject), and (b) its essence or species as determined by the quality of the action felt from it (predicate) ; (5) that reflection, by separating the essence or species from the subsistence, obtains the full specific idea (universalization), and then from this, by leaving aside some of its elements, the abstract specific idea (abstraction) ; (6) that the mind, having reached this stage of development, can proceed to further and further abstracts, including the first principles of reasoning, the principles of the several sciences, complex ideas, groups of ideas, and so on without end; (7) finally, that the same most universal idea of being, this generator and formal element of all acquired cognitions, cannot itself be acquired, but must be innate in us, implanted by God in our nature. Being, as naturally shining to our mind, must therefore be what men call the light of reason. Hence the name Rosmini gives it of ideal being; and this he laid down as the fundamental principle of all philosophy and the supreme criterion of truth and certainty. This he believed to be the teaching of St Augustine, as well as of St Thomas, of whom he was an ardent admirer and defender.

Of his numerous works, of which a collected edition in 17 volumes was issued at Milan (1842-44), supplemented by Opere postume in 5 vols. (Turin, 1859-74), the most important are the New Essay on the Origin of Ideas (Eng. trans. ,1883); The Principles of Moral Science (1831); The Restoration of Philosophyˆ in Italy (1836); The Philosophy of Right (1841-45). The following have also been translated into English: ˆ4 Catholic Catechism, by W. S. Agar (1849); The Five Wounds of the Holy Church (abridged trans, with introd. by H. P. Liddon, 1883) ; Maxims of Christian Perfection, by W. A. John- son

(1889); Psychology (Anonymous) (1884-88); Sketch of Modern Philosophy, by Lockhart (1882); The Ruling Principle of Method Applied to Education, by Mrs W. Grey (Boston, Mass., 1887); Select-Letters, by D. Gazzola. Rosmini's Sistema filosofico has been translated into English by Thos. Davidson (Rosmini 's Philosophical System, 1882, with a biographical sketch and complete bibliography) ; see also Lives by G. S. Macwalter (1883) and G. B. Pagani (1907); C. Werner, Die Italienische Philosophie des 19. Jahrhunderts (1884); F. X. Kraus, " Antonio Rosmini: sein Leben, seine Schriften," in Deutsche Rundschau, liv. lv. (1888); " Church Reformation in Italy " in the Edinburgh Review, cxiv. (July 1861); and numerous recent Italian works, for which Baldwin's Dictionary of Philosophy or Pagliani's Catalogo Generate (Milan, 1905) should be consulted.

ROSNY, JOSEPH HENRY, a pseudonym covering the colla- boration of the French novelists, Joseph Henri Honore Boex, born at Brussels in 1856, and his brother Seraphin Justin Francois Boex, born at Brussels in 1859. The novels of J. H. Rosny are full of scientific knowledge, of astronomy, anthro- pology, zoology and, above all, sociology. The stories are approached from the point of view of society rather than of the individual, but the characters, strongly individualized and intensely real, are only incidentally typical. The elder Rosny was the sole author of the earlier novels, and began novel- writing as an avowed disciple of Zola. Nell Horn, membre de I'armee du salut (1885) is a picture of London life and social reform; Le Bilateral (1886) and Marc Fane (1888) describe the revolutionary and anarchist parties of Paris; L' Immolation (1887) is a brutal story of peasant life; Le Termite (1890) is a picture of literary life in Paris; and V amir eh (1891), with Erymah (1895),

and Les Profondeurs de Kyamo (short stories, 1896) and others deal with prehistoric man. MM. Rosny were among the writers who in 1887 entered a formal protest in the Figaro against Zola's La Terre, and they were designated by Edmond de Goncourt as original members of his academy. Among their later novels the more famous are: Daniel Valgraive (1891), a study in the possibilities of personal sacrifice; L'Imperieuse Bonte (1894), an indictment of Parisian charity; L'IndomptSe (1895), the history of a girl medical student in Paris; Le Serment (1896, dramatized 1897); Les Ames perdues (1899), another anarchist novel; La Charpente (1900); Therese De gaudy (1902); Le Crime du docteur (1903); Le Docteur Harambur (1904); Le Millionaire (1905); and Sous le fardeau (1906).

ROSS, ALEXANDER (1699-1784), Scottish poet, w» born on the 13th of April 1699 at Kincardine-O'Neil, Aberdeenshire. He was educated at

Marischal College, Aberdeen, and became tutor to the children of Sir William Forbes of Craigievar. He became in 1732 schoolmaster of Lochlee, Angus, where the rest of his life was spent. He had long been in the habit of writing verse for his own amusement, when in 1768 he published, at the suggestion of James Beattie, The Fortunate Shepherdess . . . to which is (sic) added a few songs. This is a pastoral narrative poem, written in obvious imitation of Allan Ramsay's Gentle Shepherd. Its affectations are chiefly on the Surface. The background of shepherd life as known to Ross, and the rather sordid motives of the characters, despite their high-sounding names of Helenore, Rosalind, &c, are depicted with uncom- promising truth. He died at Lochlee, and was buried on the 26th of May 1784.

See Helenore, or the Fortunate Shepherdess, edited by John Long-muir (1866); also H. Walker, Three Centuries of Scottish Literature (! 893)> ii- 28-34. The bulk of Ross's writings remain in MS.

ROSS, GEORGE WILLIAM (1841-), Canadian politician, was born near Nairn, Middlesex county, Ontario, on the 18th of September 1841, the son of James Ross and Ellen M'Kinnon, natives of Ross-shire, Scotland. From 1872-1883 he was a Liberal member of the Federal House; from 1883-99 minister of education in the legislature of the province of Ontario; and from 1 899-1 905 premier and treasurer of that province. In 1905 his government was defeated, and in 1907 he retired to the Canadian Senate. He was for many years an advocate of total abstinence, and a well-known speaker on imperial questions.

ROSS, SIR HEW DALRYMPLE (1779-1868), British soldier, entered the Royal Military Academy, Woolwich, in 1793, and passed out into the Royal Artillery two years later. With the Royal Horse Artillery he saw active service during the Irish rebellion of 1798, and after eleven years' service was pro- moted captain and appointed to command " A " troop R.H.A. (afterwards famous as the " Chestnut Troop "). In 1809 the troop landed at Lisbon and at once set out to join Wellington's army, reaching the front two days after Talavera. Ross's guns were attached to the Light Division, and, with Craufurd, took part in the actions on the Coa and the battle of Busaco. When Massena began his famous retreat from the lines of Torres Vedras, Ross's troop was amongst the foremost in the pursuit; at Redinha and Pombal, at Sabugal and Fuentes d'Onor, the " Chestnuts " earned great distinction, and in December 181 1 their commander received a brevet-majority for his services. He was present at Ciudad Rodrigo and Badajoz, at the Salamanca forts and the battle of Salamanca, still attached to the Light Division. In the campaign of Vittoria, Ross's guns were continually with the most advanced troops, and after Vittoria

they captured the only piece of artillery that remained to the defeated French. A further brevet-promotion and a good service reward came to Ross for his part in the campaign. At Vera in the Pyrenees Ross's troop was one of the three which played a decisive part in the action, and Vera remains a classical example of the action of horse artillery. " A " troop was engaged at St Pierre and Orthez, and at the con- clusion of peace returned to England. It was engaged at Waterloo, and though half its guns were disabled the remainder

took part in the pursuit of the French. Ross received, besides the Peninsular and Waterloo medals, the K.C.B., the Portuguese order of the Tower and Sword and the Russian St Anne. He had commanded the troop for nineteen years when he at last received a regimental lieutenant-colonelcy. As officer com- manding Royal Artillery in the Northern District, with dele- gated command over all the forces of the four northern counties, Sir Hew Ross had for nearly sixteen years to deal with con- tinually threatened civil disorder, and bore himself as well as on the field of battle. From 1840 to 1858, when he retired, he practically directed, in one post or another, all the artillery services of the British army, and when in 1854 the test of war came, the artillery took the field in a far better condition than the rest offcord Raglan's army. Much of the present efficiency of the " Royal Regiment " is directly traceable to the influence of Sir Hew Ross, to whom it owes the institution of the School of Gunnery at Shoeburyness and the establishment of the Royal Artillery Institution at Woolwich. Major-general in 1841 and lieut .-general in 1851, he became general in 1854, and died, a field-marshal and G.C.B., in 1868.

See Memoir of the R.A. Institution, 1871 ; and Duncan, History of the Royal Regiment of Artillery.

ROSS, SIR JAMES CLARK (1800-1862), British rear-admiral and Polar explorer, was born in London on the 15th of April 1800. He entered the navy in 181 2 under his uncle, Captain (afterwards Sir) John Ross, whom he accompanied on his first Arctic voyage in search of a North-West passage (1818). Between i8i9and 1827 he returned four times to the same seas in the Arctic expeditions under Parry, and in 1829-33 again served on the same mission under his uncle, and while thus employed determined (1831) the position of the North Magnetic Pole. In 1834 he was pro- moted captain, and from 1835-38 was employed on the mag- netic survey of Great Britain. In 1830-43 he commanded

the Antarctic expedition of the ” Erebus ” and ” Terror ” (see Polar Regions), and for this service he received a knight- hood (1844) and was nominated to the French order of the Legion of Honour. He published a narrative of this expedition under the title of A Voyage of Discovery and Research to Southern and Antarctic Regions (1847), and was the author also of various reports on zoological and other matters relating to his earlier voyages. He was elected to the Royal Society in 1848, and in that year made his last expedition, as captain of the ” Enter- prise,” in the first Franklin search expedition. He died at Aylesbury on the 3rd of April 1862.

ROSS, JOHN, or Kooeskoowe (1 790-1866), chief of the Cherokee Indian Nation, was of Scotch-Indian descent, and was born among the Cherokees in Georgia in 1790. In 1819- 1827 he was president of the Cherokee national committee, in July 1827 he presided over the Cherokee constituent assembly, and under the constitution which it drafted he was principal chief from 1828 until his death. In 1830-31 he applied to the Supreme Court of the United States for an injunction restraining the state of Georgia from executing its laws within the Cherokee territory, but the court dismissed his suit on the ground that it had no jurisdiction. There was a small party among the Cherokees under the leadership of John Ridge, a subchief, who were early disposed to treat with the United States for the removal of their nation west of the Mississippi, and in February 1835, while negotiations with Ridge were progressing at Washington, Ross proposed to cede the Cherokee lands to the United States for $20,000,000. The United States Senate resolved that $5,000,000 was sufficient. The treaty negotiated by the Ridge party and the proposal to treat on the basis of a $5,ooo,ooo-payment were both rejected in a full council of the Cherokees held in October 1835. The council authorized Ross to renew negotiations, but before leaving for Washington he was arrested by the Georgia authorities on the ground that he was a white man residing in the Indian country contrary to law. Ross was soon released, but in December of this year a few hundred Cherokees met the United States Indian commissioner at New Echota and concluded with him a treaty of removal. When Ross learned this he called a

council to meet in February 1836, and at this meeting the treaty was declared null and void and a protest against the proceedings at New Echota was signed by more than 12,000 Cherokees. Notwithstanding Ross’s opposition, the Senate in the following May ratified the treaty by a vote exceeding by one the necessary two-thirds majority, and in December 1838, Ross, with the last party of Cherokees, left for the West (see Georgia). During the Civil War, Ross first urged upon the Cherokee Nation a policy of friendly inactivity; in May 1861,

proclaimed a strict neutrality; in October 1861, signed a treaty with the Confederate States; in the summer of 1862 was forced (by Union sym- pathizers in the Nation) to proclaim neutrality again; soon afterwards went over to the Union lines; and was in Washington treating with the Federal government in February 1863 when the treaty with the Confederate States was abrogated by the Cherokees. He died at Washington on the 1st of August 1866. See C. C. Royce, " The Cherokee Nation of Indians " in the Fifth Annual Report of the Bureau of Ethnology (Washington, 1887), and T. V. Parker, The Cherokee Indians (New York, 1907).

ROSS, SIR JOHN (1777-1856), British rear-admiral and Arctic explorer, son of the Rev. Andrew Ross, minister of Inch, Wigtonshire, entered the Royal Navy in 1786, serving in the Mediterranean till 1789, and afterwards in the Channel. In 1808 he acted as captain of the Swedish Fleet, and in 181 2 was promoted commander. Six years later he was given the com- mand of an Arctic expedition fitted out by the Admiralty, the first of a new series of attempts to solve the question of a North- West passage. This expedition failed to discover much that was new, and somewhat prejudiced the Arctic reputation of its leader, who attained the rank of captain on his return." But in 1829, through the munificence of Mr (afterwards Sir) Felix Booth, he was able to undertake a second Arctic expedition, which, during an absence of four years, achieved important geographical and scientific results. On his return Captain Ross was the recipient of gold medals from the English and French geographical societies, and of various foreign orders, including a knighthood of the Pole Star of Sweden, and in the following year (1834) received a knighthood and a C.B. at home. In 1850 he undertook a third voyage to the Arctic regions, this time in search of Sir John Franklin, and in the following year he attained flag-rank. His publications include — Voyage of Discovery for the Purpose of Exploring Baffin's Bay (1819); Narrative of a Second Voyage in Search of a North-West Passage, including the Discovery of the North Magnetic Pole (1835); Memoirs and Correspondence of Lord De Saumerez (1838).

ROSS, ROBERT (1766-1814), British major-general, entered the 25th Foot at the age of nineteen, and in 1795 became captain in the 7th Regiment, obtaining a half-pay majority a few months later. As a major of the 20th he served in Holland under the duke of York in 1799. At the action of Krabbendam the regiment greatly distinguished itself, though largely composed of raw militia recruits. Ross was here severely wounded. In 1 801 the 20th went to Egypt and took part in the final operations which led to Menou's surrender. In 1803, though lieutenant-colonel only by brevet, Ross succeeded to the com- mand,

and at once initiated a severe system of training, in barracks and in the field, in his regiment. The result of this was apparent when under Sir John Stuart's command the regi- ment proceeded to Naples. The 20th played a decisive part in the brilliant action of Maida, and distinguished itself not less in the subsequent storm of the castle of Scylla. In 1808-9 Ross and the 20th formed part of Anstruther's brigade of Sir John Moore's army in Spain, and though the statement that the 20th, owing to its good discipline, suffered less loss than any other regiment in the retreat on Corunna is incorrect, the regiment was among the best disciplined in the army. Later in 1809 it was sent to Walcheren, where fever soon laid low two-thirds of the men. Ross and his regiment were then sent to Ireland to recover, and here the colonel repeated the course of drill and manoeuvre which had so markedly improved the 20th in Malta. He received a gold medal for Corunna and a sword of honour for Maida (which action had already won him a

gold medal). At the end of 1 812 the 20th was again engaged in the Peninsula, and Major-General Ross early in the following year received a brigade command in Cole's division. Scarcely engaged at Vittoria, Ross's brigade played a distinguished part in the operations around Pamplona, and the 20th covered itself with glory at Roncesvalles and Sorauren. At Orthez Ross was severely wounded at the head of the brigade, which was assaulting the village of St Boes. He was among those who received the thanks of parliament for this battle, and he received the gold medal for Vittoria and the Peninsula gold medal. At the end of the war Ross was sent in command of a brigade to harry the coast of North America, and with 4500 men and three light guns landed in Maryland. At Bladensburg the Americans stood to fight in a strong position, but Ross's men routed them (Aug. 24, 1814). The same evening Washington was entered, and, the public buildings having been destroyed, the expedition re-embarked. This short and brilliant campaign excited the admiration of soldiers, critics and public alike, but the commander did not live to receive his reward. A few days later an expedition against Baltimore was undertaken; skirmish- ing soon began, and one of the first to fall was Ross. A public monument was erected to his memory in St Paul's Cathedral, and others at his residence at Rosstrevor and at Halifax, N.S. His family was granted the name Ross of Bladensburg by royal letters-patent.

See Gentleman's Magazine, 1814, ii. 483; Cole, Peninsular Generals; Smythe, History of the 20th Regiment.

ROSS, a market town in the Ross parliamentary division of Herefordshire, England; 133 m. W. by N. from London and 12 S.E. from Hereford by the Great Western railway. Pop. of urban district (1901) 3303. It occupies a fine position on and about a rocky eminence on the left bank of the river Wye. There are manufactures of machinery and agricultural imple- ments, and trade in the products of the district, such as cider and malt, and several fairs are held annually. The church of St Mary the Virgin stands high, and is surmounted by a lofty spire; it shows good Decorated and Perpendicular work. A beautiful terrace called the Prospect adjoins the churchyard and overlooks the river. The market house, dated 1670, is a picturesque building supported on columns, the upper portion serving as a town hall. There are in the town many memorials of John Kyrle, the Man of Ross, who died here in 1724, and is eulogized by Pope in his third Moral Epistle (1732). The Prospect was acquired and laid out by Kyrle, who also planted the fine elm avenues near the church; his house stands opposite the market house, where he disbursed his charities; he erected the church spire, and is buried in the chancel, where his grave remained without a monument until Pope called attention to the omission. Nearly opposite the town is Wilton Castle, which defended the ford in the disturbed reign of Stephen, and suffered in the Civil Wars, being held for the Parliament and burned by the Royalists. The inhabited portion is modern. Four miles below Ross the important ford of Goodrich probably carried traffic in British and Roman times, and a magnificent castle, on a precipice rising sheer above the right bank of the river, commands it. The keep is doubtfully assigned to a date previous to the Conquest; the important position on the Welsh March led to several subsequent additions, especially in the 14th century, and the castle was only dismantled by order of the Parliamentarians after it had strongly resisted their arms on behalf of Charles I. in 1646, being the last to fall of the royal strongholds in this county.

Ross (Ros, Rosse) was granted to the see of Hereford by Edmund Ironside, but became crown property by an exchange effected in 1559. It derived importance from its situation on the road to South Wales. In 1305, only, it was represented in parliament by two members; but it was never incorporated, and was governed by appointees of the manor court, until the Ross Improvement Act of 1865 established elected commis- sioners of the borough. Fairs on the days of the Ascension, Corpus Christi, St Margaret and St Andrew were conferred by Henry III., and were in existence in 1888. A market every

Thursday was granted by Stephen and confirmed by Henry III.; Friday is now market day.

ROSS AND CROMARTY, a northern county of Scotland. The mainland portion is bounded N. by Sutherland and Dornoch Firth, E. by the North Sea and Moray Firth, S. by Beauly Firth and Inverness-shire and W. by the strait of the Minch. The island portion, consisting of as much of the island of Lewis as lies north of a line drawn from Loch Resort to Loch Seaforth, is bounded on the W., N. and E. by the Atlantic, and S. by Harris, the southern part of Lewis. Many islands, all but eleven uninhabited, are scattered principally off the west coasts of Lewis and the mainland. The area of the main- land is 1,572,294 acres and of the islands 404,413 acres, giving a total for the county of 1,976,707 acres or 3088-6 sq. m. The inhabited islands belonging to the mainland are all situated off the west coast. They are Gillean (lighthouse) in the parish of Lochalsh, Croulin in Applecross, Horisdale, Dry and Ewe in Gairloch parish, and Martin and Tanera More, of the group of the Summer Isles in the parish of Lochbroom. On the North Sea front the chief indentations are Beauly Firth and Inner Moray Firth, marking off the Black Isle from Inverness-shire; Cromarty Firth, bounding the districts of Easter Ross and the Black Isle; Moray Firth, separating Easter Ross from Nairn- shire; and Dornoch Firth, dividing north-east Ross from Suther- landshire. On the Atlantic face — -which is a coastline of more than 300 m. — the principal sea lochs and bays, from S. to N., are Loch Duich, Loch Alsh, Loch Carron, Loch Kishorn, Loch Torridon, Loch Shieldaig, Upper Loch Torridon, Gairloch, Loch Ewe, Gruinard Bay, Little Loch Broom and Enard Bay. The chief capes are Tarbat Ness on the east coast, and Coygach, Greenstone, Reidh, Red and Hamha Points on the west. Almost all the southern boundary with Inverness-shire is guarded by a rampart of peaks, among them being An Ria- bhachan (3696), Sgurr na Lapaich (3773), Cam Eige (3877), Mam Soul (3862), Ben Attow (3383), Scour Ouran (3505), famous for its view from the summit, Ben Mohr (3570) and the Saddle (3317). To the north of Glen Torridon occur the masses of the Liatach, with peaks of 3456 and 3358 ft., and Ben Eay with four peaks above 3000 ft. each. On the north- eastern shore of Loch Maree rises Ben Slioch (3217), while the Fannich group contains at least six peaks of more than 3000 ft. The immense isolated bulk of Ben Wyvis (3429), and its sub- ordinate peaks An Socach (3295) and An Cabar (3106), is the most noteworthy feature in the north-east, and the Challich Hills in the north-west with peaks of 3483 and 3474 ft. are equally conspicuous, though less solitary. Only a small fraction of western and southern Ross is under roop ft. in height. Easter Ross and the peninsula of the Black Isle are comparatively

level. The longest stream is the Orrin, which rises in An Sithean and pursues a course mainly E. by N. to its confluence with the Conon after a run of about 26 m., during a small part of which it forms the boundary with Inver- ness-shire. At Aultgowrie the stream rushes through a narrow gorge where the drop is considerable enough to make the falls of Orrin. From its source in the mountains in Strathvaich the Blackwater flows S.E. for 19 m. till it joins the Conon, forming soon after it leaves Loch Garve the small but picturesque falls of Rogie. Within a short distance of its exit from Loch Luichart the Conon pours over a series of graceful cascades and rapids and then pursues a winding course of 12 m., mainly E. to the head of Cromarty Firth. The falls of Glomach, in the south-west, are the deepest in the United Kingdom. The stream giving rise to them drains a series of small lochs on the northern flanks of Ben Attow and, in an almost unbroken sheet about 40 ft. broad, effects a sheer leap of 370 ft., and soon afterwards ends its course in the Elchaig. The falls are usually visited from Invershiel, 7 m. to the south-west. Twelve miles south by east of Ullapool, on the estate of Brae- more, are the falls of Measach, formed by the Droma, a head- stream of the Broom. The cascades, three in number, are close to the gorge of Corriehalloch. The Oykell, throughout its course, forms the boundary with Sutherlandshire, to which

it properly belongs. The largest and most beautiful of the many freshwater lakes is Loch Maree (g.v.), but a few of the others are interesting. In the far north-west, 243 ft. above the sea, lies Loch Skinaskink, a lake of such irregularity of outline that it has a shore-line of 17 m. It contains several islands covered with rich woods affording a shelter to deer, and drains into Enard Bay by the Polly. Lochan Fada (the ” long loch “), 1005 ft. above the sea, is 3J m. in length, has a greatest breadth of f m., covers an area of 15 sq. m., and is 248 ft. deep, with a mean depth of 102 ft. Once drained by the Muic, it has been tapped a little farther west by the Fhasaigh, which has lowered the level of the lake sufficiently to behead the Muic. Other lakes are, north of Loch Maree, Loch Fionn (the ” white ” or ” clear ” lake), 8 m. long by 1 m. wide, famous for its heronries; towards the centre of the shire, Loch Luichart (5 m. long by from J m. to nearly 1 m. wide), fringed with birches and having the shape of a crescent; the mountain- girt Loch Fannich (7 m. long by 1 m. wide); and the wild narrow lochs Monar (4 m. long) and Mullardoch (5 m. long), on the Inverness-shire boundary. Of the straths or valleys the

more important run from the centre eastwards, such as Strathconon (r2 m.), Strathbran (10 m.), Strathgarve (8 m.), Strathpeffer (6 m.) and Strathcarron (14 m.). Excepting Glen Orrin (13 m.), in the east central district, the longer glens lie in the south and towards the west. In the extreme south Glen Shiel (0 m.) runs between fine mountains to its mouth on Loch Duich. General Wade's road passes down the glen. Farther north are Glen Elchaig (9 m.), Glen Carron (12 m.), in the latter of which the track of the Dingwall & Skye railway is laid, and Glen Torridon (6 m.).

Geology. — -The central portion of this county is occupied by the younger highland schists or Dalradian series. These consist of quartzites, mica-schists, garnetiferous mica-schists and gneisses, all with a gentle inclination towards the S.E. On the eastern side of the county the Dalradian schists are covered unconformably by the Old Red Sandstone ; the boundary runs southward from Edderton on Dornoch Firth, by Strathpeffer, to the neighbourhood of Beauly. These rocks comprise red flags and sandstones, grey bituminous flags and shales. An anticlinal fold with a S.W.-N.E. axis brings up the basal beds of the series about the mouth of Cromarty Firth and exposes once more the schists in the Sutors guarding the entrance to the firth. The western boundary of the younger schist is formed by the great pre-Cambrian dislocation line which traverses the county in a fairly direct course from Elphin on the north by Ullapool to Glencarron. Most of the area west of the line of disturbance is covered by Torridonian Sandstone, mainly dark reddish sandstones, grits and shales, resting unconformably on the ancient Lewisian gneiss with horizontal or slightly inclined bedding. The uncon- formity is well exposed on the shores of Gairloch, Loch Maree and Loch Torridon. These rocks, which attain a considerable thickness and are divisible into three sub-groups, build up the mountain districts about Applecross, Coigach and elsewhere. Within the Torridonian tract the older, Lewisian gneiss occupies large areas north of Coigach, on the east of Enard Bay, between Gruinard Bay and Loch Maree; between the last named and Gairloch, on both sides of middle Loch Torridon and at many other spots smaller patches are to be found. The Lewisian gneiss is every-where penetrated by basic dikes, generally with a N.W.S.E. direction; some of these are of great breadth. The Torridonian rocks are succeeded unconformably by a series of Cambrian strata which is confined to a variable but, on the whole, narrow belt lying west of the line of main thrusting. This belt of Cambrian rocks has itself suffered an enormous amount of subordinate thrusting. It is composed of the following subdivisions in ascending order: false bedded quartzite, "Pipe Rock" quartzite, fucoid beds and Olenellus band, serpulite grit,

Durness dolomite and marble, Durness dolomite and limestone : but these are not always visible at any one spot. So great has been the disturbance in the region of thrusting that in some places, as in the neighbourhood of Loch Kishorn and else- where, the rocks have been completely overturned and the ancient gneiss has been piled upon the Torridonian. On the shore of Moray Firth at Rathie a small patch of Kimeridge shale occurs; and beneath the cliffs of Shandwick there is a little Lower Oolite with a thin seam of coal. Glacial striae are found upon the mountains up to heights of 3000 ft., and much boulder clay is found in the valleys and spread over large areas in the eastern districts. Raised beaches occur at 100, 50 and 25 ft. above the present sea-level ; they are well seen in Loch Carron. Lewis, on Long Island, is made almost entirely of ancient ” Lewisian gneiss.” but a little Torridonian occurs about Stornoway.

Climate and Agriculture. — On the west coast the rainfall is excessive, averaging for the year 50-42 in. at Loch Broom and

62 in. at Strome Ferry (autumn and winter being the wettest seasons), but on the east coast the annual is only mean 27 in. The temperature for the year is 46-5° F., for January 38 F. and for July 57° F. The most fertile tracts lie on the eastern coast, especi- ally in Easter Ross and the Black Isle, where the soil varies from a light sandy gravel to a rich deep loam. Among grain crops oats is that most generally cultivated, but barley and wheat are also raised. Turnips and potatoes are the chief green crops. On the higher grounds there is a large extent of good pasturage which carries heavy flocks of sheep, blackfaced being the principal breed. Most of the horses, principally half-breds between the old garrons (hardy, serviceable, small animals) and Clydesdales, are maintained for the purposes of agriculture. The herds of cattle, mainly native Highland or crosses, are large, many of them supplying the London market. Pigs are reared, though in smaller numbers than formerly, most generally by the crofters. Owing partly to the overcrowding of the island of Lewis and partly to the unkindly nature of the bulk of the surface — which offers no opportunity for other than patchwork tillage— the number of small holdings is enormous, Sutherlandshire alone amongst Scottish counties showing an even larger proportion of holdings under 5 acres ; while the average size of all the holdings throughout the shire does not exceed 20 acres. About 800,000 acres are devoted to deer forests, a greater area than in any other county in Scotland, among the largest being Achnashellach (50,000 acres), Fannich (20,000), Kinlochluichart (20,600), Braemore (40,000), Inch- bae (21,000) and Dundonnell (23,000). At one time the area under wood must have been remarkable, if we accept the common derivation of the word “Ross” as from the Irish ros, “a

wood," and there is still a considerable extent of native woodland, princi- pally fir, oak, ash and alder. The fauna is noteworthy. Red and roe deer abound, and foxes and alpine hares are common, while badgers and wild cats are occasionally trapped. Winged game are plentiful, and amongst birds of prey the golden eagle and osprey occur. Waterfowl of all kinds frequent the sea lochs; many rivers and lakes are rich in salmon and trout, and the pearl mussel is found in the bed of the Conon.

Other Industries. — Apart from agriculture, the fisheries are the only considerable industry, the county containing two fishery districts — Stornoway and Cromarty — and portions of two others — Loch Broom (the remainder belonging to Sutherlandshire) and Loch Carron (which includes part of Inverness-shire) Herring, cod and ling form the principal catch, while salmon are taken in large quantities in the bays and at the mouth of rivers. Distilleries are found near Dingwall, Tain and some other places, and there are manufactures, on a very limited scale, of woollens, chemical manures and aerated waters, besides some sandstone quarrying and flour mills. At Muir of Ord, in the parish of Urray, are held great horse, cattle and sheep markets.

The Highland railway entering the county to the north of Beauly runs northwards to Dingwall, and then strikes off to the north-east by Invergordon and Tain, where it bends to the west by north, leaving the shire at Culrain, having largely followed the coast throughout. At Muir of Ord it sends off the Black Isle branch and at Dingwall a branch to Strathpeffer, as well as a line to Strome Ferry and Kyle of Lochalsh on the south-western shore. Coaches connect various districts with stations on the Dingwall & Skye railway.

Population and Administration. — The population of the county in 1891 was 78,727, and in 1901 that of the mainland was 47,501, and of the islands 28,949, an aggregate of 76,450 or 25 to the sq. m. Thus Ross and Cromarty, though the third largest in size, is the least populated county in Scotland, excepting Sutherland, Inverness and Argyll. In 1901 there were 12,171 persons who spoke Gaelic only (of whom 9928 belonged to the islands) and 39,392 speaking Gaelic and English (of whom 15,990 were insular). The chief towns and villages are Stornoway (pop. 2854), Dingwall (2485), Fortrose (1322), Tain (2067), Cromarty (1242), Invergordon (1085). Ullapool is a small fishing port near the mouth of Loch Broom. For administrative purposes the county is divided into six districts, namely, Black Isle (pop. 6271), Easter Ross (12,192), Lewis (28,760), Mid Ross (12,953), South-Western Ross (4103) and Western Ross (5394). The county returns one member to parliament, and Cromarty, Dingwall and Tain belong to the Wick group of parliamentary burghs, and Fortrose to the Inverness group. Excepting Cromarty, these are royal burghs, and Dingwall is the county town. Ross and Cromarty forms a sheriffdom with Sutherlandshire, and there are resident sheriffs-substitute at Dingwall and Stornoway, the former also sitting at Tain and Cromarty. The shire is under school- board control, and there are academies at Tain, Dingwall and Fortrose, while several schools earn grants for higher education. The county council gives the ” residue ” grant

to the committee on secondary education, which subsidizes science and art classes in various schools and higher grade science schools at Dingwall, Tain and Stornoway.

History. — It may be doubted whether the Romans ever effected even a temporary settlement in the area of the modern county. At that period, and for long afterwards, the land was occupied by Gaelic Picts, who, in the 6th and 7th centuries, were converted to Christianity by followers of St Columba. Throughout the next three centuries the natives were continu- ally harassed by Norse pirates, of whose presence tokens have survived in several place-names (Dingwall, Tain, &c). At this time the country formed part of the great province of Moray, which then extended as far north as Dornoch Firth and the Oykell, and practically comprised the whole of Ross and Cromarty, excepting a comparatively narrow strip on the Atlantic seaboard. When the rule of the Celtic maormors or earls ceased in the 12th

century, consequent on the planta- tion of the district with settlers from other parts (including a body of Flemings), by order of David I., who was anxious to break the power of the Celts, the bounds of Moravia were contracted and the earldom of Ross arose. At first Ross proper only included the territory adjoining Moray and Dor- noch Firths. The first earl was Malcolm MacHeth, who re- ceived the title from Malcolm IV. After his rebellion in n 79 chronic insurrection ensued, which was quelled by Alexander II., who bestowed the earldom on Farquhar Macintaggart (Farquhar, son of the priest), then abbot of Applecross, and in that capacity lord of the western district. William, 4th earl, was present with his clan at the battle of Bannockburn (1314), and almost a century later (1412) the castle of Dingwall, the chief seat on the mainland of Donald, lord of the Isles, was captured after the disastrous fight at Harlaw in Aberdeenshire, which Donald had provoked when his claim to the earldom was re- jected. The earldom reverted to the crown in 1424, but James I. soon afterwards restored it to the heiress of the line, the mother of Alexander MacDonald, 3rd lord of the Isles, who thus became nth earl. In consequence, however, of the treason of John Macdonald, 4th and last lord of the Isles and 1 2th earl of Ross, the earldom was again vested in the crown (1476). Five years later James III. bestowed it on his second son, James Stewart, whom he also created duke of Ross in 1488. By the 16th century the whole area of the county was occupied by different clans. The Rosses held what is now Easter Ross; the Munroes the small tract around Ben Wyvis, including Dingwall; the Macleods Lewis, and, in the mainland, the district between Loch Maree and Loch Torridon; the MacDonalds of Glengarry, Coygach, and the district be- tween Strome Ferry and Kyle of Lochalsh, and the Mackenzies the remainder. The county of Ross was constituted in 1661, and Cromarty in 1685 and 1698, both being consolidated into the present county in 1889 (see Cromarty, county). Apart from occasional conflicts between rival clans, the only battles in the shire were those of Invercarron, at the head of Dornoch Firth, when Montrose was crushed by Colonel Strachan on the 27th of April 1650, and Glenshiel, when the Jacobites, under the earl of Seaforth, aided by Spaniards, were defeated, at the pass of Strachel, near Bridge of Shiel, by General Wightman on the nth of June 1719.

Antiquities. — The principal ‘ relics of antiquity — mainly stone circles, cairns and forts — are found in the eastern district. A vitrified fort crowns the hill of Knockfarrel in the parish of Fodderty, and there is a circular dun near the village of Lochcarron. Some fine examples of sculptured stones occur, especially those which, according to tradition, mark the burial-place of the three sons of a Danish king who

were shipwrecked off the coast of Nigg. The largest and handsomest of these three crosses — the clach-a-charridh, or Stone of Lamentation — stands at Shandwick. It is about 9 ft. high and contains representations of the martyrdom of St Andrew and figures of an elephant and dog. It fell during a storm in 1847 and was broken in three pieces. On the top of the cross in Nigg churchyard are two figures with outstretched arms in the act of supplication; the dove descends between them, and below are two dogs. The cross was knocked down by the fall of the belfry in 1725, but has been riveted together. The third stone formerly stood at Cadboll of Hilltown, but was removed for security to the grounds of

Invergordon Castle. Among old castles are those of Lochslin, in- the parish of Fearn, said to date from the 13th century, which, though ruinous, possesses two square towers in good preservation; Balone, in the parish of Tarbat, once a stronghold of the earls of Ross ; the remains of Dingwell Castle, their original seat ; and Eilean Donain in Loch Alsh, which was blown up by English warships during the abortive Jacobite rising in 1719.

See R. Bain, History of the Ancient Province of Ross (Dingwall, 1899); J. H. Dixon, Gairloch (Edinburgh, 1888); F. N. Reid, The Earls of Ross (Edinburgh, 1894); W. C. Mackenzie, History of the Outer Hebrides (Paisley, 1904).

ROSSANO, a city of Calabria, Italy, in the province of Cos- enza, 24 m. N.N.E. from that town direct, with a station 4 m. distant on the line from Metaponto to Reggio. Pop. (1901) 13,354. It is picturesquely situated on a precipitous spur of the mountain mass of Sila overlooking the Gulf of Taranto, the highest part of the town being 975 ft. above sea-level. Rossano is the seat of an archbishop, and in the cathedral is preserved the Codex Rossanensis, an uncial MS. of the Gospels of Matthew and Mark in silver characters on purple vellum, with twelve miniatures, of great interest in the history of Byzantine art, belonging to the 6th century a.d. It was brought to Grottaferrata (q.v.) for the exhibition of Byzantine art held there in 1905. Marble and alabaster quarries are worked in the neighbourhood.

Mentioned in the Itineraries, Rossano (Roscianum) appears under the Latin empire as one of the important fortresses of Calabria. Totila took it in 548. The people showed great attachment to the Byzantine empire. In the 14th century Rossano was made a principality for the great family of De Baux. Passing to the Sforza, and thus to Sigismund of Poland, it was united in 1558 to the crown of Naples by Philip II. of Spain in virtue of a doubtful will by Bona of Poland in favour of Giovanni Lorenzo Pappacoda. Under Isabella of Aragon and Bona of

Poland the town had been a centre of literary culture; but under the Spaniards it declined. The crown sold the lordship in 161 2 to the Aldobrandini, and from them it passed to the Borghesi and the Caraffa. Rossano is best known as the birthplace of St Nilus the younger, whose life is the most valuable source of information extant in regard to the state of matters in southern Italy in the 10th century. Pope John VII. (705-7) was also a native of the town.

See F. Lenormant, La Grande-Grhce (1881), vol. i. 339 sqq.

ROSSBACH, a village of Prussian Saxony in the district of Merseburg, 8 m. S.W. of that place and N.W. of Weissenfels, famous as the scene of Frederick the Great's victory over the allied French and the army of the Empire on the 5th of November 1757. For the events preceding the battle see Seven Years' War. The Prussian camp on the morning of the 5th lay between Rossbach (left) and Bedra (right), facing the Allies, who, commanded by the French general, Charles de Rohan, prince de Soubise (17 15-1787), and Joseph Frederick William, duke of Saxe-Hildburghausen (1 702-1 787), General Feldzeug- meister of the Empire, had manoeuvred in the preceding days without giving Frederick an opportunity to bring them to action, and now lay to the westward, with their right near Branderoda and their left at Miicheln (see sketch). The advanced posts of the Prussians were in the villages immediately west of their camp, those of the Allies on the Schortau hill and the Galgenberg.

The Allies possessed a numerical superiority of two to one in the battle itself, irrespective of detachments, 1 and their advanced post overlooked all parts of Frederick's camp. They had had the best of it in the manoeuvres of the previous days, and the duke of Hildburghausen determined to take the offen- sive. He had some difficulty, however, in inducing Soubise to risk a battle, and the Allies did not begin to move off their camping-ground until after eleven on the 5th, Soubise's intention being probably to engage as late in the day as possible, with the

1 V. der Goltz (Rossbach bis Jena, 1906 edition) gives 41,000 Allies and 21,600 Prussians as the combatant strengths. Berndt's statistical work, Zahl im Kriege, gives the respective forces engaged as Allies 43.000, Prussians 21,000. Other accounts give the Allies' total strength as 64,000 and the Prussians' as 24,000.

idea of gaining what advantages he could in a partial action. The plan was to inarch the Allied army by Zeuchfeld, round Frederick's left (which was covered by no serious natural obstacle), and to deploy in battle array, facing north, between Reichardtswerben (right) and Pettstadt (left). The duke's proposed battle and the more limited aim of Soubise were equally likely to be attained by taking this position, which threatened to cut off Frederick from the towns on the Saale. This position, equally, could only be gained by marching round the Prussian flank, i.e. by a flank march before the enemy. The obvious risk of interference on the exposed flank was pro- vided against by a considerable flank guard, and in fact it was not in the execution of their original design but in hastily modifying it to suit unfounded assumptions that the Allies met with disaster.

Frederick spent the morning watching them from a house-top in Rossbach. The initial stages of their movement convinced him that the Allies were retreating southward towards their magazines, and about noon he went to dinner, leaving Captain von Gaudi on the watch. This officer formed a different impression of the Allies' intentions, for the columns which from time to time became visible in the undulations of the ground were seen to turn eastwards from Zeuchfeld. Gaudi's excited report at first served only to confirm Frederick in his error. But when the king saw for himself that hostile cavalry and infantry were already near Pettstadt, he realized the enemy's intentions. The battle for which he had manoeuvred in vain was offered to him, and he took it without hesitation. Leaving a handful of light troops to oppose the French advanced post (or flank guard) on the Schortau hill, the Prussian army broke camp and moved — half an hour after the king gave the order — to attack the enemy. The latter were marching in the normal order in two main columns, the first line on the left, the second line on the right; farther to the right was a column consisting of the reserve of foot, and between the first and second lines was the reserve artillery on the road. The right-wing cavalry was of course at the head, the left-wing cavalry at the tail of the two main columns. At first the regulation distances were preserved, but when wheeling eastward at Zeuchfeld there was much confusion, part of the reserve infantry getting in between the two main columns and hampering the movements of the reserve artillery, and the rest, on the outer flank of the wheel, being unable to keep up with the over-rapid movement of the wheeling pivot. A weak flank guard was thrown out towards Rossbach. When it was seen that the Prussians were moving, as far as could be judged, eastward, it was presumed that they were about to retreat in order to avoid being taken in flank and rear; and the Allied generals thereupon hurried the march, sending on the leading (right-

wing) cavalry towards Reichardtswerben, and calling up part of the left-wing cavalry from the tail of the column, and even the flank-guard cavalry, to take part in the general chase. That Frederick's move meant an attack upon them before they could form up, Soubise and the duke failed to realize. They had taken more than three hours to break camp, and found it difficult to suppose that Frederick's army could move off in one-sixth that time. It was obvious, moreover, that the Prussians were not deploying for battle on the plain in front of Rossbach and Nahlendorf.

Frederick had no intention either of forming up parallel to the enemy or of retreating. As his army could move as a unit twice as fast as the enemy's, he intended to make a detour, screened by the Janus Hugel and the Polzen Hiigel, and to fall upon them suddenly from the east. If at the moment of contact the Allies had already formed their line of battle facing north, the attack would strike their right flank; if they were still on the move in column eastwards or north-eastwards, the heads of their columns would be crushed before the rest could deploy in the new direction — deployment in those days being a lengthy affair. To this end General von Seydlitz, with every available squadron, hurried eastward from Rossbach, behind the Janus Hiigel, to the Polzen Hiigel; Colonel von Moller, with eighteen heavy guns, came into action on the Janus Hugel at 3.15 against the advancing columns of the Allied cavalry; and the infantry followed as fast as possible. When they came under the fire of Moller's guns, the Allied squadrons, which were now north of Reichardtswerben and well ahead of their own infantry, suffered somewhat heavily ; but it was usual to employ heavy guns to protect a retreat, and they contented themselves with bringing some field- guns into action. They were, however, amazed when Seydlitz's thirty-eight squadrons suddenly rode down upon the head and right flank of their columns from the Polzen Hiigel avec une incroyable vitesse. Gallantly as the leading German regiments deployed to meet him, the result was scarcely in doubt for a moment. Seydlitz threw in his last squadron, and then himself fought like a trooper, receiving a severe wound. The melee drifted rapidly southward, past the Allied infantry, and Seydlitz finally rallied his horsemen in a hollow near Tagewerben, ready for fresh service. This first episode was over in half an hour, and by that time the Prussian infantry, in echelon from the left, was descending the Janus Hiigel

to meet the already confused and disheartened infantry of the Allies. The latter, as their cavalry had done, managed to deploy some regiments on the head of the column, and the French in par- ticular formed one or two columns of attack — -then peculiar to the French

army — and rushed forward with the bayonet. But Moller's guns, which had advanced with the infantry, tore gaps in the close masses, and, when it arrived within effective musketry range, the attack died out before the rapid and methodical volleys of the Prussian line. Meanwhile the Allies were trying in vain to form a line of battle. The two main columns had got too close together in the advance from Pettstadt, part of the reserve which had become entangled between the main columns was extricating itself by degrees and endeavouring to catch up with the rest of the reserve column away to the right, and the reserve artillery was useless in the middle of the infantry. The Prussian infantry was still in

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echelon from the left, and the leftmost battalions that had repulsed the French columns were quickly within musket-shot of this helpless mass. A few volleys directed against the head and left flank of the column sufficed to create disorder, and then from the Tagewerben hollow Seydlitz's rallied squadrons charged, wholly unexpectedly, upon its right flank. The Allied infantry thereupon broke and fled. Soubise and the duke, who was wounded, succeeded in keeping one or two regiments together, but the rest scattered over the country- side. The battle had lasted less than an hour and a half, and the last episode of the infantry fight no more than fifteen minutes. Seven Prussian battalions only were engaged, and these expended five to fifteen rounds per man. Seydlitz and Prince Henry of Prussia, the cavalry and the infantry leaders engaged, were both wounded, but the total loss of the king's army was under 550 officers and men as compared with 7700 1 on the part of the Allies. (C. F. A.)

ROSSE, EARL OF, a title borne by the Irish family of Parsons. James Parsons, a native of Leicestershire, who flourished in the 16th century, was the father of Sir William Parsons (c. 1570-1650), one of the lords justices of Ireland. Having crossed to Ireland in early life, William Parsons became surveyor- general in 1602 and obtained land in various parts of the country. In 1620 he was made a baronet; in 1643 he was deprived of his office as lord justice, and he died early in 1650. His great- grandson, Sir Richard Parsons, bart. (c. 1657-1703), was created Baron Oxmantown and Viscount Rosse in 1681, and Richard's

son and successor, Richard (d. 1741), was made earl of Rosse in 1718. The titles became extinct when Richard, the 2nd earl, died in August 1764.

Sir William Parsons had two brothers, Sir Lawrence and Sir Fenton Parsons. Sir Lawrence, second baron of the Irish exchequer, left a son, William (d. 1653), who defended Birr Castle, King's County, for over a year against the Irish during

1 Figures again vary in different authorities. The above figure is that given by Berndt, Zahl im Kriege.

the rebellion of 1641, and whose son, Sir Lawrence Parsons (d. 1698), was made a baronet in 1677. This Sir Lawrence was a strong Protestant, and was found guilty of high treason, being attainted and sentenced to death during the brief period of James II. 's ascendancy in Ireland. He was not executed, however, and afterwards he took some part in the struggle against the supporters of James II. His descendant, Lawrence Harman Parsons (1749-1807), was created Baron Oxmantown in 1792, Viscount Oxmantown in 1795, and earl of Rosse in 1806. He died on the 20th of April 1807, and was succeeded by his nephew Lawrence.

Lawrence Parsons, 2nd earl of Rosse (1758-1841), the eldest son of Sir William Parsons, bart. (d. 1791), of Birr Castle, was born on the 21st of May 1758. Educated at Trinity College, Dublin, he entered the Irish parliament as member for the university in 1782, and soon came to the front in debate. A friend and follower of Henry Flood, he has been described as " one of the very, very few honest men in the Irish House of Commons." He favoured some measure of relief to Roman Catholics and also parliamentary reform, a speech which he delivered on this question in 1793 being described by W. E. H. Lecky as " exceedingly valuable to students of Irish history "; but he disliked and opposed the union of the parliaments of Great Britain and Ireland. After this event, however, he represented King's County in the united parliament until 1807, and he was a representative peer for Ireland from 1809 to 1841. He died at Brighton on the 24th of February 1841. Rosse wrote Observations on the Bequest of Henry Flood to Trinity College, Dublin, with a Defence of the Ancient History of Ireland (Dublin, 1795). His eldest son was the astronomer William Parsons, 3rd earl of Rosse (see below).

ROSSE, WILLIAM PARSONS, 3RD Earl or (1800-1867), Irish

astronomer and telescope constructor, was born at York on the 17th of June 1800, a son of the 2nd earl (see above). Until his father's death he was known as Lord Oxmantown. Entered at Trinity College, Dublin, in 1818, he proceeded to Magdalen College, Oxford, in 182 1, and in the same year he was returned as M.P. for King's County, a seat which he resigned in 1834. He was Irish representative peer from 1845, president of the British Association in 1843, president of the Royal Society from 1849 to 1854, and chancellor of the university of Dublin from 1862. From 1827 he devoted himself to the improvement of reflecting telescopes; in 1839 he mounted a telescope of 3 ft. aperture at his seat, Birr Castle, Parsonstown; and in February 1845 his celebrated 6-foot reflector was finished. Owing to the famine and the disturbed state of the country, which de- manded his attention as a large landowner and lieutenant of King's County (from 1831), the instrument remained unused for nearly three years, but since 1848 it has been in constant use, chiefly for observations of nebulae, for which it was par- ticularly suited on account of its immense optical power, nominally 6000. Lord Rosse died at Monkstown on the 31st of October 1867. He had four sons. The eldest, Lawrence Parsons, 4th earl of Rosse, and Baron Oxmantown, born on the 17th of November 1840, succeeded to the title on his father's death, and made many investigations on the heavenly bodies, particularly on the radiation of the moon and related physical questions; the youngest, the Hon. Charles Algernon Parsons, born on the 13th of June 1854, is famous for his commercial development of the steam turbine.

The first constructor of reflecting telescopes on a large scale, William Herschel, never published anything about his methods of casting and polishing specula, and he does not appear to have been very successful beyond specula of 18 in. diameter, his 4-foot speculum ("the 40-foot telescope ") having been little used by him (see discussion between Sir J. Herschel and Robinson in The Athenaeum, Nos. 831-36, 1843). Lord Rosse had therefore no help towards his brilliant results. His speculum metal is composed of fourˆ atoms of copper (126-4 parts) and one of tin (58-9 parts), a brilliant alloy, which resists tarnish better than any other compound tried. Chiefly owing to the brittleness of this material, Lord Rosse's first larger specula were composed of a number of thin plates of sneculum metal (sixteen for a 3-foot mirror) soldered on the back of a rtrong but light framework made of a peculiar kind of brass (275 of copper to 1 of zinc), which has the same expansion as his speculum

metal. In Brewster's Edinburgh Journal of Science for 1828 he

described his machine for polishing the speculum, which in all essential points remained unaltered afterwards. It imitates the motions made in polishing a speculum by hand by giving both a rectilinear and a lateral motion to the polisher, while the speculum revolves slowly; by shifting two eccentric pins the course of the polisher can be varied at will from a straight line to an ellipse of very small eccentricity, and a true parabolic figure can thus be obtained. The speculum lies face upwards in a shallow bath of water (to preserve a uniform temperature), and the polisher fits loosely in a ring, so that the rotation of the speculum makes it revolve also, but more slowly. Both the grinding and polishing tools are grooved, to obtain a uniform distribution of the emery used in the grinding process and of the rouge employed in polishing, as also to provide for the lateral expansion of the pitch with which the polisher is coated. In September 1839 a 3-foot speculum was finished and mounted on an altazimuth stand similar to Herschel's; but, though the definition of the images was good (except that the diffraction at the joints of the speculum caused minute rays in the case of a very bright star), and its" peculiar skeleton form allowed the speculum to follow atmospheric changes of temperature very quickly, Lord Rosse decided to cast a solid 3-foot speculum. Hitherto it had been felt as a great difficulty in casting specula that the solidification did not begin at one surface and proceed gradually to the other, the common sand mould allowing the edges to cool first, so that the central parts were subject to great straining when their time of cooling came, and in large castings this generally caused cracking. By forming the bottom of the mould of hoop iron placed on edge and closely packed, and the sides of sand, while the top was left open, Lord Rosse overcame this difficulty, and the hoop iron had the further advantage of allowing the gas developed during the cooling to escape, thus preventing the speculum from being full of pores and cavities. This invention secured the success of the casting of a solid 3-foot speculum in 1840, and encouraged Lord Rosse to make a speculum of 6 ft. diameter in 1842. In the beginning of 1845 this great reflector was mounted and ready for work. The instrument has a focal length of 54 ft. and the tube is about 7 ft. in diameter; owing to these large dimensions it cannot be pointed to every part of the heavens, but can only be moved a short distance from the meridian and very little to the north of the zenith; these restrictions have, however, hardly been felt, as there is almost at any moment a sufficient number of objects within its reach.

From 1848 to 1878 it was but with few interruptions employed for observations of nebulae (see Nebula) ; and many previously unknown features in these objects were revealed by it, especially the similarity

of ” annular ” and “planetary ” nebulae, and the remarkable ” spiral ” configuration prevailing in many of the brighter nebulae. A special study was made of the nebula of Orion, and the resulting large drawing gives an extremely good representa- tion of this complicated object. (See Telescope.)

Lord Rosse gave a detailed account of the experiments which step by step had led to the construction of the 3-foot speculum in the Philosophical Transactions for 1840. In the same publication for 1 844 and 1 850 he communicated short descriptions and drawings of some of the more interesting nebulae, and in the volume for 1 861 he published a paper ” On the Construction of Specula of 6-ft. Aperture, and a Selection from the Observations of Nebulae made with them,” with numerous engravings. The accounts of the observations given in these papers, however, were fragmentary; but in 1879-80 a complete account of them was published by the present earl (” Observations of Nebulae and Clusters of Stars made with the 6-foot and 3-foot Reflectors at Birr Castle from 1848 to 1878 “) in the Scient. Trans. R. Dublin Soc. vol. ii. The drawing of the nebula of Orion was published in the Phil- Trans, for 1868

See obituary notice in the Proc. Roy. Soc. (1868), 16, 36, and in the Monthly Notices of Roy. Astr. Soc. vol. 29, p. 123.

ROSSELLI, COSIMO (1439-c. 1507), Florentine painter, was born in 1439. At the age of fourteen he became a pupil of Neri di Bicci, and in 1460 he worked as assistant to his cousin Bernardo di Stefano Rosselli. The first work of Cosimo men- tioned by Vasari exists in S. Ambrogio, in Florence, over the third altar on the left. It is an ” Assumption of the Virgin,” a youthful and feeble work. In the same church, on the wall of one of the chapels, is a fresco by Cosimo which Vasari praises highly, especially for a portrait of the young scholar Pico of Mirandola. The scene, a procession bearing a miracle-working chalice, is painted with much vigour and less mannerism than most of this artist’s work. A picture painted by Rosselli for the church of the Annunziata, with figures of SS. Barbara, Matthew and the Baptist, is in the Academy of Florence. Rosselli also spent some time in Lucca, where he painted several altar-pieces for various churches. A picture attributed to him, taken from the church of S. Girolamo at Fiesole, is now in the National Gallery of London. It is a large retable, with, in the

centre, St Jerome in the wilderness kneeling before a crucifix, and at the sides standing figures of St Damasus and St Eusebius, St Paolo and St Eustachia; below is a predella with sm,all subjects. Though dry and hard in treatment, the figures are designed with much dignity. The Berlin Gallery possesses three pictures by Rosselli: “The Virgin in Glory,” ” The Entombment of Christ,” and ” The Massacre of the Innocents.” In r48o Rosselli, together with the chief painters of Florence, was invited by Sixtus IV. to Rome to assist in the painting of the frescoes in the Sistine Chapel. Three of these were executed by him — ” The Destruction of Pharaoh’s Army in the Red Sea,” ” Christ Preach- ing by the Lake of Tiberias,” and ” The Last Supper.” The last of these is well preserved, but is a mediocre work. Vasari’s story about the pope admiring Rosselli’s paintings more than those of his abler brother painters has probably little foundation. Rosselli’s Sistine frescoes were partly painted by his assistant Piero di Cosimo, who was so called after Cosimo Rosselli. His chief pupil was Fra Bartolommeo. According to Vasari, Rosselli died in 1484, but this is a mistake, as his will exists dated 25th of November 1506 (see Gaye, Car. ined. ii. 457 «.).

For an account of Rosselli’s Sistine frescoes, see Platner and Bunsen, Beschreibung der Stadt Rom, ii. pt. i.; and Rumohr, Italien. Forschungen, ii. 265.

ROSSELLINO, ANTONIO (1427-e. 1479), Florentine sculptor, was the son of Matteo di Domenico Gamberelli, and had four brothers, who all practised some branch of the fine arts. Almost nothing is known about the life of Antonio, but many of his works exist, and are full of religious sentiment, and executed with the utmost delicacy of touch and technical skill. The style of Antonio and his brother Bernardo is a development of that of Donatello and Ghiberti; it possesses all the refinement and sweetness of the earlier masters, but is not equal to them in vigour or originality. Antonio’s chief work, still in perfect preservation, is the lovely tomb of a young cardinal prince of Portugal, who died in 1459. It occupies one side of a small chapel, also built by Rossellino, on the north of the nave of San Miniato al Monte. 1 The recumbent effigy of the cardinal rests on a handsome sarcophagus, and over it, under the arch which frames the whole, is a beautiful relief of the Madonna between two flying angels. The tomb was begun in 1461 and finished in 1466; Antonio received four hundred and twenty-five gold florins for it. A reproduction of this tomb with slight

Marble Relief by Antonio Rossellino.

alterations, and of course a different effigy, was made by Antonio for the wife of Antonio Piccolomini, duke of Amalfi, in the

1 Illustrated by Gonnelli, Mon. Sepol. delta Toscana (Florence, 1819), pi. xxiii.

church of S. Maria del Monte at Naples, where it still exists. For the same church he also executed some delicate reliefs, which perhaps err in being too pictorial in style, especially in the treatment of the backgrounds. A fine medallion relief by him in marble, originally modelled in terra-cotta, is preserved in the Bargello at Florence (see fig.).

Bernardo Rossellino (1409-1464), Florentine sculptor, was no less able than his younger brother Antonio. His finest piece of sculpture is the tomb, in the Florentine Santa Croce, of Leonardo Bruni of Arezzo, the historian of Florence, executed in 1443 some years after Bruni's death; the recumbent effigy is of great merit. The inner cathedral pulpit at Prato, circular in form on a tall slender stem, was partly the work of Mino da Fiesole and partly by Bernardo Rossellino. The latter executed the minute reliefs of St Stephen and the Assumption of the Virgin. For his part in the work he received sixty-six gold florins. The South Kensington Museum possesses a relief by Bernardo, signed and dated (1456). It is a fine portrait of the physician Giovanni da S. Miniato. Bernardo's works as an architect were numerous and important, and he was also a skilful military engineer. He restored the church of S. Francis at Assisi, and designed several fine buildings at Civita Vecchia, Orvieto and elsewhere. He also built fortresses and city walls at Spoleto, Orvieto and Civita Castellana. He was largely employed by Nicholas V. and Pius II. for restorations in nearly all the great basilicas of Rome, but little trace of his work remains, owing to the sweeping alterations made during the 17th and 18th centuries. Between the years 1461 and 1464 (when he died while engaged on the Lazzari monument at Pistoia) he occupied the important post of capo-maestro to the Florentine duomo. A number of buildings at Pienza, executed for Pius II., are attributed to him; the Vatican registers mention the architect of these as M° Bernardo di Fiorenza, but this indication is too slight to make it certain that the elder Rossellino is referred to (see Vasari, ed. Milanesi, iii. 93 seq.).

See Wilhelm Bode, Die Italienische Plastik (Berlin, 1902).

ROSSETTI, CHRISTINA GEORGINA (1830-1894), English poet, was the youngest of the four children of Gabriele Rossetti (see the article on her brother Dante Gabriel Rossetti). She was born at 38 Charlotte

Street, Portland Place, London, on the 5th of December 1830. She enjoyed the advantages and disadvantages of the strange society of Italian exiles and English eccentrics which her father gathered about him, and she shared the studies of her gifted elder brother and sister. As early as 1847 her grandfather, Gaetano Polidori, printed privately a volume of her Verses, in which the richness of her vision was already faintly prefigured. In 1850 she contributed to The Germ seven pieces, including some of the finest of her lyrics. In her girlhood she had a grave, religious beauty of feature, and sat as a model not only to her brother Gabriel, but to Holman Hunt, to Madox Brown and to Millais. In 1853-54 Christina Rossetti for nearly a year helped her mother to keep a day-school at Frome-Selwood, in Somerset. Early in 1854 the Rossettis returned to London, and the father died. In poverty, in ill-health, in extreme quietness, she was now performing her life-work. She was twice sought in marriage, but each time, from religious scruples (she was a strong high- church Anglican), she refused her suitor; on the former of these occasions she sorrowed greatly, and her suffering is reflected in much of her early song. In 1861 she saw foreign countries for the first time, paying a six weeks' visit to Normandy and Paris. In 1862 she published what was practically her earliest book, Goblin Market, and took her place at once among the poets of her age. In this volume, indeed, is still to be found a majority of her finest writings. The Prince's Progress followed in 1866. In 1867 she, with her family, moved to 56 Euston Square, which became their home for many years. Christina's prose work Commonplace appeared in 1870. In April 187 1 her whole life was changed by a terrible affliction, known as "Graves's disease"; for two years her life was in constant danger. She had already composed her book of children's poems, entitled Sing-Song, which appeared

in 1872. After a long convalescence, she published in 1874 two works of minor importance, Annus Domini and Speaking Likenesses. The former is the earliest of a series of theological works in prose, of which the second was Seek and Find in 1879. In 1 88 1 she published a third collection of poems, A Pageant, in which there was evidence of slackening lyrical power. She now gave herself almost entirely to religious disquisition. The most interesting and personal of her prose publications (but it contained verse also) was Time Flies (1885) — a sort of symbolic diary or collection of brief homilies. In 1890 the S.P.C.K. published a volume of her religious verse. She collected her poetical writings in 1891. In 1892 she was led to publish a very bulky

commentary on the Apocalypse, entitled The Face of the Deep. After this she wrote little. Her last years were spent in retirement at 30 Torrington Square, Bloomsbury, which was her home from 1876 to her death. In 1892 her health broke down finally, and she had to endure terrible suffering. From this she was released on the 29th of December 1894. Her New Poems were published posthumously in 1896. In spite of her manifest limitations of sympathy and experience, Christina Rossetti takes rank among the foremost poets of her time. In the purity and solidity of her finest lyrics, the glow and music in which she robes her moods of melancholy reverie, her extraordinary mixture of austerity with sweetness and of sanctity of tone with sensuousness of colour, Christina Rossetti, in her best pieces, may challenge comparison with the most admirable of our poets. The union of fixed religious faith with a hold upon physical beauty and the richer parts of nature has been pointed to as the most original feature of her poetry. Hers was a cloistered spirit, timid, nun-like, bowed down by suffering and humility; her character was so retiring as to be almost invisible. All that we really need to know about her, save that she was a great saint, was that she was a great poet. (E. G.)

See the Poetical Works of C. G. R., with Memoir by W. M. Rossetti (1903). Also Edmund Gosse's Critical Kit-Kats (1896); an article by Ford Madox Hueffer in the Fortnightly Review (March 1904) ; and another in The Christian Society (Oct. 1904). The Family Letters of Christina Rossetti were edited by W. M. Rossetti in 1908.

ROSSETTI, DANTE GABRIEL (1828-1882), English poet and painter, whose full baptismal name was Gabriel Charles Dante, was born on the 12th of May 1828, at 38 Charlotte Street, Portland Place, London. He was the first of the two sons and the second of the four children of Gabriele Rossetti (1783-1854), an Italian poet and liberal, who, about 1824, after many vicissitudes connected with the part he played in the Naples reform movement against Ferdinand I., came to England, where he married in 1826 Frances Mary Polidori (d. 1886), sister of Byron's physician, Dr John Polidori, and daughter of a Tuscan, Gaetano Polidori, who had in early youth been Alfieri's secretary and who had married an English lady. In 1831 he became professor of Italian in King's College, London, and afterwards achieved a recognized position as a subtle and original, if eccentric, commentator on Dante. In 1852 he published a volume of Italian religious poems. His family, besides Dante Gabriel, consisted of Maria Francesca (1827-1876), who eventually entered an Anglican sisterhood — she is known to Dante scholars by her valuable Shadow of Dante; William Michael (b. 1829), a well-known man of letters who from 1845 to 1894 was in the Inland Revenue Office — he married a daughter of

Ford Madox Brown; and Christina (q.v.), the poet. The literary spirit was strongly entrenched here; and the talent which was always distinguished in William Michael rose to the height of rare genius in Dante Gabriel and Christina.

Dante Rossetti's education was begun at a private school in Foley Street, Portland Place, where he remained, however, only nine months, from the autumn of 1835 to the summer of 1836. He next went (in the autumn of 1836) to King's College School, where he remained till the summer of 1843, having reached the fourth class. From early childhood he had displayed a marked propensity for drawing and painting. It had there-

fore from the first been tacitly assumed that his future career would be an artistic one, and he left school early. In Latin, however, he was already fairly proficient for his age; French he knew well; Italian he had spoken from childhood, and he had some German lessons about 1844-45. But, although he learned enough German to be able to translate the Arme Heinrich of Hartmann von Aue, and some portions of the Nibelungenlied, he afterwards forgot the language almost entirely. His Greek too, such as it had been, he lost. On leaving school he went (1843) to Cary's Art Academy (previously called Sass's), near Bedford Square, and thence obtained admission to the Royal Academy Antique School towards 1846. Of the artistic education of foreign travel Rossetti had very little. But in early life he made a short tour in Belgium, where he was indubitably much impressed and influenced by the works of Van Eyck at Ghent and Memling at Bruges.

[It may be convenient to interpolate here a continuous account of Rossetti's career as a pictorial artist. Being much impressed by some of the early works of Ford Madox Brown exhibited at the Academy (1841), Westminster Hall (1844-45) and the British Institution (1845), he sought from that master of technique technical instruction of a more direct and stringent kind than he had previously submitted to. Brown, ever generous in that way, undertook without a fee the training of Rossetti as a painter, and set him to work upon such rudimentary studies as pickle-pots and other " still- life." The pupil's course of such work was, as might be ex- pected, short; the master's example and that of Millais, together with the uncompromising energy of Holman Hunt, with both of whom Rossetti became intimate about this time, helping and encouraging him. Most of all, perhaps, so far as his temporary impressions were concerned, a picture of Brown's which was shown at the " Free Exhibition," Hyde Park Corner, in the spring of 1848 profoundly affected Rossetti. This was, of course, months before the formation of the Pre- Raphaelite Brotherhood in the

autumn of the last-named year, when five painter-students, a sculptor (Thomas Woolner) and a layman (W. M. Rossetti) agreed upon certain principles they desired should obtain in art. None of the five owed the initiative of his views to any of the others or to Brown, whose impulse was purely technical and connected with Rossetti only; neither Millais, Holman Hunt, J. Collinson nor F. G. Stephens needed the help of Madox Brown, The point of Pre-Raphaelite crystallization which had so great though brief an influence upon Rossetti's life and art was found at a chance meeting of Rossetti, Millais and Holman Hunt in Millais's house in Gower Street, where certain prints from early Italian frescoes were studied. The enthusiasm of Rossetti led him to propose the formation of a " Brother- hood " with more or less definite views and much loftier aims than artists generally venture to announce. This took effect; the views of the remaining three men were already known, and in a few days they joined the new society and took their shares in the obloquy which attended the doings of Millais, Hunt and Collinson. Brown, though invited, declined to become a P-R.B. Rossetti's first effort was by means of " The Girlhood of Mary, Virgin," which in March 1849 was exhibited at Hyde Park Corner. It was a picture which attested the prodigious value of his studies since the previous October, and the native genius of the painter and the sincere passion with which he had accepted the obligations of Pre-Raphaelitism, as they were then, but not for long, understood. Nothing of his producing was more independent than the inception of "The Girlhood of Mary, Virgin"; indeed the design for it was made some half a year before the meeting in Gower Street, though the execution of this work owed not a little to the influence, if not the actual help, of Millais and Hunt. Its mysticism was Rossetti's own, its technique owed something to Brown. On the whole, there can be no doubt that in this work was the first pronouncement of a new view of art, a fresh technique and power rapidly developing itself. Of course, the style of this noteworthy and epoch-marking picture was

jejune, its handling was timid, while its coloration and tonality- were dry, not to say thin. Such was Rossetti's advent in art under the Pre-Raphaelite banner. The picture's reception was not encouraging, nor did the next work from his hands induce him to emerge from that proud exclusiveness in which all such minds as his are content to abide. The diverse moods of the other Brothers chose otherwise, but of Rossetti's im- mediate circle it has been truly said: " It appears that of seven young men and Brethren five have attained eminent positions,

four of them being pre-eminent, although for years after the society was formed no single member, whatever his position might be, escaped insult, obloquy and wicked and malicious misrepresentation. The more conspicuous the Brother [e.g. Millais], the more outrageously was he attacked. ” No estimate of Rossetti’s genius, his triumph and his life as a whole can be justly based without ample allowance being made for the circumstances which attended his advent as a painter. ” Ecce Ancilla Domini!” the smaller picture which is now in the National Gallery of British Art at Millbank, was the one perfect outcome of the original motive of the Pre- Raphaelite Brotherhood by its representative and typical member. It is replete with the mystical mood which then ruled the painter’s mind; that mood chose what may be called virginal white and its harmonies as its aptest coloration, and the intense light of morning sufficed for its tonality. It was exhibited at the Portland Gallery in 1850. After these pictures were finished, the outside world saw no more of Rossetti as a painter until it had prepared itself to see modern art from a higher plane than before.

In December 1850 there appeared the first number of The Germ, a magazine (which lasted for only four numbers) in which Rossetti had a leading place as the poet in verse and prose. The influence of Robert Browning upon Rossetti was more potent in The Germ than in that splendid romance in water-colours called ” The Laboratory,” where a court lady of the ancien regime visits an old poison-monger to obtain from him a fatal potion for her rival in love. This wonderful gem of colour, glowing in lurid and wicked passion and voluptuous suggestion, marked the opening of the artist’s second period and signalized his departure from that phase of Pre-Raphaelitism of which ” Ecce Ancilla Domini!” was the crowning achievement, and, so far as he was concerned, the artistic ne plus ultra. Millais and the other Brothers remained faithful during several years yet to come. Later in 1850, Rossetti produced the original, which is in ink, of the famous ” Hesterna Rosa,” a gambling scene of men and their mistresses in a tent by lamplight, while pallid dawn gathers force between the trees without. Then came from his hands ” Borgia,” which, like ” The Laboratory,” is in water-colours, and, like ” Hesterna Rosa,” is a sardonic tragedy. ” How they met Themselves ” came next, and, in illustrating a legend similar to that of the Doppelganger, affirmed the force, the originality and the tragic passion of Rossetti’s genius. Two lovers are walking in a twilight wood, where they are confronted suddenly by their apparitions, por- tending death. The year 1852 produced ” Giotto painting Dante’s Portrait,” and saw a new development of the painter’s mind and mood, dashed with a humour

not often to be seen in him. In its somewhat dry coloration it differed from the ardent jewel-like glow and deeper gloom of ” Borgia ” and its successor and the sumptuous visions of womanhood in later pictures. ” Found,” Rossetti’s sole contribution of the sort which Mr Holman Hunt affected, was begun somewhere about this period; but this piece of pictorial moralizing (the analogue of the poet’s own “Jenny”), vigorous and intensely pathetic as it is, was never really finished by its author, being, indeed, far remote from Rossetti’s inner self, which was rather over-scornful of didactic art, and thoroughly indisposed towards attempts to ameliorate anybody’s condition by means of pictures. Nor did the stringency of naturalistic painting suit his mood or his experience. Nevertheless, what is his in the existing picture remains a masterpiece of poetry with exquisitely finished parts. Passing a few fine but comparatively unimportant drawings,

such as “Lancelot and Guinevere at the Tomb of Arthur,” ” Lancelot looking at the Dead Lady of Shalott,” ” Mariana of the South,” ” Sir Galahad,” ” The Blue Closet,” and various works owing subjects to the Arthurian cycle of romances, we may note that the artist illustrated by five cuts Poems by Alfred Tennyson, on which Millais and Mr Holman Hunt were also engaged, and which was published by Moxon in 1857. As in “Ecce Ancilla Domini!” we had virginal white and morning light employed to strengthen the mystical significance of the design, so in ” Borgia ” Venetian voluptuousness and sensuous splendours obtained, and in ” The Blue Closet ” is a very potent and suggestive exercise intended to symbolize the association of colour with music. The last is one of the subtlest of the artist’s “inventions,” and it shows how he had developed upon ” Borgia ” an artistic sympathy which is but too likely to be ” caviare to the general.” ” The Wedding of St George ” is not so fine; nor was ” Lancelot’s Dream of the Sangreal,” Rossetti’s part in the luckless decorations of the Oxford Union ‘ (1857—58); nor are ” Guinevere and Sir Lancelot,” ” Galahad in the Chapel ” and other Arthurian examples quite worthy of his art. ” Bocca Baciata,” the super-sensuous portrait of a woman, a work of wonderful fire, and the pictures on the pulpit at Llandaff Cathedral, marked the expiration of the second epoch in Rossetti’s art and the beginning of a new, the third, last and most powerful of all the phases of his career. The picture ” Dr Johnson at the Mitre,” when the ” pretty fools ” consulted the lexicographer anent Methodism, is a good example of his humour.

In 1 86 1 Rossetti produced several fine designs for stained glass, and in the revival of stained-glass painting as an art he had a larger share than has frequently been ascribed to him. The practice of designing upon a large scale, and employment of masses of splendid though deep-toned colours, had probably something to do with the prodigious

development of his powers and the enlargement of his views as regards painting which took effect at this period (1862-63). At this time a striking and highly imaginative triptych, representing three events in the careers of Paolo and Francesca, was produced; it is a great improvement upon an earlier design. There is unprecedented energy in the group of the lovers embracing in the garden-house just as they have paused in reading the fatal romance. The composition of this group, with the circular window behind their figures, is as fine as it was comparatively novel in Rossetti's. practice. Its lurid coloration was so thoroughly in harmony with the pathos of the subject that in this respect the work excelled all the painter had previously produced. The same elements, energy, a sympathetic and poetic scheme of colour, and composition of a fine order, combined with far greater force and originality in " The Bride," or " The Beloved," that magnificent illustration of The Song of Solomon. The last named is a life-size group of powerfully coloured and diversely beautiful damsels accompanying their mistress with music and with song on her way to the bridegroom. This picture, as regards its brilliance, finish, the charms of four lovely faces and the splendour of its lighting, occupies a great place in the highest grade of modern art of all the world. It is likewise, so far as the qualities named are concerned, the crowning piece of Rossetti's art, and stands for him much as the " Sacred and Profane Love " of Titian represents that master. Very fine, indeed, but hardly so passionate and virile, is the " Beata Beatrix," now in the National Gallery of British Art with " Ecce Ancilla Domini!" which he produced thirteen years earlier. These works belong to a category of fine and quite original examples, all replete with

1 In 1857, Rossetti, when in Oxford with William Morris, con- ceived the design of filling the bays above the gallery in the then new Union debating room (now the library) with paintings from the Morte d' Arthur, and he enlisted the co-operation of several of his artistic circle, including Burne-Jones and William Morris, in the work, which was begun in. August. Morris's picture was " Sir Palomides watching Tristram and Iseult," Burne-Jones's " Nimue luring Merlin." Unfortunately the walls were too new and not properly prepared for painting; the colour soon began to fade and wear off, and in the course of twenty years or so the pictures became almost indistinguishable.

similar technical qualities, poetry and pathos. The group com- prises

paintings by which Rossetti is best known, such as ” Proserpina in Hades,” which is, on the whole, perhaps the most original, if not indeed the most poetical and powerful, of all his output; ” Sibylla Palmifera,” ” Venus Verticordia,” ” Lilith ” (the better of the two versions is now referred to), ” Washing Hands,” ” Monna Vanna,” ” II Ramoscello,” ” Aurea Catena,” ” La Pia,” ” Rosa Triplex,” ” Veronica Veronese,” “La Ghirlandata,” “Pandora,” “The Blessed Damozel,” and, last and largest, but not, perhaps, the greatest of his paintings (a distinction for which ” The Bride ” and ” Proserpina ” must contend), the famous ” Dante’s Dream,” now in the Walker Art Gallery at Liverpool. Besides these, Rossetti produced a large number of fine things. Nearly the whole of them were exhibited by the Royal Academy and at the Burlington Fine Art Club in 1883, after their author’s death.

(F. G. S.)]

Meanwhile, the literary side of Rossetti had developed pari passu with his achievements as a painter. The goal before the young Rossetti’s eyes was to reach through art the forgotten world of old romance — that world of wonder and mystery and spiritual beauty which the old masters knew and could have painted had not lack of science, combined with slavery to monkish traditions of asceticism, crippled their strength. In that great rebellion against the renascence of classicism which (after working much good and much harm) resulted in 18th- century materialism — in that great movement of man’s soul which may be appropriately named ” the Renascence of the Spirit of Wonder in Poetry and Art ” — he had become the acknowledged protagonist before ever the Pre-Raphaelite brotherhood was founded, and so he remained down to his last breath. It was by inevitable instinct that Rossetti turned to that mysterious side of nature and man’s life which to other painters of his time had been a mere fancy-land, to be visited, if at all, on the wings of sport. For if there is any permanent vitality in the Renascence of Wonder in modern Europe, if it is really the inevitable expression of the soul of man in a certain stage of civilization (when the sanctions which have made and moulded society are found to be not absolute and eternal, but relative, mundane, ephemeral and subject to the higher sanctions of unseen powers that work behind ” the shows of things “), then perhaps one of the first questions to ask in regard to any imaginative painter of the 19th century is, In what relation did he stand to the newly awakened spirit of romance ? Had he a genuine and independent sympathy with that temper of wonder and mystery which all over Europe had preceded and now followed the temper of imitation, prosaic acceptance, pseudo-classicism and domestic materialism ? or was his

apparent sympathy with the temper of wonder, rever- ence and awe the result of artistic environment dictated to him by other and more powerful and original souls around him?

We do not say that the mere fact of a painter's or a poet's showing but an imperfect sympathy with the Renascence of Wonder is sufficient to place him below a poet in whom that sympathy is more nearly complete, but we do say that, other things being equal or anything like equal, a painter or poet of this time is to be judged very much by his sympathy with that great movement, which we call the Renascence of Wonder because the word " romanticism " never did express it even before it had been vulgarized by French poets, drama- tists, doctrinaires and literary harlequins. To struggle against the prim traditions of the 18th century, the unities of Aristotle, the delineation of types instead of characters, as Chateau- briand, Madame de Stael, Balzac and Hugo struggled, was well. But in studying Rossetti's works we reach the very key of those " high palaces of romance " which the English mind had never, even in the 18th century, wholly forgotten, but whose mystic gates no Frenchman ever yet unlocked. Not all the romantic feeling to be found in all the French roman- ticists (with their theory that not earnestness but the gro- tesque is the life-blood of romance) could equal the romantic

spirit expressed in a single picture or drawing of Rossetti's,' such, for instance, as Beata Beatrix or Pandora. For, while the French romanticists — inspired by the theories (drawn from English exemplars) of Novalis, Tieck and Herder — cleverly simulated the old romantic feeling, the " beautifully devotional feeling " which Holman Hunt speaks of, Rossetti was steeped in it: he was so full of the old frank childlike wonder and awe which preceded the great renascence of mate- rialism that he might have lived and worked amidst the old masters. Hence, in point of design, so original is he that to match such ideas as are expressed in " Lilith," " Hesterna Rosa," " Michael Scott's Wooing," the " Sea Spell," &c, we have to turn to the sister art of poetry, where only we can find an equally powerful artistic representation of the idea at the core of the old romanticism — the idea of the evil forces of nature assailing man through his sense of beauty. We must turn, we say, not to art — not even to the old masters themselves — but to the most perfect efflorescence of the poetry of wonder and mystery — to such ballads as the " Demon Lover," to Coleridge's " Christabel " and " Kubla Khan," to Keats's " La Belle Dame sans Merci," for parallels to Rossetti's most characteristic designs. Now, although the idea at the heart of the highest romantic poetry (allied perhaps to that apprehension of the warring of man's soul with the appetites of the flesh which is the basis of the Christian

idea) may not belong exclusively to what we call the romantic temper (the Greeks, and also most Asiatic peoples, were more or less familiar with it, as we see in the Saldmdn and Absal of Jami), yet it became peculiarly a romantic note, as is seen from the fact that in the old masters it resulted in that asceticism which is its logical expression and which was once an inseparable incident of all romantic art. But in order to express this stupendous idea as fully as the poets have expressed it, how is it possible to adopt the asceticism of the old masters ? This is the question that Rossetti asked himself, and answered by his own progress in art. In all of his pictures, the poorest and the best, is dis- played that power which Blake calls vision — the power which, as he finely says, is ” surrounded by the daughters of inspira- tion,” the power, that is, of seeing imaginary objects and dramatic actions — physically seeing them as well as mentally — and flashing them upon the imaginations (even upon the cor- poreal senses) of others.

Mr W. M. Rossetti (in the Preface to the Collected Works, 1886) has given an interesting account of his brother’s literary nurturing. Shakespeare, Walter Scott, Byron, the Bible were the earliest influences: then Shelley, Mrs Browning, the older English and Scottish ballads, and Dante. After- wards he preferred Keats to Shelley. By 1847 he was ” deep in Robert Browning.” Malory’s Morte d’ Arthur, about 1856, engrossed him; Victor Hugo and De Musset, among French poets, were his delight. In his last years he had an enthusiasm for Chatterton. From childhood’s days he had loved to com- pose, but The Germ (1850) contained Rossetti’s first pub- lished prose or verse. In it appeared ” The Blessed Damozel,” the prose poem ” Hand and Soul,” six sonnets and four lyrics.

” The Blessed Damozel ” was written so early as 1847 or 1848. ” Sister Helen ” was produced in its original form in 1850 or 1851. His translations from the early Italian poets also began as far back as 1845 or 1846, and may have been mainly completed by 1840. He published a volume of The Early Italian Poets {Dante and his Circle) in 1861. In 1856 he contributed to the Oxford and Cambridge Magazine, in which among other things the ” Burden of Nineveh ” appeared. Materials for a volume of original poetry accumulated slowly, and these having been somewhat widely read in manuscript had a very great influence upon contemporary poetic litera- ture long before their appearance in print. He had intended to publish a volume in 1862, but the death of his wife (see below) caused its postponement till 1870. In poetry no less than in art what makes Rossetti so important a figure is the position he took up with regard to the modern revival of the ” romantic ” spirit. The Renascence of Wonder culminates

in Rossetti's poetry as it culminates in his painting. The poet who should go beyond Rossetti would pass out of the realm of poetry into pure mysticism, as certain of his sonnets show. Fine as are the sonnets (of which the sonnet sequence, the " House of Life," in the 1881 volume, may be specially men- tioned), it is in his romantic ballads that Rossetti (notwith- standing a certain ruggedness of movement) shows his greatest strength. " Sister Helen," " The Blessed Damozel," " Staff and Scrip," " Eden Bower," " Troy Town," " Rose Mary," as re- presenting the modern revival of the true romantic spirit, take a place quite apart from the other poetry of the time.

Rossetti's poetry, and his prose too, is marked by an extra- ordinary fastidiousness of expression and beauty of diction; the form and colour of his style are alike marvellous in clear- ness and loveliness of language. But the dominant character- istic, after all, is the underlying idea, the romantic motive. By the revival of the romantic spirit in English poetry we mean something much more than the revival, at the close of the 18th century, of natural language, the change discussed by Wordsworth in his famous Preface, and by Coleridge in his comments thereon — that change of diction and of poetic methods which is commonly supposed to have arisen with Cowper, or, if not with Cowper, with Burns. The truth is that Wordsworth and Coleridge were too near the great changes in question, and they themselves took too active a part in those changes, to hold the historical view of what the changes really were. Important as was the change in poetic methods which they so admirably practised and discussed, important as was the revival of natural language, which then set in, it was not nearly so important as that other revival which had begun earlier and of which it was the outcome — the revival of the romantic spirit, the Renascence of Wonder, even beneath the weight of 18th-century diction, the first movement of which is certainly English, and neither German nor French in its origin, and can be traced through Chatterton, Macpherson and the Percy Ballads.

As a mere question of methods, a reaction against the poetic diction of Pope and his followers was inevitable. But, in dis- cussing the romantic temper in relation to the overthrow of the bastard classicism and didactic materialism of the 18th century, we must go deeper than mere artistic methods in poetry. When closely examined, it is in method only that the poetry of Cowper is different from the ratiocinative and unromantic poetry of Dryden and Pope and their

followers. Pope treated prose sub- jects in the ratiocinative — that is to say, the prose — temper, but in a highly artificial diction which people agreed to call poetic. Cowper treated prose subjects too — treated them in the same prose temper, but used natural language; a noble thing to do, no doubt. But this was only a part (and by no means the chief part) of the great work achieved by English poetry at the close of last century. That period, to be sure, rendered obsolete the poetic diction of Pope; but it introduced something more precious still — entire freedom from the hard rhetorical materialism imported from France; it gave a new seeing to English eyes, which were opened once more to the mystery and the wonder of the universe and the romance of man's destiny; it revived, in short, the romantic spirit, but the romantic spirit enriched by all the clarity and sanity that the renascence of classicism was able to lend. Of the great move- ment which substituted for the didactic materialism of the 1 8th century the new romanticism of the 19th, the leaders were Coleridge and Scott, admirably followed by Byron, Shelley and Keats. Not that Wordsworth was a stranger to the romantic temper. The magnificent image of Time and Death under the yew tree is worthy of any romantic poet that ever lived, yet it cannot be said that he escaped save at moments from the comfortable 18th-century didactics, or that he was a spiritual writer in the sense that Coleridge, Blake and Shelley were spiritual writers.

Of the true romantic feeling, the ever-present apprehension of the spiritual world and of that struggle of the soul with earthly conditions which we have before spoken of, Rossetti's poetry

is as full as his pictures — so full, indeed, that it was misunderstood by certain critics, who found in the most spiritualistic of poets and painters the founder of a " fleshly school." Although it cannot be said that " The Blessed Damozel " or " Sister Helen " or " Rose Mary " reaches to the height of the masterpieces, of Coleridge, the purely romantic temper was with Rossetti a more permanent and even a more natural temper than with any other 19th-century poet, even including the author of " Christa- bel " himself. As to the other 19th-century poets, though the Ettrick Shepherd in " The Queen's Wake " shows plenty of the true feeling, Hogg's verbosity is too great to allow of really suc- cessful work in the field of romantic ballad, where concentrated energy is one of the first requisites. And even DobelPs " Keith of Ravelston " has hardly been fused in the fine atmosphere of fairy- land. Byron's "footlight bogies" and Shelley's metaphysical abstractions had of course but very little to do with the inner core of romance, and we have only to consider Keats, to whose " La Belle Dame sans Merci " and " Eve of St Mark " Rossetti always

acknowledged himself to be deeply indebted. In the famous close of the seventh stanza of ‘the ” Ode to a Nightin- gale “—

” Charmed magic casements opening on the foam Of perilous seas in faery lands forlorn ” —

there is of course the true thrill of the poetry of wonder, and it is expressed with a music, a startling magic, above the highest reaches of Rossetti’s poetry. But, without the evidence of Keats’s two late poems, ” La Belle Dame sans Merci ” and the ” Eve of St Mark,” who could have said that Keats showed more than a passing apprehension of that which is the basis of the romantic temper — the supernatural ? In contrasting Keats with Rossetti, it must always be remembered that Keats’s power over the poetry of wonder came to him at one flash, and that it was not (as we have said elsewhere) ” till late in his brief life that his bark was running full sail for the enchanted isle where the old ballad writers once sang and where now sate the wizard Coleridge alone.” Though outside Coleridge’s work there had been nothing in the poetry of wonder comparable with Keats’s ” La Belle Dame sans Merci,” the latter had previously in “Lamia” entirely failed in rendering the romantic idea of beauty as a maleficent power. The reader, owing to the atmosphere sur- rounding the dramatic action being entirely classic, does not believe for a moment in the serpent woman. The classic accessories suggested by Burton’s brief narrative hampered Keats where to Rossetti (as we see in ” Pandora,” ” Cassandra” and ” Troy Town “) they would simply have given birth to romantic ideas. It is perhaps with Coleridge alone that Rossetti can be compared as a worker in the Renascence of Wonder. Although his apparent lack of rhythmic spontaneity places him below the great master as a singer (for in these miracles of Coleridge’s genius poetry ceases to appear as a fine art at all — it is the inspired song of the changeling child ” singing, dancing to itself “), in permanence of the romantic feeling, in vitality of belief in the power of the unseen, Rossetti stands alone. Even the finest portions of his historical ballad ” The King’s Tragedy ” are those which deal with the supernatural.

The events of Rossetti’s life may be briefly summarized. In the spring of i860 he married Elizabeth Eleanor Siddall, a milliner’s assistant, who, being very beautiful, was constantly painted and drawn by him. From 1856 onwards he had been very intimate with William Morris and Edward Burne- Jones, who had the greatest affection and artistic admiration for him. Mrs Rossetti, whose health was delicate, had one still-born child in 1861, and she died from an overdose of laudanum in February 1862. Rossetti then moved from Blackfriars to 16 Cheyne Walk, Chelsea, where for a short time George Meredith, A. C.

Swinburne and W. M. Rossetti lived with him. Mrs Rossetti's own water-colour designs show an extraordinary genius for invention and a rare instinct for colour. Rossetti felt her death so acutely that in the first paroxysm of his grief he insisted upon his poems (then in manuscript) being buried in her coffin. But in 1869 the manuscripts were disin- terred, and published in 1870. From this time to his death he

continued to write poems and produce pictures — in the latter relying more and more upon his manipulative skill but exercising less and less his exhaustless faculty of invention.

In 187 1 an unsigned article in the Contemporary Review (by Robert Buchanan) on the " Fleshly School of Poetry " made a fierce attack on Rossetti's poems from what was intended to be a moral point of view, to which he answered by one on the " Stealthy School of Criticism." The attack was deeply felt by him, and increased his tendency — previously tempered by natural high spirits — towards gloomy brooding. About 1868 the curse of the artistic and poetic temperament, insomnia, attacked him. One of the most distressing effects of this malady is a nervous shrinking from personal contact with any save a few intimate and constantly seen friends. This peculiar kind of nervousness may be aggravated by the use of narcotics, and in his case was aggravated to a very painful degree; at one time he saw scarcely any one save his own family and immediate family connexions and the present writer. He was frequently away with William Morris at Kelmscot, in Oxfordshire. During the time that his second volume of original poetry, Ballads and Sonnets, was passing through the press (in 1881) his health began to give way, and he left London for Cumberland. A stay of a few weeks in the Vale of St John, however, did nothing to improve his health, and he returned much shattered. He then went to Birchington-on-Sea, but received no benefit from the change, though affectionately tended by friends like Hall Caine and others already mentioned; and, gradually sinking from a complication of disorders, he died on Sunday the 9th of April 1882.

In all matters of taste Rossetti's influence has been immense. The purely decorative arts (see Arts and Crafts) he may be said to have rejuvenated directly or indirectly. And he left the deepest impression upon the poetic methods of his time.

One of the most wonderful of Rossetti's endowments, how- ever, was neither of a literary nor an artistic kind: it was that of a rare and most winning personality which attracted towards itself, as if by an unconscious magnetism, the love of all his friends, the love, indeed, of all who knew him. (T. W.-D.)

Authorities. — See various books by W. M. Rossetti — Dante Gabriel Rossetti as Designer and Writer (1889); Ruskin, Rossetti, Pre-Raphaelitism (1899); and Some Reminiscences (1906); Memoir by W. M. Rossetti prefixed to the Collected Works, published in 1886. Lady Burne-Jones's Memorials of Edward Burne-Jones (1904) is full of interesting sidelights. See also F. G. Stephens, D. G. Rossetti; "Portfolio" monograph (1894); H. C Marillier, D. G. Rossetti (1899 and 1901); W. Sharp, Dante Gabriel Rossetti: A Record and a Study (1882); T. Hall Caine, Recollections of Dante Gabriel Rossetti (1882); W. Allingham, Letters of Dante Gabriel Rossetti to William Allingham, 1854-70 (1897). An article by Vernon Lushington in the Oxford and Cambridge Magazine (1856) is an early contemporary' view worth noting.

ROSSI, LUIGI DE, a 17th-century Italian musical composer, said to have been born at Naples towards the close of the 16th century. Of his life practically nothing is known. An opera of his, // Palazzo Incantalo, was given at Rome in 1642; in 1646 he was invited by Cardinal Mazarin to Paris, where he gave his opera Le Mariage d'Orphee et d'Euridice (1647), the first Italian opera performed in Paris. A collection of cantatas published in 1646 describes him as musician to Cardinal Antonio Berberini, and G. A. Perti in 1688 speaks of him along with Carissimi and Cesti as " the three greatest lights of our pro- fession." Rossi is noteworthy principally for his chamber-cantatas, which are among the finest that ttte 17th century produced. A large quantity are in MS. in the British Museum and in Christ Church library, Oxford. La Gelosia, printed by F.A. Gevaert in Les Gloires d'ltalie, is an admirable specimen.

ROSSI, PELLEGRINO LUIGI EDOARDO, Count (1787-1848), Italian economist and statesman, was born at Carrara on the 13th of July 1787. He was educated at Pavia and Bologna, and in 181 2 became professor of law at the latter university. In 181 5 he gave his support to Joachim Murat, and after his fall escaped to France, whence he proceeded to Geneva. There he began a course of jurisprudence applied to Roman law, the success of which gained him the unusual honour of natural-

ization as a citizen of Geneva. In 1820 he was elected as a deputy to

the cantonal council, and was a member of the extra- ordinary diet of 1832. He was entrusted with the task of drawing up a revised constitution, which was known as the Pacte Rossi. This was rejected by a majority of the diet, a result which deeply affected Rossi, and induced him to look with favour on the suggestions of Guizot and the due de Broglie that he should settle in France. He was appointed in 1833 to the chair of political economy in the College de France, vacated by the death of J. B. Say. He was naturalized as a French citizen in 1834, and in the same year became professor of constitutional law in the faculty of law at Paris. In 1836 he was elected a member of the Academie des sciences politiques et morales, was raised to the peerage in 1839 and in 1843 became doyen of the faculty of law. In 1845 he was sent to Rome by Guizot to discuss the question of the Jesuits, being finally appointed ambassador of France at Rome. The revolution of 1848 severed his connexion with France, and he remained at Rome and became minister of the interior under Pius IX. He was unpopular, however, owing to his conservative views, and was assassinated on the 15th of November, as he was alighting at the steps of the House of Assembly.

As a statesman, Rossi was a man of signal ability and intrepid character, but it is as an economist that his name will be best remembered. His Cours d'economie politique (1838-54) gave in classic form an exposition of the doctrines of Say, Malthus and Ricardo. His other works were Traite de droit penal (1829); Cours de droit constitutionnel (1866-67), and Melanges d'economie politique, d'histoire et de philosophic (2 vols., 1857). His widow left a sum of 100,000 francs to the Institut de France, to found in his memory scholarships in political economy or law. Carrara erected a statue to his memory in 1876, and in 1887 the Societe d'economie politique celebrated his centenary with a notice of his life and works.

See also le Comte Fleury d'Ideville, Le Comte Pellegrino Rossi, sa vie, ses ceuvres, sa mort (1887).

ROSSINI, GIOACHINO ANTONIO (1792-1868), Italian musical composer, was born at Pesaro on the 29th of February 1792. His father was town trumpeter and inspector of slaughter- houses, his mother a baker's daughter. The elder Rossini's sympathies for the French became a source of trouble when, after the occupation of the papal state by the French in 1796, the Austrians restored the old regime. He was sent to prison, and his wife took Gioachino to Bologna, earning her living as a prima donna buffa at various theatres of the Romagna, where she was ultimately rejoined by her husband. Gioachino remained at Bologna in the care of a pork butcher, while

his father played the horn in the bands of the theatres at which his mother sang. The boy had three years' instruction in the harpsichord from Prinetti of Novara, but Prinetti played the scale with two fingers only, combined his profession of a musician with the business of selling liquor, and fell asleep while he stood, so that he was a fit subject for ridicule with his critical pupil. Gioachino was taken from him and apprenticed to a smith. In Angelo Tesei he found a congenial master, and learned to read at sight, to play accompaniments on the piano- forte, and to sing well enough to take solo parts in the church when he was ten years of age. At thirteen he appeared at the theatre of the Commune in Paer's Camilla — his only appear- ance as a public singer (1805). He was also able to play the horn. In 1807 he was admitted to the counterpoint class of Padre P. S. Mattei, and soon after to that of Cavedagni for the 'cello at the Conservatorio of Bologna. He learned to play the 'cello with ease, but the pedantic severity of Mattei's views on counterpoint only served to accentuate the tendency of his genius towards a freer school of composition, and his insight into orchestral resources is to be ascribed rather to knowledge gained by scoring the quartets and symphonies of Haydn and Mozart, than to any prescribed rules for the com- position of music. At Bologna he was known as " il Tedes- chino " on account of his devotion to Mozart. Through the friendly interposition of the Marquis Cavalli, his first opera, La Cambiale di Matrimonio, was produced at Venice when he was a youth of eighteen. But two years before this he had already received the prize at the Conservatorio of Bologna

for his cantata 77 pianto d' armonia per la morte d'Orfeo. Be- tween 1810 and 1813, at Bologna, Rome, Venice and Milan, Rossini produced operas of which the successes were varying. All memory of them is eclipsed in that of Tancredi. The libretto was an arrangement of Voltaire's tragedy by J. A. Rossi. Traces of Paer and Paisiello were undeniably present in fragments of the music. But all critical feeling on the part of the public was drowned in the effect of sweetness and clarity produced by such melodies as " Mi rivedrai, ti rivedro " and " Di tanti palpiti," the former of which became so popular that the Italians would sing it in crowds at the law courts until called upon by the judge to desist. Rossini continued to write operas for Venice and Milan during the next few years, but their recep- tion was tame and in some cases unsatisfactory after the success of Tancredi. In 1815 he retired to his home at Bologna, where Barbaja, the impresario of the

Naples theatre, who had once been a waiter in a coffee-house and now combined the business of theatrical management with that of farming the public gaming-tables, concluded an agreement with him by which he was to take the musical direction of the Teatro San Carlo and the Teatro Del Fondo at Naples, composing for each of them one opera a year. His payment was to be 200 ducats (about £35 or $175) per month; he was also to receive a share in the gaming-tables amounting to about 1000 ducats (£175 or $875) per annum. The presence of Zingarelli and Paisiello in Naples was an incentive to intrigue against the success of the youthful composer, but all hostility was made futile by the enthusiasm which greeted the court performance of his Elisabetta regina d' Inghilterra, in which Isabella Colbran, who subsequently became the composer's wife, took a leading part. The libretto of this opera by Schmidt was in many of its inci- dents an anticipation of those presented to the world a few years later in Scott's Kenilworth. The opera was the first in which Rossini wrote the ornaments of the airs instead of leaving them to the fancy of the singers, and also the first in which the recitativo secco was replaced by a recitative accom- panied by a quartet of strings. In Almaviva, produced in the beginning of the next year in Rome, the libretto, a version of Beaumarchais' Barbier de Seville by Sterbini, was the same as that already used by Paisiello in his Barbiere, an opera which had enjoyed European popularity for more than a quarter of a century. The indignation of Paisiello's admirers expressed itself strongly on the production of the new setting, but in the thirteen days devoted to the composition of his Almaviva, Rossini had created such a masterpiece of musical comedy that the fame of Paisiello's opera was transferred to his, to which the title of II Barbiere di Siviglia passed as an inalien- able heritage. Between 1815 and 1823 Rossini produced twenty operas. Of these Otello formed the climax to his reform of serious opera, and offers a suggestive contrast with the treat- ment of the same subject at a similar point of artistic develop- ment by the composer Verdi. In Rossini's time the tragic close was so distasteful to the public of Rome that it was neces- sary to invent a happy conclusion to Otello; and there are still places in Italy in which the Shakespearian end of the story can never be performed without interruption from the audience, who warn Desdemona of Otello's deadly approach. Conditions of stage mechanism in 181 7 are illustrated by Rossini's accept- ance of the subject of Cinderella for a libretto only on the con- dition that the supernatural element should be omitted. The opera Cenerentola is to be ranked with the Barbiere. The absence of a similar precaution in the construction of his Mose in Egitto led to disaster in the scene depicting the passage of the Israelites through the Red Sea, when the defects in stage contrivance

always raised a laugh, so that the composer was at length compelled to introduce the chorus ” Dal tuo stellato Soglio ” to divert attention from the dividing waves. In 1821, three years after the production of this work, Rossini married Isabella Colbran. In 1822 he directed his Cenerentola in Vienna, where Zelmira was also performed. After this he returned to Bologna; but an invitation from Prince Metter- nich to come to Verona and ” assist in the general re-establish-

ment of harmony ” was too tempting to be refused, and he arrived at the Congress in time for its opening on the 20th of October 1822. Here he made friends with Chateaubriand and Madame de Lieven. In 1823, at the suggestion of the manager of the King’s Theatre, London, he came to England, being much feted on his way through Paris. In England he was given a generous welcome, which included an introduction to King George IV. and the receipt of £7000 after a residence of five months. In 1824 he became musical director of the Theatre Italien in Paris at a salary of £800 per annum, and when the agreement came to an end he was rewarded with the offices of chief composer to the king and inspector-general of singing in France, to which was attached the same income. The production of his Guillaume Tell in 1829 brought his career as a writer of opera to a close. The libretto was by Etienne Jouy and Hippolyte Bis, but their version was revised by Armand Marrast. The music is remarkable for its freedom from the conventions discovered and utilized by Rossini in his earlier works, and marks a transitional stage in the history of opera. In 1829 he returned to Bologna. His mother had died £d 1827, and he was anxious to be with his father. Arrange- ments for his subsequent return to Paris on a new agreement were upset by the abdication of Charles X. and the July Revolu- tion of 1830. Rossini, who had been considering the subject of Faust for a new opera, returned, however, to Paris in the November of that year. Six movements of his Stabat Mater were written in 1832 and the rest in 1839, the year of his father’s death, and the success of the work bears comparison with his achievements in opera; but his comparative silence during the period from 1832 to 1868 makes his biography appear almost like the narrative of two lives — the life of swift triumph, and the long life of seclusion, of which the biographers give us pictures in stories of the composer’s cynical wit, his speculations in fish culture, his mask of humility and indifference. His first wife died in 1845, and political disturbances in the Romagna compelled him to leave Bologna in 1847, the year of his second marriage with Olympe Pelissier, who had sat to Vernet for his picture of ” Judith and Holofernes.” After living for a time in Florence he settled in Paris in 1855, where his house was a centre of artistic society. He died at his

country house at Passy on the 13th of November 1868. He was a foreign associate of the Institute, grand officer of the Legion of Honour, and the recipient of innumerable orders. In his compositions Rossini plagiarized even more freely from him- self than from other musicians, and few of his operas are without such admixtures frankly introduced in the form of arias or overtures. A characteristic mannerism in his musical writing earned for him the nickname of " Monsieur Crescendo." His music is associated with the names of the greatest singers in lyrical drama, such as Tamburini, Mario, Rubini, Delle Sedie, Albani, Grisi, Patti and Nilsson.

ROSSLAND, an important city in the Kootenay district of British Columbia, incorporated in 1897. Pop. (1907) 4033. It is situated in a valley 7 m. W. of Trail on the Columbia river and 8 m. N. of the international boundary. It has direct railroad communication with Trail and the Arrow lakes as well as with Northport and Spokane in the state of Washington. Rossland owes its importance to the immense deposits of iron and copper pyrites carrying gold, which occur in the vicinity. The best-known mines are the Le Roy, Centre Star and War Eagle. The city derives its electric light and power service from Bonnington Falls on the Kootenay river.

ROSSLAU, a town of Germany, in the duchy of Anhalt, on the right bank of the Elbe, here crossed by two railway bridges, 3 m. by rail N. of Dessau and 35 m. S.E. of Magdeburg. Pop. (1905) 11,027. It has a ducal residence, an old castle, a hand- some parish church, and manufactures of machinery, paper, sealing-wax, wire goods, sugar, bricks and chemicals. Rosslau became a town in 1603.

ROSSLYN, EARLS OF. The first earl of Rosslyn was Alex- ander Wedderburn (see below), who was succeeded by his nephew, James St Clair Erskine (1762-1837), a son of

Wedderburn's sister Janet by her marriage with Sir Henry Erskine (d. 1765), a Scottish baronet and soldier. Entering the army in 1776, James Erskine served in Portugal, in Denmark and in the Netherlands, and became a general in 1-814. From 1782 until 1805, when he became a peer, he was a member of parlia- ment ; a Tory politician and an associate of the duke of Welling- ton, he was lord privy seal in 1829-30 and lord president of the council in 1834-35. He inherited the estates of the family of St Clair and took this name in 1789, and he

died on the 18th of January 1837. His son, James Alexander (1802-1866), became 3rd earl, and in 1890 the latter's grandson, James Francis Harry (b. 1869), became 5th earl.

ROSSLYN, ALEXANDER WEDDERBURN, ist Earl or (1 733-1805), Lord Chancellor of Great Britain, was the eldest son of Peter Wedderburn (a lord of session as Lord Chesterhall), and was born in East Lothian on the 13th of February 1733. He acquired the rudiments of his education at Dalkeith, and in his fourteenth year matriculated at the university of Edinburgh. It was from the first his desire to practise at the English bar, though in deference to his father's wishes he qualified as an advocate at Edinburgh, in 1754, but entered himself at. the Inner Temple on the 8th of May 1753, so that he might keep the Easter and Trinity terms in that year. His father was called to the bench in 1755, and for the next three years Wedder- burn stuck to his practice in Edinburgh, during which period he employed his oratorical powers in the General Assembly of the Church of Scotland, and passed his evenings in the social and argumentative clubs which abound in Edinburgh. In 1755 the precursor of the later Edinburgh Review was started, now chiefly remembered because in its pages Adam Smith criticized the dictionary of Dr Johnson, and because the contents of its two numbers were edited by Wedderburn. The dean of faculty at this time, Lockhart, afterwards Lord Covington, a lawyer notorious for his harsh demeanour, in the autumn of 1757 assailed Wedderburn with more than ordinary insolence. His victim retorted with extraordinary powers of invective, and on being rebuked by the bench declined to retract or apologize, but placed his gown upon the table, and with a low bow left the court for ever. He was called to the English bar at the Inner Temple in 1757. To shake off his native accent and to acquire the graces of oratorical action, he engaged the services of Thomas Sheridan and Charles Macklin. To secure business and to conduct his cases with adequate knowledge, he studied the forms of English law, he solicited William Strahan, the printer, " to get him employed in city causes," and he entered into social intercourse (as is noted in Alexander Carlyle's autobiography) with busy London solicitors. His local connex- ions and the incidents of his previous career introduced him to the notice of his countrymen Lords Bute and Mansfield. When Lord Bute was prime minister this legal satellite used, says Dr Johnson, to go on errands for him, and it is to Wedderburn's credit that he first suggested to the premier the propriety of granting Johnson a pension. Through the favour of Lord Bute, he was returned to parliament for the Ayr burghs in 176 1. In 1763 he became king's counsel and bencher of Lincoln's Inn, and for a short time went the northern circuits, but was more successful in obtaining business in the

Court of Chancery. He obtained a considerable addition to his resources (Carlyle puts the amount at £10,000) on his marriage in 1767 to Betty Anne, sole child and heiress of John Dawson of Marly in Yorkshire. When George Grenville, whose principles leaned to Toryism, quarrelled with the court, Wedderburn affected to regard him as his leader in politics. At the dissolution in the spring of 1768 he was returned by Sir Lawrence Dundas for Richmond as a Tory, but in the questions that arose over John Wilkes (q.v.) he took the popular side of " Wilkes and liberty," and resigned his seat in May 1769. In the opinion of the people he was now regarded as the embodiment of all legal virtue; his health was toasted at the dinners of the Whigs amid rounds of applause, and, in recompense for the loss of his seat in parliament, he was returned by Lord Clive for his pocket-borough of Bishop's Castle, in Shropshire, in January 1770. During the next session

he acted vigorously in opposition, but his conduct was always viewed with distrust by his new associates, and his attacks on the ministry of Lord North grew less and less animated in proportion to its apparent fixity of tenure. In January 1771 he was offered and accepted the post of solicitor-general. The high road to the woolsack was now open, but his defection from his former path has stamped his character with general infamy. Junius wrote of him, " As for Mr Wedderburn, there is some- thing about him which even treachery cannot trust," and Colonel Barre attacked him in the House of Commons. The new law officer defended his conduct with the assertion that his alliance in politics had been with Mr George Grenville, and that the connexion had been severed on his death. All through the American War he consistently declaimed against the colonies, and he was bitter in his attack on Benjamin Franklin (q.v.) before the Privy Council. In June 1778 Wedderburn was promoted to the post of attorney-general, and in the same year he refused the dignity of chief baron of the exchequer because the offer was not accompanied by the promise of a peerage. At the dissolution in 1774 he had been returned for Okehampton in Devonshire, and for Castle Rising in Norfolk, and selected the former constituency; on his promotion as leading law officer of the crown he returned to Bishop's Castle. The coveted peerage was not long delayed. In June 1780 he was created chief justice of the Court of Common Pleas, with the title of Baron Loughborough.

During the existence of the coalition ministry of North and Fox, the great seal was in commission (April to December 1783), and Lord Loughborough held the leading place among the commissioners. For some time after that ministry's fall he was considered the leader of the

Whig party in the House of Lords, and, had the illness of the king brought about the return of the Whigs to power, the great seal would have been placed in his hands. The king's restoration to health secured Pitt's continuance in office, and disappointed the expectations of the Whigs. In 1792, during the period of the French Revolu- tion, Lord Loughborough seceded from Fox, and on the 28th of January 1793 he received the great seal in the Tory cabinet of Pitt. The resignation of Pitt on the question of Catholic emancipation (1801) put an end to Wedderburn's tenure of the Lord Chancellorship, for, much to his surprise, no place was found for him in Addington's cabinet. His first wife died in 1 781 without leaving issue, and he married in the following year Charlotte, youngest daughter of William, Viscount Courtenay; but her only son died in childhood. Lord Lough- borough accordingly obtained in 1795 a re-grant of his barony with remainder to his nephew, Sir James St Clair Erskine. His fall in 1801 was softened by the grant of an earldom (he was created earl of Rosslyn 21st April 1801, with remainder to his nephew), and by a pension of £4000 per annum. After this date he rarely appeared in public, but he was a constant figure at all the royal festivities. He attended one of those gatherings at Frogmore, on the 31st of December 1804. On the following day he was seized with an attack of gout in the stomach, and on the 2nd of January 1805 he died at his seat, Baylis, near Salt Hill, Windsor. His remains were buried in St Paul's Cathedral on the nth of January.

At the bar Wedderburn was the most elegant speaker of his time, and, although his knowledge of the principles and precedents of law was deficient, his skill in marshalling facts and his clearness of diction were marvellous; on the bench his judgments were remark- able for their perspicuity, particularly in the appeal cases to the House of Lords. For cool and sustained declamation he stood unrivalled in parliament, and his readiness in debate was universally acknowledged. In social life, in the company of the wits and writers of his day, his faculties seemed to desert him. He was not only dull, but the cause of dulness in others, and even Alexander Carlyle confesses that in conversation his illustrious countryman was " stiff and pompous." In Wedderburn's character ambition banished all rectitude of principle, but the love of money for money's sake was not among his faults.

See Brougham's Statesmen of the Reign of George III.; Foss's Judges; Campbell's Lives of Lord Chancellors. (W. P. C.)

ROSSTREVOR, a watering-place of county Down, Ireland, on Carlingford Lough. See Warrenpoint.

ROSSWEIN, a town of Germany, in the kingdom of Saxony, situated on the Freiberger Mulde, 46 m. S.E. from Leipzig by the railway via Dobeln to Dresden. Pop. (1905) 9297. It is famous for its technical schools, among which are one for builders, another for furniture-makers, and a third for iron- mongers. The industries are considerable, and include woollen and cloth manufactures, dyeing, spinning, and the making of agricultural machinery, cigars, chemicals, bricks and iron goods. Rosswein is an old town, cloth-making being a flourishing industry here in the 14th century.

See C. V. Bohmert, Die Stadt Rosswein, 1881-94 (Dresden,

1895)-

ROSTAND, EDMOND (1869-), French dramatist, was born on the 1st of April 1869, the son of Joseph Eugene Herbert Rostand (b. 1843), a prominent journalist and economist of Marseilles. His first play, a burlesque, Les romanesques, was produced on the 21st of May 1894 at the Theatre Francais. He took the motive of his second piece, La Princesse lointaine (Theatre de la Renaissance, 5th April 1895), from the story of the troubadour Rudel and the Lady of Tripoli. The part of Melissande was created by Sarah Bernhardt, who also was the original Photine of La Samaritaine (Theatre de la Renaissance, 14th April 1897), a Biblical drama in three scenes taken from the gospel story of the woman of Samaria. The production of his ” heroic comedy ” of Cyrano de Bergerac (28th December 1897, Theatre de la Porte Saint-Martin), with Coquelin in the title-role, was a triumph. No such enthusiasm for a drama in verse had been known since the days of Hugo’s Hernani. The play was quickly translated into English, German, Russian and other European languages. For his hero he had drawn on French 17th-century history; in L’Aiglon he chose a subject from Napoleonic legend, suggested probably by Henri Welsch- inger’s Roi de Rome, 1811-32 (1897), which contained much new information about the unhappy life of the duke of Reich- stadt, son of Napoleon I. and Marie Louise, under the sur- veillance of Metternich at the palace of Schonbrunn. L’Aiglon, in six acts and in verse, was produced (15th March 1900) by Sarah Bernhardt at her own theatre, she herself undertaking the part of the duke of Reichstadt. In 1902 Rostand was elected to the French Academy. His Chantecler, produced in February 1910, was awaited with an interest (enhanced by con- siderable delay in the production) hardly equalled by the enthusiasm

of its reception. Lucien Guitry was in the title- role and Mme. Simone played the part of the pheasant, the play being a fantasy of bird and animal life, and the charac- ters denizens of the farmyard and the woods. Rostand's wife, nee Rosemonde Etienette Gerard, published in 1890 Les Pipeaux, a volume of verse crowned by the Academy.

See a notice by Henry James in vol. 84, pp. 477 seq. of the Corn- hill Magazine.

ROSTOCK, a town of Germany, in the grand duchy of Meck- lenburg-Schwerin, one of the most important commercial cities on the Baltic. It is situated on the left bank of the estuary of the Warnow, 8 m. from the port of Warnemunde on the Baltic. 177 m. N.W. of Berlin by rail, 80 m. N.E. of Liibeck, and 106 m. S. of Copenhagen. Pop. (1905) 60,790. It consists of three parts — the old town to the east, and the middle and new towns to the west — of which the first retains some of the antique features of a Hanse town, while the last two are for the most part regularly and handsomely built. There are also several suburbs. The town has four gates, one of them dating from the 14th century, and some fine squares, among them the Bliicher Platz, with a statue of Bliicher, who was born here, and the Neue Markt. Rostock was a fortress of some strength, but the old fortifications have been razed, and their site is occupied by promenades. Rostock has five old churches: St Mary's, dating from 1398 to 1472, one of the most imposing Gothic buildings in Mecklenburg, with two Romanesque towers and containing a magnificent bronze font and a curious clock; St Nicholas's, begun about 1250 and restored in 1450, and again in 1890-94; St Peter's, with a lofty tower over 400 ft. high, built in 1400, which serves as a landmark to ships at sea;

St James's, completed in 1588, and the church of the Holy Rood, begun in 1270. St Mary's church contains a monument marking the original tomb of Hugo Grotius, who died in Rostock in 1645, though his remains were afterwards removed to Delft. Among other interesting buildings are the curious 14th-century Gothic town hall, the facade of which is concealed by a Renaissance addition; the palace of the grand duke of Mecklenburg-Schwerin, built in 1702; the law courts, built in 1878-79; the university buildings, erected in 1867-70: and an assembly hall of the estates of Mecklenburg (Standehaus), a handsome Gothic building erected in 1889-93.

The university of Rostock was founded in 141 8 by Dukes Johann III. and Albrecht V. of Mecklenburg. From 1437 till 1443 it had its seat at Greifswald in consequence of commotions at Rostock; and in 1760 it was again removed, on this occasion to Biitzow. The professors

appointed by the city, however, still taught at Rostock, so that there were practically two universities in the duchy until 1789, when they were reunited at the original seat. Rostock is the seat of the supreme court for both the duchies of Mecklenburg, and is well equipped with schools, hospitals, and other institutions.

Although the population, commerce and wealth of Rostock have declined since Hanse days, it has a considerable trade, being the chief commercial town of Mecklenburg and owning a considerable fleet. Vessels drawing 16 ft. of water are able to get up to the wharves. By far the most important export is grain, which goes almost entirely to British ports; but wool, flax and cattle are also shipped. The chief imports are coal from Great Britain, herrings from Sweden, petroleum from America, timber, wine and colonial goods. Rostock has an important fair at Whitsuntide, lasting for fourteen days, and also a frequented wool and cattle market. The industries of the town are varied. One of the chief is shipbuilding. Machinery, chemicals, sugar, malt, paper, musical instruments, cotton, straw hats, tobacco, carpets, soap, playing cards, chocolate and dye-stuffs are among the manufactures. The town also contains distilleries, saw-mills, oil-mills, tanneries, breweries and electrical works.

Local historians assert that a village existed on the site of Rostock as early as a.d. 329, but no certain proofs have been traced of any earlier community than that founded here in the 12th century, which is said to have received municipal rights in 12 18. The earliest signs of commercial prosperity date from about 1260. For a time Rostock was under the dominion of the kings of Denmark. Soon after returning under the protection of Mecklenburg in the 14th century it joined the Hanseatic League; and was one of the original members of the powerful Wendish Hansa, in which it exercised an influence second only to that of Liibeck. The most prosperous epoch of its commercial history began in the latter half of the 15th century, precisely at the period when its political power began to wane. Rostock, however, never entirely lost the independ- ence which it enjoyed as a Hanse town; and in 1788, as the result of long contentions with the rulers of Mecklenburg, it secured for itself a peculiar and liberal municipal constitution, administered by three burgomasters and three chambers. In 1880 this constitution was somewhat modified, and the city became less like a state within a state. It has belonged to Mecklenburg-Schwerin since 1695; in 171 2 it was taken by the Swedes, in 1715 by the Danes and in 1 716 by the Russians. The badge of Rostock is the figure 7; and a local rhyme ex- plains that there are 7 doors to St Mary's church, 7 streets from the market-place, 7 gates on the landward side and 7 wharves on the seaward side of the town, 7

turrets on the town-hall, which has 7 bells, and 7 linden trees in the park.

See Reinhold, Chronik der Stadt Rostock (Rostock, 1836); Krabbe, Die Universitat Rostock im 75 und 16 Jahrhundert (2 vols., Rostock, 1854), Koppmann, Geschichte der Stadt Rostock (Rostock, 1887); Volckmann, Fiihrer durch Rostock (3rd ed., 1896) ; the Geschichts-quellen der Stadt Rostock (Rostock, 1885); and the Beitrage zur Geschichte der Stadt Rostock (Rostock, 1890).

ROSTOPTSCHIN, COUNT FEODOR VASSILIEVICH (1763- 1826), Russian general, was born on the 23rd of March 1763, in the government of Orel. He had great influence with the Tsar Paul, who made him in 1796 adjutant-general, grand-marshal of the court, then minister of the interior. In 1799 he received the title of count. He was disgraced in 1801 for his opposition to the French alliance, but was restored to

favour in 1810, and was shortly afterwards appointed military governor of Moscow. He was therefore charged with its defence against Napoleon, and took every means to rouse the popula- tion of the town and district against the invader. He has been generally charged with instigating the burning of Moscow the day after the French had made their entry; it is certain that the prisons were opened by his order, and that he took no means to stop the outbreak. He defended himself against the charge of incendiarism in a pamphlet printed in Paris in 1823, La Verite sur I'incendie de Moscou, but he subsequently made grave admissions. Shortly after the congress of Vienna, to which he had accompanied the Tsar Alexander, he was disgraced. He only returned to Russia in 1825, and died at Moscow on the 12th of February of the next year.

His 'Memoires ecrits en dix minutes were posthumously published at St Petersburg in 1853, his CEuvres inedites in Paris in 1894. A partial account of his life was written by his grandson A. de Segur (Paris, 1872). See also Varnhagen von Ense, Denkwiirdigkeiten, vol. ix. ; G. Tzenoff, Wer hat Moskau im Jahre 1812 in Brand gesteckt (Berlin, 1900).

ROSTOV-ON-THE-DON, a seaport of Russia, in the territory of the Don Cossacks, well situated on the high right bank of the Don, 13 m. from

its mouth in the Sea of Azov. In 1731 a small fort was erected on an island in the Don, near its mouth. Thirty years later the fortifications were transferred to the site now occupied by Rostov, 5 m. above the head of the first branch of the delta of the Don. The Don, which has here a breadth of 230 to 250 yds., with a hardly perceptible current, offers an excellent roadstead. The navigation, however, is considerably impeded by the shallowness of the river. Dredging operations have but partially remedied this. Moreover, the river is frost- bound for more than one hundred days in the year. The population has grown rapidly: while in 1881 it was 70,700, in 1897 it numbered 119,889, and in 1905 126,375, exclusive of the suburbs; if these, which comprise Nakhichevan (32,582 in 1905) be included, the population is well over 160,000, a figure which is still further swollen in the summer by the influx of about 60.000 men, who find work in connexion with the ship- ment of grain for export. The permanent population includes 15,000 Jews, 5000 Armenians, with Tatars, Poles, Germans and others. In Nakhichevan there are 20,500 Armenians. Owing to its situation on the navigable river Don and at the junction of three railways, radiating to north-western Russia, Caucasia and the Volga respectively, Rostov has become the chief sea- port of south-eastern Russia, being second in importance on the Black Sea to Odessa only. It is the chief centre for the supply of agricultural machinery to the steppe governments of south- eastern Russia. On an average, £3,000,000 to £4,000,000 worth of wheat, about £1,000,000 worth of rye, and over £1,500,000 worth of barley are exported annually, besides oats, flax, linseed, rape seed, oilcake, bran, flour, vegetable oils, raw wool and caviare. The imports average between four and five millions sterling annually, and consist largely of agricultural machinery. There are a shipbuilding yard, flour-mills, tobacco factories, iron works, machinery works, distilleries, soap works, timber mills, bell foundries, paper mills and rope works. Rostov is the chief centre of steam flour-mills for south-eastern Russia and Caucasia. Two fairs, one of which has considerable im- portance for the whole of south-eastern Russia, are held here yearly. Rostov has excellent fisheries. The town has a cathedral, a fine town hall (1897-99), navigation schools, tech- nical schools, and a good municipal library.

ROSTOV VELIKIY, a town of Russia, in the government of Yaroslavl, 35 m. by rail S.W. of the town of Yaroslavl, near Lake Rostov or Nero. Pop. (1897) 14,342. It has numerous cotton and linen mills. The great fair for which it was formerly famous has lost its importance, but the town remains the centre of a variety of domestic trades — tailoring, the manu- facture of leather, and the making of boots and small enamelled ikons (sacred images) ; it is also famous for its kitchen

gardening and the export of pickled and dried vegetables and medical herbs. Fishing is carried on. The restoration of the buildings

(royal palace, archiepiscopal palace, and five churches) of the kreml or citadel was begun in 1901. The other public buildings include six 17th-century churches, a museum and a cathedral, consecrated in 1231 and having its interior walls covered with paintings.

Rostov was founded by Slavs in or before 862, and played so prominent a role in the history of that part of Russia that it used to be known as Rostov the Great. From the beginning of the nth century to the 13th it was the chief town of a territory which included large parts of the present governments of Yaro- slavl, Vladimir and Novgorod. After the Mongol invasion of 1239-42 it rapidly declined, and in 1474 it was purchased by Ivan III. and annexed to Moscow. It was repeatedly plundered by Tatars, Lithuanians and Poles in the 15th, 16th and 17th centuries.

ROSTRA 1 (“beaks”), in Roman antiquities, the orators’ platform, which originally stood between the comitium and the forum proper, opposite the curia. It is not known when it was erected, but in 338 B.C. it was decorated by Gaius Maenius with the prows of ships captured from the people of Antium (Livy viii. 14). From that time it was called Rostra, having previously been known as templum (literally ” consecrated place “), since it had been consecrated by the augurs (Cicero, In Vatinium, x. 24). Some, however, deny the identity of the templum and rostra. On the platform or hard by were exhibited the statues of famous Romans (Camillus, Caesar), and state documents and memorials (the laws of the Twelve Tables, the treaty with the Latins, the columna rostrata of Duilius). Caesar had it pulled down, intending that it should be rebuilt on the west side of the forum, but it was left for Augustus (or Mark Antony) to carry out his plan. The term Rostra Vetera, often used by classical authors in connexion with funeral orations, makes it doubtful whether the old platform was entirely demolished, unless the name was simply trans- ferred to the new rostra of Augustus. This consisted of a rectangular platform, 78 ft. long, 33 ft. broad and n ft. above the level of the forum pavement. It was reached by steps from the back; in front there was a marble balustrade with an opening in the centre where the speaker stood, possibly also intended for a staircase leading down into the forum. In the existing remains the holes in which the beaks of the ships were fastened, arranged in pairs, are visible. Behind these remains, close to the Clivus Capitolinus, a row of light low- arched cells has been found, which, owing to a certain resem- blance to the earlier rostra as shown on the well-known, coin of Lollius Palicanus, has been identified by

Boni with the rostra removed by Julius Caesar, the other remains being attributed to the time of Domitian (for objections to this theory, see Hiilsen and Richter). In the time of Hadrian the side balus- trades were decorated with marble slabs, on which were repre- sented in relief the burning of the lists of the citizens who were in arrears to the fisc and the distribution of necessaries to the poorer citizens. Thedenat explains the first as Domitian re- assuring a deputation of citizens by burning the denunciatory reports of the delatores, and the second (the scene of which he places at the Rostra Julia) as the promulgation of the law forbidding the mutilation of children. The erection of the arch of Severus necessitated considerable alterations, the most im- portant of which was a triangular courtyard cut out of the north half of the rostra, to allow direct access to it from the side that faced the arch, its breadth being thereby reduced by a third. A later extension of the facade northwards is explained by a long inscription, recording that about the year 470, Ulpius Junius Valentinus, a city prefect, restored the structure (hence called Rostra Vandalica) after a naval victory over the Vandals. A relief on the arch of Constantine represents the emperor speaking from the rostra.

The Rostra Julia was a platform with a semicircular niche

1 The Lat. singular rostrum, a beak, the beak of a ship, is used in English of a platform, stand or pulpit from which a speaker addresses his audience. It is also used in its original meaning of a beak-like prolongation or process in zoology or botany.

in the centre, in front of the Aedes divi Julii, built by Augustus on the spot where the body of Caesar was cremated. The niche was probably used to support the bier while a funeral laudaiio was being delivered. The front on either side was decorated with the beaks of ships captured at the battle of Actium.

For results of the excavations see C. Hiilsen, Das Forum Romanum (Eng. tr. by J. B. Carter, Rome, 1906) ; see also O. Richter, ” Topo-

fraphie der Stadt Rom ” (1901), pp. 81, 93, 356 (iii. Abt. 3, pt. 2 of . von Miiller’s Handbuch der klassischen Altertumswissenschaft) ; H. Thedenat, he Forum Romain (3rd ed. 1904); J. H. Middleton, Remains of Ancient Rome (1892); O. Richter, Rekonstruktion und Geschichte der rbmischen Rednerbiihne (Berlin, 1884); F. M. Nichols, The Roman

Forum (1877); also article Rome: Archaeology.

ROTA, COURT OF, one of the departments of the medieval papal organization, existing alongside the Dataria, the Poeniten- tiaria, the two Signaturas {S. Gratiae and 5. Justitiae), and other bureaus. The Rota was the supreme court of Christendom. It consisted of twelve members, three from Rome, two from Spain, one each from Bologna, Ferrara, Venice, Milan, Germany, France, and (alternately) Tuscany or Perugia. It declined in importance when the Signitura Justitiae was set above it as the court of appeal for Italy, and more so as the geographical jurisdiction of the pope was gradually lessened. After the Council of Trent the old arrangements were replaced by the Congregations, permanent committees of cardinals which deal with definite branches of business. The Rota, however, was restored to its functions as supreme court of appeal by Pope Pius X. in 1908 (see Curia Romana).

ROTH, JUSTUS LUDWIG ADOLF (1818-1892), German geologist and mineralogist, was born at Hamburg on the 15th of September 1818. In 1867 he was appointed professor of mineralogy at the university of Berlin. He may be regarded as one of the founders of petrographical science. In his published papers he dealt with metamorphism and crystalline schists, discussed the origin of serpentine, and wrote on Vesuvian rocks and on Ponza Island. His separate works included Der Vesuv und die Umgebung von Neapel (1857); Beitrage zur Petrographie der plutonischen Gesteine (1869-ˆ84) ; Allgemeine und chemische Geologie (3 vols., 1870-93); and Uber die Erdbeben (1882). He died at Berlin on the 1st of April 1892.

ROTHE, RICHARD (1799-1867), Lutheran theologian, was born at Posen on the 28th of January 1799. He studied theology in the universities of Heidelberg and Berlin (1817-20) under Karl Daub (1765-1836), Schleiermacher and Neander, the philosophers and historians Georg Hegel, Friedrich Creuzer (1771-1858) and F. C. Schlosser (1776-1861) exercising a considerable influence in shaping his thought. From 1820 to 1822 he was in the clerical seminary at Wittenberg. In the autumn of 1823 he was appointed chaplain to the Prussian embassy in Rome, of which Baron Bunsen was the head. This post he exchanged in 1828 for a professorship in the Witten- berg theological seminary, of which in 1832 he became also second director and ephorus, and hence in 1837 he removed to Heidelberg as professor and director of a new clerical seminary; in 1849 he accepted an invitation to Bonn as professor and university preacher, but in 1854 he returned to Heidelberg as professor of theology, and afterwards became member of the Oberkirchenrath, a position he held

until his death on the 20th of August 1867. As a youth Rothe had a bent towards a supernatural mysticism; his chosen authors were those of the romantic school, and Novalis remained throughout his life a special favourite. In Berlin and Wittenberg he came under the influence of Pietism as represented by such men as Rudolf Stier (1800-1862) and Friedrich Tholuck, though Tholuck pronounced him a ” very modern Christian.” He afterwards confessed that, though he had been a sincere, he was never a happy, Pietist. In Rome, under the broadening influence of classical and ecclesiastical art, he learned to look at Chris- tianity in its human and universalistic aspects, and began to develop his great idea, the inseparable relation of religion and morals. He began then, and particularly after the revolution of July 1830, likewise to give a more definite form to his peculiar view of the relations of church and state. He thus became

out of harmony with the pietistic thought and life of Witten- berg. His removal to Heidelberg and the publication of his first important work, Die Anfange der christlichen Kirche und ihrer Verfassung (1837), coincide with the attainment of the principal theological positions with which his name is associ- ated. During the middle period of his career (1837-61) he led the life of a scholastic recluse. During the last six years of his life he came forward as the advocate of a free theology and of the Protestantenverein.

Rothe was one of the most profound and influential of modern German theologians. Like Schleiermacher he combined with the keenest logical faculty an intensely religious spirit, while his philo- sophical tendencies were in sympathy rather with Hegel than with Schleiermacher, and theosophic mysticism was more congenial to him than the abstractions of Spinoza, to whom Schleiermacher owed so much. He classed himself among the theosophists, and claimed to be a convinced and happy supernaturalist in a scientific age. His system, though it may seem to contain doubtful or even fantastic elements, is in its general outlines a noble massive whole, constructed by a profound, comprehensive, fearless and logical mind. A peculiarity of his thought was the realistic nature of his spiritualism: his abstractions are all real existences’, his spiritual entities are real and corporeal; his truth is actual being. Hence Rothe, unlike Schleiermacher, lays great stress, for instance, on the personality of God, on the reality of the worlds of good and evil spirits, and on the visible second coming of Christ. Hence his religious feeling and theological speculation demanded their realiza- tion in a kingdom of God coextensive with man’s nature, terrestrial history and human society ; and thus his theological system became a Theologische Ethik, as he entitled one of his books (3 vols., 1845- 1848). It is on this work that Rothe’s

permanent reputation as a theologian and ethical writer will rest. The first edition remained twelve years out of print before the second (5 vols., 1867-71) appeared. It was the author's purpose to rewrite the whole, but he died when he had completed the first two volumes. The re- mainder was reprinted from the first edition by Professor Heinrich Holtzmann, with the addition of some notes and emendations left by the author.

The Theologische Ethik begins with a general sketch of the author's system of speculative theology in its two divisions, theology proper and cosmology, cosmology falling into the two subdivisions of Physik (the world of nature) and Ethik (the world of spirit). It is the last subdivision with which the body of the work is occupied. After an analysis of the religious consciousness, which yields the doctrine of an absolute personal and spiritual God, Rothe proceeds to deduce from his idea of God the process and history of creative develop- ment, which is eternally proceeding and bringing forth, as its unending purpose, worlds of spirits, partially self-creative and sharing the absolute personality of the Creator. Rothe regards the natural man as the consummation of the development of physical nature, and obtains spirit as the personal attainment, with divine help, of those beings in whom the further creative process of moral development is carried on. His theory leaves the natural man, without hesitation, to be developed by the natural processes of animal evolution. The attainment of the higher stage of develop- ment is the moral and religious vocation of man; this higher stage is self-determination, the performance of every human function as a voluntary and intelligent agent, or as a person, having as its cosmical effect the subjection of all material to spiritual existences. This personal process of spiritualization is the continuation of the eternal divine work of creation. Thus the moral life and the religious life coincide, and when normal are identical; both have the same aim and are occupied with the same task, the accomplish- ment of the spiritualization of the world. " Piety, that it may become truth and reality, demands morality as its fulfilment, as the only concrete element in which the idea of fellowship with God is realized; morality, that it may find its perfect unfolding, requires the aid of piety, in the light of which alone it can comprehend its own idea in all its breadth and depth." The process of human development Rothe regards as necessarily taking an abnormal form and passing through the phase of sin. This abnormal con- dition necessitates a fresh creative act, that of salvation, which was, however, from the first, part of the divine plan. As a pre- paration for this salvation supernatural revelation was required for the purifying and revivification of the religious consciousness, and the Saviour Himself had to appear in human

history as a fresh miraculous creation, born of a woman but not begotten by a man. In consequence of His supernatural birth the Saviour, or the second Adam, was free from original sin. By His own moral and religious development He made possible a relation of perfect fellow- ship between God and man, which was the new and highest stage of the divine creation of mankind. This stage of development inaugurated by the Saviour is attained by means of His kingdom or the community of salvation, which is both moral and religious,_ and in the first instance and temporarily only religious — that is, a church. As men reach the full development of their nature, and appropriate the perfection of the Saviour, the separation between

the religious and the moral life will vanish, and the Christian state, as the highest sphere of human life representing all human functions, will displace the church. ” In proportion as the Saviour Christianizes the state by means of the church must the progressive completion of the structure of the church prove the cause of its abolition.” The decline of the church is therefore not to be deplored, but recognized as the consequence of the independence and complete- ness of the Christian life. It is the third section of his work — the Pflichtenlehre — which is generally most highly valued, and where his full strength as an ethical thinker is displayed, without any mixture of theosophic speculation.

Since Rothe’s death several volumes of his sermons and of his lectures (on dogmatics, the history of homiletics) and a collection of brief essays and religious meditations under the title of Stille Stunden (Wittenberg, 1872) have been published.

See F. Nippold, Richard Rothe, ein christliches Lebensbild (2 vols., Wittenberg, 1873-74); D. Schenkel, ” Zur Erinnerung an Dr R. Rothe,” in the Allgemeine kirchliche Zeitschrift (1867-68); H.Holtz- mann, ” Richard Rothe,” in the Jahrbuch des Protestantenvereins (1869); K. H. W. Schwarz, Zur Geschichte der neuesten Theologie (4th ed., Leipzig, 1869, pp. 417-44); Otto Pfleiderer, Religions- philosophie auf geschichtlicher Grundlage (2nd ed., Berlin, 1884, vol. i. pp. 611-15); cf. The Development of Theology in Germany since Kant (1890); W. Honig, Richard Rothe, sein Charakter, Leben und Denken (1898); Adolf Hausrath, Richard Rothe und seine Freunde (1902).

ROTHELIN, JACQUELINE DE ROHAN, Marquise de (c. 1 520-1 587),

daughter of Charles de Rohan and Jeanne de Saint-Severin. Her husband, Francois of Orleans-Longueville, marquis de Rothelin, died in 1548, and in watching her son's interests in Neuchatel she was brought into contact with the reformers in Switzerland. She then embraced Protestantism and turned her chateau at Blandy, in Brie, into a refuge for Huguenots. In 1567 she underwent a term of imprisonment at the Louvre for harbouring Protestants.

ROTHENBURG-OB -DER-TAUBER, a town of Germany, in the kingdom of Bavaria, 49 m. by rail S.W. of Nuremberg. Pop. (1905) 8436. It is beautifully situated on an eminence 200 ft. above the Tauber. It is flanked by medieval walls, towers and gates, and its antique appearance has been care- fully preserved. Perhaps the most interesting building is the town hall, one part of which dates from 1240 and the other from 1572. The latter is a beautiful Renaissance structure, with a magnificent facade and a delicate spire, and contains a grand hall, the Kaisersaal, in which every Whit Monday a play, Der Meisterlrunk, which commemorates the capture of the town by Tilly in 163 1, is performed. Other buildings are the Gothic church of St James, with curiously carved altars and beautiful stained-glass windows, and containing in the Toppler chapel the tomb of the burgomaster, Heinrich Toppler; the 15th-century church of St Wolfgang; the Fran- ciscan church; and five other churches. The town has many picturesque houses, and possesses a library with some interest- ing archives. It has manufactures of toys and agricultural machinery, electrical works and breweries.

Rothenburg-ob-der-Tauber, mentioned in the chronicles in 804 as Rotinbure, was probably a residence of the dukes of Franconia. It first appears as a town in 942 and until 1108 was the seat of the counts of Rothenburg-Komburg; when this line became extinct it passed to the family of Hohen- staufen, one member of which took the title of duke of Rothen- burg. In 1 1 72 it became a free imperial city and it attained the zenith of its prosperity under the famous burgomaster Heinrich Toppler (13 50-1 408). It took part in the movements in South Germany during the 15th and 16th centuries. In 163 1 Rothenburg was stormed by Tilly, and the cup of wine pre- sented by the burgomaster, which, according to tradition, saved the town from destruction, is annually commemorated in the play mentioned above.

See Bensen, Beschreibung und Geschichte der Stadt Rothenburg (Erlangen, 1856); Merz, Rothenburg in alter und neuer Zeit (2nd ed., Ansbach, 1881); Schultheiss, Rothenburg, ein Stddtebild (Zurich, 1892); and Das Festspiel zu Rothenburg-ob-der-Tauber (Munich, 1892) ; and W. Klein, Fuhrer durch die Stadt Rothenburg (Rothen-

burg, 1

ROTHERHAM, THOMAS (1423-1500), archbishop of York, also called Thomas Scot, was born at Rotherham on the 24th of

August 1423; he was educated in his native town and seems to have been connected with both the universities of Oxford and Cambridge. Having entered the church he became rector of Ripple, Worcestershire, and later of St Vedast, Foster Lane, London, and it was probably when he was chaplain to John de Vere, earl of Oxford, that he made the acquaintance of Elizabeth Woodville, afterwards the queen of Edward IV. In 1467 Rotherham became keeper of the privy seal to this king; in 1468 he was appointed bishop of Worcester, in 1472 bishop of Lincoln and in 1475 chancellor of England. Several times he went to France on public business; in 1475 at the treaty of Picquigny he received a pension from Louis XI. of France, and in 1480 he was chosen archbishop of York. When Edward IV. died in April 1483 the archbishop remained true to his widow Elizabeth, and consequently lost the chancellorship and was put into prison by Richard III. He was soon set at liberty, and he died in 1500 at Cawood, near York. At Oxford Rother- ham built part of Lincoln College and increased its endowment ; at Cambridge, where he was chancellor and master of Pembroke Hall, he helped to build the University Library. He founded a college at Rotherham, which was suppressed under Edward VI., and he was responsible for the building of part of the church of All Saints there.

ROTHERHAM, a market-town and municipal borough in the Rotherham parliamentary division of the West Riding of Yorkshire, England, 5 m. N.E. of Sheffield, on the Midland, North – Eastern and Great Central railways. Pop. (1891) 42,061; (1901) 54,349. It lies in the valley of the Don, where that river is joined by the Rother, and has communication by water with the Humber. The Don is crossed by a bridge on which is a small ancient building, formerly a chapel. The parish church of All Saints, occupying the site of a building dating from Anglo-Saxon times, was erected in the reign of Edward IV., and is among the best specimens of Perpendicular in the north of England. The town possesses iron, steel and brass works, railway wagon works, potteries, glass-works, breweries, saw-mills and rope-yards. At the township of Masborough, opposite Rotherham across the Don, works were established in 1746 by Samuel Walker, a successful ironmaster. The municipal borough, incorporated in 1871, is under a mayor, 6 aldermen and 18 councillors. Area, 6012 acres.

The town was of some importance in Anglo-Saxon times, and at

Templeborough, on the S.E. side of Rotherham, there was a Roman fort, but its traces are effaced. In the time of Edward the Confessor, Rotherham possessed a market and a church. During the Civil War it sided with the Parliament. It was taken by the Royalists in 1643, but after the victory of Marston Moor was yielded to a detachment of the Parlia- mentary forces.

ROTHES, EARLS OF. The first earl of Rothes was George Leslie, son of Norman Leslie of Rothes in Moray, and of Ballinbreich in Fife. In 1445 he was created Baron Leslie of Leven, and about 1458 earl of Rothes in the peerage of Scotland. His grandson George, the 4th earl (d. 1558), whose father, William, the 3rd earl, was killed at Flodden, was accused, but acquitted in 1546, of complicity in the murder of Cardinal Beaton, in which his brother and his two sons were undoubtedly implicated; he was one of the Scottish commissioners who witnessed the marriage of Mary queen of Scots with Francis, the dauphin of France. His son Andrew, 5th earl of Rothes (d. 161 1), took an active part with the lords of the congregation, first against the queen-mother, Mary of Guise, when regent of Scotland, and afterwards against Mary queen of Scots in opposing her marriage with Darnley, and in devising the murder of Rizzio. He was, however, one of the peers who acquitted Bothwell of Darnley's murder; and going over to the side' of the queen, he fought for her at Langside. He continued to occupy a position of some prominence in Scottish affairs until his death in 1611. His great-grandson, John, 7th earl of Rothes (1630-1681), held a command in the Royalist army at the battle of Worcester in 165 1, and rxcompanied Charles II. to England at the Restoration, when he became

lord president of the council in Scotland. He was lord treasurer of Scotland from 1663 till 1667, when he was made lord chan- cellor of Scotland for life. His estates having been sequestrated by the parliament in 1651, he received a re-grant in 1663 of the earldom of Rothes, together with the title of Lord Leslie and Ballinbreich, with remainders to his heirs male and female, providing that in every case where a female should succeed to the peerage the name of Leslie should be assumed by her husband. In 1680 the earl was advanced to the dignity of duke of Rothes and marquess of Ballinbreich, but these titles became extinct at his death without a son in the following year. The earldom of Rothes and the other older titles now passed, under the special remainder mentioned above, to his daughter Margaret,

whose husband, Charles Hamilton, 5th earl of Haddington, accordingly took the name of Leslie, at the same time making an arrangement by which his own peerage should pass to a younger son in order to keep the two earldoms separate. Margaret's son John, who on her death became 9th earl of Rothes, was vice-admiral of Scotland from 1715 to 1722, and fought with distinction against the Jacobite rebels in 1715; and her grandson, the 10th earl, who sold the estates of Ballinbreich to the Dundas family, was commander-in-chief in Ireland in 1754, and became a general in 1765. The office of sheriff of Fife, which had been an hereditary right of the earls of Rothes since 1540, was sold by the 10th earl under the Heritable Act of 1747. On several subsequent occasions the earldom again passed through the female line, and in 1803 Mary Elizabeth, countess of Rothes in her own right, was succeeded by her grandson, Norman Evelyn Leslie (b. 1877), as 19th earl of Rothes.

See Sir R. Douglas, The Peerage of Scotland, edited by Sir J. B. Paul; and G. E. C, Complete Peerage.

ROTHESAY, a royal, municipal and police burgh, and the chief town of the county and island of Bute, Scotland. Pop. (1901) 9378. It is situated on a beautiful bay, 40 m. S.W. of Glasgow, with which there is regular communication by railway steamers from Wemyss Bay, Gourock, Greenock (Prince's Pier) and Craigendoran, as well as by many other steamers from Glasgow and the Clyde ports. It is a popular watering-place, and as the bay is sheltered by low wooded hills and affords excellent anchorage, it is well patronized by yachts. Loch Striven, on the opposite shore of Argyllshire, is known as the " Rothesay weather-glass," its appearance furnishing a certain clue to meteorological conditions. The town is under the jurisdiction of a provost and council. Rothe- say has ceased to be a manufacturing centre, fishing being now its chief industry. Owing to its mild and equable climate it is a resort of invalids. There is a tramway to Port Banna- tyne, pleasantly situated on the east horn of Karnes Bay, and Craigmore, about 1 m. west of Rothesay, is a fashionable suburb. Ardbeg Point, Loch Fad, Loch Ascog and Barone Hill (530 ft.) are all within a mile and a half of the town, and there are numerous excursions by road to other points of interest. The Kyles of Bute are within a short sail of Rothesay. In the centre of the town are the ruins of a castle erected in 1098 either by Magnus Barefoot, king of Norway, or by the Scots as a defence against the Norwegians, with whom during the 13th century, and earlier, there was constant strife. The village which grew up round the castle was made a royal burgh by Robert III., who, in 1398, created his eldest son David duke of Rothesay, a title which became the highest Scottish title of the heir-

apparent to the crown of the United Kingdom. During the Commonwealth the castle was garrisoned by Crom- well's troops. It was burned by the followers of Argyll in 1685, and remained neglected till the rubbish was cleared away by the second marquess of Bute in 1816. It was repaired by the third marquess.

ROTHSCHILD, the name of a Jewish family which has acquired an unexampled position from the magnitude of its financial transactions. The original name was Bauer, the founder of the house being Mayer Anselm (1743-1812), the son of Anselm Moses Bauer, a small Jewish merchant of Frankfort-

on-the-Main. His father wished him to become a rabbi, but he set up as a money-lender at the sign of the " Red Shield " (Rothschild) in the Frankfort Judengasse. He had already acquired some standing as a banker when his numismatic tastes obtained for him the friendship of William, ninth landgrave and afterwards elector of Hesse-Cassel, who in 1801 made him his agent. In the following year Rothschild negotiated his first great government loan, ten million thalers for the Danish government. When the landgrave was compelled to flee from his capital on the entry of the French, he placed his silver and other bulky treasures in the hands of Rothschild, who, not without considerable risk, took charge of them and buried them, it is said, in a corner of his garden, whence he dug them up as opportunity arose for disposing of them. This he did to such advantage as to be able afterwards to return their value to the elector at 5 % interest. He died at Frankfort on the 19th of September 1812, leaving ten children, five sons and five daughters. Branches of the business were established at Vienna, London, Paris and Naples, each being in charge of one of the sons, the chief of the firm always residing at Frankfort. By a system of co-operation and joint counsels, aided by the skilful employment of subordinate agents, they obtained unexampled opportunities of acquiring an accurate knowledge of the condition of the financial market, and practically embraced the whole of Europe within their financial network. The unity of the interests of the several members of the firm has been preserved by the system of intermarriages which has been the general practice of the descendants of the five brothers. Each of the brothers received in 1815 from Austria the privilege of hereditary landowners, and in 1822 they were created barons by the same country. The charge of the Frankfort house devolved on the eldest, Anselm Mayer (1773-1855), born on the 12th of June 1773, who was chosen a member of the royal Prussian privy council of commerce, and, in 1820, Bavarian consul and court banker. The Vienna branch was undertaken by Solomon (1774- 1826), born on the 9th of December 1774, who entered into inti- mate relations with

Prince Metternich, which contributed in no small degree to bring about the connexion of the firm with the allied powers. The third brother, Nathan Mayer (1777-1836), born on the 16th of September 1777, has, however, generally been regarded as the financial genius of the family, and the chief originator of the transactions which have created for the house its unexampled position in the financial world. He went to Manchester about 1800 to act as a purchaser for his father of manufactured goods; but at the end of five years he removed to London. The boldness and skill of his financial transactions, which caused him at first to be regarded as unsafe by the lead- ing banking firms and financial merchants, later awakened their admiration and envy. By the employment of carrier-pigeons and of fast-sailing boats of his own for the transmission of news he was able to utilize to the best advantage his special sources of information, while no one was a greater adept in the art of pro- moting the rise and fall of the stocks. The colossal influence of the house dates from an operation of his in 1810. In that year Wellington made some drafts which the English government could not meet; these were purchased by Rothschild at a liberal discount, and renewed to the government, which finally redeemed at par. From this time the allied powers negotiated loans to carry on the war against Napoleon chiefly through the house of Rothschild. Rothschild never lost faith in the ultimate over- throw of Napoleon, his all being virtually staked on the issue of the contest. He is said to have been present at the battle of Waterloo. Being able to transmit to London private informa- tion of the allied success several hours before it reached the public, he effected an immense profit by the purchase of stock, which had been depressed on the news of Blucher's defeat two days previously. Rothschild was the first to popularize foreign loans in Britain by fixing the rate in sterling money and making the dividends payable in London and not in foreign capitals. Latterly he became the financial agent of nearly every civilized government, although persistently declining contracts for Spain or the American States. He did not confine himself to

operations on a large scale, but on the contrary made it a principle to despise or neglect no feasible opportunity of trans- acting business, while at the same time his operations gradu- ally extended to every quarter of the globe. He died on the 28th of July 1836, and was succeeded in the management of the London house by his son Lionel (1808-1879), born on the 22nd of November 1808, whose name is associated with the removal of the civil disabilities of the Jews. He

was elected a member for the City of London in 1847, and again in 1849 an< i I 8S2, but it was not till 1858 that the joint operation of an act of parliament and a resolution of the House of Commons, allowing the omission from the oath of the words to which as a Jew he conscientiously objected, rendered it possible for him to take his seat. He con- tinued to represent the City of London till 1874. His eldest son, Nathan (b. 1840), was created a peer as Baron Rothschild in 1885. Jacob (1792-1868), the youngest of the original brothers, was entrusted with the mission of starting the business in Paris after the restoration of the Bourbons, for whom he negotiated large loans. At the Revolution of 1848 he was a heavy loser, and had also to be protected for a time by a special guard. It was by his capital that the earliest railways were constructed in France ; the profits he obtained from the speculation were very large. He died on the 15th of November 1868. The Naples branch was superintended by another of the brothers, Karl (1780- 1855). It was always the least important of the five, and after the annexation of Naples to Italy in i860 it was discontinued.

See Das Haus Rothschild (1858); Picciotto, Sketches of Anglo- Jewish History (1875) ; Francis, Chronicles and Characters of the Stock Exchange (1853); Treskow, Biographische Notizen iiber Nathan Meyer Rothschild nebst seinem Testament (1837); Roqueplan, Le Baron James de Rothschild (1868).

ROTHWELL, an urban district in the Normanton parlia- mentary division of the West Riding of Yorkshire, England, 4 m. S.E. of Leeds. Pop. (1901) 11,702. The church of the Holy Trinity, though largely restored, retains some good Decorated details. Rothwell soon after the Conquest was granted as a dependency of the castle of Pontefract to the Lacys, who erected here a baronial residence of which there are slight remains. Coal and stone are obtained in the neighbour- hood, and the town possesses match- works and rope and twine factories in which the majority of the large industrial population is employed.

ROTIFERA (or Rotatoria), a small, in many respects well- defined and somewhat isolated, class of the animal kingdom. Now familiarly known as ” wheel animalcules,” from the wheel-like motion produced by the tings of cilia which generally occur in the head region, the so- called rotatory organs, they were first discovered by A. Leeuwenhoek, to whom we also owe the discovery of Bacteria and ciliate Infusoria. Leeuwen- hoek described Rotifer vulgaris in 1702, and he subsequently described Melicerta ringens and other species. A great variety of forms were described by other observers, but they were not separated as a class from the unicellular organisms {Protozoa) with

which they usually occur, until the appearance of C. G. Ehrenberg's monograph, which contained a mass of detail regarding their structure. At the present day few groups of the animal kingdom are so well known to the microscopist, few groups present more interesting affinities to the morpholo- gist, and few multicellular animals such a low physiological condition.

A rotifer may be regarded as typically a hemisphere or half an oblate spheroid or paraboloid with a mouth somewhere on the flat end (" disk " or " corona "), which bears a usually double ciliated ring, the outer zone the " cingulum," and inner the "trochus": this ring serves both for progression and for bringing up food. The body-wall, cuticulized outside, is formed by a single layer of ill- defined cells, and surrounds the simple body cavity (archicoele) , traversed by simple or branched muscular fibres (" mesenchyme ") (fig. 1, m,m). The mouth opens through a narrow pharynx (p) into a chamber which is (as in Crustacea) at once crop and gizzard, the mastax {ma), whose thickenings are imbedded in the postero- ventral wall. A slender ciliated gullet {e) leads into a large stomach {st) whose wall consists of large richly ciliated cells with usually a pair of simple secretory sacs opening into it: it may open through an intestine or rectum into the cloaca. A pair of coiled nephridial

tubes (n) formed of a file of perforated " drain-pipe " cells, with ciliated tag-like " flame " cells (/), open into a contractile bladder {bl),

a_\

Fig. 1. — Notommata naias. A and B represent the same animal, some of the orgaps being shown in one figure and some in the other, oc, eye-spots; g, nerve ganglion; p, pharynx; ma, mastax; e, oesophagus; st, stomach; a, anus, opening into the cloaca; gl, cement-glands in the foot; n, nephridia; f, flame- cells; bl, bladder; m, m, muscles; ov, ovary (vitellarium alone seen).

which passes by a slender duct into the cloaca. Into this also opens the genital duct from the single or paired gonad {ov). The simple nerve-ganglion or brain (g) lies on the anterodorsal side of the pharynx, and by its position determines the orientation of the animal, the cloacal opening lying on the same side, and the course of the gut being " neural." The sense organs are a pair of pigmented eyes {oc), and two pairs of antennae, one anterior proximal and near the wreath, the other distal and usually more or less lateral. The sexes are always separate, the males being of very rare occurrence in most cases. In the

female the gonad is complex as in flatworms, composed of a germary for the formation of the eggs, and a vitellary, much more conspicuous and alone figured {ov) , consisting of a definite number of large nucleated cells for the nourishment of the eggs. The apical end of the rotifer usually narrows suddenly beyond the curve of the gut and the cloacal aperture to form the foot of pseudo- podium which ends in an organ of attachment, a pair of movable toes, each with the opening of a cement-gland (gl) at its tip. Thus for orientation we place the rotifer like the cuttle-fish, head down- wards: the ciliated disk is basal or oral, proximal to the rest of the animal, the foot is apical, and the brain and cloacal aperture are anterodorsal. It is in this position that free-swimming forms glide over the substratum of organic debris in which they find their food.

The cuticle may be locally or generally hardened, in the latter case being termed a lorica. Often the head is retractile, and a constriction of flexible cuticle distal to it is termed a neck: in Philodinaceae there are a series of thin flexible rings which permit both distal and proximal ends to be telescoped into the middle ; and in Taphrocampa, regular constrictions of the whole bodywall give an appearance of metemeric segmentation to the body. In Philo- dinacea accessory toes are found, unfurnished with cement-glands and distinguished as spurs.

Corona or Disk. — This typically consists of two concentric zones, the trochus and cingulum, often separated by a groove or gutter which may be finely ciliated; but in several genera of no close affinity, where it is very oblique to the longitudinal axis of the body, it is represented by a general ciliation of the surface {Taphro- campa, Rattulus, Copeus, Adineta). We may suppose that primi- tively the mouth was seated in the centre of a funnel-shaped disk, surrounded by a double wreath. The nearest approach to this is found in Microcodon (fig. 2, 1) and its allies, the trochus being oval with two median gaps, the cingulum, more delicate, and com- plete. In Floscul ariaceae the trochus is a horseshoe-shaped ridge

deep down in the funnel-shaped disk. The cingulum appears to be represented by the margin, usually produced into long petal-like

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Fig. 2. — Diagrammatic Views of Disks of Rotifers: cingulum continuous; trochus dotted; gro'ove shaded; mouth black.

I, Simple disk of Microcodon; 2, bdelloid disk of Rotifer and of most Melicertids showing dorsal gap; 3, disk of Hydatina, with lobed ridges in the groove, bearing vibratile styles (membranelles) ; 4, disk of Melicerta ringens and M. conifera; the star represents the ciliated cup connected by ciliated depressions with the groove; 5, disk of Conochilus, like the Bdelloid, but with mouth antero-dorsal, the gap postero-ventral ; 6, disk of Stephanoceros — cingulum broken up into setiferous lobes, groove a naked funnel, trochus a horseshoe-shaped ridge, mouth central.

lobes, fringed with long stiffish setae, which in Stephanoceros are vibratile at intervals, seemingly at will. In Floscularia they serve

to convert the lobed funnel into an effi- cient casting net or clasp net: in one species (F. pelagica) there is an outer girdle of fine cilia for swimming. In Ap- silus and A trochus (fig. 3, b, d) the cingulum is a mere 'contractile hood. In most rotifers, on the contrary, the trochus is stronger than the cingulum, often lobed, and with some of its cilia aggre- gated into vibratile styles homologous with the comb- plates of Ctenophora (q.v.) and the mem- branelles of ciliate Infusoria (

tion. Thus the rotifer is, as it were, constantly drawn forward into the centre of this vortex ring. There is a dorsal interruption to the disk, in-

From H. S. Jennings in American Naturalist, vol. xxxv., by permission of Ginn & Co.

volving both trochus and cingulum and groove – in this case the two halves of the disk may be developed in lobes, flower-shaped in Melicerta ringens, but often rounded and projecting like kettledrums. These give a strong impression of two crown wheels revolving in the same sense. This appearance puzzled the older observers, who were led thereby to give the name " wheel-bearers " to the group, until the true character of c'liary motion was recognized; for a wheel cannot be

i 1 organic continuity with the support on which it rotates In Conochilus (fig. 2, 5), a Melicertan, the mouth is displaced towards the antero-dorsal side and the gap is postero-ventral.

In Melicerta ringens and M. conifera (fig. 2, 4; fig. 3, e,f) there is a glandular ciliated pit between the mouth and the chin into which the overflow water c *S!Xˆi

passes by a pair of gutters, and in which fine particles are ag- gregated into pellets, which the animal deposits, as formed, on the edge of its tube and so builds it up. M. janus builds up a tube by pellets of its own faeces (fig. 3, g). In most Ploima the dorsal gap is not well marked, and the trochus is broken up into a number of lobes, often furnished with vibratile styles, _ in front and at the sides, but ventrally passing into the uniformly ciliated oral funnel.

Other ciliated or- gans to be noticed are the proboscis cup of Bdelloidaceae, and the toes of Pedalion. Besides these Syn- chaetadae and Notom- matidae (fig. 7) possess a pair of aurioles, great eversible ciliated pouches a little above the disk, utilized in swimming. The mouth begins as a funnel, continued into ■ a narrow pharynx, which in Floscularіaceae is prolonged into a slender tube hanging freely down into the crop: this is followed by the crop-gizzard, also ciliated except behind, where it is hardened into a set of articulated sclerites (trophi) to form the gizzard or mastax. Thus the crop-gizzard has the same com- bination of structures as we find in the stomach of higher Crustacea, with which we may call it homo- plastic. The trophi are (I) a median incus or anvil (fig. 4), Y – shaped, with the foot (fulcrum) distal and the arms (rami)

apical, often independently jointed; (2) with the outer ends of the rami articulate two lateral pieces (mallei), and again com- posed of a distal longitudinal piece (manubrium) and an apical transverse piece (the uncus), the whole recalling, as the name implies, a single-clawed hammer. For the varieties and modifications of the trophi we simply refer to Hudson's figure above. The relative size of the crop to the trophi varies greatly; it is small where the trophi are well developed and com- plex, as well as in Bdelloidea; but in Floscularіaceae it is large, and so it is in Asplanchnaceae. Eversible trophi of the forcipate or virgate type, which can be used for nibbling, are common in Ploima, notably Rattulidae, and are used for attachment to the host in the parasitic Seisonaceae, &c. In Asplanchnaceae also,

From C. T. Hudson in Quar. Journal of Microscopical Science, vol. xxiv., by permission of J. & A. Churchill.

Fig. 4. — Types of Trophi. a, malleate, with enlarged view of malleus above — the Y-shaped incus consists of a short median fulcrum bearing two large rami, each of which is in contact with a stout malleus consisting of a toothed uncus carried on a long manubrium; b, sub-malleate, with enlarged view of malleus — the manubria are twice as long as the 3- to 5-toothed unci ; c, virgate — mallei rod-like, manubria and fulcrum very long, unci 1- or 2-toothed; d, forcipate — rami large and used as a for- ceps, mallei rod-like, unci pointed or evan- escent; e, incudate — stout fulcrum, rami forming a forceps, mallei evanescent ; /, un- cinate — unci large, 2-toothed, manubria evanescent, incus slender; g, ramate — rami subquadrantic, fulcrum rudimentary, man; ubria evanescent “, ft,malleo-ramate — mallei fastened by their unci to the rami, manubria looped, rami large and fulcrum slender.

where the whole crop is strengthened by a framework of bars, the incudate mastax lies in a little postero-ventral pouch which can be everted through the crop and mouth. The stomach is generally large; its wall consists of a layer of very large ciliated cells, which often contain fat globules and yellowish-green or brown particles, and outside these a connective tissue membrane; muscular fibrillae have also been described. Very constantly a pair of simple sack- like glands open into the stomach, and probably represent the hepato-pancreatic glands of other Invertebrates.

Following upon the stomach there is a longer or shorter intestine, which ends in the cloaca. The intestine is lined by ciliated cells. In forms living in a tube the intestine turns round and runs forward, the cloaca being placed so as to debouch over the margin of the tube. The cloaca is often very large; the nephridia and oviducts may open into it, and the eggs lodge there on their way outwards; they are thrown out, as are the faecal masses, by an eversion of the cloaca. Asplanchna, Notommata seiboldii, and certain species of Ascomorpha are devoid of intestine or anus, excrementitious matters being ejected through the mouth. The body cavity (archicoele) contains a fluid in which very minute corpuscles have been detected. There is no trace of a true vascular system. The nephridia (fig. 1, B, n) present a very interesting stage of develop- ment. They consist of a pair of tubules with an intracellular lumen running up the sides of the body, at times merely sinuous, at others considerably convoluted. From these are given off at irregular intervals short lateral branches, each of which terminates in

a flame-cell (/) precisely similar in structure to the flame-cells found in Planarians, Trematodes and Cestodes ; here as there the question whether they are open to the body cavity or not must probably be answered in the negative. At the base these tubes open either into a permanent bladder (fig. I, bl) which communicates with the cloaca, or directly into the cloaca. They have the same functions as the contractile vacuole of freshwater Protozoa (q.v.).

Nervous System. — There is a large ganglion lying in close contact with the pharynx, proximal to the crop and on its antero-dorsal side; in Bdelloidaceae at least it is united by short connectives with a smaller postero-ventral ganglion to form a nerve collar. From this simple nerve fibres are given off to the body-wall, especially

Fig. 5. — Pedalion mira. A, lateral surface view of an adult female : a, median ventral appendage; b, median dorsal appendage; c, distal ventro-lateral appendage; d, dorso-lateral appendage; /, dorsal antenna; g, “chin”; x’, cephalotroch. B, lateral view, showing viscera: oc, eye-spots; n, nephridia; e, ciliated toes; other letters as above. C, ventral view: x’, trochus; x, cingulum; other letters as above. D, ventral view, showing the musculature (cf. text). E, dorsal view of a male: a, lateral appendages; b, dorsal appendage. F, lateral view of a male. G, enlarged view of the antenna /. H, enlarged view of the median ventral appendage. (All after Hudson.)

to the ciliated cells of the corona, to the foot, and also to the muscles and sense organs.

The sense organs are eyes, antennae, sensory styles and a statocyst in a few species. The eyes are refractive globules set in a cup of red pigment traversed by a nerve fibre, and lie on the proximal side of the body, directly on the postero-dorsal surface of the brain, or at a little distance from it, on the neck, often within the circle on the corona, and usually well within the transparent body. There may be one, a pair, or rarely more, the outer ones being more or less rudimentary. The antennae are short tubular extensions of the body wall, sometimes retractile with a depressed tip from which protrudes a tuft of fine stiff bristles. They are possibly organs of ex- ternal taste (smell) as well as of touch. Typically there are two pairs — a proximal, more or less approximated on the postero-dorsal surface, and a distal pair, more widely separate. But the proximal pair are often fused into a single median antenna (supplied, however, by two nerves), and in one case at least the distal pair may be similarly fused. Additional paired antennae may occur within the coronal surface, which is the seat of the sensory styles, of less complex structure, which occur in many

genera. The statocyst (retro-cerebral organ of P. Marius de Beauchamp) is a sac filled with highly refractive granules soluble in dilute acids, and opening by a slender duct (or a pair) to the surface : its function is doubtless that of an organ of equilibrium, and it resembles in its opening to the surface the primitive internal ear of even Vertebrates, for the duct to the surface persists through life in the sharks.

Locomotor Organs. — Most free rotifers swim by the corona, aided by the ciliated auricles when present. In Bdelloidaceae this may alternate with a leech-like gait ; the corona being withdrawn, the cupped end of the proboscis serves as a sucker for attachment alternately with the adherent foot, so that the animal loops its way along. In two families motile articulated rods occur; in Triarthridae they probably simply expand the dimensions of the body in adaptation to life at the surface ; or as a protection against being swallowed by their smaller foes. In Polyurthra and Pteroessa they are numerous, pinnated (feathered), and are doubtless used for active swimming by jerks; they can be moved up or down, by special muscles attached to their bases, which project into the body.

Fig. 6. — Male Rotifers. 1, Euchlanis deflexa; 2, lateral; 2a, dorsal views of Colurus bicuspidatus; 3, Notops brachionus ; 4, Diglena permollis; 5, Gastropus minor; 6, Anuraea serrata; 7, Asco- morpha parasita; 8, Notholca heptodon. (Drawn from specimens by F. R. Dixon Nuttall.)

In Pedalion (fig. 5), a remarkable form discovered by Dr C. J. Hudson in 1871 and found in numbers several times since, these

appendages have acquired a new and quite special development. They are six in number, median, ventral and dorsal, and two unequal lateral pairs. The largest is placed ventrally at some distance distal to the mouth. Its free extremity is a plumose fan-like expansion (fig. 5, ha and H). It is, in common with others, a hollow process into which run two pairs of broad, coarsely transversely striated muscles. Each pair has a single insertion on the inner wall — the one pair near the free extremity of the limb, the other near its attachment; the bands run up, one of each pair on each side, and run right round the body forming an incomplete muscular girdle, the ends approximating in the median line. Above this point springs the large median dorsal limb, which

terminates in groups of long setae. It presents a single pair of muscles attached along its inner wall which run up and form a muscular girdle round the body in its posterior third. On either side is attached a dorso- lateral and ventro-lateral appendage, each with a fan-like plumose termination consisting of compound hairs or setae, found elsewhere only among arthropods (q.v.) ; each of these is moved by muscles running upwards towards the neck and arising immediately under the trochal disk, the inferior ventro-lateral pair also presenting muscles which form a girdle in the hind region of the body. It bears a group of long setose hairs the bases of which are connected with the nerve fibre. There are also two pairs of distal antennae. Pedalion presents a pair of ciliated toes in the posterior region of the body (fig. 5, B, C, and D, e), which it can apparently use as a means of attachment; Dr Hudson states that he has seen it anchored by these and swimming round and round in a circle.

Reproduction Organs. — Rotifera are unisexual, with the sexes dimorphic. The ovary is, as in many Platyhelminthes, duplex; one

part, the germary, being an organ for the production by cell multiplication of the germ-cells or eggs proper, the other, the vitellarium, much more conspicuous and usu- ally consisting of a de- finite number of large cells, producing yolk material for the growth of the egg. The whole ovary is unilateral and unpaired in most rotifers ; symmetrical in Asplanchnaceae, Philodinaceae and

Seisonaceae. In As- planchnaceae the ger- mary is median, cor- tinuous at the distal end with the middle of the transverse horse- shoe- shaped vitellary. In Bdelloidaceae and vol. Seisonaceae the whole xxxv., by permission of Ginn & Co. organ is paired, the

Fig. 7. — Loricate Rotifers, a, Notholca germary proximal,

longispina, lorica only; 6, Anuraea the vitellary next the aculeata, like the former, a floating cloaca. As a rule, pelagic type (plankton proper) ; c, Syn- the wall of the ovary chaeta stylata; corona with accessory is continued into a antennae and sensory styles; auricles for uterine tube opening swimming — an actively swimming pelagic j n to the cloaca ; but type (nekton) ; d, Pterodina patina, with in Philodiftaceae this is bdelloid corona and retractile foot with absent, and the young terminal ciliated cup ; e, Distyla gissensis are free in the body partly extended ;/, Rattulus tigris. cavity and escape by

perforating the cloacal walls. The male organs are usually a testis, a large seminal bladder and a protrusible penis. The males are unlike

the females in most species ; only in Eosphora digitata, Rhinops vitrea, Proales werneckii, and the Seisonaceae a complete digestive system is present. Frequently the foot is ciliated at the tip, as in the young of tubicolous forms.

The males of rotifers are of relatively rare occurrence, except in the genus Asplanchna, where they were first recognized as such by Bright-well in 1 841; though those of Hydatina had long since been seen and described as a distinct genus. Despite their rare occurrence, the males of over one hundred and twenty species have now been recognized, and we may well believe that all species will be found to present males. This statement may seem to need qualification; for the male of no Bdelloid has been seen, and there is but a doubtful record of ” winter-eggs ” in this group. But possibly, as in Seisona- ceae, the males resemble the females, and have escaped recognition. It may, however, well be that the capacity for wintering in the dry state has physiologically replaced the need for resistent fertilized eggs. Insemination takes place either by the introduction of the penis into the cloaca of the female, or by the puncture of the body- wall of the female by the penis, and the injection of the sperm into

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the body cavity, whence the single spermatozoa must make their way to the eggs. The females habitually produce eggs without impregnation, which again habitually develop into females, more rarely into males. These unfertilized eggs develop directly, often in the uterus. In other cases the eggs are liberated earlier and adhere to the foot, or are hatched within the tube (fig. 3, b, c). The impregnated eggs undergo a very partial development in the mother, and these pass into a state of rest, for which they are furnished with a dense shell. They always give rise to partheno- genetic females (see Reproduction). The thin-walled eggs are often termed ” summer-eggs,” the fertilized ones ” winter ” or ” ephippial ” eggs (by parity with the phyllopod Entomostraca, q.v.). But the appearance of males seems to be as much associated with those of summer drought as of winter cold. No adequate knowledge of the conditions under which males arise has been established. The phenomenon of seasonal dimorphism is of especial moment for the plankton dwellers. Not only is the appearance of males regular, but the forms of the females at different times of the year may be so distinct as to have led them to be classed as distinct species.

Development. — The egg is holoblastic, but the segmentation is very unequal, recalling that of marine annelids and of molluscs. Gastrulation takes place by epiboly, and the stomodaeum (oral invagination — mastax pharynx) takes place in two stages of the region of the closed blastopore. Un- like the molluscs and ~ˆ p annelids, however, the cloacal invagination lies outside this region, and the foot is formed by an elongation of the end of the body between the two apertures. The nerve ganglion is formed by an ingrowth of epiblast, and so are the pedal glands. ˆ The body cavity is the primitive blastocoele.

Relationships and Mor- phology. — Passing over the earlier authors who regarded this group as allied to Infusoria, a view first contested by Dujar- din, T. H. Huxley viewed them as equivalent to and on a level with the larvae of Echinoderms, and of such other trocho- phore larvae as resem- bled these, a view gener- ally adopted. But it became more and more apparent that the larvae of this category de- veloped mouth, gut and anus by the closure in the middle of such a slit- like blastopore opening into a sack-like stomach as is seen in the larvae of Turbellaria and Ne- mertina. The extra- blastoporic opening of the cloaca leads us to a verv different view, which finds negative support in the failure of previous morphologists to adapt the details of develop- ment and of the struc- ture of the disk to their identification of ” trochus ” and ” cingulum ” with the preoral and postoral wreaths of the trochophore larva. We homologize the rotifer with the Tur- bellarian larva (fig. 8, A), and with the preoral or upper part of the trochopore (fig. 8, E, F). Its adhesive foot is paralleled by a cup- shaped ciliated depression, possibly nervous, found in all the larvae cited, except some Echinoderms, and which in Asterids and Crinoids actually serves as an organ of attachment. This view obviates the deed for assuming the complicated flexures of the wreath which has to be done on other assumptions (see Rotifera, Encycl. Brit. ed. 9). Thus Trochosphaera (fig. 8, D) (which has a male of the same type as Melicerta, &c.) is an extremely modified type, and its resemblance to the trochophore larva of Lepado- rhynchus or Polygordius is only superficial. We may note that it was long since shown that the apical organ (at first assumed to De the brain) of these larvae was innervated from an anterior thickening of the circular nerve ring, corresponding with the brain of Rotifers; the nerve cells immediately below the pit are the ordinary bipolar

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Fig. 8. — Diagram of morphological rela- tions of Rotifera. A, pilidium larva of nemertine; B, Asplanchnapus schematized; C, a ploimal rotifer; D, trochosphaera female (schematized from Semper) ; E, veliger larva of mol- lusc; F, trochophore larva of annelid. a, anus; ap, apical organ, correspond- ing to foot of rotifers; at, median antenna, united by a nerve to br, brain (letter omitted in B) ; bl, bladder, re- ceiving ramified kidney in B, C, D; /, foot, and f.g, its cement-gland ; g, ovary ; k, kidney ; m, mouth ; n, supra- oesophageal ganglion; nr, nerve ring in section.

ganglion cells below invertebrate sense-organs. Moreover, the body cavity of the Rotifers is a primitive archicoele; the persistent or accrescent cleft between epiblast and hypoblast, traversed by mesenchymal muscular bands. Thus we regard Rotifers as an independent stem branching off at the outset of the rise from the Platode type to higher Invertebrata The Polyzoa {av). which in many ways recall Rotifers, appear to be equally independent.

The following classification of Rotifers is our modification of that of Hudson and Gosse, further altered through considerations put

From H.S Jennings in American Naturalist, vol. xxxv.,by permission of Ginn & Co. Fig. 9. — a, Microcodon clavus, showing corona, lateral antennae and jointed foot; b, Rhinops vitrea, corona from below, showing proboscidiform extension containing eyes; c, Philodina megalo- trocha; d, head of Rotifer macroceros, postero-ventral view, showing lobes of corona, and antero-dorsal median antenna, telescopic with setae; e, Rotifer (Actinurus) neptunius, showing head with retracted corona, and protruded dorsal proboscis bearing median antenna, and telescopic foot with toes and spurs; /. Asplanchnopus myrmeleo, showing horseshoe-shaped germarium (left), blind saccate stomach (right), apical bladder, foot, &c. ; g, Asplanchna ebbesbornii — the coiled tube at left is a kidney; h, i, incudate jaws of Asplanchna brightwellii and girodii chiefly formed of rami, with the rudimentary mallei parallel and external to them; j, Ascomorpha hyalina.

forward by C. Wesenberg-Lund, which, however, we do not consider wholly convincing. He notably regards an oblique disk with uniform ciliation as primitive, a view which we cannot adopt.

Classification : — •

(A.) Disk usually with well-marked strong trochus, ciliated groove and more delicate cingulua interrupted by an antero-dorsal median gap, usually more or less bilobed. (i.) Trophi incudate:

1. Asplanchnaceae ; trochus circular; foot _ absent or minute; trophi incudate; stomach blind; males frequent, not very dissimilar to females. Asplanchna Gosse (fig. 9, g-i) ; Asplanchnopus Deguerne (fig. 9, /) ; Ascomorpha Perty (fig. 9, j).

(ii.) Trophi malleoramal:

2. Melicertaceae ; females tubicolous, usually attached, or forming spherical floating social aggregates; males free swimming. Melicerta Schranck (fig. 3, e, /); Oecistes Ehrenberg; Lacinularia Schweigger; Conochilus Ehrenberg, with gap postero-ventral and mouth antero-dorsal (fig. 2, 5).

3_ Trochosphaeraceae ; female footless; subspherical, the corona bulging into a hemisphere which may equal the hemispherical body; anus apical; male as in Melicertaceae, Trochosphaere Semper (fig. 8, D).

E°h

4. Ploimoidaceae; subconical; corona bilobed; retractile foot absent or ciliated; motile appendages present in two families.

(a) Pterodinidea ; foot a ciliated cup; cuticle forming flat lorica. Pterodina Ehr. (fig. 7, d).

(6) Triarthridae ; body with a pair of long cervical spines pointing distally and serving for leaping movements or to extend the body and make it too big for small enemies to swallow; Pedetes Gosse (no median spines) ; Triarthra Ehr., one postero-ventral spine; Tetramastix Zacharias, two unequal median spines.

(c) Pedalionidae , foot represented by two styles, sometimes ciliated; body provided with six hollow-jointed muscular fins for swimming and leaping. Pedalion Hudson (fig. 5). (iii.) Trophi ramate:

5. Bdelloidaceae ; foot with two toes and accessory spurs or a simple perforated disk; body telescopic at either end. with an antero-dorsal proboscis ending in a ciliate cup and bearing the proximal antenna; corona usually bilobed, very wheel-like. Males if present probably like the females. Germary and ovary paired ; oviduct absent ;

oung viviparous. Rotifer Schrank (fig. 9, d, e) ; Philodina “hr. (fig. 9, c); Callidina Ehr. (eyeless); Adineta Hudson is eyeless with the corona uniformly ciliated, and pro- boscis adnate, hooked, (iv.) Trophi uncinate :

Floscularіaceae ; disk a contractile cup, often lobed, the cingulum of long vibratile cilia, of very long motionless bristles or absent, rarely with an outer zone of fine cilia. Trochus a pair of ridges or horseshoe open in front. Oral funnel produced into a fine tube hanging freely into a pharyngeal cup, containing the uncinate trophi. Body- wall usually traversed by a network of canals serving by their contraction to expand the disk. Males and larvae with a ciliated pedal cup and a simple ciliated disk, (a) Floscularidae ; tubicolous, with a lobed disk, bearing stiff or vibratile setae. Floscularia Oken (fig. 3, b); Stephanoceros Ehr. (fig. 3, a). (6) Acyclidae. Disk entire or tentaculate, not seti- ferous; Acyclus Leidz (fig. 3, c). Foot repre- sented by a button-like disk, carried far from the posterior surface; Apsilus Metchnikoff (fig. 3, d) ; Atrochus Wierzezski (fig. 3, c). (B) Ploimaeae; disk variable, often circular, sometimes with a lobed trochus bearing membranelles (vibratile styles); trophi complete, malleate, submalleate, virgate, or forcipate; anus subapical; foot usually short, and usually bearing two toes which may be much elongated.

Illoricata, cuticle soft; ciliated exsertile auricles

above the disk sometimes present. Albertia

Dujardin; Drilophagus Vejdovsky; Microcodon

Ehr. (fig. 9, a) ; Rhinops Hudson (fig. 9, b) ;

Synchaeta Ehr. (fig. 7, c); Hydatina Ehr. has no

eye ; Notommata Ehr. (restricted by Gosse) ; Copens

Gosse; Nolops Hudson (fig. 6, 3); Proales Gosse;

Gastroschiza\ Diglena Ehr. (fig. 6, 4).

Loricata, cuticle hardened armour-like, often

sculptured; Polyarthra Ehr.; Pedetes Gosse;

Euchlanis Ehr. (fig. 6, 1); Anuraea Ehr.

(fig. 7, b); Nothoka Gosse (fig. 7, a);

Distylis Eckstein (fig. 7, e) ; Rattulus Ehr.

(fig. 7. f) 1 Colurus Ehr. (fig. 6, 2) ; Taphro-

campa Gosse.

(C.) Seisonaceae. Body elongated with a narrow neck above

the disk; foot ending in a terminal perforated disk. Trophi

virgate exsertile; germary paired; genito-urinary cloaca opening

above the neck in the male, subapically in the female. Gut blind

(Paraseison), or opening into cloaca (Seison). Males resembling

females, common. All known species are parasitic on the Crustacean

Nebalia; Seison Claus; Paraseison Plate.

Habitat and Habits. — The Rotifera are all aquatic, the majority dwelling in fresh water with Protozoa and Protophyta, as well as Entomostracous Crustacea. This association with Protophyta accounts for their study by many distinguished botanists, such as W. C. Williamson and F. Cohn. Some are moss-dwellers, inhabiting the surface film of water that bathes these plants: such especially are the Bdelloids, with their exceptional capacity for resisting desiccation. Others — the majority— live among weeds, the tubicolous ones mostly upon them. A few are sapropelic, haunting the looser debris that forms the uppermost layer of the bottom ooze of quiet waters: we may cite the aberrant Floscularian Atrochus. Widely different are the habits of the plankton forms, which float or swim near the surface, and are often provided with long

cuticular extensions for this purpose (fig. 7, a, b). Asplanchna- ceae, plankton, dwellers in small pools, are, however, ovoid, and Trochosphaera is spherical and must owe its floating powers to the low density of the liquid in its enormously dilated body- cavity. Lacinularia racemovata and Conochilus form free floating aggregates, the eggs, as laid, hatching and the young settling among the approximated gelatinous tubes of the parents. Some species only

frequent the clearest waters; but the lovely transparent Hydatina senta (fig. 2, 3) likes water contaminated by the visits of cattle or the drainings of manure. Drilo- phagus and Albertia are parasitic on the surface or within the gut of Naid Oligochaete worms: Seisonaceae are ectoparasitic on the Crustacean Nebalia, Proales werneckii forms galls within the Conferva Vaucheria, and P. parasita infests the central jelly of the Phytoflagellate Volvox; P. petromyzon is a frequent commensal in the gill cavity of some Cladoceran Crustacean Eurycereus lamellatus.

The geographical distribution is cosmopolitan, as is the case with Protozoa and Protophyta of similar habits. A curious fact is that when a new and striking form is found first in one place it is shortly after collected from widely separated areas. In the case of one genus, Gastroschiza, this led to the creation of no less than six generic names.

History and Bibliography.— As rotifers are common in ponds, the first workers with the microscope observed them repeatedly, the first record being that of John Harris in 1696, who found a Bdelloid in a gallipot that had been standing in his window. Leeuwenhoek found and described some tubicolous species; and during the 1 8th century a fair number of species were observed, figured and described with names. During this time the illusion of a wheel or wheels produced by the ciliary action of the disk had puzzled all observers. C. E. Ehrenberg included the Rotifers in his Infusionsthiere, and described and figured with fair precision many of the genera and species. Dujardin gave a less detailed but more accurate account under the name of Zoophytes Systolides. The next full work was a valuable compilation by W. C. Williamson (best known as a botanist) in Pritchard's Infusoria, in 1861. Much work was done with the gradual introduction of improved methods during the last forty years of the century. The discovery and recognition of the males was made, however, at the close of the fifties. P. H. Gosse collected and described many species, and elucidated the structure of the mastax in 1856. Zoologists of the standing of Huxley, Claus and Leydig added to our knowledge of the anatomy and to the theory of their relations. But the monumental monograph of C. T. Hudson and Gosse containing a new classification, an illustrated description of all the then known species and much information on habits and structure, provided students with an easy access to the domain and stimulated many to work hard at the group. Of these new-comers we may cite C. F. Rousselet, who has found many new species and many unknown males of known species, elucidated habits and faithfully kept record of the publications on the class in the Journal of the Royal Microscopical Society. He has moreover elaborated a method for preserving Rotifera for microscopic

observa- tion, so that the types of each observer are now as readily available for comparison as the plant-specimens of the botanist's herbarium. C. Zelinka has given us the most detailed anatomical accounts we possess for several Bdelloidaceae, and was the first to utilize modern methods of microscopic technique on a complete scale.

C. G. Ehrenberg, Die Infusionsthiere als vollkpmmenere Organis- men (1838); F. Dujardin, Histoire naturelle des zoophytes (1841); T. H. Huxley, "Lacinularia socialis," Trans. Micr. Soc. i. (1853); P. H. Gosse, " Manducatory Organs in Class Rotifera," Phil. Trans. (1856); W. C. Williamson, "The Rotifera" in A. Pritchard's History of the Infusoria (1861); C. T. Hudson and P. H. Gosse, The Rotifera (1886), and supplement (1889) ; Marcus Hartog, " Roti- fera," in Cambridge Natural History, vol. ii., reprinted 1901 ; H. S. Jennings, Synopses of North American Invertebrates, xvii., " The Rotifera," Amer. Nat. xxxv. (1901); C. F. Rousselet, numerous papers in Journ. Micr. Soc. and Journ. Quekett Club; C. Wesen- berg-Lund, " Danmarks Rotifera," in Vid. Meddel. Nat. For. Kjobenhavn (1899); C. Zelinka, " Studien iiber Rotiferen," in Zeit. Wiss. Zool. xliv. (1886), xlvii. (1888), liii. (1891).
(M. Ha.)

ROTORUA, a town of Rotorua county, North Island, New Zealand. It lies in the midst of a remarkable volcanic district generally known as the Hot Spring district, or fancifully as the Wonderland, which covers an area of 660 sq. m. and extends 160 m. from N.E. to S.W. from White Island, an active volcanic cone in the Bay of Plenty to the mountains of Tongariro, Ngaruhoe and Ruapehu in the interior of the island, S.W. of lake Taupo. Rotorua attracts many visitors on account of the beauty and scientific interest of the locality and the bathing

in its various medicinal springs. It is a scattered town- ship lying on the south-western shore of lake Rotorua, amid hills reaching 2600 ft. in the immediate neighbourhood, and much of the volcanic soil supports a rich growth of forest or ” bush.”

The springs are principally alkaline, alkaline and siliceous, acidic, or acidic and hepatic (sulphurous). The township includes the Maori village of Ohinemutu, an interesting collection of native dwellings, whose inmates constantly use the numerous rudely excavated baths which are fed by springs varying in temperature from 6o° F. to the boiling-point, and are in some cases used for cooking. In the vicinity, on the lake-shore, is the government sanatorium. Two miles south of Rotorua is another native village, Whakarewarewa, where there are geysers as well as hot springs. Four miles from Rotorua, near the centre of the lake, the island of Mokoia rises to 151 8 ft. It is partly under grass and partly wooded, and is inhabited by Maoris, by whom it is regarded as holy ground. A short channel connects lake Rotorua with lake Rotoiti to the N.E. At the eastern end steep_ cliffs rise from the water, and luxuriant vegetation covers the hills. Both this lake and the smaller ones to the east, Rotoehu and Rotoma, have deeply indented shores, and are set in exquisite scenery. The group is known collectively as the Cold Lakes. The waters of Rotoma are of a particularly vivid blue. To the south of Rotoiti is Tikitere, a sombre valley abounding in mud volcanoes, springs and other active volcanic phenomena. Mount Tarawera (16 m. S.E. of Rotorua) is noted for the eruption of June 1886, which changed the outline of several lakes, destroyed the famous Pink and White terraces on the adjoining lake Tarawera, and converted a region of great beauty into a desolate wilderness. A fissure was formed extending nearly 9 m. along the axis of the disturbance, and the mission station of Wairoa (8 m. from Rotorua) on the western shore of the lake was overwhelmed. A line of craters is seen to the south-west. The large lakes Okataina, Kahahi and Rerewhakaitu lie respectively N., W. and S.E. of lake Tarawera.

ROTROU, JEAN DE (1609-1650), French tragic poet, was born on the 19th or 20th of August 1609, at Dreux in Normandy. Rotrou studied at Dreux and at Paris, and, though three years younger than Corneille, began play-writing before him. In 1632 he became playwright to the actors of the Hotel de Bourgogne. With few exceptions, the only events recorded of his life are the successive appearances of his plays and his enrolment in 1635 in the band of five poets who had the duty of turning Richelieu’s dramatic ideas into shape. Rotrou’s own first piece, L’Hypocondriaque (pr. 1631), dedicated to the Comte de Soissons, seigneur of Dreux, appeared when he was only eighteen. In

the same year he published a collection of (Euvres poetiques, including elegies, epistles and religious verse. His second piece, La Bague de I'oubli (pr. 1635), an adaptation in part from the Sortija del Olvido of Lope de Vega, was much more characteristic. It is the first of several plays in which Rotrou endeavoured to naturalize in France the romantic comedy which had flourished in Spain and England instead of the classical tragedy of Seneca and the classical comedy of Terence. Corneille hadkarungs in the same direction. Rotrou's brilliant but hasty and unequal work showed throughout marks of a stronger adhesion to the Spanish model. In 1634, when he printed Cleaginor et Doristee (acted 1630), he said he was already the author of thirty pieces; but this applies no doubt to adapta- tions. Diane (acted 1630; pr. 1633), Les Occasions perdues (acted 1631 ; pr. 1635), which won for him the favour of Richelieu, and L'Heureuse Constance (acted 1631; pr. 1635), which was praised by Anne of Austria, succeeded each other rapidly, and were all in the Spanish manner. In 163 1 Rotrou imitated Plautus in Les Menechmes (pr. 1636), and in 1634 Seneca in his Hercule mourant (pr. 1636). Comedies and tragi-comedies followed. Documents exist showing the sale of four pieces to Antoine de Sommarille for 750 livres tournois in 1636, and in the next year he sold ten to the same bookseller. He spent much time at Le Mans with his patron, M. de Belin, who was one of the opponents of Corneille in the quarrel of the Cid. It has been generally assumed, partly because of a forged letter long accepted as Corneille's, that Rotrou was his generous defender in this matter. He appears to have been no more than neutral, but is credited with an attempt at reconciliation between the parties in a pamphlet printed in 1637, L'Incognu et veritable amy de messieurs de Scttdery et Corneille. M. de Belin died in 1637,

and in 1639 Rotrou bought the post of lieutenant particulier au bailliage at Dreux. In the next year he married Marguerite Camus, and settled down as a model magistrate and pere de famille. Among his pieces written before his marriage were a translation of the Amphitryon of Plautus, under the title of Les Deux Sosies (1636), Antigone (1638), and Laure Persecutee (acted 1637; pr. 1639), in the opposite style to these classical pieces. In 1646 Rotrou produced the first of his four masterpieces, Le Veritable Saint Genest (acted 1646; pr. 1648), a story of Christian martyrdom containing some amusing by- play, one noble speech and a good deal of dignified action. Rotrou uses with considerable success the device of a play within a play. The

actor Genest becomes a real convert while playing the part of a Christian martyr. Incidentally (Act i. Sc. v.) Rotrou pays a noble tribute to the genius of Corneille. Don Bertrand de Cabrere (1647) is a tragi-comedy of merit ; Venceslas (1647 ; pr. 1648) is considered in France his master- piece, and has had several modern revivals; Cosroes (1649) has an Oriental setting, and is claimed as the only absolutely original piece of Rotrou. These masterpieces follow foreign models, and Rotrou's genius is shown in the skill with which he simplifies the plot and strengthens the situations. Saint Genest followed Lope de Vega's Lo fingido verdadero; Venceslas followed the No ay ser padre siendo rey of Francisco de Rojas. In this play Ladislas and his brother both love the princess Cassandra; Ladislas makes his way into her house and in the darkness kills a man whom he thinks to be the duke of Courland, but who is really his brother Alexandre, the favoured lover. In the early morning he meets the king and is confronted by the duke of Courland. The outline of this incident is in the Spanish play, but there the spectators are aware of the ghastly mistake at the time of the murder. Rotrou shows his dramatic skill by concealing the real facts from the audience until they are revealed to the horror-struck Ladislas himself.

In 1650 the plague broke out at Dreux. Rotrou remained at his post, although urgently desired to save himself by going to Paris; caught the disease, and died in a few hours. He was buried at Dreux on the 28th of June 1650. Rotrou's great fertility (he left thirty-five collected plays besides others lost, strayed or uncollected), and perhaps the uncertainty of dramatic plan shown by his hesitation almost to the last between the classical and the romantic style have injured his work. He has no thoroughly good play, hardly one thoroughly good act. But his situations are often pathetic and noble, and as a tragic poet properly so called he is at his best almost the equal of Corneille and of Racine. His single lines and single phrases have a brilliancy and force not to be found in French drama between Corneille and Hugo.

A complete edition of Rotrou was edited in five volumes by Viollet le Due in 1822. In 1882 M. de Ronchaud published a handsome edition of six plays — Saint Genest, Venceslas, Don Bertrand de Cabrere, Antigone, Hercule Mourant and Cosroes. Venceslas and Saint Genest are also to be found in the Chefs-d'osuvre Tragiques of the Collection Didot.

Rotrou's brother, Pierre Rotrou de Saudreville, left a memoir of him which is unfortunately lost, but this is cited by the Abb6 Brillon (1671-1736) as his authority in a Notice biographique sur Jean Rotrou, first printed in 1885 at Chartres under the editorship of L.

Merlet. Other good earlier authorities are NiceYon, Memoires pour servir d, Vhistoire des hommes illustres (1731), vol. xvi. pp. 89-97 ; and the duke de la Vallifere, Bibl. du thi&tre francois depuis son origine (Dresden, 1768), vol. ii. pp. 155-273. Modern works are by J. Jarry, Essai sur les auvres dramatiques de Jean Rotrou (Paris and Lille, 1868) ; Leonce Person, Hist, du Venceslas de Rotrou, suivie de notes critiques et biographiques (1882), in which many legends about Rotrou are discredited; Hist, du veritable Saint Genest de Rotrou (1882), Les Papiers de Pierre Rotrou de Saudre- ville (1883); Henri Chardon, La Vie de Rotrou mieux connue (1884); and Georg Steffens, Jean de Rotrou als Nachahmer Lope de Vega's (Berlin, 1891).

ROTTA, Chrotta, Hrotta (Fr. Cithare, rotta; Ger, Cy- tharc* Rotta), a medieval stringed instrument derived from the Greek cithara. The rotta possessed, in common with all other forerunners of the violin, the chief structural features of the cithara, i.e. the box sound-chest composed of back

and belly either flat or delicately a-rched connected by ribs. The rotta represents the first step in the evolution of the cithara, when arms and cross-bar were replaced by a frame joined to the body, the strings being usually restricted to eight or less. Examples of these early rottas abound in miniatures from the 8th to the 12th century or even the 14th, such as Cotton MS. Vespasian A. I. (Brit. Mus.), 700 a.d., and the MS. copy in the Durham Cathedral Library of the Cassiodorus Com- mentary on the Psalms 1 manu Bedae. The most interesting is a real specimen of wood found in an Alamannic tomb of the 4th to the 7th century at Oberflacht 2 in the Black Forest, and now preserved in the Volker Museum, Berlin.

The next step was the addition of a finger-board and the con- sequent reduction of the strings to three or four, since each string was now capable of producing several notes. In the Caro- lingian Bible presented to Charles the Bald 3 by Count Vivian of Tours there is a fine example of the rotta at this stage, in which the artist has reproduced the position of the fingers of the left hand stopping the strings, and of the right hand pluck- ing them. The same instrument occurs in a companion Bible, known as the Bible of St Paul because it was preserved in the monastery of that name " without the walls " at Rome. Although these MSS. were executed in the 9th century, they do not represent contemporary scenes, but were inspired by Romano- Christian models, if not actually copied from older MSS. This is the only representation yet found of the finger- board thus applied to the rotta. In the final transition pre- ceding the transformation into the guitar, the rotta appears as a guitar-shaped instrument without neck

or head and having a hole large enough to allow the hand to pass through left in the body on each side of the strings. At first this instrument, which developed into the crwth, was twanged with the fingers, but in the nth century it was played with a bow, the bridge having been slightly raised on feet.

The first (and perhaps also the second) of these transitions was accomplished in the Christian East, where, however, the upper frame of the earliest rotta seems to have been at once discarded in favour of a long neck with frets, for which the tanbur undoubtedly supplied the idea. This evolution is to be traced in the miniatures of a single MS., which supplies examples of all the transitions. The miniatures illustrate the Psalms in the Utrecht Psalter; they were beyond doubt originally designed to accompany a Greek or Syriac version. 4 The Utrecht Psalter, executed in the diocese of Reims under Anglo-Saxon influence during the 9th century, is no servile copy, but it owes much of its inspiration and local colour to an unknown Greek or Syrian prototype.

As soon as the neck was added to the guitar-shaped body, the instrument ceased to be a rotta and became a guitar (q.v.), or a guitar-fiddle (q.v.) if played with the bow. Of the rotta, there were two distinct types, the one derived from the cithara, the rotta proper, and the other derived from the lyre, which survived to the 18th century as the Welsh crwth. Although the various forms of the name came to be applied somewhat indiscriminately in different countries and epochs to both types, yet the structural features of both remained true to their respective archetypes.

The words rotta in England and cythara in Germany seem to have clung more especially to the first of these types, while the forms crwth, crowd, crouth were reserved for the bowed instruments, the earliest of which appeared in the nth century. 6

The crwth or crowd, so popular in England during the 14th century, does not seem to have won equal favour in Germany, where at that time the nidel or guitar-fiddle had been popularized by the minne-singers. The crwth derived from the lyre underwent no further development. • (K. S.)

ROTTENBURG, a town and episcopal see of Germany, in the kingdom of Wiirttemberg, situated on the left bank of the Neckar, which is here crossed by two bridges connecting the

1 Both miniatures are reproduced by J. O. Westwood in Facsimiles

(London, 1868).

2 Reproduced in Jahreshefte d. Wiirtemb. Altertums Ver. vol. iii. (Stuttgart, 1846), pi. viii. figs. 10 and n.

3 See Facsimile, by Comte Auguste de Bastard (Paris, 1883). 4 s The whole case of this much-discussed Psalter, with resume's of

the principal writings on the subject of facsimiles of the miniatures bearing on the evolution of the cithara, will be found in Kathleen Schlesinger's Instruments of the Orchestra, pp. 343-82 and pi. iii., vi. and vii. (London, 1909).

6 See Kathleen Schlesinger, op. cit., pp. 334, 338-39 n. and 441-

50.

town with the suburb of Ehingen, 7 m. by rail S.W. of Tubingen. Pop. (1905) 7554. It is the seat of a Roman Catholic bishop, and possesses the fine Gothic cathedral of St Martin; several other churches; an old castle now used as a prison;, and a building, formerly a Jesuit monastery and now the residence of the bishop. The chief industries are the manufacture of machinery, screws, watches and beer, tanning and the cultiva- tion of fruit and hops. Rottenburg passed into the possession of Austria in 1281 and into that of Wurttemberg in 1805. Near the town are the remains of the Roman station of Sumalo- cenna or Salmulocenae.

ROTTERDAM, a city of Holland in the province of South Holland, on both banks of the New Maas, at the confluence of the canalized Rotte, and a junction station 145 m. by rail S.S.E. of the Hague. Steam tramways connect it with Schie- dam, and with Numansdorp on the south of the island of Beier- land, and there is a regular service of steamers by river and canal to Antwerp by way of the South Holland and Zeeland Islands and in every direction. The population of the city was about 20,000 in 1632; 53,212 in 1796; 105,858 in i860; and 379,017 in 1905. Its shipping facilities have raised Rotter- dam to the position of the first commercial city of Holland. By means of the New Waterway (1869-90) to the Hook of Holland it is accessible for the largest ships. The principal quay is the Boompjes ("little trees"), forming the river- front on the north side. Although originally situated exclu- sively en the north or right bank of the Maas, in 1869

Rotterdam was extended to the southern shore by the acquisition of the commune of Feienoord; while in 1886 Delftshaven on the west, and in 1895 Charlois on the south-west and Kralingen on the east, were also incorporated. The river is spanned by a road bridge (1878) and a railway bridge (1877) passing from the Boompjes to the North Island, whence they are continued to the farther shore by swing-bridges through which the largest ships can pass to the upper river. These bridges prove useful in breaking up the ice which forms above them in winter. On the south side of the river are numerous large docks and wharves, while the city proper on the north side consists of a labyrinth of basins and canals with tree-bordered quays.

In the centre of the town is the Beursplein, or Exchange Square, with the large general post office (1875), the ” Amicitia ” club, and the exchange itself (1723). Behind the exchange is the great market-place, built on vaulting over a canal, and containing a bronze statue of Erasmus, who was born in Rotterdam in 1467. The statue is the work of Hendrik de Keyser, and was erected in 1622 (the inscription being added in 1677) to replace an older one. Beyond the market- place is the High Street, which runs along the top of the Maas Dyke. On the west of the city a pretty road planted with trees and grass plots leads from the Zoological Gardens (1857), on the north to the small park overlooking the river. In the park is a statue of the popular poet Hendrik Tollens (d. 1856), a native of the city. Among the churches of Rotterdam are an English church, originally built by the 1st duke of Marl- borough, whose arms may be seen with the royal arms over the entrance. The Groote Kerk, or Laurens Kerk (end of the 15th’ century), contains a fine brass screen (17 15), a celebrated organ with nearly 5000 pipes, and the monuments of Admirals Witte de Witte (d. 1658), Kortenaer (d. 1665), and van Brakel (d. 1690), and other Dutch naval heroes. The lofty tower commands an extensive view. In the New Market adjoining is a fountain adorned with sculptures erected in 1874 to com- memorate the jubilee of the restoration of Dutch independence (1813). The museums of the city comprise an ethnographical museum, the maritime museum established by the Yacht Club in 1874, and the Boyman’s Museum (1867) containing pictures, drawings and engravings, as well as the town library. Of the original collection of pictures bequeathed by F. J. 0. Boyman in 1847, more than half was destroyed by fire in 1864; but the collection has been enlarged since and is representative of both ancient and modern artists. Close to the museum is a statue of the statesman Gysbert Karel van Hogendorp

(1762-1834), a native of the city. Among the remaining buildings must be mentioned the town hall (17th century; restored 1823), the

court-house, the concert-hall of the ” Har- monic ” club, the record office (1900), the leeskabuiet, or sub- scription library and reading-rooms, and the ten-storeyed Witte Huis (1897), which is used for offices and is one of the highest private buildings on the Continent.

The industries comprise the manufacture of tobacco, cigars, margarine, rope, leather, &c, and there are breweries, dis- tilleries and sugar refineries. The gas, electricity (1894) and waterworks (1870) are under municipal control. Shipbuilding yards extend above and below the city, one of the earliest being that of the Netherlands Steamboat Company (1825). It is, however, as a commercial rather than as a manufactur- ing city that Rotterdam is distinguished, its progress in this respect having been very striking. Between 1850 and 1902 the area of canals and docks in use on both sides of the river increased from 96 to over 30c acres, about £2,000,000 having been spent on the building of docks in the last quarter of the 17th century. Besides its maritime trade Rotterdam has an extensive river traffic, not only with Holland, but also with Belgium and Germany. Its overseas trade is principally with the Dutch colonies, New York, La Plata and the east and west coasts of Africa. The great harbour works on the south side of the river required to accommodate this growing trade were planned by the engineer Stieltjes (d. 1878), who has a monument on the North Island. Besides being easily accessible from the river and connected with the rail- ways, the docks are provided with every facility for coaling and loading or discharging cargoes. The larger passenger steamers of the Rotterdamsche Lloyd to Netherlands India and of the Holland-American Steamship Company (the two principal passenger and cargo steamship companies at Rotter- dam) have their berths on the south side of the river. In the centre of the river there is accommodation for over thirty vessels at the mooring buoys. The increase in the import- ance of Rotterdam as a port, apart from the development of the trade of the Netherlands generally, is shown by the fact that whereas in 1846 only 31% of the total trade of the country passed through the port, in 1883 the propor- tion was 50%; in the same year 43-75% of the total number of vessels engaged in Dutch trade used the port of Rotterdam, whereas in 1850 the proportion was only 35-77%. The average number of all vessels using the port annually during the decade 1897-1906 was 7228 of 11,163,624 tons, but a steady increase was recorded during this period, from 6212 ships of 8,434,032 tons in 1897 to 8570 ships of 14,572,246 tons in 1906.

Rotterdam probably owes its existence to two castles, which existed in feudal times. In 1299 John I., count of Holland, granted to the people of Rotterdam the same rights as were enjoyed by the burghers of

Beverwijk, which were identical with those of Haarlem (K. Hegel, Stadte mid Gilden, 1891, Bd. ii.). This privilege marks the origin of the town. In 1489 it was surprised by Francis van Brederode, and in 1572 it was plundered by the Spaniards, who were in possession for four months. It continued to increase in size, various extensions of its boundaries being made, and its trading importance is to a large extent the result of its commercial intercourse with England.

ROTTWEIL, a town of Germany, in the kingdom of Wurttem- berg, lying on a hill on the left bank of the Neckar, 46 m. S.W. of Tubingen by rail. Pop. (1905) 9008. It is partly surrounded by walls, and contains two fine churches, the Gothic Heilige- Kreuz-kirche, built in the 14th century and restored in 1840, and the Capellen-kirche with a Gothic spire 230 ft. high. It has a medieval town hall, several schools and a museum of antiquities. Especially noteworthy is the collection of sculp- tures and pictures of old German art in the chapel of St Law- rence, where there is also a Roman mosaic, found in the vicinity, portraying Orpheus in the centre and, at the sides, Roman I chariot- races and gladiators. The industries of the place

embrace the manufacture of powder, locomotives, machinery, cotton, leather and beer. There is also a considerable trade in live stock, agricultural produce and wine.

Rottweil-Altstadt, which lies about f m. to the south, was a Roman colony. It has an old church and a Cistercian nunnery founded in 1221 and dissolved in 1838. Near the town is Wilhelmshall, with saline springs. In the 13th century Rott- weil became a free imperial city and was subsequently the seat of an imperial court of law, the jurisdiction of which extended over Swabia, the Rhineland and Alsace. The functions of this tribunal came to an end in 1784. In 1803 Rottweil passed into the possession of Wurttemberg.

See Ruckgaber, Geschichte der Stadt Rottweil (3 vols., Rottweil, 1835); and Greiner, Das dltere Recht der Reichsstadt Rottweil (Stuttgart, 1900).

ROTUMAH (Rotuma, Rotuam or Grenville), an island of the South Pacific Ocean, in 12° 30′ S., 177° E., about 300 m. N. by W. of Fiji, of which British colony it is a dependency. Its area is 14 sq. m., and its extreme elevation 800 ft. It is surrounded by coral reefs, and is richly

wooded. Several islets lie round it. The population is about 2200, the natives being Polynesian, though their language has been classified as Melanesian. They are Wesleyans or Roman Catholics. The chief product is copra. A European commissioner resides. Local laws, subject to approval by the legislative council of Fiji, are promul- gated by a regulation board, composed of the commissioner, native chiefs of the seven districts into which the island is divided, and two native magistrates. Rotumah was discovered by Captain Edwards of the " Pandora " in 1791, and was annexed by Great Britain in 1881.

ROUAULT, JOACHIM (d. 1478), French soldier, was a member of an old family of Poitou. He attached himself to the dauphin (afterwards Louis XL) and became his premier squire. He followed Louis in his expedition against the Swiss in 1444, distinguished himself in the war against England in 1448, and received the posts of governor of Blaye and Fronsac and con- stable of Bordeaux. After taking an important part in the battle of Castillon (1453), which resulted in the defeat and death of John Talbot, 1st earl of Shrewsbury, he fought against John V., count of Armagnac, in 1455, and in the following year made a fruitless expedition into Scotland. He took part in the campaign in Catalonia, and became marshal of France in 1461, and governor of Paris in 1471. In 1471 and 1472 he defended Amiens and Beauvais against the Burgundians. Towards the end of his life he was disgraced by Louis XL, and sentenced to banishment and the confiscation of his property.

(M. P.*)

ROUBAIX, a manufacturing town of northern France, in the department of Nord, 6 m. N.E. of Lille on the railway to Ghent. Pop. (1906) 119,955. Roubaix is situated about a mile from the Belgian frontier on the Roubaix Canal, which connects the lower Deule with the Scheldt by way of the Marcq and the Espierre. Tramways connect the town with Lille and with the neighbouring communes of Tourcoing (pop. 62,694), Croix (pop. 16,292) and Wattrelos (pop. 14,618), with which it unites to form one great industrial centre. The chief business of Roubaix is the woollen manufacture, but cotton, silk and other materials are also produced. The chief of these are fancy and figured stuffs for garments, velvet and upholstering fabrics. Wool-combing and wool-dressing works, spinning-mills, weaving establishments, dye-houses and printing-works occupy some 50,000 work-people, and four hundred firms act as commission agents for the sale of raw material and the other requisites for the industry. Power is supplied chiefly by steam, less than 5000 out of 28,000 looms being hand-looms. There are breweries, rubber-works, metal foundries and

machinery-works in the town. Tomato and grape growing under glass for the winter market is extensively prosecuted. To maintain the high standard of artistic taste which has made the industry of Rou- baix a success, schools have been multiplied. By the co-opera- tion of the town and the state the national school of industrial arts was founded in 1883. This is a small university of art,

commerce and industry, the twenty-two courses of which include all the branches of knowledge useful in any of those pursuits. Among the public institutions are the tribunal of commerce and the chamber of commerce, the exchange, a board of trade-arbitration and the establishment {bureau de conditionnement) for determining the nature and weight of silk, wool and cotton.

The prosperity of Roubaix had its origin in the first factory franchise granted in 1469 by Charles the Bold, duke of Burgundy, to Peter, lord of Roubaix, a descendant of the royal house of Brittany. In the 18th century Roubaix suffered from the jealousy of Lille of which it was a dependency, and it was not till the 19th century that its industries acquired real importance. The population, which in 1804 was only 8700, had risen in 1861 to 40,000, in 1866 to 65,000, and in 1876 to 83,000.

ROUBILIAC (more correctly Rotjbillac), LOUIS FRAN- COIS (1695-1762), French sculptor, was born at Lyons and became a pupil of Balthasar of Dresden and of ‘ N. Coustou. It is generally stated that he settled in London about 1720, but as he took the second grand prize for sculpture in 1730, while still a pupil of Coustou, it is unlikely that he visited England at an earlier date. The date 1744, as given by Dussieux, is incorrect. He was at once patronized by Walpole and soon became the most popular sculptor in England, super- seding the success of the Fleming Rysbraeck and even of Scheemakers. He died on the nth of January 1762, and was buried in the church of St Martin-in-the-Fields. Roubiliac was largely employed for portrait statues and busts, and especially for sepulchral monuments. His chief works in Westminster Abbey are the monuments of Handel, Admiral Warren, Marshal Wade, Mrs Nightingale and the duke of Argyll, the last of these being the first work which established Roubiliac’s fame as a sculptor. The statues of George I., Sir Isaac Newton, and the duke of Somerset at Cambridge, and of George II. erected in Golden Square, London, were also his work. Trinity College, Cambridge, possesses a series of busts of distinguished members of the college by him. Roubiliac possessed skill in portraiture and was technically a master, but lived at a time when his art had sunk to a low ebb. His figures are frequently uneasy, devoid of dignity and sculpturesque breadth, and

his draperies treated in a manner more suited to painting than sculpture. There are, however, noteworthy exceptions, his bust of Pope, for example, reaching a high standard. More often, however, his striving after dramatic effect detracts from repose of attitude.

His most celebrated work, the Nightingale monument, in West-minster Abbey, a marvel of technical skill, is saved from being ludicrous by its ghastly and even impressive hideousness. On this the dying wife is represented as sinking in the arms of her husband, who in vain strives to ward off a dart which Death is aiming at her. The lower part of the monument, on which the two portrait figures stand, is shaped like a tomb, out of the opening door of which Death, as a half-veiled skeleton, is bursting forth. The celebrated bust of Shakespeare, known as the Davenant bust, in the possession of the Garrick Club, London, must be attributed to Roubiliac. The statue of Shakespeare, a commission from David Garrick, and bequeathed by the actor to the English nation, is in the British Museum, and shows the talent of the sculptor in a flattering light. It is noteworthy that none of his work is recorded in France, the land of his birth and education.

See Le Roy de Sainte-Croix, Vie et ouvrages de L. F. Roubiliac, sculpteur lyonnais (169ˆ-1762) (Paris, 1882). (An extremely rare work, of which a copy is in the National Art Library, Victoria and Albert Museum, South Kensington, London.) Allan Cunningham, The Lives of the Most Eminent British Painters, Sculptors, and Architects, vol. 3, pp. 31-67 (London, 1830) — the fount of informa- tion of later biographies. Dutton Cook, Art in England (" A Sculptor's Life in the Past Century") (London, 1869); Austin Dobson, The Magazine of Art, " Little Roubiliac," vol. 17, pp. 202 and 231 (London, 1894). See also J. T. Smith, Nollekens and his Times (London, 1829 passim). Henry B. Wheatley has also devoted research to the work and life of Roubiliac. (M. H. S.)

ROUCHER, JEAN ANTOINE (1 745-1 794), French poet, the son of a tailor of Montpellier, was born on the 22nd of February 1745. By an epithalamium on Louis XVI. and Marie Antoinette he gained the favour of Turgot, and obtained

a salt-tax collectorship. His poem was entitled Les Mois; it appeared in 1779, was praised in MS., damned in print and restored to a just

appreciation by the students of literature of the 19th century. It has the drawbacks of merely didactic- descriptive poetry on the great scale, but occasionally displays much grace and spirit. The malicious wit of Rivarol's mot on the ill-success of the poem, " C'est le plus beau naufrage du siecle," is not intelligible unless it is said that one of the most elaborate passages describes a shipwreck. Roucher was a disciple of Voltaire, and therefore a friend of the Revolution, but he remained moderate in his opinions. He frequently presided over an anti- Jacobin club, and denounced the tyranny of the popular demagogues in supplements published with the Journal de Paris in 1792. He was arrested on the 4th of October 1793, and, accused of being the leader of a conspiracy among the prisoners at Saint Lazare, was sent to the guillotine on the same tumbril with his friend Andre Chenier on the 25th of July 1794. Roucher translated in 1790 Adam Smith's Wealth of Nations. His letters from prison were edited by his son-in-law under the title of Consolations de ma captivity (1797), and his death was made the subject of a tragedy in 1834 by his brother Claude Roucher-Deratte, a voluminous writer.

See A. Guillois, Pendant la terreur, la poete Roucher, 1745-17Q4 (1890), founded on the poet's papers by one of his descendants.

ROUE, a dissipated debauchee. The word is French, and its original meaning was " broken on the wheel." Breaking on the wheel was a form of execution reserved in France, and some other countries, for crimes of peculiar atrocity. A roue, therefore, came by a natural process to be understood to mean a man morally worse than a pendard or gallows-bird, who only deserved hanging for common crimes. He was also a leader in wickedness, since the chief of a gang of brigands (for instance) would be broken on the wheel, while his obscure followers were merely hanged. Philip, duke of Orleans, who was regent of France from 1715 to 1723, gave the term the sense of impious and callous debauchee, which it has borne since his time, by habitually applying it to the very bad male company who amused his privacy and his leisure. The locus classicus for the origin of this use of the epithet is in the Memoirs of Saint-Simon (vol. xii. pp. 441-46, ed. Cheruel and Regnier, Paris, 1873-86).

ROUELLE, GUILLAUME FRANCOIS (1703-1770), French chemist, was born in 1703 at Mathieu, near Caen. He started as an apothecary, but in 1742 he was appointed experimental demonstrator of chemistry at the Jardin du Roi in Paris, where he was especially influential and popular as a teacher, numbering Lavoisier and J. L. Proust among his pupils. Many stories are told of the vivacity and enthusiasm with which he lectured, of the absent-mindedness which sometimes led

him, forgetting that his pupils could not hear what he was saying, to continue his explanations while he was out of the classroom looking for some piece of apparatus, and of the vigorous tirades, generally culminating in the epithet ” plagi- aire,” in which he used to indulge against men with whom he disagreed (Hofer, Hist, de la chimie, ii. 378). His most important achievement was to define ” salts “—a term formerly used in the most loose and indeterminate way — as the compounds formed by the union of acids and bases, and further to distinguish between neutral, basic and acid salts. Other subjects on which he published papers were the inflammation of turpentine and other essential oils by nitric acid, and the methods of embalmment practised by the Egyptians. He died at Passy on the 3rd of August 1770. He is known as Rouelle the elder, to distinguish him from his younger brother and assistant, Hilaire Makin (1718-1779), who, on his resignation In 1768, succeeded him as demonstrator at the Jardin du Roi.

ROUEN, a city of France, capital of the department of Seine- Inferieure and the ancient capital of the province of Normandy, on the Seine, 87 m. N.W. of Paris by rail. Pop. (1906) 111,402. The old city lies on the north bank of the river in an amphi- theatre formed by the hills which border the Seine valley. It is surrounded by boulevards. Outside the ellipse formed by

these lie the suburbs of Martainville, St Hilaire, Beauvoisine, Bouvreuil and Cauchoise; 25 m. to the east is the industrial town of Darnetal (pop. 6770), and in the level plain on the opposite bank of the Seine is the extensive manufacturing suburb of St Sever with the industrial towns of Sotteville (pop. 18,096) and Petit Quevilly (pop. 14,852) in its immediate neighbourhood. Finally in the centre of the river, north-east of St Sever, is the He Lacroix, which also forms part of Rouen. Communication across the Seine is maintained by ferry and by three bridges, including a pont transbordeur, or moving plat- form, slung between two lofty columns and propelled by elec- tricity. Rouen possesses four railway stations. , The central point of the old town is the Place de l’Hotel de Ville, occupied by the church of St Ouen, the hotel de ville and an equestrian statue of Napoleon I., and traversed by the Rue de la Republique which leads from it past the cathedral to the Place de la Re- publique and the Quai de Paris. Parallel to this street to the west are the Rue Beauvoisine with its southern continuations, the Rue des Carmes and the Rue Grand-Pont, and the wide and handsome Rue Jeanne d’Arc terminating on the Quai de la Bourse. These thoroughfares, which are all within the boule- vards, are crossed at right angles by the Rue de la Grosse- Horloge and by the Rue Thiers, running from the Place Cauchoise on the west to the

Place de l'H6tel de Ville, and passing on the left the Jardin Solferino and the museum.

The cathedral was built on the site of a previous cathedral which was destroyed by fire in 1200, and its construction lasted from the beginning of the 13th century, to which period belong the lateral doors of the west portal, to the beginning of the 16th century, when the Tour de Beurre was completed. The spire surmounting the central tower, which is the highest in France (485 ft.), is modern. The western facade, with its profusion of niches, pinnacles and statues, belongs, as a whole, to the Flamboyant style. But the northern tower, the Tour St Romain, is in the main of the 12th century, its upper stage (with its steep, pointed roof) having been added later. The southern tower, the Tour de Beurre, so named because funds for its building were given in return for the permission to eat butter in Lent, is of a type essentially Norman, and consists of a square tower pierced by high mullioned windows and surmounted by a low, octagonal structure, with a balustrade and pinnacles. The juxtaposition of these two towers, so different in character, is the. most striking feature of the main facade, which is notable besides for its width. The portals of the transept are each flanked by two towers and decorated with sculpture and statuary. That to the north, the Portail des Libraires, looks upon the Cour des Libraires, once the resort of the booksellers of Rouen. That to the south is known as the Portail de la Calende. The plan of the church comprises a nave with aisles and lateral chapels, a transept and a choir with ambulatory. The most remarkable part of the interior is the Lady Chapel (1302-20) behind the choir with the tombs (1518-25) of Cardinal Georges dAmboise and his nephew, the statuary of which, including the kneeling statues of the two cardinals, is of the finest Renaissance workmanship. The chapel also contains the tomb (1536-44) of Louis de Breze, seneschal of Normandy. Behind the cathedral is the archiepiscopal palace, a building of the 14th and 15th centuries.

St Ouen, formerly the church of an abbey dating to the Roman period and reorganized by Archbishop St Ouen in the 7th century, exceeds the cathedral in length as well as in purity of style. In spite of the juxtaposition of the second and third, the Radiant and Flamboyant types of Gothic architecture, the building, as a whole, presents a unity which even the modern fagade has failed to mar. It was founded in 13 18 in place of a Romanesque church which previously occupied the site and of which the only relic is the chapel in the south transept. The choir alone was constructed in the 14th century. The nave of the church belongs to the 15th century, by the end of which the central tower with its octagonal lantern and four flanking turrets had been

erected. The building of the western facade, which is flanked by two towers, was not undertaken till 1846.

The walls of the church are pierced by windows filled with stained glass of the 14th, 15th and 16th centuries and cover more space than is usual even in French Gothic churches. The Portail des Marmousets, the entrance to the south transept, has a projecting porch, behind and above which rises a mag- nificent rose window. The north facade has no entrance. In the interior, now despoiled of many artistic treasures, there is an organ-case dating from 1630 and a railing of the 18th century surrounding the choir.

The church of St Maclou, behind the cathedral, begun in 1437 and finished early in the 16th century, is a rich example of the Flamboyant style, the characteristics of which are specially displayed in the decoration of the facade and the tracery of the portal with its five arched openings. It is cele- brated for carving attributed to Jean Goujon which appears on the western doors and in other parts of the church, and has a handsome organ-loft reached by a graceful open staircase, and stained glass of the 15th and 16th centuries. The spire above the central tower is modern and was finished in 1869. Close by the church is the old parish cemetery called the Aitre de St Maclou; it is surrounded by wooden galleries of the Renaissance period, supported on stone pillars on which are sculptures representing a dance of death.

The church of St Vincent, near the Seine, is a building of the 1 6th century and contains the finest stained-glass windows in Rouen; those at the end of the north aisle, by Engrand and Jean le Prince, artists of Beauvais, are the most noted. The stained glass in the churches of St Patrice (16th century) and St Godard (late 15th century) is inferior only to that of St Vincent. Among the less important ecclesiastical buildings of Rouen are the churches of St Gervais, St Romain, St Laurent, St Vivien, and the tower of St Andre, a relic of an old church of the 15th and 16th centuries.

The most important secular building in Rouen is the Palais de Justice, once the seat of the exchequer and, later, of the parle- ment of Normandy. It is in the late Gothic style and consists of a main building flanked by two wings. The left wing, known as the Salle des Procureurs, was erected in 1493 and is remark- able for its lofty

barrel-roof of timber. South of the Palais de Justice is the Porte de la Grosse Horloge, an arcade spanning the street and surmounted by a large clock of the 1 5th century with two dials. The Tour de la Grosse Horloge, which rises beside the arcade, was built in 1389. The tower known as the Tour de Jeanne d'Arc was the scene of her trial, and is all that remains of the castle built by Philip Augustus early in the 13th century. The Porte Guillaume-Lion, opening on to the Quai de Paris, is a handsome gateway built in 1749.

There are numerous old houses in Rouen in the Gothic and Renaissance styles. The Hotel de Bourgtheroulde, the most famous of them, is a stone mansion of the 15th century added to in the reign of Francis I., the facades of which are decorated with bas-reliefs representing scenes from the meet- ing of the Field of the Cloth of Gold and allegories from the Triumphs of Petrarch. Among more modern buildings are the hotel de ville of the 18th century, adjoining the north side of the church of St Ouen, the Bourse dating from the same period, and the Musee-Bibliotheque constructed in 1880 and containing rich collections of pictures and ceramics and a library with upwards of 133,000 volumes and many valuable MSS. An important museum of antiquities and a museum of natural history are contained in the old convent of the Visitation. A statue of the composer F. A. Boiieldieu overlooks the Quai de la Bourse, and one of Pierre Corneille stands at the western extremity of the lie Lacroix; both were natives of the town. At Bonsecours, on a hill on the Seine 2 m. above Rouen, are the modern church, which is a resort of pilgrims, and the monument to Joan of Arc consisting of three small Renais- sance buildings with a statue of the heroine in the principal one.

Rouen is the seat of an archbishop, a prefect, a court of appeal and a court of assizes, and headquarters of the III. army corps. Its public institutions also include a tribunal of first instance, tribunals of commerce and of maritime commerce, a council of

trade-arbitration, a chamber of commerce and a branch of the Bank of France. Among its educational establishments are preparatory schools of medicine and pharmacy, and of higher instruction in science and literature, lycees and training-colleges for both sexes, ecclesiastical seminaries, and schools of commerce and industry, of architecture, music and fine arts. All the more important nations have consulates in the city. Rouen is an important centre for trade in wines, spirits, grain and cattle. Grain, wine, coal, timber and petroleum are leading imports. Besides its manufactures it exports plaster, sugar and sand.

The principal industries of Rouen and its district are the spinning and weaving of cotton, notably the manu- facture of rouenneries (cotton fabric woven with dyed yarn), the printing and dyeing of the manufactured material and the spinning of flax, hemp and jute; ship-building and the making of braces, shirts, bodices, boots, shoes and hats is also carried on, and there are distilleries, petroleum-refineries and manufactories of chemicals, soap, machinery, carding-combs and brushes. The port of Rouen comprises the marine docks below the Boi'eldieu bridge, and the river dock, the timber dock and the petroleum dock above it. There is also a repairing dock. The Seine is tidal beyond Rouen. The port is accessible for ships drawing 19J to 22J ft. of water, and its quays have a superficial area of about 123 acres. It is served by the lines of the Orleans, the Western and the Northern railway companies, and these, in addition to the waterways connected with the Seine, make Rouen a convenient centre for the distribution of merchandise.

Ratuma or Ratumacos, the Celtic name of Rouen, was modified by the Romans into Rotomagus, and by the writers of medieval Latin into Rodomum, of which the present name is a corruption. Under Caesar and the early emperors the town was the capital of the Veliocasses, a people of secondary rank, and it did not attain to any eminence till it was made the centre of Lugdun- ensis Secunda at the close of the 3rd century, and a little later the seat of an archbishop. Rouen owed much to its first bishops — from St Mello, the apostle of the region, who flourished about 260, to St Remigius, who died in 772. The bishops built many churches and their tombs became in turn the origin of new sanctuaries. Under Louis le Debonnaire and his successors, the Normans several times sacked the city, but after the treaty of St Clair-sur-Epte in 912, Rouen became the capital of Normandy and attained still greater prosperity. It was the principal residence of the dukes and was the scene in 949 of a victory gained by Duke Richard I. over Otto the Great, emperor of Germany, Louis d'Outremer, king of France, and Arnold, count of Flanders. In 1087 William the Conqueror, mortally wounded at Mantes, died at Rouen. The succeeding Norman kings of England tended to neglect Rouen in favour of Caen and afterwards of Poitiers, Le Mans and Angers; but its monasteries, local trade and manufactures, and the communal organization which the citizens exacted from their sovereigns during the course of the 12th century maintained an importance which is indicated by the building of several fine churches, notably that of St Ouen. In 1203 Rouen was the scene of the murder of Arthur of Brittany at the hands of King John of England. Ostensibly to avenge the crime, Philip Augustus invaded Normandy and entered the capital unopposed. The union of the

province with the crown of France in no way hindered the prosperity of the city, for Philip confirmed its communal privileges and built a new castle. A convention between the merchants of Rouen and those of Paris relating to the naviga- tion of the Seine was followed by treaties with London, with the Hanseatic towns and with Flanders and Champagne. In 1302 the seat of the exchequer or sovereign court, afterwards the parlement, of Normandy was definitely fixed at Rouen, which had previously shared its sessions with other towns. In 1356 Charles the Bad, king of Navarre, a favourite in the city, was arrested within its walls, an event which displeased the inhabitants, who after the disaster at Poitiers supported the cause of Etienne Marcel. The revolt of the Harelle in 1382, caused by the exactions both of the uncles of Charles VI. and of the monks of St Ouen, was followed by heavy punishment. In spite of this a stubborn resistance was offered to Henry V. of England who, after a long siege, occupied the town in 1419. The prosperity of Rouen continued under the English domination, and during this period the greater part of the church of St Ouen was constructed. In 1431 Joan of Arc was tried and burnt in the tity. From that year the French began a series of

attempts to recapture the town, but they were unsuccessful till 1449 when Somerset, the English commander, was obliged to surrender the principal fortified places in Normandy. During the close of the 15th century and the first half of the 16th, Rouen was the metropolis of art and taste in France and was one of the first places to reflect the influence of the Renaissance. During the wars of religion the arts declined. In 1562 the town was sacked by the Protestants. This did not prevent the League from gaining so firm a footing there that Henry IV. besieged it unsuccessfully and only obtained entrance after his abjuration. The revocation of the edict of Nantes in 1685 lost Rouen many of its richest and most industrious citizens in the Calvinistic emigration. The town suffered less from the excesses of the French Revolution than from the depredations of bandits who, under the Directory, infested the neighbourhood of the city and were not suppressed till the Consulate. During the Franco-German War the city was occupied by the invaders from December 1870 till July 187 1, and had to submit to heavy requisitions.

See A. Cheruel, Histoire de Rouen pendant Vepogue communale (Rouen, 1843); Histoire de Rouen sous la domination anglaise au quinzieme siede (Rouen, 1840); N. Periaux, Histoire sommaire et

chronologique de la ville de Rouen (Rouen, 1874); C. Enlart, Rouen (Paris, 1904).

ROUERGUE (Ruthenensis pagus), one of the old provinces of France, was originally inhabited by the Rutheni. It was bounded on the N. by Auvergne, on the S. and S.W. by Lan- guedoc, on the E. by Gevaudan and the Cevennes and on the W. by Quercy. It included (1) the county of Rodez, (2) Haute and Basse Marche; and it was divided between the dioceses of Rodez and Vabres (province d'Alby after this province had been separated from that of Bourges in 1678). Administra- tively it formed first a senechaussee, dependent on Languedoc (capital Villefranche, in the Basse Marche), and later it was attached to the military governments of Guienne and Gascony. It was then part of the departments of Aveyron and of Tarn- et-Garonne. The county of Rodez, after having been in the possession of the houses of Toulouse and Carlat, fell in the 14th century into that of Armagnac. Jean II. of Armagnac having served Charles V. faithfully during his wars with England, received from him, in 1374, what were called the four " chatel- lenies " with the " Convmun de la paix," a tax which had been established there to organize resistance against foreigners. Jean V. of Armagnac was deprived of the county for crime and treason against Louis XL, in 1469, but afterwards it was given back to Charles of Armagnac, who died without legitimate issue in 1496. Its possession was then disputed between King Francis I. and the duke of Alencon, who at last compromised (1 519); the king ceded the county to his sister Marguerite d'Angouleme, who took it as dowry first to the duke of Alencon, and then to her second husband Henri d'Albret, king of Navarre. The county afterwards passed to Jeanne d'Albret, then to Henri IV., and was joined to the crown lands in 1590.

ROUGE (" red," from Lat. rubeus), a French name applied to various colouring substances of a brilliant carmine tint, especi- ally when used as cosmetics. The best of these preparations are such as have for their basis carthamine, obtained from the safflower (Carihamus tinctorius). The Chinese prepare a rouge, said to be from safflower, which, spread on the cards on which it is sold, has a brilliant metallic green lustre, but when moistened and applied to the skin assumes a delicate carmine tint. Jeweller's rouge for polishing plate is a fine red iron oxide prepared by calcination from ferrous sulphate (green vitriol).

ROUGET DE LISLE, CLAUDE JOSEPH (1 760-1836), French author, was born on the 10th of May 1760, at Lons-le-Saunier (Jura). He entered the army as an engineer, and attained the rank of captain. He was one of those authors whom a single work has made famous. The song which has immor- talized him, the Marseillaise, was composed at

Strassburg, where Rouget de Lisle was quartered in April 1792. He wrote both words and music in a fit of patriotic excitement after a

public dinner. The piece was at first called Chant de guerre de Varmee du Rhin, and only received its name of Marseillaise from its adoption by the Provencal volunteers whom Barbaroux introduced into Paris, and who were prominent in the storming of the Tuileries. The author was a moderate republican, and was cashiered and thrown into prison; but the counter-revolu- tion set him at liberty. He died at Choisy-le-Roi (Seine et Oise) on the 26th of June 1836. The stirring melody of the Marseillaise and its ingenious adaptation to the words serve to disguise the alternate poverty and bombast of the words them- selves. Rouget de Lisle wrote a few other songs of the same kind, and in 1825 he published Chants francais, in which he set to music fifty songs by various authors. His Essais en vers et en prose (1797) contains the Marseillaise, a prose tale of the sentimental kind called Adelaide et Monville, and some occasional poems.

ROUGH CAST (the French equivalent is crSpis), in architec- ture, the exterior coating originally given to the walls of common dwellings and outbuildings, but now frequently employed for decorative effect on country houses, especially those built in half timber. It is a composition of small gravel and sand, mixed with strong lime mortar, and is thrown on the walls already covered with two ordinary coats of plaster. Variety can be obtained on the surface of the wall by small pebbles of different colours, and in the Tudor period fragments of glass were sometimes embedded. The central tower of St Alban's cathedral, built with Roman tiles from Verulam, was covered with rough cast believed to be coeval with the building. The rough cast was removed about 1870.

ROUHER, EUGENE (18 14-1884), French statesman, was born at Riom (Puy de Dome) on the 30th of November 1814. He practised law in his native place after taking his degree in Paris in 1835, and in 1846 sought election by his fellow- citizens to the Chamber of Deputies as an official candidate of the Guizot ministry. It was only after the revolution of 1848, however, that he became deputy for the department of Puy de Dome. Re-elected to the Legislative Chamber in 1849 he succeeded Odilon Barrot as minister of justice, with the additional office of keeper of the seals, which he retained with short intervals until January 1852. From the 'tribune of the Chamber he described, the revolution of February as a " catastrophe," and he supported reactionary legislation, notably the bill (May 31, 1850) for the limitation of the suffrage. After the- coup d'etat of December 2, 1851, he was entrusted with the redaction of the new constitution,

and on his resignation of office in January became vice-president of the Council of State. After the formal establishment of the Empire, Napoleon III. rewarded him by a grant of £40,000 and the estate of Cirey. In 1855 he became minister of agriculture, commerce and public works, and in 1856 senator. He secured for France an excellent system of railways without making them a state monopoly, and he conducted the complicated negotiations for the treaty of commerce with England which was concluded in January i860, and subsequently arranged similar treaties with Belgium and Italy. In 1863 he became minister president of the Council of State, and on the death of A. A. M. Billault minister of state and chief spokesman of the emperor, before the Corps Legislatif. Although the government had a great majority in the Chamber, the opposition counted the redoubtable names of Thiers, Berryer and Jules Favre, and government measures were only passed by frequent resort to the closure. Rouher had to defend Napoleon's foreign adventures as well as the free- trade treaties and the extravagances of Baron Haussmann for which* he was directly responsible. After an attempted defence of the foreign policy which had aided the aggrandizement of Prussia at the expense of Austria, Thiers told him in the Chamber that there were " no more blunders left for him to make." He opposed the abortive Liberal concessions of January 1867, announced in a personal letter from Napoleon III. to himself, and resigned with the rest of the cabinet, only to resume office after a short interval as minister of finance. When concessions became inevitable Rouher, the " vice-empereur," resigned

to make way after six months' interval for Emile Ollivier. He still fought for reaction in his new office of president of the Senate. After the fall of the Empire he fled to England, but returned to France a year later to work for the fortunes of the prince imperial. After serious disturbances he was elected member for Ajaccio on the nth of February 1872, his election being characterized by the prefect of Corsica as a regular con- spiracy in favour of the Empire. In the Chamber, where he subsequently represented Riom, he formed the group of the Appel au Peuple. His first speech in the House was the occa- sion (May 21, 1872) of violent attacks by Audiffret-Pasquier and Gambetta. The death of the prince imperial in 1879 put an end to the serious chances of the Bonapartists, although Rouher sought to secure the recognition of Prince Napoleon, son of the ex-king Jerome, as heir to the imperial honours. Rouher lost his reason after a stroke of paralysis in 1883, and died on the 3rd of February 1884.

For an estimate of Rouher, see marquis de Castellane, LesHommes d'etat frangais du xix'. Steele (1888), and generally the literature dealing with the Second Empire.

ROULERS (Flemish Roeselaere), a town of Belgium, in the province of West Flanders, 13 m. N.W. of Courtrai. Pop. (1904) 24,548. It is one of the oldest communes in Belgium, and was famous for its weavers in the nth and 12th centuries. Its prosperity depends on the cultivation of flax and the manu- facture of linen. The church of St Michael is remarkable for its lofty tower. Baldwin VIII., count of Flanders, died here in 1 1 20, and in 1794 the French under Pichegru defeated the Austrians under Clerfayt.

ROULETTE, in mathematics, the locus of a point carried on a curve which rolls on another (fixed) curve. The name appears to have been used by Pascal to denote the cycloid (q.v.), which is the simplest roulette, being traced by a point on the circum- ference of a circle rolling on a straight line. The trochoids and epicycloids (q.v.) are also simple roulettes, the latter being traced by points on a circle which rolls on another circle. See W. H. Besant, Roulettes and Glissettes.

ROULETTE, a gambling game, of French origin. It is one of the two games played in the gambling-rooms at Monte Carlo, and the description here given, and the maximum and minimum stakes mentioned, are to be understood as applying to the game as it is there conducted. It is solely a game of chance, though so-called " systems " are innumerable, and some of them for a short period often appear to give the player an advantage. There is no possible system, however, which will assure success in the long-run, and it is herein that the ingenuity of the game consists. Every systematic method of play must depend upon increased stakes to retrieve past losses; and though a player with an unlimited capital might be practically certain to achieve his end in the course of time, the circumstance that there is always a maximum renders the bank invincible. The roulette table, covered with a green cloth, is made up of precisely corresponding halves with a circular space let into the middle holding the wheel, on either side of which the cloth is divided into

spaces marked passe, pair, manque, impair, and the black and red diamonds. The wheel is divided into thirty- seven compartments, col- oured alternately black and red, numbered from one to thirty-six, the thirty-seventh being zero. Pair indicates even numbers, impair odd numbers, manque includes the numbers from 1 to 18; passe, from 19 to 36. The methods of staking are innumerable. The minimum stake is five francs, which must be placed on the table in the form of a five-

franc piece, and not in smaller change. Rouge, noir,

pair, impair, manque and passe are even chances; i.e. a stake put upon any of them is paid in corresponding coin should the player win, the exception being when the little bali which is spun round the wheel falls into zero, in which case the even money chances are put “in prison” — that is to say, laid aside until another spin, when if the bank wins they are lost, if the player wins he is allowed to retrieve his money. The maximum in the case of these chances is 6000 francs, Any one who desires to play en plein puts his stake on one of the thirty-seven numbers. If the ball falls into the corresponding number on the wheel, the stake is paid thirty-five times; and as there are thirty-seven numbers on the board, with the advan- tage already described of imprisoning the even-money chances when zero comes up, it will be seen that there is a steady per- centage in favour of the tables and consequently against the player. This percentage is of course greatly increased when, as is often the case, a second zero, called douUe-zfro , is used. In some gambling-houses there is even a third one, called Eagle Bird. The maximum stake allowed en plein is 180 francs. The next most daring selection is d cheval, when the stake is placed on the line separating any two numbers, and if either of them wins the player is paid seventeen times, the highest stake permissible being 360 francs. Transversale pleine covers any three numbers in a line, the coin or note being placed on the line dividing any one of the numbers from the neighbour’ ing even-money chance, as, for instance, between 4 and passe, or 6 and manque. A transversale simple covers six numbers, as, for example, where the line between 4 and 7 joins passe, or between 6 and 9 joins manque; and if any one of these numbers wins, five times the value of the stake is paid, the maximum here being 1200 francs. En cane includes four numbers, the coin being placed, for instance, on the cross between r, 2, 4, 5, or 28, 29, 31, 32; eight times the value of the stake is paid, and the maximum is 760 francs. The dozens and the columns are also indicated on the board, the first dozen of course including 1 to 12. In each of the columns are twelve num- bers in different order. A stake placed on either a dozen or a column is paid twice its value, the maximum here being 3000 francs. A stake constantly played is called the qualre premiers, which includes zero, 1, 2 and 3, the stake being placed on the line where zero and 1 join passe, or where zero and 3 join manque. If any one of these four numbers, including zero, wins, the stake is paid eight times; and four times eight being thirty- two, there is a greater advantage to the table than when it loses en plein or on certain othet chances. Zero can also be played in combination with any one or two of its neighbours; if with one of them the stake is paid seventeen times, if

with two of them eleven times. A croupier sits on either side of the wheel; there is also one at each end of the table, their business being to assist the players in staking and recovering their winnings. Behind each of the former pair an official on a high chair super- vises the table. The croupier whose duty it is to spin the wheel waits for a time till stakes have been made, and then, exclaiming, “Messieurs, faites votre jeu!” sets the cylinder in motion, throwing the ball in the direction contrary to that in which the wheel revolves. When it is seen that the ball will soon fall at rest in one of the compartments of the cylinder the croupief gives the notice, ” Rien ne va plus,” after which no stakes can be placed. When the ball finally rests in the compartment, the croupier announces the number and the even-money chances that win, as for instance rouge, impair and manque. He and his fellows then gather in with a rake all the money that has been lost, after which the winnings are paid and the game proceeds. At the beginning of play each table is supplied with a certain large sum. When the bank loses this and is forced to send for another supply it is said to be ” broken.”

ROUND (O. Fr. rond , Lat. rotundus, the Fr. is the source also of Du. rond; Ger., Swed., Dan. and Nor. rund), circular, spherical, globular. As a substantive, the word has several specific appli- cations; thus it is used of the rung of a ladder, of a rounded cross-bar connecting the legs of a chair, of the circuit of the

watch under an officer which patrols the sentries in a fortress, fortified town, camp or other military station, and hence of the beat or customary course of a policeman, a postman, or a tradesman, and of the full course at such a game as golf. Simi- larly there were old dances called ” rounds,” in which the dancers stood in a circle or ring. They were popular in the 16th and 17th centuries. Later the name was also applied to country dances where the dancers stood in two lines. For the ” round ” in music see Canon. A complaint or remon- strance signed by a number of persons is commonly known as a ” round robin “; properly such a document should have the signatures arranged in a circle, the idea being that thus the order in which the complainants signed should be unknown. In the 16th century ” round robin ” was a name of mockery given to the Eucharist.

r ROUKDERS, an English ball game, probably dating from the 1 8th century, but not attaining to any popularity before 1800. It was the

immediate ancestor of Baseball (q.v.). Up to the year 1889 no special code of rules existed, but the game was played on the green, the field being marked out in a regular pentagon by five bases about 1 5 or 20 yds. apart, called respect- ively home-base (at which the striker stood), 1st base, 2nd base, 3rd base, and 4th base. The feeder, or bowler, stood in the middle of the pentagon and tossed the ball, which was softer than a cricket ball, to the striker, who with a round club, often a cricket stump, endeavoured to hit it as far out of the reach of the fielders as possible, a run being scored when the striker made the circuit of the bases without being put out. Almost any number of players could form a side, and the batsman would be retired when a batted ball was caught on the fly or first bounce, or when he was struck by having the ball thrown at him while running between bases. Rounders in its primitive form was more of a romp than a regular game, but it experienced a revival in Scotland and the north of England about the year 1889, when two governing bodies were formed, the National Rounders Association of Liverpool and Vicinity and the Scot- tish Rounders Association. These, with the later Gloucester Rounders Association, drew up the rules now recognized.

A hard ball similar to that used in baseball was adopted, and the rule by which a runner could be put out by hitting him with a thrown ball abandoned.. The bat must not exceed 3i in. in diameter nor 35 in. in length. The game is similar to baseball, but there are several important differences, the most radical being that the ball may be hit in any direction, as at cricket. The original pentagon has been discarded in favour of an elongated diamond, the home- base being at one end and 1st, 2nd and 3rd bases at the other Eoints, while the 4th base is situated on the line of 3rd base towards ome and 17 yds. from the former, the sides of the diamond being 22 yds. in length. The bowler stands in a space marked off in the centre of the diamond and tosses the ball to the batsman, who must hit at every ” good ” ball, i.e. one that is straight over the home- base and between head and knee. Two bad balls score one for the batsman. If the latter hits the ball he must run to 1st base and then 2nd, and so on round to home again, resting at any base; but he may be put out if the batted ball be caught on the fly or first bounce or the backstop (wicket-keeper in cricket) catch a ball struck at but not hit, or the batsman be touched with a ball while running between bases. Ten players constitute a side and three innings a piece are played, every player batting once in each innings. Each base made counts one. The backstop is placed directly behind the batsman, and behind the backstop are placed 1st cover (right), longstop (middle), and 4th cover (left). The 1st, 2nd and 3rd basemen are stationed at the bases, while behind them in the field are

placed the 2nd cover (right), centre cover and 3rd cover (left). The bases are designated by light wooden posts. An umpire presides over the game. A variation of rounders is Fieldball, invented in 1888, a combination of rounders and cricket, a wicket being placed in front of the backstop, and the four bases arranged in a circle 25 yds. distant from each other. The bat and ball are similar to those used in baseball. Another variation is called Baseball Rounders, which was invented in 1889 and is practically the same as baseball.

ROUNDHEAD, a term applied to the adherents of the parlia- mentary party in England during the great Civil War. Some of the Puritans, but by no means all, wore the hair closely cropped round the head, and there was thus an obvious contrast between them and the men of fashion with their long ringlets. ” Roundhead ” appears to have been first used as a term of derision towards the end of 1641 when the debates in parlia-

ment on the Bishops Exclusion Bill were causing riots at West- minster. One authority says of the crowd which gathered there: “They had the hair of their heads very few of them longer than their ears, whereupon it came to pass that those who usually with their cries attended at Westminster were by a nickname called Roundheads.” John Rushworth (His- torical Collections) is more precise. According to him the word was first used on the 27th of December 1641 by a dis- banded officer named David Hide, who during a riot is reported to have drawn his sword and said he would ” cut the throat of those round-headed dogs that bawled against bishops.” Clarendon (History of the Rebellion, iv. 121) remarks on the matter: ” and from those contestations the two terms of ‘ Roundhead ‘ and ‘ Cavalier ‘ grew to be received in dis- course, . . . they who were looked upon as servants to the king being then called ‘ Cavaliers,’ and the other of the rabble contemned and despised under the name of ‘ Roundheads.’ ” Baxter ascribes the origin of the term to a remark made by Queen Henrietta Maria at the trial of Strafford; referring to Pym, she asked who the roundheaded man was. The name remained in use until after the revolution of 1688.

Roundhead was also used during the Civil War as the name of a weapon. This is described as having ” an head about a quarter of a yard long, a staffe of two yards long put into their head, twelve iron pikes round about, and one in the end to stop with.”

ROUNDSMAN SYSTEM (sometimes termed the billet, or ticket, or item system), in the English poor law, a plan by which the parish paid the occupiers of property to employ the applicants for relief at a rate of

wages fixed by the parish. It depended not on the services, but on the wants of the applicants, the employer being repaid out of the poor rate all that he advanced in wages beyond a certain sum. Accord- ing to this plan the parish in general made some agreement with a farmer to sell to him the labour of one or more paupers at a certain price, paying to the pauper out of the parish funds the difference between that price and the allowance which the scale, according to the price of bread and the number of his family, awarded to him. It received the local name of billet or ticket system from the ticket signed by the overseer which the pauper in general carried to the farmer as a warrant for his being employed, and afterwards took back to the over-seer, signed by the farmer, as a proof that he had fulfilled the conditions of relief. In other cases the parish contracted with a person to have some work performed for him by the paupers at a given price, the parish paying the paupers. In many places the roundsman system was carried out by means of an auction, all the unemployed men being put up to sale periodically, sometimes monthly or weekly, at prices varying according to the time of year, the old and infirm selling for less than the able-bodied. The roundsman system disappeared on the reform of the poor law in 1834.

ROUND TABLE, THE, in the Arthurian Romance (q.v.), the table round which, in order to avoid quarrels as to precedence, King Arthur's knights are seated, and so applied collectively to the knights themselves as the title of a mythical order of chivalry. The origin of the Round Table is obscure. Geoffrey of Monmouth makes no mention of it, and the earliest record is that of Wace, much expanded by his translator, Layamon, who gives a picturesque detailed description of the fight for precedence which took place at Arthur's board on a certain Yuletide day, and the slaughter which ensued. For this slaughter Arthur took summary vengeance, slaying all the kinsfolk of the man who started the fight, and cutting off the noses of his women-folk. For the future avoidance of any such scenes a cunning workman of Cornwall offered to make a table which should seat 1600 knights and more, and at which all should be equal. Arthur accepted this offer, and the result was the Round Table, peace and harmony. Wace does not mention the number of knights.

These versions of the pseudo-chronicles .practically ascribe the foundation to Arthur; the romances, however, differ. In these either Merlin made the table for Uther Pendragon,

or it had belonged to Leodegrance, king of Cornwall and father of Guenevere, and was given to Arthur on his marriage with that princess. When the fo.unding of the Round Table is ascribed to Merlin it is generally in close connexion with the Grail legend, forming the last of a series of three, founded in honour of the Trinity — the first being the table of the Last Supper, the second that of the Grail, established by Joseph of Arimathea. The number of knights whom the table will seat varies; it might seat twelve or fifty or a hundred and fifty; nowhere, save in Layamon, do we find a practically un- limited power of accommodation. It is also to be noted that whereas, in the pseudo-chronicles, it is the common table of Arthur's court, designed in the interests of peace and unity, in the romances it is a sign of superiority, only the best and most valiant knights being adjudged worthy of a seat at the Round Table. In fact, it has become the equivalent of an order of knighthood, the members of which form a brotherhood bound by oath to succour each other at need and to refrain from fighting among themselves. The membership is not restricted to the knights of Arthur's immediate court and household, knights who are, in all essentials outsiders, appearing but as passing guests at Arthur's board, such as, e.g., Perceval and Tristan, may be elected knights of the Round Table. In two romances, the prose Tristan and the Parzival, the place of the Round Table proper is taken, on a journey, by a silken cloth laid on the ground, round which the knights are seated. In the versions more closely connected with the Grail story the name of the chosen knight appears on his seat, and there is one vacant place, the Siege perilous, eventually to be filled by the Grail winner.

It is obvious that the tradition has passed through several stages, and has varied in the process. The original source is not easy to determine. Dr Lewis Mott has pointed out that " Round Tables " exist in many parts of Great Britain, the name being often associated with circular trenches, or rings of stones, which were demonstrably employed in connexion with the agricultural festivals held at Pentecost, Midsummer and Michaelmas. However this may be, and it seems probable that Dr Mott is right in his identification, the pseudo-chroniclers and romance writers certainly had in their minds a genuine table, although, probably, one of magical properties. Thus Layamon's table can seat an indefinite number, and yet it can be carried by Arthur when he rides abroad. On closely ex- amining Layamon's version it seems probable that he had in his mind not merely a circular, but a turning table; he gives it as ground for the quarrel that all the knights wished to sit within; at the table the Cornish workman will make none shall be left without, but they shall

sit ” without and within, man against man.” It is difficult to explain this phrasing in any other hypothesis than that Layamon pictured to himself Arthur’s hall as open on one side, and that, on a great feast-day, owing to the number of guests, the table extended beyond the covering afforded by the roof. As the feast took place ” on rnid-winter’s day ” the annoyance of those who were without would be intelligible. To obviate this the cunning workman devised a circular table, turning on a pivot, with seats affixed, at which the guests sat the one half in turn within, the other without, the hall ” man against man.” This would make the Round Table analogous to the turning castles which we fre- quently meet with in romances; and while explaining the peculiarities of Layamon’s text, would make it additionally probable that he was dealing with an earlier tradition of folk- lore character, a tradition which was probably also familiar to Wace, whose version, though much more condensed than Layamon’s, is yet in substantial harmony with this latter. This, too, is certain; the fight for precedence at Arthur’s board may be paralleled by accounts of precisely similar quarrels in early Irish literature, e.g. the famous tale of Fled Bricrend or Bricriu’s Feast of the Ultonian cycle.

Recent grail researches have made it most probable that that mysterious talisman was originally the vessel of the ritual feast held in honour of a deity of vegetation, — Adonis, or

another; if the Round Table also, as Dr Mott suggests, derives from a similar source, we have a link between these two not- able features of Arthurian tradition, and an additional piece of evidence in support of the view that behind the Arthur of romance there lie not only memories of an historic British chieftain, but distinct traces of a mythological and beneficent hero. Incidentally also it would seem that those versions which connect the table more closely with Arthur are the more correct.

See Wace, Le Roman de Brut, ed. Leroux de Lincy (1836-38), vol. ii. 74-76); Layamon, Brut, ed. Madden, vol. ii. p. 532; A. C. L. Brown, The Round Table before Wace (Boston, 1900) ; Lewis F. Mott, The Round Table (Boston, 1905). (J. L. W.)

ROUND TOWERS. A peculiar class of round tower exists throughout Ireland; about one hundred and twenty examples once existed; most of these are ruined, but eighteen or twenty are almost perfect. These towers were built either near or adjoining a church; th’ey are of various dates, from perhaps the 8th to the 13th century; though varying in size and detail, they have many characteristics common to all. They are built with walls slightly battering inwards, so that the

tower tapers towards the top. The lower part is formed of solid masonry, the one doorway being raised from 6 to 20 ft. above the ground, and so only accessible by means of a ladder. The towers within are divided into several storeys by two or more floors, usually of wood, but in some cases, as at Keneith, of stone slightly arched. The access from floor to floor was by ladders. The windows, which are always high up, are single lights, mostly arched or with a flat stone lintel. In some of the oldest towers they have triangular tops, formed by two stones leaning together. One peculiarity of the door and window openings in the Irish round towers is that the jambs are frequently set sloping, so that the opening grows narrower towards the top, as in the temples of ancient Egypt. The later examples of these towers, dating from the 12th and 13th centuries, are often decorated with chevron, billet and other Norman enrichments round the jambs and arches. The roof is of stone, usually conical in shape, and some of the later towers are crowned by a circle of battlements. The height of the round towers varies from about 60 to 132 ft.; that at Kilcullen was the highest. The masonry differs according to its date, — the oldest examples being built of almost uncut rubble work, and the later ones of neatly jointed ashlar.

Much has been written as to the use of these towers, and the most conflicting theories as to their origin have been propounded. It is fairly certain, however, that they were constructed by Christian builders, both from the fact that they always are or once were near a church, and also because crosses and other Christian emblems frequently occur among the sculptured decorations of their doors and windows. Their original purpose was probably for places of refuge, for which the solid base and the door high above the ground seem specially adapted. They may also have been watch-towers, and in later times often contained bells. Their circular form was probably for the sake of strength, angles which could be attacked by a battering ram being thus avoided, and also because no quoins or dressed stones were needed, except for the openings — an important point at a time when tools for working stone were scarce and imperfect. Both these reasons may also account for the Norman round towers which are so common at the west end of churches in Norfolk, Suffolk and Essex, though these have little resemblance to those of Ireland except in the use of a circular plan. One example exactly like those of Ireland exists in the Isle of Man, within the precincts of Peel Castle adjacent to the cathedral of St German; it was probably the work of Irish builders. There are also three in Scotland, viz. at Egilshay in Orkney, and at Abernethy and Brechin.

Round towers wider and lower in proportion than those of Ireland

appear to have been built by many prehistoric races in different parts of Europe. The towers of this class in Scotland are called ” brochs “; they average about 50 ft. high and 30 ft. in internal diameter. Their walls, which are usually about 15 ft. thick at the bottom, are built hollow, of rubble masonry, with series of passages one over the other running all round the tower. As in the Irish towers, the entrance is placed at some distance from the ground; and the whole structure is designed as a stronghold. The brochs

appear, to have been the work of a pre-Christian Celtic race. Many objects in bronze and iron and fragments of hand-made pottery have been found in and near these towers, all bearing witness of a very early date. (See Anderson, Scotland in Pagan Times, 1883, and Scotland in Early Christian Times, 1881.) The nuraghi of Sardinia are described in the article on that island. During the 6th century church towers at and near Ravenna were usually built round in plan, and not unlike those of Ireland in their proportions. The finest existing example is that which stands by the church of S. Apollinare in Classe, the old port of the city of Ravenna (see Basilica, fig. 8). It is of brick, divided into nine storeys, with single- light windows below, three-light windows in the upper storeys, and two-lights in the intermediate ones. The most magnificent example of a round tower is the well-known leaning tower of Pisa, begun in the year n 74. It is richly decorated with tiers of open marble arcades, supported on free columns. The circular plan was much used by Moslem races for their minarets. The finest of these is the 13th-century minar of Kutb at Old Delhi, built of limestone with bands of marble. It is richly fluted on plan, and when complete was at least 250 ft. high.

The best account of the Irish round towers is that given by Petrie in his Ecclesiastical Architecture of Ireland (Dublin, 1845). See also Keane, Tenners and Temples of Ancient Ireland (Dublin, 1850); Brash, Ecclesiastical Architecture of Ireland (Dublin, 1875); an d Stokes, Early Architecture in Ireland (Dublin, 1878). (J. H. M.)

ROUS, FRANCIS (1570-1659), English Puritan, was born at Dittisham in Devon in 1579, and educated at Oxford (Broad- gates Hall, afterwards Pembroke College) and at Leiden, graduating at the former in January 1596-97, and at the latter thirteen months afterwards. For some years he lived in seclusion in Cornwall and occupied himself with theological studies, producing among other books The Arte of

Happines (16 19) and Testis Veritatis, a reply to Richard Montagu's Appello Caesarem. He entered parliament in 1625 as member for Truro, and continued to represent that or some neighbour- ing west country constituency in such parliaments as were summoned till his death. He obtained many offices under the Commonwealth, among them that of provost of Eton College. At first a Presbyterian, he afterwards joined the Independents. In 1657 he was made a lord of parliament. He died at Acton in January 1658-59. The subjective cast of his piety is reflected in his Mystical Marriage . , . betweene a Soule and her Saviour (1635), but he is best knownbyhis metrical version of the Psalms (1643), which was approved by the Westminster Assembly and (in a revised form) is still used in the Scottish Presbyterian churches.

ROUS, HENRY JOHN (1795-1877), British admiral and sportsman, was born on the 23rd of January 1795, the second son of the 1st earl of Stradbroke. He was educated at West- minster School, and entered the British navy in 1808, serving as a midshipman in the expedition to Flushing. He was after- wards appointed to the " Bacchante," and received a medal for bravery in various actions and expeditions. In 1823 he was made captain, and served in the Indian and New Holland stations from 1823 to 1829. In 1834 he was appointed to the command of the " Pique," a 36-gun frigate, which ran ashore on the coast of Labrador and was much damaged. Rous, however, brought her across the Atlantic with a sprung foremast and without keel, forefoot or rudder, and though the ship was making 23 ins. of water an hour. Rous, always fond of sport, retired from the navy, and became in 1838 a steward of the Jockey Club, a position which he held almost uninterruptedly to his death. In 1855 he was appointed public handicapper. He managed the duke of Bedford's stables at Newmarket for many years, and wrote a work on The Laws and Practice of Horse Racing that procured for him the title of " the Blackstone of the Turf." In 1841 he was returned M.P. for Westminster, and in 1846 Sir Robert Peel made him a lord of the admiralty. He died on the 19th of June 1877.

For the naval career of Admiral Rous see O'Byrne, Naval Bio- graphical Dictionary (London, 1849). A vivid sketch of him as a turf authority will be found in Day's Turf Celebrities (London, 1891).

ROUSSEAU, JACQUES (1630-1693), French painter, a member of a Huguenot family, was born at Paris in 1630. He was remarkable as a painter of decorative landscapes and classic ruins, somewhat in the style of Canaletto, but without his delicacy of touch; he appears also to have been influenced by Nicolas Poussin. While young Rousseau

went to Rome, where he Spent some years in painting the ancient ruins, together with the surrounding landscapes. He thus formed his style, which was artificial and conventionally decorative. His colouring for the most part is unpleasing, partly owing to his violent treatment of skies with crude blues and orange, and his chiaroscuro usually is much exaggerated. On his return to Paris he soon became distinguished as a painter, and was employed by Louis XIV. to decorate the walls of his palaces at St Germain and Marly. He was soon admitted a member of the French Academy of the Fine Arts, but on the revocation of the edict of Nantes he was obliged to take refuge in Holland, and his name was struck off the Academy roll. From Holland he was invited to England by the duke of Montague, who employed him, together with other French painters, to paint the walls of his palace, Montague House (on the site of which is now the British Museum). Rousseau was also employed to paint architectural subjects and land- scapes in the palace of Hampton Court, where many of his decorative panels still exist. He spent the latter part of his life in London, where he died in 1693.

Besides being a painter in oil and fresco Rousseau was an etcher of some ability; many etchings by his hand from the works of the Caracci and from his own designs still exist; they are vigorous, though coarse in execution.

ROUSSEAU, JEAN BAPTISTE (1671-1741), French poet, was born at Paris on the 6th of April 1671; he died at Brussels on the 17 th of March 1741. The son of a shoemaker, he was well educated and early gained favour with Boileau, who en- couraged him to write. He began with the theatre, for which he had no aptitude. A one-act comedy, Le Cafe, failed in 1694, and he was not much happier with a more ambitious play, Le Flatteur (1696), or with the opera of Venus et Adonis (1697). He tried in 1700 another comedy, Le Capricieux, which had the same fate. He then went with Tallard as an attache to London, and, in days when literature still led to high position, seemed likely to achieve success. His misfortunes began with a club squabble at the Cafe Laurent, which was much frequented by literary men, and where Rousseau indulged in lampoons on his companions. A shower of libellous and sometimes obscene verses was written by or attributed to him, and at last he was turned out of the cafe. At the same time his poems, as yet only singly printed or in manuscript, acquired him a great reputation, due to the dearth of genuine lyrical poetry between Racine and Chenier. He had in 1701 been made a member of the Academie des inscriptions; he had been offered, though he had not accepted, profitable places in the revenue department; he had become a favourite of the libertine but influential coterie of the Temple; and in

17 10 he presented himself as a candidate for the Academie francaise. Then began the second chapter of an extraordinary history of the animosities of authors. A copy of verses, more offensive than ever, was handed round, and gossip maintained that Rousseau was its author. Legal proceedings of various kinds followed, and Rousseau ascribed the lampoon to Joseph Saurin. In 171 2 Rousseau was prosecuted for defamation of character, and, on his non-appearance in court, was condemned par contumace to perpetual exile. He spent the rest of his life in foreign countries except for a clandestine visit to Paris in 1738, refusing to accept the permission to return which was offered him in 1716 because it was not accompanied by complete rehabilitation.

Prince Eugene and then other persons of distinction took him under their protection during his exile, and he printed at Soleure the first edition of his poetical works. Voltaire and he met at Brussels

ROUND TOWERS

Photo, Valentine.

IRISH ROUND TOWER: CLONDALK1N, CO. DUBLIN.

Photo, Mansell & Co.

EAST ANGLIAN ROUND CHURCH-TOWER: LITTLE SAXHAM.

Photo, Valentine,

BROCH: MOUSA, SHETLAND.

Photo by the late Sir Franris Borry.hy perm issioa of The Country Home.

BROCH; KEISS ROAD, CAITHNESS (INTERIOR, , LOWER PART, EXCAVATED).

in 1722. Voltaire's Le Pour el le conlre is said to have shocked Rousseau, who expressed his sentiments freely. At any rate the latter had thenceforward no fiercer enemy than Voltaire. His death elicited from Le'franc de Pompignan an ode of real excellence and perhaps better than anything of Rousseau's own work. That work is divided, roughly speaking, into two contrasted divisions. One consists of formal

and partly sacred odes and cantatas of the stiffest character, of which perhaps the Ode d, la fortune is the most famous ; the other of brief epigrams, sometimes licentious and always, or almost always, ill-natured. As an epigrammatist Rous- seau is only inferior to his friend Alexis Piron. In the former he stands almost alone. The frigidity of conventional diction and the disuse of all really lyrical rhythm which characterize his period do not prevent his odes and cantatas from showing at times true poetical faculty, though cramped, and inadequate to explain his extraordinary vogue. Few writers were so frequently reprinted during the 18th century, but even in his own century La Harpe had arrived at a truer estimate of his real value when he said of his poetry: " Le fond n'est qu'un lieu commun charge de declamations et meme d'idees fausses."

Besides the Soleure edition mentioned above Rousseau published another issue of his work in London in 1723. The chief edition since is that of J. A. Amar (5 vols., 1820), preceded by a notice of his life. M. A. de Latour published (1869) a useful though not complete edition, with notes and a biographical introduction.

ROUSSEAU, JEAN JACQUES (1712-1778), French philo- sopher, was born at Geneva on the 28th June 1712. His family had established themselves in that city at the time of the religious wars, but they were of pure French origin. Rous- seau's father Isaac was a watchmaker; his mother, Suzanne Bernard, was the daughter of a minister; she died in child- birth, and Rousseau, who was the second son, was brought up in a haphazard fashion, his father being dissipated, violent- tempered and foolish. But he early taught his son to read, and seems to have laid the foundation of the flighty sentimental- ism in morals and politics which Rousseau afterwards illustrated with his genius. When the boy was ten years old his father got entangled in a dispute with a fellow-citizen, and being condemned to a short term of imprisonment abandoned Geneva and took refuge at Lyons. The father and son henceforth rarely met. Rousseau was taken charge of by his mother's relations and was committed to the tutorship of M. Lambercier, pastor at Boissy. In 1724 he was removed from this school and taken into the house of his uncle Bernard, by whom he was shortly afterwards apprenticed to a notary. His master, how- ever, found or thought him incapable and sent him back. After a short time (April 25, 1725) he was apprenticed afresh, this time to an engraver. He did not dislike the work, but was or thought himself cruelly treated. In 1728 he ran away, the truancy being by his own account unintentional in the first instance, and due to the fact of the city gates being shut earlier than usual. Then began an extraordinary series of wander- ings and adventures, for much of which there is no authority but his cwn

Confessions. He first fell in with some proselytizers of the Roman faith at Confignon in Savoy, and by them he was sent to Madame de Warens at Annecy, a young and pretty widow who was herself a convert. Her influence, however, which was to be so great, was not immediately exercised, and he was passed on to Turin, where there was an institution suecially devoted to the reception of neophytes. His experi- ences here were unsatisfactory, but he abjured duly and was rewarded by being presented with twenty francs and sent about his business. He wandered about in Turin for some time, and at last established himself as footman to a Madame de Vercellis. Here occurred the famous incident of the theft of a ribbon, of which he accused a girl fellow-servant. But, though he kept his place by this piece of cowardice, Madame de Vercellis died not long afterwards and he was turned off. He found another place with the Comte de Gouvon, but lost this also through coxcombry. Then he resolved to return to Madame de Warens at Annecy. The chronology of all these events, as narrated by himself, is somewhat obscure, but they seem to have occupied about three years.

Even then Rousseau did not settle at once in the anomalous but to him charming position of domestic lover to this lady, who, nominally a converted Protestant, was in reality, as many

women of her time were, a kind of deist, with a theory of noble sentiment and a practice of libertinism tempered by good nature. It used to be held that in her conjugal relations she was more sinned against than sinning. But modern investigations seem to show that M. de Vuarrens (which is' said to be the correct spelling of the name) was an unfortunate husband, and was deserted and robbed by his wife. However, she welcomed Rousseau kindly, thought it necessary to complete his education, and he was sent to the seminarists of St Lazare to be improved in classics, and also to a music master. In one of his incom- prehensible freaks he set off for Lyons, and, after abandoning his companion in an epileptic fit, returned to Annecy to find Madame de Warens gone. Then for some months he relapsed into the life of vagabondage, varied by improbable adventures, which (according to his own statement) he so often pursued. Hardly knowing anything of music, he attempted to give lessons and a concert at Lausanne; and he actually taught at Neuchatel. Then he became, or says he became, secretary to a Greek archimandrite who was travelling in Switzerland to collect subscriptions for the rebuilding of the Holy Sepul- chre; then he went to Paris, and, with recommendations from the French ambassador at Soleure, saw something of good society; then he returned on foot through Lyons to Savoy, hearing that Madame de Warens was at Chambery. This was in

1732, and Rousseau, who for a time had unimportant employ- ments in the service of the Sardinian crown, was shortly in- stalled by Madame de Warens, whom he still called Maman, as amant en titre in her singular household, wherein she diverted herself with him, with music and with chemistry. In 1736 Madame de Warens, partly for Rousseau's health, took a country house, Les Charmettes, a short distance from Chambery. Here in summer, and in the town during winter, Rousseau led a de- lightful life, which he has delightfully described. In a desultory way he did a good deal of reading, but in 1738 his health again became bad, and he was recommended to go to Montpellier. By his own account this journey to Montpellier was in reality a voyage a Cythere in company with a certain Madame de Lar- nage. This being so, he could hardly complain when on return- ing he found that his official position in Madame de Warens's household had been taken by a person named Vintzenried. He was, however, less likely than most men to endure the position of second in command, and in 1740 he became tutor at Lyons to the children of M. de Mably, not the well-known writer of that name, but his and Condillac's elder brother. But Rousseau did not like teaching and was a bad teacher, and after a visit to Les Charmettes, finding that his place there was finally occupied, he once more went to Paris in 1741. He was not without recommendations. But a new system of musical notation which he thought he had discovered was unfavourably received by the Academie des sciences, where it was read in August 1742, and he was unable to obtain pupils. Madame Dupin, however, to whose house he had obtained the entry, pro- cured him the honourable if not very lucrative post of secretary to M. de Montaigu, ambassador at Venice. With him he stayed for about eighteen months, and has as usual infinite complaints to make of his employer and some strange stories to tell. At length he threw up his situation and returned to Paris (1745).

Up to this time — that is to say, till his thirty-third year — Rousseau's life, though continuously described by himself, was of the kind called subterranean, and the account of it must be taken with considerable allowances. From this time, how- ever, he is more or less in view; and, though at least two events of his life; — his quarrel with Diderot and. his death — aresubjects of dispute, its general history can be checked and followed with reasonable confidence. On his return to Paris he renewed his relations with the Dupin family and with the literary group of Diderot, to which he had already been introduced by M. de Mably's letters. He had an opera, Les Muses galantes, privately represented; he copied music for money, and received from Madame Dupin and her son-in-law M. de Francueil a small but regular salary as

secretary. He lived at the Hotel St Quentin for a time, and once more arranged for himself an equivocal

domestic establishment. His mistress, whom towards the close of his life he married after a fashion, was Therese le Vasseur, a servant at the inn, whom he first met in 1743. She had little beauty, no education or understanding, and few charms that his friends could discover, besides which she had a detestable mother, who was the bane of Rousseau's life. But he made himself happy with her, and (according to Rousseau's account, the accuracy of which has been questioned) five children were born to them, who were all consigned to the foundling hospital. This disregard of responsibility was partly punished by the use his critics made of it when he became celebrated as a writer on education and a preacher of the domestic affections. 1 Diderot, with whom from 1741 onwards he became more and more familiar, admitted him as a contributor to the Encyclopedic He formed new musical projects, and he was introduced by degrees to many people of rank and influence, among them Madame d'fipinay (q.v.), to whom in 1747 he was introduced by her lover M. de Francueil. It was not, however, till 1740 that Rousseau made his mark 'as a writer. The academy of Dijon offered a prize for an essay on the effect of the progress of civilization on morals. Rousseau took up the subject, developed his famous paradox of the superiority of the savage state, won the prize, and, publishing his essay (Discours sur les arts et sciences) next year, became famous. The anecdotage as to the origin of this famous essay is voluminous. It is agreed that the idea was suggested when Rousseau went to pay a visit to Diderot, who was in prison at Vincennes for his Lettre sur les aveugles. Rousseau says he thought of the paradox on his way down; Morellet and others say that he thought of treating the subject in the ordinary fashion and was laughed at by Diderot, who showed him the advantages of the less obvious treatment. Diderot himself, who in such matters, is almost absolutely trustworthy, does not claim the suggestion, but uses words which imply that it was at least partly his. It is very like him. The essay, however, took the artificial and crotchety society of the day by storm. Francueil gave Rousseau a valuable post as cashier in the receiver-general's office. But he resigned it either from conscientiousness, or crotchet, or nerv- ousness at responsibility, or indolence, or more probably from a mixture of all four. He went back to his music-copying, but the salons of the day were determined to have his society, and for a time they had it. In 1752 he brought out at

Fontainebleau an operetta, the Devin /du village, which was successful. He received a hundred louis for it, and he was ordered to come to court next day. This meant the certainty of a pension. But Rousseau's shyness or his perversity (as before, probably both) made him disobey the command. His comedy Narcisse, written long before, was also acted, but unsuccessfully. In the same year, however, a letter Sur la musique franqaise again had a great vogue. 2 Finally, for this was an important year

1 Apart from the fact that there were probably no children at all, the whole bearing of the belief of Rousseau that they were sent by him to the Enfants trouves has been falsified by hostile writers. He was a penniless man of letters, with theories as to state maintenance of children; and Therese was a consenting party. Rousseau, however, never saw any of the alleged children; and Mrs Mac- donald has shown good cause for believing that their existence was a myth, an imposition on Rousseau's credulity, invented by Thˆrfese and her mother to make the tie more binding. (H. Ch.)

2 Rousseau's influence on French music was greater than might have been expected from his very imperfect education; in truth, he was a musician by natural instinct only, but his feeling for art was very strong, and, though capricious, based upon true perceptions of the good and beautiful. The system of notation (by figures) con- cerning which he read a paper before the Acadˆmie des Sciences, August 22, 1742, was ingenious, but practically worse than useless, and failed to attract attention, though the paper was published in 1743 under the title of Dissertation sur la musique moderne. In the famous " guerre des buffons," he took the part of the " buffonists," so named in consequence of their attachment to the Italian " opera buffa," as opposed to the true French opera; and, in his Lettre sur la musique francaise, published in 1753, he indulged in a violent tirade against French music, which he declared to be so contemptible as to lead to the conclusion " that the French neither have, nor ever will have, any music of their own, or at least that, if they ever do have any, it will be so much the worse for them." This silly libel so enraged the performers at the Opera that they hanged and burned

with him, the Dijon academy, which had founded his fame, announced the subject of " The Origin of Inequality," on which he wrote a discourse which was unsuccessful, but at least equal to the former in merit. During a visit to Geneva in 1754 Rousseau saw his old friend and love Madame de Warens (now reduced in circumstances arid having lost all her charms), while after abjuring his abjuration of Protestantism he was enabled to take up his freedom as

citizen of Geneva, to which his birth entitled him and of which he was proud. Shortly afterwards, returning to Paris, he accepted a cottage near Montmorency (the celebrated Hermitage) which Madame d'fipinay had fitted up for him, and established himself there in April 1756. He spent little more than a year there, but it was an important year. Here he wrote La Nouvelle Hiloise; here he indulged in the passion which that novel partly represents, his love for Madame d'Huodetot, sister-in-law of Madame d'fipinay, a lady young and amiable, but plain, who had a husband and a lover (St Lambert), and whom Rousseau's devotion seems to have partly pleased and partly annoyed. Here too arose the obscure triangular quarrel between Diderot, Rousseau and Frederick Melchior Grimm, which ended Rousseau's sojourn at the Hermi- tage. The supposition least favourable to Rousseau is that it was due to one of his numerous fits of half-insane petulance and indignation at the obligations which he was nevertheless always ready to incur. That most favourable to him is that he was expected to lend himself in a more or less complaisant manner to assist and cover Madame d'fipinay's adulterous affection for Grimm. At any rate, Rousseau quitted the Her- mitage in the winter of 1757-58, and established himself at Montlouis in the neighbourhood.

Hitherto Rousseau's behaviour had frequently made him enemies, but his writings had for the most part made him friends. The quarrel with Madame d'fipinay, with Diderot, and through them with the philosophe party reversed this. In 1758 appeared his Lettre a d'Alembert contre les spectacles, written in the winter of the previous year at Montlouis. This was at once an attack on Voltaire, who was giving theatrical representations at Les Delices, on D'Alembert, who had con- demned the prejudice against the stage in the Encyclopidie, and on one of the favourite amusements of the society of the day. Voltaire's strong point was not forgiveness, and, though RoUsseau no doubt exaggerated the efforts of his " enemies," he was certainly henceforward as obnoxious to the philosophe coterie as to the orthodox party. He still, however, had no lack of patrons — he never had— though his perversity made him quarrel with all in turn. The amiable duke and duchess of Luxembourg, who were his neighbours at Montlouis, made his acquaintance, or rather forced theirs upon him, and he was industrious in his literary work — indeed, most of his best books were produced during his stay in the neighbourhood of its author in effigy. Rousseau revenged himself by printing his clever satire entitled Lettre d'un symphoniste de I'Acadimie Royale de Musique a ses camarades de I'orchestre. His Lettre a M. Burney is of a very different type, and does full justice to the genius of Gluck. His articles on music in the Encyclopidie deal very superficially with the

subject; and his Dictionnaire de musique (Geneva, 1767), though admirably written, is not trustworthy, either as a record of facts or as a collection of critical essays. In all these works the imperfection of his musical education is painfully apparent, and his compositions betray an equal lack of knowledge, though his refined taste is as clearly displayed there as is his literary power in the Letters and Dictionary. His first opera, Les Muses galantes, privately prepared at the house of La Popeliniere, attracted very little attention ; but Le Devin du village, given at Fontainebleau in 1752, and at the Acad6mie in 1753, achieved a great and well-deserved success. Though very unequal, and exceedingly simple both in style and construction, it contains some charming melodies, and is written throughout in the most refined taste. His Pygmalion (1775) is a melodrama without singing. Some posthumous fragments of another opera, Daphnis et Chloe, were printed in 1780; and in 1781 appeared Les Consola- tions des miseres de ma vie, a collection of about one hundred songs and other fugitive pieces of very unequal merit. The popular air known as ” Rousseau’s Dream ” is not contained in this collection, and cannot be traced back farther than J. B. Cramer’s celebrated ” Variations.” M. Castil-Blaze has accused Rousseau of extensive plagiarisms (or worse) in Le Devin du village and Pygmalion, but apparently without sufficient cause. (W. S. R.)

Montmorency. A letter to Voltaire on his poem about the Lisbon earthquake embittered the dislike between the two, being surreptitiously published. La Nouvelle Heloise appeared in the same year (1760), and it was immensely popular. In 1762 appeared the Contrat social at Amsterdam, and Emile, which was published both in the Low Countries and at Paris. For the latter the author received 6000 livres, for the Contrat 1000.

Julie, ou La Nouvelle Heloise, is a novel written in letters describing the loves of a man of low position and a girl of rank, her subsequent marriage to a respectable freethinker of her own station, the mental agonies of her lover, and the partial appeasing of the distresses of the lovers by the influence of noble sentiment and the good offices of a philanthropic Englishman. It is too long, the sentiment is overstrained, and severe moralists have accused it of a certain complaisance in dealing with amatory errors; but it is full of pathos and knowledge of the human heart. The Contrat social, as its title implies, endeavours to base all government on the consent, direct or implied, of the

governed, and indulges in much in- genious argument to get rid of the practical inconveniences of such a suggestion. Emile, the second title of which is De V Education, is much more of a treatise than of a novel, though a certain amount of narrative interest is kept up throughout.

Rousseau's reputation was now higher than ever, but the term of the comparative prosperity which he had enjoyed for nearly ten years was at hand. The Contrat social was obviously anti-monarchic; the Nouvelle Hiloise was said to be immoral; the sentimental deism of the "Profession du vicaire Savoyard " in Emile irritated equally the philosophe party and the church. On June n, 1762, Emile was con- demned by the parlement of Paris, and two days previously Madame de Luxembourg and the prince de Conti gave the author information that he would be arrested if he did not fly. They also furnished him with means of flight, and he made for Yverdun in the territory of Bern, whence he trans- ferred himself to Motiers in Neuchatel, which then belonged to Prussia. Frederick II. was not indisposed to protect the persecuted when it cost him nothing and might bring him fame, and in Marshal Keith, the governor of Neuchatel, Rousseau found a true and firm friend. He was, however, unable to be quiet or to practise any of those more or less pious frauds which were customary at the time with the un- orthodox. The archbishop of Paris had published a pastoral against him, and Rousseau did not let the year pass without a Lettre a. M. de Beaumont. The council of Geneva had joined in the condemnation of Emile, and Rousseau first solemnly renounced his citizenship, and then, in the Lettres de la mon- tagne (1763), attacked the council and the Genevan constitu- tion unsparingly. All this excited public opinion against him, and gradually he grew unpopular in his own neighbourhood. This unpopularity is said on uncertain authority to have cul- minated in a nocturnal attack on his house. At any rate he thought he was menaced if he was not, and migrated to the lie St Pierre in the Lake of Bienne, where he once more for a short, and the last, time enjoyed that idyllic existence which he loved. But the Bernese government ordered him to* quit its territory. He was for some time uncertain where to go, and thought of Corsica (to join Paoli) and Berlin. But finally David Hume offered him, late in 1765, an asylum in England, and he accepted. He passed through Paris, where his presence was tolerated for a time, and landed in England on January 13, 1766. Therese travelled separately, and was en- trusted to ' the charge of James Boswell, who had already made Rousseau's acquaintance. Here he had once more a chance of settling peaceably. Severe English moralists like Johnson thought but ill of him, but the public generally was not unwilling to testify against French intolerance, and re- garded his sentimentalism with favour. He was

lionized in London to his heart's content and discontent, for it may truly be said of Rousseau that he was equally indignant at neglect and intolerant of attention. When, after not a few displays of his strange humour, he professed himself tired of the capital,

Hume procured him a country abode in the house of Mr Daven- port at Wootton in Derbyshire. Here, though the place was bleak and lonely, he might have been happy enough, and he actually employed himself in writing the greater part of his Confessions. But his habit of self-tormenting and tormenting others never left him. His own caprices interposed some delay in the conferring of a pension which George III. was induced to grant him, and he took this as a crime of Hume's. The publication of a spiteful letter (really by Horace Walpole, one of whose worst deeds it was) in the name of the king of Prussia made Rousseau believe that plots of the most terrible kind were on foot against him. Finally he quarrelled with Hume because the latter would not acknowledge all his own friends and Rousseau's supposed enemies of the philosophe circle to be rascals. He remained, however, at Wootton during the year and through the winter. In May 1767 he fled to France, addressing letters to the lord chancellor and to General Conway, which can only be described as the letters of a lunatic. He was received in France by the marquis de Mirabeau (father of the great Mirabeau), of whom he soon had enough, then by the prince de Conti at Trye. From this place he again fled and wandered about for some time in a wretched fashion, still writing the Confessions, constantly receiving generous help, and always quarrelling with, or at least suspecting, the helpers. In the summer of 1770 he re- turned to Paris, resumed music-copying, and was on the whole happier than he had been since he had to leave Montlouis. He had by this time married Therese le Vasseur, or had at least gone through some form of marriage with her.

Many of the best-known stories of Rousseau's life date from this last time, when he was tolerably accessible to visitors, though clearly half-insane. He finished his Confessions, wrote his Dialogues (the interest of which is not quite equal to the promise of their curious sub-title, Rousseau jugede Jean Jacques), and began his Reveries du promeneur solitaire, intended as a sequel and complement to the Confessions, and one of the best of all his books. It should be said that besides these, which complete the list of his principal works, he has left a very large number of minor works and a considerable corre- spondence. During this time he lived in the Rue Platiere, which is now named after him. But his suspicions of secret enemies grew stronger rather than weaker, and at the begin- ning of 1778 he was glad to accept the offer of M. de Girardin, a rich financier, and occupy a cottage at Ermenonville. The

country was beautiful; but his old terrors revived, and his woes were complicated by the alleged inclination of Therese for one of M. de Girardin's stable-boys. On July 2nd he died in a manner which has been much discussed, suspicions of suicide being circulated at the time by Grimm and others. 1

There is little doubt that for the last ten or fifteen years of his life, if not from the time of his quarrel with Diderot and Madame d'Epinay, Rousseau was not wholly sane — the com- bined influence of late and unexpected literary fame and of constant solitude and discomfort acting upon his excitable temperament so as to overthrow the balance, never very stable, of his fine and acute but unrobust intellect. He was by no means the only man of letters of his time who had to submit to something like persecution. Freron on the orthodox side had his share of it, as well as Voltaire, Helvetius, Diderot and Montesquieu on that of the innovatorsˆ But Rousseau had not, like Montesquieu, a position which guaranteed him from serious danger; he was not wealthy like Helvetius; he had not the wonderful suppleness and trickiness which even without his wealth would probably have defended Voltaire himself; and he lacked entirely the " bottom " of Freron and Diderot. When he was molested he could only shriek at his

1 The local inquiry into the death, on the following day, resulted in a certificate that he died of apoplexy; but the story that he shot himself persisted. In December 1897 Rousseau's cofhn in the Pantheon was opened, and M. Berthelot, who examined the skull, found no trace of injury by a bullet; and on the whole there is no reason to doubt the verdict of the original inquiry at Ermenonville.

(H. Ch.)

enemies and suspect his friends. His moral character was undoubtedly weak in other ways than this, but it is fair to remember that but for his astounding Confessions the more disgusting parts of it would not have been known, and that these Confessions were written, if not under hallucination, at any rate in circumstances entitling the self-condemned criminal to the benefit of considerable doubt. If Rousseau had held his tongue, he might have stood lower as a man of letters; he would pretty certainly have stood higher as a man. He was, moreover, really sinned against, if still more sinning. The conduct of Grimm to him was certainly bad; and, though Walpole was not his personal

friend, a worse action than his famous letter, considering the well-known idiosyncrasy of the subject, would be difficult to find. It was his own fault that he saddled himself with the Le Vasseurs, but their conduct was probably, if not certainly, ungrateful in the extreme. Only excuses can be made for him; but the excuses for a man born, as Hume after the quarrel said of him, ” without a skin ” are numerous and strong.

His peculiar reputation increased after his death. During his life his personal peculiarities and the fact that his opinions were nearly as obnoxious to the one party as to the other worked against him, but it was not so after his death. The men of the Revolution regarded him with something like idolatry, and his literary merits conciliated many who were far from idolizing him as a revolutionist. His style was taken up by Bernardin de Saint Pierre and by Chateaubriand. It was employed for purposes quite different from those to which he had himself applied it, and the reaction triumphed by the very arms which had been most powerful in the hands of the Revolution. Byron’s fervid panegyric enlisted on his side all who admired Byron — that is to say, the majority of the younger men and women of Europe between 1820 and 1850 — and thus different sides of his tradition were continued for a full century after the publication of his chief books. His religious unorthodoxy was condoned because he never scoffed; his political heresies, after their first effect was over, seemed harmless from the very want of logic and practical spirit in them, while part at least of his literary secret was the common property of almost every one who attempted literature.

In religion Rousseau was undoubtedly what he has been called above — a sentimental deist; but no one who reads him with the smallest attention can fail to see that sentimentalism was the essence, deism the accident of his creed. In his time orthodoxy at once generous and intelligent hardly existed in France. There were ignorant persons who were sincerely orthodox; there were intelligent persons who pretended to be so. But between the time of Massillon and D’Aguesseau and the time of Lamennais and Joseph de Maistre the class ©f men of whom in England Berkeley, Butler and Johnson were repre- sentatives did not exist in France. Little inclined by nature to any but the emotional side of religion, and utterly undis- ciplined in any other by education, course of life, or the general tendency of public opinion, Rousseau naturally took refuge in the nebulous kind of natural religion which was at once fashionable and convenient. If his practice fell far short even of his own arbitrary standard of morality, as much may be said of persons far more dogmatically orthodox.

In politics, on the other hand, Rousseau was a sincere and, as far as in him lay, a convinced republican. He had no great tincture of learning, he was by no means a profound logician, and he was impulsive and emotional in the extreme — character- istics which in political matters predispose the subject to the preference of equality above all political requisites. He saw that under the French monarchy the actual result was the greatest misery of the greatest number, and, he did not look much further. The Contrat social is for the political student one of the most curious and interesting books existing. His- torically it is null; logically it is full of gaping flaws, practically its manipulations of the volonti de tous and the volontS generate are clearly insufficient to obviate anarchy. But its mixture of real eloquence and apparent cogency is exactly such as

always carries a multitude with it, if only for a time. Moreover, in some minor branches of politics and economics Rousseau was a real reformer. Visionary as his educational schemes (chiefly promulgated in Emile) are in parts, they are admirable in others, and his protest against mothers refusing to nurse their children hit a blot in French life which is not removed yet, and has always been a source of weakness to the nation.

But it is as a literary man pure and simple — that is to say, as an exponent rather than as an originator of ideas — that Rousseau is most noteworthy, and that he has exercised most influence. The first thing noticeable about him is that he defies all customary and mechanical classification. He is not a dramatist — his work as such is insignificant — nor a novelist, for, though his two chief works except the Confessions are called novels, Emile is One only in name, and La Nouvelle Helo'ise is as a story diffuse, prosy and awkward to . a degree. He was without command of poetic form, and he could only be called a philosopher in an age when the term was used with such meaningless laxity as was customary in the 18th century. If he must be classed, he was before all things a describer — a describer of the passions of the human heart and of the beauties of nature. In the first part of his vocation the novelists of his own youth, such as Marivaux, Richardson and Prevost, may be said to have shown him the way, though he improved greatly upon them; in the second he was almost a creator. In combining the two and expressing the effect of nature on the feelings and of the feelings on the aspect of nature he was absolutely without a forerunner or a model. And, as literature since his time has been chiefly differentiated from literature before it by the colour and tone resulting from this combination, Rousseau may be said to hold, as an influence, a place almost unrivalled in literary history. The defects of all sentimental writing are noticeable in him,

but they are palliated by his wonderful feeling, and by the passionate sincerity even of his insincere passages. Some cavils have been made against his French, but none of much weight or importance. And in such passages as the famous ” Voila de la pervenche ” of the Confessions, as the description of the isle of St Pierre in the Reveries, as some of the letters in the Nouvelle Helo’ise and others, he had achieved absolute perfection in doing what he intended to do. The reader, as it has been said, may think he might have done something else with advantage, but he can hardly think that he could have done this thing better.

(G. Sa.)

Bibliography.— The dates of most of Rousseau’s works pub- lished during his lifetime have been given above. The Confessions and Reveries, which, read in private, had given much umbrage to persons concerned, and which the author did not intend to be published until the end of the century, appeared in Geneva in 1782. In the same year and the following appeared a complete edition in forty-seven small volumes. There have been many since, the most important of them being that of Musset-Pathay (Paris, 1823). Some unpublished works, chiefly letters, were added by Bosscha (Paris, 1858) and Streckeisen Moulton (Paris, 1861). See also the latter’s Rousseau et ses amis (1865). Works on Rousseau are innumerable. The chief biographies are: in French that of Saint Marc Girardin (1874), in English the Life by Viscount Morley. But the materials for kis biography are so controversial and so personal — his own Confessions and the memoirs of associates whose accuracy and honesty are disputed — that the correct historical view can hardly be said yet to be standardized. Mrs Frederika Macdonald, in her Jean Jacques Rousseau (1906), makes out a good case for regarding Mme. d’fipinay’s Memoirs as coloured, if not actually dictated, by the malevolent attitude of Grimm and Diderot ; and her study of the documents undoubtedly qualifies a good many of the assump- tions that have been made on the strength of evidence which is at least tainted by contemporary prejudice, and leaves the way open for an interpretation of the facts which would reconcile Rousseau’s character as a writer with his actions as a man. Unfortunately for the consistency of historical writing, the view taken of Rousseau’s biography affects those of Grimm, Diderot, Mme. d’Epinay and others, and while Mrs Macdonald’s researches have done much to suggest a rehabilitation of Rousseau’s veracity they have not definitely been accepted to an extent which would justify the rewriting of these other lives in her sense. See also E. Ritter, Famille etjeunesse de Rousseau (1896); A. Houssaye, Les Charmettes (2nd ed., 1864); J. Grand-Carteret, Rousseau jugk par les Francais d’aujourd’hui

(1890); L. Ducros, J. J. Rousseau de Geneve & I'Hermitage, 1712-57 (1908). (H. Ch.)

ROUSSEAU, PIERRE ETIENNE THEODORE (1812-1867), French painter of the Barbizon school, was born in Paris on the 15th of April 1812, of a bourgeois family which included one or two artists. At first he received a business training, but soon displayed aptitude for painting. Although his father regretted the decision at first, he became reconciled to his son ˆleaving business, and throughout the artist's career (for he survived his son) was a sympathizer with him in aE his conflicts with the Salon authorities. Theodore Rousseau shared the difficulties of the romantic painters of 1830 in securing for their pictures a place in the annual Paris exhibition. The whole influence of the classically trained artists was against them, and not until 1848 was Rousseau adequately presented to the public. He had exhibited one or two unimportant works in the Salon of 1831 and 1834, but in 1836 his great work " La Descente des vaches " was rejected by the vote of the classic painters; and from then until after the revolution of 1848 he was persistently refused. He was not without champions in the press, and under the title of " le grand refuse " he became known through the writings of Thore, the critic who afterwards resided in England and wrote under the name of Burger. During these years of artistic exile Rousseau produced some of his finest pictures: "The Chestnut Avenue," "The Marsh in the Landes " (now in the Louvre), " Hoar-Frost " (now in America) ; and in 1851, after the reorganization of the Salon in 1848, he exhibited his masterpiece, " The Edge of the Forest " (also in the Louvre), a picture similar in treatment to, , but slightly varied in subject from, the composition called " A Glade in the Forest of Fontainebleau," in the Wallace collection at Hertford House.

Up to this period Rousseau had lived only occasionally at Barbizon, but in 1848 he took up his residence in the forest village, and spent most of his remaining days in the vicinity. He was now at the height of his artistic power, and was able to obtain fair sums for his pictures (but only about one-tenth of their value thirty years after his death), and his circle of admirers increased. He was still ignored by the authorities, for while Diaz was made Chevalier of the Legion of Honour in 1 85 1, Rousseau was left undecorated at this time, but was nominated shortly afterwards. At the Exposition Universelle of 1855, where all Rousseau's rejected pictures of the previous twenty years were gathered together, his works were acknow- ledged to form one of the finest of the many splendid groups there exhibited. But during his lifetime Rousseau never really conquered French taste, and after an

unsuccessful sale of his works by auction in 1861, he contemplated leaving Paris for Amsterdam or London, or even New York. Misfortune then overtook him: his wife, who had been a source of constant anxiety for years, became almost hopelessly insane; his aged father looked constantly to him for pecuniary assistance; his patrons were few. Moreoever, while he was temporarily absent with his invalid wife, a youth living- in his home (a friend of his family) committed suicide in his Barbizon cottage; when he visited the Alps in 1863, making sketches of Mont Blanc, he fell dangerously ill with inflammation of the lungs; and when he returned to Barbizon he suffered from insomnia and became gradually weakened. He was elected president of the fine art jury for the 1867 Exposition. His disappoint- ment at being passed over in the distribution of the higher awards told seriously on his health, and in August he was seized with paralysis. He slightly recovered, but was again attacked several times during the autumn. Finally, in November, he began to sink, and he died, in the presence of his lifelong friend, J. F. Millet, on the 22nd of December 1867.

Rousseau's other friend and neighbour, Jules Dupre, himself an eminent landscape painter of Barbizon, relates the difficulty Rousseau experienced in knowing when his picture was finished, and how he, Dupre, would sometimes take away from the studio some canvas on which Rousseau was labouring too long. Millet, the peasant painter, for whom Rousseau had the highest regard, was much with him during the last years of his life, and at his death Millet took charge of the insane

wife. Rousseau was a good friend to Diaz, teaching him how to paint trees, for up to a certain point in his career Diaz considered he could only paint figures.

Rousseau's pictures are always grave in character, with an air of exquisite melancholy which is powerfully attractive to the lover of landscapes. They are well finished when they profess to be completed pictures, but Rousseau spent so long a time in working up his subjects that his absolutely completed works are comparatively few. He left many canvases with parts of the picture realized in detail and with the remainder somewhat vague; and also a good number of sketches and water-colour drawings. His pen work in monochrome on paper is rare; it is particularly searching in quality. There are a number of fine pictures by him in the Louvre, and the Wallace collection contains one of his most important Barbizon pictures. There is also an example in the Ionides collection at the Victoria and Albert Museum.

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(D. C. T.)

ROUSSEAU DE LA ROTTIERE, JEAN SIMEON (b. 1747), French decorative painter, was the youngest son of Jules Antoine Rousseau, " sculpteur du Roi." The territorial addition to his patronymic has never been explained, but it is known to have been in use when he was little more than a boy. He studied at the Academie Royale, where we find him in September 1768 winning the medal given to the best painter of the quarter. He appears with his brother Jules Hugues to have been em- ployed from an early date by his father for the decorative work executed by the family at Versailles. There has been some controversy among the authorities as to the respective shares of father and son in these works, but many of the attributions are fairly determined by dates, Jules Antoine Rousseau having been at work at Versailles for years before the birth of his famous son. The " Bains du Roi," the " Salon de la Meridi- enne," part of the bedchamber of Madame Adelaide, and the "Garde-robe of Louis XVI." were among the achievements which there can be little doubt were shared in by Rousseau de la Rottiere. His most individual and most famous undertaking was, however, the decoration of the lovely " Boudoir de Madame de Sevilly," now at the Victoria and Albert Museum. This little room, 14 ft. long, 103 ft. wide and 16 ft. high, was removed from the house in the Rue de Saint Louis, in the Marais. The Seigneur de Sevilly, who was hereditary " Tresorier- general de l'Extraordinaire des guerres " under Louis XVI., married his cousin Anne Marie Louise de Pange, a favourite maid-of-honour of Marie Antoinette, and the story runs that his wife and the queen, desiring to give him a surprise, had the room decorated during his absence from Paris. It was purchased for the museum for 60,000 francs in 1869. The wall paintings of this sumptuous room came from the hand of Rousseau de la Rottiere; the overdoor and part of the ceiling were executed by Lagrenee le jeune; the architect was Ledoux; the grey marble figures of aged men on either side of the fire- place were sculptured by Clodion; the mounts of the chimney- piece are apparently from the chisel of Gouthiere. The date of the room is assigned to 1781-82, and Jean Simeon's authorship of much of its decoration is rendered certain by his own still existing sketch. The decoration is Pompeian in feeling,

and in the main its taste is admirable; the execution is of the highest excellence. The tall narrow panels are painted in medallions with amorini; festoons and bouquets of flowers fill every available space; the shutters are painted with doves and shepherdesses. Lagrenee's pictures in the upper lunettes represent the elements; upon the ceiling is Jupiter en- throned within a deep blue border. The perfection of detail, the unity of the whole composition, the dexterity with which so small a chamber, lofty out of proportion to its length and width,

has been picked out with recessed arches, the tenderness of its scheme of colour, combine to produce an exquisite effect. It is a melancholy reflection that M. de Sevilly, whom his wife and Marie Antoinette combined to surprise with this chef- d'oeuvre, was guillotined, and that his wife, whose sitting-room it was, was condemned to die with him and with Madame Elisabeth de France, whom they had befriended^ but was saved, against her will, by the princess, who made a false declaration as to her condition. She had two subsequent husbands, and lost them both in little more than two years. She herself lived less than five years after her delivery by the fall of Robespierre. There is no information as to Rousseau's later life. The last known mention of him is in 1792.

ROUSSILLON, one of the old provinces of France. It now forms the greater part of the department of Pyrenees Orientales (q.v.). It was bounded S. by the Pyrenees, W. by the county of Foix, N. by Languedoc and E. by the Mediterranean. The province derived its name from a small place near Perpig- nan, the capital, called Ruscino (Rosceliona, Castel Rossello), where the Gallic chieftains met to consider Hannibal's request for a conference. The district formed part of the Roman province of Gallia Narbonensis from 121 B.C. to a.d. 462, when it was ceded with the rest of Septimania to Theodoric II., king of the Visigoths. His successor, Amalaric, on his defeat by Clovis in 53 1 retired to Spain, leaving a governor in Septimania. In 719 the Saracens crossed the Pyrenees, and Septimania was held by them until their defeat by Pippin in 756. On the invasion of Spain by Charlemagne in 778 he found the border- lands wasted by the Saracenic wars, and the inhabitants hiding among the mountains. He accordingly made grants of land to Visigothic refugees from Spain, and founded several monas- teries, round which the people gathered for protection. In 792 the Saracens again invaded France, but were repulsed by Louis, king of Aquitaine, whose rule extended over all

Catalonia as far as Barcelona. The different portions of his kingdom in time grew into allodial fiefs, and in 893 Suniaire II. became the first hereditary count of Roussillon. But his rule only extended over the eastern part of what became the later province. The western part, or Cerdagne, was ruled in 900 by Miron as first count, and one of his grandsons, Bernard, was the first heredi- tary count of the middle portion, or B6salu. In n 11 Raymond- Berenger III., count of Barcelona, inherited the fief of Besalu, to which was added in n 17 that of Cerdagne; and in 1172 his grandson, Alfonso II., king of Aragon, united Roussillon to his other states on the death of the last count, Gerard II. The counts of Roussillon, Cerdagne and Besalu were not sufficiently powerful to indulge in any wars of ambition. Their energies had been devoted to furthering the welfare of their people. Under the Aragonese monarchs the progress of the united province still con- tinued, and Collioure, the port of Perpignan, became a centre of Mediterranean trade. But the country was destined to pay the penalty of its position on the frontiers of France and Spain in the long struggle for ascendancy between these two powers. By the treaty of Corbeil (1258) Louis IX. surrendered the sove- reignty of Roussillon and the ancient countship of Barcelona to Aragon, and from that time until the 17th century the province ceased to belong to France. James I. of Aragon had wrested the Balearic Isles from the Moors and left them with Roussillon to his son James (1276), with the title of king of Majorca. The consequent disputes of this monarch with his brother Pedro III. of Aragon were not lost sight of by Philip III. of France in his quarrel with the latter about the crown of the Two Sicilies. Philip espoused James's cause and led his army into Spain, but retreating died at Perpignan in 1285. James then became reconciled to his brother, and in 131 1 was suc- ceeded by his son Sancho, who founded the cathedral of Per- pignan shortly before his death in 1324. His successor James II. refused to do homage to Philip VI. of France for the seigniory of Montpellier, and applied to Pedro IV. of Aragon for aid. Pedro not only refused it, but on various pretexts declared war against him, and seized Majorca and Roussillon in 1344. The province was now again united to Aragon, and enjoyed peace

until 1462. In this year the disputes between John II. and his son about the crown of Navarre gave Louis XI. of France an excuse to support John against his subjects, who had risen in revolt. Louis turned traitor, and the province having been pawned to him for 300,000 crowns, was occupied by the French troops until 1493, when Charles VIII. restored it to Ferdinand and Isabella. During the war between France and Spain (1496-98) the people suffered equally from the Spanish garrisons and the French invaders. But dislike of the

Spaniards was soon effaced in the pride of sharing in the glory of Charles V., and in 1542, when Perpignan was besieged by the dauphin, the Roussillonnais remained true to their allegiance. Afterwards the decay of Spain was France's opportunity, and on the revolt of the Catalans against the Castilians in 1641, Louis XIII. espoused the cause of the former, and the treaty of the Pyrenees in 1659 secured Roussillon to the French crown.

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ROUTH, EDWARD JOHN (1831-1907), English mathe- matician, was born at Quebec on the 20th of January 1831. At the age of eleven he came to England, and after studying under A. de Morgan at University College, London, entered Peterhouse, Cambridge, in 1851. In the mathematical tripos three years later he was senior wrangler, beating J. Clerk Maxwell, who, however, tied with him for the Smith's prize. Elected a fellow of his college, he devoted himself to teaching, and quickly proved himself one of the most successful mathe- matical " coaches " ever known at Cambridge. In thirty years, of some 700 pupils who passed through his hands 500 became wranglers; and for twenty-two successive years, from 1861 to 1882, the senior wrangler was trained by him. He made considerable contributions to scientific literature, and among his publications were: An Analytical View of Newton's Principia, with Lord Brougham (1855); an Essay on the Stability of a given State of Motion, which won the Adams'. prize in 1877; and treatises on the Dynamics of Rigid Bodies, on Analytical Statics, and on the Dynamics of a Particle. He died at Cambridge on the 7th of June 1907.

ROUTH, MARTIN JOSEPH (1755-1854), English classical scholar, was born at South Elmham, Suffolk, on the 18th of September 1755. He was educated at Queen's College, Oxford, and subsequently elected to a fellowship at Magdalen, of which society he became president in 1791. He died at Oxford on the 22nd of December 1854, and retained his physical and intellectual powers to the last. He was the author of editions of the Euthydemus and Gorgias of Plato (1784), to which Dindorf declared himself indebted for his first ideas of Greek criticism, and of Bishop Burnet's History of his Own Time (2nd ed., 1833) and History of the Reign of King James the Second (1852). Routh was also an authority on patristic literature, his Re- liquiae Sacrae (2nd ed.,

1846-48), a collection of the frag- ments of the Fathers of the 2nd and 3rd centuries, and Scrip- torum ecclesiasticorum opuscula praecipua quaedam (2nd ed., 1840) being valuable contributions to ecclesiastical knowledge.

See Gentleman's Magazine, 1855; J. W. Burgon, Lives of Twelve Good Men (1888).

ROUTLEDGE, GEORGE (181 2-1888), English publisher, was born at Brampton in Cumberland on the 23rd of September 181 2. He gained his earliest experience of business with a bookseller at Carlisle. Proceeding to London in 1833, he started in business for himself as a bookseller in 1836, and as a publisher in 1843, making his first serious success by reprint- ing the Biblical commentaries of an American writer, Albert Barnes. His fame as a publisher, however, rests chiefly upon the enormous number of cheap books which he issued. A series of shilling volumes called the " Railway Library " was an immense success, including as it did Mrs Harriet Beecher Stowe's Uncle TonCs Cabin, and he also published in popular

form some of the writings of Washington Irving, Fenimore Cooper, Bulwer Lytton and Benjamin Disraeli. He also brought out a number of shilling books in " Routledge's Uni- versal Library." Routledge died in London on the 13th of December 1888. After being styled Routledge, Warne & Routledge, his firm changed its name to that of George Rout- ledge & Sons. A branch of the business was established in New York in 1854.

ROUVIER, MAURICE (1842-), French statesman, was born at Aix on the 17 th of April 1842, and spent the early years of his manhood in business at Marseilles. He supported Gambetta's candidature there in 1867, and in 1870 he founded an anti-imperial journal, L' Egalite. Becoming secretary general of the prefecture of Bouches-du-Rhone in 1870-71, he refused the office of prefect. In July 1871 he was returned to the National Assembly for Marseilles at a by-election, and voted steadily with the Republican party. He became a recognized authority on finance, and repeatedly served on the Budget Commission as reporter or president. At the general elections of 1881 after the fall of the Ferry cabinet he was returned to the chamber on a programme which included the separation of Church and State, a policy of decentraliza- tion, and the imposition of an income-tax. He then

joined Gambetta's cabinet as minister of commerce and the colonies, and in the 1883-85 cabinet of Jules Ferry he held the same office. He became premier and minister of finance on the 31st of May 1887, with the support of the moderate republican groups, the Radicals holding aloof in support of General Boulanger, who began a violent agitation against the govern- ment. Then came the scandal of the decorations in which President Grevy's son-in-law Daniel Wilson figured, and the Rouvier cabinet fell in the attempt to screen the president. Rouvier's opposition in his capacity of president of the Budget Commission was one of the causes of the defeat of the Floquet cabinet in February 1889. In the new Tirard ministry formed to combat the Boulangist agitation he was minister of finance. This portfolio he retained consecutively in the Freycinet, the Loubet and the Ribot cabinets, 1890-93. His relations with Cornelius Herz and the baron de Reinach compelled his retire- ment, however, from the Ribot cabinet at the time of the Panama scandals in December 1892. Again, in 1902, he became minister of finance, after nearly ten years in exclusion from office, in the Radical cabinet of M. Combes; and on the fall of the Combes ministry in January 1905 he was invited by the president to form a new ministry. In this cabinet he at first held the ministry of finance. In his initial declaration to the chamber the new premier had declared his intention of continuing the policy of the late cabinet, pledging the new ministry to a policy of conciliation, to the consideration of old age pensions, an income-tax, separation of Church and State. Public attention, however, was chiefly concentrated on foreign policy. During the Combes ministry M. Delcasse had come to a secret understanding with Spain on the Moroccan question, and had established an understanding with England. His policy had aroused German jealousy, which became evident in the asperity with which the question of Morocco was handled in Berlin. At a cabinet meeting on June 5th it is said that M. Rouvier reproached the Foreign Minister with imprudence in the matter of Morocco, and after a heated discussion M. Delcasse gave in his resignation. M. Rouvier himself took the portfolio of foreign affairs at this anxious juncture. He, after critical negotiations, secured on July 8th an agreement with Germany accepting the international conference proposed by the sultan of Morocco on the assurance that Germany would recognize the special nature of the interest of France in main- taining order on the frontier of her Algerian empire. Lengthy discussions resulted in a new convention in September, which contained the programme of the proposed conference, and in December M. Rouvier was able to make a statement of the whole proceedings in the chamber, which received the assent of all parties. M. Rouvier's government did not long survive the presidential election of 1906. The disturbances arising

in connexion with the Separation Law were skilfully handled by M. Clemenceau to discredit the ministry, which gave place to a cabinet under the direction of M. Sarrien.

ROVERETO, the most important industrial town in the southern or Italian-speaking portion of the Austrian province of Tirol, though its population (which in 1900 was 10,180, Italian-speaking and Romanist) is less than that of Trent. It is also the principal town of the administrative district of Rovereto. Built on the left bank of the Adige, in the widest portion of the Val Lagarina (the name given to the Adige valley from Acquaviva, above Rovereto, to the Italian frontier), it is divided into two parts by the Leno torrent. It is on the Brenner railway, by which it is 15 m. S.W. of Trent and 415 m. N. of Verona. Save in the newer quarter of the town, the streets are narrow and crooked, several being named after the most distinguished native of the place, Antonio Rosmini-Serbati {q.v.). The finest church is that of Santa Maria del Carmine, the old 14th-century church now serving as a sacristy to that built from 1678 to 1750. The church of San Marco dates from the 15th century. The town is dominated by the castle (now used as barracks), which was reconstructed in 1492 by the Venetians, after it had been burnt in 1487 by the count of Tirol. The staple silk industry (which dates from the 16th century) has declined, the number both of filande (establish- ments wherein the cocoons are unwound) and of filatoje (those wherein the silk is spun) having diminished.

In 1 13 2 the emperor Lothair found the passage of the gorge above the site of the town barred by a castle, which he took and gave to one of his Teutonic followers, the ancestor of the Castelbarco family. Towards the middle of the 13th century that family obtained by marriage the lands of the Lizzana family (whose castle rises S. of the town), and in 1300 practically founded the town and surrounded it with walls. In 1416 it was taken by the Venetians, who in 1487 successfully resisted, at Calliano, an attempt to take it made by the count of Tirol and the bishop of Trent. In 1509, at the outset of the war of the League of Cambray, the town gave itself voluntarily to the emperor Maximilian, to whom it was ceded formally by Venice in 1517, and next year incorporated with Tirol. South of Rovereto is the village of Marco, near which are certain natural remains (either those of a landslip that occurred in 883, or of a glacier moraine) believed to have been described by Dante {Inf. xii. 4-9), who is said to have spent part of the year 1304, during his exile from Florence, in the castle of Lizzana, between Marco and Rovereto. (W. A. B. C.)

ROVIGNO, a seaport of Austria, in Istria, 75 m. S. of Trieste by rail.

Pop. (1900) 10,205, mostly Italian. It is situated on the west coast of Istria, and possesses an interesting cathedral, built on the summit of the promontory Monte di Sant' Eufemia. Its campanile, built after the model of the famous campanile in Venice, is crowned with a bronze statue of St Eufemia, the patron saint of the town, whose remains are preserved in the church. It contains a station of the Berlin Aquarium, with a fine collection of the fauna of the Adriatic Sea. In the neighbourhood are vineyards, which produce the best wine in Istria, and olive gardens, while its hazel-nuts are reputed the finest in the world. Rovigno is the principal centre of the Austrian tunny and sardine fishery. The industries, in addition to ship- building and the preservation of fish, include the manufacture of tobacco, cement, macaroni and similar preparations, and flour. There is an active export trade. Its inhabitants are renowned seamen. Rovigno is the ancient Arupenvm or Rubinum, and according to tradition it was originally built on an island, Cissa by name, which disappeared during the earthquakes about 737. Rovigno passed definitively into the hands of the Venetians in 1330, and it remained true to the republic till the treaty of Campo Formio (1797).

ROVIGO, a town of Venetia, Italy, capital of the province of Rovigo. It stands on the low ground between the lower Adige and the lower Po, 50 m. by rail S.W. of Venice and 27 m. S.S.W. of Padua, and on the Adigetto Canal, 17 ft. above sea-level. Pop. (1901) 6038 (town); 10,735 (commune). It is a station

on the line between Bologna and Padua, with branches to Legnago and Chioggia. The architecture of the town bears the stamp both of Venetian and of Ferrarese influence. The cathedral church of Santo Stefano (1696) is of less interest than La Madonna del Soccorso, an octagon with a fine campanile, begun in 1594 by Francesco Zamberlano of Bassano, a pupil of Palladio. The town hall contains a library including some rare early editions, belonging to the Accademia de' Concordi, founded in 1580, and a fair picture gallery enriched with the spoils of the monasteries. The Palazzo Roncali is a fine Re naissance building by Sanmicheli (1555). Two towers of its medieval castle remain. Wool, silk, linen and leather are among the local manufactures.

Rovigo (Neo-Latin Rhodigium) appears to be mentioned as Rodigo in 838. It was selected as his residence by the bishop of Adria on the

destruction of his city by the Huns. From the nth to the 14th century the Este family was usually in authority; but the Venetians took the place by siege in 1482 3-nd retained possession of it by the peace of 1484, and though the Este more than once recovered it, the Venetians, returning in 1 5 14, retained possession till the French Revolution. In 1806 the city was made a duchy in favour of General Savary. The Austrians in 1815 created it a royal city. (T. As.)

ROVUMA, a river in East Africa, forming during the greater part of its course the boundary between German and Portuguese territory. The lower Rovuma is formed by the junction in n° 25′ S., 38° 31′ E. of two branches of nearly equal importance, the longer of which, the Lujenda, comes from the south-west, the other, which still bears the name Rovuma, from the west. Its source lies on an undulating plateau, 3000 ft. high, immediately to the east of Lake Nyasa, in io° 45′ S., 35° 40′ E., the head-stream flowing first due west before turning south and east. In its eastward course the Rovuma flows near the base of the escarpment of an arid sandstone plateau to the north, from which direction the streams, which have cut themselves deep channels in the plateau edge, have almost all short courses. On the opposite bank the Rovuma receives, besides the Lujenda, the Msinje and Luchulingo, flowing in broad valleys running from south to north. The Lujenda rises in close proximity to Lake Chilwa, in the small Lake Chiuta (1700 ft.), the swamps to the south of this being separated from Chilwa only by a narrow wooded ridge. The stream which issues from Chiuta passes by a swampy valley into the narrow Lake Amaramba, from which the Lujenda finally issues as a stream 80 yds. wide. Lower down it varies greatly in width, containing in many parts long wooded islands which rise above the flood level, and are often inhabited. The river is fordable in many places in the dry season. At its mouth it is about a mile wide. The lower Rovuma, which is often half a mile wide but generally shallow, flows through a swampy valley flanked by plateau escarpments containing several small back- waters of the river. The mouth, which lies in io° 28′ S., 40 30′ E., is entirely in German territory, the boundary near the coast being formed by the parallel of io° 40’. The length of the Rovuma is about 500 m.

ROW, JOHN (c. 1525-1580), Scottish reformer, was born near Stirling and educated in that town and at St Andrews, where he began to practise as an advocate in the consistorial court. In 1550 he was sent to Rome in the interests of John Hamilton, archbishop of St Andrews, and attracted the notice of the highest authorities, who, when his failing health drove him back to Scotland in 1558, nominated him papal nuncio to inquire into the spread of heresy in that country. That in- quiry ultimately led him to change his faith. Much influenced by

Knox's preaching, he joined the reformers and in April 1 560 was admitted minister of Kennoway in Fife, and in July of the same year minister of the Old or Middle Church at Perth. He was one of the commission of six who drew up the " Con- fession of Faith " and the " First Book of Discipline," and during the struggle with Queen Mary was often employed on important engagements. He was moderator of the Church Assembly at Edinburgh in July 1 567 and at Perth in the follow-

ing December, and again in Edinburgh 1576 and Stirling 1578. Meanwhile he helped to compile the " Second Book of Discipline," and became more than ever opposed to the Episcopal system of church government. He was a considerable scholar and is said to have been the first to teach Hebrew in Scotland. He died at Perth on the 16th of October 1580.

His son John Row (1 568-1646), minister of Camock, wrote a Historie of the Kirk of Scotland 1558 to 1637, which was con- tinued to 1639 by his son, the third John Row (c. 1598-c. 1672), rector of the Perth grammar school and then (appointed by Cromwell) principal of King's College, Aberdeen, who, with his father and grandfather was a famour Hebraist, but left the Church of Scotland to become an Independent minister. This Historie was published by the Wodrow Society and by the Maitland Club in 1842.

ROWE, NICHOLAS (1674-1718), English dramatist and mis* cellaneous writer, son of John Rowe (d. 1692), barrister and serjeant-at-law, was baptized at Little Barford in Bedford- shire on the 30th of June 1674. Nicholas Rowe was educated at Westminster School under Dr Busby. He became in 1688 a King's Scholar, and entered the Middle Temple in 1691. On his father's death he became the master of an independent fortune. His first play, The Ambitious Stepmother, the scene of which is laid in Persepolis, was produced in 1700, and was followed in 1702 by Tamerlane. In this play the conqueror represented William III., and Louis XIV. is denounced as Bajazet. It was for many years regularly acted on the anni- versary of William's landing at Torbay. The Fair Penitent (1703), an adaptation of Massinger and Field's Fatal Dowry, was pronounced by Dr Johnson to be one of the most pleasing tragedies in the language. In it occurs the famous character of Lothario, whose name passed into current use as the equiva- lent of. a rake. Calista is said to have suggested to Samuel Richardson the character of Clarissa Harlowe, as Lothario suggested Lovelace. In 1704 Rowe tried his hand at comedy, producing The Biter at Lincoln's Inn Fields. The play is said to have amused no one except the author, and Rowe returned to tragedy in Ulysses (1706). The

Royal Convert (1707) dealt with the persecutions endured by Aribert, son of Hengist and the Christian maiden Ethelinda. The Tragedy of Jane Shore, which was played at Drury Lane with Mrs Oldfield in the title- role in 1 7 14, ran for nineteen nights, and kept the stage longer than any of his other works. The Tragedy of Lady Jane Grey followed in 17 15. Rowe's friendship with Pope, who speaks affectionately of his vivacity and gaiety of disposition, led to attacks inspired by the publisher Edmund Curll, the best known of these being The New Rehearsal, or Bays the Younger, containing an Examen of Seven of Rowe's Plays, by Charles Gildon. Rowe acted as under-secretary (1709-n) to the duke of Queensberry when he was principal secretary of state for Scotland. On the accession of George I. he was made a sur- veyor of customs, and in 1715 he succeeded Nahum Tate as poet laureate. He was also appointed clerk of the council to the prince of Wales, and in 1718 was nominated by Lord Chancellor Parker as clerk of the presentations in Chancery. He died on the 6th of December 17 18, and was buried in West- minster Abbey. He was twice married, and his widow re- ceived a pension from George I. in 1719 in recognition of her husband's translation of Lucan. This verse translation, or rather paraphrase of the Pharsalia, was called by Samuel Johnson " one of the greatest productions in English poetry," and was widely read, running through eight editions between 1 7 18 and 1807.

Rowe was the first modern editor of Shakespeare. It is unfortunate that he based his text (6 vols., 1709) on the corrupt Fourth Folio, a course in which he was followed by later editors. We owe to him the preservation of a number of Shakespearian traditions, collected for him at Stratford by Thomas Betterton. These materials he used with considerable judgment in the memoir prefixed to the Works. Moreover, his practical know- ledge of the stage suggested technical improvements. He divided the play into acts and scenes on a reasonable method,

noted the entrances and exits of the players, and prefixed a list of the dramatis personae to each play. Rowe wrote occa- sional verses addressed to Godolphin and Halifax, adapted some of the odes of Horace to fit contemporary events, and translated the Caracteres of La Bruyere and the Callipaldia of C. Quillet. He also wrote a memoir of Boileau prefixed to a translation of the Lutrin.

Rowe's Works were printed in 1727, and in 1736, 1747, 1756, 1766 and 1792 ; his occasional poems are included in Anderson's and other collections of the British poets.

ROWEL (from O. Fr. rouel or roel, dim. of roue, Lat. rota, wheel), the name of the small revolving wheel or disk with radiating points forming the termination of a rider's spur. The earliest rowels probably did not revolve but were fixed. They appear on monuments of the 13th century, as in the great seal of Henry III. of England, but the older " prick " spurs remained the standard form till the 14th century (see Spur). In veterinary science, the word is used of a small disk of leather or other material used as a seton.

ROWING (O. Eng. rowan, to row, cf. Lat. remus, Gr. eperˆos, oar), (he act of driving forward or propelling a boat (q.v.) along the surface of the water by means of oars.

History. — The earliest historical records describe battles and voyages in which the ships were propelled by oars. There must, of course, have been from time to time friendly trials of speed between these ancient craft, such as that described by Virgil in the fifth book of the Aeneid, but there is no record in classical or even in medieval times of rowing having been indulged in solely as a recreation, or as a means of promoting athletic contest. The absence of any element of competition is sufficient to account for the fact that the boa.ts, the oars, and the method of rowing of the 17th century differed but little from those of the earliest times.

The history of Great Britain abounds in instances of the use of the oar. The ancient Britons propelled themselves in coracles of wickerwork covered with skins, by means of paddles rather than oars, but the Saxons were expert oarsmen, as also were the Danish and Norwegian invaders. It is recorded by William of Malmesbury that Edgar the Peaceable was rowed in state on the river Dee by eight tributary kings, himself acting as coxswain.

During the nth and 12th centuries, when roads were often impassable, considerable use was made of the various rivers of England for the transmission of both passengers and mer- chandise; and, until the introduction of coaches, the nobility and gentry who had mansions and watergates on the banks of the Thames relied almost entirely upon their boats and elaborately fitted barges as a means of conveyance from place to place.

This use of boats and barges as a means of conveyance for

merchandise and passengers provided a means of livelihood for a class of professional oarsmen known as. bargemen or water- men. They were professionals, not in the sense of professional athletes, but because they made their living by rowing and navigating passenger and other craft along and across the Thames. Watermen as a class are mentioned in history as early as the 13th century. The distress occasioned to them by the long frosts is referred to in the chronicles of that period. They are mentioned as having been employed to row the barons and their retinues to Runnymede for the signing of the Magna Carta by King John, and about the same time several of the city companies established barges for the pur- poses of processions and other pageants upon the Thames. It is stated by Fabian that in 1454 " Sir John Norman, then lord mayor of London, built a noble barge at his own expense and was rowed by watermen with silver oars, attended by such of the city companies as possessed barges, in a splendid manner." The lord mayor's procession by water to West- minster was annual until 1856, the state barge of the lord mayor being a magnificent species of shallop rowed by water- men, while those of the city companies were propelled by a double bank of oars in the fore half, the after part consisting

of a cabin which somewhat resembled that of a gondola. In 1514 and in 1555 acts of parliament were passed for the regula- tion of watermen and their boats and fares upon the Thames (7 Henry VIII. cap. vii. and 2 and 3 Ph. & Mar. cap. xvi.), and from the terms of these statutes there can be no doubt that there were in the 15th century a considerable body of men who lived by the " trade of Rowing " as it is there called. During the 16th and 17th centuries there were no doubt com- petitions from time to time between these watermen, but the first actual mention of boat-racing is the record of the estab- lishment in 1715 of Doggett's Coat and Badge. Mr Thomas Doggett, who may fairly be described as the founder of modern boat-racing, was a celebrated comedian. He established a fund to provide an annual prize of a waterman's coat with a large silver badge on the arm. The race was founded in honour of the house of Hanover and to commemorate the anniversary of " King George I.'s happy accession to the throne of Great Britain." The contest was to take place at the be- ginning of August and on the Thames between six young watermen who were not to have exceeded the time of their apprenticeship by more than twelve months. Although the first race took place in 1715 the names of the winners have only been preserved since 1791. Doggett's Coat and Badge is still an annual event, the conditions as to boats to be used and other details having been slightly modified. It is entirely controlled and managed by the Fishmongers' Company.

The first English regatta (Ital. regata) — an entertainment introduced, as the Annual Register records, from Venice — of which we have evidence, took place on the Thames off Rane- lagh Gardens in 1775. Great public interest seems to have been taken in the spectacular aspect of this pageant, the barges of the lord mayor and the city companies being present, but. there is no record of the competing wager boats or of the names of the watermen who took part in the races.

About the years 1800 to 1810 there are instances of matches between watermen for stakes presented by gentlemen who no doubt made wagers upon the result, and from these pro- fessional wager matches it was but a short step to sporting matches between the gentlemen themselves. When once the ” gentleman amateur,” as he was called, appeared, his evolu- tion, from the sportsman who occasionally rowed a match ‘ against a friend, or against time, for a wager, to the amateur oarsman of the present day, was not slow. The amateur rowing which began about the year 1800 on the Thames at Westminster has flourished as a branch of athletic sport, and has spread to every quarter of the globe.

Rowing in the United Kingdom. — The earliest rowing clubs in England were small groups of oarsmen who combined to purchase a six-oared or eight-oared boat for the purpose of racing. The club was called by the same name as the ship it possessed, and at the commencement of the 19th century the principal clubs in existence upon the Thames were the ” Star,” the ” Arrow,” the ” Shark ” and the ” Siren.” The two latter have long since disappeared, but the ” Star ” and the ” Arrow ” combined about the year 181 8 and founded the Leander Club, an institution which after varying fortunes has for many years been recognized as the premier rowing club of the world.

The earliest contemporary record of boat-racing is the Watei Ledger of Westminster School, which commences in the year 1813 with a list of the crew of the six-oared boat ” Fly.” In i8it Eton had a ten-oared boat and three boats with eight oars, but there is no existing record of a race until 1817. In 1818 Eton challenged Westminster School to row from Westminster to Kew Bridge against the tide; but the race was stopped by the authorities, and it was not until 1829 that the first contest between the two schools took place. Between 1829 and 1847 there were eight matches between Eton and Westminster. The race was revived for a few years in the sixties, and in the year 1868 the state of the lower tideway was such that the West- minster boys moved their boathouse first to Wandsworth and then to Putney. This arrangement was found to be incon- venient, and shortly afterwards

Westminster rowing came to a»

end. Eton rowing, on the other hand, has continued to prosper, and for many years it has been the greatest ” nursery ” of first- class oarsmen. Since 1861 the Eton College Boat Club has never failed to enter a crew at Henley Regatta.

At Oxford the records of periodical races between college boats begin as early as 1815, and those of Cambridge a few years later. The first contest between eight-oared crews representing the two universities took place at Henley-on- Thames in June 1829. The second contest was not until 1836, and was rowed from Westminster to Putney. In 1837 and 1838 the universities were unable to make a match, and in each of those years a race was rowed between Cambridge and the Leander Club, which had thus early become the premier club of the tideway. It was not always easy in the early days of boat-racing for the university boat clubs to agree as to the conditions and time of the match, but on several] occasions when the universities had been unable to meet on the tide- way they fought their battle whilst competing for the Grand Challenge Cup at Henley Regatta. Since 1856 the Oxford and Cambridge boat race has been an annual event. It is rowed about a week or ten days before Easter from Putney to Mortlake over what is known as the championship course, a distance of 4i m. The race is rowed with the flood-tide, and occu- pies as a rule a time varying between 19 and 22 min. The time occupied by a crew in covering this course depends a great deal more upon the conditions of wind and tide than upon the excellence, or the reverse, of the crew. The crew of each university is selected by a president, usually one of the senior members of the last crew, who is elected at the first meeting in the summer term and holds office for a year. Thus” the university race comes at the end of his term of office, and he has every opportunity during the summer and autumn of studying the material which will be at his disposal for the forma- tion of a crew in the ensuing spring. The aquatic arrangements at the two universities are very much alike. The university year begins in October. During the winter term the freshmen are instructed in the elements of rowing, while the senior men are engaged in practising for the University (inter-collegiate) Fours, a race which takes place early in November. During the latter portion of the term the president of the University Boat Club is engaged in selecting and coaching the trial eights, two picked crews comprising the bulk of the material available for the

formation of the university crew. The trial eight races are rowed in the beginning of December, that of Cambridge on the Ouse at Ely, and that of Oxford on the Thames at Moulsford, neither the Cam nor the Isis being wide enough for two crews to race abreast. During the whole of the Easter term the university crews are engaged in practice and training for the University Boat Race. The attention of the remainder of the rowing men at the universities is devoted to training for the bumping races known at Oxford and Cambridge respectively as the Torpids and Lent Races. Each college is represented in these races, and no oarsman who has rowed in the first boat of his college during the previous summer is qualified to compete. The boats start at fixed distances apart, and each boat endeavours to bump the boat in front of it, and to avoid being bumped by the boat behind. When a bump is effected, the two boats involved draw to the side, and the next night the successful boat starts in front of its victim. Each spring the boats start in the order in which they finished the previous year. The races last for six nights at Oxford and four at Cambridge. In the summer term the important bumping races between the best crews of each college take place. They are known as ” The Eights ” at Oxford and ” The May Races ” at Cambridge. To attain the position of ” Head of the River ” in these races is the summit of a college boat club’s ambition.

The great arena of rowing contests is Henley Royal Regatta. It was founded in 1839 at a public meeting held in the town hall at Henley-on-Thames, at which it was decided to raise a subscription and purchase two challenge cups, the Grand Challenge Cup to be rowed for annually in eight-oared boats open to all amateur crews, and the Town Challenge Cup for

four-oared crews residing within 5 m. of Henley. The first regatta was held on the 14th of June 1839, and was a most successful affair, the Grand Challenge Cup being won by the Trinity Boat Club, Cambridge. In 1840 another district race was” added, and in 1841 the Stewards Challenge Cup for four oars was added to the programme, open to competition upon the same conditions as the Grand Challenge Cup. There have now for many years been eight events at the regatta, four of which are open to all amateurs, viz. the Grand Challenge Cup for eight oars, the Stewards Challenge Cup for fours, the Silver Goblets for pair oars founded in 1845, an d f fle Diamond Sculls for single scullers founded in 1844. The races for which the entry is restricted are the Ladies Challenge Plate for eight oars (founded 1845) an d the Visitors Challenge Cup for four oars (founded 1847), which are open to crews from schools and colleges in the United Kingdom; also the Thames Challenge Cup for eight oars (founded 1868) and Wyfold Challenge Cup for four oars (founded 1855). The rule as to entry for the Thames

Cup is that no one who has won the Grand Challenge or Stewards Cup may compete, nor may any one enter for this race and for the Grand or Stewards Cups in the same year. The rule for the Wyfold Cup is the same, except that a com- petitor may also enter for the Grand Challenge Cup.

The original regatta course was from the upper end of the Temple Island to Henley Bridge, but a change was made in 1886 so as to avoid the corner at the finish. The races now start at the lower end of the island and finish at the upper end of the grounds of Phyllis Court. The course is 1 m. 550 yds. in length and about no ft. in width. The races are rowed against the stream, and the time usually occupied by the winning crew of the Grand Challenge Cup is within a few seconds of 7 min. In 1843 took place the famous ” seven- oar ” victory of Oxford. At the eleventh hour one of the Oxford crew was incapacitated by illness. Their opponents, the Cambridge Subscription Rooms Club, refused to allow them to introduce a substitute, and the Oxford men gained undying fame by winning the Grand Challenge Cup with seven oars. Ten years later (1853) there was a magnificent race between Oxford and Cambridge in the Grand Challenge Cup, the former winning by 18 in. only. In 1862 there was a dead heat in the final heat of the Diamond Sculls between Mr E. D. Brick- wood and Mr W. B. Woodgate. In 1878 occurred the memorable contest between Mr T. C. Edwards- Moss and Mr G. W. Lee (U.S.A.) in a heat for the Diamond Sculls which was won on the post by the former. In 1891 the Leander Club, after a dead heat with the Thames R.C., began a series of victories in the Grand Challenge Cup, winning the cup on seven occasions in the next ten years. In 1892 the Diamond Sculls left England for the first time, having been won by Mr J. J. K. Ooms of Holland. In 1895 a crew representing Cornell University, U.S.A., entered for the Grand Challenge Cup and were drawn in their heat against the Leander Club. Owing to a misunder- standing between the starter and the Leander crew,’ the latter failed to start, and the Cornell crew rowed on to the finish without offering to return to the start, a proceeding which caused no little comment at the time. On the following day they were defeated by Trinity Hall, Cambridge, the ultimate winners. In 1897 the Grand Challenge Cup was won by 2 ft. by New College, Oxford, in the record time of 6 min. 51 sees., after a desperate race with Leander. The feature of the next ten years was the persistency with which colonial and foreign crews endeavoured to carry off the principal prizes of the re- gatta, and the invasion culminated in 1906 by the capture of the Grand Challenge Cup by a crew from the Club Nautique de Gand, Belgium. On this occasion the Leander Club was not represented, but in 1907 the Belgians repeated

their victory after defeating a strong Leander crew in one of the heats. In 1903 Mr Herbert Steward, the chairman of the regatta com- mittee, published a detailed record of the regatta from its commencement, which gives a complete history of the meeting and an account of every race.

Henley regatta is rowed ” in accordance with ” the rules of

the Amateur Rowing Association, a body which has control of all other amateur rowing in England. The Henley Stewards and the Amateur Rowing Association (or A.RA.) are in complete harmony. Their rules are identically the same, but the Stewards being the older body are not subject to the A.R.A., and in the improbable event of a difference occurring they would be entitled to act independently. The A.R.A. was formed in 1882 for the purpose of drawing up a definition of an ” amateur,” and for the purpose of having a body who could if necessary select a national representative crew to meet any foreign or colonial invaders. It has long since dropped the latter portion of its original programme, and the A.R.A. as at present constituted is an association to which all the principal amateur boat clubs are affiliated. Its objects are to maintain the standard of amateur oarsmanship and to promote the interests of boat racing. It is governed by a committee which occupies in the British rowing world a position not unlike that of the stewards of the Jockey Club in racing matters. The constitution and objects of the A.R.A. are clearly defined in the rules, and their definition of an amateur is so much stricter than that of some other countries that it is advisable to set it out in extenso. It is as follows: —

1N0 person shall be considered an amateur oarsman, sculler or coxswain — ■

(1) Who has ever rowed or steered in any race for a stake, money or entrance fee ;

(2) Who has ever knowingly rowed or steered with or against a professional for any prize ;

(3) Who has ever taught, pursued or assisted in the practice of athletic exercises of any kind for profit ;

(4) Who has ever been employed in or about boats or in manual labour for money or wages;

(5) Who is or has been by trade or employment for wages a mechanic, artisan or labourer, or engaged in any menial duty;

(6) Who is disqualified as an amateur in any other branch of sport.

The rules of the A.R.A. also comprise the ” Laws of Boat Racing,” which govern the race from start to finish; and the ” Rules for Regattas,” which deal with a large number of matters such as the definition of the different classes of oarsmen, seniors, juniors and maidens, the making of entries, the powers of regatta committees, &c.

A large number of regattas are held under these rules in all parts of the country during the summer months. There are also several matches and other competitions rowed under special rules, the most important of these being the Wingfield Sculls (founded 1830), or amateur championship of the Thames, rowed in the month of July over the championship course from Putney to Mortlake (4J m.).

If the number of entries at Henley Regatta, the extension of the sphere of influence of the A.R.A. and the public interest in the Oxford and Cambridge Boat Race, may be taken as tests, rowing has more than held its own among the various competing forms of recreation in the world of British amateur athletic sport.

Rowing in the United States. — The earliest record of a boat race in the United States is that of a contest in light barges in the year 181 1 between the ” Knicker-bocker ” of New York and the ” Invincible ” of Long Island, in which the former was successful. The evolution from racing in heavy pleasure boats to racing in specially constructed craft proceeded with great rapidity, and by the year 1834 a large number of small clubs in New York had combined, under the title of the Castle Garden Boat Club Association. In 1837 the first regatta took place at Poughkeepsie, the race being between ” six-oars ” for a prize of $200. In those days there was no real distinction in America between amateur and professional, and in spite of rules and definitions the distinction between one who is qualified as an amateur and one who is not has remained in America much less certain and precise than in the United Kingdom.

Yale and Harvard Universities became centres of aquatic energy very early in the history of American rowing. The first racing boat at Yale, a six-oar, was bought in 1844, and in the following spring Harvard purchased an eight, and in 1852

a race was rowed between a Harvard crew and three Yale crews at

Lake Winnepesaukee, which resulted in a victory for the former. In 1859 Harvard again defeated Yale in a six-dared race, but on the following day at Worcester City Regatta the same crews entered for a prize and Yale defeated Harvard. In 1864 at a college regatta Yale defeated Harvard, but in 1866 Harvard with a very fine crew showed their superiority over all the other colleges. In 1869 Harvard sent a challenge to Oxford and Cambridge to row a four-oared match on the Thames from Putney to Mortlake. It was accepted by the former and the race was rowed on the 27th of August. The race aroused great public interest, and the banks of the river were crowded from end to end of the course. The crews were: Oxford, F. Willan (bow), A. C. Yarborough, J. C. Tinn6 and S. Darbishire (stroke); Harvard, J. S. Fay (bow), E. G. Lyman, W. H. Simmons and A. P. Loring (stroke). Harvard led at first, but Oxford eventu- ally rowed them down and won by three lengths.

The trip of the Harvard four to England aroused the rowing enthusiasm of other American universities such as Princeton, Cornell, Columbia and Pennsylvania, and during the next ten years considerable improvement was shown in American rowing. In 1875 no fewer than thirteen university or college crews competed in a race, in which Cornell finished first, Columbia second and Harvard third, the ships used being six-oars without coxswains. In 1876 the eight-oared match over a four-mile course between Harvard and Yale was in- stituted, and in 1878 a four from Columbia University went to Henley and won the Visitors Challenge Cup. In 1879 and 1880 there were a very large number of inter-collegiate matches and regattas, in several of which Columbia maintained the reputation which they had gained at Henley. In 1881 a Cornell four started at Henley for the Stewards Cup, but were easily beaten. During the next few years there was consider- able difference of opinion between universities as to the correct style of stroke, and in 1882 a Yale crew, coached by Mr Davis, did some fine performances, rowing a very fast short stroke in a very long boat. They were, however, eventually beaten by Harvard after an exciting race, in which it is only fair to them to record that the erratic steering of their coxswain contributed in no small degree to their defeat. The next year, 1883, Yale tried an even faster and shorter stroke, but were easily beaten by Harvard, who rowed with great length and steadiness. This year saw the end of the very fast short stroke, and although the ” strokes ” of the various crews since that day have differed in minor degrees, they settled down to a longer steadier method of rowing which is spoken of in England as the ” American style.” It differs from that adopted by English oarsmen in that there is an absence of swing and body work, and in that the oarsmen appear

to rely almost entirely upon their long slides and hard leg work. In the early ” nineties ” Cornell was almost always successful at home, and in 1895 they entered for the Grand Challenge Cup at Henley. Owing to a misunderstanding at the start the Leander crew were left at the post in the first heat, but on the next day Cornell suffered defeat at the hands of Trinity Hall. In 1896 Yale entered at Henley under the tuition of Cook, but were somewhat easily beaten by Leander. The result of these two expeditions to Henley was an attempt to introduce the English style of rowing in America. The experi- ment was not altogether successful. Mr R. C. Lehmann, who had met with considerable success in England as a coach both at Oxford and Cambridge, went to Harvard for two seasons. The attempt to instruct the American oarsmen in the English methods of swing and body work, instead of the American stroke, resulted in their falling short of perfection in either style, and they were beaten by Yale upon each occasion. Mr Lehmann’s visit, if it failed to give pace to the crews he coached, resulted, however, in improving the whole spirit of American college rowing. Mutual confidence and friendly rivalry took the place of the atmosphere of suspicion and almost of enmity which had at times existed between Harvard and Yale. In 1 895 an Inter-collegiate Rowing Association was formed by

Cornell, Columbia and Pennsylvania to organise contests at Poughkeepsie open to all colleges. In 1899 an d 1900 Pennsyl- vania won, in 1902, 1904 and 1908 Syracuse, and in most other years Cornell. The two annual inter-collegiate regattas are the Harvard- Yale at New London, and that at Poughkeepsie, open to all but not participated in by Harvard and Yale. By way of exception, Harvard rowed at Poughkeepsie in 1896, and in 1897 and 1898 Cornell rowed in two regattas. In 1901 Pennsyl- vania was just beaten by Leander Club in the race for the Grand Challenge Cup at Henley.

The history of amateur rowing in the United States, other than that of the colleges and universities, is a narrative of continual struggles on the part of the authorities to distinguish between the amateur and the non-amateur. The National Association of Amateur Oarsmen was established in 1872. Many regattas have»been held since that date under their rules, but the standard of amateurism which satisfied the N.A.A.O. has never been strict enough to comply with the requirements of the English A.R. A. or the Henley Stewards. In 1883 a Hillsdale four from U.S.A. tendered an entry at Henley, but it was

refused by the Stewards, on the ground that the men were not amateurs according to the English definition. In subsequent years several American scullers entered for the Diamond Sculls, and in 1897 they were won by E. H. Ten-Eyck of Wachusett Boat Club, Worcester, U.S.A. In 1898 Ten-Eyck's entry was refused by the Henley Stewards. No little resentment has been caused in America by the re- luctance of the English authorities to accept American entries, but their justification lies in the essential difference, not only in letter but in spirit, between the laws and customs of the two countries with regard to the amateur status and amateur sport. In 1904 a crew of the Vesper B.C. of Philadelphia were duly vouched by the N.A.A.O. and their entry accepted by the Henley Stewards. They competed and were beaten, and it afterwards became known that not only had several of the men made money out of the trip, but that two or three of the oarsmen were not qualified to row at Henley. It also appeared that certain members of the N.A.A.O. had, to say the least of it, been extremely careless in giving assurances as to the status of the Vesper crew, and all relations between the N.A.A.O. and the Henley Stewards were abruptly terminated, the Stewards determining that they would not accept foreign entries except from a country where there was a governing body which had control of amateur rowing and which had an agreement with the Stewards by which they definitely pledged themselves not to send competitors to Henley unless they came within the English definition. In 1906 Harvard challenged Cambridge. The race, which attracted an immense concourse of spectators, was rowed from Putney to Mortlake in September. Cambridge led from the start and won by three lengths.

Rowing in other Countries. — During the latter years of the 19th century and during the early years of the present century, rowing increased very greatly in popularity as a branch of athletic sport in every quarter of the globe. It would be impossible here to describe the history or organization of boat clubs and regattas in Australia, in Canada, and in the various countries of Europe. Canadian rowing has always been of a high class. In 1904 L. Scholes, a Canadian sculler, won the Diamond Sculls at Henley, and on several occasions Canadian eights and fours have competed for the Grand Challenge and Stewards Challenge Cups at Henley. In Australia they have a regatta which is called the " Australian Henley," and an inter-university contest for a cup presented by Oxford and Cambridge oarsmen. In Europe international championships have been instituted in the hope of bringing together oarsmen and scullers from all countries. The Belgian oarsmen have by their Henley successes achieved the greatest distinction among continental oarsmen. In Holland the principal

rowing clubs have their headquarters at Amsterdam, and several Dutch crews have been seen at Henley. In France there are in- numerable rowing clubs which are now governed by the Federa- tion francaise, a body which has a strict code of rules, but

which has not adopted quite so strict an amateur definition as that of the English A.R.A. In Germany, also, rowing is very extensively practised under the auspices of the Deutsche Ruderverband ; the chief contests between English and German crews of recent years were at the Cork Regatta of 1902 when Leander Club defeated the Berlin Club in the eight-oared race, and at the Henley Regatta of 1907, when a four of the Lud- wigshafener Club were defeated in a heat of the Stewards Cup by a Leander crew.

Methods and Style. — The English style is the only one in which the oarsman swings his body to the full extent fore and aft, at the same time making use of his sliding seat. Most of the foreign crews who have competed in England have sacrificed a portion of their swing in order to enable them, as they believe, to make better use of their leg work. There can be no doubt that the English style is in a sense more exhausting to the oarsman, that is to say it enables him to bring more muscle into play and to make full use of his weight and strength, but in spite of recent defeats it is still believed by English oarsmen to be the most effective. The crews of 1906 and 1907 which were defeated by the Belgians were the best that England could at the time produce, but they undoubtedly rowed in a style which fell a long way short oi ideal English rowing.

The secret of good rowing is the simultaneous application of leg and body work from end to end of the stroke. The instant the blades are covered the whole weight must be lifted from the stretcher and applied to the oar-handle, and must remain so applied until the hands come in to the chest. In order to ensure that the pressure so applied to the blade shall be as long and as .hard as possible, the body must be swung for- ward to its full extent, and during the stroke the shoulders must always be swinging back faster than the seat, while at the same time the legs are driving hard at the. stretcher. The slide and swing should be finished simultaneously. There are many subsidiary rules of style as to the movements of the hands and arms, but they are all of secondary importance and are devised so as to enable the average man to execute the working portion of the stroke effectively and often, without undue exertion to himself. The movements of a crew must be as nearly as possible simultaneous in every particular. There have been many instances of crews which although inferior in style and strength to their opponents have been victorious owing to being ”

better together.”

See the volumes on Rowing in the Badminton and Isthmian Libraries; W. E. Sherwood, Oxford Rowing; W. B. Woodgate, Oars and Sculls; E. D. Brickwood, Boat Racing; H. T. Steward, Henley Royal Regatta. (C. M. P.)

ROWLAND, HENRY AUGUSTUS (1848-1901), American physicist, was born at Honesdale, Pennsylvania, on the 27th of November 1848. From an early age he exhibited marked scientific tastes and spent all his spare time in electrical and chemical experiments. At the Rensselaer Polytechnic Institute at Troy, N.Y. he graduated in 1870, and he then obtained an engage- ment on the Western New York railway. But the work there was not to his liking, and after a short time he gave it up for an instructorship in natural science at the university of Wooster, Ohio, which in turn he resigned in order to return to Troy as assistant professor of physics. Finally, in 1876, he became the first occupant of the chair of physics at the Johns Hopkins University, Baltimore, a position which he retained until his premature death on the 16th of April 1901. Rowland was one of the most brilliant men of science that America has pro- duced, and it is curious that at first his merits were not perceived in his own country, In America he was unable even to secure the publication of certain of his scientific papers; but Clerk Maxwell at once saw their excellence, and had them printed in the Philosophical Magazine. When the managers of the Johns Hopkins University asked advice in Europe as to whom they should make their professor of physics, he was pointed out in all quarters as the best man for the post. In the interval between his election and the assumption of his duties at Baltimore, he studied physics under Helmholtz at

Berlin, and carried out a well-known research on the effect of an electrically charged body in motion, showing it to give rise to a magnetic field. As soon as he was settled at Baltimore, two important pieces of work engaged his attention. One was a redetermination of the ohm. For this he obtained a value which was substantially different from that ascertained by the committee of the British Association appointed for the purpose, but ultimately he had the satisfaction of seeing his own result accepted as the more correct of the two. The other was a new determination of the mechanical equivalent of heat. In this he used Joule’s paddle-wheel method,

though with many improvements, the whole apparatus being on a larger scale and the experiments being conducted over a wider range of temperature. He obtained a result distinctly higher than Joule's final figure; and in addition he made many valu- able observations on thermometrical questions and on the variation of the specific heat of water, which J. P. Joule had assumed to be the same at all temperatures. In 1882, before the Physical Society of London, he gave a description of the diffraction gratings with which his name is specially associated, and which have been of enormous advantage to astronomical spectroscopy. These gratings consist of pieces of metal or glass ruled by means of a diamond point with a very large number of parallel lines, on the extreme accuracy of which their efficiency depends. For their production, therefore, dividing engines of extraordinary trueness and delicacy must be employed, and in the construction of such machines Row- land's engineering skill brought him conspicuous success. The results of his labours may be found in the elaborate Photo- graphic Map of the Normal Solar Spectrum (1888) and the Table of Solar Wave-Lengths (1808). In the later years of his life he was engaged in developing a system of multiplex telegraphy.

ROWLANDS, RICHARD (fi. 1560-1620), Anglo-Dutch antiquary, whose real name was Verstegen, was the son of a cooper whose father, Theodore Roland Verstegen, a Dutch emigrant, came to England about 1500. Under the name of Rowlands, Richard went to Christ Church, Oxford, in 1565, where he studied early English history and the Anglo-Saxon language. Leaving the university without a degree, he pub- lished in 1576 a work of antiquarian research, translated from the German, entitled The Post of the World, describing the great cities of Europe; and soon afterwards he moved to Antwerp, where he resumed the name of Verstegen, and set up in business as a printer and engraver. In 1587 he went to Paris, and in 1595 to Spain, where he studied in the college at Seville, after- wards returning to Antwerp, where he lived so far as is known until his death, the date of which, though certainly later than 1620, is unknown. Rowlands was a zealous Roman Catholic, and in 1587 he published at Antwerp Theatrum Crudelitatum haereticorum, in which he criticized the treatment of the Roman Catholics in England under Elizabeth so freely that when a French translation of the book appeared in the following year he was thrown into prison at the instance of the English am- bassador in Paris. Many of his writings were published in the name of Verstegen. His works included A Dialogue on Dying Well (1603), a translation from the Italian; Restitution of Decayed Intelligence in Antiquities concerning the English Nation, dedicated to James I. (1605); Neder

Dvytsche Epigrammen (161 7); Sundry Successive Regal Governments in England (1620); Spiegel der Nederlandsche Elenden (1621). The verses on the defeat of the Irish rebels under Tyrone, entitled England's Joy, by R. R. (1601), is doubtfully attri- buted to him. Richard Verstegan, author of Nederlantische Antiquiteyten (Brussels, 1646), is probably another person, possibly Rowlands's son.

See Anthony k Wood, Athenae Oxonienses, edited by P. Bliss (4 vols., London, 1813-20); J. W. Burgon, Life and Times of Sir T. Gresham (2 vols., London, 1839); W. C. Hazlitt, Collections and Notes (London, 1882 and 1887).

ROWLANDS, SAMUEL (c. r 573-1630), English author of pam- phlets in prose and verse, which reflect the follies and humours of the lower middle-class life of his time, seems to have had no

contemporary literary reputation; but his work throws consider- able light on the social London of his day. Among his works, which include some poems on sacred subjects, are: The Betraying of Christ (1598); The Letting of Humours Blood in the Head-vaine (epigrams and satires) and A Mery Meetinge, or 'tis Mery when Knaves mete (1600) — the two latter being publicly burnt by order, but republished later under other names — {Humors Ordinarie and The Knave of Chibbes); Greenes Ghost haunting Conie-Catchers (1602), which he pre- tended to have edited from Greene's papers, but which is largely borrowed from his printed works; Tis Merrie when Gossips meete (1602), a dialogue between a Widow, a Wife, a Maid and a Vintner; Looke to it; for lie stabbe ye (1604), in which Death describes the tyrants, careless divines and other evil-doers whom he will destroy;' Hells broke loose (1605), an account of John of Leyden, and in the same year a Theatre of Divine Recreation (not extant), poems founded on the Old Testament; A Terrible Battell betwene . . . Time and Death (1606); Democritus, or Doctor Merry-man his Medicines against Melancholy humors, reprinted, with alterations, as Doctor Merrie-man, and Diogenes Lanthorne (1607) , in which " Athens " is London; The Famous History of Guy, Earl of Warwick (1607), a long romance in Rowlands's favourite six-lined stanza, and one of his hastiest, least successful efforts; Humors Looking Glasse (1608); and Martin Mark- all, Beadle of Bride- well (1610), a history of roguery containing much information about notable highwaymen and the completest vocabulary of thieves' slang up to that time. Of his later works may be mentioned Sir Thomas Overbury; or the Poysoned Knights Complaint, and The Melancholie Knight (161 5), which suggests a hearing of Beaumont and Fletcher's Knight of the Burning Pestle. The last of his humorous studies, Good Newes and Bad Newes, appeared in 1622,

and in 1628 he published a pious volume of prose and verse, entitled Heavens Glory, Seeke it: Earts vanitie, Flye it: Hells Horror, Fere it. After this nothing is known of him. Mr Gosse, in his introduction to Rowlands's complete works, edited (1872-80) for the Hunterian Club in Glasgow by Mr S. J. H. Herrtage, sums him up as a " kind of small non-political Defoe, a pamphleteer in verse whose talents were never put into exercise except when their possessor was pressed for means, and a poet of considerable talent without one spark or glimmer of genius."

Mr Gosse's notice is reprinted in his Seventeenth Century Studies (1883). A recently discovered poem by Rowlands, The Bride (1617), was reprinted at Boston, U.S.A., in 1905 by Mr A. C. Potter.

ROWLANDSON, THOMAS (1756-1827), English caricaturist, was born in Old Jewry, London, in July 1756, the son of a tradesman or city merchant. On leaving school he became a student in the Royal Academy. At the age of sixteen he resided and studied for a time in Paris, and he afterwards made frequent tours on the Continent, enriching his portfolios with numerous jottings of life and character. In 1775 he exhibited at the Royal Academy a drawing of " Delilah visiting Samson in Prison," and in the following years he was represented by various portraits and landscapes. Possessed of much facility of exe- cution and a ready command of the figure, he was spoken of as a promising student; and had he continued his early applica- tion he would have made his mark as a painter. But by the death of his aunt, a French lady, he fell heir to a sum of £7000, plunged into the dissipations of the town and was known to sit at the gaming-table for thirty-six hours at a stretch. In time poverty overtook him; and the friendship and example of Gillray and Bunbury seem to have suggested caricature as a means of filling an empty purse. His drawing of Vauxhall, shown in the Royal Academy exhibition of 1784, had been engraved by Pollard, and the print was a success. Rowlandson was largely employed by Rudolph Ackermann, the art publisher, who in 1809-n issued in his Poetical Magazine "The Schoolmaster's Tour" — a series of plates with illustrative verses by Dr William Coombe. They were the most popular of the artist's works. Again engraved by Rowlandson himself in 1812, and issued under the title of the " Tour of Dr Syntax

in Search of the Picturesque," they had attained a fifth edition by

1813, and were followed in 1820 by ” Dr Syntax in Search of Consolation,” and in 182 1 by the ” Third Tour of Dr Syntax in Search of a Wife.” The same Collaboration of designer, author and publisher appeared in the English ” Dance of Death,” issued in 18 14-16, one of the most admirable of Rowlandson’s series, and in the ” Dance of Life,” 1822. Rowlandson also illus- trated Smollett, Goldsmith and Sterne, and his designs will be found in The Spirit of the Public Journals (1825), The English Spy (1825), and The Humourist (1831). He died in London, after a prolonged illness, on the 22nd of April 1827.

Rowlandson’s designs were usually executed in outline with the reed-pen, and delicately washed with colour. They were then etched by the artist on the copper, and afterwards aqua-tinted — usually by a professional engraver, the impressions being finally coloured by hand. As a designer he was characterized by the utmost facility and ease of draughtsmanship, and the quality of his art suffered from this haste and over-production. He was a true if not a very refined humorist, dealing less frequently than his fierce contemporary Gillray with politics, but commonly touching, in a rather gentle spirit, the various aspects and incidents of social life. His most artistic work is to be found among the more careful drawings of his earlier period; but even among the exaggerated caricature of his later time we find hints that this master of the humorous might have attained to the beautiful had he so willed.

See J. Grego, Rowlandson the Caricaturist, a Selection from his Works, &c. (2 vols., 1880).

ROWLEY, WILLIAM (c. 1585-e. 1642), English actor and dramatist, collaborator with several of the dramatists of the Elizabethan period, especially with Thomas Middleton.; He is not to be identified with ” Master Rowley, once a rare scholar of learned Pembroke Hall in Cambridge,” whom Francis Meres described in his Palladis Tamia as one of the ” best for comedy.” The only Rowley at Pembroke Hall at the period was Ralph Rowley, afterwards rector of Chelmsford. William Rowley is described as the chief comedian in the Prince of Wales’s company, and it was doubtless during the two years’ union (1614-16) of these players with the Lady Elizabeth’s com- pany that he was brought into contact with Middleton. Rowley joined the King’s Servants in 1623, and retired from the stage about four years later. The fact of his marriage is recorded in 1637, and he is supposed to have died about 1642. Four plays attributed to his sole authorship are extant: A new Wonder, A Woman never Vext (printed, 1632); A Match at Midnight (1633); A Tragedie called Alls Lost by Lust (1633); and a

Shoomaker a Gentleman with the Life and Death of the Cripple that stole the Weathercock at Paules (1638). They are distinguished by effectiveness of situation and ingenuity of plot, so that we may conjecture why he was in such request as an associate in play-making, and he had further an experi- mental knowledge of the coarse comedy likely to please the pit. It is recorded by Langbaine that he ” was beloved of those great men Shakespeare, Fletcher and Jonson.” The plays he wrote with Middleton are dealt with under that heading. With George Wilkins and John Day he wrote The Travailes of the Three English Brothers (1607); with Thomas Hey wood he produced the romantic comedy of Fortune by Land and Sea (printed, 1655); he was associated with Thomas Dekker and John Ford in The Witch of Edmonton 1 (printed, 1658); A Cure for a Cuckold (printed, 1661) and The Thracian Wonder (printed, 1661) are assigned to the joint authorship of Webster and Rowley; while Shakespeare’s name was unjustifiably coupled with his on the title-page of The Birth of Merlin: or, The Childe hath found his Father (1662). Rowley also wrote an elegy on Hugh Attwell, the actor, and a satirical pamphlet describing contemporary London, entitled A Search for Money

(1609).

The dramatist Samuel Rowley, described without apparent reason by J. P. Collier as William Rowley’s brother, was employed

1 It is usual to minimize Rowley’s share in this play. Mr Seccombe [Diet. Nat. Biog., s.v. Rowley) says: ” Dekker appears to have had the chief share, but Rowley supplied some acceptable buffoonery.” J. O. Halliwell-Phillipps (Diet, of Old English Plays), however, defined it as a tragi-comedy by William Rowley, adding that he had help from the other two.

by Henslowe as a reader of plays. He wrote some scriptural plays now lost, with William Borne (or Bird, or Boyle) 2 and Edward Juby. His only extant pieces are: When you see me, You know me. Or the famous Chronicle Historie of King Henry the eight, with the birth and vertuous life of Edward Prince of Wales (1605), of interest because of its possible connexion with the Shakespearian play of Henry VIII., and The Noble Souldier. Or, A Contract Broken, justly reveng’d (1634), which was entered, however, in the Stationers’ Register as the work of Thomas Dekker, to whom the major share is probably assignable.

ROWLEY REGIS, an urban district in the Kingswinford par- liamentary division of Staffordshire, England, on the Stourbridge branch of the Great Western railway, 7 m. W. of Birmingham, Pop. (1901) 34,670. It

lies in a hilly district rich in coal and iron, while a hard basaltic intrusion known as Rowley rag is largely quarried. The town is a modern growth out of a village surrounding the church of St Giles, which dates from the 13th century, though rebuilt in 1840. Iron manufactures are extensive; there are also brick and tile works and breweries.

ROWLOCK (pronounced rullock or rollock), a device on the gunwale of a boat in or on which an oar rests, forming a fulcrum for the oar in rowing. The word is a corruption due to ” row ” of the earlier ” oar-lock,” O.E. arloc, a lock or enclosed place for an oar. The simplest form of rowlock is a notch, square or rounded, on the gunwale, in which the oar rests; other kinds are formed by two pins or pegs, ” thole pins ” (thole being ultimately the same word as Norw. toll, a young fir-tree), and by a swivel with two horns of metals, pivoted in the gun- wale or on an outrigger (see Oar) .

ROWTON, MONTAGUE WILLIAM LOWRY-CORRY, Baron (1838-1903), second son of the Right Hon. Henry Corry by his wife Harriet, daughter of the 6th earl of Shaftesbury, was born in London on the 8th of October 1838, educated at Harrow and at Trinity College, Cambridge, and called to the bar in 1863. His father, a son of the 2nd earl of Belmore, re- presented County Tyrone in parliament continuously for forty- seven years (1826-73), and was a member of Lord Derby’s cabinet (1866-68) as vice-president of the council and after- wards as first lord of the Admiralty. Montague Corry was thus brought up in close touch with Conservative party politics ; but it is said to have been his winning personality and social accomplishments rather than his political connexions that recommended him to the favourable notice of Disraeli, who in 1866 made Corry his private secretary. From this time till the statesman’s death in 1881 Corry maintained his con- nexion with Disraeli, the relations between the two men being more intimate and confidential than usually subsist between a private secretary and his political chief. When Disraeli resigned office in 1868 Corry declined various offers of public employment in order to be free to continue his services, now given gratuitously, to the Conservative leader; and when the latter returned to power in 1874, Corry resumed his position as official private secretary to the prime minister. He accom- panied Disraeli (then earl of Beaconsfield) to the congress of Berlin in 1878, where he acted as one of the secretaries of the special embassy of Great Britain. On the defeat of the Con- servatives in 1880, Corry was raised to the peerage with the title of Baron Rowton, of Rowton Castle, Shropshire. He had rendered service of an exceptional order to his chief, and after Beaconsfield’s removal to the House of Lords his private secretary

became invaluable in keeping him in touch with the rank and file of his party. Lord Rowton was in Algiers when Beaconsfield was stricken with his last illness in the spring of 1 881; but returning post-haste across Europe, he was present at the death-bed of his old chief. Beaconsfield (q.v.) bequeathed to Rowton all his correspondence and other papers.

Lord Rowton will long be remembered as the originator of the scheme known as the Rowton Houses. Consulted by Sir

2 William Borne or Bird engaged to play with the Admiral's Men for three years from 1597. In 1600 he borrowed 30s. from Henslowe to pay for a new play, Jugurth, by W. Boyle (probably another name for himself). He helped S. Rowley in Joshua (1601), and in additions (1602) to Marlowe's Dr Faustus. His connexion with the theatre ceased about 162 1.

Edward Guinness (afterwards Lord Iveagh) with regard to the latter's projetted gift of £200,000 for endowment of a trust for the improvement of the dwellings of the working classes, Rowton made himself personally familiar with the conditions of the poorest inhabitants of London; and he determined to establish " a poor man's hotel," which should offer better accommodation than the common lodging-houses, at similar prices. In the face of much discouragement and difficulty, the first Rowton House was opened at Vauxhall in December 1892, the cost (£30,000) being defrayed by Lord Rowton, though he was by no means a man of great wealth. In 1894 a company, Rowton Houses (Limited), was incorporated to extend the scheme, a main characteristic of which was that the houses should not be charitable institutions but should be on a paying commercial basis. The scheme proved a gratifying success, and was imitated not only in many of the chief towns of Great Britain, but also in different countries of Europe and in America (see Housing). Lord Rowton also devoted himself to the business of the Guinness Trust, of which he was a trustee, and was interested in many philanthropic schemes. Lord Rowton was unmarried, and the title consequently became extinct at his death, which occurred in London on the 9th of November

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ROXANA, or Roxane, daughter of the Bactrian king Oxyartes, and wife

of Alexander the Great. After the latter's death she gave birth at Babylon to a son (Alexander IV.), who was accepted by the generals as joint-king with Arrhidaeus. Having crossed over to Macedonia, and thrown in her lot with Olympias, mother of Alexander the Great, she was imprisoned by Cassander in the fortress of Amphipolis and put to death (310 or 309 B.C.). The marriage of Alexander and Roxana was the subject of a famous painting by Aetion.

See Plutarch, Alexander, 47, 77; Arrian, Anal. iv. 18, vii. 27; Diod. Sic. xviii. 3, 38, xix. 11, 52, 105; Strabo xi. p. 517, xvii. p. 794.

ROXBURGHE, EARLS AND DUKES OF. Robert Ker, 1st earl of Roxburghe (c. 1570-1650), was the eldest son of William Ker of Cessford (d. 1606) and the grandson of Sir Walter Ker (d. c. 1584), who fought against Mary queen of Scots both at Carberry Hill and at Langside. He was descended from Sir Andrew Ker of Cessford (d. 1526) who fought at Flodden and was killed near Melrose in January 1526 by the Scotts of Buccleuch. The deed was avenged when the Kers under Sir Walter killed Sir Walter Scott of Buccleuch in Edinburgh in 1552. Robert Ker was also descended, on the maternal side, from Andrew Ker of Ferniehurst (c. 1471-1545), a celebrated border chieftain. Another famous member of the family was Andrew's grandson, Sir Thomas Ker of Ferniehurst (d. 1586), who, Camden says, was " of an immovable fidelity to the queen of Scots and the king her son." He was the father of Robert Carr, earl of Somerset, the favourite of James I.

After a turbulent life on the border Robert Ker became a Scottish privy councillor in 1599 and was made Lord Roxburghe about the same time; he accompanied King James to London in 1603, and was created earl of Roxburghe in 1616. He was lord privy seal for Scotland from 1637 to 1649, and in the Scottish parliament heˆhowed his sympathy with Charles I.; but he took no part in the Civil War, although he signed the " engagement " for the king's release in 1648. He died at Floors, his residence near Kelso, on the 18th of January 1650. His son Harry, Lord Ker, had died in January 1643; conse- quently his titles and estates passed by special arrangement to his grandson, William Drummond (d. 1675), the youngest son of his daughter Jean and her husband John Drummond, 2nd earl of Perth. William took the name of Ker, became 2nd earl of Roxburghe, and married his cousin Lord Ker's daughter Jean.

The second earl's son was Robert, 3rd earl (c. 1658-1682), whose son was John, 1st duke of Roxburghe (c. 1680-1741). John became 5th earl on the death of his brother Robert, the 4th earl, in 1696, and is

described by George Lockhart of Carn- wath as ” perhaps the best accomplished young man of quality in Europe.” In 1704 he was made a secretary of state of

Scotland, and he helped to bring about the union with England, being created duke of Roxburghe in 1707 for his services in this connexion. This was the last creation in the Scottish peerage. The duke was a representative peer for Scotland in four parlia- ments; George I. made him a privy councillor and keeper of the privy seal of Scotland, and he was loyal to the king during the Jacobite rising in 171 5. He was again a secretary of state from 1716 to 1725, but he opposed the malt-tax, and in 1725 Sir Robert Walpole procured his dismissal from office. He died on the 24th of February 1741. His only son, Robert (c. 1709-1755), who had been created Earl Ker of Wakefield in 1722, became 2nd duke, and was succeeded by his son John, 3rd duke of Roxburghe (1 740-1804), the famous bibliophile. John was betrothed to Christiana, daughter of the duke of Mecklen- burg-Strelitz; but when the princess’s sister Charlotte was affianced to George III., reasons of state led to the rupture of the engagement, and he died unmarried on the 19th of March 1804. The duke’s library, including a unique collection of books from Caxton’s press, and three rare volumes of broadside ballads, was sold in 1812, when the Roxburghe Club was founded to com- memorate the sale of Valdarfer’s edition of Boccaccio. Rox- burghe’s cousin William, 7th Lord Bellenden (c. 1728-1805), who succeeded to the Scottish titles and estates, died childless in October 1805, and for seven years the titles were dormant. Then in 1812 Sir James Innes, bart. (1736-1823), a descendant of the 1st earl, established his claim to them, and taking the name of Innes-Ker, became 5th duke of Roxburghe. Among the unsuccessful claimants to the Roxburghe dukedom was John Bellenden Ker (c. 1765-1842), famous as a wit and botanist and the author of Archaeology of Popular Phrases and Nursery Rhymes (1837), whose son was the legal reformer, Charles Henry Bellenden Ker (c. 1785-1871).

The 5th duke’s great-grandson, Henry John Innes-Ker (b. 1876), became 8th duke in 1892. The duke of Roxburghe sits in the House of Lords as Earl Innes, a peerage of the United Kingdom, which was conferred in 1837 upon James Henry, the 6th duke (1816-1879).

ROXBURGHSHIRE, a Border county of Scotland, bounded W. by Berwickshire, E. and S.E. by Northumberland, S. by Cumberland, S.W. by Dumfriesshire and N.W. by the shires of Selkirk and Mid Lothian. It has an area of 426,060 acres, 01 665-7 sq. m. The only low-lying ground in the shire is found in the N. and in the valleys of the larger

rivers, and the whole S. is markedly hilly. Though the Cheviots, forming for a con- siderable distance the natural boundary with England, mostly belong to Northumberland, Catcleuch Shin (1742 ft.) and Peel Fell (1964) are Scottish peaks. The chief heights of the mountainous mass constituting the watershed between Teviotdale and Liddesdale are Cauldcleuch Head (1996), Greatmoor (1964), Pennygant (1805), Din Fell (1735), Windburgh (1622) and Arnton Fell (1464). In the W. is Crib Law (1369), and in the N., near Melrose, occur the triple Eildons (highest peak, 1385). The county is abundantly watered. The Tweed flows through the N. of the shire for 26 out of its total run of 97 m., though for about 2 m. (near Abbotsford) it is the boundary stream with Selkirkshire, and for 10 m. lower down with Berwickshire (parishes of Earlston and Merton). On the right its affluents are the Bowden and the Teviot, and on the left the Allan and the Eden. The Teviot is the principal river lying entirely in Roxburghshire. From its source near Causeway Grain Head on the Dumfriesshire border, it follows mainly a N.E. direction for 37 m. to its confluence with the Tweed at Kelso. Its chief tributaries are, on the right, Allan Water, the Slitrig, Dean Burn, the Rule, the Jed, the Oxnam and the Kale, and, on the left, Borthwick Water and the Ale, both rising in Selkirkshire. The Liddel is the leading stream in the S. Rising near Peel Fell in the Cheviots it flows S.W. to the Esk after a course of 27 m., receiving on the right Hermitage Water, on the left Kershope Bum. The Kershope and Liddel, during part of their run, serve as boundaries with Cumberland. Excepting the Liddel, which drains to the Esk, much the greater portion of the surface is drained, by the Tweed, to the North Sea. The lakes are few

and small, the largest being Yetholm or Primside Loch and Horselaw, both in the parish of Linton among outlying hills of the Cheviots. Teviotdale, Liddesdale, Tweedside and Jedvale are the principal valleys.

Geology. — This county contains a considerable range of sedi mentary rocks from the Ordovician to the Carboniferous systems, and with these are associated Jarge tracts of volcanic rocks. The Ordovician and Silurian rocks occupy the N.W. and W. part of the county; :they have been thrown into numerous sharp folds. It is on the crests of the anticlines that the strata of the former system appear flanked on either side by those of the latter. The oldest rocks are the mudstones and radiolarian cherts with contemporaneous and intrusive igneous rocks of Arenig age; these are followed by shales and greywackes of Llandeilo age and similar rocks of Caradoc age. Then comes the Silurian with the Birkhill shales and massive grits and greywackes of the Gala or Queensberry group with the Hawick rocks; these are all of Llan- dovery age and they occupy the greater part of the Silurian area. Wenlock and Ludlow rocks are found S. of Hawick rocks from Wisp Hill N.E. by Stobs Castle; other inlying masses occur in the Old Red Sandstone and Carboniferous areas, the largest of these being that which appears in a belt some 14 m. in length from near Riccarton in the direction of Hobkirk. Two divisions of the Old Red Sandstone occur; the lower, which consists of subordinate sandstones and conglomerates in sheets of contemporaneous lavas with some tuffs, is confined to the Cheviots; the strata are uncon- formable upon the upturned Silurian beds. The upper division, which in its turn is unconformable upon the lower, occupies about one-third of the county. It consists of coarse conglomerates at the base followed by sandstones and marls. It is well developed in the N., where volcanic rocks come in; the Trow Crags of Makerstown which cross the Tweed are due to these lavas. It extends from Newtown and Kelso to Kirkton with extensions in the valleys S.W. Carboniferous rocks are represented by the Calciferous sandstone series; in the S.W. in Liddesdale and on the uplands of Carter Fell, Larriston Fell, &c, they are sandstones with shales, some calcareous beds and coal and volcanic beds. In the N.E. corner of the county the outer part of the Berwickshire Carboniferous basin just comes within the boundary. An inter- esting series of volcanic ” necks ” belonging to this period is ex- emplified in Dunain Law, Black Law, Maiden Paps, Ruberslaw and other hills. Glacial deposits are represented by boulder clay and beds and ridges of sand and gravel.

Climate and Industries. — The average annual rainfall is about 37 in.,

higher in the hilly regions and somewhat lower towards the N. and E. The mean temperature for the year is 48 F., for January 38 F. and for July 60° F. The soil is chiefly loam in the level tracts along the banks of the larger streams, where it is also very fertile. In other districts a mixture of clay and gravel is mostly found, but there is besides a considerable extent of mossy land. Of the area under grain about two-thirds are occupied by oats, the remainder being principally devoted to barley. Among green crops turnips and swedes are most generally cultivated, potatoes covering a comparatively small acreage. In different parts of Tweedside and Jedvale several kinds of fruit are successfully grown. Both in the pastoral and arable localities agriculture is in an advanced condition. The hill country is everywhere covered with a thick preen pasturage admirably suited for sheep, which occupy the walks in increasingly large quantities. The herds of cattle are also heavy, horses are kept mostly for farming operations, and pigs are raised in moderate numbers. .Fairly large holdings predominate, farms of between 100 and 300 acres being general, and only in Berwick- shire

The county is the principal seat of the tweed and hosiery manu-factures in Scotland. Engineering, ironfounding, dyeing and tanning are also carried on at Hawick and Jedburgh, ana agricultural implements and machinery, chemical manures and especially fishing tackle are made at Kelso. The salmon fisheries on the Tweed are of considerable value.

The Waverley route of the North British railway runs through the county from near Melrose in the N. to Kershopefoot in the S. At St Boswells branches are sent off to Duns and Reston, and to Jedburgh and Kelso via Roxburgh. The North-Eastern railway, an English company, has a line from Berwick to Kelso, via Coldstream and Carham.

Population and Administration. — The population in 1901 was 48,804, or 73 persons to the sq. m. In 1901 there were 132 persons who spoke Gaelic and English, but none Gaelic only. The principal towns are Hawick (pop. 17,303), Kelso (4008), Jedburgh (3136), Melrose (2195). The county returns a member to parliament, and Hawick' belongs to the Border group of parliamentary burghs. Jedburgh, the county town, is a royal burgh, and Hawick, Kelso and Melrose are police

burghs. The shires of Roxburgh, Berwick and Selkirk form a sheriffdom, and a resident sheriff-substitute sits at Jedburgh and

Hawick. The county is under school-board jurisdiction, and there are secondary schools at Hawick and Kelso, while the board schools at Jedburgh and Melrose have secondary depart- ments. Most of the " residue " grant is expended in assisting teachers to attend science and art classes at Edinburgh Uni- versity and Hawick, and in subsidizing science and art and technical classes at Hawick, Kelso and elsewhere.

History and Antiquities. — Among the more important re- mains of the original inhabitants are the so-called " Druidical " stones and circles at Plenderleath between the Kale and Oxnam; on Hownam Steeple, a few miles to the N.W. (where they are locally known as the Shearers and the Bandster); and at Midshiels on the Teviot. The stones on Ninestane Rig, near Hermitage Castle, and on Whisgill are supposed to com- memorate the Britons of Strathclyde who, under Aidan, were defeated with great slaughter by Ethelfrith, king of Bernicia, at the battle of Degsanstane or Dawstane in 603. There are hill forts in Liddesdale on the Allan, in the parish of Oxnam, and on the most easterly of the three Eildons. This last is said to be the largest example of its kind in Scotland. The fortress was defended by palisades around the three circular terraces which form the hill-top. Within the enclosure there was a town of huts, judging from certain marks that indicate the site of such dwellings, and the relics of early British pottery that have been found, while the fact that springs exist renders the theory of a settlement all the more probable. One of the most important and most mysterious of British remains is the Catrail, or Picts' Work Dyke. In its original condition it is supposed to have consisted of a line of double mounds or ramparts, averaging about 30 ft. in width, with an inter- vening ditch 6 ft. broad, the slope from the centre of the mound to the middle of the bottom of the trench being 10 ft. Owing to weather and other causes, however, it is now far from per- fect and in places has disappeared for miles. Beginning at Torwoodlee, N.W. of Galashiels, it ran S.W. to Yarrow church, whence it turned first S. and then S.E., following a meandering course to Peel Fell in the Cheviots, a distance of 48 miles. Though it must have been difficult to defend so long a line, the bulk of opinion is in favour of its being a defence work. Roman remains are also of exceptional interest. Watling Street crossed the Border N. of Brownhart Law (1664 ft.) in the Cheviots, then took a mainly N.W. direction' across the Kale, Oxnam, Jed and Teviot to Newstead, near Melrose, where it is conjectured to have crossed the Tweed and run up Lauderdale into Haddingtonshire. The chief stations were Ad Fines on the Cheviots, Gadanica (Bonjedward) near Jedfoot and Eildon Hill (? Trimontium). Another so-called Roman road is the Wheel Causeway or Causey, a supposed con- tinuation of the Maiden Way which ran from

Overburgh in Lancashire to Bewcastle in Cumberland, and so to the Border. It entered Roxburghshire N. of Deadwater and went (roughly) N. as far as Wolflee, whence its direction becomes a matter of surmise. Of Roman camps the principal appear to have been situated at Cappuck, to the S.E. of Jedburgh, and near New- stead, at the base of the Eildons, the alleged site of Trimontium. After the retreat of the Romans the country was occupied by the Britons of Strathclyde in the W. and the Bernicians in the E. It was then annexed to Northumbria for over four centuries until it was ceded, along with Lothian, to Scotland in 1018. David I. constituted it a shire, its ancient county town of Roxburgh (see Kelso) forming one of the Court of Four Burghs. The castle of Roxburgh, after changing hands more than once, was captured from the English in 1460 and dismantled. Other towns were repeatedly burned down, and the abbeys of Dryburgh, Jedburgh, Kelso and Melrose ulti- mately ruined in the expedition of the earl of Hertford (the Protector Somerset) in 1544-45. The Border freebooters — of whom the Armstrongs and Elliots were the chief — conducted many a bloody fray on their own account. On the union of the crowns the county gradually settled into what was

comparatively a state of repose, disturbed to some extent during the Covenanting troubles and, to a much slighter degree, by the Jacobite rebellions.

Bibliography. — Sir George Douglas, Roxburgh, Selkirk and Peebles (Edinburgh, 1899); W. S. Crockett, The Scott Country (Edinburgh, 1902); Alexander Jeffrey, The History and Antiquities of Roxburghshire (4 vols., Edinburgh, 1857-64).

ROXBURY, formerly a city of Norfolk county, Massachu- setts, U.S.A., situated between Boston and Dorchester, but since 1868 a part of Boston. It is primarily a residential district. Among its institutions are the Roxbury Latin School, established in 1645, 1 the Fellowes Athenaeum (a part of the Roxbury branch of the Boston Public Library), with about 26,000 volumes in 1909, and the New England Hospital for Women and Children (1863), the New England Baptist Hospital (1893), the Woman's Charity Club Hospital (1890), the Roxbury Homoeopathic Dispensary (1886), the Roxbury Home for Children and Aged Women (1856), a Home for Aged Couples (1884) and the Massachusetts Home for Intemperate Women (1879). On Mount Bellevue, in West Roxbury (set apart from Roxbury in 1851

and annexed to Boston in 1873), there is an observatory (erected in 1869 by the city of Boston as a stand- pipe for the high service water supply). Among the manu- factures of the district are cotton and woollen goods, cordage, carpets, shoes and foundry products. The town of Roxbury (at first usually spelled Rocksbury) was founded in 1630 by some of the Puritan immigrants who came with Governor John Winthrop; the settlers were led by William Pynchon, who in 1636 led a party from here and founded Springfield, Mass. At the home of Rev Thomas Welde (d. 1662), the first minister, Anne Hutchinson {q.v.) was held in custody during the winter of 1637-38. Associated as teacher with Welde and his suc- cessors, Samuel Danforth and Nehemiah Walter, was John Eliot, the apostle to the Indians, who removed to Roxbury in 1632 and died here in 1690. Roxbury was the home also of Thomas Dudley, of his son Joseph and of his grandson Paul; of Robert Calef (d. 1719), the leader of the opposition to the witchcraft craze; of General Joseph Warren, and of William Eustis (1753-1825), who was U.S. secretary of war (1809-12), minister to the Netherlands (1814-18), and governor of Massachusetts (1823-25); and from 1837 to 1845 Theodore Parker was the pastor of the Unitarian Church of West Roxbury. Of special interest in the old Roxbury burial-ground is the ” Ministers’ Tomb,” containing the remains of John Eliot, and the tomb of the Dudleys. West Roxbury was the scene of the Brook Farm experiment (see Brook Farm). Roxbury was chartered as a city in 1846.

See F. S. Drake, The Town of Roxbury, its Memorable Persons and Places (Boston, 1878 and 1905).

ROY, WILLIAM (1726-1790), a famous British surveyor, military draughtsman, antiquary, &c. In 1746, when an assistant in the office of Colonel Watson, deputy quartermaster- general in North Britain, he began the survey of the mainland of Scotland, the results of which were embodied in what is known as the “duke of Cumberland’s map.” In 1755 he obtained his commission in the 4th King’s Own Foot, and in 1 7 59 gained his lieutenancy and went to serve in Germany in the Seven Years’ War. In 1765 he appears as deputy quarter- master-general to the forces, surveyor-general of coasts and engineer-director of military surveys in Great Britain; in 1767 he became F.R.S., in 1781 major-general, in 1783 director of Royal Engineers. Besides his campaigns and observations in Germany, his visits to Ireland (1766) and to Gibraltar (1768) were important. In 1783-84 he conducted observations for determining the relative positions of the French and English royal observatories. His measurement of a base-line for that purpose on Hounslow Heath in 1784, the germ of all subse- quent surveys of the United Kingdom, gained him in 1785 the

1 This school was founded, primarily through the influence of the Rev. John Eliot, by inhabitants of Roxbury. In 1672 Thomas Bell, one of the original founders, bequeathed to the school all his Roxbury lands. In 1789 the school was incorporated.

Copley medal of the Royal Society. Roy's measurements (not fully utilized till 1787, when the Paris and Greenwich observatories were properly connected) form the basis of the topographical survey of Middlesex, Surrey, Kent and Sussex. He was finishing an account of this work for the Phil. Trans. when he died on the 1st of July 1790.

Roy's principal book-publication is the Military Antiquities of the Romans in Britain (1793). See also notices of him and contributions from him in the records of the War Office and the Royal Engineers, in the Transactions of the Royal Society of London, vols.' lxvii., lxxv., lxxvii., lxxx., lxxxv., and in the Gentleman's Magazine, vols, lv., lx. He is whimsically denounced by Jonathan Oldbuck of Monkbarns in Scott's Antiquary.

ROYAL FERN, in botany, the common name for the fern Osmunda regalis, a native of Britain, where it grows in bogs, marshy woods, &c. It is a handsome plant with bi-pinnate fronds 2 to 6 ft. long and 1 ft. or more broad; the tops of the fronds are fertile, the fertile pinnae being cylindrical and densely covered with the spore-cases, giving the appearance of a dense panicle of flowers, whence the plant is known as the flowering fern. There are various cultivated forms — cristata has the ends of the fronds and the pinnae finely crested, and corymbifera has curiously forked and crested fronds. Several other species, such as O. cinnamomea, O. Claytoniana, are known as handsome greenhouse ferns' (see also Ferns) .

ROYAL SOCIETY, THE, the oldest scientific society in Great Britain, and one of the oldest in Europe. The Royal Society (more fully, The Royal Society of London for Improving Natural Knowledge) is usually considered to have been founded in the year 1660, but a nucleus had in fact been in existence for some years before that date, As early as the year 1645 weekly meetings were held in London of " divers worthy persons, inquisitive into natural philosophy and other parts of human learning, and particularly of what hath been called the New Philosophy or Experimental Philosophy," and there can be little doubt that this gathering of philosophers is identical with the " Invisible College " of which Boyle speaks in sundry letters written in 1646 and 1647. These weekly meetings, according to Wallis, were first suggested by Theodore Haak, " a German of the Palatinate then resident in London," and they were held sometimes in Dr Goddard's

lodgings in Wood Street, sometimes at the Bull-Head Tavern in Cheapside.

Some of these ” Philosophers,” resident in Oxford about 1648, formed an association there under the title of the Philosophical Society of Oxford, and used to meet, most usually in the rooms of Dr Wilkins, warden of Wadham College. A close inter- communication was maintained between the Oxford and London Philosophers; but ultimately the activity of the society was concentrated in the London meetings, which were held principally at Gresham College.

On November 28, 1660, the first journal book of the society was opened with a ” memorandum,” from which the following is an extract: ” Memorandum that Novemb. 28. 1660, These per- sons following, according to the usuall custom of most of them, mett together at Gresham Colledge to heare Mr Wren’s lecture, viz. The Lord Brouncker, Mr Boyle, Mr Bruce, Sir Robert Moray, Sir Paul Neile, Dr Wilkins, Dr Goddard, Dr Petty, Mr Ball, Mr Rooke, Mr Wren, Mr Hill. And after the lecture was ended, they did, according to the usuall manner, withdrawe for mutuall converse. Where amongst other matters that were discoursed of, something was offered about a designe of founding a Colledge for the promoting of Physico-Mathematicall Experi- mentall Learning.” It was agreed at this meeting that the company should continue to assemble on Wednesdays at three o’clock; an admission fee of ten shillings with a subscription of one shilling a week was instituted; Dr Wilkins was appointed chairman; and a list of forty-one persons judged likely and fit to join the design was, drawn up. On the following Wednesday Sir Robert Moray brought word that the king (Charles II.) approved the design of the meetings; a form of obligation was framed, and was signed by all the persons enumerated in the memorandum of the 28th of November and by seventy-three others. On the 12th of December another meeting was held at

which fifty-five was fixed as the number of the society, — per- sons of the degree of baron, Fellows of the College of Physicians, and public professors of mathematics, physics and natural philosophy of both universities being supernumeraries.

Gresham College was now appointed to be the regular meeting-place of the society. Sir Robert Moray (or Murray) was chosen president

(March 6, 1661), and continued from time to time to occupy the chair until the incorporation of the society, when Lord Brouncker was appointed the first president under the charter. In October 1661 the king offered to be entered one of the society, and next year the society was in- corporated under its present title. The name ” Royal Society ” appears to have been first applied to the Philosophers by John Evelyn, in the dedication of his translation of a book by Gabriel Naude, published in 1661. Evelyn received in that year the thanks of the ” philosophic assembly ” for the honourable mention he had made of them by the name of ” The Royal Society.”

The charter of incorporation passed the Great Seal on the 15th of July 1662, to be modified, however, by a second charter in the following year, repeating the incorporating clauses of the first charter, but conferring further privileges on the society. The second charter passed the Great Seal on the 22nd of April 1663, and was followed in 1669 by a third, confirming the powers granted by the second charter, with some modifications of detail, and granting certain lands in Chelsea to the society. The council of the Royal Society met for the first time on the 13th of May 1663, when resolutions were passed that debate con- cerning those to be admitted should be secret, and that Fellows should pay is. a week to defray expenses.

At this early stage of its history the ” correspondence ” which was actively maintained \with v continental philosophers formed an important part of the society’s labours, and selec- tions from this correspondence furnished the beginnings of the Philosophical Transactions (a publication now of world-wide celebrity). At first the publication of the Transactions was entirely ” the act of the respective secretaries.” The first number, consisting of 16 quarto pages, appeared on Monday, March 6, 1664-65, under the title of Philosophical Trans- actions: giving some Accompt of the present undertakings, studies and labours of the Ingenious in many considerable parts of the world, with a dedication to the Royal Society signed by Henry Oldenburg, the first secretary of the society. It was ordered (1st of March 1664-65) ” that the tract be licensed by the Council of the Society, being first reviewed by some of the members of the same.” In 1750, 496 numbers, or 46 volumes, had been published. After this date the work was issued under the superintendence of a committee, and the division into numbers disappeared. The society also from its earliest years published, or directed the publication of, separate treatises and books on matters of philosophy; most notable among these being the Philosophiae naturalis principia mathematica Autore Is. Newton. Imprimatur: S. Pepys, Reg. Soc. Praeses. Julii 5, 1686, 4to Londini 1687.

In 1887 the Philosophical Transactions was divided into two series, labelled A and B respectively, the former containing papers of a mathematical or physical character, and the latter papers of a biological character. More than 225 quarto volumes have been published. In 1832 appeared the first volume of Abstracts of papers printed in the Philosophical Transactions from the year 1800. This publication developed in the course of a few years into the Proceedings of the Royal Society, which has been continued up to the present time. It is published now in two series, corresponding to the two series of the Philo- sophical Transactions, and is issued in 8vo form at the rate of about three volumes a year.

It is, however, certain that one of the most important functions of the society from the beginning was the performance of ex- periments before the members. In the royal warrant of 1663 ordering the mace which the king presented to the society, it is described as ” The Royal Society for the improving of Natural Knowledge by experiments “; and during its earlier years the

time of the meetings was principally occupied by the perform- ance and discussion of experiments. The society early exercised the power granted by charter to appoint two ” curators of experiments‸” the first holder of that office being Robert Hooke, who was afterwards elected a secretary of the society.

Another matter to which the society gave attention was the formation of a museum, the nucleus being ” the collection of rarities formerly belonging to Mr Hubbard,” which, by a resolution of council passed on the 21st of February 1666, was purchased for the sum of £100. This museum, at one time the most famous in London, was presented to the trustees of the British Museum in 1781, upon the removal of the society to Somerset House. A certain number, however, of instruments and models of historical interest have remained in the possession of the society, and some of them, more peculiarly associated with its earlier years, are still preserved at Burlington House. The remainder have been deposited in the Victoria and Albert Museum, South Kensington.

After the Great Fire of London in September 1666 the apartments of the Royal Society in Gresham College were required for the use of the city authorities, and the society were therefore invited by Henry Howard of Norfolk to meet in Arundel House. At the same time he presented them with the library purchased by his “grandfather, Thomas earl of Arundel, and thus the foundation was laid of the important collection of scientific works, now exceeding 60,000

volumes, which the society possesses. Of the Arundel MSS. the bulk was sold to the trustees of the British Museum in 1830 for the sum of £3559, the proceeds being devoted to the purchase of scientific books. These MSS. are still kept in the British Museum as a separate collection. The society, however, still possesses a valuable collection of scientific correspondence, official records, and other manuscripts, including the original manuscript, with Newton's autograph corrections, from which the first edition of the Principia was printed, and many other original documents of great interest.

Under date December 21, 1671, the journal-book records that " the lord bishop of Sarum proposed for candidate Mr Isaac Newton, professor of the mathematicks at Cambridge." Newton was elected a Fellow January n, 1671-72, and in 1703 he was appointed president, a post which he held till his death in 1727. During his presidency the society moved to Crane Court, their first meeting in the new quarters being held November 8, 17 10. In the same year they were appointed visitors and directors of the Royal Observatory at Greenwich, a function which they continued to perform until the acces- sion of William IV., when by the new warrant then issued the president and six of the Fellows of the Royal Astronomical Society were added to the list of visitors.

In 1780, under the presidency of Sir Joseph Banks, the Royal Society removed from Crane Court to the apartments assigned to them by the government in the new Somerset House, where they remained until they removed to Burlington House in 1857. The policy of Sir Joseph Banks was to render the Fellow- ship more difficult of attainment than it had been; and the measures which he took for this purpose, combined with other circumstances, led to the rise of a faction headed by Dr Horsley. Throughout the years 1783 and 1784 feeling ran exceedingly high, but in the end the president was supported by the majority of the society. An account of the controversy will be found in a tract entitled An Authentic Narrative of the Dissensions and Debates in the Royal Society. An important step in pursuance of the same policy was taken in the year 1847, when the number of candidates recommended for election by the council was limited to fifteen, and the election was made annual. This limitation has remained in force up to the present time. Concurrent with the gradual restriction of the Fellowship was the successive establishment of other scientific bodies. The founding of the Linnean Society in 1788 under the auspices of several Fellows of the Royal Society was the first instance of the establishment of a distinct scientific association under royal I charter; and this has been followed by the formation of the

large number of societies now active in the promotion of special branches of science.

From the time of its royal founder onwards the Royal Society has constantly been appealed to by the government for advice in connexion with scientific undertakings of national importance. The following are some of the principal matters of this character upon which the society has been consulted by, or which it has successfully urged upon the attention of, the government: the improvement and equipment of the Royal Observatory, Greenwich, in 1710, when it was placed in the sole charge of the society; the change of the calendar in 1752; ventilation of prisons; protection of buildings and ships from lightning; measurement of a degree of latitude; determination of the length of a pendulum vibrating seconds; comparison of the British and French standards of length; the Geodetic Survey in 1784, and the General Trigonometrical Survey begun in 1 79 1 ; expeditions to observe the transits of Venus in 1761, 1769 (commanded by Captain Cook), 1877 and 1882; the Antarctic expeditions of 1772 (under Captain Cook, whose voyage extended to the circumnavigation of the globe), of 1839 (under Ross), and 1900; observations for determining the density of the earth; Arctic expeditions of 1817 (in search of the North-West Passage), of 18 19 (under Parry), of 1827 (Parry and Ross), of 1845 (Franklin), of 1874 (under Nares) ; numerous expeditions for observing eclipses of the sun; 1822, use of coal-tar in vessels of war; best manner of measuring tonnage of ships; 1823, corrosion of copper sheathing by sea-water; Babbage's calculating machine; lightning-conductors for vessels of war; 1825, supervision of gas-works; 1832, tidal observations; 1835, instruments and tables for testing the strength of spirits; magnetic observatories in the colonies; 1862, the great Melbourne telegraph; 1865, pendulum observations in India; 1866, reorganization of the meteorological department; 1868, deep- sea research; 1872, "Challenger" expedition; 1879, prevention of accidents in mines; 1 881, pendulum observations; cruise of the " Triton " in Faroe Channel; 1883, borings in delta of Nile; 1884, Bureau des Poids et Mesures; international conference on a prime meridian; 1888, inquiry into lighthouse illuminants; 1890, the investigation of colour-blindness; 1895, examination of the structure of a coral reef by boring; 1896, inquiry into cylinders for compressed gases; the establishment of an International Geodetic Bureau; 1897, determination of the relations between the metric and imperial units of weights and measures ; and, more recently, an inquiry into the

volcanic eruptions in the West Indies; international seis- mological investigation; international exploration of the upper atmosphere; measurement of an arc of the meridian across Africa. In recent years also the society, acting at the request of the govern- ment, has taken the leading part in investigations, in the course of which important discoveries have been made, in relation to various tropical diseases, beginning with the tsetse-fly disease of cattle in Africa, followed by investigations into malaria, Mediterranean fever and sleeping sickness. The society has standing committees which advise the Indian government on matters connected with scientific inquiry in India and on the observatories of India. The society has taken a leading part in the promotion of the International Catalogue of Scientific Literature from ic/OO, and of the International Association of Academies, which is composed of all the principal scientific academies of the world, meeting regularly to promote international action in questions of scientific interest.

In addition to the occasional services enumerated above, the Royal Society has exercised, and still exercises, a variety of important public functions of a more permanent nature. It still provides seven of the board of visitors of the Royal Observatory at Green- wich. From 1877 until the reconstitution of the Meteorological Office in 1906 the society nominated the meteorological council, which had the control of that office. The society has the custody of standard copies of the imperial standard yard and pound. The president and council have the control of the National Physical Laboratory, an institution established in 1899 in pursuance of the recommendations of a treasury committee appointed by H.M. government in response to representations from the Royal Society. The society had previously for many years had control of the Kew Observatory, now incorporated with the National Physical Laboratory, and still remains trustee of the Gassiot Fund, a fund established for the maintenance of the observatory. The society elects four of the nine members of the managing committee of the Lawes Agricultural Trust, and is officially represented on the governing bodies of a number of important scientific and educational institutions and of the principal public schools.

One of the most important duties which the Royal Society performs on behalf of the government is the administration of the annual grant of £4000 for the promotion of scientific research. This grant originated in a proposal by Lord John Russell in 1849 that at the close of the year the president and council should point out to the first lord of the treasury a limited number of persons to whom the grant of a reward or of a sum to defray the cost of experi- ments might be of essential service. This grant of £1000 afterwards became annual, and was

continued until 1876. In that year an additional sum of £4000 for similar purposes was granted, and the two funds of £1000 and £4000 were administered concurrently until

1 88 1, in which year the two were combined in a single annual grant of £4000 under new regulations. Since 1896 parliament has also voted annually a grant of £1000 to be administered by the Royal Society in aid of scientific publications, not only those issued by itself, but also scientific matter published through other channels. One of the most useful of the society's publications is the great catalogue of scientific papers — an index now in twelve quarto volumes, under authors' names, of all the memoirs of importance in the chief English and foreign scientific serials from the year 1800 to the year 1883. The work was prepared under the direction of the Royal Society. A continuation carrying the catalogue up to the end of the 19th century, and a subject index to the whole catalogue, have also been compiled.

A statement of the trust funds administered by the Royal Society will be found in the Year Book published annually, and the origin and history of these funds will be found in the Record of the Royal Society (2nd ed. 1901). The income of the society is derived from the annual contributions and composition fees of the Fellows, from rents and from interest on various investments. The balance- sheet and an account of the estates and property are published in the Year Book. Five medals (the Copley, two Royal, the Davy and the Hughes) are awarded by the society every year; the Rumford and the Darwin medals biennially, the Sylvester triennially and the Buchanan quinquennially. The first of these originated in a bequest by Sir Godfrey Copley (1709), and is awarded " to the living author of such philosophical research, either published or communicated to the society, as may appear to the council to be deserving of that honour ' ' ; the author may be an Englishman or a foreigner. The Rumford medal originated in a gift from Count Rumford in 1796 of £1000 3% consols, for the most important discoveries in heat or light made during the preceding two years. The Royal medals were instituted by George IV., and are awarded annually for the two most important contributions to science published in the British dominions not more than ten years nor less than one year from the date of the award. The Davy medal was founded by the will of Mr John Davy, F.R.S., the brother of Sir Humphry Davy, and is given annually for the most important discovery in chemistry made in Europe or Anglo-America. An enumeration of the awards of each of the medals and the conditions of the awards are published in the Year Book. The society also has the award of three research studentships, one founded in 1890 in memory of J. P. Joule, and the others created out of a bequest to the society by

Sir William Mackinnon in 1897.

Under the existing statutes of the Royal Society every candidate for election into the society must be recommended by a certificate in writing signed by six or more Fellows, of whom three at least must sign from personal knowledge. From the candidates so re- commended the council annually select fifteen by ballot, and the names so selected are submitted to the society for election by ballot. Princes of the blood, however, and not more than two persons selected by the council on special grounds once in two years, may be elected by a more summary procedure. Foreign members, not exceeding fifty, may be selected by the council from among men of the greatest scientific eminence abroad, and proposed to the society for election. Every Fellow of the society is liable to an admission fee of £10 and an annual payment of £4; but, by aid of a fund established in 1878 for the purpose, the admission fees and £1 of the annual contribution of all the Fellows elected since that date have been remitted. The composition for annual payments is £60. The anniversary meeting for the election of the council and officers is held on St Andrew's Day. The council for the ensuing year, out of which are chosen the president, treasurer, principal secretaries, and foreign secretary, must consist of eleven members of the existing council and ten Fellows who are not members of the existing council. These are nominated by the president and council previously to the anniversary meeting. The session of the society is from November to June; the ordinary meetings are held on Thursdays during the session, at 4.30 p.m. The selection for publication from the papers read before the society is made by the " Committee of Papers," which consists of the members of the council for the time being aided by committees appointed for the purpose. The papers so selected are published either in the Philo- sophical Transactions (4to) or the Proceedings of the Royal Society (8v

The making and repealing of laws is vested in the council, and in every case the question must be put to the vote on two several days of their meeting.

The text of the charters of the Royal Society is given in the Record, and in the same work will be found lists of the presidents, treasurers, secretaries and assistant-secretaries from the foundation to the year 1900. The same work gives a chronological list of all the Fellows, with dates of election, and an alphabetical index. Other histories are Thomson's History of the Royal Society (1812); Weld's History of the Royal Society, Bishop Sprat's (1667), which consists largely of a defence of the society against the attacks of a priori philosophers; and

Dr Birch's (1756), which treats mainl/ of the society's scientific work. (R. W. F H.)

ROYALTY (O. Fr. realte, reialte, royaulte, from Med. Lat. regalitas, the substantive of regalis, of or belonging to a king, rex), kingly state or personality, hence a royal person, or number of persons of royal birth collectively, a member of a royal family. More particularly " royalty " is used of the rights and attributes of a sovereign, and especially of dues paid to the crown, which belong to the sovereign jure coronae, such as dues from gold and silver mines, waifs, estrays, &c. The term is usually applied to the payment made by a publisher to an author on every copy of his book sold; to the payment made to a patentee on each article manufactured under his patent by a licensee (see Patents), and to the payment made to the owner of minerals for the right of working, paid on the ton or other weight raised.

ROYAN, a town of W. France, in the department of Charente Inferieure, on the right bank of the Gironde, at its mouth 63 m. below and N.N.W. of Bordeaux. Pop. (1906) 7142. Royan is one of the most frequented bathing resorts on the Atlantic seaboard. The coast is divided into a number of small bays or " conches," forming so many distinct beaches: to the E. of the town is the " Grande Conche" with the municipal casino; to the S. the " Conche de Foncillon," separated from the first-named by a quay which forms a fine terraced esplanade; beyond the fort of Royan follow in succession the conches " du Chay " and " de Robinson," and the most fashionable of all, that of Pontaillac. The port carries on sardine-fishing and an active coasting trade, but the harbour at high tide is accessible only to vessels drawing from 8 to 10 ft., and at low water is dry. Eugene Pelletan, the author, has a statue in the town, of which he was a benefactor. The lighthouse of Cordouan, 200 ft. in height, rebuilt on the site of an older tower by the architect Louis de Foix in 1584-1610 and added to about the end of the 18th century, stands on a rock ih m. W.S.W. of Royan.

Royan after passing through many hands came to the family of la Tremoille, in whose favour it was made first a marquisate and then a duchy. During the first half of the 15th century it was held by the English. During the wars of religion it was a centre of Calvinism and had to sustain in 1622 an eight days' siege by the troops of Louis XIII. As late as the end of the 18th century it was but a " bourg " of about one thousand inhabitants, noticeable only for its priory, where

Brant6me wrote a portion of his Chronicles. The prosperity of the place dates from the Restoration, when steamboat com- munication was established with Bordeaux.

ROYAT, a watering-place of central France, in the department of Puy-de-D6me, situated at a height of 1475 ft. on the Tire- taine, 15 m. S.W. of Clermont-Ferrand. Pop. (1906) 145 1. The thermal springs, situated in the part of Royat known as St Mart, are strongly impregnated with carbonic acid and chloride of sodium and are used in cases of rheumatism, gout, bronchitis, asthma, anaemia, &c. They were known in Roman times, and ruins of ancient baths are still to be seen. The village of Royat proper, a little higher up the valley, has a church of the nth and 12th centuries fortified with battle- ments.

ROYER-COLLARD, PIERRE PAUL (1763-1845), French statesman and philosopher, was born on the 21st of June 1763 at Sompuis, near Vitry le Franfais (Marne), the son of Antoine Royer, a small proprietor. His mother, Angelique Perpetue Collard, was a woman of unusual strength of character and of austere piety. Pierre Paul Royer was sent at twelve to the college of Chaumont of which his uncle, Father Paul Collard, was director. He subsequently followed his uncle to, Saint- Omer, where he studied mathematics. At the outbreak of the Revolution, which moved him to passionate sympathy, he was practising at the Parisian bar. He was returned by his section, the Island of Saint Louis, to the Commune, of which he was secretary from 1790 to 1792. After the revolution of the 10th of August in that year he was replaced by J. L. Tallien. His sympathies were now with the Gironde, and after the insurrection of the 12th Prairial (31st of May 1793)

he was in danger of his life. He returned to Sompuis, and was saved from arrest possibly by the protection of Danton and in some degree by the impression made by. his mother's courageous piety on the local commissary of the Convention. In 1797 he was returned by his department (Marne) to the Council of the Five Hundred, where he allied himself especially with Camille Jordan. He made one great speech in the council in defence of the principles of religious liberty, but the coup d'etat of Fructidor (4th of September 1797) drove him again into private life. It was at this period that he developed his legitimist opinions and entered into communication with the comte de Provence (Louis XVIII.) . He was the ruling spirit in the small committee formed in Paris to help forward a Restoration independent of the comte d'Artois and his party; but with the establishment of the Consulate he saw the prospects of the monarchy were temporarily hopeless, and the members of the committee resigned. From that time until the Restora- tion Royer-Collard devoted himself exclusively to

the study of philosophy. He derived his opposition to the philosophy of Condillac chiefly from the study of Descartes and his followers, and from his early veneration for the fathers of Port-Royal. He was occupied with the erection of a system which should provide a moral and political education consonant with his view of the needs of France. From 181 1 to 1814 he lectured at the Sorbonne. From this time dates his long association with Guizot. Royer-Collard himself was supervisor of the press under the first restoration. From 1815 onwards he sat as deputy for Marne in the chamber. As president of the commission of public instruction from 181 5 to 1820 he checked the pretensions of the clerical party, the immediate cause of his retirement being an attempt to infringe the rights of the university of Paris by giving university diplomas, independent of university examinations, to the teaching fraternity of the Christian Brothers. Royer-Collard's acceptance of the Legiti- mist principle did not prevent a faithful adhesion to the social revolution effected in 1789, and he protested in 1815, in 1820, and again under the monarchy of July against laws of exception.

He was the moving spirit of the " Doctrinaires," as they were called, who met at the house of the comte de Ste Aulaire and in the salon of Madame de Stael's daughter, the duchesse de Broglie. The leaders of the party, beside Royer-Collard, were Guizot, P . F. H. de Serre, Camille Jordan and Charles de Remusat. In 1820 he was excluded from the council of state by a decree signed by his former ally Serre. In 1827 he was elected for seven constituencies, but remained faithful to his native department. Next year he became president of the chamber, and fought against the reactionary policy which precipitated the Revolution of July. It was Royer-Collard who in March 1830 presented the address of the 221. From that time he took no active part in politics, although he retained his seat in the chamber until 1839. He died at his estate of Chateauvieux, near Vitry, on the 2nd of September 1845. He had been a member of the Academy since 1827. Royer-Collard married in 1799 Mile, de Forges de Chateauvieux. The two daughters who survived to womanhood received an education of the utmost austerity.

Royer-Collard left no considerable writings, but fragments of his philosophical work are included in Jouffroy's translation of the works of Thomas Reid. The standard life of Royer-Collard is by his friend Prosper de Barante, Vie politique de M. Royer Collard, ses discours et ses ecrits (2 vols., 1861). There are also biographies by M. A. Philippe (1857), by L. Vingtain (1858), by E. Spuller (1895), in Grands ecrivains francais. Cf. E. Faguet, Politique et morale du xix? siecle (1891) ; H. Taine, Les Philosophes francais du xix e siecle (1857); L.

Seche, Les Derniers Jansenistes (1891); and Lady Blennerhasset, ” The Doctrinaires ” in the Cambridge Modern History (vol. x. chap, ii., 1907). For further references see H. P. Thieme, Guide bibliographique (Paris, 1907).

ROYLE, JOHN FORBES (1799-1858), British botanist and teacher of materia medica, was born in Cawnpore in 1799. Entering the service of the East India Company as assistant surgeon, he devoted himself to studying botany and geology, and made large collections among the Himalaya Mountains. He also investigated the medical properties of the plants of

Hindustan and the history of their uses among the native races. The results of these investigations appeared in an essay On the Antiquity of Hindoo Medicine (1837). For nearly ten years he held the post of superintendent of the East India Company’s botanic garden in the Himalayas at Saharanpur. In 1837 he was appointed to the professorship of materia medica in King’s College, London, which he held till 1856. From 1838 onwards he conducted a special department of correspondence, relating to vegetable products, at the East India House, and at the time of his death he had just completed there an extensive and valuable museum of technical products from the East Indies. In 1 85 1 he superintended the Indian department of the Great Exhibition. He died at Acton near London on the 2nd of January 1858.

The work on which his reputation chiefly rests is the Illustrations of the Botany and other branches of Natural History of the Himalaya Mountains, and of the Flora of Cashmere, in 2 vols. 4to, begun in 1839. In addition he wrote An Essay on the Productive Resources of India (1840), On the Culture and Commerce of Cotton in India and Elsewhere (1851) and The Fibrous Plants of India fitted for Cordage (1855), together with papers in scientific journals.

ROYSTON, a market town in the Hitchin parliamentary division of Hertfordshire, England, close to the border of Cambridgeshire, 48 m. N. of London by the Cambridge branch of the Great Northern railway. Pop. of urban district (1001) 3517. The church of St John the Baptist is mainly Early English. There are a market house, and institute with library and museum. Beneath a street in the town is a curious example of a hermit’s cave, excavated in the chalk, and containing rude carvings of the crucifixion and other sacred subjects. It was discovered

in 1742. The town lies on the Roman Ermine Street, at the point where it strikes from the hills across the plain, and its straight course is deflected slightly W. Roman relics have been found, and several barrows and earth-mounds occur on the neighbouring hills. A monastery of Augustinian canons was founded here towards the close of the 12th century, but there are no remains.

ROYTON, an urban district of Lancashire, England, within the parliamentary borough of Oldham, 2 m. N. of Oldham on the Lancashire & Yorkshire railway. Though of early origin, it is, as a town, of wholly modern growth. The cotton manufacture is its chief industry. Pop. (1901) 14,881.

ROZAS, JUAN MARTINEZ DE (1759-1813), the earliest leader in the Chilean struggle for independence, was born at Mendoza in 1759. In early life he was a professor of law, and of theology and philosophy at Santiago. He held the post of acting governor of Concepcion at one time, and was also colonel in a militia regiment. In 1808 he became secretary to the last Spanish governor, Francisco Antonio Carrasco, and used his position to prepare the nationalist movement that began in

1809. After resigning his position as secretary, Rozas was mainly responsible for the resignation of the Spanish governor, and the formation of a national Junta on the 18th of September

1810, of which he was the real leader. Under his influence many reforms were initiated, freedom of trade was established, an army was organized and a national congress was called together in July 181 1. But at the end of that year divisions began to arise between Rozas' followers from Concepcion and the men of Santiago; and a feud broke out between Rozas and Jose Miguel Carrera (q.v.) who had secured control of Santiago. In 1812 Carrera succeeded in securing the banishment of his rival, who retired to Mendoza, where he died on the 3rd of March 1813.

See P. B. Figueroa, Diccionario biogrdfico de Chile, 13 $0-1887 (Santiago, 1888), and J. B. Suarez, Rasgos biogrdficos de hombres notables de Chile (Valparaiso, 1886); both giving biographical sketches of prominent characters in Chilean history.

RUABON (Rhiivabon), a town of Denbighshire, N. Wales, in the E. parliamentary division, near the Shropshire border, 5 m. S.W. of Wrexham, on the Great Western railway. Pop. (1901) 3248. It is situated on a small tributary of the Dee. The old Gothic church is

thought by some to have been founded by Mabon, a brother of Llewelyn (13th c), and has monuments

to the Wynn family, by Nollekens and Rhysbrac, and to Dr D. Powel (d. 1598), translator into English of Caradoc's (of Llancarfan) History of Wales. In the neighbourhood are collieries, engineering works, an iron foundry and chemical works, besides an extensive industry in glazed and other bricks. Near Ruabon is Caerdden (Caerddin), an ancient camp (village) surrounded by circular intrenchments, and Wynnstay, with an avenue of fine trees. Anciently the residence of Madoc ab Gruff yd Maelor (founder of Valle Crucis Abbey), it was called Wattstay, from Watt's Dyke, an old rampart on the estate. It was named Wynnstay on its coming into possession of the Wynns (17th a). Offa's Dyke, near here, is 10 ft. high, and broad enough for two carriages abreast. Not far is Chirk Castle (supposed to have been built in 1013), besieged by Crom- well's artillery: near it, in the Ceiriog valley, the defeat of Henry II. by Owen Gwynedd took place in 1165.

RUBBER, Indiarubber or Caoutchouc (a word prob- ably derived from Cahucha or Caucho the names in Ecuador and Peru respectively for rubber or the tree producing it), the chief constituent of the coagulated milky juice or latex furnished by a number of different trees, shrubs and vines. The latex of the best rubber plants furnishes from 20 to 50% of rubber. The latex is not to be confused with the sap of trees, on the circulation of which their nutrition depends. Though frequently occurring, it is not a universal feature of plant life, and does not appear to be necessary or even directly con- nected with the nutritive system of plants. Its exact function is not fully understood. Latex, though chiefly secreted in vessels or small sacs which reside in the cortical tissue between the outer bark and the wood is also found in the leaves and sometimes in the roots or bulbs. The trees and plants whose latices furnish caoutchouc in considerable quantity chiefly belong to the natural orders Euphorbiaceae, Urticaceae, Apocynaceae, Asclepiadaceae. The latex is usually obtained from the bark or stem by making an incision reaching almost to the wood when the milky fluid flows more- or less readily from the laticiferous vessels. It is, like milk, an emulsion, and when examined with the microscope is seen to consist 'of numer- ous globules suspended in a watery fluid. On standing, some latices separate, more or less readily, into an upper layer resembling cream and consisting of the globules, and, a lower watery layer. This separation can be rapidly effected with some latices by the use of a centrifugal machine, but this method has not yet been applied to any extent commercially. The globules which furnish the cream gradually pass on standing into solid caoutchouc, a process

which is facilitated by rapid stirring, or by the addition of an acid or other chemical agent. If the latex is warmed or an acid, an alkali or astringent plant juice is added to it, ” coagulation ” usually takes place more or less readily, the caoutchouc separating in solid flakes or curds. The efficacy of heat or of an acid, an alkali or other agent in promoting coagulation depends on the character of the latex, and varies with that obtained from different plants. The watery fluid in which the globules are suspended holds certain proteids, carbohydrates and a small proportion of salts in solu- tion. The latex exhibits a neutral, acid or alkaline reaction depending upon the plant from which it has been obtained.

When exposed to air the latex gradually undergoes putre- factive changes accompanied by coagulation- of the caout- chouc. The addition of a small quantity of ammonia or of formalin to some latices usually has the effect of preserving them for a considerable time. The nature of the coagulation is not yet completely understood. It has been compared with that of milk and of blood, which depend essentially on the coagula- tion or separation in curds of a proteid or albuminous substance, such as takes place When white of egg is warmed. There is, however, reason to believe that the coagulation of latex into rubber is not mainly of this character. The globules in the latex are liquid, and the phenomenon of coagulation would seem to consist in the passage of this liquid into solid caoutchouc through the kind of change known as polymerization or con- densation, in which a liquid passes into solid without alteration

of composition or by condensation with the elimination of the elements of water. The effect of chemical agents in producing coagulation are in consonance with what is known of other instances of polymeric or condensation changes, whilst the fact that the collection of globules separated by creaming after thorough washing, and therefore removal of all proteid, is susceptible of solidification into caoutchouc by a merely mechanical act such as churning, strongly supports the view that the character of the change is distinct from that of any alteration which may occur in the proteid constituents of the latex.

The existence of caoutchouc or rubber was first observed soon after the discovery of America. It was noticed that certain Indian tribes of South America played with a ball composed of a resilient and elastic

substance, which afterwards was found to possess the power of removing lead pencil marks from paper and came into commerce as ” Indian Rubber.” It was not until the middle of the 18th century that the trees which yielded caoutchouc were identified, chiefly by French observers. La Condamine ascertained the nature of the tree, now known as Hevea brasiliensis, from which the Para rubber of S. America was obtained, whilst a little later Fresnau and Aublet described the Euphorbiaceous trees which furnished the rubber of Guiana.

The methods adopted by the natives in S. America and in Mexico for incising the trees and obtaining the rubber are exceedingly primitive, but survive with little modification at the present day.

Statistics of Rubber Production. — Until recently rubber was obtained almost exclusively from the tropical forests of S. and Central America, E. and W. Africa and Asia, being the produce of naturally occurring trees and vines. The increase in the demand, for which the employment of rubber tires is largely responsible, has given an increased stimulus to the production of ” wild ” rubber, with the result that trees and vines have been recklessly cut and destroyed, and in some instances vast regions, as in the S. Sudan, have been nearly entirely denuded of rubber vines. This has led to restrictive measures, the vines being tapped under definite regulations as to the manner and time of tapping, and also to requirements as to replanting vines to take the place of those which have been injured or destroyed, certain areas being periodically closed. Such measures, which are now in operation in the French Sudan, the Congo and in German W. and E. Africa, can, however, only be enforced by special administrative machinery and at considerable expense, and this legislative action can only be regarded as temporary and preliminary to the establishment of plantations of rubber trees, which are not only easier to control, but the trees are less liable to injury from careless tapping. In Africa it seems probable that the production of rubber from vines is likely to be entirely super- seded in process of time, and replaced by the plantations of trees which are already being established in those districts in which careful experiment has determined the kind of rubber tree best adapted to the locality. The forests of tropical America have suffered similarly, trees having been injured or destroyed and in some cases cut down in order to secure the immediate increase of supply which was called for by a con- siderable rise in value. The result has been that in the forests of Brazil and Mexico the conservation of rubber trees has received greater attention, whilst new and extensive areas are planted in S. and Central America. The wild rubber of S. and Central America is still the principal source

of the rubber supply of the world, and is likely to continue to be so for many years to come. Although the cost of transport from the remote forest regions of some districts is a serious consideration, this is not likely to be operative in reducing production until there has been a considerable and permanent fall in price, by which time new areas in those countries in which planting is now taking place will probably have come into bearing.

The enormous increase in the commercial demand for rubber and the probability of the continuance of this increase in view

of the great variety of purposes to which the material can be applied, has led to great activity in rubber planting in other parts of the world, especially in Ceylon and the Malay Peninsula and Archipelago, where the Para rubber trees {Hevea brasiliensis) has been successfully introduced, and numerous plantations, many of which have not been in existence for more than ten or fifteen years, are now contributing to the world's supply. This rubber is known as " Plantation " rubber in contradistinction to the " wild " rubber.

" Plantation " Para rubber from Ceylon and the Malay States has brought prices equal to and often exceeding those of fine Para rubber from Brazil. This is largely due to the improved methods of preparing the rubber practised by the planters of Ceylon and Malaya, which lead to the exclusion of the impurities usually found in " wild " rubber. Para rubber from Brazil generally contains about 15% of water, whilst " plantation " Para is usually nearly dry and contains 1 % of water or less. It would appear, however, that the finest " wild " Para rubber as a rule possesses greater tensile strength than the " plantation " rubber. This has been ascribed by some to the presence in " wild " rubber of certain impurities derived either from the latex or introduced during the prepara- tion of the rubber which are thought to enhance the physical properties of the caoutchouc. It is more probable, however, that the superiority of the " wild " Para is principally due to the greater age of the forest trees from which the rubber is obtained, many of which are from thirty to fifty years old. It is well known that the Hevea tree usually furnishes very inferior rubber if tapped before it is six or seven years old, and there is evidence to show that the quality of the rubber improves with the age of the tree. The oldest of the plantation trees of Ceylon and Malaya are not much more than twelve years old, whilst it is to be feared that immature trees are often tapped and their latex mixed with that of older trees before coagulation, thus forming inferior rubber. It is therefore to be expected that as time goes on the quality of " plantation " rubber will improve, and there would seem to be no reason why it should not

eventually be fully equal to that of the ” wild ” rubber.

In 1909 the total production of rubber is stated to have been about 70,000 tons, of which more than one-half came from tropical America, about one-third from Africa, whilst the remainder was chiefly of Asiatic origin, including ” planta- tion ” rubber from Ceylon and Malaya, which amounted to about 3000 tons.

Chiefly owing to the supplies of ” wild ” rubber which are still available, comparatively little has been done until recently in establishing plantations either in Africa or in tropical America, but in Asia, including Ceylon, India and Malaya, in which there are relatively few important naturally-occurring rubber plants, there has been for some years great activity in forming plantations of rubber trees introduced mainly from tropical America, and there are now many millions sterling of British capital invested in companies established to form rubber plantations chiefly in Ceylon and Malaya. Each year, should therefore show an increase in the production of plantation rubber. No trustworthy estimate of the rate of the increase of production can, however, be formed, as several uncertain economic factors have to be taken into account. Among these are the precise extent of demand, the limit of the inevit- able fall in price with largely increased production, the cost of labour as increasing amounts are required, and the effect of changed conditions on the output of ” wild ” rubber and the competition of the new plantations which are being established in tropical America.

There can be little doubt that with a fall in price further uses for rubber would arise, leading to an increased demand, and among them may be mentioned its utilization as a road material. Difficulties in the supply of labour in the East may hinder the further development of the rubber-planting industry, especially at a period when a reduction in the cost of production may be the chief problem. In 1909 the average cost of producing ” plantation ” rubber in Ceylon and Malaya

RUBBER

Plate I.

Fig. 12.— PARA RUBBER TREKS, TAP

(Soiral and V Systems.)

From Photographs in the Collections oj the Imperial Institute.

I5- — FICUS ELASTICA

Fig. 16.—FUNTUMIA ELASTICA.

From Piwloˆraphs in the Collections of the Imperial Institute.

may be stated approximately to have been from iod. to is. per lb. The cost of collecting ” wild ” rubber is less easy to state with any approach to accuracy, since the cost varies in different districts of S. and Central America, but the average cost is stated not to be less than is. per lb. In Africa the cost of collection is much less, but the rubber is generally of inferior quality.

The market price of commercial rubber is determined by the current price of ” fine Para ” from S. America. This is subject to considerable fluctuation, [and varied in 1900 to 1908 from 2s. iod. to 5s. 9d. a lb. As much as 6s. 9d. per lb was given for specially prepared ” plantation Para.” Towards the latter part of 1904 the price of fine Para reached a high level and then considerably declined, reaching in 1907-8 a lower figure than had been recorded since 1900. At the beginning of 1908 the price gradually rose again to the neighbourhood of 4s. a lb. During 1909, without any serious decline in production, the price rapidly rose, owing to extraordinary causes, to about 10s. a lb, and in the early part of 1910 rose to over 12s. a lb, and subsequently fell to about half this. price. Having regard to the present cost of producing ” plantation ” rubber, and to the probability that, apart from a possible increase in the price of labour, this cost is susceptible of further reduction, it may be concluded that rubber production will continue to be profitable even should a considerable fall in market value take place.

The Principal Rubber Trees, their Cultivation, and the Prepara- tion of Rubber. — Most commercial rubber is derived from natural supplies, from the wild rubber trees of S. and Central America, India and Africa. Each year, however, the output of ” planta- tion ” rubber will show a considerable increase, and it is to be ex- pected that ultimately this will form the chief source of supply, unless unforeseen circumstances should arise to interfere with the development of the plantation industry, which has been vigorously started chiefly with European capital in the tropical possessions of Great Britain, France and Germany. The best rubber is now obtained from large trees, of which

the following are the more important: —

1. ” Para ” rubber, which takes the first position in the market, is derived from species of Hevea, principally Hevea brasiliensis, of which there are enormous forests in the valleys of the Amazon and its tributaries, and also in Peru, Bolivia, Venezuela and Guiana. In Brazil alone it is stated that the rubber area amounts to at least one million sq. m. The tree has been recently planted with great success especially in Ceylon and Malaya (Plate figs. 11 and 12).

2. ” Ceara ” or Manitoba rubber is derived from species of Manihot, chiefly Manihot Glaziovii, a native of S. America especi- ally abundant in Brazil, and successfully introduced into other countries (Plate fig. 13). The latex of this tree flows less freely than that of Hevea brasiliensis, and the collection of large quan- tities of the latex is attended with considerable difficulty. The latex is therefore usually allowed to coagulate on the tree, as it slowly exudes from the incision. On this account it is often exported in strings or ” scrap ” and not usually in biscuits or balls. Partly for this reason and partly because pieces of wood and dirt are apt to be included with the scrap, the market value of Ceara rubber is usually less than that of Para. The plantations of Manihot estab- lished in E. Africa, Ceylon and S. India have, however, begun to furnish a better quality of Ceara rubber, which is often prepared in biscuit form. Other species of Manihot are also under trial, and some give promise of good results, especially M. dichotoma and M. heptaphylla.

3. The ” Ule ” rubber of Central America and British Honduras originates from Castilloa elastica. In S. America its natural occur- rence appears to be limited to west of the Andes, but the tree is abundant in Mexico, Guatemala and Nicaragua. The rubber comes into commerce in thick strips or sheets or as ” scrap.” The rubber is usually dark in colour and is often contaminated with proteid impurities derived from the latex. Ule rubber is generally inferior in strength to Para and commands a lower price. The Castilloa tree has been experimentally planted in Ceylon, the West Indies and other countries (Plate fig. 14).

Other trees occurring in 5. America which furnish rubber of secondary commercial importance are Hancornia speciosa, yielding the Mangabeira rubber of Brazil, and species of Sapium furnishing the Colombian rubber and much of the rubber of Guiana (derived from Sapium Jenmani), which is scarcely inferior to the rubber of Para.

4. ” Rambong ” or Assam rubber is the produce of Ficus elastica,

commonly known as the indiarubber tree and cultivated in Europe as an ornamental plant. This tree, indigenous to Asia, attains large

dimensions in India, Celon and the Malay Archipelago (Plate fig. 15). It furnishes most of the rubber of India, Sumatra and Java. Although intrinsically of excellent quality, Rambong rubber, owing to the careless method of collection practised by the natives which leads to the inclusion of much impurity, usually fetches a lower price than Para. The tree has been introduced into W. Africa and Egypt, but has not proved very successful in Africa as a rubber producer.

5. ” Lagos ” rubber is the produce of the African rubber tree Funlumia elastica, which is indigenous to Africa from Uganda to W. Africa (Plate fig. 16). It is known as the silk rubber tree, probably on account of the silky hairs which are attached to the seeds. The latex, which is usually coagulated by standing or by heating, is obtained from incisions in the bark of the tree. The rubber is of good quality, though, owing to the method of preparation adopted, the product is often impure and discoloured, and consequently usually brings a lower price than the best rubbers of commerce.

6. Besides the trees described above, a number of climbing plants or vines belonging to the Apocyanaceae secrete a latex which furnishes rubber of good quality. These vines are less satisfactory than trees as rubber producers, owing to the readiness with which they are injured and destroyed by careless tapping, and to the difficulty of regulating these methods in the case of vines distributed over enormous areas of forest. Of these vines the most important are the species of Landolphia which occur throughout tropical Africa, including the Sudan, Congo, Mozambique and Madagascar, the principal of which are Landolphia owariensis and L. Heudelotii, common throughout W. Africa, and L. Kirkii and L. Dawei in E. Africa. The rubber is obtained by incising the stems of the vines and coagulating the latex by exposure, by admixture with acid vegetable juices or by heating. Landolphia rubber is usually roughly prepared and in consequence commands a low price. The vines of species of Clitandra and Carpodinus in W. Africa also furnish good rubber, as do the Forsteronia gracilis of British Guiana and Forsteronia floribunda of Jamaica. Vines resembling Landolphias are widely distributed in Asia. Among these are species of Willughbeia and Leuconotis, from which much of the rubber exported from Borneo is derived; Parameria glandulifera, common in Siam and Borneo, and Urceola esculenta and Cryptostegia grandi- flora, both common in Burma.

Among other sources from which rubber is commercially obtained

may be mentioned the Guayule plant {Parthenium argentatum) of Mexico, and the ” Ecanda ” plant of Portuguese W. Africa, from the tuberous roots of which rubber is extracted by the natives. The ” Ecanda ” plant has been named Raphionacme utilis. The root rubber prepared by the natives of the Congo and the S. Sudan is extracted partly from the roots of Landolphia or from the rhizomes of Landolphia Thollonii or Carpodinus lanceolatus. It is obtained by breaking up the roots or rhizomes in hot water and separating the rubber, and machines have now been devised for this purpose.

Little is at present known of the large rubber tree of Tonkin (Bleck-rodea tonhinensis) , the latex of which is stated to furnish excellent rubber.

Sources of Commercial Rubber

1. Para rubber is so named from the Para province of Brazil, from the principal town of which, also known as Para, most of the rubber is shipped. This rubber is obtained chiefly from Hevea brasiliensis, Mull. Arg., a large euphorbiaceous tree upwards of 60 ft. in height, and having trifoliate leaves, the leaflets being lanceolate and tapering at both ends (fig. 1). The trunk reaches about 8 ft. in circumference. The flowers are usually pale green. The fruit is a capsule containing three seeds rather larger than cobnuts, having a brown smooth surface figured with black patches. The seeds readily lose their vitality, and on this account need special care in transport. They should be loosely packed in dry soil or charcoal. These seeds have been examined at the Imperial Institute, and the kernels have been found to contain nearly half their weight (48 %) of an oil resembling linseed oil and applicable for the same purposes. The residue or ” cake ” left after expression of the oil is apparently nutritious and may prove to be of value for feeding animals. There is present in the seeds an enzyme which rapidly decomposes the oil if the seeds are crushed and kept, setting free a fatty acid and glycerin. As the seeds are very abundant, they will probably be utilized commercially as soon as the demand for planting has subsided.

In Brazil the trees are found in different districts, but flourish best on rich alluvial clay slopes by the side of rivers, where there is a certain amount of drainage, and the temperature reaches from 89 F. to 94° F. at noon and is never cooler than 73 F. at night, while rain falls during about six months and the soil and atmosphere are moist throughout the year. The genus Hevea was formerly called Siphonia, and the tree named Pao de Xerringa by the Portuguese, from the use by the Omaqua Indians of squirts or syringes made from a piece of pipe

inserted in a hollow flask-shaped ball of rubber. The trees are not generally tapped until they are ten to fifteen years old, as young trees yield inferior rubber. If carefully conducted, tapping does not injure the tree. The latex is collected in the so-called dry season between June and February. The trees are tapped in the early morning when the latex is most readily obtained.

To obtain the latex, deep incisions are made near the base of the tree extending up the trunk. Small shallow cups are placed below the

Fig. i. — Hevea brasiliensis.

incisions to receive the milk, each cup being attached by sticking a piece of soft clay to the tree and pressing the cup against it. The latex, of which each tree yields only about 6 oz. in three days, has a strong ammoniacal odour, which rapidly disappears, and in consequence of the loss of ammonia the latex will not keep for longer than a day unchanged ; hence when it has to be carried to a distance from the place of collection, 3 % of ammonia solution is added. The latex usually furnished about 30% of rubber.

To obtain the rubber, the latex is usually treated in the following manner. A piece of wood about 3 ft. long, with a flattened end forming a kind of paddle, is dipped in the milk, or this is poured over it as evenly as possible. The milk is then carefully dried by turning the mould round and round in the smoke produced by burning wood mixed with certain oily palm nuts; those of Attalea excelsa are considered best, the smoke being confined within certain limits by the narrowness of the neck of the pot in which the nuts are heated. The creosote and other products from the smoke no doubt act antiseptically and prevent to a large extent the subsequent putrefaction of the proteids retained by the coagulated rubber. Each layer of rubber is allowed to become firm before forming another; a practised hand can make 5 or 6 lb in an hour. In some districts a stout stick is substituted for the paddle, on which the rubber as it coagulates is wound cylindrically. The rubber thus prepared is the finest that can be obtained. The cakes when completed are, in order to remove them from the mould, slit open with a sharp knife, which is kept wet, and are hung up to dry. The flat rounded cakes of rubber made in this manner are known in the London market as ” biscuits. ” They retain about 15 % of moisture. The scrapings from the tree, which contain

fragments of wood, are mixed with the residues of the collecting pots and the refuse of the vessels employed, and are made up into large rounded balls, which form the inferior commercial quality called ” negrohead, ” and often contain 25 or 35 % of impurity. The yield of rubber varies, but it is stated on an average to be 10 ib of rubber per tree, and if care- fully tapped one tree will yield this amount for many years in succession.

Plantations of Hevea brasiliensis. — Hevea brasiliensis was introduced to Ceylon and Singapore from seedlings raised at Kew from Brazilian seed, specially collected by Mr H. A. Wickham in S. America. The seedlings rapidly developed and in most places in which they were planted grew into large trees which furnished satisfactory latex when tapped in their sixth or seventh year. Ever since plantations of Hevea have been made on an increasing scale in the Straits Settlements, the Federated Malay States and in Ceylon, and at the present time rubber plantations form the principal industry in these colonies. Successful plantations of Hevea have also been established in Java, Sumatra and Borneo. Many of these plantations have not yet reached the productive stage — that is, the sixth or seventh year. A large number of plantations in British Malaya and Ceylon are now actively exporting increasing quantities of rubber. Hevea seedlings were also introduced into India, but did not apparently succeed except in Burma and S. India.

It may be estimated that between one and two million acres of land in the different countries referred to have been already

appropriated for rubber plantations. Plantations are also being formed in British, French and German possessions in W. Africa and in the Congo, also in the tropical portions of Australia. In certain districts of British W. Africa the Hevea which ha? been planted promises well, especially in the Gold Coast, where good yields of latex are stated to have been obtained.

It may be useful to summarize here the experience which has beer gained in the formation of plantations of Hevea and in the oroductiot of rubber.

Hevea brasiliensis as a rule flourishes to the greatest extent at lov- altitudes on rich soil capable of retaining moisture. The nature of the soil appears, however, to be of secondary importance, provided that it is able to hold moisture and that climatic conditions of high and even temperature with considerable rainfall and absence of wind are satisfied. Although the tree is sensitive to such conditions, it appears

to possess a certain capacity of adaptation which shoulo" be borne in mind. Generally a low altitude is desirable, but good results have been obtained in Ceylon in sheltered positions at elevations of 3000 ft. and over, although at higher altitudes the growth of these trees appears to be slower. In many plantations besides catch crops (cassava, sesame, ground-nuts, &c.) other crops, such as tea, coffee, cocoa and tobacco, are grown with rubber. It is improbable, except in the early stages of the rubber tree, that this procedure will succeed; the rubber will ultimately dominate the position to the detriment and ultimate extinction of the other crop, whilst the growth of the rubber tree will be retarded. A partial exception may perhaps be made in the case of cocoa, when the two plants are placed not too closely in about equal numbers. In these circumstances it appears that satisfactory results may be obtained from both crops, at any rate for a certain number of years.

The experience of planters in general is in favour of the complete removal of weeds from a rubber plantation. This practice, which involves periodical weeding, adds considerably to the cost of maintaining plantations, and, although justified so far by results, possesses several other disadvantages. During the tropical raini the soil is liable, to a greater or less extent, to denudation, which becomes very serious when the land slopes ; and in any case, the soi' is apt to become impoverished by the loss of its soluble constituents. These disadvantages are at their maximum when the rubber trees are quite young. At a later stage the shade of the large trees compensates to a considerable extent for the absence of cover on the ground. Another disadvantage of uncovered soil in a plantation of young rubber trees is. that the ground under the heat of a tropical sun rapidly loses its moisture. For this reason proposals have been made to plant in the place of weeds low-growing leguminous plants, the growth of which will not only prevent impoverishment and loss of soil during the rains and conserve moisture in the heat, but will also have the effect of enriching the soil in nitrogenous constituents through the power leguminous plants possess of absorbing nitrogen from the air through nodules on their roots. Among the plants which are being tried for this purpose are various species of Crotolaria, passion-flower, and the well-known sensitive plant of the East. The success of the method cannot yet be judged, but the experiment is one which deserves very full trial.

One of the most important subjects in connexion with rubber plantations is the method to be adopted in tapping the trees for latex. The native methods in vogue in Brazil and Mexico are primitive and often in- jurious to the tree. At present it cannot be said that finality has been reached on the subject of the best method, giving a good

return of latex with a minimum of damage to the tree. A method at one time largely adopted was to make a series of V-shaped in- cisions on four sides of the tree to a height of about 6 ft. from the base —that is, within the reach of an ordinary man without the need for ladder or scaffold- ing; the latex obtained from the upper part of the tree is said to furnish less rubber and of poor quality. The latex is collected in cups Other_ systems are the herring-bone plan of a vertical channel

FlG. 2. — Tapping, herring-bone system

placed at the apex of each V.

with lateral connecting channels about I ft. apart at an angle of about 45 , the latex being collected in cups placed at the base of the vertical channels (fig. 2) ; the spiral system, in which a series of spiral grooves are cut all round the trunk, by which means virtually the entire area of the trunk is tapped. In some instances a combination of these methods is employed. The V-system is the oldest, but is being largely superseded by the herring-bone; the spiral system is more recent and is still on trial.

Instead of the axe or large knives which frequently inflicted serious damage to the trees, special small knives and prickers are now employed so constructed as to avoid injury to the tree through making a larger incision than is necessary, and without penetrating into the wood below the laticiferous layer. It is possible to tap or prick trees daily for a number of years without apparent injury, but the practice of tapping on alternate days appears to be safer and to afford equally satisfactory if not better results. The yield of latex is at first small, but increases with successive tappings, which appear to stimulate the local production of latex, and finally reaches a maximum.

When the bark has been removed a period of from three to four years must elapse before it is so fully renewed as to render fresh incisions possible. In the case of a tree from seven to ten years old, tapping is so arranged that by the time the last incisions on the original growth are made, the new growths on other portions are at least four years old, and ready for new incisions to be made. Too frequent tapping leads to the production of latex poor in caoutchouc, whilst tapping of trees before they are six or seven years old, and from 20-25 i n – ‘ n circumference, produces inferior rubber. As a rule, an annual yield of

more than 1-2 lb of rubber per tree must not be looked for from recent plantations, although much higher yields up to 10-15 w an d over per tree are recorded from S. America, and it is therefore probable that with greater experience as to the best methods of tapping and with older trees considerably larger yields may be expected from plantations in the future. An average of 150 trees to the acre (20X15 ft.) and a yield of I J lb of rubber per annum per tree at 2s. 6d. per lb gives the result of £28, 2s. 6d. per acre. The cost of production may be assumed to be about is. per lb, to which has to be added the expense of transport. The cost of clearing forest land and planting with rubber in Ceylon is estimated at about 100 Rs. per acre in the first year, and from 20-30 Rs. per acre in subsequent years until the sixth year, when the plantation would begin to be productive.

The point of next importance is the coagulation of the latex so as to produce rubber in the form and of the quality required by the manufacturer. The primitive methods of coagulation and curing practised in S. America undoubtedly are susceptible of considerable improvement, and certainly waste can be. reduced to a minimum. It is, however, important to remember that rough as these native methods are they result in the production of rubber which commands the highest price. As the removal of the impurities of the latex is one of the essential points to be aimed at, it was thought that the use of a centrifugal machine to separate the caoutchouc as a cream from the watery part of the latex would prove to be a satisfactory process. This method is said to answer well with the latex of Castilloa, but it appears to be inapplicable to the latex of Hevea, which does not cream readily when centrifugalized.

The plan usually adopted is to collect the latex in rectangular tanks or casks. It is then coagulated by the addition of an acid liquid, acetic acid or lime juice being generally employed, and the mixture allowed to stand. The coagulated rubber separates as a mass of spongy caoutchouc. If the coagulation has been effected in shallow dishes, the rubber is obtained in a thin cake of similar shape known as a ” biscuit.”

The rubber thus formed is washed and dried. The coagu- lated rubber separated from the watery fluid is cut up into small pieces and passed through the grooved rollers of the washing machine, from which it issues in sheets, long crinkled ribbons or ” crepe,” which are then dried in hot air chambers or in a vacuum dryer, by which means the water is dissipated at a lower temperature. In order to prevent decomposition of any proteid impurity which may remain incorporated with the rubber, the freshly coagu- lated rubber is

sometimes cured in the smoke of burning wood or a small quantity of an antiseptic such as creosote is added during coagulation.

Plantation rubber comes into commerce in the form of the crinkled ribbons known as crepe, in sheets or biscuits, and sometimes in large blocks made by compressing the crgpe rubber. Block rubber is considered to possess certain advantages in securing a constant proportion of water, and in being satisfactory for transport. The best condition and form in which to export rubber cannot be regarded as settled. The probabilities are that in the end the production of a rubber as nearly as possible free from water and impurities and of constant composition will be realized as best meeting the requirements of the modern manufacturer. The need for scrupulous cleanliness in the preparation of rubber is now recognized, and the arrangements of a rubber factory in Ceylon or Malaya are comparable with those of the modern dairy.

In the present transition stage of rubber production it is necessary for the manufacturer in Europe to wash all rubber. He receives

both the wild rubber containing variable quantities of impurity and the purer plantation rubber, the latter, however, in much smaller amount. The fact that at present washing machinery exists in all European factories and that most of the rubber received needs washing, leads to the greater purity of plantation rubber, except for special purposes, being generally discounted by the manufacturer. As soon as the output of plantation rubber of constant composition has reached much larger dimensions it is probable that the manufacturer will be able to dispense with washing. This will operate to the advantage of plantation rubber and against the wild rubber, so long as the latter is not exported in a purer condition.

So far the Hevea plantations in Ceylon and the East have not been seriously troubled by insect or fungoid pests, and those which have occurred have succumbed to proper treatment. The most serious trouble has been occasioned in the Malay States by a white thread-like fungus {Fames semitostus) which attacks the roots of the Hevea tree and eventually kills it. The development of this fungus is greatly promoted by the presence of decaying stumps and wood in the plantation. Vigorous measures are now taken in many plantations to remove all old wood and to extract stumps of old trees, which in the first instance it was considered unneces- sary to remove.

2. Manihot Glaziovii belonging to the Euphorbiaceae is the tree of N.E. Brazil which furnishes Ceara or Manigoba rubber (fig. 3). It is

closely related to the Manioc, cassava or tapioca plant (Manihot utilissima) which it re- sembles when young and exhibits a similar tuberous root system. The tree grows well on dry and rocky soil without rain for a con- siderable period of the year, and flourishes at high altitudes up to about 4000 ft. It is therefore adapted for conditions which are unsuitable for Hevea. The tree grows about 30 ft. high, with a rounded head of foliage, and greyish-green 3 to 7-lobed palmate leaves, somewhat resembling the leaves of the castor-oil plant in shape and size. The seeds (fig. 3), which are abundant and retain Fig. 3.—Manihot Glaziovii. I, branch their vitality well, have w ; t h flowers; 2, fruit; 3, seed.

a hard thick coat. The

seeds take a year to

germinate, unless the edges near the end bearing the caruncular

projecting are rasped off. Cuttings, if they have a single bud,

strike readily.

The trees are tapped when they are about five years old. The mode of collecting the rubber is as follows. After brushing away the loose stones and dirt from the root of the tree by means of a handful of twigs, the collector lays down large leaves for the latex to drop upon. He then slices off the outer layer of the bark to the height of 4 or 5 ft. The latex, which exudes slowly and in many tortuous courses, some of it ultimately falling on the ground', is allowed to remain on the tree for several days, until it becomes dry and solid, when it is pulled off in strings, which are either rolled up into balls or put into bags in loose masses, in which form it enters commerce under the name of Ceara " scrap." Ceara rubber is also exported in the form of lumps and cakes. The annual yield of rubber is rather more than 1 lb per tree. The latex coagulates readily, especially if churned or if diluted with water, when a purer rubber is obtained.

The Manihot tree has been widely introduced into other countries, and appears to succeed wherever the rainfall is not excessive. In Ceylon and in some parts of India, especially in Madras, it has succeeded well. In W. Africa the tree flourishes, but it is under trial as a rubber producer. The Manihot tree also promises well in E. Africa, Nyasaland and the Mozambique. The pure Ceara rubber, as for example the " biscuits " prepared in Ceylon, is of excellent quality, scarcely if at all inferior to Para. That derived from Brazil, however, is generally

inferior, being mixed with wood and dirt. The cultivation and collection of the rubber being troublesome, it is unlikely to be attended to in those countries in which Hevea is successful.

3. The source of ” Ule ” rubber exported from Central America, and of the ” Caucho ” rubber of Peru is Castilloa elastica, Cerv., a lofty tree, N. O. Urticaceae, with a trunk 3 ft. or more in diameter, and large hairy oblong lanceolate leaves often 18 in. long, and 7 in. wide (fig. 4). The tree grows most abundantly in a sporadic manner

Fig. 4. — CastUloa elastica. 1, leaf; 2, twig with male flowers ; with female 4, seed; 4, nat. size.

in the dense moist forests of the basin of the Rio San Juan, where the rain falls for nine months in the year. It prefers rich fertile

soil on the banks of watercourses, but does not flourish in swamps. It is found also in Costa Rica, Guate- mala, Honduras, Mexico, Cuba and Hayti, and in Panama with another species of CastUloa, and on the W. coast of S. America down to the slopes of Chimborazo; the Cordilleras of the Andes separating the Castilloas from the Heveas of Brazil.

In Nicaragua the latex is collected in April, when the old leaves begin to fall and the new ones are appearing, during which time the latex is richest. The tree is tapped either in the same manner as the Hevea, or by encircling the tree with a simple spiral cut at an inclination of 45 , or by two parallel spirals if the tree be large. At the bottom of the spiral an iron spout about 4 in. long is driven into the tree, and the milk is received in iron pails. A tree 20 to 30 ft. high to its first branches, and about 4 ft. in diameter, is expected to yield annually 20 gallons of milk, each gallon giving about 2 lb of rubber. In the evening the milk is strained through a wire sieve and transferred to barrels. The milk, which is acid, is coagulated by the addition of the alkaline juice of 3, twig the ” achete ” plant, or of another flowers; plant called ” coasso.” The strained juice of either of these plants, ob- tained by bruising the moistened herb and subsequent expression, is added to the milk in the proportion of about 1 pint to the gallon. In British Honduras an alkaline decoction prepared from the Moon plant (Calonictyon speciosum) is used for the same purpose. If these plants are not procurable, two parts of water are added to one of the milk, and the mixture allowed to stand for twelve hours. The coagulum is

next flattened out by a wooden or iron roller to get rid of the cavities containing watery liquid, and the sheets are then hung up for fourteen days to dry, when they weigh about 2 lb, the sheets being usually 2 to £ in. thick and 20 in. in diameter. When coagulated in water, the mass is placed in vats in the ground and allowed to dry, this taking place in about a fortnight. It is then rolled into balls. That which dries on the incisions in the tree is called ” bola ” or ” burucha,” and is said to be highly prized in New York. The loss of Nicaragua rubber in drying is estimated at 15%. It is exported chiefly from San Juan del Norte, or Grey Town, and the larger proportion goes to the United States. The CastUloa tree appears to be suitable for cultivation only in districts where the Para rubber would grow equally well. The tree is ready for tapping at about the same age as Hevea and the average yield of rubber is about the same. Since the latex ” creams ” readily the rubber can be separated from the latex by centrifugalizing, and its quality and market value thus enhanced. Much of the native CastUloa rubber is of inferior quality. The tree has been introduced into S. India, Ceylon and the W. Indies, where it has succeeded well, especially in Trinidad and Tobago. It is also under trial in E. and W. Africa and Nyasaland. Several other species of CastUloa than C. elastica are known to furnish rubber, but little has been recorded as to their advantages.

4. Funtumia elastica (formerly known- as Kickxia or Kixia elastica) is the W. African (Ire or Irai or Lagos) rubber tree, which belongs to the Apocynaceae, a natural order which includes the Landolphia vines as well as other rubber producers. It is a large forest tree of upright habit extending to 60 or 70 ft. in height and 3 to 4 ft. in diameter. The bright green, glabrous leaves are broad and oblong, about 6 in. in length (see fig. 5). The flowers are yellow, and the seeds enclosed in a pod are long and thin with numerous long silky fibres attached to them, which enable the seeds to be readily carried by the wind. The trees are common throughout the central regions of E. and W. Africa (from Uganda to Sierra Leone). The botanical name is taken from a W. African native name for a rubber tree — ” Funtum.”

Many of the trees in the accessible forests of W. Africa have been destroyed by over-tapping and felling. Plantations of Fun- tumia have been established in several districts, including the Gold Coast and S. Nigeria. The trees are tapped on the ” herring-bone ” plan and the milk collected in vessels at the base. This is then poured into the hollowed-out trunk of a tree, where it is allowed to stand covered with palm leaves for about a fortnight. The watery portion of the latex soaks into the trunk, and the soft spongy rubber which remains is kneaded and pressed into lumps or balls.

In some districts the cbllected milk is heated alone or diluted with water, to coagulate the rubber, but if heated alone an inferior rubber is apt to result owing to overheating.

Fig. 5. — Funtumia elastica (Lagos rubber). I, twig with flowersj 2, part of under side of leaf showing somatia at d d (about nak size); 3, fruit (about § nat. size).

The Funtumia latex can also be coagulated by the astringent infusion of Bauhinia leaves or by exposing it in shallow dishes, when the liquid ” creams.” The yield of rubber is stated as a rule to be less than that of Para. The rubber, if properly prepared, is of excellent quality, and the tree deserves further attention, especially in those regions of W. Africa which are unsuited to Hevea.

Funtumia africana furnishes a very inferior rubber, which is highly resinous.

5. Ficus elastica is the tree which produces Rambong or Assam rubber. It is well known in Europe as a small ornamental tree, but in the tropics it attains very large dimensions, and de- velops a system of branching roots which act as buttresses to the large trunk (see fig. 6). It is a native of India, Burma and the Malay Archipel- ago, and is most abundant in those regions in which the climate is dis- tinctly humid, andˆ subject to this condition the tree flourishes at high altitudes. In As- sam and in upper Burma there are extensive forests of Ficus elastica, but to a large ex- tent the trees have been damaged by careless tapping. Large plantations have been formed by the Govern- ment of India both in Assam and

Bengal, but most p (,.- Fi cus elastica. 1, twig; of the rubber ex- of inflorescence .

ported is still ob- tained from the forest trees. It has been found that although the tree grows well in many different countries and different localities, it only furnishes a satisfactory yield of rubber in mountainous dis- tricts, such as those of Assam and certain parts of Ceylon and Java. The trees are tapped when about ten years old, and as a rule annually furnish from 5-10 ft of rubber per tree. The latex flows fairly well, but is usually allowed to dry on the tree.

The rubber, if of good quality, sells at prices only slightly inferior to that of Para. When the plantations of Ficus in India are in full bearing it is possible that this tree may attract more attention, since the plantation rubber is likely to be of superior quality owing to the

greater care taken in its preparation. It seems at present doubtful, however, whether the establishment of plantations of Ficus will be profitable under ordinary conditions in India.

In addition to the trees described above there are numerous plants of some importance as rubber producers. Among these may be mentioned the Landolphia vines, which are still the chief source of African rubber. The vines grow upon forest trees, and the stems are periodically tapped. There are numerous species of these climbing plants, of which the most important as furnishing good rubber are Landolphia owariensis (see fig. 7), which occurs throughout

2, section

W. Africa and the Sudan, Landolphia Heudelotii of W. Africa, and Landolphia Kirkii and L. Dawei, which are found in the forests

Fig. 7. — Landolphia owariensis. I, twig with flowers; 2, fruit.

of E. Africa. Other species of Landolphia, including Landolphia florida, abundant in both E. and W. Africa, furnish rubber of inferior quality.

Among other shrubs and vines which yield rubber of fair quality may be mentioned Willughbeia edulis and Urceola elastica and Parameria glandulifera, which occur in Burma and Malaya.

The Sapiums of Colombia and Guiana are large trees resembling Hevea, and certain species furnish good rubber, especially the Sapium Jenmani of Guiana. Most of the native Sapiums have been destroyed by reckless tapping, and the merits of this genus have been somewhat overlooked and deserve reinvestigation. The same applies to certain species of Hevea, other than H. brasiliensis, which are known to produce good rubber in tropical America.

Pernambuco or Mangabeira rubber is obtained from Hancornia speciosa, Gom., an apocynaceous tree common on the S. American plateau in Brazil from Pernambuco to Rio de Janeiro, at a height of 3000 to 5000 ft. above the sea. It is about the size of an ordinary apple tree, with small leaves like the willow, and a drooping habit like a weeping birch, and has an edible fruit like a yellow plum called ” mangaba,” for which, rather than for the rubber, the tree is cultivated in some districts. Only a small quantity of this rubber comes to

England, and it is not much valued, being a ” wet ” rubber. It is produced in ” biscuits ” or ” sheets.” The caoutchouc is collected in the following manner: about eight oblique cuts are made all round the trunk, but only through the bark, and a tin cup is fastened at the bottom of each incision by means of a piece of soft clay. The cups when full are poured into a larger vessel, and solution of alum is added to coagulate the latex. In two or three minutes coagulation takes place, and the rubber is then exposed to the air on sticks, and allowed to drain for eight days. About thirty days afterwards it is sent to market. Pernambuco rubber, as is the case with most rubbers coagulated by saline solutions, con- tains a large quantity of water. The tree has been planted in other countries, but has so far not received much attention. It will grow on a dry sandy soil, dislikes much moisture, and needs no shade.

Forsteronia gracilis of Guiana is a climbing plant which also belongs to the Apocynaceae. Like the Forsteronia floribunda of Jamaica it yields rubber of good quality. Ficus Vogelii of W. Africa yields rubber of variable quality. The production of rubber by this tree merits further investigation, as it grows readily in nearly every district of W. Africa and the Sudan.

Specimens of the best known and of many of the lesser known rubbers are included in the Colonial and Indian Collections and Sample Rooms of the Imperial Institute, and many of the authentic specimens have been chemically and technically examined in the Scientific and Technical Department of the Institute and com- mercially valued. Reports on many of the lesser known rubbers have been published in the Bulletin of the Imperial Institute. xxin. 26

Chemistry of Rubber.

Rubber is chiefly composed of the soft, solid, elastic substance known as caoutchouc. It is usually assumed that this substance is present as such in the latex. The globules in the latex, however, consist more probably of a distinct liquid substance which readily changes into the solid caoutchouc. The coagulation of the latex often originates with the ” curding ” of the proteids present, and this alteration in the proteid leads to the solidification of the globules into caoutchouc. The latter, however, is probably a distinct effect. Under certain conditions, as when latex is allowed to stand or is centrifugalized, a cream is obtained consisting of the liquid globules, which may be washed free from proteid without change, but, either by mechanical agitation or by the addition of acid or other chemical agent, the liquid gradually solidifies to a mass of solid caoutchouc. The phenomenon therefore

resembles the change known to the chemist as polymerization, by which through molecular aggregation a liquid may pass into a solid without change in its empirical com- position. The effect may, however, also be due to chemical change known as condensation, and be accompanied by the elimination of the elements of water. So far the chemical nature of the liquid globules of the latex is unknown, and the exact character of the change into solid caoutchouc remains to be determined. The watery liquid known as rubber milk or latex is an emulsion con- sisting chiefly of a weak watery solution of proteids, carbohydrates and salts holding the liquid globules in suspension. In connexion with the production of rubber the most important factor is the proportion of caoutchouc it contains. In a good rubber this ranges from 70-90 % and over. The proportion and nature of the proteids or albuminous materials varies considerably in different latices. The proteids should be as far as possible removed during the pre- paration of the rubber, as these substances are chiefly responsible for the objectionable smell and colour of ” native ” rubbers, and their presence leads to subsequent change in the commercial material. All crude rubber contains more or less proteid, and in the opinion of some technical experts its presence even affords strength to the material, but this cannot be accepted as proved. The dissolved salts (potassium, sodium, ammonium, calcium, magnesium, &c.) of the latex are generally nearly entirely absent from the well- prepared rubber. Of considerable importance to the value of the rubber is the absence of the resinous constituents which are present in greater or smaller proportion in all latices. The presence of more than a small percentage of resin in the latex leads’ to the production of rubber containing much resin, which seriously depreciates its commercial value for most purposes. The percentage of resin in a good rubber should be as small as possible, and should in any case be less than 10%. There is no feasible method at present known of preventing the inclusion of the resin of the latex with the rubber during coagulation, and although the separation of the resin from the solid caoutchouc by means of solvents is possible, it is not practicable or profitable commercially. A complete examination of a series of different latices has shown that, in many cases, e.g. Hevea and Castilloa, the resin is present in large proportion in the latex derived from young trees, and diminishes in amount as the tree ages. This is one reason why young trees should not be tapped. The composition of latex and of typical rubbers is given below : —

Rubbers

Para Ceara Castilloa Ficus Landolphia Para Latex Rubber Rubber Rubber Elastica Kirkii

(Ceylon). (Ceylon). (Ceylon). (Ceylon). (Bengal). (E. Africa).

% % % % % %

Water. 5515 I Caoutchouc 946 76.25 8610 843 80-1

Caoutchouc 41-29 1 Resin . 2-66 10-04 12-42 n-8 6-9

Proteids . 2-18] Proteids . 1-75 8-05 087 .. 0-3

Sugar, etc. .036 Ash . . 014 2-46 0-20 o-8 7-7

Ash (salts) . 0-41 I Moisture . 0-85 3-20 0.32 o-8

The chemical analysis of crude rubber is an important guide to its value. At present, however, the methods of analysis usually employed are not sufficiently delicate to afford all the necessary information as to the intrinsic value of the higher grades of rubber, and do not go much beyond the exclusion of inferior rubber. The tests of the physical properties of crude rubber usually applied to determine its value in the market are also very rough and cannot be relied upon. The development of the rubber industry has now reached a stage at which more exact methods of determining the chemical composition and physical properties (strength and elas- ticity) of rubber are required. At present the caoutchouc present in crude rubber is usually estimated indirectly, and it is_ possible that what generally passes as caoutchouc may be in some instances a mixture of similar chemical substances, which if separated would be found to differ in those physical properties on which the technical value of rubber depends.

It is already certain that some commercial rubbers contain a variable proportion of a substance of the nature of caoutchouc, but having different properties.

True caoutchouc, the principal constituent of all rubbers, is probably essentially one and the same substance, from whatever botanical source it may have been derived. This is an elastic solid, almost transparent in thin sheets, composed entirely of carbon and hydrogen, the empirical composition of which is represented by

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the formula C 6 H 8 . It thus possesses the same composition as the hydrocarbon of gutta-percha and as that of oil of turpentine and other terpenes which are the chief components of essential oils. The properties of caoutchouc clearly show, however, that its actual molecular structure is considerably more complex than is represented by the empirical formula, and that it is to be regarded as the polymer of a terpene or similar hydrocarbon and composed of a cluster of at least ten or twenty molecules of the formula CsHs.

When solid caoutchouc is strongly heated it breaks down, without change in its ultimate composition, into a number of simpler liquid hydrocarbons of the terpene class (dipentene, di-isoprene, isoprene, &c), of which one, isoprene (CsHs), is of simpler structure than oil of turpentine (C10H16), from which it can also be obtained by the action of an intense heat.

When this volatile liquid hydrocarbon (isoprene) is allowed ro stand for some time in a closed bottle, it gradually passes into a substance having the principal properties of natural caoutchouc. The same change of isoprene into caoutchouc may also be effected by the action of certain chemical agents. It may therefore be said that caoutchouc has been already artificially or synthetically pre- pared, and the possibility of producing synthetic rubber cheaply on a commercial scale remains the only problem. At present the change of isoprene into caoutchouc is mainly of scientific interest in indicating possibilities with regard to the conversion of the liquid globules of the latex into rubber and to the formation of rubber by plants. The exact chemical nature of caoutchouc is, however, not determined, and recent researches point to the view that its molecular structure may even be somewhat different from that of the terpenes.

The exact manner in which isoprene passes into caoutchouc is also not understood. These problems are, however, certain to be solved in the near future, and then probably caoutchouc may be formed in other ways than from isoprene.

The question as to whether synthetic rubber will ever be produced cheaply on a commerical scale is therefore the important one for those who are largely interested in the rubber-planting industry. No definite answer can be given to this question at the present time. Its settlement will depend in part on the cost of producing rubber from plants, which from their point of view it is to the interests of planters to reduce as far as possible. There are many substances produced by plants which can be synthetically prepared by chemical means, but, as with quinine, the process involved is too costly to enable the synthetic

product to compete with the natural product.

The chief properties of caoutchouc and its employment for technical purposes may now be considered.

Caoutchouc is not dissolved by water or alcohol, and is not affected except by the strongest acids. Alkalis have little effect on it under ordinary circumstances, although prolonged contact with ammonia results in a partial change. The best solvents for rubber are carbon bisulphide, benzol and mineral naphtha, carbon tetra- chloride and chloroform. These liquids, either alone or mixed, are employed in making the rubber solutions used for technical purposes. Vegetable and other oils rapidly penetrate caoutchouc and lead to deterioration of its properties. Sulphur when warmed with caoutchouc combines with it, and on this fact the vulcanization of rubber depends, and also the production, with an excess of sulphur, of the hard black material known as vulcanite or ebonite.

Caoutchouc is a soft elastic resilient solid. In this respect it differs from gutta-percha, which, like caoutchouc, is derived from the latices of certain plants. The technical value of caoutchouc chiefly depends on the extent to which it is capable of being stretched without breaking, and the extent to which it at once returns to its original dimensions. Caoutchouc is a bad conductor of heat and electricity, and alone or mixed with other materials is employed as an electrical insulator.

When caoutchouc is heated slightly above the temperature of boiling water it becomes softer and loses much of its elasticity, which, however, it recoveres on cooling. At about 150 — 200° C. caoutchouc melts, forming a viscous liquid which does not solidify on cooling. This viscous liquid is present in small proportion in some commercial rubbers owing to overheating during their pre- paration. It appears to be the principal cause of stickiness or the ‘ tacky ” condition of some rubbers, which considerably depreciates their commercial value. There is some evidence that ” tackiness ” may be induced by a kind of fermentation which takes place in crude rubber.

At higher temperatures the viscous liquid suffers decomposition with the formation of various liquid hydrocarbons, principally members of the terpene series. Similar products are also formed by heating gutta-percha which closely resembles caoutchouc in its chemical structure.

RubDer slowly absorbs oxygen when exposed to air and light, the absorption of oxygen being accompanied by a gradual change in the

characteristic properties of rubber, and ultimately to the production of a hard, inelastic, brittle substance containing oxygen. Ozone at once attacks rubber, rapidly destroying it. If ozone is passed into a solution of rubber in chloroform the caoutchouc combines with a molecule of ozone forming a compound of the empirical composition CjHsOa. When this compound is acted on

by water, hydrogen peroxide and levulinic aldehyde are formed, the aldehyde being subsequently oxidized by the hydrogen peroxide, forming levulinic acid. The hydrocarbon of gutta-percha yields similar results and is therefore closely related to caoutchouc.

The study of the action of ozone on caoutchouc has thrown new light on the complex question of the chemical structure of this substance, and discloses relationships with the sugars and other carbohydrates from certain of which levulinic acid is obtained by oxidation.

Caoutchouc, like other “unsaturated ” molecules, forms compounds with chlorine, bromine, iodine and sulphur.

Commercial Treatment of Rubber.

In the industrial working of indiarubber, the various impurities present in the crude ” wild ” rubber (bark, dirt and the principal impurities derived from the latex, except resin) are removed by the following process : The lumps of crude caoutchouc are first softened by the prolonged action of hot water, and then cut into slices by means of a sharp knife — generally by hand, as thus any large stones or other foreign substances can be removed. The softened slices are now repeatedly passed between grooved rollers, known

Fig. 8. — Roller of Washing Machine.

as washing rollers (fig. 8), a supply of hot or cold water being made to flow over them. Solid impurities speedily become crushed, and are carried away by the water, while the rubber takes the form of an irregular sheet perforated by numerous holes. The loss on washing ranges from 10—15 % with ” fine Para ” to 40 % with other ” wild ” rubbers. In the future this washing of ” wild ” rubber may be conducted in the tropics, thus furnishing the manufacturer with rubber which, like ” plantation ” rubber, need not be subjected to this process in the factory. The washed product contains in its pores a notable proportion of water, which is removed by hanging the rubber for some days in a warm room. It is now ready either for incorporation with sulphur and other materials, or for agglomeration

into solid masses by means of the masticating machine — an apparatus which consists of a strong cylindrical cast-iron casing, inside which there revolves a metal cylinder with a fluted or corrugated surface. Some of the rubber having been placed in the annular space between the inner cylinder and the outer casing, the former is made to revolve; and the continued kneading action to which the rubber is subjected works it into a solid mass, something like a gigantic sausage. Before commencing the mastication it is generally necessary to warm the apparatus by means of steam; but as the operation proceeds the heat produced requires to be moderated by streams of cold water flowing through channels provided for the purpose. The inner cylinder is generally placed somewhat excentrically in the outer casing, in order to render the kneading more perfect than would otherwise be the case.

To convert the masticated rubber into rectangular blocks, it is first softened by heat, and then forced into iron boxes or moulds. The blocks are cut into thin sheets by means of a sharp knife, which is caused to move to and fro about two thousand times per minute, the knife being kept moistened with water, and the block fed up to it by mechanical means. Cut sheets are largely used for the fabrica- tion of certain classes of rubber goods — these being made by cementing the sheets together with a solution of rubber in' naphtha or benzol. Most articles made of cut sheet rubber would, however, be of very limited utility were they not hardened or vulcanized by the action of sulphur or some compound of that element. After vulcanization, rubber is no longer softened by a moderate heat, a temperature of 160° C. scarcely affecting it, nor is it rendered rigid by cold, and the ordinary solvents fail to dissolve it. It must, •however, be distinctly understood that it is not the mere admixture but the actual combination of sulphur with indiarubber that causes vulcanization. If an article made of cut sheet be immersed for a few minutes in a bath of melted sulphur, maintained at a tempera- ture of 120 C, the rubber absorbs about one-tenth of its weight of that element, and, although somewhat yellowish in colour from the presence of free sulphur, it is still unvulcanized, and unaltered as regards general properties. If, however, it be now subjected for an hour or so to a temperature of 140 C, a combination occurs, and vulcanized caoutchouc is the result. When a manufactured article has been saturated with sulphur in the melted sulphur bath, the heat necessary for vulcanization may be obtained either by high-pressure steam, by heated glycerin, or by immersion in a sulphur bath heated to about 140 C. In this last case absorption of the sulphur and its intimate combination with the rubber occur simultaneously. Cut sheets, or articles made from them, may be

saturated by being laid in powdered sulphur maintained for some hours at about 1 10 C. Sheets sulphured in this way can be made up into articles and joined together either by warming the parts to be united, or by means 01 indiarubber solution; after which the true vulcanization, or ” curing,” as it is termed, can be brought about in the usual way.

Another method of vulcanizing articles made from cut sheet rubber consists in exposing them to the action of chloride of sulphur. Either they are placed in a leaden cupboard into which the vapour is introduced, or they are dipped for a few seconds in a mixture of one part of chloride of sulphur and forty parts of carbon disulphide or purified light petroleum. Vulcanization takes place in this instance without the action of heat ; but it is usual to subject the goods for a short time to a temperature of 40 C. after their removal from the solution, in order to drive off the liquid which has been absorbed, and to ensure a sufficient action of the chloride of sulphur. Treatment with a warm alkaline solution is afterwards advisable, in order to remove traces of hydrochloric acid generated during the process. Another very excellent method of vulcanizing cut sheet goods consists in placing them in a solution of the poly- sulphides of calcium at a temperature of 140 C. Rubber employed for the manufacture of cut sheets is often coloured by such pigments as vermilion, oxide of chromium, ultramarine, orpiment, antimony, lamp black, or oxide of zinc, incorporation being effected either by means of the masticator or by a pair of rollers heated internally by steam, and so geared as to move in contrary directions at unequal

Fig. 9. — The Mixing Rollers.

speed (fig. 9). Most of the rubber now manufactured is not com- bined with sulphur when in the form of sheets, but is mechanically incorporated with about one-tenth of its weight of that substance by means of the mixing rollers — any required pigment or other matter, such as whiting or barium sulphate, being added. The mixed rubber thus obtained is readily softened by heat, and can be very easily worked into any desired form or rolled into sheets by an apparatus known as the calendering machine. Vulcanization is then ensured by exposure for half an hour or more to a temperature of I35°-I5o° C, usually in closed iron vessels into which high- pressure steam is admitted (fig. 10). Tubes are generally made up

around mandrels, and allowed throughout the curing to remain imbedded in p u 1 – verized French chalk, which affords a useful support for many articles that tend to lose their shape during the process. Of late years a considerable amount of seamless tubing has been made, much in the same way as lead piping, by forcing the mixed rub- ber through a die, and curing as above. The calendered sheets are generally cured between folds of wet cloth, the markings of Fig. 10.— A Vulcanizer. which they retain;

and hollow articles, such as playing balls or injection bottles, are vulcanized in iron or brass moulds, tinned inside and very slightly greased. Before it is put in, the article is roughly put together, and the expansion of the included air forces the rubber into contact with the internal surface of the mould, or a little carbonate of ammonia is enclosed. Belting intended for driving machinery is built up of canvas which has been thoroughly frictioned with the soft mixed rubber, and is cured by placing it in a kind of press kept by means of steam at a dry heat of about 140 C. Packing for the stuffing boxes of steam engines is similarly prepared from strips of

rubber and frictioned canvas, as also are the so-called insertion sheets, in which layers of rubber alternate with canvas or even wire gauze. Indiarubber stereotypes are now extensively made use of as hand stamps, and attempts have been made to introduce them for press and machine printing. A plaster cast of the type is, when dry, saturated with shellac varnish and redried. Rubber mixed in the usual way with about 10% of sulphur is now softened by heat, forced into the mould, and retained there by pressure during the operation of curing, which is usually effected in an iron box heated over a gas burner to 140° C.

The ordinary macintosh or waterproof cloth is prepared by spreading on the textile fabric layer after layer of indiarubber paste or solution made with benzol or coal-naphtha. If cotton or linen is used, it is usual to incorporate sulphur with the paste, and to effect vulcanization by steam heat; but, when silk or wool is em- ployed, no sulphur is added to the paste, the dried coating of rubber being merely brought into momentary contact with the mixture of chloride of sulphur and carbon disulphide already mentioned. Double texture goods are made by uniting the rubber surfaces of two pieces of the coated material. Air goods, such as cushions, beds, gas bags, and so forth, are made of textile fabrics which have been coated with mixed rubber either by the spreading process above described, or by means of heated rollers, the curing being then effected by steam heat. The manufacture of overshoes and fishing boots is an analogous process, only the canvas base is more thickly coated with a highly pigmented rubber of low

quality. The articles are first fashioned by joining the soft material; they are then varnished, and afterwards cured in ovens heated to about 135° C. The fine vulcanized ” spread sheets ” are made by spreading layers of indiarubber solution, already charged with the requisite pro- portion of sulphur, on a textile base previously prepared with a mixture of paste, glue and treacle. Vulcanization is then effected by steam heat, and, the preparation on the cloth being softened by water, the sheet of rubber is readily removed. The required thick- ness of the spread sheet is very often secured by the rubber-faced surfaces of two cloths being united before curing. The threads used in waking elastic webbing are usually cut from spread sheets. The manufacture of springs, valves and washers does not require any very special notice, these articles being generally fashioned out of mixed rubber, and vulcanized either in moulds or in powdered French chalk. Rollers are made to adhere to their metal spindles by the intervention of a layer of ebonite, and after vulcanization they are turned. In order to make spongy or porous rubber, some material is incorporated which will give off gas or vapour at the vulcanizing temperature, — such ‘as carbonate of ammonia, crystal- lized alum, and finely ground damp sawdust. Uncombined sulphur is injurious, and often leads to the decay of vulcanized goods, but an excess of sulphur is generally required in order to ensure perfect vulcanization. Sometimes the excess is partially removed by boiling the finished goods with a solution of caustic soda, or some other solvent of sulphur. In other cases the injurious effects of free sulphur are obviated by using instead of it a metallic sulphide, — generally the orange sulphide of antimony; but, for the best results, it is necessary that this should contain from 20 to 30 % of uncom- bined sulphur.

It will thus be seen that for nearly all practical purposes, including tires, vulcanized rubber mixed with mineral matter is employed. Such articles contain varying proportions of rubber (12-60%), about 1-2 % of_ combined sulphur, and from 25-70 % of mineral matter. Vulcanized rubber is also now largely used as an electrical insulator for the construction of cables, &c, instead of gutta-percha. . When the vulcanization of rubber is carried too far, from the presence of a very large proportion of sulphur and an unduly long action of heat, the caoutchouc becomes hard, horn-like, and often black. Rubber hardened by over-vulcanization is largely manu- factured under the name of ebonite or vulcanite. It is usually made by incorporating about 40 % of sulphur with purified Borneo rubber by means of the usual mixing rollers, shaping the required articles out of the mass thus obtained, and heating for six, eight or ten hours to from 135 to 150 °.

Ebonite takes a fine polish, and is valuable to the electrician on account of its insulating properties, and to the chemist and photographer because vessels made of it are unaffected by most chemical reagents. A kind of vulcanite which contains a large proportion of vermilion or other mineral pigment is used, under the name of dental rubber, for making artificial gums and supports for artificial teeth.

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RUBBLE, broken stone, of irregular size and shape. This word is closely connected in derivation with " rubbish," which was formerly also applied to what we now call " rubble." The earlier Middle English form was robeux or robows. It would appear that the original is an O. Fr. robel. Roba (older form robba) is found in Italian in the sense of refuse, trash. Robba is explained by Florio as a gown, or mantle, robe, wealth, goods, trash. The original sense was " spoil." Thus, " robe," " rob," " rubbish " and " rubble " are all cognate.

" Rubble- work " is a name applied to several species of masonry (q.v.). One kind, where the stones are loosely thrown together in a wall between boards and grouted with mortar almost like concrete, is called in Italian muraglia di getlo and in French bocage. Work executed with large stones put together without any attempt at courses is also called rubble.

RUBELLITE, a red variety of tourmaline (q.v.) used as a gem-stone. It generally occurs crystallized on the walls of cavities in coarse granitic rocks, where it is often associated with a pink lithia-mica (lepidolite).

The most valued kinds are deep red; the colour being probably due to the presence of manganese. Some of the finest rubellite is found in Siberia, whence it is sometimes called siberite, or passes under the misleading name of ” Siberian ruby.” The mills at Ekaterin- burg, where it is cut and polished, draw most of their supplies from the Ural Mountains — chiefly from Mursinka, Sarapulskaya and Shaitanka, near Ekaterinburg — but specimens are occa- sionally found at Nerchinsk in Transbaikalia. Burma is famous for rubellite, but little was known as to the conditions of its occurrence there until after the British annexation, when the old workings were visited and described by C. Barrington Brown and by F. Noetling. The pits which yield rubellite are dug in alluvial deposits in the Mong-long valley, some miles to the S.E. of Mogok, the centre of the ruby country. It was here that the Chinese obtained the rubellite so much valued in China for buttons of the caps of mandarins of certain rank. In the British Museum there is a remarkable specimen of crystal- lized rubellite of large size and fine form, but of poor colour, which was presented by the king of Ava to Colonel Michael Symes on the occasion of his mission in 1795. Very fine rubellite is found in the United States, notably at Mount Mica, near Paris, Oxford Co., Maine, where the crystals are often red at one end and green at the other. Mount Rubellite, near Hebron, and Mount Apatite at Auburn, are other localities in the same state from which fine specimens are obtained. Chesterfield and Goshen, Mass., also yield red tourmaline, frequently associated with green in the same crystal. Pink tourmaline also occurs, with lepidolite and kunzite, in San Diego Co., California. In Europe rubellite occurs sparingly at a few localities, as at San Piero in Elba and at Penig in Saxony; but the mineral is rarely if ever fit for the lapidary. (F. W. R.*)

RUBENS, PETER PAUL (1577-1640), Flemish painter, was born at Siegen, in Westphalia, on the 29th of June 1577.. His father, Johannes Rubens, a druggist, although of humble descent was a man of learning, and councillor and alderman in his native town (1562). A Roman Catholic by birth, he became a zealous upholder of the Reformation, and we find him spoken of as le plus docte Calviniste qui fust pour lors au Bas Pays. After the plundering of the Antwerp churches in 1566, the magistrates were called upon for a justification. While openly they declared themselves devoted sons of the church, a list of the followers of the Reformed creed, headed by the name of Anthony Van Stralen, the burgomaster, got into the hands of the duke of Alva. This was a sentence of death for the magis- trates, and Johannes Rubens lost no time in quitting Spanish soil, ultimately settling at Cologne (October 1568) with his wife and four children.

In his new residence he became legal adviser to Anne of Saxony, the second wife of the prince of Orange, William the Silent. Before long it was discovered that their relations were not purely of a business kind. Thrown into the dungeons of Dillenburg, Rubens lingered there for many months, his wife, Maria Pypelincx, never relaxing her endeavours to get the

undutiful husband restored to freedom. Two years elapsed before the prisoner was released, and then only to be confined to the small town of Siegen. Here he lived with his family from 1573 to 1578, and here Maria Pypelincx gave birth to Philip, afterwards town-clerk of Antwerp, and Peter Paul. A year after (May 1578) the Antwerp lawyer got leave to return to Cologne, where he died on the 18th of March 1587, after having, it is said, returned to Roman Catholicism.

Rubens went to Antwerp with his mother when he was scarcely ten years of age. He was an excellent Latin scholar, and also proficient in French, Italian, Spanish, English, German and Dutch. Part of his boyhood he spent as a page in the household of the countess of Lalaing, in Brussels; but tradition adds that his mother allowed him to follow his proper vocation, choosing as his master Tobias Verhaecht. Not the slightest trace of this first master's influence can be detected in Rubens's works. Not so with Adam Van Noort, to whom the young man was next apprenticed. Van Noort, whose aspect of energy is well known through Van Dyck's beautiful etching, was the highly esteemed master of numerous painters — among them Van Balen, Sebastian Vrancx, and Jordaens, later his son-in-law.

Rubens remained with Van Noort for the usual period of four years, thereafter studying under Otto Vaenius or Van Veen, a gentleman by birth, a most distinguished Latin scholar and a painter of very high repute. He was a native of Leiden, and only recently settled in Antwerp. Though Rubens never adopted his style of painting, the tastes of master and pupil had much in common, and some pictures by Otto Vaenius can be pointed out as having inspired Rubens at a more advanced period. For example, the "Magdalene anointing Christ's Feet," painted for the cathedral at Malaga, and now at the Hermitage in St Petersburg, closely resembles in composition the very important work of Otto Vaenius in the church at Bergues near Dunkirk.

In 1598, Adam Van Noort acting as dean of the Antwerp gild of painters, Rubens was officially recognized as " master " — that is, was allowed to work independently and receive pupils. His style at this early period may be judged from the by no means satisfactory " Holy Trinity " at Antwerp Museum, which already shows his bold, vigorous

handling, and the ” Portrait of a Youth ” in the Munich Pinakothek.

From 1600 to the latter part of 1608 Rubens belonged to the household of Vincenzo Gonzaga, duke of Mantua. The duke, who spent some time at Venice in July 1600, had his attention drawn by one of his courtiers to Rubens’s genius, and immediately induced him to enter his service. The influence of the master’s stay at Mantua was of extreme importance, and cannot be too constantly kept in view in the study of his later works.

Sent to Rome in 1601, to take copies from Raphael for his master, he was also commissioned to paint several pictures for the church of Santa Croce, by the archduke Albrecht of Austria, sovereign of the Spanish Netherlands, and once, when he was a cardinal, the titular of that see. A copy of ” Mercury and Psyche ” after Raphael is preserved in the museum at Pesth. The religious paintings — ” The Invention of the Cross,” ” The Crowning with Thorns ” and ” The Crucifixion ” — are to b” found in the hospital at Grasse in Provence (Alpes Maritimes).

At the beginning of 1603, ” The Fleming,” as he was termed at Mantua, was sent to Spain with a variety of presents for Philip III. and his minister the duke of Lerma, and thus had opportunity to spend a whole year at Madrid and become ac- quainted with some of Titian’s masterpieces. Of his own works, known to belong to the same period, in the Madrid Gallery, are ” Heraclitus ” and “Democritus.” Of Rubens’s abilities so far back as 1604 we get a more complete idea from an immense picture now in the Antwerp Gallery, the ” Baptism of Our Lord,” originally painted for the Jesuits at Mantua. Here it may be seen to what degree Italian surroundings had influenced the household painter of Vincenzo Gonzaga. Vigorous to the extreme in design, he reminds us of Michelangelo as much as any of the degenerate masters of the Roman school

while in decorative skill he seems to be descended from Titian and in colouring from Giulio Romano. Equally with this picture, ” The Transfiguration,” now in the museum at Nancy, and the portraits of ” Vincenzo and his Consort, kneeling before the Trinity,” in the library at Mantua, claim a large share of attention.

Two years later we meet a very large altar-piece of ” The Circumcision

” at St Ambrogio at Genoa, the ” Virgin in a Glory of Angels,” and two groups of Saints, painted on the wall, at both sides of the high altar in the church of Santa Maria in Valicella in Rome. These works remind us of a saying of Baglione, who was acquainted with Rubens in Italy: Apprese egli buon gusto, e diede in una maniera buona Italiana.

While employed at Rome in 1608, Rubens received most alarming news as to the state of his mother’s health. The duke of Mantua was then absent from Italy, but the dutiful son, without awaiting his return, at once set out for the Netherlands. When he arrived in Antwerp, Maria Pypelincx was no more. However strong his wish might now be to return to Italy, his purpose was overruled by the express desire of his sovereigns, Albrecht and Isabella, to see him take up a permanent residence in the Belgian provinces. On the 3rd of August 1609 Rubens was named painter in ordinary to their Highnesses, with a salary of 500 livres, and ” the rights, honours, privileges, ex- emptions,” &c, belonging to persons of the royal household, not to speak of the gift of a gold chain. Not least in importance for the painter was his complete exemption from all the regula- tions of the gild of St Luke, entitling him to engage any pupils or fellow-workers without being obliged to have them enrolled — a favour which has been of considerable trouble to the historians of Flemish art.

Although so recently returned to his native land, Rubens seems to have been, with one accord, accepted by his country- men as the head of their school, and the municipality was foremost in giving him the means of proving his acquirements. The first in date among the numerous repetitions of the “Adora- tion of the Magi ” is a picture in the Madrid Gallery, measuring 12 ft. by 17, and containing no fewer than eight-and-twenty life-size figures, many in gorgeous attire, warriors in steel armour, horsemen, slaves, camels, &c. This picture, painted in Antwerp, at the town’s expense, in 1609, had scarcely re- mained three years in the town hall when it went to Spain as a present to Don Rodrigo Calderon, count of Oliva. The painter has represented himself among the horsemen, bare- headed, and wearing his gold chain. From a letter written in May 161 1 we know that more than a hundred young men were desirous to become his pupils, and that many had, ” for several years,” been waiting with other masters until he could admit them to his studio.

Apart from the success of his works, another powerful motive had helped to detain the master in Antwerp — his marriage with Isabella Brant (October 1609). Many pictures have made us familiar with the graceful young woman who was for seventeen years to share the

master's destinies. We meet her at the Hague, St Petersburg, Berlin, Florence, at Grosvenor House, but more especially at Munich, where Rubens and his wife are depicted at full length on the same canvas. " His wife is very handsome," observes Sir Joshua Reynolds, "and has an agreeable countenance;" but the picture, he adds, " is rather hard in manner." This, it must be noted, is the case with all those pictures known to have immediately followed Rubens's return, when he was still dependent on the assist- ance of painters trained by others than himself. Even in the " Raising of the Cross," now in the Antwerp cathedral, and painted for the church of St Walburga in 1610, the dryness in outline is very striking.

According to the taste still at that time prevailing, the picture is tripartite, but the wings only serve to develop the central composition, and add to the general effect. In Wit- doeck's beautiful engraving the partitions even disappear. Thus, from the first, we see Rubens quite determined upon having his own way, and it is recorded that, when he painted

the " Descent from the Cross," " St Christopher," the subject chosen by the Arquebusiers, was altered so as to bring the artistic expressions into better accordance with his views. Although the subject was frequently repeated by the great painter, this first " Descent from the Cross " has not ceased to be looked upon as his masterpiece. Begun in 161 1, the celebrated work was placed in 1614, and certainly no more striking evidence could be given of the rapid growth of the author's abilities. Rubens received 2400 florins for this picture. In many respects, Italian influence remains conspicuous in the " Descent from the Cross." Rubens had seen Ricciarelli's fresco at the Trinita de' Monti, and was also acquainted with the grandiose picture of Baroccio in the cathedral of Perugia, and no one conversant with these works can mistake their influence. But in Rubens strength of personality could not be overpowered by reminiscence; and in type, as well as in colouring, the " Descent from the Cross " may be termed thoroughly Flemish and Rubenesque.

If Sir Dudley Carleton could speak of Antwerp in 1616 as Magna civitas, magna solitudo, there was no place neverthe- less which could give a wider scope to artistic enterprise. Spain and the United Provinces were for a time at peace; almost all the churches had been stripped of their adornments; monastic orders were powerful and richly endowed, gilds and corporations eager to show the fervour of their Catholic faith, now that the " monster of heresy " seemed for ever quelled. Gothic churches began to be decorated according to the new fashion adopted in Italy. Altars magnified to monuments,

sometimes reaching the full height of the vaulted roof, dis- played, between their twisted columns, pictures of a size hitherto unknown. No master seemed better fitted to be associated with this kind of painting than Rubens. The temple erected by the reverend fathers in Antwerp was almost entirely the painter's work, and if he did not, as we often find asserted, design the front, he certainly was the inspirer of the whole building. Hitherto no Fleming had undertaken to paint ceilings with foreshortened figures, and blend the religious with the decorative art after the style of those buildings which are met with in Italy, and owe their decorations to masters like Titian, Veronese and Tintoretto. No fewer than forty ceiling-panels were composed by Rubens, and painted under his direction in the space of two years. All were destroyed by fire in 1718. Sketches in water-colour were taken some time before the disaster by de#Wit, and from these were made the etchings by Du Pont which alone enable us to form a judgment of the grandiose undertaking. In the Madrid Gallery we find a general view of the church in all its splendour. The present church of St Charles in Antwerp is, externally, with some alteration, the building here alluded to.

Rubens delighted in undertakings of the vastest kind. " The large size of a picture," he writes to W. Trumbull in 1621, " gives us painters more courage to represent our ideas with the utmost freedom and semblance of reality. ... I confess myself to be, by a natural instinct, better fitted to execute works of the largest size." The correctness of this appreciation he was very soon called upon to demonstrate most strikingly by a series of twenty-four pictures, illustrating the life of Marie de Medicis, queen-mother of France. The gallery at the Luxem- bourg Palace, which these paintings once adorned, has long since disappeared, and the complete work is not exhibited in the Louvre. Drawings, it seems, had been asked from Quentin Varin, the French master who incited Poussin to become a painter, but Rubens was ultimately preferred. This preference may in some degree be ascribed to his former connexion with the court at Mantua, Marie de Medicis and the duchess of Gonzaga being sisters. From the cradle to the day of her reconciliation with Louis XIII., we follow Marie de Medicis after the manner in which it was customary in those days to consider personages of superior rank. The Fates for her have spun the silken and golden thread; Juno watches over her birth and entrusts her to the town of Florence; Minerva, the Graces and Apollo take charge of her education; Love

exhibits her image to the king, and Neptune conveys her across the seas; Justice, Health and Plenty endow her son; Prudence and Generosity are at her sides during the regency; and, when she resigns the helm of the state to the prince, Justice, Strength, Religion and Fidelity hold the oars. The sketches of all these paintings — now in the Munich Gallery — were painted in Antwerp, a numerous staff of distinguished collaborators being entrusted with the final execution. But the master himself spent much time in Paris, retouching the whole work, which was completed within less than four years. On the 13th of May 1625, Rubens writes from Paris to his friend Peiresc that both the queen and her son are highly satis- fied with his paintings, and that Louis XIII. came on purpose to the Luxembourg, ” where he never has set foot since the palace was begun sixteen or eighteen years ago.” We also gather from this letter that the picture representing the ” Felicity of the Regency ” was painted to replace another, the ” Departure of the Queen,” which had caused some offence. Richelieu gave himself some trouble to get part of the work, intended to represent the life of Henry IV., bestowed upon Cavalier d’Arpina, but did not succeed in his endeavours. The queen’s exile, however, prevented the undertaking from going beyond a few sketches, and two or three panels, one of which, the ” Triumph of Henry IV.,” now in the Uffizi Gallery, is one of the noblest works of Rubens or of any master.

On the nth of May 1625, Rubens was present at the nuptials of Henrietta Maria at Notre Dame in Paris, when the scaffolding on which he stood gave way, and he tells us he was just able to catch an adjoining tribune.

No painter in Europe could now pretend to equal Rubens either in talent or in renown. Month after month productions of amazing size left the Antwerp studio; and to those un- acquainted with the master’s pictures magnificent engravings by Vorsterman, Pontius and others had conveyed singularly striking interpretations. ” Whatever work of his I may require,” writes Moretus, the celebrated Antwerp printer, ” I have to ask him six months before, so as that he may think of it at leisure, and do the work on Sundays or holidays; no week days of his could I pretend to get under a hundred florins.”

Of the numerous creations of his brush, none, perhaps, will more thoroughly disclose to us Rubens’s comprehension of religious decorative art than the ” Assumption of the Virgin ” at the high altar of Antwerp cathedral, finished in 1625. It is, of twenty repetitions of this subject, the only example still preserved at the place for which it was intended. In spirit we are here reminded of Titian’s ” Assunta ” in the cathedral at Verona, but Rubens’s proves perhaps a higher

conception of the subject. The work is seen a considerable way off, and every outline is bathed in light, so that the Virgin is elevated to dazzling glory with a power of ascension scarcely, if ever, attained by any master.

Although able to rely so greatly on his power as a colourist, Rubens is not a mere decorator. He penetrates into the spirit of his subjects more deeply than, at first sight, seems consistent with his prodigious facility in execution. The ” Massacre of the Innocents,” in the Munich Gallery, is a composition that can leave no person unmoved — mothers defending their children with nails and teeth. When St Francis attempts to shelter the universe from the Saviour’s wrath (Brussels Gallery), Rubens recalls to our memory that most dramatic passage of the Iliad when Hecuba, from the walls of Troy, entreats her son Hector to spare his life. Rubens was a man of his time; his studies of Italian art in no way led him back to the Quattrocentisti nor the Raffaeleschi; their power was at an end. The influence of Michelangelo, Titian, Tintoretto, more especially Baroccio, Polidoro, and even Parmigiano, is no less visible with him than with those masters who, like Spranger, C. Schwartz and Goltzius, stood high in public estimation immediately before his advent.

In the midst of the rarest activity as a painter, Rubens was now called upon to give proofs of a very different kind

of ability. The truce concluded between Spain and tJie Nether- lands in 1609 ended in 162 1; Archduke Albrecht died the same year. His widow sincerely wished to prolong the arrange- ment, still hoping to see the United Provinces return to the Spanish dominion, and in her eyes Rubens was the fittest person to bring about this conclusion. The painter’s comings and goings, however, did not remain unheeded, for the French ambassador writes from Brussels in 1624 — •” Rubens is here to take the likeness of the prince of Poland, by order of the infanta. I am persuaded he will succeed better in this than in his negotiations for the truce.” But, if Rubens was to fail in his efforts to bring about an arrangement with the Netherlands, other events enabled him to render great service to the state.

Rubens and Buckingham met in Paris in 1625; a corre- spondence of some importance had been going on between the painter and the Brussels court, and before long it was pro- posed that he should endeavour to bring about a final arrange- ment between the Crowns of England and Spain. The infanta willingly consented, and King Philip, who much objected to the interference of an artist, gave way on hearing, through his aunt, that the negotiator on the English side, Sir

Balthasar Gerbier — a Fleming by birth — was likewise a painter. Rubens and Gerbier very soon met in Holland. Matters went on very well, and Rubens volunteered to go to Spain and lay before the council the result of his negotiations (1628). Nine months were thus spent at Madrid; they rank among the most im- portant in Rubens's career. He had brought with him eight pictures of various sizes and subjects as presents from the infanta, and he was also commissioned to paint several portraits of the king and royal family. An equestrian picture of Philip IV., destroyed by fire in last century, became the subject of a poem by Lope de Vega, and the description enables us to identify the composition with that of a painting now in the Palazzo Pitti, ascribed to Velazquez.

Through a letter to Peiresc we hear of the familiar inter- course kept up between the painter and the king. Philip delighted to see Rubens at work in the studio prepared for him in the palace, where he not only left many original pictures, but copied for his own pleasure and profit the best of Titian's. An artistic event of some importance connected with the so- journ in Spain is the meeting of Rubens and Velazquez, to the delight, and, it may be added, advantage of both.

Great as was the king's admiration of Rubens as a painter, it seems to have been scarcely above the value attached to his political services. He now commissioned the painter to go'to London as bearer of his views to Charles I., and Rubens, honoured with the title of secretary of the king's privy council in the Netherlands, started at once on his new mission. Although he stopped but four days in Antwerp, he arrived in London just as peace had been concluded with France. Received by Charles with genuine pleasure, he very soon was able to ingratiate himself so far as to induce the king to pledge his royal word to take part in no undertakings against Spain so long as the negotiations remained unconcluded, and all the subsequent endeavours of France, Venice and the States found the king immovable in this resolution. The tardiness of the Spanish court in sending a regular ambassador involved the un- fortunate painter in distressing anxieties, and the tone of his despatches is very bitter. But he speaks with the greatest admiration of England and the English, regretting that he should only have come to know the country so late. His popularity must have been very great, for on the 23rd of September 1629 the university of Cambridge conferred upon him the honorary degree of master of arts, and on the 21st of February 1630 he was knighted, the king presenting him with the sword used at the ceremony, which is still preserved by the descendants of the artist.

Although, it seems, less actively employed as an artist in England than

in Spain, Rubens, besides his sketches for the decoration of the Banqueting Hall at Whitehall, painted the admirable picture of ” The Blessings of Peace ” now in the

National Gallery. There is no reason to doubt, with Smith, that ” His Majesty sat to him for his portrait, yet it is not a little remarkable that no notice occurs in any of the royal catalogues, or the writers of the period, of the existence of such a portrait.” While in England, Rubens very narrowly escaped drowning while going to Greenwich in a boat. The fact is reported by Lord Dorchester in a letter to Sir Isaac Wake (Sainsbury, cxvi.). At the beginning of March the painter’s mission came to a close.

Rubens was now fifty-three years of age; he had been four years a widower, and before the end of the year (December 1630) he entered into a second marriage with a beautiful girl of sixteen, named Helena Fourment. She was an admirable model, and none of her husband’s works may be more justly termed masterpieces than those in which she is represented (Munich, St Petersburg, Blenheim, Liechtenstein, the Louvre, &c).

Although the long months of absence could not be termed blanks in Rubens’s artistic career, his return was followed by an almost incredible activity. Inspired mere than ever by the glorious works of Titian, he now produced some of his best paintings. Brightness in colouring, breadth of touch and pictorial conception, are specially striking in those works we know to have been painted in the latter part of his lifetime. Could anything give a higher idea of Rubens’s genius than, for example, the ” Feast of Venus,” the portrait of ” Helena Fourment ready to enter the Bath,” or the ” St Udefonso “? This last picture — now, as well as the two others just alluded to, in the Vienna Gallery — was painted for the church of the convent of St Jacques, in Brussels. On the wings are repre- sented the archdukes in royal attire, under the protection of their patron saints. The presence of these figures has led to some mistake regarding the date of the production, but it has been proved beyond doubt, through a document published by Mr Castan (1884), that the ” St Udefonso” (at Vienna- there is another resembling it at St Petersburg) belongs to the series of works executed after the journeys to Spain and England. Archduke Albrecht had been dead ten years. The picture was engraved by Witdoeck in 1638.

Isabella died in 1633, and we know that to the end Rubens remained in high favour with her, alike as an artist and as a political agent. The painter was even one of the gentlemen she deputed to meet Marie de Medicis at the frontier in 1631, after her escape from France.

Spain and the Netherlands went to war again, the king never ceasing to look upon the Dutch as rebels, and much trouble and suspicion came upon the great artist. As to the real nature of his communings with Frederick Henry of Orange, whom he is known to have interviewed, nothing as yet has been discovered.

Ferdinand of Austria, the cardinal-infant of Spain, was called to the government of the Netherlands on the death of his aunt. He was the king's younger brother, and arrived at Antwerp in May 1635. The streets had been decorated with triumphal arches and " spectacula," arranged by Rubens, and certainly never equalled by any other works of the kind. 1 Several of the paintings detached from the arches were offered as presents to the new governor-general, a scarcely known fact, which accounts for the presence of many of these works in public galleries (Vienna, Dresden, Brussels, &c). Rubens was at the time laid up with gout, but Prince Ferdinand was desirous of expressing his satisfaction, and called upon the painter, re- maining a long time at his house. Rubens and Ferdinand had met at Madrid, and only a short time elapsed before the painter was confirmed in his official standing — a matter of small importance, if we consider that the last years of his life were almost exclusively employed in working much more for the king than for his brother. About a hundred and twenty

1 Many sketches of the arches are still preserved in the museums in Antwerp, St Petersburg, Cambridge, Windsor, &c. All the compositions were etched uncier the direction of Rubens by his pupil J. Van Thulden and published under the title of Pompa introitus honori serenissimi Principis Ferdinandi Austriaci S. R. E. card, a S. P. Q. Antverp. decreta et ordinata.

paintings of considerable size left Antwerp for Madrid in 1637, 1638 and 1639; they were intended to decorate the pavilion erected at the Pardo, and known under the name of Torre de la Parada. Another series had been begun, when Ferdinand wrote to Madrid that the painter was no more, and Jordaens would finish the work. Rubens breathed his last on the 30th of May 1640.

More fortunate than many artists, Rubens left the world in the midst of his glory. Not the remotest trace of approaching old age, not the slightest failing of mind or skill, can be detected even in his latest

works, such as the ” Martyrdom of St Peter ” at Cologne, the ” Martyrdom of St Thomas ” at Prague, or the ” Judgment of Paris ” at Madrid, where his young wife appears for the last time.

Rubens has little of the Italian grace and refinement ; he was a Fleming throughout, notwithstanding his frequent recollections of those Italian masters whom he most admired, and who themselves have little, if anything, in common with Raphael. But it must be borne in mind how completely his predecessors were frozen into stiffness through italianization, and how necessary it was to bring back the Flemish school to life and nature. Critics have spoken of Rubens’s historical improprieties. Of course nobody could suppose that his classical learning did not go far enough to know that the heroines of the Old Testament or of Roman history were not dressed out as ladies of his time; but in this respect he only follows the example of Titian, Paolo Veronese, and many others. In no other school do we find these animated hunts of lions, tigers, and even the hippopotamus and the crocodile, which may be reckoned among the finest specimens of art, and here again are life and nature dis- played with the utmost power. ” His horses are perfect in their kind,” says Reynolds; his dogs are of the strong Flemish breed, and his landscapes the most charming pictures of Brabantine scenery, in the midst of which lay his seat of Steen. As a portrait painter, although less refined than Van Dyck, he shows that eminent master the way; and his pure fancy subjects, as the ” Garden of Love ” (Madrid and Dresden) and the ” Village Feast ” (Louvre), have never been equalled.

For nearly one hundred years the Flemish school may be said to have been but a reflection of the Rubenesque principles. Although Jordaens and Erasmus Quellin lived till 1678, the school might be termed a body without soul.

Some etchings ha*ve been ascribed to Rubens, but except a head of Seneca, the only copy of which is in the Print Room at the British Museum, and a beautiful figure of St Catherine, we can admit none of the other plates said to proceed from Rubens as authentic. Rubens nevertheless exercised an immense influence on the art of engraving. Under his direct guidance Soutman, Vorsterman, Pontius, Witdoeck, the two Bolswerts, Peter de Jode, N. Lauwers, and many others of less note, left an immense number of beautiful plates, reproducing the most celebrated of his paintings. To give an idea of what his influence was capable of accomplishing, pictorially speaking, it might be sufficient to notice the transforma- tion undergone by the Antwerp school of engraving under Rubens; even the modern school of engraving, in more than one respect, is a continuation of the style first

practised in Antwerp (see Line Engraving). His influence is scarcely less apparent in sculpture, and the celebrated Luke Fayd'herbe was his pupil.

Never did the Flemish school find a second Rubens. None of his four sons became a painter, nor did any of his three daughters marry an artist. According to Rubens's will, his drawings were to belong to that one of his sons who might become a painter, or in the event of one of his daughters marrying a celebrated artist, they were to be her portion. The valuable collection was dispersed only in 1659, and of the pictures sold in 1640 thirty-two became the property of the king of Spain. The Madrid Gallery alone possesses over sixty of his works. Four years after her husband s death, Helena Fourment married J. B. Van Brouckhoven de Bergheyck, knight of St James, member of the privy council, &c. She died in 1673. In 1746 the male line of Rubens's descendants was completely extinct. In the female line more than a hundred families of name in Europe trace their descent from him.

The paintings of Rubens are found in all the principal galleries in Europe: Antwerp and Brussels, Madrid, Pans, Lille, Dresden, Berlin, Munich, Vienna, St Petersburg, London, Florence, Milan, Turin exhibit several hundreds of his works. J. Smith's Catalogue gives descriptions of more than thirteen hundred compositions.

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•877) ; J- Smith, Catalogue raisonne of the Works of the most eminent Dutch and Flemish Painters, pt. ii. (London, 1830); Waagen, Peter Paul Rubens (translated from the German by R. Noel; edited by Mrs Jameson, London, 1840); H. Hymans, Histoire de la gravure dans

I'ecole de Rubens (Brussels, 1879) ; C. G. Voorhelm Schneevoogt, Catalogue des eslampes gravies d'apres Rubens (Haarlem, 1873); Max Rooses, Rubens, sa vie et ses osuvres (Antwerp, 1893) ; R. A. M. Stevenson, P. P. Rubens (Portfolio Monograph; London, 1898); Emile Michel, Rubens: his Life, his Work and his Time (London, 1899) ; H. Knackfuss, Rubens (London, 1904) ; and E. Dillon, Rubens (London, 1909). (H. H.; P. G. K.)

RUBIACEAE, in botany, a large natural order of seed plants, belonging to the series Rubiales of the subclass Sympetalae (Gamopetalae) of Dicotyledons, and containing about 350 genera with about 4500 species. It is mainly a tropical family of trees, shrubs and herbs, but some of the tribes, especially Galieae, to which the British representatives belong and which contains only herbs, are more strongly developed in temperate regions; some species of Galium reach the Arctic zone and are found at high elevations on mountains in the tropics.

The most striking characteristic of the family are the opposite-decussate, generally entire, stipulate leaves. The stipules are very varied in form ; they generally stand between the petioles of a pair of leaves (interpetiolar). The two stipules of adjacent leaves are usually united, and in the Galieae, as well shown in the British species, are enlarged and leaf-like, forming with the two leaves an apparent whorl ; by fusion or branching of the stipules the number of leaves in the whorl varies from four to eight or more. The flowers are rarely solitary, terminal or axillary, as in Gardenia; generally they are arranged in cymes or panicles or crowded into heads, and are often showy ; in British members of the family they are very small, but may be conspicuous from their numbers, as in lady's bedstraw (Galium verum). The flowers are hermaphrodite and regular with parts in fours or fives; the four or five sepals, petals and stamens are placed above the ovary, which consists of two carpels, contains one to indefinite anatropous ovules in each of the two chambers, and is crowned by a simple style ending in a head or in two lobes. The sepals are often small, sometimes reduced to a narrow ring encircling the top of the ovary or altogether absent. The united petals form a corolla which varies widely in form in the different genera; it is often funnel- or salver-shaped, the honey, which is secreted by a disk round the base of the style, being at the bottom of a longer or shorter tube, in which case the flowers are adapted for pollination by Lepidoptera or bees, as in Gardenia, Mussaenda, Guettarda, &c; in other cases it is bell-shaped or, as in Galium, rotate, with a short tube and sharply spreading segments; the honey is in these cases freely exposed or only slightly concealed and the flowers are pollinated by flies. The stamens are

attached to the corolla-tube and alternate in position with its segments; the flowers are often dimorphic (or heterostyled) with short-styled and long-styled forms as in ipecacuanha (see fig-).

The fruit also varies widely in form and is dry or fleshy. When dry it forms a capsule with septicidal or loculicidal dehiscence, or is a schizocarp separating when dry into two one-seeded mericarps which, as in the British cleavers (Galium Aparine), sometimes bear hooked appendages which aid their dispersal.

Some genera show a remarkable association with ants. Thus Myrmecodia, Hydnophylum are epiphytic plants, in which the base of the stem forms a large tuber, which is attached to the support by numerous adventitious roots. The substance of the tuber is penetrated by numerous cork-lined cavities communicating by galleries, which are inhabited by ants. There is no evidence that the presence of the ants is of any service to the plant.

The order is divided into a large number of tribes based on the number of ovules in each ovary-chamber, the character of the fruit seed and ovule, and the aestivation of the corolla. These may be arranged in three families as follows: —

Cinchoneae, often woody plants with scale-like stipules, and numerous ovules in each ovary-chamber; the fruit is generally a capsule. To this belong Cinchona (q.v.), a genus of large trees with handsome flowers containing about forty species in the Andes of South America — it is well known as the source of Peruvian bark. An allied genus, Bouvardia (q.v.), from tropical America, is cultivated for its flowers. The species of Uncaria climb by means of hooks which are modified inflorescence-axes.

Mussaenda, Gardenia (q.v.), and other genera are characterized by having a fleshy fruit.

Coffeeae, often woody or shrubby plants with scale-like stipules; each ovary-chamber contains only one ovule. Coffee (q.v.), a genus of shrubs with about twenty-five species in the Old World tropics, includes the coffee plant (C. arabica and C. liberica) ; the fruit is a two-seeded drupe, the seed is the ” coffee-bean.” The thickened root of Uragoga ipecacuanha yields ipecacuanha (q.v.).

Stellateae, herbaceous plants with leaf-like stipules; each ovary-chamber contains one ovule only. Includes the four British genera Rubia, one species of which, R. tinctorum, is madder; Galium,

including G. verum (lady's bedstraw), G. Aparine (goose-grass or

cleavers), and other British species; Asperula, including A. odoraia (woodruff) and Sherardia.

The order is closely allied to Caprifoliaceae, the chief distinction being the absence of stipules in the latter.

Ipecacuanha Plant.

RUBICON, a small stream of ancient Italy, which flowed into the Adriatic between Ariminum and Caesena, and formed the boundary between Italy and the province of Cisalpine Gaul. Hence Caesar's crossing of it in 49 B.C. was tantamount to a declaration of war against Rome as represented by Pompey and the Senate. The historic importance of this event gave rise to the phrase " crossing the Rubicon " for a step which definitely commits a person to a given course of action. There has been much controversy as to the identification of the stream; it appears that its upper course is represented by that of the Pisciatello (called Rubigone in the nth or 12th century and now Rugone or Urgone), and its lower portion by the Fiumicino, which the Urgone once joined. The point was marked by a station on the Via Aemilia below their confluence, 12 m. N.W. of Ariminum, bearing the name ad Confluentes; and here is still preserved a three-arched bridge, larger than is necessary for the water carried by the present Fiumicino.

RUBIDIUM [symbol Rb, atomic weight 85-45 (0 = i6)], a metallic element belonging to the group of the alkali metals. It is found in the minerals lepidolite, petalite and in various specimens of mica and of carnallite, and in some mineral waters. It also occurs in tea, cocoa, coffee, tobacco and in the ashes of beetroot. It was discovered by R. Bunsen and Kirchhoff (Ann., i860, 113, p. 337), in the spectroscopic examina- tion of the residues obtained on evaporation of water from a mineral spring at Durkheim, being characterized by two distinctive red lines. The best source of rubidium salts is the residue left after extracting lithium salts from lepidolite, the method of separation being based on the different solubilities of the platino-chlorides of potassium, rubidium and caesium

in water (R. Bunsen, Ann., 1862, 122, p. 351). A somewhat similar process based on the varying solubilities of the corre- sponding alums has also been devised by Redtenbacher (Jour, prak. Chcm., 1865, 95, p. 148). The metal is prepared by distilling the carbonate with carbon (an explosive compound similar to that obtained from potassium and

carbon monoxide is liable to be formed simultaneously); by reducing the hydrox- ide with aluminium: $4RbOH + 2Al = Rb_2Al_2O_3 + 2Rb + 2H_2O$ (N. Beketoff, Ber., 1888, 21, p. 424 ref.); by reducing the carbonate (C. Winckler, Ber., 1890, 23, p. 51) or the hydroxide with magnesium (H. Erdmann and P, Kothner, Aim., 1899, 294, p. 55); and by heating the fused chloride with calcium in an exhausted glass tube at 400-500 C, (L. Hackspill, Comptes rendus, 1905, 141, p. 101). The metal was first obtained electrolytically in 1910 by electrolysing the fused hydroxide in a nickel vessel, with an iron wire cathode and iron cylinder anode; the product on cooling being opened under pyridine cooled by a freezing mixture (G. von Hevesy, Zeit. anorg. Chem., 1910, 67, p. 242). It is a silvery white metal which melts at 38-5° C. and has a specific gravity of 1-52. It oxidizes rapidly on exposure to air, and decomposes cold water very rapidly. It closely resembles caesium and potas- sium in its general properties. The rubidium salts are generally colourless, mostly soluble in water and isomorphous with the corresponding potassium salts.

Rubidium hydride, RbH, was obtained in the form of colourless needles by H. Moissan {Comptes rendus, 1903, 136, p. 587) from the direct combination of its constituent elements. It rapidly dis- sociates when heated in vacuo to 300° C. The existence of the oxide Rb_2 appears to be doubtful, the results of Erdmann and Kothner (loc. cit.) pointing to the formation of Rb_2O_2 by the direct union of the metal with dry oxygen. E. Rengade {Comptes rendus, 1907, 144, p. 920), by partially oxidizing the metal in a current of dry oxygen and removing excess of metal by distillation in vacuo, has obtained oxides of composition Rb_2O_2 (yellowish white), Rb_2O_3 (black) and Rb_2O_4 (yellow). Rubidium hydroxide, RbOH, is a colourless solid which is formed by the action of rubidium on water, or by the addition of baryta water to a solution of rubidium sulphate. It is readily soluble in water, the solution being very alkaline and caustic. It melts at 301 °. Evaporation of the aqueous solution at 1 5 C. deposits a crystalline hydrated hydroxide of composition $RbOH\text{-}2H_2O$ (R. de Forcrand, Comptes rendus, 1909, 149, p. 1341). Rubidium chloride, RbCl, is formed on burning rubidium in chlorine, or on dissolving the hydroxide in aqueous hydrochloric acid. It crystallizes in colourless cubes and volatilizes when heated very strongly. It is soluble in water and combines with many metallic chlorides to form double salts. It combines also with iodine chloride and bromide and with bromine chloride and with bromine (H. L. Wells and H. L. Wheeler, Amer. Jour. Sci., 1891 (3), 43,

Rubidium sulphate, Rb 2 S0 4 , is formed by the action of sulphuric acid on the carbonate or hydroxide of the metal, or by the action of milk of lime on rubidium alum, the excess of lime being pre- cipitated by rubidium carbonate and the solution neutralized by sulphuric acid. It forms large colourless hexagonal crystals. Several sulphides of the metal have been described by W. Biltz and E. Wilke-Dorfurt {Zeit. anorg. Chem., 1906, 48, p. 297). The normal sulphide, Rb 2 S-4H 2 0, is colourless, and when heated in aqueous solution with the requisite amount of sulphur is transformed into the yellow tetrasulphide, Rb 2 S 4 -2H 2 0. A pentasulphide, Rb 2 S 5 , which crystallizes in red prisms melting at 223 C., is also obtained by the direct union of the normal sulphide with sulphur. When heated in a current of hydrogen it is transformed into the colourless disulphide, whilst if the heating be carried out in a current of nitrogen it yields the trisulphide, Rb 2 S3-H 2 0. These sulphides are much less hygroscopic than the corresponding caesium com- pounds. Rubidium nitrate, RbN0 3 , obtained by the action of nitric acid on the carbonate, crystallizes in needles or prisms and when strongly heated is transformed into a mixture of nitrite and oxide. Rubidium ammonium, RbNH 3 , was prepared by H. Moissan {Comptes rendus, 1903, 136, p. 1177) by the action of liquid ammonia on rubidium. The product combines with acetylene to form rubidium acetylide acetylene, Rb 2 C 2 -C 2 H 2 , which on heating in vacuo loses acetylene and leaves a residue of rubidium carbide Rb 2 C 2 (ibid. p. 1217). Rubidium carbonate, Rb 2 CO s , formed by the addition of ammonium carbonate to rubidium hydroxide, is a crystalline mass which melts in its water of crystallization when heated.

The atomic weight of rubidium was determined by R. Bunsen (Pogg. Ann., 1861, 113, p. 339), Picard (Zeit. anal. Chem., 1862, I, p. 519) and Godeffroy (Ann., 1876, 181, p. 185), the methods being based on the conversion of rubidium hahdes into the corresponding silver salt, and the values obtained vary from 85-40 to 85-50. The

determination of E. H. Archibald (Jour. Chem. Soc., 1904, 85, p. 776) from the analysis of the chloride and bromide gives the mean value as 85-485 (0 = i6).

RUBINSTEIN, ANTON GRIGOROVICH (1829-1894), Russian pianist, borri of Jewish parentage on the 28th of November 1829 at Wechwotynetz, in Podolia, was the son of a pencil manufacturer who migrated to Moscow. The Rubin- stein family, at the dictate of Anton's grandfather Roman Rubinstein, had all been baptized at the time of the ukase against the Jews issued in 1830 by the Tsar Nicholas. Anton was then one year old. Besides his mother he had but one teacher, the

piano master Alexander Villoing, of whom he declared at the end of his own career that he had never met a better. In July 1838 Rubinstein appeared in the theatre of the Petrowski Park at Moscow; and in the year following he went to Paris after Villoing, and in 1840 played before Liszt. For some time after this Rubinstein travelled in Holland, Germany and Scandinavia, and reached England in 1842, where on the 20th of May he made his first appearance at a Choral Fund concert. In 1845, after a brief visit to Moscow in 1843, he went with his family (including his brother Nikolaus) to Berlin in order to complete his musical education. Dehn was their master, and Mendelssohn, whom Rubinstein had met previously in London, their best friend. The sudden death of Rubinstein's father necessitated the withdrawal of his mother and Nikolaus to Moscow, while Anton, on Dehn's advice, went to Vienna to seek a livelihood. Hence, after more hard study for nearly two years, he went with the flautist Heindl, and later alone, on a concert tour in Hungary; and the outbreak of the revolution in Vienna preventing his return there, he went via Berlin to St Petersburg, where the Grand Duchess Helene appointed him Kammervirtuos. About this time an unfortunate error of the police nearly caused his ex- patriation to Siberia, from which he was saved by his patroness. During the next eight years Rubinstein spent most of his time in St Petersburg studying, playing and composing. His opera Dmitri Donskoi was produced there in 1851, and Toms der Narr in 1853. Die Sibirischen Jdger, written about the same time, was not produced. On the advice of his patroness and Count Wilhorski he visited Hamburg and Leipzig, and arrived for the second time in London in 1857, when at a Philharmonic concert he introduced his own concerto in G. In the following year he was in London again, having in the meantime been appointed Concert Director of the Royal Russian Musical Society. In 1862, in collaboration with Carl Schuberth, he founded the St Petersburg Conservatorium, of which he was director until 1867. In 1868 he travelled in Germany, France and England, and remained for some time in Vienna, where he introduced a large number of his own compositions. Thence he went to America in 1872 and 1873, when he returned to Russia, and after a short rest set off once more on concert tours. In this manner the rest of his life was spent, until in 1885 he began a series of historical recitals of immense interest, which he gave in most of the chief Euro- pean capitals. He died on the 20th of November 1894.

In addition to the works already named, Rubinstein left compositions in almost every known form. Among other of his operas are Die Kinder der Haide, Fer amors (Lalla Roukh), Nero, Der Damon and Die Makkabder, this last perhaps more frequently played than all the

others, of which the chief defect is their lack of dramatic point. On the subject of oratorio Rubinstein held original views, though his attempt to realize them in Moses and Christus was not completely successful, while his efforts in Berlin and London to found a Sacred Theatre failed entirely. Nevertheless he himself regarded the Christus as his greatest achievement. The most familiar of his five symphonies are the ” Ocean ” and the ” Dramatic.” He wrote scores on scores of pianoforte works, from complex concertos to the most commonplace salonstilcke; abundance of concerted chamber-music, and a number of songs and duets, which enjoyed some popularity. He also published several books, including his Reminiscences and Die geistliche Oper.

Rubinstein’s fame as one of the greatest of pianists will live in history. His technique bore comparison with that of Liszt; he possessed a power for interpreting the most different kinds of music which has not been surpassed.

His brother Nikolaus (1835-1881) was also a remarkable pianist, and a marvellous teacher of music. He founded the conservatorium of music at Moscow.

See Bernhard Vogel, Anton Rubinstein, Biographischer Abriss (Leipzig, 1888); Alexander MacArthur, Anton Rubinstein, a Bio- graphical Sketch (Edinburgh, 1889); Eugen Zabel, Anton Rubin- stein, Ein Kiinstlerleben (Leipzig, 1892); Anton von Halten, Anton Rubinstein (Utrecht, 1886) ; Cuthbert H. Cronk, The Works of Anton Rubinstein (London, 1900).

RUBRIC (Fr. rubrique, Lat. rubrica, ruber, red), in its earliest and original sense, red earth or ochre, ruddle, and hence applied to words written or printed in red lettering, in MSS. or printed books, such as chapter headings, paragraphs, initial letters, &c, thus marking in a distinctive manner that to which atten- tion is to be drawn. The term was also applied to the passages so marked, and more especially to the directions or rules as to the conduct of divine service in liturgical books. This is the chief current usage of the term (see Liturgy).

RUBRUQUIS (or Rubrouck), WILLIAM OF (c. 1215-1270; fl. 1253-55), Franciscan friar, one of the chief medieval travellers and travel-writers. Nothing is known of him save what can be gathered from his own narrative, and from Roger Bacon, his contemporary and brother

Franciscan. The name of Rubruquis (" Fratris Willielmi de Rubruquis ") is found in the imperfect MS. printed by Hakluyt in his collection, and followed in his English translation, as well as in the completer issue of the English by Purchas. Writers of the 16th, 17th and 19th centuries have called the traveller Risbroucke and Rysbrokius {Rysbroeck and Ruysbroek in the Biographie universelle and Nouv. biog. gene'rale) — an error founded on the identification of his name of origin with Ruysbroeck in Brabant (a few miles south of Brussels) and perhaps promoted by the fame of John of Ruysbroeck or Rysbroeck (1294-1381), a Belgian mystic, whose treatises have been reprinted as late as 1848. It is only within the last twenty years that attention has been called to the fact that Rubrouck is the name of a village and commune in old (medieval) French Flanders, belonging to the canton of Cassel in the department du Nord, and lying some 8| m. N.E. of St Omer. In the library of the latter city many medieval documents exist referring expressly to de Rubroucks 1 of the 1 2th and 13th centuries. It may be fairly assumed that Friar William came from this place; 2 thus Hakluyt 's conclusion is justified, as expressed in the title he gives to Lord Lumley's MS. printed by him, now in the British Museum, MSS. Reg., 14 C. xiii. fol. 225 r.~36 r. {Itinerarium fratris Willielmi de Rubruquis de ordine fratrum Minorum, Galli, Anno gratie 1253, ad paries Orientales.

Friar William went to Tartary under orders from Louis IX. (St Louis). That king, at an earlier date, viz. December 1 248, when in Cyprus, had been visited by alleged envoys from Elchigaday (Ilchikadai, Ilchikdai), who commanded the Mongol hosts in Armenia and Persia. The king then despatched a return mission consisting of Friar Andrew of Longjumeau or Lonjumel and other ecclesiastics, who carried presents and letters for both Ilchikadai and the Great Khan. They reached the court of the latter in the winter of 1249-50, when there was no actual khan on the throne; and they returned, along with Tatar envoys, bearing a letter to Louis from the Mongol regent-mother which was couched in terms so arrogant that the king repented sorely of having sent such a mission (" li rois se

1 A detailed notice of such documents was published by M. E. Coussemaker of Lille. See remarks by M. d'Avezac in Bull, de la Soc. de Geog., 2nd vol. for 1868, pp. 569-70.

2 The county of Flanders was at this time a fief of the French crown (see Natalis de Wailly, Notes on JoinvUle, p. 576). William's mother-tongue may have been Flemish. From his representation to Mangu Khan (p. 361) that certain " Teutonici " who had been carried away as slaves by a Tatar chief were " nostrae linguae," Dr Franz Max Schmidt

inclines to think this certain.

repenti fort quant il y envoia," Joinville, Histoire de Saint Louis, pp. 148-49, in Paris edition of 1858 by F. Michel, Paulin Paris and F. Didot). These returned envoys reached the king when he was at Caesarea, therefore between March 1251 and May 1252. But not long after the king, hearing that the Tatar prince Sartak, son of Batu, was a " baptized Christian," felt moved to open communication with him, and for this purpose deputed Friar William of Rubrouck. The former rebuff had made the king chary of sending formal embassies, and Friar William on every occasion, beginning with a sermon delivered in St Sophia's on Palm Sunday {i.e. April 13th) 1253, dis- claimed that character.

Various histories of St Louis, and other documents, give particulars of the despatch of the mission of Friar Andrew from Cyprus, but none mention that of Friar William; and the first dates given by the latter are those of his sermon at Constanti- nople, and of his entrance into the Black Sea (May 7th, 1253). He must therefore have received his commission at Acre, where the king was residing from May 1252 to the 29th of June 1253; but he had travelled by way of Constantinople, as has just been indicated, and there received letters to some of the Tatar chiefs from the emperor, who was at this time Baldwin de Courtenay, the last of the Latin dynasty.

The narrative of the journey is everywhere full of life and interest. The vast conquests of Jenghiz Khan were still in nominal dependence on his successors, at this time represented by Mangu Khan, reigning on the Mongolian steppes, but prac- tically these conquests were splitting up into several great monarchies. Of these the Ulus of Juji, the eldest son of Jenghiz, formed the most westerly, and its ruler was Batu Khan, established on the Volga. Sartak is known in the history of the Mongols as Batu's eldest son, and was appointed his successor, though he died immediately after his father (1256). The story of Sartak's Christianity seems to have had some foundation; it was currently believed among Asiatic Chris- tians, and it is alleged by Armenian writers that he had been brought up and baptized among the Russians. Pope Innocent IV. (August 29, 1254) refers with enthusiasm to Sartak's baptism, of which he had just heard from a priest whom the khan had sent as envoy to the papal court.

Rubrouck and his party landed at Soldaia, or Sudak, on the Crimean coast, then a centre of intercourse between the Mediterranean world and what is now S. Russia. Equipped with horses and carts for the steppe, they travelled success- ively to the courts (i.e.the nomad

camps) of Scacatai (Kadan?), Sartak and Batu, thus crossing the Don and arriving at the Volga: of both these rivers Friar William gives vivid and interesting sketches. Batu kept the travellers for some time in suspense, and then referred them to the Great Khan himself, an order involving the enormous journey to Mongolia. The actual travelling of the party from the Crimea to the khan's court near Karakorum cannot have been, on a rough calcula- tion, less than 5000 m., and the return journey to Lajazzo in Cilicia would be longer by 500 to 700 m. The chief dates to be gathered from the narrative are as follows: the envoys embark on the " Euxine," May 7th, 1253; reach Soldaia, May 21st; set out thence, June 1st; reach the camp of Sartak, July 31st; begin the journey from the camp of Batu E. across the steppes, September 16th; turn S.E., November 1st; reach the Talas river, November 8th; leave Cailac 3 (S. of Lake Balkash), November 30th; reach the camp of the Great Khan, December 27th; leave the camp of the Great Khan on or about July 10th, 1254; reach camp of Batu again, September 16th; leave Batu's camp at Sarai, November 1st; arrive at the Iron Gate (Derbent), November 13th; Christmas spent at Nakh- shivan or Nakhichevan (under Ararat); reach Antioch (from Lajazzo, Layes, or Ayas, of Cilicia, via Cyprus), June 29th, 1255; reach Tripoli, August 1 5th.

8 Cailac, where Rubrouck halted twelve days, is undoubtedly the Kayalik of the historians of the Mongols, the position of which is somewhat indefinite. The narrative of Rubrouck shows that it must have been near the modern Kopal.

RUBRUQUIS

8n

The camp of »>atu was first reached near the northernmost point of his summer marches, therefore about Ukek or Uvyek, near Saratov (see Marco Polo, Paris ed. of 1824, p. 3). Before the camp was left they had marched with it five weeks down the Volga. The point of departure would he on that river somewhere between 48 and 50° N. The route taken lay E. by a line running N. of the Caspian and Aral basins; then from about 70 E. to the basin of the Talas river; thence across the passes of the Kirghiz Ala-tau and S. of the Balkash Lake to the Ala-kul and the Baratula Lake (Ebi-nor). From this the travellers struck N. across the Barluk, or the Orkochuk Mountains, and thence, passing S. of the modern Kobdo, to the valley of the Jabkan river, whence they emerged on the plain of Mongolia, coming upon the Great Khan's camp at a spot ten days' journey from Karakorum and bearing in the main S. from that place, with the Khangai Mountains

between.

This route is of course not thus defined in the narrative, but is a deduction from the facts stated therein. The key to the whole is the description given of that central portion inter- vening between the basin of the Talas and Lake Ala-kul, which enables the topography of that region, including the passage of the Hi, the plain S. of the Balkash, and the Ala-kul itself, to be identified past question. 1

The return journey, being made in summer, after retravers- ing the Jabkan valley, 2 lay apparently farther to the N., and passed N. of the Balkash, probably with a fairly straight course, to the mouths of the Volga. Thence the party travelled S. by Derbent, and so by Shamakhi to the Araxes, Nakhshivan, Erzingan, Sivas and Iconium, to Lajazzo, Layas, or Ayas, where they embarked for Cyprus and Syria. St Louis had returned to France a year before.

We have alluded to Roger Bacon's mention of Friar William. Indeed, in the geographical section of the Opus Majus (c. 1262) he cites the traveller repeatedly and copiously, describing him as " frater Wilhelmus quem dominus rex Franciae misit ad Tartaros, Anno Domini 1253 . . . qui perlustravit regiones orientiset aquilonis et loca in medio his annexa, et scripsit haec praedicta illustri regi; quem librum diligenter vidi et cum ejus auctore contuli " (see Opus Majus, Oxford edition of 1897, i. 353-66). Add to this William's own incidental particulars as to his being — like his precursor, Friar John de Piano Carpini — a very heavy man (ponderosus valde), and we know no more of his personality, except the abundant indications of character afforded by the story itself. These paint for us an honest, pious, stout-hearted, acute and most intelligent observer, keen in the acquisition of knowledge, the author of one of the best narratives of travel in existence. His language indeed is dog- Latin of the most un-Ciceronian quality; but it is in his hands a pithy and transparent medium of expression. In spite of all the difficulties of communication, and of the badness of his turgemannus or dragoman, 3 he gathered a mass of particulars, wonderfully true or near the truth, not only as to Asiatic nature, geography, ethno- graphy and manners, but as to religion and language. Of his geography a good example occurs in his account of the Caspian (eagerly caught up by Roger Bacon), which is perfectly accurate, except that he places the hill country occupied by the Mulahids, or Assassins, on the E. instead of the S. shore. He explicitly corrects the allegation of Isidore that it is a gulf of the ocean: " non est verum quod dicit Ysidorus . . . nusquam enim tangit oceanum, sed undique circumdatur terra " (265). 4 Of his interest and acumen in matters of language we may cite examples. The language of

the Pascatir (or Bashkirs) and of the Hungarians is the same as he had

1 See details in Cathay and the Way Thither, pp. ccxi-ccxiv, and Schuyler's Turkistan, i.' 402-5. Mr Schuyler points out the true identification of Rubrouck's river with the Hi, instead of the Chu, which is a much smaller stream ; and other amendments have been derived from Dr F. M. Schmidt (see below).

2 This meaning may be put on Rubrouck's words: "Our going was in winter, our return in summer, and that by a way lying very much farther north, only that for a space of fifteen days' journey in going and coming we followed a certain river between mountains, and on these there was no grass to be found except close to the river." The position of the Chagan Takoi or upper Jabkan seems to suit these facts best; but Mr Schuyler refers them to the upper Irtish, and Dr F. M. Schmidt to the Uliungur.

3 " Ego enim percepi postea, quando incepi aliquantulum intelligere idioma, quod quando dicebam unum ipse totum aliud dicebat, secundum quod ei occurrebat. Turn videns Dericulum loquendi per ipsum, elegi magis tacere " (248-49).

4 The page references in the text are to d'Avezac's edition of the Latin (see below).

learned from Dominicans who had been among them (274)/ The language of the Ruthenians, Poles, Bohemians and Slavonians is one, and is the same with that of the Vandals, or Wends (275). In the town of Equius (immediately beyond the Hi, perhaps Aspara)' the people were Mahommedans speaking Persian, though so far remote from Persia (281). The Uighurs (or Yugurs) of the country about Cailac (see note above) had formed a language and character of their own, and in that language and character the Nes- torians of that tract used to perform their office and write their books (281-82). The Uighurs are those among whom are found the fountain and root of the Turkish and Comanian tongue (289). Their character has been adopted by the Mongols. In using it they begin writing from the top and write downwards, whilst line follows line from left to right (286). The Nestorians say their service, and have their holy books, in Syriac, but know nothing of the language, just as some of our monks sing the mass without knowing Latin (293). The Tibet people write as we do, and their letters have a strong resemblance to ours. The Tangut people write from right to left like the Arabs, and their lines advance upwards (329). The current money of Cathay is of cQtton caper, a palm in length and breadth, and on this they print lines like those of Mangu

Khan's seal : — " imprimunt lineas sicut est sigillum Mangu " — a remarkable expression. They write with a painter's pencil and combine in one character several letters, forming one expression: — " faciunt in una figura plures literas comprehendentes unam dictionem," — a still more remarkable utterance, showing an approximate apprehension of the nature of Chinese writing (329).

Yet this sagacious observer is denounced as an untruthful blunderer by Isaac Jacob Schmidt (a man of useful learning, of a kind rare in his day, but narrow, wrong-headed, and in natural acumen and candour far inferior to the 13th-century friar) simply because Rubrouck's evidence as to the Turkish dialect of the Uighurs traversed a pet heresv, long since exploded, which Schmidt enter- tained, viz. that the Uighurs were by race and language Tibetan. 7 Leon Cahun {Introduction a. I'histoire de I'Asie, pp. 353-55, 384-86, 392) also shows a strange perversity in depreciating Rubrouck; all this detraction may be contrasted with Oscar Peschel's admirably fair judgment (Geschichte der Erdkunde, p. 165, &c). At the same time, Rubrouck may be considered inferior as a politician and diplomatist to Carpini; and the latter's remarkable work has in its turn suffered from undiscriminating eulogy of his successor's Itinerarium. An attempt has been made to strike a balance in the judgment of these two great pioneers in the Dawn of Modern Geography, ii. 375-81.

The narrative of Rubrouck, after Roger Bacon's copious use of it, seems to have dropped out of sight, though five MSS. are still known to exist: the chief of these are (1) Corp. Chr. Coll., Cambridge, No. 66, fols. 67 v.-no v. of about 1320; (2) No. 181 of the same library, fols. 321-98, of about 1270-90; (3) Leiden Univ. Libr., No. 77 (formerly 104), fols. 160 r.-i90 r. of about 1290. It has no place in the famous collections of the 14th century, nor in the earlier Speculum Historiale of Vincent of Beauvais, which gives so much attention to the 13th-century intercourse of Latin Christendom with Tartary. It first appeared imperfectly in Hakluyt (1598 and 1599), as we have mentioned. But it was not till 1839 that any proper edition of the text was published. In that year the Recueil de Voyages of the Paris Geographical Society, vol. iv., contained an edition of the Latin text, and a collation of the MSS. put forth by M. d'Avezac, with the assistance of two young scholars, since of high distinction, viz. Francisque Michel and Thomas Wright. But there is no commentary on the subject-matter, such as M. d'Avezac attached to his edition of Friar John de Piano Carpini in the same volume. Something has been done to supply this deficiency by the two editions in the Hakluyt Society's publications, (i.) William of Rubrouck . . . John of Plan de Carpine, trans, and edited by William W. Rockhill (London, 1900); (ii.) Texts

and Versions of . . . Carpini and . . . Rubruquis . . . , edited by C. Raymond Beazley (London, 1903). Richthofen in his China, i. 602-4, has briefly but justly noticed Rubrouck. A French version, with some notes, issued at Paris in 1877, in the Bibliotheque orientale Elzevirienne hardly deserves mention. Dr Franz Max Schmidt's admirable monograph, Uber Rubruk's Reise (Berlin, 1885), has been separately

6 The Bashkirs now speak a Turkish dialect ; but they are of Finnish race, and it is quite possible that they then spoke a language akin to Magyar. There is no doubt that the Mussulman historians of that age identified the Hungarians and the Bashkirs (e.g. see extracts from Juvaini and Rashiduddin in App. to D'Ohsson's Hist, des Mongols, ii. 620-23). The Bashkirs are also constantly coupled with the Majar by Abulghazi. See Fr. tr. by Desmaisons, pp. 19,

140, 180, 189.

6 Asp = Equus. Aspara is often mentioned by the historians of Timur and his successors; its exact place is uncertain, but it lay somewhere on the Hi frontier. Dr F. M. Schmidt thinks this identi- fication impossible; but one of his reasons — viz. that Equius was only one day from Cailac — appears to be a misapprehension of the text.

7 See Forschungen im Gebiete . . . der Vblker Mittel-Asiens (St Petersburg, 1824), pp. 90-93.

printed from vol. xx. of the Zeitschrift of the Berlin Geographical Society. See also d'Ohsson, Histoire des Mongols (1852), vol. ii. pp. 283-309; Bretschneider, Mediaeval Researches from Eastern Asiatic Sources (1888), i. 204-5, 262-63, 299, 301, 305-8, 311,318, 327, 334; ii. 25, 38, 41-42, 70-71, 83-86, 91, 116, 120; Beazley, Dawn of Modern Geography, ii. 266, 278-79, 281, 298-99, 303, 320-82, 421, 449-52; iii. 17-18, 31-32, 46, 69, 84-85, 88, 98, 101, 105, 188, 236-37,544- (H. Y.;C. R. B.)

RUBY (Lat. rubeus, red), the most valued of all gem-stones, a red transparent variety of corundum, or crystallized alumina. It is sometimes termed " oriental ruby " to distinguish it from the spinel ruby, which is a stone of inferior hardness, density and value (see Spinel). When the word ruby is used without any qualifying prefix, it is always the true or so-called oriental stone that is meant in modern

nomenclature. Ancient writers, relying chiefly on colour, classed together under a common name several brilliant red stones, such as the ruby, spinel and garnet: thus the a.vOpa.% of Theophrastus and the Carbunculus of Pliny were names which seem to have been applied to several distinct minerals. Although the word ruby is used in the English translation of the Old Testament it is improbable that the true ruby was known to the ancient Hebrews.

The ruby crystallizes in the hexagonal system (see Cor- undum). The crystals have no true cleavage, but tend to break along certain gliding planes. The colour of ruby varies from deep cochineal to pale rose-red, in some cases with a tinge of purple, the most valued tint being that called by experts pigeon ‘s-blood colour. On exposure to a high tem- perature, the ruby becomes green, but regains its original colour on cooling. The red colour of ruby may be due to chromium. When a ruby of the most esteemed tint is ex- amined with the dichroscope, one image is generally seen to be carmine and the other .aurora-red, the red colour inclining to orange. This test serves to distinguish the true ruby from spinel and from garnet, since these minerals, being cubic, are not dichroic. Another means of distinction is afforded by the specific gravity of ruby (about 4), which is higher than that of spinel and garnet, whilst the superior hardness of the ruby (about 9) furnishes yet another test. The high refractivity of ruby is also characteristic, the mean ordinary index being 1-77 and the extraordinary 1-76. When cut and polished the ruby is therefore a brilliant stone, but having weak dispersive power it lacks fire. Subjected to radiant discharge in a Crookes tube, the ruby, like other forms of corundum, phosphoresces with a vivid red glow.

The oriental ruby is a mineral of very limited distribution. Its most famous localities are in Upper Burma, but until the British annexation of the country in 1886 the mines were so jealously guarded that little was known as to the conditions under which the mineral occurred. Soon after the annexation, the ruby districts were officially visited, and reported on, by Mr C. Barrington Brown, and specimens from the mines were exhaustively studied by Professor J. W. Judd. The principal district is situated in the neighbourhood of’Mogok, 90 m. N.N.E. of Mandalay. The ruby occurs in bands of a crystalline limestone, associated with granitic and gneissose rocks, some of which are highly basic; and it is from the anorthite, or lime-felspar, and the associated minerals in the pyroxene- gneisses, that the corundum, spinel and calcite, may, according to Judd, have been derived. Probably the felspar is first altered to scapolite, and this on decomposition would yield calcium carbonate and hydrous aluminium silicates, from which the anhydrous alumina might ultimately be

separated. The limestone contains (in addition to the ruby) spinel, garnet, graphite, wollastonite, scapolite, felspar, mica, pyrrhotite and other minerals. The ruby, like other kinds of corun- dum, suffers alteration under certain conditions, and passes by hydration into gibbsite and diaspore, which by further alteration and union with silica, &c, may yield margarite, vermiculite, chlorite and other hydrous silicates.

The Burmese rubies are not generally worked in the lime- stone matrix, but are mostly found loose in detrital matter, which is clayey and sandy in character and yellowish-brown

in colour, and is known locally as ” byon.” Some of the deposits occur in limestone caverns, where they may, like cave-earth, represent the insoluble residue of the limestone. Workings in the cave-deposits are called “loodwins” (crooked mines) . In the alluvium of the valleys, the ruby-pits are known as ” twinlones ” (round pits), whilst workings in the ruby- earth on the hillsides are termed ” hmyaudwins ” (water mines). The byon contains, with the ruby, other coloured corundums and spinels. Burmese rubies are found also in crystalline limestone in the hills near Sagyin, about 20 m. N. of Mandalay, and it is of mineralogical interest to note that the limestone here contains chondrodite.

Rubies are found in Siam, at several localities in the pro- vinces of Chantabun and Krat; and Professor H. Louis has described their occurrence at Moung Klung in this region. The rubies are found with sapphires and spinels, in gravels, resting in some cases on basic igneous rocks. The Siam rubies are generally of dark colour, often inclining to a deep reddish brown. Rubies occur, with sapphires and other minerals, in the gem-gravels of Ceylon, but are not usually of such good colour as the Burmese stones. A cloudy variety, which, when cut with a convex surface, exhibits a luminous star, is known as star-ruby (see Asterias). In peninsular India rubies are rarely found, though they have been reported from the corun- dum deposits of Madras and Mysore. The ruby is known, however, to occur in a micaceous limestone at Jagdalak, near Kabul in Afghanistan.

Rubies, generally of pale colour, are found with the sapphires of Montana, especially at Yogo Gulch near Utica. In the corundum deposits of N. Carolina ruby is occasionally met with, especially at Cowee Creek, Macon county, where it oc- curs in crystals of tabular, rhombohedral and prismatic habit. These crystals, sometimes of fine colour, are found in gravels resting on a soft rock called saprolite, which results from the weathering of certain basic igneous rocks; and

it is notable that the ruby crystals are associated with the variety of garnet termed rhodolite, as described by Professor Judd and W. E. Hidden. Australia has occasionally yielded rubies, but mostly of small size and inferior quality. In New South Wales and in Victoria they have been found in drift gravels, and a magenta- coloured turbid variety from Victoria has been described under the name of barklyite.

Rubies have been produced artificially with much success. At one time it was the practice to fuse together small fragments of the natural stone; and gems cut from such material were known as reconstructed rubies. This process has given way to Professor A. Verneuil's method of forming artificial ruby from purified ammonia-alum with a certain proportion of chrome- alum. The finely powdered material is caused to fall periodi- cally into an oxyhydrogen flame, the heat of which decomposes the alum, and the alumina thus set free forms liquid drops which collect and solidify as a pear-shaped mass. When of the characteristic pigeon 's-blood colour, the synthetical ruby contains about 2-5% of chromic oxide. The manufactured ruby possesses the physical characters of corundum, but may generally be distinguished by microscopic bubbles and striae. The manufacture is carried out commercially. (For other pro- cesses, see Gem, Artificial.)

It should be noted that several minerals known popularly as rubies have no relation to the true red corundum. Thus, " Cape rubies " from the South African diamond mines, " Australian rubies " from South Australia, and " Arizona rubies" are merely fine garnets; "Siberian ruby" is red tourmaline (see Rubellite), and " Balas ruby" is spinsl (q.v.). Ruby silver is a name applied to light red silver ore, or proustite; ruby copper is merely cuprite, in brilliant crystals; and ruby-blende is a clear red variety of zinc sulphide.

Bibliography. — For the Burma ruby, see " The Rubies of Burma and Associated Minerals: their mode of occurrence, origin and metamorphoses," by C. Barrington Brown and Professor J. W. Judd, Phil. Trans., 1897, 187, p. 151. For the ruby of Siarnˆ see

The Ruby and Sapphire Deposits of Moung Klung, Siam," by H. Louis, Mineralog. Mag., 1894, 10, p. 267. For synthetical ruby,

Bee G. F. Herbert Smith, Mineralog. Mag., 1908, 15, p. 153; and J. Boyer, La Synthese des pierres pr&cieuses (Paris, 1909).

(F. W. R.*)

RUBY MINES, a district in the Mandalay division of Upper Burma, lying along the Irrawaddy river between the Bhamo district on the N., the Shan States on the E., Mandalay district on the S. and Katha on the W. Including the Shan state of Mongmit, which is temporarily administered as part of the district, the total area is 5476 sq. m.; pop. (1901) 87,694. The district geographically forms part of the Shan plateau, and is to a great extent a mass of hills with a general N. and S. direc- tion. It contains considerable numbers of Kachins (13,300) and Palaungs (16,400). The annual rainfall at Mogok averages 98 in. The administrative headquarters are at Mogok, which is also the centre of the ruby-mining industry. It stands in the centre of a valley 4000 ft. above sea-level, and is reached by a cart-road from Thabeikkyin, 61 m. distant, on the Irra- waddy. The Ruby Mines Company employs about 44 Euro- peans and Eurasians in its works, which are situated at the north end of the town. The company has constructed a dam across the Yeni stream and set up an electric installation of about 450 horse-power, which works pumps and the washing machinery. The mines were worked under Burmese rule, but were discontinued on account of the small profit. Now they seem to be established on a sound financial basis. The system adopted is to excavate large open pits, from which the ruby- earth or byon is removed en masse and washed and crushed by machinery. Spinels and sapphires are found with the rubies. In 1904, the produce of rubies alone was 200,000 carats, valued at £80,000, most of which were sent to London for sale. In addition, some mining is carried on by natives, working under a licence which does not permit the use of machinery. The district contains 994 sq. m. of reserved forests.

RUCKERT, JOHANN MICHAEL FRIEDRICH (1788-1866), German poet, was born at Schweinfurt on the 16th of May 1788, the eldest son of a lawyer. He was educated at the gymnasium of his native place and at the universities of Wiirz- burg and Heidelberg. For some time (1816-17) he worked on the editorial staff of the Morgenblatt at Stuttgart. Nearly the whole of the year 181 8 he spent in Rome, and afterwards he lived for several years at Coburg. He was appointed a professor of Oriental languages at the university of Erlangen in 1826, and in 1841 he was called to a similar position in Berlin, where he was also made a privy councillor. In 1849 he resigned his professorship at Berlin, and went to live on his estate Neuses near Coburg. He died on the 31st of January 1866. When Ruckert began his literary career, Germany was engaged in her life-and-death struggle with Napoleon; and in his first volume, Deutsche Gedichte, published in 18 14 under the pseudonym ” Freimund Raimar,” he gave,

particularly in the powerful “Geharnischte Sonette,” vigorous expression to the prevailing sentiment of his countrymen. In 1815-18 appeared Napoleon, eine politische Kombdie in drei Sliicken (only two parts were published), and in 181 7 Der Kranz der Zeit. He issued a collection of poems, Ostliche Rosen, in 1822; and in 1834-38 his Gesammelle Gedichte were published in six volumes, a selection from which has passed through many editions. Ruckert, who was master of thirty languages, made his mark chiefly as a translator of Oriental poetry and as a writer of poems conceived in the spirit of Oriental masters. Much attention was attracted by a translation of Hariri’s Makamen (1826), Nal und Damajanti, an Indian tale (1828), Rostem und Sahrab, eine Heldengeschichte (1838), and Hamasa, oder die altesten arabischen Volkslieder (1846). Among his original writings dealing with Oriental subjects are Morgenldndische Sagen und Geschichten (1837), Erbauliches und Beschauliches aus dem Morgenland (1836-38), and Brahmanische Erzdhlungen (1839). The most elaborate of his works is Die Weisheit des Brahmanen, published in six volumes in 1836-39. This last and the Liebesfruhling (1844), a cycle of love-songs, are the best known of all Riickert’s productions. In 1843-45 he issued the dramas Saul und DaviS (1843). Herodes der Grosse (1844),

Kaiser Heinrich IV. (1845) and Christofero Colombo (1845), all of which are greatly inferior to the work to which he owes his place in German literature. At the time of the Danish war in 1864 he wrote Ein Dulzend Kampflieder fur Schleswig- Holstein, which,, although published anonymously, produced a considerable impression. After his death many poetical translations and original poems were found among his papers, and several collections of them were published. Ruckert had a splendour of imagination which made Oriental poetry congenial to him, and he has seldom been surpassed in rhythmic skill and metrical ingenuity. There are hardly any lyrical forms which are not represented among his works, and in all of them he wrote with equal ease and grace.

A complete edition of Riickert’s poetical works appeared in 12 vols, in 1868-69. Subsequent editions have been edited by L. Laistner (1896), C. Beyer (1896), G. Ellinger (1897). See B. Fortlage, F. Ruckert und seine Werke (1867); C. Beyer, Friedrich Ruckert, ein biographisches Denkmal (1868), Neue Mitteilungen ilber Ruckert (1873), and Nachgelassene Gedichte Ruckerts und neue Beitrdge zu dessen Leben und Schriften (1877); R. Boxberger, Ruckert- Studien (1878) ; P. de Lagarde, Erinnerungen an F. Ruckert (1886); F. Muncker, Friedrich Ruckert (1890); G. Voigt, Ruckerts Gedankenlyrik (1891).

RtJDAGl (d. 954). Farid-eddln Mahommed ‘Abdallah, the first great literary genius of modern Persia, was born in Rudag, a village in Transoxiana, about 870-900. Most of his biographers assert that he was totally blind, but the accurate knowledge of colours shown in his poems makes this very doubtful. The fame of his accomplishments reached the ear of the Samanid Nasr II. bin Ahmad, the ruler of Khorasan and Transoxiana (913-42), who invited the poet to his court. Rudagi became his daily companion, rose to the highest honours and amassed great wealth. In spite of various predecessors, he well deserves the title of ” father of Persian literature,” ” the Adam or Sultan of poets,” since he was the first who impressed upon every form of epic, lyric and didactic poetry its peculiar stamp and its individual character. He is also said to have been the founder of the ” dlwan ” — that is, the typical form of the complete collection of a poet’s lyrical compositions in a more or less alphabetical order which prevails to the present day among all Mahommedan writers. Of the 1,300,000 verses attributed to him, there remain only 52 kasidas, ghazals and ruba’is; of his epic masterpieces we have nothing beyond a few stray lines in native dictionaries. But the most serious loss is that of his translation of Ibn Mokaffa’s Arabic version of the old Indian fable book Kalilah and Dimnah, which he put into Persian verse at the request of his royal patron. Numerous fragments, however, are preserved in the Persian lexicon of AsadI of Tus (ed. P. Horn, Gottingen, 1897). In his kasidas, all devoted to the praise of his sovereign and friend, Rudagi has left us unequalled models of a refined and delicate taste, very different from the often bombastic compositions of later Persian encomiasts. His didactic odes and epigrams express in well-measured lines a sort of Epicurean philosophy of human life and human happiness; more charming still are the purely lyrical pieces in glorification of love and wine. Rudagi survived his royal friend, and died poor and forgotten by the world.

There is a complete edition of all the extant poems of Rudagi, in Persian text and metrical German translation, together with a biographical account, based on forty-six Persian MSS., in Dr H. Ethe’s ” Rudagi der Samanidendichter ” (Gbttinger Nachrichlen, x 873, pp. 663-742); see also his ” Neupersische Literatur ” in Geiger’s Grundriss der iranischen Philologie (ii.) ; P. Horn, Gesch. der persischen Literatur (1901), p. 73; E. G. Browne, Literary History of Persia, i. (1902) ; C. J. Pickering, ” A Persian Chaucer ” in National Review (May 1890).

RUDD, or Red-Eye (Leuciscus erythrophthalmus), a fish of the Cyprinid family, spread over Europe, N. and S. of the Alps, also found in Asia Minor, and common in localities where there are still waters

with muddy bottom. The rudd and the roach are very similar and frequently confused by anglers; the former differs principally in the more posterior dorsal fin, which is situated exactly opposite the space between the ventral and anal fins. It is a fine fish, but little esteemed for food,

and rarely exceeds 12 in. in length and 2 lb in weight. It feeds on small freshwater animals and soft vegetable matter, and spawns in April or May. It readily crosses with the white bream, and more rarely with the roach and bleak.

RUDDER (O.E. Rother, i.e. rower), that part of the steering apparatus of a ship which is fastened to the stern outside, and on which the water acts directly. The word may be found to be used as if it were synonymous with ” helm.” But the helm (A.S. Hillf, a handle) is the handle by which the rudder is worked. The tiller, which is perhaps derived from a provincial English name for the handle of a spade, has the same meaning as the helm. In the earliest times a single oar, at the stern, was used to row the vessel round. In later times oars with large blades were fixed on the sides near the stern. In Greek and Roman vessels two sets were sometimes employed, so that if the pitching of the ship lifted the after pair out of the water, the foremost pair could still act. As these ancient ships were, at least in some cases, sharp at both ends and could sail either way, steer (or steering) oars were fixed both fore and aft. The steer oar in this form passed through a ring on the side and was supported on a crutch, and was turned by a helm, or tiller. Norse and medieval vessels had, as far as we can judge, one steer oar only placed on the right side near the stern — hence the name “starboard,” i.e. steerside, for the right side of the ship looking forward. In the case of small vessels the steer oar possesses an advantage over the rudder, for it can bring the stern round quickly. Therefore it is still used in whaling boats and rowing boats which have to work against wind and tide, and in surf when the rudder will not act. It is not possible to assign any date for the displacement of the side rudder by the stern rudder. They were certainly used together, and the second displaced the first in the course of the 14th century when experience had shown that the rudder was more effective at the stern than at the side. The rudder of a wooden ship when fully developed was composed of four pieces. The first or main piece was hung on to the stern post of the ship. Its upper portion was known as the rudder head, and was at first an oval shaft which passed into the

ship through the rudder port, and to which the helm was fixed. A canvas bag called a rudder coat covered the opening to exclude the water. In later days Sir R. Seppings introduced the cylindrical form in order to prevent the water from coming into the round rudder port. Three back pieces were fastened to the main piece longi- tudinally. The whole were fastened together by iron bands called pintle straps, which had at the forward end a pin or pintle, which fitted into braces, i.e. fixed rings on the stern post, so that the rudder hung on hinges. The lower part of the main piece was bevelled, and so was the stern post, so as to illow the rudder to swing freely. A projecting piece called a chock or wood-lock was fixed in the head outside the ship in order to prevent the rudder from being lifted by the water out of its hinges. A small vessel can be steered by the helm or tiller, but in a larger it is necessary to apply a mechanical leverage. This was secured by carrying ropes, or in later times chains, to the sides of the ship, and then through blocks to the upper deck, round a barrel which is worked by the wheel. The principle of the rudder cannot alter, but the means employed to work it have been altered by the introduction of the screw, and by the increased size of ships. A single screw is placed in an open space before the stern post. As the opening thus created prevents the water from flowing directly on to the rudder, a screw steamer is sometimes difficult to steer. In order to make the rudder more manageable, it has been balanced, i.e. pivoted, on a shaft placed at about a third of its length from the foremost edge. In a double screw there is no opening, but the balanced rudder is still used, and the ship can be turned by reversing one of the screws. The need for more power to work the helm has led to the introduction of steam, and hydraulic steering apparatus which can be set in motion by a small wheel.

See Burney's Falconer's Dictionary (London, 1830) , Torr's Ancient Ships (Cambridge, 1894); Nares, Seamanship (Portsmouth,

1882).

RUDDIMAN, THOMAS (1674-1757), Scottish classical scholar, was born in October 1674, at Raggal, Banffshire, where his father was a farmer. He was educated at Aberdeen University, and through the influence of Dr Archibald Pitcairne he was made assistant in the Advocates' Library, Edinburgh. His chief writings at this period were editions of Florence Wilson's De Animi Tranquillitate Dialogus (1707), and the Cantici Solomonis Paraphrasis Poetica (1709) of Arthur Johnston (1587-1641), editor of the Deliciae Poetarum Scotorum. On the death of Dr Pitcairne he edited his friend's Latin verses, and arranged for the sale of his valuable library to Peter the Great of

Russia. In 1 7 14 he published Rudiments of the Latin Tongue, which was long used in Scottish schools. In 1715 he edited, with notes and annotations, the works of George Buchanan in two volumes folio. As Ruddiman was a Jacobite, the liberal views of Buchanan seemed to him to call for frequent censure. A society of scholars was formed in Edinburgh to ” vindicate that incom- parably learned and pious author from the calumnies of Mr Thomas Ruddiman”; but Ruddiman’s remains the standard edition, though George Logan, John Love, John Man and others attacked him with great vehemence. He founded (1715) a successful printing business, and in 1728 was appointed printer to the university. He acquired the Caledonian Mercury in 1729, and in 1730 was appointed keeper of the Advocates’ Library, resigning in 1752. He died in Edinburgh, on the 19th of January

1757-

Besides the works mentioned, the following writings of Ruddiman deserve notice: An edition of Gavin Douglas’s Aeneid of Virgil (17 10); the editing and completion of Anderson’s Seleclus Diplo- matum et Numismatum Scotiae Thesaurus (1739); Catalogue of the Advocates’ Library (1733-42); and a famous edition of Livy (1751). He also helped Joseph Ames with the Typographical Antiquities. Ruddiman was for many years the representative scholar of Scotland. Writing in 1766, Dr Johnson, after reproving Boswell for some bad Latin, significantly adds — ” Ruddiman is dead.” When Boswell proposed to write Ruddiman’s life, ” I should take pleasure in helping you to do honour to him,” said Johnson.

See Chalmers’s Life of Ruddiman (1794) ; Scots Magazine, January

7, 1757-

RUDE, FRANCOIS (1784-1855), French sculptor, was born at Dijon on the 4th of June 1784. Till the age of sixteen he worked at his father’s trade as a stovemaker, but in 1809 he went up to Paris from the Dijon school of art, and became a pupil of Castellier, obtaining the Grand Prix in 181 2. After the second restoration of the Bourbons he retired to Brussels, where he got some work under the architect Van der Straeten, who employed him to execute nine bas-reliefs in the palace of Tervueren. At Brussels Rude married Sophie Fremiet, the daughter of a Bonapartist compatriot to whom he had many obligations, but gladly availed himself of an opportunity to return to Paris, where in 1827 a statue of the Virgin for St Gervais and a ” Mercury fastening his Sandals ” (now in the Louvre) obtained much attention. His great success dates, however, from 1833, when he received the cross of the

Legion of Honour for his statue of a ” Neapolitan Fisher Boy playing with a Tortoise,” which also procured for him the importantcommission for all the ornament and one group in the Arc de l’Etoile. This group, the ” Depart des volontaires de 1792,” a work full of energy and fire, immortalizes the name of Rude. Amongst other pro- ductions we may mention the statue of the mathematician Gaspard Monge (1848), Jeanne d’Arc, in the gardens of the Luxembourg (1852), a Calvary in bronze for the high altar of St Vincent de Paul (1855), as well as ” Hebe and the Eagle of Jupiter,” ” Love Triumphant ” and ” Christ on the Cross,” all of which appeared at the Salon of 1857 after his death. He died suddenly on the 3rd of November 1855.

See also P. G. Hamerton, Modern Frenchmen, five biographies (1878); Carl Adolf Rosenberg, Francois Rude (1884); Louis Gonse, Les Chefs d’eeuvre des musees de France (Paris, 1900) ; L. de Fourcaud, Francois Rude, sculpteur (Paris, 1904).

RUDERAL (Lat. rudus, rubbish), a botanical term for plants growing on rubbish heaps or in waste places.

RUDESHEIM, a town of Germany in the Prussian Rhine province on the right bank of the Rhine, 19 m. S.W. of

Wiesbaden by the main line from Frankfort-on-Main to Cologne. Pop. (1905) 4773. Its situation, at the lower end of the famous vineyard district of the Rheingau, opposite Bingen and just above the romantic gorge of the Rhine, renders it a popular tourist centre. Behind the town rises the majestic Niederwald (985 ft.), on the crest of which stands the national monument, ” Geimania,” commemorating the war of 1870-71. Rudesheim has some interesting towers. The Bromserburg, or Niederburg, a massive structure built in the 13th century, formerly belonging to the archbishops of Mainz; the Boosen- burg, 01 Oberburg, which was rebuilt in 1868, with the exception of the keep; the Adlerturm, a relic of the fortifications of the town; and the Vorderburg, the remains of an old castle. The Gothic church of St James has some interesting paintings and monuments, and there is also a Protestant church. The town has electrical works, but its industries are mainly concerned with the preparation of wine, the best kinds being Rudesheimer Berg, Hinterhaus and Rottland.

See J. P. Schmelzeis, Rudesheim im Rheingau (Rudesheim, 1881); and Heiderlinden, Rudesheim und seine Umgebung (Rudesheim,

RUDINl, ANTONIO STARABBA, Marquis di (1839-1908), Italian statesman, was born at Palermo on the 6th of April 1839. In 1859 he joined the revolutionary committee which paved the way for Garibaldi's triumphs in the following year; then after spending a short time at Turin as attache to the Italian foreign office he was elected mayor of Palermo. In 1866 he displayed considerable personal courage and energy in quelling an insurrection of separatist and reactionary tendencies. The prestige thus acquired led to his appointment as prefect of Palermo, and while occupying that position he put down brigandage throughout the province; in 1868 he was prefect of Naples. In October 1869 he became minister of the interior in the Menabrea cabinet, but he fell with that cabinet a few months later, and although elected member of parliament for Canicatti held no important position until, upon the death of Minghetti in 1886, he became leader of the Right. Early in 1891 he succeeded Crispi as premier and minister of foreign affairs by forming a coalition cabinet with a part of the Left under Nicotera; his administration proved vacillating, but it initiated the economies by which Italian finances were put on a sound basis and also renewed the Triple Alliance. He was overthrown in May 1892 by a vote of the Chamber and succeeded by Giolitti. Upon the return of his rival, Crispi, to powei in December 1893, he resumed political activity, allying himself with the Radical leader, Cavallotti. The crisis consequent upon the disaster of Adowa (1st March 1896) enabled Rudini to return to power as premier and minister of the interior in a cabinet formed by the veteran Conservative, General Ricotti. He concluded peace with Abyssinia, but endangered relations with Great Britain by the unauthorized publication of confidential diplomatic corre- spondence in a Green-book on Abyssinian affairs. To satisfy the anti-colonial party he ceded Kassala to Great Britain, provoking thereby much indignation in Italy. His internal policy was marked by continual yielding to Radical pressuie and by persecution of Crispi. By dissolving the Chamber early in 1897 and favouring Radical candidates in the general election, he paved the way for the outbreak of May 1898, the suppression of which entailed considerable bloodshed and necessitated a state of siege at Milan, Naples, Florence and Leghorn. In- dignation at the results of his policy led to his overthrow in June 1898. During his second term of office he thrice modified his cabinet (July 1896, December 1897, and May 1898) without strengthening his political position. In many respects Rudini, though leader of the Right and nominally a Conservative politician, proved a dissolving element in

the Italian Conserva- tive ranks. By his alliance with the Liberals under Nicotera in 1 89 1, and by his understanding with the Radicals under Cavallotti in 1894-98; by abandoning his Conservative colleague, General Ricotti, to whom he owed the premiership in 1896; and by his vacillating action after his fall from power, he divided and demoralized a constitutional party which, with greater

sincerity and less reliance upon political cleverness, he might have welded into a solid parliamentary organization. At the same time he was a thorough gentleman and . grand seigneur. One of the largest and wealthiest landowners in Sicily, he managed his estates on liberal lines, and was never troubled by agrarian disturbances. The marquis, who had not been in office since 1898, died on the 6th of August 1908, leaving a son, Carlo, who married a daughter of Mr Henry Labouchere.

RUDOK, a small town on the Ladakh frontier of Tibet, through which all the trade of Tibet passes to Leh, and at which is maintained the Chinese'outpost that for many years persistently interfered with European exploration. Rudok is picturesquely situated on the side of a hill standing isolated in the plain near the E. end of Lake Pangong, across which the official boundary between Tibet and Kashmir runs. The houses are built in tiers, whitewashed and walled in. At the top of the hill are a large palace and several monasteries painted red. About a mile away from the foot of the hill is another monastery. Rudok is about 13,300 ft. above sea-level, and the greatest altitude on the route connecting it with Lhasa at the pass of Mariom la (the water-parting between the Brahmaputra and the Sutlej) is 15,500 ft. The winter climate of Rudok and of all the towns of the Tsangpo basin, owing to the intense dryness of the air and the light fall of snow, seems to be bracing and exhilarating rather than severe. The thermometer never ap- proaches the minimum record of Puetra (in the same latitude and at half the absolute elevation), according to the observations; of native surveyors.

RUDOLF (otherwise known as Basso Norok and Gallop), a large lake of E. equatorial Africa, forming the centre of an inland drainage system, occupying the S. of the Abyssinian highlands and a portion of the great equatorial plateau. The lake itself lies towards the N. of the great East African rift valley, between the parallels of 2° 26′ and 5 N., while the meridian of 36 E. is slightly W. of the centre of the northern wider part, the narrower southern portion bending to 365° E. The length along the curved axis is 185 m., the maximum width 37, and the area roughly 3500 sq. m. Its altitude is 1250 ft. Towards the S. it seems to be deep, but it is com- paratively shallow in the N. Its water

is brackish, but drink- able. The country bordering the lake on almost every side is sterile and forbidding. The S. end, for some 50 m. on the W. and for a longer distance on the E., is shut in by high cliffs — the escarpments of a rugged lava-strewn country, which shows abundant signs of volcanic activity, great changes having been reported since 1889. In particular, the great volcano of Lubburua (Teleki's volcano) at the S. end of the lake is said to have been destroyed between 1889 and 1897 by a sudden explosion. The highest point of the S.E. side of the lake is Mount Kulal, 7812 ft., while the culminating height within the basin of the lake is Mount Sil, 9280 ft., which lies about 20 m. S. of Lubburua. Further N., on the W. side, sandy plains alternate with lines of low hills, the immediate shores (on which the water appears to have encroached in very modern times) being marked by spits of sand, which in places cut off lagoons from the main body of the lake. These are the haunt of great numbers of water-birds. In 3 8′ N, the dry bed of the Turkwell — in its upper course a large rive* descending the slopes of Mount Elgon — approaches the lake. Near the N. end mountains again approach the shores, the most prominent being Mount Lubbur (5200 ft.), an extinct volcano with a well-preserved crater. At the extreme N.W. corner a bay some 35 m. long (Sanderson Gulf) is almost separated from the rest of the lake by two long points of land. On the E. side, open arid plains, with few trees, occupy most of the N. country. One hill, in 3° 20′ N., has a height of 3470 ft., and at the N.E. end, separating the lake from Lake Stefanie, is a hilly country, the highest point between the lakes being 3524 ft. Immediately N. of these hills rises the Hummurr Range, with one peak exceeding 7000 ft. Near the S. end is the volcanic island of Elmolo, 10 m. long, and there are a feˆ small islets. Just N. of 4° N. is a small volcanic

island with highest point 2100 ft. At the N. end of the lake a level swampy plain is traversed by various arms of the lake and by the Nianam river. This river has been shown to be identical with the Omo, the course of which >was long one of the most debated questions of African geography. Its northernmost feeders rise on the high plateau S. of the Blue Nile, in o° 10′ N., and being swollen by other streams from the E. and W., soon form a large river. During its lower course it makes two considerable bends to the W. before finally entering the lake as a deep stream a quarter of a mile wide. Lake Rudolf (previously known on the east coast by report) was discovered in 1888 by Count Samuel Teleki and Lieutenant Ludwig von Hohnel. It was

subsequently visited by Dr Donaldson Smith, Vittorio Bottego, H. S. H. Cavendish, H. H. Austin, and others, and by 1905 its shores and the neighbouring country had become fairly well known. In 1907, by an agree- ment between the powers concerned, the N.E. end of the lake, into which the Omo debouches, was assigned to Abyssinia, the rest of the lake to Great Britain.

Authorities. — Geographical Journal (September 1896, April 1898, August 1899, May 1904; the last-named issue contains a map by Captain P. Maud, R.E.) ; Ludwig von Hohnel, Discovery of Lakes Rudolf and Stefanie (London, 1894); A. Donaldson Smith, Through Unknown African Countries (London, 1897) ; A. H. Neumann, Elephant-Hunting in East Equatorial Africa (London, 1898) ; L. Vannutelli and C. Citerni, L'Omo (Milan, 1899) ; M. S. Wellby, 'Twixt Sirdar and Menelik (London, 1901); H. H. Austin, Among Swamps and Giants in Equatorial Africa (1902); C. H. Stigand, To Abyssinia through an Unknown Land (1910).

(E. He.)

RUDOLPH I. (1218-1291), German king, son of Albert IV. count of Habsburg, and Hedwig, daughter of Ulrich count of Kyburg, was born at Limburg on the 1st of May 1218. At his father's death in 1239 Rudolph inherited the family estates in Alsace, and in 1245 he married Gertrude, daughter of Burk- hard III. count of Hohenberg. He paid frequent visits to the court of his godfather the emperor Frederick II., and his loyalty to Frederick and to his son Conrad IV. was richly rewarded by grants of land, but in 1254 was excommunicated by Pope Innocent IV. The disorder in Germany after the fall of the Hohenstaufen afforded an opportunity for Rudolph to increase his possessions. His wife was an heiress; and on the death of his childless uncle, Hartmann VI. count of Kyburg, in 1264, he seized his valuable estates. Successful feuds with the bishops of Strassburg and Basel further aug- mented his wealth and his reputation; rights over various tracts of land were purchased from abbots and others; and he was also the possessor of large estates in the regions now known as Switzerland and Alsace.

These various sources of wealth and influence had rendered Rudolph the most powerful prince in S.W. Germany when, in the autumn of 1273, the princes met to elect a king. His election at Frankfort on the 29th of September 1273 was largely due to the efforts of his brother-in-law, Frederick III. of Hohenzollern, burgrave of Nuremberg. The support of Albert duke of Saxe-Lauenburg, and of Louis II. count palatine of the Rhine and duke of upper Bavaria, had been purchased

by betrothing them to two of Rudolph's daughters; so that Ottakar II. king of Bohemia, a candidate for the throne, was almost alone in his opposition. Rudolph was crowned at Aix-la-Chapelle on the 24th of October 1273, and the feast which followed has been described by Schiller in Der Graf von Hapsburg. To win the approbation of the pope Rudolph re- nounced all imperial rights in Rome, the papal territory and Sicily, and promised to lead a new crusade; and Pope Gregory X., in spite of Ottakar's protests, not only recognized Rudolph himself, but persuaded Alphonso X. king of Castile, who had been chosen German king in 1257, to do the same. In November 1274 it was decided by the diet at Nuremberg that all crown estates seized since the death of the emperor Frederick II. must be restored, and that Ottakar of Bohemia must answer to the diet for not recognizing the new king. Ottakar refused to appear or to restore the provinces of Austria, Styria, Carinthia and Carniola which he had seized. He was

placed under the ban; and in June 1276 war was declared against him. Having detached Henry I. duke of lower Bavaria from his side, Rudolph compelled the Bohemian king to cede the four provinces in November 1276. Ottakar was then invested with Bohemia by Rudolph, and his son Wenceslaus was betrothed to a daughter of the German king, who made a triumphal entry into Vienna. Ottakar, however, raised questions about the execution of the treaty, made an alliance with some Polish chiefs and procured the support of several German princes, including his former ally, Henry of lower Bavaria. To meet this combination Rudolph entered into alliance with Ladislaus IV. king of Hungary, and gave addi- tional privileges to the citizens of Vienna. On the 26th of August 1278 the rival armies met on the banks of the river March near Durnkrut, and Ottakar was defeated and killed. Moravia was subdued and its government entrusted to Rudolph's representatives, while Wenceslaus was again betrothed to one of his daughters.

Rudolph's attention was next turned to his new possessions in Austria and the adjacent countries. He spent several years in establishing his authority there, but found some difficulty in making these provinces hereditary in his family. At length the hostility of the princes was overcome, and in December 1282 Rudolph invested his sons Albert and Rudolph with the duchies of Austria and Styria at Augsburg, and so laid the foundations of the greatness of the house of Habsburg.

Turning to the west he compelled Philip I. count of upper Burgundy to cede some districts to him in 1281, forced the citizens of Berne to pay the tribute which they had previously refused, and in 1289 marched against Philip's successor, Otto IV., and compelled him to do homage.

In 1281 his first wife died, and on the 5th of February 1284 he married Isabella, daughter of Hugh IV. duke of Burgundy. Rudolph was not very successful in restoring internal peace to Germany. Orders were indeed issued for the establishment of landpeaces in Bavaria, Franconia and Swabia, and afterwards for the whole of Germany; but the king lacked the power, or the determina- tion, to enforce them, although in December 1289 he led an expedition into Thuringia where he destroyed a number of robber-castles. In 1291 he attempted to secure the election of his son Albert as German king; but the princes refused on the pretext of their inability to support two kings, but perhaps because they feared the increasing power of the Habsburgs. Rudolph died at Spires on the 15th of July 1291 and was buried in the cathedral of that city. He had a large family, but only one of his sons, Albert, afterwards the German king Albert I., survived him. Rudolph was a tall man with pale face and prominent nose. He possessed many excellent qualities, bravery, piety and generosity; but his reign is memorable rather in the history of the house of Habsburg than in that of the kingdom of Germany.

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RUDOLPH II. (1552-1612), Roman emperor, son of the emperor Maximilian II. by his wife Maria, daughter of the emperor Charles V., was born in Vienna on the 18th of July 1552. In 1563 he was sent to Spain, where his natural abilities were improved by a good education, but he lacked the frank and tolerant spirit of his father, resembling rather his uncle Philip II. of Spain. In 1572 he was crowned king of Hungary, three years later king of Bohemia; and in October 1575 he was chosen king of the Romans, or German king, at Regensburg, becoming emperor on his father's death in October 1576. The importance of Rudolph's reign is negative rather than positive, consisting more in what he did not do than in what he did; although it is questionable whether any ruler could have pre- vented the religious struggles of Germany and the Thirty Years' War.

The more active part of the emperor's life was the period from his accession to about 1597. During that time he attended the infrequent imperial diets, and took an interest in the struggle in the Netherlands and the defence of the empire against the Turks. He was at times suspicious of the papal policy, while his relations with Spain were somewhat inharmonious. As a convinced Roman Catholic he forwarded the progress of the counter-reformation, and in general the tolerant policy of Maximilian II. was reversed. Political as well as religious privileges were attacked; the administration was conducted by Germans; and the result was a considerable amount of discontent which became very pronounced about the opening of the 17th century. Concurrently with the growth of this unrest Rudolph had become increasingly subject to attacks of depression and eccentricity, which were so serious as to amount almost to insanity. In 1604, after a war with Turkey had been in progress since 1593, many of the Hungarians rebelled against Ruuolph and chose Stephen Bocskay as their prince. By this time the members of the Habsburg family were thoroughly alarmed at the indifference or incompetence of the emperor; and their anxieties were not diminished by the knowledge that he was in feeble health, was unmarried, and had refused to take any steps towards securing the election of a successor. In April 1606 they declared Rudolph incapable of ruling, and recognized one of his younger brothers, the archduke Matthias, afterwards emperor, as their head; and in the following June Matthias, having already with the emperor's reluctant consent taken the conduct of affairs into his own hands, made peace by granting extensive concessions to the rebellious Hungarians, and concluded a treaty with the sultan in November of

the same year. Then shaking off his lethargy Rudolph prepared to renew the war with the Turks; a move which Matthias met by throwing himself upon the support of the national party in Hungary. Matthias also found adherents in other parts of his brother's dominions, with the result that in June 1608 the emperor was compelled to cede to him the kingdom of Hungary together with the government of Austria and Moravia. Rudolph now sought the aid of the princes of the empire, and even of the Protestants; but he had met with no success in this direction when trouble arose in Bohemia. Having at first rejected the demand of the Bohemians for greater religious liberty, the emperor was soon obliged to yield to superior force, and in 1609 he acceded to the popular wishes by issuing the Letter of Majesty (Majestatsbrief), and then made similar concessions to his subjects in Silesia and elsewhere. A short reconciliation with Matthias was followed by further disorder in Bohemia, which was invaded by Rudolph's cousin, the archduke Leopold (1 586-1632). The Bohemians invoked the aid of Matthias, who gathered an army; and in 161 1 the emperor, practically a prisoner at Prague, was again forced to cede a kingdom to his brother. Rudolph died at Prague, his usual place of residence, on the 20th of January 161 2, and was succeeded as emperor by Matthias.

Rudolph was a clever and cultured man, greatly interested in chemistry, alchemy, astronomy and astrology; he was a patron of Tycho Brahe and Kepler, and was himself something

of a scholar and an artist. He was the greatest collector of his age, his agents ransacking Europe to fill his museums with rare works of art. His education at the Spanish court and an hereditary tendency to insanity, however, made him haughty, suspicious and consequently very unpopular, while even in his best days the temper of his mind was that of a recluse rather than of a ruler.

The sources for the life and times of Rudolph II. are somewhat scanty, as many of the official documents of the reign, which were kept at Prague and not at Vienna, were destroyed, probably during the Thirty Years' War. The best authorities, however, are: Rudolphi II. epistolae ineditae, edited by B. Comte de Pace (Vienna, 1 771) ; M. Ritter, Quellenbeitr age zur Geschichte des Kaisers Rudolf II (Munich, 1872); and Deutsche Geschichte im Zeitalter der Gegen- reformation und des dreissigjahrigen Krieges (Stuttgart, 1887 fol.) ; L. von Ranke, Zur deutschen Geschichte: Vom Religionsfrieden bis zum 30-jdhrigen Kriege (Leipzig, 1868); A. Gindely, Rudolf II. und seine Zeit (Prague, 1862-68) ; F. Stieve, Die Verhandlungen ilber die Nachfolge Kaiser Rudolfs II. (Munich, 1880); in the Allgemeine Deutsche Biographic,

Band xxix. (Leipzig, 1889) ; and Der U.rsprung des dreissigjahrigen Krieges (Munich, 1875) ; F. von Bezold, Kaiser Rudolf II. und die heilige Liga (Munich, 1886); J. Janssen, Geschichte des Deutschen Volks seit dent Ausgang des Mittelalters (Freiburg, 1878 fol.), of which there is an English trans- lation by M. A. Mitchell and A. M. Christie (London, 1896 fol.) ; and H. Moritz, Die Wahl Rudolfs II. (Marburg, 1895).

RUDOLPH, or Raoul (d. 936), king of the Franks and duke of Burgundy, was a son of Richard duke of Burgundy, and was probably a member of the Carolingian family. He became duke of Burgundy on his father's death in 921, and having married Emma, daughter of Robert duke of the Franks, assisted his father-in-law to drive the Frankish king, Charles III. (the Simple), from his throne. Robert then became king of the Franks, and when he was killed in battle in June 923 he was succeeded by Rudolph, who was crowned at Soissons in the following month. Giving Burgundy to his brother-in-law Giselbert of Vergi (d. 956), the new king was fully occupied in resisting the attacks of the Normans, and in combating the partisans of Charles the Simple; but his enterprises were mainly unsuccessful, and his authority was not generally recognized. But when engaged in a struggle with his brother-in-law, Herbert II. count of Vermandois, over the possession of the county of Laon, Rudolph experienced happier fortunes. At Limoges a great victory was gained over the Normans, whose . duke, William I., did homage to him in 933; invasions of Aquitaine led to his recognition as king by the powerful lords of that district; and Herbert of Vermandois was defeated and put to flight. In 93s peace was made between these rivals; and on the 14th of January 936 Rudolph died at Auxerre, leaving no

See W. Lippert, Konig Rudolf von Frankreich (Leipzig, 18

RUDOLPH (d. 1080), German king, and duke of Swabia, opponent of the emperor Henry IV., was a son of Kuno count of Rheinfelden, who possessed estates in both Burgundy and Swabia. He received the duchy of Swabia from Agnes, regent and mother of the young king, Henry IV., in 1057, and two years later married the king's sister Matilda (1045-1060), and was made administrator of the kingdom of Burgundy, or Aries. Differences soon arose between the king and his brother-in-law, whose loyalty was suspected during the Saxon War of 1073. When Henry was excommunicated and deposed by pope Gregory VII., the princes met at Forchheim, and elected Rudolph as German king. He renounced the right of investi- ture, disclaimed any intention of making the crown hereditary in his family, and was crowned at Mainz on the 27th of March 1077. He found no support in

Swabia, but, uniting with the Saxons, won two victories over Henry's troops, and, in 1080, was recognized by the pope. On the 15th of October 1080, Rudolph was severely wounded at Hohenmolsen, and died the next day. He was buried at Merseburg, where his beautiful bronze tomb is still to be seen.

See O. Grund, Die Wahl Rudolfs von Rheinfelden zum Gegenkonig (Leipzig, 1880).

RUDOLPH, or Raotjx, known as Rudolph Glaber (Rudolph the Bald) (d. c. 1050), French chronicler, was born in

Burgundy about 985, and was in turn an inmate of the mon- asteries of St Leger at Champeaux and St Benigne at Dijon, afterwards entering the famous abbey of Cluny, and becoming a monk at St Germain at Auxerre before 1039. He also appears to have visited Italy. His Historiarum sui temporis libri V ., dedicated to St Odilon, abbot of Cluny, purports to be a uni- versal history from 900 to 1044; but is an irregular narration of events in France and Burgundy. Rudolph was a strong believer in the approaching end of the world.

The Historiarum was first printed in 1 596, and published by A. Duchesne in the Historiae Francorum Scriptores, tome iv. (Paris, 1639-49). Extracts are printed in the Monumenta Germaniae historica, Band vii. ; but perhaps the best edition of the work is the one edited by M. Prou in the Collection de textes pour servir a Vetude et I ' enseignement de Vhistoire (Paris, 1886). Rudolph also wrote a Vita S. Gulielmi, abbatis S. Benigni, published by J. Mabillon in the Acta Sanctorum, tome vi. (Paris, 1668).

See A. Molinier, Les Sources de Vhistoire de France, tome ii. (Paris, 1902); and A. Potthast, Bibliotheca historica (Berlin, 1896).

RUDOLSTADT, a town of Germany, capital of the princi- pality of Schwarzburg-Rudolstadt, and the chief residence of the prince, lies on the left bank of the Saale, 18 m. S.W. of Jena, by the railway Grossheringen-Saalfeld, in one of the most beautiful districts of Thuringia. Pop. (1905) 12,494. The picturesque town is a favourite tourist resort. Besides con- taining the government buildings of the little principality, Rudolstadt is well provided with schools and other institutions, including a library of 65,000 volumes. The residence of the prince is the Heidecksburg, a palace on an eminence 200 ft. above

the Saale, which was rebuilt after a fire in 1735, and contains a picture gallery, a magnificent banqueting hall and a library. The Ludwigsburg, another palace in the town, built in 1742, accommodates the natural history collections belonging to the prince. The principal church dates from the end of the 15th century and contains tombs and effigies of many former princes. In the Anger, a public park between the town and the river, is the theatre. The Rudolsbad — a handsome hydro- pathic establishment with a richly decorated interior — lying amidst extensive grounds, is also noticeable. Various memorials in and near the town commemorate the visits of Schiller to the neighbourhood in 1787 and 1788. The industries of the place include the manufacture of porcelain, chocolate and dye- stuffs, wool-spinning and bell-founding.

The name of Rudolstadt occurs in an inventory of the posses- sions of the abbey of Hersfeld in the year 800. After passing into the possession of the German kings and then of the rulers of Orlamiinde and of Weimar, it came into the hands of the counts of Schwarzburg in 1335. Its civic rights were confirmed in 1404, and since 1599 it has been the residence of the ruling house of Schwarzburg-Rudolstadt.

See Renovanz, Chronik von Rudolstadt (Rudolstadt, i860); Anemiiller, Geschichtsbilder aus der Vergangenheit Rudolstadts (Rudolstadt, 1888); and Woerl, Rudolstadt (2nd ed., Leipzig,

1890).

RUDRA (probably from the root rud, ” to howl,” hence ” the howler “), in Hindu Vedic mythology, a storm god, and father of the Maruts who are frequently called Rudriyas. He shoots tempests at the earth, but is not essentially a malevolent deity, being invoked as a protector of cattle. In the Atharvaveda he is lord of life and death, and in later Hinduism one of the Hindu trinity, the god Siva.

See A. A. Macdonell, Vedic Mythology (Strassburg, 1897); Sir William Muir, Original Sanskrit Texts, iv. 299-420.

RUE (Fr. rue, Lat. ruta, from Gr. pvrrj, the Pelopon- nesian word for the plant known as iriyyavov), the name of a woody or bushy herb, belonging to the genus Ruta, especially Ruta graveolens, the ” common rue,” a plant with bluish green spotted leaves and greenish yellow flowers. It has a strong pungent smell and the leaves have a bitter taste. The plant was much used in medieval and later medicine as a stimulative and irritant drug. It was commonly supposed to be much used by witches. From its association with ” rue,” sorrow,

repentance (O. Eng. hreow, from hreowan, to be sorry

for, cf. Ger. reuen), the plant was also known as ” herb of grace,” and was taken as the symbol of repentance.

RUEDA, LOPE DE (i5io?-is6s?), Spanish dramatist, was born early in the 16th century at Seville, where, according to Cervantes, he worked as a .metal-beater. His name first occurs in 1554 as acting at Benavente, and between 1558 and 1 561 he was manager of a strolling company which visited Segovia, Seville, Toledo, Madrid, Valencia and Cordova. In the last-named city Rueda fell ill, and on the 21st of March 1565 made a will which he was too exhausted to sign; he probably died shortly afterwards, and is said by Cervantes to have been buried in Cordova cathedral. He was twice married; first to a disreputable actress named Mariana, who became the mistress of the duke de Medinaceli; and second to Rafaela Angela, who bore him a daughter. His works were issued posthumously in 1567 by Timoneda, who toned down certain passages in the texts. Rueda’s more ambitious plays are mostly adapted from the Italian; in Eufemia he draws on Boccaccio, in Medora he utilizes Giancarli’s Zingara, in Armelina he combines Raineri’s Attilia with Cecchi’s Servigiale, and in Los Enganados he uses Gl’Ingannati, a comedy produced by the Intronati, a literary society at Siena. These follow the original so closely that they give no idea of Rueda’s talent; but in his pasos or prose interludes he displays an abundance of riotous humour, great knowledge of low life, and a most happy gift of dialogue. His predecessors mostly wrote for courtly audiences or for the study; Rueda with his strollers created a taste for the drama which he was able to gratify, and he is admitted both by Cervantes and Lope de Vega to be the true founder of the national theatre.

His works have been reprinted by the marquis de la Fuensanta del Valle in the Coleccion de libros raros 6 curiosos, vols, xxiii. and xxiv.

RUEIL, a town of N. France, in the department of Seine-et- Oise, at the W. foot of Mt Valerien, 6 m. W. of Paris by tramway. Pop. (1906) 10,439. Rueil has a church rebuilt under Napoleon III. in exact imitation of a previous church in the Renaissance style, and containing the tombs of the Empress Josephine and her daughter Hortense de Beauharnais. In the 17th century Richelieu built a chateau which no longer exists. Rueil has important photographic works and manufactures of lime and cement, &c. Close to the town is the chateau of Malmaison, a building of the 18th century famous as the residence of the empress Josephine. It was afterwards occupied by Maria Christina, queen of Spain, and by the empress Eugenie. In 1900

the owner, Daniel Osiris, presented it and the park to the nation; the apartments have been as far as possible restored to the condition in which they were when inhabited by Josephine and Napoleon.

RUFF, a bird so called from the very beautiful and remark- able frill of elongated feathers that, just before the breeding- season, grow thickly round the neck of the male, who is considerably larger than the female, known as the reeve. In many respects this species, the Tringa pugnax of Linnaeus and the Machetes pugnax of modern ornithologists, is one of the most singular in existence. The best account is that given in 1813 by G. Montagu (Sup pi. Orn. Dictionary), who seems to have been struck by the peculiarities of the species, and, to investigate them, visited the fens of Lincolnshire, possibly excited thereto by the example of T. Pennant, whose information, collected there in 1769, was of a kind to provoke further inquiry, while Daniel {Rural Sports, iii. p. 234) had added some other parti- culars, and subsequently G. Graves in 1816 repeated in the same district the experience of his predecessors. Since that time the great changes produced by the drainage of the fen-country have banished this species from nearly the whole of it, so that R. Lubbock (Obs. Fauna of Norfolk, pp. 68-73) and H. Steven- son (Birds of Norfolk, ii. pp. 261-271) can alone be cited as modern witnesses of its habits in England, while the trade of netting or snaring ruffs and fattening them for the table has for many years practically ceased.

The cock bird, when, to use the fenman's expression, he has

not " his show on," and the hen at all seasons, offer no very remarkable deviation from ordinary sandpipers; outwardly 1 there is nothing, except the unequal size of the two sexes, to rouse suspicion of any abnormal peculiarity. But when spring comes all is changed. In a surprisingly short time the feathers clothing the face of the male are shed, and their place is taken by papillae or small caruncles of bright yellow or pale pink. From each side of his head sprouts a tuft of stiff curled feathers, while the feathers of the throat change colour, and beneath and around it sprouts the frill or ruff already mentioned as giving the bird his name. The feathers which form this remarkable adornment are, like those of the " ear-tufts," stiff and incurved at the end, but much longer — measuring more than 2 in. They are closely arrayed, capable of depression or elevation, and form a shield to the front of the breast impenetrable by the bill of a rival. 2 More

extraordinary than this, from one point of view, is the great variety of coloration that obtains in these temporary outgrowths. Considering the really few colours that the birds exhibit, the variation is something marvellous, so that fifty examples may be compared without finding a very close resemblance between any two of

Ruff.

them, while the individual variation is increased by the ” ear- tufts,” which generally differ in colour from the frill. The colours range from deep black to pure white, passing through chestnut or bay, and many tints of brown or ashy-grey, while often the feathers are more or less closely barred with some darker shade, and the black is very frequently glossed with violet, blue or green — or, in addition, spangled with white grey or gold-colour. The white, on the other hand, is not rarely freckled, streaked, or barred with grey, rufous-brown or black. In some examples the barring is most regularly concentric, in others more or less broken-up or undulating, and the latter may be said of the streaks. It was ascertained by Montagu, and has since been confirmed by A. D. Bartlett, that every ruff assumes tufts and frill exactly the same in colour and markings as those he wore in the preceding season; and thus, polymorphic as is the male as a species, as an individual he is unchangeable. The white frill is said to be the rarest, and birds exhibiting it have white necks even in winter.

That all this wonderful ” show ” is the consequence of the polygamous habit of the ruff can scarcely be doubted. No

1 Internally there is a great difference in the form of the posterior margin of the sternum, as long ago remarked by Nitzsch.

2 This ” ruff ” has been compared to that of Elizabethan or Jacobean costume, but it is essentially different, since that was open in front and widest and most projecting behind, whereas the bird’s decorative apparel is most developed in front and at the sides and scarcely exists behind.

other species of Limicoline bird has, so far as is known, any tendency to it. Indeed, in many species of Limicolae, as the dotterel, the godwits (q.v.), phalaropes and perhaps some others, the female is larger and more brightly coloured than the male, who in such cases seems to take upon himself some at least of the domestic duties. Both Montagu and Graves, to say nothing of other writers, state that the ruffs, in England, were far more numerous than the reeves; and their testimony can

hardly be doubted; though in Germany J. F. Naumann (Vog. Deutschland's, vii. p. 544) considers that this is only the case in the earlier part of the season, and that later the females greatly outnumber the males. By no one have the ruff's characteristics been more happily described than by J. Wolley, in a communication to W. C. Hewitson (Eggs of Brit. Birds, 3d ed., p. 346), as follows: —

" The ruff, like other fine gentlemen, takes much more trouble with his courtship than with his duties as a husband. Whilst the reeves are sitting on their eggs, scattered about the swamps, he is to be seen far away flitting about in flocks, and on the ground dancing and sparring with his companions. Before they are con- fined to their nests, it is wonderful with what devotion the females are attended by their gay followers, who seem to be each trying to be more attentive than the rest.. Nothing can be more expressive of humility and ardent love than some of the actions of the ruff. He throws himself prostrate on the ground, with every feather on his body standing up and quivering; but he seems as if he were afraid of coming too near his mistress. If she flies off, he starts up in an instant to arrive before her at the next place of alighting, and all his actions are full of life and spirit. But none of his spirit is expended in care for his family. He never comes to see after an enemy. In the [Lapland] marshes, a reeve now and then flies near with a scarcely audible ka-ka-kuk; but she seems a dull bird, and makes no noisy attack on an invader."

The breeding-grounds of the ruff extend from Great Britain across N. Europe and Asia; but the birds become less numerous towards the E. They winter in India, reaching even Ceylon, and Africa as far as the Cape of Good Hope. The ruff also occasionally visits Iceland, and there are several well-authen- ticated records of its occurrence on the E. coast of the United States, while an example is stated (Ibis, 1875, p. 332) to have been received from the N. of S. America. (A. N.)

RUFFIAN (Fr. rufian, It. ruffiano), a brutal, violent person, a swaggering, low bully. The etymology is obscure, but the word has been connected with " ruffler," a bully, swaggerer, one who "ruffles" (M. Du. rofieln, to pander). An early derivation, quoted in Du Cange, derives it from Lat. rufus, red, as the hair of the meretrices, with whom the ruffiani were generally associ- ated, was red or gold, as contrasted with the black hair of sober matrons.

RUFFO, FABRIZIO (1744-1827), Neapolitan cardinal and politician, was born at San Lucido in Calabria on the 16th of September 1744. His father, Litterio Ruffo, was duke of Baran- ello, and his mother, Giustiniana, was of the family of Colonna. Fabrizio owed his

education to his uncle, the cardinal Thomas Ruffo, then dean of the Sacred College. In early life he secured the favour of Giovanni Angelo Braschi di Cesera, who in 1775 became Pope Pius VI. Ruffo was placed by the pope among the chierici di camera — the clerks who formed the papal civil and financial service. He was later promoted to be treasurer-general, a post which carried with it the ministry of war. Ruffo's conduct in office was diversely judged. Colletta, the historian of Naples, speaks of him as corrupt, and Jomini repeats the charge. Ruffo's biographer, Sachinelli, says that he incurred hostility by restrict- ing the feudal powers of some of the landowners in the papal states. In 1791 he was removed from the treasurership, but. was created cardinal on the 29th of September, though he was not in orders. He never became a priest. Ruffo went to Naples, where he was named administrator of the royal domain of Caserta, and received the abbey of S. Sophia in Benevento in commendam. When in December 1798 the French troops advanced on Naples, Ruffo fled to Palermo with the royal family. He was chosen to head a royalist movement in Calabria, where his family, though impoverished by debt, exercised large feudal powers. He was named vicar-general on the 25th of January i7oo~ On the 8th of February he landed at

La Cortona with a small following, and began to raise the so- called " army of the faith " in association with Fra Diavolo and other brigand leaders. Ruffo had no difficulty in upsetting the republican government established by the French, and by June had advanced to Naples (see Naples and Nelson). The campaign has given rise to much controversy. Ruffo appears to have lost favour with the king by showing a tendency to spare the republicans. He resigned his vicar-generalship to the prince of Cassero, and during the second French conquest and the reigns of Joseph Bonaparte and Murat he lived quietly in Naples. Some notice was taken of him by Napoleon, but he never held an important post. After the restoration of the Bourbons he was received into favour. During the revolu- tionary troubles of 1822 he was consulted by the king, and was even in office for a very short time as a " loyalist " minister. He died on the 13th of December 1827.

The account of Ruffo given in Cqlletta's History of Naples (English translation, Edinburgh, i860) must be taken with caution. Colletta was a violent liberal partisan, who wrote in exile, and largely from memory. He has been corrected by the Duca de Lauria, Intorno alia storia del Reatne di Napoli di Pietro Colletta (Naples, 1877). Ruffo's

own side of the question is stated in Memorie Storiche sulla vita del Cardinale Fabrizio Ruffo, by Domenico Sacchinelli (Naples, 1836). See also Fabrizio Ruffo: Revolution and Gegen-Revolution von Neapel, by Baron von'Helfert (Vienna, 1882).

RUFIJI, a large river of German East Africa, entering the sea by a considerable delta, between 7° 45′ and 8° 13′ S. Its upper basin, which extends from N. to S. through over 300 m., is drained by three main branches, which unite to form the lower Rufiji. Of the three upper branches, the two southern, the Luvegu and the Ulanga, though shorter than the northern- most (the Ruaha), carry a greater volume of water, as they come from a more rainy region, and by their junction in 8° 35′ S-, 37° 25′ E., the Rufiji proper may be said to be formed.

The Luvegu rises 10 50′ S., 35° 50′ E., and flows N.E. in a wooded valley, generally narrow, and bordered by a broken country in great part uninhabited and covered with thin forest. In' its lower course it is a large stream — 100 to 150 yds. wide.

The Ulanga is formed by a number of streams descending from the outer escarpment of the high plateau which runs N.E. from the head of Lake Nyasa and in Uhehe becomes broken up in ranges of mountains. The most important head-stream, the Ruhudye, rises in about 9° 30′ S., 34 40′ E. As a whole, the Ulanga valley is broad, level and swampy, the river running in a very winding course and sending off many diverging arms. It is navigable throughout the greater part of its course, having even in the dry season a general depth of 3 to 12 ft., with a width of 40 to 120 yds. In April and May nearly all the streams overflow their banks and cover a great part of the plain.

Just below the junction of the Luvegu and Ulanga, the Rufiji flows through a narrow pass by the Shuguli falls, and continues N.E. in a fairly straight course to the junction of the' Ruaha, in 7° 55′ S-i 37° 5 2 ' E. The most remote branches of the Ruaha rise N. of Lake Nyasa in the Livingstone mountains. The united stream makes a wide sweep to the N. of the Uhehe mountains,' from which it receives various tributaries, finally flowing S.E. and E. to the Rufiji. A little below the junction the Rufiji is broken by the Pangani falls, but is thence navigable by small steamers to its delta. In this part of its course the river receives no large tributaries but sends out divergent channels. The country on either side is a generally level plain, inundated, on the south, in the rains, and the river varies in width from 100 to 400 yds., with an average current of 3 m. an hour. The main mouth of the river is that known as Simba Uranga, the bar of which can be crossed by ocean vessels at high water, but all the branches are very shallow as

the apex of the delta is approached. Much of the delta is suited for rice- growing.

RUFINUS, TYRANNIUS, presbyter and theologian, was born at or near Aquileia at the head of the Adriatic, probably be- tween 340 an 345. In early manhood he entered the cloister as a catechumen, receiving baptism about 370. About the same time a visit of Jerome to Aquileia led to a close friendship between the two, and shortly after Jerome's departure for the East Rufinus also was drawn thither (in 372 or 373) by his interest in its theology and monasticism. He first settled in Egypt, hearing the lectures of Didymus, the Origenistic head of the catechetical school at Alexandria, and also cultivating friendly relations with Macarius the elder and other ascetics in the desert. In Egypt, if not even before leaving Italy, he

had become intimately acquainted with Melania, a wealthy and devout Roman widow; and when she removed to Palestine, taking with her a number of clergy and monks on whom the persecutions of the Arian Valens had borne heavily, Rufinus (about 378) followed her. While his patroness lived in a con- vent of her own in Jerusalem, Rufinus, at her expense, gathered together a number of monks in a monastery on the Mount of Olives, devoting himself at the same time to the study of Greek theology. This combination of the contemplative life and the life of learning had already developed in the Egyptian monasteries. When Jerome came to Bethlehem in 386, the friendship formed at Aquileia was renewed. Another of the intimates of Rufinus was John, bishop of Jerusalem, and formerly a Nitrian monk, by whom he was ordained to the priesthood in 390. In 394, in consequence of the attack upon the doctrines of Origen made by Epiphanius of Salamis during a visit to Jerusalem, a fierce quarrel broke out, which found Rufinus and Jerome on different sides; and, though three years afterwards a formal reconciliation was brought about between Jerome and John, the breach between Jerome and Rufinus remained unhealed.

In the autumn of 397 Rufinus embarked for Rome, where, finding that the theological controversies of the East were exciting much interest and curiosity, he published a Latin translation of the Apology of Pamphilus for Origen, and also (398-99) a somewhat free rendering of the wepl apx&v (or De Principiis) of that author himself. In the preface to the latter work he referred to Jerome as an admirer of Origen, and as having already translated some of his works with modifications of ambiguous doctrinal expressions. This allu- sion annoyed Jerome, who was exceedingly sensitive as to his reputation for orthodoxy, and the consequence was a bitter pamphlet war, very

wonderful to the modern onlooker, who finds it difficult to see anything discreditable in the accusation against a biblical scholar that he had once thought well of Origen, or in the countercharge against a translator that he had avowedly exercised editorial functions as well. At the instigation of Theophilus of Alexandria, Anastasius (pope 398-402) summoned Rufinus from Aquileia to Rome to vindicate his orthodoxy; but he excused himself from a personal attend- ance in a written Apologia pro fide sua. The pope in his reply expressly condemned Origen, but left the question of Rufinus's orthodoxy to his own conscience. He was, however, regarded with suspicion in orthodox circles (cf. the Decretum Gelassii, § 20) in spite of his services to Christian literature. In 408 we find Rufinus at the monastery of Pinetum (in the Campagna?); thence he was driven by the arrival of Alaric to Sicily, being accompanied by Melania in his flight. In Sicily he was engaged in translating the Homilies of Origen when he died in 410.

The original works of Rufinus are — (1) De Adulteratione Librorum Origenis — an appendix to his translation of the Apology of Pamphilus, and intended to sh"ow that many of the features in Origen's teaching which were then held to be objectionable arise from interpolations and falsifications of the genuine text; (2) De Benedictionibus XII Patriarckarum Libri II— an exposition of Gen. xlix. ; (3) Apologia s. Invectivarum in Hieronymum Libri II; (4) Apologia pro Fide Sua ad Anastasium Pontificem; (5) Historia Eremitica — consisting of the lives of thirty-three monks of the Nitrian desert ; x (6) Expositio Symboli, a commentary on the creed of Aquileia comparing it with that of Rome, which is valuable for its evidence as to church teaching in the 4th century. The Historiae Ecclesiasticae Libri XI of Rufinus consist partly of a free translation of Eusebius (10 books in 9) and partly of a continuation (bks. x. and xi.) down to the death of Theo- dosius the Great. The other translations of Rufinus are — (1) the Instituta Monachorum and some of the Homilies of Basil ; (2) the Apology of Pamphilus, referred to above; (3) Origen's Principia; (4) Origen's Homilies (Gen.-Kings, also Cant, and Rom.) ;(5) Opuscula of Gregory of Nazianzus; (6) the Sententiae of Sixtus, an unknown Greek philosopher; (7) the Sententiae of Evagrius; (8) the Clementine Recognitions (the only form in which that work is now extant) ; (9) the Canon Paschalis of Anatolius Alexandrinus. We can hardly overestimate the influence which Rufinus exerted on Western theologians by thus putting the great Greek fathers into the Latin tongue. D. Vallarsi's uncompleted edition of Rufinus (vol. i. fol., Verona, 1745) contains the De Benedictionibus, the Apologies, the

1 On this work see Dom Butler in Texts and Studies, vi. i. pp. 10 ff.

Expositio Symboli, the Historia Eremitica and the two original books of the Hist. Eccl. See also Migne, Patrol, (vol. xxi. of the Latin series). For the translations, see the various editions of Origen, Eusebius, &c.

See W. H. Freemantle in Diet. Chr. Biog. iv. 555-60; A. Ebert, Attg. Gesch. d. Litt. d. Mittelalters im Abendlande, i. 321-27 (Leipzig, 1889); G. Kriiger in Hauck-Herzog's Real-encyk. fur prot. Tkeol., where there is a full bibliography.

RUFUS, GAIUS VALGIUS, Lain poet, friend of Horace and Maecenas, and consul in 12 B.C. He was known as a writer of elegies and epigrams, and his contemporaries believed him capable of great things in epic. The author of the pane- gyric on Messalla declares Rufus to be the only poet fitted to be the great man's Homer. Rufus did not, however, confine himself to poetry. He discussed grammatical questions by correspondence, translated the rhetorical manual of his teacher Apollodorus of Pergamum, and began a treatise on medicinal plants, dedicated to Augustus. Horace addressed to him the ninth ode of the second book.

Fragments in R. Weichert, Poetarum Latinorum Vitae et Carminum Reliquiae (1830); R. linger, De C. Valgii Rufi Poematis (1848); O. Ribbeck, Geschichte der romischen Dichtung (1889), ii. ; M. Schanz, Geschichte der romischen Litter atur (1899), ii. I; Teuffel, Hist, of Roman Literature (Eng. trans., 1900), 241.

RUFUS, LUCIUS VARIUS {c 74-14 B.C.), Roman poet of the Augustan age. He was the friend of Virgil, after whose death he and Plotius Tucca prepared the Aeneid for publica- tion, and of Horace, for whom he and Virgil obtained an intro- duction to Maecenas. Horace speaks of him as a master of epic and the only poet capable of celebrating the achievements of Vipsanius Agrippa {Odes, i. 6) ; Virgil (under the name of Lycidas, Ed. ix. 35) regrets that he had hitherto produced nothing comparable to the work of Varius or Helvius Cinna. From Macrobius {Saturnalia, vi. 1, 39; 2, 19) we learn that Varius composed an epic poem De Morte, some lines of which are quoted as having been imitated or appropriated by Virgil; Horace {Sat. 1. 10, 43) probably alludes to another epic, and, according to the scholiast on Epistles, i. 16, 27-29, these three lines are taken bodily from a panegyric of Varius on Augustus. But his most famous literary production was the tragedy Thyesles, which Quintilian {Inst. Oral. x.

1, 98) declares fit to rank with any of the Greek tragedies. The didascalia (which is preserved in a Paris MS.) informs us that it was produced at the games celebrated (29 B.C.) by Augustus in honour of the victory at Actium, and that Varius received a present of a million sesterces from the emperor.

Fragments in E. Bahrens, Frag. Poetarum Romanorum (1886) ; monographs by A. Weichert (1836) and R. Unger (1870, 1878, 1898); M. Schanz, Geschichte der romischen Litteratur (1899), ii. 1; Teuffel, Hist, of Roman Literature (Eng. trans., 1900), 223.

RUG, a term of Scandinavian origin (cf. Swed. rugg, rough hair; Norw. dial, rugga, rough), and probably connected with ” rough ” and ” rag,” originally for a kind of coarse woollen material, like frieze; hence it is used of a piece of thick material used as a wrap or covering for the knees or body in travelling or in bed, and especially for a thick mat or small-sized carpet laid on the floor (see Carpet).

RUGBY, a market town in the Rugby parliamentary division of Warwickshire, England, finely situated on a tableland rising from the S. bank of the Avon, near the Oxford Canal. Pop. of urban district (1901), 16,830. It is an important junction op the London & North-Western railway, by which it is 82! m. N.W. from London; it is served also by the Great Central railway and by a branch of the Midland railway from Leicester.

The boys’ school, ranking as one of the most famous public schools in England, was founded and endowed under the will (1567) of Laurence Sheriff, a merchant grocer and servant to Queen Elizabeth, and a native either of Rugby or of the neigh- bouring village of Brownsover. The endowment consisted of the parsonage of Brownsover, Sheriff’s mansion house in Rugby, and one-third (8 acres) of his estate in Middlesex, near the Foundling Hospital, London, which, being let on building leases, gradually increased to about £5000 a year. The full

endowment was obtained in 1653. The school originally stood opposite the parish church, and was removed to its present site on the S. side of the town between 1740 and 17 50. In 1809 it was rebuilt from designs by Henry Hakewill (i77r- 1830); the chapel, dedicated to St Lawrence, was added in 1820. At the tercentenary of the school in 1867 subscriptions were set on foot for founding scholarships, building additional schoolrooms, rebuilding or enlarging the chapel and other objects. The chapel was rebuilt and reconsecrated in 1872, and further additions were made in 1898. A swimming bath was erected in 1876; the Temple observatory, containing a fine equatorial

refractor by Alvan Clark, was built in 1877, and the Temple reading-room with the art museum in 1878. The workshops underneath the gymnasium were opened in 1880, and a new big school and class-rooms were erected in 1885. From about 70 to 1777 the numbers attending the school have increased to nearly 600. A great impulse' was given to the progress of the school during the headmastership of Thomas Arnold, 1827-42. Among Arnold's successors were Archibald Campbell Tait and Frederick Temple, both after- wards archbishops of Canterbury.

The parish church of «St Andrew was rebuilt from designs by W. Butterfield and reconsecrated in 1879. A tower and spire were added in 1895. An aisle commemorates John Moultrie (1799-1874), rector, widely known as the "poet pastor." The church of Holy Trinity is by Sir G. G. Scott, and the Roman Catholic church of St Marie by A. W. Pugin. Trade is mainly agricultural; there is a large cattle market, and several fairs are held annually.

The early history of Rugby is obscure, but a settlement of the Danes is presumed from the name, and from the neighbouring tract of Dunsmore Heath (Danesmoor). Rugby was originally a hamlet of the adjoining parish of Clifton-on-Dunsmore,, and is separately treated of as such in Domesday Book. Ernaldus de Bosco (Ernald de Bois), lord of the manor of Clifton, seems to have erected the first chapel in Rugby, in the reign of Stephen, about 1 140. It was afterwards granted by him, with certain lands, to endow the abbey of St Mary, Leicester, which grant was confirmed by his successors and by royal charter of Henry II. In the second year of King John (1200) a suit took place between Henry de Rokeby, lord of the manor of Rugby, and Paul, abbot of St Mary, Leicester, which resulted in the former obtaining possession of the advowson of Rugby, on condition of homage and service to the abbot of Leicester. By virtue of this agreement the chapel was converted into a parish church and the vicarage into a rectory.

RUGE, ARNOLD (1802-1880), German philosopher and political writer, was born at Bergen, in the island of Riigen, on the 13th of September 1802. He studied at Halle, Jena and Heidelberg, and became an adherent of the party which sought to create a free and united Germany. For his zeal he was confined for five years in the fortress of Kolberg, where he studied Plato and the Greek poets. On his release in 1830 he published Schill und die Seinen, a tragedy, and a translation of Oedipus in Colonus. Ruge settled in Halle, where in 1837 with E. T. Echtermeyer he founded the Hallesche Jahrbucher fur deutsche Kunst und Wissenschaft. In this periodical he discussed the

questions of the time from the point of view of the Hegelian philosophy. The Jahrbucher was detested by the orthodox party in Prussia; and was finally suppressed by the Saxon government in 1843. In Paris Ruge tried to act with Karl Marx as co-editor of the Deutsch-Franzosische Jahr- bucher, but had little sympathy with Marx's socialistic theories, and soon left him. In the revolutionary movement of 1848 he organized the Extreme Left in the Frankfort parliament, and for some time he lived in Berlin as the editor of the Die Reform. The Prussian government intervened and Ruge soon afterwards left for Paris, hoping, through his friend Alexandre Ledru-Rollin, to establish relations between German and French republicans; but in 1849 both Ledru-Rollin and Ruge had to take refuge in London. Here, in company with Giuseppe Mazzini and other advanced politicians, they formed a " Euro- pean Democratic Committee." From this Ruge soon withdrew, and in 1850 went to Brighton, where he supported himseH by teaching and writing. In 1866 and 1870 he vigorously

supported Prussia against Austria, and Germany against France. In his last years he received from the German government apensionof iooo marks. He died on the 31st of December 1880.

Ruge was a leader in religious and political liberalism, but did not produce any work of enduring importance. In 1846-48 his Gesammelte Schriften were published in ten volumes. After this time he wrote, among other books, Unser System, Revolutions- novellen, Die Loge des Humanismus, and A us fruherer Zeit (his memoirs). He also wrote many poems, and several dramas and romances, and translated into German various English works, including the Letters of Junius and Buckle's History of Civilization. His Letters and Diary (1825-80) were published by Paul Nerrlich (Berlin, 1885-87). See A. W. Bolin's L. Feuerbach, pp. 127-52 (Stuttgart, 1891).

RUGELEY, a market town in the Lichfield parliamentary division of Staffordshire, England, in the Trent valley. Pop. of urban district (1901), 4447. The London & North-Western railway has stations on the main line (Trent Valley, 124ˆ m. N.W. from London), and at the town, on a branch line to Walsall. The Grand Trunk canal here follows the Trent. To the S.W. lie the hills of Cannock Chase. The church of St Augustine is modern; of the parish church of the 14th century only the tower and chancel remain? The municipal offices, market hall and assembly-room are contained in one building (1879). A grammar

school was founded in 1611. There are ironfoundries, corn-mills and tanneries; and the parish includes several collieries.

RUGEN, an island of Germany, in the Baltic, immediately opposite Stralsund, ij m. off the north-west coast of Pomerania in Prussia, from which it is separated by the narrow Strelasund, or Bodden. Its shape is exceedingly irregular, and its coast- line is broken by numerous bays and peninsulas, sometimes of considerable size. The general name is applied by the natives only to the roughly triangular main trunk of the island, while the larger peninsulas, the landward extremities of which taper to narrow necks of land, are considered to be as distinct from Riigen as the various adjacent smaller islands which are also included for statistical purposes under the name. The chief peninsulas are those of Jasmund and Wittow on the north, and Monchgut, at one time the property of the monastery of Eldena, on the south-east ; and the chief neighbouring islands are Ummanz and Hiddensee, both off the north-west coast. Riigen is the largest island in Germany. Its greatest length from N. to S. is 32 m.; its greatest breadth is 25J m.; and its area is 377 sq. m. The surface gradually rises towards the west to Rugard (335 ft.) — the ” eye of Riigen ” — near Bergen, \>ut the highest point is the Hertaburg (505 ft.) in Jasmund. Erratic blocks are scattered throughout the island, and the roads are made with granite. Though much of Riigen is flat and sandy, the fine beech woods which cover a great part of it, and the bold northern coast scenery combine with the convenient sea-bathing offered by the various villages around the coast to attract large numbers of visitors. The most beauti- ful and attractive part of the island is the peninsula of Jasmund, which terminates to the north in the Stubbenkammer (Slavonic for ” rock steps “), a sheer chalk cliff, the summit of which, the Konigsstuhl, is 420 ft. above the sea. The east of Jasmund is clothed with an extensive beech wood called the Stubbenitz, in which lies the Borg, or Herta Lake. Connected with Jas- mund by the narrow isthmus of Schabe to the west is the peninsula of Wittow, the most fertile part of the island. At its north-west extremity rises the height of Arcona, with a lighthouse.

A ferry connects the island with Stralsund, and from the landing-stage at Altefahr a railway traverses the island, passing the capital Bergen to Sassnitz, on the north-east coast. Hence a regular steamboat service connects with Trelleborg in Sweden, thus affording direct communication between Berlin and Stock- holm. The other chief places are Garz, Sagard, Gingst and Putbus, the last being the old capital of a barony of the princes of Putbus. Sassnitz, Gohren, Sellin and Lauterbach- Putbus are among the favourite bathing resorts. Schoritz was the birthplace of the patriot and poet, Ernst Moritz

.Arndt.

Ecclesiastically Riigen is divided into 75 parishes, in which the pastoral succession is said to be abnost hereditary. The in- habitants are distinguished from those of the mainland by peculiarities of dialect, costume and habits; and even the various peninsulas differ from each other in these particulars. The peninsula of Monchgut has best preserved its peculiarities; but there, too, primitive simplicity is yielding to the influence of the annual stream of summer visitors. The inhabitants raise some cattle, and Riigen has long been famous for its geese; but the only really considerable industry is fishing,— the herring-fishery being especially important. Riigen, with the neighbouring islands, forms a governmental department, with a population (1905) of 47,023.

The original Germanic inhabitants of Riigen were dispossessed by Slavs; and there are still various relics of the long reign of paganism that ensued. In the Stubbenitz and elsewhere Huns' or giants' graves are common; and near the Hertha Lake are the ruins of an ancient edifice which some have sought to identify with the shrine of the heathen deity Hertha or Nerthus, referred to by Tacitus. On Arcona in Wittow are the remains of an ancient fortress, enclosing a temple which was destroyed in 1 1 68 by the Danish king Waldemar I . , when he made himself master of the island. Riigen was ruled then by a succession of native princes, under Danish supremacy, until 1218. After being for a century and a half in the possession of a branch of the ruling family in Pomerania, it was finally united with that duchy in 1478, and passed with it into the possession of Sweden in 1648. With the rest of Western Pomerania Riigen has belonged to Prussia since 1815.

See Fock, Riigensch-pommersche Geschichten (6 vols., Leipzig, 1861-72); R. Baier, Die Insel Riigen nach ihrer archaologischen Bedeutung (Stralsund, 1886) ; R. Credner, Rugen. Eine Inselstudie (Stuttgart, 1893) ; Edwin Miiller, Die Insel Rugen (17th ed., Berlin, 1900); Schuster, Fiihrer durch die Insel Riigen (7th ed., Stettin, 1901); Boll, Die Insel Riigen (Schwerin, 1858); O. Wendler, Geschichte Rugens seit der dltesten Zeit (Bergen, 1895) ; A. Haas, Riigensche Sagen und Mdrchen (Greifswald, 1891) ; U. John, Volkssagen aus Rugen (Stettin, 1886); and E. M. Arndt, Fairy Tales from the Isle of Rugen (London, 1896).

RUHLA, a town of Germany, partly in the duchy of Saxe- Weimar and partly in that of Saxe-Coburg-Gotha. Pop. (1905) 701 7. It stretches along the valley of the Erb in the Thuringian forest 8 m. S. of

Eisenach, and attracts a number of visitors owing to its beautiful natural surroundings and its mineral springs. Its staple industry is the making of wooden and meerschaum pipes; it has also electrical works, and some small manufactures. Ruhla, which is known locally as Die Ruhl, was famous in the middle ages for its armourers, and subsequently for its cutlers.

See Ziegler, Das Thiiringerwalddorf Ruhla (Dresden, 1876).

RUHNKEN, DAVID (17 23-1 798), one of the most illustrious scholars of the Netherlands, was of German origin, having been born in Pomerania in 1723. His parents had him educated for the church, but after two years at the university of Wittenberg he determined to live the life of a scholar. At Wittenberg Ruhnken lived in close intimacy with the two most distinguished professors, Ritter and Berger. To them he owed a thorough grounding in ancient history and Roman antiquities and litera- ture; and from them he learned a pure and vivid Latin style. At Wittenberg, too, Ruhnken derived valuable mental training from study in mathematics and Roman law. Probably nothing would have severed him from his surroundings there but a desire which daily grew upon him to explore the inmost recesses of Greek literature. Neither at Wittenberg nor at any other German university was Greek in that age seriously studied. It was taught in the main to students in divinity for the sake of the Greek Testament and the early fathers of the church. F. A. Wolf is the real creator of Greek scholarship in modern Germany, and Porson's gibe that " the Germans in Greek are sadly to seek " was barbed with truth. It is significant of the state of Hellenic studies in Germany in 1743 that their leading exponents were Gesner and Ernesti. Ruhnken was well advised by his friends at Wittenberg to seek the university of Leiden, where, stimulated by the influence of Bentley, the great scholar Tiberius Hemsterhuis had founded the only real school of Greek learning which had existed on the Continent since the days of Joseph Scaliger and Isaac Casaubon.

Perhaps no two men of letters ever lived in closer friendship than Hemsterhuis and Ruhnken during the twenty-three years which passed from Ruhnken's arrival in the Netherlands in 1743 to the death of Hemsterhuis in 1766. A few years made it clear that Ruhnken and Valckenaer were the two pupils of the great master on whom his inheritance must devolve. As his reputation spread, many efforts were

made to attract Ruhnken back to Germany, but after settling in Leiden, he only left the country once, when he spent a year in Paris, ransacking the public libraries (1755). For work achieved, this year of Ruhnken may compare even with the famous year which Ritschl spent in Italy. In 1757 Ruhnken was appointed lecturer in Greek, to assist Hemsterhuis, and in 1761 he succeeded Ouden- dorp, with the title of ” ordinary professor of history and elo- quence,” but practically as Latin professor. This promotion drew on him the enmity of some native Netherlanders, who deemed themselves (not without some show of reason) to possess stronger claims for a chair of Latin. The only defence made by Ruhnken was to publish works on Latin literature which eclipsed and silenced his rivals. In 1766 Valckenaer succeeded Hem- sterhuis in the Greek chair. The intimacy between the two colleagues was only broken by Valckenaer’s death in 1785, and stood without strain the test of common candidature for the office (an important one at Leiden) of university librarian, in which Ruhnken was successful. Ruhnken’s later years were clouded by severe domestic misfortune, and by the political commotions which, after the outbreak of the war with Eng- land in 1780, troubled the Netherlands without ceasing, and threatened to extinguish the university of Leiden. He died in

1798.

Personally, Ruhnken was as far as possible removed from being a recluse or a pedant. He had a well-knit and even hand- some frame, attractive manners (though sometimes tinged with irony), and a nature simple and healthy, and open to im- pressions from all sides. Fond of society, he cared little to what rank his associates belonged, if they were genuine men in whom he might find something to learn. His biographer even says of him in his early days that he knew how to sacrifice to the Sirens without proving traitor to the Muses. Life in the open air had a great attraction for him; he was fond of sport, and would sometimes devote to it two or three days in the week. In his bearing towards other scholars Ruhnken was generous and dignified, distributing literary aid with a free hand, and meeting onslaughts for the most part with a smile. In the records of learning he occupies an important position. He forms a principal link in the chain which connects Bentley with the modern scholarship of the Continent. The spirit and the aims of Hemsterhuis, the great reviver of Continental learning, were committed to his trust, and were faithfully maintained. He greatly widened the circle of those who valued taste and precision in classical scholarship. He powerfully aided the emancipation of Greek studies from theology; nor must it be forgotten that he first in modern times dared to think of rescuing Plato from the hands of the

professed philosophers— men pre- sumptuous enough to interpret the ancient sage with little or no knowledge of the language in which he wrote.

Ruhnken's principal works are editions of (1) Timaeus's Lexicon of Platonic Words, (2) Thalelaeus and other Greek commentators on Roman law, (3) Rutilius Lupus and other grammarians, (4) Velleius Paterculus, (3) the works of Muretus. He also occupied himself much with the history of Greek literature, particularly the oratorical literature, with the Homeric hymns, the scholia on Plato and the Greek and Roman grammarians and rhetoricians. A dis- covery famous in its time was that in the text of the work of Apsines on rhetoric a large piece of a work by Longinus was embedded. Modern views of the writings attributed to Longinus have lessened the interest of this discovery without lessening its merit. The biography of Ruhnken was written by his great pupil, Wyttenbach, soon after his death. (J. S. R.)

RUHR, a river of Germany, an important right-bank tribu- tary of the lower Rhine. It rises on the north side of the Winter- berg in the Sauerland, at a height of about 2000 ft. above the sea. It first takes a northerly and north-westerly course, and in a deep and well-wooded valley winds past the romantically

situated town of Arnsberg. Shortly after reaching Neheim it bends to the south-west, courses through the mining district around Hagen, and receives from the left the waters of the Lenne. Hence in a tortuous course it works its way past Witten, Steele, Kettwig and Mulheim, and, after a course of 142 m., discharges itself into the Rhine at Ruhrort. From this place the Ruhr canal connects it with Duisburg. The river is navigable from Witten downwards (43 m.), by the aid of eleven locks; but navigation is often greatly impeded through dearth of water.

RUHRORT, a town of Germany, in the Prussian Rhine province, situated at the junction of the Ruhr and the Rhine, in the midst of a productive coal district, 15 rn. N. of Diisseldorf and 12 E. of Crefeld by rail. Ruhrort has the largest river harbour in Europe, with quays extending nearly 5 m. along the river, and it is the principal shipping port for the coal of the Westphalian coalfield, which is despatched in the fleet of steam-tugs and barges belonging to the port. The coal is sent principally to South Germany and the Netherlands. Grain and timber are also exported and iron ore is imported. In 1905 the port was entered and cleared by over 27,000 vessels of 7,418,065 tons. The industries of the town include large iron and steel works, ship-building yards and tanneries. Ruhrort has three Evangelical and three Roman Catholic churches, and several schools and public institutions.

Rurhort is first mentioned in 1379, and obtained civic rights in 1551. Having been in the possession of the counts of La Marck, it passed into that of Brandenburg in 1614. In 1905 it was united with Duisburg and Meiderich to form a single munici- pality, the joint population being 41,416.

See Geschichte der Stadt Ruhrort (Ruhrort, 1882).

RUIZ, JUAN (c. 1283-c. 1350), Spanish poet, was born probably at Alcala de Henares, and became arch-priest of Hita. Though he draws his physical portrait in the Libro de buen amor, he gives no exact biographical details. It may be inferred from his writings that he was not an exemplary priest, and one of the manuscript copies of his poems states that he was imprisoned by order of Gil Albornoz, archbishop of Toledo. It is not known whether he was sentenced for his irregularities of conduct, or on account of his satirical reflections on his ecclesiastical superiors. Nor is it possible to fix the precise date of his imprisonment. Albornoz nominally occupied the see of Toledo from 1337 to 1368, but he fell into disgrace in 1351 and fled to Avignon. A consideration of these circumstances points to the probable conclusion that Ruiz was in prison from 1337 to 1350, but this is conjecture. What seems established is that he finished the Libro de buen amor in 1343 while in gaol, and that he was no longer arch-priest of Hita in January 1351; it is assumed that he died shortly before the latter date.

Ruiz is by far the most eminent poet of medieval Spain. His natural gifts were supplemented by his varied culture; he clearly had a considerable knowledge of colloquial (and perhaps of literary) Arabic; his classical reading was apparently not exten- sive, but he knew by heart the Disticha of Dionysius Cato, and admits his indebtedness to Ovid and to the De Amore ascribed to Pamphilus; his references to« Blanchefleur, to Tristan and to Yseult, indicate an acquaintance with French literature, and he utilizes the fabliaux with remarkable deftness; lastly, he adapts fables and apologues from Aesop, from Pedro Alfonso's Disciplina clericalis, and from medieval bestiaries. All these heterogeneous materials are fused in the substance of his versified autobiography, into which he intercalates devout songs, parodies of epic or forensic formulae, and lyrical digressions on every aspect of life. Ruiz, in fact, offers a complete picture of picaresque society in Spain during the first half of the 14th century, and his impartial irony lends a deeper tone to his rich colouring. He knows the weaknesses of both clergy and laity, and he dwells with equal complacency on the amorous adventures of great ladies, on the perverse intrigues arranged by demure nuns behind their convent

walls, and on the simpler instinctive animalism of country lasses and Moorish dancing-girls. In addition to the faculty of genial observation Ruiz has the gift of creating characters and pre- senting types of human nature: from his Don Furon is derived

the hungry gentleman in Lazarillo de Tormes, in Don Melon and Dona Endrina he anticipates Calisto and Melibea in the Celestina, and Celestina herself is developed from Ruiz' Trota- conventos. Moreover, Ruiz was justly proud of his metrical innovations. The Libro de buen amor is mainly written in the cuaderna via modelled on the French alexandrine, but he im- parts to the measure a variety and rapidity previously unknown in Spanish, and he experiments by introducing internal rhymes or by shortening the fourth line into an octosyllabic verse; or he boldly recasts the form of the stanza, extending it to six or seven lines with alternate verses of eight and five syllables. But his technical skill never sinks to triviality. All his writing bears the stamp of a unique personality, and, if he never attempts a sublime flight, he conveys with contagious force his enthusiasm for life under any conditions — in town, country, vagabondage or gaol.

His influence is visible in El Corbacho, the work of another jovial goliard, Alphonso Martinez de Toledo, arch-priest of Talavera, who wrote more than half a century before the Libro de buen amor was imitated by the author of the Celestina. Ruiz is mentioned with respect by Santillana, and that his reputa- tion extended beyond Spain is proved by the surviving fragments of a Portuguese version of the Libro de buen amor. By some strange accident he was neglected, and apparently forgotten, till 1790, when an expurgated edition of his poems was published by Tomas Antonio Sanchez; from that date his fame has steadily increased, and by the unanimous verdict of all competent judges he is now ranked as the greatest Spanish poet of his century.

An accurate edition of his works was published by M. Jean Ducamin at Toulouse in 1901, and he is the subject of Sr. D. Julio Puvol y Alonso's critical study, El Arcipreste de Hita (Madrid, 1906). (J. F.-K.)

RUKWA (sometimes also Rikwa and Hikwa), a shallow lake in German East Africa, lying 2650 ft. above the sea in a N.W. continuation of the rift-valley which contains Lake Nyasa. The sides of the valley here run in steep parallel walls 30 to 40 m. apart, from S.E. to N.W., leaving

between them a level plain extending from about 75° to 8§° S. This whole area ‘ was probably once covered by the lake, but this has shrunk so that the permanent water occupies only a space of 30 m. by 12 at the S. immediately under the E. escarpment. In the rains its extends some 40 m. farther N., and the north of the plain is likewise then covered with water to a depth of about 4 ft. The rest of the plain is a bare expanse intensely heated by the sun in the dry season, and forming a tract of foul mud near the lake shores. But in 1903-4 the level of the lake rose so that the waters covered the whole depression. The lake has two large feeders, one coming from the W., the other from the S.E. The W. feeder, the Saisi, or Momba, rises in 8o° 50′ S., 31 30′ E., and traverses a winding valley cut out of the high plateau between lakes Nyasa and Tanganyika. It enters the lake on its N.W. side. The other chief feeder, the Songwe, rises in g a 8′ S., 33° 30′ E. on the same plateau as the Saisi and flows N.W., entering Rukwa at its S. end. The Songwe is joined about 50 m. about its mouth by the Rupa, whose head-waters are in the high-lying land N.E. of Rukwa. The maximum depth of the lake is about 105 ft. Its water is very brackish and of a milky colour from the mud stirred up by the wind. It contains great quantities of fish. First seen from the north by Joseph Thomson in 1880, it was visited by Dr Kaiser, a German, in 1882, and has since been thoroughly explored by various British and German travellers.

See ” Begleitworte zu der Karte der Gebiete am sudlichen Tangan-jika- und Rukwa- See,” by Paul Sprigade, in Mitteil. v. Forsch. u. Gelehrten a. d. deutschen Schutzgebieten (Berlin, 1904), with map on the scale of 1 : 500,000.

RULHIERE (or Rulhieres), CLAUDE CARLOMAN DE (1735- 1791), French poet and historian, was born at Bondy, near Paris, on the 12th of June 1735. He became aide-de-camp to Marshal Richelieu, whom he followed through the Hanoverian campaign of 1757 and to his government at Bordeaux in 1758; and at twenty-five he was sent to St Petersburg as secretary of legation. Here he actually saw the revolution which seated

Catherine II. on the throne, and thus obtained the facts of Anecdotes sur la revolution de Russie en 1762. Catherine made repeated efforts to secure the destruction of the MS., which remained unpublished until after the empress’s death. Rul- hiere became secretary to the comte de Provence (afterwards Louis XVIII.) in 1773, and he was admitted to the Academy in 1787. The later years of his life were spent chiefly in Paris, where he held an appointment in the Foreign Office and went much into society; but he visited Germany and Poland

in 1776. His unfinished Histoire de Vanarchie de Pologne (4 vols., 1807) was published posthumously under the editorship of P. C. F. Daunou. The only important historical work which he published during his lifetime was his Eclaircissements his- toriques sur les causes de la revocation de I'edit de Nantes . . . (2 vols., 1788), undertaken in view of the restoration to the Protestants of their civil rights. Rulhiere died at Bondy on the 30th of January 1791.

His short sketch of the Russian revolution is justly ranked among the masterpieces of the kind in French. Of the larger Poland Carlyle, as justly, complains that its allowance of fact is too small in proportion to its bulk. The author was also a fertile writer of vers de sociiti, short satires, epigrams, &c, and he had a considerable reputation among the witty and ill-natured group also containing Nicolas Chamfort, Antoine de Rivarol, Louis Ren6 de Champcenetz, &c. On the other hand he has the credit of caring for J. J. Rousseau in his morose old age, until Rousseau as usual quarrelled with him.

Rulhiere's works were edited, with a notice by P. R. Anguis, in 1819 (Paris, 6 vols. 8vo). The Russian Revolution may be found in the Chefs-d'ceuvre historiques of the Collection Didot, and the Poland, with title altered to Revolutions de Pologne, in the same collection. See also a notice by Eugene Asse prefixed to an edition 1890) of Rulhiere's Anecdotes sur le Marechal de Richelieu; Sainte- Beuve, Causeries du lundi (vol. iv.).

RULLUS, PUBLIUS SERVILIUS, Roman tribune of the people in 64 B.C., well known as the proposer of one of the most far-reaching agrarian laws brought forward in Roman history. This law provided for the establishment of a com- mission of ten, empowered to purchase land in Italy for dis- tribution amongst the poorer citizens and for the foundation of colonies. Its professed object was to clear Rome of the large number of pauper citizens, who formed a standing menace to peace. The members of the commission were to be invested with powers so extensive that Cicero spoke of them as ten " kings." They were to be elected for five years by seventeen of the tribes chosen by lot from the thirty-five; the imperium was to be conferred upon them by the lex curiata, together with judicial powers and the rank of praetor. Only those were eligible who personally gave in their names, a clause obviously intended to exclude Pompey, who was at the time absent in the East. In fact, the commission as a whole was intended to act as a counterpoise to his power. The only land available for the purposes of the bill was the Ager Campanus and the Ager Stellatis, where 5000 citizens were to be settled at once, but as these were utterly insufficient, other lands were to be acquired by purchase.

The necessary money was to be found by the sale of all the public property in Italy which had been ordered to be sold by resolutions of the senate (in 81, or subsequently), but which the fear of unpopularity had deterred the consuls from selling; by the sale of lands, &c, in the provinces which had become public property since 88, and even of the domains acquired during the Mithradatic war. A special article, the object of which was to pacify those who had received grants of land from Sulla, declared such possessions to be private property, for which compensa- tion was to be paid in case of surrender. The revenues of the provinces which were now being organized by Pompey, and the booty and money taken or received by generals during war were also to be applied to this purpose. The places to which colonies were to be sent were not specified (with the exception mentioned above), so that the commissioners would be able to sell wherever they pleased, and it was left to them to decide what was public or private property.

RUM— RUMANIA

*25

Cicero delivered four speeches against the bill, of which three are still extant, although the first is mutilated at the beginning. The second is the most important for the history of the bill; nothing is known of the fourth. Very little enthusiasm was shown in the matter by the people, who pre- ferred the distribution of doles in the city to the prospect of distant allotments. One of the tribunes even threatened to put his veto on the bill, which was withdrawn before the voting took place. The whole affair was obviously a political move, probably engineered by Caesar, his object being to make the democratic leaders the rulers of the state. Although Caesar could hardly have expected the bill to pass, the aristocratic party would be saddled with the odium of rejecting a popular measure, and the people themselves would be more ready to welcome a proposal by Caesar himself, an expectation fulfilled by the passing of the lex Julia in 59, whereby Caesar at least partly succeeded where Rullus had failed.

See the orations of Cicero De lege cgraria, with the introduction in G. Long's edition, and the same author's Decline of the Roman Republic, iii. p. 241 ; Mommsen, Hist, of Rome, bk. v. ch. 5 ; art. Agrarian Laws.

RUM, or Roum (Arab. ar-Rum), a very indefinite term in use among Mahommedans at different dates for Europeans generally and for the Byzantine empire in particular; at one time even for the Seljuk empire in Asia Minor, and now for Greeks inhabit- ing Ottoman territory. When the Arabs met the Byzantine Greeks, these called themselves

‘Pwjucuot, or Romans, a reminiscence of the Roman conquest and of the founding of the new Rome at Byzantium. The Arabs, therefore, called them “the Rum” as a race-name (already in Kor. xxx. 1), their territory ” the land of the Rum,” and the Mediterranean ” the Sea of the Rum.” The original ancient Greeks they called ” Yunan ” (Ionians), the ancient Romans, ” Rum ” and some- times ” Latlnlytin ” (Latins) . Later, inasmuch as Muslim contact with the Byzantine Greeks was in Asia Minor, the term Rum became fixed there geographically and remained even after the conquest by the Seljuk Turks, so that their territory was called the land of the Seljuks of Rum. But as the Mediterranean was ” the Sea of the Rum,” so all peoples on its N. coast were called sweepingly, ” the Rum.” In Spain any Christian slave-girl who had embraced Islam was named Rumiya, and we find the crew of a Genoese vessel being called Romans by a Muslim traveller. The crusades introduced the Franks (Ifranja), and later Arabic writers recognize them and their civilization on the N. shore of the Mediterranean W. from Rome; so Ibn Khaldun in the latter part of the 14th century. But Rilmi is still used in Morocco for a Christian or European in general, instead of the now elsewhere commoner Ifranji. (D. B. Ma.)

RUM (according to Skeat, a corruption of Malay brum or bram; the adjective ” rum,” i.e. ” queer,” being a distinct word, in Gipsy rorti) , a potable spirit’ distilled chiefly from fermented cane-sugar. It is mainly the produce of the West Indian Islands, notably Jamaica, and of Demerara. There are two’ kinds of Jamaica rum, namely, ” common ” or ” clean ” rum, and ” flavoured ” or ” German ” rum. The latter is used almost entirely for purposes of blending with lighter types of spirit. Compared with other potable spirits such as whisky and brandy, the Jamaica rums are distinguished by their very high propor- tion of secondary products, particularly of the compound esters. Among the latter butyric ” ether ” (ethyl butyrate) predomi- nates. The Demerara rums are of a lighter character. Rum has a deep brown colour imparted by caramel or by storage in sherry casks, or, most generally, by both. ” Tafia ” is an in- ferior quality of rum produced in the French colonies. ” Negro ” rum, which is the lowest quality of all, and into the wash for which the debris of the sugar-cane enters, is consumed locally by the coloured workers. The spirit prepared from beet-sugar molasses cannot be regarded as rum, for, unless it is highly rectified, it possesses a disagreeable odour and taste. Fictitious rum is, however, sometimes prepared from highly rectified beet spirit and rum ” essence ” — a mixture of artificial esters (ethyl butyrate, &c.L birch bark oil and so on. Highly rectified

beet spirit is also occasionally used for blending with genuine rum,

particularly with the ” flavoured ” or ” German ” rum. The latter name originated in the fact that this kind of rum was exported very largely to Germany for the purpose of blending. The general composition of various kinds of rum is manifest from the annexed table. The consumption of rum in the United Kingdom has fallen off considerably of late years, con- currently with the general tendency of the public towards lighter and ” drier ” alcoholic beverages (see Spirits).

Composition of Different Varieties of Rum

(Analyses by W. Collingwood Williams ; cf . /. Soc. Chem. Ind. 1907, p. 498.)

Description.

Alcohol per cent by vol.

Total Acid.

Volatile Acid.

Esters.

Higher Alco- hols.

Fur- fural.

Alde- hydes.

(Results expressed in grams per ico litres of absolute alcohol.)

1. Jamaica Rums —

A. “Common Clear ” Average Maximum . Minimum .

B. ” Flavoured ” Average . Maximum . Minimum .

2. Demerara Rums .

79.1 82.1 68.6

77-3 80.0 66.1

78.5

ISS 3°

102.5 145 45

71 to 1 23

6r

146

21

95- S

137 39 18.41075

366.5 1058 88

768.5 1204

39i 37 to 96

98.5

ISO

46

107 144 80

4-5

ii-S

1.0

5-2 12.0

2.7

0.6to2. 7

15-3

30.0

5-o

20.7 375 130

RUMANIA, or Roumania [Romdnia], a kingdom of south- eastern Europe, situated to the north-east of the Balkan Pen- insula, 1 and on

the Black Sea. Pop. (1910, estimate) 6,850,000; area, about 50,720 sq. m., or about 6500 sq. m. less than the combined areas of England and Wales. Rumania begins on the seaward side with a band of territory called the Dobrudja (q.v.) ; and broadens westward into the form of a blunted cres- cent, its northern horn being called Moldavia, its southern Walachia.

Physical Features. — Along the inner edge of this crescent run the Carpathian Mountains, also called, towards their western extremity, the Transylvanian Mountains (q.v.) or Transylvanian Alps; and the frontier which marks off Rumania from Hungary is drawn along their crests. The eastern boundary is formed by the river Pruth (Prutu), between Moldavia and Russia; farther south by the Kilia mouth of the Danube (Dunarea), between the Dobrudja and Russia, and by the Black Sea. In the extreme south-east, an irregular line, traced from Ilanlac, 10 m. S. of Mangalia, on the coast, as far as the Danube at Silistria, 85 m. inland, separates the Dobrudja from Bulgaria. Otherwise, the Danube constitutes the whole southern frontier; its right bank being Bulgarian for 290 m., and Servian, in the extreme west, for 50 m. The Danube (q.v.) enters Rumania through the Verciorova or.Kazan 2 Pass. It here resembles a long lake, overshadowed by precipitous mountains, which vary from 1000 to 2000 ft. in height, and are covered by birches and pines. In this neighbourhood the channel contracts to about 116 yds. in width, with a depth of 30 fathoms. At the eastern end of the pass are the celebrated Iron Gates, a rapid so named by the Turks, not from che surrounding heights, which here descend gradually to the river, but from the number of submerged rocks in the waterway. As it flows eastward from the frontier, the Danube gains in breadth and volume. Islands are frequent; the banks recede and become lower until, after 50 m,, they stand almost level with the water. Henceforward, for 290 m., the Rumanian shore is a desolate fen-country, varied only by a few hills, by cities, and by lagoons often 15 m. long. East of Bucharest, a chain of lagoons and partially drained marshes stretches inland for 45 m. At Silistria the river bends N.N.E. for 110 m. with the Dobrudja on its right, and a barren plain, called the Baragan Steppe, on_ its left. It here encloses two large swampy. islands, the upper being 57 m., the lower 43 m. long. Both have an average breadth of 10 m. Beyond Galatz, the river again turns eastward, branching out, near Tulcea, into three great waterways, which wind through a low-lying alluvial delta to the sea. The northern estuary is named the Kilia Mouth; the central, the Sulina; the southern, the St George's. Between Verciorova and the Sulina Mouth, the Danube traverses 540 m. Its current is rapid, and supplies the motive

1 In 1904, in a lecture read before the Rumanian Geographical Society, M. A. Sturdza showed that Rumania should not be included in the Balkan Peninsula, where it is placed by many writers and cartographers. This view was accepted by the Society, and a copy of the lecture was forwarded to all similar associations in Esrope. See A. Sturdza, La Roumanie n'appartient pas a la peninsuh balkanique (Bucharest, 1904).

2 I.e. Cauldron.

B *6° C > 8 *

D

RUMANIA

English Miles

20 30 40 50 60

Boundaries of Provinces

t Boundaries of Departments…

Capitals of Provinces

Capitals of Departments

Railways

' D O u jV? uj |'

O.ttrov \>; ,

^^■^^^il^-^c

Q Longitude East .18° of Greenwich £)

power for thousands of floating watermills, which lie moored in the shallows. It is fed by many tributaries, which rise in the Carpathians as mountain torrents, growing broad and sluggish as they flow south-

eastward through the central Rumanian plain. In Walachia, it is joined by the Jiu (or Schyl) opposite Rahova; by the Olt (ancient Aluta) at Turnu Magurele; by the united streams of the Dimbovitza (Dambovifa) and Argesh (A rges) at 01 tenitza ; by the Jalomitza (Ialomifi.) opposite Hirsova. The Olt pierces the Carpathians, by way of the Rothenthurm Pass, and forms the boundary of Little {i.e. western) Walachia, or Oltland. The Sereth (Siretu or Seret-“) flows for about 340 m. from its Transylvanian source through Moldavia, and meets the Danube near Galatz, after receiving the Moldova, Bistritza (Bistrita), Trotosh (Trotosu), Milcovu, Putna, Ramnicu and Buzeu on the west; and the BSrlad (Bzrladu) on the east. The Milcovu was the former boundary between Walachia and Moldavia. The Pruth rises on the northern limit of Moldavia, forms the eastern frontier for 330 m., and falls into the Danube 10 m. E. of Galatz. Its chief Rumanian tributaries are the Basheu (Baseu) and Jijia, rivers of the north. The Dobrudja (q.v.) or Dobrogea covers about 2900 sq. m. between the Black Sea and the lower reaches of the Danube. Its high crystalline rocks, covered with sedimentary formations, descend abruptly towards the delta, but more gradually towards the south, where the Bulgarian steppes encroach upon Rumanian soil. The few small rivers which drain the hills generally flow seaward, but those of the delta and steppes belong to the Danubian system. The coast is a low-lying region of sandhills, meres and marshes with one lagoon, 42 m. long, connected by a short stream with the St George Mouth. Its outlet on the sea is named the Portidje Mouth (Gura portitii) of the Danube. North of this, the lagoon is called Lake Razim ; while its southern half, shut off by three long islands, is the Blue Lake (Sinoe Osero, in Bulgarian).

Apart from the Dobrudja, the whole of Rumania is included in the northern basin of the lower Danube. It consists of a single inclined plane stretching upwards, with a north-westerly direction, from the left bank of the river to the summits of the Carpathians. It is divided into three zones — steppe, forest and alpine. The first begins beyond the mud-flats and reed-beds which line the water’s edge, and is a vast monotonous lowland, sloping so gently as to seem almost level.- The surface is a yellow clay, with patches of brown or dark grey, outliers of the Russian ” black earth. ” Cereals, chiefly maize, with green crops and fields of gourds, alternate with fallow land overgrown by coarse grasses, weeds and stunted shrubs. Among

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the scanty trees, willows and poplars are commonest. The second zone extends over the foothills and lower ridges of the Carpathians. This

region, called by Rumans ” the district of vines, ” is the most fertile portion of the country. In it grow most fruits and flowers which thrive in a temperate climate. Oaks, elms, firs, ashes and beeches are the principal forest trees. The third zone covers the higher mountains on their southern and eastern sides, whose violently contorted strata leave many transverse valleys, though usually inclining laterally towards the south-east. The birch and larch woods of this zone give way to pine forests as the altitude increases; and the pines to mosses, lichens and alpine plants, just below the jagged iron-grey peaks, many of which attain altitudes of 6000 to 8000 ft.

Geology. — The axis of the Transylvanian Alps consists of sericite schists and other similar rocks; and these are followed on the south by Jurassic, Cretaceous and Early Tertiary beds. The Jurassic and Cretaceous beds are ordinary marine sediments, but from the Cenomanian to the Oligocene the deposits are of the peculiar facies known in the Alps and Carpathians as Flysch. Farther north, the Flysch forms practically the whole of the Rumanian flank of the Carpathians. Along the foot of the Car- pathians lies a broad trough of Miocene salt-bearing beds, and in this trough the strata are sometimes horizontal and sometimes strongly folded. Outside the band of Miocene beds the Sarmatian, Pontian and Levantine series, often concealed by Quaternary deposits, cover the great part of the Danube plain. Even the Pontian beds are sometimes folded. In the Dobrudja crystalline rocks, presumably of ancient date, rise through the Tertiary and recent deposits and form the hills which lie between the Danube and the Black Sea. 1

Climate. — The Rumanian climate alternates between extreme cold in winter, when the thermometer may fall to — 20 Fahrenheit and extreme heat in summer, when it may rise to ioo° in the shade. Autumn is the mildest season; spring lasts only for a few weeks. Spring at Bucharest has a mean temperature of 53 ; summer,

1 See L. Teisseyre and L. Mrazec, Apercu geologique sur les formations salifires et les gisements de sel en Roumanie, Moniteur des interUs petroliferes roumains (1902), pp. 3-51; S. Stefanescu, £tude sur les terrains tertiaires de Roumanie (1897) ; T. Bergeron, ” Observations relatives a la structure de la haute vallee delajalo- mita (Roumanie) et des Carpathes roumaines, ” Bull. Soc. Geol. France, ser. 4, vol. iv. (1904), pp. 54-77.

72-5°; autumn, 65 ; winter, 27-5°. For about 155 days in each year, Rumania suffers from the bitter north-east wind (crivets) which sweeps over south Russia; while a scorching west or south- west wind (austru) blows for about 126 days. Little snow falls in the plains, but among the mountains it may lie for five months. The frosts are severe, the Danube being often icebound for three months. The rainfall, which is heaviest in summer, averages about 15-20 in.

Fauna. — In its fauna, Walachia has far more affinity to the lands lying south of the Danube than to Transylvania, although several species of Claudilia, once regarded as exclusively Transylvanian, are found south of the Carpathians. Moldavia and the Baragan Steppe resemble the Russian prairies in their variety of molluscs and the lower kinds of mammals. Over 40 species of freshwater mussels (Unionidae) have been observed in the Rumanian rivers. The lakes of the Dobrudja likewise abound in molluscs; parent forms, in many cases, of species which reappear, greatly modified, in the Black Sea. Insect life is somewhat less remarkable; but besides a distinctive genus of Orthoptera {Jaquetia Hospodar), there are several kinds of weevils (Curculionidae) said to be peculiar to Rumania. Birds are very numerous, including no fewer than 4 varieties of crows, 5 of warblers, 7 of woodpeckers, 8 of buntings, 4 of falcons, and 5 of eagles; while among the hosts of waterfowl which people the marshes of the Danube are 9 varieties of ducks, and 4 of rails. Roe-deer, foxes and wolves find shelter in the forests, where bears are not uncommon; and chamois frequent the loftiest and most inaccessible peaks.

Minerals. — The mineral wealth of Rumania lies chiefly in the mountains. Petroleum, salt, lignite and brown coal are largely worked. Deposits of rock-salt, a valuable government monopoly, stretch from the department of Suceava in northern Moldavia to that of Gorjiu in Walachia, and are mined in the departments of Bacau, Prahova and Ramnicu Sarat. The presence of petroleum, indicated by many ancient workings in the shape of shallow hand- dug wells, can be traced continuously at the foot of the Transyl- vanian Alps, from Turnu Severin into Bukovina. Rumans claim for their product a higher percentage of pure oil than is found in the American, Galician and Caucasian wells; and, although Ameri- can competition nearly destroyed this industry between 1873 and 1895, improved methods and legislation favouring the introduction of foreign capital enabled it to recover. At the beginning of the 20th century the Rumanian petroleum deposits were among the most important in the world. The industry is carried on by private producers as well as by the state, the American Standard Oil Company being largely interested. The total output, coming chiefly from the departments of Bacau, Buzeu, Dimbovitza and Prahova, was 250,000 metric tons in 1900, 615,000 in 1905, and 1,300,000 in 1909. Associated with petroleum is ozokerite, con- verted by the peasantry into candles. Lignite is used as fuel on the railways. The chief anthracite beds, those in the Gorjiu department, are leased until 1975 to an English capitalist, who has the right to construct railways. Extensive coalfields exist in the Dobrudja, and the Dimbovitza. Mehedintzi, Muscel, Prahova and Valcea

departments. Iron, copper, lead, mercury, cinnabar, cobalt, nickel, sulphur, arsenic and china clay also occur. Among the mountains, gold was perhaps worked under Trajan : who first appointed a Procurator Metallorum, or overseer of mines, for Dacia; certainly in the 14th century, when immigrant Saxon miners established a considerable trade with Ragusa, in Dalmatia. Under the Turks, gold-washing was carried on by gipsy slaves, but it has long been abandoned as unprofitable. Until 1896 building materials were chiefly imported; but, after that year, many quarries were opened to develop the native resources of limestone, sandstone, serpentine, red, yellow and green granite, and marbles of all colours, including the white marble from Dorna in Suceava, said by Rumans to rival that of Carrara in Italy Clear amber is found beside the Buzeu and its affluents, with brown and grey clouded amber, and a blue fluorescent variety, of considerable value.

Rumania has long been noted for its mineral springs. Ruins of a Roman bath exist near Curtea de Argesh. In the Valcea de- partment, besides many other iodine, sulphur and mud baths, there are the state-supported spas of Calimanescii, Caciulata and Govora, situated among some of the finest Carpathian scenery. Most famous of all is Sinaia (q.v.), the summer residence of the Court; while important springs exist at Lake Sarat, near Braila; at Slanic, in the Prahova department, where flooded and abandoned salt-mines are fitted up as baths; at the Tekir Ghiol mere, near Constantza; and at Baltzatesti (Bal(atestii) , in the Neamtzu (Neam(ii) department, a favourite resort of invalids from many parts of eastern Europe.

Agriculture. — That, in 1900, Rumania ranked third, 1 after the United States and Russia, among the grain-growing countries of the world, is due partly to the fertile soil, whose chemical constituents are the same as in the “black earth” region of Russia, though even

‘The relative importance of Rumania was afterwards lessened by the development of wheat-culture in Canada, Argentina and elsewhere.

richer in nitrates; partly also to the improved methods and ap- pliances introduced in the last quarter of the 19th century. The frail wooden ploughs with a lance-headed share that only scratched the surface soil, were then superseded by iron ploughs; steam threshers replaced the oxen which trod out the corn, and modern implements were widely adopted. Vast harvests of wheat and maize ripen on the plains and lower hills. Apart from cereals, the principal crops are beans, potatoes, beetroot and tobacco. Among the wine-producing countries of Europe, Rumania stood fifth in 1900, despite the ravages

of phylloxera, old-fashioned culture, lack of storage and other drawbacks. The red wines of Moldavia, especially the brand known as Piscul Cerbului, resemble Bordeaux. The best white wines came from Cotnar in the Jassy department, but here phylloxera ruined the vineyards. Golden Cotnar was akin to Tokay. To combat the phylloxera, the government ordered the destruction of all infected vines, distributed immune American stocks and established schools of viticulture. On the upland fruit farms, although apples, pears, medlars, cherries, plums, peaches, apricots and melons thrive, the chief attention is given to damsons, from which is extracted a mild spirit (tsuica), highly esteemed throughout Rumania. This industry began to decline after i860, but revived with the establishment of government schools of fruit-culture in many villages. Further instruction was given at various horti- cultural institutes in the towns, notably the Botanic Gardens and Institute of Bucharest, where the experiments in planting figs, almonds, hops and cotton yielded favourable results. Tobacco is largely cultivated, under state supervision.

There are three breeds of Rumanian oxen, besides the peculiar black buffaloes, with horns lying almost fiat along their necks. Cheap transit enables the Rumanian farmers to compete success- fully in the meat-markets of Austria, Germany and Holland. The southern Dobrudja and the Baragan Steppe, with the mountain pastures of Argeh, Buzeu, Dimbovitza, Muscel and Prahova, are occupied by large sheep-runs; 1200 farms were created in the Baragan by the Land Act of 1889. In winter the flocks are driven from the highlands to the plains. Cheeses of ewe's milk, packed in sheepskins or bark, are in great demand. Swine and pork are largely exported to Russia and Austria-Hungary. Besides the Moldavian and Servian breeds, thousands of so-called " swamp hogs "run wild among the marshes and on the islands of the Danube. Silkworm-rearing, once an important household industry, had been almost abandoned, when, in 1891, the goyernment established mulberry nurseries, and distributed silkworms free of charge. Silkworm-rearing is taught in the monasteries and agricultural schools, especially in the College of Agriculture and Sylviculture, at Ferestnu, near Bucharest. Similar measures were adopted to check the decline of bee-keeping, and a model apiary was founded in 1890, under government control.

Forests— The forests of Rumania were long either neglected or exploited in the most reckless fashion. Large tracts of woodland were cleared near the railways, and the communal rights of grazing and gathering firewood destroyed the aftergrowths. Nevertheless, in 1910 there were 2,760,000 acres under forests, chiefly in the mountains of north-western Moldavia. More than 1,000,000 acres are state

property. Under King Charles, an ardent forester, the wholesale destruction of timber was arrested, and new plantations met with success. Lumber is floated down the rivers of the Car- pathian watershed to the Danube, and so exported to Turkey and Bulgaria; casks, shaped planks and petroleum drums go chiefly to Austria and Russia. Wood-carving is taught in many schools, and a special school of forestry exists at Branesci in the Ilfov depart- ment. Estates in private hands are liable to state control, under the Forests Act of 1886.

Land Tenure. — The Rumanian system of land tenure dates from 1864, when most of the land was held in large estates, owned privately, or by the state or by monasteries. There was also a small class of peasant proprietors, called mocheneni in Walachia, resechi in Moldavia, living and working in family communities; but the great mass of the peasantry cultivated the lands of the large pro- prietors, giving a certain number of days' work to their manorial lord, in addition to a tithe of the raw produce. They received in return a plot of ground proportionate to the number of animals they owned, and had also rights of grazing and of collecting fuel in the forests. In 1864, under the government of Prince Cuza, a new law was promulgated, conferring on each peasant family freehold property in lots varying from l\ to 15 acres, according to the number of oxen that they owned. The man with no cattle received the minimum; the owner of 2 oxen got 10 acres, and the possessor of 4 received I2j to 15 acres. The price of the land, which was calculated on the basis of the value of the forced labour to which the landlord had been entitled, was about £1, 16s. per acre, paid to the landlord by the state as compensation, and subsequently recovered from the peasants in fifteen annual instalments. In the first dis- tribution, which took place almost immediately after the law was Cassed. 280,000 families in Walachia and about 127,000 in Moldavia ecame freeholders, holding nearly 4 million acres or one-third of the cultivated area of the country. These peasant plots were all declared inalienable for thirty years. The law of emancipation, although passed with the best of motives, did not to any great

extent benefit the peasantry. The limited size of their farms, and the necessity for buying wood and paying for pasturage, both of which were formerly free, prevented them from obtaining complete

independence of the large proprietors, on whose estates they still had to work for payment in money or kind, while their improvidence soon got them into the hands of Jewish money-lenders, who, fortu- nately for the peasants, were by law unable to become proprietors of the soil. In 1866 and 1872 laws were passed for still further improv- ing the position of these small proprietors; and in 1879 a measure was carried for allotting lands to 48,000 recently married couples, and for restoring to many peasant families lands which had been alienated.

By the Land Act of 1889, the state domains, amounting to nearly one-third of the total area of Rumania (originally the property of the church and the convents, confiscated by Prince Cuza in 1866), were distributed among the peasantry. The land was divided into lots of I2§, 25 and 37I acres. Peasants having no land might purchase the smaller lots on very easy terms. Those who already held less than 12 \ acres might purchase up to that amount. When a change of residence became necessary to enable the peasant to take up the new allotment, the state advanced £6 to each family to defray expenses. The price to be paid for the land differed in different districts, and was to be paid to the state in small annual instalments. If any land remained after satisfying the wants of the peasants, it was to be sold by public auction in lots of 50 to 62J acres. All lots in both cases were declared inalienable for thirty years. The sale of the larger lots gave rise to so many abuses that in 1896 a law was passed abolishing their further sale. As a result of these measures the majority of Rumans are peasant proprietors; but the smallness of the holdings renders scientific farming difficult except by co- operation, and many proprietors can only live by working for the owners of large estates. Thus, though the average value of agri- cultural land increased by 60% between 1870 and 1900, the position of the peasantry is far from satisfactory, and the resultant discon- tent was the chief cause of the agrarian rising in 1907.

Fisheries. — Among European freshwater fishing-grounds, the Danube is only surpassed by the Volga; the most valuable fish being sturgeon and sterlet, mostly netted in the St George mouth; carp, often weighing 50 lb; pike, perch, tench and eels. By an act of 1895, a close period was instituted, the lakes and rivers restocked, and the state fisheries, which are either farmed by private companies or directly administered, were set in order. The coarse-grained grey Rumanian caviare is forwarded to Berlin, and there blended with Russian caviare. Flounders and mullet are caught in the Black Sea, and there are oyster-beds in the delta and on the Dobrudja littoral. The principal markets for Rumanian fish are Turkey, Russia and Austria-Hungary. Fish of inferior quality is imported, chiefly from Russia.

Manufactures and Commerce. — The native mines, fields and forests provide raw material for most of the few factories which exist. These include petroleum refineries, iron foundries, distilleries, flour mills, sugar refineries, sawmills, paper mills, chemical works, glass works, soap and candle works, &c. A law passed in 1887 prcvided that any one undertaking to found an industrial estab- lishment with a capital of at least £2000, or employing at least 25 workmen (of whom two-thirds should be Rumanians), should be granted 12 acres of state land, exemption for a term of years from all direct taxes, freedom from customs dues for machinery and raw material imported, exemption from road taxes, reduction in cost of carriage of materials on the state railways, and preferential rights to the supply of manufactured articles to the state.

The following table shows the value of Rumanian imports and exports for five years: —

Year.

1904 1905 1906 1907 1908

Exports. £10,475,000

18,284,000 19,654,000 22,157,000 15,158,000

Imports. . £12,455,000

13,510,000 . 16,885,000 .’ 17,220,000

16,563,000

The principal imports are metals and machinery (£5,510,000 in 1908), textiles, silk, wool, hair and hides. Grain (£11,297,000 in 1908), petroleum (£1,543,000) and timber (£1,059,000) are by far the most important exports, the remainder consisting of live-stock the animal products, fruit, vegetables and mineral waters. In 1908 the chief consumers of Rumanian goods were (in order) Belgium, Great Britain and Italy; the chief exporters to Rumania were Germany, Austria-Hungary, Great Britain and France. The wide fluctuations in Rumanian commerce are largely due to the depen- dence of the country on the grain harvest.

Finance.— The state revenue is derived from customs; from public works and public land; from indirect taxes in the shape of stamp, inheritance, beer, spirit, petroleum and other duties; from direct taxes on land and buildings, with road-tolls, licences for the sale of alcohol

and traders' registration fees; from the tobacco, salt, match, playing-card and cigarette-paper monopolies; and from the postal, telegraphic and telephonic services. The chief items of expenditure are interest on the national debt, and the cost of defence, public works and education.

The following table shows the estimated revenue and expenditure for five years:—

Year.

Revenue.

Expenditure

1906-7

• £9 > 557.ooo

£9,509,000

1907-8

. 10,099,000

9,979,000

1908-9

. 16,440,000

16,390,000

1909-10

. 17,427,000

17,146,000

1910-11

. 18,443,000

18,443,006 .

The great increase after 1907-8 is due to the inclusion of railway receipts and expenditure, with some other items not previously enumerated.

In May 1905 the outstanding public debt, which amounted to about £54,000,000, mainly placed in Germany and bearing interest at an average rate of 5 %, was converted into a uniform 4 % stock. Besides this reducticm of interest, the state secured an extension of fourteen years in each of the various periods allotted for repayment of the component loans. But a considerable increase in the total debt was involved, because a bonus of I0j% in new 4% stock, issued at par, was offered to induce bondholders to convert, while, to cover the bonus, an additional 4% loan was riased at 90-70, amounting to £4,000,000, redeemable in 1945. At the beginning of the fiscal year 1909-10 (March 31st, O.S.) the total outstanding debt was £58,367,000, and the debt charges for the year were estimated at £3,518,080.

Banks and Currency. — Apart from the General Bank of Rumania (capital £200,000), which is owned by a syndicate mainly of Germans, the largest credit establishments belong to the state. They include the National Bank (capital and reserves in 1910, £1,560,000), founded in 1880; the Agricultural Loan Bank, founded in 1894; the Rural and Urban Land Credit Institutes, which lend money on agricultural and building land respectively; the Cassa Rurala, which buys estates for resale in small lots; savings banks in all the principal towns; and the Deposit and Trust Fund, which takes charge of estates left vacant through intestacy, surplus departmental and communal funds, securities given by contractors for public works, &c.

After the Crimean War, a bimetallic currency was adopted, with the leti (franc) of 100 bani (centimes) as the unit of value. But after 1878 the Russian silver rouble was rated so highly as to drive the native coins out of circulation ; and in 1889 Rumania joined the Latin Monetary Union and adopted a: gold standard. Besides the silver pieces worth j, I, 2 and 5 lei, gold coins of 5, 10 and 20 lei are used. Silver is legal tender only up to 50 lei. All taxes and customs dues must be paid in gold, and, owing to the small quantities issued from the Rumanian mint, foreign gold is current, especially French 20-franc pieces (equal at par to 20 lei), Turkish gold lire (22-70), Old Russian Imperials (20-60) and English sovereigns of (25-22). Besides bronze coins of less value than \ leu, nickel pieces worth 5, 10 and 20 bani were authorized by a law of 1900. The French decimal system is in use for weights and measures, together with Turkish standards. On the railways and in post offices the Gregorian calendar is employed ; elsewhere the Julian remains in use.

Chief Towns. — The chief towns, with their estimated population in 1910, are Bucharest, the capital (300,000) ; Jassy, the capital of Moldavia (80,000) ; Galatz (66,000), Braila (60,000), Ploesci

(50,000), Craiova (46,000), Botoshani (34,000), Berlad (25,000), Focshani (25,000), Tulcea (20,000), Constantza (16,000), Giurgevo (15,000). Other towns which, like the foregoing, are described in separate articles are Alexandria, Babadag, Bacau, Buzeu, Calafat, Calarashi, Campulung, Caracal, Curtea de Argesh, Dorohoi, Dragashani, Falticeni, Hushi, Mangalia, Neamtzu, Oltenitza, Piatra, Pitesci, Ramnicu Sarat, Ramnicu Valcea, Roman, Sinaia, Sulina, Tlrgu Jiu, Tirgu Ocna, Tirgovishtea, Tecuci, Tumu Magurele, Tumu Severin and Vaslui.

Communications. — Until the 19th century, traffic was carried on in Rumania chiefly by means of ox-wagons, over the roughest cf roads. After 1830, however, many highways were opened, these being usually excellent among the mountains but deteriorating as they descend into the lowlands, where stone is dear. Highways are maintained by the state, department or commune, according to their size and importance. In 1869, the first Rumanian railway was opened, between Bucharest and Giurgevo, its port. Other lines followed rapidly; some built by private enterprise, others by the state, which by 1888 had bought the entire system. This centres in one main line, carried southwards from Suczawa in Bukovina through the whole length of Moldavia, and turning westwards through Walachia to meet the Hungarian frontier at Verciorova. Branch lines extend, on one side, up the lateral valleys of the Carpathians, and, on the other, to Jassy and the principal Danubian ports. A direct line connects Jassy with Galatz; another traverses the Dobrudja from Constantza to Cernavoda, where it crosses the Danube and proceeds north-west to join the main line. The double bridge of Cernavoda, with the viaducts leading to it, stretches for 12J m. across the river and surrounding marshes. Besides the junctions at Suczawa and Verciorova, the Rumania system meets the Hungarian through the Gyimes, Rothenthurm and Vulkan Passes; the Russian by lines from Jassy and Galatz to Kishinev in Bessarabia; the Bulgarian and Servian by means of numerous

ferries. Rumania has no canals, and the canalization of its rivers is impeded by drought and floods. The Pruth and Sereth are navigable for a short distance by small sailing craft ; the conservancy of the Danube (q.v.) is controlled by a European commission, which sits at

Galatz. Besides river services, the state maintains lines of sea-going ships from Constantza to Constantinople and the Aegean Islands, and from Braila to Rotterdam. In 1908 the ports of Rumania were entered by 32,888 vessels of 9,269,000 tons, of which 30,504 of 6,529,000 tons belonged to the river (Danubian) trade. The merchant navy of Rumania comprised about 495 vessels of 145,000 tons, including 88 steamers.

Population. — The population of Rumania numbered 5,912,520 in 1899, and about 6,850,000 in 1910. Fully 6,000,000 of these were Rumans or Vlachs (q.v.). The population of foreign descent comprises many Jews, Armenians, gipsies, Greeks, Germans, Turks, Tatars and Magyars, Servians and Bulgarians. The Jews increase more rapidly than any of these peoples except the Armenians. They usually congregate in the larger towns, though in northern Moldavia there are a few purely Jewish villages, recalling those of Poland.

The bitter feeling against them in Rumania is not so much due to religious fanaticism as to the fear that if given political and other rights they will gradually possess themselves of the whole soil. In many towns in northern Moldavia the Jews are in a majority, and their total numbers in Rumania are about 300,000, i.e. about one-twentieth of the entire population, a larger ratio than exists in any other country in the world. In many places they have the monopoly of the wine and spirit shops, and retail trade generally; and as they are always willing to advance money on usury, and are more intelligent and better educated than the ordinary peasant, there is little doubt that in a country where the large landowners are proverbially extravagant, and the peasant proprietors needy, the soil would soon fall into the hands of the Jews were it not for the stringent laws which pre- vent them frdm owning land outside the towns. When in addition it is considered that the Moldavian Jews, who are mostly of Polish and Russian origin, speak a foreign language, wear a distinguishing dress and keep themselves aloof from their neighbours, the antipathy in which they are held by the Rumanians generally may be understood.

The gipsies, who are mostly converts to the Orthodox Church, still, as a rule, cling to their vagabond existence, though their skill at all handicrafts finds them ready employment in the towns. During their centuries of slavery, they were organized into castes, as musicians, metal workers, masons, &c; but after about 1850 the bonds of caste were gradually relaxed and gipsies began to intermarry with Rumans. The Greeks form a floating population of merchants and small traders, anxious to amass a fortune and return home. German and Austrian business men visit the country in large numbers, and colonies of

German farmers flourish among the mountains of Little Walachia. In central Moldavia there is a large population of Magyar descent, and the Servian and Bulgarian elements are strong near the Danube. The interior of the Dobrudja is occu- pied largely by Turks and Bulgarians, with Tatars, Russians and Armenians, but here the Ruman steadily gains ground at the expense of the alien. At Megidia, a flourishing town of about 10,000 inhabitants, which sprang up after i860 between Cerna- voda and Constantza, the Tatars predominate. Russians of the Lipovan sect live in exile in Bucharest and other cities, earning a livelihood as cab-drivers, and wearing the long coats and round caps of their countrymen.

National Characteristics. — Two dissimilar types are noticeable among the Rumans. One is fair-haired, florid and blue-eyed; the other, more frequent among the Carpathians, is dark, resembling the southern Italians. Both alike are hardy, though rarely tall; both, when of the peasant class, frugal and inured to toil amid the rigours of their native climate. Proud of their race and country, they acquired, with their independence, an ardent sense of nationality; and they look forward to the day which will reunite them to their kinsmen in Transylvania and Bessarabia. They have been taught, originally in the interests of Transylvanian Roman Catholicism,

to regard themselves as true descendants of the Romans. The peasants retain their distinctive dress, long discarded, except on festivals and at court, by the wealthier classes. Men wear a long linen tunic, leather belt, white woollen trousers and leather gaiters, above Turkish slippers or sandals. The low- landers' head-dress is generally a high cylindrical cap of rough cloth or felt, while the mountaineers prefer a small round straw hat. Sundays and holidays bring out a sleeveless jacket, embroidered in red and gold; and both sexes wear sheepskins in cold weather. The linen dresses of women are fastened by a long sash or girdle, wound many times round the waist: the holiday attire being a white gown covered with embroideries, one or more brightly coloured aprons and necklaces of beads or coins. The standard of comfort is lowest along the Danube and in parts of the Dobrudja. As the land becomes higher, the dwellings improve; but, despite the presence of a doctor in each commune, disease is everywhere rife. Many villages are wholly built of timber and thatch, especially amongst the Carpathians, the floors being frequently raised on piles, several feet above the ground. The inner walls are often hung with hand-woven tapestries, which harmonize well with the smoke-blackened rafters, the primitive loom and the huge Dutch stove characteristic of a prosperous Rumanian farm. Many pagan beliefs linger on in the country, where vampires, witches and the evil eye are

dreaded by all. The peasants reassure themselves by the use of charms and spells, and by a strict observance of the forms which their creed prescribes. A cross guards every well or spring; every home has its ikons or sacred pictures. Church festivals and fasts are kept with equal care. For months together a Ruman will subsist on vegetables and mamaliga, the maize porridge that forms his staple diet. Beef and mutton are rarely touched, and in some districts pork is only eaten on St Hilary's day (the 20th of December, O.S.). Veal is the one kind of meat generally consumed Wine and plum-spirit, or the more powerful brandy distilled from grain, are drunk in great quantities by the townsfolk, more sparingly by countrymen; Rumans generally being more sober than the western Europeans. The ceremonies which accompany a wedding preserve the tradition of marriage by capture; a peasant bride must enter her new home carrying bread and salt, and in parts of Walachia a flower is painted on the outer wall of cottages in which there is a girl old enough to marry. Young men swear eternal brotherhood; girls, eternal sister- hood; and the Church ratines their choice in a service at which the feet of the pair are chained together. This relation- ship is morally and legally regarded as not less binding than kinship by birth. The dead are borne to the grave with un- covered faces, and a Rumanian funeral is a scene of much barbaric display. All classes delight in music and dancing. Women hold spinning-parties at which the leader begins a ballad, and each in turn contributes a verse. A number of satirical folk-tales (largely of Turkish origin) are current at the expense of Jew, gipsy or parish priest. The Rumanian folk-songs, sung and often improvised by the villagers, or by a wandering guitar-player (cobzar), are of exceptional interest and beauty (see Literature, below). The national dances and music closely resemble those of the Southern Slavs (see Montenegro and Bulgaria).

Constitution. — In 1866, Prince Charles of Hohenzollern- Sigmaringen was chosen prince of Rumania by a constituent assembly elected under universal suffrage. This body at the same time drew up a constitution, which remains in force, though modified in 1879 and 1884. In 1881, Prince Charles was proclaimed king. As he proved childless, the succession was accepted by his brother, Prince Leopold, on behalf of his son William; and in 1888 William renounced his claim in favour of Ferdinand his younger brother. Thus the monarchy became hereditary in the family of Hohenzollern-Sigmaringen. No woman may ascend the throne; and, in default of a male heir, the representatives of the people can choose a king among the royal families of western Europe.

Parliament consists of a senate, elected for eight years, and

a chamber of deputies, elected for four years. Senators must be forty years old and possess an income of 9400 lei (£376). They are chosen by two colleges of electors; one composed of citizens with an income of £80; the other, of citizens with incomes varying from £32 to £80. The heir-apparent, the two arch- bishops, the six bishops and the rectors of both universities, sit ex officio in the senate. For the chamber of deputies, all citizen taxpayers of full age may vote, being organized for the purpose into three colleges. All persons with an income of £50 vote in the first; all residents in an urban commune who pay taxes amounting to sixteen shillings yearly, with those who have been through the primary course of education, and all members of the liberal professions, retired officers and state pensioners, vote in the second. The third college is formed of the remaining taxpayers. Those who can read and write vote directly, the rest indirectly. Every fifty indirect electors choose a delegate, who votes along with the direct electors. The naturalization of Jews and Moslems is hedged about by many technical difficulties, and requires a separate vote of the legislature in every individual case. Deputies must be not less than twenty-five years of age. Both senators and deputies receive 20 lei for each day of actual attendance, and travel free on the railways. The king may temporarily veto any measure passed by parliament. Executive power is vested in a council under the presidency of a prime minister, and representing the ministers of foreign affairs; justice; the interior; religion and education; war; finance; agriculture, trade, industry and public domains; and public works. Entire liberty of speech, assembly and the press is guaranteed by the constitution, by which also the titles and privileges of the boiars or nobles were abolished.

For purposes of local government, Rumania is divided into 32 departments, each controlled by a prefect, and subdivided into sub-prefectures and communes. The sub-prefectures (plasii) correspond with the French arrondissements. Prefects and sub- prefects are appointed by the state, but the chief civic officials are elected. Very heavy octroi duties provide the means of municipal administration.

Law and Justice. — Until the 17th century justice was administered according to custom and precedent, or, in ecclesiastical cases, by the rules of an ill-defined canon law. The first change was introduced by

Matthew Bassaraba, prince of Walachia (1633-54), an d by Basil the Wolf, prince of Moldavia (1634-53). Basil drew up a criminal code, on the principle of ” an eye for an eye.” Thus, a man guilty of arson was burned alive. No idea of equality before the law as yet existed: nobles might only be beheaded or banished. Bassaraba, besides reforming the canon law, issued a similar criminal code, with a number of civil enactments, based on Roman law, and regulating testaments, guardianship, &c. The next great advance began with the Russian protectorate over Rumania (1828-56), when magistrates were made irremovable, and new tribunals created, including a petty court in each rural commune. But nothing was yet done to modify the relative positions of noble and serf. The growth of the present system dates from the union of Moldavia and Walachia in 1859. The main provisions of Rumanian law are drawn from the codes of western powers, especially the Code Napoleon. Besides the communal courts, there are quarter-sessional or circuit courts, where simple cases are decided. An appeal from these lies to the departmental courts, which sit in every capital of a department, and in which sessions are held, at stated times, for the trial by jury of serious offences. Any appeal from the departmental courts is brought before the appeal courts of Bucharest, Craiova, Galatz or Jassy; and thence, if necessary, to the supreme tribunal, or court of cassation (Curtea de Casatie), which sits in Bucharest.

Defence. — At the accession of Prince Charles, the Rumanian army consisted of raw levies, led by adventurers from any country, provided with no uniform, and, in many cases, armed only with pikes or sabres. Under Prince Charles universal and compulsory service was introduced. The present system, in which his reforms culminated, rests upon a law of 1891, modified in 1900 and 1908.

By this law the forces are divided into three sections. The first is composed of men between the ages of 21 and 30, enrolled in the field army and its reserves. Every citizen capable of bearing arms must serve from his 30th to his 36th year in the second section, or territorial militia, which musters in spring for shooting-practice and in the autumn for field manoeuvres. In the militia are included soldiers who have served their time in the ranks, and recruits chosen by lot from the yearly contingent of conscripts but not immediately summoned for duty in the field army. Finally, every citizen between the ages of 36 and 46 belongs to the third section, called the Gloata (Landsturm), which can only be called upon for

home service in war. In time of peace the field army consists of four complete army corps, with headquarters at Craiova, Bucharest, Jassy

and Galatz; besides an independent brigade in the Dobrudja, and a separate cavalry division with headquarters at Bucharest. Its peace strength in 1909-10 was 4415 officers, 89,227 non-com- missioned officers and men, and 18,920 horses. The infantry was armed with the Mannlicher magazine rifle (model 1893), the cavalry with the Mannlicher carbine, the horse and field artillery with Krupp quick-firing guns. On a war footing the field army would contain 225,000 combatants. It was estimated that the militia should ultimately furnish an additional force of 100,000 men, but up to 1910 this branch of the service was not completely organized. The arrangements for mobilization are otherwise very complete, and the field army is maintained in a high state of efficiency. The war budget for 1909-10 was £2,271,300.

The fortifications designed in 1882 by the Belgian engineer, General Brialmont, and completed at a cost of more than £4,000,000, form the keystone of the national defences. They consist of the Sereth Line, an entrenchment extending over a front of 45 m. from Galatz to Focshani, and intended to cover an army of defence against invaders from the north-east, and of the outworks which make Bucharest the largest fortified camp in the world, except Paris. All these fortifications, including the additional works at Galatz and Focshani, are strongly armed with Krupp and Gruson guns.

The Rumanian navy is divided into two squadrons ; one for the Danube, with headquarters at Galatz; one for the Black Sea, with headquarters at Constantza. In 1909-10 the fleet comprised one cruiser, seven gunboats, eight torpedo-boats, six coastguard vessels, a training-ship, a despatch-boat, a ship for the mining service and numerous vessels for naval police. The state possesses a floating dock and a marine arsenal at Galatz.

Religion. — The State Church of Rumania, which is governed by a Holy Synod, professes the Orthodox Oriental creed. Its indepen- dence was formally recognized by the oecumenical patriarch of Con-stantinople, in 1885. The Rumanian Church had claimed its inde-pendence from very ancient times, but under the Turkish suzerainty and Phanariote hospodars Greeks were generally elected as bishops, and the influence of the Greek patriarch at Constantinople came to be more and more felt. In 1864 it declared itself independent of all foreign prelates. In 1872 a law was passed by which the bishops were elected by the senate, the chamber of deputies, and the synod sitting as an assembly (the only other occasion on which provision is made for such an assembly is in the event of the throne becoming vacant without any apparent heir). It was subsequently decided to con-

secrate the holy oil in Rumania instead of procuring it from Russia or Constantinople; but the Greek patriarch protested. Secret negotiations were entered into which came to a successful issue. The patriarch feared on the one hand that the growing influence of the Russian Church would give a colour of Slavism to the whole church, and that a Russian might eventually be appointed oecumenical patriarch at Constantinople, while the Rumanians hoped by means of the independence of their church to deprive the Russians of all excuse for interfering in their internal affairs under the pretext of religion. The Rumanians, although obtaining complete indepen- dence, agreed to recognize the patriarch at Constantinople as the chief dignitary of the Orthodox Church.

The metropolitan archbishop of Bucharest, officially styled metropolitan primate of Rumania, presides over the Holy Synod; the other members being the metropolitan of Jassy (primate of Moldavia), the six bishops of Rclmnicu V&lcea, Roman, Hushi, Buzeu, Curtea de Argesh and the Lower Danube (Galatz) ; together with eight bishops in partibus, their coadjutors. Metropolitans and bishops are elected by the senate and deputies, sitting_ together. In Hungary there are a uniate metropolitan and three bishops be- longing to the Rumanian church. The secular clergy marry before ordination; and only regular clergy (kalugari) are eligible for high preferment. Although many convents had been closed and utilized for secular purposes, there were in 1910 no less than 168, including nunneries. The older convents are usually built in places difficult of access and are strongly fortified ; for in troublous times they served as refuges for the peasants or rallying-places for demoralized troops. The sequestration of the monastic estates, which in 1 864 covered nearly one-third of Rumania, was due to flagrant abuses. Many estates were held by alien foundations, such as the convents of Mount Athos and Jerusalem; while the revenues of many more were spent abroad by the patriarch of Constantinople. Religious liberty is accorded to all churches, Jews, Moslems, Roman Catholics, Pro- testants, Armenians and Lipovans having their own places of worship.

Education. — Primary education is free and compulsory, ” where schools are available,” for children between seven and eleven years of age. At the close of the”i9th century, however, the accommoda- tion was insufficient, the attendance limited in consequence, and the percentage of illiterates high; reaching 88-5% in some of the rural communes. Great improvements were effected between 1900 and 1907, the number of schools increasing from 3643 to 4463, and the pupils from 298,000 to 515,000. The state contributes to the maintenance of elementary schools, for the Vlachs in Macedonia,

Bulgaria and Transylvania.

Secondary and higher education are also free. There are gym- nasia, or grammar schools of four classes, roughly corresponding with the German sub-gymnasia ; and lyceums of eight classes, which answer to the German gymnasia. Up to the fourth class all pupils are taught alike in the lyceums; in the fifth, however, they are divided into a literary or ” humanist ” section, and a scientific or ” realist ” section. The four upper classes are taught French and German; English and Italian being added for the ” realists,” Greek and Latin for the ” humanists.” Technical instruction is given in the agricultural schools; in various arts and crafts institutes, such as those of Bucharest and Jassy ; in the veterinary and engineering colleges of Bucharest; in numerous commercial schools, and in schools of domestic economy for girls. In 1909-10 there were four ecclesiastical seminaries, seven training schools for teachers and eight military schools. The cost of education is largely borne by the communes, as well as by the state. At Bucharest and Jassy there are universities with faculties of law, philosophy, science and medicine and theology.

Antiquities. — The history of primitive civilization in Rumania can be traced back to the Neolithic Age ; numerous remains of this period have been found at Vodastra in the Romanatzi department. Roman rule left a deep imprint on the country. The following Roman towns have been identified: (1) in the Dobrudja, Cius (Hirsova), Troesmis (Iglitza), Arrubium (Machin), Viodunum (Isakcha), Istrus (Karaharman), Tropaeum (Adam Klissi), Kallatis (Mangalia), Tomi (Constantza); (2) in Moldavia, Dinogetia (Tiglina); (3) in Walachia, Drobetae (Turnu Severin), Malva (Celeiu), Castra Nova (Craiova), Romula (Resca), Sorium (Roshiori de Vede), Pelendava (Bradesci), Acidava (Jenuseshti), Rusidava (Dragasani), Castra Traiana (Ramnicu Valcea), Arutela (Bivolari), Pons Vetus (Caineni), Komidava (Petroasa), Ramidava (Buzeu). A great military road encircled the Dobrudja hills and skirted the Bulgarian shore of the Danube. It was linked by a ferry at Celeiu to two lesser roads; one striking northwards into Transylvania, up the Olt valley, the other bending westwards until it reached the Jiu, and there diverging southwards to Turnu Severin, and northwards to the Vulcan Pass. The plains near the Olt and Jiu estuaries are rich in Roman remains, notably in the towns of

Caracal, Grodjibod and Islaz. Ruins and inscriptions may be seen at Resca, a temple at S!aveni ; villas and a statue of the emperor Commodus (a.d. 161-92) at Celeiu. All these lie within a radius of 60 m. Two ramparts, known as Trajan's wall, can be discerned, one on either side of the railway from Cernavoda to Constantza ; and there were bridges over the Danube at Turnu Severin and Turnu Magurele. The Tropaeum Trajani, or Adam Klissi monument (found near Rassova in the Dobrudja and removed to Bucharest museum), is a round stone structure of 100 ft. circumference and 40 ft. high, carved in low relief with scenes repre- senting Trajan's conquest of Dacia. (See G. Tocilescu, Das Monu- ment von Adam Klissi, Vienna, 1895.) Few monuments were left by the barbarian invaders who ravaged Rumania from the 3rd eentury to the 14th save some vestiges of Gothic culture at Buzeu, and at Petroasa, close by. The celebrated treasure of Petroasa (commonly written Petrossa), preserved in Bucharest museum, consists of embossed and jewelled gold plate, and probably dates from the 6th century (see Plate). Medieval tapestries, with ecclesiastical vestments, ornaments and some fine pieces of early woodwork, are also preserved in Bucharest museum. The attempt to create a national style of architecture, based on Greek and Byzantine models, began under Stephen the Great of Moldavia (1457-1 504), lasting until the 17th century, when it wa. arrested, first by political disorders, and, later, by the commercial develop- ment which caused a demand for cheap and rapid building. Its chief accomplishment is the cathedral of Curtea de Argesh (q.v.). Painting and sculpture, like modern Rumanian architecture, are still in their infancy.

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History

(1) Introduction. — The earliest record of the lands which

constitute the kingdom of Rumania begins with the period

immediately preceding their conquest by the Romans.

For information upon this period, and upon the

subsequent centuries of Roman or Byzantine rule, see

Dacia. From the 6th to the 12th century, wave after wave of barbarian conquerors, Goths, Tatars, Slavs and others, passed over the country, and, according to one school of historians, almost obliterated its original Daco-Roman popu- lation; the modern Vlachs, on this theory, representing a later body of immigrants from Transdanubian territory. According to others, the ancient inhabitants were, at worst, only sub- merged for a time, and their direct descendants are the Rumans of to- day. Each of these conflicting views is supported by strong evidence; and the whole controversy, too large and too obscure for discussion here, is considered under the heading Vlachs.

Towards the close of the 13th century, Walachia and Moldavia were occupied by a mixed population, composed partly of Vlachs, but mainly of Slavs and Tatars; in Great Walachia, 1 also called Muntenia, the Petchenegs and Cumanians fhe predominated. Rumanian historians have striven, by Vlachs in piecing together the stray fragments of evidence which tne 13th survive, to prove that their Vlach ancestors had not, <ˆ atur y. as sometimes alleged, been reduced to a scattered com- munity of nomadic shepherds, dwelling among the Carpathians as the serfs of their more powerful neighbours. The researches of Hasdeu, Xenopol and other historians tend to show the existence of a highly organized Vlach society in Transylvania, Oltland and certain districts of Hungary and Moldavia; of a settled commonalty, agricultural rather than pastoral; and of a hereditary feudal nobility, bound to pay tribute and render military service to the Hungarian crown, but enjoying many privileges, which were denned by a distinct customary law (jus valahicum). Although the characteristic titles of voivode, knez and ban (all implying military as well as civil authority) are of Slavonic origin, and perhaps derived from the practice of the later Bulgarian (or Bulgaro-Vlachian) empire, the growth of Vlach feudal institutions is attributed to German influences, which permeated through Hungarian channels into the Vlach world, and transformed the primitive tribal chiefs into a feudal aristocracy of boiars or boyards 2 (nobles) .

With the 13th century, at latest, begins the authentic political history of the Vlachs in Rumania, but it is not the history of a united people. The two principalities of Walachia amwth of and Moldavia developed separately, and each has its Rumanian separate annals. About the year 1774 it first oation- becomes possible to trace the progress of these ality – Danubian Principalities in a single narrative, owing to the uniform system of administration adopted by the Turkish authorities, and the rapid contemporary growth of a national consciousness among the Vlachs. At last, in 1859, the two principalities were finally united under the name of Rumania. The subjoined history of the country is arranged under the four headings: Walachia, Moldavia, the Danubian Principalities and Rumania, in order to emphasize this historical development.

(2) Walachia. — Tradition, as embodied in a native chronicle of the 1 6th century, entitled the History of the Ruman Land since the arrival of the Rumans (Istoria \icrei Romdnesci de p OU nda- cdndii au desc&licata Romdnii) , gives a precise account Hon of the of the founding of the Walachian state by Radu Negru, Princi- or Rudolf the Black (otherwise known as Negru Voda, P” m y- the Black Prince), voivode of the Rumans of Fogaras in Transylvania, who in 1290 descended with a numerous people into the Transalpine plain and established his capital first at Campulung and then at Curtea de Argesh. Radu dies in 13 10, and is succeeded by a series of voivodes whose names and dates are duly given; but this early chapter of Walachian history has been rudely handled by critical historians. A considerable body of Vlachs doubtless emigrated from Hungary at this time, and founded in Walachia a principality dependent

1 i.e. Walachia east of the Olt, not to be confused with the MeydXi? BXaxia in southern Macedonia (see Balkan Peninsula).

2 In later Rumanian history there arose a class who obtained their rank by merit or favour, and did not necessarily bequeath it to their heirs._ But the hereditary aristocracy also survived, and feudalism remained characteristic of Rumanian society up to i860.

on the Hungarian crown; but material is lacking for a detailed

description of the movement.

In 1330 the voivode John Bassaraba ‘ or Bazarab the Great (1310-38) succeeded in inflicting a crushing defeat on his Hun- suzerain King Charles I. of Hungary, and for fourteen

gariao years Walachia enjoyed complete independence. Louis Suprem- the Great (1342-82) succeeded for a while in restor- acy ‘ ing the Hungarian supremacy, but in 1367 the voivode

Vlad or Vladislav inflicted another severe defeat on the Hun- garians, and succeeded for a time in ousting the Magyar governor of Turnu Severin, and thus incorporating Oltland in his own dominions. Subsequently, in order to retain a hold on the loyalty of the Walachian voivode, the king of Hungary invested him with the title of duke of Fogaras and Omlas, Ruman dis- tricts in Transylvania.

Under the voivode Mircea (1386-1418), whose prowess is still celebrated in the national folk-songs, Walachia played for a while a more ambitious part. This prince during the earlier part of his reign sought a counterpoise to Hungarian influence in close alliance with King Ladislaus V. of Poland. He added to his other titles that of ” count of Severin, despot of the Dobrudja, and lord of Silistria,” and both Vidin and Sistora appear in his possession. A Walachian contingent, apparently Mircea’s, aided the Servian tsar Lazar in his vain endeavour to resist the Turks at Kossovo (1389); later he allied himself with his former enemy Sigismund of Hungary against the Turkish sultan Bayezid I., who inflicted a crushing defeat on the allied armies at Nikopolis in 1396. Bayezid subsequently invaded and laid waste a large part of Walachia, but the voivode succeeded in inflicting considerable loss on the retiring Turks, and the capture of Bayezid by Timur in 1402 gave the country a reprieve. In the internecine struggle that followed amongst the sons of Bayezid, Mircea espoused the cause of Musa; but, though he thus obtained for a while con- siderable influence in the Turkish councils, this policy eventually drew on him the vengeance of the sultan Mahomet I., who succeeded in reducing him to a tributary position.

During the succeeding period the Walachian princes appear alternately as the allies of Hungary or the creatures of the Pei ‘/ s Turk. In the later battle of Kossovo of 1448, between W Kh the Hungarians, led by Hunyadi Janos and the sultan

Hungary Murad II., the Walachian contingent treacherously and the surrendered to the Turks; but this did not hinder the victorious sultan

from massacring the prisoners and adding to the tribute a yearly contribution of 3000 javelins and 4000 shields. In 1453 Constantinople fell; in 1454 Hunyadi died; and a year later the sultan invaded Walachia to set up Vlad IV. (1455-62), the son of a former voivode. The father of this Vlad had himself been notorious for his ferocity, but his son, during his Turkish sojourn, had improved on his father's example. He was known in Walachia as Dracul, or the Devil; and has left a name in history as Vlad the Impaler. The stories of his ferocious savagery exceed belief. • He is said to have feasted amongst his impaled victims. When the sultan Mahomet, infuriated at the impalement of his envoy, the pasha of Vidin, who had been charged with Vlad's deposition, invaded Walachia in person with an immense host, he is said to have found at one spot a forest of pales on which were the bodies of men, women and children. The voivode Radu (1462-75) was substituted for this monster by Turkish influence, and con- strained to pay a tribute of 12,000 ducats; but Vlad returned to the throne in 1476-77.

The shifting policy of the. Walachian princes at this time is well described in a letter of the Hungarian king Matthias Corvinus (1458-90) to Casimir of Poland. " The voivodes," he writes, " of Walachia and Moldavia fawn alternately upon the Turks, the Tatars, the Poles and the Hungarians, that among so many masters their perfidy may remain unpunished." The

1 A. Sturdza gives a genealogical table, showing that Radu belonged to the great native dynasty of Bassarab (q.v.) or Bassaraba, which continued, though not in unbroken succession, to rule in Walachia until 1658, and in Moldavia until 1669.

prevalent laxity of marriage, the frequency of divorce, and the fact that illegitimate children could succeed as well as those born in lawful wedlock, by multiplying the candidates for the voivodeship and preventing any regular system of succession, contributed much to the internal confusion of the country. The elections, though often controlled by the Turkish Divan, were still constitutionally in the hands of the boiars, who were split up into various factions, each with its own pretender to the throne. The princes followed one another in rapid succession, and usually met with violent ends. A large part of the popu- lation led a pastoral life, and at the time of Verantius's visit to Walachia in the early part of the 16th century, the towns and villages were built of wood and wattle and daub. Tirgovishtea alone, at this time the capital of the country, was a considerable town, with two stone castles.

A temporary improvement took place under Neagoe Bassaraba (151 2-21). Neagoe was a great builder of monasteries; he founded the cathedrals of Curtea de Argesh (q.v.) and Tirgovish- tea, and adorned Mount Athos with his pious works. He trans- ferred the direct allegiance of the Walachian Church from the patriarchate of Ochrida in Macedonia to that of Constantinople. On his death, however, the brief period of comparative prosperity which his architectural works attest was tragically interrupted, and it seemed for a time that Walachia was doomed to Turkish sink into a Turkish pashalic. The Turkish commander, opprea- Mahmud Bey, became treacherously possessed of Nea- sions. goe's young son and successor, and, sending him a prisoner to Stambul, proceeded to nominate Turkish governors in the towns and villages of Walachia. The Walachians resisted desperately, elected Radu, a kinsman of Neagoe, voivode, and succeeded with Hungarian help in defeating Mahmud Bey at Grumatz in 1522. The conflict was prolonged with varying fortunes until in 1524 the dogged opposition of the Walachians triumphed in the sultan's recognition of Radu.

But the battle of Mohacs in 1526 decided the long preponder- ance of Turkish control. The unfortunate province served as a transit route for Turkish expeditions against Hungary and Transylvania, and was exhausted by continual requisitions. Turkish settlers were gradually making good their footing on Walachian soil, and mosques were rising in the towns and villages. The voivode Alexander, who succeeded in 1591, and like his predecessors had bought his post of the Divan, carried the oppres- sion still further by introducing a janissary guard and farming out his possessions to his Turkish supporters. Meanwhile the Turkish governors on the Bulgarian bank never ceased to ravage the country, and again it seemed as if Walachia must share the fate of the Balkan States and succumb to the direct government of the Ottoman.

In the depth of the national distress the choice of the people fell on Michael, the son of Petrushko, ban of Craiova, the first dignitary of the realm, who had fled to Transylvania to escape Alexander's machinations. Supported at Constantinople by two influential personages, Sigismund Bathory, prince of Transylvania (1581-98 andi6oi-2), and the English ambassador, Edward Barton, and aided by a loan of 200,000 florins, Michael succeeded in procuring from the Divan the deposition of his enemy and his own nomination.

The genius of Michael "the Brave" (1593-1601) secured Walachia for a time a place in universal history. The moment for action was favourable. The emperor Rudolph II. had gained some successes over

the Turks, and Sigismund tae Brave. Bathory had been driven by Turkish extortions to throw off the allegiance to the sultan. But the first obstacle to be dealt with was the presence of the enemy within the walls. By previous concert with the Moldavian voivode Aaron, on the 13 th of November 1 594, the Turkish guards and settlers in the two princi- palities were massacred at a given signal. Michael followed up these ” Walachian Vespers ” by an actual invasion of Turkish territory, and, aided by Sigismund Bathory, succeeded in carrying by assault Rustchuk, Silistria and other places on the right bank of the lower Danube. A simultaneous invasion of Walachia by a large Turkish and Tatar host was successfully defeated;

the Tatar khan withdrew with the loss of his bravest followers, and, in the great victory of Mantin on the Danube (1595), the Turkish army was annihilated, and its leader, Mustafa, slain. The sultan now sent Sinan Pasha, ” the Renegade,” to invade Walachia with 100,000 men. Michael withdrew to the mountains before this overwhelming force, but, being joined by Bathory with a Transylvanian contingent, the voivode resumed the offen- sive, stormed Bucharest, where Sinan had entrenched a Turkish detachment, and, pursuing the main body of his forces to the Danube, overtook the rearguard and cut it to pieces, capturing enormous booty. Sinan Pasha returned to Constantinople to die, it is said, of vexation; and in 1597, the sultan, weary of a disastrous contest, sent Michael a red flag in token of recon- ciliation,’ reinvested him for life in an office of which he had been unable to deprive him, and granted the succession to his son.

In 1599, on the abdication of Sigismund Bathory in Transyl- vania, Michael, in league with the imperialist forces, and in Conquest connivance with the Saxon burghers, attacked and of Trail- defeated his successor Andreas Bathory near Hermann- aylvania. s ta.dt, and, seizing himself the reins of government, secured his proclamation as prince of Transylvania. The emperor consented to appoint him his viceroy {locum tenens per Transylvaniam), and the sultan ratified his election. As prince of Transylvania he summoned diets in 1599 and 1600, and, having expelled the voivode of Moldavia, united under his sceptre three principalities. The partiality that he showed for the Ruman and Szekler parts of the population alienated, however, the Transylvanian Saxons, who preferred the direct government of the emperor. The imperial commissioner General Basta lent his support to the disaffected party, and Michael was driven out of Transylvania by a

successful revolt, while a Polish army invaded Walachia from the Moldavian side. Michael's coolness and resource, however, never deserted him. He resolved to appeal to the emperor, rode to Prague, won over Rudolph by his singular address, and, richly supplied with funds, reappeared in Transylvania as imperial governor. In con- junction with Basta he defeated the superior Transylvanian forces at Goroslo, expelling Sigismund Bathory, who had again aspired to the crown, and taking one hundred and fifty flags and forty-five cannon. But at the moment of his returning prosperity Basta, who had quarrelled with him about the supreme command of the imperial forces, procured his murder on the 19th of August 1601. Not only had Michael succeeded in rolling back for a time the tide of Turkish conquest, but for the first and last time in modern history he united what once had been Trajan's Dacia, in its widest extent, and with it the whole Rumaa race north of the Danube, under a single sceptre.

Michael's wife Florika and his son Nicholas were carried off into Tatar captivity, and Serban or Sherban, of the Bassaraba family, was raised to the voivodeship of Walachia by imperialist influences, while Sigismund resumed the government of Tran- sylvania. On his deposition by the Porte in 1610, there fol- lowed a succession of princes who, though still for the most part of Ruman origin, bought their appointment at Stambul. Walachian contingents were continually employed by the Turks in their Polish wars, and the settlement of Greeks in an official or mercantile capacity in the principality provoked grave discontent, which on one occasion took the form of a massacre.

The reign of the voivode Matthias Bassaraba (1633-54) was an interval of comparative prosperity. Matthias repulsed Matthias his powerful rival, Basil the Wolf, the voivode of Bassa- Moldavia and his Tatar and Cossack allies. His last raba – days were embittered, however, by an outbreak of

military anarchy. His illegitimate son and successor, Con- stantine §erban (1634-58), was the last of the Bassaraba dynasty to rule over Walachia; and on his death the Turkish yoke again weighed heavier on his country. The old capital, Tirgovishtea, was considered by the Divan to be too near the Transylvanian frontier, and the voivodes were accordingly compelled to transfer their residence to Bucharest, which was finally made the seat of government in 1698. xxm. 27

The mechanical skill of the Walachians was found useful by the Turks, who employed them as carpenters and pontonniers: and during the siege of Vienna in 1683 the Walachian serban contingent, which,

under the voivode §erban Cantacu- canta- zene, had been forced to co-operate with the Turks, cuzene. was entrusted with the construction of the two bridges over the Danube above and below Vienna. The Walachian as well as the Moldavian prince, who had been also forced to bring his contingent, maintained a secret system of communication with the besieged, which was continued by §erban after his return to Walachia. The emperor granted him a diploma creating him count of the empire and recognizing his descent from the imperial house of Cantacuzene, §erban meanwhile collecting his forces for an open breach with the Porte. His prudence, however, perpetually postponed the occasion, and Walachia enjoyed peace to his death in 1688. This peaceful state of the country gave the voivode leisure to promote its internal culture, and in the year of his death he had the satisfaction of seeing the first part of a Walachian Bible issue from the first printing-press of the country, which he had established at Bucharest. He had also caused to be compiled a history of Walachia, and had called to the country many teachers of the Greek language, whose business it was to instruct the sons of the boiars in grammar, rhetoric and philosophy.

Immediately on §erban's death the . boiars, to prevent the Porte from handing over the office to the Greek adventurer who bid the highest, proceeded to elect his sister's son C(MJ . Constantine Brancovan. The Turkish envoy then in stantiae Bucharest was persuaded to invest Brancovan with the Bran- caftan, or robe of office, in token of Turkish approval, covan – and the patriarch of Constantinople, who was also present, and the archbishop of Walachia, Theodosius, consecrated him together at the high altar of the cathedral, where he took the coronation oath to devote his whole strength to the good of his country and received the boiars' oath of submission. Bran- covan, it is true, found it expedient to devote his predecessor's treasure to purchasing the confirmation of his title from the Divan, but the account of his coronation ceremony remains an interesting landmark in the constitutional history of the country. In his relations with the Habsburg power he displayed the same caution as the voivode §erban. In spite of defeats inflicted on the Turks by the imperial troops at Pozharevats, Nish and Vidin, in 1689, it was only by an exercise of force that they secured winter quarters in Walachia; and though, after the battle of Poltava in 1709, Brancovan concluded a secret treaty with the tsar Peter the Great, he avoided giving open effect to it. The tranquillity which he thus obtained was employed by Brancovan as by his predecessor in furthering the internal well-being of the country, with what success is best apparent from the description of Walachia left by the Florentine Del Chiaro, who visited thˆ country in 1 709 and

spent Dej seven years there. He describes the stoneless Walachian ctiaro's plain, with its rich pastures, its crops of maize and descrip- millet, and woods so symmetrically planted and w*j°hi carefully kept by Brancovan's orders that hiding in them was out of the question. Butter and honey were exported to supply the sultan's kitchen at Stambul; wax and cattle to Venice; and the red and white wine of Walachia, notably that of Pitesei, to Transylvania. The Walachian horses were in demand among the Turks and Poles. Near Ribnik and elsewhere were salt-mines which supplied all the wants of the Transdanubian provinces of Turkey; there were considerable copper mines at Maidan; and iron was worked near Tirgovishtea. The gipsy community was bound to bring fifteen pounds weight of gold from the washings of the Argesh. Many of the boiars were wealthy, but the common people were so ground down with taxation that " of their ancient Roman valour only the name remained." To avoid the extortion of their rulers numbers had emigrated to Transylvania and even to the Turkish provinces. The principal Walachian city was Bucharest, con- taining a population of about 50,000; but, except for two large hans or merchants' halls built by Brancovan and his

predecessor, and the recently erected palace, which had a marble staircase and a fine garden, the houses were of wood. The dress of the men was thoroughly Turkish except for their lamb- skin caps, that of the women half Greek, half Turkish. The houses were scrupulously clean and strewn with sweet herbs. Del Chiaro notices the great imitative capacity of the race, both artistic and mechanical. A Walachian in Venice had copied several of the pictures there with great skill; the copper-plates and wood engravings for the new press were executed by native hands. The Walachians imitated every kind of Turkish and European manufacture; and, though the boiars imported finer glass from Venice and Bohemia, a glass manufactory had been established near Tirgovishtea which produced a better quality than the Polish. From the Bucharest press, besides a variety of ecclesiastical books, there were issued in the Ruman tongue a translation of a French work entitled The Maxims of the Orientals and The Romance of Alexander the Great. In 1700 Brancovan had a map of the country made and a copperplate engraving of it executed at Padua.

The prosperity of Walachia, however, under its " Golden Bey," as

Brancovan was known at Stambul, only increased the Pan of Turkish exactions; and, although all demands were Bran- punctually met, the sultan finally resolved on the covan. removal of his too prosperous vassal. Brancovan was accused of secret correspondence with the emperor, the tsar, the king of Poland and the Venetian republic, of betray- ing the Porte's secrets, of preferring Tirgovishtea to Bucharest as a residence, of acquiring lands and palaces in Transylvania, of keeping agents at Venice and Vienna, in both of which cities he had invested large sums, and of striking gold coins with his effigy. 1 An envoy arrived at Bucharest on the 4th of April 1 7 14, and proclaimed Brancovan mazil, i.e. deposed. He was conducted to Constantinople and beheaded, together with his four sons. A scion of the rival Cantacuzenian family was elected by the pasha's orders, and he, after exhausting the principality for the benefit of the Divan, was in turn deposed and executed in 17 16.

From this period onwards the Porte introduced a new system with regard to its Walachian vassals. The line of national The princes ceased. The office of voivode or hospodar

Phan- was sold to the highest bidder at Stambul, to be farmed arlote ou t from a purely mercenary point of view. The

- " princes who now succeeded one another in rapid succes- sion were mostly Greeks from the Phanar quarter of Con- stantinople who had served the palace in the quality of dragoman (interpreter), or held some other court appointment. They were nominated by imperial firman without a shadow of free election, and were deposed and transferred from one principality to another, executed or reappointed, like so many pashas. Like pashas they rarely held their office more than three years, it being the natural policy of the Porte to multiply such lucrative nominations. The same hospodar was often reappointed again and again as he succeeded in raising the sum necessary to buy back his title. Constantine Mavrocordato was in this way hospodar of Walachia at six different times, and paid on one occasion as much as a million lion-dollars (£40,000) for the office. The princes thus imposed on the country were generally men of intelligence and culture. Nicholas Mavrocordato, the first of the series, was himself the author of a Greek work on duties, and maintained at his court Demeter Prokopios of Moschopolis in Macedonia, who wrote a review of Greek literature during the 17th and beginning ofthei8th centuries. Constantine Mavrocordato was the author of really liberal reforms. He introduced an urbarium or land law, limiting

to 24 the days of angaria, or forced labour, owed yearly by the peasants to their feudal lord. In 1747 he decreed the abolition of serfdom, but this enactment was not carried

1 One of these, with the legend ” constantinvs bassaraba de

BRANCOVAN D.G.VOEVODAET PRINCEPS VALACHIAE TRANSALPINAE,”

and having on the reverse the crowned shield of Walachia containing a raven holding a cross in its beak between a moon and a star, is engraved by Del Chiaro. They were of 2, 3 and 10 ducats weight.

into effect. But the rule of the Phanariotes could not but be productive of grinding oppression, and it was rendered doubly hateful by the swarms of Greek adventurers who accompanied them. Numbers of the peasantry emigrated, and the population rapidly diminished. In 1 745 the number of tax-paying families, which a few years before had amounted to 147,000, had sunk to 70,000. Yet the taxes were continually on the increase, and the hospodar Scarlat Ghica (1758-61), though he tried to win some popularity by the removal of Turkish settlers and the abolition of the vakarit or tax on cattle and horses, which was peculiarly hateful to the peasantry, raised the total amount of taxation to 25,000,000 lion-dollars, about £1,000,000. The Turks meantime maintained their grip on the country by hold- ing on the Walachian bank of the Danube the fortresses of Giurgevo, Turnu Severin and Orsova, with the surrounding districts.

But the tide of Ottoman dominion was ebbing fast. Already, by the peace of Passarowitz Pozharevats in 1718, the banat of Craiova had been ceded to the emperor, though by the peace of Belgrade in 1739 it was recovered by the Porte for its Wala- chian vassal. In 1769 the Russian general Romanzov occupied the principality, the bishops and clergy took an oath of fidelity to the empress Catherine, and a deputation of boiars followed. The liberties of the country were guaranteed, taxation reformed and in 1772 the negotiations at Fokshani between Russia and the Porte broke down because the empress’s representatives insisted on the sultan’s recognition of the independence of Walachia and Moldavia under a European guarantee. Turkish rule was, however, definitely restored by the treaty of Kutchuk Kainardji, in 1774; and as from this period onwards Walachian history is closely connected with that of Moldavia, it may be convenient before continuing this review to turn to the earlier history of the sister principality.

(3) Moldavia. — According to the native traditional account, as first given by the Moldavian chroniclers of the 16th, 17th and 18th centuries, Dragosh the son of Bogdan, the founder of the Moldavian principality, emigrated with his followers from the Hungarian district of Marmaros in the northern Carpathians. The dates assigned to this event vary from 1299, given by Urechia, to 1342, given by the monastic chronicle of Putna. The story is related with various fabulous accompaniments. From the aurochs (zimbru), in pursuit of which Dragosh first arrived on the banks of the Moldova, is derived the ox-head of the Moldavian national arms, and from his favourite hound who perished in the waters the name of the river. From the Hungarian and Russian sources, which are somewhat more precise, the date of the arrival of Dragosh, who is confused with the historical Bogdan Voda (1349-1365), appears to have been 1349, and his departure from Marmaros was carried out in defiance of his Hungarian suzerain.

These legendary accounts seem to show that the Moldavian voivodate was founded, like that of Walachia, by Vlach immi- grants from Hungary, during the first half of the 14th century. Its original strength lay probably in History. the compact Ruman settlements among the eastern Carpathians, first mentioned by Nicetas of Chonae, about n64. The Moldavian lowlands were still held by a variety of Tatar tribes, who were only expelled after 135c, by the united efforts of Andrew Laszkovich, voivode of Transylvania, and Bogdan Voda, the first independent prince of Moldavia. Coins bearing the name of Bogdan are still extant; and there is an inscription over his tomb at the monastery of Radautzi, in Bukovina, placed there by Stephen the Great of Moldavia (1457-1504).

In the agreement arrived at between Louis of Hungary and the emperor Charles IV. in 1372, the voivodate of Moldavia was recognized as a dependency of the crown of St Stephen. _ . The overlordship over the country was, however, claims of contested by the king of Poland, and their rival Poland claims were a continual source of dispute between the a ° d two kingdoms. In 141 2 a remarkable agreement was arrived at between Sigismund, in his quality of king of Hungary, and King Ladislaus Il.of Poland, by which both parties

consented to postpone the question of suzerainship in Moldavia. Should, however the Turks invade the country, the Polish and Hungarian forces were to unite in expelling them, the voivode was to be deposed, and the Moldavian territories divided be- tween the allies. During the first half of the 15th century Polish influence was preponderant, and it was customary for the voivodes of Moldavia to do homage to the king of Poland at his cities of Kameniec or Snyatin.

In 1456 the voivode Peter, alarmed at the progress of the Turks, who were now dominant in Servia and Walachia, offered the sultan Mahomet II. a yearly tribute of 2000 ducats. fbl"anac ° n his deposition, however, in 1457 by Stephen, known as " the Great," Moldavia became a power formidable alike to Turk, Pole and Hungarian. Throughout the long reign of this voivode, which lasted forty-six years, from 1458 to 1504, his courage and resources never failed. In the early part of his reign he appears, in agreement with the Turkish sultan and the king of Poland, turning out the Hungarian vassal, the ferocious Vlad, from the Walachian throne, and annexing the coast cities of Kilia and Cetatea Alba or Byelgorod, the Turkish Akkerman. These cities he refused to cede to the sultan, and, about this period, he entered into negotiations with Venice and the shah of Persia, in the vain hope of organizing a world-wide coalition against the Turks. In the autumn of 1474 the sultan Mahomet entered Moldavia at the head of an army estimated by the Polish h'.storian Dlugosz at 120,000 men. The voivode Stephen withdrew into the interior at the approach of this overwhelming host, but on the 17th of January 1475, turned to bay at Rahova (Podul Inalt, near Vaslui) and gained a complete victory over the Turks. Four pashas were among the slain ; . over a hundred banners fell into the Moldavian hands; and only a few survivors succeeded in reaching the Danube. In 1476 Mahomet again invaded Moldavia, but, though successful in the open field, the Turks were sorely harassed by Stephen's guerilla onslaughts, and, being thinned by pestilence, were again constrained to retire. In 1484 the same tactics proved successful against an invasion of Bayezid II. Three years later a Polish invasion of Moldavia under John Albert with 80,006 men ended in disaster, and shortly afterwards the voivode Stephen, aided by a Turkish and Tatar contingent, laid waste the Polish territories to the upper waters of the Vistula, and succeeded in annexing for a time the Polish province of Pokutia, between the Carpathians and the Dniester.

Exclusive of this temporary acquisition, the Moldavian terri- tory at this period extended from the river Milcovu, which formed Moldavia tne boundary of Walachia, to the Dniester. It in- circa eluded the Carpathian region of Bukovina, literally

1500. ” the beechwood, ” where lay Sereth and Suciava

(Suczawa), the earliest residences of the voivodes, the maritime district of Budzak (the later Bessarabia), with Kilia, Byelgorod and the left bank of the lower Danube from Galatz to the Sulina mouth. The government, civil and ecclesiastical, was practically the same as that described in the case of Walachia, the officials bearing for the most part Slavonic titles derived from the practice of the Bulgaro-Vlachian tsardom. The church was Orthodox Oriental, and depended from the patriarch of Ochrida. In official documents the language used was Slavonic, the style of a Moldavian ruler being Nachalnik i Voievoda Moldovlasi, prince and duke (=Ger. Fiirst and Herzog) of the Moldov-lachs. The election of the voivodes, though in the hands of the boiars, was strictly regulated by hereditary principles, and Cantemir describes the extinction of the house of Dragosh in the 1 6th century as one of the unsettling causes that most contributed to the ruin of the country. The Moldavian army was reckoned 40,000 strong, and the cavalry were especially formidable. Ver- antius of Sebenico, an eye-witness of the state of Moldavia at the beginning of the 16th century, mentions three towns of the interior provided with stone walls — Suciava, Chotim (Khotin) and Ncamtzu; the people were barbarous, but more warlike than the Walachians and more tenacious of their national costume, punishing with death any who adopted the Turkish.

In 1 504 Stephen the Great died, and was succeeded by his son, Bogdan III. ” the One-eyed. ” At feud with Poland about Pokutia, despairing of efficacious support from hard- Moldavia pressed Hungary, the new voivode saw no hope of tributary safety except in a dependent alliance with the ad- *° the vancing Ottoman power, which already hemmed Moldavia in on the Walachian and Crimean sides. In 1513 he agreed to pay an annual tribute to the sultan Selim in return for the sultan’s guarantee to preserve the national constitution and religion of Moldavia, to which country the Turks now gave the name of Kara Bogdan, from their first vassal. The terms of Moldavian submission were further regulated by a firman signed by the sultan Suleiman at Budapest in 1529 by which the yearly present or backshish, as the tribute was euphoniously called, was fixed at 4000 ducats, 40 horses and 25 falcons, and the voivode was bound at need to supply the Turkish army with a contingent of 1000 men. The Turks pursued much the same policy as in Walachia. The tribute was gradually increased. A hold was obtained on the country by the occupation of various fortresses on Moldavian soil with the surrounding territory — in 1538 Cetatea Alba, in 1592 Bender, in 1702 Chotim (Khotin). Already by the middle of the 16th century the yoke was so heavy that the voivode Elias (1546-51) became

Mahommedan to avoid the sultan's anger.

At this period occurs a curious interlude in Moldavian history. In 1 561 the adventurer and impostor Jacob Basilicus succeeded with Hungarian help in turning out the voivode Alexander Lapusheanu (1552-61 and 1563-68) and Basilicus. seizing on the reins of government. A Greek by birth, adopted son of Jacob Heraklides, despot of Paros, Samos and other Aegean islands, acquainted with Greek and Latin literature, and master of most European languages; appearing alternately as a student of astronomy at Wittenberg, whither he had been invited by Count Mansfeld, as a correspondent of Melanchthon, and as a writer of historical works which he dedicated to Philip II. of Spain, Basilicus, finding that his Aegean sovereignty was of little practical value beyond the crowning of poet laureates, fixed his roving ambition on a more substantial dominion. He published an astounding pedigree, in which, starting from " Hercules Triptolemus," he wound his way through the royal Servian line to the kinship of Moldavian voivodes, and, having won the emperor Ferdinand to his financial and military support, succeeded, though at the head of only 1600 cavalry, in routing by a bold dash the vastly superior forces of the voivode, and even in purchasing the Turkish confirmation of his usurped title. He assumed the style of BacriXeus MoX5a/3tas, and eluded the Turkish stipulation that he should dismiss his foreign guards. In Moldavia he appeared as a moral reformer, endeavouring to put down the prevalent vices of bigamy and divorce. He erected a school, placed it under a German master, and collected children from every part of the country to be maintained and educated at his expense. He also busied himself with the col- lection of a library. But his taxes — a ducat for each family — were considered heavy; his orthodoxy was suspected, his foreign counsellors detested. In 1563 the people rose, massacred the Hungarian guards, the foreign settlers, and finally Jacob himself.

The expelled voivode Alexander was now restored by the Porte, the schools were destroyed, and the country relapsed into its normal state of barbarism under Bogdan IV. (1568- 72). Bogdan's successor, John the Terrible (1572-74), was provoked by the Porte's demand for 120,000 ducats as tribute instead of 60,000 as heretofore to rise against the oppressor; but after gaining three victories he was finally defeated and slain (1574), and the country was left more than ever at the mercy of the Ottoman. Voivodes were now created and deposed in rapid succession by the Divan, but the victories of Michael the Brave in Walachia infused a more independent spirit into the Moldavians. The Moldavian dominion was now disputed by the Transylvanians and Poles, but in 1600 Michael succeeded in annexing it to his " Great

Dacian ” realm. On Michael’s murder the Poles under Zamoyski again

asserted their supremacy, but in 1618 the Porte once more recovered its dominion and set up successively two creatures of its own as voivodes — Gratiani, an Italian who had been court jeweller, and a Greek custom-house official, Alexander.

As in Walachia at a somewhat later date, the Phanariote regime seemed now thoroughly established in Moldavia, and Tbe it became the rule that every three years the voivode

Phan- should procure his confirmation by a large baksheesh, ariote anc i every year by a smaller one. But Prince Basil ”””” the Wolf (Vasilie Lupul), an Albanian, who succeeded in 1634, showed great ability, and for twenty years maintained his position on the Moldavian throne. He introduced several internal reforms, codified the written and unwritten laws of the country, established a printing press, Greek monastic schools, and also a Latin school. He brought the Moldavian Church into more direct relation with the patriarch of Constantinople, but also showed considerable favour to the Latins, allowing them to erect churches at Suciava, Jassy and Galatz. The last voivode of the Bassaraba family, Elias Voda, reigned from 1667 to 1669.

During the wars between Sobieski, king of Poland (1674- 96), and the Turks, Moldavia found itself between hammer and anvil, and suffered terribly from Tatar devastations. The voivode Duka was forced like his Walachian contemporary to supply a contingent for the siege of Vienna in 1683. After Sobieski’s death in 1696, the hopes of Moldavia turned to the advancing Muscovite power. In 1711 the voivode Cantemir. Demetrius Cantemir, rendered desperate by the Turkish exactions, concluded an agreement with the tsar Peter the Great by which Moldavia was to become a protected and vassal state of Russia, with the enjoyment of its traditional liberties, the voivodeship to be hereditary in the family of Cantemir. On the approach of the Russian army the prince issued a proclamation containing the terms of the Russian protectorate and calling on the boiars and people to aid their Orthodox deliverers. But the long Turkish terrorism had done its work, and at the approach of a Turkish and Tatar host the greater part of the

Moldavians deserted their voivode. The Russian campaign was unsuccessful, and all that Peter could offer Cantemir and the boiars who had stood by him was an asylum on Russian soil.

In his Russian exile Cantemir composed in a fair Latin style his Descriptio Moldaviae, the counterpart, so far as Moldavia is concerned, to Del Chiaro's contemporary descrip- tion of Walachia. The capital of the country was now Jassy, to which city Stephen the Great had trans- ferred his court from Suciava, the earlier residence of the voivodes. It had at this time forty churches — some of stone, some of wood. Fifty years before it had con- tained 12,000 houses, but Tatar devastations had reduced it to a third of its former size. The most important commercial emporium was the Danubian port of Galatz, which was fre- quented by vessels from the whole of the Levant from Trebizond to Barbary. The cargoes which they here took in consisted of Moldavian timber (oak, deal and cornel), grain, butter, honey and wax, salt and nitre. Kilia, at the north mouth of the Danube, was also frequented by trading vessels, including Venetian and Ragusan. Moldavian wine was exported to Poland, Russia, Transylvania, and Hungary; that of Cotnar was in Cantemir's opinion superior to Tokay. The excellence of the Moldavian horses is attested by a Turkish proverb; and annual droves of as many as 40,000 Moldavian oxen were sent across Poland to Danzig. Moldavia proper was divided into the upper country or T'erra de sus, and the lower country, or T'erra de josu. Bessarabia had been detached from the rest of the principality and placed under the direct control of the military authorities. It was divided into four provinces: that of Budzak, inhabited by the Nogai Tatars; that of Cetatea Alba, the Greek Monkastron, a strongly fortified place; and those of Ismaila and Kilia. The voivodes owed their nomination entirely to the Porte, and the great officers of the realm were appointed at their discretion. These were the

Can- temir's descrip- tion of Moldavia,

Great Logothete (Marele Logofetu) or chancellor; the governor of Lower Moldavia — Vorniculu de t'erra de josu; the governor of Upper Moldavia — -Vorniculu de t'erra de sus; the Hatman or commander-in-chief; the high chamberlain — Marele Postel- nicu; the great Spathar, or sword-bearer; the great cup- bearer — Marele Paharnicu; and the treasurer, or Vistiernicu, who together formed the prince's council and were known as Boiari de Svatu. Below these were a number of subordinate officers who acted as their assessors and were known as boiars of the Divan (Boiari de Divanu). The high court of justice was formed by the prince, metropolitan and boiars: the Boiari de Svatu decided on the verdict; the metropolitan declared the law;

and the prince pronounced sentence. The boiars were able to try minor cases in their own residences, but. subject to the right of appeal to the prince's tribunal. Of the char- acter of the Moldavian people Cantemir does not give a very favourable account. Their best points were their- hospitality and, in Lower Moldavia, their valour. They cared little for letters, and were generally indolent, and their prejudice against mercantile pursuits left the commerce of the country in the hands of Armenians, Jews, Greeks and Turks. The pure- blood Ruman population, noble and plebeian, inhabited the cities and towns or larger villages; the peasantry were mostly of Little Russian and Hungarian race, and were in a servile condition. There was a considerable gipsy population, almost every boiar having several Zingar families in his possession; these were mostly smiths.

From this period onwards the character of the Ottoman domination in Moldavia is in every respect analogous to that

of Walachia. The office of voivode or hospodar was „ .,

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f armed out by the Porte to a succession of wealthy ation of

Greeks from the Phanar quarter of Constantinople. Phan- All formality of election by the boiars was now dis- arlote pensed with, and the princes received their caftan of office at Constantinople, where they were consecrated by the Greek patriarch. The system favoured Turkish extortion in two ways: the presence of the voivode's family connexions at Stambul gave the Porte so many hostages for his obedience; on the other hand the prince's themselves could not rely on any support due to family influence in Moldavia itself. They were thus mere puppets of the Divan, and could be deposed and shifted with the same facility as so many pashas — an object of Turkish policy, as each change was a pretext for a new levy of baksheesh. The chief families that shared the office during this period were those of Mavrocordato, Ghica, Callimachi, Ypsilanti and Murusi. Although from the very conditions of their creation they regarded the country as a field for ex- ploitations, they were themselves often men of education and ability, and unquestionably made some praiseworthy attempts to promote the general culture and well-being of their subjects. In this respect, even the Phanariote regime was preferable to mere pasha rule, while it had the further consequence of pre- serving intact the national form of administration and the historic offices of Moldavia. Gregory Ghica (1774-77), who himself spoke French and Italian, founded a school or " gym- nasium " at Jassy, where Greek, Latin and theology were

taught in a fashion. He encouraged the settlement of German Protestant colonists in the country, some of whom set up as watchmakers in Jassy, where they were further allowed to build an evangelical church. J. L. Carra, a Swiss who had been tutor to Prince Ghica's children, and who published in 1 781 an account of the actual state of the principalities, speaks of some of the boiars as possessing a taste for French literature and even for the works of Voltaire, a tendency actively com- bated by the patriarch of Constantinople.

The Russo-Turkish War, which ended in the peace of Kutchuk Kainardji (1774), was fatal to the integrity of Moldavian territory. The house of Austria, which had already annexed Galicia in 1772, profited by the situation to Bukovina. arrange with both contending parties for the peace- ful cession of Bukovina to the Habsburg monarchy. This richly wooded Moldavian province, containing Suciava

(Suczawa), the earliest seat of the voivodes, and Cernautii or Czernovicz, was in 1774 occupied by Habsburg troops with Russian connivance, and in 1777 Baron Thugut procured its formal cession from the sultan.

(4) The Danubian Principalities : 17ˆ4-1859. — By the treaty of Kutchuk Kainardji Russia consented to hand back Treaty of the principalities to the sultan, but by Article xvi. Kutchuk several stipulations were made in favour of the Wal- Kaiuardjl. ac hians and Moldavians. The people of the princi- palities were to enjoy all the privileges that they had possessed under Mahomet IV. ; they were to be freed from tribute for two years, as some compensation for the ruinous effects of the last war; they were to pay a moderate tribute ; the agents of Walachia and Moldavia at Constantinople were to enjoy the rights of national representatives, and the Russian minister at the Porte should on occasion watch over the interests of the principalities. The stipulations of the treaty, though deficient in precision (the Walachians, for instance, had no authentic record of the privileges enjoyed under Mahomet IV.), formed the basis of future liberties in both principalities; but for the moment all reforms were postponed.

The treaty was hardly concluded when it was violated by the Porte, which refused to recognize the right of the Walachian boiars to elect

their voivode, and nominated Alexander Ypsilanti, a creature of its own. In 1777 Gonstantine Murusi was made voivode of Moldavia in the same high-handed fashion. The Divan seemed intent on restoring the old system of government in its entirety, but in 1783 the Russian representative extracted from the sultan a decree (hattisherif) defining more precisely the liberties of the principalities and fixing the amount of the annual tribute — for Walachia 619 purses exclusive of various ” presents ” amounting to 130,000 piasters, and for Moldavia 135 purses and further gifts to the extent of 115,000 piasters. By the peace of Jassy in 1792 the Dniester was recognized as the Russian frontier, and the privileges of the principalities as specified in the hattisherif confirmed. In defiance of treaties, however, the Porte continued to change the hospodars almost yearly and to exact extraordinary installation presents. The revolt of Pasvan Oglu in Bulgaria was the cause of great injury to Walachia. The rebels ravaged Little Walachia in 1801-2, and their ravages were succeeded by those of the Turkish troops, who now swarmed over the country. Exaction followed exac- tion, and in 1802 Russia resolved to assert her treaty rights in favour of the oppressed inhabitants of the principalities. On the accession of Constantine Ypsilanti (1802-6) in Walachia, and of Alexander Murusi (1802-6) in Moldavia, the Porte was constrained to issue a new hattisherif by which every prince Russian was to hold his office for at least seven years, unless the protec- Porte satisfied the Russian minister that there were good ”””• and sufficient grounds for his deposition. This clause

of the hattisherif was not enforced. All irregular contributions were to cease, and all citizens, with the exception of the boiars and clergy, were to pay their share of the tribute. The Turkish troops then employed in the principalities were to be paid off, and one year’s tribute remitted for the purpose. The boiars were to be responsible for the maintenance of schools, hospitals and roads; they and the prince together for the militia. The number of Turkish merchants resident in the country was limited. Finally, the hospodars were to be amenable to repre- sentations made to them by the Russian envoy at Constanti- nople, to whom was entrusted the task of watching over the Walachian and Moldavian liberties. This, it will be seen, was a veiled Russian protectorate.

In 1804 the Serbs under Karageorge rose against the Turkish dominion, and were secretly aided by the Walachian voivode Ypsilanti. The Porte, instigated by Napoleon’s ambassador Sebastiani, resolved on Ypsilanti’s deposition, but the hospodar succeeded in escaping to St Petersburg. In the war that now ensued between the Russians and the Turks, the Russians were for a time successful, and

even demanded that the Russian territory should extend to the Danube. They occupied the principalities from 1806 to 181 2. In 1808 they formed a

governing committee consisting of the metropolitan, another bishop, and four or five boiars under the presidency of General Kusnikov. The seat of the president was at Jassy, and General Engelhart was appointed as vice-president at Bucharest. By the peace of Bucharest, however, in 1812, the principalities were restored to the sultan under the former conditions, with the exception of Bessarabia, which was ceded to the tsar. The Pruth thus became the Russian boundary.

The growing solidarity between the two Ruman principalities received a striking illustration in 1816, when the Walachian and Moldavian hospodars published together a code applicable to both countries, and which had been elaborated by a joint com- mission. The Greek movement was now beginning to assume a practical shape. About 1780 Riga Velestiniul, a Heilenized Vlach from Macedonia who is also known by the purely Greek name of Rigas Phereos, had founded in Bucharest a patriotic and revolutionary association known as the Society of Friends (eraipia t&v l\u>v) which gradually attained great in- The fluence. In i8iolgnatius,themetropolitanof Walachia, «< fletaer- founded a Greek literary society in Bucharest which 1st" soon developed into a political association, and many move " similar bodies were formed throughout the Greek world, men ' and finally united into one powerful secret society, the Hetairia. Some of the members even cherished the fantastic hope of restoring the ancient Byzantine empire. In r82i Alexander Ypsilanti, a son of the voivode, and an aide-de-camp of the tsar Alexander I., entered Moldavia at the head of the Hetaerists, and, representing that he had the support of the tsar, prevailed on the hospodar Michael Sutzu to aid him in invading the Otto- man dominions. To secure Walachian help, Ypsilanti advanced on Bucharest, but the prince, Theodore Vladimirescu, who repre- sented the national Ruman reaction against the Phanariotes, repulsed his overtures with the remark " that his business was not to march against the Turks, but to clear the country of Phanariotes." Vladimirescu was slain by a Greek revolu- tionary agent, but Ypsilanti rashly continuing his enterprise after he had been repudiated by the Russian emperor, his forces were finally crushed by the Turks at Dragashaiii, in Walachia, and at Skuleni, in Moldavia; and the result of his revolt was a Turkish occupation of the principalities. In 1822 the Turkish troops, who had committed great excesses, were withdrawn on the combined representations of Russia, Austria and Great Britain. The country, however, was again ravaged by the retiring troops, quarters of Jassy and Bucharest burnt, and the

complete evacuation delayed till 1824, when the British government again remonstrated with the Porte (see Eastern Question; Greece; Ypsilanti; Alexander).

By the convention of Akkerman between the Russians and the Turks in 1826 the privileges of the principalities were once more confirmed, and they were again ratified in 1829, p eac eot under Russian guarantee, by the peace of Adrianople. Adria- By this peace all the towns on the left bank of the fffi 6 ‘ Danube were restored to the principalities, and the Porte undertook to refrain from fortifying any position on the Walachian side of the river. A Russian army occupied the country until the Porte fulfilled its promises. The princi- palities were to enjoy commercial freedom, and the right of establishing a quarantine cordon along the Danube or else- where. The internal constitution of the countries was to be regulated by an ” Organic Law,” which was drawn up by assem- blies of bishops and boiars at Jassy and Bucharest, acting, however, under Russian control. The Organic Law thus elabo- rated was by no means of a liberal character, and amongst other abuses maintained the feudal privileges of the boiars. It was ratified by the Porte in 1834, and the Russian army of occu- pation thereupon withdrew. The newly elected hospodars, Alexander Ghica (1834-42) and George Bibescu (1842-48) in Walachia, and Michael Sturdza (1834-49) in Moldavia, ruled in accordance with the Organic Law. Their reigns were marked by the social, financial and political predominance of Russia, which had steadily increased since 1711. The treaty of 1774 had given Russia a firm foothold in Rumanian politics. This

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had been strengthened by the kaltisherif of 1802; while the treaties of 1812, 1826 and 1829 had respectively yielded up Bessarabia, the Sulina mouth of the Danube and the St George mouth to the tsar. From 1834 to 1848 the Russian consul at Bucharest was all-powerful.

The revolutionary movement of 1848 extended from the Rumans of Hungary and Transylvania to their kinsmen of the Move- Transalpine regions. Here its real object was the over- ment of throw of Russian influence. In Moldavia the agitation '***■ was mostly confined to the boiars, and the hospodar

Michael Sturdza succeeded in arresting the ringleaders. In Walachia, however, the outbreak took a more violent form. The people assembled at Bucharest, and demanded a constitu- tion. Prince Bibescu, after setting his signature to the con- stitution submitted to him, fled to Transylvania, and a provisional government was formed. The Turks, however, urged thereto by Russian diplomacy, crossed the Danube, and a joint Russo-Turkish dictatorship restored the Organic Law. By the Balta-Liman convention of 1849 the two governments agreed to the appointment of Barbu Stirbeiu (Stirbey) as prince of Walachia, and Gregory Ghica for Moldavia.

On the entry of the Russian troops into the principalities in 1853, the hospodars fled to Vienna, leaving the government in the hands of their ministers. During the Danubian campaign that now ensued great suffering was inflicted on the inhabitants, but in 1854 the cabinet of Vienna induced the Russians to withdraw. Austrian troops occupied the principalities, and the hospodars returned to their posts. One important consequence of the revolution had been the banishment of many rising politicians to western Europe, where they were brought into contact with a higher type of civilization. The practice initiated by the more liberal Phanariotes of sending Rumanian students to the French, German and Italian universities tended in the same direction. Statesmen such as I. C. Bratianu, D. A. Sturdza, S. I. Ghica, D. Ghica and Lascar Catargiu (whose biographies are given under separate headings) received their political training abroad, and returned to educate their countrymen. To this fact the surprisingly rapid progress of Rumania, as compared with the Balkan States, may very largely be attributed.

By the treaty of Paris in 1856 the principalities with their existing privileges were placed under the collective guarantee Treaty of of the contracting Powers, while remaining under the Paris, suzerainty of the Porte — the Porte on its part engag-

1856. ˆg tQ reS p ec t the complete independence of their

internal administration. A strip of southern Bessarabia was restored to Moldavia, so as to push back the Russian frontier from the Danube mouth. The existing laws and statutes of both principalities were to be revised by a European Com- mission, sitting at Bucharest, and their work was to be assisted by a Divan or national council which the Porte was to convoke for the purpose in each of the two provinces, and in which all classes of Walachian and Moldavian society were to be represented. The European commission, in arriv- ing at its conclusions, was to take into consideration the opinion expressed by the representative councils; the Powers were to come to terms with the Porte as to the recom- mendations of the commission; and the final result was to be embodied in a hattisherif of the sultan, which was to lay down the definitive organization of the two principalities. In 1857 the commission arrived, and the representative councils of the two peoples were convoked. On their meeting in September Union they at once proceeded to vote with unanimity the of the union of the two principalities into a single state under

prind- the name of Romania (Rumania), to be governed by paiities, a f ore jg n p r i nC e elected from one of the reigning dynasties of Europe, and having a single representative assembly. The Powers decided to undo the work of national union. By the convention concluded by the European congress at Paris in 1858, it was decided that the principalities should continue as heretofore to be governed each by its own prince. Walachia and Moldavia were to have separate assemblies, but a central

commission was to be established at Fokshani for the prepara- tion of laws of common interest, which were afterwards to be submitted to the respective assemblies. In accordance with this convention the deputies of Moldavia and Walachia met in separate assemblies at Bucharest and Jassy, but the choice of both fell unanimously on Prince Alexander John Cuza (January 1859). (A. J. E.; X.) •

(5) Rumania. — Thus the union of the Rumanian nation was accomplished. A new conference met in Paris to discuss the situation, and in 1861 the election of Prince Cuza Prince was ratified by the Powers and the Porte. The two Cuza, assemblies and the central commission were preserved 1859-66. till 1862, when a single assembly met at Bucharest and a single ministry was formed for the two countries. The central com- mission was at the same time abolished, and a council of state charged with preparing bills substituted for it. In May 1864, owing to difficulties between the

government and the general assembly, the assembly was dissolved, and a statute was sub- mitted to universal suffrage giving greater authority to the prince, and creating two chambers (of senators and of deputies). The franchise was now extended to all citizens, a cumulative voting power being reserved, however, for property, and the peasantry were emancipated from forced labour. Up to this point the prince had ruled wisely; he had founded the universities of Bucharest and Jassy; his reforms had swept away the last vestiges of feudalism and created a class of peasant freeholders. But the closing years of his reign were marked by an attempt to concentrate all power in his own hands. He strove to realize his democratic ideals by despotic methods. His very reforms alienated the goodwill of all classes; of the nobles, by the abolition of forced labour; of the clergy, by the confiscation of monastic estates; of the masses, by the introduction of a tobacco monopoly and the inevitable collapse of the inflated hopes to which his agrarian reforms had given rise. His own dissolute conduct increased his unpopularity, and at last the leading statesmen in both province's, who had long believed that the national welfare demanded the election of a foreign prince, conspired to dethrone him. In February 1866 he was compelled to abdicate; and a council of regency was formed under the presidency of Prince Ion Ghica. The count of Flanders, brother to the king of the Belgians, was proclaimed hospodar of the united provinces, but declined the proffered honour.

Meanwhile a conference of the Powers assembled at Paris and decided by a majority of four to three that the new hospodar should be a native of the country. The principalities, Election however, determined to elect Prince Charles, the of Prince second son of Prince Charles Antony of Hohenzollern- Charles, Sigmaringen. On a referendum, 685,969 electors voted in his favour, against 224 dissentients. Prince Charles was an officer in the Prussian army, twenty-seven years of age, and was related to the French imperial family as well as to the royal house of Prussia: his nomination obtained not only the tacit consent and approval of his friend and kinsman King William of Prussia, but also the warm and more open support of Napoleon III. The king of Prussia, however, had agreed that the new hospodar should be a native of the principalities, and could not therefore openly approve of Prince Charles's election. Acting on the advice of Bismarck, the prince asked for a short leave of absence, resigned his commission in the Prussian army on crossing the frontier, and hastened down the Danube to Rumania, under a feigned name and with a false passport. On the 20th of May he landed at Turnu Severin, where he was enthusiastically welcomed. He reached

Bucharest on the 22nd, and on the same day, in the presence of the provisional government, took the oaths to respect the lav/s of the country and to maintain its rights and the integrity of its territory. In October Prince Charles proceeded to Constantinople and was cordially received by his suzerain, the sultan, who bestowed on him the firman of investiture, admitted the principle of hereditary succession in his family, and allowed him the right of maintaining an army of 30,000

men. Rumania was to remain part of the Ottoman empire within the limits fixed by the capitulations and the treaty of Paris.

The first Rumanian ministry formed under the new prince was composed of the leading statesmen of all political parties, Foreign care Dem g taken that the two provinces should be and equally represented. A new constitution was unan-

domestk imously passed by the chamber on the nth of July. M6*ˆrfl ˆ P rov ided for an Upper and Lower House of Re- presentatives, and conferred on the prince the right of an absolute and unconditional veto on all legislation. Other reforms were urgently needed. There was an empty treasury, and the floating debt amounted to £7,000,000; maladministra- tion was rampant in every department of the state; the national guard was mutinous, while the small army of regulars was badly organized and inefficient. The existence of famine and cholera added to the difficulties of the government, and in March 1867 the Lower House, by a majority of three, passed the laconic resolution, ” The chamber inflicts a vote of blame on the government. ” As the result of this vote M. Kretzulescu, a Moderate Conservative, was called to the head of affairs, and I. C. Bratianu entered the government as minister of the interior. The new ministry, of which Bratianu was the leading spirit, showed considerable energy: a concession was granted for the construction of the first Rumanian railway, from Bucharest to Giurgevo, and the reorganization of the army was undertaken. Among other less judicious measures, a ‘decree was passed ostensibly directed against all vagabond foreigners, . but really aimed at the Jews, large numbers of whom, including many respected landowners and men of business, were im- prisoned, or expelled, from Jassy, Bacau and other parts of Moldavia. This harsh treatment created intense indignation abroad, especially in France and Great Britain; and the emperor Napoleon wrote personally to Prince Charles, pro- testing against the persecution. The country could not afford to lose the goodwill of the

emperor of the French, at that time one of the most powerful factors in Europe — in July 1869 Bratianu, although immensely popular, found it necessary to resign office, and with him fell the rest of the cabinet.

On the 15th of September 1869, Prince Charles married Princess Elizabeth of Wied, afterwards celebrated under her literary name of Carmen Sylva. 1 In the same year the army was reorganized, and a rural police created. Every able-bodied citizen was rendered liable to give three days' work yearly towards the construction of roads, or to pay a small tax as an equivalent. An important railway concession, which subse- quently caused grave political complications, was granted to the German contractors Strausberg and Offenheim.

Much excitement was aroused in Rumania by the outbreak of the war between Prussia and France. The sympathies of The the Rumanians were entirely on the side of the French,

rebellion whom they regarded as a kindred Latin race, while of 1870. those of the prince were naturally, with his native country. The excitement culminated in a revolutionary outbreak at Ploesci, where a hot-headed deputy, Candianu Popescu, after the mob had stormed the militia barracks, issued a proclamation deposing Prince Charles and appointing General Golescu regent. Owing to the loyalty of the regular army the insurrection was speedily quelled. But the feeling in the country was strong against the German sovereign, who seriously thought of abdicating when a jury acquitted the accused rebels. On the 7th of December he wrote confidentially to the sovereigns whose representatives had signed the treaty of Paris, suggesting that the future of Rumania should be regulated by a European congress.

A few days subsequently the prince learned that the German railway contractor Strausberg was unwilling or unable to pay The rail- the coupons of the railway bonds due on the 1st of way crisis January 187 1, which were mostly held by influential oiiS7l. people in Germany. This threw the responsibility of payment on Rumania, and was a severe blow to the prince,

1 For biographical details, see Charles, king of Rumania ; and Elizabeth, queen of Rumania.

through whose instrumentality the loan had been placed. Matters were brought to a crisis by the Prussian government threatening to force the Rumanian government to provide for the unpaid coupons. The country was financially in no condition to comply. Bitter

indignation prevailed against everything German, and culminated in an attack on the German colony in Bucharest on the 22nd of March 1871. On the following morning the prince summoned the members of the council of regency of 1866, and informed them of his inten- tion to place the government in their hands. Lascar Catargiu and General Golescu, the only two members present, as well as Dimitrie Sturdza and other influential persons, declined to accept the responsibility. Catargiu offered to unite the different sections of the Conservative party in order to deal with the crisis. The prince accepted his offer. The elections took place early in May 1871, and the government, to which all the most respectable elements in the country had rallied, obtained a large majority. When parliament met in May the prince had a most enthusiastic reception. The anti-German feeling in the country had greatly subsided, in consequence of the crushing defeat of France; and in January 1872 the chambers passed a law by which Rumania undertook to pay the railway coupons. The German syndicate was satisfied, and the railway crisis ended.

Catargiu's ministry was the tenth that had held office in the five years since the prince's arrival, but it was the first one that was stable. In March 1875 the budget for 1876, The amounting to £4,000,000, nearly double in amount Catargiu 'that of the year 1866, was passed without difficulty, ministry, and on the 28th of the month the parliamentary ~ '

session closed. It was the first occasion in Rumania that the same chamber had sat for the whole constitutional period of four years, and also the first time that the same ministry had opened and closed the same parliament.

Only the fall of the Catargiu ministry saved the country from revolution. The leading Liberals had promoted a con- spiracy for the arrest and expulsion of the prince, and the formation of a provisional government under General Dabija. The prospect of a return to power put an end to these machina- tions. Catargiu's ministry was succeeded by an administration under General Florescu, known as the "cabinet of the generals," and, a month later, by the so-called " ministry of conciliation " under M. Jepureanu. A commission of the chambers drew up an indictment against Catargiu and his late colleagues, accusing them of violating the constitution and the public liberties, squandering the state reyenues, and other abuse of power. Unable to stem the tide of popular passion, which was crying for the impeachment of Catargiu, Jepureanu resigned office, and Bratianu formed a new Liberal cabinet, destined to guide the country through many eventful years.

But the re-opening of the Eastern Question was destined to bring to a climax the great struggle of Rumania for existence and independence, and temporarily to throw into the Tne shade all domestic questions. The insurrection in Russo- Bulgaria, with its accompanying horrors, followed by Turkish the deposition of sultan Murad and the succession of igfiUjg the sultan Abdul Hamid, contributed to indicate the near approach of a Russo-Turkish war. Russia had shown symptoms of anger against Rumania for not having taken up a decided attitude in the approaching struggle, and the Russian ambassador Ignatiev had some months previously threatened that his government would seize Rumania as a pledge as soon as the Turks occupied Servia and Montenegro. Prince Charles decided to send a mission, composed of Bratianu and Colonel Slaniceanu (the minister of war), to the imperial headquarters at Livadia. They were well received by the emperor (October 1876), but in spite of mixed threats and cajoleries on the part of Gorchakov, Ignatiev and others, Bratianu returned without having definitively committed his country to active measures.

On the 14th of November six Russian army corps were mobilized to form the army of the south under the grand duke

Nicholas. A few days later two secret envoys arrived at Bucharest, the one M. de Nelidov, to negotiate on the part of the Russian government for the passage of their army through Rumania, the other Ali Bey, to arrange on behalf of the sultan a combination with Rumania against Russia. Prince Charles cleverly temporized with both powers. Negotiations with Russia were continued, and Bratianu was sent to Constantinople to put pressure upon Turkey to secure certain rights and privileges which would practically have made Rumania independent, except that it would still have paid a fixed tribute; but the conference of the powers assembled at that capital came to a definite end on the 19th of January 1877, when the Turkish government declined every proposal of the conference. Mean- while the Porte, in issuing Midhat Pasha's famous scheme of reforms, had greatly irritated Rumanian politicians by includ- ing their country in the same category as the other privileged provinces, and designating its inhabitants as Ottoman subjects. A secret convention was signed between Russia and Rumania on the 1 6th of April, by which Rumania allowed free passage to the Russian armies, the tsar engaging in return to maintain

its political rights and to protect its integrity, while all matters of detail connected with the passage of the Russian troops were to be regulated by a special treaty. On the 23rd of April Russia declared war against Turkey, and the grand duke Nicholas issued a proclamation to the Rumanian nation, announcing his intention of entering their territory in the hope of finding the same welcome as in former wars. The Rumanian govern- ment made a platonic protest against the crossing of the frontier, and the Rumanian troops fell back as the Russians advanced;' provisions and stores of all kinds were supplied to the invading army against cash payments in gold, and the railways and telegraphs were freely placed at its disposal. The Rumanian chambers were assembled on the 26th of April, and the con- vention with Russia was sanctioned. The Ottoman govern- ment immediately broke off diplomatic relations with Rumania, and on the nth of May the chambers passed a resolution that a state of war existed with Turkey. .(For a detailed account of the subsequent campaign, in which Prince Charles and the Rumanian army contributed greatly to the success of the Russian arms, see Russo-Turkish Wars, and Plevna.) The fall of Plevna left the Russian army free to march on Constan- tinople, and on the 31st of January 1878 the preliminaries of peace were signed at Adrianople. They stipulated that Rumania should be independent and receive an increase of territory.

Peace between Russia and Turkey was signed at San Stefano on the 3rd of March. On the 29th of January the Rumanian The agent at St Petersburg was officially informed of the

Berlin intention of the Russian government to regain posses- settie- s j on £ t jj e R uman j an portion of Bessarabia, i.e. that /. Cession portion which was ceded to Moldavia by Russia after of Bess- the Crimean War. Rumania was to be indemnified at arabia. t jj e eX pense of Turkey by the delta of the Danube and the Dobrudja as far as Constantza. The motive assigned was that this territory had not been ceded to Rumania, ■ but to Moldavia, and had been separated from Russia by the almost obsolete treaty of Paris (1856). But the proposed exchange of territory aroused the most bitter indignation at Bucharest. Bratianu and Cogalniceanu were sent to Berlin to endeavour to prevail on the representatives of the Powers there assembled in June 1878 to veto the cession of Bessarabia to Russia; but the Rumanian delegates were not permitted to attend the sittings of the congress until the Powers had decided in favour of the Russian claim. The treaty of Berlin in dealing with Rumania decided to recognize its independence, subject to two conditions: First (Art. xlv.), that the principality should restore. to the emperor of Russia that portion of the Bessarabian territory detached from Russia by the treaty of Pads in 1856, bounded

on the west by the mid-channel of the Pruth, and on the south by the mid-channel of the Kilia branch and the Staryi Stambul mouth. Second (Art. xliv.), that absolute freedom of worship should be granted to all persons in Rumania;

that no religious beliefs should be a bar to the enjoyment of any political rights; and, further, that the subjects of all the powers should be treated in Rumania on a footing of perfect equality. Article xlvi. declared that the islands forming the delta of the Danube, the Isle of Serpents, and the province of Dobrudja, as far as a line starting from the east of Silistria and terminating on the Black Sea south of Mangalia, should be added to Rumania. Other articles defined the international position of Rumania, while Article liii. decreed that it should have a repre- sentative on the European commission of the Danube. Bratianu wrote with some truth that the Great Powers by sacrificing Rumania were able to obtain more concessions for themselves from Russia, and Lord Beaconsfield was constrained to admit that ” in politics ingratitude is often the reward of the greatest services. ” The Rumanians submitted reluctantly to the retrocession of Bessarabia; and the Dobrudja was occupied by Rumanian troops on the 26th of November

1878.

But Article xliv. of the treaty of Berlin caused tremendous agitation throughout the country, and almost provoked a revolution. Article vii. of the constitution of 1866 laid 2. The down that ” only Christians can become citizens of Jewish Rumania ” — in other words, all Jews were excluded 9″ e stion. from the rights of citizenship; and as no foreigner could own land in Rumania outside the towns, no Jew could become a country proprietor. Public opinion in Rumania rendered it .almost impossible for any government to carry out the wishes of the Berlin tribunal. To do so involved a change in the constitution, which could only be effected by a specially elected constituent assembly. This body met on the 3rd of June, and sat through the entire summer. The irritation of the powers at the unexpected delay was so great that Great Britain proposed a collective note on the subject, to be executed by the Austrian cabinet; while Prince Bismarck threatened, if the Berlin proposition were not carried out, to refer to the suzerain power at Constantinople. At last, however, on the 1 8th of October, Article vii. was repealed, and it thus became possible for Rumanian Jews to become naturalized . and to hold land. It was further decided to admit to naturalization the 883 Jewish soldiers who had served in the war; but with all other Jews individual naturalization was required, and this was hedged about by so many difficulties, a special vote of the

legis- lature being required, with a two-thirds majority in each individual case, that although the compromise thus effected was accepted by the powers, the actual result was that, from 1880 to 1884, out of 385 persons who were naturalized in Rumania, only. 71 were Rumanian Jews. As the process df naturalization has never been accelerated, the 300,000 Jews said to inhabit Rumania are still regarded as foreigners; and although liable to military service and to the payment of taxes, are unable to own rural land or possess electoral or other civil rights.

Italy was the first of the Powers to notify its recognition of Rumanian independence (December 1879); but Bismarck succeeded in prevailing on the Western Powers not 3 _ . . to give official recognition until Rumania should have lishment purchased the railways from their German owners, of the This unpopular measure caused some delay; but jˆ" 1,an ' M Great Britain, France and Germany formally recognized °

the independence of the country on the 20th of February 1880. Early in 188 1 it was generally felt that the time had arrived for Rumania to be created a kingdom. On the 13th of March the tsar Alexander II. was assassinated, and the Rumanian opposition chose this occasion to accuse the Liberal government of aiming at republican and anti-dynastic ideals. To refute this charge, the ministry proposed the elevation of the Rumanian principality into the kingdom of Rumania. The prince accepted the resolution; within ten days the new kingdom was recog- nized by all the Great Powers, and the coronation took place at Bucharest on the 22nd of May 1881. The royal crown was constructed of steel made from Turkish cannon captured at Plevna.

HIST0RY1

Rumania was now comparatively, but not entirely, free from fears of serious foreign complications. Austria and Relations Russia alike resented the decision to fortify Bucharest J[** and the Sereth line, adopted by the Rumanian govern-

and ment in 1882. Relations with Russia had remained

Austria- strained ever since the war. The delimitation of the Hungary. Dobrudja frontier was still unsettled, and owing to Russian opposition was not finally disposed of till 1884. Expenses incurred during the war

led to much controversy, especially when the Russian government claimed the return of £120,000 advanced to enable the Rumanians to mobilize, and considered by them as a free gift. A compromise was made, both parties withdrawing their claims, in April 1882.

Relations with Austria-Hungary were also on a very un- pleasant footing. There were two principal subjects of discord — the navigation of the Danube (q.v.) and the ” national question,” i.e. the status of the Vlach communities outside Rumania, and especially in Transylvania and Macedonia (see Vlachs and Macedonia). The Danube question became acute in 1881, 1883 and 1899; the national question is a more permanent source of trouble, affecting Austria-Hungary, Greece, Turkey and Bulgaria. King Charles, who naturally favoured the ally of Germany, and Bratianu, who regarded Russian policy with suspicion, endeavoured to promote a better understanding with Austria-Hungary. But there was a strong anti-German party in the country, especially among the old boiars and the peasantry. Community of creed, ancient traditional influence, the entire absence of Russian merchants, and the consequent avoidance of many small commercial rivalries, contributed to bring about a sort of passive preference for Russia, while the bitter disputes that had occurred with Germany on the question of railway finance had left a very hostile feeling.

In March 1883 the government decided to introduce various important changes into the constitution. Three electoral colleges Revision were formed instead of four,; a considerable addition of the was made to the numbers of the senate and chamber; Coast!- trial by jury was established for. press offences, except tution, those committed against the royal family and the sovereigns of foreign states; these were to be tried by the ordinary tribunals without jury. A bill was passed endowing the crown with state lands, giving an annual rent of £24,000 in addition to the civil list fixed in 1866 at £49,000; another measure granted free passes on the railways, and an allowance of £1 daily during the sitting of parliament to all senators and deputies. The revision of the constitution had estranged the two heads of the Liberal party, I. C. Bratianu, who was mainly responsible for the new measures, and C. A. Rosetti, who unsuccessfully advocated reforms of a far more democratic character. These two had been united by a most intimate friendship. One had never acted without the other. Rosetti was said to be the soul whilst Bratianu was the voice of the same personality. Henceforward Bratianu had sole control of the Liberal government. The revising chambers having fulfilled their special mandate, were dissolved in Sep- tember 1884, and a new parliament assembled in November, the government, as usual, obtaining a large majority in both houses.

Since 1876 Bratianu had exercised an almost dictatorial power, and anything like a powerful parliamentary opposition Coalition had ceased to exist. But he had been too long in of parties p 0wer ; t ne numerous state departments were ex- “Sˆos clusively filled with his nominees; and some pecuniary Bratianu, scandals, in which the minister of war and other 1883-88. high officials were implicated, helped to augument his fast-growing unpopularity. New parties were formed in opposition, and the National Liberal and Liberal-Conservative parties combined to attack him. The first of these maintained that the government should be essentially Rumanian, and, while maintaining friendly relations with foreign Powers, should in no wise allow them to interfere with interal affairs. They also advocated reduction of expenditure and the inde-

pendence of the magistracy. The Liberal-Conservatives held generally the same views, but had as their ideal of foreign policy a guaranteed neutrality. Another party which now attracted considerable attention was that of the Junimists, or Young Conservatives. The name was taken from the Junimea, a literary society formed in Jassy in 1874 by P. Carp, T. Rosetti, and Maiorescu, and transformed into a political association in 1,881. Their programme for home affairs in- volved the amelioration of the position of the peasantry and artisan classes, whose progress they considered had been overlooked, the irremovability of the magistracy, and a revision of the communal law in the sense of decentralization. In financial matters they advocated the introduction of a gold standard and. the removal of the agio on gold, also the intro- duction of foreign capital to develop industries in the country; and as regards foreign policy, they were strong advocates of intimate and friendly relations with Austria-Hungary. Elec- tions for a new chamber took place in February 1888, and the whcle of the leaders of the opposition were elected, including Dimitrie Bratianu, the premier’s brother, and Lascar Catargiu. I. C. Bratianu definitely retired on the 4th of April, after having held the premiership for twelve eventful years. Had he con- tinued much longer in office it is probable that there, would have been a revolutionary movement against the dynasty. During the previous parliament a Conservative manifesto, signed by Catargiu, D. Bratianu and other leaders of the opposition, openly threatened that if the ministers were not removed before the general election, the responsibility would be thrown, “not on those who served the crown, but on him who bore it “; and the name of Prince George Bibescu had been openly mentioned as a possible successor. .

In the new chamber elected in October 1888 only five members of Bratianu’s party retained their seats. The most prominent statesman in

the new Conservative-Junimist ad- _. ministration was P. Carp, who in the spring of 1889 servative' succeeded in passing a bill which authorized the Juulmlst distribution of state lands among the peasantry. «"'**«•. Despite this admirable measure, he was unable to retain office, and three changes of ministry followed. The Conservative-Junimist parliament nevertheless restored tranquillity to the country. On the 22nd of May 1891, the 25th anniversary of the king's accession was celebrated with great enthusiasm. Meanwhile the gold standard had been introduced (1889), and the financial situation was regarded as satisfactory. In December 1891 a stable cabinet was at last formed by Lascar Catargiu. The new ministry during their four years' tenure of office passed several useful measures through parliament. The state credit was improved by tbe con- version of the public debt; the sale of the state lands to the peasantry was actively continued; a law was passed making irremovable the judges of the court of appeal and the presidents of tribunals, and other important judicial reforms were carried out; a mining law was passed with the object of introducing foreign capital; and the commercial marine was developed by the formation of a state ocean service of passsenger and cargo steamers. Great reforms, which had been unsuccessfully attempted by former governments, were made in the service of public instruction and in the organization of the clergy. In 1893 and 1894 commercial and extradition treaties and a trade-mark convention were made with Great Britain, Austria- Hungary and Germany. Meanwhile the Liberal opposition was being reorganized. On the death , of I. C. Bratianu, in 1 89 1, his brother Dimitrie was proclaimed chief of the united Liberal party, but he also died in June 1892, and the veteran statesman Dimitrie Sturdza was recognized as the head of the Liberals. In 1894 he started a very violent agitation in favour of the Rumanians in Hungary. Another popular opposition cry was "Rumania for the Rumanians. " The new mining law, among other concessions, gave foreigners the right to lease lands for long periods for the working of petroleum, and this was denounced by the opposition as being hostile to national interests, and also as being against the spirit of the constitution,

which prohibited foreigners from holding lands. The bill was carried by the government in April 1895, as well as another important measure favouring the construction of local rail- ways by private

contractors. The Liberal opposition pro- tested, retired from the chamber, and took no further part in legislative proceedings. The Liberal party had been out of office for eight years, the Conservative Junimist coalition had practically carried out its complete programme, and legis lation was at a deadlock owing to the abstention of the Liberal opposition. As the electorate showed itself in favour of a change of ministry, Catargiu resigned, and a new Liberal government was formed by D. Sturdza.

The advent to power of a statesman who had recently been making such violent attacks on the Hungarian government _. caused some anxiety in Austria-Hungary. When

Liberal once office was obtained, it was to the interest of the admiais- new government that the agitation should subside. mowo°' Tk e official opening by the emperor of Austria of the new channel through the Iron Gates of the Danube, on the 27th of September 1896, was the means of bringing about a great improvement in the relations between the two countries. It led to an exchange of visits between the emperor and King Charles, who also visited the tsar Nicholas II. in August 1898. The visit was the symbol of a reconciliation between the Rumanians and the Russians, the relations between whom had been the reverse of cordial since 1878. As regards home politics, the overwhelming majority of the Liberal party at the elections of 1895, instead of being a source of strength, proved the very reverse. It caused the party to split up into factions — Sturdzists, Aurelianists and Flevists, so called after the names of their respective chiefs. Sturdza himself soon had to retire. The head of the Orthodox Church, the metro- politan Gennadius, had for some years past, as head of the philanthropic establishments founded by the princess Bran- covan, desired to obtain the entire management of these wealthy foundations, and had made violent attacks on the two adminis- trators, Prince George Bibescu and Prince Stirbei, both members of the Brancovan family. In the quarrel that ensued the prelate was openly accused of simony, of heresy, and other matters more suitable for a criminal court. After a public trial before the Holy Synod, he was found guilty of certain canonical offences, and sentenced to be deposed. The same night, he was seized by the police, and removed by force to a neighbouring monastery. This harsh treatment of the head of the Church led to an attack on Sturdza. On the 3rd of December 1896, the president of the council, M. Aurelian, was called on to reconstitute a Liberal cabinet, with the principal object of calming public opinion by the settlement of this question. Aurelian then appealed to the patriotic sentiments of the Conservative party to help to solve the difficulty, and with the aid of Lascar Catargiu and Tache Ionescu the fol- lowing

decision was reached: the Holy Synod was to reverse its judgment, and the metropolitan was to be restored to his ecclesiastical rank; but, after holding it for a few days, he was voluntarily to resign and to receive as compensation a handsome pension. Calm was thus restored, but Aurelian and his col- leagues were not inclined to hand over their portfolios to Sturdza and his partisans. The struggle terminated in the success of Sturdza, who in April 1897 returned to power and remained president of the council until 1899. Few of the important measures promised in the Liberal programme were passed, one for the reform of public instruction being the most noteworthy. Sturdza's government, which had risen to power mainly on the national question, was also destined to fall on it. ■ A popular agitation was raised on the subject of certain subsidies made by the Rumanians for the support of the Rumanian schools at Kron- stadt in Transylvania, and Sturdza was accused of too great subserviency to the Hungarian government. The agitation cul- minated in street riots at Bucharest. On the same evening that Sturdza tendered his resignation to the king (April 1899) the veteran Conservative statesman Lascar Catargiu suddenly died. The Conservatives, led by G. G. Cantacuzene, returned to

office with an overwhelming majority. They were immediately confronted by an acute economic crisis. The financial Tb position of the country had hitherto on the surface financial been very satisfactory. The public debt, mostly crisis of placed in Germany, amounted to about £51,000,000. {f£?~ The interest had been regularly paid. But the facility with which money had always been borrowed gave rise to great extravagance. Expenses which ought to have been defrayed out of the ordinary budget, such as the erection of magnificent public offices at Bucharest, were frequently defrayed out of the loans; and the custom had arisen when money was scarce of issuing treasury bonds. When the Conservatives came into office they found that the payment of 25 millions of these bonds would shortly become due, and there were no resources in the treasury to meet them. Owing to the Transvaal War and other causes, the money market was most unfavourable, especially in Germany; and there was an almost entire failure of the harvest. The value of cereals exported in 1898 was about 9 millions sterling, in 1899 only 3ˆ millions. The government managed to extricate itself from its immediate difficulties in the autumn of 1899, by raising a loan of £7,000,000 in Berlin, but on very stringent terms. Besides paying a much higher rate of interest than heretofore, it bound itself not to contract any further loans until this one was paid. The Conservatives were united in wishing to meet the financial crisis by a moderate reduction of expenditure and a large increase of taxation, while the Liberal opposition advocated the

permanent reduction of the annual expenditure of £800,000, which would necessitate the raising of £200,000 only by fresh taxation. The Con- servative programme was naturally unpopular; Carp and the Junimists were unwilling to co-operate with the government, and, on the 26th of February 1901, D. Sturdza again became premier. His administration lasted until the 31st of December 1904, and averted the impending bankruptcy of Rumania by a policy of strict retrenchment. In 1904 Sturdza was able to Financial exceed the proposed limit of annual expenditure, reform, £8,740,000, owing to a great increase in the value l9 °i-5. of the tobacco monopoly. Even a recurrence of agricultural depression during the same year left the national credit intact. Another financial reform was undertaken by the Conserva- tives, who returned to power on the 4th of January 1905, with G. G. Cantacuzene as prime minister, and in May floated the conversion loan, already described.

The chief causes of the agrarian insurrection in March 1907 have been outlined above (under Land Tenure). But an additional cause was the harsh treatment of the Agrarian peasants on the state and communal lands leased to rising 0/ Jewish middlemen. At first an attack on the Jews t90J ‘ alone, the rising soon became a jacquerie directed against all the large landowners. Numerous towns and villages were sacked and partly burned, and 140,000 soldiers were employed to suppress the revolt. On the 24th of March the Cantacuzene ministry resigned and was succeeded by a Liberal government under the leadership of D. Sturdza, who completed the restora- tion of order by strong military measures and afterwards initi- ated remedial legislation. He abolished the system by which public lands were leased to middlemen, reduced the land tax on small holdings, and granted new facilities for obtaining credit to the peasants. After a general election in June 1907, Sturdza remained in office with an overwhelming majority. To meet the cost of agrarian reform, and of the reorganization of the army (1908), he introduced various fiscal changes, notably an alteration in the budget system, by which the total revenue and expenditure were shown for the first time (see Finance, above). ‘ Rumania was little affected by the political changes in the Balkan Peninsula (1908-10) coincident with the Turkish revolution, the annexation of Bosnia and Herzegovina _ ma _ ta by the Dual Monarchy, the proclamation of Bulgarian aa

propaganda most offensive to Rumanian nationalism. An trade of the sultan Abdul Hamid had in 1906 recognized the existence of the Kutzo-Vlachs as a religious body {millet), forming an integral part of the Rumanian Church. This decision was regarded by the Greeks as a blow to their own interests, and Greek,? revolutionary bands were accused of persecuting the Kutzo-Vlachs. (See also Macedonia.) Even before 1906 there was keen rivalry between Greece and Rumania, and the " Macedonian question " was the under- lying cause of the disputes which, arising ostensibly from quite trivial causes, led temporarily to the rupture of diplomatic relations between Gieece and Rumania in 1905, 1906 and 1910. Bibliography.— No scientific history of Rumania was published up to the 20th century, but the task of collecting and editing original documents was partially carried out by the Rumanian Academy and by private students, especially after 1880. The so-called Chronicle of Hurul is a modern forgery, and up to the 14th century the only valid authorities are Slavonic, Hungarian and Byzantine chroniclers. Thenceforward a great mass of material is available. It is partly incorporated in the yearly Annalele of the Academy, 2nd series, from 1880; and in the 30 volumes ol E. de Hurmuzaki's Doeumente privitore relative la istoria Romdnilor (Bucharest, 1876, &c). Other important original documents, or works containing such documents, are Verantius's 16th-century De situ Transylvaniae, Moldaviae, et Transalpinae, in Kovachich's Scriptores rerum Hungari- carum minores (Budapest, 1798); G. Urechia's late 16th-century Chronique de Moldavie, ed. J. Picot (Paris, 1878); Rumanian text in Old Slavonic characters, with French translation and notes of great value; the 17th-century Opere Complete of Miron Costiu, ed. V. A. Urechia (Bucharest, 1886) ; A. M. del Chiaro, Istoria delle moderne rivoluzioni delta Valachia con la descrizipne del paese (Venice, 1878); the early 18th-century Operele principelui D. Cantemiru, issued by the Academy (Bucharest, 1872, &c.) ; N. Iorga, Acte si fragmente cu privire la istoria Romdnilor (Bucharest, 1895-97); M. Kogalniceanu, Cronicele Romdnii (Bucharest, 1872-74) ; J. L. Carra, Histoire de Moldavie et de Valachie, avec une dissertation sur I' Stat actuel de ces deux Provinces (Jassy, 1777); A. M. Blanc de Lanautte, MSmoire sur Vital ancien et actuel de la Moldavie, presents a S.A.S. le prince A. Ypsilanti en 1787 (Bucharest, 1902); D. A. Sturdza, Acte si doeumente relative la istoria renascerei Romdnii (Bucharest, 1900, &c.) ; ibid., Scrierile si cuvtntarile lui I. C. Bratianu (Bucharest, 1903, &c). On the Phanariote period see P. Eliade, De I' influence francaise sur V esprit public en Roumanie. Les origines. Elude sur I' Stat de la sociStS roumaine & I'epoque des regnes phanariotes (Paris, 1898). For a general history of Rumania, see V. A. Urechia, Istoria Romdnilor (Bucharest, 1891, &c, 8 vols.); A. D.

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Language

Rumanian ' is, geographically, an isolated eastern member of the group of Romance languages (q.v.), being severed from all the rest by countries in which the predominant speech is Slavonic or Magyar. It represents the original rustic Latin of the Roman provincials in Moesia and Dacia, as modified by centuries of alien rule. Structurally, its Latin characteristics have been well preserved; but its vocabulary has undergone great changes, becoming so far Slavonized that the ratio of words of Slavonic origin to words of Latin origin is approximately as three to two; large numbers of loan-words have also been added from Turkish, Greek, Magyar and other sources. It is noteworthy, however, that where Latin words have survived they are sometimes purer than in the Romance languages of the West

1 i.e. the so-called Daco-Rumanian, spoken by the vast majority of Rumans over the whole of Rumania, in Transylvania, Bukovina, the Banat, Bessarabia, and some districts of Servia and Bulgaria bordering on the Danube. The two most important dialects are the Istro-Rumanian, spoken in part of Istria but rapidly becoming extinct, and the Macedo-Rumanian, spoken by the Kutzo-Vlachs (see Vlachs). The Istro-Rumanian forms, as it were, a link — now completely severed — between the Romance of the Balkans and the Romance of the West. In the Macedo-Rumanian there are no Magyar loan-words, but there is a large Albanian element, and Greek loan-words are more numerous than Slavonic.

(e.g. Lat. domina is better represented by Rum. domnli, " lady," than by Ital. donna, Span, dona, Port, dona, Fr. dame). Some words indeed 2 — such as laudare, to praise, ducere, to lead — retain unaltered the forms under which they were used by Virgil and Cicero. A feature of the language which dis- tinguishes it from all other members of the group, and appears to be of even higher antiquity than the word-forms

above mentioned, is the retention of a suffix article — e.g. frate, brother, fratele, the brother; zi, day, ziua, the day. This usage seems to have survived from the pre-Roman period. A similar suffix article is retained in Albanian, which almost certainly represents the original language of the Thraco-Illyrian tribes (see Albania) ; and these tribes belonged to the same ethnical and linguistic group as the Daco-Moesians represented by the Vlachs.

Rumanian orthography remained in a transitional state through- out the 19th century. The Latin alphabet is used, with special signs to represent sounds borrowed from Slavonic, &c. All the unaccented vowels except e are pronounced as in Italian; e has the same phonetic value as in Old Slavonic (= French e) and is often similarly preiotized (=ye in yet), notably at the beginning of all words except neologisms. The accented vowels S and 6 are pro- nounced as ea and oa (petra, rock, = peatra ; morte, death, — moarte) ; they are written in full, as diphthongs, at the end of a word and sometimes in other positions. The sound of the Slavonic JJ (a guttural y) is represented by a, e or 0, though these letters occur as frequently in words of Latin origin (e.g. cind = quando) as in those derived from Slavonic ; 3j£ is represented by d or t, having the nasal sound of un in French; t and u at the end of a word are mute or short. Of the consonants, c followed by e or i = ch (as in church), otherwise k ; 4 or d resembles the English j ; g is hard before e and i, otherwise soft; h is guttural, as ch in loch; j is pronounced as in French; r as in Russian; s or s (Slav. Ill) as sh; \ or t (Slav. II,) as Is or tz ; w is wanting. The remaining consonants have the same phonetic values as in English.

Rumanian is highly inflected. It possesses two regular sub- stantive declensions and six cases, the vocative being in common use. The large class of heterogeneous nouns which are masculine in the singular and feminine in the plural constitute what is some- times called the neuter declension. There are three regular con- jugations, distinguished (as in Latin) according to the termination of the present infinitive in a, e or i; e.g. (1) a ara or arare, to plough, (2) a crede or credere, to believe, (3) a dormi or dormire, to sleep. Verbs ending in i, however, are sometimes classed as a fourth con- jugation. The second form of the present infinitive (arare, credere, dormire) is used as a noun. The so-called ” simple perfect ” (perfectul simplu) has often the force of an aorist. Compound tenses are formed by the addition of certain particles and of the auxiliary verbs — a ave, to have, a fi, to be, and a voi, to will. For the passive voice, a fi is used, with the past participle of the required verb. All tenses of reflexive verbs except the imperative and present participle are formed by prefixing the pronoun which indicates the object to the verb, in the dative or genitive case

(abbreviated) as the verb may require; but in the reflexive imperative and present participle the verb precedes the pronoun; e.g. a propune, to propose, a si propune, to propose to oneself, but propune }i, propose to yourself.

The accentuation of Rumanian, though complex, is governed by certain broad principles, except in the case ot neologisms, many of which have been borrowed from French and Italian without change of accent. Nouns retain the accent of the nominative singular in all cases and in both numbers (e.g. coplld, girl, vocative plur. copllelor), except when a diminutive or augmentative suffix is added ; the accent then shifts to the suffix. The language is very rich in diminutive and augmentative forms; e.g. the name Ion or loan (John), has the diminutives Ionica, Ioni(a, Ionascu, lanache, Ienachel, &c. In verbs — apart from a few exceptional tenses — the accent falls on the first syllable of the inflectional suffix, e.g. eu dorm, I sleep, but eu dormlssem, I had slept. For the sake of euphony, a vowel is frequently interpolated between two consonants; e.g. in masculine nouns terminating in a consonant, an interpolated u precedes / to form the suffix article (om, man, om-u-l, the man).

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' Apart from certain instances in which the Latin form has been artificially restored in comparatively modern times. (See under Literature.)

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(X.) Literature

The intellectual development of Rumania has never until modern times been affected by Latin culture, but it has been profoundly influenced first by Slavonic literature, then by the Greek or Byzantine literature, and last, by the Western, notably French and Italian novels. The history of Rumanian literature can be divided into three distinct periods : the Slavonic, from the beginnings of Rumanian literature in the middle of the 16th century down to 1710; the Greek, from 1710-1830, corresponding with the era of Phanariote rule; and the modern period, from 1830 to the present. The change from Slavonic to Rumanian was very gradual. Slavonic had been the language of the Church from the early middle ages, and was therefore hallowed in the eyes of the people and the clergy ; through the political connexion with the Slavonic kingdoms of the south, Bulgaria and Servia, it had also been the language of the chancelleries and of the court. Even when the Rumanian language at last supplanted the Slavonic, it did not emancipate itself from the original; the new was merely a translation from the old, and at the beginning it was as literal as possible. We have therefore in the first period a medieval literature transplanted to Rumania and consisting of translations from the Slavonic. The reason of the change from Slavonic into Rumanian is to be sought in the influence the Reformation had among the Rumanian inhabitants of Transylvania.

The second period is marked by a complete waning of Slavonic influence, through the literary activity of the Greek hospodars. The Slavonic kingdoms of the south had lost their independence; they had ceased to produce anything worth having, whilst the Greeks brought with them the old literature from Byzantium and thus drove out the last remnants of Slavonic. They also treated Rumanian as an uncouth and barbarian language, and imposed upon the Church their own Greek language, Greek literature and , Greek culture. This literature

may be taken to represent the period of the Renaissance in the West; but when the yoke of the Phanariotes was shaken off, the link that connected Rumanian literature with Greek was also broken, and under modern influences began the romantic movement which has dominated Rumanian literature since 1830.

Much of the Rumanian literature of the first two periods has been preserved only in MSS.; few of these have been investigated, and a still smaller number have been compared with their original. The Rumanian Academy keeps jealous watch over the treasures it has accumulated, and few have had access to the riches entombed in its archives; nor has any private or public collection been catalogued. An ex- haustive history of Rumanian literature is, for the time being, a pious wish.

First Period: c. 1550-1710. — Rumanian literature begins, like all modern European literature, with translations from the Bible. The oldest of these are direct translations from Slavonic texts, following the original word for word, even in its grammatical construction. The first impetus towards the printing of the Ru- manian translations came from the princes and judges in Tran- sylvania. It is under their orders and often at their expense that the first Slavonic printing-presses were established in places like Kronstadt (Brashov) Orastia, Sasz-Shebesh and Belgrad (Alba Julia, in Transylvania)where Slavonic and Rumanian books appeared. The foremost printer and translator was a certain Diakonus Koresi, of Greek origin, who had emigrated to Walachia and thence to Transylvania. He was assisted in his work by the ” popes ” (parish priests) of those places where he worked. The very first

The Bible.

book published in Rumanian is the Gospels printed in Kronstadt between 1560 and 1 561. An absolutely identical Slavonic text of the Gospels appeared in the same year, or one year earlier, which no doubt was the original for the Rumanian translation. Following up the list of publications of the books of the Bible in chronological order, we find Diakonus Koresi immediately afterwards — • the date has not yet been definitely ascertained — printing a Rumanian translation of the Acts of the Apostles; in 1577 he printed at Sasz-Shebesh a Psalter in both Slavonic and Rumanian; the Rumanian follows the Slavonic verse for verse. A MS. Psalter more recently discovered shows close affinity to this edition, and, in spite of the opinions held by some critics, must be considered as a copy of it made about 1585; it even reproduces the printer’s errors of Koresi’s edition. To the 16th century belong also the

first attempts to translate the historical books of the Old Testament which appeared in Orastia in 1582, under the title Palia. The example thus set could not fail to react upon the Rumanians in Walachia, with whom the Transylvanians stood in close commercial and political connexion. The Slavonic language still reigned supreme in the Church ; yet once the example had been set in Transylvania, and the influence of the Slavonic nations had begun to slacken, it was inevitable that the Rumanian language should sooner or later come to its own. It was in Transylvania that the first complete Rumanian translation of the New Testament appeared (Belgrad, 1648). This translation was based upon the Slavonic original, but the text had been verified and corrected, by comparison with a Calvinistic translation, and had been collated with the Greek. The chief author of this translation, which may be termed classical, seems to have been a certain Hieromonach Sylvestre who lived in Walachia and who had undertaken, by order of the prince Betlen- gabor of Transylvania (1613-29), a translation of the whole Bible. Upon this version, no doubt, are based the editions of Iordache Cantacuzene(Bucharest , 1 682) , and that of §erban Greceanu (1693), in which for the first time the Greek text is printed side by side with the Rumanian; and; the edition of Anthim the Iberian (!7°3)- In these may also be traced a few reminiscences of the older version by Koresi, of which a copy, made by Radu Gramatik (1574), and once the property of Peter Cercel, is now in the British Museum. Sylvestre also prepared a new edition of the Psalter as part of his Bible (Belgrad, 1651), verifying the text by reference to the Hebrew and Greek originals. The first edition of the complete Bible was published (1688) by order of Prince loan §erban Canta- cuzene, by Radu Greceanu, assisted by his brother ˆerban and by Metrofan the bishop of Buzeu. This may be considered as the supreme monument of Rumanian literature in Walachia in the 17th century. No other Rumanian translation approaches it in style and diction, although the authors, as they own, utilized the older translations, and for the New Testament and the Psalter they utilized Sylvestre's work. At least a hundred years had to pass ere a new edition of the whole Bible was undertaken, nor was the Bible used for private reading, except such passages as were included in the lessons read in church. These were translated independently by Dositheiu under the title of Pirimiar (Jassy, 1683), and were almost the last work that came from his prolific pen. As far back as 1600 Dositheiu had made a new translation of the Psalter from the Slavonic and printed it in both languages (Jassy, 1680). Upon this translation he based the rhymed Psalter at which he had worked from 1660-73, when it appeared in Uniev. This is the first example of rhymed psalms in Rumanian, the author following the Polish rhymed version of Ian Kohanowski. Albert Molnar had

translated a French rhymed Psalter into Hungarian (1607) and this served as the basis for a literal translation made by Ianos Viski (1697). About the same time Theodor Korbea attempted to versify the Psalter and dedicated his work to Peter the Great of Russia. A new translation of the Psalter from Slavonic, with a commentary, the first of its kind, was made in 1697 by Alexander Dascalul (Alexander Preceptor Polonus). All these last-mentioned Psalters are still in MS.

Turning from the Bible to homilies and the liturgy, we find the ancient collections of homilies in Rumania to be due to the same proselytizing movement. Almost the first book printed „ ... by Koresi (at the expense of the magistrate of Kronstadt, ” om ”' es ‘ ForoMiklaus, c. 1570), seems to have been a translation from some Calvinistic compilation of homilies, one for every Sunday in the year. A Slavonic original sent by the metropolitan Serafim of Walachia served as the basis for a second collection of homilies known as Evangelie invdtflioare (1580) It differs from the former in language and tendency and proves that Koresi was only a translator and printer. The first collection of homilies, henceforth known as Cazanii, appeared in Dliigopole, i.e. Campulung, in Walachia, in 1642. It was compiled by a certain Melchisedec and contained thir- teen homilies. Very voluminous is the next collection, Evangelie invd{atoare tdlcuita, translated from the Russian by Sylvestre (Govora, 1643). One year later appeared the first book printed in Moldavia, the collection of homilies Carte romdneascd de invdt&turd (Jassy, T643). It is a volume of 1000 folio pages, of which the first half is absolutely identical with Sylvestre’s collection. A similar unacknowledged loan was made by Meletie the Macedonian, compiler of the homilies which appeared at Deal in 1644. Of special interest

is the next publication of homilies Cheea intelesului, ” the Key of understanding,” by the Walachian metropolitan Varlaam, trans- lated from the Russian and printed at Bucharest in 1678. This, the first book printed in Bucharest, begins the long series of editions which have issued from the press of the ” Mitropolie ” in Bucharest. From this press originated also the no less important presses at Buzeu and Ramnicu Valcea, where in the following two centuries almost all the books for the Church service were printed. Two or three more collections may be mentioned here— one called Sicriu de aur. “the

Golden treasury," by loan of Vinri (Sasz-Shebesh. 1688), probably from some Hungarian Calvinistic collection of obituary sermons; and the " Pearls," Mdrgdritare, an anthology made from the Greek homilies of St Chrysostom, Epiphanius, Anastasius Sinaita, &c, and translated from the Greek by the brothers Radu and Serban Greceanu. The only collection of original sermons is the Didahii delivered by the metropolitan Anthim the Iberian (g.».), the scholar, artist, translator, printer and great linguist, who was the first to issue books in Arabic and even in Georgian from his printing-presses in Bucharest. The Didahii were published at Bucharest in 1888.

The Rumanian language was not yet introduced into the Church. All the service books were in Slavonic, but during this period most of j.. them were translated, and some of them printed, although

Lltunrv no *~ y e * ornc i a " v used. The burial service seems to have ^' been the first to be translated. Two Evhologia appeared during the second half of the 17th century, one by the bishop Dosi- theiu (Jassy, 1679-80) , which remained almost unknown, and the other based upon the Slavonic, by loan of Vinti (Belgrad, 1689). This Molitavnic (prayer-book) has been the basis of all subsequent editions of the Rumanian Prayer-book. The Liturgy proper was also translated by bishop Dositheiu in 1679, but a translation from the Greek, by Jeremia Kakavela (Jassy, 1697), was the one adopted in the churches. Passing over the numerous editions of the Akathist and Katavasiar, some partly in Rumanian, we may mention the Ceasoslov (Book of Hours), said to have been printed for the first time in Transylvania in 1696, but certainly printed or reprinted by the metropolitan Anthim (Tirgovishtea, 1715), In 1694 Alexander Dascalul translated, and the bishops Mitrofan of Buseu and Kesarie of Ramnicu Valcea printed (among other church books) the twelve volumes of the Mineu in Slavonic with Rumanian rubrics, and short lives of the saints, as well as the Triod and the Anthologion.

In addition to the activity of the Reformers in Transylvania, there was also a Roman Catholic propaganda in Rumania, and the Orthodox Church found it necessary to convoke a synod in Jassy for the purpose of formulating anew its own dogmatic standpoint. It was held in 1645 under the presidency of Peter of Mogila, and a formulary of the Orthodox creed was drawn up. An answer to the Lutheran Catechism of Heidelberg (translated into Rumanian and printed at Fogaras in 1648) was also prepared by Bishop Varlaam. R. Greceanu translated the formulary from Greek into Rumanian under the title Pravoslavnicd martunsire (Bucharest, 1692). Of a more decided polemical character is the Lumina of Maxim of Peloponnesus, translated from the Greek

(Bucharest, 1699).

Of far greater interest is the literature of maxims, and lives of saints, real or apocryphal, intended to teach by example. Such are Ethical tne max ‘ ms i n the Floaerea darurilor, translated from the tilers- Greek (Sneagov, 1700), and going back to the Italian Fiore

(ure> de virtH; the Invdla\uri crestinesti, ” Christian teachings ”

of Filoteos (ibid., 1700); the short moral guide, Carare pre scurt, by loan of Vinti (Belgrad, 1685), translated from some Hungarian original; the Mdntuirea pacatosilor , or ” Salvation of sinners,” translated from the Greek by a certain Cozma in 1682, which is a storehouse of medieval exempla; and above all the Mirror of _ Kings, ascribed to Prince Neagoe Bassaraba, written originally in Slavonic (or Greek, if the prince be really the author), aTf J translated (c. 1650) into Rumanian. This exceeds all the other publications of its class in purity of language and excellence of style. Of the lives of saints, the Prolog, translated from the Slavonic at the beginning of the 17th century (MS.), and the Viefile Sfinfilor. by Dositheiu (2 vols., Jassy, 1682), are the most important. In the latter, which is his greatest work, Dositheiu uses not only Greek texts, but also Slavonic legends and other MS. material ; and he includes a goodly number of the apocryphal legends of saints. To this kind of literature belongs also the Lafsaikon, i.e. the Historia Lausiaca of Palladius, differing, however, in some points from the original. The legends of the saints of the Pecherskaya in Kiev were translated by Alexander Dascalul. All these are still in MS.

The first law-books were also compiled during this period. The Slavonic Nomokanon, which rests on Greek legislation and embodies L aw , the canonical and civil law, had previously been used in

Rumania. In 1640 there appeared in Govora the first canonical law-book, which was at the same time the first Rumanian book printed in Walachia. This Pravild (code) was probably the work of the historian Moxa or Moxalie. In 1632 Evstratie the Logofet (logothete) also translated a Pravild from the Greek, which remains in MS. In 1646 appeared the Pravild aleasa, or ” Selected Code,” compiled, no doubt, by Evstratie and published with the authority of the then reigning Prince Vasile Lupul (Basil the Wolf), hence known as the Code of Vasile. In 1652 there appeared in Bucharest

a complete code of laws, translated from the Greek and Slavonic and adapted to local needs under the direction of the prince of Walachia,

Matthias Bassaraba. The Indreptarea legii, in which Pravild of Vasile was incorporated without acknowledgment, remained the recognized code almost down to i8”66. It embraces the canonical as well as the civil law. The chief authors were Uriil Nasturel and Daniil M. Panoneanul.

The earliest historical works are short annals, written originally in Slavonic by monks in the monasteries of Moldavia and Walachia. In 1620 Moxa translated from the Slavonic a short history „. of the world down to 1498. Two other universal histories ”’ stor y- were translated from Greek and Slavonic chronographs. One by Pavel Danovici contains the history of the world told in the style of the Byzantine chroniclers; it includes the legend of Troy, the history of Pope Sylvester and the description of the various church councils; and it concludes at the year 1636. The second is the Hrongraf of Dorotheus of Monembasia, translated by a certain Ion Buburezau. Both are still in MS. The Old Slavonic annals were later on translated and new notes were added, each subsequent writer annexing the work of his predecessor, and prefixing his name to the entire compilation. Ancient Rumanian historiography is thus difficult to unravel. In Moldavia, where the influence, of Poland had been great and Western writings were accessible, we find the best chroniclers. The writers are often actors in the dramas which they describe, and often also the victims. A history of Moldavia from the earliest times to 1594 is ascribed to Nestor or to his son, Gregorie Ureche, or to Simion Dascalul. It was continued by the Evstratie mentioned above, and probably also by Missail Calugarul. The most important author whose writings rank as classical is Miron Costin, who either took up the thread where it was left by Simion and Ureche and wrote the history of Moldavia from 1594- 1662, or continued the history from where (probably) Evstratie had left it (c. 1630-62). Nicolae Costin (d. 1715), son of Miron, completed the history at both ends. He starts from the creation and endeavours to fill up the lacuna from 1662 to his own time, 1 7 14. It is doubtful, however, whether the portion from 1662-1701 is his work or whether another compiler had filled up that section. Acsintie Uricariul, 1715, brings to a close the corpus of Moldavian Chronicles.

_ The same uncertainty holds good also for Walachia. The be- ginnings are the work of an anonymous author, whose chronicle, continued by a certain Constantin Capitanul, describes the history of Walachia from Radu Negru (i.e. Rudolph the Black), c. 1290- 1688. An addition to this Chronicle from the time of the Roman Conquest to Attila is ascribed to Tudosie Vestemianul, twice metropolitan of Walachia (1669-73, 1677-1703). The Chronicle of Capitanul was further continued by Radu Greceanu to 1707, and finally by Radu Popescu to

1720. Two works remain still to be mentioned — a comprehensive history of both principalities by an anonymous author, probably the Spatar Milescu, who finished his eventful life as ambassador of Russia to China (still in MS.), and the Hronicul Moldo-Vlahilor of Prince Demetrius Cantemir (see Cantemir), more an apology for the Roman origin of the Rumanians than a true history. Cantemir wrote the original in Latin and translated it into Rumanian in 1710. His style shows an immense superiority to that of the previous historians. Of poetry there is scarcely a trace during the whole period under review except some rhymed Psalters and a few rhymed dedications to patrons.

Second Period: 1710-1830. — The Phanariote period has been described as one of total decay; the political degradation of Rumania was thought to be reflected in its spiritual life. But the facts do not warrant this opinion. The few who had taken the trouble to study Rumanian literature paid not the slightest attention to the vast MS. material accumulated during the years of the Phanariote dominion, and out of sheer ignorance and political bias condemned this period as sterile. Another influence was far more potent than the conduct of the Greek princes, though some of them were real benefactors of the people. In Transylvania one section of the influence Rumanian population had accepted the spiritual ot Ku,,, a „ rule of the pope; they became now GreekrCatholic, CathoU- instead of Greek Orthodox. Rome took good care clsm ‘ to educate the priesthood far above the status of the Orthodox priests, and continued an extensive proselytizing activity. So long as the Rumanians were spiritually united with the other Orthodox nations, and so long as they used the Slavonic or Cyrillic alphabet, they would practically be cut off from the Latin West. If, however, they could be induced to discard the old Slavonic alphabet and substitute for it the Latin, and could be brought to recognize their national and ethnical unity with ancient Rome, it was hoped that then they would be more easily induced to enter into the unity of faith. Thus a great change was wrought towards the end of the j8th and in th?

first half of the 19th century in the whole current of Rumanian literature. It suited the promoters of that movement to pretend that they started a new era. But the Latin or Transylvanian movement wrought great havoc in Rumanian literature and caused the greatest confusion in the language. Only now are some authors beginning to free themselves from the evil influence.

By the end of the 17th century Rumanian had become the author- ized language of the Church, and the Rumanian translation of LUur- e Gospels (printed 1693) had become the Authorized

, . Version. Most of the liturgical books officially adopted

*! ‘ and revised in this period are still used for church ser-

toxical vices. Such are the Ceasoslov, revised by Bishop Kliment and °^ R& mr >i cu Valcea (1745), the Evhologion (1764), the

ethical Katavasiar (1753), The monumental publication of the litera- Mineiu, in 12 folio volumes, by Bishops Kesarie and

turBm Filaret of R&mnicu Valcea (1776-80), is equal in im-

portance if it be not superior to the no less monumental publication of the Lives of Saints, also in 12 huge folio volumes, published under the direction and with the assistance of the metro- politan Veniamin of Moldavia. The latter was translated from the Russian, appeared in Neamtzu (1809-12), and was reprinted in Bucharest (1835-36). In beauty, richness and lucidity of language, and in dignity of style, these two books resemble the Bible of 1688.

Slavonic having entirely disappeared from the sources of literature, writers and translators turned to Greek originals and for more than a century were busy translating into Rumanian the most important works of the older Fathers of the Church. Some of these transla- tions were printed much later; thus the Hexaemeron of Basil the Great (andofEpiphanius) translated in the middle of the 1 8th century, was printed at Bucharest in 1827. The Scala Coeli of Joh. Klimakus, the Treasury of St Damascenus (MS. 1747 by a certain Mihalacea), the homilies of Cyril of Alexandria, and those of Ephraem the Syrian, were printed at Neamtzu in 1818. The Panoplia of Euthymius Zygabenus (1775) and the Commentary of Theophylact were printed by Veniamin (Jassy, 1805). The homilies of Theodor Studites (MS. of 1712) were

edited by Bishop Filaret and published at Ramnicu Valcea in 1784; a translation of Gregory of Nazianzus appeared at Bucharest in 1727. The great polemical work of Simeon of Thessalonica, the Greek original of which was published by Dositheiu (Jassy, 1683), had been translated into Rumanian long before it was printed (Bucharest, 1756). The Lafsaikon, mentioned above, was printed at Bucharest in 1 754. All these translations are written in good Rumanian. One can see how a language not originally suited for abstract problems and theological dialectics was slowly but surely improved and made capable of expressing profound and subtle ideas.

In Transylvania, with the conversion to Greek-Catholicism of Bishop Athanasius in 1701, the Greek Orthodox had to place them- selves down to 1850 under the protection of the Servian metropolitan of Karlovatz. No writer of any consequence arose among them. The " United " fared better, and many a gifted young Rumanian was sent to Rome and helped from Vienna to obtain a serious educa- tion and occasionally also temporal promotion. With a view prob- ably to counteract the literary activity in Rumania, the bishops P. P. Aaron and lean Bobb were indefatigable in the translation of Latin writers. First and foremost a new translation of the whole Bible was undertaken by Samuel Klain. It appeared in Blazh ('793-95)- It falls short of the older version of 1688; it was modernized in its language, and no doubt a careful examination would reveal differences in the translation of those passages in which the Catholic tradition differs from the Eastern. Bobb translated Thomas a Kempis's Imitatio Christi (Blazh, 1812) ; he wrote a Theologhie morala {ibid. 1801) and adapted the Rumanian service-books to the new order of things. Popular catechisms and various histories of the Church were then written. Mention may be made of a few more moral treatises such as the Usa pocainfei, "Gate of Penitence" (Kronstadt, 1812); Oglinda omului din auntru, "The Mirror of the Inner Man"; or Pilde filosofesti, " Philosophical Saws and Maxims " (Tirgovishtea, 1715). Of greater importance was the collection of fables with their " moral " translated and modified from the Servian of Obrenovich — Fabule moralicesti, by Tzikindeal (Budapest, 1814). These are heavy and follow the original too literally. Tzikindeal (d. 1818) and his contemporaries in Hungary had lost contact with the Rumanian literature in Walachia and Moldavia, and the same was the case with the other writers of their school. Radovici or Dinu din Golesti, an enlightened Walachian boyar, who was one of the first Rumanians to describe a journey in Western Europe, is also the author of a collection of maxims and parables, Adunare de pilde bisericesti si filosofesti (Budapest, 1824); he left a larger collection in MS. partly edited by Zane in his

Proverbele Romdnilor, vols, xi.-xvi.

After I7 2 7 Rumanian was recognized as the language of the law-courts, and through the annexation of Bukovina by Austria L aw , (‘774) a “d of Bessarabia by Russia (1812), codes for the

civil and political administration of those provinces were drawn up in Rumanian, either in accordance with the established law of the land or in consonance with the laws of Austria and Russia.

Such legal codes reflect the German or Russian original. They were > however, of importance as they served as models (to some extent) for the new legislative code compiled in Moldavia under Prince Calimach; this was originally published in Greek (1816), and after- wards translated into Rumanian with the assistance of G. Asaki (Jassy, 1833). The Walachian civil laws and local usages were collected and arranged under the direction of Prince Ypsilanti (1780) in Greek and Rumanian; and under Prince Caragea another code was published (1817), which remained in force until 1832, when the ” Organic Law ” changed the whole trend of legislation. One more collection, an abstract from the Greek Basilica, published by Donici (Jassy, 1814), must be mentioned, for through it the legal terminology of the modern codes was more or less fixed.

The last and probably the best writer of Rumanian history in the Phanariote period is Neculcea. He wrote a history of Moldavia to his own time, but for the period before 1684 his work is H > sta more or less an abstract from older writers. The original **’

part covers the period from 1 684-1 743, and is to some extent an autobiography of a very adventurous life. Neculcea adds to his chronicle a collection of historical legends, many of them still found in the ballads of Moldavia. Among other historians might be mentioned N. Roset, the continuator of Neculcea. Enaki (Ianache) Cogalniceanu wrote a history of the period 1 730-1 774, and followed the example of Greek writers by introducing rhymes into it. He was also the author of some political satires and other poems on G. Ghica, M. Bogdan and loan Cuza. The historians of the time under pressure of political exigencies did not scruple to invent treaties between the Porte and the Rumanian principalities. A series of such spurious collections of treaties were submitted to the Powers for ratification ; in them imaginary rights and privileges alleged to have been granted by the Turks were described, and the Rumanian representatives asked that after the peace negotiations of 1774 they should be sanctioned afresh. In Walachia there was not a single historian of importance in the first.

half of the 18th century. In the second we have the chronicle of Dionisie Eclesiarh (1764-1815), a simple-minded and uncritical writer who describes contemporary events. The ancestor of a great family of poets and writers, I. Vacarescu described the history of the Ottoman empire from the beginning to 179 1, interpolating doggerel verses. Alexander Beldiman describes in a rhymed epic, Eteria (1821), the first battles between the Greeks and the Turks in Moldavia. It is a bitter satire upon the Greeks. Similar in tendency is another rhymed chronicle known under the name of Zilot (c. 1825).

Whilst a political and national revival was taking place in Moldavia and Walachia, towards the beginning of the 19th century, the Latin movement went on in Transylvania. There ethical and religious tendencies got the upper hand. Three historians had been partly educated in Rome under the protection of Prince Borgia and the influence of the Jesuit Minotto and the College of the Propaganda ; they were Samuel Klain, Petru Maior and George Sincai. To Klain's initiative can be traced most of the work of the three. Unfortunately his writings, with a few exceptions, are still in MS. He is the author of the first history of the Rumanians in Dacia written according to the standards of Western science. It seems to have described the wars between the Romans and the Dacians, and to have been continued down to 1795; a history of the Rumanian Church also formed part of the book. P. Maior published an almost identical history (Budapest, 1812), and it is probable that he had made use of Klain's composition. In both the tendency is the same — to trace the modern Rumanians directly from the ancient Romans, and to prove their continuity in these countries from the time of Trajan to this day. Political and religious aims were combined in this new theory. A conflict was raging between the Hungarians and Rumanians, and history was required to furnish proofs of the greater antiquity of the Rumanians in Transylvania. George $incai (1753-1816), who was an intimate friend of Klain and colla- borated in most of his works, succeeded him as revisor at the printing office in Budapest. Sincai worked for nearly forty years at his monumental History of Rumania, which the Hungarian censor did not allow to be printed on account of its nationalist and anti-Magyar tendencies. It remained until 1853-54, when it was printed at the expense of Prince Gr. Ghica. The edition of 1886 is only a reprint, though both the original MS. and a better copy had meanwhile been discovered.

These books had no immediate influence in Walachia and Moldavia, where fiction and the drama had developed under the influence, first, of Greek and then to an increasing extent of French, Italian and German models. It was towards the end of Imagtn- thei 8th century

that Rumanian literature began to emanci- ? *’ ve pate itself, very slowly of course, and to start on a career of Lliera- its own in poetry and belles lettres. Curiously enough, the ”’

first novel to be translated was the ” Ethiopic History ” of Bishop Heliodorus. The Odyssey and Iliad were then translated into prose, and the Arabian Nightsˆ after undergoing an extraordinary change in Italian and modern Greek, appear in Rumanian literature at the middle of the 18th century under the name of Halima. The Glykis, a Greek printing firm in Venice, published many popular books in Rumanian which found their way into the principalities. The epic of Vincenzo Cornaro was translated into prose alternating

The Drama,

with verse, first under the name of Erotocril and then slightly changed as Filerot si Antusa. Anton Pann printed it as his own composition. Kritil si Andronius (Jassy, 1794) is almost the last novel or story translated direct from the Greek. The young men of Walachia had come into contact with Western literature, which they were anxious to transplant to their own country. Some had been sent to Paris for their education, such as Poteca, Marcovici, the Voinescus, Moroiu and others, who developed an almost feverish activity in translation. Most of the writings of Florian, Marmontel, Le Sage, Montesquieu and others were rapidly translated into Rumanian. The picaresque novel Lazarillo de Tormes also found its translator, and appeared in 1839, Paul and Virginia in 1831. Campe’s German Robinson Crusoe (1816) and his Discovery of America were translated by Draghici (1835). G. Asaki and Alexander Beidiman in Moldavia developed a similar activity. Beidiman copied a number of ancient chronicles, wrote a satire on the Greeks, and translated and adapted a number of French tragedies and dramas, in verse and prose.

Nowhere has the theatre played a more important r61e in the history of civilization than in Walachia and Moldavia, more in the former than in the latter. It formed the rallying-ground for the new generation which chafed under the tyranny of a Greek court. A certain Aristia, of Greek origin, but soon acclimatized to his surroundings as teacher at the high school in Bucharest, was the first to adapt foreign

dramas for the Rumanian stage. These were first performed in Greek.and afterwards trans- lated into Rumanian. The plays produced on the Rumanian stage included most of the dramas of Moliere, some of Corneille, Kotzebue and Metastasio, whose Achille in Schiro was the first drama translated into Rumanian (by Iordache Slatineau, printed at Sibiu in 1797). Schiller was also translated, and a few plays of Shakespeare (Hamlet, &c.) from a French version. Victor Hugo's Angelo and Maria Tudor were translated by Constantin Negrutin. Those who kept in touch with the old literature — men such as Beidiman, Marcovici and Negrutin — were able even in their metrical translations to do justice to 'the originals and at the same time not to distort the character of the Rumanian language. Among such translators was Skavinschi, who came originally from Transylvania to Jassy, and translated Regnald's Democrit into verse. The lyrical and epic poetry of the time follows somewhat the same lines, but with certain notable differences. The individuality Poetry, °f tne authors is more marked, and they advance' much sooner from translations to independent poetry. Tran- sylvania, which awoke to a new life towards the end of the 18th century, produced some of the most popular poets. Among them were Vasile Aaron (1770-1822) and Ion Barak (1779-1848). Aaron wrote the Passion, in 10,000 verses (1802; often reprinted); the lyrical romances of Piram si Tisbe (1808) and Sofronim si Hariti (1821); and the humorous Leonat si Dorofata, a satire on bad women and on drunken husbands, now a chapbook. Barak wrote Rasipirea lerusalimului (182 1), " The Destruction of Jeru- salem," almost as long as Aaron's Passion ; and he versified a Magyar folktale, Arghir si Elena, which has also become a chapbook, and has been interpreted as a political poem with a hidden meaning. He also translated the Arabian Nights from the German. In Walachia a certain Ion Budai Deleanu, a man of great learning, author of a hitherto unpublished Rumanian dictionary of great value, wrote a satirical epos in which gipsies play the chief part. It is called Tiganiafa (1812) and consists of 12 songs and of many thousand verses. The author displays a profound knowledge of the life and the customs of the gipsies, and of Western literature from the Batrackomyomachia to the Pucelle of Voltaire.

The love-songs of the time are primitive imitations of the Neo- Greek lyric dithyrambs and rhapsodies, which through the teaching of the princes of Walachia were considered as the fountainhead of poetical inspiration. But a closer acquaintance with the West led to greater independence in poetical composition. In the three generations of the Vacarescu one can follow this process of rapid evolution. Ianache Vacarescu, author of the first native Rumanian grammar on

independent lines, was also the first who tried his hand at poetry, following Greek examples. He then studied Italian, French and German poetry, and made translations from Voltaire and Goethe. His son Alecu (b. 1795) followed his example. Both were overshadowed by the grandson loan (b. 1818), who was more than any other man both the representative of an epoch fast vanish- ing and the harbinger of the new spirit that was stirring young Rumania. The collected poems of I. Vacarescu were published in 1848; but among them were some of the poems of Ianache and Alecu, which were confused with his own work. In this volume, Colec{ie din poeziile domnului mare logofet I. Vacarescu, there are odes, hymns, patriotic poems, ballads, lyrical and didactic poems, some of them among the most beautiful in the language. A con- temporary of his earlier period, Paris Mumuleanu (1794-1837), wrote his Rost de poezie (1820) under Greek influence, but after- wards passed under the spell of Maior and Tzikindea, whose Latin propaganda he was one of the first to advocate in Rumania. In his Caractere (Bucharest, 1828) Latin forms are common. One more poet, and a real one, is Vasile Carlova (1809-1831), whose Ruins of Tlrgovishtec sufficed to place him among the foremost Rumanian poets of the 19th century.

In Moldavia a similar development took place, translations leading up to independent production. The most prominent figure is that of the scholar and linguist Constantin Konaki (1 777-1 849), who might be termed the Rumanian Longfellow for the facility and felicity of his translations from Western poetry and for his short poems, easily set to music and very popular. His Alcatuiri si tdlmaciri appeared in 1858. Constantin Negrutin, who was at first influenced by the Russian poets, notably Pushkin, successfully translated poems of Victor Hugo, and rivalled Konaki in his dex- terity and fidelity to the original.

Third Period: 1830- . — The agitation for the trans- literation of the alphabet, the elimination of all non-Latin words from the language and the ostracism of the old literature, completely crippled all literary activity, first in Transylvania and then in Rumania. The Latin movement was first brought into Walachia by a certain George Lazar from across the moun- tains. Lazar was appointed teacher at the St Sava school of Bucharest, where he spread the new doctrine of the Latin origin of the Rumanians; Latinizing tendencies were, however, not yet imported into the language. Of his pupils there was one whose influence became decisive: Ion Eliade (Heliade),

afterwards also known as I. E. Radulescu (1802-1872), „„, .

.. » ..... Eliade.

a man of immense activity, of great power of initiative

and of still greater imagination. He it was who ushered in

the new epoch, and for close upon forty years he stood at the

head of almost every literary undertaking.

There were two periods in his life — the latter the exact opposite and negation of the former. Up to 1848 he was closely connected with politics, the theatre and the school — he was the successor to Lazar ; he wrote grammars, and the introductions to his grammars are models of lucidity, combined with a wide historical view. He was the founder of the first political and literary review, and he had a genius for discovering talent, and the merit of assisting it. Through his reviews he trained the middle-class to read and to take an active interest in literary problems. Through his Curier de ambe sexe (1837-41) he disseminated translations from political and other works, thus paving the way for the political change of 1848. About this time he turned to philology, and fell under the spell of the Transylvanian school. Slowly he developed his theories about language and writing, and he ended as a fanatic wedded to extra- ordinary views. He was a prolific writer and translator of dramas and novels from French and Italian, the latter appearing mostly in his periodical. The number of his publications is legion.

All the prominent Rumanians of that period were politicians; they strove to obtain the emancipation of the country from Turkish dominion, and, later on, the union of Walachia and Mol- davia. Everything was placedat theserviceof this national aspiration, which is the keynote of the poems of Bolinti- neanu (1826-1873). He also was discovered by Radulescu, who published his first and best known poem, ” The Dying Virgin.” In 1848 he was exiled, together with the other leaders of the revolution, and he spent the next nine years in travels in the East. There he gathered the materials for his lyrical poems ” Macedonele ” and ” Florile Bosforului ? ” Returning in 1857 to Walachia, he occupied high administrative posts, and he wrote a number of historical novels (Traian, Mircea, §tefan, &c), dramas (Lapusneanu, Mihnea, Mihaiu, &c), longer poems (Sorin, Conrad), and his politico-philo- sophical novel Elena. These mostly patriotic compositions were as a rule less felicitous than his political satires (Nemesis, Menade, &c). His peculiar strength lay in rhe historical ballad, which he was the first to introduce into Rumanian poetry, and in the vivid portraiture of Oriental scenery and emotions. He died in a lunatic asylum forgotten by all, and even his writings have, save in

one early edition, not been published without unwarranted alterations by the editor Sion.

A contemporary of Bolintineanu was Grigorie Alexandrescu (1812-1885), also a pupil of Eliade. Imperfect in his rhyme and rhythm, his poetry is of a didactical nature, and his best a .. poems are rhymed fables, many of which are thinly dis- a ndrescu guised political satires. He also translated the Alzire ‘

(1834) and Merope (1847) of Voltaire. Among his contemporaries may be mentioned G. Crejeanu (1829-1887) and A. Sihleanu (1834-1857), who left some weak poems of a sentimental and patriotic character. A Depara^ianu (1835-1865), whose language shows traces of the new Latinizing school ; and Nicolae Nicoleanu (1833-1871), whose powerful poems, full of deep and often mystical reflections, lead on from Alexandrescu to Eminescu, all three being the poets of pessimism. In Teodor S_erbanescu (b. 1839) we find the reflex of Bolintineanu of the earlier period, in the beauty and simplicity of his lyrical poems — not yet published in complete form. Like §erbanescu, Vasile Alecsandri (1821-1890), the greatest of Rumanian lyrical poets (see Alecsandri), was a Moldavian. In France, under the influence of Beranger and the romantic school, he was led to turn to popular

Bolinti- neanu.

Prose Writers.

poetry for inspiration. He collected Rumanian popular songs and Ate ballads (Doine, 1844) (Lacramioare, 1853). In Pasteluri

sandrl O867) he introduced admirable pictures of popular life into

Rumanian poetry. In Legende (1871) and Ostasii nostrii (1877) he strikes the patriotic note. His fame rests on his lyrical poetry alone, which retains some of the charm of popular poetry. Alecsandri is less successful in his dramas, most of which are adapta- tions from French originals; the only merit of his novels is that amidst the phonetic and philological turmoil he kept to the purer language of the people.

From Alecsandri there is a natural transition to his great rival, who

was also his superior in depth of thought and in mastery of Bml sea ˆ orm an< ˆ language, the great poet of pessimism, Mihail " e ' Eminescu (q.v.). Mention may also be made of Matilde Cugler Poni (b. 1853), who published some admirable short poems in the Rumanian reviews (Poesii, 1888). Veronica Micle (1853-1889) belongs to the same circle of gifted Moldavian women (Poesii, 1887). But all these men or women disappear with the appearance of Eminescu, who, like Bolintineanu, started a new school of poetry and left a deep and growing influence upon the new generation. His best follower, though possessing originality of his own, is A. Vlahuˆa (b. 1859). G. Cosbuc, who has risen more recently to fame, is the poet of the unfortunate Rumanian peasant, emancipated only in name and on paper, and a prey to greedy landowners and to a medieval administration. The poets of this school drew their inspiration from popular poetry, and all of them were sons of the lower middle class or of peasants, who by dint of heavy work and great hardship were able to rise above the narrow social conditions in which they were born.

Somewhat different has been the development of the Rumanian prose writers. They suffered in consequence of the philological confusion brought about by Eliade and his assistants, mostly men who after 1848 immigrated from Transylvania and brought with them their own prejudices and narrow intolerance. Too great influence was accorded to them, and the result was that for a long time scarcely a single Rumanian novelist or historian can be mentioned. It was only after N. Balcescu had undertaken the edition of the ancient Walachian chronicles, and had found in tnem admirable prose writers, that he ventured on a con- tinuous history (1851-52) of the Rumanians under Michael the Brave, written not as a didactic treatise but as a poem in prose — full of colour and of energy. A. Odobescu, the friend and literary executor of Balcescu, was a consummate scholar of ancient and medieval anti- quities, and wrote a history of ancient art. His Pseudkynegetikos is an unsurpassed model of elegant writing and of fine irony. What Alecsandri was for verse, Odobescu was for prose. He also created the Rumanian historical novel, by his Mihnea Voda (1858) and Doamna Kiajna (i860). The first novel describing human nature in everyday life is the Ciocoii vechi si noi (1863) of Nicolae Filimon (1 8 1 9-1 865) . I n Moldavia where the knowledge of the old chroniclers had not entirely died out and disturbing philological influences were not so acutely felt, we find the vigorous writings of Mihail Cogalniceanu — one of the leading spirits of the 19th century, the greatest mind and the real founder of Rumania. Cogalniceanu published various reviews, some of a political, others of a more literary character, such as the Dacia literard (1840) and Archiva

romdneasca (1845-46) ; he has also the great merit of having published for the first time a collection of the Moldavian chronicles. G. Asaki (1788-1871), a second Eliade, helped to inaugurate a literary reform in Moldavia; but the result was disappointing, until the literary society known as the Junimea was started, in the 'seventies, by Titu Maiorescu (b. 1839), who was then a professor at Jassy. Titu Maiorescu put a stop to the prevailing Latinism, and turned the current of Rumanian literature into a more healthy channel, by the publication of his Critice (1874).

loan Ghica, a contemporary • of the revolutionaries of 1848, gathered his recollections of those agitated times into two volumes, Amintiri (1890) and Scrisori catre V. Alecsandri (1887), which besides their historical value have become a model of Rumanian prose. Among writers of fiction three names stand out prominently: Ion Slavici (b. 1848) describes the life of the people, notably of the Transylvanian peasants, in short stories, Nuvele din popor. Barbu Stefanescu de la Vrancea (b. 1858). also wrote short popular stories characterized by a wealth of imagery and richness of language; but the characters are all mostly unreal and exaggerated. The best known collections are Sultanica (1885) and Trubadurul (1887). loan Caragiali (b. 1852), the most popular Rumanian dramatist of modern times, who has brought on the stage living types of the lower and middle classes, and has skilfully portrayed the effect of modern veneer on old customs, is also the author of the powerful short novel Faclia de paste. Dobrogeanu Gherea (b. 1853) has in his Studii critice (1890 sqq.) been a ruthless but none the less judicious critic.

Curiously enough, there is not a single novel in the Rumanian literature with a sustained plot; none which presents a study of the development of human character amid the multifarious vicissitudes of life. The reason for this deficiency is perhaps the unsettled conditions of Rumanian life, and the lack of a profound and long- established civilization; or it may be found in the unstable and

fickle character of the people. Whatever the cause may be, while Rumanian poetry could well compare with that of any Western nation, in the domain of prose writing, and of novels in particular, one must look to the future to fill up the gap now existing.

There existed in Rumania another set of literary monuments at least as old as any of the books hitherto enumerated, but which appealed to a wider circle. Rumanian utera- folk-literature contains both popular written books ture: and oral songs, ballads, &c. It is advisable to group Folklore, the material in three sections: (1) the romantic and Tales '

secular literature; (2) the religious literature; — both of these being written — and (3) the modern collections of ballads, songs, tales, &c.

To the first belong the oldest books, such as the History of Alex- ander the Great, which was known in Rumania in the 17th century. It rests mostly upon a Sloveno-Greek text and is of the utmost interest for the study of this cycle of legends. The first printed copy appeared in 1794, and has been reprinted in innumerable editions. Next comes the legend of Constantine, of his town and his exploits — a remarkable collection of purely Byzantine legends. In addition to these there is the history of St Sylvester and the conversion of Constantine, &c, all still in MS. The History of Barlaam and loasaf (see Barlaam and Josaphat) may also be mentioned here, for it appealed to the people not so much for its religious interest as for the romantic career of the hero. The parables and apologues contained in the legend were incorporated into the Teachings of Prince Neagoe, and were also circulated separ- ately; they are found in many old MSS. Udri§te (Uriil) Nasturel translated the History from the Slavonic in 1640. One of its episodes, the farewell song of the prince departing into the forest, has since become one of the most widespread popular songs. Of similar oriental origin is the Dream of Mamer, the interpretation of which goes back to the Panchatantra, and must have reached Rumania early in the 18 th century, probably in Slavonic. The history of Syntippa and the Seven Masters has also become a popular book. It was translated from the Greek version. To the same cycle ,of oriental tales belongs the Halima, already described, which G. Gorjeanu printed (3 vols., 1835-37) as. his own work. The History of Arkir and Anadam, printed by Anton Pann from older MSS., is the now famous Old Testament apocryphon of Akyrios the Wise, mentioned in Tobit and found in many languages. In Rumanian it rests on an older Greek-Slavonic text, and owes its great popularity to the wise and witty proverbs it contains. ” Esop,” whose wonderful biography (by Planudes) agrees in many points with Arkir, has also become one of the Rumanian popular books. The history of Bertoldo, which, though of Italian origin, reached Rumania through a Greek translation, belongs to the same cycle of rustic wisdom and cunning, and is the last representative of an old series of legends clustering round the figures of Solomon and Ashmodai, or Solomon and Markolph. These books are of course anonymous, most of them being trans- lations and adaptations. One man, however, stands out pro- minently in this section of romantic and secular folk-literature. This was Anton Pann, who was born in 1797 at Slivden, of Bul- garian parentage, and died at Bucharest in 1854. Carried away by the Russians in his early youth, he settled in Rumania, learned Church music, and became one of its best

exponents, married four times, had an adventurous life, but lived among the people for whom he wrote and composed his tunes. In about twenty years he published no less than fifty books, all of them still popular. Besides his edition of the Rumanian Church service-books with musical notation, he published a series of tales, proverbs and songs either from older texts or from oral information; and he made the first collection of popular songs, Spitalul amorului, ” The Hospital of Love ” (1850-53), with tunes either composed by himself or obtained from the gipsy musicians who alone performed them. Of his numerous writings two or three are of the greatest interest to folklore. His Povestea vorbii (first ed. I vol., 1847; 2nd ed. 3 vols., 1851-53) is a large collection of proverbs ingeniously con- nected with one another and leading up to or starting from a popular tale exemplifying the proverb. The Fabule si istorioare (2 vols., 1839-41) is a collection of short popular stories in rhyme; Sez$toarea la tara (1852-53) is a description of the Rumanian Spinnstube, for which the peasants gather in one of their houses on a winter’s night, the girls and women spinning and working, the young men telling tales, proverbs, riddles, singing songs, &C. Pann also collected the jokes of the Turkish jester, Nasreddin, under the title of Nasdravaniile lui Nastratin Hogea (1853), also in rhyme. He also published a collection of Christmas carols, set to music by himself; these are still sung by boys on Christmas night.

Far larger than the secular is the religious popular literature; it comprises many apocryphal tales from the Old and the New Testa- ments, and not a few of the heretical tales circulated by the various sects of Asia Minor and Thracia, which percolated into Rumania through the medium of Slavonic. A brief enumeration of the

chief tales must suffice. Only a few of them have hitherto been published. They exist in numerous MSS. which testify to their great popularity; in the popular songs one finds many traces of their influence upon the people’s imagination. They include the History of Adam and Eve, the Legend of the Cross, The Apocalypse of Abraham, the History of the Sibyl, the Legends of Solomon; numerous New Testament apocryphal tales, starting with legends of St John the Baptist; a very remarkable version of the Gospel of Nicodemus; and the Epistle of Pilate. Printed in tens of thousands of copies are certain apocalyptic legends dealing with eschatological problems. The ancient Apocalypse of Peter appears here under the name of Paul, then there

is an Apocalypse of the Virgin Mary, who, like Peter, is carried by the Archangel through the torments of Hell and the bliss of Paradise, and through whose intervention sufferers are granted pardon on certain days of the year. Combined with these is the Sunday Epistle, sent from Heaven, enjoining strict observance, not only of Sunday, but also of Friday and Wednesday, as holy days. Most of these texts date in their Rumanian form from the 16th and 17th centuries; the Sunday Epistle is well known in connexion with the Flagellants. In the same pamphlet as the Sunday Epistle was published the legend of St Sisoe and sometimes that 01 Avestitza, — the former saved the children of his sister from the attacks of the devil, who had devoured them and had to restore them alive; the latter is the female child-stealing demon, who is prevented by an angel from carrying out her evil design. In both cases the repetition of the legend and the recitation of a string of mystical names serve, like some other tales, apocryphal and otherwise, as amulets, sufficient to protect from the devil. Upon the recitation of some of these texts rest many popular charms and incantations. Therein lies the importance of this written literature, for it gives us the clue to much that now lives in the mouths of the people, and is by some considered to be of immemorial antiquity. A number of astrological calendars and prognostica are among the best known and most widely circulated popular books, and the lives of St Alexius, Xenophon, &c. have become chapbooks.

The whole of this popular literature belongs to what may be called the cycle of the Balkan nations, in every one of which exact parallels are to be found. Not that there was any direct, deliberate borrowing by one nation from the other, but all of them seem to have stood for a long time under identical psychological in- fluences and to have developed on similar lines. The superstitions of one are often found to be those of the others, and in such a form that they could not have been taken over independently from a third source; they show too much family likeness. Thus also the popular songs of Rumania, the ” doine,” the ” hora,” the ” cantece,” ” colinde,” ” legende,” i.e. the love songs, the heroic ballads, legends, songs at the ring-dance, hymns and carols, though instinct with a charm of their own, find their counterparts in many a song, ballad, &c. of the Balkan nations. The heroes are often the same: Serbs, Bulgars and Rumanians sing the heroic deeds of Baba Novak and recite the legend of the Monastery of Argesh, or the ballad of Iorgovan, found in the Malorussian Byliny. One of the first to collect these treasures of Rumanian poetry was V. Alecsandri (1852-1866), who, however, retained only their poetical beauty and did not reproduce them with that strict accuracy which modern study of folklore demands. A. M. Maricnescu collected those

of Transylvania (1859); S. F. Marian, those of the Bukovina (1873); T. T. Burada, those of the Dobrudja (1880); but the most complete collection is that of G. Dem. Teodorescu, Poesii popidare romdne (Bucharest, 1885). The collection of fairy tales started later than that of the ballads. The first collec- tion is the German translation of tales heard by the Brothers Schott (1845). The most important collections, now deservedly considered as classical from every point of view, are the successive publications of P. Ispirescu. The collected tales of the Moldavian Ion Creanga (1837-89) appeared in his Opere complecte (1908). Ex- cellent collections are those of D. Stancescu, Basme (1885-1893), I. G. Sbiera, Basme (1886), Francu si Candrea (1888). Kutzo-Vlach tales and folklore will be found in G. Weigand, Die Aromunen, vol. ii. The only review devoted to the study of folklore is the Sazatoare, founded in 1892.

In recent times a kind of stagnation seems to have overtaken Rumania, and although attempts have been made to place the intellectual life of the nation on a sounder basis, the work of transi- tion from the past to the present has hitherto absorbed more energy than appears necessary. Whatever the causes may have been, the fact remains, that now there is a great dearth of talent and great poverty in output.

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RUMELIA, or Roumelia (Turkish Rumili, ” the land of the Romans,” i.e. the East Roman or Byzantine empire), a name commonly used, from the 15th century onwards, to denote that part of the Balkan Peninsula which was subject to Turkey.

More precisely it was the country bounded N. by Bulgaria, W. by Albania and S. by the Morea, or in other words the ancient provinces, including Constantinople and Salonica, of Thrace and Macedonia. The name was ultimately applied more especially to a province composed of central Albania and western Macedonia, having Monastir for its chief town. Owing to administrative changes effected between 1870 and 1875, the name ceased to correspond with any political division. Eastern Rumelia was constituted an autonomous province of the Turkish empire by the Berlin treaty of 1878; but on the 18th of September 1885, after a bloodless revolution, it was united with Bulgaria (q.v.).

RUMFORD, BENJAMIN THOMPSON, Count (1753-1814), British-American man of science, philanthropist and adminis- trator, was born at Woburn, in Massachusetts, on the 26th of March 1753. The Thompson family had been settled in New England since the middle of the previous century, and belonged to the class of moderately wealthy farmers. His father died while he was very young, and his mother speedily married a second time. But he seems to have been well cared for, and he was at the age of fourteen sufficiently advanced "in algebra, geometry, astronomy, and even the higher mathematics," to calculate a solar eclipse within four seconds of accuracy. In 1766 he was apprenticed to a storekeeper at Salem, in New England, and while in that employment occupied himself in chemical and mechanical experiments, as well as in engraving, in which he attained to some proficiency. The outbreak of the American War put a stop to the trade of his master, and he. thereupon left Salem and went to Boston, ■ where he engaged himself as assistant in another store. He was at that period between seventeen and eighteen years old, and at nineteen, he says, " I married, or rather I was married." His wife was the widow of Colonel Benjamin Rolfe, and the daughter of Timothy Walker, " a highly respectable minister, and one of the first settlers at Rumford," now called Concord, in New Hampshire. His wife was possessed of considerable property, and was his senior by fourteen years.

This marriage was the foundation of his success. Soon after, it he became acquainted with Governor Wentworth of New Hampshire, who conferred on him the majority of a local regiment of militia. He speedily became the object of distrust among the friends of the American cause, and it was considered prudent that he should seek an early opportunity of leaving the country. On the evacuation of Boston by the royal troops, therefore, in 1776, he was selected by Governor Wentworth to carry despatches to England. On his arrival in London Lord George Germain, secretary of state, appointed him to a clerkship in his office. Within a few months he was advanced to the post of secretary of the province of Georgia, and in about four years he was made under-secretary of state. His official duties, however, did not interfere with the prosecution of scientific pursuits, and in 1779 he was elected a fellow of the Royal Society. Among the subjects to which he especially directed his attention were the explosive force of gunpowder, the construction of firearms, and a system of signalling at sea. In connexion with the last, he made a cruise in the Channel fleet, on board the " Victory," as a volunteer under the command of Admiral Sir Charles Hardy. On the resignation of Lord North's administration, of which Lord George Germain was one of the least popular members, he left the civil service, and was nominated to a cavalry command in

the revolted provinces of America. But the War of Independence was practically at an end , and in 1783 he finally quitted active service, with the rank and half-pay of a lieutenant-colonel. He now formed the design of joining the Austrian army, for the purpose of campaigning against the Turks, and so crossed over from Dover to Calais with Gibbon, who, writing to his friend Lord Sheffield, calls his fellow-passenger, ” Mr Secretary- Colonel-Admiral-Philosopher Thompson.” At Strassburg he was introduced to Prince Maximilian, afterwards elector of Bavaria, and was by him invited to enter the civil and military service of that state. Having obtained the leave of the British

government to accept the prince’s offer, he received the honour of knighthood from George III., and during eleven years he remained at Munich as minister of war, minister of police, and grand chamberlain to the elector. His political and courtly employments, however, did not absorb all his time, and he contributed during his stay in Bavaria a number of papers to the Philosophical Transactions. But that he was sufficiently alert as the principal adviser of the elector the results of his labours in that capacity amply prove. He reorganized the Bavarian army; he immensely improved the condition of the industrial classes throughout the country by providing them with work and instructing them in the practice of domestic economy; and he did much to suppre’ss mendicity. The multitude of beggars in Bavaria had long been a public nuisance and danger. In one day he caused no fewer than 2600 of these outcasts and depredators in Munich and its suburbs alone to be arrested by military patrols, and transferred by them to an industrial establishment which he had prepared for their reception. In this institution they were both housed and fed, and they not only supported themselves by their labours but earned a surplus for the benefit of the electoral revenues. The principle on which their treatment proceeded is stated by him in the following memorable words: ” To make vicious and abandoned people happy,” he says, ” it has generally been supposed necessary first to make them virtuous. But why not reverse this order? Why not make them first happy, and then virtuous? ”

In 1791 he was created a count of the Holy Roman Empire, and chose his title of Rumford from the name as it then was of the American township to Which his wife’s family belonged. In 1795 he visited England, one incident of his journey being the loss of all his private papers, including the materials for an autobiography, which were

contained in a box stolen from off his postchaise in St Paul's Churchyard. During his residence in London he applied himself to the discovery of methods for curing smoky chimneys and the contrivance of improvements in the construction of fireplaces. But he was quickly recalled to Bavaria, Munich being threatened at once by an Austrian and a French army. The elector fled from his capital, and it was entirely owing to Rumford that a hostile occupation of the city was prevented. It was now proposed that he should be accredited as Bavarian ambassador in London; but the circumstance that he was a British subject presented an insur- mountable obstacle. He, however, again came to England, and remained there in a private station for several years.

In 1798 he presented to the Royal Society his " Enquiry concerning the Source of Heat which is excited by Friction," in which he combated the current view that heat was a material substance, and regarded it as a mode of motion. In 1799 he, in conjunction with Sir Joseph Banks, projected the establish- ment of the Royal Institution. It received its charter of incorporation from George III. in 1800, and Rumford himself selected Sir Humphry Davy as scientific lecturer there. Until 1804 he lived at the Royal Institution in Albemarle Street, London, or at a house which he rented at Brompton, and he then established himself in Paris, marrying (his first wife having died in 1792) as his second wife the wealthy widow of Lavoisier, the celebrated chemist. With this lady he led an extremely uncomfortable life, till at last they agreed to separate. He took up his residence at Auteuil, where he died suddenly on the 21st of August 18 14, in the sixty-second year of his age.

Rumford was the founder and the first recipient of the Rumford medal of the Royal Society. He was also the founder of the Rum- ford medal of the American Academy of Arts and Sciences, and of the Rumford professorship in Harvard University. His complete works with a memoir by G. E. Ellis were published by the American Academy of Arts and Sciences in 1870-75.

RUMl, (1207-1273). Mahommed b. Mahommed b. Husain albalkhl, better known as Maulana. Jalal-uddln RumI (or simply Jalal-uddin, or Jelal-eddln), the greatest Sufic poet of Persia, was born on the 30th of September 1 207 (604 a.h. 6th of Rabi' I.) at Balkh, in Khorasan, where his family had resided from time immemorial. He claimed descent from the caliph Abubekr,

and from the Khwarizm-Shah Sultan 'Ala-uddin b. Tukush (1199-1220), whose only daughter, Malika-i-Jahan, had been married

to Jalal-uddin's grandfather. Her son, Mahommed, commonly called Baha-uddln Walad, was famous for his learn- ing and piety, but being afraid of the sultan's jealousy, he emigrated to Asia Minor in 121 2. After residing for some time at Malatla and afterwards at Erzingan in Armenia, Baha- uddln was called to Laranda in Asia Minor, as principal of the local college. Here young Jalal-uddln grew up, and in 1226 married Jauhar Khatun, the daughter of Lala Sharaf-uddln of Samarkand. Finally, Baha-uddln was invited to Iconium by 'Ala-uddin Kaikubad (1219-1236), the sultan of Asia Minor,' or, as it is commonly called in the East, Rum — whence Jalal- uddin's surname (takhallus) RumI.

After Baha-uddln 's death in 1231, Jalal-uddln went to Aleppo and Damascus for a short time to study, but, dissatisfied with the exact sciences, he returned to Iconium, where he became by and by professor of four separate colleges, and devoted himself to the study of mystic theosophy. His first spiritual instructor was Sayyid Burhan-uddln Husainl of Tirmidh, one of his father's disciples, and, later on, the wander- ing Sufi Shams-uddln of Tabriz, who soon acquired a most powerful influence over Jalal-uddln. Shams-uddin's aggressive character roused the people of Iconium against him, and during a riot in which Jalal-uddin's eldest son, 'Ala-uddin, was killed, he was arrested and probably executed; at least he was no more seen. In remembrance of these victims of popular wrath Jalal-uddln founded the order of the Maulawl (in Turkish MevlevI) dervishes, famous for their piety as well as for their peculiar garb of mourning, their music and their mystic dance (sama), which is the outward representation of the circling movement of the spheres, and the inward symbol of the circling movement of the soul caused by the vibrations of a Sufi's fervent love to God. The establishment of this order, which still possesses numerous cloisters throughout the Turkish empire, and the leadership of which has been kept in Jalal- uddin's family in Iconium uninterruptedly for the last six hundred years, gave a new stimulus to his zeal and poetical inspiration. Most of his matchless odes were composed in honour of the Maulawl dervishes, and even his opus magnum, the Mathnawl (Mesnevi), or, as it is usually called, The Spiritual Mathnawi (mathnawi-i-ma'nawi) , in six books or daftars, with 30,000 to 40,000 double-rhymed verses, can be traced to the same source. The idea of this immense collection of ethical and moral precepts was first suggested to the poet by his favourite disciple Hasan, better known as Husam-uddln, who in 1258 became Jalal-uddin's chief assistant. Jalal-uddln dictated to him, with a short interruption, the whole work during the remaining years of his life. Soon after its comple- tion Jalal-uddln died, on the 17th of December

1273 (672 a.h. 5th of Jornada II.). His first successor in the rectorship of the Maulawl fraternity was Husam-uddln himself, after whose death in 1284 Jalal-uddin's younger and only surviving son, Shaikh Bahaudd-In Ahmed, commonly called Sultan Walad, and favourably known as author of the mystical mathnawi Rababnama, or the Book of the Guitar (died 13 12), was duly installed as grand-master of the order.

Jalal-uddin's life is fully described in Shams-uddin Ahmed Aflaki's Manakib-ul 'drifin (written between A.D. 1318 and 1353), the most important portions of which have been translated by J. W. Redhouse in the preface to his English metrical version of The Mesnevi, Book the First (London, 1881); there is also an abridged translation of the Mathnawi, with introduction on Sufism, by E. H. Whinfield (2nd ed., 1898). Complete editions have been printed in Bombay, Lucknow, Tabriz, Constantinople and in Bulaq (with a Turkish translation, 1268 a.h.), at the end of which a seventh daftar is added, the genuineness of which is refuted by a remark of Jalal- uddin himself in one of the Bodleian copies of the poem, Ouseley, 2 94 (f- 328a seq.). A revised edition was made by 'Abd-ullatff between 1024 and 1032 a.h., and the same author's commentary on the Mathnawi, Lata'if-ulma'nawi, and his glossary, Lata'if-allughat, have been lithographed in Cawnpore (1876) and Lucknow (1877) respectively, the latter under the title Farhang-i-mathnawt. For the other numerous commentaries and for further biographical and literary particulars of Jalal-uddin, see Rieu's Cat. of the Persian MSS

of the Brit. Mus., vol. ii. p. 584 seq. ; A. Sprenger's Oudh Cat., p. 489; Sir Gore Ouseley, Notices of Persian Poets, p. 112 seq.; H. Eth6, in Morgenlandische Studien (Leipzig, 1870), p. 95 seq., and in Geiger and Kuhn's Grundriss der iranischen Philologie (Stuttgart, 1896-1904), vol. ii. pp. 287-292. Selections from Jalal-uddin's diwan (often styled Diwan-i-Skams-i-Tabriz) are translated in German verse by V. von Rosenzweig (Vienna, 1838); into English by R. A. Nicholson (2nd ed., 1898) and W. Hastie (1903). (H. E.)

RUMINANTIA, a term employed by Cuvier to include all the existing artiodactyle ruminating ungulate mammals now classed under the groups Pecora, Tylopoda and Tragulina. By Professor Max Weber it is employed as a collective designation for these groups, together with the extinct Anthracotheroidea and Dichobunoidea; but its use seems

best restricted to a general term rather than a definite systematic group. (See Artiodactyla, Pecora, Tylopoda.)

RUMKER, CARL LUDWIG CHRISTIAN (1788-1862), German astronomer, was born in Mecklenburg on the 28th of May 1788. He served in the British navy from 1807 until 1817, and was director of the school of navigation at Hamburg from 1819 till 1820. In 1821 he went to New South Wales as astronomer at the observatory built at Parramatta by Sir Thomas Brisbane. He returned to Europe in 1830 and took charge of the obser- vatory at Hamburg. His chief work was concerned with the cataloguing of stars: a preliminary catalogue of the stars of the S. hemisphere was published in 1832 at Hamburg, and in 1846-52 he published his great catalogue of 12,000 stars. In 1857 he went to reside at Lisbon, where he died on the 21st of December 1862.

His son, George Friedrich Wixhelm (183 2-1 900), born on the 31st of December 1832, at Hamburg, was astronomer at the observatory at Durham, England, from 1853 to 1856. He then became assistant at the Hamburg observatory, and in 1862 was appointed director of the same institution. From 1884 he was the Hamburg delegate for the International Earth Measurement. He died on the 3rd of March 1900.

RUNCIMAN, ALEXANDER (1736-1785), Scottish historical painter, was born in Edinburgh in 1736. He studied at Foulis's Academy, Glasgow, and at the age of thirty proceeded to Rome, where he spent five years. It was at this time that he became acquainted with Fuseli. The painter's earliest efforts had been in landscape; he soon, however, turned to historical and imaginative subjects, exhibiting his " Nausicaa at Play with her Maidens" in 1767 at the Free Society of British Artists, Edinburgh. On his return from Italy, after a brief residence in London, where in 1772 he exhibited in the Royal Academy, he settled in Edinburgh, and was appointed master of the Trustees' Academy. He was patronized by Sir James Clerk, whose hall at Penicuik House he decorated with a series of subjects from Ossian. He also executed various religious paintings and an altar-piece in the Cowgate Episcopal Church, Edinburgh, and easel pictures of " Cymon and Iphigenia," " Sigis- munda weeping over the Heart of Tancred,". and " Agrippina landing with the Ashes of Germanicus." He died in Edinburgh on the 4th of October 1785. His works, while they show high intention and considerable imagination, are frequently defective in form and extravagant in gesture. His younger brother, John Runciman (1 744-1 766), who accompanied him to Rome, and died at Naples in 1766, was an artist of great promise. His " Flight into Egypt," in the National Gallery of Scotland, is remarkable for the

precision of its execution and the mellow richness of its colouring.

RUNCORN, a market town and river-port in the Northwich parliamentary division of Cheshire, England, on the S. of the estuary of the Mersey 16 m. above Liverpool. Pop. of urban district (1901) 16,491. It is served by the London & North- western railway, and has extensive communications by canal. The modern prosperity of the town dates from the completion In 1773 of the Bridgewater Canal, which here descends into the Mersey by a flight of locks. Runcorn is a sub-port of Manchester, with which it is connected by the Manchester Ship Canal, and has extensive wharfage and warehouse accom- modation. The chief exports are coal, salt and pitch; but

there is also a large traffic in potters' materials. A trans- porter bridge between Runcorn and Widnes, with a suspended car worked by electricity to convey passengers and vehicles (the first bridge of the kind in England) was constructed in 1902. The town possesses shipbuilding yards, iron foundries, rope works, tanneries, and soap and alkali works.

Owing to the Mersey being here fordable at low water, Runcorn was in early times of considerable military importance. On a rock which formerly jutted into the Mersey ˆEthelfleda erected a castle in 916, but of the building there are now no remains; while the rock was removed to further the cutting of the ship canal. -Sthelfleda is also said to have founded a town, but it is not noticed in Domesday. The ferry is noticed in a charter in the 12 th century:

RUNDALE (apparently from "to run" and "dale," valley, originally something separated off, cf. " deal"), the name of a form of occupation of land, somewhat resembling the English " common field " system. The land is divided into discon- tinuous plots, and cultivated and occupied by a number of tenants to whom it is leased jointly. The system was common in Ireland, especially in the western counties. In Scotland, where the system also existed, it was termed " run-rig " (from " run," and " rig " or " ridge ").

RUNEBERG, JOHAN LUDVIG (1804-1877), Swedish poet, son of a sea-captain, was born at Jakobstad, in Finland, on the 5th of February 1804. He was brought up by an uncle at Uleaborg, and entered the university of Abo in the autumn term of 1822. In 1823 he broke off his studies to act as tutor in two quiet Finnish villages, Saarijarvi and Ruovesi, where he gained a thorough knowledge of the popular life and poetry, and on his return to Abo he began to contribute verses to the local newspapers. In the spring of 1827 he received the degree of

doctor of philosophy. The university had been removed after the great fire of 1827 to Helsingfors, where Runeberg became, in 1830, amanuensis to the council of the university. In the same year he published at Helsingfors his first volume of Dikter (Poems), and a collection of Serbiska folks&nger (Servian folksongs) translated into Swedish. In 183 1 his verse romance of Finnish lif e, Grafven i Perrho (The Grave in Perrho) , received the small gold medal of the Swedish Academy, and the poet married Fredrika Charlotta Tengstrom, daughter of the arch- bishop of Finland. In the same year he was appointed university lecturer on Roman literature. In 1832 he published his beautiful little idyll, Elgskyttarne (The Elk-Hunters); and in 1833 a second collection of lyrical poems. He founded in 1832 the Helsingfors Morgonblad, a paper which dealt chiefly with aesthetic and literary questions, and exercised great influence both in Sweden and Finland. In it appeared many of his own poems and tales. His comedy, Friaren fran Landet (The Country Lover, 1834), was not a success, but in 1836 he published Hanna, a charming idyll of Finnish country life, written in hexameters. In 1837 Runeberg accepted the chair of Latin at Borga. College, and resided in that little town for the rest of his life.

He was now recognized in his remote Finland retirement as second only to Tegner among the poets of Sweden. In 1841 he published Nadeschda, a romance of modern Russian life, and Julqvallen (Christmas Eve), another idyll of Finnish life. The third volume of his Dikter bears the date 1843, and the noble cycle of unrhymed verse romances called Kung Fjalar, the setting of which is taken from old Scandinavian legend, was published in 1844. Finally, in 1848, he achieved a great popular success by his splendid series of poems on the war of independence in 1808, when Swedes and Finns fought side by side. The series bears the name of F&nrik Stals Sagner (Ensign Steel's Stories); a second series appeared in i860. From 1847 to 1850 the poet was rector of Borga College, a post which he resigned to take the only journey out of Finland which he ever accomplished, a visit to Sweden in 1851. In 1854 he collected his prose essays into a volume entitled Smarre BerSttelser. In the same year he was made president of a committee for the preparation of a national Psalter, which

issued, in 1857, a psalm-book largely contributed by Runeberg for public use. He once more attempted comedy in his Kan ej (Can't) in 1862, and tragedy, with infinitely more success, in his stately

Kungarne pd Salamis (The Kings at Salamis) in 1863. Runeberg died at Borga. on the 6th of May 1877. His writings were collected by C. R. Nyblom in six volumes in 1870, and his posthumous writings in three volumes (1878-79).

The poems of Runeberg show the influence of the Greeks and of Goethe up'on his mind; but he possesses a great originality. It is hardly possible to over-estimate the value of his patriotic poems as a link between the Swedish and Finnish nations. He has remained one of the most popular Swedish poets, although his whole life was spent in Finland.

An account of his life and works by C. R. Nyblom is prefixed to the Satnlade Skrijter of 1870. For a minute criticism of Runeberg's principal poems, with translations, see Gosse's Studies in the Literature of Northern Europe (1879). A selection of his lyrical pieces was published in an English translation by Messrs Magnusson & Palmer in 1878. There are also monographs on Runeberg by Dietrichson and Rancken (Stockholm, 1864), by Cygnaus (Helsing-fors, 1873), by Ljunggren (Lund, 1882-83), an d Peschier (Stutt- gart, 1881).

RUNES, RUNIC LANGUAGE AND INSCRIPTIONS. The art of

writing with an alphabet appears to have been introduced into Germanic Europe in the Iron Age. Something hieratic and mysterious was involved in the idea of letters as used to convey thought, and from the earliest recorded times they were called runes, from the Gothic runa (run, in Icelandic), which originally means a secret thing, a mystery, and was later used to describe a letter of the ancient language (see Alphabet and Scan- dinavian Languages). The Iron Age is supposed to have existed from circa 200 to circa 650, and it is to the close of this epoch that the beginning of the writing on Scandinavian memorials is attributed. There are runes which have been dis- covered in England, and some also on the Germanic mainland of Europe, but it is in the Scandinavian peninsula that the vast majority of inscribed monuments have been discovered. The custom of erecting runic monuments, i.e. stones engraved with more or less literary statements, over the bodies of the dead, was practised first, there can be no doubt, in Norway and Sweden, then spread to Denmark and over the whole North of Europe. It is remarkable, however, that two of the three runic alphabets from which our knowledge of the whole range of rune-literature is founded, were discovered outside Scandinavia. These three alphabets exist, the first on a thin gold bractea found in 1774 at Vadstena, in Sweden; the second on a bracelet, dug up at Charnoy, in

Burgundy; the third on a knife, found in the Thames in 1857, and now in the British Museum. There are two principal runic alphabets, the older consisting of 24 letters, and beginning with f ; the later of 16 letters. During the. last century before the introduction of Christianity, the larger alphabet was increased by 3 letters.

The oldest runes which have been examined are those found on the Thorsbjerg Shield-buckle, which is at present in the Kiel Museum; here the writing, which runs from right to left in straight lines, is of the fourth or fifth century. Other invaluable sources of runic knowledge are the. diadem of Straarur, the Vimose comb and the brooch of Himlingbje, which was found in the Vier Fen. Still greater importance has the Golden Horn, discovered at Gellehuus, near Tondern, in 1734; this monument was stolen by thieves and melted down, but fortunately not until a careful copy of it had been made, which is now in the Museum at Copenhagen. It is not until the 6th century that the runic stones begin. The most ancient are believed to be those of Einang, of Tune, of Strand, of Varnum, of Tanum and of Berga. Perhaps a little later are the stones at Vaanga, Skarkind, Skaaiing, Torvik, Bo and others, too numerous to mention, but all, as seems likely, erected between 550 and 600. On the famous Tune-stone, the name of the author of the inscription is preserved, “I Wiwar made these runes,” and this is not an isolated instance. The original direction of the runic writing was from left to right, like Latin, but quite early the reverse method was introduced. A union

of these forms produced more complicated systems, in which much was left, to the individual taste.

From the. earliest times uninscribed memorial stones in Scandinavia, bautasteinar , were raised to preserve the memory of the dead, and these certainly partook of a more or less religious and sacrificial character. It is evident that, during the Iron Age, stones continued to be erected which had no inscriptions, after the runic alphabets had been invented, and that at first the runes were added only in cases of great importance or solemnity. These runic stones were as a rule posed on the top of the grave, or by the side of it, on mounds, of which only one example survives, that of the stone of Einang, in Norway. But runic stones were not infrequently placed in the grave itself. These were smaller than those erected outside the. grave, and they did not lend themselves to lengthy or elaborate inscrip- tions. The majority of graves containing sUch small rune- stones, bearing merely the name of the deceased or a magical sentence, have been found in Norway. But the antiquity of most of these is questioned, that of Vatn, which is the oldest, being now placed no earlier than the 8th

century. The very important stone of Valdby, which is the oldest Norwegian monument employing the shorter alphabet, is attributed by Wimmer to heathen times, indeed, but to, a. date no earlier than the second half of the 9th century. It is supposed that the most ancient of the runic stones of Sweden, those respec- tively of Vanga, Skarkind and Kinnevad, must have come from the interior of graves, but there is no certain proof of this: The latest criticism tends to the belief that when runes were first inscribed on Scandinavian monuments, they were placed both upon and inside graves, but that after the runic letters had been used for about a century, the latter custom tended to exclude the former. About the year 800 both customs began to invade Denmark, the practice of placing the rune-stones inside, however, soon getting the upper hand. It is a curious fact that in Iceland not a single rune-stone which can be re- ferred back to heathen times is known to exist; the Icelandic rune-stones all date from a period well advanced in the middle ages. It was the old theory that the ancient stones had mouldered away under stress of weather, but that is abandoned, and it is now supposed that the aristocratic exiles from Norway, who settled in Iceland, had not yet adopted. in their old home the practice of inscribed monuments to their dead. There were bautasteinar in Iceland, as we know, but there is no evidence that these bore runes upon them.

It is in Denmark that the runic inscriptions exist which pos- sess the highest literary interest. These are all attributed to the beginning of the 9th century. The Kallerup Stone was discovered in 1826 at the village of Hojetostrup, a Danish mile E. of Roskilde; it has been lifted and placed in its original position. This monument contains a statement in old Danish,- to the effect that it marks the grave of Hornbora, son of Swidi. The Stone of Snoldelev was discovered in 1768, not far from the spot where the Kallerup Stone was found; it is now in the Archaeological Museum at Copenhagen; this has a long and important inscription in a form of old Scandinavian, allied to the classical Icelandic. The Stone of Helnaes was found on the islet of that name in i860, and is now at Copenhagen. The other most famous runic monuments are those of Flemlose, Orja, Norrenaera, Glarendrup, Fryggevaelde and Ronninge, of all of which Wimmer has published full analytical de- scriptions.

These inscriptions are of . remarkable value as historical documents, from a period of which no other definite records remain in existence. From a literary point of view, they re- present what Germanic language was up to the point at which Ulfilas created a new alphabet for his version of the Bible, by adapting to the runic alphabets a number of Greek letters. It was an error, now exploded, to suppose

that the notae im- pressae, which Tacitus describes in his Germania, were written runes; these were simply signs, or mystic marks, which had no linguistic significance. These are described in; the staves of the Edda as having been revealed to mankind by the god. OcUn,

and they were of a hieratic character. The suggestion is that the written runes were introduced from the south of Europe by a Phoenician agency, and that they were copied from Greek or Roman coins which had found their way to Scandinavia. In several of the sagas it is recorded that runes were inscribed on round pieces of wood, called kefti, or runic sticks. It has been suggested that the Eddaic poems were preserved in this way, but the only authority for this is that the Sonatorrek is said to have been taken down on a kefli. In Christian times runes came to be regarded as an archaic curiosity, and were engraved on sticks, chairs and spoons; a loto stick with runes on it is preserved in the Bodleian library. In the Fornsogur runes are mentioned as carved on the blade of an oar. Even cases occur in which the normal Latin alphabet was called riinamdl or a language of Runes. A runic letter was called a rilnastafr in Icelandic.

Authorities. — Ludwig F. A. Wimmer, Runeskriftens oprindelse og udvikling i Norden (Copenhagen, 1874); L. F. A. Wimmer, Die Runenschrift (Berlin, 1887) ; J. Taylor, Greeks and Goths: a Study on the Runes (London, 1879); G. Stephens, The Old- Northern Runic Monuments of Scandinavia and England (Copen- hagen, 1879); Bugge, Tolkning af runeindskriften p& Rokstenen i Ostergotland (Stockholm, 1878); Cleasby and Vigfussen, Icelandic- English Dictionary (Oxford, 1874); Wilhelm Grimm, Ueber deutsche Runen (Gottingen, 1821); Olsen, Runerne i den oldislandske Literatur (Christiania, 1891). (E. G.)

RUNG, a short round bar or stick used as a cross-bar or rail in a chair, and particularly as one of the steps or rounds of a ladder. In Scottish the word retains the original meaning of a staff or stick, especially a short thick cudgel. The O.E. hrung is used only of a bar or rail in a wagon; the word also occurs in O.Du. ronge, beam of a plough, Ger. Runge, pin, bolt.

RUNNIMEDE, or Runnymede, a meadow on the S. bank of the river Thames, England, in the county of Surrey and the parish of Egham. It is celebrated in connexion with the signa- ture of Magna Carta (q.v.) by King John on the 15th of June 1 21 5. It has been disputed whether

the ceremony took place actually in the meadow or on Magna Carta or Charter Island lying off it. The charter itself indicates Runnimede by name, but this may have included the island, which is the traditional site and was in 121 7 the meeting-place of Henry III. and Louis (afterwards Louis VIII.) of France.

RUNNING, the most primitive form of athletic exercise considered as a sport. Athletic apparatus of every kind has been improved in modern times, but the spiked running-shoe may be said to represent the sole advantage enjoyed by the modern runner over his Olympic prototype. As an athletic sport running has been in vogue from the earliest times, and the simple foot-race (5p6/uos), run straight away from starting-, point to goal, or once over the course of the stadion (a little over 200 yds.), formed an event in the Greek pentathlon, or quintuple games (see Games, Classical). It was diversified with the race once over the course and return, and the SiavKos, a long run many times (often as many as twelve, i.e. about 2j m.) up and down the stadion. There was also the bpbjxos ottKltuv, a short race for warriors, who wore full armour and carried sword and shield, which has been imitated by the modern military race in full marching order. Except in the warriors' race the Greek runners were naked, save occasionally for a pair of light shoes. No records of the times made by the runners in the Greek races have been handed down. It may be inferred that the contests were very severe, since the ancient Olympic chronicles preserve the memory of several runners, of whom Ladas was the most conspicuous, who fell dead at the completion of the long course, and were buried in state with their brows encircled by the victor's chaplet. In ancient Italy running was practised in circus exhibitions, as described by Virgil (Aen. v. 286 seq.).

In the middle ages the best runners were oftenest found among the couriers maintained by potentates and munici- palities, those of Tartary, England, Scotland, Italy and the Basque country having enjoyed the greatest reputation, while the Peichs, or Persian couriers of the Turkish sultans, often

ran from Constantinople to Adrianople and back, a distance of about 220 m., in two days and nights. Many couriers carried silver beads in their mouths to obviate thirst. Couriers (syce) who run before the carriages of their masters are still in use in the East. In the districts of India not traversed by railways, dak runners are still employed to carry the mails from village to village, many wearing bells about their necks to frighten away the tigers. The runners of the American Indians were famous, and extraordinary tales are told of their swiftness and endurance.

In all parts of Great Britain, running at short distances, as well as steeplechases and cross-country runs, has been popu- lar for many centuries, each district and period having its champions, some of whom achieved national reputation. Dur- ting the Puritan rule and that of Charles II. athletic sports all but died out in England, only to be revived with renewed vigour in the early part of the 19th century, when the public schools and universities began to pay more attention to them. A significant event in the history of running was the institution of the famous ” Crick Run” (cross-country) at Rugby in 1837. The establishment of the Cambridge University sports (1857), the Oxford sports (i860), and the British championship meet- ings (1866) placed athletics upon a formal and recognized basis. Records made thereafter received the stamp of authenticity, those made in former years being doubtful on account of lax measurements and timing. In the United States and Canada authentic records date from the institution of the American Championships in 1876. The National Association of Amateur Athletes of America was formed in 1880.

Running at the present day is divided into sprinting (dis- tances up to one-quarter of a mile), middle-distance running (from one-quarter of a mile to 1000 yds.) and long-distance running (over 1000 yds.).

Sprinting consists of running over short distances with a full and continuous burst of speed, the chief distances being 100 yds., 220 yds. and quarter-mile. , Distances up to and in- cluding 220 yds. are in America called dashes. The course for sprinting races, when run in the open air, is marked off in lanes for the individual runners by means of cords stretched upon short iron rods. Starting in sprints has now become very expert. The old method of dropping a handkerchief was the worst possible way to give the starting signal, since the muscles react most slowly to impressions of sight, less so to those of touch, and most quickly to those of sound, a difference of -j-It of a second in reaction amounting to over one foot in a run of 100 yds. All modern foot-races are therefore started by the pistol; the runners wait for the signal in a crouching attitude, with the fingers of both hands resting on the ground on each side of the body, from which position they spring upwards and forwards at the sound of the pistol. The crouching start was found to be much quicker in getting off the mark than the upright attitude formerly adopted, and by 1892 had been adopted by all first-class sprinters in America, and a year or two later in Great Britain. Another advantage is that the runner is steadier on the mark, and since its adoption the prescribed penalty of being placed one yard behind the mark for starting before the pistol-shot has been very seldom enforced, and the risky experiment of ” beating the pistol,” i.e. letting the body fall forward in the hope that the shot would come

before the feet had to be moved, has practically disappeared.

The improvement in training and the adoption of the crouch- ing start have resulted in the continued reduction of sprinting records. ” Even time,” or 10 sees., is still considered a fine performance for the hundred yards, but has been repeatedly beaten both in England and America. A. F. Duffey, who, like C. A. Bradley and J. W. Morton, won the English champion- ship in four successive years, shares with D. J. Kelly the record, 9§ sees., for 100 yds.; and J. W. Morton, a Scot, as well as J. H. Hempton and W. T. Macpherson of New Zealand, are credited with “9$ sees. The excellence of American runners in the sprints is probably accounted for partly by temperament influenced by climate; but the American practice of running

short races of from 50 to 75 yds. during the numerous indoor meetings held in winter-time offers excellent training in start- ing and getting rapidly into full stride.

The best time for the eighth mile (220 yds.), a distance often run in America, is 21J sees., made in 1896 on a straightaway track by B. J. Wefers.

The quarter-mile (440 yds.) is almost always run on a curved track, and hence a quick start is important, for should the runner who has the advantage of the inside position allow himself to be outrun in the distance to the first turn, one of his opponents is likely to cut in and deprive him of it, while on the other hand a runner on the outside must actually outrun the inside man in order to be on even terms after the turn. The element of strategy, unknown in straight sprints, thus enters into the quarter. Speed is, of course, the chief requisite for a quarter-miler, but a certain amount of staying power is also necessary. The standard time for the quarter is 50 sees., which means an average speed of 11-3 sees, for each 100 yds. round the course. That of M.W. Long of Columbia University, who made the record, 47 sees., in 1900, was on that occasion io-68 sees, for each hundred yards.

The system of ” relay races,” usually run by four men each going a quarter of the distance, is a popular variety. The favourite distance is a mile, each man running a quarter at top speed. This method of racing was introduced in the United States about the year 1890 on the model of the Massachusetts firemen’s ” bean-pot ” races, and has since

become very popular there. The old method was for the men running the second quarter of the course to wait on the mark for the first relay men to arrive, and then, snatching small flags from their hands, to continue the race, handing over the flags to the third relay upon completing their quarter. The flags, being cumbersome, were afterwards abandoned, and the new runners are now required only to touch the persons of the preceding contestants. The 1 m. record, 3 min. 2i| sees., was made in 1898 by B. J. Wefers, M. W. Long, T. E. Burke and H. S. Lyons of the New York Athletic Club.

Middle- Distance Running. — The chief middle distances are 600 yds., 660 yds., 880 yds. (half-mile) and 1000 yds., but of these the half-mile is the only one commonly recognized in championship sports. Endurance is more important at these distances, though speed is essential, and the element of strategy increases. An element unknown to sprinting enters into middle- and long-distance runs, namely that of pace-making; even when the real race is between two individuals at least one other runner on each side takes part in the contest, in order to ” make the pace ” for his principal. Emilio Lunghi (U.S.A.) holds the half-mile world’s record of 1 min. 52ˆ sees., made in 1909. J. F. K. Cross of Oxford University ran the half-mile at Oxford in 1888 in 1 min. 54! sees. The record for 1000 yds., 2 min. 13 sees., was made by L. E. Myers (U.S.A.). The distance of three-quarters of a mile is seldom run now at large meetings.

Long-Distance Running. — This includes all flat races of 1 m. or more, as well as steeplechasing, hare-and-hounds, and other forms of cross-country running. Great Britain has always been the home of long-distance running, different forms of cross- country racing having been popular all over the kingdom for centuries. In England at the championship meeting the distance events on the flat are the 1 m., 4 m. and 10 m. races, and in the inter-university sports the 1 m. and 3 m. ; in America the distances are 1 m., 2 m. and 5 m.; but any and all of these distances are often included in important British and American programmes. Hard daily training is necessary for a distance runner. Good pace- making and strategy in general are of great importance. The runner must learn to ” run to the watch,” i.e. to cover the different portions of the distance in a certain time, in order to be placed most advantageously for the finish. The mile race requires speed as well as stamina. Most champion milers are capable of doing the half under 2 min. The record for the mile, made in 1886 at Lillie Bridge by W. G. George, as a professional, is 4 min., n\ sees.; the amateur record is 4 min.

i5f sees., made by T. P. Conner! in America, J. Binks, holding the

British amateur record with 4 min. i6f sees., made at Stamford Bridge in 1902. The longer-distance races require more stamina than speed, and a careful husbanding of strength. The following table gives the records (up to 1908) for the distance runs on the fiat, longer than 1 m.: —

Distance.

Name.

Time.

Date.

h. m. s.

2 miles

A. Shrubb

9 9i

1904

3 ..

A. Shrubb

14 CI

1903

4 ,.

A. Shrubb

19 231

1904

5 ..

A. Shrubb

24 331

1904

10 ,,

A. Shrubb

5040I

1904

15 ..

F. Appleby

1 20 4f

1902

20 „

G. Crossland

1 51 54

1894

30 „

J. A. Squires

3 17 3&i

1885

40 „

J. E. Dixon

4 46 54

1884

50 „

J. E. Dixon

6 18 26J

1885

Place.

Glasgow Stamford Bridge Glasgow Stamford Bridge Glasgow Stamford Bridge Stamford Bridge Balham Birmingham Balham.

In addition to the records for the above-mentioned distances, Shrubb held in 1908 the records for 6, 7, 8, 9 and n m., and also for the greatest distance covered in I h., namely, II m. 1316 yds. He won the 4 m. and the 10 m. British championship 1901-4 inclusive, and the I m. championship 1903 and 1904; also the French 1 m. and 3 m. championship 1902-4 inclusive. Shrubb was moreover a first-rate cross-country runner also; he won the British 10 m. cross-country championship 1901-4 inclusive, and the international 8 m. cross-country championship 1902-4. In 1863 a full-blooded Seneca Indian, L. Bennet, known as ” Deerfoot,” ran 12 m. in 1 h. 2 m. 2J sees.

Real cross-country running is a fast jog over hill and dale. It may take the form of a race from the gymnasium or club- house across the fields to a given spot and back again, passing certain objects or buildings; of a practice run behind the coach preparatory to a long-distance race on the track; or of a paper- chase, or hare-and-hounds, the ” hares,” two or three in number, starting a few minutes before the ” hounds,” and leaving a trail of scraps of paper dropped from bags, which must be followed by the ” hounds.” In Great Britain the standard distance is 10 m., but in America it is somewhat less, the distance for the intercollegiate championship race being 6j m.

Steeplechasing was originally only a cross-country run over a course plentifully provided with natural obstacles, such as brooks, ditches, fences and hedges; but at the present day the steeplechase takes place in the inner enclosure of an athletic field and the obstacles are artificial. They are placed about 70 or 80 yds. apart, and consist of hurdles, a stone wall about 3 ft. high and 2 or 3 ft. broad, and a water-jump, a ditch about 6 ft. broad filled with water and guarded by a wall or fence covered with thick furze or other thick shrubbery. Steeple- chase courses differ widely, but the usual distance both in Great Britain and America is 2 m. The time necessary to cover this distance varies according to the difficulties of the course, but a few seconds under n min. is considered very fast time.

Team-racing is a favourite form of distance running, each team consisting of 10 men and the distance usually 4 m., the standard of the modern Olympic Games. Different systems of scoring are in vogue, but the usual one allows the winner ten points, the second to arrive nine, and so on, the tenth arrival scoring one. The team aggregating

the highest number of points wins.

Among modern distance events the Marathon Run of about 40 kilometres (24 m. 1500 yds.) is the most important. It was introduced in the first revived Olympic Games at Athens in 1896 (see Athletic Sports) in memory of the famous Greek runner who was said to have brought the news of the battle of Marathon in Athens, dropping dead when his task was finished.

RUODLIEB, a romance in Latin verse by an unknown German poet who flourished about 1030;. he was almost certainly a monk of the Bavarian abbey of Tegernsee. The poem is one of the earliest German romances of knightly adventure, and its vivid picture of feudal manners gives it a certain value as an historical document. The poet was probably an eye-witness of the episode (11. 4231-5221) which represents the meeting of the emperor Henry II. with Robert of France on the banks

of the Maas in 1023. Ruodlieb was left unfinished, and further- more the MS. was cut up and used for binding books, so that the fragments were only gradually discovered (from 1807 onwards) and pieced together. The framework of the story is borrowed from a popular marchen of the youth who takes service away from home, and is paid in wise saws instead of current coin. He receives at the same time a loaf, with instructions not to cut it until he is once more at home. This contains the coins. The proverbs, usually three in number, were increased in Ruodlieb to twelve, each of which was the starting-point of an episode by which the hero was made to appreciate its value.

For examples of the three-proverb tale see W. Bottrell, Traditions and Hearthside Stories (Penzance, 2nd series, 1873); Cuthbert Bede, The White Wife . . . (London, 1868) ; K. V. K.[illinger], Erin (Stuttgart and Tubingen, 1849), and others in the French romance of the Saint Graal, in the Gesta Romanorum (the three proverbs bought by Domitian) and the old French Dit des trois pommes. The best edition of Ruodlieb is by F. Seiler (Halle, 1882). There is a modern version by M. Heine (Leipzig, 1897), and a full analysis of the contents is given by R. Koegel, Gesch. d. deutschen Lit. bis zum Ausgange des Mittelalters (Strassburg, 1894-97, “• PP-

342-412).

RUPAR, a town of British India, in Umballa district of the Punjab, on the left bank of the river Sutlej, 43 m. N. of Umballa, n 20 ft. above sea-level. Pop. (1901) 8888. It was the scene of Ranjit Singh's visit to Lord William Bentinck when governor-general in 1831. Here are the head works of the Sirhind canal. Rupar has manufactures of cotton twill and hardware. Hindu and Mahommedan fairs are held.

RUPEE (Hindustani rupiya, from Sanskrit rupya), the standard coin of the monetary system in India. A silver coin of 175 grains Troy, called tanka, approximating to the rupee, was struck by the Mahommedan rulers of Delhi in the 13th century; but the rupee itself, of 179 grains, was introduced by Sher Shah in 1542. The English at first followed various indigenous standards; but since 1835 the rupee has uniformly weighed 180 grains, containing 165 grains of pure silver. The weight of the rupee (one tola) is also the unit upon which the Indian standard of weights is based. Down to about 1873 the gold value of the rupee was 2s., and ten rupees were thus equal to £1; but after 1873, owing to the depreciation of silver, the rupee at one time sank as low in value as is. In order to provide a remedy the government of India decided in 1893 to close the mints, and in 1899 to make the rupee legal tender at fifteen to £1. This policy proved successful, and since 1899 the exchange value of the rupee has practically remained at is. 4d. Therefore a lakh of rupees, which before 1873 was worth £10,000, is now only worth £6666, and a crore of rupees, which was formerly a million sterling, now only amounts to £666,666. The rupee is divided into sixteen annas, now worth id. each, and the anna is subdivided into 12 pies. (See India, and Money.)

RUPERT (Hrodbert), ST, according to the Gesta Sancti Hrodberti, which dates from the 9th century, was a kinsman of the Merovingian house, and bishop of Worms under Childe- bert III. (695-711). At the invitation of th: duke of Bavaria, Theodo II., Rupert went to Regensburg (Ratisbon), where he began his apostolate. He founded the church of St Peter near the Wallersee, and subsequently, at Salzburg, the church of St Peter, together with a monastery and a dwelling for the clerks, as well as a convent for women " in superiori castro Iuvavensium." He died and was buried at Salzburg. He is regarded as the apostle of the Bavarians, not that the land was up to that time altogether heathen, but because of his services in the promotion and consolidation of its Christianity.

See Bibliotheca hagiographica Latina (Brussels, 1899), n. 7390- 7403; W % Levison, " Die alteste Lebensbeschreibung Ruperts von Salzburg " in Neues Archiv fur aeltere deutsche Geschichtskunde, xxviii. 283 seq.; Hauck, Kirchengeschichte Deutschlands (3rd ed.), '• 372 seq. (H. De.)

RUPERT, PRINCE, Count Palatine of the Rhine and Duke of Bavaria (1619-1682), third son of the elector palatine and ” winter king ” of Bohemia, Frederick V., and of Elizabeth,

daughter of James I. of England, was born at Prague on the 17th of December 1619. A year later his father was defeated at the battle of the Weisser-Berg, near Prague, and driven from Bohemia. After many wanderings the family took refuge in Holland, where Rupert’s boyhood was spent. In 1633 the boy was present at the siege of Rheinberg in the suite of the Prince of Orange, and in 1635 he served in this prince’s bodyguard. In 1636 he paid his first visit to England, was entered as an undergraduate, though only nominally, at St John’s College, Oxford, and was named as the governor of a proposed English colony in Madagascar. But this scheme did not mature, and Charles sent his nephew back to Holland, haying, however, formed a high opinion of his energy, talent and resolution. In 1637 he was again serving in the wars, and in 1638, after dis- playing conspicuous bravery, he was taken prisoner by the imperialists at the action of Vlotho (17th October) and held in a not very strict captivity for three years. In 1641 he was released, and, rejoining his mother in Holland, was summoned to England to the assistance of his uncle, for the Great Rebellion was about to break out.

In July 1642 he landed at Tynemouth. Charles at once made him general of the horse and independent of Lord Lindsey, the nominal commander of the whole army. From this point until the close of the first Civil War in 1646 Prince Rupert is the dominant figure of the war. His battles and campaigns are described in the article Great Rebellion. He was distinctively a cavalry leader, and it was not until the battle of Marston Moor in 1644 that the Royalist cavalry was beaten. The prince’s strategy was bold as well as skilful, as was shown both in the Royalist movements of 1644 which he proposed, and in the two far-ranging expeditions which he carried out for the relief of Newark and of York. In November 1644, in spite of the defeat at Marston Moor, he was appointed general of the king’s army. But this appointment, though welcome to the army, was obnoxious to the king’s counsellors, who resented the prince’s independence of their control, to some of the nobility over whose titles to consideration he had ridden roughshod, and to some of the officers whose indiscipline and rapacity were likely to be repressed with a heavy hand. These dissensions culminated, after the prince’s surrender of Bristol to Fairfax, in a complete break with Charles, who dismissed him from all his offices and bade Rupert and his younger brother Maurice seek their fortunes beyond the seas.

Rupert's character had been tempered by these years of responsible command. By 1645, although the parliamentary party accused him not merely of barbarity but of ingratitude for the kindnesses which his family had received from English people in the days of the Palatinate War, Rupert had in fact become a good Englishman. He was convinced, after Marston Moor, that the king's cause was lost, in a military sense, and moreover that the king's cause was bad. When he surrendered Bristol without fighting to the uttermost, it was because Fair- fax placed the political issue in the foreground, and after the capitulation the prince rode to Oxford with his enemies, frankly discussing the prospect of peace. Already he had deliberately advised Charles to make peace, and had come to be suspected, in consequence, by Charles's optimistic adviser Digby. But to Charles himself the news of the fall of Bristol was a thunderbolt. " It is the greatest trial to my constancy that has yet befallen me," he wrote to the prince, " that one that is so near to me in blood and friendship submits himself to so mean an action." Rupert was deeply wounded by the implied stain on his honour; he forced his way to the king and demanded a court-martial. The verdict of this court smoothed over matters for a time, but Rupert was now too far estranged from the prevailing party at court to be of any assistance, and after further misfortunes and quarrels they separated, Charles to take refuge in the camp of the Scots, Rupert to stay, as a spectator without command, with the Oxford garrison. He received at the capitulation a pass from the parliament to leave England, as did also his faithful comrade Maurice.

For some time after this Rupert commanded the troops

formed of English exiles in the French army, and received a wound at the siege of La Bassee in 1647. Charles in misfortune had understood something of his nephew's devotion, and wrote to him in the friendliest terms, and though the prince had by no means forgiven Digby, Colepeper and others of the council, he obtained command of a Royalist fleet. The king's enemies were now no longer the Presbyterians and the majority of the English people but the stern Independent community, with whose aims and aspirations he could not have any sympathy whatever. A long and unprofitable naval campaign followed, which extended from Kinsale to Lisbon and from Toulon to Cape Verde. But the prince again quarrelled with the council, and spent six years (1654-60) in Germany, during which period nothing is known of him, except that he vainly attempted (as

also before and afterwards) to obtain the apanage to which as a younger son he was entitled from his brother the elector palatine. At the Restoration he settled in England again, receiving from Charles II. an annuity and becoming a member of the privy council. He never again fought on land, but, turning admiral like Blake and Monk, he bore a brilliant part in the Dutch Wars. He died at his house in Spring Gardens, Westminster, on the 29th of November 1682.

Apart from his military renown, Prince Rupert is a dis- tinguished figure in the history of art as one of the earliest mezzotinters. It has often been said that he was the inventor of mezzotint engraving, but this is erroneous, as he obtained the secret from a German officer, Ludwig von Siegen. One of the most beautiful and valuable of early mezzotints is his " Head of St John the Baptist." He was also interested in science, experimented with the manufacture of gunpowder, the boring of guns and the casting of shot, and invented a modified brass called " prince's metal."

Prince Rupert was duke of Cumberland and earl of Holder- ness in the English peerage. He was unmarried, but left two natural children ; one a daughter who married General Emmanuel Scrope Howe and died in 1740, and the other a son, whose mother (who claimed that she was married to the prince) was Frances, daughter of Sir Henry Bard, Viscount Bellamont. The son was killed in 1686 at the siege of Buda.

See E. Warburton's Life of Pr. Rupert (London, 1849) and addi- tional authorities quoted in the memoir by C. H. Firth in the Diet. Nat. Biog.

RUPERT (1352-1410), German king, and, as Rupert III., elector palatine of the Rhine, was a son of the elector Rupert II. and Beatrice, daughter of Peter II., king of Sicily. He was born at Amberg on the 5th of May 1352, and from his early years took part in the government of the Palatinate to which he succeeded on his father's death in 1398. He was one of the four electors who met at Oberlahnstein in August 1400 and de- clared King Wenceslaus deposed. This was followed by the election of Rupert as German king at Rense on the 21st of that month, and by his coronation at Cologne on the 6th of the following January. Winning some recognition in S. Germany, he made an expedition to Italy, where he hoped to receive the imperial crown, and to crush Gian Galleazzo Visconti, duke of Milan. In the autumn of 1401 he crossed the Alps, but his troops, checked before Brescia, melted away, and in 1402 Rupert, too poor to continue the campaign, returned to Ger- many. The news of this failure increased the disorder in Germany, but the king met with some success in his efforts to restore peace, and in October 1403 he was recognized by Pope Boniface IX. It

was only the indolence of Wenceslaus that prevented his overthrow, and in 1406 he was compelled to make certain concessions. The quarrel was complicated by the papal schism, but the king was just beginning to make some headway when he died at his castle of Landskron near Oppenheim on the 18th of May 1410 and was buried at Heidelberg. He married Elizabeth, daughter of Frederick IV. of Hohenzollern, burgrave of Nuremburg, and left three sons and four daughters. Rupert, who earned the surname of clemens, was brave and generous, but his resources were totally inadequate to bear the strain of the German kingship.

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1899).

RUPERT'S LAND, a former district of Canada. The generous charter of Charles II. given in 1670 to the Hudson's Bay Com- pany gave rights of possession, trade and administration of justice " of all those seas, streights and bays, rivers, lakes, creeks and sounds, in whatsoever latitude they shall be, that lie within the entrance of the streights commonly called Hudson's streights, together with all the lands, countries and territories upon the coasts and confines of the seas, streights, bays, lakes, rivers, creeks and sounds aforesaid, which are not now actually possessed by any of our subjects, or by the subjects of any other Christian prince or state."

The general interpretation given to this was that it included all the country drained into Hudson Bay. As Prince Rupert was first governor of the Hudson's Bay Company his name was given to the concession under the name " Rupert's Land." It will be observed that Athabasca, New Caledonia and British Columbia were not included in this grant. They were held under the title Indian Territories by the Hudson's Bay Company by licence terminable every twenty-one years, the last term closing with 1859. Rupert's Land was transferred to Canada by the imperial government in 1870, and ceased to exist as a political name. It is still used as the title of the episcopal diocese, which is in the main coincident with the province of Manitoba.

RUPILIUS, PUBLIUS, Roman statesman, consul in 132 B.C. During the inquiry that followed the death of Tiberius Gracchus, conducted by himself and his colleague Popillius Laenas, he proceeded with the utmost severity against the supporters of Gracchus. In the same year he was despatched to Sicily, where he suppressed the revolt of the slaves under Eunus. During 131 he remained as proconsul of the island, and, with the assistance of ten commissioners* appointed by the senate, drew up regulations for the organization of Sicily as a province. These regulations were known by the title of leges Rupiliae, though they were not laws in the strict sense. Rupilius was subsequently brought to trial (123 B.C.) and condemned for his treatment of the friends of Gracchus. The disgrace of his condemnation, added to disappointment at the failure of his brother to obtain the consulship in spite of the efforts of Scipio, caused his death shortly afterwards.

See Cicero, De Am. 19, Tusc. disp. iv. 17, in Verr. ii. 13, 15; Diod. Sic. xxxiv. 1, 20; Veil. Pat. ii. 7.

RUPPIN, or Neuruppin, a town of Germany, in the Prussian province of Brandenburg, lies on the W. bank of a small lake, the Ruppiner See, 37 m. N.W. of Berlin by rail. Pop. (1905) 18,555. The town, which was rebuilt in fine, regular fashion after a destructive fire in 1787, contains three Protestant churches, a Roman Catholic church and various educational and benevolent institutions. Its inhabitants are employed in the manufacture of cloth, starch and machinery, in iron-founding and lithography. Important cattle and horse fairs are held here. • Ruppin received municipal rights in 1256.

The small town of Altruppin, lying at the north end of the lake, has a 15th-century church and some small manufactures. Pop. (1905) 1813.

See Heydemann, Neuere Geschichte der Stadt Neuruppin(Neuruppin, 1863); and G. Bittkau, Altere Geschichte der Stadt Neuruppin (Neuruppin, 1887).

RUSELLAE, an ancient town of Etruria, Italy, about 10 m. S.E. of Vetulonia and 5 m. N.E. of Grosseto, situated on a hill with two summits, the higher 636 ft. above sea-level. It was one of the twelve cities of the Etruscan confederation, and was taken in 294 B.C. by the Romans. In 205 B.C. it contributed grain and timber for the needs of Scipio's fleet. A colony was founded here either by the Triumviri or by Augustus. The place was deserted in 1138, and the episcopal see was transferred

to Grosseto. The ruins are now thickly overgrown with brushwood; but the walls, nearly 2 m. in circumference, are in places well preserved. They consist of large unworked blocks of a travertine which naturally splits into roughly rect- angular blocks; these are quite irregular, and often as much as 9 ft. long by 4 ft. wide: in the interstices smaller pieces are inserted. The walls are embanking walls, with a low breastwork in places. Within the circuit which they enclose, now under cultivation, are two summits, one occupied by a Roman amphi- theatre [the other by a tower (?) of uncertain date]: a Roman cistern also is visible. Some 2 m. S.S.W. are modern baths, fed by hot springs, which were in use in Roman times also, as the discovery of remains of Roman buildings shows.

See G. Dennis, Cities and Cemeteries of Etruria (London, 1883), ii. 222. (T. As.)

RUSH, BENJAMIN (1745-1813), American physician, was born in Byberry township, near Philadelphia, on a homestead founded by his grandfather, a Quaker gunsmith, who had followed Penn from England in 1683. In 1760 he graduated at Princeton. After serving an apprenticeship of six years with a doctor in Philadelphia, he went for two years to Edinburgh, where he attached himself chiefly to William Cullen. He took his M.D. degree there in 1768, spent a year more in the hospitals of London and Paris, and began practice in Philadelphia at the age of twenty-four, undertaking at the same time the chemistry class at the Philadelphia medical college. He was a friend of Franklin, a member of Congress for the state of Pennsylvania in 1776, and one of those who signed the Declaration of Indepen- dence the same year. He had already written on the Test Laws, ” Sermons to the Rich,” and on negro slavery; and in 1774 he started along with James Pemberton the first anti-slavery society in America, and was its secretary for many years. In 1787 he was a member of the Pennsylvania convention which adopted the Federal constitution, and thereafter he retired from public life, and gave himself up wholly to medical practice. In 1789 he exchanged his chemistry lecture- ship for that of the theory and practice of physic; and when the medical college, which he had helped to found, was absorbed by the university of Pennsylvania in 1791 he became professor of the institutes of medicine and of clinical practice, succeeding in 1796 to the chair of the theory and practice of medicine. He gained great credit when the yellow fever devastated Phila- delphia, in 1793, by his assiduity in visiting the sick, and by his bold and apparently successful treatment of the disease by bloodletting. He died in Philadelphia on the 19th of April 1 81 3, after

a five days' illness from typhus fever. His son Richard is separately noticed. Another son, -James (1 786-1869), was a physician, and author of various books, such as Philosophy of the Human Voice (1827) and Analysis of the Human Intellect (1865L

Benjamin Rush's writings covered an immense range of subjects, including language, the study of Latin and Greek, the moral faculty, capital punishment, medicine among the American Indians, maple sugar, the blackness of the negro, the cause of animal life, tobacco smoking, spirit drinking, as well as many more strictly professional topics. His last work was an elaborate treatise on the Diseases of the Mind (1812). He is best known by the five volumes of Medical Inquiries and Observations, which he brought out at intervals from 1789 to 1798 (two later editions revised by the author).

See eulogy by his friend Dr David Hosack (Essays, i., New York, 1824), with biographical details taken from a letter of Rush to President John Adams; also references in the works of Thacker, Gross and Bowditch on the history of medicine in America. His part in the yellow fever controversies is indicated by La Roche (Yellow Fever in Philadelphia from i6gg to 1854, 2 vols., Philadelphia, 1855) and by Bancroft (Essay on the Yellow Fever, London, 181 1). His services as an abolitionist pioneer are recorded in Clarkson's History of the A bolition of the African Slave Trade.

RUSH, RICHARD (1780-1859), American' statesman and diplomatist, son of Dr Benjamin Rush, was born in Philadelphia, Pennsylvania, on the 29th of August 1780 He graduated at Princeton in 1797, and was admitted to the bar in 1800. He was attorney-general of Pennsylvania in 181 1, comptroller of the treasury of the United States in 1811-14, attorney- general in the cabinet of President James Madison in 1814-17,

acting secretary of state from March to September 181 7, minister to Great Britain in 1817-25, secretary of the treasury in the cabinet of President J. Q. Adams in 1825-29, and candidate for vice-president on the Adams ticket in 1828. In 18 1.8, while minister to Great Britain, he, in association with Albert Gallatin,; concluded with British plenipotentiaries the important treaty which determined the boundary line between the United States and Canada from the Lake of the Woods to the Rocky Moun- tains and provided for the joint occupation of Oregon for ten years. He also conducted the negotiations with Canning in 1823 relating to the S. American policy of the Holy Alliance. He followed the Adams-Clay faction of the Democratic-Republican party in the split of 1825-28, but returned to the

Democratic party about 1834 on the bank issue. In 1835 he and Benjamin C. Howard, of Baltimore, Maryland, were sent by President Jackson to prevent an outbreak of hostilities in the Ohio-Michigan boundary dispute. In 1836-38 Rush was commissioner to receive the Smithson legacy (see Smithsonian Institution), and in 1847-49 ne was minister to France. He died at Philadelphia on the 30th of July 1859.

He published A Narrative of a Residence at the Court of London from 1817 to 1825 (2 vols., 1833-45; a ” editions after the first edition of the 1st volume are entitled Memoranda of a Residence, &c); Washington in Domestic Life (1857), compiled from letters written by Washington to his private secretary in 1790-98; and Occasional Productions, Political, Diplomatic and Miscellaneous (i860) ; and while attorney-general he suggested the plan for the compilation, Laws of the Nation (5 vols., 1815), edited by John B. Colvin.

RUSH. Under the name of rush or rushes, the stalks or hollow stem-like leaves of several plants have minor industrial applications. The common rushes (species of J uncus; see Juncaceae) are used in many parts of the world for chair- bottoms, mats and basket-work, and the pith serves as wicks in open oil-lamps and for tallow candles — whence rushlights The fibrous stems and leaves of the bulrush or reed-mace. Typha angustifolia, are used in N. India for ropes, mats and baskets. Scirpus and other Cyperaceae are used for chair- bottoms, mats and thatch; the rush mats of Madras aie made from a species of Cyperus. The sweet-rush, yielding essential oil, is a grass, Andropogon Schoenanthus, known also as lemon grass. Large quantities of the “horse-tail,” Equisetum . hie- male, are used under the name of Dutch or scouring rush for scouring metal and other hard surfaces on account of the large proportion of silica the plant contains. Flowering rush is Butomus umbellatus (see Alismaceae) ; wood -rush is the common name for Luzula (see Juncaceae). Acorus Calamus, sweet-flag, is also known as sweet-rush.

RUSHDEN, an urban district in the E. parliamentary division of Northamptonshire, England, 66 m. N.N.W. from London by the Midland railway. Pop. (1901) 12,453. The church of St Mary is a fine cruciform building with western tower and spire. It is mainly decorated, with perpendicular addir tions, but retains some Early English details. The growth of Rushden as a town is modern. The industrial population is employed in boot and shoe making, the local staple.

RUSHWORTH, JOHN (c. 1612-1690), the compiler of the Historical Collections commonly described by his name, was the son of Lawrence

Rushworth of Acklington Park, Wark- worth, Northumberland. When he was given the degree of M.A. at Oxford in 1649, he was said to belong to Queen's College, but there are no traces of his presence at the university. He was bred to the law, and in 1638 was appointed solicitor to the town of Berwick. He was enrolled in Lincoln's Inn in 1641, and was called to the bar in 1647. He made a point of attending on all public occasions of a political and judicial character, such as proceedings before the Star Chamber or the Council, and of making shorthand notes of them. On the 25th of April 1640 he was appointed an assistant clerk to the House of Commons. He was on duty when King Charles I. came down to arrest the five members on the 4th of January 1642, and made notes of his speech. The king insisted on taking the notes, and ordered them to be published. Rushworth

attended the trial of the earl of Strafford, and took shorthand notes of the proceedings. He was much employed as a mes- senger between the king and the parliament, and from the nth of April 1644 till the 9th of March 1647 was licenser of pamphlets. When the new model army was formed he was appointed secretary to the parliamentary general, Sir Thomas Fairfax. He was present at the battle of Naseby, of which he wrote an account. When Fairfax, who was offended by the execution of the king, resigned his command, Rushworth was for a short time secretary to Cromwell. He was afterwards employed by the council of state and during the protectorate, and sat in Cromwell's parliament for Berwick. When Richard Cromwell resigned the protectorate, Rushworth was employed by the Rump after it had been re-established by Monk. He made his peace with the government of Charles II., and though he was threatened with trial as a regicide he was not seriously molested. During the reign of Charles II. he continued to act as agent for the town of Berwick, and he sat for it in parlia- ment. He was also for a time agent for Massachusetts, but the colony complained that it received no advantage from his services. During the last years of his life he fell into poverty, and from 1684 till his death on the 12th of May 1690 he was a resident in the King's Bench prison. At this time he had destroyed his memory by over-indulgence in drink. The collection of papers which he made was published in eight volumes folio between 1659 and 1701. The volumes from the fourth onwards appeared after his death. The first, which appeared with a dedication to Richard Cromwell, was recalled and the dedication was suppressed.

RUSKIN, JOHN (1819-1900), English writer and critic, was born in London, at Hunter Street, Brunswick Square, on the 8th of February 1819, being the only child of John James Ruskin and Margaret Cox. They were Scots, first cousins, the grandchildren of a certain John Ruskin of Edinburgh (1732- 1780). In Praeterita the author professes small knowledge of his ancestry. But the memoirs published on the authority of the family trace their descent to the Adairs and Agnews of Galloway. In this family tree are men famous in arms and in the public service: Sir Andrew Agnew of Lochnaw, Admiral Sir John Ross, Field-Marshal Sir Hew Dalrymple Ross, Dr John Adair, in whose arms Wolfe died at Quebec, and the Rev. W. Tweddale of Glenluce, to whom the original Covenant, now in the Glasgow Museum, had been confided. The name Ruskin is said to be a variant of Erskine, or Roskeen, or Rogerkin, and even Roughskin. It is more probably Rusking, an Anglian family, which passed northwards and became Ruskyn, Rusken and Ruskin.

John Ruskin, the author's grandfather, a handsome lad of twenty, ran away with Catherine Tweddale, daughter of the Covenanting minister and of Catherine Adair, then a beautiful girl of sixteen. He settled in Edinburgh and engaged in the wine trade, lived liberally in the cultivated society of the city, lost his health and his fortune, and ended his days in debt. His son, John James Ruskin (1785-1864), father of the author, was sent to the High School at Edinburgh under Dr A. Adam, received a sound classical education, and was well advised by his friend Dr Thomas Brown, the eminent metaphysician. When of age, John James was sent to London to enter the wine trade. There, in 1809, he founded the sherry business of Ruskin, Telford & Domecq; Domecq being proprietor of a famous vineyard in Spain, Telford contributing the capital of the firm, and Ruskin having sole control of the business. John James Ruskin, a typical Scot, of remarkable energy, probity and foresight, built up a great business, paid off his father's debts, formed near London a most hospitable and cultured home, where he maintained his taste for litera- ture and art, and lived and died, as his son proudly wrote upon his tomb, " an entirely honest merchant." He was also a man of strong brain, generous nature and fine taste. After a delay of nine years, having at last obtained an adequate income, he married his cousin, Margaret Cox, who had already lived for eighteen years with his mother, the widow of John

Ruskin of Edinburgh. When this marriage of the two cousins, who had known each other all their lives, took place in 1818, neither of them was young. John James was thirty-three and Margaret was thirty-seven. In the following year (8th Feb- ruary 1819) their only child,

John, was born in Hunter Street, London.

Margaret Ruskin, the author's mother, was a handsome, strong, stern, able, devoted woman of the old Puritan school, Calvinist in religion, unsparing of herself and others, rigid in her ideas of duty, proud, reserved and ungracious. She was the daughter of Captain Cox, of Yarmouth, master mariner in the herring fishery, who died young; whereupon his widow maintained herself as landlady of the King's Head Inn at Croydon. Her younger daughter married Mr Richardson, a baker, of Croydon; the elder, Margaret, married John James Ruskin. Jessie, a sister of John James, married Peter Richardson, a tanner, of Perth, so that the author had cousins of two Richardson families, unconnected with each other. In his own memoirs he speaks much more of these than of any Ruskins, Tweddales, Adairs or Agnews. The child was brought up under a rigid system of nursing, physical, moral and intellectual; kept without toys, not seldom whipped, watched day and night, but trained from infancy in music, drawing, reading aloud and observation of natural objects. When he was four the family removed to a house on Heme Hill, then a country village, with a garden and rural surroundings. The father, who made long tours on business, took his wife, child and nurse year after year across England as far as Cumberland and Scotland, visiting towns, cathedrals, castles, colleges, parks, mountains and lakes. At five the child was taken to Keswick; at six to Paris, Brussels and Waterloo; at seven to Perthshire. At fourteen he was taken through Flanders, along the Rhine, and through the Black Forest to Switzerland, where he first imbibed his dominant passion for the Alps. His youth was largely passed in systematic travelling in search of everything beautiful in nature or in art. And to one so precocious, stimulated by a parent of much culture, ample means and great ambition, this resulted in an almost unexampled aesthetic education. In childhood also he began a systematic practice of composition, both in prose and verse. His mother trained him in reading the Bible, of which he read through every chapter of every book year by year; and to this study he justly attributes his early command of language and his pure sense of style. His father read to him Shakespeare, Scott, Don Quixote, Pope and Byron, and most of the great English classics; and his attention was especially turned to the formation of sentences and to the rhythm of prose. He began to compose both in prose and verse as soon as he had learned to read and write, both of which arts he taught himself by the eye.

His first letter is dated 1823, when he was only four. In it he corrects his aunt, who had put up the wooden pillars of his Waterloo bridge " upside down." At five he was a book- worm. At seven he began a work in four volumes, with " copper-plates printed and composed by a little

boy, and also drawn." His first poem, correct in rhyme and form, was written before he was seven. At nine he began " Eudosia, a poem of the Universe." From that year until his Newdigate Prize, at the age of twenty, he wrote enormous quantities of verse, and began dramas, romances and imitations of Byron, Pope, Scott and Shelley. What remain of these effusions have no special quality except good sense, refined feeling, accuracy of phrase, and a curious correctness of accent and rhythm. Of true poetry in the higher sense there is hardly a single line.

His schooling was irregular and not successful. At the age of eleven he was taught Latin and Greek by Dr Andrews, a scholar of Glasgow University. About the same time he had lessons in drawing and in oil painting from Runciman. French and Euclid were taught by Rowbotham. At fifteen he was sent for two years to the day-school of the Rev. T. Dale of Peckham, and at seventeen he attended some courses in

literature at King's College, London. In painting he had lessons from Copley Fielding and afterwards from J. D. Harding. But in the incessant travelling, drawing, collecting specimens and composition in prose and verse he had gained but a very moderate classical and mathematical knowledge when he matriculated at Oxford; nor could Tie ever learn to write tolerable Latin. As a boy he was active, lively and docile; a good walker, but ignorant of all boyish games, as naif and as innocent as a child; and he never could learn to dance or to ride. He was only saved by his intellect and his fine nature from turning out an arrant prig. He was regarded by his parents, and seems to have regarded himself, as a genius. As a child he had been "a savant in petticoats"; as a boy he was a poet in breeches. At the age of seventeen he saw Adele, the French daughter of Monsieur Domecq, Mr Ruskin's partner, a lovely girl of fifteen. John fell rapturously in love with her; and, it seems, the two fathers seriously contemplated their marriage. The young poet wooed the girl with poems, romances, dramas and mute worship, but received nothing except chilling indifference and lively ridicule. To the gay young beauty, familiar with Parisian society, the raw and serious youth was not a possible parti. She was sent to an English school, and he occasionally saw her. His unspoken passion lasted about three years, when she married the Baron Duquesne. Writing as an old man, long after her death, Ruskin speaks of his early love without any sort of rapture. But it is clear that

it deeply coloured his life, and led to the dangerous illness which for some two years interrupted his studies and made him a wanderer over Europe.

As the father was resolved that John should have everything that money and pains could give, and was one day to be a bishop at least, he entered him at Christ Church, Oxford, as a gentleman-commoner — then an order reserved for men of wealth and rank. Ruskin's Oxford career, broken by the two years passed abroad, was not very full of incident or of useful- ness. Though he never became either a scholar or a mathema- tician, he did enough accurate work to be placed in the honorary fourth class both in classics and in mathematics. By the young bloods of the " House " he was treated pleasantly as a raw outsider of genius. By some of the students and tutors, by Liddell, Newton, Acland and others, he was regarded as a youth of rare promise, and he made some lifelong friendships with men of mark and of power. Both he and his college took kindly the amazing proceeding of his mother, who left her husband and her home to reside in Oxford, that she might watch over her son's health. The one success of his Oxford career was the winning the Newdigate Prize by his poem " Salsette and Elephanta," which he recited in the Sheldonian Theatre (June 1839). Two years of ill-health and absence from home ensued. And he did not become " a Graduate of Oxford " until 1842, in his twenty-fourth year, five years after his first entrance at the university. In fact, his desultory school and college life had been little more than an interruption and hin- drance to his real education — the study of nature, of art and of literature. Long before Ruskin published books he had ap- peared in print. In March 1834, when he was but fifteen, Loudon's Magazine of Natural History published an essay of his on the strata of mountains and an inquiry as to the colour of the Rhine. He then wrote for Loudon's Magazine of Architecture, and verses of his were inserted in Messrs Smith & Elder's Friendship's Offering, by the editor, T. Pringle, who took the lad to see the poet Rogers. At seventeen he wrote for Black- wood a defence of Turner, which the painter, to whom it was first submitted, did not take the trouble to forward to the magazine. At eighteen he wrote a series of papers, signed Kata Phusin, i.e. " after Nature," for Loudon's Magazine, on " The Poetry of Architecture." In 1838 (he was then nineteen) Mr Loudon wrote to the father, "Your son is the greatest natural genius that ever it has been my fortune to become acquainted with."

Having recovered his health and spirits by care and foreign travel, and having taken his degree and left Oxford, Ruskin set to work steadily at Heme Hill on the more elaborate defence of

Turner, which was to become his first work. Modern Painters, vol. i., by ” a Graduate of Oxford,” was published May 1843, when the author was little more than twenty-four. It produced a great and immediate sensation. It was vehemently attacked by the critics, and coolly received by the painters. Even Turner was somewhat disconcerted; but the painter was now known to both Ruskins, and they freely bought his pictures. The family then went again to the Alps, that John might study mountain formation and ” fc Truth ” in landscape. In 1845 he was again abroad in Italy, working on his Modern Painters, the second volume of which appeared in 1846. He had now plunged into the study of Bellini and the Venetian school, Fra Angelico and the early Tuscans, and he visited Lucca, Pisa, Florence, Padua, Verona and Venice, passionately devoting himself to architecture, sculpture and painting in each city of north Italy. He wrote a few essays for the Quarterly Review and other periodicals, and in 1849 (ael. 30) he published The Seven Lamps of Architecture, with his own etchings, which greatly increased the reputation acquired by his Modern Painters.

On the 10th of April 1848, a day famous in the history of Chartism, Ruskin was married at Perth to Euphemia Chalmers Gray, a lady of great beauty, of a family long intimate with the Ruskins. The marriage, we are told, was arranged by the parents of the pair, and was a somewhat hurried act. It was evidently ill-assorted, and brought no happiness to either. They travelled, lived in London, saw society, and attended a ” Drawing-room ” at Buckingham Palace. But Ruskin, im- mersed in various studies and projects, was no husband for a brilliant woman devoted to society. No particulars of their life have been made public. In 1854 his wife left him, ob- tained a nullification of the marriage under Scots law, and ultimately became the wife of John Everett Millais. John Ruskin returned to his parents, with whom he resided till their death; and neither his marriage nor the annulling of it seems to have affected seriously his literary career.

Ruskin’s architectural studies, of which The Seven Lamps was the first fruit, turned him from Turner and Modem Painters. He planned a book about Venice in 1845, and The Stones of Venice was announced in 1849 as in preparation. After intense study in Italy and at home, early in 1851 (the year of the Great Exhibition in London) the first volume of The Stones of Venice appeared (aet. 32). It was by no means a mere antiquarian and artistic study. It was a concrete expansion of the ideas of The Seven Lamps — that the buildings and art of a people are the expression of their religion, their morality, their national aspirations and social habits. It was, as Carlyle wrote to the author, “a sermon in stones,” ” a singular sign of the times,” ” a new

Renaissance." It appeared in the same year with the Construction of Sheepfolds — a plea for the reunion of Christian churches — in the same year with the essay on Pre-Raphaelilism, the year of Turner's death (19th December). The Stones of Venice was illustrated with engravings by some of the most refined artists of his time. The author spent a world of pains in having these brought up to the highest perfection of the re- productive art, and began the system of exquisite illustration, and those facsimiles of his own and other sketches, which make his works rank so high in the catalogues and price-lists of collectors. This delicate art was carried even farther in the later volumes of Modern Painters by the school of engravers whom Ruskin inspired and gathered round him. And these now rare and coveted pieces remain to rebuke us for our modern preference for the mechanical and unnatural chiaroscuro of photogravure — the successor and destroyer of the graver's art. Although Ruskin was practised in drawing from the time that he could hold a pencil, and had lessons in painting from some eminent artists, he at no time attempted to paint pictures. He said himself that he was unable to compose a picture, and he never sought to produce anything that he would call a work of original art. His drawings, of which he produced an enormous quantity, were always intended by himself to be studies or memoranda of buildings or natural objects precisely as they appeared to his eye. Clouds, mountains, landscapes, towers,

churches, trees, flowers and herbs were drawn with wonderful precision, minuteness of detail and delicacy of hand, solely to recall some specific aspect of nature or art, of which he wished to retain a record. In his gift for recording the most subtle characters of architectural carvings and details, Ruskin has hardly been surpassed by the most distinguished painters.

In 1853 The Stones of Venice was completed at Heme Hill, and he began a series of Letters and Notes on pictures and architecture. In this year (aet. 34) he opened the long series of public lectures wherein he came forward as an oral teacher and preacher, not a little to the alarm of his parents and amidst a storm of controversy. The Edinburgh Lectures (November 1853) treated Architecture, Turner, and Pre-Raphaelitism. The Manchester Lectures (July 1857) treated the moral and social uses of art, now embodied in A Joy for Ever. Some other lectures are reprinted in On the Old Road and The Two Paths (1859). These lectures did not prevent the issue of various Notes on the Royal

Academy pictures and the Turner collections; works on the Harbours of England (1856); on the Elements of Drawing (1857); the Elements of Perspective (1859); and at last, after prolonged labour, the fifth and final volume of Modern Painters was published in i860 (aet. 41). This marks an epoch in the career of John Ruskin; and the year i860 closed the series of his works on art strictly so called; indeed, this was the last of his regular works in substantial form. The last forty years of his life were devoted to expounding his views, or rather his doctrines, on social and industrial problems, on education, morals and religion, wherein art becomes an incidental and instrumental means to a higher and more spiritual life. And his teaching was embodied in an enormous series of Lectures, Letters, Articles, Selections and serial pamphlets. These are now collected in upwards of thirty volumes in the final edition. The entire set of Ruskin's publications amounts to more than fifty works having distinctive titles. For some years before i860 Ruskin had been deeply stirred by reflecting on the con- dition of all industrial work and the evils of modern society. His lectures on art had dealt bitterly with the mode in which buildings and other works were produced. In 1854 he joined Mr F. D. Maurice, Mr T. Hughes, and several of the new school of painters, in teaching classes at the Working Men's College. But it was not until i860 that he definitely began to propound a new social scheme, denouncing the dogmas of political economy. Four lectures on this topic appeared in the Cornhill Magazine until the public disapproval led the editor, then W. M. Thackeray, to close the series. They were published in 1862 as Unto this Last. In the same year he wrote four papers in the same sense in Fraser's Magazine, then edited by J. A. Froude; but he in turn was compelled to suspend the issue. They were completed and ultimately issued under the title Munera Pulveris. These two small books contain the earliest and most systematic of all Ruskin's efforts to depict a new social Utopia: they contain a vehement repudiation of the orthodox formulas of the economists; and they are for the most part written in a trenchant but simple style, in striking contrast to the florid and discursive form of his works on art.

In 1864 Ruskin's father died, at the age of 79, leaving his son a large fortune and a fine property at Denmark Hill. John still lived there with his mother, aged 83, infirm, and failing in sight, to whom came as a companion their cousin, Joanna Ruskin Agnew, afterwards Mrs Arthur Severn. At the end of the year 1864 Ruskin delivered at Manchester a new series of lectures — not on art, but on reading, education, woman's work and social morals — the expansion of his earlier treatises on economic sophisms. This afterwards was included with a Dublin lecture of 1868 under the fantastic title of Sesame and

Lilies (perhaps the most popular of his social essays), of which 44,000 copies were issued down to 1900. He made this, in 1 87 1, the first volume of his collected lectures and essays, the more popular and didactic form of his new Utopia of human life. It contains, with Fors, the most complete sketch of his conception of the place of woman in modern society. In the very characteristic preface to the new edition of 1871 he

proposes never to reprint his earlier works on art; disclaims many of the views they contained, and much in their literary form; and specially regrets the narrow Protestantism by which they were pervaded. In the year 1866 he published a little book about girls, and written for girls, a mixture of morals, theology, economics and geology, under the title of Ethics of the Dust; and this was followed by a more important and popular work, The Crown of Wild Olive. This in its ultimate form contained lectures on ” Work,” ” Traffic,” ” War,” and the ” Future of England.” It was one of his most trenchant utterances, full of fancy, wit, eloquence and elevated thought. But a more serious volume was Time and Tide (1867), a series of twenty-five letters to a workman of Sunderland, upon various points in the Ruskinian Utopia. This little collection of ” Thoughts,” written with wonderful vivacity, ingenuity and fervour, is the best summary of the author’s social and economic programme, and contains some of his wisest and finest thoughts in the purest and most masculine English that he had at his command. In 1869 he issued the Queen of the Air, lectures on Greek myths, a subject he now took up, with some aid from the late Sir C. Newton. It was followed by some other occa-sional pieces; and in the same year he was elected Slade pro- fessor of art in the university of Oxford. He now entered on his professorial career, which continued with some intervals down to 1884, and occupied a large part of his energies. His lectures began in February 1870, and were so crowded that they had to be given in the Sheldonian Theatre, and frequently were repeated to a second audience. He was made honorary fellow of Corpus Christi, and occupied rpoms in the college. In 1 87 1 his mother died, at the age of 90, and his cousin, Miss Agnew, married Mr Arthur Severn. In that year he bought from Mr Linton, Brantwood, an old cottage and property on Coniston Lake, a lovely spot facing the mountain named the Old Man. He added greatly to the house and, property, and lived in it continuously until his death in 1900. In 1871, one of the most eventful years of his life, be began Fors Clavigera, a small serial addressed to the working men of England, and pub- lished only by Mr George Allen, engraver, at Keston, in Kent, at 7d., and afterwards at iod., but without discount, and not through the trade. This was a

medley of social, moral and religious reflections interspersed with casual thoughts about persons, events and art. Fors means alternatively Fate, Force or Chance, bearing the Clavis, Club, Key or Nail, i.e. power, patience and law. It was a desultory ex- position o£ the Ruskinian ideal of fife, manners and society, full of wit, play, invective and sermons on things in general. It was continued with intervals down to 1884, and contained ninety-six letters or pamphlets, partly illustrated, which origin- ally filled eight volumes and are now reduced to four.

The early years of his Oxford professorship were occupied by severe labour, sundry travels, attacks of illness and another cruel disappointment in love. In spite of this, he lectured, founded a museum of art, to which he gave pictures and draw- ings and £5000; he sought to form at Oxford a school of drawing; he started a model shop for the sale of tea, and model lodgings in Marylebone for poor tenants. At Oxford he set his pupils to work on making roads to improve the country. He now founded ” St George’s Guild, ” himself contributing £7000, the object of which was to form a model industrial and social movement, to buy lands, mills and factories, and to start a model industry on co-operative or Socialist lines. In con- nexion with this was a museum for the study of art and science at Sheffield. Ruskin himself endowed the museum with works of art and money; a full account of it has been given in Mr E. T. Cook’s Studies in Ruskin (1890), which contains the particulars of his university lectures and of his economic and social experiments. It is unnecessary to follow out the history of these somewhat unpromising attempts. None of them came to much good, except the Sheffield museum, which is an established success, and is now transferred to the town. In Fors, which was continued month by month for seven years, Ruskin poured out his thoughts, proposals and rebukes on

society and persons with inexhaustible fancy, wit, eloquence and freedom, until he was attacked with a violent brain malady in the spring of 1878 (act. 59) ; and, although he recovered in a few months sufficiently to do some occasional work, he resigned his professorship early in 1879. The next three years he spent at Brantwood, mainly in retirement, and unhappy in finding nearly all his labours interrupted by his broken health. In 1880 he was able to travel in northern France, and began the Bible of Amiens, finished in 1885; and he issued occasional numbers of Fors, the last of which appeared at

Christmas 1884. In 1882 he had another serious illness, with inflammation of the brain; but he recovered sufficiently to travel to his old haunts in France and Italy — his last visit. And in the following year he was re-elected professor at Oxford and resumed his lectures; but increasing brain excitement, and indignation at the establishment of a laboratory to which vivisection was admitted, led him to resign his Oxford career, and he retired in 1884 to Brantwood, which he never left. He now suffered from frequent attacks of brain irritation and exhaustion, and had many causes of sorrow and disappointment. His lectures were published at intervals from 1870 to 1885 in Aratra Pentelici, The Eagle's Nest, Love's Meinie, Ariadne Florentine, Val d'Arno, Proserpina, Deucalion, The Laws of Fesole, The Bible of Amiens, The Art of England and The Pleasures of England, together with a series of pamphlets, letters, articles, notes, catalogues and circulars.

In the retirement of Brantwood he began his last work, Praeterita, a desultory autobiography with personal anecdotes and reminiscences. He was again attacked with the same mental malady in 1885, which henceforth left him fit only for occasional letters and notes. In 1887 it was found that he had exhausted (spent, and given away) the whole of the fortune he had received from his father, amounting, it is said, to some- thing like £200,000; and he was dependent on the vast and increasing sale of his works, which produced an average income of £4000 a year, and at times on the sale of his pictures and realizable property. In 1872 a correspondent had remonstrated with him in vain as to taking " usury," i.e. interest on capital lent to others for use. In 1874 Ruskin himself had begun to doubt its lawfulness. In 1876 he fiercely assailed the practice of receiving interest or rent, and he henceforth lived on his capital, which he gave freely to friends, dependants, public societies, charitable and social objects. The course of his opinions and his practice is fully explained in successive letters in Fors. Until 1889 he continued to write chapters of Praeterita, which was designed to record memories of his life down to the year 1875 (aet. 56). It was, in fact, only completed in regular series down to 1858 {aet. 39), with a separate chapter as to Mrs Arthur Severn, and a fragment called Dilecta, containing letters and early recollections of friends, especially of Turner. These two books were published between 1885 and 1889; and except for occasional letters, notes and prefaces, they form the last writings of the author of Modern Painters. His literary career thus extends over fifty years. But he has left nothing more graceful, naive and pathetic than his early memories in Praeterita — a book which must rank with the most famous " Confessions " in any literature. The last ten years of his life were

passed in complete retirement at Brantwood, in the loving care of the Severn family, to whom the estate was transferred, with occasional visits from friends, but with no sustained work beyond correspondence, the revision of his works, and a few notes and prefatory words to the books of others. He wished to withdraw his early art writings from circulation, but the public demand made this practically impossible. And now the whole of his writings are under the control of Mr George Allen, in several forms and prices, including a cheap series at 5s. per volume.

The close of his life was one of entire peace and honour. He was loaded with the degrees of the universities and membership of numerous societies and academies. ” Ruskin Societies ” were founded in many parts of the kingdom. His works were translated and read abroad, and had an enormous circulation

in Great Britain and the United States. Many volumes about his career and opinions were issued in his lifetime both at home and abroad. His 80th birthday, 8th February 1899, was celebrated by a burst of congratulations and addresses, both public and private. His strength failed gradually: his mind remained feeble but unclouded, and his spirit serene. An attack of influenza struck him down, and carried him off suddenly after only two days’ illness, 20th January 1900. He was buried in Coniston churchyard by his own express wish, the family refusing the offer of a grave in Westminster Abbey.

Ruskins literary life may be arranged in three divisions. From 1837 to i860 {aet. 1 8, to 41) he was occupied mainly with the arts. From i860 to 1871 {aet. 41 to 52) he was principally occupied with social problems. From 187 1 to 1885 (aet. 52 to 66) he was again drawn back largely to art by his lectures as professor, whilst pro- secuting his social Utopia by speech, pen, example and purse. But the essential break in his life was in i860, which marks the close of his main works on art and the opening of his attempt to found a new social gospel. With regard to his views of art, he himself modified and revised them from time to time; and it is admitted that some of his judgments are founded on imperfect study and personal bias. But the essence of his teaching has triumphed in effect, and has profoundly modified the views of artists, critics and the public, although it is but rarely accepted as complete or final. The moral of his teaching — that all living art requires truth, nature, purity, earnestness — has now become the axiom of all aesthetic work or judgment. John Ruskin founded the Reformation in Art.

With regard to his economic and social ideas there is far less general

concurrence, though the years that have passed since Unto this Last appeared have seen the practical overthrow of the rigid plutonomy which he denounced. So, too, the vague and senti- mental socialism, which pervades Munera Pulveris, Time and Tide and Fors is now very much in the air, and represents the aspira- tions of many energetic reformers. But the negative part of Ruskin's teaching on economics, social and political problems, has been much more effective than the positive part of his teaching. It must be admitted that nearly the whole of his practical experi- ments to realize his dreams have come to nothing, which is not unnatural, seeing his defiance of the ordinary habits and standards of the world. A more serious defect was his practice of violently assailing philosophers, economists and men of science, of whom he knew almost nothing, and whom he perversely misunderstood : men such as Adam Smith, Comte, Mill, Spencer, Darwin and all who followed them. In art, Ruskin had enjoyed an unexampled training, which made him a consummate expert. In philosophy and science he was an amateur, seeking to found a new sociology and a Utopian polity out of his own inner consciousness and study of nature, of poetry and the Bible. It is not wonderful if, in doing this, he' poured forth a quantity of crude conceits and some glaring blunders. But in the most Quixotic of his schemes, and the most Laputan of his theories, his pure and chivalrous nature, his marvellous insight into the heart of things and men, and his genius to seize on all that is true, real and noble in life, made his most startling proposals pregnant with meaning, and even his casual play full of fascination and moral suggestion.

In mastery of prose language he has never been surpassed, when he chose to curb his florid imagination and his discursive eagerness of soul. The beauty and gorgeous. imagery of his art works bore away the public from the first, in spite of their heretical dogmatism and their too frequent extravagance of rhetoric. But his later economic and social pieces, such as Unto this Last, Time and Tide, Sesame and Lilies, are composed in the purest and most lucid of English styles. And many of his simply technical and explanatory notes have the same quality. Towards the close of his life, in Fors and in Praeterita, will be found passages of tenderness, charm and subtlety which have never been surpassed in our language.

Ruskin's life and writings have been the subject of many works composed by friends, disciples and admirers. The principal is the Life, by W. G. Collingwood, his friend, neighbour and secretary (1900). His pupil, Mr E. T. Cook, published his Studies in Ruskin in 1890, with full details of his career as professor. Mr J. A. Hobson, in John Ruskin, Social Reformer (2nd ed., 1899), has elaborately discussed his social

and economic teaching, and claims him as ” the greatest social teacher of his age.” An analysis of his works has been written by Mrs Meynell (1900). His art theories have been discussed by Professor Charles Waldstein of Cambridge in The Work of John Ruskin (1894), by Robert de la Sizeranne in Ruskin et la religion de la beaute (1897), and by Professor H. J. Brunhes of Fribourg in Ruskin et la Bible (1901). The monumental ” library edition ” of Ruskin’s works (begun in 1903), prepared by Mr E. T. Cook, with Mr A. Wedderburn, is the greatest of all the tributes of literary admiration. (F. Ha.)

RUSSELL (Family). The great English Whig house of the Russells, earls and dukes of Bedford, rose under the favour of Henry VIII. Obsequious genealogists have traced their

lineage from ” Hugh de Rozel,” alias ” Hugh Bertrand, lord of le Rozel,” a companion of the Conqueror, padding their fiction with the pedigree of certain Russells who are found holding Kingston Russell in Dorset as early as the reign of King John. But the first undoubted ancestor of the Bedford line is Henry Russell, a Weymouth merchant, returned as a burgess for that borough in four parliaments between 1425 and 1442. He may well have been the son of Stephen Russell, another Weymouth merchant, whose name is just before his in the list of those men of substance in Dorsetshire who, in 1434, under the act of parliament, were to be sworn not to maintain breakers of the peace. Stephen Russell, having served the office of bailiff of Weymouth,was returned as burgess to the parliament of 1395, and one William Russell was returned for King’s Melcombe in 1340. Both Stephen and Henry were in the wine trade with Bordeaux, and in 1427 Henry Russell was deputy to the chief butler of England for the port of Melcombe. In 1442 a pardon under the privy seal significantly describes Henry Russell of Weymouth, merchant, as alias Henry Gascoign, gentleman, and it is therefore probable that the ducal house of Bedford springs from a family of Gascon wine-merchants settled in a port of Dorsetshire, a county remarkable for the number of such French settlers.

Henry Russell of Weymouth made a firm footing upon the land by his marriage with Elizabeth Hering, one of the two daughters and co-heirs of John Hering of Chaldon Hering, a Dorsetshire squire of old family, heir of the Winterbournes of Winterbourne Clenston and of the Cernes of Draycot Cerne. John Russell, eldest son of this match, born before

1432, and returned to parliament for Weymouth in 1450, had his seat at Berwick in Swyre, he and his son and heir, James Russell, being buried in the parish church of Swyre.

Thus John Russell, son and heir of James, was born in a family of squire's rank, whose younger branches went on for many generations as merchants and shipowners at Weymouth. A happy accident is said to have brought him to court. The archduke Philip, son of the emperor Maximilian, was driven by heavy weather into Weymouth, whence Sir Thomas Trenchard had him escorted to the king at Windsor. According to tradition, John Russell, Trenchard's young kinsman, was lately home from his travels with a knowledge of foreign tongues, those travels being probably made in the mercantile interests of his family. As travelling companion, or as a spy upon the strange guests, young Russell was sent with the archduke, who is said to have commended him to King Henry. Certain it is that on the accession of Henry VIII. John Russell advanced rapidly, serv- ing the crown as soldier and as diplomatic agent. He fought well at Therouanne, saw the Field of Cloth of Gold and the French disaster at Pavia, lost an eye by an arrow at Morlaix. In 1523 he was knight-marshal of the king's household. In 1526 he married a rich widow, Anne, daughter and co-heir of Sir Guy Sapcotes by the co-heir of Sir Guy Wolston, a match which brought to the Russells the Buckinghamshire estate of Chenies, in whose chapel many generations of them lie buried. His peerage as Lord Russell of Chenies dated from 1539, and in the same year he had the Garter. Having held many high offices — lord high admiral, lord president of Devon, Cornwall, Dorset and Somerset, and lord privy seal — he was named by Henry VIII. as one of his executors. At the crowning of Edward VI. he was lord high steward, and after his defeat of the western rebels was raised, in 1550, to the earldom of Bedford. Queen Mary, like her brother, made him lord privy seal, although he is said to have favoured that Reformation which enriched him. He died in London in 1555, leaving to his son a vast estate of church lands and lands forfeited by less successful navigators of the troubled sea of Tudor politics. In the west he had the abbey lands of Tavistock, which give a marquess's title to his descendants. In Cambridgeshire he had the abbatial estate of Thorney, in Bedfordshire the Cistercian house of Woburn, now the chief seat of the Russells. In London he had Covent Garden with the " Long Acre." Thus the future wealth of his house was secured by .those " immoderate grants " which made

a text for Edmund Burke's furious attack upon a duke of Bedford.

He left an only son, Francis, second earl of Bedford, K.G. (c. 1527-1585), who, being concerned in Wyatt's plot, escaped to the

Continent and joined those exiles at Geneva whose religious sympathies he shared. He returned in 1557, and was employed by Queen Mary before her death. Under Queen Elizabeth he governed Berwick, and was lord-lieutenant of the northern counties. Three of his four sons died before him, the third, killed in a border fray, being father of Edward, third earl of Bedford, who died without issue in 1627. The fourth son, William, created Lord Russell of Thornhaugh in 1603, was a soldier who fought fiercely before Zutphen beside his friend Sir Philip Sidney, whom he succeeded as governor of Flushing, and was from 1594 to 1597 lord-deputy of Ireland. He died in 1613, leaving an only son, Francis, who in 1627 suc- ceeded his cousin as fourth earl of Bedford. This earl built the square of Covent Garden, and headed the ” undertakers ” who began the scheme for draining the great Fen Level. . He op- posed the king in the House of Lords, but might have played a part as mediator between the sovereign and the popular party who accepted his leadership had he not died suddenly of the smallpox in 1641 on the day of the king’s assent to the bill for Strafford’s attainder. William, the eldest surviving son, succeeded as fifth earl, Edward, the youngest son, being father of Edward Russell (1653-1727), admiral of the fleet, who, having held the chief command in the victory of La Hogue, was created in 1697 earl of Orford. The fifth earl of Bedford, after fighting for the parliament at Edgehill and for the king at Newbury, surrendered to Essex and occupied himself with completing the drainage of the Bedford Level. He carried St Edward’s staff at the crowning of Charles II., but quitted political life after the execution of his son, Lord Russell, in 1683. In 1694 he was created duke of Bedford and marquess of Tavistock, titles to which his grandson, Wrdthesley Russell, succeeded in 1700. The “patriot” Lord Russell had added to the family estates by his marriage with Rachel, daughter and co-heir of Thomas Wrothesley, the fourth earl of South- ampton, from whom she finally inherited the earl’s property in Bloomsbury, with Southampton House, afterwards called Bedford House. Her son, the second duke of Bedford, married the daughter of a rich citizen, John Howland of Streatham, a match strangely commemorated by the barony of Howland of Streatham, created for the bridegroom’s grandfather, the first duke, in 1695. The third duke, another Wrothesley Russell (1708-1732), died without issue, his brother John (1710-1771) succeeding him. This fourth duke, opposing Sir Robert W a l~ pole, became, by reason of his rank and territorial importance, a recognizeˆ leader of the Whigs. In the duke of Devonshire’s administration he was lord-lieutenant of Ireland, and he served as lord high constable at the coronation in 1760. His son Francis, styled marquess of Tavistock, was killed in 1767 by a fall in the hunting field, and Lord Tavistock’s son Francis (1 765-1802)

became the fifth duke. This was the peer whom Burke, smarting from a criticism of his own pension, assailed as ” the Leviathan of the creatures of the crown,” enriched by grants that ” outraged economy and even staggered credi- bility.” He pulled down Bedford House, built by Inigo Jones, Russell Square and Tavistock Square rising on the site of its gardens and courts. Dying unmarried, he was succeeded by his brother John, the sixth duke (1766-1839), whose third son was the statesman created in 1861, Earl Russell of Kingston Russell, better known as Lord John Russell. Lord Odo Russell, a nephew of ” Lord John,” and ambassador at Berlin from 1871 to his death in 1884, was created Lord Ampthill in 1881. Herbrand Arthur Russell (b. 1858), the eleventh duke and fifteenth earl, succeeded an elder brother in 1893. (O. Ba.)

RUSSELL, ISRAEL COOK (1852-), American geologist,

was born at Garrattsville, New York, on the 10th of December

1852. He graduated at New York University in 1872, and later

studied at the School of Mines, Columbia, where he was

.assistant professor of geology from 1875-77. He was assistant

Geologist on the United States Geographical and Geological Sur- veys in 1878, and in 1880 became attached to the Geological Survey of the United States. In 1892 he was appointed pro- fessor of geology in the university of Michigan.

His publications include Sketch of the Geological History of Lake Lahontan (1885); The Newark System (Bulletin No. 85 U.S. Geel. Survey, 1892); Present and Extinct Lakes of Nevada (1896); Glaciers of North America (1897); Volcanoes of North America (1897); Glaciers of Mount Rainier (Ann. Rep. U.S. Geol. Survey, 1898); and North America (1900).

RUSSELL, JOHN (1745-1806), British portrait painter in pastel, was born at Guildford, Surrey. At an early age he entered the studio of Francis Cotes, R.A., from whom he derived his artistic education, and set up his own studio in 1767. Russell was a man of remarkable religious character, a devout follower of Whitefield. He began an elaborate intro- spective diary in Byrom’s shorthand in 1766 and

continued it to the time of his death. In it he records his own mental condition and religious exercises, entering with a certain morbid ingenuity into long disquisitions, and only occasionally record- ing information concerning his sitters. His religious life is the key to his complex character, as it actuated his whole career. He obtained the gold medal at the Royal Academy for figure drawing in 1770 and exhibited from the beginning of the Academy down to 1805. He was the finest painter in crayons England ever produced, and although he painted in oil, in water-colours and in miniature, it was by his works in crayon that his reputation was made. He wrote the Elements of Painting in Crayon, and described in it his method. He made his own crayons, blending them on his pictures by a peculiar method termed ” sweetening.” This he carried out with his fingers, rubbing in the colours and softening them in outline, uniting colour to colour so accurately that they melt into one another with a characteristic cadence. His pastel work is to oil painting ” what the vaudeville is to the tragedy or the sonnet to the epic.” His colours were pure and his blending so perfect that no change is to be seen in his works since they were executed. Sir Joseph Banks, writing in 1789 respecting his portraits of the president, of Lady, Mrs and Miss Banks, stated that ” the oil pictures of the present time fade quicker than the persons they are intended to present, but the colours made use of by Russell will stand for ever,” and in that prophecy is so far justified.

An important picture by him hangs in the Louvre (” Child with Cherries “), and two, including ” The Old Bathing Man at Brighton,” are owned by the crown. At the Royal Academy, of which he was a member, he exhibited three hundred and thirty works, and his portraits were engraved by Collyer, Turner, Heath, Dean, Bartolozzi, Trotter and other prominent engravers. Russell received warrants of appointment to the king, queen, prince of Wales and the duke of York. He was interested in astronomy, a friend of Sir W. Herschell, and no mean mathematician. He drew an exceedingly accurate map of the moon, and invented a piece of complicated mechan- ism for exhibiting its phenomena, publishing a pamphlet, illustrated by his own drawings, describing the apparatus.

Two of his sons inherited their father’s talent, and one of them, William (1 780-1870), exhibited five fine portraits in the Royal Academy.

See George C. Williamson, John Russell (London, 1894).

(G. C. W.) RUSSELL, JOHN (d. 1494), English bishop and chancellor, was admitted to Winchester College in 1443, and in 1449 went to

Oxford as fellow of New College. He resigned his fellowship in 1462, and appears to have entered the royal service. In April 1467 and January 1468 he was employed on missions to Charles the Bold at Bruges. He was there again in February 1470 as one of the envoys to invest Charles with the Garter: the Latin speech which Russell delivered on this last occasion was one of Caxton's earliest publications, probably printed for him at Bruges by Colard Mansion (see Blades, Life of Caxlon, 1. p. vii, ii. 29-31). In May 1474 he was promoted to be keeper of the privy seal, and retained his office even after his

consecration as bishop of Rochester on the 22nd of September 1476, and translation to Lincoln on the 9th of September 1480. As a trusted minister of Edward IV., he was one of the executors of the king's will; but on the 13th of May 1483 he accepted the office of chancellor in the interest of Richard of Gloucester, apparently with great reluctance. He retained the great seal till the 29th of July 1485. Russell was above all things an official, and was sometimes employed by Henry VII. in public affairs. But his last years were occupied chiefly with the business of his diocese, and of the university of Oxford, of which he had been elected chancellor in 1483. He died at Nettleham on the 30th of December 1494, and was buried at Lincoln Cathedral.

Sir Thomas More calls Russell " a wise manne and a good, and of much experience, and one of the best-learned men, undoubtedly, that England had in hys time." Two English speeches composed by Russell, for the intended parliament of Edward V., and the first parliament of Richard III., are printed in Nichols's Grants of Edward V. (Camden Soc). Some other writings of less interest remain in manuscript.

For contemporary notices see especially More's Life of Richard III., the Continuation of the Croyland Chronicle, ap. Freeman Scriptores, and Bentley's Excerpta Historica, pp. 16-17. See also Wood's History and Antiquities of the University of Oxford, and T. Kirby, Winchester Scholars, and Annals of Winchester College. There are modern biographies in Campbell's Lives of the Chancellors, and Foss's Judges of England. (C. L. K.)

RUSSELL, JOHN RUSSELL, ist Earl (1792-1878), British statesman, third son of the 6th duke of Bedford, by Georgiana Elizabeth Byng, second daughter of the 4th Viscount Torring- ton, was born in London on the 18th of August 1792. He was sent to a private school at Sunbury in 1800, and from 1803 to 1804 he was at Westminster School, but was then withdrawn on account of his delicate health. From 1805 to 1808 he was with a private tutor at Woodnesborough,

near Sandwich. After travelling in Scotland and in Spain, he studied from the autumn of 1809 to 181 2 at the university of Edinburgh, then the academic centre of Liberalism, and dwelt in the house of Professor John Playfair. On leaving the university, he travelled in Portugal and Spain, but on the 4th of May 1813 he was returned for the ducal borough of Tavistock and thereupon came back to England.

In foreign politics Lord John Russell's oratorical talents were especially shown in his struggles to prevent the union of Norway and Sweden. In domestic questions he cast in his lot with those who opposed the repressive measures of 181 7, and protested that the causes of the discontent at home should be removed by remedial legislation. When failure attended all his efforts he resigned his seat for Tavistock in March 181 7, and meditated permanent withdrawal from public life, but was dissuaded from this step by the arguments of his friends, and especially by a poetic appeal from his friend Tom Moore. In the parliament of 1818-20 he again represented the family borough in Devon, and in May 1819 began his long advocacy of parliamentary reform by moving for an inquiry into the corruption which prevailed in the Cornish constituency of Grampound. During the first parliament (1820-26) of George IV. he sat for the county of Huntingdon, and secured in 1821 ' the disfranchisement of Grampound, but the seats were not transferred to the constituency which he desired. Lord John Russell paid the penalty for his advocacy of Catholic emancipa- tion with the loss in 1826 of his seat for Huntingdon county, but he found a shelter in the Irish borough of Bandon Bridge. He led the attack against the Test Acts by carrying in February 1828 with a majority of forty-four a motion for a committee to inquire into their operations, and after this decisive victory they were repealed (9th of May 1828). He warmly supported the Wellington ministry when it realized that the king's govern- ment could only be carried on by the passing of a Catholic Relief Act (April 1829). For the greater part of the short- lived parliament of 1830-31 he served his old constituency of Tavistock, having been beaten in a contest for Bedford county at the general election by one vote; and when Lord Grey's

Reform ministry was formed, in November 1830, Lord John Russell accepted the office of paymaster-general without a seat in the cabinet. This exclusion was the more remarkable in that he was chosen (1st of March 183 1) to explain the pro- visions of the Reform Bill, to which

the cabinet had given its formal sanction. The Whig ministry was soon defeated, but an appeal to the country increased the number of their ad- herents, and Lord John Russell was returned by the freeholders of Devon. After many a period of doubt and defeat, ” the bill, the whole till, and nothing but the bill ” passed into law (7th of June 1832), and Lord John stood forth in the mind of the people as its champion. After the passing of the Reform Bill he sat for the S. division of Devon, and continued to retain the place of paymaster-general in the ministries of Lord Grey and Lord Melbourne. The former of these cabinets was broken up by the withdrawal of Mr Stanley, afterwards Lord Derby.

Lord John Russell had visited Ireland in the autumn of 1833 and had come back with a keen conviction of the necessity for readjusting the revenues of the Irish church. To these views he gave expression in a debate on the Irish Tithe Bill (May 1834), whereupon Stanley, with the remark that ” Johnny has upset the coach,” resigned his place. The latter was abruptly, if not rudely, dismissed by William IV. when the death of Lord Spencer promoted the leader of the House of Commons, Lord Althorp, to the peerage, and Lord John Russell was proposed as the spokesman of the ministry in the Commons (Nov. 1834). At the general election which ensued the Tories received a considerable accession of strength, but not sufficient to ensure their continuance in office, and the adoption by the House of Commons of the proposition, that the surplus funds of the Irish church should be applied to general education, necessitated the resignation of Sir Robert Peel’s ministry (April 1835). In Lord Melbourne’s new administration Lord John Russell became home secretary and leader of the House of Commons, but on his seeking a renewal of confidence from the electors of South Devon, he was defeated and driven to Stroud. The Whig ministry succeeded in passing a Municipal Reform Bill (7th of Sept. 1835), and a settlement of the tithe question in England and Ireland (1836). In May 1839, on an adverse motion concerning the administration of Jamaica, the ministry was left with a majority of five only, and promptly resigned. Sir Robert Peel’s attempt to form a ministry was, however, frustrated by the refusal of the queen to dismiss the ladies of the bedchamber, and the Whigs resumed their places with Lord John Russell as secretary of state for the colonies. Their prospects brightened when Sir John Yarde Buller’s motion of ” no confidence ” at the opening of the Session of 1840 was defeated by twenty-one, but a similar vote was some months later carried by a majority of one, whereupon the Whig leader announced a dissolution of parlia- ment (June 1841). At the polling-booth his friends sustained a crushing defeat; the return of Lord John Russell for the City of London was almost their solitary triumpTi.

On Sir Robert Peel's resignation (1846) the task of forming an administration was entrusted to Lord John Russell, and he remained at the head of affairs from July 1846 to Feb. 1852, but his tenure of office was not marked by any great legislative enactments. His celebrated Durham letter (4th of Nov. 1850) on the threatened assumption of ecclesiastical titles by the Roman Catholic bishops weakened the attachment of the " Peelites " and alienated his Irish supporters. The impotence of their opponents, rather than the strength of their friends, kept the Whig ministry in power, and, although beaten by a majority of nearly two to one on Mr Locke King's County Franchise Bill in February 1851, it could not divest itself of office. Lord Palmerston's unauthorized recognition of the French coup d'etat was followed by his dismissal from the post of foreign secretary (Dec. 1851), but he had his revenge in the ejectment of his old colleagues in February 1852. During Lord Aberdeen's administration Lord John Russell led the Lower. House, at first as foreign secretary (to the 21st of February 1853), then without portfolio, and lastly as president of the council (June

1854). In 1854 he brought in a Reform Bill, but in consequence of the war with Russia the bill was allowed to drop. His popularity was diminished by this failure, and although he resigned in January 1855, on Mr Roebuck's motion for an inquiry into the conduct of the war in the Crimea, he did not regain his old position in the country. At the Vienna conference (1855) Lord John Russell was England's representative, and immediately on his return he became secretary of the colonies (May 1855), but the errors in his negotiations at the Austrian capital followed him and forced him to retire in July of the same year.

For some years after this he was the " stormy petrel " of politics. He was the chief instrument in defeating Lord Palmerston in 1857. He led the attack on the Tory Reform Bill of 1859. A reconciliation was then effected between the rival Whig leaders, and Lord John Russell consented to become foreign secretary in Lord Palmerston's ministry (i860) and to accept an earldom (July 1861). During the American War Earl Russell's sympathies with the North restrained his country from taking sides in the contest, and he warmly sympathized with the efforts for the unification of Italy, but he was not equally successful in preventing the spoliation of Denmark. On Lord Palmerston's death (October 1865) Earl Russell was once more summoned to form a cabinet, but the defeat of his ministry in the following June on the Reform Bill which they had introduced was followed by his retirement from public life. His leisure hours were spent after this event in the preparation of numberless letters and speeches, and in the

composition of his Recollections and Suggestions (1875), but everything he wrote was marked by the belief that all philosophy, political or social, was summed up in the Whig creed of fifty years previously. Earl Russell died at Pembroke Lodge, Richmond Park, 28th May 1878.

Earl Russell was twice married — first in 1835, to Adelaide, daughter of Mr Thomas Lister, and widow of Thomas, second Lord Ribblesdale, and secondly, in 1841, to Lady Frances Ann Maria, daughter of Gilbert, second earl of Minto. By the former he had two daughters, by the latter three sons and one daughter. His eldest son, Lord Amberley, who married a daughter of the second Baron Stanley of Alderley, predeceased him on the 9th of January 1876, and their eldest son (b. 1865) succeeded as second Earl Russell.

Lord Russell played some part as an author. His tales, tragedies and essays (including The Nun of Arrouca, 1822, and Essays and Sketches by a Gentleman who has left his Lodgings, 1820) are for- gotten, but his historical works, Life of William Lord Russell (1819), Memoirs of the Affairs of Europe (1824-29, 2 vols.), Cor- respondence of John, 4th Duke of Bedford (1842-46, 3 vols.), Memorials and Correspondence of C. J. Fox (1853-57, 4 vols.), and Life and Times of C. J. Fox (1859-66, 3 vols.) are among the chief authorities on Whig politics. He also edited the Memoirs, Journal and Cor- respondence of Thomas Moore (1853-56, 8 vols.).

The chief biography is that by Sir Spencer Walpole (1891, 2 vols.). The volume by Stuart J. Reid (1895, ” Prime Ministers of Queen Victoria” Series) should also be consulted. (W. P. C.)

RUSSELL, JOHN SCOTT (1808-1882), British engineer, was born in 1808 near Glasgow, a ” son of the manse,” and was at first destined for the ministry. But this intention on his father’s part was changed in consequence of the boy’s early leanings towards practical science. He attended in succession the universities of St Andrews, Edinburgh and Glasgow, — taking his degree in the last-named at the age of sixteen. After spending a couple of years in workshops, he settled in Edinburgh as a lecturer on science, and soon attracted large classes. In 1832-33 he was engaged to give the natural philosophy course at the university, the chair having become vacant by the death of Sir John Leslie. In the following year he began his remarkable series of observations on waves. Having been consulted as to the possibility of utilizing steam-naviga- tion on the Edinburgh & Glasgow canal, he replied that the question could not be answered without experiments, which he Was willing to undertake if a portion of the canal were

placed at his disposal. The results of this inquiry are to be found in the Trans. Roy. Soc. Ed. (vol. xiv.), and in the British

Association Reports (seventh meeting). The existence of the long wave, or wave of translation, with many of its most important features, was here first recognized, and it was clearly pointed out why there is a special rate, depending on the depth of the water, at which a canal-boat can be towed at the least expenditure of effort by the horse. The elementary mathe- matical theory of the long wave was soon supplied by com- mentators on Scott Russell's work, and a more complete investi- gation was subsequently given by Sir G. G. Stokes. Russell indulged in many extraordinary and groundless speculations, some of which were published in a posthumous volume, The Wave oj Translation (1885). His observations led him to propose and experiment on a new system of shaping vessels, known as the wave system, which culminated in 'the building of the " Great Eastern." His activity and ingenuity were also displayed in many other fields, — steam-coaches for roads, improvements in boilers and in marine engines, the immense iron dome of the Vienna Exhibition, cellular double bottoms for iron ships, &c. With Mr Stafford Northcote (afterwards Lord Iddesleigh), he was joint-secretary of the Great Exhibi- tion of 185 1 ; and he was one of the chief founders of the Institution of Naval Architects. He died at Ventnor on the 8th of June 1882.

RUSSELL, THOMAS (1762-1788), English poet, was born at Beaminster, early in 1762. He was the son of John Russell, an attorney at Bridport, in Dorsetshire, and his mother was Miss Virtue Brickie, of Shaftesbury. He was educated at the grammar school of Bridport, and in 1777 proceeded to Win- chester, where he stayed three years, under Dr Joseph Warton, and Thomas Warton, the professor of poetry. In 1780 Russell became a member of New College, Oxford. He graduated B.A. in 1784 and was ordained priest in 1786. During his residence at the university he devoted himself to French, Italian, Spanish, Portuguese, Provencal and even German literature. His health, however, broke down, and he retired to Bristol hot wells to drink the waters; but in vain, for he died there on the 31st of July 1788. He was buried in Power- stock churchyard, Dorset. In 1789 was published a thin volume, containing his Sonnets and Miscellaneous Poems, now a very rare book. It contained twenty-three sonnets, of regular form, and a few paraphrases and original lyrics. The sonnets are the best, and it is by right of these that Russell takes his place as one of the most interesting precursors of the romantic school. " War, Love, the Wizard, and the Fay he sung " — in other words, he rejected entirely the narrow circle of subjects laid down for 18th-century poets. In this he

was certainly influenced both by Chatterton and by Collins. But he was still more clearly the disciple of Petrarch, of Boccaccio and of Camoens, each of whom he had carefully and enthusiastically studied. His sonnet, " Suppos'd to be written at Lemnos," is his masterpiece, and is unquestionably the greatest English sonnet of the 18th century.

The anonymous editor of Russell's solitary volume is said to have been William Howley (1766-1848), long afterwards arch- bishop of Canterbury, who was a youthful bachelor of New College when Russell, who had been his tutor, died. His memoir of the poet is very perfunctory, and the fullest account of Russell is that published in 1897 by T. Seccombe.

RUSSELL, WILLIAM CLARK (1844-), British author, was born at the Carlton House Hotel, New York, on the 24th of February 1844, the son of Henry Russell, author of " Cheer, Boys, Cheer," and other popular songs. He went to school at Winchester, and then at Boulogne, joining the merchant service at thirteen, and serving for eight years. This apprentice- ship to a seafaring life was turned to account in a series of stories which have fascinated two generations of boy readers. John Holdsworth, Chief Mate (1874), immediately made his reputation. Other successful stories were: The Wreck of the Grosvenor (1875), in which he pleaded for better food for English seamen; The Frozen Pirate (1877), An Ocean Tragedy (1881), The Emigrant Ship (1894), The Ship, Her Story (1894), The Convict Ship (1895), What Cheer! (1895), The Two Captains (1897), Tlie Romance of a. Midshipman (1898), The Ship's

Adventure (1899), Overdue (1903), Abandoned (1904), His Island Princess (1905). He joined the staff of the Newcastle Daily Chronicle, and afterwards became a leader writer on the Daily Telegraph, but the double labour of journalism and novel- writing threatened his health, and he resigned in 1887. Many of the papers which he contributed to the Daily Telegraph were collected in volume form in Round the Galley- Fire and other volumes. He also wrote a Life of Lord Collingwood (1891), and, with W. H. Jacques, Nelson and the Naval Supremacy of England (New York, 1890).

RUSSELL, SIR WILLIAM HOWARD (1821-1907), English war correspondent, was born at Lily vale, near Tallaght, in the county of Dublin, on the 28th of March 1821, being one of the Russells of Limerick, whose settlement in Ireland dates from the time of Richard II. He entered Trinity College in 1838. Three years later he was

thrown very much on his own resources, but a relative, Mr R. W. Russell, who had been sent to Ireland by The Times, deputed him to report the Irish elections at Longford, and his success definitely turned his attention to journalism. Coming to London in 1842, he went to Cambridge, but left before taking a degree. In the following year he was sent by The Times to Ireland to report the O'Connefl meetings. In 1845 he was appointed to superintend the reports on the Irish railways, and was shortly afterwards sent by The Times to inspect the O'Connell property in S.W. Ireland, when his plain speaking drew forth a characteristic tirade from the " Liberator." For a short period in 1847 his services were temporarily transferred to the Morning Chronicle, but with that exception he remained permanently connected with The Times. He was sent as special correspondent to Denmark in the war of 1849-50. He did not, however, at once relinquish a legal career, and was called to the bar at the Middle Temple in 1851. On the outbreak of the Crimean War in 1853 he went out as special correspondent, and, accompanying the light division to Gallipoli, proceeded with the first detachment to Varna. On the embarkation for the Crimea he was attached to the second division, and landed with it on the 14th of September. He was present at the battle of the Alma on the 20th of September, at the investment of Sevastopol, at Bala- clava on the 25th of October and Inkerman on the 5th of November.

Towards the end of May 1855 he accompanied the expedition to Kertch, and did not return to the Crimea until the following August. In September and October he described the attacks on the Malakoff and Redan, the occupation of Sevastopol and the capture of Fort Kinburn. The popularity of The Times Crimea correspondence led to its republication in two volumes under the title of The War, 1855-56. Russell's letters to The Times were mainly responsible for the enlightenment of the public at home as to the conduct of affairs at the scene of action, and his exposure of the mismanagement during the winter of 1854 did more than anything else to cause the downfall of Lord Aberdeen's ministry. In 1856 Russell was sent to Moscow to describe the coronation of the tsar, and in the following year was attached to the headquarters of Lord Clyde in India. He was present at the siege and capture of Lucknow in 1858, the operations in Oude, the battle of Bareilly and the actions in Rohilkhand, and he received the Indian war medal with the Lucknow clasp. The events of those stirring times are vividly recorded in My Diary in India in 1858-59, Next year he was sent to Italy, but arrived on the eve of the armistice at Villa-franca. On the 7th of January i860 appeared the first number of the Army and Navy Gazette, which he founded, and of which he was

editor and principal proprietor. In 1861 Russell pro- ceeded to Washington, and reached M'Dowell's headquarters just before the first battle of Bull Run, and his account of the Federal retreat drew much hostile criticism. He published a full account of the war, in so far as he had witnessed it, in My Diary, North and South, during the Civil War in America, 1862. Returning to England in 1863, he remained at home until 1866, when he proceeded to the headquarters of General Benedek and witnessed the battle of Koniggratz, 3rd of July.

During the interval of peace that followed he accompanied the prince of Wales to the Nile, Constantinople, the Crimea and Greece in 1868, and published an account of the tour in the following year, when he also contested the borough of Chelsea unsuccessfully in the Conservative interest. On the out- break of the Franco-Prussian War in 1870, Russell was with the crown prince from the battle of Worth, 6th of August, and Sedan, 12th of September, till the capitulation of Paris. His account appeared in 1874 under the title of My Diary during the Last Great War. His description of the burning of Paris by the Communards was not the least of his journalistic triumphs. In 1875-76 he was honorary private secretary to the prince of Wales during his tour through India, of which he published an account in 1877. When Lord Wolseley was sent to quell the Zulu rebellion in 1879, Russell was attached to his staff as correspondent. In 1881 he went with the duke of Sutherland's party for a tour in the United States and Canada, described in Hesperothen, and in 1882 he was again with Lord Wolseley in the Egyptian campaign. In 1895 he published a personal retrospect entitled The Great War with Russia. Russell was knighted in May 1895, and was the recipient of numerous war medals and various foreign orders. He married twice, first in 1846 Miss Burro wes, who died not long afterwards, and secondly in 1884 the Countess A. Malvezzi. He died on the nth of February 1907.

RUSSELL, LORD WILLIAM (1639-1683), English politician, was the third son of the 1st duke of Bedford and was born on the 29th of September 1639. About 1654 he was sent to Cambridge with his elder brother Francis (on whose death in 1678 he obtained the courtesy title of Lord Russell). On leaving the university, the two brothers travelled abroad, visit- ing Lyons and Geneva, and residing for some while at Augsburg. William's account of his impressions is spirited and interesting. He was at Paris in 1658, but had returned to Woburn in December 1659. At the Restoration he was»elected for the family

borough of Tavistock. For a long time he appears to have taken no part in public affairs, but rather to have indulged in the follies of court life and intrigue; for both in 1663 and 1664 he was engaged in duels, in the latter of which he was wounded. In 1669 he married Rachel (1636-1723), second daughter of the 4th earl of Southampton, and widow of Lord Vaughan, thus becoming connected with Shaftesbury, who had married South- ampton's niece. With his wife Russell always lived on terms of the greatest affection and confidence. She corresponded with Tillotson and other distinguished men, and a collection of her admirable letters was published in 1773.

It was not until the formation of the " country party," in opposition to the policy of the Cabal and Charles's French- Catholic plots, that Russell began to take an active part in affairs. He then joined Cavendish, Birch, Hampden, Powell, Lyttleton and others in vehement antagonism to the court. With a passionate hatred and distrust of the Catholics, and an intense love of political liberty, he united the desire for ease to Protestant Dissenters. His first speech appears to have been on the 22nd of January 1673, in which he inveighed against the stop of the exchequer, the attack on the Smyrna fleet, the corruption of courtiers with French money, and " the ill ministers about the king." He also supported the proceedings against the duke of Buckingham. In 1675 he moved an address to the king for the removal of Danby (see Leeds, Duke of) from the royal councils, and for his impeachment. On the 15th of February 1677, in the debate on the fifteen months' prorogation, he moved the dissolution of parliament; and in March 1678 he seconded the address praying the king to declare war against France. The enmity of the country party against Danby and James, and their desire for a dissolution and the disbanding of the army, were greater than their enmity to Louis. The French king therefore found it easy to form a temporary alli- ance with Russell, Hollis and the opposition leaders, by which they engaged to cripple the king's power of hurting France and to compel him to seek Louis's friendship, — that friendship, how- ever, to be given only on the condition that they in their turn

should have Louis's support for their cherished objects. Russell in particular entered into close communication with the marquis de Ruvigny (Lady Russell's maternal uncle), who came over with money for distribution among members of parliament. By the testimony of Barillon, however, it is clear that Russell himself utterly refused to take any part in the intended corruption.

By the wild alarms which culminated in the Popish Terror Russell appears to have been affected more completely than his otherwise

sober character would have led people to expect. He threw himself into the party which looked to Monmouth as the representative of Protestant interests, a grave political blunder, though he afterwards was in confidential communication with Orange. On the 4th of November 1678 he moved an address to the king" to remove the duke of York from his person and councils. At the dissolution of the pensionary parliament, he was, in the new elections, returned for Bedfordshire. Danby was at once overthrown, and in April 1679 Russell was one of the new privy council formed by Charles on the advice of Temple. Only six days after this we find him moving for a committee to draw up a bill to secure religion and property in case of a popish successor. He does not, however, appear to have taken part in the exclusion debates at this time. In June, on the occasion of the Covenanters' rising in Scotland, he attacked Lauderdale personally in full council.

In January 1680 Russell, along with Cavendish, Capell, Powell, Essex and Lyttleton, tendered his resignation to the king, which was received by Charles " with all my heart." On the 1 6th of June he accompanied Shaftesbury, when the latter indicted James at Westminster as a popish recusant; and on the 26th of October he took the extreme step of moving " how to suppress popery and prevent a popish successor "; while on the 2nd of November, now at the height of his influence, he went still further by seconding the motion for exclusion in its most emphatic shape, and on the 19th carried the bill to the House of Lords for their concurrence. The limitation scheme he opposed, on the ground that monarchy under the conditions expressed in it wˆiuld be an absurdity. The statement, made by Echard alone {Hist, of England, ii.), that he joined in opposing the indulgence shown to Lord Strafford by Charles in dispensing with the more horrible parts of the sentence of death — an indulgence afterwards shown to Russell himself — is entirely unworthy of credence. On December 18 he moved to refuse supplies until the king passed the Exclusion Bill. The prince of Orange having come over at this time, there was a tendency on the part of the opposition leaders to accept his endeavours to secure a compromise on the exclusion question. Russell, how- ever, refused to give way a hair's-breadth.

On the 26th of March 1681, in the parliament held at Oxford, Russell again seconded the Exclusion Bill. Upon the dissolu- tion he retired into privacy at his country seat of Stratton in Hampshire. It was, however, no doubt at his wish that his chaplain wrote the Life of Julian the Apostate, in reply to Dr Hickes's sermons, in which the lawfulness of resistance in extreme cases was defended. In the wild schemes of Shaftesbury after the election of Tory sheriffs for London

in 1682 he had no share; upon the violation of the charters, however, in 1683, he began seriously to consider as to the best means of resisting the govern- ment, and on one occasion attended a meeting at which treason, or what might be construed as treason, was talked. Monmouth, Essex, Hampden, Sidney and Howard of Escrick were the principal of those who met to consult. On the breaking out of the Rye House Plot, of which neither he, Essex, nor Sidney had the slightest knowledge, he was accused by informers of promis- ing his assistance to raise an insurrection and compass the death of the king. Refusing to attempt to escape, he was brought before the council, when his attendance at the meeting referred to was charged against him. He was sent on the 26th of June 1683 to the Tower, and, looking upon himself as a dying man, betook himself wholly to preparation for death. Monmouth offered to appear to take his trial, if thereby he could help Russell, and Essex refused to abscond for fear of injuring his friend's chance of escape. Before a committee of

the council Russell, on the 28th of June, acknowledged his presence at the meeting, but denied all knowledge of the proposed insurrection. He reserved his defence, however, until his trial. He would probably have saved his life but for the perjury of Lord Howard. The suicide of Essex, the news of which was brought into court during the trial, was quoted as additional evidence against him, as pointing to the certainty of Essex's guilt. On July 10 he was tried at the Old Bailey, his wife assisting him in his defence. Evidence was given by an in- former that, while at Shaftesbury's hiding-place in Wapping, Russell had joined in the proposal to seize the king's guard, a charge indignantly denied by him in his farewell paper, and that he was one of a committee of six appointed to prepare the scheme for an insurrection. Howard, too, expressly declared that Russell had urged the entering into communications with Argyll in Scotland. Howard's perjury is clear from other witnesses, but the evidence was accepted. Russell spoke with spirit and dignity in his own defence, and, in especial, vehemently denied that he had ever been party to a design so wicked and so foolish as those of the murder of the king and of rebellion. It will be observed that the legality of the trial, in so far as the jurors were not properly qualified and the law of treason was shamefully strained, was denied in the act of 1 William & Mary which annulled the attainder. Hallam maintains that the only overt act of treason proved against Russell was his concurrence in the project of a rising at Taunton, which he denied, and which, Ramsay being the only witness,

was not sufficient to warrant a conviction.

Russell was sentenced to die. Many attempts were made to save his life. The old earl of Bedford offered £50,000 or £100,000, and Monmouth, Legge, Lady Ranelagh, and Rochester added their intercessions. Russell himself, in petitions to Charles and James, offered to live abroad if his life were spared, and never again to meddle in the affairs of England. He refused, however, to yield to the influence of Burnet and Tillotson, who endeavoured to make him grant the unlawfulness of resistance, although it is more than probable that compliance in this would have saved his life. He drew up, with Burnet's assistance, a paper con- taining his apology, and he wrote to the king a letter, to be delivered after his death, in which he asked Charles's pardon for any wrong he had done him. A suggestion of escape from Lord Cavendish he refused. He behaved with his usual quiet cheerfulness during his stay in the Tower, spending his last day on earth as he had intended to spend the following Sunday if he had reached it. He received the sacrament from Tillotson, and Burnet twice preached to him. Having supped with his wife, the parting from whom was his only great trial, he slept peace- fully, and spent the last morning in devotion with Burnet. He went to the place of execution in Lincoln's Inn Fields with perfect calmness, which was preserved to the last. He died on the 21st of July 1683, in the forty-fourth year of his age. His attainder was reversed in 1689, and his son Wriothesley (1680- 1711) succeeded his grandfather as 2nd duke of Bedford in 1700.

A true and moderate summing-up of his character will be found in his Life, by Lord John Russell (1820). (O. A.)

RUSSELL OF KILLOWEN, CHARLES RUSSELL, Baron (1832-1900), lord chief justice of England, was born at Newry, county Down, on the 10th of November 1832. He was the elder son of Arthur Russell, a Roman Catholic gentleman, who was engaged in commerce and brewing in Newry. Edu- cated first at Belfast, afterwards in Newry, and finally at St Vincent's College, Castleknock, Dublin, in 1849, he was articled to a firm of solicitors in Newry. In 1854 he was admitted, and began to practise his profession. Disturbances between Roman Catholics and Orangemen were at that time prevalent in this part of Ireland, and in the legal proceedings which ensued at quarter and petty sessions young Russell distinguished himself as a bold and skilful advocate in the cause of his co-religionists. The political zeal which always formed an important element in Russell's character happily harmonized with these professional duties. After practising, however, for two years, he determined to seek a wider field for his abilities,

and to become a barrister in England. It was a wise ambition, early conceived by young Russell, stimulated by his present success, and encouraged by the counsel of at least one competent adviser, Judge Jones, who was much impressed by Russell's ability in the conduct of a case at the Newry quarter sessions. He believed, moreover, that to succeed at the Irish bar he would have (to use his own phrase) to " swallow his convictions." With this end in view Russell, whilst still practising and residing in Belfast, became a student of Trinity College, Dublin. He matriculated there in 1855, and passed examinations from time to time, but did not wait to become a graduate. In 1856 he went to London and became a student of Lincoln's Inn. In 1858 he married, in Belfast, Ellen, the eldest daughter of Dr Mulholland, a physician of distinction in that city. In 1859 he was called to the bar, after gaining by examination a first-class honour certificate, and joined the Northern Circuit. Except some valuable introductions to friends in London and Liverpool, which his uncle, the president of Maynooth, had given to him, Russell brought to the work of his profession no external aids. He had to rely upon himself. But the equip- ment was sufficient. A well-built frame; a strong, striking face, with broad forehead, keen grey eyes, and a full and sensitive mouth; a voice which, though not musical, was rich, and responded well to strong emotions, whether of indignation, or scorn, or pity; an amazing power of concentrating thought; an intellectual grasp, promptly seizing the real points of the most entangled case, and rejecting all that was secondary, or petty, or irrelevant; a faculty of lucid and forcible expression, which, without literary ornateness or grace of style, could on fit occasions rise to impassioned eloquence — all these things Russell had. But beyond and above all these -was his immense personality, an embodiment of energetic will which riveted attention, dominated his audience, and bore down opposition. His successful advocacy in the Colin Campbell divorce case in 1886, and his famous cross-examination of hostile witnesses and still more famous speech before the Parnell Commission in 1888, afforded perhaps the best examples of Russell's character- istic powers. He was not a learned lawyer in the sense in which Willes, or Mellish, or Blackburn were learned lawyers; he did not possess the fine legal acumen of his great contemporary, Herschell; but he had a sufficient apprehension of legal prin- ciples. He handled a point of law with telling directness and force. His argument as the leading counsel for Great Britain in the Bering Sea Arbitration in 1893, and his address at Saratoga Springs on International Law and International Arbitration in August 1896, were expositions of law in its practical application to matters of state which the most learned jurist must admire for their thoroughness and perspicuity.

Russell's success, after he joined the Northern Circuit, did not, of course, come to him at once. For some time his work in court was principally in the Court of Passage at Liverpool, which he regularly attended from London. He wrote a book on its procedure, which was published in 1862. This ancient local court, possessing both common law and Admiralty juris- diction, had as its presiding judge — then styled "assessor" — an eminent leader of the Northern Circuit, Mr Edward James. Substantial commercial cases were tried there, and of these Russell soon had a goodly portion. Steadily, and, for a barrister, speedily, Russell's fortune grew. His biographer, Mr Barry O'Brien, has given, in The Life of Lord Russell of Killowen (1901), an account of Russell's fees, which shows that they were, in round figures: in 1859, £117; in 1862, £1016; in 1866, £2367; and in 1870, £4230. At the beginning of this period Russell wrote occasionally for the newspapers, and especially for the Irish press. From early boyhood onwards he maintained a keen interest in politics, and pre-eminently in the public affairs of Ireland. In 1859 he published a pamphlet entitled The Catholic in the Workhouse, and an article from his pen is to be found in The Dublin Review, vol. xlviii. p. 497. His legal work was not wholly confined to the north of England. He was employed at the Guildhall and elsewhere by solicitors of position in the City of London. He was one of the counsel engaged in

the Windham lunacy case in 1861, and in the action of Saurin v. Starr in 1869. In 1865 he argued in ex parte Chavasse before Lord Westbury, L.C., and soon afterwards was honoured by him with the offer of a county court judgeship.

In 1872 Russell took "silk," and from that date for some time he divided the best leading work of the circuit with Holker, Herschell and Pope. In 1874 Holker became solicitor- general in the Conservative administration. In 1880 Herschell accepted the same office in a Liberal ministry, and about the same time Pope practically left the circuit, to become in a short time one of the most successful advocates at the parliamentary bar. Russell's success as a Q.C. during this period of his career was prodigious. He excelled in the conduct alike of com- mercial cases and of those involving, as he used to say, " a human interest," although undoubtedly it was the latter which more attracted him. He was seen to the least advantage in cases which involved technical or scientific detail. If his advocacy suffered a defeat, however, it was never an inglorious defeat. Those who were on the

Northern Circuit at the time will not easily forget the case of Dixon v. Plimsoll — a libel action brought by a Liverpool shipowner against Mr S. Plimsoll — tried before Baron Amphlett and a Liverpool special jury, in which Holker won a notable victory for the defendant; or Nuttall v. Wilde, a breach of promise action, in which Pope led brilliantly for the successful plaintiff, and Russell's speech for the defence was one of the finest in point of passion and pathos that was ever heard upon the Northern Circuit. At the same time, with all his fighting power, Russell was eminently a sagacious adviser. No barrister knew better how and when to settle a case, where the client's true interest called for a settlement.

In 1880 a new phase of Russell's arduous life began. He was returned to parliament as an independent Liberal member for Dundalk, a constituency which he had twice before un- successfully contested. From that time forward until his appointment to a lordship of appeal in succession to Lord Bowen in 1894, he sat in the House of Commons: for Dundalk until 1885, and afterwards for South Hackney, where he was returned as the Liberal member on four successive occasions — once in 1885, twice in 1886, and again in 1892. The entrance into parliament laid upon Russell's time and labour a heavy additional tax. His was a nature which could not, in work or even in pleasure, be content to do anything lightly or by halves. He was essentially a man of action; intensity — at times almost fierce intensity — both of purpose and of devotion to its fulfil- ment characterized everything he did. Upon such a man parliamentary fife between 1880 and 1894 necessarily entailed a severe strain. During the whole of this epoch, in home affairs, Irish business almost monopolized the political stage; and Russell was Irish to the core. From 1880 to 1886, as a private member, and as the attorney-general in Mr Gladstone's ad- ministrations of 1886 and 1892, he worked in and out of parlia- ment for the Liberal policy in regard to the treatment of Ireland as few men except Russell could or would work. He never spared himself. After a long day in the turmoil of the courts, he cheerfully gave a long evening to a distant and often, from the standpoint of personal notoriety, an obscure, platform. His position throughout was clear and consistent. Before 1886 on several occasions he supported the action of the Irish Nationalist party. He opposed coercion, voted for compensa- tion for disturbance, advocated the release of political prisoners and voted for the Maamtrasna inquiry. He wrote to the Daily Telegraph a series of letters on the Irish land question, which were afterwards published (1889) in a collected form. But he never became a member of the Irish Home Rule or of the Parnellite party; he was elected at Dundalk as an independent Liberal, and such he remained.

He was proud of the kingdom in whose might and glory Ireland could claim so large a part; and when, as attorney-general in the Gladstone administration, he warmly advocated the establishment of a subordinate parlia- ment in Ireland, he did so because he sought the amelioration and not the destruction of Ireland's relations with the rest of that kingdom. " I am absolutely opposed," he said {The Life

of Lord Russell of Killowen, p. 194) to the South Hackney voters, " to separation; but, reserving imperial control on all imperial questions, I think Irishmen on Irish soil should have the power of dealing in the way which seems best to them with all questions that concern them." It is impossible to say that Russell's success in the House of Commons, considerable as it was, was comparable to his success as an advocate in the courts of justice. He was listened to, always with respect and often with admiration, but he was not made for a debater; and the position of a law officer has generally not proved favourable to the attainment of parliamentary eminence. In great public affairs the law officer advises and supports, but not for him is the glory of initiating public policy.

Russell's parliamentary duties, fully as he discharged them, first as a private member and afterwards as attorney-general, were not allowed by him to obstruct his professional career. He rapidly became in London what he was already in Lanca- shire, the favourite leader in nisi prius actions. The list of causes cilebres in the period 1880-94 is really a record of Russell's cases, and, for a great part, of Russell's victories. The best known of the exceptions from the latter category was the libel action Belt v. Lawes in 1882, which, after a trial before Baron Huddleston and a special jury lasting more than forty days, resulted in a verdict for the plaintiff, fcr whom Sir Hardinge Giffard (afterwards Lord Chancellor Halsbury) appeared as leading counsel. The triumph of his client in the Colin Campbell divorce suit in 1886 afforded perhaps the most brilliant instance of Russell's forensic capacity in private litigation. His fees in 1885, the year before he became attorney- general, amounted to nearly £17,000. More important, however, as well as more famous, than any of his successes in the ordinary courts of law during this period were his performances as an advocate in two public transactions of mark in British history. The first of these in point of date was the Parnell Commission of 1888-90, in which Sir Charles Russell appeared as leading counsel for Mr Parnell. The commission held its first sitting on the 22nd of October 1888, and presented its report in Feb- ruary 1890. In April 1889, after 63 sittings of the commission, in the course of which 340 witnesses had been examined, Sir Charles Russell, who had already destroyed the chief personal charge against Mr Parnell by a brilliant

cross-examination, in which he proved it to have been based upon a forgery, made his great opening speech for the defence. It lasted several days, and concluded on the 12th of April. This speech, besides its merit as a wonderful piece of advocacy, possesses permanent value as an historical survey of the Irish question during the last century, from the point of view of an Irish Liberal. It was in the same year published after careful revision by its author (1889). The second public transaction was the Bering Sea Arbitration, held in Paris in 1893. Sir Charles Russell, then attorney-general, with Sir Richard Webster (afterwards Lord Alverstone, L.C.J.), was the leading counsel for Great Britain. Russell, in the course of his very powerful argument before the tribunal, maintained the proposition, which he again handled in his Saratoga address to the American Bar Association in 1896, that " international law is neither more nor less than what civilized nations have agreed shall be binding on one another as international law." The award was, substantially, in favour of Great Britain. In recognition of their distinguished services, the queen bestowed upon both the leading repre- sentatives of Great Britain the honour of the grand cross of St Michael and St George.

In 1894 Russell's career as an advocate ended. A judgeship, if he had wished it, had been within his reach twelve years before. In 1894, on the death of Lord Bowen, he accepted the position of a lord of appeal. A month later he was appointed lord chief justice of England in succession to Lord Coleridge, to whose memory he devoted in the following September a paper in the North American Review. To the discharge of his func- tions as a judge Russell brought with him all the qualities of intellect and character which had made him so eminent as an advocate, and their greatness was not less conspicuous in his

new position. Brief as was his tenure of the office, he proved himself well worthy of it. He was dignified without pompous- ness, quick without being irritable, and masterful without tyranny. He was scrupulously punctual. Suitors and hearers could not but be impressed by the manifest determina- tion of the lord chief justice to get at the truth, and to do so without waste of time. If this was a fault, it was that of excessive zeal, for despatch. When, occasionally, there were flashes of impatience, they were elicited by the exhibition, as he deemed it, of want of preparation, or slovenliness, or ver- bosity on the part of the advocate before him. Even the youngest and most obscure practitioner could always count upon the assiduous attention of the lord chief justice to a pertinent and thoughtful argument. In 1896 Lord Russell (Pollock B. and Hawkins J. being on this occasion

his colleagues on the bench) presided at the trial at bar of the leaders of the Jameson Raid. It was a state trial of grave importance. Russell's conduct of it, in the midst of much popular excitement, was by itself sufficient to establish his reputation as a great judge. One other event at least in his career while lord chief justice deserves a record, namely, his share in the Venezuela Arbitration in 1890. Lord Herschell, who had been nominated to act with Lord Justice Collins (afterwards Master of the Rolls) , as a British representative on the Commission of Arbitra- tion, of which the distinguished Russian jurist M. Martens was president, died somewhat suddenly in America before the beginning of the proceedings. The lord chief justice accepted the invitation to take the vacant place, and performed his very onerous duty with conspicuous ability.

Nor was it only on the bench, or as an international judge that Lord Russell of Killowen sought, during the last years of his busy life, to do service to his country. He signalized his zeal as a law reformer by the public advocacy of radical changes in the system of legal education in the Inns of Court, and by the promotion of measures to put down the vice of secret and illicit commissions in commercial and business life. On the former subject he delivered in 1895 an address in Lincoln's Inn Hall, under the auspices of the Council of Legal Education, which was afterwards printed and published. In 1899, dealing with the latter question, he introduced in the House of Lords a bill, which had its first reading. He again introduced a bill in the session of 1900, which was read a second time, but did not become law. On the 10th of August 1900 the great advocate and great judge passed quietly away at his London residence, after a short illness due to an internal malady.

In private as in public life Russell was always strenuous, and most attracted by things that called for the exercise of activity, whether bodily or intellectual. Inaction he disliked both for himself and in others. Though not an athlete, he took an interest in manly pastimes: he was fond of riding and of breeding horses; he liked being on the racecourse; and he enjoyed games, both of skill and of chance. A student of books he was not; he could lay no claim to wide learning or elegant scholarship; but he could appreciate a good book; he was versed in Shakespeare; and he knew and loved the poetry and the songs of his native land. When he wrote, his style, inornate, clear and forcible, reflected the character of his thought. He was a staunch and sympathetic friend, ever ready, in an unostentatious way, to help, where help was really needed. While he undoubtedly exhibited at times, chiefly during the earlier part of his career, a certain brusqueness and impetuousness of speech and demeanour, those who came into contact with him recognized that such occasional out-

bursts never sprang from any desire to hurt, or from any unkindness of disposition. In his contests at the bar he never made an enemy. He was a strong man, and he liked to have his way; but he was also large-hearted and without a tinge of rancour in his disposition. He was never offended by opposition. Whilst he did not himself shine as a wit or a humorist in conversation or in after-dinner oratory, he heartily enjoyed fun and humour in others; and, wherever he was, the

force and distinctness of his personality never failed to impress his company. Probably no English lawyer ever excited abroad the admiration which was accorded to Lord Russell of Killowen, alike on the continent of Europe and in America. To the United States he paid two visits, the first in 1883 and the second in 1896. On both occasions he won golden opinions, which were manifested in widespread and warm expressions of sympathy and regret when the news of the death of Lord Russell of Killowen passed across the Atlantic. Between 1894 and 1897 Lord Russell of Killowen received the degree of Doctor of Laws honoris causa from the universities of Dublin, Edinburgh and Cambridge, and from the Laval university, Quebec. In 1892 he was treasurer of Lincoln's Inn. He left surviving him, besides his widow, five sons and four daughters. His sister Katherine (in religion, Sister Mary Baptist Joseph), pioneer sister of mercy in California, had died two years before at San Francisco. (W. R. K.)

RUSSELL OF THORNHAUGH, WILLIAM, ist Baron (c. 1558-1613), English soldier, was a younger son of Francis Russell, 2nd earl of Bedford, and was educated at Magdalen College, Oxford. After spending a few years abroad, he went to Ireland in 1580, and having seen some service in that country he was knighted in September 1581. In 1585 he joined the English forces in the Netherlands, being made lieutenant-general of cavalry; in September 1586 he so distinguished himself at Zutphen that the Spaniards pronounced him " a devil and not a man"; and in 1587 he became governor of Flushing in succession to his late friend, Sir Philip Sidney. He differed with the estates of Holland and with his superior, Lord Willoughby de Eresby; consequently, on his own initiative, he was recalled to England in July 1588. In May 1594 Russell was made lord deputy of Ireland in place of Sir William Fitz- william. He relieved Enniskillen, but his attempts to capture the insurgent leaders, Hugh O'Neill, earl of Tyrone, and Fiagh MacHugh O'Byrne, came to nothing. In May 1595 Sir John Norris landed in Ireland, his orders being to help the lord deputy in his difficult task. Russell was somewhat chagrined at the choice, as he and Norris were not very good friends, but for a short time they acted together against the rebels in the N. of Ireland. Russell then led an expedition into Connaught, but soon he and Norris were at variance.

Having captured O'Byrne in May 1597, Russell laid down his office and left Ireland later in the month. In 1603 he was created Baron Russell of Thornhaugh, and he died on the 9th of August 1613. In 1627 his only son Francis succeeded his cousin Edward as 4th earl of Bedford.

Russell's Journal of his doings in Ireland is in the Carew MSS., and many of his letters are in the British Museum. See J. H. Wiffen, Historical Memoirs of the House of Russell (1833), and R. Bagwell, Ireland under the Tudors, vol. iii. (1890).

RUSSIA (Rossiya), the general name for the European and Asiatic dominions of the " Tsar of All the Russias." Although the name is thus correctly applied, both in English and Russian, to the whole area of the Russian empire, its application is often limited, no less correctly, to European Russia, or even to European Russia exclusive of Finland and Poland. The use of the name in its most comprehensive sense dates only from the expansion of the empire in the 19th century; to the historian who writes of the earlier growth of the empire, Russia means, at most, Russia in Europe, or Muscovy, as it was usually called until the 18th century, from Moscow, its ancient capital. The origin of the term " Russia " has been much disputed. It is certainly derived, through Rossiya, from Slavonic Rus or Ros (Byzantine 'P& or Tojctoi), a name first given to the Scandinavians who founded a principality on the Dnieper in the 9th century; and afterwards extended to the collection of Russian states of which this principality formed the nucleus. The word Rus, in former times wrongly connected with the tribal name Rhoxolani, is more probably derived from Ruotsi, a Finnish name for the Swedes, which seems to be a corruption of the Swedish rothsmenn, " rowers " or " seafarers,"

[PHYSICAL FEATURES

I. The Russian Empire The Russian empire stretches over a vast territory in E. Europe and N. Asia, with an area exceeding 8,660,000 sq. m., or one-sixth of the land surface of the globe (one twenty-third of its whole superficies). It is, however, but thinly peopled on the average, including only one-twelfth of the inhabitants of the earth. It is almost entirely confined to the cold and temperate zones. In Novaya Zemlya and the Taimyr peninsula, it projects within the Arctic Circle as far as 77° 6′ and 77 40′ N. respectively; while its S. extremities

reach 38° 50′ in Armenia, 35 on the Afghan frontier, and 42 30′ on the coasts of the Pacific. To the W. it advances as far as 20 40′ E. in Lapland, 17 in Poland, and 29 42′ on the Black Sea; and its E. limit — East Cape on the Bering Strait — is in 191° E. The White, Barents and Kara Seas of the Arctic bound it on the N., and the northern Pacific — that is, the Seas of Bering, Okhotsk and Japan — bounds it on the E. aries> " The Baltic, with the Gulfs of Bothnia and Finland, limits it on the N.W.; and two sinuous lines of land frontier separate it respectively from Sweden and Norway on the N.W. and from Prussia, Austria and Rumania on the W. On the S. and E. the frontier has changed frequently according to the expansion and contraction of the empire under the pressure of political exigency and expedience. The Black Sea is the principal demarcating feature on the S. of European Russia. On the W. side of that sea the S. frontier touches the Danube for some 120 m.; on the E. side of the same sea it zigzags from the Black Sea to the Caspian, utilizing the river Aras (Araxes) for part of the distance. As the Caspian is virtually a Russian sea, Persia may be said to form the next link in the S. boundary of the Russian empire, followed by Afghanistan. On the Pamirs Russia has since 1885 been conterminous with British India (Kashmir); but the boundary then swings away N. round Chinese Turkestan and the N. side of Mongolia, and, since 1904-5, it has skirted the N. of Manchuria, being separated from it by the river Amur. As thus traced, the boundary in Central Asia includes the two khanates of Bokhara and Khiva, which, though nominally protected states, are to all intents and purposes integral parts of the Russian empire. But it excludes Manchuria, with the Liao-tung peninsula and Port Arthur, upon which Russia only placed her grasp in 1898-99, a grasp which she was compelled by Japan to release after the war of 1904-5. The total length of the frontier line of the Russian empire by land is 2800 m. in Europe, and nearly 10,000 m. in Asia, and by sea over 11,000 m. in Europe and between 19,000 and 20,000 m. in Asia.

Russia has no oceanic possessions; her islands are all appendages of the mainland to which they belong. Such are Karlo, East Kvarken, the Aland archipelago, Dago, and Osel or Oesel in the Baltic Sea; Novaya Zemlya, with Kolguyev and Vaigach, in the Barents Sea; the Solovetski Islands in the White Sea; the. New Siberian archipelago, Wrangel Land and Bear Islands, off the Siberian coast; the Commander Islands off Kamchatka; the Shantar Islands and the N. of Sakhalin in the Sea of Okhotsk. The Aleutian archipelago was sold to the United States in 1867, together with Alaska, and in 1875 the Kurile Islands were ceded to Japan.

If the border regions, that is, two narrow belts, on the N. and S., be

left out of account, a striking uniformity of physical Leading feature prevails throughout the whole vast extent physical of the Russian empire. High plateaus like that of features. p am i r (the ” Roof of the World “) and Armenia, and lofty mountain chains like the snow-clad Caucasus, the Alai, the Tian-shan, the Sayan Mountains, exist only on the out- skirts of the empire.

Viewed broadly, the Russian empire may be said to occupy the territories to the N.W. of the great plateau formation Plateau of the old continent — the backbone of Asia — which formation stretches with decreasing altitude and width from of Mia. ftie high tableland of Tibet and Pamir to the lower plateaus of Mongolia, and thence N.E. through the Vitim

The

alpine

belt.

The flat lands.

region to the farthest extremity of Asia. Thus it consists of the immense plains and flat lands which extend between the plateau formation and the Arctic Ocean, including the series of parallel chains and hilly spurs which skirt the former region on the N.W. And it is only to the E. of Lake Baikal that it climbs up on to the plateau, from which it descends again before it reaches the Pacific.

This plateau formation — the oldest geological continent of Asia — being unfit for agriculture and for the most part unsuited for per- manent settlement, while its oceanic slopes have from the dawn of history been occupied by a relatively dense population, long pre- vented Slav colonization from reaching the Pacific. The Russians chanced to cross it in the 17th century at its narrowest and most N. part, and thus struck the Pacific on the foggy and frozf n shores of the Sea of Okhotsk; but two centuries elapsed ere, after colonizing the depressions around Lake Baikal, they crossed over the plateau in a more genial zone and descended to the Pacific by the Amur. After that they spread rapidly S., up to the nearly uninhabited valley of the Usuri, to what is now the Gulf of Peter the Great. In the S.W. higher portions of the plateau formation the empire has only comparatively recently planted its foot on the Pamir, and it was only a few years earlier that it established itself firmly on the high- lands of Armenia.

A broad belt of hilly tracts — in every respect alpine in character, and

displaying the same variety of climate and organic life as alpine tracts usually do — skirts the plateau formation throughout its entire length on the N. and N.W., forming an inter- mediate region between the plateau and the plains. The Caucasus, the Elburz, the Kopet-dagh and Paropamisus, the intricate and imperfectly known network of mountains W. of the Pamir, the Tian-shan and the Ala-tau mountain regions, and farther N.E. the Altai, the still unnamed complex of the Minusinsk Mountains, the intricate mountain-chains of Sayan, with those of the Olekma, Vitim and Aldan all arranged en echelon — the former from N.W. to S.E., and the others from S.W. to N.E. — all these belong to the same alpine belt that borders the plateau from end to end of the series.

The flat lands which extend from the base of the Alpine foothills to the shores of the Arctic Ocean, assume the character either of dry deserts, as in the Aral-Caspian depression, or of low tablelands, as in central Russia and E. Siberia, of lacustrine regions in N.W. Russia and Finland, or of marshy prairies in W. Siberia, and of tundras in the far N. Throughout the whole of this vast area, their monotonous surfaces are diversified by only a few, and, for the most part, low, hilly tracts. Recently emerged from the Post-Pliocene sea, or freed from their mantle of ice, they persistently maintain the self-same features over immense areas; and the few portions that rise above the general elevation have more the character of broad and gentle swellings than of mountain-chains. Of this class are the swampy plateaus of the Kola peninsula, sloping gently S. to the lacustrine region of Finland and N.W. Russia; the Valdai table- lands, where all the great rivers of Russia take their rise ; the broad and gently sloping meridional belt of the Ural Mountains; and lastly the Taimyr, Tunguzka and Verkhoyansk ranges in Siberia, which, notwithstanding their sub-Arctic position, do not reach the snow-Hne. The picturesque Bureya Mountains above the Amur, the forest-clad Sikhota-ahn on the Pacific, and the volcanic chains of Kamchatka belong, however, to quite another orographical construction, being the border-ridges of the terraces by which the great plateau formation descends to the depths of the Pacific Ocean. It is owing to these leading orographical features — divined by Carl Ritter, but only recently ascertained and established as fact by geographical research — that so many of the great „. rivers of the old continent are comprised within the limits . W ers < of the Russian empire. Taking their rise on the plateau formation, or in its outskirts, they flow first along lofty longitudinal valleys formerly filled with great lakes, next they cleave their way through the rocky barriers, and finally they enter the lowlands, where they become navigable, and, describing wide curves to avoid here and

there the minor plateaus and hilly tracts, they bring into water-communication with one another places thousands of miles apart. The double river-systems of the Volga and Kama, the Ob and Irtysh, the Angara and Yenisei, the Lena and Vitim on the Arctic slope, and the Amur and Sungari on the Pacific slope, are instances. These were the obvious channels of Russian colonization.

A broad depression — the Aral-Caspian desert — has arisen where the plateau formation reaches its greatest altitude, and at the same time suddenly changes its direction from N.W. to N.E. This desert is now filled to only a small extent by the salt waters of the Caspian, Aral and Balkash inland seas; but it bears unmistakable traces of having been during Post-Pliocene times an immense inland basin. There the Volga, the Ural, the Syr-darya and the Amu-darya discharge their waters without reaching the ocean, but they bring life to the rapidly desiccating Transcaspian steppes, and link together the most remote parts of Russia.

Geology. — The most striking feature in the geology of Russia is its

remarkable freedom from disturbances, either in the form of mountain folding or of igneous intrusions. Over the greater part of the

J Quaternary j Tertiary * I Cretaceous

Volgian

I Trias A Pernio- Trias

I Permian end

I Pernio- Carboniferous

3 Carboniferous

til Devonian

Silurian A other Palaeozoic Rocka 0/ t*« Caucasus

ˆ| Cambrian

country the strata are still nearly as flat as when they were first laid down, and the deposits, even of the Cambrian period, are as soft as those of the Mesozoic and Tertiary formations in England. Only in the Urals, the Caucasus, the Timan Mountains, the region of the Donets coalfield, and the Kielce Hills is there any sign of the great folding from which nearly the whole of the rest of Europe has suffered at one time or another.

In the early part of the Palaeozoic era only the gneissic region of Finland and Olonets and probably the Archean mass of S. Russia remained constantly above the sea; but there were several oscillations. Gradually, however, the sea retreated from W. Russia and in the Upper Carboniferous and Permian periods it was confined to the E.

At the beginning of the Mesozoic era the whole country became land, bearing upon its surface the salt lakes in which the Trias was laid down. During the Jurassic period the sea again invaded the region, both from the N. and from the S., but still the W. of Russia rose above the waves. In the Cretaceous period the waters with- drew from the N.E., but in the S. they spread W., covering the whole of Poland and finally uniting with the ocean in which the chalk of W. Europe was deposited. The Tertiary era was marked by a gradual extension S. of the N. land-mass. In the later stages arms of the sea were cut off and were converted at first into lagoons and then into brackish or fresh-water lakes which continued to occupy much of S. Russia until the beginning of the Quaternary period.

During the first part of the Glacial period Russia seems to have been covered by an immense ice-sheet, which extended also over central Germany, and of which the E. limits cannot yet be determined.

The Archean rocks have a broad extension in Finland, N. Russia, the Ural Mountains and the Caucasus. In S. Russia they form the floor upon which lies a thin covering of Tertiary beds, and they are exposed to view in the valleys of the Dnieper and the Bug. They consist for the most part of red and grey gneisses and granulites, with subordinate layers of granite and granitite. The Finland rappa-kivi, the Serdobol gneiss, and the Pargas and Rustiala marble (with the so-called Eozoon canadense) yield good building stone; while iron, copper and zinc-ore are common in Finland and in the Urals. Rocks regarded as representing the Huronian system appear also in Finland, in N.W. Russia, as a narrow strip on the Urals, and in the Dnieper ridge. They consist of a series of unfossiliferous crystalline slates.

The Cambrian is represented by blue clays, ungulite sandstones and bituminous slates in Esthonia and St Petersburg. The Ordo- vician and Silurian systems are widely developed, and it is most probable that, with the exception of the Archean continents of Finland and the S , the sea covered the whole of Russia. Being concealed, however, by more recent deposits, the deposits appear on the surface only in N.W. Russia (Esthonia, Livonia, St Peters- burg and on the Volkhov), where all the subdivisions of the system have been found; in the Timan ridge; on the W. slope of the Urals; in the Pai-kho ridge; and in the islands of the Arctic Ocean. In Poland the rocks of these periods are met with in the Kielce Mountains, and in Podolia in the deeper ravines.

The Devonian dolomites, limestones and red sandstones cover immense tracts and appear on the surface over a much wider area. From Esthonia these rocks extend N.E. to Lake Onega, and S.E. to Mogilev; they form .the central plateau, as also the slopes of the Urals and the Petchora region. In N.W. and middle Russia they contain a special fauna, and it appears that the Lower Devonian series of W. Europe, represented in Poland and in the Urals, is missing in N.W. and central Russia, where only the Middle and Upper Devonian divisions are found.

Carboniferous deposits occur over nearly the whole of E. Russia, their W. boundary being a line drawn from Archangel to the upper Dnieper, thence to the upper Don, and S. to the mouth of the last-named river, with a long narrow gulf extending W. to encircle the plateau of the Donets. They are visible, however, only on the W. borders of this region, being covered towards the E. by thick Permian and Triassic strata. Russia has three large coal- bearing regions — the Moscow basin, the Donets region and the Urals. In the Valdai plateau there are only a few beds of mediocre coal. In the Moscow basin, which was a broad gulf of the Carbon- iferous sea, coal appears as isolated inconstant seams amidst littoral deposits, the formation of which was favoured by frequent minor subsidences of the seacoast. The coal is here confined to the lower division of the system; the Upper Carboniferous (corre- sponding with the English Coal-Measures) is exclusively marine, consisting chiefly of Fusulina limestone. The Donets Coal-Measures, containing abundant remains of a rich land-flora, cover nearly 16,000 sq. m., and comprise a valuable stock of excellent anthracite and coal, together with iron-mines. In this basin, as in W. Europe generally, the principal coal seams occur in the Upper Carbon- iferous, while the Lower Carboniferous is mainly composed of marine deposits, with, however, the first bed of coal near its summit. Several smaller coalfields on the slopes of the Urals and on the Timan ridge may be added to the above. The Polish coalfields belong to

another Carboniferous area of deposit, which extended over Silesia.

The Permian limestones and marls occupy a strip in E. Russia of much less extent than that assigned to them by Murchison. The variegated marls of E. Russia, rich in salt-springs, but very poor in fossils, are now held by most Russian geologists to be Triassic. The Permian deposits contain marine shells and also remains of plants similar to those of England and Germany. But in the government of Vologda, on the rivers Sukhona and N. Dvina, Clossopteris, Noeggerathiopsis and other ferns characteristic of the Indian Gondwana beds have been found; and with these are numerous remains of reptiles similar to those which occur in the Indian deposits. In the Urals the marine facies is more fully developed and the fauna shows affinities with that of the Pro- ductus limestone of the Central Asian mountain belt.

During the Jurassic period the sea began again to invade Russia from S.E. and N.W. The limits of the Russian Jurassic system may be represented by a line drawn from the double valley of the Sukhona and Vytchegda to that of the upper Volga, and thence to Kieff, with a wide gulf penetrating towards the N.W. Within this space three depressions, all running S.W. to N.E., are filled up with Upper Jurassic deposits. They are much denuded in the higher parts of this region, and appear but as isolated islands in central Russia. In the S.E. all the older subdivisions are repre- sented, the deposits having the characters of a deep-sea formation in the Aral-Caspian region and on the Caucasus.

Cretaceous beds— sands, loose sandstones, marls and white chalk — occupy nearly the whole of the region S. of a line drawn from the Niemen to the upper Oka and Don, and thence N.E. to Simbirsk. Over a large part of this area, however, they are con- cealed by the later Tertiary deposits, and they are absent over the Dnieper and Don ridge in the Yaila Mountains and in the higher parts of the Caucasus. They are rich in grinding stone, and in phosphatic deposits.

The Tertiary formations occupy large areas in S. Russia. The Eocene covers wide tracts from Lithuania to Tsaritsyn, and is represented in the Crimea and Caucasus by thick deposits belong- ing to the same ocean which left its deposits on the Alps and the Himalayas. Oligocene, quite similar to that of N. Germany, and containing brown coal and amber, has been met with only in Poland, Courland and Lithuania. The Miocene (Sarmatian stage) occupies extensive tracts in S. Russia, S. of a line drawn through Lublin to Ekaterinoslav and Saratov. Not only the higher chains of Caucasus and Yaila, but also the Donets ridge, rose above the

level of the Miocene sea, which was very shallow to the N. of this last ridge, while farther S. it was connected both with the Vienna basin and with the Aral-Caspian. The Pliocene appears only in the coast region of the Black and Azov Seas, but it is widely developed in the Aral-Caspian region, where, however, the Ust-Urt and the Obshchiy Syrt rose above the sea.

The thick Quaternary, or Post-Pliocene, deposits which cover nearly all Russia were for a long time a puzzle to geologists. They consist of a boulder clay in the N. and of loess in the S. The former presents an intimate mixture of boulders brought from Finland and Olonets (with an addition of local boulders) with small gravel, coarse sand and the finest glacial mud, — the whole bearing no trace of ever having been washed up and sorted by water in motion, except in subordinate layers of glacial sand and gravel; the size of the boulders decreases on the whole from N. to §., and the boulder clay, especially in N. and central Russia, often takes the shape of ridges parallel to the direction of the motion of the boulders. Its S. limits, roughly corresponding with those estab- lished by Murchison, but not yet settled in the S.E. and E., are, according to M. Nikitin, the following: — from the S. frontier of Poland to Ovrutch, Uman, Kremenchug, Poltava and Razdornaya (50° N. latitude), with a curve N. to Kozelsk (?) ; thence due N. to Vetluga (58° N. latitude), E. to Glazova in Vyatka, and from this place towards the N. and W. along the watershed of the Volga and Pechora (?). S. of the 50th parallel appears the loess, with all its usual characters (land fossils, want of stratifica- tion, &c), showing a remarkable uniformity of composition over very large surfaces; it covers both watersheds and valleys, but chiefly the former. Such being the characters of the Quaternary deposits in Russia, the majority of Russian geologists now adopt the opinion that Russia was covered, as far as the above limits, with an immense ice-sheet which crept over central Russia and central Germany from Scandinavia and N. Russia. Another ice- covering was probably advancing at the same time from the N.E., that is, from the N. of the Urals, but the question as to the glacia- tion of the Urals still remains open. As to the loess, the usual view is that it was a steppe-deposit due to the drifting of fine sand and dust during a dry episode in the Pleistocene period.

The deposits of the Post-Glacial period are represented through- out

Russia, Poland and Finland, as also throughout Siberia and Central Asia, by very thick lacustrine deposits, which show that, after the melting of the ice-sheet, the country was covered with immense lakes, connected by broad channels (the fjdrden of the Swedes), which later on gave rise to the actual rivers. On the outskirts of the lacustrine region, traces of marine deposits, not higher than 200 or perhaps even 150 ft. above present sea-level, are found alike on the Arctic Sea and on the Baltic and Black Sea coasts. A deep gulf of the Arctic Sea advanced up the valley of the Dvina; and the Caspian, connected by the Manych with the Black Sea, and by the Uzboy valley with Lake Aral, penetrated N. up the Volga valley, as far as its Samara bend. Unmistakable traces show that, while during the Glacial period Russia had an arctic flora and fauna, the climate of the Lacustrine period was more genial than it is now, and a dense human population at that time peopled the shores of the numberless lakes.

The Lacustrine period has not yet reached its close in Russia. Finland and the N.W. hilly plateaus are still in the same geological phase, and are dotted with numberless lakes and ponds, while the rivers continue to dig out their yet undetermined channels. But the great lakes which covered the country during the Lacustrine period have disappeared, leaving behind them immense marshes like those of the Pripet and in the N.E. The disappearance of what still remains of them is accelerated not only by the general decrease of moisture, but also perhaps by the gradual upheaval of N. Russia, which is going on from Esthonia and Finland to the Kola peninsula and Novaya Zemlya, at an average rate of about two feet per century. This upheaval — the consequences of which have been felt even within the historic period, by the drainage of the formerly impracticable marshes of Novgorod and at the head of the Gulf of Finland — -together with the destruction of forests (which must be considered, however, as a quite subordinate cause), contributes towards a decrease of precipitation over Russia and towards increased shallowness of her rivers. At the same time, as the gradients are gradually increasing on account of the upheaval of the continent, Lhe rivers dig their channels deeper and deeper. Consequently central and especially S. Russia witness the formation of numerous miniature canons; or ovraghi (deep ravines), the summits of which rapidly advance and ramify in the loose surface deposits. As for the S. steppes, their desiccation, the consequence of the above causes, is in rapid progress. 1

1 Bibliography : Memoirs, Izvestia and Geological Maps of the Committee for the Geological Survey of Russia; Memoirs and Sborniks of the Mineralogical Society, of the Academy of Science and of the Societies of Naturalists at the Universities; Mining Journal;

Murchison's Geology of Russia; Helmersen's and Mdller's Geological Maps of Russia and the Urals; Inostrantsev in Appendix to Russian translation of Reclus's Geogr. Univ., and Manual of Geology (Russian).

Population. — The population of the empire, which was estimated at 74,000,000 in 1859, was found to be over- 129,200,000 at the census of 1897, taken over all the empire except Finland. In 1904 it was estimated to be 143,000,000, and in 1906, accord- ing to a detailed estimate of the Central Statistical Committee, it was 149,299,300. Thus from i860 to 1897 the population increased 74!, and from 1897 to 1904 26-3, an average annual increase of about 35 as compared with an average annual increase of 2j% during the period 1860-97. The increase took place chiefly in the large cities, in Siberia, Poland, Lithuania, S. Russia and Caucasia. The official divisions of the empire are given here, and details are given in separate articles.

Province or Government

European Russia —

Archangel

Livonia

Saratov

Astrakhan

Minsk

Simbirsk

Bessarabia

Mogilev

Smolensk

Chernigov

Moscow

Tambov

Courland

Nizhniy-Novgorod

Taurida

Don Cossacks' territory

Novgorod

Tula

Ekaterinoslav

Olonets

Tver

Esthonia

Orel

Ufa

Grodno

Orenburg

Vilna

Kaluga

Penza

Vitebsk

Kazan

Perm

Vladimir

Kiev

Podolia

Volhynia

Kostroma

Poltava

Vologda

Kovno

Pskov

Voronezh

Kursk

Ryazan

Vyatka

Kharkov

St Petersburg

Yaroslavl

Kherson

Samara

Poland — ■

Kalisz

Piotrkow

Siedlce

Kielce

Plock

Suwalki

Lomza

Radom

Warsaw

Lublin

Grand-Duchy of Finland —

Abo-Bjorneborg

St Michel

Viborg

Kuopio

Tavastehus

Vasa

Nyland

Uleaborg

Caucasia —

Kuban

Stavropol

Terek

Baku

Elizavetpol

Kutais

Black Sea territory

Erivan

Tiflis with Zaka

Daghestan

Kars

taly

Russia %n Asia —

‘Akmolinsk

.

Semipalatinsk

The Steppes

Turgai

l Uralsk

Semiryechensk

Samarkand

Turkestan —

(Ferghana (Syr-darya Transcaspia Western Siberia—

S Tobolsk Tomsk Eastern Siberia —

(Irkutsk Yakutsk

(Transbaikalia Yeniseisk

Amur Region —

(Amur

/ Maritime Province Sakhalin It has been found, from a comparison of the densities of population of the various provinces in 1859 with the distribution in 1897, that the centre of density has distinctly moved S., towards the snores of the Black Sea, and W., the greatest increase having taken place in the E. Polish and in the Lithuanian provinces, along the S.W. border, in the prairie belt beside the Black Sea, and in Orenburg. N. Caucasia and S.W. Siberia likewise show a considerable increase. The census of 1897 revealed in several provinces a remarkably low proportion of men to women. This was owing to the fact that large numbers of the men engaged in agricultural pursuits during the summer temporarily move every year into the large industrial centres for the winter. Consequently there were only 87-4 and 89-8 women to every 100 men in the governments of St Petersburg and Taurida respectively, but as many as 133-8 in Yaroslavl, 1 19 in Tver and 117 in Kostroma. The average number of women to every 100 men in the Russian governments proper was 102-9; i n Poland, 98-6; in Finland, 102-2; in Caucasia, 88-9; in Siberia, 93-7; and in Turkestan and Transcaspia, 83-0.

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Environs of ST. PETERSBURG

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RUSSIA IN EUROPE

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Capitals of Governments & Provinces –

Boundaries of Governments & Provinces… ...;,»>*.•■-•■

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Canals …….a…….’—-— A/m/pm ^^®

Swamps…….. = .j~^’

Glaciers…

Tundras..

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Emery Walker so.

The effects of emigration and immigration cannot be estimated with accuracy, because only those who cross the frontier with pass- ports are taken account of. The statistics of these show that there was during the thirty-two years, 1856-88, an excess of emigration over immigration of 1,146,052 in the case of Russians, and a surplus of immigration of 2,304,717 foreigners. On the other hand, in the six years, 1892-97, the excess of Russian emigration over immigra- tion was 207,353, as compared with an excess of foreign immigration over emigration of only 136,740. During the years 1900-4 inclusive the total emigrants from Russia numbered 2,358,539, of whom 1,144,246 were Russians; while the immigrants numbered 2,333,053, of whom 1,432,057 were foreigners. It is also known that the number of Russian immigrants into the United States in 1 891-1902 was 742,869, as compared with 313,469 in 1873-90, or a grand total since 1873 of 1,056,338. By far the greater part of these were Jews. The emigration to Siberia varies much from year to year. It was 26,129 in 1888, and 60,000 in 1898. During the two following years it amounted to an average of over 160,000, but in the years 1901-3 to an average of 84,638 per annum. Altogether some 800,000 peasants are estimated to have settled in Siberia during the period 1886-96, but during the years 1893-1905 no less than ?our millions in all. There is also some emigration from central Russia to the S. Urals, as well as to some of the steppe governments.

Within the empire a very great diversity of nationalities is com- prised, due to the amalgamation or absorption by the Slav race of a variety of Ural-Altaic stocks, of Turko-Tatars, Turko-Mongols and various Caucasian races. In some cases their ethnical relations have not yet been completely determined. According to the results obtained by the census committee of 1897, v/crking on a linguistic basis, the distribution of races was as given in the table opposite: 1 —

Taken as a whole, only 13% of the population of Russia IVed in towns in 1897, but in the years 1857-60 less than 10% was urban. CH . In Russia proper less than 2 % emigrated from the

es ‘ villages to the towns during the forty years ending 1897.

The following table shows the urban population in the various divisions of the empire in 1897: —

Urban Population.

Percentage of Total.

European Russia ….

Poland

Finland ….. Caucasia ….. Siberia ….. Central Asia ….

Russian Empire .

12,027,038

2,055,892

281,216

• 1,010,615

473-796

936,655

12-8

21-7

II-O

10-9 93

12-0

16,785,212

13-0

There were in European Russia and Poland only twelve cities with more than 100,000 inhabitants in 1884; in 1900 there were sixteen, namely, St Petersburg, Moscow, Warsaw, Odessa, Lodz, Riga, Kiev, Kharkov, Vilna, Saratov, Kazan, Ekaterinoslav, Rostov-on-the Don, Astrakhan, Tula and Kishinev. In other parts of the empire there were four cities each having over 100,000 inhabitants in that year, namely, Baku, Tiflis, Tashkent and Helsingfors. While only three of these are in

middle Russia (Moscow, Tula and Kazan), eight are in S. Russia. There are thirty-four cities in European Russia and Poland, and forty in the entire empire, with from 50,000 to 100,000 inhabitants each. The rural population live for the most part in villages, not as a rule scattered about the country. In the inclement regions of the N. and in the N. parts of the forest zone the villages are very small. They are larger, but still small, in White Russia, Lithuania and the region of the lakes; but in the steppe governments they are very appreciably bigger, some of the Cossack stanitsas or settlements exceeding 20,000, and many of them numbering more than 10,000 inhabitants each. The houses are generally built of wood and wear a poverty-stricken aspect. Owing to the great risks from fire the villages usually cover a large area of ground, and the houses are scattered and straggling. The mortality in most towns is so great that during the last ten years of the 19th century, in a very great number of cities, the deaths exceeded the births by I to 4 in the thousand. (P. A. K.; J. T. Be.)

Government and Administration. — Russia was described in the Almanack de Gotha for 1910 as ” a constitutional monarchy under an autocratic tsar.” This obvious contradiction in terms well illustrates the difficulty of defining in a single formula the system, essentially transitional and meanwhile sui generis, established in the Russian empire since October 1905. Before this date the fundamental laws of Russia described the power of the emperor as ” autocratic and unlimited.” The imperial style is still “Emperor and Autocrat of All the Russias”; but in the fundamental laws as remodelled between the imperial manifesto of 17/30 October and the opening of the first Duma

1 See A. Ai’toff, Peuples et langas.es de la Russie (Paris, 1906), based on the report of the Russian Census Committee of 1897.

on the 27th of April 1906, while the name and principle of autocracy was jealously preserved, the word ” unlimited ” vanished. Not that the regime in Russia had become in any true sense constitutional, far less parliamentary; but the ” unlimited autocracy ” had given place to a ” self-limited autocracy,” whether permanently so limited, or only at the discretion of the autocrat, remaining a subject of heated con- troversy between conflicting parties in the state. 2 Provisionally, then, the Russian governmental system may perhaps be best defined — as M. Chasles suggests 3 — as ” a limited monarchy under an autocratic emperor.”

At the head of the government is the emperor, 4 whose power is limited only by the provisions of the fundamental laws of the empire.

Of these some are ancient and undis- puted: the empire may not be partitioned, but em p etor . descends entire in order of primogeniture, and by preference to the male heir ; the emperor and his consort must belong to the Eastern Orthodox Church; the emperor can wear no crown that entails residence abroad. By the mani- festo of the i7/3oth of October 1905 the emperor voluntarily limited his legislative power by decreeing that no measure was to become law without the consent of the Imperial Duma, a freely elected national assembly. By the law of the 20th of February 1906 the Council of the Empire was associated with the Duma as a legislative Upper House; and from this time the legislative power has been exercised normally by the emperor only in concert with the two chambers.

The Council of the Empire, or Imperial Council (Gosudar- stvenniy Sovyet), as reconstituted for this purpose, consists of 196 members, of whom 98 are nominated by the emperor, The while 98 are elective. The ministers, also nominated, Council are ex officio members. Of the elected members J the , 3 are returned by the ” black ” clergy (the monks), m P re – 3 by the “white” clergy (seculars), 5 18 by the corporations of nobles, 6 by the academy of sciences and the universities, 6 by the chambers of commerce, 6 by the industrial councils, 34 by the governments having zemstvos, 16 by those having no zemstvos, and 6 by Poland. As a legislative body the powers of the Council are co-ordinate with those of the Duma; in practice, however, it has seldom if ever initiated legislation. 6

The Duma of the Empire or Imperial Duma (Gosudarstvennaya Duma), which forms the Lower House of the Russian parlia- ment, consists (since the ukaz of the 2nd of June 1907) of 442 members, elected by an exceedingly complicated Duma. process, so manipulated as to secure an overwhelming preponderance for the wealthy, and especially the landed classes, and also for the representatives of the Russian as opposed to the subject peoples. Each province of the empire, except the now disfranchised steppes of Central Asia, 7 returns a certain proportion of members (fixed in each case by system. law in such a way as to give a preponderance to the Russian element), in addition to those returned by certain of

2 M. Stolypin defended the ukaz of the 2nd of June 1907, which in flat contradiction of the provisions of the fundamental laws altered the electoral law without the consent of the legislature, on the ground that what the autocrat had granted the autocrat could take away. The members of the Opposition, on the other hand, quoting Art. 84 of the fundamental laws (” The empire is governed on the immutable basis of laws issued according to the established order “), argued that the

emperor himself could only act within the limits of the order established by those laws. It is noteworthy that even the third Duma in its address to the throne, if it avoided the tabooed word “Constitution,” avoided also all mention of autocracy.

3 Le Parlement russe, p. 151.

4 Imperalor is the official style. The Russian translation is Gosudar. Popularly, however, the emperor is known by his old Russian title of tsar (q.v.).

6 This is the first time since Peter the Great that the clergy have been given a voice in secular affairs in Russia.

6 The number of the council was formerly not fixed, and there are still honorary councillors who have no right to sit. Thus in 1910 the honorary president of the council was the grand-duke Michael Nicolaievich, the actual president M. G. Akimov. The judicial and administrative work of the old council was in 190O assigned to sepa.ate committees.

7 These returned 23 members in the first and second Dumas.

Table

showing Distribution

of Races

__ ‘ ‘ ””

Russia in Europe.

Poland.

Caucasia.

Siberia.

Central Asia.

Finland.

Totals. 1

f Great Russians .

48,558,721

267,160

1,829,793

4,423,803

587,992

5.939

55.673.408

r

„. Little Russians .

20,414,866

335,337

1,305,463

223,274

101,611

22,380,551

blavs . . J White R uss ians .

5.823,383

29,347

19,642

12,346

829

5,885,547

Poles

1,109,934

6,755,503

25,U7

29,177

11,576

7,931,307

1 Other Slavs 2 .

213,268

7,365

3,855′

182

189

224,859

Lithuanians^^™™™* ■

i,345.i6o

305,3 2 2

5,!2I

1,877

1,042

1,658,532

1,422,021

5,064

i,5″

6,714

627

1.435.937

C Rumanians .

1,121,669

5,223

7,232

1,134,124

Latin and 1 Germans

1,312,188

407,274

56,729

5.424

8,874

1,925

1,790,489

Teutonic J Greeks .

86,626

100,299

186,925

Aryans . . –

Races . Other Europeans 4 I Swedes .

29,841 14.199

1,435

349,733

34,276 363,932

Armenians .

76,635

1,096,461

4,862

1,173,096

Persians

1,630

29,278

8,015

38,923

Tajiks . .

350,397

350,397

Iranians . –

Talyshes and

Tates Kurds . Ossetes

130,347

99,836

171,716

130,347

99,836

171,716

. Gypsies

16,004

1,056

3,041

6,253

771

27,125

3.7H.995

1,267,194

40,498

32,597

7,872

5,063,156

r Esthonians ‘ .

989.883

4,372

4,281

4,202

1,002,738

Finns Lapps .

143,068 1,812

2,352,990 1,300

2,496,058 3.112

Mordvinians

989,959

20,802

13,080

1,023,841

Finns . *

Karelians Cheremisses . Syryenians . Permiaks Votyaks Other Finns 5

208,101 375.439 146,535 103,339 420,970

43,393

7.083 24.453

208,101

375.439

I53,6i8

103,339

420,970

67,846

Samoyedes .

3.940

11,929

15.869

Tatars .

1. 953. 1 55

4,336

1,509,785

210,154

60,197

3,737.627

Ural- Altaiansˆ

Chuvashes .

837.872

929

411

4.232

3ii

843,755

Bashkirs

1,488,297

83

953

978

2,672

1,492,983

Turks (Osmanlis)

68,807

156

139,419

172

268

208,822

Turko-

Turkomans .

7.938

6

24,522

124

248767

281,357

Kirghiz

264,059

123

98

32,648

3,988,893

4.084,139

4 UiUar o .

Sarts

184

158

305

968,008

968,655

Uzbegs

43

77

726,414

726,534

Yakuts

227,384

227,384

Kara-kalpaks

1

2

104,271

104,274

.Others .

466

204,561

63

518,949

724.039

Tunguses

70,064

70,064

Mongols . /Kalmucks . . 1 L Bunats

170,865

14,409

288,663

185,274 288,663

(” Georgian Races 6 .

1,352,455

1,352,455

Caucasians 4 Circassians and

[other Caucasians 1 .

1,091,782

••

1,091,782

KORYAKS, CHUKCHIS, &C. ...

39,349

39,349

Chinese, Japanese and Koreans

86,113

86,113

I TI i_i-.l-

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■ tU 4. Ul

1 These totals include in some cases small linguistic groups not mentioned in the table. ‘About 77% Bulgarians, the rest mostly Bohemians (Czechs). 3 Inclusive of 448,022 Zhmuds.

4 Principally Frenchmen, with Englishmen, Italians, Norwegians, Danes, Dutchmen and Spaniards.

6 Ethnologically the Bulgarians ought perhaps to come here; but, as a large admixture of Slav blood flows in their veins and they speak a distinctly Slav language, they have in this table been grouped with the Slavs.

6 Includes Georgians, Mingrelians, Imeretians, Lazes and Svanetians.

7 For details, see table under the heading Caucasia. Of the total given here, 20 % are Circassians.

the great cities. The members of the Duma are elected by electoral colleges in each government, and these in their turn are elected, like the zemstvos (see below), by electoral assemblies chosen by the three classes of landed proprietors, citizens and peasants. In these assemblies the large proprietors sit in person, being thus electors in the second degree; the lesser proprietors are represented by delegates, and therefore elect in the third degree. The urban population, divided into two categories according to their taxable wealth, elects delegates

direct to the college of the government (Guberniya), and is thus represented in the second degree; but the system of division into categories, according not to the number of taxpayers but to the amount they pay, gives a great preponderance to the richer classes. The peasants are represented only in the fourth degree, since the delegates to the electoral college are elected by the volosts (see below). The workmen, finally, are specially treated. Every industrial concern employing fifty ! hands or over elects one or more delegates to the electoral

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46

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SOUTHERN RUSSIA

Scale. 1:5,750,000 Eiif-lish Miles

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60 So 100 i;<

Capitals of Governments & Provinces.

Boundaries of Governments & Provinces fortifications …¥r Railways .

YwylgachV” **”” Sch(Jnbrur.nP» S kˆ’ l ˆˆA % / % “ ˆ\ˆV

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46

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college of the government, in which, like the others, they form a separate curia.

In the college itself the voting — secret and by ballot through- out — is by majority; and since this majority consists, under the actual system, of very conservative elements (the landowners and urban delegates having fths of the votes), the progres- sive elements — however much they might preponderate in the country — would have no chance of representation at all save for the curious provision that one member at least in each government must be chosen from each of the five classes represented in the college. For example, were there no re- actionary peasant among the delegates, a reactionary majority might be forced to return a Social Democrat to the Duma. As it is, though a fixed minimum of peasant delegates must be returned, they by no means probably represent the opinion of the peasantry. That in the Duma any Radical elements survive at all is mainly due to the peculiar franchise enjoyed by the seven largest towns — St Petersburg, Moscow, Kiev, Odessa, Riga and the Polish cities of Warsaw and Lodz. These elect their delegates to the Duma direct, and though their votes are divided into two curias (on the basis of taxable property) in such a way as to give the advantage to wealth, each returning the same number of delegates, the democratic colleges can at least return members of their own complexion. 1

The competence of the Russian parliament 2 thus constituted is strictly limited. It shares with the emperor the legislative Powers power, including the discussion and sanctioning of 0/ the the budget. But, so far as the parliament is concerned, Duma. this power is subject to numerous and important exceptions. All measures, e.g. dealing with the organization of the army and navy are outside its competence; these are no longer called ” laws ” but ” ordinary administrative rules.” Moreover, the procedure of the Houses practically places the control of legislation in the hands of ministers. Any member may bring in a ” project of law,” but it has to be submitted to the minister of the department concerned, who is allowed a month to consider it, and himself prepares the final draft laid on the table of the House. Amendments, however, may be and have been carried against the government. Ministers are responsible, moreover, not to parliament but to the emperor. They may be interpellated, but only on the

legality, not the policy, of their acts. In the words of M. Stolypin, there is no intention of converting the ministerial bench into a prisoners' dock. If by a two-thirds majority the action of a minister be arraigned, the president of the Imperial Council lays the case before the emperor, who decides. The powers of the parliament over the budget are even more limited, though not altogether illusory. No legislation by means of the budget is allowed, i.e. no alteration may be made in credits necessary for carrying out a law. This deprives parliament of control over the administrative departments, all the ministries being thus " armour-plated " — to use the cant phrase current in Russia — except that of ways and communications (railways). The sum of 700,000,000 roubles per annum is thus excepted from the control of the chambers. Other exceptions are the " Institutions of the Empress Marie," which absorb, tnter alia, the duties on playing-cards and the taxes on places of public entertainment; the imperial civil list, so far as this does not exceed the sum fixed in 1906 (16,359,595 roubles!); the ex- penses of the two imperial chanceries, 10,000,000 roubles per annum, which constitute in effect a secret service fund. Al- together, half the annual expenditure of the country is outside the control of parliament. Nor is this all. If the budget be not sanctioned by the emperor, that of the previous year remains in force, and the government has power, motu proprio, to impose the extra taxes necessary to carry out new laws. In certain circum- stances, too, the emperor reserves the right to raise fresh loans.

1 Thus M. Guchkov, leader of the Octobrists, and M. Miliukov, leader of the cadets, were both returned by the second curia of St Petersburg to the third Duma.

s Strictly speaking, the title is inapplicable, there being no col- lective official name for the two chambers. The word parliament may, however, be used as a convenient term, failing a better.

Further, the emperor has the power to issue ordinances having the force of law, i.e. under extraordinary circumstances when the Duma is not sitting. These ordinances must, how- ever, be of a temporary nature, must not infringe the funda- mental laws or statutes passed by the two chambers, or change the electoral system, and must be laid upon the table of the Duma at the first opportunity. Since, however, the emperor has the power of proroguing or dissolving the Duma as often as he pleases, it is clear that these temporary ordinances might in effect be made permanent. Finally, the emperor has the right to proclaim anywhere and at any time a state of siege. In this way the fundamental laws were suspended not only in Poland but in St Petersburg and other parts of the empire during the greater part of the

four years succeeding the grant of the constitution.

It should be noted, none the less, that the third Duma suc- ceeded in establishing its position, and that in view of its useful activities even the extreme Right came to realize that there could be no return to the old undisguised absolutist regime (see History, below, ad fin.).

By the law of the 18th of October (November 1) 1905, to

assist the emperor in the supreme administration a Council

of Ministers (Sovyet Ministrov) was created, under a „

... .\ / ., £ . ‘ , ‘ . Councilor

minister president, the first appearance of a prime Ministers.

minister in Russia. This council consists of all the ministers and of the heads of the principal administrations. The ministries are as follows: (1) of the Imperial Court, to which the administration of the apanages, the chapter of the imperial orders, the imperial palaces and theatres, and the Academy of Fine Arts are subordinated; (2) Foreign Affairs; (3) War and Marine; (4) Finance; (5) Commerce and Industry (created in 1905); (6) Interior (including police, health, censorship and press, posts and telegraphs, foreign religions, statistics); (7) Agriculture; (8) Ways and Com- munications; (9) Justice; (10) Public Instruction. Dependent on the Council of Ministers are two other councils: the Holy Synod and the Senate.

The Holy Synod (established in 1721) is the supreme organ of government of the Orthodox Church in Russia. It is presided over by a lay procurator, representing the emperor, and consists, for the rest, of the three Synod metropolitans of Moscow, St Petersburg and Kiev, the archbishop of Georgia, and a number of bishops sitting in rotation.

The Senate (Pravitelstvuyushchi Senat, i.e. directing or governing senate), originally established by Peter the Great, consists of members nominated by the emperor. Its functions, which are exceedingly various, are carried senate out by the different departments into which it is divided. It is the supreme court of cassation (see Judicial System, below); an audit office, a high court of justice for all political offences; one of its departments fulfils the functions of a heralds’ college. It also has supreme jurisdiction in all disputes arising out of the administration of the empire, notably differences between the representatives of the central power and the elected organs of local self-government. Lastly, it examines into registers and promulgates

new laws, a function which, in theory, gives it a power, akin to that of the Supreme Court of the United States, of rejecting measures not in accordance with the fundamental laws.

For purposes of provincial administration Russia is divided into 78 governments (guberniya), 18 provinces (oblast) and 1 district (okrug). Of these n governments, 17 pˆ,. provinces and 1 district (Sakhalin) belong to Asiatic vincial Russia. Of the rest 8 governments are in Finland, ˆ a ‘ˆ/” is ‘ 10 in Poland. European Russia thus embraces 59 governments and 1 province (that of the Don). The Don province is under the direct jurisdiction of the ministry of war; the rest have each a governor and deputy -governor, the latter presiding over the administrative council. In addition there are governors-general, generally placed over several governments and armed with more extensive powers,

usually including the command of the troops within the limits of their jurisdiction. In 1906 there were governors-general in Finland, Warsaw, Vilna, Kiev, Moscow and Riga. The larger cities (St Petersburg, Moscow, Odessa, Sevastopol, Kertch- Yenikala, Nikolayev, Rostov) have an administrative system of their own, independent of the governments; in these the _ .. chief of police acts as governor. As organs of the

central government there are further, the ispravniki, chiefs of police in the districts into which the governments are divided. These are nominated by the governors, 1 and have under their orders in the piincipal localities commissaries (stanovoi pristav). Ispravniki and stanovoi alike are armed with large and ill-defined powers; and, since they are for the most part illiterate and wholly ignorant of the law, they have proved exasperating engines of oppression. Towards the end of the reign of Alexander II., the government, in order to preserve order in the country districts, also created a special class of mounted rural policemen (uryadniki, from uriad, order), who, armed with power to arrest all suspects on the spot, rapidly became the terror of the countryside. 2 Finally, in the towns every house is provided with a detective policeman in the person of the porter (dvornik), who is charged with the duty of reporting to the police the presence of any suspicious characters or anything else that may interest them. 3

In addition to the above there is also a police organization, in direct subordination to the ministry of the interior, of which the principal function is the discovery, pre- poiice. vention and extirpation of political sedition. A secret police, armed with inquisitorial and arbitrary powers, has always existed in autocratic Russia. Its most famous development was the so-called ” Third Section ” (of the imperial chancery) instituted by the emperor Nicholas I. in 1826. This was entirely independent of the ordinary police, but was associated with the previously existing corps of gendarmes (Korpus Zhandarmov), whose chief was placed at its head. Its object had originally been to keep the emperor in close touch with all the branches of the administration and to bring to his notice any abuses and irregularities (see Nicholas I.), and for this purpose its chief was in constant personal intercourse with the sovereign. Actually, however, its activity, directed mainly to the discovery of political offences, degenerated into a hideous reign of terror. Its organization was spread all over Russia; its procedure was secret and summary (transportation by administrative order) ; and, its instruments being for the most part ignorant and largely corrupt, its victims were counted by thousands.

The ” Third Section ” was suppressed by Alexander II. in 1880, but only in name. In fact it was transformed into a separate department of the ministry of the interior, and, provided with an enormous secret service fund, soon dominated the whole ministry. The corps of gendarmes was also incor- porated in this department, the under-secretary of the interior being placed at its head and at that of the police generally, with practically unlimited jurisdiction in all cases which, in the judgment of the minister of the interior, required to be dealt with by processes outside the ordinary law. In 1896 the powers of the minister were extended at the expense of those of the under-secretary, who remained only at the head of the corps of gendarmes; but by a law of the 24th of September 1904 this was again reversed, and the under-secretary was again placed at the head of all the police with the title of under- secretary for the administration of the police.

Local Elected Administrative Bodies. — Alongside the local organs of the central government in Russia there are three classes of local elected bodies charged with administrative functions: (1) the peasant assemblies in the mir and the volost,

1 From Catherine II. ‘s time to that of Alexander II. they were elected by the nobles. This was changed in consequence of the emancipation of the serfs.

2 They were soon nicknamed Kuryadniki, chicken-stealers (from Kura, hen). See Leroy-Beaulieu, L'Empire des tsars, ii. 134.

- The dvornik is on duty for sixteen hours at a stretch, during which he is not allowed to sleep or even to shelter in the porch.

The volost

(2) the zemstvos in the 34 governments of Russia proper,

(3) the municipal dumas. Of these the peasant assemblies are the most interesting and in some respects the most important, since the peasants {i.e. three-quarters of the population of Russia) form a class apart, 4 largely excepted from _. . the incidence of the ordinary law, and governed in accordance with their local customs. The mir itself, with its customs, is of immemorial antiquity (see Village Communities) ; it was not, however, till the emancipation of the serfs in 1861 that the village community was withdrawn from the patrimonial jurisdiction of the landowning nobility and endowed with self-government. The assembly of the mir consists of all the peasant householders of the village. 5 These elect a head-man (starosta) and a collector of taxes, who was responsible, at least until the ukaz of October 1906, which abolished communal responsibility for the payment of taxes, for the repartition among individuals of the taxes imposed on the commune. A number of mirs are united into a volost, or canton, which has an assembly consisting of elected delegates from the mirs. These elect an elder (starskina) and, hitherto, a court of justice (volostnye sud). See Judicial System, below. The self-government of the mirs and volosts is, however, tempered by the authority of the police commissaries (stanovoi) and by the power of general oversight given to the nominated " district committees for the affairs of the peasants."

The system of local self-government is continued, so far as the 34 governments of old Russia are concerned, 6 in the elective district and provincial assemblies (zemstvos). These bodies, one for each district and another for zems t Y os. each province or government, were created by Alex- ander II. in 1864. They consist of a representative council (zemskoye sobranye) and of an executive board (zemskaya uprava) nominated by the former. The board consists of five classes of members: (1) large landed proprietors (nobles owning 590 acres and over), who sit in person; (2) delegates of the small landowners, including the clergy in their capacity of landed proprietors; (3) delegates of the wealthier townsmen; (4) delegates of the less wealthy urban classes; (5) delegates of the peasants, elected by the volosts?

The rules governing elections to the zemstvos were taken as a model for the electoral law of 1906 and are sufficiently indicated by the account of this given below. The zemstvos were originally given large powers in relation to the incidence of taxation, and such questions as education, public health, roads and the like. These* powers were, however, severely restricted by the emperor Alexander III. (law of 12/25 June 1890), the zemstvos being absolutely subordinated to the governors, whose consent was necessary to the validity of all their decisions, and who received drastic powers of discipline over the members. 8 It was not till 1905 that the zemstvos regained, at least de facto, some of their inde- pendent initiative. The part played by the congress of zemstvos in the earlier stages of the Russian revolution is outlined below (see History: § 2. Development of the Russian Constitution).

4 Until the ukaz of October 18, 1906, the peasant class was stereo- typed under the electoral law. No peasant, however rich, could qualify for a vote in any but the peasants' electoral colleges. The ukaz allowed peasants with the requisite qualifications to vote as landowners. At the same time the Senate interpreted the law so as to exclude all but heads of families actually engaged in farming from the vote for the Duma.

6 None but peasants — not even the noble-landowner — has a voice in the assembly of the mir.

6 Sixteen provinces have no zemstvos, i.e. the three Baltic pro- vinces, the nine western governments annexed from Poland by Catherine II., and the Cossack provinces of the Don, Astrakhan, Orenburg and Stavropol.

7 By the law of the 12th (25th) of June 1890 the peasant members of the zemstvos were to be nominated by the governor of the govern- ment or province from a list elected by the volosts.

8 In spite of these restrictions and of an electoral system which tended to make these assemblies as strait-laced and reactionary as any government bureau, the zemstvos did good work, notably educational, in those provinces where the proprietors were inspired with a more liberal spirit. Many zemstvos also made extensive and valuable inquiries into the condition of agriculture, industry

I and the like.

JUDICIAL SYSTEM]

Since 1870 the municipalities in European Russia have had institutions like those of the zemstvos. All owners of houses,

and tax-paying merchants, artisans and workmen dumas. are enrolled on lists in a descending order according

to their assessed wealth. The total valuation is then divided into three equal parts, representing three groups of electors very unequal in number, each of which elects an equal number of delegates to the municipal duma. The executive is in the hands of an elective mayor and an uprava, which consists of several members elected by the duma. Under Alexander III., however, by laws promulgated in 1892 and 1894, the municipal dumas were subordinated to the governors in the same way as the zemstvos. In 1894 municipal institutions, with still more restricted powers, were granted to several towns in Siberia, and in 1895 to some in Caucasia.

In the Baltic provinces (Courland, Livonia and Esthonia) the landowning classes formerly enjoyed considerable powers

of self-government and numerous privileges in matters provinces. Meeting education, police and the administration of

local justice. But by laws promulgated' in 1888 and 1889 the rights of police and manorial justice were transferred from the landlords to officials of the central government. Since about the same time a process of rigorous Russification has been carried through in the same provinces, in all departments of administration, in the higher schools and in the university of Dorpat, the name of which was altered to Yuriev. In 1893 district committees for the management of the peasants' affairs, similar to those in the purely Russian governments, were intro- duced into this part of the empire.

Judicial System. — Not the least valuable of the gifts of the " tsar emancipator," Alexander II., to Russia was the judicial System system established by the statute (Sudebni Ustav) of before the 20th of November 1864. The system which this ,864 ' superseded was not indigenous to Russia, but had

been set up by Peter the Great, who had taken as his model the inquisitorial procedure at that time in vogue on the continent of western Europe. Both civil and criminal procedure were secret. All the

proceedings were conducted in writing, and the judges were not confronted with either the parties or the witnesses until they emerged to deliver judg- ment. This secrecy, combined with the fact that the judges were very ill paid, led to universal bribery and corruption. To check this courts were multiplied (there were five, six or more instances), which only multiplied the evil. Documents accumu- lated from court to court, till none but the clerks who had written them could tell their gist; costs were piled up; and all this, combined with the confusion caused by the chaotic mass of imperial ukazes, ordinances and ancient laws — often inconsistent or flatly contradictory — made the administration of justice, if possible, more dilatory and capricious than in the old, unreformed English court of chancery. Above all, there was no dividing line between the judiciary and the administrative functions. The judges were not so by profession; they were merely members of the official class (chinovniks) , the prejudices and vices of which they shared.

Of this system — except so far as the confusion of the laws is concerned — the reform of 1864 made a clean sweep. The new

system established — based partly on English, partly 1864. on F renc h models — was built up on certain broad

principles: the separation of the judicial and ad- ministrative functions, the independence of the judges and courts, the publicity of trials and oral procedure, the equality of all classes before the law. Moreover, a democratic element was introduced by the adoption of the jury system and — so far as one order of tribunal was concerned — the election of judges. The establishment of a judicial system on these principles constituted, as M. Leroy-Beaulieu justly observes, a funda- mental change in the conception of the Russian state, which, by placing the administration of justice outside the sphere of the executive power, ceased to be a despotism. This fact made the new system especially obnoxious to the bureaucracy, and during the latter years of Alexander II. and the reign of

Alexander III. there was a piecemeal taking back of what had been given. It was reserved for the third Duma, after the revolution, to begin the reversal of this process. 1

The system established by the law of 1864 is remarkable in that it set up two wholly separate orders of tribunals, each having their own courts of appeal and coming in contact only in the senate, as the supreme court of cassation. The first of these, based on the English model, are the courts of the elected justices of the peace, with

jurisdiction over petty causes, whether civil or criminal; the second, based on the French model, are the ordinary tribunals of nominated judges, sitting with or without a jury to hear important cases.

The justices of the peace, who must be landowners 2 or (in towns) persons of moderate property, are elected by the municipal dumas in the towns, and by the zemstvos justices in the country districts, for a term of three years. of the They are of two classes: (1) acting justices (uchastokvye P e ˆ c ˆ mirovye sudi); (2) honorary justices (pochetnye mirovye sudi). The acting justice sits normally alone to hear, causes in his canton of the peace (uchastok), but, at the request of both parties to a suit, he may call in an honorary justice as assessor or substitute. 3 In all civil cases involving less than 30 roubles, and in criminal cases punishable by no more than three days' arrest, his judgment is final. In other cases appeal can be made to the " assize of the peace " (mirovye syezd), consisting of three or more justices of the peace meeting monthly (cf. the English quarter sessions), which acts both as a court of appeal and of cassation. From this again appeal can be made on points of law or disputed procedure to the senate, which may send the case back for retrial by an assize of the peace in another district.

The ordinary tribunals, in their organization, personnel and procedure, are modelled very closely on those of France (see France, Law and Institutions). From the town The judge (ispravnik), who, in spite of the principle laid ordinary down in 1864, combines judicial and administrative tribunals – functions, an appeal lies (as in the case of the justices of the peace) to an assembly of such judges; from these again there is an appeal to the district court (okrugniya sud), consisting of three judges; 4 from this to the court of appeal (sudebniya palata); while over this again is the senate, which, as the supreme court of cassation, can send a case for retrial for reason shown. The district court, sitting with a jury, can try criminal cases without appeal, but only by special leave in each case of the court of appeal. The senate, as supreme court of cassation, has two departments, one for civil and one for criminal cases. As a court of justice its main drawback is that it is wholly unable to cope with the vast mass of documents representing appeals from all parts of the empire.

Two important classes in Russia stood more or less outside the competence of the above systems: the clergy and the peasants. The ecclesiastical courts still retain a Ecclesl- jurisdiction over the clergy which they have lost asthal elsewhere in Europe; and in them the old secret courts. written procedure survives. Their interest for the laity lies

1 An ukaz of 1879 gave the governors the right to report secretly on the qualifications of candidates for the office of justice of the peace. In 1889 Alexander III. abolished the election of justices of the peace, except in certain large towns and some outlying parts of the empire, and greatly restricted the right of trial by jury._ The confusion of the judicial and administrative functions was introduced again by the appointment of officials as judges. In 1909 the third Duma restored the election of justices of the peace.

2 The justices, though noble-landowners, are almost exclusively of very moderate means, and, though elected by the land-owning class, they are — according to M. Leroy-Beaulieu — prejudiced in favour of the poor mujik rather than of the wealthy landlord.

3 These honorary justices are mainly recruited from the ranks of the higher bureaucracy and the army.

4 This corresponds to the French cour d' arrondissement, but its jurisdiction is, territorially, much wider, often covering several districts or even a whole government.

mainly in the fact that marriage and divorce fall within their competence; and their reform has been postponed largely because the wealthy and corrupt society of the Russian capital preferred a system which makes divorce easily purchasable and avoids at the same time the scandal of publicity. The case of the peasants is more interesting, and deserves a some- what more detailed notice.

The peasants, as already stated, form a class apart, untouched by the influence of Western civilization, the principles of which they are quite incapable of understanding or appreci- courts. ating. This fact was recognized by the legislators of 1864, and beneath the statutory tribunals created in that year the special courts of the peasants were suffered to survive.' These were indeed but a few years older. Up to 1 86 1, the date of the emancipation, the peasant serfs had been under the patrimonial jurisdiction of their lords. The edict of emancipation abolished this jurisdiction, and set up instead in each volost a court particular to the peasants (volostnye sud), of which the judges and jury, themselves peasants, were elected by the assembly of the volost (volostnye skhod) each year. In these courts the ordinary written law

had little to say; the decisions of the volost courts were based on the local customary law, which alone the peasants, and the peasants alone, under- stand. The justice administered in them was patriarchal and rough, but not ineffective. All civil cases involving less than 100 roubles value were within their competence, and more important cases by consent of the parties. They acted also as police courts in the case of petty thefts, breaches of the peace and the like. They were also charged with the mainten- ance of order in the mir andthe family, punishing infractions of the religious law, husbands who beat their wives, and parents who ill-treated their children. The penalty of flogging, pre- ferred by the peasants to fine or imprisonment, was not unknown. The judges were, of course, wholly illiterate, and this tended to throw the ultimate power into the hands of the clerk (pisar) of the court, who was rarely above corruption.

In 1880, according to the observations of M. Leroy-Beaulieu, 1 the fines inflicted by the court were commonly paid in vodka, which was consumed on the premises by the judges and the parties to the suit; there is no reason to suppose that this amiable custom has been abandoned.

The peasants are not compelled to go to the volost court. They can apply to the police commissaries (stanovoi) or to the justices of the peace; but the great distances to be traversed in a country so sparsely populated makes this course highly inconvenient. 2 On the other hand, from the volost court there is no appeal, unless it has acted ultra vires or illegally. In the latter case a court of cassation is provided in the district com- mittee for the affairs of the peasants (Uyezdnoe po krestianskim dolam prisutslviye) , which has superseded the assembly of arbiters of the peace (mirovye posredniki) established in 1866. 3

(W. A. P.)

Previous to the revolution of 1905 but little progress had been made in Russia as regards education. 4 Distrust of the natural sciences, _. even in their technical applications, and of Western

ti ‘a*’ ideas of free government; desire to make university education, and even secondary education, a privilege of the wealthier classes; neglect of primary education, coupled with suppression by the ministry of public instruction of all initia- tive, private and public, in the matter of disseminating education among the illiterate classes — these were the distinctive features of the educational policy of the last twenty years of the 19th century.

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1 L'Empire des tsars, ii. p. 310.

2 In the ordinary tribunals weight is given to the " customs " of the peasants, even when these conflict with the written law.

3 The abolition of the special courts of the peasants was an- nounced in the same imperial ukaz (18th of October 1906) which promised the relief of the peasants from the arbitrary control of the communes, and permission for them to migrate elsewhere without losing their communal rights. This was made part of the general reform of Russian local government, which in the autumn of 1910 was still under the consideration of the Duma.

4 Of the effects of the political changes in Russia on the educa- tional system of the country it was, even in the autumn of 1910, too early to say anything save that an undoubted impetus had

It was only towards its close that a change took place in the attitude of the government towards technical education, and a few high and middle technical schools were opened. It was only then, too, that a reform was started in secondary education, with the object of revising the so-called " classical " system favoured in the lyceums since the 'seventies, the complete failure of which has been demonstrated after nearly thirty years of experiment. Apart from the schools under the ministry of war (Cossack voiskos and schools at the barracks), the great bulk of the primary schools are either under the ministry of public instruction or of the Holy Synod. Those under the latter body are of recent growth, the policy of the last twenty years of the 19th century having been to hand over the budget allowances for primary instruction to the Holy Synod, which opened parish schools under the local priests. The schools under the Synod are themselves divided into two categories: parish schools and reading schools of an inferior grade. No teaching certificate is required by the teachers in either class of school, the permission of the bishop (like the French lettre d' obedience of 1849) being sufficient. The conse- quence is, that the village priests, being too much occupied with their parochial duties, cannot give more than casual or perfunctory attention to the schools, and the numerous pupils either exist on paper only, or are handed over to half-educated cantors, deacons or hired teachers. One good feature of the Russian primary school system, however, is that in many villages there are school gardens or fields; in nearly 1000 schools, bee-keeping, and in 300 silkworm culture is taught; while in some 900 schools the children receive instruction in various trades;

and in 300 schools in slojd (a system of manual training originated in Finland). Girls are taught handwork in many schools. Nearly 50 % of the teachers are women. The total expenditure on primary schools in 1900 was £5.300,000 (about the average in recent years), of which 20% was supplied by the state, 23% by the zemstvos, 35!% by the village communities and the municipalities and n J % by private persons. The middle schools are maintained by the state, which contributes 25% of the expenditure of the classical and technical schools, by the fees of the pupils (30%), and by donations from the zemstvos and municipalities. The total grants from the state exchequer for education of all grades in all parts of the empire amounted in 1906 to £8,107,000. The progress of primary educa- tion is illustrated by the fact that, while in 1885 there was one school for every 2665 inhabitants and one pupil for every 48 inhabitants, in 1898 the figures were 1643 and 31 inhabitants respectively. According to the census of 1897 the number of illiterates varied from 89-2 to 44-9% of the population in the rural districts, and from 63-6 to 37-2 % in the urban.

For higher education there were in 1904 only 9 universities (Yuriev or Dorpat, Kazan, Kharkov, Kiev, Moscow, Odessa, St Petersburg, Warsaw and Tomsk), with 19,400 students, 6 medical academies (one for women), 6 theological academies, 6 military academies, 5 philological institutes, 3 Eastern languages institutes, 3 law schools, 4 veterinary institutes, 4 agricultural colleges, 2 mining institutes, 4 engineering institutes, 2 universities for women (930 students at St Petersburg), 3 technical pedagogic schools, 10 technical institutes, 1 forestry and 1 topographical school. There has, however, been much activity since 1905 in the establish- ment of new educational institutions, notably technical and com- mercial schools, which are placed under the new minister of commerce and industry. Finland has a university of its own at Helsingfors.

The standard of teaching in the universities is on the whole very high, and may be compared to that of the German universities. The students are hard working, and generally very intelligent. Mostly sons of poor parents, they live in extreme poverty, sup- porting themselves chiefly by translating and by tutorial work. The state of secondary education still leaves much to be desired. The steady tendency of Russian society towards increasing the number of secondary schools, where instruction would be based on the study of the natural sciences, is checked by the government in favour of the classical gymnasiums. 5 Sunday schools and public lectures are virtually prohibited.

A characteristic feature of the intellectual movement in Russia is its

tendency to extend to women the means of higher instruction. The gymnasiums for girls are both numerous and good. In addi- tion to these, notwithstanding government opposition, a series

been given to the effort for improvement, and that the question had been seriously taken in hand by the imperial administration and the Duma. What form it would ultimately take depended still on the balance between the forces of conservatism and change, the suspicious temper of the autocracy being revealed, during the years of unstable equilibrium, by the alternate concession and with- drawal of privileges, e.g. in the matter of the independence of the universities. Any account of the educational system cannot, therefore, be otherwise than historical and provisional [Ed.].

5 An imperial rescript of 10th of June 1902 foreshadowed a re-organization of secondary education, and an imperial ukaz of 15th of March 1903 laid down the lines on which this was to proceed. The old curriculum of the Real schools is now superseded.

of higher schools, in which careful instruction is given in natural and social sciences, have been opened in the chief cities under the name of ” pedagogical courses.” At St Petersburg a women’s medical academy, the examinations of which were even more searching than those of the ordinary academy (especially as regards diseases of women and children), was opened, but after about one hundred women had received the degree of M.D. it was suppressed by government. In several university towns there are free teaching establishments for women, supported by subscription, with pro- grammes and examinations equal to those of the universities.

The natural sciences are much cultivated in Russia. Besides the Academy of Science, the Moscow Society of Naturalists, the _. ... Mineralogical Society, the Geographical Society, with its

/”<. Caucasian and Siberian branches, the archaeological

societies and the scientific societies of the Baltic pro- vinces, all of which are of old and recognized standing, there have lately sprung up a series of new societies in connexion with each university, and their serials are yearly growing in importance, as, too, are those of the

Moscow Society of Friends of Natural Science, the Chemico-Physical Society, and various medical, educational and other associations. The work achieved by Russian savants, especially in biology, physiology and chemistry, and in the sciences descriptive of the vast territory of Russia, is well known to Europe.

The ordinary revenue of the empire is in excess of the ordinary expenditure, but the extraordinary expenditure not only swallows Finance up t ‘ 1 ‘ s sur P’ us > but necessitates the raising of fresh loans every year. On the other hand, there is a good deal to show for this extraordinary expenditure. A considerable number of new railways, including the Siberian, have been built with money obtained from that source. But since 1894 all extra- ordinary items of expenditure, with the exception of those for the construction of new lines of railway, have been defrayed out of ordinary revenue. The only sources of extraordinary revenue still remaining under that head are the money derived from loans and the perpetual deposits in the Imperial Bank. The ordinary revenue, obtained principally from the sale of spirits (28%), which is a state monopoly, from state railways (23ˆ%) and customs (10$%), steadily rose from a total of £132,750,000 in 1895 to a total of £214,360,000 in 1905. Other noteworthy sources of revenue are trade licences, direct taxes on lands and forests, stamp duties, posts and telegraphs, indirect taxes on tobacco, sugar and other commodities, the crown forests, and land redemption payable annually by the peasants since 1861. At the same time the total ordinary expenditure has increased at a similarly steady rate, namely, from £119,391,000 in 1895 to £202,544,000 in 1905. In 1904, 81 j % of the extraordinary expenditure, namely, £71,550,000, was incurred in consequence of the war with Japan, and to this must be added in 1906 a further expenditure of £42,085,000. The total national debt of Russia nearly trebled between 1852 (£57.038,600) and 1862 (£145,500,000), and again between 1872 (£242,277,000) and 1892 (£526,109,000) it more than doubled, while by 1906 it amounted altogether to £812,040,000. Of the total, 77 % stands at 4% and 17 at less than 4%.

The system of obligatory military service for all, introduced in 1874, has been maintained, but the six years’ term of service has Army been reduced to five, while the privileges granted to

young men who have received various degrees of education have been slightly extended. During the reign of Alexander III. efforts were mainly directed towards — (1) reducing the time required for the mobilization of the army; (2) increasing the immediate readiness of cavalry for war and its fitness for serving as mounted infantry

(dragoon regiments taking the place of hussars and lancers) ; (3) strengthening the W. frontier by fortresses and railways; and (4) increasing the artillery, siege and train reserves. Further, the age releasing from service was raised from 40 to 43 years and the militia (landsturm) was reorganized. The measures taken during the reign of Nicholas II. have been chiefly directed towards increasing the fighting capacity and readiness for im- mediate service of the troops in Asia, and towards the better re- organization of the local irregular militia forces. Broadly speaking, the army is divided into regulars, Cossacks and militia. The peace strength of the army is estimated at 42,000 officers and 1,100,000 men (about 950,000 combatants), while the war strength is approximately 75,000 officers and 4,500,000 men. However, this latter figure is merely nominal, the available artillery and train service being much below the strength which would be required for such an army; estimates which put the military forces of Russia in time of war at 2,750,000 — irrespective of the armies which may be levied during the war itself — seem to approach more nearly the strength of the forces which could actually be mustered. The infantry and rifles are armed with small-bore magazine rifles, and the active artillery have steel breech-loaders with extreme ranges of 4150 to 4700 yds.

Before the Japanese war Russia maintained four separate squadrons: the Baltic, the Black Sea, the Pacific and the Caspian. N But in the operations before Port Arthur and in the

yy ‘ disastrous battle of Tsushima the Russian fleets were

almost completely annihilated. The bulk of the Black Sea fleet and a few other battleships were, however, still left, and since 1904

Boun- daries.

steps have been taken to build new ships, both battleships and powerful cruisers. Kronstadt is the naval headquarters in the Baltic, Sevastopol in the Black Sea and Vladivostok on the Pacific.

Fortresses. — The chief first-class fortresses of Russia are Warsaw and Novogeorgievsk in Poland, and Brest-Litovsk and Kovno in Lithuania. The second-class fortresses are Kronstadt and Sveaborg in the Gulf of Finland, Ivangorod in Poland, Libau on the Baltic Sea, Kerch on the Black Sea and Vladivostok on the Pacific. In the third class are Viborg in Finland, Ossovets and Ust Dvinsk (or Dunamunde) in Lithuania, Sevastopol and Ochakov on the Black Sea, and Kars and Batum in Caucasia. There are, more over, 46 forts and fortresses unclassed, of

which 6 are in Poland, 8 in W. and S.W. Russia, and the remainder (mere fortified posts) in the Asiatic dominions.

II. European Russia

Geography. — The administrative boundaries of European Russia, apart from Finland, coincide broadly with the natural limits of the East-European plains. In the N. it is bounded by the Arctic Ocean; the islands of Novaya- Zemlya, Kolguyev and Vaigach also belong to it, but the Kara Sea is reckoned to Siberia. To the E. it has the Asiatic dominions of the empire, Siberia and the Kirghiz steppes, from both of which it is separated by the Ural Mountains, the Ural river and the Caspian— the administrative boundary, however, partly extending into Asia on the Siberian slope of the Urals. To the S. it has the Black Sea and Caucasia, being separated from the latter by the Manych depression, which in Post-Pliocene times connected the Sea of Azov with the Caspian. The W. boundary is purely conventional: it crosses the peninsula of Kola from the Varanger Fjord to the Gulf of Bothnia; thence it runs to the Kurisches Haff in the southern Baltic, and thence to the mouth of the Danube, taking a great circular sweep to the W. to embrace Poland, and separating Russia from Prussia, Austrian Galicia and Rumania.

It is a special feature of Russia that she has no free outlet to the open sea except on the ice-bound shores of the Arctic Ocean. Even the White Sea is merely a gulf of that ocean. The deep indentations of the gulfs of Bothnia and Finland are surrounded by what is ethnologically Finnish territory, and it is only at the very head of the latter gulf that the Russians have taken firm foothold by erecting their capital at the mouth of the Neva. The Gulf of Riga and the Baltic belong also to territory which is not inhabited by Slavs, but by Finnish races and by Germans. It is only within the last hundred and thirty years that the Russians have definitely taken possession of the N. shores of the Black Sea and the Sea of Azov. The E. coast of the Black Sea belongs properly to Transcaucasia, a great chain of mountains separating it from Russia. But even this sheet of water is an inland sea, the only outlet of which, the Bosphorus, is in foreign hands, while the Caspian, an immense shallow lake, mostly bordered by deserts, possesses more importance as a link between Russia and her Asiatic settlements than as a channel for inter- course with other countries.

The great territory occupied by European Russia — 1600 m. in length from N. to S., and nearly as much from E. to W. — is on the whole a broad elevated plain, ranging between 500 and 900 ft. above sea-level, deeply cut into by river- valleys, and bounded on all sides by

broad swellings C ˆJ; or low mountain-ranges: the lake plateaus of Finland and the Maanselka heights in the N.W.; the Baltic coast-ridge and spurs of the Carpathians in the W., with a broad depression between the two, occupied by Poland; the Crimean and Caucasian mountains in the S.; and the broad but moderately high swelling of the Ural Mountains in the E.

From a central plateau, which comprises the governments of Tver, Moscow, Smolensk and Kursk, and projects E. towards Samara, attaining an average elevation of 800 to 900 ft. above the sea, the surface slopes gently in all directions to a level of 300 to 500 ft. Then it again rises gradually as it approaches the hilly tracts which enclose the great plain. This central swelling may be considered a continuation towards the E.N.E. of the great line of upheavals of N.W. Europe; the elevated grounds of Finland would then repre- sent a continuation of the Scanian plateaus of S. Sweden, and the northern mountains of Finland a continuation of Kjolen (the Keel) which separate Sweden from Norway, while the other great line df

upheaval of the old continent, which runs N.W. to S.E., would be represented in Russia by the Caucasus in the S. and by the Timan ridg;e of the Pechora basin in the N.

1 he hilly aspect of several parts of the central plateau is not due to foldings of the strata, which for the most part appear to be hori- zontal, but chiefly to the excavating action of the rivers, whose valleys are deeply eroded in the plateau, especially on its borders. The round flattened summits of the Valdai plateau do not rise above noo ft., and they present the appearance of mountains only in consequence of the depths of the valleys — the rivers which flow towards the depression of Lake Peipus being only 200 to 250 ft. above the sea. The same is true of the plateaus of Livonia, ” Wendish Switzerland,” and the government of Kovno, which do not exceed 1000 ft. at their highest points; and again of the E. spurs of the Baltic coast-ridge between the governments of Grodno and Minsk. The same elevation is reached by a very few flat summits of the plateau about Kursk, and farther E. on the Volga about Kamyshin, where the valleys are excavated to a depth of 800 or 900 ft., giving quite a hilly aspect to the country. It is only in the S.W., where spurs of the Carpathians enter the governments of

Volhynia, Podolia and Bessarabia, that ridges reaching 1 100 ft. are met with, these again intersected by deep ravines.

The depressions which gap the borders of the central plateau thus acquire a greater importance than the small differences in its vertical elevation. Such is the broad depression of the middle Volga and lower Kama, bounded on the N. by the faint swelling of the Uvaly, the watershed between the Arctic Ocean and the Volga basin. Another broad depression, 250 to 500 ft. above the sea, still filled by Lakes Peipus, Ladoga, Onega, Byelo-ozero, Lacha, Vozhe, and many thousands of smaller lakes, skirts the central plateau on the N., and follows the same E.N.E. direction. Only a few low swellings penetrate into it from the N.W., about Lake Onega, and reach 900 ft., while in the N.E. it is enclosed by the Timan ridge (1000 ft.). A third depression, traversed by the Pripet and the middle Dnieper, extends to the W. and penetrates into Poland. This immense lacustrine basin is now broken up into numberless ponds, lakes and marshes (see Minsk). It is bounded on the S. by the broad plateaus which spread out E. of the Carpathians. S. of 50° N. the central plateau slopes gently towards the S., and we find there a fourth depression stretching W. and E. through Poltava and Kharkov, but still reaching in its higher parts 500 to 700 ft. It is separated from the Black Sea by a gentle swelling which may be traced from Kremenets in Volhynia to the lower Don, and perhaps farther S.E. This swelling includes the Donets coal-measures and the middle granitic ridges which give rise to the rapids of the Dnieper, Finally a fifth depression, which descends below the level of the ocean, extends for more than 200 m. to the N. of the Caspian, comprising the lower Volga and the Ural and Emba rivers, and establishing a link between Russia and the Aral-Caspian region. It is continued farther N. by plains below 300 ft., which join the depression of the middle Volga, and extend as far as the mouth of the Oka.

The Ural Mountains present the aspect of a broad swelling whose strata no longer exhibit the horizontality which is characteristic of central Russia, and moreover are deeply cut into by rivers. They are connected in the W. with broad plateaus which join those of central Russia, but their orographical relations to other upheavals must be more closely studied before they can be definitely pro- nounced on.

The rhomboidal peninsula of the Crimea, connected by only a narrow isthmus with the continent, is occupied by an arid plateau sloping gently N. and E., and bordered on the S.E. by the Yaila Mountains, the summits of which range between 4000 and 5000 ft.

Owing to the orographical structure of the East-European plains, the river systems have become more than usually prominent and important features of the configuration. Taking their Klvers. origin from a series of lacustrine basins scattered over the plateaus and differing slightly in elevation, the Russian rivers describe immense curves before reaching the sea, and flow with a very gentle gradient, while numerous large tributaries collect their waters from over vast areas. Thus the Volga, the Dnieper and the Don attain respectively lengths of 2325, 1410 and 1325 m., and their basins run to 563,300, 202,140 and 166.000 sq. m. respectively. Moreover, the chief rivers, the Volga, the W. Dvina, the Dnieper, and even the Lovat and the Oka, take their rise (in the N.W. of the central plateau) so close to one another that they may be said to radiate from the same centre. The sources of the Don interlace with the tributaries of the Oka, while the upper tributaries of the Kama join those of the N. Dvina and Pechora. In consequence of this, the rivers of Russia have been from remote antiquity the principal channels of trade and migration, and have contributed much more to the elaboration of national unity than any political institutions. Boats could be conveyed over flat and easy portages from one river-basin to another, and these portages were subse- quently transformed with a relatively small amount of labour into navigable canals, and even at the present day the canals have more importance for the traffic of the country than have most of the railways. By their means the plains of the central plateau — the very heart of Russia, whose natural outlet was the Caspian — were brought into water-communication with the Baltic, and the Volga

basin was connected with the Gulf of Finland. The White Sea has also been brought into connexion with the central Volga basin while the sister-river of the Volga — the Kama — became the main artery of communication with Siberia.

But although the rivers of Russia rank before the rivers of W. Europe in respect of length, they are far behind them as regards the volumes of water which they discharge. They freeze in winter and dry up in summer, and most of them are navigable only during the spring floods; even the Volga becomes so shallow during the hot season that none but boats of light draught can pass over its shoals.

Arctic Ocean Basin. — The Pechora rises in the N. Urals, and enters the ocean by a large estuary at the Gulf of Pechora. Its basin, thinly-peopled and available only for cattle-breeding and for hunting, is quite isolated from Russia by the Timan ridge. The river is navigable for 770 m. ; grain and a variety of goods conveyed from the upper Kama are floated down, while furs, fish and other products of the sea

are shipped up the river to be transported to Cherdyn on the Kama. The Mezeii enters the Bay of Mezen; it is navigable for 450 m., and is tlie channel of a considerable export of timber. The N. Dvina is formed by the union of the Yug and the Sukhona. The latter, although it flows over a great number of rapids, is navigable throughout its length (330 m.) ; it is connected by canal with the Caspian and the Baltic. The Vychegda, which flows W.S.W. to join the Sukhona, through a woody region, thinly peopled, is navigable for 500 m. and in its upper portion is connected by a canal with the upper Kama. The N. Dvina flows with a very slight gradient through a broad valley, and reaches the White Sea at Archangel. Notwithstanding serious obstacles offered by shallows, corn, fish, salt and timber are largely shipped to and from Archangel. The Onega, which flows into Onega Bay, has rapids; but timber is floated down in spring, and fishing and some navigation, are carried on in the lower portion.

Baltic Basin. — The Neva (40 m.) flows from Lake Ladoga into the Gulf of Finland. The Volkhov, discharging into Lake Ladoga, and forming part of the Vyshniy-Volochok system of canals, is an important channel for navigation ; it flows from Lake Ilmen, which receives the Msta, connected with the Volga, and the Lovat. The Svir, also discharging into Lake Ladoga, flows from Lake Onega, and, being part of the Mariinsk canal system, is of great importance for navigation. The Narova flows out of Lake Peipus into the Gulf of Finland at Narva; it has remarkable rapids, which are used to generate power for cotton- mills; in spite of this, the river is navi- gated. Lake Peipus, or Chudskoye, receives the Velikaya, a channel of traffic with S. Russia from a remote antiquity, but now navigable only in its lower portion, and the Embach, navigated by steamers to Dorpat (Yuryev). The S. Dvina, which falls into the sea below Riga, is shallow above the rapids of Jacobstadt, but navigation is carried on as far as Vitebsk — corn, timber, potash, flax, &c, being the principal shipments of its navigable tributaries (the Obsha, Ulla and Kasplya). The Ulla is connected, by the Berezina canals with the Dnieper. The Memel (Niemen), with a course of 470 m. in Russia, rises in the N. of Minsk, leaves Russia at Yurburg, and enters the Kurisches Haff ; rafts are floated upon it almost from its source, and steamers ply as far as Kovno; it is connected by the Oginsky canal with the Dnieper. For the Vistula, with the Bug and Narew, see Poland.

Black Sea Basin. — The Pruth rises in Austrian Bukovina, and separates Russia from Rumania; it enters the Danube, which flows along the Russian frontier for 100 m. below Reni, touching it with its Kilia branch. The Dniester (530 m. in Russia) rises in Galicia. Light boats and rafts are floated at all points, and steamers ply on its lower

portion ; its estuary has important fisheries. The Dnieper, with a basin of 202,140 sq. m., drains 13 governments, the aggregate population of which numbers over 28,000,000. It also originates in the N.W. parts of the central plateau, in the same marshy lakes which give rise to the Volga and the W. Dvina, and enters the Black Sea. In the middle navigable part of its course, from Dorogo- buzh to Ekaterinoslav, it is an active channel for traffic. It receives several large tributaries: — on the right, the Berezina, connected with the W. Dvina, and the Pripet, both very important for naviga- tion — as well as several smaller tributaries on which rafts are floated; on the left the Sozh, the Desna, one of the most important rivers of Russia, navigated by steamers as far as Bryansk, the Sula, the Psiol and the Vorskla. Below Ekaterinoslav the Dnieper flows for 46 m. over a series of rapids. At Kherson it enters its long (40 m.) but shallow estuary, which receives the S. Bug and the Ingul. The Don, with a basin of 166,000 sq. m., and navigable for 880 m., rises in the government of Tula and enters the Sea of Azov at Rostov, after describing a great curve to the E. at Tsaritsyn, approaching the Volga, with which it is connected by a railway (45 m.). Its navigation is of great importance, especially for goods brought from the Volga, and its fisheries are extensive. The chief tributaries are the Sosna and North Donets on the right, and the Voronezh, Khoper, Medvyeditsa and Manych on the left. The Ylya, the Kuban and the Rion belong to Caucasia.

The Caspian Basin. — The Volga, the chief river of Russia, has a length of 2325 m., and its basin, about 563,300 sq. m. in area, contains a population of nearly 40,000,000. It is connected with the Baltic by three systems of canals (see Volga). The Ural, in its lower

part, constitutes the frontier between European Russia and the Kirghiz steppe; it receives the Sakmara on the right and the Ilek on the left. The Kuma, the Terek and the Kura, with the Aras, which receives the waters of Lake Gok-cha, belong to Caucasia. 1

The soil of Russia depends chiefly on the distribution of the boulder-clay and loess, on the degree to which the rivers have severally excavated their valleys, and on the moistness of the climate. Vast areas in Russia are quite unfit for cultivation, 19% of the aggregate surface of European Russia (apart from Poland and Finland) being

occupied by lakes, marshes, sand, &c, 39% by, forests, 16% by prairies, and only 26% being under cultivation. The distribution of all these is, however, very unequal, and the five following subdivisions may be established: — (1) the tundras; (2) the forest region; (3) the middle region, com- prising the surface available for agriculture and partly covered with forests; (4) the black-earth (chernozyom) region; and (5) the steppes. Of these the black-earth region — about 150,000,000 acres — which reaches from the Carpathians to the Urals, from the Pinsk marshes in the S.VV. to the upper Oka in the N.E., is the most important. It is covered with a thick sheet of black earth, a kind of loess, mixed with 5 to 15 % of humus, due to the decomposition of an herbaceous vegetation, which developed luxuriantly during the Lacustrine period on a continent relatively dry even at that epoch. On the three-fields system corn has been grown upon it for fifty to seventy consecutive years without manure. Isolated black-earth islands, though less fertile, occur also in Courland and Kovno, in the Oka- Volga-Kama depression, on the slopes Of the Urals, and in a few patches in the N. Towards the Black Sea coast its thickness diminishes, and it disappears in the valleys. In the extensive region covered with boulder-clay the black earth appears only in isolated places, and the soil consists for the most part of a sandy clay, containing a much smaller admixture of humus. There cultivation is possible only with the aid of a considerable quantity of manure. Drainage finding no outlet through the thick clay, the soil Of the forest region is often hidden beneath extensive marshes, and the forests themselves are often mere thickets choking marshy ground ; large tracts of sand appear in the W., and the admixture of boulders with the clay in the N.W. renders agriculture difficult. On the Arctic coast the forests disappear, giving place to the tundras. Finally, in the S.E., towards the Caspian, on the slopes of the southern Urals and the plateau of Obshchiy Syrt, as also in the interior of the Crimea, and in several parts of Bessarabia, there are large tracts of real desert, buried under coarse sand and devoid of vegetation.

Notwithstanding the fact that Russia extends from N. to S. through 30° of latitude, the climate of its different portions, apart Climate Irom the Crimea and Caucasia, presents a striking uni- formity. The aerial currents — cyclones, anti-cyclones and dry S.E. winds — prevail over extensive areas, and sweep across the flat plains without hindrance. Everywhere the winter is cold and the summer hot, both varying in their duration, but differing relatively little in the extremes of temperature recorded. There is no place in Russia, Archangel and Astrakhan included, where the thermometer does not rise in summer nearly to 86° Fahr. and descend in winter to -13° and -22°. It is only

on the Black Sea coast that the absolute range of temperature does not exceed 108 , while in the remainder of Russia it reaches 126 to 144 , the oscillations being between -22 and -31°, occasionally going down as low as-54 , and rising as high as 86° to 104 , or even 109 . Everywhere the rainfall is small : if Finland and Poland on the one hand and Caucasia with the Caspian depression on the other be excluded, the average yearly rainfall varies between 16 and 28 in. Nowhere does the maximum rainfall take place in winter (as in W. Europe), but it occurs in summer, and everywhere the months of advanced spring are warmer than the corresponding months of autumn.

Though thus exhibiting the distinctive features of a continental climate, Russia does not lie altogether outside the reach of the moderating influence of the ocean. The Atlantic cyclones penetrate to the Russian plains, mitigating to some extent the cold of winter, and in summer bringing with them their moist winds and thunder- storms. Their influence is chiefly felt in W. Russia, though it does reach as far as the Urals and beyond. They thus check the extension and limit the duration of the cold anticyclones.

‘Bibliography of Geography: see Tillo, in Izveslia of Russian Geogr. Soc. (1883); P. P. Semenov, Geogr. and Statist. Dictionary of the Russian Empire (in Russian, 5 vols., St Petersburg, 1863-84), the most trustworthy source for the geography of Russia; the official Svod Materialov, with regard to Russian rivers (1876); Statistical Sbornik of the Ministry of Communications, vol. x. (freezing of Russian rivers, and navigation). A great variety of monographs dealing with separate rivers and basins are available; e.g. S. Martynov, Das Petschoragebiet (St Petersburg, 1905) ; G. von Helmersen, Das Olonezische Bergrevier (St Petersburg, i860); Turbin, The Dnieper; Prasolenko, “The Dniester,” in Engin. Journ. (1881); Danilevsky, “Kuban,” in Mem. Geogr. Soc. i. ; K. E. von Baer, Kaspische Studien (St Petersburg, 1857-59) ; V. Ragozin, Volga (St Petersburg, 1890); Peretyatkovich, Volga; and Mikhailov, Kama. An orohydrographical map of Russia in tour sheets was published in 1878.

Throughout Russia the winter is of long duration. The last days of frost are experienced for the most part in April, but as late as May to the N. of 55° N. The spring is exceptionally beautiful in central Russia; late as.it usually is, it sets in with vigour, and vegetation develops with a rapidity which gives to this season in Russia a special charm, unknown in warmer climates. The rapid melting of the snow at the same time causes the rivers to swell, and renders a great many minor streams navigable for a few weeks. But a return of cold weather,

injurious to vegetation, is very frequently observed in central and E. Russia between May the 18th and the 24th, so that it is only in June that warm weather sets in definitely, and it reaches its maximum in the first half of July (or of August on the Black Sea coast). In S.E, Russia the summer is much warmer than in the corresponding latitudes of France, and really hot weather is experienced everywhere. It does not, however, prevail for long, and in the first half of September frosts begin on the middle Urals. They descend upon W. and S. Russia in the beginning of Octpber, and are felt on the Caucasus about the middle of November. The temperature drops so rapidly that a month later, about October the loth on the middle Urals and November the 15th throughout Russia, the thermometer ceases to rise above the freezing-point. The rivers freeze rapidly; towards November 20th all the streams of the White Sea basin are ice-bound, and so remain for an average of 167 days; those of the Baltic, Black Sea and Caspian basins freeze later, but about December the 20th nearly all the rivers of the country are highways for sledges. The Volga remains frozen for a period varying between 1 50 days in the N. and 90 days at Astrakhan, the Don for 100 to no days, and the Dnieper for 83 to 122 days. On the W. Dyiria ice prevents navigation for 125 days, and even the Vistula at Warsaw remains frozen for 77 days. The lowest tempera- tures are experienced in January, the average being as low as 20 to 5 Fahr. throughout Russia ; in the west only does it rise above 22°. On the whole, February and March continue to be cold, and their average temperatures rise above zero nowhere except on the Black Sea coast. Even at Kiev and Lugansk the average of March is below 30 , while in central Russia it is 25 ° to 22°, and as low as 20° and 16 at Samara and Orenburg.

All Russia is comprised between the isotherms of 32 and 54 . On the whole, they are more remote from one another than even on the plains of N. America, those of 46 to 32 ° being distributed over twenty degrees of latitude. They are, on the whole, inclined towards the S. in E. Russia; thus the isotherm of 39° runs from St Petersburg to Orenburg, and that of 35 ° from Tornea in Finland to Uralsk. The inflexion is still greater for the winter isotherms. Closely following one another, they run almost N. and S. ; thus Odessa and Konigsberg are situated on the same winter isotherm of 28 ; St Petersburg, Orel and the mouth of the Ural river on about 20°; and Mezen and Ufa on 9 . The summer isotherms cross the winter isotherms nearly at right angles, so that Kiev and Ufa, Warsaw and Tobolsk, Riga and the upper Kama have the same average summer temperatures of 64°, 62 J° and 61° respectively.

The laws and relations of the cyclones and anti-cyclones in Russia are

not yet thoroughly understood. It appears, however, that in January the cyclones mostly travel across N.W. Russia (N. of 55 and W. of 40° E.), following directions which vary between N.E. and S.E. In July they are pushed farther towards the N., and cross the Gulf of Bothnia, while another series of cyclones sweep across middle Russia, between 50 and 55 N. Nor are the laws of the anti-cyclones established. The winds closely depend on the routes followed by both. Generally, however, it may be said that alike in January and in July W. and S.W. winds prevail in W. Russia, while E. winds are most common in S.E. Russia. N. winds are predominant on the Black Sea coast. The strength of the wind is greater, on the whole, than in the continental parts of W. Europe, and it attains its maximum velocity in winter. Terrible tempests blow from October to March, especi- ally on the S. steppes and on the tundras. Hurricanes accompanied with snow (burans, myatels), and lasting from two to three days, or N. blizzards without snow, are especially dangerous to man and beast. The average relative moisture reaches 80 to 85% in the N., and only 70 to 81 % in S. and E. Russia. In the steppes it is only 60% during summer, and still less (57) at Astrakhan. The average amount of cloud is 73 to 75% on the White Sea and in Lithuania, 68 to 64 in central Russia, and only 59 to 53 in the S. and S.E. The amount of rainfall is shown in the Table on next page. 2

The flora of Russia, which represents an intermediate link between the flora of Germany and the flora of Siberia, is strikingly uniform over a very large area. Though not poor at any given pj ra.

place, it appears so if the space occupied by Russia be taken into account, only 3300 species of phanerogams and ferns

2 Bibliography of Meteorology : Memoirs of the Central Phy? ical Observatory; Repertorium fur Meteor ologie and Meteorological Sbornik, published by the same body; Veselovsky, Climate of Russia (Russian); H. Wild, Temperatur-Verhaltnisse des Russ. Reiches (1881); Voyeikov, The Climates of the Globe (Russ., 1884), containing the best general information about the climate of Russia.

being known. Four regions may be distinguished: the Arctic, the Forest, the Steppe and the Circum-Mediterranean.

Height

Average Temperatures.

Average Rainfall

in Jnrh<»«

North Latitude.

above Sea in Feet.

Year.

Janu- ary.

July.

Year.

November to March.

o /

O

Archangel .

64 34

3°

32-7

7-6

6o-6

16-2

4-3

Petrozavodsk

61 47

160

36-4

n-8

62-1

Helsingfors .

60 10

40

39’Q

19-5

61-5

19-6

7-3

St Petersburg

59 57

20

38-4

150

64-0

18-3

5-3

Bogoslovsk .

59 45

630?

29-4

-3-8

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3-i

Dorpat

58 22

220

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24-9

7‘3

Kostroma .

57 46

360

37-3

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66-3

19-4

5-2

Ekaterinburg

56 49

890

32-8

2-2

63-5

14- 1

1-6

Kazan .

55 47

260

37-2

7-0

67-3

18-0

5-4

Moscow

55 45

520

39-0

I2-I

66-0

23-0

7-3

Vilna .

54 41

390

43-8

22-1

65-6

Warsaw

52 14

360

44.9

23-8

65-4

22-8

67

Orenburg

51 45

360

37-9

47

70-9

17-1

5-8

Kursk .

51 44

690

41-0

13-7

67-2

19-9

5-6

Kiev

50 27

590

44-2

21-0

66-3

20-1

6-0

Tsaritsyn

48 42

100

44.4

13-4

74-6

Lugansk

48 27

200

45-6

17-0

73-0

14-3

4-3

Odessa .

46 29

270

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15-6

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Astrakhan .

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Sevastopol .

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73-3

64-9

23-4

Tiflis .

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I44O

54-5

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757

19-3

4-3

The Arctic Region comprises the tundras of the Arctic littoral beyond the N. limit of the forests, which closely follows the coast- line, with deviations towards the N. in the river valleys (70° N. in Finland and on the Arctic Circle about Archangel, 68° N. on the Urals, 71 ° in W. Siberia). The shortness of the summer, the deficiency of drainage and the depth to which the soil freezes in winter, are the circumstances which determine the characteristic features of the vegetation of the tundras. Their flora is far closer akin to the floras of N. Siberia and N. America than to that of central Europe. Mosses and lichens are distinctive, as also are the birch, the dwarf willow and several shrubs; but where the soil is drier, and humus has been able to accumulate, a variety of herbaceous flowering plants, some of them familiar in W. Europe, make their appearance. Only 275 to 280 phanerogams are found within this region.

The Forest Region of the Russian botanists includes the greater part of the country, from the Arctic tundras to the steppes, and over this immense expanse it maintains a remarkable uniformity of character. Beketov subdivides it into two portions — the forest region proper and

the ” Ante-Steppe ” (predstepie). The N. limit of the ante-steppe is represented by a line drawn from the Pruth through Zhitomir, Kursk, Tambov and Stavropol-on- Volga to the sources of the Ural river. But the forest region proper presents a different aspect in the N. from that in the S., and must in turn be subdivided into two parts — the coniferous region and the region of the oak forests — these being separated by a line drawn through Pskov, Kostroma, Kazan and Ufa. Of course the oak occurs farther_ N. than this, and coniferous forests extend farther S., advancing even to the border-region of the steppes. To the N. of this line the forests are of great extent and densely grown, more frequently diversified by marshes than by meadows or culti- vated fields. Vast and impenetrable forests, impassable marches and thickets, numerous lakes, swampy meadows, with cleared and dry spaces here and there occupied by villages, are the leading features of this region. Fishing and hunting are the most important sources of livelihood. The characteristics of the oak region, which comprises all central Russia, are totally different. The surface is undulatory; marshy meadow lands no longer exist on the flat watersheds, and only a few in the deeper and broader river valleys. Forests are still numerous where they have not been destroyed by the hand of man, but their character has changed. Conifers are rare, and the Scotch pine, which is abundant on the sandy plains, takes the place of the Abies. The forests are composed of the birch, oak and other deciduous trees, the soil is dry, and the woodlands are divided by green prairies. Viewed from rising ground, the landscape presents a pleasing variety of cornfield and forest, while the horizon is broken by the bell-towers of the numerous villages strung along the banks of the streams.

Viewed as a whole, the flora of the forest region is to be regarded as European-Siberian; and, though certain species disappear towards the E., while new ones make their appearance, it maintains, on the whole, the same features throughout from Poland to Kam- chatka. _ Thus the beech (Fagus sylvatica) is unable to survive the continental climate of Russia, and does not penetrate beyond Poland and the S.W. provinces, reappearing again in the Crimea. The silver fir does not extend over Russia, and the oak does not

cross the Urals. On the other hand, several Asiatic species (Siberian pine, larch, cedar) grow freely in the N.E., while numerous shrubs and herbaceous plants, originally from the Asiatic steppes, have found their way into the S.E. But* all these do not greatly alter the general character of the vegetation. The coniferous forests of the north contain, besides conifers, the birch (Betula alba, B. pub- escens, B. fruticosa and B. verrucosa), which extends from the Pechora to the Caucasus, the aspen, two species of alder, the mountain-ash (Sorbus

aucuparia), the wild cherry and three species of willow. S. of 62 “64° N. appears the lime tree, which multiplies rapidly and, notwithstanding the rapidity with which it is being exterminated, constitutes entire forests in the east (central Volga, Ufa). Farther S. the ash (Fraxinus excelsior) and the oak make their appearance, the latter (Quercus pedunculata) reaching in isolated groups and single trees as far N. as St Peters burg and South Finland (Q. Robur appears only in the S.W.). The hornbeam is prevalent in the Ukraine, and vhe maple begins to appear in the S. of the coniferous region. In the forest region no fewer than 772 flowering species are found, of which 568 dicotyledons occur in the Archangel government (only 436 to the E. of the White Sea, which is a botanical limit for many species). In central Russia the species become still more numerous, and, though the local floras are not yet complete, they number 850 to 1050 species in the separate governments, and about 1600 in the best explored parts of the S.W. Corn is cultivated throughout this region. Its N. limits advance almost to the Arctic coast at Var- anger Fjord, farther E. they hardly reach N. of Archangel, and the limit is still lower towards the Urals. The N. boundary of rye closely corresponds to that of barley. Wheat is cultivated in S. Finland, but in W. Russia it hardly gets N. of 58 ° N. Its true domains are the oak region and the steppes. Fruit trees are cultivated as far as 62° N. in Finland, and as far as 58° in the E. Apricots and walnuts flourish at Warsaw, but in Russia they do not thrive beyond 50 . Apples, pears and cherries are grown throughout the oak region.

The Region of the Steppes, which is coincident with the whole of S. Russia, may be subdivided into two zones — an intermediate zone and that of the steppes proper. The ante-steppe of the preceding region and the intermediate zone of the steppes include those tracts in which the W. European climate contends against the Asiatic, and where a struggle is carried on between the forest and the steppe. It is comprised between the summer isotherms of 59 and 63°, being bounded on the S. by a line which runs through Ekaterinoslav and Lugansk. S. of this line begin the steppes proper, which extend to the sea and penetrate to the foot of the Caucasus.

The steppes proper are very fertile, elevated plains, slightly undulating, and intersected by numerous ravines which are dry in summer. The undulations are scarcely apparent. Not a tree is to be seen, the few woods and thickets being hidden in the depres- sions and deep valleys of the rivers. On the thick layer of black earth by which the steppe is covered a luxuriant vegetation develops in spring; after the old grass has been burned a bright green pre- vails over immense stretches, but this rapidly disappears under the burning rays

of the sun and the hot E. winds. The colouring of the steppe changes as if by magic, and only the silvery plumes of the steppe-grass (Slipa pennata) wave in the wind, tinting the steppe a bright yellow. For days together the traveller sees no other vegetation; even this, however, disappears as he approaches the regions recently left dry by the Caspian, where saline clays, bearing a few Salsolaceae, or mere sand, take the place of the black earth. Here begins the Aral-Caspian desert. The steppe, however, is not so devoid of trees as at first sight appears. In- numerable clusters of wild cherries {Prunus Chamaecerasus), wild apricots (Amygdalus nana), the Siberian pea-tree (Caragana fru- tescens), and other deep-rooted shrubs grow at the bottoms of the depressions and on the slopes of the ravines, imparting to the steppe that charm which manifests itself in the popular poetry. Unfortunately the spread of cultivation is fatal to these oases (they are often called “islands ” by the inhabitants); the axe and the plough ruthlessly destroy them.

The vegetation in the marshy bottoms of the ravines and in the valleys of the streams and rivers is totally different. The moist soil encourages luxuriant thickets of willows (Salicineae), surrounded by dense chevaux-de-frise of wormwood and thorn- bearing Compositae, and interspersed with rich but not extensive prairies, harbouring a great variety of herbaceous plants; while in the deltas of the Black Sea rivers impenetrable beds of reeds {Arundo phragmites) shelter a forest fauna. But cultivation rapidly changes the physiognomy of the steppe. The prairies are superseded by wheat-fields, and flocks of sheep destroy the true steppe-grass (Stipa pennata).

A great many species unknown in the forest region make their appearance in the steppes. The Scotch pine still grows on all sandy’ spaces, and the maple (Acer tatarica and A. campestre), the hornbeam and the black and white poplar are very common. The number of species of herbaceous plants rapidly increases, while beyond the Volga a variety of Asiatic species are added to the W. European flora.

The Circum-Mediterranean Region is represented by a narrow

strip on the S. coast of the Crimea, where a climate similar to that of the Mediterranean coast, has permitted the development of a flora

closely resembling that of the valley of the Arno in Italy. Human cultivation has destroyed the abundant forests which sixty years ago made deer-hunting possible at Khersones. The olive and the chestnut are rare; but the beech reappears, and the Pinus pinaster recalls the Italian pines. At a few points, such as Nikita near Livadia and Alupka, where plants have been acclimatized by human agency, the Californian Wellingtonia, the Lebanon cedar, many evergreen trees, the laurel, the cypress, and even the Anatolian palm (Chamaerops excelsa) flourish. The grass vegetation is very rich, and, according to lists still incomplete, no fewer than 1654 flowering plants are known. But on the whole, the Crimean flora has little in common with that of the Caucasus. 1

Russia belongs to the same zoo-geographical region as central Europe and N. Asia, the same fauna extending in Siberia as far as the Yenisei and the Lena. In the forests not many hauaa. animals which have disappeared from W. Europe have held their ground; while in the Urals only a few — now Siberian, but formerly also European — are met with. In S.E. Russia, however, towards the Caspian, there is a notable admixture of Asiatic species. Three separate sub-regions may, however, be dis- tinguished on the E. European plains — the tundras, including the Arctic islands, the forest region, especially the coniferous part of it, and the ante-steppe and steppes of the black earth region. The Ural Mountains might be distinguished as a fourth sub-region, while the S. coast of the Crimea and Caucasia, as well as the Caspian deserts, have each their own individuality.

The fauna of the Arctic Ocean off the Norwegian coast corre- sponds, in its W. parts at least, to that of the N. Atlantic Gulf Stream. The White Sea and the Arctic Ocean to the E. of Svyatoi Nos on the Kola peninsula belong to a separate zoological region, connected with, and hardly separable from, that part of the Arctic Ocean which washes the Siberian coast as far as the mouth of the Lena. The Black Sea, the fauna of which appears to be very rich, belongs to the Mediterranean region, slightly modified, while the Caspian partakes of the characteristic fauna inhabiting the lakes and seas of the Aral-Caspian depression.

In the region of the tundras life has to contend with such un- favourable conditions that it cannot be abundant. Still, the reindeer frequents it for its lichens, and on the drier slopes of the moraine deposits there occur four species of lemming, hunted by the Arctic fox (Vulpes lagopus). The willow-grouse {Lagopus albus), the ptarmigan (L. alpinus or mutus), the lark, the snow- bunting {Plectrophanes nivalis), two or three species of Sylvia, one Phylloscopus and a

Motacilla must be added. Numberless aquatic birds visit it for breeding purposes. Ducks, divers, geese, gulls, all the Russian species of snipes and sandpipers {Limicolae, Tringae), &c, swarm on the marshes of the tundras and on the crags of the Lapland coast.

The forest region, and especially its coniferous portion, though it has lost some of its representatives within historic times, still possesses an abundant fauna. The reindeer, rapidly disappearing, is now met with only in the governments of Olonets and Vologda; Cervus pygargus is found everywhere, and reaches Novgorod. The weasel, the fox and the hare are exceedingly common, as also are the wolf and the Lear in the N., but the glutton (Gulo borealis), the lynx and the elk (C. alces) are rapidly disappearing. The wild boar is confined to the basin of the W. Dvina, and the Bison europea to the Byelovyezh forest in Grodno. The sable has quite disappeared, being found only on the Urals; the beaver may be trapped at a few places in Minsk, and the otter is very rare. On the other hand, the hare, grey partridge (Perdix cinerea), hedgehog, quail, lark, rook and stork find their way into the coniferous region as the forests are cleared. The avifauna of this region is very rich; it includes all the forest and garden birds known in W. Europe, as well as a very great variety of aquatic birds. A list, still incomplete, of the birds of St Petersburg runs to 251 species. Hunting and shooting give occupation to a great number of persons. The reptiles are few. As for fishes, all those of W. Europe, except the carp, are met with in the lakes and rivers in immense quantities, the characteristic feature of the region being its wealth in Coregoni and in Salmonidae generally.

In the ante-steppe the forest species proper, such as Pteromys volans and Tamias striatus, disappear, but common squirrel (Sciurus vulgaris), weasel and bear are still met with in the forests. The hare is increasing rapidly, as well as the fox. The avifauna, of course, becomes poorer; nevertheless, the woods of the steppe, and still more the forests of the ante-steppe, give refuge to many

1 Bibliography of Flora : Beketov, Appendix to Russian transla- tion of Griesebach and Reclus's Geogr. univ.; C. F. von Ledebour, Flora Rossica (Stuttgart, 1842-53) ; E. R. von Trautvetter, Rossiae Arcticae Plantae (1880), and Florae Rossicae Fontes (St Petersburg, 1880). For flora of the tundras, Beketov's " Flora of Archangel," in Mem. Soc. Natur. of St Petersburg University, xv. (1884); Regel, Flora Rossica (1884) ; Brown, Forestry in the Mining Dis- tricts of the Urals (1885); Reports by Commissioners of Woods and Forests in Russia (1884).

birds, even to hazel-hen (Tetrao bonasa), capercailzie (T. tetrix) and woodcock (T. urogallus). The fauna of the scrub in the river valleys is

decidedly rich, and includes aquatic birds. The destruc- tion of the forests and the advance of wheat into the prairies are rapidly thinning the steppe fauna. The various species of rapacious animals are disappearing, together with the colonies of marmots; the insectivores are also becoming scarce in consequence of the destruction of insects; while vermin, such as the suslik, or pouched marmot (Spermophilus) , and the destructive insects which are a scourge to agriculture, become a real plague. The absence of Coregoni is a characteristic feature of the fish-fauna of the steppes; the carp, on the contrary, reappears, and the rivers abound in sturgeon (Acipenseridae). In the Volga below Nizhniy-Novgorod the sturgeon (Acipenser ruthenus), and others of - the same family, as well as a very great variety of ganoids and Teleostei, appear in such quantities that they give occupation to nearly ioo.coo people. The mouths of the Caspian rivers are especially celebrated for their wealth of fish. 2

Ethnography. — Remains of Palaeolithic man, contemporary with the large Quaternary mammals, are few in Russia; they have been discovered only in Poland, Poltava and Voronezh, and perhaps also on the Oka. Those of the later Lacustrine period, on the contrary, are so numerous that there is scarcely one lacustrine basin in the regions of the Oka, the Kama, the Dnieper, not to speak of the lake-region itself, and even the White Sea coasts, where remains of Neolithic man have not been discovered. The Russian plains have been, however, the scene of so many migrations of successive races, that at many places a series of deposits belonging to widely distant epochs are found one upon another. Settlements belonging to the Stone age, and manufactories of stone implements, burial-grounds of the Bronze epoch, earthen forts and burial-mounds (kurgans) — of this last four different types are known, the earliest belonging to the Bronze period — are superposed, rendering the task of unravelling their several relations one of great difficulty.

Two different races — a brachycephalic and a dolichocephalic — can be distinguished among the remains of the earlier Stone period (Lacustrine period) as having inhabited the plains of E. Europe. But they are separated by so many generations from the earliest historic times that sure conclusions regarding them are impossible; at all events, as yet Russian archaeologists are not agreed as to whether the ancestors of the Slavs were Sar- matians only or Scythians also, whose skulls have nothing in common with those of the Mongol race. The earliest data which may be regarded as established belong to the 1st century, when the Finns migrated from the N. Dvina region towards the W., and the Sarmatians were compelled to abandon the region of the Don, and cross the Russian steppes from E. to W., under the

pressure of the Aorzes (the Mordvinian Erzya) and Siraks, who in their turn were soon followed by the Huns and Uigur-Turkish Avars.

In the 7th century S. Russia was the seat of the empire of the Khazars, who drove the Bulgarians, descendants of the Huns, from the Don, one section of them migrating up the Volga to found there the Bulgarian empire, and the remainder travelling towards the Danube. This migration compelled the N. Finns to advance farther W., and a body of intermingled Ta vasts and Karelians penetrated to the S. of the Gulf of Finland.

2 Bibliography of Fauna: see Pallas, Zoographia Rosso-Asiatica; Syevertsov for the birds of south-eastern Russia; M.-A. Bogdanov, Birds and Mammals of the Black-Earth Region of the Volga Basin (in Russian, Kazan, 1871); Karelin for the southern Urals; Kessler for fishes; Strauch, Die Schlangen des Russ. Reiches, for reptiles generally; Rodoszkowski and the publications of the Entomological Society generally for insects; Czerniavsky for the marine fauna of the Black Sea; Kessler for that of Lakes Onega and Ladoga; Grimm for the Caspian. The fauna of the Baltic provinces is described in full in the Memoirs of the scientific bodies of these provinces. A. T. von Middendorf's Sibirische Reise, vol. iv., Zoology (St Petersburg, 1875), though dealing more especially with Siberia, is an invaluable source of information for the Russian fauna generally. A. E. Nordenskiold's Vega-expeditionens Vetenskapliga Iakttagelser (5 vols., Stockholm, 1872-87) may be consulted for the mammals of the tundra region and marine fauna. For more detailed bibliographical information see Apercu des travaux zoo-geographiques, published at St Petersburg in connexion with the Exhibition of 1878; and the index Ukazatel Russkoi Littratury for natural science, mathematics and medicine, published since 1872 by the Society of the Kiev University.

[ETHNOGRAPHY

As early as the 8th century, and probably still earlier, a stream of Slav colonization, advancing E. from the Danube, poured over the plains of S.W. Russia. It is also most probable that another similar stream — the N., coming from the Elbe, through the basin of the Vistula— ought to be distinguished. In the 9th century the Slavs occupied the upper Vistula, the S. of the Russian lacustrine region, and the W. of the central plateau. They had Lithuanians to the W. ; various Finnish

tribes, inter- mingled towards the S.E. with Turkish (the present Bashkirs) ; the Bulgars, whose origin still remains doubtful, on the middle Volga and Kama; and to the S.E. the Turkish-Mongol races of the Pechenegs, Polovtsi, Uzes, &c, while in the S., along the Black Sea, was the empire of the Khazars, who had under their rule several Slav tribes, and perhaps also some of Finnish origin. In the 9th century also the Ugrians are supposed to have left their Ural abodes and to have traversed S.E. and S. Russia on their way to the basin of the Danube. If the Slavs be subdivided into three branches — the W. (Poles, Czechs and Wends), the S. (Servians, Bulgarians, Croatians, &c.),and the E. (Great, Little and White Russians), it will be seen that, with the exception of some 3,000,000 Little Russians, now settled in East Galicia and in Poland, and of a few on the southern slope of the Carpathians, the whole of the E. Slavs occupy, as a compact body, W., central and S. Russia.

Like other races of mankind, the Russian race is not pure. The Russians have absorbed r and assimilated in the course of their history a variety of Finnish and Turko-Finnish elements. Still, craniological researches show that, notwithstanding this fact, the Slav type has been maintained with remarkable per- sistency: Slav skulls ten and thirteen centuries old exhibit the same anthropological features as those which characterize the Slavs of our own day. This may be explained by a variety of causes, of which the chief is the maintenance by the Slavs down to a very late period of gentile or tribal organization and gentile marriages, a fact vouched for, not only in the pages of the Russian chronicler Nestor, but still more by visible social evidences, the gens later developing into the village community, and the colonization being carried on by large co-ordinated bodies of people. The Russians do not emigrate as isolated individuals; they migrate in whole villages. The overwhelming numerical superiority of the Slavs, and the very great differences in ethnical type, belief and mythology between the Indo- European and the Ural-Altaic races, may have contributed to the same end. Moreover, while a Russian man, far away from home among Siberians, readily marries a native, the Russian woman seldom does the like. All these causes, and especially the first-mentioned, have enabled the Slavs to maintain their ethnical purity in a relatively high degree, whereby they have been enabled to assimilate foreign elements and make them intensify or improve the ethnical type, without giving rise to half-breed races. The very same N. Russian type has thus been maintained from Novgorod to the Pacific, with but minor differentiations on the outskirts — and this notwithstanding the great variety of races with which the Russians have come into contact. But a closer observation of what is going on in the recently colonized

confines of the empire — where whole villages live without mixing with the natives, but slowly bringing them over to the Russian manner of life, and then slowly taking in a few female elements from them — gives the key to this feature of Russian life.

Not so with the national customs. There are features — the wooden house, the oven, the bath — which the Russian never abandons, even when swamped in an alien population. But when settled among these the Russian— the N. Russian — readily adapts himself to many other differences. He speaks Finnish with Finns, Mongolian with Buriats, Ostiak with Ostiaks; he shows remarkable facility in adapting his agri- cultural practices to new conditions, without, however, abandon- ing the village community; he becomes hunter, cattle-breeder or fisherman, and carries on these occupations according to local usage; he modifies his dress and adapts his religious beliefs to the locality he inhabits. In consequence of all this,

the Russian peasant (not, be it noted, the trader) proves himself to be an excellent colonist.

Three different branches can be distinguished among the Russians from the dawn of their history: — the Great Russians, the Little Russians (Malorusses or Ukrainians), and the White Russians (the Byelorusses). These correspond to the two *?!',. currents of immigration mentioned above — the N. and S., ”’™ sloas with perhaps an intermediate stream, the proper place ” of the White Russians not having been as yet exactly Russians. determined. The primary distinctions between these branches have been increased during the last nine centuries by their contact with different nationalities — the Great Russians absorbing Finnish elements, the Little Russians undergoing an admixture of Turkish blood, and the White Russians submitting to Lithuanian influence. Moreover, notwithstanding the unity of language, it is easy to de- tect among the Great Russians themselves two separate branches, differing from pne another by slight divergences of language and type and deep diversities of national character — the Central Russians and the Novgorpdians. The latter extend throughout N. Russia into Siberia. Many minor anthropological differentiae can be distinguished among both the Great and the Little Russians, depending probably on the assimilation of various minor subdivisions of the Ural- Altaians.

The Great Russians occupy in one compact mass the space enclosed by a line drawn from the White Sea to Lake Pskov, the upper courses of the W. Dvina and the Donets, and thence, through the mouth of the Sura, by the Vetluga, to the Mezefi. To the E. of this boundary they

.are intermingled with Turko-Finns, but in the Ural mountains they reappear in a second compact body, and thence extend through S. Siberia and along the Courses of the Lena and the Amur. Great Russian Nonconformists are disseminated among Little Russians in the governments of Chernigov and Mogilev, and they reappear in greater masses in Novoroissa (i.e. S. Russia), as also in N. Caucasia.

The Little Russian's occupy the steppes of S. Russia, the S.W. slopes of the central plateau and those of the Carpathian and Lublin mountains, and the Carpathian plateau, that is, the governments of Podolia, Volhynia, Poltava, and Kiev. The Zaporozhian Cossacks colonized the steppes farther E., towards the Don, where they met with a large population of Great Russian runaways, constituting the present Don Cossacks. The Zaporozhian Cossacks, sent by Catherine II. to colonize the E. coast of the Sea of Azov, constituted there the Black Sea and later the Kuban Cossacks (part of whom, the Nekrasovsty, migrated to Turkey). They have also peopled large parts of the government of Stavropol and of N. Caucasia.

The White Russians, intermingled to some extent with Great and Little Russians, Poles and Lithuanians, occupy the upper parts of the W. slope of the central plateau.

The Finnish races, which in prehistoric times extended from the Ob all over N. Russia, even then were subdivided into Ugrians, Permyaks, Bulgarians and Finns proper, who drove back the pre- vious Lapp population from what is now Finland, and about tne 7th century penetrated to the S. of the Gulf of Finland, in the region of the Livs and Kurs, where they fused to some extent with the Lithuanians and the Letts. At present the races of Finnish origin are represented in Russia by the following: (a) the W. Finns; the Ta vasts, in central Finland; the Kvaens, in N.W. Finland; the Karelians, in the E., who also occupy the lake regions of Olonets and Archangel, and have settlements in Novgorod and Tver; the Izhoires, on the Neva and the S.E. coast of the Gulf of Finland ; the Esths, in Esthonia and the N. of Livonia; the Livs, on the Gulf of Riga; and the Kurs, intermingled with the Letts; (b) the N. Finns, or Lapps, in N. Finland and on the Kola peninsula, and the Samoyedes in Archangel and W. Siberia; (c) the Volga Finns, or rather the old Bulgarian branch, to which belong the Mordvinians, and the Cheremisses in Kazan, Kostroma and Vyatka, though they are classified by some authors with the following : (d) the Permyaks, or Cis-Uraiian Finns, including the Votiaks on the E. of Vyatka, the Permyaks in Perm, the Syryenians or Zyryans in Vologda, Archangel, Vyatka and Perm ; (e) the Ugrians, or Trans- Uralian Finns, includ- ing the Voguls on both slopes of the Urals, the Ostiaks in

Tobolsk and partly in Tomsk, and the Magyars, or Ugrians.

The following are the chief subdivisions of the Turko-Tatars in European Russia : — (1) The Tatars, of whom three different branches must be distinguished: (a) the Kazan Tatars on both banks of the Volga, below the mouth of the Oka, and on the lower Kama, but penetrating farther S. in Ryazan, Tambov, Samara, Simbirsk and Penza ; (b) the Tatars of Astrakhan at the mouth of the Volga ; and (c) those of the Crimea, a great many of whom emigrated to Turkey after the Crimean War (185ˆ—56). There are, besides, a certain number of Tatars in the S.E. m Minsk, Grodno and Vilna. (2) The Bashkirs, who inhabit the slopes of the S. Urals, that is, the steppes of Ufa and Orenburg, extend also into Perm and Samara. (3) The Chuvashes, on the right bank of the Volga, in Kazan and Simbirsk. (4) The Meshcheryaks, a tribe of Finnish origin who formerly inhabited the basin of the Oka, and, driven thence during the 15th century by the Russian colonists, immigrated into Ufa and Perm, where they now live among tne Baskhirs, having adopted their religion and customs. (5) The Teptyars, also of Finnish origin.

settled among the Tatars and Bashkirs in Samara and, Vyatka. The Bashkirs, Meshcheryaks and Teptyars rendered able service to the Russian government against the Khirgiz, and until 1863 they constituted a separate Cossack army. (6) The Khirgiz, whose true abodes were in Asia, in the Ishim and Khirgiz steppe. One section of them crossed the Urals and occupied the steppes between the Urals and the Volga; the remainder belong to Turkestan and Siberia.

The Mongol race is represented in Russia by the Kalmucks, who inhabit the steppes of Astrakhan between the Volga, the Don and the Kuma. They are Lamaists by religion and immigrated to the mouth of the Volga from Dzungaria, in the 17th century, driving out the Tatars {.nd Nogais, and after many wars with the Don Cossacks, one part of them was taken in by the Don Cossacks, so that even now there are among these Cossacks several Kalmuck sotnias or squadrons. They live for the most part in tents, and support themselves by breeding live stock, and partly by agriculture. The Semitic race is represented by upwards of 5,000,000 Jews. They first entered Poland from Germany during the era of the crusades, and soon spread through Lithuania,

Courland, the Ukraine, and, in the 18th century, Bessarabia. The rapidity with which they peopled certain towns (e.g. Odessa) and the whole province? was really prodigious. The law of Russia prohibits them from entering Great Russia, only the wealthiest and best educated enjoying this privilege ; nevertheless they are met with everywhere, even on the Urals. Their chief abodes, however, continue to be Poland, the \V. provinces of Lithuania, White and Little Russia, and Bessarabia. In Russian Poland they constitute I3i% of the total population. In Kovno, Vilna, Mogilev, Grodno, Volhynia, Podolia, Minsk, Vitebsk, Kiev, Bessarabia and Kherson, they constitute, on the average, 12 to I7i % of the population, while in the cities and towns of these governments they reach 30 to 59% of the population. Organized as they are into a kind of community for mutual pro- tection and mutual help, they soon become master? of the trade wherever they penetrate. In the villages they are mostly innkeepers, intermediaries in trade and pawnbrokers. In many towns most of the skilled labourers and a great many of the unskilled (for instance, the grain-porters at Odessa and elsewhere) are Jews.

The Jews of the Karaite sect differ entirely from the orthodox Jews both in worship and in mode of life. They, too, are inclined to trade, but they also carry on agriculture successfully. Those inhabiting the Crimea speak Tatar, and the few who are settled in W. Russia speak Polish. They are on good terms with the Russians.

Of W. Europeans, the Germans only attain considerable numbers in European Russia. In the Baltic provinces they constitute the ennobled landlord class, and are the tradesmen and artisans in the towns. Considerable numbers of Germans, tradesmen and artisans, settled at the invitation of the Russian government iri many of the larger towns as early as the 16th century, and to a much greater extent in the 18th century. Numbers were invited in 1762 to settle in S. Russia, as separate agricultural colonies, and these have since then gradually extended into the Don region and N. Caucasia. Protected as they were by the right of self-government, exempted from military service, and endowed With considerable allotments of good land, these colonies are much wealthier than the neighbouring Russian peasants, from whom they have adopted the slowly modified village community. They are chiefly Lutherans, but many of them belong to other religious sects — -Anabaptists, Moravians, Merinonites. During the closing years of the 19th century great numbers of Germans flocked into the industrial governments of Poland, namely, Piotrkow, Warsaw and Kalisz. ,

The Rumanians (Moldavians) inhabit the governments of Bessa- rabia,

Podolia, Kherson and Ekaterinoslav. In Bessarabia they constitute from one-fourth to three-fourths of the population of certain districts, and nearly 50% of the entire population of the government. On the whole the Novorossian governments (Bessa- rabia, Kherson, Ekaterinoslav and Taurida) exhibit the greatest variety of population. Little and Great Russians, Rumanians, Bulgarians, Germans, Greeks, Frenchmen, Poles, Tatars and Jews are mingled together and scattered about in small colonies, especially in Bessarabia. The Greeks inhabit chiefly the towns, where they are traders, as also do the Armenians, scattered through the towns of S. Russia, and appearing in larger numbers only in the district of Rostov.

The Lithuanians prevail in Kovno, Vilna and Suwalki; and the Letts, who are, however, more scattered, are chiefly concentrated in Vitebsk, Courland and Livonia.

In the Baltic provinces (Esthonia, Livonia and Courland) the prevailing population is Esthonian, Kuronian or Lettish, the Germans being respectively only 3-8, 7-6 and 8-2 % of the population. The relations of the Esths and Letts with their landlords are any- thing but friendly.

The governments of St Petersburg (apart from the capital), Olonets and Archangel contain an admixture of Karelians, Samo- yedes and Syryenians, the remainder being Great Russians. In the E. and S.E. provinces of the Volga (Nizhniy-Novgorod, Sim- birsk, Samara, Penza and Saratov) the Great Russians prevail, the remainder being chiefly Mordvinians, Tatars, Chuvashes and

Religion.

Bashkirs, ; Germans in Samara and Saratov, and Little Russians in the last named. In the Ural governments of Perm and Vyatka Great Russians are in the majority, the remainder being a variety of Finno-Tatars. In the S. Ural governments (Uralsk, Orenburg, Ufa) the admixture of Turko-Tatars — of Kirghiz in Uralsk, Bashkirs in Orenburg and Ufa, and less important races — becomes con- siderable.

The state religion is that of the Orthodox Greek Church (Orthodox Catholic or Orthodox Eastern Church). Its head is the tsar; but although he makes and annuls all appointments, he does not determine questions of dogmatic theology. The principal ecclesiastical authority is the Holy Synod, the head of which, the Procurator, is one of the council of ministers and exercises very wide powers in ecclesiastical matters. In theory all religions may be freely professed,

except that certain restrictions, such as domicile, 1 are laid upon: the Jews; but in actual fact the dissenting sects are more or less severely treated. According to returns published in 1905 the adherents of the different religious com- munities in the whole of the Russian empire numbered ap- proximately as follows, though the heading Orthodox Greek includes a very great many Raskolniki or Dissenters. Indeed it is estimated that there are more than 12,000,000 Dissenters in Great Russia alone.

Orthodox Greek . Dissenters

Armenian Gregorians Armenian Catholics Roman Catholics Lutherans . . . Reformed . .

Baptists Mennonites . Anglicans . Other Christians . Karaite Jews Jews … Mahommedans Buddhists Other non-Christians

Total

87,123,600

2,204,600

1,179,240

38,840

11,468,000

3,572,650

85,400

38.140

66,560

4,180

3. 950

12,900

5,215,800

13,907,000

433,860

285,300

125,640,020

The ecclesiastical heads of the national Orthodox Greek Church consist of three metropolitans (St Petersburg, Moscow, Kiev), fourteen archbishops and fifty bishops, all drawn from the ranks of. the monastic (celibate) clergy. The parochial clergy are celibate in so far as they must be married when appointed, but if left widowers may not marry again.

All Russians, with the exception of a number of White Russians who belong to the United Greek Church (see Roman Catholic Church), profess the Orthodox Greek faith or belong to one or other of the numberless dissident sects. The Poles and most of the Lithuanians are Roman Catholics. The Esths and all other Western Finns, the Germans and the Swedes are Protestant. The Tatars, Bashkirs and Kirghiz are Mahommedans; but the last-named have to a great extent maintained along with Mahommedanism their old Shamanism. The same holds good of the Meshcheryaks, both Moslem and Christian. The Mordvinians are nearly all Orthodox Greek, as also are the Votyaks, Voguls, Cheremisses and Chuvashes, but their religions are, in reality, modifications of Shamanism under the influence of some Christian and Moslem beliefs. The Moguls, though baptized, are in fact believers in fetishism as much as the unconverted Samoyedes. Finally, the Kalmucks are Lamaite Buddhists.

In his relations with Moslems, Buddhists and even fetishists the Russian peasant looks rather to conduct than to creed, the latter being in his view simply a matter of nationality. Indeed, towards paganism, at least, he is perhaps even more than tolerant, preferring on the whole to keep on good terms with pagan divinities. The numerous outbreaks against the Jews are directed, not against their creed, but against them as keen business men and extortionate money-lenders. Any idea of proselytism is quite foreign to the ordinary Russian mind, and the outbursts of proselytizing zeal occasionally manifested by the clergy are really due to the desire for ” Russification,” and traceable to the influence of the higher clergy and of the government.

1 The restrictions on domicile were to some extent relaxed in the beginning of 1907.

[RELIGION

It is this political father than religious spirit which also underlies the repressive attitude of the government, and of the Orthodox Church as the organ of the government, kotalkj.” ‘ towards the various dissident sects (Raskolniki, from raskol, schism), which for more than two centuries past have played an important part in the popular life of Russia, and, since the political developments of the end of the 19th and early years of the 20th century, have tended to do so more and more. To understand the problem of the Raskolniki it is necessary to bear two things in mind: the fundamental principle of Eastern Orthodoxy as distinct from Western Catholicism, and the practical identification in Russia of the National Church with the National State. The very basis of Orthodoxy is that the Church is by Christ’s ordinance unalterable, that its tradi- tional forms, every one of which is a vehicle of saving grace, were established in the beginning by Christ and his apostles, and that consequently nothing may be added or altered. The trouble began early in the 17th century with the attempt, made in connexion with the printing of the liturgical books, to emend certain ritual details in which there was proved to have been a departure from primitive usage; 1 it came to a head under the patriarch Nikon (q.v.). Under his influence a synod endorsed the changes in 1654; one bishop alone, Paul of Colomna, dissented, and he was deposed, knouted and kept in prison till he died mad. In 1656 the synod anathematized the adherents of the old forms, and the anathema was confirmed by those of 1666 and 1667. To the conservatives, known subsequently as Old Ritualists or Old Believers, this marked the beginning of the reign of Antichrist (was not 666 the number of the Beast?); but they continued the struggle, conservative opposition to the Westernizing policy of the tsars, which was held responsible for the introduction of Polish luxury and Latin heresy, giving it a political as well as a religious character. The rising of the Strelitsi in 1682 all but gave them the victory; the crushing of the rising relegated them definitely to the status of schismatics. They were placed in still completer antagonism to the established Orthodox Church by the innovations of Peter the Great. The Muscovite tsars had pursued them with fire and sword. The Russian emperors, having established them- selves as heads of the Church and the Holy Synod as a state department, were not likely willingly to tolerate their existence.

The Raskol was threatened with extinction by the gradual dying out of its priests, which led to a further schism within itself, into the

Popovshchina (with priests) and the Bezpopovsh- china (without priests) . The Popovsti, who were served by priests converted from the Orthodox Church, made their head- quarters in the island of Werka, in a tributary of the Dnieper, in Poland (1695), and after its destruction by the government in 1735 and again in 1764, at Starodubye in the government of Chernigov, whence their doctrine spread in the country of the Don. In 1 7 71 their headquarters were fixed at Moscow, in the Rogoshkiy cemetery assigned to them during the plague; here they had a monastery, seminary and consistory, until they were ejected by the emperor Nicholas I. In 1832 priests were forbidden to join them, and they had to apply to a deposed Bosnian metropolitan, who became their chief bishop, estab- lishing his see in the monastery of Belokrinitsa in Bukovina. In 1862 the synod of the Popovshchina passed a circular letter making advances to the government with a view to a com- promise, which was arranged on the basis of the Old Believers consenting to accept the ministrations of Orthodox priests on condition that they should use the unrevised books. This led to a further schism into three sections: those who recognize the metropolitan and the. compromise (Edinovyertsi) , those who recognize the metropolitan but repudiate the compromise, those who repudiate both {Bieglopopovtsi) . There had already been other schisms on such questions as the right way to swing a censer and the legality of self-immolation for the Lord's sake.

The Bezpopovtsi, known also as Pomoranye, because they are

1 The most important alterations were the repetition twice, instead of three times, of the " Alleluiah " at the Eucharist, and the making the sign of the cross with two fingers instead of three.

mainly found in the sparsely populated country near the White Sea, are in some ways more remarkable. They reject the ministration of priests altogether, since in the time of Antichrist {i.e. the heretic tsar) the only sacrament that remains is baptism. They therefore elect elders, who expound the Scriptures, baptize and hear confessions. They are, however, in no sense evan- gelicals in the Western sense; for they observe rigorous fasts, reverence icons, and believe implicitly in the efficacy of the multiplication of crossings, bowings and prostrations. They have, moreover, thrown off from time to time a number of extravagant offshoots. Such are the Philippovsti, founded by one Philip (who burned himself alive for Christ's sake in 1743)) who have exalted self-immolation into a principle; the Stranniki (pilgrims) and Byeguni (runners), who interpret Matt. x. 37 ff. literally, and reject legal marriage; the Nyetovsti (denyers), who deny the necessity for common worship, since there are no priests; the

Molchalyniki (mutes), whom no torture can persuade to utter a word.

Closely akin to these, though not derived from the Old Believers, are certain mystic sects which deny the efficacy of the sacraments altogether. Of these the most remarkable are the so-called Khlysti (" flagellants," from klyesat, " to strike, la,sh," but possibly a corruption of Khristi, " Christs "). They originated in 1645, when, according to their belief, God the Father descended in a chariot of fire on Mount Gorodim, in the province of Vladimir, and took up his abode in a peasant named Daniel Philippov, who chose another peasant, named Ivan Suslov, for his son, the Christ. Suslpv selected a " mother of God " and twelve apostles. Though twice crucified and once flayed by order of the tsar, he always rose again, and did not die till 1 7 16. Suslov chose a successor in one Prokopiy Lupkin, and since then — in the belief of the sect — every generation, even every community > has had its Christ and its " mother of God," who are worshipped by reason of the Divine Spirit dwell- ing in them. It is the duty of all believers to strive to become oneor other of these by subduing the flesh, which is the product of Evil, and all motions of the will. Each community is pre- sided over by an " angel," or prophet, and a prophetess, whose word is law. All alike are subject to the twelve command-, ments issued by the " Sabaoth," that is to say Daniel Philip- pov. These include the prohibition of alcoholic drink, of fleshly sins and' of marriage, and the inculcation of faith in the Holy Ghost and complete surrender to his influence. At their prayer- meetings the Khlysti dance to the accompaniment of hymns, the dance gradually developing into a wild dervish-like spinning which is kept up till they drop, foaming at the mouth and pro- phesying. Perhaps the most remarkable fact about this sect is that it is secret, and that its members ostensibly belong to the Orthodox Church.

An offshoot of the Khlysti is the more celebrated secret sect of the Skoptsi (skopets, a eunuch), which represents an extreme ascetic reaction from the promiscuous immorality of some (by no means all) of the Khlysti. Their idea of attaining salva- tion is self-mutilation according to the counsel of perfection implied in Matt. xix. 12 and xviii. 8, 9. The " royal seal " is complete self -castration; partial mutilation is known as the " second purity." In the case of women the mutilation usually takes the form of amputation of the breasts. This horrible sect, which was founded by one Selivanov in the last quarter of the 1 8th century, seems tcrhave a morbid attraction for people of all classes in Russia, and all the efforts of the government have not succeeded in stamping it out (see Skoptsi).

Closer akin to certain Western forms of dissidence from traditional

Catholicism, though of native growth, are the Molo- kani, so called popularly because they continue to drink milk (moloko) during fasts. Their origin is unknown, but they are officially mentioned as early as 1765. They style themselves ” truly spiritual Christians,” and in their rejection of the sacra- ments, their indifference to outward forms, and their insistence on the spiritual interpretation of the Bible (” the letter killeth “), they are closely akin to the Quakers, whom they resemble also in their inoffensive mode of life and the practice of mutual help.

From the Molokani the Dukhobortsi, in England better known as Doukhobors (q.v.), are distinguished by their subordination of the Scriptures to the authority of the ” inner light.” They are dualists, like the Bogomils (q.v.), ascribing the body to a fall from a state when the soul was on the same plane as God. The Incarnation was no isolated historical occurrence, but it is repeated over and over again in the faithful, each one of whom is in a certain sense God, by virtue of the indwelling Spirit. Both the Molokani and the Dukhobortsi deny the authority of the civil government as such, and object on principle to military service. The former, however, give little trouble; on the other hand, the government has from time to time proceeded with extreme severity against the Dukhobortsi, whose refusal to serve in the army, if allowed to go unpunished, would have set a contagious example.

Dissidence of all kinds has made a considerable advance since the emancipation of the serfs in 1861, the increase — as might be expected in a wholly illiterate population — being greatest in the more extrava- gant sects. On the other hand, Western Protestantism has also made great headway, notably the Stundists, whose rationalistic- Protestant teaching has gained a firm foothold especially in Little Russia, where the Raskol never penetrated. The Baptists have also made considerable progress, notably among the Molokani. 1

Social Conditions. — The old subdivisions of the population into orders possessed of unequal rights is still maintained. The great mass of the people, 81 -6%, belong to the peasant order, the others being: nobility, 1-3%; clergy, 0-9; the burghers and merchants, 9-3; and military, 6-i. Thus more than 88 millions of the Russians are peasants. Half of them were formerly serfs (10,447,149 males in 1858) — the remainder being ” state peasants ” (9,194,891 males in 1858,

exclusive of the Archangel government) and ” domain peasants ” (842,740 males the same year).

The serfdom which had sprung up in Russia in the 16th century, and became consecrated by law in 1609, taking, how- ever, nearly one hundred and fifty years to attain its full growth, was abolished in 1861. This act liberated the serfs from a yoke which was really terrible, even under the best landlords, and from this point of view it was obviously an immense benefit. 2 But it was far from securing corresponding economic results.

The household servants or dependents attached to the personal service of their masters were merely set free; and they entirely went to reinforce the town proletariat. The peasants proper received their houses and orchards, and allot- ments of arable land. These allotments were given over to the rural commune (mir), which was made responsible, as a whole, for the payment of taxes for the allotments. For these allot- ments the peasants had to pay, as before, either by personal labour or by a fixed rent. The allotments could be redeemed by them with the help of the crown, and then they were freed from all obligations to the landlord. The crown paid the land- lord in obligations representing the capitalized rent, and the peasants had to pay the crown, for forty-nine years, 6% interest on this capital. The redemption was not calculated on the value of the allotments of land, but was considered as a compensation for the loss of the compulsory labour of the serfs; so that throughout Russia, with the exception of a few provinces in the S.E., it was — and still remains, notwithstanding a very great increase in the value of land — much higher than the market value of the allotment. Moreover, many proprietors contrived to curtail seriously the allotments which the peasants had possessed under serfdom, and frequentfy they deprived them of precisely the parts which they were most in need of, namely, pasture lands around their houses, and forests. The effect of this, craftily calculated beforehand, was to compel the peasants to rent pasture lands from the landlord at any price.

‘See N. Tsakni, Russie sectaire (1888); A. Leroy-Beaulieu, L’ Empire des Tsars, tome iii. (1889; trans. 1896); C. K. Grass, Russische Sekten (1907 sqq.). Further useful references are given in Bonwetsch’s article, ” Raskolniken,” in Herzog-Hauck, Real- encyklop. (3rd ed., 1905), vol. xvi. p. 436.

- It was only as late as 1904, however, that the landed proprietors were forbidden by law to inflict corporal punishment upon the peasants.

The present condition of the peasants — according to official documents — appears to be as follows. In the twelve central governments they grow, on the average, sufficient rye-bread for only 200 days in the year— often for only 180 and 100 days. One quarter of them have received allotments of only 2-9 acres per male, and one-half less than 8-5 to 11-4 acres — the normal size of the allotment necessary to the subsistence of a family under the three-fields system being estimated at 28 to 42 acres. Land must thus of necessity be rented from the landlords at fabulous prices. The aggregate value of the redemption and land taxes often reaches 185 to 275% of the normal rental value of the allotments, not to speak of taxes for recruiting purposes, the church, roads, local administration and so on, chiefly levied from the peasants. The arrears increase every year; one-fifth of the inhabitants have left their houses; cattle are disappearing. Every year more than half the adult males (in some districts three-fourths of the men and one-third of the women) quit their homes and wander throughout Russia in search of labour. In the governments of the black-earth region the state of matters is hardly better. Many peasants took the ” gratuitous allotments,” whose amount was about one-eighth of the normal allotments.

The average allotment in Kherson is only 0-90 acre, and for allotments from 2-9 to 5-8 acres the peasants pay 5 to 10 roubles of redemption tax. The state peasants are better off, but still they are emigrating in masses. It is only in the steppe govern- ments that the situation is more hopeful. In Little Russia, where the allotments were personal (the mir existing only among state peasants), the state of affairs does not differ for the better, on account of the high redemption taxes. In the W. provinces, where the land was valued cheaper and the allotments somewhat increased after the Polish insurrection, the general situation might be better were it not for the former misery of the peasants. Finally, in the Baltic provinces nearly all the land belongs to the German land- lords, who either farm the land themselves, with hired labourers, or let it in small farms. Only one-fourth of the peasants are farmers, the re- mainder being mere labourers, who are emigrating in great numbers.

The situation of the former serf-proprietors is also unsatisfactory. Accustomed to the use of compulsory labour, they have failed to accommodate themselves to the new conditions. The millions of roubles of redemption money received from the crown have been spent without any real or lasting agricultural improvements having been affected. The forests have been sold, and only those land- lords are prospering who exact rack-rents for the land without which the peasants could not live upon their allotments. During the years 1861

to 1892 the land owned by the nobles decreased 30%, or from 210,000,000 to 150,000,000 acres; during the follow- ing four years an additional 2,119,500 acres were sold; and since then the sales have gone on at an accelerated rate, until in 1903 alone close upon 2,000,000 acres passed out of their hands. On the other hand, since 1861, and more especially since 1882, when the Peasant Land Bank was founded for making advances to peasants who were desirous of purchasing land, the former serfs or rather their descendants, have between 1883 and 1904 bought about 19,500,000 acres from their former masters. There has been an increase of wealth among the few, but along with this a general impoverishment of the mass of the people, and the peculiar institu- tion of the mir, framed on the principle of community of ownership and occupation of the land, was not conducive to the growth of individual effort. In November 1906, however, the emperor Nicholas II. promulgated a provisional ukaz permitting the peasants to become freeholders of allotments made at the time of emancipa- tion, all redemption dues being remitted. This measure, which was endorsed by the third Duma in an act passed on the 21st of December 1908, is calculated to have far-reaching and profound effects upon the rural economy of Russia. Thirteen years pre- viously the government had endeavoured to secure greater fixity and permanence of tenure by providing that at least twelve years must elapse between every two redistributions of the land belonging to a mir amongst those entitled to share in it. 3 The ukaz of November 1906 had provided that the various strips of land held by each peasant should be merged into a single holding ; the Duma, however, on the advice of the government, left this to the future! as an ideal that could only gradually be realized.

The co-operative spirit of the Great Russians shows itself in another sphere in the artel, which has been a prominent feature of Russian life since the dawn of history. The artel ,.. rtl very much resembles the co-operative society of W. ‘*”«•” Europe, with this difference that it makes its appearance without

8 See Collection of Materials on the Village Community, vol. i. ; Collection of Materials on Landholding, and Statistical Descriptions of Separate Governments, published by several zemstvos (Moscow, Tver, Nyzhniy-Novgorod, Tula, Ryazan, Tambov, Poltava, Saratov, &c); Kawelin, The Peasant Question; Vasilchikov, Land Property and Agriculture (2 vols.), and Village Life and Agriculture; Ivan- ukov, The Fall of Serfdom m Russia ; Shashkov, ” Peasantry in ■the Baltic Provinces, in Russkaya Mysl. (1883), iii. and ix. ; V. V., Agric. Sketches of Russia; Golovachov, Capital and Peasant Farming; Engelhardt’s Letters from the Country,

any impulse from theory, simply as a spontaneous outgrowth of popular life. When workmen from any province come, for instance, , to St Petersburg to engage in the textile industries, or to work as carpenters, masons, &c, they immediately unite in groups of ten to fifty persons, settle in a house together, keep a common table and pay each his part of the expense to the elected elder of the artel. All over Russia there is a network of such artels — in the cities, in the forests, on the banks of the rivers, on journeys and even in the prisons.

The industrial artel is almost as frequent as the preceding, in all those trades which admit of it. Artels of one or two hundred : carpenters, bricklayers, &c, are common wherever new buildings have to be erected, or railways or bridges constructed; the con- tractors always prefer to deal with an artel, rather than with separate workmen. It is needless to add that the wages divided by the artels are higher than those earned by isolated workmen.

Finally, a great number of artels on the stock exchange, in the seaports, in the great cities, during the great fairs and on railways have grown up, and have acquired the confidence of tradespeople to such an extent that considerable sums of money and complicated banking operations are frequently handed over to an artelshik (member of an artel) without any receipt, his number or his name being accepted as sufficient guarantee. These artels are recruited only on personal acquaintance with the candidates for membership. Co-operative societies have also been organized by several zemstvos. They have achieved good results, but do not exhibit, on the whole, the same unity of organization as those which have arisen in a natural way among the peasants and artisans.

The chief occupation of approximately seven-eighths of the

population of European Russia is agriculture, but its character

varies considerably according to the soil, the climate and

„ ” the geographical position of the different regions. A

culture. ginuous line drawn from Zhitomir via Kiev, Tula and Kazan to Ufa — that is, from W.S.W. to E.N.E.ˆ-separates the ” northern soils ”

from the ” southern soils.” To the S. of this line, as far as the sandy deserts of Astrakhan and the steppes of N. Caucasia, lies the ” black earth ” region. Broadly speaking, the forests here yield to steppes, and the soil is very fertile; but the whole region suffers periodically from drought. The “northern soils,” which are glacial deposits more or less redistributed by water, are much less fertile as a rule, and consist of all possible varieties from a tough boulder clay to loose sand. Both N. and S. of this line it is customary to distinguish several zones, lying, generally, parallel to it, and differentiated chiefly by climatic differences. In the tundras of the extreme N. agriculture does not exist; the reindeer constitutes the principal wealth of the nomad Samoyedes and Lapps. In the forest region S. of the tundras, which extends over an area of more than 500,000 sq. m.* agriculture is carried on with great difficulty, not only because of the infertility of the soil, but also because of the severity of the climate and the fact that there are only three to four months in the year during which agriculture can be carried on. Apart from hunting and fishing, the exploitation of the forests provides the principal occupation of the inhabitants. Crops, chiefly barley, rye, oats, turnips and green crops, are, however, grown on clearings in the forest, though the yield is poor. S. of 6o° N. agriculture becomes the predominant industry, while the exploitation of the forests plays only a secondary part. In this zone, which extends over an area of nearly 600,000 sq. m., and on the S. touches the agrarian line already mentioned, the principal crops are rye and oats, with barley and wheat coming next, though flax and green crops are also grown. Cattle have to be housed for the winter. In the W. of this zone, that is in the Baltic provinces, the climate is less severe as well a9 moister. Agriculture is carried on in a more intelligent manner, and the yield is higher. Flax is almost of as much importance as wheat, and the potato is more cultivated than in any other part of Russia. Hardy fruit thrives, and live-stock breeding prospers. In the W. governments of Kovno, Vitebsk, Vilna, Mogilev, Minsk and Grodno the climate is more temperate, but agriculture is more backward than in the Baltic provinces. The three-field system of cropping a patch of land until, its fertility is exhausted, and then allowing it to revert to the primeval con- dition, is still pursued, and both landowners and peasantry suffer from want of capital and lack of agricultural training. Flax is one of the principal exports of this region, timber being another.

In middle Russia the winters are both longer and harder, and agriculture is consequently carried on under greater difficulties. One of the most serious of these is caused not by the unfavourable character of the climate but by the shortness of labour. Since their

emancipation in 1861, the peasants of the central govern- ments of Russia have in large numbers drifted away into' the black earth zone, or have gone to the factories. The methods of agri- culture are still unscientific and unprogressive. Rye is the staple crop, though buckwheat, flax, green crops and the potato are cultivated in considerable quantities.

Agriculture is most advanced in the W. of the black earth zone, that is in the governments of Kiev, Podolia, Poltava and in part of Kharkov. The winters are less severe, and modern agricultural machinery ia generally employed, at all events on the larger estates.

Jn consequence of these more favourable conditions there is greater variety in the cropping; a good deal of wheat is grown, as well as beetroot for sugar, fibre plants and oleaginous plants, fruit, and even (W. of the Dnieper) the vine. Live-stock breeding is likewise in a more prosperous condition. The rest of the black earth zone, which stretches from these governments N.E. to the Volga, is less favoured by nature; the winters are longer and more, inclement, and droughts are not uncommon. When this happens there is great suffering from famine, for wheat is the crop upon which the people principally depend, though rye, buckwheat and oats are also cultivated. But a long course of continuous cropping with these grain crops, without affording compensation to the soil in the form of manure or deep cultivation, has so ex- hausted it that its productiveness has sadly deteriorated. The consecjuence is that the peasantry are constantly in a state bordering on destitution, and exposed to the horrors of famine, like those which visited them in 1890 and 1898, and threatened in 1907.

S. of the above zone come the S. steppes. In the W., in Bess- arabia, the three chief products are maize, wine and hardy fruit, especially plums. Here the climate is temperate and fairly moist, but farther E. it is distinctly more arid. Wheat is the principal crop, with barley second. Water-melons, sun-flowers and flax, both the last two for oil, are usual crops. But the breeding of horses and sheep is of equal importance with agriculture. Here again both capital and labour are short, and the cultivation of the soil suffers from the fact that, owing to the absence of timber, dry dung is used for fuel instead of being employed as manure. The steppe conditions extend over the greater part of the Crimea and tip to the foothills of the Caucasus. The actual distribution of. arable land, forests and meadows, in European Russia and Poland is shown in the following table :—

European Russia.

Poland. j

Acres.

Per- centage.

Acres.

Per- centage.

Arable land . Meadows and pasturages . Forests . . Uncultivated .

Total

301,435,000

185,498,000 452,152,000 220,279,000

26

16 39 19

16,900,000

6,059,000 7,334,000

I.594.0OO

53

19 23

5

1.159.364,000

100

31,887,000

100

The land in European Russia and Poland (Caucasia being ex- cluded) is divided amongst the different classes of owners as follows: —

European Russia.

Poland.

Acres.

Per- centage.

Acres.

Per- centage.

State and im- perial family

Peasants .

Private owners, towns, &c.

Unfit for culti- vation .

Total .

406,816,000 446,657,000

245,835,000

66,056,000

35,

3»i

21

5i

1,808,000 13,584,000

15,106,000

1,389,000

51

42ˆ

47*

4*

1,159,364,000

100

31,887,000

100

Down to January 1st 1903, the peasants had actually redeemed out of the land allotted to them in 1861 a total of 280,530,516 acres. In Poland the peasants as a body have, in addition to the land thus assigned to them by the government, bought some 2j million acres since 1863, and of this quantity they purchased no less than 1,600,000 acres, or 64% of the whole, between 1893 and 1905.

Taking the whole of European Russia and Poland, almost exactly two-thirds of the total area is sown every year with cereals. But generally in from 18 to 33 out of the 72 governments in European Russia (including,Caucasia) and Poland the yield of cereals is not sufficient for the wants of the people. In 30 to 40 governments, however, there is in most years a surplus available for export. Out of the total acreage under cereals 34% is generally sown with

S'e, 26% with wheat, 20% with oats and 10 J % with barley, eetroot (6ˆ8 million tons annually) for sugar is especially cul- tivated in Poland, the governments of Kiev, Podolia, Volhynia, Kharkov, Bessarabia and Kherson. About 100,000 tons of tobacco are grown annually in the S. Flax and hemp occupy considerable acreages in central and N.W. Russia. The vine is cultivated as far N. as 49 N. (in Bessarabia, Crimea, Don Cossacks territory and Caucasia), the annual production of wine amounting to 35~5° million gallons, three-fifths in Caucasia. Market-garden- ing aha fruit-growing are profitable occupations in certain parts of S. and central Russia, and have led recently to the establishment

INDUSTRIES)

RUSSIA

W§

of factories for canning fruit and for making jam and pickles. Transcaucasia supplies, chiefly from the government of Erivan, some 12,000 tons of raw cotton annually. The tea plant thrives and is being planted fairly rapidly on the Black Sea littoral in Transcaucasia.

Live-stock are diminishing in numbers all round: in the ease of horses, from 21 per 100 inhabitants in 1882 to n per 100 in* habitants in

1904; of cattle, from 31 in 1851 to 23 in 1882 and 27 in 1904 ; sheep, from 56 to 46 and 41 in the years named respectively ; and pigs, from 13 to 9 and 10 respectively. Recent investigations in the government of Moscow have revealed that 40% of the peasant households possessed no horses, and similar inquiries in 41 governments elicited the fact that 28% of the peasant house- holds were without horses, although of the total number of horses in the country 82% belong to the peasantry. The animal commonly met with is small and possessed of very little strength ; the best are those of Poland, the W. governments and the S. steppe country. Both the horses of the Cossacks and the bityug race of S. Russia are fine animals, and those of the Kirghiz, though not big, are famous for their endurance. Finland ponies are exported in large numbers. The best bred races of cattle are those of Poland, the W. provinces, Little Russia and the far N. (Kholmogory). Of the 55 million sheep kept in Russia onlyabout 15 millions belong to the fine merino breed, and these are pastured chiefly on the Black Sea steppes. Modern dairy-farming is only just beginning in Russia, but butter is being exported in increas- ing quantities to W. Europe, including Great Britain. , Poultry- farming is being more extensively engaged in, and vast numbers of eggs are exported.

Agriculture stands at a low level in Russia. The landowners are often poor, and suffer from want of capital and lack of enter- prise. The peasantry are impoverished, and in many parts live on the verge of starvation for the greater part of the year. While the methods of agriculture have generally shown little, if any, advance, the population is increasing rapidly; and although since the emancipation of the peasants the average annual export of cereals has increased from less than ii million tons in i860 to over 6 million tons in 1900, this result has been attained largely by the repeated cropping to exhaustion of the soil. Thus the cultivators, whether noble or peasant, have not profited much from the change in their economic circumstances brought about by the social emancipation of 1861. Agriculture suffers from the widespread poverty of the agricultural classes, from the taxation which weighs unjustly upon the peasantry, from their lack of education, their technical ignorance and national indolence, and from the absence of those progressive institutions (e.g. co-operative buying) by means of which the peasantry of Denmark have so wonderfully improved their position. As illustrating the general impoverishment of the Russian peasantry, it may be stated that the arrears of taxation owed by them have increased enormously since 1882, when they amounted to £2,854,000, until in 1900 the total amount was put at £15,222,000. And, strange to say, the

heaviest arrears are due from the fertile black earth region of S. Russia, namely, 80% of their total indebtedness. Within recent years, however, some efforts have been made both by the Ministry of Agriculture and by the more enlightened of the zemstvos to improve the education of the peasantry, but the progress achieved has been small. The methods adopted by the zemstvos for improv- ing the condition of agriculture have included the formation of agricultural councils, the appointment of inspectors, and the founding of museums, meteorological stations and depots for the, sale of agricultural machinery. Measures are being taken by the zemstvos to increase the very low productivity of the forests- These cover a considerable area, as may be seen by the following table for 1904: —

Region.

Square Miles.

Percentage of Total Area.

European Russia

Poland

Total .

706,500 11,500 79,000 29,200

39

23

55 16

826,200

39

The distribution of forests is very unequal, the area covered by them in the various governments varying from 70% of the total area in the Ural governments of Perm and Ufa, and 68 % in Olonets and Archangel, down to 2 % in the S.E. The state is the chief owner of forests (almost exclusive owner in Archangel), and owns no less than 289,226,000 acres in European Russia and Poland (235,000,000 acres of good forests), while private persons own 171,800,000 acres, the peasant communities 67,250,000 and the imperial family 22,400,000 acres.

Sericulture, which was in a flourishing condition in the ‘sixties both in Caucasia and in S. Russia, was reduced to a very low ebb, in consequence of the silkworm disease, and was only renewed with any vigour towards the end of the ‘eighties. At the beginning of

the 20th century it was most developed in Transcaucasia (Kutais, Elisavetpol), arid extended into N. Caucasia. Sericulture is taught in a number of special schools and in a great number of village schools. Attempts are being made to re-establish the silkworm industry in S. Russia and in Poland. Altogether raw silk and silk yarn to an annual value exceeding 1 J millions sterling are exported from Russia.

Notwithstanding the wealth of the country in minerals and metals of all kinds, and the endeavours made by government to encourage mining, including the imposition of protective „. tariffs even against Finland (in 1885), this and the related MU "“S industries are still at a low stage of development. The ft/1′ remoteness of the mining from the industrial centres, the ~? fJ”” want of technical instruction and of capital, and the ousirles. existence of vexatious regulations, aggravated by the disturbed condition of the country, which hinder credit, confidence and enterprise, are amongst the chief reasons for this. The imports of foreign metals in the rough and of coal are steadily increasing, while the exports, never otherwise than insignificant, show no advance. As a producer of iron Russia nevertheless runs France neck and neck for the fourth place amongst the iron-producing countries of the world, her annual output having increased from 1,004,800 metric tons in 1891 to 2,808,000 in 1901 and to 2,900,000 in 1904. The two principal mining centres of European Russia are the Urals, Ekater- lnoslav, Kharkov and the Don Cossacks territory. The Ural industry is the older, and is still conducted on primitive methods, wood being largely used for fuel, and the ore and metals being transported by water down the Kama and other rivers. The minerals chiefly produced in the Urals are iron, coal, gold, platinum; copper, salt and precious stones. The production of pig-iron nearly doubled between 1890 and 1900, increasing from 446,800 tons in the former year to 801,600 in the latter; but since 1900 the output has declined, the total for 1904 (inclusive of Siberia) being 644,000 tons. The amount of iron and steel produced in the Urals is not quite 20% of the total in all European Russia and Poland. The output of coal in the Urals is, altogether, less than 3 % of the total for all the empire and 4% of the output of European Russia (ex-clusive of Poland) alone. The annual increase is but small, 261,300 tons having been the total in 1891, and 517,000 tons the total in 1904. Gold has been mined in the Urals since 1820; but since 1802 the output has fallen off very considerably. Whereas in the latter year

the yield amounted to 395,500 oz., in 1900 it was only 291,250 oz. No less than 96% of the world's supply of platinum comes from the Urals; but the total output only ranges between 10,000 and 16,000 R> annually. The copper industry has greatly declined since the 18th century; whereas then it kept 20 smelting works employed, now one-tenth of that number can hardly be kept going. The output for the year is less than 4000 tons. At one time all Russia was supplied with salt from the Urals, but at the present time the output is extremely small, less than 350 tons annually. Salt has been mined there since the 16th century.

The mining- region of S. Russia is much more important. It is of comparatively recent foundation (i860), and is carried on largely with French and Belgian capital, with modern appliances and with modern scientific knowledge. Out of an average of some 2,700,00© tons of pig-iron produced annually in the whole of the Russian empire, 61 -5 % is produced in the basin of the Donets, and out of an average of 2,160,500 tons of worked iron and steel 48-7 % are prepared in the same region. The principal consumer of this iron and steel is the government, for its railways, locomotives, wagonsˆ arsenals, artillery, &c. The output of coal in the Russian empire has increased from a total of less than 300,000 tons in i860 to 3,280,000 in 1880, 15,878,200 in 1900, and 18,620,000 tons in 1904. Of these totals something like 70 % is produced in the S. coal-field. Coal takes, however, an altogether secondary place as a fuel in Russia; wood is much more extensively used, not only for domestic, but also for industrial purposes. It is estimated that for domestic purposes nearly 150,000,000 tons of wood are consumed every year, while the steamships, railways and factories consume another 20 or 25 million tons. At the same time large quantities of petroleum refuse are used as fuel in the railways of S.E. Russia and Caucasia, and on the steamboats of the Volga system. For the petroleum industry and the mining of the Caucasus region, see Caucasia. Mining in Poland and Siberia are more fully discussed under those! headings. 1 Since the time of Peter the Great, the Russian government has been unceasing in its efforts for the creation and development of home manufactures. Important monopolies in the 18th „ fe

tares and

century, and prohibitive import duties, as well as large money bounties, in the 19th, contributed towards the

accumulation of immense private fortunes, but manu- j e ˆLj_ factures have on the whole developed but slowly. A aust " es ' great upward

movement has, however, been observable since 1863. About that time a thorough reform of the machinery in use was effected whereby the number of. hands employed was reduced, but the yearly production doubled or trebled. Manufacturing industry in the modern sense can hardly be said to have existed in Russia

1 See Russian Journal of Financial Statistics, in English (2 vols., St Petersburg, 1901).

before the 19th century, that Is to say, industries carried on with capital and machinery in large factories. Industry of this character was first established in Poland in 1820, and it has grown there rapidly, though never so rapidly as during the last few years of the 19th century. The principal centre is Lodz in the government of Piotrkow, the staple industry being cottons. A good many factories have sprung up also in Warsaw and at Sosnowice and Bendzin in the extreme S.W. corner of Poland. Besides cottons the products include woollens and cloth, silks, chemicals, machinery, ironware, beer and flour. At Lodz alone the workmen, in great part Germans and Jews, number between 50,000 and 60,000, and the total output of the factories is estimated at £9,000,000 ;to £10,500,000 annually. Similar industries, carried on by similar methods, exist at St Peters- burg, Riga, Narva and Odessa. In S. Russia, more particularly at Ekaterinoslav, a very vigorous metallurgical industry has grown up since i860 in conjunction with the iron and coal mining.

The peculiar feature of Russian industry is the development out of the domestic petty handicrafts of central Russia of a semi- factory on a large scale. Owing to the forced abstention from agricultural labour in the winter months the peasants of central Russia, more especially those of the governments of Moscow, Vladimir, Yaroslavl, Kostroma, Tver, Smolensk and Ryazan have for centuries carried on a variety of domestic handicrafts during the period of compulsory leisure. The usual practice was for the whole of the people in one village to devote themselves to one special occupation. Thus, while one village would produce nothing but felt shoes, another would carve sacred images (ikons), and a third spin flax only, a fourth make wooden spoons, a fifth nails, a sixth iron chains, and so on. In the same way certain governments become famous for certain commodities, as Moscow for

osier baskets, flower baskets, wicker furniture and lace; Kostroma for lace, wooden utensils, toys, wooden spoons, cups and bowls, bast sacks and mats, bast boots and garden products; Yaroslavl for furniture, brass samovars, saucepans, spurs, rings, &c. ; Vladimir for furniture, osier baskets and flower-stands and sickles; Nizhniy-Novgorod for bast mats and sacks, knives, forks and scissors ; Tver for lace, nails, sieves, anchors, fish-hooks, locks, coarse clay pottery, saddlery and harness, boots and shoes, and so on. Out of theste have grown large factories, employing as many as 10,000 to 12,000 men each; but when harvest comes round, these men leave the factories and repair to their fields, and meantime the factories stand still for two or three months. Nor do the people work on the holidays of the church, the number of days they lose in this way amounting to nearly one-third of the whole year. Hence, although wages are painfully low, the cost of production to the manufacturer is relatively high; and it is still further increased by the cost of the raw materials, by the heavy rates of transport owing to the distance from the sea, by the dearness of capital and by the scarcity of fuel. As a consequence this central Russian industry, even when sup- ported by very high protective duties, is only able to produce for the home market and the markets of the adjacent territories in Asia which are under Russian political control. Here again cotton is the principal product ; and the remarkable growth of the industry is illustrated by the fact that, whereas in 1843 there were only 350,000 spindles at work, fifty years later there were 4,332,000 so employed, and in 1900, 6,554, 600. The number of looms increased from 87,190 in 1890 to 154,600 in 1900. Next after cottons come woollens, silk, cloth, chemicals, machinery, paper, furniture, hats, cement, leather, glass and china and other products. From the governments of Vyatka and Vladimir large numbers of bricklayers, carpenters and other handicraftsmen migrate temporarily to the S. governments every year, and similarly plasterers and painters from the government of Moscow.

The growth of Russian industry is set forth in the following table, which compares the number of workers for 1887, 1897 and 1902, of all factories throughout the empire of which the annual production was valued at more than £210: —

Number of Workers.

Branch of Industry.

1887.

1897.

1902.

Textiles ….

399.178

642,520

708,186

Food products

205,223

255,357

303,213

Animal products .

38,876

64,418

—

Wood …..

30.7O3

86,273

79,664

Paper … . .

19.491

46,190

78,395

Chemical products

21.134

35.320

60,108

Ceramics ….

67.346

H3.29I

150,809

Mining and metals

390,915

544,333

549,000

Meta’ goods

103,300

214,311

252,215

Various …. Total

41,882

66,249

78,183

1,318,048

2,098,262

2,259,773

With regard to Russian industry generally, the extravagant prices which have to be paid for iron and all iron goods, owing to the prohibitive tariffs, combined with the obstacles put in the way of education, hamper the development of all industries. The cotton factories excel chiefly in the production of red and printed

cottons. In the flax-mills the tendency is to produce the finest tissues as well as the coarser. The silk-mills employ silk obtained from the Caucasus, Italy and France. The growth of the sugar industry is shown by the fact that in 1888-93 the average annual production of sugar was 444,520 tons, in 1902-3 it was 1,180,293 tons. Since 1894 the government has had a monopoly in retailing spirituous liquors, but not wine or beer; but distilling, a very widespread industry, is left in private hands. Beer is chiefly brewed in Poland and the Baltic provinces. Tanneries exist in nearly every government, but it is especially at Warsaw and St Petersburg, and after these at Moscow, that the largest and best modern tanneries and shoe and glove factories are estab- lished. The governments of Orel (shoe factories), Kherson, Vyatka, Nizhniy- Novgorod, Perm, Kiev and Kazan rank next in this respect. Furniture factories are developing greatly, as is the paper industry. Flour-mills play an important part in the general industry of Russia, and there are several tobacco and hemp factories.

Far from being destroyed by the competition of the ” modern ” factories, domestic industries have well maintained their ground, new branches of petty trade having sprung up in some districts, among them the manufacture of agricultural machinery (thrashing machines in Ryazan, Vyatka and Perm; ploughs in Smolensk, &c.) deserves notice.

The wealth of Russia consisting mainly of raw produce, the trade of the country turns chiefly on the purchase of this for export, and on the sale of manufactured and imported goods . . .

in exchange. This traffic is in the hands of a great tr a A e

number of middlemen, — in the W. Jews, and elsewhere Russians, — to whom the peasants are for the most part in debt, as they purchase in advance on security of subsequent payments in corn, tar, wooden Wares, &c. A good deal of the internal trade is carried on by travelling merchants.

The fairs are very numerous. Those of Nizhniy-Novgorod, with a return of 20 millions sterling, of Irbit and Kharkov, of Menzelinsk in

Ufa, and Omsk and Ishim in Siberia, have con- siderable importance both for trade and for home manufactures. Altogether, no fewer than 16,600 fairs are held in Russia, 85% of them in European Russia. Of these, 30 show returns of goods imported to the value of over £100,000 each, 41 from £50,000 to £100,000, and 437 from £10,000 to £50,000 each.

The external trade of the Russian empire (bullion and the external trade of Finland not included) since the year 1886 is shown in the following table :—

Years (average).

1886-1891 1 892-1 896 1897-1901 1 902-1 905

Exports.

£72,200,000

60,360,000 68,500,000

103,448,000

Imports.

£43,250,000

46,100,000 55,180,000

.66,533,000

The exports rank in the following order: — cereals (wheat, barley, rye, oats, maize, buckwheat) and flour, 49-2%; timber and wooden wares, 7-2; petroleum, 5-8; eggs, 5-4; flax, 5; butter, 3; sugar, 2-4; cottons and oilcake, 2 each; oleaginous seeds, &c, 1-5; with hemp, spirits, poultry, game, bristles, hair, furs, leather, manganese ore, wool, caviare, live-stock, gutta-percha, vegetables and fruit, and tobacco. The two best customers of Russia are Germany, which takes 23-3% of her total exports, and the United Kingdom, which takes 22-9%. Then follow the Netherlands (9-8%), France, Italy, Finland, Belgium, Austria-Hungary, Den- mark, Turkey and Sweden. The commodities which the United Kingdom principally takes are wheat, wool, barley, eggs, oats and flax. With regard to the imports into Russia — they consist mainly of raw materials and machinery for the manufactures, and of provisions, the principal items being raw cotton, 17% of the aggregate; machinery and metal goods, 13%; tea, 5%; mineral ores,

5%; gums and resins, 4%; wool and woollen yarns, 3l%; textiles, 3%; fish, 3%; with leather and hides, chemicals, silks, wine and spirits, colours, fruits, coffee, tobacco and rice. The countries from which Russia buys most extensively are Germany (34%), the United Kingdom (15 J) and the United States (9I). Machinery, coal, iron, woollens, ships, lead and copper are the Commodities supplied by the United Kingdom.

The total mercantile marine of Russia does not aggregate 700,000 tons; and it is distributed in the following proportions: 35*4% in the Caspian Sea, 34-7% in the Black Sea and shloolnir Sea of Azov, 24-7% in the Baltic Sea and 5-2% in pp *”

the White Sea. And these proportions represent fairly well the tonnages entering and clearing at the ports of these respective seas. But of the vessels that visit the Russian ports in the way of trade every year only 8-3% are Russian, the rest being of course foreign. Russian craft play, however, a much more important part on the internal waterways, the traffic on which increases rapidly, e.g. whilst in 1894 it amounted to an aggregate of 23,293,400 tons, in 1904 it reached a total of 38,720,240, or an increase of over 66% in the ten years. During the same period the tonnage of the craft themselves more than doubled, while the

crews increased 19! %, the number of men employed in the latter year being approximately 150,000.

In i860 Russia possessed less than 1000 m. of railways; by 1885 this had increased to 16,155 m., and by the middle of 1905 there _ _ were open for traffic over 40,500 m. of railway, of which

Kanwayt. 34,150 m . or 84-3 % were in European Russia and nearly 6400 m. (157 %) in Asiatic Russia. Between 1895 an d IO °5 the building of railways proceeded at a rapid rate, the total length nearly doubling within the ten years, namely, from 22,600 to 40,500 m. The European railways cost on an average £10,465 per mile to construct, and the Asiatic railways £5092 per mile.

A considerable number of new railways, some of great strategic as well as commercial importance, were built during the last twenty

years of the 19th century. At the same time the chief lines of railway which had been built by public companies with a state guarantee, and which represented a loss to the empire of £3 (I7l> 2 5° per annum, as well as a growing indebtedness, were bought by the state. On the whole, the state derives profit from its railways, although several of the later lines, while imperative for state pur- poses, must necessarily yield but a very small revenue, or be worked at a loss. The most important of the new railways is the Siberian, of which the first section, Chelyabinsk to Omsk, was opened in December 1895, and which, except for a short section round Lake Baikal, in 1901 was completed right through to Stryetensk, on the Shilka, the head of navigation on the Shilka and the Amur, 2710 m. from Chelyabinsk and 4076 miles from Moscow, via Samara and Chelyabinsk. The section round the S. end of Lake Baikal was completed in 1905. At the Pacific end of the Siberian railway a line connecting Vladivostok with Khabarovsk (479 m.) at the junction of the Amur and the Usuri, was first of all built, following the valley of the Usuri. But it was soon found that the cost of the section required to complete the railway between Stryetensk and Khabarovsk, along the Shilka (246 m.) and the Amur (1160 m.), would be enormous, while neither the wild mountainous tracts of the lower Shilka and upper Amur, nor the marshy, often inundated region between Khabarovsk and the Little Khingan mountains, could ever be the seat of a numerous population. Consequently a company was formed by the Russian government in 1896 to con- struct, with the consent of the Chinese government, a railway from Vladivostok across Manchuria to Karymskaya near Chita in Trans- baikalia. This runs for 222 m. on Russian territory and for 1080 m. on Manchurian territory, and from Kharbin sends off a branch to Dalny near Port Arthur on the Liao-tung peninsula. The first portion of the Manchurian railway, built by Russian engineers, with Chinese labour, was finished in 1902. At the same time several secondary lines were built in connexion with the Siberian line. Chelyabinsk was linked by a transverse line with the middle Urals railway, which connects Perm, the head of navigation in the Volga basin, with Tyumen, the head of navigation on the Ob and Irtysh, passing through Ekaterinburg and other mining centres of the middle Urals. Tomsk is now connected with the main line by a short side branch. A railway has also been built to connect Perm with Kotlas, near the confluence of the Sukhona with the Yug, at the head of the N. Dvina. This N. portion of the Russian railway system was further completed by the opening in 1 906 of a line from St Petersburg via Vologda to Vyatka, intersecting the Moscow- Archangel line at Vologda.

Another line of great strategic importance was built across the Transcaspian territory to Ferghana. Starting from Krasnovodsk, it runs S.E. to Merv (560 m.), with a branch line (194 m.) to Kushk, near Herat, then N.E. across the desert to Charjui, on the Amur river, Bokhara and the Russian fort Katta-kurgan, and then to Samarkand, Kokand and Andijan in Ferghana, 710 m. from Merv, with a branch to Tashkent (220 m.). This railway has become important for the export of raw cotton from Central Asia to Russia. In 1905 a second totally independent line was opened from Tashkent down the Syr-darya to Kazalinsk, and thence to Orenburg.

A third line of great importance is the junction line between the Transcaucasian railway — which runs from Batum and Poti to Baku, via Tiflis, with a branch line to Kars — and the railway system of Russia proper. This junction has been effected not across the main Caucasus range, but at its E. extremity, that is, via the Caspian ports of Baku and Petrovsk, which are connected with Vladikavkaz (Beslan junction). The Black Sea port of Novorossiysk, in W. Caucasia, having been connected with the Rostov-Vladikavkaz line, has consequently also been brought into touch with the Russian railways. The Volga is reached from central Russia by seven lines of railways, including one to Kazan, and three main lines radiate from the Volga E. (one to Siberia and two to the Ural river), while the upper Volga (Yaroslavl) is connected with Archangel by a line 523 m. long. A zone tariff was introduced on the Russian railways in 1894, and the cost of long journeys was considerably reduced ; a journey of 623 m. can be made third class at a cost of only about 17 shillings, while for less than twice as much 1990 m. can be covered.

Fish form an important article of national food. The numerous

fasts of the national church prescribe a fish diet on many days in the

year, and the continuous frost of winter is favourable to

Fishing. tne tranS p or tation of fish for great distances. Along the

Murman coast of the Arctic Ocean and in the White Sea, where many

millions of herrings are caught annually by some 3000 persons, the yearly produce is estimated at the value of £140,000. In the Baltic Sea, as well as in the lakes of its basin (Ladoga, Onega, Ilmen, &c), the yearly value is estimated at £200,000. Of anchovies alone, 10,000,000 jars are prepared annually, while salted fish is, next after bread, the staple food of large masses of the population. The Black Sea fisheries,

in which about 4000 men are engaged, yield fish valued at £300,000 per annum. The value of the fish has much increased owing to the introduction of cold storage; as a result of the employment of this method of packing, fish is now exported in a fresh state from the Black Sea to all parts of S.W. Russia, and even to Moscow. The annual yield of the Azov Sea fisheries, occupying 15,000 men, is valued at £600,000. In the Volga section of the Caspian Sea fish are caught to the value of about £1 ,000,000 annually ; in the Ural section over 40,000 tons of fish and nearly 1500 tons of caviare are obtained. The total value of the Caspian fisheries is estimated at £3,000,000 per annum. Taking the Lake Aral and Siberian river fisheries into account, it is estimated that altogether the fishing industries yield a revenue to the state of £330,000 annually. 1 In addition from 13,000 to 60,000 seals and about 200 whales are killed annually off the Murman coast. Hunting is an occupation of considerable importance in N. and N.E. Russia, and along the shores of the Arctic Ocean.

Authorities. — The Russkiy Encyclopedicheskiy Slovar, edited by Brockhaus and Efron, was begun in 1890, with the idea of giving a Russian version of Brockhaus's Conversations Lexikon, but from the very first volumes it became a monumental encyclopaedia, and is, indeed, an inexhaustible source of information on everything Russian. A general popular description of Russia entitled Rossiya, containing excellent geographical, geological and other descriptions of separate regions, and very well-chosen illustrations, was begun in 1899 under the editorship of V. P. Semenov. La Russie & la fin du six? Steele, under the editorship of W. W. Kovalevsky, is especially worthy of notice. See also H. Norman, All the Russias (London, 1902) ; Sir D. Mackenzie Wallace, Russia (2 vols., new ed., 1905, London) ; A. Leroy-Beaulieu, L'Empire des tsars (3 vols., 1882-88; Eng. trans., London, 1893-96) ; A. Hettner, Das europaische Russland (Leipzig, 1905); R. Martin, The Future of Russia (Eng. trans., London, 1906) ; M. M. Kovalevsky, Russian Political Institu- tions (Chicago, 1902), Modern Customs and Ancient Laws of Russia (London, 1891), Le Rigime economique de la Russie (Paris, 1898), and Die produktiven Krafte Russlands (Paris, 1896); A. M. B. Meakin, Russia (London, 1906) ; G. von Schulze-Gavernitz, Volks- wirthschaftliche Studien aus Russland (Leipzig, 1899) ; J. Machat, La Developpement economique de la Russie (Paris, 1902); Industries of Russia, by the Department of Trade and Manufactures (English by J. M. Crawford, 5 vols., St Petersburg, 1893) ; A. F. Rittich, " Die Ethnographic Russiands " in Petermanns Mitteilungen, Erganzungsheft 54 (Gotha, 1878); C. Joubert, Russia as it really is (London, 1904). (P. A. K.; J. T. Be.)

History

The history of Russia may be conveniently divided into four consecutive periods: (1) the period of Independent Principalities; (2) the Mongol Domination; (3) the Tsardom of Muscovy; and (4) the Modern Empire.

1. A Conglomeration of Independent Principalities. — The first period, like the early history of many other countries, begin? with a legend. Nestor, an old monkish chronicler origin of Kiev, relates that in the middle of the 9th century of the the Slav and Finnish tribes inhabiting the forest * ussfaJ,s – region around Lake Ilmen, between Lake Ladoga and the upper waters of the Dnieper, paid tribute to military adventurers from the land of Rus, which is commonly supposed to have been a part of Sweden. In the year 859 these tribes expelled the Northmen, but finding that they quarrelled among themselves, they invited them, three years later, to return. Our land, said the deputation sent to Rus for this purpose, is great and fertile, but there is no order in it; come and reign and rule over us. Three brothers, princes of Rus, called re- spectively Rurik, Sineus and Truvor, accepted the invitation and founded a dynasty, from which many of the Russian princes of the present day claim descent.

Who were those warlike men of Rus who are universally recognized as the founders of the Russian Empire? This question has given rise to an enormous amount of discussion among learned men, and some of the disputants have not yet laid down their arms; but for impartial outsiders who have carefully studied the evidence there can be little doubt that

1 See Researches into the State of Fisheries in Russia (9 vols.), edited by Minister of Finance (1896, Russian) ; Kusnetzow's Fischerei und Thiererbeutung in den Gewdssern Russlunds (1898).

the men of Rus, or Variags, as they were sometimes called, were simply the hardy Norsemen or Normans who at that time, in various countries of Europe, appeared first as armed marauders and then lived in the invaded territory as a dominant military caste until they were gradually absorbed by the native population. Lake Hmen and the river Volkhov, on which stands Novgorod, Rurik's capital, formed part of the great waterway from the Baltic to the Black Sea, and we know that

by this route travelled from Scandinavia to Constantinople the tall fair-haired Northmen who composed the famous Varangian bodyguard of the Byzantine emperors.

The new rulers did not long confine their attention to the tribes who had invited them. They at once began to conquer

the surrounding country in all directions, and before ˆ7 two centuries had passed they had established them-

dftions. selves firmly at Kiev on the Dnieper, invaded The Byzantine territory, threatened Constantinople with

*£?”””” a fleet of small craft, obtained as consort for one

of their princes, Vladimir I, (g.v.), a sister of the Byzantine emperor on condition of the prince becoming a Christian, adopted Christianity for themselves and their subjects, learned to hold in check the nomadic hordes of the steppe, and formed matrimonial alliances with the reigning families of Poland, Hungary, Norway and France. In short, they became a considerable power in eastern Europe, and might be regarded as one of the claimants for the inheritance of the decrepit East Roman Empire. Unfortunately for the political future of this new state, its internal consolidation did not keep pace with its territorial expansion. In theory the whole Russian land Was a gigantic family estate belonging to the Rurik dynasty, and each member of that great family considered himself entitled to a share of it. It had to be divided, therefore, into a number of independent principalities, but it continued to be loosely held together by the dynastic sentiment of the descendants of Rurik and by the patriarchal authority — a sort of patria potestas—oi the senior member of the family, called the grand-prince, who ruled in Kiev, “the mother of Russian cities.” His administrative authority was confined to his own principality, but when territorial disputes arose between two or more of his relations, his paternal influence was exercised in the interests of peace and justice. What added to the practical difficulties of this arrangement was that the post of grand-prince was not an hereditary dignity in the sense of descending from father to son, but was always to be held by the senior member of the dynasty; and in the sub- ordinate principalities the same principle of succession was applied, so that reigning princes had to be frequently shifted about from one district to another, according as they could establish the strongest claim to vacant principalities. What constituted in this primitive system of inheritance the strength of a claim was often not easily determined, and even when the legal question was clear enough the law was not

always respected by the contending parties. Hence family quarrels became very frequent. These princes were, in fact, men of like passions with ourselves, and acted as powerful men generally do in a rude state of society. Instead of conforming to abstract principles of public law and hereditary succession, they strove to enlarge their territories at the expense of their rivals, and to leave them at their death to their sons rather than to their brothers, nephews and more distant relations. ; In these circumstances, the traditional authority of the grand-prince, never very great, rapidly declined, and the complicated law of succession, never scrupulously respected, was gradually replaced by ” the good old rule, the simple plan, that he should take who has the power, and he should keep who can.” Yaroslav, surnamed the Great, a man of commanding person- ality, was the last grand-prince who upheld vigorously the old system. After his death in 1054 the process of disintegration went on apace and the family feuds multiplied at an alarming rate. During the next 170 years (1054-1224) no less than 64 princi- palities had a more or less ephemeral existence, 293 princes put forward succession-claims, and their disputes led to 83 civil wars.

During these interminable struggles of rival princes, Kiev, which had been so long the residence of the grand-prince and of the metropolitan, was repeatedly taken by storm and ruthlessly pillaged, and finally the whole valley of the Dnieper fell a prey to the marauding tribes of the steppe. Thereupon Russian colonization and political influence retreated north- wards, and from that time the continuous stream of Russian history is to be sought in the land where the Vikings first settled and in the adjoining basin of the upper Volga. Here new principalities were founded and new agglomerations of prin- cipalities came into existence, some of them having a grand- prince who no longer professed allegiance to Kiev. Thus appeared the grand-prince of Suzdal or Vladimir, of Tver, of Ryazan and of Moscow — all irreconcilable rivals with little or no feeling of blood-relationship. The more ambitious and powerful among them aspired not to succeed but to subdue the others and to take possession of their territory, and the armed retainers, who were wont formerly to wander about as free lances, gave up their roving mode of life, settled down per- manently in one principality; became landed proprietors, and sought to share as boyars the princes’ authority.

Among the principalities of that northern region the first place was long held by Novgorod. Since the days when Rurik had first chosen it as his headquarters, the little town Republic on the Volkhov had grown into a great Commercial of Nov- elty and, a member of the Hanseatic league, and it had *° reA brought under subjection a vast

expanse of territory, stretch- ing from the shores of the Baltic to the Ural Mountains, and containing several subordinate towns, of which the principal were Pskov, Nizhniy-Novgorod and Vyatka. Unlike the ordinary Russian principalities, it had a republican rather than a monarchical form of government. Indeed, it was not so much a principality as a municipal republic of the Venetian type. It always had a prince, no doubt, but he was engaged by formal contract without much attention being paid to hereditary rights, and he was merely leader of the troops, while all the political power remained in the hands of the civil officials and the Vetche, a popular assembly which was called together in the market-place, as occasion required, by the tolling of the great bell. Descendants of Rurik, impregnated with the pride of a dominant military caste, did not much like serving those truculent, wilful burghers, and some of them, after a time, voluntarily laid down their office and retired to more congenial surroundings. Those of them who tried to have their own way and came into conflict with the authorities had always to yield in the long run, and they were liable to be treated very uncere- moniously, so that the vulgar adage, ” If the prince is bad, into the mud with him!” became a maxim of state policy.

There was here in the Russian land the germ of republicanism of constitutional monarchy, but it was not destined to be developed, The principality which was to become the nucleus of the’ future Russian empire was not Novgorod with its demo- cratic institutions, but its eastern neighbour Moscow, in which the popular assembly played a very insignificant part, and the supreme law was the will of the prince. The opposition which he encountered came not from the burghers b’ut from the boyars and the nobles.

II. The Mongol or Tatar Domination, 1238-1462. — Between Moscow and Novgorod there was a long and bitter rivalry, breaking out occasionally into armed conflicts, and Mongol among the princes of the other principalities the old and struggle for precedence and territory went on un- Tatarin- ceasingly until it was suddenly interrupted, in the vas ns ‘ first half of the thirteenth century, by the unexpected irruption of an irresistible foreign foe coming from the mysterious regions of the Far East. ” For our sins,” says the Russian chronicler of the time, ” unknown nations arrived. No one knew their origin or whence they came, or what religion they practised. That is known only to God, and perhaps to wise men learned in books.” The Russian princes first heard of them from the wild nomadic Polovtsi, who usually pillaged the Russian settlers on the frontier but who now preferred

friendship and said: ” These terrible strangers have taken our country, and to-morrow they will take yours if you do not come and help us.” In response to this call some Russian princes formed a league and went out eastward to meet the foe, but they were utterly defeated in a great battle on the banks of the Kalka (1224), which has remained to this day in the memory of the Russian common people. Now the country was at the mercy of the invaders, but, instead of advancing, they suddenly retreated and did not reappear for thirteen years, during which the princes went on quarrelling and fighting as before, till they were startled by a new invasion much more formidable than its predecessor. This time the invaders came to stay, and they built for themselves a capital, called Sarai, on the lower Volga. Here the commander of ” the Golden Horde,” as the western The section of the Mongol empire was called, fixed his

Golden headquarters and represented the majesty of his Horde. sovereign the grand khan who lived with the Great Horde in the valley of the Amur. About the origin and character of these terrible invaders we are much better in- formed than the early Russian chroniclers. The nucleus of the invading horde was a small pastoral tribe in Mongolia, the thief of which, known subsequently to Europe as Jenghiz Khan (q.v.), became a mighty conqueror and created a vast empire stretching from China, across northern and central Asia, to the shores of the Baltic and the valley of the Danube — a heterogeneous state containing many nationalities held together by purely administrative ties and by an enormous military force. For forty years after the death of its founder it remained united under the authority of a series of grand khans chosen from among his descendants, and then it began to fall to pieces till the various fractions of it became independent khanates. The khanate closely connected with the history of Russia was that of Kipchak or the Golden Horde, the khans of which settled, as we have seen, on the lower Volga and built for them- selves a capital called Sarai. Here they had their headquarters and held Russia in subjection for nearly three centuries.

The term by which this subjection is commonly designated, the Mongol or Tatar yoke, suggests ideas of terrible oppression, Character but in reality these barbarous invaders from the Far of Tatar East were not such cruel, oppressive taskmasters as rule ‘ is generally supposed.

In the first place, they never

settled in the country, and they had not much direct deal- ings with the inhabitants. In accordance with the admoni- tions of Jenghiz to his children and grandchildren, they retained their pastoral mode of life, so that the subject races, agriculturists and dwellers in towns, were not disturbed in their ordinary avocations. In religious matters they were extremely tolerant. When they first appeared in Europe they were idolaters or Shamanists, and as such they had naturally no religious fanaticism; but even when they adopted Islam they remained as tolerant as before, and the khan of the Golden Horde (Berkai) who first became a Mussulman allowed the Russians to found a Christian bishopric in his capital. One of his successors, half a century later, married a daughter of the Byzantine emperor, and gave his own daughter in marriage to a Russian prince. These represent the bright side of Tatar rule. It had its dark side also. So long as a great horde of nomads was encamped on the frontier the country was liable to be invaded by an overwhelming force of ruthless marauders. These in- vasions were fortunately not frequent, but when they occurred they caused an incalculable amount of devastation and suffering. In the intervals the people had to pay a fixed tribute. At first it was collected in a rough-and-ready fashion by a swarm of Tatar tax-gatherers, but about 1259 it was regulated by a census of the population, and, finally, the collection of it was entrusted to the native princes, so that the people were no longer brought into direct contact with the Tatar officials.

By the princes the ” yoke ” was felt more keenly, and it was very galling. In order to reply to accusations brought against them, or in order to be confirmed in their functions, they had to travel to the Golden Horde on the Volga or even to the camp of the grand khan in some distant part of Siberia,

and the journey was considered so perilous that many of them, before setting out, made their last will and testament and wrote a parental admonition for the guidance of their children. Nor were these precautions by any means superfluous, for not a few princes died on the journey or were condemned to death and executed for real or imaginary offences. Even when the visit to the Horde did not end so tragically, it involved a great deal of anxiety and expense, for the Mongol dignitaries had to be con- ciliated very liberally, and it was commonly believed that the judges were more influenced by the amount of the bribes than by the force of the arguments. The grand khan was the lord paramount or suzerain of the Russian princes, and he had the force required for making his authority respected.

Ambitious members of the Rurik dynasty, instead of seeking to acquire territory by conquest in the field, now sought to attain their ends by intrigue and bribery at the Mongol court.

Of all the princes who sought to advance their fortunes in this way the most dexterous and successful were those of Moscow. They made themselves responsible for the tribute of The other principalities as well as of their own, and gradu- princes of ally they became lieutenants-general of their Mongol q? s ˆY' suzerain. So long as the Mongol empire remained Donskol, united and strong, they were most submissive and 1362- obsequious, but as soon as it was weakened by internal t389 ' dissensions and began to fall to pieces, they assumed airs of independence, intrigued with the insubordinate Tatar generals, retained for their own use the tribute collected for the grand khan, and finally put themselves at the head of the patriotic movement which aimed at throwing off completely the hated Mongol yoke. For this purpose Dimitri Donskoi formed in 1380 a coalition of Russian princes, and gained a great victory over Khan Mamai of the Golden Horde on the famous battle- field of Kulikovo, the memory of which still lives in the popular legends. For some time longer the Tatars remained troublesome neighbours, capable of invading and devastating large tracts of Russian territory and of threatening even the city of Moscow, but the Horde was now broken up into independent and mutually hostile khanates, and the Moscow diplomatists could generally play off one khanate against the other, so that there was no danger of the old political domination being re-established. Having thus freed themselves from Tatar control, the Moscow princes continued to carry out energetically their traditional policy of extending and consolidating their dominions at the expense of their less powerful relations. Already Dimitri of the Don was called the grand-prince of all Russia, bat the assump- tion of such an ambitious title was hardly justified by facts, because there were still in his time principalities with grand- princes who claimed to be independent. The complete suppres- sion of these small moribund states and the creation of the autocratic tsardom of Muscovy were the work of Ivan III., surnamed the Great, his son Basil and his grandson Ivan IV., commonly known as Ivan the Terrible, whose united reigns cover a period of ,122 years (1462-1584).

III. The Tsardom of Muscovy. — What may be called the home policy of 'these three remarkable rulers consisted in absorbing the few principalities which still remained indepen- /van ///. dent, and in creating for themselves an uncontrolled 1462- monarchical authority. In the pursuit of both of these lsos ' objects they were completely successful. When Ivan III. came to the throne the remaining

independent principalities were Great Novgorod, Pskov, Tver, Ryazan and Novgorod- Seversk. He first directed his attention to Novgorod, and by gradually undermining and then destroying the ancient republican liberties he reduced the haughty city, which had long styled itself Lord Novgorod the Great, to the rank of a provincial town. Then he annexed its colonies and thereby extended his dominions to the Polar Ocean and the Ural Mountains. At the same time he took possession of Tver, on the ground that the prince had allied himself with Lithuania. His sue- Basil ill. cessor Basil followed in his footsteps, and dealt with isoSr the municipal republic of Pskov was Ivan had dealt 3 ‘

with Novgorod. Finding the inhabitants too much attached tc

their ancient liberties, he abolished the popular assembly, removed the great bell to Novgorod, installed his own boyars in the administration, transported 300 of the leading families to other localities, replaced them by 300 families from Moscow, and left in the town a strong garrison of his own troops. Ryazan shared the same fate. In 1521 the prince, being suspected of forming an alliance with the Crimean Tatars, was summoned to Moscow and arrested. Two years later the prince of Novgorod- Seversk was accused of intriguing with the Poles and imprisoned for the rest of his life. Thus all the principalities were brought under the power of Moscow, and in that respect there remained nothing for Ivan the Terrible to do. He took precautions, however, against any of the dead or moribund principalities being resuscitated, and punished with merciless severity any attempt to resist or undermine his authority.

With the suppression and absorption of the independent principalities the problem was only half solved. The tsars of Character Muscovy meant to be autocratic rulers alike in their ofthe old and in their new territories. Their forefathers tsardom, na(j Deen trained in the Tatar school of politics and administration, and in their ideas of government they had come to resemble Tatar khans much more than grand-princes of the old patriarchal type. Their autocratic tendencies were fostered also by the Church. As Christianity was brought into Russia from Constantinople it was only natural that the ecclesiastics, many of whom were Greeks, should admire Byzantine ideals and recommend

them as models to be imitated. For the ambitious Moscow princes many of the Byzantine ideas were very accept- able. They liked to consider themselves as the Lord's anointed, placed high above all ordinary mortals even of the most exalted rank ; and when Constantinople fell into the hands of the infidel they began to imagine that, as the most powerful potentates of the Eastern Orthodox world they were the protectors of the Ortho- dox faith and the political heirs of the East Roman emperors. With a view to strengthen this claim Ivan III. married a niece of the emperor Constantine Palaeologus, who had fallen fight- ing when his capital was taken by the Turks (1453). From that moment Ivan's subjects noticed a change in his attitude towards them, and attributed it to the evil influence of the Greek princess. In the old times the grand-prince was simply primus inter pares among the minor princes, and these lived with their boyars almost on a footing of equality. Now the tsar of Muscovy and of all Russia adopted the airs and methods of a Tatar khan and surrounded himself with the pomp and splendours of a Byzantine emperor. Ivan III., notwithstanding the influence of his Greek consort, showed some respect for the ancient traditions and the susceptibilities of those around him, but his successor Basil did not follow his father's example. All through his reign he preferred to employ as officials men of humble origin, and habitu- ally treated the boyars and great nobles very unceremoniously. For disobedience to his orders he imprisoned a boyar who was his own brother-in-law, and he caused another to be beheaded for complaining that the boyar-council was not consulted in important affairs of state. A boyar of Nizhniy-Novgorod who allowed himself to criticize the new order of things, and attributed the change to the influence of the Greek princess, had his tongue cut out. From the ecclesiastics Basil likewise insisted on unquestioning obedience, and he did not hesitate to depose by his own authority a metropolitan who was at that time the highest dignitary of the Russian Church. According to Siegmund von Herberstein (1486-1566), an Austrian envoy who visited Moscow at that period, no sovereign in Europe was obeyed like the grand-prince of Muscovy, and his court was remarkable for barbaric luxury. In his palace were numerous equerries, chamberlains and other court dignitaries, and when he went out he was attended by a guard of young nobles dressed in gaudy costumes and armed with silver halberds. 1

Such radical changes naturally produced a great deal of

1 See Friedrich Adelung, Siegmund Freiherr von Herberstein, mit besonderer Rilcksicht auf seine Reisen in Russland geschildert. (St Petersburg, 18 18); autobiography of Herberstein in Fontes rerum Austriacarum, part i. vol. i. pp. 67-396.

dissatisfaction among men of Slavonic temperament, whose grandfathers had been independent princes, boyars or free lances, and the malcontents could not adopt the old practice of emigrating to some other principality. There was no longer within the Russian land any independent principality in which an asylum could be found, and emigration to a principality beyond the frontier, such as Lithuania, was regarded as treason, for which the property of the fugitive would be confiscated and his family might be punished. In these circumstances the only outlet for discontent was sedition, and the malcontents awaited impatiently a favourable opportunity for an attempt to curb or overthrow the autocratic power. That opportunity came when Basil died in 1533, leaving as successor a child only three years old, and the chances seemed all on the side of the nobles; but the result belied the current expectations, for the child came to be known in history as Ivan the Terrible, and died half a century later in the full enjoyment of unlimited auto- cratic power. The fierce struggle between autocratic tyranny and oligarchic disorder, which went on in intermittent fashion during the whole of his reign, cannot be here described in detail, but the chief incidents may be mentioned.

During Ivan's minority the country was governed, or rather misgoverned, first by his mother, and then by rival factions led by great nobles such as the princes Shuiski and Ivan the Belski. Only once during this period did the young Terrible, tsar come forward and assert his authority. Having 1533-84. convoked his boyars he reproached them collectively with robbing the treasury and committing acts of injustice, and he caused one of them, a Prince Shuiski who happened to be in power at the moment, to be seized by his hunts- men and torn in pieces by a pack of hounds, as a warning to others. Thus apparently he asserted his authority, but in reality, being only thirteen years old, he was a mere puppet in the hands of one of the opposition factions, who wished to oust their rivals, and for the next four years the misgovernment of the nobles went on as before. It was not till he was about seventeen that he took an active part in the ad- ministration, and one of his first acts foreshadowed his future policy: he insisted on the metropolitan crowning him, not as grand-prince of Muscovy, but as tsar of all Russia (1547). From the earliest times the term tsar — a contraction of the word Caesar — had been applied to the kings in Biblical history and the Byzantine emperors, and Ivan III. had already been de- scribed in the Church service as " the ruler and autocrat of all Russia, the new Tsar Constantine in the new city of Constantine Moscow," but on no previous occasion had a grand-prince been crowned under that title. A few months later occurred in Moscow a great fire, which destroyed nearly the whole of

the city, and a serious popular tumult, in which the tsar's uncle was murdered by the populace. Ivan regarded these events as a punishment from Heaven-, for the neglect of his duties, and he began to attend to public affairs under the influence of an en- lightened priest called Sylvester and an official of humble origin called Adashev. With the assistance of these two counsellors he held in check the lawless, turbulent nobles, and ruled justly, to the satisfaction of the people, for fourteen years. Then suddenly, for reasons which cannot easily be explained, he inaugurated a reign of terror which lasted for twenty-four years and earned for him the epithet of "theTerrible." Though there had been no open insurrection, he caused many boyars and humbler persons to be executed, and when some of the great nobles, fearing a similar fate, fled across the frontier and tendered their allegiance to the prince of Lithuania, his suspicion and indigna- tion increased and he determined to adopt still more drastic measures. For this purpose he organized, outside the regular administration, a large corps of civil officials and armed re- tainers, whose duty it was to obey him implicitly in all things; and with this force, which rose rapidly from 1000 to 6000 men, he acted like a savage invader in a conquered country. Ac- companied by these so-called Oprichniki, who have been compared to the Turkish Janissaries of the worst period, he ruthlessly devastated large districts — with no other object

apparently than that of terrorizing the population and reward- ing his myrmidons — and during a residence of six weeks in Novgorod, lest the old turbulent spirit of the municipal republic should revive, he massacred, it is said, no less than 60,000 of the inhabitants, including many women and children. It is quite possible, as some apologists suggest, that the number of his victims may have been exaggerated, but that they are to be counted by thousands there can be no doubt. In the monastery of St Cyril has been preserved a list of those for whom he requested the prayers of the Church, the total being 3470. The only refer- ence to Novgorod in this curious document is: " Remember, O Lord, the souls of thy Novgorodian servants to the number of 1505 persons." According to the Novgorodian annalists as many as 1500 persons were sometimes put to death in a single day. Perhaps the discrepancy is to be explained by supposing that the pious tsar did not consider all his victims as servants of the Lord, whose souls deserved the prayers of the faithful.

While thus uniting under their vigorous autocratic rule the small rival principalities, the Moscow princes had to keep a watchful eye on their eastern neighbours. The Golden Horde, long weakened by internal dissensions, had now fallen into several khanates, the chief of which were Kazan, Astrakhan and the Crimea. As these independent Tatar states were always jealous of each other, and their jealousy often broke out in open hostility, it was easy to prevent any com- bined action on their part; and as in each khanate there were always several pretenders and contending factions, Muscovite diplomacy had little difficulty in weakening them individually and preparing for their annexation. In the case of Kazan and Astrakhan the annexation was effected without any great effort in 1552-54, and two years later the Bashkirs, who had likewise formed part of the great Mongol empire, consented to pay tribute. On the other hand, the khans of the Crimea were able, partly from their geographical position and partly from having placed themselves under the protection of the sultans of Turkey, to resist annexation for more than two centuries and to give the Muscovites a great deal of trouble, not only by frequent raids and occasional invasions, but also by allying themselves with the Western enemies of the tsars. As late as 1571 Moscow was pillaged by a Tatar horde; but there was no longer any question of permanent political subjection to the Asiatics, and the Russian frontier was being gradually pushed forward at the expense of the nomads of the steppe by the constant advance of the agricultural population in quest of virgin soil. These latter, like the colonists in the American Far West, had to be constantly on the alert against the attacks of their trouble- some neighbours, and they accordingly organized themselves in semi-military fashion. Those of them who lived on the out- skirts of the pacified territory adopted a mode of life similar to that of their hereditary opponents, and constituted a peculiar class known as Cossacks, living more by flocks and Cossacks, herds and by marauding expeditions than by agri- culture. In the basins of the southern rivers they formed semi-independent military communities. Those of the Volga and the Don professed allegiance to the tsar of Muscovy, whilst those of the Dnieper recognized at first as their suzerain the king of Poland. In neither case did the allegiance involve strict obedience to orders from the superior, and their loyalty was always in danger of being troubled by their love of inde- pendence and equality and their desire for loot. More than once they raided and pillaged in wholesale fashion the territory they were supposed to protect. On the whole, however, at that period as in more recent times, they contributed largely to the process of territorial expansion. (See also Poland: History.) Before the Eastern menace had been entirely removed the am- bitious Moscow princes had begun to look with envious with °" S

eves beyond their western frontier. Here lay the prin- Poiand cipality of Lithuania and beyond it the kingdom of ana Poland, two loosely conglomerated states which had

ˆto’ been created by the Piast and Gedymin dynasties in pretty much the same way as the tsaidom of Muscovy had been created by the descendants of Rurik. When

the two became united under one ruler towards the end of the 14th century they formed a broad strip of territory stretching from the Baltic to the Black Sea and separating Russia from central Europe. For Russian ambition the barrier was a formidable one, but it did not entirely preclude possibilities of expansion in a more or less remote future. When examined closely it was found to contain many internal flaws. In no sense could it be considered a homogeneous political unit, for in Lithuania the majority of the population were Russian in nationality, language and religion, whereas in Poland the great majority of the inhabitants were Polish and Roman Catholic. Gradually, it is true, the Lithuanian nobles, who possessed all the land and held the peasantry in a state of serfage, adopted Polish nationality and culture, but this change did not secure homogeneity, because the masses clung obstinately to their old nationality and religion, and all the efforts of the Church of Rome to bring them under papal authority proved fruitless. A further source of weakness was the political organization. Nominally it was an hereditary monarchy, but the warlike, turbulent nobles systematically encroached on the sovereign power till they reduced it to a mere shadow and made it elective, with the result that the kingdom of Poland, including the princi- pality of Lithuania, was at last, politically speaking, the most anarchical country in Europe.

As the Muscovite and the Lithuano-Polish princes were equally ambitious and equally anxious to widen their borders, they naturally came into conflict. At first the Muscovite was decidedly the aggressor. On the death of Casimir, king of Poland and grand-prince of Lithuania, in 1492, the kingdom and the principality ceased to be united and Ivan III. con- sidered he had a good opportunity for attacking the latter. After a short campaign a peace was concluded and Ivan’s daughter was given in marriage to the Lithuanian grand- prince, but the matrimonial alliance did not improve the relations between the two countries. On the contrary it served as a pretext for Ivan to interfere in Lithuanian affairs. He not only insisted that his daughter’s religion should be duly respected, but he constituted – himself the protector of the Orthodox population and this led to a new war in 1499, which went on till 1503, when it was concluded by the cession

to Russia of Chernigov, Starodub and 17 other towns. His successor, Basil, tried to get himself elected grand-prince of Lithuania when the throne became vacant by the death of his brother-in-law in 1506, but the choice fell on the late prince's brother Sigismund, who was likewise elected king of Poland. The two countries were thus once more united and better able to resist aggression, but some of the great nobles were discon- tented and Basil hoped with their assistance to attain his ends. He began war therefore in 1514 and at once captured Smolensk, but in the following year he was defeated, and the war dragged on during more than seven years, with varying successes and without any important result. In the negotiations for peace the inordinate pretensions of the Muscovite prince were put forward boldly: he not only refused to restore Smolensk, but claimed Kiev and a number of other towns on the ground that in the old time of the independent principalities they had belonged to descendants of Rurik.

The policy of expansion westwards, inaugurated by Ivan III., was modified and enlarged by Ivan the Terrible. The former had aimed simply at making annexations in Lithuania; Ivgn JV the latter aspired to obtaining a firm footing on the and Baltic coast and establishing direct relations, diplo- western matic and commercial, with the Western Powers. Europe, In this respect he was a precursor of Peter the Great, but he greatly underestimated the difficulties of the task. To reach the Baltic he had to overcome the resistance, not only of the Lithuanians and the Poles, but also of the Teutonic and Livonian military orders, the Swedes and the Danes, who all had possessions in the intervening territory and who all objected to the barbarous Muscovites, already sufficiently formidable, strengthening themselves by direct foreign trade with western Europe and especially by the importation of arms and cunning

foreign artificers. Like the European settlers on the coast of Africa in more recent times, they wished the barbarians of the interior to be restricted to the use of their primitive weapons. One of the Polish kings, for example, threatened with death the English sailors who should attempt to carry on the illicit trade in arms, on the ground that " the Muscovite, who is not only our opponent of to-day but the eternal enemy of all free nations, should not be allowed to supply himself with cannons, bullets and munitions or with artisans who

manu- facture arms hitherto unknown to those barbarians.” This was precisely the reason why Ivan IV. was so anxious to force his way to the coast. His grandfather had obtained from Venice an ” artist ” who undertook ” to build churches arid palaces, to cast big bells and cannons, to fire off the said cannons and to make every sort of castings very cunningly”; and with the aid of that clever Venetian he had become the proud possessor of a ” cannon-house,” subsequently dignified with the name of “arsenal.” In imitation of the grandfather the grandson gave a commission to a Saxon, in whom he had confidence, to collect artists and artisans in Germany and bring them to Moscow, but he was prevented from carrying out his scheme by the Livonian Order (1547). A few years later (1553) he found unexpectedly a different route for communication with the West. A ship of an English squadron which was trying First t0 reac h China by the North-East passage, entered the

relations northern Dvina, and her captain, Richard Chancellor, witn journeyed to Moscow in quest of opportunities for trade.

tag and. jj e met w j (.j 1 suc f 1 a f avouraD i e reception from the tsar

that on his return to England a special envoy was sent to Moscow by Queen Mary, and he succeeded in obtaining for his countrymen the privilege of trading freely in Russian towns. In return the Russians were allowed to trade freely in England. This afforded great satisfaction to Ivan, but it did not entirely satisfy his requirements, because the new route by the White Sea and North Cape was long and uncertain and for a great part of the year communications were stopped by the ice. He continued, therefore, his efforts to reach the Baltic coast, and he soon came into collision with the Swedes. After a dilatory war of three years he concluded a peace on the ground of free commercial relations, and then he attacked the Livonian Order, on the pretext that the Livonian town of Dorpat had not paid tribute according to ancient treaties. Finding himself unable to resist the Muscovites, the grand master of the Order put himself under Polish protection, and this led to a seven years’ war (1563-70) with Poland, during which the Swedes and Danes intervened on their own account. Ivan did not display much military talent, but he showed a remarkable amount of tenacity. No sooner had he made peace with the Poles and failed to get himself elected as their king, than he began a war with the Swedes which dragged on for more than a decade (1572- 1583), and before it was ended he was again at war with Poland (1579-81). Though severely tried by disappointments • and defeats he never lost hope, and when he died in 1584 he was preparing to renew the

struggle and endeavouring to form for that purpose an alliance with England; his great idea, however, was not to be realized till more than a century later, and mean- while the tsardom of Muscovy had to pass through a severe internal crisis in which its existence was seriously endangered. Ivan the Terrible had succeeded in stamping out ruthlessly all open resistance to his will, and had created an autocratic Theodore government of the Oriental type; but the elements /., 1584- of disorder were still lying beneath the surface, and ,S9S ‘ as soon as the cunning, energetic despot died they

reappeared. His son and successor, Theodore (Feodor), was a weak man of saintly character, very ill fitted to con- solidate his father’s work and maintain order among the ambitious, turbulent nobles; but he had the good fortune to have an energetic brother-in-law, with no pretensions to sanctity, called Boris Godunov, who was able, with the tsar’s moral support, to keep his fellow-boyars in order. This he did during fourteen years, and his administration was signalized by two important innovations— the attaching of the peasants

to the land (adscriptio glebae) and the creation of the patriarchate ■ — both of which deserve a passing notice.

Boris has often been called the creator of serfage in Russia, but in reality he merely accelerated a process which was the natural result of economic conditions. In a primitive, Begin- thinly populated, agricultural country, in which the ningsof demand for agricultural labour greatly exceeds the serfdom. supply, the value of land is in proportion to the number of permanent labourers settled on it, and the landed pro- prietors naturally try to attract to their estates as many peasants as possible; and in this competition the large proprietors have evidently an advantage over their humbler and weaker rivals. Such had been for a considerable time the con- dition of Russia, and the small proprietors were now becoming so impoverished that they could no longer fulfil their duties to the state. The remedy they proposed was that the labourers should be prohibited from migrating from one estate to another, and an order to that effect was issued, with the result that the peasants, being no longer able to change their domicile and seek new employers, fell practically under the unlimited power of the proprietors on whose land they resided. This change was, of course, popular among the lower and middle ranks of the landlord class, but was very displeasing to the great nobles. The second of the two innovations above mentioned was popular among all classes. Hitherto the highest authority in the Russian Church was the metropolitan, who was The nominally under the jurisdiction of the patriarch of patri- Constantinople, and as soon as Constantinople fell

“rebate. into the hands of the infidel, and the tsars of Muscovy claimed to be the successors of the Byzantine emperors, it seemed right and proper that the Russian Church should become autocephalous and be governed by an independent Russian patriarch. The change was very dexterously effected by Godunov, with the formal assent of the Eastern Orthodox Church as a whole, and one of his adherents was placed on the patriarchal throne.

Having thus gained the support of a large majority of the landed proprietors and the ecclesiastics, Boris Godunov in- creased his influence to such an extent that on the Bor& death of Tsar Feodor without male issue in 1598 he aodunov, was elected his successor by a Great National Assembly. is°s- His short reign was not ‘.so successful as his adminis- 160s ‘ tration under the weak Feodor. The oligarchical party considered it a disgrace to obey a simple boyar; conspiracies were frequent, the- rural districts were desolated by famine and plague, great bands of armed brigands roamed about the country committing all manner of atrocities, the Cossacks on the frontier were restless, and the government showed itself incapable of maintaining order. Under the influence of the great nobles who had unsuccessfully opposed the election of Godunov, the general discontent took the form of hostility to him as a usurper, and rumours were heard that the late tsar’s younger brother Dimitri (Demetrius), supposed fhe to be dead, was still alive and in hiding. In 1603 pseudo- a man calling himself Dimitri, and professing to be Demet- the rightful heir to the throne, appeared in Poland, ruses. and a few months later he crossed the frontier with a large force of Poles, Russian exiles, German mercenaries and Cossacks from the Dnieper and the Don. In reality the younger son of Ivan the Terrible had been strangled before his brother’s death— +by orders, it was said, of Godunov — and the mysterious individual who was impersonating him was an impostor; but he was regarded as the rightful heir by a large section of the population, and immediately after Boris’s death in 1605 he made his triumphal entry into Moscow. Thus began a period of Russian history commonly called ” the Troublous Times, ” which lasted until 1613. (See Demetrius, Pseudo-.)

The reign of Dimitri was short and uneventful. Before a year had passed a conspiracy was formed against him by an ambitious noble called Basil (Vassili) Shuiski, and Basil he was assassinated in the Kremlin. The chief con- Shuiski, spirator, Shuiski, seized the power and was elected io~06-i0> tsar by an Assembly composed of his faction, but neither

the ambitious boyars, nor the pillaging Cossacks, nor the German mercenaries were satisfied with the change, and soon a new impostor, likewise calling himself Dimitri, son of Tsar Ivan, came forward as the rightful heir. Like his predecessor, Pseudo- h e enjoyed the protection and support of the Polish Demet- king, Sigismund III., and was strong enough to riusii., compel Shuiski to abdicate; but as soon as the

throne was vacant Sigismund put forward as a candidate his own son, Wladislaus. To this latter the people of Moscow swore allegiance on condition of his maintaining Orthodoxy and granting certain rights, and on this under- standing the Polish troops were allowed to occupy the city and the Kremlin. Then Sigismund unveiled his real plan, which was to obtain the throne not for his son but for himself. This scheme did not please any of the contending factions and it roused the anti-Catholic fanaticism of the masses. At the same time it was displeasing to the Swedes, who had become rivals of the Poles on the Baltic coast, and they started* a false Dimitri of their own in Novgorod.

Russia was thus in a very critical condition. The throne was vacant, the great nobles quarrelling among themselves, Accession the Catholic Poles in the Kremlin of Moscow, the ot the Protestant Swedes in Novgorod, and enormous bands house of f brigands everywhere. The severity of the crisis

produced a remedy, in the form of a patriotic rising of the masses under the leadership of a butcher called Minin and a Prince Pozharski. In a short time the invaders were expelled, and a Grand National Assembly elected as tsar Michael Romanov, the young son of the metropolitan Philaret, who was connected by marriage with t'he late dynasty.

During the reign of Michael (1613-45) the new dynasty came to be accepted by all classes, and the country recovered „. . . to some extent from the disorders and exhaustion 1613-45. from which it had suffered so severely; but it was not

strong enough to pursue at once an aggressive foreign policy, and the tsar prudently determined to make peace with Sweden and conclude an armistice of fourteen years with Poland. At the conclusion of the armistice in 1632, during a short interregnum in Poland, he attempted

to avenge past injuries and recover lost territory; but the campaign was not successful, and in 1634 he signed a definitive treaty by no means favourable to Russia. That lesson was laid to heart, and he subsequently maintained a purely defensive attitude. As a precaution against Tatar invasions he founded fortified towns on his southern frontiers— Tambov, Kozlov, Penza and Simbirsk; but when the Don Cossacks offered him Azov, which they had captured from the Turks, and a National Assembly, convoked for the purpose of considering the question, were in favour of accepting it as a means of increasing Russian in- fluence on the Black Sea, he decided that the town should be restored to the sultan, much to the disappointment of its captors. In the reign of Michael's successor, Alexius (1645-76), the country recovered its strength so rapidly that the tsar was

tempted to revive the energetic aggressive policy 1645-76. an d P u t forward claims to Livonia, Lithuania and

Little Russia, but he was obliged to moderate his pretensions. Livonia continued to be under Swedish rule, and Lithuania remained united with Poland. Some advantages, however, were obtained. Smolensk and Chernigov were definitely incorporated in the tsardom of Muscovy, and great progress was made towards the absorption of Little Russia.

Roughly speaking, Little Russia, otherwise called the Uk- raine, may be described as the basin of the Dnieper south- The ward of the 51st parallel of latitude. In the 16th

Ukraine, century it was a thinly populated region inhabited

chiefly by Cossacks, speaking the so-called Little Russian dialect, and until 1569 it formed nominally part of Lithuania, but was practically independent. In that year, when Lithuania and Poland were permanently united, it fell under Polish rule, and the Polish government considered it necessary to tame the wild inhabitants and bring them under regular administration. For this decision there were good xxiii. 29

reasons, for those turbulent sons of the steppe paid no taxes and were much given to brigandage, and their raiding pio- pensities occasionally created international difficulties with the khan of the Crimea and the sultan of Turkey. It was proposed, therefore, in 1576, that 6000 families should be registered as a militia under a Polish Hetman for the protection of the country against Tatar raids, and that the remainder of the inhabitants should be assimilated to the ordinary

peasants of Poland. This arrangement was very distasteful to all classes. The registered Cossacks objected to being placed under a Hetman not freely chosen by themselves, and those who were not included in the militia objected still more strongly to the prospect of being reduced to the miserable condition of Polish serfs. To escape this danger many of them moved down the river and settled on the waste lands beyond the rapids. Here, about 1590, was founded an independent military colony called the S etc ft, the members of which, recognizing no authority but that of their own elected officers, lived by fishing, hunting and making raids on the Tatars, and were always ready to assist their less for- tunate countrymen in resisting Polish aggression. For half a century the struggle between the two races went on with varying success, but on the whole the Polish government proved stronger than its insubordinate subjects, and about 1638 it seemed to have attained its object. Polish proprietors settled in large numbers on the Cossack territory, and great efforts were made, with the assistance of the Jesuits, to bring the Orthodox popula- tion under papal authority. But for both proprietors and Jesuits a surprise was in store. Threatened seriously in their liberty and their faith, the people rose with greater enthusiasm than before, and a general insurrection, in which the peasants joined, spread over the whole country under the leadership of Bogdan Chmielnicki or Khmelnitski (q.v.), whose name is still remembered in the Ukraine. As in all previous insurrections the Poles proved stronger in the field, and Khmelnitski in desperation sought foreign assistance, first in Constantinople and then in Moscow. For some time Tsar Alexius hesitated, because he knew that intervention could entail a war with Poland, but after consulting a National Assembly on the sub- ject, he decided to take Little Russia under his protection, and in January 1654 a great Cossack assembly ratified the arrange- ment, on the understanding that a large part of the old local autonomy should be preserved. In the expected war with Poland, which followed quickly, the Russians were so successful that the arrangement was upheld; but it was soon found that the Cossacks, though they professed unbounded devotion to the Orthodox tsar, disliked Muscovite, quite as much as Polish, interference in their internal affairs, and some of their leaders were in favour of substituting federation with Poland for annexation by Russia. In these circumstances the tsar was induced to accept a compromise, and signed in 1667 the treaty of Andrussovo, by which the territory in dispute was partitioned and the middle course of the Dnieper became the frontier be- tween Russia and Poland.

In the reign of Alexius a conflict took place between the tsar and the patriarch, which is often described as a cdnflict between Church and

State, and which illustrates the relations between the temporal and the spiritual power Tne tsar in Russian state-organization. Until the beginning of ^^^ the 17th century the Byzantine tradition that in all matters outside the sphere of dogma the ecclesiastical is subordinate to the civil power had been observed in Russia; but the traditional conceptions had been to some extent under- mined during the reign of Michael, when the metropolitan Philaret, who was the tsar's father (vide supra), became patriarch and was associated with his son in the government on a footing of equality. Like the tsar, he had the official title of " Great Lord " (veliki gosttddr), and he had his palace, his court-digni- taries, his retinue, his boyars and his officials all organized on the model of those of the sovereign. Without his assent and blessing no important decisions were taken, all state docu- ments emanating from the highest authority bore his signa- ture, and he was regarded, both in the official world and by the

public generally, as the tsar's equal in rank and dignity. His immediateˆ successors, being men of humble origin and sub- missive character, made no pretensions to such an exalted position, but when the haughty, ambitious and energetic Nikon, who enjoyed in large measure the affection and favour of the devout Tsar Alexius, became patriarch, he took Philaret as his model, and propounded, like the popes in western Europe, the doctrine that the spiritual is higher than the temporal power, the former corresponding to the sun and the latter to the moon in the firmament. In accordance with this view he declared that the patriarch was the image of Christ, the head of the Church, and was therefore subject to no earthly authority, and he complained of the tsar's interference in ecclesiastical affairs. His pretensions and his haughty dictatorial manner at last exhausted the tsar's patience, and he was formally deposed and exiled to a monastery. As no voice was raised in his defence and the decision of the ecclesiastical council which condemned him was universally accepted without protest, we must con- clude that the conflict was not really between Church and State but simply between the haughty, ambitious Patriarch Nikon and the devout, long-suffering Tsar Alexius. The incident afforded a new proof, where no proof was required, that the autocratic power in Russia was supreme. In order to prevent such

incidents in future, Peter the Great abolished the patri- archate altogether, and entrusted the administration of the Church to a synod entirely dependent on the government.

Much more important in its consequences was Nikon's activity as an ecclesiastical reformer. During the Russian Dark Ages

certain clerical errors had crept into the liturgical books of Nikon. an ˆ certain peculiarities had been adopted in the ritual.

These had been detected and pointed out by learned ecclesiastics of Kiev, where some of the ancient learning of Byzantium had been preserved, and Nikon determined to make the necessary corrections. He determined also to introduce into the Church many desirable reforms. His project was approved by an ecclesiastical council and was supported by the tsar, but it met with violent opposition from a large section of the clergy, and it alarmed the ignorant masses, who regarded any alterations in the ritual, however insignificant they might be, as heretical and very dangerous to salvation. When put into execution the project produced in the Russian Church a great schism and numerous fantastic sects. The cruel persecutions instituted by the authorities with a view to securing conformity increased the number and fanaticism of the schismatics and heretics, and created among them a widespread belief that the reign of Antichrist, foretold in the Apocalypse, was at hand. In support of this idea, independently of the ecclesiastical innovations, many significant facts could be adduced. Numerous foreigners had been allowed to settle in Moscow and to build for them- selves a heretical church, and their strange unholy customs had been adopted by not a few courtiers and great dignitaries. Matveyev, the most influential of the boyars, had married a foreigner who conversed freely with her husband's male friends, contrary to the Muscovite notions of respectability and decorum, and his house, in which the tsar was a frequent visitor, was furnished and decorated in foreign fashion. Books on mundane subjects, not at all conducive to the spiritual edification of the faithful, were read by the tsar's counsellors, and a theatre had been erected, in which the tsar often witnessed very unedifying dramas and ballets. Worst of all, the Orthodox tsar occasion- ally abandoned the decorous flowing robes of his venerated ancestors, and appeared publicly in the unseemly costume of heretical foreigners, whilst his consort, when carried through the streets in a litter, did not conceal her face from the public gaze. Such innovations troubled deeply the pious souls of the conservative Muscovites, and confirmed them in their repugnance to accept the ecclesiastical reforms. Though this original fanaticism gradually cooled and the rigorists had to make many concessions to

the exigencies of practical life, a large section of the Russian people remained outside the official fold, so that at the present day, if we may credit the most competent authorities, the schismatics and heretics number more than twelve millions.

While the Muscovites of the upper classes were thus beginning to abandon their old oriental habits, their government was preparing to make a political evolution of a similar kind. ■ .

Notwithstanding the efforts of the Poles and the relations. Military Orders to exclude Russia from the shores of the Baltic and keep her in a state of isolation, she was coming slowly into closer relations with central and western Europe. The emperor, the governments of England, Holland, France and Sweden, and even the Grand Turk made advances to the tsar. Some of them wished to gain him as an ally against their rivals, whilst others hoped to obtain from him commercial privileges and permission to trade directly with Persia. The political and the commercial proposals were alike received with coldness, because the native diplomatists had aims which could not be reconciled completely with the policy of any other country, and the native merchants were afraid of foreign competition. The negotiations gave, therefore, little tangible result, but they helped to prepare the way for the new order of things which was soon to be introduced by Alexius's son, Peter the Great.

Before reaching the new order of things, the country had to pass through an internal crisis similar to that which followed the death of Ivan the Terrible, but not nearly so severe. Alexius had been twice married and had left several children by each of his wives, and, as generally happened in such cases, a struggle for power ensued between the two rival families. The late tsar's eldest son, Theodore, was weak in health and died Theodore without male issue after an uneventful reign of six tn„ years (1676-82). As the second son, Ivan, next in ,676 – 82 – the order of succession, was almost an imbecile, the third son, Peter, born of the second marriage, was proclaimed tsar, and his maternal relations became the dominant faction, but their triumph was of very short duration. An ambitious, ener- getic sister of Ivan, well known in Russian history as Sophia Alexeyevna,instigated the stryeltsi(strelitz) , as the troops Sophia of the unreformed standing army were called, to upset Aiexey- the arrangement. After making a tumult in the Krem- e v*> lin and assassinating several of the men in power, they insisted that Ivan should be proclaimed tsar conjointly with ivan v. Peter, and that Sophia should act as regent during the <#•)> minority of the two young sovereigns. She accepted 1682-89. unhesitatingly the difficult and dangerous post, and ruled auto-

cratically for seven years (1682-89), DUt this did not satisfy her ambition. Having discovered that Peter, who had reached the age of seventeen, was thinking of taking the administration into his own hands, she conspired against him with the commander of the stryeltsi and some of his maternal relations; but she was circumvented by the rival faction and interned in a convent, and Peter's mother was put in her place. The importance of these incidents, which are very characteristic of political life in the tsardom of Muscovy, will appear in the sequel.

If Peter really thought of taking the administration into his own hands, he very soon abandoned the idea and returned to the irregular suburban life he had led during his half- Peterthe sister's regency—associating with foreigners who could Great, teach him the mechanical arts of the West, drilling 1689- troops, building and sailing boats, forming projects for the creation of a great navy, indulging publicly in Bacchanalian revels and boisterous amusements not at all to the taste of his pious countrymen, and appearing in Moscow as Orthodox tsar only on great ceremonial occasions. Already the desire to make his country a great naval power was becoming his ruling passion, and when he found by experience that the White Sea, Russia's sole maritime outlet, had great practical inconveniences as a naval base, he revived the project of getting a firm footing on the shores of the Black Sea or the Baltic. At first he gave the preference to the former, and with the aid of a flotilla of small craft, constructed on a tributary of the Don, he succeeded in capturing Azov from the Turks. Greatly elated by this success, he recommended to the council of boyars the construction of a powerful fleet for carrying on war with the infidel, and he himself went abroad to learn more about shipbuilding and useful foreign inventions, and to prepare

diplomatically the projected crusade. His foreign tour, dur- ing which he visited Germany, Holland, England, France and Austria, lasted nearly a year and a half, and was suddenly interrupted, when on his way from Vienna to Venice to study the construction of war-galleys, by the alarming news that the turbulent stryeltsi of Moscow had mutinied anew with the intention of placing Sophia on the throne. On arriving in Moscow he found that the mutiny had been suppressed and the ringleaders punished, but he considered it necessary to reopen the

investigation and act with exemplary severity. Of the surviving mutineers over twelve hundred were executed, some of them by his own hand, and the entire corps was dis- banded.

From this moment may be dated the personal reign of Peter, for he now began to direct personally all branches of the adminis- tration, and governed with indefatigable vigour for twenty-seven years, during which he greatly increased the area and profoundly modified the internal condition of his country. At first he concentrated his attention on foreign affairs. During his foreign tour he had discovered that the idea of a grand crusade against the infidel was irrealizable, for France was, according to her traditional policy, the ally of the sultan, Austria wished to avoid trouble on her eastern frontier in order to devote her energies to the question of the Spanish succession, and all the other countries which he wished to draw into the coalition had good reasons of their own for desiring the maintenance of peace in eastern Europe. For his Baltic schemes, on the contrary, he had found the ground well prepared. During a halt of a few days in Poland on his way back from Vienna, King Augustus had explained to him a project for partitioning the trans- Baltic provinces of Sweden, by which Poland should recover Livonia and annex Esthonia, Russia should obtain Ingria and Karelia, and Denmark should take possession of Holstein. As Sweden was known to be exhausted by the long wars of Gustavus Adolphus and his successors, and weakened by internal dissensions, the dismemberment seemed an easy matter, and Peter embarked on the scheme with a light heart; but his illusions were quickly dispelled by the eccentric young Swedish king, Charles XII., who arrived suddenly in Esthonia and completely routed the Russian army before Narva. Thus began the so-called Northern War, which lasted intermittently for more than twenty years, and was terminated by the treaty of Nystad (Sept. 10, 1721). By that treaty Peter acquired not only Ingria and Karelia, as originally contemplated, but also Livonia, Esthonia and part of Finland. The problem of obtaining a firm footing on the Baltic coast, on which Ivan the Terrible had squandered his resources to no purpose, was now solved satisfactorily.

Peter's other favourite, scheme, that of acquiring the com- mand of the Black Sea, was as far from realization as ever. In the midst of the Northern War, shortly after the great Russian victory of Poltava (1709), the sultan, at the instigation of Swedish and French agents, determined to" recover Azov, and made great military preparations for that purpose. Having annihilated at Poltava the army of Charles XII., Peter was not at all indisposed to renew the struggle with Turkey, and began the campaign in the confident hope of making extensive con- quests; but he had only got as far as the Pruth when he found

himself surrounded by a great Turkish army, and, in order to extricate himself from his critical position, he had to sign a humiliating treaty by which Azov and other conquests were restored to the sultan. His dreams of freeing the Christians from the yoke of the infidel had to be abandoned, and the conquest of the northern shores of the Black Sea was postponed till the reign of Catherine II.

Those tedious and exhausting wars did not prevent Peter from attending to internal affairs, and he displayed as a reformer Peter the even more vigour and tenacity than as a general in Great's the field. His first reforms were connected with the reforms, gj-my. Several of his immediate predecessors had come to recognize that Russia, with her antiquated military organiza- tion, was unable to cope with her Western neighbours, and

had begun to organize, with the help of foreigners, a military force more in accordance with modern requirements; but the progress made in that direction had been slow and unsatis- factory. Unlike his predecessors, Peter was in a hurry to realize his plans, and he set to work at once. In less than two years from the time of disbanding the stryeltsi he contrived to create an army of 40,000 men. This army, it is true, was so inefficient that it was completely routed by the Swedish king with a most inferior force, but it was improved gradually until it learned to conquer its Swedish opponents. To accom- plish such a feat it was necessary, of course, to expend large sums of money; and as the country could ill bear an increase of taxation, the whole financial system had to be improved and the natural resources of the country had to be developed. At the same time the military and financial requirements dislocated the local and central administration, and conse- quently a series of radical administrative reforms had to be undertaken. Thus one reform led to another; but Peter was not dismayed by the magnitude of the task, and worked vigorously in all departments with a sublime disregard for the clamour of reactionary opponents and for the feelings and prejudices of his subjects in general. A prudent ruler in his position would have sought to preserve the outward forms while changing the inner substance, but Peter was not at all prudent in that sense. Very often he wantonly provoked opposition, as when he shaved off his beard and compelled his chief officials to do likewise, though he well knew that the operation was regarded by the ignorant masses and the pious of all ranks as a sinful defacing of the image of God. In his eyes the beard was a symbol of the old regime, and as such it must be removed. Reckless of consequences, he swept away the venerated ceremonial formalities' which his ancestors had scrupulously observed, openly scoffed at ancient usage, habitu- ally dressed in foreign costume, and generally

chose foreign heretics as his boon companions. In adopting foreign innova- tions, he showed, like the Japanese of the present day, no sentimental preference for any particular nation, and was ready to borrow from the Germans, Dutch, English, Swedes or French whatever seemed best suited for his purpose. The innovations, it must be admitted, did not prove so efficient as he expected, because human nature and traditional habits cannot be changed as quickly as institutions. When the Boyar Duma became the Senate, and the Prikazi or adminis- trative departments were organized under the name of Colleges, and when every important town was endowed with a Rathhaus, a Polizeimeister, gilds, aldermen, and all the municipal para- phernalia of western Europe, the vices of the old institutions survived in the new. Notwithstanding the changes in organiza- tion and terminology, the officials remained ignorant, indolent, careless, indifferent to the public welfare, high-handed and extortionate, and the local self-government which was intended to enlighten and control them proved sadly wanting in vitality and practically worthless. So inefficient, indeed, w r ere the reforms as a whole, and so unsuited to the national character and customs, that the Slavophil critics of a later date could maintain plausibly the paradoxical thesis that in regard to internal administration Peter was anything but a national benefactor. However that may be, it must be confessed even by Slavophils that he dragged his countrymen, more by force than by persuasion, from the paths of traditional routine and pushed them along with all his might on the broad road of progress in! the modern sense of the term. , Abandoning the ancient Muscovite capital, where many influential personages were fanatically hostile to his innovations and not a few of the superstitious inhabitants regarded him with horror as Anti- christ, he built at the mouth of the Neva a new capital which was to serve as ” a window through which his people Founda- might look into Europe ” ; and laying aside the national tion of St title of tsar he proclaimed himself (171 1) emperor Peters- (Imperator) of all Russia — much to the surprise and urg ‘ indignation of foreign diplomatic chancelleries, which resented the audacity of a semi-barbarous potentate in claiming to be

equal in rank with the head of the Holy Roman Empire. Gradually, however, the chancelleries had to withdraw their protests, for it came to be generally recognized that the semi- barbarian, who died at the early age of fifty-three, had trans- formed the oriental tsardom of Muscovy into a state of the Western type and had made it a powerful

member of the European family of nations (see Peter I.).

IV. The Modern Empire.— On the death of Peter (172s) the internal tranquillity and progress of the empire were again seriously threatened by the uncertainty of the order of succes- sion, and the autocratic power which he had wielded so vigor- ously passed into the hands of a series of weak, indolent sovereigns who were habitually guided by personal caprice and the advice of intriguing favourites rather than by serious politi- cal considerations. During this period, which lasted from 1725 to 1762, the male line of the Romanov dynasty became extinct, and the succession passed to various members of the female line, which intermarried with German princes. In this way German influence was enormously increased, and was represented by men of considerable capacity holding the highest official posi- tions, such as Biren, Munnich and Ostermann. The main events of the period may be summarized very briefly. Peter, by his first marriage, had a son, the unhappy cesarevich Alexius (q.v.), who figures more largely in imaginative literature than in history — a narrow-minded, obstinate, pious youth, who had no sympathy with his father's violent innovations, and was completely under the influence of the old Muscovite reactionary faction. Intimidated by the paternal anger and threats he took refuge in Austria, and when he had been induced by illusory promises to return to Russia he was tried for high treason by a special tribunal, and after being subjected to torture died in prison (1718). To avert the danger of a man of this type succeeding to the throne Peter made a law by which the reigning sovereign might choose his successor according to his own judgment, and two years later he caused his second wife, Catherine Catherine, the daughter of a Lithuanian peasant, to /., be crowned with all due solemnity, " in recognition

1725-27. Q £ t jj e cour ageous services rendered by her to the Russian Empire." This gave Catherine a certain right to the throne at her husband's death, and her claims were supported by Peter's most influential coadjutors, especially by Prince Menshikov, an ambitious man of humble origin who had been raised by his patron to the highest offices of state. On the other hand the great nobles of more conservative tendencies wished to get the young son of the cesarevich Alexius made emperor under their own control. The former faction triumphed, and Catherine reigned for about a year and a half, after which the son of the cesarevich Alexius, Peter II., occupied the throne from 1727 to 1730. At first he was under the tutelage of Menshikov, who wished him to marry his daughter, but he soon contrived, with the aid of the Dolgorukis and other old families, to get his imperious tutor arrested and exiled to Siberia. The Dol- gorukis and their friends

thus came into power, and on the death of Peter II. in 1730 they offered the throne to Anne, duchess of Courland, a daughter of Ivan V., elder brother of Peter the Great, on condition of her signing a formal docu- ment by which the seat of government should be transferred from St Petersburg to Moscow, and the autocratic power should be limited and controlled by a grand council composed of their own faction. Anne accepted the condition and became empress, but when she discovered that the attempt to limit her powers in favour of a small conservative oligarchy was extremely unpopular among all classes, she submitted the question to an assembly of 800 ecclesiastical and lay dignitaries, and at their request the unlimited autocratic rule was re-established. Her reign (1730-40) was a regime of methodical German despotism on the lines laid down by her uncle, Peter 1 the Great, and as she was naturally indolent and much addicted to frivolous amuse- ments, the administration was directed by her favourite Biren (q.v.) and other men of German origin. Having no male issue,

Peter II.,

1727-30.

she chose as her successor the infant son of her niece, Anna Leopoldovna, duchess of Brunswick, and at her death the child was duly proclaimed emperor, under the name of Ivan VI., but in little more than a year he was dethroned by the partisans of the Princess Elizabeth, a daughter of Peter the Great and Catherine I. As a true daughter of the great Russian EiUa- reformer, Elizabeth (1 741-61) relegated the German beth, element to a subordinate position in the administra- H41-&- tion and gave her confidence to genuine Russians like Bestuzhev, Vorontsov, Razumovski (her morganatic husband) and the Shuvalovs. Her hatred of Germans showed itself like- wise in her persistent struggle with Frederick the Great, which cost Russia 300,000 men and 30 millions of roubles — an enor- mous sum for those days — but in the choice of a successor she could not follow her natural inclinations, for among the few descendants of Michael Romanov there was no one, even in the female line, who could be called a genuine Russian. She pro- claimed, therefore, as heir-apparent the son of her deceased elder sister Anna, Charles Peter Ulrich, duke of Holstein- Gottorp, a German in character, habits and religion, and tried to Russianize him by making him adopt the Eastern Orthodox faith and live in St Petersburg during the whole of her reign; but her well-meant efforts were singularly unsuccessful. Im- pervious to

Russian influence, he remained true to his original nationality, and by his undisguised aversion to everything in his adopted country and his passionate, childish admiration of Frederick the Great, he made himself so unpopular that within a few months of his accession, in December 1761, he was dethroned and assassinated by the partisans of his ambitious and able consort, the famous Catherine II. 1

During the long reign of Catherine II. (1762-96) Russia made rapid progress in civilization, and came to be fully recog- nized as one of the Great Powers. Coming after a Catherine series of incompetent rulers, the German princess //•, proved herself a worthy successor to Peter the Great lr

1 To assist the reader in threading the genealogical maze briefly described above, the following tabular statement is inserted : — (I.) Michael, founder of the Romanov dynasty (1613-45).

(II.) Alexius (1645-76).

Anne,

1730-40.

(III.) Theodore

(1676-82).

(IV.) Ivan V.

(1682-).

Sophia (Regent 1682-80).

(IV.) Peter I. + (V.) Catherine I.

(1682-1725). (1725-27).

Catherine,

duchess of

Mecklenburg.

[.) An

(VII.) Anne

(1730-40).

Cesarevich Alexius

Anna Leopoldovna, duchess of Brunswick.

(VIII.) Ivan VI.

(1740-41).

Anna, duchess of Holstein.

(IX.) Elizabeth

(1741-61).

(VI.) Peter II. (1727-3°)-

(X.) Peter III. + (XI.) Catherine (1761-62). II.

(1762-96).

THE MODERN EMPIRE]

RUSSIA

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of various nationalities, was called together at Moscow to consider the needs of the empire and the means of satisfying them. The instructions for the guidance of the Assembly were prepared by the empress herself and were, as she frankly admitted, the result of ” pillaging the philosophers of the West,” especially Montesquieu and Beccaria. As many of the democratic principles frightened her more moderate and ex- perienced advisers, she wisely refrained from immediately putting them into execution. After holding more than 200 sittings the so-called Commission was dissolved without getting beyond the realm of theory and pia desideria. Subsequently very important reforms were introduced, not by the vote of an assembly, but by the fiat of the autocratic power. The large Admlals- territorial units of administration created by Peter the trative Great were broken up into so-called ” governments ” reforms. (gubernii) and further subdivided into districts (uyezdy) , and each government was confided to the care of a governor and a vice-governor assisted by a council. A certain amount of local self-government was entrusted to the nobles and the burghers, and the judicial administration was thoroughly reorganized in an enlightened and humane spirit. The great estates of the Church, on

which were settled about a million serfs, were secularized and assimilated with the state-domains. At one moment the idea of emancipating all the serfs was entertained, but the project was speedily abandoned, because it would have alienated the nobles — the only class on which Catherine could rely for support. To conciliate them she greatly extended the area of serfage by making large grants of land and serfs to courtiers and public servants who had specially distinguished themselves. About education a great deal was spoken and written, and a certain amount of progress was effected. Whilst primary education was neglected, sec- ondary schools were created in the principal towns and a Russian Academy was founded in St Petersburg. In the imperial court, so far as outward decorum and refinement were con- cerned, there was an immense improvement, and the upper section of the old Russian Dvorianstvo became a noblesse with French aristocratic conceptions and ideals. A taste for French literature spread rapidly, and the poets and dramatists of Paris found clever imitators in St Petersburg.

By such means Catherine made herself very popular in the upper ranks of society, but as a woman and a usurper who did little or nothing to lighten the burdens of the people she failed to gain the loyalty and devotion of the masses. In the first part of her reign popular discontent found expression in various forms, and on one occasion it produced a serious insurrection. In 1773 a Don Cossack called Pugachev, who was so uneducated that he could not even sign the manifestoes written for him, declared himself to be Peter III., and announced that he was going to St Petersburg to punish his faithless wife and place his son Paul on the throne. Many believed, or affected to believe, in the pretender, and in a short time he gathered around him a large force of Cossacks, peasants, Tatars and Tchuvash, swept over the basin of the lower Volga, exe- cuted mercilessly the landed proprietors, seized and pillaged the town of Kazan, and kept the whole country in a state of alarm for more than a year. Finally, after a crushing defeat in which 2000 of the insurgents were killed and 6000 taken prisoners, he was betrayed by some of his followers and executed in Moscow. His name and exploits still live in the popular legends, and the insurrection is often referred to in revolutionary pamphlets as a laudable popular protest against tyrannical autocracy.

In foreign affairs Catherine devoted her attention mainly to pushing forward the Russian frontier westwards and south- Foreign wards, and as France was the traditional ally of policy of Sweden, Poland and Turkey, she adopted at first the so-called systeme du Nord, that is to say, a close alliance with Prussia, England and Denmark against France and Austria, who had buried their traditional enmity in the

famous alliance of 1756. The first step westwards was taken in Courland, which lay between Russian territory and

Cath- erine.

the Baltic coast. At the time of her accession the duchy was ruled by a son of the Polish king Augustus III., and he gave a pretext for aggression by refusing to allow Russian troops returning from the Seven Years' War to pass through bis territory. For this unfriendly act he was deposed and replaced by Biren, who had previously been duke of Courland (1737-40) and had since been an exile in Siberia and Yaroslav. Under Biren (1763-69) and his son and successor (1760-05), as nominees of Catherine, Courland was completely under Russian influence until 1795, when it was formally incorporated with the empire. The next country to feel the expansive tendencies of Russia was Poland, which had now very little Poland. power of resistance. Whilst Russia, Austria, Prussia and France were becoming powerful monarchies with centralized administration, Poland had remained a weak feudal republic with an elected king chosen under foreign influence and fettered by constitutional restrictions. All political authority was in the hands of turbulent nobles who quarrelled among them- selves, who were always inclined to submit the questions at issue to the arbitrament of arms, and who did not scruple to invite foreign powers to intervene on their behalf. The middle classes, which were making other countries rich and powerful, existed only in an embryonic condition. Instead of a well- organized army of the modern type there was merely an undisciplined militia composed almost exclusively of irregular cavalry; and the national defences as a whole were so weak that, in the opinion of such a competent authority as Maurice of Saxony, the country might easily be conquered by a regular army of 48,000 men. Here was a tempting field for the application of Catherine's aggressive policy, and if she had had to deal merely with the Poles she would have had an easy task. Unfortunately for the success of her schemes she had to reckon with stronger states which were anxious to check the Russian advance, and which were determined, in the event' of aggression, to have a share of the plunder. Frederick the Great was at that moment impatient to extend and consolidate his kingdom by getting possession of the basin of the lower Vistula, which separated eastern Prussia from the rest of his dominions, while Austria had also claims on Polish territory and would certainly not submit to be excluded by her two rivals. In these cir- cumstances Catherine hesitated to bring matters to a crisis, but hef hand was forced by Frederick, and in 1772 the first partition of Poland took place without any very strenuous resistance on the part of the victim. This national disaster opened the eyes of many Polish patriots

to the necessity of changing radically the old order of things, and an attempt was made by them to remove some of the more glaring absurdities of the existing constitution: the throne was declared to be hereditary, the liberum veto by which any petty noble could annul the most important decision of the national assembly was abolished, the royal authority was greatly strengthened, and the towns were empowered to send deputies to the Diet (1791). Such salutary reforms were naturally unwelcome to the aggressive neighbours who wished to preserve the traditional anarchy in order to have new facilities for intervention, and as Russia had signed with the puppet-king in 1768 a treaty by which the constitution could not be modified without her consent, she had a plausible ground for protest. She waited, however, until a deputation of the malcontents, who regretted the loss of liberum veto and who were afraid that the party of reform might undertake the emancipation of the serfs, came to St Petersburg and asked for support in defence of the ancient liberties. Then an imperial manifesto reminding the Poles of the treaty of 1768 was issued and a large Russian force entered the Ukraine. This led to the second partition (1793), by which Russia obtained the eastern provinces with three millions of inhabitants. Even now the work of spoliation was not complete. When the patriots under Koscziusko made a desperate effort to recover the national independence the struggle produced a third partition (1795), by which the remainder of the kingdom was again divided between Russia, Prussia and Austria. Thus Poland disappeared for a time from the map of Europe.

[THE MODERN EMPIRE

Russia’s advance westward raised indirectly the Eastern Question, because it threatened two of France’s traditional Treaty of allies, Sweden and Poland, and Choiseul considered Kuehuk- that the best means of checkmating Catherine’s Kalnarjl, a gg re ssive schemes was to incite France’s third traditional ally, Turkey, to attack her. This was not a difficult matter, because the Sublime Porte had many things to complain of in the past and had good reason to fear aggression in the near future. War was accordingly declared in 1768, but it proved disastrous for the sultan; and he had to sign in 1774 the treaty of Kuchuk-Kainarji, which gave Russia a firm hold on the Black Sea and the lower Danube (see Turkey: History). The Tatars of the Bug, of the Crimea and of the Kuban were liberated from the suzerainty of the Porte; Azov, Kinburn and all the fortified places of the Crimea were

ceded to Russia; the Bosphorus and Dardanelles were opened to Russian merchant vessels; and Russian ambassadors obtained the right to intervene in favour of the inhabitants of the Danubian principalities. Ten years later the semblance of independence which was left to the khans of the Crimea was destroyed and the peninsula formally annexed to the empire.

The peace concluded at Kuchuk-Kainarji was not of long duration. Catherine had conceived an ambitious plan of solving radically the Eastern Question by partitioning Turkey as she and her allies had partitioned Poland, and she had persuaded the emperor Joseph II. to take part in the scheme. It was intended that Russia should take what remained of the northern coast of the Black Sea, Austria should annex the Turkish provinces contiguous to her territory, the Danubian principalities and Bessarabia should be formed into an in- dependent kingdom called Dacia, the Turks should be expelled from Europe, the Byzantine empire should be resus- citated, and the grand-duke Constantine, second son of the Russian heir-apparent, should be placed on the throne of the Palaeologi. Rumours of this gigantic scheme reached Con- stantinople, and as Catherine's menacing attitude left little doubt as to her aggressive intentions the Porte presented an ultimatum and finally declared war (1787). Fortune again favoured the Russian arms, but as Austria was less successful and signed a separate peace at Sistova in 1791, Catherine did not obtain much material advantage from the campaign. By the peace of Jassy, signed in January 1792, she retained Ochakov and the coast between the Bug and the Dniester, and she secured certain privileges for the Danubian principalities, but the Turks remained in Constantinople, and the realization of the famous Greek project, as it was termed, had to be indefinitely postponed.

During the first years of the French Revolution Catherine's sympathy with philosophic liberalism rapidly evaporated, and Catherine sne ˆd au> m ner P ower to stimulate the hostility of an+tbe the European sovereigns to the democratic movement; Revolu- but she carefully abstained from joining the Coalition,

"' and waited patiently for the moment when the

complications in western' Europe would give her an oppor- tunity of solving independently the Eastern Question in ac- cordance with Russian interests. That moment never came. In November 1796, when the country was not yet prepared to enter on a decisive struggle with Turkey, Catherine died at the age of sixty-six, and was succeeded by her son Paul, whom she had kept during her long reign in a state of

semi-captivity.

The short reign of Paul (1 796-1801) resembled in many points the still shorter one of his father, Peter III. Both sovereigns Paul. were childishly wayward and capriciously autocratic;

both were recklessly indifferent to the feelings, convic- tions and wishes of those around them; both took a passionate interest in the minutiae of military affairs; as Peter had conceived a boundless admiration for Frederick the Great, so Paul conceived a similar admiration for Napoleon, and both suddenly reversed the national policy to suit this feeling; both were singularly blind to the consequences of their foolish conduct; and both fell victims to court conspiracies which could be in some measure justified, or at least excused, on patriotic grounds.

Paul left no deep, permanent mark on Russian history. In internal affairs he wished to undo what his mother had done, but his impulsive, incoherent efforts in that direction merely dislocated the administrative mechanism without producing any tangible results. In foreign affairs he displayed the same capriciousness and want of perseverance. After proclaiming his intention of conferring on his subjects the blessings of peace, he joined in 1798 an Anglo- Austrian coalition against France; but when Austria paid more attention to her own interests than to the interests of monarchical institutions- in general, and when England did not respect the independence of Malta, which he had taken under his protection, he succumbed to the artful blandishments of Napoleon and formed with him a plan for ruining the British empire by the conquest of India. Having roused, by what ought perhaps to be called his insanity, the enmity, distrust and fear of all around him, including some members of his own family, he was assassinated on the night of the 23rd to 24th of March 1801, and was succeeded by his son Alexander I.

The early part of Alexander's reign (1801-25) was a period of generous ideas and liberal reforms. Under the influence of his Swiss tutor, Frederick Cesar de Laharpe, he Alex- had imbibed many of the democratic ideas of the anderi., time, and he aspired to put them in practice, with 180l ~ 2S – the assistance at first of three young friends, Novosiltsov, Adam Czartoryski and Strogonov, who were his intimate counsellors and were popularly known as the Triumvirate, and later of Mikhail Speranski (q.v.). Some of the more oppressive measures of the previous reign were abolished; the clergy, the nobles and the merchants were exempted from corporal punishment; the central organs of administration were modernized and the Council of

the Empire was created; the idea of granting a constitution was academically discussed; great schemes for educating the people were entertained; parish schools, gymnasia, training colleges and ecclesiastical seminaries were founded; the existing universities of Moscow, Vilna and Dorpat were reorganized and new ones founded in Kazan and Kharkov; the great work of serf -emancipation was begun in the Baltic provinces. In all these schemes Alexander took a keen personal interest; but his enthusiasm was soon cooled by practical difficulties, and his attention became more and more engrossed by foreign affairs.

At that time, in respect of foreign affairs, Russia was entering on a new phase of her history. Hitherto she had confined her efforts to territorial expansion in eastern Europe and in Asia, and she had sought foreign alliances merely as temporary expedients to facilitate the attainment of that object. Now she was beginning to consider herself a powerful member of the European family of nations, and she aspired to exercise a predominant influence in all European questions. This tendency was already shown by Catherine when she created the League of Neutrals as an arm against the naval supremacy of England, and by Paul when he insisted that his peace negotiations with Bonaparte should be regarded as part of a general European pacification, in which he must be consulted. Alexander insisted still more strongly on this claim, and in the convention which he concluded with the First Consul in October Alex- 1 801 it was agreed that the maintenance of a just ander and equilibrium between Austria and Prussia should be Naooleoa – taken as an invariable principle in the plans\ of both parties, that the integrity of the kingdom of the Two Sicilies should be respected, that the duke of Wiirttemberg should receive in Germany an indemnity proportionate to his losses, that the dominions of the elector of Bavaria should be preserved intact, and that the independence of the Ionian Islands should not be violated. Having obtained these important concessions the tsar imagined for a moment that in any further territorial changes he would be consulted and his advice allowed due weight, and he seems even to have indulged in the hope that the affairs of Europe might be directed by himself and his new ally. His illusion was soon dispelled, because the aims and policy of the two potentates were utterly irreconcilable. Whilst

the one strove to erect bulwarks against French aggression, the other was preparing the ground for fresh annexations. During 1803-4 the breach between the two rivals widened, because Napoleon became more and more aggressive and unceremonious in Italy and Germany. Before the end of 1803 Alexander had come to perceive the necessity of resisting him energetically in order to save Europe from complete subjection, and in August 1804 he recognized that an armed conflict was inevitable. It broke out in the following year, and after the battles of Austerlitz (December 1805) and Friedland (June 1807), in which the Russians were completely defeated, the two sovereigns had their famous interviews at Tilsit, at which they not only made peace but agreed to divide the world between them, with a sublime indifference to the interests of other states. The grandiose project was at once vaguely outlined in three formal documents, to the intense satisfaction of both parties, and on both sides there was much rejoicing at the conclusion of such an auspicious alliance; but the diplomatic honeymoon was not of long duration. The mutual assurances of unbounded confidence, admiration and sympathy, if there was any genuine sincerity in them, represented merely a transient state of feeling. Napoleon, who could brook no equal, was nourishing the secret hope that his confederate might be used as a docile subordinate in the realization of his own plans, and the confederate soon came to suspect that he was being duped. His suspicions were intensified by the hostile criticisms of the Tilsit arrangement among his own subjects and by the arbitrary conduct of his ally, who continued his aggressions in reckless fashion as if he were sole master of Europe. The sovereigns of Sardinia, Naples, Portugal and Spain were dethroned, the pope was driven from Rome, the Rhine Confederation was extended till France obtained a footing on the Baltic, the grand-duchy of Warsaw was re- organized and strengthened, the promised evacuation of Prussia was indefinitely postponed, an armistice between Russia and Turkey was negotiated by French diplomacy in such a way that the Russian troops should evacuate the Danubian prin- cipalities, which Alexander intended to annex to his empire, and the scheme for breaking up the Ottoman empire and ruining England by the conquest of India, which had been one of the most attractive baits in the Tilsit negotiations, but which had not been formulated in the treaty, was no longer spoken of. At the same time Napoleon threatened openly to crush Austria, and in 1809 he carried out his threat by defeating the Austrian armies at Wagram and elsewhere, and dictating the treaty of Schonbrunn (October 14).

Russia now remained the only unconquered power on the continent, and it was evident that the final struggle with her could not be long

delayed. It began in 18 12 by the advance of the Grande Armee on Moscow, and it ended in 1813 at Waterloo. During those three years Alexander was the chief antagonist of Napoleon, and it was largely due to his skill and persistency that the allies held together and freed Europe permanently from the Napoleonic domination. When peace was finally concluded, he had obtained that predominant position in European politics which had been the object of his ambition since the commence- ment of his reign, and he now believed firmly that he had been chosen by Providence to secure the happiness of the world in general and of the European nations in particular. In the fulfilment of this supposed mission he was not very successful, Mex- because his conception of national happiness and the

under and means of obtaining it differed widely from that of the the re- peoples whom he wished to benefit. They had fought action la f or f ree d om J n order to liberate themselves not only from the yoke of Napoleon but also from the tyranny of their own governments, whereas he expected them to remain submissively under the patriarchal institutions which their native rulers imposed on them. Thus, in spite of his academic sym- pathy with liberal ideas, he became, together with Metternich, a champion of political stagnation, and co-operated willingly in the reactionary measures against the revolutionary move- ments in Germany, Italy and Spain. In the affairs of his own

1825-55.

country he refrained from developing and extending the liberal institutions which he had created immediately after his accession, and he finally adopted in all departments of administration a strongly reactionary policy. This naturally caused profound disappointment and dissatisfaction in the liberal section of the educated classes and especially among the young officers of the regiments which had spent some years in western Europe. Some of these officers had been in touch with the revolutionary movements, and had adopted the idea then prevalent in France, Germany and Italy that the best instrument for assuring political progress was to be found in secret societies. In Russia such societies began to be formed about 1816. The tsar, though he came to know of their existence, refrained from taking re- pressive measures against them, and when he died suddenly at Taganrog on the 1st of December 1825, two of them made an attempt to realize their political aspirations. The heir to the throne was the late tsar's eldest brother, Constantine, but he declined, for private reasons, to accept the succession, Nicholas and a few days elapsed before the second brother, /., Nicholas, was proclaimed emperor. Taking

advantage of this short interregnum, some members of the secret societies, mostly officers of the Guards, organized a mutiny among the troops quartered in St Petersburg and in Podolia, with a view to effecting a political revolution, but the movement was easily suppressed, and the ringleaders, known subsequently as the Decembrists, were severely punished (see Nicholas I.).

Nicholas was a blunt soldier incapable of comprehending his brother's sentimental sympathy with liberalism. The Decembrists' abortive attempt at revolution and the Polish insurrection of 1831, which he crushed with great severity, confirmed him in his conviction that Russia must be ruled with a strong hand. That conviction he put into practice with extreme rigour during the thirty years of his reign (1825- 55), endeavouring by every means at his disposal to prevent revolutionary ideas from germinating spontaneously among his subjects and from being imported from abroad. For this purpose he . created a very severe press-censorship and an expensive system of passports, which made it more difficult for Russians to visit foreign countries. It would be unjust, however, to say that he was the determined enemy of all progress. Progress was to be made in certain directions and in a certain way. Not only was the army to be well drilled and the fleet to be. carefully equipped, but railways were to be constructed, river-navigation was to be facilitated, manufacturing industry was to be developed, commerce was to be encouraged, the administration was to be improved, the laws were to be codified and the tribunals were to be reorganized. All this was to be done, however, under the strict supervision and guidance of the autocratic power, with as little aid as possible from private initiative and with no control whatever of public opinion, because influential public opinion is apt to produce insubordina- tion. When the results proved unsatisfactory, remedies were sought in increased administrative supervision, draconian legislation and severe punishment, and no attempt was made to get out of the vicious circle. In the last months of his life, under the influence of a great national disaster, the conscientious, persistent autocrat began to suspect that his system was a mistake, but he still clung to it obstinately. " My successor," he is reported to have said on his death-bed, " may do as he pleases, but I cannot change ! "

This steadfast faith in autocratic methods and the exaggerated fear of revolutionary principles were shown in foreign as well as in home affairs. Like Alexander in the last period of his reign, Nicholas considered himself the supreme guardian of European order, and was ever on the watch to oppose revolution in all its forms. Hence he was generally in strained relations with France, especially in the time of

Louis Philippe, who became king not by the grace of God but by the will of the people. During the revolutionary ferment of 1848-49 he urged the Prussian king to refuse the imperial crown, co-operated with the Austrian emperor in suppressing the Hungarian insurrection, and com- pelled the Prussians to withdraw their support from the insurgents

in Schleswig-Holstein. Unfortunately for the peace of the world his habitual policy of maintaining the existing state of things was frequently obscured and disturbed by his desire to maintain and increase his own and his country's prestige, influence and territory. By the Persian War, which broke out in 1826, in consequence of frontier disputes, he annexed the provinces of Erivan and Nakhichevan, and during the whole of his reign the conquest of the Caucasus was systematically carried on. With regard also to the Ottoman empire his policy cannot be said to have been strictly conservative. As protector Nicholas 0I the Orthodox Christians he espoused the cause of /. and the the rayahs in Greece, Servia and Rumania. Under a ottoman threat of war he obtained in 1826 the Convention of empre. Akerman,by which theautonomyof Moldavia, Walachia and Servia was confirmed, free passage of the straits was secured for merchant ships and disputed territory on the Asiatic frontier was annexed, and in July 1827 he signed with England and France the treaty of London for the solution of the Greek question by the mediation of the Powers. As the sultan rejected the mediation, his fleet was destroyed by the combined squadrons of the three Powers at Navarino; and as this " untoward event " did not suffice to overcome his resistance, a Russian army crossed the Danube and after two hard-fought campaigns advanced to Adrianople. Here, on the 14th of September 1829, was signed a treaty by which the Porte ceded to Russia the islands at the mouth of the Danube and several districts on the Asiatic frontier, granted full liberty to Russian navigation and commerce in the Black Sea, and guaranteed the autonomous rights previously accorded to Moldavia, Walachia and Servia. By the 10th article of the treaty, moreover, Turkey acceded to the protocol of the 22nd of March 1829, by which the Powers had agreed to the erection of Greece into a tributary principality. This attempt of Russia to secure the sole prestige of liberating Greece was, however, frustrated by the action of the other Powers in putting forward the principle of the independence of the

new Greek state, with a further extension of frontiers.

The result of the war was to make Russia supreme at Con- stantinople; and before long an opportunity of further increasing her influence was created by Mehemet Ali', the ambitious pasha of Egypt, who in November 1831 began a war with his sovereign in Syria, gained a series of victories over the Turkish forces in Asia Minor and threatened Constantinople. Sultan Madmud II. after appealing in vain to Great Britain for active assistance turned in despair to Russia. Nicholas immediately sent his Black Sea fleet into the Bosphorus, landed on the Asiatic shore a force of 10,000 men, and advanced another large force towards the Turkish frontier in Bessarabia. Under pressure from Treaty of England and France the Egyptians retreated and the Uokiar- Russian forces were withdrawn, but the tsar had mean- Skeiessi, w hile (July 8, 1833) concluded with the sultan the treaty of Unkiar-Skelessi, which constituted ostensibly a defensive and offensive alliance between. the two Powers and established virtually a Russian protectorate over Turkey. In a secret article of the treaty the sultan undertook in the event of a casus foederis arising, and in consideration of being relieved of his obligations under the articles of the public treaty, to close the Dardanelles to the warships of all nations " au besoin," which meant in effect that in the event, of Russia being threatened with an attack from the Mediterranean he would close the Dardanelles against the invader. England and France pro- tested energetically and the treaty remained a dead letter, but the question came up again in 1840, after Mahmud's renewed attempt to crush Mehemet Ali had ended in the utter defeat of the Turks by Ibrahim at Nezib (June 24, 1839). This time Mehemet Ali was supported by the French government, which aimed at establishing predominant influence in Egypt, but he was successfully opposed by a coalition of Great Britain, Russia, Austria and Prussia, which checkmated the aggressive de- signs of France by the convention of London (July 15, 1840) (see Mehemet Ali and Turkey). In this way the development of Russian policy with regard to Turkey was checked for some years, but the project of confirming and extending the Russian

protectorate over the Orthodox Christians was revived in 1852, when Napoleon III. obtained for the Roman Catholics certain privileges with regard to the Holy Places in pj a ˆe S . Palestine. At the same time Austria intervened in Montenegrin affairs and induced the sultan to withdraw his troops from the principality. In these two incidents the tsar perceived a diminution of Russian prestige and influence in Turkey, and Prince Menshikov was sent on a special mission to Constantinople to obtain reparation in the form of a treaty which should guarantee the rights of the Orthodox Church with regard to the

Holy Places and confirm the protectorate of Russia over the Orthodox rayahs, established by the treaties of Kainarji, Bucharest and Adrianople. The resistance of the sultan, supported by Great Britain and France, led to the Crimean War, which was terminated by the taking of The Sevastopol (September 1855) and the treaty of Paris Crimean (March ˆo, 1856). By that important document Russia War ‘ reluctantly consented to a strict limitation of her armaments in the Black Sea, to withdrawal from the mouths of the Danube by the retrocession of Bessarabia which she had annexed in 181 2, and finally to a renunciation of all special rights of inter- vention between the sultan and his Christian subjects. Nicholas did not live to experience this humiliation. He had died at St Petersburg on the 2nd of March 1855 and had been succeeded by his eldest son, Alexander II.

The first decade of Alexander’s reign is commonly known in Russia as ” the epoch of the great reforms,” and may be de- scribed as a violent reaction against the political and Alex- intellectual stagnation of the preceding period. The ander //., repressive system of Nicholas, in which all other public ˆSSS-81. interests were sacrificed to that of making Russia a great military power, the guardian of order in Europe and the pre- dominant factor in the Eastern Question, had been tried and- found wanting. Ending in a military disaster and a diplomatic humiliation, it had failed to attain even the narrow object for which it had been created. This was clearly perceived and keenly felt by the educated classes, and as soon as the strong hand of the uncompromising autocrat was withdrawn, they clamoured loudly for radical changes in the aims and methods of their rulers. Russia must adopt, it was said, those enlightened principles and liberal institutions which made the Western nations superior to her not only in the arts of peace but even in the art of war; only by imitating her rivals could she hope to overtake and surpass them in the race of progress. On that subject there was wonderful unanimity, and the few persons who could not join in the chorus had the prudence to remain silent. For the first time in the history of Russia public opinion in the modern sense became a power in the state and influenced strongly the policy of the government. Though the young emperor was of too phlegmatic a temperament to be carried away by the prevailing excitement and of too practical a turn of mind to adopt wholesale the doctrinaire theories of his self- constituted, irresponsible advisers, he recognized that great administrative and economic changes were required, and after a short period of hesitation he entered on a series of drastic re- forms, of which the most important were the emancipation of the serfs, the thorough reorganization of the judicial administra- tion and

the development of local self-government. All these undertakings, in which the humane, liberal-minded autocrat received the sympathy, support and co-operation of the more enlightened of his subjects, were successfully accomplished. The serfs were liberated entirely from the arbitrary rule of the land- owners and became proprietors of the communal land; the old tribunals which could be justly described as " dens of iniquity and incompetence," were replaced by civil and criminal law- courts of the French type, in which justice was dispensed by trained jurists according to codified legislation, and from which the traditional bribery and corruption were rigidly excluded; and the administration of local affairs — roads, schools, hospitals, &c. — was entrusted to provincial and district councils freely elected by all classes of the population. In addition to these great and bene- ficent changes, means were taken for developing more rapidly the

vast natural resources of the country, public instruction received an unprecedented impetus, a considerable amount of liberty was accorded to the press, a strong spirit of liberalism pervaded rapidly all sections of the educated classes, a new imaginative and critical literature dealing with economic, philosophical and political questions sprang into existence, and for a time the young generation fondly imagined that Russia, awakening from her tradi- tional lethargy, was about to overtake, and soon to surpass, on the path of national progress, the older nations of western Europe.

These sanguine expectations were not fully realized. The economic and moral condition of the peasantry was little improved by freedom, and in many districts there were signs of positive impoverishment and demoralization. The local self-government institutions after a short period of feverish and not always well-directed activity, showed symptoms of organic exhaustion. The reformed tribunals, though incom- parably better than their predecessors, did not give universal satisfaction. In the imperial administration, the corruption and long-established abuses which had momentarily vanished, began to reappear. Industrial enterprises did not always succeed. Education produced many unforeseen and undesirable practical results. The liberty of the press not unfrequently degenerated into licence, and sane liberalism was often replaced by socialistic dreaming. In short, it became only too evident that there was no royal road to national

prosperity, and that Russia, like other nations, must be content to advance slowly and laboriously along the rough path of painful experience. In these circum- stances sanguine enthusiasm naturally gave way to despondency, and the reforming zeal of the government was replaced by tend- encies of a decidedly reactionary kind. Partly from disappoint- ment and nervous exhaustion, and partly from a conviction that the country required rest in order to judge the practical results of the reforms already accomplished, the tsar refrained from further initiating new legislation, and the government gave it to be understood that the epoch of the great reforms was closed.

In the younger ranks of the educated classes this state of things produced keen dissatisfaction, which soon found vent ftevolu- i Q revolutionary agitation. At first the agitation tionary was of an academic character and was dealt with by props- the press-censure; but it gradually took the form of **" "■' secret associations, and the police had to interfere. There were no great, well-organized secret societies, but there were many small groups, composed chiefly of male and female students of the universities and technical schools, which worked independently for a common purpose. Finding that the walls of autocracy could not be overturned by blasts of revolutionary trumpets in the periodical press and in clandestinely printed seditious proclamations, the young enthusiasts determined to seek the support of the masses, or, as they termed it, " to go in among the people " (idti v narbd). Under the disguise of doctors, midwives, school teachers, governesses, factory hands or common labourers, they sought to make proselytes among the peasantry and the workmen in the industrial centres by revolutionary pamphlets and oral explanations. For a time the propaganda had very little success, because the unedu- cated peasants and factory workers could not understand the phraseology and abstract principles of socialism; but when the propagandists descended to a lower platform and spread rumours that the tsar had given all the land to the peasants, and was prevented by the proprietors and officials from carrying out his benevolent intentions, there was a serious danger of agrarian disorders, and energetic measures were adopted by the authori- ties. Wholesale arrests were made by the police, and many of the accused were imprisoned or exiled to distant provinces, some by the regular tribunals, and others by so-called " adminis- trative procedure " without a formal trial. The activity of the police and the sufferings of the victims naturally produced intense excitement and bitterness among those who escaped arrest, and a secret organization calling itself the Executive Committee announced in its clandestinely printed organs that the functionaries

who distinguished themselves in the sup- pression of the propaganda would be ” removed.” A number

of prominent officials were accordingly condemned \o death by this secret terrorist tribunal, and in some cases the sentences were carried out. General Mezentsov, the head of the political police, was assassinated in broad daylight in one of the principal streets of St Petersburg, and in the provinces a good many officials of various grades shared the same fate. As these acts of terrorism had quite the opposite of the desired effect, re- peated attempts were made on the life of the emperor, and at last the carefully laid plans of the conspirators were successful. On the 13th of March 1881, when returning from a military parade to the Winter Palace, Alexander II. was terribly wounded by the explosion of a bomb, and died shortly afterwards. (For details of this revolutionary movement, see Nihilism.)

In respect of foreign policy the reign of Alexander II. differed widely from that of Nicholas. The Eastern Colossus no longer inspired respect and fear in Europe. Until the country had completely recovered from the exhaustion of the no/fc/” Crimean War the government remained in the back- ground of European politics. Its attitude was graphically described in the famous declaration of Prince GorchaWv: ” La Russie ne boude pas; elle se recueille.” On one point, however, this description was not accurate; Russia sulked so far as Austria was concerned, for she could not forget that the emperor Francis Joseph, by his wavering and unfriendly conduct towards her during the Crimean War, had ill repaid her assistance to the Habsburg Monarchy in 1849, and had fulfilled the cynical prediction of Prince Schwarzenberg that his country would astonish the world by her ingratitude. It was not without secret satisfaction, therefore, that Prince Gorchakov watched the repeated defeats of the Austrian army in the Italian campaign of 1839, and he felt inclined to respond to the advances made to him by Napoleon III. ; but the germs of a Russo-French alliance, which had come into existence immedi- ately after the Crimean War, ripened very slowly, and they were completely destroyed in 1863 when the French emperor wounded Russian sensibilities deeply by giving moral and diplomatic support to the Polish insurrection. On that occasion Bismarck helped Gorchakov to ward off the threatened intervention of France and England, and he thereby founded the cordial relations which subsisted between the cabinets of Berlin and St Petersburg down to 1878, and which contributed powerfully to the creation of the German empire by defending the Prussian cabinet against the jealousy and enmity of Austria and France. In return for these services Bismarck helped Russia to recover a portion of what she had lost by the Crimean War,

for it was thanks to his connivance and diplomatic support that she was able in 187 1 to denounce with impunity the clauses of the treaty of Paris which limited Russian armament in the Black Sea. Had the tsar been satisfied with this important success, which enabled him to rebuild Sevastopol and construct a Black Sea fleet, his reign might have been a peaceful and prosperous one, but he tried to recover the remainder of what Kusso- had been lost by the Crimean War, the province of Turkish Bessarabia and predominant influence in Turkey. War of To effect this, he" embarked on the Turkish War of t8T7 – 78 – 1877-78, which ended in disappointment Though the cam- paign enabled him to recover Bessarabia at the expense of his Rumanian ally, it did not increase Russian prestige in the East, because the Russian army was repeatedly repulsed by the Turks, and when at last it reached Constantinople, it was pre- vented from entering the city by the threatening attitude of England and Austria. In the field of diplomacy there was like- wise disappointment. The concessions extorted from the Porte in the preliminary treaty of San Stefano (March 3, 1878) were revived and considerably modified in favour of Turkey by the congress of Berlin (June 13- July 13, 1878); see Europe: history. Much greater success attended the efforts of Russian diplomacy and Russian arms in Asia. By the treaty of Aigun (May 28, 1858), and without any military operations, the Russian cession of a great part of. the basin of the Amur was expansion obtained ' from China. Six years later began the '" Asla " rapid expansion of Russia in Central Asia, and at the end

of Alexander II. 's reign her domination had been firmly established throughout nearly the whole of the vast expanse of territory lying between Siberia on the north and Persia and Afghanistan on the south, and stretching without interruption from the eastern coast of the Caspian to the Chinese frontier. The greater part of the territory was formally incorporated into the empire, and the petty potentates, such as the khan of Khiva and the amir of Bokhara, who were allowed to retain a semblance of their former sovereignty, became obsequious vassals of the White Tsar.

The assassination of Alexander II. by the terrorists made a profound impression on his son and successor, and determined Alex- the general character of his rule. Alexander III.

aaderlii., (1881-94), who had never sympathized with liberalism 1881-94. j n anv f onrij en tered frankly on a reactionary policy, which was pursued consistently during the whole of his reign. He could not, of course, undo the great reforms of Reaction his predecessor, but he amended them in such a way under as to counteract what he considered the exaggerations Alexander f liberalism. Local self-government in the village communes, the rural districts and the towns was carefully restricted, and placed to a greater extent under the control of the regular officials. The reformers of the previous reign had endeavoured to make the emancipated peasantry administratively and economically independent of the landed proprietors; the conservatives of this later era, proceeding on the assumption that the peasants did not know how to make a proper use of the liberty prematurely conferred upon them, endeavoured to re-establish the influence of the landed proprietors by appointing from amongst them " land-chiefs," who were to exercise over the peasants of their district a certain amount of patriarchal jurisdiction. The reformers of the previous reign had sought to make the new local administration (zemstvo) a system of genuine rural self-government and a basis for future parliamentary institutions; these later conservatives transformed it into a mere branch of the ordinary state adminis- tration, and took precautions against its ever assuming a political character. Even municipal institutions, which had never shown much vitality, were subjected to similar restrictions. In short, the various forms of local self-government, which were intended to raise the nation gradually to the higher political level of western Europe, were condemned as unsuited to the national character and traditions, and as productive of disorder and demoralization. They were accordingly replaced in great measure by the old autocratic methods of administration, and much of the administrative corruption which had been cured, or at least repressed, by the reform enthusiasm again nourished luxuriantly.

In a small but influential section of the educated classes there was a conviction that the revolutionary tendencies, which culminated in Nihilism and Anarchism, proceeded from the adoption of cosmopolitan rather than national principles in all spheres of educational and administrative activity, and that the best remedy for the evils from which the country was suffering was to be found in a return to the three great principles of Nationality, Orthodoxy and Autocracy. This doctrine, which had been invented by the Slavophils of a previous generation, was early instilled into the mind of Alexander III. by Pobe- donostsev (g.v.), who was one of his teachers, and later his most trusted adviser, and its influence can be traced in

all the more important acts of the government during that monarch's reign. His determination to maintain autocracy was officially proclaimed a few days after his accession. Nationality and Eastern Orthodoxy, which are so closely connected as to be almost blended together in the Russian mind, received not less attention. Even in European Russia the regions near the frontier contain a great variety of nationalities, languages and religions. In Finland the population is composed of Finnish-speaking and Swedish-speaking Protestants; the Baltic provinces are inhabited by German-speaking, Lett- speaking and Esth-speaking Lutherans; the inhabitants of the south-western provinces are chiefly Polish-speaking Roman

Catholics and Yiddish-speaking Jews; in the Crimea and on the Middle Volga there are a considerable number of Tatar- speaking Mahommedans; and in the Caucasus there is a conglomeration of races and languages such as is to be found on no other portion of the earth's surface. Until recent times these various nationalities were allowed to retain unmolested the language, religion and peculiar local administration of their ancestors; but when the new nationality doctrine came into fashion, attempts were made to spread among them the language, religion and administrative institutions of the dominant race. In the reigns of Nicholas I. and Alexander II. these attempts were merely occasional and intermittent; under Alexander III. they were made systematically and with very little consideration for the feelings, wishes and interests of the people concerned. The local institutions were assimilated to those of the purely Russian provinces; the use of the Russian language was made obligatory in the administration, in the tribunals and to some extent in the schools; the spread of Eastern Orthodoxy was encouraged by the authorities, whilst the other confessions were placed under severe restrictions; foreigners were prohibited from possessing landed property; and in some provinces administrative measures were taken for making the land pass into the hands of Orthodox Russians. In this process some of the local officials displayed probably an amount of zeal beyond the intentions of the govern- ment, but any attempt to oppose the movement was rigorously punished. Of all the various races the Jews were the most severely treated. The great majority of them had long been confined to the western and south-western provinces. In the rest of the country they had not been allowed to reside in the villages, because their habits of keeping vodka-shops and lending money at usurious interest were found to demoralize the peasantry, and even in the towns their numbers and occupa- tions had been restricted by the authorities. But, partly from the usual laxity of the administration and partly from the readiness of the Jews to conciliate the needy officials,

the rules had been by no means strictly applied. As soon as this fact became known to Alexander III. he ordered the rules to be strictly carried out, without considering what an enormous amount of hardship and suffering such an order entailed. He also caused new rules to be enacted by which his Jewish sub- jects were heavily handicapped in education and professional advancement. In short, complete Russification of all non- Russian populations and institutions was the chief aim of the government in home affairs.

In the foreign policy of the empire Alexander III. likewise introduced considerable changes. During his father's reign its main objects were: in the west, the maintenance of the alliance with Germany; in south-eastern Europe, policy. the recovery of what had been lost by the Crimean War, the gradual weakening of the Sultan's authority, and the increase of Russian influence among the minor Slav nation- alities; in Asia, the gradual but cautious expansion of Russian domination. In the reign of Alexander III. the first of these objects was abandoned. Already, before his accession, the bonds of friendship which united Russia to Germany had been weakened by the action of Bismarck in giving to the cabinet of St Petersburg at the Berlin congress less diplomatic support than was expected, and by the Austro- German treaty of alliance (October 1879), concluded avowedly for the purpose of opposing Russian aggression; but the old relations were partly re-established by secret negotiations in 1880, by a meeting of the young tsar and the old emperor at Danzig in 1881, and by the meeting of the three emperors at Skierniewice in 1884, by which the Three Emperors' League was reconstituted for a term of three years (see Europe: History). Gradually, however, a great change took place in the tsar's views with regard to the German alliance. He suspected Bismarck of harbouring hostile designs against Russia, and he came to recognize that the permanent weakening of France was not in accordance with Russian political interests. He determined, therefore, to oppose any further disturbance of the balance of power in favour

of Germany, and when the treaty of Skierniewice expired in 1887 he declined to renew it. From that time Russia gravitated slowly towards an alliance with France, and sought to create a counterpoise against the Triple Alliance of Germany, Austria and Italy. The tsar was reluctant to bind himself by a formal treaty, because the French

government did not offer the re- quisite guarantees of stability, and because he feared that it might be induced, by the prospect of Russian support, to assume an aggressive attitude towards Germany. He recognized, however, that in the event of a great European war the two nations would in all probability be found fighting on the same side, and that if they made no preparations for concerted military action they would be placed at a grave disadvantage in com- parison with their opponents of the Triple Alliance, who were believed to have already worked out an elaborate plan of campaign. In view of this contingency the Russian and French military authorities studied the military questions in common, and the result of their labours was the preparation of a military convention, which was finally ratified in 1894. During this period the relations between the two governments and the two countries became much more cordial. In the summer of 1891 the visit to Kronstadt of a French squadron under Admiral Gervais was made the occasion for an enthusiastic demonstration in favour of a Franco-Russian alliance; and two years later (October 1893) a still more enthusiastic reception was given to the Russian Admiral Avelan and his officers when they visited Toulon and Paris. But it was not till after the death of Alex- ander III. that the word ” alliance ” was used publicly by official personages. In 1895 the term was first publicly em- ployed by M. Ribot, then president of the council, in the Chamber of Deputies, but the expressions he used were so vague that they did not entirely remove the prevailing doubts as to the exist- ence of a formal treaty. Two years later (August 1897), during the official visit of M. Felix Faure to St Petersburg, a little more light was thrown on the subject. In the complimentary speeches delivered by the president of the French Republic and the tsar, France and Russia were referred to as allies, and the term ” nations alliees ” was afterwards repeatedly used on occasions of a similar kind.

In south-eastern Europe Alexander III. adopted an attitude of reserve and expectancy. He greatly increased and strength- ened his Black Sea fleet, so as to be ready for any emergency that might arise, and in June 1886, contrary to the declaration made in the Treaty of Berlin (Art. 59), he ordered Batum to be transformed into a fortified naval port, but in the Balkan Pen- insula he persistently refrained, under a good deal of provoca- tion, from any intervention that might lead to a European war. The Bulgarian government, first under Prince Alexander and afterwards under the direction of M. Stamboloff, pursued systematically an anti-Russian policy, but the cabinet of St Petersburg confined itself officially to breaking off diplomatic relations and making diplomatic protests, and unofficially to giving tacit encouragement to revolutionary agitation.

In Asia, during the reign of Alexander III. the expansion of Russian domination made considerable progress. A few weeks after his accession he sanctioned the annexation of the territory of the Tekke Turkomans, which had been conquered by General Skobelev, and in 1884 he formally annexed the Merv oasis without military operations. He then allowed the military authorities to push forward in the direction of Afghanistan, until in March 1885 an engagement took place between Russian and Afghan forces at Panjdeh. Thereupon the British government, which had been for some time carrying on negotiations with the cabinet of St Petersburg for a delimitation of the Russo-Afghan frontier, intervened energetically and prepared for war; but a compromise was effected, and after more than two years of negotiation a delimitation convention was signed at St Peters- burg on 20th July 1887. The forward movement of Russia was thus stopped in the direction of Herat, but it continued with great activity farther east in the region of the Pamirs, until another Anglo-Russian convention was signed in 1895. During the whole reign of Alexander III. the increase of terri-

tory in Central Asia is calculated by Russian authorities at 429,895 square kilometres.

On 1st November 1894 Alexander III. died, and was succeeded by his son, Nicholas II., who, partly from similarity of character and partly from veneration for his father's memory, continued the existing lines of policy in home and ˆzander foreign affairs. The expectation entertained in many ///„• ac . quarters that great legislative changes would at once cession ot be made in a liberal sense was not realized. When J**° ,as an influential deputation from the province of Tver, which had long enjoyed a reputation for liberalism, ventured to hint in a loyal address that the time had come for changes in the existing autocratic regime, they received a reply which showed that the emperor had no intention of making any such changes. Private suggestions in the same sense, offered directly and respectfully, were no better received, and no important changes were made in the legislation of the pre- ceding reign. But a great alteration took place noiselessly in the manner of carrying out the laws and ministerial circulars. Though resembling his father in the main points of his character, the young tsar was of a more humane disposition, and he was much less of a doctrinaire. With his father's aspiration of making Holy Russia a homogeneous empire he thoroughly sympathized in principle, but he disliked the systematic perse- cution of Jews, heretics and schismatics to which it gave rise, and he let it be understood, without any formal order or pro- clamation, that the severe measures hitherto employed would not meet with his approval. The officials

were not slow to take the hint, and their undue zeal at once disappeared. Nicholas II. showed, however, that his father's policy of Russification was neither to be reversed nor to be abandoned. When an in- fluential deputation was sent from Finland to St Petersburg to represent to him respectfully that the officials were infringing the local rights and privileges solemnly accorded at the time of the annexation, it was refused an audience, and the leaders of the movement were informed indirectly that local interests must be subordinated to the general welfare of the empire. In accordance with this declaration, the policy of Russification in Finland was steadily maintained, and caused much disappoint- ment, not only to the Finlanders, but also to the other nation- alities who desired the preservation of their ancient rights.

In foreign affairs Nicholas II. likewise continued the policy of his predecessor, with certain modifications suggested by the change of circumstances. He strengthened the cordial under- standing with France by a formal agreement, the terms of which were not divulged, but he never encouraged the French govern- ment in any aggressive designs, and he maintained friendly relations with Germany. In the Balkan Peninsula a slight change of attitude took place. Alexander III., indignant at what he considered the ingratitude of the Slav nationalities, remained coldly aloof, as far as possible, from all intervention in their affairs. About three months after his death, de Giers, who thoroughly approved of this attitude, died (26th January 1895), and his successor, Prince Lobanov, minister of foreign affairs from 19th March 1895 to 30th August 1896, endeavoured to recover what he considered Russia's legitimate influence in the Slav world. For this purpose Russian diplomacy became more active in south-eastern Europe. The result was perceived first in Montenegro and Servia, and then in Bulgaria. Prince Ferdinand of Bulgaria had long been anxious to legalize his position by a reconciliation, and as soon as he got rid of Stam- boloff he made advances to the Russian government. They were well received, and a reconciliation was effected on certain conditions, the first of which was that Prince Ferdinand's eldest son and heir should become a member of the Eastern Orthodox Church. As another means of opposing Western influence in south-eastern Europe, Prince Lobanov inclined to the policy of protecting rather than weakening the Ottoman empire. When the British government seemed disposed to use coercive meas- ures for the protection of the Armenians, he gave it clearly to be understood that any such proceeding would be opposed by Russia. After Prince Lobanov's death and the appointment

of Count Muraviev as his successor in January 1897, this tendency of Russian policy became less marked. In April 1897, it is true, when the Greeks provoked a war with Turkey, they received no support from St Petersburg, but at the close of the war the tsar showed himself more friendly to them; and after- wards, when it proved extremely difficult to find a suitable person as governor-general of Crete (see C re te), he recom- mended the appointment of his cousin, Prince George of Greece — a selection which was pretty sure to accelerate the union of the island with the Hellenic kingdom. How far the recom- mendation was due to personal feeling, as opposed ‘to political considerations, it is impossible to say.

In Asia, after the accession of Nicholas II., the expansion of Russia, following the line of least resistance and stimulated Russia k v the construction of the Trans-Siberian railway, and Japan took the direction of northern China and the effete in the little kingdom of Korea. A great part of the eastern Far East, section of the railway was constructed on Chinese territory, and elaborate preparations were made for bringing Manchuria within the sphere of Russian influence. With this view, the cabinet of St Petersburg, at the close of the Chino-Japanese War in 1895, objected to all annexations by Japan in that quarter, and insisted on having the treaty of Shimonoseki modified accordingly. Subsequently, by ob- taining from the Tsungli-Yaman a long lease of Port Arthur and Talienwan and a concession to unite those ports with the Trans-Siberian by a branch line, she tightened her hold on that portion of the Chinese empire and prepared to complete the work of aggression by so-called ” spontaneous infiltration.” From Manchuria, it was assumed, the political influence and spontaneous infiltration would naturally spread to Korea, and on the deeply indented coast of the Hermit Kingdom might be constructed new ports and arsenals more spacious and strategically more important than Port Arthur.

This grandiose project was unexpectedly destroyed by the energetic resistance of Japan, who had ear-marked the Hermit Kingdom for herself, and who declared plainly that she would never tolerate the exclusive influence of Russia in Manchuria. In vain the Russian diplomatists sought to overcome her opposition by dilatory negotiations, in the firm conviction that a small island kingdom in the Pacific would never have the audacity to attack a power which had conquered and absorbed the whole of Northern Asia. Their

calculations proved erroneous. Convinced that the onward march of the Colossus could not be permanently arrested by mere diplomatic con- ventions, the cabinet of Tokio suddenly broke off diplomatic relations and commenced hostilities (February 8, 1904). For Russia the war proved a series of uninterrupted reverses both on land and on sea, until it was terminated by the treaty of Portsmouth in October 1905 (see Russo-Japanese War).

What contributed powerfully to the conclusion of peace was the fact that the Russian government was hampered by Revolu- internal troubles. The old Liberal movement and the tioaary terrorist organizations which had been suppressed by movement Alexander III. were being resuscitated, and the liberal la Russia. an(j revolutionary leaders, taking advantage of the unpopularity of the war, were agitating for the convocation of a Constituent Assembly, which should replace the hated bureaucratic regime by democratic institutions. With great reluctance the tsar consented to convoke a consultative cham- ber of deputies as a sop to public opinion, but that conces- sion stimulated rather than calmed public opinion, and shortly after the conclusion of peace the Liberals and the Revolutionaries, combining their forces, brought about a general strike in St Petersburg together with the stoppage of railway communication all over the empire. Panic-stricken for a moment, the government issued a manifesto proclaiming Liberal principles and promising in vague language all manner of political reforms (October 3c, 1905), and when the inordinate expectations created by this extraordinary document were not at. once realized, preparations were made for overthrowing the existing regime by means of an armed insurrection. Many

believed chat the end of autocracy had come, and an extem- porized Council of Labour Deputies, anxious to play the part of a ComitS de Salut Public, was ready to take over the supreme power and exercise it in the interests of the proletariat. In reality the revolutionary movement was not so strong and the government not so weak as was generally supposed. Mutinies occurred, it is true, during the next few weeks in Kronstadt and Sevastopol, and in December there was street-fighting for several days in Moscow, but such serious disorders were speedily suppressed, and thereafter the revolutionary manifestations were confined to mass meetings, processions with red flags, attempts on the lives of officials and policemen, robberies under arms and agrarian disturbances.

Notwithstanding the unsatisfactory results of the October manifesto the tsar kept his promise of convoking a legislative assembly, and on the 10th of May 1906 the first Duma was opened by his majesty in

person; but it was so systematically and violently hostile to the government and so determined to obtain executive, in addition to its legislative, functions, that it was dissolved on the 23rd of July without any legislative work being accomplished. The second Duma, which met on the 5th of March 1907, avoided some of the mistakes of its predecessor, but as a legislative assembly it showed itself equally incompetent, and a large section of its members were implicated in a well-organized attempt to spread sedition in the army by revolutionary propaganda. It was dissolved, therefore, on the 16th of June 1907, and the electoral law which had given such unsatisfactory results was modified by imperial ukase.

The third Duma was subsequently convoked for the 14th of November 1907. (D. M. W.)

Development of the Russian Constitution. — At the end of 1910 the Russian revolution, which seemed at one time to promise an overturn as complete as that of the ancien regime in France, would seem to have entered on a path of orderly and conservative development, and it is possible, now that the smoke of combat has cleared away, to form some estimate of the forces through the interplay of which this result has been achieved. At the outset the superficial resemblance between the revolutionary movement in Russia and that of 1789 in France was rhe striking: there was the same breakdown of the Russian traditional machinery of government, the same general revolu- outcry for control by a representative national assembly, tloa – the same gradual and reluctant concessions wrung from the crown under pressure of disaffection in the army, popular Smeutes, the assassination of unpopular officials, and the burning of country houses by organized bands of peasants. Similar, too, was the revelation, when freedom of speech was at last allowed, of the unhappy effect of the long divorce of the intellect of the country from any experience of practical politics. But here the analogy breaks down. France in 1789, though its ancient pro- vincial boundaries survived, had long since been welded into a nation conscious of its common interests; Russia remains a vast empire, composed of the most heterogeneous, sometimes even mutually hostile, elements, whose antagonisms were bound to be an element of weakness in any assembly truly representative of all sections of the people. In France the Revolution had been the work of the middle classes; in Russia an indigenous middle class has, comparatively speaking, no existence, the peasants forming the overwhelming majority of the population. 1 The supreme peril to the autocracy in Russia lay in the genuine grievances of the peasants, less political than economic, which had opened their minds to revolutionary propaganda. These grievances once removed, and their

legitimate land-hunger satisfied, the peasants would become a bulwark of the estab- lished order, whatever that might be, as had happened in similar circumstances in Austria in 1849. As for the revolutionary ” intellectuals,” without the lever of agrarian discontent they

1 In 1897 only 15% of the population were engaged in commerce or industry, including the work-people. Of the middle class, moreover, a large proportion were Jews and Germans. The peasants numbered 75 %.

Previous reforms.

were practically powerless, the more so as their political activity consisted mainly in ” building theories for an imaginary world.” The bourgeois revolutionists of France had all been philosophes, but their philosophy had at least paid lip-service to ” reason “; the Russian revolutionists who formed the majority of the first and second Dumas, as though inspired by the exalted nonsense preached by Tolstoi, 1 subordinated reason to sentiment, until — their impracticable temper having been advertised to all the world — it became easy for the government to treat them as a mere excrescence on the national life, a malignant growth to be removed by a necessary operation. In 1909 the number of exiles for political reasons from Russia was reckoned at 180,000; but the third Duma, purged and packed by an ingenious franchise system, was in its third year passing measures of beneficent legislation, in complete harmony with the government. It is proposed to trace briefly the steps by which this result was obtained.

In order to explain the course of the revolution which came to a head in 1905 it is necessary to say a few words about constitu- tional plans and liberal experiments, initiated from above, which had preceded it. Of the ancient zemski sobor (assembly of the country) it is unnecessary here to say much, though Nicholas II. was pressed by the more reaction- ary elements to model his parliament on this rough equivalent of the Western states-general. The zemski sobor, which had played a considerable part in the struggle of the tsars against the great boyars in the 17th century, had met but once since the days of Peter the Great. 2 The origin of the present constitution of Russia must be

sought, not in this ancient and obsolete institu- tion, but in the artificial constitution elaborated by Mikhail Speranski (q.v.) in 1809 at the instance of the emperor Alexander I. Of Speranski's plan only the establishment of the Imperial Council (January 1st, 1810) was realized in his lifetime. 3 In 1864, however, the emperor Alexander II. carried the scheme a step further by the creation of elected provincial assemblies (zemslvos), to which in 1870 elected municipal councils (dumas) were added. The opportunity thus given for debate naturally stimulated the movement in favour of constitutional govern- ment, which received new impulses from the sympathetic attitude of the emperor Alexander II., his grant in 1879 of a constitution to the liberated principality of Bulgaria, and the multiplication of Nihilist outrages which pointed to the necessity of conciliating Liberal opinion in order to present a united front against re- volutionary agitation. In January 1881 Count Loris-Melikov, minister of the interior, proposed to convene a " general com- mission " to examine legislative proposals before these were laid before the Imperial Council; this commission was to consist of members elected by the zemslvos and the larger towns, and others nominated in the provinces having no zemstvos. The plan was approved by Alexander II. on the very morning of his assassination (February 17th, 1881), but it was never pro- mulgated. The new tsar, Alexander III., was an apt pupil of his tutor Pobedonostsev (q.v.), the celebrated procurator of the Reaction Holy Synod, for whom the representative system was under " a modern lie," and his reign covered a period of frank Alexander reac tion, during which there was not only no question of granting any fresh liberties but those already conceded (e.g. the principle of the separation of the administrative and judicial functions) were largely curtailed. The result of this policy of repression, associated as it was with gross incom- petence and corruption in the organs of the administration, was the rapid spread of the revolutionary movement, which gradually permeated the intelligent classes and ultimately 1 " Tolstoi observed that that was argument and reason, and that he paid no attention to them; he only guided himself (he said) by sentiment, which he felt sure told him what was good and right! " — Interview with Metchnikoff in Sir Ray Lankester's Science from an Easy Chair, p. 43.

' In 1767, when Catherine II. — in a mood of encyclopaedist enlightenment — summoned it. The meeting confined its attention to economic questions, and had no political character whatever.

3 In his speech at the opening of the first Polish parliament at Warsaw in 1 81 8, Alexander I. publicly announced his intention of granting free institutions to Russia.

affected even the stolid and apparently immovable masses of the peasantry.

The movement came to a head, as a result of the disasters of the war with Japan, in 1904. The assassination of the minister of the interior Plehve, on the 14th of July, j n fi uence by the revolutionist Sazonov was remarkable as a of the symptom mainly owing to the widespread sympathy Japanese of the European press of all shades of opinion with r ”

the motives of the assassin. It was clear that the system with which the murdered minister’s name had been associated stood all but universally condemned, and in the appointment of the conciliatory Prince Sviatopolk-Mirski as his successor the tsar himself seemed to concede the necessity for a change of policy. 4 In November, with the tacit consent of Meeting the police, a private assembly of eminent members ofzomst- of local zemstvos and municipal dumas was held vos ‘ in St Petersburg to discuss the situation. The majority of this decided to approach the crown with a suggestion for a reform of the Russian system on the basis of a national representative assembly, an extension of local self-government, and wider guarantees for individual liberty. The day on which the deputation laid these views before Prince Mirski was hailed by public opinion as recalling the 5th of May 1789, the date of the meeting of the French states-general at Versailles. The emperor, however, whatever his own views, was surrounded by reactionary influences, of which the most powerful were the empress-mother, Pobedonostsev the pro- curator of the Holy Synod, Count Muraviev and the Grand- duke Sergius. The imperial ukaz of the 12th of December enunciating reforms affecting the peasants, workmen and local zemstvos failed to satisfy public opinion; for there was no word in it of constitutional government. Petitions con- tinued to flow in to the emperor’s cabinet, praying for a national representation, from the zemstvos, from the nobles Agitation and from the professional classes, and their moral and was enforced by general agitation, by partial strikes, outrages. and by outrages which culminated at Moscow in the murder of the Grand-duke Sergius (February 4th, 1905). In the imperial counsels the resisting forces still seemed to have the upper hand. Prince Mirski resigned, his resignation being immediately followed by a reactionary imperial manifesto reaffirming the principle of autocracy (February 18th). Bulygin, Mirski’s successor, had no knowledge of this until after its publication; he hastened to the tsar and obtained the issue on the same day of a rescript which, while reserving the ” fundamental laws of the empire ” inviolate, stated the emperor’s intention of summoning the representatives of the people to aid in ” the preparation and

examination of legislative proposals." A commission of inquiry, under the emperor's presidency, was now established to elaborate the means for carrying this promise into effect. On the 6th of June, in reply to a deputation of the second congress of zemstvos headed by Prince Trubetzkoi, the emperor promised the speedy convoca- tion of a National Assembly. When, however, on the 6th of August, the new law was promulgated, it was found that the "Imperial Duma" 6 was to be no more than a consultative body, charged with the examination of legislative proposals before these came before the Imperial Council, the duty and right of passing them into law being still reserved for the autocrat alone. The members of the Duma, moreover, were placed at the mercy of the government by a clause empower- ing the Directing Senate to suspend or deprive them. The promulgation of this truncated constitution was greeted by a furious agitation, culminating in September in a general strike, rightly described as the most remarkable political phenomenon of modern times. For days the whole mechanism of civilized existence in Russia was at a standstill, all intercourse

4 Sazonov's sentence of twenty years' hard labour was commuted by Nicholas II. to fourteen years,

5 Duma = council, assembly {dumat, to think over, reflect upon). The name was first suggested by Speranski, under Alexander I., for the suggested parliament of delegates from the zemstvos and local dumas.

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RUSSIA

[THE MODERN CONSTITUTION

with the outside world cut off; until at last the govern-

ment was forced to yield, and on the i7/3oth of tional ' October 1905 the tsar issued the famous manifesto manifesto promising to Russia a constitution based on the of October main principles of modern Liberalism: national re- 1905 presentation, freedom of conscience and opinion,

guarantees for individual liberty. The enormous programme of constitutional reform fore- shadowed in the manifesto had to be elaborated in haste by Count Witte, the minister of the interior, under circumstances by no means promising. The organs of government seemed paralysed by the repudiation of the principle on which their authority was based, and the empire to be in danger of falling into

complete anarchy. The revolutionary terrorists took advantage of the situation to multiply outrages; popular agitation was fomented by a multitude of new journals preaching every kind of extravagant doctrine, now that the censor no Tne longer dared to act; in December the trouble

“Union culminated in a formidable rising in Moscow. The of the revolutionary terrorists were countered by the p’oDie”” terrorists of the reaction who, under the name of

” the Union of the Russian People,” began an organized extermination of the elements supposed to be hostile to the traditional regime. The ” black band ” (chernaya solnia), or ” black hundreds,” as they were branded by public opinion, directed their attacks especially against the Jews, and pogroms.} i.e. organized wholesale robbery and murder of Jews, occurred in many places, it was believed with the connivance of’ the police and veiled approval in exalted quarters.

Meanwhile the political parties which were to divide the new Duma had taken shape. Apart from the extremists on Develop- one s ˆ e or tne otner i frank reactionaries on the meat of Right and Socialists on the Left, two main divisions political of opinion revealed themselves in the congresses of parties. t k e zems t vos that met at Moscow in September and November. In the former there had been a fusion between the Radicals, supporters of the autonomy of Poland and a federal constitution for the empire, and the Independence party (Osvobozhdenya) formed by political exiles at Paris in 1903, the fusion taking the name of Constitutional Democrats, known (from a word-play on the initials K.D.) as ” Cadets.” The more moderate elements found a rallying cry in the manifesto of October, took the name of ” the Party of 17 October,” and became known as ” Octobrists.” In the semslvo congress of November the ” Cadets ” protested against the ” grant ” of a constitution already elaborated, and demanded the con- vocation of a Constituent Assembly. The Octobrists, on the other hand, supported Count Witte’s moderate programme, the most important provisions of which were the extension (n December 1905) of the suffrage under the stillborn con- stitution of August, and (20 February 1906) the reorganization of the Duma as the Lower House, and of the Imperial Council (half of which was to be elective) as the Upper House 2 in the new parliament.

The elections were held in March 1906, and on the 27th of April the emperor Nicholas II. solemnly opened the first Duma

of the Empire. The ” Cadets ” commanded an over- Duma, whelming

majority in the Lower House, and their

intractable temper and ignorance of affairs became at once apparent. The address in reply to the speech from the throne, voted after a debate in which abstract theories had triumphed over common sense, demanded universal suffrage, the establishment of pure parliamentary government, the abolition of capital punishment, the expropriation of the land- lords, a political amnesty, and the suppression of the Imperial Council. When the minister of the interior, M. Goremykin, who had succeeded Witte at the head of the government, met these preposterous demands with a flat refusal, the House voted, on the motion of M. Kuzmin-Karaviev, for an appeal to the

1 Pogrom = pillage, destruction.

2 See the section Government and Administration, above.

people (July 4). 3 Four days later the government dissolved the Duma, M. Goremykin at the same time being replaced by M. Stolypin. The " Cadets " refused to accept this action and, in imitation of the famous meeting in the tennis-court at Versailles, adjourned to Vyborg in Finland, where, under the ex- The president of the Duma, M. Muromtsov, they drew up Vyborg and issued a manifesto calling on the Russian people mani- to refuse taxes and military service. Its sole result, es "' apart from the punishment which afterwards fell on its authors, 4 was to show how little the majority of the dissolved Duma had represented the Russian people. Isolated mutinies in the army followed, and terrorist outrages here and there — notably, in August, the dastardly bomb outrage in the Isle of Apothecaries at St Petersburg, which seriously injured one of M. Stolypin's little daughters; but the mass of the nation and of the army remained wholly unmoved, while the repetition of troubles was made more difficult by the establishment of field courts martial with summary powers.

The second Duma met on the 6th of March 1907. M. Stolypin had not ventured to alter the electoral law without parliamentary consent , but with the aid of a complaisant Senate the pro- The visions of the existing law were interpreted in a restrictive second sense for the purpose of influencing the elections. The Duma. result was, however, hardly more satisfactory to the government. The " Cadets," it is true, lost many seats both to the Socialists and to the extreme Right, but they held the balance of the House, of which the Octobrists and the Right together only constituted one-fifth, and their leader, M. Golovin, was elected president of the House. The temper of the second Duma,

was, indeed, even more democratic than that of the first; but M. Stolypin did his best to work in harmony with it, realizing that under the existing law another dissolution could but lead to a like result, and shrinking from the only alternative — an alteration of the law by a coup d'etat, a course which could only be justified on the plea of extreme necessity. On the 19th of March he laid before the House his programme of reforms, which included the emancipa- tion of the peasants from the control of the communes and the handing over to them of the crown lands and imperial estates. The majority, however, refused to be reconciled. The abolition of the field courts martial was demanded; on the 13th of April a bill for the expropriation of landlords was carried by a two- thirds majority, 6 and the 30th the Army Bill would have been lost but for the Polish vote. The crisis came with the discovery of a treasonable plot for the subornation of the army, in which many Socialist members of the Duma were involved. On the 14th of June Stolypin's proposal for the arrest of 16 members and the indictment of 55 was shelved by being referred to a committee. The excuse for which the government had been waiting yl/teratfon was thus provided, and two days later the Duma was by ukaz dissolved. An imperial ukaz fixed the new elections ottbe for the 14th of September, and the meeting of the e ˆ oral third Duma for the 14th of November; at the same time, in violation of the October manifesto, the electoral law was altered, so as to secure a representation at once more Russian and more conservative. The non-Russian frontier provinces (okrainas) had even before been under-represented (one member for every 350,000 inhabitants, as against one for every 250,000 in the central provinces); the members returned by Poland, the Caucasus and Siberia were now reduced from 89 to 39, those from the Central Asian steppes (23) were swept away altogether; the total number of deputies was reduced from 524 to 442. Even more drastic were the changes in the electoral machinery, by far the most complicated in Europe, established by the law of 1905. 6 This was based on the principle of indirect

3 Of this M. Chasles remarks that it would have been a revolu- tionary act even in republican France.

4 They were condemned in 1907 to three months' imprisonment and loss of civil rights.

6 This was reversed, on the 8th of June, by 238 votes to 191, after a patient exposition by M. Stolypin of the fact that there was plenty of land in Russia for the peasants without any attack on private property.

8 The electoral law covers 107 octavo pages.

election, through a series of electoral colleges. It was a simple matter to manipulate these so as to throw the effective power into the hands of the propertied classes without ostensibly The depriving any one of the vote. 1 The result was that

third in the third Duma, which met on the 1 5th of November

Duma. 1907, the conservative Right preponderated as much as the Left had done in its two predecessors. Its president, M. Khomiakov, had been one of the founders of the ” Union of 17 October,” but even the Octobrists formed but a third of the House and were compelled to act with the reactionaries of the Right; and the vice-president, Prince Volkonsky, was a member of the Union of the Russian People.

On the whole, the new Duma was fairly representative of the changed temper of the Russian people, disillusioned and weary of anarchy. The government had done wisely in obscuring the passion for democratic ideals by an appeal to Russian chauvinism, an appeal soon to bear fruit in disuniting the revolutionary parties. The congress of zemstvos, hitherto the focus of Liberalism, had petitioned the government, before the opening of the third Duma, to take measures for the restoration of order. The authorities began to exhibit something of their old spirit. M. Dubrovin, president of the Union of the Russian People and organizer of pogroms, having written a letter of congratulation to the tsar on the occasion of the coup d’etat, received a gracious reply; the hideous reign of terror of the ” Black Hundred ” in Odessa did not prevent the Grand-duke Constan- tine from accepting the badge of membership of the Union. The ordinary laws, too, had been suspended; the fining and confiscation of newspapers had been resumed, and the ” Cadets ” had been forbidden to hold a congress. All this, however, did not argue an intention on the part of the government to revert to the autocratic status quo. M. Stolypin indeed defended the coup d’etat in the Duma on the ground that the autocrat had merely altered what the autocrat had originally granted; but, while laying stress on the necessity for restoring order in the body politic, he announced a long programme of reforms, including agrarian measures, reform of local government and its extension in the frontier provinces, and state insurance of workmen. The most far-reaching of these reforms, carried in the first session of the third

Duma, was the partial abolition of the communal and family ownership of land, which involved the establishment of a class of true peasant-proprietors. 2 Be- sides this, the Duma had passed before its adjournment on the 28th of October 1908 much useful legislation, some 300 bills in all, including two for the building of important railways on the Amur and in Siberia. Nor had it exhibited by any means a wholly docile spirit. On the 7th of June, for instance, M. Guchkov attacked the maladministration in the navy, pointing out that no reforms were possible so long as grand-dukes were at the head of its departments. The Duma endorsed this all but unanimously, and as the result the Grand-dukes Peter and Sergius resigned their posts of inspector-general of Engineers and Ordnance respectively, and the Grand-duke Nicholas his chairmanship of the Committee of National Defence. A year later the Duma again came into collision with the government in a matter highly illuminating of the struggle between the ancient traditions and the new ideas in Russia. On the 14th of June 1909 a bill was passed removing the disabilities hitherto attaching to some 15,000,000 of Old Believers. In spite of strenuous government opposition, inspired by the authorities of the Orthodox Church, amendments were carried allowing dissi- dent ministers to assume ecclesiastical titles and to preach, and permitting Christians to join non-Christian religions or even to describe themselves as unbelievers. Thus a step forward was made in securing the freedom of conscience proclaimed in the October manifesto and denounced by a synod of Orthodox bishops at Kiev in 1908, though the rights granted by the Duma were seriously curtailed in the Imperial Council, and have been largely rendered a dead letter by the action of the administration.

1 See above, Government and Administration.

8 The law establishing individual peasant-proprietorship was passed on December 21st.

Meanwhile the pan-Russian movement had been gaining apace. At first it had seemed that the new birth of Russia would lead to a revival of pan-Slavism, directed not, ˆ eo .siav as in the middle of the 19th century, against Austria andpan- but against Germany. In May 1908 a deputation of Russian the Slav members of the Austrian Reichsrat paid a move ” ceremonial visit to the Duma at St Petersburg, and in this ” neo-Slav ” demonstration M. Dmowski, leader of the Polish party in the Duma, took part. In the following year, however, the situation was completely altered, a result due to the grow- ing anti-Polish feeling in the Duma and, more especially, to the support given by the Austrian Slavs to the annexation of Bosnia and Herzegovina. This event caused

the utmost excitement in Russia; the crown prince of Servia, who arrived in St Peters- burg on the 28th of October to ask for the armed assistance of the tsar, was received with enthusiasm by all classes of the people; and, though armed intervention was impossible, M. Isvolsky took the lead in the abortive demand for a European conference (see Europe: History). Neo-Slav dreams were now replaced by a passionate desire to consolidate the Russian empire on a purely Russian basis. Even the remnant of the ” Cadets ” had by this time renounced their sympathy with Polish aspirations, and in the matter of Finland the Duma proved itself even more imperial than the emperor himself. The Finnish question is dealt with elsewhere (see Finland : History). ., Here it may suffice to mention, as illustrating the changed temper of the Russian national assembly, The Duma that the Russian majority of the Duma included «”* among the imperial questions in Finland which the pl “iand. Finnish diet ought to refer to the imperial legislature not only all military matters — as the tsar demanded (Rescript of October 14) — but the question of the use of the Russian language in the grand-duchy, the principles of the Finnish administration, police, justice, education, formation of business companies and of associations, public meetings, the press, the customs tariff, the monetary system, means of communication, and the pilot and lighthouse system. The old tendency illus- trated by the outcome of the revolutionary movements of 1848 was once more in evidence — the tendency of merely artificial theories of democratic liberty to succumb to the immemorial instinct of race and race ascendancy.

As an international force Russia had been, of course, all but completely crippled by the outcome of the Japanese War and the subsequent revolution. Her recovery, however, inter- revealed the immense reserves of her strength. On national the 30th of July 1907 she signed a convention with posttion Japan of mutual respect for treaty and territorial rights, and guaranteeing the integrity of China. On the 31st of August of the same year the long period of mutual suspicion between Great Britain and Russia was closed by a convention for an amicable settlement of all questions likely to disturb the relations of the two Powers in Asia generally, including the demarcation of Persia into spheres of influence (see Persia: History). This new entente with Great Britain, cemented by a visit paid by King Edward VII. to the tsar at Reval on the 9th June 1908, helped to knit close once more the loosened alliance with France, and so to preserve the threatened balance of Europe. That in the work of restoring its military position the Russian government had the support of the Russian parliament was proved by a subsidy of £11,000,000 voted by the Duma, on the 30th of December 1909, for the special service of

the reorganization and redistribution of the army. (W. A. P.)

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literature, is incomparably superior to it in authority. Of other works it is only possible to give a classified selection. In general, the reader must be warned that most Russian works on history, especially those dealing with recent years, are inspired by a violent party bias— the inevitable result of the conflict of diametrically opposed political ideals, — and this quality is shared by not a few foreign books about Russia.

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(W. A. P.)

RUSSIAN LANGUAGE. For the characteristics which this special branch of the Slavonic family shares with the rest, for a table showing the Russian alphabet and the transliterations of it used in this and in other (non-linguistic) articles of the Encyclopaedia, and for the points which distinguish Russian alike from the Southern (Balkan) and from the North- Western (Polish, Cech, &c.) branches of Slavonic, see Slavs. These latter points, fully treated under corresponding sections of the article Slavs, are here summarized: —

I. Proto-Slavonic (Proto-Sl.) half vowels d and t have dis- appeared as such:* (i), though still written at the ends of words, is mute; it serves but to show that the foregoing con- sonant is “hard.” See V. below for “hard” and “soft” (denoted by ‘) consonants, not the ” hard ” = surd, tenuis, “.soft ” = sonant, media of Eng. usage. Where a vowel was indispensable to help out a group of consonants, u has been replaced by o or e, but these vowels sometimes appear without such justification (e.g. ogoni, Lat. ignis); t when so needed becomes e, otherwise it disappears or else leaves a trace in the

‘softness ” of the preceding consonant, in which case it is still written: Old Slavonic (O.S.), sunu, “sleep”; dint, “day”; R. sonii. (u mute), deni(d’en’).

II. Proto-Sl. y survives in R. and Polish. The sound is a ” high-mixed-narrow *,” pronounced with the lips as fori and the tongue as for u, not unlike Eng. y in ” rhythm.” After labials there is a distinct w sound before the vowel. After gutturals it has become i.

III. Treatment of Liquids: retention of r’ instead of the f of N.W. Slav.; retention as in Polish of hard / (between I and w not unlike Eng. / in ” milk,” ” people “); helping out of sonant r and / by a vowel put in before the r or /; especially the so- called full vocalism by which, e.g. Proto-Sl. * gordu, ” town,” became R. gorodu, O.S. gradu, Polish, grod; Proto-Sl. *melko, ” milk,” R. moloko, O.S. mleko, Polish, mleko.

IV. Proto-Sl. nasals: a. (Fr. on), became R. u; e (Fx. in), R. a,ja: O.S. pati, ” way “; peti, ” five,” R. puti,p’ati.

V. Softening (Palatalization, &c) : Proto-Sl. tj, dj gave R. I, z, Proto-Sl. *svgtja, “candle”; *medja, “boundary”; R. sveca, m’eza. Proto-Sl. pj, bj, vj, mj gave R. and S. Slav, pi, bl, vl, ml, e.g. R. z’ eml’a; Polish, ziemia, ” land.” Before Proto-Sl. soft vowels e, e, e, i, ,i consonants were affected, the tongue being raised in anticipation of the narrow vowel, and so not making so clean a contact with the palate. Then what amounted to a new/ developed in R., as i became practically/; e and e (orig. e) came to sound as je, e as ja at the beginning of a syllable, and all together with i began very much to soften the preceding consonant in literary R.; however, this new/ never broke down the consonant into a palatalized sibilant or affricate, though it had this effect in .White Russian (Wh. R.) and Polish.

The result is that almost every consonant in Russian can be pronounced ” hard ” or ” soft,” a distinction which is vny difficult for a foreigner to make, as his tendency is to overdo the softness and

pronounce a full / after the consonant instead of the palatal element melting into it. This is encouraged by the alphabetic system by which the letters e (fc), 10, x, stand for je, ju, ja at the beginning of a syllable, but after a consonant merely indicate that the consonant is soft, the vowel being the same as in 3, y, a (e, u, a), e.g. T a stands for t'-a rather than tor t-ja. A soft consonant in its turn narrows the vowel before it, e.g. the vowel in jeli, " fir," is like a in "Yale "; that in jllii, * marks a hypothetical form-

" ate," like e in " yell ": e and £ (I) are now indistinguishable, except that accented e before a hard consonant has a tendency to be pronounced jo, e.g. s' elu, " of villages," is pronounced s 1 pi, but selu, " sat," s' el: e =jo is sometimes denoted by e.

VI. Great Russian has kept g where Little Russian (Lit. R.) and Wh. R., like Cech and High Sorb, now have h.

VII. A specially Russian point is that Proto-Sl. je and ju beginning a word, appear in R. as o and u; O.S. jedinii, " one," jutro, " morning," R. odinU, utro.

VIII. Russian has lost the distinctions of quantity which survive in Cech and S. Slav., but its accent is free as in S. Slav. The accent is extremely capricious, often falling differently in different cases of the same noun, or persons of the same tense, also it is an expiratory accent, so strong that the unaccented syllables are much slurred over and their vowels dulled. In learning Russian it is therefore most important to pay great attention to the accent, and at first to read accented texts.

The above phonetic peculiarities have marked Russian as far back as we can trace it. In the earliest documents it appears with an apparatus of grammatical forms practically identical with that ascribed to primitive Slavonic. The history of the language is not so much that of its phonetic decay as that of its morphological simplification and syntactic development. The tracing of this process is rendered difficult by the fact that O.S. was the ecclesiastical and literary language until the 17th century, and though in the end the O.S. texts suffer modifications, producing the Russian form of Church Slavonic, it is only by accident that the Russian forms appear in them. Russian is better represented in additions made by the scribe, as in the colophon of the

Ostromir gospel (a.d. 1056/57), the oldest dated O.S. MS. In a certain number of legal documents dating from the 12th century onwards Russian forms definitely predominate, but the subject-matter is too limited to offer much material.

Borrowings. — The effect of the Church language upon Russian has been very strong, comparable to that of Latin upon French or English: O.S. forms of words and suffixes, betrayed by their phonetic peculiarities though pronounced more or less a la russe, have in some cases ousted the native forms, in other cases the two exist side by side; the Slav, form generally has the more dignified or metaphorical, the Russian the simpler and more direct sense: even some of the grammatical termina- tions (e.g. pres. part, act.; certain forms of the adj., &c.) are Slavonic; but speakers are quite unconscious of using any- thing that is not Russian (see S. Bulic, Church Slavonic Elements in Modern Russian, St P., 1893), and not till the 18th century did even grammarians understand the difference. Less important elements have been the Tatar which gave names for many Oriental things such as weapons, jewels, stuffs, garments and some terms concerned with government, and the Polish, which during the 17th century supplied many terms needed to express European things and ideas. In the 18th century such importations were made from Latin and all the Western European languages, in Peter's time mostly from German and Dutch (for nautical terms, English supplied some), in Catherine's rather from French, which had become the language of the aristocracy. During the first quarter of the 19th century modern Russian found itself and discarded superfluous Slavonic and European borrowings alike. Since then fresh loan-words have mostly belonged to the international quasi-Greek ter- minology, though like German R. sometimes prefers analogous compounds made from its own roots.

Literary Russian as spoken by educated people throughout the empire is the Moscow dialect (see below) modified by these influences. It is still a highly inflected language, comparable in that respect rather to Latin and Greek than to the languages of western Europe, though during historic time it has lost many of the grammatical forms whose full development we can study in O.S., and whose presence we can assert in the scanty remains of Old R. This process has relieved it of the dual number, save for certain survivals; in the nouns, of the vocative case (save for certain ecclesiastical forms), and many

of the distinctions between the declensions, especially in the plural, the oblique cases of the simple, and the more cumbrous forms of the compound, adjective; in the verbs, of the supine, the imperfect, the aorist and the conditional (now reduced to a particle) ; but this

simplification leaves it with six cases, Nom., Ace, Gen., Dat., Instrumental and Locative, three genders, three substantival declensions, -a, -0, -i, and traces of u and consonantal stems, a special pronominal declension with many tricky forms, an adjective which takes its place between them, and a system of numerals in which a com promise between grammar and logic has produced a kind of maze. The forms of the verb are easier, as only the present indie, has three persons, the imperat. has but the and, and the past is a participle, which, having discarded the copula, dis- tinguishes only gender and number. The infinitive and four participles offer no special difficulty, but the gerundives or verbal adverbs, from the old masc. nom. sing., are troublesome. The curious mechanism by which these few verbal forms are by means of the aspects made to express most of our tenses and other shades of meaning of which even English is incapable, is briefly explained under Slavs. On the whole the syntax is simple, the periods which imitation of Latin and German once brought into fashion having given place to the shorter sentences of French and English models.

Such a language, though less difficult than it is generally supposed, is learned much better if some preliminary study is devoted to the accidence, before the student launches out into conversation, as otherwise the habit may be acquired of dis- regarding the terminations and speaking very incorrectly.

Dialects. — Russian dialects fall into two main divisions — Great (Velikorusskij), including White (Belorusskij) Russian, and Little Russian (Malorusskij). The latter is spoken in a belt reaching from Galicia and the Northern Carpathians (see Ruthenians) through Podolia and Volhynia and the govern- ments of Kiev, Chernigov, Poltava, Kharkov and the southern part of Voronezh to the Don and the Kuban upon which the Dnepr Cossacks were settled. To the south of this belt in ” New Russia ” the population is much mixed, but Little Russians on the whole predominate. In all there must be about 30,000,000 Little Russians.

The Great Russian division includes all other Russian speakers — the main body to the N. and E. of the Little Russians, the settlers in Siberia, the Caucasus and along the southern coast, the educated classes, officials and many towns- men throughout the empire, probably not less than 70,000,000 speakers exclusive of White Russians. On the whole it is very conservative, and therefore, in spite of its vast extent, is wonder- fully uniform. It falls into two main dialect groups — the northern or group and the southern or a group. The line between them runs roughly E.S.E. from Pskov to the Oka and

then eastwards to the Urals. The northern group is the more conservative and pronounces very nearly according to the spelling, unaccented remaining 0, but o is in general rather like u, while e before hard consonants is apt to be jo and before soft consonants i. The southern part of this group, compris- ing most of the governments of Vladimir and Yaroslavl with adjoining parts of Tver and Kostroma, are alone free from a further peculiarity, a tendency to mix up c and I which can be traced in the ancient documents of N6vgorod and has spread with the N6vgorod colonists across the whole of N. Russia to the Urals and Siberia. These distant dialects have adopted many words from the Ugro-Finnish natives. The southern or a group of dialects pronounces unaccented 0, e and even i as a or ja; with this goes a tendency to pronounce g as h, and to mix up « and v. The Moscow dialect, which is the foundation of the literary language, and White Russian, are both best classed with the a dialect.

The Moscow dialect really covers a very small area, not even the whole of the government of Moscow, but political causes have made it the language of the governing classes and hence of literature. It is a border dialect, having the southern pro- nunciation of? unaccented as a, but in the jo for accented e

before a hard consonant it is akin to the North and it has also kept the northern pronunciation of g instead of the southern h. So too unaccented e sounds like i or ji.

White Russian, in the governments of Vitebsk, Mohilev and Minsk, and adjoining parts of Pskov, Smolensk, Chernigov and Vilna (some 10,000,000 speakers), appears at first so different from Great Russian that it was long classed as a separate division. It was the official language of the Lithuanian princi- pality afterwards merged in Poland and hence was under strong Polish influence. Little R. was under somewhat similar in- fluence, so that the two dialects have approximated in some respects; but originally White Russian was not much nearer Lit. R. than was any other south Gt. R. dialect. In its main characteristic Wh. R. approximates to Polish, but this likeness goes deeper than the surface Polonisms above referred to, as it falls into its natural place in the classification of Slavonic lan- guages by the phenomena of ” softening.” Accordingly t and d, when soft or before soft v, become c and dz, e.g. K.t’elo, ” body,” d’elo, ” deed,” m’edv’edi, ” bear,” Wh. R. telo, dzelo, m’adzv’edz’, Polish cialo, dzieio,

niedzwiedb. Other special points which distinguish Wh. R. from the other a dialects are a tendency to confuse « and v and to pronounce either of them as a w, the same sound also taking the place of hard / closing a syllable; r is always hard; /, a sound essentially non-Slavonic, appears as ch or chv, e.g. chrancuz, R. francuz, ” a Frenchman,” Chv’odar, R. F’odor, ” Theodore.”

In accidence we may note the preservation of the vocative; of the sibilants before case terminations where R. has restored gutturals by analogy, e.g. locatives nazi, rucl, sasi, R. nogi, ruke, soche, from nogd, ” foot,” rukd, ” hand,” sochd, ” plough “; and of the 3rd sing. pres. ind. in t for I’, or without any t. V’adz’et or v’adz’ e for R. ved’otu, ” leads.”

On the boundary between Wh. R. and the Novgorod dialect the former has the latter’s confusion of c and c.

The best account of Wh. R. is E. Karskij, Sketch of the Sounds and Forms of Wh. R. Speech (Moscow, 1886); there is a dic- tionary by Nosovic (St P., 1875). Bezsonov, Wh. R. Songs (Moscow, 1871), and P. V. Schein in a whole series of publica- tions give good specimens of the dialect.

The Little Russian dialect claims to be a literary language; it has established this claim in Galicia (see Ruthenians) , but its use as such is much restricted in Russia. The Little Russians differ from the Great Russians not only in language but in physical type, customs, domestic architecture and folk-lore; but though Russophobes have tried to prove that this is due to the Finnish element in the Great Russians, it cannot be sub- stantiated, and the Little Russians, especially the descendants of the Cossacks, have no small Tatar element in them. For the last three centuries they have been under strong Polish influence, and this has had great effect upon the vocabulary but not much on phonetics or morphology. Little Russian is divided into three main groups of dialects: those of Hungary, which show an approximation to Slovak; those of Galicia, which rather recall Polish; and those of the Ukrain and other districts in Russia, which gradually shade into South Great Russian and White R., though the love of the sound a is noticeably absent. Little Russian is rather characterized by itacism; for original y and original i have coincided in a sound between i and y not unlike the Eng. short i, and original e, also e and even after having been lengthened in compensation for lost semi-vowels are now represented by i.

Further, Little Russian has reduced the common Russian softening,

only keeping it before a and and i for S and 0, and hardening the consonant before e and original *. In common with Wh. R. it has h for g, a vocative case, gutturals made sibilant before i (for i) in oblique cases, 3rd sing, without the t, 1st plur. in -mo and -me instead of mil, nn for nj, 11 for Ij, it for tj, w for u, v and hard /, but all these occur more or less throughout S. Russian and only tend to a superficial resemblance.

These phonetic peculiarities are not universal, but the presence of the narrowed I, e and o is sufficient to mark a dialect as Little Russian. The Russian alphabet is modified for Little Russian

use as r = h and hence t =g; e is used for the e which does not soften the preceding vowel, u for the thick and i for the pure i.

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RUSSIAN LITERATURE. To get a clear idea of Russian literature, it will be most convenient for us to divide it into oral and written. The first of these sections includes the interesting byliny, or " tales of old time," as the word may be translated, which have come down to us in great numbers, as they have been sung by wandering minstrels all over the country. The scholars who have given their attention to these composi- tions have made the following division of them into cycles: (1) that of the older heroes; (2) that of Vladimir, prince of Kiev; (3) that of Novgorod; (4) that of Moscow; (5) that of the Cossacks; (6) that of Peter the Great; (7) the modern period. These poems, if they may be so songs. styled, are not in rhyme; the ear is satisfied with a certain cadence which is observed throughout. For a long time they were neglected, and the collection of them began only towards the conclusion of the 17th century. The style of Russian literature which prevailed from the time of Lomonosov was wholly based upon the French or pseudo-classical school. It was, therefore, hardly likely that these peasant songs would attract attention. But when the gospel of romanticism was preached and the History of Karamzin appeared, a new impulse was given to the collection of all the remains of popular literature. In 1804 appeared a volume based upon those which had been gathered together by Cyril or Kirsha Danilov, a Cossack, at the beginning of the 1 8th century. They were received with much enthusiasm, and a second edition was published in 1818. In the following year there appeared at Leipzig a translation of many of these pieces into German, in consequence of which they became known much more widely. This little book of 160 pages is important because the originals of some of the byliny translated in it are now lost. Since that time large collections of these poems have been'published, edited by Rybnikov,Hilferding,Sreznevskiy, Avenarius and others.

These curious productions have all the characteristics of popular poetry in the endless repetitions of certain conventional phrases — the " green wine," " the bright sun " (applied to a hero), " the damp earth " and others. The heroes of the first cycle are monstrous beings, and seem to be merely impersonifica- tions of the powers of nature; such are Volga Vseslavich, Mikula Selianinovich and Sviatogor. They are

called the bogatyri starshie. Sometimes we have the giants of the mountain, as Sviatogor, and the serpent Gorinich, the root of part of both

names being gora (mountain). The serpent Gorinich lives in caves, and has the care of the precious metals. Sometimes animal natures are mixed up with them, as zmei-bogatyr, who unites the qualities of the serpent and the giant, and bears the name of Tugarin Zmievich. There is the Pagan Idol (Idolistche Poganskoe), a great glutton, and Nightingale the Robber (Solovey Razboinik), who terrifies travellers and lives in a nest built upon six oaks.

In the second cycle the legends group themselves round the celebrated Prince Vladimir of Kiev. The chief hero is Ilya Muromets, who performs prodigies of valour, and is of gigantic stature and superhuman strength. The cycle of Novgorod deals with the stories of Vasilii Buslaevich and Sadko, the rich merchant. The fourth cycle deals with the autocracy; already Moscow has become the capital of the future empire. We are told of the taking of Kazan, of the- conquest of Siberia by Yermak, of Ivan the Terrible and his confidant Maliuta Skur- latovich. It is observable that in the popular tradition Ivan is not spoken of with any hatred. As early as 161 9 some of these byliny were committed to writing by Richard James, an Oxford graduate who was in Russia as chaplain of the embassy. The most pathetic is that relating to the unfortunate Xenia, the daughter of Boris Godunov. Yermak, the conqueror of Siberia, forms the subject of a very spirited lay, and there is another on the death of Ivan the Terrible. Considering the relation in which she stood to the Russians, we cannot wonder that Marina, the wife of the false Demetrius, appears as a magician. Many spirited poems are consecrated to the achieve- ments of Stenka Razin, the bold robber of the Volga, who was for a long time a popular hero. The cycle of Peter the Great is a very interesting one. We have songs in abundance on the achievements of the tsar, as the taking of Azov in 1696. There is also a poem on the execution of the streltsy, and another on the death of Peter. In the more modern period there are many songs on Napoleon. The Cossack songs, written in the Little Russian language, dwell upon the glories of the sech, the sufferings of the people from the invasions of the Turks and Mongols, the exploits of the Haidamaks and, lastly, the fall of the Cossack republic. Besides these, the Russians can boast of large collections of religious poems, many of them containing very curious legends. In

them we have a complete store of the beliefs of the Middle Ages. A rich field may be found here for the study of comparative mythology and folk-lore. Many of them are of considerable antiquity, and some seem to have been derived from the Midrash. Some of the mere important of these have been collected by Beszonov. Besides the byliny or legendary poems, the Russians have large collections of skazki or folk-tales, which have been gathered together by Sakharov, Afanasiev and others. They also are full of valuable materials for the study of comparative mythology.

Leaving the popular and. oral literature, we come to what has been committed to writing. The earliest specimen of Earliest Russian, properly so called, must be considered the written Ostromir Codex, written by the diak Gregory at the literature. or(j er f Ostromir, the posadnik or governor of Novgo- rod. This is a Russian recension of the Slavonic Gospels, of the date 1056-57. Of the year 1073 we have the Izbornik or " Mis- cellany " of Sviatoslav. It was written by John the diak or deacon for that prince, and is a kind of Russian encyclopaedia, drawn from Greek sources. The date is 1076. The style is praised by Buslaev as clear and simple. The next monument of the language is the Discourse concerning the Old and New Testament, by Hilarion, metropolitan of Kiev. In this work there is a panegyric on Prince Vladimir of Kiev, the hero of so much of the Russian popular poetry. Other writers are Theo- dosius, a monk of the Pestcherskiy cloister, who wrote on the Latin faith and some Pouchenia or " Instructions, " and Luke Zhidiata, bishop of Novgorod, who has left us a curious Discourse to the Brethren. From the writings of Theodosius we see that many pagan habits were still in vogue among the people. He finds fault with them for allowing these to continue, and also for their drunkenness; nor do the monks escape his censures.

Zhidiata writes in a more vernacular style than many of his contemporaries; he eschews the declamatory tone of' the Byzantine authors.

With the so-called Chronicle of Nestor (q.v.) begins the long series of the Russian annalists. There is a regular catena of these chronicles, extending with only two breaks Annalists to the time of Alexis Mikhailovich, the father of Peter and the Great. Besides the work attributed to Nestor, haveners. we have chronicles of Novgorod, Kiev, Volhynia and many others. Every town of any importance could boast of its annalists, Pskov and Suzdal among others. In some respects these compilations, the productions of monks in their cloisters, remind us of the Anglo-Saxon Chronicle, dry details alternating with here and there a picturesque incident; and many of these annals abound with

the quaintest stories. There are also works of early travellers, as the igumen Daniel, who visited the Holy Land at the end of the nth and beginning of the 12th century. A later traveller was Athanasius Nikitin, a merchant of Tver, who visited India in 1470. He has left a record of his adventures, which has been translated into English and pub- lished for the Hakluyt Society. Later also is the account written by the two merchants, Korobeinikov and Grekov. They were sent with a sum of money to the Holy Sepulchre to entreat the monks to pray without ceasing for the soul of the son of Ivan the Terrible, whom his father had killed. A curious monument of old Slavonic times is the Pouchenie (" Instruction "), written by Vladimir Monomakh for the benefit of his sons. This com- position is generally found inserted in the Chronicle of Nestor; it gives a quaint picture of the daily life of a Slavonic prince.

In the 1 2th century we have the sermons of Cyril, the bishop of Turov, which are attempts to imitate in Russian the florid Byzantine style. In his sermon on Holy Week, Christianity is represented under the form of spring, /#*„£,« Paganism and Judaism under that of winter, and evil thoughts are spoken of as boisterous winds. And here may be mentioned the many lives of the saints and the Fathers to be found in early Russian literature. Some of these have been edited by Count Bezborodko in his Pametniki Starinnoy Russkoy Literatury (" Memorials of Ancient Russian Literature ").

We now come to the story of the expedition of Prince Igor, which is a kind of bylina in prose, and narrates the expedi- tion of Igor, prince of Novgorod-Severskiy, against the Polovtzes. The manuscript was at one time preserved of jL or . in a monastery at Yaroslavl, but was burnt in the great fire at Moscow in the year 181 2. Luckily the story had been edited (after a fashion) by Count Musin-Pushkin, and a tran- script was also found among the papers of the empress Catherine. The original was seen by several men of letters in Russia, Karam- zin among the number. There is a mixture of Christian and heathen allusions, but there are parallels to this style of writing in such a piece as the " Discourse of a Lover of Christ and Advocate of the True Faith, " from which an extract has been given by Buslaev in his Chrestomathy. There is a great deal of poetical spirit in the story of Igor, and the metaphors are frequently very vigorous. Mention is made in it of another bard named Boyan, but none of his inspirations have come down to us. A strange legend is that of the tsar Solomon and Kitovras, but the story occurs in the popular literatures other of many countries. Some similar productions among the popular Russians are merely adaptations of old Bulgarian tales, tales ' especially the so-called apocryphal writings. The Zadonstchina is a

sort of prose poem much in the style of the ” Story of Igor, ” and the resemblance of the latter to this piece and to many other of the skazania included in or attached to the Russian chronicle, furnishes an additional proof of its genuineness. The account of the battle of the ” Field of Woodcocks, ” which was gained by Dmitri Donskoy over the Mongols in 1380, has come down in three important versions. The first bears the title ” Story of the Fight of the Prince Dmitri Ivanovich with Mamai”; it is rather meagre in details but full of expressions showing the patriotism of the writer. The second version is more complete in its historical details, but still is not without

Codes of laws.

anachronisms. The third is altogether poetical. The Poviest o Drakule (” Story of Drakula “) is a collection of anecdotes relating to a cruel prince of Walachia who lived in the 15th century. (See Rumania, History.) Several of the barbarities described in it have also been assigned to Ivan the Terrible.

The early Russian laws present many features of interest, such as the Russkaya Pravda of Yaroslav, which is preserved in the chronicle of Novgorod; the date is between 1018 and 1054. The laws show Russia at that time to have been in civilization quite on a level with the rest of Europe. But the evil influence of the Mongols was soon to make itself felt. The next important code is the Sudebnik of Ivan III., the date of which is 1497; this was followed by that of Ivan IV. of the year 1550, in which we have a republication by the tsar of his grand-father’s laws, with additions. In the time of this emperor also was issued the Stoglav (1551), a body of ecclesiastical regulations. Mention must also be made of the Ulozhenie or ” Ordinance ” of the tsar Alexis. This abounds with enact- ments of sanguinary punishment: women are buried alive for murdering their husbands; torture is recognized as a means of procuring evidence; and the knout and mutilation are mentioned on almost every page. Some of the penalties are whimsical: for instance, the man who uses tobacco is to have his nose cut off; this was altered by Peter the Great, who himself practised the habit and encouraged it in others.

In 1553 a printing press was established at Moscow, and in 1564 the first book was printed, an ” Apostol,” as it latroduc- is called, i.e. a book containing the Acts of the Apostles tion of and the Epistles. The

printers were Ivan Feodorov printing. anc j p e t e r Timofieiev; a monument has been erected to the memory of the former. As early as 1548 Ivan had invited printers to Russia, but they were detained on their journey. Feodorov and his companions were soon, however, compelled to leave Russia, and found a protector in Sigismund III. The cause appears to have been the enmity of the copyists of books, who succeeded in drawing over to their side the more fanatical priests. The first Slavonic Bible was printed at Ostrog in Volhynia in 1581. Another press, however, was soon established at Moscow; up to 1600 sixteen books had been issued there.

A curious work of the time of Ivan the Terrible is the Domostroy, or " Book of Household Management," which is Time of said to have been written by the monk Sylvester. Ivan the This priest was at one time very influential with Terrible. Ivan, but ultimately was banished to the Solovetskoy monastery on the White Sea. The work was originally intended by Sylvester for his son Anthemius and his daughter-in-law Pelagia, but it soon became very popular. We have a faithful picture of the Russia of the time, with all its barbarisms and ignorance. We see the unbounded authority of the husband in his own household: he may inflict personal chastisement upon his wife; and her chief duty lies in ministering to his wants. To the reign of Ivan the Terrible must also be assigned the Chetii-Minei or " Book of Monthly Readings," con- taining extracts from the Greek fathers, arranged for every day of the week. The work was compiled by the metropolitan Macarius, and was the labour of twelve years. An important writer of the same period was Prince Andrew Kurbskiy, de- scended from the sovereigns of Yaroslavl, who was born about 1528. In his early days Kurbskiy saw a great deal of service, having fought at Kazan and in Livonia. But he quarrelled with Ivan, who had begun to persecute the followers of Sylvester and Adashev, and fled to Lithuania in 1563, where he was well received by Sigismund Augustus. From his retreat he commenced a correspondence with Ivan, in which he reproached him for his many cruelties. Ivan in his answer declared that he was quite justified in taking the lives of his slaves if he thought it right to do so. Kurbskiy died in exile in 1583. He also wrote a life of Ivan, but Bestuzhev Riumin thinks that his hatred of Ivan led him to exaggerate, and he regrets that Karamzin should have followed him so closely. Besides the answers of

17th century.

Ivan to Kurbskiy, there is his letter to Cosmas and the brother- hood of the Cyrillian monastery on the White Lake (Bielo Ozero), in which he reproaches them for the self-indulgent lives they are leading. Other

works of the 16th century are the Stepennaya Kniga, or ” Book of Degrees ” (or ” Pedigrees “), in which his- torical events are grouped under the reigns of the grand-dukes, whose pedigrees are also given; and the Life of the Tsar Feodor Ivanovich (1584-98), written by the patriarch Job.

To the beginning of the 17 th century belongs the Chronograph of Sergius Kubasov of Tobolsk. His work extends from the creation of the world to the accession of Michael Romanov, and contains interesting accounts of such of the members of the Russian royal family as Kubasov had himself seen. Something of the same kind must have been the journal of Prince Mstislavskiy, which he showed the English ambassador Jerome Horsey, but which is now lost. 1

To the time of the first Romanovs belongs the story of the siege of Azov, a prose poem, which tells us, in an inflated style, how in 1637 a body of Cossacks triumphantly repelled the attacks of the Turks. There is also an account of the siege of the Troitza monastery by the Poles during the ” Smutnoe Vremya,” or Period of Troubles, as it is called^that which deals with the adventures of the false Demetrius and the Polish invasion which followed. But all these are surpassed by the work on Russia of Gregory Karpov Kotoshikhin. He served in the ambassador’s 1 office (posolskiy prikaz), shikhin. and when called upon to give information against his colleagues fled to Poland about 1664. Thence he passed into Sweden and wrote his account of Russia under Alexis Mikhailovich at the request of Count Delagardie, the chancellor. He was executed in 1667 for slaying in a quarrel the master of the house in which he lived. The manuscript was found by Professor Soloviev of Helsingfors at Upsala and printed in 1840. The picture which Kotoshikhin draws of his native country is a sad one, and from his description, and the facts we gather from the Domostroy, we can reconstruct the Old Russia of the time before Peter the Great. Perhaps, as an exile, Kotoshikhin allowed himself to write too bitterly. A curious work is the Uriadnik Sokolnichia Puti (” Directions for Falconry “), which was written for the use of the emperor Alexis, who, like many Russians of old time, was much addicted to this pastime. The Serb, Yuri Krzhanich, who wrote in Russian, was the first pan-Slavist, anticipating Kollar by one hundred B jth. a ” and fifty years or more. He wrote a critical Servian grammar (with comparison of the Russian, Polish, Croatian . and White Russian), which was edited from the’ manuscripts by Bodianski in 1848. For his time he had a very good insight into Slavonic philology. His pan-Slavism, however, sometimes took a form by no means practical. He went so far as to main- tain that a common Slavonic language might be made for all the peoples of that race — an impossible project which has been the

dream of many enthusiasts. He was banished to Siberia, and finished his grammar at Tobolsk. He also wrote a work on the Russian empire in the middle of the 17th century, com- pleted in 1676, which was edited by Beszonov in i860. The picture drawn, as in the corresponding production of Koto- shikhin, is a very gloomy one. To this period belongs the life of the patriarch Nikon by Shusherin. The struggles of Nikon with the tsar, and his emendations of the sacred books, which led to a great schism in Russia, are well known. They have been made familiar to Englishmen by the eloquent pages of the late Dean Stanley. 2 From this revision may be dated the rise of the Raskolniks (Dissenters) or Staro-obriadtsi (those who adhere to the old ritual). With Simeon Polotzki (Polotskiy) (1628-1680) the old period of Russian

1 Horsey says: ” I read in their cronickells written and kept in secreat by a great priem prince of that country named Ktiez Ivan Fedorowich Mistisloskoie, who, owt of his love and favour, imparted unto me many secreats observed in the memory and procis of his tyme, which was fowerscore years, of the state, natur, and govern- ment of that comonweelth. ‘ — Bond, Russia at the Close of the Sixteenth Century (Hakluyt Society, 1856).

2 Lectures on the Eastern Church.

literature may be closed. He was tutor to the tsar Feodor, son of Alexis, and may be said to have helped to intro- duce the culture of the West into Russia, as he was educated at Kiev, then a portion of Polish territory. Polotzki came to Moscow about 1664. He wrote religious works (V ‘tenets Vicry, ” The Garland of Faith “), and composed poems and religious dramas (The Prodigal Son, Nebuchadnezzar, &c). He has left us some droll verses on the tsar’s new palace of Kolomenskoe, which are very curious doggerel. The artificial lions that roared, moved their eyes, and walked especially delighted him. There does not seem to be any ground for the assertion (often met with even in Russian writers) that Sophia, the sister of Peter the Great, was acquainted with French, and translated some of the plays of Moliere.

And now all things were to be changed. Russia was to adopt the forms of literature in use in the West. One of the The chief helpers of Peter the Great in the education of

modem the people was Feofane (Theophanes) Procopovich period. (1681-1736), author of the Ecclesiastical Regulations and some plays, who advocated the cause of science; the old school was defended by Stephen Yavorskiy (1658-1722), whose Rock of Faith was written to refute the Lutherans and Calvinists. Another remarkable writer of the times of Peter the Great was Pososhkov (b. 1673), a peasant by birth, who produced a valuable work on Poverty and Riches. Antiokh Kantemir (1708-1744), son of a former hospodar of Moldavia, wrote some clever satires still read; they are imitated from Boileau. He also translated parts of Horace. Besides his satires, he published versions of Fontenelle's Pluralite des Mondes and the histories of Justin and Cornelius Nepos. He was for some time Russian ambassador at the courts of London and Paris. But more celebrated than these men was Michael Lomonosov (q.v.). He was an indefatigable writer of verse and prose, and has left odes, tragedies, didactic poetry, essays and fragments of epics.

Vassilii Tatistchev (1686-1750) was the author of a Russian history which is interesting as the first attempt in that field. He was disgraced for peculation, and died at Astrakhan, as governor, in 1750. His work was not given to the world till after his death. There had been a slight sketch published before by Khilkov, entitled the Marrow Tredia- °f Russian History. Basil Trediakovski (1703-1769) was kovskl. born at Astrakhan, and we are told that Peter, passing

through that city at the time of his Persian expedition, had Trediakovski pointed out to him as one of the most promising boys of the school there. Whereupon, having questioned him, the tsar said, with truly prophetic insight, " A busy worker, but master of nothing." His Telemakhida, a poem in which he versified the Telemaque of Fenelon, drew upon him the derision of the wits of the time. He had frequently to endure the rough horse-play of the courtiers, for the position of a literary man at that time in Russia was not altogether a cheerful one. His services, however, to the Russian language were great.

From the commencement of the reign of Elizabeth Russian literature made great progress, the French furnishing models. Sumaro- Alexander Sumarokov (1718-1777) wrote prose and verse iov- in abundance — comedies, tragedies, idyls, satires and

epigrams. He is, perhaps, best entitled to remembrance for his plays, which are rhymed, and in the French style. His Dmitri Samozvanets (" Demetrius the Pretender ") is certainly not Kniazh- w ' tnout merit. Some of the pieces of Kniazhnin had Bln great success in their time, such as The Chatterbox, The

Originals and especially The Fatal Carriage. He is now almost forgotten. In 1756 the first theatre was opened at St Petersburg, the director being Sumarokov. Up to this time the Russians had acted only religious plays, such as those written by Simeon Polotzki. The reign of Catherine II. (1762-96), herself a voluminous writer, saw the rise of a whole generation of court poets. Everything in Russia was to be forced like plants in a hot-house; she was to have Homers, Pindars, Horaces and Virgils. Michael Khera- Kheraskov (1733-1807) wrote besides other poems two skov. enormous epics — the Rossiada in twelve books, and

Vladimir in eighteen ; they are now but little read. Bogdan- Hippolitus Bogdanovich (1743-1803) wrote a pretty lyric ovlch. piece, Dushenka, based upon La Fontaine, and telling the

old story of the loves of Cupid and Psyche. With Ivan Khem- Khemnitzer begins the long list of fabulists; this half- nhzer. oriental form of literature, so common in countries ruled

absolutely, has been very popular in Russia. Khemnitzer (1744-1784), whose name seems to imply a German origin, began by translating the fables of Gellert, but afterwards produced original

RadlsU chev.

specimens. A writer of real national comedy appeared in Denis von Visin, probably of German extraction, but born at Moscow (1744-1792). His best production is Nedorosl Vista.

(" The Minor "), in which he satirizes the coarse features of Russian society, the ill-treatment of the serfs, and other matters. He saw France on the eve of the great Revolution, and has well described what he did see. Russian as he was, and accustomed to serfdom, he was yet astonished at the wretched condition of the French peasants. The great poet of the age of Catherine, the laureate of her glories, was Gabriel Derzhavin (1743-18 1 6). He D essayed many styles of composition, and was a great iT in

master of his native language. There is something " av ' grandiose and organ-like in his high-sounding verses; unfortunately he occasionally

degenerates into bombast. His versification is perfect ; and he had the courage to write satirically of many persons of high rank. His Ode to God is the best known of his poems in Western countries. He was a student of Ossian, and of Edward Young, the author of the Night Thoughts. Other celebrated poems of Derzhavin are Felitza, Odes on the Death of Prince Mestcherskiy, The Nobleman, The Taking of Ismail, and The Taking of Warsaw. His Memoirs were published in 1857.

An unfortunate author of the days of Catherine was Alexander Radistchev (1 749-1802), who, having, in a small work, A Journey to _ St Petersburg and Moscow, spoken too severely of the miserable condition of the serfs, was punished by banish- ment to Siberia, from which he was afterwards allowed to return, but not till his health had been permanently injured by his sufferings. An equally sad fate befell the spirited writer Nicholas Novikov (1744-1818), who, after having worked hard as a N .. journalist, and done much for education in Russia, fell ” ov ” a > v – under the suspicion of the government, and was imprisoned by Catherine. On her death he was released by her successor. The short reign of Paul was not favourable to literary production ; the censorship of the press was extremely severe, and many foreign books were excluded from Russia.

But a better state of things came with the reign of Alexander, one of the glories of whose day was Nicholai Karamzin (q.v.). His chief work is his History of the Russian Empire, but he appeared in the fourfold aspect of historian, novelist, essayist and poet. Nor need we do more than mention the celebrated Archbishop Platon (q.v.). Ivan Dmitriev (1760-1837) wrote some pleasing lyrics and epistles, but without much force. He appears from his trans- lations to have been well acquainted with the English poets. Ozerov (1769-1816) wrote a great many tragedies, which are but little read now. They are in rhyming alex- Ozerov. andrines. He occasionally handled native subjects with success, as in his Dmitri Donskoy (1807) and Yaropolk and Oleg (1798). In Ivan Kriloff (q.v.) the Russians found their most Krllott. genial fabulist. As Derzhavin was the poet of the age of Catherine, so Vasilii Zhukovskiy (1783-1852) may be Zhuk- said to have been that of the age of Alexander. He is ovskly. more remarkable, however, as a translator than as an original poet. With him Romanticism began in Russia. He became reader to the empress and afterwards tutor to her children. In 1802 he published his version of Gray’s Elegy, which at once became a highly popular poem in Russia. Zhukovskiy translated many pieces from the German (Goethe, Schiller, Uhland) and English (Byron, Moore, Southey). One of his original produc- tions, “The Poet in the Camp of the Russian Warriors,” was on the lips of every one at

the time of the War of the Fatherland (Otechestvennaia Voina) in 1812. He produced versions of the episode of Nala and Damayanti from the Mahabharata, of Rustum and Zohrab from the Shah-Namah, and of a part of the Odyssey. In the case of these three masterpieces, however, he was obliged to work from literal translations (mostly German), as he was unacquainted with the original languages. The Iliad was trans- lated during this period by Gnedich, who was familiar with Greek. He has produced a faithful and spirited Onedlch. version, and has naturalized the hexameter in the Russian language with much skill. Constantine Batiushkov (1787-1855) Ba(l _ was the author of many elegant poems, and at the outset ushkov of his career promised much, but sank into imbecility, and ‘

lived in this condition to an advanced age. Merzliakov and Tziganov deserve a passing notice as the writers of songs some of which still keep their popularity. During his short life (1799-1837) Alexander Pushkin produced many celebrated poems, Pushkin which will be found enumerated in the article devoted nrlboye- to him (see Pushkin). In Alexander Griboyedov (1795- dQy 1829) (q.v.) the Russians saw the writer of one of their most clever comedies (Gore ot Uma), which may perhaps be trans- lated ” The Misfortune of being Too Clever ” (lit. ” Grief out of Wit”). Ivan Kozlov (1774-1838) was author of some pretty original lyrics, and some translations from the English, among others Burns’s Cottar’s Saturday Night. He became a cripple and blind, and his misfortunes elicited some cheering and sympathetic lines from Pushkin, which will always be read with pleasure.

Pushkin found a successor in Michael Lermontov (q.v.), who

Karam- zin.

Platon. Dmftriev.

Kozlov.

has left us many exquisite lyrics. A genuine bard of the people, Lermoa- ? n d one of their most truly national authors, was Alexis

Voronezh. He has left us a few exquisite lyrics, which Koltsov. are to bg f oun d i n a ll the collections of Russian poetry. He died of consumption after a protracted illness. Another poet who much

resembled Koltsov was Ivan Nikitin (1826- Nlkltln. 1861), born in the same town, Voronezh. His best poem was Kulak. Nikitin, to support his relations, was obliged to keep an inn; this he was afterwards enabled to change for the more congenial occupation of a bookseller. The novel in Russia has had its cultivators in Zagoskin and Lazhechnikov, who imitated Sir Walter Scott. The most celebrated of the romances Zagoskin. f 2agoskin was Yuri Miloslavskiy, a tale of the expulsion of the Poles from Russia in 161 2. The book may even yet be read with interest: it gives a very spirited picture of the times; unfortunately, a gloss is put upon the barbarity of the manners of the period. Among the better known productions of Lazhech- nikov are The Heretic and The Palace of Ice. A flashy but now forgotten writer of novels was Thaddeus Bulgarin (1789-1859) author of Ivan Vyshigin, a work which once enjoyed considerable popularity.

The first Russian novelist of great and original talent was Nicholai Gogol (1809-1852) (q.v.). In his Dead Souls he satirized ^^ all classes of society, some of the portraits being wonder-

OogoL fully vivid. Being a native of Little Russia, he describes its scenery and the habits of the people, especially in such stories as the Old- Fashioned Household, or in the more powerful Taras Bulba. This last is a highly wrought story, giving us a picture of the savage warfare carried on between the Cossacks and Poles. Gogol was also the author of a good comedy, The Reviser, wherein the petty pilferings of Russian municipal authorities are satirized. In his Memoirs of a Madman and Portrait, he shows a weird and fantastic power which proves him to have been a man of strong imagination. The same may be said of The Cloak, and the curious tale Vii (" The Demon "), where he gives us a picture of Kiev in the old days.

In the field of fiction Gogol had various famous successors, con- cerning whom details will be found in separate articles. It must suffice here to enumerate Alexander Herzen (d. 1869); tate M ' van Goncharov (1812-1891); Dmitri Grigorovich (1822-

novellsts. jSqq), author of The Fisherman and The Emigrants; Alexis Pisemskiy (1822-1900); Michael Saltikov (1826-1889); Feodor Dostoievskiy (1821-1881); Alexander Ostrovskiy (1823- 1886); Feodor Rieshetnikov (1841-1871); Count A. Tolstoy (1817-1875), also famous as a dramatist; and greater than all these Ivan Turgeniev (1819-1883), and Count L. Tolstoy (1828-1910), the last of whom ranks as much more than a man of letters.

In Vissarion Belinski the Russians produced their best critic. For

thirteen years (1834-47) ne was tne Aristarchus of Russian literature and exercised a healthy influence. In his later days he addressed a withering epistle to Gogol on the newly adopted reactionary views of the latter.

Since the time of Karamzin the study of Russian history has made great strides. He was followed by Nicholas Polevoy (1775- 1842), who wrote what he called the History of the Russian {*'*" People (6 vols., 1829-33), but. his work was not received

torlaas. -with much favour. Polevoy was a self-educated man, the son of a Siberian merchant; besides editing a well-known Russian journal, The Telegraph (suppressed in 1834), he was also the author of many plays, among others a translation of Hamlet. Since his time, however, the English dramatist has been produced in a more perfect dress by Kroneberg, Druzhinin and others. Sergius Solo- viev (1820-1879) was the author of a History of Russia which may be described rather as a quarry of materials for future his- torians of Russia than an actual history. In 1885 died N. Kosto- marov, the writer of many valuable monographs, of which those on Bogdan Khmelnitskiy and the False Demetrius deserve special mention. From 1847 to 1854 Kostomarov, whose interest in the history of Little Russia and its literature made him suspected of separatist views, wrote nothing, having been banished to Saratov, and forbidden to teach or publish. But after this time his literary activity began again, and, besides separate works, the leading Russian reviews, such as Old and New Russia, The Historical Messenger, and The Messenger of Europe, contained many con- tributions from his pen of the highest value. Constantine Kavelin (1818-1855) was the author of many valuable works on Russian law, and Kalatchev published a classical edition of the old Russian codes. Ilovaiskiy and Gedeonov attempted to upset the general belief that the founders of the Russian empire were Scandinavians. A good history of Russia (1855) was published by N. Ustrialov, but his most celebrated work was his Tzarstvovanie Petra Velikago (" Reign of Peter the Great ") ; in this many important docunwnts first saw the "light, and the circumstances of the death of the un- fortunate Alexis were made clear. Russian writers of history have not generally occupied themselves with any other subject than that of their own country, but an exception may be found in the writings of Timofei Granovskiy (1813-1855), such as Abbe" Suger (1849) and Four Historical Portraits (1850). So also Kudriav-

tsov, who died in 1850, wrote on " The Fortunes of Italy, from the Fall of the Roman Empire of the West till its Reconstruction by Charlemagne." He also wrote on " The Roman Women as described by

Tacitus." We may add Kareyev, professor at Warsaw, who wrote on the condition of the French peasantry before the Revolution. Other writers on Russian history have been H. Pogodine (d. 1873), who compiled a History of Russia till the In- vasion of the Mongols (1871), and especially I. Zabielin, who has written a History of Russian Life from the most Remote Times (1876), and the Private Lives of the Czarinas and Czars (1869 and 1872) and a History of Moscow. Leshkov has written a History of Russian Law to the 18th Century, and Tchitcherin a History of Provincial Institutions in Russia in the 17th Century (1856). To these must be added the work of Zagoskin, History of Law in the State of Muscovy (Kazan, 1877). Professor Michael Kovalevskiy, of the university of Moscow, wrote an excellent work on Communal Land Tenure, in which he investigates the remains of this custom throughout the world. In 1885 Dubrovin published an excellent history of the revolt of Pugachev. The valuable work by Alex- ander Pypin (b. 1833) and Vladimir Spasovich, History of Slavonic Literatures, is the most complete account of the subject, and has been made more generally accessible by the German translation of Pech. N. Tikhonravov (1832-1893) wrote a Chronicle of Russian Literature and Antiquities (5 vols., 1859-61). The History of Slavonic Literature by Schafarik, published in 1826, has long been antiquated. A history of Russian literature by Paul Polevoy has appeared, which has gone through two editions. The account of the Polish rebellion of 1863 by Berg, published in 1873, which gave many startling and picturesque episodes of the celebrated struggle, was withdrawn from circulation. It appeared originally in the pages of the Russian magazine Starina.

Nicholas Nekrasov, who died in 1877, left six volumes of poetry which in many respects remind us of the writings of Crabbe; the poet is of that realistic school in which Russian authors so much resemble English. Another writer of poetry f»e*s.

deserving mention is Ogariev, for a long time the companion in exile of Herzen in England; many of his compositions appeared in the Polar Star of the latter, which contains the interesting autobiographical sketches of Herzen, entitled Byloe i Dumi (" The Past and my Thoughts ")._ Apollon Maikov (1821-1847) at one time enjoyed great popularity as a poet; he is a kind of link with Pushkin, of whose elegance of versification he is an imitator. Another poet of a past generation was Prince Viazemskiy (1792- 1878). Graceful lyrics were written by Mei, Fet (whose name would apparently prove Dutch extraction, Veth), Stcherbina, and, going a little further back, Yazykov, the friend of Pushkin, and Khomiakov, celebrated for his Slavophile propensities. To these may be added Mdlle Zhadovskaya,

Benediktov, Podolinskiy and Tiutchev. Polonskiy (1 820-1 898) contributed exquisite lyrics to the Viestnik Yevropi.

Excellent works on subjects connected with Slavonic philology have been published by Vostokov, who edited the Ostromir Codex, and Sreznevskiy and Bodianskiy , who put forth an edition of the celebrated codex used at Reims for the coronation V ” ”’ of the French kings. After their deaths their work was “‘gists. carried on by Professor Grot (Philological Investigations, also many critical editions of Russian classics), Budilovich, professor at Warsaw, Potebnya of Kharkov, and Baudoin de Courtenay, who, among other services to philology, has described the Slavonic dialect spoken by the Resanians, a tribe living in Italy, in two villages of the Julian Alps. The songs (byliny) of the Russians have been collected by Zakrevskiy, Rybnikov, Hilferding, Barsov and others, and their national tales by Sakharov, Afanasiev and Erlenvein. Kotliarevskiy, Tereshenko and others have treated of their customs and superstitions. S. Stanislaus Mikutskiy, professor at the uni- versity of Warsaw, has published his Materials for a Dictionary of the Roots of the Russian and all Slavonic Dialects, but it represents a somewhat obsolete school of philology. The Early Russian Text Society continues its useful labours, and has edited many interesting monuments of the older Slavonic literature. Two valuable codices have been printed in Russia, Zographus and Marianus, interesting versions of the Gospels in Palaeoslavonic. They were edited by the learned Croat Jagic, who occupied the chair of Sreznevskiy in St Petersburg. An excellent Tolkovi Slovar Velikorusskago Yazika (” Explanatory Dictionary of the Great Russian Language “) was compiled by Vladimir Dahl. Alexander Hilferding published some valuable works on ethnology and phil- ology, among others on the Polabs, an extinct Slavonic tribe who once dwelt on the banks of the Elbe. The Russians have not exhibited many works in the field of classical or other branches of philology. Exception, however, must be made of the studies of Tchubinov in Georgian, Minayev in the Indian and Tsvetayev in the old languages of Italy.

In moral and mental philosophy the Russians have produced but few authors. We meet with some good mathematicians, Lobachevskiy among others, and in natural science the publications of the Society for Natural History at Moscow have attracted considerable attention.

Recent Literature. — The death of Nekrasov in 1877 deprived Russia of her most eminent poet since the days of Pushkin and

Lerraontov. During the last generation of the 19th century most of the Titans of her literature departed, and cannot be said to have left successors of equal merit. Dostoievskiy, Pisemskiy, Turgeniev, Goncharov, Ostrovskiy and Saltikov followed each other to the grave in rapid succession. Leo Tolstoy alone remained, a veritable patriarch, whose views on life gave him a world-interest beyond even the contributions of his great prose fiction. In 1895 Apukhtin, author of many graceful lyrics, died; in 1897 Apollon Maikov, and soon afterwards Polonskiy. These men were well known throughout Russia. A new school of poets has sprung up, consisting for the most part of the so-called decadents and symbolists. Among them may be mentioned A. Korinfskiy; Ivan Bunin, who has published an excellent translation of Longfellow's Hiawatha; and Constantine Balmont. The last of these has given to the public several volumes of lyrics, many of which exhibit a graceful imagination. He has been a successful translator of Shelley, and of Edgar Allan Poe, Ibsen and Calderon. We must also mention V. Briusov and K. Sluchevskiy, Mme. Gippius-Merezhkovskaya and Mme. Myrrha Lokhvitskaya. Excellent historical novels have been written by Merezhkovskiy (Merejkovsky (q.v.)). The drama is not in a flourishing condition. Very little of merit has been produced since the great trilogy (1866-69) of Alexis Tolstoy dealing with the reign of Ivan the Terrible — full of picturesque horrors for the dramatist — and the bourgeois comedies of Ostrovskiy.

If we turn to history, in which the Russians have always shown considerable talent, we can cite some really good work. We cannot here find room to discuss the memoirs and other documents which appear in the Russian Antiquary [Russkaya Starina), the Historical Messenger {I storicheskiy Viestnik) and other journals, the name of which is legion. In 1897 Professor Bestuzhev-Riumin, of the university of St Petersburg, died. He had held his chair of history since 1865. His valuable History of Russia must now remain a torso only, the first volume and the first half of the second having alone appeared. Soloviev and Kostomarov are dead. The famous school of Russian historians is thus almost extinct. But some excellent writers in this department have come to the front. Pro- fessor Miliukov has started his Sketches of the History of Russian Culture (Ocherki po istorii russkoi kulturi), which has been much read. Professor Bilbasov wrote a History of Catherine II. and N. Shilder a Life of Alexander I. D. Evarnitskiy has added a third volume to his interesting work on the Zaporozhian Cossacks. The Russians have always enjoyed a considerable reputation as memoir-writers, and the Recollections of Mme. Smirnov, which first appeared in the Northern Messenger (Sieverny Viestnik), proved very interesting. Pushkin appears here

before us in the most minute details of his everyday life. The centenary of his birth (1899) was signalized by the publication of many interesting monographs on his strange career. The details furnished by his nephew, L. Pavlistchev, were especially noteworthy. The second volume appeared of the classical History of the Russian Church, by E. Golubinskiy. A valuable con- tribution to early Russian history was furnished by the Legal An- tiquities (Yuridicheskia Drevnosti)-oi V. Serguievich, by which quite a new light has been thrown upon the Russian sobor. The well- known savant, Maxime Kovalevskiy, published the second volume of his Economic Development of Europe to the Rise of Capitalism. N. Rozhkov wrote an important work entitled Village Economy in Muscovy in the Sixteenth Century. This book analyses the conditions under which economic production was developed in Old Russia. S. Platonov published a History of the Insurrections in Russia in the Sixteenth and Seventeenth Centuries. He holds entirely new views on the oprichina, the famous bodyguard of Ivan the Terrible. Professor B. Kliuchevskiy, of the university of Moscow, published in 1883 a valuable book on the Russian Duma, as the privy council of the emperors was called, and in 1899 he issued his Aids to Lectures on Russian History. Russian writers have not often devoted them- selves to the political and social conditions of other countries, but an exception must be made in the case of the books by Professor Vinogradov, formerly of Moscow, notably his Investigations into the Social History of England in the Middle Ages (1887). The learned author, who was called to Oxford as Corpus professor of juris- prudence, also prepared an edition of this work for the English public. In fiction no new writers appeared of equal calibre to Gogol, Turgeniev, Dostoievskiy and Tolstoy. But A. Chekhov showed considerable power in his short stories. Some of the tales of Gorki (q.v.), Ertel and Yasinskiy are also of great merit. The brilliant Garshin died insane in 1888.

A few words must be said on the literature of the Russian dialects, the Little and White Russian. The Little Russian is rich in skazki (tales) and songs. Peculiar to them is the duma, a narra- tive poem which corresponds in many particulars with the Russian bylina. Since the commencement of the 19th century, the Little Russian dumy have been repeatedly edited, as by Maksimovich Metlinskiy and others, and an elaborate edition was undertaken by Dragomanov and Antonovich. Just as the byliny of the Great Russians, so also these dumy of the Little Russians admit of classification, and they have been divided by their latest editors as follows: (1) the songs of the druzhina, treating of the early princes and their followers; (2) the Cossack period (Kozachestvo) , in which the Cossacks are

found in continual warfare with the Polish pans and the attempts of the Jesuits to introduce the Roman Catholic religion; (3) the period of the Haidamaks, who formed the nucleus of the national party, and prolonged the struggle.

The foundation of the Little Russian literature (written, as opposed to the oral) was laid by Ivan Kotliarevskiy (1769-1838), whose travesty of part of the Aeneid enjoys great popularity among some of his countrymen. Others, however, object to it as tending to bring the language or dialect into ridicule. A truly national poet appeared in Taras Shevchenko, born at the village of Kirilovka, in the government of Kiev, in the condition of a serf. The strange adventures of his early life he has told us in his autobiography. He did not get his freedom till some time after he had reached manhood, when he was purchased from his master by the generous efforts of the poet Zhukovskiy and others. Besides poetry, he occupied himself with painting, with considerable success. He unfortunately became obnoxious to the government, and was punished with exile to Siberia from 1847 to 1857. He did not long survive his return, dying in 1861, aged forty-six. No one has described with greater vigour than Shevchenko the old days of the Ukraine. In his youth he listened to the village traditions handed down by the priests, and he has faithfully reproduced them. In the powerful poem entitled Haidamak we have a graphic picture of the horrors enacted by Gonta and his followers at Uman. The funeral of the poet was a vast public procession; a great cairn, surmounted with a cross, was raised over his remains, where he lies buried near Kaniov on the banks of the Dnieper. His grave has been styled the ” Mecca of the South Russian Revolutionists.” A complete edition of his works, with interesting biographical notices — one contributed by the novelist Turgeniev— appeared at Prague in 1876. Besides the national songs, excellent collections of the South Russian folk-tales have appeared, edited by Drago- manov, Rudchenko, and others. Many of these are still recited by the tchumaki, or wandering pedlars. A valuable work is the Zapiski Yuzhnoy Rossii (” Papers on Southern Russia “), published at St Petersburg in 1857 by Panteleimon Kulish. After he got into trouble (with Kostomarov and Shevchenko) for his political views, the late works of this author show him to have undergone a complete change. Other writers using the Little Russian language are Marko-Vovchok (that is, Madame Eugenia Markovich) and Yuri Fedkovich, who employs a dialect of Bukovina. Fedkovich, like Shevchenko, sprang from a peasant family, and served as a soldier

in the Austrian army against the French during the Italian campaign. Naturally we find his poems filled with descriptions of life in the camp. Like the Croat Preradovi6, he began writing poetry in the German language, till he was turned into more natural paths by some patriotic friends. A collection of songs of Bukovina was published at Kiev in 1875 ˆ Lonachevskiy. Eugene Zelechovskiy compiled a valuable Dictionary of Little Russian. There is a good grammar by Osadtsa, a pupil of Miklosich.

In the White Russian dialect are to be found only a few songs; with the exception of portions of the Scriptures and some legal documents. A valuable dictionary has been published White by Nosovich, but this is one of the most neglected of the p U sslaa Russian dialects. Collections of White Russian songs have dialect. been published by Shein and others.

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RUSSO-JAPANESE WAR, 1904-5. The seizure by Russia of the Chinese fortress of Port Arthur, which she had a few years previously, in concert with other powers, compelled Japan to relinquish, was from the Russian point of view the logical outcome of her eastward expansion and her need for an ice-free harbour on the Pacific. The extension of the Trans-Siberian railway through Manchuria to Port Arthur and a large measure of influence in Manchuria followed equally naturally. But the whole course of this expansion had been watched with sus- picion by Japan, from the time of the Saghalien incident of 1875, when the island power, then barely emerging from the feudal age, had to cede her half of the island to Russia, to the Shimono- seki treaty of 1895, when the powers compelled her to forego the profits of her victory over China. The subsequent occupation of Port Arthur and other Chinese harbours by European powers, and the evident intention of consolidating Russian influence in Manchuria, were again and again the subject of Japanese repre- sentations at St Petersburg, and these representations became more vigorous when, in 1903, Russia seemed to be about to extend her Manchurian policy into Korea. No less than ten draft treaties

were discussed in vain between August 1903 and February 1904, and finally negotiations were broken oS on February 5th. 1 Japan had already on the 4th decided to use force, and her military and naval preparations, unlike those of Russia, kept pace with her diplomacy.

This was in fact an eventuality which had been foreseen and on which the naval and military policy of Japan had been based for ten years. She too had her projects of expansion and hegemony, and by the Chino-Japanese War she had gained a start over her rival. The reply of the Western powers was first to compel the victor to maintain the territorial integrity of China, and then within two years to establish themselves in Chinese harbours. From that moment Japanese policy was directed towards establishing her own hegemony and meeting the advance of Russia with a fait accompli. But her armaments were not then adequate to give effect to a strong-handed policy, so that for some years thereafter the government had both to impose heavy burdens on the people and to pursue a foreign policy of marking time, and endured the fiercest criticism on both counts, for the idea of war with Russia was as popular as the taxes necessary to that object were detested. But as the army and the navy grew year by year, the tone of Japanese policy became firmer. In 1902 her position was strengthened by the alliance with England; in 1903 her army, though in the event it proved almost too small, was considered by the military authorities as sufficiently numerous and well prepared, and the arguments of the Japanese diplomatists stiffened with menaces. Russia, on the other hand, was divided in policy and consequently in military intentions and preparations. In some quarters the force of the new Japanese army was well understood, and the estimates of the balance of military power formed by the minister of war, Kuropatkin, coincided so remarkably with the facts that at the end of the summer of 1903 he saw that the moment had come when the preponderance was on the side of the Japanese. He therefore proposed to abandon Russian projects in southern Manchuria and the Port Arthur region and to restore Port Arthur to China in return for considerable con- cessions on the side of Vladivostok. His plan was accepted, but ” a lateral influence suddenly made itself felt, and the com- pletely unexpected result was war.” Large commercial interests were in fact involved in the forward policy, ” the period of heavy capital expenditure was over, that of profits about to commence,” and the power and intentions of Japan were ignored or mis- understood. Further, Dragomirov, a higher military authority even than Kuropatkin,

declared that ” Far Eastern affairs were decided in Europe.” Thus Russia entered upon the war both unprepared in a military sense, and almost entirely in- different to its causes and its objects. To the guards and patrols of the Manchurian railway and the garrisons of Port Arthur and Vladivostok, 80,000 in all, Japan could, in consequence of her recruiting law of 1896, oppose a first -line army of some 270,000 trained men. Behind these, however, there were scarcely 200,000 trained men of the older classes, and at the other end of the long Trans-Siberian railway Russia had almost limitless resources. 2 The strategical problem for Japan was, how to strike a blow sufficiently decisive to secure her object, before the at present insignificant forces of the East Siberian army were augmented to the point of being unassailable. It turned, therefore, principally upon the efficiency of the Trans-Siberian rail- way and in calculating this the Japanese made a serious under- estimate. In consequence, far from applying the ” universal service ” principle to its full extent, they trained only one-fifth of the annual contingent of men found fit for service. The quality of the army, thus composed of picked men (a point which is often forgotten) , approximated to that of a professional force; but this policy had the result that, as there was no adequate second-line army, parts of the first-line had to be reserved, instead of being employed at the front. And when for want of these active troops the first great victory proved indecisive,

1 Belated declarations of war appeared on the 10th.

2 The total Russian army on a peace footing is almost l,ooq,obo strong.

half-trained elements had to be sent to the front in considerable numbers — indeed the ration strength of the army was actually trebled. The aim of the war, ” limited ” in so far that the Japanese never deluded themselves with dreams of attacking Russia at home, was to win such victories as would establish the integrity of Japan herself and place her hegemony in the Far East beyond challenge. Now the integrity of … Japan was worth little if the Russians could hope tjves „/ ultimately to invade her in superior force, and as the Port Arthur was the station of the fleet that might J*P*t>ese convoy an invasion, as well as the symbol of the longed-for hegemony, the fortress was necessarily the army’s first objective, a convincing Sedan was the next. For the navy, which had materially only a narrow margin of superiority over the Russian Pacific Squadron, the object was to keep the two halves of that squadron, at Port Arthur and Vladivostok respect- ively, separate and to destroy them in detail. But in February weather these objects could not be pursued

simultaneously. Prior to the break-up of the ice, the army could only disembark at Chemulpo, far from the objective, or at Dalny under the very eyes of its defenders. The army could therefore, for the moment, only occupy Korea and try to draw upon itself hostile forces that would otherwise be available to assist Port Arthur when the land attack opened. For the navy, instant action was im- perative. 1 On the 8th of February the main battle-fleet, commanded by Vice-Admiral Togo, was on the way to Port Arthur. During the night his torpedo-boats surprised the Russian squadron in harbour and inflicted serious losses, and later in the day the battleships engaged the coast batteries. Repulsed in this attempt, the Japanese established a stringent blockade, which tried the endurance of the ships and the men to the utmost. From time to time the torpedo-craft tried to run in past the batteries, several attempts were made to block the harbour entrance by sinking vessels in the fair- way, and free and deadly use was made by both sides of submarine mines. But, though not destroyed,- the Port Arthur squadron was paralysed by the instantaneous assertion of naval superiority.

Admiral Alexeiev, the tsar's viceroy in the Far East and the evil genius of the war, was at Port Arthur and forbade the navy to take the risks of proceeding to sea. 3 For a time, when in place of Admiral Starck (who was held responsible for the sur- prise of February), Admiral Makarov, an officer of European reputation, commanded the fleet, this lethargy was shaken off. The new commander took his ships to sea every day. But his energetic leadership was soon ended by a tragedy. A field of electro-mechanical mines was laid by the Japanese MakAro* in the night of April i2th-i3th, and on the following at Port day the Japanese cruisers stood inshore to tempt Arthur ' the enemy on to the mine-field. Makarov, however, crossed it without accident, and pursued the cruisers until Togo's battle-fleet appeared, whereupon he went about and steamed for port. In doing so he recrossed the mine-field, and this time the mines were effectual. The flagship " Petropavlovsk " was struck and went down with the admiral and 600 men, and another battleship was seriously injured. Then the advocates of passivity regained the upper hand and kept the squadron in harbour, and henceforward for many months the Japanese navy lay unchallenged off Port Arthur, engaging in minor operations, covering the transport of troops to the mainland, and watching for the moment when the advance of the army should force the Russian fleet to come out. Meantime seven Japanese cruisers under Vice-Admiral Kaimamura went in search of the Russian Vladivostok squadron; this, however, evaded them fof some months, and inflicted some damage on the Japanese mercantile marine and transports. The Japanese had

not waited to gain command of the sea before beginning the sea transport of that part of their troops allotted to Korea. The roads of that country were so poor that the landing had

3 A vivid picture of the state of affairs in the navy at this period is given in Semenov' s Rasplata (Eng. trans.).

to be made, not on the Straits of Tsushima, but as far north as The possible. Chemulpo, nearer by 50 m. to Port Arthur

Japanese than to Japan, was selected. On the first day of 1 st Army hostilities Rear- Admiral Uriu disembarked troops at la Korea, chgniuipo under the eyes of the Russian cruiser " Variag," and next day he attacked and destroyed the " Variag " and some smaller war-vessels in the harbour, and the rest of the 1st Army (General Kuroki) was gradually brought over during February and March, in spite of an unbeaten and, under Makarov's regime, an enterprising hostile navy. But owing to the thaw and the subsequent break-up of the miser- able Korean roads, six weeks passed before the columns of the army (Guard, 2nd and 12th divisions), strung out along the " Mandarin road " to a total depth of six days' march, closed upon the head at Wiju, the frontier town on the Yalu. Opposite to them they found a large Russian force of all arms.

The Russian commanders, at this stage at least, had not and could not have any definite objective. Both by sea and by land their policy was to mass their resources, repulsing mean- time the attacks of the Japanese with as much damage to the enemy and as little to themselves as possible. Their strategy was to gain time without immobilizing themselves so far that the Japanese could impose a decisive action at the moment that suited them best. Both by sea and by land, such strategy was an exceedingly difficult game to play. But afloat, had Makarov survived, it would have been played to the end, and Togo's fleet would have been steadily used up. One day, indeed (May 15th), two of Japan's largest battleships, the " Hatsume " and the " Yashima," came in contact with free mines and were sunk. One of them went to the bottom with five hundred souls. But the admiral was not on board. The Russian sailors said, when Makarov's fate was made known, " It is not the loss of a battle- ship. The Japanese are welcome to two of them. It is he." Not only the skill, but the force of character required for playing with fire, was wanting to Makarov's successors.

It was much the same on land. Kuropatkin, who had taken command of the army, saw from the first that he would have Kuro- to 8 am three months, and disposed his forces as they

patkia's came on the scene, unit by unit, in perfect accord plan. with the necessities of the case. His expressed intention

was to fight no battle until superiority in numbers was on his side. He could have gained his respite by concentrating at Harbin or even at Mukden or at Liao-Yang. But he had to reckon with the fleet 1 at Port Arthur. He knew that the defences of that place were defective, and that if the fleet were destroyed whilst that of Togo kept the sea, there would be no Russian offensive. He therefore chose Liao-Yang as the point of concentration, and having thus to gain time by force instead of by distance, he pushed out a strong covering detachment towards the Yalu.

But little by little he succumbed to his milieu, the atmosphere of false confidence and passivity created around him by Alexeiev. After he had minutely arranged the Eastern Detachment in a series of rearguard positions, so that each fraction of it could contribute a little to the game of delaying the enemy before retiring on the positions next in rear, the commander of the detachment, Zasulich, told him that " it was not the custom of a knight of the order of St George to retreat," and Kuropatkin did not use his authority to recall the general, who, whether competent or not, obviously misunderstood his mission. Thus, whilst the detachment was still disposed as a series of rear- guards, the foremost fractions of it stood to fight on the Yalu, against odds of four to one.

The Japanese 1st Army was carefully concealed about Wiju until it was ready to strike. Determined that in this first battle against a white nation they would show their mettle, the Japanese lavished both time and forethought on the minutest preparations. Forethought was still busy when, in accordance with instructions from Tokio, Kuroki on the 30th of April ordered the attack to begin at daybreak on the 1st of May. For several miles above Antung the rivers Yalu and Aiho are 1 Not, as is often assumed, the fortress itself.

parallel and connected by numerous channels. The majority of the islands thus formed were held and had been bridged by the Japanese. The points of passage were commanded by high ground a little farther up where the valleys definitely diverge, and beyond the flank of the

ill-concealed positions of the defence. The first task of the right division (12th) was to cross the upper Yalu and seize this. To the Guard and 2nd divisions was assigned the frontal attack on the Chiuliencheng position, where the Russians had about one-half of the Yalu. their forces under Major-General Kashtalinski. On the 30th of April,, Inouye's 12th division accomplished its task of clearing the high ground up to the Aiho. The Russians, though well aware that the force in their front was an army, neither retired nor concentrated. Zasulich's medieval generalship had been modified so far that he intended to retreat when he had taught the Japanese a lesson, and there- fore Kuropatkin's original arrangements were not sensibly modified. So it came about that the combined attack of the 2nd and Guard divisions against the front, and Inouye on the left flank and rear, found Kashtalinski without support. After a rather ineffective artillery bombardment the Japanese advanced in full force, without hesitation or finesse, and plunging into the river, stormed forward under a heavy fire. A few moments after- wards Zasulich ordered the retreat. But the pressure was far too close now. Broken up by superior numbers the Russian line parted into groups, each of which, after resisting bravely for a time, was driven back. Then the frontal attack stopped and both divisions abandoned themselves to the intoxication of victory. Mean- while, the right attack (12th division) encountering no very serious resistance, crossed the Aiho and began to move on the left rear of the Russians. On the side of the defence, each colonel had been left to retire as best he could, and thus certain fractions of the retreating Russians encountered Inouye's advancing troops and were destroyed after a most gallant resistance. The rearguard itself, at Hamatan, was almost entirely sacrificed, owing to the wrong direction taken in retreating by its left flankguard. Fresh attempts were made by subordinates to form rearguards, but Zasulich made no stand even at Feng- hwang-cheng, and the Japanese occupied that town unopposed on the 5th of May. The Japanese losses were noo out of over 40,000 present, the Russian (chiefly in the retreat) at least 2500 out of some 7000 engaged.

The Yalu, like Valmy, was a moment in the world's history. It mattered little that the Russians had escaped or that they had been in inferior numbers. The serious fact was that they had been beaten.

The general distribution of the Russian forces was now as follows: The main army under Kuropatkin was forming, by successive brigades, in two groups — I. Siberian Corps (Stakel- berg), Niu-chwang and Kaiping; II. Siberian Corps, Liao-Yang. Zasulich (III. Corps and various other units) had still 21,000. In the Port Arthur " fortified rayon," under Lieut.-General Stoessel (IV. Corps), were 27,000 men, and

General Linievich around Vladivostok had 23,000. These are, however, paper strengths only, and the actual number for duty cannot have been higher than 110,000 in all. The Trans-Siberian railway was the only line of communication with Europe and western Siberia, and its calculated output of men was 40,000 a month in the summer. In October 1904, therefore, supposing the Japanese to have used part of their forces against Port Arthur, and setting this off against the absence of Linievich and Stoessel, Kuropatkin could expect to have a sufficient superiority in numbers to take the offensive. His policy was still, ” No battle before we are in superior force.”

For the moment it was equally Japan’s interest to mark time in Manchuria. Still intent upon the Russian Port Arthur squadron, she had embarked her 2nd Army (General Oku, 1st, 3rd, L am u aK 4th and 5th divisions) during April, and sent it to of the Chinampo whence, as soon as the ice melted and Japanese Kuroki’s victory cleared the air, it sailed to the 2 ” d selected landing-place near Pitszewo. Here, under the protection of a continuous chain of war-vessels between the Elliot

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Port Arthur

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Islands and the mainland, Oku began to disembark on the 5th of May. But the difficulties of the coast were such that it took three weeks to disembark the whole and to extend across the peninsula to Port Adams. Oku then, leaving the 5th division behind, moved down with the rest towards Kinchow, and after storming that place found himself face to face with a position of enormous strength, Nanshan Hill, at the narrowest part of the peninsula, where part of a Russian division (3000 only out of 12,000 were actually engaged) had fortified itself with extreme care. On the 26th of May took place the battle of Nanshan. The Japanese attack was convergent, but there was no room for envelopment; the Russian position moreover was ” all-round ” and presented no flanks, and except for the enfilade fire of the Japanese and Russian gunboats in the shallow bays on either side the battle was locally at every point a frontal attack and defence. The first rush of the assailants carried them up to the wire and other obstacles, but they were for many hours unable to advance a step farther. But the resolute Oku attacked time after time, and at last the 4th division on his right, assisted by its gunboats,

Naashaa.

Emery Walker sc

forced its way into the Russian position. The Russians had just begun to retreat, in accordance with orders from higher authorities. But it was a second undeniable victory. It was, moreover, a preface to those furious assaults on Port Arthur which, because they were the expression of a need that every soldier felt, and not merely of a tactical method, transcend all cool-blooded criticism. The Japanese losses were 4500 out of 30,000 engaged or 15%, that of the Russians fully half of the 3000 engaged. The victors captured many guns, but were too exhausted to pursue the Russians, whose retirement was not made in the best order.

The transports were now conveying the 6th and nth divisions to Pitszewo; these were to form the 3rd Army (Nogi) for opera- tions against Port Arthur. Oku exchanged his 1st division for the 6th. The 2nd Army then turned northward (3rd, 4th, 5th and 6th divisions). The 10th division, forming the nucleus of the 4th Army, had begun to land at Takushan on the ioth of May . The 2nd and 4th Armies were the left wing of a widespread I converging movement on Liao-Yang.

Oku had the greatest

distance to march, Kuroki the smallest. The latter therefore had to stand fast in the face of the Russian Eastern Detachment, which was three days' march at most from Feng-hwang-cheng and could be supported in three more days by Kuropatkin's main body, whereas the pressure of Oku's advance would not begin to be felt by the Russian Southern Detachment until the twelfth day at earliest. It was necessary therefore for the first objective to make a slight concession to the second. Oku had to start at the earliest possible moment, even though operations against Port Arthur were thereby delayed for a week or two. In fact, Oku's march began on June 13th, Kuroki's on June 24th; the moves of the intermediate forces at various dates within this time.

Meanwhile Kuropatkin, assembling the main army week by week, was in a difficult position. His policy of gaining time had received a severe blow in the failure of his executive officer to realize it, and that officer, though his unpursued troops quickly regained their moral, had himself completely lost con- fidence. On the news of the battle (coupled with that of a fresh army appearing on the Korean coast), 1 Kuropatkin instantly sent off part of his embryo central mass to bar the mountain passes of Fenshuiling and Motienling against the imagined relentless pursuit of the victors, and prepared to shift his centre of concentration back to Mukden. The subsidiary protective forces on either flank of Zasulich had promptly abandoned their look-out positions and fallen back to join him. But the commander-in-chief, soon realizing that the Japanese were not pursuing, reasserted himself, sent the protective troops back to their posts, and cancelled all orders for the evacuation of Liao- Yang. From this time forward, Kuropatkin allowed his sub- ordinates little or no initiative. A few days later, Zasulich's persistent requests to be allowed to retreat and the still uncertain movements of the 2nd Army induced him once more to pre- pare a concentration on Mukden. But on the 6th of May he learned that the Japanese 1st Army had again halted at Feng-hwang-cheng and that the 2nd Army was disembarking at Pitszewo, and he resumed (though less confidently) his original idea. The Eastern protective detachment, now strengthened and placed under the orders of Count Keller, was disposed with a view to countering any advance on Liao-Yang from the east by a combination of manoeuvre and fighting. 2 It was at this moment of doubt that Alexeiev, leaving Port Arthur just in time and profoundly impressed

with the precarious state of affairs in the fleet and the fortress, gave the order, as commander- Aiexehv in-chief by land and sea, for an ” active ” policy (19th and May). Kuropatkin, thus required to abandon his own

Kum- plan, had only to choose between attacking the 1st

pa ”’ Army and turning upon Oku. He did not yield at once; a second letter from the viceroy, the news of Nanshan, and above all a signed order from the tsar himself, ” Inform General Kuropatkin that I impose upon him all the responsibility for the fate of Port Arthur,” were needed to bring him definitely to execute a scheme which in his heart he knew to be perilous. The path of duty for a general saddled with a plan which he dis- approves is not easily discoverable. Napoleon in like case refused, at the risk of enforced resignation, but so did Moreau; the generality of lesser men have obeyed, but so did Suvarov.

Stakelberg’s I. Siberian Corps was therefore reinforced towards the end of May up to a strength of above 35,000. But

1 This was the 2nd Army, waiting in the port of Chinampo for the moment to sail for Pitszewo.

2 One isolated incident which deserves mention took place at this time, the bold raid of Colonel Madritov and 500 Cossacks against the communications of the 1st Army. The raid (involving a ride of 240 m. forward and back) was carried out in entire ignorance of the battle of the Yalu, and on arriving at Anju Madritov found nothing to attack, the 1st Army having after its victory adopted a short line of communication from a sea base near the Yalu mouth. This incident suggests two reflections — first that raids or attacks in rear of the ” centre of operations ” are valueless, however daring, and second that had Zasulich, in his determination to be worthy of his knighthood, concentrated for battle, the presence of the Madritov detachment on the field would have prevented the lamentable and costly misunderstandings of the retreat on Hamatan.

it remained a detachment only. The Liao-Yang central mass was still held in hand, for the landing of the 4th Army — really only a division at present — at Takushan and the wrong placing of another Japanese division supposed to be with Kuroki (really intended for Nogi) had aroused Kuropatkin’s fears for the holding capacity of Keller’s detachment. Moreover, dis- liking the whole enterprise, he was most unwilling to use up his army in it. The Russians, then, at the beginning of June, were divided into three groups, the Southern, or

offensive group (35,000), in the triangle Neuchwang-Haicheng-Kaiping; the Eastern or defensive group (30,000), the main body of it guard- ing the passes right and left of the Wiju-Liao-Yang road, the left (Cossacks) in the roadless hills of the upper Aiho and Yalu valleys, the right (Mishchenko's Cossacks and infantry supports) guarding Fenshuiling pass and the road from Takushan; the reserve (42,000) with Kuropatkin at Liao-Yang; the " Ussuri Army ". about Vladivostok; and Stessel's two divisions in the Kwantung peninsula.

On the other side the 1st Army was at Feng-hwang-cheng with one brigade detached on the roads on either hand, the left being therefore in front of the Takushan division and facing the Fenshuiling. Oku's 2nd Army (4 divisions or 60,000 com- batants) was about Port Adams. This last was the objective of the attack of Stakelberg's 35,000. Kuropatkin's stakel- orders to his subordinate were a compromise between berg's his own plan and Alexeiev's. Stakelberg was to crush expert- by a rapid and energetic advance the covering forces "?

of the enemy met with, and his object was " the capture of the Nanshan position and thereafter an advance on Port Arthur." Yet another object was given him, to " relieve the pressure pn Port Arthur by drawing upon himself the bulk of the enemy's forces," and he was not to allow himself to be drawn into a decisive action against superior numbers. Lastly, on June 7th, while Stakelberg was proceeding southward on his ill-defined errand, Kuropatkin, imposed upon by the advance of the Takushan column to Siu-yen, forbade him to concentrate to the front, only removing the veto when he learned that the 4th Army had halted and entrenched at Siu-yen.

On the 14th, all his arrangements for supply and transport being at last complete, Oku moved north. Although he was still short of part of the 6th division, he was in superior force. He had, moreover, the perfectly definite purpose of fighting his way north, and at Telissu or Wafangkou on the 14th of June, as he expected, he came upon Stakelberg's detach- ment in an entrenched position. On the 14th andisth, attacking sharply on the Russian front and lapping round both its flanks, .Oku won an important and handsome victory, at a cost of 1200 men out of 35,000 engaged, while the Russians, with a loss of at least 3600 out of about 25,000 engaged, retired in disorder. Thus swiftly and disastrously ended the southern expedition.

Meantime, except for the movement on Siu-yen already mentioned, 3 and various reconnaissances in force by Keller's main body and by Rennenkampf's Cossacks farther inland, all was quiet along the Motienling front. Kuroki entrenched him- self carefully about Feng-

hwang-cheng, intending, if attacked by the Russian main army, to defend to the last extremity the ground and the prestige gained on the 1st of May.

From this point to the culmination of the advance at Liao- Yang, the situation of the Japanese closely resembles that of the Prussians in 1866. Haicheng represents Munchengratz, Liao-Yang Gitschin, and the passes east of Liao-Yang Nachod and Trautenau. The concentration of the various Japanese armies on one battlefield was to be made, not along the circum- ference of the long arc they occupied, but towards the centre. Similarly, Kuropatkin was in the position of Benedek. He possessed the interior lines and the central reserve which enables interior lines to be utilized, and a stroke of good fortune pro- longed the period in which he could command the situation, for

3 The occupation of Siu-yen was chiefly the work of the brigade pushed out to his left by Kuroki. Only a portion of the 10th division from Takushan helped to drive away Mishchenko's Cossacks.

Telissu.

on the 23rd of June an unexpected sortie of the Russian Port Arthur squadron paralysed the Japanese land offensive. In the squadron were seen the battleships damaged in the February attacks, and the balance of force was now against Togo, who had lost the " Yashima " and the " Hatsuse." The squadron nevertheless tamely returned to harbour, Togo resumed the blockade and Nogi began his advance from Nanshan, but the 2nd and 4th Armies came to a standstill at once (naval escort for their sea-borne supplies being no longer available), and the 1st Army, whose turn to advance had just arrived, only pushed ahead a few miles to cover a larger supply area. On the 1st of July the Vladivostok squadron appeared in the Tsushima Straits, and then vanished to an unknown destination, and whether this intensified the anxiety of the Japanese or not, It is the fact that the 2nd Army halted for eleven days at Kaiping, bringing the next on its right, 4th Army, to a standstill likewise. Its next advance brought it to the fortified position of Tashichiao, where Kuropatkin had, by drawing heavily upon his central reserve and even on the Eastern Detachment, massed about two army corps.

On the 24th Oku attacked, but the Russian general, Zarubayev,

handled his troops very skilfully, and the Japanese were repulsed with a loss of 1200 men. Zarubayev, who had used cbiao. on ly a b°ut na lf his forces in the battle, nevertheless retired in the night, fearing to be cut off by a descent of the approaching 4th Army on Haicheng, and well content to have broken the spell of defeat. Oku renewed the attack next day, but found only a rearguard in front of him, and without following up the retiring Russians he again halted for six days before proceeding to Haicheng to effect a junction with the 4th Army (Nozu), which meantime had won a number of minor actions and forced the passage of the mountains at Fenshuiling South. 1

The 1st Army, after its long halt at Feng-hwang-cheng, which was employed in minutely organizing the supply service-ˆ-a task of exceptional difficulty in these roadless mountains — re- opened the campaign on the 24th of June, but only tentatively on account of the discouraging news from Port Arthur. A tremendous rainstorm imposed further delays, for the coolies and the native transport that had been laboriously collected scattered in all directions. The Motienling pass, however, had been seized without difficulty, and Keller's power of counter- attack had been reduced to nothing by the despatch of most of his forces to the concentration at Tashichiao. But Oku's 2nd Army was now at a standstill at Kaiping, and until he was further advanced the 1st Army could not press forward. The captured passes were therefore fortified (as Feng-hwang-cheng had been) for passive resistance. This, and the movements of the 4th Army, which had set its face towards Haicheng and no longer seemed to be part of a threat on Liao-Yang, led to the idea being entertained at Kuropatkin's headquarters that the centre of gravity was shifting to the south. To clear up the situation Keller's force was augmented and ordered to attack Kuroki. It was repulsed with a loss of nearly 1000 men in the action at the Motienling (17th July), but it was at least ascer- tained that considerable forces were still on the Japanese right, Actions an d upon the arrival of a fresh army corps from Europe on the Kuropatkin announced his intention of attacking eastern Kuroki. And in effect he succeeded in concentrating tnnt ' the equivalent of an army corps, in addition to Keller's

force, opposite to Kuroki's right. But having secured this advantage he stood still for five days, and Kuroki had ample time to make his arrangements. The Japanese general occupied some 20 m. of front in two halves, separated by 6 m. of impassable mountain, and knowing well the danger of a " cordon " defensive, he met the crisis in another and a bolder fashion. Calling in the brigade detached to the assistance of Nozu as well as all other available fractions of his scattered army, he himself attacked

1 The 5th division of the 2nd Army had been sent to join the 10th as the latter approached Hsimucheng. The Guard brigade of Kuroki's army which had served with Nozu in the advance had now returned to Feng-hwang-cheng.

on the 31st of July, all along the line. It was little more than an assertion of his will to conquer, but it was effectual. On his left wing the attacks of the Guard and 2nd divisions (action of Yang-tzu-ling) on the Russian front and flank failed, the frontal attack because of the resolute defence, the flank attack from sheer fatigue of the troops. Count Keller was killed in the defence. Meantime on the Japanese right the 12th division attacked the large bodies of troops that Kuropatkin had massed (Yu-shu-ling) equally in vain. But one marked success was achieved by the Japanese. The Russian 35th. and 36th regi- ments (10th European Corps) were caught between two advanc- ing columns, and, thanks to the initiative of one of the column leaders, Okasaki, destroyed. At night, discouraged oh each wing by the fall of Count Keller and the fate of the 35 th and 36th, the whole Russian force retired on Anping, with a loss of 2400, to the Japanese 1000 men.

This was the only manifestation of the offensive spirit on Kuropatkin's part during the six months of marking time. It was for defence, sometimes partial and elastic, sometimes rigid and " at-all-costs," that he had made his dispositions throughout. His policy now was to retire on Liao-Yang as slowly as possible and to defend himself in a series of concentric prepared positions. In his orders for the battle around _ his stronghold there is no word of counter-attack, retire- and his central mass, the Special weapon of the com- meat on mander-in-chief, he gave over to Bilderling and to Ll "° m Zarubayev to strengthen the defence in their respec- "* tive sections or posted for the protection of his line of retreat. Nevertheless he had every intention of delivering a heavy and decisive counterstroke when the right moment should come, and meantime his defensive tactics would certainly have full play on this prearranged battlefield with its elaborate redoubts, bombproofs and obstacles, and its garrison of a strength obviously equal (and in reality superior)' to that of the assailants.

The Japanese, too, had effected their object, and as they converged on their objective, the inner flanks of the three armies had connected and the supreme commander Marshal Oyama had taken command of the whole. But, as the event was to prove, the military policy of Japan had failed to produce the requisite number of men for the desired Sedan, and so, instead of boldly pushing out the 1st Army to such a distance that it could manoeuvre, as Moltke did in 1866 and 1870, he attached

it to the general line of battle. It was not in two or three powerful groups but in one long chain of seven deployed divisions that the advance was made.

On the 25th of August the 2nd and 4th Armies from Haicheng and the 1st Army from the Yin-tsu-ling and Yu-shu-ling began the last stage of their convergent advance. The Russian first position extended in a semicircle from Anshantien (on the Liao-Yang-Hai-cheng railway) into the hills at Anping, and thence to the Taitse river above Liao-Yang; both sides had mixed detachments farther out on the flanks. The. first step in the Japanese plan was the advance of Kuroki's army to Anping. Throughout the 25th, night of 25th-26th, and 26th Battle of of August, Kuroki advanced, fighting heavily all Liao- along the line, until on the night of the 26th the Yang ' defenders gave up the contested ground at Anping. Hitherto there had only been skirmishing on a large scale on the side of Hai-cheng. Kuropatkin having already drawn in his line of defence on the south side towards Liao-Yang, the 2nd and 4th Japanese Armies delivered what was practically a blow in the air. But on the 27th there was a marked change in the Japanese plan. The right of the 1st Army, when about to continue the advance west on Liao-Yang, was diverted northward by Oyama 's orders and ordered to prepare to cross the Taitszeho. The retirement of the Russian Southern Force into its entrenchments ■ emboldened the Japanese commander-in-chief to imitate Moltke's method to the full. On the 28th, however, the 1st Army made scarcely any progress. The right (1 2th) division reached the upper Taitszeho, but the divisions that were to come up on its left were held fast by their

LIAO-YANG

English Miles

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Russians (29-30 August) '... Japanese advance .

opponents. The 29th was an uneventful day, on which both sides prepared for the next phase.

The Russians' semicircle, now contracted, rested on the Taitszeho above and below the town, and their forces were massed most closely on either side of the " Mandarin " road that the 1st Army had

followed. Opposite this portion of the line was the Guard and the 4th Army. Oku was astride the railway, Kuroki extending towards his proposed crossing-points just beyond Kuropatkin's extreme left (the latter was behind the river) . On the 30th the attack was renewed. The Guard, the 4th Army and the 2nd Army were completely repulsed.

On the night of the 30th the first Japanese troops crossed the Taitszeho near Lien-Tao-Wun, and during the 31st three brigades were deployed north of K wan-tun, facing west. The Russian left wing observed the movement all day, and within its limited local resources made dispositions to meet it. Kuro- patkin's opportunity was now come. The remainder of the 2nd division was following the 12th, leaving a nine-mile gap between Kuroki and Nozu, as well as the river. It was not into this gap, which had no military significance, but upon : the isolated divisions of the 1st Army that the Russian general pro- posed to launch his counterstroke. Reorganizing his southern defences on a shorter front, so as to regain possession of the re- serves that he had so liberally given away to his subordinates, he began to collect large bodies of troops opposite Kuroki, while Stakelberg and Zarubayev, before withdrawing silently into the

lines or rather the fortress of Liao-Yang, again repulsed Oku's determined attacks on the south side. But it was not in con- fidence of victory that Kuropatkin began the execution of the new plan — rather as a desperate expedient to avoid being cut off by the 1st Army, whose strength he greatly overestimated. On the morning of the 1st of September — the anniversary of Sedan, as the Japanese officers told their men — Oyama, whose intentions the active Kuroki had somewhat outrun, delivered a last attack with the 2nd and 4th Armies, and the Guard on the south front, in the hope of keeping the main body of the Russians occupied and so assisting Kuroki, but the assailants encountered no resistance, Zarubayev having already retired into the fortress. North of the Taitszeho the crisis was approaching. Kuroki's left, near the river, vigorously attacked a hill called Manjuyama which formed part of the line of defence of the XVII. Corps from Europe. But the right of the 1st Army (12th division) was threatened by the gathering storm of the counter- stroke from the side of Yentai Mines, and had it not been that the resolute Okasaki continued the attack on Manjuyama alone, the Japanese offensive would have come to a standstill. Manjuyama, thanks to the courage of the army commander and of a single brigadier, was at last carried after nightfall, and the dislodged Russians made two counter-attacks in the dark before they would acknowledge themselves beaten. Next

morning, . when Kuroki, who had conceived the mistaken idea of a general retreat of the Russians on Mukden, was preparing

to pursue, the storm broke. Kuropatkin had drawn together seven divisions on the left rear of the XVII. Corps, the strength of the whole being about 90,000. On the extreme left was Orlov's brigade of all arms at Yentai Mines, then came the I. Siberian Corps (Stakelberg), then the X. Corps, then the XVII. But Orlov, perplexed by conflicting instructions and caught in an unfavourable situation by a brigade of the 12th division which was executing the proposed " pursuit," gave wa}' — part of his force in actual rout — and the cavalry that was with him was driven back by the. Kobi (reserve army) brigade of the Guard. The fugitives of Orlov's command disordered the on-coming corps of Stakelberg, and the outer flank of the great counterstroke that was to have rolled up Kuroki's thin line came to an entire standstill. Meantime the X. Corps furiously attacked Okasaki on the Manjuyama, and though its first assault drove in a portion of Okasaki's line, a second and a third, made in the night, failed to shake the constancy of the 15th brigade. Misunderstandings and movements at cross-purposes multiplied on the Russian side, and at midnight Kuropatkin at last obtained information of events on the side of Yentai Mines. This was to the effect that Orlov was routed, Stakelberg's command much shaken, and at the same time Zarubayev in Liao-Yang, upon whom Oku and Nozu had pressed a last furious attack, reported that he had only a handful of troops still in reserve. Then Kuropatkin 's resolution collapsed, although about three divisions were still intact, and he gave the order to retreat on Mukden.

Thus the Japanese had won their great victory with inferior forces, thanks " in the first instance to the defeat of General Orlov. But at least as large a share in the ruin of the Russian operations must be attributed to the steadfast gallantry of the 15th brigade on Manjuyama." The losses of the Japanese ■ Russian totalled 23,000, those of the Russians 19,000. Coming, retreat as it did, at a moment when the first attacks on Port °° Arthur had been repulsed with heavy losses, this

brilliantly successful climax of the four months' cam- paign more than restored the balance. But it was not the expected Sedan. Had the two divisions still kept in Japan been present Kuroki would have had the balance of force on his side, the Russian retreat would have been

confused, if not actually a rout, and the war would have been ended on Japan's own terms. As it was, after another day's fighting, Kuropatkin drew off the whole of his forces in safety, sharply repulsing an attempt at pursuit made by part of the 12th division on the 4th of September. The railway still delivered 30,000 men a month at Mukden, and Japan had for a time outrun her re- sources. At St Petersburg the talk was not of peace but of victory, and after a period of reorganization the Russians advanced afresh to a new trial of strength. But the remainder of the Manchurian campaign, like the second half of the war of 1859, was nothing more than a series of violent and resultless encounters of huge armies — armies far larger than those which had fought out the real struggle for supremacy at Liao-Yang and Magenta.

At this time the siege of Port Arthur had only progressed so far that the besiegers were able to realize the difficulties before them. Nogi landed on the 1st of June, and his army (istand 1 Ith divisions) gradually separated itself from Oku's and got into position for- the advance on Port Arthur. Dalny, the commercial harbour, was seized without fighting, and a month was spent in preparing a base NorTs there. But so far from retiring within his fort-line Stessel

advance too ' c up a stron S position outside. Dislodged from this on on Port tlle 26th °^ J une ' tne Russians Checked Nogi's further Arthur. advance on July 3-4 by a fierce, though unsuccessful, counterstroke. Having been reinforced by the 9th division and two extra brigades of infantry, Nogi advanced again on the 26th. The Russians, having had a month wherein to intrench themselves, held out all along the line; but after two days and one night of fighting amongst rocks and on precipitous hill-sides, the Japanese broke through on the night of July 27-28. Stessel then withdrew in good order into Port Arthur, which in the two months he had gained by his fighting manoeuvre had been considerably strengthened. Nogi had already lost 8000 men.

The defences of Port Arthur, as designed by the Russians in 1 900, and owing to the meagre allotment of funds only partially carried out before the war, had some tincture, but no more, of modern continental ideas. There was a continuous enceinte of plain trace

round the Old Town, at a distance of 1000 to 2000 yds. from it, which had not and could not have had any influence on the issue of the siege. The main line of defence followed the outer edge of the amphitheatre of hills surrounding the harbour. These hills had their greatest development on the N.E. side, their outer crests being some 4000 yds. from the Old Town. West of the Lun river the defensive line

offered by the hills is less defined, and the line adopted for the permanent works was on the north only 3000 yds. from the harbour and 2000 yds. from the New Town. Running S.W. and S. back to the coast, it gradually draws in quite close to the S.W. end of the harbour. The total length of this line from sea to sea is some 12 m. Its most obvious weakness is that 5000 yds. N.W. of the harbour and New Town the now famous ” 203-Metre Hill ” overlooks both. Here it had been intended to construct permanent works, but considerations of expenditure had caused this to be deferred.

On this main line of defence some seven or eight permanent works had been disposed (it is difficult to define with accuracy, as some of the concreted works were little better than semi-permanent in character). Some of these had been prepared with interior parapets and plat- forms of concrete for medium guns. Fort Erh-Lung was of this character. The general design appears to have been grounded on the French detached forts of the ‘seventies (see Fortification), as the front parapet was designed for infantry and the interior, 10 ft. higher, for guns. The ditch, 30 ft. deep, excavated in the rock; was flanked by counterscarp galleries. The living casemates were under the gorge parapet. A grave defect in the design was that there was no covered communication between these casemates and the parapets. Fort Chi-Kuan had no artillery parapet. The ditch, 12 to 15 ft. deep, was defended by counterscarp „ . galleries. The casemates in the gorge, partially cut *pfrf S off from the terreplein by a couple of deep sunk yards Arthur or areas, could be defended in the last resort as a keep. In addition to this the terreplein was retrenched. In both of these forts there was an apparently meaningless projection at the gorge. It is possible that these were embryonic ” batteries traditores ” to flank the intervals. Fort Sung-Shu was of the same type as Chi-Kuan. These three were the only permanent forts seriously attacked.

The permanent works were supplemented before the siege began by,a prodigious development of semi-permanent works and trenches. Every knoll had its redoubt or battery, and the trenches were arranged line behind line, to give supporting, cross and enfilade fire in every direction. Thus on the north front, from Chi-Kuan battery to Sung-Shu, a distance of about two miles, there were three permanent forts and seven semi-permanent works and batteries. Behind these was the ” Chinese Wall,” and behind that more batteries and trenches. On the north-west front, 203-Metre Hill, in advance of the main line, was occupied by strong semi-permanent works, with trenches and redoubts to either flank; and 174-Metre Hill, 1500 yds. beyond it, was also held. The Lun-Ho valley where it cut through the line was closed by entanglements and fougasses, and swept by batteries on each side. In

front of the centre, the Waterworks Redoubt, a semi-permanent work covering the Port Arthur water supply, and connected by trenches with the four Temple Redoubts a mile away to the west, formed a strong advanced position. Wire entanglements were disposed in repeated lines in front of the defences, but they were not of a strong type. The Russians, with the resources of the fleet at their disposal (just as at Sevastopol), used great numbers of machine guns and electric lights, and the available garrison at first was probably, including sailors, 47,000 men.

Such were the defences that the Japanese attacked, with a force at the outset (30th of July) little more than superior numerically to the defenders, and an entirely inadequate siege train (18 6-in. howitzers, 66 4-7-in. guns and howitzers, and about 200 field and mountain guns) . They were imperfectly informed of the strength of the garrison and the nature of the defences. Recollections of their easy triumph in 1894 and perhaps thoughts of Sevastopol, German theories of the ” brusque attack,” the fiery ardour of the army, and above all the need of rapidly crushing or expelling the squadron in harbour, combined to suggest a bombardment and general assault. The bombardment began on the 19th of August and continued for three days, while the infantry was spreading along the front and gaining ground where it could. The real assault was made on the night of the 21st on the two Pan-Lung forts (semi-permanent) on the centre of the north-eastern front. The fighting was of the utmost severity, and continued through the 22nd ; and although the stormers captured the two forts they were absolutely unable to make any further pro- gress under the fire of the permanent forts Erh-Lung and Chi-Kuan on either side of, and the Wan-tai fort behind, Pan-Lung. Every attempt to bring up supports to the captured positions failed, and the Russians concentrated on the spot from all quarters. On the night of the 23rd-24th, just as the assault was being renewed, Stessel delivered a fierce counter-attack against the lost positions, and the result of an all-night battle was that though the forts were not recaptured, the assault was repulsed with over 5000 casualties, and the Japanese in Pan-Lung were isolated. This sortie raised the spirits of the Russians to the highest pitch. They seemed indeed to have broken the spell of defeat. On the Japanese side 15,000

Attacks on the north front.

men had been killed and wounded in three weeks. The Russians

strengthened their works around the captured forts in such a way as effectually to prevent farther advance, and the Japanese 3rd Army had now to resign itself to a methodical siege. Small sorties, partial attacks 1 and duels between the Japanese guns and the generally more powerful ordnance of the fortress continued. The siege approaches were first directed against theTemple- Waterworks group, which was stormed on the 19th and 20th of September. Pan-Lung was connected with the Japanese lines by covered ways, approaches were begun towards several of the eastern forts, and on the 20th of September 180-Metre Hill was stormed, though the crest was untenable under the fire from 203-Metre Hill. The Japanese were now beginning to pay more attention to the western side of the fortress, and from the 19th to the 22nd there was hard fighting around 203-Metre Hill, the attack being eventually repulsed with the loss of 2000 men. Operations in the west were thereupon abandoned for the time being, and the eastern forts remained the principal objective of the attack. Heavier howitzers had been sent for from Japan, and on the 1st of October the first batteries of 28 centimetre (11 in.) howitzers came into action. They fired a shell weighing 485 lb, with a bursting charge of 17 lb. On the 12th, the Japanese took the trenches between the Waterworks Redoubt and Erh-Lung, and cut the water- supply. Saps were then pushed on against Erh-Lung, and to help in their progress a Russian advanced work called " G " was captured on the 1 6th, by a skilfully combined attack of infantry and artillery. From this time forward there was a desperate struggle at the sap- heads on the north front. 2

On the 26th of October another assault was made on Chi-Kuan

1 A particular feature of these constant night-fights was the effective use of the defenders' searchlight, not only to show up the enemy but to blind him.

2 Hand grenades and extemporized trench mortars were used on both sides with very great effect. The Japanese hand grenades consisted of about I lb of high explosive in a tin case ; the Russian cases were of all sorts, including old Chinese shell. The Japanese employed wire-netting screens to stop the Russian grenades. Various means were tried for the destruction of entanglements. Eventually it was found that the best plan was to sap through them.

Fort and Battery, and was continued at intervals, varied by Russian counter-attacks, till the 2nd of November. By this time the Japanese were becoming disheartened. They had incurred an additional loss of 13,000 men without substantial gain, except a lodgment on the counterscarp of Sung-Shu. This prepared the way for mining, which

had already been begun at Erh-Lung. On the 1 7th of November seven mines were exploded at Sung-Shu, which blew in the back of the counterscarp galleries. At Erh-Lung on the 20th of November three mines were exploded, which half filled the ditch, and the Japanese later on sapped across to the escarp over the debris. At Chi-Kuan, the counterscarp gallery had been breached by an ill-managed Russian mine on the 23rd of October and the Japanese got in through the breach and made a lodgment. They did not, however, get possession of the whole of the counterscarp galleries before about the middle of November. On the 22nd of November the Japanese assaulted the trench round Chi-Kuan battery. It was captured and retaken by counter-attack twice between 6 p.m. and 1 a.m. In this fight each side was using corpses as breastworks.

On the 26th of November another assault was made on the same lines as that of the 30th of October. By this time the besiegers were sapping under the escarps of the northern forts, and it would have been better to delay. But the situation was serious in the extreme. In Manchuria Kuropatkin's army had reasserted itself. From Europe Rozhestvenski's squadron was just setting sail for the Far East. Marshal Oyama sent his principal staff officers to stimulate Nogi to fresh efforts, and some exhausted units of the besieging army were replaced by fresh troops from Japan. With 100,000 men and this urgent need of immediate victory, Nogi and the marshal's staff officers felt bound tp make a third general assault. The siege works had indeed made considerable progress. The ditches of Sung-Shu and Erh-Lung were partially filled. They held most of the ditch of Chi-Kuan Fort and were cutting down the escarp, and two parallels had been made only 30 yds. from the Chinese Wall at " G " and Pan-Lung.

The general attack was made at I p.m. At Sung-Shu the stormers got into the fort, but suffered much from the artillery on the western side of the Lun-ho valley, and were beaten out of it again in 20 minutes ; 2000 men tried in vain to get up the Lun-ho valley to take Sung-Shu in rear. At Erh-Lung they could not get over the outer parapet. At " G " they took a portion of the Chinese Wall and lost

Metre Hill.

Fallot

it again, other trenches with a cross fire being behind. At Pan-Lung the machine guns on the Wall prevented them from leaving the parallel. At Chi-Kuan Fort the terreplein of the fort had been covered with entanglements defended by machine guns on the gorge parapets, and the Japanese could make no way. Briefly, there was a furious fight all along the line, and nothing gained. On the 27th cf November, after losing 12,000 men, the assault was abandoned. On the north front the Japanese returned to mining.

But so urgent was the necessity of speedy victory that the fighting had to continue elsewhere. And at last, after every other point had been attempted, the weight of the attack was directed on 203-Metre Hill. A battery of 11-inch howitzers was established only one mile away. On the 28th of November assaults were made and failed. On the 30th of Novemberan attack with fresh troops failed again. On the 1st of December there was a heavy bombardment by the big howitzers, which obliged the Russians to take shelter in rear of the ruined works. On the 2nd of December the Russians tried a counter-attack. During the next two days the artillery were busy. The engineers sapped up to the ruins of the western work, saw the shelters on the reverse slope and directed artillery fire by telephone. Thirty-six guns swept the ground with shrapnel. Finally on the 5th of December the Japanese attacked successfully. Their losses in the last ten days at 203- Metre Hill had been probably over 10,000. Those of the Russians were about 5000, chiefly from artUlery fire.

This was the turning-point of the siege. At once the 1 i-inch howitzers, assisted by telephone from 203-Metre, opened upon the Russian ships; a few days later these were wholly hors de combat, and at the capitulation only a few destroyers were in a condition to escape. The siege was now pressed with vigour by the construction ,of batteries at and around 203 Metre, by an infantry advance against the main western defences, and by renewed operations against the eastern forts. The escarp of Chi-Kuan was blown up, and at the cost of 800 men, General Sameyeda (nth division), personally lead- ing his stormers, captured the great fort on the 19th of December. The escarp of Ehr-Lung was also blown up, and the ruins of the fort were stormed by the 9th division on the 28th of December, though a mere handful of the defenders prolonged the fighting for eight hours and the assailants lost 1000 men. Sung-Shu suffered a worse fate on the 31st, the greater part of the fort and its defenders being blown up, and on this day the

whole defence of the eastern front collapsed. The Japanese 7th and 1st divisions were now advancing on the western main line; the soul of the defence, the brave and capable General Kondratenko, had been killed on the 15th of December, and though the Japanese seem to have anticipated a further stand, 1 Stessel surren- dered on the 2nd of January 1905, with 24,000 effective and slightly wounded and 15,000 wounded and sick men, the remnant of his original 47,000. The total losses of the 3rd Japanese Army during the siege were about 92,000 men (58,000 casualties and 34,000 sick). Meanwhile the Japanese navy had scored two important successes. After months of blockade and minor fighting, the Russian Port Arthur squadron had been brought to action on the 10th of Naval August. Admiral Vitheft, Makarov's successor, had put to

battle of sea Portly after the appearance of the 3rd Army on the ■"** land front of Port Arthur. The battle opened about noon, 20 m. south of the harbour; the forces engaged on each side varied somewhat, but Togo finally had a superiority. Admiral Vitheft was killed. As the Russians became gradually weaker, the Japanese closed in to within 3 m. range, and Prince Ukhtomsky (who succeeded to the command on Vitheft's fall) gave up the struggle at nightfall. The Russians scattered, some vessels heading southward, the majority with the admiral making for Port Arthur, whence they did not again emerge. All the rest were either forced into neutral ports (where they were interned) or destroyed, among the latter being the third-class cruiser " Novik," which had already earned a brilliant reputation for daring, and now steamed half round Japan before she was brought to action and run ashore. The victors blockaded Port Arthur, until near the close of the siege, when, after going ashore and examining the remnant of the Russian fleet from 203-Metre Hill, Togo concluded that it would be safe to return to Japan and give his ships a complete refit. Kaimura's squadron, after various adventures, at last succeeded on the 14th of August in engaging and defeating the Russian Vladivostok squadron (Admiral Jessen). Thus the Russian flag disappeared from the Pacific, and thenceforward only the Baltic fleet could hope seriously to challenge the supremacy of the Japanese navy.

The remainder of the war on land, although it included two battles on a large scale and numerous minor operations, was principally a test of endurance. After Liao-Yang there were no extended operations, the area of conflict being confined to the plain of the coast side of the Hun-ho and the fringe of the

1 As regards food and ammunition, the resources of the defence were not by any means exhausted, and General Stessel and other senior

officers of the defence were tried by courts-martial, and some of them convicted, on the charge of premature surrender.

mountains. Japan had partially accomplished her task, , but had employed all her trained men in this partial accomplish- ment. It was questionable, even in October 1904) whether she could endure the drain of men and money, if it were prolonged much further. On the other hand, in Russia opposition to the war, which had never been popular, gradually became the central feature of a widespread movement against irresponsible government. Thus while the armies in Manchuria faced one another with every appearance of confidence, behind them the situation was exceedingly grave for both parties. A state of equilibrium was established, only momentarily disturbed by Kuropatkin's offensive 1 on the Sha-ho in October, and by the Sandepu incident in the winter, until at last Oyama fought a battle on a grand .scale and won it. Even then, however, the results fell far short of anticipation, and the armies settled down into equilibrium again.

After the battle of Liao-Yang Kuropatkin reverted for a moment td the plan of a concentration to the rear at Tiding. Politically, however, it was important to hold Mukden, the Manchurian capital, and since the Japanese, as on previous occasions, reorganized instead of pursuing, he decided to stand his ground, a resolution which had an excellent effect on his. army. Moreover, growing in strength day by day, and aware that the Japanese had outrun their powers, he resolved, in spite of the despondency of many of his senior officers, to take the offensive. He disposed of about 200,000 men, the Japanese had about 170,060. The latter lay entrenched north of Liao-Yang, from a point" 9 m. west of the rail- Way, through Yentai Station and Yentai Mines, to the hills farther east. There had been a good deal of rain, and the ground was heavy. Kuropatkin's intention-' was to work round the Japanese right on the hills with his eastern wing (Stakelberg) , tomove his western wing (Bilderling) slowly southwards, entrenching each strip of ground gained, and finally with the centre— -i.e. Bilderling's left— and Stakelberg, to envelop and crush the 1st Army, which formed the Japanese right, keeping the 4th Army (Nozu) and the 2nd Army (Oku) in countenance by means of Bilderling's main body. The manoeuvre began on the 5th of October, and by the evening of the 10th, after four days of fairly heavy advanced-guard fighting, chiefly between Bilderling and Nozu, Stakelberg Was in his assigned position in the mountainous country, facing west towards Liao- Yang, with his left on the Taitseho. The advance of Bilderling, however, . necessarily methodical and slow in any .case, had .taken more time than was anticipated. Still, Bilderling crossed the Sha-ho and made some progress towards Yentai, and the sha-ho demonstration was so far

effectual that Kuroki's warn- ings were almost disregarded by the Japanese headquarters. The commander of the 1st Army, however, took his measures well, and Stakelberg found the greatest trouble in deploying his forces for action in this difficult country. Oyama became convinced of the truth on the 9th and 10th, and prepared a great counter-attack. Kuroki with only a portion of the 1st Army was left to defend at least 15 m. of front, and the entire 2nd and 4th Armies and the general reserves were to be thrown upon Bilderling. On the nth the real battle opened. Kuroki displayed the greatest skill, but he was' of course pressed back by the four-tp-one superiority of the Russians. Still the result of Stakelberg's attack, for which he wg.s unable to deploy his whole force, was disappointing, but the main Japanese attack on Bilderling was not much more satisfactory, for the Russians had entrenched every step of their previous advance, and fought splendidly. The Russian commander-in-chief states in his work on the war that Bilderling became engaged a fond instead of gradu- ally withdrawing as Kuropatkin intended, and at any rate it is unquestioned that in consequence of the serious position- of affairs on the western wing,, not only did Stakelberg use his reserves to support Bilderling, when the 12th division of Kuroki's army was almost at its last gasp and must have yielded to fresh pressure, but Kuropatkin himself suspended the general offensive on the 13th of October. In the fighting 'of the I3th-i6th of October the Russians gradually gave back as far as the line of the Sha-ho, the Japanese following until the armies faced roughly north and south on parallel fronts. The fighting, irregular but severe, continued. Kuropatkin was so far averse to retreat that he ordered a new offensive, which was carried out on the i6-l7th. Putilov and Novgorod hills, south of the Sha-ho, were stormed by the Russians, and the Japanese made several efforts to retake these positions without success. Kuropatkin wished to continue the offensive, but his corps com- manders offered so much opposition to a further offensivethat he at last gave up the idea. The positions of the rival armies from the 1 8th of October, the close of the battle of the Sha-ho, t? the 26th of January 1905, the opening of the battle of Sandepu (Heikoutai)— a period almost entirely devoid of incident — may be described by the old-fashioned term " winter quarters." The total losses of the Russians are stated as 42,000 men, but this is very considerably exaggerated ; the Japanese acknowledged 20,000 casualties.

In January 1905, apart from Mishcheriko's cavalry raid in rear

MUKDEN

£«K«h Miles

of Oyama's forces (January 8th-i6th) the only change in the relative positions of Oyama and Kuropatkin as they stood after the battle of the Sha-ho was that the Japanese had extended somewhat west- wards towards the Hun-ho. The Russians, 300,000 strong, were now organized in three armies, commanded by Generals Linievich, Grippenberg and Kaulbars; the total strength of the Japanese 1st, 2nd and 4th Armies and reserve was estimated by the Russians at 220,000. Towards the end of January, Kuropatkin took the offensive. He wished to inflict a severe blow before the enemy could be reinforced by the late besiegers of Port Arthur, and sent Grippenberg with seven divisions against Oku's two on the Japanese left. The battle of Sandepu (Heikoutai), fought in a terrible snow- storm on the 26th and 27th of January 1905, came near to being a great Russian victory. But the usual decousu of Russian operations and their own magnificent - resistance saved the Japanese, and after two days' severe fighting, although Grippenberg had not been checked, Kuropatkin, in face of a counter-attack by Oyama, decided to abandon the attempt. The losses were roughly 8000 Japanese to over 10,000 Russians.

Both sides stood fast in the old positions up to the verge of the last and greatest battle. Kuropatkin was reinforced, and appointed Kaulbars to succeed Grippenberg and Bilderling to the command of the 3rd Army vacated by Kaulbars. On the other hand, Nogi's 3rd Army, released by the fall of Port Arthur, was brought up on the Japanese left, and a new army under Kawamura (5th), formed of one of the Port Arthur and two reserve divisions, was working from the upper Yalu through the mountains towards the Russian left rear. The Russian line in front of Mukden from the Hun-ho, through the Putilov and Novgorod hills on the Sha-ho, to the mountains, was 47 m. long, the armies from right to left being II. (Kaulbars), III. (Bilderling) and I. (Linievich) ; a general reserve was at Mukden. On the other side from left to right, on a line 40 m. long, were Oku (2nd Army), Nozu (4th), Kuroki (1st) and Kawamura (5th), the general reserve in rear of the centre at Yentai and the 3rd Army in rear of Oku. Each side had about 310,000 men present. The entire front of both armies was heavily en- trenched. The Russians had another offensive in contemplation Xxiii. 30

Emery. Walker sc

when the JapaneseforestaUed them by advancing on the 21st of

February, The 5th Army gradually drove in Kuropatkin's small detachments in the mountains, and came up jˆuiaieit. in line with Kuroki, threatening to envelop the Russian left. The events on . this side and misleading information induced Kuropatkin to pay particular attention to his left. The Japanese 1st and 5th Armies were now engaged (25th February), and elsewhere all wa,s quiet. But on the 27th the fighting spread to the centre,, and Nogi (originally behind Oku) was on the march to envelop the Russian right. He was held under observation throughput by Russian cavalry, but it seems that little attention was paid to 'their reports by Kuropatkin, who was still occupied with Kuroki and Kawamura, and even denuded his right of its reserves to reinforce his left. With a battle-front exceeding two days' marches the wrong distribution of reserves by both sides was a grave misfortune. Kuropatkin was at last convinced, on the 28th of February, of the danger from the west, and did all in his power to form a solid line of defence on the west side of Mukden. Nogi's first attack (ist- 2nd March) had not much success, and a heavy counterstroke was delivered on the 2nd. Fighting for localities and altera- tions in the interior distribution of the opposing forces occupied much time, and by the 3rd, though the battle had become severe, Kuropatkin had merely drawn in his right and right centre (now facing W. and S.W. respectively) a little nearer Mukden. His centre on the Sha-ho held firm, Kuroki ajid Kawamura made but slight progress against his left in the mountains. Nogi and Oyama were equally impressed with the strength of the new (west) Russian front, and like Grant at Petersburg in 1864, extended farther and farther to the outer flank, the Russians following suit. The Japanese marshal now sent up his : army reserve 1 , which had been kept far to the rear at Yentai, to help Nogi. It was not before the evening of the 6th of 'March tli&t'it came up with the 3rd Army and was 'placed in position opposite the centre of the Russian west front. On

the rest of the line severe local fighting had continued, but the Russian positions were quite unshaken, and Kuropatkin's reserves — which would have been invaluable in backing up the counter-attack of the 2nd of March — had returned to face Nogi. He had organized another counterstroke for the 6th, to be led by Kaulbars, but this collapsed unexpectedly after a brief but severe fight.

Kuropatkin now decided to draw in his centre and left towards Mukden. On the 7th, the various columns executed their movement to the Hun-ho with complete success, thanks to good staff work. The Japanese followed up only slowly. Nogi and Kaulbars stood fast, facing each other on the west front; after the arrival of the general reserve, Nogi was able to prolong his line to the north and eventually to bend it inwards towards the Russian line of retreat. Bilderling and Linievich were now close in to Mukden and along the Hun-ho. On the other side Oku had taken over part of Nogi's line, thus freeing the 3rd Army for further extension to the north-west, and the rest of the 2nd Army, the 4th, the 1st and the 5th were approaching the Hun-ho from the south (March 8th). On this day the Russian fighting between Nogi and Kaulbars was very severe, retreat on and Kuropatkin now made up his mind to retreat TieUng. towards Tieling. On the 9th, by Oyama's orders, Nogi extended northward instead of further swinging in south-east- ward, Oku now occupied all the original line of the 3rd Army, Nozu alone was left on the south front, and Kuroki and Kawa-mura began to engage Linievich seriously. But Nogi had not yet reached the Mukden-Tieling railway when, on the night of the 9th, every preparation having been made, Kuropatkin's retreat began. On the 10th, covered by Kaulbars, who held off Nogi, and by strong rearguards at and east of Mukden, the movement continued, and though it was not executed with entire precision, and the rearguards suffered very heavily, the Russians managed to draw off in safety to the northward. On the evening of the 10th, after all their long and hardly contested enveloping marches, Nogi's left and Kawamura's right met north of Mukden. The circle was complete, but there were no Russians in the centre, and a map of the positions of the Japanese on the evening of the 10th shows the seventeen divisions thoroughly mixed up and pointing in every direction but that of the enemy. Thus the further pursuit of the Russians could only be under- taken after an interval of re-organization by the northernmost troops of the 5th and 3rd Armies. But the material loss in- flicted on the Russians was far heavier than it had ever been before. It is generally estimated that the Russian losses were no less than 97,000, and the Japanese between 40,000 and 50,000. Japan had had to put forth her supreme effort for the battle, while of Russia's whole strength not one-tenth had been used. But Russia's strength in Europe, with but one line whereby it could be brought to bear in the Far East, was immaterial, and on the theatre of war a quarter of the Russian field forces had been killed, wounded or taken.

It remains to narrate briefly the tragic career of the Russian Baltic fleet. Leaving Libau on the I3th-i5th of October 1904, the Rozbest- ˆ

eet steamed down the North Sea, expecting every night . _ ” to be attacked by torpedo-boats. On the 21st, in their excitement, they opened fire on a fleet of British trawlers voyage. Qn t ˆ e p gg er Bank (q.v.), and several fishermen were killed. This incident provoked the wildest indignation, and Russia was for some days on the verge of war with England. A British fleet ” shadowed ” Rozhestvenski for some time, but eventually the Russians were allowed to proceed. On reaching Madagascar, Rozhestvenski heard of the fall of Port Arthur, and the question of returning to Russia arose. But a reinforcement under Rear- Admiral Nebogatov was despatched from the Baltic via Suez early in March 1905, and the armada proceeded by the Straits of Malacca, Nebogatov joining at Kamranh Bay in Cochin China. The united fleet was formidable rather in number than in quality; the battleships were of very unequal value, and the faster vessels were tied to the movements of many ” lame ducks.” Rozhest- venski had, moreover, numerous store-ships, colliers, &c. Never- theless, the Japanese viewed his approach with considerable anxiety, and braced themselves for a final struggle. Of the various courses open to him, Togo prudently chose that of awaiting Rozhestvenski in home waters. The Russians left Kamranh on the 14th of May, and for a time disappeared into the Pacific. _ It was assumed that

they were making for Vladivostok either via Tsushima strait or by the Pacific. Rozhestvenski chose the former course, and on the 27th of May the fleets met near Tsushima. About 1.45 p.m., the BatUe f Russians, who were still in a close cruising formation, Tsushima attempted to open out for battle as the Japanese ap- (Seg t proached. The Russian battleships, originally heading j._ fl _ 1 N.N.E., swerved to the E. as the Japanese battle squadron passed across their front. Togo’s fire was concentrated first on the ” Osliabia,” the leading Russian battleship, and by 2.25 she was hors de combat. At this time both the battle-fleets were running E. Togo, concentrating his fire on each ship in succession- and seek- ing by superior speed to head off the Russians, now inclined towards the S.E., and the Russians conformed. At 3, the Russian flagship ” Suvarov” had fallen out of the line, though stili firing. Rozhest- venski himself had been wounded, and the command had devolved on Nebogatov. Shortly afterwards the Russians suddenly turned N., and sought to pass, across the wake of Togo’s battle-fleet, up the straits. Thereupon the leading Japanese ships promptly turned together, covered by the rear ships, which ran past them on the original course and then came round in succession; this manoeuvre was so well executed that the Japanese again headed off their enemy, who swerved for the second time towards the E. The Japanese thereupon executed the same manoeuvre as before, and

steamed S.E. again (about 4.40). They were not unscathed, but the Russians were suffering far more severely. Meanwhile, the cruisers on both sides had been heavily engaged. The Russian cruisers kept on the right of their battleships, while the Japanese, very superior in speed, ran S., S.E. and E. across the rear of the enemy's main squadron, and about 3 ranged up alongside the Russian cruisers. The latter were slower, and hampered by the crowd of damaged battleships, store-ships and colliers; before 5 they were in the greatest confusion, which was presently increased by the battleship squadron, how turned back and heading W., with Togo in pursuit. The Russians again broke out northward; but some of the Japanese squadrons hung on to the remnant of the enemy's battle-fleet, and the others dealt with the numerous Russian vessels that were unable to keep up. Then Togo called off his ships, and gave the torpedo craft room and the night in which to act. At day- light the larger ships joined in again, and before long the whole Russian fleet, with few exceptions, had been captured or sunk.

After the disasters of Mukden and Tsushima, and being threatened with internal disorder in European Russia, the tsar, early in June, accepted the mediation of the president of The the United States, and pourparlers were set on foot. Peace of The war meanwhile drifted on through May, June and Ports ' h July. Linievich, who succeeded Kuropatkin shortly after the battle of Mukden, retired slowly northward, re-organizing his forces and receiving fresh reinforcements from Europe. A Japanese expedition occupied Saghalien (July 8-30) , and another, General Hasegawa, advanced through Korea towards Vladivos- tok. But the fighting was desultory. The peace negotiations were opened at Portsmouth, New Hampshire, on the 9th of August, and by the end of the month the belligerents had agreed as to the main points at issue, that Russia should cede the half of Saghalien, annexed in 1875, surrender her lease of the Kwangtung peninsula and Port Arthur, evacuate Manchuria and recognize Japan's sphere of influence in Korea. The treaty of peace was signed on the 23rd of August 1905.

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RUSSO-TURKISH WARS

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RUSSO-TURKISH WARS (1828-29 and 1877-78). The earlier wars between Russia and Turkey possess little military interest to-day, and are scarcely remembered except as the occasion of Suvarov’s exploits. The first of the three 19th-century (1806- 181 2) wars, however, though much less vigorously fought than the preceding wars, at any rate introduced the ” Eastern ques- tion ” into European politics as a factor affecting the balance of power, and its cessation at the moment of Napoleon’s advance on Moscow had a great effect on the emperor’s Russian campaign. The second war is more celebrated. It was a reflex of the Greek War of Independence, and began with the invasion of Rumania by the Russians in May 1828. One corps invested and took Braila, another passed by Bucharest and besieged Rustchuk and Silistria, and a third crossed the Danube below Isacka. The first and the last were united as an army under the tsar and advanced through the Dobrudja on Shumla. But after a considerable amount of fighting it was decided that the Turks here were too strong for the invaders, and the tsar drew off his forces by degrees towards Varna, which was besieged next. But the Shumla troops were thus gradually set free to join the Turkish field army under the grand vizier, which, however, merely menaced, without seriously attacking, the besiegers of Varna. The place surrendered on the 10th of October 1828, and the tsar at once turned upon the grand vkier, attacked him on the river Kamchik (15th October) and forced him to retreat to Aidos.

Meantime, however, Silistria offered a gallant resistance. Even when the besiegers were reinforced from the main army they could not master the defence, and when winter came on the siege was abandoned, and the Russians drew off into Rumania into winter quarters. In Asia, meanwhile, a Russian army under Prince Paskievich had advanced from Tiflis, and captured Kars and other places, while the Black Sea fleet secured the surrender of Poti. Paskievich next defeated the Turks at Akhalzik (27th August), captured Ardahan, and advanced by Bayazid to the upper Euphrates. But coming there into conflict with the fierce Kurds, he gave up further enterprises and, leaving garrisons in the strong places, took his army back into the Caucasus for the winter.

In 1829 Diebitsch took over the command of the 70,000 men on the Danube, and resolved to carry the war over the Balkans. As a preliminary the fleet seized Sozopolis (Sisepol). A second and vigorously pressed siege of Silistria ended with the surrender of the place on June 30th, the Turkish operations for the expulsion of the Sozopolis garrison and the relief of Silistria being dilatory as before. The Turkish army was at this time in process of reorganization on a European model, which added to the difficulties of their situation. The grand vizier, Reschid Mehmet, in May attempted to combine the Rustchuk and Shumla garrisons for the expulsion of the Russians from Varna, but unsuccessfully, the two columns being beaten in detail. Soon afterwards Diebitsch, with part of the army investing Silistria, marched against him and defeated him at Tcherkovna (nth June). Immediately after this Diebitsch carried out the brilliant passage of the Balkans and advanced to Adrianople, which laid Constantinople at his mercy, and brought about an immediate peace. A month after its signature, a Turkish army from the west, attempting to re- capture Adrianople behind Diebitsch, was defeated on the 1 6th October at Arnaut Kaliessi. In Asia, meantime, Pas- kievich, after relieving Akhalzik, where his garrison had been blockaded, won two victories on two successive days at Kainly and Milli Duzov (1st and 2nd June), and captured a number of fortresses, his victorious advance being arrested only by the terms of peace. (X.)

The War of 1877-78. — On 24th April 1877, the tsar declared war against Turkey, with the avowed object of righting the wrongs of the Christians in Turkey. The Turco-Servian war was just over. Contrary to expectation the Turks had proved victorious. Hostilities had ceased in October 1876, though it was not till 1st March 1877 that peace had been signed. During 1876 the Turks had also quelled an insurrection of the Christians

in Bulgaria, when the treatment they meted out to the Chris- tians and the cry of ” Bulgarian atrocities ” had aroused the sentimental sympathies of Europe.

The Danube formed the Turkish frontier. Flowing west to east along the southern boundary of Rumania, it turned to the north and then to the east to the Black Sea, enclosing the Dobrudja, an inhospitable and difficult region, of rectangular shape, some 100 m. N. to S. by 30 to 60 m. E. to W., which was the extreme northern part of the Turkish dominions.

The Russians did not anticipate that the opposition to be encountered from the Turkish forces would be of a serious nature. As for natural obstacles, there were the Danube and the Balkans directly across their route, but the passage of these was not likely to cause any serious delay.

The Turkish fortresses of the Quadrilateral — Rustchuk, Silistria, Shumla and Varna — could be avoided, and Nikopol and Vidin were more or less isolated. It would only be necessary to cover the lines of communication from the action of the garrisons of these places. It was known that Osman Pasha was at Vidin with what remained of the Turkish force which had defeated the Servians the previous year, and it would be necessary to detach a force to operate against him. There would be some delay in the forwarding of supplies, due to the fact that the Rumanian railway was of different gauge to the railways of Russia, but this would not be serious. This line, the only railway through Rumania, ran from Galatz to Bucha- rest, where one branch ran west by Slatina and the other to Giurgevo on the Danube, where it connected with a line south of the river from Rustchuk to Shumla and Varna through Rasgrad. It was generally imagined that the advance to Constantinople would be of the nature of a triumphal march. By a clause of the Treaty of Paris of 1856 the Russian naval forces in the Black Sea had been destroyed, and though this clause was revoked in 1871, in 1877 the Turks possessed the undoubted command of the sea. Had things been different, an advance through the Dobrudja, with a safe fine of supply by water, would have offered many advantages. Under existing circumstances, with Turkish gunboats on the Danube and ironclads on the Black Sea, such a course was out of the question.

The plan of campaign formed by the Russians was as follows: One corps was to enter the Dobrudja to protect the fine of communication against any Turkish advance east of Plans of the Danube, while the remainder would cross the cam- Danube between Rustchuk and Nikopol, cross the P*iz B – Balkans and advance on Adrianople.

Detached forces would meanwhile mask the ” Quadrilateral ” and the Turkish force at Vidin.

A Convention had been made with Rumania, allowing the passage of the Russians through the country. The Rumanians proclaimed their independence of Turkey, and although the tsar declined their offer of active co-operation for the time being, their troops occupied Calafat, facing Vidin, and early in May their batteries engaged the guns of Vidin across the river. The Russian army with which it was proposed to carry on the war, consisted of six army corps and two rifle brigades. Each corps was formed of one cavalry and two infantry divisions. There were in addition 74 squadrons and 52 guns of Cossacks. Each infantry division had 48, and each cavalry division 12 guns. This force had been mobilized in the November of the previous year, and was now distributed as follows: —

Commander-in-chief: The grand-duke Nicholas, with head- quarters at Kishinev.

VII. Army Corps ■ . . Odessa and Tatar Bunar.

XI.

. Tarutinskaja and Kanszany.

VIII.

Kishinev.

XII.

Ungheni.

IX.

. Winnica.

,x.

Crimea.

Rifle Brigades

Bestomak.

The mobilization of the IV., XIII., and XIV. Army Corps had been ordered in December 1876, but they would not be ready to move till the following month — May 1877. In

addition to the above, there were heavy artillery with 400 siege guns, engineers with pontoon trains, naval launches, and the necessary supply trains. The total Russian forces numbered 200,000 combatants of all arms, with 850 field and 400 siege guns.

For some months prior to the tsar's declaration, Turkey had realized that war was inevitable, but such preparations as were made were far from adequate. Abdul Kerim, who had commanded in Servia the previous year, was still acting as commander-in-chief, but the task set him was not an easy one. With the Russians in front, the Servians and Monte- negrins, whose action was known to be uncertain, on the flank, and the Christian population of Bulgaria, in sympathy with the Russians, in the midst, it required a younger and more energetic man, with a greater knowledge of the art of war than he possessed, to plan and to carry out a successful defence of the Moslem dominions. The prospect of war had aroused the Turks, and the nation had taken steps to prepare for the conflict, but they lacked trained leaders. The Turkish officers were but ill-instructed. Works on the art of war did not exist in the Turkish language General . conscription existed in Turkey, ' but there was an entire absence of organization. Theoretically, each of the six districts into which the empire was divided should have produced an army of four corps, but it was only on paper. Practically the troops were not organized in corps. At the outbreak of war, Osman's force, some 30,000 strong, was at Vidin; a few battalions were spread along the Danube from Vidin to Silistria, with a brigade of infantry at Nikopol, another at Sistova, and the best part of two divisions at Rustchuk. Abdul Kerim's head- quarters were at Shumla where there were two more infantry divisions. A cavalry division was in process of organization. Varna was the base of supply and was connected by rail with Shumla and Rustchuk. Suleiman Pasha with some 40,000 men was still in Montenegro. The total Turkish forces in Europe at that time were about 120,000 men with 450 guns, but they were disseminated instead of being concentrated, or grouped in view of a rapid concentration. Abdul Kerim's plan, or rather his

idea, was, that the Russians would find some difficulty in the first place in forcing the passage of the Danube, and when they had succeeded in this, they would be bound to enter the zone of the Quadrilateral, where he hoped, operating with the fortresses as supports, to deal with them successfully. As regards the Turkish fleet, at the outset, in addition to a fleet of 8 ironclads below Braila, there were 7 monitors and 18 wooden ships of war on the Danube between Hirsova arid Vidin.

In the matter of armament the Turks had the advantage. The artillery were armed with a Krupp breech-loading gun, which was better than the Russian bronze gun, while the Peabody-Martini rifles of the infantry were superior to the Russian Krenk. The firearm of the Turkish cavalry was the Winchester repeating carbine, which was inferior to the short Berden with which the Russian cavalry was armed. But this advantage in armament was discounted by the fact that, from motives of economy, the Turkish soldier had done but little rifle practice.

Hostilities commenced on the 24th of April, when the Russian army advanced in three columns towards Bucharest, lsi the eastern flank covered by the XI. Corps which

PeHod.— marched to Galatz. By the end of May the bulk The of the Russian forces were assembled at Bucharest

Russian practically opposite the intended point of passage, and with the advanced guard under General Skobelev

passage at Giurgevo, and cavalry observing the river line „ th ° from Turnu Magureli to Kalarashi. It was now Danube. dec ; ded to await the arr i va j f t h e jy., XUli, and

XIV. Corps and the necessary bridging material for the passage of the Danube.

On June 15th the troops were disposed as follows: 8th Cavalry Division at Turnu Magureli; 12th at Oltenitza; 2nd at Kalarashi; Advanced Guard at Giurgevo; XI. Army Corps

at Oltenitza and Giurgevo; VIII., XII., XIII., |IX., at Bucharest; |IX. at Slatina; IV. at Slobodsia; XIV. at Galatz; VII. at Odessa; X. in the Crimea. Meanwhile steam launches were brought overland, and the Russians, by means of torpedoes, submarine mines and their shore batteries, had succeeded in clearing the Danube of Turkish vessels between Nikopolis and Rustchuk. Two of the smaller iron- clads had

been sunk, the remainder of the flotilla driven under the shelter of the fortresses, while barricades of mines effectually isolated them and prevented them from again entering the zone of operations. Of the large ironclads on the lower Danube, one was sunk near Sulina, and from that time the remainder stayed in Sulina harbour.

On June 22nd the XIV. Army Crops crossed into the Dobrudja at Galatz and advanced south, the Turkish detach- ment there retiring before them. Pontoons having been brought by rail, the necessary rafts and boats (which had been constructed at Slatina on the Aluta) were floated down to the neighbourhood of Zimnitza, and on June 24th siege batteries opened fire on Nikopol and Rustchuk, while the IX. Army Corps made a feint of crossing just below Nikopol. These measures were effective in confusing the Turkish commander as to the Russian intentions, and on the night of June 26/27th, 12 companies of rifles, with a squadron and 6 guns, were landed on the south bank opposite Zimnitza, and within twenty-four hours the whole of the VIII. Corps had crossed the river. By July 2nd the Russians had completed a bridge over the river, which is 1000 yds. wide at this part. At Sistova was a Turkish brigade of infantry. The commander, in the early morning of the 27th, received information from his outposts of the crossing, but instead of moving with his whole force, sent two battalions to oppose it. The Russians drove them back, and when reinforced, advanced against the heights in rear of Sistova, which were occupied with a loss of 800 men, the Turkish troops retreating to Tirnova and Nikopol. The Turks had remained ignorant of the Russians' concentration in Rumania and no attempt had been made to discover their plans. Abdul Kerim remained inactive in the fortresses of the Quadrilateral, and even when he heard of the crossing at Sistova, decided that it was but a demonstration. No measures were taken to observe the Russians. They were thus able to complete their crossing practically undisturbed, and this although it was never likely that the Russians would voluntarily select a point of passage leading into the Quadrilateral. Every- thing pointed to a crossing between Nikopol and Rustchuk. The best course for the Turks under existing circumstances would have been to leave garrisons in the fortresses, to observe the river line and to push reconnaissances to the north of the river, and to dispose the field army in a central position, whence it could concentrate on any point as soon as the enemy's intentions were revealed.

On June 30th Lieuti-General Gurko was put in command of a detachment composed of 10 battalions, 31 squadrons and 32 guns, with which he was ordered to advance rapidly to 2nd Tirnova to gain possession of a pass over the Balkans, Period.— to damage railways

and telegraphs, and to endeavour Opera- to stir up a Bulgarian revolt. He crossed the Danube Bulgaria by the Russian bridge on July 3rd and occupied to the Tirnova on July 7th, the Turkish garrison retreating ta}1 ot to Osman Bazar. At Tirnova he learned that the evna ‘ Shipka Pass was occupied by 3600 Turks, and that none of the remaining passes were held in any force. He then determined to cross by the Hainkioi Pass and to turn the Shipka. He started from Timova on the 12th July, on which day the head of the VIII. Corps reached the town. Hainkioi was occupied on the 14th, a detachment of 300 Turks being driven away. Gurko then sent two squadrons to cut the telegraph at Yeni Zagra, and leaving a garrison to hold the pass, set out for Kazanlik on July 16th. It had been arranged that a force from the VIII. Corps should attack the Shipka Pass (q.v.) from the north on the 17th, Gurko attacking simultaneously from the south; but his advance was delayed

by small bodies of the enemy, and he failed to co-operate, with the result that the attack from the north was repulsed. The Turkish commander, however, evacuated the pass that night (July i8th/ioth). It was occupied by the Russians on July 19th, and held till the end of the war. Gurko’s detach- ment was followed across the Danube bridge by the XII. and XIII. Army Corps, which crossed between July 3rd and 8th and moved towards the Jantra river; the IX. Corps was across by July 10th and advanced on Nikopol; the XI. Corps crossed July ioth-i5th; and finally the IV. Corps between July 20th and 30th. The VIII. Corps had meanwhile advanced on Tirnova, as we have seen.

On July 3rd Abdul Kerim received orders from Constanti- nople to advance against the Russians, and set out with the force from Shumla for Rustchuk, immediately preceded by the cavalry division. Still no attempt was made to gain contact with the Russians and discover their intentions. From Rust- chuk, Abdul Kerim advanced towards the Jantra, and after a skirmish between the Turkish cavalry and a Russian cavalry brigade again retired. Realizing Abdul Kerim’s incapacity, and rendered anxious by Gurko’s successful advance, the authorities at Constantinople now decided to give the com- mand to Mehemet Ali. He superseded Abdul Kerim on July 19th, and at once ordered the concentration of all available forces at Rasgrad. Meanwhile Osman Pasha, who had till now been condemned to inactivity at Vidin, received permission to march.

Vidin, with its modern fortifications and heavy armament, and with the Danube on one side and marshy ground towards the interior, was a place of considerable strength. But with the Russians south of the Danube there could no longer be any justification for keeping Osman's 30,000 men isolated. Leaving garrisons in Vidin and the other towns along the Danube from Nikopol to Rakovitza, and to bar the roads from Servia, Osman left Vidin with the remaining 19 battalions, 6 squadrons and

9 batteries on July 13th. His original plan was to join the

10 battalions under Hairi Pasha, then garrisoning Nikopol, and attack the Russian flank between Biela and Tirnova; but on July 15th he received news that the Russians were attacking Nikopol, and he then decided to march straight to Plevna, where there was a garrison of 3000 men under Atouf Pasha. First Osman reached Plevna (q.v.) on July 19th, and at battle of once took up a position which had been previously Plevna. reconnoitred by Atouf Pasha, on the hills to the north-east and east of the town. He had arrived just in time. On July 16th the Russian IX. Corps had taken Nikopol, and on the 1 8th orders were received to occupy Plevna with one division. At 5 a.m. on July 20th General Schilder-Schuldner, with the 5th Division IX. Corps and other forces, attacked Osman's position. No preliminary reconnaissance was made, and the Russians, after an artillery bombardment lasting about an hour, attacked at four points with separate columns. By midday the Russians were in retreat, having lost over 2800 men. There was no pursuit. On July 20th Osman was reinforced by fourteen battalions from Sofia, and the following day sent Rifaat Pasha with six battalions, a battery and some Circassian cavalry to occupy Lovcha in order to secure his communications with Sofia.

Osman's force at Plevna, within three days' march of the one Russian bridge over the Danube and flanking their line of operations, could not be neglected, and General Kriidener, commanding the IX. Corps, received orders to attack again as soon as possible. After the battle of the 20th he had been reinforced by brigades of the IV. and XII. Corps and a cavalry Second division. With this force, 30,000 in all, he attacked battle ot on July 30th. Kriidener advanced in two columns, Plevna. cavalry covering both flanks. Skobelev, with the cavalry on the southern flank, was subsequently reinforced by infantry, so there were practically three columns of attack. A general reserve of one brigade was kept at Karagatsch (16 m. east of Plevna). After an artillery engagement which lasted from 8.30 a.m. \i]\ 2.30 p.m. the infantry advanced. The

fighting lasted till sunset, when the Russians withdrew to Karagatsch, having lost 7300 officers and men. The Turkish casualties were 2000. General Kriidener, having reconnoitred the position, had hesitated to attack with the force available, and only acted in obedience to the orders received from head- quarters, then 80 m. distant at Tirnova. His defeat was an unpleasant surprise for the Russians. Their plans were rudely upset, and their attention was now directed solely to the taking of Plevna. Headquarters were moved from Tirnova back to Bulgareni, Gurko was called back from south of the Balkans, the Rumanian army was called in to co-operate, orders were issued for the Guards and Grenadier Corps and the 24th and 26th infantry divisions to mobilize, 188,000 of the 1st Ban militia and three divisions of the reserve were called out, and the 2nd and 3rd infantry divisions and the 3rd Rifle Brigade from Moscow district, where they had been mobilized, were at once ordered to the front.

At this time the position of the Russians was as follows: the XIV. and part of the VII. Corps were north of the Danube, covering the communications; the IV. and IX. Corps were opposed to Osman Pasha at Plevna and his garrisons of Lovcha and Orchanie (the advanced depot of the Plevna force); the XL, XII. and XIII. Corps were along the White Lorn facing Mehemet AH, who was on the line Rasgrad-Eski Djuma with a force of about 80,000 infantry with 60 guns and a few regiments of cavalry, in addition to the garrisons of the fortresses; a small garrison on the Shipka Pass. Gurko was south of the Balkans, where Suleiman Pasha had a force of some 30,000 men. The Russian casualties since the commencement had reached 15,000, and' their numbers south of the Danube did not exceed 130,000. Suleiman Pasha could have joined Osman or Mehemet Ali, avoiding the Shipka, and a vigorous offensive against the Russian flank at that time held out every prospect of success. The Shipka Pass would of necessity have been evacuated, but all through we find the Turkish commanders with their eyes fixed on geographical, which were sometimes strategical, points, and losing sight of the fact that the Russian army was their first objective. It is true that the ministers at Constantinople were largely responsible for the faulty strategy, but the generals in the field were also to blame. It was the moment for vigorous action on the part of the Turks. The moral equilibrium of the enemy was upset and the whole army demoralized by this second defeat at Plevna, but not a move was made. Again Osman failed to pursue. He was weak in cavalry, but he had sufficient to keep in touch with the enemy, who were utterly demoralized, and could have followed on with his whole force. He was but 35 m. distant from Sistova, and the result of the demolition of the bridge would have been incalculable. He was

subsequently forbidden by Constantinople to assume the offensive, but it was not necessary to consult ministers as to pursuit after a successful battle, and they cannot be held re- sponsible for this. The other Turkish commanders received news of the results of the battles of Plevna with incredulity, and likewise failed to turn them to account.

South of the Balkans was Suleiman's army. He was ordered from Montenegro on July 1st, and, leaving garrisons along the Montenegrin frontier, embarked at Antivari on July 15th. Disembarking at Dedeagatch on the 21st, he moved thence by train to Adrianople. His command, increased by some 15 battalions under Reouf Pasha, raised in the Balkan zone, amounted to approximately 30,000 men, and he was ordered to retake the Shipka Pass and to join Osman Pasha. Suleiman arrived at Karabunar on July 20th and moved to Eski Sagra, where he was joined by Reouf Pasha. Gurko, who had been resting about the Shipka Pass, ignorant of the arrival of Sulei- man, moved against Reouf Pasha on the 27th of July, and found himself confronted by their combined forces on the 31st. He was attacked by Suleiman that day and was forced to retire. His force consisted of 15,000 men, including six battalions of Bulgarian volunteers which had just been raised. The following day he retreated across the Balkans by Hainkioi, where he left two brigades to hold the Hainkioi and Elena Passes, the

Bulgarian troops joining the garrison on the Shipka. Suleiman Sulei- remained at Yeni Zagra till the 17th of August, when man's he set out for the Shipka. On August 21st the heights attack on east of the pass were taken, and during the next Shipka f ew c j a y S there was desperate fighting; but the original garrison was gradually reinforced, and the Russians held on. In this fighting the Russian losses amounted to close on 4000, while the Turkish casualties were about treble that number. Suleiman now intrenched himself close to the Russian position, and there he remained till Sept. 17th, when after a three days' bombardment he again assaulted the position, but was repulsed with considerable loss. This was the last assault made on the Russian position. Suleiman replaced Mehemet Ah as commander-in-chief on Oct. 2nd, and was himself succeeded by Reouf Pasha. Thus, under orders from Constantinople, Suleiman frittered away his opportunity and his army in a fruitless attempt to retake the Shipka Pass.

It was not till the middle of August that Mehemet Ali decided to move

against the Russians and ordered an advance. The The Cesarevich (afterwards Alexander III.), who was

fighting opposing him with the XI., XII. and XIII. Corps, in on the all about 50,000, was extended on the line of the White Lom – Lorn from Pirgos to Eski Djuma. On August 22nd

and 23rd there were engagements about Ayaslar, resulting in the retirement of the Russians. On August 30th he attacked at Karahassankoi and drove the Russians across the river. On September 3rd he crossed the White Lom and again defeated them at Katzelevo, the enemy retiring behind the Banitcha Lom. On September 12th Mehemet Ali continued his advance, but halted on the 14th for a week. He then made an attack on Cerkovna on the 21st, but was repulsed with a loss of 1600 men, and two days later retired his army behind the White Lom. He had effected nothing. As will be seen later, the Russian operations against Plevna had not been in any way disturbed. The containing force under the Cesarevich had retired a certain distance, but it still held the main Turkish army. Mehemet Ali's original plan had been to advance by Osman Bazar, effect a junction with Suleiman, and move on Tirnova. But Suleiman was averse to his plan and it was negatived at Constantinople, though if this plan had been carried out with vigour, the position of the Russians should have been critical. He then advanced on a front of 50 m. instead of moving concentrated, which is the explanation of his failure. It is true that he was much hampered by the state of his cavalry, which was exhausted, and consequently was without information, while the Russians were well served. Mehemet Ali now concentrated his force, but at this juncture he was superseded by Suleiman Pasha.

To return to Plevna. At this time the Russians were dis- posed in a semicircle round Plevna, their right or N. flank Third resting on Ribina and the S. flank resting on Bogot. battle of On August 30th Osman had moved out with a column Plevna. f a y arms towards Pelishat. The following day he engaged the Russians. The Turks lost 300 killed and 1000 wounded, and the Russian losses were about 1000. It is difficult to say what was the object of this sortie, which was of the nature of a reconnaissance in force. It achieved nothing. The Turks were not defeated, but retired again into Plevna the same evening. By the end of August the whole of the Rumanian army had crossed the Danube, and during the first days of September the first Russian reinforcements, consisting of the 2nd and 3rd infantry divisions and the 3rd Rifle Brigade, had arrived and joined the forces round Plevna. Mehemet Ali's advance and the assaults on the Shipka had been

repulsed. The Russians could expect no further reinforcements before October, and it was therefore decided to make a third attempt to take Plevna, but first of all to occupy Lovcha. Skobelev had already made an unsuccessful attempt on August 6th, and General Prince Imeretinski, with a force of two infantry Lovcha. divisions and a brigade of Cossacks, in addition to Skobelev's mixed brigade, was now entrusted with the task. The garrison under Rifaat Pasha amounted to 8 bat- talions, 6 guns and some Circassians. Fighting commenced

on Sept. 1st and on the 3rd the Turks were driven out, most of the survivors finding their way to Plevna, and bringing 5 guns with them. The Russians lost 1500, the Turks 2500. On Sept. 2nd, Osman set out with a strong relieving column from Plevna, but on the 4th, hearing that the Russians had already occupied the town, he turned back and reached Plevna on the 6th. On Sept. 5th, 8 battalions and 2 batteries reached Orkhanie, and Osman's force, including the Lovcha troops, numbered about 30,000 men and 72 guns. The Russian forces, including the Rumanians, numbered about 90,000. Their plan was, after a long artillery bombardment, to attack the eastern front with the Rumanian forces, the south-eastern front with the IV. and IX. Corps and the southern front with Imeretinski's command. The attacks were to be simultaneous. The cavalry divisions were to be kept in rear and close to the flank of the attacking infantry. During the night of Sept. 6th/7th the troops were moved into preparatory position, and batteries were constructed at 3000 to 5000 yds. from the outer works. The artillery bombardment was commenced at 6 a.m. on Sept. 7th and continued till midday Sept. nth. So far the infantry had only been engaged on the south flank, where Skobelev had succeeded Imeretinski in the command. He had succeeded in advancing ; to within 2000 yds. of the southern Turkish redoubts and had entrenched himself. The orders for Sept. nth were for the infantry assaults to be delivered at 3 p.m. after a six hours' cannonade. A dense fog interfered with the artillery bombardment. At the end of the day the Rumanians had taken No. 1 Grivitza redoubt, the attack on the S.E. front had been repulsed and Skobelev had established himself within 1000 yds. of Plevna, having taken Kavanlik and Issa forts. On Sept. 1 2th the Turks retook these forts and drove Skobelev back. During the next two days the Russians continued to bombard the works, but no further attack was made. The Rumanians remained in possession of the Grivitza redoubt, defeating an attempt made by the Turks to retake it on Sept. 14th. The Russians then decided to retire and entrenched them- selves on a line with Verbitza-Radischevo, with their cavalry extending to the Vid on either flank. There was no question of pursuit; in the first and second battles the numbers had

been about equal, but now the Russians were vastly superior and Osman would have been crushed by a powerful counter-attack.

In their third battle the Turks had lost 5000, while the Russian casualties amounted to close on 20,000. The Russian bombardment, lasting four days, had effected nothing. It had not caused 200 casualties. The object of the artillery is to cover the advance of the infantry, and the arms must work in combination. The defender does not expose himself to the artillery fire unless Compelled to do so by the approaching infantry. The Russians failed to realize this and practically wasted their ammunition. They had again failed to recon- noitre the position and attacked along the whole front instead of pressing home in strength at the decisive points. Their attacks were not even simultaneous, and Osman was able to shift his reserves from point to point. In addition to this, when the Russians retired one-third of their force had not been engaged. Thedefectsin their plan of action are largely attribut- able to the fact that though control was nominally centred in one man, senior officers were present who interfered with his arrangements.

It was now decided to complete the investment of Plevna, and Todleben, the defender of Sevastopol, was entrusted with supreme control of the operations. He arrived invest- on the scene on Sept. 28th, but it was not till Oct.. 24th mentand that the investment was completed, and, meanwhile, fa,1 ° f on Sept. 24th and again on Oct. 8th, stong reinforce- evna ‘ ments arrived, raising the Turkish force under Osman to 84 battalions, 25 squadrons and 96 guns, with an effective of 48,000 men. Plevna had been re-victualled and the sick and wounded had been sent back to Orchanie. General Krilov, who had been operating west of the Vid, with 52 squadrons and 30 horse artillery guns, had failed to prevent these movements, and was superseded by General Gurko on Oct. 8th. The Russian

move* meats*

Guards Corps had all reached Plevna by Oct. 20th, and two divisions were at once placed under Gurko’s orders, raising his command to 35,000 infantry, 10,000 cavalry and 48 guns. His instructions were to capture the Turkish positions along the Sofia road. He compelled the garrison of Dolni-Dubnik to retire into Plevna, and captured Gorni Dubnik and Telis with their garrisons after severe fighting on Oct.

24th and 28th. Osman's force was thereby reduced by 12 battalions. About the middle of November the opposing forces were distributed as follows: 6 divisions along the Lom, under the Cesarevich, facing Suleiman's army; 3 divisions holding the Shipka under Radetzky; 1 division at Lovcha; 25 divisions west of the Vid under Gurko; and 12 divisions east of the Vid, investing Plevna. The XIV. Corps was in the Dobrudja, the VII. Corps about Odessa and the X. Corps in the Crimea.

On the Turkish side Suleiman advanced across the Lom, leaving small garrisons in the fortresses, and attacked at Mechka Turkish on Nov. 19th, and at Mechka and Tristenik on Nov. 26th, and again on Dec. 12th, but each time without success, and he retired across the Lom. South of the Balkans Vessil Pasha had succeeded Reouf Pasha on the Shipka. He continued to contain the three Russian divisions there, but made no attempt to dislodge them, beyond small offensive demonstrations made with the object of concealing the departure of large drafts which were sent to Sofia.

At Sofia and Orkhanie, the Turks were forming an army of recruits and reservists with the object of advancing to the relief of Osman. Mehemet Ah was entrusted with the command. Osman had already asked the sultan's permission to evacuate Plevna, with a view to co-operating with Mehemet Ali, but permission was refused. It was not till the investment was completed that the sultan changed his mind, too late, and gave his sanction to the move. The Russians received information of Mehemet Ali's intended advance, and as the force round Plevna amounted to 191 battalions, 120 squadrons and 650 guns, it was decided that Gurko should move with his detachment towards Sofia. He concentrated his force at Yablonitza on Nov. 5th and succeeded in driving the Turkish advanced guard from Orkhanie. Mehemet Ali now occupied a strong position covering the Arabi Konak Pass over the Balkans, and, with a force of 43 battalions with cavalry and guns, made no attempt to relieve Osman.

Osman Pasha, his supplies having given out, eventually decided on a sortie. His troops had been short of food .since 3rd the beginning of November, and the number of sick

Period.— had risen to 10,000. His plan was to break through Passage to the west and make for Sofia via Berkovitz. The ° .. e Russians observed the preparations made and con-

and ad- centrated sufficient force at the threatened point, with vance to the result that Osman and his army of 40,000 men Constan- capitulated. The Turkish losses in the action were tiaopie. about 6000

and the Russians lost about 1500. The Russians now decided, notwithstanding the difficulties due to the winter season, to push on across the Balkans. The VII. and X. Corps were still left guarding the Russian coasts. The Cesarevich was left north of the Balkans with 71,000 men to guard the communications. Gurko's force was raised to 80,000. Leaving a containing force to oppose the Turks at the Arabi Konak Pass positions, he crossed by the Curiak Pass. The Turks retired unobserved, and after a feeble stand at Tashkosen retreated to Kustendil. Gurko occupied Sofia on Jan. 4th. Radetzky's force at the Shipka was raised to 66,000, with which force, having defeated Vessil Pasha, he was to join Gurko south of the Balkans. Radetzky commenced operations on Jan. 5th. Keeping one division to hold the works on the Shipka, he moved the remainder of the force in two columns under Skobelev and Prince Mirski, who were to cross one on each side and attack simultaneously from the south. Vessil Pasha held an entrenched camp at Shenovo with some 12,000 men; the remainder of his force was in position on the mountains. Owing to the difficulties of the crossing, Skobelev was delayed. Mirski attacked on

Jan. 8th and was repulsed. The following day Skobelev and Mirski attacking together were successful, and Vessil Pasha capitulated with his force,'some 36,000, of whom 6000 were sick and wounded. Vessil Pasha had pointed out the danger of his position on Jan. 7th, but, contrary to Suleiman's advice, the war minister, believing an armistice imminent, had ordered him to hold on to the Shipka Pass. Mehemet Ali's force, dangerously delayed owing to interference by the minister of war, eventually reached Tatar-Bazardjik, which was selected by Suleiman (now commander-in-chief) for the concentration of his forces. Having received news of the capture of the Shipka force he retired on Philippopolis, with Gurko's forces closely pursuing. But Radetzky's forces had already pushed on and practically cut Suleiman off from Adrianople. After some engagements about Philippopolis on Jan. 15th, 16th and 17th, he retreated towards the Aegean Sea through the Rhodope mountains, having lost most of his guns, and reached Enos about Jan. 28th, whence what remained of his force was con- veyed by water to Constantinople.

Suleiman had again missed his opportunity. The Russians crossed the Balkans in a wide front of about 180 miles, and there was opportunity for successful action by a capable com- mander. There were not only the columns commanded by Gurko and Radetzky, but also a third column under General Kartzoff, which crossed by the Trojan Pass, after which it joined Gurko's force. There were the troops under Mehemet Ali about Sofia, Vessil Pasha's force about the Shipka, and the main army on the Lom, which had been withdrawn south of the

Balkans after the fall of Plevna, so that Suleiman, who had been appointed commander-in-chief, had an available force of 130 battalions, 120 guns and a proportion of cavalry. The fortified town of Adrianople offered a strong central position at which to concentrate his forces, and with this point as support, acting on interior lines, he could have dealt with the invading and widely separated columns in detail. But he missed his opportunity and left his scattered forces to be overwhelmed by superior numbers in each instance. The minister for war was undoubtedly responsible to a great extent for this faulty strategy, but the blame falls on the head of Suleiman as commander-in-chief. There was no object in leaving Vessil Pasha on the Shipka. All available forces should have been concentrated in a sound strategical situation.

The Servians had crossed the frontier after the fall of Plevna, and the Montenegrins were also pressing on. On Jan. i6tb the Russians occupied Adrianople, and on Jan. 30th they were facing the Buyuk Tchemedji lines, with their flanks resting on the Black Sea and the Sea of Marmora. Mehemet Ali was in command of what remained of the Turkish armies behind the lines. On Jan. 31st an armistice was arranged, and on March 3rd the treaty of San Stefano was signed, the terms of which were modified later at the Berlin Conference in June and July 1878.

The Russo-Turkish War proved once for all the great value of improvised fortifications, in other words, of spade work in warfare, and the advantages of field works as regards invisibility against artillery fire. It was not only at Plevna that field intrenchments were made use of. Notable instances were the defence of Lovcha by the small Turkish garrison of 8 battalions with one battery, which from their entrenchments kept Skobelev with over 20,000 men and 90 guns at bay for three days, inflicting on him a loss of over 1500 men. Again ; at Gorni Dubnik on Oct. 24th, 3500 Turks with 4 guns held their works throughout the day against 20,000 Russians with 60 guns, inflicting a loss on them of over 3300, and eventuaDy were forced to surrender by a surprise attack under cover of darkness, when their ammunition had run short, and their numbers had been reduced by 1500 casualties. In the attack the success of Skobelev stands out, and we find that he had realized the necessity of intrenching the ground he had gained.

The war was brought to a conclusion, but the Turks had not been beaten in battle. With the exception of the fighting round Plevna and the rout of Suleiman’s army at Philippopolis

there had been no decisive battles. The Turks had been defeated owing to the incapacity of their leaders, none of whom had previously commanded an army organized according to modern ideas. They were ignorant of strategic principles. Then, again, the interference with the generals in the field by the authorities at Constantinople had in each case resulted in the disasters which invariably follow the attempt of civilian amateurs to control warlike operations.

On the Russian side, the enemy had been at first despised, and consequently the forces originally employed were inadequate, which meant subsequent delays, losses and expense. The command of the sea had proved of little value to the Turks. Their flotilla rendered them no assistance. In the early stages it could have materially assisted by landing reconnoitring parties N. of the Danube, and by interfering with the Russians when crossing the river. The Russian bridge offered a tempt- ing objective throughout the campaign, but commanders with the requisite dash and initiative were not forthcoming. The defeat of the Turks was due in the first place to the failure of their politicians to ensure the adequate organization and train- ing of the army during peace time, in the second place to the want of a commander who had educated himself to undertake the responsibilities entrusted to him. (J. H. V. C.)

A separate campaign had been waged, as before, in Asia Minor. Here the Turks under Mukhtar Pasha had 57,000 men in two corps, the one on the side of Batoum and Ardahan, the other between Erzerum and Kars. His opponent, Loris Melikov, had at first only some 28,000 infantry, but a disproportionate number of Cossack Sotnias. The Russians advanced in three weak columns. On the 17th of May after bombardment the right column stormed Ardahan. The right and centre columns then closed inwards upon Kars, which they besieged, but the siege was given up in July, after Mukhtar, advancing to its relief with 35,000 men, had repulsed Melikov's attack at Zivin (June 26th). The left column occupied Bayazid without difficulty, but when it had proceeded thence on the Erzerum road the Russian garrison was blockaded by the Turks and the column retraced its steps to relieve the place. After this it halted at Igdir in the Araxes valley. Meanwhile the Turks on the coast had advanced, in concert with their fleet, and raised an insurrection amongst the Mahommedans of the littoral. They were eventually repulsed, but the insurrection was not completely suppressed until the summer of 1878.

In August Mukhtar, who had followed up Melikov's retreat from Kars, and won the victory of Kizil-Tepe, led 30,000 men in front of this position, and behind them the Kars garrison of 10,000. Ismail on the Bayazid side had 40,000; Dervish, at Batoum 17,000. :■ But after an interval of two months Melikov was reinforced, while drafts for the armies in Europe were taken from Mukhtar, and the grand- duke Michael, assuming command of the Russians, defeated his opponent completely in the battle of the Aladja Dagh (Oct. 15th). The remnants of Mukhtar's army retreated on Erzerum, and while part of the Russian army besieged Kars, and part attempted to cut off the retreat of Ismail on the Bayazid road, while the corps from the Araxes valley followed the latter up. Ismail slipped past them, however, and rejoined Mukhtar at Erzerum. But the two together were no longer able to resist the superior numbers of the Russians, who defeated them in a last battle at Dexe Boyun (Nov. 4th). Kars was stormed on the night of the 1 ith of November.

RUST (O.E. rust, a word which appears in many Teutonic languages, cf. Du. roest, Ger. rost); in origin it is allied with " ruddy " and " red," the reddish-brown powdery substance which forms on the surface of iron or steel exposed to atmo- spheric corrosion. Formerly the process was regarded as oxidation pure and simple, and, although it was known that iron did not rust in dry air, yet no attempt was made to explain why water was necessary to the action. F. Crace-Calvert in 187 1 showed that the carbon dioxide of the atmosphere was a factor; and in 1888 Crum Brown published the theory — termed the " carbonic acid theory " — that water and carbon dioxide react with iron to form ferrous carbonate and hydrogen, the ferrous carbonate being subsequently oxidized by moist oxygen to ferric hydrate and regenerating carbon dioxide, which again reacts with more iron. This theory was contro- verted by Wyndham Dunstan, who attempted to prove that carbon dioxide was not necessary to rusting; and in place of the acid theory, he set up a scheme which involved the pro- duction of hydrogen peroxide. G. T. Moody has since shown that when all traces of carbon dioxide are removed (which is a matter

of great experimental difficulty) iron may be left, in contact with oxygen and water for long periods without rust appearing, but on the admission of carbon dioxide specks are rapidly formed. It also appears that rust changes in composition on exposure to the atmosphere, both the ferrous oxide and carbonate being in part oxidized to ferric oxide. Acids, other than carbonic, may promote rusting; this is particularly the case with ironwork exposed to the acids — sulphurous, nitric, &c. — contained in smoke. It is probable that the action depends upon the presence of iron, oxygen and water, and some acid which makes the

water an electrolyte.

Steel differs in many ways from iron in respect of atmospheric corrosion; the heterogeneous nature of steel gives occasion to a selective rusting, ferrite is much more readily attacked than the cementite and pearlite; moreover, the introduction of other elements may retard rusting; this is particularly the case with the nickel-steels.

RUSTCHUK (Bulg. RussS), the capital of the department of Rustchuk, Bulgaria, on the right bank of the Danube, where it receives the E. Lom. Pop. (1906) 33,552. Rustchuk is the headquarters of a military division and of a naval flotilla stationed on the Danube. As a river-port and the terminus of railways from Varna and from Sofia via Trnovo, it has much commercial importance; and it possesses tobacco and cigarette factories, soap-works, breweries, aerated water factories, dyeworks, tanneries, sawmills, brick and tile works and a celebrated pottery.

In the time of the Romans Rustchuk was one of the fortified points along the line of the Danube. In the Tabula Peutin- geriana it appears as Prisca, in the Antonine Itinerary as Seran- taprista, in the Notitia as Seragintaprista and in Ptolemy as Priste Polis. Destroyed by barbarian invaders in the 7th century the town recovered its importance only in comparatively modern times. In 1810 it was captured by the Russians, who destroyed the fortifications. It played an important part in the Russo-Turkish Wars of 1828-29, 1853—54 and 1877-78. In 1877 it was nearly destroyed by the Russian artillery stationed in the Rumanian town of Giurgevo, on the opposite bank of the Danube.

RUSTENBURG, a district and town of the Transvaal, South Africa. The district originally included all the N.W. part of the country, but is now of much smaller dimensions. Its S. border is marked by the Magaliesberg and other hills forming the N. escarpment of the high veld and the watershed between the Vaal and Limpopo. Several of the headstreams of the Limpopo rise within the district on the N. slopes of the Magaliesberg. The climate of the district is sub-tropical and the principal cultivation is that of tobacco, and fruit , trees, notably oranges. The opening of the railway to Pretoria in 1906 led to a marked development of trade. In an amphi- theatre formed by the hills and 61 m. by rail W. of Pretoria is the town of Rustenburg with a population (1004) of 181 5. The town is one of the oldest in the Transvaal, having been founded in 1850 by the Voortrekkers. It was at Rustenburg that the volksraad met in March 1852 to ratify the Sand River Conven- tion granting independence to the Transvaal Boers. At the time it was feared that there would be civil war between Hendrik

Potgieter and Andries Pretorius, but they were reconciled in Potgieter's tent. Later Rustenburg became the home of the Kruger family. It was occupied by the British under R. S. Baden Powell in June 1000.

RUSTICATION {i.e. the making " rustic " or countrified, from Lat. rus, country; thus the term " rusticate " is used for taking a country holiday, or in academic circles to be "rusticated" is to be sent away from a university for punishment), in architecture, the technical term (French equivalent bossage) given to masonry in which the centre part of the face of the stone is either left rough as it came from the quarry, or is worked in various ways to give variety to the surface. The earliest example exists in the platform at Pasargadae in Persia (560 B.C.), erected by Cyrus, where the edge round the four sides of the stone forms a draft, two or three inches wide, worked with a chisel, the centre

part being left rough. Similar work- exists at Arak-el-Emir in Palestine (151 B.C.). The finest examples are those of the walls of the temple at Jerusalem, and at Hebron, where the stones are of immense size and the rustication projects sometimes over a foot. The Crusaders' castles in Palestine are all boldly rusti- cated, but the projecting portions have been worked over with a chisel in diagonal lines, and this enables them to be distinguished from the earlier masonry. In the five-sided tower at Nurem- berg and the Burg-Capelle at Rothenburg, the rustication has a decorative value, so that in later work it was employed for the quoin-stones of towers. The masonry of the Palazzo Vecchio, and of the Pitti, Strozzi and Riccardi palaces, all in Florence, and of other palaces in Siena and Volterra, is rusticated. Rustication was employed in terraces and grottos in Italy, where on account of its extravagances it gave rise to the term " grotesque." In the later Renaissance the edges of the stone were bevelled off, with a sunk joint in addition; and the treatment was known as vermiculated, if in imitation of earth burrowed by worms; marine, if with small shell holes; stalactitic, if carved in imitation of lime deposits, &c. In Italy the projecting portions were sometimes worked into facets. Rustication was introduced into England by Inigo Jones, who, in old Somerset House, York Stairs Watergate, the gateway of the Botanical Garden at Oxford, and elsewhere, used it only in alternate courses, his example being followed by other architects of the Renaissance. The term is now applied to the* ashlar blocks of masonry which alternate

with the circular drums of columns in many public buildings.

RUSTOW, FRIEDRICH WILHELM (1821-1878), Swiss soldier and military writer, was a Prussian by birth. He entered the service of his native country, and served for some years, until the publication of Der Deutsche Militdrstaat vor und wahrend der Revolution (Zurich, 1850) brought him official condemnation. He was sentenced by a court-martial to a long term of fortress imprisonment, but succeeded in escaping to Switzerland. He obtained military employment in the service of the Republic, and in 1857 was major on the engineer staff. Three years later he accompanied Garibaldi in the famous expedition against the two Sicilies as colonel and chief of the staff, and to him must be ascribed the victories of Capua (19th Sept. i860) and the Volturno (1st Oct. i860). At the end of the campaign he once more settled down at Zurich. At the out- break of the war of 1870 he offered his services to Prussia, but was not accepted. In 1878, on the foundation of a military professorship at Zurich, Riistow applied for the post, and, on its being given to another officer, lost heart and committed suicide.

Two younger brothers, both Prussian soldiers, were also distinguished men. The elder, Alexander (1824-1866), is remembered for his work Der Kiistenkrieg (Berlin, 1848); the younger, Caesar (1826-1866), was one of the foremost experts of his time in the design and construction of military rifles, and the writer of several treatises on that subject, of which we may mention Die Kriegshandfeuerwajfen (Berlin, 1857-64). Both Alexander and Caesar fell on the field of battle in the war of 1866, at Koniggratz and Dermbach respectively.

Amongst F. W. Rustow's works, which covered nearly every branch of the military art, a large number must be mentioned. Historical — Heerwesen und Kriegfuhrung Julius Cdsars (Gotha, 1855; 2nd ed., Nordhausen, 1862), Kommentar zu Napoleon Ill's Geschichie Julius Ctisars (Stuttgart, 1865-67), Geschichte des Grie- chischen Kriegswesens (in collaboration with Kochly, Aarau, 1852), Militdr. Biographen {David, Xenophon, Montluc) (Zurich, 1858), Geschir.hU der Infanterie (Gotha, 1857-58; 3rd ed., 1884), Die Ersten Feldziige Napoleons 1796-1797 (Zurich, 1867), Der Krieg von 1805 in Deutschland und Italien (Frauenfeld, 1854), Geschichte des Ungarischen Insurrektionkrieges 1848-49 (Zurich, i860), reminiscences of i860 in Italy (Leipzig, 1861) and monographs on the campaigns of 1848-49 in Italy (Zurich, 1849) and the Crimean War (Zurich, 1855-56). Critical and General — Allgemeine Taktik (Zurich, 1858; 2nd ed., 1868), Kriegspolitik und Kriegsgebrauch (Zurich, 1876), Militar-Handworterbuch (Zurich, 1859), Die Feldherrnkunst

des XIX Jahrhunderts (Zurich, 1857; 3rd ed., 1878-79), Der Krieg -und seine Mittel (Leipzig, 1856). He also wrote Annalen des Kdnigreichs Italien (Zurich, 1862-63).

See Zernim, ” F. W. Riistow,” in Unsere Zeit. vol. 2 (Leipzig, 1882).

RUTEBEUF, or Rtjstebtjef (fl. 1245-1285), French irouvere, was born in the first half of the 13th century. His name is nowhere mentioned by his contemporaries. He frequently plays in his verse on the word Rutebeuf, which was probably a nam de guerre, and is variously explained by him as derived from rude bmuf and rude ceuvre. He was evidently of humble birth, and he was a Parisian by education and residence. Paulin Paris thought that he began life in the lowest rank of the minstrel profession as a jongleur. Some of his poems have autobiographical value. In Le Mariage de Rutebeuf he says that on the 2nd of January 1261 he married a woman old and ugly, with neither dowry nor amiability. 1 In the Complainte de Rutebeuf he details a series of misfortunes which have reduced him to abject destitution. In these circumstances he addresses himself to Alphonse, comte de Poitiers, brother of Louis IX., for relief. Other poems in the same vein reveal that his own miserable circumstances were chiefly due to a love of play, particularly a game played with dice; which was known as griesche. It would seem that his distress could not be due to lack of patrons; for his metrical life of Saint Elizabeth of Hungary was written by request of Erard de Valery, who wished to present it to Isabel, queen of Navarre; and he wrote elegies on the deaths of AnCeau de lTsle Adam, the third of the name, who died about 1251, Eude, comte de Nevers (d. 1267), Thibaut V. of Navarre (d. 1270), andAlphonse, comte de Poitiers (d. 1271), which were probably paid for by the families of the personages celebrated. In the Pauvrete de Rutebeuf he addresses Louis IX. himself.

The piece which is most obviously intended for popular recitation is the DU de VHerberie, a dramatic monologue in prose and verse supposed to be delivered by a quack doctor. Rutebeuf was also a master in the verse conte, and the five of his fabliaux that have come down to us are gay and amusing. The matter, it may be added, is sufficiently gross. The adventures of Frere Denyse le cordelier, and of ” la dame qui alia trois fois autour du moutier,” find a place in the Cent Nouvelles nouvelles.

Rutebeuf’s serious work as a satirist probably dates fronn about 1260. His chief topics are the iniquities of the friars, and the defence of the secular clergy of the university of Paris against their encroachments; and he delivered a series of eloquent and insistent poems (1262, 1263,

1268, 1274) exhorting princes and people to take part in the crusades. He was a redoubtable champion of the university of Paris in its quarrel with the religious orders who were supported by Pope Alexander IV., and he boldly defended Guillaume de Saint- Amour when he was driven into exile. The libels, indecent songs and rhymes condemned by the pope to be burnt together with the Perils des derniers temps attributed to Saint-Amour, were probably the work of Rutebeuf. The satire of Renart le Bes- tournS, which borrows from the Reynard cycle little but the names under which the characters are disguised, was directed, according to Paulin Paris, against Philip the Bold. To his later years belong his religious poems, and also the Voie de Paradis, the description of a dream, in the manner of the Roman de la Rose.

The best work of Rutebeuf is to be found in his satires and verse contes. A miracle play of his, Le Miracle de ThSophile, is one of the earliest dramatic pieces extant in French. The subject of Theophilus, the Cilician monk who made a pact with the devil, which was afterwards returned to him by the inter- vention of the Virgin, was a familiar one with the story-tellers of the middle ages. Rutebeuf can claim no priority in the choice of the subject, which had been treated dramatically in the Latin piece ascribed to the nun Hroswitha of Gandersheim, but }iis piece has considerable importance in dramatic history.

The CEuvres of Rutebeuf were edited by Achille Jubinal in 1839 (new edition, 1874) ; a more critical edition is by Dr Adolf Kressner

1 It has been suggested that Brunetto Latini was thinking of Rutebeuf when he wrote in his Livre du Trisor: ” Le Rire, le jeu, voila la vie du jongleur, qui se moque de lui-mSme, de sa femme, de ses enfants.de tout le monde.”

(Rustebuefs Gedichte; Wolfenbttttel, 1885). See also the article by Paulih Paris in Hist. lilt, de la France (1842), vol. xx. pp. 719-83, and Rutebeuf (1891), by M. Leon Cledat, in the Grands Ecriyains franqais Series.

RUTH, BOOK OF, in the Old Testament. The story of Ruth (the Moabitess, great-grandmother of David) is one of the Old Testament Hagiographa and is usually reckoned as the second of the five

Megilloth (Festal Rolls). This position corresponds to the Jewish practice of reading the book at the feast of Pentecost; Spanish MSS., however, place it at the head of the Megilloth; and the Talmud (Baba Bathra, 146) gives it the first place among all the Hagiographa. On the other hand, it follows Judges in the Septuagint, the Vulgate and the English version. But although it was very natural that a later rearrangement should transfer Ruth from the Hagiographa to the historical books, and place it between Judges and Samuel, no motive can be suggested for the opposite change, and the presumption is that it found a place in the last part of the Jewish canon after the second (with the his- torical books) had been definitely closed. See Bible: Old Testament, section I. ” Canon “; Canticles; Lamentations.

That the book of Ruth did not originally form part of the series of “Former Prophets” (Joshua-Kings) is further probable from the fact that it is quite untouched by the process of ” prophetic ” or ” Deuteronomistic ” editing, which helped to give that series its present shape after the fall of the kingdom of Judah. The narrative has no affinity with the point of view which looks on the history of Israel as a series of examples of divine justice and mercy in the successive rebellions and repentances of the people of God. 1 But if the book had been known at the time when the history from Joshua to Kings was edited it could hardly have been excluded from the collec- tion; the ancestry of David (iv. 17, 18-22) was of greater interest than that of Saul, which is given in 1 Sam. ix. 1, whereas the old history names no ancestor of David beyond his father Jesse.

In truth the book of Ruth presents itself as dealing with times far back (Ruth i. 1), and takes delight in depicting details of antique life and obsolete usages (iv. 7) ; it views the stormy period before the institution of the kingship through the softening atmosphere of time, which imparts to the scene a gentle sweetness very different from the harsher colours of the old narratives of the book of Judges. It has indeed been argued that, as the author seems to take no offence at the marriage of Israelites with Moabite women, he must have lived before the time of Ezra and Nehemiah (Ezra ix.; Neh. xiii.); but the same argument would prove that the book of Esther was written before Ezra. , The very designation of a period of Hebrew history as ” the days of the judges ” is based on the Deuteronomistic additions to the book of Judges (ii. 16 sqq.) and does not occur till the period of the exile. It is true that the language has some features which appear to link it with the narratives in Samuel and Kings, but it might fairly be assumed either that the book is the work of a late author well acquainted with the earlier literature, or that an old narrative had undergone some rewriting at a later age. No definite conclusion can be

drawn from the fact that the language stands in marked contrast to that of Chronicles, Ezra, Nehemiah, &c, since writings presumably more or less con- temporary did not necessarily share the same characteristics (observe, for example, the prose parts of Job) .

Like the stories appended to Judges (by a post-Deuteronomic hand) the book of Ruth connects itself with Bethlehem, the Desbra. traditional birthplace of David. Some connexion between Bethlehem and Moab has been found in the (now corrupt) text of 1 Chron. iv. 22 (where the Targum and late rabbinical exegesis discover references to the story of Ruth), and is more explicitly suggested by the isolated 1 Sam. xxii. 3 seq. which evidently knew of some relationship between Moab and the illustrious descendant of Boaz and Ruth. Next, the writer claims the sympathy of his readers

1 The religious pragmatism lacking in the original is in part supplied by the Targum (i. 5, 6).

Date.

for Ruth, upon whose Moabite origin he frequently insists, and this feature is noteworthy in view of the aversion with which intermarriage was regarded at a certain period (Deut. xxiii. 3; Neh. xiii.; Ezra ix. seq.). The independent evidence for the present post-exilic form of the book has consequently led many scholars to the conclusion that it was directed against the drastic steps associated with the reforms of Ezra and Nehemiah, which, as is known, were not every- where acceptable. Thus, not only do we have a beautiful portrait of a woman of Moabite origin, but she becomes the ancestress of David himself, and in the days of these measures the charming and simple story would inevitably” suggest the question whether the exclusiveness of Judaism could not be carried too far. There is no reason, however, to believe that this was the original object of the story. It contains other features of considerable interest to which more importance seems to be attached, and, the writer is evidently an artist who takes manifest delight in the touching and graceful details of his picture, and is not simply guided by a desire to impart historical information or to enforce some particular lesson.

One does not look for absolute consistency in oriental narratives, and even this little book contains several internal intricacies which demand investigation. The genealogy from Perez to David in iv. 18-22 is of little value problems. since Salma (Salmon), fatherof Boaz, is a Calebite clan- name,, not associated with its earlier seat S. of Hebron as in Judges i., 1 Sam. xxv., &c, but as ” father ” of Bethlehem,

representing exilic or later conditions (1 Chron. ii. 51 ; see Caleb). Apart from other signs of a late date in this list of the ancestors and descendants of Boaz, iv. 12 certainly implies that the genealogical lines of Perez and Boaz were not identical, and thus verses 18-22 in the opinion of most scholars are a later addition.

Further, the story involves points of old family usage which are no longer clear.; The well-known custom which gives the nearest heir of the dead a right to inherit the widow is naturally distinct from the levirate (q.v.), where it is the brother's duty to marry his widowed sister-in-law if childless, and where the eldest son succeeds to the name and inheritance of the deceased. In Hebrew usage the refusal to perform the levirate brought ignominy (see Deut. xxv. 5-10), and Gen. xxxviii. relates how Tamar, when Shelah was not given to her, obtained a child through her father-in-law Judah (see esp. vers. 14, 26) ? In addition to these customs to prevent the alienation of the estate and to perpetuate the family name, the post-exilic story in Num. xxvii. i-n, xxxvi. gives daughters the right of inheritance provided they do not marry outside the tribe. Although the levirate still continued (Matt. xxii. 24 sqq.), the late laws in Lev. xviii. 16, xx. 21, as also this story, may be aimed against it. Finally, the goel (" next kinsman," lit. " avenger "; see Driver, Ency. Bib. col. 1745 sqq.) has the, first right of purchase to an estate (Jer. xxxii. 6-15), and indeed must redeem the property which his needy relative might be compelled to sell (Lev. xxv., see ver. 25). Now it appears that Boaz combines the essential duty of the goel in purchasing the estate over which Naomi holds rights, and at the same time marries, not Naomi, who is now old, but her daughter-in-law Ruth, in order to perpetuate her husband's family. Naomi, who had realized the impossibility of the levirate in her case (i. 11 seq.), returned home a disconsolate and childless widow (i. 20 seq.), but the filial Ruth fell in with her plans and put herself entirely into the hands of the kinsman Boaz (iii.). In the happy finale, Naomi is the recipient of congratulations upon the birth of a son to the faithful Ruth (iv. 17a, "there is a son born to Naomi ") ; the name of the dead is thus "raised up" (iv. 5, 10), and the child Obed is clearly recognized

2 See further, W. R. Smith, Kinship and Marriage in Early Arabia, 2nd ed. p. 105; Wellhausen, Gbtting. Gelehrte Anzeig. (1893), PP- 455 seq- Ruth iv. 7 refers to the custom of drawing off the shoe as a sign of renunciation (cf. Deut. loc. cit., and G. A. Smith, Ency. Bib. col. 5196 head), and ver. 12 to the story of Tamar and judah. Compare, for the retention of simple methods of transacting business, the striking of hands (Prov. vi. I, xxii. 26).

as of the Kne of Elimelech and Mahlon (Naomi's husband and son). In point of fact, a nearer kinsman than Boaz had agreed to purchase the estate (as goel), which Naomi evidently had not yet sold (see commentaries on iv. 3); but he was unwilling to marry Ruth (reading in ver. 5, " and also Ruth thou must buy "; cf. ver. 10), recognizing that if a son were born the estate would revert to the line of Elimelech, thus leaving him at a disadvantage. He was evidently unprepared for what seems a novel condition (contrast Boaz in iii. 12 seq.), although, from the felicitations in iv. n-13, the issue of the marriage is actually reckoned to the husband (Boaz). It is improbable that these conflicting features in v. n-13 and ver. 17a, and all that they involve, co-existed, and it is possible that the former (with the implied reference to the coming David) is not part of the original. However, as in the equally com- plicated story in Gen. xxxviii., it is difficult to trace the extent or growth of the various motives, e.g. the primary interest in Naomi, the romantic marriage of Ruth, the selling of the land (which comes only in ch. iv.), &c.

Literature. — See S. R. Driver, Literature of Old Testament, who, with C. F. Kent (Beginnings of Heb. Hist. p. 310 seq.), favours a pre- exilic origin. An exilic date has found the support of Ewald and Konig, but that it is now of the post-exilic age is the opinion of most writers. See further W. R. Smith's art. " Ruth " in'Ency. Brit. 9th ed. (several portions of which have been retained by the present writer), revised and supplemented by T. K. Cheyne in Ency. Bib.; A. Bertholet, Kurzer Handkommenlar (1898); W. Nowack, Hand- kommentar (1902); and (with special reference to traces of earlier mythological motives) H.~Wmckler,Altorient.Forschungen (iii. 66 sqq.). For the customs discussed above, see I. Benzinger, Ency. Bib. col. 2949 seq.; j. A. Bewer, Theol. Stud. u. Krit. (1903), pp. 328 seq., 502 sqq. (with G. A. Barton's art. " Ruth " in Jew. Encyc); and T. VV. Juynboll, Theolog. Tijdschr. /1906), pp. 158 sqq.

(W. R. S.;S. A. C.)

RUTHENIANS, a name applied to those of the Little Russians who are Austrian subjects. The name is a form of the word Russian. The Ruthenians were separated from the bulk of Russians by the accident of the two feudal principalities of the old Red Russia, Halic and Volhynia, having fallen to Lithuania, which in turn was united with Poland. At the partition of Poland no one troubled about ethnological boundaries. The language is in substance like the Little Russian of the Ukraine, though it has marked differences; the most interesting

dialects are those in the extreme W., which approach to Slovak and that of the Huzuli in Bukovina. The Ruthenians number some three million in Galicia, Bukovina, and in the Carpathians along the edges of Hungary from the 21st meridian eastwards. Throughout Galicia the Poles form the aristocracy, though in two-thirds of it Ruthenians form the bulk of the population, while the middle class is Jewish or German. The Ruthenians are therefore under an alien yoke both politically and economic- ally: in religion they mostly belong to the Uniate Church, acknowledging the Pope but retaining their Slavonic liturgy and most of the outward forms of the Greek Church. Their intellectual centre is Lemberg (Lviv or Lwow), where some lectures in the university are given in their language, and they are agitating for it to have equal rights with Polish. Yet here Little Russian is freer than in the Russian empire, and in Lem- berg is the centre of its literature, the society called by the name of Sevcenko, the Little Russian poet. This society publishes voluminous transactions in a special orthography and deals with everything concerning Little Russia, its archae- ology, people and language.

See summary of the work of the Sevcenko for ten years in Archiv f. slavische Phil, xxvii. (1905), p. 279.

RUTHENIUM [symbol Ru, atomic weight 101-7 (0=i6)], in chemistry, a metallic element, found associated with platinum, in platinum ore and in osmiridium. The metal may be obtained from the residues obtained in the separation of osmium from osmiridium. These are washed with ammonium chloride until the filtrate is colourless, ignited, fused with caustic potash and nitre, the melt dissolved in water and nitric acid added to the solution until the colour of potassium ruthenate disappears. A precipitate of ruthenium oxide gradually separates; this is collected and ignited in a graphite crucible and finally fused in

the oxyhydrogen furnace (H. Sainte-Claire Deville and H. J. Debray, Ann. chim. phys., 1859, (3), 56, p. 406). For other methods see C. E. Claus, Pogg. Ann., 1845, 65, P- 200; E. Fremy, Comptes rendus, 1854, 38, p. 1008; T. Wilm, Ber., 1883, 16, p. 1524. A purer ruthenium is obtained by A. Gutbier and L. Trenkner (Zeit. anorg. Chem., 1905, 45, p. 166) by heating the crude metal (obtained by other processes) in a current of oxygen until all the osmium is volatilized as tetroxide. The residue is then fused with caustic potash and nitre, dis- solved in water, saturated with chlorine and distilled on the water-bath in a current of chlorine. Pure ruthenium tetroxide distils over. This is then dissolved in water, reduced by alcohol and ignited in oxygen. Ruthenium in bulk resembles platinum in its general appearance, and

has been obtained crystalline by heating an alloy of ruthenium and tin in a current of hydro- chloric acid gas. Its specific gravity (after fusion) is 12-063 (A. Joly, Cotnptes rendus, 1893, 116, p. 430). It fuses easily in the electric arc. It oxidizes superficially when heated, but fairly rapidly when ignited in an oxidizing blowpipe flame, forming a black smoke of the oxide. It is also oxidized when fused with caustic potash and nitre, forming a ruthenate. Acids have practically no action on the metal, but it is soluble in solutions of the alkaline hypochlorites. Like most of the other metals of the group, it absorbs gases. A colloidal form has been obtained by A. Gutbier and G. Hofmeier (Jour, prakt. Chem., 1905, (2), 71, p. 452) by reducing ruthenium salts with hydrazine hydrate in the presence of gum-arabic.

Several oxides of ruthenium, have been described, the definite existence of some of which appears to be doubtful. The dioxide, Ru0 2 , is formed by heating sulphate, or by heating the metal in a current of oxygen. _ It crystallizes in oqtahedra isomorphous with stannic oxide. It is insoluble in acids and decomposes when heated to a sufficiently high temperature. Fusion with caustic potash converts it into a mixture of potassium ruthenate and ruthenium sesquioxide, Ru 2 3 , which is a black, almost insoluble powder. An oxide of composition Ru 4 9 is obtained as a black hydrated powder when the peroxide is heated with water for some time. It becomes anhydrous at about 360 C, and is unattacked by acids and alkalis. The peroxide, Ru0 4 , is formed when a solu- tion of potassium ruthenate is decomposed by chlorine, or by oxidizing ruthenium compounds with potassium chlorate and hydrochloric acid, or with potassium permanganate and sulphuric acid. It forms a golden yellow crystalline mass, which sublimes slowly in vacuo, and. melts at 25-5° C. It blackens on exposure to moisture, and decomposes when exposed to light. It is insoluble in water, but gradually decomposes, forming a hydrated oxide, Ru 2 O s H 2 0. It is readily reduced. Its vapour possesses a characteristic smell, somewhat resembling that of ozone. Ruth enium dichloride, RuCl 2 , is obtained (in solution) by reducing the sesquichloride by sulphuretted hydrogen or zinc. It is stable in the cold. The sesquichloride, Ru 2 Cl 6 , is formed when a mixture of chlorine and carbon monoxide is passed over finely divided ruthenium heated to 350 C. (Joly, Comptes rendus, 1892, 114, p. 291). It is a brown powder which is readily decomposed by boiling water. It absorbs ammonia readily, forming Ru 2 Cl 6 -7NH 3 . Numerous double chlorides are known, e.g. Ru»Cl.-4KCl; Ru 2 Cl 6 -4NH 4 Cl, &c. The pure tetrachloride, RuCl 4 > has not been isolated, but is chiefly known in the form of its double salts, such as potassium ruthenium chloride, K 2 RuCl 6 > which is obtained when finely

divided ruthenium is fused with caustic potash and potassium chloride is gradually added to the fused mass (U. Antony and A. Luchesi, Gazz, 1899, 29, II. p. 82). It is a red-brown crystalline powder, which is soluble in water. A similar ammonium salt has been obtained. Ruthenium sulphides are obtained when the metal is Warmed with pyrites and some bOrax, and the fused mass treated with hydrochloric acid first in the cold and then hot. The insoluble residue contains a mixture of two sulphides, one of which is converted into the sulphate by nitric acid, whilst the other (a crystalline solid) is insoluble in acids. Ruthenium sulphate, $Ru(S0_4)_2$, as obtained by oxidizing the sulphide, is an orange-yellow mass which is deliquescent and dissolves in water, the solution possessing a strongly acid reaction. Rouge de Ruthene, $Ru_2(OH)_2$-$CI_4(NH_4)_7$, is obtained from ammonia and ruthenium sesquichloride at 40 C, the product being purified by crystalliza tion from ammonia. It forms small brown lamellae which dis- solve slowly in water to give a fuchsin-red solution possessing a violet reflex. The solution possesses a considerable tinctorial power, dyeing silk in the cold. Potassium ruthenium cyanide, $K_4Ru(CN)_6$-$3H_20$; formed when potassium ruthenate is boiled with a solution of potassium cyanide, crystallizes in colourless plates which are soluble in water. A ruthenium silicide, RuSi, has been prepared by H. Moissan (Comptes rendus, 1903, 137, p. 229) by the

direct combination of the two elements in the electric furnace. It forms very hard metallic-looking crystals, burns in oxygen, and is not attacked by acids. Potassium ruthenate, KijRuOi-HsO, obtained by fusion of the metal with caustic potash and nitre, crystallizes in prisms which become covered with a black deposit on exposure to moist air. It is soluble in water, giving an orange- red solution which becomes green on standing, and gradually deposits the hydrated pentoxide, $Ru_2{}_6$-H_2 (H. Debray and A. Joly, Comptes rendus, 1888, 106, p. 1494). The per-rulhenate, KRuC>4, formed by the action of chlorine on the ruthenate, or of alkalis on the peroxide at 50 C, is a black crystalline solid which is stable in dry air but decomposes when heated strongly. On the nitroso, nitroso-ammonium and nitroso-diammonium com- pounds see C. E. Claus, Ann., 1856, 98, p. 317; A. Joly, Comptes rendus, 1888, 107, p. 994; 1889, 108, pp. 854, 1300; 1890, in, p. 969; L. Brizard, ibid., 1896, 122, p. 730; 1896, 123, p. 182. The atomic weight of ruthenium was determined by A. Joly {Comptes rendus, 1889, 188, p. 946), who obtained the values 101-5 and 101-3.

RUTHERFORD, HARK, the pen-name of William Hale White, English author, who was born at Bedford about 1830. His father, William White, a member of the nonconformist community of the Bunyan Meeting, removed to London, where he was well known as a doorkeeper of the House of Commons; he wrote sketches of parliamentary life for the Illustrated Times, papers afterwards collected by his son as The Inner Life of the House of Commons (1897). The son was educated for the Congregational ministry, but the development of his views prevented his taking up that career, and he became a clerk in the admiralty. He had already served an apprenticeship to journalism before he made his name as a novelist by the three books "edited by Reuben Shapcott," The Autobiography of Mark Rutherford (1881), Mark Rutherford's Deliverance (1885), and The Revolution in Tanner's Lane (1887). Under his own name he translated Spinoza's Ethic (1883). Later books are Miriam's Schooling, and other Papers (1890), Catherine Furze (2 vols., 1893), Clara Hopgood (1896), Pages from a Journal, with other Papers (1900), and John Bftnyan (1905). Though for a long time little appreciated by the public, his novels— particularly the earlier ones — have a power and style which must always give his works a place of their own in the literary history of their time.

RUTHERFORD, WILLIAM GUNION (1853-1907), English scholar, was born in Peeblesshire on the 17th of July 1853. He was educated at St Andrews and Oxford, .where he graduated in natural science, with a view to following the medical pro- fession, which he abandoned in favour of a scholastic career. From 1883 to 1901 he was headmaster of Westminster school; and his death, on the 19th of July 1907, deprived classical scholarship in England of one of its most brilliant modern representatives. Rutherford devoted special attention, to Attic idioms and the language of Aristophanes. ; His most important work, the New Phrynichus (1882), dealing with the Atticisms of the grammarian, was supplemented by his Babrius (1883), a specimen of the later Greek, which was the chief subject of C. A. Lobeck's earlier commentary (1820) on Phrynichus. His edition (1896-1905) of the Aristophanic scholia from the Ravenna MS. was less successful. Mention may also be made of his Elementary Greek Accidence and Lex Rex, a list of cognate words in Greek, Latin and English.

RUTHERFURD (or Rutherford), SAMUEL {c. 1600-1661), Scottish divine, was born about 1600 at the village of Nisbet, Roxburghshire. He went to college at Edinburgh in 1617, graduating M.A. in 1621, and two years afterwards was elected professor of humanity. On account of an alleged indiscretion before his marriage in 1626 he was dismissed his professorship in that year, but, after studying theology,

he was in 1627 appointed minister of Anwoth, Kirkcudbrightshire, and soon took a leading place among the clergy of Galloway. In 1636 his first book, entitled Exercitaliones Apologeticae pro Divina Gratia — an elaborate treatise against Arminianism — appeared at .Amsterdam. Its severe Calvinism led to a prosecution by the bishop, Thomas Sydserf, in the High Commission Court, first at Wigtown and afterwards at Edinburgh, with the result that Rutherfurd was deposed from his pastoral office, and sentenced to confinement in Aberdeen during the king's pleasure.

His banishment lasted from September 1636 to February 1638, and the greater number of his published Letters belong to this period of his life. He was present at the signing of the Covenant in Edinburgh in 1638, and at the Glasgow Assembly of the same year he was restored to his parish. In 1639 he was appointed professor of divinity in St Mary's College, St Andrews. He only accepted the position on the condition that he should be allowed to act as colleague to Robert Blair in the church of St Andrews. He was sent up to London in 1643 as one of the eight commissioners from Scotland to the Westminster Assembly. Remaining at his post over three years, he did great service to the cause of his party. In 1642 he had published his Peaceable and Temperate Plea for Paul's Presbyterie in Scotland, and the sequel to> it in 1644 on The Due Right of Presbyteries provoked Milton's contemptuous reference to " mere A. S. and Rutherfurd " in his sonnet On the New Forcers of Conscience under the Long Parliament. In 1644 also appeared Rutherfurd's Lex Rex, a Dispute for the Just Prerogative of King and People, which gives him a recognized place among the early writers on constitutional law; it was followed by The. Divine Right of Church Government and Excommunication (1646), and Free Disputation against Pretended Liberty of Conscience (1648), characterized by Bishop Heber as " perhaps the most elaborate defence of persecution which has ever appeared in a Christian country." Among his other works are the Tryal and Triumph qf Faith (1645), Christ Dying and Drawing Sinners to Himself (1647), and Survey of the Spiritual Antichrist (1648). In 1647 he returned to St Andrews to become principal of the New College there, and in 1648 and 165 1 he declined successive invitations to theological chairs at Harderwijk and Utrecht. After the Restoration in 1660, his Lex Rex was ordered to be burned. He was deprived of all his offices, and on a charge of high treason was cited to appear before the ensuing parliament. His health utterly broke down, and he drew up, on the 26th of February 1661, a Testimony, which was posthumously published. He died on the 23rd of the following March.

The fame of Rutherfurd now rests principally upon his remark- able

Letters, which,' to the number of 215, were first published anonymously by M'Ward, an amanuensis, as Joshua Redivivus, or Mr Rutherfoord's Letters, in 1664. They have been frequently reprinted, the best edition (365 letters) being that by Rev. A. A. Bonar (1848), with a sketch of his life. In addition to the other works already mentioned, Rutherfurd published in 1651 a treatise, De Divina Providentia, against Molinism, Socinianism and Armini- anism, of which Richard Baxter, not without justice, remarked that " as the Letters were the best piece so this was the worst he had ever read."

See also a short Life by Rev. Dr Andrew Thomson (1884) ; Dr A. B. Grosart in Representative Nonconformists; Dr Alexander Whyte, Samuel Rutherford and some of his Correspondents (1894); Rev. R. Gilmour, Samuel Rutherford (1904).

RUTHERGLEN (locally pronounced Ruglen), a royal municipal and police burgh of Lanarkshire, Scotland. Pop. of royal burgh (1901) 18,279; It is situated on the left bank of the Clyde, 2 J m. by the Caledonian railway S.E. of Glasgow, with the E. of which it is connected by a bridge. The parish church stands near the spire of the ancient church where, according to tradition, the treaty was made in 1297 with Edward I., by which Sir John Menteith undertook to betray Wallace to the English. The principal public building is the town hall, dating from 1861. The industries include collieries, chemical works^ dye-works, cotton- and paper-mills, chair-making, tube-making, pottery, rope- and twine- works and some shipbuilding. It forms one of the Kilmarnock group of parliamentary burghs, ■frith Dumbarton,lPort-Glasgow, Renfrew and Kilmarnock.

Rutherglen was erected into a royal burgh by David I. in 1126. It then included a portion of Glasgow, but in 1226 the boundaries were rectified so as to exclude the whole of the city. In early times it had a castle, which was taken by Robert Bruce from the English in 13 13. It was kept in good repair till after the battle of Langside (1568), when it was burnt by order of the regent Moray. In 1679 the Covenanters published their "Declaration and Testimony " at Rutherglen prior to the battles of Drumclog and Bothwell Brig (1679).

RUTHIN (Rhudd ddin, " red fortress "), a municipal and contributory parliamentary borough (with Denbigh and Holt) and market town of Denbighshire, N. Wales, situated on a hill rising from the river Clwyd,

21 m. from Chester, and 215 from London by rail. Pop. (1901) 2643. It is on the Great Western railway (Denbigh, Corwen & Ruthin branch). Apart from the legends of Arthur and his limestone block (shown in the market-place), the first event of note in its history is its con- nexion with the de Grey de Ruthyn family (the first lord died 1353). Owen Glendower attacked it unsuccessfully in 1400. It was sold by the de Greys to Henry VII., and Elizabeth gave it to the earl of Warwick. In 1646, after two months' siege, it was dismantled by the Parliamentarians. The new castle occupies the same site, and is built of the same coloured sand- stone as the old. New buildings for the Free Grammar School (founded in 1595 by Gabriel Goodman, dean of Westminster, who also in 1590 had built the hospital for twelve decayed house- keepers), were opened in the town in 1893. The old (conventual) Anglican church of St Peter, once belonging to " Les Bons- hommes," and made collegiate in 1310 by John de Grey, has a Perpendicular north aisle roof, nearly 500 panels of carved oak, and cloisters which have been made into a house for the warden of the hospital. Agriculture is the staple, but there are chemical, aerated waters, bricks, terra-cotta and other manufactures.

RUTHVEN, the name of a noble Scottish family which traces its descent from a certain Trior, who settled in Scotland during the reign of David I. In 1488 one of its members, Sir William Ruthven (d. 1528), was created a lord of parliament as Lord Ruthven. His eldest son William was killed at Flodden in 1 313, and consequently his grandson William succeeded him in the title, and after holding the offices of extraordinary lord of session and keepe/ of the privy seal died in December 1552, leaving three sons. The eldest of these, Patrick, 3rd Lord Ruthven (c. 1520-1566), played an important part in the political intrigues of the 16th century as a strong Protestant and a supporter of the lords of the congregation. He favoured the marriage of Mary with Darnley, and was the leader of the band which murdered Rizzio. This event was followed by his flight into England, where he died on the 13th of June 1566. Ruthven wrote for Queen Elizabeth a Relation of the murder, which is preserved in MSS. in the British Museum.

A descendant of the 1st Lord Ruthven in a collateral line, also named Patrick Ruthven (c. 1573-1651), distinguished him- self in the service of Sweden, which he entered about 1606. As a negotiator he was very useful to Gustavus Adolphus because of his ability to " drink immeasurably and preserve his understanding to the last," and he also won fame on the field of battle. Having taken part in the Thirty Years' War and been governor of Ulm, he left the Swedish service and returned to Scotland, where he was employed by Charles I. He

defended Edinburgh Castle for the king in 1640, and when the Civil War broke out he joined Charles at Shrewsbury. He led the left wing at the battle of Edgehill, and after this engage- ment was appointed general-in-chief of the Royalist army. For his services he was created Lord Ruthven of Ettrick in 1639, earl of Forth in 1642 and earl of Brentford in 1644. The earl compelled Essex to surrender Lostwithiel, and was wounded at both battles of Newbury. But his faculties had begun to decay, and in 1644 he was superseded in his command by Prince Rupert. After visiting Sweden on a mission for Charles II., Brentford died at Dundee on the 2nd of February 1651. He left no sons and his titles became extinct.

Patrick, 3rd Lord Ruthven, was succeeded as 4th lord by his son William (c. 1541-1584), who like his father was pro- minent in the political intrigues of the period and was also concerned in the Rizzio murder. In 1582 he devised the plot to seize King James VI., known as the raid of Ruthven, and he was the last-known custodian of the famous silver casket containing the letters alleged to have been written by Mary, queen of Scots, to Bothwell. In 1581 he was created earl of Gowrie, but all his honours were forfeited when he was attainted and executed in May 1584 (see Gowrie, 3RD Earl of).

The 2nd Lord Ruthven left a son, Alexander (d. 1599), the founder of the family of Ruthven of Freeland, and the grand- father of Sir Thomas Ruthven (d. 1673), on whom Charles II. bestowed the title of Lord Ruthven of Freeland in 165 1. When his son David died unmarried in April 1701 the title of Baroness Ruthven was assumed by the latter's sister, Jean (d. 1722), although according to some authorities the peerage had be- come extinct. It was, however, assumed in 1722 by Isobel (d. 1732), wife of James Johnson, who took the name of Ruthven on succeeding to the family estates; and their son, James Ruthven (d; 1783), took the title and was allowed to vote at the elections of Scots representative peers. In 1853 the barony again descended to a female, Mary Elizabeth Thornton (c. 1784- 1864), the wife of Walter Hore (d. 1878). She and her husband took the name of Hore-Ruthven, and their grandson, Walter James Hore-Ruthven (b. 1838), became the 8th baron in 1864.

See the Ruthven Correspondence, edited with introduction by theRev.W.D. Macray(i868); J. H. Round, "The Barony of Ruthven of Freeland " in Joseph Foster's Collectanea Genealogica (1881-85) ; and Sir R. Douglas, The Peerage of Scotland (new ed. by Sir J. B. Paul).

RUTILE, the most abundant of the three native forms of titanium dioxide (Ti0 2) ; the other forms being anatase (q.v.) and brookite

(q.v.). Like anatase, it crystallizes in the tetra- gonal system, but with different angles and cleavages, it being crystallographicahy related to cassiterite, with which it is iso- morphous. The crystals resemble, cassiterite in their prismatic habit and terminal pyramid planes (fig. 1) and also in the twin- ning: the prism planes are striated vertically. , Geniculated twins, with e (joi) as twin-plane, are of frequent occurrence, and the twinning is usually several times repeated, giving rise to triplets (fig. 2), sextets ,and octets. Twin-lamellae are often

Fig. 1.

Fig. 2,

present in the crystals. Acicular crystals are sometimes twinned together to form reticulated skeletal plates to which the name ” sagenite,” from Gr. crayqvr) (a net), is applied. A rarer type of twinning, on the plane (301), gives rise to heart-shaped or kite-shaped forms. There are distinct cleavages parallel to the faces of the prisms m (no), and a (100). The colour is usually reddish-brown, though yellowish in the very fine needles, and black in the ferruginous varieties (” nigrine ” arid ” ilmeno- rutile “) : the streak is pale brown. The name rutile, given by A. G. Werner in 1803, refers to the colour, being from the Latin rutilus (red). Crystals are transparent to opaque, and have a brilliant metallic-adamantine lustre. The hardness is 6| and the specific gravity 4-2, ranging, however, up to 5-2 in varieties containing 10% of ferric oxide. The refractive indices and the positive birefringence are high.

Rutile occurs as a primary constituent in eruptive rocks, but more frequently in schistose rocks. As delicate acicular crystals it is often enclosed in mica and quartz: in mica (q.v.) it gives rise to the phenomenon of asterism; and clear transparent quartz (rock-crystal) enclosing rutile is often cut as a gem under the name of ” Venus’ hair stone ” (Veneris crinis Of Pliny). Larger crystals occur in the cavities of granite and crystalline schists ; very large twinned crystals have been found at Graves Mountain in Lincoln county, Georgia, and good specimens have been obtained from several places in Norway and the Swiss and Tirolese Alps. As a secondary mineral, rutile in the form of minute needles is of wide distribution in various sedimentary rocks, especially clays and slates. As rounded grains it is often met with in auriferous sands and gravels. The mineral has little economic value : it has been used for imparting a yellow colour to glass and porce- lain, and for this purpose is mined at Risor and other places in Norway.’ 1 (L.‘J. S.)

RUTILIUS CLAUDIUS NAMATIANUS, Roman poet, flour- ished at the beginning of the 5th century a.D. He was the author of a Latin poem, De Reditu Suo, in elegiac metre, de- scribing a coast voyage from Rome to Gaul in a.d. 416. The literary excellence of the work, and the flashes of light which it throws across a momentous but dark epoch of history, combine to give it exceptional importance among the relics of late Roman literature. The poem was in two books; the exordium of the first and the greater part of the second have been lost. What remains consists of about seven hundred lines.

The author is a native of S. Gaul (Toulouse or perhaps Poitiers) , and belonged, like Sidonius, to one of the great governing families of the Gaulish provinces. His father, whom he calls Lachanius, had held high offices in Italy and at the imperial court, had been governor of Tuscia (Etruria and Umbria), then imperial treasurer (comes sacrarum largitionum), imperial recorder. (quaestor), and governor of the capital itself (praefectus urbi). Rutilius boasts his career to have been no less dis- tinguished than his father's, and particularly indicates that he had been secretary of state (magister officiorum) and governor of the capital (i. 157, 427, 467, 561). After reaching manhood, he passed through the tempestuous period between the death of Theodosius (395) and the fall of the usurper Attalus, which occurred near the date when his poem was written. He witnessed the chequered career of Stilicho as actual, though not titular, emperor of the West; he saw the hosts of Rada- gaisus rolled back from Italy, only to sweep over Gaul and Spain; the defeats and triumphs of Alaric; the three sieges and final sack of Rome, followed by the marvellous recovery of the city; Heraclian's vast armament dissipated; and the fall of seven pretenders to the Western diadem. Undoubtedly the sympathies of Rutilius were with those who during this period dissented from and, when they could, opposed the general tendencies of the imperial policy. We know from himself that he was the intimate of those who belonged to the circle of the great orator Symmachus — men who scouted Stilicho's compact with the Goths, and led the Roman senate to support the pre tenders Eugenius and Attalus in the vain hope of reinstating the gods whom Julian had failed to save.

While making but few direct assertions about historical char- acters or events, the poem forces on us important conclusions concerning the politics and religion of the time. The attitude of the writer towards paganism is remarkableˆ The whole poem is intensely pagan, and is

penetrated by the feeling that the world of literature and culture is and must remain pagan; that outside paganism lies a realm of barbarism. The poet wears an air of exalted superiority over the religious innovators of his day, and entertains a buoyant confidence that the future of the ancient gods of Rome will not belie their glorious past. Invective and apology he scorns alike, nor troubles himself to show, with Claudian, even a suppressed grief at the indignities put upon the old religion by the new. As a statesman, he is at pains to avoid offending those politic Christian senators over whom pride in their country had at least as great power as attachment to their new religion. Only once or twice does Rutilius speak directly of Christianity, and then only to attack the monks, whom the temporal authorities had hardly as yet recognized, and whom, indeed, only a short time before, a Christian emperor had forced by thousands into the ranks of his army. Judaism Rutilius could assail without wounding either pagans or Christians, but he intimates, not ob- scurely, that he hates it chiefly as the evil root whence the rank plant of Christianity had sprung.

We read in Gibbon that " Honorius excluded all persons who were adverse to the catholic church from holding any office in the state," that he " obstinately rejected the service of all those who dissented from his religion," and that " the law was applied in the utmost latitude and rigorously executed." Far different is the picture of political life impressed upon us by Rutilius. His voice is assuredly not that of a partisan of a discredited and over- borne faction. We see by the aid of his poem a senate at Rome composed of past office-holders, the majority of whom Were certainly pagan still. We discern a Christian section whose Christianity was political rather than religious, who were Romans_ first and Christians afterwards, whom a new breeze in politics might easily have wafted back to the old religion. Between these two sec- tions the broad old Roman toleration reigns. Some ecclesiastical historians have fondly imagined that after the sack of Rome the bishop Innocent returned to a position of predominance. No one who fairly reads Rutilius can cherish this idea. The air of the

capital, perhaps even of Italy, was still charged with paganism. The court was far in advance of the people, and the persecuting laws were in large part incapable of execution.

Perhaps the most interesting lines in the whole poem are those in which Rutilius assails the memory of " dire Stilicho," as he names him. Stilicho, " fearing to suffer all that had caused himself to be feared," annihilated those defences of Alps and Apennines which the

provident gods had interposed between the barbarians and the Eternal City, and planted the cruel Goths, his ” skin- clad ” minions, in the very sanctuary of the empire. His wile was wickeder than the wile of the Trojan horse, than the wile of Althaea or of Scylla. May Nero rest from ali the torments of the damned, that they may seize on Stilicho; for Nero smote his own mother, but Stilicho the mother of the world!

We shall not err in supposing that we have here (what we find nowhere else) an authentic expression of the feeling entertained by a majority of the Roman senate concerning Stilicho. He had but imitated the policy of Theodosius with regard to the barbarians; but even that great emperor had met with passive opposition from the old Roman families. The relations, however, between Alaric and Stilicho had been closer and more mysterious than those between Alaric and Theodosius, and men who had seen Stilicho surrounded by his body-guard of Goths not unnaturally looked on the Goths who assailed Rome as Stilicho’s avengers. It is noteworthy that Rutilius speaks of the crime of Stilicho in terms far different from those used by Orosius and the historians of the lower empire. They believed that Stilicho was plotting to make his son emperor, and that he called in the Goths in order to climb higher. Rutilius holds that he used the barbarians merely to save himself from impending ruin. The Christian historians assert that Stilicho designed to restore paganism. To Rutilius he is the most uncompromising foe of paganism. His crowning sin (recorded by the poet alone) was the destruction of the Sibylline books — a sin worthy of one who had decked his wife in the spoils of Victory, the goddess who had for centuries presided over the deliberations of the senate. This crime of Stilicho alone is sufficient in the eyes of Rutilius to account for the disasters that afterwards befell the city, just as Merobaudes, a generation or two later, traced the miseries of his own day to the overthrow of the ancient rites of Vesta. With regard to the form of the poem, Rutilius handles the elegiac couplet with great metrical purity and freedom, and betrays many signs of long study in the elegiac poetry of the Augustan era. The Latin is unusually clean for the times, and is generally fairly classical both in vocabulary and construction. The taste of Rutilius, too, is comparatively pure. If he lacks the genius of Claudian, he also lacks his overloaded gaudiness and his large exaggeration, and the directness of Rutilius shines by comparison with the laboured complexity of Ausonius. It is common to call Claudian the last of the Roman. poets. That title might fairly be claimed for Rutilius, unless it be reserved for Merobaudes. At any rate, in passing from Rutilius to Sidonius no reader can fail to feel that he has left the region of Latin poetry for the region of Latin verse.

Of the many interesting details of the poem we can only mention a

few. At the outset we have an almost dithyrambic address to the goddess Roma, whose glory has ever shone the brighter for disaster, and who will rise once more in her might and confound her barbarian foes. The poet shows as deep a consciousness as any modern historian that the grandest achievement of Rome was the spread of law. Next we get incidental but not unimportant re- ferences to the destruction of roads and property wrought by the Goths, to the state of the havens at the mouths of the Tiber, and the general decay of nearly all the old commercial ports on the coast. Most of these were as desolate then as now. Rutilius even exagger- ates the desolation of the once important city of Cosa in Etruria, whose walls have scarcely changed from that day to ours. The port that served Pisae, almost alone of all those visited by Rutilius, seems to have retained its prosperity, and to have foreshadowed the subsequent greatness of that city. At one point on the coast the villagers everywhere were " soothing their wearied hearts with holy merriment," and were celebrating the festival of Osiris.

Authorities. — All existing MSS. of Rutilius are later than 1494, and are copies from a lost copy of an ancient MS. once at the monastery of Bobio, which disappeared about 1700. The editio princeps is that by J. B. Pius (Bologna, 1520), and the prin- cipal editions since have been those by Barth (1623), P. Burman (1731, in his edition of the minor Latin poets), Wernsdorf (1778, part of a similar collection), Zumpt (1840), and the critical edition by Lucian Miiller (Teubner, Leipzig, 1870), and another by Vessereau (1904) ; also an annotated edition by Keene, with a translation by G. F. Savage-Armstrong (1906). Miiller writes the poet's name as Claudius Rutilius Namatianus, instead of the usual Rutilius Claudius Namatianus; but if the identification of the poet's father with the Claudius mentioned in the Theodosian Code (2, 4, 5) be correct, Miiller is probably wrong. Rutilius receives more or less attention from all writers on the history or literature of the times, but a lucid chapter in Beugnot, Histoire de la destruction du Paganisme en Occident (1835), may be especially mentioned, and one in Pichon's Derniers ecrivains profanes (1906). (J. S. R.)

RUTILIUS RUFUS, PUBLIUS, Roman statesman, orator and historian, born c. 158 B.C. He was on intimate terms with the younger Scipio, under whom he served in the Numantine War (134), and he also accompanied Q. Metellus Numidicus in the campaign against Jugurtha (109). In 105 he was elected to the consulship, and restored the

discipline of the army and introduced an improved system of drill. Subsequently, he went as legate to Q. Mucius Scaevola, governor of Asia. By assisting his superior in his efforts to protect the provincials from the extortions of the publicani, or farmers of taxes, Rufus incurred the hatred of the equestrian order, to which the publicani belonged. In 92 he was charged with the very offence of extortion which he had done his utmost to prevent. The charge was absurd, but as the juries at that time were chosen from the equites, his condemnation was only to be expected. Rufus accepted the verdict with the resignation befitting a Stoic and pupil of Panaetius. He retired to Mytilene, and afterwards to Smyrna, where he spent the rest of his life, and where Cicero saw him as late as the year 78. Although invited by Sulla to return to Rome, Rufus refused to do so. It was doubtless during his stay at Smyrna that he wrote his auto- biography and a history of Rome in Greek, part of which is known to have been devoted to the Numantine War. He possessed a thorough knowledge of law, and wrote treatises on that subject, some fragments of which are quoted in the Digests. He was also well acquainted with Greek literature."

See Cicero, Pro Fonteio, 17, Brutus, 22, 30; Livy, epit. 70; Macrobius, Sat. I. xvi. 34; Appian, Hisp. 88; Athenaeus iv. p. 168; W. H. Suringar, De Romanis Autobiogr aphis (Leiden, 1846); H. Peter, Hist. Rom. Reliquiae, I. cclxi.-cclxviii. (life), frags, p. 187; A. H. J. Greenidge, Hist, of Rome, i. p. 484.

RUTLAND, EARLS AND DUKES OF. The 1st earl of Rutland was Edward Plantagenet (1373-1415), son of Edmund, duke of York, and grandson of King Edward III. In 1390 he was created earl of Rutland, but was to hold the title only during the lifetime of his father, on whose death in 1402 the earldom accordingly became extinct, the earl then becoming duke of York. The title earl of Rutland seems to have been assumed subsequently by different members of the house of York, though it does not appear that any of them had a legal right to it. One of these was the 1st earl's nephew, Richard Planta- genet, duke of York, father of King Edward IV. Richard's daughter Anne married for her second husband Sir Thomas St Leger, and their daughter Anne married George Manners, 12th Baron Ros, or Roos (d. 1513). Their son, Thomas Manners (d. 1543), was therefore great-grandson of Richard Plantagenet, who had styled himself earl of Rutland among other titles. In 1525 Thomas Manners was created earl of Rutland, and his descendants have held this title to the present day.

Thomas was a favourite of Henry VIII., who conferred on him many offices and extensive grants of land, including Belvoir Castle, in

Leicestershire, which became henceforth the chief resi- dence of his family. He was succeeded in the earldom by his son Henry (c. 1516-1563); and his second son, Sir John Manners, acquired Haddon Hall, Derbyshire, by his marriage with Dorothy, daughter of Sir George Vernon, called ” the king of the Peak.” Henry, the 2nd earl, was an admiral of the fleet in the reign of Queen Mary, and later enjoyed the favour of Queen Elizabeth. His son Edward, 3rd earl (c. 1548-1587), who was also a favourite with Elizabeth, left no sons, and the barony of Ros, which had hitherto descended with the earldom, passed to his daughter Elizabeth (d. 1591), wife of William Cecil, earl of Exeter; his successor in the earldom was his brother John (d. 1588), whose son Roger, 5th earl (1576-1612), married a daughter of Sir Philip Sidney. The barony of Ros was restored to the main line of the family in the person of Francis, 6th earl (1 578-1632), who inherited it in 1618 as heir general of his cousin William Cecil, Lord Ros (1590-1618) ; but it was again separated from the earldom of Rutland on the death of Francis without male issue, and the assumption of the courtesy title of Lord Ros by the eldest son of subsequent earls of Rutland appears to have had no legal basis.

The 8th earl, a cousin of his predecessor and also of the 6th earl, was John (1604-1679), eldest son of Sir George Manners (d. 1623) of Haddon, a descendant of Sir John Manners, the second son of the 1st earl. His son John, 9th earl (1638-17 11), a partisan of the revolution of 1688, received the Princess Anne at Belvoir Castle on her flight from London; after the accession of Anne to the throne she created him marquess of Granby and duke of Rutland in 1703. The 1st duke was three times married; the divorce in 1670, while he was still known as Lord Ros, of his first wife, Anne, daughter of the marquess of Dor- chester, was a very celebrated legal case, being the first instance of divorce a vinculo by act of parliament, a divorce a mensa et thoro having previously been granted by the ecclesiastical courts. His grandson John, the 3rd duke (1696-1779), was the father of John Manners, marquess of Granby (q.v.), a distinguished soldier, whose son Charles, 4th duke of Rutland (1754-1787), succeeded his grandfather. When marquess of Granby he represented Cambridge University in the House of Commons, and hotly opposed the policy that led to war with the American colonies. He was instrumental in procuring the entrance of the younger Pitt to the House of Commons, and remained through life an intimate friend of that statesman. After succeeding to the dukedom in 1779, he sat in the cabinets of Shelburne and of Pitt, and became lord lieutenant’ of Ireland in 1784. He was one of the earliest to advocate a legislative union between Ireland and Great Britain, which he recommended in a letter to Pitt in

June 1784. The poet Crabbe was for some time private chaplain to the duke at Belvoir. His wife, Mary Isabella (1756-1831), ” the beautiful duchess,” whose portrait was four times painted by Sir Joshua Reynolds, was a daughter of the 4th duke of Beaufort. His eldest son, John Henry, 5th duke (1778-1857), was ” the duke ” in Disraeli’s Coningsby; the latter’s two sons, the marquess of Granby and Lord John Manners, figuring in the same novel as ” the marquis of Beaumanoir ” and ” Lord Henry Sidney ” respectively. Both these sons succeeded in turn to the dukedom, Lord John Manners succeed- ing his brother Charles Cecil John, the 6th duke (1815-1888), as 7th duke of Rutland (see below) in 1888. In 1891 he was made a knight of the Garter, being the tenth earl and the sixth duke of Rutland of the same creation to wear this illustrious order.

RUTLAND, JOHN JAMES ROBERT MANNERS, 7TH Duke of (1818-1906), English statesman, was born at Belvoir Castle on the 13th of December 1818, being the younger son of the 5th duke of Rutland by Lady Elizabeth Howard, daughter of Byron’s guardian, the 5th earl of Carlisle. Lord John Manners, as he then was, was educated at Eton and Trinity College, Cambridge. In 1841 he was returned for Newark in the Tory interest, along with W. E. Gladstone, and sat for that borough until 1847. Subsequently he sat for Colchester, 1850-57; for North Leicestershire, 1857-85; and for East Leicestershire from 1885 until in 1888 he took his seat in the House of Lords upon succeeding to the dukedom.

Melbourne’s Whig government had been doomed for some time before it went out in June 1841. The Tories came in with a large majority under Peel, and among Manners’s friends who were successful in the constituencies, besides Gladstone, were Smythe, afterwards 7th Viscount Strangford, at Canterbury, Baillie-Cochrane, afterwards 1st Lord Lamington, at Bridport; and Disraeli at Shrewsbury. Cherishing many, of the ideas of the cavaliers of the 17th century, and full of political and literary ardour, Lord John was soon prominent in the social group which revolved round Lady Blessington. In 1841 he committed some of his loyalist and other fancies to a volume called England’s Trust,’ and other Poems, which he dedicated to his friend Smythe, and in which occurred the familiar line about ” laws and learning ” and ” our old nobility.” Before the end of this year Manners had definitely associated himself with the ” Young England ” party, under the leadership of Disraeli. This party sought to extinguish the predominance of the middle-class bourgeoisie, and to re-create the political prestige of the aristocracy by resolutely proving its capacity to ameliorate the social, intellectual, and material condition of

the peasantry and the labouring classes. At the same time its members looked for a regeneration of the Church, and the rescue of both the Church and , Ireland from the trammels inherited from the Whig predominance of the 18th century. Manners made an extensive tour of inspection in the industrial parts of N. England, in the course of which he and his friend Smythe expounded their views with a brilliancy which frequently extorted compliments from the leaders of the Manchester school. In 1843 he supported Lord Grey's motion for an inquiry into the condition of England, the serious dis- affection of the working classes of the north being a subject to which he was constantly drawing, the attention of parliament. Among other measures that he urged were the disestablish- ment , of the Irish Church, the modification of the Mortmain Acts, and the resumption of regular diplomatic relations with the Vatican. In the same year he issued in pamphlet form a strong Plea for National Holydays. In 1844 Lord John vigorously supported the Ten-hours Bill, which, though strongly opposed by Bright, Cpbden, and other members of the Manchester school, was ultimately passed in May 1847. In October during that year he took part in, and spoke at, the brilliant soiree held at the Manchester Athenaeum under the presidency of Disraeli. A few days later he and his friends attended a festival at Bingley, in Yorkshire, to celebrate the allotment of land for gardens to working men, a step which) through the agency of his father, he had done a great deal to further. About the same time Smythe dedicated to him his Historic Fancies as to " the Sir Philip Sidney of our generation." Manners figured as Lord Henry Sidney in Disraeli's Coningsby, and not a few of his ideas are represented as those of Egremont in Sybil and Waldershare in Endymion. But the disruption of the Young England party was akeady impending. Lord John's support to Peel's decision to increase the Maynooth grant in 1845 led to a difference with Disraeli. Divergences of opinion with regard to Newman's secession from the English Church produced further defections in the ranks, and the rupture was completed by Smythe acquiescing in Peel's con- version to Free Trade. Lord John produced another volume of verse, known as English Ballads, chiefly patriotic and historical, in 1850. In the same year he wrote the letterpress for an atlas of coloured views by J. C. Schetky; and he published several pamphlets, one on the Church of England in the Colonies, in 1851. During the three short administrations of Lord Derby (1851, 1858, and 1866) he sat in the cabinet as first commissioner of the office of works. On the return of the Conservatives to power in 1874 he became postmaster-general in

Disraeli's administration, and was made G.C.B. on his retirement in 1880. He was again postmaster-general in Lord Salisbury's administration, 1885-86, and was head of the department when sixpenny telegrams were introduced. Finally, in the Conservative government of 1886-92 he was chancellor of the duchy of Lancaster. He had succeeded to the dukedom of Rutland in March 1888, upon the death of his elder brother. He died on the 4th of August 1906 at Belvoir Castle.

He was succeeded as 8th duke by his eldest son (b. 1852), who had been Conservative M.P. for the Melton division of Leicestershire from 1888 to 1895; and whose wife, as marchioness of Granby, became well known as a clever artist, a volume of her Portraits of various distinguished men and women being published in 1899.

RUTLAND, a midland county of England, bounded N. and E. by Lincolnshire, N. and W. by Leicestershire, and S.E. by Northamptonshire. It is the smallest county in England, having an area of 152 sq. m. The surface is pleasantly undu- lating, ridges of high ground running E. and W., separated by rich valleys. The principal of these valleys is the vale of Catmose, in the Oakham district, to the N. of which rises a tableland commanding wide views into Leicestershire. The vale maintains its reputation for richness of soil assigned to it by Drayton in his Poly-Olbion. This, the N.W. part of the county, is also the district of the well-known Cottesmore hunt.

The royal forest of Lyfield, or Leafield, which included the greater part of the hundreds of Oakham and Martinsley, once extended over the county between Oakham and Uppingham, and patches of it still exist. To the S. of Uppingham it was known as Beaumont Chase. The river Welland, flowing N E., forms the S.E. boundary of Rutland with Northamptonshire. The Gwash, or Wash, which rises in Leicestershire, flows east- ward through the centre of the county, and just beyond its borders in Lincolnshire joins the Welland The Chater, also rising in Leicestershire and flowing E., enters the Welland about 2 m. from Stamford. The Eye, forming part of the S.W. boundary, is also tributary to the Welland.

Geology. — The county consists entirely of Jurassic formations, viz. of Liassic and Oolitic strata — the harder beds, chiefly limestone containing iron, forming the hills and escarpments, and the clay- beds the slopes of the valleys. The oldest rocks are those belonging to the Lower Lias in the N.W. The bottom of the vale of Catmose is formed of marlstone rock belonging to the Middle Lias, and its sides are composed of lpng slopes of Upper Lias clay. The Upper Lias also

covers a large area in the W. of the county, and is worked for bricks at Luffenham and Seaton. The lowest of the Oolitic formations is the Northampton sand, which has yielded iron ore at MantOn and Cottesmore, The Lincolnshire Oolitic limestone prevails in the E. of the county N. of Stamford. It is largely quarried for building purposes, the quarries at Ketton, Clipsham, and Casterton being famous beyond the boundaries of the county. The Great Oolite and Estuarine beds prevail towards the S.E. Glacial deposits of boulder clay, sand and gravel, mask the older strata in many places.

Industries. — In the E. and S.E. districts the soil is light and shallow. In the other districts it consists chiefly of a tenacious but fertile loam, and in the vale of Catmose the soil is either clay or loam, or a mixture of the two. The prevailing redness, which colours even the streams, is owing to the ferruginous limestone carried down from the slopes of the hills. The name of the county is by some authorities derived from this characteristic of the soil, but the explanation is doubtful. The E. of the county is chiefly under tillage and the W. in grass. Nearly nine-tenths of the total area (a high proportion) is under cultivation, wheat being by far the most important grain crop. Turnips and swedes occupy the greater part of the area under green crops. The rearing of sheep (Leicesters and South Downs) and cattle (Shorthorns) occupies the chief atten- tion of the farmer. Large quantities of cheese are manufactured and sold as Stilton. Agriculture is practically the only industry of importance, but there is some quarrying and boot-making.

The main line of the Great Northern railway intersects the N.E. corner, and branches of that system, of the London & North- western, and of the Midland railways, serve the remainder of the county.

Population and Administration. — The area of the ancient and administrative county is 97,273 acres, with a population in 1891 of 20,659, and in 1901 of 19,709. The county contains five hundreds. There are no municipal boroughs or urban districts. The county town is Oakham (pop. 3294), and other towns are Uppingham (2588) and Ketton (1041). The county is in the midland circuit, and assizes are held at Oakham. It has one court of quarter sessions, but is not divided for petty-sessional purposes. There are 58 civil parishes. The county is in the diocese of Peterborough, and contains 42 ecclesiastical parishes or districts, wholly or in part. It returns one member to parliament. •

History. — The district which is now Rutland was probably occupied by a tribe of Middle Angles in the 6th or 7th century, and was subsequently absorbed in the kingdom of Mercia. Although mentioned by name in the will of Edward the Con- fessor, who bequeathed it to

his queen Edith for life with remainder to Westminster Abbey, Rutland did not rank as a county at the time of the Domesday Survey, in which the term Rutland is only applied to that portion assessed under Notting- hamshire, while the S.E. portion of the modern county is surveyed under Northamptonshire, where it appears as the wapentake of Wiceslea. Rutland is first mentioned as a distinct county under the administration of a separate sheriff in the pipe roll of 1159, but as late as the 14th century it is designated ” Rutland Soke ” in the Vision of Piers Plowman, and the curious connexion with Nottinghamshire, a county which does not adjoin it at any point, was maintained up to the reign of Henry III., when the sheriff of Nottingham was by statute appointed also escheator in Rutland. Of the five modern hundreds of Rutland, Alstoe and Martinsley appear in the Domesday Survey of Nottinghamshire as wapentakes, Martinsley at that date including the modern hundred of Oakham Soke; East hundred

and Wrangdike hundred are mentioned in the middle of th6 1 2th century, the latter formerly including the additional hundred of Little Casterton. The shire-court for Rutland was held at Oakham. ■■ •’

Rutland was originally included in the diocese of Lincoln, and in 1291 formed a rural deanery within the archdeaconry of Northampton; but on the erectibn of Peterborough to an episcopal see by Henry- VIII. in 1541, the archdeaconry of Northampton, with the deanery of Rutland, was transferred to that diocese. In t&jg the deanery of Rutland Was subdivided into three portions, and in 1876 it was placed within the newly- founded archdeaconry of Oakham.

Among the most conspicuous of the Norman lords connected with this county was Walkelin de Ferrers, who founded Oakham Castle in the 12th century. The castle was subsequently be- : stowed by Richard II., together with the earldom of Rutland (see above), on Edward, son of Edmund, duke of York. Essendine (Essenden or Essingdon) was purchased in 1545 by Richard Cecil of Burleigh, and the title of baron of Essenden bestowed on his grandson is retained by the earls of Salisbury. Sir Everard Digby, one of the conspirators in the Gunpowder plot, belonged to the family of Digby, of Stoke Dry. Burley-ˆ on-the-hill was held by Henry Despenser, the warlike bishop of Norwich, in the reign of Richard II., and was purchased by George Villiers, duke of Buckingham, who entertained James I. there with Ben Jonson’s Mask of the Gypsies.

The battle of Stamford was fought at Horn, near Exton; in March 1470 between Edward IV. and the Lancastrians, when from the precipitate flight of the latter the engagement became known as Losecoat Field. On the outbreak of the Civil War Rutland displayed a strong puritanical and anti-royalist senti- ment, and in 1642 the sheriff and a large number of the gentry and nobility of the county forwarded a petition to tne House of Lords begging that the county might be placed in a state of defence, and that the votes of papists and prelates might be disallowed; and again, in 1648, a memorial addressed to Lord Fairfax protested against the design of the parliament to treat with Charles.

Rutland has always been mainly an agricultural county. The Domesday Survey mentions numerous mills in Rutland, and a fishery at Ayston rendered 325 eels. In the 14th century the county exported wool. Stilton cheese has long been made in Leyfield Forest and the vale of Catmose, and limestone is dug in many parts of the county. The development of the economic resources of Rutland was helped in 1793 by the extension of the Melton Mowbray canal to Oakham.

Two members were returned to parliament for the county of Rutland from 1295 until under the Redistribution of Seats Act of 1885 the representation was reduced to one member.

The only old castle of which there are important remains is Oakham, dating from the time of Henry II. and remarkable for its Norman hall. Of Essendine Castle only the moat remains. The Bede-house at Liddington dates from the end of the 14th century. Hambleton Hall, now a farm-house, is a good specimen of Jacobean architecture. Many old houses of the 17th and I8th centuries are to be met with in the villages. An interesting feature of the ecclesiastical architecture of the county is the frequent con- tinuation of the round-headed arch after the Early English style had become fully developed ; as, for instance, in the Early English churches at Great Casterton, Stretton, Empinghamj Clipsham (Early English and Decorated), and St Peter's, Preston, where the nave arcade is Norman on one side and Early English on the other, but yet retains round-headed arches on both sides. Tickencote church is a remarkable specimen of late Norman work, with one of the finest chancel-arches extant in this style. Ketton church is transitional Norman, Early English, and early Decorated, the broach spire being of later date. St Mary's, Greetbam, is a good example of Decorated, with fine tower and spire.

See Victoria County History, Rutland; James Wright, History and Antiquities of the County of Rutland (London, 1684); T. Blore, History

and A ntiguities of the County of Rutland, vok i. pt. 2 (con- taining the East hundred and including the hundred of Casterton Parva; Stamford, 1811); C. G. Smith, A Translation of that portion of Domesday Book which relates to Lincolnshire and Rutland (London,

1870).

RUTLAND, a city and the county seat of Rutland county, Vermont, U.S.A., oh Otter creek, about 67 m. S. by E. of

Burlington. Pop. '(1900) 11,499, of whom 1533 were 1 foreignˆ born; (1 910 census) 13,546. Area, &l sq. in: It is served by the' Delaware & Hudson (being a terminus of one of 1 its branches) and the Rutland (New York Central system) railways; It is pleasantly situated within sight of the Greeti Mountains. Among its public buildings and institutions are the United States Government Building, the State House of Correction, the Rutland Free Library (1886, with 17,500 volumes in 1908); the H. H. Baxter Memorial Library, a Memorial Hall, the County Court House, the City Hall, and the City Hospital. The famous Rutland marble is quarried in W. Rutland (pop. in 1916, 3427 and Proctor (pop. in 1910, 2871), which were parts of the town- ship of Rutland until 1886. In 1905 the value of the city's factory products was $2,522,856 (28-8% more than in 1900). The township of Rutland was granted by New Hampshire in 1 761 to John Murray of Rutland, Massachusettsˆ and about the. same time it was granted (as Fairfield) by New York. No settlement was made until 1770, and in 1772 the place was again granted by New York under the name of Socialborough< From 1784 to 1804 Rutland was one of the capitals of Vermont, and the Capitol, built in 1784, is the second oldest , building in the state. The Rutland Herald, one of the oldest newspapers in Vermont still published, was established as a Federalist weekly in 1794 — a daily edition first appeared in 1861, and is now Republican. In 1847 the village of Rutland was incorporated, and in 1892 a portion of the township including the village was chartered as a city.

RUTLEDGE, JOHN (1739-1860), American jurist and politician,' was born in Charleston, South Carolina, in 1 739. He studied law in London and began to practise in Charleston in 1761. He was a delegate to the Stamp Act Congress in 1765, and to ˆthe Continental Congress in 1774-77 and 1782-83; he was chair- man of the committee which framed the state constitution oi 1776, and the first " president" (governor) of South Carolina in 1776ˆ78. Disapproving of certain changesin the constitution, he resigned in 1778, but was elected governor in the following year, and served until 1782. From

1784 to 1789 he was a member of the state court of chancery. In the Constitutional Convention of 1787 he urged that the president and the Federal judges should be chosen by the national legislature; and prefer- ably by the Senate alone, and thkt.ˆthe; president shduld be chosen for a term of seven years, a,nd should be ineligible to succeed himself. Rutledge championed the Constitution ‘ in the South Carolina convention by which that instrument was adopted on behalf of the state* He was associate justice of the United States Supreme Court in 1789-91, and chief justice of the supreme court of South Carolina in 1791-95. Nominated chief justice of the Supreme Court of the United States hi 17954 he presided during the August term, but the Senate refused to confirm the nomination, apparently because of his opposition to the Jay Treaty. His mind failed late in 1795, and he died 1 in Charleston on the 23rd of July 1800. •■■*

His brother, Edward Rutledge (1749-1800), a signer of the Declaration of Independence, was born in Charleston on the 231 × 1 of November 1749. He studied law in his brother’s office, and iv London in 1769-73, and began to practise in Charleston inn 773; He served in the Continental Congress in 1774-77, and. wfes semf with John Adams and Benjamin Franklin to confer on 1 terms’ of- peace with Lord Howe on Staten Island in September 1776. As captain of artillery and later as lieutenant-colonel he’ served against the British in South Carolina in 1779-80, .but he was captured near Charleston in 1780, and was imprisoned at St Augustine, Florida, for a year. He was a member of the state legislature from 1782 to 1798, and’ in 1791 drafted the act which abolished primogeniture in South Carolina. From 1.798 until his death in Charleston, on the 23rd of January 1800, he was governor of South Carolina.

RUTLEY, FRANK (1842ˆ1904), English geologist and petrog- rapher, was born at Dover on, the 14th of May 1842; He was educated partly at Bonn, but his interest in geology was kindled at the Royal School of Mines, where he studied f 10m: 1862-645 he then joined the arrhy, and served as lieutenant until 1867,

when he became an Assistant Geologist on the Geological Survey. Working then in the Lake district, he began to make a special study of rocks and rock-forming minerals, and soon qualified as acting petrographer on the Geological Survey. For several years he worked in this capacity at the Museum in Jermyn Street: he described the

volcanic rocks of E. Somerset and the Bristol district in 1876, and wrote special memoirs on The Eruptive Rocks of Brent Tor (1878), and on The Felsitic Lavas of England and Wales (1885). He was the author of an exceedingly useful little book on Mineralogy (1874; 12th ed., 1900); also of The Study of Rocks (1879; 2n d ed., 1881), Rock-forming Minerals (1888), and Granites and Greenstones (1894); and of a number of petrographical papers, dealing with perlitic and spherulitic structures, with the rocks of the Malvern Hills, &c. In 1882 he was appointed lecturer on Miner- alogy in the Royal College of Science, and held this post until ill-health compelled him to retire in 1898. He died in London on the 16th of May 1904.

Obituary (by H. B. Woodward), with bibliography, in Geol. Mag. Guly 1904).

RUTULI, a people of ancient Italy inhabiting Ardea and the district round it on the coast of Latium, at no great dis- tance from Aricia, and just W. of the territory of the Volsci. They are ranked by the form of their name with the Siculi and Appuli (Apuli), probably also with the Itali, whose real Italic name would probably have been Vituli (see Italy). This sug- gests that they belong to a fairly early stratum of the Indo- European population of Italy. The same is suggested by the tradition adopted or moulded by Virgil, by which the leader of the people of the soil in their resistance to the settlement of Aeneas was the Rutulian prince Turnus, a name which, if any conjecture could be founded on it, might be held to point rather to Etruria than to any pure Italic source; he is repre- sented as the hospes of the exiled Etruscan king Mezentius, and as taking up arms to defend him against his angry subjects. Pliny (iii. § 6) classes them, with the Siculi, among the primitive tribes that at one time or another inhabited part of Latium, and it is to be observed that they are not included in the thirty Latin communities who once took part in the Latin Festival on the Alban Mount (see further Siculi). (R. S. C.)

RUVIGNY, HENRI DE MASSUE, Marquis de, afterwards Earl or Galwav (1648-1720), was born at Paris on the 9th of April 1648, and was the son of the 1st Marquis de Ruvigny, a distinguished French diplomatist, and a relative of Rachel, the wife of Lord William Russell. He saw service under Turenne, who thought very highly of him. Probably on account of his English connexions he was selected in 1678 by Louis XIV. to carry out the secret negotiations for a compact with Charles II., a difficult mission which he executed with great skill. Succeeding his father as ” general of the Huguenots,” he refused Louis’s offer, at the revocation of the Edict of Nantes, to retain him in that office; and in 1690, having gone into exile with his fellow Huguenots, he entered

the service of William III. of England as a major-general, forfeiting thereby his French estates. In July 1691 he distinguished himself at the battle of Aughrim, and in 1692 he was for a time commander-in-chief in Ireland. In November of that year he was created Viscount Galway and Baron Portarlington, and received a large grant of forfeited estates in Ireland. In 1693 he fought at Neerwinden and was wounded, and in 1694, with the rank of lieutenant- general, he was sent to command a force in English pay which was to assist the duke of Savoy against the French, and at the same time to relieve the distressed Vaudois. But in 1695 the duke changed sides, the Italian peninsula was neutralized, and Galway's force was withdrawn to the Netherlands. From 1697 to 1 701, a critical period of Irish history, the Earl of Galway (he was advanced to that rank in 1697) was practically in control of Irish affairs as lord justice of Ireland. After some years spent in retirement, he was appointed in 1704 to command the allied forces in Portugal, a post which he sustained with honour and success until the battle of Almanza in 1707, in which Galway, in spite of care and skill on his own part, was

decisively defeated. But he scraped together a fresh army, and, although infirm, was reappointed to his command by the home government. After taking part in one more campaign, and distinguishing himself by his personal bravery in action, he retired from active life. His last service was rendered in 1715, when he was sent as one of the lords justices to Ireland during the Jacobite insurrection. As most of his property in Ireland had been restored to its former owners, and all his French estates had long before been forfeited, parliament voted him pensions amounting to £1500 a year. He died unmarried on the 3rd of September 1720. The English peerage died with him, but not the French marquisate. 1

RUVO, a town and episcopal see of Apulia, Italy, in the province of Bari, 21 m. W. of the city of that name by steam tramway, 853 ft. above sea-level. Pop. (1901) 25,245. The cathedral, a basilica with a very lofty nave (so high, indeed, that the gable of the facade is only slightly above the steep sloping roofs of the aisles, and the clerestory is very small), and with two aisles, has three apses, a square campanile and a rich facade with three portals. It belongs probably to the 13th century. The interior has a fine triforium; it contains some interesting frescoes of the 15th century, and is unique in Apulia in having a gallery supported by corbels round the nave (see A. Avena, Monumenti dell' Italia Meridionale, Rome, 1902, 117). S. Giovanni Rotondo is an ancient circular baptistery with two large fonts. In the Palazzo Jatta is a famous and beautiful collection of vases and coins found in the Apulian tombs around the city; part of these, however,

are now to be found in the museum at Naples. The Palazzo Spinola has an interesting Renaissance court. Ruvo occupies the site of the ancient Rubi, on the Via Trajana (see Appia, Via). Coins were issued by the city before it became Roman. (T. As.)

RUWENZORI, more correctly Runsoro, said to be known also as Kokora, a mountain range in Central Africa, lying just north of the equator, and intersected near its eastern edge by 30 E. It has a length of about 65 m., with a maximum breadth of about 30 m., and its highest peaks rise above the limits of perpetual snow. ‘ The range as a whole, the major axis of which runs a little east of north, falls steeply on the west to the Central African rift-valley traversed by the Semliki, the western head- stream of the Nile, while on the east the fall is somewhat more gradual towards the highlands of western Uganda. The upper parts are separated by fairly low passes into six groups of snowy summits, lying a little to the west of the central line, rising in each case more than 15,000 ft. above the sea and reaching, in the culminating point of the western group (Mount Stanley), about 16,800 ft.

The origin of the range seems connected with that -of the rift-valley on the west, both being due to vertical displacements of the earth’s crust. Ruwenzori has been formed by an up- heaval en masse of a portion of the archaean floor of the con- tinent, bounded east and west by lines of fracture, but resulting in a general dip from west to east. A further upheaval seems to have produced an ellipsoidal anticline, causing the strata to dip outwards at a generally high angle. Traces of volcanic action are almost non-existent. Composed in its outer parts of gneisses and mica-schists offering no great resistance to denudation, in its centre the range consists of much more refractory rocks (amphibolites, diorites, diabases, &c), to which fact, coupled with the existence of vertical fractures, the per- sistence and separation of the higher summits is probably due. The snow-clad area does not now extend more than ten miles in any direction, though there is abundant evidence that the glaciers were formerly far more extensive.

The upper region is almost entirely enveloped by day in thick cloud, which descends on the east to about 9000 ft., and lower still on the west. It sometimes lifts towards evening, giving a sight of the snowy peaks, but by 9 a.m. these have

1 The later Viscounts Galway are descended from John Monckton (1695-1751), who was created viscount in 1727. His first wife’s mother, wife of the 2nd duke of Rutland, was a daughter of Lady William Russell, and thus a connexion of the Ruvignys.

once more been hidden. As a result, the climate is very humid, the rainfall being probably at least too in. annually, and the slopes are furrowed by numberless streams, the most im- portant fed by the glaciers of the upper region, and afterwards flowing in deeply cut valleys between the outer spurs. From the innermost recesses between Mounts Stanley, Speke and Baker, the main branches of the Mobuku descend to the east, while the four principal streams on the west unite to form the Butagu, the drainage on both sides ultimately finding its way to the Semliki, either directly or through Lake Dweru and the Albert Edward Nyanza.

As in other ranges of Central Africa the vegetation displays well-marked zones, varying with the altitude; but owing to the lower level to which the cloud descends on the west (probably an outcome of the general climatic regime of Central Africa, as the range lies between the east African plateau and the relatively low-lying basin of the Congo), the limits of the several zones reach a lower level on the west than on the east. They have been defined as follows by Mr R. B. Woosnam of the British Museum scientific expedition of 1906-7:—

Zones. Grass Forest . Bamboos Tree heaths . Lobelias and Senecios

Upper Limits (East Side). 6,500 ft.

• 8,500 „

10,000 ,,

. 12,500 „

• H.500 „

above which is the summit region of snow and bare rock. The boundaries between the zones are not of course hard and fast lines, but merely indicate the levels between which the respective forms are specially characteristic, though they occur also in higher or lower zones. The forest zone is perhaps the best marked, being visible from a distance as a dark ring. On the west it merges in part with the low-lying forest of the Semliki valley. Owing to the abundance of moisture, mosses, hepaticae and lichens are prevalent in several of the zones, and bogs, with Vaccinium and other low-growing plants, are’ common above the forest zone. Helichrysums are abundant m the

zone immediately below the snow, where they form large bushes. The larger mammals are found chiefly on the lower slopes, but bushbuck, pigs, leopards, monkeys, a hyrax and a serval cat occur at higher altitudes. The birds include kites, buzzards, ravens, sun-birds, touracos, a large swift, and various warblers and other small kinds. The upper limit of human settlement, with cultivation of colocasia and beans, has been placed at 6700 ft.

(< Attempts have been made to identify the range with the " Mountains of the Moon " of Ptolemy and other ancient writers the snows of which were thought to feed the Nile lakes. But in view of the extreme vagueness of the statements and the absence of all detailed knowledge of the geography, it is far more likely that the rumours of snowy mountains really referred to Mounts Kenya and Kilimanjaro, especially as they seem to have been obtained rather from the east coast than from the direction of the Nile. In modern times the existence of a snowy range in this part of Africa was first made known by Sir Henry Stanley during the Emin Pasha relief expedition of 1887-89, though hints of high mountains had been obtained by Stanley himself and by Romolo Gessi in 1876 and by others from the neighbourhood of the Albert Nyanza. Stanley named the main mass Ruwenzori, and outlying eastern peaks he called Mt. Gordon Bennett, Mt. Lawson, Mt. Edwin Arnold &c— the last named lying N.E. of Lake Dweru. Subsequently Stanley's own name was given to the chief summit. One of Stanley's officers, Lieut. Stairs, ascended the western slopes to over 10,000 ft. in 1889, and partial ascents were after- wards made by Dr Stuhlmann, Mr Scott Elliot, Mr J E Moore, Sir Harry Johnston, Mr Douglas Freshfield, and others. Early m 1906 some of the secondary ridges above the snow- line were scaled by Messrs Grauer, Tegart and Maddox, and by Dr Wollaston and other members of the British Museum expedition, while later in the year the duke of the Abruzzi led a well-equipped expedition, including various scientists, to

the upper parts of the range, and with the help of trained Alpine guides ascended not only the culminating twin summits (which he named Margharita and. Alexandra after the queens of Italy and England), but all the principal snow-clad peaks. The expedition produced for the first time a detailed map of the upper region, and threw much light on the geology and natural history of the range.

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Mountains of the Moon (London, 1901); Sir H. H. Johnston, The Uganda Protectorate (London, 1902); The Duke of the Abruzzi in Geog. Jnl. (February 1907) ; R. B. Woosnam, ibid. (December l ?°V ; »£" Flll PPi. Ruwenzori (London, 1908), the general account ot the Abruzzi expedition, and // Ruwenzori, Parte Scientifica (2 vols Milan, 1909); A. R. F. Wollaston, From Ruwenzori to the Coneo (London 1908) ; R. G. T. Bright, " The Uganda-Congo Boundary,- Geog. Jnl. (1909). (E. He.)

RUYSBROEK (or Ruysbroeck), JAN VAN (1293-1381), Dutch mystic, was born at Ruysbroek, near Brussels, in 1293. In 13 1 7 he was ordained priest and became vicar of St Gudule, Brussels. When sixty years of age he withdrew with a few companions to the monastery of Groenendael, near Waterloo, giving himself to meditation and mystical writing, and to a full share of the practical tasks of the society. He was known as the " Ecstatic Teacher," and formed a link between the Friends of God and the Brothers of the Common Life, sects which helped to bring about the Reformation. Ruysbroek insisted that " the soul finds God in its own depths," and noted three stages of progress in what he called " the spiritual ladder " of Christian attainment: (1) the active life, (2) the inward life, (3) the contemplative life. He did not teach the fusion of the self in God, but held that at the summit of the ascent the soul still preserves its identity. His works, of which the most important were De vera contemplatione and De septem gradibus amoris, were published in 1848 at Hanover; also Reflections from the Mirror of a Mystic (1906) and Die Zierde der geistlichen Hochzeit (1901).

See Rufus M. Jones, Studies in Mystical Religion, pp. 308-14 (.1909); M Maeterlinck, Ruysbroek and the Mystics, with selections pom The Adornment of the Spiritual Marriage (tr. by J. T. Stoddart London, 1894); and art. Mysticism.

RUYSDAEL (or Ruisdaal), JACOB VAN (c. 1628-1682), the most celebrated of the Dutch landscapists, was born at Haarlem. He appears to have studied under his father Izaak Ruysdael, a landscape painter, though other authorities make him the pupil of Berghem and of Albert van Everdingen. The earliest date that appears on his paintings and etchings is 1645. Three years later he was admitted a member of the gild of St Luke in Haarlem; in 1659 he obtained the freedom of the city of Amsterdam, and in 1668 his name appears there as a witness to the marriage of Hobbema. During his lifetime his works were little appreciated, and he seems to have suffered from poverty. In 1681 the sect of the Mennonites, with whom he was connected, petitioned the council of Haarlem for his admission into the almshouse of the town,

and there the artist died on the 14th of March 1682.

The works of Ruysdael may be studied in the Louvre and the National Gallery, London, and in the collections at the Hague, Amsterdam, Berlin, and Dresden. His favourite subjects are simple woodland scenes, similar to those of Ever- dingen and Hobbema. He is especially noted as a painter of trees, and his rendering of foliage, particularly of oak leafage, is characterized by the greatest spirit and precision. His views of distant cities, such as that of Haarlem in the possession of the marquess of Bute, and that of Katwijk in the Glasgow Corporation Galleries, clearly indicate the influence of Rem- brandt. He frequently paints coast-scenes and sea-pieces, but it is in his rendering of lonely forest glades that we find him at his best. The subjects of certain of his mountain scenes seem to be taken from Norway, and have led to the supposition that he had travelled in that country. We have, however, no record of such a journey, and the works in question are probably merely adaptations from the landscapes of Van

Everdingen, whose manner he copied at one period. Only a single architectural subject from his brush is know&r- an admirable interior of the New Church, Amsterdam, in the possession of the marquess of Bute. The prevailing hue of his landscapes is a full rich green, which, however, has darkened with time, while a clear grey tone is characteristic of his sea- pieces. The art of Ruysdael, while it shows- little of the scientific knowledge of later landscapists, is sensitive and poetic in sentiment, and direct and skilful in technique. Figures are sparingly introduced into his compositions, and such as occur are believed to be from the pencils of Adrian Varidevelde, Philip Wouwerman, and Jan Lingelbach.

Unlike the other great Dutch landscape painters, Ruysdael did not aim at a pictorial record of particular scenes,, but he carefully thought out and arranged his compositions, intro- ducing into them an infinite variety of subtle contrasts in the formation of the clouds, the plants and tree forms, and the play of light. He particularly excels in the painting of cloudy skies which are spanned dome-like over the landscape, and determine the light and shade of the objects.'

Characteristic of his early period, from about 1646 to 1653;, is the choice of very simple, motifs and the careful and laborious study of the details of nature. The time between his departure from Haarlem

and his settling in Amsterdam may have been spent in travelling 1 and helped, him to gain a broader View of nature and to widen the horizon of his art. ‘ Mr Otto Beit owns a magnificent view’ of the “Castle of Bentheim,” dated 1654, from which it may be concluded that his wanderings extended to Germany. In his last period, from about 1675 onwards, he shows a tendency towards overcrowded , com- positions, and affects a darker tonality ,. which may partly be due to the use of thin paint on a dark ground. Towards the end, in his leaning towards the romantic mood, he preferred to draw his inspiration from other masters, instead of going to nature direct, his favourite subjects being rushing torrents and waterfalls, and ruined castles on mountain crests, . which are frequently borrowed from the Swiss views by Roghman.

Ruysdael etched a few plates, which were reproduced by Amand Durand in 1878, with text by Georges Duplessis. The ” Cornfield ” and the ” Travellers ” are characterized by M. Duplessis as prints of a high order which may be regarded as the most significant expressions of landscape art. in the Low Countries. ‘

RYAN, LACY (c. 1604-1760), English actor, appeared at the Haymarket about J709. By 17T8 he had joined the company at Lincoln’s Inn Fields, where he shared the lead with his friend Quin. In 1732 he followed the company to Covent Garden, and there, He remained until his death. Iago, Cassius, Edgar (in King Lear) and Macduff were among his best parts.

RYAZAN, a government of central Russia, bounded by the governmentsof Moscow and Tula on the W., by Vladimir on the N., and by Tambov on the E. and S., with an area of 16,250 sq. m. Ryazan is an intermediate link between the central Great Russian governments and the steppe governments of the S.E.— the wide and deep’ valley of the Oka being the natural boundary between the two. On the left of the Oka the surface often consists of sand, marshes and forests; while on the right the fertile black-earth prairies begin, occupying especially the districts of Ranenburg, Sapozhok and Dankov. The whole of Ryazan is a plateau about 700 ft. above the sea, but deeply cut by the river valleys and numerous ravines. Iron-ores, lime- stone, grindstone grits, potters’ clays, and thick beds of peat are worked, besides coal. The N. belongs to the forest regions, and, notwithstanding the wholesale destruction of forests, these (chiefly coniferous) in several districts still cover one-third of the surface. In the S., where the proximity of the steppes is felt, they are much less extensive, the prevailing species being oak, birch, and other deciduous trees. Altogether forests cover about onei-fifth of the total area.

The Oka is the chief river; it is navigable throughout, and receives the navigable Pronya and Pra, besides a great many smaller streams utilized for floating timber. Steamers ply on the Oka to Kasimov and Nizhiiiy-Novgorod. The Don belongs to Ryazan in its upper course only. On the whole, the S. districts are not well watered. Small lakes are numerous in the broad depression

of the Oka. and elsewhere, while extensive marshes occur : in the N.E. districts; a few attempts at draining some of these beside the Oka have resulted in the reclamation of excellent pasture lands. The climate is a little warmer than at Moscow, the average tempera- ture at the city of Ryazan being 40° ; February, 3°-2; July, 67 .

‘ The estimated population in 1966 was 2,100,900, and is nearly Great Russiatr throughout, containing only a trifling admixture of Tatars, Poles and Jews in towns. Some Tatars immigrated into the Kasimov region in the 15th century, and are noted for their honesty of character as well as for their agricultural prosperity. The people of the Pra river are described as Mesh- cheryaks, but their manners and customs do hot differ from those of the Russians. The chief occupation is agriculture. Out of the total area only 8% is unfit for tillage, and between 50 and 60% is under crops; although the area under cultiva- tion and the crops themselves are increasing, yet even here, in one of the Wealthiest governments of Russia, the situation of the pe’asants is far from satisfactory. Live-stock breeding is rapidly falling off Qfi account of want of pasture lands, but hay, which is abundant, especially on the rich meadow lands of the Oka, is exported. More than half of the land (52%) is owned by the village communities, 40% by private owners, 5% by the crown, and 2% by various institutions. During the last thirty years of the 19th century the nobles sold 36% (1,261,000 acres) of their lands, mainly to merchants and peasants; the latter cultivate two-thirds of the total cultivated- area.

The principal crops are oats, rye and potatoes, with wheat, barley, buckwheat, flax, hemp, toba.cco, hops and fruit. But the crops are insufficient for the needs of the inhabitants. Tobacco, hops, vegetables and fruit, however, are grown for export. Bee- keeping is developing and manufactures increasing, the factories being chiefly cotton and flax mills,, flour mills, machine works, tanneries, soap works, boot, cement, glass and match factories, distilleries, and chemical works.

The government is ‘divided into twelve districts, the chief towns of which are Ryazan, Dankov, Egorievsk, Kasimov, Mikhailov, Pronsk, Ranenburg, Ryazhsk, Sapozhok, Skopin, Spask and Zaraisk. Small industries, such as boat-building, the preparation of pitch and tar, the

making of ‘wooden vessels and sledges, mat- weaving and boot-making, are carried on in the Villages, especially in the N., which belongs, properly speaking, to the Vladimir industrial region. Domestic trades, such as. lace-making (supported by two schools) and embroidering on leather, give occupation to 40,000 women. Trade, especially in corn and manufactured goods, is brisk, and has been stimulated by the opening of coal-mines, e.g. in the district of Skopin. Considerable efforts have been made by the local governing bodies to increase the number of schools. Most interesting archaeological finds have been made in the government, and have been placed in the new museum at the city of Ryazan.

The Slavs began to colonize the region of Ryazan as early’ as the 9th century, penetrating thither both from the N . W. (Great Russians) and from the Dnieper (Little Russians). As early as the loth century the principality of Murom and Ryazan is mentioned in the chronicles. During the following centuries this principality increased both in extent and in wealth, and included parts of what are now the governments, of Kaluga and Moscow. Owing to the fertility of the soil, its Russian population rapidly increased, while the Finnish tribes which formerly inhabited it migrated farther E., or became merged among the Slavs. The Mongol invasion of 1239-42 stopped all development. The principality, however, still continued to exist; its princes strongly opposed the annexation by Moscow; making alliance with the Mongols and with Lithuania, but they finally succumbed, and the principality was definitely annexed in 1517.

RYAZAN, a town of Russia, capital of the government of the same name, 124 m. by rail S.E. of Moscow, on the elevated right bank of the Trubezh, a mile above its confluence with the Oka. Pop. (1897) 44,552. A wide prairie dotted with large villages, ■ the bottom of a former lake, spreads out from the base of the crag on which Ryazan stands, arid actually has the aspect of an immense lake when it is inundated in the spring. Ryazan is the see of an archbishop of the Orthodox Greek Church. The cathedral, first built in the 17 th century, was reconstructed in 1776. The Krestovozdvizhensk church con- tains-tombs of the princes of the 15th and 16th centuries.

The capital of Ryazan principality was Ryazan — now Old Ryazan, a village close to Spask, also on the Oka. It is mentioned in annals as early as 1097, but continued to be the chief town of the principality only until the 14th century. In the nth century one of the Kiev princes founded, on the banks

of a small lake, a fort which received the name of Pereyaslav-Ryazanskiy. In 1294 (or in 1335) the bishop of Murom, com- pelled to leave his own town, settled in Pereyaslav-Ryazanskiy. The princes of Ryazan followed his example, and by and by completely abandoned the old republican town of Ryazan. In 1300 a congress of Russian princes was held there, and in the following year the town was taken by the Moscow prince. It continued, however, to be the residence of the Ryazan princes until 1517. In 1365 and 1377 it was plundered and burned by the Tatars, but in 1460, I5r3, 1521 and 1564 it was strong enough to repel them. Earthen walls with towers were erected after 1301; and in the 17th century a kreml or citadel still stood on the high crag above the Trubezh.

RYAZHSK, a town of Russia, in the government of Ryazan, 72 m. by rail S. of the city of Ryazan. Pop. (1807) 12,993. It is one of the chief railway junctions of Russia, where meet the lines from Moscow to S. Russia and Caucasia and from Poland to Samara and Siberia. It has become a centre for all the corn- growing regions of Russia, and is a wealthy place.

RYBINSK, or Ruibinsk, a town of Russia, in the govern- ment of Yaroslavl, 60 m. by river N.W. of Yaroslavl. It is connected by rail (186 m.) with Bologoye, on the line between St Petersburg and Moscow. It derives its import- ance from its situation on the Volga, opposite the mouth of the Sheksna, which connects the Volga with the regions around Lake Ladoga. Rybinsk has also an active trade in agricultural products from the neighbouring districts. The permanent population, which was 25,223 in 1897, is increased in the summer by nearly 100,000 workers from different parts of Russia.

RYDBERG, ABRAHAM VIKTOR (1828-1895), Swedish author and publicist, was born in Jonkoping on 18th December 1828. He was educated at the high school of Vaxio, and passed on to the university of Lund in‘1851. While at school he was publishing verse and prose in the periodicals; some of these early miscellanies he collected in 1894 in the volumes called % Varia. As a student he turned to more precise labours, and devoted himself to science. He had almost determined to adopt the profession of an engineer, when he was offered in 1855 a post on the staff of one of the largest Swedish news- papers. This caused his thoughts to return to imaginative literature, and it was in the feuilleton of this journal (the Goteborgs Handels-och sjofartstidning) that Viktor Rydberg’s romances successively appeared; he was editorially connected with it until 1876. The Freebooter on the

Baltic (1857) and The Last of the Athenians (1859) gave Rydberg a place in the front rank of contemporary novelists. It was a surprise to his admirers to see him presently turn to theology, but with The Bible's Teaching about Christ (1862), in which the aspects of modern Biblical criticism were first placed before Swedish readers, he enjoyed a vast success. He followed this up by a number of contributions to the popular philosophy of religion; all inspired by the same reverent and yet searching spirit of inquiry. The modernity of his views led to his being opposed by the orthodox clergy, but by the wider public he was greatly esteemed. Nevertheless, it is said that it was his religious criticism which so long excluded him from the Swedish Academy, since he was not elected until 1877, when he had long been the first living author of Sweden. Roman Days is a series of archaeological essays on Italy (1876). He collected his poems in 1882; his version of Faust dates from 1876. In 1884 he was appointed professor of ecclesiastical history at Stockholm. He died, after a short illness, on the 22nd of September 1895. In Viktor Rydberg Sweden possessed a writer of the first order, who carried on the tradition of Bostrom and Geijer in philo- sophy and history, and possessed in addition a glow of imagina- lion and a marvellous charm of style. He was an idealist of the old romantic type which Sweden had known for three- quarters of a century; he was the last of that race, and perhaps, as a mere writer, the greatest. In personal character Rydberg was extremely like his writings — stately, ardent and cere- monious, with a fund of amiability which made him universally beloved. His premature death was the subject of national

mourning, and had even a historical significance, for with him the old romantic influence in Swedish literature ceased to be paramount. (E. G.)

RYDE, a municipal borough and watering-place in the Isle of Wight, England, 5 m. S.S.W. of Portsmouth. Pop. (1901) 11,043. It is beautifully situated on rising ground on the N.E. coast, overlooking Spithead. It occupies the site of a village called La Rye or La Riche, which was destroyed by the French in the reign of Edward II. About the close of the 18th century it was a small fishing hamlet, but it rapidly grew into favour as a watering-place. Ryde is connected by rail with the other towns in the island, and there is also steam- boat communication with Portsmouth, Southampton, Southsea, Portsea and Stoke's Bay. The pier, built originally in 181 2, but since then greatly extended, forms a delightful promenade half a mile in length. The railway trains run out to its head, and an electric tramway also runs along it. The principal buildings are All Saints church, erected in 1870 from the designs of Sir Gilbert Scott, and other churches, the market

house and town hall, the Royal Victoria Yacht club-house, the theatre and the Royal Isle of Wight Infirmary. There are golf-links near the town. The town was incorporated in 1868, and is governed by a mayor, 6 aldermen and 18 councillors. Area, 819 acres.

RYDER, ALBERT PINKHAM (1847-), American artist, was born at New Bedford, Mass., on the 19th of March 1847. He was a pupil of William E. Marshall and of the schools of the National Academy of Design. Among his better known paint- ings are: ” Temple of the Mind,” ” Jonah and the Whale,” ” Christ appearing unto Mary,” ” The Flying Dutchman,” ” Charity,” and ” The Little Maid of Arcadie.” He became a member of the Society of American Artists in 1878, and a National Academician in 1906.

RYE, a market town and municipal borough in the Rye parliamentary division of Sussex, England, 11 m. N.E. by E. from Hastings, on the South-Eastern & Chatham railway. Pop. (1901) 3900. It rises on a sharp eminence above the S. of Romney Marsh, which within historic times was an inlet of the English Channel. The sea began to recede in the 16th century, and now the river Rother forms a small estuary with its mouth 2 m. from the town; this serves as a small harbour with a depth of 15 ft. at high tide, and there is some trade in coal, grain and timber. Fishing and shipbuilding are carried on, and there is a market for sheep (which are pastured in great numbers on the marshes), wool, grain and hops. The church of St Mary is of mixed architecture, chiefly Transitional, Norman and Early English; it is cruciform, with a low central tower. Of the old fortifications there remain portions of the town wall, a strong quadrangular tower built by William of Ypres, earl of Kent, and lord warden in the time of Stephen, and now forming part of the police station, and a handsome gate with a round tower on each side, known as the Land Gate, at the entrance into Rye from the London road. Picturesque old houses are numerous. In the low land S. of the town stands Camber Castle, one of the coastal defensive works of Henry VIII. In the vicinity are golf-links, to which a steam tram runs from the town. The municipal borough is under a mayor, 4 aldermen and 12 councillors. Area, 985 acres.

In the time of Edward the Confessor, Rye (Ria, Ryerot, La Rie) was a fishing village and, as part of the manor of ” Rames- lie,” was granted by the king to the abbot and convent of Fecamp, by whom it was retained until Henry III. resumed it. By 1086 Rye was probably a port of consequence, and a charter of Richard I. shows that in the reign of Henry II., if not before, it had been added to the Cinque Ports. The fluctuations of the sea and attacks of the French caused its decline in the 13th and 14th centuries, and the walls were therefore built in the

reign of Edward III. The decay of Winchelsea contributed to the partial revival of Rye in the 15th and 16th centuries, when it was a chief port of passage. Towards the end of the 1 6th century the decay of the port began, and notwithstanding frequent attempts to improve the harbour it never recovered its ancient prosperity. Rye was incorporated under a mayor and jurats

by the beginning of the 14th century, but possesses no charter distinct from the Cinque Ports. As a member of the Cinque Ports, which were summoned from 1322 onwards, Rye returned two representatives to parliament from 1366 until 1832; after that date one only until 1885. In 1290 the barons of the royal port of Rye were granted a three days' fair in September, altered in 1305 to March. The mayor and commonalty evidently held weekly markets on Wednesday and Friday before 1405, as in that year the Friday market was changed to Saturday. Ship- building has been carried on since the 13th century.

RYE. This cereal, known botanically as Secale cereale, is supposed to be the cultivated form of S. montanum, a wild perennial species occurring in the more elevated districts of parts of the Mediterranean region, and W. to Central Asia. Its cultivation does not appear to have been practised at a

very early date, relatively speaking. Alphonse de Can- dolle, who has col- lected the evidence on this point, draws attention to the fact that no traces of this cereal have hitherto been found in Egyptian monu- ments, or in the earlier Swiss dwell- ings, though seeds have been found in association with weapons of the Bronze period at Olmutz. The ab- sence of any special name for it in the Semitic, Chinese and Sanskrit languages is also adduced as an indication of its comparatively re- cent culture. On the other hand, the general occurrence of the name in the more modern lan- guages of N. Europe, under various modifica- tions, points to the cultivation of the plant then, as now, in those regions. The origin of the Latin name secale, which exists in a modified form among the Basques and Bretons, is not explained. Rye is a tall-growing annual grass, with fibrous roots, flat, narrow, ribbon-like bluish-green leaves, and erect or decurved cylindrical slender spikes like those of barley. The spikelets contain two or three flowers, of which the uppermost is usually imperfect. The outer glumes are acute and glabrous, the flowering glumes lance-shaped, with a comb-like keel at the back, and the outer or lower one

prolonged at the apex into a very long bristly awn. Within these are three stamens surrounding a compressed ovary, with two feathery stigmas. When ripe, the grain is of an elongated oval form, with a few hairs at the summit. When the ovaries of the plant become affected with a peculiar fungus (Claviceps purpurea) they become blackened and distorted, constituting ergot (q.v.).

In the S. of Great Britain rye is chiefly or solely cultivated as a forage-plant for cattle and horses, being usually sown in autumn for spring use, after the crop of roots, turnips, &c, is exhausted, and before the clover and lucerne are ready. For forage purposes it is best to cut early, before the leaves and haulms have been exhausted of their supplies to benefit the

Rye (Secale cereale), about \ nat. size. 1, single spikelet; 2, single flower with awned plume and palea; 3, pistil; 4, grain. 1,2,4, about two-thirds nat. size.

grain. In the N. of Europe, and more especially in Scandinavia, Russia and parts of N. Germany, rye is the principal cereal; and in nutritive value, as measured by the amount of gluten it contains, it stands next to wheat, a fact which furnishes the ex- planation of its culture in N. latitudes ill-suited for the growth of wheat. Rye bread or black bread is in general use in N. Europe. The straw, which is prized on account of its length, is used for making hats and in the manufacture of paper. The bran is used for cattle-food and poultices, and the grain in the distillery.

RYEZHITSA, a town of Russia, in the government of Vitebsk, 150 m. N.W. from the town of Vitebsk and on the railway between St Petersburg and Warsaw. Its population increased from 7306 in 1867 to 10,681 in 1897 ; but its im- portance is mainly historical. The cathedral is a modern building (1846). Ryezhitsa, or, as it is called in the Livonian chronicles, Roziten, was founded in 1285 by the Teutonic Knights to keep in subjection the Lithuanians and Letts. The castle was continually the object of hostile attacks. In 1561 the Teutonic Knights gave it in pawn to Poland, and, though it was captured by the Russians in 1567 and 1577, and had its fortifications dismantled by the Swedes during the war of 1656-60, it continued Polish till 1773, when White Russia was united with the Russian empire.

RYLAND, WILLIAM WYNNE (1738-1783), English engraver, was born in London in July 1738, the son of an engraver and copper-plate printer. He studied under Ravenet, and in Paris under Boucher and J. P. le Bas. After spending five years on the continent he returned to

England, and having engraved portraits of George III. and Lord Bute after Ramsay, and a portrait of Queen Charlotte and the Princess Royal after Francis Cotes, R.A., he was appointed engraver to the king. In 1766 he became a member of the Incorporated Society of Artists, and he exhibited with them and in the Royal Academy. In his later life Ryland abandoned line-engraving, and intro- duced ” chalk-engraving,” in which the line is composed of stippled dots, and in which he transcribed Mortimer’s ” King” John Signing Magna Charta,” and copied the drawings of the old masters and the works of Angelica Kauffman. In consequence of his extravagant habits his affairs became involved; he was convicted of forging bills upon the East India Company, and, after attempting to commit suicide, was executed at Tyburn on the 29th of August 1783.

RYLANDS, JOHN (1801-1888), English manufacturer and mer- chant, was born at St Helens, Lancashire, on the 7th of February 1801, and was educated at the grammar school in that town. In 1819 he, his elder brothers and his father, a manufacturer of cotton goods, founded the firm of Rylands & Sons, cotton goods and linen manufacturers, at Wigan. The business rapidly increased, dye-works and bleach-works were added, and the discovery of coal under some of the firm’s property added materi- ally to its wealth. In 1825 the partners became merchants as well as manufacturers, and subsequently acquired spinning mills at Bolton and elsewhere. In 1847, his father being dead and his brothers having retired, John Rylands assumed entire control of the business, which in 1873 was turned into a limited liability company. It has mills at Manchester, Bolton, and Wigan, and is now probably the largest concern of the kind in Great Britain. John Rylands was a benefactor to various charities, and was one of the original financiers of the Man- chester Ship Canal. He died at Stretford on the nth of December 1888. A permanent memorial, the John Rylands Library, was erected by his widow in Manchester in 1899.

RYLE, JOHN CHARLES (1816-1900), English bishop, was born at Macclesfield on the 10th of May 1816, and was educated at Eton and at Christ Church, Oxford, where he was Craven Scholar in 1836. After holding a curacy at Exbury in Hampshire, he became rector of St Thomas’s, Winchester (1843), rector of Helmingham, Suffolk (1844), vicar of Stradbroke (1 861), honorary canon of Norwich (1872), and dean of Salisbury (1880) ; but before taking this office was advanced to the new see of Liverpool, where he remained until his resignation, which took place three months before his death at Lowestoft on the 10th of June 1900.

Ryle was a strong supporter of the evangelical school. Among his longer works are Christian Leaders of the Eighteenth Century (1869), Expository Thoughts on the Gospels (7 vols., 1856-69), Principles for Churchmen (1884). His second son, Herbert Edward Ryle (b. 1856), a distinguished Old Testament scholar, was made bishop of Exeter in 1901, and in 1903 bishop of Winchester.

RYLSK, a town of Russia, in the government of Kursk, 71 m. by rail W.S.W. of the town of Kursk. It is connected by a branch line with the Kursk-Kiev railway. Pop. (1897) 11,415. It has oil works, blast furnaces, and manufactories of soap and tallow, and an active trade in corn, hemp, and scythes imported from Austria. It was founded in the 9th century, and is frequently mentioned in the annals from 11 52 onwards. Its cathedral was built in the 15th century.

RYMER, THOMAS (1641-1713), English historiographer royal, was the younger son of Ralph Rymer, lord of the manor of Brafferton in Yorkshire, described by Clarendon as ” possessed of a good estate,” and executed for his share in the ” Presby- terian rising ” of 1663. Thomas was probably born at Yafforth Hall early in 1641, and was educated at a private school kept at Danby-Wiske by Thomas Smelt, a noted Royalist, with whom Rymer was ” a great favourite,” and ” well known for his great critical skill in human learning, especially in poetry and history.” l

He was admitted as pensionarius minor at Sidney Sussex College, Cambridge, on April 29, 1658, but left the university without taking a degree. On May 2, 1666, he became a member of Gray’s Inn, and was called to the bar on June 16, 1673. His first appearance in print was as translator of Cicero’s Prince (1668), from the Latin treatise (1608) drawn up for Prince Henry. He also translated Rapin’s Reflections on Aristotle’s Treatise of Poesie (1674), with a preface in defence of the classical rules for unity in the drama, and followed the principles there set forth in a tragedy in verse, licensed September 13, 1677, called Edgar, or the English Monarch, which was a failure. The printed editions of 1678, 1691 and 1693 belong to the same issue, with new title-pages. Rymer’s views on the drama were again given to the world in the shape of a printed letter to Fleetwood Shepheard, the friend of Prior, under the title of The Tragedies of the Last Age Consider’d (1678, 2nd ed. 1692). To Ovid’s Epistles Translated by Several Hands (1680), with preface by Dryden, ” Penelope to Ulysses ” was contributed by Rymer, who was also one of the ” hands ” who ” Englished ” the Plutarch of 1683-86. The life of Nicias fell to his share.

He furnished a preface to Whitelocke's Memorials of English Affairs (1682), and wrote in 1681 A General Draught and Prospect of the Govern- ment of Europe, reprinted in 1689 and 17 14 as Of the Antiquity, Power, and Decay of Parliaments, where, ignorant of his future dignity, the critic had the misfortune to observe, " You are not to expect truth from an historiographer royal." He contributed three pieces to the collection of Poems to the Memory of Edmund Waller (1688), afterwards reprinted in Dryden's Miscellany Poems, and is said to have written the Latin inscription on Waller's monument in Beaconsfield churchyard. The preface to the posthumous Historia Ecclesiastica (1688) of Thomas Hobbes is said to have been by Rymer, but the Life of Hobbes (1681) sometimes ascribed to him was written by Richard Blackburne. He produced a congratulatory poem upon the arrival of Queen Mary in 1689. His next piece of authorship was to translate the sixth elegy of the third book of Ovid's Tristia for Dryden's Miscellany Poems (1692, p. 148). On the death of Thomas Shadwell in 1692 Rymer received the appoint- ment of historiographer royal, at a yearly salary of £200. Imme- diately afterwards appeared his much discussed Short View of Tragedy (1693), criticizing Shakespeare and Ben Jonson, which produced The Imperial Critick (1693) of Dennis, the epigram of Dryden, 2 and the judgment of Macaulay that Rymer was " the

1 See Hickes, Memoirs of John Kettlewell (1718), pp. 10-14.

2 " The corruption of a poet is the generation of a critic " (Ded. of the Third Miscellany, in Works (1821), xii. p. 49), which is much more pointed than Beaconsfield's reference to critics as " men who have failed in literature and art " (Lothair, chap, xxxv.) or Balzac's sly hit at Merim6e in similar terms. The poet's remarks on the

worst critic that ever lived." John Dunton (Life and Letters, p. 354), however, considered him " orthodox and modest," and Pope " one of the best critics we ever had " [Spence's Anecdotes). Rymer contended that although Shakespeare possessed humour he had no genius for tragedy, Othello being merely " a bloody farce without salt or savour."

Within eight months of his official appointment Rymer was directed (August 26, 1693) to carry out that great national undertaking with which his name will always be honourably connected, and of which there is reason to believe that Lords Somers and Halifax were the original promoters. The Codex Juris Gentium Diplomaticus (1693) of Leibnitz was taken by the editor as the model of the Foedera. The plan was to publish all records of alliances and other transactions in which England was concerned with foreign powers from 1101 to the time of

publication, limiting the collection to original documents in the royal archives and the great national libraries. Unfortunately, this was not uniformly carried out, and the work contains some extracts from printed chronicles. From 1694 he corresponded with Leibnitz, by whom he was greatly influenced with respect to the plan and formation of the Foedera. While collecting materials, Rymer unwisely engraved a spurious charter of King Malcolm, acknowledging that Scotland was held in homage from Edward the Confessor. When this came to be known the Scottish antiquaries were extremely indignant. G. Redpath published a MS. on the independence of the Scottish crown, by Sir T. Craig, entitled Scotland's Sovereignly Asserted (1695), and the subject was referred to by Bishop Nicolson in his Scottish Historical Library (1702). This led Rymer to address three Letters to the Bishop of Carlisle (1 702-1 706) explaining his action, and discussing other antiquarian matters. Sir Robert Sibbald answered the second letter (1704). The first and second letters are usually found together; the third is extremely rare. Rymer had how been for some years working with great industry, but was constantly obliged to petition the crown for money to carry on the undertaking. Up to August 1698 he had expended £1253, and had only received £500 on account.

At last, on November 20, 1704, was issued the first folio volume of the Foedera, Conventiones, Litter ae et cujuscunque generis Acta Publico inter reges Angliae et alios quosvis imperatores, reges, &°c, ab. a.D. 1 10 1 ad nostra usque tempora habita aut tr aetata. The publication proceeded with great rapidity, and fifteen volumes were brought out by Rymer in nine years. Two hundred and fifty copies were printed; but, as nearly all of them were presented to persons of distinction, the work soon became so scarce that it was priced by booksellers at one hundred guineas. A hundred and twenty sheets of the fifteenth volume and the copy for the remainder were burnt at a fire at William Bowyer's, the printer, on January 30, 1712-13. Rymer died shortly after the appearance of this volume, but he had prepared materials for carrying the work down to the end of the reign of James I. These were placed in the hands of Robert Sanderson, his assistant. For the greater part of his life Rymer derived his chief sub- sistence from a mortgage assigned to him by his father. His miscellaneous literary work could not have been very profitable. At one time he was reduced to offer his MSS. for a new edition for sale to the earl of Oxford. About 1703 his affairs became more settled, and he afterwards regularly received his salary as historiographer, besides an additional £200 a year as editor of the Foedera. Twenty-five copies of each volume were also allotted to him. He died at Arundel Street, Strand, December 14, 1713, and

was buried in the church of St Clement Danes. His will was dated July 10, 1713. Tonsonissued an edition of Rochester's Works (17 14), with a short preface by the late historiographer. Another posthumous publication was in a miscellaneous collec- tion called Curious Amusements ,hy M. B. (1714), which included " some translations from Greek, Latin and Italian poets, by T. Tragedies of the Last Age have been reprinted in his Works (1821), xv. pp. 383-396, and in Johnson's Life of Dryden. See also Dryden's Works, i. 377, vi. 251, xi. 60, xiii. 20. " I never came across a worse critic than Thomas Rymer," says Prof. George Saintsbury, who discusses his theories at length in History of Criticism (1902), pp. ˆ91-397. See also A. Hofherr, T. Rymers dramatische Kritik (iqo8).

Rymer." Some of his poetical pieces were also inserted in J. Nichols's Select Collection (1780-86, 8 vols.), and two are reproduced in A. H. Bullen's Musa Proterva (1895).

Two more volumes of the Foedera were issued by Sanderson in 1715 and 1717, and the last three volumes (xviii., xix. and xx.) by the same editor, but upon a slightly different plan, in 1726-35. The latter volumes were published by Tonson, all the former by Churchill. Under Rymer it was carried down to 1586, and continued by San- derson to 1654. The rarity and importance of the work induced Tonson to obtain a licence for a second edition, and George Holmes, deputy keeper of the Tower records, was appointed editor. The new edition appeared between 1727 and 1735. The last three volumes are the same in both issues. There are some corrections, enumerated in a volume, The Emendations in the New Edition oj Mr Rymer' s Foedera, printed by Tonson in 1730, and on the whole the second is an improvement upon the first edition. A third edition, embodying Holmes's collation, was commenced at the Hague in 1737 and finished in 1745. It is in smaller type than the others, and is compressed within ten folio volumes. The arrangement is rather more convenient ; there is some additional matter ; the index is better ; the type is not so good, but it is to be preferred to either of the previous editions. When the volumes of the Foedera first appeared they were analysed by Leclerc and Rapin in the Bibliotheque choisie and Bibliothkque ancienne et moderne. Rapin's articles were col- lected together and appended, under the title of Abrege historique des actes publiques de V Angleterre, to the Hague edition. A trans- lation, called Acta Regia, was published by Stephen Whatley, (1726-27), 4 vols. 8vo, reprinted

both in 8vo and folio, the latter edition containing an analysis of the cancelled sheets, relating to the journals of the first parliament of Charles I., of the 18th volume of the Foedera.

In 1810 the Record Commissioners authorized Dr Adam Clarke to prepare a new and improved edition of the Foedera. Six parts, large folio, edited by Clarke, Caley and Holbrooke, were published between 18 1 6 and 1830. Considerable additions were made, but the editing was performed in so unsatisfactory a manner that the publication was suspended in the middle of printing a seventh part. The latter portion, bringing the work down to 1383, was ultimately issued in 1869. A general introduction to the Foedera was issued by the Record Commission in 1817, 4to.

The wide learning and untiring labours of Rymer have received the warmest praise from historians. His industry was praised by Hearne (Collections, ii. 296). Sir T. D. Hardy styles the Foedera ” a work of which this nation has every reason to be proud, for with all its blemishes — and what work is faultless? — it has no rival in its class ” (Syllabus, vol. ii. xxxvi.), and Mr J. B. Mullinger calls it ” a collection of the highest value and authority ” (Gardiner and Mullinger’s Introduction to English History, p. 224).

The best account of Rymer is to be found in the prefaces to Sir T. D. Hardy’s Syllabus (1869-85, 3 vols. 8vo). There is an unpublished life by Des Maizeaux (Brit. Mus. Add. MS. No. 4223), and a few memoranda in Bishop Kennet’s collections (Lansd. MS. No. 987). See also Diet, of Nat. Biogr. vol. 1. In Caulfield’s Portraits, &c. (18 19), i. 50, may be seen an engraving of Rymer, with a description of a satirical print of him as ” a garreteer poet.” Rymer’s two critical works on the drama are discussed by Sir T. N. Talfourd in the Retrospective Review (1820), vol. i. pp. 1— 15.

Sir T. D. Hardy’s Syllabus gives in English a condensed notice of each instrument in the several editions of the Foedera, arranged in chronological order. The third volume contains a complete index of names and places, with a catalogue of the volumes of transcripts collected for the Record edition of the Foedera. In 1869 the Record Office printed, for private destribution, Appendices A to E ” to a report on the Foedera intended to have been submitted by C. Purton Cooper to the late Commissioners of Public Records,” 3 vols. 8vo (including accounts of MSS. in foreign archives relating to Great Britain, with facsimiles). In the British Museum is preserved (Add. MS. 24699) a folio volume of reports and papers relating to the Record edition. Rymer left extensive materials for a new edition of the Foedera, bound

in 59 vols, folio, and embracing the period from 1 1 1 5 to 1698. This was the collection offered to the earl of Oxford. It was purchased by the Treasury for £215 from a Mrs Anna Parnell, to whom Rymer left all his property, and is now in the British Museum (Add. MSS. Nos. 4573 to 4630, and 18911), A catalogue and index may be consulted in the 17th volume of Tonson's edition of the Foedera. The Public Record Office possesses a MS. volume, compiled by Robert Lemon about 1800, containing instruments in the Patent Rolls omitted by Rymer. In the same place may be seen a volume of reports, orders, &c, on the Foedera, 1 808-1 1, and the transcripts collected for the new and unfinished edition. (H. R. T.)

RYOT, or Rayat (from the Arabic re? a, " to pasture "), properly a subject, then a tenant of the soil. The word is used throughout India for the general body of cultivators; but it has a special meaning in different provinces. The ryotwari

tenure is one of the two main revenue systems in India. Where the land revenue is imposed on an individual or community owning an estate, and occupying a position analogous to that of a landlord, the assessment is known as zamindari; and where the land revenue is imposed on individuals who are the actual occupants, the assessment is known as ryotwari. Under zamindari tenure the land is held as independent property; while under ryotwari tenure it is held of the crown in a right of occupancy, which is under British rule both heritable and trans- ferable. The former system prevails in northern and central India, and the latter in Bombay, Madras, Assam and Burma.

RYSWICK, TREATY OF, the peace which in 1697 ended the war between France on the one side and the Empire, England, Spain and Holland, on the other. Begun in 1689 under the leadership of the new king of England, William III., its object was to put a check on the ambitious designs of Lotus XIV., and it raged in the Netherlands, the Rhineland, Italy, Ireland and Spain, in India and America and on the sea (see Grand Alliance, War of the). Negotiations for peace had begun in 1696, but they were soon broken off, William III. and the English parliament at this time refusing to treat except " with our swords in our hands." But in May 1697 they were renewed under the mediation of the king of Sweden. The French repre- sentatives had their headquarters at the Hague and those of the allies at Delft, the conferences between them taking place at Ryswick. For the first few weeks no result was reached, and in June William III. and Louis XIV., the protagonists in the struggle, each appointed one representative to meet together privately. The two chosen were William Bentinck, earl

of Portland, and marshal Boufflers, and they soon drew up the terms of an agreement, to which, however, the emperor Leopold I. and the king of Spain would not assent. But in a short time Spain gave way, and on the 20th of September 1697 a treaty of peace was signed between France and the three powers, England, Spain and Holland, the Empire still holding aloof. William then persuaded Leopold to make peace, and a treaty between France and the Empire was signed on the 30th of October following.

The basis of the peace was that all towns and districts seized since the treaty of Nijmwegen in 1679 should be restored. Then France surrendered Freiburg, Breisach and Philippsburg • to Germany, although she kept Strassburg. On the other hand, she regained Pondicherry and Nova Scotia, while Spain recovered Catalonia, and the barrier fortresses of Mons, Luxemburg and Courtrai. The duchy of Lorraine, which for many years had been in the possession of France, was restored to Leopold Joseph, a son of duke Charles V., and the Dutch were to be allowed to garrison some of the chief fortresses in the Netherlands, including Namur and Ypres. Louis undertook to recognize William as king of England, and promised to give no further assistance to James II.; he abandoned his interference in the electorate of Cologne and also the claim which he had put forward to some of the lands of the Rhenish Palatinate.

For further details see C. W. von Koch and F. Scholl, Histoire abregee des traites de paix (1817-18) ; A. Moetjens, Actes et mimoires de la paix de Ryswick (The Hague, 1725); A. Legrelle, Notes et documents sur la paix de Ryswick (Lille, 1894); an d H. Vast, Les Grands Traites du regne de Louis XIV (Paris, ˆ93-99). See also L. von Ranke, Englische Geschichte, English translation as History oj England (Oxford, 1875).

RZHEV, or Rzhov, a town of Russia, in the government of Tver, 76 m. S.W. of the town of Tver, occupying the bluffs on both banks of the Volga (here 350 ft. wide) near the con- fluence of the Vazuza. Pop. (1900) 31,514. It is the terminus of a branch line (85 m.) from the St Petersburg & Moscow railway, and is the centre of a large transit trade between Orel, Kaluga and Smolensk and the ports of St Petersburg and Riga. In the 12th century Rzhev belonged to the principality of Smolensk. Under the rulers of Novgorod it became from 1225 a subordinate principality, and in the 15th century the two portions of the town were held by two independent princes.

S— SAAR

Sthe twenty-first letter of the Phoenician alphabet, is one of the four sibilants which that alphabet possesses. In the Phoenician alphabet it takes a form closely resem- bling the English W, and this when moved through an angle of 90 is the ordinary Greek sigma S. In Phoenician itself and in the other Semitic alphabets the position of the middle legs of the W is altered so that the symbol takes such forms as \1/ or ‘V oruJ ,ultimatelyendingsometimesinaformlikeKlaid sideways,ˆ . In Greek, where 2 is the twentieth letter of the alphabet, or, if the merely numerical S”and ? are excluded, the eighteenth,

another form ˆ or \ according to the direction of the writing is

also widespread. This, which is the only form of the earliest

period at Cumae, where it is also found more rounded \ , is

the origin of the Latin S and its descendants. The development from the angular to the curved shape of S may be seen in its occurrences on the early cippus found in the Roman Forum in 1899. Apart from doubtful instances it is there six times clearly engraved; four of the instances are angular, the other two are more or less rounded. The Semitic name of the symbol is shin; the Greek name sigma may mean merely the hissing letter and may be a genuine Greek derivative from the verb cifco, hiss. Some, however, see in it a corruption of the Semitic name samekh, the letter which corresponds in alphabetic position and in shape to the Greek £ (x). The Dorian Greeks, however, as Herodotus tells us (i. 139), called that letter san which the Ionian Greeks called sigma; san seems more likely to be an attempt to reproduce the Semitic name. Herodotus says nothing of a difference in shape, but most authorities regard the form M« which with the value of s is practically confined to Doric areas, as being san. In the compound aay.bpa%, san like koppa (kotttt arias) was known to the Athenians as a brand for highbred horses (cf. Aristophanes, Clouds, 122, 1298, 23, 438). For the symbol T which was used at Ephesus and other places in Asia Minor and elsewhere for the sound represented by crcr in Ionic Greek, by tt in Attic, see Alphabet. Further points of diffi- culty in connexion with the sibilants are discussed under X and Z. The pronunciation of s was originally unvoiced: in English it is often used for the voiced sound as well, compare lose with loose, house with houses. At the end of words the voiced sound is often written with -s, the unvoiced with -js as in his and hiss. In other cases the pronunciation can be ascertained only from the context, as in use, unvoiced for the substantive, voiced for the verb. Sometimes a

difference of meaning is indicated by difference of spelling though the sounds in the two words are identical, as in furs and furze. The voiced form of * (i.e. z) readily passes into r in many languages: compare the Eng. hare with the Ger. Hase, the Eng. ear and Lat. auris with the Gothic auso and Lithuanian ausis, “ear.”. Here also should be mentioned the sound sh, which, like th, is not a combination of sounds though written with two symbols. Hence in transcription from foreign languages and in works on phonetics it is represented by s or if. The difference in formation between /and 5 is that the former is dental or alveolar, the latter is produced farther back and has at least two varieties. In the usual Eng. sh the tip of the tongue is bent backwards so that the tongue becomes spoon-shaped. The voiced sound to this is generally written z as in azure, but sometimes s as in pleasure. The sound of sh is also sometimes represented by s, as in sure, sugar. This is occasioned by the >’-sound with which u now begins, and is carried further in dialect than in the literary language, sue and suit, for example, being pronounced in Scotland like the Eng. shoe and shoot. The sh sound is sometimes not even written with a sibilant, as in the pronunciation of the ci and ti of words like rhetorician and nation. (p. Gi.)

, SAALE, a river of Germany, a tributary of the Elbe, rises between Bayreuth and Hof in the N.E. of Bavaria, springing out

of the Fichtelgebirge at an altitude of 2390 ft. It pursues a winding course in a northerly direction, and after passing the manufacturing town of Hof, flows amid well-wooded hills until it reaches the pleasant vale of Saalberg. Here it receives the waters of the Schwarza, in whose romantic valley lies the castle of Schwarzburg, the ancestral seat of the princes of the ruling house of Schwarzburg-Rudolstadt. From Saalberg the Saale enters the dreary limestone formation of Thuringia, sweeps beneath the barren, conical hills lying opposite to the university town of Jena, passes the pleasant watering-place of Kosen, washes numerous vine-clad hills and, after receiving at Naumburg the deep and navigable Unstrut, flows past Weissenfels, Merse- burg, Halle, Bernburg and Kalbe, and joins the Elbe just above Barby, after traversing a distance of 226 m. It is navigable from Naumburg, 100 m., with the help of sluices, and is con- nected with the Elster near Leipzig by a canal. The soil of the lower part of its valley is of exceptional fertility, and produces, amongst other crops, large supplies of sugar beetroot. Among its affluents are the Elster, Regnitz and Orla on the right bank , and the Ilm, Unstrut, Salza, Wipper and Bode on the left. Its upper course is rapid. Its valley, down to Merseburg, is pictur- esque, and even romantic, because of the many castles which crown the enclosing heights. It is sometimes called the Thuringian or

Saxon Saale, to distinguish it from another Saale (70 m. long), a right-bank tributary of the Main, in the Bavarian district of Lower Franconia.

See Hertzberg, Die historische

1895).

Bedeutung des Saaletals (Halle,

SAALFELD, a town of Germany, in the duchy of Saxe- Meiningen, picturesquely situated on the left bank of the Saale, 24 m. S. of Weimar and 77 S.W. of Leipzig by rail. Pop. (1905) 13,245. One of the most ancient towns in Thuringia, Saalfeld, once the capital of the extinct duchy of Saxe-Saalfeld, is still partly surrounded by old walls and bastions, and contains some interesting medieval buildings, among them being a palace, built in 1679 on the site of the Benedictine abbey of St Peter, which was destroyed during the Peasants' War. Other notable edifices are the Gothic church of St John, dating from the beginning of the 13th century; the Gothic town hall, completed in 1537; and, standing on an eminence above the river, the Kitzerstein, a palace said to have been originally erected by the German king Henry I., although the present building is not older than the 16th century. But perhaps the most interesting relic of the past in Saalfeld is the striking ruin of the Hoher Schwarm, called later the Sorbenburg, said to have been erected in the 7th century. Saalfeld is situated in one of the busiest parts of Meiningen and has a number of prosperous industries, including the manufacture of machinery, bricks, colours, malt, cigars, hosiery and vinegar. Other industries are brewing, printing and iron-founding, and there are ochre and iron mines in the neighbourhood.

Saalfeld grew up around the abbey founded in 1075 by Anno, archbishop of Cologne, and the palace built by the emperor Frederick I. In 1389 it was purchased by the landgrave of Thuringia, and with this district it formed part of Saxony. In 1680 it became the capital of a separate duchy, but in 1699 it was united with Saxe-Coburg, passing to Saxe-Meiningen in 1826. On the 10th of October 1806 a battle took place near Saalfeld between the French and the Prussians, during which Prince Louis Ferdinand of Prussia was killed.

See Wagner and Grobe, Chronik der Stadt Saalfeld (Saalfeld, 1 865-1 867), and Thummel, Kriegstage aus Saalfelds Vergangenheit (Berlin, 1882).

SAAR, a river of Germany, a right-bank tributary of the Mosel. It rises in the Donon, an eminence of the Vosges, close to the Franco-German frontier, and flows at first north, then north-west and finally north again to its junction with the Mosel

at Konz. Its length is 143 m. The middle part of its valley is an important industrial district, with coal-mines and a variety of manufactures; the Saar wines are also well known. The principal towns on the Saar are Saargemiind, Saarbriicken and St Johann (which face each other across the river), Saarlouis and Saarburg. The river is navigable up to Saargemiind, a distance of 75 m. From here there is connexion with the Rhine- Marne canal by way of the Saar canal, built in 1862, and 40 m. in length, following the Saar valley upwards for about half that distance.

SAARBRtfCKEN, a town of Germany, in the Prussian Rhine Province, on the left bank of the Saar, a navigable tributary of the Mosel, is situated 49 m. by rail N.E. of Metz, at the south end of one of the most extensive coal-fields in Europe, to which it has given its name. Pop. (1885) 10,453; (1905) 26,944. With the towns of St Johann, immediately opposite on the right bank of the river, and Malstatt-Burbach, Saarbriicken forms a single community, the three places having been united in 1909. Saarbriicken has four Protestant churches, a Roman Catholic and an Old Catholic church, and a town hall adorned with paintings by Anton von Werner, illustrating episodes of the war of 1870. Other buildings are the castle, until 1793 the residence of the princes of the house of Nassau-Saarbriicken; a gym- nasium, founded in 1615, and a celebrated mining academy. The industries of St Johann-Saarbriicken include wool-spinning, brewing, and the manufacture of leather, tobacco, chemicals and iron wares. The trade is chiefly connected with the produce of the neighbouring coal-mines and that of the numerous im- portant iron and glass works of the district. The Saarbriicken coal-fields extend over 70 sq. m., are estimated to yield about 10,000,000 tons annually, and give employment to nearly 50,000 men.

Saarbriicken owes its name to a bridge which existed in Roman times. Its early lords were the bishops of Metz, the counts of the lower Saargau, and the counts of the Ardennes. From 1381 to 1793 it belonged to the counts of Nassau-Saar- briicken, and then, after having been in the possession of France from 1801 to 1815, it passed

to Prussia. In the Franco-Prussian War Saarbriicken was seized by the French on the 2nd of August

1870, but the first German victory on the heights of Spicheren, 3 m. to the south, relieved it four days later.

See Kollner, Geschichte der Stddte Saarbriicken und St Johann (Saarbriicken, 1865); Ruppersberg, Geschichte der ehemaligen Grafschaft Saarbriicken (Saarbriicken, 1899-1903); and H. Kniebe, Bilder aus Saarbriickens Vergangenheit (Saarbriicken, 1894).

SAARBURG, a town of Germany, in the imperial province of Alsace-Lorraine, on the Saar, 44 m. N.W. from Strassburg by rail. Pop. (1905) 9818. Its chief industries are the manufacture of watch springs, gloves, lace, beer and machinery, and it has a trade in grain. Saarburg, which has been identified with the Pons Saravi of the Romans, belonged to France from 1661 to

1871, its earlier owners having been the bishops of Metz and the dukes of Lorraine.

Another Saarburg is a town in Prussia at the confluence of the Saar and the Leuk. Pop. (1905) 2186. It has the ruins of a castle, formerly belonging to the electors of Trier, and is still partly surrounded by walls. It has manufactures of bells, furniture and cigars, other industries being tanning and vine- growing. Saarburg dates from the 10th century and received municipal rights in 1291. From 1036 until 1727, when it passed into the possession of France, it belonged to the electors of Trier. It became Prussian in 181 5.

See Hewer, Geschichte der Burg und Stadt Saarburg (Trier, 1862).

SAARGEMUND (Fr. Sarreguemines) , a town of Germany, in the imperial province of Alsace-Lorraine, situated at the con- fluence of the Blies and the Saar, 40 m. E. of Metz, 60 m. N.W. of Strassburg by rail, and at the junction of lines to Trier and Saarburg. Pop. (1905) 14,932. It carries on considerable manufactures of faience, plush, velvet, leather, porcelain and earthenware, and is a chief depot for the papier-mache boxes, mostly snuff-boxes, which are made in great quantities in the neighbourhood. Saargemiind, originally a Roman settlement, obtained civic

rights early in the 13th century. In 1297 it was ceded by the count of Saarbriicken to the duke of Lorraine, and passed with Lorraine in 1766 to France, being transferred to Germany in

1871.

See Thomire, Notes hisloriques sur Sarreguemines (Strassburg, 1887); and Box, Notice sur le pays de la Saare (Nancy, 1903).

SAARLOUIS, a town and former fortress of Germany, in the Prussian Rhine Province, situated in a fertile district on the left bank of the Saar, and on the railway from Saarbriicken to Trier, 40 m. S. of the latter. Pop. (1905) 8313. The town is well laid out and has spacious streets and a handsome market square. It contains a Roman Catholic and a> Protestant church, a town hall, the walls of the council chamber in which are hung with Gobelins, the gift of Louis XIV., a classical school and a hospital. There are coal-mines in the vicinity, and the town has consider- able manufactures of porcelain, enamel wares and leather, as well as a brisk trade in cattle and grain.

Saarlouis was founded in 1681 by Louis XIV. of France, and was fortified by Vauban in 1680-1685. By the peace of Paris, in 181 5, it was ceded to the allies and by them was made over to Prussia. The fortifications were dismantled in 1889. Marshal Ney was born here.

See Niessen, Geschichte des Kreises Saarlouis (Saarlouis, 1893 and 1897); and Baltzer, Historische Notizen uber die Stadt Saarlouis (Trier, 1865).

SAAVEDRA, ANGEL DE, Duke of Rivas (1701-1865), Spanish poet and politician, was born at Cordova on the 19th of March 1791. He fought in the war of independence, was a prominent member of the advanced Liberal party from 1820 to 1823, and in the latter year was condemned to death. He escaped to London and lived successively in Italy, Malta and France, until the amnesty of 1834, when he returned to Spain, shortly afterwards succeeding his brother as duke of Rivas. In 1835 ne became minister of the interior under Isturiz, and along with his chief had again to leave the country. Returning in 1837, he joined the moderate party, became prime minister, and was subsequently ambassador at Paris and Naples. He died on the 22nd of June 1865. In 1813 he published Ensayos poiticos, and between that date and his first exile several of his tragedies (the most notable being Alatar, 1814, and Lanuza, 1822) were put upon the stage. Traces of foreign influence are observ- able in El Moro Expdsito (1833), a narrative poem dedicated to John Hookham Frere; these are still more marked in Don Alvaro 6 La Fuerza del sino (first played on the 22nd of March 1835), a drama of historical importance inasmuch as it established the new French romanticism in Spain.

Bibliography. — Obras completas del Duque de Rivas (Madrid, 1894-1904); L. A. deCueto, ” Discurso,” in Memorias de la academia espanola (Madrid, 1870) ; M. Cafiete, Escritores espanoles i hispano-americanos (Madrid, 1884) ; J. Valera in ElAteneo (Madrid, December 1888-February 1889) ; E. Pineyro, El Rontanticismo en Espana (Paris,

1904).

SAAVEDRA FAJARDO, DIEGO DE (1584-1648), diplomatist and man of letters, was born of a noble family at Aigezares (Murcia) on the 6th of May 1584. Educated for the church at Salamanca, he took orders, and in 1606 was appointed secretary to Cardinal Gaspar Borgia, the Spanish ambassador at Rome. Ultimately he became Spanish plenipotentiary at Regensburg in 1636 and at Munster in 1645. He returned to Spain in 1646 and took up the post of member of the council of the Indies to which he had been nominated in 1636, but shortly afterwards retired to a monastery, where he died in 1648. In 1640 he published his Empresas politicas, 6 idea de un principe politico cristiano, a hundred short essays on the education of a prince; these were written primarily for the son of Philip IV. Its sententious style is still admired in Spain. It passed through a number of editions

and was translated in several languages, the English version being by Astry (2 vols., 8vo, London, 1700). An unfinished historical work, entitled Corona gdtica, castellana, y austriaca politicamente Uustrada, appeared in 1646. Another work ascribed to Saavedra, the Rephblica literaria, was pub- lished posthumously in 1670; it is a satirical discussion on some of the leading characters in the ancient and modern world of letters.

Collected editions of his works appeared at Antwerp in 1 677-1 678, and again at Madrid in 1789-1790; see also vol. xxv. of the Bibl. de aut. esp. (1853).

SAAZ (Czech Zatec), a town of Bohemia, Austria, 64 m. N.W. of Prague by rail. Pop. (1900) 16,168, mostly German. It lies on the Eger, which is spanned here by a suspension bridge, 210 ft. long, which is the oldest of its kind in Bohemia, having been constructed in 1826. It possesses several ancient churches, of which one is said to date from 1206, and a town hall built in 1559. Saaz is the centre of the extensive hop trade of the neighbourhood. In early times it was the seat of a royal count (Zupan oTgaugraf). Acoat-of-arms was given to the inhabitants ; by Ladislaus for their courage during the storming of Milan; and the place is mentioned as a royal town under Ottokar II. From the outbreak of the Hussite Wars to the Thirty Years' War Saaz was Hussite or Protestant, but after the battle of the White Mountain (1620) the greater part of the Bohemian in- habitants left the town, which became German and Roman Catholic.

SABADELL, a town of north-eastern Spain, in the province of Barcelona; on the river Ripoll and on the Barcelona-Sara- gossa railway. Pop. (1900) 23,294. The town has handsome modern public buildings, including the town hall, schools for primary and higher education, hospitals and theatres. Cloth, linen, paper, flour and brandy are manufactured, and there are iron foundries and saw-mills. About half the inhabitants are employed in the textile factories. Sabadell is said to be the Roman Sebendunum, but in Spanish annals it is not noticed until the 13th century.

SABAEANS. The ancient name of the people of Yemen (q.v.) was Saba (Saba' with final hemza); and the oldest notices of them are in the Hebrew Scriptures. The list of the sons of Joktan in Gen. x. 26-29 contains in genealogical form a record of peoples of South Arabia

which must rest on good informa- tion from Yemen itself. Many of these names are found on the inscriptions or in the Arabic geographers — Sheba (Saba'), Hazarmaveth (Hadramut), Abimael (Abime'athtar), Jobab (Yuhaibib, according to Halevy), Jerah (Warah of the geographers), Joktan (Arab Qahtan; waqata = qahata). On the other hand, the names of some famous nations mentioned on the inscriptions are lacking, from which it may be concluded that they did not rise to prominence till a later date. Saba' (Sheba) itself, which was in later times the chief name, has in Gen. x. 28 a subordinate place; it was perhaps only a collective name for the companies of merchants who conducted the South- Arabian export trade (the root saba' in the inscriptions meaning to make a trading journey), and in that case would be of such late origin as to hold one of the last places in a list that has genealogical form. Two other accounts in Genesis, originally independent, give supplementary information drawn from the Sabaean colonies, the stations and factories established to facilitate trade through the desert. The inscriptions of Al-'Ola published by D. H. M tiller show that there were Minaean colonies in North Arabia. Other South Arabs, and especially the Sabaeans, doubtless also planted settlers on the northern trade routes, who in process of time united into one community with their North-Arab kinsmen and neighbours. Thus we can understand how in Gen. xxv. 2-3 Sheba and Dedan appear among the North- Arab " sons of Keturah." Again, the Sabaeans had colonies in Africa and there mingled with the black Africans; and so in Gen. x. 7 Sbeba and Dedan, the sons of Raamah (Raghma), appear in the genealogy of the Cushites. With the Ethiopians Saba' means " men," a clear indication of their Sabaean descent. The queen of Sheba who visited Solomon may have come with a caravan trading to Gaza, to see the great king whose ships plied on the Red Sea. The other biblical books do not mention the Sabaeans except incidentally, in allusion to their trade in incense and perfumes, gold and precious stones, ivory, ebony, and costly garments (Jer. vi. 20; Ezek. xxvii. 15, 20, 22 seq.; Isa. lx. 6; Job vi. 19). These passages attest the wealth and trading importance of Saba from the days of Solomon to those of Cyrus. When the prologue to Job speaks of plundering

Sabaeans (and Chaldaeans) on the northern skirts of Arabia, these may be either colonists or caravans, which, like the old Phoenician and Greek traders, combined on occasion robbery with trade. The prologue may not be historical; but it is to be presumed that it deals with historical possibilities, and is good evidence thus far.

The biblical picture of the Sabaean kingdom is confirmed and supplemented by the Assyrian inscriptions. Tiglath- Pileser II. (733

B.C.) tells us that Teima, Saba',' and Haipa (= Ephah, Gen. xxv. 4 and Isa. lx. 6) paid him tribute of gold, silver and much incense. Similarly Sargon (715 B.C.) in his Annals mentions the tribute of Shamsi, queen of Arabia, and of Itamara of the land of Saba' — gold and fragrant spices, horses and camels.

The earliest Greek accounts of the Sabaeans and other South- Arabian peoples are of the 3rd century B.C. Eratosthenes (276-194 B.C.) in Strabo (xv. 4. 2) says that the extreme south of Arabia, over against Ethiopia, is inhabited by four great nations — the Minaeans (Meiealoi, M 771/0101; Ma'In of the inscriptions) on the Red Sea, whose chief city is Carna; next to them the Sabaeans, whose capital is Mariaba (Mariab of the inscriptions); then the Catabanes (Qataban of the inscriptions), near the Straits of Bab-el-Mandeb, the seat of whose king is Tamna; fourthly, and farthest east, the people of Hadramut (Chatramotitae), with their city Sabota. The Catabanes pro- duce frankincense and Hadramut myrrh, and there is a trade in these and other spices with merchants who make the journey from Aelana (Elath, on the Gulf of 'Akaba) to Minaea in seventy days; the Gabaeans (the Gaba'an of the inscriptions, Pliny's Gebanitae) take forty days to go to Hadramut. This short but important and well-informed notice is followed a little later by that of Agatharchides (120 B.C.), who speaks in glowing terms of the wealth and greatness of the Sabaeans, but seems to have less exact information than Eratosthenes. He knows only the Sabaeans and thinks that Saba is the name of their capital. He mentions, however, the " happy islands " beyond the straits, the station of the Indian trade (§ 103). Artemidorus (100 B.C.), quoted by Strabo, gives a similar account of the Sabaeans and their capital Mariaba, of their wealth and trade, adding the characteristic feature that each tribe receives the wares and passes them on to its neighbours as far as Syria and Mesopotamia. The accounts of the wealth of the Sabaeans brought back by traders and travellers excited the cupidity of Rome, and Augustus entrusted Aelius Gallus with an expedition to South Arabia, of which we have an authentic account in Strabo (xvi. 4. 22). He hoped for assistance from the friendly Nabataeans; but, as they owed everything to their position as middlemen for the South-Arabian trade, which a direct communication between Rome and the Sabaeans would have ruined, their viceroy Syllaeus, who did not dare openly to refuse help, sought to frustrate the emperor's scheme by craft. Instead of showing the Romans the caravan route, he induced them to sail from Cleopatris to Leucocome, and then led them by a circuitous way through waterless regions, so that they reached South Arabia too much weakened to effect anything. But the expedition brought back a considerable

knowledge of the country and its products, and the Roman leader seems to have perceived that the best entrance to South Arabia was from the havens on the coast. So at least we may conclude when, a hundred years later (a.d. 77, as Dillmann has shown), in the Periplus of an anonymous contemporary of Pliny (§ 23) we read that Charibael of Zafar, " the legitimate sovereign of two nations, the Homerites and Sabaeans," maintained friendly relations with Rome by frequent embassies and gifts. Pliny's account of Yemen, too, must be largely drawn from the expedition of Gallus, though he also used itineraries of travellers to India, like the Periplus Maris Erythraei just quoted.

Nautical improvements, and the discovery that the south- west monsoon (Hippalus) gave sure navigation at certain seasons, increased the connexion of the West with South Arabia, but also wrought such a change in the trade as involved a revolution in the state of that country. The hegemony of the Sabaeans

now yields to that of a new people, the Homerites or Himyar, and the king henceforth bears the title " king of the Himyarites and Sabaeans." Naval expeditions from Berenice and Myos- hormus to the Arabian ports brought back the information on which Claudius Ptolemy constructed his map, which still surprises us by its wealth of geographical names. i

Sabaean colonies in Africa have been already mentioned. That Abyssinia was peopled from South Arabia is proved by its language and writing; but the difference between the two languages is such as to imply that the settlement was very early and that there were many centuries of separation, during which the Abyssinians were exposed to foreign influences. New colonies, however, seem to have followed from time to time, and, according to the Periplus (§ 16), some parts of the African coast were under the suzerainty of the Sabaean kings as late as the Sabaeo-Himyaritic period; the district of Azania was held for the Sabaean monarch by the governor of Maphoritis (Ma'afir), and was exploited by a Sabaean company. Naturally difficulties would arise between Abyssinia and the Sabaean power. In the inscription of Adulis (2nd century) the king of Ethiopia claims to have made war in Arabia from Leucocome to the land of the Sabaean king. And the Ethiopians were not without successes, for on the Greek inscription of AxQm (c. the middle of the 4th century) King Aeizanes calls himself " king of the Axumites, the Homerites, and Raidan, and of the

Ethiopians, Sabaeans, and Silee." More serious was the conflict under Dhu-Nu'as (Dhu- Nuwas of the Arab historians) in the beginning of the 6th century; it ended in the overthrow of the Hirnyarite king and the sub- jugation of Yemen, which was governed by a deputy of the Axumite king, till (about 570) the conquerors were overthrown by a small band of Persian adventurers.

With the exception of what the South-Arabian Hamdani relates of his own observation or from authentic tradition, the Mahommedan Arabic accounts of South Arabia and Sabaea are of little worth. The great event they dwell on is the bursting of the dam of Ma'rib, which led to the emigration northwards of the Yemenite tribes. We may be sure that this event was not the cause but the consequence of the decline of the country. When the inland trade fell away and the traffic of the coast towns took the sea route, the ancient metropolis and the numerous inland emporia came to ruin, while the many colonies in the north were broken up and their population dispersed. To this the Koran alludes in its oracular style, when it speaks (xxxiv. 17) of well-known cities which God appointed as trading stations between the Sabaeans and the cities He had blessed (Egypt and Syria), and which He destroyed because of their sins.

Inscriptions.— This abstract of the history of Yemen from ancient sources can now be verified and supplemented from inscriptions. Doubts as to the greatness and importance of the Sabaean state, as attested by the ancients, and as to the existence of a special Sabaean writing, called " Musnad," of which the Arabs tell, were still current when Niebuhr, in the 18th century, brought to Europe the first account of the existence of ancient inscriptions (not seen by him- self) in the neighbourhood of Yarim. Following this hint, Seetzen, in 1 8 10, was able to send to Europe, from porphyry blocks near Yarim, the first copies of Sabaean inscriptions. They could not, however, be read. But the inscriptions found by Wellsted in 1834 at Hisn Ghorab were deciphered by Gesenius and Rodiger. Soon after this the courageous explorer Arnaud discovered the ancient Mariab, the royal city of the Sabaeans, and at great risk copied fifty-six inscriptions and took a plan of the walls, the dam, and the temple to the east of the city. These, with other inscriptions on stone and on bronze plates brought home by Englishmen, found a cautious and sound interpreter in Osiander. The historical and geographical researches of Kremer and Sprenger gave a fresh impulse to inquiry. Then Joseph Halevy made his remarkable journey through the Jauf, visiting districts and ruins which no European foot had trod since the expedition of Gallus, and returned with almost 800 inscriptions. Of more recent travellers S. Langer and E. Glaser have done most for epigraphy, while Manzoni is

to be remembered for his excellent geographical work.

The alphabet of the Sabaean inscriptions is most closely akin to the Ethiopic, but is purely consonantal, without the modifications in the consonantal forms which Ethiopic has devised to express vowels. There are twenty-nine letters, one more than in Arabic, Satnech and Si , Vung distinct forms, as in Hebrew. This alphabet, which is probably tfce parent of the South-Indian character, is un- doubtedly derived frons> the so-called Phoenician alphabet, the

connecting link being the forms of the Safa inscriptions and of the Thamudaean inscriptions found by Doughty and Euting. Of the latter we can determine twenty-six characters, while a twenty- seventh probably corresponds to Arabic ? (£>)• A sign for ˆ

also probably existed, but does not occur in the known inscriptions. In the Thamudaean and Sabaean alphabets the twenty-two original Phoenician characters are mostly similar, and so are the differentiated

forms for £ and f- , while w>, ■5, and probably also J* and .jtf, have

been differentiated in many ways. This seems to imply that the two alphabets had a common history up to a certain point, but parted company before they were fully developed. The Tha- mudaean inscriptions are locally nearer to Phoenicia, and the letters are more like the Phoenician; this character therefore appears to be the link connecting Phoenician with Sabaean writing. It may be noticed that a Thamudaean legend has been found on a Baby- lonian cylinder of about 1000 B.C., and it is remarkable that the Sabaean satara, ” write,” seems to be borrowed from Assyrian shafaru. _ _ _ ‘ v .

The language of the inscriptions is South Semitic, forming a link between the North Arabic and the Ethiopic, but is much nearer the former than the latter. Of the two dialects commonly called Sabaean and Minaean the latter might be better called Hadramitic, inasmuch as it is the dialect of the inscriptions found in fjadramut, and the Minaeans seem undoubtedly to have entered the Jauf from Hadramut.

The inscriptions not only give names of nations corresponding to those in the Bible and in classical authors, but throw, a good deal of fresh light on the political history of Yemen. The inscrip- tions and coins give the names of more than forty-five Sabaean kings. The chronology is still vague, since only a few very late inscriptions are dated by an era and the era itself is not certain. But the rulers named can be assigned to three periods, according as they bear the title ” mukrab of

Saba," " king of Saba," or " king of Saba and Raidan." The last, as we know from the Axum in- scriptions, are the latest, and those with the title " mukrab" must be the earliest. Four princes of the oldest period bear the name Yatha'amar, and one of these may, with the greatest probability, be held to be the " Itamara Sabai " who paid tribute to Sargon of Assyria. This helps us to the age of some buildings also; The famous dam of Ma'rib and its sluices were the work of this ancient prince — structures which Arnaud in the 19th century found in the same state in which Hamdani saw them a thousand years ago. The power of these old sovereigns extended far beyond Ma-rib, for their names are found on buildings and monuments in the Jauf.

We cannot tell when the kings took the place of the mukrab, but the Sabaeo-Himyaritic period seems to begin with, or a little after, the expedition of Aehus Gallus. A fragmentary inscription of Ma'rib (Br. Mus., 33) was made by " Ilsharh Yahdib and Ya'zil Bayyin, the two kings of Saba and Raidan, sons of Far'm Yanhab, king of Saba." If this Ilsharh is identical with the 'IMaaapos of Strabo, king of Mariaba at the time of the Roman invasion, the inscription preserves a trace of the influence of that event on the union of the two kingdoms.

The inscriptions of the latest period present a series of dates — 669, 640, 582, 573, 385 — of an unknown era. Reinaud thought of the Seleucid era, which is not impossible; but Halevy observes that the fortress of Mawiyyat (now Hisn Ghorab) bears the date 640, and is said to have been erected " when the Abyssinians overran the country and destroyed the king of Himyar and his princes." Referring this to the death of Dhu Nuwas (a.d. 525), Halevy fixes 115 B.C. as the epoch of the Sabaean era. This ingenious combina- tion accords well with the circumstance that the oldest dated inscription, of the year 385 (a.d. 270), mentions Athtar, Shams and other heathen deities, while the inscriptions of 582 (a.d. 467) and 573 (a.d. 458), so far as they can be readˆ contain no name of a heathen god, but do speak of a god Raljmanan— that is, the Hebrew Rahman, " the compassionate " (Arabic, al Rahman), agreeably with the fact that Jewish and Christian influences were powerful in Arabia in the 4th century. The only objections to Halevy's hypo- thesis are (1). that we know nothing of an epoch-making event in 115 b.c, and (2) that it is a little remarkable that the latest dated inscription, of the year 669 (a.d. 554), should be twenty-five years later than the Abyssinian conquest. An inscription found by Wrede at 'Obne is dated " in the year 120 of the Lion in Heaven, which we must leave the astronomers to explain.

The inscriptions throw considerable light not only on the Sabaean* but on other South-Arabian nations. The Minaeans, whose import-

ance has been already indicated, appear in the inscriptions as only second to the Sabaeans, and with details which have put an end to much guesswork, e.g. to the idea that they are connected with Mina near Mecca. Their capital, Ma'in, lay in the heart of the Sabaean country, forming a sort of enclave on the right hand of the road that leads northward from Ma'rib. South-west of Ma'in, on the west of the mountain range and commanding the road from San'a to the north, lies Baraqish, anciently Yathil, which the inscriptions and Arabic geographers always mention with Ma'in- The third Minaean fortress, probably identical with the Kappa of the Greeks, lies in the middle of the northern Jauf, and north of the other two.

The three Minaean citadels He nearly in this position (.•.), with old Sabaean settlements (Raiam) all round them, and even with some Sabaean places (e.g. Nask and Kamna) within the triangle they form. The dialect of the, Minaeans is sharply distinguished from the Sabaeans (see above) . The inscriptions haye yielded the names of twenty-seven Minaean kings, who were quite independent, and, as it would seem, not always friends of the Sabaeans, for neither dynasty mentions the other on its inscriptions, while minor kings and kingdoms are freely mentioned t>y both, 'presumably when they stood under the protection of the one or the other respectively. The Minaeans were evidently active rivals of the Sabaean influence, and a war between the two .is once mentioned. In Hadramut they disputed the hegemony with one another, the government there being at one time under a Minaean, at another under a Sabaean prince, while the language shows now the one and now the other influence. The religions also of the two powers present many points of agreement, with some notable differences. , Thus, puzzling as the fact appears, it is clear that the Minaeans formed a sort of political and linguistic island in the Sabaean country. The origin of the Minaeans from Hadramut is rendered probable by the pre dominance of their dialect in the inscriptions of that country (except in that of Hisn Ghorab), by the rule, already mentioned,of a Minaean prince in rjadramut, and by. Pliny's statement (H.N, xii. 63) that frankincense was collected at Sabota (the capital of Hadramut; inscr. mac), but exported only through the Gebanites, whose kings received custom dues on it, compared with xii. 69, where he speaks of Minaean myrrh " in qua et Atramitica est et Geb- banitica et Ausaritis Gebbanitarum regno," &c, implying that Minaean myrrh was really a Hadramite and Gebanite product. All this suggests a close connexion between the Minaeans and

Hadramut; and from the Minaean inscriptions we know that the Gebanites were at one time a Minaean race, and stood in high favour with the queen of Ma'in v Thus we are led to conclude that the Minaeans were a Hadramite settlement in the Jauf, whose object was to secure the northern trade road for their products. We cannot but see that their fortified posts in the north of the Sabaean kingdom had a strategical purpose; and 60 Pliny (xii. 54) says, " Attingunt et Minaei, pagus alius, per quos evehitur uno tramite angusto [from Hadramut]. Hi primi commercium turis fecere maximeque exer- cent, a quibus et Minaeum dictum est." Besides this road, they had the sea-route, for, according to Pliny, their allies, the' Gebanites, held the port of Ocelis. If the Minaeans were later- immigrants from Hadramut, we can Understand how they are not mentioned in Gen. x. In later times, as is proved by the Minaean colony in Al-'Ola, which Euting has revealed to us, they superseded the Sabaeans in some parts of the north. In the '019 inscriptions we read the names of Minaean kings arid gods. Notable also is the mention in I Chron. iv. 41 of the "■ Bedouin encampments (c'thk) and the Ma'inim " smitten by the Simeonites, which may possibly refer to the destruction of a Minaean caravan protectee! by these Bedouins. The LXX. at least renders Ma'inim by Miraiovs. It seems bold to conjecture that the Minaeans were in accord with the'Rornans under Aelius Gallus, yet it; is noteworthy that no Minaean town is named among the cities which that general destroyed, though ruin fell on Nask and Kamna, which lie inside the Minaean territory.

The inscriptions seem to indicate that the monarchies of South Arabia were hereditary, the son generally following the' father, though not seldom the brother of the deceased came between, apparently on the principle of seniority, which we find also in North Arabia. Eratosthenes (in Strabo xvi. 4, 3) says that the first child born to one of the magnates after a king came to the throne was his designated successor; the wives of the magnates who were pregnant at the (king's accession were carefully watched, and the first child born was brought up as heir to the kingdom. There seems to be a mistake in the first part of this statement; what Eratosthenes will have said is that the oldest prince after the king was the designated successor. This law of succession explains how we repeatedly find two kings named together among the Sabaeans, and almost always find two ameng the Minaeans; the second king is, the heir. The principle of seniority, as we know from North Arabian history, gives rise to intrigues and palace revolutions, and was probably often violated in favour of the direct heir. On the other hand, it readily leads to a limited power of election by the magnates, and in fact good Arabian sources speak of

seven electoral princes. Some inscriptions name, besides the king, an eponymus, whose office seems to have been priestly, his titles being dhu karif, eponymus and rashfiw, ” sacrificer.” All royal inscriptions are signed by him at the beginning and the end, and he appears with the king on coins.

Religion. — In spite of the many ruins of temples and inscriptions, the religion of the Sabaeans is obscure. Most of the many names of gods are mere names that appear and vanish again in particular districts and temples. Of the great national gods of the Sabaeans and Minaeans we know a little more. The worship of the heavenly bodies, for which there is Arabic evidence, had really a great place in Yemen. Sun-worship seems to have been peculiar to the Sabaeans and Hamdanites; and, if the Sabis of Sabota (Pliny) was in fact the sun deity Shams, this must be ascribed to Sabaean influence. The Sabaean Shams was a goddess, while the chief divinity of the Minaeans was the god ‘Athtar, a male figure, worshipped under several forms, of which the commonest are the Eastern ‘Athtar and

‘Athtar Dhu KabrJ. Wadd and Nikrah, the gods 6f love and hate, are possibly only’ other forms of the two ‘Athtars. The Sabaeans also recognize ‘Athtar; but with them he is superseded by Almaqah, who, according to Hamdani, is the planet Venus; and therefore is identical with ‘Athtar. The moon-god Sin appears on an inscription of Shab-wat; but, according to Hamdani, Haubas, ” the drier,” was the Sabaean moon-god. On the Shabwat inscription ‘Athtar is the father of Sin, and it is noteworthy that these two deities also appear as nearly related in the Babylonian legend of ‘Ishtar’s descent to Hades, where ‘Ishtar is conversely the daughter of the god Sin. The mother of ‘Athtar on another inscription is probably the sun. We find also the common Semitic II (El) and a Dhu Samai answering to the northern Ba’al Shamayim. Three gods of the inscriptions are named in the Koran — Wadd, Yaghuth and Nasr. In the god- name Ta’lab there may be an indication of tree-worship. The many minor deities may be passed over ; but we must mention the sanc- tuary of Riyam, with its images of the sun and moon, and, according to tradition, an oracle. In conformity with old Semitic usage, pilgrimages were made at definite seasons to certain deities, and the Sabaean pilgrim month, DhQ Hijjatan, is the northern Dhfl’l-rfijja. The outlines, and little more, of a few of the many temples can still be traced. Noteworthy are the elliptic form of the chief temples in Ma’rib and Sirwah, and the castle of Naqab-al-Hajar with its entrances north and south. ,

Sacrifices and incense Were offered to the gods. The names for altar (midhbah) and sacrifice (dhibh) are common Semitic words, and the

altar of incense has among other names that of mifctar, as in Hebrew. A variety of spices— the wealth of the land — are named on these altars, as rand, ladanum, costus, tarum, &c. Frankincense appears as luban, ˆnd there are other names not yet understood. The gods received tithes of the produce of trade and of the field, in kind or in ingots and golden statues, and these tributes,' with freewill offerings, erected and maintained the temples. Temples and fortifi- cations were often combined. The golden statues were votive offerings; thus a man and his wife offer four statues for the health of their four children,: and a man offers to Dhu Samai statues of a man and two camels, in prayer for his own health and the protection of his camels from disease of the joints. , .

Their commerce brought the Sabaeans under Christian and Jewish influence ; and, though the old gods were too closely connected with their life and trade to be readily abandoned, the great change in the trading policy, already spoken of, seems to have affected religion as welt as the state. •The inland gods lost importance with the) failure of the overland trade, and Judaism and Christianity seem for a time to have contended for the mastery in South; Arabia. Jewish influence appears in the name Rahman (see above), while efforts at Christianization seem to have gone, forth from . . several places at various times. According to Philostorgius, the Homerltea were converted under Constantius II. by the Indian Theophilus, whp built churches in Zafar and Aden. Another account places their cohversion in the reign of Anastasius (491-518)/ In Nejratt Syrian missionaries seem to have introduced Christianity (Noldeke). > But, as the religion of the hostile Ethiopians, Christianity found political obstacles to its adoption in Yemen ; and, as heathenism had quite lost its power, it is intelligible that Dhu Nuwas, who was at war . with Ethiopia before the last fatal struggle, became a Jew. His expedition against Christian Nejran had therefore political as well as religious motives. . The Ethiopian conquest rather hurt than helped Christianity. The famous qalls (biKK-qaia) 'of Abraha in San'a seems to have been looked on as a sign of foreign dominion, and Islam found it easy to supersede Christianity in Yemen. '■ '

Coins.— In older times and in many, districts coins were not used, and trade was carried on mainly by barter. Nor have there been many great finds of coins ; indeed most of the pieces in European collections probably come from the same hoard. At the same, time the coins throw a general light on the relations of ancient Yemen. The oldest known pieces are imitations of the Athenian- mintage of the 4th century B.C., with the legend A6E and the owl standing on an overturned amphora. The reverse has the head of Pallas with a

Sabaean N. Of younger coins the first series has a king's head on the reverse, and the old obverse is enriched with two Sabaean monograms, which have been interpreted as meaning " majesty" and " eponymus " respectively. In a secpnd series the Greek legend has disappeared, and, instead of the two Sabaean mono- gramˆ, we have the names of the king and the eponymus. Athird series shows Roman influence and must be later than the expedition" of Gallus. As the standard of the coins of Attic type is not Attic but Babylonian, we must not think of direct Athenian influence. The type must have been introduced either from Persia or from Phoenicia (Gaza). One remarkable tetradrachm with the Sabaean legend Abyath'a is imitated from an Alexander of the 2nd century B.C., the execution being quite artistic and the weight Attic. There are also cojns struck at Raydan and Harib, which must be assigned to the Himyarite period (1st and 2nd century A.D.). The inscriptions speak of " bright Hayyili coins in high relief," but of these none have been found. They also speak of sela' pieces. The sela' in late Hebrew answers 1 to the older shekel, and the mention of it seems, to point tp Jewish or Christian influence.

Lijprature. — Fresnel 7- Pieces rel. aux insert. Himyarites dec. pur. M. Arnaud (1845); Inscriptions in the Himyariiic Character in the

British Museum (London, 1863); Praetorius, Beitr. zur Erkldrung der himjar. Inschr. (3 parts, Halle, 1 872-1 874); Kremer, Siid- arabische Sage (1866); Sprenger, Alte Geogr. Arabiens (1873); D. H. Miiller, Siidarabische Studien (Vienna, 1877) ; Id., Die Burgen u. Schlosser Sudarabiens (2 parts, Vienna, 1 879-1 881) (especially for chronology and antiquities); Mordtmann and Miiller, Sabdisr.he Denkmaler (Vienna, 1883); Derenbourg, Etudes sur Vipigraphie du Yemen (Paris, 1884); Id., Now. mud. (1885); Glaser, Mitteilungen uber . . . sab. Inschr. (1886); Hamdanf, Geogr. d. arab. Halbinsel, ed. D. H. Miiller, vol. i. (Leiden, 1884). See also papers by Osiander, Z.D.M.G. xix.-xx. (1864-1865); Halevy, Journ. As. (1872-1874); D. H. Miiller, Z.D.M.G. xxix.-xxxi., xxxvii. ; Prideaux, Tr. Soc. Bibl. Arch. (1873); Derenbourg, Bal. and Or. Record (London, 1887).

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Abhandlungen(i8<)2 sqq.) ; Fr. Hommel, Siidarabische Chrestomathie (Munich, 1893) ; J. H. Mordt- mann, Himjarische Inschriften und AUerliimer in den kgl. Museen zu Berlin (Berlin, 1893); H. Winckler, Altorientalische Forschungen (" das Land Musri "); D. H. Miiller, Epigraphische Denkmaler aus Abessinien (Vienna, 1894) ; E. Glaser, Die Abessinier in Arabien und Afrika (Munich, 1 895); J.H.Mordtmann, Musee Imperial Ottoman, &c. ■(Constantinople, 1895); D. H. Miiller, " Arabia " in Pauly-Wissowa, Realencychpadie des klassischen Altertums, i. 344-3§9 (1897); J. H. Mordtmann, Beitrdge zur mindischen Epigraphik (\fyeimar, 1897) ; E. Glaser, Zwei Inschriften uber den Dambruch von Mdrib; D. H. Miiller, Siidarabische Alterliimer im kunsthistorischen Hofmuseum (Vienna, 1899); M. Lidzbarski in Ephemeris (1901 sqq.); O. Weber, Studien zur siidarabischen Altertumskunde, i.-iii. (1901-1908); H. Grimme, " Verschiedene Aufsatze " in O.L.Z., &c. ; D. Nielsen, Die alt- arabische Mondreligion (1904); D. Nielsen, Neue Katabanische Inschriften (1906) ; E. Glaser, Alljemenische Nachrichten, vol. i. (1906); M. Hartman, " Siidarabisches," i.viii., in O.L.Z. (1907 1908); Melanges H. Derenbourg (Paris, 1909); M. Hartman, Die arabische Frage mit einem Versuche der Archdologie Jemens (Halle, 1908); D. Nielsen, Der siidarabische Gott Ilmekah (1909); O. Weber, ” Gottes Symbole auf siidarabischen Denkmalern ” in the Hilprechi- Buch (1909), 269-280; cf. also Arabia, Axum.

The lexical material, in so far as it touches the Hebrew, was in- corporated by D. H. Miiller in the ioth-i2th edition of the Gesenius Lexicon and is now incorporated by O. Weber in the 15th edition of the Gesenius-Buhl Lexicon. For collected literature see: up to 1892, F. Hommel’s Siidarabische Chrestomathie; from 1892 to 1907, O. Weber’s Studien zur siidarabischen Allertumskvnde, iii. (D. H. M.)

SABAKI, a river of British East Africa which enters the Indian Ocean in 3 12′ S., just north of Malinda. The Sabaki rises (as the Athi) in i° 42′ S., and after flowing north-east 70 m. across the Kapote and Athi plains, turns south-south-east under the wooded slopes of the Yatta ridge, which shuts in its basin on the east. In 3°S. it turns east, and in its lower course (known as the Sabaki) traverses the sterile quartz-land of the outer plateau. The valley is in parts low and flat, covered with forest and scrub, and containing small lakes and backwaters connected with the river in the rains. At this season the stream — which rises as much as 30 ft. in places — is deep and strong and of a turbid yellow colour; but navigation is interrupted by the Lugard falls, about 100 m. from its mouth. Its total length is about 400 m. Apart from the numerous small feeders of the upper river, almost the only tributary is the Tsavo, from the east side of Kilimanjaro, which enters in about 3

S.

SABAS, ST (430-531), a Palestinian monk, born near Caesarea of Cappadocia. Becoming a monk in his childhood, he went to Jerusalem and lived as a hermit. After a time he established the ” Great Laura ” monastery in the neighbourhood of the Dead Sea, and later on the ” New Laura,” under St Basil’s Rule. In the Lauras the young monks lived a cenobitical life, but the elders a semi-eremitical one, each in his own hut within the precincts of the Laura, attending only the solemn church services. Sabas was made exarch or superior of all the monasteries in Palestine, and composed a Typicon or Rule for their guidance. He took a prominent part, on the orthodox side, in the Monophysite and Origenistic controversies. His Laura long continued to be the most influential monastery in those parts, and produced several distinguished monks, among them St John of Damascus. It is now known as the monastery of Mar Saba. He is commemorated on the 5th of December.

Another saint of this name, surnamed ” the Goth,” suffered martyrdom at the hands of Athanaric the Visigoth in the reign of Valentinian, and he is commemorated on the t2th of April in

the Roman Martyrology, on varying days from 12th to 18th in the Greek Menologies.

Sabas’s Life was written by his disciple Cyril of Scythopolis. The chief modern authority is A. Ehrhard in W;tzer u. Welte’s Kirchen- lexikon (ed. 2) and Romische Quartalschnft, vii. ; see also Helyot, Histoire des ordres religieux (1714), i. c. 16, and Max Heimbucher, Orden u. Kongregationen (1907), i, § 10. (E. C. B.)

SABATIER, LOUIS AUGUSTE (1839-1901), French Protest- ant theologian, was born at Vallon (Ardeche), in the Cevennes, on the 22nd of October 1839, and was educated at the Protestant theological faculty of Montauban and the universities of Tubingen and Heidelberg. After holding the pastorate at Aubenas in the Ardeche from 1864 to 1868 he was appointed professor of reformed dogmatics in the theological faculty of Strassburg. His markedly French sympathies during the war of 1870 led to his expulsion from Strassburg in 1872. After five years’ effort he succeeded in establishing a Protestant theological faculty in Paris, and became professor and then dean. In 1886 he became a teacher in the newly founded religious science department of the Ecole des Hautes Etudes of the Sorbonne. Among his chief works were The Apostle Paul (3rd ed., 1896) ; Mimoire sur la notion tebraique de I’ Esprit (1879); Les

Origines UlUraires de V ‘Apocalypse (1888); The Vitality of Christian Dogmas and their Power of Evolution (1890); Religion and Modern Culture (1897); Historical Evolution of the Doctrine of the Atonement (1903); Outlines of a Philosophy of Religion (1897); and his posthumous Religions of A uthority and the Religion of the Spirit (1904), to which his colleague Jean R6ville prefixed a short memoir. These works show Sabatier as “at once an accomplished dialectician and a mystic in the best sense of the word.” He died on the 12th of April 1901.

On his theology see E. Menegoz in Expository Times, xv. 30, and G. B. Stevens in Hibbert Journal (April 1903).

His brother, Paul Sabatier, was born at St Michel de Chabrillanoux in the Cevennes on the 3rd of August 1858, and was educated at the faculty of theology in Paris. In 1885 he became vicar of St Nicolas, Strassburg, and in 1889, declin- ing an offer of preferment which was conditional on his becoming a German subject, he was expelled. For four years he was pastor of St Cierge in the Cevennes and then devoted himself entirely to historical research. He had already produced an edition of the Didache, and in November 1893 published his important Life of St Francis d’ Assist. This book gave a great stimulus to the study of medieval literary and religious docu- ments, especially of such as are connected with the history of the Franciscan Order. In 1908 he delivered the Jowett Lectures on Modernism at the Passmore Edwards Settlement, London.

SABAZIUS, a Phrygian or Thracian deity, frequently identified with Dionysus, sometimes (but less frequently) with Zeus. His worship was closely connected with that of the great mother Cybele and of Attis. His chief attribute as a chthonian god was a snake, the symbol of the yearly renovation of the life of nature. Demosthenes (De corona, p. 313) mentions various ceremonies practised during the celebration of the mysteries of this deity. One of the most important was the passing of a golden snake under the clothes of the initiated across their bosom and its withdrawal from below — an old rite of adoption. From Val. Max. i. 3, 2 it has been concluded that Sabazius was identified in ancient times with the Jewish Sabaoth (Zebaoth). Plutarch (Symp. iv. 6) maintains that the Jews worshipped Dionysus, and that the day of Sabbath was a festival of Sabazius. Whether he was the same as Sozon, a marine deity of southern Asia Minor, is doubtful. Some explain the name as the ” beer god,” from an Illyrian word sabaya, while others suggest a connexion with Safo (god of ” health “) or ciBas. His image and name are often found on “votive hands,” a kind of tausman adorned with emblems, the nature of which is obscure. His

ritual and mysteries (Sacra Savadia) gained a firm footing in Rome dur- ing the 2nd century a.d., although as early as 139 B.C. the first Jews who settled in the capital were expelled by virtue of a law which proscribed the propagation of the cult of Jupiter Sabazius.

See J. E. Harrison, Prolegomena to Greek Religion (1908), p. 414; H. Usener, Gbtternamen (1896), p. 44; F. Cumont, ” Hypsistes ‘ ic Revue de V instruction publique en Belgique, xl. (1899); C. S. Blinken- berg, Archdologische Studien (1904).

SABBATAI SEBI (1626-1676), Jewish mystic, whose Messianic claims produced an unparalleled sensation throughout the world, was born in Smyrna. He was of Spanish descent and was gifted with a personality of rare fascination. As a lad he was attracted by the mysticism of Luria (q.v.), which impelled him to adopt the ascetic life. He passed his days and nights in a condition of ecstasy. He began to dream of the fulfilment of Messianic hoˆs, being supported in his vision by the outbreak of English Millenarianism. Christian visionaries fixed the year 1666 for the millennium, and in his appeal to Cromwell on behalf of the return of the Jews to England Menasseh ben Israel ((?.».) made strong appeal to this belief. Sabbatai’s father (Mordecai) was the Smyrna agent for an English house, and often heard of the expectations of the English Fifth Monarchy men. Dazzled by this confirmation of his nascent confidence, Sabbatai for a time found himself the object of suspicion and even persecution. This treatment, so far from extinguishing the flame, eventually converted it into a conflagration. It was in 1648 (the year which Kabbalists had calculated as the year of salvation) that Sabbatai proclaimed himself Messiah, and in Constantinople came across an able but somewhat unscrupulous man, who pretended that he had been warned by a prophetic voice that Sabbatai was indeed the long-awaited Redeemer. Others believed in him, but at first his adherents were a small circle of devotees who kept their faith a. secret. He charmed men by his sweet singing of Psalms, and children were always fascinated by him. And now the era of his miracles begins. He journeyed to Jerusalem, and there was the instrument for conferring unexpected services on the community. An oppressive exaction was imposed by a local pasha, and in order to win the succour of Raphael Halebi, Sabbatai repaired to Cairo, being on his route at Hebron hailed as Messiah. His mission was completely successful. At Cairo Sabbatai married. As a boy he had been married and divorced twice — but these were merely nominal

unions. Now, however, the romantic story of a beautiful girl (Sarah) was on people's lips; she was firm in her assertion that she was the destined bride of the Messiah. Sabbatai had, at the same time, announced that in a dream a spiritual bride had been promised to him. At the house of Halebi bride and bridegroom met. The adhesion of Halebi produced many imitators, and with a retinue of believers, a charming wife and considerable funds, Sabbatai returned in triumph to the Holy Land. Nathan of Gaza assumed the r&le of Elijah, the Messiah's forerunner, proclaimed the coming restoration of Israel and the salvation of the world through the bloodless victory of Sabbatai " riding on a lion with a seven-headed dragon in his jaws '"(Graetz). Again 1666 was given as the apocalyptic year. Threatened with excommunica- . tion by the Rabbis of Jerusalem, Sabbatai returned to Smyrna (autumn of 1665). Here he was received with wild enthusiasm, and the masses were carried beyond all bounds. With delirious joy the Jews of Smyrna— men, women and children — fell down and worshipped. They prepared for the return.. Men left their work to make ready for the start. They fasted, they rejoiced; one hour they chilled themselves in the cemeteries, the next they rushed frantically through the streets singing Psalmic refrains. Nor did Sabbatai's adherents all belong to the ignorant classes. The Rabbi Hˆyim Benveniste and other men of repute and learning shared the general delusion. It is unnecessary to tell the rest of the story in detail. Many letters are extant, written home to English and Dutch business-houses, in which the marvels of Sabbatai are reported, sometimes with apparent belief in them. From the Levant the Sabbataean movement spread to Venice, Amsterdam, Hamburg and London. Sabbatai was no longer able to doubt the reality of his mission. Day by day he was hailed from all the world as king of the Jews. But his character was too weak to sustain the part. Though he was almost deified by many of his brethren, who at his word agreed to modify their religious observances, yet he was unable to turn the enthusiasm of thousands to any account. Had he boldly led the way to Jerusalem, he would probably have carried every- thing before him. At the beginning of the fateful year 1666 Sabbatai went (or was summoned) to Constantinople. Here

he was arrested, but reports of miracles continued, and many of the Turks were inclined to become converts. Soon he was transferred to Abydos, amidst the almost tragic consternation of his deluded followers. In September Sabbatai was brought before the Sultan, and he had not the courage to refuse to accept Islam. And so the Messianic imposture ended in the apostacy of Sabbatai. The reaction among the Jews was terrible, and a sense of shame was joined to feelings of

despair. But the sober- minded among the Jews— these had throughout been the vast majority — seized their opportunity to reclaim those who had been the victims of a terrible wrong. Yet many continued to believe in him, as he from time to time attempted to resume his r61e. In 1676 he died in obscurity in Albania. A sect of Sabbataeans — the Dormeh of Salonica — survived him, and for many a long year the controversy for and against his claims left an echo in Jewish life.

The literature on the life and career of this remarkable man is very extensive. Sabbatai Sebi figures largely in English books of the period. A valuable account is given in particular by Graetz, History of the Jews, vol. v. ch. iv. 1. Zangwill has a brilliant sketch of Sabbatai's career in his Dreamers of the Ghetto. (I. A.)

SABBATH, the day of cessation from work, 1 which among the Hebrews followed six days of labour and closed the week.

1. Observance. — The later Jewish Sabbath, observed in accordance with the rules of the Scribes, was a very peculiar institution, and formed one of the most marked distinctions between the Hebrews and other nations, as appears in a striking way from the fact that on this account alone the Romans found themselves compelled to exempt the Jews from all military service. The rules of the Scribes enumerated thirty-nine main kinds of work forbidden on the Sabbath, and each of these prohibitions gave rise to new subtilties. Jesus's disciples, for example, who plucked ears of corn in passing through a field on the holy day, had, according to Rabbinical views, violated the third of the thirty-nine rules, 2 which forbade harvesting; and in healing the sick Jesus Himself broke the rule that a sick man should not receive medical aid on the Sabbath unless his life was in danger. In fact, as our Lord puts it, the Rabbinical theory seemed to be that the Sabbath was not made for man but man for the Sabbath, the observance of which was so much an end in itself that the rules prescribed for it did not require to be justified by appeal to any larger principle of religion or humanity. The precepts of the law were valuable in the eyes of the Scribes because they were the seal of Jewish particularism, the barrier erected between the world at large and the exclusive community of Yahweh's grace. The ideal of the Sabbath which all these rules aimed at realizing was absolute rest from everyr thing that could be called work; and even the exercise of those offices of humanity which the strictest Christian Sabbatarians regard as a service to God, and therefore as specially appropriate to His day, was looked on as work. To save life was allowed, but only because danger to life " superseded the Sabbath." In like manner the special ritual at the temple

prescribed for the Sabbath by the Pentateuchal law was not regarded as any part of the hallowing of the sacred day; on the contrary, the rule was that, in this regard, ” Sabbath was not kept in the sanctuary.” Strictly speaking, therefore, the Sabbath was neither a day of relief to toiling humanity nor a day appointed for public worship; the positive duties of its observance were to wear one’s best clothes, eat, drink and be glad (justified from Isa. lviii. 13). A more directly religious element, it is true, was introduced by the practice of attending the synagogue service; but it is to be

1 The grammatical inflexions of the word ” Sabbath ” would show that it is a feminine form, properly shabbat-t for shabbat-t. The root has nothing to do with resting in the sense of enjoying repose; in transitive forms and applications it means to ” sever,” to put an end to,” and intransitively it means to ” desist,” to ” come to an end.” The grammatical form of shabbath suggests a transitive sense, ” the divider,” and apparently indicates the Sabbath as dividing the month. It may mean the day which puts a stop to the week’s work, but this is less likely. It certainly cannot be translated ” the day of rest.”

a From the Thirty-ninth was deduced the familiar ” Sabbath day’s journey ” (Acts i. 12), based primarily, it would seem, upon the command in Ex. xvi. 29. It was a distance of 2000 cubits.

remembered that this service was primarily regarded not as an act of .worship but as a meeting for instruction . in the law.

2. Attitude of Jesus.— So far, therefore, as the Sabbath existed for any end outside itself it was an institution to help every Jew to learn the law, and from this point of view it is regarded by Philo and Josephus,,who are accustomed to seek a philosophical justification for the peculiar institutions of their religion. But this certainly was not the leading point of view with the mass of the Rabbins; 1 and .at any rate it is quite certain that the synagogue is a post-exilic institution, and therefore that the Sabbath in old Israel must have been entirely different from the Sabbath of the Scribes. But that it was destitute of any properly religious observance or meaning is inconceivable, for, though many of the religious ideas of the old Hebrews were crude, their institutions were never arbitrary and meaningless, and when they spoke of conseciating the Sabbath they must have had in view some religious exercise of an intelligible kind by which they paid

worship-to Yahweh. Indeed, that the old Hebrew Sabbath was quite different from the Rabbinical Sabbath is ddmonstrated in the trenchant criticism which Jesus, directed against the latter (Matt. xii. 1-14; Mark ii. 27). The general position which. He takes up, that ” the Sabbath is made for man and not man for the Sabbath,” 2 is only a special application of the wider principle that the law is not an end in itself but a help towards the realiza- tion in life of the great ideal of love to God and man, which is the sum of all true religion. But Jesiis further maintains that this view of the law as a whole, and the interpretation of the Sabbath law which it involves, can be historically justified from the Old Testament. And in this connexion He introduces two of the main methods to which historical criticism of the Old Testament has recurred in modern times: He appeals to the oldest history rather than to the Pentateuchal code as proving that the later conception of the law was unknown in ancient times (Matt. xii. 3 seq.), and to the exceptions to the Sabbath law which the Scribes themselves allowed in the interests of worship (v. 5) or humanity (v. n), as showing that the Sabbath must originally have been devoted to purposes of worship and humanity, and was not always the purposeless arbitrary thing which the schoolmen made it to be. Modern criticism of the history of Sabbath observance among the Hebrews has done nothing more than follow out these arguments in detail, and show that the result is in agreement with what is known as to the dates of the several component parts of the Pentateuch.

3. Old I/sage.— Of’the legal passages that speak of the Sabbath all those which show affinity with the doctrine of the Scribes— regarding the Sabbath as’ an arbitrary sign between Yahweh and Israel, entering into details as to particular acts that are forbidden, and enforcing the observance by severe penalties, so that it no longer has any religious value, but appears as a mere legal constraint— are post-exilic (Exod. xvi. 23-30, xxxi. 12-17, xxxv. 1-3; Num. xv. 32-36); while the older laws only demand such cessation from daily toil, and especially from agricultural labour, as among air ancient peoples naturally accompanied a day set apart as a religious festival, and in particular lay weight on the fact that the Sabbath’ is a humane institution, a holiday for the labouring classes (Expd. xxiii. 12; Deut. v. 13-15). As it staiids in these ancient laws, the Sabbath is not at all the unique thing which it was madetobe by the Scribes. ” The Greeks and the barbarians,” says Strabo (x. 3, 0), ” have this in common, that they accompany their sacred rites by a festal remission of labour.” So it was in old Israel: the Sabbath was one of the stated religious feasts; like the new moon and the three great agricultural sacrificial celebrations (Hosea ii.. ii) ; the new moons and the Sabbaths alike called men to

the sanctuary to do sacrifice (Isa. i. 14); the remission of ordinary business belonged. to both

1 See the Mishnah, tract. ” Shabbath ” and the alleviation per- mitted in the. tract. ” Erubin ” ;, and compare Schiirer, Gesch. d. jud. Volkes'-P, pp. 393 seq., where the Rabbinical Sabbath js well explained and illustrated in detail. ,

2 Cp. the discussion in Talmud Yoma, fol. 856: “The sabbath is delivered into your hands, not you into the hands of the Sabbath ” (cjted by S, R. .Driver, Hastings', Diet. Bil/le, aft. ” Sabbath,” ; iv.. p. 322). See also art.JVlidrash,, § 4, end.

alike (Amos viii..s) > and for precisely the same. reasorjk: Hosea even takes it for granted that in captivity the Sabbath, will be suspended, like all, the other feasts, because in his day a feast implied a sanctuary. This conception of the Sabbath, however, necessarily underwent an important modification when the local sanctuaries were abolished under the ” Deuteronomic ” reform, and those sacrificial rites and feasts which inHosea's time formed the essence of every act of religion were limited to the central altar, which most men could visit only at rate intervals. From this time forward the new moons j which till then had been at least as important as.- the Sabbath and were celebrated by sacrificial feasts as; occasions of religious gladness, fall into insignificance, except in the conservative temple ritual. The Sabbath did not share the same fate, but with the abolition of local sacrifices it became for most Israelites an institution of humanity divorced from ritual. So it appears in the Deuteronomic decalogue, and presumably also in Jer. xvii. 19 seq. In this form the seventh day's rest was one of the few outward ordinances by which the Israelite could still show his fidelity to Yahweh and mark his separation from the heathen. Hence we understand the importance attached to it in the exilic literature (Isa. lvi. 2 seq., lviii. 13), and the character- of a sign between Yahweh and Israel ascribed to it in the post-exilic law. This attachment to the Sabbath, beautiful and touching so long as it was a spontaneous ex- pression of continual devotion to Yahweh, acquired a less pleasing character when, after the exile, it came to be enforced by the civil arm (Neh. xiii.), and when the later law even declared Sabbath- breaking a capital offence. This increasing strictness is exempli- fied by the attitude of the Book of Jubilees (ii. 17-32, 1. 6-13). But it is just to ■ remember that without the stern discipline of the law the community of the second temple could hardly have escaped dissolution, and that Judaism alone preserved for Christianity the hard-won achievements of the prophets. 3

4. Early Christian Church.— The. Sabbath exercised a twofold influence on the early Christian church.. On the one hand, the weekly celebration of the resurrection on the Lord's day could not have arisen except in a circle that already knew the week as a sacred division of time; and, moreover, the manner in which the Lord's day was observed was directly influenced by the synagogue service. On the other hand, the Jewish Christians continued to keep the Sabbath, like other points, of the old law. Eusebius (H.E. iii. 27) remarks that the Ebionites observed both the Sabbath and the Lord's day; and this practice obtained to some extent in much wider circles, for the Apostolical Constitutions recommend that the Sabbath shall be kept as a memorial feast'of the creation as well as the Lord's day as a memorial of the resurrection. The festal character of the Sabbath was long recognized in a modified form in the # Eastern church by a prohibition of fasting on that day, which was also a point in the Jewish Sabbath law (comp. Judith: viii. 6). On the other hand, Paul had quite distinctly laid down from the first days of Gentile Christianity that the Jewish Sabbath was not binding on Christians (Rom. xiv. 5 seq.; Gal. iv. 10; Col. ii. 16), and controversy with Judaizers led in, process of time to direct condemnation of those who still kept the Jewish day (e.g. Co. of Laodicea, a.d. 363). Nay, in the Roman church a practice of fasting on Saturday as well as on Friday was current before the time of Tertullian. The stepsby which the practice of resting from labour on the Lord's day instead of on the Sabbath was established in' Christendom and received civil as well as ecclesiastical sanction are dealt with under Sunday; it is enough to observe here that this practice is naturally arid even necessarily connected with the religious observance of the Lord's day as a day of worship and religious gladness, and is in full accordance with the principles laid down by Jesus in His criticism of the Sabbath of the Scribes. But of course the

3 In actual life the Sabb&th was often far from being the burden which the Rabbinical enactments would have led us to expect. It "is celebrated, by the very people who did observe it, in hundreds of hymns, which would fill volumes, as a, day of rest and joy, of presentiment of the pure bfiss and happiness which are stored up for the righteousm the world to come " (S. Schechter, Jewish Quart. : Review, Uii-p. 763; op. id., Studies in Judaism, pp. 296 sqq.).

complete observance of Sunday rest was not generally possible to the

early Christians before Christendom obtained civil recognition. 1

5. Origin.— As the Sabbath was originally a religious feast, the question of the origin of the Sabbath resolves itself into an inquiry why and in what circle a festal cycle of seven days was first established. In Gen. ii. 1-3 and in Exod. xx. 11 the Sabbath is declared to be a memorial of the completion of the work of creation in six days. But it appears certain that the decalogue as it lay before the Deuteronomist did not contain any allusion to the creation (see Decalogue), and it is generally believed that this reference was added by the same post-exilic hand that wrote Gen. i. 1— ii. 4a. The older account of the creation in Gen. ii. 46 seq. does not recognize the hexaemeron, and it is even doubtful whether the original sketch of Gen. i. distributed creation over six days. The connexion, therefore, between the seven days' week and the work of creation is now generally recognized as secondary. 2 But, if the week as a religious cycle is older than the idea of the week of creation, we cannot hope to find more than probable evidence of the origin of the Sabbath. Unless the Sabbath was already an institution peculiarly Jewish, it could not have served as a mark of distinction from heathenism. This, however, does not necessarily imply that in its origin it was specifically Hebrew, but only that it had acquired distin- guishing features of a marked kind. What is certain is that the origin of the Sabbath must be sought within a circle that used the week as a division of time. Here again we must distinguish between the week as such and the astrological week, i.e. the week in which the seven days are named each after the planet which is held to preside over its first hour. 3 It is plain, however, that there is a long step between the astrological assignation of each hour of the week to a planet and the recognition of the week as an ordinary division of time by people at large. Astrology is in its nature an occult science, and there is no trace of a day of twenty-four hours among the ancient Hebrews. Moreover, it is doubtful from extant remains of Assyrian calendars whether the astrological week prevailed in civil life even among the Babylonians and Assyrians. They did not dedicate each day in turn to its astrological planet; and it is therefore precarious to assume that the Sabbath was in its origin what it is in the astrological week, the day sacred to Saturn, and that its observance is to be derived from an ancient Hebrew worship of that planet. 4

The week, however, is found in various parts of the world in a form that has nothing to do with astrology or the seven planets, and with such a distribution as to make it pretty certain that it had no artificial origin, but suggested itself independently, and for natural reasons, to different races. In fact, the four quarters of the moon supply an

obvious division of the month; and, wherever new moon and full moon are religious occasions, we get in the most natural way a sacred cycle of fourteen or

1 See, further, E. Schflrer in Zeit. f. Neu-Test. Wissens. (1905), pp. 1-66. For the theological discussions whether and in what sense the fourth commandment is binding on Christians, see Decalogue.

» ” The week, ended by the Sabbath, determined the ‘ days ‘ of creation, not the ‘days’ of creation the week” (S. R. Driver, Genesis (1909), p. 35). At the same time, there was a peculiar appropriateness in associating the Sabbath with the doctrine that Yahweh is the Creator of all things; for we see from Isa. xl.-lxvi. that this doctrine was a mainstay of Jewish faith in those very days of exile which gave the Sabbatb a new importance for the faithful.

‘ If the day is divided into twenty-four hours and the planets preside in turn over each hour of the week in the order of their periodic times (Saturn, Jupiter, Mars, Sun, Venus, Mercury, Moon), we get the order of days of the week with which we are familiar. For, if the Sun presides over the first hour of Sunday, and therefore also over the eighth, the fifteenth and the twenty-second, Venus will have the twenty-third hour, Mercury the twenty-fourth, and the Moon, as the third in order from the Sun, will preside over the first hour of Monday. Mars, again, as third from the Moon, will preside over Tuesday (Dies Martis, Mardi), and so forth. This astrological week became very current in the Roman empire, but was still a hoVelty in the time of Dio Cassius (xxxvii. 18).

4 The evidence of the worship of Saturn among the oldest Hebrews is doubtful. Amos v. 26 (where Chiun is taken to represent Kawan-Saturn) is of uncertain interpretation, see W. R. Harper’s discussion, tiosen, pp. 139-141 {International Crit. Comm., 1905).

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fifteen days, of which the week of seven or eight days (determined by half moon) is the half. Thus the old Hindus chose the new and the full moon as days Of sacrifice; the eve of the sacrifice was called upavasatha, and in Buddhism the same word (updsatha) has come to denote a Sabbath observed on the full moon, on the day when there is no moon, and on the two days which are eighth from the full an,d the new moon respectively, with fasting and other religious exercises. 5 From this point of view it is most significant that in the older parts of the Hebrew Scriptures the new moon and the Sabbath are almost

invariably mentioned together. 6

Nor are Other traces wanting of the connexion of sacrificial occasions — i.e. religious feasts— with the phases of the moon among the Semites. Thus the Harranians had four sacrificial days in every month, and of these two at least were determined by the conjunction and opposition of the moon. 7 That full moon as well as new moon had a religious significance among the ancient Hebrews seems to follow from the fact that, when the great agricultural' feasts were fixed to set days, the full moon was chosen. In older times these feast-days appear to have been Sabbaths (Lev. xxiii. 1 1 ; comp. the article Passover). A week determined : by the phases of the moon has an average length of 295-7-4 = 7! days, i.e. three weeks out of eight would have eight days. But there seems to be in 1 Sam. xx. 27, compared with verses 18, 24, an indication that in old times the feast of the new moon lasted two days. 8 In that case a week of seven working days would occur only once in two months. We cannot tell when the Sabbath became dissociated from the month r but the change seems to have been made before the Book of the Covenant, which already regards the Sabbath simply as an institution of humanity and ignores the new moon. In both points it is followed by Deuteronomy.' (W. R. S.; S. A. C.)

[6. The Babylonian and Assyrian Sabbath. — The Babylonian calendars contain explicit directions for the "Observance of abstention from certain secular acts on certain days which forms a close parallel to the Jewish Sabbatical rules. Thus for the 7th, 14th, 2 1st, 28th and also the 19th days of the intercalary Elul it is prescribed that " the shepherd of many nations is not to eat meat roast with fire nor any food cooked by fire, he is not to change the clothes on his body nor put on gala dress, he may not bring sacrifices nor may the king ride in his chariot, he is not to hold court nor may the priest seek an oracle for him in the sanctuary, no physician may attend the sick room, the day is not favourable for invoking curses, but at night the king may bring his gift into the presence of Marduk and Ishtar. Then he may offer sacrifice so that his prayers be accepted." Clearly, then, it was a day of suspended activity, but it will be noted that no religious observances are prescribed in place of the forbidden secular matters. So far no evidence is forthcoming that the same days of each month were observed as these of this special rarely occurring rtionth. Calendars exist for other months which make no such regulations for any days. These abstentions are prescribed for the king and a few other persons; there is n6 evidence that they were observed by all the people. The 19th day is supposed to have had its sacred nature as the 49th day from the commencement of the preceding month, assuming

that to have had 30 days. The months often had only 29 days, when the same character ought to have applied to the 20th day of the following month. There is no evidence that these days were . called shabdttu, a word which is rendered by umu nuh libbi, ” day of rest of the heart,” and has been thought to be the origin of Sabbath. This name shabattu was certainly applied to the 15th d»v of the month, and um nuh libbi could mean ” day of rest in th middle,” referring to the moon’s pause at the full. The frequent >ld Testament association of ” new moons and Sabbaths ” may poi t to an original observance of the 1st and 15th days of the rrion h. Many days are indicated in the calendar as nubattu, a term which signifies rest, pause, and especially a god’s connubial rest with his consort goddess. The observance of such days was a bar to attending even to important diplomatic business or setting out on a journey. Such nubattu days fell on the 3rd, 7th and 16th of the intercalary month of Elul, and were noted as the nubattu of Marduk and his consort. It would be precarious to assume that the same days in each month were nubattu, for the nubattu fell on the 4th of Iyar on one occasion.

6 Childers f , Pali Diet. p. 535 ; Kern, Manual of Buddhism, p. 99, Mahavagga, ii< 1, I (Eng. trans, i. 239, 291).

6 Both were days of cessation from business (Amos viii. 5) , and were fitting occasions to visit a prophet (2 Kings iv. 23). They naturally take their rise among an agricultural folk. On abstinence from work on the New Moon by Jewish women of the present time, see M. Friedmann, Jew. Quart. Rev. iii. (1891), p. 712. See also I. Benzinger, Encyc. Biblica, cols. 3401 sqq.

‘ The others— according to the Fihrist, 319, 14— are the 17th and the 28th; see Chwolsohn, Ssdbier, ii. 8, 94 seq.

8 It appears from Judith viii. 6 that even in later times there were two days at the new moon on which it was not proper to fast.

9 See further J. M. Meinhold, Sabbat und Woche im Alten Test. (Gottingen, 1905) ; Zeit. f. Altlest. Wissens. 1909, pp. 81ˆ112.

Possibly the intercalary month was abnormal, the incidence of observances depending not on the day of the month in ordinary months but on the day of the week reckoned consecutively through the year. For it is obvious that if each 7th day during the year was

observed as above, it would, like our Sunday or a Jewish Sabbath, fall on a different day of the month in different months. It is quite possible that shabattum and nubattum are from the same root and originally denoted much the same thing — a pause, abstention, from whatever cause or for ceremonial purposes. The intercalary month being purely arbitrary may exhibit a normal arrangement, supposing that the month and the week begin together.

There are traces of what may be called a ” five-day week,” but also some traces of a period of seven days. The former would be an exact submultiple of the 30-day month, but the exact relation of seven days to the month is not very clear. If the 15th always, was full moon day, the 7th would coincide well with half moon, but the 2 1 st and 28th would fall away considerably from the moon’s phases. The significance of seven throughout Babylonian literature is very marked, and most of the material has been collected by J. Hehn, Siebenzahl und Sabbat (1907). It is quite consistent with the evidence to suppose that a seven-day week was in use in Babylonia, but each item may be explained differently, and a definite proof does not exist. The enormous number of dated documents has induced some scholars to attempt a statistical research into the observance of the 7th, 14th, 2 1 st, 28th and 19th days of the months as Sabbaths. This has not been carried out with sufficient caution. If the Sabbath involved abstention from all such business as recorded in dated documents and always fell on these days, then the 7th, &c., should show a marked falling off in the number of dated documents. This appears actually to be the case in the period of the First Dynasty of Babylon and also in the 7th century in Assyria, where early Babylonian customs were kept up conservatively. In other cases the inclusion of documents relating to the temple business, payments of tithes and other dues, salaries to temple officials, and such ceremonies as marriages, &c, which may have demanded the presence of the congregation and were at least partly religious in nature, have been allowed to com- plicate the matter. Such business as did not profane the Sabbath according to Babylonian ideas cannot be quoted against their observance of their Sabbath. Further, if the Sabbaths fell on each 7th day through the year, any indication by dated documents of a falling off in the number of transactions on the 7th day of the month must obviously be completely disguised. As most of the records appealed to are from temple archives, it may be expected that the Sabbath days would show an increased number of records.

For reasons above indicated the whole subject is in its infancy. Even if it could be shown that the Pentateuchal regulations were universally observed in Israel from Mosaic times, it would not preclude a certain

indebtedness to Babylonia for at least the germ of the institution. On the other hand, complete indentity of regu- lations and observance in Babylonia and Israel at one period need not show more than development on the same lines. The evidence of Babylonian observance has not yet been exhaustively considered. Its most suggestive likenesses are indicated above, but further evidence may render the similarity less striking when the meaning of it is more fully understood. (C. H. W. J.)]

7. Sabbatical Year. — The Jews under the second temple observed every seventh year as a Sabbath according to the (post-exilic) law of Lev. xxv. 1-7. It was a year in which all agriculture was remitted, in which the fields lay unsown and the vines grew unpruned, only the spontaneous yield of the land might be gathered. That this law was not observed before the captivity we learn from Le”». xxvi. 34 seq. (cp. 2 Chron. xxxvi. 21); indeed, so long as the Hebrews were an agricultural people, in a land often ravaged by severe famines, the law of the Sabbatical year could not have been observed. Even in later times it was occasionally productive of great distress (1 Mac. vi. 49, 53; Jos. Ant. xiv. 16, 2). In the older legislation, however, we already meet with a seven years’ period in more than one connexion. The release of a Hebrew servant after six years’ labour (Exod. xxi. 2 seq.; Deut. xv. 12 seq.) has only a remote analogy to the Sabbatical year. But in Exod. xxiii. 10 seq. it is prescribed that the crop of every seventh year shall be left for the poor, and after them for the beasts. The difference between this and the later law is that the seventh year is riot called a Sabbath, and that there is no indication that all land was to lie fallow on the same year. In this form a law prescribing one year’s fallow in seven may have been anciently observed, but it scarcely originated from the analogy of a seventh day of rest. It is extended in v n to the vineyard and the olive oil, but here the culture necessary to keep the vines and olive trees in order is not forbidden; the precept is only that the produce is to be left to the poor. In Deuteronomy this law is not repeated,

but a fixed seven years’ period is ordained for the benefit of poor debtors, apparently in the sense that in the seventh year no interest is to be exacted by the creditor from a Hebrew, or that no proceedings are to be taken against the debtor in that year (Deut. xv. 1 seq.). See the discussion by Driver, Internat. Crit. Comm., ad. loc, and the commentaries on Neh. v. n.

Literature. — In addition to the references already made, seethe articles in Ency. Bib. and Hastings’ Diet. Bible (with references); Fr. Bohn, Sabbat im Allen Testament u. altjiidisch relig. Aberglauben

(Gutersloh, 1903: an interesting list of unlucky days from an old Egyptian calendar on p. 57 seq.); and for post-Biblical literature, F. Weber's Jiidische Theologie (Index), by Franz Delitzsch and Schnedermann (1897). (W. R. S.; S. A. C.)

SABBATION, or Sambatyon, a river (real or imaginary) in Media — named in some old authorities (Palestinian Talmud, and Midrash Gen. Rabba, lxxiii.) — the site of the exile of the Ten Tribes. But Josephus (War, vii. v. 1) has this curious passage, from which, no doubt, many of the subsequent legends were derived: —

" Now Titus Caesar tarried some time at Berytus (Beirut) and then removed thence and gave magnificent shows in all the cities of Syria through which he went, and exhibited the captive Jews as proof of the destruction of that nation. He saw on his march a river (identified by Sir C. W. Wilson with ' the stream running from the intermittent spring Fauwar ed-Deir in the Lebanon ') of such a nature as deserves to be recorded in history. It runs between Arcaea ('Arka), which is part of Agrippa's kingdom, and Rapharaea (Rafaniyeh, at north end of the Lebanon), and has something very wonderful and peculiar in it. For when it runs, its current is strong, and has plenty of water; after which its springs fail for six days together, and leave its channel dry, as any one may see. After this it runs on the seventh day as it did before, and as though it had undergone no change at all, and it has been observed to keep this order perpetually and exactly : whence they call it the Sabbatic river, so naming it from the sacred Sabbath of the Jews."

Whiston, in his notes to Josephus, already points out that Pliny describes the same river (Hist. Nat. xxxi. n), but accord- ing to his account the river ran for six days and rested on the seventh. This is the favourite form of the legend, for though there are intermittent streams in various parts of Asia, none has yet been found to correspond to the fixed regularity posited in the tradition. Various medieval travellers reported such rivers, e.g. Petahiah of Regensburg, who states that such a stream may be found near Jabneh, but his assertion is unfounded. Mahommedans still assert that Josephus's statement is true of the Nahr-al-Arus in the neighbourhood in which he locates his Sabbatic river, but modern travellers report that this stream runs every third day. Such facts would, however, be sufficient to explain the origin of the legend. The accounts of Josephus and Pliny do not assert that the intermittence of the current had any connexion with Saturday. Aqlba (q.v.) in the early part of the 2nd century a.d., however, assumes this connexion (Sanhedrin 65 b), and a confusion between the Sambatyon of the Lost Tribes and the

Sabbatical river of Syria begins to manifest itself. It is owing to the narrative of Eldad the Danite (q.v.) that the Sambatyon river rose into wide fame in the 9th century. His diary became the Arabian Nights not only of the Jews but also of many medieval Christians and Moslems. Eldad describes the Children of Moses, a powerful and Utopian race, whose territory is surrounded by a wonderful river. He describes it in these terms: —

" The river Sambatyon is 200 yds. broad, about as far as a bow- shot. It is full of sand and stones, but without water ; the stones make a great noise like the waves of the sea and a stormy wind, so that in the night the noise is heard at a distance of half a day's journey. There are sources of water which collect themselves in one pool, out of which they water the fields. There are fish in it, and all kinds of clean birds fly round it. And this river of stone and sand rolls during the six working days and rests on the Sabbath day. As soon as the Sabbath begins, fire surrounds the river, and the flames remain until the next evening, when the Sabbath ends."

Noldeke (Beitrage zur Geschichte des Alexanderrotnans, 48) has shown that the Sambatyon appears in one version of the Alexander Legend. Kaswini, the author of the Arab Cosmography, also refers to the Sambatyon. So does Prester John in his letter addressed to the emperor Frederick; in his account it is the violence of the current of sand and stone that prevents the Lost Tribes from reuniting. It is unnecessary to summarize

the various embellishments of the legend; in one version the river attains a width of 17 m. and throws stones as high as a house. But there are no stones on Saturday; it then resembles a lake of snow-white sand. Menasseh ben Israel (q.v.), who gave vogue to this latter story in his Hope of Israel, adds the detail that if sand from Sambatyon be kept in a bottle it agitates itself during six days but remains still on the Saturday.

The site of the Sambatyon varies considerably in the different narratives. Media, Ethiopia, Persia, India, the Caspian district, — all these are suggested. Reggio identified the river with the Euphrates, Fiinn with the Zeb in Adiabene. But as Neubauer remarks: " It would be lost time to trouble ourselves about the identification of this stream."

See Neubauer, ” Where are the Ten Tribes? ” in Jewish Quarterly Review, vol. i. passim; M. Seligsohn in Jewish Encyclopedia, x. 681.

(I. A.)

SABBIONETA, a town of Lombardy, Italy, in the province of Mantua, from which it is 20 m. S.W. by steam tramway, not far from the N. bank of the Po, 59 ft. above sea-level. Pop. (1901) 1835 (town); 7016 (commune). Its period of prosperity was under Vespasiano Gonzaga (d. 1591), who was its duke; by him it was transformed into a small ” Residenzstadt.” It was well fortified and built, and from this period date the ducal palace (now the Municipio), the theatre designed by Scomozzi, &c. The church and the summer palace contain frescoes by the Campi of Cremona. Here in 1567 a Hebrew printing-press was set up.

SABELLIC, 1 the name originally given by Mommsen in his Unteritalische Dialekte to the pre-Roman dialects of Central Italy which was neither Oscan nor Umbrian. The progress of study has, however, grouped them under more specific names, such as the ” North Oscan ” group (see Paeligni) and the ” Latinian ” group (see Latin Language), and the only content now left for the term SabeUic consists of a group of 8 or 9 inscrip- tions to which it certainly cannot be applied with truth. They are probably, if not .certainly, the most ancient inscriptions in existence on Italian soil. Since they were all found on a strip of the eastern coast running from the mouth of the Aternus on the south to Pesaro on the north, it is probably best to call them simply ” East Italic ” or ” Adriatic.”

Not even the transcription of their alphabet has reached the stage of certainty, for even in this small number of inscriptions the alphabet seems to vary. The chief doubt is about the value of V and V (or A and A) which appear beside the symbol A on the same inscriptions; and of the dots in the middle of the line which are certainly not interpuncts. They may conceivably have some connexion with the dots in Venetic inscriptions, which R. S. Conway has endeavoured to explain (see Veneti). The most striking characteristic of the group of inscriptions is that the direction of the writing in alternate lines is not merely reversed but inverted (” serpentine boustrophedon ” as on the Etruscan stele of Capua of the 5th century B.C.) (see Etruria: Language). Thus if the first line consisted of the letters ABC. in that order, the next would be J3Q, i.e. with each letter turned so as to face the left, and with its head downwards. This arrangement appears in some of the Venetic inscriptions also. The longest of the inscriptions is that from Grecchio, now preserved in the Naples Museum. The

probability is that this and all the rest were epitaphs, but a translation is as yet out of the question. The stone from Castrignano gives us (certain forms which seem to be recognizable as Indo-European, namely paterefo, materefo, though it is far from certain that the symbolˆ, which is here represented by/, really has that value. Pauli's conjecture that these inscriptions probably represented the language of some settlers from Illyria has little support except that of some coincidences in tribal and local names on the two sides of the Adriatic (e.g. " Truentum, quod solum Liburnorum in Italia relicuum est " (Plin. Nat. Hist. iii. no), -entum being a frequent Illyrian ending, and Liburni an Illyrian tribe), though it is a priori likely enough.

_ For the authorities for the alphabets and the text of the inscrip- tions as known down to 1897, see R. S. Conway's Italic Dialects

1 For the Sabellian tribes, see Sabine.

(Cambridge, 1897), ii. 528; and nothing has yet (1908) been added to what was written about the alphabets by Karl Pauli (Altiial. Stud. iii., "Die Veneter," Leipzig, 1891, pp. 220 seq. and p. 423). Some plausible (but wholly uncertain) conjectures by W. Deecke as to the meaning of some of the inscriptions may be sought in the appendix to Zvetaieff's Inscrr. Italiae inferioris dialecticae; and since 1897 a further inscription of this class has been found at Belmonte Piceno, which is preserved in the museum at Bologna and reported by Brizio in Notiz. degli scavi, 1903, p. 104.

It is to be noticed that a much longer and far more legible inscription from Novilara (now in the museum at Pesaro — a cast of it is at Bologna) sometimes spoken of as SabeUic, whose first two words are mimnis erut, is perhaps more probably to be regarded as containing some variety of Etruscan, though its character is far from certain. Its alphabet closely resembles Etruscan of the 4th century B.C. It is a very interesting monu- ment both for its own sake, since it is sculptured as well as inscribed (there is one — or more — hunting or pastoral scene on the back), and because the archaeological stratum (late Bronze period) of the cemetery from which it is believed to have come is clearly marked.

With a companion fragment it is fully described by Brizio in Monumenti anhchi, v. (1895), and it has also been discussed by Elia Lattes in Hermes (xxxi. 465 and xliii. 32). (R. S. C.)

SABELLIUS (fl. 230), early Christian presbyter and theologian, was of Libyan origin, and came from the Pentapolis to Rome early in the 3rd

century. To understand his position a brief review of the Christian thought of the time is necessary. Even after the elimination of Gnosticism the church remained without any uniform Christology; the Trinitarians and the Unitarians continued to confront each other, the latter at the beginning of the 3rd century still forming the large majority. These in turn split into two principal groups — the Adoptianists and the Modalists — the former holding Christ to be the man chosen of God, on whom the Holy Spirit rested in a quite unique sense, and who after toil and suffering, through His oneness of will with God, became divine, the latter maintaining Christ to be a manifestation of God Himself. Both groups had their scientific theologians who sought to vindicate their characteristic doctrines, the Adoptianist divines holding by the Aristotelian philosophy, and the Modalists by that of the Stoics; while the Trinitarians (Tertullian, Hippolytus, Origen, Novatian), on the other hand, appealed to Plato.

In Rome Modalism was the doctrine which prevailed from Victor to Calixtus or Callistus (c. 100-220). The bishops just named protected within the city the schools of Epigonus and Cleomenes, where it was taught that the Son is identical with the Father. But the presbyter Hippolytus was successful in convincing the leaders of that church that the Modalistic doctrine taken in its strictness was contrary to Scripture. Calixtus saw himself under the necessity of abandoning his friends and setting up a mediating formula designed to harmonize the Trinitarian and the Modalistic positions. But, while excommunicating the strict Unitarians (Monarchians), he also took the same course with Hippolytus and his followers, declaring their teaching to be ditheism. The mediation formula, however, proposed by Calixtus became the bridge by which, in the course of the decades immediately following, the doctrine of the Trinity made its way into the Roman Church. In the year 250, when the Roman presbyter Novatian wrote his book De Trinitate, the doctrine of Hippolytus, once discredited as ditheism, had already becomo official there. At the same time Rome and most of the other churches of the West still retained a certain leaning towards Modalistic monarchianism. This appears, on the one hand, in the use of expressions having a Modalistic ring about them — see especially the poems of Commodian, written about the time of Valerian — and, on the other hand, in the rejection of the doctrine that the Son is subordinate to the Father and is a creature (witness the controversy between Dionysius of Alexandria and Dionysius of Rome), as well as in the readiness of the West to accept the formula of Athanasius, that the Father and the Son are one and the same in substance (dfwobcnoi).

The strict Modalists, whom Calixtus had excommunicated along with

their most zealous opponent Hippolytus, were led

by Sabellius. His party continued to subsist in Rome for a considerable time afterwards, 1 ‘ and withstood Oalixtus as an unscrupulous apostate. In the West, however, the influence of Sabellius seems never to have been important; in the. East, on the other hand, after the middle of the 3rd century his doctrine found much acceptance, first in the Pentapolis and afterwards in other provinces. 2 It was violently controverted by the bishops, notably by Dionysius of Alexandria, and the develop- ment in the East of the philosophical doctrine of the Trinity after Origen (from 260 to 320) was very powerfully influenced by the opposition to Sabellianism. Thus, fbr example, at the great synod held in Antioch in 268 the word ifwov&ios was rejected, as seeming to favour Unitarianism. The Sabelliah doctrine itself, however, during the decades above mentioned underwent many changes in the East and received a philosophical dress. In the 4th century this and the allied doctrine of Marcellus of Ancyra were frequently confounded, so that it is exceedingly difficult to arrive at a clear account of it in its genuine form. Sabellianism, in fact, became a collective name for all those Unitarian doctrines in which the divine nature of Christ was acknowledged. The teaching of Sabellius himself was very closely allied to the older Modalism (” Patripassianism “■) of Noetus and Praxeas, but was distinguished from it by its more careful theological elaboration and by the account it took of the Holy Spirit. His central proposition was to the effect that Father, Son and Holy Spirit are the same person, three names thus being attached to one and the same being. What weighed most with Sabellius was the monotheistic interest.. The One Being was also named by him vlowaTUp— an expression purposely chosen to obviate ambiguity. To explain how one and the same being could have various forms of manifestation, he pointed to the tripartite nature of man (body, soul, spirit), and to the sun, which manifests itself as a heavenly body, as a source of light and also as a. source of warmth. He further maintained that God is not at one and the same time Father, Son and Spirit, but, on the contrary, has been active in three appar- ently consecutive manifestations or energies — first in the izpocrunrov of the Father as Creator and Lawgiver, then in the itpbaomav of the Son as Redeemer, and lastly in the -KpoaoˆKOV of the Spirit as the Giver of Life. It is by this doctrine of the succession of the irpbooywa that Sabellius is distinguished from the older Modalists. In particular it is significant, in conjunction with the reference to the Holy Spirit, that Sabellius

regards the Father also as merely a form of manifestation of the one God — in other words, has formally put Him in a position of complete equality with the other Persons. This view prepares the way for Augustine's doctrine of the Trinity. Sabellius himself appears to have made use of Stoical formulas (v\a.Tvve

The sources of our knowledge of_ Sabellianism are Hippolytus (Philos. bk. ix.), Epiphanius (Haer. lxii.) and Dionys. Alex. {Epp.) ; also various passages in Athanasius and the other fathers of the 4th century. For modern discussions of the subject see Schleiermacher (Theol. Ztschr. 1822, Hft. 3) ; Lange (Zlsckr. f. hist. Theol. 1832, ii. 2)?, Dollinger (Hippolyt u. Kallist. 1853), Zahn {Marcell v. Ancyra, 1867) ; R. L. Ottley, The Doctrine of the Incarnation (1896) ; various histories of Dogma, and Harnack (s.v. " Monarchianismus," in rierzqg- Hauck, Realencyk. fur prot. Theol. und Kirche, xiii. 303). (A. Ha.)

SABIANS. The Sabians (as-Sabi'un) who are first mentioned in the Koran (ii. 59, v. 73, xxii. 17) were a semi-Christian sect of Babylonia, the Elkesaites, closely resembling the Mandaeans or so-called " Christians of St John the Baptist," but not identical with them. Their name is probably derived from the. Aramaic »*, a dialectical form of jo*, and signifies " those who wash themselves "; the term al-mughtasila, which is sometimes applied to them by Arab writers, has the same meaning, and they were also known as iinepofiaimcrTai. How Mahomet understood the 1 In the 18th century there was discovered in one of the catacombs of Rome an inscription containing the words " qui et Filius diceris et Pater inveniris." This can only have come from a Sabellian. * Whether Sabellius himself ever visited the East is unknown.

term " Sabians " is uncertain, but he mentions them together with the Jews and Christians. The older Mahommedan theo- logians were agreed that they possessed a written revelation and were entitled accordingly to enjoy a toleration not granted to mere heathen. Curiously enough, the name " Sabian "was used by theMeccanidolaters to denote Mahomet himself andhis Moslem converts, apparently on account of the frequent ceremonial ablutions which formed a striking feature of the new religion.

From these true Sabians the pseudo-Sabians of IJarran (Carrhae) in Mesopotamia must be carefully distinguished. In a.d. 830 the Caliph Ma'mun, while marching against the Byzan- tines, received a deputation of the inhabitants of Harran. Astonished by the sight of their long hair and extraordinary costume, he inquired what religion they professed, and getting no satisfactory answer threatened to

exterminate them, unless by the time of his return from the war they should have embraced either Islam or one of the creeds tolerated in the Koran. Con- sequently, acting on the advice of a Mahbmmedan jurist, the Harranians declared themselves to be " Sabians," a name which shielded them from persecution in virtue of its Koranic authority and was so vague that it enabled them to maintain their ancient beliefs undisturbed. There is no doubt as to the general nature of the religious beliefs and practices which they sought to mask. Since the epoch of Alexander the Great Harran had been a famous centre of pagan and Hellenistic culture; its people were Syrian heathens, star-worshippers versed in astrology and magic. In their temples the planetary powers were propitiated by blood-offerings, and it is probable that human victims were occasionally sacrificed even as late as the 9th century of our era. The more enlightened Harranians, however, adopted a religious philosophy Strongly tinged with Neoplatonic and Christian elements. They produced a brilliant succession of eminent scholars and scientists who transmitted to the Moslems the results of Babylonian civilization and Greek learning, and their influence at the court of Baghdad secured more or less toleration for Sabianism, although in the reign of Harun al-Rashid the Harranians had already found it necessary to establish a fund by means of which the conscientious scruples of Moslem officials might be overcome. Accounts of these false Sabians reached the West through Maimonides, and then through Arabic sources, long before it was understood that the name in this application was only a disguise. Hence the utmost confusion prevailed in all European accounts of them till Chwolsohn published in 1856 his Ssabier und der Ssabismus, in which the authorities for the history and belief of the Harranians in the middle ages are collected and discussed.

See also " Nouveaux documents pour l'6tude de la religion des Harraniens," by Dozy and De Goeje, in the Actes of the sixth Oriental congress, ii. 281 f. (Leiden, 1885). (R. A. N.)

SABICU WOOD is the produce of a large leguminous tree, Lysiloma Sabicu, a native of Cuba. The wood has a rich maho- gany colour; it is exceedingly heavy, hard and durable, and therefore most valuable for shipbuilding. Sabicu, on account of its durability, was selected for the stairs of the Great Exhibition (London) of 1851, and, notwithstanding the enormous traffic which passed over them, the wood at the end was found to be little affected by wear.

SABINE, SIR EDWARD (1788-1883), English astronomer and geodesist, was born in Dublin on the 14th of October 1788, a scion of a family said to be of Italian origin. He was educated at the Royal

Military Academy, Woolwich, and obtained a commission in the royal artillery at the age of fifteen, attaining the rank of major-general in 1859. His only experience of warfare seems to have been at the siege of Fort Erie (Canada) in 18 14. In early life he devoted himself to astronomy and physical geo- graphy, and in consequence he was appointed astronomer to Various expeditions, among others that of Sir J. Ross (1818) in search of the North-West Passage, and that of Sir E. Parry soon afterwards. Later, he spent long periods on the inter-tropical coasts of Africa and America, and again among the snows of Spitzbergen. He was associated with Henry Williams Chisholm and others as a member of the Royal Commission of

ly

1 868-1869 for standardizing weights and measures. Sabine was for ten years (1861-1 871) president of the Royal Society, and was made K.C.B. in 1869. He died at East Sheen, Surrey, on the 26th of May 1883.

Of Sabine's scientific work two branches in particular deserve very high credit — his determination of the length of the second's pendulum, and his extensive researches connected with terrestrial magnetism. The establishment of a system of magnetic obser- vatories in various parts of British territory all over the globe was accomplished mainly on his representations; and a great part of his life was devoted to their direction, and to the reduc- tion and discussion of the observations. White; the majority of his researches bear on one or other of the. subjects just mentioned, others deal with such widely different topics as the birds of Green- land, ocean temperatures, the Gulf Stream, barometric measure- ment of heights, arcs of meridian, glacier transport of rocks, the volcanoes of the Hawaiian Islands, and various points of meteorology.

SABINI, an ancient tribe of Italy, which was more closely in touch with the Romans from the earliest recorded period than any other Italic people. They dwelt in the mountainous country east of the Tiber, and north of the districts inhabited by the Latins and the Aequians in the heart, of the Central Apennines. Their boundary, between the southern portion of the Umbrians on the north-west, and of the Picentines on the north-east, was probably not very closely determined. The traditions connect them closely with the beginning of

Rome, and with a large number of its early institutions, such as the worship of Jupiter, Mars and Quirinus, and the patrician form of marriage (confarreatio). . –

Of their language as distinct from that of the Latins no articulate memorial has survived, but we have a large number of single words attributed to them by Latin writers, among which such forms as (i) fircus, Lat. hircus; (2) ausum, Lat. aurum; (3) nouensiles, Lat. nouensides (" gods of the nine seats ") ; (4) the river name Farfarus, beside pure Lat. Fabaris (Servius, ad Aen. vii. 715); and (5) the traditional name of the Sabine king* Nutna Pompilius (contrasted with Lat. Quinctilius), indicate clearly certain peculiarities in Sabine phonology: namely, (1) the representation of the Indo-European palatal aspirate gh by / instead of Lat. h; (2) the retention of 5 between vowels; (3) the change of medial and initial d to /; (4) the retention of medial / which became in Latin b or d; and (5) the change oflnd.-Eur. q to p. Not less clear is the well attested tradition (e.g. Paul ex Fest. 327 M.) that the Sabines were the parent stock of the Samnites, and this is directly confirmed by the name which the Samnites apparently used for themselves, which, with a Latinized ending, would be Safini (see Samnites and the other articles there cited, dealing with the minor Samnite tribes).

It is one of the most important problems in ancient history to determine what was the ethnological relation of these tribes, whom we may call "Safine," to the people of Rome on the one hand, and the earlier stratum or strata of population in Italy on the other. Much light has been thrown on this group of questions in recent years both from linguistic and from archaeological sources. For the historical and archaeological evidence which connects the Sabines with the patricians of Rome, see Rome, Ancient History. The linguistic side of the matter may be conveniently dealt with here. From this point of view the question to be asked is what language did the Safines speak? Was it most nearly akin to Latin or toOscan or again toUmbrian and Volscian?

A single monument of 5th- or 4th-century Safine would be of unique value; but in the absence of any such direct evidence we are thrown back on a few cardinal facts: (1) Festus, though he continually cites the Lingua Osca never spoke of Lingua Sabina, but simply of Sabini, and the same is practically true of Varro, who never refers to the language of the Sabines as a living speech, though he does imply (v. 66 and 74) that the dialect used in the district differed somewhat from urban Latin. The speech therefore of the Sabines by Varro's time had become too Latinized to give us more than scanty indications of what

it had once been.

(2) The language of the Samnites was that which we now call Oscah (see OSCA Lingua) . (3) The evidence of the glosses and place-names already referred to confirms ‘ tradition by . the resemblance which they show to the phonological characteristics of Oscan. On the other hand there are two or three forms called Sabine by Latin writers which’ do appear to show the sound q unchanged, especially the name of the Sabine god Quirinus, which seems to be at least indirectly connected with the name of the Sabine town Cures. We do not, however, know that the initial sound of this word was originally a Velar q, and Professor Ridge- way (” Who were the Romans,” London, 1908, in Proceedings of the British Academy, iii. 19) rightly lays some stress on the fact that the name in Greek form is simply nvpivos (not Koipivos: whereas Lat. Quintus is regularly transcribed koLptos), and suggests that the initial sound may have been slightly modified so as to correspond with the pure Latin word quiritgs (spearmen). In one or two other examples of an apparent q in Safine names or glosses it is not difficult to show that the sound was originally a pure palatal followed by a suffixal;M’(e.g: tesqua, “desert places,” probably for Hers-c-ua, cf. paˆc T ua, and Greek repxrq-lveiv, Lat. terra, ” dry land,” from tersa\ so that they Would in fact offer no difficulty.

There is further an important piece of evidence which connects together all the Safine tribes’ and distinguishes them sharply, at least in the 5th and following centuries B.C., from the earlier strata of population in Italy. As this point arises in connexion with so many tribes it is desirable to offer the evidence for it here once for all. It rests upon the different character of the suffixes used by particular tribes and comfnuriities to form their ethnic name.

There are only six suffixes so used among the names of ancient Italy. 1 These suffixes are: ulo, io,co, rio,ti (or-ati-),ehsi.

1, The suffix m/o appears , only in a few old names, §ictdi, Rutuli, Appuli, Poediculi and *Vituli, which would have been the pure Latin form instead of Itali, which was taken over from the Grecized form

‘iTffXof. ‘

2. Excluding this small group, the frequency of the occurrence of these suffixes in ancient Italy is shown by the following table :

Table of Ethnic Suffixes in Ancient Italy. ‘

Dialectic Area.

IO.

CO.

NO.

TI. ■

ENSI.

Totals..

Messapii .

2

16

2

20

Peucetii

1

15

3

19

Daunii

1

8

3

2

14

Bruttii

2

11

2

4

19

Lucani

2

13

3

2

20

Hirpini

33

1

2

36′

Frentani

4

4

2

10 •

Samnites

1

(V)

5

4

3

X 3 ;

Campani .

.3

(1)

43

5

3

54

Aurunci

.

1

l(x)

2

1

5 .

Volsci

I

29

10

1

42

Hernici

1

I

3

2

6,

Marsi

1

3

4

i

9

Aequi

.-

6

2

9

Latini

4

I (2)

44

8

20

77”’.”

Early Rome .

2

19

6

..27., .

Sabini

!3

4

2

19

Etruria (including

the Falisci)

5

.. 2 .

34

9

20

7* >

Marrucini

1

(I)

2

1

• • ■/ ■

l,,^,.;

Paeligni .

. ,

5

2

7

Vestini . . .

8

4

, ‘ . 2 –

14

Piceni . .

(V) :

15

5

■ ■ 14

34

Umbri

Totals .

•-

23

35

15

73

27

7

354

106

107.

601 ,

(7)

The figures in brackets refer to the forms in CINO ; see below.

3. The names in to seemto have been evenly distributed over the Italian area and not to mark any particular tribe or epoch.

4. The suffix-ewst'-can be shown to have borne a political significance,

1 This statement with those which follow is based upjon, the collections of the place-names of ancient Italy, arranged according to their locality, by R. S. Conway in The Italic Dialects (Cambridge.

1897).

that is to say, it was used by the Romans to form the names of the inhabitants of municipal towns, as for instance Foro-iulienses, the inhabitants of Forum Julii. There remain, therefore, the three suffixes co, no, and U, and it will be seen from the table that the relative frequency of these suffixes in different dialect-areas varies very greatly. The suffix no, for example, has almost driven out any other in the district of the Hirpini, and it is greatly preponderant among the Campani, in the district of the Lucani, and among the Latini and Sabini themselves.

5. On the other hand, the co suffix, which is nowhere frequent, is practically confined to the central areas.

6. The U suffix is comparatively frequent in the Volscian district and very frequent in the Umbrian ; it is also fairly well represented in Latium and Etruria.

7. In the article Volsci it is shown that the addition of the no suffix is often a mark of the conquest of an original co folk by a Safine tribe. It is also fairly frequently added to names formed with the it suffix: Ardea gave first Ardeates and then Ardeatini; the Picentes became Picentini, the Camerles Camertini; of such forms there are no fewer than 54.

8. The addition of the ati suffix to the no ethnicon, as in Iguvinates, is comparatively rare, and no doubt denotes the opposite process, namely, the absorption of a no tribe by a population to whom it was natural to use the suffix li. The two opposite pro- cesses confirm the inference that both are due to some change of race, not merely to a change of custom in the same population in a later age; for in that case the change would have been in one direction only.

The assumption of the Safine origin of the no suffix is further confirmed by the practice of the Romans themselves. The folk of Latium after the Safine conquest were no longer Latiares but Latini; and over against the old name Quiritis was the new Populus Romanus. Just the same rough and ready nomen- clature was applied to communities conquered on foreign soil; the SirapridTcu became Spartani, the XvpaxSouK Syracusani, and the ‘Atrtaruoi Asiani, and so on.

The assumption that Latin was properly the language of the Latian plain and of the Plebs at Rome, which the conquering patrician nobles learnt from their subjects, and substituted for their own kindred but different Safine idiom, renders easier to understand the borrowing of a number of words into Latin from some dialect (presumably Sabine) where the velars had been labialized; for example, the very common word bos, which in pure Latin should have been *vos. And in general it may be stated that the hypothesis of such an intermixture of forms from neigh- bouring dialects has been rendered in recent years far more credible by the striking evidence of such continual intermixture going on within quite modern periods of time afforded by the Atlas linguistique de la France, even in the portion which has already been published.

The conclusion, therefore, to which the evidence appears to lead us is that in, say, the 7th century, B.C., the Safines spoke a language not differing in any important particulars from that of the Samnites, generally known as Oscan; and that when this warlike tribe combined with the people of the Latian plain to found or fortify or enlarge the city of Rome, and at the end of the 6th century to drive out from it the Etruscans, who had in that century become its masters, they imposed upon the new com- munity many of their own usages, especially within the sphere of politics, but in the end adopted the language of Latium henceforth known as lingua Latina, just as the Normans adopted the language of the conquered English.

The glosses and place-names of the ancient Sabine district are collected by R. S. Conway, the Italic Dialects (Cambridge, 1897), p. 351. For the history of the Sabine district see Mommsen, C.I.L. ix. p. 396; and Beloch, ” Der italische Bund unter romischer Hegemonie ” (Leipzig, 1880) and ” La Conquista Romana della regione Sabina,” in the Rivista di storia antica (1905), ix. p. 269.

(R. S. C.)

SABINIANUS, pope from 604 to 606, successor of St Gregory the Great. He incurred unpopularity by his unseasonable economies. The erudite Italian Augustinian Onofrio Panvinio (1529-1568) in his Epitome pontificum Romanorum (Venice, 1557) attributes to this pope the introduction of the custom of ringing bells at the canonical hours and for the celebration of the eucharist.

SABLE, the name of a small quadruped, closely akin to the martens, and known by the zoological name of M us tela zibellina. It is a native of Siberia and famous for its fur. The name

appears to be Slavonic in origin, cf. Russian sobol, whence it has been adapted into various languages, cf. Ger. Zobel, Dutch Sabel; the Mod. Fr. zibelline and Med.Lat. zibellina derive from the Ital. form. The Eng. and Med. Lat. sabellum are from the O. Fr. sable or saible (see Marten and Fur). ” Sable ” in English is a rhetorical or poetical synonym for ” black.” This comes from the usage in heraldry (first in French) for the colour equivalent to black, represented conventionally by a cross- hatching of vertical and horizontal lines. It has usually been assumed that this is an extension of the name of the fur, but sable fur is brown.

SABL& MADELEINE DE SOUVB.fi, Marquise de (1599- 1678) French writer, was born in 1599, the daughter of Gilles de Souvre, marquis de Courtenvaux, tutor of Louis XIII., and marshal of France. In 16 14 she married Philippe Emmanuel de Laval, marquis de Sable, who died in 1640, leaving her in somewhat straitened circumstances. With her friend the comtesse de St Maur she took rooms in the Place Royale, Paris, and established a literary salon. Here originated that class of literature of which the Maximes of La Rochefoucauld are the best-known example. The Maximes of the marquise de Sable were in fact composed before those of La Rochefoucauld, though not published till after her death. In 1655 she retired, with the comtesse de St Maur, to the Convent of Port Royal des Champs, near Marly, removing in 1661, when that establish- ment was closed, to Auteuil. In 1669 she took up her residence in the Port Royal convent in Paris, where she died on the 16th of January 1678.

SABLE, a town of western France, in the department of Sarthe, on the river Sarthe, 30 m. W.S.W. of Le Mans by rail. Pop. (1906) 4952. Sable has a chateau of the 18th century, a fortified gateway, relic of a medieval stronghold, and a modern church with fine stained glass of the early 1 5th century. Its importance, however, is chiefly due to the marble quarries of the vicinity, the products of which are worked in the town, where flour-milling, the manufacture of farm-implements and trade in cattle are also carried on. A communal college is among the public institutions. From the nth century Sable was the seat of a powerful barony, which in 1602 was made a duchy-peerage in favour of Urbain de Laval, marshal of France. The place afterwards came into the possession of Colbert de Torcy, nephew of the great Colbert who built the chateau. In 1488 a treaty which resulted in the union of France and Brittany was concluded at Sable, between Charles VIII. and Duke Francis II. ‘

SABLE ANTELOPE, the English name for a large and hand- some South African antelope (Hippotragus niger), exhibiting the rare feature

of blackness or dark colour in both sexes/ The sable and the roan antelope (H. equinus) belong to a genus nearly related to the oryxes, with which they form a group or sub- family. In all these antelopes long cylindrical horns are present in both sexes; the muzzle is hairy; there is no gland below the eye; the tail is long and tufted; and in the breadth of their tall crowns the upper molar-teeth resemble those of the oxen. The sable and roan antelopes are distinguished from Oryx by the stout and thickly ringed horns rising vertically from a ridge over the eyes at an obtuse angle to the plane of the lower part of the face, and then sweeping backwards in a bold curve. Sable antelope are among the handsomest of South African antelopes, and are endowed with great speed and staying power. They are commonly met with in herds including from ten to twenty individuals, but on rare occasions as many as fifty have been seen together. Forest-clad highlands are their favourite resorts. The roan antelope is a larger animal, with shorter horns, whose general colour in both sexes is strawberry-roan. It is typically a South African species, but is represented by a local race in the eastern Sudan (H. equinus bakeri) distinguished by its redder colour and different face-makings.

SABLE ISLAND, an island of Nova Scotia, Canada, no m. S.E. of Cape Canso, in 43° 56′ N. and 60° W. It is composed of shifting sand, and is about 20 m. in length by 1 m. in breadth, rising in places to a height of 85 ft. In the interior is a lake about 10 m. in length. At either end dangerous sandbars run out

about 17 m. into the ocean. It has long been known as ” the graveyard of the Atlantic “; over 200 known wrecks have been catalogued, and those unrecorded are believed greatly to exceed this number. The coast is without a harbour and liable to fogs and storms; irregular ocean currents of great strength sweep round it, and its colour makes it indistinguishable until close at hand. Since 1873 an efficient lighthouse system and life-saving station has been maintained by the Canadian government, and the danger has been much lessened. Since 1904 it has been connected with the mainland by wireless telegraphy. The island is constantly changing in shape, owing to the action on the sand of wind and wave, and tends to diminish in size. Since 1763, when taken over by Britain, it has shrunk from 40 m. in length to 20, from 2§ in breadth to 1, and from 200 ft. in height to 85; since 1873 the western lighthouse has thrice been removed eastward. As this makes navigation still more dangerous, the Canadian government has

planted thousands of trees and quantities of root-binding grass, and the work of destruction has been somewhat stayed. Wild fruits grow plentifully during the summer, and cranberries are exported. Wild ducks, gulls, and other birds nest in large numbers, and a native breed of ponies has long flourished.

Sable Island, estimated as being then over 100 m. in length, was known to the early navigators under the name of Santa Cruz. Early in the 16th century horses were left on its shores by the Portuguese, and the native ponies, supposed to be their descendants, are still exported. In 1598 a band of convicts were left by the marquis de la Roche, but in 1603 the survivors were restored to France.

See Rev. Geo Patterson in Transactions of Royal Society of Canada (1894 and 1897).

SABRE-FENCING, the art of attack and defence with the sabre, or broad-sword. Besides the heavy German basket- sabre and the Schlager (see below) there are two varieties of sabre used for fencing, the military sword and the so-called light sabre. These are nearly identical in shape, being composed of a slightly curved blade about 34 in. in length and a handle furnished with a guard to protect the hand; but the military sword, or broad-sword proper, the blade of which is about f in. wide near the guard, tapering to § in. near the point, is consider- ably heavier than the light sabre and is generally preferred by military instructors, being almost identical with the regulation army sabre in size and weight. Until 1900 it was the common fencing sabre in Great Britain, the United States, and most European countries, although its use was practically confined to military circles. About 1900 the light Italian sabre was intro- duced and became the recognized cut-and-thrust weapon among fencers throughout the world. In Austria-Hungary it became popular as early as 1885, while in Italy, the country of its origin, it has been in use since the middle of the 19th century. Its blade is about W in. wide a little below the guard, tapering to y T in. just under the point. For practice this is truncated and the edge blunt, but in scoring both edge and point are assumed to be sharp, while in countries on the continent of Europe (though not in Great Britain or the United States) the back-edge (false-edge) is also supposed to be sharpened for some 8 in. from the point. In Italy when used for duelling the point and both edges are actually sharpened.

The modern sabre is a descendant of the curved light cavalry sword of the late 18th century, which was introduced into Europe from the Orient by the Hungarians.

The old-time European swords used for cutting were nearly all straight, like the Ital. schiavona and spadroon, the English and German two-handers and the Scotch claymore (see Sword). There was indeed a heavy curved fencing weapon called dussack, very popular in the German fencing schools of the 16th and 17th centuries, which was of wood, very broad and as long as the fencer's arm, with an elliptical hole for the hand in place of a guard. But the dussack was introduced from Bohemia, where, as in Hungary, swords were oriental in shape, and as it com- pletely disappeared in the last half of the 17th century it can hardly be considered in any way as the ancestor of the modern

sabre. The old English back-sword, the traditional English weapon, though the curved form was not quite unknown, was almost invariably straight. The ancient English sword-and- buckler play (see Fencing) was, to the disgust of its devotees, driven out as a method of serious combat by the introduction at the beginning of the Elizabethan era of the Italian thrusting rapier. Nevertheless it survived as a sport up to the first half of the 1 8th century, being practised, together with the back- sword or broad-sword play, cudgelling or single-stick fencing, foiling and boxing, by the fencing masters of that period, whose exhibitions, given for the most part in the popular bear-gardens, were described by Pepys, Steele and others. The masters who figured in these " stage-fights " were called " prize-fighters "; and at that period they regarded boxing only as an unimportant part of their art. The most famous of them was Figg, the " Atlas of the Sword " (see Fencing). The back-sword of Figg's time was essentially the military sword then in use, having a single straight edge. The blows were aimed at the head, body or legs. Towards the close of the 18th century sticks began to be used for back-swording, the play at first being aimed at any part of the person; but the head soon came to be the sole object of attack, blows on the body and arms being used only to gain an opening. The usual defence was from a high hanging guard. No lunging was allowed. Fencing with the broad-sword did not, however, at any period entirely disappear in England, and was taught by all the regular masters, especially by the celebrated Angelo. The earlier play, of the time of Figg and later, was simple and safe. The prevailing defensive position was the hanging guard, high or medium, with the arm extended and the point downwards. There were also high inside and outside, tierce, quarte, low prime, seconde, and the head or "St George," parries; the last, a guard with the blade nearly horizontal above the head, being the supposed position of England's patron saint from which he dealt his fatal blow at the dragon. Owing to the great weight of the old back- sword wristplay was almost impossible, the cuts being delivered with a chopping stroke. Later in the 18th century

a nimbler style, called the Austrian, came into fashion, owing to the introduction of a lighter, curved sabre, the principal guards being the medium, with extended hand and sword held perpen- dicularly with the point up; the hanging, with the point down, both outside and inside; the half-circle; the “St George”; and the spadroon, with horizontal arm and sword pointing downwards. The spadroon (Ital. spadrone), a light, straight, flat-bladed and two-edged sword, was also a popular 18th-century weapon, and was used both for cutting and thrusting. The thrusting attacks and parries were generally similar to those of the small-sword (see Foil-Fencing), but few or no ‘circular parries were used. The cuts were like those of the broad-sword. The Germans, like the British, were once masters of the edge in fencing, but the art declined with the introduction of the point, and sabre-playing survived only in the army and in academic circles with the heavy basket-sabre (see below).

The school of sabre still taught in most armies, and up to the end of the 19th century by fencing-masters of all countries except Italy and Austria-Hungary, shows little advance from that in vogue in Angelo’s time. Two fundamental guards are usual, one (taught at the French army school at Joinville-le-Pont) corresponding to the guard of tierce in foil-fencing, except that the left forearm rests in the small of the back; and the other a high hanging guard, with crooked arm and the point of the sabre directed slightly forwards. The methods of coming on guard differ considerably, but have nothing to do with fencing proper. In 1896 the Florentine (Radaelli) system of sabre was introduced into the British army, the cavaliere F. Masiello spending some time at Aldershot for the purpose of training the army sword-masters; but since the year 1901 regular instruction in swords-manship has practically been abandoned.

Fencing on horseback for cavalry is simple in comparison with light sabre-play. The cavalry sword is of two patterns, one the heavy, straight cuirassier’s sword, and the other somewhat lighter with a slightly curved blade. On the attack straight

point thrusts, and wide sweeping cuts are used. The three principal parries are the “head” (or “high prime”) with horizontally held blade; the ”; tierce,” on the right, parrying cuts at the left side of the head and body; and the ” quarte,” on the opposite side. ‘•-■,,■■.

The modern style of fencing with the light sabre was perfected in Italy during the last quarter of the 19th century, the most important pioneer in its development having been G. Radaelli, a Milanese master, who became chief instructor of the sabre in the Royal Italian Military Fencing Academy in 1874, when it was transferred to Milan from Parma. Radaelli's system was described by F. Masiello, an army officer whose works remain the chief authority on the light sabre. An old-time rivalry between the Neapolitan and the northern Italian fencing methods came to a crisis when M. Parise, an expert of the southern school, secured first place for foil-fencing in a tournament instituted by the military authorities, the result being the transfer of the Military Fencing Academy to Rome under the title of Scuola Magistrate di Roma. There was, however, less difference between the two schools in sabre than in foil play, and the Radaelli system for the former was so generally esteemed that a master of that method was established at the Roman Academy.

The light fencing-sabre is made up of two principal parts, the blade and the handle. The blade, from 33ˆ to 34 in. long and slightly and gradually curved from hilt to point (which is truncated), has the tongue, or tang, which runs through the handle; the heel, or thick uppermost part of the blade fitting on to the guard; the edge, running from heel to point; the back-edge or false-edge (sometimes not allowed), running from the point along the back for about 8 in.; and the back, running from point to heel (unless there is a back-edge). - The blade is fluted on both sides from the heel where the back-edge begins! The handle consists of the guard, of thin metal, extending from the pummel to the heel of the blade* to protect the hand; the grip (of wood, fish-skin, or leather, often bacjced-with metal) , shaped to fit the hand, through which the tongue of the blade passes; and the pummel, or knob – , a button which finishes off the handle and holds the tongue in place.

The recognition of the light fencing-sabre as a practice weapon only, related to the heavier military sword as the foil is to the duelling-sword, at once makes apparent the difference between the play of the two cut- and thrust-weapons. As a light cut with the military sabre will be of little advantage in battle, however prettily delivered, it is evident that in 'order to produce a shock of impact sufficient to put an adversary out of action, a wide sweeping movement with the sword (moulinet; Ital. molinelli) is necessary. With the fencing-sabre a hit is a hit if properly delivered with the edge or point, however light it may be: For hits of this kind less force is necessary, and wide moulinets are not only useless but dangerous, since in making them the point must for a moment be directed away from the opponent, and momentary

openings are thus left of which the opponent may take advantage by attacks on the preparation. For this reason the cuts of the Radaelli school are delivered with moulinets of very narrow radius, made as r muchas possible: by a movement of the elbow only, keeping the point directed menacingly towards the opponent. Again, whereas in battle a wound on any part of the person may be effective and the school of the heavy sabre has to reckon with this fact, in fencing with the light sabre no hit lower than the hips counts, although hits upon any part of the person above the hips are good; in England duts cm the outside of the thigh are allowed. This' somewhat narrows the scope of the fencing-sabre, just as the scope of the foil is narrower than that of the duelling-sword. ■■■■.,-,■■

The military sword is, on account of its weighty usually held firmly in the hand with the thumb overlapping the fingers; but i in holding the light sabre the thumb is placed on the flat of the grip, giving a perfect command over the 'movements of the blade, called by the Italians pasteggio. Both attacks and parries are executed as narrowly as possible, avoiding the wide move- ments common in heavy sabre-play, and the moulinets (which are -ellipses described by the point as it is drawn back for a cut)

are made, not by swinging the sword round the head, but by drawing back the handheld in front of the body, and with the point directed forward. The thrust's with the light sabre are made with the thumb to the left; whereas in the French school it is turned down, so that the blade curves upward. The modefh school allows no such parries as the "St George," in executing Which the blade is held at right angles to the body, but teaches that the point should always be directed towards the adversary as much as possible. The attacks are either " simple," ■ " com- plex " or " secondary," and bear a general resemblance to those in foil-fencing (

Terms used in Sabre- Fencing. — " Absence of the blade ": a guard so wide as apparently to leave the body uncovered, so as to entice the adversary to attack. " Appuntata " (Fr. remise): a supple- mentary cut or thrust after the failure of an; attack, when the ad- versary replies slowly or with a feint. " Assault " (Ital. assalto), a regular bout. " Attacks on the blade " (see below under " beat," " disarmament," " graze " and " press "). " Beat " (Ital: baituta): a hard dry stroke on the adversary's blade, in order to drive it aside and push home an attack; a " re-beat " is made by beating lightly on one side, then dropping the point quickly under the adversary's blade and beating violently on the other side. Cavazione (see below under " disengage "). " Completion "_ (see below under riposte). " Controtempo ' : to parry an attack in such

a manner that the adversary is hit at the same time. ” Deceive the blade ” : when the adversary attempts an ” attack on the blade ” to avoid contact by a narrow circular movement of the point and hand ; this is gener- ally followed by a straight thrust or cut, as the forcˆ ©f his blow Will carry his blade, wide and leave an opening. ” Development ” (attacks on the) : attacks made while the adversary is making a complex attack, i.e. one consisting of at least two movements (feint and rear attack). Deviamento (see below under ” press “). ” Disarmament ” (Ital. sforzo) : striking the adversary’s weapon from his hand by means of a sweeping stroke along his blade from the point downwards. . ” Disengage ” (Ital. cavazione) : being on guard (engaged) in one line, to draw one’s point under the adversary’s sword and lunge on the other side: to avoid a cut by retiring the right foot behind the left; a time-cut at the adversary’s arm is usually made at the same time. ” Graze ” (Ital. fito) : to run one’s blade along that of the-adversary and push home the attack suddenly. ” Invitation guard ” : a guard in any line with the blade intention- ally so Wide that the adversary lunges into the apparent opening, only to meet a prepared counter. Incontro (Ital. for double-hit): both fencers attacking at the same instant. ” Lines ” (of engage- ment) : the four quarters into which the trunk is divided, attacks and parries opposite them being called after them. These are, with the hand held in ” supination ” (thumb on top of sabre-grip): upper right, “sixte”; upper left hand, “quarte”; lower right ” octave ” (not used in sabre); lower left ” half - circle .”. (not used in sabre). When the hand is held in “pronation ” (thumb down) the lines are: upper right, “tierce’ ; upper left, “prime”; lower right, ” seconde ” ; lower left, “low prime” (” secori’de ” generally used). Quinte and septime are also lines of the Italian school. ” Lunge “: the advance of the body by stepping forward with the right foot in order to deliver a cut or thrust. ” Opposition ” ; pressing the hand and blade in attack towards the side the adversary’s blade is on; the object being to occupy his blade and cover orie’s person from a ” riposte.” ” Press”: forcing the adversary’s blade aside by a sudden push in order to create an opening for aji attack, either directly or on the same side after he has recovered his blade and parried too wide on his supposed threatened side. ” Preparation ” (attacks on the) : mostly made by ” deceiving ” when the’ adversary attempts a beat, graze or press. “Re-beat ‘ (see ” beat “): ” Re- mise ” (see “appuntata”). “Riposte”: a quick cut or thrust made after parrying an attack, without lunging. ˆWhen the riposte in its turn is parried and replied to with another riposte, the French call this second riposte the tac-au-tac. Sftirzo (see ” disarmament “). Scandaglio: studying an opponent’s style at the beginning of a bout. ” Stop-thrust “; a direct thrust made as the adversary begins a complex attack, i.e. one of more

than one movement. The stpp- thrust must get home palpably before the adversary's attack or the attack' alone is counted, the rule of scoring being that he who is attacked must take the parry. " Time-cut ■": a quick slash at the adversary's arm as he begins a complex attack. Toccatol: Ital. for " hit! " Touchel: French for "hit!"

Manchette-Fencing (Fr. mancUette, a cuff) is a variety of sabred play popular in Germany, in which the fencers stand at such &

distance from each other that only hand and fore-arm can be reached with the last few inches of the sword nearest the point, both edges being supposed to be sharp. No thrusts are allowed, and both feet must remain stationary where they are planted when the bout begins. Narrow parries are necessary, though many cuts are avoided by withdrawing the hand. Manchette- f ending is not considered good practice for the light sabre and is therefore losing ground.

The German Basket-Sabre (Krummer Sabel, or Krummstibel) is a descendant of the heavy cavalry sabre once in use in some branches of the German horse. It is now used almost exclusively by students. It has a strongly curved blade about 32. in. long and 1 in. broad, tapering slightly towards the end, which is truncated, no thrusts being allowed. The hand.is protected by a large guard of heavy steel basket-work, and the handle is shaped to fit the hand, the forefinger being run through a leathern loop. On account of the great weight of the weapon- (about 2J lb, more than half of which is in the guard) blows delivered with a full swing are impracticable, and all cuts are made from the elbow and wrist, the hand being generally kept as high as possible. The Mensur is the distance at which the combatants stand from one another. There are three recognized distances, that in general use being the middle, from which two sabres can be crossed at about 15 in. from, the points. Neither combatant may move his left foot (the right in the case of a left-handed fencer) from the position in which it is placed at the beginning of the bout, all advances and retreats being made by the movements of the right foot and the body. The position of the engagement is in high tierce, the arm being held straight out towards the adversary. The feet are planted about 24 in. apart, the right in advance. The right shoulder is bent forward and the stomach drawn back, imparting a slight stoop to the fencer. There are eight cuts and as many parries. The basket-sabre is used in the more serious students' duels; the neck, wrist, armpits and body below the

nipples being heavily bandaged.

Rapier-fencing among the students of the German universities and technical high-schools of Germany, Austria, Switzerland and Russia may be considered under the sabre, as the rapier, although originally used for thrusting as well as cutting, is now employed by students only to cut. According to the association of German fencing-masters the modern weapon when blunt and used only for practice is called Rapier or Haurapier, but when sharpened for duelling, ScUdger (striker) . It is derived from the long straight sword of the German Reiters, or light cavalry, who were famous in the 1 6th century and later. Its use, however, was only occasional before the middle of the 19th century, when it gradually took the place of the dangerous, Pariser, or long French small-sword, for the semi-serious duels (Mensuren) of the students. There are two varieties of rapier, each having a thin flat blade about 335 in. long and y\ in. wide and truncated at the point, but distinguished by the shape of the handle. The bell-rapier {Glockenrapier) , used c-nly at the north German universities of Leipzig, Berlin, Halle, Breslau, Konigs- berg and Greifswald, is furnished with a guard consisting of a cup or bell of iron about 41 in. in diameter and 2 in. deep, joined to the pummel by a steel shaft protecting the hand. Its total weight is about if lb. The basket-rapier (Korbrapier), used at all universities except. those named above, has a handle protected by a sort of basket of heavy steel wire. Its total weight is 2 lb. The balance is just below the guard. The blade of the rapier is divided conventionally into the forte, the half next the hilt, and the foible. These ar$ again divided into . full and- half forte and fuJl and half foible, the half foible being the weakest quarter of tˆe blade, nearest the point. Every bcut, whether with sharp or blunt weapons, is preceded, by the command Auf die Mensur 1 (on the mark, literally distance). The two fencers take position with feet apart and the right slightly in advance just fai enough from one another to. allow their heads to be reached by the sword without moving the feet, which remain firm during the entire bout. During the first half of the 10th century the objective points of the rapier included the upper arm and breast; but later the head, including the face, became

the sole target. In practice a heavy mask of wire with felt top, a glove with padded arm-piece (Stulp) and a padded apron to protect body and- legs are worn. There ia one defensive position, which is with the arm stretched upward bringing the hand and hilt about 6 in. in front of and above the i forehead, and the point of the rapier directed diagonally downward across the body arid to the outside of the adversary’s knees. “The fencers having at the ‘ command Bindet die” Klingert! (Jbin blades!) placed their hilts together with the points of

the rapiers directed upwards, attack simultaneously at the com- mand Los! (Go!). All blows are delivered" from the wrist, slightly helped by the forearm, the hand never being dropped below the level of the eyes. No movement of the head dr body is allowed except such as is unavoidably connected with that of the sword-arm.

Bibliography. — For the light sabre see La Scherma italiaiia'di spada e'di sciabola, by Ferdinando Masiello (Florence, 1887); Infantry Sword Exercise (British War Office,. London, ,1896), prac-: tically the system of Masiello; Istruzione per.la scherma, &c,„ by S, de Frate (Milan, 1885); La Scherma per la sciabola, byL..Barbasetti (Vienna, 1898); a German translation of the foregoing, Das Sabel- fechten (Vienna, 1899) ; Die Fechtkunst, by Gustav Hergsell (Vienna, 1892). For the old-style sabre see Cold Steel, by Alfred Huttori (London, 1889); Broadsword and Singlestick, by R. G- Al'anson Winn and C. Phillips Wolley, " All England " series (London, 1898); Foiland Sabre, by L. Roiidelle (Boston, 1892), an exposition of the French military system. For sabre-fencing for cavalry see The Cavalry Swordsman, by Alfred Hutton (London, 1867) ; L'Escrime du sabre & cheval, by A. Alessandri and £mile Andre (Paris, 1895). For German basket-sabre and schlager, Die deutsche Hiebfechtschule filr Korb- und Glockenrapier (Leipzig, 1887), published by the associa- tion of German academic fencing-masters; L'Escrime dans les universites allemandes, &o; by L. C. Roux (Paris, 1885), a French exposition of the German student fencing. (F,. B.)

SABZAWAR, a town of Afghanistan, situated at an elevation of 3550 ft. on the left bank of the river Harud, 93 m. S. of Herat. Sabzawar was once a city of considerable size, and still possesses a fortress with sides of about 200 or 250 yds. This fortress: has been abandoned, and the town, which is the centre of a group of villages; is now fairly prosperous, with a bazaar of about 800 shops a.nd a busy traffic with Seistan. The plains about Sabzawar are highly cultivated by the Nurzai \ Durariis, and each village boasts its own little mud fort. «

SABZEVAR, a district of the province of Khorasari in Persia, formerly called Baihak. • It is situated between Nishapur oh the east and Shahrud-Bostam on the west, and has a length of about 80 m. and a breadth of 50; its population is about 6o,ooc

Sabzevar, the capital of the district, is situated 150 m. E. of Shahrud and 65 m. W. of Nishapur, in 36 12′ N., 57° 39′ E., at an elevation' of 3100 ft. The population, which was 30,000 before the famine in 1871, is now about 15,000. There are some good caravanserais, a well-supplied bazaar, three colleges-, two large and thirty small mosques,

and post and telegraph offices. ”’.”’”•”””.

SACCHARIC ACID, C 6 H, O 8 or H0 2 C[CH:OH] 4 CO^^ in chemistry, a tetraoxydicarboxylic acid which exists in three stereoisomers: forms. The ordinary or dextrp (d)-sacqharicacid is formed in the oxidation of cane sugar, grape sugar, ^-gluconic acid and many other carbohydrates with nitric acid. It forms a, deliquescent mass. On standing, , the syrupy acid gives the crystalline lactonic acid, CeHgQ?. Sodium amalgam reduces it to glucuronic acid, GsHioO? or OHC[CH-0HliCQ 2 H, Whilst hydriodicacid reduces it to adipiq acid, H02C[CH2]4C0 2 H, Nitric acid oxidizes it to dextrortartaric acid and oxalic acid, L’aeyo (l)r saccharic acid is formed by oxidizing ^-gluconic acid- with nitric acid, whilst the inactive (i + Q-acid is obtained similarly from inactive gluconic acid, These acids closely resemble the d ^cid except: in their action on polarized light. Fdr their relations

to the glucoses see Sugak. Muck acid (q.v:) is isomeric with these acids.

SACCHARIN, the name given to several distinct chemical sub- stances. The saccharin of commerce, so named from its exces r sively sweet taste, is a coal-tar product, being the imide of ortho-

sulphobenzoic acid, CjEU^sq^^NH. It may be prepared by

the oxidation of ortho-toluenesulphonamide CH3-C6HcS0 2 NH 2 , with potassium permanganate (C. Fahlberg and I.Remsen, Ber., 1879, 12, p. 469); by the electrolytic oxidation of the above sulphonamide (German patent 35211); by the action of con- centrated sulphuric acid on ortho-sulphamidobenzoic acid, NHj-SOj-CsH4-C0 2 H (German patent 113720); by warming the chloride of ortho-sulphobenzoic acid phenyl ester (SOjCI-CijHv COjCjHs) with excess of aqueous ammonia (R. List and M. Stein, Ber., 1898, 31, p. 1662); and from benzaldehyde ortho- sulphonic acid by conversion into its acid chloride, which with ammonia yields the corresponding acid-amide, which gives saccharin on oxidation with atmospheric oxygen (German patent 94948). It is a crystalline powder which melts at 220° C. with partial decomposition. It is soluble with difficulty in cold water, but is moderately soluble in hot water and readily soluble in alcohol. By the action of concentrated hydrochloric acid at 150 C. it is decomposed into ammonia and ortho-sulphobenzoic acid. With phosphorus pentachloride above 200 C. it

yields ortho- chlornitrobenzene. Sodium saccharin, C 8 H4(CO)-(S0 2)-N-Na, 2HjO, is used under the name of ” soluble saccharin ” or “crystallose,” and is readily soluble in hot water. The ammonium salt is named ” sucramine.” Saccharin is’ largely used for sweetening purposes, pure saccharin being 500 times sweeter than sugar. Until 1891 the commercial product contained about 40 % of the tasteless para compound and was only 300 times as sweet as sugar; the mixture, however, is now separated by dissolving out the saccharin with xylene, in which solvent the para compound is insoluble. Saccharin is used as a sugar sub- stitute for diabetic patients. It is interesting to note that 0-sulphobenzoic acid has an acid taste, and the sulphamide is tasteless; the sweetness of saccharin therefore appears to be con- nected with the formation of a cyclic anhydride. In the United Kingdom there is an import duty of is. 3d. per oz. on saccharin and similar products, and manufacturers have to take out a licence. In the United States the import duty is $1-50 + 10% ad valorem per lb. Austria-Hungary, France, Belgium and Germany pro- hibit the importation. On the estimation of saccharin in com- mercial samples and for its detection in foods and beverages see J. H. Kastle, Jour. Chem. Soc, 1905, 87, p. 503; E. M’K. Chace, Jour. Amer. Chem. Soc, 1904, 39, p. 1627.

The lactones of the saccharic acids are also known as ” saccharins.” By boiling dextrin or laevulose with milk of lime the so-called ” sac-

CH s OHQH-CHOHQ-CH, charin,” a lactone of the formula,

O CO

is obtained (E. Peligot, Ber., 1880, 13, p. 196; H. Kiliani, Ber., 1882, ‘5i P- 2 954)- It crystallizes in large prisms, has a bitter taste, and is easily soluble in hot water. Potassium permanganate oxidizes it to carbonic and acetic acids. Heating with caustic potash to 200 °C. gives formic and lactic acids, and when reduced by hydriodic acid and phosphorus it is converted into oY-dimethylbutyrolactone. ” Iso-saccharin ” and ” meta-saccharih ” are. formed by the action of lime on milk sugar (H. Kiliani, Ber., 1885, 18, p. 631). The former melts at 95 C, and on reduction by hydriodic acid and phosphorus is converted into a-y-dimethylvalerolactone. Meta- saccharin melts at 141-142 C. and is easily soluble in water.

SACCHETTI, Franco (c. 1335-c. 1400), Italian poet and novelist, was the son of Benci di Uguccione, surnamed ” Buono,” of the noble and ancient Florentine family of the Sacchetti (comp. Dante, Par. c. xvi.), and was born at Florence about the year 1335. While still a young

man he achieved repute as a poet, and he appears to have travelled on affairs of more or less importance as far as to Genoa, Milan and " Ischiavonia." When a sentence of banishment was passed upon the rest of the house of Sacchetti by the Florentine authorities in 1380 it appears that Franco was expressly exempted, " per esser tanto uomo buono,"and in 1383 he was one of the " eight," discharging the office of " prior " for the months of March and April. In 138s

he was chosen ambassador to Genoa, but preferred": to go as podesta to Bibbiena in Casentino. In 1392 he was podesta of San Miniato, and in 1396 he held a similar office at Faenza. In 1398 he received from his fellow-citizens the post of captain of their then province of Romagna, having his residence at Portico. The date of his death is unknown; most probably it occurred about 1400, though some writers place it as late as 1410.

Sacchetti left a considerable number of sonnetti, canzoni, ballate, madrigali, &c, which have never been printed, but which are still extant in at least one MS. in the Laurentian library of Florence. His Novelle were first printed in 1724, from the MS. in the same collection, which, however, is far from complete. They were originally 300 in number, but only 258 in whole or in part now survive. They are written in pure and elegant Tuscan, and, based as they are for the most part on real incidents in the public and domestic life of Florence, they are valuable for the light they throw on the manners of that age, and occasionally also for the biographical facts preserved in them.

SACCHI, ANDREA (c. 1600-1661), Italian painter of the later Roman school, was born at Nettuno near Rome in 1600, or perhaps as early as 1598. His father, Benedetto, a painter of undistinguished position, gave him his earliest instruction in the art; Andrea then passed into the studio of Albani, of whom he was the last and the most eminent pupil, and under Albani he made his reputation early. The painter of Sacchi's pre- dilection was Raphael; he was the jealous opponent of Pietro da Cortona, and more especially of Bernini. In process of time he became one of the most learned designers and one of the soundest colourists of the Roman school. He went to Venice and to Parma to study Venetian colour and the style of Correggio; but he found the last-named master unadaptable for his own proper methods in art, and he returned to Rome. Sacchi was strong in artistic theory, and in practice slow and fastidious; it was his axiom that the merit of a painter consists in producing, not many middling pictures, but a few and perfect ones. His works have dignity, repose, elevated yet natural forms, severe but not the less pleasing colour, a learned treatment of architec- ture and perspective; he is thus a painter of the correct and

laudable academic order, admired by connoisseurs rather than by ambitious students or the large public. His principal painting, often spoken of as the fourth best easel-picture in Rome — in the Vatican Gallery — is ” St Romuald relating his Vision to Five Monks of his Order.” The pictorial crux of dealing with these figures, who are all in the white garb of their order, has often been remarked upon; and as often the ingenuity and judgment of Sacchi have been praised in varying the tints of these habits according to the light and shade cast by a neighbouring tree. The Vatican Gallery contains also an early painting of the master — the ” Miracle of St Gregory,” executed in 1624; a mosaic of it was made in 1771 and placed in St Peter’s. Other leading examples are the ” Death of St Anna,” in S Carlo ai Catinari; ” St Andrew,” in the Quirinal; ” St Joseph,” at Capo alle Case; also, in fresco, a ceiling in the Palazzo Barberini — ” Divine Wisdom ” — reckoned superior in expression and selection to the rival work of Pietro da Cortona. There are likewise altar- pieces in Perugia, Foligno and Camerino. Sacchi, who worked almost always in Rome, left few pictures visible in private galleries: one, of ” St Bruno,” is in Grosvenor House. He had a flourishing school: Nicholas Poussin and Carlo Maratta were his most eminent scholars; Luigi Garzi and Francesco Lauri were others, and Sacchi’s own son Giuseppe, who died young, after giving very high hopes. This must have been an illegitimate son, for Andrea was unmarried when he died at Nettuno in 166 1.

SACCHINI, ANTONIO MARIA GASPARE (1734-1786), Italian musical composer, was born at Pozzuoli, on the 23rd of July 1734. He was the son of a poor fisherman and was heard singing on the sands by Durante, who undertook his education at the Conservatorio di Sant’ Onofrio at Naples. Durante and Piccinni taught him composition, and Nicola Fiorenza the violin. The intermezzo Fra Donato was written for the theatre of the Conservatorio in 1756, but his first serious opera was produced at Rome in 1762, and was followed by many others, nearly all of which Were successful. In 1769 he went to Venice, and in conseauence of the great success achieved there by the

production of his opera Alessandro nell’ Indie he was appointed director of the Conservatorio dell’ Ospedaletto, where he trained some admirable female singers and wrote church music. In 1772 he visited London, where, notwithstanding a cruel cabal formed against him, he achieved a brilliant success, especially in his four new operas, Tamerlano, Lucio Vero, Nitetli e Perseo and // Gran Cid. Later he met with an equally enthusiastic reception in Paris, where in 1783 his

Rinaldo was produced under the immediate patronage of Queen Marie Antoinette, to whom he had been recommended by the emperor Joseph II. But neither in England nor in France did his reputation continue to the end of his visit. He seems everywhere to have been the victim of bitter jealousy. Even Marie Antoinette was not able to support his cause in the face of the general outcry against the favour shown to foreigners; and by her command, given with the utmost reluctance, his last opera and undoubted master- piece, (Edipe a Colone, was set aside in 1786 to make room for Lemoine's Phedre — a circumstance which so preyed upon his mind that he died of chagrin on the 7th (or 8th) of October 1786.

Sacchini's style was rather graceful than elevated, and he was deficient both in creative power and originality. But the dramatic truth of his operas, more especially the later ones, is above all praise, and he never fails to write with the care and finish of a thorough and accomplished musician. (Edipe was extremely successful after his death, and was performed at the Academie nearly six hundred times.

SACERDOTALISM (from Lat. sacerdos, priest, literally one who presents sacred offerings, sacer, sacred, and dare, to give), a term applied, usually in a hostile sense, to the system, method and spirit of a priestly order or class, under which the functions, dignity and influence of the members of the priesthood are exalted in the ministry of religion, and in the church at the expense of the laity. This exalting of the priesthood in the Christian church is based on the claim that the priest exercises sacrificial and supernatural powers in the celebration of the Eucharist.

SACHEVERELL, HENRY (1674-1724), English ecclesiastic and politician, was the son of Joshua Sacheverell, rector of St Peter's, Marlborough. He was adopted by his godfather, Edward Hearst, and his wife, and was sent to Magdalen College, Oxford, in 1689, was demy of his college from 1689 to 1701 and fellow from 1701 to 17 13. Addison, another Wiltshire lad, entered at the same college two years earlier, but was also elected a demy in 1689; he inscribed to Sacheverell in 1694 his account of the greatest English poets. Sacheverell took his degree of B.A. in 1693, and became M.A. in 1695 and D.D. in 1708. His first preferment was the small vicarage of Cannock in Stafford- shire; but he leapt into notice when holding a preachership at St Saviour's, Southwark. His famous sermons on the church in danger from the neglect of the Whig ministry to keep guard over its interests were preached, the one at Derby on the 15th of August, the other at St Paul's Cathedral on the 5th of November 1 709. They were immediately reprinted, the latter being dedi- cated to

the lord mayor and the former to the author's kinsman, George Sacheverell, high sheriff of Derby for the year; and, as the passions of the whole British population were at this period keenly exercised between the rival factions of Whig and Tory, the vehement invectives of this furious divine on behalf of an ecclesiastical institution which supplied the bulk of the adherents of the Tories made him their idol. The Whig ministry, then slowly but surely losing the support of the country, were divided in opinion as to the propriety of prosecuting this zealous parson. Somers was against such a measure; but Godolphin, who was believed to be personally alluded to in one of these harangues under the nickname of " Volpone," urged the necessity of a prosecution, and gained the day. The trial lasted from 27th February to 23rd March 1710, and the verdict was that Sacheverell should be suspended for three years and that the two sermons should be burnt at the Royal Exchange. This was the decree of the state, and it had the effect of making him a martyr in the eyes of the populace and of bringing about the downfall of the ministry. Immediately on the expiration of his sentence (13th April 1713) he was instituted to the valuable

rectory of St Andrew's, Holborn, by the new Tory ministry, who despised the author of the sermons, although they dreaded his influence over the mob. He died at the Grove, Highgate, on the 5th of June 1724.

See Hearne's Diaries, Bloxam's Register of Magdalen and Hill Burton's Queen Anne, vol. ii. There is an excellent bibliography by Falconer Madan (1887).

SACHEVERELL, WILLIAM (1638-1691), English statesman, son of Henry Sacheverell, a country gentleman, was born in 1638. His family had held a good position in Derbyshire and Nottinghamshire since the 12th century, the name appearing as Sent Cheveroll in the roll of Battle Abbey, and William inherited large estates from his father. He was admitted at Gray's Inn in 1667, and in 1670 he was elected member of parliament for Derbyshire. He immediately gained a prominent position in the party hostile to the Court, and before he had been six months in the House of Commons he proposed a resolution that all " popish recusants " should be removed from military commands; the motion, enlarged so as to include civil employment, was; carried without a division on the 28th of February 1672-1673. This resolution was the forerunner of the Test Act, in the pre- paration of which Sacheverell took an active part, and which caused the hreak

up of the cabal. He now took part in nearly every debate in the House of Commons, being recognized as one of the, most able of the leaders of the opposition or country party. He strongly opposed the king's policy of alliance with France, advocating a league with the Dutch instead, and the refusal of supplies until the demands of the Commons should be complied with. Sacheverell took especial interest in the state of the navy and spoke in many debates on this question. In 1677 he carried an address to the king calling upon him to conclude an alliance with the United Provinces against Louis XIV., and when the Speaker adjourned the House by Charles's order Sacheverell made an eloquent protest, asserting the right of the House itself to decide the question of its adjournment. When parliament met early in 1678 assurances were received from Charles II. that he had arranged the treaties demanded by the Commons; but Sacheverell boldly questioned the king's good faith, and warned the Commons that they were being deceived. When the secret treaty with France became known, thus confirming Sacheverell's insight, the latter called for the disbandment of the forces and advocated the refusal of further supplies for military purposes; and in June 1678 he resolutely opposed Lord Danby's proposal to grant £300,000 per annum to Charles II. for life. Barillon mentions Sacheverell among the Whig leaders who accepted bribes from Louis XIV., but the evidence against him is not conclusive.

When Titus Oates began his pretended revelations in 1678 Sacheverell was among those who most firmly believed in the existence of a Popish plot. He was one of the most active investigators of the affair, and one of the managers of the im- peachment of the five Catholic peers. He also acted for a time as chairman of the secret committee of the Commons, and drew up the report on the examination of the Jesuit Coleman, secretary to the duchess of York. He was a member of the committee for drafting the articles of impeachment against Danby in 1678, and was appointed one of the managers of the Commons; and in 1679, when the impeachment, interrupted by the dissolution of parliament, was resumed in the new parliament, he spoke strongly against the validity of Danby's plea of pardon by the, king. The allegations made in Sacheverell's report on the examination of Coleman prompted the country party to demand' the exclusion of James, duke of York, from the succession to the throne, the first suggestion of the famous Exclusion Bill being made by Sacheverell on the 4th of November 1678 in a debate — " the greatest that ever was in Parliament," as it was pronounced by contemporaries — raised by Lord Russell with the object of removing the duke from the King's Council. He vigorously promoted the bill in the House of Commons

and opposed granting supplies till it should pass. When Charles offered an alternative scheme (1679) for limiting the powers of a Catholic sovereign, Sacheverell made a great speech in which he pointed out the

insufficiency of the king's terms for securing the object desired by the Whigs. In the conflict between the Petitioners and the Abhorrers he supported the former, and on the 27th of October 1680 brought forward a motion asserting the right of petitioning' the king to summon parliament, and proposed the impeachment of Chief Justice North as the author of the proclamation against tumultuous petitioning. Sacheverell was one of the managers on behalf of the Commons at the trial of Lord Stafford in West minster Hall; but took no further part in public affairs till after the elections of March 1681, when he was returned unopposed for Derbyshire. He was prosecuted for riot in connexion with the surrender of the charter of Nottingham in 1682, being tried before Chief Justice Jeffreys, who fined him 500 marks.

At the general election following the death of Charles II. in 1685 Sacheverell. lost his seat, and for the next four years he lived in retirement on his estates. In the convention parliament summoned by the prince of Orange, in which he sat for Heytes- bury, he spoke in favour of a radical resettlement of the constitu- tion, and served on a committee, of which Somers was chairman, for drawing up a new constitution in the form of the Declaration of Right; and he was one of the representatives of the Commons In their conference with the peers on the question of declaring the throne' vacant. William III. appointed Sacheverell a lord of the admiralty, but he resigned the office after a few months. He procured the omission of Lord Jeffreys's name, from the Act of Indemnity. In 1690 he moved a famous amendment to the, Corporation Bill, proposing the addition of a clauseˆthe purport of which was misrepresented by Macaulayrˆ-for disqualifying for office for seven years municipal functionaries who in defiance of the majority of their colleagues had surrendered their charters to the Crown. A celebrated debate on this question took place in the House of Commons in January 1690; but: the evident intention of the Whigs to perpetuate their own ascendancy by tampering with the franchise contributed largely to the Tory reaction which resulted in the defeat of the Whigs in the elections, of that year. Sacheverell was elected member for Nottingham- shire; but he died on the 9th o£ October 1691, before taking his seat. In the judgment of Speaker Onslow, Sacheverell was the 'ˆablest parliament man " of the. reign of Charles

II. He was one of the earliest of English parliamentary orators; his speeches gre'atly impressed his contemporaries, and in a later generation, as Macaulay observes, they were " a favourite theme of old men who lived to seethe conflicts of Walpole and Pulteney." Though his fame has become dimmed in comparison with that of Shaftes- bury, Russell and Sidney, he was not less conspicuous in the parliamentary proceedings of Charles II. 's reign, and he left a more permanent mark than any of them on the constitutional changes of the period.

Sacheverell was twice ; 'married. His first wife was Mary, daughter of William Staunton of. Staunton; and his second was Jane, daughter of Sir John Newton. His eldest son Robert represented the borough! of Nottingham in six parliaments and diedini7i4. The family became extinct in 1724. •

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London, 1878); Laurence Eachard, History of England (3 vols., London, 1707ˆ1718); and the Histories of England by Lingard, Von Ranke and Macaulay. (R J. M.)

, SACHS,. HANS (1494-1576), German poet and dramatist, was born at Nuremberg on the 5th of November 1494. His father was a tailor, and he himself was trained to the calling of a shoemaker. Before this, however, he received a good education at the Latin school of: Nuremberg, which left behind it a lasting interest in the stories of antiquity. In the spring of 1509 he began his apprenticeship, and was at the same time initiated into the art of the Meistersingers by a weaver, Leonhard Nunnenpeck. In 1 5 11 he set out on his Wanderjahre, and worked

at his craft in many towns, including Regensburg, Passau, Salzburg, Munich, Osnabriick, Lubeck and Leipzig. In 1516 he returned to Nuremberg, where he remained during the rest of his life, working steadily at his handiwork and devoting his leisure time to literature. In 151 7 he became master of his gild and in 15 19 married. The great event of his intellectual life was the coming of the Reformation; he became an ardent adherent of Luther, and in 1523 wrote in Luther's honour the poem beginning Die wittenbergisch Nachtigall, Die manjetzt horet iiberall, and four remarkable dialogues in prose, in which his warm sympathy with the reformer is tempered by counsels of moderation. In spite of this, his advocacy of the new faith brought upon him a reproof from the town council of Nuremberg; and he was forbidden to publish any more Biichiein oder Reimen. It was not long, however, before the council itself openly threw in its lot with the Reformation. After the death of Hans Sachs's first wife in 1560 he married again. His death took place on the 19th of January 1576.

Hans Sachs was an extraordinarily fertile poet. By the year 1567 he had composed, according to his own account, 4275 Meisterlieder, 1700 tales and fables in verse, and 208 dramas, which filled no fewer than 34 large manuscript volumes; and this was. not all, for he continued writing until 1573. The Meister- lieder were not printed, being intended solely for the use of the Nuremberg Meistersinger school, of which Sachs was the leading* spirit. His fame rests mainly on the Spruchgedkhte, which include his dramatic writings. His f tragedies'" ahff" comedies " are/however, little more than stories told in dialogue, and divided at convenient pauses into a varying number of acts; of the essentials of dramatic construction or the nature of dramatic action Sachs has little idea. The subjects are drawn from the most varied sources, the Bible, the classics and the Italian novelists being especially laid under contribution. He succeeds best in the short anecdotal Fastnachtsspiel or Shrovetide play, where characterization and humorous situation are of more im- portance than dramatic form or construction. 'Farces like Der fahrende Schiller im Parodies (1550), Das Wildbad (1550), Dasheiss Eisen(i55i), Der Bauer im Fegefeuer (1552) are inimitable in their way, and have even been played with success on the modern stage.

Hans Sachs himself made a beginning to an edition of his collected-writings by publishing three large folio volumes (1558-1561); after his death two other volumes appeared (1578, 1579). A critical edition has been published by the Stuttgart Liter'arischer Verein, editedby A. von Keller and E: Goetze (23 vols., 1870-1896) ; Sdmt- liche Fastnachtsspiele, ed. by E. Goetze (7 vols., 1880-1887); Sfimt- liche Fabeln und Schwanke, by the same (3 vols., 1893). There are also

editions of selected writings by J.Tittmann (3 vols., 1870-1871 ; new ed., 1883-1885} and B. Arnold (2 vols., 1885). See E.‘K. J. Liitzelberger, Hans Sachs (1876); C. Schweitzer, FUude sur la vie et les ceuvres de Hl ns Sachs (1887); K. Drescher, Hans Sachs- Studien (1890, 1891); E. Goetze, Hans Sachs (1891); A. L. Sciefel, Hans Sachs-Forschungen (1894); R. Genee, Hans Sachs und seine Zeit (1894; 2nd ed., 1902); E’. Geiger, Hans Sachs als Dichter in seinen Fastnachtsspielen(igoˆ). 1 • ■■ .

SACHS* JULIUS VON (1832-1897), German botanist, was born at Breslau on the 2nd of October 1832. At an early age he showed a taste for natural history, arid on leaving school he became, in 1851, private assistant to the physiologist J. E. Purkinje at Prague. In 1S56 he graduated as doctor of philo- sophy, and then adopted a botanical career, establishing himself as Privatdozeht for plant physiology in the university of Prague. In 1859 h6 was appointed physiological assistant to the Agri- cultural Academy of Tharandt in Saxony; and in 186 1 he was called to be director of the Polytechnic at Chemnitz, but was almost immediately transferred to the Agricultural Academy at Poppelsdorf, near Bonn, where he remained until 1867, when he was nominated professor of botany in the university of Freiburg-im-Breisgau. In 1868 he accepted the chair, of botany in the university of Wiirzburg, which he continued to occupy (in spite of calls to all the important German universities) until his death on the 29th of May 1897.

Sachs achieved distinction as an investigator, a writer and a teacher; his name will ever be especially associated with the great development of plant physiology which marked the lattef half of the > 19th. century, though there is scarcely a branch of’

botany to which he did not materially contribute. His earlier papers, scattered through the volumes of botanical journals and of the publications of learned societies (a collected edition was published in 1892-93), are of great and varied interest. Prominent among them is the series of ” Keimungsgeschichten,” which laid the foundation of pur knowledge of microchemical methods, as also of the morphological and physiological details of germination. Then there is his resuscitation of the method of ” water-culture,” and the application of it to the investigation of the problems of nutrition; and further, his discovery that the starch-grains to be found in chloroplastids are the

first visible product of their assimilatory activity. His later papers were almost exclusively published in the three volumes of the Arbeiten des botanischen Instituts in WUrzburg (1871-88). Among these are his investigation of the periodicity of growth in length, in connexion with which he devised the self registering auxano meter, by which he established the retarding influence of the highly refrangible rays of the spectrum on the rate of growth; his researches on heliotropism and ; geotrOpism, in which he introduced the ” clinostat “; his Work on the structure and the’ arrangement of cells in growing-points; the elaborate experi- mental evidence upon which he based his ” imbibition-theory ” of the transpiration-current; his exhaustive study of the assimilatory activity of the green leaf; and other papers of interest. Sachs’ first published volume was the Ilandbuch der Experimenlalphysiologie der Pflanzen (1865; French edition, 1868), which gives an admirable account of the state of knowledge in certain departments of the subject, and includes a great deal of original information. This was followed in 1868 by the first edition of his famous Lehrbuch der Bbtanik, by far the best book of its kind. It is a comprehensive work, giving an able summary of the botanical science of the period, enriched with the results of many original investigations. The fourth and last German edition was published in 1874, and two English editions were issued by the Oxford Press in 1875 and 1882 respectively. The Lehrbuch was eventually superseded by the Vorlesungen iiber Pflanzenphysidogie (1st ed., 1882; 2nd ed., 1887; Eng. ed., Oxford, 1887), a work more Kmited in scope, but yet covering more ground than its title would imply; though it is a remarkable book, it has not gained the general recognition accorded to the Lehrbuch. Finally, there is the Geschichte der Botanik (1875); a brilliant and learned account of the development of the various branches of botanical science from the middle of the 1 6th century up to i860, of which an English edition was published in 1890 by the Oxford Press. As a teacher Sachs exerted great influence, for his vigorous personality and his ready and lucid utterance enabled him not only to instruct, but to fire his students with something of his own enthusiasm.

A full account of Sachs’ life and work was given by Professor Goebel, formerly his assistant, in Flora (1897), of which an English translation appeared in Science Progress for 1898. There is also an obituary notice of him in the Proc. Roy. Soc, vol. lxii. (S. H. V*.)

SACHS, MICHAEL (1808-1864), German Rabbi. He was one of the first of Jewish graduates of the modern universities, taking his Ph.D. degree in 1836. He was appointed Rabbi in Prague in 1836, and in Berlin in 1844. He took the conservative side against the Reform

agitation, and so strongly opposed the introduction of the organ into the Synagogue that he retired from the Rabbinate rather than acquiesce. Sachs was one of the greatest preachers of his age, and published two volumes, of Sermons (Predigten, 1866-1891). . He co-operated with Zunz {q.v.) in a new translation of the Bible. Sachs is best remembered for his work on Hebrew poetry, Religiose Poesie der Juden in Spanien (1845); his more ambitious critical work (Beitrage zur Sprach- und Alterthumsforschung, 2 vols., 1852-1854) is of less lasting value. His poetical gifts he turned to admirable account in his translation of the Festival Prayers (Mahzor, 9 vols., 1855), a new feature of which was the metrical rendering of the medieval Hebrew hymns. Another very popular work by Sachs contains poetical paraphrases of Rabbinic legends (Stimmen vom Jordan und Euphrat, 1833). (I. A.)

SACK, a large bag made of a coarse material such as is described under Sacking below. The word occurs with very little variation in all European languages, cf. Gr. ctAkkos, Lat. saccus, Fr. sac, Span, saco, Du. zak, &c. All are borrowed from the Hebrew sag, properly a coarse stuff made of hair, hence a bag made of this material. Most etymologists attribute the widespread occurrence of the word to the story of Joseph and his brethren in Gen. xliv. The Hebrew Word itself is probably Egyptian, as is evidenced by the Coptic sok. Apart from its ordinary meaning, the word is used as a unit of dry measure, which has varied considerably at different times and places and for ‘different goods; it is the customary British measure for coals, potatoes, apples and some other goods, and is equivalent to three bushels. From the end of the 17th to the middle of the 18th century the sack or ” sacque ” was a fashionable type of gown for women, having a long flowing loose back — hanging in pleats from the neck. It is still used as a tailor’s or dressmaker’s term for a loose straight-back coat. The Fr. sac meant aˆso pillage, plunder, whence saccager, to plunder a town; especially after it had been taken by assault or after a siege. There is no doubt that it is an extension Of ” sack,” a bag, with a reference to the most obvious receptacle for booty. The slang expression ” to give the sack,” ” to get the sack,” of a person who has been turned out of a situation or been given notice’ to leave is an old French proverbial expression. Cotgrave gives On luy a donne sa sac et ses quilles,” he hath his passport given him, he is turned out to grazing, said of a servant whom his master hath put away.” The New English Dictionary finds the expression also in isth-century Dutch.

It remains to distinguish the name, familiar from English literature of the 16th and 17th centuries, of a Spanish wine, which was of a strong, rough; dry kind (in Fr. vin sec, whence the name), and therefore

usually sweetened and mixed with spice and mulled or ” burnt.” It became a common name for all the stronger white wines of the South.

SACKBUT, Shakbusshe, Sagbut, Draw., or Drawing Trumpet ‘(Scotland, draucht trumpet) or Fla? > Trumpet (Fr. saquebute, saqueboute, cacbouc, trompette }yt*pionique; Ger. Posaune, Busaun, Pusin, Zug-Trommet;‘ItaI.tfqmba da tirarsi or tromba spezzata; Span, sacabuchi; Dutch 11 bazuin Schuijftrompelte) , the earliest form of slide trumpet, which afterwards developed into the trombone. As soon as the effect of the slide in lengthening the main tube and therefore pro- portionally deepening the pitch of the instrument was under- stood, and its capabilities had been fully realized, tjie develop- ment of a family of powerful tenor and bass instruments followed as a matter of course. It is not known exactly in what country the principle of the slide was first discovered and applied to musical instruments; if it be not an Oriental device, then the credit is probably due to the Netherlands or to South Germany before or during the 13th century. ..

The early history of the sackbut is among the most interesting of all instruments. Various attempts have been rnade to fix the etymology of the word as derived from Span, sacabucke through Frenchj The Rev. F. W. Galpin l suggests a derivation front sacar, tti draw out, and buche, identical with biicha (Lat. buxus), used in the sense of a tube or pipe originally of boxwood. To accept’ this etymology would be to lose sight of the fact that all the technical names applied to the sackbut in various languages directly acknow- ledge its descent from the buccina (q.v.), with the exception of Italian,, in which the recognition is indirectly made through the synonym tromba. A clue to the etymology of sacabuche is afforded by the well-known fact that not only did the Arabs after the conquest introduce oriental musical instruments by way of Spain to western Europe, but the Arabic names also clung to the instruments in’many cases. The Arabs had a military trumpet they called Buk or Buque, a word they had borrowed from the Christians, 2 and it is mentioned in a musical treatise of the 14th century (Escorial MS. 69) among the musical instruments then in use in Spain. It has been claimed on philological grounds that England derived her knowledge of the sackbut from France, but the oldest known form of the word in English is shakbusshe, which occurs in the accounts of Henry VII.

1 ” The Sackbut, its Evolution and History,“‘in Proc. Mus. Assoc. London (1906-1907).

2 See Edw. W. Lane, Arabic-English Lexicon (London, 1863), bk. i. pt. i. p. 276.

for the 3rd of May 1495, 1 and is obviously of Spanish origin. Sackbut appears early in the 1 6th century.

The word sacabuche was at some time applied in Spain to the ship's pump; and the questions naturally arise, Which came first, and Was the musical instrument named after the pump from the great resemblance in their respective actions as well as in outward form? 5 It is certainly significant that the Ital. tromba, from which sprang " trumpet " and " trombone," means a pump as well as a trumpet and the trunk of an elephant. Even if it could be proved beyond doubt that the slide had been applied to the trumpet before the word tromba was used for it, there would still remain several difficulties to be disposed of. (1) The word trumba, trumbin, trompe, already general in the romances of the 12th and 13th centuries, was at first applied to the tubas and curved horns, probably from the similar curve of the elephant's trunk. (2) If tromba referred to the pump, it must have been applied to the slide trumpet, and tromba da tirarsi for " sackbut is senseless tautology. (3) The etymology given above from buk or buque, trumpet, supported by similarly compounded words in English, Scotch, Dutch, Italian, would have to be regarded as a strange but not unparalleled philological co- incidence. The earliest instance yet discovered of the use of saca- buche as a musical instrument seems to be in the 14th century. 8

The transformation of the busine {buccina) into the sackbut involved two or three processes, the addition of the slide being accomplished in at least two stages. It was applied first to the straight busine made in three or four sections having rings or knobs at the joints. The sliding portions or joints here doubtless served much as in our modern wood wind instruments for tuning purposes or for changing the key. The long slide, added for the purpose of obtaining a diatonic compass, denoted a further step in the evolution. When applied to the straight busine it differed materially from the slide of the sackbut or trombone, for the normal position of the instru- ment was with the slide fully drawn out, so that the knobs were equidistant; on the slide being gradually closed the pitch was proportionally raised in order to fill in the gaps of the first fifth by new fundamentals, upon each of which the harmonic series would be obtainable. An example of this early use of the slide is to be found in a miniature from a psalterium executed in the south of France during the 13th century, now preserved in the library of the university of Munich (MS. 24, 4to fol. 966). Here (fig. 1)

the per- former is represented playing on a busine in which two of the knobs or rings denoting the joints or sections are shown touching each other. The hand is grasping the instrument just under the lower ring in the act of pushing it up to close the slide, as is_ indicated by the position of the wrist. This is the earliest indication of the existence of the slide yet found by the writer, and the instrument, although straight, is one of the earliest sackbuts. The manipulation of the slide on the long straight busine must have been exceedingly difficult, requiring hot only skill, but a long arm. This led to the next step in the evolution, i.e. the bending of the tube in three parallel branches like a flattened S> an example of which, also of the 13th century, is found on some carved woodwork from the abbey of Cluny. 4

The folding of the busine marks the advent of the new double slide, like a U- made to draw out and lower the pitch. This radical change did not come all at once, the intermediate step being the folding of the busine, with the old single slide, the whole S being drawn up and down, as the slide closed and opened again. This interesting development is shown (fig. 2) in a miniature by Taddeo Crivelli in the Borso Bible 6 (1450-1471). The two upper joints defined by rings are clearly drawn of larger calibre than the lower folded portion, which has been drawn out to what would approxi- mately correspond to the third position on the trombone lowering the pitch one tone. A single slide would require to be extended about twice the distance of the double or folded tube on the trombone to produce any given effect. This drawing of the sackbut must not be taken as showing the instrument in use in Crivelli's day, it is clearly retrospective, for sackbuts in a more advanced stage are not uncommon in works of art of the same century. In a MS. 6 preserved in the library of the Arsenal in Paris, executed for the dukes of Burgundy in the middle of the 15th century, is seen a trumpet of

1 See W. H. Black, Sir N. H. Nicolas, etc., Excerpta historica (London, 1833), P- I02 –

a This question has been thoroughly investigated by the late Professor George Case in his work on the trombone.

- See Felipe Pedrell, Organographia musical, antigua espafiola, p. 116.

4 Illustration in Du Sommerard, Les Arts au moyen &ge, Atlas, pi. i. ch. xii.

6 See Hermann Julius Hermann, " Zur Gesch. d. Miniaturmalerei am

Hofe der Este in Ferrara," in Jahrb. d. Kunstsamml. d. aUer- hocksten Koiserhauses (Vienna, 1900), bd. xxi. pL xiii.

• Illustration in Du Sommerard, op. cU., album, 4″ serie, pi. xvft.

Fig. 1.

Fig, 2.

Fig. 3.

the cavalry type with a single straight slide drawn out so far that the bell rests on the performer's foot (fig. 3).

The last transition immediately preceding the change into the trombone consisted in folding the tube to form two JJ shaped bends, one of which pointed downwards and the other over the shoulder, reaching to the level of the back of the head; the third branch was bent over between the other two, but in a plane almost at right angles above them, the bell extend ing downwards beyond the first bend. Sack- buts of this type are to be seen in Durer's picture in the Nuremberg town hall, and in others by artists of the 15th century, as, for instance, in Gentile Bellini's Processipne in piazza S. Marco among the band to the right of the picture.

The further history and development 1 of, the sackbut are given under Trombone. See also Trumpet and Buccina. (K. S.)

SACKETT'S HARBOR, a village in Jefferson county, New York, U.S.A., at the eastern end of Lake Ontario, on the south shore of Black River Bay, about 1 m. from its mouth, and about 10 m. W. by S. of Watertown. Pop. (1890) 787; (1900) 1266; (1905) 903; (1910) 868. Sackett's Harbor is served by the New York Central & Hudson River railway. It is built on low land, around a small, nearly enclosed harbour, the northern shore of which is formed by Navy Point, a narrow tongue of land extending about j m. nearly due eastward from the mainland. About 1 m. to the W. by S. is Horse Island, approximately j m. long (east and west), and nearly as broad, only a few feet above the lake level and separated from the mainland by a. narrow strait, always fordable, and sometimes almost dry; at its eastern end is Sackett's Harbor Lighthouse. The harbour is deep enough for the largest lake vessels. The village is a summer resort, At Sackett's Harbor are Madison Barracks, a United States military post, established in 1813 and including a reservation of 99 acres; and a United States Naval Station. In the post cemetery is the grave of General Zebulon M. Pike, who was killed at York (now Toronto) on

the 27th of April 181-3. The first settlement was made in 1801 by Augustus Sackett, and the village was incorporated in 182 1. In the War of 181 2 Sackett's Harbor was an important strategic point for the Americans, who had here a naval station, Fort Tompkins, at the base of Navy Point, and Fort Volunteer, on the eastern side of the harbour. In July 1812 a British squadron unsuccessfully attempted to capture a brig and schooner in the harbour. From Sackett's Harbor American expeditions against York (now Toronto) and Fort George respectively set out in April and May 1813; though scantily garrisoned it was successfully de- fended by General Jacob Brown (who had just taken command) against an attack, on the 29th of May, of Sir George Prevost with a squadron under Sir James Lucas Yeo. The British losses were 259; the American 157, including Lieut.-Colonel Electus Backus, commander of the garrison before General Brown's arrival. Almost all the American stores at the naval station were destroyed to save them from the enemy. The blockade of the harbour by Yeo was abandoned in June 18 14 after the defeat of a force from the squadron sent out to capture guns which were being brought from Oswego to Sackett's Harbor to equip the " Superior," an American vessel launched on the 1st of May, and a smaller vessel nearly completed. Sackett's Harbor was the starting-point of a force of 700 men under a Pole named von Schultz, who in November 1838, during the uprising in Upper Canada (Ontario) attempted to invade Canada, was taken prisoner near Prescott, was tried at Kingston, being defended by Sir John Macdonald, and with nine of his followers was executed in Kingston in December.

See A. T. Mahan, Sea-Power in its Relation to the War of 1812 (2 vols., Boston, 1905); and William Kingsford, The History of Canada, vol. viii. (Toronto, 1895).

SACKING AND SACK MANUFACTURE. Sacking is a heavy closely-woven fabric, originally made of flax, but now almost exclusively made of jute or of hemp. The more expensive kinds, such as are used for coal sacksˆfor government and other vessels, are made of hemp, but the jute fibre is extensively used for the same purpose, and almost entirely for coal sacks for local house supplies. The same type of fabric is used for wool sacks, cement bags, ore bags, pea sacks and for any heavy substance; it is also made up into a special form of bag for packing cops and rolls of jute and flax yarns for delivery from spinners to manufacturers. Proper sacking is essentially a twilled fabric, in which the number of warp threads per inch greatly exceeds the number per inch of weft. The illustration shows a typical kind of

three-leaf twill, double warp sacking.

All three-leaf twill sackings are double in the warp, but four-leaf sackings are single. They are usually 27 in. wide, but other widths are made.

The lower part of the illus- tration shows four repeats of the three-leaf twill, while the lines drawn to the plan of the fabric show that each line of the design is reproduced in the cloth by two warp threads. The weft is single, but each one is usually about four times the weight of the warp for the same length (about 8 lb warp and 32 lb weft). Large quantities of cotton sacks are made for flour, sugar and similar produce: these sacks are usually plain cloth, some woven circular in the loom, others made from the piece. Large quantities of seamless bags or sacks for light substances are woven in the loom, but these are almost invariably made with what is termed the double plain weave, i.e. the cloth, although circular except at the end, is perfectly plain on both sides. Circular bags have been made both with three-leaf and four-leaf twills, but it is found much more convenient and economical to make the cloth for these kinds, and in most cases for all other types, in the piece, and then to make it up into sacks by one or other of the many types of sewing machines. The pieces are first cut up into definite lengths by special machinery, which may be perfectly automatic, or semi- automatic—usually the latter, as many thicknesses may be cut at the same time, each of the exact length. The lengths of cloth are then separately doubled up, the sides sewn by special sewing machines of the Laing or Union make (of which there are seven or eight different kinds for different types of bags), and the ends hemmed. It will thus be seen that the length required is twice the length of the sack plus the amount for hemming the mouth.

The sack is now ready for delivery, unless the name of the owner, some trade mark, or other particulars are required to appear on- it. These particulars are printed on in one or more colours by the Kinmond and Kidd patent multicolour sack-printing machine.

The chief centres for these goods are Dundee and Calcutta, all varieties of sacks and bags being made in and around the former city. (T. Wo.)

SACKVILLE, GEORGE, ist Viscount (1716-1785), generally remembered as Lord George Sackville or Lord George Germain, third son of Lionel Cranfield Sackville, ist duke of Dorset, was born on the 26th of January 1716. Educated at Westminster School and Trinity College, Dublin, he was gazetted captain in the 7th Cathcart's Horse

(now 6th Dragoon Guards) in 1737, and three years later was transferred to Bragg's regiment of foot (Gloucestershire Regiment) as lieutenant-colonel; imme- diately afterwards the regiment sailed for active service on the Rhine, and although it was not present at the battle of Dettingen, its lieutenant-colonel was made brevet colonel and aide-de-camp to the king. It was not until two years later that Sackville took part in his first battle, Fontenoy. Wounded in the charge of

Cumberland's infantry column, he was taken to the tent of King Louis XV. to have his wound dressed. Released, by what means does not appear, he was sent home to serve against the Pretender in Scotland. He was given the colonelcy of the 20th (Lancashire Fusiliers), but was too late to take part in the battle of Culloden. In 1 747-1 748 he was again with the duke of Cumberland in the Low Countries, and in 1749 was transferred to the cavalry, receiving the colonelcy of the 7th (3rd) Irish Horse (Carabineers). With this office he combined those of first secretary to his father, the lord-lieutenant of Ireland, and Irish secretary of war, and a seat in each of the tvto Houses of Commons at Westminster and Dublin, winning at the same time the repute of being " the gayest man in Ireland except his father." In 1755 he was pro- moted major-general, took an English command, and vacated his Irish offices. In 1757 he was made lieutenant-genera! of the ordnance, and transferred to a fourth colonelcy. In 1758, under the duke of Marlborough, he shared in the ineffective raid on Cancale Bay, and the troops, after a short sojourn in the Isle of Wight, were sent to join the allied army of Duke Ferdinand of Brunswick in Germany. Marlborough died shortly after they landed, and Sackville succeeded him as commander-in-chief of the British contingent. But no sooner had he taken over the command than his haughty and domineering temper estranged him both from his second-in-command, Lord Granby, and the commander-in-chief, Prince Ferdinand. This culminated on the day of Minden (August 1, 1758). The British infantry, aided by some of the Hanoverians, had won a brilliant success, and every man in the army looked to the British cavalry to charge and to make it a decisive victory. But Sackville, in spite of repeated orders from Prince Ferdinand, sullenly refused to allow Granby's squadrons to advance. The crisis passed, and the victory remained an indecisive success. Popular indignation was unbounded, and Sackville was dismissed from his offices. But his courage, though impugned, was sufficient to make him press for a court-martial, and a court at last assembled in 1760. This pronounced him guilty of disobedience, and adjudged him " unfit to serve his Majesty in any military capacity whatsoever." The sentence was executed with

gratuitous harshness. It was read out on parade to every regiment in the service, with a homily attached, and placed on record in every regimental order book. Further, it was announced in the Gazette that his Majesty had expunged Sackville's name from the roll of the Privy Council. This, and Sackville's own dogged perseverance, turned the scale in his favour. No reverses to the British arms occurred to keep alive the memory of his lost opportunity, and in 1763 his name was restored to the list of the Privy Council. Hitherto without party ties in parliament, in 1769 he allied himself with Lord North. To this period belong the famous Junius Letters, with the authorship of which Sackville was erroneously credited. In 1770, under the terms of a will, he assumed the name of Germain. In the same year his coolness and courage in a duel with Captain George Johnstone, M.P., assisted to rehabilitate him, and in 1775, having meantime taken an active part in politics, he became secretary of state for the colonies in the North cabinet. Thus, though still standing condemned as unfit for any military employ- ment, he exercised a powerful and unfortunate influence on the military affairs of the nation. Some of the business of the war department in those days fell to the colonial office, and Germain was practically the director of the war for the suppression of the revolt in the American colonies. What hopes of success there were in such a struggle Germain and the North cabinet dissipated by their misunderstanding of the situation and their friction with the generals and the army in the theatre of war. But this failure was not on the same footing as that of Minden, and in spite of virulent party attacks, King George III., on the resigna- tion of the North ministry, offered him a peerage. Sackville, in characteristic fashion, stipulated for a viscounty, as otherwise he would be junior to his secretary, his lawyer and to Amherst, who had been page to his father. There was some opposition to his taking his seat in the House of Lords. But his health was failing and he withdrew from politics, spending his last years as a benevolent and autocratic country magnate. He died at

Stoneland Lodge (Buckhurst Park), Sussex, on the 26th of August 1785.

SACKVILLE, MORTIMER SACKVILLE-WEST, ist Baron (1820-1888), was descended from Sir Richard Sackville, a Kentish gentleman, and a cousin of Ann Boleyn. A member of parliament and courtier under Henry VIII., Richard Sackville became chancellor of the court of augmentations in 1548 and was knighted in 1549. He amassed a great

deal of wealth, and Sir Robert Naunton said his name should be ” fill-sack,” rather than ” Sack-ville.” He was on friendly terms with Roger Ascham, whom he advised to write his Scholemaster. In 1604 his son Thomas was created earl of Dorset, and from him the earls and dukes of Dorset (q.v.) of the Sackville family were descended.

Mortimer Sackville- West was a younger son of George John Sackville-West, 5th Earl de la Warr (See de la Warh) : his mother, Elizabeth, Baroness Buckhurst, being a daughter of John Frederick Sackville, 3rd duke of Dorset. When in 1873 his elder brother, Reginald Windsor, became 7th Earl de la Warr, Mortimer succeeded by arrangement to, the extensive estates of the Sackvilles, including Knole Park, their beautiful Kentish residence, which had come to his family through his mother. In 1876 he was created Baron Sackville of Knole, arid died on the ist of October 1888.

His brother, Lionel Sackville-West (1827-1908), succeeded as 2nd baron. He had a long career in the diplomatic service. From 1872 to 1878 he was ambassador to the Argentine Republic; from 1878 to 1881 he represented his country at Madrid, and from 1 88 1 to 1888 at Washington. His retirement was due to an unfortunate interference in American domestic politics, or what was taken as such, which caused some stir. He died in September 1908 and was succeeded by his nephew Lionel Edward (b. 1867) as 3rd baron. By a Spanish dancer, Josefa Duran de Ortega, known also as Pepita de Oliva, Mr Sackville-West, as the 2nd baron then was, had several children, and soon after his death one of these, calling himself Ernest Henri Jean Baptiste Sackville- West, claimed to be a lawful son and bis father’s heir. He asserted that between 1863 and 1867 Sackville-West had married his mother. The case came before the English courts of law in 1909-1910, and it was decided that the children of this union were all illegitimate, as Pepita’s husband, Jean Antonio Gabriel de Oliva, was alive during the whole period of his wife’s connexion with Sackville-West.

SACO, a city of York county, Maine, U.S.A., on the Saco river, and the Atlantic Ocean, opposite Biddeford, with which it is connected by bridges, and 14 m. S.W. of Portland. Pop. (1890), 6075; (1900) 6122 (903 foreign-born); (1910) 6583. It is served by the Boston & Maine railway, and is connected with Portland by an electric line. The actual municipal limits include an area of about 40 sq. m., but much of this is sparsely settled, and the centre of settlement, or city proper, is about 5 m. above the mouth of the Saco. The city has a public park (Pepperrell Park) of 30 acres, the Dyer Library (1790), containing in 1908 16,000 volumes, and York Institute (established in 1866 and

incorporated in 1867), with a library of 5000 volumes in 1908; and is the seat of Thornton Academy (co-educational), incorporated in 181 1, opened in 1813, but closed during 1848-1889 after the burning of the old building. Old Orchard Beach, in the vicinity, extend- ing along the shore front of the township of Old Orchard (pop. in 1900, 964) and part of the shore fronts of Saco and Scarboro, is a popular summer resort; in August 1907 nearly all the hotels were burnt, but others have since been built. At Saco the river falls about 55 ft. and provides excellent water-power. The city's principal manufactures are cotton goods and cotton-mill machinery. Saco was settled as early as 1631, and was the seat of the Gorges government from 1636 to 1653, when it passed under the jurisdiction of Massachusetts. Until 1762 Saco and Biddeford formed one town or plantation— until 1 7 18 under the name of Saco, and from 17 18 to 1762 under the name of Biddeford. In 17 16 Sir William Pepperrell acquired title to the principal part of what is now Saco, in 1752 this was made a separate parish, and ten years later

it was incorporated as a separate township under the name of Pepperellboro. In 1779 the Pepperrell property was confiscated as that of a loyalist, and in 1805 the name of the township was changed to Saco. In 1867 Saco was chartered as a city.

SACRAMENT, in religion, a property or rite defined in the Anglican catechism as " an outward and visible sign of an in- ward and spiritual grace" ; if the grace be allowed to be inherent in the external symbolic thing or act as well as in the faithful who receive or do it, this definition holds good not only for the Latin Church, but for more primitive religions as well. In the Greek Church the equivalent word is nvorriptov, a mystery, a usage which is explained below.

The Latin word sacramentum originally meant any bodily or sensible thing, or ah action, or a form of words solemnly endowed with a meaning and purpose which in itself it has not. Thus the money deposited by each of two litigants in a sacred precinct or with a priest, was called a sacrament. The winner of the suit got back his deposit, but the loser forfeited his to the god or to the winning party. In Livy it signifies the oath (q.v.) whjch soldiers took among themselves not to run away or desert. Pliny uses it similarly of the oath by which the Christiana of Bithynia bound themselves at their solemn meetings not, to commit any act of wickedness. Tertulliari (c. 160-240) uses it in both senses, of an oath, as in the passage of his treatise A bout Spectacles, where he says that no Christian " passes oyer to the enemy's camp without throwing away his arms, without abandon- ing the standards and sacraments of his chief." In the treatise To the

Nations,!. 16, he speaks of ” the sacraments of our religion,” intending, it would appear, the love-feast and Eucharist. So in the Apology, ch. vii., he speaks of ” the sacrament of infanticide and of the eating of a murdered child and of incest following the banquet,” the crimes of which the Christians were commonly accused. In the work Against Marcion, iv. 34, he speaks of the sacrament of baptism and Eucharist. In the work against the Jews, ch. xi., he speaks of the letter Tan set in ink on the fore- heads of the men of Jerusalem (Ezek. ix. 4), as ” the sacrament of the sign,” i.e. of the cross; and in chap. xiii. of the same work he dwells on the sacrament of the wood prefigured in 2 Kings vi. 6. The stick with which Elisha made the iron to swim in that passage, and the wood which Isaac carried up the mountain for his own pyre ” were sacraments reserved for fulfilment in the time of Christ.” In other words they were types, things which had a prophetic significance. In the same work, chap, x., he speaks of ” the Sacrament of the Passion foreshadowed in pro- phecies.” In his work On the Soul, chap, xviii., the aeons and genealogies of the Gnostics are “the sacraments of heretical ideas.” In the work About the Crown, chap, hi., he describes how the faithful ” take the sacrament of the Eucharist also in their meetings held before dawn.” Elsewhere he speaks of ” the sacraments of water, oil, bread.” In the work Against Valen- tinians, chap, xxxix., he speaks of the ” great sacrament of the name,” here rendering the Greek word fivcrrfipiov, mystery. In the tract On Monogamy, chap, xi., he speaks of ” the sacrament of monogamy.” Elsewhere he talks of the “sacra- ment of faith,” and ” of the Resurrection,” and ” of human salvation,” and ” of the Pascha,” and ” of unction,” and ” of the body of Christ.” Later Latin fathers use the word with similar vagueness, e.g. Augustine speaks of the salt administered to catechumens before baptism and of their exorcism as sacraments; and as late as n 29 Godefrid so calls the salt and water, oil and chrism, the ring and pastoral staff used in ordinations. But by this time the tendency was in the West to restrict the sense of the word. Thus Isidore Hispalensis, c. 630, in his book of Origins, vi. 19, recognized as sacraments baptism and the chrism, and the Body and Blood, and he writes thus: “Under the screen of corporeal objects a divine virtue of the sacraments in question secretly brings about salvation; wherefore they are called sacraments from their secret or sacred virtues.” Bernard (In coen. Dom. § 4, op. ii. 88) calls the rite of washing feet a sacrament, because without it we have no portion with Christ (John xiii.. 8), and therefore it is necessary to salvation. Hugo de St Victor, c. it 20, in his work On the

Sacraments, distinguishes six, but of different grades of im- portance. The two principal ones necessary to salvation are baptism and the Eucharist; then come the water of aspersion and the wearing of cinders, and so forth; these advance a man in sanctity. Lastly come those needful to the hallowing and instituting of other sacraments, those which, concern the con- ferring of orders or of monkish habit. In his Summa he declares that as there are seven chief sins, either original or of act, so there must be seven sacraments to remedy them; but he only enumerates six, namely baptism and the sacraments of confirma- tion, of the altar, of penance, last unction and matrimony. Peter Lombard (c. 1150) added as a seventh that of ordination, and to this number the Latin Church adhered at the councils of Florence and Trent. This enumeration was also adopted in 1575 as against the Augustan confession of the year 1540 by Jeremiah Patriarch of Constantinople, and again in a council held in the same city in 1639 to anathematize Cyril Lucar, who with the Anglicans recognized two only, baptism and the Eucharist. It is hardly fair on the strength of these two pro- nouncements to attribute the doctrine of seven sacraments to the Eastern churches in general; except under a sporadic Latin influence, they have not troubled themselves so to define their number.

In this article it is impossible to attempt a history of the sacraments and of the controversies which in every age have arisen about them. It is enough to formulate a few general considerations of a kind to orientate and guide inquirers. To begin with, it is obvious that the number of sacraments must vary according to the criterions we use of what constitutes a sacrament. The Anglicans recognize baptism and the Eucharist alone, under the impression that Christ ordained these and none other. The Latin doctors by arguments as good as those usually put forth in such controversies have no difficulty in proving that Christ instituted all seven. How, they argue, could Paul (1 Cor. iv. 1) call himself and others ” ministers of Christ and stewards of the mysteries of God ” unless the mysteries in question had been directly instituted by Christ. They contend even that extreme unction was so instituted, and that St James in his Epistle did but promulgate it. So Christ in- stituted confirmation non exhibendo sed promittendo, not by undergoing it and so setting it forth in His own person, but by promising to send the Paraclete. The sacrament of confession and penance He equally instituted when He assigned the power of the keys to the Apostles.

The Latin Church, following Gulielmus Antissiodorensis (c.1215), distinguishes in each sacrament the matter from the form. The matter is the sensible thing which in accordance with Christ’s institution can

be raised to a sacramental plane. It is, e.g. water with immersion in the case of baptism; bread and wine in the Eucharist; anointing and laying on of hands in confirmation; contrition in the sacrament of penance. The form consists of the words used in the rite, e.g. in penance, of the formula “I absolve thee”; in the Eucharist, of the words ” This is my body ” and ” This is the cup of my blood ” or ” This is my blood “; in confirmation, of the words ” I sign thee with sign of the cross and confirm thee with chrism of salvation in name of Father and Son and Holy Spirit”; in baptism, of the words ” I baptize thee in the name of Father, Son and Holy Spirit (or among the Greeks ” N. or M. is baptized in the name,” &c). Merely verbal change in these formulae made without prejudicing the sense does not invalidate the sacrament. On the part of the minister or priest officiating must be present also an inward intention or will to do what the Church does. Thus a drunkard’s or a madman’s sacraments would only be mockery, even though the recipients received them in good faith and devoutly. On the other hand, sanctity of life on the part of the minister is not necessary in order to the validity of the sacraments which he confers, although this was held to be the case by the Donatists in the 4th century, and following them by the Waldensians and Albigenses in the 12th, and by the followers of Hus and Wycliffe in the 14th. The latter enunciated the following rule: “If a bishop or priest be

living in mortal gin, then he neither ordains, nor consecrates-, nor baptizes.” The. Cathars even held it necessary, in case a bishop fell into mortal : sin, to repeat his baptisms and ordinations, for they had been vitiated by his sins. On such points the Catholics followed the more sensible course.

Certain of the sacraments can obviously only be once conferred, e.g. baptism, confirmation and orders; but can be conditionally repeated, if there is a doubt of their having been validly con- ferred. In conditional baptism the Latins, since about the year 1227, use the formula, “If thou art not baptized, then do I baptize thee,” &c. The Latins further insist on a strict observ- ance of the traditional matter aln’d form. Thus baptism is not valid if wine or ice be used instead of water, nor the Eucharist if water be consecrated in place of wine, nor confirmation unless the chrism has been blesses! by a bishop; also olive oil must be used. The distinction, be it noted, of form and matter seems more appropriate to the sacraments of baptism, Eucharist, confirmation and last unction, than to those of orders, penance and matrimony. The recognition by the Church of the. last- named as a sacrament was, in spite of the commendation uttered by Jesus (Mark x. 9), slow and arduous, owing to the encratite enthusiasms of the first generations of believers. In many regions baptism involved

renunciation of married life, and for at least the first two hundred years marriage was a civil rrte preceding baptism, which was deferred until the age of thirty or even later. Liturgical forms for consecrating marriage are of late development, and the Church took the institution under its protection through outside social pressure rather than of its own will and wish.

In any Latin pontifical or Greek euchologion we find numerous prayers for the consecration, not only of men, but of things. Here is an example of such a petition from the 9th century codex of Heribert, archbishop of Milan: 1 “Be thou graciously pleased by the infusion of the Holy Spirit to strengthen and enhance the substance, of old approved by thee, of this oil here before thee; to the end that whatsoever in the human kind hath been touched therewith may speedily pass to a higher nature, and that the ancient Enemy may not, after anointing with the same, claim aught for himself, but that he may grieve for that he is exposed to the shafts of this blessed engine of defence, and groan because by the oil of peace the swellings of his antique fury are kept down and repressed; through our Lord Jesus Christ,” &c.

Or again the following prayer for baptism over the water from the Ethiopic Statutes of the Apostles as translated, by the Rev. G. Horner (London, 1904, p. 165): ” God, my Lord almighty, who madest heaven and earth … who mingledst and unitedst the immortal with the mortal, who madest living man a combination of the two, and gavest to that whkh was made body a soul also, which thou causest to dwell within: stir this water and fill it up with thy Holy Spirit, that it may become water and Spirit for regeneration to those who are to be baptized: work a holy work and make them to become son’s and daughters of thy holy name.”

Such petitions as the above are common in the more ancient of the Christian cults, and are all alike inspired by the idea that a spirit or divine virtue can be confined in material objects which are to be brought into contact with or swallowed by men and animals. The same idea pervades old medical treatises ;< for a drug was not a chemical substance taking effect naturally on the human system, but something into which a supernatural virtue had been magically introduced, in order the more easily and efficaciously to be brought to bear; upon the patient. The spirits which take possession of man or animal can equally take possession of a material substance, and even replace the substance, leaving the outward accidents of colour, shape and size f un- changed. This primitive belief, termed "animism" by E. B. Tylor, asserts itself evejy where in Christianity; and objects thus

invested with spiritual or curative powers are called by the Latin doctors sacramentals. Thus in the Theologia dpgmatica

1 Monumenta veteris liturgiae Ambrosianae, by M. Magistretti and A- > Qeriani (Milan, 1897), p. 99.

et moralis of P. M. Belmont, bishop of Claremont (8th ed., Paris, 1899, vol. ill. p. 119) the following definition is given of sacramenlalia: " Sacramentals are certain things or actions instituted or consecrated by the Church for the production of certain spiritual effects, and sometimes for the obtaining of a temporal effect."

Some of the older authorities, like Caietanus and Soto, taught that sacramentals as above defined have power to produce their effects ex opere operato, i.e. by their own inherent virtue; others that they produce them ex opere operands, i.e. through the merit and disposition of the user. But in the latter case, argues M. Belmont, what is the use of the prayers offered up over the substances; and how account for the differences of effects which by the testimony of the faithful are respectively caused by water duly blessed and by water falsely blessed? If the mere state of mind of the person using the water deter- mines the effect, then in the case of both kinds of benediction, the true and the false alike, it would be one and the same. He therefore inclines to the opinion that there is no inherent virtue in sacramentals, but that God is moved by the prayers uttered in their consecration to produce salutary effects in those who use them. Thus he avoids on the one side the opus operatum view, and on the other a merely receptionist position.

The consecration of material objects and in general their use in religion and cult was consistently avoided by the Mani- cheans; not because they failed to share the universal belief of earlier ages that spirits can be inducted by means of fitting prayers and incantations into inanimate things, but because the external material world was held to be the creation of an evil demiurge and so incapable of harbouring a pure spirit. The sacramentals of the great Church were denounced by them as vehicles of the evil one; and this class of prejudice was carried to such a length that some of them eschewed even baptism with water and the sacrament of bread and wine. That they retained the laying on of hands in their spiritual baptism was an incon- sistency which their orthodox opponents did not fail to note;

the human hand, argued the latter, is, like the rest of the body, no less the work of the evil creator than water, oil, bread and wine, or than the wood, metal and stone out of which altars, images and churches are made. Relics for the same reason were abhorred by the Manicheans; the Catholics defending them on the ground that the bodies of saints participate in a divine virtue and have a power of making men whole and working miracles in the same manner as had the cloak of Elijah (2 Kings ii. 14), or the corpse of Elisha {ibid. xiii. 21), the hem of Christ's garment (Matt. ix. 20), Peter's shadow (Acts v. 15), the hand- kerchiefs or aprons off Paul's body (ibid. xix. 12). The Mani- cheans' answer to such arguments was that miracles worked by Christ and the Apostles in the material world were only appari- tional and not real, while those of the Old Testament were satanic. It has been argued that the sacramental rites of the Christians were largely imitated from the pagan mysteries; but for the first two hundred years this is hardly true, except perhaps in the case of certain Gnostic sects whose leaders intentionally amalgamated the new faith with old pagan ideas and rites. It is true that Gentile converts carried Over into the new religion many ideas and habits of cult contracted under the old; this was inevitable, for no one lightly changes his religious habits and categories. For long generations the doctors of the Church fought bravely against such an infusion of heathen customs; thus in Latin countries we find the rule to keep New Year's day as a fast, just because the pagans feasted on it, giving one another gifts (strenae, Fr. Urennes) and taking omens for the coming year. But in the 4th century this puritanic zeal gave way; and this and other pagan feasts were taken over by the Church; a century earlier in Asia Minor Gregory the Thau- maturge was actively transforming into shrines and cult of martyrs the temples and idolatrous rites of heroes and demigods. In proportion as such conversion was facile and rapid, it was probably imperfect.

That baptism is called the Seal (afoayis), and Illumination (0wtw>i6s) in the 2nd century has been set down to the influence

of the pagan mysteries; but as a matter of fact the former term is a metaphor from military discipline, and the idea con- veyed in the latter that gnosis or imparting of divine love is an illumining of the soul is found both in the Old and New Testaments. Nor because the pagans regarded the close meetings of the Christians usually held in private houses as mysteries in which incest and cannibalism were rife, does it follow that the Christians themselves accepted the comparison. On the contrary, as a thousand passages in the earlier apologists attest, they viewed the pagan mysteries with horror and detestation. Nor were they so solicitous, as it is pretended, to conceal from the

authorities what they did and said in their liturgical meetings. The Christians 1 of Bithynia were evidently quite frank about them to Pliny (c. 112), and Justin in his Apology reveals everything to a pagan emperor (c. 150). That catechumens could not participate in the agape or love-feast (of which in this epoch the Eucharist was merely an episode) does not give to those feasts the character of a Greek mystery. The uncircum- cized proselyte was similarly excluded from the Paschal meal on which the Eucharist was largely modelled, even though it may not have been in any way a continuation of the same. Baptism and the agap6 took their rise in Palestine, and in their origin certainly owed little or nothing to outside influences. For both there can be found Jewish models, if necessary. The sacred feasts of the Essenes and Therapeutae in particular, as de- scribed by Josephus and Philo, closely resembled the Eucharistic agape.

Undeniably Clement of Alexandria and Origen apply the language of the Greek mysteries to Christian gnosis and life. ” These are,” says Clement, ” divine mysteries, hidden from most and revealed to the few who can receive them.” And Origen compares them to the sacred vessels, and would have them ” guarded secretly behind the veil of the conscience and not lightly produced before the public.” He who so produces them ” dances out the word of the true philosophy,” — a technical description of the profanation of the mysteries. It is not even safe, according to these two fathers, to commit too much to writing; and Clement undertakes not to reveal in writing many secrets known to the initiated among his readers; otherwise the indiscreet eye of the heathen may rest on them, and he will have cast his pearls before swine. But we may discount most such talk in these writers as bellettristic pedantry, copied as a rule from Philo of Alexandria, their literary model. In the latter’s description of the Therapeutae (ed. Mangey, ii. 475) we read how each ascetic had ” in his house a room in which in solitude they celebrated the mysteries of the holy life, introducing nothing therein, either to drink or to eat, nor anything else necessary for the uses of the flesh.” And in scores of other passages Philo dwells on ” the ineffable mysteries ” of Jewish faith and allegory. He even writes thus: ” O ye initiated ones, with purified sense of hearing, shall ye accept in your souls these truly sacred mysteries, nor divulge them to any of the uninitiated. ... I have been initiated by Moses the friend of God in the great mysteries.” But because he uses the language of the Greek mysteries, Philo never imitated the thing itself; and he is ever ready to denounce it in the bitterest terms. Clement and Origen really meant no more than he. At a later period, however, the difficulty of screening the rites of baptism and Eucharist from the eyes of catechumens and from their ears the

creeds and liturgies — a difficulty which had ever been formidable and which after the overthrow of paganism must have become insurmountable — seems to have provoked not only a great outpouring on the part of the Christian rhetors, like Basil, Chrysostom, the Gregories and the Cyrils, of phrases borrowed from the Greek mysteries, but perhaps an actual use of precautions. Thus the bishop of Rome, Julius (c. 340), complained (Athanasius, Apol. cont. Arian. 31, Migne 25, 300) that a court of law had not been cleared of catechumens, Jews and pagans, in a case where the legal discussion introduced the topic of the table of Christ; and the preachers of the 4th and

1 Perhaps, however, Pliny refers only to the renegades among them.

5th centuries in their discourses often make a point of not citing the creed or describing the Eucharist; they stop short and ejaculate such remarks as laaaw ol iricrToi, norunt fideles (" the faithful know it "). Such was the Discipline, arcani. All will admit who study the post-Nicene Church, that the Christian sacraments have stolen the clothes of the pagan mysteries, dethroned and forbidden by the Christian emperors. The catechumenate, an old institution, older in most regions than the mysteries themselves, suggested and rendered feasible such wholesale theft, especially in an age in which the sacerdotal class wished to be pre-eminent, and left nothing undone to enhance in the eyes of the multitude the importance and solemnity of rites which it was their prerogative to administer. The dis-appearance, too, of the pagan mysteries must have left a void in many hearts, and the clerics tried to fill it up by themselves masquerading as hierophants.

In the age of the Council of Nice the custom arose of baptizing children of three, because at that age they can already talk and utter the baptismal vows and responses. Not a few homilies of that age survive, denouncing the deferring of baptism, and urging on parents the duty of initiating their young children. Thus there is much evidence to show that long before a.d. 500 child baptism was in vogue. But in that case how can the creed and ritual of baptism, the Lord's Prayer and the Eucharistic formulae, have been kept secret? How can they have been the " awful mysteries," the " dread and terrible canons," the " mystic teachings," the " ineffable sentences," the " oracles too sacred to be committed to writing " which the

homilists of that age pretend them to have been? Could our modern freemasons continue to hide their watchwords and ritual, or even make a pretence of doing so, if they were constrained by public opinion to initiate every child three years of age? The thing is absurd. When, therefore, we find such phrases in Greek and Latin homilies of the period of 350 to 550 we must regard them as elaborate make-believe. Because catechumens as well as the faithful were present at the sermons, the preachers thought it becoming to throw them in; but the audience must have been aware that their secrets were open ones.

Literature. — Theologia dogmatica et moralis ad mentem S. Thomae Aquinatis et S. Alphonsi de Ligorio (6 vols., Paris, 1899); Gustav Anrich, Das antike Mysterienwesen (Gottingen, 1894); L. Duchesne, Origines du culte Chretien (Paris, 1898) ; Joseph Bingham, Origines ecclesiasticae (London, 1834); Adolf Harnack, Dogmen- geschichte (Freiburg, 1897). (F. C. C.)

SACRAMENTALS (Sacramentalia) , in the Roman Catholic Church certain acts or ordinances instituted not by Christ, but by the Catholic Church with divine authority. They are believed, in their application to persons and things, to communicate quasi ex opere operalo through ordained priests the grace of God, consisting in purification, supernatural revivification and sanctification. The term is thus used to cover the rites of dedication, consecration and benediction, and, closely connected with the last-named, exorcism.

SACRAHENTARIANS, the name given to those who during the Reformation controversies not only denied the Roman Catholic ” transubstantiation,” but also the Lutheran ” con- substantiation.” They comprised two parties: (1) the followers of Capito, Carls’.adt and Bucer, who at the diet of Augsburg presented the Confessio Telrapoltiana from Strassburg, Constance, Lindau and Memmingen; (2) the followers of the Swiss reformer Zwingli, who to the same diet presented his private confession of faith. The doctrinal standpoint was the same — an admission of a spiritual presence of Christ which the devout soul can receive and enjoy, but a total rejection of any physical or corporeal presence. After holding their own view for some years the four cities accepted the Confession of Augsburg, and were merged in the general body of Lutherans; but Zwingli’s position was incorporated in the Helvetic Confession. It is a curious inversion of terms that in recent years has led to the name Sacramentarians being applied to those who hold a high or extreme view of the efficacy of the sacraments.

SACRAMENTO, the capital of California, U.S.A., and the county-seat

of Sacramento county, 91 m. (by rail) N.E. of S'an

Francisco, on the eastern bank of the Sacramento river, about 61 m. above its mouth, at the point where it is joined by the American. Pop. (1850) 6820, (1890) 26,386, (1900) 29,282, of whom 6723 were foreign-born (1371 Germans, 1293 Irish, 964 Chinese, 655 English, 446 English Canadian and 337 Japanese) and 402 were negroes, (1910, census) 44,696. Land area (1906) 4-49 sq. m. Sacramento is on the direct east- ward line to Ogden, Utah, of the Southern (once the Central) Pacific railway (which has its main shops here), the starting point of the Southern Pacific line to Portland, Oregon, the terminus of several shorter branches of the Southern Pacific and on the Western Pacific, which has repair shops here, and it is served by interurban electric railways connecting with places in the Sacramento and San Joaquin valleys. The city is about 200 m. below Red Bluff, the head of river navigation for boats drawing 2 or 25 ft. of water; for boats drawing 4 to 5 ft. Colusa, 91 m. above Sacramento, is the head of navigation; at low water, vessels drawing 7 ft. of water go up the river to Sacramento. There are two daily steamer lines to San Francisco, besides freight lines.

The city site is level (formerly in many parts 5 ft. below flood- level of the river) and is about 30 ft. above sea-level, and the street plan is rectangular. The business quarter has been filled in, and levees have been built along the Sacramento and American rivers. The climate is mild: the average annual temperature is 60-5° F.; average for winter months, 48-3°; for spring, 59-5°; for summer, 71-7°; for autumn, 61-5°; average rainfall, 19-94 in.; average number of clear days per annum, 244. The principal buildings are: a very fine state capitol (cornerstone laid, i860; completed, 1874) in a wooded park of .35 acres, in which is an Insectary where parasites of injurious insects are propagated; Roman Catholic and Protestant Episcopal cathedrals; the county court-house; the city hall; the public library (in 1908, 41,400 volumes); and the Crocker Art Gallery, which was presented to the city by the widow of Judge E. B. Crocker, one of the founders of the Central Pacific, with an art school and an exhibit of the minerals of the state. There is a state library of 140,000 volumes in the capitol; connected with it are travelling libraries sent out through the rural districts of the state. In Sacramento are the large state printing establish- ment, in which, in addition to other books and documents, text-books for the entire state school system are printed; the College of the Christian Brothers, Howe's Academy, Atkinson's Business College, St Joseph's Academy, the Stanford-Lathrop Memorial Home for Friendless Girls (1900), under the Sisters of Mercy, two other orphanages, the Southern Pacific Railway, Hospital (1868), the Mater Misericordiae Hospital (1895,

Sisters of Mercy), Wentworth Hospital, a City Receiving Hospital (1884), the Marguerite Home (for old ladies), the Mater Misericordiae Home (1895, Sisters of Mercy) and the Peniel Rescue Home (1899). Just outside the city limits is the State Agri- cultural Pavilion, with race track and live-stock exhibition grounds (where the State Agricultural Society holds its annual " State Exposition " in September).

The city has a large wholesale trade. Its prosperity rests upon that of the splendid Sacramento Valley, a country of grain and fruit farms, along whose eastern side lie the gold-producing counties of the state. It is the centre of the greatest deciduous fruit region of California, and shipped about 11,000 car-loads east of the Rocky Mountains in 1909. Sacramento derives electric power from Folsom, on the American river, 22 m. away, and from Colgate, on the Yuba river, 119 m. distant. The manufacturing interests of the city arfe large and varied: the city's manufactures include flour (1905, value $1,172,747), lumber, distilled liquors, canned and preserved vegetables and fruits, packed meats, cigars and harness. In 1905 the total value of the factory product was $10,319,416. In 1909 the assessed valuation of the city was about $30,400,000, and the bonded indebtedness about $1,100,000. The city owns its own water system, which has a capacity of 22 million gallons daily, and is a financial success. In 1839 John Augustus Sjutter (1803-1880), a Swiss military

officer, was allowed to erect a fort on the then frontier of Cali- fornia, on the present site of Sacramento. He became a Mexican official (1840), and in 1841 obtained from the Mexican govern- ment a grant of 11 square leagues of land. Sutter's fort, or " New Helvetia " (a reproduction of which, with a historical museum, in Fort Sutter Park, is one of the objects of interest in the city), was on the direct line of overland immigration from the East, and its position— -purposely Selected by Sutter with a view to freedom of interference from Mexican officials — made Sutter a man of great importance in the last years of the Mexican regime. After the discovery of gold in 1848, made on Sutter's land, near the present Coloma, about 45 m. E.N.E. of Sacramento, several rival towns were started on Sutter's property near the fort. Of these fortune finally favoured Sacramento — a name already frequently applied to the fort, and adopted for the name of the settlement about its embarcadero or river landing in 1848. The first sale of town lots was in January 1849. Here began the determined

movement for the organization of a state government. The extraordinary richness of the placer mines of ‘49 caused the city to grow with wonderful rapidity. In October 1849 its population was probably 2000, in December 4000 and a year later 10,000. Trouble with land “squatters ” almost led to local war in 1850. In 1849 the city offered $1,000,000 for the honour of being the state capital, which it finally secured in February 1854 (the legislature having already met here once in 1851). Between November 1849 and January 1853 the city was thrice devastated by fearful floods, and it was two-thirds destroyed by fire in November 1852; but though these misfortunes caused a collapse of inflated realty values they did not seriously cripple the city in its development. A city government was organized in August 1849, and in February 1850 this government was incorporated, and in 1863 reincorpor- ated ; the city and county governments were consolidated from 1858 to 1863; and a new city charter was received in 1893, coming into effect in 1894. The first local steam railway of California was opened from Sacramento in 1855, and here in 1863 was begun the building of the Central Pacific railway across the Sierras, the first train from the Atlantic coast reaching Sacramento in May 1869. In 1862 there was another flood, the most destructive in the history of the city; since then the measures taken for protection have secured safety from the river. The government of the city in the ‘fifties was excessively corrupt and expensive. Progress since the end of the flush mining days has been steady and conservative. ” SACRARITJM, the term in classic architecture given to the cella of a temple, and to the apartment in a dwelling-house which was sacred to a deity. In medieval architecture the term is applied on the European continent to that portion of a chancel, which, enclosed with a railing or balustrade in front of the altar, is ‘devoted to the celebration of the Holy Eucharist; this in England is generally known as the presbytery:

SACRED HEART. Devotion to the Sacred Heart of Jesus is a cult peculiar to the modern Roman Catholic Church. The principal object of this devotion is the Saviour Himself. The secondary and partial object is that Heart which was the seat or organ of His love, arid which forms the natural symbol thereof . Heart and love are viewed, not physiologically, but in their moral connexion. The chief liturgical expressions of this cult are the institution of a feast of ‘the Sacred Heart and public representations of it by statues and pictures.

Private worship of Christ’s heart in particular is of great antiquity in the Churchj and is prominent in St Gertrude and other mystics. It was greatly stimulated in the 1 7th century by St Francis” of Sales (q.v.) who gave this symbol to his Order (the Visitation) as its badge. The

Venerable Fr. Eudes must also be mentioned as a great propagator of the devotion, in the same century, and he was the first to obtain a certain public, though only local, authorization of the new pious practices. Blessed Margaret Mary Alacoque (1647-1690),ˆ Visitation nun of Paray-le-Monial, assisted by her director, the Venerable Claude de la Colombiere, S.J, (1641-1682), was the instrument of the introduction of the specific worship of the Sacred Heart

into the Church by a decision of the supreme authority, although their Work only took effect long after their death. Mary of Modena, the exiled queen of James II., at the instance of the Visitation, petitioned in 1697 for a proper Feast of the Sacred Heart. Neither then, however, nor on the presentation of new petitions in 1726, was an affirmative answer obtained. Meanwhile the chief objection, that of ” novelty,” was gradually removed by the multiplication of local manifestations, the genuineness of which was proved to the satisfaction of the Roman Congregation of Rights, and in 1765 it was allowed for houses of the Visitation and certain countries. It must be added that this devotion was strongly opposed, not only by the Jansenists, but by others within the Church, under the mistaken idea that the Heart of Christ was viewed in it as separate from the rest of His Being. The formulation of this objection by the synod of Pistoia, 1 in 1786, however, only provoked a clearer explanation of the doctrine, which contributed to confirm the cult. In 1856 Pius IX. introduced the feast into the general calendar of the Roman Catholic Church, fixing the Friday after the Octave of Corpus Christi for its celebration. The Beatification of Blessed M.‘M. Alacoque in 1864 gave a new impetus to the cause of which she had been the apostle.

See Nic. Nilles, S.J., De rationibus festorum SS. Cordis Jesu, &c. (3rd ed., Innsbruck, 1873); E. Letrierce, S.J., Hlud.es sur le Sucre Cwur el la Visitation (Paris, 1890). These two works contain biblio- graphical lists. Dalgairns, The Devotion to the Heart of Jesus (1853); H. E. Manning, The Glories of the Sacred Heart (1876); Jos. Nix, Cultus ‘ SS. Cordis Jesu . . . cum additamento de cultu purissimi cordis B.V. Mariae (2nd ed., Freiburg-i.-B., 1891). (H. B. M.)

SACRIFICE (from Lat. sacrificium; sacer, holy, and facere, to make), the ritual destruction of an object, or, more commonly, the slaughter of a victim by effusion of blood, suffocation, fire or other means. While the Hebrew for sacrifice, mi, makes the killing of the victim the central feature of the ceremony, the Latin word brings out the fact that an act of sacralization (see Taboo) is an essential element in many cases. The sacrifice of desacralization is, however, also found; hence MM. Hubert and Mauss describe a sacrifice as ” a religious act, which,

by the consecration of a victim, modifies the moral state of the sacrificer or of certain material objects which he has in view," i.e. it either confers sanctity or removes it and its analogue, impurity. It is, in fact, " a procedure whereby communication is established between the sacred and profane spheres by a victim, that is to say by an object destroyed in the course of the ceremony." By this definition the term sacrifice is extended to cover the inanimate offering which is consumed by fire, broken or otherwise rendered useless for the purpose of human life.

Theories of Sacrifice. — Explanations of sacrifice, as of other rites, are naturally not wanting among the peoples who have practised or still practise it; but they are often of the nature of aetiological myths and give no clue to the original meaning. Scientific theories date from the second half of the last century, and were originated in the first instance by the English anthropo- logical school.

(a) According to the view put forward by Dr Tylor, the sacrifice is originally a gift, offered to supernatural beings by man for the purpose of securing their favour or minimizing their hostility. By a natural series of transitions the gift theory became transformed, in the minds of the sacrificers, into the homage theory, which again passed by an easy transition into the renunciation theory. These were, in fact, simply the popular theories of sacrifice put on an evidential basis by facts drawn from various stages of culture.

(b) -With W. Robertson Smith, on the other hand, a new era was reached, in which the recently recognized existence of Totemism (q.v.) was made the basis of an attempt to give a

'Scipione de Ricci, bishop of Pistoia from 1780 to 1791, on the ex-Jesuits requesting him to consecrate a bell dedicated to this object, issued a pastoral letter (3rd June 1784) in which he pointed out that the spirit of true religion was " far removed from fetichism," and warned his flock against " cardiolatry." This pastoral was subsequently in 1786 annexed to the resolutions passed by the re- forming synod of Pistoia (q.v.), and was condemned with eighty-four I other propositions by papal bull in 1794. — Ed,

theory of origins. The first form of his theory distinguishes (i.) honorific, (ii.) piacular and (iii.) mystical or sacramental sacrifices;

but the latter type is traced back lo the same cycle of ideas as that in which the piacular sacrifice originated, (i.) The essential feature of this type was that the god and his worshippers shared the sacrifice and might thus be regarded as commensals, or table companions. The human commensals were the totem-kin, whom Robertson Smith conceived to have been in the habit of sharing a common meal in daily life, or at least of not mixing with other kins. The object of sharing the meal with the god was to renew the blood bond. The victim was the animal of a hostile totem-kin or an animal commonly offered to the god. The god was originally a stranger, taken into the kin by a rite of blood brotherhood, and this constitutes the dark point of the theory; for Robertson Smith regards the blood bond as relatively late; hence we do not see how the god became associated with the kin. (ii.) The piacular sacrifice arose from the need of atoning for bloodshed within the kinship group; properly speaking, the culprit himself should suffer: should he be unknown or beyond the reach of vengeance, a substitute had to be found. This was naturally found in the non-human member of the totem-kin — the totem animal; in a sense, therefore, the god died for his people, (iii.) In the mystical sacrifice the god is himself slain and eaten by his worshippers. In the Religion of the Semites (2nd ed., 1894) the theory was remodelled so as to overcome the difficulty pointed out above. The god, the victim and the human group are regarded as of the same kin; the animal (totem) is the earlier form of the god; the deity was originally female, for under matrilineal rules the mother alone is of kin to her children, but, with the rise of descent in the male line, the god was transformed into a male. The sacrifice is in its origin a communion; god and worshippers have a bond of kinship between them; but it is liable to be interrupted or its strength diminished. Ceremonies of initiation are the means by which the alliance is established between the deity and the young man, when the latter enters upon the rights of manhood; and the supposed bond of kinship is thus regarded as an artificial union from the outset, so far as the individual is concerned, although Robertson Smith still maintains the theory of the fatherhood of the god, where it is a question of the origin orf the totem-kin. From the communion sacrifice sprang the piaculum, which here becomes a subsidiary form and finds its full explanation in the ideas connected with the mystic union of god and worshippers. For the object of the piactdum is the re-establishment of the broken alliance, which was precisely that of the communion sacrifice. With the decline of totemism arose the need for human sacrifice — the only means of re-establish- ing the broken tie of kinship when the animal species was no longer akin to man. ‘

This theory of Robertson Smith's has been attacked from two sides. In the first place, L. Marillier (Ra>. de I'hist. des religions, xxxvi. 243) argues that if there was an original bond of kinship between the god and the kin, there is no need to maintain it by sacrificial rites, and cites against Smith's view the practice of totemic groups. To this it might be replied that the real signi- ficance of initiation ceremonies is still obscure; it is a plausible argument that the child does not form part of the kin till after initiation, but this argument seems inconclusive, for in West Australia there is solidarity, according to Grey (Journals, ii. 239), between the whole of the kinship group, whether adult or not; and, moreover, nowhere are rites found which are intended to strengthen the union between a man and his totem by meang of the blood bond, unless we include the aberrant totemism of the Arunta (Spencer and Gillen, Native Tribes of Central Australia, 167), who eat their totems in order to gain magical powers of increasing the stock of the totem animal. Marillier further argues that if, on the other hand, there was no bond between god and people but that of the common meal, it does not appear that the god is a totem god; there is no reason why the animal should have been a 1 totem; and in any case this idea' of sacrifice can hardly have been anything but a slow growth and con- sequently not the origin of the practice. In the second place,

MM. Hubert and Maus's point out that Robertson Smith is far from having established either the historical or the logical con- nexion between the common meal and the other types of sacrifice; the simplest Semitic forms known to us are the most recently recorded; further their simplicity may mean no more than documentary insufficiency, and in any case does not imply any priority; the piaculum is found side by side with the communion at all times. Moreover, under piaculum are confused purification, propitiations and expiations; Smith's contention that purifica- tions, whose magical character he recognizes but interprets as late, are not sacrificial, is far from conclusive.

(c) Building in part on the foundation laid by Robertson Smith, Dr J. G. Frazer has put forward the view that while the sacrifice of the god may have been piacular, it was also intended to preserve his divine life against the inroads of old age. This theory he exemplifies by two orders of cases, (i.) the putting to death of the man-god, who is often also the king, on whose health is held to depend the safety of his people, of the world, or even of the universe; and (ii.) the annual killing of the representative of the spirit of vegetation orof the Corn-spirit (see Demonology).

(d) For L. Marillier sacrifice was, at its origin, essentially a magical rite — the liberation by the effusion of a victim's blood of a magical force which was to bend the gods to the will of man; from this arose, under the influence of cult of the dead, the gift theory of sacrifice. Adopting the theory of W. R. Smith, Marillier also maintained, but without clearly explaining the relation of this part of his theory to the preceding, that a human kinship group conceived the idea of allying itself with one god in particular. This they did by sacrificing a victim and effecting communion with the god by the application of its blood to the altar; or, more directly, by the sacrifice of the animal-god and the contact of the sacrificer with its blood.

(c) Dr Westermarck takes the view that human sacrifice is as a : rule an act of substitution, in that men offer a victim in the hope of saving themselves; but he also recognizes funeral sacrifices of various kinds. Certain sacrifices of animals he explairis as intended to transfer a conditional curse.

(/) The preceding theories are attempts, in the main, to derive from one source all the forms of sacrifice. MM. Hubert and Mauss, while admitting that in all sacrifices is found some idea of purchase or substitution, decline to admit that all have issued from one primitive form. In their view, based on an analysis of Hebrew and Hindu forms of sacrifice, the unity of sacrifice consists in the immediate aim of the ritual, not in the ultimate end to be attained; for we rarely find a rite other than complex' and by the same sacrifice more than one result may be sought or attained. The unity of procedure consists in the fact that every sacrifice involves putting the divine in communication with the profane by an intermediary— the victim — which may be piacular Or honorific, a messenger or a means of divination; a means of alimenting the eternal life of the species or a source of magical energy which the rite diffuses over objects in its neighbourhood. •

(g) Our knowledge of primitive forms of sacrifice is meagre; even were it more extensive, it would probably be impossible to determine the origin or origins of sacrifice; for no ritual has necessarily survived unchanged in form and meaning since its inception, and even permanence of form cannot be taken to imply a corresponding permanence of meaning for the worshippers. If, however, we turn to Australia, where sacrifice is 'unknown* we find more than one class of rites in which we can trace an idea akin to some forms of sacrifice. Just as the German reaper leaves the last ears of corn as an offering to Wodan, so the Australian black offers a portion of a find of honey; in New South Wales a pebble is said to have been offered or a number of spears, in Queensland the skin removed in forming the body-scars.

Thus it appears that the gift theory may after all be primitive; 1 the worship of, or care for, the dead may have supplied in other areas the motive for the transition from offering to sacrifice or the evolution may have been due to the spiritualization of the gods. In Australia, among the Hottentots,

in the Malay Peninsula and elsewhere, "blood ceremonies are in use which are unconnected with the slaughter of a victim; in this blood ritual we may see another possible source of sacrifice. The Arunta hold that the spirits of kangaroos are expelled by human blood from certain rocks. By parity of reasoning a blood ritual may have been adopted by peoples who practise the expulsion of evils, conceiving them either animistically or as powers; catharsis, in the sense of removal of uncleanness, is not necessarily primitive.

Principles of Classification. — It is possible to classify sacrifices according to (a) the occasion of the rite, (b) the end to be achieved, (c) the material object to be affected or (d) the form of the rite.

(a) The division into periodical and occasional is important in Hindu and other higher religions, and the sutras constantly draw the distinction; the former class is obligatory, the latter facultative. In less developed creeds the difference tends to remain in the background; but where sacrifices are found, solemn annual rites, communal, purificatory or expiatory, are celebrated, and these are held to be in like manner obligatory.

(b) The end to be achieved is, as has been shown by Hubert and Mauss, sometimes sacralization, sometimes desacralization. In the former case the sacrificer is raised to a higher level; he enters into closer communion with the gods. In the latter either some material object, not necessarily animate, is deprived of a portion of its sanctity and made fit for human use, or the sacrificer himself loses a portion of his sanctity or impurity. In the sacrifice of sacralization the sanctity passes from the victim to the object; in that of desacralization, from the object to the victim, (c) Sacrifices may be classified into (i.) subjective or personal, where the sacrificer himself gains or loses sanctity or impurity; (ii.) objective, where the current of mana (see Taboo) is directed upon some other person or object, and only a secondary effect is produced on the sacrificer himself, (d) The form of the sacrifice is discussed in the next section.

Ritual. — For Hinduism and later Judaism we possess a wealth of material on which to base a comparative study of the forms of sacrifice; a form of this — animal sacrifice in the Vedas — has been analysed by MM. Hubert and Mauss. For Greece and Rome, where the instructions as to ritual were not embodied in the elaborate codes handed down in Hinduism or Judaism, our material is far less complete. For other areas we have often no description of the procedure at all, but merely the briefest outline of the actual process of slaughter, and we are ignorant whether the form of the rite is in reality simple (either from a loss of primitive elements or from never having advanced beyond the stage at which we find it), or whether the absence of detail Is due to the inattention or lack of interest of the observer. It must therefore be understood that the following analysis of ritual, based on the most elaborate codes known to us, is by no means conclusive as to the primitive form or forms of sacrifice. The necessary elements of a Hindu sacrifice are: (1) the sacrificer, who provides the victim, and is affected, directly or indirectly, by the sacrifice; he may or may not be identical with (2) the officiant, who performs the rite; we have further (3) the place, (4) the instruments of sacrifice and (5) the victim; where the sacrificer enjoys only the secondary results, the direct influence of the sacrifice is directed towards (6) the object; finally, we may distinguish (7) three moments of the rite — (a) the entry, (b) the slaughter, (c) the exit.

The sacrifices of sacralization and desacralization mentioned above find their analogues in the Hindu scheme of the rite; sacralization and desacralization, sometimes performed by means of subsidiary sacrifices, are the essential elements of the prepara- tion for sacrifice and the subsequent lustration. In the most developed forms, such as the offering of soma, they assumed a great importance; (1) the sacrificer had to pass from the world of man into a world of the gods; consequently he was separated from the common herd of mankind and purified; he underwent ceremonies emblematic of rebirth and was then subject to number- less taboos imposed for the purpose of maintaining his ceremonial purity. In like manner (2) the officiant prepared himself for his task; but in his case the natural sanctity of the priest relieved

him of the necessity of undergoing all that the common man had to pass through; in fact, this was one of the causes which brought him into existence,' the other being the need of a functionary familiar with the ritual, who would avoid disastrous errors of procedure, destructive of the efficacy of the sacrifice. (3) Where there was an appointed place of sacrifice — the Temple at Jerusalem, according to later Jewish prescription — there was no need of preparation of a place of

sacrifice; but the Hindu chose, each for himself, the site of his altar. (4) The necessary rites included (a) the establishment of the fires, friction being the only permitted method of kindling it, (b) the tracing on the ground of the vedi, or magical circle, to destroy impurities, (c) the digging of the hole which constituted the real altar, (d) the preparation of the post which represented the sacrificer and to which the victim was tied, and other minor details. (5) The victim might be naturally sacred or might have to undergo sanctification. In the former case (a) individual animals might be distinguished by certain marks, or (b) the whole species might be allied to the god; in the latter case the victim had to be without blemish; (c) the age, colour or sex of the victim might differ according to the purpose of the sacrifice. It was first cleansed; then plied with laudatory epithets; and, thirdly, soothed, so that it might be more acceptable to the gods and less likely to do an injury after its death, when its spirit was set free. It had now reached a degree of sanctity and only the priest might touch it; it was sprinkled with water, and anointed with butter; finally, the priest made three turns round it with a lighted torch in his hand, which finally separated it from the world and fitted it for its high purpose. The object of the sacrifice being to bridge the gulf between the sacred and profane worlds, the sacrificer had to remain in contact with the victim, either personally, or, to avoid ritual perils, by the intermediary of the priest. After excuses made to the animal or to the species in general, the victim was placed in position, and silence observed by all who were present. The cord was drawn tight and the victim ceased to breathe; its spirit passed into the world of the gods. But this did not conclude the ceremony, even as far as the victim was concerned; it remained to dispose of the corpse. After a rite intended to secure its perfect ceremonial purity, a part of the victim, the vapa, was removed, held over the fire and finally cast into it. The remainder, divided into eighteen portions, was cooked; seven fell to the sacrificer, after an invocation, which made them sacred by calling the deity to descend into the offering and thus sanctify the sacrificer. (6) Then followed the rites of desacralization, including burning of certain of the instruments, lustration of the post, destruction of the butter, &c. Finally the priest, the sacrificer and his wife performed a lustration, found in an exaggerated form in the ” bath ” which concluded the soma sacrifice, and the ceremonies were at an end.

How far this scheme of sacrifice holds good for other areas, and in particular for more primitive peoples, is an open question; Our data are nowhere so full as for India; where they are com- paratively abundant they refer either to a civilized or semi- civilized people, or to an area, like West Africa, where the influence of Islam has

introduced a disturbing element. Though the moralization of gods has only proceeded pari passu with the moralization of mankind, the deities of the more advanced nations are perhaps felt by them to be more terrible and more difficult of access than the divinities of lower races; herein lies one explanation of the power of the priesthood. Even if the conception of the relative sanctity of gods and men re- mained unaltered, it by no means follows that in primitive times the same precautions were necessary in approaching the former as were demanded by the consciousness of later generations. With our present knowledge the problem of the original form of sacrifice, if there be a single primary form, is insoluble.

No general survey of sacrificial ritual is possible here, but a few details as to the mode of slaying the victim and disposing of the body may be given. The head of the animal or man may be cut off (and custom often requires that a single blow shall suffice), its spine broken or its heart torn out; it may be

stoned, beaten to death or shot, torn in pieces, drowned or buried, burned to death or hung, thrown down a precipice, strangled or squeezed to death. The sacrificer may aim at causing a speedy death or a slow one. The corpse may be burnt, in part or as a whole; portions may be assigned to the priest, the sacrificer and the gods; the skull, bones, &c, may receive special treatment; the fat or blood may be set aside, and they or the ashes may be singled out as the share of the god, to be offered upon the altar; the skin of the victim may be employed as a covering for the idol or material representative of the god, either permanently or till the next annual sacrifice. The blood of the victim may be drunk by the priest as a means of inducing inspiration, its entrails may be employed in divination, its flesh consumed in a common meal, exposed to the birds and beasts of prey or buried in the earth.

It is equally impossible to give a general survey of the purposes of sacrifice; not only are they too numerous but it is rare to find any but mixed forms; the scapegoat, for example, is also a messenger to the dead, and its flesh is eaten by the sacrificers. Certain main types may, however, be enumerated.

Cathartic Sacrifice. — In primitive cults the distinction between sacred and unclean is far from complete or well defined (see Taboo);

consequently we find two types of cathartic sacrifice — (i.) one to cleanse of impurity and make fit for common use, (ii.) the other to rid of sanctity and in like manner render suitable for human use or intercourse.

(i.) The most conspicuous example of the first class is the scapegoat. Two goats were provided by the ancient Hebrews on the Day of Atonement; the high priest sent one into the desert, after confessing on it the sins of Israel; it was not permitted to run free but was probably cast over a precipice; the other was sacrificed as a sin-offering. In like manner in the purification of lepers two birds were used; the throat of one was cut, the living bird dipped in the blood mingled with water and the leper sprinkled; then the bird was set free to carry away the leprosy. In both these rites we seem to have a duplication of ritual, and the parallelism of sacrifice and liberation is clear.

(ii.) As an example of the second class may be taken the sacrifice of the bull to Rudra. MM. Hubert and Mauss interpret this to mean that the sanctity of the remainder of the herd was con- centrated on a single animal; the god, incarnate in the herd, was eliminated by the sacrifice, and the cattle saved from the dangers to which their association with the god exposed them. In the Feast of Firstfruits we have another example of the same sort; comparable with this concentration of holiness is the respect or veneration shown to a single animal as representative of its species (see Animal Worship). In both these cases the object of the rite is the elimination of impurity or of a source of danger. But the Nazarite was equally bound to lay aside his holiness before mixing with common folk and returning to ordinary life; this he did by a sacrifice, which, with the offering of his hair upon the altar, freed him from his vow and reduced him to the same level of sanctity as ordinary men.

With regard to the scapegoat, it must be noted that we also meet with a more concrete idea of expulsion of evil (see Demonology, Exorcism), which is present among the most primitive peoples, such as the Australians. This raises the problem of how far the catharsis dealt with above is in its original form an elimination of impurity, and how far something more definite — a spirit or other principle of evil — is held to be expelled by scapegoat and allied ceremonies.

Communal Sacrifice. — In spite of the importance attached to the idea of the common meal by Robertson Smith, it is not a primitive rite of adoption. The custom of eating the body of the victim does not necessarily spring from any idea of com- munion with the god; it may

also arise from a desire to incor- porate the sanctity which has been imparted to it — an idea on a level with many other food customs (see Couvade) , and based on the idea that eating anything causes its qualities to pass into the eater. Where the victim is an animal specially associated with a god (the most conspicuous case is perhaps that of the corn spirit), it may be granted that the god is eaten; but precisely

in these cases there is no custom of giving a portion of the victim to the god.

Deificatory Sacrifice.- — The object of certain sacrifices is to provide a tutelary deity of a house, town or frontier, (a) In Burma, as in many other countries, those who die a violent death are held to haunt the place where they met their fate; consequently when a town is built living men are interred beneath the ramparts and the pillars of the gates, (b) In parts of North America the nagual or manitu animal, of which the Indian dreams during the initiation fast and which is to be his tutelary spirit, is killed with certain rites, (c) Human representatives of the corn or vegetation spirits are killed; in these, as in other cases of the sacrifice of the man-god cited by Dr Frazer, the killing of the old god is at the same time the making of a new god. (d) Suicide is treated as a means of raising a human being to the rank of a god. (e) Gods may be sacrificed (in theriomorphic form) to themselves as a means of renewing the life of the god. (/) The method of creating a fetish (see Fetishism) on the Congo resembles deificatory sacrifice; but here there is no actual slaughter of a human being; magical means are alone relied upon.

Honorific Sacrifices. — Whatever their origin, sacrifices tend to be interpreted as gifts to the god. Man seeks to influence his fellow men in various ways, by intimidation, by deceit, by bribery; and it is quite natural to find the same ideas in the sphere of religion. Food is often given to a god because he is believed to take pleasure in eating; the germ of this idea may have been identical with that of some funerary sacrifices — to nourish the divine life. At a later period, pari passu with the spiritualization of the god, comes a refinement of the tastes attributed to him, and the finer parts of the sacrifice, finally it may be only its savour, are alone regarded as acceptable offerings. Just as attendants are provided for the dead, so the god receives sacrifices intended to put slaves at his disposal. This latter idea was the more likely to arise, as the gift theory of sacrifice is closely associated with that of the god as the ruler or king to whom man brings a tribute, just as he had to appear before his earthly king bearing gifts in his hands. The honorific sacrifice is essentially a propitiation; it must be distinguished from the piaculum (see below), to which in some aspects

it is allied.

Mortuary Sacrifice. — Sacrifices, especially of human beings, are offered immediately after a death or at a longer interval. Their object may be (a) to provide a guide to the other world; (b) to provide the dead with servants or a retinue suitable to his rank; (c) to send messengers to keep the dead informed of the things of this world; (d) to strengthen the dead by the blood or life of a living being, in the same way that food is offered to them or blood rituals enjoined on mourners.

Piacular Sacrifice. — Whereas the god receives a gift in the honorific sacrifice, he demands a life in the piacular. This, according to Westermarck, is the central idea of human sacrifice: the victim is substituted for the sacrificer, to deliver him from perils by disease, famine or, more indefinitely, from the wrath of the god in general. The essential feature of the piaculum is that it is an expiation for wrong-doing, and the victim is often human. Human Sacrifice. — Many theories of the relation of human to animal sacrifice have been put forward, most of them on an insufficient basis of facts. It has been held that animal sacrifice is the primitive form and that the decay of totemism or lack of domestic animals has brought about the substitution of a human victim; but it has also been urged that in many cases animal victims are treated like human beings and must con- sequently have replaced them, that human beings are smeared with the blood of sacrifice, and must therefore have themselves been sacrificed before a milder regime allowed an animal to replace them. If tradition is any guide, human sacrifice seems in many important areas to be of secondary character; in spite of the great development of the rite among the Aztecs, tradition says that it was unknown till two hundred years before the con- quest; in Polynesia human sacrifices seem to be comparatively modern; and in India they appear to have been rare among the Vedic peoples. On the whole, human sacrifice is far commoner

among the semi-civilized and barbarous races than in still lower stages of culture. In Australia, however, where sacrifice of the ordinary type is unknown, the ritual killing of a child is practised in connexion with the initiation of a magician; it is therefore by no means axiomatic that animals were offered before human beings; the problem of priority is one to be solved for each area separately, but probably no solution is

possible; in the absence of Aztec traditions it would hardly have seemed probable that two centuries had seen so great a transformation.

Among the forms of human sacrifice must be reckoned religious suicide. This is perhaps mainly found in India but is not unknown in Africa and other parts of the world. Human sacri- fices were known in ancient India and survived till late in the 19th century (see below); both Greeks and Romans practised them, no less than the wilder races of ancient Europe. Semites and Egyptians, Peruvians and Aztecs, slew human victims; Africa, especially the West Coast, till recently saw thousands of human victims perish annually; in Polynesia, Tahiti and Fiji were great centres of the rite — in fact, it is not easy to name an area where it has not been known.

No general survey of sacrifice on geographical lines is possible, but some of the more important features in each area may be noticed.

Sacrifice in Greece and Rome. — Both the mainland of Greece and the Greek colonies practised human sacrifice, usually as a means towards expulsion of evil. Thus, the Athenians main- tained a number of outcasts, from whom in times of national calamity two were selected, one for the men, one for the women, and stoned to death outside the city; at the Thargelia two victims were annually put to death in the same way. Many animal sacrifices were known; of especial importance is the annual sacrifice of a goat on the Acropolis, though at other times the animal was not permitted to enter the temple.

Important features of Greek sacrifice, though not necessarily found in every rite, were the putting of wreaths and pieces of wool on the victim, the gilding of its horns, the lustration of the officiant and the sprinkling of those present with holy water. It was held inauspicious if the animal were unwilling; if it nodded all was well. Barley meal 1 was strewn on its neck, and a lock of hair cut from its forehead and burned. The animal was then clubbed, its throat cut and the altar sprinkled with its blood. Finally the body was skinned and cut up and the god's share burned on the altar.

The important Attic sacrifice of the Dipolia, known as rd fiovovia, demands some notice. Cakes were laid on the altar of Zeus Polieus and oxen driven round; the one which touched the cakes was the victim. An officiant at once struck it with his axe and another cut its throat; then all save the one who struck the first blow partook of its flesh. Then the hide was stuffed with grass and yoked to a plough; the participants were charged with ox murder and each laid the blame on

the other; finally the axe was thrown into the sea. ; The interpretation of the rite is uncertain; it may perhaps be connected with agrarian rites.

At Rome the scapegoat did not suffer death; but in the Saturnalia a human victim seems to have been slain till the 4th century a.d. Many forms of animal sacrifice were found; the generalized account given above for Greece is true also for the Romans.

Sacrifice in Egypt, — Of Egyptian ritual little is known; our knowledge rests mainly on the evidence of pictures. At Deir el Bahri we see that the animal had its throat cut in Mahommedan fashion; it lay on its side, the legs tied together; the heart was taken out, then the liver; the burnt sacrifice was hardly known.

Sacrifice in India. — An account of animal sacrifice has been given above. Among human sacrifices may be mentioned the suttee, or custom of immolating a widow on the funeral pyre of the husband, and the Khond sacrifice of the Meriah, who was either purchased or the son of a victim father. Some days before

'This sprinkling of the victims with sacrificial meal (Lat. mold) is the origin of the word immolare, to sacrifice, slaughter; Eng. " immolate," " immolation."

the sacrifice, the victim, who was often kept in captivity for long periods, was devoted by the cutting of his hair, previously unshorn, and his sanctity was increased later by various cere- monies of anointing. Finally he was taken in procession, stupefied or otherwise rendered incapable of resistance, and put to death by strangulation or pressure. The remains were dismembered and carried to the fields, excepting the portion offered to the earth goddess, which was buried.

Sacrifice in Africa. — Especially in West Africa many forms of sacrifice are found. In the annual " customs " of Dahomey, now abolished, hundreds of human victims were offered. Three main forms of human sacrifice existed in this area: (1) the scapegoat; (2) the messenger; and (3) the expiation, but combinations were not infrequent. The victim was often kept in captivity and well fed; to transfer their sins people laid their hands upon him as he was led in procession, his head covered with ashes; on the way to the place of sacrifice were three enclosures, the second open to chiefs and priest only, the third to the officiant and his helper alone; the blood of the victim was offered to the gods. At the present day the animal victim may he burned or drowned, buried in the earth or simply exposed. Sometimes the

sacrificer's hands are laid on the victim before it is slain, or he may be smeared with its blood; in other cases the blood is smeared on the door posts, or the sacrificer is touched on every part of the body with the victim's body. On the Congo, if a man commits a murder, the community votes whether he shall die or be expelled; if the latter, a victim is killed, of which all must partake; but this is not, as might be imagined, a case of Robertson Smith's piaculum for the re-establishment of the tribal bond; for the criminal is driven out of the com- munity.

Sacrifice in America. — Sacrifice was relatively infrequent and undeveloped among the Red Indians. The Pawnees, however, had an elaborate ritual, in which a human victim was sacrificed to the Morning Star; the blood of the victims was sprinkled on the fields, and the details of the rite are not unlike those of the Khond custom. The Iroquois sacrifice of the White dog bore in later times the character of a scapegoat festival; but it is doubtful how far this was an original feature. The animals were decorated with wampum and strangled, and then the sins of the people were transferred to them; then the remains were burned and the ashes gathered up, taken through the village and sprinkled before every house. In Mexico human sacrifices were very common; the lowest estimate is 20,000 annually. The victims were often feted for a whole year and treated as divine; the heart was an offering to the god, the body was eaten by the priests and nobles and the head was preserved with those of previous victims.

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(N. W. T.)

. The Idea of Sacrifice in the Christian Church.

There can be no doubt that the idea of sacrifice occupied an important

place in early Christianity. It had been a funda- mental element of both Jewish and Gentile religions, and Christianity tended rather to absorb and modify such elements than to abolish them. To a great extent the idea had been modified already. Among the Jews the preaching of the prophets had been a constant protest against the grosser forms of sacrifice", and there are indications that when Christianity arose bloody Sacrifices were already beginning to fall into disuse; a saying which was attributed by the Ebionites to Christ repeats tMs

protest in a strong form, "I have come to abolish the sacrifices; and if ye do not cease from sacrificing the wrath of God will not cease from you " (Epiph. xxx. 16). Among the Greeks the philosophers had come to use both argument and ridicule against the idea that the offering of material things could be needed by or acceptable to the Maker of them all. Among both Jews and Greeks the earlier forms of the idea had been rationalized into the belief that the most appropriate offering to God is that of a pure and penitent heart, and among them both was the idea that the vocal expression of contrition in prayer or of gratitude in praise is also acceptable. The best instances of these ideas in the Old Testament are in Psalms 1. and li., and in Greek literature the striking words which Porphyry quotes from an earlier writer, " We ought, then, having been united and made like to God, to offer our own conduct as a holy sacrifice to Him, the same being also a hymn and our salvation in passionless excellence of soul " (Euseb. Dem. ev. 3). The ideas are also found both in the New Testament and in early Christian litera- ture: " Let us offer up a sacrifice of praise to God continually, that is, the fruit of lips which make confession to His name " (Heb. xiii. 15); "That prayers and thanksgivings, made by worthy persons, are the only perfect and acceptable sacrifices I also admit" (Just. Mart. Trypho, c. 117); "We honour God in prayer, and offer this as the best and holiest sacrifice with righteousness to the righteous Word " (Clem. Alex. Strom, vii. 6).

But among the Jews two other forms of the idea expressed themselves in usages which have been perpetuated in Christianity, and one of which has had a singular importance for the Christian world. The one form, which probably arose from the conception of Yahweh as in an especial sense the protector of the poor, was that gifts to God may properly be bestowed on the needy, and that consequently alms have the virtue of a sacrifice. Biblical instances of this idea are — " He who

doeth alms is offering a sacrifice of praise" (Ecclus. xxxii. 2); "To do good and to communicate forget not, for with such sacrifices God is well pleased " (Heb. xiii. 16) ; so the offerings sent by the Philippians to Paul when a prisoner at Rome are " an odour of a sweet smell, a sacrifice acceptable, well pleasing to God " (Phil. iv. 18). The other form, which was probably a relic of the conception of Yahweh as the author of natural fertility, was that part of the fruits of the earth should be offered to God in acknowledgment of His bounty, and that what was so offered was especially blessed and brought a blessing upon both those who offered it and those who afterwards partook of it. The persistence of this form of the idea of sacrifice constitutes so marked a feature of the history of Christianity as to require a detailed account of it.

In the first instance it-is probable that among Christians, as among Jews, every, meal, and especially every social meal, was regarded as being in some sense a thank-offering. Thanksgiving, blessing and offering were co-ordinate terms. Hence the Talmudic rule, " A man shall not taste anything before blessing it " (Tosephla Berachoth, c. 4), and hence St Paul's words; " He that eateth, eateth unto the Lord, for he giveth God thanks " (Rom. xiv. 6; cp. 1 Tim. iv. 4). But the most important offering was the solemn oblation in the assembly on the Lord's day. A precedent for making such oblations elsewhere than in the temple had been afforded by the Essenes, who had endeavoured in that way to avoid the contact with unclean persons and things which a resort to the temple might have involved (Jos. Antiq. xviii. 1. 5), and a justification for.it was found in the prophecy of Malachi, " In every place incense is offered unto my name and a pure offering; for my name is great among the Gentiles, saith the Lord of hosts " (Mai. i. 11, repeatedly quoted in early Christian writings, e.g. Teaching of the Twelve Apostles, c. 14; Just. Mart. Trypho, c. 28, 41,-116; Irenaeus iv. 17. 5).

The points in relation to this offering which are clearly demonstrable from the Christian writers of the first two centuries, but which subsequent theories have tended to confuse, are these. (1) It was regarded as a true offering or sacrifice; for in the Teaching of the Twelve Apostles, in Justin Martyr and in Irenaeus it is designated by each of the terms which are used

to designate Sacrifices in the Old Testament. (2) It wasprimarily an offering of the fruits of the earth to the Creator; this is clear from both Justin Martyr and Irenaeus (the latter of whom not only explicitly states that such oblations are continued 'among Christians, but also meets the current objection to them by arguing that they are offered

to God not as though He needed anything but to show the gratitude of the offerer (Iren. iv. 17, 18). (3)' It was offered as a thanksgiving partly for creation and pre- servation and partly for redemption: the latter is the special purpose mentioned (e.g.) in the Teaching of (he Twelve Apostles; the former is that upon which Irenaeus chiefly dwells; both are mentioned together in Justin Martyr (Trypho, c. 41). (4) Those who offered it were required to be not only baptized Christians but also " in love and charity one with another "; there is an indication of this latter requirement in the Sermon on the Mount (Matt. v. 23, 24, where the word translated " gift " is the usual LXX. word for a sacrificial offering, and is so used elsewhere in the same Gospel, viz. Matt. viii. 4, xxiii. 19), and still more explicitly in the Teaching, c. 14, "Let not any one who has a dispute with his fellow come together with you (i.e. on the Lord's day) until they have been reconciled, that your sacrifice be not denied." This brotherly unity was symbolized by the kiss of peace. (5) It was offered in the assembly by the hands of the president; this is stated by Justin Martyr (Apol. i. 65, 67), and implied by Clement of Rome (Ep. i. 44. 4). • : , '

Combined with this sacrifice of the fruits of the earth to the > Creator in memory of creation and redemption, and probably always immediately following it, was the sacred meal at which part of the offerings was eaten. Such a sacred meal had always, or almost always, formed part of the rites of sacrifice. There was the idea that what had been solemnly offered to God was especially hallowed by Him, and that the partaking of it united the partakers in a special bond both to Him and to one another. In the case of the bread and wine of the Christian sacrifice, it was believed that, after having been offered and blessed, they became to those who partook of them the body and blood of Christ. This "communion of the body and blood of Christ," which in early writings is clearly distinguished from the thank-offering which preceded it, and which furnished the materials for it, gradually came to supersede the thank-offering in import- ance, and to exercise a reflex influence upon it. In the time of Cyprian, though not before, we begin to find the idea that the body and blood of Christ were not merely partaken of by the worshippers but also offered in sacrifice, and that the Eucharist was not so much a thank-offering for creation and redemption as a repetition or a showing forth anew of the self-sacrifice of Christ. This idea is repeated in Ambrose and Augustine, and has since been a dominant idea of both Eastern and Western Christendom. But, though dominant, it has not been universal; nor did it become dominant until several centuries after its first promulgation. The history of it has yet to be written. For, in spite of the important controversies to which it has given birth, no one has

been at the pains to distinguish between (i.) the theories which have been from time to time put forth by eminent writers, and which, though they have in some cases ultimately won a general acceptance, have for a long period remained as merely individual opinions, and (ii.) the current beliefs of the great body of Christians which are expressed in recognized formularies. A catena of opinions may be produced in favour of almost any theory; but formularies express the collective or average belief of any given . period', and' changes in them are a sure indication that there has been a : general change in ideas.

■It is clear from the evidence of the early Western Eturgies that, for at least six centuries, the primitive conception of the nature of the Christian sacrifice remained. There is a clear distinction between the sacrifice and the communion whiqh followed it, and that which is offered Consists of the fruits of the earth and not of the body and blood of Christ. Other ideas no doubt attached themselves to the primitive conception, of which there is no certain evidence in primitive times, e.g. the idea of the propitiatory character of the offering, but these

ideas rather confirm than disprove the persistence of those primitive conceptions themselves.

All Eastern liturgies, in their present form, are of later date than the surviving fragments of the earlier Western liturgies, and cannot form the basis of so sure an induction; but they entirely confirm the conclusions to which the Western liturgies lead. The main points in which the pre-medieval formularies of both the Eastern and the Western Churches agree in relation to the Christian sacrifice are the following, (i) It was an offering of the fruits of the earth to the Creator, in the belief that a special blessing would descend upon the offerers, and sometimes also in the belief that God would be propitiated by the offerings. The bread and wine are designated by all the names by which sacrifices are designated (sacrificia, hostiae, libamina, and at least once sacrificium placationis) , and the act of offering them by the ordinary term for offering a sacrifice (immolatio). (2) The offering of bread arid wine was originally brought to the altar by the person who offered it, and placed by him in the hands of the presiding officer. In course of time there were two important changes in this respect: (a) the offerings of bread and wine

were commuted for money, with which bread and wine were purchased by the church officers; (b) the offerings were sometimes handed to the deacons and by them taken to the bishop at the altar, and sometimes, as at Rome, the bishop and deacons went round the church to collect them. 1 (3) In offering the bread and wine the offerer offered, as in the ancient sacrifices, primarily for himself, but inasmuch as the offering was regarded as having a general propitiatory value he mentioned also the names of others in whom he was interested, and especially the departed, that they might rest in peace. Hence, after all the offerings had been col lected, and before they were solemnly offered to God, it became a custom to recite the names both of the offerers and of those for whom they offered, the names being arranged in two lists, which were known as diptychs. Almost all the old rituals have prayers to be said ” before the names,” ” after the names.” It was a further and perhaps much later development of the same idea that the good works of those who had previously enjoyed the favour of God were invoked to give additional weight to the prayer of the offerer. In the later series of Western rituals, beginning with that which is known as the Leonine Sacramentary, this practice is almost universal. (4) The placing of the bread and wine upon the altar was followed by the kiss of peace. (5) Then followed the actual offering of the gifts to God (immolatio missae) . It was an act of adoration or thanksgiving, much longer in Eastern than in Western rituals, but in both classes of rituals beginning with the form ” Lift up your hearts,” and ending with the Ter Sanctus or Trisagion. 2 The early MSS. of Western rituals indicate the importance which was attached to this part of the liturgy by the fact of its being written in a much more ornate way than the other parts, e.g. in gold uncial letters upon a purple ground, as distinguished from the vermilion cursive letters of the rest of the MS. With this the sacrifice proper was concluded. (6) But, since the divine injunction had been ” Do this in remembrance of me,” the sacrifice was immediately followed by a commemoration of the passion of Christ, and that again by an invocation of the Holy Spirit (epiclesis) that He would make the bread and wine to become the body and blood of Christ. Of this invocation, which is constant in all Eastern rituals, there are few, though sufficient, surviving traces in Western rituals.’ Then after a prayer for sanctification, or for worthy reception, followed the Lord’s Prayer, and after the Lord’s Prayer the communion.

In the course of the 8th and 9th centuries, by the operation 1 Of this proceeding an elaborate account exists in the very interesting document printed by Mabillon in his Museum Italicum as ” Ordo

Romanus I.” ; the small phials of wine which were brought were emptied into a large bowl, and the loaves of bread were collected in a bag.

5 The elements of the form are preserved exactly in the liturgy of the Church of England.

“It is found, e.g., in the second of Mone’s masses from the Reichenau palimpsest, and in Mabillon’s MissaleGothicum, No. 12 ; it is expressly mentioned by Isidore of Seville as the sixth element in the Eucharistic service, De offic. eccles. i. 15.

of causes which have not yet been fully investigated, the theory which is first found in Cyprian became the dominant belief of Western Christendom. The central point of the sacrificial idea was shifted from the offering of the fruits of the earth to the offering of the body and blood of Christ. The change is marked in the rituals by the duplication of the liturgical forms. The prayers of intercession and oblation, which in earlier times are found only in connexion with the former offering, are repeated in the course of the same service in connexion with the latter. The designations and epithets which are in earlier times applied to the fruits of the earth are applied to the body and blood. From that time until the Reformation the Christian sacrifice was all but universally regarded as the offering of the body and blood of Christ. The innumerable theories which were framed as to the precise nature of the offering and as to the precise change in the elements all implied that conception of it. It still remains as the accepted doctrine of the Church of Rome. For, although the council of Trent recognized fully the distinction which has been mentioned above between the Eucharist and the sacrifice of the mass, and treated of them in separate sessions (the former in Session xiii., the latter in Session xxii.), it continued the medieval theory of the nature of the latter. The reaction against the medieval theory at the time of the Reformation took the form of a return to what had no doubt been an early belief, — the idea that the Christian sacrifice consists in the offering of a pure heart and of vocal thanksgiving. Luther at one period (in his treatise De captivitate Babylonica) maintained, though not on historical grounds, that the offering of the oblations of the people was the real origin of the conception of the sacrifice of the mass; but he directed all the force of his vehement polemic against the idea that any other sacrifice could be efficacious besides the sacrifice of Christ. In the majority of Protestant communities the idea of a sacrifice has almost lapsed. That which among Catholics is most commonly regarded in its aspect as an offering and spoken of as the ” mass ” is usually regarded in its aspect as a participation in the symbols of

Christ's death and spoken of as the " communion." But it may be inferred from the considerable progress of the Anglo-Catholic revival in most English-speaking countries that the idea of sacrifice has not yet ceased to be an important element in the general conception of religion. (E. Ha.)

SACRILEGE, the violation or profanation of sacred things, a crime of varying scope in different religions. It is naturally much more general and accounted more dreadful in those primitive religions in which cultual objects play so great a part, than in more highly spiritualized religions where they tend to disappear. But wherever the idea of sacred exists, sacrilege is possible. The word itself comes from the Lat. sacrilegium, which originally meant merely the theft of sacred things, although already in Cicero's time it had grown to include in popular speech any insult or injury to them.

The history of sacrilege reflects a large phase of the evolution of religion. In primitive religions inclusive of almost every serious offence even in fields now regarded as merely social or political, its scope is gradually lessened to a single part of one section of ecclesiastical criminology, following inversely the development of the idea of holiness from the concrete to the abstract, from fetishism to mysticism. The primitive defence against sacrilege lay directly in the nature of sacred things, those that held a curse for any violation or profanation. This brings us at once into the whole field of taboo (q.v.). From it we pass without a break, merely narrowing the application as the con- ception of sacredness grew clearer and less associated with magic, into early criminal law with its physical sanctions. The Levifical code exacted of the offender reparation for the damage with the addition of one-fifth of the amount, and an expiatory sacrifice (Lev. v. 15, 16). Even the gold and silver ornaments of the images of false gods were not to be coveted nor appropriated for fear of being contaminated with the curse which they could impart (cf. Deut. vii. 25). The tragic story of the stoning of Achan, who stole some of the spoils of Jericho which Joshua had consecrated to the treasury of Yahweh, is one of the most

graphic details of Old Testament history (cf. Joshua vii.

20-25).

No religion was more prodigal in rules to safeguard that which was holy or consecrated than the Jewish, especially in its temple laws; violation of them often led to mob violence as well as divine chastisement. The temple rules do not apply to syna- gogues, however, and unseemly conduct in them is liable only to civil action. The whole wide field of Jewish taboo naturally involves sacrilege as its reverse side. Such violations of holy things as making mock of the Scriptures, or even reciting them as one would ordinary literature, was sacrilege in the eyes of the rabbi. Even imitation of the style of the Talmud has also been accounted sacrilege.

While the Roman cults were amply protected by taboos, there was no comprehensive term in Roman law for religious violations and profanations in general. Sacrilegium was narrowly construed as the theft of sacred things from a sacred place. Sacred things, according to Gaius, were those things that had been definitely consecrated to the gods — and so had come to partake of their holiness. Sacred places did not include private shrines. According to Ulpian the punishment for sacrilegium varied according to the position and standing of the culprit and the circumstances under which the crime was committed. For the lower classes it was crucifixion, burning or the wild beasts. The latter penalty was also attached to theft of sacred things by night, but stealing by day from a temple objects of little value brought only sentence to the mines. People of higher rank were deported. During classical times the law kept to the narrow meaning of sacrilegium, but in popular usage it had grown to mean about the same as the English word. Traces of this usage are frequent in Augustan writers. The early church Fathers use the word most frequently in the restricted sense, although an effort has been made to read the wider meaning in Tertullian. But by the middle of the 4th century the narrower meaning had disappeared. In Ambrose, Augustine and Leo L, sacrilegium means sacrilege. The wider meaning had invaded the law as well. Mommsen was of the opinion that sacrilegium had no settled meaning in the laws of the 4th century. But it was rather that an enlarged application of the idea of sacred made the crime of sacrilege in the sense of violatio sacri a more general one. This was partly due to the influence of Christianity, which sought to include as objects of sacrilege all forms of church property, rather than merely those things consecrated in pagan cults, partly to the efforts of the later emperors to surround themselves and everything emanating from them with highest sanctions. In the Theodosian Code the various crimes which are accounted sacrilege include — apostasy, heresy, schism, Judaism, paganism, attempts against the immunity of churches and clergy or privileges of church courts, the desecration of sacraments, &c. and

even Sunday. Along with these crimes against religion went treason to the emperor, offences against the laws, especially counterfeiting, defraudation in taxes, seizure of confiscated property, evil conduct of imperial officers, &c. There is no formal definition of sacrilege in the code of Justinian but the conception remains as wide. The church had found in the imperial law a strong protector.

The penitentials (q.v.), or early collections of disciplinary canons, gave much attention to sacrilege. In the earliest of them, sacrilege in the narrower sense is not a separate class of crime, but the wider usage goes with variations through the different collections. There is also the greatest difference in the penalties assigned, reaching from Utile more than restitution of property to penance of one to five or even fifteen years. The Frankish synods emphasize the crime of seizing church property of every kind, including the vast estates so envied by the lay nobility. In the Pseudo-Isidore the attempt was made to include even property on which the church had merely a legal claim. The murder or injury of the clergy is also sacrilege in both penitentials and capitularies. The practice of magic, superstition, &c, are also frequently referred to as sacrilege, especially during the long struggle with German heathenism. With the definite triumph of the church, the profanation of its sanctuaries became

less frequent, and once robbery or seizure of ecclesiastical possessions or violation of its privileges tended to absorb the attention of synods and popes. Gratian's Decretum mirrors two tendencies, the church legislation with its growingly less extended application, and the wide meaning as in Justinian's Code, owing to the revival of Roman law in the nth century. It thus was once more declared to include all violations of the divine law. A somewhat distorted, but well-substantiated use of the word sacrilegium in medieval Latin was its application to the fine paid by one guilty of sacrilege to the bishop.

The penalties in the canon law included, in addition to restitu- tion, penance, fines and excommunication ; and right of asylum was denied to the culprit. The jurisdiction was something jointly shared with the temporal power in case corporal punish-, ment were involved. The numerous enactments of councils to ensure the proper care of church property, prohibiting the use of churches for secular purposes, for the storing of grain or valuables, for dances and merry-making, do not technically come under the head of legislation against sacrilege. The worst sacrilege of all, defiling the Host, is mentioned frequently, and generally brought the death penalty accompanied by the cruellest and most ignominious tortures. The period of the Reformation naturally increased the commonness of the crime. Under the emperor Charles V.

the penalty for stealing the Host was the stake; that for other crimes was graded accordingly. In France, in 1561, under Charles IX. it was forbidden under penalty of death to demolish crosses and images and to commit other acts of scandal and impious sedition. In the declaration of 1682, Louis XIV. decreed the same penalty for sacrilege joined to superstition and impiety, and in the somewhat belated religious persecution of the duke of Bourbon in 1724 those convicted of larceny in churches, together with their accomplices, were condemned, the men to the galleys for life or for a term of years, the women to be branded with the letter V and im- prisoned for life, or for a term. When one takes into account that the next article of the declaration decreed death for domestic theft, the legislation is not relatively cruel. Yet even in the enlightened 18th century popular fanaticism made of sacrilege the most heinous offence. The trial of La Barre in 1766 at Abbeville (see Voltaire) is the most famous in modem times. Convicted of wearing his hat while a religious procession was passing — as well as of blasphemy — he was accused as well of having mutilated a crucifix standing on the town bridge. Declared guilty, after torture, he was sentenced to have his tongue cut out, to be beheaded and the body to be burned, a sentence which was confirmed by the parlement of Paris and the bigoted king Louis XV. In the midst of the French Revolution respect for civic festivals was sternly enacted, but sacrilege was an almost daily matter of state policy. In the penal code the penalty for interfering with and molesting worshippers is slight, a fine of from 16 to 300 francs and prison from six days to three months, while damage or insult to the objects of worship brought only 16 francs to 500 francs fine, and prison from fifteen days to six months. In 1825 the reactionary parlement once more brought back the middle ages, by decreeing the death penalty for public profanation, the execution to be preceded by the amende honorable before the church doors. ” Theft sacrilege ” was treated in a separate series of equally savage clauses. This was a crime not recognized in the penal code, which was therefore to be modified by this law. No attenuating circumstances were to be recognized, as in the general scheme of the penal code. This ferocious legislation was expressly and summarily abrogated in 1830. (J.T.S.*)

English Law. — In English law, sacrilege is the breaking into a place of worship and stealing therefrom. At common law benefit of clergy was denied to robbers of churches. A statute of 1553 made the breaking or defacing of an altar, crucifix or cross in any church, chapel or churchyard punishable with three months’ imprisonment on conviction before two justices, the imprisonment to be continued unless the offender entered into surety for good behaviour at quarter

sessions. The tendency of the later law has been to put the offence of sacrilege in the same position as if the offence had not been committed in a sacred building Thus breaking into a place of worship at night, says Coke, is burglary, for the church is the mansion house

of Almighty God. The Larceny Act of 1861 punishes the breaking into, or out of, a place of divine worship in the same way as burglary, and the theft of things sacred in the same way as larceny. Now by the Malicious Damage Act 1861 the unlawful and malicious destroying or damaging any picture, statue, monument or other memorial of the dead, painted glass or other monument or work of art, in any church, chapel, meeting-place or other place of divine worship is a misdemeanour punishable by imprisonment for six months, and in the case of a male under the age of sixteen years with whipping. (T. A. I.)

SACRISTY (through Fr. sacristie, from med. Lat. sacristia or sacrisHna), the term in ecclesiastical architecture given to the room or hall in a large church wherein are kept the vest- ments and utensils (sacra) used in the services and celebrations. Like the diaconicon in the Greek Church, it was usually situated on the north side of the chancel, but its position varies according to that of the chapter-house, as it is generally placed between the latter and the church.

SACRO BOSCO, JOHANNES DE [John Holy wood] (d. 1244 or 1256), astronomical author, studied at Oxford and was afterwards professor of mathematics at the university of Paris. He wrote a treatise on spherical astronomy, Tractatus de sphaera, first printed at Ferjara in 1472. This was the second astro- nomical work to be printed. Although recording no advance on the Arabian commentaries on Ptolemy, it gained a great reputa- tion; twenty-four editions appeared before 1500, and at least forty between 1500 and 1647, in which year the last edition was published at Leiden. About the year 1232 he wiote De anni ratione or De computo ecclesiastico (printed editions at Paris in 1538 (?), 1550, 1572 and at Antwerp in 1547 and 1566), in which he points out the increasing error of the Julian calendar, and suggests a remedy which is nearly the same as that actually used under Gregory XIII. three hundred and fifty years later.

He also wrote Algorismus or De arte numerandi, printed in 1490 (?), in 15 1 7 (Vienna), 1521 (Cracow), 1523 (Venice); De astrolabib and Breviarum juris.

SADDLE (a word common to Teutonic languages, cf. Ger. Saltel, Duf. zadel, also in Russ. siedlo and Lat. sella, for sedla; it is not derived directly from Lat. sedile, which means a chair, but all the words are to be referred to the root sadˆ, which gives Lat. sedere, Eng. ” sit,” ” settle,” ” seat,” &c), a seat, usually of leather, fixed by girths to the back of a horse for riding; also a padded cushion for the back of a draught horse, fastened by girths and crupper; to it are attached the supports for the shafts’, and rings for the reins (see Saddlery). The word is also applied to many objects resembling a saddle in shape or function, such as a block to support a spar in a ship, or in machinery to support a rod, or in masonry (q.v.) the top or ” apex stone ” of the gable of a roof, &c.

Saddle bars, in architecture (Fr. traverses), are narrow hori- zontal iron bars passing from mullion to mullion, and often through the whole window from side to side, to steady the stone work, and to form stays, to which the lead work is secured. When the bays of the

windows are wide, the lead lights are further strengthened by upright bars, passing through eyes forged on the saddle bars, and called stanchions. When saddle bars pass right through the mullions in one piece, and are secured to the jambs, they have sometimes been called ” stay bars.”

SADDLERY and HARNESS, two terms which embrace the whole equipment for the horse when used for riding or driving. “Harness” (O. Fr. harneis, hiod. harnais, Ger. Hafnisch, of unknown origin) was originally a general term for equipment, e.g. the body armour of a soldier. It is now usually confined to the draught horse’s equipment, ” saddle and bridle ” being used of that of the riding horse.

Saddlery is principally a leather trade, and the craft has been established in England as a separate trade since the 13th century, when the London Saddlers’ Company received its charter from Edward I. There is evidence also of its early prosperity at Birming- ham; the principal seat of the cheaper saddlery trade is now at Walsall. Saddler’s ironmongery embraces the making of buckles, chains, stirrups, spurs, bits, hames, &c.

The ” bridle ” (O.E. bridel for brigdel, from bregdan, to pull) is the combination of straps and buckles which fits on the horse’s head, the headstall, together with the bit and reins which it keeps in position. The headstall consists of the headpiece passing behind the ears and joining the head-band over the forehead ; the cheek-straps run down

the head to, the bit to which they are fastened ; in the driving bridle the ” blinkers,” rectangular or round leather flaps which prevent the horse from seeing anything except what lies in front, are attached to the cheek-straps; the nose-band passes round the: head above the nostrils and the throat-lash from the top of the cheek-straps under- neath the head. The ” martingale ” passes between the horse’s legs with one end fastened to the girth and the other to the bridle or nose- band. It prevents the! horse throwing up his head. The bit is the nietal contrivance inserted in the mouth to which the reins are attached. There are innumerable patterns of bits, but they may be divided into the “snaffle ” (Du. snavel, horse’s muzzle), the ” curb ” and combinations of the two. The ” snaffle ” for the riding horse has a smooth jointed steel mouthpiece, with straight cheek-bars, the rings for the reins and cheek-pieces of the headstall being fixed in the ■bars at the junction with the mouthpiece. A severer snaffle has the mouthpiece twisted and fluted. The bars prevent the horse pulling the bit through the mouth. The snaffle without bars is generally termed a ” bridoon.” The commonest form of bit used in driving is the double-

ring snaffle, in which the rings work one -within the other, the headstall straps fastening to one and the reins to the other, or, if the horse is driven on the double ring, the reins are buckled to both rings. The curb-bit (Fr. courbe, Lat. curvus, bent, crooked) is one to which a curb-chain or strap is attached, fastened to hooks on the upper ends of the cheek-bars of the bit and passing under the horse's lower jaw in the chin groove. The reins are attached to rings at the lower ends of the cheek-bars, the leverage thus pressing the curb-chain against the jaw. The mouthpiece of the curb-bit is unjointed and has in the centre a " port," i.e. a raised curve allowing liberty for the tongue and bringing the pressure on the base of the horse's jaw. The curb-bit and the bridoon can be used together with separate headstalls and reins,, but there are many combination bits, such as the Pelham. In this the' mouthpiece, without port, is that of the snaffle bit (it may be unjointed), with the rings fixed at the junction of the mouthpiece and cheek-bars; the lower ends have rein rings as in the plain curb-bit.

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Fig. 1. — a, Bridoon or snaffle; e, Curb. Polo bits: — b, Rugby Pelham; c, Hanoverian with rubber mouth; d, Kerro Pelham. (From Messrs Champion and Wilton.)

Fig. 2. — Some Types of Driving Bits. (From Messrs. Champion and Wilton.)

The riding saddle is composed of the " tree," the framework or skeleton, the parts of which are the pommel or head, the projection which fits over the withers, and the side bars which curve round into the cantle or hind-bow. The tree in the best saddles is made of beechwood split with the grain; thin canvas is glued over the wood to prevent splitting, and iron or steel plates then riveted on the head and on the cantle. Linen webs are fastened lengthwise and across, over which is nailed canvas and serge between" which the padding is stuffed. To the tree are fastened the stirrup-bars. The leather covering! of the tree should be of pig-skin; cheap saddles are made of sheep-skin stamped to imitate pig-skin. The various parts, of the man's saddle are the seat, the skirt, i.e. the fold or pad of leather on either side of the head, and the hanging flaps; knee-rolls are not used as much as they were, except where roughly broken-in horses are ridden. The saddle is cut straight over the withers with a square- ended cantle, as in the hunting saddle, or cut back over the withers with a round-ended cantle, as in the polo saddle. The saddles in use on the continent of Europe still retain the high pommel and cantle and heavy knee-rolls discarded by riders trained in the British school and the hunting-field.

The saddles of the East and of the Arabs keep their primitive shape, and they are really seats in which rather than on which the rider sits. The Mexican saddle, with its silver adornments and embossed leather, is a characteristic type. It has a very high padded pommel and a round-headed projecting cantle.

The lady's side-saddle when first fully developed had two heads or pommels, between which the right leg was supported, the support for the left being the stirrup. The third pommel or " leaping head," against which the left leg rests, was, it is said, invented as the result of a match between two gentlemen riders to ride a steeplechase on side-saddles; the winner had provided himself this support for his left leg. At first the "leaping head" was only, used in the

hunting-field and the double cow-horn was still retained; as its usefulness became apparent the second pommel practically disap- peared.

Space forbids the discussion of the varieties of harness for the pair-horse carriage, the four-horse coach, the farm wagon, &c,, or the different kinds of ornamentation that are or have been lavished upon it. The leather collar, heavily padded, passes over the head and

Fig. 3. — a, Side-saddle; b, hunting saddle; c, officer's regulation saddle (British army). (From models made by Messrs Champion and Wilton.)

rests firmly on the shoulders; the hames, linked pieces of metal, fit tightly round it and are fastened at the top by the hame-strap; they bear the traces, or straps which pass along the horse's sides and the shafts and are attached by loops slipped over hooks in the body of the carriage. Where the collar is dispensed with, the traces are attached to a breast-strap against which the horse works. This breast harness is much used for the lightly harnessed American trot- ting horses, and for military draught horses. The saddle pad is a narrow leather cushion girthed under the belly and held in position by the crupper-dock and the crupper, a loop strap passing under the tail. The saddle supports the shafts by the back-band and its tugs and by the belly-band. The reins pass from the bit through " terrets " or rings on the hames and pad. The harness on the horse's hind- quarters consists of the breeching, passing round behind the horse and helping in backing

and stopping the vehicle, the hip-strap fastened to the breeching and passing over the hind-quarters, and the kicking- strap falling across the loins and fastened to the shafts. The bearing rein, when used merely as a support to the head, or as an aid to the improvement of the paces, consists of a separate bridooh-bit with the reins passing through rings on the throat-band and thence slipped over a hook on the pad. The severer form, which brings the rein over the head-stall, keeps the horse's head up in a cramped attitude and the mouth continually working on the bit. A recent modifica- tion of the severer form is not attached to the bit.

Historical Sketch. — Questions as to the epoch in the history of mankind when the horse was first trained for draught and riding are for archaeologists and anthropologists to discuss (see Horse, § History). With the domestication of the horse came the develop- ment of the bit; first a halter of hide bound the muzzle, then a thong slipped into the mouth, finally replaced by wood or bone. Stone age objects have been found in lake-dwellings, such as that at Robenhausen, near Zurich which may have been bits ; one is slightly curved, with two knobs grooved at either end for the reins. Bits from the bronze age and the iron age can be seen in most museums showing that the forms have changed little. The Scandinavian museums are particularly rich in early remains of harness and horse-trappings. An early bronze age bit of bone with horn cheek-pieces and with holes on the upper ends for the head- stall, and on the lower ends for the reins, was found at the Corcelletes lake dwelling, and a twisted bronze bit jointed by interlocking rings with straight cheek-pieces and rings and loops for headstall and reins is in the National Museum at Zurich. In the late iron age burial of a Gaulish chief with his chariot at Somme-Bionne were found two horse's bits of the ordinary jointed snaffle type (see Archaeology, plate VI). A heavy snaffle unjointed bit with red and blue enamel ornamentation is illustrated in the British Museum Guide to the Late Iron Age. Assyrian and Babylonian .monuments show the harness of the chariot horses and the bridling of the riding horse, cf. Babylonia and Assyria, Plate II, fig. 2.

In ancient Greece and Rome the bit and bridle were used during historic times, and allusions to riding without them refer to exhibi- tions of horsemanship. On Trajan's column the Numidians ride without bridles or bits, and various North African tribes trained their horses to obey their voice alone (cf. Claudfan, Epig. i. 10, of the Gaulish essedarii, driving without bridle and reins). The locus classieus for the bridling and saddling of the Greek horse is Xenophon, Iltpl iTTuirijs. The Greek name for the bridle bit and reins collectively is xaXuw (Lat. frenum), the bit proper is otA/uov; in Lat. frenum is

also used of the bit itself. The headstall (icopvtpaia) and cheek-straps (rapriia) were richly decorated. In Homer (II. iv. 142) the latter are ornamented with ivory plates stained with purple, and such have been found on the site of Troy (Schliemann, Ilios, 476, 631). The head-band also bore a crest (Xo6j, crista), and in front the &fjnrvi (frontale) might be extended down the face to serve as a defence, as in the medieval chaufrein. This frontal was a special subject of decoration. Of the two principal types of ancient bits, the un-

jointed and the jointed mouthpiece, the latter is the most common form. There are also other forms of bits ; those with sharp points were called lupdta. (Virg. Georg. iiij 208). There is a Greek bit in the British Museum with revolving disks, a device which occurs in medieval bits, to give the horse something to keep turning in his mouth. The curb was also used: Xenophon distinguishes between the snaffle (XeTos xˆXwAs) and ,the j curb. The curb-strap or chain was termed btroxaXivMa or ˆaXioK, which, however, may mean a muzzle. A bronze bit found at Pompeii has a twisted and jointed metal mouthpiece and a plain curved bar acting as a curb-strap. The cheek-bars of the bit take a variety of forms : straight bars, circles with rays, square or oblong plaques, triangles and the swan- necked or S-shaped type are all found. In medieval times compli- cated and severe bits were used, and heavy bits with cruel mouth- pieces and long elaborately curved cheek-bars are still used by Arabs and the riders of Central and South America. The bit of the armed war-horse in the middle ages was sometimes provided with very long cheek-bars covered with sharp spikes to prevent the foot-soldier catching hold of the bridle (see R. Tschille and R. Forrer, Die Pferdetren.se in ihrer Formen-Entwicklung, 1903, for illustrations of bits from prehistoric times to the 16th century).

The saddle was not used in Egypt ; the Assyrian monuments (cf . the illustration noticed above) chiefly show decorated saddle-cloths rather than any form of the saddle proper. The harness of the chariots of Egypt and Assyria are also illustrated on the monuments (see especially Sir J. G. Wilkinson, Maimers and Customs of the Ancient Egyptians). The ancient Greeks rode bare-backed as in the Panathenaic frieze of the Parthenon or used a saddle-cloth (tyiiririov, Lat. ephippium; sella as applied to a saddle is quite late). Even the saddle-cloth does not appear to have been in use till thesthcentury. A , 6th-century vase, found at Paphnae, Lower Egypt (Flinders- Petrie and Murray, Tanis, 1888, ii. pi. xxix.), shows a woman riding astride on a cloth, with fully developed headstall and powerful bit. A black-figured sarcophagus, now in the British Museum, from Clazomenae, shows a long pointed ephippium with a chest-strap. These indicate Asiatic

influence, for Daphnae was an Ionian and Carian settlement of the 7th century B.C. In Xenophon (l.c*) we find that the saddle-cloth had been adopted by the Athenian cavalry, and from his advice as to the seat to be adopted pads or roils seem to have been added. There were no stirrups (till the time of the emperor Maurice, a.d, 602), and the rider mounted at a vault or by ; bJocks; mounting by the spear used as a vaulting pole was also practised as an athletic feat. On a funeral monument of the time of Nero in the museum at Mainz is the figure of a horseman on a saddle-cloth With something resembling the pommel and cantle of a saddle, but the first saddle proper is found in the so-called column of Theodosius at Constantinople (usually ascribed to the end of the 4th century a.d., though it may be more than 1 00 years earlier), where two figures are riding oh high-peaked saddles resting on embroidered saddle-cloths. In medieval times the saddle was much like that of the Oriental saddle of to-day with high peaks before and behind. ; In the military saddle of the 14th and 15th century the high front parts of the saddle were armoured and extended to protect the legs of the rider. The jousting saddle (cf. the example in the Tower of London) becomes almost a box into which the rider is fixed ; the high cantle fits round the rider's loins and when charging he lifted himself into practically a standing position in the stirrups. The saddle for use on the road or hunting was much like the Arab saddle of to-day, and similar forms are in use in Europe and elsewhere where the British saddle has not been adopted. Women rode astride or on a pillion behind a male rider. The side-saddle is sajd to date from the end of the. 12th century. For the harness of the ancient draught horse see Chariqt.

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SADDLEWORTH, an urban district in the Colne Valley parliamentary division of the West Riding of Yorkshire, England, 14 m. N.E. of Manchester, on the London & North Western railway. Pop., (1001) 12,320. It lies on the western side of the elevation of Stanedge, which here forms the; watershed between streams flowing westward to the Irish Sea and eastward to the North Sea. Early earthworks and tumuli are numerous in the locality. The Huddersfield canal follows the valley, and, like the railway, is carried under Stanedge by a long tunnel.

SADDUCEES, a sect or party of the Jews mentioned in the historical

books of the New Testament (with the exception of the fourth Gospel), by Josephus,

to justify their presence there. From the standpoint of the Pharisees who championed the hope of everlasting life and believed in the existence of angels, through whom God could communicate with men, they were infidels. As the Pharisees accumulated the oral tradition which was afterwards codified and elaborated or preserved by fragments, which served some useful purpose, in the Talmud and other Rabbinic writings, the Sadducees acquired concrete regulations to oppose so long as they dared. The Pharisees even improved upon the Temple ritual, and their popularity enabled them to force the Sadducees into adopting the improvements.

But though some of those who bore the title may be reckoned at their best as orthodox conservatives, their position was, as far as our mainly Pharisaic authorities permit us to learn, merely negative; and all the information we possess, whether it rests on facts or on prejudice, points to their close affinity with the Jews who renounced their faith altogether and advertised the fact — say by habitual and unwarranted breach of the Sabbath, for example. In fact, broadly speaking, the Sadducees for the period during which they are reported to exist, represent and embody the tendency to conformity with neighbouring Gentiles, which is deplored and denounced by Jewish writers from Moses to Philo. And there is this to be said that idolatry may be an outward symbol of a real indebtedness to idolaters which is not necessarily wiped out when the tangible idols are smashed. Idolatry is plainly incompatible with the law of Moses: so were Greek caps; but the Jews who conformed to Hellenism in the time of Antiochus Epiphanes acquired much that was conserved and utilized in that great attempt to convert the Greek world to Judaism, whose best monument is the works of Philo. The process is normal: first, there is an unqualified adoption of a foreign culture by the Sadducees of the time being: then, after unqualified opposition, the Pharisees of the time admit whatever is admissible within the four corners of the Law and are con- fronted by other Sadducees who have not followed the first into temporary or permanent separation from the existing Jewish way of life and absorption in the immediate foreign environment, and who, therefore, will have none of the current innovations which the Pharisees have in course of time selected as capable of assimilation and reconciliation with the existing body of growing doctrine and

practice. The Jews spoiled the Egyptians: some made a golden calf and worshipped if: others destroyed it and turned the spoils into vessels for the sanctuary: some again sighed for the fleshpots of Egypt, if they did not actually return thither.

The controversies of the Pharisees and Sadducees afford a typical example of this process. With the approval of Antiochus Epiphanes, the Sadducean section embraced the outward forms of Hellenism, and out of the persecution of the orthodox which followed was born the hope of a future life which was in the circumstances the necessary corollary of God's righteousness and was discovered to be latent in Scripture. Later Sadducees, who actually bore the name, resisted this and all the character- istics of the Pharisees and continued to flatter the predominant foreigner— Greek or Roman — by imitating him with less reckless bravado than the first Hellenizers and with growing assurance. They were men of the world, and men of this world, and, so far as they still professed and practised Judaism, they preferred to repudiate the additions for which they felt no need, but which had entered into the faith of their fathers. The Pharisees, who pruned and fed the tree of Judaism so that it might bear fruit for the healing of the Nation — and the nations in the latter days — gave them the opportunity of posing as the champions of the primitive standards. But, though the reformers thus played into the hands of the Sadducees, the people were not deceived by the badge which Sadducean priests adopted and paraded to save their faces: they loved the Pharisees and were ready to go to death at their bidding. The Sadducees were the hypocrites of the Jewish world, just as the Epicureans were the hypocrites of the Greek world. The rest of the Jews rated the Sadducees as atheists, just as the rest of the Greeks rated the Epicureans «s atheists and discerned, as Plutarch said, the sardonic grin

behind the mask of their obsequious devotion to the ceremonies at which the force of public opinion compelled their attendance. The Sadducee was a Jew outwardly so long as he so retained place, power and profit. The destruction of Jerusalem, long before it was consummated in a.d. 70, robbed them of the place and nation which alone compensated them for the inconveniences of their nominal allegiance. They knew well enough the power of invincible Rome; and her advance warned them to take themselves and their talents to the market of the wide world, to which in heart and mind they had always belonged.

Josephus (Ant. xiii. 5. 9, §§ 171-173, Niese) introduces the Sadducees along with the Pharisees and Essenes in his account of Jonathan's

reign (161-143 B.C.) as the third of the sects of the Jews, and defines their tenets thus: ” They deny the existence of God (Josephus says ‘ Fate,’ as he is speaking to pagans) and the Divine government of human affairs; and they assert that everything lies in our power, so that we are responsible for our good or bad fortune.” Similarly, in the earlier history of the Jewish War (ii. 8. 14, §§ 164-166, Niese) to which he refers, he says: ” The Sadducees do away with Destiny altogether and set God beyond the possibility of punishing or supervising men. They assert that man is free to choose good or evil since both are set before him, and that he receives good or evil according to his choice. They deny the immortality of the soul and the punishments and rewards of Hades. In contrast with the mutual friendliness and loyalty of the Pharisees, their behaviour towards one another is lacking in courtesy, and when they mix with their fellow-countrymen, they are as offhanded as if their fellows were aliens.” Josephus might have added that they were disposed to treat aliens as they should have treated their friends.

In the New Testament there is already a tendency to ignore the Sadducees and to transfer to the surviving and active sect of the Pharisees denunciations addressed to hypocrites. The feud which set Pharisee and Sadducee against one another is ignored, and generally the condign oblivion which overtook this sect of the Jews is already beginning. The Christian Fathers seem to confound them with the Samaritans, and the confusion is natural enough. The Sadducees were as little loyal to the Judaism of Jerusalem as the Samaritans — and they were less sincere and less interested in religion.

The Talmud reports ancient controversies on points of law; and gives the Sadducees a founder, Zadok the disciple of Antigonus the man of Soco who prohibited the hope of reward for service done to God. But this explanation of the name is as worthless as the rest of the Talmudic accounts of the Sadducees who were plready dead and gone. For the present the explanation put forward by A. E. Cowley (Ency. Bib. 4236) holds the field: a Persian word Zindik meaning Zoroastrian, and therefore infidel in the mouths of those who did not hold with Zoroaster, was applied to them by their opponents, and gradually altered so as to mean something in Hebrew — i.e. Zadokite or Righteous. Its acquired significance could be varied by the inflexion of the voice or the suggestion of inverted commas.

Schiirer (Geschichte des judischen Volkes, ii., 4th ed., pp. 447-456, 475-48Q) gives the evidence of the ancient authorities and references to modern studies of the subject. See also Jews. (J. H. A. H.)

SADE, DONATIEN ALPHONSE FRANQOIS, Count [usually called the marquis de Sade] (1740-1814), French licentious writer, was born in Paris on the 2nd of June 1740. He entered the light-horse at fourteen and saw considerable military service before returning to Paris in 1766. Here his vicious practices became notorious, and in 1772 he was condemned to death at Aix for an unnatural offence, and for poisoning. He fled to Italy, but in 1777 he was arrested in Paris, removed to Aix for trial, and there found guilty. In 1778 he escaped from prison, but was soon re-arrested and finally committed to the Bastille. Here he began to write plays and obscene novels. In 1789 h» was removed to the Charenton Lunatic Asylum, but was dis- charged in 1790, only to be recommitted as incurable in 1803. He died there on the 2nd of December 1814. Among his works, all of the type indicated, were Justine (1791), Juliette (1792), Philosophic dans le boudoir (1793) and Les Crimes de I'amour (1800). The word Sadism, meaning a form of sexual perversion, is derived from his name.

SA DE MIRANDA, FRANCISCO DE (1485-1558), Portuguese poet, was the son of a canon of Coimbra belonging to the ancient and noble family of Sk, and passed his early years by the banks of the river Mondego, the source of inspiration to poets in every age. He probably made his first studies of Greek, Latin and philosophy in one of the colleges of the Old City, and in 1505 went to Lisbon University, beginning at the same time to frequent

the court. Verse-making and gallantry occupied much of his time there, and by virtue of his talents and name he became one of a group comprising the greatest nobles and most celebrated poets of the age, including Bernadim Ribeiro and Christovao Falcao, who surrounded the beautiful and gifted D. Leonor de Mascarenhas. He seems to have resided for the most part in the capital down to 1 5 2 1 , dividing his time between the palace and the university, in the latter of which he had taken the degree of doctor of law by 15 16. Honoured by the friendship of Prince John (afterwards John III.), he accompanied the court as it moved from place to place during the reign of King Manoel, and witnessed the triumphs of the Fortunate Monarch; and at a time when the flag of Portugal floated victorious in every sea and her ships encircled the globe, it was not surprising that the youthful poet should aspire to be the Virgil of a new Augustus ruling a universal monarchy. His studious and reflective mind and sound sense did not allow him, however, to nourish these illusions for long, and we find him pointing

out in tones of prophetic melancholy the signs of decadence and future disaster. He had come out of the university so good a lawyer that he was able to act as ad interim professor of his faculty, and he was offered a judicial post, but his independent spirit and punctilious conscience led him to refuse it. He had only embarked on a legal career to please his father, and on the latter's death he abandoned law for moral and stoic philosophy and poetry, and resolved to travel. He had observed with regret the modest intellectual position of his country, for all her wealth and epic achievements, the latter of which had found no echo in poetry; and if he were to learn and be able to introduce new forms of art fed by fresh ideals, as he desired, he felt he must go abroad. The Cancioneiro de Resende, which represented the poetical efforts of courtiers for almost a century and contained Miranda's early verses, showed the extent of the national poverty by its artificiality, and lack of ideas, of sincerity and of good taste. These defects are not surprising, seeing that during most of that long period the literary movement had been confined to court circles and had remained essentially imitative of Spanish models, with hardly a vestige of national or popular inspiration about it. Portugal had been too busy building up a world-empire to imbibe much of the mental culture of the Renaissance, and even the classics were for the most part only known through Spanish translations. Direct intercourse between Portugal and Italy partook of a commercial rather than a literary or artistic character, and, previously to Miranda's journey, Italian poetry was practically unknown.

In the middle of July 1520 he set out across Spain for Italy, and spent the years 1521 to 1525 abroad, visiting Milan, Venice, Florence, Rome, Naples and Sicily " with leisure and curiosity." He enjoyed intimacy with Giovanni Ruccellai, Lattanzio Tolomei and Sanazarro; he saluted the illustrious Vittoria Colonna, a distant connexion of his family, and in her house he probably talked with Bembo and Ariosto, and perhaps met MachiavelJi and Guicciardini. He assisted at the rebirth of the Italian drama and saw the performance of classical prose comedies, a form of art which he was to transplant to Portugal. Lastly he heard the echoes of the Protestant revolt, and witnessed with horror the dissolution of morals which prepared the way for the Reformation. Returning home in 1525, he brought with him the sonnet and canzone of Petrarch, the tercet of Dante, the ottava rima of Ariosto, the eclogue in the manner of Sanazarro, and Italian cndecasyllabic verse. He did not, however, like his disciple Antonio Ferreira (q.v.), abandon the national redondilha, but rather continued to employ it and carried it to perfection in his Cartas. Settling down in Coimbra or its environs, he lived there from 1526-1527 until 1532.

The visit of King John III. and his court to the city enabled him to resume his old relations with the reigning house and the cultivated members of the nobility, who received him affably and listened with interest to the story of his Italian tour. Gil Vicente, the court dramatist, was then at the height of his fame, but his autos appeared poor things to Si de Miranda as compared with the comedies he had seen in Italy; and urged by his friends to present an example of the new style, he wrote the Estrangeiros. Produced in 1527-1528, it was

the first Portuguese prose comedy, and was composed on the lines of the classical Roman drama as modified by contemporary Italian authors like Ariosto; it had a great and immediate success, notwithstanding the opposition of the partisans of the popular auto, who saw themselves attacked in the prologue. In 1528 Miranda made his first real attempt to introduce the new forms of verse by writing in Spanish a canzon entitled Fabula do Mondego, and in 1530-153 2 he followed it up with the eclogue Aleixo, which among its redondilhas has some endeca- syllables — the earliest attempt at ottava rima in Portuguese. Various sonnets dedicated to friends also belong to this period. The foundations of the Italian school were now laid, and hence- forth Miranda's reputation as a poet grew visibly, while he was also one of the most esteemed of courtiers; but the opposition of his literary foes increased with his very success. Moreover, in the sphere of politics pessimism had taken firm hold of him. From being a land of promise, India had become for him, as for Camoens, " the mother of villains, the stepmother of men of honour "; and though the wealth of the East poured into Lisbon, Portugal remained poor because agriculture was neglected and corn had to be imported from abroad. Miranda protested in vigorous terms against the fever of adventure and lust of gold, but few gave ear to his moralizings or had leisure to read poetry, and in 1 534 he left the court.

The year 1532 had marked his passage from the active to the contemplative life, and the eclogue Basto, in the form of a pastoral dialogue written in redondilhas, opened his new manner. It has a pronounced personal note, and its episodes are described in a genuinely popular tone. The shepherds Gil and Bento repre- sent, the one city sociability, the other rustic aloofness, or the contrast between life at court and in the country, and serve as a vehicle for the poet's ideas. The same epoch saw the composition of his Cartas or sententious letters in quintilhas, which, with Basto and his satires, make up the most original, if not the most valuable, portion of his legacy, and served as models for two centuries. His allusion in Aleixo to the exile of Bernardim Ribeiro, and his defence of his friend, seem to have offended that powerful grandee, the count of Castanheira, and

probably hastened his retirement from court, and the royal gift of a Commenda of the Order of Christ, situate by the river Neiva on the borders of Galicia, came opportunely, because the rents Si de Miranda drew from it and a small private fortune enabled him to live in modest comfort at the neighbouring Quinta da Tapada. Poetry with him was never a mere pastime, and, after a short period of repose, the gift of a MS. of the verses of Garcilasso and Boscan, founders of the Italian school in Castile, encouraged him to resume the work of reform commenced at Coimbra; between 1535 and 1538 he composed five eclogues in endecasyllables, four in Spanish and one in Portuguese, which show evident traces of their influence.

Before long he heard echoes of his new song, first from the pro- vince, then from the court. In 1536 he married D. Briolanja de Azevedo, a lady of rare qualities and education, belonging to an illustrious Minho family. He spent the rest of his life in retire- ment at the Quinta da Tapada, which became a centre from which the reform of Portuguese poetry spread; for he developed great poetical activity in his retreat, and while he read and annotated Homer in the original Greek, he did not disdain domestic plea- sures and country sports. His evenings were occupied by music and the performance of comedies and mimes, and by readings of Bembo and Ariosto with cultivated neighbours; and he extended hospitality to savants like Nicholas Cleynarts and Francisco de Hollanda, and launched on the career of letters such men as Diogo Bernardes, the author of the Lima.

In 1538 he wrote his second classical prose comedy, the Vilhalpandos, which was played before the Cardinal Infant Henry, afterwards king, at his request, and on the poet's death that prince saw to the printing of this and the earlier comedy. During the years 1543 to 1553, except for a few occasional poems Si de Miranda kept silence, and the cause is not far to seek; the Inquisition had got to work, and the Jesuits had acquired control of the university and displaced the humanists. When

the king and court lent their presence to auios dafi and organized public penances, initiating a reign of fanaticisms and sadness, there was no place for poetry. Sa de Miranda could only deplore in private the misfortunes of his country and devote himself to polishing his verses and educating his children. His life's Work was done, for the year 1550 saw Camoens writing his admirable sonnets, canzons and elegies, and the Italian school had definitely triumphed. The last eight

years of Sa de Miranda's life produced a cycle of beautiful poems evoked by the personality of Prince John, the heir-apparent, who loved letters and especi- ally poetry, and whose precocity of talent made him the hope of all patriots. In 1550 and 1551, after the prince's visit to the university of Coimbra, he honoured the master by asking for a collection of his poems, and on three occasions we find the latter despatching portions of his song-book to Lisbon accompanied by dedicatory sonnets. Moreover, he had the further gratification of receiving verses from Antonio Ferreira, Jorge de Montemayor, Diogo Bernardes, and Andre Falcao de Resende, which were so many proofs of the vitality of his school. Three misfortunes, however, came on him in quick succession. He lost his eldest son in i553> Prince John died in 1554, and in 1555 his wife died. His friend King John III. passed away in 1557, and on the 15th of March 1558 Sa de Miranda followed him to the grave.

He was not a great writer and never entered into the hearts of his countrymen, remaining the poet of the cultured, who Could understand him and pardon his metrical imperfections. He led the way, however, in a revolution in literature, and especially in poetry, which under his influence became higher in aim, purer in tone and broader in sympathy. He is obviously not at ease in the new forms which he had introduced, and his verse is, as a rule, austere, unharmonious and often difficult of understanding, but these remarks do not, of course, apply to his redondilhas. Some of his sonnets are, however, admirable, and display a grave tenderness of feeling, a refinement of thought, and a simplicity of expression which give them a high value. As examples it is Only necessary to mention the one beginning " O sol he grande . . .," and the lines he composed on the death of his wife. Sa de Miranda wrote much and successfully in Castilian, several of his best eclogues being in that language. The charm of these com- positions lies in their convincing descriptions of natural scenery and country life, which he loved and comprehended to perfection.

Sa de Miranda's works were first published in 1595, but the admirable critical edition of Madame Michaelis de Vasconcellbs (Halle, 1885), containing life, notes and glossary, supersedes all others so far as the poems are concerned. His plays can best be read in the 1784 edition of the collected works. No modern or critical edition is available. See also Oswald Crawford, Portugal Old and New (London, 1880); Dr Sbusa Viterbo, Estudos sobre Sd de Miranda (3 parts, Coimbra, 1895-1896); Decio Carneiro, Sd de Miranda e a sua obra (Lisbon, 1895); and Dr Theophilo Braga, Sd de Miranda (Oporto, 1896). (E. Pr.)

SADHU, a Hindu ascetic, corresponding to the Mahommedan fakir (q.v.). The Sadhiis, who are known also as Sanyasis, Gosains and Bairagis, are of various sects, hold peculiar opinions, indulge in strange practices, and subject themselves in many cases to cruel hardships and fantastic disciplines. They range in moral standing frorh the peripatetic philosopher to the idle vagabond. Some lead the life of contemplation, which Hindus consider especially holy; others pose as alchemists, physicians, fortune-tellers, palmists or acrobats; while others yet again practise voluntary tortures, such as holding one arm upright until it withers, or lying continually upon a bed of spikes. Some go about almost naked, or smeared. all over with ashes; but the usual garment of an ascetic is stained an orange red with ochre. Hence was derived the colour of the Mahfatta flag. Alone among Hindus their dead are buried instead of being burned, usually in a sitting posture, and often in salt. During the disturbed period of Indian history, before British rule was firmly established, armed bodies of Sanyasis or Gosains attached themselves to the Mahratta armies, and also ravaged Northern Bengal in the time of Warren Hastings.

SA'Dl (c. 1184-1292). MusxiH-trDDiN, or more correctly Mrj$HARKiF-tiDDiN b. Mrj§LiH-TJDDlN, the greatest didactic poet and the most popular writer Of Persia, was born about

1184 (a.h. 580) in Shiraz. After the premature death of his father he was taken under the protection of Sa'd b. ZengI, the atabeg of Fars, who sent him to pursue his studies in the famous medresseh of Baghdad, the Nizamiyya, where he remained about thirty years (1196-1 224). About 1210 (a.h. 606) his literary fame had spread as far as Kashgar in Turkistan, which the young poet (who in honour of his patrOh had assumed the name of Sa'di) visited in his twenty-sixth or twenty-seventh year. After mastering all the dogmatic disciplines of the Islamitic faith he turned his attention first to practical philosophy, and later on to the more ideal tenets of Sufic pantheism, under the spiritual guidance of the famous sheikh Shihab-uddln Umar SuhrawardI (died 1234; a.h. 632). Between 1220 and 1225 he paid a visit to a friend in Isfahan, went from there to Damascus, and returned to Isfahan just at the time of the inroads of the Mongols, when the atabeg Sa'd had been deposed by the victorious Khwarizm ruler of Ghiyass-uddln (1226). Sadly grieved by the misfortune of his patron and disgusted with the miserable condition of Persia, Sa'di quitted Shiraz and entered upon the second period of his life — that of his wanderings (1226-1256). He proceeded via Balkh, Ghazni and the Punjab to Gujarat, on the western coast of which he visited the famous shrine of Siva in Somnath. After a prolonged stay in Delhi, where he learnt Hindustani, he sailed for Yemen. Overcome with grief at the

loss of a beloved child (when he had married is not known), he undertook an expedition into Abyssinia and a pilgrimage to Mecca and Medina. Thence he directed his! steps towards Syria and lived as a renowned sheikh for a consider- able time in Damascus, which he had once already visited. There and in Baalbek he added to his literary renown that of a first-rate pulpit orator. Specimens of his spiritual addresses are preserved in the five homilies (on the f ugitiveness of hurfian life, on faith and fear of God, on love towards God, on rest in God and on the search for God). At last, weary of Damascus, he withdrew into the desert near Jerusalem and led a solitary wandering life, till one day he was taken captive by a troop of Frankish soldiers, brought to Tripoli, and condemned to forced labour in the trenches of the fortress. After enduring Countless hardships, he was eventually rescued by a rich friend in Aleppo, who paid his ransom, and gave him his daughter in marriage. But Sa'di, unable to live with his quarrelsome wife, set out on fresh travels, first to North Africa and then through the length and breadth of Asia Minor and the adjoining countries. Not until he had passed his seventieth year did he return to Shiraz (about 1256; a.h. 653). Finding the place of his birth tranquil and prosperous under the wise rule of Abubakr b. Sa'd, the son of his old patron (1 226-1260; a.h. 623-658), the aged poet took up his permanent abode, interrupted only by repeated pilgrimages to Mecca, and devoted the remainder of his life to Sufic con- templation and poetical composition. He died at Shiraz in 1292 (a.h, 691) according to Hamdallah MustaufI (who wrote only forty years later), or in December 1291 (a.h. 690), at the age of no lunar years.

The experience of the world gained during his travels, his intimate acquaintance with the various countries he had visited; his insight into human character, together with an inborn loftiness Of thought and the purest moral standard, made it easy for Sa'di to compose in the short space of three years his two master- pieces, which have immortalized his name, the Bustdn or " Fruit- garden " (1257) and the Guiistan or " Rose-garden " (1258), both dedicated to the reigning atabeg Abu Bekr. The former, also called Sa'dindma, is a kind of didactic epopee in ten chapters and dOuble-rhymed verses, which passes in review the highest philosophical and religious questions, not seldom in the very spirit of Christianity, and abounds with sound ethical maxims and matchless gems of transcendental speculation. The latter is a prose work of a similar tendency in eight chapters, inter- spersed with numerous verses and illustrated, like the Bustdn, by a rich store of clever tales and charming anecdotes; it discusses more or less the same topics as the larger work, but has acquired a much greater popularity in both the East and the West, owing to its easier and more

varied style, its ‘attractive

lessons of practical wisdom, and its numerous bons mots. But Sa’dl’s Diwdn, or collection of lyrical poetry, far surpasses the Bustan and Gulisian, at any rate in quantity, whether in quality also is a matter of taste. Other minor works are the Arabic qasidas, the first of which laments the destruction of the Arabian caiiphate by the Mongols in 1258 (a.h. 656); the Persian qasidas, partly panegyrical, partly didactical; the mardthi, or elegies, beginning with one on the death of Abu Bekr and ending with one on the defeat and demise of the last caliph, Mosta’sim; the mulammadt, or poems with alternate Persian and Arabic verses, of a rather artificial character; the tarji’at, or refrain- poems; the ghazals, or odes; the sahibiyyah and mukatla’at, or moral aphorisms and epigrams; the rubd’iyyat, or quatrains; and the mufraddt, or distichs. Sa’dl’s lyrical poems possess neither the easy grace and melodious charm of Hafiz’s songs nor the overpowering grandeur of Jelalud-din Ruml’s divine hymns, but they are nevertheless full of deep pathos and show such a fearless love of truth as is seldom met with in Eastern poetry. Even his panegyrics, although addressed in turn to almost all the rulers who in those days of continually changing dynasties presided over the fate of Persia, are free from that cringing servility so common in the effusions of Oriental encomiasts.

The first who collected and arranged his works was ‘Ali b. Ahmad b. Bisutun (1326-1334; A.H 726-734). The most exact information about Sa’dl’s life and works is found in the introduction to Dr W. Bacher’s Sa’dl’s Aphorismenund Sinngedichte (Sahibiyyah) (Strass- burg, 1879; a complete metrical translation of the epigrammatic poems), and in the same author’s ” Sa’di Studien,” in Zeitschrift der morgenldndischen Gesellschaft, xxx. pp 81-106; see also H. Eth6 in W Geiger s Grundriss der iranischen Philologie, ii. pp. 292-296, with lull bibliography; and E, G. Browne, Literary History of Persia, PP 5 2 5S39- Sa’di’s Kulhyydt or complete works have been edited by Harrington (Calcutta, 1791-1795) (with an English translation ol some ol the prose treatises and of Daulat Shah’s notice on the poet, 01 which a German version is found in Graf’s Rosengarten (Leipzig, 1846 p. 229 sq.) ; for the numerous lithographed editions, see Rieu’s Lers. Cat. 0) the Brit. Mus. ii. p. 596. The Bustan has been printed in Calcutta (1810 and 1828), as well as in Lahore, Cawnpore, Tabriz, &c. , a critical edition with Persian commentary was published by K. H.

Graf at Vienna in 1850 (German metrical translations by the same, Jena 1850, and by Schlechta-Wssehrd.Vienna, 1852); English prose translations by H. W. Clarke (London,, 1879); and Ziauddin Gulam Moheiddin (Bombay, 1889); verse by G. S. Davie (1882); French translation by Barbier de Meynard (Paris, 1880). The best editions of the Gulisian are by A. Sprenger (Calcutta, 1851) and by Platts (London, 1874); the best translations into English by Eastwick (1852) and by Platts (1873), the first four bobs in prose and verse by Sir Edwin Arnold (1899); into French by Defremery (1858) ; into German by Graf (1846) ; see also S. Robinson's Persian Poetry for English Readers (1883), pp. 245-366. The Pandnamah, or book of wisdom (ot doubtful genuineness) has been translated by A. N. Wollaston (1908), with Persian text. Select qasidas, ghazals, elegies, quatrains and distichs have been edited, with a German .netrical translation, by Graf, in the Z.D.M.G. ix. p. 92 sq., xii. p. 82 sq., xiii. p. 445 sq., xv. p. 541 sq. and xviii. p. 570 sq. On the Sufic character of Sa'di in contrast to Hafiz and Rumi, comp. Ethfs, " Der Sufismus und seine drei Tlauptvertreter," in MorgenldndisJie Studien (Leipzig, 1870), pp. 95-124. (H.E.)

SADIYA, the extreme north-east frontier station of British India, in the Lakhimpur district of Eastern Bengal and Assam. It stanas high on a grassy plain, nearly surrounded by forest- clad mountains, on the right bank of what is locally (but errone- ously) considered the main stream of the Brahmaputra. On the opposite bank a railway has recently been opened which connects with the Assam-Bengal line. Sadiya is garrisoned by detachments of native infantry and military police, and is the base of a chai-' of outposts. There is a bazaar, to which the hill-men beyond the frontier— Mishmis, Abors and Khamtis — bring down rubber, wax, ivory and musk, to barter for cotton-cloth, salt, metal goods, &c.

SADLER, MICHAEL THOMAS (1780-1S35), English social reformer and economist, was born at Snelston, Derbyshire, on the 3rd of January 1780. Settling down in business in Leeds in 1800, he early took an active part in political life, devoting himself particularly to the administration of the poor law. In 1828 he wrote Ireland: its Evils and their Remedies, in which he advocated a poor-law, and a tax on absenteeism. He also took a share in the Malthusian controversy, writing The Law of Population: a Treatise in Disproof of the Super-fecundity of xxiii. 32

Human Beings and developing the Real Principle of their Increase (1830). He entered parliament in 1829 as member for Newark, and devoted his efforts to questions of social reform. He took a leading

part in the agitation for the prevention of child labour in factories — he was chairman of the committee appointed to inquire into the subject. He contested Leeds after the Reform Bill of 1832 (Aldborough, for which he had sat after Newark, being deprived of its member), but was defeated by Macaulay. In 1834 he was unsuccessful at Huddersfield, and failing health prevented any further attempts to re-enter parliament. He settled down in Belfast, where his firm had business interests, and died at New Lodge on the 29th of July 1835.

See R. B. Seeley, Memoirs of M. T. Sadler (1842).

SADLER (or Sadleir), SIR RALPH (1507-1587), English statesman, the son of Henry Sadler, steward of the manor of Cilney, near Great Hadham, Hertfordshire, was bom at Hackney, Middlesex, in 1507. While a child he was placed in the family of Thomas Cromwell, afterwards earl of Essex, whose secretary he eventually became. Between 1525 and 1529 his patron's letters are full of Sadler's name in connexion with Cardinal Wolsey's suppression of the monasteries; this probably brought him under the king's notice, for in 1536 he was made gentleman of the privy chamber, and from that time was continually employed by Henry VIII. In 1537 Sadler went first to Scotland to try to reconcile Margaret to her son King James V., and then to France on the same mission to James himself. He seems to have been successful, and was again in Scotland in 1 540 trying to induce the king to follow his uncle's ecclesiastical policy. In or about January 1540, he was made secretary of state along with Sir Thomas Wriothesly, and was knighted, probably about the same time. On James V.'s death Sadler again went to Scotland (March 1543) to negotiate a marriage between prince Edward and his cousin Mary; he was unsuccessful, but still retained Henry's confidence. On Henry's death in 1547, Sadler was by his will made one of the councillors to the sixteen noblemen entrusted with the young king's guardianship^ In the same year he was appointed treasurer to the army sent to Scotland, and for his services in rallying the repulsed cavalry at the battle of Musselburgh or Pinkie, he was created a knight- banneret. He also received many grants of land, including the manor of Standon in Hertfordshire, where he built a magnificent house in 1546. When Mary ascended the throne he retired, living quietly till Elizabeth's accession. He issued the writs for the privy council meeting at Hatfield on the 20th of November 1558, and during the first year of the queen's reign he once more became a privy councillor. He sat in the parliament of January 1558-1559 as member for Hertford, which he had already represented in 1 541, 1542 and 1553. Not long after-wards his strong Protestant sympathies and his acquaintance with Scotch affairs induced Elizabeth to send him (1559) to Scotland,

ostensibly to settle the border disputes, but in reality to secure a union with the Protestant party there, and he was largely instrumental in bringing about the treaty of Leith, July 6th, 1560. In 1568 Sadler was appointed chancellor of the duchy of Lancaster, and in. the same year was one of the English Commissioners employed in treating on the matters arising from the flight of the Queen of Scots. From this time he seems to have been continually engaged as., a discreet and trusty servant in connexion with Mary's captivity, and was frequently sent with messages to her. On the 25th of August 1584, when, owing to the imputations made by his countess, George 6th earl of Shrewsbury was allowed to resign his guardianship of the Queen, Sadler was appointed to succeed him. In September Mary was removed from Sheffield to Wing- field and thence early in 1585 to Tutbury. In April, Sadler, after numerous petitions on his part, was permitted to resign his distasteful charge. He is said by some to have been sent to Scotland to announce to James VI. his mother's deafh, but this is not corroborated by tne state papers. On the 30th of March 1.587. Sadler died at Standon, and was buried in the church there. He had married about 1534 Elizabeth Mitchell,

whose first husband Matthew Barre had deserted her and was believed to be dead. Barre, however, re-appeared a few years later, and Sadler then obtained an act of parliament legiti- matizing his children. Sadler was not a brilliant statesman, but a inost faithful and intelligent servant. His letters, particularly those on Scottish affairs, are most interesting.

Bibliography. — letters and Negotiations of Sir Ralph Sadler (Edinburgh, 1720); The State Papers and Letters of Sir R. Sadler, ed. Arthur Clifford, with a memoir by Sir Walter Scott (Edinburgh, 1809, 3 vols.) ; article by N. H.N. in Gentleman's Magazine for March 1835; J. M. Cussans, Hist, of Hertfordshire (1870-1873, 3 vols.); Memoir of the Life and Times of Sir R. Sadleir, by F. Sadleir Stoney (1877) ; Life and Letters of Thomas Cromwell, by R. B. Merriman (Oxford, 1902, 2 vols.).

SADO, an island belonging to Japan, lying 32 m. W. of Niigata, on 38 N., 138 30′ E. It has a circumference of 130 m., an area of 336 sq. m. and a population of 113,000. The port is Ebisa, on the east coast; and at a distance of i6| m., near the west coast, is the town of Aikawa, having in its vicinity gold and silver mines, for which Sado is famous.

They have been worked from very early times. Sado consists of two parallel hill ranges separated by a lower isthmus; the loftiest peak is that of Kimpokuzan (3815 ft.), to the north of Aikawa.

SADOLETO, JACOPO (1477-1547), Italian humanist and churchman, was born at Modena in 1477, and, being the son of a noted jurist, was designed for the same profession. He gave himself, therefore, to humanistic studies and acquired reputation as a Latin poet, his best-known piece being one on the group of Laocoon. Passing to Rome, he obtained the patronage of Cardinal Carafa and adopted the ecclesiastical career. Leo X. chose him as his secretary along with Pietro Bembo, and in 1517 made him bishop of Carpentras. Sadoleto had a remarkable talent for affairs and approved himself a faithful servant of the papacy in many difficult negotiations under successive popes, especially as a peacemaker; but he was no bigoted advocate of papal authority, and the great aim of his life was to win back the Protestants by peaceful persuasion — he would never coun- tenance persecution — and by putting Catholic doctrine in a con- ciliatory form. Indeed his chief work, a Commentary on Romans, though meant as a prophylactic against the new doctrines, gave great offence at Rome and Paris. Sadoleto was a diligent and devoted bishop and left his diocese with reluctance even after he was made cardinal (1536). His piety and tolerant spirit, combined with his reputation for scholarship and eloquence and his diplomatic abilities, give him a unique place among the churchmen of his time. He died in 1547.

His collected works appeared at Mainz in 1607, and include, besides his theologico-irenical pieces, a collection of Epistles, a treatise on education (first published in 1533), and the Phaedrus, a defence of philosophy, written in 1538. The best collection is that published at Verona (1737-1738); it includes the life by Fiordibello. See also Pericaud, Fragments biographiques sur Jacob Sadolet (Lyons, 1849); Joty, Ittude sur Sadolet (Caen, 1857); Balan, Monumenta, vol. i. (Innsbruck, 1885) ; Rochini's edition of the letters (Modena,

1872).

SADOLIN, JORGEN (c. 1490-1559) Danish reformer, the son of Jens Christensen, a curate and subsequently a canon of Viborg cathedral, and consequently, in all probability, born (c. 1499) out of wedlock, as his Catholic opponents frequently took care to remind him. He himself never used the name Sadolinus, which seems to have been invented subsequently by his son Hans, and points to the fact that the family were originally saddle-makers. We first hear of him on the 1st of December 1525, when Frederick I. permitted him to settle at Viborg to

teach young persons of the poorer classes ” whatever might be profitable.” On this occasion he is described as ” magister ” and no doubt got his degree abroad, where he seems to have been won for the Reformation. He sided with Hans Tausen when the latter first began to preach the gospel at Viborg, and Tausen, though himself only in priest’s orders, shortly before he left the place, ordained Sadolin (1529). Amongst ” the free priests ” who attended the herredag of Copenhagen in 1530 Sadolin occupied a prominent place. Frederick subse- quently transferred him to Funen, where he acted, according to his own expression, as ” adjutor in verbo ” to Knud

Gyldenstjerne, bishop of Odense. At the diocesan council held on the 27th of May 1532, during the absence of the bishop, he presented to the assembled priests a translation of Luther’s catechism, with Luther’s name omitted, preceded by an earnest plea in favour of a better system of education and a more practical application of the Christian life, which occupies a conspicuous place in the literature of the Danish Reformation. In the following year Sadolin published the first Danish translation of the Confession of Augsburg. He disappears during the troublous times of ” C’-revens Fejde ” (1533-1536), though we get a glimpse of him at the end of 1 536 as one of the preachers at Vor Frue Kirke, the principal church of Copenhagen. On the 2nd of September 1537 he was consecrated by the German reformer, Johann Bugenhagen, who himself only had priest’s orders, superintendent, or first evangelical bishop, of Funen. As bishop he was remarkable for the success with which he provided the necessary means for the support of churches, schools and hospitals in his widespread diocese, which had been deprived of its usual sources of income by the wholesale con- fiscation of church property. Towards the Catholics he adopted a firm, but moderate and reasonable, tone, and his indulgence towards the monks in St Knud’s cloister drew down upon him a fierce attack from the Puritan clergyman of Odense, who absurdly accused him of being a crypto-Catholic. He gave the funeral oration over Christian III. in St John’s Church at Odense in February 1559, though now very infirm and blind, and died at the end of the same year.

See Bricka, Dansk Biografish Lx. Art. Sadolin (Copenhagen, 1887). (R. N. B.)

SADOWA (Czech, Sddovd), a village of Bohemia, Austria, 4 m. N.W. of Koniggratz. Pop. (1900) 183, exclusively Czech. Sadowa, with the small adjoining wood, was one of the principal and most hotly contested Prussian positions . in the decisive battle now usually called by the name of Koniggratz (see Seven Weeks’ War).

SAEPINUM (mod. Altilia, near Sepino), a Samnite town 9 m. S. of the modern Campobasso, on the ancient road from Beneventum to Corfinium. It was captured by the Romans in 293 B.C. The position of the original town is on the mountain far above the Roman town, and remains of its walls in Cyclopean masonry still exist. The city walls (in opus reticulatum) of the Roman town were erected by Tiberius before he became emperor, the date (between 2 B.C. and a.d. 4) being given by an inscription. Within them are remains of a theatre and other buildings, including temples of Jupiter and Apollo, and there still exists, by the gate leading to Bovianum, an important inscription of about a.d. 168, relating to the tr allure (see Apulia) in Roman days, forbidding the natives to harm the shepherds who passed along them (Corp. inscr. Lat. ix. 2438).

See L. Fulvio in Not. degli scav. (1878), 374.

SAETERSDAL, a district in the south of Norway, comprising the valleys of the Otter river and its tributaries. The river rises in the fjelds above the Bukken Fjord, and flows south to Christiansund. The natives preserve old customs and an individual costume. A railway follows the valley to Byglands Fjord (48 m.), on the lake of that name, fostering the local agricultural and timber trade, and a driving road continues to Viken i Valle from which bridle-paths lead to Dalen in Tele- marken, and over the Enden and Malen fjelds to Lake Suldal on the Bratlandsdal route.

SAFED KOH (" white mountain "), in many respects the most remarkable range Of mountains on the north-west frontier of India, extending like a 14,000 ft. wall, straight and rigid, towering above all surrounding hills, from the mass of moun- tains which overlook Kabul on the south-east to the frontiers of India, and preserving a strike which — being more or less perpendicular to the border line — is in strange contrast to the usual conformation of frontier ridge and valley. The highest peak, Sikaram, is 15,620 ft. above sea-level, and yet it is not a conspicuous point oh this unusually straight-backed range. Geographically the Safed Koh is not an isolated range, for there is no break in the continuity 0/ water divide which connects it

with the great Shandur offshoot of the Hindu Kush except the narrow trough of the Kabul river, which cuts a deep waterway across where it makes its way from Dakka into the Peshawar plains. Strategically it is

an important topographical feature, for it divides the basin of the Kabul river and the Khyber route from the valley of Kurram, leaving no practicable pass across its rugged crest to connect the two. Its western slopes, where it abuts on the mountain masses which dominate the Kabul plain, are forest-covered and picturesque, with deep glens inter- secting them, and bold craggy ridges; the same may be said of the northern spurs which reach downward through the Shinwari country towards Gandamak and Jalalabad. Here the snow lies late and moisture is abundant— but on the southern sun-scorched cliffs but little vegetation is to be seen. Approaching the Peshawar plains the Safed Koh throws off long spurs east- ward, and amongst the foothills of these eastern spurs the Afridi Tirah long remained hidden from European eyes.

SAFES, STRONG-ROOMS AND VAULTS. The term ” safe,” whilst really including any receptacle for the secure custody of valuables provided with a lock or other device intended to prevent any person except the owner or some person authorized by him gaining access thereto, has gradually come to be confined to such receptacles when fitted with a vertical door, as distin- guished from a lid, and of such a size that they can be moved into position, by the use of proper appliances, in one piece. Such receptacles, when so large as to require that their parts should be assembled in situ, fall under the term ” strong-rooms,” or in the case of safe-deposits ” vaults,” and when constructed with hinged lids, as distinct from doors, under the terms ” cash-box,” ” deed-box ” and “coffer.” The term ” coffer ” is probably the most ancient, and in earlier days included, as it still does in France, what are now known as safes.

Although it is practically certain that boxes provided with locks or coffers must have followed closely on the development of locks (q.v.) and been in use in ancient Egypt, yet no examples remain to us of earlier date than the middle ages. The earliest examples extant were constructed of hard wood banded with hammered iron, and subsequent development took place rather on artistic than on practical lines up to the time of the introduction of boxes entirely of iron. On the continent of Europe the iron box was developed to a very high standard of artistic beauty and craftsmanship, but with no real increase of security. Several specimens of these coffers supposed to be of 17th-century work- manship are preserved in the museum at Marlborough House. Cast-iron chests seem to have been made in various parts of Great Britain in the early part of the 19th century, but the use of wrought iron was probably confined to London until 1820, or thereabouts, when the trade spread to Wolverhampton.

Up to this time no attempt had been made to make coffers fireproof, for though a patent for fireproofing had been taken out in 1801 by Richard Scott, it does not appear to have been used. In 1834, however, a patent was obtained by William Marr for the application of non-conducting linings, followed about four years later by a similar patent in the name of Charles Chubb. The foundation, however, of the modern safe industry was laid by Thomas Milner, originally a tinsmith of Sheffield, who after a few years' business in Manchester established, in 1830, works at Liverpool for the manufacture of tinplate and sheet iron boxes and who later made plate iron chests or coffers and, probably the earliest, safes about the year 1846. To him is due the modern system of fireproofing, which owes its merit to the use not of non-conductors but of an absorbent material which in the case of fire will be permeated with moisture present in it, either in the form of liquid contained in tubes which burst or otherwise discharge their contents when subjected to heat, or mixed with it as water of crystallization in combination with an inorganic salt. The patent he obtained in 1840 contains the following claim: " Constructing, forming, or manufacturing boxes, safes, or other depositories of an outer case of iron or other metal or material, enclosing one, two, or more inner cases, with spaces or chambers between them, containing an absorbent material or composition, tack as porous wood, dust of wood, dust of bones, or similar

substances, in which are distributed vessels, pipes or tubes filled with an alkaline solution or any other liquid or matter evolving steam or moisture, the tubes or vessels bursting or otherwise discharging themselves on the exposure of the box or other depository to heat or fire, into the surrounding absorbent matter, which thus pervaded with moisture and rendered difficult of destruction, protects the inner cases or boxes and their contents." In 1843, Edward Tann, Edward Tann, Junr., and John Tann took out a patent for securing the presence of moisture by means of a chemical salt. In their patent they give preference to alum in combination with Austin's cement or gypsum, but they also claim " any non-conductors of heat may be used, and for alum may be substituted sulphate of potash, muriate of ammonia, borax, impure potash, nitrate of soda, soda in cake, pearlash, or any of the known alkalis." Milner considered this an infringement of his patent of 1840, and in an action before Lord Campbell and a special jury in the Queen's Bench, on the 3rd of June 1851, a verdict was given upholding his contention. For some years no marked improvements in safes were made, although the manufacture had been taken up in various places by different firms. Safes had, however, been constructed of thicker materials, and some attention had been

paid to the more secure attachment of the various parts; also, with the advent

of the wrought-iron safe, as distinct from the coffer, the practice had developed of securing the door by a number of bolts operated by a handle and fastening them in the locked position by the lock proper, in order that a small key might be used (Charles Chubb's patent, 1845).

Concurrently with the increase of strength in safes and prob- ably with the increased value of articles preserved in safes, the skill of the professional thief had also increased, and this went on for some years until the Cornhill burglary of 1865 called general attention to the question. In i860 a patent was taken out by Samuel Chatwood for a safe constructed of an outer and inner body with the intervening space filled with ferro-manganese or speigeleisen in a molten state, the total thickness being 2 in. (fig. 1). The drilling of conical holes in the inner surface of the outer plate as shown in the figure renders the use of drills of any materials at present known quite inoperative; as the drill, even if it could be made sufficiently hard to pierce the speigeleisen, would on meeting it be bedded in the soft steel and unable to free itself. The construction of such a safe was an expensive matter, and it was not till after the robbery above referred to that he was enabled to sell a single example; it is, however, still in demand for the preservation of diamonds, as probably the only

absolutely drill-proof receptacle. This patent is noteworthy as being the only one connected with the lock and safe industry which has been extended by the privy council.

It is about this period (1860-1870), perhaps the most important in the history of safes, that the opening of safes by wedges seems to have become prominent. The effect of wedges was to bend out the side of the safe sufficiently to allow of the insertion of a crowbar between the body and the edge of the door, and various devices were adopted by different makers with the object of resisting this mode of attack. These devices may be placed in three classes: (1) the fixing to the door of studs or projections which, when the door closed, passed into holes or recesses in the frame of the body; (2) the use of bolts hooking into the side framing or entering the bolt holes at an angle; (3) the strengthen- ing of the side framing and of the attachment of the bolts to the outer

door-plate. The third of these methods (fig. 2) was patented by Samuel Chatwood in 1862, and is still very commonly employed. The second method was used by. Chubb and Chat- wood, but is not to-day in general use. The first method was used by all makers of repute, but has now been abandoned, as the increased structural strength of the better class of safes renders such devices unnecessary.

To prevent safes from being opened by the drilling of one or two small holes in such positions as to destroy the security of the lock itself, advantage was taken of the improvements in the

manufacture of high carbon steel, and even in. what is to-day called the ” fire-proof ” safe a plate of steel which offers con- siderable resistance to drilling is placed between the outer door plate and the lock.

For many years little advance was made except such as consisted in substituting steel for iron and in general gaining increased strength by the utilization of better materials, although many safes are made and sold to-day which offer little if any more resistance to fire and thieves than those of 1860-1870. About 1888 the ” solid ” safe was introduced. In this the top, bottom and two sides of the safe, together with the flanges at the back only or at both back and front, are bent from a single steel plate (fig. 3). This construction, with solid corners, also illustrated in figs. 1 and 2, only became practicable in conse- quence of the great improvements which had been made in the quality of steel plates; the credit of its invention formed the subject of litigation, which, however, was not carried to an issue. The abolition of corner joints, which up to 1888 had been. made by dovetailing and by the use of angle irons, had been previously attempted by welding, but the process was abandoned as commercially impracticable.

In the early days of the safe industry in America the conditions as far as protection from fire was concerned were entirely different from those obtaining in Great Britain. The timber construction employed in American buildings rendered fires much more fierce, but at the same time of very short duration, not more than an

Fig. 3.

hour or two, To meet this condition of affairs thick sides of non-conducting materials were more efficacious than the chambers of steam-generating materials employed in British construction, but the gradual abandonment of timber and the increasing size of buildings have called for changes in the methods of fire- proofing.

The American ” burglar proof” safe (fig. 4) seems to have developed from the fire-proof (fig. 5) simply by the addition of extra thicknesses of metal, usually alternately hard and soft, without any serious increase of structural strength; this: <;on- struction, known as the " laminated " or " built up," offers little resistance to burglars, as the various layers can be separated from one another by the use either of explosives, especially nitro- ■: glycerine, or of wedges. In 1890 a commission was appointed- by the U.S.A. government to report upon the strong-rooms or ! vaults Of the treasury at • Washington ; and their report 1 was ■ ! presented in September 1893. This commission based their conclusions on experiments conducted in their presence, as well as on well-authenticated experiments performed by safe—maker$! on their own and other makers' productions, and they found

Fig. 4. — American Burglar- proof Construction.

Fig. 5.— American Fire proof Safe.

that, with the single exception of the Corliss safe, all the safes which came under their notice — and these comprised all the ; best-known American makes— could be opened by burglars by

1 Report of Special Commission of Experts as to Means of improving’ Vault Facilities of the Treasury Department (Washington, 1894).

drilling, by the use of explosives, and by the use of wedges and s’milar well-known tools. This Corliss safe consists of a spherical shell of cast iron several inches thick and with its exterior hardened by “chilling.” It is fitted with a ground-in door rotat- ing concentrically with the shell and internally. The spherical form and great thickness render the useful space in the interior very small and of inconvenient shape.

The requirements of a modern safe may be briefly summarized.

In fire- and thief-proof safes, the body and door must be constructed ot sufficient thickness, and the joints as well as the attachment of the door to the body frame of sufficient strength, to remain ‘ uninjured by a # fall from the highest position in ifr which the safe may be placed to the basement, or by the impact of any debris, coping stones, girders, &c. falling from the highest part of the building to the basement. The space between the outer body and the inner casing must be properly charged with a steam-generating mixture in

sufficient quantity to keep the interior of the safe moist for the whole time during which it may be subjected to heat in the case of a fire. The same requirements must be satisfied in burglar-proof safes. In addition, the body and door must be of such material and of such thickness that it is impossible to cut a sufficiently large hole to extract the contents, and so constructed that they can- not be dismembered; the framing and attachment of the bolts to the door must be able to resist the action of wedges or forcing screws; the vital parts of the lock and bolt- work must be further protected so that it is impossible to attack them by drilling, and this protection must not be liable to be destroyed by the action of heat; the lock itself must not be capable of having its security destroyed by the explosion of the largest quantity of explosive which can be inserted. If these conditions are satisfied there is little fear that the oxy-acetylene blowpipe, the elec- tric arc or the use of the higher ex- plosives can be made effective. The amount of protection required to meet the above conditions must, in each case, depend on what tools it is reasonable to anticipate may be employed by the burglar and the maximum time which he may have at his disposal. The use of high explosives has become a more frequent method of attack by burglars in Great Britain, but where the safes have been of the best quality, of solid construction and good work-manship, this means of attack has been rendered ineffective.

Strong-rooms and Vaults. — It is not hard to imagine that the use of strong-rooms was much earlier than that of safes; in fact, there can be no doubt that masonry rooms provided with heavy wooden doors secured by locks were in use in ancient Egypt, and that the development of strong-room doors attached to masonry rooms followed that of the old coffers very closely. No exact date can be obtained as to the introduction of what we may call modern strong-rooms, but it is only reasonable to suppose that, where larger quantities of valuables had to be preserved than a safe would conveniently hold, a safe-door of larger dimensions

would be made and attached to a masonry or brick room. The next step would be the discovery that the walls of such a room offered little protection against even unskilled violence, and the lining of the room with metal would immediately follow ; the door frame, as a matter of course, being attached to the plating. Strong-rooms of this construction are in common use to-day by

Fig. 6.

banks and other institutions; and, as with safes, so with string? rooms, development has taken place in the direction of increasing the

thickness and the structural strength as well as in the applica- tion of superior locking devices (see Locks).

This increase of structural strength has been carried along somewhat different lines by different makers in Great Britain and along still more diverse lines in America. Masonry or brick- work alone is now rarely relied on for the protection of goods of any great value; concrete, however, reinforced by old railway metals imbedded therein and sometimes connected together to form, as it were, a cage, is in use. Railway metals attached to steel plates and also bedded in concrete are very largely employed. Thick plates of steel and latterly of manganese and other special steels are also in common use. Various forms of strong-room walls are illustrated in fig* 6.

Usually a strong-room is provided with an open-work gate or

"grille" as well as a door, so that the contents may be protected by the gate during business hours without preventing the free access of air; they are usually also fitted for convenient sub- division. Safe deposit vaults do not differ in any way from strong-rooms, except that they are fitted up with small safes or integers provided with special locks, so that the renter can gain access to his own integer only, and this only with the assistance of a custodian.

Many electrical devices have been introduced, having for their object the giving of an alarm when strong-rooms or safes are im- properly approached or tampered with. Most of these devices were quite useless, as they could at once be rendered inoperative; but though others displayed greater ingenuity, it is very questionable whether they are of any real utility, and they have not remained in common use. Where the value known to be contained in a strong- room is sufficiently great, an attack by tunnelling must be specially guarded against, and as in this form of attack the time which may be devoted to preparing for the actual breaking through is practically unlimited, the use of some device which will give warning of any such attack before the floor of the strong-room itself is reached is of very great importance. Probably the best of such devices, and one which is in practical use, consists of a network of small pipes, laid in concrete below the floor, and filled with glycerin or other liquid. To this network a mercury manometer is connected. If any breach is made in the pipe system, a leakage takes place, causing an alteration in the

level of the mercury in the manometer, which may, if desired, be arranged to ring a bell. The manometer should in any case be observed regularly on the opening of the strong- room. (A. B. Ch.)

SAFETY-LAMP, a form of lamp, used especially in mines, which is so constructed that it will burn without igniting a gaseous explosive mixture by which it is surrounded. To effect this end, the flame is encircled with a protecting metal case which is perforated with numerous small holes. Through these air for feeding the flame can enter freely and the products of combustion escape; but the flame or gases cannot pass out at a sufficiently high temperature to cause the ignition of the explosive mixture outside, because on arriving at the perforations they give up much of their heat to the large metallic surface they encounter, by which it is conducted away. In 1816 Sir Humphry Davy discovered the suitability of wire gauze as the material of the metal case, when the substance of the wire was rightly proportioned to the size of the aperture. The standard adopted as the limit for safety at that time was a gauze of 28 iron wires to the linear inch, having 784 apertures per square inch, but in some lamps the apertures are occasionally made still smaller.

The common safety or Davy lamp consists of a small cylindrical oil lamp, covered with a cylinder of wire gauze about 6 in. long and ii in. in diameter, with a flat gauze top. The upper part of the gauze is doubled to prevent it from being worn into holes by the products of combustion, and the air for feeding the flame enters round the wick. The gauze is mounted in a cage, consisting of three upright wires, screwed into a flat brass ring at each end. A handle is attached to the upper ring, while the lower one screws on to a collar on the oil-vessel of the lamp. When the two parts are screwed together the lamp is locked by a bolt passing through both parts, which is screwed down flush with or below the surface of the outer ring, so that the gauze cannot be removed without the use of a key.

In Stephenson's safety-lamp, generally known as the " Geordie " from its inventor George Stephenson, the light is covered by a glass chimney, surrounded by an outer casing and top of wire gauze. The feed air is admitted through numerous small holes in a copper ring a little below the level of the wick. This is one of the safest forms of lamp, but requires considerable care in use, especially in keeping the small feed holes clear from dust and oil; the glass protects the gauze from becoming overheated, and when the air is dangerously charged with gas the light is extinguished.

In the lamp invented by Dr W. Reid Clanny (1776-1850) about the

same time as those of Davy and Stephenson, a glass cylinder is substituted for the lower portion of the wire gauze. The air for supplying the flame, entering at the bottom of the gauze and passing down the inner side of the glass, protects the latter to some extent from becoming overheated, but a large amount of light is lost by absorption in the glass, so that there is no great advantage over the ordinary Davy lamp to compensate for the extra weight and cost, especially as the safety property of the lamp depends upon the glass cylinder, which may be readily broken when subjected to the ordinary accidents of working. A more perfect form of lamp of the same character is that of Mueseler, which is extensively used in Belgium. It differs from Clanny's lamp by the addition of a conical chimney above the flame, which produces a rapid draught, and consequently a more perfect cooling of the glass cylinder by the downnow of feed air for the flame.

The safety of the Davy lamp is endangered by exposure to a current of gas moving at more than 6 ft. a second, as the flame is then liable to be forced through the gauze, and the Clanny and Stephenson lamps are not safe in currents exceeding 8 and 10 ft. respectively. These early forms have therefore been improved and modified to meet the requirements of safety in air-currents travelling at a high velocity. In the Hepplewhite-Gray lamp there is a conical glass surrounding the light, with a gauze chimney, pro- tected by an outer metal cylinder; the air supply to the flame is carried downwards through three tubes forming the standards of the cage. This lamp, in addition to giving a good light overhead owing to the shape of the glass, is peculiarly sensitive to gas, and therefore valuable in testing for fire-damp. Other approved lamps are the Deflector and those of Marsaut and Mueseler when specially bonneted to resist extra high-speed currents. The illuminant now generally used in Great Britain is a mixture of rape oil with half its volume or more of petroleum, which is more suitable than vegetable or animal oil alone. In Germany, and also in America, Wolf's lamp, burning benzoline or petroleum spirit upon an asbestos wick, is very popular as giving a much better light than oil. Special care is, however, required in filling, so that no free liquid may be left in the holder; the spirit must be entirely absorbed by a filling of sponge, and any superfluous quantity poured off. Portable electric lamps, supplied by accumulators or dry batteries, have been introduced into coal- mines ; but owing to the weight and cost their use is as yet very restricted.

The ordinary safety-lamp affords indications of the presence of fire-damp (marsh gas) in the air of a mine. When the amount exceeds 2 or 2 § , it may be detected by reducing the flame till it is practically non-

luminous, when a pale blue flame or luminous cap will be seen above the ordinary flame. This varies in size with the percentage of fire-damp, until when there is about 10 the blue flame fills the whole interior of the gauze cylinder. If the lamp is allowed to remain too long in such a fiery atmosphere, it becomes dangerous, because the gauze, becoming heated to redness, may fire the external gas. For detecting the presence of fire-damp in amounts less than 2j%, special lamps with non-luminous flames are adopted. In Pieler's lamp, which is of the ordinary Davy form, alcohol is burned on a silk wick, and a screen is provided so that the flame can be hidden. When exposed in air containing i% a cap of 1 1 in. is formed, which increases to 2 in. with J %, and with I J % the lamp is filled with a deep blue glow. Another and more useful method is that of Dr F. Clowes, who uses a hydrogen flame 0-4 in. long, obtained by attaching a cylinder containing compressed hydrogen to an ordinary safety-lamp. When used for gas testing the hydrogen is turned into the oil flame, which is for the time ex- tinguished, and relighted when the observation is finished. So small a proportion as 0-2 % of gas can be detected by this method. The locking of safety-lamps, so as to render them incapable of being opened by the miners when at work, is a point that has given play to a large amount of ingenuity. One of the most favourite devices is a combination of the wick-holder with the locking bolt, so that the latter cannot be withdrawn without lowering the wick and extinguishing the flame. Another method consists in the use of a lead rivet, uniting the two parts of the lamp, impressed with a seal, which cannot be removed without defacing the device. All this class of contrivances have the defect of only being efficacious when the miners are not provided with matches or other means of obtaining a light. A more physically perfect method is that adopted by Bidder, where the locking bolt is magnetized and held in place by a force which can only be overcome by the application of a battery of heavy and powerful steel magnets. These are kept in the lamp cabin at the pit bottom, where the lamps are cleaned and served out lighted to the miners at the commencement of the shift, and are collected before they return to the surface. (H. B.)

$AFFARIDS, a Persian dynasty of the 9th century, founded by Yakub (Yaqub) b. Laith b. Saffar (" coppersmith ") about 866, who, originally a leader of bandits and outlaws, became governor of Sejistan. He soon added to his province Herat, Fars, Balkh and Tokharistan, overthrew the Tahirids in Khorasan, and, nominally still dependent on the caliphs of Bagdad, estab- lished a dynasty in Sejistan (see Caliphate, section C, Abbasids, § 10, and Persia: History, section B). Soon after 900 the dynasty became subordinate to the Samanids (q.v.) and few of

its rulers had any real authority. Under the last of the dynasty, Taj ud-din Binaltagin (1225-1229), a usurper of the royal family of the Khwarizm shahs, the country was captured by the Mongols.

See S. Lane Poole, Mahommedan Dynasties (1894), p. 129 ; Stockvis, Manuel d'histoire (Leiden, 1888), vol. i. p. 137; on the later Saffarids, H. Sauvaire, in the Numismatic Chronicle (1881).

SAFFI, or Asn, a seaport on the west coast of Morocco, in 32°2o'N.9° 12′ W-, 106 m. W.N.W.of Marrakesh. (Pop. about 15,000.) Although the principal wool and grain port of central Morocco, the anchorage is an open roadstead and communica- tion with the shore is at times difficult. The old palace with

beautifully decorated courts in fair repair, built by Mohammed XVII., is a prominent object above the town, and there are many interesting buildings and ruins.

SAFFLOWER (ultimately from the Arabic safra, yellow) or Bastard Saffron (Carthamus tinctorius), a plant of the natural order compositae; its flowers form the basis of the safflower dye of commerce. The plant is a native of the East Indies, but is cultivated in Egypt and to some extent in southern Europe. To obtain the dyeing principle — carthamin, C14H14O? — the flowers are first washed to free them from a soluble yellow colouring matter they contain; they are then dried and powdered, and digested in an alkaline solution in which pieces of clean white cotton are immersed. The alkaline solution having been neutral- ized with weak acetic acid, the cotton is removed and washed in another alkaline solution. When this second solution is neutral- ized with acid, carthamin in a pure condition is precipitated as a dark red powder. It forms a brilliant but fugitive scarlet dye for silk, but is principally used for preparing toilet rouge.

SAFFRON (Arab. za'fardn),a. product manufactured from the dried stigmas and part of the style of the saffron crocus, a cultivated form of Crocus sativus; some of the wild forms (var. Thomasii, Cartwrightianus) are also employed for the manu- facture. The purple flower, which blooms late in autumn, is very similar to that of the common spring crocus, and the stigmas, which are protruded from the perianth, are of a characteristic orange-red colour. The fruit is rarely formed. The Egyptians, though acquainted with the bastard safflower,

do not seem to have possessed saffron; but it is named in Canticles iv. 14 among other sweet-smelling herbs. It is also repeatedly mentioned (/cp6icos) by Homer, Hippocrates and other Greek writers; and the word ” crocodile ” was long supposed to have been derived from KpoKos and SeiXos, whence we have such stories as that ” the crocodile’s tears are never true save when he is forced where saffron groweth ” (Fuller’s Worthies). It has long been cultivated in Persia and Kashmir, and is supposed to have been introduced into China by the Mongol invasion. It is mentioned in the Chinese materia medica (Pun Isaou, 1552-1578). The chief seat of cultivation in early times, however, was the town of Corycus (modern Korghoz) in Cilicia, and from this central point of distribution it may not improbably have spread east and west. According to Hehn, the town derived its name from the crocus; Reymond, on the other hand, with more probability, holds that the name of the drug arose from that of the town. It was cultivated by the Arabs in Spain about 961, and is mentioned in an English leech- book of the 10th century, but seems to have disappeared from western Europe till reintroduced by the crusaders. According to Hakluyt, it was brought into England from Tripoli by a pilgrim, who hid a stolen corm in the hollow of his staff. It was especially cultivated near Hinton in Cambridgeshire and in Essex at Saffron Walden, its cultivators being called ” crokers.”

Saffron was used as an ingredient in many of the complicated medicines of early times. That it was very largely used in cookery is evidenced by many writers; thus Laurenbergius {Apparatus plantarum, 1632) makes the large assertion ” In re familiari vix ullus est telluris habitatus angulus ubi non sit croci quotidiana usurpatio aspersi vel incocti cibis.” The Chinese used also to employ it largely, and the Persians and Spaniards still mix it with their rice. As a perfume it was strewn in Greek halls, courts and theatres, and in the Roman baths. The ‘streets of Rome were sprinkled with saffron when Nero made his entry into the city.

It was, however, mainly used as a dye. It was a royal colour in early Greek times, though afterwards, perhaps from its abundant use in the baths and as a scented salve, it was especially appropriated by the hetairae. In ancient Ireland a king’s man tie was dyed with saffron, and even down to the 17th century the ” lein-croich,” or saffron-dyed shirt, was worn by persons of rank in the Hebrides. In medieval illumination it furnished, as a glaze upon burnished tinfoil, a cheap and effective sub- stitute for gold. The sacred spot on the forehead of a Hindu pundit is also partly composed of it. Its main use in England

was to colour pastry and confectionery, and it is still used for this

purpose in some parts of the country (notably Cornwall) .

One grain of saffron rubbed to powder with sugar and a little water imparts a distinctly yellow tint to ten gallons of water. This colouring power is due to the presence of polychlorite, a substance whose chemical formula appears to be CˆHeoOis, and which may be obtained by treating saffron with ether, and afterwards exhausting with water. Under acids it yields the following reaction —

C48H60O18 + H2O = 2Cl6Hi80e + C10H1 4O + C6H12O6.

Polychlorite. Crocin. Essential oil. Sugar.

Crocin, according to Watts, Diet, of Chem., has a composition of C29H42O16 or C58H42O30. This crocin is a red colouring matter, and it is surmised that the red colour of the stigmas is due to this reaction taking place in nature.

Saffron is chiefly cultivated in Spain, France, Sicily, on the lower spurs of the Apennines and in Persia and Kashmir. The ground has to be thoroughly cleared of stones, manured and trenched, and the corms are planted in ridges. The flowers are gathered at the end of October, in the early morning, just when they are beginning to open after the night. The stigmas and a part of the style are carefully picked out, and the wet saffron is then scattered on sheets of paper to a depth of 2 or 3 in. ; over this a cloth is laid, and next a board with a heavy weight. A strong heat is applied for about two hours so as to make the saffron ” sweat,” and a gentler temperature for a further period of twenty-four hours, the cake being turned every hour so that every part is thoroughly dried. This is known as cake saffron to distinguish it from hay saffron, which consists merely of the dried stigmas.

The drug has naturally always been liable to great adulteration in spite of penalties, the severity of which suggests the surviving tradition of its sacred character. Thus in Nuremberg a regular saffron inspection was held, and in the 15th century we read of men being burned in the market-place along with their adulterated saffron, while on another occasion three persons convicted of the same crime were buried alive. Grease and butter are still very frequently mixed with the cake, and shreds of beef dipped in saffron water are also used. Good saffron has a deep orange-red colour ; if it is light yellow or blackish, it is bad or too old.

SAFFRON WALDEN, a market-town and municipal borough in the Saffron Walden parliamentary division of Essex, England, beautifully

situated near the Cam in a valley surrounded by hills, on a branch of the Great Eastern railway, 43I m. N.N.E. from London. Pop. (1901) 5896. It has a somewhat ancient appearance and possesses a spacious market-place. Of the old castle, dating probably from the 12th century, but in part protected by much earlier earthworks, the keep and a few other portions still remain. Near it are a series of curious circular excavations in the chalk, called the Maze, of unknown date or purpose. The earthworks west and south of the town are of great extent; there was a large Saxon burial-ground here. The church of St Mary the Virgin, a beautiful specimen of the Perpendicular style, dating from the reign of Henry VII., but frequently repaired and restored, contains the tomb of Lord Audley, chancellor to Henry VIII. There is an Edward VI. grammar school, occupying modern buildings. The town pos- sesses a museum with good archaeological and natural history collections, a literary institute and a horticultural society. The benevolent institutions include the hospital and the Edward VI. almshouses. There is a British and Foreign School Society's training college for mistresses. In the neighbourhood is the fine mansion of Audley End, built by Thomas, 1st earl of Suffolk, in 1603 on the ruins of the abbey, converted in 1190 from a Benedictine priory founded by Geoffrey de Mandeville in 1136. Brewing, malting and iron-founding are carried on. The borough is under a mayor, 4 aldermen and 12 councillors. Area, 7502 acres.

Saffron Walden (Waledana) was almost certainly fortified by the Britons, and probably by some earlier race. The town corporation grew out of the Gild of the Holy Trinity, which was incorporated under Henry VIII., the lord of the town, in 1514. It was dissolved under Edward VI., and a charter was obtained for Walden, appointing a treasurer and chamberlain and twenty- four assistants, all elective, who, with the commonalty, formed the corporation. In 1694 William and Mary made Walden a free borough, with a mayor, 4 aldermen and 12 town councillors. The corporation became a local board of health under the act of 1858, and a municipal borough in 1875. The culture of saffron was the most characteristic industry at Walden from the reign of Edward III. until its gradual extinction about 1768.

SAFRANINE, in chemistry, the azonium compounds of symmetrical diamino-phenazine and containing the ring system annexed: —

cA c<\

They are obtained by the joint oxidation of one molecule of a paradiamine with two molecules of a primary amine; by the condensation of para-aminoazo compounds with primary amines (O. Witt, Ber., 1877, 10, p. 874), and by the action of para-nitrosodialkylanilines with secondary bases such as diphenylmetaphenylenediamine. They are crystalline solids showing a characteristic green metallic lustre; they are readily soluble in water and dye red or violet. They are strong bases and form stable monacid salts. Their alcoholic solution shows a yellow-red fluorescence.

Phenosafranine is not very stable in the free state; its chloride forms green plates. It can be readily diazotized, and the diazonium salt when boiled with alcohol yields aposafranine or benzene induline, Ci8Hi 2 Nj. F. Kehrmann showed that aposafranine could be dia- zotized in the presence of cold concentrated sulphuric acid, and the diazonium salt on boiling with alcohol yielded phenylphenazonium salts. Aposafranone, CisHuNjO, is formed by heating aposafranine with concentrated hydrochloric acid. These three compounds are perhaps to be represented as ortho- or as paraquinones (see papers by F. Kehrmann, O. Fischer and E. Hepp; R. Nietzki and others, Ber., 1895 et seq.). The ” safranine ” of commerce is a tolusafranine. The first aniline dye-stuff to be prepared on a manufacturing scale was mauveine, C27H 26 N 4 C1, which was obtained by Sir W. H. Perkin by heating crude aniline with ootassium bichromate and sulphuric acid. It is a N-phenylsafranine (see Indulines).

SAGA (literally a story committed to writing), a word derived from Icel. segja, to say. The term is common to most of the Teutonic languages, where we find Eng. say, Ger. sagen, the O. Eng. secgan, Dan. sige and Swed. segja, all identical in meaning. A saga, therefore, was originally something reported, segin saga, a tale told, in English a saw. But the earliest literature of Scandinavia goes back to an age before writing was invented, and when the legends were first put down they were called sagas because they were things which had been told or repeated from mouth to mouth. The early books speak of sagas which, apparently, had never been written down and were in conse- quence lost; but, as soon as the art of writing was understood, the word saga began for the future to be used exclusively for written historical books. A volume made up of such histories was known as a sogubdk or book of sagas. They weie not rigidly historical; any story which was written down, and repeated accoiding to the literary formula, was called a saga. The telling of tales was a recognized form of entertainment at Icelandic banquets, and inHaraldssaga HafSrd’Sa there are very interesting details regarding these public saga-tellings; the person who repeated or read the tale being known as the

soguma'Sr or saga- man, and being held in high honour at the feast.

The saga was properly a creation of the peculiar conditions under which Icelandic society was constituted in the earliest medieval times. The aristocratic Icelander had no diversions, except games of strength and skill out of doors and the listening to professional story-tellers indoors. As has been often pointed out, the saga is a prose epic, and in its various kinds it follows strict laws of composition. The lesser epic, in its original form, was the biography of some heroic Icelander who had lived in the 10th or nth century. It was composed with great tegularity, so as to proceed uniformly from the birth of the hero to his death, and indeed from before the one date until after the other. The style is brief, clear and conversational; the hero was often a distinguished poet, and in that case some of the best of his verses are interwoven into the narrative, being put in his mouth on striking occasions. Alliteration takes a great part in the ornament of the style. The skill with which the story is told, the high romantic sense of honour and courage which is displayed, the quick turns of the dialogue, the brilliant evolution of the plot, all these give enduring charm to the more successful and ample of the sagas, and in the earlier examples

these qualities are very rarely missing. It is to be remembered, however, that the saga was intended to be listened to, not read, by an audience which was mainly interested in three subjects, namely fighting, litigation and pedigree. It was illegitimate for the saga-man, in the preparation of his epic, to allow himself to stray for any length of time from one of those three themes; since even love must be considered in the light of an episode.

The period of the saga-age, as it was called, the sogu-old or epoch celebrated in the sagas, is now confined between the years 890 and 1030, and opens with the original colonization of Iceland. The deaths in 1030 of two great statesmen, Snorri and Skapti the Lawman, mark its close; almost immediately afterwards, before the end of the nth century, the actual age of saga- composition is in full action; and lastly comes the rit-old, or age of writing when the sagas were preserved in their present literary form, the blossoming time of which was the :3th century. According to the definite statement of the great historian, Sturla, the first man who wrote down in the Norse tongue, in Iceland, " histories relating to times ancient and modern," was Ari FrofSi (1067ˆ148),' who was therefore the earliest of the saga-writers. He, as we know, was the author of three works of vast importance in the history of Icelandic literature. These were Konunga-bdk or the Book of King, Landnama-bok or the Book of Settlements and Islendinga-bdk or

the Book of Icelanders. The second of these, in which Ari was assisted by Kolsegg Asbjornsson, survives and is of priceless value. Of the first and third, we possess abbreviations and summaries. It is believed that the admirable style in which the sagas are composed was the invention of Ari, to whose individual genius the form of classic prose tradition is attributed. He has no rival in this respect, and is the true father of the Icelandic saga. The works of Saemund Vigfusson (1056-1133), who succeeded Ari as a writer of the lives of kings, are unfortunately lost.

We now pass to what are called the Greater or Islendinga sagas, which are of a more intense and romantic character than the historical biographies. Among these the greatest is Njalssaga (or Njala), which few critics will question to be the most eminent masterpiece of Icelandic literature. There is no clue to the name of the author, who was evidently a lawyer; extensive as is the work, it is evidently written by one hand, for peculiarities and felicitous originalities of style recur through- out the whole saga. It must have been composed between 1230 and 1280. Vigfusson has described Njala as being, par excellence, the saga of law, and adds, ” the very spirit indeed of Early Law seems to breathe through its pages.” The scene in which Njal, the Lawman of judgment and peace, is burned in his homestead by his enemies is perhaps the most magnificent passage which has been preserved in the whole ancient literature of the North. The story of Njala is placed at the close of the 10th and the first years of the nth century. Eyrbyggiasaga deals with politics as Njalssaga deals with law; it is a precious Compendium of history and tradition handed down from heathen times. It has been suggested that it may be, at all events in part, the work of Sturla the Lawman, who died in 1284. Extremely beautiful in its relation to external nature, a matter often ignored in the sagas, is Laxdaelasaga, which is also the most romantic in sentiment. It was probably written about 1235, but by whom is unknown. The aristocratic spirit of the great Icelandic families finds its most characteristic exposition in Egilssaga, a very vigorous tale of adventure, the central figure of which, Egil, is depicted with more psychological subtlety than is usual in the sagas; it probably belongs to about 1230. Into Grettissaga there enter biographical and mythical elements, curiously mingled; it is also confused in form, and is probably a recension, made about 1310, of two or more earlier sagas now lost, the finest parts of which.it is thought that Sturla may have written. These are the five famous groups of anonymous narrative which are known as the Greater Sagas.

The Minor Sagas must be treated more briefly. Hensa- \>orissaga, belonging to the south-west of Iceland, deserves attention because of

its extreme antiquity; it has. been dated 993. Gunnlaugssaga Ormstungu (The story of Gunnlaug Worm-

Tongue) is a love-story of great sentimental charm. In Gislasaga the gloom of the Icelandic outlaw-life is strikingly depicted in the adventures of Gisli, who is under a ban and is hunted from place to place. A very unusual specimen of the minor saga is Bandamannasaga, a comic story of manners in the north of Iceland in the nth century, in which an intrigue of the old families banded against the pretensions of a wealthy parvenu, is told in a spirit of broad humour. The most archaic of the minor sagas is Kormakssaga, the story of the loves of the dark- eyed Kormak and Steingerda; this is, according to Vigfusson, the most primitive piece of Icelandic prose writing that has come down to us. Another very ancient and very simple saga is V aizdaelasaga. Among sagas which deal with the earliest history of America in the chronicles of Greenland and Vinland, a foremost place is taken by Floamannasaga, which possesses peculiar interest from its description of the shipwreck of colonists on the coast of Greenland; this belongs to the close of the ioth century. We possess a late (13th century) recension of what must have been equally important as a record of the Greenland colony in the 1 ith century, Fostbraedrasaga. Vigfusson formed a class of still shorter sagas than these, thaettir or ” morsels ” of narrative. At the close of the great period of the composition of all these anonymous sagas, of which few can have been written later than 1260, a work of enormous length and value was composed or compiled by a poet and historian of great eminence, Sturla Thordsson (1215-1284). About the year 1270 he began to compile the mass of sagas which is now known by his name as Sturlungasaga. The theory that Sturla was the author of the whole of this bulky literature is now abandoned; it is certain that Hrafn Sveinbiornssaga, for instance, belongs to an earlier generation, and the same is true of Gtldmundar Saga Goda. Vigfusson distinguished these and other sagas, which Sturla evidently only edited, from those which it is certain that he composed, and gathered the latter together under the title of Islendingasaga. It is certain that it is to Sturla that we owe almost all our knowledge of Icelandic history from 1200 to 1260. Islendinga is divided into two main sections, the former closing in a general massacre of the characters of the story in about 1240, the latter dealing much more minutely with new persons and subsequent events. To Sturla also are attributed two saga-biographies, the Hakonssaga and the Magnussaga. It is a remarkable fact that while

Icelandic Saga- literature begins and ends with a definite figure of a writer, all that lies between is wholly anonymous. Ari was the earliest and Sturla the latest of the saga-writers of the classical period, but in the authors of Njala and Laxdaela we have nameless writers whose genius was still greater than that of the pioneer and of the rear-guard of Icelandic literature. These unknown men deserve a place of honour among the best narrative-writers who have ever lived. The elder brother of Sturla was called Olaf Hvitaskald, or the White Poet (i2oo? i25o); he was a learned man, who worked at the arrangement and compilation of the sagas which form the mass of Sturlunga. In another class are the stories of bishops, Biskupasogur, which are not sagas in the true sense, but have considerable value as biographical material for recon structing Icelandic social life in the 1 2th century. The admirable saga of Bishop Laurence (1 266-1331) was composed by his private secretary, Einar Haflidason (1304-1393), who also wrote Annals, and is the latest Icelandic biographer. After his time a long silence fell on the literature of the country, a silence not broken until the revival of Icelandic learning in the 17th century.

It is evident that a vast number of sagas must be lost; when we consider how many are preserved, we can only express amazement at the fecundity of the art of saga-telling in the classic age. The MSS., on which what we have were preserved, were all on vellum, and there were no sagas written on paper until the time of Bishop Odd, who died in 1630; there was an enormous destruction of vellums during the dark age. After 1640 it became the practice to make transcripts on paper from the perishing vellum MSS. The best authority on the history of the sagas is the copious prolegomena to Dr Gudbrandr Vigfusson's edition of the text of Sturlungasaga, published in 2 vols., by the Clarendon Press at Oxford in 1878. See also the edition of Biskupasogur, issued by the same author, at

Copenhagen,, in;" 1858. Mobius and Vigfusson published the Forn-sogur or archaic sagas, in i860, and all the work of Vigfusson calls for the closest attention from those interested in this subject. In connexion with the descents of Northmen on the shores of Britain particular interest attaches to the four volumes of sagas edited for the " Rolls " series (1887-1894). William Morris, who had done much to interpret the spirit of the sagas to English readers, and who published a translation of Grettissaga in 1869, started in 1891 the " Saga Library," in conjunction With Mr E. Magniisson; of this a sixth volume appeared in 1906. Mr Sephton has published versions of several of the purely historical sagas. , , No account has been given above of the famous Heimskringla or " Round of the World," of Snorri Sturlason, because this great work, although it contains stories of the kings of Norway,

hardly belongs to the same class as the biographical sagas of Iceland. The Heimskringla is purely a storehouse of primitive Norwegian history.

See also Jonnson, Der oldnordiske og oldislandske Lileraturshistorie (Copenhagen, 1893-1902); F. W. Horn, Geschichte der Literatur des skandinavischen Nordens (Leipzig, 1879). (E. G.) ‘

SAGAING, a district and division of Upper Burma, lying to the south and west of Mandalay. The district has an area of 1862 sq. m.; pop. (1901) 282,658, showing an increase of 15% in the decade. It occupies both banks of the Irrawaddy, at its confluence with the river Chindwin. The chief crops are sesa- mum, millet, rice, peas, wheat and cotton. The total rainfall in 1905 was 34-76 in., taken at Sagaing. In the hot season the maximum shade temperature rises to a little over 100° F. The lowest readings in the cold season average about 56° F.

Sagaing, the headquarters town, is opposite Ava, a few miles below Mandalay; pop. (1901) 9643. It was formerly a capital of Burma. It is the terminus of the railway to Myitkyina. A steam ferry connects with the Rangoon-Mandalay line, and the steamers of the Irrawaddy Flotilla Company call daily.

The Sagaing division includes the four districts of Upper and Lower Chindwin, Shwebo and Sagaing; areaˆ 29,566 sq. m.; pop. (1901) 1,000,483.

SAGALLO, a small settlement on the north shore of the Gulf of Tajura, French Somaliland. A dismantled fort built by the Egyptians (who occupied the place between 1875 and 1884) is the most prominent object. In January 1889 Sagallo was occupied by a Cossack chief named Achinov, who was accom- panied by the archimandrite Pa’isi and some 200 people, including priests, women and children. Pai’si had been entrusted by the metropolitan of Novgorod with an evangelistic mission to the Abyssinian Church; while Achinov stated that he had a com-? mission from the Negus for the purchase of arms and ammunition. The presence of Achinov at Sagallo (where he occupied the fort, which he found deserted) was regarded by the French government as an invasion of French territorial rights. The Russian foreign office having disavowed (7th of February) any connexion with Achinov, instructions were sent from Paris to secure the removal of the Cossacks. On the 17th of February French warships appeared off the port, and an ultimatum was sent to Achinov calling on him to surrender, but without effect. The fort was bombarded, and seven persons killed, two being women and four children. The

Cossacks then surren- dered, not having fired a shot. They were subsequently deported to Suez, whence they returned to Russia. Achinov was interned by the Russian government for some months (until October 1889). In 1891 he returned to Abyssinia. Pa'isi was promoted by his ecclesiastical superiors. In Paris the incident caused great excitement amongst the Russophils, and the con- sequent demonstrations led to the suppression of the League of Patriots and the prosecution of M. Paul Derpulede.

See L' Archimandrite Pa'isi et V Ataman Achinoff, by vicomte de Constantin (Paris, 189 1).

SAGAN, a town of Germany, in the Prussian province of Silesia, situated on the Bober, a tributary of the Oder, 60 m. S.S.E. of Frankfort-on-Oder and 102 m. S.E. of Berlin by the direct main line of railway to Breslau. Pop. (1905) 14,208. It is still partly surrounded by its old fortifications and has numerous medieval houses. It contains the handsome palace of the dukes of Sagan. Among other buildings are an Evan- gelical church with a conspicuous steeple and containing the burial vaults of the ducal family, and Augustine and a Jesuit

monasterial church, a medieval town-hall with old cloisters attached, a Roman Catholic gymnasium and a large hospital, named after its founder, the duchess Dorothea (1793-1862), wife of Edmund, duke of Talleyrand-Perigord-Dino. The leading industry of the town is cloth-weaving, with wool and flax spinning; there is also some trade in wool and grain.

The mediate principality of Sagan, now forming a portion of the Prussian governmental district of Liegnitz, and formed in 1397 out of a portion of the duchy of Glogau, has several times changed hands by purchase as well as by inheritance. One of its most famous possessors was Wallenstein, who held it for seven years before his death in 1634. Bought by Prince Lobkowitz in 1646, the principality remained in his family until 1787, when it was sold to Peter, duke of Courland, whose descendant, Prince Bozon (b. 1832), son of Napoleon Louis (1811-1898), duke of Talleyrand-Perigord, owned it in 19 10. The principality has an area of nearly 500 sq. m. and a population of 65,000.

SA6AR or Saugor Island, an island at the mouth of the Hugli river, in

the Twenty-four Parganas district of Bengal. The word means ” sea “; and, as being the place where the sacred stream of the Ganges is believed to mingle with the ocean, the island is one of the most frequented places of Hindu pilgrimage in all India, the time for the greatest annual gathering being in January. On the seaward face is a lighthouse, and farther out are the Sandheads, the cruising-ground of the Calcutta pilots.

SAGASTA, PRAXEDES MATEO (1827-1903), Spanish states- man, was born on the 21st of July 1827 at. Torrecilla de Cameros, in the province of Logrofio. He began life as an engineer, and from his college days he displayed very advanced Liberal inclina- tions. He entered the Cortes in 1854 as a Progressist deputy for Zamora. After the coup d’Stat of Don Leopold O’Donnell in 1856, Sagasta had to go into exile in France, but promptly returned, to become the manager of the Progressist paper La Iberia, and to sit in the Cortes from 1859 to 1863. He seconded the Progressist and revolutionary campaign of Prim and the Progressists against the throne of Queen Isabella, conspiring and going into exile with them. He returned, via Gibraltar, with Prim, Serrano and others, to take part in the rising at Cadiz, which culminated in the revolution of September 1868, and Sagasta was in succession a minister several times under Serrano and then under King Amadeo of Savoy, 1868-1872. Sagasta ultimately headed the most Conservative groups of the revolutionary politicians against Ruiz Zorrilla and the Radicals, and against the Federal Republic in 1873. He took office under Marshal Serrano during 1874, after the pronunciamiento of General Pavia had done away with the Cortes and the Federal Republic. He vainly attempted to crush the Carlists in 1874, and to check the Alphonsist military conspiracy that overthrew the government t»f Marshal Serrano at the end of December 1874. Barely eight months after the restoration of the Bourbons in the autumn of 1875, Sagasta accepted the new state of things, and organized the Liberal dynastic party that confronted Canovas and the Conservatives for five years in the Cortes, until the Liberal leader used the influence of his military allies, Jovellar, Campos and others, to induce the king to ask him to form a Cabinet in 1881. The Liberals only retained the con- fidence of the king by postponing the realization of almost all their democratic and reforming programme, and limiting their efforts to financial reorganization and treaties of commerce. A military and republican rising hastened Sagasta’s fall, and he was not readmitted into the councils of Alphonso XII. On the death of that king in 1885, Sagasta became premier with the assent of Canovas, who suspended party hostility in the early days of the regency of Queen Christina. Sagasta remained in office until 1890,

long enough to carry out all his reform programme, including universal suffrage and the establishment of trial by jury. A coalition of generals and Conservatives turned Sagasta out in July 1890, and he only returned to the councils of the regency in December 1892, when the Conservative party split into two groups under Canovas and Silvela. He was still in office when the final rising of the Cubans began in February

1895, and he had to resign in March because he could not find superior officers in the army willing to help him to put down the turbulent and disgraceful demonstrations of the subalterns of Madrid garrison against newspapers which had given offence to the military. Sagasta kept quiet until nearly the end of the struggle with the colonies, when the queen-regent had to dismiss the Conservative party, much shorn of its prestige by the failure of its efforts to pacify the colonies, and by the assassination of its chief, Canovas delCastillo. Sagasta's attempt to conciliate both the Cubans and the United States by a tardy offer of colonial home rule, the recall of General Weyler, and other concessions, did not avert the disastrous war with the United States and its catastrophe. The Liberal party and Sagasta paid the penalty of their lack of success, and directly the Cortes met in March 1899, after the peace treaty of the 10th of December 1898 with the United States, they were defeated in the senate. He pursued his policy of playing into the hands of the sovereign whilst keeping up the appearances of a Liberal, almost democratic, leader, skilful in debate, a trimmer par excellence, and abler in opposition than in office. He returned with the Liberals to power in March 1 001 . His task, however, was beyond his years. The economic situation was of the gravest. Strikes and discontent were rife. Still, Sagasta held on long enough to witness the surrender of the regency by Queen Christina into the hands of her son, Alfonso XIII. , in May 1902. In the following December Sagasta 'was defeated on a vote of censure and resigned office. Shortly afterwards he fell into ill- health, and died at Madrid on the 15th of January 1903.

SAGE, RUSSELL (1816-1906), American financier, was born in Verona township, Oneida county, New York, on the 4th of August 1816. He worked as a farm-hand until he was 15, when he became an errand boy in a grocery conducted by his brother, Henry R. Sage, in Troy, New York. He had a part interest in 1837-1839 in a retail grocery in Troy, and in a whole- sale store there in 1830-1857. He served as an alderman of Troy in 1841-1848, and as treasurer of Rensselaer county in 1845-1849. In 1853-1857 he was a Whig representative in Congress. He became an associate of Jay Gould in the develop- ment and sale of railways; and in 1863 removed to New York City, where,

besides speculating in railway stocks, he became a money-lender and a dealer in ” puts ” and ” calls ” and ” privileges,” and in 1874 bought a seat in the New York Stock Exchange. He gradually accumulated a fortune, which at his death was variously estimated as from $60,000,000 to $80,000,000. On the 4th of December 1891 an attempt was made to assassinate him in his office by one Henry Norcross, who demanded a large sum of money, and upon being refused exploded a dynamite bomb, and was himself killed. 1 Sage died in New York on the 22nd of July 1906. In 1869 he had married Miss Margaret Olivia Slocum (b. 1828), a graduate (1847) of the Troy Female Seminary (now the Emma Willard School). She inherited nearly all of his great fortune, and out of it she gave away a long series of liberal benefactions to various institutions

SAGINAW, a city and the county-seat of Saginaw county, Michigan, U.S.A., situated on both banks of the Saginaw river, about 16 m. from its entrance into Saginaw Bay and about 96 m. N.W. of Detroit. Pop. (1890) 46,322, (1900) 42,345, of whom 11,435 were foreign-born, (1910) 50,510. Saginaw is served by the Grand Trunk, seven divisions of the Pere Marquette (which has repair shops here) and four divisions of the Michigan Central railways, by interurban electric railways to Detroit and Bay City, and by steamboat lines to several of the lake ports. The city is built on level ground covering an area of about 13 sq. m. and somewhat more elevated than the sur- rounding country. In the city are St Vincent’s Orphan Home (1875) and St Mary’s Hospital (1874) under the Sisters of Charity, a Woman’s Hospital (1888) and the Saginaw General Hospital

1 Mr Sage’s secretary was also killed, and one of his clerks, W. R. Laidlaw, jr., was badly injured. Laidlaw afterward repeatedly sued Sage for damages, claiming that Sage had used him as a shield at the moment of the explosion, but his suits were unsuccessful.

(1887); the Hoyt Library and the Public Library; a large auditorium, belonging to the city; an armoury; the Germania Institute, with a kindergarten, a gymnastic school and a German library; and a free bathhouse and manual training school (1903), a part of the public school system. There is an annual music festival in May. The city has parks, including Hoyt Park (27 acres), used for athletic sports, Rust Park (150 acres), occupying an island in the river, and Riverside Park, a pleasure resort. Saginaw is situated in a good farming region with a

fertile soil, especially adapted to the culture of sugar beets; other important crops are beans, cabbages, tomatoes, cucumbers, hay, apples and grains. In the vicinity of the city there are salt wells, and Saginaw county is the most productive coalfield in the state — in 1907 its output was 1,047,927 tons, more than half the total for the state. The city is an important distributing centre, has a large wholesale trade (especially in groceries, hardware, boots and shoes, and dry goods), and in 1904 in the value of its factory products ($10,403,508, 20-2% more than in 1900) it ranked fifth among the cities of the state. The muni- cipality owns and operates the water-works. The first settlement was made on the west bank of the river in 181 5 and was called Saginaw City; the settlement on the east side of the river made in 1849 was called East Saginaw and was financed by Eastern capitalists. East Saginaw in 1855 was incorporated as a village. East Saginaw and Saginaw City each received a city charter in 1859, but in 1890 the two were consolidated as the city of Saginaw, and in 1897 the charter was revised.

SAGITTA (“the arrow” or “dart”), in astronomy, a con- stellation of the northern hemisphere, mentioned by Eudoxus (4th century B.C.) and Aratus (3rd century B.C.), and catalogued by Ptolemy, Tycho Brahe and Hevelius, who each described 5 stars. The fable was that this constellation was one of the arrows with which Hercules killed the vulture which gnawed the liver of Prometheus. S. Sagittae is a short period variable, period 8-38 days, range in magnitude 5-6 to 6-4.

SAGITTARIUS (” the archer “), in astronomy, the 9th sign of the zodiac (q.v.) denoted by the symbol,?’, an arrow or dart. It is also a constellation, mentioned by Eudoxus (4th century B.C.) and Aratus (3rd century B.C.), and catalogued by Ptolemy, 31 stars, Tycho Brahe 14 and Hevelius 22. The Greeks repre- sented this constellation as a centaur in the act of shooting an arrow, and professed it to be Crotus, son of Eupheme, the nurse of the Muses. Several short period variables occur in the constellation, e.g. X3 Sagittarii, W71 Sagittarii and Y Sagittarii, having periods of 7-01, 7-59, 5-77 days respectively. Nova Sagittarii is a ” new ” star, which was discovered by Mrs Flem- ing in 1899; the nebula M. 17 Sagittarii is an omega or horse- shoe nebula, while the nebula and cluster M. 8 Sagittarii is a splendid irregular nebula associated with a great number of faint stars.

SAGO, a food-starch prepared from a deposit in the trunk of several palms, the principal source being the sago palm (Metro- xylon Sagu) (see fig.), a native of the East Indian Archipelago, the sago forests being especially extensive in the island of Ceram. The trees flourish only in low marshy situations, seldom attaining a height of 30 ft., with

a thick-set trunk. They attain maturity as starch-yielding plants at the age of about fifteen years, when the stem is gorged with an enormous mass of spongy medullary matter, around which is an outer rind consisting of a hard dense woody wall about 2 in. thick. When the fruit is allowed to form and ripen, the whole of this starchy core disappears, leaving the stem a mere hollow shell; and the tree immediately after ripening its fruit dies. When ripe the palms are cut down, the stems divided into sections and split up, and the starchy pith extracted and grated to a powder. The powder is then kneaded with water over a strainer, through which the starch passes, leaving the woody fibre behind. The starch settles in the bottom of a trough, in which it is floated, and after one or two washings is fit for use by the natives for their cakes and soups. That intended for exportation is mixed into a paste with water and rubbed through sieves into small grains, from the size of a coriander seed and larger, whence it is known according to size as pearl sago, bullet

sago, &c. A large proportion of the sago imported into Europe comes from Borneo, and the increasing demand has led to a large extension of sago-palm planting along the marshy river-banks of Sarawak.

Sago is also obtained from Metroxylon Rumphii as well as from various other East Indian palms such as the Gomuti palm {Arenga saccharifera) , the Kittul palm (Caryota urens), the

Sago Palm {Metroxylon Sagu), much reduced.

1 , Portion of leaf. 4, Spike of male flowers.

2, Portion of female inflo-

rescence in fruiting stage. 5, Same cut lengthwise.

6, Fruit.

3, Branch of male inflorescence, 7, Section of fruit and seed, s;

e, embryo.

cabbage palm (Corypha umbraculifera) , besides Corypha Gebagan, Raphia flabelliformis and Phoenix farinifera, also from Mauritia flexuosa and Guilielma speciosa, two South American species. It is also obtained from the pith of species of Cycas.

SAGUENAY, a river of Quebec province, Canada, flowing into the St Lawrence 120 m. N.E. of Quebec. It drains Lake St John, from which it

issues by two impassable rapids, La Grande and La Petite Decharge. Thence for 40 m. it flows E.S.E. in a series of rapids, navigable only by skilled boatmen in canoes, to Chicoutimi, the seat of a Roman Catholic bishop, a prosperous little town exporting great quantities of lumber. Six miles farther down is Ha Ha Bay, a favourite summer resort. From Chicoutimi the river is navigable by small steamers, and from Ha Ha Bay to the mouth by vessels of the largest size. It is indeed rather a loch or bay than a river, containing neither rock nor shoal, and having at its mouth a depth of some 600 ft. greater than that of the St Lawrence. Its width varies from three-quarters of a mile to two miles, and the waters are blackened by the shadow of treeless cliffs, over 1000 ft. in height, separated*here and there by narrow wooded valleys, and culminat- ing in Capes Trinity and Eternity, 1600 and 1800 ft. in height. Above Chicoutimi it runs through hills of about 400 ft. in height, densely wooded with spruce, maple and birch. Tadoussac, at its mouth, is the oldest European trading post in Canada.

Lake St John is a shallow basin, 26 m. by 20, with an area of 365 sq. m. It receives the waters of the Ashuapmuchuan, often spoken of as the upper course of the Saguenay, the Mistassini, the Peribonka and various other important streams. A numerous farming population live near its shores. It is well known to anglers as containing the celebrated ouinaniche, or land-locked salmon, which attains a weight of about 6 B).

SAGUNTUM, now Sagunto or Murviedro, an ancient town in a fertile district of eastern Spain (Castellon de la Plana) 20 m. N. of Valencia, close to the coast. Its history comprises one brief flash of tragic glory and a long obscure happiness. At the outbreak of the Second Punic War (219 B.C.) it was a large and commercially prosperous town of native — not Greek — origin. It sided with Rome against Carthage, and drew Hannibal's first assault. Its long and noble resistance, told by the Roman historian Livy in no less noble language, ranks with the Spanish defence of Saragossa in the Peninsular War. Finally in 218 Hannibal took it and passed on into Italy. Then we hear little more of it till at the opening of the Christian era it appears as a flourishing Romano-Spanish town with a Latin-speaking population and the rank of municipium. This later prosperity lasted most of the empire through, and is attested by inscriptions and ruins (notably a theatre, demolished by Suchet).

SAHARA, the great desert of northern Africa. The Sahara has an area, according to Dr A. Bludau's calculation of the areas of African river basins, of 3,459,500 sq. m., made up as follows: —

Sq. m. Drainage or slope to Atlantic .... 131,000 Drainage or slope to Mediterranean . . . 502,000

Drainage inland 2,602,500

Slope to Niger basin 224,000

Total . . 3,459,500 This includes Tripoli and Fezzan, which practically belong to the desert zone, but does not include arid portions of the basins of the Nile and Niger, in which the drainage is at most intermittent, and which might with reason be included in the Sahara. The area would thus be brought up to at least 35 million sq. m., about the area of Europe minus the Scandinavian peninsula.

The physical limits of this region are in some directions marked with great precision, as in parts of Morocco and Algeria, where the southern edge of the Atlas range looks out on what bond- ˆ as a ˆ most; tne appearance of a boundless sea, and aries. forms, as it were, a bold coast-line, whose sheltered bays

and commanding promontories are occupied by a series of towns and villages — Tizgi, Figuig, El Aghuat, &c. In other directions the boundaries are vague, conventional and disputed. This is especially the case towards the south, where the desert sometimes comes to a close as suddenly as if it had been cut off with a knife, but at other times merges gradually and irregularly into the well-watered and fertile lands of the Sudan. While towards the east the valley of the Nile at first sight seems to afford a natural frontier, the characteristics of what is usually called the Nubian desert are so identical in most respects with those of the Sahara proper that some authorities extend this designation to the shores of the Red Sea. The desert, indeed, does not end with Africa, but is prolonged eastwards through Arabia towards the desert of Sind. As the Nubian region is described under Sudan: § Anglo- Egyptian, the present article is confined to the country west of the Nile Valley, the Libyan desert inclusive. Its greatest length, along the 20th parallel of north latitude, is some 3200 m.; its breadth north to south varies from 800 to 1400 m.

The sea-like aspect of certain portions of the Sahara has given rise to much popular misconception, and has even affected the General ideas an(ˆ phraseology of scientific writers. Instead of aspect. being a

boundless plain broken only by wave-like mounds of sand hardly more stable than the waves of ocean, the Sahara is a region of the most varied surface and irregular relief, ranging from 100 ft. below to 5000 and 6000 and even in isolated instances to 8000 ft. above the sea-level, and, besides sand-dunes and oases, containing rocky plateaus, vast tracts of loose stones and pebbles, ranges of the most dissimilar types, and valleys through which abundant watercourses must once have flowed.

In the centre of the Sahara is a vast mountain region known as the Ahaggar (Hoggar) Tasili or plateau. The culminating peaks of this plateau. Mounts Watellen and Hikena, are about 900 m. in a straight line almost due S. of the city of Algiers and about 1200 m. due N. of the mouth of the Niger. They also occupy, speaking roughly, a central position between the Atlantic and the Nile.

The Ahaggar plateau is not inferior to the Alps, in area, but its highest peaks do not greatly exceed 8000 ft. They are believed to be volcanic like those of Auvergne. Upon their summits snow is reputed to lie from December to March. South-east of the main plateau, and partly filling the valley between the Ahaggar plateau and the Tasili of the Asjer (see infra); are the Anahef mountains. To the north the valley is again contracted by the Irawen mountains.

Besides this central group of mountains, sometimes spoken of as the Atakor-‘n-Ahaggar (Summits of the Ahaggar) ,- there are various other massifs in the Sahara. On the north-west of the ,

Ahaggar, and separated from it by a wide plain, is the I “°” Baa Muidir plateau, which extends nearly east and west 200 m. ra ses ‘ North-east of the Ahaggar (in the direction of Tripoli) is the Tasili of the Asjer (4000-5000 ft.), which runs for 300 m. in a N.E. to S.E. direction. South-east of the Tasili of tne Asjer is a range of hills known as the Tummo (or War) mountains. Still farther south is the mountainous region of Tibesti (or Tu), with an average height of some 7000 ft., the volcanic cone of Tussid rising to an estimated height of 8800 ft. Towards the south and east the Tibesti highlands are connected with the lower ranges of Borku and Ennedi, which merge into the plains of Wadai and Darfur. The slopes are bare and rocky. By some authorities the Tasili of the Asjer, the Tummo, Tibesti and Borku ranges are considered ” the orographic backbone ” of the Sahara.

In addition to the plateaus and ranges named, there are several . disconnected mountain masses. Midway between the Atakor-‘n-Ahaggar and Nigeria are the Air or Asben hills in which Dr Erwin von

Sary discovered (1877) the distinct volcanic crater of Teginjir with a vast lava-bed down its eastern side. By some Writers Air (q.v.) is not included in the Sahara, as it lies within the limit of the tropical rains; but the districts farther south have all the character- istics of the desert. West of Air, and north-east of the bend of the Niger, lies the hilly region sometimes known as Adrar of the Iforas or of the Awellimiden (the southern confederacy of the Tuareg). To the N.E., in Fezzan (q.v.), are the dark mountains of Jebel-es- Soda, which are continued S.E. towards Kufra by the similar range of the Haruj; and in the extreme S.W., at no great distance from the Atlantic, is the hilly country of the western Adrar (q.v.).

Nearly all the rest of the Sahara consists in the main of undulating surfaces of rock (distinguished as hamtnada), vast tracts of water-worn pebbles (serir) and regions of sandy dunes (variously called maghter, erg or areg, igidi, and in the east rhart), which occupy about one-ninth or one-tenth of the total area. The following is the general distribution of the dunes: —

From a point on the Atlantic coast south of Cape Blanco a broad belt extends N.E. for about 1300 m., with a breadth varying from 50 to 300 m. This is usually called the Igidi or Gidi, from the Berber word for dunes. In part it runs parallel dunes. with the Atlas mountains. Eastward it is continued, south of Algeria and Tunisia, by the Western Erg and Eastern Erg, separated by a narrow valley at Golea. South of the Eastern Erg (which extends as far north as the neighbourhood of the Gulf of Gabes) the continuity of the sandy tract is completely broken by the Hammada al-Homra (or Red Rock Plateau), but to the south of this region lie the dunes of Edeyen, which, with slight interruptions, extend to Murzuk in Fezzan. South of the hammada of Murzuk the dunes of Murzuk stretch south-east. This series of tracts may be called the northern zone of the Sahara ; it forms a kind of bow, with its extremities respectively at the Atlantic and the Libyan desert and its apex in the south of Tunisia. In the south are the Juf (depressions), covering a vast area to the south-east of the middle portion of the Igidi, another area between the Adghagh plateau and the Ahaggar, and a third between Air and Tibesti. The Juf or depressions are not, except in rare instances, below sea- level. In the Libyan desert is a vast region of dunes of unascertained limits; the characteristics of the Libyan desert being thought typical of the whole of the Sahara originated the idea of ” a sea of shifting sand ” as descriptive of the entire desert. Here a region of over 500,000 sq. m. extending east from the Tibesti mountains to the valley of the Nile, bounded south by Wadai and Darfur and north by Fezzan and the Cyrenaica, appears to be almost entirely sterile and increasingly

covered by dunes. There is only one known route through this dreadful wilderness — one running north and south to the oases of Kufra, which lie in its centre.' The dunes in the Libyan desert, so far as is known, run N.N.W. and S.S.E. In the Eastern Erg the dunes also lie in long lines in a N.N.W. and S.S.E. direction, presenting a gradual slope to windward and an abrupt descent to leeward. There they are generally about 60 or 70 ft. high, but in other parts of the Sahara they are said to attain a height of upwards of 300 ft.

Under the influence of the wind the surface of the dunes is subject to continual change, but in the mass they have attained such a state of comparative equilibrium that their topographic distribution may be considered as permanent, and some of them, such as Gern (Peak) al-Shuf and Gern Abd-al-Kader, to the south of Golea, have names of their own. The popular stories about caravans and armies being ; engulfed in the moving sands are regarded as apocryphal (save perhaps in some instances in the Libyan desert) , but there is abundant

Skeleton

river'

system.

evidence against the theory of M. Vatonne as to the dunes having been formed in situ.

Although now mainly waterless, the Sahara possesses the skeleton of a regular river-system. From the north side of the Atakor-'n- Ahaggar, through which runs the " water-parting " between the basins of the Mediterranean and Atlantic, begins Wadi Igharghar, which, running northwards between the Tasili plateau and the Irawen mountains, appears to lose itself in the sands of the Eastern Erg, but can be traced northwards for hundreds of miles. Its bed contains rolled fragments of lava and freshwater shells (Cyrena and Planorbis). In a line almost parallel to Wadi Igharghar, Wadi Mya descends from the plateau ot Tademayt, and shows the importance of its ancient current by deep erosion of the Cretaceous rocks, in which a large number of left-hand tributaries have also left their mark. The streams flowing south from the Atlas, which seem to be absorbed in the sands of the desert, evidently find a, series of underground reservoirs or basins capable of being tapped by artesian wells over very extensive areas. As

Olympiodorus (quoted by Photius) mentions that the inhabitants of the Sahara used to make excava- tions from 100 to 120 ft. deep, out of which jets of pure water rose in columns, it is clear that this state of matters is (historically) of ancient date. Since 1856 French engineers have carried on a series of borings which have resulted in the fertilizing of extensive tracts. In Wadi Righ (otherwise Rhir), which runs for 80 m. towards the south-west of the Shat Melrir (department of Constantine, Algeria), the water-bearing stratum is among permeable sands, which are covered to a depth of 200 ft. by impermeable marls, by which the water is kept under pressure. In this valley many artesian wells have been sunk by the French. Connexions probably exist with subterranean water-supplies in the mountains to the north. That the water in the artesian reservoirs is kept aerated is shown by the existence below ground of fishes, crabs and freshwater molluscs, all of which were ejected by the' well called Mezer in Wadi Righ. Further west the Wadis Zusfana and Ghir unite to form the Saura, known in Tuat as the Messaud. These rivers still carry water as far as the northern part of Tuat; thence the course of the Messaud was, apparently, S.W. to the eastern Juf. There are also well- marked river-beds in the central Sahara. The Wadi Telemsi, rising in Adrar, of the Iforas, apparently joined the Niger near' Gao, while the Wadi Taffassassent, which rose in the Ahaggar mountains, is believed to have been the ancient upper course of the lower Niger. The oases are also proofs of the presence of a steady supply of underground moisture, for vegetation under the Saharan climate (beyond the few plants specially adapted to desert conditions) is exceptionally thirsty.

The existence of these wadis' or river-beds is a factor in the con- sideration of the cause of the desert nature of the country. In all parts of the Sahara there is evidence of denudation carried Oon" out on a sca ' e ot unusual magnitude. The present surface

of the desert has been exposed to the protracted wear and tear of the elements. But to determine the exact method by which the elements have done their work has hitherto proved beyond the

Eower of science. The theory of submarine denudation was accepted y many scientists of the mid- Victorian era. The sand-dunes, the salt efflorescence and deposits, and the local occurrence of certain modern marine molluscs all go to help the hypothesis of a diluvial sea. Nor is evidence lacking that in cretaceous times portions of the Sahara were covered by the sea. Colonel P. L. Monteil brought home (1892) a fossil sea-urchin from Bilma. In I902 at Tamaske, some 250 m. W. of Zinder, and a little north of Sokoto, a nautilus and four sea-urchins (fossils) were found by Captain Gaden in a limestone bed. Similar fossils occur

in the, region between Zinder and Air, and others of the same age have been found near Dakar. Basing his conclusions on these and other facts, de Lapparent held that an arm of the sea extended inland from the Atlantic to the eastern Sahara. This sea was bounded on the north and east by the mountains of Air, Ahaggar, the Asjer Tasili, &c. An extensive acquaintance with Saharan characteristics shows, however, that a sea for the Sahara as a whole is impossible. Henri Schirmer, who in 1893 published an admirable summary of Saharan geography up to that date, argued that the desert nature of the Sahara is due to forces which have been at work for ages, although, as in all deserts, the dryness is probably progressively increasing. The primary cause is to be sought in the existing distribution of land and sea, the great land mass of North Africa causing an outflow of air in all directions (and consequent absence of rain) in winter, and an in-draught in summer, when the surface is intensely heated and the relative humidity of the atmosphere becomes so small that con-densation is all but impossible. The vicinity of the comparatively cod Mediterranean in the north accentuates the force of the winds from that direction, which, blowing towards a lower latitude, are in their very nature dry winds. The influence of mountain ranges, such as the Atlas, round the border of the desert, is thus but a sub- ordinate cause of the latter's dryness, which would probably be little diminished did the Atlas not exist. This dryness reacts again on the temperature conditions of the Sahara, accentuating both the daily and annual variation. The intense heat of the day is compensated by the cold of the nights, so that the mean annual temperature is aot excessive. The difference between the mean temperature of

the hottest and coldest month has been found to be as high as 45° F.,and the extreme range at least 90° F., maxima of 1 12 and over having been frequently observed. As a result of the extreme dryness of the air, evaporation is excessive, and, being greater than the precipitation, involves a progressive desiccation of the Sahara. The surface of the rocks, heated by the sun and suddenly chilled by rapid radiation at night, gets fractured and crumbled; elsewhere the cliffs have been scored and the sand thus formed is at once turned by the wind into an active instrument of abrasion. In many places it has planed the flat rocks of the hammada as smooth as ice. Elsewhere it has scored the vertical faces of the cliffs with curious imitations of glacial striation, and helped to undercut the pillar or table-like eminences — remains of former more extensive plateaus — which, under the name gur, are among the most familiar products of Saharan erosion. The softer quartz rocks of the Quater- nary and Cretaceous series have been made to yield the sand which, drifted and sifted by

the winds, has taken on the form of dunes. The slighest breeze is enough to make the surface “smoke ” with dust ; and at times the weird singing of the sands, waxing louder and iouder, tells the scientific traveller that the motion is not con- fined to the superficial particles. The dry wind of the Sahara is known in southern Europe as the Sirocco. It brings with it clouds of fine red dust, as noted long since by Idrisi, the Arabian geographer. Dr Theobald Fischer and Dr Oscar Fraas agree in believing that the desiccation has markedly increased in historic times. Evidence derived from ancient monuments combined with the statements of Herodotus and Pliny are held to prove that the elephant, the rhino- ceros, and the crocodile existed in North African regions where the environment is now utterly alien, and on the other hand that the camel is a late introduction.

Any attempt to improve the climatic conditions of the Sahara as a whole can hardly meet with success when the causes of its desiccation are considered. Much may, however, be done to modify local conditions, and fairly satisfactory results have been obtained in the direction of fixing the dunes and covering them with a growth of vegetation. Experiments carried out by the French at Ain Sefra, on the northern border of the desert, have shown that by protecting the sand from the action of the wind by a litter of alfa grass, time is given for the establishment of suitable trees, which include the tamarisk, acacia, eucalyptus, prickly pear, peach and aspen poplar, the last-named having proved the most capable of all of resisting the desert conditions. Such planting operations can only be carried out in favourable localities, such as valleys in which a certain amount of water is available. Wide areas like the arid stony plateaus (hammada) must be abandoned as hopeless.

As already stated, the popular conception of the Sahara as a sand desert is erroneous. It is really a stony, wind-swept waste with much bare rock visible, the actual area of pure sand forming a relatively small portion. A broad belt of G e °l°g lc *> Archaean rocks extends throughout the desert, appearing s*™* 1 “*’ at intervals in the form of hills and plateaus from beneath the superficial sands and Quaternary deposits, Examples are the granite of Air and the gneiss and mica-schists of this massif and of the Ahaggar plateau. Flanking this zone are immense tracts occupied by rocks of Devonian and Carboniferous ages, from which characteristic marine fossils have been obtained at the springs of El Hassi and between Wad Draa and the dunes ot Igidi. Productus africanus is a common fossil of the Carboniferous rocks. At the close of the Carboniferous period it has been generally considered that the southern and central Sahara became dry land and has remained so up to the present day. Marine fossils of Cretaceous age

have, however, been found within recent years in the central regions; while Eocene echinoids have been obtained near Sokoto (Geol. Mag., 1904). During Lower Cretaceous times the Mediterranean covered the Algerian and Tripolitan Sahara and the northern portion of the eastern desert; the extensive development of the Cretaceous system being, one of the most striking features of Saharan geology. At, the close of the Cretaceous period the Tripolitan Sahara completely emerged, but parts of the Tunisian and Algerian Sahara seem to have remained below sea-level until the end of the Lower Eocene. Only on the extreme borders of the desert, however, do tertiary for- mations play any prominent part. During the Quaternary, jperiod the Sahara possessed a moister climate than the present. This is shown by the numerous water-cut valleys, now dry, and by the remains of hippopotamus in the Quaternary deposits'^

The idea so long held that the Sahara represented the recently dried-up bed of an extension of the Mediterranean has been dis- proved by the investigations of French geologists. The sand is mainly derived from the wide expanse of Cretaceous sandstones, which become rapidly disintegrated by the contraction caused by the wide range of temperature between day and night. The loose sands of the Quaternary deposits also furnish abundant material. The true dune sand is remarkable for the uniformity of its com- position and the geometrical regularity of its grains, which measure less than -03937 in. While individually these appear transparent or reddish yellow (from the presence of iron), they have in the mass a rich golden hue. _ According to Tissandier animal organisms, such as the microscopic shells of Rhizopoda, abundant in sea-sand, are strikingly absent.

Botanically the Sahara is the meeting-ground of representatives

of the " Mediterranean " and the " Tropical " floras which have accommodated themselves to the peculiar climatic conditions. The line of demarcation between the two floral areas, almost coinciding in the west with the Tropic of Cancer and in the east Botan and dipping south towards the meridian of Lake Chad, assigns Zoology. kv far the greater portion of the area to " Mediterranean " influences. Uniformity, in spite of differences of altitude and soil, is a general characteristic of the vegetation, which outside of the oases consists mainly of plants with a tufty, dry, stiff habit of growth. The oases are the special home of the date-palm, of which there are about 4,000,000

in the Algerian oases alone. In company with this tree, without which life in the Sahara would be practically impossible, are grown apples, peaches, oranges, citrons, figs, grapes, pomegranates, &c. From December to March wheat, barley and other northern grain crops are successfully cultivated, and in the hotter season rice, dukhn, durra and other tropical products. Alto- gether the oasal flora has considerable variety; thirty-nine species are known from the Kufra group, forty-eight from the Aujila group.

Zoologically the Sahara is also partly Mediterranean, partly Tropical. Apart from the domestic animals (camels, asses, &c, and very noticeably a black breed of cattle in Adrar), the list of fifteen mammals comprises the jerboa, the fennek or fox, the jackal, the sand rat (Psatnmomys obesus), the hare, the wild ass and three species of antelope. In Borku, Air, &c, baboons, hyaenas and mountain sheep are not uncommon. Without counting migratory visitants, about eighty species of birds have been registered — the ostrich, the Cerlhilauda deserti or desert-lark (which often surprises the traveller with its song), Emberiza Saharae, three species of Dromolea, Sec. Tortoises, lizards, chameleons, geckos, skinks, &c. of fifteen different species were collected by the single Rohlfs ex- pedition of 1873-1874; the serpents comprise the horned viper, Psammophis sibtians, Coelopeltis lacertina, the python and several other species. The edible frog also occurs. Cyprinodon dispar, a fish not unlike Cyprinodon calaritanus, is found in all the brackish waters of north Sahara and swarms in the lake of the Siwa oasis.

The chief centres of population in the Sahara are, firstly, the

oases, which occupy positions where the underground water

makes its way to the surface or is readily reached by

Centre* boring: and, secondly, certain mountainous districts

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tkta. where the atmosphenc moisture is condensed, and a

moderate rainfall is the result. Except in the south of Algeria, where cultivation has been extended by means of artesian wells, the condition of the Sahara oases is far from prosperous. Prior to the French occupation, a feeling of in- security had been engendered by the marauding habits of the nomad tribes; cultivation had become more restricted; and the decline of the caravan trade had brought ruin to certain centres, such as Murzuk. The most important are the oases

of the Tuat region, especially Insalah; those of Ghat and Ghadames on the route from Tripoli to Zinder; and of Kufra, in eastern Sahara (see Tuat and Tripoli). The various confederations of the Tuareg, in the central Sahara, are grouped round hilly districts. The most important are the Awellimiden, on the left bank of the Middle Niger; and the Kel-Ui, grouped around the mountainous districts of Air or Asben; the two northern con- federations, those of the Ahaggar and Asjer, being less powerful. Much information respecting the Awellimiden confederation was obtained during the voyage down the Niger, in 1896, of Lieutenant Hourst of the French Navy, who was much struck with its powerful organization under the chief' Madidu. North- west of Timbuktu in the district or " Kingdom " of Biru is the oasis and town of Walata, a Tuareg settlement. Other moun- tainous districts in which a certain amount of rain falls regularly, and which contain a population above the average for the Sahara, are Tibesti and Borku, in the east centre, and Adrar in the west. Tibesti and Borku are peopled by Tibbus; the western Adrar by Moors (Berbers). The northern portions of the Sahara are inhabited by nomad Arabs.

Attempts have been made by many explorers and writers to trace in certain of the existing inhabitants the remnants of an aboriginal race of negro affinities, which inhabited the

Sahara before the arrival of the Berbers and Arabs.

E. F. Gautier, writing in 1908, maintained that the evidence available (for the central Sahara) rendered probable the hypothesis that at a period perhaps as recent as the Roman conquest of North Africa the Sahara was still neolithic and peopled by a race of agricultural negroes, who extended to the confines of Algeria. Negro influence is undoubtedly seen in various parts of the Sahara, but it may date from a much more

recent pefiofl than has been supposed. For example, the con- nexion between many of the place-names in Fezzan and the language of Bornu is attributable to the northward extension of the influence of the Bornu-Kanem empire between the nth and 14th centuries A.d. The allusions by classical writers to Ethiopians as inhabitants of the Sahara prove little, in view of the very vague and general meaning attached to the word. The physical characteristics, and especially the dark colour, of many of the Saharan populations is apparently a stronger argument, but even this is capable of another explanation. Caravans of negro slaves from time immemorial passed northwards along the main

desert routes, and it is just in the oases on these routes that the dark element in the population is chiefly found. It may there- fore be attributed to the intermarriage of the original lighter inhabitants of the oases with such slaves. The Tibbu iq.v.) or Tebu, once thought to be almost pure negroes, proved, when examined by Gustav Nachtigal in Tibesti, where they are found in greatest purity, to be a superior race with well-formed features and figures, of a light or dark bronze rather than black. Their language is related to that of the Kanuri in Bornu, but it appears that the Kanuri have derived theirs from the Tibbu, not the Tibbu from the Kanuri. Physically, the Tibbu appear to resemble somewhat the Tuareg, and there is little doubt that they are a Hamitic, not a negro, people.

The commerce of the Sahara is not inconsiderable. Among the more important trade routes are (1) from Morocco to Cairo by Insalah and Ghadames, which is followed by the Cbmm pilgrims of western Africa bound for Mecca; this route has been largely superseded by the sea route from Tangier to . Alexandria; (2) from Kuka (Lake Chad) to Murzuk and Tripoli; (3) from Kano and Zinder to Tripoli by Air and Ghat; (4) from Timbuktu to Insalah, Ghadames and Tripoli; (5) from Timbuktu to Insalah and thence to Algeria and Tunisia; (6) from Timbuktu to Morocco. The Senussi movement brought into prominence the desert routes between Wadai in the south and Jalo and Benghazi in the north, which partially superseded some of the older routes. Other causes tended to reduce the importance of the old routes. The long-established route from Darfur to the Kharga and Dakhila oases fell into disuse on the closing of the eastern Sudan by the Mahdist troubles. The great route leading from Tripoli via Ghadames and Ghat, to Zinder, Kano, and other great centres of the Hausa States maintains its importance, but the opening of trade from the side of the Niger by the British in the early years of the 20th century affected its value. The route across the western Sahara to Timbuktu is less used than formerly owing to the establishment by the French of a route from Senega] via Nioro to the Upper Niger. The old route, however, retains some importance on account of the salt trade from the Sahara, which centres at Timbuktu. Salt and date palms are the chief products of the Sahara. The principal sources of the salt supply are the rock-salt deposits of the Juf (especially Taudeni), the lakes of Kufra and the rock salt and brine of Bilma (?.».).

The hope of an eventual commercial exploitation of the Sahara rests mainly on the possible existence of mineral wealth. To supply easy communication between Algeria and Nigeria the Tran*- construction of a railway across the desert has found sahmrma many advocates. Two principal routes have been o a iiway suggested, the one taking an

easterly line from Biskra scheme*. through Wargla to Air (Agades) and Zinder — generally, the route followed by Foureau (see below) ; the other starting from the terminus of the most westerly railway already existing, and reaching Timbuktu via Igli and the Tuat oases. A third suggested route is one from Igli to the Senegal, still farther west.

Reference may also be made to the proposal, strenuously advo- cated between 1870 and 1885, to open up the region to the south of Algeria and Tunisia by the construction of an inland sea. According to Colonel Francois Roudaire (1836-1885), the piling author of this scheme, deceptively styled the ” flooding tthe of the Sahara,” it was possible to create an inland sea Sahara. with an average depth of 78 ft. and an area of 3100 sq. m., or about fourteen times the size of the Lake of Geneva. A French government commission decided that the excavation of the necessary canal would not be difficult, and that in spite of silting-up processes the canal when cut would at least last 1000 to 1500 years. Ferdinand de Lesseps, Roudaire’s principal supporter, visited the district in 1883 and reported that the canal would cost five years’ labour and 150,000,000 francs. The scheme (which fell into abeyance on the

death of Roudaire) was based on the following facts. The Gulf of Gabes is separated by a ridge 13 m. across and 150 ft. high from Shat- al Fejej, a depression which extends S.W. into the Shat Jerid, which in its turn is separated from the Shat Rharsa only by a still narrower ridge. Shat Garsa is succeeded westwards by a series of smaller depressions, and beyond them lies the Shat Melrir, whose N.W. end is not far from the town of Biskra.

Politically the Sahara belongs partly to Morocco (Tafilet, &c), partly to the Turkish empire (Tripoli, Egypt, &c), but principally _ .„. , to France. The French first acquired an interest in the Divisions Sahara ˚y their conquest of Algiers (1830-45). They gradually extended their influence southward with the purpose of forming a junction with their possessions on the Senegal. The acquisition of Tunisia (1881) largely increased the hold of the French on the Sahara, and the work of French pioneers to the south of Algeria was recognized by the Anglo-French agreement of 1890, which assigned to France the whole central Sahara from Algeria to a line from Say on the Niger to Lake

Chad. The southern limit of the territory was, however, not strictly defined until 1898, when a new agreement gave to France a rectangular block south of the line mentioned, including the important frontier town of Zinder. A further agreement in 1904 again modified the frontier in favour of France. To the north-east and east the boundary of the French sphere was extended, by an Anglo-French Declaration of March 1899, and defined as running south-east, from the intersection of the Tropic of Cancer with 16° E., until it meets the meridian of 24 E., following this south to the frontier of Darfur. French Sahara is thus connected with the French possessions in West Africa and with the Congo-Shari territories of France on the south-east. On the west, where Spain claimed the Sahara coast between Capes Blanco and Bojador, the inland frontier was defined by the Franco-Spanish agreement of 1900, whereby Spain was apportioned a Hinterland with an average depth of 240 m. from the sea-shore.

It is impossible to ascertain the extent of the knowledge of the Sahara possessed by the ancients. The Egyptians penetrated the Libyan and Nubian deserts at points, and Carthaginians and Phoenicians were acquainted with the northern fringe of the desert in the west. European exploration dates from the beginning" of the 19th century. In 1819 Captain G. F. Lyon and Joseph Ritchie penetrated from Tripoli to Murzuk, where Ritchie died. In 1822 came the great journey of Walter Oudney,Hugh Clapperton andDixonDenham, from Tripoli to Lake Chad, and a year or two later Major A. G. Laing succeeded in reaching Timbuktu, also from Tripoli. In 1828 Rene Caillie crossed from Timbuktu to Morocco. Heinrich Barth in the course of his great journey (1840-1856), commenced from Tripoli under the leadership of James Richardson, traversed a considerable portion oi the Sahara. Between 1859 and 1861 Henri Duveyrier explored parts of the Tuareg domain. Knowledge of the northern Sahara, from Morocco to Tripoli, was largely increased by the journeys of Gerhard Rohlfs, begun in 1861; Rohlfs subsequently crossing (1865) from Tripoli to Lake Chad by nearly the same route as that previously taken by Barth. In 1873-1874 Rohlfs visited the oases in the north of the Libyan desert and in 1878-

1879 reached the oasis of Kufra. In 1876-1877 another German traveller, Erwin von Bary, made his way to Ghat and Air, but was assassinated. A French expedition under Colonel Paul Flatters after penetrating far south of Algeria was massacred (1881) by Tuareg. Farther west success was attained in 1880 by a German explorer, Dr Oskar Lenz, who, starting from Morocco made his way, partly by a new route, to Timbuktu. In 1892 the Sahara was crossed from Lake Chad to Tripoli by the French Colonel Monteil.

It was not until 1899 that the central Sahara, from Algeria to Air, was traversed for the first time by Europeans. This was accomplished under the leadership of Fernand Foureau. This journey was undertaken in pursuance of the efforts of the French to obtain effective control of the Sahara. South of Algeria military posts had been gradually pushed into the desert, Golea being until 1900 the farthest point which acknowledged French rule. The great desideratum was the opening up of a route to the Niger countries which might in time divert the trade from Tripoli to Algeria, but all attempts long proved fruitless, owing to the opposition of the tribes inhabiting central Sahara. In 1886 Lieutenant Palat was murdered a little south of Gurara, and in

1880 the same fate befell Camille Douls in Tidikelt (Tuat) in his attempt to reach Timbuktu from the north. In 1890 Foureau — who in 1883 had undertaken a first journey of exploration

south of Wargla — reached the Tademayt plateau in 28° N., fixing the position of 35 places, and in 1892-1893 came the first of his long series of expeditions undertaken with a view of penetrating the country of the Azjer Tuareg, the powerful confederacy which lay on the route to Air and Lake Chad, never traversed in its entirety by a European. All efforts to obtain a passage were unavailing until in 1898-1899 Foureau, accom- panied by an escort of troops under Major Lamy, at last attained his object, finally reaching Zinder, the important trade centre on the borders of Nigeria, and midway between the river Niger and Lake Chad, on the 2nd of November 1899.

The important section of Foureau's route began at Ain El-Hajaj, in about 26 £ ° N., immediately beyond which the frowning massif of Tindesset had to be crossed by a most difficult route among a chaos of rocks and ravines, the geological formation being principally sandstone. After descending the southern escarpment of the " Tasili," the expedition crossed the mountainous region named Anahef, composed of quartz and granite, through which the line of partition between the basins of the Mediterranean and Atlantic was found to run. Thence the route lay across the wide plain of quartz gravel, strewn with blocks of granite, known to the Tuareg as Tiniri, to the well of In-Azaua, beyond which a march of eleven days, with a water-supply at one point only, led to the first village of Air, where the Tuareg proved hostile. Agades, the capital of Air, was reached by a march through difficult mountains, with valleys which gradually opened into a wide plain. From Agades to Zinder the route lay, first, through the bare and arid district of Azauak; next, through the bush-

covered Tagama, a district abound- ing in game; and, lastly, through the cultivated country of Damer- ghu. Zinder had only once before been reached by way of Air — by Barth's expedition in 1850. It was now occupied by a French force which had advanced from the Niger (see Senegal : Colony).

Foureau's achievement was quickly followed by increased political activity of the French in the Sahara south of Algeria, where, in addition to the work of other explorers, surveys had been carried by French officers (especially Captains Germain and Laperrine in 1898) as far as the important centre of Insalah, the position of which had, as a result, been shifted some 25 m. E. of its former position on the maps, being found to lie in 2° 16′ E., 20° 17′ 3o"N. Early in 1900 G. B. M. Flamand, who had been entrusted with a scientific mission to the Tuat oases, came into collision with the natives, and Insalah was occupied by the military escort which accompanied him. This was quickly followed by the occupation of Tuat, and Igli (see Tuat).

Simultaneously with these events, an attempt was made to pave the way for the establishment of French influence in western Sahara by the expedition of Paul Blanchet to Adrar, which had not been visited since the middle of the 19th century. It returned in September 1900, only partially successful, Blanchet and his companions having been detained for some time as virtual prisoners on the borders of Adrar. The leader almost immediately succumbed to fever. In 1903-1909 the country N. of the lower Senegal, including Adrar, was brought under French control and organized as the territory of Mauretania.

The most marked progress was, however, effected in the central Sahara, where the French posts were gradually pushed farther south under a military organization, which resulted in the complete pacification of the Tuareg countries. Travel was thus made possible from one border of the desert to the other, and a number of successful expeditions gathered a rich harvest of results respecting the mapping, geology, and other features of this part of the Sahara. Some of the best work was done by Laperrine, Arnaud, Cortier and Nieger on the military side, and, on the civilian, by Villatte, Gautier and Chudeau. Apart from these French enterprises, Hanns Vischer, a Swiss in the service of British Nigeria, in 1906 travelled from Tripoli to Bornu through Murzuk and Bilma. In 1910 Capt. A. H. Haywood traversed the Sahara, being the first Englishman to cross the desert from Gao to Insalah.

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SAHARANPUR, a city and district of British India, in the Meerut division of the United Provinces. The city is situated on a stream called the Damaula Nadi, 907 ft. above sea-level, 998 m. by rail from Calcutta. Pop. (1901) 66,254, ˚f whom more than half are Mahommedans. It is an important junction of the North-Western railway with the Oudh and Rohilkhand line. The government botanical gardens were established in 181 7. There are railway workshops, and a large industry is pursued in wood-carving.

The District of Saharanpur has an area of 2228 sq. m. It forms the most northerly portion of the Doab, ,or alluvial tableland between the Ganges and Jumna. The Siwalik hills rise precipitously on its northern frontier; at their base stretches a wild submontane tract, with much forest and jungle. Cultiva- tion generally in this part is backward, the surface of the country being broken by ravines. South of this tract lies the broad alluvial plain of the Doab, with fertile soil and good natural water-supply. This portion of the country is divided into parallel tracts by numerous streams from the . Siwaliks, while the Eastern Jumna and Ganges canals cover the district with a network of irrigation channels. The annual rainfall averages about 37 in. The population in 1901 was 1,045,230, showing an increase of 4-4% in the decade. The principal crops are wheat, rice, pulse, millet, and maize, with some sugar-cane and cotton. The district contains the towns of Roorkee and Hard war.

During the later years of the Mogul empire, Saharanpur suffered much from the perpetual raids of the Sikhs, but in 1785 the district under Ghulam Kadir enjoyed comparative tranquillity. On his death the country fell into the hands of the Mahrattas. It was afterwards again overrun by the Sikhs, remaining practically in their hands until their defeat at Charaon November 1804, when it passed under British rule. Several disturbances subsequently took place among the native chiefs; but from 1824 to 1857 nothing occurred to disturb the peace of the district. The Mutiny in this part was soon quelled.

SAHEL (Arabic for “shore”); a common place-name in countries where Arabic is the dominant language.. By sahel any coast belt may be indicated, but the name has become the definite designation of certain districts, e.g. the Tunisian coast between the gulfs of Hammamet and Gabes. Another region so called is that part of the Sahara washed by the Atlantic. The name is also used to designate the territory under French jurisdiction west of Timbuktu and north of the Senegal. Sahel thus understood comprises regions which form the inter-

mediate zone between the fertile lands of the Sudan and the desert. In

its plural form, Swahili, the word has become the tribal name of the natives inhabiting the coast strip opposite Zanzibar.

SAHIB, a title of respect in India, specially used to designate Europeans. The word is Arabic, and originally means a com- panion. It is generically fixed to the titles of men of rank, as Khan Sahib, Nawab Sahib, Raja Sahib, and is equivalent to master. The proper feminine form is sahiba; but the hybrid term memsahib (from madam and sahib) is universally used in India for European ladies.

SAHOS, or Shohos, Africans of Hamitic stock living to the W. of Massawa. Some authorities regard them as true Abys- sinians, but more probably they are akin to the Gallas and Afars. They are for the most part Mahommedans, but some few are Christians.

SAHYADRI, a mountain range of India. The term, which is Sanskrit rather than vernacular, is applied to the entire system of the Western Ghats (q.v.) from the Tapti river to Cape Comorin, but more especially to that part of the system in the Bombay Presidency. In this restricted sense the Sahyadri hills begin in Khandesh district, and run S. as far as Gap.

In the territory of the Nizam of Hyderabad, the cross range forming the watershed between the river systems of the Tapti and the Godavari, is locally known as Sahyadri Parbat.

SAIDAPET, a town of British India, administrative head- quarters of Chingleput district, Madras, on the South Indian railway, 5 m. S.W. of Madras city, from which it is separated by a line of tanks. Pop. (1901) 14,254. The government teachers' college has a hostel or boarding-house for Brahmans, opened in 1897. The agricultural college, originally (1865) a model farm, has been transferred to Coimbatofe.

SAID PASHA (c. 1830-), surnamed Kuchuk, Turkish

statesman, was at one time editor of the Turkish newspaper Jeridi-i-Havadis. He became first secretary to Sultan Abd-ul- Hamid II. shortly after his accession, and is said to hive contributed to the realizations of his majesty's design of con- centrating power in his own hands; later he became successively minister of the interior and Vali of Brussa, reaching the high post of grand vizier in 1879. A Turkish statesman of the old school, he was regarded as somewhat bigoted and Opposed to the extension of foreign influence in Turkey. He' was grand vizier four more times under Abd-ul-Hamid. In 1896 he took refuge at the British embassy at Constantinople, and, though then

assured of his personal liberty and safety, remained practically a prisoner in his own house. He came into temporary prominence again during the revolution of 1908. On the 22nd of July he succeeded Ferid Pasha as grand vizier, but on the 6th of August was replaced by Kiamil Pasha, a man of more liberal views, at the instance of the young Turkish committee.

SAID PASHA KURD (1834-1907), Turkish statesman, son of Hussein Pasha, was born at Suleimanie. After holding various administrative posts he became governor-general of the Archipelago (1881), minister for foreign affairs (1882), ambassador at Berlin (1883) and again foreign minister in 1885. He was afterwards president of the Council of State, an office which he held till his death on the 29th of October' 1907. ■

SAIGA (Saiga tataricd), the native designation of a desert- dwelling antelope, easily recognized by its extraordinary swollen and puffy nose, in which the apertures of the tubular nostrils are directed downwards. The ringed lyrate horns of the males are amber-coloured, and wide apart on the head. There is a small gland on each side of the face below the eye; and the ears are remarkable for their short and rounded f orm. The colour is whitish in winter and sandy in summer. It is the" sole repre- sentative of its genus. At the present day the headquarters of this antelope are the Kirghiz Steppes, but a century ago its range extended as far west as Poland. During the latter part of the Tertiary period the saiga was much more widely distributed, fossilized remains having been obtained from many parts of Western Europe, including Britain.

SAIGO, TAKAMORI (1832-1877), Japanese patriot, was born in Satsuma in 1832. From early youth he took a prominent part in the politics of his clan, and owing to his extreme opinions with regard to the expediency of abolishing the Tokugawa administration, he was banished (1858) to the island of Oshima (Satsuma), where he attempted unsuccessfully to commit suicide. Ultimately he rose to high rank in the newly organized imperial government, but in 1873 he retired from the cabinet by way of protest against its decision not to take armed action against Korea. Thenceforth he became the rallying point of a large number of men dissatisfied with the new administration, and in 1877 he headed a rebellion which taxed all the resources of the central government. After several months of desperate

fighting, Saigo and a small remnant of his followers made a swift retreat to Kagoshima, and fell fighting (September 14) within sight of their homes. Saigo's patriotism and his great services in the cause of the restoration of the administrative power to the throne were so fully recognized that his son was raised to the peerage with the title of marquess, and his own memory was honoured by the erection of a bronze statue in Tokyo.

SAIGON, a town of French Indo-China, capital of the colony of Cochin-China, on the right bank of the river Saigon, 34 m. from the sea. Pop. (1905) 54,745, of whom 8749 were French (exclusive of troops), 152 Europeans of other nationalities, about 30,000 Annamese, 14,000 Chinese. The town is enclosed by the river Saigon on the east, the Chinese Arroyo on the south and the Arroyo of the Avalanche on the north, while on the west it extends towards the neighbouring town of Cholon. Double rows of trees give shade in all the streets, the width and uni- formity of which, together with the beautiful gardens (including the zoological gardens), make Saigon one of the finest towns of the Far East. It is lighted chiefly by electricity and its water- supply is secured by a filtering reservoir. The chief public buildings are the government house, the palace of the lieutenant- governor of Cochin-China, the law courts, the theatre, the post- office and the cathedral. The commercial port, at the mouth of the Chinese Arroyo, carries on a large rice trade. The naval harbour comprises an arsenal and has a repairing dock.

Saigon is the seat of two chambers of the court of appeal of French Indo-China, of tribunals of first instance and of com- merce, and of the vicar apostolic of Cochin-China. Its muni- cipal council consists of eight French and four native members elected by universal suffrage. This body elects a mayor and two assistants.

Before the French "conquest, Saigon, then known as Gia-dinh- thatih, was the capital of Lower Cochin-China, which consisted of the " six southern provinces " of the Annamese empire, and con- stituted a vice-royalty under the government of a kinhluoc. In 1836 it was fortified for the emperor Gia Long by Colonel Ollivier. The French captured it in 1859, and it was part of the territory ceded in 1862.

SAIL, the English equivalent of the common Teutonic word for one of the two universal means of propulsion of a vessel through the water, the other being the oar (q.v.). For the various types of sail see Rigging, and for the textile material used see Sailcloth below. The origin of the O. Eng. segl or segel and its cognates, e.g. Dutch zeil, Dan. sell, Ger. Segel, &c, is not known; it is certainly not con- nected with the Lat.

sagulum, cloak, mantle. It may be derived from the Indo-European root sagh-, seen in Sanskrit sah, endure, the idea being of that which bears up against or resists the wind.

SAILCLOTH, now more commonly called canvas (q.v.). usually a double warp, single weft fabric of the same structure as bagging (q.v.), although it is sometimes made with single threads of warp. Hemp and ramie are occasionally used in sails the seam is about ij in. in width, and in the British navy stuck the manufacture of this cloth, but flax and cotton are the or stitc hed in the middle of the seam to give additional strength; chief fibres employed. Many of the sails of fishing smacks and ʲ 1 ™ 3 ™ the _ U g hl ; er ˆ {ls , are about 1 in. wide. The whole of the similar ve« P U L ma ˆ *nHr»1„ „f ™tf *i v. ■ ,• F loths are then brought together, and spread out, and the tabling (or

similar vessels are made entirely of cotton— the fabric sometimes hemming, so to speak) is turned in and finished off with about 72

retaining its natural colour, but more often dyed or stained tan. Since most of the larger vessels are now driven by steam, the quantity of cloth used for sails is comparatively small. A large quantity of cloth, however, is used on steamships for covers, and for coal bags, sailcloth buckets, &c.

The very best kind of sailcloth is made from long flax, as this fibre possesses flexibility, lightness and strength combined. The number of threads per inch of warp varies from 14 double threads to 48 double threads, and from 12 to 36 shots per inch of weft, while the usual widths are 18, 24, 30 and 36 in. Cotton canvas has for its limits about 26 to 54 threads of warp per inch, and 15 to 46 shots per inch; the warp yarn for cottons may be 2, 3 or several ply.

Great care has to be exercised in the manufacture of canvas for the British Admiralty. The yarns must be made wholly from long flax, well and evenly spun, and properly twisted. They must also be free from blacks, and be twice boiled in order to remove all injurious matter. From the grey state to the cleaned state the yarns must lose 10% of weight, and no delete- rious substance whatever must be used in any stage. The mill washing and first boiling reduce the weight about 8%, while about 2 % is removed during the second boiling. Finally, the yarn is thoroughly .washed to remove all traces of alkali. The successive processes which the yarn is subjected to remove all impurities, and leave the yarn in the best condition for weaving. Canvas is made in sixteen different qualities: the heaviest is No. 0000, then follow Nos. 000, 00, o, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, n and 12. Of these sixteen varieties Nos. 1 to 8 are mostly in use. Nos. 1, 2, 4, 6 and 7 are used for royal navy canvas, and Nos. 4 and 6 for the merchant navy. The canvas for the Admiralty is 24 in. wide, and the pieces, termed bolts, should be as nearly as practicable 40 yds. of legal measure in length, and to be completely manufactured — particular attention being given to the weaving; the selvages to be evenly and well manufactured, the thrum to be left on each end of the bolt, and to be made as nearly as possible in the proportion of weights given below.

The breaking tests for red and grey canvas are 5 % below those for white canvas.

Sailmaking is a very ancient industry, but it is, naturally, much less

important than it was before the introduction of steamships. The operations of the sailmaker may be stated as follows. The dimensions of mast and yards and sail plan being supplied, the master sailmaker is enabled to determine the dimensions of each sail — after due allowance for stretching — in terms of cloths and depth in yards — if a square sail, the number of cloths in the head, number in the foot and the depth in yards; if a fore-and-aft sail (triangular), the number of cloths, in the foot and the depth in yards of the luff or stay and of leech or after-leech; if a fore-and- aft sail (trapezium form), the number of cloths in the head, number in foot, and the depth of mast or luff and of after-leech. These particulars obtained, there is got out what is technically termed a ” casting,” which simply means the shape, length, &c, of each individual cloth in the sail. These figures are given to the cutter, who proceeds to cut out the sail cloth by cloth in consecutive order, numbering them I, 2, 3, 4, &c; the series of cloths thus cut out are handed over to the workman, who joins them together by care- fully made double flat seams, sewn with twine specially prepared for the purpose, with about 120 stitches in a yard. In the heavy

Canvas

Weight

Weight

Length

No. of

Breaking

Breaking

Dimensions

Number.

of Warp.

of Bolt.

of Bolt.

Reed.

Threads.

Test for Warp.

Test for Weft.

of Testing Strip.

lb.

lb.

yds.

Score.

Double.

lb.

lb.

in.

1

26

46

39

i6|

660

340

480

24X1

2

24

43

39

l6i

660

320

460

24X1

3

22

40

39

I6J

660

300

440

24X1

4

21

36

39

17

680

280

400

24X1

5

19

33

39

17

680

26O

370

24X1

6

18

30

39

17

680

250

35°

24X1

7

15

27

40

20

800 single

330

390

24X1I

8

H

23

40

20

800 „

310

380

24Xii

IOIO

stitches to a yard. Strengthening pieces or “linings” are affixed where considered necessary, in courses and top-sails such pieces as reef-bands, middle-bands, foot-bands, leech-linings, bunt-line cloths ; in top-sails (only) a top-lining or brim ; in other and lighter sails such pieces as mast-lining clew and head, tack and corner pieces; holes, such as head, reef, stay (luff), mast, cringle, bunt-line, &c, are also made where required, a grommet of line of suitable size being worked in them to prevent their being cut through. The next thing to be done is to secure the edges of the sail. Bolt rope, a compara tively soft laid rope made from the finer hemp yarn (Italian) is used for this purpose; in the British navy it ranges from I in. (increasing in size by quarter inches) up to 8 in. inclusive ; it is then neatly sewn on with roping twine specially prepared, the needle and twine passing between and clear of every two strands of the rope in roping. Where slack sail has to be taken in, it is the practice to leave it to the judg- ment of the sail-maker; but where possible it is better to set up the rope by means of a tackle to a strain approximate to what it will have to bear when in use, and whilst on the stretch mark it off in yards, as also the edge of the sail in yards, so that by bringing the marks together in roping the sail will stand flat. In the British navy the largest size of rope sewn

on to a sail is 6 in; sizes above this are used for foot and clew ropes of top-sails and courses, being first wormed, parcelled (that is, wound round with strips of worn canvas), tarred and served over with spun yarn; the foot of the sail is then secured to it by being marled in. Where two sizes of bolt-rope used in roping a sail have to be connected, it is effected by a tapered splice. Cringles (similar to the handle of a maund) formed by a strand of bolt-rope, mostly having a galvanized iron thimble in them as a protection, are then stuck where necessary, as at the corners, sides or leeches, mast or luff; they are required either for making stationary or hauling ” taut ” by tackle or otherwise certain parts of the sail when in use. Fore-and-aft sails, such as spankers, gaff- sails and storm try-sails, are reduced in size by reef-points made of stout line (4 to 20 lb), crow-footed in the middle, a hole being pierced through every seam ; one-half of the point is passed through and the crowfoot sewn firmly to the sail; the number of reefs depends upon the size of the sail, and the reefs are placed parallel to the foot. The sails — now finished in respect of making — have to be fitted, that is, such ropes have to be attached to each of them as are necessary for proper use; such ropes may be summarily stated as follows: head-earings, robands, reef-earings, reef-lines, spilling and slab lines, reef-tackle pendant, reef-points, bow-line bridles, bunt-line toggles, bunt-becket, leech-line strops and toggles, toggles in clews, sheet ropes, down-haul, lacings, head and stay, tack-rope (gaff top-sail), tack lashing, bending strops, matting and gaskets.

The tools and appliances of a sailmaker are not very numerous : a bench about 7 ft. long and 15 in. high, upon which he sits; palms

for seaming and roping to fit the hand, made of hide lined with leather, a plate properly tem- pered being fixed in it having chambers to catch the head of the needle, thus acting as a thimble ; needles of various sizes, that for seaming being the smallest; and fids, splicing, serving and stretching knife, rubber, sail – hook, bobbin for twine, and sundry small articles. (T. Wo.)

SAINFOIN (Onobry- chis saliva) in botany is a low-growing per- ennial plant with a woody rootstock, whence proceed the stems, which are covered with fine hairs and bear numerous long pinnate leaves, the segments of which are elliptic. The flowers are borne in close pyra- midal or cylindrical clusters on the end of long stalks. Each flower is about half an inch in length with lanceolate calyx-teeth shorter than the corolla, which, latter is papilionaceous, pink, with darker stripes of the same colour.

Sainfoin (Onobrychis saliva). nat. size.

1, Fruit,

The indehiscent pods or legumes are flattened from side to side, wrinkled, somewhat sickle-shaped and crested, and con- tain a single olive-brown seed shaped like a small bean. In Great Britain the plant is a native of the calcareous districts of the southern counties, but elsewhere it is considered as an escape from cultivation. It is native throughout the whole of Central (Europe and Siberia; but it does not seem to have been cultivated in Great Britain till 1651, when it was introduced from France or French Flanders, its French name being retained. Alphonse de Candolle (Origin of Cultivated Plants, p. 104) considers that the cultivation of sainfoin originated in the south of France as late perhaps as the 15th century. It is grown as a forage plant, being especially well adapted for dry limestone soils. It has about the same nutritive value as lucerne, and is esteemed for milch cattle and for sheep in winter. Besides the common form, a second known as giant sainfoin is met with in cultivation, being more rapid in its growth.

SAINT (lat. sanctus, ” holy “), the term originally applied, e.g. in the New Testament and in the most ancient monuments of Christian thought, to all believers. In this sense it is still used by those modern Christian sects which profess to base their polity on the Bible only (e.g. the Mormons or ” Latter Day Saints “)• In ancient inscriptions it often means those souls who are enjoying eternal happiness, or the martyrs. Thus we find inscriptions in the Catacombs such as vivas inter sanctos, refrigera cum spiritu sancto, and people were buried ad sanctos. For a long time, too, sanctus was an official title, particularly reserved for bishops (v. Analecta Bollandiana, xviii. 410-41 1). It was not till almost the 6th century that the word be- came a title of honour specially given to the dead whose cult was publicly celebrated in the churches. It was to the martyrs that the Church first began to pay special honour. We find traces of this in the 2nd half of the 2nd century, in the Martyrium Polycarpi (xviii. 3) in connexion with a meeting to celebrate the anniversary of the martyr’s death. Another passage in the same document (xvii. 3) shows clearly that this was not an innovation, but a custom already established among the Christians. It does not follow that it was henceforth universal. The Church of Rome does not seem to have inscribed in its calendar its martyrs of an earlier date than the 3rd century. The essential form of the cult of the martyrs was that of the honours paid to the illustrious dead; and these honours were officially paid by the community. They consisted in a gathering at the martyr’s tomb on the anniversary of his death. St Cyprian, speaking of the confessors who died in prison, wrote to his priests, ” Denique et dies eorum, quibus excedunt, adnotate, ut

commemora- tiones eorum inter memorias martyrum celebrare possimus ” (Epist. xii. 2). The list of anniversaries of a church formed its Martyrology (q.v.). In the early days each church confined itself to celebrating its own martyrs; but it was not long before it be- came customary to celebrate the anniversaries of martyrs of other churches. In the oldest Roman ferial we already find festivals of Carthaginian martyrs, and similarly, in the Carthaginian calendar, Roman festivals, while Wright’s Syriac Martyrology contains numerous traces of this exchange of festivals. From the 5th century onwards certain celebrated saints were honoured almost universally; St Augustine (Sermo, 276, § 4) says that the festival of St Vincent was celebrated throughout the whole of the Christian world. The same was the case of the festivals of St Stephen, St James and St John, and St Peter and St Paul, as is shown by the liturgical documents, but these festivals were held in connexion with that of Christmas (26th, 27th and 28th December), and were not strictly speaking anniversaries.

The calendars at first included only martyrs, but their scope was gradually widened. The first to find a place in them were the bishops. Apparently they were at first arranged in a series of anniversaries separate from that of the martyrs, as seems to be shown by the existence at Rome of the Depositio episcoporum side by side with the Depositio martyrum; the two lists seem to have been combined, as in the calendar of Carthage, which includes the dies nataliciorum martyrum et depositiones episcoporum. Some of the most famous bishops also ended by passing from one calendar into the other. Finally, the ascetics came to share in the honours paid to the martyrs, and we see in the Historia religiosa of Theodoret how quickly this

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assimilation took place. In times of persecution the martyrs were buried among the rest of the faithful, but one can understand that their tombs, at which gatherings took place at least on the day of their anniversary, were distinguished from the ordinary tombs by some sign. When the peace of the Church permitted it, they were enshrined in chapels and often in sumptuous basilicas. In the West these buildings were raised over the tomb, which was left intact; but in the East there was no hesitation in disturbing the graves of the saints and removing the bodies to a basilica built to receive them. It is in this way that the relics of St Babylas were placed in the sanctuary built by Gallus at Daphne (Socrates, Hist. eccl. iii. 18; Sozomen, Hist. eccl. v. 19). As a matter of fact, the discipline of the Eastern churches with

regard to the relics was, from the very beginning, much less severe than that of Rome and a great number of the Western churches. From the 4th century on are recorded cases of translation of the bodies of saints, and they did not even shrink from dividing the sacred relics. In the West the principle already laid down by St Gregory the Great in his letter to Constantia, namely that of not disturbing the bodies of the saints, was for a long time the rule in all cases, and the portions distributed to the churches were simply branded, that is to say, linen which had lain upon the tomb of the saint, or, in other words, representative relics. But as early as the 7th century there is proof of a relaxation of this rule which had so well safeguarded the authenticity of the relics. It was finally disregarded altogether; in the 9th century translations of relics were extremely frequent, and led to inextricable confusion in the future.

As to the belief in the efficacy of the prayers of the saints for those still living on earth, and similarly in the efficacy of the prayers addressed to the saints, St Cyril of Jerusalem indicates in the following words the advantages of the commemoration of the saints: ” Then we make mention also of those who have fallen asleep before us, first of patriarchs, prophets, apostles, martyrs, that God would at their’ prayers and intercessions receive our supplication ” (Cat. Myst. v. 9). It is difficult to understand a much-discussed passage of Origen (De oratione, 14), except as applying to prayer addressed to the saints. The Fathers of the 4th century, and notably the Cappadocian Fathers, provide us with a quantity of evidence on this subject, which leaves no doubt as to the practice of the invocation of saints, nor of the complete approval with which it was viewed. St Basil, for example, says: “I accept also the holy apostles, prophets and martyrs, and I call upon them for their intercession to God, that by them, that is by their mediation, the good God may be propitious to me, and that I may be granted redemption for my offences ” (Epist. 360).

The cult of the saints early met with opposition, in answer to which the Church Fathers had to defend its lawfulness and explain its nature. The Church of Smyrna had early to explain its position in this matter with regard to St Polycarp: ” We worship Christ, as the Son of God ; as to the martyrs, we love them as the disciples and imitators of the Lord ” (Martyrium Polycarpi, xvii. 3). St Cyril of Alexandria defends the worship of the martyrs against Julian; St Asterius and Theodoret against the pagans in general, and they all lay emphasis on the fact that the saints are not looked upon as gods by the Christians, and that the honours paid to them are of quite a different kind from the adoration reserved to God alone. St Jerome argued against Vigilantius with his accustomed vehemence, and especially meets the objection

based on the resem- blance between these rites and those of the pagans. But it is above all St Augustine who in his refutation of Faustus, as well as in his sermons and elsewhere, clearly defined the true character of the honours paid to the saints: ” Non eis templa, non eis altaria, non sacrificia exhibemus. Non eis sacerdotes offerunt, absit, Deo praestantur. Etiam apud memorias sanctorum martyrum cum offerimus, nonne Deo offerimus ? . . . Quando audistis dici apud memoriam sancti Theogenis: offero tibi, sancte Theogenis: aut ? offero tibi Petre, aut: offero tibi Paule?” (Sermo, 273. 7; cf. Contra Faustum, xx. 21). The undoubted abuses which grew up, especially during the middle ages, raised up, at the time of the Reformation, fresh adversaries of the cult of the saints. The council of Trent, while reproving all superstitious practices in the invocation of the saints, the veneration of relics and the use of images, expresses as follows the doctrine of the Roman Church: ” That the saints who reign with Christ offer to God their prayers for men; that it is good and useful to invoke them by supplication and to have recourse to their aid and assistance in order to obtain from God His benefits through His Son our Saviour Jesus Christ, who alone is our Saviour and Redeemer ” (Sess. xxv.). At the present day the canonization (q.v.) of saints is reserved in the Roman Church to the sovereign pontiff. The Anglican Church, while still commemorating many of the Catholic saints, has not, since the Reformation, admitted any new names to the authoritative list, with the single exception of that cf King Charles I., whose ” martyrdom ” was celebrated by authority from the Restoration until the year 1859.

See D. Petavius, De theologicis dogmatibus, De incarnatione, 1., xiv. ; F. Suarez, Defensio fidei catholicae (against King James I.) ; L. Duchesne, Les Origines du culte chretien, ch. viii. ; E. Lucius, Die Anfdnge des Heiligenkults (Tubingen, 1904) ; H. R. Percival, The Invocation of Saints (London, 1896) ; A. P. Forbes, An Explanation of the Thirty-nine Articles (Oxford, 1878). (H. De.)

ST AFFRIQUE, a town of Southern France, capital of an arrondissement in the department of Aveyron, on the Sorgues, 68 m. N.N.W. of Beziers on a branch line of the railway to Clermont Ferrand. Pop. (1906) town, 4473; commune 6571. An old bridge over the Sorgues and some megaliths in the neighbourhood, especially the dolmen at Tiergues, are of anti- quarian interest. There is considerable trade in wool and Roquefort cheese.

St Affrique grew up in the 6th century around the tomb of St Africain, bishop of Comminges. In the 12th century a fortress was built on the neighbouring rock of Caylus. The possession of St Affrique was vigorously contested during the wars of religion. It was eventually

occupied by the Huguenots till 1629, when it was seized and dismantled by a royal army.

ST ALBANS, EARLS AND DUKES OF. The English title of earl of St Albans was first borne by Richard Bourke, or de Burgh, 4th earl of Clanricarde (d. 1635), who was lord president of Connaught from 1604 to 1616 and governor of Galway in 1616. In 1624 he was made Baron Somerjiill and Viscount Tunbridge in the English peerage, and in 1628 earl of St Albans, Baron Imanney and Viscount Galway. He became the third husband of Frances, dowager countess of Essex, whose first husband had been Sir Philip Sidney, and his English titles became extinct on the death of his only son, Ulick, 2nd earl of St Albans and marquess of Clanricarde, in 1657.

The second creation of an earl of St Albans was in 1660, when Henry, Baron Jermyn, was made an earl under this title; but again it became extinct on his death in 1684.

The dukedom of St Albans was created in 1684 in favour of Charles Beauclerk (1670-1726), a natural son of Charles II. by Nell Gwynne. Born in London on the 8th of May 1670, Charles was made Baron Hedington and earl of Burford in December 1676. He became colonel in the 8th regiment of horse in 1687, and took service with the emperor Leopold I., being present at the siege of Belgrade in 1688, After the battle of'Landen in 1693, William III. made him captain of the gentlemen pensioners, and four years later gentleman of the bedchamber His father had given him the re- version of the office of hereditary master falconer and that of heredi- tary registrar of the Court of Chancery, which fell vacant in 1698. His Whig sentiments prevented his advancement under Anne, but he was restored to favour at the accession of George I. He died at Bath on the 10th of May 1726. His wife Diana, daughter and heiress of Aubrey de Vere, last earl of Oxford, was a well-known beauty, who became lady of the bedchamber to Caroline, princess of Wales, and survived until the 15th of January 1742. Charles was succeeded by his eldest son, Charles Beauclerk, 2nd duke of St Albans (1696-1751), while his youngest son, Lord Aubrey Beauclerk (c. 1710-1741), became a captain in the royal navy, and perished in a fight in the West Indies on the 22nd of March 1741. The second duke's son and heir, George Beauclerk, 3rd duke (1730-1786), was followed by his second cousin, George Beauclerk (1758-1787), 4th duke, who died unmarried, and was succeeded as 5th duke by his cousin, Aubrey Beauclerk (1740-1802). He was succeeded by his son Aubrey, the 6th duke _(1765-18 1 5), whose infant son Aubrey, 7th duke (b. 1815), died within a year of his father. The 8th duke, William (1766-1825), was

the second son of the 5th duke. His son William (1 801-1849), the 9th duke, married the actress Harriot Mellon, widow of the banker Thomas Coutts. She was celebrated for her beauty, and was painted by Romney. Her fortune derived from her first husband passed to her granddaughter Angela, Baroness Burdett-Coutts in her own right. The 9th duke was succeeded by his son by a second marriage, William Amelius Aubrey de Vere (1840-1898), whose son, Charles Victor Albert Aubrey de Vere, became the nth holder of the title.

ST ALBANS, HENRY JERMYN, Earl of (c. 1604-1684), was the third son of Sir Thomas Jermyn of Rushbroke, Suffolk. At an early age he won the favour of Queen Henrietta Maria, whose vice-chamberlain he became in 1628, and master of the horse in 1639. He was a consummate courtier, a man of dissolute morals, and much addicted to gambling. He was member for Bury St Edmunds in the Long Parliament and an active and reckless royalist. He took a prominent part in the army plot of 1641, and on its discovery fled to France. Returning to England in 1643, he resumed his personal attendance on the queen, and after being raised to the peerage as Baron Jermyn of St Edmunds- bury in that year, he accompanied Henrietta Maria in 1644 to

France, where he continued to act as her secretary. In the same year he was made governor of Jersey, whence he conducted the prince of Wales to Paris. He conceived the idea of ceding the Channel Islands to France as the price of French aid to Charles against the parliament; and in other respects also he meddled with foreign politics, his great influence with the queen being a continual embarrassment to royalist statesmen, especially after the execution of Charles I. When Charles II. went to Breda, Jermyn remained in Paris with Henrietta Maria, who persuaded her son to create him earl of St Albans in 1660. Gossip which the historian Hallam accepted as authentic, but which is supported by no real evidence, asserted that Jermyn was secretly married to the widow of Charles I. At the Restoration St Albans became lord chamberlain, and received other appointments. He supported the policy of friendship with France, and he contributed largely to the close secret understanding between Charles II. and Louis XIV., being instrumental in arranging the preliminaries of the treaty of Dover in 1669. In 1664 he obtained a grant of land in London near St James's Palace, where Jermyn Street preserves the memory of his name, and where he built the St Albans' market on a site afterwards cleared for

the con- struction of Regent Street and Waterloo Place. The earl, who was a friend and patron of Abraham Cowley, died in St James's Square, for the building of which he had provided the plan in January 1 684. St Albans being unmarried, the earldom became extinct at his death, while the barony of Jermyn of St Edmunds- bury passed by special remainder, together with his property, to his nephew Thomas Jermyn, and after the latter's death to Thomas's brother Henry Baron Dover (q.v.).

ST ALBANS, a city, municipal borough, and market town in the St Albans parliamentary division of Hertfordshire, England, on the main line of the Midland railway and on branches of the London & North-Western and the Great Northern lines, 20 m. N.W. of London. Pop. (1891) 12,898; (1901) 16,019. St Albans became the seat of a bishop in 1877; the diocese covering the greater part of Essex, and Hertfordshire, with small portions of Cambridgeshire, Bedfordshire and Buckinghamshire. The great cathedral, or abbey church, is finely situated on the steep hill, above the small river Ver, on which the central part of the city is placed.

Shortly after the martyrdom of St Alban, probably in 303, a church was built on the spot where he was slain, and in 793 Offa, king of Mercia, who professed to have discovered the relics of the martyr, founded in his honour a monastery for Benedictines, which became one of the richest and most important houses of that order in the kingdom. The abbots, Ealdred and Ealmer, at the close of the 10th century began to break up the ruins of the old Roman city of Verulamium for materials to construct a new abbey church ; but its erection was delayed till the time of William the Conqueror, when Paul of Caen, a relative of Archbishop Lanfranc, was in 1077 appointed abbot. The cathedral at Canterbury as built by Lanfranc was almost a reproduction of St Stephen's, Caen; but Paul, while adopting the same model for St Albans, built it on a much larger scale. The church was consecrated in 1 1 15, but had been finished some years before. Of the original Norman church the principal portions now remaining are the eastern bays of the nave, the tower and the transepts, but the main outlines of the building are still those planned by Paul. It is thus one of the most important speci- mens of Norman architecture in England, with the special character- istic that, owing to the use of the flat broad Roman tile, the Norman portions are peculiarly bare and stern. The western towers were pulled down in the 13th century. About 1155 Robert de Gorham repaired and beautified the early shrine and rebuilt the chapter- house and part of the cloister; but nothing of his work now remains except part of a very beautiful doorway discovered in recent times. About 1200 Abbot John de Cella

pulled down the west front and portions of the north and south aisles. He began the erection of the west front in a new and enriched form, and his work was con- tinued by his successor William de Trumpyngtone in a plainer manner. In 1257 the eastern portion was pulled down, and between the middle of the 13th and the beginning of the 14th century a sanctuary, ante-chapel and lady chapel were added, all remarkably fine specimens of the architecture of the period. In 1323 two great columns on the south side suddenly fell, and this necessitated the rebuilding of five bays of the south aisle and the Norman cloisters. Various incongruous additions were made during the Perpendicular period, and much damage was also done during the dissolution of the abbeys to the finer work in the interior. Structural dangers gave rise to an extensive restoration and partial rebuilding, begun under the direction of Sir Gilbert Scott, and completed in 1894 by Lord

Grimthorpe, some of whose work was, and remains, the subject of much adverse criticism. The abbey's extreme • length outside is 550 ft., which is exceeded by Winchester by 6 ft. The nave (292 ft.) is the longest Gothic nave in the world and exceeds that of Winchester by about 20 ft. The length of the transepts is 175 ft. inside. The monastic buildings have all disappeared except the great gateway.

St Michael's church, within the site of Verulamium, was originally constructed in the 10th century. Considerable portions of the Norman building remain. The church contains the tomb of Lord Chancellor Bacon. St Stephen's church, dating from the same period, contains some good examples of Norman architecture. St Peter's church has been in great part rebuilt, but the Early Perpen- dicular nave remains. The restored clock-house in the market-place was built by one of the abbots in the reign of Henry VIII. There is an Edward VI. grammar school. The principal modern buildings are the corn exchange, the court-house, the prison, the public baths, a technical school and the public library. There are two hospitals (one for infectious diseases), a dispensary and almshouses founded in 1734 by Sarah, duchess of Marlborough. The principal industries are the manufacture of silk, straw-plaiting, brush-making, letterpress and chromo-lithographic printing. There are also breweries and iron-foundries. A public park of 24 acres was opened in 1894, and a recreation ground in 1898. The increase in population is largely due to the growth of a residential district on the outskirts, owing mainly to the convenient proximity to London. The city is governed by a mayor, 4 aldermen, and 12 councillors. Area, 997 acres.

To the south-west of the present city of St Albans stood the ancient

Verulamium (q.v.), one of the oldest towns in Britain, on Watling Street. The ruins served as a quarry not only to the builders of the Abbey, but also for the other churches and the monastic buildings of St Albans, and Roman bricks are found even in the fabric of the churches of neighbouring villages, as at Sandridge, 2% m. N.E. After being burnt by Boadicea, Veru- lamium revived, and its church was famous early in the 8th century. The origin of the royal castle of Kingsbury is variously assigned to the 6th and 8th centuries. In the 9th and 10th centuries the abbots enlarged the town, which was confirmed to them as a borough by Henry II. In 1 253 a charter gave borough jurisdiction to the good men of St Albans; but the borough court was, apparently, discontinued for about 200 years after the rebellion of 1381. A charter of 1533, confirmed in 1553 and I SS9 -1 56°> incorporated the mayor and burgesses. Charters of 1663, 1664 and 1685, and the Municipal Corporations Act of 1835, altered the form of the corporation; and in 1877 St Albans became a city. Two burgesses were returned to the parliament of 1306-1307, and to others, until, after 1336, such right fell into abeyance Until its resumption in 1553. Its abolition, as a result of corrupt electioneering practices, took place in 1852.

During Wat Tyler's insurrection the monastery was besieged by the townspeople, many of whom were executed in conse- quence. At St Albans the Lancastrians were defeated on the 21st of May 1455, their leader, the duke of Somerset, being killed, and Henry VI. taken prisoner; here, too, Queen Margaret defeated the earl of Warwick on the 17th of February 1461. During the civil wars the town was garrisoned for the parliament. On a printing press, one of the earliest in the kingdom, set up in the abbey the first English translation of the Bible was printed.

See Victoria County History, Herts, vol. ii. ; Peter Newcome, The History of the Abbey of St Albans (London, 1793) ; and Chronica monasterii S. Albani, edited by H. T. Riley for the " Rolls " series

(1863-1876).

SAINT ALBANS, a city and the county-seat of Franklin county, Vermont, U.S.A., 57 m. (by rail) N.N.W. of Montpelier. Pop. (1900) 6239, including 1201 foreign-born; (1910) 6381. St Albans is served by the Central Vermont railway, which has general offices and shops here, and by an electric line connecting with Lake Champlain at St Albans Bay and with Swanton, 9 m. N. The city is built on a plain less than 3 m. from Lake Champlain and about 300 ft. above it; surrounding hills (Aldis and Belle vue) rise still higher and command

charming views of the Green Mountains, Lake Champlain and the Adirondacks. Among the prominent buildings are a U.S. customs-house, the city hall, the court house, a public library, a hospital (1882), the Warner Home for Little Wanderers (1882) , two Roman Catholic parochial schools and two convents. There are marble quarries in the vicinity, but the surrounding country is devoted largely to dairying. St Albans has a large creamery, manufactures con- densed milk and ships large quantities of butter.

SAINT ALBIN— ST AMAND-LES-EAUX

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The first permanent settlement here was established in 1786; the township of St Albans (pop. in 1900, 1715) was incorporated in 1859, and the larger part of it was chartered as the city of St Albans in 1897. On the 19th of October 1864 Lieut. Bennett H. Young led from Canada about twenty-five un-uniformed Confederate soldiers in a raid on St Albans. They looted three banks, wounded several citizens, one mortally, and escaped to Canada, where Young and twelve others were arrested and brought to trial. But they were never punished, and even the $75,000 which had been taken from them on their arrest was returned to them. Later, however, the Canadian government refunded this amount to the banks. In 1866 and again in 1870 the Fenians made St Albans a base for attacks on Canada, and United States troops were sent here to preserve neutrality.

SAINT ALBIN, ALEXANDER CHARLES OMER ROUSSELIN DE CORBEAU, Comte de (1773-1847), French politician, was born in Paris, of a noble Dauphinois family, and was educated at the College d'Harcourt. He embraced the revolutionary ideas with enthusiasm. As civil commissioner at Troyes he was accused of terrorism by some, and by the revolutionary tribunal' of moderation. He was imprisoned for a short time in 1794. On his release the Citoyen Rousselin entered the ministry of the interior, and under the Directory he became secretary- general, and then civil commissioner of the Seine. Attached to the party of Bernadotte, he was looked on with suspicion by the imperial police, and during the later years of the empire spent his time in retirement at Provence. During the Hundred Days, however, he served under Carnot at the ministry of the interior. Under the Restoration he defended Liberal principles in the Constitu- tionnel, of which he was the founder. Although Louis Philippe had been his friend since the days of the, Revolution, he accepted no office from the monarchy of July. He retired from the Constitulionnel in 1838, and died on the 15th of June 1847. His chief works deal with the

soldiers of the Revolution. They are: Vie de Lazare Hoche (2 vols., 1798); Notice historique sur le general Marbol (1800); M. de C hampionnel (i860) ; and notices of others posthumously published by his son, Hortensius de Saint Albin, as Documents relatijs a la Revolution Fran$aise . . .

(1873).

ST ALDEGONDE, PHILIPS VAN MARNIX, Heer van (1538-1598), Dutch writer and statesman, was born at Brussels, the son of Jacob van Marnix, baron of Pottes. He studied theology under Calvin and Beza at Geneva and, returning to the Netherlands in 1560, threw himself energetically into the cause of the Reformation, taking an active part in the compromise of the nobles in 1565 and the assembly of St Trond. He made himself conspicuous by issuing a pamphlet in justification of the iconoclasts who devastated Flanders in 1566, and on Alva's arrival next year had to fly the country. After spending some time in Friesland and in the Palatinate he was in 1570 taken into the service of William, prince of Orange, and in 1572 was sent as his representative to the first meeting of the States-general assembled at Dordrecht. In 1573 he was taken prisoner by the Spaniards at Maaslandsluys, but was exchanged in the following year. He was sent as the representative of the insurgent provinces to Paris and London, where he in vain attempted to secure the effective assistance of Queen Elizabeth. In 1578 he was at the diet of Worms, where he made an eloquent but fruitless appeal for aid to the German princes. Equally vain were his efforts in the same year to persuade the magistrates of Ghent to cease persecuting the Catholics in the city. He took a conspicuous part in arranging the Union of Utrecht, and in 1583 was chosen burgomaster of Antwerp. In 1585 he surrendered the city, after a 13 months' siege, to the Spaniards. Violently attacked by the English and by his own countrymen for this act, he retired from public affairs and, save for a mission to Paris in 1590, lived henceforth in Leiden or on his estate in Zeeland, where he worked at a translation of the Bible. He died at Leiden on the 15th of December 1598.

St Aldegonde, or Marnix (by which name he is very commonly known) , is celebrated for his share in the great development of Dutch literature which followed the classical period represented by such writers as the poet and historian Pieter Hooft. Of his works the best known is the Roman Bee-hive {De roomsche byen-korf), published in 1569 during his exile in Friesland, a bitter satire on the faith and

practices of the Roman Catholic Church. This was translated or adapted in French, German and English. As a poet, St Aldegonde is

mainly known through his admirable metrical translation of the Psalms (1580), and the celebrated Wilhelmus van Nassauwe, one of the two officially recognized national anthems of Holland, is also ascribed to him. His complete works, edited by Lacroix and Quinet, were published at Brussels in 7 vols. (1855-1859), and his religious and theological writings, edited by Van Turenenbergen, at Paris, in 3 vols. (1871-1891).

See E. Quinet, Marnix de St Aldegonde (Paris, 1854); Juste, Vie de Marnix (The Hague, 1858); Fredericq, Marnix en zijne neder- landsche geschriften (Ghent, 1882); Tjalma, Philips van Marnix, heer van Sint-Aldegonde (Amsterdam, 1896).

ST ALDWYN, MICHAEL EDWARD HICKS BEACH, 1ST

Viscount (1837-), English statesman, son of Sir Michael Hicks Beach, 8th Bart., whom he succeeded in 1854, was born in London in 1837, and was educated at Eton and Christ Church, Oxford, where he graduated with a first class in the school of law and modern history. In 1864 he was returned to parliament as a Conservative for East Gloucestershire, the county in which his estates of Williamstrip Park were situated; and during 1868 he acted both as parliamentary secretary to the Poor Law Board and as under-secretary for the Home Depart- ment. In 1874 he was made chief secretary for Ireland, and was included in the Cabinet in 1877. From 1878 to 1880 he was secretary of state for the colonies. In 1885 he was elected for West Bristol, and the Conservative party having returned to power, became chancellor of the exchequer and leader of the House of Commons. After Mr Gladstone's brief Home Rule Ministry in 1886 he entered Lord Salisbury's next Cabinet again as Irish secretary, making way for Lord Randolph Churchill as leader of the House; but troubles with his eyesight compelled him to resign in 1887, and meanwhile Mr Goschen replaced Lord Randolph as chancellor of the exchequer. From 1888 to 1892 Sir Michael Hicks Beach returned to active work as president of the Board of Trade, and in 1 895 — Mr Goschen being transferred to the Admiralty — he again became chancellor of the exchequer. In 1899 he lowered the fixed charge for the National Debt from twenty-five to twenty-three millions — a reduction imperatively required, apart from other reasons, by the difficulties found in redeeming Consols at their then inflated price. When com- pelled to find means for financing the war in South Africa, he insisted on combining the raising of loans with the imposition of fresh taxation; and besides raising the income-tax each year, up to is. 3d. in 1902, he introduced taxes on sugar and exported Coal (1901), and in 1902 proposed the reimposition of the registra- tion duty on corn and flour which had

been abolished in 1869 by Mr Lowe. The sale of his Netheravon estates in Wiltshire to the War Office in 1898 occasioned some acrid criticism concern- ing the valuation, for which, however, Sir Michael himself was not responsible. On Lord Salisbury's retirement in 1902 Sir Michael Hicks Beach also left the government. He accepted the chairmanship of the Royal Commission on Ritualistic Practices in the Church, and he did valuable work as an arbi- trator; and though when the fiscal controversy arose he became a member of the Free-food League, his parliamentary loyalty to Mr Balfour did much to prevent the Unionist free-traders from precipitating a rupture. When Mr Balfour resigned in 1905 he was raised to the peerage as Viscount St Aldwyn.

ST AMAND-LES-EAUX, a town of northern France, in the department of Nord, at the junction of the Elnon with the Scarpe, 22 m. S.E. of Lille by rail. Pop. (1906), town, 10,195; commune, 14,454. The town has a communal college and a school of drawing, and carries on iron-founding and the manufacture of porcelain, hosiery, chains and nails, but is better known for its mineral waters and mud baths. There are five springs; the water (67 to 77 F.) contains sulphate of lime and sulphur, and deposits white gelatinous threads without smell or taste. The mud baths are of benefit to patients suffering from rheuma- tism, gout and certain affections of liver and skin. Though from the discovery of statues and coins in the mud it is evident that these must have been frequented during the Roman period, it was only at the close of the 17th century that they again became of more than local celebrity. Of the abbey there remain

an entrance pavilion serving as town hall and the richly decorated facade of the church, both dating from the 17th century.

St Amand owes its name to St Amand, bishop of Tongres, who founded a monastery here in the 7th century. The abbey was laid waste by the Normans in 882 and by the count of Hainaut in 1340. The town was captured by Mary of Burgundy in 14.77, by the count of Ligne, Charles V.'s lieutenant, in 1521, and finally in 1667 by the French. In 1793 St Amand was the headquarters of General Dumouriez in revolt against the Republican government.

ST-AMAND-MONT-ROND, a town of central France, capital of an arrondissement in the department of Cher, 39 m. S. by E. of Bourges

on the railway to Montlucon. Pop. (1906), 7711. The town stands at the foot of the hill of Mont-Rond on the right bank of the Cher, at its confluence with the Marmande and on the canal of Berry. A church of the period of transition from the Romanesque to Gothic style and several old houses are the more interesting buildings. The beautiful chateau of Meillant, built from 1500 to 1510 by the admiral Charles of Amboise, is 5! m. from St Amand; and the abbey of Noirlac, a fine type of Cistercian abbey with a 12th-century church, is 2§ m. from the town.

The town grew up round a monastery founded by St Amand, a follower of St Columban, in the 7th century. Its ruined stronghold, on the hill of Mont-Rond, was of importance in the middle ages, and during the Fronde, when it belonged to the great Conde, was a centre of resistance to the royal troops, by whom it was taken after a siege of eleven months in 1652. It was for a time the property of Sully, who retired to it under the regency of Marie de' Medici.

SAINT-AMANT, MARC ANTOINE DE GERARD, Sieur de (1594-1661), French poet, was born near Rouen in the year 1594. His father was a merchant who had, according to his son's account, been a sailor and had commanded for 22 years une escadre de la reine Elizabeth — a vague statement that lacks confirmation. The son obtained a patent of nobility, and attached himself to different great noblemen — the due de Retz and the comte d'Harcourt among others. He saw military service and sojourned at different times in Italy, in England — a sojourn which provoked from him a violent poetical attack on the country, Albion (1643) — in Poland, where he held a court appointment for two years, and elsewhere. Saint-Amant's later years were spent in France; and he died at Paris on the 29th of Decemoe 1661.

Saint-Amant has left a not inconsiderable body of poetry. His Albion and Rome ridicule set the fashion of the burlesque poem, a form in which he was excelled by his follower Paul Scarron. In his later years he devoted himself to serious subjects and produced an epic, Mo'ise sauve (1653). His best work consists of Bacchan- alian songs, his Debauche being one of the most remarkable convivial poems of its kind.

The standard edition is that in the Bibliothique Elzevirienne, by M. C. L. Livet (2 vols. Paris, 1855).

SAINT ANDRE, ANDR6 JEANBON (1749-18 13), French revolutionist, was born at Montauban (Tarn-et-Garonne) on the 25th of February

1749, the son of a fuller. Although his father was a Protestant, St Andre was brought up by the Jesuits at Marseilles and took orders. He turned Protestant, however, and became pastor at Castras and afterwards at Montauban. The proclamation of liberty of worship made him a supporter of the Revolution, and he was sent as deputy to the Convention by the department of Lot. He sat on the Mountain, voted for the death of Louis XVI. and opposed the punishment of the authors of the September massacres. In July 1793 he was president of the Convention, entered the Committee of Public Safety the same month and was sent on mission to the Armies of the East. On the 20th of September 1793 he obtained a vote of one hundred million francs for constructing vessels, and from September 1793 to January 1794 reorganized the military harbours of Brest and Cherbourg. In May 1794 he took part with Admiral Villaret de Joyeuse in a fight with the English. Finally, after a mission in the south, which lasted from July 1794 to March 1795 and in which he showed great moderation, he was arrested on the 28th of May 1795, but was released by the amnesty of the year IV. He was then appointed consul at Algiers and Smyrna (1798), was kept prisoner by the Turks for three years, and subsequently became prefect of the department of Mont-Tonnerre (1801) and commissary-general of the three

departments on the left bank of the Rhine. He died at Mainz on the 10th of December 1813.

See Levy-Schneider, Le Conventionnel Jeanbon St Andre" (Paris,

1901).

SAINT ANDRfi, JACQUES D'ALBON, Seigneur de (c. 1505- 1562), French soldier and favourite of Henry II. of France. He was made marshal of France, governor of Lyonnais and ambassador in England. He served with great bravery against the emperor Charles V. in 1552. In 1557 he was taken prisoner at the battle of Saint Quentin, but was released the following year, and took part in negotiating the peace of Cateau-Cam- bresis. After the death of Francis II. he formed in 1561 with the constable de Montmorency and Francis, duke of Guise, an alliance known as " the triumvirate " against the Protestants and the queen-mother. He perished at the battle of Dreux by the hand of a private enemy.

ST ANDREWS, a city, royal burgh, university town and seaport of Fifeshire, Scotland. Pop. (1901), 7621. It is situated on a bay of the North Sea, 12! m. S.E. of Dundee by the North British railway, via Leuchars junction. It occupies a plateau of sandstone rock about 50 ft.

high, on the north breaking off in precipitous cliffs in which the sea has worn numerous caves. The Eden enters St Andrews Bay to the north-west of the Links; and Kinness Burn, skirting the south side of the town, flows into the harbour. Almost the whole activity of St Andrews is centred in education and golf. There are a few small businesses, however, such as brewing, tanning, shipping and fishing. The harbour, which is somewhat difficult of access, is protected by a pier 630 ft. long. The city has been called the " Mecca of Golf," partly because the Royal and Ancient Golf Club, founded in 1754, is the legislative authority of the game, and partly because its beautiful links — acquired by the town in 1894 and containing three courses — rank amongst the finest in the world. For the sake of the game, the bracing air and the bathing which the sandy beach of its bay affords, visitors are attracted to St Andrews in great numbers. The chief modern buildings include the town hall, the Templars' Hall, the Volunteer Hall, the Gibson Hospital, the Memorial Cottage Hospital, the Marine Biological Station (erected by Dr C. H. Gatty and opened in 1896), the Library and the Golf Club House, erected in 1853. The city was never surrounded by walls, and of its ancient gates the West Port only remains. The Martyrs' Memorial, erected to the honour of Patrick Hamilton, George Wishart, and other martyrs of the Reformation epoch, stands at the west end of the Scores on a cliff overlooking the sea.

The cathedral originated partly in the priory of Canons Regular founded by Bishop Robert (1122-1159). At the end of the 17th century some of the priory buildings were still entire and considerable remains of others existed, but nearly all traces have now disappeared except portions of the priory wall and the archways, known as the Pends. The wall is about three-quarters of a mile long, and bears turrets at intervals. The 3rd marquis of Bute undertook the restora- tion of the priory, but the work was interrupted by his death in 1900. The cathedral was founded by Bishop Arnold (1159-1162), to supply more ample accommodation than was afforded by the church of St Regulus. Of this church in the Romanesque style, probably dating from the 10th century, there remain the square tower, 108 ft. in height, and the choir, of very diminutive proportions. On a plan of the town, about 1530, a chancel appears, and on seals affixed to the city and college charters there are representations of other build- ings attached. The cathedral was constructed in the form of a Latin cross, the total length inside the walls being 355 ft., the length of the nave 200 ft., of the choir and lateral aisles 62 ft. and of the lady chapel at the eastern extremity 50 ft. The width at the transepts was 166 ft. and of the nave and choir 62 ft. The building was finished in the time of Bishop

Lamberton (1297-1328), and was dedicated on the 5th of July 1318, the ceremony being witnessed by Robert Bruce. When entire it had, besides a central tower, six turrets, of which two at the east and one of the two at the west extremity, rising to a height of 100 ft., remain. The building was partly destroyed by fire in 1378, and the restoration and further embellishment were completed in 1440. It was stripped of its altars and images in 1559. It is believed that about the end of the 16th century the central tower gave way, carrying with it the north wall. Afterwards large portions of the ruins were taken away for building purposes, and nothing was done to preserve them until 1826. Since then it has been tended with scrupulous care, an interesting feature being the cutting out of the ground-plan in the turf. The principal portions extant, partly Norman and partly Early English, are the

east and west gables, the greater part of the south wall of the nave and the west wall of the south transept.

The picturesque ruins of the castle are situated on a rocky pro- montory much worn away by the sea. It is supposed to have been erected by Bishop Roger about the beginning of the 13th century as an episcopal residence, and was strongly fortified. It was fre- quently taken by the English, and after it had been captured by the Scottish regent, Andrew Murray, in 1336-1337, was destroyed lest it should fall into their hands. Towards the close of the century it was rebuilt by Bishop Trail in the form of a massive fortification with a moat on the south and west sides. James I. spent some of his early years within it under the care of Bishop Wardlaw, and it was the birthplace of James III. (1445). From a window in the castle Cardinal Beaton witnessed the burning of George Wishart in front of the gate (1546), and in the same year he was murdered within it by a party of Reformers. The castle was taken from the con- spirators by the French, among the prisoners captured being John Knox. Some years afterwards it was repaired by Archbishop Hamilton, but in less massive and less substantial form. By 1656, however, it had fallen into such disrepair that the town council ordered the materials to be used for repairing the pier. The principal remains are a portion of the south wall enclosing a square tower, the ” bottle dungeon ” — so named from its shape: it was a cell hewn out of the solid rock — below the north-west tower, the kitchen tower and a curious subterranean passage. The grounds have been laid out as a public garden.

The town church, formerly the church of the Holy Trinity, was originally founded in 11 12 by Bishop Turgot. The early building was a beautiful Norman structure, but at the close of the 1 8th century the whole, with the exception of little else than the square tower and spire, was re-erected in a plain and ungainly style. In this church John Knox first preached in public (May or June 1547), and in it, on June 4th 1559, he delivered the famous sermon from St Matthew xxi. 12, 13, which led to the stripping of the cathedral and the destruction of the monastic buildings. The church contains an elaborate monument in white marble to James Sharp, archbishop of St Andrews (assassinated 1679). In South Street stands the lovely ruin of the north transept of the chapel of the Blackfriars' monastery founded by Bishop Wishart in 1274; but all traces of the Observan- tine monastery founded about 1450 by Bishop Kennedy have dis- appeared, except the well.

The great university of St Andrews owed its origin to a society formed in 1410 by Lawrence of Lindores, abbot of Scone, Richard Cornwall, archdeacon of Lothian, William Stephen, afterwards archbishop of Dunblane, and a few others. A charter was issued in 1411 by Bishop Henry Wardlaw (d. 1440), who attracted the most learned men in Scotland as professors, and six bulls were obtained from Benedict XIII. in 1413 confirming the charter and constituting the society a university. The lectures were delivered in various parts of the town until 1430, when Wardlaw allowed the lecturers the use of a building called the Paedagogium, or St John's. St Salvators College was founded and richly endowed by Bishop Kennedy in 1456; seven years later it was granted the power to confer degrees in theology and philosophy, and by the end of the century was regarded as a constituent part of the university. In 1 51 2 St Leonard's College was founded by Prior John Hepburn and Archbishop Alexander Stewart on the site of the buildings which at one time were used as a hospital for pilgrims. In the same year Archbishop Stewart nominally changed the original Paedagogium into a college and annexed to it the parish church of St Michael of Tarvet; but its actual erection into a college did not take place until 1537, when it was dedicated to the Blessed Virgin Mary of the Assumption. The outline of the ancient structure is preserved, but its general character has been much altered by various restorations. It forms two sides of a quadrangle, the library and principal's residence being on the north and the lecture rooms and the old dining-hall on the west. The University library, which now includes the older college libraries, was founded about the middle of the 17th century, rebuilt in 1764, and improved in 1829 and 1889-1890. The lower hall in the older part of the building was used

at times as a provincial meeting-place for the Scottish parliament. When the constitution of the colleges was remodelled in 1579 St Mary's was set apart for theology; and in 1747 the colleges of St Salvator and St Leonard were formed into the United College. The buildings of St Leonard's are now occupied as a school for girls. The college chapel is in ruins. The United College occupies the site of St Salvator's College, but the old buildings have been removpd, with the exception of the college chapel,

now used as the university chapel and the parish church of St Leonard's, a fine Gothic structure, containing an elaborate tomb of Bishop Kennedy and Knox's pulpit; the entrance gateway, with a square clock tower (152 ft.); and the janitor's house with some class-rooms above. The modern building, in the Elizabethan style, was erected between 1827 and 1847. University College, Dundee, was in 1890 affiliated to the univer- sity of St Andrews. This arrangement was set aside by the House of Lords in 1895, but a reaffiliation took place in 1897. In 1887-1888 a common dining-hall for the students was estab- lished; in 1892 provision was made "within the university for the instruction of women; and for the board and residence of women students a permanent building was opened in 1896. To the south of the library medical buildings, erected by the munificence of the 3rd marquess of Bute, were opened in 1899- It was during the principalship of Dr James Donaldson, who succeeded John Tulloch (1823-1886), that most of the modern improvements were introduced.

Madras College, founded and endowed by Dr Andrew Bell (1755-1832), a native of the city, is a famous higher-class school. The town, which is governed by a council, provost and bailies, gives its name to the district group of burghs for returning one member to parliament, the other constituents being the two Anstruthers, Crail, Cupar, Kilrenny and Pittenweem.

Four miles N.W. is Leuchars (pop. 711), the church of which, dating from 1100, contains some beautiful Norman work in the chancel and apse, the nave being modern. It was in this church that Alexander Henderson (1583-1646) heard the sermon that led him to give up Episcopacy. At Guard Bridge (pop. 715), so named from the six-arched bridge erected by Bishop Wardlaw at the mouth of the Eden, are a large paper-mill and brickworks. Mt Melville, to the S.W. of the city, was the residence of the novelist G. J. Whyte- Melville (1821-1878), and Kinaldie, to the S., was the birthplace of Sir Robert Ayton the poet (1570-1638). On the shore, to the S.E., stands the huge detached rock which, from its shape, bears the name of the Spindle rock.

History. — St Andrews was probably the site of a Pictish stronghold, and tradition declares that Kenneth, the patron saint of Kennoway, established a Culdee monastery here in the 6th century. The foundations of the little church dedicated to the Virgin were discovered on the Kirkheugh in 1 860. Another Culdee church of St Mary on the Rock is supposed to have stood on the Lady's Craig, now covered by the sea. At that period the name of the place was Kilrymont (Gaelic, " The church of the King's Mount ") or Muckross. Another legend tells how St Regulus or Rule, the bishop of Patras in Achaea, was guided hither bearing the relics of Saint Andrew. The Pictish king Angus gave him a tract of land called the Boar Chase, no doubt the Boar hills of the present day, and the name of the spot was changed to St Andrews, the saint soon afterwards (747) becoming the patron-saint of Scotland (but see Andrew, St). St Andrews is said to have been made a bishopric in the 9th century, and when the Pictish and Scottish churches were united in 908, the primacy was transferred to it from Dunkeld, its bishops being thereafter known as bishops of Alban. It became an archbishopric during the primacy of Patrick Graham (1466-1478). The town was created a royal burgh in 1124. In the 16th century St Andrews was one of the most important ports north of the Forth and is said to have numbered 14,000 inhabitants, but it fell into decay after the Civil War. Defoe says that when he saw it one-sixth of its houses were ruinous and the sea had so encroached on the harbour that it was never likely to be restored; but the slight improvement in trade and public spirit which Bishop Pococke seemed to detect in 1760 continued throughout the 19th century.

Authorities. — S. W. Martine, History and Antiquities of St Rule's Chapel, St Andrews (1787); Grierson, Delineations of St Andrews (1807; 3rd ed.,1898); Reliquiae Divi Andreae (1797) ; Liber Cartarum Sancti Andreae (Bannatyne Club, 1841) ; W. F. Skene, " Ecclesiastical Settlements in Scotland," in Proc. Soc. Antiq. Scot. (1862-1863)

C. J. Lyon, History of St Andrews (1843) ; A. M'Lachlan, St Andrews its Historical Associations and Public Buildings (Edinburgh, 1885)

D. Hay Fleming, The Martyrs and Confessors of St Andrews (Cupar, 1887); Register of the Christian Congregation of St Andrews, 1559-1600 (Edinburgh, Scottish History Society, 1889-1890); Guide to St Andrews; Andrew Lang, St Andrews (London, 1893); D.R.Kerr, St Andrews in 1645-1646 (London, 1895) ; James Maitland Anderson,

The University of St Andrews: an Historical Sketch (1878) ; Annual Register of St Andrews University.

SAINT ARNAUD, JACQUES LEROY DE (1801-1854), marshal of France, was born at Paris on the 20th of August 1801. He entered the army in 181 7, and after ten years of garrison service, which he varied by gambling and wild courses, he still held only the lowest commissioned grade. He then resigned, led a life of adventure in several lands and returned to the army at thirty as a sub-lieutenant. He took, part in the suppression of the Vendee emeute,and was for a time on General(Marshal) Bugeaud's staff. But his debts and the scandals of his private life compelled him to go to Algeria as a captain in the Foreign Legion. There he distinguished himself on numerous occasions, and after twelve years had risen to the rank of marichal de camp. In 1848 he was placed at the head of a brigade during the revolution in Paris. On his return to Africa, it is said because Louis Napoleon considered him suitable to be the military head of a coup d'itat, an expedition was made into Little Kabylia, in which St Arnaud showed his prowess as a commander-in-chief and provided his superiors with the pretext for bringing him home as a general of division (July 1851). He succeeded Marshal Magnan as minister of war and superintended the military operations of the coup d'etat of the 2nd of December (1851) which placed Napoleon III. on the throne. A year later he was made marshal of France and a senator, remaining at the head of the war office till 1854, when he set out to command the French in the Crimea, his British colleague being Lord Raglan. He died on board ship on the 29th of September 1854 shortly after commanding at the battle of the Alma. His body was con- veyed to France and buried in the Invalides.

See Lettres du Marichal de Saint Arnaud (Paris, 1855; 2nd edition with memoir by Sainte-Beuve, 1858).

ST ARNAUD, a town of Kara-Kara county, Victoria, Australia, 158 m. by rail N.W. of Melbourne. Pop. (1901), 3656. It is a flourishing town with a fine town hall, a school of mines and the court house, in which sittings of the supreme court are held. There are tanneries, chaff and wood yards, and flour- and bone-mills in the town, which lies in a gold-mining, pastoral and agricultural district, the mining being chiefly quartz. To the N.W. is some of the finest agricultural land in the colony.

ST ASAPH, a cathedral city and a contributory parliamentary borough of Flintshire, N. Wales, on the Rhyl-Denbigh branch of the London & North-Western railway, about 6 m. from each of these towns. Pop.

(1901), 1788. Its Welsh name, Llanelwy, is derived from the Elwy, between which stream and the Clwyd it stands. Asaph, to whom the cathedral (one of the smallest in Great Britain) is dedicated, was bishop here after Kentigern's return hence to Glasgow, and died in 596. The small, irregularly built town has also a parish church (Anglican), remains of a Perpendicular chapel near Ffynnon Fair (St Mary's Well), a bishop's house, a grammar school (1882) and almshouses for eight poor widows, founded in 1678 by Bishop Barrow. The hill on which St Asaph stands is Bryn Paulin, supposed to have been the camping-ground of Suetonius Paulinus, on his way to Anglesey. The early cathedral, of wood, was burned by the English in r247 and 1282, and that built by Bishop Anian in the 13th century (Decorated) was mostly destroyed during the war of Owen Glendower in 1402; Bishop Redman's building (c. 1480) was completed by the erection of the choir about 1770. During the Civil War the Parliamentarians did not spare the building. The choir and chancel were restored, from designs by Sir Gilbert Scott, in 1867-1868, the nave in 1875. The church is plain, cruciform, and in style chiefly Decorated but partly Early English, with a square tower; it has a library of nearly 2000 volumes (some rare) ; memorials to Bishop Dafydd ab Owain (d. 1502), to Bishop Luxmore(d. 1830), to the poetess Felicia Hemans, a resident near St Asaph (d. 1835); and Perpendicular oak choir stalls. In the neighbour- hood is the modern mansion of Bodelwyddan, of which the estate was bought by Sir W. Williams, speaker of the House of Commons in Charles II. 's time.

ST AUGUSTINE, a city and the county-seat of St John's county, Florida, U.S.A., in the N.E. part of the state, about 36 m. S.E. of Jacksonville. Pop. (1900) 4272, including 1735 negroes; (1910) 5494; many of the native whites are descendants of those Minorcans who were settled at New Smyrna, Florida, by Andrew Turnbull in 1769, and subsequently removed to St Augustine. St Augustine is served by the Florida East Coast railway and by the Florida East Coast Canal, an inland waterway from the St John's river to the Florida Keys.

The city stands on a narrow, sandy peninsula, about 12 ft. above the sea, formed by the Matanzas and San Sebastian rivers, and is separated from the ocean by the northern end of Anastasia Island. St George, the chief street in St Augustine, is only 17 ft. wide, and Treasury Street is, at its east end, an alley across which two people may clasp hands. There are many old houses, some of which have balconies projecting above the streets. At its northern end is the old fort of San Marco (now renamed Fort Marion in honour of General Francis Marion), a well-preserved specimen of Spanish military architecture, begun, it is supposed, about 1656 and finished in 1756.

The St Francis barracks (now the state arsenal) occupy the site of the old Franciscan convent, whose walls still remain as the first storey. In the military cemetery are buried a number of soldiers who were massacred by the Seminoles near the Great Wahoo Swamp on the 28th of August 1835. At the end of St George Street and near Fort Marion is the City Gate (two pillars, each 20 ft. high) ; from this gate a line of earthworks formerly stretched across the northern end of the peninsula. In the centre of the city is the Plaza de la Constitucion, in which are an obelisk erected in 1813 to com- memorate the Spanish Liberal Constitution of 1812, and a monument (1872) to citizens who died in the Confederate Army. On this square are the market (built in i840,partially burned in 1887, and after- wards rebuilt), often erroneously spoken of as ” the slave market ” ; a Roman Catholic cathedral (built in 1791, burned in 1887, and rebuilt and enlarged in 1 887-1 888); Trinity church (Protestant Episcopal); and the post office (once the Spanish government building). In the western part of the city is the beautiful Memorial Presbyterian Church, built in 1889 as a memorial to his daughter, by Henry M. Flagler. Facing King Street (the Alameda) is the magnificent Hotel Ponce de Leon (Spanish Renaissance), of shell-concrete, also by Flagler. The Alcazar (with a large swimming pool fed by a sulphur- ous artesian well), in the Moorish style, and the Alcazar Annex (wjth a large sun parlour), formerly the Cordova Hotel, designed and built by Franklin W. Smith, in the Hispano-Moorish style, are also’ famous hostelries. In an old building (restored) is housed the Wilson Free Public Library. Another old building houses the collections of the St Augustine Institute of Science and Historical Society, organized in 1884. St Augustine is the seat of the state school for the deaf and blind (1885).

At St Augustine are car and machine shops of the Florida East Coast railway. Oyster canning and fishing are engaged in to some extent, and cigars are manufactured, but the city is important chiefly as a winter resort, the number of its visitors approximating 25,000 a year. The climate is delightful, the mean temperature for the winter months being about 58 F. and for the entire year about 70 F.

St Augustine is the oldest permanent settlement of Europeans in the United States. It was founded by Spanish colonists under the leadership of Pedro Menendez de Aviles, who sighted land here in 1565, on the 28th of August, St Augustine’s day, whence the name. On the 6th of September he landed and began his fortifications. St Augustine’s colonial history is almost identical with the history of Florida (

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recaptured without bloodshed by a Federal force, and was held by the Federals until the close of the Civil War.

See George R. Fairbanks, The History and Antiquities of the City of St Augustine (New York, 1858); Charles B. Reynolds, Old St Augustine (St Augustine, 1885) ; and D. Y. Thomas, ” Report upon the Historic Buildings, Monuments and Local Archives of St Augus- tine,” in vol. i. pp. 333-352 of the Annual Report (1905) of the American Historical Association.

ST AUSTELL, a market town in the St Austell parliamentary division of Cornwall, England, 14 m. N.E. of Truro, on the Great Western railway. Pop. of urban district (1901) 3340. It is pleasantly situated on a steep slope 2 m. inland from St Austell bay on the south coast. To the north the high ground culminates at 1034 ft. above the sea in Hensbarrow Downs, so called from a barrow standing at the loftiest point. The church of the Holy Trinity is Perpendicular, with Decorated chancel, richly orna- mented in a manner unusual in the county. The town is the centre of a district productive of china clay (kaolin), about 400,000 tons being annually exported by sea to the potteries of Staffordshire and to Lancashire, when it is used in the calico- works for sizing. The deposits of clay became important about 1763, and Josiah Wedgwood acquired mines in the neighbour- hood. Mines were previously worked for tin and copper, and in some cases after being exhausted of ore continued to be worked for clay. The Cardaze mine to the north-east is notably rich; it is a shallow excavation of great superficial extent, which appears to have been worked from very early times. Close to St Austell is a good example of an ancient baptistery, called Mena- cuddle Well, the little chapel being Early English.

ST BARTHOLOMEW, or St Barthelemy, an island in the French West Indies. It lies in 17 55′ N. and 63° 60′ W., about 130 m. N.W. of Guadeloupe, of which it is a dependency. It is shaped like an irregular crescent, the horns, enclosing the bay of St Jean, pointing to the N.; its surface is hilly, culminating near the centre in a limestone hill 1003 ft. high. It is 8 sq. m. in area, and devoid of forests, and water has often to be imported from the neighbouring island of St Kitts. The surrounding rocks and shallows make the island difficult of access. Despite the lack of water, sugar, cotton, cocoa, manioc and tobacco are grown. The capital, Gustavia, on the S.W. coast, possesses a small but safe harbour. Lorient is the only other town. The inhabitants, mainly of French and negro descent, are English- speaking, and number about 3000. St Bartholomew was occupied by France in 1648

and ceded to Sweden in 1784. In 1877 it was again acquired by France at the cost of £11,000.

ST BARTHOLOMEW, MASSACRE OF, the name given to the massacre of the Huguenots, which began in Paris on St Bartholo- mew's day, the 24th of August 1572. The initiative for the crime rests with Catherine de' Medici. Irritated and disquieted by the growing influence of Admiral Coligny, who against her wishes was endeavouring to draw Charles IX. into a war with Spain, she resolved at first to have him assassinated. The blow failed, and the admiral was only wounded. The attempt, however, infuriated the Huguenots, who had flocked to Paris for the wedding of Henry of Navarre and Marguerite de Valois. Charles IX. declared that the assassin should receive condign punishment. Catherine then conceived the idea of killing at a blow all the Huguenot leaders, and of definitely ruining the Protestant party. After holding a council with the Catholic leaders, including the duke of Anjou, Henry of Guise, the marshal de Tavannes, the duke of Nevers, and Rene de Birague, the keeper of the seals, she persuaded the king that the massacre was a measure of public safety, and on the evening of the 23rd of August succeeded in wringing his authorization from him. The king himself arranged the manner of its execution, but it is scarcely probable that he fired upon the Huguenots from a window of the Louvre. The massacre began on Sunday at daybreak, and continued in Paris till the 17th of September. Once let loose, it was impossible to restrain the Catholic populace. From Paris the massacre spread to the provinces till the 3rd of October. The due de Longue- ville in Picardy, Chabot-Charny (son of Admiral Chabot) at Dijon, the comte de Matignon (1525-1597) in Normandy, and other provincial governors, refused to authorize the massacres.

Francois Hotman estimates the number killed in the whole of France at 50,000. There were many illustrious victims, among them being Admiral Coligny, his son-in-law Charles de Teligny and the logician Peter Ramus. Catherine de' Medici received the congratulations of all the Catholic powers, and Pope Gregory XIII. commanded bonfires to be lighted and a medal to be struck.

See H. Bordier, La St Barthelemy et la critique moderne (Paris, 1879); H. Baumgarten, Vor der Bartholomdusnacht (Strassburg, 1882); and H. Mariejol, " La Reiorme et la Ligue " (Paris, 1904), in vol. vi. of the Htstoire de France, by E. Lavisse, which contains a more complete bibliography of the subject.

ST BENOtT-SUR-LOIRE, a village of north-central France, in the department of Loiret, on the right bank of the Loire, 22 m. E.S.E. of

Orleans by road. St Benoit (Lat. Floriacum) possesses a huge basilica, the only survival of a famous monastery founded in the 7th century to which the relics of St Benedict were brought from Monte Cassino. Of great importance during the middle ages, owing partly to its school, the establishment began to decline in the 16th century. In 1562 it was pillaged by the Protestants and, though the buildings were restored by Richelieu, the abbey did not recover its former position. The basilica was built between c. 1025 and 12 18. Its narthex has a second storey supported on columns with remarkable carved capitals; there are two sets of transepts, above which rises a square central tower. In the interior are the tomb of Philip I., stalls of the 15th century, and, in the crypt, a modern shrine con- taining the remains of St Benedict, which still attract many pilgrims.

ST BERNARD PASSES, two of the best-known passes across the main chain of the Alps, both traversed by carriage roads. The Great St Bernard (81 n ft.) leads (53 m.) from Martigny (anc. Octodurus) in the Rhone valley (Switzerland) to Aosta (anc. Augusta Praetoria) in Italy. It was known in Roman times. The hospice on the pass was founded (or perhaps re- founded) by St Bernard of Menthon (d. about 1081), and since the 1 2th or early 13th century has been in charge of a community of Austin canons, the mother-house being at Martigny. Annually the servants of the canons, and the famous dogs, save many lives, especially of Italian workmen crossing the pass. In May 1800 Napoleon led his army over the pass, which was then traversed by a bridle road only. The Little St Bernard (7179 ft.) also was known in Roman times, and the hospice refounded by St Bernard of Menthon, though it is now in charge of the military and re- ligious order of SS. Maurice and Lazarus. The pass leads (39 m.) from Bourg St Maurice in the Isere valley (French department of Savoie) to Aosta, but is much less frequented by travellers than its neighbour opposite. (W. A. B. C.)

There is no certain mention of the road over the pass of the Great St Bernard (Alpis Poenina, Poeninus Mons) before 57 B.C. when Julius Caesar sent Servius Galba over it, ” because he wished that the pass, by which traders had been accustomed to go at great risk and with very high transport charges, should be opened.” But even in Strabo’s time it was impassable for wheeled traffic; and we find that Augusta Praetoria originally had but two gates, one opening on the road towards the Little St Bernard {Alpis Grata), the other towards Eporedia (Ivrea), but none towards the Alpis Poenina. But the military arrangement of the German provinces rendered the construction of the road necessary, and it is mentioned as existing in a.d. 69. Remains of it cut in the rock, some 12! ft. in width, still exist near the lake at the top of the pass. On the plain at the top of the pass is the temple of

Jupiter Poeninus (Penninus), remains of which were excavated in 1890-1893, though objects connected with it had long ago been found. The oldest of the votive-tablets which can be dated belongs to the time of Tiberius, and the temple may be attributed to the beginning of the empire; objects, however, of the first Iron age (4th or 5th century B.C.) were also found 1 and many Gaulish coins. Other buildings, probably belonging to the post station at the top of the pass, were also discovered. Many of the objects found then and in previous years, including

1 So Not. degli scavi (1891), 81; but the statement is contra- dicted, ibid. (1894), 44.

many votive-tablets, are in the museum at the hospice of the Great St Bernard.

See NoHzie degli scavi, passim, especially E. Ferrero (1890), 294; C. Promis, Antichitd, di Aosta (Turin, 1862).

The Little St Bernard was known to the Romans as Alpis Graia. It derived its name from the legend that Hercules, returning from Spain with the oxen of Geryon, crossed the Alps by this route, though the legend rather suits the route through'the Maritime Alps. According to many modern scholars, Hannibal passed this way over the Alps, though the question has been much discussed (see art. Hannibal, and Partsch in Pauly- Wissowa, Realencyklopadie i., 1604). In any case it was the principal pass over the Alps into Gallia Comata until the pass of the Alpis Cottia (Mont Genevre) was opened by Cn. Pompeius in 75 B.C., and became the principal route, though the road was only completed under Augustus by Cottius in 3 B.C. Various remains of the road are visible, and those of a building (possibly a temple of Jupiter) have been found on the summit of the pass.

See Notizie degli scavi (1883), 7 (1894), 46; and C. Promis, Antichitd. di Aosta (Turin, 1862), 115 sqq. (T. As.)

ST BERTRAND-DE-COMMINGES, a village of south-western France at the foot of the Pyrenees in the department of Haute- Garonne, about 70 m. S.W. of Toulouse by rail and road. St Bertrand stands about 1 m. from the left bank of the Garonne on the slopes of an isolated hill crowned by its celebrated cathedral of Notre Dame. The fagade of the church with its square tower and the first bay with its aisles are

Romanesque, and belong to a church begun about the end of the nth century by Bishop Bertrand (1075-1123), afterwards canonized. The nave with its side chapels and the choir, in the Gothic style, date from the first half of the 14th century and were chiefly the work of Bertrand de Goth, bishop from 1295 to 1299 and afterwards Pope Clement V. The choir screen, rood-loft and altar, which form an enclosure within the church, are masterpieces of Renaissance wood-carving, as are also the choir stalls. The church contains several tombs, the most interesting of which are the fine white marble tomb of Bishop Hugh of Chatillon (d. 1352), and the mausoleum of St Bertrand (both of the 15th century), whose relics are preserved in the treasury. On the south side of the church there is a ruined cloister of Romanesque architecture.

St Bertrand-de-Comminges (Lugdunum Convenarum)was founded in 72 B.C., and before the end of the 5th century became the seat of a bishopric suppressed at the Revolution. The town was destroyed towards the end of the 6th century by Guntrum, king of Burgundy, after it had served as a refuge to Gondowald, pretender to the crown of Aquitaine.

SAINT-BON, SIMONE ARTURO (1823-1892), Italian admiral, was born at Chambery on the 20th of March 1823. Leaving the Naval Academy in 1847, he attained the rank of commander in i860, and that of vice-admiral in 1867. He took part in the Crimean war, distinguished himself in i860 at the siege of Ancona, and was decorated for valour at the siege of Gaeta. At the battle of Lissa, in 1866, his vessel, the ” Formidable,” forced the entrance of the port of San Giorgio and silenced the Austrian batteries, for which exploit he received a gold medal. In 1873 he was elected deputy, and appointed by Minghetti to be minister of marine, in which position he revolutionized the Italian navy. Insisting upon the need for large battleships with high powers of attack and defence, and capable of fighting as single units, he introduced the colossal types of which the ” Duilio ” and the ” Dandolo ” were the earliest examples. Falling from power with the Right in 1876, he resumed active service, but in 1891 was again appointed minister of marine. He died on the 26th of November 1892, while still in office. He is remembered in Italy as the originator of the modern Italian fleet.

ST BR1EUC, a town of western France, capital of the depart- ment of C&tes-du-Nord, 63 m. N.W. of Rennes by the railway to Brest. Pop. (1906) town 15,270; commune 23,041. It stands 290 ft. above the sea, between 1 and 2 m. from the English Channel and less than a mile from the right bank of the Gouet, at the mouth of which is its seaport,

Le Legue. St Brieuc is the seat of a bishopric in the province of Rennes, and has a cathedral dating from the 13th century, but partially rebuilt in the 1 8th, and afterwards extensively restored. In the interior the tombs

of the bishops and a Renaissance organ-loft deserve mention. The oldest part of the episcopal palace date back to the 16th century. The h6tel-de-ville contains a museum and picture gallery. An Ursuline convent serves as barracks. There are numerous houses of the 15th and 16th centuries, in one of which James II., king of England, is said to have lodged in 1689. A colossal image of the Virgin looks down upon the town from an eminence on the north, and there is a statue of Du Guesclin. The industries include wool-spinning, timber-sawing, iron and steel-working, and the manufacture of brushes and agricultural implements.

St Brieuc owes its origin and its name to the missionary St Briocus, who came from Wales in the 5th century, and whose tomb afterwards attracted crowds of pilgrims. The place was defended in “375 by Olivier de Clisson against the duke of Brittany, and again attacked by the same Clisson in 1394, the cathedral suffering greatly in both sieges. In 1592 the town was pillaged by the Spaniards, in 1601 ravaged by the plague, and in 1628 surrounded by walls of which no traces remain. Between 1602 and 1768 the states of Brittany several times met at St Brieuc. During the Reign of Terror Chouans and Republicans carried on a ruthless conflict with each other in the vicinity. The ancient fort of P6ran, built of vitrified granite, is about 5 m. S. of St Brieuc.

ST CATHARINES, a city of Ontario, Canada, and the capital of Lincoln county, on the Welland Canal and the Grand Trunk, and St Catharines and Niagara Central railways, 35 m. S. of Toronto, with which it has steamer connexion. Pop. (1901) 9946. It is connected by electric tramways with the neighbouring towns and villages, and is in the midst of a fine fruit-growing district. Its excellent water-power provides motive force for numerous industries, among which are flour-mills and factories for the manufacture of edge tools and agricultural implements. Bishop Ridley College, under Anglican control, is an important residential school. There are mineral springs which are much visited by invalids.

ST CHAMOND, a manufacturing town of east-central France, in the department of Loire, 75 m. E.N.E. of St Etienne, on the railway from St Etienne to Lyons. Pop. (1906) 14,147. The town lies in a small basin surrounded by mountains at the confluence of the Janon with

the Gier, an affluent of the Rhone. It has coal-mines forming part of the Rive-de-Gier basin. The milling of raw silk, the manufacture of ribbons and laces of every kind, dyeing and the construction of naval and railway material are the foremost industries. There are also metal-foundries, manufactories of nails, heavy iron goods, looms and other industrial establishments.

St Chamond, founded in the 7th century by St Ennemond or Chamond, archbishop of Lyons, became the chief town of the Jarret, a little principality formed by the valley of the Gier. Silk-milling was introduced in the town in the middle of the 16th century by Gayotti, a native of Bologna. Remains are found at St Chamond of a Roman aqueduct, which conveyed the waters of the Janon along the valley of the Gier to Lyons.

ST CHARLES, a city and the county -seat of St Charles county, Missouri, U.S.A., situated on the N. bank of the Missouri river, about 20 m. above its mouth, and about 23 m. N.W. of St Louis. Pop. (1910) 9437. It is served by the Wabash and the Missouri, Kansas & Texas railway systems, and by an electric railway to St Louis. A great steel bridge, 6535 ft. long (built 1868-1871), crosses the river and gives entry to the Wabash railroad from St Louis. It has three spans of 305 to 321 ft., which at the time of their construction were the longest of their kind in the world. A highway bridge also crosses the river, and is the only waggon bridge between Jefferson City and the mouth of the river. At St Charles »are a Presbyterian school for women (Lindenwood College); StCharles Military College(Methodist Episcopal, 1837), the Academy of the Sacred Heart (1818); St Joseph's Hospital, and the Emmaus Asylum for Epileptics. St Charles has import- ant car works (among the largest in the United States), a large shoe factory, flour mills, brick and tile yards and breweries. St Charles county is very fertile, and its yield of wheat is especi- ally large. At the sand works at Klondike, in the southern part of the county, large quantities of silica are blasted, crushed, bolted and shipped.

A French settlement was begun at St Charles in 1769, and soon

thereafter a Spanish official was placedin residence. St Charles was organized as a village under territorial law in 1809, and in 1849 was chartered as a city. It was the first capital of the state (1820-1826).

SAINT CLAIR, a borough of Schuylkill county, Pennsylvania, U.S.A., on Mill Creek, 3 m. N. of Pottsville, and about 40 m. by rail N.N.W. of Reading. Pop. (1910) 6455- Saint Clair is served by the Pennsylvania and the Philadelphia & Reading railways. It is engaged chiefly in the mining (very largely surface-stripping) and shipping of anthracite coal, and in the manufacture of miners' supplies. Saint Clair was settled in 1825 and was incorporated as a borough in 1850.

ST CLAIR, a lake and river of North America, forming part of the boundary between the state of Michigan, U.S.A., and the province of Ontario, Canada. The lake is 29 m. long and 20 broad. It contains numerous islands, receives from the Canadian side several rivers, the largest of which is the Thames, and is drained into Lake Erie by the Detroit river. At its foot are the cities of Detroit (Michigan) and Windsor (Ontario). On the north it receives the St Clair river, the outlet of Lake Huron, The shores of both lake and river are flat, and their waters shallow, but, owing to the enormous traffic which passes through, they have been in great part canalized, and can accommodate the largest steamers.

ST CLAUDE, a town of eastern France, capital of an arrondisse- ment in the department of Jura, 42 m. S.S.E. of Lons-le-Saunier by rail. Pop. (1906) 9558. The town is beautifully situated 1300 ft. above sea-level at the western base of Mont Bayard, among the heights of the eastern Jura at the confluence of the Bienne and the Tacon. The latter river is crossed by a fine suspension bridge. The cathedral of St Pierre, once the abbey- church, a building of the 14th to the 18th centuries, contains fine 1 sth-century stalls and a reredos of the Renaissance period. The town is the seat of a bishop, suffragan of Lyons, and of a sub-prefect. St Claude has been noted since the close of the middle ages for its fancy articles in horn, tortoise-shell, hardwood, ivory, &c, and there are manufactures of briar-root pipes. Diamond-cutting and lapidary work and the manufacture of measures are also prosperous industries.

The town derives its name from that of an archbishop of Besancon who died in the 7th century in the monastery founded here in the 5th century. This monastery subsequently acquired almost independent sovereignty in the locality, and held its retainers in a state of serfdom till the Revolution. Voltaire pleaded the cause of the serfs, though unsuccessfully, before the parlement of Besancon, and in memory of his services a statue was erected to him in 1887. St Claude was constituted a bishopric in 1762. The abbey-buildings and most of the town were destroyed by fire in 1799.

ST CLOUD, a town of northern France, in the department of Seine-et-Oise, on the left bank of the Seine, 2 m. W. of the fortifications of Paris by road. Pop. (1906) 731.6. Picturesquely built on a hill-slope, St Cloud overlooks the river, the Bois de Boulogne and Paris; and, lying amid the foliage of its magnifi- cent park and numerous villa gardens, it is one of the favourite resorts of the Parisians. The palace of St Cloud, which had been a summer residence for Napoleon I., Louis XVIII. , Charles X., Louis Philippe and Napoleon III., was burned by the Prussians in 1870 along with part of the village. In spite of the damage inflicted on the park at the same period its magnifi- cent avenues and ornamental water still make it one of the pleasantest spots in the neighbourhood of Paris. Every year in September, at the time of the pilgrimage of St Cloud, a fair lasting four weeks is held in the park. Within its precincts are situated the national Sevres porcelain manufactory and the Breteuil pavilion, the seat of the international commission on the metre. St Cloud possesses a modern church in the style of the 1 2th century with an elegant stone spire; and here, too, is established the higher training college for male teachers for the provincial training colleges of primary instruction.

Clodoald or Cloud, grandson of Clovis, adopted the monastic life and left his name to the spot where his tomb was discovered

after the lapse of 1200 years, in a crypt near the present church. He had granted the domain to the bishops of Paris, who pos- sessed it as a fief tirl the 18th century. At St Cloud Henry III. and the king of Navarre (Henry IV.) established their camp during the League for the siege of Paris; and there the former was assassinated by Jacques Clement. The castle was at that time a plain country house belonging to Pierre de Gondi, arch- bishop of Paris; in 1658 it was acquired by the duke of Orleans, who was the originator of the palace which perished in 1870. Peter the Great of Russia was received there in 171 7 by the regent, whose grandson sold the palace to Marie Antoinette. It was at St Cloud that Bonaparte executed the coup d'etat of 18th Brumaire (1799); after he became emperor the palace was his favourite residence, and there he celebrated his marriage with Marie Louise. In 1815 it was the scene of the signing of the capitulation of Paris; and in 1830 from St Cloud Charles X. issued the orders which brought about his fall. Napoleon III. was there when he received the senatusconsult which restored the empire in his favour (1st December 1852). Seized by the Prussians at the beginning of the investment of Paris in 1870, St Cloud was sacked during the siege.

ST CLOUD, a city in Stearns, Benton and Sherburne counties, Minnesota, U.S.A., and the county-seat of Stearns county, about 65 m.

N.W. of Minneapolis, on both banks of the Missis- sippi river, and about 970 ft. above sea-level. Pop. (1900) 8663, of whom 1907 were foreign-born; (1910 U.S. census) 10,600. It is served by the Great Northern and the Northern Pacific railways. It is the seat of one of the State Normal Schools (1869), and of the Minnesota State Reformatory (1887). In the city are a Carnegie library, a Federal building, a Roman Catholic cathedral, St Raphael's Hospital (Roman Catholic), St Clotilda's Academy of Music and two business colleges. The Mississippi has a considerable fall here, and provides valuable water-power. Among the manufactures are flour, barrels, bricks, and foundry and machine-shop products — the Great Northern maintains extensive car and repair shops here. In 1905 the value of the city's factory product was $1,994,476, an increase of 27-8% since 1900. There are large lumberyards, and excellent grey and red granites (St Cloud is called " the Granite City ") from neighbouring quarries are exported. The city lies in a large grain-growing and stock-raising district. St Cloud was settled in 1852, platted in 1854, incorporated as a village in 1868, and chartered as a city in 1889. Until reached by the Great Northern railway, St Cloud was the Hudson's Bay Company's terminus for the unloading of furs from the wooden ox-carts (" Red river " carts).

ST CROIX or Santa Cruz, the largest island in the Danish West Indies. It lies 65 m. S.E. of Puerto Rico, in 17° 40′ N. and 64° 14′ W., is 22 m. long, varies in breadth from 1 m. to 6 m., and has an area of 84 sq. m. Pop. (1901) 18,590. Parallel with the western coast is a range of hills, culminating in Mount Eagle (1164 ft.). The narrower western part is also hilly, but on the S. shore there are marshy tracts with lagoons of brackish water. Sugar is the staple product, and near Christianstad there is a central factory conducted by the government. The planters are mostly English, and their language predominates. The capital, Christianstad (locally known as " Bassin "), is situated at the head of an inlet on the N. coast, but its harbour is to a large extent choked with mud. It is a picturesque town, and the seat of the Danish governor during half the year. The only other town, Frederickstad, stands on an open roadstead on the W. coast. It is locally known as " West End," and part of the town, wrecked by the blacks in 1878, lies in ruins. The climate is healthy, the mean annual temperature being 74 F. and the average rainfall 45-7 in. per annum.

St Croix was discovered in 1493 by Columbus, and was owned in turn by the Dutch, British and Spanish. In 1651 it was taken by France, and two years later was given to the Knights of Malta by Louis XIV. In 1733 it was purchased by Denmark. Slavery was abolished in 1848 after a violent insurrection which had broken out among the slaves.

See Sir H. H. Johnston, The Negro in the New World (1910).

SAINT-CYRAK, a French Benedictine abbey in the province of Berry, now comprised in the department of the Loiret. From 1620 to 1643 it was held by the famous Jansenist reformer, DuVergier (q.v.) , who is consequently often spoken of by French writers as the Abbe de Saint-Cyran.

ST CYR-L'lSCOLE, a town of northern France in the depart- ment of Seine-et-Oise, 3 m. W. of Versailles at the end of the old park of Louis XIV. Pop. (1906) 2696. Its importance is due to the famous military school (Scole sptciale militaire) in which officers for the cavalry and infantry are trained. It was estab- lished in 1808 in the convent which Madame de Maintenon founded for the education of noble young ladies in poor circum- stances. Racine's Esther and Athalie were first acted here, having been written expressly for the pupils. Madame de Main- tenon's tomb is still preserved in the chapel. The convent was suppressed at the Revolution, and the gardens are now partly transformed into parade-grounds.

ST DAVIDS {Tyddewi), a cathedral town of Pembrokeshire, Wales, situated near the sea to the S.E. of St David's Head, the most westerly promontory of South Wales. Pop. (1901) 1 7 10. St Davids is 10 m. distant from the station of Letterston on the Great Western railway, and about 16 m. from Fishguard to the N.E., and 16 m. from Haverfordwest to the E. The little town, locally known as " the city," stands in a lofty position east of the Cathedral Close, and consists of five streets, which converge on an open space called the Cross Keys, formerly used as a market-place and distinguished by its High Cross, a single shaft erect on a square base of six steps, restored in 1873. From the cross a lane leads westward to the Tower Gate, flanked by two ancient towers in a ruinous condition. From this point is obtained a superb view of the close with the cathedral and ruined palace in the valley of the Alun below, to which the rocky outline of Cam Llidi forms an imposing background.

The cathedral church of SS. Andrew and David, in spite of centuries of neglect and ill-advised alterations, remains the largest and most interesting pile of ecclesiastical buildings in the Princi- pality. It is largely built of a beautiful purple-hued sandstone, which is quarried locally. Its proportions are: length (exclusive of the Trinity and Lady

chapels), 2 54$ ft.; breadth of nave and aisles, 51 3 ft.; breadth of transepts including tower, 116 ft.; and height of central tower, 116 ft. In spite of the antiquity of its foundation, the earliest and main portion of the existing fabric was erected under Bishop Peter de Leia (1176-1198) in the transitional Norman-English style. Bishop David Martyn (1290-1328) built the Lady Chapel; Bishop Henry de Gower (1328-1347), one of the greatest of ecclesiastical builders in Wales, made many additions in the Decorated style, including the stone rood-screen and southern porch; and Bishop Edward Vaughan (1 509-1 522) erected the Trinity Chapel between the choir and Lady Chapel. Under the last-named prelate the magnificence of St Davids reached its height, but owing to the changes during the Reformation and the un- scrupulous rapacity of Bishop William Barlow (1536-1548) the fabric suffered severely; nor was it spared later during the Civil Wars, when the Lady Chapel, the aisles of the presbytery, and even the transepts were unroofed and partially dismantled. In 1793 the cathedral was repaired by Thomas Nash, who rebuilt the western front in a debased Perpendicular style. The work of much-needed restoration was carried out throughout the latter half of the 19th century, especially between 1862 and 1869, when Sir Gilbert Scott strengthened the building at a cost of over £43,000. In 1873 Nash's incongruous work was replaced by a new facade intended to har- monize with the original design of Bishop de Leia, and at the be- ginning of the 20th century the Lady Chapel and Bishop Vaughan's chapel were restored in memory of Bishop Basil Jones (d. 1897) and of Deans Allen and Phillips. The interior of the nave, separated by six wide bays from the aisles, is singularly imposing with its triforium and clerestory windows. It possesses an elaborate roof of Irish oak, the gift of Treasurer Owen Pole {c. 1 500). The nave is divided from the choir by Bishop Gower's fine stone screen, whilst the choir itself contains the richly carved stalls erected by Bishop Tully (1460-1481), the episcopal throne, and an elegant oaken screen that serves to separate choir and presbytery. The painted roof (freely restored) exhibits the coats-of-arms of Bishops Tully and Richard Martin, Treasurer Owen Pole and other benefactors. The eastern wall of the choir has been greatly altered by the addition of modern Venetian mosaic designs in the original lower triplet of lights, and by the insertion of lancet windows in place of a large Perpendicular window of the 15th century. Bishop Vaughan's chapel contains fine Tudor fan vaulting, and the Lady Chapel good decorated sedilia. The cathedral, before the Reformation, was remarkably rich in sculptured tombs and monuments, but many

of these have perished and all the brasses have disappeared. In the

presbytery stands prominent the altar tomb with modern brasses inserted of Edmund Tudor, earl of Richmond (d. 1456), father of King Henry VII. Among the other surviving monuments, all more or less injured and defaced, are the tombs of Bishop Gower and of several bishops of St Davids; the canopied effigies popularly but erroneously attributed to Prince Rhys (d. 1 196) and his son Rhys; the stone base of the destroyed shrine of St David ; a priest's effigy formerly believed to be that of the celebrated Giraldus Cambrensis; and the large Jacobean monument of Treasurer Thomas Lloyd (d. 1612). To the north of the cathedral is to be seen. the ruined shell of the beautiful chapel with an adjoining tower, forming part of the college of St Mary, founded by John of Gaunt and Bishop Adam Houghton in 1377.

On the west bank of the Alun stands the splendid and indeed unique ruin of the episcopal palace erected by Bishop Gower (c. 1342). Built for the purpose of culture and entertainment rather than for defence, Bishop Gower's ecclesiastical mansion is " essenti- ally a palace and not a castle; and it is hardly too much to affirm that it is altogether unsurpassed by any existing English edifice of its kind." Built upon vaulted cellars, the palace occupies three sides of a quadrangle 120 ft. square, and though roofless and deserted for nearly three hundred years it retains most of its principal features. The great hall, 96 ft. by 33 ft., possesses a traceried wheel-window; the chief portal is still imposing; and the chapel retains its curious bell-turret; while the peculiar but singularly graceful arcaded parapet of the roof extends intact throughout the whole length of the building. Partially dismantled by Bishop Barlow (c. 1540) the half-ruined palace was occasionally occupied by succeeding bishops prior to the Civil Wars, and in 1633 a chapter was held within its walls under Bishop Field.

The Close, 18 acres in extent and extra-parochial, contains the deanery and other residences of the cathedral clergy, mostly occupy- ing the sites of ancient buildings. It formerly owned four gateways, of which the South or Tower Gate alone remains. The whole of the wild and bleak but picturesque neighbourhood of St Davids teems with legendary and historical associations, and cromlechs and ruined chapels are numerous, amongst the latter the chapels of St Justinian (Capel Stinan) and St Non being the most remarkable.

History. — At some unknown period in the 6th century the celebrated patron saint of Wales, Dewi or David, removed the chief seat of South Welsh ecclesiastical life to Menevia or Menapia (Mynyw), which is traditionally reported to have been the saint's birthplace. The site chosen for this new foundation was the marshy valley of the Alun — the Vallis Rosina of medieval historians — and this spot became

known henceforth as Tyddewi or St Davids. The dread of an imminent Anglo-Saxon invasion of Gwent, the determination to remove his monastic clergy from court influence, and the desire of opening closer communication with the sister Churches of Ireland, are among the various reasons suggested for David's remarkable policy, which made St Davids the leading religious centre in South Wales for nearly a thousand years. From the 7th to the nth centuries the successors of St David occasionally ventured to exercise metro- politan rights over South Wales, and even over all land west of the Severn, and the character and extent of these ancient claims have frequently been made the subject of speculation or controversy among historians, some of whom have not hesitated to designate the early Celtic holders of the see by the title of " archbishop." These ill-defined claims were destroyed by St Anselme's forcible appointment of the Norman monk Bernard to the bishopric in 111S, from which date to the present timeˆSt Davids has ranked as a suffragan see of Canterbury; nor has its ancient independ- ence ever been seriously asserted, save by the intrepid Gerald de Barri (Giraldus Cambrensis), who vainly strove from 1199 to 1203 to induce Pope Innocent III. to acknowledge the power of the cathedral chapter to elect its own bishops without reference to English king or primate. St Davids early became populai as a place of pilgrimage, and amongst the many suppliants who visited St David's shrine were William the Conqueror, Henry II. and Edward I. with Queen Eleanor. Probably with a view to conciliate the native clergy for Anselme's unpopular policy in Wales, Henry I. obtained from Pope Calixtus II. the canoniza- tion of St David about 1 1 20, and in local esteem two pilgrimages to St Davids were vulgarly supposed to be equivalent to one journey to Rome itself: a sentiment preserved in the curious monkish hexameter:

" Roma semel quantum bis dat Menevia tantum." From 11 15 to the Reformation the see was held by prelates

(many of them natives of Wales) who did much to enrich and beautify the vast group of ecclesiastical buildings in the Closes But with the partial destruction of the palace and the removal of tne episcopal residence to Abergwili, it was riot long before St Davids sank into a mere monument of its former splendour and importance. In 1539 Bishop Barlow even petitioned Thomas Cromwell for permission to remove the see itself to Carmarthenj a request which tradition declares Henry VIII. refused to grant solely out of respect for the

memory of his grandfather Edmund Tudor, whose tomb had recently been taken from the suppressed priory of Grey Friars at Carmarthen and set up before the high altar of the cathedral. During the 17th and 18th centuries all the ancient buildings of the Close, except the cathedral (which served also as a parish church for the village of St Davids), were allowed to fall into hopeless ruin. Amongst the 119 bishops who have held the see since its foundation by St David may be mentioned Asser, the friend of King Alfred (d. 906) ; Samson (10th century), honoured by the Welsh chroniclers with the proud title of ” Archbishop of the Isle of Britain “; Rhyddmarch (d. 1096), the first biographer of St David; Henry de Gower (d. 1347), the munificent patron of art; Robert Ferrar, burned at Carmarthen in 1555 under Queen Mary; Richard Davies (d. 1581), patriot and translator of the Welsh Book of Common Prayer; Archbishop William Laud, bishop of the see between 1621 and 1627; George Bull, divine (d. 1710); and Connop Thirlwall, scholar and historian (d. 1875). The official title of the bishops of St Davids is Episcopus Menevensis. (H.M.V.)

ST DENIS, an industrial town of northern France, capital of an arrondissement in the department of Seine, 5 m. N. of Paris. Pop. (1906) 62,323. St Denis, an important junction on the northern railway, stands in a plain on the right bank of the Seine, which is here joined by the canal of St Denis. It has numerous metallurgical works, where railway material, naval engines and the like are constructed, distilleries of spirits, glass- works, potteries and manufactories of drugs, chemical products, oils, nickel plate and pianos. The name and fame of the town are derived from the abbey founded by Dagobert I. on the spot where St Denis, the apostle of Paris, was interred. The abbey buildings, occupied by a school for daughters of members of the Legion of Honour, founded by Napoleon I., date from the 18th century.

The church exhibits the transition from the Romanesque to the Gothic style. The west front was built between 1137 and 1140. The right-hand tower is almost pure Romanesque; that on the left was Gothic, and its spire was carried to a height of 280 ft., but it was struck by lightning in 1837 and reconstructed in so clumsy a manner that it had to be reduced to the level of the roof of the nave. The rose window, now occupied by a clock face, dates from the 13th century. Under one of the three rows of arches above the main entrance runs an inscription recording the erection of the church by Abbot Suger (q.v.), minister of Louis VI., with abbatial funds and its consecration in 1140. The porch formed by the first three bays of the church contains some remains of the basilica of Pippin the Short and Charlemagne, by whom the church was rebuilt. The nave proper (235 ft. long and 57 wide)

has seven bays, and dates, as well as most of the choir and transepts, from the reign of St Louis. The secondary apse (rondpoint) and its semicircular chapels (consecrated in 1144) are considered as the first perfected attempt at Gothic. The transeDts have fine facades, the north of the 12th, the south of the 13th century, each with two unfinished towers ; if the plan had been fully carried out there would have been six towers besides a central spire in lead. The church contains a series of tombs of the kings and princes of the royal houses of France. The most remarkable are those of Louis XII. and Anne of Brittany, executed from 1516 to 1532; of Henry II. and Catherine de' Medici, a masterpiece by Germain Pilon (1564-1583) ;of Louis of Orleans and Valentine of Milan, from the old church of the Celestines at Paris (1502-15 15) ; of Francis I. and Claude of France, one of the most splendid tombs of the Renaissance, executed under the direction of Philibert Delorme (1550-1560) ; and that of Dago- bert, which, though considerably dilapidated, ranks as one of the most curious of medieval (13th-century) works of art. In the apse some stained glass of the time of Suger remains. The crypt dates partly from the 10th or nth century. In the centre is the vault where the coffin of the king used to lie until, to make room for that of his successor, it was removed to its final resting-place. It is at present occupied by the coffin of Louis XVIII. , the last sovereign whose body was borne to St Denis. Besides fine statues, the crypt contains the Bourbon vault, in which among other coffins are de- posited the remains of Louis XVI. and Marie Antoinette.

St Denis, the ancient Catulliacum, was a town of no pretensions till the foundation of its abbey, which became one of the most powerful in France. The rebuilding of the church, begun in the 1 2th century by Suger, was completed in the 13th century. Among the many domains of the abbey was the French Vexin. It was held during the later middle ages by the French kings and vassals of the abbey, and to this fact is due their adoption of the oriflamme or red banner of St Denis as the royal standard. St Louis caused mausoleums to be erected with figures of the princes already buried in the abbey; and from his time to that of Henry II. every monarch in succession had his monument. Louis XIV. reduced the abbey to the rank of a priory; and at the Revolution it was suppressed, the tombs being violated and the church sacked (1793). Two years later all the remains that could be recovered were placed in the museum of the Petits Augustins at Paris; but the bronze tombs had been melted down, the stained-glass windows shattered, and large numbers of interesting objects stolen or lost. Louis XVIII. caused all the articles belonging to St Denis to be brought back to their original site, and added numerous other monuments from the suppressed

abbeys. But it was not till after 1848 that, under the direction of Viollet le Due, the basilica recovered its original appearance. St Denis, which was the key of Paris on the north, was more than once pillaged in the Hundred Years' War, suffering especially in 1358 and 1406. A sanguinary battle, in which the Catholic leader Constable Anne de Montmorency found victory and death, was fought between Huguenots and Catholics in the [neighbourhood on the 10th of November 1567.

See F. de Guilhermy, Monographic de V&glise royale de St Denis (Paris, 1848).

ST Dlfi, a town of eastern France, capital of an arrondissement in the department of Vosges, 38 m. N.E. of Epinal by rail. Pop. (1906) town, 16,783; commune, 22,136. St Die is situated on the Meurthe in a basin surrounded by well-wooded hills. The town, part of which was laid out in a uniform style after the fire of 1757, is built largely of red sandstone. Its cathedral has a Romanesque nave (12th century) and a Gothic choir; the portal of red stone dates from the 18th century. A fine cloister (13th century), containing a stone pulpit, communicates with the Petite- Eglise or Notre-Dame, a well-preserved specimen of Romanesque architecture (12th century). The h6tel-de-ville contains a theatre, a library with some valuable manuscripts, and a museum of antiquities. There is a monument by Merci6 to Jules Ferry, born in the town in 1832. St Die is the seat of a bishop and of a sub-prefect. The town benefited from the immigration of Alsatians after the Franco-German War of 1870-71, and its industries include the spinning and weaving of cotton, bleaching, wire-drawing, metal-founding, and the manufacture of hosiery, woodwork of various kinds, machinery, iron goods and wire-gauze.

St Die (Deodatum, Theodata, S. Deodati Fanum) grew up round a monastery founded in the 7th century by St Deodatus of Nevers, who gave up his episcopal functions to retire to this place. In the 10th century the community became a chapter of canons; among those who subsequently held the rank of provost or dean were Giovanni de' Medici, afterwards Pope Leo X., and several princes of the house of Lorraine. Among the extensive privileges enjoyed by them was that of coining money. Though they co-operated in building the town walls, the canons and the dukes of Lorraine soon became rivals for the authority over St Die. Towards the end of the 15th century one of the earliest printing-presses of Lorraine was founded at St Die. The institution of a town council in 1628, and the establishment in 1777 of a bishopric which appropriated part of their spiritual jurisdiction, contributed greatly to diminish the influence of the canons; and with

the Revolution they were com- pletely swept away. During the wars of the 15th, 16th and 17th centuries the town was repeatedly sacked. It was also partially destroyed by fire in 1065, 1 155, 1554 and 1757. Funds for the rebuilding of the portion of the town destroyed by the last fire were supplied by Stanislas, last duke of Lorraine.

ST DIZIER, a town of north-eastern France, in the depart- ment of Haute-Marne, 45 m. N.N.W. of Chaumont by rail, on the Marne and the Haute-Marne canal. Pop. (1906) town, 10,316; commune, 14,661. The town is a very important 1 centre of the iron trade, with foundries, forges and engineering

works, and has trade in grain and timber. It dates from the 3rd century, when the relics of Bishop St Didier (whence the name of the town) were brought thither after the destruction of Langres by the Germans. It sustained a memorable siege against Charles V. in 1544.

STE ANNE DE BEAUPRE, a post-village of Montmorency county, Quebec, Canada, at the junction of the Ste Anne river with the St Lawrence, and on the Quebec, Montmorency & Charlevoix railway, 22 m. below the city of Quebec. It stands in a rolling agricultural country, with hills in the background; and near by, on the Ste Anne river, are beautiful falls and excellent fishing. For over two centuries Ste Anne has been known as a Roman Catholic place of pilgrimage, and many miracles are still said to be performed through the intercession of the saint, the mother of the Virgin. In the basilica, an over- ornate building, are ever-increasing piles of crutches and other aids, cast aside by the cured. The resident population is about 1 500, chiefly composed of hotel-keepers and members of religious orders, but throughout the year many pilgrimages are made, and on such days as the feast day of Ste Anne (26th of July) 30,000 people are often present. The total number of pilgrims in 1905 was 170,000. In addition to the basilica the village contains numerous religious edifices, the chief being the Scala Santa, built in imitation of the Holy Stairs at Rome.

SAINTE-BEUVE, CHARLES AUGUSTIN (1804-1860), French critic, was born at Boulogne-sur-Mer (No. 16 Rue du Pot d'Etain) on the 23rd of December 1804. He was a posthumous child, his father, a native of Picardy, and controller of town-dues at Boulogne, having married in this same year, at the age of fifty- two. The father was a man of

literary tastes, and used to read, like his son, pencil in hand; his copy of the Elzevir edition of Virgil, covered with his notes, was in his son's possession, and is mentioned by him in one of his poems. Sainte-Beuve's mother was half English, her father, a mariner of Boulogne, having married an Englishwoman. The little Charles Augustin was brought up by his mother, who never remarried, and an aunt, his father's sister, who lived with her. They were poor, but the boy, having learnt all he could at his first school at Boulogne, persuaded his mother to send him, when he was near the age of fourteen, to finish his education at Paris. He boarded with a M. Landry, and had for a fellow-boarder and intimate friend Charles Neate, afterwards fellow of Oriel College and member of parliament for the city of Oxford. From Landry's boarding-house he attended the classes, first of the College Charlemagne, and-then of the College Bourbon, winning the head prize for history at the first, and for Latin verse at the second. In 1823 he began to study medicine, attending lectures on anatomy and physiology and walking the hospitals. But mean- while a Liberal newspaper, the Globe, was founded in 1827 by Paul Francois Dubois, one of Sainte-Beuve's old teachers at the College Charlemagne. Dubois called to his aid his former pupil, who, now quitting the study of medicine, contributed historical and literary articles to the Globe, among them two, which attracted the notice of Goethe, on Victor Hugo's Odes et ballades. These articles led to a friendship with Victor Hugo and to Sainte-Beuve's connexion with the romantic school of poets, a school never entirely suited to his nature. In the Globe appeared also his interesting articles on the French poetry of the 16th century, which in 1828 were collected and published, 1 and followed by a second volume containing selections from Ronsard. In 1829 he made his first venture as a poet with the Vie, poisies, et pensSes de Joseph Delorme. His own name did not appear; but Joseph Delorme, that " Werther in the shape of Jacobin and medical student," as Guizot called him, was the Sainte-Beuve of those days himself. About the same time was founded the Revue de Paris, and Sainte-Beuve contributed the opening article, with Boileau for its subject. In 1830 came his second volume of poems, the Consolations, a work on which Sainte-Beuve looked back in later life with a special affection. To himself it marked and expressed, he said, that epoch of his

1 Tableau historique et critique de la poesie francaise au X VI' silcle (2nd ed., 1842).

life to which he could with most pleasure return, and at which he could like best that others should see him. But the critic in him grew to prevail more and more and pushed out the poet. 2 In 1 83 1 the

Revue des deux mondes was founded in rivalry with the Revue de Paris, and from the first Sainte-Beuve was one of the most active and important contributors. He brought out his novel of Volupte in 1834, his third and last volume of poetry, the PensSes d'aoAt, in 1837. He himself thought that the activity which he had in the meanwhile exercised as a critic, and the offence which in some quarters his criticism had given, were the cause of the less favourable reception which this volume received. He had long meditated a book on Port-Royal. At the end of 1837 he quitted France, accepting an invitation from the academy of Lausanne, where in a series of lectures his work on Port-Royal came into its first form of being. In the summer of the next year he returned to Paris to revise and give the final shape to his work, which, however, was not completed for twenty years. 3 In 1840 Victor Cousin, then minister of public instruc- tion, appointed him one of the keepers of the Mazarin Library, an appointment which gave him rooms at the library, and, with the money earned by his pen, made him for the first time in his life easy in his circumstances, so that, as he afterwards used to say, he had to buy rare books in order to spend his income. A mo're important consequence of his easier circumstances was that he could study freely and largely. He returned to Greek, of which a French schoolboy brings from his lycee no great store. With a Greek teacher, M. Pantasides, he read and re-read the poets in the original, and thus acquired, not, perhaps, a philological scholar's knowledge of them, but a genuine and invaluable acquaintance with them as literature. His activity in the Revue des deux mondes continued, and articles on Homer, Theocritus, Apollonius of Rhodes, and Meleager were fruits of his new Greek studies. He wrote also a very good article in 1844 on the Italian poet Leopardi; but in general his subjects were taken from the great literature which he knew best, that of his own country — its literature both in the past and in the contemporary present. Seven volumes of Portraits, contributed to the Revue de Paris and the Revue des deux mondes, exhibit his work in the years from 1832 to 1848, a work constantly increasing in range and value. 4 In 1844 he was elected to the French Academy as successor to Casimir Delavigne, and was received there at the beginning of 1845 by Victor Hugo.

From this settled and prosperous condition the revolution of February 1848 dislodged him. In March of that year was published an account of secret-service money distributed in the late reign, and Sainte-Beuve was put down as having received the sum of one hundred francs. The smallness of the sum would hardly seem to suggest corruption; it appears probable that the money was given to cure a smoky chimney in his room at the Mazarin Library, and was wrongly entered as secret-

service money. But Sainte-Beuve, who piqued himself on his independence and on a punctilious delicacy in money matters, was indignant at the entry, and thought the proceedings of the minister of public instruction and his officials, when he demanded to have the matter sifted, tardy and equivocal. He resigned his post at the Mazarin and accepted an offer from the Belgian government of a chair of French literature in the university of Liege. There he gave the series of lectures on Chateaubriand and his contemporaries which was afterwards (in i860) pub- lished in two volumes. 6 He liked Liege, and the Belgians would have been glad to keep him; but the attraction of Paris carried

2 Sainte-Beuve was at this time a devoted Catholic and a little later for a very short period a disciple of Lamennais. But he gradually separated from his Catholic friends, and at the same time a coldness grew up between him and Victor Hugo. He became the lover of Madame Hugo, and a definite separation between the former friends ensued in 1834. [Ed.]

3 Port-Royal (1840-1848, 5 vols.; 3rd and revised ed., 1866; 5th ed. with index, 1888-1891).

4 He was a friend of Madame Recamier, at whose house he met Chateaubriand. He became an especially close friend of Louis Mathieu, Comte Mole, for whose niece, Mme d'Arbouville, he conceived a lasting attachment. [Ed.]

6 Chateaubriand et son groupe litteraire sous I' Empire.

him back there in the autumn of 1849. Louis Napoleon was then president. Disturbance was ceasing; a time of settled govern- ment, which lasted twenty years and corresponds with the second stage of Sainte-Beuve's literary activity, was beginning. Dr Veron, the editor of the Constitutionnel, proposed to him that he should supply that newspaper with a literary article for every Monday; and thus the Causeries du lundi were started. They at once succeeded, and " gave the signal," as Sainte- Beuve himself says with truth, " for the return of letters." Sainte-Beuve now lived in the small house in the Rue Mont- parnasse (No. 11), which he occupied for the remainder of his life, and where in 1850 his mother, from whom he seems to have inherited his good sense, tact and finesse, died at the age of eighty-six.

For three years he continued writing every Monday for the Constitutionnel; then he passed, with a similar engage- ment, to the Moniteur. In 1857 his Monday articles began to be published in volumes, and by 1862 formed a collection in fifteen volumes; they afterwards were resumed under the title of Nouveaux lundis, which now make a collection of thirteen volumes more. In 1854 he was nominated to the chair of Latin poetry at the college of France. His first lecture there (in 1855) was received with interruptions and marks of disapprobation by many of the students, displeased at his adherence to the empire; at a second lecture the interruption was renewed. Sainte-Beuve had no taste for public speaking and lecturing; his Jrontis mollities, he said, unfitted him for it. He was not going to carry on a war with a party of turbulent students; he proposed to resign, and when the minister would not accept his resignation of his professorship he resigned its emoluments. The Etude sur Virgile, a volume published in 1857, contains what he had meant to be his first course of lectures. He was still a titular official of public instruction; and in 1858 his services were called for by Gustave Rouland, then minister of public instruction, as a lecturer (maitre de conferences) on French literature at the ficole Normale Supeneure. This work he discharged with assiduity and success for four years. In 1859 he was made commander of the Legion of Honour, having twice previously to 1848 refused the cross. During the years of his official engagement his Monday contributions to the Moniteur had no longer been continuous; but in 1862 an arrangement was proposed by which he was to return to the Constitutionnel and again supply an article there every Monday. He consented, at the age of fifty-seven, to try this last pull, as he called it, this “dernier coup de collier”; he resigned his office at the Ecole Normale and began the series of his Nouveaux lundis. They show no falling off in vigour and resource from the Causeries. But the strain upon him of his weekly labour was great. ” I am not a monsieur nor a gentle- man,” he writes in 1864, ” but a workman by the piece and by the hour.” ” I look upon myself as a player forced to go on acting at an age when he ought to retire, and who can see no term to his engagement.” He had reason to. hope for relief. Except himself, the foremost literary men in France had stood aloof from the empire and treated it with a hostility more or less bitter. He had not been hostile to it: he had accepted it with satisfaction, and had bestowed on its official journal, the Moniteur, the lustre of his literature. The prince Napoleon and the princess Mathilde were his warm friends. A senatorship was mentioned; its income of £1600 a year would give him opulence and freedom. But its coming was delayed, and when at last in April 1 865 he was made senator, his health was seriously compromised. The disease of which he died, but of which the doctors

did not ascertain the presence until his body was opened after his death — the stone — began to distress and disable him. He could seldom attend the meetings of the senate; the part he took there, however, on two famous occasions — when the nomination of Ernest Renan to the college of France came under discussion in 1867, and the law on the press in the year following — provoked the indignation of the great majority in that conservative assembly. It delighted, however, all who ” belonged,” to use his own phrase, ” to the diocese of free thought “; and he gave further pleasure in this diocese by

leaving the Moniteur at the beginning of 1869, and contributing to a Liberal journal, the Temps. 1 His literary activity suffered little abatement, but pain made him at last unable to sit to write; he could only stand or lie. He died in his house in the Rue Montparnasse on the 13th of October 1869.

The work of Sainte-Beuve divides itself into three portions — his poetry, his criticism before 1848 and his criticism after that year. His novel of Volupte may properly go with his poetry.

We have seen his tender feeling for his poetry, and he always maintained that, when the ” integrating molecule,” the foundation of him as a man of letters, was reached, it would be found to have a poetic character. And yet he declares, too, that it is never without a sort of surprise and confusion that he sees his verses detached from their context and quoted in public and in open day. They do not seem made for it, he says. This admirable critic knew, indeed, the radical inadequacy of French poetry. It is to English poetry that he resorts in order to find his term of comparison, and to award the praise which to French poetry he refuses. ” Since you are fond of the poets,” he writes to a friend, ” 1 should like to see you read and look for poets in another language, in English for instance. There you will find the most rich, the most dulcet and the most new poetical literature. Our French poets are too soon read; they are too slight, too mixed, too corrupted for the most part, too poor in ideas even when they have the talent for strophe and line; to hold and occupy for long a serious mind ”

But, even as French poetry, Sainte-Beuve’s poetry had faults of its own. Critics who found much in it to praise yet pronounced it a poetry ” narrow, puny and stifled,” and its style ” slowly dragging and laborious ” Here we touch on a want which must no doubt be recognized in him, which he recognized in himself, and whereby he is separated from the spirits who succeed in uttering their most highly inspired note and in giving their full measure — some want of flame, of breath, of pinion. Perhaps we may look for the cause in a

confession of his own: ” I have my weaknesses; they are those which gave to King Solomon his disgust with everything and his satiety with life. I may have regretted sometimes that I was thus extinguishing my fire, but I did not ever pervert my heart.” It is enough for us to take his confession that he extinguished or im- paired his fire.

Yet his poetry is characterized by merits which make it readable still and readable by foreigners. So far as it exhibits the endeavour of the romantic school in France to enlarge the vocabulary of poetry and to give greater freedom and variety to the alexandrine, it has interest chiefly for readers of his own nation. But it exhibits more than this. It exhibits already the genuine Sainte-Beuve, the author who, as M. Duvergier de Hauranne said in the Globe at the time, ” sent a sa maniere, ecrit comme il sent,” the man who, even in the forms of an artificial poetry, remains always ” un penseur et un homme d’esprit.” That his Joseph Delorme was not the Werther of romance, but a Werther in the shape of Jacobin and medical student, the only Werther whom Sainte-Beuve by his own practical experience really knew, was a novelty in French poetical literature, but was entirely characteristic of Sainte-Beuve. All his poetry has this stamp of direct dealing with common things, of plain unpre- tending reality and sincerity; and this stamp at that time made it, as Beranger said, ” a kind of poetry absolutely new in France.”

It has been the fashion to disparage the criticism of the Critiques, et portraits litteraires, the criticism anterior to 1848, and to sacrifice it, in fact, to the criticism posterior to that date. Sainte-Beuve has himself indicated what considerations ought to be present with us in reading the Critiques et portraits, with what reserves we should read them. They are to be considered, he says, ” rather as a dependency of the elegiac and romanesque part of my work than as express criticisms.” They have the copiousness and enthusiasm of youth; they have also its exuberance. He judged in later life Chateaubriand, Lamartine, Victor Hugo more coolly, judged them differently. But the Critiques et portraits contain a number of articles on personages, other than contemporary French poets and romance-writers, which have much of the soundness of his later work, and, in addition, an abundance and fervour of their own which are not without their attraction. Many of these are delightful reading. The articles on the Greek poets and on Leopardi have been already mentioned. Those on Boileau, Moliere, Pierre Daunou and Charles Claude Fauriel, on Madame de la Fayette and Mademoiselle A’iss6 may be taken as samples of a whole group which will be found to support perfectly the test of reading, even after we have accustomed ourselves to the later work of the master. Nay, his soberness and tact show themselves even in this earlier stage of his

criticism, and even in treating the objects of his too fervid youthful enthusiasm. A special object of this was Victor Hugo, and in the first article on him in the Portrait! contemporains we have certainly plenty of enthusiasm, plenty of exuberance. We have the epithets ” adorable,” ” sublime, ‘ ” supreme,” given to Victor Hugo’s poetry; we are told of ” the majesty of its high and sombre philosophy.” But the article next

1 This course of action definitely separated him from the Bona* partists and led to a quarrel with Princess Mathilde. — [Ed,]

following this, and written only four years later, in 1835, is the article of a critic, and takes the points of objection, seizes the weak side of Victor Hugo’s poetry, how much it has of what is ” creux,” ” sonore,” ” artificiel,” ” voulu,” ” th6atral,” ” violent,” as .dis- tinctly as the author of the Causeries could seize it. ” The Frank, energetic and subtle, who has mastered to perfection the technical and rhetorical resources of the Latin literature of the decadence,” is a description never to be forgotten of Victor Hugo as a poet, and Sainte-Beuve launches it in this article, written when he was but thirty years old, and still a painter of ■” portraits de jeunesse ” only.

He had thus been steadily working and growing; nevertheless, 1848 is an epoch which divides two critics in him of very unequal value. When, after that year of revolution and his stage of seclusion and labour at Liege, he came back to Paris in the autumn of 1849 and commenced in the Constitutionntl the Causeries du lundi, he was astonishingly matured. Something of fervour, enthusiasm, poetry, he may have lost, but he had become a perfect critic — a critic of measure, not exuberant; of the centre, not provincial; of keen industry and curiosity, with ” Truth ” (the word engraved in English on his seal) for his motto; moreover, with gay and amiable temper, his manner as good as his matter — the ” critique souriant,” as, in Charles Monselet’s dedication to him, he is called.

The root of everything in his criticism is his single-hearted devotion to truth. What he called ” fictions ” in literature, in politics, in religion, were not allowed to influence him. Some one had talked on his being tenacious of a certain set of literary opinions. ” I hold very little,” he answers, ” to literary opinions; literary opinions occupy very little place in my life and in my thoughts. What does occupy me seriously is

life itself and the object of it.” ” I am accustomed incessantly to call my judgments in question anew, and to re-cast my opinions the moment I suspect them to be without validity.” ” What I have wished ” (in Port-Royal) ” is to say not a word more than I thought, to stop even a little short of what I believed in certain cases, in order that my words might acquire more weight as historical testimony.” To all exaggeration and untruth, from whatever side it proceeded, he had an antipathy. ” I turn my back upon the Michelets and Quinets, but I cannot hold out my hand to the Veuillots.”

But Sainte-Beuve could not have been the great critic he was had he not had, at the service of this his love of truth and measure, the conscientious industry of a Benedictine. ” I never have a holiday. On Monday towards noon I lift up my head, and breathe for about an hour; after that the wicket shuts again and I am in my prison cell for seven days.” The Causeries were at this price. They came once a week, and to write one of them as he wrote it was indeed a week’s work. The ” irresponsible indolent reviewer ” should read his notes to his friend and provider with books, M. Paul Cheron of the National Library. Here is a note dated the 2nd of January 1853: ” Good-day and a happy New Year. To-day I set to work on Grimm. A little dry; but after St Francois d,e Sales ” (his Monday article just finished) ” one requires a little relief from roses. 1 have of Grimm the edition of his Correspondance by M. Taschereau. I have also the Memoirs of Madame d’Epinay, where there are many letters of his. But it is possible that there may be notices of him mentioned in the bibliographical book of that German whose name I have forgotten. I should like, too, to have the first editions of his Correspondance; they came out in successive parts.” Thus he prepared himself, not for a grand review article once a quarter, but for a newspaper review once a week.

His adhesion to the empire caused him to be represented by the Orleanists and Republicans as without character and patriotism, and to be charged with baseness and corruption. The Orleanists had, in a great degree, possession of the higher press in France and of English opinion — of Liberal English opinion more especially. And with English Liberals his indifference to parliamentary govern- ment was indeed a grievous fault in him; “you Whigs,” as Croker happily says, ” are like quack doctors, who have but one specific for all constitutions.” To him either the doctrine of English Liberals, or the doctrine of Republicanism, applied absolutely, was what he called a ” fiction,” one of those fictions which ” always end by obscuring the truth.” Not even on M. de Tocqueville’s authority would he consent to receive ” les hypotheses dites les plus honor-

ables ” — ” the suppositions which pass for the most respectable. All suppositions he demanded to sift, to see them at work, to know the place and time and men to which they were to be applied. For the France before his eyes in 1849 he thought that something ” solid and stable ” — un mur, ” a wall,” as he said — was requisite, and that the government of Louis Napoleon supplied this wall. But no one judged the empire more independently than he did, no one saw and enounced its faults more clearly ; he described himself as being, in his own single person, ” the gauche of the empire,” and the description was just.

To these merits of mental independence, industry, measure, lucidity, his criticism adds the merit of happy temper and disposition. Goethe long ago noticed that, whereas Germans reviewed one another as enemies whom they hated, the critics of the Globe reviewed one another as gentlemen. This arose from the higher social develop- ment of France and from the closer relations of literature with life there But Sainte-Beuve has more, as a critic, than the external politeness which once at any rate distinguished his countrymen – he has a personal charm of manner due to a sweet and humane temper. He complained of un peu de duretS, ” a certain dose of hardness,” in the new generation of writers. The personality of an author had a peculiar importance for him; the poetical side of his subjects, however latent it might be, always attracted him. and he always sought to extricate it. This was because he had the moderate, gracious, amiably human instincts of the true poetic nature. ” Let me beg of you,” he says in thanking a reviewer who praised him, ” to alter one or two expressions at any rate. I cannot bear to have it said that I am the first in anything whatever, as a writer least of all; it is not a thing which can be admitted, and these ways of classing people give offence.” Literary man and loyal to the French Academy as he was, he can yet write to an old friend after his election: ” All these academies, between you and me. are pieces of childishness; at any rate the French Academy is. Oui least quarter of an hour of solitary reverie or of serious talk, yours and mine, in our youth, was better employed; but, as one gets old, one falls back into the power of these nothings; only it is well to know that nothings they are.”

Perhaps the best way to get a sense of the value and extent of the work done in the last twenty years of his life by the critic thus excellently endowed is to take a single volume of the causeries du lundi, to look through its list of subjects, and to remember that with the qualities above mentioned all these subjects are treated. Any volume will serve; let us take the fourth. This volume con- sists of articles on twenty-four subjects. Twenty of these are the following:

Mirabeau and Sophie, Montaigne, Mirabeau and Comte de la Marck, Mademoiselle de Scudery, Andrˆ Chenier as politician, Saint-Evremond and Ninon, Joseph de Maistre, Madame de Lambert, Madame Necker, the Abb6 Maury, the Due de Lauzun of Louis XVI. ‘s reign, Marie Antoinette, Burton, Madame de Main- tenon, De Bonald Amyot, Mallet du Pan, Marmontel, Chamfort, RulhiSre. Almost every personage is French, it is true; Sainte- Beuve had a maxim that the critic should prefer subjects which he possesses familiarly. The great place of France in the world is very much due to her eminent gift for social life and development ; and this gift French literature has accompanied, fashioned, perfected, and continues to reflect. And nowhere shall we find such interest more completely and charmingly brought out than in Sainte-Beuve’s Causeries du lundi and the Nouveaux lundis. As a guide to bring us to a knowledge of the French genius and literature he is unrivalled.

(M A.)

Authorities. — See his ” Ma Biographie ” in Nouveaux lundis, xiii., Leitres d. la princesse (1873); Correspondance (1 877-1 878) and Nouvelle Correspondance (1880); the Vicomte d’Haussonville’s Sainte-Beuve (‘875) ; Scherer, Htudes sur la litterature contemporaine, iv. ; G. Michaut, Sainte-Beuve avant les Lundis (1903). Sainte-Beuve’s centenary was celebrated in various ways; for centenary criticism see the Edinburgh Review (April 1905) (” Sainte-Beuve and the Romantics “) ; Monthly Review (April 1905) (by F. Brunetiere) ; Revue des Deux Mondes (March 1905) (by Victor Giraud). In the CEuvres choisies de Juste Olivier (1879) are some “Souvenirs”; and in 1903 the Revue des Deux Mondes published several interesting articles on a correspondence of Sainte-Beuve with Olivier.

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Very Rev. Joseph Armitage Robinson, M.A., D.D.

Dean of Wells. Dean of Westminster, 1902-1911. Fellow of the British Academy. Chaplain-in-Ordinary to the King. Hon. Fellow of Christ's College, Cambridge. Norrisian Professor of Divinity in the University of Cambridge, 1893- 1899. Author of Some Thoughts on the Incarnation; &c.

James Bartlett. f Scaffold;

Lecturer on Construction, Architecture, Sanitation', Quantities, &c, King's College, i Seweraee' London. Member of Society of Architects, Institute of Junior Engineers, Quantity | «

Surveyors' Association. Author of Quantities. I Snoring.

Joseph Beavington Atkinson. f

Formerly Art-critic of the Saturday Review. Author of An Art Tour in the Northern \ Schadow. Capitals of Europe; Schools of Modern Art in Germany. L

H. Julius Eggeling, Ph.D. f

Professor of Sanskrit and Comparative Philology, Edinburgh University. Formerly J Sanskrit. Secretary and Librarian to the Royal Asiatic Society. ■ l. .

John Edwin Sandys, M.A., Litt.D., LL.D. r

Public Orator in the University of Cambridge. Fellow of St John's College, Cambridge. Fellow of the British Academy. Author of History of Classical "* Scholarship ; &c.

Rev. John Frederick Smith.

Author of Studies in Religion under German Masters; translated G. H. A. von – Ewald's Commentaries on the Prophets of the Old Testament

and the Book of Job.

James George Frazer, M.A., D.C.L., LL.D., Litt.D.

Professor of Social Anthropology, Liverpool University. Fellow of Trinity College, – Cambridge. Fellow of the British Academy. Author of The Golden Bough; &c.

Joseph G. Horner, A.M.I.Mech.E.

Author of Plating and Boiler Making ; Practical Metal Turning ; &c.

John Graham Kerr, M.A., F.R.S.

Regius Professor of Zoology in the University of Glasgow. Formerly Demonstrator in Animal Morphology in the University of Cambridge. Fellow of Christ's College, ■ Cambridge, 1898-1904. Walsingham Medallist, 1898. Neill Prizeman, Royai Society of Edinburgh, 1904.

John George Robertson, M.A., Ph.D.

Professor of German Language and Literature, University of London. Editor of the Modern Language Journal. Author of History of German Literature ; Schiller after ' a Century; &c.

Sir James George Scott, K.C.I.E.

Superintendent and Political Officer, Southern Shan States. The Upper Burma Gazetteer.

Scaliger {in part).

Schleiermacher {in part).

Saturn {in part).

Screw.

Selachians; Shark {in part).

Author of Burma;

Rev. James Gilliland Simpson, M.A. •

Canon of St Paul's, London. Principal of Leeds Clergy School and Lecturer of Leeds . Parish Church, 1900-1910.

John Henry Arthur Hart, M.A.

Fellow, Theological Lecturer and Librarian, St John's College, Cambridge.

John Henry Middleton, M.A., Litt.D., F.S.A., D.C.L. (1846-1896).

Slade Professor of Fine Art in the University of Cambridge, 1886-1895. Director of the Fitzwilliam Museum, Cambridge, 1889-1892. Art Director of the South Kensington Museum, 1892-1896. Author of The Engraved Gems of Classical Times; Illuminated Manuscripts in Classical and Mediaeval Times.

John Horace Round, M. A., LL.D. (Seutaee*

Balliol College, Oxford. Author of Feudal England; Studies in Peerage and Family -i ocuiage, History ; Peerage and Pedigree. [_ SerjeBnty.

John Holland Rose, M.A. , Litt.D. -\ f

Christ's College, Cambridge. Lecturer on Modern History to the Cambridge J gavary. University Local Lectures Syndicate. Author of Life of Napoleon I.; Napoleonic 1 Studies; The Development of the European Nations; The Life of Pitt; &c. I

Schiller.

Salween: River; Shan States

Scotland, Episcopal Church of. -j Scribes.

Sangallo; Sculpture {in part).

X

J. H. V. C.

J. K. I. 1. L. M.

J. M. M.

J. P.-B. J. S. F.

J. S. R.

J. T. Be. J. T. C.

J. T. S.* J. W.

J. W. He.

K. G. J. K. S. L. Be.

L. J. S.

L. V. L. V.*

M. A. C.

INITIALS AND HEADINGS OF ARTICLES

John Henry Verrinder Crowe. r

Lieut. -Colonel, Royal Artillery. Commandant of the Royal Military College of Canada. Formerly Chief Instructor in Military Topography and Military History -j Shipka PaSS. and Tactics at the Royal Military Academy, Woolwich. Author of Epitome of the Russo-Turhish War, 1877-1878; &c. I

John Kells Ingram, LL.D.

See the biographical article: Ingram, John Kblls.

f Say, Jean Baptiste; I Senior, Nassau.

Salamis: Cyprus.

John Linton Myres, M.A., F.S.A., F.R.G.S.

Wykeham Professor of Ancient History in the University of Oxford, and Fellow of Magdalen College. Formerly Gladstone Professor of Greek and Lecturer in Ancient . Geography, University of Liverpool. Lecturer in Classical Archaeology in the University of Oxford, and Student and Tutor of Christ Church. Author of A History of Rome ; &c.

John Malcolm Mitchell. [Sehelling (in part) ;

Sometime Scholar of Queen’s College, Oxford. Lecturer in Classics, East London ■{ Shaftesbury, 3rd Earl Of College (University of London). Joint-editor of Grote’s History of Greece. I (in part).

James George Joseph Penderel-Brodhurst. (Sheraton, Thomas.

Editor of the Guardian, London. \ «•«»«, * »”»••

John Smith Flett, D.Sc., F.G.S. fSand; Sandstone;

Petrographer to the Geological Survey of the United Kingdom. Formerly Lecturer J coannli + o (T? rhA- on Petrology in Edinburgh University. Neill Medallist of the Royal Society of 1 » c »P 0Ule Knocks), Edinburgh. Bigsby Medallist of the Geological Society of London. I Schorl.

James Smith Reid, M.A., LL.D., Litt.D.

Professor of Ancient History and Fellow and Tutor of Gonville and Caius College, Cambridge. Hon. Fellow, formerly Fellow and Lecturer of Christ's College. Browne's and Chancellor's Medals. Editor of editions of Cicero's Academia; De Amicilia; &c.

John Thomas Bealby.

Joint-auth

Joseph Thomas Cunningham, M.A., F.Z.S.

Lecturer on Zoology at the South-Western Polytechnic, London. Formerly Fellow of University College, Oxford. Assistant Professor of Natural History in the University of Edinburgh. Naturalist to the Marine Biological Association.

James Thomson Shotwell, Ph.D.

Professor of History in Columbia University, New York City.

Severus, Lucius Septimius.

St Petersburg (in part) ; Sakhalin (in part) ; Samara:

Government (in part) ; Samarkand: City (in part) ; Saratov: Government (in part).

Scaphopoda; Sea-Serpent (in part).

J Saint-Simon, Comte de

\ (in part).

Seamen, Laws relating to; Sheriff.

James Williams, M.A., D.C.L., LL.D.

All Souls' Reader in Roman Law in the University of Oxford, and Fellow of Lincoln College. Author of Wills and Succession ; &c.

James Wycliffe Headlam, M.A. r

Staff Inspector of Secondary Schools under the Board of Education, London.

Formerly Fellow of King's College, Cambridge. Professor of Greek and Ancient J. Schmerling, Anton von. History at Queen's College, London. Author of Bismarck and the foundation of the German Empire ; &c. I

Kingsley Garland Jayne.

Sometime Scholar of Wadham College, Oxford. Author of Vasco da Gama and his Successors.

Kathleen Schlesinger.

Editor of the Portfolio of Musical Archaeology. Orchestra.

Matthew Arnold Prizeman, 1903. -I Salamanca.

Author of The Instruments of the ■

Sambuca; Saxhorn; Saxophone; Serpent: Music; Shawm; Shofar.

CheV tnSs he A L u e fn or ol SCU,ptUr6: Mod ™ **"*■

Seapolite; Scolecite.

Leonce Benedite.

Keeper of the Musee National du Luxembourg, Paris. Honour. President of the Societe des Peintres orientalistes Histoire des Beaux Arts; &c.

Leonard James Spencer, M.A.

Assistant in the Department of Mineralogy, British Museum. Formerly Scholar of Sidney Sussex College, Cambridge, and Harkness Scholar. Editor of the * Mineralogical Magazine.

Linda Mary Villari.

See the biographical article : Villari, Pasquale.

Luigi Villari. r

Italian Foreign Office (Emigration Department). Formerly Newspaper Corre- spondent in the East of Europe. Italian Vice-Consul in New Orleans, 1906, Phila- -i Savoy, House of. delphia, 1907, and Boston, U.S.A., 1907-1910. Author of Italian Life in Town and Country ; &c. I

Maurice Arthur Canney, M.A. r

Assistant Lecturer in Semitic Languages in the University of Manchester. Formerly] c-honVol nnnfol Exhibitioner of St John's College, Oxford. Pusey and Ellerton Hebrew Scholar, 1 ocnenKel » UUUM ' Oxford, 1892; Kennicott Hebrew Scholar, 1895; Houghton Syriac Prize, 1896. I

Savonarola.

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RLP.

INITIALS AND HEADINGS OF ARTICLES xi

Malcolm Bell. f_. _ „ _, .

Author of Pewter Plate ; &c. \ Sheffield Plate.

MiCHAEif Brett f

Barrister-at-Law, Middle Temple. \ Salvage: Military.

Sir Mackenzie Dalzell Chalmers, K.C.B., C.S.I., M.A. f

Trinity College, Oxford, Barrister-at-Law. Formerly Permanent Under-Secretary J of State for the Home Department, London, and First Parliamentary Counsel to 1 Sale 01 Goods, the Treasury. Author of Digest of the Law of Bills of Exchange ; &c. ‘ l

Marcus Hartog, M.A., D.Sc, F.L.S. _ f

Professor of Zoology, University College, Cork. Author of ” Protozoa,” in the “j Sarcodina. Cambridge Natural History; and papers for various scientific journals. I

Marion H. Spielmann, F.S.A.

Formerly Editor of the Magazine of Art. Member of Fine Art Committee of Inter- national Exhibitions of Brussels, Paris, Buenos Aires, Rome and the Franco- British Exhibition, London. Author of History of “Punch”; British Portrait

Painting to the Opening of the iglh Century; Works of G. F. Watts, R.A.; British Sculpture and Sculptors of To-Day; Henriette Ronner; Sec.

Sculpture (in part) ; Shakespeare: Portraits.

Morris Jastrow, Ph.D.

Professor of Semitic Languages, University of Pennsylvania. Author of Religion -J Shamash. of the Babylonians and Assyrians ; &c.

Maximiltan Otto Bismarck Caspari, M.A. f Sa i amis .

Reader in Ancient History in London University. Lecturer in Greek in Birmingham ■{ * a,amls > University, 1905-1908. I Samos (m part).

Leon Jacques Maxime Prinet. f

Auxiliary of the Institute of France (Academy of Moral and Political Sciences). -! St Neetaire; Author of L' Industrie du sel en Franche-Comte. |_ St Pol, Counts Of.

M. Th. Houtsma. f

Professor of Semitic Languages in the University of Utrecht. \ Seljuks.

Osmund Airy, M.A., LL.D. f

H.M Inspector of Schools and Inspector of Training Colleges, Board of Education, J ofc .. „, A . _, , .

London. Author of Louis XIV. and the English Restoration; Charles II.; &c.1 SnaltesDury, 1st Earl 01. Editor of the Lauderdale Papers ; &c. I

P. A. K. Prince Peter Alexeivitch Kropotkin.

See the biographical article: Kropotkin, Prince, P. A.

St Petersburg {in part) ; Sakhalin {in part) ; Samara: Government {in part) ; Samarkand: City (in part) ; . Saratov: Government (in part).

P. C. M. Peter Chalmers Mitchell, M.A., F.R.S., F.Z.S., D.Sc., LL.D.

Secretary of the Zoological Society of London. University Demonstrator in Com- I – parative Anatomy and Assistant to Linacre Professor at Oxford, 1888-1891. 1 sex< Author of Outlines of Biology ; &c. I

Percy Gardner, LL.D., F.S.A., D.Litt. -fennnae

See the biographical article : Gardner, Percy. \ »««?»»•

Paul George Konody. f

Art Critic of the Observer and the Daily Mail. Formerly Editor of the Artist. < Sculpture (in part). Author of The Art of Walter Crane; Velasquez, Life and Work; &c. L

Percy Somers Tyringham Stephens, J.P. J*

Contributor to the Badminton Magazine. \ Snooting.

Paul Vinogradoff, D.C.L., LL.D. J

See the biographical article: Vinogradoff, Paul. ˆSerittom.

Sir Phillip Watts, K.C.B., F.R.S., LL.D. f «..-t». ttj?iˆ.«, <■;,,,, **it,** t****

Director of Naval Construction for the British Navy. Chairman of the Federation I Sm ?- Htstory since the Inven- of Shipbuilders. Naval Architect and Director of War Shipbuilding Department 1 <*"» °J Steamships-. of Sir W. G. Armstrong, Whitworth & Co., Ltd., 1885-1901. [Shipbuilding.

Robert Adamson, LL.D. J Cb |,,,ii,,,_ (s „ A/tW \

See the biographical article : Adamson, Robert. \ » eneuln S tf » pan).

Robert Alexander Stewart Macalister, M.A. , F.S.A. f Samaria*

St John's College, Cambridge. Director of Excavations for the Palestine Ex- ■{ choohom ploration Fund. L&neenem.

Colonel Robert Alexander Wahab, C.B., C.M.G., CLE. f

Formerly H.M. Commissioner, Aden Boundary Delimitation. Served with Tirah J «-_. Expeditionary Force, 1897-1898, and on the Anglo-Russian Boundary Com- 1 o*" 8 – mission, Pamirs, 1895. I

Richard Copley Christie. f g „ a ii,, er u n j, art \

See the biographical article: Christie, Richard Copley. \ » cau B er V n P an >-

Robert Drew Hicks, M.A. I seneca (in part).

Fellow, formerly Lecturer in Classics, Trinity College, Cambridge. \

Richard Garnett, LL.D. J Sarpi, Paolo;

See the biographical article: Garnett, Richard. \ Satire.

Reginald Innes Pocock, F.Z.S. J Scorpion.

Superintendent of the Zoological Gardens, London. L

INITIALS AND HEADINGS OF ARTICLES

R. J. H.

R. L.*

R. L. A. R. N. B.

R. P.*

R. S. C.

R. W.

S. A. C.

S.N. T. As.

T. A. A. T. A. I. T. Ba.

T. C. A.

T. F.

T. G. C.

T. K. T. K. C. T. L. H.

Ronald John McNeill, M.A.

Christ Church, Oxford. Barrister-at-Law.

Gazette (London).

Formerly Editor of the St James's

St John, Oliver;

St Leger, Sir Anthony;

Scroggs, Sir William;

Scrope Family;

Ship-money;

Shrewsbury, Duke of.

Richard Lydekker, F.R.S., F.G.S., F.Z.S. r

Member of the Staff of the Geological Survey of India, 1874-1882. Author of J Seal {in part) ; Catalogue of Fossil Mammals, Reptiles and Birds in the British Museum; The Deer\ Serow; Sheep (in part), of all Lands; The Game Animals of Africa; &c. |_

Sir Reginald Laurence Antrobus, K.C.M.G. f

Crown Agent for the Colonies, London. Assistant Under-Secretary of State for -J St Helena {in part). the Colonies, 1 898-1909. [

Robert Nisbet BAiN(d. 1909). f

Assistant Librarian, British Museum, 1883-1909. Author of Scandinavia: The c hne* <»H Hannihai- Political History of Denmark, Norway and Sweden, 15 13-1900; The First Romanovs, \ ° e "° 5lea > Mannioai, 1613-172$; Slavonic Europe: The Political History of Poland and Russia from Shaflrov, Peter. 1469 to 1796 ; &c. I

Robert Peele.

Professor of Mining in Columbia University, New York.

Shaft-sinking.

Robert Seymour Conway, M. A., D.Litt. r

Professor of Latin and Indo-European Philology in the University of Manchester. J Cai«irt«c Formerly Professor of Latin in University College, Cardiff ; and Fellow of Gonville | “arnrUuJS. and Caius College, Cambridge. Author of The Italic Dialects. [

Robert Wallace, F.R.S. (Edin.), F.L.S.

Professor of Agriculture and Rural Economy at Edinburgh University, and Garton Lecturer on Colonial and Indian Agriculture. Professor of Agriculture, R.A.C.,_ Cirencester, 1882-1885. Author of Farm Live Stock of Great Britain; The Agri- culture and Rural Economy of Australia and New Zealand; Farming Industries of Cape Colony; &c.

Stanley Arthur Cook, M.A. f c . e

Lecturer in Hebrew and Syriac, and formerly Fellow, Gonville and Caius College, SaMSOn; Samuel; Cambridge. Editor for the Palestine

Exploration Fund. Author of Glossary of -I Samuel, Books of; Aramaic Inscriptions; The Laws of Moses and the Code of Hammurabi; Critical Saul* Serpent-worship. Notes on Old Testament History; Religion of Ancient Palestine; &c. I ‘

Sheep {in part).

Simon ‘Newcomb, LL.D., D.Sc.

See the biographical article: Newcomb, Simon.

{

Saturn: Planet.

Thomas Ashby, M.A., D.Litt.

Director of the British School of Archaeology at Rome. Formerly Scholar of Christ Church, Oxford. Craven Fellow, 1897. Conington Prizeman, 1906. Member, of the Imperial German Archaeological Institute. Author of The Classical Topo- graphy of the Roman Campagna.

Thomas Andrew Archer, M.A.

Author of The Crusade of Richard I. ; &c.

Thomas Allan Ingram, M.A., LL.D. Trinity College, Dublin.

Sir Thomas Barclay, M.P.

Member of the Institute of International Law. Officer of the Legion of Honour.

Salerno; Sardinia; Sassari; Satricum; Saturnia; Segesta; Segusio; Selinus; Sessa Aurunca; Severiana, Via.

Salvian.

Savings Banks {in part).

Author of Problems of International Practice and Diplomacy ; &c. burn, 1910.

M.P. for Black-

Search.

Sir Thomas Clifford Allbutt, K.C.B., M.A., M.D., D.Sc, LL.D., F.R.S. r

Regius Professor of Physic in the University of Cambridge, and Fellow of Gonville J Semmelweiss Ienatz and Caius College. Physician to Addenbrooke's Hospital, Cambridge. Editor of 1 > 8 •

Systems of Medicine. [

Rev. Thomas. Fowler, M.A. , D.D., LL.D. (1832-1904). r

President of Corpus Christi College, Oxford, 1881-1904. Honorary Fellow of chaHochtiro **JrH TParl «f Lincoln College. Professor of Logic, 1873-1888. Vice-Chancellor of the University \ &nalle5Dur y> a ™ J"**" 0I of Oxford, 1899-1901. Author of Elements of Deductive Logic; Shaftesbury and (tn part). Hutcheson; &c. I

Thomas Gilbert Carver, M.A., K.C. (1848-1906). r

Formerly Judge of County Courts. Author of On the Law relating to the Carriage-} Salvage. of Goods by Sea. ' [

Thomas Kirkup, M.A., LL.D.

Author of An Inquiry into Socialism; Primer of Socialism; &c.

Rev. Thomas Kelly Cheyne, D.Litt., D.C.L., D.D. See the biographical article: Cheyne, T. K.

Sir Thomas Little Heath, K.C.B., D.Sc

Assistant Secretary to the Treasury. Formerly Fellow of Trinity College, Cam- bridge. Author of Treatise on Conic Sections ; &c.

J Saint-Simon, Comte de

I {in part).

I Seraphim.

Serenus "of Antissa.

INITIALS AND HEADINGS OF ARTICLES

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rh. N.

T. T. T. W. F.

T. W. R. D.

W. A. B. C.

W. A. D.

W. A. P.

W. Ba.

W. C. D. W.

W. E. A. A.

W. E. Ho.

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TUEODOR NOLDEKE.

See the biographical article: Noldeke, Theodor.

Sir Travers Twiss, K.C., B.C.L., F.R.S.

See the biographical article: Twiss, Sir Travers.

{

Semitic Languages,

-I Sea Laws.

Thomas William Fox. f

Professor of Textiles in the University of Manchester. Author of Mechanics of J. Shuttle.

Weaving. [_

Thomas William Rhys Davids, LL.D., Ph.D.

Professor of Comparative Religion, Manchester University. President of the Pali Text Society. Fellow of the British Academy. Secretary and Librarian of the Royal Asiatic Society, 1885-1902. Author of Buddhism; Sacred Books of the Buddhists ; Early Buddhism ; Buddhist India ; Dialogues of the Buddha ; &c.

Rev. William Augustus Brevoort Coolidge, M.A., F.R.G.S., Ph.D.

Fellow of Magdalen College, Oxford. Professor of English History, St David's College, Lampeter, 1 880-1 881. Author of Guide du Haut Dauphine; The Range of the Todi; Guide to Grindelwald ; Guide to

Switzerland; The Alps in Nature and in History; &c. Editor of the Alpine Journal, 1880-188 1 ; &c.

Sanchi; SSriputta; Sasana Vamsa.

St Gall: Canton; St Gall:

Town; St Gotthard Pass; St Moritz; Sarnen; Saussure, Horace Benedict de; Savoie; Schaflhausen: Canton; Schaflhausen: Town; Scheuchzer, Johann; Schwyz; Sempach.

Sherman, John.

William Archibald Dunning, Ph.D., LL.D.

Lieber Professor* of History and Political Philosophy, Columbia University, New York. Author of Essays on the Civil War and Reconstruction ; A History of Political ‘ Theories. [_

Walter Alison Phillips, M.A. r St John of Jerusalem, Order

Formerly Exhibitioner of Merton College and Senior Scholar of St John’s College, J of ; –

Oxford. Author of Modern Europe; &c. |_ Sehleswig-Holstein Question.

William Backer, Ph.D.

Professor of Biblical Science at the Rabbinical Seminary, Budapest.

Shammai.

William Cecil Dampier Whetham, M.A., F.R.S. Fellow and Tutor of Trinity College, Cambridge. Recent Development of Physical Science ; &c.

Author of Theory of Solution ; -i Science.

William Edmund Armytage Axon, LL.D. r

Formerly Deputy Chief Librarian of the Manchester Free Libraries. On Literary J c a if 0H i Staff of Manchester Guardian, 1874-1905. Member of the Gorsedd, with the bardic j name of Manceinion. Author of Annals of Manchester; &c. [

William Evans Hoyle, M.A., D.Sc, F.Z.S., M.R.C.S.

Christ Church, Oxford. Director of the National Museum of Wales. Manchester Museum, 1889-1899.

William Fream, LL.D. (d. 1906). f

Formerly Lecturer on Agricultural Entomology, University of Edinburgh, and J Sheep (in part). Agricultural Correspondent of The Times. [_

Winifred F. Knox.

Author of The Court of a Saint.

Director of the -i Sea-Serpent (in part).

Saladin.

Seeley, Sir J. R.

Seth.

Rev. William Hunt, M.A., Litt.D.

President of the Royal Historical Society, 1 905-1 909. Author of History of the English Church, 5 Q7-1 066; The Church of England in the Middle Ages; Political' History of England, 1760-1801. I

William Henry Bennett, M.A., D.D., D.Litt. r

Professor of Old Testament Exegesis in New and Hackney Colleges, London, j Formerly Fellow of St John's College, Cambridge, and Lecturer in Hebrew at Firth 1 College, Sheffield. Author of Religion of the Post-Exilic Prophets; &c. [

Sir William Henry Flower, F.R.S. J Seal (in part).

See the biographical article: Flower, Sir W. H.]^

William Henry Hadow, M.A., Mus.Doc.

Principal of Armstrong College, Newcastle-on-Tyne. Formerly Fellow and Tutor Schubert. of Worcester College, Oxford. Member of Council, Royal College of Music. Editor " of Oxford History of Music. Author of Studies in Modern Music ; &c.

Walter Lynwood Fleming, A.M., Ph.D. f

Professor of History in Louisiana State University. Editor of Documentary History J Secession. of Reconstruction ; &c. (

William Lawson Grant, M.A. r , . . . ,

Professor of History at Queen's University, Kingston, Canada. Formerly Beit j St John: Canada; Lecturer in Colonial History at Oxford University. Editor of Acts of the Privy 1 St Pierre and MiquelOE. Council (Colonial Series) ; Canadian Constitutional Development- [_

Sir William Lee-Warner, M.A., G. C.S.I. f

Member of the Council of India. Formerly Secretary in the Political and Secret J Sayyid Ahmad Khan, Sir. Department of the India Office. Author of Life of the Marquis of Dalhousie;ˆ Memoirs of Field -Marshal Sir Henry Wylie Norman; &c. v

XIV

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M.

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INITIALS AND HEADINGS OF ARTICLES

William Minto, M.A.

See the biographical article : Minto, William.

William Michael Rossetti.

See the biographical article : Rossetti, Dante G.

Lieut.-Colonel William Patrick Anderson, M.Inst.C.E., F.R.G.S}

Chief-Engineer, Department of Marine and Fisheries of Canada. Member of the Geographic Board of Canada. Past President of Canadian Society of Civil Engineers.

William Robertson Smith, LL.D.

See the biographical article: Smith, W. R.

William Thomas Calman, D.Sc, F.Z.S.

Assistant in charge of Crustacea, Natural History Museum, South Kensington. Author of ” Crustacea,” in a Treatise on Zoology, edited by Sir E. Ray Lankester.

William Wallace.

See the biographical article: Wallace, William (1844-1897).

William Walker Rockwell, Lie. Theol.

Assistant Professor of Church History, Union Theological Seminary, New York. Author of Die Doppelehe lies Landgrafen Philipp von Hessen.

•| Scott, Si

Sir Walter {in part).

f Sebastiano del Piombo; 1 Shelley.

St Lawrence: River.

/Salt: Ancient History and \ Religious Symbolism.

{

Shrimp.

■j Schopenhauer {in part), i Saragossa, Councils ok

PRINCIPAL UNSIGNED ARTICLES

St Vitus's Dance.

Sal Ammoniac.

Salicylic Acid.

Salisbury.

Salt Lake City.

Saltpetre.

Salt.

Salvador.

Salvation Army.

Salzburg.

Samoa.

Samoyedes.

Sanctuary.

San Francisco.

Santo Domingo.

Sarsaparilla.

Saskatchewan.

Savannah.

Saxe-Coburg-Gotha.

Saxe-Meiningen.

Saxe- Weimar-Eisenach.

Saxony.

Scarlet Fever.

Sehleswig-Holstein.

Scilly Isles.

Scipio.

Scrophulariaceae.

Scurvy.

Seal-Fisheries.

Seattle.

Sea-Urchin.

Sedition.

Seismometer.

Selenium.

Selkirkshire.

Senna.

Sennar.

Sequoia.

Serjeant.

Servo-Bulgarian War.

Settlement.

Severn..

Sewing Machines.

Sextant.

Seychelles.

Shadow.

Shakers.

Shamash.

Sheffield.

Shell-heaps.

Shell-money.

Sheridan.

Shetland.

Shoe.

Shorthand (modern).

Shropshire.

ENCYCLOPEDIA BRITANNICA

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SAINTE-CLAIRE DEVILLE, ETIENNE HENRI (1818-1881), French chemist, was born on the nth of March 1818 in the island of St Thomas, West Indies, where his father was French consul. Together with his elder brother Charles he was educated in Paris at the College Rollin. In 1844, having graduated as doctor of medicine and doctor of science, he was appointed to organize the new faculty of science at Besancon, where he acted as dean and professor of chemistry from 1845 to 1851. Return- ing to Paris in the latter year he succeeded A. J. Balard at the ficole Normale, and in 1859 became professor at the Sorbonne in place of J. B. A. Dumas, for whom he had begun tc lecture in 1853. He died at Boulogne-sur-Seine on the 1st of July 1881.

He began his experimental work in 1 84 1 with investigations of oil of turpentine and tolu balsam, in the course of which he discovered toluene. But his most important work was in inorganic and thermal chemistry. In 1849 he discovered anhydrous nitric acid (nitrogen pentoxide), a substance interesting as the first obtained of the so-called ” anhydrides ” of the monobasic acids. In 1855, ignorant of

what Wohler had done ten years previously, he succeeded in obtaining metallic aluminium, and ultimately he devised a method by which the metal could be prepared on a large scale by the aid of sodium, the manufacture of which he also developed. With H. J. Debray (1827-1888) he worked at the platinum metals, his object being on the one hand to prepare them pure, and on the other to find a suitable metal for the standard metre for the Inter- national Metric Commission then sitting at Paris. With L. J. Troost (b. 1825) he devised a method for determining vapour densities at temperatures up to 1400 ° C, and, partly with F. Wohler, he investigated the allotropic forms of silicon and boron. The artificial preparation of minerals, especially of apatite and isorhor- phous minerals and of crystalline oxides, was another subject in which he made many experiments. But his best known contribution to general chemistry is his work on the phenomena of reversible reactions, which he comprehended under a general theory of ” dis- sociation.” He first took up the subject about 1857, and it was in the course of his investigations on it that he devised the apparatus known as the ” Deville hot and cold tube.”

His brother, Charles Joseph Sainte- Claire Deville (1814-1876), geologist and meteorologist, was born in St Thomas on the 26th of February 1814. Having attended at the Ecole des Mines in Paris, he assisted Elie de Beaumont in the chair of geology at the College de France from 1855 until he succeeded him in 1874. He made researches on volcanic phenomena, especially on the gaseous emanations. He investigated also the variations of temperature in the atmosphere and ocean. He died at Paris on the 10th of October 1876.

Hjs published works include: Etudes geologiques sur les ties de Teneriffe et de Fogo (1848); Voyage geologique aux Antilles et aux ties de Teneriffe et de Fogo (1848-1859); Recherches sur les princi- paux phenomenes de meteorologie et de physique generate aux Antilles (1849); Sur les variations periodiques de la temperature (1866), and Coup d’cEil historique sur la giologie (1878).

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ST ELMO’S FIRE, the glow accompanying the slow discharge

of electricity to earth frem the atmosphere. This discharge, which is identical with the ” brush ” discharge of laboratory experiments, usually appears as a tip of light on the extremities of pointed objects such as church towers, the masts of ships, or even the fingers of the outstretched hand: it is commonly accompanied by a crackling or fizzing noise. St Elmo’s fire is most frequently observed at low levels

through the winter season during and after snowstorms.

The name St Elmo is an Italian corruption through Sant' Ermo of St Erasmus, a bishop, during the reign of Domitian, of Formiae, Italy, who was broken on the wheel about the 2nd of June 304. He has ever been the patron saint of Mediterranean sailors, who regard St Elmo's fire as the visible sign of his guar- dianship. The phenomenon was known to the ancient Greeks, and Pliny in his Natural History states that when there were two lights sailors called them Castor and Pollux and invoked them as gods. To English sailors St Elmo's fires were known as " corposants " (Ital. corpo santo).

See Hazlitt's edition of Brand's Antiquities (1905) under " Castor and Pollux." .

ST EMILION, a town of south-western France, in the depart- ment of Gironde, i\ m. from the right bank of the Dordogne and 27 m. E.N.E. of Bordeaux by rail. Pop. (1906), town, 1091; commune, 3546. The town derives its name from a hermit who lived here in the 7th and 8th centuries. Pictur- esquely situated on the slope of a hill, the town has remains of ramparts of the 12th and 13th centuries, with ditches hewn in the rock, and several medieval buildings. Of these the chief is the parish, once collegiate, church of the 12th and 13th centuries. A Gothic cloister adjoins the church. A fine belfry (12th, 13th and 15th centuries) commanding the town is built on the terrace, beneath which are hollowed in the rock the ora- tory and hermitage of St Emilion, and adjoining them an ancient monolithic church of considerable dimensions. Remains of a monastery of the Cordeliers (15th and 17th. centuries), of a building (13th century)known as the Palais Cardinal, and a square keep (the chief relic of a stronghold founded by Louis VIII.) are also to be seen. Disused stone quarries in the side' of the hill are used as dwellings by the inhabitants. St Emilion is celebrated for its wines. Its medieval importance, due to the pilgrimages to the tomb of the saint and to the commerce in its wines, began to decline towards the end of the 13th century owing to the foundation of Libourne. In 1272 it was the first of the towns of Guyenne to join the confederation headed by Bordeaux.

SAINTE-PALAYE— ST ETIENNE

SAINTE-PALAYE, JEAN BAPTISTE LA CURNE (or Lacuene) DE (1697-1781), French scholar, was born at Auxerre on the 6th of June 1697. His father, Edme, had been gentleman of the bed-chamber to the duke of Orleans, brother of Louis XIV. Sainte-Palaye had a twin brother to whom he was greatly attached, refusing to marry so as not

to be separated from him. For some time he held the same position under the regent Orleans as his father had under the duke of Orleans. He had received a thorough education in Latin and Greek, and had a taste for history. In 1724 he had been elected an associate of the Academie des Inscriptions et Belles-Leltres, merely from his reputation, as nothing haji been written by him before that date. From this time he- devoted himself exclusively to the work of this society. After having published numerous memoirs on Roman history, he began a series of studies on the chroniclers of the middle ages for the Historiens des Gaules et de la France (edited by Dom Bouquet) : Raoul Glaber, Helgaud, the Gesta of Louis VII., the chronicle of Morigny, Rigord and his con- tinuator, William le Breton, the monk of St Denis, Jean de Venette, Froissart and the Jouvencel. He made two journeys into Italy with his brother, the first in 1739-1740, accompanied by his compatriot, the president Charles de Brosses, who related many humorous anecdotes about the two brothers, particularly about Jean Baptiste, whom he called ” the bilious Sainte- Palaye ! ” On returning from this tour he saw one of Join- ville’s manuscripts at the house of the senator Fiorentini, well known in the history of the text of this pleasing memorialist. The manuscript was bought for the king in 1741 and is still at the Bibliotheque nationale. After the second journey (1749) Lacurne published a letter to de Brosses, on Le Goilt dans les arts (1751). In this he showed that he was not only attracted by manuscripts, but that he could see and admire works of art. In 1 7 59 he published the first edition of his Memoir es sur I’ancienne chevalerie, consideree comme un etablissement politique el militaire, for which unfortunately he only used works of fiction and ancient stories as sources, neglecting the heroic poems which would have shown him the nobler aspects of this institution so soon corrupted by ” courteous ” manners; a second edition appeared at the time of his death (3 vols. 1781, 3rd ed. 1826). He prepared an edition of the works of Eustache Deschamps, which was never published, and also made a collection of more’ than a hundred volumes of extracts from ancient authors relating to French antiquities and the French language of the middle ages. His Glossaire de lalanguefrancaise was ready in 1 7 56, and a prospectus had been published, but the great length of the work prevented him finding a publisher. It remained in manuscript for more than a century. In 1 764 a collection of his manuscripts was bought by the government and after his death were placed in the king’s library; they are still there (fonds Moreau), with the exception of some which were given to the marquess of Paulmy in exchange, and were later placed in the Arsenal. Lacurne de Sainte-Palaye ceased work about 1771; the death of his brother was greatly felt by him, he became childish, and died on the 1st of March 1781.

Sainte-Palaye had been a member of the Academie Francaise since 1758. His life was written for this Academie by Chamfort and for the Academie des Inscriptions by Dupuy; both works are of no value. See, however, the biography of Lacurne, with a list of his published works and those in manuscript, at the beginning of the tenth and last volume of the Dictionnaire historique de I'ancien langage francois, ou glossaire de la langue frangoise depuis son origine jusqu'au siecle de Louis XIV., published by Louis Favre (1875-

1882).

SAINTES, a town of western France, capital of an arrondisse- ment in the department of Charente-Inferieure, 47 m. S.E. of La Rochelie by the railway from Nantes to Bordeaux. Pop. (1906), •town, 13,744; commune, 19,025. Saintes is pleasantly situated on the left bank of the Charente, which separates it from its suburb of Les Dames. It is of interest for its Roman remains, of which the best preserved is the triumphal arch of Germanicus, dating from the reign of Tiberius. This formerly stood on a Roman bridge destroyed in 1843, when it was removed and reconstructed on the right bank of the river. Ruins of baths and of an amphitheatre are also to be seen. The amphitheatre,

larger than that of Nimes, and in area surpassed only by the Coliseum, dates probably from the close of the 1st or the beginning of the 2nd century and was capable of holding 20,000 spectators. A Roman building known as the Capitol was destroyed after the capture of the town from the English by Charles of Alencon, brother of Philip of Valois, in 1330, and its site is occupied by a hospital. Saintes was a bishop's see till 1790; the cathedral of St Peter, built in the first half of the 12th century, was rebuilt in the 15th century, and again after it had been almost destroyed by the Huguenots in 1568. The interior has now an unattractive appearance. The tower (15th century) is 236 ft. high. The church of St Eutropius (founded at the close of the 6th century, rebuilt in the nth, and had its nave destroyed in the Wars of Religion) stands above a very interesting well-lighted crypt — • the largest in France after that of Chartres — adorned with richly sculptured capitals and containing the tomb of St Eutropius (4th or 5th century). The fine stone spire dates from the 15th century. Notre-Dame, a splendid example of the architecture of the nth and 12th centuries, with a noble clock- tower, is no longer devoted to religious purposes. The old hotel de ville (16th and 18th centuries) contains a library, and the present hotel de ville a museum. Bernard Palissy, the porcelain- maker, has a statue in the town, where he lived from 1542 to 1562. Small vessels ascend the river as far as Saintes, which carries on trade in grain, brandy and wine, has iron foundries, works of the

state railway, and manufactures earthenware, tiles, &c.

Saintes (Mediolanum or Mediolanium), the capital of the Santones, was a nourishing town before Caesar's conquest of Gaul; in the middle ages it was capital of the Saintonge. Christianity was introduced by St Eutropius, its first bishop, in the middle of the 3rd century. Charlemagne rebuilt its cathedral. The Normans burned the town in 845 and 854. Richard Cceur de Lion fortified himself within its walls against his father Henry II., who captured it after a destructive siege. In 1242 St Louis defeated the English under its walls and was received into the town. It was not, however, till the reign of Charles V. that Saintes was permanently recovered from the English. The Protestants did great damage during the Wars of Religion.

ST ETIENNE, an industrial town of east-central France, capital of the department of Loire, 310 m. S.S.E. of Paris and 36 m. S.S.W. of Lyons by rail. Pop. (1906), town, 130,940; commune, 146,788. St Etienne is situated on the Furens, which flows through it from S.E. to N.W., partly underground, and is an important adjunct to the silk manufacture. The town is uni- formly built, its principal feature being the straight thoroughfare nearly 4 m. long which traverses it from N. to S. The chief of the squares is the Place Marengo, which has a statue of F. Gamier, the explorer, and is overlooked by the town hall and the prefecture, both modern. The church of St Etienne dates from the 15th century, and the Romanesque church of the abbey of Valbenoite is on the S.E. outskirts of the town. A valuable collec- tion of arms and armour, a picture gallery, industrial collections, and a library with numerous manuscripts are in the Palais des Arts. St Etienne is the seat of a prefect, and has an important school of mining, and schools of music, chemistry and dyeing, &c.

The town owes its importance chiefly to the coal-basin which extends between Firminy and Rive-de-Gier over an area 20 m. long by 5 m. wide, and is second only to those of Nord and Pas-de-Calais in France. There are concessions giving employment to some • 18,000 workmen and producing annually between 3,000,000 and 4,000,000 tons. The mineral is of two kinds — smelting coal, said to be the best in France, and gas coal. There are manufactures of ribbons, trimmings and other goods made from silk and mixtures of cotton and silk. This industry dates from the early 17th century, is carried on chiefly in small factories (electricity supplying the motive power), and employs at its maximum some 50,000 hands. The attendant industry of dyeing is carried on on a large scale. The manufacture of steel and iron and of heavy iron goods such as armour-plating occupies about 3000 workmen, and about half that number are employed in the production

of ironmongery generally. Weaving machinery, cycles, automobiles and agricultural imple- ments are also made. The manufacture of fire-arms, carried on at the national factory under the direction of artillery officers, employs at busy times more than 10,000 men, and can turn out 480,000 rifles in the year. Private firms, employing 4500 hands, make both military rifles and sporting-guns, revolvers, &c. To these industries must be added the manufacture of elastic fabrics, glass, cartridges, liqueurs, hemp-cables, &c.

At the close of the 12th century St fitienne was a parish of the Pays de Gier belonging to the abbey of Valbenoite. By the middle of the 14th century the coal trade had reached a certain development, and at the beginning of the 15th century Charles VII. permitted the town to erect fortifications. The manufacture of fire-arms for the state was begun at St fitienne under Francis I. and was put under the surveillance of state inspectors early in the 18th century. In 1789 the town was producing at the rate of 12,000 muskets per annum; between September 1794 and May 1796 they delivered over 170,000; and 100,000 was the annual average throughout the period of the empire. The first railways opened in France were the line between St fitienne and Andrezieux on the Loire in 1828 and that between St fitienne and Lyons in 1831. In 1856 St fitienne became the administrative centre of the department instead of Montbrison.

ST EUSTATIUS and SABA, two islands in the Dutch West Indies. St Eustatius lies 12 m. N.W. of St Kitts in 17 50′ N. and 62° 40′ W. It is 8 sq. m. in area and is composed of several volcanic hills and intervening valleys. It contains Orangetown, situated on an open roadstead on the W., with a small export trade in yams and sweet potatoes. Pop. (1908) 1283.

A few miles to the N.W. is the island of Saba, 5 sq. m. in extent. It consists of a single volcanic cone rising abruptly from the sea to the height of nearly 2800 ft. The town, Bottom, standing on the floor of an old crater, can only be approached from the shore 800 ft. below, by a series of steps cut in the solid rock and known as the ” Ladder.” The best boats in the Caribbees are built here; the wood is imported and the vessels, when complete, are lowered over the face of the cliffs. Pop. (1908) 2294. The islands form part of the colony of Curacao (q.v.) .

SAINT-EVREMOND, CHARLES DE MARGUETEL DE SAINT-DENIS, Seigneur de (1610-1703), was born at Saint- Denis-le-Guast, near

Coutances, the seat of his family in Normandy, on the 1st of April 1610. He was a pupil of the Jesuits at the College de Clermont (now Louis-le- Grand), Paris; then a student at Caen. For a time he studied law at the College d 'H at court. He soon, however, took to arms, and in 1629 went with Marshal Bassompierre to Italy. He served through great part of the Thirty Years' War, distinguishing himself at the siege of Landrecies (1637), when he was made captain. During his campaigns he studied the works of Montaigne and the Spanish and Italian languages. In 1639 he met Gassendi in Paris, and became one of his disciples. He was present at Rocroy, at Nordlingen, and at Lerida. For a time he was person- ally attached to Conde, but offended him by a satirical remark and was deprived of his command in the prince's guards in 1648. During the Fronde, Saint-fivremond was a steady royalist. The duke of Candale (of whom he has left a very severe portrait) gave him a command in Guienne, and Saint-fivremond, who had reached the grade of martchal de camp, is said to have saved 50,000 livres in less than three years. He was one of the numerous victims involved in the fall of Fouquet. His letter to Marshal Crequi on the peace of the Pyrenees, which is said to have been discovered by Colbert's agents at the seizure of Fouquet's papers, seems a very inadequate cause for his disgrace. Saint- fivremond fled to Holland and to England, where he was kindly received by Charles II. and was pensioned. After James II. 's flight to France Saint-fivremond was invited to return, but he declined. Hortense Mancini, the most attractive of Mazarin's attractive group of nieces, came to England in 1670, and set up a salon for love-making, gambling and witty conversation, and here Saint-fivremond was for many years at home. He died on the 29th of September 1703 and was buried in West- minster Abbey, where his monument still is in Poet's Corner close to that of Prior.

Saint-fivremond never authorized the printing of any of his works during his lifetime, though Barbin in 1668 published an unauthorized collection. But he empowered Des Maizeaux to publish his works after his death, and they were published in London (2 vols., 1705), and often reprinted. His masterpiece in irony is the so-called Conversation du marechal d'Hocquincourt avet le pere Canaye (the latter a Jesuit and Saint-fivremond's master

at school), which has been frequently classed with the Lettres provinciates.

His CEuvres melees, edited from the MSS. by Silvestre and Des Maizeaux, were printed by Jacob Tonson (London, 1705, 2 vols.; 2nd ed. t 3 vols., 1709), with a notice by Des Maizeaux. His corre-

spondence with Ninon de Lenclos, whose fast friend he was, was published in 1752; La Com&die des academistes, written in 1643, was printed in 1650. Modern editions of his works are by Hippeau (Paris, 1852), C. Giraud (Paris, 1865), and a selection (1881) with a notice by M. de Lescure.

ST FLORENTIN, a town of north-central France, in the depart- ment of Yonne, 37 m. S.E. of Sens on the Paris-Lyon-Mediter- ranee railway. Pop. (1906) 2303. It stands on a hill on the right bank of the Armance, half a mile from its confluence with the Armancon and the canal of Burgundy. In the highest part of the town stands the church, begun in the latter half of the 15th century, and though retaining the Gothic form, with great flying buttresses, is mainly in the Renaissance style. It is approached through a narrow alley up a steep flight of steps, and contains a fine Holy Sepulchre in bas-relief and a choir- screen and stained glass of admirable Renaissance workmanship. The nave, left incomplete, was restored and finished between 1857 and 1862. The market-gardens of St Florentin produce large quantities of asparagus. The town stands on the site of the Roman military post Castrodunum, the sceneof themartyrdom in the 3rd century of Saints Florentin and Hilaire, round whose tomb it grew up. The abbey established here in the 9th century afterwards became a priory of the abbey of St Germain at Auxerre. The town and its territory belonged, under the Merovingians, to Burgundy, and in later times to the counts of Champagne, from whom it passed to the kings of France. Louis XV. raised it from the rank of viscounty to that of county and bestowed it on Louis Phelypeaux, afterwards Due de la Vrilliere.

ST FLOUR, a town of south-central France, capital of an arrondissement in the department of Cantal, situated at a height of 2900 ft. on a basaltic plateau overlooking the Lander, a tributary of the Truyere, 47 m. E.N.E. of Aurillac by rail. Pop. (1906) 4090. The streets are dark and narrow, but the town has spacious promenades established in the 18th century. St Flour grew up round the tomb of St Florus, the apostle of Auvergne, who died there in the 4th century. The abbey founded there about the beginning of the nth century became in 1317 an episcopal chapter, and the town is still the seat of a bishopric. The cathedral (1396-1466) is the principal building. The manufacture of coarse woollen fabrics, of earthenware and candles is carried on. A few miles S.E. of the town the gorge of the Truyere is spanned by the fine railway viaduct of Garabit over 600 yds. long and at -a height of 400 ft. above the river.

ST GALL (Ger. St Gallen), one of the cantons of north- east Switzerland, on the border of the Austrian province of the Vorarlberg

and of the independent principality of Liechtenstein. It entirely surrounds the canton of Appenzell, which, like a great part of this canton, formerly belonged to the abbots of St Gall, while the ” enclave ” of Horn is in the canton of Thurgau.

Its area is 779-3 sq. m., of which 710-1 sq. m. are reckoned ” productive,” forests covering 157-1 sq. m. and vineyards 1-8 sq. m., while of the remainder 2-8 sq. m. are occupied by glaciers. The altitude above the sea-level varies from 1306 ft. (the lake of Constance) to 10,667 ft. (the Ringelspitz). The canton includes portions of the lake of Constance (21 J sq. m.), of the Walensee (rather over 7 sq. m.), and of the lake of Zurich (4 sq. m.), and several small lakes wholly within its limits. Hilly in its N. region, the height gradually increases towards the S. border, while to its S. W. and E. extend considerable alluvial plains on the banks of the Linth and of the Rhine. The two rivers just named form in part its frontiers, the principal stream within the canton being the Thur (as regards its upper course), with the middle reach of its principal affluent, the Sitter, both forming part of the Rhine basin. It has ports on the lake of Constance (Rorschach) and of Zurich (Rapperswil), as well as Weesen and Walenstadt on the Walensee, while the watering place of Ragatz (q.v.) is supplied with hot mineral waters from Pfafers. The main railway lines from Zurich past Sargans for Coire, and from Sargans past Altstatten and Rorschach for Constance.skirtits borders, while the capital is on the direct railway line from Zurich past Wil to Rorschach, and communicates by rail with Appenzell and with Frauenfeld. In 1900 the population of the canton was 250,285, of whom 243,358 were German-speaking, 5300 Italian-speaking and 710 French-speaking, while there were 150,412 ” Catholics ” (whether

Roman or ” Old “), 99,114 Protestants and 556 Jews (mostly in the 1 extensive collection of embroideries of all ages and dates. There

town of St Gall). Its capital is St Gall, the other most populous places being Tablat (pop. 12,590), Rorschach (914°). Altstatten (8724), Straubenzell (8090), Gossau (6055) and Wattwil (4971). In the southern and more Alpine portion of the canton the inhabitants mainly follow pastoral pursuits. In 1896 the number of ” alps ” or mountain pastures in the canton amounted to 304, capable of supporting 21,744 cows, and of an estimated total value of nearly 14 million francs. In the central and northern regions agriculture is generally combined with manufactures.

The canton is one of the most industrial in Switzerland. Cotton-spinning is widely spread, though cloth-weaving has declined. But the characteristic industry is the manufacture, mostly by machines, of muslin, embroidery and lace. It is reckoned that the value of the embroideries and lace exported from the canton amounts to about one-seventh of the total value of the exports from Switzerland. The canton is divided into fifteen administrative districts, which comprise ninety-three communes.

The existing constitution dates from 1890. The legislature or Grossrat is elected by the communes, each commune of 1500 inhabitants or less having a right to one member, and as many more as the divisor 1 500, or fraction.over 7 50, justifies. Members hold office for three years. For the election of the seven members of the executive or Regierungsrat, who also hold office for three years, all the communes form a single electoral circle. The two members of the federal Standerat are named by the legislature, while the thirteen members of the federal Nationalrat are chosen by a popular vote. The right of " facultative referendum " or of " initiative " as to legislative projects belongs to any 4000 citizens, but in case of the revision of the cantonal constitution 10,000 must sign the demand. The canton of St Gall was formed in 1803 and was augmented by many districts that had belonged since 1798 to the canton Linth or Glarus — the upper Toggenburg, Sargans (held since 1483 by the Swiss), Gaster and Uznach (belonging since 1438 to Schwyz and Glarus), Gams (since 1497 the property of the same two members), Werdenberg (owned by Glarus since 1517), Sax (bought by Zurich in 1615), and Rapperswil (since 171 2 under the protection of Zurich, Bern and Glarus).

Authorities. — I. von Arx, Geschichte d. Kant. St Gall (3 vols., 1810-1813); G. J. Baumgartner, Geschichte d. schweiz. Freistaates u. Kant. St Gall (3 vols., Zurich and Stuttgart, 1868-1890); H. Fehr, Stoat u. Kirche in St Gall (1899); W. Gotzinger, Die romanischen Namen d. Kant. St Gall (1891); O. Henne am Rhyn, Geschichte d. Kant. St Gall von 1861 (1896); Der Kanton St Gall, 1803-1(103 (1903); J- Kuoni, Sagen des Kantons St Gotten (St Gall, 1903); St Gallische Geschichtsquellen, edited by G. Meyer von Kronau; Mitteilungen z. vaterldndischen Geschichte (publ. by the Cantonal Hist. Soc, from 1861); Th. Schlatter, Romanische Volksnamen und Verwandtes (St Gall, 1903); T. Schneider, Die Alpwirtschaft im Kanton St Gall (Soleure, 1896) ; A. Steinmann, Die ostschweizerische Slickerei-Industrie (Zurich, 1905) ; Urkundenbuch d. AJbtei St Gall, edited by H. Wartmann; H. Wartmann, " Die geschichtliche Entwickelung d. Stadt St Gall bis 1454 " (article in vol. xvi., 1868, of the Archiv f. Schweizer Geschichte), and Franz Weidmann, Geschichte d. Stiffs u.

Landschaft St Gall (1834). (W. A. B. C.)

ST GALL, capital of the Swiss canton of that name, is situated in the upland valley of the Steinach, 2195 ft. above the sea-level. It is by rail 9 m. S.W. of Rorschach, its port on the lake of Constance, and 53 m. E. of Zurich. The older or central portion of the town retains the air of a small rural capital, but the newer quarters present the aspect of a modern commercial centre. At either extremity considerable suburbs merge in the neighbour- ing towns of Tablat and of Straubenzell. Its chief building is the abbey church of the celebrated old monastery. This has been a cathedral church since 1846. In its present form it was con- structed in 1756-1765. The famous library is housed in the former palace of the abbot, and is one of the most renowned in Europe by reason of its rich treasures of early MSS. and printed books. Other portions of the monastic buildings are used as the offices of the cantonal authorities, and contain the extensive archives both of this monastery and of that of Pfafers. The ancient churches of St Magnus (Old Catholics) and of St Lawrence (Protestant) were restored in the 19th century. The town library, which is rich in Reformation and post-Reformation MSS. and books, is in the buildings of the cantonal school. The museum contains antiquarian, historical and natural history

are a number of fine modern buildings, such as the Bourse. The town is the centre of the Swiss muslin, embroidery and lace trade. About 10,000 persons were in 1900 occupied in and near the town with the embroidery industry, and about 49,000 in the canton. Cold and fogs prevail in winter (though the town is protected against the north wind), but the heat in summer is rarely intense. In 1900 the population was 33,116 (having just doubled since 1870), of whom almost all were German-speaking, while the Protestants numbered 17,572, the Catholics (Roman or ” Old “) 15,006 and the Jews 419.

The town of St Gall owes its origin to St Gall, an Irish hermit, who in 614, built his cell in the thick forest which then covered the site of the future monastery, and lived there, with a few companions, till his death in 640. Many pilgrims later found their way to his cell, and about the middle of the 8th century the collection of hermits’ dwellings was transformed into a regularly organized Benedictine monastery. For the next three centuries this was one of the chief seats of learning and education in Europe. About 954 the monastery and its buildings were surrounded by walls as a protection against the Saracens, and this was the origin of the town. The temporal powers of the abbots vastly increased, while in the 13th century the town obtained divers privileges from the emperor and from the abbot, who

about 1205 became a prince of the Empire. In 1311 St Gall became a free imperial city, and about 1353 the gilds, headed by that of the cloth-weavers, obtained the control of the civic government, while in 141 5 it bought its liberty from the German king Sigismund. This growing independence did not please the abbot, who struggled long against it and his rebellious subjects in Appenzell, which formed the central portion of his dominions. After the victory of the Appenzellers at the battle of the Stoss (1405) they became (141 1) “allies” of the Swiss confederation, as did the town of St Gall a few months later, this connexion becoming an ” everlasting ” alliance in 1454, while in 1457 the town was finally freed from the abbot. The abbot, too, became (in 1451) the ally of Zurich, Lucerne, Schwyz and Glarus. In 1468 he bought the county of the Toggenburg from the representatives of its counts, a family which had died out in 1436, and in 1487 built a monastery above Rorschach as a place of refuge against the turbulent citizens, who, however, destroyed it in 1489. The Swiss intervened to protect the abbot, who (1490) concluded an alliance with them which’reduced his position almost to that of a ” subject district.” The townsmen adopted the Reformation in 1524, and this new cause of difference further envenomed their relations with the abbots. Both abbot and town were admitted regularly to the Swiss diet, occupying a higher position than the rest of the ” allies ” save Bienne, which was on the same footing. But neither succeeded in its attempts to be received a full member of the Confederation, the abbot being too much like a petty monarch and at the same time a kind of ” subject ” already, while the town could not help much in the way of soldiers. In 1798 and finally in 1805 the abbey was secularized, while out of its dominions (save the Upper Toggen- burg, but with the Altstatten district, held since 1490 by the Swiss) and those of the town the canton Santis was formed, with St Gall as capital. (W. A. B. C.)

SAINT-GAUDENS, AUGUSTUS (1848-1907), American sculptor, was born in Dublin, Ireland, of a French father (a shoemaker by trade), and an Irish mother, Mary McGuinness, on the 1 st of March 1848, and was taken to America in infancy. He was apprenticed to a cameo-cutter, studying in the schools of the Cooper Union (1861) and the National Academy of Design, New York (1865-1866). His earliest work in sculpture was a bronze bust (1867) of his father, Bernard P. E-Saint-Gaudens. In 1868 he went to Paris and became a pupil of Jouffroy] in the Ecole des Beaux-Arts. Two years later, with his fellow-student Mercie, he went to Italy, where he spent three years. At Rome he executed his statues ” Hiawatha ” and ” Silence.” He then settled in New York. In 1874 he-made a bust of the statesman, William M. Evarts, and was commissioned to execute a large collections, while the

new museum of industrial art has an I relief for St Thomas's Church, New York, which brought him

into prominence. His statue of Admiral Farragut, Madison Square, New York, was commissioned in 1878, exhibited at the Paris Salon in 1880 and completed in 188 1. It immediately brought the sculptor widespread fame, which was increased by his statue of Lincoln (unveiled 1887), for Lincoln Park, Chicago. In Springfield, Mass., is his " Deacon Chapin," known as " The Puritan." His figure of " Grief " (also known as " Death " and " The Peace of God ") for the Adams (Mrs Henry Adams) Memorial, in Rock Creek Cemetery, Washington, D.C., has been described as " an idealization complete and absolute, the render- ing of a simple, natural fact — a woman in grief— yet with such deep and embracing comprehension that the individual is magnified into a type." His Shaw Memorial in Boston, a monument to Robert G. Shaw, colonel of a negro regiment in the Civil War, was undertaken in 1884 and completed in 1897; it is a relief in bronze, n ft. by 15, containing many figures of soldiers, led by their young officer on horseback, a female figure in the clouds pointing onward. In 1903 was unveiled his equestrian statue (begun in 1892) to General Sherman, at 59th street and Fifth avenue, New York; preceding the Union commander is a winged figure of " Victory." This work, with others, formed a group at the Paris Exposition of 1900. A bronze copy of his " Amor Caritas " is in the Luxembourg, Paris. Among his other works are relief medallion portraits of Robert Louis Stevenson (in St Giles's Cathedral, Edinburgh) and the French painter Jules Bastien-Lepage; Garfield Memorial, Fairmount Park, Philadelphia; General Logan, Chicago; the Peter Cooper Memorial; and Charles Stewart Parnell in Dublin. Saint-Gaudens was made an officer of the Legion of Honour and corresponding member of the Institute of France. He died at Cornish, N.H., on the 3rd of August 1907. His monument of Phillips Brooks for Boston was left practically completed. Saint-Gaudens is rightly regarded as the greatest sculptor produced by America, and his work had a most powerful influence on art in the United States. In 1877 he married Augusta F. Homer and left a son, Homer Saint-Gaudens. His brother Louis (b. 1854), also a sculptor, assisted Augustus Saint-Gaudens in some of his works.

See Royal Cortissoz, Augustus Saint-Gaudens (1907) ;Lorado Taft, History of American Sculpture (1903), containing two chapters de- voted to Saint-Gaudens ; Kenyon Cox, Old Masters and New (1905) ; C. Lewis Hind, Augustus Saint-Gaudens (1908).

ST GAUDENS, a town of south-western France, capital of an arrondissement in the department of Haute-Garonne, 1 m. from the left bank of the Garonne, 57 m. S.S.W. of Toulouse, on the railway to Tarbes. Pop. (1906), town, 4535; commune, 7120. The church, once collegiate, dates chiefly from the nth and 12th centuries, but the main entrance is in the flamboyant Gothic style. The town has sawing-, oil- and flour-mills, manufactures woollen goods, and is a market for horses, sheep and agricultural produce. St Gaudens derives its name from a martyr of the 5th century, at whose tomb a college of canons was afterwards established. It was important as capital of the Nebouzan, as the residence of the bishops of Comminges and for its cloth industry.

SAINT-GELAIS, MELIN DE (1487-1558), French poet, was born at Angouleme on the 3rd of November 1487. He was the natural son of Octavien de St Gelais (1466-1502), afterwards bishop of Angouleme, himself a poet who had translated the Aeneid into French. Melin, who had studied at Bologna and Padua, had the reputation of being doctor, astrologer and musician as well as poet. He returned to France in 1515, and soon gained favour at the court of Francis I. by his skill in light verse. He was made almoner to the Dauphin, abbot of Reclus in the diocese of Troyes and librarian to the king at Fontaine- bleau. He enjoyed immense popularity until the appearance of Du Bellay's Defense et illustration … in 1549, where St Gelais was not excepted from the scorn poured on contemporary poets. He attempted to ridicule the innovators by reading aloud the Odes of Ronsard with burlesque emphasis before Henry II., when the king's sister, Margaret of Valois, seized the book and read them herself. Ronsard accepted Saint-Gelais's apology for this incident, but Du Bellay satirized the offender in the Poete courtisan. In 1554 he collaborated, perhaps with Francois

Habert (1520-1574?), in a translation of the Sopkomsbe of Trissino which was represented (1554) before Catherine de Medicis at Blois. Saint-Gelais was the champion of the style marotique and the earliest of French sonneteers. He died in 1558 His CEuvres were edited in 1873 (3 vols., Bibl. elzevirienne) by Prosper Blanchemain.

SAINT-GEORGES, GEORGES HENRI VERNOY DE (1790- 1875), French dramatist, was born in Paris on the 7th of November 1799. Saint-Louis ou les deux diners (1823), a vaudeville written in collaboration with Alexandre Tardif, was followed by a series of operas and ballets. In 1829 he became manager of the Opera Comique. Among his more famous libretti are: Le Val d'Andorre (1848) for Halevy, and La Fille du r&giment (1840) for Donizetti. He

wrote some fifty pieces in collaboration with Eugene Scribe, Adolphe de Leuven, or Joseph Mazillier, and a great number in collaboration with other authors. Among his novels may be mentioned Un Manage de prince. Saint-Georges died in Paris on the 23rd of December 1875.

SAINT-GERMAIN, Comte de (c. 1710-c. 1780) called der Wundermann, a celebrated adventurer who by the assertion of his discovery of some extraordinary secrets of nature exercised considerable influence at several European courts. Of his parentage and place of birth nothing is definitely known; the common version is that he was a Portuguese Jew, but various surmises have been made as to his being of royal birth. It was also stated that he obtained his money, of which he had abun- dance, from acting as spy to one of the European courts. But this is hard to maintain. He knew nearly all the European languages, and spoke German, English, Italian, French (with a Piedmontese accent), Portuguese and Spanish. Grimm affirms him to have been the man of the best parts he had ever known. He was a musical composer and a capable violinist. His knowledge of history was comprehensive, and his accomplishments as a chemist, on which be based his reputation, were in many ways real and considerable. He pretended to have a secret for removing flaws from diamonds, and to be able to transmute metals. The most remarkable of his professed discoveries was of a liquid which could prolong life, and by which he asserted he had himself lived 2000 years. After spending some time in Persia, Saint-Germain is mentioned in a letter of Horace Walpole's as being in London about 1743, and as being arrested as a Jacobite spy and released. Walpole says: " He is called an Italian, a Spaniard, a Pole; a somebody that married a great fortune in Mexico and ran away with her jewels to Constantinople; a priest, a fiddler, a vast nobleman." At the court of Louis XV., where he appeared about 1748, he exercised for a time extraordinary influence and was employed on secret missions by Louis XV.; but, having interfered in the dispute between Austria and France, he was compelled in June 1760, on account of the hostility of the duke of Choiseul, to remove to England. He appears to have resided in London for one or two years, but was at St Petersburg in 1762, and is asserted to have played an important part in connexion with the conspiracy against the emperor Peter III. in July of that year, a plot which placed Catherine II. on the Russian throne. He then went to Germany, where, according to the Memoires authentiques of Cagliostro, he was the founder of freemasonry, and initiated Cagliostro into that rite. He was again in Paris from 1770 to 1774, and after frequenting several of the German courts he took up his residence in Schleswig-Holstein, where he and the Landgrave Charles of Hesse pursued together the study of the " secret " sciences.

He died at Schleswig in or about 1780-1785, although he is said to have been seen in Paris in 1789.

Andrew Lang in his Historical Mysteries (1904) discusses the career of Saint-Germain, and cites the various authorities for it. Saint- Germain figures prominently in the correspondence of Grimm and of Voltaire. See also Oettinger, Graf Saint-German (1846); F. Bulau, Geheime Geschichten una rdthselhafte Menschen, Band i. (1850-1860); Lascelles Wraxall, Remarkable Adventures (1863); and U. Birch in the Nineteenth Century (January 1908).

SAINT-GERMAIN, CLAUDE LOUIS, Comte de (1707-1778),

French general, was born on the 15th of April 1707, at the

Chateau of Vertamboz. Educated at Jesuit schools, he intended

I to enter the priesthood, but at the last minute obtained from

Louis XV. an appointment as sub-lieutenant. He left France, according to the gossip of the time, because of a duel; served under the elector palatine; fought for Hungary against the Turks, and on the outbreak of the war of the Austrian Succession (1740) joined the army of the elector of Bavaria (who later became emperor under the name of Charles VII.), displaying such bravery that he was promoted to the grade of lieutenant field-marshal. He left Bavaria on the death of Charles VII., and after brief service under Frederick the Great joined Marshal Saxe in the Netherlands and was created a field-marshal of the French army. He distinguished himself especially at Lawfeld, Rancoux and Maastricht. On the outbreak of the Seven Years' War (1756) he was appointed lieutenant-general, and although he showed greater ability than any of his fellow-commanders and was admired by his soldiers, he fell a victim to court intrigues, professional jealousy and hostile criticism. He resigned his commission in 1760 and accepted an appointment as field-marshal from Frederick V. of Denmark, being charged in 1762 with the reorganization of the Danish army. On the death of Frederick in 1766 he returned to France, bought a small estate in Alsace near Lauterbach, and devoted his time to religion and farming. A financial crisis swept away the funds that he had saved from his Danish service and rendered him dependent on the bounty of the French ministry of war. Saint-Germain was presented at court by the reformers Turgot and Malesherbes, and was ap- pointed minister of war by Louis XVI. on the 25th of October

1775. He sought to lessen the number of officers and to establish order and regularity in the service. His efforts to introduce Prussian discipline in the French army brought on such opposition that he resigned in September 1777. He accepted quarters from the king and a pension of 40,000 livres, and died in his apartment at the arsenal on the 15th of January 1778.

ST GERMAIN-EN-LA YE, a town of northern France, in the department of Seine-et-Oise, 13 m. W.N.W. of Paris by rail. Pop. (1906), town, 14,974; commune, 17,288. Built on a hill on the left bank of the Seine, nearly 300 ft. above the river, and on the edge of a forest 10,000 to 11,000 acres in extent, St Germain has a bracing climate, which makes it a place of summer residence for Parisians. The terrace of St Germain, constructed by A.Lenotre in 1672, is 15 m. long and 100 ft. wide; it was planted with lime trees in 1745 and affords an extensive view over the valley of the Seine as far as Paris and the surrounding hills: it ranks as one of the finest promenades in Europe.

A monastery in honour of St Germain, bishop of Paris, was built in the forest of Laye by King Robert. Louis VI. erected a castle close by. Burned by the English, rebuilt by Louis IX., and again by Charles V., this castle did not reach its full development till the time of Francis I., who may be regarded as the real founder of the building. A new castle was begun by Henry II. and completed by Henry IV. ; it was subsequently demolished, with the exception of the so-called Henry IV. pavilion, where Thiers died in 1877. The old castle has been restored to the state in which it was under Francis I. The restoration is particularly skilful in the case of the chapel, which dates from the first half of the 13th century. In the church of St Germain is a mausoleum erected by George IV. of England (and restored by Queen Victoria) to the memory of James II. of England, who after his deposition resided in the castle for twelve years and died there in 1701. In one of the public squares is a statue of Thiers. At no great distance in the forest is the Couvent des Loges, a branch of the educational establish- ment of the Legion of Honour (St Denis). The fSte des Loges (end of August and beginning of September) is one of the most popular in the neighbourhood of Paris.

ST GERMANS, a small town in the Bodmin parliamentary divi- sion of Cornwall, England, pleasantly situated on the river Lynher, 9 § m. W. by N. of Plymouth by the Great Western railway. Pop. (1901) 2384. It contains a fine church dedicated to St Germanus. The west front is flanked by towers both of which are Norman in the lower parts, the upper part being in the one Early English and in the othei Perpendicular. The front itself is wholly Norman, having three

windows above a porch with a beautiful ornate door- way. Some Norman work remains in the body of the church, but the most part is Perpendicular or Decorated. Port Eliot, a neighbouring mansion, contains an excellent collection of pictures, notably several works of Sir Joshua Reynolds.

St Germans is supposed to have been the original seat of the Cornish bishopric. It was the see of Bishop Burhwold, who died in 1027. Under Leofric, who became bishop of Crediton and Cornwall in 1046, the see was removed to Exeter. Bishop Leofric founded a priory at St Germans and bestowed upon it twelve of the twenty-four hides which in the time of the Confessor constituted the bishops' manor of St Germans. There was then a market on Sundays, but at the time of the Domesday Survey this had been reduced to nothing owing to a market established by the count of Mortain on the same day at Trematon castle. In 1302 the grˆnt of infangenethef, assize of bread and ale, waif and stray by Henry III. was confirmed to the bishop, who in 131 1 obtained a further grant of a market on Fridays and a fair at the feast of St Peter ad Vincula. In 1343 the prior sustained his claim to a prescriptive market and fair at St Germans. After the suppression the borough belonging to the priory remained with the crown until 16 10. Meanwhile Queen Elizabeth created it a parliamentary borough. From 1563 to 1832 it returned two members to the House of Commons. In 1815 John Eliot was created earl of St Germans, and in 1905 the first suffragan bishop of Truro was consecrated bishop of St Germans.

ST GILLES, a town of southern France, in the department of Gard, on the canal from the Rhone to Cette, 12J m. S.S.E. of Nimes by road. Pop. (1906) 5292. In the middle ages St Gilles, the ancient Vallis Flaviana, was the seat of an abbey founded towards the end of the 7th century by St Aegidius (St Gilles). It acquired wealth and power under the counts of Toulouse, who added to their title that of counts of St Gilles. The church, which survives, was founded in n 16 when the abbey was at the height of its prosperity. The lower part of the front (12th century) has three bays decorated with columns and bas-reliefs, and is the richest example of Romanesque art in Provence. The rest of the church is unfinished, only the crypt (1 2th century) and part of the choir, containing a spiral staircase, being of interest. Besides the church there is a Romanesque house serving as presbytery. The decadence of the abbey dates from the early years of the 13th century when the pilgrimage to the tomb of the saint became less popular; the monks also lost the patronage of the counts of Toulouse, owing to the penance inflicted by them on Raymond VI. in 1 209 for the murder of the papal legate Pierre de Castelnau. St Gilles was the seat of the first grand priory of the Knights Hospitallers in Europe (12th century) and

was of special importance as their place of embarka- tion for the East. In 1226 the countship of St Gilles was united to the crown. In 1562 the Protestants ravaged the abbey, which they occupied till 1622, and in 1774 it was suppressed.

ST GIRONS, a town of south-western France, capital of an arrondissement in the department of Ariege, 29 m. W. of Foix by rail. Pop. (1906) 5216. The town is situated on the Salat at the foot of the Pyrenees. There are mineral springs at Audinac in the vicinity, and the watering-place of Aulus, about 20 m. to the S.S.E., is reached by road from St Girons. St Lizier-de- Couserans (g.v.),nn ancient episcopal town, is 1 m. N.N.W.

ST GOAR, a town of Germany, in the Prussian Rhine Province, on the left bank of the Rhine, opposite St Goarshausen and just below the famous Lorelei, 12 m. above Boppard by the railway from Coblenz to Mainz. Pop. (1905) 1475. It is in part sur- rounded by the ruins of its old walls, and contains an Evangelical church, with some Renaissance monuments, and a Roman Catholic church with an image of St Goar of Aquitania, around whose chapel the place originally arose. Below the town, high on an eminence above the Rhine, stands Schloss Rheinfels, the property of the king of Prussia, the most perfect of the feudal castles on the banks of the river. In the later middle ages St Goar was the capital of the county of Katzenelnbogen, and on the extinction of this family it passed to Hesse- Cassel. It came into the possession of Prussia in 181 5.

ST GOTTHARD PASS, the principal route from northern Europe to Italy. It takes its name (it is not known wherefore) from St Gotthard, bishop of Hildesheim (d. 1038), but does not seem to be mentioned before the early 13th century, perhaps because the access to it lies through two very narrow Alpine

valleys, much exposed to avalanches. The hospice on the summit is first mentioned in 1331, and from 1683 onwards was in charge of two Capuchin friars. But in 1775 the buildings near it were damaged by an avalanche, while in 1799-1800 everything was destroyed by the French soldiery. Rebuilt in 1834, the hospice was burnt in March 1905. The mule path (dating from about 1293) across the pass served for many centuries, for though Mr Greville, in 1775, succeeded in taking a light carriage across, the carriage-road was only constructed between 1820 and 1830. Now the pass is deserted in favour of the great tunnel (pierced in 187 2-1880, 91 m. in length, and attaining a

height of 3786 ft.), through which runs the railway (opened in 1882) from Lucerne to Milan (1755 m.), one of the greatest engineering feats of the 19th century. It runs mainly along the eastern shore of the Lake of Lucerne, from Lucerne to Fliielen (32J m.), and then up the Reuss valley past Altdorf and Wassen, near which is the first of the famous spiral tunnels, to Goeschenen (56 m. from Lucerne). Here the line leaves the Reuss valley to pass through the tunnel and so gain, at Airolo, the valley of the Ticino or the Val Leventina, which it descends, through several spiral tunnels, till at Biasca (38 m. from Goeschenen) it reaches more level ground. Thence it runs past Bellinzona to Lugano (305 m. from Biasca) and reaches Italian territory at Chiasso, 35 m. from Milan. In 1909 the Swiss government exercised the right accorded to it by the agreement of 1879 of buying the St Gotthard Railway from the company which built it within thirty years of that date. (W. A. B.C.)

ST HELENA, an island and British possession in the South Atlantic in 15 55′ 26″ S., 5° 42′ 30″ W. (Ladder Hill Observatory). It lies 700 m. S.E. of the island of Ascension (the nearest land), 1200 m. W. of Mossamedes (the nearest African port), 1695 N.W. of Cape Town, and is distant from Southampton 4477 m. It has an area of about 47 sq. m., the extreme length from S.W. to N.E. being ioj m. and the extreme breadth 8J. The island is of volcanic formation, but greatly changed by oceanic abrasion and atmospheric denudation. Its principal feature, a semi- circular ridge of mountains, open towards the south-east and south, with the culminating summit of Diana's Peak (2704 ft.) is the northern rim of a great crater; the southern rim has disappeared, though its debris apparently keeps the sea shallow (from 20 to 50 fathoms) for some 2 m. S.E. of Sandy Bay, which hypothetically forms the centre of the ring. From the crater wall outwards water-cut gorges stretch in all directions, widening as they approach the sea into valleys, some of which are 1000 ft. deep, and measure one-eighth of a mile across at bottom and three-eighths across the top (Melliss). These valleys contain small streams, but the island has no rivers properly so called. Springs of pure water are, however, abundant. Along the enclosing hillsides caves have been formed by the washing out of the softer rocks. Basalts, andesites and phonolites, represent the chief flows. Many dikes and masses of basaltic rock seem to have been injected subsequently to the last volcanic eruptions from the central crater. The Ass's Ears and Lot's Wife, picturesque pinnacles standing out on the S.E. part of the crater ridge, and the Chimney on the coast south of Sandy Bay, are formed out of such injected dikes and masses. In the neighbourhood of Man and Horse (S.W. corner of the island), throughout an area of about -40 acres, scarcely 50 sq. yds. exist not

crossed by a dyke. On the leeward (northern) side of St Helena the sea-face is generally formed by cliffs from 600 to 1000 ft. high, and on the windward side these heights rise to about 2000 ft., as at Holdfast Tom, Stone Top and Oid Joan Point. The only practicable landing-place is on the leeward side at St James's Bay — an open roadstead. From the head of the bay a narrow valley extends for ij m. The greatest extent of level ground is in the N.E. of the island, where are the Deadwood and Long- wood plains, over 1700 ft. above the sea.

Climate. — Although it lies within the tropics the climate of the island is healthy and temperate. This is due to the south-east trade- wind, constant throughout the year, and to the effect of the cold waters of the South Atlantic current. As a result the tempera- ture varies little, ranging on the sea level from 68° to 84° in summer and 57° to 70° in winter. The higher regions are about 10 cooler. The

rainfall varies considerably, being from 30 to 50 in. a year in the hills.

Flora. — St Helena is divided into three vegetation zones: (1) the coast zone, extending inland for I m. to if m., formerly clothed with a luxuriant vegetation, but now " dry, barren, soilless, lichen- coated, and rocky," with little save prickly pears, wire grass and Mesembryanthemum; (2) the middle zone (400-1800 ft.), extending about three-quarters of a mile inland, with shallower valleys and grassier slopes — the English broom and gorse, brambles, willows, poplars, Scotch pines, &c, being the prevailing forms; and (3) the central zone, about 3 m. long and 2 m. wide, the home, for the most part, of the indigenous flora. According to W. B. Hemsley (in his report on the botany of the Atlantic Islands), 1 the certainly in- digenous species of plants are 65, the probably indigenous 24 and the doubtfully indigenous 5 ; total 94. Of the 38 flowering plants 20 are shrubs or small trees. With the exception of Scirpus nodosus, all the 38 are peculiar to the island; and the same is true of 12 of the 27 vascular cryptogams (a remarkable proportion). Since the flora began to be studied, two species — Melhania melanoxylon and Acalypha rubra — are known to have become extinct; and at least two others have probably shared the same fate — Heliotropium pennifolium and Demazeria obliterata. Melhania melanoxylon, or " native ebony," once abounded in parts of the island now barren; but the young trees were allowed to be destroyed by the goats of the early settlers, and it is now extinct. Its beautiful congener Melhania erythroxylon (" redwood ") was still tolerably plentiful in 1810, but is now reduced to a few specimens. Very rare, too, has become Pelargonium cotyledonis, called " Old Father Live-for-ever," from its retaining vitality for months without soil or water. Commi- dendron robustum (" gumwood "), a

tree about 20 ft. high, once the most abundant in the island, was represented in 1868 by about 1300 or 1400 examples; and Commidendron rugosum (" scrubwood ") is. confined to somewhat limited regions. Both these plants are char- acterized by a daisy- or aster-like blossom. The affinities of the indigenous flora of St Helena were described by Sir Joseph Hooker as African, but George Bentham points out that the Compositae shows, at least in its older forms, a connexion rather with South America. The exotic flora introduced from all parts of the world gives the island almost the aspect of a botanic garden. The oak, thoroughly naturalized, grows alongside of the bamboo and banana. Among other trees and plants are the common English gorse ; Rubus pinnatus, probably introduced from Africa about 1775; Hypochaeris radicata, which above 1500 ft. forms the dandelion of the country; the beautiful but aggressive Buddleia Madagascariensis ; Physalis peru- viana; the common castor-oil plant; and the pride of India. The peepul is the principal shade tree in Jamestown, and in Jamestown valley the date-palm grows freely. Orange and lemon trees, once common, are now scarce.

Fauna. — St Helena possesses no indigenous vertebrate land fauna. The only land groups well represented are the beetles and the land shells. T. V. Wollaston, in Coleoptera Sanctae Helenae (1877), shows that out of a total list of 203 species of beetles 129 are probably aboriginal and 128 peculiar to the island — an individuality perhaps unequalled in the world. More than two-thirds are weevils and a vast majority wood-borers, a fact which bears out the tradition of forests having once covered the island. The Hemiptera and the land-shells also show a strong residuum ofpeculiar genera and species. A South American white ant (Termes tenuis, Hagen.), introduced from a slave-ship in 1840, soon became a plague at Jamestown, where it consumed a large part of the public library and the woodwork of many buildings, public and private. Practically everything had to be rebuilt with teak or cypress — the only woods the white ant cannot devour. Fortunately it cannot live in the higher parts of the island. The honey-bee, which throve for some time after its introduction, again died out (cf. A. R. Wa.iace,' Island Life, 1880). Besides domestic animals the only land mammals are rabbits, rats and mice, the rats being especially abundant and building their_ nests in the highest trees. Probably the only endemic land bird is the wire bird, Aegialitis sanctae Helenae; the averdevat, Java sparrow, cardinal, ground-dove, partridge (possibly the Indian chukar), pheasant and guinea-fowl are all common. The pea-fowl, at one time not uncommon in a wild state, is long since exterminated. There are no freshwater fish, beetles or shells. Of sixty-five species of sea-fish caught off the island seventeen

are peculiar to St Helena; economically the more important kinds are gurnard.eel, cod, mackerel, tunny, bullseye, cavalley, flounder, hog-fish, mullet and skulpin.

Inhabitants. — When discovered the island was uninhabited. The majority of the population are of mixed European (British, Dutch, Portuguese), East Indian and African descent— the Asiatic strain perhaps predominating; the majority of the early settlers having been previously members of the crews of ships returning to Europe from the East. From 1840 onward for a considerable period numbers of freed slaves of West African origin were settled here by men-of-war engaged in suppressing the slave trade. Their descendants form a distinct element

1 In the “Challenger” expedition reports, Botany, vol. i. (1885).

in the population. Since the substitution of steamships for ‘ sailing vessels and the introduction of new methods of preserving meat and vegetables (which made it unnecessary for sailing vessels to take fresh provisions from St Helena to avoid scurvy) the population has greatly diminished. In 1871 there were 6444 inhabitants; in 1909 the civil population was estimated at 3553. The death-rate that year, 6-4 per 1000, was the lowest on record in the island. The only town, in which live more than half the total population, is Jamestown. Longwood, where Napoleon died in 1821, is 3ˆ m. E. by S. of Jamestown. In 1858 the house in which he lived and died was presented by Queen Victoria to Napoleon III., who had it restored to the con- dition, but unfurnished, in which it was at the time of Bona- parte’s death.

Agriculture, Industries, &fc. — Less than a third of the area of the island is suitable for farming, while much of the area which might be (and formerly was) devoted to raising crops is under grass. The principal crop is potatoes, which are of very good quality. They were chiefly sold to ships — especially to ” passing ” ships. They are now occasionally exported to the Cape. Cattle and sheep were raised in large numbers when a garrison was maintained, so that difficulty has been found in disposing of surplus stock now that the troops have been withdrawn. The economic conditions which formerly prevailed were entirely altered by the substitution of steamers for sailing vessels, which caused a great decrease in the number’ of ships calling at Jamestown. A remedy was sought in the establishment of

industries. An attempt made in 1860-1872 to cultivate cinchona proved unsuccessful. Attention was also turned to the aloe (Furcraea gigantea), which grows wild at mid elevations, and the New Zealand flax (Phormium tenax), an intro- duced plant, for their utilization in the manufacture of fibre. From 1875 to 1 88 1 a company ran a mill at which they turned out both aloe and flax fibre, but the enterprise proved unremunerative. In 1907 the government, aided by a grant of £4070 from the imperial exchequer, started a mill at Longwood for the manufacture of phormium fibre, with encouraging results. Fish curing and lace making are also carried on to some extent.

Trade is chiefly dependent upon the few ships that call at James- town — now mostly whalers or vessels in distress. There is also some trade with ships that ” pass ” without ” calling.” 1 In thirty years (1877-1907) the number of ships ” calling ” at the port sank from 664 with 449,724 tonnage to 57 with 149,182 tonnage. In the last- named year the imports were valued at £35,614; the exports (ex- cluding specie) at £1787 — but the goods supplied to ” passing ” vessels do not figure in these returns. In 1908 fibre and tow (valued at £3557) were added to the exports, and in 1909 a good trade was done with Ascension in sheep. St Helena is in direct telegraphic communication with Europe and South Africa, and there is a regular monthly mail steamship service.

Government, Revenue, &c. — St Helena is a Crown colony. The island has never had any form of local legislative chamber, but the governor (who also acts as chief justice) is aided by an executive council. The governor alone makes laws, called ordinances, but legislation can also be effected by the Crown by order in council. The revenue, £10,287 in 1905, had fallen in 1909 to £8778 (including a grant in aid of £2500), the expenditure in each of the five years (1 905-1 909) being in excess of the revenue. Elementary education is provided in government and private schools. St Helena is the seat of an Anglican bishopric established in 1859. Ascension and Tristan da Cunha are included in the diocese.

History. — The island was discovered on the 21st of May 1502 by the Portuguese navigator Joao de Nova, on his voyage home from India, and by him named St Helena. The Portuguese found it uninhabited, imported live stock, fruit- trees and vegetables, built a chapel and one or two houses, and left their sick there to be taken home, if recovered, by the next ship, but they formed no permanent settlement. Its first known permanent resident was Fernando Lopez, a Portuguese in India, who had turned traitor and had been mutilated by order of Albuquerque. He preferred being marooned to returning to Portugal in

his maimed condition, and was landed at St Helena in 1 5 13 with three or four negro slaves. By royal command he visited Portugal some time later, but returned to St Helena, where he died in 1546. In 1584 two Japanese ambassadors to Rome landed at the island. The first Englishman known to have visited it was Thomas Cavendish, who touched there in June 1 588 during his voyage round the world. Another English

1 ” Calling ” ships are those which have been boarded by the harbour master and given pratique. Since 1886 boatmen are allowed to communicate with ships that have not obtained pratique, and these are known as ” passing ” ships.

seaman, Captain Kendall, visited St Helena in 159 1, and in 1593 Sir James Lancaster stopped at the island on his way home from the East. In 1603 the same commander again visited St Helena on his return from the first voyage equipped by the East India Company. The Portuguese had by this time given up calling at the island, which appears to have been occupied by the Dutch about 1645. The Dutch occupation was temporary and ceased in. 1651, the year before they founded Cape Town. The British East India Company appropriated the island immediately after the departure of the Dutch, and they were confirmed in possession by a clause in their charter of 166 1. The company built a fort (1658), named after the duke of York (James II.), and established a garrison in the island. In 1673 the Dutch succeeded in obtaining possession, but were ejected after a few months' occupation. Since that date St Helena has been in the undisturbed possession of Great Britain, though in 1706 two ships anchored off James- town were carried off by the French. In 1673 the Dutch had been expelled by the forces of the Crown, but by a new charter granted in December of the same year the East India Company were declared “the true and absolute lords and proprietors” of the island. At this time the inhabitants numbered about 1000, of whom nearly half were negro slaves. In 1810 the company began the importation of Chinese from their factory at Canton. During the company's rule the island prospered, thousands of homeward-bound vessels anchored in the road- stead in a year, staying for considerable periods, refitting and revictualling. Large sums of money were thus expended in the island, where wealthy merchants and officials had their resi- dence. The plantations were worked by the slaves, who were subjected to very barbarous laws until 1792, when a new code of regulations ensured their humane treatment and prohibited the importation of any new slaves. Later it was enacted that all children of slaves born on or after Christmas Day 181 8 should be free, and between 1826 and 1836 all slaves were set at liberty.

Among the governors appointed by the company to rule at St Helena was one of the Huguenot refugees, Captain Stephen Poirier (1697-1707), who attempted unsuccessfully to introduce the cultivation of the vine. A later governor (1 741-1742) was Robert Jenkin (q.v.) of ” Jenkin’s ear ” fame. Dampier visited the island twice, in 1691 and 1701; Halley’s Mount commemor- ates the visit paid by the astronomer Edmund Halley in 1676- r678 — the first of a number of scientific men who have pursued their studies on the island.

In 1815 the British government selected St Helena as the place of detention of Napoleon Bonaparte. He was brought to the island in October of that year and lodged at Longwood, where he died in May 1821. During this period the island was strongly garrisoned by regular troops, and the governor, Sir Hudson Lowe, was nominated by the Crown. After Napoleon’s death the East India Company resumed full control of St Helena until the 22nd of April 1834, on which date it was in virtue of an act passed in 1833 vested in the Crown. As a port of call the island continued to enjoy a fair measure of prosperity until about 1870. Since that date the great decrease in the number of vessels visiting Jamestown has deprived the islanders of their principal means of subsistence. When steamers began to be substituted for sailing vessels and when the Suez Canal was opened (in 1869) fewer ships passed the island, while of those that still pass the greater number are so well found that it is unnecessary for them to call (see also § Inhabitants). The with- drawal in 1906 of the small garrison, hitherto maintained by the imperial government, was another cause of depression. During the Anglo-Boer war of 1899-1902 some thousands of Boer prisoners were detained at St Helena, which has also served as the place of exile of several Zulu chiefs, including Dinizulu.

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(London, 1816) ; Extracts from the St Helena Records from 1673 to 18$$ (compiled by H. R. Janisch, sometime governor of the island, James- town, 1885); Charles Darwin, Geological Observations on Volcanic Islands (1844). For a condensed general account consult (Sir)

C. P. Lucas, Historical Geography of the British Colonies (vol. Hi., West Africa, 2nd ed., Oxford, 1900). See also M. Danvers, Report on the Records of the India Office, vol. i. pt. i. (London, 1887); The Africa Pilot, pt. ii. (5th ed., 1901) ; Report on the Present Position and Prospects of the Agricultural Resources of the Island of St Helena, by (Sir) D. Morris (1884; reprinted 1906). (R. L. A.; F. R. C.)

ST HELENS, a market town and municipal, county, and parliamentary borough of Lancashire, England, 14 m. E.N.E. from Liverpool, on the London & North- Western and Great Central railways. Pop. (1891) 72,413; (1901) 84,410. A canal com- municates with the Mersey. The town is wholly of modern development. Besides the town hall and other public buildings and institutions there may be mentioned the Gamble Institute, erected and presented by Sir David Gamble, Bart., for a technical school, educating some 2000 students, and library. Among several public pleasure grounds the principal are the Taylor Park of 48 acres, and the smaller Victoria and Thatto Heath Parks. This is the principal seat in England for the manufacture of crown, plate, and sheet glass; there are also art glass works, and extensive copper smelting and refining works, as well as chemical works, iron and brass foundries, potteries and patent medicine works. There are collieries in the neighbourhood. To the north of the town are a few ecclesiastical ruins, known as Windleshaw Abbey, together with a well called St Thomas' well, but the history of the foundation is not known. The parliamentary borough (1885) returns one member. The county borough was created in 1888. The town was incorporated in 1868, and the corporation consists of a mayor, 9 aldermen and 27 councillors. Area 7285 acres.

ST HELIER, the chief town of Jersey, the largest of the Channel Islands. Pop. (1901) 27,866. It lies on the south coast of the island on the eastern side of St Aubin's Bay. The harbour is flanked on the W. by a rocky ridge on which stands Elizabeth Castle, and commanded on the east by Fort Regent on its lofty promontory. The parish church is a cruciform building with embattled tower, dating in part from the 14th century. It contains a monument to Major Peirson, who on the occasion of a French attack on Jersey in 1781 headed the militia to oppose them, and forced them to surrender, but was killed as his followers were at the point of victory. The French leader, Baron de Rullecourt, is buried in the churchyard. The spot where Peirson fell, in what is now called Peirson Place, is marked by a tablet. A large canvas by John Singleton Copley depicting the scene is in the National Gallery, London, and a copy is in the court house of St Helier. This building (la Cohue), in Royal Square, is the meeting-place of the royal court and deliberative States of Jersey. Victoria College was opened in

1852 and commemorates a visit of Queen Victoria and the prince consort to the island in 1846. A house in Marine Terrace is distinguished as the residence of Victor Hugo (1851- 1855). Elizabeth Castle, which is connected with the main- land by a causeway, dates from 1551-1590; and in 1646 and 1649 Prince Charles resided here. In 1649 he was pro- claimed king, as Charles II., in Jersey by the royalist governor George Carteret. On actually coming to the throne he gave the island the mace which is still used at the meetings of the court and States. Close to the castle are remnants of a chapel or cell, from which the rock on which it stands is known as the Hermitage, dating probably from the 9th or 10th century, and traditionally connected with the patron saint Helerius.

SAINT-HILAIRE, AUGUSTIN FRANgOIS CESAR PROU- VEN$AL DE, commonly known as Atjguste de (1799-1853), French botanist and traveller, was born at Orleans on the 4th of October 1799. He began to publish memoirs on botanical subjects at an early age. In 1816-1822 and in 1830 he travelled in South America, especially in south and central Brazil, and the results of his study of the rich flora of the regions through which he passed appeared in several books and numerous articles in scientific journals. The works by which he is best known are

the Flora Brasiliae Meridionaiis (3 vols., folio, with 192 coloured plates, 1825-1832), published in conjunction with A. de Jussieti.' and J. Cambessedes, Histoire des plantes les plus remarquables du Brisil et de Paraguay (1 vol. 4to, 30 plates, 1824), Plantes usuelles des Bresiliens (1 vol. 4to, 70 plates, 1827-1828), also in con- junction with De Jussieu and Cambessedes, and Voyage dans le district des diamants etsur le littoral du Bresil (2vols., 8vo, 1833). His Lecons de botanique, comprenant principalement la morphologie vtgitale (1840), was a comprehensive exposition of botanical morphology and of its application to systematic botany. He died at Orleans on the 30th of September 1853.

ST HUBERT, a small town of Belgium in the province of Luxemburg and in the heart of the Ardennes. Pop. (1904) 3204. It is famous for its abbey church containing the shrine of St Hubert, and for its annual pilgrimage. According to tradition the church and a monastery attached to it were founded in the 7th century by Plectrude, wife of Pippin of Herstal. The second church was built in the 12th century, but burnt by a French army under Conde in the 16th century. The present building is its successor, but has been restored in modern times and presents no special feature. The tomb of St Hubert— a marble sarcophagus ornamented with bas-reliefs and having four

statuettes of other saints at the angles — stands in one of the side chapels. The legend of the conversion of St Hubert — a hunter before he was a saint — by his meeting in the forest a stag with a crucifix between its antlers, is well known, and explains how he became the patron saint of huntsmen. The place where he is supposed to have met the stag is still known as ” la converserie ” and is almost 5 m. from St Hubert on the road to La Roche. The pilgrimage of St Hubert in May attracts annually between thirty and fifty thousand pilgrims. The buildings of the old monastery have been utilized for a state training-school for waifs and strays, which contains on an average five hundred pupils. In the middle ages the abbey of St Hubert was one of the most important in Europe, owning forty villages with an annual income of over 80,000 crowns. During the French Revolution, when Belgium was divided into several departments, the possessions of the abbey were sold for £75,000, but the bishop of Namur was permitted to buy the church itself for £1350.

ST HYACINTHE, a city and port of entry of Quebec, Canada, and capital of St Hyacinthe county, 32 m. E.N.E. of Montreal, on the left bank of the river Yamaska and on the Grand Trunk, Canadian Pacific, Intercolonial, and Quebec Southern railways. Pop. (1901) 9210. It is the seat of a Roman Catholic bishop, and contains a classical college, dairy school, two monasteries and several other educational and charitable institutions. It has manufactures of organs, leather, woollens and agricultural implements, and is an important distributing centre for the surrounding district.

SAINTINE, JOSEPH XAVIER (1798-1865), French novelist and dramatist, whose real surname was Boniface, was born in Paris on the 10th of July 1798. In 1823 he produced a volume of poetry in the manner of the Romanticists, entitled Poemes, odes, ipitres. In 1836 appeared Picciola, the story of the comte de Charney, a political prisoner in Piedmont, whose reason was saved by his cult of a tiny flower growing between the paving stones of his prison yard. This story is a masterpiece of the sentimental kind, and has been translated into many European languages. He produced many other novels, none of striking individuality with the exception of Seul (1857), which purported to be the authentic record of Alexander Selkirk on his desert island. Saintine was a prolific dramatist, and collaborated in some hundred pieces with Scribe and others, usually under the name of Xavier. He died on the 21st of January 1865.

ST INGBERT, a town of Germany, in the kingdom of Bavaria on the Rohrbach, 14 m. by rail W. of Zweibriicken. Pop. (1905) 15,521. It has coal-mines and manufactures of glass and machinery. There are

also large iron and steel works in the town, and other industries are the making of powder, leather, cigars, soap and cotton. St Ingbert is named after the Irish saint, St Ingobert, and belonged for 300 years to the electorate of Trier.

ST IVES, a market town, municipal borough and seaport in the St Ives parliamentary division of Cornwall, England, 10 m. N.N.E. of Penzance, on a branch of the Great Western railway. Pop. (1901) 6699. It lies near the W. horn of St Ives Bay on the N. coast. The older streets near the harbour are narrow and irregular, but on the upper slopes there are modern terraces with good houses. The small harbour, protected by a breakwater, originally built by John Smeaton in 1767, has suffered from the accumulation of sand, and at the lowest tides is dry. The fisheries for pilchard, herring and mackerel are important. Boat-building and sail-making are carried on. An eminence south of the town is marked by a granite monument erected in 1782 by John Knill, a native of the town, who intended to be buried here; to maintain a quinquennial celebration on the spot he bequeathed property to the town authorities. The borough is under a mayor, 4 aldermen and 12 councillors. Area, 1890 acres. The town takes name from St Hya, or la, an Irish virgin and martyr, who is said to have accompanied St Piran on his missionary journey to Cornwall in the 5th century, and to have landed near this place. The Patent Rolls disclose an almost continuous series of trials for piracy and plunder by St Ives sailors from the beginning of the 14th to the end of the 16th century. A mere chapelry of Lelant and the less important member of the distant manor of Ludgvan Leaze, which in Domesday Book appears as Luduam, it had no fostering hand to minister to its growth. In order to augment the influence of the Tudors in the House of Commons, Philip and Mary in 1558 invested it with the privilege of returning 2 members. Its affairs were at that time administered by a headwarden, who after 1598 appears under the name of portreeve, 12 chief burgesses and 24 ordinary burgesses. The portreeve was elected by the 24; the 12 by the chief inhabitants. This body had control over the fishing, the harbour and harbour dues, the fabric of the church, sanitation and the poor. In 1639 a charter of incorpora- tion was granted under which the portreeve became mayor, the 12 became aldermen, and the 24 were styled burgesses. Pro- vision was made for four fairs and for markets on Wednesdays and Saturdays, also for a grammar school. This charter was ■surrendered to Charles II. and a new one granted in 1685, the latter reducing the number of aldermen

to 10 and of burgesses also to 10. It ratified the parliamentary franchise and the fairs and markets, and provided a court of pie-powder; it also con- tained a clause safeguarding the rights of the marquess of Winchester, lord of the manor of Ludgvan Leaze and Porthia. In 1835 a mayor, 4 aldermen and 12 councillors were invested with the administration of the borough. In 1832 St Ives lost one of its members, and in 1885 the other. Both markets are now held, but only one of the fairs. This takes place on the Saturday nearest St Andrew's day.

ST IVES, a market town and municipal borough in the northern parliamentary division of Huntingdonshire, England, mainly on the left (north) bank of the Ouse, 5 m. E. of Huntingdon by the Great Eastern railway. Pop. (1901) 2910. The river is crossed by an old bridge said to have been built by the abbots of Ramsey early in the 15th century. A building over the centre pier of the bridge was once 'used as a chapel. The causeway (1827) on the south side of the river is built on arches so as to assist the flow of the river in time of flood. The church of All Saints is Perpendicular, with earlier portions. A curious custom is practised annually in this church in connexion with a bequest made by a certain Dr Robert Wilde in 1678: it is the distribution of Bibles to six boys and six girls of the town. The original provision was that the Bibles should be cast for by dice on the Communion table. Oliver Cromwell was a resident in St Ives in 1634-1635, but the house which he inhabited — Slepe Hall — was demolished in the middle of the 19th century. St Ives has a considerable agricultural trade. It is governed by a mayor, 4 aldermen and 12 councillors. Area 2326 acres.

The manor of " Slepe " is said to have been given by jEthelstan " Mannessune " to the abbot of Ramsey and confirmed to him by King Edgar. It owed its change of name to the supposed discovery of the grave of St Ive, a Persian bishop, in 1001,

and a priory was founded in the same year by Abbot Ednoth as a cell to Ramsey. St Ives was chiefly noted for its fair, which was first granted to the abbot of Ramsey by Henry I. to be held on Monday in Easter week and eight days following. In the reign of Henry III. merchants from Flanders came to the fair, which had become so important that the king granted it to be continued beyond the eight days if the abbot agreed to pay a farm of £50 yearly for the extra days. The fair, with a market on Monday granted to the abbot in 1286, survives, and was purchased in 1874 by the corporation from the duke of Manchester. The town was incorporated in 1874.

ST JEAN-D'ANG£LY, a town of western France, capital of an arrondissement in the department of Charente-Inferieure, 33 m. E. of Rochefort by rail. Pop. (1006) 6242. St Jean lies on the right bank of the Boutonne, which is navigable for small vessels. The parish church of St Jean stands on the site of an abbey church of the 13th century, of which some remains are left. In 1568 the monastery was destroyed by the Huguenots, but much of it was rebuilt in the 17th and 18th centuries, to which period belong two towers and the facade of an unfinished church.

St Jean owes the suffix of its name to the neighbouring forest of Ang6ry (Angeriacum) . Pippin I. of Aquitaine in the 9th century established there a Benedictine monastery which was afterwards reputed to possess the head of John the Baptist. This relic attracted hosts of pilgrims; a town grew up, took the name of St Jean d'Angeri, afterwards d'Ang&y, was fortified in 1131, and in 1204 received a charter from Philip Augustus. The possession of the place was disputed between French and English in the Hundred Years' War, and between Catholics and Protestants at a later date. In 1569 it capitulated to the duke of Anjou (afterwards Henry III.). Louis XIII. again took it from the Protestants in 1621 and deprived it of its privileges and its very name, which he changed to Bourg-Louis.

ST JEAN-DE-LUZ, a coast town of south-western France, in the department of Basses-Pyrenees, at the mouth of the Nivelkj 14 m. S.W. of Bayonne on a branch of the Southern railway. Pop. (1906) 3424. St Jean-de-Luz is situated in the Basque country on the bay of St Jean-de-Luz, the entrance to which is protected by breakwaters and moles. It has a 13th- century church, the chief features of which are the galleries in the nave, which, according to the Basque custom, are reserved for men. The Maison Lohobiague, the Maison de l'lnfante (both 17th cent.), and the hotel de ville (1657) are picturesque old buildings. St Jean is well known for its bathing and as a winter resort. Fishing is a considerable industry.

From the 14th to the 17th century St Jean-de-Luz enjoyed a prosperity due to its mariners and fishermen. Its vessels were the first to set out for Newfoundland in 1520. In 1558, owing to the depredations of its privateers, the Spaniards attacked and burned the town. In 1627, however, it was able to equip 80 vessels, which succeeded in saving the island of R6 from the duke of Buckingham. In 1660 the treaty of the Pyrenees was signed at St Jean-de-Luz, and was followed by the marriage there of the Infanta Maria Theresa and Louis XIV. At that time the population numbered 15,000. The cession of Newfoundland to England in 1713, the loss of Canada, and the silting-up of the

harbour were the three causes which contri- buted to the decline of the town.

ST JOHN, CHARLES WILLIAM GEORGE (1800-1856), English naturalist and sportsman, son of General the Hon. Frederick St John, second son of Frederick, second Viscount Bolingbroke, was born on the 3rd of December 1809. He was educated at Midhurst, Sussex, and about 1828 obtained a clerk- ship in the treasury, but resigned in 1834, in which year he married a lady with some fortune. He ultimately settled in the ” Laigh ” of Moray, ” within easy distance of mountain sport.” In 1853 a paralytic seizure deprived him of the use of his limbs, and for the benefit of his health he removed to the south of England. He died at Woolston, near Southampton, on the 22nd of July 1856. His works are Wild Sports and Natural History of the Highlands (1846, 2nd ed. 1848, 3rd ed. 1861); Tour in Sutherland (1849, 2nd ed., with recollections by Captain H. St John, 1884); Notes of Natural History and Sport in Morayshire, with Memoir by C. Innes (1863, 2nd ed. 1884). They are written in a graphic style, and illustrated with engravings, many of them from clever pen-and-ink sketches of his own.

ST JOHN, JAMES AUGUSTUS (1801-1875), British author and traveller, was born in Carmarthenshire, Wales, on the 24tl

of September 1801. He received private instruction in the classics, and also acquired proficiency in French, Italian, Spanish, Arabic and Persian. He obtained a connexion with a Plymouth newspaper, and when, in 1824, James Silk Buckingham started the Oriental Herald, St John became assistant editor. In 1827, together with D. L. Richardson, he founded the London Weekly Review, subsequently purchased by Colburn and transformed into the Court Journal. He lived for some years on the Continent and went in 1832 to Egypt and Nubia, travelling mostly on foot. The results of his journey were published under the titles Egypt and Mohammed Alt, or Travels in the Valley of the Nile (2 vols., 1834), Egypt and Nubia (1844), and I sis, an Egyptian Pilgrimage (2 vols., 1853). On his return he settled in London, and for many years wrote political ” leaders ” for the Daily Telegraph. In 1868 he published a Life of Sir Walter Raleigh, based on researches in the archives at Madrid and elsewhere. He died in London on the 22nd of September 1875.

Besides the works mentioned St John was also the author of Journal of a Residence in Normandy (1830) ; Lives of Celebrated Travellers (1830); Anatomy of Society (1831); History, Manners and Customs of the Hindus (1831); Margaret Ravenscroft, or Second Love (3 vols., 1835); The Hellenes, or Manners and Customs of Ancient Greece (1842); Sir Cosmo Digby, a novel (1844); There and Back Again in Search of Beauty (1853); The Nemesis of Power (1854); Philosophy at the Foot of the Cross (1854); The Preaching of Christ (1855) ; The Ring and the Veil, a novel (1856) ; Life of Louis Napoleon (1857); History of the Four Conquests of England (1862); and Weighed in the Balance, a novel (1864). He also edited, with notes, various English classics.

Of his four sons, all journalists and authors of some literary distinction — Percy Bolingbroke (1821-1889), Bayle, Spenser and Horace Roscoe (1 832-1 888) — the second, Bayle St John (1822- 1869), began contributing to the periodicals when only thirteen. When twenty he wrote a series of papers for Fraser under the title ” De re vehiculari, or a Comic History of Chariots.” To the same magazine he contributed a series of essays on Montaigne, and published in 1857 Montaigne the Essayist, a Biography, in 4 volumes. During a residence of two years in Egypt he wrote The Libyan Desert (1849). While in Egypt he learnt Arabic and’visited the oasis of Siwa. On his return he settled for some time in Paris and published Two Years in a Levantine Family (1850) and Views in the Oasis of Siwah (1850). After a second visit to the East he published Village Life in Egypt (1852); Purple Tints of Paris: Characters and Manners in the New Empire (1854); The Louvre, or Biography of a Museum (1855); the Subalpine Kingdom, or Experiences ana Studies in Savoy (1856); Travels of an Arab Merchant in the Soudan (1854); Maretimo, a Story of Adventure (1856); and Memoirs of the Duke of Saint-Simon in the Reign of Louis XIV. (4 vols., 1857).

ST JOHN, OLIVER (c. 1598-1673), English statesman and judge, was the son of Oliver St John. There were two branches of the ancient family to which he belonged, namely, the St Johns of Bletso in Bedfordshire, and the St Johns of Lydiard Tregoze in Wiltshire, both descendants of the St Johns of Staunton St John in Oxfordshire. Oliver St John was a member of the senior branch, being great-grandson of Oliver St John, who was created Baron St John of Bletso 1 in 1559, and a distant cousin of the 4th baron who was created earl of Bolingbroke in 1624, and who took an active part on the parliamentary side of the Civil W T ar, being killed at the battle of Edgehill. Oliver was educated at Queens’ College, Cambridge, and was called to the bar in 1626. He appears to have got into trouble with the

court in connexion with a seditious publication, and to have associated himself with the future popular leaders John Pym and Lord Saye. In 1638 he defended Hampden on his refusal to pay Ship Money, on which occasion he made a notable speech. In the same year he married, as his second wife, Elizabeth Cromwell, a cousin of Oliver Cromwell, to whom his first wife also had been distantly related. The marriage led to an intimate friendship with Cromwell. St John was member for Totnes in both the Short and the Long Parliament, where he acted in close alliance with Hampden and Pym, especially in opposition to the impost of Ship Money (q.v.). In 1641, with a view of securing his support, the king appointed St John solicitor-general. None the less he

1 This title is still held by the family lineally descended from the 1st baron, said by J. H. Round to be the only peerage family descended in the male line from an ancestor living in the time of Domesday Book.

took an active part in promoting the impeachment of Strafford and in preparing the bills brought forward by the popular party in the Commons, and was dismissed from office in 1643. On the outbreak of the Civil War, he became recognized as one of the parliamentary leaders. In the quarrel between the parliament and the army in 1647 he sided with the latter, and throughout this period he enjoyed Cromwell's entire confidence.

In 1648 St John was appointed chief justice of the common pleas; and from this time he devoted himself mainly to his judicial duties. He refused to act as one of the commissioners for the trial of Charles. He had no hand in Pride's Purge, nor in the constitution of the Commonwealth. In 1651 he went to the Hague as one of the envoys to negotiate a union between England and Holland, a mission in which he entirely failed; but in the same year he successfully conducted a similar negotia- tion with Scotland. After the Restoration he published an account of his past conduct (The Case of Oliver St John, 1660), and this apologia enabled him to escape any more severe vengeance than exclusion from public office. He retired to his country house in Northamptonshire till 1662, when he went to live abroad. He died on the 31st of December 1673.

By his first wife St John had two sons and two daughters. His daughter Johanna married Sir Walter St John of Lydiard Tregoze and was the grandmother of Viscount Bolingbroke. By his second wife he had two children, and after her death he married, in 1645, Elizabeth, daughter of Daniel Oxenbridge.

See the above-mentioned Case of Oliver St John (London, 1660), and St John's Speech to the Lords, Jan. 7th, 1640, concerning Ship- money (London, 1640). See also Mark Noble, Memoirs of the Pro- tectoral House of Cromwell, vol. ii. (2 vols., London, 1787) ; Anthony a

Wood, Fasti OxonienSis, edited by P. Bliss (4 vols., London, 1813); Edward Foss, The Judges of England, vol.vi. (9 vols., London, 1848); S. R. Gardiner, History of the Great Civil War (3 vols., London, 1886-

1891), and History of the Commonwealth and Protectorate (3 vols., London, 1894-1901); Lord Clarendon, History of the Rebellion and Civil Wars in England (7 vols., Oxford, 1839) ; Thurloe State Papers (7 vols., London, 1742) ; Edmund Ludlow, Memoirs, edited by C. H. Firth (2 vols., Oxford, 1894); Thomas Carlyle, Oliver Cromwell's Letters and Speeches; C. H. Firth's art. in Diet, of Nat. Biog., vol. 1. (London, 1897). (R. J. M.)

ST JOHN, the capital of St John county, New Brunswick. Canada, in 45° 14′ N., and 66° 3′ W., 481 m. from Montreal by the Canadian Pacific railway. Pop. (1901) 40,711. It is situated at the mouth of the St John river on a rocky peninsula. With it are incorporated the neighbouring towns of Carleton and (since 1889) Portland. The river, which is spanned by two bridges, enters the harbour through a rocky gorge, which is passable by ships for forty-five minutes during each ebb and flow of the tide. The harbour level at high tide (see Fundy, Bay op) is 6 to 12 ft. higher than that of the river, but at low tide about as much below it, hence the phenomenon of a fall outwards and inwards at every tide. St John is an important station of the Intercolonial, Canadian Pacific, and New Brunswick Southern railways, and shares with Halifax the honour of being the chief winter port of the Dominion, the harbour being deep, sheltered and free from ice. It is the distributing centre for a large district, rich in agricultural produce and lumber, and has larger exports than Halifax, though less imports. It is also the centre of fisheries which employ nearly 1000 men, and has important industries, such as saw, grist, cotton and woollen mills, carriage, box and furniture factories, boiler and engine shops. The beauty of the scenery makes it a pleasant residential city.

St John was visited in 1604 by the Sieur de Monts (1560-c. 1630) and his lieutenant Champlain, but it was not until 1635 that Charles de la Tour (d. 1666) established a trading post, called Fort St Jean (see Parkman, The Old Regime in Canada), which existed under French rule until 1758, when it passed into the hands of Britain. In 1783 a body of United Empire Loyalists landed at St John and established a city, called Parr Town until 1785, when it was in- corporated with

Conway (Carleton), under royal charter, as the city of St John. It soon became and has remained the largest town in the province, but for military reasons was not chosen as the capital (see Fredericton). Its growth has been checked by several destructive fires, especially that of Tune 1877, when half of it was swept away, but it has since been rebuilt in great part of more solid materials. (W. L. G.)

ST JOHN, an island in the Danish West Indies. It lies 4 m. E. of St Thomas, is 10 m. long and 25 m. wide; area 21 sq. m. It is a mass of rugged mountains, the highest of which is Camel Mountain (1270 ft.). Although one of the best watered and most fertile of the Virgin Group, it has little commerce. It is a free port, and possesses in Coral Bay the best harbour of refuge in the Antilles. The village of Cruxbay lies on the northern coast. Pop. (1001) 925. (

ST JOHN, a river of New Brunswick, Canada, rising in two branches, in the state of Maine, U.S.A., and in the province of Quebec. The American branch, known as the Walloostook, flows N.E. to the New Brunswick frontier, where it turns S.E. and for 80 m. forms the international boundary. A little above Grand Falls the St John enters Canada and flows through New Brunswick into the Bay of Fundy at St John. Its total length is about 450 m. It is navigable for large steamers as far as Fredericton (86 m.), and in spring and early summer for smaller vessels to Grand Falls (220 m.), where a series of falls and rapids form a descent of 70 or 80 ft. Above the falls it is navigable for 65 m. It drains an area of 26,000 sq. m., of which half is in New Brunswick, and receives numerous tributaries, of which the chief are the Aroostook, Allagash, Madawaska (draining Lake Temiscouata in Quebec), Tobique and Nashwaak.

ST JOHN OF JERUSALEM, KNIGHTS OF THE ORDER OF THE HOSPITAL OF (Ordo fratrum hospitalariorum Hierosoly- mitanorum, Ordo militias Sancti Johannis Baptislae hospitalis Hierosolymitani) , known also later as the Knights of Rhodes and the Sovereign Order of the Knights of Malta. The history of this order divides itself naturally into four periods: (1) From its foundation in Jerusalem during the First Crusade to its expulsion from the Holy Land after the fall of the Latin kingdom in 1291; (2) from 1309-1310, when the order was established in Rhodes, to its expulsion from the island in 1522; (3) from 1529 to 1798, during which its headquarters were in Malta; (4) its development, as reconstituted after its virtual destruction in 1798,

to the present day.

Early Developments. — Medieval legend set back the beginnings to the days of the Maccabees, with King Antiochus as the founder and Zacharias, father of the Baptist, as one of the first masters; later historians of the order maintained that it was established as a military order contemporaneously with the Latin conquest of Jerusalem, and that it had no connexion with any earlier foundation (so P. A. Paoli, De origine). This view would now seem to be disproved, and it is clear that the order was connected with an earlier Hospitale Hierosolymitanum. 1 Such a hospital had existed in the Holy City, with rare interrup- tions, ever since it had become a centre of Christian pilgrimage. About 1023 certain merchants of Amalfi had purchased the site of the Latin hospice established by Charlemagne, destroyed in 1010 with the other Christian establishments by order of the fanatical caliph Hakim Biamrillah, 2 and had there founded a hospital for pilgrims, served by Benedictines and later dedicated to St John the Baptist. 3 When, in 1087, the crusaders surrounded the Holy City, the head of this hospital was a certain Gerard or

1 Cf. the bull of Pope Celestine II. to Raymond du Puy, in the matter of the Teutonic order, which describes the Hospital as ” Hospitalem domum sancte civitatis Jerusalem, que a longis retro temporibus Christi pauperum usibus dedicata, tam christianorum quam etiam Sarracenorum tempore . . . . ” (Le Roulx, Cartulaire, i. No. 154).

2 This solution of the much debated question of the connexion of the Hospital with the Benedictine foundation of Sancta Maria Latina is worked out in much detail by M. Delaville Le Roulx in his Les Hospitaliers en Terre Sainte, chap. i.

3 William of Tyre says that they erected in that place an altar to St John Eleemon, patriarch of Alexandria, renowned for his charities. This mistake led to the widespread belief that this saint, and not St John the Baptist, was the original patron of the order. A passage in the bull addressed by Pope Paschal to Gerard (Cartulaire, No. 30) would seem to leave the dedication in doubt: ” Xenodochium, quod . . . juxta beati Johannis Baptistae ecclesiam instituisti.” The patronage of St John may thus have merely been the result of this juxtaposition, as the Templars took their name from the site of the mother-house.

Gerald, 4 who earned their gratitude by assisting them in some way during the siege. 6 After the capture of the city he used his popularity to enlarge and reconstitute the hospital. If, as M. Le Roulx surmises, he had previously been affiliated to the Benedictines, he now left them

and adopted for his order the Augustinian rule. Donations and privileges were showered upon the new establishment. Godfrey de Bouillon led the way by granting to it in Jerusalem itself the casal Hessilia (Es Silsileh) and two bakehouses. 6 Kings, nobles and prelates followed suit, not in the Holy Land only, but in Provence, France, Spain, Portugal, England and Italy: in Portugal a whole province was in 1 1 14 made over to Gerard and his brethren (Cartul. i. No. 34). In 11 13 Pope Paschal II. took the order and its possessions under his immediate protection (bull of Feb. 15th to Gerard, Cartul. i. No. 30), his act being confirmed in 1119 by Calixtus II. and subsequently by other popes. Gerard was indeed, as Pope Paschal called [him, the "institutor" of the order, if not its founder. It retained, however, during his lifetime its purely eleemosynary character. The armed defence of pilgrims may have been part of its functions, but its organization as an aggres- sive military force was the outcome of special circumstances — the renewed activity of the Saracens — and was the work of Raymond du Puy, who succeeded as grand master on the death of Gerard (3rd of September 11 20) J

Not that Raymond can be proved to have given to his order anything of its later aristocratic constitution. There is no mention in his Rule 8 of the division into knights, chaplains and sergeants; indeed, there is no mention of any military duties whatever. It merely lays down certain rules of conduct and discipline for the brethren. They are to be bound by the threefold vow of chastity, poverty and obedience. They are to claim nothing for themselves save bread, water and raiment; and this latter is to be of poor quality, " since our Lord's poor, whose servants we say we are, go naked and sordid, and it is a disgrace for the servant to be proud when his master is humble." Finally, the brethren are to wear crosses on the breast of their capes and mantles, " ut Deusperipsum vexillum et fidem et operationem et obedientiam nos custodiat." 9 Yet that Raymond laid down military regulations for the brethren is certain. Their underlying principle is revealed by a bull of Pope Alexander III. addressed (1178-1180) to the grand master Roger des Moulins, in which he bids him, " according to the custom of Ray- mond," abstain from bearing arms save when the standard of the Cross is displayed either for the defence of the kingdom or in an attack on a " pagan " city. 10

The statesmanlike qualities of Raymond du Puy rendered his long mastership epoch-making for the order. When it was decided to fortify Ibelin (Beit-Jibrin) as an outpost against attacks from the side of Ascalon, it was to the Hospitallers that the building and defence of the new castle were assigned; and from 1 137 onwards they took a regular part in the wars of the Cross. It was owing to Raymond's diplomatic

skill, too, that the order was enabled to profit by the bequest made to it by Alphonso I. of Aragon, who had died childless, of a third of his kingdom. To have claimed the literal fulfilment of this bequest would have been to risk losing it all, and Raymond acted wisely in transferring the bequest, with certain important reservations, to Raymond Berenger IV., count of Barcelona and regent of

- In spite of his fame, nothing is known of his origin. The surname ” Tunc ” or ” Tonque ” often given to him is, as Le Roulx points out, merely the result of a copyist’s error for ” Gerardus tunc …”

‘According to the legend, he joined the defenders on the walls and, instead of hurling stones, hurled bread at the Christians, who were short of supplies. Haled before the Mussulman governor, his accusers were confounded when the incriminating loaves they produced were discovered to be turned into stones.

6 ” Fours.” So the charter of Baldwin I. (Cartul. No. 20; cf. No. 225). In his Hospitallers Le Roulx has “tours,” i.e. two towers, probably a misprint.

7 The existence of a certain Roger as grand master between Gerard and Raymond, maintained by some historians, is finally disproved by Raymond’s own testimony: ” Reginmundus, per gratiam Dei post obitum domini Giraldi factus servus pauperum Christi ” (Cartul. i. No. 46).

8 The date of this can only be approximately assigned, in so far as it was confirmed by Pope Eugenius III., who died in 1 153.

9 For text see Cartulaire, i. No. 70.

10 Cartul. i. No. 527.

Aragon (16th of September 1140). 1 It was probably also during his sojourn in the West for the above purpose that Raymond secured from Pope Celestine II. the bull dated December 7th, 1 143, subordinating to his jurisdiction the Teutonic hospice, founded in n 28 by a German pilgrim and his wife in honour of the Blessed Virgin, which was the nucleus of the Teutonic Order (q.v.). This order was to remain subordinate to the Hospitallers actually for some fifty years, and nominally for some thirty years longer. 2 Raymond took part in the Second Crusade and was present at the council of the leaders held at

Acre, in 1148, which resulted in the ill-fated expedition against Damascus. The failure before Damascus was repaired five years later by the capture of Ascalon (19th of August 1153), in which Raymond du Puy and his knights had a conspicuous share.

Meanwhile, in addition to its ever-growing wealth, the order had received from successive popes privileges which rendered it, like the companion order of the Temple, increasingly independent of and obnoxious to the secular clergy. In 1135 Innocent II. had confirmed to Raymond the privileges accorded by Paschal II., Calixtus II. and Honorious II., and in addition forbade the diocesan bishops to interdict the churches of the Hospitallers, whom he also authorized, in case of a general interdict, to cele- brate mass for themselves alone. 3 In 1137 he gave them the privilege of Christian burial during such interdicts and the right to open interdicted churches once a year in order to say mass and collect money. 4 These bulls were confirmed by Eugenius III. in 1153 5 and Anastasius IV. in 1154, the latter adding the per- mission for the order to have its own priest, independent of the diocesan bishops. 6 In vain the patriarch of Jerusalem, attended by other bishops, journeyed to Rome in 1155 to complain to Adrian IV. of the Hospitallers' abuse of their privileges and to beg him to withdraw his renewal of his predecessor's bull. 7

Far different was the effect produced by Raymond du Puy's triumphant progress through southern Europe from the spring of 1 1 57 onward. From the popes, the emperor Frederick I., kings and nobles, he received fresh gifts, or the confirmation of old ones. After the 25th of October 1158, when his presence is attested at Verona, this master builder of the order disappears from history; he died some time between this date and 1×60, when the name of another grand master appears.

During the thirty years of his rule the Hospital, which Gerard had instituted to meet a local need, had become universal. In the East its growth was beyond calculation: kings, prelates and laity had overwhelmed it with wealth. In the West, all Europe combined to enrich it; from Ireland to Bohemia and Hungary, from Italy and Provence to Scandinavia, men vied with each other to attract it and establish it in their midst. It was clear that for this vast institution an elaborate organization was needed, and this need was probably the occasion of Raymond's presence in Europe. The priory of St Gilles already existed as the nucleus of the later system; the development of this system took place after Raymond's death.

Constitution and Organization. — The rule of the Hospital, as

formulated by Raymond du Puy, was based on that of the Augustinian Canons (q.v.). Its further developments, of which only the salient characteristics can be mentioned here, were closely analogous to those of the Templars (q.v.), whose statutes regulating the life of the brethren, the terms of admission to the order, the maintenance of discipline, and the scale of punishments, culminating in ex- pulsion (pert de la maison), are, mutatis mutandis, closely paralleled by those of the Hospitallers. These, too, were early (probably in Raymond's time) divided into three classes: knights (fratres milites), chaplains (fratres capellani), and serjeants (fratres servientes armigeri), with affiliated brethren (confratres) and " donats " (donati, i.e. regular subscribers, as it were, to the order in return for its privileges and the ultimate right to enter the ranks of its knights). Similar, too, was the aristocratic rule which confined admission to the first

1 Cartul. i. No. 136. The arrangement was confirmed by the pope in 1 1 58 (Le Roulx, Hospiialiers, p. 59).

2 The foundation of the Teutonic Order as a separate organization was solemnly proclaimed in the palace of the Templars at Tyre on the 5th of March 1 198. Its rule was confirmed by Pope Innocent III. on Feb. 15th, 1198 (Cartul. i. No. 1072).

3 Cartul. i. No. 113. * lb. i. No. 122. 6 lb. i. No. 217. 6 lb. i. No. 226.

'This renewal was dated 19th of December 1154 (lb. i. No. 229).

class to sons born in lawful wedlock of knights 8 or members of knightly families, a rule which applied also to the donats. 9 For the serjeant men-at-arms it sufficed that they should not be serfs. Below these a host of servientes did the menial work of the houses of the order, or worked as artisans or as labourers on the farms.

All the higher offices in the order were filled by the knights, except the ecclesiastical — which fell to the chaplains — and those of master of the squires and turcopolier (commander of the auxiliary light cavalry), which were reserved for the serjeants-at-arms. Each knight was allowed three horses, each serjeant two. The fratres capellani ranked with the knights as eligible for certain temporal posts; at their head was the " conventual prior " (clericorum magister et ecclesie custos, prior clericorum Hospitalis).

In two important respects the Knights of St John differed from the Templars. The latter were a purely military organization; the

Hospitallers, on the other hand, were at the outset preponderatingly a nursing brotherhood, and, though this character was subordinated during their later period of military importance, it never disappeared. It continued to be a rule of the order that in its establishments it was for the sick to give orders, for the brethren to obey. The chapters were largely occupied with the building, furnishing, and improvement of hospitals, to which were attached learned physicians and surgeons, who had the privilege of messing with the knights. The revenues of particular properties were charged with providing luxuries (e.g. white bread) for the patients, and the various provinces of the order with the duty of forwarding blankets, clothes, wine and food for their use. The Hospitallers, moreover, encouraged the affiliation of women to their older, which the monastic and purely military rule of the Templars sternly forbade. So early as the First Crusade a Roman lady named Alix or Agnes had founded at Jerusalem a hospice for women in connexion with the order of St John. Until 1 187, when they fled to Europe, the sisters had devoted themselves to prayer and sick-nursing. In Europe, however, they developed into a purely contemplative order. 10

The habit of the order, both in peace and war, was originally a black cappa clausa (i.e. the long monastic bell-like cloak with a slit ■ on each side for the arms) with a white, eight-pointed ” Maltese ” cross on the breast. As this was highly inconvenient for fighting, Innocent IV. in 1248 authorized the brethren to wear in locis sus- pectis a large super-tunic with a cross on the breast (Cartul. ii. No. 2479), and in 1259 Alexander IV. fixed the habit as, in peace time, a black mantle, and in war a red surcoat with a white cross (Cartul. ii. No. 2928).

The unit of the organization of the order was the commandery (preceptory), a small group of knights and serjeants living in com- munity under the rule of a commander, or preceptor, 11 charged with the supervision of several contiguous properties. The commanderies were grouped into priories, each under the rule of a prior (styled unofficially ” grand prior,” magnus prior), and these again into provinces corresponding to certain countries, under the authority of grand commanders. These largest groups crystallized in the 14th century as national divisions under the name of ” langues ” (languages). 12 At the head of the whole organization was the grand master. The grand master was elected, from the ranks of the knights of justice, by the same process as the grand master of the Templars (q.v.). Alone of the bailiffs (bailivi), as the officials of the order were generically termed, he held office for life. His authority

8 The knights were ultimately distinguished as ” Knights of Justice ”

(chevaliers de justice) and ” Knights of Grace ” (chevaliers de grdce). The former were those who satisfied the conditions as to birth, and were therefore knights ” justly ” ; the latter were those who were admitted ” of grace ” for superlative merits.

9 An exception was made in favour of the natural sons of counts and greater personages (Statute 7 of 1270; Cartul. ii. 3396).

10 Their premier house in Europe was at Sigena in Aragon, which they still occupy. It was granted to them by Sancia of Navarre, queen of Aragon, in 1 184, the order being definitively established there in 1188. Their .rule, which is that of Augustinian Canonesses, and dates from October 1188, is printed by Le Roulx, Cartulaire, i. No. 859. There is no word about nursing in it. In England the most important house was Buckland. The chief Danish house survives in the Lutheran convent of St John the Baptist at Schleswig, a Stift for noble ladies, whose superior has the title of prioress. On solemn occasions a realistic wax head of St John the Baptist on a charger is still produced.

“Commander (comandeor, commandeur), with its Latin translation preceptor, came into use as the title of these officials somewhat late. In earlier documents they are styled ospitalarius, bajulus (bailiff), magister (master).

12 Omitting the Anglo-Bavarian langue, created in 1782, the langues (in the 15th century) were eight in number. They were (1) Provence (grand priories of St Gilles and Toulouse), (2) Auvergne (grand priory of Auvergne), (3) France (grand priories of France, Aquitaine, Champagne), (4) Italy (grand priories of Lombardy, Rome, Venice, Pisa, Capua, Barletta, Messina), (5) Aragon (castellany of Amposta, grand priories of Catalonia and Navarre), (6) England (grand priories of England — [including Scotland — -and Ireland), (7) Germany (grand priories of Germany or Heitersheim, Bohemia, Hungary, Dacia — i.e. Scandinavia— and the Bailiwick (Ballei) of

was very great, but not absolute. The supreme legislative and controlling power was vested in the general chapter of the knights, at the periodical meetings of which the great officers of the order had to give an account of their stewardship, and which alone had the right to pass statutes binding on the order The executive power of the grand master, like that of the great dignitaries immedi- ately subordinate to

him, was in the nature of a delegation from the chapter. He was assisted in its exercise by four councils: (1) the ” convent ” or ordinary chapter, a committee of the general chapter, 1 for administrative business; (2) a secret council, for criminal cases and affairs of state ; (3) a full council, to hear appeals from the two former; 2 and (4) the “venerable chamber of the treasury” for financial matters. To the general chapter at headquarters corre- sponded the chapters of the priories and the commanderies, which controlled the action of the priors and commanders.

Immediately subordinate to the grand master were the seven great dignitaries of the order, known as the conventual bailiffs: the grand preceptor, 3 marshal, draper (Fr. drapier) or grand con- servator, hospitaller, treasurer, admiral, turcopolier. 4 The grand preceptor, elected by the chapter at the same time as the grand master and subject to his approval, was the lieutenant of the latter in his absence, empowered to seal for him and, in the event of his capture by the enemy, to act as vice-master. The functions of the marshal, draper, treasurer and turcopolier were practically identical with those of the officials of the same titles in the order of Knights Templars. That of hospitaller, on the other hand, was naturally a charge of exceptional importance in the order of St John; he had a seal of his own, and was responsible for everything concerning the hospitals of the order, the dispensing of hospitality, and of alms. The admiral, as the name implies, was at sea what the marshal was on land. ‘ The office first appears in 1299 when the knights, after their expulsion from the Holy Land, had begun to organize their new sea-power in Cyprus. As to the equipage and suites of the grand master and the great dignitaries, these were practically on the same scale and of the same nature as those described in the article Tem- • plars for the sister order. The grand master had the right himself to nominate his companions and the members of his household (seneschal, squires, secretaries, chaplains, &c), which, as Le Roulx points out, was such as to enable him to figure as the equal of the kings and princes with whom he consorted.

The grand-mastership of Gilbert d’Assailly was signalized by the participation of the Hospitallers in the abortive expeditions of Amalric of Jerusalem into Egypt in 1162, 1168 and 1169. On the 10th of August 11 64 also they shared in the disastrous defeat inflicted by Nur-ed-din at Harran en the count of Tripoli. The important position occupied by them in the councils of the kingdom is shown by the fact that the grand preceptor Guy de Mauny was one of the ambassadors sent in 1 169 to ask aid of the princes of the West. Another important development was the bestowal on the order by Bohemund III., prince

of Antioch, in 1168, and King Amalric, as regent of Tripoli, in 1170, of con- siderable territories on the north-eastern frontier, to be held with almost sovereign power as a march against the Saracens (Cartu- laire, i. Nos. 331, 411). The failure of the expedition to Egypt, however, brought considerable odium on Gilbert d'Assailly, who

Brandenburg), (8) Castile (grand priories of Castile and Leon, and Portugal). Of the grand priories the most ancient and by far the most important was that of St Gilles, founded early in the 12th century, the authority of which extended originally over the whole of what is now France and a great part of Spain. In the 16th century its seat was transferred to Aries. Out of this developed the langues of Auvergne, France, Aragon and Castile, with their sub- sidiary priories. The date of the creation, of the various grand commanderies differs greatly: that of Italy was established in the 13th century, the langue of Germany in 1422, that of Castile was split off from Aragon in 1462. The castellany of Amposta (founded 1 1 57) ranked as a priory. The bailiwick of Brandenburg, which had long been practically independent of the grand prior of Germany, obtained the right to elect its own bailiff (Herrenmeister) in 1382, subject to the approval of the grand prior. In the Holy Land there were no priors; the commanderies were directly under the grand master, and the commanders (who retained the style of bailli, bailivus) ranked with the grand priors elsewhere.

1 This seems to have consisted in practice of the great dignitaries of the order. See Le Roulx, Hospitaliers, p. 314.

2 A peculiarity of the order of St John was the esgart des freres (esgart, Lat. sguardium — court) which could be demanded by any knight who thought himself wronged by a decision of his superiors, even of the grand master.

1 To be carefully distinguished from the regional grand preceptors or grand commanders, and also from the grand commander d'oulremer, who represented the grand master in the West generally.

- To these the grand bailiff (German, langue) and grand chancellor (Castile) were added later.

resigned the grand-mastership, probably in the autumn of 1170. 6 Under the short rule of the grand master Jobert (d. 11 77) the question of a renewed attack on Egypt was mooted; but the confusion reigning in the Latin kingdom and, not least, the scandalous quarrels between the Templars and Hospitallers, rendered all aggressive action

impossible. In n 79 the growing power of the two military orders received its first set back when, at the instance of the bishops, the Lateran Council forbade them to receive gifts of churches and tithes at the hands of laymen without the consent of the bishops, ordered them to restore all ” recent” 6 gifts of this nature, and passed a number of decrees in restraint of the abuse of their privileges.

A more potent discipline was to befall them, however, at the hands of Saladin, sultan of Egypt, who in 1186 began his sys- tematic conquest of the kingdom. It was the Hospitallers who, with the other religious orders, alone offered an organized resistance to his victorious advance; On the 1st of May 1187 occurred the defeat of Tiberias, in which the grand master Gilbert des Moulins fell riddled with arrows, and this was followed on the 4th of July by the still more disastrous battle of Hittin. The flower of the Christian chivalry was slain or captured; the Hospitallers and Templars who fell into his hands Saladin massacred in cold blood. On the 2nd of October Jerusalem fell. Ten brethren of the Hospital were allowed to remain for a year to look after the sick; the rest took refuge at Tyre. In these straits Armengaud d’Asp was elected grand master (1188) and the headquarters of the order were established at Margat (Markab), near the coast some distance northwards of Tripoli. In the interior the knights still held some scattered fortresses; but their great stronghold of Krak 7 was reduced by famine in September 1188 and Beauvoir in the following January.

The news of these disasters once more roused the crusading spirit in Europe; the offensive against Saladin was resumed, the Christians concentrating their forces against Acre in the autumn of 11 89. In the campaigns that followed, of which Richard I. of England was the most conspicuous hero, and which ended in the recovery of Acre and the sea-coast generally for the Latin kingdom, the Hospitallers, under their grand master Gamier de Naplouse 8 (Neapoli), played a prominent part. The grand-mastership of Geoffroy de Donjon, who suc- ceeded Gamier in 1192 and ruled the order till 1202, 9 was signalized, not by feats of arms, since the Holy Land enjoyed a precarious peace, but by a steady restoration and development of the property and privileges of the order, by renewed quarrels with the Templars, and in 1198 by the establishment — in face of the protests of the Hospitallers — of the Teutonic knights as a separate order. Under the grand-mastership of the pious Alphonso of Portugal, and of Geoffrey le Rat, who was elected on Alphonso’s resignation in 1206, the knights took a vigorous part in the quarrel as to the succession in Antioch; under that of Garin de Montaigu (elected 1 207) they shared in the expedition to Egypt (12 18-12 21), of which he had been a vigorous advocate (see

Crusades: The Fifth Crusade). In 1222ˆ at the instance of the emperor Frederick II., the grand master accompanied the king of Jerusalem and others to Europe to discuss the preparation of a new crusade, visiting Rome, proceeding thence to Paris and London, and returning to the Holy Land in 1225. The expedition failed of its object so far as the organization of

5 See Le Roulx, Hospitaliers, p. 76 sqq. The resignation led to bitter divisions in the order. It was urged that the resignation was invalid without the consent of the general chapter and the pope; and a temporary schism was the result. Gilbert was drowned in 1 183 crossing from Dieppe to England, whither he had gone at the invitation of Henry II.

6 The words ” tempore moderno ” were interpreted by Pope Alexander III. in a bull of the 1st of June 1179 as within ten years of the opening of the council (Cartul. 1. No. 566).

7 The stupendous ruins of Krak-des-Chevaliers (at Kerak, S.E. of the Dead Sea) attest the wealth and power of the knights (for a restoration see Castle, fig. 5). The castle had been given to the Hospitallers by Guillaume du Crac in 1 142. In n 93 it was again in their hands, and was subsequently greatly enlarged and strengthened. It was finally captured by the Egyptians under Bibars in 127 1.

8 Gamier had been prior of England and later of France.

9 So Le Roulx. p. 1 19.

a general crusade was concerned; but the Hospital received everywhere enormous accessions of property. 1 Garin de Montaigu died in 1228, after consolidating by his statesmanlike attitude the position and power of his order, on the eve of Frederick II. ‘s crusade. In this crusade, conducted in spite of a papal excommunication, the Hospitallers took no part, being rewarded with the approval of Pope Gregory IX., who, in August 1229, issued a bull to the patriarch of Jerusalem ordering him to maintain the jurisdiction of .the Hospital over the Teutonic knights, who had dared to assist the German emperor. 2 In 1233, under the grand master Guerin, the Hospitallers took a leading part in the successful attack on the principality of Hamah. The motive of this, however — which was no more than the refusal of the emir to pay them the tribute due — seems to point to an

increasing secularization of then- spirit. In 1236 Pope Gregory IX. thought it necessary to threaten both them and the Templars with excommunication, to prevent their forming an alliance with the Assassins, 3 and in 1238 issued a bull in which he inveighed against the scandalous lives and relaxed discipline of the Hospitallers. 4

Events were soon to expose the order to fresh tests. Under the grand-mastership of Pierre de Vieille Bride 6 occurred the brief ” crusade ” of Richard of Cornwall (nth of October 1240 to 3rd of May r24i). The truce concluded by Richard with the sultan of Egypt was accepted by the Hospitallers, rejected by the Templars, and after his departure something like a war broke out between the two bodies. In the midst of the strife of parties, in which Richard of Cornwall had recognized the fatal weakness of the Christian cause to He, came the news of the invasion of the Chorasmians. On the 23rd of August the Tatar horde took and sacked Jerusalem. On the 17th of October, in alliance with the Egyptians under Bibars, it overwhelmed the Christian host at Gaza. Of the Hospitallers only sixteen escaped; 325 of the knights were slain; and among the prisoners was the grand master, Guillaume de Chateauneuf. 6 Amid the general ruin that followed this defeat, the Hospitallers held out in the fortress of Ascalon, until forced to capitulate on the 15th of October r247. Under the vice-master, the grand pre- ceptor Jean de Ronay, they took part in 1249 in the Egyptian expedition of St Louis of France, only to share in the crushing defeat of Mansurah (nth of February 1250). Of the knights present all were slain, except five who were taken prisoners, the vice-master and one other. 7 At the instance of St Louis, after the conclusion of peace, 25 Hospitallers, together with the grand master Guillaume de Chateauneuf, were released. 8

On the withdrawal of St Louis from the Holy Land (April 1254), a war of aggression and reprisals broke out between Christians and Mussulmans; and no sooner was this ended by a precarious truce than the Christians fell to quarrelling among themselves. In the war between the Genoese and Venetians and their respective partisans, the Hospitallers and Templars fought on opposite sides. In spite of so great a scandal and of the hopeless case of the Christian cause, the possessions of the order were largely increased during Guillaume de Chateauneuf’s mastership, both in the Holy Land and in Europe.

Under the grand-mastership of Hugues de Revel, elected probably in 1255, the menace of a new Tatar invasion led to serious efforts to secure harmony in the kingdom. In 1258 the Templars, Hospitallers, and Teutonic knights decided to

1 Detailed by Le Roulx, Hospitallers, pp. 149-156.

2 Cartul. ii. No. 1944. The Teutonic knights refused to obey. In January 1240 Gregory called on them to explain their insub-ordination (No. 2247) and in March 1241 again ordered them to submit (No. 2270).

3 Cartul. ii. No. 2149. 4 Cartul. ii. No. 2186.

6 Not Villebride. The name is a corruption of Vieille Brioude (Le Roulx, Hosp. p. 183).

6 It has been generally supposed, on the authority of the chronica majora of Matthew of Paris (iv. 307-31 1), that -the grand-master was killed at Gaza.

7 See the contemporary letter, Cartulaire, ii. No. 252 1.

8 Cartul. ii. Nos. 2540-2541.

submit their disputes in Syria, Cyprus and Armenia to arbitration, a decision which bore fruit in 1260 in the settlement of their differences in Tripoli and Margat. The satisfactory arrangement was possibly affected by the result of a combined attack made in 1259 on the Hospitallers by the Templars and the brethren of St Lazarus and St Thomas, which had resulted in the practical extermination of the aggressors, possibly also by the crushing defeat of the Templars and the Syrian barons by the Turcomans at Tiberias in 1260. However achieved, the concord was badly needed; for Bibars, having in 1260 driven back the Tatars and established himself in the sultanate of Egypt, began the series of campaigns which ended in the destruction of the Latin kingdom. In 1268 Bibars conquered Antioch, and the Christian power was confined to Acre, Chateau Pelerin, Tyre, Sidon, and the castles of Margat, Krak and Belda (Baldeh), in which the Hospitallers still held out. The respite afforded by the second crusade of St Louis was ended by his death at Tunis in 1270. On the 30th of March 1271 the great fortress of Krak, the key to the county of Tripoli, surrendered after a short siege. The crusade of Prince Edward of England did little to avert the ultimate fate of the kingdom, and with it that of the Hospitallers in the Holy Land. This was merely delayed by the preoccupa- tions of Bibars elsewhere, and by his death in 1277. In 1280 the Mongols overran northern Syria; and the Hospitallers distinguished themselves by two victories against enormous odds, one over the Turcomans and one over the emir of Krak (February 1281). The situation, however, was desperate, and the grand master Nicolas

Lorgne, who had succeeded Hugues de Revel in 1277, wrote despairing letters of appeal to Edward I. of England. On the 25th of May 1285, Margat surrendered to the sultan Kalaun (Mansur Saifaldin). Not even the strong character and high courage of Jean de Villiers, who succeeded Nicolas Lorgne as grand master in 1285, could do more than stave off the ultimate disaster. The Hospitallers assisted in the vain defence of Tripoli, which fell on the 26th of April 1289. On the 18th of May 1291 the Mussulmans stormed Acre, the last hope of the Christians in the Holy Land. Jean de Villiers, wounded, was carried on board a ship, and sailed to Limisso in Cyprus, which became the headquarters of the order. For the remaining two years of his life Jean de Villiers was occupied in attempting the reorganization of the shattered order. The demoralization in the East was, however, too profound to admit a ready cure. The knights, represented by the grand dignitaries, addressed a petition to Pope Boniface VIII. in 1295 asking for the appointment of a permanent council of seven difinitores to control the grand master, who had become more and more autocratic. The pope did not consent; but in a severe letter to the new grand master, Eudes de Pin, he sternly reproved him for the irregularities of which he had been guilty. 9 In 1296 Eudes was succeeded by Guillaume de Villaret, grand prior of St Gilles, who for three years after his election remained in Europe, regulating the affairs of the order. In 1300, in response to the urgent remonstrances of the knights, he appeared in Cyprus. In 1299 an unnatural alliance of the Christians and Mongols gave a momentary prospect of regaining the Holy Land; in 1300 the Hospitallers took part in the raid of King Henry II. (de Lusignan) of Cyprus in Egypt, and gained some temporary successes on the coast of Syria. Of more advantage for the* prestige of the order, however, were the immense additions pi property and privileges which Guillaume de Villaret had secured in Europe from the pope and many kings and princes, 10 and the reform of the rule and drastic reorganization of the order promulgated in a series of statutes between 1300 and 1304, the year of Guillaume's death. 11 Of these changes the most significant was the definition of the powers and status of the admiral, a new great dignitary created in 1299.

The grand-mastership of Foulques de Villaret, Guillaume's

9 Cartulaire, iii. Nos. 4267, 4293; cf. the letter of the chapter- general to Guillaume de Villaret, iii. No. 4310.

10 Le Roulx, Hospitaliers, p. 259 sqq.

11 These statutes are printed in the Cartulaire, iii. Nos. 4515, iv. Nos.

4549, 4574, 4612.

nephew and successor, 1 was destined to be eventful for the order. On the 5th of June 1305 Bertrand de Got became pope as Clement V. The new pope consulted the grand master of the Templars and Hospitallers as to the organization of a new crusade, and at the same time raised the question of the fusion of the military orders, a plan which had already been suggested by St Louis, dis- cussed at the council of Lyons in 1 2 74, and approved by the pope's patron Philip IV. of France. The proposal broke down on the opposition of Jacques de Molay, grand master of the Temple; but the desired result was obtained by other and more question- able means. In October 1307 Philip IV. caused all the Templars in France, including the grand master, to be arrested on charges of heresy and gross immorality; Pope Clement V., a creature of the French king, reluctantly endorsed this action, and at his instance the other sovereigns of Europe followed the example of Philip. The famous long-drawn-out trial of the Templars followed , ending at the council of Vienne in 13 14, when Pope Clement decreed the dissolution of the order of the Temple and at the same time assigned the bulk of its property to the Hospital. 2 (See Templars, Knights.)

Meanwhile an event had occurred which marks an epoch in the history of the order of the Hospital. In 1306 Foulques de Villaret, anxious to find a centre where the order would be untrammelled by obligations to another power as in Cyprus, came to an agreement with a Genoese pirate named Vignolo de' Vignoli for a concerted attack on Rhodes and other islands belonging to the Greek emperor. The exact date of their com- pleted conquest of the island is uncertain; 3 nor is it clear that the grand master took a personal part in it. By command of the pope he had left Cyprus for Europe at the end of 1306 or the beginning of 1307, and he did not return to the East till late in 1309. He returned, however, not to Cyprus but to Rhodes, and it is with 1310, therefore, when its headquarters were established in the latter island, that the second period of the history of the order of the Hospital opens. 4

The Knights in Rhodes. — The history of the order for the next fifty years is very obscure. Certain changes, however, took place which profoundly modified its character. The most important of these was its definitive division into " langues." The begin- nings of this had been

made long before; but the system was only legalized by the general chapter at Montpellier in 1 330. Hitherto the order had been a cosmopolitan society, in which the French element had tended to predominate; henceforth it became a federation of national societies united only for purposes of com- merce and war. To the headship of each ” langue ” was attached one of the great dignitaries of the order, which thus came to represent, not the order as a whole but the interests of a section. 6 The motive of this change was probably, as Prutz suggests, 6

1 M. Le Roulx dates his election between the 23rd of November 1304 and the 3rd of November 1305 {Hosp. p. 268).

2 The Templars' property in the Spanish peninsula and Majorca was specially excepted, being subsequently assigned to the sovereigns, who transferred some of it to the native military orders. Nor did the Hospitallers receive by any means all of the rest. Philip IV. charged against the Hospital an enormous bill for expenses incurred in the trial of the Templars, including, as one item, those for torturing the knights. In France at least the Hospitallers complained that they were actually out of pocket. See Finke, Papsttum und Unter- ■gang des Tempelherrenordens, i. ad fin. None the less, the great accession of territorial property necessitated the subdivision of the gjeat regional jurisdictions, notably that of the priory of St Gilles, into new grand priories.

3 The question is discussed in detail by M. Le Roulx, Hospitallers, pp. 278 sqq. He himself dates the surrender of the castle of Rhodes in 1308. Cf. Hans Prutz, ” Anfange der Hospitaliter auf Rhodos ” in Sitzungsber. der K. Bay. Akad. d. Wissenschaften (1908), i. Abhandlung.

4 Foulques de Villaret's head seems to have been turned by his success. His early vigour and statesmanlike qualities gave place to luxury, debauchery and a tyrannical temper. He was ultimately deposed, and died at the castle of Teyran in Languedoc in 1327.

5 The great dignitaries were distributed as follows: Grand commander of Provence, the grand preceptor; Auvergne, the grand marshal; France, the grand hospitaller; Italy, the grand admiral; Aragon, the grand conservator or draper; England, the turcopolier; Germany, the grand bailiff; Castile, the grand chancellor.

• ” Die Anfange der Hospitaliter auf Rhodos.”

fear of the designs of Philip IV. of France and his successors to which point had been given by the fate of the Templars, and the consequent desire to destroy the preponderance of the French element. 7

The character and aims of the order were also profoundly affected by their newly acquired sovereignty — for the shadowy overlordship of the Eastern emperor was soon forgotten — and above all by its seat. The Teutonic order had established its sovereignty in Prussia, in wide and ill-defined spheres beyond the north-eastern marches of Germany. The Hospitallers ruled an island too narrow to monopolize their energies, but occupying a position of vast commercial and strategic importance. Close to the Anatolian mainland, commanding the outlet of the Archipelago, and lying in the direct trade route between Europe and the East, Rhodes had become the chief distributing point in the lively commerce which, in spite of papal thunders, Christian traders maintained with the Mahommedan states; and in the new capital of the order representatives to every language and religion of the Levant jostled, haggled and quarrelled. 8 The Hospitallers were thus divided between their duty as sovereign, which was to watch overthe interests of their subjects, and their duty as Christian warriors, which was to combat the Infidel. In view of the fact that the crusading spirit was everywhere declining, it is not surprising that their policy was henceforth directed less by religious than by political and commercial considerations. Not that they altogether neglected their duty as protectors of the Cross. Their galleys policed the narrow seas ; their consuls in Egypt and Jerusalem watched over the interests of pilgrims; their hospitals were still maintained for the service of the sick and the destitute. But, side by side with this, secularizа- tion proceeded apace. In 1341 Pope Clement VI. wrote to the grand master denouncing the luxury of the order and the misuse of its funds; in 1355 Innocent VI. sent the celebrated Juan Fernandez de Heredia, castellan of Amposta and grand com- mander of Aragon, as his legate to Rhodes, armed with a bull which threatened the order with dissolution if it did not reform itself and effect a settlement in Turkey. In 1348, indeed, the Hospitallers, in alliance with Venice and Cyprus, had captured Smyrna; but the chief outcome of this had been commercial treaties with their allies. Such treaties were, in fact, a matter of life and death; for the island was not self-supporting, and even towards the Infidel the attitude of the knights was necessarily influenced by the fact that their supplies of provisions were mainly drawn from the Mussulman mainland. By the 15th century their crusading spirit had grown so weak that they even attempted to negotiate a commercial treaty with the Ottoman sultan; the project broke down on the refusal of the knights to accept the sultan’s suzerainty.

The earlier history of the Hospitallers bristles with obscure questions on which modern scholarship (notably the labours of Delaville Le Roulx) has thrown new light. From 1355 onward, however, the case is different; the essential facts have been established by writers who were able to draw on a mass of well-ordered materials.

Their history during the two centuries of the occupation of Rhodes, so far as its general interest for Europe is concerned, is that of a long series of naval attacks and counter-attacks; its chief outcome, for which the European states owed a debt of gratitude but ill acknowledged, the postponement for some two centuries of the appearance of the Ottomans as a first-rate naval power in the Mediterranean. The seaward advance of Osman the Turk was arrested by their victories; in 1358 they successfully defended Smyrna; in 1365 under their grand master Raymond Beranger (d. 1374), and in alliance with the king of Cyprus, they captured and burned Alexandria. The Ottoman peril, however, grew ever more imminent, and in 1395, under their grand master Philibert de Naillac, the Hospitallers

7 Philip IV. strenuously opposed the change for this reason. Prutz, Die geistlichen Ritterorden, pp 358 sqq. Compare the division of the general councils of Basel and Constance into nations."

8 See the regulations made, soon after the capture of the island, in the Capitula Rodi, a fragment of a code, published by Ewald in

I News Archiv iv. pp. 265-269

shared in the disastrous defeat of Nicopolis. The invasion followed of Timur the Tatar, invited to his aid by the Eastern emperor. Sultan Bayezid, the victor of Nicopolis, was over- thrown; but Timur turned against the Christians and in 1402 captured Smyrna, putting the Hospitallers who defended it to the sword. It was after this disaster that the knights built, on a narrow promontory jutting from the mainland opposite the island of Kos, the fortress of St Peter the Liberator. The castle, which still stands, its name corrupted into Budrun (from Bedros, Peter), w T as long a place of refuge for Christians flying from slavery. 1 Some years later the position of the order as a Mediter- ranean sea-power was strengthened by commercial treaties with Venice, Pisa, Genoa, and even with Egypt (1423). The zenith of its power was reached a few years later, when, under the

grand master Jean Bonpar de Lastic, it twice defeated an Egyptian attack by sea (1440 and 1444). A new and more imminent peril, however, arose with the capture of Constantinople by the Turks in 1453, Ior Mahommed II. had announced his intention of making Rhodes his next objective. The attack was delayed for twenty-seven years by the sultan's wars in south-eastern Europe; and meanwhile, in 1476, Pierre d'Aubusson (q.v.), the second great hero of the order, had been elected grand master. Under his inspiration, when in June 1480 the Turks, led by three renegades, attacked the island, the knights made so gallant a resistance that, in July, after repeated and decisive repulses, the Turks retreated. In 1503 Pierre d'Aubusson was succeeded by Aymar d'Amboise, who directed a long series of naval battles. In 1521 the famous Philippe de Villiers de ITsle d'Adam was elected grand master, just as the dreaded sultan Suleiman the Magnificent directed his attack on Rhodes. In 1522 he besieged the island, reinforcements failed, the European powers sent no assistance, and in 1523 the knights capitulated, and withdrew with all the honours of war to Candia (Crete). The emperor Charles V., when the news was brought to him, exclaimed, " Nothing in the world has been so well lost as Rhodes! " But he refused to assist the grand master in his plans for its recovery, and instead, five years later (1530), handed over to the Hospi- tallers the island of Malta and the fortress of Tripoli in Africa.

The Knights in Malta. — The settlement of the Hospitallers in Malta was contemporaneous with the Reformation, which profoundly affected the order. The master and knights of the bailiwick of Brandenburg accepted the reformed religion, without, however, breaking off all connexion with the order (see below). In England, on the other hand, the refusal of the grand prior and knights to acknowledge the royal supremacy led to the confiscation of their estates by Henry VIII., and, though not formally suppressed, the English " langue " practically ceased to exist. 2 The knights of Malta, as they came to be known, none the less continued their vigorous warfare. Under Pierre du Pont, who succeeded Villiers de ITsle d'Adam in 1534, they took a conspicuous part in Charles V.'s attack on Goletta and Tunis (1535). In 1550 they defeated the redoubtable corsair Dragut, but in 1531 their position in Tripoli, always precarious, became untenable and they capitulated to the Turks under Dragut, concentrating their forces in Malta. In 1557 Jean Farisot de la Vallette (1494-1548) was elected grand master, and under his vigorous rule strenuous efforts were made to put the defences of Malta into a fit state to resist the expected

1 There is a reduction of a photograph of the castle in Bedford and

Holbeche's Order of the Hospital, p. 20. The building materials were largely taken from the Mausoleum of Halicarnassus.

2 The great priory church at Clerkenwell in London was almost wholly destroyed by the Protector Somerset, who used the materials for his palace in the Strand. Only the great gateway, spanning St John Street, now survives above ground of the priory buildings. It is the headquarters of the revived English " langue." Sir John Rawson, prior of Kilmainham, the headquarters of the order in Ireland, accepted the royal supremacy and was created Lord Clontarf . In 1679 the duke of Ormonde erected the present hospital on the site of the ancient priory. The preceptory of Torphichen, head- quarters of the order in Scotland, was surrendered in 1547 by the preceptor Sir James Sandilands of Calder, who was created Lord Torphichen. As " Lord of St John " he had had precedence of all the barons of Scotland, and this right — originally exercised as a spiritual peer — was retained by him and his successors.

Turkish attack. On the 18th of May 1565 the Ottoman fleet, under Dragut, appeared before the city, and one of the most famous sieges in history began. 3 It was ultimately raised on the 8th of September, on the appearance of a large relieving force despatched by the Spanish viceroy of Sicily, after Dragut and 25,000 of his followers had fallen. The memory of La Vallette, the hero of the siege, who died in 1568, is preserved in the city of Valletta, which was built on the site of the struggle. In 1 57 1 the knights shared in the victory of Lepanto; but this crowning success was followed during the 17th century by a long period of depression, due to internal dissensions and cul- minating during the Thirty Years' War, the position of the order being seriously affected by the terms of the peace of Westphalia (1648). The order was also troubled by quarrels with the popes, who claimed to nominate its officials (a claim renounced by Innocent XII. in 1697), and by rivalry with the Mediterranean powers, especially Venice. In Malta itself there were four rival claimants to independent jurisdiction: the grand master, the bishop of Malta, the grand inquisitor, whose office was instituted in 1572, and the Society of Jesus, introduced by Bishop Gargallo in 1592. The order, indeed, saw much fighting: e.g. the frequent expeditions undertaken during the grand-mastership of Alof de Vignacourt (1601-1622); the defence of Candia — which fell after a twenty years' siege in 1669 — under Nicholas Cottoner, grand master from 1665 to 1680; and, during the grand mastership of Gregorio Caraffa (1 680-1 690), a campaign (1683) with John Sobieski, king of Poland, against the Turks in Hungary, and the attack in alliance with Venice on the Morea in 1687, which involved the Hospitallers in the defeat at Negro- pont in 1689.

The decline of the order was hastened by the practice of electing aged grand masters to ensure frequent vacancies; such were Luiz Mendez de Vasconcellos (1622-1623) and Antonio da Paula (1623-1636) and Giovanni Paolo Lascaris (de Castellar), in 1636, who died twenty-one years later at the age of ninety-seven. The character of the order at this date became more exclusively aristocratic, and its wealth, partly acquired by commerce, partly derived from the contributions of the commanderies scattered throughout Europe, was enormous. The wonderful fortifications, planned by French architects and improved by every grand master in turn, the gorgeous churches, chapels and auberges, the great library founded in 1650, were the outward and visible sign of the growth of a corresponding luxury in the private life of the order. Neverthe- less, under Raymond Perellos de Roccaful (1697-1720) and Antonio Manoel de Vilhena (1722-1736), the knights restored their prestige in the Mediterranean by victories over the Turks. In 1 741 Emmanuele Pinto de Fonseca, a man of strong character, became grand master. ” He expelled the Jesuits, resisted papal encroachments on his authority and, refusing to summon the general chapter, ruled as a despot.

Emanuel, prince de Rohan, who was elected grand master in succession to Francesco Jimenes de Texada in 1775, made serious efforts to revive the old spirit of the order. Under him, for the first time since 1603, a general chapter was convoked; the orders of St Anthony and St Lazarus were incorporated, and the statutes were revised and codified (1782). In 1782 also Rohan, with the approval of George III. established the new Anglo-Bavarian ” langue.” The last great expedition of the Maltese galleys was worthy of the noblest traditions of the order; they were sent to carry supplies for the sufferers from the great earthquake in Sicily. They had long ceased to be effec- tive fighting ships, and survived mainly as gorgeous state barges in which the knights sailed on ceremonial pleasure trips.

The French Revolution was fatal to the order. Rohan made no secret of his sympathy with the losing cause in France, and Malta became a refuge-place for the emigres. In 1792 the vast possessions of the order in France were confiscated, and six years later the Directory resolved on the forcible seizure of Malta

3 In Protestant England public prayers were offered for the success of the knights. Yet a few years later Queen Elizabeth was seeking the alliance of the sultan against Spain, on the ground of I their common religion as against ” the idolators [‘!

itself. Rohan had died in 1797, and his feeble successor, Baron Ferdinand von Hompesch, 1 though fully warned, made no preparations to resist. In the early summer of 1708, after a siege of only a few days, he surrendered the island, with its impregnable fortifications, to Bonaparte, and retired ignomini- ously to Trieste, carrying with him the precious relics of the order — the hand of St John the Baptist presented by the sultan Bayezid, the miraculous image of Our Lady of Philermo, and a fragment of the true cross.

With this the history of the order of St John practically ends. Efforts were, however, made to preserve it. Many of the knights had taken refuge at the court of Paul I. of Russia, with whom in 1797 Hompesch had made an alliance. In October 1798 these elected the emperor Paul grand master, and in the following year Hompesch was induced to resign in his favour. The half- mad tsar took his new functions very seriously, but his murder in 1 801 ruined any hope of recovering Malta with Russian assistance. A chapter of the order now granted the right of nomination to the pope, who appointed Giovanni di Tommasi grand master. From his death in 1805 until 1879, when Leo XIII. restored the title of grand master in favour of Fra Giovanni Ceschi a Santa Croce, the heads of the order received only the title of lieutenant master. In 1814 the French knights summoned a chapter general and elected a permanent commission for the government of the order, which was recognized by the Italian and Spanish knights, by the pope and by King Louis XVIII. In the Italian states much of the property of the order was restored at the instance of Austria, and in 1841 the emperor Ferdinand founded the grand priory of Lombardo-Venetia.

Present Constitution of the Order. — The ” Sovereign Order of Malta ” is now divided into the Italian and German langues, both under the Sacred Council (Sagro consiglio) at Rome. The Italian langue embraces the grand priories of Rome, Lombardy and Venice, and Sicily; the German langue consists of (1) the grand priory of Bohemia, (2) the association of the honorary knights (Ehrenritter) in Silesia, (3) the association of Ehrenritter in Westphalia and the Rhine country, (4) the association of English knights (not to be confused with the English order), (5) the knights received in gremio religionis, i.e. those not attached to any of the preceding divisions. At the head of the order is the grand master. Each priory has a certain number of bailiffs (grand commanders, commendatori), commanders, professed knights (i.e. those who have taken the vows), knights of justice (novices), honorary knights, knights of grace, donats and chaplains.

Candidates for knighthood have to prove sixteen quarterings of nobility and, if under age, must be sons of a landowner of the province and of a mother born within its limits. If an Austrian subject, the postulant must obtain the emperor's leave to join the order; the election is by the chapter, and subject to confirmation by the pope. Knights of justice take a yearly oath to fulfil the duties laid on them by the order. After ten years they may take the full oath as professed knights. At any time before doing so, however, they are free to retire from the order and may receive the croix de devotion as honorary knights, their sole obligation being an annual subscription to the order. The croix de demotion is also bestowed on ladies of sufficiently impeccable descent. The grand master also has the right, motu proprio, to bestow the cross on distinguished people not of noble birth, who are known as knights of grace. The grand cross 2 of the order is sometimes given, honoris causa, to sovereigns and others, who then rank as honorary bailiffs. This is a gold, white enamelled " Maltese " cross, surmounted by a crown, which is worn suspended round the neck by a black ribbon. Bailiffs, professed knights and chaplains wear in addition a white linen cross sewn on to the left breast. The grand priory of Bohemia has made the nursing of the sick its speciality, and especially the organization of military hospitals. The hospice between Bethlehem and Jeru- salem is under the protection of the Austrian emperor.

Protestant Orders. — In addition to the Sovereign Order of the Knights of Malta, there exist two Orders of St John of Jerusalem which derive their origin from the same source: the Prussian Johanniterorden and the English Order of St John of Jerusalem. Of these the Prussian order has the most interesting history. At the Reformation the master and knights of the bailiwick of Branden- burg adopted the new religion. They continued, however, like other Ritterstifter, to enjoy their corporate rights; they even continued to acknowledge the jurisdiction of the grand preceptor of the German langue, in so far as the confirmation of official appointments was concerned, and to send their contributions to the common fund of

1 He was the only German in the list of grand masters. 4 So called because the dignitaries wore a larger cross than the generality of the knights.

the order. On the 30th of October 1810, under stress of the miseries of the Napoleonic occupation of Prussia, the order was secularized and its estates confiscated; in 1812 King Frederick William III. founded the chivalrous order of St John, to which the expropriated knights were admitted as honorary knights. In 1853 Frederick William IV. reversed

this action, abolished the new chivalrous order and reconstituted the bailiwick of Brandenburg, on the ostensible ground that its maintenance had been guaranteed by the treaty of Westphalia (1648). The master (Herrenmeister) is elected by the chapter. All members of the order must be of noble birth and belong to the Evangelical Church. The cross worn is of white enamelled gold with four black eagles between the arms; a white linen cross is also sewn on the left breast of the red tunic which forms part of the uniform. The order has founded, and supports, many hospitals, including a hospice at Jerusalem (see Herrlich, Die Ballei Brandenburg, 4th ed., Berlin, 1904).

As already mentioned, the English langue, though deprived of its lands, was never formally suppressed. In 1 826-1 827 the commission instituted by the French knights in 1814, which was aiming at taking advantage of the Greek War of Independence to reconquer Rhodes or to secure some other island in the Levant, suggested the restoration of the English langue, obviously with the idea of securing the help of Great Britain for their project. Certain eminent English- men, e.g. Sir Sydney Smith, had already been affiliated to the order by the grand master Baron von Hompesch; the commission now placed itself in communication with the Rev. Sir William Peat, chaplain to King George IV., and other English gentlemen of position. The negotiations resulted in articles of convention re- viving the English langue. In 1834 Sir William Peat, elected prior of the English langue, qualified himself by taking the oath de fideli administratione in the court of King's Bench, under the charter (never repealed) of Philip and Mary re-establishing the order. 3 For fifty years this was all the official recognition obtained by this curious and characteristic sham-Gothic restoration of the Romantic period. The " English langue," however, though somewhat absurd, did good service in organizing hospital work, notably in the creation of the St John's Ambulance Association, and this work was recog- nized in high quarters, the princess of Wales (afterwards Queen Alexandra) becoming a lady of justice in 1876 and the duke of Albany joining the order in 1883. In 1888 Queen Victoria granted a charter formally incorporating the order, the headquarters of which had been established in the ancient gate-way of the priory at Clerkenwell. In 1889 the prince of Wales (King Edward VII.) was installed as grand prior.

The objects and constitution of the order are practically the same as those of its Prussian equivalent. The sovereign is its supreme head and patron, the heir to the throne for the time being its grand prior. It is essentially aristocratic, though — for obvious reasons — proof of sixteen quarterings of nobility is not exacted as a condition of membership. The cross is the gold, white-enamelled Maltese cross,

differenced by two lions and two unicorns placed between the arms. The order also gives medals to persons of all ranks ” for service in the cause of humanity.” Among other good works, it supports an ophthalmic hospital at Jerusalem. Unlike the Prussian order, the members need not be Protestants, though they must profess Christianity. 4

Authorities. — From the 12th century onwards the knights exercised peculiar care in the preservation of their records, and the vast archives of the order are still preserved, all but intact, at Malta. These include not only those of the central establishment but also a large number of those of the separate commanderies. They in- clude papal bulls, the records of the general chapter, the statutes of the grand masters, title deeds, charters, and from 1629 onwards the special transactions of the Conseil d’&tat. These materials were exploited by several writers in the 17th and 1 8th centuries. The first was Giacomo Bosio, the 3rd edition of whose Istoria delta . . . illustrissima militia di S. Giov. Cierosolimitano was published in 3 vols, at Rome in 1676. This was followed by S. Pauli’s Codice diplomatico del sacro militare ordine Geros. (2 vols., Lucca, 1733- ‘737) and P. A. Paoli’s Dell’ origine ed istituto del sacro militar ordine , &c. (Rome, 1781). These are still useful sources as containing references to, and extracts from, documents since lost. In 1883 J. Delaville Le Roulx published Les Archives del’ Ordrede Saint- Jean, an analysis of the records preserved at Malta. This was followed in 1904 by his monumental Cartulaire general des Hospitallers de Saint- Jean de Jerusalem (1100-1310), 4 vols, folio. This gives (1) all documents anterior to 1 120, (2) all those emanating from the great dignitaries of the order, (3) all those emanating from popes, em- perors, kings and great feudatories, (4) those which fix the date of the foundation of particular commanderies, (5) those regulating the relations of the Hospitallers with the lay and ecclesiastical authorities and with the other military orders, (6) the rules, statutes and customs of the order. Hitherto unpublished documents (from the archives of Malta and elsewhere) are published in full ; those already published, and the place where they may be found, being indicated in proper sequence. Based on the Cartulaire is Le Roulx’s Les

3 See Bedford and Holbeche, Appendix D.

4 The medieval vows are, of course, not taken.

Hospilaliers en Terre Sainte et en Chypre (Paris, 1904), an invaluable work in which many hitherto obscure problems have been solved. It contains a full list of published authorities. Of English works may be mentioned John Taaffe's History of the Order of Malta (1852); J. M. Kemble's Historical introduction to The Knights Hospitallers in England (Camden Soc, London, 1857); W. Porter, Hist, of the Knights of Malta (2 vols. 1858, new ed. 1883); Bedford and Holbeche, The Order of the Hospital of St John of Jerusalem (1902), for the modern order. (W. A. P.)

ST JOHNS, the capital of Newfoundland, situated on the east coast of the island, in the peninsula of Avalon, in 47 33′ 54″ N., and 5 2 40′ 18″ W. It is the most easterly city of America, only 1700 m. from Queenstown in Ireland, and 2030 from Liverpool. It stands on rising ground on the north side of a land-locked harbour, which opens suddenly in the lofty iron-bound coast. The entrance, known as The Narrows, guarded by Signal Hill (520 ft.) and South Side Hill (620 ft.), is about 1400 ft. wide, narrowing to 600 ft. between Pancake and Chain Rocks. At the termination of the Narrows the harbour trends suddenly to the west, thus completely shutting out the ocean swell. Vessels of the largest tonnage can enter at all periods of the tide. There is good wharf accommodation and a well-equipped dry dock. St Johns practically monopolizes the commerce of the island (see Newfoundland), |>eing the centre of the cod, seal and whale fisheries. The chief industries are connected with the fitting out of the fishing vessels, or with the disposal and manufacture of their catch. Steamship lines run to Liverpool, New York, Halifax (N.S.) and Saint Pierre. Nearly all the commerce of the island is sea-borne, and well-equipped steamers connect St Johns with the numerous bays and outports. It is the eastern terminus of the government railway across the island to Port-aux-Basques, whence there is steamer connexion with the mainland at Sydney.

The finest buildings in the city are the Anglican and Roman Catholic cathedrals. Education is controlled by the various religious bodies; many of the young men complete their studies in Canada or Great Britain. St Johns is not an incorporated town. A municipal council was abolished after having largely increased the debt of the city, and it is now governed by com- missioners appointed by the governor in council.

St Johns was first settled by Devonshire fishermen early in the 1 6th century. It was twice sacked by the French, and captured by them in the Seven Years' War (1762), but recaptured in the same year, since when it has remained in British possession. Both in the War of

American Independence and in that of 1812 it was the headquarters of the British fleet, and at one time the western end of the harbour was filled up with American prizes. The old city, built entirely of wood, was twice destroyed by fire (1816-1817 and 1846). Half of it was again swept away in 1892, but new and more substantial buildings have been erected.

The population, chiefly of the Roman Catholic faith and of Irish descent, increases slowly. In 1901 the electoral district of St Johns contained 39,994 inhabitants, of whom 30,486 were within the limits of the city.

ST JOHNS, a town and port of entry of Quebec, Canada, and capital of St Johns county, 27 m. S.E. of Montreal by rail, on the river Richelieu and at the head of the Chambly canal. Pop. (1901) 4030. A large export trade in lumber, grain and farm produce is carried on, and its mills and factories produce flour, silk, pottery, hats, &c. Three railways, the Grand Trunk, Canadian Pacific and Central Vermont, enter St Johns. On the opposite bank of the river is the flourishing town of St Jean d'Iberville (usually known simply as Iberville), connected with St Johns by several bridges.

SAINT JOHNSBURY, a township and the county-seat of Caledonia county, Vermont, U.S.A., on the Passumpsic river, about 34 m. E.N.E. of Montpelier. Pop. (1890) 6567; (1900) 7010; (1910) 8098; of the village of the same name (1900) 5666 (1309 foreign-born); (1910) 6693. Area of the township, about 47 sq. m. Saint Johnsbury is served by the Boston & Maine and the Saint Johnsbury & Lake Champlain railways. The farms of the township are devoted largely to dairying. In the village are a Y.M.C.A. building (1885); the Saint Johnsbury Academy (1842); the Saint Johnsbury Athenaeum (1871), with a library (about 18,000 volumes in 1909) and an art gallery;

the Fairbanks Museum of Natural Science (1891), founded by Colonel Franklin Fairbanks; St Johnsbury Hospital (1895); Brightlook Hospital (1899, private); the large scales manu- factory of the E. & T. Fairbanks Company (see Fairbanks, Erastus), and also manufactories of agricultural implements, steam hammers, granite work, furniture and carriages. There are two systems of water- works, one being owned by the village. The township of Saint Johnsbury was granted to Dr Jonathan Arnold (1741-1793) and associates in 1786; in the same year a settlement was established and the place was named in honour of Jean Hector Saint John de Crevecceur (1731-1813), who wrote Letters of an American Farmer (1782), a glowing description of America, which brought thither many immigrants, and who intro-

duced potato planting into France. The township government was organized in 1790, and the village was incorporated in 1853.

ST JOHN'S WORT, in botany, the general name for species of Hypericum, especially H. perforatum, small shrubby plants with slender stems, sessile opposite leaves which are often dotted with pellucid glands, and showy yellow flowers. H. Androsacnium is Tutsan (Fr. tout saine), so called from its healing properties. H . calycinum (Rose of Sharon) , a creeping plant with large almost solitary flowers 3 to 4 in. across, is a south-east European plant which has become naturalized in Britain in various places in hedges and thickets.

SAINT JOSEPH, a city and the county-seat of Berrien county, Michigan, U.S.A., on Lake Michigan at the mouth of the Saint Joseph river, near the S.W. corner of the state. Pop. (1890) 3733! (1900) 5155, of whom 1183 were foreign-born; (1910 U.S. census) 5936. It is served by the Michigan Central and the Pere Marquette railways, by electric interurban railway to South Bend, Indiana, and by a steamboat line to Chicago. Benton Harbor, about 1 m. S.W., with which St Joseph is connected by electric line, is a terminus of the Cleveland, Cincinnati, Chicago & St Louis railway. The U.S. government has deepened the harbour channel to 18 ft.; and the St Joseph river has been made navigable for vessels drawing 3 ft. from St Joseph to Berrien Springs (25 m. by river). A canal, 1 m. long, extends from the upper part of the harbour to Benton Harbor. St Joseph has a public library. The city is a summer and health resort; it has mineral (saline sulphur) springs and a large mineral-water bath house. The general offices and the hospital (1902) of the Michigan Children's Home Society are here. The city has an important trade in fruit, and has various manu- factures, including paper, fruit packages, baskets, motor boats, gasolene launches, automobile supplies, hosiery and knit goods, air guns and sashes and blinds. The municipality owns and operates its water-works and electric-fighting plant.

On or near the site of the present city La Salle built in 1679 Fort Miami. In the same county, on or near the site of the present city of Niles (pop. 1910, 5156), French Jesuits established an Indian mission in 1690, and the French government in 1697 erected Fort St Joseph, which was captured from the English by the Indians in 1763, and in 1781 was seized by a Spanish party from St Louis. Fort Miami has often been confused with this Fort St Joseph, 60 m. farther up the river. St Joseph was settled in 1829, incorporated as a village in 1836 and first chartered as a city in 1891.

SAINT JOSEPH, a city and the county-seat of Buchanan county,

Missouri, U.S.A., and a port of entry, situated in the north-western corner of the state on the E. bank of the Missouri river. It is the third in size among the cities of the state. Pop. (1880) 32,431; (1890) 52,324; (1900) 102,979, of whom 8424 were foreign-born and 6260 were negroes; (1910 census) 77,403. St Joseph is a transportation centre of great import- ance. It is served by six railways, the Atchison, Topeka & Santa Fe, the Chicago, Burlington & Quincy, the Chicago Great Western, the Chicago, Rock Island & Pacific, the Missouri Pacific, and the St Joseph & Grand Island; in addition there are two terminal railways. A steel bridge across the Missouri (built in 1872; rebuilt in 1906) connects the city with Elwood, Kansas (pop. 1910, 636), and is used by two railways. The city is laid out on hills above the bluffs of the river. The site was completely remade, however (especially in 1866-1873), and the entire business portion has been much graded down. The principal public buildings are the Federal building, the court house, an auditorium seating 7000, a Union Station and a

public library. There are six city parks, of which the largest are Krug Park (30 acres) and Bartlett Park (20 acres). The State Hospital (No. 2) for the Insane(opened 1874) is immediately E. of St Joseph; in the city are the Ensworth, St Joseph and Woodson hospitals, a Memorial Home for needy old people and the Home for Little Wanderers. South St Joseph, a manu- facturing suburb, has a library and so has the northern part of the city. The great stock-yards of South St Joseph are sights of great interest. In 1909 the state legislature provided for a commission form of government which took effect in April 1910; a council of five, elected by the city at large, has only legislative powers; the mayor appoints members of a utilities commission, a park commission and a board of public works, and all officers except the city auditor and treasurer; and the charter provides for the initiative, the referendum and the recall. The city maintains a workhouse (1882), also two market houses, and owns and manages an electric-lighting plant. Natural gas is also furnished to the city from oil-fields in Kansas. A private company owns the water-works, first built in 1879 and since greatly improved. The water is drawn from the Missouri, 3 m. above the city, and is pumped thence into reservoirs and settling basins. Beside the local trade of a rich surrounding farming country, the railway facilities of St Joseph have enabled it to build up a great jobbing trade (especially in dry goods), and this is still the greatest economic interest of the city. Commerce and

transport were the only distinctive basis of the city's growth and wealth until after 1890, when there was a great increase in manufacturing, especially, in South St Joseph, of the slaughtering and meat-packing industry in the last three years of the decade. In 1900 the manufactured product of the city and its immediate suburbs was valued at $31,690,736, of which $19,009,332 were credited to slaughtering and packing. In the decade of 1890-1900 the increase in the value of manu- factures (165-9%) was almost five times as great in St Joseph as in any other of the largest four cities of the state, and this was due almost entirely to the growth of the slaughtering and meat-packing business, which is for the most part located outside the municipal limits. In 1905 the census reports did not include manufactures outside the actual city limits; the total value of the factory product of the city proper in 1905 was $11,573,720; besides slaughtering and packing the other manufactures in 1905 included men's factory-made clothing (valued at $1,556,655) flour and grist-mill products (valued at $683,464), saddlery and har- ness (valued at $524,918), confectionery ($437,096), malt liquors ($407,054), boots and shoes ($350,384) and farm implements.

In 1826 Joseph Robidoux, a French half-breed trader, established a trading post on the site of St Joseph. Following the purchase from the Indians of the country, now known as the Platte Purchase, in 1836, a settlement grew up about this trading post, and in 1 843 Robidoux laid out a town here and named it St Joseph in honour of his patron saint. St Joseph became the county-seat in .1846, and in 1851 was first chartered as a city. It early became a trading centre of importance, well known as an outfitting point for miners and other emigrants to the Rocky Mountain region and the Pacific coast. During the Civil War it was held continuously by the Unionists, but local sentiment was bitterly divided. After the war a rapid development began. In 1885 St Joseph became a city of the second class. Under the state constitution of 1 875 it has had the right, since attaining a population of 100,000, to form a charter for itself. In September 1909, at a special election, it adopted the commission charter described above.

ST JUNIEN, a town of west-central France in the department of Haute-Vienne, on the right bank of the Vienne, 26 m. W. by N. of Limoges on the railway from Limoges to Angouleme. Pop. (1906) town, 8484; commune, 11,400. The 12th century collegiate church, a fine example of the Romanesque style of Limousin, contains a richly sculptured tomb of St Junien, the hermit of the 6th century from whom the town takes its name. Another interesting building is the Gothic chapel of Notre-Dame, with three naves, rebuilt by Louis XL, standing close to a

medieval bridge over the Vienne. The town, which ranks second in the department in population and industry, is noted for leather-dressing and the manufacture of gloves and straw paper.

SAINT-JUST, ANTOINE LOUIS LEON DE RICHEBOURG DE (1767—1794), French revolutionary leader, was born at

Decize in the Nivernais on the 25th of August 1767. At the outbreak of the Revolution, intoxicated with republican ideas, he threw himself with enthusiasm into politics, was elected an officer in the National Guard of the Aisne, and by fraud — he being yet under age — admitted as a member of the electoral assembly of his district. Early in 1789 he had published twenty cantos of licentious verse, in the fashion of the time, under the title of Organt au Vatican. Henceforward, however, he assumed a stoical demeanour, which, united to a policy tyrannical and pitilessly thorough, became the characteristic of his life. He entered into correspondence with Robespierre, who, flattered by his worship, admitted him to his friendship. Thus supported, Saint- Just became deputy of the department of Aisne to the National Convention, where he made his first speech on the condemnation of Louis XVI. — gloomy, fanatical, remorseless in tone — on the 13th of November 1792. In the Convention, in the Jacobin Club, and among the populace his relations with Robespierre became known, and he was dubbed the ” St John of the Messiah of the People.” His appointment as a member of the Committee of Public Safety placed him at the centre of the political fever-heat. In the name of this committee he was charged with the drawing up of reports to the Convention upon the absorbing themes of the overthrow of the party of the Gironde (report of the 8th of July 1793), of the Herbertists, and finally, of that denunciation of Danton which consigned him and his followers to the guillotine. What were then called reports were rather appeals to the passions; in Saint-Just’s hands they furnished the occasion for a display of fanatical daring, of gloomy eloquence, and of undoubted genius; and — with the shadow of Robespierre behind him — they served their turn. Camille Desmoulins, in jest and mockery, said of Saint-Just — the youth with the beautiful countenance and the long fair locks — ” He carries his head like a Holy Sacrament.” ” And I,” savagely replied Saint- Just, ” will make him carry his like a Saint Denis.” The threat was not vain: Desmoulins accom- panied Danton to the scaffold. The same ferocious inflexibility animated Saint-Just with reference to the external policy of France. He proposed that the National Convention should itself, through its committees, direct all military movements and all branches of the government (report of the 10th of October I 793)- This was agreed to, and Saint-Just was despatched to Strassburg,

in company with another deputy, to superintend the military operations. It was suspected that the enemy without was being aided by treason within. Saint- Just's remedy was direct and terrible: he followed bis experience in Paris, " organized the Terror," and soon the heads of all suspects sent to Paris were falling under the guillotine. But there were no executions at Strassburg, and Saint-Just repressed the excesses of J. G. Schneider (q.v.), who as public prosecutor to the revolu- tionary tribunal of the Lower Rhine had ruthlessly applied the Terror in Alsace. Schneider was sent to Paris and guillotined. The conspiracy was defeated, and the armies of the Rhine and Moselle having been inspirited by success — Saint-Just himself taking a fearless part in the actual fighting — and having effected a junction, the frontier was delivered and Germany invaded* On his return Saint-Just was made president of the Convention. Later, with the army of the North, he placed before the generals the dilemma of victory over the enemies of France or trial by the dreaded revolutionary tribunal; and before the eyes of the army itself he organized a force specially charged with the slaughter of those who should seek refuge by flight. Success again crowned his efforts, and Belgium was gained for France (May, 1794). Meanwhile affairs in Paris looked gloomier than ever, and Robespierre recalled Saint-Just to the capital. Saint- Just proposed a dictatorship as the only remedy for the con- vulsions of society. At last, at the famous sitting of the 9th Thermidor, he ventured to present as the report of the com- mittees of General Security and Public Safety a document expressing his own views, a sight of which, however, had been refused to the other members of committee on the previous evening. Then the storm broke. He was vehemently inter- rupted, and the sitting ended with an order for Robespierre's

arrest (see Robespierre). On the following day, the 28th of July 1794, twenty-two men, nearly all young, were guillotined. Saint-Just maintained his proud self-possession to the last.

See CEuvres de Saint-Just, precedees d'une notice historique sur sa vie (Paris, 1833-1834); E. Fleury, Ittudes revolutionnaires (2 vols., 1851), with which cf. articles by Sainte Beuve (Causeries du lundi, vol. v.), Cuvillier-Fleury (Portraits politiques et revolutionnaires) ; E. Hamel, Histoire de Saint-Just (1859), which brought a fine to the publishers for outrage on public decency ; F. A. Aulard, Les Orateurs de la Legislative et de la Convention (2nd ed., Paris, 1905). The CEuvres completes de Saint-Just have been edited with notes by C. Vellay

(Paris, 1908).

ST JUST (St Just in Penwith), a market town in the St Ives parliamentary division of Cornwall, England, i\ m. by road W. of Penzance. Pop. of urban district (1901) 5646. This is the most westerly town in England, lying in a wild district 1 m. inland from Cape Cornwall, which is 4 m. N. of Land's End. The urban district has an area of 7633 acres, and includes the small industrial colonies near some of the most important mines in Cornwall. The Levant mine is the chief, the workings extend- ing beneath the sea. Traces of ancient workings and several exhausted mines are seen. The church of St Just is Per- pendicular, with portions of the fabric of earlier date. There are ruins of an oratory dedicated to St Helen on Cape Cornwall.

ST KILDA, a city of Bourke county, Victoria, Australia, 35 m. by rail S. of, and suburban to, Melbourne. Pop. (1901) 20,544. It is a fashionable watering-place on Hobson's Bay, and possesses the longest pier in Australia. The esplanade and the public park are finely laid out; and portions of the sea are fenced in to protect bathers. The town hall, the public library, the assembly hall, and the great Anglican church of All Saints are the chief buildings.

ST KILDA (Gaelic Hirta, " the western land "), the largest of a small group of about sixteen islets of the Outer Hebrides, Inverness-shire, Scotland. It is included in the civil parish of Harris, and is situated 40 m. W. of North Uist. It measures 3 m. from E. to W. and 2 m. from N. to S., has an area of about 3500 acres, and is 7 m. in circumference. Except at the landing- place on the south-east, the cliffs rise sheer out of deep water, and on the north-east side the highest eminence in the island, Conagher, forms a precipice 1220 ft. high. St Kilda is probably the core of a Tertiary volcano, but, besides volcanic rocks, contains hills of sandstone in which the stratification is distinct. The boldness of its scenery is softened by the richness of its verdure. The inhabitants, an industrious Gaelic-speaking community (no in 1851 and 77 in 1901), cultivate about 40 acres of land (potatoes, oats, barley), keep about 1000 sheep and a few head of cattle. They catch puffins, fulmar petrels, guillemots, razor- birds, Manx shearwaters and solan geese both for their oil and for food. Fishing is generally neglected. Coarse tweeds and blanketing are manufactured for home use from the sheep's wool which is plucked from the animal, not shorn. The houses are collected in a little village at the head of the East Bay. The island is practically inaccessible for eight months of the year, but the inhabitants communicate with the outer world by means of " sea messages," which are despatched in boxes when a strong west wind is blowing, and generally make the western islands or mainland

of Scotland in a week.

The island has been in the possession of the Macleods for hundreds of years. In 1779 the chief of that day sold it, but in 187 1 Macleod ol Macleod bought it back, it is stated, for £3000. In 1724 the population was reduced by smallpox to thirty souls. They appear to catch what is called the ” boat-cold ” caused by the arrival of strange boats, and at one time the children suffered severely from a form of lockjaw known as the ” eight days’ sickness.”

See works by Donald Munro, high dean of the Isles (1585), M. Martin (1698), Rev. K. Macaulay (1764), R. Connell (1887); Miss Goodrich-Freer, The Outer Isles; Richard and Cherry Kearton, With Nature and a Camera (1896).

ST KITTS, or St Christopher, an island in the British West Indies, forming, with Nevis and Anguilla, one of the presidencies in the colony of the Leeward Islands. It is a long oval with a narrow neck of land projecting from the south-eastern end; total length 23 m., area 63 sq. m. Mountains traverse the central part from N.W. to S.E., the greatest height being Mount Misery (3771 ft.). The island is well watered, fertile and healthy, and

its climate is cool and dry (temperature between 78 and 85° F.; average annual rainfall 38 in.). The circle of land formed by the skirts of the mountains, and the valley of Basseterre con- stitute nearly the whole of the cultivated portion. The higher slopes of the hills afford excellent pasturage, while the summits are crowned with dense woods. Sugar, molasses, rum, salt, coffee and tobacco are the chief products; horses and cattle are bred. Primary education is compulsory. The principal towns are Old Road, Sandy Point and the capital Basseterre, which lies on the S.W. coast (pop. about 10,000). One good main road, macadamized throughout, encircles the island. The local legislature consists of 6 official and 6 unofficial members nominated by the Crown. St Kitts was discovered by Columbus in 1493 and first settled by Sir Thomas Warner in 1623. Five years later it was divided between the British and the French, but at the Peace of Utrecht in 17 13 it was entirely ceded to the British Crown. Population, mostly negroes, 29,782.

SAINT-LAMBERT, JEAN FRANCOIS DE (1716-1803), French poet, was born at Nancy on the 26th of December 1716. He entered the army and, when Stanislaus Leszczynski was estab- lished in 1737 as duke of Lorraine, he became an official at his court at Luneville. He left the army after the Hanoverian campaign of 1756-57, and devoted himself

to literature, producing a volume of descriptive verse, Les Saisons (1769), now never read, many articles for the Encyclopidie, and some miscellaneous works. He was admitted to the Academy in 1770. His fame, however, comes chiefly from his amours. He was already high in the favour of the marquise de Boufflers, Stanislaus's mistress, whom he addressed in his verses as Doris and Thtmire, when Voltaire in 1748 came to Luneville with the marquise de Chatelet. Her infatuation for him and its fatal termination are known to all readers of the life oi Voltaire. His subsequent liaison with Madame d'Houdetot, Rousseau's Sophie, though hardly less disastrous to his rival, continued for the whoie lives of himself and his mistress. Saint-Lambert's later years were given to philosophy. He published in 1798 the Principe des mozurs chez toutes les nations ou catechisme universel, and published his CEuvres philosophiques (1803), two years before his death on the 9th of February 1803. Madame d'Houdetot survived until the 28th of January 1813.

See G. Maugras, La Cow de Luneville (1904) and La Marquise de Boufflers (1907) ; also the literature dealing with Rousseau and Voltaire.

ST LAWRENCE. The river St Lawrence, in North America, with the five fresh-water inland seas (see Great Lakes), Superior, Michigan, Huron, Erie and Ontario, forms one of the great river systems of the world, having a length, from the source of the river St Louis (which rises near the source of the river Mississippi and falls into the head of Lake Superior) to Cape Gaspe, where it empties into the Gulf of St Lawrence, of 2100 m. The river is here considered as rising at the foot of Lake Ontario, in 44 10′ N., 76 30′ W., where the name St Lawrence is first applied*to it.

The river, to the point where it crosses 45 N. in its north- westerly course, forms the boundary line between the state of New York and the province of Ontario; thence to the sea it is wholly within Canadian territory, running through the province of Quebec. At Point des Monts, 260 m. below Quebec, it is 26 m. wide, and where it finally merges into 'the Gulf of St Lawrence, 150 m. farther on, it is 90 m. wide, this stretch being broken by the large island of Anticosti, lying fairly in the mouth. The character of the river banks varies with the geological formations through which it runs. Passing over the Archaean rocks of the Laurentian from Kingston to Brockville the shores are very irregular, and the river is broken up by protrusions of glaciated summits of the granites and gneisses into a large number of picturesque islands, " The Thousand Islands," greatly frequented as a summer resort. From Brockville to Montreal the river runs through

flat-bedded Cambro-silurian limestones, with rapids at several points, which are all run by light-draught passenger boats. For the up trip the rapids are avoided by canalization. From Montreal to Three Rivers the course is through an alluvial plain over-lying the limestones,

the river at one point expanding into Lake St Peter, 20 m. long by 10 m. wide, with a practically uniform depth of 10 ft. Below Three Rivers the banks grow gradually higher until, after passing Quebec through a cleft in slate rocks of Cambrian age, the river widens, washing the feet of the Laurentian Mountains on its north shore ; while a more moderately hilly country, terminating in the Shickshock Mountains of the Gaspe Peninsula, skirts its south shore.

From Kingston, at the head of the river, to Montreal, a distance of 170 m., navigation is limited to vessels of 14 ft. draught by the capacity of the canals. From Montreal to Quebec, 160 m., a ship channel has been dredged to a depth of 30 ft.; below Quebec the river is tidally navigable by vessels of any draught. The canals on the St Lawrence above Montreal have been enlarged to the capacity of the Welland canal, the improved system having been opened to commerce in the autumn of 1899. Instead of enlarging the Beauharnois canal, on the south side of the river, a new canal, the ” Soulanges,” was built from Coteau Landing to Cascades Point, on the north side, the Beauharnois canal still being used for small barges. The locks of the enlarged canals are all 45 ft. wide, with an available depth of 14 ft. and a minimum length of 270 ft. The following table shows the canalized stretches in this portion of the river:—

Name.

From

To

Length in Miles.

Number of Locks.

Fall in Feet.

Galops

River ….

Rapide Plat

River ….

Farran Point

River ….

Cornwall Canal .

Lake St Francis

Soulanges .

Lake St Louis .

Lachine

Head of Galops Rapids Head of Ogden Island Head of Croil Island Dickinson Landing Coteau Landing Lachine

Iroquois Morrisburg Farran Point Cornwall Cascades Point Montreal

7*

t*

3a

ioi

1

5 11 305

H H

84

3 2 1 6

4 5

154

“I

34 48 824 45

109J

21

206

In the stretch between Montreal and Quebec the ship channel, begun by the Montreal Harbour Commissioners, has been assumed by the Dominion government as a national work, and improve- ments, involving extensive dredging, have been undertaken with the aim of securing everywhere a minimum depth of 30 ft. with a minimum width of 450 ft. The whole river from Kingston to the sea is well supplied with aids to navi- gation. In the dredged portions lights are arranged in pairs of leading lights on foundations sufficiently high and solid to resist the pressure of ice movement, and there is an elabo- rate system of fog alarms, gas-lighted and other buoys, as well as telegraphic, wireless and telephonic communication, storm signal, weather and ice reporting stations and a life-saving service.

Montreal, at the head of ocean navigation, the largest city in Canada, is an important distributing centre for all points in western Canada, and enjoys an extensive shipping trade with the United Kingdom, the sea-going shipping exceeding 1,500,000 tons, and the inland shipping approximating 2,000,000 tons, annually. Quebec is the summer port used by the largest steamers in the Canadian trade. There are numerous flourishing towns on both banks of the river, from Kingston, a grain trans- ferring port, to the sea. Large quantities of lumber, principally spruce (fir) and paper pulp, are manufactured at small mills along the river, and shipped over sea directly from the place of production. The mail steamers land and embark mails at Rimouski, to or from which they are conveyed by rail along the south shore.

The importance to Canada of the river St Lawrence as a national trade route cannot be over-estimated. As a natural highway between all points west of the Maritime Provinces and Europe it is unique in permitting ocean traffic to penetrate 1000 m. into the heart of a country. It is, moreover, the shortest freight route from the Great Lakes to Europe. From Buffalo

to Liverpool via New York involves rail or 7-ft. canal transport of 496 m. and an ocean voyage of 3034 nautical miles. Via Montreal there is a 14-ft. transport of 348 m. and river and ocean voyage of 2772

nautical miles. From Quebec to Liverpool by Cape Race is 2801 nautical miles, while the route by Belle Isle, more nearly a great circle course, usually taken between July and October, is only 2633 nautical miles. On the other hand the St Lawrence is not open throughout the year; the average time between the arrival of the first vessel at Montreal from sea and the departure of the last ocean vessel is seven months. From Kingston to Quebec the river freezes over every winter, except at points where the current is rapid. Below Quebec, although there is heavy border ice, the river never freezes over. For a few winters, while the bridge accommodation at Montreal was restricted to the old single-track Victoria bridge, railway freight trains were run across the ice bridge on temporary winter tracks. Efforts have been made to lengthen the season of navigation by using specially constructed steamers to break the ice; and it is claimed that the season of navigation could be materially lengthened, and winter floods prevented by keeping the river open to Montreal. Winter ferries are maintained at Quebec, between Prince Edward Island and Nova Scotia, and between Newfoundland and Sydney, Cape

Breton. In the winter of 1898-1899 an attempt was made to run a winter steamer from Paspebiac to England, but it was not successful, principally because an unsuitable vessel was used. To pass through the field of ice that is always present in the gulf, in greater or lesser quantity, specially strengthened vessels are required.

The river above tide water is not subject to excessive flooding, the maxi- mum rise in the spring and early summer months, chiefly from northern tributaries from the Ottawa eastward, being 10 ft. The Great Lakes serve as impounding reservoirs for the gradual distribution of all overflows in the west. At Montreal, soon after the river freezes over each winter, there is a local rise of about 10 ft. in the level of the water in the harbour, caused by restriction of the channel by anchor ice ; and in the spring of the year, when the volume of the water is augmented, this obstruction leads to a further rise, in 1886 reaching a height of 27 ft. above ordinary low water. To prevent flooding of the lower parts of the city a dike was in 1887 built along the river front, which prevented a serious flooding in

1899.

Tides enter the Gulf of St Lawrence from the Atlantic chiefly through Cabot Strait (between Cape Breton and Newfoundland), which is 75 m. wide and 250 fathoms deep. The tide entering through Belle Isle Strait, 10 m. wide and 30 fathoms deep, is comparatively little felt. The tidal undulation, in passing through the gulf, expands so widely

as to be almost inappreciable in places, as, for example, at the Magdalen Islands, in the middle of the gulf, where the range amounts to about 3 ft. at springs, becoming effaced at neaps. There is also little more tide than this at some points on the north shore of Prince Edward Island. The greatest range is attained in North- umberland Strait and in Chaleur Bay, where it amounts to 10 ft. At the entrance to the estuary at Anticosti it has again the oceanic range of about 6 ft., and proceeds up the estuary with an ever- increasing range, which attains its maximum of 19 ft. at the lower end of Orleans Island, 650 m. from the ocean at Cabot Strait. This must be considered the true head of the estuary. At Quebec, 30 m. farther up, the range is nearly as great; but at 40 m. above Quebec it is largely cut off by the Richelieu Rapids, and finally ceases to be felt at Three Rivers, at the lower end of Lake St Peter, 760 m. from the ocean.

The St Lawrence provides ample water-power, which is being increasingly used. Its rapids have long been used for milling and factory purposes; a wing dam on the north side of Lachine Rapids furnishes electricity to Montreal; the falls of Montmorency light Quebec and run electric street cars; and from Lake Superior to the gulf there are numerous points on the tributaries to the St Lawrence where power could be used.

Nearly all the rivers flowing into the St Lawrence below Quebec are stocked with salmon (Salmo salar), and are preserved and leased to anglers by the provincial government. In the salt

water of the gulf and lower river, mackerel, cod, herring, smelt, sea-trout, striped bass and other fish are caught for market.

The St Lawrence is spanned by the following railway bridges : (1) A truss bridge built near Cornwall in 1900 by the New York & Ottawa railroad, now operated by the New York Central railroad. (2) A truss bridge with a swing, built in 1890 by the Canada Atlantic railway at Coteau Landing. (3) A cantilever bridge built in 1887 by the Canadian Pacific railway at Caugh- nawaga. (4) The Victoria Jubilee bridge, built as a tubular bridge by the Grand Trunk railway in i860, and transformed into a truss bridge in 1897-1898. The new bridge rests on the piers of the old one, enlarged to receive it, is 6592 ft. long by 67 ft. wide, has 25 spans, double railway and trolley tracks, driveways and sidewalks, and was erected without interruption of traffic. (5) A

very large cantilever bridge, having a central span of 1800 ft., crosses the river at a point 7 m. above Quebec. The southern half of the superstructure, while in course of erection in August 1907, fell, killing 78 men, and necessitating a serious delay in the completion of the work.

The river St Lawrence was discovered by Jacques Cartier, commissioned by the king of France to explore and trade on the American coast. Cartier entered the strait of Belle Isle in 1534; but Breton fishermen had previously resorted there in summer and penetrated as far as Brest, eleven leagues west of Blanc Sablon, the dividing line between Quebec and Labrador. Cartier circled the whole gulf, but missed the entrance to the river. On his second voyage in 1536 he named a bay on the north shore of the gulf, which he entered on the 10th of August, the feast of St Lawrence, Baye Sainct Laurens, and the name gradually extended over the whole river, though Cartier himself always wrote of the River of Canada. Early in September, he reached " Canada," now Quebec, and on the 2nd of October reached Hochelaga, now Montreal. No permanent settlement was then made. The first, Tadousac, at the mouth of the Saguenay, was established by Champlain in 1603, and Quebec was settled by him in 1608. Between that time and 1616 Champlain explored the whole river system as far west as Lake Huron, reaching it by way of the Ottawa river, and taking possession of the country in the name of the king of France. It became British by the treaty of Paris, in 1763.

See S. E. Dawson, The St Lawrence, Us Basin and Border Lands (New York, 1905) (historical) ; St Lawrence Pilot (7th ed., Hydro- graphic Office, Admiralty, London, 1906) ; Sailing Directions for the St Lawrence River to Montreal (United States Hydrographic Office publication, No. 108 D, Washington, 1907): Annual Reports of the Canadian Departments of Marine and Fisheries, Public Works, and Railways and Canals, Ottawa); Transactions (Royal Society, Canada, 1898-1899), vol. iv. sec. iii.; T. C. Keefer on " Ice Floods and Winter Navigation of the St Lawrence," Transactions (Canadian Society of Civil Engineers, Presidential Address of W. P. Anderson, on improvements to navigation on St Lawrence, 1904).

(W. P. A.)

ST LEGER, SIR ANTHONY (c. 1496-1559), lord deputy of Ireland, eldest son of Ralph St Leger, a gentleman of Kent, was educated abroad and at Cambridge. He quickly gained the favour of Henry VIII. , and was appointed in 1537 president of a commission for inquiring into the condition of Ireland. This work he carried out with ability and

obtained much useful knowledge of the country. In 1540 he was appointed lord deputy of Ireland. His first task was to repress disorder, and he at once proceeded with severity against the Kavanaghs, permitting them, however, to retain their lands, on their accepting feudal tenure on the English model. By a similar policy he exacted obedience from the O'Mores, the O'Tooles and the O'Conors in Leix and Offaly; and having conciliated the O'Briens in the west and the earl of Desmond in the south, the lord deputy carried an act in the Irish parliament in Dublin conferring the title of king of Ireland on Henry VIII. and his heirs. Conn O'Neill, who in the north had remained sullenly hostile, was brought to submission by vigorous measures. For the most part, however, St Leger's policy was one of moderation and conciliation — rather more so, indeed, than Henry VIII. approved. He recommended The O'Brien, when he gave token of a sub- missive disposition, for the title of earl of Thomond; O'Neill

was created earl of Tyrone; and administrative council was instituted in the province of Munster; and in 1544 a levy of Irish soldiers was raised for service in Henry VIII. 's wars. St Leger's personal influence was proved by an outbreak of disturbance when he visited England in 1544, and the prompt restoration of order on his return some months later. St Leger retained his office under Edward VI., and again effectually quelled attempts at rebellion by the O'Conors and O'Byrnes. From 1548 to 1550 he was in England. He returned charged with the duty of introducing the reformed liturgy into Ireland. His conciliatory methods brought upon him the accusation that he lacked zeal in the cause, and led to his recall in the summer of 1 55 1. After the accession of Mary he was again appointed lord deputy in October 1553, but in consequence of a charge against him of keeping false accounts he was recalled for the third time in 1556. While the accusation was still under investi- gation, he died on the 16th of March 1559.

By his wife Agnes, daughter of Hugh Warham, a niece cf Archbishop Warham, he had three sons, William, Warham and Anthony. William died in his father's lifetime leaving a son, Sir Warham St Leger (d. 1600), who was father of Sir William St Leger (d. 1642), president of Munster. Sir William took part in " the flight of the earls " (see O'Neill) in 1607, and spent several years abroad. Having received a pardon from James I. and extensive grants of land in Ireland, he was appointed president of Munster by Charles I. in 1627. He warmly supported the arbitrary government of Strafford, actively assisting in raising and drilling the Irish levies destined for the service of the king against the Parliament. In the great rebellion of 1641 he bore the chief responsibility for dealing with the insurgents in Munster; but the

forces and supplies placed at his disposal were utterly inadequate. He executed martial law in his province with the greatest severity, hanging large numbers of rebels, often without much proof of guilt. He was still struggling with the insurrection when he died at Cork on the 2nd of July 1642. Sir William's daughter Margaret married Murrough O'Brien, 1st earl of Inchi- quin; his son John was father of Arthur St Leger, created Viscount Doneraile in 1703. ,

A biography of Sir Anthony St Leger will be found in Alhenae Cantabrigienses, by C. H. Cooper and T. Cooper (Cambridge, 1858) ; see also Calendar of State Papers relating to Ireland, Hen. VIII.-Eliz. ; Calendar of Letters and Papers of the Reign of Henry VIII. ; Calendar of State Papers {Domestic Series), Edward VI.— James I.; Calendar of Carew MSS. ; J. O'Donovan's edition of Annals of Ireland by the Four Masters (7 vols., Dublin, 1851); Richard Bagwell, Ireland under the Tudors (3 Vols., London, 1 885-1890) ; J. A. Froude, History of England (12 vols., London, 1856-1870). For Sir William St Leger, see Strafford's Letters and Despatches (2 vols., London, 1739) ; Thomas Carte, History of the Life of James, Duke of Ormonde (6 vols., Oxford, 1851); History of the Irish Confederation and the War in Ireland, edited by Sir J. T. Gilbert (Dublin, 1882-1891). (R. J. M.)

ST LEONARDS, EDWARD BURTENSHAW SUGDEN, ist

Baron (1781-1875), lord chancellor of Great Britain, was the son of a hairdresser of Duke Street, Westminster, and was born on the 1 2th of February 1781. After practising for some years as a conveyancer, he was called to the bar at Lincoln's Inn in 1807, having already published his well-known treatise on the Law 'of Vendors and Purchasers (14th ed., 1862). In 1822 he was made king's counsel and chosen a bencher of Lincoln's Inn. He was returned at different times for various boroughs to the House of Commons, where he made himself prominent by his opposition to the Reform Bill of 1832. He was appointed solicitor-general in 1829, was named lord chancellor of Ireland in 1834, and again filled the same office from 1841 to 1846. Under Lord Derby's first administration in 1852 he became lord chancellor and was raised to the peerage as Lord St Leonards. In this position he devoted himself with energy and vigour to the reform of the law; Lord Derby on his return to power in 1858 again offered him the same office, which from considerations of health he declined. He continued, however, to take an active interest especially in the legal matters that came before the House of Lords, and bestowed his particular attention on the reform of the law of property. He died at Boyle Farm, Thames Ditton, on the 29th of January i8?<.

After his death his will was missing, but his daughter, Miss Charlotte Sugden,. was able to recollect the contents of a most intricate document, and in the action of Sugden v. Lord St Leonards (L.R. i P.D. 154) the court accepted her evidence and granted probate of a paper propounded as containing the provisions of the lost will. This decision established the pro- position that the contents of a lost will may be proved by secondary evidence, even of a single witness.

Lord St Leonards was the author of various important legal publications, many of which have passed through several editions. Besides the treatise on purchasers already mentioned, they include Powers, Cases decided by the House of Lords, Gilbert on Uses, New Real Property Laws and Handybook of Property Law, Misrepresenta- tions in Campbell's Lives of Lyndhurst and Brougham, corrected by St Leonards. See The Times (30th of January 1875) ; E. Manson, Builders of our Law (1904); J. R. Atlay, Lives of the Victorian Chancellors, vol. ii.

ST LIZIER-DE-COUSERANS, a village of south-western France in the department of Ariege on the right bank of the Salat, 1 m. N.N.W. of St Girons. Pop. (1906) 615; commune 1295. St Lizier, in ancient times one of the twelve cities of Novempopulania under the name of Lugdunum Consoranorum, was later capital of the Couserans and seat of a bishopric (sup- pressed at the Revolution) to the holders of which the town belonged. It has a cathedral of the 1 2th and 14th centuries with a fine Romanesque cloister and preserves remarkable remains of Roman ramparts. The old episcopal palace (17th century) and the adjoining church (14th and 17th centuries), once the cathedral with its fine chapter-hall (12th century), form part of a lunatic asylum. The Salat is crossed by a bridge of the 1 2th or 13th century. The town owes its name to its bishop Lycerius, who is said to have saved it from the Vandals in the 7th century. The chief event in its history was its devastation in 1 130 by Bernard III., count of Comminges, a disaster from which it never completely recovered.

ST LO, a town of north-western France, capital of the depart- ment of Manche, 475 m. W. by S. of Caen by rail. Pop. (1906) town 9379; commune, 12,181. St L6 is situated on a rocky hill on the right bank of the Vire. Its chief building is the Gothic church of Notre-Dame, dating mainly from the 16th century. The facade, flanked by two lofty towers and richly decorated, is impressive, despite its lack of

harmony. There is a Gothic pulpit outside the choir. In the hotel-de-ville is the " Torigni marble," the pedestal of an ancient statue, the in-scriptions on which relate chiefly to the annual assemblies of the Gallic deputies held at Lyons under the Romans. The modern church of Sainte-Croix preserves a Romanesque portal which belonged to the church of an ancient Benedictine abbey. St L6 is the seat of a prefect and has tribunals of first instance and of commerce, a training college for masters, a school of drawing, a branch of the Bank of France, a chamber of arts and manu- factures, and a government stud. The town has trade in grain, fat stock, troop-horses and farm produce, and carries on tanning, wool-spinning and bleaching and the manufacture -of woollen and other fabrics.

St L6, called Briove.ra in the Gallo-Roman period, owes its present name to St L5 (Laudus), bishop of Coutances (d. 568). In the middle ages St L6 became an important fortress as well as a centre for the weaving industry. It sustained numerous sieges, the last in 1574, when the town, which had embraced Calvinism, was stormed by the Catholics and many of its inhabitants massacred. In 1800 the town was made capital of its department in place of Coutances.

ST LOUIS, the chief city and a port of entry of Missouri, an'd the fourth in population among the cities of the United States, situated on the W. bank of the Mississippi river, about 20 m. below its confluence with the Missouri, 200 m. above the influx of the Ohio, and 1270 m. above the Gulf of Mexico, occupying a land area of 61-37 S Q- m – m a commanding central position in the great drainage basin of the Mississippi system, the richest portion of the continent. Pop. (1880) 350,518, (1890) 451,770, (1900) 575,238, (191°) 687,029.

The central site is marked by an abrupt terraced rise from the river to an easily sloping tableland, 4 or 5 m. long and somewhat less than 1 m. broad, behind which are rolling hills. The length of the river-front is about 19 m. The average elevation of the

city is more than 425 ft.; and the recorded extremes of low and high water on the river are 379 and 428 ft. (both established in 1844). The higher portions of the city lie about 200 ft. above the river level, and in general the site is so elevated that there can be no serious interruption of business except by extraordinary floods. The natural drainage is excellent, and the sewerage system, long very imperfect, has been made adequate. The street plan is approximately rectilinear. The stone-paved wharf or river-front, known as the Levee or Front Street, is 3-7 m. long. Market Street, running E. and W., is regarded as the central thoroughfare; and the numbering of the streets is

systematized with reference to this line and the river. Broadway (or Fifth Street, from the river) and Olive Street are the chief shopping centres; Washington Avenue, First (or Main) and Second Streets are devoted to wholesale trade; and Fourth Street is the financial centre. The most important public buildings are the Federal building, built of Maine granite; the county court house (1839- 1862, $1,199,872), — a semi-classic, plain, massive stone structure, the Four Courts (1871, $755,000), built of cream-coloured Joliet stone, and a rather effective city hall (1890-1904, $2,000,000), in Victorian Gothic style in brick and stone. The chief slave- market before the Civil War was in front of the Court House. The City Art Museum, a handsome semi-classic structure of original design, and the Tudor-Gothic building of the Washington University, are perhaps the most satisfying structures in the city architecturally. Among other noteworthy buildings are the Public Library, the Mercantile Library, the Mercantile, the Mississippi Valley, the Missouri-Lincoln, and the St Louis Union Trust Com- pany buildings; the German-Renaissance home of the Mercantile Club; the florid building of the St Louis Club; the Merchants' Exchange; the Missouri School for the Blind; the Coliseum, built in 1897 for conventions, horse shows, &c, torn down in 1907 and rebuilt in Jefferson Avenue, and the Union Station, used by all the railways entering the city. This last was opened in 1894, and cost, including the site, $6,500,000; has a train-shed with thirty-two tracks, covers some eleven acres, and is one of the largest and finest railway stations in the world. The city owns a number of markets. In 1907 a special architectural commission, appointed to supervise the construction of new municipal buildings, purchased a site adjacent to the City Hall, for new city courts and jail, which were begun soon afterwards.

The valley of Mill Creek (once a lake bed, " Chouteau Pond," and afterwards the central sewer) traverses the city from W. to E. and gives entry to railways coming from the W. into the Union Station. The terminal system for connecting Missouri with Illinois includes, in addition to the central passenger station, vast centralized freight warehouses and depots; an elevated railway along the levee; passenger and freight ferries across the Mississippi with railway connexions; two bridges across the river; and a tunnel leading to one of them under the streets of the city along the river front. The Merchants' Bridge (1887-1890, $3,000,000), used solely by the railways, is 1366-5 ft. long in channel span, with approaches almost twice as long. The Eads Bridge (1868-1874; construction cost $6,536,730, total cost about $10,000,000) is 3 m. farther down the river; it Carries both wagon ways and railway tracks, is 1627 ft. clear between shore abutments, and has three spans. Built entirely of steel above the piers, it is a

happy combination of strength and grace, and was considered a marvel when erected.

St Louis has exceptionally fine residential streets that are accounted among the handsomest in the world. The most notable are Portland Place, Westmoreland Place, Vandeventer Place, Kingsbury Place, &c, in the neighbourhood of Forest Park: broad parked avenues, closed with ornamental gateways, and flanked by large houses in fine grounds. The park system of the city is among the finest in the country, containing in 1910 2641-5 acres (cost to 1909, $6,417,745). Forest Park (1372 acres), maintained mainly in a natural, open-country state, is the largest single member of the system. In one end of it was held the Louisiana Purchase Exposition in 1904. Tower Grove Park (277 acres) and the Missouri Botanical Gardens

(45 acres), probably the finest of their kind in the country, were gifts to the city from a public-spirited citizen, Henry Shaw (1800- 1 889), who also endowed the botanical school of Washington University. Carondelet (180 acres), O'Fallon (158 acres) ,and Fairground(i 29 acres, including a 65-acre athletic field) are the finest of the other parks. King's Highway is a boulevard (partly completed in 1910) from the Mississippi on the S. to the Mississippi on the N., crossing the western part of the city. In accord with a general movement in American cities late in the 19th century, St Louis made a beginning in the provision of small " neighbourhood parks," intended primarily to better the lives of the city's poor, and vacation playgrounds for children; and for this purpose five blocks of tenements were condemned by the city. In the different parks and public places are statues of Columbus, Shakespeare (Tower Grove Park) and Humboldt (Tower Grove Park), by Ferdinand von Mueller of Munich; a replica of the Schiller monument at Marbach in Germany, and of Houdon's Washington (Lafayette Park) ; statues of Thomas Hart Benton (Lafayette Park; by Harriet Hosmer), of Francis Preston Blair (W. W. Gardner) and Edward Bates (J. W. McDonald), both in Forest Park, and of General Grant (R. P. Bringhurst) in the City Hall Park; all of these being in bronze. In the cemeteries of the city — of which the largest are Belief on taine (350 acres) and Calvary (415 acres) — there are notable monuments to Henry Shaw, and to Nathaniel Lyon, Sterling Price, Stephen W. Kearny and W. T. Sherman, all closely associated with St Louis or Missouri. There are various lake, river and highland pleasure-resorts near the city; and about 12 m. S. is Jefferson

Barracks, a national military post of the first class. The old arsenal within the city, about which centred the opening events of the Civil War in Missouri, has been mainly abandoned, and part of the grounds given to the municipality for a park.

The annual fair, or exposition, was held in the autumn of each year — except in war time — from 1855 to 1902, ceasing with the preparations for the World's Fair of 1904. One day of Fair Week (" Big Thursday ") was a city holiday; and one evening of the week was given over after 1878 to a nocturnal illuminated pageant known as the Procession of the Veiled Prophet, with accompaniments in the style of the carnival (Mardi Gras) at New Orleans; this pageant is still continued.

Among the educational institutions of the city, Washington University, a largely endowed, non-sectarian, co-educational school opened in 1857, is the most prominent. Under its control are three secondary schools, Smith Academy and the Manual Training School for Boys, and Mary Institute for Girls. The university embraces a department of arts and sciences, which includes a college and a school of engineering and architecture, and special schools of law, medicine (1899), dentistry, fine arts, social economy and botany. Affiliated with the university is the St Louis School of Social Economy, called until 1909 the St Louis School of Philanthropy, and in 1906- 1909 affiliated with the university of Missouri. The Russell Sage Foundation co-operates with this school. In 1909 Washington University had 1045 students. In 1905 the department of arts and sciences and the law school were removed to the outskirts of the city, where a group of buildings of Tudor-Gothic style in red Missouri granite were erected upon grounds, which with about $6,000,000 for buildings and endowment, were given to the univer- sity. St Louis University had its beginnings (1818) as a Latin academy, became a college in 1820, and was incorporated as a university in 1832. One of the leading Jesuit colleges of the United States, it is the parent-school of six other prominent Jesuit colleges in the Middle West. In 1910 it comprised a school of philosophy and science (1832), a divinity school (1834), a medical school (1836), ˆ law school (1843), a dental school (1908), a college, three academies and a commercial department; and its enrolment was 1181. It is the third largest, and the Christian Brothers' College (1851), also Roman Catholic, is the fourth largest educational institution in the state. The Christian Brothers' College had in 1910 30 instructors and 500 students, most of whom were in the preparatory department. Besides the Divinity School of St Louis University, there are three theological seminaries, Concordia (Evangelical Lutheran, 1839), Eden Evangelical College (German Evangelical Synod of North

America, 1850) and Kennck Theological Seminary (Roman Catholic, 1894). There are two evening law schools, Benton College (1896) and Metropolitan College (1901).

The public school system came into national prominence under the administration (1 867-1 880) of William T. Harris, and for many years has been recognized as one of the best in the United States.

The first permanent kindergarten in the country in connexion with the public schools was established in St Louis in 1 873 by W. T. Harris (g.».), then superintendent of schools, and Miss Susan Ellen Blow. The first public kindergarten training school was established at the same time. There is a teachers' college in the city school system, and there are special schools for backward children. Several school buildings have been successfully used as civic centres. The city has an excellent educational museum, material from which is avail- able for object lessons in nature study, history, geography, art, &c., in all public schools. In the year 1907-1908 the total receipts for public education were $4,219,000, and the expenditure was $3,789,604. The City Board of Education was chartered in 1897.

The German element has lent strength to musical and gymnastic societies. The Museum and School of Fine Arts was established in 1879 as the Art Department of Washington University. In 1908 it first received the proceeds of a city tax of one-fifth mill per dollar, and in 1909 it was reorganized as the City Art Museum. In its building (the " Art Palace," built in 1 903-1904 at a cost of $943,000 for the Louisiana Purchase Exposition ; now owned by the city) in Forest Park are excellent collections (largely loaned) of sculpture and paintings (illustrating particularly the development of American art) and of art objects. The School of Fine Arts, now separate from the museum and a part of Washington University, has classes in painting, drawing, design, illustration, modelling, pottery, book- binding, &c. Among the libraries the greatest collections are those of the Mercantile Library (in 1910, 136,000 volumes and pamphlets), a subscription library founded in 1846, and the public library (1865) — a fine city library since 1894, with 312,000 volumes in 1910 and six branch libraries, the gift of Andrew Carnegie, who also gave the city $500,000 towards the new public library, which was begun in 1909 and cost $1,500,000. Other notable collections are those of the St Louis Academy of Science and of the Missouri Botanical Gardens. There are at least three newspapers of national repute : the Republic, established in 1808 as the Missouri Gazette, and in 1822-1886 called the Missouri Republican; the Globe-Democrat (1852); and the Westliche Post (1857).

In trade, industry and wealth St Louis is one of the most substantial cities of the Union. Its growth has been steady; but without such ” booms ” as have marked the history of many western cities, and especially Chicago, of which St Louis was for several decades the avowed rival. The primacy of the northern city was clear, however, by 1880. St Louis has borne a reputa- tion for conservatism and solidity. Its manufactures aggregate three-fifths the value of the total output of the state. In 1880 their value was $114,333,375, and in 1890 $228,700,000; the value of the factory product was $193,732,788 in 1900, and in 1905 $267,307,038 (increase 1900-1905, 38%).

Tobacco goods, malt liquors, boots and shoes and slaughtering and meat-packing products were the leading items in 1905. The packing industry is even more largely developed outside the city limits and across the river in East St Louis. St Louis is the greatest manufacturer of tobacco products among American cities, and probably in the world; the total in 1905 was 8-96% of the total out- put of manufactured tobacco in the United States; and the output of chewing and smoking tobacco and snuff in 1900 constituted 23-5.% and in 1905 23-7% of the product of the country. St Louis is also the foremost producer of white lead, street and railway cars, and wooden ware ; and in addition to these and the items above particularized, has immense manufactories of clothing, coffee and spices (roasted), paints, stoves and furnaces, flour, hardware, drugs and chemicals and clay products. One of its breweries is said to be the largest in the world.

Aside from traffic in its own products, the central position of the city in the Mississippi Valley gives it an immense trade in the pro- ducts of that tributary region, among which grains, cotton, tobacco, lumber, live stock and their derived products are the staples. In addition, it is a jobbing centre of immense interests in the distribu- tion of other goods. The greatest lines of wholesale trade are dry goods, millinery and notions; groceries and allied lines; boots and shoes; tobacco; shelf and heavy hardware; furniture; railway supplies; street and railway cars; foundry and allied products; drugs, chemicals and proprietary medicines; beer; wooden-ware; agricultural implements; hides; paints; paint oils and white lead; electrical supplies; stoves, ranges and furnaces; and furs — the value of these different items ranging from 70 to 10 million dollars each. 1 According to the St Louis Board of Trade, St Louis is the largest primary fur market of the world, drawing supplies even from northern Canada. As a wool market Boston alone surpasses it, and as a vehicle market it stands in the second or third place. In the other industries just named, it claims to stand first among the cities of the Union. It is one of the greatest interior cotton markets of the country — drawing its supplies mainly from Arkansas, Texas

and Oklahoma — but a large part of its receipts are for shipment on through bills of lading, and are not net receipts handled by its

1 These are arranged in the order shown by the Annual Statement for 1906 reported to the Merchants' Exchange.

own factors. The gross cotton movement continues to increase, but the field of supply has been progressively lessened by the development of Galveston and other ports on the gulf. As a grain and stock market St Louis has felt the competition of Kansas City and St Joseph.

River and railway transportation built up in turn the command- ing commercial position of the city. The enormous growth of river traffic in the decade before i860 gave it at the opening of the Civil War an incontestable primacy in the West. In 1010 about twenty independent railway systems, great and small (including two terminal roads within the city), gave outlet and inlet to commerce at St Louis; and of these fifteen are among the greatest systems of the country: the Baltimore & Ohio South- western, the Chicago, Burlington & Quincy, the Chicago & Alton, the Cleveland, Cincinnati, Chicago & St Louis, the St Louis & San Francisco, the Illinois Central, the Missouri, Kansas & Texas, the Missouri Pacific, the Pennsylvania, the St Louis South-Western, the Southern, the Wabash, the Louisville & Nashville, the Mobile & Ohio, and the Toledo, St Louis & Western. The construction of the Missouri Pacific Railway system was begun at St Louis in 1850, and various other roads were started in the next two years. For several decades railway develop- ment served only to increase the commercial primacy of the city in the southern Mississippi Valley, but in more recent years the concentration of roads at Kansas City enabled that place to draw from the west and south-west an immense trade once held by St Louis. River freighting is of very slight importance. St Louis is a port of entry for foreign commerce; its imports in 1907 were valued at $7,442,967; in 1909 at $6,362,770.

The population of St Louis in 1840 was 16,469; in 1850 it was 77,860 (seventh in size of the cities of the country); in i860, 160,773; in 1870, 310,864 (third in size); in 1880, 350,518; in 1890, 451,770; in 1900, 575,238; and in 1910, 687,029. Since 1890 it has been fourth in population among the cities of the United States. Of the population in 1900 (575,238) 111,356 were foreign-born and 35,516 were negroes. Of the foreign-born in 1900, 58,781 were Germans, 19,421 were Irish,

5800 were English, 4785 Russian. In 1900, 154,746 inhabitants of St Louis were children of German parents.

Under the state constitution of 1875 St Louis, as a city of 100,000 inhabitants, was authorized to frame its own charter, and also to separate from St Louis county. These rights were exercised in 1876. The General Assembly of the state holds the same powers over St Louis as over other cities. The electorate may pass upon proposed amendments to the charter at any election, after due precedent publication thereof. The mayor holds office for four years. In 1823 the mayor was first elected by popular vote and the municipal legislature became unicameral. The bicameral system was again adopted in 1839. The municipal assembly consists of a Council of 13 chosen at large for four years — half each two years — and a House of Delegates, 28 in number, chosen by wards for two years. A number of chief executive officers are elected for four years; the mayor and Council appoint others, and the appointment is made at the middle of the mayor's term in order to lessen the immediate influence of municipal patronage upon elections. Single com- missioners control the parks, streets, water service, harbour and wharves, and sewers, and these constitute, with the mayor, a board of public improvement. Under an enabling act of 1907 the municipal assembly in 1909 created a public service com- mission, of three members, appointed by the mayor. The measure of control exercised by the state is important, the governor appointing the excise (liquor-licence) commissioner, the board of election commissioners, the inspector of petroleum and of tobacco, and (since 1861) the police board. St Louis is normally Republican in politics, and Missouri Democratic. Taxes for state and municipal purposes are collected by the city. The school board, as in very few other cities of the country, has independent taxing power. The city owns the steamboat landings and draws a small revenue from their rental. The heaviest expenses are for streets and parks, debt payments, police and education. The bonded debt in 1910 was $27,815,312, and the assessed valuation of property in that year was $550,207,640.

The city maintains hospitals, a poor-house, a reformatory work-house, an industrial school for children, and an asylum for the insane.

The water-supply of the city is derived from the Mississippi, and is therefore potentially inexhaustible. Settling basins and a coagu- lant chemical plant (1904) are used to purify the water before distribution. After the completion of the Chicago drainage canal the state of Missouri endeavoured to compel its closure, on the ground that it polluted the Mississippi; but it was established to the satisfaction of the Supreme Court of the United States that the back- flush from Lake

Michigan had the contrary effect upon the Illinois river, and therefore upon the Mississippi. Except for sediment the water-supply is not impure or objectionable. No public utilities, except the water-works, markets and public grain elevators, are owned by the city. The street railways are controlled — since a state law of 1899 permitted their consolidation — by one corporation, though a one-fare, universal transfer 5-cent rate is in general opera- tion. A single corporation has controlled the gas service from 1846 to 1873 and since 1890, though under no exclusive franchise; and the city has not the right of purchase.

St Louis was settled as a trading post in 1764 by Pierre Laclede Liguest (17 24- 1 778), representative of a company to which the French crown had granted a monopoly of the trade of the Missouri river country. When, by the treaty of Paris of 1763, the portion of Louisiana E. of the Mississippi was ceded by France to Great Britain, many of the French inhabitants of the district of the Illinois removed into the portion of Louisiana W. of the river, which had passed in 1762 under Spanish sovereignty; and of this lessened territory of upper Louisiana St Louis became the seat of government. In 1767 it was a log-cabin village of perhaps 500 inhabitants. Spanish rule became an actuality in 1770 and continued until 1804, when it was momentarily sup- planted by French authority— existent theoretically since 1800 — and then, after the Louisiana Purchase, by the sovereignty of the United States. In 1780 the town was attacked by Indian allies of Great Britain. Canadian-French hunters and trappers and boatmen, a few Spaniards and other Europeans, some Indians, more half-breeds, and a considerable body of Americans and negro slaves made up the motley population that became inhabitants of the United States. The fur trade was growing rapidly. Under American rule there was added the trade of a military supply-point for the Great West, and in 1817-1819 steamship traffic was begun with Louisville, New Orleans, and the lower Missouri river. Meanwhile, in 1808, St Louis was incorporated as a town, and in 1823 it became a city. The city charter became effective in March 1823. The early ‘thirties marked the beginning of its great prosperity, and the decade 1850-1860 was one of colossal growth, due largely to the river trade. All freights were being moved by steamship as early as 1825. The first railway was begun in 1850. At the opening of the Civil War the commercial position of the city was most commanding. Its prosperity, however, was dependent upon the prosperity of the South, and received a fearful set-back in the war. When the issue of secession or adherence to the Union had been made up in 1861, the outcome in St Louis, where the fate of the state must necessarily be decided, was of national importance. St Louis was

headquarters for an army department and con- tained a great national arsenal. The secessionists tried to manoeuvre the state out of the Union by strategy, and to seize the arsenal. The last was prevented by Congressman Francis Preston Blair, Jr., and Captain Nathaniel Lyon, first a sub- ordinate and later commander at the arsenal. The garrison was strengthened; in April the president entrusted Blair and other loyal civilians with power to enlist loyal citizens, and put the city under martial law if necessary; in May ten regiments were ready — made up largely of German-American Republican clubs (" Wide Awakes "), which had been at first purely political, then — when force became necessary to secure election rights to anti-slavery men — semi-military, and which now were quickly made available for war; and on the 10th of May Captain Lyon surrounded and made prisoners a force of secessionists quartered in Camp Jackson on the outskirts of the city. A street riot followed, and 28 persons were killed by the volleys of the military. St Louis was held by the Union forces throughout the war.

During a quarter century following 1857 the city was the centre of an idealistic philosophical movement that has had hardly any counterpart in American culture except New England trans- cendentalism. Its founders were William T. Harris (q.v.) and Henry C. Brockmeyer (b. 1828), who was lieutenant-governor of the state in 1876-1880. A. Bronson Alcott was one of the early lecturers to the group which gathered around these two, a group which studied Hegel and Kant, Plato and Aristotle. Brockmeyer published excellent versions of Hegel's Unabridged Logic % Phenomenology and Psychology. Harris became the greatest of American exponents of Hegel. Other members of the group were Thomas Davidson (1840-1900), Adolph E. Kroeger, the translator of Fichte, Anna Callender Brackett (b. 1836), who published in 1886 an English version of Rosenkranz's History of Education, Denton Jaques Snider (b. 1841), whose best work has been on Froebel, and William McKendree Bryant (b. 1843), who wrote Hegel's Philosophy of Art (1879) and Hegel's Educa- tional Ideas (1896). This Philosophical Society published (1867- 1893) at St Louis The Journal of Speculative Philosophy, the first periodical of the sort in English.

Since the war the city's history has been signalized chiefly by economic development. A period in this was auspiciously closed in 1904 by the holding of a world's fair to celebrate the centennial of the

purchase from France, in 1803, of the Louisiana territory — since then divided into 13 states, and containing in 1900 some 1 2 , 500,000 inhabitants. Preparations for this Louisiana Purchase Exposition began in 1898. It was the largest world's fair held to date, the site covering 1240 acres, of which 250 were under roof. The total cost, apart from individual exhibitions, was about $42,500,000, of which the national government contributed $5,000,000 and the city of St Louis and its citizens $10,000,000. Altogether 12,804,616 paid admissions were collected (total admissions 19,694,855) during the seven months that it was open, and there was a favourable balance at the close of about

$1,000,000.

Up to 1848 St Louis was controlled in politics almost absolutely by the Whigs; since then it has been more or less evenly con- tested by the Democrats against the Whigs and Republicans. The Republicans now usually have the advantage. As men- tioned before, the state is habitually Democratic; " boss " rule in St Louis was particularly vicious in the late 'nineties, and corruption was the natural result of ring rule — the Democratic bosses have at times had great power — and of the low pay — only $25 monthly — of the city's delegates and councilmen. But the reaction came, and with it a strong movement for independent voting. Fire, floods, epidemics, and wind have repeatedly attacked the city. A great fire in 1849 burned along the levee and adjacent streets, destroying steamers, buildings, and goods worth, by the estimate of the city assessor, more than $6,000,000. Cholera broke out in 1832-1833, 1849-1851, and 1866, causing in three months of 1849 almost 4000 deaths, or the death of a twentieth of all inhabitants. Smallpox raged in 1872-1875. These epidemics probably reflect the one-time lamentable lack of proper sewerage. Great floods occurred in 1785, 1811, 1826, 1844, 1872, 1885 and 1903; those of 1785 and 1844 being the most remarkable. There were tornadoes in 1833, 1852 and 1 871; and in 1896 a cyclone of 20 minutes' duration, accom- panied by fire but followed fortunately by a tremendous rain, destroyed or wrecked 8500 buildings and caused a loss of property valued at more than $10,000,000.

East St Louis, a city of St Clair county, Illinois, U.S.A., on the E. bank of the Mississippi, lies opposite St Louis, Missouri. Pop. (1880), 9185; (1890), 15,169; (1900), 29,655, of whom 3920 were foreign born (mostly German and Irish); (1910 census) 58,547. It is one of the great railway centres of the country. Into it enter from the east sixteen lines of railway, which cross to St Louis by the celebrated steel arch bridge and by the Merchants' Bridge. It is also served by three inter- urban electric railways. The site of East St Louis is in the " American

Bottom," little above the high-water mark of the river. This " bottom " stretches a long distance up and down the river, with a breadth of 10 or 1 2 m. It is intersected by many

sloughs and crescent-shaped lakes which indicate former courses of the river. The manufacturing interests of East St Louis are important, among the manufactories being packing establish- ments, iron and steel works, rolling-mills and foundries, flour- mills, glass works, paint works and wheel works. By far the most important industry is slaughtering and meat packing: both in 1900 and in 1905 East St Louis ranked sixth among the cities of the United States in this industry; its product in 1900 was valued at $27,676,818 (out of a total for all industries of $32,460,957), and in 1905 the product of the slaughtering and meat-packing establishments in and near the limits of East St Louis was valued at $39,972,245, in the same year the total for all industries within the corporate limits being only $37,586,198. The city has a large horse and mule market. East St Louis was laid out about 1818, incorporated as a town in 1859, and chartered as a city in 1865.

Consult the Encyclopaedia of the History of St Louis (4 vols., St Louis, 1899); J- T. Scharf, History of St Louis City and County . . . including Biographical Sketches (2 vols., Philadelphia, 1883); E. H. Shepherd, Early History of St Louis and Missouri . . . 1763- 1843 (St Louis, 1870); F. Billon, Annals of St Louis . . . 1804 to 1821 (2 vols., St Louis, 1886-1888); G. Anderson, Story of a Border City during the Civil War (Boston, 1908) ; The Annual Statement of the Trade and Commerce of St Louis . . . reported to the Merchants' Exchange, by its secretary.

ST LOUIS, the capital of the French colony of Senegal, West Africa, with a population (1904) of 24,070, or including the suburbs, 28,469. St Louis, known to the natives as N'dar, is 163 m. by rail N.N.E. of Dakar and is situated on, an island 11 J m. above the mouth of the Senegal river, near the right bank, there separated from the sea by a narrow strip of sand called the Langue de Barbarie. This strip of sand is occupied by the villages of N'dar Toute and Guet N'dar. Three bridges connect the town with the villages; and the Pont Faidherbe, 2132 ft. long, affords communication with Bouetville, a suburb on the left bank, and the terminus of the railway to Dakar. The houses of the European quarter have for the most part flat roofs, balconies and terraces. Besides the governor's residence the most prominent buildings are the cathedral, the great mosque, the court-house, the barracks and military offices, and the docks. The round beehive huts of Guet N'dar are mainly inhabited by native fishermen. N'dar Toute consists of villas with gardens, and is a summer watering-place. There

is a pleasant public garden, and N'dar Toute is approached by a magnificent alley of palm-trees. The low-lying position of St Louis and the extreme heat render it unhealthy, whilst the sandy nature of the soil causes intense inconvenience. The mouth of the Senegal being obstructed by a shifting bar of sand, the steamships of the great European lines do not come up to St Louis; passengers embark and land at Dakar, on the eastern side of Cape Verde. Ships for St Louis have often to wait outside or inside the bar for days or weeks, and partial unloading is frequently necessary. From July to the end of September — that is during flood-time — the water over the bar is, however, deep enough to enable vessels to reach St Louis without difficulty.

St Louis is believed to have been the site of a European settlement since the 15th century, but the present town was founded in 1626 by Dieppe merchants known as the Compagnie normande. It is the oldest colonial establishment in Africa belonging to France (see Senegal). Its modern development dates from 1854. The town, however, did not receive municipal government till 1872. All citizens, irrespective of colour, can vote. From 1895 to 1903 St Louis was not only the capital of Senegal, but the residence of the governor-general of French West Africa. In November of the last- named year the governor-general removed to Dakar, Small forts defend St Louis from the land side — the surrounding country, the Cayor, being inhabited by a warlike race, which previously to the building (1882-1885) of the St Louis-Dakar railway was a continual source of trouble.

The town carries on a very active trade with all the countries watered by the Senegal and the middle Niger. St Louis is connected with Brest by a direct cable, and with Cadiz via the Canary Islands.

ST LUCIA, the largest of the British Windward Islands, West Indies, in 14 N., 61° W., 24 m. S. of Martinique and 21 m. N.E. of St Vincent. Its area is 233 sq. m., length 42 m., maximum hreadth 12 .to.., and its coast-line is 150 m. long. It is considered one of the loveliest of all the West Indian islands. It is a mass

of mountains, rising sheer from the water, their summits bathed in perpetual mist. Impenetrable forests alternate with fertile plains, and deep ravines and frowning precipices with beautiful bays and coves. Everywhere there is luxuriant vegetation.

Les Pitons (2720 and 2680 ft.) are the chief natural feature — two immense pyramids of rock rising abruptly from the sea, their slopes, inclined at an angle of 60°, being clad on three sides with densest verdure. No connexion has been traced between them and the mountain system of the island. In the S.W. also is the volcano of Soufnere (about 4000 ft.), whose crater is 3 acres in size and covered with sulphur and cinders. The climate is humid, the rain- fall varying from 70 to 120 in. per annum, with an average tempera- ture of 80 ° F. The soil is deep and rich; the main products are sugar, cocoa, logwood, coffee, nutmegs, mace, kola-nuts and vanilla, all of which are exported. Tobacco also is grown, but not for export. The usine or central factory system is established, there being four government sugar-mills. Snakes, formerly prevalent, have been almost exterminated by the introduction of the mongoose. Only about a third of the island is cultivated, the rest being crown land under virgin forest, abounding in timber suitable for the finest cabinet work. The main import trade up to 1 904 was from Great Britain; since then, owing to the increased coal imports from the United States, the imports are chiefly from other countries. The majority of the exports go to the United States and to Canada. In the ten years 1898-1907 the imports averaged £322,000 a year; the exports £195,000 a year. Bunker coal forms a large item both in imports and exports. Coal, sugar, cocoa and logwood form the chief exports.

Education is denominational, assisted by government grants. The large majority of the schools are under the control of the Roman Catholics, to whom all the government primary schools were handed over in 1898. There is a government agricultural school. St Lucia is controlled by an administrator (responsible to the governor of the Windward I slands) , assisted by an executive council. The legislature consists of the administrator and a council of nominated members. Revenue and expenditure in the period 1 901-1907 balanced at about £60,000 a year. The law of the island preserves, in a modified form, the laws of the French monarchy.

Castries, the capital, on the N.W. coast, has a magnificent land- locked harbour. There is a concrete wharf 650 ft. long with a depth alongside of 27 ft., and a wharf of wood 552 ft. in length. It is the principal coaling station of the British fleet in the West Indies, was strongly fortified, and has been the military headquarters. (The troops were removed and the military works stopped in 1 905.) It is a port of registry, and the facilities it offers as a port of call are widely recognized, the tonnage of ships cleared and entered rising from 1,555,000 in 1898 to 2,627,000 in 1907. Pop. (1901) 7910. Soufriere, in the south, the only other town of any importance, had a population

of 2394. The Canbs have disappeared from the island, and the bulk of the inhabitants are negroes. Their language is a French patois, but English is gradually replacing it. There is a small colony of East Indian coolies, and the white inhabitants are mostly Creoles of French descent. The total population of the island (1901)

is 49-833-

History. — St Lucia is supposed to have been discovered by Columbus in 1502, and to have been named by the Spaniards after the saint on whose day it was discovered. It was inhabited by Caribs, who killed the majority of the first white people (Englishmen) who attempted to settle on the island (1605). For two centuries St Lucia was claimed both by France and by England. In 1627 the famous Carlisle grant included St Lucia among British possessions, while in 1635 the king of France granted it to two of his subjects. In 1638 some 130 English from St Kitts formed a settlement, but in 1641 were killed or driven away by the Caribs. The French in 1650 sent settlers from Martinique who concluded a treaty of peace with the Caribs in 1660. Thomas Warner, natural son of the governor of St Kitts, attacked and overpowered the French settlers in 1663, but the peace of Breda (1667) restored it to France and it became nominally a dependency of Martinique. The British still claimed the island as a dependency of Barbadoes, and in 1722 George I. made a grant of it to the duke of Montague. The year following French troops from Martinique compelled the British settlers to evacuate the island. In 1748 both France

and Great Britain recognized the island as ” neutral.” In 1762 its inhabitants surrendered to Admiral Rodney and General Monckton. By the treaty of Paris (1763), however, the British acknowledged the claims of France, and steps were taken to develop the resources of the island. French planters came from St Vincent and Grenada,cotton and sugar plantations were formed, and in 1772 the island was said to have a population of 15,000, largely slaves. In 1778 it was captured by the British; its harbours were a rendezvous for the British squadrons and Gros Ilet Bay was Rodney’s starting-point before his victory over the Comte de Grasse (April 1782). The peace of Versailles (1783) restored St Lucia to France, but in 1 794 it was surrendered to Admiral Jervis (Lord St Vincent). Victor Hugues, a partisan of Robespierre, aided by insurgent slaves, made a strenuous resistance and recovered the island in June 1795. Sir Ralph Abercromby and Sir John Moore, at the head of 12,000 troops, were sent in 1796 to reduce the island, but it was not until 1797 that the revolutionists laid down their arms. By the treaty of Amiens St Lucia was anew declared French. Bonaparte intended to make it the capital of the Antilles, but it once more capitulated to the British (June 1803) and was finally ceded to Great Britain in 1814. In 1834, when the slaves were emanci- pated, there were in St Lucia over 13,000 negro slaves, 2600 free men of colour and 2300 whites. The development of the island — half ruined by the revolutionary war — has been retarded by epidemics of cholera and smallpox, by the decline of the sugar- cane industry and other causes, such as the low level of education. The depression in the sugar trade led to the adoption of cocoa cultivation. Efforts were also made to plant settlers on the crown lands — with a fair amount of success. The colony success- fully surmounted the financial stringency caused by the with- drawal of the imperial troops in 1905.

Pigeon Island, formerly an important military port, lies off the N.W. end of St Lucia, by Gros Ilet Bay.

See Sir C. P. Lucas, Historical Geography in the British Colonies, vol. ii., ” The West Indies ” (2nd ed. revised by C. Atchley, Oxford, 1905), and the works there cited; also the annual reports on St Lucia issued by the Colonial Office.

ST MACAIRE, a town of south-western France, in the depart- ment of Gironde, on the Garonne, 29 m. S.E. of Bordeaux by rail. Pop. (1906), 2085. St Macaire is important for its medieval remains, which include a triple line of ramparts with old gate- ways. There are also several houses of the 13 th and 14th centuries. The imposing church of St Sauveur (nth to 15th centuries) has a doorway with beautiful 13th-century carving and interesting mural paintings. St Macaire (anc. Ligend) owes its name to the saint whose relics were preserved in the monastery of which the church of St Sauveur is the principal remnant.

ST MAIXENT, a town of western France, in the department of Deux-Sevres, on the Sevre Niortaise, 15 m. N.E. ofNiortby rail. Pop. (1906), 4102. The town has a fine abbey church built from the 12th to the 15th century, but in great part destroyed by the Protestants in the 16th century and rebuilt from 1670 to 1682 in the flamboyant Gothic style. The chief parts anterior to this date are the nave, which is Romanesque, and a lofty 15th-century tower over the west front. The crypt contains the tomb of Saint Maxentius, second abbot of the monastery, which was founded about 460. The town has a com- munal college, a chamber of arts and manufactures, and an infantry school for non-commissioned officers preparing for the rank of sub-lieutenant. It was the birthplace of Colonel Denfert- Rochereau, defender of Belfort in 1870-1871, and has a statue to him. The industries include dyeing and the manufacture of hosiery, mustard and plaster. The prosperity of the town was at its height after the promulgation of the edict of Nantes, when it numbered 12,000 inhabitants.

ST MALO, a seaport of western France, capital of an arrondisse- ment in thedepartment of lle-et-Vilaine, 51 m.N.N.W. of Rennes by rail. Pop. (1906) town, 8727; commune, 10,647. St Malo is situated on the English Channel on the right bank of the estuary of the Ranee at its mouth. It is a garrison town sur- rounded by ramparts which include portions dating from the 14th, 15th and 1 6th centuries, but as a whole were rebuilt at the end of the 17th century according to Vauban's plans, and restored in the 19th century. The most important of the gates are that of St Vincent and the Grande Porte, defended by two massive 15th-century towers: The granite island on which St Malo stands communicates with the mainland on the north- east by a causeway known as the " Sillon " (furrow), 650 ft. long, and at one time only 46 ft. broad, though now three times that breadth. In the sea round about lie other granite rocks,

which have been turned to account in the defences of the coast ; on the islet of the Grand Bey is the tomb (1848) of Francois Auguste, vicomte de Chateaubriand, a native of the town. The rocks and beach are continually changing their appearance, owing to the violence of the tides; spring-tides sometimes rise 50 ft. above low-water level, and the sea sometimes washes over the ramparts. The harbour of St Malo lies south of the town in the creek separating it from the neighbouring town of St Servan. Including the contiguous and connected basins belonging more especially to St Servan, it comprises an outer basin, a tidal harbour, two wet-docks and an inner reservoir, affording a total length of quayage of over 2 m. The wet-docks have a minimum depth of 13 to 15 ft. on sill, but the tidal harbour is dry at low water. The vessels entered at St Malo-St Servan in 1906 numbered 1004 of 279,217 tons; cleared 1023 of 298,720 tons. The great bulk of trade is with England, the exports comprising large quantities of fruit, dairy-produce, early potatoes and other vegetables and slate. The chief imports are coal and timber. The London and South- Western railway maintains a regular service of steamers between Southampton and St Malo. The port carries on shipbuilding and equips a fleet for the Newfoundland cod-fisheries. The industries also include iron- and copper-founding and the manufacture of portable forges and other iron goods, cement, rope and artificial manures. The town is the seat of a sub-prefect and has tribunals of first instance and of commerce. Communication between the quays of St Malo and St Servan is maintained by a travelling bridge.

St Malo is largely frequented for sea-bathing, but not so much as Dinard, on the opposite side of the Ranee. The town presents a tortuous maze of narrow streets and small squares lined with high and sometimes quaint buildings (e.g. the 16th-century house in which Rene Duguay-Trouin was born). Above all rises the stone spire (1859) of the cathedral, a building begun in the 1 2th century but added to and rebuilt at several subsequent periods. The castle (13th cent.), which defends the town towards the ” Sillon,” is flanked with four towers, one of which, the great keep, is an older and loftier structure, breached in 1378 by the duke of Lancaster. St Malo has statues to Chateaubriand, Duguay-Trouin and the privateer Robert Surcouf (1773-1827), natives of the town. The museum contains remains of the ship ” La Petite Hermine,” in which Jacques Cartier sailed to the St Lawrence (q.v.), and a natural history collection.

In the 6th century the island on which St Malo stands was the retreat of Abbot Aaron, who gave asylum in his monastery to Malo

(Maclovius or Malovius), a Cambrian priest, who came hither to escape the episcopal dignity, but afterwards became bishop of Aleth (now St Servan) ; the see was transferred to St Malo only in the 12th century. Henceforth the bishops of St Malo claimed the temporal sovereignty over the town, a claim which was resolutely disputed by the dukes of Brittany. The policy of the citizens themselves, who thus gained substantial powers of self-government, was directed by consistent hostility to England and consequently to the dukes. They took the side of Bishop Josselin de Rohan and his successor in their quarrel with dukes John IV. and John V., and it was not till 1424 that John V., by the agency of Charles VI. of France and with the sanction of the pope, finally established his authority over the town. In 1488 St Malo unsuccessfully resisted the French troops on behalf of the duke. During the troubles of the League the citizens hoped to establish a republican government, and on the nth of March 1590 they exterminated the royal garrison and imprisoned their bishop and the canons. But four years later they surrendered to Henry IV. of France. During the following century the maritime power of St Malo attained some importance. In November 1693 and July 1695 the English vainly bombarded it. The people of St Malo had in the course of a single war captured upwards of 1 500 vessels (several of them laden with gold and other treasure) and burned a considerable number more. Enriched by these successes and by the wealth they drew from the New World, the shipowners of the town not only supplied the king with the means necessary for the famous Rio de Janeiro expedition conducted by Duguay-Trouin in

1711, but also lent him large sums for carrying on the war of the Spanish Succession. In June 1758 the English sent a third expedition against St Malo under the command of Charles Spencer, third duke of Marlborough, and inflicted great loss on the royal shipping in the harbour of St Servan. But another expedi- tion undertaken in the following September received a complete check. In 1778 and during the wars of the Empire the St Malo privateers resumed their activity. In 1789 St Servan was separated from St Malo and in 1801 St Malo lost its bishopric. During the Reign of Terror the town was the scene of sanguinary executions.

See M. J. Poulain, Hisloire de Saint-Malo . . . d’apres les docu- ments inedits (2nd ed., Lille, 1887).

SAINT-MARC GIRARDIN (1801-1873), French politician and man of letters, whose real name was Marc Girardin, was born in Paris on the 22nd of February 1801. After a brilliant uni- versity career in Paris he began in 1828 to contribute to the Journal des Debats, on the staff of

which he remained for nearly half a century. At the accession of Louis Philippe he was appointed professor of history at the Sorbonne and master of requests in the Conseil d'Etat. Soon afterwards he exchanged his chair of history for one of poetry, continuing to contribute political articles to the Debats, and sitting as deputy in the chamber from 1835 to 1848. He was charged in 1833 with a mission to study German methods of education, and issued a report advocating the necessity of newer methods and of technical instruction. In 1844 he was elected a member of the Academy. During the revolution of February 1848 Girardin was for a moment a minister, but after the establishment of the republic he was not re-elected deputy. After the war of 1870-71 he was returned to the Bordeaux assembly by his old department — the Haute Vienne. His Qrleanist tendencies and his objections to the republic were strong, and though he at first supported Thiers, he afterwards became a leader of the opposition to the president. He died, however, on the 1st of April 1873 at Morsang-sur-Seine, before Thiers was actually driven from power.

His chief work is his Cours de litter ature dramatique (1 843-1 863), a series of lectures better described by its second title De V usage des passions dans le drame. The author examines the passions, discussing the mode in which they are treated in ancient and modern drama, poetry and romance. The book is really a defence of the ancients against the moderns, and Girardin did not take into account the fact that only the best of ancient literature has come down to us. Against the Romanticists he waged untiring war. Among his other works may be noticed Essais de litter ature (2 vols. 1844), made up chiefly of contributions to the Debats ,- his Notices sur. VAllemagne (1834), and many volumes of collected Souvenirs, Reflexions, &c, on foreign countries and passing events. His latest works of literary importance were La Fontaine et les Fabulistes (1867) and an £tude sur J.-J. Rousseau (1870) which had appeared in the Revue des deux mondes.

See Ch. Labitte, " Saint-Marc Girardin," in the Revue des deux mondes (Feb. 1845) ; Tamisier, Saint-Marc Girardin; etude liiteraire (1876); Hatzfield and Meunier, Les Critiques litteraires du XIX" siede (1894).

SAINT-MARTIN, LOUIS CLAUDE DE (1743-1803), French philosopher, known as " le philosophe inconnu," the name under which his works were published, was born at Amboise of a poor but noble family, on the 18th of January 1743. By his father's desire he tried first law and then the army as a profession. While in garrison at Bordeaux he came under the influence of Martinez de Pasquales, usually called a Portuguese Jew (although later research has made it probable that he was a Spanish Catholic), who taught a species of mysticism drawn

from cabbalistic sources, and endeavoured to found thereon a secret cult with magical or theurgical rites. In 177 1 Saint-Martin left the army to become a preacher of mysticism. His conversational powers made him welcome in Parisian salons, but his zeal led him to England, where he made the acquaintance of William Law (q.v.), the English mystic, to Italy and to Switzerland, as well as to the chief towns of France. At Strassburg in 1788 he met Charlotte de Boecklin, who initiated him into the writings of Jacob Boehme, and inspired in his breast a semi-romantic attachment. His later years were devoted almost entirely to the composition of his chief works and to the translation of those of Boehme. Although he was not subjected to any persecution in consequence of his

opinions, his property was confiscated after the Revolution because of his social position. He was brought up a strict Catholic, and always remained attached to the church, although his first work, Of Errors and Truth, was placed upon the Index. He died at Aunay, near Paris, on the 23rd of October 1803.

His chief works are — Lettre a un ami sur la Revolution Francaise; &lair sur I' association humaine; De V esprit des choses; Ministere de I'homme-esprit. Other treatises appeared in his (Euvres posthumes (1807). Saint-Martin regarded the French Revolution as a sermon in action, if not indeed a Miniature of the last judgment. His ideal society was " a natural and spiritual theocracy," in which God would raise up men of mark and endowment, who would regard themselves strictly as " divine commissioners " to guide the people. All ecclesi- astical organization was to disappear, giving place to a purely spiritual Christianity, based on the assertion of a faculty superior to the reason — moral sense, from which we derive knowledge of God. God exists as an eternal personality, and the creation is an over- flowing of the divine love, which was unable to contain itself. The human soul, the human intellect or spirit, the spirit of the universe, and the elements or matter are the four stages of this divine emana- tion, man being the immediate reflection of God, and nature in turn a reflection of man. Man, however, has fallen from his high estate, and matter is one of the consequences of his fall. But divine love, united to humanity in Christ, will work the final regeneration.

See J. B. Gence, Notice biographique (1824); L. I. Moreau, Le Philosophe inconnu (1850); E. M. Caro, Essai sur la vie et la doctrine

de Saint-Martin (1852); Sainte-Beuve, Causeries du lundi, x.190; A.J. Matter, Saint-Martin, le philosophe inconnu (1862); A. Franck, La Philosophic mystique en France a la fin du dix-huitieme siecle (1866) ; A. E. Waite, The Life of Louis Claude de Saint-Martin (1901). There are English translations of The Ministry of Man the Spirit (1864) and of Select Correspondence (1863) by E. B. Penny.

ST MARTIN, an island in the West Indies, about 5 m. S. of the British island of Anguilla in 18 N. and 63 W. It is 38 sq. m. in area and nearly triangular in form, composed of conical hills, culminating in Paradise Peak (1920 ft.). It is the only island in the Antilles owned by two European powers; 17 sq. m. in the N., belonging to France, form a dependency of Guadeloupe, while the rest of the island, belonging to Holland, is a dependency of Curacao. Sugar, formerly its staple, has been succeeded by salt. The chief town of the French area is Marigot, a free port on the W. coast; of the Dutch, Philipsburg, on the S. St Martin was first occupied by French freebooters in 1638, but ten years later the division between France and Holland was peaceably made. The inhabitants, mostly English-speaking negroes, number about 3000 in the French part, and in the Dutch the population in 1908 was 3817.

ST MARY (Santa Maria), an island in the Atlantic Ocean, belonging to Portugal and forming part of the Azores (q.v.). Pop. (1900), 6383; area, 40 sq. m. St Mary is the southernmost and easternmost of the Azores, lying south of the larger island of St Michael's, through the medium of which its trade is con- ducted, as it has no good harbours of its own. It produces wheat in abundance, of which a considerable quantity is exported. Various volcanic rocks are the predominant formations, but beds of limestone also occur, giving rise to numerous stalactite grottoes all over the island. The chief town is Villa do Porto (2506).

ST MARYLEBONE (commonly called Marylebone), a north- western metropolitan borough of London, England, bounded N. by Hampstead, E. by St Pancrasand Holborn, S. by the City of Westminster, and W. by Paddington. Pop. (1901), 133,301. It is mainly a rich residential quarter; the most fashionable part is found in the south, in the vicinity of Cavendish and Portman Squares, but there are numerous fine houses surrounding Regent's Park and in the north-western district of St John's Wood. Oxford Street, with its handsome shops, bounds the borough on the south, crossing Regent Street at Oxford Circus; Edgware Road on the west; Marylebone Road crosses from east to west, and from this Upper Baker Street gives access to Park, Wellington, and Finchley Roads; and Baker Street leads south- ward. Poor and squalid streets are found, in close proximity to the wealthiest

localities, between Marylebone Road and St John's Wood Road, and about High Street in the south, the site of the original village. The formation of the Great Central Railway, the Marylebone terminus of which, in Marylebone Road, was opened in 1899, caused an extensive demolition of streets and houses in the west central district. St Marylebone

was in the manor of Tyburn, which takes name from the Tyburn, a stream which flowed south to the Thames through the centre of the present borough. The church was called St Mary at the Bourne. The name Tyburn (q.v.) was notorious chiefly as applied to the gallows which stood near the existing junction of Edgware Road and Oxford Street (Marble Arch). The manor at the Domesday Survey was in the possession of the nunnery at Barking, but the borough includes several estates, such as the manor of Lyllestone in the west, the name of which is preserved in Lisson Grove. From 1738 to 1776 Marylebone Gardens (which had existed under other names from the close of the 17th century) became one of the most favoured evening resorts in London. They extended east of High Street as far as Harley Street, but by 1778 the ground was being built over. Another historic site is Horace Street near Edgware Road, formerly Cato Street, from which the conspiracy which bore that name was directed against the ministry in 1820.

The borough includes almost the whole of Regent's Park, with a portion of Primrose Hill north of it. These have altogether an area of 472 acres. The park, originally Marylebone Park, was enclosed by James I., and received its modern name from the Prince Regent, afterwards George IV. It contains the Zoological Gardens, one of the most noteworthy institutions of its kind, attracting numerous visitors to its splendid collections of living animals. Here are also the gardens of the Royal Botanic Society, incorporated in 1839. They are enclosed and beautifully laid out, and contain hot-houses and a museum. Exhibitions are held each year. The Toxophilite Society, founded in 1781, has also occupied grounds here since 1883. The picturesque lake is supplied by the ancient Tyburn. The Regent's Canal skirts the north side of the park. Another famous enclosure is Lord's Cricket Ground, St John's Wood Road. The founder, Thomas Lord (1814), at first established a cricket ground in the present Dorset Square, but it was soon moved here. Lord's, as it is called, is the headquarters of the M.C.C. (Marylebone Cricket Club), the governing body of the game ; here are played the home matches of this club and of the Middlesex County Cricket Club, the Oxford and Cambridge, Eton and Harrow, and other well-known fixtures. The Wallace Art Collection, Hertford House, Manchester Square, was bequeathed by Sir Richard Wallace to

the nation on the death of his wife in 1897. The waxwork exhibition named after Madame Tussaud, who founded it in Paris in 1780, occupies large buildings in Marylebone Road. The Parkes Museum of the Sanitary Institute is in Margaret Street. The Queen's Hall, Langham Place, is used for concerts, including a notable annual series of orchestral promenade concerts. StMarylebone contains a great number of hospitals, among which are the Middlesex, Mortimer Street; Throat Hospital and Dental Hospital and School, Great Portland Street; Lying-in and Ophthalmic Hospitals, Maryle- bone Road; Samaritan Hospital for women, Seymour Street ; Con- sumption Hospital, Margaret Street; and the Home for incurable children, St John's Wood Road. There are also several industrial homes. Harley Street, between Marylebone Road and Cavendish Square, is noted as the residence of medical practitioners. Educa- tional institutions include the Trinity and the Victoria Colleges of Music, in Manchester Square and Berners Street respectively; the Bedford College for women, and the Regent's Park Baptist College. The parliamentary borough of Marylebone has east and west divisions, each returning one member. The borough council consists of a mayor, 10 aldermen and 60 councillors. Area, 1472-8 acres.

SAINT MARYS, a city of Auglaize county, Ohio, U.S.A., on the Saint Marys river and the Miami & Erie canal, about 85 m. W.N.W. of Columbus. Pop. (1910), 5732. Saint Marys is served by the Lake Erie & W estern > the Western Ohio (electric), and the Toledo & Ohio Central railways. About 1 m. west is a feeding reservoir of the canal covering about 17,600 acres. Saint Marys is in the Ohio oil region. The city occupies the site of a former Shawnee village, in which a trading post was established in 1782 by James Girty, 1 from whom the place was for some years

1 James Girty (1743-1817) was one of the notorious Girty brothers, the sons of Simon Girty (d. 1751), an Irish immigrant. The brothers were taken prisoners by the French and Indian force which in 1756 captured Fort Granville, in what is now Mifflin county, Pennsylvania. James was adopted by the Shawnees and lived among them for three years, after which he acted as an interpreter and trader; he fre- quently accompanied the Indians against the English settlers, and exhibited the greatest ferocity. He conducted a profitable trading business with the Indians at St Marys in 1783-1794, when he with- drew to Canada upon the approach of General Wayne, and again from 1795 until just before theWarof 1812, when he again withdrew to Canada, where he died. His brother Simon (1741-1818), who lived with the Senecas for several years after his capture, was even more bloodthirsty; he served against the Indians in Lord Dunmore's War,

and in 1776, during the War of Independence, entered the

called Girty's Town. Fort St Marys was built in 1784 or 1785 by a detachment of General Anthony Wayne's troops, and in 1812 Ft. Barbee was erected at the instance of General W. H. Harrison by Colonel Joshua Barbee. During the War of 181 2 the place was for some time the headquarters of General Harrison's army. St Marys was laid out as a town in 1823, and became a city in 1903 under the general municipal code which came into effect in that year.

ST MARY'S LOCH, a fresh-water lake of Selkirkshire, Scotland. It lies in the high land towards the western border, and is visited from Selkirk (16 m. E. by N.) or Moffat (15 m. S.W.). It is 814 ft. above the sea, is from 80 to 90 ft. deep, 3 m. long, about 1 m. wide at its widest, and has a shore-line of 73 m. A narrow isthmus divides its head from the small Loch of the Lowes (about 1 m. long), which is believed to have been once part of it, the difference of level being only r 5 in. St Mary's is emptied by the Yarrow, and its principal feeder is Megget Water, a noted angling stream. It takes its name from St Mary's Kirk, the ruins of which lie near the northern shore. From the 13th century, when the church is first mentioned, till its destruction in 1557, it was variously known as the Forest Kirk (in which William Wallace was elected Warden of Scotland) . St Mary's of Farmaini- shope, an old name of the adjoining lands of Kirkstead, St Mary of the Lowes, and the Kirk of Yarrow. It had been partly restored, but gradually fell into decay, its place being taken by the church of Yarrow farther down the vale. In the graveyard was buried John Grieve (1781-1836), the Edinburgh hatter, a poet of some capacity, patron of James Hogg, the Ettrick Shepherd. At the head of the lake is the celebrated inn opened by Tibbie Shiel (Mrs Richardson, d. 1878), which was visited by many distinguished men of letters.

ST MAUR-DES-FOSSES, a south-eastern suburb of Paris, on the right bank of the Marne, 7 m. from the centre of the city. Pop. (1906), 28,016. St Maur and the residential district sur- rounding it cover a peninsula formed by a loop in the Marne, the neck of which is crossed by the canal of St Maur. In the reign of Clovis II. the monastery of Les Fosses was founded; the amplification of the name came when the body of St Maurus was brought there by the monks of St Maur-sur-Loire. About the same time was inaugurated the pilgrimage of Notre-Dame des Miracles, which still takes place annually. In 1465 a treaty

of peace, putting an end to the ” War of the Public Weal,” was concluded between Louis XI. and his revolted barons at St Maur.

ST MAUR-SUR-LOIRE, a village of western France in the department of Maine-et-Loire on the Loire about 15 m. below Saumur. Here St Maurus towards the middle of the 6th century founded the first Benedictine monastery in Gaul. About the middle of the 9th century it was reduced to ruins by the Normans; in anticipation of the disaster the relics of the saint were trans- ferred to the abbey of Fosses (afterwards St Maur-des-Fosses: see above). St Maur-sur-Loire was afterwards restored and fortified; the extant remains consist of a part of the church (12th and 17th centuries) and buildings of ‘the 17th and 18th centuries.

ST MAWES, a small seaport in the St Austell parliamentary division of Cornwall, England, beautifully situated on an arm of Falmouth Harbour. Pop. (1901), 1178. The inlet admits only small vessels to the little harbour, but there is a considerable fishing industry. A large circular castle, vis-a-vis with that, of Pendennis near Falmouth, and dating from the same period (Henry VIII.), guards the entrance. Near the shore of the inlet opposite St Mawes is the small church of St Anthony in Roseland, an excellent example of Early English work, retaining a good Norman doorway.

British service as an interpreter, and after the war instigated Indian attacks on the frontier and fought with the Indians against General Arthur St Clair and General Anthony Wayne. Another brother, George Girty (1745-c. 1812), lived among the Delawares for several years, was also a trader and interpreter, and was likewise a renegade. Thomas (1739-1820), though he associated much with the Indians, did not participate in their wars. See W. Butterfield’s History of the Girtys (Cincinnati, 1890).

The history of St Mawes is simple. The saint of that name is said to have made the creek of the Fal a halting-place in the 5th century. The chapel of St Mawes, pulled down in 18 12, was licensed by the bishop in 1381, and both chapel and village were’ situated within the manor of Bogullos, which in the 16th century belonged to the family of Wydeslade. In the 16th century John Leland speaks of the castle as lately begun and describes St Mawes as ” a quarter of a mile from the castle, a pretty village or fishertown with a pier called St Mawes and there is a chapel of the saint and his chair of stone and hard by his well.” The number of houses half a century later did not exceed twenty, and John Wydeslade, as lord of the manor of Bogullos, owned the village. For the part which he took in the rebellion of 1549

Wydeslade was hanged and his lands forfeited, and in 1562 the manor was granted by Queen Elizabeth to Sir Reginald Mohun of Hall. In the same year St Mawes was incorporated and invested with the right of returning two members to the House of Commons, a privilege which it enjoyed until 1832. In 1607 the portion of the manor of Bogullos which embraced St Mawes was sold by Sir Thomas Arundell, who had married a daughter of Sir William Mohuh, to Thomas Walker, and by the latter it was resold to Sir George Parry, who represented the borough in parliament from 1640 to 1642. Sir George Parry sold St Mawes to John Tredenham, whose sons, Sir William and Sir Joseph, and Sir Joseph's son, John Tredenham, became successively its parliamentary representatives. On the death of the last named St Mawes passed by sale to John Knight, whose widow married Robert Nugent, afterwards Earl Nugent, and until the Reform Act of 1832 the Nugents controlled the elections at St Mawes. The corporation, founded in 1562, which consisted of a mayor, or portreeve, and other officers elected by about twenty free tenants, was dissolved under the Municipal Cor- porations Act in 1835. Its silver mace now belongs to the corporation of Wolverhampton, to whom it passed after the great sale of the effects of the duke of Buckingham at Stowe in 1848, the duke having obtained it as the heir of the Earls Nugent.

ST MICHAEL'S (Sao Miguel), the largest island in the Portuguese archipelago of the Azores. Pop. (1900), 121,340; area, 297 sq. m. The east end of St Michael's rises from a head- land 1400 ft. high to the inland peak of Vara (3573 ft.), whence a central range (2000 to 2500 ft.) runs westward, terminating on the south coast in the Serra da Agoa do Pau, about half- way across the island. The range gradually declines in approach- ing its last point, where it is not more than 100 ft. high. The middle part of the island is lower, and more undulating, its western extremity being marked by the conspicuous Serra Gorda (1572 ft.); its shores on both sides are low, broken and rocky. The aspect of the western portion of the island is that of a vast truncated cone, irregularly cut off at an elevation of about 800 ft., and falling on the north, south and west sides' to a perpendicular coast between 300 and 800 ft. high. In the highest parts an undergrowth of shrubs gives the mountains a rich and wooded appearance. Like all volcanic countries, the island has an uneven surface with numerous ravines, and streams of semi-vitrified and scoriaceous lava which resist all atmospheric influences and repel vegetation. Heavy rains falling on the mountains afford a constant supply of water to four lakes at the bottom of extinct craters, to a number of minor reservoirs, and through them, to small rapid streams on all sides.

Hot springs abound in many parts, and vapour issues from almost

every crevice. But the most remarkable phenomena are the Caldeiras (“Cauldrons”), or Olhos (“Eyes”), i.e. boiling fountains, which rise chiefly from a valley called the Furnas (” Furnaces “), near the western extremity of the island. The water rises in columns about 12 ft. high and dissolves in vapour. The ground in the vicinity is entirely covered with native sulphur, like hoar-frost. At a small distance is the Muddy Crater, 45 ft. in diameter, on a level with the plain. Its contents are in a state of continual and violent ebullition, accompanied with a sound resembling that of a tempestuous ocean. Yet they

never rise above its level, unless occasionally to throw to a small distance a spray of the consistence of melted lead. The Furnas abounds also in hot springs, some of them of a very high tempera- ture. There is almost always, however, a cold spring near the hot one. These have long been visited by sufferers from palsy, rheumatism, scrofula and similar maladies. Bath-rooms and other buildings have been erected.

The plains of St Michael’s are fertile, producing wheat, barley and Indian corn; vines, oranges and other fruit trees grow luxuriantly on the sides of the mountains. The plants are made to spring even from the interstices of the volcanic rocks, which are sometimes blasted to receive them. Raised in this manner, these fruits are of superior quality; but the expense of such a mode of cultivation necessarily restricts it. The western part of the island yields hemp.

The principal town and seaport is Ponta Delgada (q.v.), with ‘7.675 inhabitants in 1900. The other chief towns are Arrifes (5644), Lagoa (7950), Povoacao (5093), Ribeira Grande (8496) and Villa Franca do Campo (8162). (See also Azores.)

ST MICHAEL’S MOUNT, a lofty pyramidal island, exhibiting a curious combination of slate and granite, rising 400 yds. from the shore of Mount’s Bay, in Cornwall, England. It is united with Marazion by a natural causeway cast up by the sea, and passable only at low tide. If its identity with the Mictis of Timaeus and the Ictis of Diodorus Siculus be allowed, St Michael’s Mount is one of the most historic spots in the west of England. It was possibly held by a body of religious in the Confessor’s time and given by Robert, count of Mortain, to Mount St Michael, of which Norman abbey it continued to be a priory until the dissolution of the alien houses by Henry V., when

it was given to the abbess and Convent of Syon. It was a resort of pilgrims, whose devotions were encouraged by an in- dulgence granted by Pope Gregory in the nth century. The Mount was captured on behalf of Prince John by Henry Pomeroy in the reign of Richard I. John de Vere, earl of Oxford, seized it and held it during a siege of twenty-three weeks against 6000 of the king's troops in 1473. Perkin Warbeck occupied the Mount in 1497. Humphry Arundell, governor of St Michael's Mount, led the rebellion of 1549. During the reign of Queen Elizabeth it was given to Robert, earl of Salisbury, by whose son it was sold to Sir Francis Basset. Sir Arthur Basset, brother of Sir Francis, held the Mount against the parliament until July 1646. It was sold in 1659 to Colonel John St Aubyn and is now the property of his descendant Lord Levan. The chapel is extra-diocesan and the castle is the residence of Lord St Levan.

Many relics, chiefly armour and antique furniture, are preserved in the castle. The chapel of St Michael, a beautiful 15th-century building, has an embattled tower, in one angle of which is a small turret, which served for the guidance of ships. Chapel rock, on the beach, marks the site of a shrine dedicated to the Virgin Mary, where pilgrims paused to worship before ascending the Mount. A few houses are built on the hillside facing Marazion, and a spring supplies them with water. The harbour, widened in 1823 to allow vessels of 500 tons to enter, has a pier dating from the 15th century, and subsequently enlarged and restored. Pop. (1901), in.

ST MIHIEL, a town of north-eastern France, in the department of Meuse, on the right bank of the Meuse and the Canal de l'Est, 23 m. S. by E. of Verdun by rail. Pop. (1906) of the town, S943 (not including a large garrison), of the commune, 9661. St Mihiel is famous for its Benedictine abbey of St Michael, founded in 709, to which it owes its name. The abbey buildings (occupied by the municipal offices) date from the end of the 17th century and the beginning of the 1 8th century, and the church from the 1 7th century. The latter contains a wooden carving of the Virgin by the sculptor Ligier Richier, born at St Mihiel in 1506. Other interesting buildings are the church of St Etienne, chiefly in the flamboyant Gothic style, which contains a magnificent Holy Sepulchre by Ligier Richier, and several houses dating from the 15th, 16th and 17th centuries. On the road to Verdun are seven huge rocks, in one of which a sepulchre (18th century), containing a life-sized figure of Christ, has been hollowed. St Mihiel formerly possessed fortifications and two castles which were destroyed in 1635 by the royal troops in the course of a quarrel between Louis XIII. and Charles IV., duke of Lorraine. The town is the seat of a court of assizes, and has the tribunal

of first instance belonging to the arrondissement of Commercy and a communal college.

ST MORITZ (in Ladin, San Murezzan), the loftiest (6037 ft.) and the most populous village of the Upper Engadine in the Swiss canton of the Grisons. It is built above the north shore of the lake of the same name (formed by the Inn), and is by rail 56 m. from Coire by the Albula railway, or by road 48! m. from Martinsbruck (the last village in the Engadine), or by road 30 m., over the Maloja Pass, from Chiavenna. In 1900 it had a popula- tion of 1603, 475 being German-speaking, 433 Ladin-speaking, and 504 (railway workmen) Italian-speaking, while 837 were Protestants and 743 Catholics. The village is about 1 m. north of the baths, an electric tramway connecting the two. Both are now much frequented by foreign visitors. The baths (chalybeate, sparkling with free carbonic acid) were known and much resorted to in the 16th century, when they were described by Paracelsus; they were visited in 1779 by Archdeacon W. Coxe. They are frequented chiefly by non-English visitors in summer, the English season at St Moritz being mainly the winter, for the sake of skating and tobogganing. (W. A. B. C.)

ST NAZAIRE, a town of western France, capital of an arron- dissement in the department of Loire-Inferieure, 40 m. W.N.W. of Nantes by rail and 29 m. by river. Pop. (1906), 30,345. St Nazaire, situated on the right bank of the Loire at its mouth, is a modern town with straight thoroughfares crossing one another at right angles. It possesses nothing of antiquarian interest except a granite dolmen 10 ft. long and 5 ft. wide resting horizontally on two other stones sunk in the soil, above which they rise 6| ft. The only noteworthy building is a modern church in the Gothic style of the 14th century. The harbour, which constitutes the outport of Nantes and is accessible to ships of the largest size, is separated from the estuary by a narrow strip of land, and comprises an outer harbour and entrance, two floating docks (the old dock and the Penhouet dock), three graving docks, and the extensive shipbuilding yards of the Loire Company and of the General Transatlantic Company whose steamers connect St Nazaire with Mexico, the Antilles and the Isthmus of Panama. Ships for the navy and the mercantile marine are built, and there are important steel-works, blast- furnaces, forges, and steam saw-mills. The town is the seat of a sub-prefect, and has a tribunal of first instance, a board of trade- arbitration, an exchange, a chamber of commerce, a communal college, and schools of navigation and industry. Next to British and French, Spanish, Norwegian and Swedish vessels most frequent the port. In the decade 1898-1907 the value of imports greatly fluctuated, being highest in 1898 (£2,800,000) and lowest in 1904 (£1,688,000),

the average for each of the ten years being £2,280,000. The value of the exports in the same period varied between £3,724,000 in 1899 and £1,396,000 in 1906, the average being £2,935,200. Imports include coal and patent fuel, iron ore and pyrites, timber, rice and hemp; exports include iron ore, coal and patent fuel, pit wood, sugar, garments and woven goods, preserved fish, and wine and spirits.

According to remains discovered on excavating the docks, St Nazaire seems to occupy the site of the ancient Corbilo, placed by Strabo among the more important maritime towns of Gaul. At the close of the 4th century the site of Corbilo was occupied by Saxons, and, their conversion to Christianity being effected one or two hun- dred years later by St Felix of Nantes, the place took the name of St Nazaire. It was still only a little ” bourg ” of some 3000 in- habitants when under the second empire it was chosen as the site of the new harbour for Nantes, because the ascent of the Loire was becoming more and more difficult. In 1868 the sub-prefecture was transferred to St Nazaire from Savenay.

ST NECTAIRE (corrupted into Sennecterre and Senneterre), the name of an estate in Auvergne, France, which gave its name to a feudal house holding distinguished rank in the 13th century. The eldest branch of this family held the marquisate of La Fert6 (q.v.), and produced a heroine of the religious wars of the 1 6th century, Madeleine de St Nectaire, who married Guy de St Exupery, seigneur de Miremont, in 1548, and fought successfully at the head of the Protestants in her territory against the troops of the League. To the same house belonged the branches of the marquises of Chateauneuf, the seigneurs of Brinon-sur-Sauldre

and St Victour, and the seigneurs of Clavelier and Fontenilles, all of which are now extinct. (M. P.*)

ST NEOTS (pronounced St Neets), a market town in the southern parliamentary division of Huntingdonshire, England, on the right (east) bank of the Ouse, 51 1 m. N. of London by the Great Northern railway. Pop. of urban district, (1901) 3880. A stone bridge crosses the river, built in 1589 from the ruins of a former priory. The parish church of St Mary is a fine Perpendicular building of the later 15th century. The original oak roof is noteworthy. Among other buildings may be mentioned the Victoria museum (1887), the library and

literary institute, and the endowed school (1760). Paper-mills, breweries, floui-mills, and engineering works furnish the chief industries of the town.

The name of St Neots is derived from the monastery founded in the adjoining parish of Eynesbury in the reign of King Edgar (967-975). St Neot, a priest of Glastonbury Abbey in Somerset, became a recluse at a place which he named Neotstoke, near Bodmin in Cornwall, where he died about the end of the 9th century. His shrine at Eynesbury being threatened by the incursion of the Danes early in the nth century, the relics were conveyed to Crowland Abbey, in Lincolnshire, of which he became one of the patron saints. But in n 12 the monastery was refounded from that of Bee in Normandy. An Anglo-Saxon enamelled mosaic in the Ashmolean Museum at Oxford is supposed to contain a portrait of St Neot. In 1648 a troop of Royalists under the command of Villiers, duke of Buckingham, was routed in St Neots by the Parliamentarians.

ST NICOLAS, a town of Belgium in the province of East Flanders, about 12 m. S.W. of Antwerp. Pop. (1904), 32,767. It is the principal town of Waes, formerly a district of bleak and barren downs, but now the most productive part of Belgium. St Nicolas is the centre and distributing point of this district, being an important junction on the direct line from Antwerp to Ghent; it has also many manufactures of its own. The principal church dedicated to St Nicolas was finished in 1696, but the other public buildings are only of the 19th century.

ST NICOLAS, or St Nicolas du Port, a town of north-eastern France, in the department of Meurthe-et-Moselle, on the left bank of the Meurthe, 8 m. S.E. of Nancy by rail. Pop. (1906), 4796. The town has a fine Gothic church dating from the end of the 15th and the first half of the 16th century, and possessing a finger-joint of St Nicolas formerly the object of pilgrimages which were themselves the origin of well-known fairs. The latter became less important after 1635, when the Swedes sacked the town. There are important salt- workings in the vicinity; cotton spinning and weaving are carried on. Its port, shared with Varangeville on the opposite side of the river, has an active trade.

ST OMER, a town and fortress of northern France, capital of the department of Pas-de-Calais, 42 m. W.N.W. of Lille on the railway to Calais. Pop. (1906), 17,261. At St Omer begins the canalized portion of the Aa, which reaches the sea at Grave- lines, and under its walls it connects with the Neuffoss6 canal, which ends at the Lys. The fortifications were demolished during the last decade of the 19th

century and boulevards and new thoroughfares made in their place. There are two harbours outside and one within the city. St Omer has wide streets and spacious squares, but little animation. The old cathedral belongs almost entirely to the 13th, 14th and 15th centuries. A heavy square tower finished in 1499 surmounts the west portal. The church contains interesting paintings, a colossal statue of Christ seated between the Virgin and St John (13th century, originally belonging to the cathedral of Therouanne and presented by the emperor Charles V.), the cenotaph of St Omer (13th century) and numerous ex-votos. The richly decorated chapel in the transept contains a wooden figure of the Virgin (12th century), the object of pilgrimages. Of St Bertin, the church of the abbey (built between 1326 and 1520 on the site of previous churches) where Childeric III. retired to end his days, there remain some arches and a lofty tower, which serve to adorn a public garden, Several other churches or convent chapels are of xxiv. 2

interest, among them St Sepulchre (14th century), which has a beautiful stone spire and stained-glass windows. A fine collection of records, a picture-gallery, and a theatre are all accommodated in the town hall, built of the materials of the abbey of St Bertin. There are several houses of the 16th and 17th centuries; of the latter the finest is the Hotel Colbert, once the royal lodging, and now occupied by an archaeological museum. Among the hospitals the military hospital is of note as occupying the well- known college opened by the English Jesuits in 1592. The old episcopal palace adjoining the cathedral is used as a court-house. The chief statue in the town is that of Jacqueline Robin (see below). St Omer is the seat of a sub-prefect, of a court of assizes, of tribunals of first instance and of commerce, of a chamber of commerce, and of a board of trade arbitration. Besides the lycee, there are schools of music and of art. The industries include the manufacture of linen goods, sugar, soap, tobacco- pipes, and mustard, the distilling of oil and liqueurs, dyeing, salt-refining, malting and brewing. The suburb of Haut Pont to the north of St Omer is inhabited by a special stock, which has remained faithful to the Flemish tongue, its original costume and its peculiar customs, and is distinguished by honesty and industry. The ground which these people cultivate has been reclaimed from the marsh, and the legres (i.e. the square blocks of land) communicate with each other only by boats floated on the ditches and canals that divide them. At the end of the marsh, on the borders of the forest of Clairmarais, are the ruins of the abbey founded in 1140 by Thierry d'Alsace, to which Thomas Becket betook himself in 1165. To the south of St Omer, on a hill commanding the Aa, lies the camp of Helfaut, often called the camp of St Omer. On the Canal de Neuf-Fesse, near the town, is the Ascenseur des Fontinettes, a

hydraulic lift enabling canal boats to surmount a difference of level of over 40 ft.

Omer, bishop of Therouanne, in the 7th century established the monastery of St Bertin, from which that of Notre-Dame was an offshoot. Rivalry and dissension, which lasted till the Revolution, soon sprang up between the two monasteries, becoming especially virulent when in 1559 St Omer became a bishopric and Notre-Dame was raised to the rank of cathedral. In the 9th century the village which grew up round the mona- steries took the name of St Omer. The Normans laid the place waste about 860 and 880, but ten years later found town and monastery surrounded by walls and safe from their attack. Situated on the borders of territories frequently disputed by French, Flemish, English and Spaniards, St Omer long continued subject to siege and military disaster. In 1071 Philip I. and Count Arnulf III. of Flanders were defeated at St Omer by Robert the Frisian. In n 27 the town received a communal charter from William Clito, count of Flanders. In 1493 it came to the Low Countries as part of the Spanish dominion. The French made futile attempts against it between 1551 and 1596, and again in 1638 (under Richelieu) and 1647. But in 1677, after seventeen days' siege, Louis XIV. forced the town to capitulate; and the peace of Nijmwegen permanently confirmed the con- quest. In 1 71 1 St Omer, on the verge of surrendering to Prince Eugene and the duke of Marlborough, owing to famine, was saved by the daring of Jacqueline Robin, who risked her life in bringing provisions into the place. St Omer ceased to be, a bishopric in 1801.

See L. Deschamps de Pas, Hist, de la ville de Saint-Omer (2nd ed., Arras, 1 881). For a full bibliography of other works see U. Chevalier, Repertoire des sources hist, topo-bibliographie (Montbeliard, 1903), ii. 2743 seq.

SAINTON, PROSPER PHILIPPE CATHERINE (1813-1890), French violinist, was the son of a merchant at Toulouse, where he was born on the 5th of June 1813. He entered the Paris Conservatoire under Habeneck in 1831, and became professor of the violin in the Conservatoire of Toulouse. In 1844 he made his first appearance in England, at a Philharmonic concert directed by Mendelssohn. Settling in London, he was in 1845 appointed professor at the Royal Academy of Music. In the early organizations for chamber music which culminated in the establishment of the Popular concerts, Sainton bore an important

part; and when the Royal Italian Opera was started at Covent Garden, he led the orchestra under Costa, with whom he migrated to Her Majesty's Theatre in 1871. From 1848 to 1855 he was leader of the Queen's Band, and in 1862 he conducted the music at the opening of the International Exhibition. In i860, he married the famous contralto singer, Miss Charlotte Dolby (see below). He was leader of the principal provincial festivals for many years, and gave a farewell concert at the Albert Hall in 1883. He died on the 17th of October 1890. His method was sound, his style artistic, and his educational wcrk of great value, the majority of the most successful orchestral violinists having been his pupils.

SAINTON-DOLBY, CHARLOTTE HELEN (1821-1885), English contralto singer, was born in London on the 17th of May 1821, studied at the Royal Academy of Music from 1832 to 1837, Crivelli being her principal singing-master. In 1837 she was elected to a king's scholarship, and first appeared at a Phil- harmonic concert in 1841. In October 1845 she sang at the Gewandhaus, Leipzig, through the influence of Mendelssohn, who had been delighted by her singing in St Paul. The contralto music in his Elijah was written for her voice, but she did not appear in that work till the performance at Exeter Hall on the 16th of April 1847. She married M. Sainton in i860, and in

1870 she retired from the career of a public singer, but two years afterwards started a ” vocal academy ” in London. She made various successful attempts as a composer, and the cantatas ” The Legend of St Dorothea” (1876), “The Story of the Faithful Soul “(1879), and ” Florimel ” (1885), enjoyed considerable success. Her last public appearance was at her husband’s farewell concert in June 1883, and she died on the 18th of February 1885. A scholarship in her memory was founded at the Royal Academy of Music. Her voice was of moderate power and of fine quality, but it was her dignified and artistic style that gave her the high place she held for so many years both in oratorio and ballads.

SAINTONGE, one of the old provinces of France, of which Saintes (q.v.) was the capital, was bounded on the N.W. by Aunis, on the N.E. by Poitou, on the E. by Angoumois, on the S. by Guienne, and on the W. by Guienne and the Atlantic. It now forms a small portion of the department of Charente and the greater part of that of Charente Inferieure. In the time of Caesar, Saintonge was occupied by the Santones, whose capital was Mediolanum; afterwards it was part of Aquitania Secunda. The civitas Santonum, which formed the bishopric of Saintes, was divided into two pagi: Santonicus (whence Sanctonia, Saintonge) and Al ienensis, later Alniensis (Aunis). Halved by the treaty of 1259, it was wholly ceded to the king of England in 1360, but reconquered by Du Guesclin in 1371. Up to 1789 it was in the same gouvernement with Angoumois, but from a judiciary point of view Saintonge was under the parlement of Bordeaux and Angoumois under that of Paris.

See D. Massiou, Histoire politique, civile el religieuse de la Saintonge el de V Aunis (6 vols., 1836-1839; 2nd ed., 1846); P. D. Rainguet, Biographie saintongeaise (1852). See also the publications of the Societe des archives historiques de la Saintonge et de V Aunis (1874 fol.).

ST OUEN, an industrial town of northern France, in the department of Seine, on the right bank of the Seine 1 m. N. of the fortifications of Paris. Pop. (1906) 37,673. A chateau of the early 19th century occupies the site of a chateau of the 17th century bought by Madame de Pompadour in 1745, where in 1814 Louis XVIII. signed the declaration promising a con- stitutional charter to France. Previously there existed a chateau built by Charles of Valois in the early years of the 14th century, where King John the Good inaugurated the short-lived order of the Knights of ” Notre Dame de la noble maison,” called also the ” ordre de l’etoile.” The industries of St Ouen include metal founding, engineering and machine construction and the manufacture

of government uniforms, pianos, chemical products, &c. It has important docks on the Seine and a race-course.

ST PANCRAS, a northern metropolitan borough of London, England, bounded E. by Islington, S.E. by Finsbury, S. by Holborn, and W. by St Marylebone and Hampstead, and extend-

ing N. to the boundary of the county of London. Pop. (1901) 2 35>3 I 7- I n the south it includes a residential district, contain- ing boarding-houses and private hotels. In the centre are Camden Town and Kentish Town, and in the north, where part of Highgate is included, are numerous villas, in the vicinity of Parliament Hill, adjoining Hampstead Heath. A thorough- fare called successively Tottenham Court Road, Hampstead Road, High Street Camden Town, Kentish Town Road, and Highgate Road, runs from south to north; Euston Road crosses it in the south, and Camden Road and Chalk Farm Road branch from it at Camden Town. Besides the greater part of Parliament Hill (267 acres), purchased for the public use in 1886, the borough includes a small part of Regent's Park (mainly in the borough of St Marylebone) and Waterlow Park (29 acres) on the slope of Highgate Hill. It also contains the termini, King's Cross, St Pancras, and Euston, of the Great Northern, Midland, and London and North Western railways, with extensive goods depdts of these companies. The parish church of St Pancras in the Fields, near Pancras Road, has lost its ancient character owing to reconstruction, though retaining several early monuments. The new church in Euston Road (1822) is a remarkable adaptation of classical models. Among institutions, University College, Gower Street, was founded in 1826, and provides education in all branches common to universities excepting theology. With the department of medicine is con- nected the University College Hospital (1833) opposite the College. There are several other hospitals; among them the Royal Free Hospital (Gray's Inn Road), the North-west London hospital, Kentish Town, and, in Euston Road, the British (Forbes Winslow memorial) hospital for mental disorders, British hospital for skin diseases, and New hospital for women, administered by female physicians. St Katherine's Hospital, a picturesque building overlooking Regent's Park, with a chapel containing some relics of antiquity, was settled" here (1825) on the formation of the St Katherine's Docks near the Tower of London, where it was founded by Queen Matilda in 1 148. Its patronage has always been associated with queens, and here was established the Queen Victoria Home for Nurses of the poor, founded out of the women's gift of money to the Queen at her jubilee (1887). Other institutions are the London School of Medicine for women, the Royal Veterinary College and the Aldenham technical institute. The

Passmore Edwards Settle- ment, taking name from its principal benefactor, was founded largely through the instrumentality of Mrs Humphry Ward. Near Regent's Park is Cumberland Market. The parliamentary borough of St Pancras has north, south, east and west divisions, each returning one member. The borough council consists of a mayor, 10 aldermen and 60 councillors. Area, 2694-4 acres.

St Pancras is mentioned in Domesday as belonging to the chapter of St Paul's Cathedral, in which body the lordship of the manors of Cantelows (Kentish Town) and Totenhall (Tottenham Court) was also invested. Camden Town takes name from Baron Camden (d. 1794), lord chancellor under George III. King's Cross was so called from a statue of George IV., erected in 1830, greatly ridiculed and removed in 1845, but an earlier name, Battle Bridge, is tradition- ally derived from the stand of Queen Boadicea against the Romans, or from one of Alfred's contests with the Danes. Somers Town, between King's Cross and Camden Town, was formerly inhabited by refugees from the French Revolution, many of whom were buried in St Pancras churchyard. In the locality of Somers Town there were formerly to be traced earthworks of unknown age, which William Stukeley argued had belonged to a Roman camp of Julius Caesar. Attached to the former manor-house of Totenhall was one of the famous pleasure resorts of the 17th and 18th centuries, and from c. 1760 to the middle of the 19th century the gardens at Bagnigge Wells (King's Cross Road) were greatly favoured; there were here, moreover, medicinal springs.

ST PAUL, a volcanic island in the southern Indian Ocean, in 38 42′ 50″ S., 77 32′ 29″ E., 60 m. S. of Amsterdam Island, belonging to France. The two islands belong to two separate eruptive areas characterized by quite different products; and the comparative bareness of St Paul contrasts with the dense vegetation of Amsterdam. On the north-east of St Paul, which has an area of 2f sq. m., is a land-locked bay, representing the old crater, with its rim broken down on one side by the sea.

The highest ridge of the island is not more than 820 ft. above the sea. On the south-west side the coasts are inaccessible. According to Velain, the island originally rose above the ocean as a mass of rhyolitic trachyte similar to that which still forms the Nine Pin rock to the north of the entrance to the crater. Next followed a period of activity in which basic rocks were produced by submarine eruptions

— lavas and scoriae of anorthitic character, palagonitic tuffs, and basaltic ashes; and finally from the crater, which must have been a vast lake of fire like those in the Sandwich Islands, poured forth quiet streams of basaltic lavas which are seen dipping from the centre of the island towards the cliffs at angles of 20 to 30 . The only remain- ing indications of volcanic activity are the warm springs and emanations of carbon dioxide.

See C. Velain, Passage de Venus sur le soleil (9 decembre 1874). Expedition francaise aux lies St Paul et Amsterdam (Paris, 1877); Description geologique de la presqu'ile d 'Aden . . . Reunion … 5/ Paul et Amsterdam (Paris, 1878); and an article in Annates de geographie, 1893.

ST PAUL, the capital of Minnesota, U.S.A., and the county- seat of Ramsey county, situated on the Mississippi river, about 2150 m. above its mouth, at the practical head of navigation, just below the Falls of St Anthony. It is about 360 m. N. W. of Chicago, Illinois, and its W. limits directly touch the limits of Minneapolis. Pop. (1880) 41,473; (1890) 133,156; (1900) 163,632, of whom 46,819 were foreign-born (12,935 Germans, 9852 Swedes, 4892 Irish, 3557 English-Canadians, 2900 Norwegians, 2005 English, 1488 Austrians, 1343 Bohemians, 1206 Danes, and 1015 French-Canadians), 100,599 of foreign parentage (i.e. both parents foreign born), and 2263 negroes; (1910 census) 214,744. Land area (1906) 52-28 sq. m. St Paul is served by the Chicago, Burlington & Quincy, the Chicago Great Western, the Chicago, Rock Island & Pacific, the Northern Pacific, the Minneapolis, St Paul & Sault Ste Marie, the Chicago & North-western, the Chicago, Milwaukee & St Paul, the Great Northern, and the Minneapolis & St Louis railways. Five bridges span the Mississippi, the largest of which, known as High Bridge, is 2770 ft. long and 200 ft. high. Four interurban lines connect with Minneapolis.

St Paul is attractively situated 670-880 ft. above sea-level, on a series of lofty limestone terraces or bluffs, formerly heavily wooded. It lies on both sides of the river, but the principal part is on the east bank. In its park system the numerous lakes within and near the city have been utilized. Of the parks, Como Park (425 acres; including Lake Como and a fine Japanese garden and a lily pond), and Phalen Park (600 acres, more than 400 of which are water area), are the largest. There are also 47 smaller squares and " neighbourhood parks " aggregating 560 acres. In Indian Park (135 acres), at the crest of the bluffs (Dayton's Bluffs), in the east central part of the city, are burial-mounds of the Sioux. Summit Avenue Boulevard, 200 ft. wide and extending for 25 m. along the heights, is a fine residential street.

Boulevards along the bluffs on either side of the river connect with the Minneapolis park system. Harriet Island, in the Mississippi river opposite the business centre of the city, is attractively parked, and on it are public paths. Adjoining the city on the south-west, at the junction of the Minnesota and Mississippi rivers, is the Fort Snelling U.S. Government Military R eservation , with a round stone fort, built in 1 8 20. The principal public building is the State Capitol, completed in 1905. It was designed by Cass Gilbert (b. 1859), is of Minnesota granite and white Georgia marble with a massive central white dome, and has sculptural decorations by D. C. French and interior decorations by John La Farge, E. H. Blashfield, Elmer E. Garnsey (b. 1862), and Edward Simmons (b. 1852). Other prominent buildings are the City Hall and Court House, a Gothic greystone structure; the Federal building, of greystone, opposite Rice Park; a Young Men's Christian Association building; the Metropolitan Opera House; the Auditorium, which was built by public subscription; the St Paul armoury (1905), with a drill hall; the Chamber of Commerce; and the Union railway station. Among the principal churches are the Roman Catholic Cathedral, and the People's, the Central Presbyterian, the Park Congre-

gational, and the First Baptist churches. The wholesale district is in the lower part of the city near the Union railway station ; the retail shops are mostly in an area bounded by Wabasha, Seventh, Fourth and Roberts streets.

St Paul has an excellent public school system, which include. .) in 1909 three high schools, a teachers' training school, a manua training high school, forty-eight grade schools, and a parenta school. Among other educational institutions are the Freemai School; St Paul Academy; Barnard School for Boys; Si Paul College of Law (1900); the College of St Thomas (Romar Catholic, 1885); St Paul Seminary (Roman Catholic, 1894), founded by James J. Hill as the provincial seminary of the ecclesiastical province of St Paul with an endowment of $500,000, 40 acres of land, and a library of 10,000 volumes; Luther Theological Seminary (1885); Hamline University (co-educa- tional; Methodist Episcopal), chartered in 1854, with a medical school in Minneapolis (chartered 1883; part of Hamline since 1895), and having in the college and preparatory school, in 1908- 1909, 17 instructors and 384 students; Macalester College (Presbyterian; co-educational), founded as Baldwin Institute in 1853, reorganized and renamed in 1874 in honour of a bene- factor, Charles Macalester (1798-1873) of Philadelphia; and the School of Agriculture (1888) and the Agricultural Experiment Station (1887) of the University of Minnesota, in St Anthony Park, west of Como Park and south of the

fair grounds. Among the libraries are the City Public Library, the State Law Library and the Minnesota Historical Society Library. The Minnesota Historical Society, organized in 1849, nas an archaeological collection in the east wing of the Capitol. In the private residence of James J. Hill is a notable art gallery, containing one of the largest and best collections of the Barbizon School in existence. The principal newspapers are the Dispatch (Independent, 1878) and the Pioneer-Press, the latter established by James M. Goodhue (1800-1852) in 1849. Among the hospitals and charit- able institutions are the City and County, St Joseph's and St Luke's hospitals, all having nurses' training schools; the Swedish Hospital, the Scandinavian Orphan Asylum, the Home, for the Friendless, the Magdalen Home and the Women's Christian Home. Within the city limits (east of Indian Mounds Park) is the Willowbrook (state) Fish Hatchery, second to none in the United States in completeness of equipment; and adjoin- ing the city on the north-west are the extensive grounds (200 acres) and buildings of the State Agricultural Society, where fairs are held annually.

Although as a manufacturing city St Paul, not possessing the wonderful water-power of its sister city, does not equal Minneapolis, yet as a commercial and wholesale distributing centre it is in some respects superior, and it is the principal jobbing market of the North-west. Situated at the natural head of navigation on the Mississippi, it has several competing lines of river steamboats in addition to the shipping facilities provided by its railways and the lines of the Minnesota Transfer Co., a belt line with 62 m. of track encircling St Paul and Minne- apolis. St Paul is the port of entry for the Minnesota Customs District, and imports from Canada and from the Orient via the Pacific railways constitute an important factor in its commercial life, its imports and exports were valued at $6,154,289 and $9,909,940 respectively in 1909. Coal and wood, grain, farm produce and dairy products are important exports. St Paul is the principal market in the United States for the furs of the North-west, and there are extensive stock-yards and slaughtering and packing houses in the neighbouring city of South St Paul (pop. in 1910, 4510), St Paul ranks second to Minneapolis among the cities of the state as a manufacturing centre. The total value of its factory products in 1905 was $38,318,704, an increase of 27-5% since 1900. The following were among the largest items: fur goods; printing and publishing — book (especially law-book) and job, newspapers and periodicals; malt liquors; steam-railway car building and repairing; boots and shoes; foundry and machine-shop products; lumber and planing-mill products; men's clothing; tobacco, cigars and cigarettes; and saddlery

and harness.

St Paul is governed under a charter of 1900, which may be amended by popular vote on proposals made by a permanent charter commission. The mayor, comptroller and city treasurer are elected for two years. The mayor has the veto power and appoints the members of boards of police, parks, library, fire, water-supply and education. The legislature is bicameral, consisting of an assembly of nine members elected on a general city ticket and a board of aldermen chosen one from each of the twelve wards. The water-supply is pumped through 275 m. of water mains from a group of lakes north of the city, and the system has a capacity of 40,000,000 gallons per day.

History. — The earliest recorded visit of a European to the site of St Paul was that of the Jesuit Louis Hennepin in 1680. The traders Pierre Le Sueur and Nicholas Perrot visited the region between 1690 and 1700, and apparently established a temporary trading post somewhere in the neighbourhood. The first man of English descent to record his visit was Jonathan Carver, who, according to his journal, spent some time in the vicinity in 1767-1768. In 1805 Lieut. Zebulon M. Pike concluded a treaty with the Sioux. The first steamboat made its way up the river in 1823. The site of St Paul was opened to settlement by the treaty of Prairie du Chien, negotiated by Governor Henry Dodge of Wisconsin with the Chippewas in 1837. Two years later (1839) the first permanent settlement was made by Swiss and Canadian refugees from Lord Selkirk's Red River colony. In 1841 Father Lucien Gaultier erected a log mission chapel, which he named St Paul's; from this the settlement was named St Paul's Landing and finally St Paul. On the erection of Minnesota Territory in 1849, St Paul was incorporated as a village and became the Territorial capital. Its population in 1850 was only n 12. It was chartered as a city in 1854, and continued as the capital of the new state after its admission (1858). The first railway connecting St Paul and Minneapolis was completed in 1862, at which time St Paul's population exceeded 10,000 and in 1869 through railway con- nexion with Chicago was effected. The city of West St Paul was annexed in 1874. The growth of the city had been comparatively slow until 1870, in which year the population was 20,030; but the rapid railway construction and the settlement and clearing of the Western farm lands increased its commercial and industrial importance as it did that of its sister city, Minne- apolis. In 1884 the city (limits were extended to the Minneapolis line.

See F. C. Bliss, St Paul, its Past and Present (St Paul, 1888); C. C. Andrews, History of St Paul, Minnesota (Syracuse, N.Y., 1 890) ; Warner and Foote, History of Ramsey County and the City of St Paul (Minneapolis, 1881) ; C. D. Elfelt, ” Early Trade and Traders in St Paul,” and A. L. Larpenteur, ” Recollections of the City and People of St Paul,” both in the Minnesota Historical Society’s Collections, vol. ix. (1901).

ST PAUL’S CATHEDRAL, the cathedral church of the diocese of London, England, standing in the heart of the City, at the head of Ludgate Hill. (For plan, &c, see Architecture: Renaissance in England.) The name of a bishop of London, Restitutus, is recorded in 314, but his individuality and even his existence are somewhat doubtful, and nothing is known of the existence of a church until Bede’s notice that early in the 7th century one was built here by ˆEthelberht of Kent at the instance of the missionary Mellitus, who became bishop. Tradition placed upon the site a Roman temple of Diana. The church was dedicated to St Paul, and, after passing through many vicissitudes, was removed in 1083, when Bishop Maurice, with the countenance of William the Conqueror, undertook the erection of a new cathedral. The building was not pressed forward with vigour, and in 1135 much of it was damaged by fire. The tower was completed in 1221; an Early English choir followed shortly after, and was enlarged after 1255 when Bishop Fulk brought great energy to bear upon the repair and elaboration of the building. At the close of the century the cathedral Was regarded as finished; but a new spire was built early in the 14th century. Much of the Norman work, particu- larly in the nave, had been left untouched by the Early English builders (who in other parts merely encased it), and the cathedral

was a magnificent monument of these styles, and of the early Decorated. Perpendicular additions were not extensive, and the cathedral remained with little alteration until 1561, when lightning struck the spire and fired the church. The spire was never rebuilt. In the time of James I. the fabric had so far decayed that the king was prevailed upon to make a personal examination of it, and Inigo Jones was entrusted with the work of restoration. In accordance with the architectural tendencies of his time he added a classical portico to the west front, and made similar alterations to the transepts. Again, however, in 1666 the bad state of the fabric necessitated extensive repair, and Dr (afterwards Sir) Christopher Wren furnished a scheme including a central dome. All his plans were complete in August of that year, but in September the great fire of London almost destroyed the building, and rendered what was left unsafe and beyond restoration.

Estimates of the dimensions of the old cathedral differ, Stow making the extreme length 690 ft., but modern investigations give 596 ft. The internal height of the choir was 101 ft., and that of the nave, which was of twelve bays, 93 ft., and the extreme breadth of the building was 104 ft. The summit of the wonderful spire was 489 ft. above the ground. The present building is wider than the old, and its orientation is more northerly, but its northern, eastern and southern extremities approximately correspond with those of old St Paul's, the west front of which, however, with its flanking towers, lay nearly 100 ft. west of Wren's front. It should be noticed that the eastern part of the old cathedral incorporated the original parish church of St Faith after 1255, when part of the new crypt was allotted to the parish in return. Moreover, the ancient church of St Gregory by St Paul actually adjoined the cathedral on the south-west. In the angle west of the south transept lay a cloister, in the midst of which was the octagonal chapter house, dating from 1332. To the north-east of the cathedral stood Paul's Cross, in an open space devoted to public meetings; it included a pulpit, and here religious disputations were held and papal bulls promulgated. In 1643 it was removed, but a new cross, erected under the will of H. C. Richards, K.C., M.P., was unveiled in 1910.

The formal provision for the rebuilding of the cathedral was made in 1668, and the foundation stone was laid in 1675. The first service was held in it in 1697, and the last stone was set in place in 1 710. The cost is curiously estimated, but was probably about £850,000, the greater part of which was defrayed by a duty on sea-borne coal. The material is Portland stone. Wren had to face many difficulties. He naturally insisted on the style of the Renaissance, and his first design was for a building in the form of a Greek cross, but the general desire was that at least the ground-plan of the old English cathedrals should be followed, and the form of a Latin cross was forced upon him. He offered various further designs, and one was accepted, but Wren set the broadest construction upon the permission granted him to alter its ornamental details, and luckily so. The extreme length of the building is 513 ft., the breadth across the transepts 248 ft., of the nave 122 ft., of the west front 179 ft. The length of the nave is 223 ft., and of the choir 168 ft., leaving 122 ft. beneath the dome at the crossing. The cross at the top of the lantern above the dome is 363 ft. above the ground.

The cathedral is approached on the west from an open pavement, on which stands a statue of Queen Anne. There is also an inscription marking the spot on which Queen Victoria returned thanks on the occasion of her Diamond Jubilee (1897). A broad flight of steps leads up to the west front, of two orders, flanked by towers. In the north

tower is a chime of bells ; in the south the clock, with the old great bell (17 16), tolled on the death of certain high personages, and the new great bell, placed in 1882, weighing about 17 tons. The nave is of four bays, with aisles, and chapels of one bay width immediately east of the western towers. The transepts are of two bays, and are entered by north and south porches approached by circular flights of steps. On the pediment of the south porch is sculptured a phoenix with the inscription Resurgam (I shall rise again), in allusion to a famous episode. Wren, planning his site and desiring to mark in the ground the point of the centre of his dome, bade a workman bring a piece of stone for the purpose. He picked up at hazard a fragment of an ancient tombstone bearing this single word, which Wren adopted as a motto. The choir of four bays terminates in an apse, but the rich and lofty modern reredos stands forward, and the apse is thus divided off from the body of the church and forms the Jesus chapel. The choir stalls are a fine example of the work of Grinling Gibbons. The dome is supported by the four vast piers in the angles of the cross, within which are small chambers, and by eight inner piers. The spandrels between the I arches which stand upon these piers are ornamented with mosaics,

from the designs of G. F. Watts and others, executed by Salviati. Wren had looked forward to a comprehensive scheme of decoration in mosaic. The later extension of this work was entrusted to Sir W. B. Richmond. Above the arches is a circular gallery known as the Whispering Gallery from the fact that a whisper can be easily heard from one side to the other. Above this there are pilasters, with square-headed windows, in three out of every four intervening spaces; and above again, the domed ceiling, ornamented in mono- chrome by Sir James Thornhill immediately after its completion; but the paintings have suffered from the action of the atmosphere and are hardly to be distinguished from below. The inner wall of the dome begins to slope inward from the level of the Whispering Gallery, but this is masked outside by a colonnade, extending up to a point a little above the top of the internal pilasters. From this point upward the dome is of triple construction, consisting of (i) the inner dome of brick, pierced at the top to render the lantern visible from below; (2) a brick cone, the principal member of the structure, bearing the lantern; (3) the dome visible from without, of lead on a wooden frame. The golden gallery at the base of the lantern (top of the outer dome) is about 65 ft. above the top of the inner dome.

The monuments in St Paul's are numerous, though not to be compared with those in Westminster Abbey. The most notable is that in the nave to the duke of Wellington (d. 1852) by Alfred Stevens. In the crypt, which extends beneath the entire building, are many tombs and memorials — that of Nelson in the centre beneath the dome, those of many famous artists in the so-called Painters' Corner, and in the south choir aisle that of Wren himself, whose grave is marked only by a plain slab, with the well-known inscription ending Si monumentum requiris, circumspice (" If thou seekest a monument, look about thee "). Above the south-west chapel in the nave is the chapter library, with many interesting printed books, MSS. and drawings relating to the cathedral. For St Paul's School, established by John Colet, dean, and formerly adjacent to the cathedral, see the article on Hammersmith, whither it was subsequently removed.

Authorities. — Parentalia or Memoirs (of Sir Christopher Wren), completed by his son Christopher, now published by his Grandson, Stephen Wren (London, 1758); Sir William Dugdale, History of St Paul's (1818); Dean Milman, Annals of St Paul's (1868); William Longman, The Three Cathedrals dedicated to St Paul (1873); Documents illustrating the History of St Paul's (Camden Society, 1880); Rev. W. Sparrow-Simpson, Chapters in the History of Old St Paul's (1881); Gleanings from Old St Paul's (1889); and St Paul's and Old City Life (1894) ; Rev. A. Dimock, St Paul's (in Bell's " Cathedral " series, 1901); Rev. Canon Benham, Old St Paul's (1902). In this last work and elsewhere are shown the valuable drawings of Wen- ceslaus Hollar, showing the old cathedral immediately before the great fire.

ST PAUL'S ROCKS, a number of islets in the Atlantic, nearly i° N. of the equator and 540 m. from South America, in 29° 15′ \V. The whole space occupied does not exceed 1400 ft. in length by about half as much in breadth. Besides sea-fowl the only land creatures are insects and spiders. Fish are abundant, seven species (one, Holocentrum sancti pauli, peculiar to the locality) being collected by the " Challenger " during a brief stay. Dar- win (On Volcanic Islands) decided that St Paul's Rocks were not of volcanic origin; later investigators maintain that they probably are eruptive.

See Reports of the Voyage of H. M.S. Challenger: Narrative of the Cruise, vol. i.

ST PETER, a city and the county-seat of Nicollet county, Minnesota, U.S.A., on the Minnesota river, about 75 m. S.W. of Minneapolis. Pop. (1905, state census) 4514 (875 foreign-born); (1910) 4176. It is served by the Chicago & North-Western railway and by steamboat lines on

the Minnesota river, which is navigable for light draft steamboats to this point. The neighbouring lakes with their excellent fishing attract many summer visitors. The city has a Carnegie library, and is the seat of the Minnesota Hospital for the Insane (1866), and of Gustavus Adolphus College (Swedish Evangelical Lutheran; co-educa- tional), which was founded in 1862 and has a college, an Academy and School of Pedagogy, a School of Commerce and a School of Music. St Peter is an important market for lumber and grain; it has stone quarries and various manufactures. Settled about 1852, St Peter was incorporated as a village in 1865, and was chartered as a city in 1891. In 1857 the legislature, a short time before its adjournment for the session, passed a bill to remove the capital of Minnesota to St Peter, but the bill was not pre- sented to the governor for his signature within the prescribed time, and when the legislature re-convened a similar bill could not be passed.

ST PETER PORT, the chief town of Guernsey, one of the Channel Islands. Pop. (1901) 18,264. It lies picturesquely on a steep slope above its harbour on the east coast of the island. The harbour is enclosed by breakwaters, the southern of which connects with the shore and continues beyond a rocky islet on which stands Castle Cornet. It dates from the 12th century and retains portions of that period. Along the sea-front of the town there extends a broad sea-wall, which continues north- ward nearly as far as the small port of St Sampson's, connected with St Peter Port by an electric tramway. To the south of the town Fort George, with its barracks, stands high above the sea. On the quay there is a bronze statue of Albert, Prince Consort (1862), copied from that on the south side of the Albert Hall, London. St Peter Port was formerly walled, and the sites of the five gates are marked by stones. St Peter's, or the town church, standing low by the side of the quay, was consecrated in 1312, but includes little of the building of that date. It has, however, fine details of the 14th and 15th centuries, and is, as a whole, the most noteworthy ecclesiastical building in the islands. The other principal buildings are the court house, used for the meetings of the royal court and the states, the Elizabeth College for boys, founded by Queen Elizabeth, but occupying a house of the year 1825, and the Victoria Tower, commemorating a visit of Queen Victoria in 1846. Hauteville House, the residence of Victor Hugo from 1856 to 1870, is preserved as he left it, and is open to the public. The harbour is the chief in the island, and a large export trade is carried on especially in vegetables, fruit and flowers. The construction of the harbour was ordered by King Edward I. in 1275.

ST PETERSBURG, a government of north-western Russia, at the head

of the Gulf of Finland, stretching for 130 m. along its south-east shore and the southern shore of Lake Ladoga, and bordering on Finland, with an area of 17,221 sq. m. It is hilly on the Finland border, but flat and marshy elsewhere, with the exception of a small plateau in the south (Duderhof Hills), 300 to 550 ft. high. It has a damp and cold climate, the average temperatures being: at St Petersburg, for the year 39 F., for January 15 , for July 64°; yearly rainfall, 18-7 in.; at Sermaks, at the mouth of the Svir on the E. side of Lake Ladoga (6o° 28′ N.), for the year 37°, for January 13°, for July 62 ; yearly rainfall, 20-8 in. Numerous parallel ridges of glacier origin intersect the government towards Lake Peipus and north of the Neva. Silurian and Devonian rocks appear in the south, the whole covered by a thick glacial deposit with boulders (bottom moraine) and by thick alluvial deposits in the valley of the Neva. The bays of Kronstadt, Koporya, Luga and Narva afford good anchorage, but the coast is for the most part fringed with reefs and sandbanks. The chief river is the Neva. The feeders of Lake Ladoga — the Volkhov, the Syas, and the Svir, the last two forming part of the system of canals connecting the Neva with the Volga — are important channels of commerce, as also is the Narova. Marshes and forests cover about 45% of the area (70% at the end of the 18th century). The popula- tion, which was 635,780 in 1882, numbered 873,043 in 1897, without the capital and its suburbs ; including the latter it was 2,103,965. Of this latter number 466,750 were women and 160,499 lived in towns. The estimated pop. in 1906 was 2,510,100. The average density was 121 per sq. m. The population is chiefly Russian, with a small admixture of Finns and Germans, and according to religion it is distributed as follows : Greek Orthodox, 78%; Nonconformists, i-6%; Lutherans, 17%; and Roman Catholics, 2-4%. A remarkable feature is the very slow natural increase of the population. During the 25 years 1867 to 1 89 1 the natural increase was only 867. The government is divided into eight districts, the administrative headquarters of which, with their populations in 1897, are: St Petersburg (q.v.), Gdov (2254 inhabitants), Luga (5687), Novaya Ladoga (4144), Peterhof (11,300), Schliisselburg (5285), Tsarskoye Selo (22,353) and Yamburg (4166). Most of the towns are summer resorts for the population of the capital. Till the latter part of the 19th century education stood at a very low level, but progress has since been made, and now three-quarters of all who

enter the army from this government are able to read. The zemstvo (provincial council) has organized village libraries and lectures on a

wide scale. Many improvements have been made, especially since 1897, in sanitary organization. Generally speaking, agriculture is at a low ebb. The principal crops are cereals (rye, oats and barley), potatoes and green crops, the total area under cultivation being only 13%. These crops, which are often ruined by heavy rains in the late summer, are insufficient for the population. Flax is cultivated to some extent. Nearly 21% of the area consists of meadows and pasture. Dairy farming is developing. Timber, shipping, stone quarrying and fishing are important industries; the chief factories are cotton, tobacco, machinery, sugar, rubber and paper mills, chemical works, distilleries, breweries and printing works.

, ST PETERSBURG, the capital of the Russian empire, situated at the head of the Gulf of Finland, at the mouth of the Neva, in 59° 56′ N., and 30° 20′ E., 400 m. from Moscow, 696 m. from Warsaw, 1400 m. from Odessa (via Moscow), and 1390 m. from Astrakhan (also via Moscow). The Neva, before entering the Gulf of Finland, forms a peninsula, on which the main part of St Petersburg stands, and itself subdivides into several branches. The islands so formed are only 10 or n ft. above the average level of the water. Their areas are rapidly increasing, while the banks which continue them seaward are gradually disappearing. The mainland is not much higher than the islands. As the river level rises several feet during westerly gales, extensive portions of the islands and of the mainland are flooded every winter. In 1777, when the Neva rose 10-7 ft., and in 1824, when it rose 13-8 ft., nearly the whole of the city was inundated, and the lower parts were again under water in 1890, 1897 and 1898, when the floods rose 8 ft. A ship canal, completed in 1875-1888 at a cost of £1,057,000, has made the capital a seaport. Be- ginning at Kronstadt j it terminates at Gutuyev Island in a harbour capable of accommodating fifty sea-going ships. It is 23 ft. deep and 175 m. long. The Neva is crossed by three permanent bridges — the Nicholas, the Troitsky or Trinity (1897-1903), and the Alexander or Liteinyi; all three fine specimens of archi- tecture. One other bridge — the Palace — across the Great Neva connects the left bank of the mainland with Vasiiyevskiy or Basil Island; but, being built on boats, it is removed during the autumn and spring. Several wooden or floating bridges connect the islands, while a number of stone bridges span the smaller channels. In winter, when the Neva is covered with ice 2 to 3 ft. thick, temporary roadways for carriages and pedestrians are made across the ice and artificially lighted. In winter, too, thousands of peasants come in from the villages with their small Finnish horses and sledges to ply for hire.

The Neva continues frozen for an average of 147 days in the year

(25th November to 21st April). It is unnavigable, however, for some time longer on account of the ice from Lake Ladoga, which is sometimes driven by easterly winds into the river at the end of April and beginning of May. The climate of St Petersburg is changeable and unhealthy. Frosts are made much more trying by the wind which accompanies them; and westerly gales in winter bring oceanic moisture and warmth, and melt the snow before and after hard frosts. The summer is hot, but short, lasting barely more than five or six weeks; a hot day, how- ever, is often followed by cold weather: changes of temperature amounting to 35 Fahr. within twenty-four hours are not un- common. In autumn a chilly dampness lasts for several weeks, and in spring cold and wet weather alternates with a few warm days.

Mean temperature, Fahr. .

Rainfall, inches

Prevailing winds …. Average daily range of tempera- ture, Fahr

January. i5°-o

0-9

S.W.

July. 64°-o

26

W.

The Year. 38°-6

18-8

W.

7”-7

Topography. — The greatei part of St Petersburg is situated on the mainland, on the left bank of the Neva, including the best streets, the largest shops, the bazaars and markets, the palaces,

cathedrals and theatres, as well as all the railway stations, except that of the Finland railway. From the Liteinyi bridge to that of Nicholas a granite embankment, bordered by palaces and large private houses,

lines the left bank of the Neva. About midway, behind a range of fine houses, stands the Admiralty, the very centre of the capital. Formerly a wharf, on which Peter the Great caused his first Baltic ship to be built in 1706, it is now the seat of the ministry of the navy and of the hydrographical department, the new Admiralty building standing farther down the Neva on the same bank. A broad square, partly laid out as a garden (Alexander Garden), surrounds the Admiralty on the west, south and east. To the west, opposite the senate, stands the fine memorial to Peter the Great, erected in 1782, and now backed by the cathedral of St Isaac. A bronze statue, a master- piece by the French sculptor Falconet, represents the founder of the city on horseback, at full gallop, ascending a rock and pointing to the Neva. South of the Admiralty is the ministry of war and to the east the imperial winter palace, the work of Rastrelli (1764), a fine building of mixed style; but its admirable proportions mask its huge dimensions. It communicates by a gallery with the Hermitage Fine Arts Gallery. A broad semi-circular square, adorned by the Alexander I. column (1834), separates the palace from the buildings of the general staff and the foreign ministry. The range of palaces and private houses facing the embankment above the Admiralty is interrupted by the macadamized ” Field of Mars,” formerly a marsh, but transformed at incredible expense into a parade-ground, and the Lyetniy Sad (summer-garden) of Peter the Great. The Neva embankment is continued to a little below the Nicholas bridge under the name of ” English embankment,” and farther down by the new Admiralty buildings.

The topography of St Petersburg is very simple. Three long streets, the main arteries of the capital, radiate from the Admiralty — the Prospekt Nevskiy(Neva Prospect), the Gorokhovaya, and the Prospekt Voznesenskiy (Ascension Prospect). Three girdles of canals, roughly speaking concentric, intersect these three streets — the Moika, the Catherine and the Fontanka; to these a number of streets run parallel. The Prospekt Nevskiy is a very broad street, running straight east-south-east for 3200 yds. from the Admiralty to the Moscow railway station, and thence 1650 yds. farther, bending a little to the south, until it again reaches the Neva at Kalashnikov Harbour, near the vast com- plex of the Alexander Nevski monastery (1713), the seat of the metropolitan of St Petersburg. The part of the street first mentioned owes its picturesque aspect to its width, its atrractive shops, and still more its animation. But the buildings which border it are architecturally poor. Neither the cathedral of the Virgin of Kazan (an ugly imitation on a small scale of St Peter’s in Rome), nor the still uglier Gostiniy Dvor (a two-storied quadrilateral building divided into second-rate shops) , nor the Anichkov Palace (which resembles

immense barracks), nor even the Roman Catholic and Dutch churches do anything to embellish it. About midway between the public library and the Anichkov Palace an elegant square hides the old-fashioned Alexandra theatre; nor does a profusely adorned memorial (1873) to Catherine II. beautify it much. The Gorokhovaya is narrow and badly paved, and is shut in between gloomy houses occupied mostly by artizans. The Voznesenskiy Prospekt, on the con- trary, though as narrow as the last, has better houses. On the north, it passes into a series of large squares connected with that in which the monument of Peter the Great stands. One of them is occupied by the cathedral of St Isaac (of Dalmatia), and another by the memorial (1859) to Nicholas I., the gorgeousness and bad taste of which contrast strangely with the simplicity and significance of that of Peter the Great. The general aspect of the cathedral is imposing both without and within; but on the whole this architectural monument, built between 1819 and 1858 according to a plan of Montf errant, under the personal direction of Nicholas I., does not correspond either with its costliness (£2,431,300) or with the efforts put forth for its decoration by the best Russian artists.

The eastern extremity of Vasilyevskiy Island is the centre of commercial activity; the stock exchange is situated there as well as the quays and storehouses. The remainder of the island is occupied chiefly by scientific and educational institutions — ■ the academy of science, with a small observatory, the university, the philological institute, the academy of the first corps of cadets, the academy of arts, the marine academy, the mining institute and the central physical observatory, all facing the Neva. Petersburg Island contains the fortress of St Peter and St Paul (1 703-1 740), opposite the Winter Palace; but the fortress is now a state prison. A cathedral which stands within its walls is the burial-place of the emperors and the imperial family. The mint and an artillery museum are also situated within the fortress. The remainder of the island is meanly built, and is the refuge of the poorer officials (chinovniks) andof the intellectual proletariat. Its northern part, separated from the main island by a narrow channel, bears the name of Apothecaries' Island, and is occupied by a botanical garden of great scientific value and several fine private gardens and parks. Krestovskiy, Elagin and Kamennyi Islands, as also the opposite (right) bank of the Great Nevka (one of the branches of the Neva) are occupied by public gardens, parks and summer residences. The mainland on the right bank of the Neva above its delta is known as

the Viborg Side, and is connected with the main city by the Liteinyi bridge, closely adjoining which are the buildings of the military academy of medicine and spacious hospitals. The small streets (man j' of them unpaved), with numerous wooden houses, are inhabited by students and workmen; farther north are great textile and iron factories. Vast orchards and the yards of the artillery laboratory stretch north-eastwards, while the railway and the high road to Finland, running north, lead to the park of the Forestry Institute. The two villages of Okhta, on the right bank, are suburbs; higher up, on the left bank, are several factories (Alexandrovsk) which formerly belonged to the crown. The true boundary of St Petersburg on the south is the Obvodnyi Canal, running parallel to the three canals already mentioned and forming a sort of base to the Neva peninsula; but numerous orchards, cemeteries and factories, and even unoccupied spaces, are included within the city boundaries in that direction, though they are being rapidly covered with buildings. Except in a few principal streets, which are paved with wood or asphalt, the pavement is usually of granite setts. There are two government dockyards, the most important of which is the new admiralty yard in the centre of the city. At this yard there are three building slips and a large experimental basin, some 400 ft. in length, for trials with models of vessels. The Galerny Island yard is a little lower down the river, and is devoted entirely to construction. There are two building slips for large vessels, besides numerous workshops, storehouses and so forth. The Baltic Yard is near the mouth of the Neva, and was taken over by the ministry of marine in 1894. Since that time the establish- ment has been enlarged, and a new stone building slip, 520 ft. in length, completely housed in, has been finished.

Population. — The population of St Petersburg proper at the censuses specified was as follows: —

Year.

Total.

Men.

Women.

Proportion of Men to every 100 Women.

1869 1881 1890 1897

667,207

861,303

954,400

1,132,677

377.38o

473.229 512,718 616,855

289,827 388,074 441,682 515.822

130 122 116 119

A further increase was revealed by the municipal census of 1900, when the population of the city was 1,248,739, having thus increased 30-9% in ten years. In 1905 the total population was estimated to number 1,429,000. The population of the suburbs was 134,710 in 1897, and 190,635 in 1900. Including its suburbs, St Petersburg is the fifth city of Europe in point of size, coming after London, Paris, Berlin and Vienna. The large proportion of men in its population is due to the fact that great numbers come from other parts of Russia to work during the winter in the textile factories, and during the summer at un-

loading the boats. Russians numbered 828,354 in 1897, or 73-1% of the population; Germans 43,798, or 3-9%; Poles 22,307, or i-9%; Finns, 16,731, or 1.5%; and Jews 10,353, or 0-9%. The various religions are represented by 84-9% Orthodox Greeks, 9-9 Protestants, and 3-3 Roman Catholics. The pro- portion of illegitimate children is ten times higher than in the rest of Russia, namely 250 to 286 per thousand births. It is thus nearly the same as in Paris, but lower than in Moscow (292 per thousand) and Vienna (349 per thousand) . The mortality varies very much in different parts of the city — from 12 per thousand in the best situated, the admiralty quarter, to 16 in other central parts, and 25 and 27 in the outlying quarters. The mortality has, however, notably decreased, as it averaged 36 per thousand in the years 1870 to 1874, and only 27 from 1886 to 1895, and 24 in 1897. Infectious diseases, i.e. turberculosis, diphtheria, inflammation of the lungs, typhoid, scarlet fever and measles, are the cause of 37 to 38% of all deaths. The high mortality in certain quarters is largely due to overcrowding and bad water.

An interesting feature of the Russian capital is the very high proportion of people living on their own earnings or income (” independent “) as compared with those who live on the earnings or

income of some one else (” dependent “). Only a few industrial establishments employ more than twenty workmen, the average being less than ten and the figure seldom falling below five. The large factories are beyond the limits of St Petersburg. Although 36% of the population above six years old are unable to read, the workmen are amongst the most intelligent classes in Russia.

Education, Science and Art. — Notwithstanding the hardships and prosecutions to which it is periodically subjected, the university (nearly 4000 students) exercises a pronounced influence en the life of St Petersburg. The medical faculty forms a separate academy, under military jurisdiction, with about 1500 students. There are, moreover, a philological institute, a technological institute, a forestry academy, an engineering academy, two theological academies (Orthodox Greek and Roman Catholic), an academy of arts, five military academies and a high school of law. Higher instruction for women is provided by a medical academy, a free university, four other institutions for higher education, and a school of agriculture. The scientific institutions include an academy of sciences, opened in 1726, which has rendered immense service in the exploration of Russia. The oft-repeated reproach that it keeps its doors shut to Russian savants, while opening them too widely to German ones, is not without foundation. The Pulkovo astronomical observatory, the chief physical (meteorological) observatory (with branches throughout Russia and Siberia), the astronomical observatory at Vilna, the astronomical and magnetical observatory at Peking, and the botanical garden, are all attached to the academy of sciences. The Society of Naturalists and the Physical and Chemical Society have issued most valuable publications. The geological committee is ably pushing forward the geological survey of the country; the Mineralogical Society was founded in 1817. The Geographical Society, with branch societies for West and East Siberia, Caucasus, Orenburg, the north-western and south-western provinces of European Russia, is well known for its valuable work, as is also the Entomological Society. There are four medical societies, and an archaeological society (since 1 846) , an historical society, an economical society, gardening, forestry, technical and navigation societies. The conservatory of music, with a new building (1891-1896), gives superior musical instruction. The Musical Society is worthy of notice. Art, on the other hand, has not freed itself from the old scholastic methods at the academy. Several independent artistic societies seek to remedy this drawback, and are the true cradle of the Russian genre painters.

The imperial public library contains valuable collections of books (1,000,000) and MSS. The library of the academy of sciences con-

tains more than 500,000 volumes, 13,000 MSS., rich collections of works on oriental languages, and valuable collections of periodical publications from scientific societies throughout the world. The museums of the Russian capital occupy a prominent place among those of Europe. That of the Academy of Sciences, of the Navy, of Industrial Art (1896), of the Mineralogical Society, of the Academy of Arts, the Asiatic museum, the Suvorov museum (1901), with pictures by Vereshchagin, the Zoological museum and several others are of great scientific value. The Hermitage Art Gallery contains a first-rate collection of the Flemish school, some pictures of the Russian school, good specimens of the Italian, Spanish and old French schools, invaluable treasures of Greek and Scythian antiquities, and a good collection of 200,000 engravings. Old Christian and old Russian arts are well represented in the museums of the Academy of Arts. The New Michael Palace was in 1 895-1 898

converted into a museum of Russian art— the Russian museum is one of the handsomest buildings in the city.

In the development of the Russian drama St Petersburg has played a far less important part than Moscow, and the stage there has never reached the same standard of excellence as that of the older capital. On the other hand, St Petersburg is the cradle of Russian opera and Russian music. There are in the city only four theatres of import- ance — all imperial — two for the opera and ballet, one for the native drama, and one for the French and German drama.

Industries and Trade.— St Petersburg is much less of a manufactur- ing city than Moscow or Berlin. The period 1880 to 1890 was very critical in the history of the northern capital. With the develop- ment of the railway system the southern and south-western provinces of Russia began to prosper more rapidly than the upper Volga provinces; St Petersburg began to lose its relative importance in favour of the Baltic ports of Riga and Libau, and its rapid growth since the Crimean War seemed in danger of being arrested. The danger, however, passed away, and in the last decade of the 19th century the city continued its advance with renewed vigour. A great influx of functionaries of all sorts, consequent upon the state taking into its hands the administration of the railways, spirits, &c, resulted in the rapid growth

of the population, while the introduction of a cheap railway tariff, and the subsidizing and encouraging in other ways of the great industries, attracted to St Petersburg a considerable number of workers, and favoured the growth of its larger industrial establishments. St Petersburg is now one of the foremost industrial provinces in Russia, its yearly returns placing it immediately after Moscow and before Piotrkow, in Poland. The chief factories are cottons and other textiles, metal and machinery works, tobacco, paper, soap and candle factories, breweries, dis- tilleries, sugar refineries, ship-building yards, printing works, potteries, carriage works, pastry and confectionery and chemicals. The export trade of St Petersburg is chiefly in grain (especially rye and oats), flour and bran, oil seeds, oil cakes, naphtha, eggs, flax and timber. It shows very great fluctuations, varying in accordance with the ciops, the range being from £8,000,000 to £10,000,000. The exports are almost entirely to western Europe by sea (from £5,500,000 to £6,5O0,r>x>), and to Finland (£1,500,000 to £3,000,000). The im- ports consist chiefly of coal, metals, building materials, herrings, coffee and tea, better-class timber, raw cotton, wood pulp and cellulose, and manufactured goods, and amount to about £14,000,000 annually.

Six railways meet at St Petersburg. Two run westwards along both shores o' the Gulf of Finland to Hangoudd and to Port Baltic respectively; two short lines connect Oranienbaum, opposite Kronstadt and Tsarskoye Selo (with Pavlovsk) with the capital; and three great trunk lines run — south-west to Warsaw (with branches to Riga and Smolensk), south-east to Moscow (with branches to Novgorod and Rybinsk), and east to Vologda, Vyatka and Perm. The Neva is the principal channel for the trade of St Petersburg with the rest of Russia, by means of the Volga and its tributaries.

Administration. — The municipal affairs of the city are in the hands of a municipality, elected by three categories of electors, and is practically a department of the chief of the police. The city is under a separate governor-general, whose authority, like that of the chief of police, is unlimited.

Environs. — St Petersburg is surrounded by several fine residences, mostly imperial palaces with large and beautiful parks. Tsarskoye Selo, 15 m. to the south-east, and Peterhof, on the Gulf of Finland, are summer residences of the emperor. Pavlovsk, 17 m. S. of the city, has a fine palace and parks, where summer concerts attract thousands of people. There is another imperial palace at Gatchina, 29 m. S. Oranienbaum, 25 m. W. on the south shore of the Gulf of Finland, is a rather neglected place. Pulkovo, on a hill 9 m. S. from St Petersburg,

is well known for its observatory ; while several villages north of the capital, such as Pargolovo and Murino, are visited in summer by the less wealthy inhabitants.

History. — The region between Lake Ladoga and the Gulf of Finland was inhabited in the 9th century by Finns and some Slavs. Novgorod and Pskov made efforts to secure and maintain dominion over this region, so important for their trade, and in the 13th and 14th centuries they built the forts of Koporya (in the present district of Peterhof), Yam (now Yamburg), and Oryeshek (now Schlusselburg) at the point where the Neva issues from Lake Ladoga. They found, however, powerful opponents in the Swedes, who erected the fort of Landskrona at the junction of the Okhta and the Neva, and in the Livonians, who had their fortress at Narva. Novgorod and Moscow successively were able by continuous fighting to maintain their supremacy over the region south of the Neva throughout the 16th century; but early in the 17th century Moscow was com- pelled to cede it to Sweden, which erected a fortress on the Neva at the mouth of the Okhta. In 1700 Peter the Great began his wars with Sweden. Oryeshek was taken in 1702, and in the

following year the Swedish fortress on the Neva. Two months later (29th June 1703) Peter laid the foundations of a cathedral to St Peter and St Paul, and of a fort which received his own name (in its Dutch transcription, “Piterburgh”). Next year the fort of Kronslott was erected on the island of Kotlin, as also the Admiralty on the Neva, opposite the fortress. The emperor took most severe and almost barbarous measures for increasing his newly founded city, which was built on marshy ground, the buildings resting on piles. Thousands of people from all parts of Russia were removed thither and died in erecting the fortress and building the houses. Under Elizabeth fresh compulsory measures raised the population to 150,000, and this figure was nearly doubled during the reign of Catherine II. (1762-1796). The chief embellishments of St Petersburg were effected during the reigns of Alexander I. (1801-1825) and Nicholas I. (1825- 1855). From the earliest years of Russian history trade had taken this northern direction. Novgorod owed its wealth to this fact; and as far back as the 12th century the Russians had their forts on Lake Ladoga and the Neva. In the 14th and 15th centuries they exchanged their wares with the Danzig merchants at Nu or Nu — now Vasilyevskiy Island. By founding St Petersburg Peter the Great only restored the trade to its old channels. The system of canals for connecting the upper Volga and the Dnieper with the great lakes of the north completed the work; the commercial mouth of the Volga was thus transferred to the Gulf of Finland, and St Petersburg became the export harbour for more than

half Russia. Foreigners hastened thither to take possession of the growing export trade, and to this the Russian capital is indebted for its cosmopolitan character. The develop- ment of the railway system and the colonization of southern Russia now operate, however, adversely to St Petersburg, while the rapid increase of population in the Black Sea region is tending to shift the Russian centre of gravity; new centres of commercial, industrial, and intellectual life are being developed at Odessa and Rostov. The revival of Little Russia is another influence operating in the same direction. Since the abolition of serfdom and in consequence of the impulse given to Russian thought by this reform, the provinces are coming more and more to dispute the right of St Petersburg to guide the political life of the country. It has been often said that St Petersburg is the head of Russia and Moscow its heart. The first part at least of this saying is true. In the development of thought and in naturalizing in Russia the results of west European culture and philosophy St Petersburg has played a prominent part. It has helped greatly to familiarize the public with the teachings of west European science and thinking, and to give to Russian literature its liberality of mind and freedom from the trammels of tradition. St Petersburg has no traditions, no history beyond that of the palace conspiracies, and there is nothing in its past to attract the writer or the thinker. But, as new centres of intellectual life and new currents of thought develop again at Moscow and Kiev, or arise anew at Odessa and in the eastern provinces, these places claim the right to their own share in the further development of intellectual life in Russia.

(P. A. K., J. T. Be.)

SAINT-PIERRE, CHARLES IRENEE CASTEL, (Abbe de (1658-1743), French writer, was born at the chateau de Saint- Pierre-l'Eglise near Cherbourg on the 18th of February 1658. His father was bailli of the Cotentin, and Saint-Pierre was educated by the Jesuits. In Paris he frequented the salons of Madame de la Fayette and of the marquise de Lambert. He was presented to the abbacy of Tiron, and was elected to the Academy in 1695. In the same year he gained a footing at court as almoner to Madame. But in 1718, in consequence of the political offence given by his Discours sur la polysynodie, he was expelled from the Academy. He afterwards founded the club of the Entre sol, an independent society suppressed in 1731. He died in Paris on the 29th of April 1743.

Saint-Pierre's works are almost entirely occupied with an acute though generally visionary criticism of politics, law and social institutions. They had a great influence on Rousseau, who left elaborate

examinations of some of them, and reproduced

not a few of their ideas in his own work. His Pi-ojet de paix perpituelle, which was destined to exercise considerable influence on the development of the various schemes for securing universal peace which culminated in the Holy Alliance, was published in 1713 at Utrecht, where he was acting as secretary to the French plenipotentiary, the Abbe de Polignac, and his Polysynodie contained severe strictures on the government of Louis XIV., with projects for the administration of France by a system of councils for each department of government. His works include a number of memorials and projects for stopping duelling, equalizing taxation, treating mendicancy, reforming education and spelling, &c. It was not, however, for his suggestions for the reform of the constitution that he was disgraced, but because in the Polysynodie he had refused to Louis XIV. the title of le Grand. Unlike the later reforming abbes of the philosophe period, Saint-Pierre was a man of very unworldly character and quite destitute of the Frondeur spirit.

His works were published at Amsterdam in 1738-1740 and his Annates politique* in London in 1757. A discussion of his principles, with a view to securing a just estimation of the high value of his political and economic ideas, is given by S. Siegler Pascal in Un Contemporain egare au XVI II' siecle. Les Projets de I' abbe de Saint-Pierre, 1658-1743 (Paris, 1900).

SAINT-PIERRE, JACQUES HENRI BERNARDIN DE (1737- 1814), French man of letters, was born at Havre on the 19th of January 1737. He was educated at Caen and at Rouen, and became an engineer. According to his own account he served in the army, taking part in the Hesse campaign of 1760, but was dismissed for insubordination, and, after quarrelling with his family, was in some difficulty. He appears at Malta, St Petersburg, Warsaw, Dresden, Berlin, holding brief commissions as an engineer and rejoicing in romantic adventures. But he came back to Paris in 1765 poorer than he set out. He came into possession of a small sum at his father's death, and in 1 768 he set out for the Isle of France (Mauritius) with a government commission, and remained there three years, returning home in 1 77 1. These wanderings supplied Bernardin with the whole of his stock-in-trade, for he never again quitted France. On his return from Mauritius he was introduced to D'Alembert and his friends, but he took no great pleasure in the company of any literary man except J. J. Rousseau, of whom in his last years he saw much, and on whom he formed both his

character and his style. His Voyage a I' lie de France (2 vols., 1773) gained him a reputation as a champion of innocence and religion, and in consequence, through the exertions of the bishop of Aix, a pension of 1000 livres a year. It is soberest and therefore the least characteristic of his books. The Etudes de la nature (3 vols., 1784) was an attempt to prove the existence of God from the wonders of nature; he set up a philosophy of sentiment to oppose the materializing tendencies of the Encyclopaedists. His masterpiece, Paul et Virginie, appeared in 1789 in a supple- mentary volume of the Etudes, and his second great success, much less sentimental and showing not a little humour, the Chaumiere indienne, not till 1790. In 1792 he married a very young girl, Felicite Didot, who brought him a considerable dowry. For a short time in 1792 he was superintendent of the Jardin des Plantes, and on the suppression of the office received a pension of 3000 livres. In 1795 he became a member of the Institute. After his first wife's death he married in 1800, when he was sixty-three, another young girl, Desiree Pelleport, and is said to have been very happy with her. On the 21st of January 1814 he died at his house at Eragny, near Pontoise.

Paul et Virginie has been pronounced gaudy in style and unhealthy in tone. Perhaps Bernardin is not fairly to be judged by this famous story, in which the exuberant sensibility of the time finds equally exuberant expression. His merit lies in his breaking away from the arid vocabulary which more than a century of classical writing has brought upon France, in his genuine preference for the beauties of nature, and in his attempt to describe them faithfully. After Rousseau, and even more than Rousseau, Bernardin was in French literature the apostle of the return to nature, though both in him and his immediate follower Chateaubriand there is still much mannerism and unreality.

Aimfe Martin, disciple of Bernardin and the second husband of his second wife, published a complete edition of his works in 18 volumes

(Paris, 1818-1820), afterwards increased by seven volumes of correspondence and memoirs (1826). Paul et Virginie, the Chaumiere indienne, &c. have often been separately reprinted. See also Arvede Barin's Bernardin de Saxnt Pierre (1891).

ST PIERRE and MIQTJELON, two islands 10 m. off the south coast of Newfoundland, united area about 91 sq. m. Both are rugged masses of granite, with a few small streams and lakes, a thin covering of soil and scanty vegetation. Miquelon, the larger of the two, consists of Great

Miquelon and Little Miquelon, or Langlade; previous to 1783 these were separated by a' navigable channel, but they have since become connected by a dangerous mudbank. St Pierre has a sheltered harbour with about 14 ft. of water, and a good roadstead for large vessels. Their importance is due to their proximity to the great Banks, which makes them the centre of the French Atlantic fisheries. These are kept up by an elaborate system of bounties by the French government, which considers them of great importance as training sailors for the navy. Fishing lasts from May till October, and is carried on by nearly five hundred vessels, of which about two-thirds are fitted out from St Pierre, the remainder coming from St Malo, Cancale and other French coast towns. The resident population, which centres in the town of St Pierre, is about 6500, swelled to over 10,000 for a time each year by extra fishing hands from France, but is steadily declining owing to emigration into Canada. Owing to the low rates of duty, vast quantities of goods, especially French wines and liquors, are imported, and smuggled to Newfoundland, the United States and Canada, though of late years this has been checked by a gradual rise in the scale of duties, and by the presence since 1904 of a British consul. St Pierre is connected with Halifax (N.S.) and St Johns (Newfoundland) by a regular packet service, and is a station of the Anglo American Cable Co. and the Compagnie francaise des cdbles tttegraphiques. Excellent facilities for primary and secondary education are given, but the attraction of the fisheries prevents their being fully used.

The islands were occupied by the French in 1660, and fortified in 1700. In 1702 they were captured by the British, and held till 1763, when they were given back to France as a fishing station. They are thus the sole remnant of the French colonies in North America. Destroyed by the English in 1778, restored to France in 1783, again captured and depopulated by the English in 1793, recovered by France in 1802 and lost in 1803, the islands have remained in undisputed French possession since 1814 (Treaty of Paris).

See Henrique, Les Colonies francaises , t. ii. (Paris, 1889) ; Levasseur, La France, t. ii. (Paris, 1893); L'Annee coloniale, yearly since 1899, contains statistics and a complete bibliography; P. T. McGrath in The New England Magazine (May 1903) describes the daily life of the people. (W. L. G.)

ST POL, COUNTS OF. The countship of St Pol-sur-Ternoise in France (department of Pas-de-Calais), belohged in the nth and 1 2th centuries to a family surnamed Candavene. Elizabeth, heiress of this house, carried the countship to her husband, Gaucher de Chatillon, in 1205. By the marriage of Mahaut de Ch&tillon with Guy VI. of Luxemburg,

St Pol passed to the house of Luxemburg. It was in possession of Louis of Luxemburg, constable of France, who was beheaded in 1475. The constable's property was confiscated by Louis XL, but was subsequently restored in 1488 to his granddaughters, Marie and Francoise of Luxemburg. Marie (d. 1542) was countess of St Pol, and married Francois de Bourbon, count of Vend6me. Their son, Francois de Bourbon, count of St Pol (1491-1545), was one of the most devoted and courageous generals of Francis I. Marie, daughter of the last-mentioned count, brought the countship of St Pol to the house of Orleans-Longueville. In 1705 Marie of Orleans sold it to Elizabeth of Lorraine-Lillebonne, widow of Louis de Melun, prince of Epinoy, and their daughter married the prince of Roban-Soubise, who thus became count of St Pol. (M. P.*)

ST POL-DE-LEON, a town of north-western France, in the department of Finistere, about 1 m. from the shore of the English Channel, and 13J m. N. of Morlaix by the railway to Roscoff. Pop. (1906), town, 3353; commune, 8140. St Pol-de- Leon is a quaint town with several old houses. The cathedral is

largely in the Norman Gothic style of the 13th and early 14th centuries. The west front has a projecting portico and two towers 180 ft. high with granite spires. Within the church there are beautifully carved stalls of the 16th century and other works of art. On the right of the high altar is a wooden shrine con- taining the bell of St Pol de Leon, which was said to cure headache and diseases of the ear, and at the side of the main entrance is a huge baptismal font, popularly regarded as the stone coffin of Conan Meriadec, king of the Bretons. Notre Dame de Kreizker, dating mainly from the second half of the 14th century, has a celebrated spire, 252 ft. high, which crowns the central tower. The north porch is a fine specimen of the flamboyant style. In the cemetery, which has a chapel of the 15th century, there are ossuaries of the year 1 500.

In the 6th century a Welsh monk, Paul, became bishop of the small town of Leon, and lord of the domain in its vicinity, which passed to his successors and was increased by them. In 1793 the town was the centre of a serious but unsuccessful rising provoked by the recruiting measures of the Convention.

SAINT PRIEST, FRANCOIS EMMANUEL GUIGNARD, Chevalier, then

Comte de (1735-1821), French statesman, was born at Grenoble on the 12th of March 1735. He was admitted a knight (chevalier) of the Order of Malta at five years of age, and at fifteen entered the army. He left active service in 1763 with the grade of colonel, and for the next four years represented the court of France at Lisbon. He was sent in 1768 to Constanti- nople, where he remained with one short interval till 1785, and married Wilhelmina von Ludolf , daughter of the Neapolitan ambassador. His Mtmoires sur I'ambassade de France en Turquie et le commerce des Francais dans le Levant, prepared during a visit to France, were only published in 1877, when they were edited by C. Schefer. After a few months spent at the court of the Hague, he joined the ministry of Necker as minister without a portfolio, and in Necker's second cabinet in 1789 was secretary of the royal household and minister of the interior. He became a special object of the popular hatred because he was alleged to have replied to women begging for bread, " You had enough while you had only one king; demand bread of your twelve hundred sovereigns." Nevertheless he held office until December 1790. Shortly after his resignation he went to Stockholm, where his brother-in-law was Austrian ambassador. In 1795 he joined the comte de Provence at Verona as minister of the household. He accompanied the exiled court to Blankenburg and Mittau, retiring in 1808 to Switzerland. After vainly seeking permission to return to France he was expelled from Switzerland, and wandered about Europe until the Restoration. Besides the memoirs already mentioned he wrote an Examen des assemblies provinciates (1787).

His eldest son, GuillaumeEmmanuel(i776-i8i4), became major-general in the Russian service, and served in the campaigns of Alexander I. against Napoleon. He died at Laon in 1 814. The second, Armand Emmanuel Charles (1782-1863), became civil governor of Odessa, and married Princess Sophie Galitzin. The third, Emmanuel Louis Marie Guignard, vicomte de Saint Priest (1789-1881), was a godson of Marie Antoinette. Like his elder brother he took part in the invasion of France in 18I4. At the Restoration he was attached to the service of the duke of AngoulSme, and during the Hundred Days tried to raise Dauphine in the royal cause. He served with distinction in Spain in 1823, when he was promoted lieutenant-general. After two years at Berlin he became French ambassador at Madrid, where he negotiated in 1828 the settle- ment of the Spanish debt. When the revolution of July compelled his retirement, Frederick VII. made him a grandee of Spain, with the title of duke of Almazan, in recognition of his services. He then joined the circle of the duchess of Berry at Naples, and arranged her escapade in Provence in 1832. Saint Priest was arrested, and was only released after ten months' imprisonment.

Having arranged for an asylum in Austria for the duchess, he returned to Paris, where he was one of the leaders of legitimist society until his death, which occurred at Saint Priest, near Lyons, on the 26th of February 1881.

Alexis Guignard, comte de Saint Priest (1805-1851), was the son of Armand de Saint Priest and Princess Galitzin. Educated in Russia, he returned to France with his father in 1822, and soon made his mark in literary circles. His most important works were Histoire de la royaule considSree dans ses origines jusqua la formation des principalis monarchies de I'Europe (2 vols., 1842) ; Histoire de la chute des Jesuiles (1844); Histoire de la conquite de Naples (4 vols.,

1 847-1 848). He was elected to the Academy in January 1849. Meanwhile he had departed from the legitimist tradition of his family to become a warm friend to the Orleans monarchy, which he served between 1833 and 1838 as ambassador in Brazil, at Lisbon and at Copenhagen. He died, while on a visit to Moscow, on the 29th of September 1 851.

SAINT PRIVAT, a village of Lorraine, 7 m. N.W. of.Metz. The village and the slopes to the west played a great part in the battle of Gravelotte (August 18, 1870). (See Metz and Franco-German War.) At St Privat occurred the famous repulse of the Prussian Guard by Marshal Canrobert's corps.

ST QUENTIN, a manufacturing town of northern France, capital of an arrondissement in the department of Aisne, 32 m. N.N.W. of Laon by rail. Pop. (1906) 49,305. The town stands on the right bank of the Somme, at its junction with the St Quentin Canal (which unites the Somme with the Scheldt) and the Ciozat Canal (which unites it with the Oise). The port carries on an active traffic in building materials, coal, timber, iron, sugar and agricultural produce. Built on a slope, with a southern exposure, the town is dominated by the collegiate church of St Quentin, one of the finest Gothic buildings in the north of France, erected during the 12th, 13th, 14th and 15th centuries. The church, which has no west facade, terminates at that end in a tower and portal of Romanesque architecture; it has double transepts. Its length is 436 ft. and the height of the nave 124 ft. The choir (13th century) has a great re- semblance to that of Reims; like the chapels of the apse it is decorated with polychromic paintings. There are remains of a choir-screen of the 14th century. Under the choir is a crypt of the nth century, rebuilt in the 13th century, and containing the tombs of St Quentin (Quintin) and his fellow-martyrs Victoricus and Gentianus. The Champs Elysees, an extensive promenade, lies east of the

cathedral. The hotel-de-ville of St Quentin is a splendid building of the 14th, 15th and 1 6th centuries, with a flamboyant facade, adorned with curious sculptures. The council-room is a fine hall with a double wooden ceiling and a huge chimneypiece, partly Gothic partly Renaissance. A monument commemorates the siege of 1557 (see below), and another close to the river the part, played by the town in 1870 and 1871. A building of the 20th century is appropriated to the law court, the learned societies, the museum and the library. St Quentin is the seat of a sub-prefect, of tribunals of first instance and of commerce, and of a board of trade-arbitration, and has an exchange, a chamber of commerce and lycees for both sexes. The town is the centre of an industrial district which manufactures cotton and woollen fabrics. St Quentin produces chiefly pique and window-curtains, and carries on the spinning and preliminary processes and the bleaching and finishing. Other industries are the making of embroideries by machinery and by hand, and the manufacture of iron goods and machinery. Trade is in grain, flax, cotton and wool.

St Quentin (anc. Augusta Veromanduorum) stood at the meeting-place of five military roads. In the 3rd century it was the scene of the martyrdom of Gaius Quintinus, who had come thither from Italy as a preacher of Christianity. The date of the foundation of the bishopric is uncertain, but about 532 it was transferred to Noyon. Towards the middle of the 7th century St Eloi (Eligius), bishop of Noyon, established a collegiate chapter at St Quentin's tomb, which became a famous place of pilgrimage. The town thus gained an importance which was increased during the middle ages by the rise of its cloth manu- facture. After it had been thrice ravaged by the Normans, the town was surrounded by walls in 883. It became under Pippin, grandson of Charlemagne, one of the principal domains of the counts of Vermandois, and in 1080 received from Count Herbert IV. a charter which was extended in 1103 and is the earliest of those freely granted to the towns of northern France. From 1420 to 1471 St Quentin was occupied by the Burgundians. In 1557 it was taken by the Spaniards (see below). Philip commemorated the victory over the relieving force under the Constable Montmorency by the foundation of the Escurial. Two years later the town was restored to the French, and in 1560 it was assigned as the dowry of Mary Stuart. The

fortifications erected under Louis XIV. were demolished between 1810 and 1820. During the Franco-Prussian War St Quentin repulsed the

German attacks of the 8th of October 1870; and in January 1871 it was the centre of the great battle fought by General Faidherbe (below).

1. Battle of 1557. — An army of Spaniards under Emmanuel Philibert of Savoy, invading France from the Meuse, joined an allied contingent of English troops under the walls of St Quentin, which was then closely besieged. Admiral Coligny threw himself on to the town, and the old Constable Montmorency prepared to relieve it. On St Lawrence's Day, 10th August, the relieving column reached the town without difficulty, but time was wasted in drawing off the garrison, for the pontoons intended to bridge the canal had marched at the tail of the column, and when brought up were mismanaged. The besiegers, recovering from their surprise, formed the plan of cutting off the retreat of the relieving army. Montmorency had thrown out the necessary protective posts, but at the point which the besiegers ehose for their passage the post was composed of poor troops, who fled at the first shot. Thus, while the constable was busy with his boats, the Spanish army filed across the Bridge of Rouvroy, some distance above the town, with impunity, and Mont morency, in the hope of executing his mission without fighting, refused to allow the cavalry under the due de Nevers to charge them, and miscalculated his time of freedom. The Spaniards, enormously superior in force, cut off and destroyed the French gendarmerie who formed the vanguard of the column, and then headed off the slow-moving infantry south of Essigny-le-Grand. Around the 10,000 French gathered some 40,000 assailants with forty-two guns. The cafinon thinned their ranks, and at last the cavalry broke in and slaughtered them. Yet Coligny gallantly held St Quentin for seventeen days longer, Nevers rallied the remnant of the army andj garrisoning Peronne, Ham and other strong places, entrenched himself in front of Compiegne, and the allies, disheartened by a war of sieges and skirmishes, came to a standstill. Soon afterwards Philip, jealous of the renown of his generals and unwilling to waste his highly trained soldados in ineffective fighting, ordered the army to retreat (17th October), disbanded the temporary regiments and dispersed the permanent corps in winter quarters.

2. The Battle of 1871 was fought between the German I. army under General von Goeben and the French commanded by General Faidherbe. The latter concentrated about St Quentin on the 18th of January, and took up a defensive position on both sides of the Somme Canal. The Germans, though inferior in numbers, were greatly superior in discipline and training, afnd General von Goeben boldly decided to attack both wings of the French together on the 19th. The attack took the customary enveloping form. After several hours'

fighting it was brought to a standstill, but Goeben, using his reserves in masterly fashion, drove a wedge into the centre of the French line between the canal and the railway, and followed this up with another blow on the other bank of the canal, along the Ham road. This was the signal for a decisive attack by the whole of the left wing of the Germans, but the French offered strenuous resistance, and it was not until four o'clock that General Faidherbe made up his mind to retreat. By skilful dispositions and orderly movement most of his infantry and all but six of his guns were brought off safely, but a portion of the army was cut off by the victorious left wing of the Germans, and the defeat, the last act in a long-drawn-out struggle, was sufficiently decisive to deny to the defenders any hope of taking the field again without an interval of rest and reorganization. Ten days later the general armistice was signed.

SAINT-REAL, CESAR VICHARD DE (1639-1692), French historian, was born in Savoy, but educated in Paris by the Jesuits. Varillas gave him his taste for history and served as his model; he wrote hardly anything but historical novels. The only merit of his Don Carlos (1673) is that of having furnished Schiller with several of the speeches in his drama. In the following year he produced the Conjuration des Espagnols contre la Republique de Venise en 1618, which had a phenomenal success, but is all the same merely a literary pastiche in the style of Sallust. This work and his reputation as a free-thinker brought him to the notice of Hortense Mancini, duchesse de Mazarin, whose reader and friend he became, and who took him with her to England (1675). The authorship of the duchess's Mimoires has been ascribed to him, but without reason. Among his authentic works is included a short treatise De la critique (1691), directed against Andry de Boisregard's Reflexions sur la langue franf,oise. His CEuvres completes were published in 3 volumes (1745); a second edition (1757) reached 8 volumes, but this is due to the inclusion of some works falsely attributed to him. Saint-Real was, in fact, a fashionable writer of his period; the demand for him in the book-market was similar

to that for Saint-Evremond, to whom he was inferior. He wrote in an easy and pleasant, but mediocre style.

See Pere Lelong; Bibliotheque historique de la France, No. 48, 122; Barolo, Memorie spettanti alia vita di Saint-Real (1780; Saint- Real was an associate of the Academy of Turin) ; Sayous, Histoire de la litterature frangaise & I'etrahger.

ST REMY, a town of south-eastern France in the department of Bouches-du-Rhone, 15 m. N.E. of Aries by road. Pop. (1906), town,

3668; commune, 6148. It is prettily situated to the north of the range of hills named the Alpines or Alpilles in a valley of olive trees. The town has a modern church with a lofty 14th-century spire. About a mile to the south are Gallo- Roman relics of the ancient Glanum, destroyed about 480. They comprise a triumphal arch and a fine three-storied mausoleum of uncertain date. Near by is the old priory of St Paul-de-Mausole with an interesting church and cloister of Romanesque architecture. In the vicinity of St Remy there are quarries of building stone, and seed-cultivation is an important industry.

ST RIQUIER, a town of northern France, in the department of Somme, 8 m. N.E. of Abbeville by rail. Pop. (1906) 1158. St Riquier (originally Centula) was famous for its abbey, founded about 625 by Riquier (Richarnis), son of the governor of the town. It was enriched by King Dagobert and prospered under the abbacy of Angilbert, son-in-law of Charlemagne. The buildings (18th century) are occupied by an ecclesiastical seminary. The church, a magnificent example of flamboyant Gothic architecture of the 15th and 16th centuries, has a richly sculptured west front surmounted by a square tower. In the interior the fine vaulting, the Renaissance font and carved stalls, and the frescoes in the treasury are especially noteworthy. The treasury, among other valuable relics, possesses a copper cross said to be the work of St Eloi (Eligius). The town has a municipal belfry of the 13th or 14th centuries. In 1536 St Riquier repulsed an attack by the Germans, the women especially distinguishing themselves. In 1544 it was burnt by the English, an event which marks the beginning of its decline.

See H6nocque, ” Hist, de l’abbaye et de la ville de St Riquier,” in Mem. soc. antiq. Picardie. Documents inedits, ix.xi. (Paris, 1880

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SAINTS, BATTLE OF THE. This battle is frequently called by the date on which it took place — the 12th of April 1782. The French know it as the battle of Dominica, near the coast of which it was fought. The Saints are small rocky islets in the channel between the islands of Dominica and Guadaloupe in the West Indies. The battle is of exceptional importance in naval history; it was by far the most considerable fought at sea in the American War of Independence, and was to Great Britain of the nature of a deliverance, since it not only saved Jamaica from a formidable attack, but after the disasters in North America went far to restore British prestige. The comte de Grasse,with 33 sail of the line, was at Fort Royal in Martinique. His aim was to effect a combination with a Spanish force from Cuba, and

invade Jamaica. A British fleet (36 sail of the line), commanded by Sir George, afterwards Lord Rodney (q.v.), was anchored in Gros Islet Bay, Santa Lucia. On the 8th of April the British lookout frigates reported that the French were at sea, and Rodney immediately sailed in pursuit. Light and variable sea or land breezes made the movements of both fleets uncertain. Some of the ships of each might have a wind, while others were becalmed. On the 9th of April eight ships of the British van, at some distance from the bulk of their fleet, and nearly opposite the mountain called the Morne au Diable in Dominica, were attacked by fifteen of the French. The comte de Grasse, whose own ships were much scattered and partly becalmed, and who moreover was hampered by the transports carrying soldiers and stores, did not press the attack home. His chief wish was to carry his fleet through the channel between Dominica and Guadaloupe, while Rodney was anxious to force a battle. During the night of the nth-i2th the greater part of the French had cleared the channel, but a collision took place between two of their ships by which one was severely damaged. The crippled vessel was seen and pursued by four ships of the

British van. The comte de Grasse recalled all his vessels, and bore down towards the British. Rodney ordered the last of his ships to lead into action, the others following her in succession, and the detached ships falling in behind as they returned from the pursuit. The two fleets in line of battle passed one another, the French steering in a southerly, the British in a northerly direction. Both were going very slowly. Fire was opened about 8 o'clock, and by 10 o'clock the leading British ship had passed the last of the French. While the action was in progress, one of the variable winds of the coast began to blow from the south, while the northern extremities of the fleets were in an easterly breeze. Confusion was produced in both forces, and a great gap was created in the French line just ahead of the " Formidable" (ioo), Rodney's flagship. The captain of the fleet, Sir Charles Douglas, called his attention to the opening, and urged him to steer through it. The fighting instructions then in force made it incumbent on an admiral to preserve the order in which he began the action unchanged. Rodney hesitated to depart from the traditional order, but after a few moments of doubt accepted the suggestion. The " Formidable " was steered through the opening, followed by six of those immediately behind her. The ships towards the rear passed through the disordered French in the smoke, which was very thick, without knowing what they had done till they were beyond the

enemy. About i o'clock the British had all either gone beyond the French or were to the east of them. The French were broken into three bodies, and were completely disordered. The comte de Grasse, in his flagship the " Ville de Paris," with five other vessels, was isolated from his van and rear. Rodney directed his attack on these six vessels, which were taken after a very gallant resistance. It was the general belief of the fleet that many more would have been captured if Rodney had pursued more vigorously, but he was content with the prizes he had taken. Two more of the French were captured by Sir Samuel Hood, afterwards Lord Hood, in the Mona Passage on the 19th of April.

See Beatson, Naval and Military Memoirs (London, 1804), vol. 5; and a careful analysis from the French side by Chevalier, Histoire de la marine francaise pendant la gtierre de Vindependance americaine (Paris, 1877). (D. H.)

SAINT-SAENS, CHARLES CAMILLE (1835-), French composer, was born in Paris on the 3rd of October 1835. After having as a child taken lessons on the piano, and learned the elements of composition, he entered the Paris Conservatoire in the organ class, then presided over by Eugene Benoist, obtaining the second prize in 1849, an d the first two years later. For a short time he studied composition under Halevy, and in 1852, and again in 1864, competed without success for the Grand Prix de Rome. Notwithstanding these unaccountable failures, Saint- Saens worked indefatigably. In 1853, when only eighteen, he was appointed organist at the Church of St Merry, and from 1861 to 1877 was organist at the Madeleine, in succession to Lefebure-Wely. An overture entitled " Spartacus," which has remained unpublished, was crowned at a competition instituted in 1863 by the Soci6te Sainte Cecile of Bordeaux. The greatest triumph of his early career was, however, attained in 1867, when the prize was unanimously awarded to him for his cantata " Les Noces de Promethee " in the competition organized during the International Exhibition of that year — a prize competed for by over two hundred musicians.

Though he had acquired a great name as a pianist, and had made successful concert tours through Europe, he had not succeeded in reaching the ears of the larger public by the produc- tion of an opera, which in France counts for more than anything else. After the tragic events of 1870, when Saint-Saens did his duty as a patriot by serving in the National Guard, the oppor- tunity at last offered itself, and a one-act opera from his pen, La Princesse jaune, with words by Louis Gallet, was produced at the Opera Comique with moderate success on the 12th of June 1872. Le Timbre d'argent, a four-act opera performed

at the Theatre Lyrique in 1877, was scarcely more successful. In the meanwhile his ” symphonic poems” ” Le Rouet d’Omphale,” ” Danse Macabre,” ” Phaeton ” and ” La Jeunesse d’Hercule ”

obtained for him a world-wide celebrity. These admirable examples of ” programme music ” count among his best known works.

At last, through the influence of Liszt, his Biblical opera Samson et Dalila was brought out at Weimar in 1877. This work, gener- ally accepted as his operatic masterpiece, had been begun as far back as 1869, and an act had been heard at one of Colonne’s concerts in 1875. Notwithstanding its great success at Weimar, its first performance on French soil took place at Rouen in 1890. The following year it was given in Paris at the Eden Theatre, and finally in 1892 was produced at the Grand Opera, where it has remained one of the most attractive works of the repertoire. Its Biblical subject stood in the way of its being performed on the London stage until 1909, when it was given at Covent Garden with great success. None of his works is better calculated to exemplify the dual tendencies of his style. The first act, with its somewhat formal choruses, suggests the influence of Bach and Handel, and is treated rather in the manner of an oratorio. The more dramatic portions of the opera are not uninfluenced by Meyerbeer, while in the mellifluous strains allotted to the temptress there are occasional suggestions of Gounod. Of Wagner there is but little trace, save in the fact that the com- poser has divided his work into scenes, thus avoiding the old-

fashioned denominations of ” air,’

1 duet, :

trio,” &c. The

score, however, is not devoid of individuality. The influences mentioned above, possibly excepting that of Bach in the earlier scenes, are rather of a superficial nature, for Saint-Saens has undoubtedly a style of his own. It is a composite style, certainly, and all the materials that go towards forming it may not be absolutely his; that is, the eclecticism of his mind may lead him at one moment to adopt an archaic form of expression, at another to employ the current musical language of his day, and sometimes to blend the two. It is perhaps in the latter case that he shows most individuality; for although his works may denote the varied influences of such totally dissimilar masters as Bach, Beethoven, Liszt and Gounod, he ever contrives to put in some- thing of his own.

After the production of Samson el Dalila Saint-Saens stood at the parting of the ways — looked at askance by the reactionary section of the French musicians, and suspected of harbouring subversive Wagnerian ideas, but ready to be welcomed by the progressive party. Both sides were doomed to disappointment, for in his subsequent operas Saint-Saens attempted to effect a compromise between the older and the newer forms of opera. He had already entertained the idea of utilizing the history of France for operatic purposes. The first and only result of this project has been Etienne Marcel, an opera produced at Lyons in 1879. Although of unequal merit, owing partly to its want of unity of style, this work contains much music of an attractive kind, and scarcely deserves the neglect into which it has fallen. Forsaking the history of France he now composed his opera Henry VIII., produced at the Paris Grand Opera in 1883. The librettists had concocted a piece that was sufficiently well knit and abounded in dramatic contrasts. While adhering to his system of compromise by retaining certain conventional operatic features, Saint-Saens had in this instance advanced somewhat by employing leit motivs in a more rigorous fashion than hitherto, although he had not gone so far as to discard airs cut after the old pattern, duets and quartets. Henry VIII., which was given at Covent Garden in 1898, occupies an honourable place among the composer's works. Proserpine, a lyrical drama produced at the Paris Opera Comique in 1887, achieved a succes d'estime and no more. A not much better fate befell Ascanio, an opera founded on Paul Meurice's drama Benvenuto Cellini, and brought out at the Grand Opera in 1890. Phryne", however, a two-act trifle of a light description, produced at the Opera Comique in 1893, met with success. In 1895 Fridigonde, an opera begun by Ernest Guiraud and completed by Saint-Saens, was produced in Paris. The " lyrical drama " Les Barbares, given at the Grand Opera in 1901, was received with marked favour.

Saint-Saens worked successfully in every field of his art. Besides the operas above alluded to, he composed the following oratorios

and cantatas: "Oratorio de Noel," " Les Noces de Promeithee," Psalm " Coeli enarrant," " Le Deluge," " La Lyre et la harpe "; three symphonies; four symphonic poems (" Le Rouet d'Omphale," "Phaeton," " Danse Macabre," "La Jeunesse d'Hercule'); five pianoforte concertos; three violin concertos; two suites, marches, and other works for orchestra; the ballet Zavotte; music to the drama

Dejanire, given at the open-air theatre of Beziers; a quintet for piano and strings, a quartet for piano and strings, two trios for piano and strings, a string quartet, a septet, violoncello sonata, two violin sonatas; a Mass, a Requiem, besides a quantity of piano and organ music, and many songs, duets and choruses. He also published three books, entitled Harmonie et melodie, Portraits et souvenirs, and Problemes et mystkres, besides a volume of poems, Rimes familieres. The honorary degree of Doctorof Music was conferred upon himby Cambridge University in 1893.

SAINTSBURY, GEORGE EDWARD BATEMAN (1845-),

English man of letters, was born at Southampton on the 23 rd of October 1845. He was educated at King's College School, London, and at Merton College, Oxford (B.A., 1868), and spent six years in Guernsey as senior classical master of Elizabeth College. From 1874 to 1876 he was headmaster of the Elgin Educational Institute. He began his literary career in 1875 as a critic for the Academy, and for ten years was actively engaged in journalism, becoming an important member of the staff of the Saturday Review. Some of the critical essays contributed to the literary journals were afterwards collected in his Essays in English Literature, 1780-1860 (2 vols., 1890-1895), Essays on French Novelists (1891), Miscellaneous Essays (1892), Corrected Impres- sions (1895). His first book, A Primer of French Literature (1880), and his Short History of French Literature (1882; 6th ed., Oxford, 1901), were followed by a series of editions of French classics and of books and articles on the history of French litera- ture, which made him the most prominent English authority on the subject. His studies in English literature were no less comprehensive, and included the valuable revision of Sir Walter Scott's edition of Dryden's Works (Edinburgh, 18 vols., 1882- 1893), Dryden (1881) in the " English Men of Letters " series, History of Elizabethan Literature (1887), History of Nineteenth Century Literature (1896), A Short History of English Literature (1898, 3rd ed. 1903), an edition of the Minor Caroline Poets of the Caroline Period (2 vols., 1905-1906), a collection of rare poems of great value, and editions of English classics. He edited the series of " Periods of European Literature," contributing the volumes on The Flourishing of Romance and the Rise of Allegory (1897), and The Earlier Renaissance (1901). In 1895 he became professor of rhetoric and English literature at Edinburgh univer- sity, and subsequently produced two of his most important works, A History of Criticism (3 vols., 1900-1904), with the companion volume Loci Criiici, Passages Illustrative of Critical Theory and Practice (Boston, U.S.A., and London, 1903), and A History of English Prosody from the 12th Century to the Present Day (i., 1906;

ii., 1908; iii., 1910); also The Later Nineteenth Century (1909).

ST SERVAN, a town of western France, in the department of Ille-et-Vilaine, on the right bank of the Ranee, south of St Malo, from which it is separated by the Anse des Sablons, a creek 1 m. wide (see St Malo). Pop. (1906) 9765. It is not enclosed by walls, and with its new nouses, straight wide streets and numerous gardens forms a contrast to its neighbour. North of the town there is a wet-dock, 27 acres in extent, forming part of the harbour of St Malo. The creek on which it opens is dry at low water, but at high water is 30 to 40 ft. deep. The dock is used chiefly by coasting and fishing vessels, a fleet starting annually for the Newfoundland cod-fisheries. Two other ports on the Ranee, south-west of the town at the foot of the tower of Solidor, are of small importance. This stronghold, erected towards the close of the 14th century by John IV., duke of Brittany, for the purpose of contesting the claims to the temporal sovereignty of the town of Josselin de Rohan, bishop of St Malo, consists of three distinct towers formed into a triangle by loop- holed and machicolated curtains. To the west St Servan termi- nates in a peninsula on which stands the ” cit6,” inhabited by work-people, and the “fort de la cite”; near by is a modern chapel which has replaced the cathedral of St Peter of Aleth,

the seat of a bishopric from the 6th to the 12th century. The parish church is modern (1742-1842). St Servan has a com- munal college. It carries on steam-sawing, boat-building, rope- making and the manufacture of ship’s biscuits.

The ” Cite ” occupies the site of the city of Aleth, which at the close of the Roman empire supplanted Corseul as the capital of the Curiosolites. Aleth was a bulwark of Druidism in those regions and was not Christianized till the 6th century, when St Malo became its first bishop. On the removal of the bishopric to St Malo Aleth declined and was almost destroyed by St Louis in 1235; the houses that remained standing became the nucleus of a new community, originating from St Malo, which placed itself under the patronage of St Servan, apostle of the Orkneys. It was not till the Revolution that St Servan became a separate commune from St Malo with a municipality and police of its own.

ST SEVER, a town of south-western France, capital of an arrondissement in the department of Landes, 11 m. S.S.W. of Mont de Marsan on the Southern railway between that town and Bayonne. Pop. (1906) town, 2508; commune, 4644. St Sever stands on an eminence on the left bank of the Adour in the district of the Chalosse. Its streets, bordered in places by old houses, are narrow and winding. The

promenade of Morlanne laid out on the site of a Roman camp called Palestrion com- mands a fine view of the Adour and the pine forests of the Landes. The church of St Sever, a Romanesque building of the 1 2th century, with seven apses, once belonged to the Bene- dictine abbey founded in the 10th century. The public in- stitutions of the town include the sub-prefecture, a tribunal of first instance, and a practical school of agriculture and viticulture which occupies a former Dominican convent. There is trade in the agricultural products of the Chalosse, especially geese.

SAINT-SIMON, CLAUDE DE ROUVROY, Due de (1607- 1693), French courtier, was born in August 1607, being the second son of Louis de Rouvroi, seigneur du Plessis (d. 1643), who had been a warm supporter of Henry of Guise and the League. With his elder brother he entered the service of Louis XIII. as a page and found instant favour with the king. Named first equerry in March 1627 he became in less than three years captain of the chateaux of St Germain and Versailles, master of the hounds, first gentleman of the bed-chamber, royal councillor and governor of Meulan and of Blaye. On the fall of La Rochelle he received lands in the vicinity valued at 80,000 livres. About three years later his seigniory of Saint-Simon in Vermandois was erected into a duchy, and he was created a peer of France. He was at first on good terms with Richelieu and was of service on the Day of Dupes (nth of November 1630). Having suffered disgrace for taking the part of his uncle, the baron of Saint- Leger, after the capture of Catelet (15th of August 1636), he retired to Blaye. He fought in the campaigns of 1638 and 1639, and after the death of Richelieu returned to court, where he was coldly received by the king (18th of February 1643). Thence- forth, with the exception of siding with Conde during the Fronde, he took small part in politics. He died in Paris on the 3rd of May 1693. By his first wife, Diane de Budos de Portes, a relative of Conde, whom he married in 1644 and who died in 1670, he had three daughters. By his second wife, Charlotte de l'Aubespine, whom he married in 1672, he had a son Louis, the " author of the memoirs " (see below).

SAINT-SIMON, CLAUDE HENRI DE ROUVROY, Comte de (1760-1825), the founder of French socialism, was born in Paris on the 17th of October 1760. He belonged to a younger branch of the family of the due de Saint-Simon (above). His education was directed by D'Alembert. At the age of nineteen he assisted the American colonies in their revolt against Britain. From his youth Saint-Simon felt the promptings of an eager ambition. His valet had orders to awake him every morning with the words, " Remember, monsieur le comte, that you have great things to do." Among his early schemes

was one to unite the Atlantic and the Pacific by a canal, and another to construct a canal from Madrid to the sea. Although he was imprisoned in the Luxem'bourg during the Terror, he took no part of any importance in the Revolution, but profited by it to amass a little fortune by land speculation — not on any selfish account, however, as he said, but to facilitate his future projects.

Accordingly, when he was nearly forty years of age he went through a varied course of study and experiment, in order to enlarge and clarify his view of things. One of these experiments was an unhappy marriage — undertaken merely that he might have a salon — which, after a year's duration, was dissolved by mutual consent. The result of his experiments was that he found himself completely impoverished, and lived in penury for the remainder of his life. The first of his numerous writings, Lellres d'un habitant de Geneve, appeared in 1802; but his early writings were mostly scientific and political. In 1817 he began in a treatise entitled L' Industrie to propound his socialistic views, which he further developed in L'Organisateur (1810), a periodical on which Augustin Thierry and Auguste Comte collaborated. The first number caused a sensation, but it brought few converts. In 1821 appeared Du systeme industriel, and in 1823-1824 Catechisme des industriels. The last and most im- portant expression of his views is the Nouveau Christianisme (1825), which he left unfinished. For many years before his death in 1825 (at Paris on the 19th of May), Saint-Simon had been reduced to the greatest straits. He was obliged to accept a laborious post, working nine hours a day for £40 a year, to live on the generosity of a former valet, and finally to solicit a small pension from his family. In 1823 he attempted suicide in despair. It was not till very late in his career that he attached to himself a few ardent disciples.

As a thinker Saint-Simon was entirely deficient in system, clearness and consecutive strength. But his great influence on modern thought is undeniable, both as the historic founder of French socialism and as suggesting much of what was after- wards elaborated into Comtism. Apart from the details of his socialistic teaching, which are vague and unsystematic, we find that the ideas of Saint-Simon as to the reconstruction of society are very simple. His opinions were conditioned by the French Revolution and by the feudal and military system still prevalent in France. In opposition to the destructive liberalism of the Revolution he insisted on the necessity of a new and positive reorganization of society. So far was he from advocating fresh

social revolt that he appealed to Louis XVIII. to inaugurate the new order of things. In opposition, however, to the feudal and military system, the former aspect of which had been strengthened by the restoration, he advocated an arrangement by which the industrial chiefs should control society. In place of the medieval church the spiritual direction of society should fall to the men of science. What Saint-Simon desired, therefore, was an industrialist state directed by modern science in which universal association should suppress war. In short, the men who are fitted to organize society for productive labour are entitled to bear rule in it. The social aim is to produce things useful to life. The contrast between labour and capital so much emphasized by later socialism is not present to Saint-Simon, but it is assumed that the industrial chiefs, to whom the control of production is to be committed, shall rule in the interest of society. Later on the cause of the poor receives greater atten- tion, till in his greatest work, The New Christianity, it takes the form of a religion. It was this development of his teaching that occasioned his final quarrel with Comte. Previous to the publication of the Nouveau Christianisme, Saint-Simon had not concerned himself with theology. Here he starts from a belief in God, and his object in the treatise is to reduce Christianity to its simple and essential elements. He does this by clearing it of the dogmas and other excrescences and defects which have gathered round the Catholic and Protestant forms of it. He propounds as the comprehensive formula of the new Christianity this precept — ” The whole of society ought to strive towards the amelioration of the moral and physical existence of the poorest class; society ought to organize itself in the way best adapted for attaining this end.” This principle became the watchword of the entire school of Saint-Simon.

During his lifetime the views of Saint-Simon had very little influence; and he left only a few devoted disciples, who continued to advocate the doctrines of their master, whom they revered as a prophet. Of these the most important were

Olinde Rodrigues, the favoured disciple of Saint-Simon, and Barthelemy Prosper Enfantin (q.v.), who together had received Saint-Simon’s last instructions. Their first step was to establish a journal, Le Producteur, but it was discontinued in 1826. The sect, however, had begun to grow, and before the end of 1828, had meetings not only in Paris but in many provincial towns. An important departure was made in 1828 by Amand Bazard, who gave a ” complete exposition of the Saint-Simonian faith ” in a long course of lectures at Paris, which were well attended. His Exposition de la doctrine de St Simon (2 vols., 1828-1830), which is by far the best account of it, won more

adherents. The second volume was chiefly by Enfantin, who along with Bazard stood at the head of the society, but who was superior in meta- physical power, and was prone to push his deductions to extremities. The revolution of July (1830) brought a new freedom to the socialist reformers. A proclamation was issued demanding the community of goods, the abolition of the right of inheritance, and the enfranchisement of women. Early next year the school obtained possession of the Globe through Pierre Leroux (q.v.), who had joined the school, which now numbered some of the ablest and most promising young men of France, many of the pupils of the Ecole Polytechnique having caught its enthusiasm. The members formed themselves into an association arranged in three grades, and constituting a society or family, which lived out of a common purse in the Rue Monsigny. Before long, however, dissensions began to arise in the sect. Bazard, a man of logical and more solid temperament, could no longer work in harmony with" Enfantin, who desired to establish an arrogant and fantastic sacerdotalism with lax notions as to marriage and the relation of the sexes. After a time Bazard seceded and many of the strongest supporters of the school followed his example. A series of extravagant entertainments given by the society during the winter of 1832 reduced its financial resources and greatly discredited it in character. They finally removed to Menilmontant, to a property of Enfantin, where they lived in a communistic society, distinguished by a peculiar dress. Shortly after the chiefs were tried and condemned for proceedings prejudicial to the social order; and the sect was entirely broken up (1832). Many of its members became famous as engineers, economists, and men of business.

In the school of Saint-Simon we find a great advance on the vague and confused views of the master. In the philosophy of history they recognize epochs of two kinds, the critical or negative and the organic or constructive. The former, in which philosophy is the dominating force, is characterized by war, egotism and anarchy ; the latter, which is controlled by religion, is marked by the spirit of obedience, devotion, association. The two spirits of antagonism and association are the two great social principles, and on the degree of prevalence of the two depends the character of an epoch. The spirit of association, however, tends more and more to prevail over its opponent, extending from the family to the city, from the city to the nation, and from the nation to the federation. This principle of association is to be the keynote of the social development of the future. Under the present system the industrial chief exploits the proletariat, the members of which, though nominally free, must accept his terms under pain of starvation. The only remedy for this is the abolition of the law of

inheritance, and the union of all the instruments of labour in a social fund, which shall be exploited by association. Society thus becomes sole proprietor, intrusting to social groups and social functionaries the management of the various properties. The right of succession is transferred from the family to the state. The school of Saint-Simon insists strongly on the claims of merit ; they advocate a social hierarchy in which each man shall be placed according to his capacity and rewarded according to his works. This is, indeed, a most special and pronounced feature of the Saint-Simon socialism, whose theory of government is a kind of spiritual or scientific autocracy, degenerating into the fantastic sacerdotalism of Enfantin. With regard to the family and the relation of the sexes the school of Saint- Simon advocated the complete emancipation of woman and her entire equality with man. The " social individual " is man and woman, who are associated in the exercise of the triple function of religion, the state and the family. In its official declarations the school maintained the sanctity of the Christian law of marriage. Connected with these doctrines was their famous theory of the " rehabilitation of the flesh," deduced from the philosophic theory of the school, which was a species of Pantheism, though they repudiated the name. On this theory they rejected the dualism so much emphasized by Catholic Christianity in its penances and mortifications, and held that the body should be restored to its

due place of honour. It is a vague principle, of which the ethical character depends on the interpretation ; and it was variously interpreted in the school of Saint-Simon. It was certainly immoral as held by Enfantin, by whom it was developed into a kind of sensual mysticism, a system of free love with a religious sanction.

An excellent edition of the works of Saint-Simon and Enfantin was published by the survivors of the sect (47 vols., Paris, 1865- 1878). See, in addition to the works cited above, L. Reybaud, Etudes sur les reformateurs contemporains (7th edition, Paris, 1864) ; Paul Janet, Saint-Simon el le Saint-Simonisme (Paris, 1878); A. J. Booth, Saint-Simon and Saint- Simonism (London, 1871); Georges Weill, Un Precurseur du socialisme, Saint-Simon el son ceuvre (Paris, 1894), and a history of the £cole Saint- Simonienne, by the same author (1896); G. Dumas, Psychologie de deux messies positivistes St Simon et Comle (1905); E. Levasseur's Etudes sociates sous la Restauration, contains a good section on Saint-Simon.

(T. K.;J.T. S.*)

SAINT-SIMON, LOUIS DE ROUVROY, Due de (1675-1755), French soldier, diplomatist and writer of memoirs, was born at Versailles on the 16th of January 1675. The peerage granted to his father, Claude de St Simon (q.v.), is the central fact in his history. The French peerage under the old regime was a very peculiar thing, difficult to comprehend at all, but quite certain to be miscomprehended if any analogy of the English -peerage is imported into the consideration. No two things could be more different in France than ennobling a man and making him a peer. No one was made a peer who was not ennobled, but men of the noblest blood in France and representing their houses might not be, and in most cases were not, peers. Derived at least traditionally and imaginatively from the douze pairs of Charlemagne, the peers were supposed to represent the chosen of the noblesse, and gradually, in an indefinite and constantly disputed fashion, became associated with the parlement of Paris as a quasi-legislative (or at least law-registering) and directly judicial body. But the peerage was further complicated by the fact that not persons but the holders of certain fiefs were made peers. Strictly speaking, neither Saint-Simon nor any one else in the same case was made a peer, but his estate was raised to the rank of a duchS pairie or a comle pairie as the case might be. Still the peers were in a way a standing committee repre- sentative of the entire body of nobles, and it was Saint-Simon's lifelong ideal, and at times his practical effort to convert them into a sort of great council of the nation.

His mother, Charlotte de l'Aubespine, belonged to a family not of the oldest nobility but one which had been distinguished in the public service at least since the time of Francis I. Her son Louis was well educated, to a great extent by herself, and he hadTiad for godfather and godmother Louis XIV. and the queen. After some tuition by the Jesuits (especially by Sanadon, the editor of Horace), he joined the mousquetaires gris in 1692. He was present at the siege of Namur, and the battle of Neer- winden. But it was at this very time that he chose to begin the crusade of his life by instigating, if not bringing, an action on the part ot the peers of France against Luxembourg, his victorious general, on a point of precedence. He fought, how- ever, another campaign or two (not under Luxembourg), and in 1695 married Gabrielle de Durfort, daughter of the marechal de Lorges, under whom he latterly served. He seems to have regarded her with a respect and affection not very usual between husband and wife at the time; and she sometimes succeeded in modifying his aristocratic ideas. But as he did not receive the promotion he desired he flung up his commission in 1702. Louis took a dislike to him, and it was with difficulty that he

was able to keep a footing at court. He was, however, intensely interested in all the transactions of Versailles, and by dint of a most heterogeneous collection of instruments, ranging from dukes to servants, he managed to obtain the extraordinary secret information which he has handed down. His own part appears to have been entirely subordinate. He was appointed ambassador to Rome in 1705, but the appointment was cancelled before he started. At last he attached himself to the duke of Orleans and, though this was hardly likely to conciliate Louis's goodwill to him, it gave him at least the status of belonging to a definite party, and it eventually placed him in the position of tried friend to the acting chief of the state. He was able,

moreover, to combine attachment to the duke of Burgundy with that to the duke of Orleans. Both attachments were no doubt all the more sincere because of his undying hatred to " the bastards," that is to say, the illegitimate sons of Louis XIV. It does not appear that this hatred was founded on moral reasons or on any real fear that these bastards would be intruded into the succession. The true cause of his wrath was that they had precedence of the peers.

The death of Louis seemed to give Saint-Simon a chance of realizing his hopes. The duke of Orleans was at once acknowledged regent, and Saint-Simon was of the council of regency. But no steps were taken to carry out his favourite vision of a France ruled by the nobles for its good, and he had little real influence with the regent. He was indeed gratified by the degradation of " the bastards," and in 1721 he was appointed ambassador to Spain to arrange for the marriage (not destined to take place) of Louis XV. and the infanta. His visit was splendid; he received the grandeeship, and, though he also caught the smallpox, he was quite satisfied with the business. After his return he had little to do with public affairs. His own account of the cessation of his intimacy with Orleans and Dubois, the latter of whom had never been his friend, is, like his own account of some other events of his life, obscure and rather suspicious. But there can be little doubt that he was practically ousted by the favourite. He survived for more than thirty years; but little is known of his life. His wife died in 1743, his eldest son a little later; he had other family troubles, and he was loaded with debt. When he died, at Paris on the 2nd of March 1755, he had almost entirely outlived his own generation (among whom he had been one of the youngest) and the prosperity of his house, though not its notoriety. This last was in strange fashion revived by a distant relative born five years after his own death, Claude Henri, comte de Saint-Simon (q.v.).

It will have been observed that the actual events of Saint-Simon's life, long as it was and high as was his position, are neither numerous nor noteworthy. He is, however, an almost unique example of a man who has acquired great literary fame entirely by posthumous publications. He was an indefatigable writer, and he began very early to set down in black and white all the gossip he collected, all his interminable legal disputes of precedence, and a vast mass of unclassified and almost unclassifiable matter. Most of his manu- scripts came into the possession of the government, and it was long before their contents were published in anything like fulness. Partly in the form of notes on Dangeau's Journal, partly in that of original and independent memoirs, partly in scattered and multi- farious tracts and disquisitions, he had committed to paper an immense amount of matter. But the mere mass of these productions is their least noteworthy feature, or rather it is most remarkable as contrasting with their character and style. Saint-Simon, though careless and sometimes even ungrammatical, ranks among the most striking memoir-writers of France, the country richest in memoirs of any in the world. His pettiness, his absolute injustice to his private enemies and to those who espoused public parties with which he did not agree, the bitterness which allows him to give favourable portraits of hardly any one, his omnivorous appetite for gossip, his lack of proportion and perspective, are all lost sight of in admiration of his extraordinary genius for historical narrative and character- drawing of a certain sort. He has been compared to Tacitus, and for once the comparison is just. In the midst of his enormous mass of writing phrases scarcely inferior to the Roman's occur frequently, and here and there are passages of sustained description equal, for intense concentration of light and life, to those of Tacitus or of any other historian. As may be expected from the vast extent of his work, it is in the highest degree unequal. But he is at the same time not a writer who can be " sampled " easily, inasmuch'as his most characteristic phrases sometimes occur in the midst of long stretches of quite uninteresting matter. A few critical studies of him, especially those of Sainte-Beuve, are the basis of much, if not most, that has been written about him. Yet no one is so little to be taken at second-hand. Even his most famous passages, such as the account of the death of the dauphin or of the Bed of Justice where his enemy the duke of Maine was degraded, will not give a fair idea of his talent. These are his gallery pieces, his great " machines," as French art slang calls them. Much more noteworthy as well as more frequent are the sudden touches which he gives. The bishops are " cuistres violets " ; M. de Caumartin " porte sous son manteau toute ■ la fatuity que M. de Villeroy etale sur son baudrier"; another politician has a " mine de chat facheV' In short, the interest of the Memoirs,

independent of the large addition of positive knowledge which they make, is one of constant surprise at the novel and adroit use of word and phrase. Some of Macaulay's most brilliant portraits

and sketches of incident are adapted and sometimes almost literally translated from Saint-Simon.

The first edition of Saint-Simon (some scattered pieces may have been printed before) appeared in 1788. It was a mere selection in three volumes and was much cut down before it was allowed to appear. Next year four more volumes made their appearance, and in 1 79 1 a new edition, still further increased. The whole, or rather not the whole, was printed in 1 829-1 830 and reprinted some ten years later. The real creator of Saint-Simon, as far as a full and exact text is concerned, was M. Cheruel, whose edition in 20 volumes dates from 1856, and was reissued again revised in 1872. So immense, however, is the mass of Saint-Simon's MSS. that still another recension was given by M. de Boislisle in 1882, with M. Cheruel's assistance, while a newer edition, yet once more revised from the MS., was begun in 1904. It must, however, be admitted that the matter other than the Memoirs is of altogether inferior interest and may be pretty safely neglected by any one but professed anti- quarian and historical students. For criticism on Saint-Simon there is nothing better than Sainte-Beuve's two sketches in the 3rd and 15th volumes of the Causeries du lundi. The latter was written to accompany M. Cheruel's first edition. In English by far the most accurate treatment is in a Lothian prize essay by E. Cannan (Oxford and London, 1885). (G. Sa.)

ST THOMAS, an incorporated city and port of entry of Ontario, Canada, capital of Elgin county, on Kettle creek, 13 m. S. of London and 8 m. N. of Lake Erie. Pop. (1901) 11,485. It is an important station on the Grand Trunk, Michigan Central, Lake Erie & Detroit River, and Canadian Pacific railways. It has numerous schools, a collegiate institute, and Alma ladies' college. The Michigan Central railway shops, car-wheel foundry, flour, flax and planing mills are the principal industries.

ST THOMAS (Sao Thome), a volcanic island in the Gulf of Guinea immediately north of the equator (o° 23′ N.) and in 6° 40′ E. With the island of Principe (Prince's Island), it forms the Portuguese province of St Thomas. From the Gabun, the nearest point of the mainland of

Africa, St Thomas is distant 166 m., and from Cameroon 297 m. The extreme length of the island is 32 m. the breadth W. to E. 21 m.; the area is about 400 sq. m.

From the coast the land rises towards lofty verdant mountains (St Thomas over 7000 ft.). At least a hundred streams, great and small, descend the mountain-sides through deep-cut ravines, many of them forming beautiful waterfalls, such as those of Blu-blu on the Agua Grande. The island during its occupation by the Netherlands acquired the name of " The Dutchman's Churchyard," and the death- rate is still very high. Malaria is common in the lower regions, but the unhealthiness of the island is largely due to the absence of hygienic precautions. During the dry season (June to September) the temperature ranges in the lower parts between 66-2° and 8o-6° F., and in the higher parts between 57/2° and 68°; in the rainy season it ranges between 69-8° and 89-6 in the lower parts, and between 64-4° and 8o-6° in the higher parts. On Coffee Mount (2265 ft.) the mean of ten years was 68-9°, the maximum 90-5° and the minimum 47-3°. The heat is tempered by the equatorial ocean current. The rainfall is very heavy save on the north coast.

The ■ soil is exceedingly fertile and a considerable area is densely forested. Among the products are oranges, lemons, figs, mangoes, and in the lower districts the vine, pineapple, guava and banana. The first object of European cultivation was sugar, and to this the island owed its prosperity in the 1 6th century;, sugar has been displaced by coffee and, principally, cocoa, introduced in 1795 and 1822 respectively. In 1907 the export of cocoa (including that from Principe) was over 24,000 tons, about a sixth of the world's supply. The cocoa zone lies between 650 and 2000 ft. above the sea. Vanilla and cinchona bark both succeed well, the latter at altitudes of from 1800 to 3300 ft. Rubber, quinine, cinnamon, camphor and the kola-nut are also produced, but since 1890 — when the production was under 3000 tons — cocoa has been almost exclusively grown. About 175 sq. m. were in 1910 under cultivation. The value of the imports was £175,000 in 1896 and £708,000 in 1908; that of the exports was £398,000 in 1896 and £1,760,000 in 1908. The shipping trade (190 vessels of 490,000 tons in 1908) is chiefly in the hands of the Portuguese. The revenue (1909-1910) was about £195,000, the expenditure £162,000.

At the census of 1900 the inhabitants were returned at 37,776, of whom 1012 were whites (mainly Portuguese). The town of St Thomas, capital and chief port of the province, residence of the governor and of the Curador (the legal guardian of the servicaes, i.e. labourers), is

situated on Chaves Bay on the N.E. coast. It is the starting-point of a railway 9 m. long, which connects with the Decauville railways on the cocoa estates. The inhabitants, apart from the Europeans, consist (1) of descendants of the original settlers, who were convicts from Portugal, slaves and others from Brazil and negroes from the Gabun and other parts of the Guinea coast. They number about 8000, are a brown-skinned, indolent race, and occupy

rather than cultivate about one-eighth of the island. They are known as ” natives ” and use a Negro-Portuguese ” lingua de S ThomeV’ (2) On the south-west coast are Angolares — some 3000 in number — descendants of two hundred Angola slaves wrecked at Sete Pedras in 1544. They retain their Bunda speech and customs, and are expert fishermen and canoemen. (3) Contract labourers from Cape Verde, Kabinda, &c, and Angola. These form the bulk of the population. In 1891, before the great development of the cocoa industry, the population was only 22.000. 1

St Thomas was discovered on the 21st of December 1470 by the Portuguese navigators Joao de Santarem and Pero de Escobar, who in the beginning of the following year discovered Annobom (” Good Year “). They found St Thomas uninhabited. The first attempts at colonization were Joao de Paiva’s in 1485; but nothing permanent was accomplished till 1493, when a body of criminals and of young Jews taken from their parents to be baptized were sent to the island, and the present capital was founded by Alvaro de Carminha. In the middle of the 16th century there were over 80 sugar mills on the island, which then had a population of 50,000; but in 1567 the settlement was attacked by the French, and in 1574 the Angolares began raids which only ended with their subjugation in 1693. In 1595 there was a slave revolt; and from 1641 to 1644 the Dutch, who had plundered the capital in 1600, held possession of the island. The French did great damage in 1709; the sugar trade had passed to Brazil and internal anarchy reduced St Thomas to a deplorable state. It was not until the later hall of the 19th century that prosperity began to return.

The greatly increased demand for cocoa which arose in the last decade of the century led to the establishment of many additional plantations, and a very profitable industry was developed. Planters, however, were handicapped by the scarcity of labour, for though a number of Cape Verde islanders, Krumen and Kabindas sought employment on short-term agreements, the ” natives ” would not work. The difficulty was met by the recruitment of indentured natives from Angola, as many as 6000 being brought over in one year. The mortality among these

labourers was great, but they were very well treated on the plantations. No provision was, however, made for their repa- triation, while the great majority were brought by force from remote parts of Central Africa and had no idea of the character of the agreement into which they were compelled to enter. From time to time governors of Angola endeavoured to remedy the abuses of the system, which both in Portugal and Great Britain was denounced as indistinguishable from slavery, not- withstanding that slavery had been legally abolished in the Portuguese dominions in 1878. In March 1909 certain firms, British and German, as the result of investigations made in Angola and St Thomas, refused any longer to import cocoa from St Thomas or Principe Islands unless the recruitment of labourers for the plantations was made voluntary. Repre- sentations to Portugal were made by the British government, and the Lisbon authorities stopped recruitment entirely from July 1909 to February 1910, when it was resumed under new regulations. British consular agents were stationed in Angola and St Thomas to watch the working of these regulations. (See statement by Sir E. Grey reported in The Times, July 2nd, 1910). As one means of obviating the difficulties encountered in Angola the recruitment of labourers from Mozambique was begun in 1908, the men going out on a yearly contract.

Principe Island lies 00 m. N.E. of St Thomas, has an area of 42 sq. m. and is also of volcanic origin. Pop. (1900) 4327. The tsetse fly (which is not found in St Thomas) infests the wooded part of the island, and through it sleeping sickness has been spread among the inhabitants. The principal industry is the cultivation of cocoa. The chief settlement is St Antonio.

See A. Negreiros, Historia ethnographica da Ilha de S ThomS (Lisbon, 1895) and lie de San ThomS (Paris, 1901); C. Gravier ” Mission scientifique a l’ile de San Thom6 ” Nouv. Arch. Miss. Scient. t. xv. (Paris, 1907) ; A. Pinto de Miranda Guedes, ” Viagao em S Thome 1 ” in B.S.G. Lisboa (1902) pp. 299-357; E. de Campos

1 According to Aug, Chevalier (in O. Occidenle, May 20th, 1910) the population of St Thomas and Principe combined in Dec. 1909 was 68,221, the ” natives ” being given at over 23,000.

” S. Thome ” B.S.G. Lisbon (1908), pp. 1 13-134; W. A. Cadbury, | Labour in Portuguese West Africa (2nd ed., London, 1910) ; A ilha de S Thome (Lisbon, 1907) ; The Boa Entrada Plantations (Edinburgh, 1907) ; and British Consular reports.

ST THOMAS, an island in the Danish West Indies. It belongs to the Virgin Island group, and lies 40 m. E. of Porto Rico, in 18 20′ N. and 64° 55′ W. Pop. (1901) 11,012, mostly negroes. It is 13 m long, varies in width from 1 m. to 4 m. and has an area of 33 m. It consists of a single mountain ridge, the peaks of a submerged range, culminating in West Mountain (1555 ft.). St Thomas stands on a prolongation of the range which supports the Greater Antilles, and is built up of much disintegrated eruptive rock (porphyry and granite) The climate is tropical, varying in temperature between 70 F. and 8o° F., modified, however, by the sea breezes. The average yearly rainfall is about 45 in., earthquakes are not unknown, and hurricanes at times sweep over the island. The only town, Charlotte Amalie (pop. 8540), lies in the centre of the S coast, at the head of one of the finest harbours in the West Indies. This consists of an almost land- locked basin, about f m. across, varying in depth from 27 to 36 ft., and entered by a narrow channel only 300 yds. wide. It is equipped with a floating dock, which can accommodate ships up to 3000 tons, a patent slip for smaller vessels and a repairing yard. Danish is the official language, but English predominates, while French, Spanish and Dutch are also spoken. St Thomas was once the greatest distributing centre in the West Indies, but the introduction of steamships and cables led to its decline, and the removal of the Royal Mail Steamship Company’s headquarters to Barbados in 1885 was the final blow. The production of sugar, which decayed gradually after the abolition of slavery, is practically extinct. Aloes, fibrous plants and fruit are grown. St Thomas is the seat of government for the Danish West Indies (St Thomas, St John and St Croix), a crown colony administered by a governor, who is assisted by a colonial council. The governor resides for half the year in St Thomas, and in St Croix for the rest. The chief importance of St Thomas lies in the fact that it is a coaling station for ships plying to and from the West Indies.

The island was discovered by Columbus in 1493, and first colonized by the Dutch in 1657. After their departure in 1667 the island came into the hands of the British, and it was held by them till 167 1, when

it passed into the hands of the Danish West India Company, which was succeeded in 1685 by the so-called Brandenburg Company, the shareholders of which were mainly Dutch. The king of Denmark having taken over the island in 1754, declared it a free port, and during the European wars of the 18th century the neutrality of Denmark gave a great impetus to the trade of St Thomas. It was during this period that the distributing trade of the island grew up. It was held by the British in 1801 and again from 1807 to 181 5, during which it was the great rendezvous of British merchant vessels waiting for convoy. In 1867, when the islands were governed at a loss to the mother country, a treaty was concluded under which the United States agreed to buy them for 7! million dollars, but, although the suggestion first emanated from the United States, its Senate refused to ratify the treaty. In 1902 another treaty of cession was signed by which the United States was to buy the islands for 5 million dollars, but the Danish parliament rejected it. The importance of the islands to the United States consists in their suitability as a West Indian naval base.

ST TROND, a town of Belgium in the province of Limburg about 18 m. N.W. of Liege. Pop. (1904) 15,116. It occupies an important strategical position with regard to the N.E. frontier of Belgium, and General Brialmont recommended its fortifica- tion. In the middle ages it was a fortified town belonging to the bishops of Liege, and Charles the Bold captured it in 1467. In 1566 the Assembly of Compromise met at St Trond.

SAINT-VICTOR, PAUL BINS, Comte de (1827-1881), known as Paul de Saint- Victor, French author, was born in Paris on the nth of July 1827. His father Jacques B. M. Bins, comte de Saint-Victor (1772-1858), is remembered by his poem L'Espirance, and by an excellent verse translation of Anacreon.

Saint- Victor, who ceased to use the title of count as being out of keeping with his democratic principles, began as a dramatic critic on the Pays in 1851, and in 1885 he succeeded Theophile Gautier on the Presse. In 1866 he migrated to the Libertg, and in 1869 joined the staff of the Moniteur universel. In 1870, during the last days of the second empire, he was made inspector- general of fine arts. Almost all Saint- Victor's work consists of articles, the best known being the collection entitled Hommes et dieux (1867). His death interrupted the publication of Les Deux Masques, in which the author intended to survey the whole dramatic literature of ancient and modern times. Saint- Victor's critical faculty was considerable, though rather one-sided. He owed a good deal to Theophile Gautier, but he carried ornateness to a pitch far beyond Gautier's. Saint- Victor died in Paris

on the 9th of July 1881.

See also Deljant, Paul de Saint-Victor (1887). ST VINCENT, JOHN JERVIS, Earl of (1735-1823), British admiral, was the second son of Swynfen Jervis, solicitor to the admiralty, and treasurer of Greenwich hospital. He was born at Meaford in Staffordshire on the 9th of January 1735, and entered the navy on the 4th of January 1749. He became lieutenant on the 19th of February 1755, and served in that rank till 1759, taking part in the conquest of Quebec. He was made commander of the ” Scorpion ” sloop in 1759, and post- captain in 1 760. During the peace he commanded the ” Alarm ” 32 in the Mediterranean, and when he was put on half pay he travelled widely in Europe, taking professional notes everywhere. While the War of American Independence lasted, he commanded the ” Fourroyant ” (80) in the Channel, taking part in the battle of Ushant on the 27th of July 1778 (see Keppel, Viscount) and in the various reliefs of Gibraltar. His most signal service was the capture of the French ” Pegase ” (74) after a long chase on the 19th of April 1782, for which he was made K.B. In 1783 he entered parliament as member for Launceston, and in the general election of 1 784 as member for Yarmouth. In politics he was a strong Whig. On the 24th of September 1 787 he attained flag rank, and was promoted vice-admiral in 1793. From 1793 till 1795 he was in the West Indies co-operating with the army in the conquest of the French islands. On his return he was promoted admiral. In November 1.795 he took command in the Mediterranean, where he maintained the blockade of Toulon, and aided the allies of Great Britain in Italy.

But in 1796 a great change was produced by the progress of the French armies on shore and the alliance of Spain with France. The occupation of Italy by the French armies closed all the ports to his ships, and Malta was not yet in the possession of Great Britain. Then the addition of the Spanish fleet to the French altered the balance of strength in the Mediterranean. The Spaniards were very inefficient, and Jervis would have held his ground, if one of his subordinates had not taken the extraordinary course of returning to England, because he thought that the dangerous state of the country required that all its forces should be concentrated at home. He was therefore obliged to act on the instructions sent to him (and to retire to the Atlantic, with-drawing the garrisons from Corsica and other places. His headquarters were now on the coast of Portugal, and his chief duty was to watch the Spanish fleet at Cadiz. On the 14th of February 1797 he gained a most complete victory against heavy odds (see St Vincent, Battle of). The determination to fight, and the admirable discipline of his squadron, which was very largely the fruit of his own care in

preparation, supply the best proof that he was a commander of a high order. For this victory, which came at a very critical time, he was made an earl and was granted a pension of £3000. His qualities as a disciplinarian were soon to be put to a severe test. In 1797 the grievances of the sailors, which were of old standing, and had led to many mutinies of single ships, came to a head in the great general mutinies at Spithead and the Nore. Similar movements took place on the coast of Ireland and at the Cape of Good Hope (see the article Navy: History). The spirit spread to the fleet under St Vincent, and there was an undoubted danger that some outbreak would take place in his command. The

peril was averted by his foresight and severity. He had always I taken great care of the health of his men, and was as strict with the officers as with sailors. It must in justice be added that he was peculiarly fitted for the work. We have ample evidence from his contemporaries that he found a pleasure in insulting officers whom he disliked, as well as in hanging and flogging those of his men who offended him. He carried his strictness with his officers to an extent which aroused the actual hatred of many among them, and exasperated Sir John Orde (1751- 1824) into challenging him to fight a duel. Yet he cannot be denied the honour of having raised the discipline of the navy to a higher level than it had reached before; he was always ready to promote good officers, and the efficiency of the squadron with which Nelson won the battle of the Nile was largely due to him. His health broke down under the strain of long cruising, and in June 1799 he resigned his command.

When the earl's health was restored in the following year he took the command of the Channel fleet, into which he introduced his own rigid system of discipline to the bitter anger of the captains. But his method was fully justified by the fact that he was able to maintain the blockade of Brest for 121 days with his fleet. In 1801 he became first lord and held the office till Pitt returned to power in 1803. His administration is famous in the history of the navy, for he now applied himself to the very necessary task of reforming the corruptions of the dockyaids. Naturally he was fiercely attacked in and out of parliament. His peremptory character led him to do the right thing with the maximum of dictation at Whitehall as on the quarter-deck of his flagship. He also gave an opening to his critics by devoting himself so wholly to the reform of the dockyards that he neglected the

preparation of the fleet for war. He would not recognize the possibility that the peace of Amiens would not last. Pitt made himself the mouthpiece of St Vincent's enemies, mainly because he considered him as a dangerous member of the party which was weakening the position of England in the face of Napoleon. When Pitt's second ministry was formed in 1803, St Vincent refused to take the command of the Channel fleet at his request. After Pitt's death he resumed the duty with the temporary rank of admiral of the fleet in 1806, but held it only till the following year. After 1810 he retired to his house at Rochetts in Essex. The rank of admiral of the fleet was conferred on him in 1821 on the coronation of George IV., and he died on the 14th of March 1823. Lord St Vincent married his cousin Martha Parker, who died childless in 1 8 1 6. There is a monument to the earl in St Paul's Cathedral, and portraits of him at different periods of his life are numerous. The earldom granted to Jervis became extinct on his death, but a viscounty, created for him in 1 801, passed by special remainder to Edward Jervis Ricketts (1767-1857), the second son of his sister Mary who had married William Henry Ricketts, of Longwood, Hampshire. The 2nd viscount took the name of Jervis, and the title is still held by his descendants.

See Life by J. S. Tucker (2 vols.), whose father had been the admiral's secretary (marred by excessive eulogy). The life by Captain Brenton is rather inaccurate.. The Naval Career of Admiral John Markham contains an account of the reforms in the navy. His administrations produced a swarm of pamphlets. Many mentions of him will be found in the correspondence of Nelson.

(D. H.)

ST VINCENT, one of the British Windward Islands in the West Indies, lying about 13 15′ N., 6i° 10′ W., west of Barbados andsouth of St Lucia. It is about 18 m.long by n in extreme width, and has an area of 140 sq. m. A range of volcanic hills forms the backbone of the island; their slopes and spurs are beautifully wooded, and the valleys between the spurs are fertile and picturesque. The culminating point is the volcano called the Soufriere (3500 ft.) in the north, the disastrous eruption of which in May 1902 devastated the most fertile portion of the island, a comparatively level tract lying to the north, called the Carib Country (see below). The climate of St Vincent is fairly healthy and in winter very pleasant; the average annual rainfall exceeds 100 in., and the temperature ranges from 88° F. in August to 66° in December and January. Hurricanes are not uncommon.

The capital of the island is Kingstown, beautifully situated on the

south-west coast near the foot of Mount St Andrew (2600 ft.).

The population of the island in 1891 was 41,054 (2445 white, 7554 coloured, 31,055 black); in 1906 it was estimated at 44,000. There were about 3300 East Indian coolies, a large number of whom were introduced in 1861 and following years, but on the expiry of their indentures mostly returned home; there were also a few Caribs of mixed blood, the majority of the aboriginal Caribs having been deported to British Honduras in 1797. Kingstown has a population of about 4000. The principal products of the island are sugar (but the sugar-industry has here, as elsewhere, undergone various vicissitudes), arrowroot and rum; and the cultivation of Sea Island cotton, introduced about 1903, has been successfully de- veloped by the government, which established a ginnery at Kings- town. Other articles of export are cacao, cotton, spices, fruit, vegetables, live stock and poultry. The average annual value of exports in 1896-1906 was £63,157 (in 1903-1904, the year following that of the great eruption.it was £38,174, and in 1905-1906 it was £53. 7 8) and of imports, £80,467. In 1905-1906 the value of im- ports from the United Kingdom was £25,471, and that of exports to the United Kingdom £24,405.

The present constitution dates from 1877, when the legislative council, consisting of four official and four nominated unofficial members, was formed. In 1899 an important scheme was entered upon, by means of a grant of £15,000 from the Imperial treasury, for settling the labouring population, distressed by the failures of the sugar industry, in the position of peasant proprietors. Estates were acquired from private owners for this purpose, and besides this a number of small holdings on crown lands (which are situated mainly in the high-lying central parts of the island) have been sold. Educa- tion is carried on in 27 state-aided schools, and there are at Kings- town a grammar school and an agricultural school. The Anglican, Wesleyan and Roman Catholic churches are well represented, and there are some Presbyterians.

St Vincent is generally stated to have been discovered on St Vincent's day, the 22nd of January 1498 by Columbus. Its Carib inhabitants, however, remained undisturbed for many years. In 1627 Charles I. granted the island to the earl of Carlisle; in 1672 it was re-granted to Lord Willoughby, having been previously (1660) declared neutral. In 1722 a further grant of the island was made, to the duke of Montague, and now for the first time a serious effort at colonization was made, but the French insisted on the maintenance of neutrality, and this was confirmed by the treaty of Aix-la-Chapelle (1748). In 1762, however,

General Monckton captured the island; the treaty of Paris in 1763 confirmed the British possession, and settlement proceeded in spite of the refusal of the Caribs to admit British sovereignty. Recourse was had to arms, and in 1773 a treaty was concluded with them, when they were granted lands in the north of the island as a reserve. In 1779 the island was sur- rendered to the French, but it was restored to Britain by the treaty of Versailles (1783). In 1795 the Caribs rose, assisted by the French, and were only put down after considerable fighting by Sir Ralph Abercromby in 1796, after which the majority of them were deported. The emancipation of negro slaves in the island took place in 1838; in 1846 the first Portu- guese labourers were introduced, and in 1861 the first East Indian coolies. St Vincent suffered from a terrific hurricane in 1780, and the Soufriere was in eruption in 1821. Severe distress was occasioned by the hurricane of the nth of September 1898, from which the island had not recovered when it was visited by the eruption of the Soufriere in 1902. This eruption was synchronous with that of Mont Pele in Martinique (q.v.). There had been signs of activity, since February 1901, but the most serious eruption took place on the 6th/7th of May 1902. There were earthquakes in the following July, and further eruptions on the 3rd of September and the 15th of October, and on the 22nd of March 1903. Many sugar and arrowroot plantations were totally destroyed, and the loss of life was estimated at 2000. A Mansion House Fund was at once started in London for the relief of the sufferers, and subscriptions were sent from all parts of the civilized world, and notably from the United States.

ST VINCENT, BATTLE OF, fought on the 14th of February 1797, between the British and Spanish fleets, the most famous and important of many encounters which have taken place at the same spot. The battle of 1797 is of peculiar significance in British naval history, not only because it came at a vital moment,

but because it first revealed the full capacity of Nelson, which was well known in the navy, to all his countrymen. In the course of 1796 the Spanish government had made the disastrous alliance with the French republic, which reduced its country to the level of a pawn in the game against England. The Spanish fleet, which was in a complete state of neglect, was forced to sea. It consisted of 27 sail of the line under the command of Don Jose de Cordoba — fine ships, but manned in haste by drafts of soldiers, and of landsmen forced on board by the

press. Even the flagships had only about eighty sailors each in their crews. Don Jose de C6rdoba, who had gone out with no definite aim, was in reality drifting about with his unmanageable ships in two confused divisions separated from one another, in light winds from the W. and W.S.W., at a distance of from 25 to 30 m. S.W. of the Cape. While in this position he was sighted by Sir John Jervis, of whose nearness to himself he was ignorant, and who had sailed from Lisbon to attack him with only 15 sail of the line. Jervis knew the inefficient condition of the Spaniards, and was aware that the general condition of the war called for vigorous exertions. He did not hesitate to give battle in spite of the numerical superiority of his opponent. Six of the Spanish ships were to the south of him, separated by a long interval from the others which were to the south west. The British squadron was formed into a single line ahead, and was steered to pass between the two divisions of the Spaniards. The six vessels were thus cut off. A feeble attempt was made by them to molest the British, but being now to leeward as Jervis passed to the west of them, and being unable to face the rapid and well directed fire to which they were exposed, they sheered off. One only ran down the British line, and passing to the stern of the last ship succeeded in joining the bulk of her fleet to windward. As the British line passed through the gap between the Spanish divisions the ships were tacked in succession to meet the wind- ward portion of the enemy. If this movement had been carried out fully, all the British ships would have gone through the gap and the Spaniards to windward would have been able to steer unimpeded to the north, and perhaps to avoid being brought to a close general action. Their chance of escape was baffled by the independence and promptitude of Nelson. His ship, the ” Captain ” (74), was the third from the end of the British line. Without waiting for orders he made a sweep to the west, threw himself across the bows of the Spaniards. His movement was seen and approved by Jervis, who then ordered the other ships in his rear to follow Nelson’s example. The British force was thrown bodily on the enemy. As the Spanish crews were too utterly unpractised to handle their ships, and could not carry out the orders of their officers which they did not understand, their ships were soon driven into a herd, and fell on board of one another. Their incompetence as gunners enabled the ” Captain ” to assail their flagship, the huge ” Santisima Trinidad ” (130), with comparative impunity. The ” San Josef ” (112), and the ” San Nicolas ” (80), which fell aboard of one another, were both carried by boarding by the ” Captain.” Four Spanish ships, the ” Salvador del Mundo ” and ” San Josef ” (112), the ” San Nicolas ” (80), and the ” San Isidro ” (74), were taken. The ” Santisima Trinidad ” is said to have struck, but she was not taken possession of. By about half-past three the Spaniards

were fairly beaten. More prizes might have been taken, but Sir John Jervis put a stop to the action to secure the four which had surrendered. The Spaniards were allowed to retreat to Cadiz. Sir John Jervis was made Earl St Vincent (g.v.) for his victory. The battle, which revealed the worthlessness of the Spanish navy, relieved the British government from a load of anxiety, and may be said to have marked the complete predominance of its fleet on the sea.

Authorities. — A very interesting account of the battle of Cape St Vincent, A Narrative of the Proceedings of the British Fleet, &c. (London, 1797), illustrated by plans, was published immediately afterwards by Colonel Drinkwater Bethune, author of the History of the Siege of Gibraltar, who was an eyewitness from the ” Lively ” frigate. See also James’s Naval History (London, 1837); and Captain Mahan, The Influence of Sea Power on the French Revolution and Empire (London, 1892). (D. H.)

ST VITUS’S DANCE, 1 or Chorea, a disorder of the nervous system occurring for the most part in children, and characterized mainly by involuntary jerking movements of the muscles throughout almost the entire body (see Neuropathology). Among the predisposing causes age is important, chorea being essentially an ailment of childhood and particularly during the period of the second dentition between the ages of nine and twelve. It is not often seen in very young children nor after puberty; but there are many exceptions. It is twice as frequent with girls as with boys. Hereditary predisposition to nervous troubles is apt to find expression in this malady, especially if the general health becomes lowered. Of exciting causes strong emotions, such as fright, ill-usage or hardship of any kind, insufficient feeding, overwork or anxiety, are among the most common; while, again, some distant source of irritation, such as teething or intestinal worms, appears capable of giving rise to an attack. It is an occasional but rare complication of pregnancy. The connexion of chorea with rheumatism is now universally recog- nized, and is shown not merely by its frequent occurrence before, after or during the course of attacks of rheumatic fever in young persons, but even independently of this by the liability of the heart to suffer in a similar way in the two diseases. Poynton and Paine have demonstrated a diplococcus, which they regard as the specific micro-organism of rheumatism, and which has been found in the lymph spaces in the cortex in chorea. An attempt has recently been made to demonstrate the infectious nature of the chorea.

The symptoms of St Vitus’s dance sometimes develop suddenly as the result of fright, but much more frequently they come on insidiously.

They are usually preceded by changes in disposition, the child becoming sad, irritable and emotional, while at the same time the general health is somewhat impaired. The first thing indicative of the disease is a certain awkwardness or fidgetiness of manner together with restlessness. In walking, too, slight dragging of one limb may be noticed. The convulsive muscular movements usually first show themselves in one part, such as an arm or a leg, and in some instances they may remain localized to that limited extent, while in all cases there is a tend- ency for the disorderly symptoms to be more marked on one side than on the other. When fully developed the phenomena of the disease are very characteristic. The child when standing or sitting is never still, but is constantly changing the position of the body or limbs or the facial expression in consequence of the sudden and incoordinate action of muscles or groups of them. These symptoms are aggravated when purposive move- ments are attempted or when the child is watched. Speech is affected both from the incoordinate movements of the tongue and from phonation sometimes taking place during an act of inspiration. The taking of food becomes a matter of difficulty, since much of it is lost in the attempts to convey it to the mouth, while swallowing is also interfered with owing to the' irregular action of the pharyngeal muscles. When the tongue is protruded it comes out in a jerky manner and is immediately withdrawn, the jaws at the same time closing suddenly and sometimes with considerable force. In locomotion the muscles of the limbs act incoordinately and there is a marked alteration of the gait, which is now halting and now leaping, and the child may be tripped by one limb being suddenly jerked in front of the other. In short, the whole muscular system is deranged in its operations, and the term " insanity of the muscles " not inaptly expresses the condition, for they no longer act in harmony or with purpose, but seem, as Trousseau expresses it, each to have a will of its own. The muscles of organic life (involuntary muscles) appear scarcely,

1 This name was originally employed in connexion with those remarkable epidemic outbursts of combined mental and physical excitement which for a time prevailed among the inhabitants of some parts of Germany in the middle ages. It is stated that sufferers from this dancing mania were wont to resort to the chapels of St Vitus (more than one in Swabia), the saint being believed to possess the power of curing them. The transference of the name to the disease now under consideration was a manifest error, but so closely has the association now become that the original application of the term hat. been comparatively obscured.

if at all, affected in this disease, as, for example, the heart, the rhythmic movements of which are not as a rule impaired. But the heart may suffer in other ways, especially from inflammatory conditions similar to those which attend upon rheumatism and which frequently lay the foundation of permanent heart-disease. In severe cases of St Vitus's dance the child comes to present a distressing appearance, and the physical health declines. Usually, however, there is a remission of the symptoms during sleep. The mental condition of the patient is more or less affected, as shown in emotional tendencies, irritability and a somewhat fatuous expression and bearing, but this change is in general of transient character and ceases with convalescence.

This disease occasionally assumes a very acute and aggravated form, in which the disorderly movements are so violent as to render the patient liable to be injured, and to necessitate forcible control of the limbs, or the employment of anaesthetics to produce unconsciousness. Such cases are of very grave character, if, as is common, they are accompanied with sleeplessness, and they may prove rapidly fatal by exhaustion. In the great majority of cases, however, complete recovery is to be anticipated sooner or later, the symptoms usually continuing for from one to two months, or even sometimes much longer.

The remedies proposed have been innumerable, but it is doubtful whether any of them has much control over the disease, which under suitable hygienic conditions tends to recover of itself. These conditions, however, are all-important, and embrace the proper feeding of the child with nutritious light diet, the absence of all sources of excitement and annoyance, and the rectification of any causes of irritation and of irregularities in the general health. For a time, and especially if the symptoms are severe, confinement to the house or even to bed may be necessary, but as soon as possible the child should be taken out into the open air and gently exercised by walking. Ruhrah, recognizing the importance of rest, recom- mends a modified Weir-Mitchell treatment. Of medicinal remedies the mst serviceable appear to be zinc, arsenic and iron, especially the last two, which act as tonics to the system and improve the condition of the blood. In view of the connexion of chorea with rheumatism, Koplik and Dr D. B. Lees recommend salicylate of soda in large doses. Recently ergot, hot packs and mcnobromate of camphor have found advocates, while cessation of the movements has followed, the application of an ether spray to the spine twice daily. As sedatives in cases of sleeplessness, bromide of potassium and chloral are of use. In

long-continued cases of the disease much benefit will be obtained by a change of air as well as by the employ- ment of moderate gymnastic exercises. The employment of massage and of electricity is also likely to be beneficial. After recovery the general health of the child should for a long time receive attention, and care should be taken to guard against excitement, excessive study or any exhausting condition, physical or mental, from the fact that the disease is apt to recur, and that other nervous disorders still more serious may be developed from it.

In the rare instances of the acute form of this malady, where the convulsive movements are unceasing and violent, the only measures available are the use of chloral or chloroform inhalation to produce insensibility and muscular relaxation, but the effect is only palliative.

SAINT-WANDRILLE, a village of north-western France, in the department of Seine-Inferieure, 28 m. W.N.W. of Rouen by rail. It is celebrated for the ruins of its Benedictine abbey. The abbey church belongs to the 13th and 14th centuries; portions of the nave walls supported by flying buttresses are standing, and the windows and vaulting of the side aisles are in fair preservation. The church communicates with a cloister, from which an interesting door of the Renaissance period opens into the refectory. Beside this entrance is a richly ornamented lavabo of the Renaissance period. The refectory is a room over 100 ft. long, lighted by graceful windows of the same period. The abbey was founded in the 7th century by St Wandrille, aided by the donations of Clovis II. It soon became renowned for learning and piety. In the 13th century it was burnt down, and the rebuilding was not completed till the beginning of the 16th century. Later in the same century it was practically destroyed by the Huguenots, and again the restoration was not finished for more than a hundred years. The demolition of the church was begun at the time of the Revolution, but proceeded slowly and in 1832 was entirely stopped.

SAINT YON, a family of Parisian butchers in the 14th and 15th century. Guillaume de Saint Yon is cited as the richest butcher of the Grande Boucherie in the 14th century. The

family played an important r61e during the quarrels of the Armagnacs and Burgundians. They were among the leaders of the Cabochian revolution of 1413. Driven out by the Armagnacs, they recovered their influence after the return of the Burgundians to Paris in 141 8, but had to flee again in 1436 when the constable, Arthur, earl of Richmond, took the city. Gamier de Saint Yon was ichevin of Paris in

1413 and 1419; Jean de Saint Yon, his brother, was valet de ckambre of the dauphin Louis, son of King Charles VI. Both were in the service of the king of England during the English domination. Richard de Saint Yon was master of the butchers of the Grande Boucherie in 1460.

See A. Langnon, Paris pendant la domination anglaise (Paris, 1878) ; A. Colville, Les Cabochiens el Vordonnance de 1413.

ST YRIEIX, a town of west central France, capital of an arrondissement in the department of Haute-Vienne, on the left bank of the Loue, 26 m. S. of Limoges on the railway to Brive. Pop. (1906) town 3604, commune 7916. The town possesses a church in the early Gothic style known as Le Moutier, dating from the 12th and 13th centuries, and a tower of the 12th century which is a relic of its fortifications. Its quarries of kaolin discovered in 1765 were the first known in France. The town owes its name to Aredius (popularly St Yrieix) who in the 6th century founded a monastery to which its origin was due.

SAIS (Egyptian Sai), an ancient city of the Egyptian Delta, lying westward of the Thermuthiac or Sebennytic branch of the Nile. It was Capital of the 5th nome of Lower Egypt and must have been important from remote times. In the 8th century B.C. Sais held the hegemony of the Western Delta, while Bubastite families ruled in the east and the kings of Ethiopia in Upper Egypt. The Ethiopians found their most vigorous opponents in the Saite princes Tefnachthus and his son Bocchoris ” the Wise ” of the XXIVth Dynasty. After reigning six years the latter is said to have been burnt alive by Sabacon, the founder of the Ethiopian XXVth Dynasty. At the time when invasions by the Assyrians drove out the Ethiopian Taracus again and again, the chief of the twenty princes to whom Esarhaddon and Assur-bani-pal successively entrusted the government was Niku, king of Sais and Memphis. His son Psammetichus (q.v.) was the fdunder of the XXVI th Dynasty. Although the main seat of government was at Memphis, Sais remained the royal residence throughout this flourishing dynasty. Neith, the goddess of Sais, was identified with Athena, and Osiris was worshipped there in a great festival.

The brick enclosure wall of the temple is still plainly visible near the little village of Sa el hagar (Sa of stone) on the east bank of the Rosetta branch, but the royal tombs and other monuments of Sais, some of which were described by Herodotus, and its inscribed records, have all gone. Only crude brick ruins and rubbish heaps remain on the site, but a few relics conveyed to Alexandria and Europe in the Roman age have come down to our day, notably the inscribed statue of a

priest of Neith who was high in favour with Psam- metichus III., Cambyses and Darius. Bronze figures of deities are now the most interesting objects to be found at Sa el hagar.

(F. Ll. G.)

SAISSET, BERNARD (d. c. 1314), French bishop, was abbot of Saint Antonin de Pamiers in 1268. Boniface VIII., detaching the city of Pamiers from the diocese of Toulouse in 1295, made it the seat of a new bishopric and appointed Saisset to the see. Of a headstrong temperament, Saisset as abbot energetically sustained the struggle with the counts of Foix, begun two centuries before, for the lordship of the city of Pamiers, which had been shared between the counts and abbots by the feudal contract of pariage. The struggle ended in 1297 by an agree- ment between the two parties as to their common rights, and when the pope raised the excommunication incurred by the count, Saisset absolved him in the refectory of the Dominican monastery in Pamiers (1300). Saisset is, however, famous in French history for his opposition to King Philip IV. As an ardent Languedocian he hated the French, and spoke openly of the king in disrespectful terms. But when he tried to organize a general rising of the south, he was denounced to the king, perhaps by his old enemies the count of Foix and the bishop of Toulouse. Philip IV. charged Richard Leneveu, archdeacon of Auge in the diocese of Lisieux, and

Jean de Picquigni, vidame of Amiens, to make an investigation, which lasted several months. Saisset was on the point of escaping to Rome when the vidame of Amiens surprised him by night in his episcopal palace. He was brought to Senlis, and on the 24th of October 1301 appeared before Philip and his court. The chancellor, Pierre Flotte, charged him with high treason, and he was placed in the keeping of the archbishop of Narbonne, his metropolitan. Philip IV. tried to obtain from the pope the canonical degradation of Saisset. Boniface VIII., instead, ordered the king in December 1301 to free the bishop, in order that he might go to Rome to justify himself. At the same time, he sent the famous bulls Salvator mundi, a sort of repetition of Clericis laicos, and Ausculla fili, which opened a new stage of the quarrel between the pope and king. In the heat of the new struggle Saisset was forgotten. He had been turned over in February 1302 into the keeping of Jacques des Normands, the papal legate, and was ordered to leave the kingdom at once. He lived at Rome until after the incident at

Anagni. In 1308 the king pardoned him, and restored him to his see. He died, still bishop of Pamiers, about 1314.

There is no proof for the legend that Bernard Saisset earned Philip IV. ‘s hatred in 1 300-1 301 by boldly sustaining the pope’s demand for the liberation of the count of Flanders, and by publicly proclaiming the doctrine of papal supremacy.

See Dom Vaissete, Histoire generate de Languedoc, ed. Privat, t. ix. pp. 216-310; Histoire litteraire de la France, t. xxvi. pp. 540-547; E. de RoziSre, Le Passage de Pamiers, in Bibliotheque de l’Ecole des Chartes (1871) ; Ch. V. Langlois in Lavisse’s Histoire de France, t. i£I. . pt. ii., pp. 142-146.

SAISSET, EMILE EDMOND (1814-1863), French philosopher, was born at Montpellier on the 16th of September 1814, and died at Paris on the 17th of December 1863. He studied philosophy in the school of Cousin, and carried on the eclectic tradition of his master along with Ravaisson and Jules Simon. He was professor of philosophy at Caen, at the Ecole Normale in Paris and later at the Sorbonne.

His chief works are a monograph on Aenesidemus the Sceptic (1840); Le Scepticisme: Mnesidkme, Pascal, Kant (1845); a trans- lation of Spinoza (1843); Precurseurs et disciples de _ Descartes (1862); Discours de la philosophie de Leibnitz (1857) — a work which had great influence on the progress of thought in France; Essai de philosophie religieuse (1859) ; Critique et histoire de la philosophie{i86ˆ).

SAKA, or Shaka, the name of one or more tribes which invaded India from Central Asia. The word is used loosely, especially by Hindu authors, to designate all the tribes which from time to time invaded India from the north, much as all the tribes who invaded China are indiscriminately termed Tatars. Used more accurately, it denotes the tribe which invaded India 130-140 B.C. They are the Sacae and Sakai of classical authors and the Se of the Chinese, which may represent an original Sek or Sok. The Chinese annalists state that they were a pastoral people who lived in the neighbourhood of the modern Kashgar. About 160 B.C. they were driven southward by the advance of the Yue-Chi from the east. One portion appears to have settled in western Afghanistan, hence called Sakasthana, in modern Persian Sejistan. The other section occupied the Punjab and possessed themselves of the territory which the Graeco-Bactrian kings had acquired in India, that is Sind, Gujarat and Malwa. The rulers of these provinces bore the title of Satrap (Kshatrapa or Chhatrapa) and were

apparently subordinate to a king who ruled over the valley of Kabul and the Punjab. In 57 B.C. the Sakas were attacked simultaneously by Parthians from the west and by the Malava clans from the east and their power was destroyed. It should be added that what we know of Saka history is mostly derived from coins and inscriptions which admit ,of various interpretations and that scholars are by no means agreed as to names and. dates. In any case their power, if it lasted so long, must have been swept away by the Kushan conquest of Northern India.

Nothing is known of the language or race of the Sakas. Like most of the invaders of India at this period they adopted Buddhism, at least partially. They can be traced to the neigh- bourhood of Kashgar, but not like the Yue-Chi to the frontiers of China. They may have been Turanians akin to that tribe.

or they may have been Iranians akin to the Iranian element in Transoxiana and the districts south of the Pamirs. They cannot be the same as the Scythians of Europe, though the name and original nomadic life are points in common.

See Vincent Smith, Early History of India (1908) ; O. Franke, Beitrdge aus chinesischen Quellen zur Kenntnis der Turkvolker und Skythen (1904) ; P. Gardner, Coins of Greek and Scythian Kings in India (1886); and various articles by Vincent Smith, Fleet, Cunningham, A Stein, Sylvain Levi and others in the Journal of the Royal Asiatic Society, Journal asiatique, Indian Antiquary, Zeitsch. der Deutschen Morgenldndischen Gesellschaft, &c. (C. El.)

SAKAI, an aboriginal people of the Malay peninsula found chiefly in south Perak, Selangor and Pahang. Representatives are widely scattered among Malayan villages, but these are so crossed with the Malays as to be no longer typical. An attempt has been made to identify the Sakai with the Mon-Annam group of races, i.e. the tribes which till 600 years ago possessed what is now Siam, and some of whom still occupy Pegu and Cambodia. Professor Virchow suggested that the Sakai belong to what he calls the Dravido-Australian race, the chief representatives of which he finds in the Veddahs of Ceylon, the civilized Tamils of south India and the aborigines of Australia. In essential characteristics of hair and head there is a remarkable agreement. The difficulty in accepting the theory is in the colour of the skin, • which among the Sakais is often a light shade of yellowish brown, whereas among Tamils black is the prevailing colour. Vijchow meets this by pointing out that Sinhalese, though admittedly Aryans, are often so dark as to be practically black. The Sakais are, however, it

is now generally held, kinsmen of their Negrito neighbours, the Semangs (q.v.), and are, like the latter, dwarfish, seldom exceeding 4 ft. 9 in. Their skins are usually a darkish brown, but showing a reddish tinge about the breast and extremities. The head is long, and the hair a black brown, rather wavy then woolly. The face inclines to be long, and would be hatchet-shaped but for the breadth of the cheek bones. The chin is long and pointed, the forehead high and flat, the brows often beetling. The nose is small, slightly tilted or rounded off at the tip, but broad and with deep-set nostrils. The beard is usually scanty. The arm-stretch is almost always greater than their height. Their food is varied; the wilder tribes living on jungle fruits and game they hunt with the blow- pipe, while the more civilized grow yams, sweet potatoes, maize, sugar cane, rice and tapioca. The Sakai blow-pipe is a tube 6 to 8 ft. long formed of a single joint of a rare species of bamboo (Bambusa Wrayi). This tube is inserted into another for protec- tion. The darts are made of fine slivers from the mid-rib of the leaf of certain palms, and are about the size of a knitting needle. The point is usually coated with poison compounded from the sap of the Upas tree (Antiaris toxicaria) and of a species of strychnos. Each dart is carried in a separate reed, thirty to fifty of these latter being rolled up and carried in a bamboo quiver. The Sakais can kill at thirty paces with these blow-pipes. They are nomads, building mere leaf-shelters in or under the trees. Their dress is of bark-cloth and they scar their faces, as do the Semangs. They are skilful in mat-making and basket- work, but they have no kind of weaving or pottery. They are musical, using a rough lute of bamboo and a nose-flute, and they sing well in chorus. They have in common with the Semangs curious marriage ceremonies. The dead are slung from a pole and carried to a distant spot in the jungle. Here, wrapped in new bark-cloth, the body is buried in a shallow trench, the clothes worn by the deceased being burned in a fire lighted near, the grave. When filled up, rice is sown on the grave and watered, and some herbs and bananas are planted round it for the soul to feed on. Afterwards a three-cornered hutch, not unlike a doll's-house but mounted on high piles, is built at the foot, in which the soul may live. This soul-house is about ij ft. high, is thatched with leaves and has a ladder by which the soul can climb in.

SAK£, the national beverage of Japan. In character it stands midway between beer and wine. It is made chiefly from rice (see Brewing). Sake contains 12 to 15% of alcohol and about 3% of solid matter (extractives), 0-3% of lactic

acid, a small quantity of volatile acid, 0-5 % of sugar and o-8 % of glycerin. There are about 20,000 sake breweries in Japan, and the annual output is about 150 million gallons. Sake is a yellowish-white liquid, its flavour somewhat resembling that of madeira or sherry. It is warmed prior to consumption, as the flavour is thereby improved and it is rendered more digestible. The name is said to be derived from the town of Osaka which, from time immemorial, has been famous for its sake. According to Morewood it is probable that the wine called ” sack ” in England derived its name from the Japanese liquor, being introduced by Spanish and Portuguese traders (see Wine).

SAKHALIN, or Saghalien, a large elongated island in the North Pacific, lying between 45 57′ and 54° 24′ N., off the coast of the Russian Maritime Province in East Siberia, divided between the Russian and Japanese empires. Its proper Ainu name, Karafuto or Karaftu, has been restored to the island by the Japanese since 1905. Sakhalin is separated from the mainland by the narrow and shallow Strait of Tartary or Mamiya Strait, which often freezes in winter in its narrower part, and from Yezo (Japan) by the Strait of La Perouse. The island is 600 m. long, and 16 to 105 broad, with an area of 24,560 sq. m.

Its orography and geological structure are imperfectly known. Two, or perhaps three, parallel ranges of mountains traverse it from north to south, reaching 2000 to 5000 ft. (Mt. Ichara, 4860 ft.) high, with two or more wide depressions, not exceeding 600 ft. above the sea. Crystalline rocks crop out at several capes; Cretaceous lime- stones, containing an abundant and specific fauna of gigantic ammonites, occur at Dui on the west coast, and Tertiary conglomer- ates, sandstones, marls and clays, folded by subsequent upheavals, in many parts of the island. The clays, which contain layers of good coal and an abundant fossil vegetation, show that during the Miocene period Sakhalin formed part of a continent which com- prised north Asia, Alaska and Japan, and enjoyed a comparatively warm climate. The Pliocene deposits contain a mollusc fauna more arctic than that which exists at the present time, indicating probably that the connexion between the Pacific and Arctic Oceans was broader than it is now. Only two rivers are worthy of mention. The Tym, 250 m. long and navigable by rafts and light boats for 50 m., flows north and north-east with numerous rapids and shallows, and enters the Sea of Okhotsk. The Poronai flows south-south-east to the Gulf of Patience or Shichiro Bay, on the south-east coast. Three other small streams enter the wide semicircular Gulf of Aniva or Higashifushimi Bay at the southern extremity of the island.

Owing to the influence of the raw, foggy Sea of Okhotsk, the climate is

very cold. At Dui the average yearly temperature is only 33-o°Fahr. (January 3-4°; July 6l-o°), 35-0° at Kusunai and 37-6° at Aniva (January, 9-5; July, 6o-2°). At Alexandrovsk near Dui the annual range is from 81 in July to -38° in January, while at Rykovsk in the interior the minimum is -49° Fahr. The rainfall averages 22J in. Thick clouds for the most part shut out the sun; while the cold current from the Sea of Okhotsk, aided by north-east winds, brings immense ice-floes to the east coast in summer. The whole of the island is covered with dense forests, mostly coniferous. The Ayan spruce (Abies ayanensis), the Sakhalin fir (Abies sachalensis) and the Daurian larch are the chief trees; on the upper parts of the mountains are the Siberian rampant cedar (Cembra pumila) and the Kurilian bamboo (Arundinaria kurilense). Birch, both European and Kamchatkan (Betula alba and B. Ermani), elder, poplar, elm, wild cherry (Prunus padus), Taxus baccata and several willows are mixed with the conifers; while farther south the maple, mountain ash and oak, as also the Japanese Panax ricinifolium, the Amur cork (Philodendron amurense), the spindle tree (Euonymus macropterus) and the vine (Vitis thunbergii) make their appearance. The under- woods abound in berry-bearing plants (e.g. cloudberry, cranberry, crowberry, red whortleberry), berried elder (Sambucus racemosa), wild raspberry and Spiraea. Bears, foxes, otters and sables are numerous, as also the reindeer in the north, and the musk deer, hares, squirrels, rats and mice everywhere. The avi-fauna is the common Siberian, and the rivers swarm with fish, especially species of salmon (Oncorhynchus). Numerous whales visit the sea-coast. Sea-lions, seals and dolphins are a source of profit.

Sakhalin was inhabited in the Neolithic Stone Age. Flint implements, exactly like those of Siberia and Russia, have been found at Dui and Kusunai in great numbers, as well as polished stone hatchets, like the European ones, primitive pottery with decorations like those of Olonets and stone weights for nets. Afterwards a population to whom bronze was known left traces in earthen walls and kitchen-middens on the Bay of Aniva. The native inhabitants consist of some 2000 Gilyaks, 1300 Ainus, with 750 Orochons, 200 Tunguses and Some Yakuts. The Gilyaks in the north support themselves by fishing and hunting.

The Ainus inhabit the south part of the island. There are also 32,000 Russians, of whom over 22,150 are convicts. A little coal is mined and some rye, wheat, oats, barley and vegetables are grown, although the period during which vegetation can grow averages less than 100 days. Fishing is actively prosecuted, especially by the Japanese in the south.

History. — Sakhalin, which was under Chinese dominion until the 19th century, became known to Europeans from the travels of Martin

Gerritz de Vries in the 17th century, and still better from those of La Perouse (1787) and Krusenstern (1805). Both, however, regarded it as a peninsula, and were unaware of the existence of the Strait of Tartary, which was discovered in 1809 by a Japanese, Mamiya Rinzo. The Russian navigator Nevelskoi in 1849 definitively established the existence and navigability of this strait. The Russians made their first permanent settle- ment on Sakhalin in 1857; but the southern part of the island was held by the Japanese until 1875, when they ceded it to Russia. By the treaty of Portsmouth (U.S.A.) of 1905 the southern part of the island below 50 N. was re-ceded to Japan, the Russians retaining the other three-fifths of the area.

See C. H. Hawes, In the Uttermost East (London, 1903).

(PA. K.; J. T. Be.)

SAKI, the native name of a group of tropical American monkeys nearly allied to those known as uakaris (see Uakari), with which they agree in the forward inclination of the lower incisor teeth, the depth of the hinder part of the lower jaw, and the non-prehensile tail. The sakis, which form the genus Pithecia, are specially characterized by their long and generally bushy tails, distinct whiskers and beard, and the usually elon- gated hair on the crown of the head, which may either radiate from a point in the centre, or be divided by a median parting. They are very delicate animals, difficult to keep in confinement, and in that state exhibiting a gentle disposition, and being normally silent (see Primates).

SAKURA-JIMA, a Japanese island, oval in shape and measur- ing 7 m.by 5 m., lying in the northern part of the Bay of Kagoshima (31 40′ N., 130° 35′ E.). It has a volcano 3743 ft. high (of which an eruption was recorded in 1779), and is celebrated for its hot springs, its oranges and its giant radishes (daikon), which some- times weigh as much as 70 lb.

SALA, GEORGE AUGUSTUS HENRY (1828-1895), English journalist, was born in London, on the 24th of November 1828. His father, Augustus John James Sala (1792-1828), was the son of Claudio Sebastiano Sala, an Italian, who came to London to arrange ballets at the theatres; his mother, Henrietta Simon (1789-1860), was an actress and teacher of singing. Sala was at school in Paris and studied drawing in London. In his earlier years he did odd jobs in scene-painting and book illustration. He wrote a tragedy in French, Fredigonde, before he was ten years old, and in 1851 attracted the attention of Charles Dickens, who published articles and stories by

him in Household Words and All the Year Round, and in 1856 sent him to Russia as a special correspondent. About the same time he got to know Edmund Yates, with whom, in his earlier years, he was constantly connected in his journalistic ventures. From i860 to 1886, over his own initials, he wrote ” Echoes of the Week ” for the Illustrated London News. Afterwards they were continued in a syndicate of weekly newspapers almost to his death. Thackeray, when editor of the Cornhill, published articles by him on Hogarth in i860, which were issued in volume form in 1866. In i860 he started Temple Bar, which he edited till 1866 when the magazine was taken over by Messrs Bentley. Mean- while he had become in 1857 a contributor to the London Daily Telegraph, and it was in this capacity that he did his most, characteristic work, whether as a foreign correspondent in all parts of the world, or as a writer of leaders or special articles. His literary style was highly coloured, bombastic, egotistic and full of turgid periphrases, but his articles were invariably full of interesting matter and helped to make the reputation of the paper. He collected a large library and had an elaborate system of commonplace-books, so that he could bring into his articles enough show or reality of special information to make

excellent reading for a not very critical public; he had an extraordinary faculty for never saying the same thing twice in the same way. He earned a large income from the Telegraph and other sources, but he never could keep his money. In 1863 he started on his first tour as special foreign correspondent to his paper. He spent the year 1864 in America and published a Diary of the war. Expeditions to Algiers, to Italy during Garibaldi’s 1866 campaign, to Metz during the Franco-German war, to Spain in 1875 at the end of the Carlist war, were among his early journalistic enterprises, the long list of which closed with his journey through America and Australia in 1885. In 1892, when his reputation was at its height, he started a weekly paper called Sala’s Journal, but it was a disastrous failure; and in 1895 he had to sell his library of 13,000 volumes. Lord Rosebery gave him a civil list pension of £100 a year, but he was a broken-down man, and he died at Brighton on the 8th of December 1895. Sala published many volumes of fiction, travels and essays, and edited various other works, but his metier was that of ephemeral journalism.

See The Life and Adventures of George Augustus Sala, written by himself (2 vols., 1895).

SALAAM (Arab, salam, “peace”), the Oriental term for a salutation. The word is used for any act of salutation, as of an ambassador to a monarch, and so in a secondary sense of a compliment. Properly it is the oral salutation of Mahommedans to each other; but it has acquired the special meaning of an act of obeisance.

SALAD (Med. Lat. salata, salted, pickled, salare, to sprinkle with salt), a dish, originally dressed with salt, of green uncooked herbs, such as lettuce, endive, mustard, cress, &c, usually served with a flavouring of onion, garlic or leeks, and with a dressing of vinegar, oil, mustard, pepper and salt, or with a cream, for which there are many receipts; hard-boiled eggs, radishes and cucumber are also added.

SALADE, Sallet or Salet, a head-piece introduced in the early 15th century replacing the heavy helmet. Its essential features are its smooth rounded surface, like an inverted bowl, and its long projecting neck guard. Usually there was no movable vizor, but the front fixed part covered most of the face, a slit being left for the eyes. The word is said to come through the Old Fr. from the Span, celada, Ital. celata, Lat. caelata, sc. cassis, engraved helmet, caelare, to engrave, chase (see Helmet).

SALADIN (Arab. Sala-ud-din, ” Honouring the Faith”) (1138- 1193), first Ayyubite sultan of Egypt, was born at Tekrit in 1 138. The brilliance of his career was only made possible by the condition of the East in the 1 2th century. Such authority as remained to the orthodox caliph of Bagdad (see Caliphate) or the heretical Fatimites (q.v.) of Cairo was exercised by their viziers. The Seljukian empire had, after 1076, been divided and subdivided among Turkish atabegs. The Latin kingdom of Jerusalem had existed since 1089 only because it was a united force in the midst of disintegration. Gradually, however, Christian enthusiasm had aroused a counter enthusiasm among the Moslems. Zengi, atabeg of Mosul, had inaugurated the sacred war by his campaigns in Syria (1137-1146). Nur-ed-din, his son, had continued his work by further conquests in Syria and Damascus, by the organization of his conquered lands, and, in 1157, by ” publishing everywhere the Holy War.” The opportunity of Saladin lay therefore in the fact that his lifetime covers the period when there was a conscious demand for political union in the defence of the Mahommedan faith. By race Saladin was a Kurd of Armenia. His father, Ayyub (Job), and his uncle Shirkuh, sons of a certain Shadhy of Ajdanakan near Dawin, were both generals in Zengi’s army. In 1139 Ayyub received Baalbek from Zengi, in 1146 he moved, on Zengi’s death, to the court of Damascus. In 1154 his influence secured Damascus to Nur-ed-din and he was made governor. Saladin was

therefore educated in the most famous centre of Moslem learning, and represented the best traditions of Moslem culture.

His career falls into three parts, his conquests in Egypt 1164- 1174, the annexation of Syria 1174-1187, and lastly the destruc-

tion of the Latin kingdom and subsequent campaigns against the Christians, 1187-1192. The conquest of Egypt was essential to Nur-ed-din. It was a menace to his empire on the south, the occasional ally of the Franks and the home of the unorthodox caliphs. His pretext was the plea of an exiled vizier, and Shirkuh was ordered to Egypt in n 64, taking Saladin as his lieutenant. The Christians under Count Amalric immediately intervened and the four expeditions which ensued in 1164, 1167, 1 168 and 1 169 were duels between Christians and Saracens. They resulted in heavy Christian losses, the death of Shirkuh and the appointment of Saladin as vizir. His relations towards the unorthodox caliph Nur-ed-din were marked by extraordinary tact. In 1 171 on the death of the Fatimite caliph he was powerful enough to substitute the name of the orthodox caliph in all Egyptian mosques. The Mahommedan religion was thus united against Christianity. To Nur-ed-din he was invari- ably submissive, but from the vigour which he employed in adding to the fortifications of Cairo and the haste with which he retreated from an attack on Montreal (n 71) and Kerak (n 73) it is clear that he feared his lord's jealousy.

In 1 1 74 Nur-ed-din died, and the period of Saladin 's conquests in Syria begins. Nur-ed-din's vassals rebelled against his youthful heir, es-Salih, and Saladin came north, nominally to his assistance. In n 74 he entered Damascus, Emesa and Hamah; in 1175 Baalbek and the towns round Aleppo. The next step was political independence. He suppressed the name of es-Salih in prayers and on the coinage, and was formally declared sultan by the caliph 1175. In n 76 he conquered Saif-ud-din of Mosul beyond the Euphrates and was recognized as sovereign by the princes of northern Syria". In n 77 he returned by Damascus to Cairo, which he enriched with colleges, a citadel and an aqueduct. From n 77 to 1180 he made war on the Christians from Egypt, and in 1180 reduced the sultan of Konia to sub- mission. From 1 181-1 183 he was chiefly occupied in Syria. In 1 183 he induced the atabeg Imad-ud-din to exchange Aleppo for the insignificant Sinjar and in 1186 received the homage of the atabeg of Mosul. The last independent vassal was thus subdued and the Latin kingdom enclosed on every side by a hostile empire.

In 1 187 a four years' truce was broken by the brilliant brigand Renaud de Chatillon and thus began Saladin's third period of

conquest. In May he cut to pieces a small body of Templars and Hospitallers at Tiberias, and, on July 4th, inflicted a crushing defeat upon the united Christian army at Hittin. He then overran Palestine, on September 20th besieged Jerusalem and on October 2nd, after chivalrous clemency to the Christian inhabitants, crowned his victories by entering and purifying the Holy City. In the kingdom only Tyre was left to the Christians. Probably Saladin made his worst strategical error in neglect- ing to conquer it before winter. The Christians had thus a stronghold whence their remnant marched to attack Acre in June 1 189. Saladin immediately surrounded the Christian army and thus began the famous two years' siege.

Saladin's lack of a fleet enabled the Christians to receive reinforcements and thus recover from their defeats by land. On the 8th of June 1191 Richard of England arrived, and on the 1 2th of July Acre capitulated without Saladin's permission. Richard followed up his victory by an admirably ordered march down the coast to Jaffa and a great victory at Arsuf. During 1 191 and 1 192 there were four small campaigns in southern Palestine when Richard circled round Beitnuba and Ascalon with Jerusalem as objective. In January 1 192 he acknowledged his impotence by renouncing Jerusalem to fortify Ascalon. Negotiations for peace accompanied these demonstrations, which showed that Saladin was master of the situation. Though in July Richard secured two brilliant victories at Jaffa, the treaty made on the 2nd of September was a triumph for Saladin. Only the coast line was left to the Latin kingdom, with a free passage to Jerusalem; and Ascalon was demolished. The union of the Mahommedan East had beyond question dealt the death-blow to the Latin kingdom. Richard returned to Europe, and Saladin returned to Damascus, where on the 4th of March 1193,

after a few days' illness, he died. He was buried in Damascus and mourned by the whole East.

The character of Saladin and of his work is singularly vivid. In many ways he was a typical Mahommedan, fiercely hostile towards unbelievers — " Let us purge the air of the air they breathe " was his aim for the demons cf the Cross, — intensely devout and regular in prayers and fasting. He showed the pride of race in the declaration that ' ' God reserved this triumph for the Ayyubites before all others. ' ' His generosity and hospitality were proved in his gifts to Richard and

his treatment of captives. He had the Oriental's power of endurance, alternating with violent and emotional courage. Other virtues were all his own, his extreme gentleness, his love for children, his flawless honesty, his invariable kindliness, his chivalry to women and the weak. Above all he typifies the Mahommedan's utter self- surrender to a sacred cause. His achievements were the inevitable expression of his character. He was not a statesman, for he left no constitution or code to the East; his empire was divided among his relatives on his death. As a strategist, though of great ability, he cannot be compared to Richard. As a general, he never organized an army. " My troops will do nothing," he confessed, " save when I ride at their head and review them. ' His fame lives in Eastern history as the conqueror who stemmed the tide of Western conquest on the East, and turned it definitely from East to West, as the hero who momentarily united the unruly East, and as the saint who realized in his personality the highest virtues and ideals of Mahommedanism.

Authorities. — The contemporary Arabian authorities are to be found in Michaud's Recueil des historiens des Croisades (Paris. 1876). This contains the work of Baha-ud-din (1 145-1234), diplomatist, and secretary of Saladin, the general history of Ibn-Athir (1160- 1233), the eulogist of the atabegs of Mosul but the unwilling admirer of Saladin, and parts of the general history of Abulfeda. The biography of the poet Osema ibn Murkidh (1095-1188), edited by Derenbourg (Paris, 1886), gives an invaluable picture of Eastern life. Later Arabian authorities are Ibn Khallikan (1211-1282) and Abu- Shama (born 1267). Of Christian authorities the following are important, the history of William of Tyre (1137-1185), the Itiner- arium peregrinorum, probably the Latin version of the Carmen Ambrosii (ed. by Stubbs, " Rolls " series, London, 1864), and the Chronique d'outremer, or the French translation of William of Tyre's history and its continuation by Ernoul, the squire of Balian, seigneur of Ibelin, 1228. The best modern authority is Stanley Lane-Poole's Saladin (" Heroes of the Nations " series, London, 1903). See also the bibliography to Crusades. (W. F. K.)

SALAMANCA, a frontier province of eastern Spain, formed in 1833 out of the southern part of the ancient kingdom of Leon, and bounded on the N. by Zamora and Valladolid, E. by Avila, S. by Caceres and W. by Portugal. Pop. (1900) 320,765; area, 4829 sq. m. Salamanca belongs almost entirely to the basin of the Duero (Portuguese Douro, q.v.), its principal rivers being the Tormes, which follows the general slope of the province towards the north-west, and after a course of 135 m. flows into the Duero, which forms part of the north-west boundary; the Yeltes and the Agueda, also tributaries of the Duero; and the

Alagon, an affluent of the Tagus. The northern part of the province is flat, and at its lowest point (on the Duero) is 488 ft. above sea- level. The southern border is partly defined along the crests of the Credos and Gata ranges, but the highest point is La Alberca (5692 ft.) in the Sierra de Pena Francia, which rises a little farther north. The rainfall is irregular; but where it is plentiful the soil is productive and there are good harvests of wine, oil, hemp, and cereals of all kinds. Forests of oak, pine, beech and chestnut cover a wide area in the south and south-west; and timber is sent in large quantities to other parts of Spain. Sheep and cattle also find good pasturage, and out of the forty-nine Spanish provinces only Badajoz, Caceres and Teruel have a larger number of live stock. Gold is found in the streams, and iron, lead, copper, zinc, coal and rock crystal in the hills, but the mines are only partially developed, and it is doubtful if the deposits would repay exploitation on a larger scale. The manu- factures of the province are few and mostly of a low class, in- tended for home consumption, such as frieze, coarse cloth, hats and pottery. The capital, Salamanca (pop. 1900, 25,690), and the town of Ciudad Rodrigo (8930) are described in separate articles. Bejar (9488) is the only other town of more than 5000 inhabitants. The railways from Zamora, Medina, Plasencia and Penaranda converge upon the capital, whence two lines go west- ward into Portugal — one via Barca d'Alva to Oporto, the other via Villar Formoso to Guarda. Few Spanish provinces lose so

small a number of emigrants, and the population tends gradually to increase. See also Leon.

SALAMANCA (anc. Salmantica or Elmantica) , the capital of the Spanish province of Salamanca, on the right bank of the river Tormes, 2648 ft. above sea-level and 172 m. by rail N.W. of Madrid. Pop. (1000) 25,690. Salamanca is the centre of a network of railways which radiate N. to Zamora, N.E. to Medina, E. to Penaranda, S. to Plasencia, W.S.W. to Guarda in Portugal, and W. to Oporto in Portugal. The river is here crossed by a bridge 500 ft. long built on twenty-six arches, fifteen of which are of Roman origin, while the remainder date from the 16th century. The city is still much the same in outward appearance as when its tortuous streets were thronged with students. The university was naturally the chief source of wealth to the town, the popula- tion of which in the 16th century numbered 50,000, 10,000 of whom were students. Its decay of course reacted on the towns- folk, but it fortunately also arrested the process of modernization. The ravages of war alone have wrought serious damage, for the French in their defensive operations in 1811-1812 almost destroyed the western quarter. The ruins still remain, and give an air of desolation which is not borne out by the real condition of the

inhabitants, however poverty-stricken they may appear. Side by side with the remains of a great past are the modern buildings: two theatres, a casino, bull-ring, town hall and electric light factory. The magnificent Plaza Mayor, built by Andres Garcia de Quifiones at the beginning of the 18th century, and capable of holding 20,000 people to witness a bull-fight, is one of the finest squares in Europe. It is surrounded by an arcade of ninety arches on Corinthian columns, one side of the square being occupied by the municipal buildings. The decora- tions of the facades are in the Renaissance style, and the plaza as a whole is a fine sample of Plateresque architecture.

The University. — Salamanca is still rich in educational estab- lishments. It still keeps up its university, with the separate faculties of letters, philosophy, sciences, law and medicine; its university and provincial public library, with 80,000 volumes and 1000 MSS.; its Irish college, provincial institute, superior normal school, ecclesiastical seminary (founded in 1 7 78) , economic and other learned societies, and very many charitable founda- tions. The city has still its 25 parishes, 25 colleges, and as many more or less ruinous converits, and 10 yet flourishing religious houses. The university, the oldest in the Peninsula, was founded about 1230 by Alphonso IX. of Leon, and refounded in 1242 by St Ferdinand of Castile. Under the patronage of the learned Alphonso X. its wealth and reputation greatly increased (1252- 1282), and its schools of canon law and civil law attracted students even from Paris and Bologna. In the 15th and 16th centuries it was renowned throughout Europe. Here Columbus, to whom a statue was erected in 1891, lectured on his discoveries, and here the Copernican system was taught long before it had won general acceptance. But soon after 1550 a period of decline set in. The university statutes were remodelled in 1757, but financial troubles and the incessant wars which checked almost every reform in Spain prevented any recovery up to 1857, when a fresh reorganization was effected. At the beginning of the 20th century the number of students was about 1200, and the number of professors 19 — fewer than in any other Spanish university.

Principal Buildings. — The chief objects of interest in the city are the old and new cathedrals. The old cathedral is a cruciform building of the 12th century, begun by Bishop Jeronimo, the con- fessor of the Cid (q.v.). Its style of architecture is that Late Roman- esque which prevailed in the south of France, but the builder showed much originality in the construction of the dome, which covers the crossing of the nave and transepts. The inner dome is made to spring, not from immediately above the arches, but from a higher stage of a double arcade pierced with windows. The thrust of the vaulting is borne by

four massive pinnacles, and over the inner dome is an outer pointed one covered with tiles. The whole forms a most effective and graceful group. On the vault of the apse is a fresco of Our Lord in Judgment by the Italian painter Nicolas Florentino (15th century). The reredos, which has the peculiarity of fitting the curve of the apse, contains fifty-five panels with paintings mostly by the same artist. There are many fine monuments in the south transept and cloister chapels. An adjoining building, the Capilla de Talavera, is used as a chapel for service according to the Mozarabic rite, which

is celebrated there six times a year. On the north of and adjoining the old church stands the new cathedral, built from designs by Juan Gil de Ontafion. Though begun in 1509 the work of construction made little progress until 1513, when it was entrusted to Ontafion under Bishop Francisco de Bobadilla; though not finished till 1734, it is a notable example of the late Gothic and Plateresque styles. Its length is 340 ft. and its breadth 160 ft. The interior is fairly Gothic in character, but on the outside the Renaissance spirit shows itself more clearly, and is fully developed in the dome. Every- where the attempt at mere novelty or richness results in feebleness. The main arch of the great portal consists of a simple trefoil, but the label above takes an ogee line, and the inner arches are elliptical. Above the doors are bas-reliefs, foliage, &c, which in exuberance of design and quality of workmanship are good examples of the latest efforts of Spanish Gothic. The church contains paintings by J. F. de Navarrete (1526-1579) and L. de Morales (c, 1509-1586), and some overrated statues by Juan de Juni (16th cent jry). The treasury is very rich, .nd amongst other articles possesses a custodia which is a masterpiece of goldsmith's work, and a bronze crucifix of undoubted jiuthenticity, which was borne before the Cid in battle. The great bell weighs over 23 tons. Of the university buildings the facade of the library is a peculiarly rich example of late 15th-century Gothic. The cloisters are light and elegant; the grand staircase ascending from them has a fine balustrade of foliage andfigures. The Colegio de Nobles Irlandeses, formerly Colegio de Santiago Apostol, was built in 1521 from designs by Pedro de Ibarra. The double arcaded cloister is a fine piece of work of the best period of the Renaissance. The Jesuit College is an immense and ugly Renaissance building begun in 1614 by Juan Gomez de Mora.. The Colegio Viejo, also called San Bartolome, was rebuilt in the 18th century, and now serves as the governor's palace. The convent of Santo Domingo, sometimes called San Esteban, shows

a mixture of styles from the 13th century onwards. The church is Gothic with a Plateresque facade of great lightness and delicacy. It is of purer design than that of the cathe- dral ; nevertheless it shows the tendency of the period. The reredos, one of the finest Renaissance works in Spain, contains statues by Salvador Carmona, and a curious bronze statuette of the Virgin and Child on a throne of champleve enamel of the 12th century. The chapter-house, built by Juan Moreno in 1637, and the staircase and sacristy are good examples of later work. The convent of the Augustinas Recoletas, begun by Fontana in 1616, is in better taste than any other Renaissance building in the city. The church is rich in marble fittings and contains several fine pictures of the Neapolitan school, especially the Conception by J. Ribera (1588-1656) over the altar. The convent of the Espirita Santo has a good door by A. Berruguete (c. 1480-1561). There is also a rather effective portal to the convent of Las Duefias. The church of S. Marcos is a curious circular building with three eastern apses; and the churches of S. Martin and S. Matteo have good early doorways. Many of the private houses are untouched examples of the domestic architecture of the prosperous times in which they were built. Such are the Casa de las Conchas, the finest example of its period in Spain; the Casa de la Sal, with a magnificent courtyard and sculptured gallery; and the palaces of Maldonado, Monterey and Espinosa.

In the middle ages the trade of Salamanca was not insignificant, and the stamped leather-work produced there is still sought after. Its manufactures are now of little consequence, and consist of china, cloth and leather. The transport trade is, however, of more import- ance, and shows signs of increasing, as a result of the extension of railway communication between 1875 and 1900. During this period the population increased by nearly 7000.

History. — The town was of importance as early as 222 B.C., when it was captured by Hannibal from the Vettones; and it afterwards became under the Romans the ninth station on the Via Lata from Merida to Saragossa. It passed successively under the rule of the Goths and the Moors, till the latter were finally driven out about 1055. About 1100 many foreign settlers were induced by Alphonso VI. to establish themselves in the district, and the city was enlarged and adorned by Count Ray- mond of Burgundy and his wife, the Princess Urraca. The Fuero de Salamanca, a celebrated code of civil law, probably dates from about 1200. Thenceforward, until the second half of the 1 6th century, the prosperity of the university rendered the city one of the most important in Spain. But in 1593 the establishment of an independent bishopric at Valladolid (then the seat of the court), which had previously been subject to the see of Salamanca, dealt a

serious blow to the prestige of the city; and its commerce was shattered by the expulsion of the Moriscos in 1610 and the wars of the 18th and 19th centuries.

See Villar y Macias, Historia de Salamanca (3 vols., Salamanca, 1887) ; H. Rashdall, Universities of Europe in the Middle Ages, vol. ii. pt. 1. (London, 1895); Lapunya, La Universidad de Salamanca y la cidlura espanola en el siglo XII J. (Paris, 1900). (K. G. J.)

Battle of Salamanca, 1812. (For the operations which preceded this battle see Peninsular War.) On the 22nd of July 1812 the

Allied army under Wellington (about 46,000 with 60 guns) was drawn up south of Salamanca, the left resting on the river Tormes at Santa Marta, with a division under Pakenham and some cavalry on the north bank at Cabrerizos ; the right near the village of Arapiles and two hills of that name. Wellington's object was to cover Salamanca and guard his communications through Ciudad Rodrigo with Portugal. The French under Marshal Marmont (about 42,000 with 70 guns) were collecting towards Wellington's right, stretching southwards from Calvariza de Ariba. The country generally is undulating, but crossed by some marked ridges and streams.

Until the morning of the battle it had been uncertain whether Marmont wished to reach Salamanca by the right or left bank of the Tormes, or to gain the Ciudad Rodrigo road, but Wellington now felt that the latter was his real objective. At daylight there was a rush by both armies for the two commanding hills of the Arapiles; the Allies gained the northern (since termed the " English "), and the French the southern (since termed the " French ") Arapiles. While Marmont was closing up his forces, a complete change of position was carried out by Wellington. Pakenham was directed to march through Salamanca, crossing the Tormes, and move under cover to a wood near Aldea Tejada, while Wellington, holding the village of Arapiles and the northern hill, took up a line with four infantry divisions, a Portuguese brigade (Bradford), a strong force of cavalry, and Don Carlos's Spanish brigade, under cover of a ridge between Arapiles and Aldea Tejada. By noon his old right had become his left, and he was nearer to the Ciudad Rodrigo road, flanking Marmont should he move towards it.

Salamanca,

Battle of SALAMANCA

July xznd, 18×2

English Miles

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French r*ff

Aldea Lcnguk^

Emery Walker sc.

Redrawn from Maj.-Gen. C. W. Robinson’s Wellington’s Campaigns, by permission of Hugh Rees, Ltd.

It was not Wellington’s wish {Despatches, July 21, 1812) to fight a battle ” unless under very advantageous circumstances.” He knew that large reinforcements were nearing the French, and, having determined to fall back towards Portugal, he began to pass his baggage along the Ciudad Rodrigo road. Marmont, about 2 p.m., seeing the dust of his baggage column, ignorant of his true position, and anxious to intercept his retreat, ordered two divisions under Maucune, the leading one of which became afterwards Thomieres’, 1 to push westward, while he himself attacked Arapiles. Maucune moved off, flanked by some cavalry and fifty guns, leaving a gap between him and the rest of the French. Wellington instantly took advantage of this. Directing Pakenham to attack the head of the leading French division, and a Portuguese brigade (Pack) to occupy the enemy by assaulting the south (or French) Arapiles, he prepared to bear down in strength upon Maucune’s right flank. The French attack upon Arapiles was after hard fighting repulsed ; and, at about 5 p.m., Maucune’s fori a, when in confusion from the fierce attack of Pakenham and Wellington in front and flank and suffering severely, was suddenly trampled down ” with a terrible clamour and dis- turbance ” (Napier) by an irresistible charge of LeMarchant’s and Anson’s cavalry under Sir Stapleton Cotton. This counterstroke decided the battle, Marmont’s left wing being completely broken. The French made a gallant but fruitless effort to retrieve the day, and repulsed Pack’s attack upon the French Arapiles; but, as the light waned, Clausel, Marmont being wounded, drew off the French army towards Alba de Tormes and retired to Valladolid. Bot> armies lost heavily, the Allies about 6000, the French some 15,000 men, 12 guns 2 eagles and several standards.

The rout would have been even more thorough had not the castle and ford at Alba de

1 Some authorities differ as to this (see The Salamanca Campaign, by Captain A. H. Marindin, 1906, appendix, pp. 51-59).

Torrnes been evacuated by its Spanish garrison without Wellington's knowledge.

Salamanca was a brilliant victory, and followed as it was by the capture of Madrid, it severely shook the French domination in Spain. (C. W. R.)

SALAMANCA, a village in Cattaraugus county, New York, U.S.A., in the township of Salamanca, about 52 m. S. by E. of Buffalo. Pop. (1900), 4251, of whom 789 were foreign- born; (1910, census), 5792. Salamanca is served by the Erie, the Buffalo, Rochester & Pittsburg and the Pennsylvania railways, and by interurban electric lines connecting with Olean, N. Y., Bradford, Pennsylvania, and Little Valley (pop in 1910, 1368), the county-seat, about 8 m. N. The village is built on both sides of the Allegany river. The agricultural and industrial development of the region has been retarded by its being within the Allegany Indian Reservation (allotted originally to the Seneca Indians by the Big Tree Treaty of 1 798 and still including the valley of the Allegany river for several miles above and below Salamanca) ; but land is now held under a 99 year lease authorized by Congress in 1892. The village is a railway centre and division terminal, and has repair shops of the Erie and the Buffalo, Rochester & Pittsburg railways. The first settlement in the district (which was included within the " Holland Purchase" of 1792-1793) was made in 1815 near the site of West Salamanca (pop. in 1910, 530), i§ m. W. of Salamanca, and in the same township. Salamanca (until 1873 known as East Salamanca) was incorporated in 1879, taking its name from the township, which was erected in 1854 as Buck Tooth Township and in 1862 was renamed in honour of a Spanish banker who was a large stockholder of the Atlantic & Great Western railway, built through the township this year, and later merged with the Erie railway.

See History of Cattaraugus County, New York (Philadelphia, Pa., 1879).

SALAMANDER. Salamanders in the restricted sense (genus

Salamandra of N. Laurenti) are close allies of the newts, but of exclusively terrestrial habits, indicated by the shape of the tail, which is not distinctly compressed. The genus is restricted in its habitat to the western parts of the Palaearctic region and represented by four species only: the spotted salamander, 5. maculosa, the well-known black and yellow creature inhabiting Central and Southern Europe, North-West Africa and South- western Asia; the black salamander, S. atra, restricted to the Alps; 5. caucasica from the Caucasus, and 5. luschani from Asia Minor. Salamanders, far from being able to withstand the action of fire, as was believed by the ancients, are only found in damp places, and emerge in misty weather only or after thunderstorms, when they may appear in enormous numbers in localities where at other times their presence would not be suspected. They are usually much dreaded by country people, and Although they are quite harmless to man, the large glands which are disposed very regularly on their smooth, shiny bodies, secrete a very active, milky poison which protects them from the attacks of many enemies.

The breeding habits of the two well-known European species are highly interesting. They pair on land, the male clasping the female at the arms, and the impregnation is internal. Long after pairing the female gives birth to living young. 5. maculosa, which fives in plains or at low altitudes (up to 3000 ft.), deposits her young, ten to fifty in number, in the water, in springs or cool rivulets, and these young at birth are of small size, provided with external gills and four limbs, in every way similar to advanced newt larvae. S. atra, on the other hand, inhabits the Alps between 2000 and 9000 ft. altitude. Localities at such altitudes not being, as a rule, suitable for larval life in the water, the young are retained in the uterus, until the completion of the metamorphosis. Only two young, rarely three or four, are born, and they may measure as much as 50 mm. at birth, the mother measuring only 120. The uterine eggs are large and numerous, as in S. maculosa, but as a rule only one fully develops in each uterus, the embryo being nourished on the yolk of the other eggs, which more or less dissolve to form a large mass of nutrient matter. The embryo passes through three stages — (1) still en- closed within the egg and living on its own yolk; (2) free, within the vitelline mass, which is directly swallowed by the mouth; (3) there is no more vitelline mass, but the embryo is possessed of long ex- ternal gills, which serve for an exchange of nutritive fluid through the maternal uterus, these gills functioning in the same way as the chorionic villi of the mammalian egg. Embryos in the second stage,

if artificially released from the uterus, are able to live in water, in the same way as similarly developed larvae of S. maculosa. But the

uterine gills soon wither and are shed, and are replaced by other gills differing in no respect from those of its congener.

Authorities. — Marie von Chauvin, Zeitschr. Wiss. Zool. xxix. (1877), P 3 2 4> P- Kammerer, Arch. f. Entwickel. xvii. (1904), p. 1 ; Mme. Phisalix-Picot, Recherches embryologiques, histologiqu.es et physiologiques sur les glandes & venin de la salamandre terrestre (Paris, 1900, 8vo).

SALAMIS, an island of Greece in the Saronic Gulf of the Aegean Sea, extending along the coasts of Attica and Megaris, and enclosing the Bay of Eleusis between two narrow straits on the W. and S. Its area is 36 sq. m., its greatest length in any direction 10 m.; its extremely irregular shape gives rise to the modern popular name KouXXoDpi, i.e. baker's crescent. In Homer Salamis was the home of the Aeginetan prince Telamon and his sons Ajax and Teucer, and this tradition is confirmed by the position of the ancient capital of the island opposite Aegina. It subsequently passed into the hands of the Megarians, but was wrested from them about 600 B.C. by the Athenians under Solon (q.v.) and definitely awarded to Athens by Sparta's arbitration. Though Attic tradition claimed Salamis as an ancient possession the island was not strictly Athenian territory; a 6th-century inscription shows that it was treated either as a cleruchy or as a privileged foreign dependency. The town of Salamis was removed to an inlet of the E. coast opposite Attica. In 480 Salamis became the base of the allied Greek fleet after the retreat from Artemisium, while the Persians took their station along the Attic coast off Phalerum. Through the stratagem of the Athenian Themistocles the Greeks were enclosed in the straits by the enemy, who had wheeled by night across the entrance of the E. channel and detached a squadron to block the W. outlet. The Greeks had thus no resource but to fight, while the Persians could not utilize their superior numbers, and as they advanced into the narrow neck of the east strait were thrown into confusion. The allies, among whom the Athenians and Aeginetans were conspicuous, seized this opportunity to make a vigorous attack which probably broke the enemy's line. After waging a losing fight for several hours the Persians retreated with the loss of 200 sail and of an entire corps landed on the islet of Psyttaleia in the channel; the Greeks lost only 40 ships out of more than 300. During the Peloponnesian War Salamis served as a repository for the country stock of Attica. About 350 Salamis obtained the right of issuing copper coins. In 318 Cassander placed in it a Macedonian garrison which was finally withdrawn through the advocacy of the Achaean states- man Aratus (232). The Athenians thereupon supplanted the inhabitants by a cleruchy of their own citizens. By the 2nd century a.d. the settlement

had fallen into decay. In modern times Salamis, which is chiefly peopled by Albanians, has regained importance through the transference of the naval arsenal to Ambelaki near the site of the ancient capital. Excavations in this region have revealed large numbers of late Mycenaean tombs.

Authorities. — Strabo pp. 383, 393-394; Pausanias i. 35-36; Plutarch, Solon, 8-10; Aeschylus, Persae, 337-471; Herodotus viiL 40-95; Diodorus xi. 15-19; Plutarch, Themistocles, 11-15; W. Goodwin, Papers of the American School of Classical Studies ap Athens, I. p. 237 ff. (Boston, 1885); G. B. Grundy, Great Persian War (London, 1901), ch. ix. ; B. V. Head, Historia numorum (Oxford, 1887), pp. 328-329; A. Wilhelm in Athenische Mitteilungen (1898), pp. 466-486; W. Judeich, ibid.(l8gg), pp. 321-338; C. Horner, Quaestiones Salaminiae (Basle, 1901); H. Raase, Die Schlacht bei Salamis (Rostock, 1904) ; R. W. Macan, Appendix to Herodotus vii.-ix. (London, 1908) ; J. Beloch in Klio (1908). (M. O. B. C.)

SALAMIS, the principal city of ancient Cyprus, situated on the east coast a little north of the river Pedias (Pediaeus). It had a good harbour, well situated for commerce with Phoenicia, Egypt and Cilicia, which was replaced in medieval times by Famagusta (Ammochostos), and is wholly silted now. Its trade was mainly in corn, wine and oil from the midland plain (Mesaoria) , and in salt from the neighbouring lagoons. Tradition- ally, Salamis was founded after the Trojan War (c. 1180 B.C.) by Teucer from Salamis, the island off Attica, but there was an important Mycenaean colony somewhat earlier. The spoils of its tombs excavated in 1896 are in the British Museum.

A king Kisu of Silna (Salamis) is mentioned in a list of tributaries of Assur-bani-pal of Assyria in 668 B.C., and Assyrian influence is marked in the fine terra-cotta figures from a shrine at Toumba excavated in 1890-189 1. The revolts of Greek Cyprus against Persia in 500 B.C., 386-380 B.C. and 352 B.C. were led respectively by kings Onesilaus, Evagoras (q.v.) and Pnytagoras, who seem to have been the principal Hellenic power in the island. In 306 Demetrius Poliorcetes won a great naval victory here over Ptolemy I. of Egypt. Under Egyptian and Roman administration Salamis flourished greatly, though under the Ptolemaic priest-kings and under Rome the seat of government was at New Paphos (see Paphos). But it was greatly

damaged in the Jewish revolt of A.D. 116-117; it also suffered repeatedly from earthquakes, and was wholly rebuilt by Constantius II. under the name Constantia. There was a large Jewish colony in Ptolemaic and early Roman times, and a Christian community founded by Paul and Barnabas in A.D. 45-46. Barnabas was himself a Cypriote, and his reputed tomb, discovered in A.D. 477, is still shown, a little inland, near the monastery of Ai Barnaba. St Epiphanius was archbishop a.d. 367-402. The Greek city was destroyed by the Arabs under the Caliph Moawiya in 647, and does not seem to have revived. In later times the site was plundered for the building of Famagusta; it is now covered by sandhills, and its plan is imperfectly known. The market-place and a few public buildings were excavated in 1890-1891, but nothing of importance was found.

See W. H. Engel, Kypros (Berlin, 1841 ; classical allusions) ; J. A. R. Munro and H. A. Tubbs, Journ. Hellenic Studies, xii. 59 ff., 298 ff. (site and monuments) ; British Museum, Excavations in Cyprus (London, 1900; Mycenaean tombs); G. F. Hill, Brit. Mus. Cat. Coins of Cyprus (London, 1904; coins). (J. L. M.)

SAL AMMONIAC, 1 or Ammonium Chloride, NH4CI, the earliest known salt of ammonia (q.v.), was formerly much used in dyeing and metallurgic operations.

The name Hammoniacus sal occurs in Pliny (Nat. Hist. xxxi. 39), who relates that it was applied to a kind of fossil salt found below the sand, in a district of Cyrenaica. The general opinion is, that the sal ammoniac of the ancients was the same as that of the moderns ; but the imperfect description of Pliny is far from being conclusive. The native sal ammoniac of Bucharia, described by Model and Karsten, and analysed by M. H. Klaproth, has no resemblance to the salt described by Pliny. The same remark applies to the sal ammoniac of volcanoes. Dioscorides (v. 126), in mentioning sal ammoniac, makes use of a phrase quite irreconcilable with the description of Pliny, and rather applicable to rock-salt than to our sal ammoniac. Sal ammoniac, he says, is peculiarly prized if it can be easily split into rectangular fragments. Finally, we have no proof whatever that sal ammoniac occurs at present, either near the temple ot Jupiter Ammon, or in any part of Cyrenaica. Hence we conclude that the term sal ammoniac was applied as indefinitely by the ancients as most of their other chemical terms. It may have been given to the same salt which is known to the moderns by that appellation, but was not confined to it.

In any case there can be no doubt that it was well known to the

alchemists as early as the 13th century. Albertus Magnus, in his treatise De alchy-mia, informs us that there were two kinds of sal ammoniac, a natural and an artificial. The natural was sometimes white, and sometimes red; the artificial was more useful to the chemist. He does not tell us how it was prepared, but he describes the method of subliming it, which can leave no doubt that it was real sal ammoniac. In the Opera mineralia of Isaac Hollandus the elder, there is likewise a description of the mode of subliming sal ammoniac. Basil Valentine, in his Currus triumphalis antimonii, describes some of the peculiar properties of sal ammoniac in, if possible, a still less equivocal manner.

Egypt is the country where sal ammoniac was first manu- factured, and from which Europe for many years was supplied with it. This commerce was first carried on by the Venetians, and afterwards by the Dutch. Nothing was known about the method employed by the Egyptians till the year 1719. In 1716 C. J. Geoffroy read a paper to the French Academy, showing that sal ammoniac must be formed by sublimation; but his opinion was opposed so violently by W. Homberg and N. Lemery, that the paper was not printed. In 1719 D. Lemaire, the French consul at Cairo, sent the Academy an account of the mode of manufacturing sal ammoniac in Egypt. The salt, it appeared, was obtained by simple sublimation from soot. In the year 1760 Linnaeus communicated to the Royal Society a correct detail of the whole process, which he had received from Dr F. Hasselquist, who had travelled in that country as a

1 Some derive the name sal ammoniac from Jupiter Ammon, near whose temple it is alleged to have been found; others, from a district of Cyrenaica called Ammonia. Pliny's derivation is from the sand (S/u/ttos) in which it occurred.

naturalist {Phil. Trans., 1760, p. 504). The dung of black cattle, horses, sheep, goats, &c, which contains sal ammoniac ready formed, is collected during the first four months of the year, when the animals feed on the spring grass, a kind of clover. It is dried, and sold to the common people as fuel. The soot from this fuel is carefully collected and sold to the sal ammoniac makers, who work only during the months of March and April, for it is only at that season of the year that the dung is fit for their purpose.

The composition of this salt seems to have been first discovered by J. P. Tournefort in 1700. The experiments of C. J. Geoffroy in 1716 and 1723 were still more decisive, and those of H. L. Duhamel de Monceau, in 1735, left no doubt upon the subject. Dr Thomson first

pointed out a process by synthesis, which has the advantage of being very simple, and at the same time rigidly accurate, resulting from his observation that when hydrochloric acid gas and ammonia gas are brought in contact with each other, they always combine in equal volumes.

The first attempt to manufacture sal ammoniac in Europe was made, about the beginning of the 18th century, by Mr Goodwin, a chemist of London, who appears to have used the mother ley of common salt and putrid urine as ingredients. The first successful manufacture of sal ammoniac in Great Britain was established in Edinburgh about the year 1760. It was first manufactured in France about the same time by A. Baume. Manufactories of it were afterwards established in Germany, Holland and Flanders.

It is now obtained from the ammoniacal liquor of gas works by distilling the liquor with milk of lime and passing the ammonia so obtained into hydrochloric acid. The solution of ammonium chloride so obtained is evaporated and the crude ammonium chloride purified by sublimation. The subliming apparatus consists of two parts: (1) a hemispherical stoneware basin placed within a close- fitting iron one, or an enamelled iron basin, and (2) a hemispherical lead or stoneware lid, or dome, cemented on the top of the basin to prevent leakage. The dome has a small aperture in the top which remains open to preclude accumulation of pressure. The carefully dried crystallized salt is pressed into the basin, and, after the lid, has been fitted on, is exposed to a long-lasting moderate heat. The salt volatilizes (mostly in the form of a mixed vapour of the two components, which reunite on cooling), and condenses in the dome in the form of a characteristically fibrous and tough crust.

The pure salt has a sharp saline taste and is readily soluble in water. It readily volatilizes, and if moisture be rigorously excluded, it does not dissociate, but in the presence of mere traces of water it dissociates into ammonia and hydrochloric acid (H. B. Baker, Journ. Chent. Soc, 1895, 65, p. 612). ‘

Sal ammoniac (ammonium chloride, British and United States pharmacopoeiae) as used in medicine is a white crystalline odourless powder having a saline taste. It is soluble in I in 3 of cold water and in I in 50 of 90 % alcohol. It is incompatible with carbonates of the alkalis. The dose is 5 to 20 grs. Ammonium chloride has a different action and therapeutic use from the rest of the ammonium salts. It possesses only slight influence over the heart and respiration, but it has a specific effect on mucous membranes as the elimination of the

drug takes place largely through the lungs, where it aids in loosening bronchial secretions. This action renders it of the utmost value in bronchitis and pneumonia with associated bronchitis. The drug may be given in a mixture with glycerine or liquorice to cover the disagreeable taste or it may be used in a spray by means of an atomizer. The inhalation of the fumes of nascent ammonium chloride by filling the room with the gas has been recommended in foetid bronchitis. Though ammonium chloride has certain irritant properties which may disorder the stomach, yet if its mucous mem- brane be depressed and atonic the drug may improve its condition, and it has been used with success in gastric and intestinal catarrhs of a subacute type and is given in doses of 10 grains half an hour before meals in painful dyspepsia due to hyperacidity. It is also an intestinal and hepatic stimulant and a feeble diuretic and dia- phoretic, and has been considered a specific in some forms of neuralgia.

SALARIA, VIA, an ancient highroad of Italy, which ran from Rome by Reate and Asculum to Castrum Truentinum (Porto d'Ascoli) on the Adriatic coast, a distance of 151 m. Its first portion must be of early origin, and was the route by which the Sabines came ;to fetch salt from the marshes at the mouth of the Tiber. Of its course through the Apennines considerable remains exist.

See T. Ashby in Papers of the British School at Rome, iii. 3-38 ; N. Persichetti, Viaggio archeologico sulla Via Sal-aria net Circondario di Cittaducale (Rome, 1893) ; and in Romische Mitteilungen (1903), 276 seq.

SALAR JUNG, SIR (1829-1883), Indian statesman of Hyderabad, born in 1829, descendant of a family which had held various appointments, first under the Adil Shahi kings of Bijapur, then under the Delhi emperors and lastly under the Nizams. While he was known to the British as Sir Salar Jung, his personal name was Mir Turab Ali, he was styled by native officials of Hyderabad the Mukhtaru '1-Mulk, and was referred to by the general public as the Nawab Sahib. He succeeded his uncle Suraju '1-Mulk as prime minister in 1853. The condition of the Hyderabad state was at that time a scandal to the rest of India. Salar Jung began by infusing a measure of discipline into the Arab mercenaries, the more valuable part of the Nizam's army, and employing them against the rapacious nobles and bands of robbers who had annihilated the trade of the country. He then constituted

courts of justice at Hyderabad, organized the police force, constructed and repaired irrigation works, and established schools. On the outbreak of the Mutiny he supported the British, and although unable to hinder an attack on the residency, he warned the British minister that it was in comtemplation. The attack was repulsed; the Hyderabad contingent remained loyal, and their loyalty served to ensure the tranquillity of the Deccan. Salar Jung took advantage of the preoccupation of the British government with the Mutiny to push his reforms more boldly, and when the Calcutta authorities were again atliberty to consider the condition of affairs his work had been carried far towards completion. During the lifetime of the Nizam Afzulu'd-dowla, Salar Jung was considerably hampered by his master's jealous supervision. When Mir Mahbub Ali, however, succeeded his father in 1869, Salar Jung, at the instance of the British govern- ment, was associated in the regency with the principal noble of the state, the Shamsu '1-Umara or Amir Kabir, and enjoyed an increased authority. In 1876 he visited England with the object of obtaining the restoration of Berar. Although he was un- successful, his personal merits met with full recognition. He died of cholera at Hyderabad on the 8th of February 1883. He was created G. C.S.I, on the 28th of May 1870, and received the honorary degree of D.C.L. from the University of Oxford on the 21st of June 1876. His grandson enjoyed an estate of i486 sq. m., yielding an income of nearly £60,000.

See Memoirs of Sir Salar Jung, by his private secretary, Syed Hossain Bilgrami, 1883.

SALARY, a payment for services rendered, usually a stipulated sum paid monthly, quarterly, half-yearly or yearly, and for a permanent or lengthy term of employment. It is generally contrasted with " wages," a term applied to weekly or daily payment for manual services. As laid down by Bowen, L. J., In re Shine (1892)) 1 Q.B. 529, " Salary means a definite payment for personal services under some contract and computed by time." The Latin salarium meant originally salt money (Lat. sal, salt), i.e. the sum paid to soldiers for salt. In post-Augustan Latin the word was applied to any allowance, pension or stipend.

SALAS, or San Martin de Salas, a town of southern Spain, in the province of Oviedo; on the road from Tineo to Grado, and on a small sub-tributary of the river Narcea. Pop. (1900), 17,147. The official total of the inhabitants includes not only the actual residents in the town, but also the population of the district of Salas, a mountainous region in which coal-mining and agriculture are the principal industries. The products of this region are sent for export to Cudillero, a small harbour on the Bay of Biscay.

SALAS BARBADILLO, ALONSO JER6NIM0 DE (c. 1580- 1635), Spanish novelist and playwright, born at Madrid about 1580, and educated at Alcala de Henares and Valladolid. His first work, La Patrona de Madrid restituida (1609), is a dull devout poem, which forms a strange prelude to La Hija de Celestina (161 2), a malicious transcription of picaresque scenes reprinted under the title of La Ingeniosa Elena. This was followed by a series of similar tales and plays, the best of which are El Cavallero puntual (1614), La Casa de placer honesto (1620),

Don Diego de Noche (1623) and a most sparkling satirical volume of character-sketches, El Curioso y iabio Alexandro (1634). He died in poverty at Madrid on the 10th of July 1635. Some oi his works were translated into English and French, and Scarron's Hypocrites is based on La Ingeniosa Elena; he deserved the vogue which he enjoyed till late in the 17th century, for his satirical humour, versatile invention and pointed style are an effective combination.

SALDANHA BAY, an inlet on the south-western coast of South Africa, 63 m. by sea N. by W. of Cape Town, forming a land-locked harbour. The northern part of the inlet is known as Hoetjes Bay. It has accommodation for a large fleet with deep water close inshore, but the arid nature of the country caused it to be neglected by the early navigators, and with the growth of Cape Town Saldanha Bay was rarely visited. Considerable deposits of freestone in the neighbourhood attracted attention during the later 19th century. • Proposals were also made to create a port which could be supplied by water from the Berg river, 20 m. distant. From Kalabas Kraal on the Cape Town-Clanwilliam railway, a narrow gauge line runs via Hopefield to Hoetjes Bay — 126 m. from Cape Town.

Saldanha Bay is so named after Antonio de Saldanha, captain of a vessel in Albuquerque's fleet which visited South Africa in 1503. The name was first given to Table Bay, where Saldanha's ship cast anchor. On Table Bay being given its present name (1601) the older appellation was transferred to the bay now called after Saldanha. In 1 781 a British squadron under Commodore George Johnstone I 73 I ~ l 7ˆ7) seized six Dutch East Indiamen, which, fearing an attack on Cape Town, had taken refuge in Saldanha Bay. This was the only achievement, so far as South Africa was concerned, of the expedition despatched to seize Cape Town during the war of 1781-

1783.

SALDERN, FRIEDRICH CHRISTOPH VON (1719-1785), Prussian

soldier and military writer, entered the army in 1735, and (on account of his great stature) was transferred to the Guards in 1739. As one of Frederick's aides-de : camp he was the first to discover the approach of Neipperg's Austrians at Mollwitz. He commanded a guard battalion at Leuthen, again distinguished himself at Hochkirch and was promoted major- general. In 1760 at Liegnitz Frederick gave him four hours in which to collect, arrange and despatch the spoils of the battle, 6000 prisoners, 100 wagons, 82 guns and 5000 muskets. His complete success made him a marked man even in Frederick's army. At Torgau, Saldern and Mollendorf (q.v.) with their brigades converted a lost battle into a great victory by their desperate assault on the Siptitz Heights. The manoeuvring skill, as well as the iron resolution, of the attack, has excited the wonder of modern critics, and after Torgau Saldern was accounted the " completest general of infantry alive " (Carlyle). In the following winter, however, being ordered by Frederick to sack Hubertusburg, Saldern refused on the ground of conscience. Nothing was left for him but to retire, but Frederick was well aware that he needed Saldern's experience and organizing ability, and after the peace the general was at once made inspector of the troops at Magdeburg. In 1766 he became lieutenant-general. The remainder of his life was spent in the study of military sciences in which he became a pedant of the most pronounced type. In one of his works he discussed at great length the question between 76 and 75 paces to the minute as the proper cadence of infantry. There can be no question that " Saldern-tactics " were the most extreme form of pedantry to which troops were ever subjected, and contributed powerfully to the disaster of Jena in 1806. His works included Taktik der Infanterie (Dresden, 1784) and Taktische Grundsatze (Dresden, 1786), and were the basis of the British " Dundas " drill-book.

See Kuster, Charakterzilge des Generalleutenants von Saldern (Berlin, 1792).

SALE, GEORGE (c. 1697-1736), English orientalist, was the son of a London merchant. In 1720 he was admitted a student of the Inner Temple, but subsequently practised as a solicitor. Having studied Arabic for some time in England, he became, in 1726, one of the correctors of the Arabic version of the New Testament, begun in 1720 by the Society for Promoting Christian .Knowledge, and subsequently took the principal part in the

work. He made an extremely paraphrastic, but, for his time, admirable English translation of the Koran (1734 and often reprinted), and had a European reputation as an orientalist. He died on the 13th of November 1736. His collection of oriental manuscripts is now in the Bodleian library, Oxford.

SALE, SIR ROBERT HENRY (1782-1845), British soldier, entered the 36th Foot in 1795, and went to India in 1798, as a lieutenant of the 12th Foot. His regiment formed part of Baird's brigade of Harris's army operating against Tippoo Sahib, and Sale was present at Mallavelly (Mallawalli) and Seringapatam, subsequently serving under Colonel Arthur Wellesley in the campaign against Dhundia. A little later the 1 2th was employed in the difficult and laborious attack on Paichi Raja. Promoted captain in 1806, Sale was engaged in 1808-1809 against the Raja of Travancore, and was at the two actions of Quilon, the storm of Travancore lines and the battle of Killianore. In 1810 he accompanied the expedition to Mauritius, and in 1813 obtained his majority. After some years he became major in the 13th, with which regiment he was for the rest of his life associated. In the Burmese War he led the 13th in all the actions up to the capture of Rangoon, in one of which he killed the enemy's leader in single combat. In the concluding operations of the war, being now lieutenant-colonel, he commanded a brigade, and at Malown (1826) he was severely wounded. For these services he received the C.B. In 1838, on the outbreak of the Afghan War, Brevet-Colonel Sale was assigned to the command of the 1 st Bengal brigade of the army assembling on the Indus. His column arrived at Kandahar in April 1839, and in May it occupied the Herat plain. The Kandahar force next set out on its march to Kabul, and a month later Ghazni was stormed, Sale in person leading the storming column and distinguishing himself in single combat. The place was well provisioned, and on its supplies the army finished its march to Kabul easily. For his services Sale was made K.C.B. and received the local rank of major-general, as well as the Shah's order of the Duranee Empire. He was left, as second-in-command, with the army of occupation, and in the interval between the two wars conducted several small campaigns ending with the action of Parwan which led directly to the surrender of Dost Mahommed. By this time the army had settled down to the quiet life of canton- ments, and Lady Sale and her daughter came to Kabul. But the policy of the Indian government in stopping the subsidy to the frontier tribes roused them into hostility, and Sale's brigade received orders to clear the line of communication to Peshawar. After severe fighting Sale entered Jalalabad on the 12th of November 1841. Ten days previously he had

received news of the murder of Sir Alexander Burnes, along with orders to return with all speed to Kabul. These orders he, for various reasons, decided to ignore; suppressing his personal desire to return to protect his wife and family, he gave orders to push on, and on occupying Jalalabad at once set about making the old and half- ruined fortress fit to stand a siege. There followed a close and severe investment rather than a siege, and the garrison's sorties were made usually with the object of obtaining supplies. At last Pollock and the relieving army appeared, only to find that the garrison had on the 7th of April 1842 relieved itself by a brilliant and completely successful attack on Akbar's lines. Sir Robert Sale received the G.C.B.; a medal was struck for all ranks of defenders, and salutes fired at every large canton- ment in India. Pollock and Sale after a time took the offensive, and after the victory of Haft Kotal, Sale's division encamped at Kabul again. At the end of the war Sale received the thanks of parliament. In 1845, as quartermaster-general to Sir H. Gough's army, Sale again took the field. At Moodkee (Mudki) he was mortally wounded, and he died on the 21st of December 1845. His wife, who shared with him the dangers and hardships of the Afghan war, was amongst Akbar's captives. Amongst the few possessions she was able to keep from Afghan plunderers was her diary (Journal of the Disasters in Afghanistan, London,

1843).

See Gleig, Sale's Brigade in Afghanistan (London, 1846); Kaye, Lives of Indian O/fcers (London, 1867); W. Sale, Defence of Jellalabad (London, 1846) ; Regimental History of the 13th Light Infantrv.

SALE, a town of Tanjil county, Victoria, Australia, the principal centre in the agricultural Gippsland district, on the river Thomson, 127ˆ m. by rail E.S.E. of Melbourne. Pop. (i90i),3462. It is the seat of the Anglican bishop of Gippsland, and contains the cathedral of the Roman Catholic bishop of Sale. Attached to its mechanics' institute are schools of mines, art and technology, and a fine free library. The finest buildings, excluding a number of handsome churches, are the Victoria Hall and the convent of Notre Dame de Sion. The Agricultural Society has excellent show grounds, in which meetings are annually held. Sale is the head of the Gippsland lakes naviga- tion, the shipping being brought from the lakes to the town by canal. Daily communication is maintained with Cunningham at the lakes' entrance, and ocean-going steamers ply frequently between Sale and Melbourne.

SALE, an urban district in the Altrincham parliamentary division of Cheshire, England, 5 m. S.W. of Manchester. Pop. (1901), 12,088. It is

served by the Manchester, South Junction & Altrincham and the London & North-Western railways, and the Cheshire Lines, and has become a large residential suburb of Manchester. At the beginning of the 19th century the greater part of the township was still waste and unenclosed. There are numerous handsome villas. Market gardening is carried on in the neighbourhood ; and there are large botanical gardens.

SALEM, a city and district of British India, in the Madras presidency. The city is on both banks of the river Tirumani- muttar, 3 m. from a station on the Madras railway, 206 m. S.W. of Madras city. Pop. (1901), 70,621. There is a considerable weaving industry and some manufacture of cutlery. Its situa- tion in a green valley between the Shevaroy and Jarugumalai hills is picturesque.

The District of Salem has an area of 7530 sq. m. Except towards the south it is hilly, with extensive plains- lying between the several ranges. It consists of three distinct tracts, formerly known as the Talaghat, the Baramahal and the Balaghat. The Talaghat is situated below the Eastern Ghats on the level of the Carnatic generally; the Baramahal includes the whole face of the Ghats and a wide piece of country at their base; and the Balaghat is situated above the Ghats on the tableland of Mysore.

The western part of the district is mountainous. Amongst the chief ranges (5000-6000 ft.) are the Shevaroys, the Kalrayans, the Melagiris, the Kollimalais, the Pachamalais and the Yelagiris. The chief rivers are the Cauvery with its numerous tributaries, and the Ponniar and Palar; the last, however, only flows through a few miles of the north-western corner of the district. The forests are of considerable value. The geological structure of the district is mostly gneissic, with a few irruptive rocks in the form of trap dikes and granite veins. Magnetic iron ore is common in the hill regions, and corundum and chromate of iron are also obtainable. The qualities of the soil differ very much ; in the country immediately surrounding the town of Salem a thin layer of calcareous and red loam generally prevails, through which quartz rocks appear on the surface in many places. The climate, owing to the great difference of elevation, varies considerably ; on the hills it is cool and bracing, and for a great part of the year very salubrious; the annual rainfall averages about 32 in.

The population in 1901 was 2,204,974, showing an increase of 1 2 % in the decade. The principal crops are millets,, rice, other food grains and oil-seeds, with a little cotton, indigo and tobacco. Coffee is grown on the Shevaroy hills. The chief irrigation work is the Barur tank

system. Salem suffered severely from the famine of 1877-1878. The Madras railway runs through the district, with two narrow-gauge branches. The chief industry is cotton-weaving, and there is some manufacture of steel from magnetic iron ore. There are many saltpetre refineries, but no large industries. The district was acquired partly by the treaty of peace with Tippoo Sultan in 1792 and partly by the partition treaty of Mysore in 1799. By the former the Talaghat and Baramahal were ceded, and by the latter the Balaghat or what is now the Hosur taluk.

SALEM, a city and one of the county-seats (Lawrence is the other) of Essex county, Massachusetts, about 15 m. N.E. of Boston. Pop. (1900), 35,956, of whom 10,902 were foreign-born (including 4003 French Canadians, 3476 Irish, and 1585 English

Canadians), 23,038 were of foreign parentage (one or the other parent foreign-born) and 156 were negroes; (1910), 43,697. Area, 8-2 sq. m. Salem is served by the Boston & Maine and by interurban electric railways westward to Peabody, Danvers and Lawrence, eastward to Beverly, and southward to Marblehead, Swampscott, Lynn and Boston. It occupies a peninsula projecting toward the north-east, a small island (Winter Island) connected with the neck of the peninsula (Salem Neck) by a causeway, and some land on the mainland. Salem has many historical and literary landmarks. There are three court-houses, one of granite (1839-1841) with great monolithic Corinthian pillars, another (1862), adjoining it, of brick, and a third (1908-1909) of granite, for the probate court. The City Hall was built in 1837, and enlarged in 1876. The Custom House (1818-1819) is described in the introduction to Hawthorne's Scarlet Letter, and in it Hawthorne worked as surveyor of the port in 1845-1849. The public library building (1888) was given to the city by the heirs of Captain John Bertram.

The Essex Institute (1848) is housed in a brick building (1851) with freestone trimmings and in old Plummer Hall (1857); its museum contains some old furniture and a collection of portraits ; it has an excellent library and publishes quarterly (1859 sqq.) Historical Collections. The Peabody Academy of Science, founded by the gift in 1867 of $140,000 from George Peabody and incorporated in 1868, is established in the East India Marine Hall (1824), bought for this

Eurpose from the Salem East India Marine Society. The Marine ociety was organized in 1799, its membership being limited to ” persons who have actually navigated the seas beyond the Cape of Good Hope or Cape Horn, as masters or supercargoes of vessels belonging to Salem ” ; it assists the widows and children of members. Its museum, like the ethnological and natural history collection of the Essex Institute, was bought by the Peabody Academy of Science, whose museum now includes Essex county collections (natural history, mineralogy, botany, prehistoric relics, &c), type collections of minerals and fossils; implements, dress, &c. of primitive peoples, especially rich in objects from Malaysia, Japan and the South Seas; and portraits and relics of famous Salem merchants, with models and pictures of Salem merchant vessels. The Salem Athenaeum (1810), the successor of a Social Library (1760) and a Philosophical Library (1781) is housed in Plummer Hall (1908), a building in the southern Colonial style, named in honour of a benefactor of the Athenaeum, Caroline Plummer (d. 1855), who endowed the Plummer Professorship of Christian Morals at Harvard. Some of the old houses were built by ship-owners before the War of Independence, and more were built during the first years of the 19th century when Salem privateersmen made so many fortunes. Many of the finest old houses are of the gambrel type ; and there are many beautiful doorways, doorheads and other details. Nathaniel Hawthorne’s birthplace was built before 1692; another house — now recon- structed and used as a social settlement — is pointed out as the original ” house of seven gables.” The Corwin or “Witch” house, so called from a tradition that Jonathan Corwin, one of the judges in the witchcraft trials, held preliminary examinations of witches here, is said to have been the property of Roger Williams. The Pickering house, built before 1660, was the homestead of Timothy Pickering and of other members of that family. Among the other buildings and institutions are Hamilton Hall (1805); the Franklin Building (1861) of the Salem Marine Society; a large armoury; a state normal school (1854); an orphan asylum (1871), under the Sisters of the Grey Nuns ; the Association for the Relief of Aged and Destitute Women (i860), occupying a fine old brick house formerly the home of Benjamin W. Crowninshield (1772-1851), a member of the national House of Representatives in 1824-1831 and Secretary of the Navy in 1814; the Bertram Home for Aged Men (1877) in a house built in 1806-1807; the Plummer Farm School for Boys (incorporated 1855, opened 1870), another charity of Caroline Plummer, on Winter Island; the City Almshouse (1816) and the City Insane Asylum (1884) on Salem Neck; a home for girls (1876); the Fraternity (1869), a club-house for boys; the Marine Society Bethel and the Salem Seamen’s Betlrel; the Seamen’s Orphan and Children’s Friend Society (1839); an Associated

Charities (1901), and the Salem Hospital (1873).

Among the Church organizations are: the First (Unitarian; originally Trinitarian Congregational), which dates from 1629 and was the first Congregational church organized in America ; the Second or East Church (Unitarian) organized in 1718; the North Church (Unitarian), which separated from the First in 1772; the Third or Tabernacle (Congregational), organized in 1735 from the First Church; the South (Congregational), which separated from the Third in 1774; several Baptist churches; a Quaker society, with a brick_ meeting-house (1832); St Peter's, the oldest Episcopalian church in Salem, with a building of English Gothic erected in 1833, and Grace Church (1858).

Washington Square or the Common (8 acres) is in the centre of the city. The Willows is a 30-acre park on the Neck shore, and in North

Salem is Liberty Hill, another park. On a bluff projecting into South river is the old " Burying Point," set apart in 1637, and the oldest cemetery in the city; its oldest stone is dated 1673; here are buried Governor Simon Bradstreet, Chief-Justice Benjamin Lynde (1666-1745) and Judge John Hathorne (1641-1717) of the witch-craft court. The Broad Street Burial Ground was laid out in 1655. On Salem Neck is Fort Lee and on Winter Island is Fort Pickering (on the site of a fort built in 1643), near which is the Winter Island Lighthouse.

The main trade of Salem is along the coast, principally in the transhipment of coal; and the historic Crowninshield's or India wharf is now a great coal pocket. The harbour is not deep enough for ocean-going vessels, and manufacturing is the most important industry. In 1905 the total value of the factory products Was $12,202,217 (13.9% more than in 1900), and the principal manu- factures were boots and shoes and leather. The largest single establishment is the Naumkeag Steam Cotton Company, which has 2800 looms and about 1500 mill-hands. Another large factory is that of the silversmiths, Daniel Low & Co.

History. — Salem was settled in 1626 by Roger Conant (1593- 1679) and a company of " planters," who in 1624 (under the Sheffield patent of 1623 for a settlement on the north shore of Massachusetts Bay) had attempted a plantation at Cape Ann, whither John Lyford and others had previously come from Plymouth through " dissatisfaction with the extreme separation from the English church." Conant was not a separatist, and the Salem settlement was a commercial venture, partly agri- cultural and partly to provide a wintering place for Banks

fishermen so that they might more quickly make their spring catch. Cape Ann was too bleak, but Naumkeag was a ” pleasant and fruitful neck of land,” which they named Salem in June 1629, probably in allusion to Psalm lxxvi. 2. In 1628 a patent for the territory was granted by the New England Council to the Dorchester Company, in which the Rev. John White of Dor- chester, England, was conspicuous, and which in the same year sent out a small company under John Endecott as governor. Under the charter for the Colony of Massachusetts Bay (1629), which superseded the Dorchester Company patent, Endecott continued as governor until the arrival in 1630 of John Winthrop, who soon removed the seat of government from Salem first to Charlestown and then to Boston. In July or August 1629 the first Congregational Church (see Congrega- tionalism, § American) in America was organized here; its “teacher” in 1631 and 1633 and its pastor in 1634-1635 was Roger Williams, a close friend of Governor Endecott and always popular in Salem, who in 1635 Aed thence to Rhode Island to escape arrest by the officials of Massachusetts Bay. In 1686, fearing that they might be dispossessed by a new charter, the people of Salem for £20 secured a deed from the Indians to the land they then held. Although not strictly Puritan the character of Salem was not essentially different from that of the other Massachusetts towns. The witchcraft delusion of 1692 centred about Salem Village, now in the township of Danvers, but then a part of Salem. Ten girls, aged nine to seventeen years, two of them house servants, met during the winter of 1691-1692 in the home of Samuel Parris, pastor of the Salem Village church, and after learning palmistry and various ” magic ” tricks from Parris’s West Indian slave, Tituba, and influenced doubtless by current talk about witches, accused Tituba and two old women of bewitching them. The excitement spread rapidly, many more were accused, and, within four months, hundreds were arrested, and many were tried before commissioners of oyer and terminer (appointed On the 27th of May 1692, including Samuel Sewall, q.v., of Boston, and three inhabitants of Salem, one being Jonathan Corwin); nineteen were hanged, 1 and one was pressed to death in September for refusing to plead when he was accused. All these trials were conducted in accordance with the English law of the time; there had been an execution for witchcraft at Charlestown in 1648; there was a case in Boston in 1655; in J 68o a woman of Newbury was condemned to death for witchcraft but was reprieved by Governor Simon Bradstreet; in England and Scotland there were many executions long after the Salem delusion died out. The reaction came suddenly in Salem, and in May 1693 Governor William Phips ordered

1 There is nothing but tradition to identify the place of execution with

what is now called Gallows Hill, between Salem and Peabody.

:he release from prison of all then held on the charge of witchcraft.

Salem was an important port after 1670, especially in the India trade, and Salem privateers did great damage in the Seven Years' War, in the War of Independence (when 158 Salem privateers took 445 prizes), and in the War of 1812. On this foreign trade and these rich periods of privateering the prosperity of the place up to the middle of the 19th century was built.

The First Provincial Assembly of Massachusetts met in Salem in 1774. On the 20th of February 1775 at the North Bridge (between the present Salem and Danvers) the first armed resist- ance was offered to the royal troops, when Colonel Leslie with the 64th regiment, sent to find cannon hidden in the Salem " North Fields," was held in check by the townspeople. Salem was the birthplace of Nathaniel Hawthorne, W. H. Prescott, Nathaniel Bowditch, Jones Very and W. W. Story.

Marblehead was separated from Salem township in 1040-, Beverly in 1668, a part of Middleton in '1728, and the district of Danvers in 1752. Salem was chartered as a city in 1836.

See Charles S. Osgood and Henry M . Batchelder, Historical Sketch of Salem, 1626-187Q (Salem, 1879); Joseph B. Felt, Annals of Salem (ibid., 1827; 2nd ed., 2 vols., 1845-1849); Charles W. Upham, Salem Witchcraft (2 vols., Boston, 1867); H. B. Adams, Village Communities of Cape Ann and Salem (Baltimore, 1883); Eleanor Putnam (the pen-name of Mrs Arlo Bates), OldSalem (Boston, 1886); C. H. Webber and W. S. Nevins, Old Naumkeag (Salem, 1877) ; R. D. Paine, Ships and Sailors of Old Salem (New York, 1909) , and Visitor's Guide to Salem (Salem, 1902) published by the Essex Institute.

SALEM, a city and the county-seat of Salem county, New Jersey, U.S.A., in the S.W. part of the state, on Salem Creek, about 38 m. S.W. of Philadelphia. Pop. (1900), 581 1, of whom 263 were foreign-born and 809 were negroes; (1910 U.S. census), 6614. It is served by the West Jersey & Seashore railroad, and has steamer connexion with Philadelphia. Among its institutions is the John Tyler Library, established as Salem Library in 1804 and said to be the third oldest public library in the state. In Finn's Point National Cemetery, about 4 m. N. of Salem, there are buried some 2460 Confederate soldiers, who

died during the Civil War while prisoners of war at Fort Delaware, on an island in Delaware river nearly opposite the mouth of Salem Creek. Salem lies in a rich agricultural region. Among the city's manufactures are canned fruits and vegetables, condiments, glass-ware, brass and iron-work, hosiery, linoleum and oil-cloth. Near the present site in 1643 colonists from Sweden built Fort Elfsborg; but the Swedish settlers in 1655 submitted to the Dutch at New Amsterdam, and the latter in turn surrendered to the English in 1664. In 1675 John Fenwicke, an English Quaker, entered the Delaware river and founded the first permanent English settlement on the Delaware (which he called Salem). After purchasing lands from the Indians, Fenwicke attempted to maintain an independent government, but in 1682 he submitted to the authority of the proprietors of West Jersey. During the War of Independence Salem was plundered on the 17th of March 1778 by British troops under Colonel Charles Mawhood, and on the following day a portion of these troops fought a sharp but indecisive engagement at Quinton's Bridge, 3 m. S. of the town, with American militia under Colonel Benjamin Holmes. Salem was incorporated as a town in 1695, and was chartered as a city in 1858.

SALEM, a city of Columbiana county, Ohio, U.S.A., 67 m. N.W. of Pittsburg and about the same distance S.E. of Cleveland. Pop. (1900), 7582, including 667 foreign-born and 227 negroes; (1 9 1 o) 8943 . Salem is served by the Pennsylvania (the Pittsburg, Fort Wayne & Chicago division) and the Youngstown & Ohio River railways, and by an interurban electric line to Canton. The city has a Carnegie library (1896), two beautiful cemeteries, a park, and a Home for Aged Women. It is situated in a fine agricultural region; coal is mined in the vicinity; natural gas is obtained in abundance; and the city has various manu- factures. It was settled by Friends in 1806, incorporated as a town in 1830 and as a village in 1852, and chartered as a city in 1887. For several years preceding the Civil War it was a station on the " underground railway " and the headquarters of " the

Western Anti-Slavery Society," which published here the Anti- Slavery Bugle.

SALEM, the capital of Oregon, U.S.A., and the county-seat of Marion county, on the east bank of the Willamette river, 52 m. S.S.W. of Portland. Pop. (1900), '4258, including 522 foreign- born; (1910) 14,094. It is served by the Southern Pacific railway, by the Oregon Electric line (to Portland), and by a steamship line to Portland. The city is in the centre of the Willamette Valley, a rich farming and fruit-growing country. It has wide, well- shaded streets, and two public parks. Among the public buildings and institutions are the State

Capitol, the State Library, a city public library, the county court-house, the Federal building, the state penitentiary and several charitable institutions. Salem is the seat of Willamette University (Methodist Episcopal, 1844), an outgrowth of the mission work of the Methodist Episcopal church begun in 1834 about 10 m. below the site of the present city; of the Academy of the Sacred Heart (Roman Catholic, i860) and of two business colleges. Immediately north of the city at Chemawa is the Salem (non-reservation) government school for Indians, with an excellently equipped hospital. Water power is derived (in part, by an 18 m. canal) from the Santiam, an affluent of the Willamette river. The city is a market for the produce of the Willamette Valley. The settlement here, gathering about the Methodist mission and school, began to grow in the decade 1840-1850. Salem was chartered as a city in 1853, and in i860 was made the capital of the state. It grew rapidly after 1900, and its territory was increased in 1903.

SALEM, a town and the county-seat (since 1838) of Roanoke county, Virginia, U.S.A., on the Roanoke river, about 60 m. W. by S. of Lynchburg. Pop. (1900), 3412, including 798 negroes; (1910) 3849. It is served by the Norfolk & Western and the Virginian railways, and has electric railway connexion with Roanoke, about 6 m. E. The town is a summer resort about 1000 ft. above the sea, surrounded by the Alleghany and Blue Ridge mountains. There are chalybeate and sulphur springs in the vicinity. Salem is the seat of a Lutheran Orphan Home (1888), of the Baptist Orphanage of Virginia (1892) and of Roanoke College (co-educational; Lutheran; chartered, 1853). The town is in a dairying, agricultural and fruit-growing region. The Roanoke river provides water-power. The water supply is obtained from a spring within the town limits, from which there flows about 576,000 gallons a day, and from an artesian well. This part of Roanoke county was granted in 1767 to General Andrew Lewis, to whom there is a monument in East Hill Cemetery, where he is buried. Salem, laid out in 1802, was incorporated as a town in 1813.

SALE OF GOODS. Sale (O.Eng. sola, sellan, syllan, to hand over, deliver) is commonly defined as the transfer of property from one person to another for a price. This definition requires some consideration in order to appreciate its full scope., The law of sale is usually treated as a branch of the law of contract, because sale is effected by contract. Thus Pothier entitles his classical treatise on the subject, Traite du contrat de vente, and the Indian Contract Act (ix. of 1872) devotes a chapter to the sale of goods. But a completed contract of sale is something more. It is a contract plus a transfer of property. An agreement to sell or buy a thing, or, as lawyers call it, an executory contract of sale, is a contract pure and simple. A purely personal bond arises thereby between seller and buyer. But a complete or executed contract of sale effects a transfer of ownership with all the advantages and risks incident thereto. By an agreement to sell a. jus in personam is created; by a sale a, jus in rem is trans- ferred. The essence of sale is the transfer of property for a price. If there be no agreement for a price, express or implied, the transaction is gift, not sale, and is regulated by its own peculiar rules and considerations. So, too, if commodity be exchanged for commodity, the transaction is called barter and not sale, and the rules relating to sales do not apply in their entirety. Again, a contract of sale must comtemplate an absolute transier of the property in the thing sold or agreed to be sold. A mortgage may be in the form of a conditional sale, but English law regards the

The Code of 1893.

substance and not the form of the transaction. If in substance the object of the transaction is to secure the repayment of a debt, and not to transfer the absolute property in the thing sold, the law at once annexes to the transaction the complex consequences which attach to a mortgage. So, too, it is not always easy to distinguish a contract for the sale of an article from a contract for the supply of work and materials. If a man orders a set of false teeth from a dentist the contract is one of sale, but if he employs a dentist to stop one of his teeth with gold the contract is for the supply of work and materials. The distinction is of practical importance, because very different rules of law apply to the two classes of contract. The property which may be the subject of sale may be either movable or immovable, tangible or intangible. The present article relates only to the sale of goods — that is to say, tangible movable property. By the laws of all nations the alienation of land or real property is, on grounds of public policy, subject to special regulations. It is obvious that the assignment of " things in action," such as debts, contracts and negotiable instruments, must be governed by very different principles from those which regulate the transfer of goods, when the object sold can be transferred into the physical possession of the transferee.

In 1847, when Mr Justice Story wrote his work on the sale of personal property, the law of sale was still in process of development. Many rules were still unsettled, especially the rules re- lating to implied conditions and warranties. But for several years the main principles have been well settled. In 1891 the subject seemed ripe for codification, and Lord Herschell introduced a codifying bill which two years later passed into law as the Sale of Goods Act, 1893 (56 & 57 Vict. c. 71). Sale is a consen- sual contract. The parties to the contract may supplement it with any stipulations or conditions they may see fit to agree to. The code in no wise seeks to fetter this discretion. It lays down a few positive rules — such, for instance, as that which reproduces the 17th section of the Statute of Frauds. But the main object of the act is to provide clear rules for those cases where the parties have either formed no intention or have failed to express it. When parties enter into a contract they contemplate its smooth performance, and they seldom provide for contingencies which may interrupt that performance — such as the insolvency of the buyer or the destruction of the thing sold before it is delivered. It is the province of the code to provide for these contingencies, leaving the parties free to modify by express stipulation the provisions imported

by law. When the code was in contemplation the case of Scotland gave rise to difficulty. Scottish law varies widely from English. To speak broadly, the Scottish law of sale differs from the English by adhering to the rules of Roman law, while the English common law has worked out rules of its own. Where two countries are so closely connected in business as Scotland and England, it is obviously inconvenient that their laws relating to commercial matters should differ. The Mercantile Law Commission of 1855 reported on this question, and recommended that on certain points the Scottish rule should be adopted in England, while on other points the English rule should be adopted in Scotland. The recommendations of the Commission were partially and rather capriciously adopted in the English and Scottish Mercantile Law Amendment Acts of 1 856. Certain rules were enacted for England which resembled but did not really reproduce the Scottish law, while other rules were enacted for Scotland which resembled but did not really reproduce the English law. There the matter rested for many years. The Codifying Bill of 1891 applied only "to England, but on the advice of Lord Watson it was extended to Scotland. As the English and Irish laws of sale were the same, the case of Ireland gave rise to no difficulty, and the act now applies to the whole of the United Kingdom. As regards England and Ireland very little change in the law has been effected. As regards Scotland the process of assimilation has been carried further, but has not been completed. In a few cases the Scottish rule has been saved or re- enacted, in a few other cases it has been modified, while on other points, where the laws were dissimilar, the English rules have been adopted.

Now that the law has been codified, an analysis of the law resolves itself into an epitome of the main provisions of the statute. The act is divided into six parts, the first dealing with the formation of the contract, the second with the effects of the contract, the third with the performance of the contract, the fourth with the rights of an unpaid seller against the goods, and the fifth with remedies for breach of contract, the sixth part is supplemental. The 1st section, which ftiay be regarded as the keystone of the act, is in the following terms: "A contract of sale of goods is a contract whereby the seller transfers or agrees to transfer the property in goods to the buyer lot a money consideration called the price. A contract of sale may be absolute or conditional. When under a contract of sale the property in the goods is transferred from the seller to the buyer the contract is called a ' sale,' but when the transfer of the property in the goods is to take place at a future time or subject to some

condition thereafter to be fulfilled the contract is called an ' agreement to sell.' An agreement to sell becomes a sale when the time

elapses or the conditions are fulfilled subject to which the property in the goods is to be transferred." This section clearly enunciates the consensual nature of the contract, and this is confirmed by section 55, which provides that " where any right, duty or liability would arise under a contract of sale by implication of law," it may be negatived or varied by express agreement, or by the course of dealing between the parties, or by usage, if the usage be such as to bind both parties to the contract. The next question is who can sell and buy. The act is framed on the plan that if the law of contract were codified, this act would form a chapter in the code. The question of capacity is therefore referred to the general law, but a special provision is inserted (section 2) relating to the supply of necessaries to infants and other persons who are incompetent to contract. Though an infant cannot contract he must live, and he can only get goods by paying for them. The law, therefore, provides that he is liable to pay a reasonable price for necessaries supplied to him, and it defines necessaries as " goods suitable to the condition in life of such minor or other person, and to his actual requirements at the time of the sale and delivery."

The 4th section of the act reproduces the famous 17th section of the Statute of Frauds, which was an act " for the prevention of frauds and perjuries." The object of that statute Was to prevent people from setting up bogus contracts of sale by requiring material evidence of the contract. The section provides that " a contract tor the sale of any goods of the value of ten pounds or upwards shall not be enforceable by action unless the buyer shall accept part of the goods so sold, and actually receive the same, or give something in earnest to bind the contract, or in part payment, or unless some note or memorandum in writing of the contract be made and signed by the party to be charged, or his agent in that behalf." It is a much disputed question whether this enactment has done more good or harm. It has defeated many an honest claim, though it may have prevented many a dishonest one from being put forward. When judges and juries have been satisfied of the bona fides of a contract which does not appear to satisfy the statute, they have done their best to get round it. Every expression in the section has been the subject of numerous judicial decisions, which ran into almost impossible refinements, and illustrate the maxim that hard cases make bad law. It is to be noted that Scotland is excluded from the operation of section 4. The Statute of Frauds has never been applied to Scotland; and Scotsmen appear never to have felt the want of it.

As regards the subject-matter of the contract, the act provides that it may consist either of existing goods or " future goods " — that is to say, goods to be manufactured or acquired by the seller after the

making of the contract (§ §). Suppose that a man goes into a gunsmith's shop and says, " This gun suits me, and if you will make or get me another like it I will buy the pair." This is a good contract, and no question as to its validity would be likely to occur to the lay mind. But lawyers have seriously raised the question, whether there could be a valid contract of sale when the subject-matter of the contract was not in existence at the time when the contract was made. The price is an essential element in a contract of sale. It may be either fixed by the contract itself, or left to be determined in some manner thereby agreed upon, e.g. by the award of a third party. But there are many cases in which the parties intend to effect a sale, and yet say nothing about the price. Suppose that a man goes into a hotel and orders dinner without asking the price. How is it to be fixed ? The law steps in and says that, in the absence of any agree- ment, a reasonable price must be paid (§ 8). This prevents ex- tortion on the part of the seller, and unreasonableness or fraud on the part of the buyer.

The next question dealt with is the difficult one of conditions and warranties (§§ 10 and 11). The parties may insert what stipulations they like in a contract of sale, but the law has to interpret them. The term" warranty "has a peculiar and technical Warr anty. meaning in the law of sale. It denotes a stipulation which the law regards as collateral to the main purpose of the contract. A breach, therefore, does not entitle the buyer to reject the goods, but only to claim damages. Suppose that a man buys a particular horse, which is warranted quiet to ride and drive. If the horse turns out to be vicious, the buyer's only remedy is to claim damages, unless he has expressly reserved a right to return it. But if, instead of buying a particular horse, a man applies to a dealer to supply him with a quiet horse, and the dealer supplies him with a vicious one, the stipulation is a condition. The buyer can either return the horse, or keep it and claim damages. Of course the right of rejection must be exercised within a reasonable time. In Scotland no distinction has been drawn between conditions and warranties, an3 the act preserves the Scottish rule by providing that, in Scotland, " failure by the seller to perform any material part of a contract of sale " entitles the buyer either to reject the goods within a reasonable time after delivery, or to retain them and claim compensation (§11 (2)). In England it is a very common trick for the buyer to keep the goods, and then set up in reduction of the price that they are of inferior quality to what was ordered. To discourage this practice in Scotland the act provides that, in that country, the court may require the buyer who alleges a breach of contract to bring the agreed price into court

pending the decision of the case (§ 59). It seems a pity that this sensible rule was not extended to England.

In early English law caveat emptor was the general rule, and it was one well suited to primitive times. Men either bought their goods in the open market-place, or from their neighbours, and buyer and seller contracted on a footing ol equality. Now the complexity of modern commerce, the division of labour and the increase of technical skill, have altogether altered the state of affairs. The buyer is more and more driven to rely on the honesty, skill and judgment of the seller or manufacturer. Modern law has recognized this, and protects the buyer by implying various conditions and warranties in contracts of sale, which may be summarized as follows: First, there is an implied undertaking on the part of the seller that he has a right to sell the goods (§ 12). Secondly, if goods be ordered by description, they must correspond with that description (§ 13). This, of course, is a universal rule — ■ Si aes pro auro veneat, non valet. Thirdly, there is the case of manufacturers or sellers who deal in particular classes of goods. They naturally have better means of judging of their merchandise than the outside public, and the buyer is entitled within limits to rely on their skill or judgment. A tea merchant or grocer knows more about tea than his customers can, and so does a gun- smith about guns. In such cases, if the buyer makes known to the seller the particular purpose for which the goods are required, there is an implied condition that the goods are reasonably fit for it, and if no particular purpose be indicated there is an implied condition that the goods supplied are of merchantable quality (§ 14). Fourthly, in the case of a sale by sample, there is ” an implied condition that the bulk shall correspond with the sample in quality,” and that the buyer shall have a reasonable opportunity of comparing the bulk with the sample (§ 15).

The main object of sale is the transfer of ownership from seller to buyer, and it is often both a difficult and an important matter to determine the precise moment at which the change of Effects of owners hip is effected. According to Roman law, which is Contract. gt jjj ˆ f oun

In the vast majority of cases people only sell what they have a right to sell, but the law has to make provision for cases where a man sells goods which he is not entitled to sell. An agent may * misconceive or exceed his authority. Stolen goods may

be passed from buyer to buyer. Then comes the question, Which of two innocent parties is to suffer? Is the original owner to be permanently deprived of his property, or is the loss to fall on the innocent purchaser? Roman law threw the loss on the buyer, Nemo plus juris in alium transferre potest quam ipse kabet. French law, in deference to modern commerce, protects the innocent purchaser

and throws the loss on the original owner. ” En fait de meubles, possession vaut titre ” (Code civil, art. 1599). English law is a compromise between these opposing theories. It adopts the Roman rule as its guiding principle, but qualifies it with certain more or less arbitrary exceptions, which cover perhaps the majority of the actual cases which occur (§§ 21 to 26). In the first place, the pro- visions of the Factors Act, 1889 (52 and 53 Vict. c. 45, extended to Scotland by 53 and 54 Vict. c. 40), are preserved. That act validates sales and other dispositions of goods by mercantile agent acting within the apparent scope of their authority, and also protects innocent purchasers who obtain goods from sellers left in possession, or from intending buyers who have got possession of the goods while negotiations are pending. In most cases a contract induced by fraud is voidable only, and not void, and the act provides, accordingly, that a voidable contract of sale shall be avoided to the prejudice of an innocent purchaser. The ancient privilege of market overt 1 is preserved intact, section 22 providing that ” where goods are sold in market overt, according to the usage of th» market, the buyer acquires a good title to the goods provided he buys them in good faith, and without notice of any defect or want of title on the part of the seller.” The section does not apply to Scotland, nor to the law relating to the sale of horses which is contained in two old statutes, 2 & 3 Phil, and Mar. c. 7, and 31 Eliz. c. 12. The minute regulations of those statutes are never complied with, so their practical effect is to take horses out of the category of things which can be sold in market overt. The privilege of market overt applies only to markets by prescription, and does not attach to newly- created markets. The operation of the custom is therefore fitful and capricious. For example, every shop in the City of London is within the custom, but the custom does not extend to the greater London outside. If then a man buys a stolen watch in Fleet Street.ˆhe may get a good title to it, but he cannot do so if he buys it a few doors off in the Strand. There is, however, a qualification of the rights acquired by purchase even in market overt. When goods have been stolen and the thief is prosecuted to conviction, the property in the goods thereupon revests in the original owner, and he is entitled to get them back either by a summary order

of the convicting court or by action. This rule dates back to the statute 21 Hen. VIII. c. II. It was probably intended rather to encourage prosecutions in the interests of public justice than to protect people whose goods were stolen.

Having dealt with the effects of sale, first, as between seller and buyer, and, secondly, as between the buyer and third parties, the act proceeds to determine what, in the absence of .

convention, are the reciprocal rights and duties of the ” erf orm- parties in the performance of their contract (§§ 27 to 37). aace ‘ ” It is the duty of the seller to deliver the goods and of the buyer to accept and pay for them in accordance with the terms of the contract of sale ” (§ 27). In ordinary cases the seller’s duty to deliver the goods is satisfied if he puts them at the disposal of the buyer at the place of sale. The normal contract of sale is represented by a cash sale in a shop. The buyer pays the price and takes away the goods : ” Unless otherwise agreed, delivery of the goods and payment of the price are concurrent conditions ” (§ 27). But agreement, express or implied, may create infinite variations on the normal contract. It is to be noted that when goods are sent to the buyer which he is entitled to reject, and does reject, he is not bound to send them back to the seller. It is sufficient if he intimate to the seller his refusal to accept them (§ 36).

The normal theory of sale is cash against delivery, but in the great majority of actual cases, especially in commercial transactions, this theory is departed from in practice. The interests of the seller are therefore protected by two rules — namely, * ignisat those as to lien and as to stoppage in transitu. In the /?* absence of any different agreement, as, for instance, where * era * there is a stipulation for sale on credit, the unpaid seller has a right to retain possession of the goods until the price is paid or tendered. The right may, of course, be waived, even when it is not negatived by the contract. It is to be noted that when the seller takes a bill of exchange or other negotiable instrument for the price, the instru- ment operates as conditional payment. On the dishonour of the instrument the seller’s rights revive (§§ 38-43). If the buyer becomes insolvent the unpaid seller has a further right founded on ancient mercantile usage. He may have parted with both the property in and possession of the goods sold, but he can attach the goods as long as they are in the hands of a carrier or forwarding agent, and have not reached the actual possession of the seller or his immediate agent. “Subject to the provisions of this Act, when the buyer of goods becomes insolvent, the unpaid seller who has parted with the possession of the goods has the right of stopping them in transitu — ■ that is to say, he may resume possession of the goods

as long as they are in course of transit, and may retain them until payment or tender of the price ” (§ 44). The right of stoppage, however, cannot be exercised to the prejudice of third parties to whom the bill of lading or other document of title to goods has been lawfully trans- ferred for value (§ 47).

The ultimate sanction of a contract is the legal remedy for its

1 That is, ” open market,” where the goods on sale are exposed to view.

breach. Seller and buyer have each their appropriate remedies. If the property in the goods has passed to the buyer, or if, under the contract, ” the price is payable on a day certain irrespec- “” tive of delivery,” the seller’s remedy for breach of the con-

j**^|f tract is an action for the price (§ 49). In other cases his asase er. remet j v j s an ac tj on f or damages for non-acceptance. In the case of ordinary goods of commerce the measure of damages is the difference between the contract price and the market or current

grice at the time when the goods ought to have been accepted, ut this test is often applicable. For instance, the buyer may have ordered some article of special manufacture for which there would be no market. The convenient market-price rule is therefore sub- ordinate to the general principle that ” the measure of damages is the estimated loss directly and naturally resulting in the ordinary course of events from the buyer’s breach of contract ” (§ 56). Similar considerations apply to the buyer’s right of action for non-delivery of the goods (§ 51). Section 52 deals with a peculiar feature of English law. In Scotland, as a general rule, a party who complains of a breach of contract is entitled to claim that the contract shall be specifically performed. In England a court of common law could only award damages, and apart from certain recent statutes, a claim for specific performance could only be entertained by a court of equity in a very narrow class of cases when the remedy by damages wasdeemed inadequate. But now, underthe act of 1893, ” in any action for breach of contract to deliver specific or ascertained goods the court may, if it thinks fit, direct that the contract shall be per- formed specifically without giving the defendant the option of re- taining the goods on

payment of damages.” The buyer who com- plains of a breach of warranty on the part of the seller has two remedies. He may either set up the breach of warranty in reduction of the price, or he may pay the price and sue for damages. The prima facie measure of damages is the difference between the value of the goods at thj time of delivery and the value they would have had if they had answered to the warranty (§ 53).

The sixth part of the act is supplemental, and is mainly con- cerned with drafting explanations, but section 58 contains some rules for regulating sales by auction. It prohibits secret bidding on behalf of the seller to enhance the price, but is silent as to combina- tion by buyers to reduce the price. Such a combination, commonly known as a ” knock out,” is left to be dealt with by the ordinary law of conspiracy.

The Sale of Goods Act 1893 was the third attsmpt made by the English parliament to codify a branch of commercial law. It would be out of place here to discuss the policy of mercantile codification, but it may be noted that there are very few reported cases on the construction of the act, so that its interpretation does not seem to have given rise to difficulty. As has been noted above, the act preserves some curious anomalies and distinctions between English and Scottish law. But the amendments re- quired to remove them would be few and simple, should the legislature ever think it worth while to undertake the task.

United States. — The law as to the sale of real estate agrees gener ally with English law. It is considerably simplified by a system of registration. The covenant of warranty, unknown in England, is the principal covenant for title in the United States. It corresponds generally to the English covenant for quiet enjoyment. The right of judicial sale of buildings under a mechanic’s lien for labour and materials is given by the law of many states. The sale of public lands is regulated by Act of Congress. In the law of sale of personal property American law is also based upon English law. The principal differences are that the law of market overt is not recognized by the United States, and that an unpaid vendor is the agent of the vendee to resell on non-payment, and is entitled to recover the difference between the contract price and the price of resale. Warranty of title is not carried as far as in England. United States decisions draw a distinction between goods in the possession and goods not in the possession of the vendor at the time of ‘5*ale. There is no warranty of title of the latter. The Statute of Frauds has been construed in some respects differently from the English decisions. As to unlawful sales, it has been held that a sale in a state where the sale is lawful is valid in a state where it is un-lawful by statute, even though the goods are in

the latter state.

The ordinary text-books on the law of sale are constantly re-edited and brought up to date. The following among the others may be consulted: Benjamin's Sale of Personal Property; Blackburn's Contract of Sale; Campbell's Law of Sale and Mercantile Agency; Brown's Sale of Goods Act (Scotland); Chalmers's Sale of Goods Act; Moyle's Contract of Sale in the Civil Law; E. J. Schuster s Principles of German Civil Law; Beddarride's Des achats el ventes commer- ciales; Story's Sale of Personal Property (United States).

(M. D. Ch.)

SALEP (Arab, sahleb, Gr. 8px«), a drug extensively used in oriental countries as a nervine restorative and fattener, and also much prescribed in paralytic affections. It probably owed its original popularity to the belief in the " doctrine of signatures."

It is not used in European medicine. It consists of the tuberous roots of various species of Orchis and Eulophia, which are decorti- cated, washed, heated until horny in appearance, and then dried. Its most important constituent is a mucilaginous substance which it yields with cold water to the extent of 48 %.

SALERNO (anc. Salernum), a seaport and archiepiscopal see of Campania, Italy, capital of the province of Salerno, on the west coast, 33 m. by rail S.E. of Naples. Pop. (1901), 28,936 (town); 45,313 (commune). The ruins of its old Norman castle stand on an eminence 905 ft. above the sea with a back- ground of graceful limestone hills. The town walls were destroyed in the beginning of the 19th century; the seaward portion has given place to the Corso Garibaldi, the principal promenade. The chief buildings are the theatre, the prefecture, and the cathedral of St Matthew (whose bones were brought from Paestum to Salerno in 954), begun in 1076 by Robert Guiscard and consecrated in 1084 by Gregory VII. In front is a beautiful quadrangular court (112 by 102 ft.), surrounded by arcades formed of twenty-eight ancient pillars mostly of granite from Paestum, and containing twelve sarcophagi of various periods; the middle entrance into the church is closed by remarkable bronze doors of 11th-century Byzantine work. The nave and two aisles end in apses. Two magnificent marble ambones, the larger dating from 1175, a large nth-century altar frontal in the south aisle, having scenes from the Bible carved on thirty ivory tablets, with 13th-century mosaics in the apse, given by Giovanni da Procida, the promotor of the Sicilian Vespers, and the tomb of Pope Gregory VII., and that of Queen

Margaret of Durazzo, mother of King Ladislaus, erected in 1412, deserve to be mentioned. In the crypt is a bronze statue of St Matthew. The cathedral possesses a fine Exultet roll. S. Domenico near it has Norman cloisters, and several of the other churches contain paintings by Andrea Sabbatini da Salerno, one of the best of Raphael's scholars. A fine port constructed by Giovanni da Procida in 1.260 was destroyed when Naples became the capital of the kingdom, and remained blocked with sand till after the unification of Italy, when it was cleared; but it is now unimportant. The chief industries are silk and cotton-spinning and printing. Good wine is produced in the neighbourhood. A branch railway runs N. up the Irno valley to Mercato S. Severino on the line from Naples to Avellino.

A Roman colony (Salernum) was founded in 194 B.C. to keep the Picentini in check. It was captured by the Samnites in the Social War. It was the point at which the coast road to Paestum diverged from the Via Popillia, rejoining it again E. of Buxentum. In the 4th century the correclores of Lucania and the territory of the Bruttii resided here, but it did not attain its full importance till after the Lombard conquest. Dismantled by order of Charlemagne, it became in the 9th century the capital of an independent principality, the rival of that of Benevento, and was surrounded by strong fortifica- tions. The Lombard princes, who had frequently defended their city against the Saracens, succumbed before Robert Guiscard, who took the castle after an eight months' siege and made Salerno the capital of his new territory. The removal of the court to Palermo and the sack of the city by the emperor Henry VI. in 1 194 put a stop to its development. The medical school of the Cimtas Hippo- cratica (as it called itself on its seals) held a high position in medieval times. Salerno university, founded in I i$o, and long one 6f the great seats of learning in Italy, was closed in 1817.

See A. Avena, Monumenti dell' Italia Meridionale (Naples, 1902), i. 371 sqq. _ (T. As.)

SALERS, a village of central France, in the department of Cantal, 30 m. N. of Aurillac by road. Pop. (1906), 659. Salers dates from the gth or 10th century and its lords were already powerful in the nth century. It is finely situated on a plateau overlooking the valley of the Maronne. It is a quaint old town with a church of the 13th and 15th centuries, remains of its ancient ramparts and many houses of the 15th and 16th centuries. Salers has given its name to a celebrated breed of red cattle raised in the district.

SALESBURY (or Salisbury), WILLIAM (c. 1520-c. 1600), Welsh

scholar, was a native of Denbighshire, being the son of Foulke Salesbury, who belonged to a family said to be descended from a certain Adam of Salzburg, a member of the ducal house of Bavaria, who came to England in the 12th century. Salesbury was educated at Oxford, where he accepted the Protestant

faith, but he passed most of his life at Llanrvvst, working at his literary undertakings. The greatest Welsh scholar of his time, Salesbury was acquainted with nine languages, including Latin, Greek and Hebrew, and was learned in philology and botany. He died about 1600. About 1546 he edited a collection of Welsh proverbs (Oil synwyr pen kembero), probably the first book printed in Welsh, and in 1547 his Dictionary in Englyshe and Welshe was published (facsimile edition, 1877). In 1563 the English parliament ordered the Welsh bishops to arrange for the translation of the Scriptures and the book of common prayer into Welsh. The New Testament was assigned to Salesbury, who had previously translated parts of it. He received valu- able assistance from Richard Davies, bishop of St Davids, and also from Thomas Huet, or Hewett (d. 1591), but he himself did the greater part of the work. The translation was made from the Greek, but Latin versions were consulted, and in October 1567 the New Testament was published for the first time in Welsh. This translation never became very popular, but it served as the basis for the new one made by Bishop William Morgan (c. 1 547- 1 604) . Salesbury and Davies continued to work together, translat- ing various writings into Welsh, until about 1576 when the literary partnership was broken. After this event, Salesbury, although continuing his studies, produced nothing of importance.

Other noteworthy members of the family (the modern spelling is Salusbury) are: John Salesbury (c. 1500-1573), who held many preferments under the Tudor sovereigns and was bishop of Sodor and Ma.i from 1571 to 1573; Thomas Salesbury (c. 1555-1586), an associate of Anthony Babington, who was executed for conspiring against Queen Elizabeth; Henry Salesbury (1561-c. 1637), the author of a Welsh grammar published in 1593; Thomas Salesbury (d. 1643), a poet, who probably fought for Charles I. at Edgehill; and another royalist, William Salesbury (c. 1580-c. 1659), governor of Denbigh Castle, which, in 1646, he gallantly defended in the interests of the king.

SALEYER (Dutch, Saleijer), a group of islands belonging to the government of Celebes and its dependencies in the Dutch East Indies, numbering altogether 73, the principal being Saleyer, Tambalongang, Pulasi and Bahuluwang; between S°36′ and 7 25′ S. and 119 50′ and 121 30′ E. The mainisland, Saleyer, is over 50 m. long and very narrow; area, 248 sq. m. The strait separating it from Celebes is more than 100 fathoms deep and, running in a strong current, is dangerous for native ships to navigate. The strata of the island are all sedimentary rocks: coralline limestone, occasionally sandstone; everywhere, except in the north and north-west, covered by a fertile soil. The watershed is a chain running throughout the island from N. to S., reaching in Bontona Haru 5840 ft., sloping steeply to the east coast.

The population, mainly a mixed race of Macassars, Buginese, the natives of Luvu and Buton, is estimated at 57,000 on the main island and 24,000 on the dependent isles. They use the Macassar language, are for the most part nominally Mahommedans (though many heathen customs survive), and support themselves by agriculture, fishing, seafaring, trade, the preparation of salt (on the south coast) and weaving. Field work is largely performed by a servile class. Raw and prepared cotton, tobacco, trepang, tortoise-shell, coco-nuts and coco-nut oil, and salt are exported. There are frequent emigra- tions to Celebes and other parts of the archipelago. For that reason, and also on account of its excellent horses and numerous buffaloes, Saleyer is often compared with Madura, being of the same import- ance to Celebes as is Madura to Java.

SALFORD, a municipal, county and parliamentary borough of Lancashire, England, 189 m. N.W. by N. of London and 31 m. E. by N. of Liverpool. Pop. (1908 estimate), 239,234. Salford also gives its name to the hundred of south-west Lanca- shire in which Manchester is situated; probably because when the district was divided into hundreds Manchester was in a ruinous condition from Danish ravages. The parliamentary and municipal boundaries of Salford are identical; area, 5170 acres. The parliamentary borough has three divisions, each returning a member. The borough, composed of three townships identical with the ancient manors of Salford, Pendleton and Broughton, is for the most part separated from Manchester by the river Irwell, which is crossed by a series of bridges. The valley of the Irwell, now largely occupied by factories, separates the higher ground of Broughton from that of Pendleton, and

is flattest at the south where it joins the Manchester boundary. At the other extremity of Salford it joins the borough of Eccles. The chief

railway station is Exchange station, which is in Salford, but has its main approach in Manchester. The Lancashire & Yorkshire and the London & North- Western railways serve the town.

Until 1634 Salford was entirely dependent upon Manchester in its ecclesiastical arrangements. In that year Sacred Trinity Church ("Salford Chapel") was built and endowed under the will of Humphrey Booth the elder, who also founded charities which have grown greatly in value. The yearly income of more than £17,000 is disposed of in perfsions and in hospital grants. His grandson, Humphrey Booth the younger, left money for the repair of the church and the residue is distributed amongst the poor. The yearly revenue is about £1400. Salford is the seat of a Roman Catholic bishopric, and its cathedral, St John's, with its spire of 240 ft., is the most noteworthy ecclesiastical building in the borough. Salford has been to a large extent overshadowed by Manchester, and the two boroughs, in spite of their separate government, are so closely con- nected as to be one great urban area. Many of the institutions in Manchester are intended for the service also of Salford, which, however, has resisted all attempts at municipal amalgamation.

The chief public buildings are the museum and art gallery at Peel Park, the technical school, the education offices and the Salford Hospital. The town hall, built in 1825, is no longer adequate for municipal needs. Broughton and Pendleton have each a separate town hall. The large and flourishing technical school was developed from a mechanics' institution. Peel Park, bought by public sub- scription in 1 846, was the first public recreation ground in the borough. In the grounds are Langworthy Gallery and a museum. In the park are statues of Queen Victoria, the Prince Consort, Sir Robert Peel, Joseph Brotherton and Richard Cobden. The only other monu- ment — a South African War memorial — is outside and almost opposite Peel Park. Other parks are at Seedley, Albert and Buile Hill ; the last contains a museum, the contents of which have been transferred from Peel Park. There is also Kersal Moor, 21 acres of Moorland, crossed by a Roman road, which has been noticed for the variety of its flora, and for the capture of the Oecophara Woodiella, of which there is no other recorded habitat. The David Lewis recreation ground at Pendleton may also be named. Altogether Salford has thirty parks anrJopen spaces having a total area of 217 acres. The corporation have also provided two cemeteries.

When the municipal museum was founded in 1849 a reference library formed part of the institution, and from this has developed a free library system in which there are also nine lending libraries.

The commercial and industrial history of Salford is closely bound up with that of Manchester. It is the seat of extensive cotton, iron, chemical and allied industries. It owes its development to the steam-engine and the factory system, and in recent years has shared in the increase of trade owing to the construction of the Manchester Ship Canal, which has added greatly to its prosperity. This will be seen by an examination of the rateable value of the three townships now comprised in the borough. This in 1692 was £1404; in 1841, £244,853; in 1884, £734,220; in 1901, £967,727; in 1908-1909, £1,022,172.

The municipal government is in the hands of a town council consisting of 16 aldermen and 48 councillors elected in 16 wards. The water-supply is from Manchester. The corporation have an excellent tramway service. There are also municipal baths. Salford has a separate commission of the peace.

There are no certain figures as to the population before 1773, when at the instance of Dr Thomas Percival a census was taken of Manchester and Salford. The latter had then 4755 inhabitants. Census returns show that its population in 1801 was 14,477; m 1851, 63,850; and in 1901, 220,956. The death-rate in 1906 was 18-5 per thousand.

Within the present borough area there have been found neo- lithic implements and British urns, as well as Roman coins. In 1851 traces of a Roman road were still visible. Domesday Book mentions Salford as held by Edward the Confessor and as having a forest three leagues long and the same broad. At the Conquest it was part of the domain granted to Roger of Poitou, but reverted to the crown in 1102. After successively belonging to the earls of Chester and of Derby it passed to Edward Crouch- back, earl of Lancaster. It was erected into a duchy and county palatine in 1353, and when the house of Lancaster succeeded to : the throne their Lancashire possessions were kept separate. Salford and Pendleton are still parts of the ancient duchy of Lancaster, belonging to the English crown. In 1231 Ranulf de Blundeville, earl of Chester, granted a charter constituting Salford a ” free borough.” But the government notwithstanding was essentially manorial and not municipal. In the Civil Wars between Charles I. and the parliament, Salford was royalist,

and the unsuccessful siege of Manchester was conducted from its side

of the Irwell. Its later history is mainly identical with that of Manchester (q.v.). In 1844 it received a municipal charter and became a county borough in 1889.

Bibliography. — There is no separate history of Salf ord ; see publications named under Manchester. The MS. records of the Portmote or Court Leet, 1 597-1669, were edited by J. G. Mandley for the Chetham Society, but others still remain in manuscript in the State Paper Office. (W. E. A. A.)

SALICETI, ANTOINE CHRISTOPHE (1757-1809), French revolutionist, was born at Saliceto, in Corsica, on the 26th of August 1757, of a family of Piacenza. After studying law in Tuscany, he became an avocat at the upper council of Bastia, and was elected deputy of the Third Estate to the French states-general in 1789. As deputy to the Convention, Saliceti voted for the death of Louis XVI. , and was sent to Corsica on mission to oppose the counter-revolutionary intrigues. But the success of his adversaries compelled him to withdraw to Provence, where he took part in repressing the revolts at Marseilles and Toulon. It was on this mission that he met and helped his compatriot Bonaparte. On account of his friendship with Robespierre, Saliceti was denounced at the revolution of 9 Thermidor, and was saved only by the amnesty of the year IV. He subsequently organized the army of Italy and the two departments into which Corsica had been divided, was deputy to the Council of the Five Hundred, and accepted various offices under the Consulate and the Empire, being minister of police and of war at Naples under Joseph Bonaparte (1806-1809). He died at Naples on the 23rd of December 1809 — it has been alleged by poison.

SALICIN, SALICINUM, C 13 H 18 7 , the bitter principle of willow-bark, discovered by Leroux in 1831. It exists in most species of Salix and Populus, and has been obtained to the extent of 3 or 4% from the bark of S. helix and S. pentandra,

Salicin is prepared from a decoction of the bark by first precipitat- ing the tannin by milk of lime, then evaporating the filtrate to a soft extract, and dissolving out the salicin by alcohol. As met with in commerce it is usually in the form of glossy white scales or needles. It is neutral, odourless, unaltered by exposure to the air, and has a bitter taste. It is soluble in about 30 parts of water and 80 parts of alcohol at the ordinary temperature, and in 0-7 of boiling water or in 2 parts of boiling alcohol, and more freely in alkaline liquids. It is also soluble in acetic acid without alteration, but is insoluble in chloroform and benzol. From phloridzin it is distinguished by its ammoniacal solution

not becoming coloured when exposed to the air. Chemically, it is a glucoside derived from glucose and saligenin (o-oxy-benzyl alcohol), into which it is decomposed by the enzymes ptyaline and emulsin. Oxidation converts it into helicin (salicyl- aldehyde-glucose). Populin, a benzoyl salicin, is a glucoside found in the leaves and bark of Populus tremula.

Salicin is used in medicine for the same purposes as salicylic acid and the salicylates. It is also used as a bitter tonic, i.e. a gastric stimulant, in doses of five grains. The ordinary dose may go up to forty grains or more with perfect safety, though the British Pharma- copoeia limits it to twenty. The remote action of the drug is that of salicylic acid or the numerous compounds that contain it (see Salicylic Acid).

SALIC LAW, and other Feankish Laws. The Salic Law is one of those early medieval Frankish laws which, with other early Germanic laws (see Germanic Laws), are known collect- ively as leges barbarorum. It originated with the Salian Franks, often simply called Salians, the chief of that conglomeration of Germanic peoples known as Franks.

The Salic Law has come down to us in numerous MSS. and in divers forms. The most ancient form, represented by Latin MS. No. 4404 in the Bibliotheque Nationale at Paris, consists of 65 chapters. The second form has the same 65 chapters, but contains interpolated provisions which show Christian influence. The third text consists of 99 chapters, and is divided into two groups, ac- cording as the MSS. contain or omit the ” Malberg glosses.” 1 The

1 Some of the MSS. contain words in a barbarian tongue and often preceded by the word ” malb.” or ” malberg.” These are admitted to be Frankish words, and are known as the Malberg glosses. Opinions differ as to the true import of these glosses ; some scholars hold that the Salic Law was originally written in the Frankish vernacular, and that these words are remnants of the ancient text, while others regard them as legal formulae such as would be used either by a plaintiff in introducing a suit, or by the judge to denote the exact composition to be pronounced. It is more probable, however, that these words served the Franks, who were ignorant of Latin, as clues to the general sense of each paragraph of the law.

fourth version, as emended by Charlemagne, consists of 70 chapters with the Latinity corrected and without the glosses. Though he added some new provisions, Charlemagne respected the ancient ones, even those which had long fallen into disuse. The last version, published by B. J. Herold at Basel in 1557 (Originum ac Germani- carum

antiquitatum libri) from a MS. now lost, is founded on the second recension, but contains additions of considerably later date.

The law is a compilation, the various chapters were composed at different periods, and we do not possess the original form of the compilation. Even the most ancient text, that in 65 chapters, contains passages which a comparison with the later texts shows to be interpolations. It is possible that chapter i., De mannire, was taken from a Merovingian capitulary and afterwards placed at the beginning of the Salic Law. This granted, internal evidence would go to show that the first compilation dates back to thetimeof Clovis, and doubtless to the last years of his reign, after his victory over the Visigoths (507-511). Many facts combine to preclude the assign- ment of an earlier date to the compilation of the law. The Germanic tribes had no need to use the Latin language until they had coalesced with the Gallo-Roman population. The scale of judicial fines is given in the denarius (" which makes so many solidi "), and it is known that the monetary system of the solidus did not appear until the Merovingian period. Even in its earliest form the law contains no trace of paganism — a significant fact when we consider how closely law and religion are related in their origins. As pointed out by H. Brunner in his Deutsche Rechtsgeschickte (i. 438), the Salic Law contains imitations of the Visigothic laws of Euric (466-485). Finally, chapter xlvii. seems to indicate that the Frankish power extended south of the Loire, since it speaks of men dwelling " trans Legerem " being summoned to the mallus (judicial assembly) and being allowed eighty nights for their journey. On the other hand, it is impossible to place the date of compilation later. The Romans are clearly indicated in the law as subjects, but as not yet forming part of the army, which consists solely of the antrustions, i.e. Frankish warriors of the king's bodyguard. As yet the law is not impregnated with the Christian spirit ; this absence of both Christian and Pagan elements is due to the fact that many of the Franks were still heathens, although their king had been converted to Christianity. Christian enactments were introduced gradually into the later versions. Finally, we find capitularies of the kings immediately following Clovis being gradually incorporated in the text of the law — e.g. the Pactum pro tenore pads of Childebert Land Clotaire I. (511- 558), and the Edictum Chilperici (561-584), chapter iii. of which cites and emends the Salic Law.

The law as originally compiled underwent modifications of varying importance before it took the form known to us in Latin MS. No. 4404, to which the edict of Childebert I. and Clotaire I. is already appended. The classes of MSS. distinguished above give evidence of further changes, the law being supplemented by other capitularies and

sundry extravagantia, prologues and epilogues, which some historians have wrongly assumed to be parts of the main text. Finally, Charlemagne, who took a keen interest in the ancient documents, had the law emended, the operation consisting in eliminating the Malberg glosses, which were no longer intelligible, correcting the Latinity of the ancienl text, omitting a certain number of interpolated chapters, and adding others which had obtained general sanction.

The Salic Law is a collection of ancient customs put into writing by order of the prince. In the sense that they already existed and came ready-made to the prince's hand, it is legitimate to speak of these customs as a popular law, a V olksrecht; but it was the prince who gave them force of law, emended them, and rejected such of the ancient usages as appeared to him antiquated. The king, moreover, had the right to add provisions to the law; and we find capitularies of Charlemagne and Louis the Pious in the form of additamenta to the Salic Law.

From this it will be seen that the Salic Law is not a political law; it is in no way concerned with the succession to the throne of France, and it is absolutely false to suppose that it was the Salic Law that was invoked in 1316 and 1322 to exclude the daughters of Louis X. and Philip V. from the succession to the throne. The Salic Law is pre-eminently a penal code, which shows the amount of the fines for various offences and crimes, and contains, besides, some civil law enactments, such as the famous chapter on succession to private property {de alode), which declares that daughters cannot inherit land. The text is filled with valuable information on the state of the family and property in the 6th century, and it is astonishing to find Montesquieu describing the Salic Law as the law of a people ignorant of landed property. The code also contains abundant information on the organization of the tribunals (tribunal of the hundred and tribunal of the king) and on procedure.

Like all the barbarian laws, the law of the Salian Franks

was a personal law; it applied only to the Salian Franks. As the Salians, however, were the victorious race, the law acquired an authority in excess of the other barbarian laws, and in the additions made to the Ripuarian, Lombard, and other allied laws, the Carolingians endeavoured to bring these laws into harmony with the

Salic Law. Moreover, many persons, even of foreign race, declared themselves willing to live under the Salic Law. The principle of personality, however, gradually gave way to that of territoriality; and in every district, at least north ot the Loire, customs were formed in which were combined in varying proportions Roman law, ecclesiastical law and the various Germanic laws. So late as the 10th and nth centuries we find certain texts invoking the Salic Law, but only in a vague and general way; and it would be rash to conclude from this that the Salic Law was still in force.

Of the numerous editions of the Salic Law only the principal ones can be mentioned: J. M. Pardessus, Loi salique (Paris, 1843), 8 texts; G. Waitz, Das alte Recht der salischen Franken (1846), text of the first version; J. F. Behrend, Lex Salica (1873; 2nd ed., Weimar, 1897) ; J. H. Hessels, Lex Salica: the Ten Texts with the Glosses, and the Lex Emendala, with notes on the Frankish words in the Lex Salica by H. Kern (1880), the various texts shown in synoptic tables ; A. Holder, Lex Salica (1879 seq.), reproductions of all the MSS. with all the abbreviations; H. Geffcken, Lex Salica (Leipzig, 1898), the text in 65 chapters, with commentary paragraph by paragraph, and appendix of additamenta; and the edition undertaken by Mario Krammer for the Mon. Germ. hist. For further information see the dissertations prefixed to the editions of Pardessus, Waitz and Hessels ; Jungbohn Clement, Forschungen iiber das Recht der salischen Franken (Berlin, 1876); R. Sohm, Der Prozess der Lex Salica (Weimar, 1867; French trans, by M. Thevenin) and Die frankische Reichs- und Gerichtsverfassung (Weimar, 1876); J. J. Thonissen, L'Organisa- iion judiciaire, le droit pSnal et la procedure de la hi salique (2nd ed., Brussels and Paris, 1882); P. E. Fahlbeck, La Royaute et la droit royal francs (Lund, 1883); Mario Krammer, " Kritische Untersu- chungen zur Lex Salica" in the Neues Archiv, xxx. 263 seq.; H. Brunner, Deutsche Rechtsgeschichte (2nd ed., Leipzig, 1906), i. 427 seq. The Lex Ripuaria was the law of the Ripuarian Franks, who dwelt between the Meuse and the Rhine, and whose centre was Cologne. We have no ancient MSS. of the law of the Ripuarians; the 35 MSS. we possess, as well as those now lost which served as the basis of the old editions, do not go back beyond the time of Charlemagne (end of 8th century and 9th century). In all these MSS. the text is identical, but it is a revised text — in other words, we have only a lex emendata.

On analysis, the law of the Ripuarians, which contains 89 chapters, falls into three heterogeneous divisions. Chapters i.- xxxi. consist of a scale of compositions; but, although the fines are calculated, not on the unit of 15 solidi, as in the Salic Law, but on that of 18 solidi, it is clear that this part is already influenced by the Salic Law. Chapters

xxxii.-lxiv. are taken directly from the Salic Law; the provisions follow the same arrangement; the unit of the compositions is 15 solidi; but capitularies are interpolated relating to the affranchisement and sale of immovable property. Chapters lxv.-lxxxix. consist of provisions of various kinds, some taken from lost capitularies and from the Salic Law, and others of unknown origin. The compilation apparently goes back to the reign of Dagobert I. (629-639), to a time when the power of the mayors of the palace was still feeble, since we read of a mayor being threatened with the death penalty for taking bribes in the course of his judicial duties. It is probable, however, that the first two parts are older than the third. Already in the Ripuarian Law the diverg- ences from the old Germanic law are greater than in the Salic Law. In the Ripuarian Law a certain importance attaches to written deeds; the clergy are protected by a higher wergild — 600 solidi for a priest, and 900 for a bishop; on the other hand, more space is given to the cojuratores (sworn witnesses); and we note the appearance of the judicial duel, which is not men- tioned in the Salic Law.

There is an edition of the text of the Ripuarian Law in Mon. Ger. hist. Leges (1883), v. 185 seq. by R. Sohm, who also brought out a separaie edition in 1885 for the use of schools. For further informa- tion see the prefaces to Sohm's editions; Ernst Mayer, Zur Entstehung der Lex Ribuariorum (Munich, 1886); Julius Ficker, " Die Heimat der Lex Ribuaria " in the Mitteilungen fur osterrei- chische Geschichtsforschung (supplt., vol. v.); H. Brunner Deutsche Rechtsgeschichte (2nd ed., Leipzig, 1906), i., 442.

Lastly, we possess a judicial text in 48 paragraphs, which bears the title of Notitia vel commemoratio de ilia ewa {law), quae se ad Amor em habet. This was in use in the district along the Yssel formerly called Hamalant. The name Hamalant is unquestionably derived from the Frankish tribe of the Chamavi, and the document is often called Lex Francorum Chamavorum. This text, however, is not a law, but rather an abstract of the special usages obtaining in those regions — what the Germans call a Weistum. It was compiled by the itinerant Frankish officials known as the missi Dominici, and the text undoubtedly goes back to the time of Charlemagne, perhaps to the years 802 and 803, when the activity of the missi was at its height. In certain chapters it is possible to discern the questions of the missi and the answers of the inhabitants.

There is an edition of this text by R. Sohm in Mon. Germ. hist. Leges, v. 269, and another appended to the same writer's school edition of the Lex Ribuaria. For further information see E. T. Gaupp, Lex Francorum Chamavorum (Breslau, 1855; French trans, in vol. i. of the

Revue historique de droit frangais et etranger) ; Fustel de Coulanges, Nouvelles Recherches sur quelques problemes d'histoire (Paris, 1891), pp. 399-414; H. Froidevaux, Recherches sur la lex dicta Francorum Chamavorum (Paris, 1891). (C. Pf.)

SALICYLIC ACID (ortho-hydroxybenzoic acid), an aromatic acid, C 6 H 4 (OH)(C0 2 H), found in the free state in the buds of Spiraea Ulmaria and, as its methyl ester, in gaultheria oil and in the essential oil of Andromeda Leschenaultii. It was discovered in 1838 by Piria as a decomposition product of salicin. It may be obtained by the oxidation of saligenin and of salicylic aldehyde ; by the distillation of copper benzoate; by the decomposition of anthranilic acid with nitrous acid; by fusion of ortho-chlor or ortho-brom benzoic acid with potash ; by heating ortho- cyanphenol with alcoholic potash; by heating a mixture of phenol, carbon tetrachloride and alcoholic potash to ioo° C. (F. Tiemann and K Reimer, Ber., 1876, 9, p. 1285); and by the action of sodium on a mixture of phenol and chlorcarbonic ester (T. Wilm and G. Wischin, Zeit.f. Chemie, 1868, 6).

It is manufactured by Kolbe's process or by some modification of the same. Sodium phenolate is heated in a stream of carbon dioxide in an iron retort at a temperature of 180-220° C, when half the phenol distils over and a basic sodium salicylate is left. The sodium salt is dissolved in water and the free acid precipitated by hydrochloric acid (H. Kolbe, Ann., i860, 115, p. 201). R. Schmitt (Jour. prak. Chem., 1885 (2), 31, p. 407) modified the process by saturating sodium phenolate at 130° C. with carbon dioxide, in an autoclave, sodium phenyl carbonate C6HsO – C0 2 Na being thus formed; by continuing the heating under pressure this carbonate gradually changes into mono-sodium salicylate. S. Manasse (German patent 73,279) prepared an intimate mixture of phenol and potassium carbonate, which is then heated in a closed vessel with carbon dioxide, best at i30-l6o°C. The Chemische Fabrik vorm. Hofmann and Schotensack decompose a mixture of phenol (3 molecules) and sodium carbonate (4 mols.) with carbonyl chloride at 140-200° C. When 90 % of the phenol has distilled over, the residue is dissolved and hydrochloric acid added, any phenol remaining is blown over in a current of steam, and the salicylic acid finally precipitated by hydrochloric acid. The acid may also be obtained by passing carbon monoxide over a mixture of sodium phenolate and sodium carbonate at200°C.:Na 2 C0 3 + C 6 H 2 ONa+CO = Cvˆ0jNaj + HC0 2 Na;and by heating sodium phenolate with ethyl phenyl carbonate to 200° C. : C«H 6 0-C0 2 C 2 H +C 6 H 6 ONa = HO-CeHiCOsNa+CeHs-GHs. It is to be noted in the Kolbe method of synthesis that potassium pheno- late may be used in place of the sodium salt, provided that the temperature be kept low

(about 150° C.) , for at the higher temperature (220° C.) the isomeric para-oxybenzoic acid is produced.

Salicylic acid crystallizes in small colourless needles which melt at 155° C. It is sparingly soluble in cold water, but readily dissolves in hot. It sublimes, but on rapid heating decomposes into carbon dioxide and phenol. It is volatile in steam. Ferric chloride colours its aqueous solution violet. Potassium bichro- mate and sulphuric acid oxidize it to carbon dioxide and water; and potassium chlorate and hydrochloric acid to chloranil. On boiling with concentrated nitric acid it yields picric acid. When heated with resorcin to 200 C. it gives trioxybenzophenone. Bromine water in dilute aqueous solution gives a white pre- cipitate of tribromophenol-bromide C 8 H 2 Br 3 OBr. Sodium reduces salicylic acid in boiling amyl alcohol solution to w-pimelic acid (A. Einhorn and R. Willstatter, Ber., 1893, 26, pp. 2, 913; 1894, 27 p. 331). Potassium persulphate oxidizes it in alkaline solution, the product on boiling with acids giving

hydroquinone carboxylic acid (German Patent 81,297). When boiled with calcium chloride and ammonia, salicylic acid gives a

precipitate of insoluble basic calcium salicylate, C 6 H4<ˆ Q 2 ˆ>Ca, a reaction which serves to distinguish it from the isomeric meta- and para-hydroxybenzoic acids. It yields both esters and ethers since it is an acid and also a phenol.

Methyl Salicylate, C6H4-C0 2 CH 3 , found in oil of wintergreen, in the oil of Viola tricolor and in the root of varieties of Polygala, is a pleasant-smelling liquid which boils at 222 ° C. On passing dry ammonia into the boiling ester, it gives salicylamide and dimethylam-ine. When boiled with aniline it gives methylaniline and phenol. Ethyl salicylate, C6H 4 (OH)-C0 2 C 2 H6, is obtained by boiling salicylic acid with alcohol and a little sulphuric acid, or by dropping an alco-holic solution of salicylic acid into /3-naphthalene sulphonic acid at a temperature of 140-150 C. (German Patent 76,574). It is a pleasant-smelling liquid which boils at 233° C. It is practically unchanged when boiled with aniline. Phenyl salicylate, CjHˆOIiO-C-OaCeHs, or salol, is obtained by heating salicylic acid, phenol and phosphorus oxychloride to 120-125° C.; by heating salicylic acid to 210° C. ; or by heating salicyl metaphosphoric acid and phenol to 140-150 C. (German Patent 85,565). It crystallizes in rhombic plates which melt at 42 C. and boil

at 172 C. (12 mm.). Its sodium salt is transformed into the isomeric C6H 4 (OC 6 H 5) C0 2 Na when heated to 300 . When heated in air for many hours it decomposes, yielding carbon dioxide, phenol and xanthone. Acetyl- salicylic acid (salacetic acid), C«H4(OCOCH S)‘C0 2 H, is obtained by the action of acetyl chloride on the acid or its sodium salt (K. Kraut, Ann ., 1869, 150, p. 9). It crystallizes in needles and melts at 132 C. (with decom- position). Hydrolysis with baryta water gives acetic and salicylic acids. It is used in medicine under the names aspirin, acetysal, aletodin, saletin, xaxa s &c. It has the same action as salicylic acid and salicylates, but is said to be much freer from objectionable secondary effects. Salicylo- salicylic acid 0-(C 6 H 4 C0 2 H) 2 is obtained by continued heating of salicylic acid and acetyl chloride to 130- 140° C. It is an amorphous yellow mass which is easily soluble in alcohol.

Applications. — The addition of a little of the acid to glue renders it more tenacious; skins to be used for making leather do not undergo decomposition if steeped in a dilute solution; butter containing a small quantity of it may be kept sweet for months even in the hottest weather. It also prevents the mouldiness of preserved fruits and has been found useful in the manufacture of vinegar. The use of salicylic acid as a food preservative, was, however, condemned in the findings of the commission appointed by the government of the United States of America, in 1904.

Medicine. — The pharmacopeial dose of the acid is 5-20 grains, but it is so unrelated to experience and practice that it may be ignored. The British Pharmacopeia contains only one prepara- tion, an ointment containing one part of acid to 49 of white paraffin ointment. Salicylic acid is now never given internally, being replaced by its sodium salt, which is much cheaper, more soluble and less irritating to mucous membranes. The salt has a sweet, mawkish taste.

Salicylic acid and salicin (q.v.) share the properties common to the group of aromatic acids, which, as a group, are antiseptic without being toxic to man — a property practically unique ; are unstable in the body ; are antipyretic and analgesic ; and diminish the excretion of urea by the kidneys. As an antiseptic salicylic acid is somewhat less powerful than carbolic acid, but its insolubility renders it un- suitable for general use. It is much more powerful than carbolic acid in its inhibitory action upon unorganized ferments such as pepsin or ptyalin. Salicyclic acid is not absorbed by the skin, but it rapidly kills the cells of the epidermis, without affecting the im- mediately subjacent cells of the dermis (” true skin “). It has a very useful local anhidrotic action. Salicylic acid is a powerful irritant when inhaled or

swallowed in a concentrated form, and even when much diluted it causes pain, nausea and vomiting. When salicin is taken internally no irritant action occurs, nor is there any antisepsis. Whatever drug of this group be taken, the product absorbed by the blood is almost entirely sodium salicylate. When the salt is taken by the mouth, absorption is extremely rapid, the salt being present in the peripheral blood within ten minutes.

Sodium salicylate circulates in the blood unchanged, decom- position occurring in the kidney, and probably in tissues suffering from the Diplococcus rheumaticus of Poynton and Paine. It used to be stated that these drugs are marked cardiac depressants; and the heart being invariably implicated in rheumatic fever, it is supposed that these drugs must be given with great caution. It has now been established that, provided the kidneys be healthy, natural salicylic acid, sodium salicylate prepared from the natural acid, and salicin, are not cardiac depressants. Of the two latter, 300 grains may be

given in a dose and i| oz. in twenty-four hours, without any toxic symptoms. The artificial acid and its salt contain ortho-, para- and meta-cresotic acids, which are cardiac depressants. The vegetable product — which is extremely expensive — must be prescribed or the synthetic product guaranteed ” physiologically pure,” i.e. tested upon animals and found to have no toxic properties. Salicylates are the next safest to quinine of all antipyretics, whilst being much more powerful in all febrile states except malaria. Sodium sali- cylate escapes from the blood mainly by the kidneys, in the secretion of which sodium salicylate and salicyluric acid can be detected within fifteen minutes of its administration. After large doses haematuria has been observed in a few cases. The rapid excretion by the kidneys is one of the cardinal conditions of safety, and also necessitates the very frequent administration of the drug.

Therapeutics. — Salicylic acid is used externally for the removal of corns and similar epidermic thickenings. It causes some pain, so that a sedative should be added. A common formula has 1 1 parts of the acid, 3 of extract of Indian hemp, and 86 of collodion. There is probably no better remedy for corns. Perspiration of the feet cannot be attacked locally with more success than by a powder consisting of salicylic acid, starch and chalk.

These drugs are specific for acute rheumatism (rheumatic fever). The drug is not a true specific, as quinine is for malaria , since it rarely, if ever, prevents the cardiac damage usually done by rheu- matic fever; but it entirely removes the agonizing pain, shortly after its

administration, and, an hour or two later, brings down the temperature to normal. In thirty-six hours no symptoms are left. If the drug be now discontinued, they will return in over 90% of cases. In acute gonorrhoeal arthritis, simulating rheumatic fever, salicylates are useless. They may thus afford a means of diagnosis. In rheumatic hyperpyrexia, where the poison has attacked the central nervous system, salicylates almost always fail. The mode of their administration in rheumatic fever is of the utmost importance. At first 20 grains of sodium salicylate should be given every hour: the interval being doubled as soon as the pain disappears, and extended to three hours when the temperature becomes normal. The patient should continue to take about 100 grains a day for at least a fortnight after he is apparently convalescent, otherwise a recrudescence is very probable.

Salicylate of soda may occasionally be of use in cases of gallstone, owing to its action on the bile. It often relieves neuralgia, especially when combined with caffeine and quinine.

Salicylism, or salicylic poisoning, occurs in a good many cases of the use of these drugs. Provided the kidneys be healthy, the symptoms may be ignored. If nephritis be present, it may be seriously aggravated, and the drug must therefore be withheld. The headache, deafness, ringing in the ears and even delirium of salicylism, are practically identical with the symptoms of cinchonism. The drug must be at once withheld if haemorrhages (subcutaneous, retinal, &c.) are observed. As in the case of quinine, the administra- tion of small doses of hydrobromic acid often relieve the milder symptoms.

SALIERI, ANTONIO (1750-1825), Italian composer, was born at Legnano, on the 19th of August 1750. His father was a mer- chant who died a bankrupt. Through the family of Mocenigo he obtained free admission to the choir school of St Mark’s, Venice. In 1766 he was taken to Vienna by F. L. Gassmann, who introduced him to the emperor Joseph. His first opera, Le Donne letterate, was produced at the Burg-Theater in 1770. Others followed in rapid succession, and his Armida (1771) was a triumphant success.

On Gassmann’s death in 1774, he became Kapellmeister and, on the death of Bonno in 1788, Hof kapellmeister. He held his offices for fifty years, though he made frequent visits to Italy and Paris, and composed music for many European theatres. His chefd’xuvre was Tarare (afterwards called Axur, re d’Ormus), a work which was preferred by the public of Vienna to Mozart’s Don Giovanni. It was first produced at Vienna on the 8th of June 1787, and was revived at

Leipzig in 1846, though only for a single representation. His last opera was Die Neger, produced in 1804. After this he devoted himself to the composition of church music, for which he had a very decided talent. Salieri lived on friendly terms with Haydn, but was a bitter enemy to Mozart, whose death he was suspected of having produced by poison; but no evidence was ever forthcoming to give colour to the accusation. He retired from office on his full salary in 1824, and died at Vienna on the 7th of May 1825. Salieri gave lessons in composition to Cherubini and to Beethoven, who dedicated to him his " Three Sonatas for Pianoforte and Violin," Op. 12.

See also Albert von Hermann, Antonio Salieri, eine Sludie (1897); J. F. Edler von Mosel, Uber das Leben und die Werke des Antonio Salieri (Vienna, 1827).

SALII, the " dancers," an old Italian priesthood, said to have been instituted by Numa for the service of Mars, although later tradition derived them from Greece. They were originally twelve in number, called Salii Palatini to distinguish them from

a second college of twelve, Salii Agonales or Collini, said to have been added by Tullus Hostilius; the Palatini were consecrated to Mars, the Collini to Quirinus. All the members were patricians, vacancies being rilled by co-optation from young men whose parents were both living; membership was for life, subject to certain exceptions. The officials of the college were the magister, the praesul, and the vates (the leaders in dance and song).

Each college had the care of twelve sacred shields called ancilia. According to the story, during the reign of Numa a small oval shield fell from heaven, and Numa, in order to prevent its being stolen, had eleven others made exactly like it. They were the work of a smith named Mamurius Veturius, probably identical with the god Mamers (Mars) himself. These twelve shields (amongst which was the original one) were in charge of the Salii Palatini. The greater part of March (the birth-month of Mars), beginning from the 1st, on which day the ancile was said to have fallen from heaven and the campaigning season began, was devoted to various ceremonies con- nected with the Salii. On the 1st, they marched in procession through the city, dressed in an embroidered tunic, a brazen breast- plate and a peaked cap ; each carried a sword by his side and a short staff in his right hand,

with which the shield, borne on the left arm, was struck from time to time. A halt was made at the altars and temples, where the Salii, singing a special chant, danced a war dance. Every day the procession stopped at certain stations (mansiones), where the shields were deposited for the night, and the Salii partook of a banquet (see Horace, Odes, i. 37. 2). On the next day the pre- cession passed on to another mansio; this continued till the 24th, when the shields were replaced in their sacrarium. During this period the Salii took part in certain other festivities: the Equirria (Ecurria) on the 14th, a chariot race in honour of Mars on the Campus Martius (in later times called Mamuralia, in honour of Mamurius), at which a skin was beaten with staves in imitation of hammering ; the Quinquatrus on the 19th, a one-day festival, at which the shields were cleansed; the Tubilustrium on the 23rd, when the trumpets of the priests were purified. On the 19th of October, at the Armi- lustrium or purification of arms, the ancilia were again brought out and then put away for the winter. The old chant of the Salii, called axamenta, was written in the old Saturnian metre, in language so archaic that even the priests themselves could hardly understand it. . See Quintilian, Instit. i. 6. 40; also J. Wordsworth, Fragments and Specimens of Early Latin (1874). The best account of the Salii generally will be found in Marquardt, Romische Staatsverwaltung, iii. (1885) pp. 427-438.

SALIMBENE, Or more usually Salimbene or Parma (1221- c. 1290), the name taken by the Italian writer, Ognibene di Guido di Adamo. The son of a crusader, Gui di Adamo, and born at Parma on the 9th of October 1221, Ognibene entered the order of the Minorites in 1238, and was known as brother Salimbene. He passed some years in Pisa and other Italian towns; then in 1247 he was sent to Lyons, and from Lyons he went to Paris, returning through France to Genoa, where he became a priest in 1249. From 1249 to 1256 he resided at Ferrara, engaged in writing and in copying manuscripts, but later he found time to move from place to place. His concluding years were mainly spent in monastic retirement in Italy, and he died soon after 1 288.

Salimbene was acquainted with many of the important personages of his day, including the emperor Frederick II., the French king St Louis and Pope Innocent IV. ; and his Chronicon, written after 1281, is a work of unusual value. This covers the period 1 167-1287. Salimbene is a very discursive and a very personal writer, but he gives a remarkably vivid picture of life in France and Italy during the 13th century. The manuscript of the chronicle was found during the 1 8th century, and passed into the Vatican library, where it now remains. The part of the Chronicon dealing with the period between 1212 and 1287 was edited by A. Bertani and published at Parma in 1857. This

edition, however, is very defective, but an excellent and more complete one has been edited by O. Holder- Egger, and is printed in Band xxxii. of the Monumenta Cermaniae historica. Scriptores (Hanover, 1905).

See U. Balzani, Le Croniche italiane nel medio evo (Milan, 1884); L. Cl&lat, De fratre Salimbene et de ejus chronicae auctoritate (Paris, 1878); E. Michael, Salimbene und seine Chronik (Innsbruck, 1889); A. Molinier, Les Sources de Vhistoire de France, tome iii. (1903) ; D. W. Duthie, The Case of Sir John Fastolf and other Historical Studies (1907); G. G. Coulton, From St Francis to Dante (1906).

SALINA, a city and the county-seat of Saline county, Kansas, U.S.A., on the Smoky Hill river, near the mouth of the Saline river, about 100 m. W. of Topeka. Pop. (1905) 7829; (1910) 9688. It is served by the Atchison, Topeka & Santa Fe, the Chicago, Rock Island & Pacific, the Missouri Pacific and the Union Pacific railways. Salina has a Carnegie library, and is

the seat of Kansas Wesleyan University (Methodist Episcopal; chartered in 1885, opened in 1886) and of St John's Military School (Protestant Episcopal) . The city is the see of a Protestant Episcopal bishop. Salina is the central market of a fertile farming region. Power is furnished by the river, and among the manu- factures are flour, agricultural implements, foundry products and carriages. The first settlement on the site of Salina was made in 1857. Its first railway, the Union Pacific, came through in 1867. Salina was first chartered as a city in 1870.

SALINA CRUZ, a seaport of Mexico, in the state of Oaxaca, at the southern terminus of the Tehuantepec National Railway. It is situated near the mouth of the Tehuantepec river, on the open coast of the Isthmus of Tehuantepec, and has no natural harbour. There was only a small Indian village here before Salina Cruz was chosen as the Pacific terminus of the railway. Since then a modern town has been laid out and built on adjacent higher ground. The new port was opened to traffic in 1907 and in 1909 its population was largely composed of labourers. A costly artificial harbour has been built by the Mexican govern- ment to accommodate the traffic of the Tehuantepec railway. It is formed by the construction of two breakwaters, the western 3260 ft. and the eastern 1900 ft. long, which curve toward each other at their outer extremities and leave an entrance 635 ft. wide. The enclosed space is divided into an outer and inner harbour by a double line of quays wide enough to carry six great warehouses with electric cranes on both sides and a number of railway tracks. Connected with

the new port works is one of the largest dry docks in the world — 610 ft. long and 89 ft. wide, with a depth of 28 ft. on its sill at low water. The works were planned to handle an immense volume of transcontinental freight, and before they were finished four steamship lines had arranged regular calls at Salina Cruz; this number has since been largely increased.

SALINS, a town of eastern France, in the department of Jura, on a branch line of the Paris-Lyon railway. Pop. (1906) 4293. Salins is situated in the narrow valley of the Furieuse, between two fortified hills, while to the north rises Mont Poupet (2798 ft.). The town possesses an interesting Romanesque church (which has been well restored) and an hotel de ville of the 18th century. A Jesuit chapel of the 17th century contains a library (established in 1 593) and a museum. Salins owes its name to its saline waters, used for bathing and drinking. There are also salt workings and gypsum deposits.

The territory of Salins, which was enfeoffed in the 10th century by the abbey of Saint Maurice in Valais to the counts of Macon, remained in possession of their descendants till 11 75. Maurette de Salins, heiress of this dynasty, left the lordship to the house of Vienne, and her granddaughter sold it in 1225 to Hugh IV., duke of Burgundy, whoceded it in 1237 to John of Chalon (d.1267) in exchange for the countship of Chalon-sur-Sa6ne. John's descendants — counts and dukes of Burgundy, emperors and kings of the house of Austria — bore the title of sire de Salins. In 1477 Salins was taken by the French and temporarily made the seat of the parlement of Franche- Comti by Louis XI. In 1668 and 1674 it was retaken by the French and thenceforward remained in their power. In 1825 the town was almost destroyed by fire. In 1871 it successfully resisted the German troops.

SALISBURY, EARLS OF. The title of earl of Salisbury was first created about 1149, when it was conferred on Patrick de Salisbury (sometimes from an early date called in error Patrick Devereux), a descendant of Edward de Salisbury, mentioned in Domesday as vicecomes of Wiltshire. His granddaughter Isabella became countess of Salisbury suo jure on the death of her father, William the 2nd earl, without male heirs, in 1196, and the title was assumed by her husband, William de Longespee (d. 1226), illegitimate son of King Henry II. possibly by Rosamond Clifford (" The fair Rosamond "). Isabella survived her husband, and outlived both her son and grandson, both called Sir William de Longespee, and on her death in 1261 her great-granddaughter Margaret (d. 1310), wife of Henry de Lacy, earl of Lincoln, probably became suo jure countess of Salisbury; she transmitted the title to her daughter Alice, who married Thomas

Plantagenet, earl of Lancaster. Lancaster having been attainted and beheaded in 1322, the countess made a surrender of her lands

and titles to Edward II., the earldom thus lapsing to the crown.

The earldom of Salisbury was granted in 1337 by Edward III. to William de Montacute, Lord Montacute (1301-1344), in whose family it remained till 1400, when John, 3rd earl of this line, was attainted and his titles forfeited. His son Thomas (1388- 1428) was restored in blood in 1421; and Thomas's daughter and heiress, Alice, married Sir Richard Neville (1400-1460), a younger son of Ralph Neville, 1st earl of Westmorland and a grandson of John of Gaunt, who sat in parliament in right of his wife as earl of Salisbury; he was succeeded by his son Richard, on whose death without male issue in 147 1 the earldom fell into abeyance. George Plantagenet, duke of Clarence, brother of Edward IV., who married Richard's daughter and co-heiress, Isabel, became by a separate creation earl of Salisbury in 1472, but by his attainder in 1478 this title was forfeited, and immedi- ately afterwards was granted to Edward Plantagenet, eldest son of Richard duke of Gloucester, afterwards Richard III., on whose death in 1484 it became extinct.

Richard III.'s queen, Anne, was a sister of the above-mentioned Isabel, duchess of Clarence, and co-heiress with her of Richard Neville, earl of Salisbury. On the death of Queen Anne in 1485 the abeyance of the older creation terminated, Edward Plantagenet, eldest son of George duke of Clarence by Isabel Neville, becoming earl of Salisbury as successor to his mother's right. He was attainted in 1504, five years after his execution, but the earldom then forfeited was restored to his sister Margaret (1474-1541), widow of Sir Richard Pole, in 1513- This lady was also attainted, with forfeiture of her titles, in 1539.

Sir Robert Cecil, second son of the 1st Lord Burghley (q.v.), was created earl of Salisbury (1605), having no connexion in blood with the former holders of the title. (See Salisbury, Robert Cecil, ist Earl or.) In his family the earldom has remained till the present day, the 7th earl of the line having been created marquess of Salisbury in 1789.

See G. E. C, Complete Peerage, vol. vii. (1896).

SALISBURY, ROBERT ARTHUR TALBOT GASCOYNE- CECIL, 3RD

Marquess or (1830-1903), British statesman, second son of James, 2nd marquess, by his first wife, Frances Mary Gascoyne, was born at Hatfield on the 3rd of February 1830, and was educated at Eton and Christ Church, Oxford, where he took his degree in 1850. At Oxford he was an active member of the Union Debating Society. The first, few years after leaving the university were spent by Lord Robert Cecil (as he then was) in travel, as far afield as New Zealand; but in 1853 he was returned unopposed to the House of Commons as Conservative member for Stamford, being elected in the same year a fellow of All Souls. He made his maiden speech in Parliament on the 7th of April 1854, in opposition to Lord John Russell's Oxford University Bill. The speech was marked by scepticism as to the utility of reforms, and Lord Robert prophesied that if the wishes of founders were disregarded, nobody would in future care to found anything. In 1857 he Burly appeared as the author of his first Bill — for establishing

years in the voting-paper system at parliamentary elections ; and in the same year he married Georgina Caroline, daughter of Sir Edward Holt Alderson, a baron of the Court of Exchequer, a large share of whose great intellectual abilities she inherited. Lord Robert Cecil continued to be active not only in politics, but, for several years, in journalism, the income he earned by his pen being then a matter of pecuniary importance to him. One of his contemporaries at Oxford had been Thomas Hamber of Oriel, who became editor of the Standard, and during these years Cecil was an occasional contributor of " leaders " to that paper. He also contributed to the Saturday Review, founded in 1855 by his brother-in-law Beresford Hope, and edited by his friend Douglas Cook; not infrequently he wrote for the Quarterly (where, in 1867, he was to publish his famous article on "the Conservative Surrender"); and in 1858 he contributed to Oxford Essays a paper on " The Theories of Parliamentary Reform," giving expression to the more intellectual and aristocratic antagonism to doctrinaire Liberal views on the

Parlia- ment

subject, while admitting the existence of many anomalies in the existing electoral system. In February of the next year, when Disraeli introduced his Reform Bill with its " fancy franchises," the member for Stamford was prominent among its critics from the Tory point of view. During the seven years that followed Lord Robert was always ready to defend the Church, or the higher interests of Conservatism and property; and his speeches then, not less than later, showed a caustic quality and a tendency to what became known as " blazing indiscretions." For example, when the repeal of the paper duty was

being discussed in 1861, he asked whether it ” could be maintained that a person of any education could learn anything worth knowing from a penny paper ” — a question the answer to which has been given by the powerful, highly organized, and admirable Conservative penny press of a subsequent day. A little later he declared the proceed- ings of the Government ” more worthy of an attorney than of a statesman”; and on being rebuked, apologized — to the attorneys. He also charged Lord John Russell with adopting ” a sort of tariff of insolence ” in his dealings with foreign Powers, strong and weak.

It was not, however, till the death of Palmerston and the removal of Lord John Russell to the House of Lords had brought Gladstone to the front that Lord Robert Cecil — who became Lord Cranborne by the death of his elder „* ni f* er . brother on the 14th of June 1865 — began to be accepted the as a politician of the first rank. His emergence Franchise coincided with the opening of the new area in British « ,ues “°» ; politics, ushered in by the practical steps taken to u on jggz. extend the parliamentary franchise. On the 12th of March 1866 Gladstone brought forward his measure to establish a £7 franchise in boroughs and a £14 franchise in counties, which were calculated to add 400,000 voters to the existing lists. Lord Cranborne met the Bill with a persistent opposition, his rigorous logic and merciless hostility to clap-trap tending strongly to reinforce the impassioned eloquence of Robert Lowe. But though he attacked the Government Bill both in principle and detail, he did not absolutely commit himself to a position of hostility to Reform of every kind; and on the .defeat of Glad- stone’s Ministry no surprise was expressed at his joining the Cabinet of Lord Derby as secretary of state for India, even when it became known that a settlement of the Reform question was part of the Tory programme. The early months of the new Government’s tenure were marked by the incident of the Hyde Park riots; and if there had been members of the Cabinet and party who believed up to that time that the Reform question was not urgent the action of the Reform League and the London populace forced them to a different conclusion. On the nth of February Disraeli informed the House of Commons that the Government intended to ask its assent to a series of thirteen resolutions; but when, on the 26th of February, the Liberal leaders demanded that the Government should produce a Bill, Disraeli at once consented to do so. The introduction of a Bill was, however, delayed by the resignation of Lord Cranborne, General Peel and Lord Carnarvon. The Cabinet had been considering two alternative measures, widely different in kind and extent, and the final decision between the two was taken in ten minutes (whence the nickname of the ” Ten Minutes Bill “) at an informal gathering of the

Cabinet held just before Derby was engaged to address a general meeting of the party. At a Cabinet council held on the 23rd of February measure A had been agreed upon, the three doubtful ministers having been persuaded that the checks and safeguards provided were sufficient ; in the interval between Saturday and Monday they had come to the conclusion that the checks were inadequate; on Monday morning they had gone to Lord Derby and told him so; at two o'clock the rest of the Cabinet, hastily summoned, had been informed of the new situation, and had there and then, before the meeting at half-past two, agreed, in order to retain their three colleagues, to throw over measure A, and to present measure B to the country as the fruit of their matured and unanimous wisdom. Derby at the meeting, and Disraeli a few hours later in the House of Commons, explained their new

measure — a measure based upon a £6 franchise; but their own side did not like it, the Opposition were furious, and the moral sense of the country was revolted by the undisguised adoption of almost the very Bill which the Conservatives had refused to accept from their opponents only a year before. The result was that the Government reverted to measure A, and the three ministers again handed in their resignations. In the debate on the third reading of the Bill, when its passage through the House of Commons without a division was assured, Lord Cranborne showed with caustic rhetoric how the " precautions, guarantees, and securities " with which the Bill had bristled on its second reading had been dropped one after another at the bidding of Gladstone.

In countries where politics are conducted on any other than the give-and-take principles in vogue in England, such a breach as

that which occurred in 1867 between Lord Cranborne * e . and his former colleagues, especially Disraeli, would Lords. have been beyond repair. But Cranborne, though an

aristocrat both by birth and by conviction, was not impracticable; moreover, Disraeli, who had himself risen to eminence through invective, admired rather than resented that gift in others; and their common opposition to Gladstone was certain to reunite the two colleagues. In the session of 1868 Gladstone announced that he meant to take up the Irish question, and to deal especially with the

celebrated ” Upas tree,” of which the first branch was the Established Church. By way of giving full notice to the electorate, he brought in a series of resolutions on this question; and though the attitude adopted’ by the official Conservatives towards them was not one of serious antagonism, Lord Cranborne vigorously attacked them. This was his last speech in the House of Commons, for on the 1 2th of April his father died, and he became 3rd marquess of Salisbury. In the House of Lords the new Lord Salisbury’s style of eloquence — terse, incisive and wholly free from false ornament — found an even more appreciative audience than it had met with in the House of Commons. The questions with which he was first called upon to deal were questions in which his interest was keen — the recommendations of the Ritual Commission and, some time later, the Irish Church Suspensory Bill. Lord Salisbury’s argu- ment was that the last session of an expiring parliament was not the time in which so grave a matter as the Irish Church Establishment should be judged or prejudged; that a Suspensory Bill involved the question of disestablishment; and that such a principle could not be accepted by the Lords until the country had pronounced decisively in its favour. Even then there were those who raised the cry that the only business of the House of Lords was to register the decisions of the Commons, and that if they refused to do so it was at their peril. Lord Salisbury met this cry boldly and firmly: —

” When the opinion of your countrymen has declared itself, and you see that their convictions — their firm, deliberate, sustained convic- tions — are in favour of any course, I do not for a moment deny that it is your duty to yield.”

In the very next session Lord Salisbury was called upon to put his view into practice, and his influence went far to persuade the peers to pass the Irish Church Disestablishment Bill. In his opinion the general election of the autumn of 1868 had been fought on this question; his friends had lost, and there was nothing for them to do but to bow to the necessities of the situa- tion. The story of his conduct in the matter has been told in some fulness in the Life of Archbishop Tait, with whom Salisbury acted, and who throughout those critical weeks played a most important part as mediator between the two extreme parties — ■ those of Lord Cairns (representing Ulster) and Gladstone. October 1869 saw the death of the old Lord Derby, who was still the titular leader of his party; and he was succeeded as leader of the House of Lords by Cairns. For the dignified post of chancellor of the university of Oxford Convocation unanimously chose as Derby’s successor the marquess of Salisbury. Derby had translated the Iliad very well, but his successor was far more able to sympathize with the

academic mind and temper. He • was at heart a student, and found his best satisfaction in scientific

research and in scientific speculation; while still a young man he had made useful contributions to the investigation of the flora of Hertfordshire, and at Hatfield he had his own laboratory, where he was able to satisfy his interest in chemical and electrical research. As regards his connexion with Oxford may be men- tioned in particular his appointment, in 1877, of a second University Commission, and his appearance, in September 1894, in the Sheldonian Theatre as president of the British Association.

It is not necessary to dwell at any length upon the part taken by Lord Salisbury between 1869 and 1873 in respect of the other great political measures of Gladstone's Government — the Irish Land Act, the Act Abolishing Purchase in ˆ S uf eH t the Army, Forster's Education Act, &c. Nor does oti874. his attitude towards the Franco-German War of 1870- 71 call for any remark; a British leader of Opposition is bound, even more than a minister, to preserve a discreet silence on such occasions. But early in 1874 came the dissolution, suddenly announced in Gladstone's famous Greenwich letter, with the promise of the abolition of the income-tax. For the first time since 1841 the Conservatives found themselves in office with a large majority in the House of Commons. In Disraeli's new Cabinet in 1874 Salisbury accepted his old position at the India Office, The first task with which the new secretary of state had to deal was one of those periodical famines which are the great scourge of India; he supported the action of Lord Northbrook, the viceroy, and refused to interfere with private trade by prohibiting the export of grain. This attitude was amply justified, and Lord Salisbury presently declared that the action of the Government had given so much confidence to private traders that, by their means, " grain was pouring into the dis- tressed districts at a greater rate than that which was being carried by the public agency,- the amount reaching nearly 2000 tons a day." The Public Worship Regulation Bill of 1874 was the occasion of a famous passage of arms between Salisbury and his chief. The Commons had inserted an amendment which, on consideration by the Lords, Salisbury opposed, with the remark that it was not for the peers to attend to the " bluster " of the lower House merely because a small majority there had passed the amendment. The new clause was accordingly rejected, and the Commons eventually accepted the situation; but Disraeli, banteringly criticizing Salisbury's use of the word " bluster," alluded to him as " a man who does not measure his phrases. He is one who is a great master of gibes and flouts and jeers."

From the middle of 1876 the Government was occupied with foreign affairs. In regard to the stages of Eastern fever through which the nation passed between the occurrence of the Bulgarian ” atrocities ” and the signature of T ˆ e the Treaty of Berlin, the part played by Salisbury question. was considerable. The excesses of the Bashi-Bazouks took place in the early summer of 1876, and were recorded in long and highly-coloured despatches to English newspapers; presently there followed Gladstone’s pamphlet on Bulgarian Horrors, his speech on Blackheath and his enunciation of a ” bag-and-baggage ” policy towards Turkey. The autumn went by, Servia and Montenegro declared war upon Turkey and were in imminent danger of something like extinction. On the 31st of October Russia demanded an armistice, which Turkey granted; and Great Britain immediately proposed a conference at Constantinople, at which the powers should endeavour to make arrangements with Turkey for a genera) pacification of her provinces and of the inflammable communities adjoining. At this conference Great Britain was represented by Lord Salisbury. It met early in December, taking for its basis the British terms, namely, the status quo ante in Servia and Montenegro; a self-denying ordinance on the part of all the powers; and the independence and territorial integrity of the Ottoman empire, together with large administrative reforms assured by guarantees. General Ignatieff , the Russian ambassador, was effusively friendly with the British envoy; but though the philo-Turkish party in England professed themselves scandalized, Salisbury made no improper concessions to Russia, and departed in no way from the agreed policy of the British

Cabinet. On the 20th of January the conference broke up, Turkey having declared its recommendations inadmissible; and Europe withdrew to await the inevitable declaration of war. Very early in the course of that war the intentions of Great Britain were clearly indicated in a despatch of Lord Derby to the British representative at St Petersburg, which announced that so long as the struggle concerned Turkish interests alone Great Britain would be neutral, but that such matters as Egypt, the Suez Canal, the regulations affecting the passage of the Dardanelles, and the possession of Constantinople itself would be regarded as matters to which she could not be indifferent. For some nine months none of these British interests appeared to be threatened, nor had Lord Salisbury’s own department to concern itself very directly with the progress of the belligerents. Once or twice, indeed, the Indian secretary committed himself to statements which laid him

open to a good deal of attack, as when he rebuked an alarmist by bidding him study the Central Asian question ” in large maps. ” But with the advance of Russia through Bulgaria and across the Balkans, British anxiety grew. In mid-December explanations were asked from the Russian Government as to their intentions with regard to Constantinople. On the 23rd of January the Cabinet ordered the fleet to sail to the Dardanelles. Lord Carnarvon resigned, and Lord Derby handed in his resignation, but withdrew it. The Treaty of San Stefano was signed on the 3rd of March; and three weeks later, when its full text became known, the Succeeds Cabinet decided upon measures which finally induced Lord Derby Lord Derby, at the end of the month, to retire from a u, F ? l ? lga the Foreign Office, his place being immediately filled by Lord Salisbury. The new foreign secretary at once issued the famous ” Salisbury circular ” to the British representatives abroad, which appeared in the newspapers on the 2nd of April. This elaborate and dignified State paper was at once a clear exposition of British policy, and practically an invitation to Russia to reopen the negotiations for a European congress. These negotiations, indeed, had been proceeding for several weeks past; but Russia having declared that she would only discuss such points as she pleased, the British Cabinet had withdrawn, and the matter for the time was at an end. The bulk of the document consisted of an examination of the Treaty of San Stefano and its probable effects, Lord Salisbury justifying such an examination on the ground that as the position of Turkey and the other countries affected had been settled by Europe in the Treaty of Paris in 1856, the powers which signed that treaty had the right and the duty to see that no modifications of it should be made without their consent.

The effect of the circular was great and immediate. At home the Conservatives were encouraged, and many moderate Liberals rallied to the Eastern policy of the Govern- ment. Abroad it seemed as if the era of divided councils was over, and the Russian Government promptly recognized that the circular meant either a congress or war with Great Britain. For the latter alternative it was by no means prepared, and very soon negotiations were reopened, which led to the meeting of the congress at Berlin on the 13th of June. The history of that famous gathering and of its results is narrated under Europe. Lord Beaconsfield on two or three subsequent occasions referred to the important part that his colleague had played in the negotiations, and he was not using merely the language of politeness. Rumours had appeared in the London press as to a supposed Anglo-Russian agreement that had been signed between Salisbury and the Russian ambassador, Count Shuvaloff, and these rumours or statements were

described by the foreign secretary in the House of Lords, just before he left for Berlin, as ” wholly unauthentic.” But on the 14th of June what purported to be the full text of the agreement was published by the Globe newspaper through a certain Charles Marvin, at that time employed in occasional transcribing work at the Foreign Office, and afterwards known by some strongly anti-Russian books on the Central Asian question. Besides the general inconvenience of the disclosure, the agreement, which stipulated that Batum and Kars might

At Berlin Congress.

be annexed by Russia, made it impossible for the congress to insist upon Russia entirely withdrawing her claim to Batum, though at the time of the meeting of the congress it was known to some of the negotiators that she was not unwilling to do so. In one respect Salisbury’s action at the congress was unsuccessful. Much as he disliked Gladstone’s sentimentalism, he was not without a certain sentimentalism of his own, and at the Berlin Congress this took the form of an unexpected and, as it happened, useless pushing of the claims of Greece. But in the main Salisbury must be held to deserve, almost equally with his great colleague, the credit for the Berlin settlement. Great, however, as was the work done at Berlin, and marked the relief to all Europe which was caused by the signing of the treaty, much work, and of no pleasant kind, remained for the British Foreign Office and for the Indian Government before the Beaconsfield parliament ended and the Government had to render up its accounts to the nation. Russia, foreseeing a possible war with Great Britain, had during the spring of 1878 redoubled her activity in Central Asia, and, almost at the very time that the treaty was being signed, her mission was received at Kabul by the Amir Sher Ali. Out of the Amir’s refusal to receive a counterbalancing British mission there grew the Afghan War; and though he had ceased to control the India Office, Salisbury was naturally held responsible for some of the preliminary steps which, in the judgment of the Opposition, had led to these hostilities. But the Liberals entirely failed to fix upon Salisbury the blame for a series of events which was generally seen to be inevitable. A defence of the foreign policy of the Government during the year which followed the Berlin Treaty was made by Salisbury in a speech at Manchester (October 1879), which had a great effect throughout Europe. In it he justified the occupation of Cyprus, and approved the beginnings of a league of central Europe for preserving peace.

In the spring of 1880 the general election overthrew Beacons- field’s Government and replaced Gladstone in power, and the country entered upon five eventful years, which were Leader to see the

consolidation of the Parnellite party, the of Con- reign of outrage in Ireland, disasters in Zululand and aervative the Transvaal, war in Egypt, a succession of costly y ‘

mistakes in the Sudan, and the final collapse of Gladstone’s Government on a trifling Budget question. The defeat of 1880 greatly depressed Beaconsfield, who till then had really believed in that ” hyperborean ” theory upon which he had acted in 1867 — the theory that beyond and below the region of democratic storm and violence was to be found a region of peaceful conser- vatism and of a dislike of change. After the rude awakening of April 1880 Beaconsfield seems to have lost heart and hope, and to have ceased to believe that wealth, birth and education would count for much in future in England. Salisbury, who on Beacons- field’s death a year later was chosen, after the claims of Cairns had been withdrawn, as leader of the Conservative peers (Sir Stafford Northcote continuing to lead the Opposition in the lower House), was not so disposed to counsels of despair. After the Conservative reaction had come in 1886, he was often taunted with pessimism as regards the results, and he certainly spoke on more than one occasion in a way which appeared to justify the caricatures which appeared of him in the Radical press in his character of Hamlet; but in the days of Liberal ascendancy Salisbury was confident that the tide would turn. We may pass briefly over the years of Opposition between 1880 and 1885; the only policy that could then wisely be followed by the Con- servative leaders was that of giving their opponents sufficient rope. In 1884 a new Reform Bill was introduced, extending household suffrage to the counties; this was met in the Lords by a resolution, moved by Cairns, that the peers could not pass it unaccompanied by a Redistribution Bill. The Government, therefore, withdrew their measure. In the summer and autumn there was a good deal of agitation ; but in November a redistribu- tion scheme was settled between the leaders of both parties, and the Bill passed. When, in the summer of 1885, Gladstone resigned, it became necessary for the country to know whether Salisbury or Northcote was the real Conservative leader; and

the Queen settled the matter by at once sending for Lord Salis- bury, who became prime minister for the first time in 1885.

The ” Forwards ” among the Conservatives, headed by Lord Randolph Churchill, brought so much pressure to bear that

Northcote was induced to enter the House of Lords Minister as ear ” °* Iddesleigh, while Sir Michael Hicks Beach 18CS. w as made leader of the House of Commons, Loid

Randolph Churchill secretary for India, and Mr Arthur Balfour president of the Local Government Board. The new Government had only to prepare for the general election in the autumn. The ministerial programme was put forward by Salisbury on the 7th of October in an important speech addressed to the Union of Conservative Associations assembled at Newport, in Monmouthshire; and in this he outlined large reforms in local government, poured scorn upon Mr Chamberlain’s Radical policy of ” three acres and a cow,” but promised cheap land transfer, and opposed the disestablishment of the Church as a matter of life or death to the Conservative party. In this Lord Salisbury was declaring war against what seemed to be the danger should Mr Chamberlain’s ” unauthorized programme ” succeed; while the comparative slightness of his references to Ireland showed that he had no more suspicion than anybody else of the event which was about to change the whole face of British politics, to break up the Liberal party and to change the most formidable of the advanced Radicals into an ally and a colleague. The general election took place, and there were returned to parliament 335 Liberals, 249 Conservatives and 86 Home Rulers; so that if the last two parties had combined, they would have exactly tied with the Liberals. The Conservative Government met parliament, and after a short time were put into a minority of 79 on a Radical land motion, brought in by Mr Chamberlain’s henchman, Mr Jesse Collings. Mr Gladstone’s Unionism: return to office, and his announcement of a Bill giving PHme a separate parliament to Ireland, were quickly followed Minister, by the secession of the Unionist Liberals; the defeat of 1886. t Vj e -gjrj. an a pp ea j t0 tne country; and the return

of the Unionist party to power with a majority of 118. Salisbury at once offered to make way for Lord Hartington, but the suggestion that the latter should form a Government was declined; and the Conservatives took office alone, with an Irish policy which might be summed up, perhaps, in Salisbury’s words as ” twenty years of resolute government.” For a few months, until just before his sudden death on the 12th of January 1887, Lord Iddesleigh was foreign secretary; but Salisbury, who meantime had held the post of lord privy seal, then returned to the Foreign Office. Meanwhile the increasing friction between him and Lord Randolph Churchill, who, amid many qualms on the part of more old-fashioned Conservatives, had become chancellor of the exchequer and leader of the House of Commons, had led to the latter’s resignation, which, to his own surprise, was

accepted; and from that date Salisbury's effective primacy in his own party was unchallenged.

Only the general lines of Salisbury's later political career need here be sketched. As a consequence of the practical 1886-1902. mon opoly of political power enjoyed by the Unionist

party after the Liberal disruption of 1886 — for even in the years 1892-1895 the situation was dominated by the permanent Unionist majority in the House of Lords — Salisbury's position became unique. These were the long-looked-for days of Conservative reaction, of which he had never despaired. The situation was complicated, so far as Salisbury personally was concerned, by the coalition with the Liberal Unionists, which was confirmed in 1895 by the inclusion of the duke of Devonshire, Mr Chamberlain, and other Liberal Unionists in the Cabinet. But though it appeared anomalous that old antagonists like Lord Salisbury and Mr Chamberlain should be working together in the same ministry, the prime minister's position was such that he could disregard a superficial criticism which paid too little heed to his political faculty and his patriotic regard for the requirements of the situation. Moreover, the practical work of reconciling Conservative traditions with domestic reform depended rather on Salisbury's nephew, Mr Balfour, who led

the House of Commons, than on Salisbury, who devoted himself almost entirely to foreign affairs. The new Conservative move- ment, moreover, in the country at large, was, in any case, of a more constructive type than Salisbury himself was best fitted to lead, and he was not the real source of the political inspiration even of the Conservative wing of the Unionist party during this period. He began to stand to some extent outside party and above it, a moderator with a keenly analytic and rather sceptical mind, but still the recognized representative of the British empire in the councils of the world, and the trusted adviser of his sovereign. Though himself the last man to be selected as the type of a democratic politician— for his references to extensions of popular government, even when made by his own party, were full of mild contempt — Salisbury gradually acquired a higher place in public opinion than that occupied by any contemporary statesman. His speeches — which, though carelessly composed, continued to blaze on occasion with their old fire and their some- what mordant cynicism— were weightier in tone, and became European events. Without the genius of Disraeli or the personal magnetism of Gladstone, he yet inspired the British public with a quiet confidence that under him things would not go far wrong, and that he would not act rashly or unworthily of his country. Even political

opponents came to look on his cautious and balanced conservatism, and his intellectual aloofness from interested motives or vulgar ambition, as standing between them and something more distasteful. Moreover, in the matter of foreign affairs his weight was supreme. He had lived to become, as was indeed generally recognized, the most experienced working diplomatist in Europe. His position in this respect was shown in nothing better than in his superiority to criticism. In foreign affairs many among his own party regarded him as too much inclined to ” split the difference ” and to make ” graceful concessions ” — as in the case of the cession of Heligoland to Germany — in which it was complained that Great Britain got the worst of the bargain. But though occasionally, as in the with- drawal of British ships from Port Arthur in 1898, such Criticism became acute, the plain fact of the preservation of European peace, often in difficult circumstances, reconciled the public to his conduct of affairs. His patience frequently justified itself, notably in the case of British relations with the United States, which were for a moment threatened by President Cleveland’s message concerning Venezuela in 1895. And though his loyalty to the European Concert in connexion with Turkey’s dealings with Armenia and Crete in 1895-1898 proved irritatingly in- effectual — the pace of the concert, as Lord Salisbury explained, being rather like that of a steam-roller — no alternative policy could be contemplated as feasible in any other statesman’s hands. Salisbury’s personal view of the new situation created by the methods of the sultan of Turkey was indicated not only by a solemn and unusual public warning addressed to the sultan in a speech at Brighton, but also by his famous remark that in the Crimean War Great Britain had ” put her money on the wrong horse. ” Among his most important strokes of diplomacy was the Anglo-German agreement of 1890, delimiting the British and German spheres of influence in Africa. The South African question from 1896 onwards was a matter for the Colonial Office, and Salisbury left it in Mr Chamberlain’s hands.

A peer premier must inevitably leave many of the real problems of democratic government to his colleagues in the House of Commons. In the Upper House Lord Salisbury was paramount. Yet while vigorously opposing the Radical agitation for the abolition of the House of Lords, he never interposed a -non possumus to schemes of reform. He was always willing to consider plans for its improvement, and in May 1888 himself introduced a bill for reforming it and creating life peers; but he warned reformers that the only result must be to make the House stronger. To abolish it, on the other hand, would be to take away a necessary safeguard for protecting ” Philip drunk ” by an appeal to ”

Philip sober. “■

Lord Salisbury suffered a severe loss by the death in 1900 of his wife, whose influence with her husband had been great, as her devotion had been unswerving. Her protracted illness was

one among several causes, including his own occasional ill-health, which after 1895 made him leave as much as possible of the work of political leadership to his principal colleagues — Mr Arthur Balfour more than once acting as foreign secretary for several weeks while his uncle stayed abroad. But for some years it was felt that his attempt to be both prime minister and foreign secretary was a mistake; and after the election of 1900 Salisbury handed over the seals of the foreign office to Lord Lansdowne, remaining himself at the head of the government as lord privy seal. In 1902, upon the conclusion of peace in South Africa, he felt that the time had come to retire from office altogether; and on the nth of July his resignation was accepted by the king, and he was succeeded as prime minister by Mr Arthur Balfour.

From this moment he remained in the political background, and his ill-health gradually increased. He died at Hatfield on the 22nd of August 1903, and was succeeded in the marquessate by his eldest son Lord Cranborne (b. 1861), who entered the house of commons for the Darwen division of Lancashire (1885- 1892) and since 1893 had been member for Rochester. The new marquess had been under-secretary for foreign affairs since 1900, and in October 1903 he became lord privy seal in Mr Balfour’s ministry. Of the other four sons, Lord Hugh Cecil (b. 1869) became a prominent figure in parliament as Conservative member for Greenwich (1895-1906), first as an ardent and eloquent High Churchman in connexion with the debates on education, &c, and then as one of the leaders of the Free-Trade Unionists opposing Mr Chamberlain; and his elder brother Lord Robert Cecil (b. 1864), who had at first devoted himself to the bar and become a K.C., entered parliament in 1906 for Maryle- bone, holding views in sympathy with those of Lord Hugh, who had been defeated through the opposition of a Tariff Reform Unionist in a triangular contest at Greenwich, which gave the victory to the Radical candidate. In the elections of January 1910 Lord Robert Cecil resigned his candidature for Marylebone, owing to the strong opposition of the Tariff Reformers, which threatened to divide the party and lose the seat; he stood for Blackburn as a Unionist Free Trader and was

defeated. On the other hand Lord Hugh Cecil was returned for Oxford University in place of the Rt. Hon. J. G. Talbot. Lord Hugh's candidature, which was announced in 1909 simultaneously with the resignation of the sitting member, was opposed by many who disagreed with his fiscal views and his attitude on Church questions; but it was found that he had the support of the great majority of the electors, and he was ultimately returned un- opposed. (H. Ch.)

SALISBURY, ROBERT CECIL, ist Earl of (c. 1565-1612), English lord treasurer, the exact year of whose birth is unrecorded, was the youngest son of William Cecil, ist Lord Burghley, and of his second wife Mildred, daughter of Sir Anthony Cooke, of Gidea Hall in Essex. He was educated in his father's house and at Cambridge University. In 1584 he was sent to France, and was returned the same year to parliament, and again in 1586, as member for Westminster. In 1588 he accompanied Lord Derby in his mission to the Netherlands to negotiate peace with Spain,and sat in the parliament of 1588, and in the assemblies of 1593, 1597 and 1601 for Hertfordshire. About 1589 he appears to have entered upon the duties of secretary of state, though he did not receive the official appointment till 1596. On the 20th of May 1 591 he was knighted, and in August sworn of the privy council. In 1597 he was made chancellor of the duchy of Lancaster, and in 1598 despatched on a mission to Henry IV. of France, to prevent the impending alliance between that country and Spain. The next year he succeeded his father as master of the court of wards. On Lord Burghley's death on the 4th of August both Essex and Bacon desired to succeed him in the supreme direction of affairs, but the queen preferred the son of her last great minister. On Essex's disgrace, consequent on his sudden and unauthorized abandonment of his command in Ireland, Cecil's conduct was worthy of high praise. " By employing his credit with Her Majesty in behalf of the Earl," wrote John Petit (June 14, 1600), " he has gained great credit

to himself both at home and abroad." At this period began Cecil's secret correspondence with James in Scotland. Hitherto Cecil's enemies had persuaded James that the secretary was unfavourable to his claims to the English throne. An under- standing was now effected by which Cecil was able to assure James of his succession, ensure his own power and predominance in the new reign against Sir Walter Raleigh and other competitors, and secure the tranquillity of the last years of Elizabeth, the conditions demanded by him being that all attempts of James to obtain parliamentary recognition of his title should cease, that an absolute respect should be paid to the queen's feelings, and that the communications should remain a profound secret. Writing later in the reign of James, Cecil says: " If Her Majesty

had known all I did, how well these (? she) should have known the innocency and constancy of my present faith, yet her age and orbity, joined to the jealousy of her sex, might have moved her to think ill of that which helped to preserve her.” x

Such was the nature of these secret communications, which, while they aimed at securing for Cecil a fresh lease of power in the new reign, conferred undoubted advantages on the country. Owing to Cecil’s action, on the death of Elizabeth on the 24th of March 1603, James was proclaimed king, and took possession of the throne without opposition. Cecil was continued in his office, was created Baron Cecil of Essendon in Rutlandshire on the 13th of May, Viscount Cranborne on the 20th of August 1604, and earl of Salisbury on the 4th of May 1605. He was elected chancellor of the University of Cambridge in February 1601, and obtained the Garter in May 1606. Meanwhile Cecil’s success had completed the discontent of Raleigh, who, exasperated at his dismissal from the captaincy of the guard, became involved — whether innocently or not is uncertain — in the treasonable conspiracy known as the ” Bye Plot.” Cecil took a leading part in his trial in July 1603, and, though probably convinced of his guilt, endeavoured to ensure him a fair trial and rebuked the attorney-general, Sir Edward Coke, for his harshness towards the prisoner. On the 6th of May 1608 the office of lord treasurer was added to Salisbury’s other appointments, and the whole conduct of public affairs was placed solely in his hands. His real policy is not always easy to distinguish, for the king con- stantly interfered, and Cecil, far from holding any absolute or continuous control, was often not even an adviser but merely a follower, simulating approval of schemes opposed to his real judgment. In foreign affairs his aim was to preserve the balance of power between France and Spain, and to secure the independ- ence of the Netherlands from either state. He also hoped, like his father, to make England the head of the Protestant alliance abroad; and his last energies were expended in effecting the marriage in 161 2 of the princess Elizabeth, James’s daughter, with the Elector Palatine. He was in favour of peace, preoccupied with the state of the finances at home and the decreasing revenue, and, though sharing Raleigh’s dislike of Spain, was instrumental in making the treaty with that power in 1604. In June 1607 he promised the support of the government to the merchants who complained of Spanish ill-usage, but declared that the commons must not meddle with questions of peace and war. In 161 1 he disapproved of the proposed marriage between the prince of Wales and the Infanta. His bias against Spain and his fidelity to the national interests render, therefore, his accept- ance of a pension from Spain a surprising incident in his career. At the

conclusion of the peace in 1604 the sum Cecil received was £1000, which was raised the following year to £1500; while in 1609 he demanded an augmentation and to be paid for each piece of information separately. If, as has been stated, 2 he received a pension also from France, it is not improbable that, like his contemporary Bacon, who accepted presents from suitors on both sides and still gave an independent decree, Cecil may have maintained a freedom from corrupting influences, while his acceptance of money as the price of information concerning the intentions of the government may have formed

1 Correspondence of King James VI. of Scotland with Sir R. Cecil, ed. by J. Bruce (Camden Soc, 1861), p. xl.

2 Gardiner, History of England, i. 214.

part of a general policy of cultivating good relations with the two great rivals of England (one advantage of which was the communication of plots formed against the government), and of maintaining the balance of power between them. It is difficult, however, in the absence of complete information, to understand the exact nature and signification of these strange relations.

As lord treasurer Salisbury showed considerable financial ability. During the year preceding his acceptance of that office the expenditure had risen to £500,000, leaving, with an ordinary revenue of about £320,000 and the subsidies voted by parliament, a yearly deficit of £73,000. Lord Salisbury took advantage of the decision by the judges in the court of exchequer in Bates's case in favour of the king's right to levy impositions; and (on the 28th of July 1608) imposed new duties on articles of luxury and those of foreign manufacture which competed with English goods, while lowering the dues on currants and tobacco. By this measure, and by a more careful collection, the ordinary income was raised to £460,000, while £700,000 was paid off the debt, leaving at the beginning of 1610 the sum of £300,000. This was a substantial reform, and if, as has been stated, the " total result of Salisbury's financial administration " was " the halving of the debt at the cost of doubling the deficiency," l the failure to secure a permanent improvement must be ascribed to the extravagance of James, who, disregarding his minister's entreaties and advice, continued to exceed his income by £149,000. But a want of

statesmanship had been shown by Salisbury in forcing the king's legal right to levy impositions against the remonstrances of the parliament. In the " great contract," the scheme now put forward by Salisbury for settling the finances, his lack of political wisdom was still more apparent. The Commons were to guarantee a fixed annual subsidy, on condition of the abandonment of impositions and of the redress of grievances by the king. An unworthy and undignified system of higgling and haggling was initiated between the crown and the parliament. Salisbury could only attribute the miscarriage of his scheme to the fact " that God did not bless it." But Bacon regarded it with severe disapproval, and in the parliament of 1613, after the treasurer's death, he begged the king to abandon these humiliating and dangerous bargainings, " that your majesty do for this parliament put off the person of a merchant and contractor and rest upon the person of a king." In fact, the vicious principle was introduced that a redress of grievances could only be obtained by a payment of subsidies. The identity of interests between the crown and the nation which had made the reign of Elizabeth so glorious, and which she herself had consummated on the occasion of her last public appearance by a free and voluntary concession of these same impositions, was now destroyed, and a divergence of interests, made patent by vulgar bargaining, was substituted which stimulated the disastrous struggle between sovereign and people, and paralysed the national development for two generations.

This was scarcely a time to expect any favours for the Roman Catholics, but Salisbury, while fearing that the Roman Church in England would become a danger to the state, had always been averse from prosecution for religijn, and he attempted to dis- tinguish between the large body of law-abiding and loyal Roman Catholics and those connected with plots and intrigues against the throne and government, making the offer in October 1607 that if the pope would excommunicate those that rebelled against the king and oblige them to defend him against invasion, the fines for recusancy would be remitted and they would be allowed to keep priests in their houses. This was a fair measure of toleration. His want of true statesmanship was shown with regard to the Protestant Nonconformists, towards whom his attitude was identical with that afterwards maintained by Laud, and the same ideal pursued, namely that of material and outward conformity, Salisbury employing almost the same words as the archbishop later, that " unity in belief cannot be preserved unless it is to be found in worship." 2

Bacon's disparaging estimate of his cousin and rival was

1 Spedding, Life and Letters of Bacon, iv. 276. 1 Gardiner, History of England, i. 199.

probably tinged with some personal animus,- and instigated by the hope of recommending himself to James as his successor; but there is little doubt that his acute and penetrating description of Salisbury to James as one ” fit to prevent things from growing worse but not fit to make them better,” as one ” greater in operatione than in opere,” is a true one. 3 Elsewhere Bacon accuses him ” of an artificial animating of the negative ” — in modern language, of official obstruction and ” red tape.” But in one instance at least, when he advised James not to press forward too hastily the union of England and Scotland, a measure which especially appealed to Bacon’s imagination and was ardently desired by him, Salisbury showed a prudence and judgment superior to his illustrious critic. It can scarcely be denied that he rendered substantial services to the state in times of great difficulty and perplexity, and these services would probably have been greater and more permanent had he served a better king and in more propitious times. Both Elizabeth and James found a security in Salisbury’s calm good sense, safe, orderly official mind and practical experience of business, of which there was no guarantee in the restlessness of Essex, the enterprise of Raleigh or the speculation of Bacon. On the other hand, he was neither guided nor inspired by any great principle or ideal, he contributed nothing towards the settlement of the great national problems, and he precipitated by his ill-advised action the disastrous struggle between crown and parliament.

Lord Salisbury died on the 24th of May 16 12, at the parsonage house at Marlborough, while returning to London from taking the waters at Bath. During his long political career he had amassed a large fortune, besides inheriting a considerable portion of Lord Burghley’s landed estate. In 1607 he exchanged, at the king’s request, his estate of Theobalds in Hertfordshire for Hatfield. Here he built the magnificent house of which he himself conceived the plans and the design, but which he did not live to inhabit, its completion almost coinciding with his death. In person and figure he was in strange contrast with his rivals at court, being diminutive in stature, ill-formed and weak in health. Elizabeth styled him her pygmy; his enemies delighted in vilifying his “wry neck,” “crooked back” and “splayfoot,” andin Bacon’s essay on ” Deformity,” it was said, ” the world takes notice that he paints out his little cousin to the life.” 4 Molin, the Venetian ambassador in England, gives a similar description of his person, but adds that he had “a noble countenance and features.” 6 Lord Salisbury wrote The State and Dignitie of a Secretaire of Estate’s Place (publ. 1642, reprinted in Harleian Miscellany, ii. and Somers Tracts (1809),

v.; see also Harleian MSS. 305 and 354), and An Answer to Certain Scandalous Papers scattered abroad under Colour of a Catholick Admonition (1606), justifying his attitude towards recusants after the discovery of the Gun- powder Plot (Harl. Misc. ii.; Somers Tracts, v.). He married Elizabeth, daughter of William Brooke, 5th Baron Cobham, by whom, besides one daughter, he had William (1591-1668), his successor as 2nd earl.

No complete life of Robert Cecil has been attempted, but the materials for it are very extensive, including Hist. MSS. Comm. Series, Marquis of Salisbury's MSS. (superseding former reports in the series), from which MSS. selections were published in 1740 by S. Haynes, by Wm. Murdin in 1759, by John Bruce, in The Corre- spondence of King James VI. with Sir Robert Cecil, in 1 86 1 (Camden Society), and by Ed. Lodge, in Illustrations of English History , in 1838.

The 2nd earl of Salisbury, who sided with the parliament during the Civil War and represented his party in negotiations with the king at Uxbridge and at Newport, was succeeded by his grandson James (1648-1683) as 3rd earl. James's descendant, James, the 7th earl (1 748-1823), who was lord chamberlain of the royal household from 1783 to 1804, was created marquess of Salisbury in 1789. His son and successor, James Brownlow William, the 2nd marquess (1791-1868), married Frances Mary, daughter of Bamber Gascoyne of Childwall Hall, Lancashire, and took the name of Gascoyne before that of Cecil. He was lord privy seal in 1852 and lord president of the council in 1858- 1859; his son and heir was the famous prime minister.

3 Spedding, Life and Letters of Bacon, iv. 278 note, 279.

4 Chamberlain to Carleton, Birch's Court of King James, i. 214. 6 Col. of Slate Papers: Venetian, x. 515.

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SALISBURY, 4 th EARL OF— SALISBURY

SALISBURY, THOMAS DE MONTACUTE, 4 th Earl oe (1388-1428), was son of John, the third earl, who was executed in 1400 as a supporter of Richard II. Thomas was granted part of his father's estates and summoned to parliament in 1409, though not fully restored till 1421. He was present throughout the campaign of Agincourt in 141 5, and at the naval engagement before Harfleur in 1416. In the expedition of 1417-18 he served with increasing distinction, and especially at the siege of Rouen. During the spring of

1419 he held an independent command, capturing Fecamp, Honfleur and other towns, was appointed lieutenant-general of Normandy, and created earl of Perche. In 1420 he was in chief command in Maine, and defeated the Marechal de Rieux near Le Mans. When Henry V. went home next year Salisbury remained in France as the chief lieutenant of Thomas, duke of Clarence. The duke, through his own rash- ness, was defeated at Bauge on the 21st of March 1421. Salisbury came up with the archers too late to retrieve the day,but recovered the bodies of the dead, and by a skilful retreat averted further disaster. He soon gathered a fresh force, and in June was able to report to the king " this part of your land stood in good plight never so well as now." (Foedera, x. 131). Salisbury's success in Maine marked him out as John of Bedford's chief lieutenant in the war after Henry's death. In 1423 he was appointed governor of Champagne, and by his dash and vigour secured one of the chief victories of the war at Cravant on the 30th of July. Subsequent operations completed the conquest of Champagne, and left Salisbury free to join Bedford at Verneuil. There on the 17th of August, 1424, it was his "judgment and valour " that won the day. During the next fhree years Salisbury was employed on the Norman border and in Maine. After a year's visit to England he returned to the chief command in the field in July, 1428. Against the judgment of Bedford he determined to make Orleans his principal objective, and began the siege on the 1 2th of October. Prosecuting it with his wonted vigour he stormed Tourelles, the castle which protected the southern end of the bridge across the Loire, on the 24th of October. Three days later whilst surveying the city from a window in Tourelles he was wounded by a cannon-shot, and died on the 3rd of November 1428. Salisbury was the most skilful soldier on the English side after the death of Henry V. Though employed on diplomatic missions both by Henry V. and Bedford, he took no part in politics save for a momentary support of Humphrey, duke of Gloucester, during his visit to England in 1427-1428. He was a patron of John Lydgate, who presented to him his book The Pilgrim (now Harley MS. 4826, with a miniature of Salisbury, engraved in Strutt's Regal Antiquities). By his first wife Eleanor Holand, daughter of Thomas, earl of Kent, Salisbury had an only daughter Alice, in her right earl of Salisbury, who married Richard Neville, and was mother of Warwick the King- maker. His second wife Alice was grand-daughter of Geoffrey Chaucer, and after his death married William de la Pole, duke of Suffolk.

The chief accounts of Salisbury's campaigns are to be found in the Gesta Henrici Quinti, edited by B. Williams for the Eng. Hist. Soc. (London, 1850) in the Vita Henrici Quinti (erroneously attributed to

Thomas of Elmham), edited by T. Hearne (Oxford, 1727); the Chronique of E. de Monstrelet, edited by L. D. d'Arcq (Paris, 1857-1862) ; the Chrtmiques of Jehan de Waurin, edited by W. and E. L. C. P. Hardy (London, 1864-1891); and the Chronique de la Pucelle of G. Cousinot, edited by Vaflet de Viriville (Paris, 1859). For modern accounts see Sir J. H. Ramsay, Lancaster and York (Oxford, 1892); and C. Oman, Political History of England, 1377- 1485 (London, 1906). (C. L. K.)

SALISBURY, WILLIAM L0N6SW0RD (or Longespee), Earl of (d. 1226), was an illegitimate son of Henry II. In 1 1 98 he received from King Richard I. the hand of Isabella, or Ela (d. 1261), daughter and heiress of William, earl of Salisbury, and was granted this title with the lands of the earldom. He held many high offices under John, and commanded a section of the English forces at Bouvines (1214), when he was made a prisoner. He remained faithful to the royal house except for a few months in 1216, when John's cause seemed hopelessly lost. He was also a supporter of Hubert de Burgh. In 1225

he went on an expedition to Gascony, being wrecked on the Isle of Re on the return voyage. The hardships of this adventure undermined his health, and he died at Salisbury on the 7th of March 1226, and was buried in the cathedral there. The eldest of Longsword's four sons, William (6.1212-1250) did not receive his father's earldom, although he is often called earl of Salisbury. In 1247 he led the English crusaders to join the French at Damietta and was killed in battle with the Saracens in February

1250.

SALISBURY, a township of Litchfield county, in the north- western corner of Connecticut, U.S.A. Pop. (1910) 3322. Area, about 58 sq. m. Salisbury is served by the Central New England, and the New York, New Haven & Hartford railways. In the township are several villages, including Salisbury, Lakeville, Lime Rock, Chapinville and Ore Hill. Much of the township is hilly, and Bear Mountain (2355 ft.), near the Massachusetts line, is the highest elevation in the state. The Housatonic river forms the eastern boundary. The township is a summer resort. In it are the Scoville Memorial Library (about 8000 volumes in 1910); the Hotchkiss preparatory school (opened in 1892, for boys); the Salisbury School (Protestant Episcopal, for boys), removed to Salisbury from Staten Island in 1901 and formerly St Austin's school; the Taconic School (1896, for girls); and the Connecticut School for Imbeciles (established as a private institution in 1858). Among the manufactures are charcoal, pig-iron, car wheels

and general castings at Lime Rock, cutlery at Lakeville, and knife-handles and rubber brushes at Salisbury. The iron mines are among the oldest in the country; mining began probably as early as 1731.

The first settlement within the township was made in 1720 by Dutchmen and Englishmen, who in 17 19 had bought from the Indians a tract of land along the Housatonic, called ” Weatogue ” — an Indian word said to mean ” the wigwam place.” In 1732 the township was surveyed with its present boundaries, and in 1738 the land (exclusive of that held under previous grants) was auctioned by the state at Hartford. In that year the present name was adopted, and in 1741 the township was incorporated.

See Malcolm D. Rudd, An Historical Sketch of Salisbury, Con- necticut (New York, 1899); and Ellen S. Bartlett, ” Salisbury,” in The Connecticut Quarterly, vol. iv. No. 4, pp. 345 sqq. (Hartford, Conn., 1898).

SALISBURY, a city and municipal and parliamentary borough, and the county town of Wiltshire, England, 83J m. W. by S. of London, on the London and South- Western and Great Western railways. Pop. (1901) 17,117. Its situation is beautiful. Viewed from the hills which surround it the city is seen to lie among flat meadows mainly on the north bank of the river Avon, which is here joined by four tributaries. The magnificent cathedral stands close to the river, on the south side of the city, the streets of which are in part laid out in squares called the ” Chequers.” To the north rises the bare upland of Salisbury Plain.

The cathedral church of St Mary is an unsurpassed example of Early English architecture, begun and completed, save its spire and a few details, within one brief period (1220-1266). There is atradi- tion, supported by probability, that Elias de Derham, canon of the cathedral (d. 1245), was the principal architect. He was at Salisbury in 1220-1229, and had previously taken part in the erection of the shrine of Thomas a Becket at Canterbury. The building is 473 ft. in extreme length, the length of the nave being 229 ft. 6 in., the choir 151 ft., and the lady chapel 68 ft. 6 in. The width of the nave is 82 ft. and the height 84 ft. The spire, the highest in England, measures 404 ft. (For plan, see Architecture : Romanesque and Gothic in England.) The cathedral, standing in a broad grassy close, consists of a nave of ten bays, with aisles and a lofty north porch, main transepts with eastern aisles, choir with aisles, lesser transepts, presbytery and lady chapel. The two upper storeys of the tower and the spire above are early Decorated. The west front, the last portion of the original building completed, bears in its rich orna- mentation signs of the transition to

the Decorated style. The perfect uniformity of the building is no less remarkable within than without. The frequent use of Purbeck marble for shafts contrasts beautifully with the delicate grey freestone which is the principal building material. In the nave is a series of monuments of much interest, which ■ were placed here by James Wyatt, who, in an unhappy restoration of the cathedral (1782-1791), destroyed many magnificent stained-glass windows which had escaped the Reformation, and also removed two Perpendicular chapels and the detached belfry which stood to the north-west of the cathedral. One of the memorials is a

small figure of a bishop in robes. This was long connected with the ceremony of the ” boy bishop,” which, as practised both here and elsewhere until its suppression by Queen Elizabeth, consisted in the election of a choir-boy as ” bishop ‘ during the period between St Nicholas’ and Holy Innocents’ Days. The figure was supposed to represent a boy who died during his tenancy of the office. But such small figures occur elsewhere, and have been supposed to mark the separate burial-place of the heart. The lady chapel is the earliest part of the original building, as the west end is the latest. The cloisters, south of the church, were built directly after its completion. The chapter-house is of the time of Edward I., a very fine octagonal example, with a remarkable series of contemporary sculptures. The library contains many valuable MSS. and ancient printed books. The diocese covers nearly the whole of Dorsetshire, the greater part of Wiltshire and very small portions of Berkshire, Hampshire, Somersetshire and Devonshire. ‘

There are three ancient parish churches: St Martin’s, with square tower and spire, and possessing a Norman font and Early English portions in the choir; St Thomas’s (of Canterbury), founded in 1240 as a chapel to the cathedral, and rebuilt in the 15th century; and St Edmund’s, founded as the collegiate church of secular canons in 1268, but subsequently rebuilt in the Perpendicular period. The residence of the college of secular priests is occupied by the modern ecclesiastical college of St Edmund’s, founded in 1873. St John’s chapel, founded by Bishop Robert Bingham in the 13th century, is occupied by a dwelling-house. There is a beautiful chapel attached to the St Nicholas hospital. The poultry cross, or high cross, an open hexagon with six arches and a central pillar, was erected by Lord Montacute before 1335.’ In the market-place is Marochetti’s statue to Sidney Herbert, Lord Herbert of Lea. The modern public buildings include the court-house, market, corn exchange and theatre. A park was laid out in 1887 to commemorate the jubilee of Queen Victoria, and in the same year a statue was erected to Henry Fawcett, the economist, who was born at Salisbury. Among remaining specimens of ancient domestic architecture may be mentioned the banqueting-hall of John Halle, wool merchant, built about 1470; and Audley House, belonging also to the 15th century, and repaired in 1881 as a diocesan church house. There are a large number of educational and other charities, including the bishop’s grammar school, Queen Elizabeth’s grammar school, the

St Nicholas hospital and Trinity hospital, founded by Agnes Bottenham in 1379. Brew- ing, tanning, carpet-making and the manufacture of hardware and of boots and shoes are carried on, and there is a considerable agricul- tural trade. The city is governed by a mayor, 7 aldermen and 21 councillors. Area, 1710 acres.

History. — The neighbourhood of Salisbury is rich in anti- quities. The famous megalithic remains of Stonehenge (g.v.) are not far distant. From Milford Hill and Fisherton Sarum. many prehistoric relics have been brought to the fine Blackmore Museum in the city. But the site most intimately associated with Salisbury is that of Old Sarum, the history of which forms the preface to that of the modern city. This is a desolate place, lying a short distance north of Salisbury, with a huge mound guarded by a fosse and earthworks. The summit is hollowed out like a crater, its rim surmounted by a rampart so deeply cut away that its inner side rises like a sheer wall of chalk 100 ft. high.

Old Sarum was probably one of the chief fortresses of the early Britons and was known to the Romans as Sorbiodunum. Cerdic, founder of the West Saxon kingdom, fixed his seat there in the beginning of the 6th century. Alfred strengthened the castle, and it was selected by Edgar as a place of national assembly to devise means of checking the Danes. Under Edward the Confessor it possessed a mint. The ecclesiastical importance of Old Sarum begins with the establishment of a nunnery by Edward the Confessor. Early in the 8th century Wiltshire had been divided between the new diocese of Sherborne a'nd that of Winchester. About 920 a bishopric had been created at Rams- bury, east of Savernake Forest; to this Sherborne was joined in 1058 and in 1075/6 Old Sarum became the seat of a bishopric, transferred hither from Sherborne. Osmund, the second bishop, revised the form of communion service in general use, compiling a missal which forms the groundwork of the celebrated " Sarum Use." The "Sarum Breviary" was printed at Venice in 1483, and upon this, the most widely prevalent of English liturgies, the prayer-books of Edward VI. were mainly based. Osmund also built a cathedral, in the form of a plain cross, and this was traceable in the very dry summer of 1834. Old Sarum could have afforded little room for a cathedral, bishop's palace, garrison and townsfolk. The priests complained of their bleak

New Saram.

and waterless abode, and still more of its transference to the keeping of lay castellans. Soldiers and priests were at perpetual feud ; and after a licence had been granted by Pope Honorius III., it was decided to move down into the fertile Avon valley. In 1 102 the notorious bishop,

Roger Poore, by virtue of his office of sheriff, obtained custody of the castle and the grant of a comprehensive charter from Henry I. which confirmed and extended the possessions of the ecclesiastical establishment, annexed new benefactions and granted perpetual freedom in markets and fairs from all tolls and customs. This was confirmed by Henry II., John, and Henry III. With the building of New Sarum in the 13th century and the transference to it of the see, Old Sarum lapsed to the crown. It has since changed hands several times, and under James I. formed part of the property of the earldom of Salisbury. By the 16th century it was almost entirely in ruins, and in 1608 it was ordered that the town walls should be entirely demolished. The borough returned two members to parliament from 1295 until 1832 when it was de- prived of representation by the Reform Act, the privilege of election being vested in the proprietors of certain free burgage tenures. In the 14th century the town appears to have been divided into aldermanries, the will of one John atte Stone, dated 1361, including a bequest of land within the aldermanry of Newton. In 1 102 Henry I. granted a yearly fair for seven days, on August 14 and for three days before and after. Henry III. granted another fair for three days from June 28, and Richard II. for eight days from September 30.

The new city, under the name of New Sarum (New Saresbury, Salisbury) immediately began to spring up round the cathedral close. A charter of Henry III. in 1227 recites the removal from Old Sarum, the king's ratification and his laying the foundation-stone of the church. It then grants and confirms to the bishops, canons and citizens, all liberties and free customs previously enjoyed, and declares New Sarum to be a free city and to constitute forever part of the bishop's demesne. During the three following centuries periodical disputes arose between the bishop and the town, ending generally in the complete submission of the latter. One of these resulted in 1472 in the grant of a new charter by Edward IV. empowering the bishop to enforce the regular election of a mayor, and to make laws for governing the town. In 1611 the city obtained a charter of incorporation from James I. under the title of " mayor and commonalty " of the city of New Sarum, the governing body to consist of a mayor, recorder and twenty- four aldermen, with power to make by-laws. This charter was renewed by Charles I. and confirmed by Cromwell in 1656. The latter recites that since the deprivation of archbishops and bishops, by parliament, the mayor and commonalty have bought certain possessions of the late bishop of New Sarum, together with fairs and markets. These it confirms, constitutes the town a city and county, subjects the close to its jurisdiction and

invests the bailiff with the powers of a sheriff. In 1659 with the restoration of the bishops, the ancient charter of the city was revived and that of 1656 cancelled. In 1684 during the friction between Charles II. and the towns, Salisbury surrendered its charter voluntarily. Four years later in 1688 James II. restored to all cities their ancient charters, and the bishop continued to hold New Sarum as his demesne until 1835. The Municipal Corporations Act of that year reported that Salisbury was still governed under the charter of 161 1, as modified by later ones of Charles II., James II. and Anne.

In 1 221 Henry III. granted the bishop a fair for two days from August 14, which in 1227 was prolonged to eight days. Two general fairs were obtained from Cromwell in 1656, on the Tuesday before Whit-Sunday and on the Tuesday in the second week before Michaelmas. In 1792 the fairs were held on the Tuesday after January 6, on the Tuesday and Wednesday after March 2 5, on Whit-Monday, on the second Tuesday in September, on the second Tuesday after October 10, and on the Tuesday before Christmas Day; in 1888 on July 15 and October 18; and now on the Tuesdays after January 6 and October 10. A large pleasure-fair was held until recently on Whit-Monday and

Tuesday, but in 1885 this was reported as of bad character and it is now discontinued. A grant of a weekly market on Tuesday was obtained from Henry III. in 1227. In 1240 this privilege was being abused, a daily market being held, which was finally prohibited in 1361. In 13 16 a market on Saturday was granted by Edward II. and in 1656 another on every second Tuesday by Cromwell. In 1769 a wholesale cloth market was appointed to be held yearly on August 24. In 1888 and 1891 the market days were Tuesday and Saturday. A great corn market is now held every Tuesday, a cattle market on alternate Tuesdays, and a cheese market on the second Thursday in the month. Salisbury returned two members to parliament until 1885 when the number was reduced to one. As early as 1334 the town took part in foreign trade and was renowned for its breweries and woollen manufactories, and the latter industry continued until the 17th century, but has now entirely declined. Commercial activity gave rise to numerous confraternities amongst the various trades, such as those of the tailors, weavers and cutlers. The majority originated under Edward IV., though the most ancient — that of the tailors — was said to have been formed under Henry VI. and still existed in 1835. The manufacture of cutlery, once a flourishing industry, is now decayed.

See Victoria County History. Wiltshire; Sir R. C. Hoare, History of New Sarum (1843) ; and History of Old Sarum (1843).

SALISBURY, a town and the county-seat of Wicomico county, Maryland, U.S.A., on the Wicomico river, about 23 m. from its mouth. Pop. (1900) 4277, including 1006 negroes; (1910) 6690. It is served by the Baltimore, Chesapeake & Atlantic (which has shops here), and the New York, Philadelphia & Norfolk railways, and by steamers on the Wicomico river, which has a channel 9 ft. deep; Salisbury is the head of navigation. Grain, vegetables and lumber are shipped along the coast. Salisbury was founded in 1732, organized as a town in 1812, and incorporated in 1854 and again in 1888.

SALISBURY, a city and the county-seat of Rowan county, North Carolina, U.S.A., about 120 m. W. by S. of Raleigh. Pop. (1890) 4418; (1900) 6277 (2408 negroes); (1910) 7153. Salisbury is served by the Southern railway, which has repair shops here. It is the seat • of Livingstone College (African Methodist Episcopal, removed from Concord to Salisbury in 1882, chartered 1885). There is a national cemetery here, in which 12,147 Federal soldiers are buried. The city has various manufactures and is the trade centre of the surrounding farming country. Salisbury was founded about 1753, was first incorporated as a town in 1755 and first chartered as a city in 1770. During the Civil War there was a Confederate military prison here. On the 12th of April 1865 the main body of General George Stoneman's cavalry encountered near Salisbury a force of about 3000 Confederates under General William M. Gardner, and captured 1364 prisoners and 14 pieces of artillery.

SALISHAN, the name of a linguistic family of North American Indian tribes, the more important of which are the Salish (Flat- heads), Bellacoola, Clallam, Colville, Kalispel, Lummi, Nisqually, Okinagan, Puyallup, Quinault, Sanpoil, Shushwap, Skokomish, Songeesh, Spokan and Tulalip. They number about 20,000, and live in the southern part of British Columbia, the coast of Oregon, and the north-west of Washington, Montana and Idaho. SALLI (Sid), a seaport on the Atlantic coast of Morocco, on the north side of the Bu Ragrag opposite Rabat (q.v). Pop. about 30,000. The shrine of Sidi Abd Allah Hasun in Salli is so sacred as to close the street in which it stands to any but Moslems. Outside the town walls there is no security for life or property. A bar at the mouth of the river excludes vessels of more than two hundred tons; steamers lie outside, communi- cating with the port by lighters of native build manned by descendants of the pirates known as "Salli Rovers." (See Barbary Pirates.)

SALLO, DENIS DE, Sieur de la Coudraye [pseudonym Sieur d' Hidonville] (1626-1669), French writer, and founder of the first French literary and scientific journal, was born at Paris in 1626. In 1665 he published the first number of the Journal des savants. The Journal, under his direction, was suppressed

after the thirteenth number, but was revived shortly afterwards. He died in Paris on the 14th of May 1669.

SALLUST [Gaius Sallustius Crispus] (86-34 B.C.), Roman historian, belonging to a well-known plebeian family, was born at Amiternum in the country of the Sabines. After an ill-spent youth he entered public life, and was elected tribune of the people in 52, the year in which Clodius was killed in a street brawl by the followers of Milo. ■ Sallust was opposed to Milo and to Pompey's party and to the old aristocracy of Rome. From the first he was a decided partisan of Caesar, to whom he owed such political advancement as he attained. In 50 he was removed from the senate by the censor Appius Claudius Pulcher on the ground of gross immorality, the real reason probably being his friendship for Caesar. In the following year, no doubt through Caesar's influence, he was reinstated and appointed quaestor. In 46 he was praetor, and accompanied Caesar in his African campaign, which ended in the decisive defeat of the remains of the Pompeian party at Thapsus. As a reward for his services, Sallust was appointed governor of the province of Numidia. In this capacity he was guilty of such oppression and extortion that only the influence of Caesar enabled him to escape condemnation. On his return to Rome he purchased and laid out in great splendour the famous gardens on the Quirinal known as the Horti Sallustiani. He now retired from public life and devoted himself to historical literature. His account of the Catiline conspiracy (De conjuratione Catilinae or Bellum Catilinarium) and of the Jugurthine War (Bellum Jugurthinum) have come down to us complete, together with fragments of his larger and most important work (Hisloriae), a history of Rome from 78—67, intended as a continuation of L. Cornelius Sisenna's work. The Catiline Conspiracy (his first published work) contains the history of the memorable year 63. Sallust adopts the usually accepted view of Catiline, and describes him as the deliberate foe of law, order and morality, without attempting to give any adequate explanation of his views and intentions. Catiline, it must be remembered, had supported the party of Sulla, to which Sallust was opposed. There may be truth in Mommsen's suggestion that he was particularly anxious to clear his patron Caesar of all complicity in the conspiracy. Anyhow, the subject gave him the opportunity of showing off his rhetoric at the expense of the old Roman aristocracy, whose degeneracy he delighted to paint in

the blackest colours. On the whole, he is not unfair towards Cicero. His Jugurthine War, again, though a valuable and interesting monograph, is not a satisfactory performance. We may assume that he had collected materials and put together notes for it during his governor- ship of Numidia. Here, too, he dwells upon the feebleness of the senate and aristocracy*‘too often in a tiresome, moralizing and philosophizing vein, but as a military history the work is unsatisfactory in the matter of geographical and chronological details. The extant fragments of the Histories (some discovered in 1886) are enough to show the political partisan, who took a keen pleasure in describing the reaction against the dictator’s policy and legislation after his death. The loss of the work is to be regretted, as it must have thrown much light on a very eventful period, embracing the war against Sertorius, the campaigns of Lucullus against Mithradates of Pontus, and the victories of the great Pompey in the East. Two letters (Duae epistolae de republica ordinanda), letters of political counsel and advice addressed to Caesar, and an attack upon Cicero (Invectiva or Declamatio in Ciceronem), frequently attributed to Sallust, are probably the work of a rhetorician of the first century A.D., also the author of a counter-invective by Cicero. Sallust is highly spoken of by Tacitus (Annals, iii. 30); and Quintilian (ii. 5, x. 1), who regards him as superior to Livy, does not hesitate to put him on a level with Thucydides On the whole the verdict of antiquity was favourable to Sallust as an historian. He struck out for himself practically a new line in literature, his predecessors having been little better than mere dry-as-dust chroniclers, whereas he endeavoured to explain the connexion and meaning of events, and was a successful delineator of character. The contrast between his early life

and the high moral tone adopted by him in his writings was frequently made a subject of reproach against him; but there is no reason why he should not have reformed. In any case, his knowledge of his own former weaknesses may have led him to take a pessimistic view of the morality of his fellow-men, and to judge them severely. His model was Thucydides, whom he imitated in his truthfulness and impartiality, in the introduction of philosophizing reflections and speeches, and in the brevity of his style, sometimes bordering upon obscurity. His fondness for old words and phrases, in which he imitated his contemporary Cato, was ridiculed as an affectation; but it was just this affectation and his rhetorical exaggerations that made Sallust a favourite author in the 2nd century a.d. and later.

Editions and translations in various languages are numerous. Editio princeps (1470); (text) R. Dietsch (1874); H. Jordan (1887); A. Eussner (1887); (text and notes) F. D. Gerlach (1823- 1831); F. Kritz (1828-1853; ed. minor, 1856); C. H. Frotscher (1830); C. Merivale (1852); F. Jacobs, H. Wirz (1894); G. Long, revised by J. G. Frazer, with chief fragments of Histories (1884); W. W. Capes (1884); English translation by A. W. Pollard (1882). There are many separate editions of the Catilina and Jugurtha, chiefly for school use. The fragments have been edited by F. Kritz (1853) and B. Maurenbrecher (1891-1893); and there is an Italian translation (with notes) of the supposititious letters by G. Vittori (1897). On Sallust generally J. W. Lobell's Zur Beurtheilung des S. (18 1 8) should still be consulted; there are also treatises by T. Vogel (1857) and M. Jager (1879 and 1884), T. Rambeau (1879); L. Constans, De sermone Sallustiano (1880); P. Bellezza, Dei fonti e dell' autorila storica di Sallusiio (1891); and special lexicon by O. Eichert (1885). The sections in Teuffel-Schwabe's History of Roman Literature are full of information ; see also bibliography of Sallust for 1 878-1 898 by B. Maurenbrecher in C. Bursian, Jahres- bericht uber die Fortschritle der klassischen Altertumswissenschaft

(1900).

SALMASIUS, CLAUDIUS, the Latinized name of Claude Saumaise (1588-1653), French classical scholar, born at Semur- en-Auxois in Burgundy on the 15th of April 1588. His father, a counsellor of the parlement of Dijon, sent him, at the age of sixteen, to Paris, where he became intimate with Casaubon. He proceeded in 1606 to the university of Heidelberg, where he devoted himself to the classics.

Here he embraced Protestantism, the religion of his mother; and his first publication (1608) was an edition of a work by NilusCabasilas, archbishop of Thessalonica, in the 14th century, against the primacy of the pope {De primatu Papae), and of a similar tract by the Cala- brian monk Barlaam (d. c. 1348). In 1609 he brought out an edition of Florus. He then returned to Burgundy, ana 1 qualified for the succession to his father's post, which he eventually lost on account of his religion. In 1620 he published Casaubon's notes on the Augustan History, with copious additions of his own. In 1623 he married Anne Mercier, a Protestant lady of a distinguished family; the union was by no means a happy one, his wife being represented as a second Xanthippe. In 1629 Salmasius produced his magnum opus as a critic, his commentary on Solinus's Polyhistor, or rather on Pliny, to whom Solinus is indebted for the most important part of his work. Greatly as this commentary may have been overrated by his con- temporaries, it

is a monument of learning and industry. Salmasius learned Arabic to qualify himself for the botanical part of his task. After declining overtures from Oxford, Padua and Bologna, in 1631 he accepted the professorship formerly held by Joseph Scaliger at Leiden. Although the appointment in many ways suited him, he found the climate trying; and he was persistently attacked by a jealous clique, led by Daniel Heinsius, who as university librarian refused him access to the books he wished to consult. Shortly after his removal to Holland, he composed at the request of Prince Frederick of Nassau, his treatise on the military system of the Romans (De re militari Romanorum), which was not published until 1657. Other works followed, mostly philological, but including a denuncia- tion of wigs and hair-powder, and a vindication of moderate and lawful interest for money, which, although it drew down upon him many expostulations from lawyers and theologians, induced the Dutch Church to admit money-lenders to the sacrament. His treatise De primatu Papae (1645), accompanying a republication of the tract of Nilus Cabasilas, excited a warm controversy in France, but the government declined to suppress it.

In November 1649 appeared the work by which Salmasius is best remembered, his Defensio regia pro Carolo I. His advice had already been sought on English and Scottish affairs, and, inclining to Presbyterianism or a modified Episcopacy, he had written against the Independents. It does not appear by whose influence he was induced to undertake the Defensio regia, but Charles II. defrayed the expense of printing, and presented the

author with £100. The first edition was anonymous, but the author was universally known. A French translation which speedily appeared under the name of Claude Le Gros was the work of Salmasius himself. This celebrated work, in our day principally famous for the reply it provoked from Milton, even in its own time added little to the reputation of the author. His reply to Milton, which he left unfinished at his death, and which was published by his son in 1660, is insipid as well as abusive. Until the appearance of Milton's rejoinder in March 1651 the effect of the Defensio was no doubt considerable ; and it probably helped to procure him the flattering invitation from Queen Christina which induced him to visit Sweden in 1650. Christina loaded him with gifts and distinctions, but upon the appearance of Milton's book was unable to conceal her conviction that he had been worsted by his antagonist. Milton, addressing Christina herself, ascribes Salmasius's withdrawal from Sweden in 1651 to mortification at this affront, but this appears to be negatived by the warmth of Christina's subsequent letters and her pressing invitation to return. The claims of the university of Leiden and dread of a second Swedish winter seem

fully adequate motives. Nor is there any foundation for the belief that Milton's invectives hastened his death, which took place on the 3rd of September 1653, from an injudicious use of the Spa waters.

As a commentator and verbal critic, Salmasius is entitled to very high rank. His notes on the Augustan History and Solinus display not only massive erudition but massive good sense as well; his perception of the meaning of his author is commonly very acute, arid his corrections of the text are frequently highly felicitous. His manly independence was shown in many circumstances, and the bias of his mind was liberal and sensible. He was accused of sour- ness of temper; but the charge, if it had any foundation, is extenu- ated by the wretched condition of his health.

The life of Salmasius was written at great length by Philibert de la Mare, counsellor of the parlement of Dijon, who inherited his MSS. from his son. Papillon says that this biography left nothing to desire, but it has never been printed. It was, however, used by Papillon himself, whose account of Salmasius in hisBibliotheque des auteurs de Bourgogne (Dijon, 1745) is by far the best extant, and con- tains an exhaustive list of his works, both printed and in MS. There is an Uoge by A. Clement prefixed to his edition of Salmasius's Letters (Leiden, 1656), and another by C. B. Morisot, inserted in his own Letters (Dijon, 1656). See also E. Haag, La France protestante, (ix. 149-173); and, for the Defensio regia, G. Masson's Life of Milton.

SALMERON Y ALFONSO, NICOLAS (1838-1908), Spanish statesman, was born at Alhama la Seca in the province of Almeria, on the 10th of April 1838. He was educated at Granada and became assistant professor of literature and philosophy at Madrid. The last years of the reign of Isabella II. were times of growing discontent with her bad government and with the monarchy. Salmeron joined the small party who advocated the establishment of a republic. He was director of the Opposi- tion paper La Discusion, and co-operated with Don Emilio Castelar on La Democracia. In 1865 he was named one of the members of the directing committee of the Republican party. In 1867 he was imprisoned with other suspects. When the revolution of September 1868 broke out, he was at Almeria recovering from a serious illness. Salmeron was elected to the Cortes in 1871, and though he did not belong to the Socialist party, defended its right to toleration. When Don Amadeo of Savoy resigned the Spanish crown on the nth of February 1873 Salmeron was naturally marked out to be a leader of the party which endeavoured to establish a republic in Spain. After serving as minister of justice in the Figueras cabinet, he was chosen president of the Cortes, and then, on the 1 8th of July

1873, president of the republic, in succession to Pi Margall. He became president at a time when the Federalist party had thrown all the south of Spain into anarchy. Salmeron was compelled to use the troops to restore order. When, however, he found that the generals insisted on executing rebels taken in arms, he resigned on the ground that he was opposed to capital punishment (7th September). He resumed his seat as president of the Cortes on the 8th of September. His successor, Castelar, was compelled to restore order by drastic means. Salmeron took part in the attack made on him in the Cortes on the 3rd of January 1874, which provoked the generals into closing the

chamber and establishing a provisional military government. Salmeron went into exile and remained abroad till 1881, when he was recalled by Sagasta. In 1886 he was elected to the Cortes as Progressive deputy for Madrid, and unsuccessfully endeavoured to combine the jarring republican factions into a party of practical moderate views. On the 18th of April 1907 he was shot at, but not wounded, in the streets of Barcelona by a member of the more extreme Republican party. He died at Pau on the 21st of September 1908.

SALMON, GEORGE (1819-1904), British mathematician and divine, was born in Dublin on the 25th of September 1819 and educated at Trinity College in that city. Having become senior moderator in mathematics and a fellow of Trinity, he took holy orders, and was appointed regius professor of divinity in Dublin University in 1866, a position which he retained until 1888, when he was chosen provost of Trinity College. He was provost until his death on the 22nd of January 1904. As a mathematician Salmon was a fellow of the Royal Society, and was president of the mathematical and physical section of the British Association in 1878. He was a D.C.L. of Oxford and an LL.D. of Cambridge.

His published mathematical works include: Analytic Geometry of Three Dimensions (1862), Treatise on Conic Sections (4th ed., 1863) and Treatise on the Higher Plane Curves (2nd ed., 1873); these books are of the highest value, and have been translated into several languages. As a theologian he wrote Historical Introduction to the Study of the New Testament (1885), The Infallibility of the Church (1888), Non-Miraculous Christianity (1881) and The Reign of Law

(1873).

SALMON and SALMONIDAE. 1 The Salmonidae are an im- portant family of fishes belonging to the Malacopterygian Teleosteans, characterized as follows: Margin of the upper jaw formed by the premaxillaries and the maxillaries — supra- occipital in contact with the frontals, but frequently overlapped by the parietals, which may meet in a sagittal suture; opercular bones all well developed. Ribs sessile, parapophyses very short or absent; epineurals, sometimes also epipleurals, present. Post-temporal forked, the upper branch attached to the epiotic, the lower to the opisthotic; postclavicle, as usual, applied to the inner side of the clavicle. A small adipose dorsal fin. Air-bladder usually present, large. Oviducts rudimentary or absent, the ova falling into the cavity of the abdomen before extrusion.

The Salmonidae are very closely related to the Clupeidae, or herring family, from which they are principally distinguished by the position of the postclavicle and by the presence of a rayless fin on the back, at a considerable distance from the true or rayed dorsal fin ; this so-called adipose fin is an easy recogni- tion-mark of this family, so far as British waters are concerned, for, if it is present in several other families, these have no repre- sentatives in the area occupied by the fresh-water salmonids, with the exception of the North American Siluridae and Percop- sidae, which are readily distinguished by the pungent spine or spines which precede the rays of the first dorsal fin. The imper- fect condition of the oviducts, quite exceptional among fishes, owing to which the large ripe eggs may be easily squeezed out of the abdomen, is a feature of great practical importance, since it renders artificial impregnation particularly easy, and to it is due the fact that the species of Salmo have always occupied the first place in the annals of fish-culture.

The Salmonidae inhabit mostly the temperate and arctic zones of the northern hemisphere, and this is the case with all fresh- water' forms, with one exception, Retropinna, a smelt-like fish from the coasts and rivers of New Zealand. A few deep-sea forms {Argentina, Microstoma, Nansenia, Bathylagus) are known from the Arctic ocean, the Mediterranean and the Antarctic ocean, down to 2000 fathoms. The question has been discussed whether the salmonids, so many of which live in the sea, but resort to rivers for breeding purposes, were originally marine or fresh-water. The balance of opinion is in favour of the former hypothesis, which is supported by the fact that the overwhelm- ing majority of the members of the suborder of which the salmonids form part permanently inhabit the sea. The clupeids,

1 The Latin name salmo possibly means literally ” the leaper,” from satire, to leap, jump.

for instance, which are their nearest allies, are certainly oi marine origin, as proved by their abundance in Cretaceous seas, yet a few, like the shads, ascend’ rivers to spawn, in the same way as the salmon does, without this ever having been adduced as evidence in favour of a fresh-water origin of the genus Clupea to which they belong.

No remains older than Miocene (Osmerus, Prothymailus, Thaumaturus) are certainly referable to this family, the various Cretaceous forms originally referred to it, such as Osmeroides and Pachyrhizodus, being now placed with the Elopidae. There is probably no other group of fishes to which so much attention has been paid as to the Salmonidae, and the species have been unduly multiplied by some writers. Perhaps not more than 80 should be regarded as valid, but some of them fall into a number of local forms which are distinguished as varieties or subspecies by some authors, whilst others would assign them full specific rank. These differences of opinion prevail whether we deal with Salmo proper or with Coregonus.

Classification. — The recent genera may be arranged in five groups : The first, which includes Salmo, Brachymystax, Stenodus, Coregonus, Phylogephyra and Thymallus, has 8 to 20 branchiostegal rays, 9 to 13 rays in the ventral fin, the pyloric appendages more or less numerous (17 to 200) and breeding takes place in fresh water. The second group, with the single genus Argentina, is, like the follow- ing, marine, and is characterized by 6 branchiostegal rays, II to 14 ventral rays, the stomach caecal, with pyloric appendages in moderate numbers (12 to 20). The third group, genera Osmerus, Thaleichthys , Mallotus, Plecoglossus, Hypomesus, has 6 to 10 branchiostegal rays, 6 to 8 ventral rays, the stomach caecal, with pyloric appendages few (2 to 11) or rather numerous. The fourth group, genera Microstoma, Nansenia, Bathylagus, deep-sea forms with the branchiostegal rays reduced to 3 or 4, ventral rays 8 to 10, the stomach caecal and pyloric appendages absent ; whilst the fifth group, with the genera Retropinna and Salanx, is distinguished from the preceding in having no air-bladder, branchiostegal rays 3 to 6, ventral rays 6 or 7, stomach siphonal and pyloric appendages absent.

The genus Salmo, the most important from the economical and sporting points of view, is characterized by small smooth scales, which at certain seasons may become embedded in the slimy skin, a moderately high dorsal fin with 10 to 12 well-developed rays, and a large mouth provided with strong teeth, which are present not only in

the jaws and on the palate, but also on the tongue ; the maxillary or posterior bone of the upper jaw extends to below or beyond the eye. Young specimens (see Parr) are marked with dark vertical bars on the sides (parr-marks) , which in some trout are retained throughout life, and have the caudal fin more or less deeply forked or marginate, the form of the fin changing with the age and sexual development of the fish. Adult males have the jaws more produced in front than females, and both snout and chin may become curved and hooked. As pointed out by A. Gunther, who was the first to make a profound study of the members of this genus, and especially of the British forms, there is probably no other group of fishes which offers so many difficulties to the ichthyologist with regard to the distinction of species, as well as to certain points in their life-history, the almost infinite variations which they undergo being dependent on age, sex and sexual development, food and the properties of the water. The difficulties in their study have rather been increased by the excessive multiplication of so-called specific forms. Opinions also vary as to the importance to be attached to the characters which serve to group the principal species into natural divisions. Whilst A. Gunther admitted two genera, Salmo and Oncorhynchus, D. S. Jordan and B. W. Evermann go so far as to recognize five, Oncorhynchus, Salmo, Hucho, Cristivomer and Salvelinus. The latter arrangement is certainly the more logical, the difference between the first genus and the second being of rather less importance than that between the second and the third. However, considering the slightness of the distinctive characters on which these divisions are based, and the complete passage which obtains between them, the writer of this article thinks it best to maintain the genus Salmo in the wide sense, whilst retaining the divisions as subordinate divisions or sub-genera, with the following definitions : —

Oncorhynchus (Pacific salmon). — Vomer flat, toothed along the shaft, at least in the young; anal fin with 12 to 17 well-developed rays.

Salmo (true salmon and trout). — Vomer flat, toothed along the shaft, at least in the young; anal fin with 8 to 12 well-developed rays.

Salvelinus (char). — Vomer boat-shaped, the shaft strongly depressed behind the head, which alone is toothed, the teeth forming an isolated fascicle; anal fin with 8 to 10 welUdeveloped rays.

Hucho (huchens). — Vomer as in the preceding, but teeth forming a single arched transverse series continuous with the palatine teeth; anal fin with 8 to 10 well-developed rays.

The salmon itself (Salmo salar), the type of the family, is a large fish,

attaining a length of 4 or 5 ft., and living partly in the

sea, partly in fresh water, breeding in the latter. Fish which thus ascend rivers to spawn are called ” anadromous.” It may be briefly defined as of silvery coloration, with small black spots usually confined to the side above the lateral line, with the teeth on the shaft of the vomer disappearing in the adult, with 18 to 22 gill-rakers on the first branchial arch, with 11 or 12 well- developed rays in the dorsal fin, no to 125 scales in the lateral line, and n or 12 (exceptionally 13) between the latter and the posterior border of the adipose fin. The young, called “parr” or “samlet,” characterized by a smaller mouth, the maxillary bone not extending much beyond the vertical of the centre of the eye, the presence of an alternating double or zigzag series of teeth on the shaft of the vomer, the presence of dark vertical bars on the sides of the body, together with more or less numerous small red spots, is hatched in the spring, and usually remains for about two years in the rivers, descending at the third spring to the sea, where it is known as “smolt.” In the sea it soon assumes a more uniform silvery coloration and from this state, or ” grilse,” develops its sexual organs and re-enters rivers to breed, after which operation, much emaciated and unwholesome as food, it is known as ” kelt,” and returns to the sea to recuperate. It has now been ascertained by the investigations instituted in Norway by K. Dahl that the smolts, immediately after leaving the rivers, make for the open sea, and do not return to the coast until they have reached the grilse stage. Thus specimens measuring between 8 and 18 in. hardly ever fall into the hands of the angler. The salmon inhabits the North Atlantic and its tributary waters. It is known to extend as far north as Scandinavia, Lapland, Iceland, Greenland and Labrador, and as far south as the north-west of Spain and the state of Connecticut. It ascends the Rhine as far as Basel. There are land-locked forms in Scandinavia and in Canada and Maine, which are regarded by some authors as distinct species {S. hardinii from Lake Wener, 5. sebago from Sebago Lake in Maine, 5. ouananiche from Lake St John, Canada and neighbouring waters). These non- migratory forms are smaller than the typical salmon, never exceeding a weight of 25 lb, the ouananiche, the smallest of all, rarely weighing 73ft and averaging 33. Although spending their whole life in fresh waters, the habits of these fish are very similar to those of the sea salmon, ascending tributary streams to spawn in their higher ranges, and then returning to the deep parts of the lakes, which are to them what the sea is to the

anadromous salmonids.

The salmon breeds in the shallow running waters of the upper streams of the rivers it ascends. The female, when about to deposit her eggs, scoops out a trough in the gravel of the bed of the stream. This she effects by lying on her «ide and ploughing into the gravel by energetic motions of her body. She then deposits her eggs in the trough ; while she is engaged in these operations she is attended by a male, who sheds milt over the eggs as the female extrudes them, fertilization being, as in the great majority of Teleostei, external. The parent fish then fill up the trough and heap up the gravel over the eggs until these are covered to a depth of some feet. The gravel heap thus formed is called a ” redd.” The period of the year at which spawning takes place in the British Isles, and in similar latitudes of the northern hemisphere, varies to a certain extent with the locality, and in a given locality may vary in different years; but, with rare exceptions, spawning is confined to the period between the beginning of September and the middle of January.

The eggs are spherical and non-adhesive; they are heavier than water, and are moderately tough and elastic. The size varies slightly with the age of the parent fish, those from full-sized females being slightly larger than those from very young fish. According to rough calculations made at salmon-breeding establishments, there are 25,000 eggs to a gallon ; the diameter is about a quarter of an inch. It is usually estimated that a female salmon produces about 900 eggs for each pound of her own weight ; but this average is often exceeded. The time between fertilization and hatching, or the escape of the young fish from the egg-membrane, varies considerably with the temperature to which the eggs are exposed. It has been found that at a constant temperature of 41 ° F. the period is 97 days; but the period may be as short as 70 days and as long as 150 days without injury to the health of the embryo. It follows therefore that in the natural conditions eggs deposited in the autumn are hatched in the early spring. The newly hatched fish, or ” alevin,” is provided with a very large yolk-sac, and by the absorption of the yolk is nourished for some time; although its mouth is fully formed and open, it takes no food. The alevin stage lasts for about six weeks, and at the end of it the young fish is about I J in. long.

The grilse, after spawning in autumn, return again to the sea in the winter or following spring, and reascend the rivers as mature spawning salmon in the following year. Both salmon and grilse after spawning are called ” kelts.’ The following recorded experi- ment illustrates the growth of grilse into salmon: a grilse-kelt of 2 lb was

marked on March 31, 1858, and recaptured on August 2 of the same year as a salmon of 81b.

The ascent of rivers by adult salmon is not so regular as that of grilse, and the knowledge of the subject is not complete. Although salmon scarcely ever spawn before the month of September, they do not ascend in shoals just before that season; the time of ascent extends throughout the spring and summer. A salmon newly arrived in fresh water from the sea is called a clean salmon, on account of its bright, well-fed appearance; during their stay in the rivers the fish lose the brilliancy of their scales and deteriorate in condition. The time of year at which clean salmon ascend from the sea varies greatly in different rivers; and rivers are, in relation to this subject, usually denominated early or late. The Scottish rivers flowing into the German Ocean and Pentland Firth are almost all early, while those of the Atlantic slope are late. The Thurso in Caithness and the Naver in Sutherlandshire contain fresh-run salmon in December and January; the same is the case with the Tay. In Yorkshire salmon commence their ascent in July, August or September if the season is wet, but if it is dry their migration is delayed till the autumn rains set in. In all rivers more salmon ascend immediately after a spate or flood than when the river is low, and more with the flood tide than during the ebb. In their ascent salmon are able to pass obstructions, such as waterfalls and weirs of considerable height, and the leaps they make in surmounting such impediments and the persistence of their efforts are very remarkable.

We reproduce here, with additions, Professor Noel Paton's summary (published first in the loth edition of this Encyclopedia) of observations on the life-history of the salmon. Important ad- vances in our knowledge of the life-history of the salmon have been made through the investigations of Professor F. Miescher on the Rhine at Basel, of Professor P. P. C. Hoek in Holland, of Mr Archer as lessee of the river Sands in Norway and as inspector of salmon fisheries for Scotland in conjunction with Messrs Gray and Tosh, and of a number of workers in the laboratory of the Royal College of Physicians of Edinburgh. With regard to the food of salmon, the enormously rapid growth of smolts to grilse and of salmon from year to year shows that they feed in the sea. In a few months a smolt will increase from a few ounces to 4 or 5 lb; while Archer's weighings of 16 salmon which had been marked and recaptured in the following year showed an average gain of 36 , reckoned on from kelt stage to kelt stage. During the season of 1895 Tosh, at Berwick-on-Tweed, opened between March and August 514 fish, and found food in the stomachs of 76, or over 14 of the whole. As to the nature of the food, it was found to be as

follows: —

Herring 36 or 47 %

Crustacea, amphipods, &c 14,, 18%

Sand eels II ,, 14%

Haddock and whiting 8 ,, 10%

Feathers and vegetable matter . . 7 ,, 9%

Excluding the feathers and vegetable matter, which are not really of the nature of food, all the material found in the stomach was of marine origin. Hoek, out of 2000 fish examined by him, found 7 with food in the stomach, and, curiously enough, 4 of these were taken on the same day. In each case marine fish constituted the food. As to where salmon go to feed in the sea, our information is still very deficient, but the prevalence of herring in the stomach would seem to indicate that they must follow the shoals of these fish which approach the coast during the summer months. While there can be no doubt that salmon feed in the sea, the question of whether they feed in fresh water has been much debated. It is difficult for the popular mind to conceive of an active fish like the salmon subsisting for several months without food, and the fact that the fish so frequently not only takes into its mouth but actually swallows worms and various lures has still further tended to confirm many people in the conviction that salmon do feed in fresh water. In discussing the question it is well clearly to understand what is meant by feeding. It is the taking, digesting and absorbing of material of use in the economy in such quantities as to be of benefit to the individual. Accepting this definition, it may at once be said that all the evidence we possess is entirely opposed to the view that salmon feed when in fresh water. Miescher examined the stomachs of about 2000 salmon captured at Basel, about 500 m. from the mouth of the Rhine, and in only two did he find any indication of feeding. These two fish were male kelts. One contained the remains of a cyprinoid fish, and the other had a dilated stomach with an acid secretion, but no food remains. Hoek, who, as already stated, examined about 2000 fish, found food of marine origin in 7, but in none food derived from fresh water. Of the 132 stomachs of salmon from the estuaries and upper waters of Scottish rivers examined in the laboratory of the College of Physicians not one contained any food remains. The stomach of salmon captured in fresh water is collapsed and shrunken. Its mucous membrane is thrown into folds, and it contains a small amount of mucus of a neutral reaction. The intestine,

which usually contains numerous

tape-worms, is full of a greenish-yellow viscous material which, when examined under the microscope, is found to consist of mucus with shed epithelial and other, cells and with masses of crystals of carbonate of lime. In no case does the microscope reveal any food remains such as fish-scales, plates of Crustacea or bristles of worms or annelids. In the fish taken in the estuaries up to the month of August the gall-bladder is distended ; in those taken later in the year it is empty. In all the fish from the upper waters the gall-bladder is empty and collapsed. According to the investigations of Hoek and of Gulland, the lining membrane of the stomach and intestine degenerates while the fish is in the river, but the correctness of these observations has been denied by F. B. Brown and J. Kingston Barton. Gillespie finds that the activity of the digestive processes is low in fish taken from the rivers, and that micro-organisms, which would be killed by the hydrochloric acid of the gastric juice were it actively secreted, flourish in the intestines of the fish from the upper waters. Those who believe that the salmon feeds in fresh water explain the fact that the stomach is always found empty by the supposition that the fish vomits any food when it is captured, and several descriptions of cases in which this has been observed might be quoted; but such observations must be accepted with caution, and the contracted state of the stomach, the absence of the hydrochloric acid of the gastric juice, and lastly the absence of any traces of digested food remains in the contents of the intestine, negative this explanation.

The question may be presented in another way. Is there any reason why the salmon should feed while in fresh water? The investigations carried on in the laboratory of the College of Physicians have definitely shown that the salmon leaves the sea with an enormous supply of nourishment stored in its muscles, and that during its sojourn in fresh water it gets its energy and builds up its rapidly growing ovaries and testes from this stored material. Briefly stated, these investigations show that the supply of albuminous material and fats stored in the muscles and used while the fish is in the river is amply sufficient for the greatest requirements of the fish. The amount of energy liberated from the fats and albuminous material is 570 times more than is required to raise the fish from the level of the estuary to that of the upper waters! These analyses further show that all the materials required for the construction of the ovaries and the testes

are found in sufficient quantity in the muscles, with the exception of iron, which is, however, abundantly present in the blood.

It is a very common opinion that kelts feed voraciously while still in fresh water, and this has been used as an argument that they should be destroyed. It is not easy to bring forward such satis- factory evidence as has been adduced in the case of unspawned salmon, since it is illegal to kill kelts; but none of the 25 kelts procured by the Scottish Fishery Board, and examined in the College of Physicians' laboratory, contained any food, and Mr Anderson, formerly of Dunkeld, informs Professor Paton that in the old days, when kelts were habitually killed when captured, he has opened a large number and never found any trace of food in the stomach. Some fishers declare that they have seen kelts devouring salmon fry, but it is not easy to make accurate observations in deep water. According to Dr Gulland's investigations, the mucous membrane of the stomach and intestine is completely regenerated while the gall-bladder contains bile, and the digestive activity of the alimentary canal is greater than in salmon before spawning. Kelts thus appear at least to be capable of feeding.

The rate of growth of the genitalia has been carefully studied by Miescher, Archer and Hoek. From January till about the end of May the growth of the ovaries is slow. In Hoek's series of obser- vations, which are the most complete, they increased from -35 to ■85 % of the body weight. After this they enlarge more rapidly, and by the end of August are about 3 % in salmon taken at the mouth of the Tweed, about 4 % in the salmon from the mouth of the Rhine and about 8 % in the salmon from the Basel fisheries. By November they have risen to 20% in the Tweed and in Holland, and to 23 % in the upper reaches of the Rhine. According to Archer's observations, the development of the ovaries in grilse in the earlier months somewhat lags behind that in the salmon. The growth of the testes has been chiefly investigated by Archer and Tosh in the Tweed and by Miescher at Basel. From March to the middle of July in the Tweed these organs increase from about -19 to '35% of the weight of the fish. In July their rate of growth increases, and they reach their maximum development at the end of September, when they are about 6% of the body weight. In the Rhine in March they weigh about • 1 %, and they reach their maximum development of about 5 % in October.

What leads to the migration of salmon from sea to river and river to sea ? It is usually supposed that they come to the river to spawn; that it is the nisus generativus that drives them from the sea, where their ova will not develop, to the fresh water where develop- ment is

possible. But it is found that salmon are passing from sea to river at all seasons of the year, and with their genitalia in all stages of development — some fish, running in March with ovaries only 1 % of the body weight, other fish not running till October with ovaries 15 or 16% of the body weight. It is difficult, then, to accept the theory that the sexual act is the governing factor. That it is a secondary factor seems to be indicated by the great run of

fish in June, July and August, when the genitalia are most rapidly growing There is one respect, however, in which all the fish leaving the sea for the river agree, and that is in the amount of stored material accumulated in their bodies. In the early running fish this material is largely confined to the muscles, but in the later coming fish it is more equally distributed between muscles and genitalia. The amount of stored material may be measured by the amount of solids, and if we express the results of all the fish examined in terms of fish of uniform size — 100 cm. in length — the following results are obtained : —

Nov. 1

Feb.

Mar.

April.

May and June.

July and

Aug.

Oct.

and Nov.

Kelts.

Muscles Ovaries

Total

2481 23

2214 24

2355 24

2599 33

2210

47

2270 72

1750 545

946 9

2504

2238

2379

2632

2257

2342

2295

955

It would thus appear that, when the salmon has in the sea accumulated a certain definite amount of nourishment, it ceases to feed, and returns to the river irrespective of the state of its genital organs. Nutrition, and not the nisus generativus, appears to be the motive power. That the fish after' spawning returns to the sea in search of food is fully recognized by all.

Course of Migration.— It is well known that while salmon run all the year through in greater or lesser numbers, the run of grilse takes place in the summer months, from May to August. But it is further possible to divide the salmon into classes — the so-called winter salmon of the Rhine, large fish running from October to February, with unripe ovaries and testes; and the summer salmon, running for the most part from March to October, with genitalia more or less ripe. These summer fish are small in the early months, but increase in size as the autumn advances. The winter salmon, along with the early summer or spring fish, appear to pass directly to the upper reaches of the river, and to spawn there, while the larger late-coming fish appear to populate the lower waters. This seems to be indicated by the

comparison of upper-water and estuary fish throughout the year. The period at which male and female fish enter the rivers also appears to be somewhat different. The observations of Tosh, Miescher and Hoek show that throughout the year the female fish exceed the males in number, and, secondly, that during the earlier months of the year female fish run in much larger numbers than do male fish. It is only in September that anything like an equality between the two sexes is established. But in Great Britain it is not until the end of August that the nets are removed, and one cannot but believe that the destruction of such a very large proportion of females as are captured during the early months of the season must have a most prejudicial effect upon the breeding stock.

Rate of Migration. — By a comparison of the first appearance of winter salmon and of grilse in the markets of Holland and of Basel — 500 m. up the river — Miescher gives some data for the determination of the average rate at which salmon ascend an unobstructed stream. It was found that winter salmon appeared at Basel about 54 days after their appearance in Holland, which would give a rate of passage of about 10 m. per diem. From a smaller number of observations on grilse, it appears that they travel at a somewhat slower rate. It is, however, doubtful how far these figures are of value in deciding the rate at which fish pass up the lower reaches of the river.

Great difficulties have been experienced in ascertaining the age and rate of growth of salmon. The practice has long ago been resorted to of ” marking ” salmon, the most satisfactory mark being a small oblong silver label, oxidized or blackened, bearing distinctive letters and numbers, to the dorsal fin. But of late the structure of the scales has been studied with the object of obtaining indications of the age, growth and spawning habit. H. W. Johnston in 1905 contributed an interesting paper on the subject. The scales bear concentric lines, which vary in number and relative distance according to the growth of the fish, and during the feeding periods these lines are added with more rapidity and a greater degree of separation than at other times. Johnston has endeavoured to ascertain their meaning in Tay salmon, and he has shown that the number of lines external to their last annual ring gives some clue to the time at which they left the sea; he is thus able to distinguish among ascending salmon such as are on their first return from such as have made the journey once or oftener before.

The group of Pacific salmon, or king salmon, commonly desig- nated as Oncorhynchus, contains the largest and commercially the most important of the Salmonidae. They are anadromous species inhabiting

the North Pacific and entering the rivers of America as well as of Asia. The best known and most valuable is the quinnat (S. quinnat), ascending the large rivers in spring and summer, spawning from July to December. They die after the breeding season is over, and never return to the sea. For the important Sal- monidae known as Trout, Char,Whitefish,Smelt,Grayling, &c, see the separate articles. The huchen (S. hucho) of the Danube is an elongate, somewhat pike-like form, growing to the same size

1 Winter fish not due to spawn till following November.

as the salmon, of silvery coloration, with numerous small black dots, extending on the dorsal fin. Allied to it are S. fluviatilis from Siberia and S. perryi or blackistoni from the northern island of Japan.

The genus Stenodus is intermediate between Salmo and Coregonus (whitefish). S. leuciththys is an anadromous species, inhabiting the Caspian Sea and ascending the Volga and the Ural ; it is also found in the Arctic ocean, ascending the Ob, Lena, &c. It grows to a length of 5 ft. A second species occurs in Arctic North America; this is the ” Inconnu,” S. mackenzii, from the Mackenzie river and its tributaries.

The capelin {Mallotus villosus, so called from the villous bands formed by the scales of mature males) is a salmonid of the coasts of Arctic America and north-eastern Asia; it deposits its eggs in the sand along the shores in incredible numbers, the beach becoming a quivering mass of eggs and sand. Plecoglossus, a salmonid from Japan and Formosa, is highly remarkable for its lamellar, comb-like, lateral teeth. The siel-smelts, Argentina, are deep-sea salmonids, of which examples have occasionally been taken off the coasts of Scotland and Ireland. Bathylagus, another salmonid discovered by the ” Challenger ” expedition, is still better adapted for life at great depths (down to 1700 fathoms), the eyes being of enormous size.

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SALMONEUS, in Greek mythology, son of Aeolus (king of Magnesia in Thessaly, the mythic ancestor of the Aeolian race), grandson of Hellen and brother of Sisyphus. He removed to Elis, where he built the town of Salmone, and became ruler of the country. His subjects were ordered to worship him under the name of Zeus; he built a bridge of brass, over which he drove at full speed in his chariot to imitate thunder, the effect being heightened by dried skins and caldrons trailing behind, while torches were thrown into the air to represent lightning. At last Zeus smote him with his thunderbolt, and destroyed the town (Apollodorus i. 9. 7; Hyginus, Fab. 60, 61; Strabo viii. p. 356; Manilius, Astronom. 5, 91; Virgil, Aen. vi. 585, with Heyne's excursus). Joseph Warton's idea that the story is introduced by Virgil as a protest against the Roman custom of deification is not supported by the general tone of the Aeneid itself. According to Frazer (Early History of the Kingship, 1905; see also Golden Bough, i., 1900, p. 82), the early Greek kings, who were expected to produce rain for the benefit of the crops, were in the habit of imitating thunder and lightning in the character of Zeus. At Crannon in Thessaly there was a bronze chariot, which in time of drought was shaken and prayers offered for rain (Antigonus of Carystus, Historme mirabiles, 15). S. Reinach (Revue archtologique, 1903, i. 154) suggests that the story

that Salmoneus was struck by lightning was due to the misinterpretation of a picture, in which a Thessalian magician appeared bringing down lightning and rain from heaven ; hence arose the idea that he was the victim of the anger or jealousy of Zeus, and that the picture represented his punishment.

SALOME, in Jewish history the name borne by several women of the Herod dynasty. (1) Sister of Herod the Great, who became the wife successively of Joseph, Herod's uncle, Costobar, governor of Idumaea, and a certain Alexas. (2) Daughter of Herod by

El pis, his eighth wife. (3) Daughter of Herodias by her first husband Herod Philip. She was the wife successively of Philip the Tetrarch and Aristobulus, son of Herod of Chalcis. This Salome is the only one of the three who is mentioned in the New Testament (Matt. xiv. 3 sqq.; Mark vi. i7sqq.) and only in connexion with the execution of John the Baptist. Herod Antipas, pleased by her dancing, offered her a reward " unto the half of my kingdom "; instructed by Herodias, she asked for John the Baptist's " head in a charger " x (see Herod II. Antipas) .

Salome is also the name of one of the women who are mentioned as present at the Crucifixion (Mark xv. 40), and afterwards in the Sepulchre (xvi. 1). Comparison with Matt, xxvii. 56 suggests that she was also the wife of Zebedee (cf. Matt. xx. 20-23). It is further conjectured that she was a sister of Mary the mother of Jesus, in which case James and John would be cousins of Jesus. In the absence of specific evidence any such identifica- tion must be regarded with suspicion.

SALON, a town of south-eastern France, in the department of Bouches-du-Rhone, 40 m. N.N.W. of Marseilles by rail. Pop. (1906), town, 9927; commune, 14,030. Salon is situated on the eastern border of the plain of Crau and on the irrigation canal of Craponne, the engineer of which, Adam de Craponne (1519- 1559, has a statue in the town, where he was born. The chief buildings are the church of St Laurent (14th century), which contains the tomb of Michael Nostradamus, the famous astrologer, who died at Salon in 1565, and the church of St Michel (12th century), with a fine Romanesque portal. The central and oldest part of the town preserves a gateway of the 15th century and the remains of fortifications. There are remains of Roman walls near Salon, and in the h6tel-de-ville (17th century) there is a milestone of the 4th century. The town carries on an active trade in oil and soap, which are the chief of its numerous manu- factures. Olives are largely grown in the district, and there is a large trade in them and in almonds._

SALONICA, Salonika or Saloniki (anc. Thessalonica, Turkish Selanik, Slav. Solun); the capital of the Turkish vilayet of Salonica, in western Macedonia, and one of the principal seaports of south-western Europe. Pop. (1905) about 130,000, including some 60,000 Sephardic Jews, whose ancestors fled hither in the 1 6th century to escape religious persecution in Spain and Portugal: their language is a corrupt form of Spanish, called Ladino (i.e. Latin), and spoken to some extent by other com- munities in the city. Salonica lies on the west side of the Chalcidic peninsula, at the head of the Gulf of Salonica (Sinus Thermaicus) , on a fine bay whose southern edge is formed by the Calamerian heights, while its northern and western side is the broad alluvial plain produced by the discharge of the Vardar and the Bistritza, the principal rivers of western Macedonia. Built partly on the low ground along the edge of the bay and partly on the hill to the north (a compact mass of mica schist), the city with its white houses enclosed by white walls runs up along natural ravines to the castle of the Heptapyrgion, or Seven Towers, and is rendered picturesque by numerous domes and minarets and the foliage of elms, cypresses and mulberry trees. The commercial quarter of the town, lying to the north-west, towards the great valleys by which the inland traffic is conveyed, is pierced by broad and straight streets paved with lava. There are electric tram- ways and a good water-supply, but most of the older houses are fragile wooden structures coated with lime or mud, and the sanitation is defective. Apart from churches, mosques and synagogues, there are a few noteworthy modern buildings, such as the Ottoman Bank, the baths, quarantine station, schools and hospitals; but the chief architectural interest of Salonica is centred in its Roman and Byzantine remains.

Antiquities. — The Via Egnatia of the Romans (mod. Jassijol or Grande Rue de Vardar) traverses the city from east to west, between the Vardar Gate and the Calamerian Gate. Two Roman triumphal arches used to span the Via Egnatia. The arch near the Vardar Gate — a massive stone structure probably erected towards the end of the 1st century a.d., was destroyed in 1867 I 1 Charger, a large flat plate (see Charge).

to furnish material for repairing the city walls; an imperfect inscription from it is preserved in the British Museum. The other arch, popularly called the arch of Constantine, but with greater probability assigned to the reign of Galerius (a.d. 305-311), is built of brick and

partly faced with sculptured marble. A third example of Roman architecture — the remains of a white marble portico supposed to have formed the entrance to the hippodrome — is known by the Judaeo-Spanish designation of Las Incantadas, from the eight Caryatides in the upper part of the structure. There are also numerous fragments of Roman inscriptions and statuary. The conspicuous mosques of Salonica are nearly all of an early Christian origin; the remarkable preservation of their mural decorations makes them very im- portant for the history of Byzantine architecture. The principal are those dedicated to St Sophia, St George and St Demetrius.

St Sophia (Aya Sofia), formerly the cathedral, and probably erected in the 6th century by Justinian's architect Anthemius, was converted into a mosque in 1589. It is cased with slabs of white marble. The whole length of the interior is 1 10 ft. The nave, forming a Greek cross, is surmounted by a hemispherical dome, the 600 sq. yds. of which are covered with a rich mosaic representing the Ascension. St Demetrius, which is probably older than the time of Justinian, consists of a long nave and two side aisles, each ter- minating eastward in an atrium the full height of the nave, in a style not known to occur in any other church. The columns of the aisles are half the height of those in the nave. The internal decoration is ali produced by slabs of different-coloured marbles. St George's, conjecturally assigned to the reign of Constantine (d. 337), is circular in plan, measuring inrernally 80 ft. in diameter. The external wall is 18 ft. thick, and at the angles of an inscribed octagon are chapels formed in the thickness of the wall, and roofed with wagon-headed vaults visible on the exterior; the eastern chapel, however, is en- larged and developed into a bema and apse projecting beyond the circle, and the western and southern chapels constitute the two entrances of the building. The dome, 72 yds. in circumference, is covered throughout its entire surface of 800 sq. yds. with what is the largest work in ancient mosaic still extant, representing a series of fourteen saints standing in the act of adoration in front of temples and colonnades. The Eski Juma, or Old Mosque, is another interest- ing basilica, evidently later than Constantine, with side aisles and an apse without side chapels. The churches of the Holy Apostles and of St Elias also deserve mention. Of the secular buildings, the Caravanserai, usually attributed to Murad II. (1422-1451), probably dates from Byzantine times.

Salonica is the see of an Orthodox Greek archbishop. Each religious community has its own schools and places of worship, among the most important being the Jewish high-school, the Greek and Bulgarian gymnasia, the Jesuit college, a high-school founded in i860 and supported by the Jewish Mission of the Established Church of

Scotland, a German school, dating from 1887, and a college for boys and a secondary school for girls, both managed by the French Mission La'ique and subsidized since 1905 by the French government.

Railways, Harbour and Commerce. — Salonica is the principal Aegean seaport of the Balkan Peninsula, the centre of the import trade of all Macedonia and two-thirds of Albania, and the natural port of shipment for the products of an even larger area. It is the terminus of four railways. One line goes north to Nish in Servia, where it meets the main line (Paris- Vienna-Constantinople) of the Oriental railways; another, after following the same route as far as Uskiib in Macedonia, branches off to Mitrovitza in Albania; the extension of this line to Serajevo in Bosnia was projected in 1908 in order to establish direct communication between Austria and Salonica. A third line, intended ultimately to reach the Adriatic, extends westward from Salonica to Monastir. A fourth, the Con- stantinople junction railway to Constantinople, is of great strategic importance; during the war with Greece in 1897 it facilitated the rapid concentration of Ottoman troops on the borders of Thessaly, and in 1908 it helped to secure the triumph of the Young Turks by bringing the regiments favourable to their propaganda within striking distance of Constantinople.

The new harbour, which was opened to navigation in December 1901, allows the direct transhipment of all merchandise whatever may be the direction of the wind, which was previously apt to render shipping operations difficult. The harbour works consist of a breakwater 1835 ft. long, with 28 ft. depth of water on its landward side for a width of 492 ft. Opposite the breakwater is a quay 1475 ft. long, which was widened in 1903-1907 to a breadth of 306 ft. ; at each end of the quay a pier 656 ft. long projects into the sea. Between the extremities of these two piers and those of the breakwater are the two entrances to the harbour. The average number of ships, including small coasters, which entered the port in each of the three years 1905-1907 was 3400, of 930,000 tons. Salonica exports grain, flour, bran, silk cocoons, chrome, manganese, iron, hides and skins, cattle and sheep, wool, eggs, opium, tobacco and fennel. The average yearly value of the imports from 1900 to 1905

was £2,500,000, and that of the exports £1,200,000. The imports consist principally of textiles, iron goods, sugar, tobacco, flour, coffee and chemicals. The volume of the export trade tended to decrease in the first decade of the 20th century. The making of morocco leather and other leather-work, such as saddlery, harness and boots and shoes, affords employment to a large number of persons. Other industries are cotton-spinning, brewing, tanning, iron-founding, and

the manufacture of bricks, tiles, soˆp, flour, ironmongery and ice. The spirit called mastic or raki is largely produced.

History. — Thessalonica was built on the site of the older Greek city of Therma, so called in allusion to the hot-springs of the neighbourhood. It was founded in 315 b.c. by Cassander, who gave it the name of his wife, a sister of Alexander the Great. It was a military and commercial station on a main line of com- munication between Rome and the East, and had reached its zenith before the seat of empire was transferred to Constantinople. It became famous in connexion with the early history of Christ- ianity through the two epistles addressed by St Paul to the community which he founded here; and in the later defence of the ancient civilization against the barbarian inroads it played a considerable part. In 390 7000 citizens who had been guilty of insurrection were massacred in the hippodrome by command of Theodosius. Constantine repaired the port, and probably enriched the town with some of its buildings. During the iconoclastic reigns of terror it stood on the defensive, and succeeded in saving the artistic treasures of its churches: in the 9th century Joseph, one of its bishops, died in chains for his defence of image-worship. In the 7th century the Macedonian Slavs strove to capture the city, but failed even when it was thrown into confusion by a terrible earthquake. It was the attempt made to transfer the whole Bulgarian trade to Thes- salonica that in the close of the 9th century caused the invasion of the empire by Simeon of Bulgaria. In 904 the Saracens from the Cyrenaica took the place by storm; the public buildings were grievously injured, and the inhabitants to the number of 22,000 were carried off and sold as slaves throughout the countries of the Mediterranean. In 11 85 the Normans of Sicily took Thessalonica after a ten days' siege, and perpetrated endless barbarities, of which Eustathius, then bishop of the see, has left an account. In 1204 Baldwin, conqueror of Constanti- nople, conferred the kingdom of Thessalonica on Boniface, marquis of Montferrat; but in 1222 Theodore, despot of Epirus, one of the natural enemies of the new kingdom, took the city and had himself there crowned by the patriarch of Macedonian Bulgaria. On the death of Demetrius, who had been supported in his endeavour to recover his father's throne by Pope Honorius III., the empty title of king of Salonica was adopted by several claimants. In 1 266 the house of Burgundy received a grant of the titular kingdom from Baldwin II. when he was titular emperor, and it was sold by Eudes IV. to Philip of Tarentum, titular emperor of Romania, in 1320. The Venetians to whom the city was transferred by one of the Palaeologi, were in power when Murad II. appeared, and on the 1st of May 1430, in spite of the desperate resistance of the

inhabitants, took the city, which had thrice previously been in the hands of the Turks. They cut to pieces the body of St Demetrius, the patron saint of Salonica, who had been the Roman proconsul of Greece, under Maximian, and was martyred in a.d. 306. In 1876 the French and German consuls at Salonica were murdered by the Turkish populace. On the 4th of September 1890 more than 2000 houses were destroyed by fire in the south-eastern quarters of the city. During the early years of the 20th century Salonica was the headquarters of the Committee of Union and Progress, the central organization of the Young Turkey Party, which carried out the constitutional revolution of 1908. Before this event the weakness of Turkey had encouraged the belief that Salonica would ultimately pass under the control of Austria-Hungary or one of the Balkan States, and this belief gave rise to many political intrigues which helped to delay the solution of the Macedonian Question.

Vilayet. — The vilayet of Salonica has an area of 13,510 sq. m. and an estimated population of 1,150,000. It is rich in minerals, including chrome, manganese, zinc, antimony, iron, argentiferous

lead, arsenic and lignite, but some of these are unworked. The chief agricultural products are grain, rice, beans, cotton, opium and poppy seed, sesame, fennel, red pepper, and much of the finest tobacco grown in Europe; there is also some trade in timber, live- stock, skins, furs, wool and silk cocoons. The growth of commerce has been impeded by the ignorance of cultivators, the want of good roads and the unsettled political condition of Turkey. Apart from the industries carried on in the capital, there are manufactures of wine, liqueurs, sesame oil, cloth, macaroni and soap. The principal towns, Seres (pop. 30,000), Vodena (25,000) and Cavalla (24,000), are described in separate articles; Tikvesh (21,000) is the centre of an agricultural region, Caraferia (14,000) a manufacturing town, and Drama (13,000) one of the centres of tobacco cultivation.

SALOON, a large room for the reception of guests in a mansion. The French salon itself is formed from salle, Ger. Saal, hall, reception-room, represented in Old English by the cognate seel, hall, properly ” abiding-place,” from the root seen in Gothic saljan, to dwell, cf. Russ. selo, village. The word in its proper sense has now a somewhat archaistic flavour, being chiefly used of the 1 8th century, and it has come principally to be used (1) of the large rooms on passenger

steamers; (2) on English railways of carriages for the accommodation of large parties not divided into compartments, and in the United States of the so-called ” drawing-room cars “; and (3) of a bar or place for the sale of intoxicants.

SALSAFY, or Salsify, Tragopogon porrijolius, a hardy biennial, with long, cylindrical, fleshy, esculent roots, which, when properly cooked, are extremely delicate and wholesome; it occurs in meadows and pastures in the Mediterranean region, and in Britian is confined to the south of England, but is not native. The salsafy requires a free, rich, deep soil, which should be trenched in autumn, the manure used being placed at two spades’ depth from the surface. The first crop should be sown in March, and the main crop in April, in rows a foot from each other, the plants being afterwards thinned to 8 in. apart. In November the whitish roots should be taken up and stored in sand for immediate use, others being secured in a similar way during intervals of mild weather. The genus Tragopogon belongs to the natural order Compositae, and is represented in Britain by goat’s beard, T. pratensis, found in meadows, pastures and waste places. The flowers close at noon, whence the popular name ” John-go-to-bed-at-noon.”

SALSETTE (= ” sixty-six villages “), a large island in British India, N. of Bombay city, forming part of Thana district. Area, 246 sq. m. It is connected with Bombay Island and also with the mainland by bridge and causeway. Salsette is a beautiful, well-wooded tract, its surface being diversified by hills and mountains, some of considerable height, while it is rich in rice fields. In various parts of the island are ruins of Portuguese churches, convents and villas; while the cave temples of Kanheri form a subject of interest. There are 109 Buddhist caves, which date from the end of the 2nd century A.D., but are not so interesting as those of Ajanta, Ellora and Karli. Salsette is crossed by two lines of railway, which have encouraged the building of villa residences by the wealthier merchants of Bombay. The population in 1901 was 146,933. The island was taken from the Portuguese by the Mahrattas in 1739, and from them by the British in 1774; it was formally annexed to the East India Company’s dominions in 1782 by the treaty of Salbai.

There is another Salsette in the Portuguese settlement of Goa, a district with a population (1900) of 113,061.

SALSOMAGGIORE, a village of Emilia, Italy, in the province of Parma, 6 m. S.W. of Borgo San Donnino by steam tramway. Pop. (1901) 1387 (village); 7274 (commune). It is situated 525 ft. above sea-level at the foot of the Apennines, and is a popular watering-place, the baths

being especially frequented. The water is strongly saline.

SALT, SIR TITUS, Bart.(i8o3-i876), English manufacturer, was born on the 20th of September 1803, at Morley, Yorkshire. In 1820 he was apprenticed to learn wool-stapling at Bradford, and his father, having followed him there and started in that business, took him into partnership in 1824. His success in intro- ducing the coarse Russian wool (donskoi) into English worsted manufacture, due to special machinery of his own devising, gave his firm a great impetus. In 1836 he solved the difficulties

of working alpaca (q.v.) wool, created an enormous industry in the production of the staple goods for which that name was retained, and became one of the richest manufacturers in Brad- ford. In 1853 he opened, a few miles out of the city on the Aire, the extensive works and model manufacturing town of Saltaire. From 1859-1861 Salt was M. P. for Bradford, of which city he had been mayor in 1848, and in 1869 he was created a baronet. He died on the 20th of September 1876, and was accorded a public funeral. After his death his many benevolent institutions at Saltaire, at first continued by his widow, were transferred to a trust.

See R. Balgarnie, Sir Titus Salt, his Life and its Lessons.

SALT (a common Teutonic word, cf. Dutch zout, Ger. Sals, Scand. salt; cognate with Gr. ctXs, Lat. sal). In chemistry the term salt is given to a compound formed by substituting the hydrogen of an acid by a metal or a radical acting as a metal, or, what comes to the same thing, by eliminating the elements of water between an acid and a base (see Acid; Chemistry).

Common Salt.

Common salt, or simply salt, is the name given to the native and industrial forms of sodium chloride, NaCl. Pure sodium chloride, which may be obtained by passing hydrochloric acid gas into a saturated solution of the commercial salt, whereupon it is precipitated, forms colourless, crystalline cubes (see also below under Rock salt) which melt at 815. 4 , and begins to volatilize at slightly higher temperatures. It is readily soluble in water, 100 parts of which dissolve 35-52 parts at 0° and 39.16 parts at 100°. The saturated solution at 109. 7 contains 40-35 parts of salt to 100 of water. On cooling a saturated solution to -io°, or by cooling a solution in hot hydrochloric acid, the hydrate NaCl. 2H 2 separates; on further cooling an aqueous solution to -20 a cryohydrate containing 23-7% of

the salt is deposited. The consideration of this important substance falls under two heads, relating respectively to sea salt or ” bay ” salt and ” rock ” salt or mineral salt. The one is probably derived from the other, most rock salt deposits bearing evidence of having been formed by the evaporation of lakes or seas.

Sea Salt. — Assuming that each gallon of sea water contains 0-2547 lb of salt, and allowing an average density 2-24 for rock- salt, it has been computed that the entire ocean if dried up would yield no less than four and a half million cubic miles of rock-salt, or about fourteen and a half times the bulk of the entire continent of Europe above high-water mark. The proportion of sodium chloride in the water of the ocean, where it is mixed with small quantities of other salts, is on the average about 3.33%, ranging from 2-9% for the polar seas to 3-55% or more at the equator. Enclosed seas, such as the Mediterranean, the Red Sea. the Black Sea, the Dead Sea, the Caspian and others, are dependent of course for the proportion and quality of their saline matter on local circumstances (see Ocean).

At one time almost the whole of the salt in commerce was produced from the evaporation of sea water, and indeed salt so made still forms a staple commodity in many countries possessing a seaboard, especially those where the climate is dry and the summer of long duration. In Portugal there are salt works at Setubal, Alcacer do Sal, Figueira and Aveiro. Spain has salt works at the Bay of Cadiz, the Balearic Islands, &c; Italy at Sicily, Naples, Tuscany and Sardinia. France has its ” marais salants du midi ” and also works on the Atlantic seaboard; whilst Austria has ” Salzgarten ” at various places on the Adriatic (Sabbioncello, Trieste, Pirano, Capo d’Istria,&c). In England and Scotland the industry has greatly fallen off under the competition of the rock-salt works of Cheshire.

The process of the spontaneous evaporation of sea water was studied by Usiglio on Mediterranean water at Cette. The density at first was 1-02. Primarily but a slight deposit is formed (none until the concentration arrives at specific gravity 1-0509), this deposit consisting for the most part of calcium carbonate and ferric oxide. This goes on till a density of 1 • 1 3 1 5 is attained, when hydra ted calcium sulphate begins to deposit, and continues till specific gravity 1-2646 is reached. At a density of 1-218 the deposit becomes augmented by sodium chloride, which goes down mixed with a little magnesium chloride and sulphate. At specific gravity 1-2461 a

little sodium bromide has begun also to deposit. At specific gravity

1-311 the volume of the water contained—

Magnesium sulphate 11-45%

Magnesium chloride .... 19-53 %

Sodium chloride 15-98%

Sodium bromide 2-04%

Potassium chloride 3-30%

Up to the time then that the water became concentrated to specific gravity 1-218 only 0-150 of deposit had formed, and that chiefly composed of lime and iron, but between specific gravity 1-218 and 1-313 there is deposited a mixture of —

Calcium sulphate 0-0283 %

Magnesium sulphate 0-0624%

Magnesium chloride 0-0153%

Sodium chloride 2-7107 %

Sodium bromide 0-0222 %

2-8389%

Of this about 95 % is sodium chloride. Up to this point the separation of the salts has taken place in a fairly regular manner, but now the temperature begins to exert an influence, and some of the salts deposited in the cold of the night dissolve again partially in the heat of the day. By night the liquor gives nearly pure mag- nesium sulphate; in the day the same sulphate mixed with sodium and potassium chlorides is deposited. The mother-liquor now falls to a specific gravity of 1-3082 to 1-2965, and yields a very mixed deposit of magnesium bromide and chloride, potassium chloride and magnesium sulphate, with the double magnesium and potassium sulphate, corresponding to the kainite of Stassfurt. There is also deposited a double magnesium and potassium chloride, similar to the carnallite of Stassfurt, and finally the mother-liquor, which has now again risen to specific gravity 1-3374, contains only pure mag- nesium

chloride.

The application of these results to the production of salt from sea water is obvious. A large piece of land, barely above high-water mark, is levelled, and if necessary puddled with clay. In tidal seas, a ” jas ” (or storage reservoir) is constructed alongside, similarly rendered impervious, in which the water is allowed to settle and concentrate to a certain extent. In non-tidal seas this storage basin is not required. The prepared land is partitioned off into large basins {adernes or muants) and others (called in France aires, auillets or tables salantes) which get smaller and more shallow in proportion as they are intended to receive the water as it becomes more and more concentrated, just sufficient fall being allowed from one set of basins to the other to cause the water to flow slowly through them. The flow is often assisted by pumping. The sea salt thus made is collected into small heaps on the paths around the basins or the floors of the basins themselves, and here it under- goes a first partial purification, the more deliquescent salts (especially the magnesium chloride) being allowed to drain away. From these heaps it is collected into larger ones, where it drains further, and becomes more purified. The salt is collected from the surface by means of a sort of wooden scoop or scraper, but in spite of every precaution some of the soil on which it is produced is inevitably taken up with it, communicating a red or grey tint.

Generally speaking this salt, which may contain up to 15% of impurities, goes into commerce just as it is, but in some cases it is taken first to the refinery, where it either is simply washed and then stove-dried before being sent out, or is dissolved in fresh water and then boiled down and crystallized like white salt from rock-salt brine. The salt of the ” salines du midi ” of the south-east of France is far purer, containing about 5% of impurities. In northern Russia and in Siberia sea water is concentrated by freezing, the ice which separates containing little salt ; the brine is then boiled down when an impure sea salt is deposited.

Rock-salt. — To mineralogists rock-salt is often known as halite — a name suggested in 1847 by E. F. Glocker from the Greek a\s (salt). The word halite, however, is sometimes used not only for the species rock-salt but as a group-name to include a series of haloid minerals, of which that species is the type. Halite or rock-salt crystallizes in the cubic system, usually in cubes, rarely in octahedra; the cubes being solid, unlike the skeleton-cubes obtained by rapid evaporation of brine. The mineral has perfect cubic cleavage. Percussion- figures, readily made on the cleavage-faces, have rays parallel to faces of the

rhombic dodecahedron; whilst figures etched with water represent the four-faced cube. Rock-salt commonly occurs in cleavable masses, or sometimes in laminar, granular or fibrous forms, the finely fibrous variety being known as “hair-salt.” The hardness is 2 to 2-5 and the spec. grav.

2-1 to 2-6. Rock-salt when pure is colourless and transparent, but is usually red or brown by mechanical admixture with ferric oxide or hydroxide. The salt is often grey, through bituminous matter or other impurity, and rarely green, blue or violet. The blue colour, which disappears on heating or dissolving the salt, has been variously ascribed to the presence of sodium subchloride, sodium, sulphur or of a certain compound of iron, or again to the existence of minute cavities with parallel walls. Halite occasionally exhibits double refraction, perhaps due to natural pressure. It is remarkably diathermanous, or capable of transmitting heat-rays, and has therefore been used in certain physical investigations. Pure halite consists only of sodium chloride, but salt usually contains certain magnesium compounds rendering it deliquescent. Minute vesicular cavities are not infrequently present, sometimes as negative cubes, and these may contain saline solutions or carbon dioxide or gaseous hydrocarbons. Some salt decrepitates on solution (Knistersalz) , the phenomenon being due to the escape of condensed gases.

Halite may occur as a sublimate on lava, as at Vesuvius and some other volcanoes, where it is generally associated with potassium chloride; but its usual mode of occurrence is in bedded deposits, often lenticular, and sometimes of great thick- ness. The salt is commonly associated with gypsum, often also with anhydrite, and occasionally with sylvite, carnallite and other minerals containing potassium and magnesium. Deposits of rock-salt have evidently been formed by the evaporation of salt water, probably in areas of inland drainage or enclosed basins, like the Dead Sea and the Great Salt Lake of Utah, or perhaps in some cases in an arm of the sea partially cut off, like the Kara Bughaz, which forms a natural salt-pan on the east side of the Caspian. Such beds of salt are found in strata of very varied geological age; the Salt Range of the Punjab, for instance, is probably of Cambrian age, while, the famous salt- deposits of Wieliczka, near Cracow, have been referred to the Pliocene period. In many parts of the world, including the British area, the Triassic age offered conditions especially favourable for the formation of large salt-deposits.

In England extensive deposits of rock-salt are found near the base of the Keuper marl, especially in Cheshire. The mineral occurs generally

in lenticular deposits, which may reach a thickness of more than 100 ft. ; but it is mined only to a limited extent, most of the salt being obtained from brine springs and wells which derive their saline character from deposits of salts. Much salt is obtained from north Lancashire, as also from the brine pits of Staffordshire, Worcestershire, Yorkshire, Durham and the Isle of Man (Point of Ayre). The salt of N.E. Yorkshire and S. Durham is regarded by some authorities as Permian, but that near Carrickfergus in Co. Antrim, Ireland, is undoubtedly of Triassic age. The Antrim salt was discovered in 1850 during a search for coal: one of the beds at Duncrue mine has a thickness of 80 ft. Important deposits of rock- salt occur in the Keuper at Berchtesgaden, in the Bavarian Alps; at Hall in Tirol and at Hallein, Hallstatt, Ischl and Aussee in the Salzkammergut in Austria. Salt occurs in the Muschelkalk at Friedrichshall and some other localities in Wurttemberg and Thur- ingia; and in the Bunter at Schoningen near Brunswick.

The Permian system (Zechstein) yields the great salt-deposits worked at Stassfurt and at Halle in Prussian Saxony. The Stassfurt deposits are of special importance for the sake of the associated salts of potassium and magnesium, such as carnallite and kainite. These deposits, in addition to having a high commercial importance, present certain problems which have received much attention, more particularly at the hands of van't Hoff and his collaborators, whose results are embodied in his Zur Bildung der ozeanischen Salzab- lagerungen, vol. i. (1905), vol. ii. (1909). (A summary is given in A. W. Stewart, Recent Advances in Physical and Inorganic Chemistry, 1909; see also van't Hoff, Lectures on Theoretical and Physical Chemistry, vol. i.) A typical section is as follows: Beneath the surface soil of sandstone there is a layer up to 100 ft. in thickness of carnallite, MgCl 2 -KCl-6H 2 0, mixed with a little salt; this is followed by a thicker deposit of kieserite, MgSCvH 2 0, containing rather more salt than the upper bed. Deeper down there are suc- cessively strata of polyhalite, MgS0 4 -K2SOr2CaS04-2H 2 0, and anhydrite, CaSO*, interspersed with regular layers of rock-salt; whilst below the anhydrite we have the main rock-salt deposits. A bed of rock-salt in the Zechstein at Sperenberg near Berlin has been proved by boring to have a thickness of upwards of 4000 ft. The salt of Bex in Switzerland is Jurassic, whilst Cretaceous salt occurs in Westphalia and Algiers. Important deposits of salt are developed in many parts of the Tertiary strata. At Cardona, near Barcelona, Tertiary salt forms hill-masses, while the Carpathian

sandstone in Galicia and Transylvania is rich in salt. The extensive mines at Wieliczka are in this rock-salt, as also is the salt of Kalusz in Galicia, which is associated with sylvite, KC1.

In North America salt is widely distributed at various geological horizons. In New York it occurs in the Salina beds of the Onondaga series, of Silurian age; and Silurian salt is found also in parts of Michigan and in Ontario, Canada. Some of the salt of Michigan is regarded as Carboniferous. Rock-salt is mined in several states, as New York, Kansas and Louisiana; but American salt is mostly obtained from brine. Deposits of salt, regarded as either Cretaceous or Tertiary, occur in the island of Petite Anse, west of Vermilion Bay, in Louisiana. Salt often occurs in association with petroleum and natural gas, and extensive beds were discovered in the Wyoming valley in boring for petroleum. In the dry regions of the West salt occurs as an incrustation on the surface of the soil — a mode of occurrence found in desert areas in various parts of the world.

Cubic pseudomorphs representing rock-salt are sometimes seen in strata which have been deposited in shallow water, especially on the margin of a salt-lake. The salt has been dissolved out of its original matrix, and the cavity so formed has then been filled with fine clayey or other mineral matter, forming a cubic cast. Such casts are not infrequent in the Keuper marls and sandstones, and in the Purbeck beds of England.

Manufacture. — The chief centres of manufacture in England are at Northwich, Middlewich, Winsford and Sandbach in Cheshire, Weston-on-Trent in Staffordshire, Stoke Prior and Droitwich in Worcestershire and Middlesbrough in Yorkshire. 1 The Cheshire and Worcestershire salt deposits are by far the most important. Although brine springs have been known to exist in both these counties ever since the Roman occupation, and salt had been made there from time immemorial, it was not till 1670 that rock-salt about 30 yds. thick was discovered at Marbury near Northwich by some men exploring for coal, at a depth of 34 yds. In 1779 three beds of rock-salt were discovered at Lawton, separated from one another by layers of indurated clay. The old Marston or Marston Rock mine is the largest and perhaps the oldest in England. It was worked for about a hundred years in only its upper bed, but in 1 78 1, after traversing a layer of indurated clay intersected with small veins of salt iOj yds. thick, a layer of rock-salt 33 to 37 yds. thick was found. Beneath it are others, but they are thin and im- pure. The total depth of the mine to the bottom of the lower

level is 120 yds. At Winsford, where the same formation seems to recur, it is 159 yds. from the surface. The Marston mine covers an area of about 40 acres. The salt is first reached at 35-40 yds. in the Northwich district, and the upper layer is 25-30 yds. in thickness (Marston 23-26 yds.); it has above it,- apparently lying in the recesses of its surface, a layer of saturated brine. This is the brine which is raised at the various pumping stations in Northwich and elsewhere around, and which serves to produce white salt. The beds are reached by sinking through the clays and variegated marls typical of this for- mation. The salt is blasted out with gunpowder. The Middles- brough deposit was discovered by Bolckow and Vaughan in boring for water in 1862 at a depth of 400 yds., but was not utilized, and was again found by Messrs Bell Brothers at Port Clarence at a depth °f 376 yds. In Cheshire the surface-water trickling through the overlying strata dissolves the salt, which is subsequently pumped as brine, but at Middlesbrough the great depth and impermeability of the strata precludes this, so another method has been resorted to. A bore is made into the salt, and lined with tubing, and this tube where it traverses the salt is pierced with holes. Within this is hung loosely a second tube of much smaller dimensions so as to leave an annular space between the two. Through this space the fresh surface water finds its way, and dissolving the salt below rises in the inner tube as brine, but only to such a level that the two columns bear to one another the relation of ten to twelve, this being the inverse ratio of the respective weights of saturated brine and fresh water. For the remaining distance the brine is raised by a pump. The fresh water, however, as it descends rises to the surface of the salt, tending rather to dissolve its upper layers and extend superficially, so that after a time the superincumbent soil, being without support, falls in. These interior landslips, besides choking the pipes and breaking the communication, often produce sinkings at the surface. The same inconvenience is felt in the environs of Nancy, and a similar one produces on a larger scale the sinking and subsidences at Winsford and Northwich.

In the United States extensive deposits and brine springs are worked, and also incrustations (see above). Canada also is a pro- ducer. South America possesses several salt deposits and brine springs. Asiatic Russia is very abundantly supplied with salt, as likewise is China; and Persia is perhaps one of the countries most abundantly endowed with this natural and useful product. In India there is the great salt range of the Punjab, as well as the Sambhur Lake, and salt is obtained from sea water at many places along its extensive seaboard.

1 The termination ” wich ” in English place-names often points to

ancient salt manufacture — the word ” wich ” (creek, bay; Icel. vik) having acquired a special sense in English usage. In Germany the various forms of the non-Teutonic words Hall, Halle occurring in place-names point in the same way to ancient salt-works.

Rock-salt is the origin of the greater part of the salt manufactured in the world. It occurs in all degrees of purity, from that of mere salty clay to that of the most transparent crystals. In the former case it is often difficult to obtain the brine at a density even approach- ing saturation, and chambers and galleries are sometimes excavated within the saliferous beds to increase the dissolving surface, and water let down fresh is pumped up as brine. Many brine springs also occur in a more or less saturated condition. In cases where the atmospheric conditions are suitable the brine is run into large tanks and concentrated merely by solar heat, or it may be caused to trickle over faggots arranged under large open sheds called ” gradua- tion houses ” (Gradirhauser) , whereby a more extensive surface of evaporation is obtained and the brine becomes rapidly concentrated. After settling it is evaporated in iron pans. The use, however, of the “graduation houses” is dying out, as both their construction and their maintenance are expensive. The purer rock-salt is often simply ground for use, as at Wieliczka and elsewhere, but it is more frequently pumped as brine, produced either by artificial solution as at Middlesbrough and other places, or by natural means, as in Cheshire and Worcestershire. One great drawback to the use of even the purest rock-salt simply ground is its tendency to revert to a hard unwieldy mass, when kept any length of time in sacks. As usually made, white salt from rock-salt may be classified into two groups: (1) boiled: known as fine, table, lump, stoved lump, superfine, basket, butter and cheese salt (Fr. sel fin-fin, sel & la minute, &c); (2) unboiled: common, chemical, fishery, Scotch fishery, extra fishery, double extra fishery and bay salt (Fr. sel de 12, 24, 48, 60 and 72 heures). All these names are derived from the size and appearance of the crystals, their uses and the modes of their production. The boiled salts, the crystals of which are small, are formed in a medium constantly agitated by boiling. The fine or stoved table salts are those white masses with which we are all familiar. Basket salt takes its name from the conical baskets from which it is allowed to drain when first it is ” drawn ” from the pan. Butter and cheese salts are not stove-dried, but left in their more or less moist condition, as being thus more easily applied to their respective uses. Of the unboiled salts the first two, corresponding to the Fr. sel de 12 heures and sel de 24 heures, show by their English names the use to which they are applied, and the others merely depend for their quality on the length of time which elapses between successive ” drawings,”

and the temperature of the evaporation. The time varies for the unboiled salts from twelve hours to three or four weeks, the larger crystals being allowed a longer time to form, and the smaller ones being formed more quickly. The temperature varies from 55° to 180 F.

One difference between the manufacture of salt from rock-salt brine as carried on in Britain and on the Continent lies in the use in the latter case of closed or covered pans, except in the making of fine salt, whereas in Britain open ones are employed. With open pans the vapour is free to diffuse itself into the atmosphere, and the evaporation is perhaps more rapid. When covered pans are used, the loss of heat by radiation is less, and the salt made is also cleaner. It has also been proposed to concentrate the brines under diminished pressure. In S. Pick's system a triple effect is obtained by evapora- ting in these connected vessels, so that the steam from one heats the. second into which it is led (see Soc. of Eng., 1891, p. 115).

In Britain the brine is so pure that, keeping a small stream of it running into the pan to replace the losses by evaporation and the removal of the salt, it is only necessary occasionally (not often) to reject the mother-liquor when at last it becomes too impure with magnesium chloride; but in some works the mother-liquor not only contains more of this impurity but becomes quite brown from organic matter on concentration, and totally unfit for further service after yielding but two or three crops of salt crystals. Some- times, to get rid of these impurities, the brine is treated in a large tub (bessoir) with lime; on settling it becomes clear and colourless, but the dissolved lime forms a skin on its surface in the pan, retards the evaporation and impedes the crystallization. At times sodium sulphate is added to the brine, producing sodium chloride and mag- nesium sulphate by double decomposition with the magnesium chloride. A slight degree of acidity seems more favourable to the crystallization of salt than alkalinity ; thus it is a practice to add a certain amount of alum, 2 to 12 lb per pan of brine, especially when, as in fishery salt, fine crystals are required. The salt is " drawn " from the pan and placed (in the case of boiled salts) in small conical baskets hung round the pan to drain, and thence moulded in square boxes and _ afterwards stove-dried, or (in case of unboiled salts) " drawn " in a heap on to the " hurdles," on which it drains, and thence is carried to the -store.

In most European countries a tax is laid on salt ; and the coarser as well as the finer crystals are therefore often dried so as not to pay duty on more water than can be helped.

The brine used in the salt manufacture in England is very nearly

saturated, containing 25 or 26,% of sodium chloride, the utmost water can take up being 27%; and it ranges from 38 to 42 oz. of salt per gallon. In some other countries the brine has to be concen- trated before use.

Saltmaking is by no means an unhealthy trade, some slight soreness of the eyes being the only affection sometimes complained of; indeed the atmosphere of steam saturated with salt in which

the workmen live seems specially preservative against colds, rheu- matism, neuralgia, &c.

A parliamentary commission was appointed in 1881 to investigate the causes of the disastrous subsidences which are constantly taking place in all the salt districts, and the provision of a remedy. It led to no legislative action; but the evil is recognized as a grave one. At Northwich and Winsford scarcely a' house or a chimney stack remains straight. Houses are keyed up with " shaps," " face plates " and " bolts," and only kept from falling by leaning on one another. The doors and windows have become lozenge-shaped, the walls bulged and the floors crooked. Buildings have sunk — some of them disappearing altogether. Lakes have been formed where there was solid ground before, and incalculable damage done to property in all quarters. At the same time it is difficult to see how this grievance can be remedied without inflicting serious injury, almost ruin, upon the salt trade. The workings in Great Britain represent the annual abstraction of rather more than a mass of rock equal to a foot in thickness spread over a square mile. The table gives the outputs in metric tons of the most important producers in 1900 and 1905 (from Rothwell, Mineral Industry, 1908).

Salt Production in Metric Tons.

1900.

1905.

Austria

France

Germany

Hungary ….

Italy

Japan

Russia …..

Spain

United Kingdom . United States .

330,277 1,088,634 1,514.027

189.363 1,021,426

367.255

669,694

1,768,005

450,041

1,873,601

2,651,278

343,375 1,130,000

1,777,557

195,410

1,212,600

437,699

483.506

1,844,678

493.451 1,920,149

3.297.285

See F. A. Ftirer, Salzbergbau- und Salinenkunde (Braunschweig, 1900) ; J. O. Freiherr von Buschmann, Das Salz: dessen Vorkommen und

Verwertung (Leipzig, vol. I, 1909, vol. 2, 1906). (X.)

Ancient History and Religious Symbolism. — Salt must have been quite unattainable to primitive man in many parts of the world. Thus the Odyssey (xi. 122 seq.) speaks of inlanders (in Epirus ?) who do not know the sea and use no salt with their food. In some parts of America, and even of India (among the Todas), salt was first introduced by Europeans; and there are still parts of central Africa where the use of it is a luxury ‘confined to the rich. Indeed, where men live mainly on milk and flesh, consuming the latter raw or roasted, so that its salts are not lost, it is not necessary to add sodium chloride, and thus we understand how the Numidian nomads in the time of Sallust and the Bedouins of Hadramut at the present day never eat salt with their food. On the other hand, cereal or vegetable diet calls for a supplement of salt, and so does boiled meat. The important part played by the mineral in the history of commerce and religion depends on this fact; at a very early stage of progress salt became a necessary of life to most nations, and in many cases they could procure it only from abroad, from the sea-coast, or from districts like that of Palmyra where salty incrustations are found on the surface of the soil. Sometimes indeed a kind of salt was got from the ashes of saline plants {e.g. by the Umbrians, Aristotle, Met. ii. p. 459), or by pouring the water of a brackish stream over a fire of (saline) wood and collecting the ashes, as was done in ancient Germany (Tac. Ann. xiii. 57), in Gaul and in Spain (Plin. H.N. xxxi. 7. 82 seq.); but these were imperfect surrogates. Among inland peoples a salt spring was regarded as a special gift of the gods. The Chaonians in Epirus had one which flowed into a stream where there were no fish; and the legend was that Heracles’ had allowed their forefathers to have salt instead of fish (Arist. ut supra). The Ger- mans waged war for saline streams, and believed that the presence of salt in the soil invested a district, with peculiar sanctity and made it a place where prayers were most readily heard (Tac. ut sup.). That a religious significance was attached to a substance so highly prized and which was often obtained with difficulty is no more than natural. And it must also be remembered that the habitual use of salt is intimately connected with the advance from nomadic to agricultural life, i.e. with precisely that step in civilization which had most influence on the cults of almost all ancient nations. The gods were worshipped as the givers of the kindly fruits of the earth, and, as all over the world ” bread and salt ” go together in common use and common phrase, salt was habitually asspciated with offerings, at least with all offerings which consisted in whole or in part of cereal elements. This practice is found alike among the Greeks and Romans and among the Semitic peoples (Lev. ii. 13) ; Homer calls salt

” divine,” and Plato names it ” a substance dear to the gods ” {Timaeus, p. 60; cf. Plutarch, Sympos. v. 10). As covenants were ordinarily made over a sacrificial meal, in which salt was a necessary element, the expression ” a covenant of salt ” (Numb, xviii. 19) is easily understood; it is probable, however, that the preservative qualities of salt were held to make it a peculiarly fitting symbol of an enduring compact, and influenced the choice of this particular element of the covenant meal as that which was regarded as sealing

an obligation to fidelity. Among the ancients, as among Orientals down to the present day, every meal that included salt had a certain sacred character and created a bond of piety and guest friendship between the participants. Hence the Greek phrase aXas nal T-pdirefai/ irapa.0a.ivav, the Arab phrase ” there is salt between us,” the expression ” to eat the salt of the palace ” (Ezra iv. 14, R.V.), the modern Persian phrase namak haram, ” untrue to salt,” i.e. disloyal or ungrateful, and many others. Both early in the history of the Roman army and in later times an allowance of salt was made to officers and men. In imperial times, however, this salarium was an allowance of money for salt (see Salary).

It has been conjectured that some of the oldest trade routes were created for traffic in salt; at any rate salt and incense, the chief economic and religious necessaries ot the ancient world, play a great part in all that we know of the ancient highways of commerce. Thus one of the oldest roads in Italy is the Via Salaria, by which the produce of the salt pans of Ostia was carried up into the Sabine country. Herodotus’s account of the caravan route uniting the salt-oases of the Libyan desert (iv. 181 seq.) makes it plain that this was mainly a salt-road, and to the present day the caravan trade of the Sahara is largely a trade in salt. The salt of Palmyra was an important element in the vast trade between the Syrian ports and the Persian Gulf (see Palmyra), and long after the glory of the great merchant city was past ” the salt of Tadmor ” retained its reputation (Mas’udi viii. 398). In like manner the ancient trade between the Aegean and the coasts of southern Russia was largely dependent on the salt pans at the mouth of the Dnieper and on the salt fish brought from this district (Herod, iv. 53; Dio Chrys. ~>, 437). In Phoenician commerce salt and salt fish — the latter a valued delicacy in the ancient world — always formed an important item. The vast salt mines of northern India were worked before the time ot 1 . lexander (Strabo v. 2, 6, xv. 1, 30) and must have been the centre of a wide-spread trade. The economic importance of salt is further indicated by the almost universal prevalence in ancient and medieval times, and indeed in most countries down to the present day, of salt taxes or of

government monopolies, which have not often been directed, as they were in ancient Rome, to enable every one to procure so necessary a condiment at a moderate price. In Oriental systems of taxation high imposts on salt are seldom lacking and are often carried out in a very oppressive way, one result of this being that the article is apt to reach the consumer in a very impure state largely mixed with earth. ” The salt which has lost its savour ” (Matt, v. 13) is simply the earthy residuum of such an impure salt after the sodium chloride has been washed out.

Cakes of salt have been used as money in more than one part of the world — for example, in Abyssinia and elsewhere in Africa, and in Tibet and adjoining parts. See the testimony of Marco Poio (bk. ii. ch. 48) and Colonel Yule’s note upon analogous customs elsewhere and on the use of salt as a medium of exchange in the Shan markets down to our own time, in his translation of Polo ii. 48 seq. In the same work interesting details are given as to the importance of salt in the financial system of the Mongol emperors (ii. 200 seq.). (W. R. S.)

SALTA, a N.W. province of Argentina, bounded N. by Bolivia and the province of Jujuy, E. by the territories of Formosa and the Chaco, S. by Santiago del Estero and Tucuman, and W. by the Los Andes territory and Bolivia. Area, 62,184 sq. m.; pop. (1904, estimated) 136.059. The western part of the province is mountainous, being traversed from N. to S. by the eastern chains of the Andes. Indenting these, however, are large valleys, or bays, of highly fertile and comparatively level land, like that in which the city of Salta is situated. The eastern part of the province is chiefly composed of extensive areas of alluvial plains belonging to the Chaco formation, whose deep, fertile soils are among the best in Argentina. This part of the province is well wooded with valuable construction timbers and furniture woods. The drainage to the Paraguay is through the Bermejo, whose tributaries cover the northern part of the province; and through the Pasage or Juramento, called Salado on its lower course, whose tributaries cover the southern part of the province and whose waters are discharged into the Parana. The climate is hot, and the year is divided into a wet and a dry season, the latter characterized by extreme aridity. Irrigation is necessary in a great part of the province, though the rainfall is abundant in the wet season, about 21 in. Fever and ague, locally called ckucho, is prevalent on the lowlands, but in the mountain districts the climate is healthy. There is considerable undeveloped mineral wealth, including gold, silver and copper, but its inhabitants are almost exclusively agriculturist. Its principal products are sugar, rum (aguardiente), wine, wheat, Indian corn, barley, tobacco, alfalfa and coffee. The Cafayate wines are

excellent, but are chiefly consumed in the province.

Various tropical fruits are produced in abundance, but are not sent to market on account of the cost of transportation. Stock- raising is carried on to a limited extent for the home and Bolivian markets. The province is traversed by a government railway (the Central Northern) running northward from Tucuman to the Bolivian frontier, with a branch from General Giiemes westward to the city of Salta (q.v.), the provincial capital. The principal towns are Oran (1904, 3000) on a small tributary (the Zcnta) of the Bermejo, in the northern part of the province, formerly an important depot in the Bolivian trade, and nearly destroyed by earthquakes in 1871 and 1873; Rosario de Lerma (pop. 1904, 2500), 30m. N.W. of Salta in the great Lerma valley; and Rosario de la- Frontera (pop. 1904, 1200) near the Tucuman frontier, celebrated for its hot mineral baths and gambling establishment.

Salta was at one time a part of the great Inca empire, which extended southward into Tucuman and Rioja. It was overrun by adventurers after the Spanish conquest. The first Spanish settle- ment within its borders was made by Hernando de Lerma in 1582. Salta was at first governed from Tucuman, but in 1776 was made capital of the northern intendencia, which included Catamarca, Jujuy and Tucuman. After the War of Independence there was a new division, and Salta was given its present boundaries with the exception of the disputed territory on the Chilean frontier, now the territory of Los Andes.

SALTA, a city of Argentina, capital of a province of the same name, and see of a bishopric, on a small tributary (the Arias) of the Pasage, or Juramento, 976 m. by rail N.N.W. of Buenos Aires. Pop. (1904, estimated) i8,oco. Salta is built on an open plain 3560 ft. above the sea, nearly enclosed with mountains. The climate is warm and changeable, malarial in summer. The city is laid out regularly, with broad, paved streets and several parks. Some of the more important public buildings face on the plaza mayor. There are no manufactures of importance. Salta was once largely interested in the Bolivian trade, and is still a chief distributing centre for the settlements of the Andean plateau. Near the city is the battlefield where General Belgrano won the first victory from the Spanish forces (181 2) in the War of Independence. There is a large mestizo element in the popula- tion, and the Spanish element still retains many of the character- istics of its colonial ancestors. In Salta Spanish is still spoken with the long-drawn

intonations and melodious ” 11 ” of southern Spain.

Salta was founded in 1582 by Governor Abreu under the title of San Clemente de Nueva Sevilla, but the site was changed two years later and the new settlement was called San Felipe de Lerma. In the 17th century the name Salta came into vogue.

SALTA (Italian for “Jump!”), a table-game for two intro- duced at the end of the 19th century, founded on the more ancient game of Halma. It is played on a board containing 100 squares, coloured alternately black and white. Each player has a set of 1 5 pieces, one set being green, the other pink. These are placed upon the black squares of the first three rows nearest the player, and are classified in these rows as stars, moons and suns. The pawns move forward one square at a time, except when a pawn is situated in front of a hostile piece with an unoccupied space on the further side , in which case the hostile pawn must be jumped, as at draughts, but without removing the jumped pawn from the board. The object of the game is to get one’s pieces on the exact squares corresponding to their own on the enemy’s side, the stars in the star-line, the moons in the moon-line, &c. Salta tournaments have taken place in which chess masters of repute participated.

See Salta, by Schubert (Leipzig, 1900).

SALTASH, a municipal borough in the Bodmin parliamentary division of Cornwall, England, 5 m. N.W. of Plymouth, on the Great Western railway. Pop. (1901) 3357. It is beautifully situated on the wooded shore of the Tamar estuary, on the lower part of which lies the great port and naval station of Plymouth. Local communications are maintained by river steamers. At Saltash the Royal Albert bridge (1857-1859) carries the railway across the estuary. It was built by Isambard Brunei at a cost of £230,000, and is remarkable for its great height. The church of St Nicholas and St Faith has an early Norman tower, and part

of the fabric is considered to date from before the Conquest ; but there was much alteration in the Decorated and Perpendi- cular periods. The church of St Stephen, outside the town, retains its ornate Norman font. The fisheries for which Saltash was famous have suffered from the chemicals brought down by the Tamar; but there is a considerable seafaring population, and the town is a. recruiting ground for the Royal Navy. The borough is under a mayor, 4 aldermen and 1 2 councillors. Area, 194 acres.

The Sunday market established by the count of Mortain at his castle of Trematon, which ruined the bishop of Exeter's market at St Germans, was probably held at Saltash a short distance from the castle. Saltash (Esse, 1297; Ash, 1302; Assheburgh, 1392) belonged to the manor of Trematon and the latter at the time of the Domesday Survey was held by Reginald de Vailetort of the count. Reginald's descendant and namesake granted a charter (undated) to Saltash about 1 190. It confirms to his free burgesses of Esse the liberties enjoyed by them under his ancestors, viz. : burgage tenure, exemption from all jurisdiction save the " hundred court of the said town," suit of court limited to three times a year, a reeve of their own election, pasturage in his demesne lands on certain terms, a limited control of trade and shipping, and a fair in the middle of the town. This charter was confirmed in the fifth year of Richard II. Roger de Vailetort, the last male heir of the family, gave the honour of Trematon and with it the borough of Saltash to Richard, king of the Romans and earl of Cornwall. Thenceforth, in spite of attempts to set aside the grant, the earls and subsequently the dukes of Cornwall were the lords of Saltash. It was probably to this relation that the burgesses owed the privilege of parliamentary representation, conferred by Edward VI. In 1584 Queen Elizabeth granted a charter of incorporation to Saltash. This was superseded by another in 1683 under which the governing body was to consist of a mayor and six aldermen. In 1774, the corporation being in danger of extinction, burgesses were added, but it was not until 1886 that the ratepayers acquired the right of electing representatives to the council, the right up to that time having been exercised by the members of the corporation. The parliamentary franchise was enjoyed by the mayor, aldermen and the holders of burgage tene- ments. In 1814 they numbered 120. In 1832 Saltash was deprived of its two members. The count of Mortain's Sunday market had given place in 1337 to one on Saturday and this is still held. Queen Elizabeth's charter provided for one on Tuesday also, but this has disappeared. A fair en the feast of St Faith yielded 6s. 8d. in 1337. This is no longer held, but fairs at Candlemas and St James, of ancient but uncertain origin, remain. Saltash was sufficiently con- siderable as a port in the 1 6th century to furnish a frigate at the town's expense against the Armada. This probably represents the zenith of its prosperity.

SALTBURN BY THE SEA, a seaside resort in the Cleveland parliamentary division of the North Riding of Yorkshire, England, 21 m. E. of Middlesbrough by a branch of the North Eastern railway. Pop. of urban district (1901) 2578. A frm sandy beach extends westward to Redcar and the mouth of the Tees, while eastward towards Whitby the

cliffs become very fine, Boulby Cliff (666 ft.) being the highest sea cliff in England. Several fishing villages occur along this coast, of which nons is more picturesque than Staithes, lying in a steep gully in the cliff. There are brine baths supplied from wells near Middlesbrough, a pier, gardens and promenades. Inland the county is hilly and picturesque, though in part defaced by the Cleveland iron mines.

SALT-CELLAR, a vessel containing salt, placed upon the table at meals. The word is a combination of “salt” and ” saler,” assimilated in the 16th and 17th centuries to “cellar” (Lat. cellarium, a storehouse). ” Saler ” is from the Fr. (Mod. saliere), Lat. solarium, that which belongs to salt, cf. ” salary.” Salt cellar is, therefore, a tautological expression. There are two types of salts, the large ornamental salt which during the medieval ages and later was one of the most important pieces of household plate, and the smaller ” salts,” actually used and placed near the plates or trenchers of the guests at table; ‘they were hence styled ” trencher salts.” The great salts, below which the inferior guests sat, were, in the earliest form which survives, shaped like an hour-glass and have a cover. New College, Oxford, possesses a magnificent specimen, dated 1493. Later salts take a. square or cylindrical shape. The Elizabethan salt, kept with the regalia in the Tower of London, has a rover with numerous figures. The London Livery Companies possess many salts of a still later pattern, rather low in height and without a

cover. The ” trencher salts ” are either of triangular or circular shape, some are many-sided. The circular silver salt with legs came into use in the 18th century.

SALTER, JOHN WILLIAM (1820-1869), English naturalist and palaeontologist, was born on the 15th of December 1820. He was apprenticed in 1835 to James de Carle Sowerby, and was engaged in drawing and engraving the plates for Sowerby’s Mineral Conchology, the Supplement to his English Botany, and other Natural History works. In 1842 he was employed for a short time by Sedgwick in arranging the fossils in the VVood- wardian Museum at Cambridge, and he accompanied the professor on several geological expeditions (1842-1845) into Wales. In 1846 he was appointed on the staff of the Geological Survey and worked under Edward Forbes until 1854; he was then appointed palaeontologist to the survey and gave his chief

attention to the palaeozoic fossils, spending much time in Wales and the border counties. He contributed the palaeontological portion to A. C. Ramsay's Memoir on the Geology of North Wales (1866), assisted Murchison in his work on Siluria (1854 and later editions), and Sedgwick by preparing A Catalogue of the Collection of Cambrian and Silurian Fossils contained in the Geological Museum of the University of Cambridge (1873). Salter prepared several of the Decades of the Geological Survey and became the leading authority on Trilobites, contributing to the Palaeontographical Society four parts of A Monograph of British Trilobites (1864- 1867). He resigned his post on the Geological Survey in 1863, and died on the 2nd of August 1869.

SALTILLO, a city and the capital of the state of Coahuila, Mexico, about 615 m. by rail N. by W. of the city of Mexico. Pop. (1900) 23,996. Saltillo is on the Mexican National railway and another railway connects it with the important mining and industrial town of Torreon, on the Mexican Central. The city is on the great central plateau of Mexico, about 5200 ft. above sea-level. It has a cool and healthy climate, and is a resort in summer for the people of the tropical coast districts, and in winter for invalids from the north. The city is laid out in regular squares, with shady streets and plazas. The residences are of the Spanish colonial type, with heavy walls and large rooms to insure coolness during the heat of the day. Among its public institu- tions are a national college, an athenaeum, the Madero Institute with a good library, some fine churches, and the charitable institutions common to all Mexican cities. Saltillo is an active commercial and manufacturing town, and an important railway centre. Its manufactures include cotton and woollen fabrics, knitted goods and flour. The woollen " zarapes " or " ponchos" of Saltillo are among the finest produced in Mexico. There are undeveloped coal deposits in the vicinity.

Saltillo was founded in 1586 as an outpost against the Apache Indians. It became an incorporated city in 1827. In 1824 the capital of the state of Coahuila and Texas was at Saltillo. A partisan controversy removed the seat of government to Monclova in 1833, but it was returned to Saltillo in 1 835. The battle of Buena Vista was fought near Saltillo on the 22nd-23rd of February 1847. After leaving San Luis Potosi, President Juarez established his capital at Saltillo for a brief period.

SALT LAKE CITY, the capital city of Utah and the county-seat of Salt Lake county, in the N.W. part of Utah, immediately E. of the Jordan river in the Salt Lake Valley, near the base of the Wasatch mountains, at an altitude of about 4350 ft., about n m. S.E. of the Great Salt Lake,

about 710 m. W. by N. of Denver and about 930 m. E. of San Francisco. Pop. (i860) 8236; (1900) S3,53i; (19/0 census) 92,777. Area, 51-25 sq. m. Of the total population in 1900, 12,741 (nearly one-fourth) were foreign-born, including 5157 English, 1 1687 Swedes, 965 Danes, 963 Germans and 912 Scotch; 35,152 were of foreign-parentage (one or the other parent foreign-born); 278 were negroes, 214 Chinese, 22 Japanese. Salt Lake City is served by the Denver & Rio Grande, the Union Pacific, the Western Pacific, the Oregon Short Line, and the San Pedro, Los Angeles & Salt Lake railways; it is also a terminus of shorter roads to Ogden, to Los Angeles and to Mercur, a mining town in the Oquirrh mountains

1 The early Mormon missions in England were very successful, and many of the leaders of the church and those otherwise prominent in Salt Lake City have been of English birth.

(S. of Great Salt Lake) whose ores are reduced by the cyanide process. The Oregon Short Line and the San Pedro, Los Angeles & Salt Lake have a union railway station (1909), and the Denver & Rio Grande and the Western Pacific also have a large union rail- way station (1910). The street railway system is excellent; electric cars were introduced in 1889; and the street railways were reorganized by E. H. Harriman, who bought a controlling interest in them.

The situation of the city is striking, with views of mountains and of the Great Salt Lake, and the climate is dry and salubrious. The city is the headquarters of the Church of Jesus Christ of Latter-Day Saints (see Mormons). The streets are laid out, according to the plan of Brigham Young, with city blocks of 10 acres each (660 ft. sq.) and streets 132 ft. wide, and well shaded with trees planted along irrigating ditches, fed by mountain streams. Brigham (or South Temple) Street is a fine boulevard running 3 m. from the Temple to Fort Douglas. Most of the streets are numbered and named ” East ” or ” West,” ” North ” or ” South,” from their direction from the centre of the city, the Temple Block. State Street is the official name of First East Street ; and East Temple Street is called Main, and South Temple Street (east of the Temple block) is called Brigham. The only developed parks are Pioneer and City Hall, both small, and Liberty Park (no acres), in which Brigham Young built a grist mill in 1852 and which was bought from his estate by the city in 1880. There are bathing parks on the shores of Great Salt Lake, n-15 m. W. of the city — the best known being Saltair, which has a Moorish pavilion; and 5 m. S. is Wandamere (formerly Calder’s) Park (64 acres). Three miles E. of the city is Fort Douglas, established as Camp Douglas in 1862 by Colonel P. Edward Connor (1820-1891), afterwards prominently

connected with the develop- ment of the mineral resources of Utah ; the fort overlooks the city, being more than 4900 ft. above sea-level. In the city there are medicinal and thermal springs, and water at a temperature of 98- 104 F. is piped to a large bath-house (1850) in the N. part of the city.

The most prominent buildings are those of the Church of Latter- Day Saints, particularly, in Temple Square', the Temple, Tabernacle, and Assembly Hall. The great Mormon Temple (1853-1893) has grey granite walls 6 ft. thick, is 99 X 186 ft., and has six spires, the highest (220 ft.) having a copper statue of the angel Moroni. The elliptical Tabernacle (1870) has a rounded, turtle-shell shaped roof, unsupported by pillars or beams, seats nearly 10,000, and has a large pipe organ (5000 pipes). The Assemby Hall (1880), also of granite, has an auditorium which seats about 2500. In 1909 a bishopric building, with many of the business offices of the church, was built. Other buildings connected with the history of the Mormon church are three residences of Brigham Young, called the Lion House, the Beehive (the beehive is the symbol of the industry of the Mormon settlers in the desert and appears on the state seal), and the Amelia Palace or Gardo House (1877), which is now privately owned and houses an excellent private art gallery. Three blocks E. of the Temple is St Mary's, the Roman Catholic cathedral (1909, 100-200 ft.; with two towers 175 ft. high). Other large churches are: St Mark's Cathedral (1869, Protestant Episcopal) and the First Presbyterian Church (1909). There is a large city and county building (1894), built of rough grey sandstone from Utah county; it has a dome on the top of which is a statue of Columbia; over its entrances are statues of Commerce, Liberty and Justice; its bal- conies command views of the neighbouring country and of the Great Salt Lake; the interior is decorated with Utah onyx. Other buildings are : the Federal building ; the Packard Library, the public library of the city (1905), one block E. of Temple Block, which housed in 1910 about 40,000 volumes; and several business buildings. Typical qf the city is the great building of the Zion's Co-operative Mercantile Institution, a concern established by Brigham Young in 1868 — there are several large factories connected with it, and its annual sales average more than $5,000,000. A monument to Brigham Young and the Utah Pioneers, crowned by a statue of Brigham Young, by C. E. Dallin, was unveiled in 1897, at the intersection of Main and Brigham Streets. The city has numerous hospitals and charities, and there is a state penitentiary here. In the S.E. part is the Judge Miner's Home and Hospital (Roman Catholic), a memorial to John Judge, a successful Utah miner.

Salt Lake City has a good public school system In the city is the

University of Utah, chartered in 1850 as the University of the state of Deseret and opened in November 1850; it was practically discontinued from 1 85 1 until 1867, and then was scarcely more than a business college until 1869; its charter was amended in 1884 and a new charter was issued in 1894, when the present style of the corporation was assumed; in 1894 60 acres from the Fort Douglas reservation were secured for the campus. _ In 1909-1910 the university consisted of a school of arts and sciences, a state school of mines (1901), a normal school, and a preparatory department. Other institutions of learning are : the Latter-Day Saints University (1887) and the Latter-Day Saints High School, St Mary's Academy (1875; under the Roman Catholic Sisters of the Holy Cross), All Hallows College (1886; Roman Catholic), Gordon Academy (1870; Congregational) , Rowland Hall Academy (1 880 ; Protestant Episcopal)

and Westminster College (1897; Presbyterian). There is a state Art Institute, which gives an annual exhibition, provides for a course of public lectures on art, and houses in its building the state art collection. The city has always been interested in music and the drama: the regular choir of 500 voices of the Mormon Tabernacle (organized in 1890) is one of the best choruses in the country, and closely connected with its development are the Symphony Orchestra and the Salt Lake Choral Society. Brigham Young was an admirer of the drama, and the Salt Lake Theatre (1862) has had a brilliant history. There is a Young Men's Christian Association (organized in 1890). The principal clubs are the Alta, University, Commercial, Country, and Women's. There are a Masonic Temple and buildings of the Elks and Odd Fellows.

Salt Lake City is the great business centre of Utah and one of the main shipping points of the West for agricultural products, live stock (especially sheep), precious metals and coal; and the excellent railway facilities contribute greatly to the commercial importance of the city. In 1905 the value of the factory products was $7,543,983, being 76-3% more than in 1900 and being nearly one-fifth of the total value of the factory products of all Utah. There are three large steam-car repair shops in the city. Among the more valuable manufactures are: newspapers, books, &c. ($924,495 in 1905), malt liquors, confectionery, flour, foundry and machine-shop products, dairy products, salt, knit goods, mattresses, sugar, cement, &c. Electricity is

largely used in the newer factories, the power being derived from Ogden river, near Ogden, about 35 m. away, and from cataracts in Cottonwood canyon and other canyons.

The city is governed under a charter of 1851. The government is in the hands of a mayor, elected for two years, and of a unicameral municipal council, consisting of 15 members, elected from the five wards of the city for two years or for four years. The municipality owns the water works. In 1909 the assessed valuation, real and personal, was $52,180,789; the tax levy was $677,411; and the city debt was $4,399,400 (exclusive of $1,528,000, the bonded in- debtedness of the city schools).

The history of the city is largely that of the Mormons (q.v.) and in its earlier years that of Utah (q.v.). The Mormons first came here in 1847; an advance party led by Orson Pratt and Erastus Snow entered the Salt Lake Valley on the 22nd of July. President Brigham Young upon his arrival on the 24th approved of the site, saying that he had seen it before in a vision; on the 28th of July he chose the site for the temple. In August the city was named ” the City of the Great Salt Lake,” and this name was used until 1868 when the adjective was dropped by legislative act. In the autumn the major body of the pioneers arrived. The first government was purely ecclesiastical, the city being a “stake of Zion ” under a president; “Father” Joseph Smith was the first president. The gold excitement of 1849 and the following years was the source of the city’s first prosperity: the Mormons did not attempt to do any mining — Brigham Young counselled them not to abandon agriculture for prospecting — but they made themselves rich by outfitting those of the gold-seekers who went to California overland and who stopped at the City of the Great Salt Lake, the westernmost settlement of any importance. On the 4th of March 1849 a convention met here which appointed a committee to draft a constitution; the constitution was immediately adopted, the independent state of Deseret was organized and on the 12th of March the first general election was held. In 1850 the city had a population of 6000, more than half the total number of inhabitants of the Great Salt Lake Valley, which, as well as the rest of Utah, was largely settled from Salt Lake City. In January 1851 the general assembly of the state of Deseret chartered the city; and the first municipal election was held in April of the same year; the charter was amended in 1865. Immigration from Europe and especially from England was large in the earlier years of the city, beginning in 1848. Salt Lake City was promin- ently identified with the Mormon church in its struggle with the United States government ; in 1858 it was entirely deserted upon the approach of the United States troops. Since the Civil War, the non-

Mormon element (locally called ” Gentile “) has steadily increased in strength, partly because of industrial changes and partly because the city is the natural point of attack on the Mormon church of other denominations, which are comparatively stronger here than elsewhere in Utah.

See the bibliography under Mormons and under Utah; and particularly E. W. Tullidge, History of Salt Lake City (Salt Lake City, 1886), the famous descriptions in Captain Stansbury’s report (1850), and in R. F. Burton’s The City of the Saints (1861), and H. H. Bancroft, History of Utah (San Francisco, 1890).

SALTO, a town and river port of Uruguay and capital of a department of the same name, on the Uruguay river 60 m. above Paysandu. Pop. (1900, estimate) 1 2,000. It has railway con- nexion with Montevideo via Paysandu and Rio Negro (394 m.), and with Santa Rosa, on the Brazilian frontier (113 m.). It is also connected with Montevideo and Buenos Aires by river steamers, Salto being at the head of high water navigation for large vessels. There are reefs and rocks in the river between Paysandu and Salto that make navigation dangerous except at high water. Above Salto the river is obstructed by reefs all the way up to the Brazilian frontier, about 95 m., and is navigable for light-draft vessels only at high water. Farther up, the river is freely navigable to Santo Tome (Argentina) — a distance of about 1 70 m. Travellers wishing to ascend the river above Salto usually cross to Concordia, Entre Rios, and go up by railway to Ceibo, near Monte Caseros, from which point small steamers ascend to Uruguayana, Itaqui, and other river ports. The streets of Salto are well paved and lighted with electricity, and there are some good public buildings. The town has two meat-curing establishments (saladeros) and is the shipping port for north-western Uruguay and, to some extent, for western Rio Grande do Sul (Brazil). Behind Salto lies a rich, undulating grazing country, whose large herds supply its chief exports.

The department of Salto — area, 4866 scj. m., pop. (1900) 40,589, (1907, estimate) 53,154 — is an undulating, well-watered region occupying the north-west angle of Uruguay. Its industries are almost exclusively pastoral About one-third of its population are foreigners, chiefly Brazilians.

SALTPETRE (from the Lat. sal, salt, petra, a rock), the commercial name given to three naturally occurring nitrates, distinguished as (1) ordinary saltpetre, nitre, or potassium nitrate, (2) Chile saltpetre, cubic nitre, or sodium nitrate, (3) wall-saltpetre or calcium nitrate.

These nitrates generally occur as efflorescences caused by the oxidation of nitrogenous matter in the presence of the alkalies and alkaline earths.

1. Ordinary Saltpetre or Potassium Nitrate, KNO3, occurs, mingled with other nitrates, on the surface and in the superficial layers of the soil in many countries, especially in certain parts of India, Persia, Arabia and Spain. The deposits in the great limestone caves of Kentucky, Virginia and Indiana have been probably derived from the overlying soil and accumulated by percolating water; they are of no commercial value. The actual formation of this salt is not quite clear; but it is certainly conditioned by the simultaneous contact of decaying nitrogenous matter, alkalies, air and moisture. The demand for saltpetre as an ingredient of gunpowder led to the formation of saltpetre plantations or nitriaries, which at one time were common in France, Germany, and other countries; the natural conditions were simulated by exposing heaps of decaying organic matter mixed with alkalies (lime, &c.) to atmospheric action. The salt is obtained from the soil in which it occurs naturally, or from the heaps in which it is formed artificially, by extracting with water, and adding to the solution wood-ashes or potassium carbonate. The liquid is filtered and then crystallized. Since potassium nitrate is generally more serviceable than the sodium salt, whose deliquescent properties inhibit its use for gunpowder manufacture, the latter salt, of which immense natural deposits occur (see below (2) Chile saltpetre), is converted into ordinary saltpetre in immense quantities. This is generally effected by adding the calculated amount of potassium chloride (of which immense quantities are obtained as a by-product in the Stassfurt salt industry) dissolved in hot water to a saturated boiling solution of sodium nitrate; the common salt, which separates on boiling down the solution, is removed from the hot solution, and on cooling the potassium nitrate crystallizes out and is separated and dried.

As found in nature, saltpetre generally forms aggregates of delicate acicular crystals, and sometimes silky tufts; distinctly developed crystals are not found in nature. When crystallized from water, crystals belonging to the orthorhombic system, and having a prism angle of 6i° 10’, are obtained; they are often twinned on the prism planes, giving rise to pseudo-hexagonal groups resembling aragonite. There are perfect cleavages

parallel to the dome (on). The hardness is 2, and the specific gravity 2-1. It is fairly soluble in water; 100 parts at 0° dis- solving 13-3 parts of the salt, and about 30 parts at 20 ; the most saturated solution contains 327-4 parts of the salt in 100 of water; this solution boils at 114-1°. It fuses at 339° to a colourless liquid, which solidifies on cooling to a white fibrous mass, known in pharmacy as sal prunella. It is an energetic oxidizing agent, and on this property its most important applica- tions depend. At a red heat it evolves oxygen with the formation 01 potassium nitrite, which, in turn, decomposes at a higher temperature. Heated with many metals it converts them into oxides, and with combustible substances, such as charcoal, sulphur, &c, a most intense conflagration occurs. Its chief uses are in glass-making to promote fluidity, in metallurgy to oxidize impurities, as a constituent of gunpowder and in pyrotechny; it is also used in the manufacture of nitric acid.

Potassium nitrate was used at one time in many different diseased conditions, but it is now never administered internally, as its extremely depressant action upon the heart is not com- pensated for by any useful properties which are not possessed by many other drugs. One most valuable use it has, however, in the treatment of asthma. All nitrites {e.g. sodium nitrite^ ethyl nitrite, amyl nitrite) cause relaxation of involuntary muscular fibre and therefore relieve the asthmatic attacks, which depend upon spasm of the involuntary muscles in the bronchial tubes. Saltpetre may be made to act as a nitrite by dissolving it in water in the strength of about fifty grains to the ounce, soaking blotting-paper in the solution and letting the paper dry. Pieces about 2 in. square are then successively put into a jar and lighted. The patient inhales the fumes, which contain a considerable proportion of nitrogen oxides. This treatment is frequently very successful indeed in relaxing the bronchial spasm upon which the most obvious features of an attack depend.

2. Chile saltpetre, cubic nitre or sodium nitrate, NaNOs, occurs under the same conditions as ordinary saltpetre in deposits covering immense areas in South America, which are known locally as caliche or terra salitrosa, and abound especially in the provinces of Tarapaca and Antofagasta in Chile. The nitrate fields are confined to a narrow strip of country, averaging 2J m. in width, situated on the eastern slopes of the coast ranges and extending from north to south tor 260 geographical miles, between the latitudes 25 45′ and 19° 12′ S The nitrate forms beds, varying in thickness from 6 in. to 12 ft ‘ under a covering of conglomerate locally known as lostra, which is itself overlain by a loose sandy soil. The conglomerate consists of rock fragments, sodium chloride and various sulphates, cemented together

by gypsum to form a hard compact mass 6 to 10 ft. in thickness. The caliche has often a granular structure, and is yellowish- white, bright lemon-yellow, brownish or violet in colour. It contains from 48 to 75% of sodium nitrate and from 20 to 40% of common salt, which are associated with various minor saline components including sodium lodate and more or less insoluble mineral, and also some organic matter, e.g. guano, which suggests the idea that the nitrate was formed by the nitrification of this kind of excremental matter. 1 he caliche is worked up in loco for crude nitrate bv ex- tracting the salts with hot water, allowing the suspended earth to settle, and then transferring the clarified liquor, first to a cistern where it deposits part of its sodium chloride at a high temperature and then to another where, on cooling, it yields a crop of crystals of purified nitrate. The nitre thus refined is exported chiefly from Valparaiso whence the name of ” Chile saltpetre.” The mother liquors used to be thrown away, but are now utilized for the extrac- tion of their iodine (q.v.).

Chemically pure sodium nitrate can be obtained bv reoeated ˆcrystallization of Chile saltpetre or by synthesis. I? forms Sour less, transparent rhombohedra, like those of Iceland spar; the angles iˆt n rt Y T a ‘ 1° “Singles, being 73 ° 30’, so that the crystals look like cubes: hence the name of ” cubic saltpetre.” There are perfect cleavages parallel to the rhombohedral faces, and the crystals exhibit a strong negative double refraction, like calcite. One hundred Su-%°t rˆtif* k -r nd at . IOO ° dissolve 72-9 and 180 parts of the tII’ if boiling-point of the saturated solution, 216 parts.

The salt fuses at 316°; at higher temperatures it loses oxygen [more SiTVˆ corresponding potassium salt) with the formation of nitrite which at very high temperatures, is reduced ultimately to a mixture of peroxide, Na 2 2 , and oxide, Na 2 0. The chief applications of Chile saltpetre are in the nitric acid industry, and m the manufacture of ordmary saltpetre for making gunpowder ordmary Chile saltpetre being unsuitable by reason of its cfeliquelcent nature a property however, not exhibited by the perfectly pure .alt. It is also employed as a manure. For references to memoirs

‘\r? :Ti $ i 71,° i £ e C wx? ni H ate de P° sits . see G. P. Merrill, The

Non-Metalkc Minerals (New York, 1904).

3. Wall-saltpetre or lime saltpetre, calcium nitrate, Ca(N0 3)j is found as an efflorescence on the walls of stables; it is now manu- factured in large quantities by fixing atmospheric nitrogen, i.e. bv passing a powerful electric arc discharge through moist air and absorbing the

nitric acid formed by lime. Its chief applications are as a manure and in the nitric acid industry.

SALT RANGE, a hill system in the Punjab and North- West Frontier Provinces of India, deriving its name from its extensive deposits of rock-salt. The range commences in Jhelum. district in the lofty hill of Chel (3701 ft.), on the right bank of the river Jhelum, traverses Shahpur district, crosses the Indus in Mianwali district, thence a southern branch forms the boundary between Bannu and Dera Ismail Khan until it finally merges in the Waziristan system of mountains. The salt range contains the great mines of Mayo, Warcha and Kalabagh, which yield an inexhaustible supply of salt, and supply the wants of all Northern India. Coal of an inferior quality is also found

SALTYKOV (STCHEDRIN), MICHAEL EVGRAFOVICH (1826- (1889), Russian satirist, was born on his father's estate in the province of Tula, 15th (27th) January 1826. His early education was completely neglected, and his youth, owing to the severity and the domestic quarrels of his parents, was full of the most melancholy experiences. Left entirely to himself, he developed a love for reading; but the only book in his father's house was the Bible, which he studied with deep attention. At ten years of age he entered the Moscow Institute for the sons of the nobility, and subsequently the Lyceum at St Petersburg, where Prince Lobanov Rostofski, afterwards minister for foreign affairs was one of his schoolfellows. Whfle there he published poetry' and translations of some of the works of Byron and Heine; and on leaving the Lyceum he obtained employment as a clerk in the Ministry of War. In 1884 he published Zaputennoye Dyelo (A Complicated Affair "), which, in view of the revolutionary movements at that time in France and Germany, was the Cause of his banishment to Vyatka, where he spent eight years as a minor government official. This experience enabled him to study the life and habits of civil servants in the interior, and to give L ,V. ?, 1 , CtUre ° f Russian Provincial officials in his GubernsMe Otcherki (Provincial Sketches "). On his return to St Peters- burg as he was quickly promoted to administrative posts of con- siderable importance. After making a report on the condition of the Russian police, he was appointed deputy governor, first of Ryazan and then of Tver. His predilection for literary work !?i UC6 , d – hlm t0 kave the g° vernm ent service, but pecuniary difficulties soon compelled him to re-enter it, and in 1864 he was appointed president of the local boards of taxation succes- sively at Penza, Tula and Ryazan. In 1868 he finally quitted the civil service. Subsequently he wrote his principal works, namely, Poshekhonskaya Starina (" The Old Times of Poshek- hona"), which possesses a certain autobiographical interest- Istona odnavo Goroda (" The History of a

Town “); A Satirical History of Russia; Messieurs el Mesdames Pompadours- and Messieurs Golovlof. At one time, after the death of the poet ISekrasov, he acted as editor of a leading Russian magazine, the Contemporary. He died in St Petersburg on the 10th of April (12th May) 1889. (G D)

SALUS, in Roman mythology the personification of health and prosperity. In 302 b.c. a temple was dedicated to Salus on the Quirmal (Livy x. 1); and in later times public prayers were offered to her on behalf of the emperor and the Roman people at the beginning of the year, in time of sickness, and on the emperor’s birthday. In 180 b.c, on the occasion of a plague, vows were made to Apollo, Aesculapius and Salus (Livy xl. 37) Here the special attribute of the goddess appears to be health- and in later times she was identified with the Greek goddess of health, Hygieia.

SALUTATIONS, or Greetings, the customary forms of kindly or respectful address, especially on meeting or parting or on occasions of ceremonious approach. Etymologically the word salutation (Lat. salutatio, ” wishing health “) refers only to words spoken.

Forms of salutation frequent among savages and barbarians may last on almost unchanged in civilized custom. The habit of affectionate clasping or embracing is seen at the meetings of the Andaman islanders and Australian blacks, or where the Fuegians in friendly salute hug “like the grip of a bear.” 1 This natural gesture appears in old Semitic and Aryan custom : ” Esau ran to meet him (Jacob) and embraced him, and fell on his neck, and kissed him, and they wept ” (Gen. xxxiii. 4) ; so, when Odysseus makes himself known, Philoetius and Eumaeus cast their arms round him with kisses on the head, hands and shoulders (Odyss. xxi. 223).

The idea of the kiss being an instinctive gesture is negatived by its being unknown over half the world, where the prevailing salute is that by smelling or sniffing (often called by travellers ” rubbing noses “) , which belongs to Polynesians, Malays, Burmese and other Indo-Chinese, Mongols, &c, extending thence eastward to the Eskimo and westward to Lapland, where Linnaeus saw relatives saluting by putting their noses together. 2 This seems the only appearance of the habit in Europe. On the other hand the kiss, the salute by tasting, appears constantly in Semitic and Aryan antiquity, as in the above

cases from the book of Genesis and the Odyssey, or in Herodotus's description of the Persians of his time kissing one another — if equals on the mouth, if one was somewhat inferior on the cheek (Herod, i. 134). In Greece in the classic period it became customary to kiss the hand, breast or knee of a superior. In Rome the kisses of in- feriors became a burdensome civility (Martial xii. 59). The early Christians made it the sign of fellowship: "greet all the brethren with an holy kiss" (1 Thess. v. 26; cf. Rom. xvi. 16, &c). It early passed into more ceremonial form in the kiss of peace given to the newly baptized and in the celebration of the Eucharist; 3 this is retained by the Oriental Church. After a time, however, its indiscriminate use between the sexes gave rise to scandals, and it was restricted by ecclesiastical regulations — men being only allowed to kiss men, and women women, and eventually in the Roman Church the ceremonial kiss at the communion being only exchanged by the ministers, but a relic or cross called an osculatorium or pax being carried to the people to be kissed. 4 While the kiss has thus been adopted as a re- ligious rite, its original social use has continued. Among men, however, it has become less effusive, the alteration being marked in England at the end of the 17 th century by such passages as the advice to Sir Wilfull by his London-bred brother: " in the country, where great lubberly brothers slabber and kiss one another when they meet; . . . 'T is not the fashion here." 5 Court ceremonial keeps up the kiss on the cheek between sovereigns and the kissing of the hand by subjects, and the pope, like a Roman emperor, receives the kiss on his foot. A curious trace which these osculations have left behind is that when ceasing to be performed they are still talked of by way of politeness: Austrians say, "Kiiss d'Hand!" and Spaniards, "Beso a Vd. las manos!" "I kiss your hands!"

Strokings, pattings and other caresses have been turned to use as salutations, but have not a wide enough range to make them im- portant. Weeping for joy, often occurring naturally at meetings, is sometimes affected as a salutation ; but this seems to be different from the highly ceremonious weeping performed by several rude races when, meeting after absence, they renew the lamentations over those friends who have died in the meantime. The typical case is that of the Australian natives, where the male nearest of kin presses his breast to the new comer's, and the nearest female relative, with piteous lamentations, embraces his knees with one hand, while with the other she scratches her face till the blood drops. 6 Obviously this is no joy- weeping, but mourning, and the same is true of the New Zealand tangi, which is performed at the reception of a distinguished visitor, whether he has really dead friends to mourn or not. 7

Cowering or crouching is a natural gesture of fear or inability to resist that belongs to the brutes as well as man ; its extreme form is lying prostrate face to ground. In barbaric society, as soon as

1 W. P. Snow in Trans. Ethnol. Soc., n.s., i. 263.

2 J. E. Smith, Linnaeus ‘s Tour in Lapland, i. 315.

- Bingham, Antiquities of the Chr. Church, bk. xii. c. 4, xv. c. 3.
- The latter term has supplied the Irish language with its term for a kiss, pog, Welsh poc ; see Rhys, Revue Celtique, vi. 43.

6 Congreve’s Way of the World, act iii.

6 Grey, Journals, ii. 255.

T A. Taylor, New Zealand, p. 221.

distinctions are marked between master and slave, chief and commoner, these tokens of submission become salutations. The sculptures of Egypt and Assyria show the lowly prostrations of the ancient East, while in Dahomey or Siam subjects crawl before the king, and even Siberian peasants grovel and kiss the dust before a noble. A later stage is to suggest, but not actually perform, the prostration, as the Arab bends his hand to the ground and puts it to his lips or forehead, or the Tongan would touch the sole of a chief’s foot, thus symbolically placing himself under his feet. Kneeling prevails in the middle stages of culture, as in the ceremonial of China ; Hebrew custom sets it rather apart as an act of homage to a deity (1 Kings xix. 18; Isa. xlv. 23); medieval Europe distinguishes • between kneeling in worship on both knees and on one knee only in homage, as in the Boke of Curtasye (15th century): —

” Be curtayse to god, and knele doun

On bothe knees with grete deuocioun;

To mon |>ou shalle knele opon be ton,

pe to|>er to Jiy self Jou halde alofi.” Bowing, as a salute of reverence, appears in its extreme in Oriental custom, as among the ancient Israelites: ” bowed himself to the ground seven times ” (Gen. xxxiii. 3).* The Chinese according to the degree of respect implied bow kneeling or standing. 9 The bowing salutation, varying in Europe from something less than the Eastern salaam down to the slightest

inclination of the head, is interesting from being given mutually, the two saluters each making the sign of submission to the other, which would have been absurd till the sign passed into mere civility. Uncovering is a common mode of salutation, originally a sign of disarming or defencelessness or destitution in the presence of a superior. Polynesian or African chiefs require more or less stripping, such as the uncovering to the waist which Captain Cook describes in Tahiti. 10 Taking off the hat by men has for ages been the accepted mode in the Western world. Modern usage has moderated this bowing and scraping (the scrape is throwing back the right leg as the body is bent forward), as well as the curtseys (courloisie) of women. Some Eastern nations are apt to see disrespect in baring the head, but insist on the feet being un- covered, Burma was agitated for years by ” the great shoe question,” whether Europeans should be called on to conform to native custom rather than their own, by taking off their shoes to enter the royal presence. 11 Grasping hands is a gesture which makes its appearance in antiquity as a legal act symbolic of the parties joining in compact, peace or friendship; this is well seen in marriage, where the hand grasp was part of the ancient Hindu ceremony, as was the “. dex- trarum junctio ” in Rome, which passed on into the Christian rite. In the classic world we see it passing into a mere salutation, as where the tiresome acquaintance met by Horace on his stroll along the Via Sacra seizes his hand (Hor., Sat. i. 9).

Giving the right hand of fellowship (Gal. ii. 9) passed naturally into a salutation throughout Christendom, and spread, probably from Byzantium, over the Moslem world. The emphatic form of the original gesture in ” striking hands ” is still used to make the greeting more hearty. The variety called in English ” shaking hands ” (Ger. H dnde-schiitteln) only appears to have become usual in the middle ages.’- 2 In the Moslem legal form of joining hands the parties press their thumbs together. 13 This has been adopted as a salute by African tribes.

As to words of salutation, it is found even among the lower races that certain ordinary phrases have passed into formal greetings. Thus among the Tupis of Brazil, after the stranger’s silent arrival in the hut, the master, who for a time had taken no notice of him, would say ” Ereioube?” that is, “Art thou come?” to which the proper reply was, “Yes, I am come”! 14 Many formulas express difference of rank and consequent respect, as where the Basuto salute their chiefs with Tama sevata I i.e. ” Greeting, wild beast ! ” Congo negroes returning from a journey salute their wives with an affectionate Okowe I but they meekly kneeling round him may not repeat the word, but must say Ka I ka ! 16 Among cultured nations, salutations are apt to be expressions

of peace and goodwill, as in the Biblical instances, ” Is it well with thee ? ” (2 Kings iv. 26) ; ” Peace to thee, and peace to thine house,” &c. (1 Sam. xxv. 6; see Ezra iv. 17). Such formulas run on from age to age, and the latter may be traced on to the Moslem greeting, Salam ‘alaikuml “The peace be on you,” to which the reply is Wa-‘alaikum as-salam I “And on you be the peace (sc. of God) ! ” This is an example how a greeting may become a pass-word among fellow-believers, for it is usually held that it may not be used by or to an infidel. From an epigram of Meleager (Anth., ed. Jacobs vii. 119; cf. Plautus, Poen: v. passim) we learn that, while the Syrian salutation was Shelom (” Peace ! “), the Phoenicians greeted by wishing life (‘nxvin, the

8 See the Egyptian bow with one hand to the knee; Wilkinson, Anc. Eg.

9 S. Wells Williams, Middle Kingdom, i. 801.

10 See references to these customs in Tylor, Early History of Mankind, ch. iii.

11 Shway Yoe, The Burman, ii. 158, 205.

12 See Tylor in Macmillan’ s Mag. (May 1882), p. 76.

13 Lane, Mod. Eg. i. 219.

14 Jean de Lery, part ii. p. 204.

15 Magyar, Reise in Siid-Afrika.

ion, &c, of Neo-Punic gravestones). The cognate Babylonian form, ” O king, live for ever!” (Dan. iii. 9), represents a series of phrases which continue still in the Vivat rex! ” Long live the king!” The Greeks said x“‘P«. ” Be joyful!” both at meeting and parting; the Pythagorean vyiaivei.v and the Platonic e5 vpirrav, wish health; at a later time aairdfoˆtu, “I greet!” came into fashion. The Romans applied Salve 1 ” Be in health ! ” especially to meeting, and Vale! ” Be well!” to parting. In the modern civilized world, everywhere, the old inquiry after health appears, the ” How do you do ? becoming so formal as often to be said on both sides without either waiting for an answer. Hardly less wide in range is the set of phrases “Good day!” ” Good night!” &c,

varying according to the hour and translating into every language of Christendom. Among other European phrases, some correspond to our ” welcome! ” and “farewell! ” while the religious element enters into another class, exemplified by our “Good-bye!” (“God be with you!”), and French Adieul Attempts have been made to shape European greetings into expressions of orthodoxy, or even tests of belief, but they have had no great success. Examples are a Protestant German salutation “Lobe Jesum Christum!” answered by “In Eviigkeit, Amen!” and the formula which in Spain enforces the doctrine of the Immaculate Conception, ” Ave Maria purisima!” answered by “Sin pecado concebidat” On the whole, though the half-meaning- less forms of salutation may often seem ridiculous, society would not carry them on so universally unless it found them useful. They serve the purpose of keeping up social intercourse, and establishing relations between the parties in an interview, of which their tone may strike the keynote. (E. B. T.)

SALUZZO, a city and episcopal see of Piedmont, Italy, in the province of Cuneo, 42 m. S. of Turin by rail, 1296 ft. above sea-level. Pop. (1901) 10,306 (town), 16,208 (commune). The upper town preserves some part of the fortifications which pro- tected it when, previous to the plague of 1630, the city had upwards of 30,000 inhabitants. The old castle of the marquises of Saluzzo now serves as a prison. Besides the Gothic cathedral (1480-1511), with the tombs of the marquises, the churches of San Giovanni (formerly San Domenico), San Bernardo and the Casa Cavazza, now the municipal museum, are noteworthy. Railways run to Cuneo and Airasca (the latter on the Turin- Pinerolo line) and steam tramways in various directions. The castle of Manta, in the vicinity, contains interesting 15th-century frescoes by a French artist (see P. d’Ancona in V Arte for 1905; 94, P- 184).

The line of the marquises of Saluzzo began (1 142) with Manfred, son of Boniface, marquis of Savona, and continued till 1548, when the city and territory were seized by the French. The marquises being opponents of the house of Savoy, and taking part in the struggles between France and the empire, the city often suffered severely from the fortunes of war. Henry IV. restored the marquis- ate to Charles Emmanuel I. of Savoy at the peace of Lyons in 1601. Among the celebrities of Saluzzo are Silvio Pellico, Bodoni, the famous printer of Parma of the late 18th and early 19th centuries, and Casalis the historian of Sardinia. The history of the marquisate was written by Delfino Muletti (5 vols., 1829-1833).

SALVADOR, or San Salvador (Republica del Salvador), the smallest but most densely peopled of the republics of Central America,

bounded on the N. and E. by Honduras, S. by the Pacific Ocean, and W. by Guatemala. (For map, see Central America.) Pop. (1906) 1,116,253; area, about 7225 sq. m. Salvador has a coastline extending for about 160 m. from the mouth of the Rio de la Paz to that of the Goascoran in the Bay of Fonseca (q.v.). Its length from E. to W. is 140 m., and its average breadth about 60 m.

Physical Features. — With the exception of a comparatively narrow seaboard of low alluvial plains, the country consists mainly of a plateau about 2000 ft. above the sea, broken by a large number of volcanic cones. These are geologically of more recent origin than the main chain of the Cordillera which rises farther N. The principal river of the republic is the Rio Lempa, which, rising just beyond the frontier of Guatemala and crossing a corner of Honduras, enters Salvador N. of Citala. After receiving the surplus waters of the Laguna de Guija, it flows E. through a magnificent valley between the plateau and the Cordillera, and then turning S. skirts the base of the volcano of Siguatepeque and reaches the Pacific in 88° 40′ W. Among its numerous tributaries are the Rio Santa Ana, rising near the city of that name, the Asalguate, which passes the capital San Salvador, the Sumpul, and the Torola, draining the N.E. of Salvador and part of Honduras. The Lempa is for two-thirds

of its course navigable by small steamers. The Rio San Miguel drains the country between the bay of Fonseca and the basin of the Lempa. The volcanic mountains do not form a chain but a series of clusters: the Izalco group in the W. — including Izalco (formed in 1770), Marcelino, Santa Ana, Naranjos, Aguila, San Juan de Dios, Apaneca, Tamajaso and Lagunita; the San Salvador group, about 30 m. E.; Cojute- peque to the N.E. and the San Vicente group to the E. of the great volcanic lake of Ilopango; the Siguatepeque summits to the N.E. of San Vicente; and the great S.E. or San Miguel group — San Miguel, Chinameca, Buenapa, Usulatan, Tecapa, Taburete. Cacaguateque and Sociedad volcanoes in the N.E. belong to the inland Cordillera. Santa Ana (8300 ft.) and San Miguel (7120 ft.) are the loftiest volcanoes in the country.

The neighbourhood of the capital is subject to earthquakes. San Miguel is described as one of the most treacherous burning mountains in America, sometimes several years in complete repose and then all at once bursting out with terrific fury. In 1879-1880 the Lake of Ilopango was the scene of a remarkable series of phenomena. With a length of 5ˆ m. and a breadth of 45, it forms a rough parallelogram with deeply indented sides, and is surrounded in all directions by steep mountains except at the points where the villages of Asino and

Apulo occupy little patches of level ground. Between the 31st of December 1879 and the nth of January 1880 the lake rose 4 ft. above its level. The Jibpa, which flows out at the S.E., became, instead of a very shallow stream 20 ft. broad, a raging torrent which soon scooped out for itself in the volcanic rocks a channel 30 to 35 ft. deep. A rapid subsidence of the lake was thus produced, and by the 6th of March the level was 34! ft. below its maximum. Towards the centre of the lake a volcanic centre about 500 ft. in diameter rose 150 ft. above the water, surrounded by a number of small islands.

Climate. — The lowlands are generally hot and, on the coast, malarial; but on the tablelands and mountain slopes of the interior the climate is temperate and healthy. There are only two seasons: the wet, which Salvadorians call winter, from May to October; and the dry, or summer, season, from November to April. In July and August there are high winds, followed by torrents of rain and thunderstorms; in September and October the rain, not heavy, is continuous. For an account of the geology, fauna and flora of Salvador, see Central America.

Inhabitants. — The population in 1887 was stated to be 664,513, (1901) 1,006,848, (1906) 1,116,253. The number of Ladinos (whites and persons of mixed blood) is about 775,000 and of Indians about 230,000. The various elements were, before 1901, estimated as follows, and the proportion still holds good in the main: whites (creoles and foreigners) 10%, half-castes 50%, Indians 40%, and a very small proportion of negroes. The whites of pure blood are very few, a liberal estimate putting the proportion at 2-5%. There is no immigration into the country, and the rapid increase with which the population is credited can be due only to a large surplus of births over deaths. The chief towns, which are described in separate articles, comprise San Salvador the capital (pop. 1905, about 60,000), Santa Ana (48,000), San Miguel (25,000), San Vicente (18,000), Sonsonate (17,000), Nueva San Salvador or Santa Tecla (18,000) and the seaport of La Union (4000). For the ancient Indian civilization of Salvador, see Central America: Archaeology, and Mexico: History.

Agriculture. — The only industry extensively carried on is agriculture, but the methods employed are still primitive. The more important products are coffee, sugar, indigo and balsam. The country is rich in medicinal plants. Peruvian balsam {Myrospermum Salvatorense or Myroxylon Pereirae) is an indi- genous balm, rare except on the Balsam Coast, as the region about Cape Remedios is named. It is not cultivated in Peru, but owes its name to the fact that, during the early period of Spanish rule, it was forwarded to the Peruvian port of Callao

for tran- shipment to Europe. Rubber is collected; tobacco is grown in small quantities; cocoa, rice, cereals and fruits are cultivated. The government seeks ‘to encourage cotton-growing, and has

to the doctrine of Roman law that ” spontaneous services ” in the. protection of lives and property should be rewarded. But that doctrine has not found a place in English law except, as part of the maritime law administered in the court of admiralty. Thus services on land, say in rescuing lives or houses or goods from fire, do not entitle the person rendering those services to reward, unless he has acted under some contract or employment. But at sea the right to reward springs from the service itself if it has been rendered to a ship, or her passengers, crew or cargo, or to property which has been thrown or washed out of her. And such a service entitles to salvage though the ship may be in harbour, or within a river, or even in a dock. This connexion of the lives or property with a ship seems essential. The right does not arise upon saving goods which have got adrift in river or harbour, even if they have been washed out to sea, nor upon saving property of other kinds which may be in peril on the sea of on the seashore. Thus a claim to reward for saving a gas- buoy or beacon, which had broken from its moorings in the Upper Humber, and was aground on the Lincolnshire coast, was disallowed by the House of Lords, affirming the court of appeal, in the case of the gas-float ” Whitton No. 2,” 1897, A.C.

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The definite right to salvage for saving lives from ships is the creation of modern statutes. Formerly the Admiralty judges treated the fact that lives had been saved as enhancing the merit of a salvage of property by the same salvors, where the two could be connected; and so indirectly gave life salvage. And this is still the position in cases where the Merchant Shipping Act of r8o4 does not apply. This act (§544) applies to all cases in which the ” services are rendered wholly or in part -within British waters in saving life from any British or foreign vessel, or elsewhere in saving life from any British vessel.” Also (§ 545) it can De applied, by Order in Council, to life salvage from ships of any foreign country whose government ” is willing that salvage should be awarded by British courts for services rendered in saving life from ships belonging to that country where the ship is beyond the limits of British jurisdiction.” By section 544 the life

salvage is made payable ” by the owner of the vessel, cargo or apparel saved ” ; and is to be paid in priority to all other claims for salvage. Where the value of the vessel, cargo and apparel saved is insufficient to pay the life salvage, the Board of Trade may in their discretion make up the deficiency, in whole or in part, out of the Mercantile Marine Fund. The effect of the act is to impose a common responsibility upon the owners of ship and cargo to the extent of their property saved. Whatever is saved becomes a fund out of which life salvors may be rewarded, and to which they are entitled in priority to other salvors. In the case of the cargo ex “Schiller” (1877, 2 P.D. r45) salvage was allowed out of specie raised by divers from the sunken wreck, to persons who had saved some of the passengers and crew.

This limitation of liability to the amount of the property salved is also true with regard to salvage of property. The ordinary remedy of the salvor is against the property itself; by proceedings in rem, to enforce the maritime lien given him by the law upon that property. This enables him to arrest the property, if within the jurisdiction, into whose hands soever it may have come; and, if necessary, to obtain a sale, and payment of his claim out of the proceeds. The salvor has also a remedy in personam, used only in exceptional cases, against the owners or others interested in the property saved (Five steel barges, 15 P.D. 142) ; but it seems certain that that depends upon property having been saved, and having come to the owner’s hands; and that the amount which can be awarded is limited by the value of that property.

An essential condition is that the lives or property saved must have been in danger — either in immediate peril, or in a position of “difficulty and reasonable apprehension.” Danger to the salvor is not essential, though it enhances his claim to reward; but to constitute a salvage service there must have been danger to the thing salved. Again, the service must have helped usefully towards saving the lives or property. Ineffectual

efforts, however strenuous and meritorious, give rise to n<; claim. But the service need not be completely successful. If it has contributed to an ultimate rescue it will be rewarded, though that may have been accomplished by others. And as we have seen, there must have been ultimate success. Some of the property involved in the adventure must have been saved. And the value of that, or the fund realized by its sales, limits the total of the awards to all the salvors. Cases, of course, occur in which services at sea are employed by ships in danger: as where a steamer with a broken propeller shaft employs another steamer to tow her; or where a vessel which has lost her anchors

employs another to procure anchors for her from shore. In such cases the conditions of reward above set out may not apply. Reward may be payable, notwithstanding entire failure of success, by the express or implied terms of the employment. But such a reward is not truly " salvage."

Services rendered in the performance of a duty owed do not entitle to salvage. The policy of the law is to stimulate voluntary effort, not to weaken obligation. Thus the crew cannot (while still the crew) be salvors of the ship or cargo; nor can the passengers, unless they have voluntarily stayed on the ship for the purpose of saving her. Nor can a pilot employed as such be salvor, unless he has boarded her in such exceptional circum- stances that his doing so for pilotage fees could not reasonably be required; or unless the circumstances of the service, entered upon as pilotage, have so changed as to alter its character; and it may be doubted whether such a change of circumstances is a valid ground for a claim of salvage remuneration by the pilot where he has had no opportunity of leaving the ship. So again of the owners and crew of a tug employed to tow a ship. They cannot claim salvage for rescuing her from a danger which may arise during the towage, unless circumstances have super- vened which were not contemplated, and are such as to require extraordinary aid from the tug, or to expose her to extraordinary risk. Officers and crew of a ship of the royal navy may have salvage where they have rendered services outside the protec- tion which their ship ought to afford. But by the Merchant Shipping Act 1894, § 557, such a claim must be with consent of the Admiralty; and no claim can be made in respect of the ship herself.

The kinds and degrees of service are very various. The rewards given vary correspondingly. Regard is paid, first, to the degree of the danger to the property salved, to its value, and to the effect of the services rendered ; next, to the risks Tun by the salvors, the length and severity of their efforts, the enterprise and skill displayed, and to the value and efficiency of the vessel or apparatus they have used, and the risks to which they have exposed her. In a modern case (the ” Glengyle,” 1898, A.C. 519) a specially large award was given to vessels kept constantly ready for salving operations in Gibraltar Bay. It was owing to that readiness that the rdscue had been possible. On the other hand, any negligent or improper conduct of the salvors will be considered in diminution of the award: as where they have negligently exposed the ship to damage, or have plundered the cargo, or dealt with it contrary to the owner’s interests. And where the rescue has been from a danger which Was brought about by the negligent or improper conduct of those who effected the rescue, no salvage is allowed. So that where two colliding ships were both to blame for the collision, the master

and crew of one of them were not allowed salvage for services in saving cargo of the other (cargo ex ” Capella,” L.R. 1 A. and E. 356). ‘

In apportioning the total award given for a salvage service among the owners, master and crew of the vessel by means of which it has been rendered, the special circumstances of each case have to be considered. In nearly all cases a large portion goes to the owners, and as in recent times the value and efficiency Of ships (especially of steamships) have increased, so the propor- tion of the whole usually awarded to the owners has also increased. In an ordinary case of salvage by a steamship towing a distressed ship into safety, the share of the owners is usually about three- fourths; of the remainder the master usually gets about one-third,

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and the officers and crew divide the rest in proportion to their: ratings. But where the salving ship has’ sustained special damage in the service, or her owners have been put to loss by it, that is taken into account. On the other hand, where Special personal services have been rendered by members of the crew they are specially rewarded.
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As an illustration take the case of the;” Rasche “• (L.R. 4. A. and E. 137)- The brigantine ” Rasche,” derelict, was fallen in with (by the ship ” Scythia ” (carrying a. very valuable cargo) 220 m. N. of the Lizard. The mate and three, hands of the ”” Scythia ” were put on board, and in circumstances of much hardship and danger they brought her after eighteen days safely to Liverpool. After deducting expenses incurred by the owners of the “Scythia,” the value of the property saved was £6294. Sir R. Phillimore awarded £3 2 9°; and of this he gave £600 to the mate, £510 to each of the three men who had .accompanied him; £500 to the owners of the ” Scythia ” ; and £350 to her other officers and crew.

An agreement as to the salvage to be paid is sometimes made” at the time the assistance is given. When made fairly the court- will act upon it, though it may turn out to be a bad. bargain for one or other of the parties, i But if the facts were not correctly apprehended by one or both, or if the position was one of such difficulty that those salved had no real option as to accepting the salvor’s terms, the courts will set the agreement aside.

This happened, for instance, where the salving ship : refused to rescue 550 wrecked pilgrims from the Parkin . Rock in the Red Sea for a less sum than £4000. An agreement had in consequence been sighed for their conveyance for that sum to Jedda, two or three days' sail. The Parkin Rock stands 6 ft. above the water, a*nd had bad weather come on the lives would have been in great danger. It was held that the sum asked for was exorbitant; and that the agreement, made under practical .compulsion, could not stand (the ' Medina," 2 PiD. 5). On the other "hand, an agreement to tow, for a fixed sum, a vessel which had suffered considerable damage, was set aside, and salvage awarded, oh the ground: that the damaged condition had not been disclosed to the tug when the contract was made (the " Kingaloch," 1 Spink, 265). .. .

The award of salvage is generally made in one sum against ship, freight and cargo; and those , interests contribute to the amount in proportion to the value saved. No distinction is made between the degree of service rendered to one interest and another. But, with a possible exception in the case of life salvage, there is not a joint liability of the several interests. Each is liable to the salvors for his own share, and for ; no more. The ship cannot be made to pay the cargo's share, nor the cargo the ship's. If, however, the, shipowner pays the cargo's share,, he has a lien upon it for the amount. In practice the liabilities fpr salvage are ordinarily adjusted as part of general average. Strictly, however, there is a difference. The . liability to pay salvage is a direct liability to the salvors, arising at once, e.g. at the port of refuge, and proportional to the values there; whereas the liability to contribute to a general average -loss or expenditure is postponed until the completion or break up of the adventure, and depends upon the values of the interests which have arrived there; which may be very different. (See Average, Insurance, Marine, and also Admiralty. Jurisdiction.)

Authorities. — Kennedy, On, the Law of Civil Salvage (London, 1907); Abbott, Law of Merchant Ships and Seamen (14th ed., London, 1901); Carver, Carriage by Sea (5th ed., London, T909).

(T. G. C.) •"■2. Military Salvage is analogous to civil salvage. Itisdefined as such a service as may become the ground for the demand of a reward in the court as a prize court, and consists in the rescue of property from the enemy in time of war. Such cases almost invariably relate to ships and their cargoes; and they : have always been dealt with by courts having Admiralty jurisdiction, sitting as prize courts. . They involve the determination of two questions: first, whether the property is to be restored to its original owner or

condemned as prize to the recaptor ; and second, what amount .of salvage, if any, is to accompany restitu- tion. Generally speaking, the first question depends upon the law of nations, which may be taken to be that where a ship has been carried by an enemy infra praesidia, and especially after a sentence of condemnation, the title of the original owner is divested, and does not revest upon recapture by third parties. In such a case, therefore, jure gentium restitution cannot be claimed. The municipal law of civilized countries, however,

: does “not encourage subjects to ” ; make* reprisals upon one another” (the ” Renard,” Marr. Adm. Dec. 2 2 2) /and laws are generally found; as in England, which as between subjects of that particular state provide for restitution irrespective of any change in the title to the subject matter which may have occurred. But (speaking henceforth of England) in cases which do not fall strictly within these acts, the old maritime law, which was In unison’ with the gerierallaw of nations, is applied by the courts, ; Moreover, the English. Prize Acts do not apply to foreign owners of recaptured prizes, and therefore no award Call be made against them unless in accordance with the law ‘ of nations. In practice the courts have acted Upon the ” rule of reciprocity ” : where recaptures have been made of the property of formal allies, dealing with them as the allied state would have dealt with : English property. In the case of neutral recaptures restitution is always ordered. An exception to the rule Of restitution as between British subjects is made in the case of a British ship whichhas been ” set forth as a ship of war ” by the captor, and subsequently retaken by a British ship. Such a ship is not liable to restoration, but is the prize of the recaptor. This exception, the object of which is to encourage 1 the capture of armed ships, • dates from 1793, previous acts having provided for restitution upon payment of a moiety as salvage. The condition of setting forth ias’ a ship of war is satisfied, where under a fair semblance of authority, which is not disproved, the ship “has been used in the operations of war, and constituted a part of the naval force of the enemy ” (the ” Ceylon,” 1 Dod. 105) . Such a user perma- nently obliterates the ship’s original character, and extinguishes all future claims to restitution (” L’Actif,” Edw. 185).

As to the right to salvage and the amount which will be allowed; this is also a question of the jus gentium, though usually governed by municipal law. The right was recognized so long ago as the nth century, when the ” Consolato del Mare” (see Consulate of the Sea) laid down elaborate provisions on the subject. In England the first statutory recognition of the right occurs in 1648, when an act of the Commonwealth, which in its outline has been the model for all subsequent Prize Acts, provides that British vessels captured by an

enemy and retaken by British ships shall be restored upon payment of brie-eighth of the value of the property in lieu of salvage, or one-half in the case of a prize ” set forth as a ship of war.” From that date until 1864* the date of the act now in force, there have been thirteen Prize Acts dealing with recapture, each of which, except that of 1864, has been passed to meet a particular occasion, and has expired with the cessation of the then existing hostilities. Since the first act, and down to the act of 1805 inclusive, a distinction has always been drawn between a recapture effected by one of the royal ships of war and a recapture by a privateer or other vessel. In the former case the allowance has always been one-eighth, in the latter it varied, but was usually one-sixth. In the act of 1692 a clause taken from a Dutch law gave salvage to a privateer, rising in amount from one-eighth to one-half according to the number of hours the prize had been in the enemy’s possession, but this clause has disappeared since 1756. There is no provision in the present act for the payment of salvage, except hi case of re- capture by one Of His Majesty’s ships, but it seems beyond question’ that recaptors are entitled at law to salvage, although they rriay hold no commission from the crown. ” It is the duty of every subject of the king to assist his fellow-subjects in war; and to retake their property in the possession of the enemy: no commission is necessary to give a person so employed a title to the reward which the policy of the law allots to that meritorious act of duty ” (the “Helen,” 3 C. Rob. 226, per Sir W. Scott). Though it is improbable that privateers will figure in any future war, it may reasonably be anticipated that recaptures may be made by private vessels, and in such cases salvage would probably be awarded, the proportion lying in the discretion of the court. Similarly, salvage is awarded in the case of recapture from pirates or from a mutinous crew. In the case of royal ships the present act allows one-eighth salvage, which in cases of ” special difficulty or’ danger ” the court rriay increase to a quarter. The latter pr6visidri is ari innovation.

established in the suburbs of the capital an agricultural college and model farm.

Mining. — In the Cordillera, which runs through Salvador, there are veins of various metals — gold, silver, copper, mercury and lead being found mostly in the E., and iron in the W. Coal has been discovered at various points in the valley of the Lempa. In the republic there are about 180 mining establishments, about half of them .being in the

department of Morazan; they are owned by British, United States and Salvadorian companies. Only gold and silver are worked. The output, chiefly gold, was valued at £250,000 in 1907.

Commerce. — The trade of Salvador is almost entirely confined to the import of cotton goods, woollen goods, sacks and machinery, and to the export of coffee and a few other agricul- tural products. In 1900 the formation of a statistical office was decreed. The average yearly value of the imports for the five years 1904-1908 was £804,000, of the exports £1,250,000. The coffee exported in 1908 was valued at £830,000. The imports, comprising foodstuffs, hardware, drugs, cottons, silk and yarn, come (in order of value) chiefly from Great Britain, the United States, France and Germany; the exports are mostly to the United States and France.

Shipping and Communications. — Until 1855 the roads of Salvador were little better than bridle-paths, and fords or ferries were the sole means of crossing the larger rivers. During the next half-century about 2000 m. of highways were built, and the rivers were bridged. The first railway, a narrow-gauge line, between the port of Acajutla and Sonsonate, was opened in 1882, and afterwards extended to Ateos on the E. and Santa Ana on the N.W. A railway from the capital to Nueva San Salvador was also constructed, and in 1900 was linked to the older ‘system by a line from Ateos to San Salvador. In 1903, a concession was granted for an extension from Nueva San Salvador to the port of La Libertad. From 350 to 450 vessels annually entered and cleared at Salvadorian ports (chiefly Acajutla, La Libertad and La Union), during the years 1895 to 1905. The old port of Acajutla has been closed, and a new port opened in a more sheltered position about 1 m. N., where an iron pier, warehouses and custom-house have been erected. Salvador joined the postal union in 1879.

Currency and Credit. — In 1910 there were three commercial banks and an agricultural bank within the republic. In 1897 a law was passed adopting a gold standard. The currency of the country in 1910 consisted entirely of silver pesos, the fractional money under 900 fine having, by arrangement with the govern ment, been all exported by the banks. The peso or dollar at par is valued at four shillings; its actual value was about is. 8d. in 1 9 1 o. The metric system of weights and measures was adopted by decree of January 1886, but the old Spanish weights and measures still continue in general use.

Finance. — The revenue is mainly derived from import and export duties, but considerable sums are also obtained from excise, and smaller amounts from stamps and other sources. The principal

branches of expenditure are the public debt, defence and internal administration. The official figures showing the revenue and expenditure for the five years 1904-1908 are as follows (pesos being converted into sterling at the rate of 12 to £1):-

Years.

Revenue.

Expenditure.

1904

1905 1906 1907 1908

675,000 711,000 707,000 728,000 1,064,000

734,ooo

837,000

1,024,000 886,000

1,019,000

The foreign debt, amounting to £726,420 (£240,000 of a 6% loan of 1889, and £485,720 of another of 1892) was in 1899 converted into 5 % mortgage debentures of the Salvador Railway Company Limited, to which the government has guaranteed, for eighteen years from the 1st of January 1899, a fixed annual subsidy of £24,000. In March 1908 a newforeign loan was raised, amount- ing to £1,000,000. The bonds were issued at 86, and bore 6%

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interest, secured partly upon the special import duty of $3.60 (American gold) on every kilogramme of imported merchandise, partly upon the export duty of 40 c. (American gold) on every quintal (100 lb) of coffee up to 500,000 lb. The 4% internal debt amounted in 1905 to £840,170.

Government. — The constitution proclaimed in 1824, and modified in 1859, 1864, 1871, 1872, 1880, 1883 and 1886, vests the legislative power in a chamber of 70 deputies, including 42 landowners (3 for each department), all chosen by the direct vote of the people. The president and vice-president are likewise chosen by direct popular vote, and they hold office for 4 years. The president is not eligible for

the presidency or vice-presidency during the following presidential term. He is assisted by 4 ministers. Local government is carried on in each of the 14 departments by governors appointed by the central executive. The municipalities are administered by officers (alcaldes, regi- dores, &c.) elected by the inhabitants.

Religion and Education. — The Roman Catholic religion prevails throughout the republic, but there is complete religious freedom, so far as is compatible with public order. Civil marriage is legal, monastic institutions are prohibited, and education is in the hands of laymen. Primary education is gratuitous and obligatory. For secondary instruction there are about 20 higher schools, including 3 technical institutes, and 2 schools for teachers, one for men and the other for women — these five institutions being supported by the government. At San Salvador there is a national college for the higher education of women. Superior and professional instruction is provided at the national university in the capital.

Justice is administered by a supreme court, and in district, circuit and local courts. The active army consists of about 3000 men, and the militia, of about 18,000. In time of war all males between the ages of eighteen and sixty are liable for service. The navy consists of one customs cruiser.

History. — Salvador received its name from Pedro de Alvarado, who conquered it for Spain in 1525-26. Its independence of the Spanish Crown dates from 1822; (see Central America: History). Revolutions have been frequent. In July 1906 war broke out between Salvador, Honduras and Guatemala, but was terminated within the month by the arbitration of the United States president (see as above). In 1907 Salvador supported Honduras (q.v.) against Nicaragua; its prosperity was not, however, seriously impaired by the defeat of its ally.

See E. G. Squier, The States of Central America (London, 1868); D. Guzman, Apuntamientos sobre la topografia fisica de la republica del Salvador (San Salvador, 1883); D. Gonzalez, Datos sobre la republica de El Salvador (San Salvador, 1901); No. 58 of the Bulletins of the Bureau of American Republics (Washington, 1892) ; annual reports of the Council of the Corporation of Foreign Bond- holders (London) and of the British Foreign Office.

SALVAGE (from Lat. salvus, safe). There is no general rule or principle of law which entitles one who saves the life 01 property of another to be rewarded by him. But in certain special classes of cases the law does require the appointed courts to reward those who by their

exertions have rescued lives or property from probable damage or destruction. The reward so given is called salvage and the same word is often used to denote the service rewarded. Apart from the application of the term by analogy to the saving of property from fire on land, the recovery of property from destruction by the aid of voluntary payments (as in the case of payments to prevent the forfeiture of an insurance policy), or a solicitor's charges for property recovered by his means, the subject of salvage divides into (1) civil salvage, (2) military salvage.

1. Civil Salvage in English law is defined as such a service as may become the ground of a reward in the (admiralty) court on the civil side of its jurisdiction, and consists in the preservation of life or property from some of the dangers of the sea. The jurisdiction to give it is an admiralty jurisdiction. But the right to reward was recognized in the courts of common law before the admiralty court became, as it now is, a part of the High Court of Justice, e.g. by enforcing a possessory lien of the salvor over the salved property. The origin of the rule has been traced

It may appear that the grant of salvage to ships of war, the duty of whose commanders it is, according to the naval instruc- tions, " if possible, to rescue any British vessel which he may find attacked or captured by the enemy, " needs some justifica- tion. Objections on this ground have never been seriously treated, it being urged that it is politic to encourage the under- taking of such enterprises, even where they coincide with the path of duty. Where, however, a transport was rescued from under the guns of an enemy by a ship of war, under whose charge she sailed, salvage was refused on the ground that the salvor was only doing what he was bound to do (the " Belle, " Edw. 66). So no salvage is due to a crew who rescue a ship from mutineers, this being only their duty under a subsisting contract (the " Governor Raffles," 2 Dod. 14). On the other hand, a crew who rescue their ship from the prize crew of a belligerent are entitled to salvage, since the capture discharges them from their contract with the owner, and they act as volunteers (the " Two Friends," 1 C. Rob. 271). In the case of a neutral captured by one belligerent and recaptured by the other, which has been already alluded to, no salvage is as a rule allowed, upon the supposition that if the vessel had been carried into the port of the enemy justice would have been done and the vessel restored. In the case of the French war at the opening of the 19th century no such

supposi- tion existed, and salvage was usually awarded on the recapture of neutral property from the French. (M. Bt.)

SALVAGE CORPS. The London Salvage Corps is maintained by the fire offices of London. The corps was first formed in 1865 and began operations in March 1866. The staff of the corps when first formed consisted of 64. Since that time, owing to the many improvements that have taken place in the system of dealing with salvage, and the increase in the work to be done, the corps has necessarily been strengthened, and the staff now numbers over 100. The various stations of the corps are well placed, and the Metropolis has been mapped out so that when a fire takes place it may be attended to at the earliest possible moment. The headquarters are situated at Watling Street, which is called the No. 1 station, and this station protects the City of London enclosed by the Euston Road, Tottenham Court Road, City Road and the river Thames; this is known as the ” B ” district. No. 2 station is at Commercial Road, and attends to the whole of the E. and N.E. portion of London to the N. of the Thames, and is known as the ” C ” district. No. 3 station, opposite the headquarters of the Metropolitan Fire Brigade Station in the Southwark Bridge Road, protects the whole of S. London, and is known as the ” D ” district. No. 4 station, at Shaftesbury Avenue, is called the ” A ” district, and covers the West End and Kensington. Finally, No. 5 station, in Upper Street, Islington, guards the parish of Islington. The working staff, which is mainly recruited from the royal navy, consists of the chief officer and a superintendent, foreman and crew of men at each station. The stations of the corps are connected by telephone with the fire brigade stations from whence the ” calls ” are received. In addition to the home staff, there is also a staff constantly employed during the daytime in inspecting docks, wharves, Manchester goods and uptown warehouses, and reports are made weekly to the committee.

Generally speaking, the work of the Corps may be divided into two distinct classes — (1) services at fires; (2) watching and working salvage.

(1) Services at Fires form the most important feature of the work. Much depends upon the method of dealing with the salvage. If, for instance, a large Manchester goods warehouse was on fire in the top part, it would be very little advantage to the offices interested in the risk if the men were set to work removing the stock off the ground floor. The best method would be to cover up with tarpaulin all goods there, and prevent the water from collecting on the lower floors. It will be gathered that the most important work of the corps is to

prevent damage to goods, and that water is mostly looked after. The damage from fire is left almost entirely to the fire brigade. The traps, which immediately on receipt of an alarm proceed to the scene of the fire with their crew of men, carry every kind of appliance

for the saving of goods from destruction by fire or damage by water, as well as lime-light apparatus for use in working after the fire has been extinguished, thus enabling the men to note the position of dangerous walls, &c; and a portable coal-gas apparatus, which can be employed in the interior of buildings when the ordinary means of illumination has failed; in addition to ambulance appliances for emergencies.

(2) Working Salvage.— When a fire takes place, a man is left behind in charge of the salvage if the property is insured; or if that fact cannot be ascertained, but it appears probable that it is, a man is left until the information is obtained later. The duty, if an important one, is divided into a day and night duty. This enables an experienced man to be sent on day duty to meet the surveyor, and to carry out his instructions regarding the working out of the salvage; and a junior man at night. The day man, if working out salvage, would employ a number of men called strangers, over whom he acts as a kind of foreman. The ” working out ” may take the form of dividing up damaged goods into lots ready for a sale to be held by the surveyor, or of sifting over the debris to find remains of certain articles claimed for. If, for instance, a large fire occurred at a pianoforte manufacturer’s, and the debris was all in one common heap, the London Salvage Corps might have to arrange certain quantities of pegs and wires in order to give an idea of the number of pianos before the fire. The watching continues until the loss is settled, when the charge of the premises is given over to the assured.

There are also salvage corps on similar lines, but on a smaller scale, in Liverpool and Glasgow. (C. J. F.)

SALVANDY, NARCISSE ACHILLE (1795-1856), French politician, was born at Condom (Gers)on the nth of June 1795; of a poor family Irish by extraction. He entered the army in 1813, and next year was admitted to the household troops of Louis XVIII. A patriotic pamphlet on La Coalition et la France (18 16) attracted the attention of Decazes, who employed him to disseminate his views in the press, and he waged war against the Villele ministry of 1822-1828. Under the July monarchy he sat almost continuously in the Chamber of Deputies from 1830 till 1848, giving his support to the Conservative party. Minister of education in the Mole cabinet of 1837-1839, and again in 1845, he

superintended the reconstitution of the Council of Education, the foundation of the French School at Athens and the restoration of the Ecole des Chartes. For short periods in 1841 and 1843 he was ambassador at Madrid and at Turin, and became a member of the French Academyin 1835. Under the Empire he took no part in public affairs, and died at Graveron (Eure) on the 16th of December 1856.

SALVATION ARMY, a religious philanthropic organization founded by William Booth (q.v.), who in 1865 began to hold meetings for preaching in the streets in London and in tents, music halls, theatres and other hired buildings. Large numbers attended, many of whom had never entered a place of worship, and presently an organized society was formed called ” The Christian Mission.” Booth was assisted by his wife, Catherine Booth, a woman of remarkable gifts, who won for the new movement the sympathy of many among the cultured classes. In 1878 the Mission, which had spread beyond London, was reorganized on a quasi-military basis, and the title of ” The Salvation Army ” was definitely adopted in June 1880. The local societies became ” Corps,” and their evangelists ” Field Officers,” with Booth as ” General ” of the whole body. The spiritual operations of the Army at once rapidly expanded in spite of much disorderly opposition in some places. In 1878 there were 75 corps and 120 officers in the United Kingdom, the amount contributed by the outside public being £1925. Since then the number of corps and officers has greatly increased. Very large numbers who have ” professed conversion ” are reported annually. No figures of membership, however, are published. In doctrine, the Army is in harmony with the main principles of the evangelical bodies, ” as embodied in the three creeds of the Church.” Its preaching is practical and direct, asseverating the reality of Sin, ” the everlasting punishment of the wicked,” and Redemption. The Army proclaims the

supreme duty of self-sacrifice for the sake of the salvation of others

The Army is under the control of the General for the time being, who issues all orders and regulations. Large powers devolve upon other officers, such as the ” Chief of the Staff,” the ” Foreign Secretary,” and the ” Chancellor,” who direct affairs from the ” International Headquarters ” in London. The system of government is autocratic, ” unquestioning obedience ” being required throughout all ranks. The Army is divided, usually in harmony with national boundaries, into ”

territories," each under a " Commissioner," with headquarters in the capital of the country. The Territories are generally divided into " Provinces " and these again into " Divisions," which include a number of corps, each supporting its own " Captain " and " Lieutenant." The " soldiers " or members are drawn from all classes of the community. The property of the Army in the United Kingdom is held by the General for the time being, for the benefit of the Army exclusively, he being constituted the sole trustee of the property, in the disposal of which and in the appoint- ment of his successor he is placed under the government of a deed poll, executed by Booth while the body was still known as " The Christian Mission," and enrolled in the Court of Chancery in August 1878. In other countries various modifications have been necessary, but the General's ultimate con- trol has been practically assured. A further deed poll providing for the removal of a General in the contingency of " mental incapacity " or other " unfitness," and for the election of a successor, was executed by Booth in July 1904.

Funds are raised from the voluntary offerings of the corps, from open-air and other collections, from friends interested in evangelical and chari- table work, and from the profits on publications and general trading. The financial statements of the various national headquarters funds are an- nually published, certified by public accountants, in each country. In 1909 the general income and expenditure account of International Head- quarters in London dealt with a total of £64,345. Details of the aggregate income raised in the United Kingdom by the corps are not pub- lished. The annual Self-Denial offering (Great Britain) was £12,663 in 1888, £72,562 in 1906 and £69,034 in 1910. The value of the assets Total number of officers engaged exclusively in social work, 2520. of the spiritual work in the United Kingdom ho^^V^orief Ug ex – cnmmals are now recelved m the ordlnary labour increased from £558,992 in 1891 to £1,357,706

and was started with subscriptions amounting to over £100,000. A separate deed poll, making the General sole trustee, was executed by Booth in regard to the property and funds of this branch of work. Since then, both in Great Britain and abroad, the scheme has been actively carried on. The amount received in the year ending 30th September 1909 for cheap food and lodging in the United Kingdom was returned at £42,022 for the men's work, and £6417 for the women's. Large numbers of unemployed, ex-criminal and other needy persons have been aided or dealt with. In the year ending 30th September 1909, the number of persons received into the " elevators " or factories was reported as 6425, of women and girls received into rescue homes as 2559. The farm colony at Hadleigh in Essex has a

large acreage under cultivation, with fruit and market gardens and various industrial undertakings. The emigration depart- ment, although a development of the Darkest England Scheme, has no connexion with the rescue work; in 1907 the passage money received amounted to £85,014, and in 1909 to £38,179. An ” anti-suicide bureau ” was opened in 1907, and at Boxted, near Colchester, a scheme for Small Holdings has been initiated. In 1909 the value of the property held under the Darkest England Scheme in the United Kingdom was returned at £329,645, and the income of the central fund at £50,594.

Summary of Social Operations throughout the World (Compiled from the ” S.A. Year-Booh, 1910 “).

Number of Institutions.

United Kingdom.

Abroad.

Total,

Total Accommo- dation.

Men’s Work- Shelters and Food Depots . Labour Bureaus …. Labour Homes and Factories . Ex-criminal Homes Farm Colonies ….

Women’s Work —

Rescue and Maternity Homes . Shelters and Food Depots Children's Homes and Creches . Slum Posts ….

Other Social Institutions . .

Total Institutions

3i

8

28

1

2

32

10

2

44 17

156 50

117 18 15

107 20

57 103

87

187 58

145 18

17

139

30

59

147

104

I8.53I

4.936 486

3.469 1.934

174

73°

904

29.356

in 1909, the liabilities on account of loans upon mortgage and otherwise amounting at the latter date to £662,235. The assets of the Trade Departments were valued at £110,657 in 1909.

Statistics of Spiritual Operations (Compiled from the ” S.A. Year Book, 1910 “).

Corps and Outposts.

Officers and Cadets.

The British Isles

The United States …. South America and West Indies Canada and Newfoundland Australasia and Java …. India, Ceylon, Japan and Korea . South Africa and St Helena . France, Belgium, Switzerland and

Italy

Germany and Holland

Sweden, Norway, Finland, ‘Denmark

Gibraltar and Malta ….

Total .

t

1447 871 128

465 1283

2584 113

374 248

1067

2

3.I9I 1

2,983

188

95o

1,721

1,626

278

499 772

I.5I3

5

8582

13.726

Employees (without rank), 6269.

1 Officers and employees (British Isles), 7538.

Booth's scheme for Social Relief, described in In Darkest England, and the Way Out (1890), attracted wide-spread interest,

There are a number of subsidiary branches of work, such as the Young People's Legion, and the Naval and Military League for work among men in the military, naval and merchant services. In England there is a bank (the Reliance Bank, Ltd.) and a Life Assurance Society, the funds of the latter amounting to £566,309 in 1909. All officers and many of the rank and file wear a uniform. Music is universally employed. While the organiza- tion has succeeded in securing

recognition and favour in high places both in England and abroad, it has been seriously criticized at times, notably by Huxley and others in 1890-1891, and more recently by J. Manson in The Salvation Army and the Public, a work which led to much public discussion of the Army's religious, social and financial operations and methods. In 1 9 10 some resignations took place among the higher officials.

Authorities. — William Booth, Orders and Regulations for Soldiers; Orders and Regulations for Field Officers; Orders and Regulations for Staff Officers; Salvation Soldiery; Interview with W. E. Gladstone; In Darkest England and the Way Out (189O); Bramwell Booth, Social Reparation; Servants of All (1899); Booth-Tucker, The Life of Catherine Booth (1892); Railton, Heathen England; Twenty-one Years' Salvation Army; Arnold White, Truth about the Salvation Army (\8g2, 1900 and 1906); The Great Idea (1909; 2nd ed., 1910); T. F. G. Coates, The Life Story of General Booth (2nd ed., 1906); Harold Begbie, Broken Earthenware (1909) ; various reports and accounts; The War Cry, The Social Gazette, The Salvation Army Year Book, &c. Criticism; Thomas H. Huxley, " Social Diseases and Worse Remedies" in Collected Essays, vol. ix. (1895); John

Manson, The Salvation Army and the Public (1906; 3rd ed., 1908); Salvation Army Headquarters, A Calumny Refuted: A Reply to the Unfounded Charges of Sweating, &c. (1908) ; United Workers' Anti-Sweating Committee, Salvation Army Sweating: A Reply to the Mis-statements of General Booth and his Officials (1908; 2nd ed., 1910); Reports of the Trades Union Congress (1907 to 1910).

SALVER, a flat tray of silver or other metal used for carrying or serving glasses, cups, dishes, &c, at table or for the presenting of a letter or card by a servant. In a royal or noble household the fear of poisoning led to the custom of tasting the food or drink before it was served to the master and his guests; this was known as the " assay " of meat and drink, and in Spanish was called salva (salvar, to preserve from risk, Lat. salvare, to save). The term salva was also applied to the dish or tray on which the food or drink was presented after the tasting process. There seems no doubt that this Spanish word is the source of the English " salver "; a parallel is found in the origin of the term " credence-table," which is from the Ital. credenza, Lat. credere, to believe, trust (see Credence and Credence-Table).

SALVIA, a large genus belonging to the natural order Labiatae (q.v.), containing about 500 species in the temperate and warmer regions of both hemispheres. The name is derived from the Lat. salvo, from the healing properties of sage, S. officinalis (see figure under Labiatae). S. verbenaea, Clary, is a native of Britain found in dry pastures and waste places.

Some of the Salvias are among the most showy of the soft-wooded winter-flowering plants, the blossoms being of a bright glowing scarlet. The three most useful species are 5. splendens, S. Heerii and 5. gesneriflora, the first beginning to flower early in the autumn and lasting till Christmas, while the others follow immediately in succession, and continue in full beauty till April. Young plants should be propagated annually about February, and after nursing through the spring should be grown outdoors in a fully exposed situation, where they can be plunged in some non-conducting material, such as half-decomposed leaves. The young shoots should be stopped to secure bushy plants, but not later than the middle of August. The most suitable compost for them is a mixture

From Strasburger's Lehrbuch der Bolanik, by permission of Gustav Fischer. Pollination of Salvia Fratensis.

1, Flower visited by a bumble-

bee, showing the projection of the curved connective from the helmet-shaped upper lip and the deposition of the pollen on the back of the bumble-bee.

2, Older flower, with connective

drawn back, and elongated style.

4, The staminal apparatus at rest, with connective en- closed within the upper lip.

3, The same when disturbed by the entrance of the proboscis of the bee in the direction of the arrow..

/, Filament.

c, Connective. [anther.

s, The obstructing half of the

of mellow fibry loam enriched with a little mild thoroughly decom-

posed manure, made sufficiently porous by the addition of sand or grit. In spring, and during the blooming period, the temperature should be intermediate between that of a stove and greenhouse. There are other very ornamental species of easy growth, increased by cuttings in spring, and succeeding well in ordinary rich loamy soil. Of these S. angustifolia bears spikes of fine bright-blue flowers in May or June; S. chamaedryoides, a dwarfish subject, has deep- blue flowers in August; S. fulgens produces scarlet flowers in August; and 5. involucrata produces fine red flowers during the autumn. 5. patens is a lovely blue free-blooming sort, flowering in August, the colour being unique.

SALVIAN, a Christian writer of the 5th century, was born probably at Cologne (De gub. Dei, vi. 8, 13), some time between 400 and 405. He was educated at the school of Treves and seems tc have been brought up as a Christian. His writings appear to show that he had made a special study of the law; and this is the more likely as he appears to have been of noble birth and could describe one of his relations as being ” of no small

account in her own district and not obscure in family ” (Ep. i.). He was certainly a Christian when he married Palladia, the daughter of heathen parents, Hypatius and Quieta, whose dis- pleasure he incurred by persuading his wife to retire with him to a distant monastery, which is almost certainly that founded by St Honoratus at Lerins. For seven years there was no communi- cation between the two branches of the family, till at last, when Hypatius had become a Christian, Salvian wrote him a most touching letter in his own name, his wife’s, and that of his little daughter Auspiciola, begging for the renewal of the old affection (Ep. iv.). This whole letter is a most curious illustration of Salvian’s reproach against his age that the noblest man at once forfeited all esteem if he became a monk (De gub. iv. 7; cf. viii. 4) .

It was presumably at Lerins that Salvian made the acquaint- ance of Honoratus (ob. 429), Hilary of Aries (ob. 449), and Eucherius of Lyons (ob. 449). That he was a friend of the former and wrote an account of his life we learn from Hilary (Vita Hon., ap. Migne, 1. 1260). To Eucherius’s two sons, Salonius and Veranus, he acted as tutor in consort with Vincent of Lerins. As he succeeded Honoratus and Hilary in this office, this date cannot well be later than the year 426 or 427, when the former was called to Aries, whither he seems to have summoned Hilary before his death in 429 (Eucherii Instructio ad Salonium, ap. Migne, 1. 773; Salv., Ep. ii.). Salvian continued his friendly intercourse with both father and sons long after the latter had

left his care; it was to Salonius (then a bishop) that he wrote his explanatory letter just after the publication of his treatise Ad ecclesiam ; and to the same prelate a few years later he dedicated his great work, the De gubernatione Dei. If French scholars are right in assigning Hilary's Vita Honorati to 430, Salvian, who is there called a priest, had probably already left Lyons for Mar- seilles, where he is known to have spent the last years of his life (Gennadius, ap. Migne, lviii. 1099). It was probably from Marseilles that he wrote his first letter — presumably to Lerins — begging the community there to receive his kinsman, the son of a widow of Cologne, who had been reduced to poverty by the barbarian invasions. It seems a fair inference that Salvian had divested himself of all his property in favour of that society and sent his relative to Lerins for assistance (Ep. i., with which compare Ad eccles. ii. 9, 10; iii. 5). It has been conjectured that Salvian paid a visit to Carthage; but this is a mere infer- ence based on the minute details he gives of the state of this city just before its fall (De gub. vii. viii.). He seems to have been still living at Marseilles when Gennadius wrote under the papacy of Gelasius (492-496).

Of Salvian's writings there are still extant two treatises, entitled respectively De gubernatione Dei (more correctly De praesenti judicio) and Ad ecclesiam, and a series of nine letters. The De gubernatione, Salvian's greatest work, was published after the capture of Litorius at Toulouse (439), to which he plainly alludes in vii. 40, and after the Vandal conquest of Carthage in the same year (vi. 12), but before Attila's invasion (450), as Salvian speaks of the Huns, not as enemies of the empire, but as serving in the Roman armies (vii. 9). The words " proximum bellum " seem to denote a year very soon after 439. In this work, which furnishes a valuable if prejudiced description of life in 5th-century Gaul, Salvian deals with the same problem that had moved the eloquence of Augustine and Orosius. Why were these miseries falling on the empire? Could it be, as the pagans said, because the age had forsaken its old gods?- or, as the semi-pagan creed of some Christians taught, that God did not constantly overrule the world he had created (i. 1)? With the former Salvian will not argue (iii. 1). To the latter he replies by asserting that, " just as the navigating steersman never looses the helm, so does God never remove his care from the world." Hence the title of the treatise. In books i. and ii. Salvian sets himself to prove God's constant guidance, first by the facts of Scripture history, and secondly by the enumeration of special texts declaring this truth. Having thus " laid the foundations " of his work, he declares in book iii. that the misery of the Roman world is all due to the neglect of God's commandments and the

terrible sins of every class of society. It is not merely that the slaves are thieves and runaways, wine-bibbers and gluttons — the rich are worse (iv. 3). It is their harshness and greed that drive the poor to join the Bagaudae and fly for shelter to the barbarian invaders (v. 5 and 6). Every- where the taxes are heaped upon the needy, while the rich, who have the apportioning of the impost, escape comparatively free (v. 7). The great towns are wholly given up to the abominations of the

circus and the theatre, where decency is wholly set at nought, and Minerva, Mars, Neptune and the old gods are still worshipped (vi. 1 1 ; cf. vi. 2 and viii. 2). Treves was almost destroyed by the barbarians; yet the first petition of its few surviving nobles was that the emperor would re-establish the circus games as a remedy for the ruined city (vi. 15). And this was the prayer of Christians, whose baptismal oath pledged them to renounce ” the devil and his works . . . the pomps and shows (spectacula) ” of this wicked world (vi. 6). Darker still were the iniquities of Carthage, surpassing even the unconcealed licentiousness of Gaul and Spain (iv. 5) ; and more fearful to Salvian than all else was it to hear men swear ” by Christ ” that they would commit a crime (iv. 15). It would be the atheist’s strongest argu- ment if God left such a state of society unpunished (iv. 12) — especially among Christians, whose sin, since they alone had the Scriptures, was worse than that of barbarians, even if equally wicked, would be (v. 2). But, as a matter of fact, the latter had at least some shining virtues mingled with their vices, whereas the Romans were wholly corrupt (vii. 15, iv. 14). With this iniquity of the Romans Salvian contrasts the chastity of the Vandals, the piety of the Goths, and the ruder virtues of the Franks, the Saxons, and the other tribes to whom, though heretic Arians or unbelievers, God is giving in reward the inheritance of the empire (vii. 9, 11, 21). It is curious that Salvian shows no such hatred of the heterodox barbarians as was rife in Gaul seventy years later. It is difficult to credit the universal wickedness adduced by Salvian, especially in face of the contemporary testimony of Symmachus, Ausonius and Sidonius. Salvian was a 5th-century socialist of the most extreme type, and a zealous ascetic who pitilessly scourged everything that fell short of an exalted morality, and exaggerated, albeit unconsciously, the faults that he desired to eradicate.

Ad ecdesiam is explained by its common title, Contra avaritiam. It strongly commends meritorious almsgiving to the church. It is quoted more than once in the De gubernatione. Salvian published it under the

name of Timothy, and explained his motives for so doing in a letter to his old pupil, Bishop Salonius (Ep. ix.). This work is chiefly remarkable because in some places it seems to recommend parents not to bequeath anything to their children, on the plea that it is better for the children to suffer want in this world than that their parents should be damned in the next (iii. 4). Salvian is very clear on the duty of absolute self-denial in the case of sacred virgins, priests and monks (ii. 8-10). Several works mentioned by Gennadius, notably a poem ” in morem Graecorum ” on the six days of creation (hexaemeron), and certain homilies composed for bishops, are now lost (Genn. 67).

The Ad ecdesiam was first printed in Sichard’s Antidoton (Basel, 1528); the De gubernatione by Brassicari (Basel, 1530). The two appeared in one volume at Paris in 1575- Pithoeus added variae lectiones and the first seven letters (Paris, 1580); Ritterhusius made various conjectural emendations (Altorf, 1611), and Baluze many more based on MS. authority (Paris, 1663-1669). Numerous other editions appeared from the 16th to the 18th century, all of which are now superseded by the excellent ones of C. Halm (Berlin, 1877) and F. Pauly (Vienna, 1883). The two oldest MSS. of the De gubernatione belong to the 10th century (Cod. Paris, No. 13,385) and the 13th (Brussels, 10,628); of the Ad ecdesiam to the 10th (Paris, 2172) and the nth (Paris, 2785); of Epistle IX. to the 9th (Paris, 2785) ; of Epistle VIII. to the 7th or 8th century (Paris, 95,559) and to the 9th or 10th century (Paris, 12,237, 12,236). Of the first seven epistles there is only one MS. extant, of which one part is now at Bern (No. 219), the other at Paris (No. 3791). See Histoire litte- raire de France, vol. ii. ; Zschimmer’s Salvianus (Halle, 1875). Salvian’s works are reprinted (after Baluze) in Migne’s Cursus patrologiae, ser. lat. vol. liii. For bibliography, see T. G. Schoene- mann’s Bibliotheca patrum (ii. 823), and the prefaces to the editions of C. Halm (Monum. Germ., 1877) and F. Pauly (.Vienna, Corp. scr. eccl. Lat., 1883). Gennadius, Hilary and Eucherius may be consulted in Migne, vols, lviii. and 1. See also S. Dill, Roman Society in the Last Century of the Western Empire, pp. 1 15-120. (T. A. A.)

SALVINI, TOMMASO (1829-), Italian actor, was born at Milan on the 1st of January 1829. His father and mother were both actors, and Tommaso first appeared when he was barely fourteen as Pasquino in Goldoni’s Donne curiose. In 1847 he joined the company of Adelaide Ristori, who was then at the beginning of her brilliant career. It was with her as Elettra that he won his first success in tragedy, playing the title role in Alfiero’s Orcste at the Teatro Valle in Rome. He fought in the cause of Italian independence in 1849; otherwise his life was an unbroken series of successes in his art. He acted frequently in England,

and made five visits to America, his first in 1873 an(i his last in 1889. In 1886 he played there Othello to the Iago of Edwin Booth. Apart from Othello, which he played for the first time at Vicenza in June 1856, his most famous impersona- tions included Conrad in Paolo Giacometti's La Morte civile, Egisto in Alfieri's Merope, Saul in Alfieri's Saul, Paolo in Silvio Pellico's Francesca da Rimini, Oedipus in Nicolini's play of that

name, Macbeth and King Lear. Salvini retired from the stage in 1890, but in January 1902 took part in the celebration in Rome of Ristori's eightieth birthday (see the Century Magazine for June 1902, vol. lxiii.). Salvini published a volume entitled Ricordi, anedotti ed impressioni (Milan, 1895). Some idea of his career may be gathered from Leaves from the Autobiography of Tommaso Salvini (London, 1893).

His son Allessandro (1861-1896), also an actor, had several notable successes in America, particularly as D'Artagnan in The Three Guardsmen.

SALWEEN, a river of Burma. This river, called Nam Kong by the Shans, Thanlwin by the Burmese, Lu Kiang, or Nu Kiang, or Lu Tzu Kiang by the Chinese, is the longest river in Burma, and one of the wildest and most picturesque streams in the world. Its sources are still undetermined, but there seems little doubt that it rises in the Tanla mountains, S. of the Kuen Lun, somewhere in 32 or 33° N., and that perhaps it draws some of its water from the Kara Nor. It is thus a much longer river than the Irrawaddy. From the time it leaves Tibet it has a very narrow basin, and preserves the character of a gigantic ditch, or railway cutting, with for long stretches no other affluents than the mountain torrents from the hills, which rise from 3000 to 5000 or 6000 ft. above the level of- the river-bed. In the dry season the banks are alternate stretches of blinding white, fine sand, and a chaos of huge boulders, masses and slabs of rock, with here and there, usually where a tributary enters, long stretches of shingle. In the rains all these disappear, and the water laps against forest trees and the abrupt slope of the hills. The average difference between high and low water level of the Salween throughout the Shan States- is between 50 and 60 ft., and in some places it is as much as 90. There are many rapids, caused by reefs of rock running across the bed, or by a sudden fall of from one to several feet, which produce very rough water below the swift glide; but the most dangerous places for navigation are where a point juts out into the stream, and the current, thrown back, causes a violent double back- water. Nevertheless, long stretches of the river, extending to scores of miles, are habitually navigated by

native boats. The current is extremely variable, from § m. an hour to ten knots. Launches ply regularly from Moulmein to the mouth of the Yonzalin, in Lower Burma. The worst part of the whole Salween, so far as is known, is the gorge between the mouth of the Yonzalin and Kyaukhnyat. It is quite certain that steam launches could ply over very long sections of the river above that, perhaps as far as the Kaw ferry, or even the Kunlong ferry. In British territory, however, there are very few settlements on the river itself, and frequently the ferry villages are built 1000 ft. above the river.

The Chinese believe the Salween valley to be deadly to all strangers, but it is in Chinese territory — particularly in the Lu Kiang, or Mong Hko state— that there is the largest population on the river until Lower Burma is reached. A description of the Salween resolves itself into a list of the ferries at which it can be crossed, for no one marches up the river. The river is bridged by the Chinese on the main route from Teng Yueh (Momien) and Bhamo to Tali-fu. There are two spans ; these are not in a straight line, but parallel to one another at the distance of the breadth of the central pillar. Each span is formed by twelve or fourteen massive iron chains, with planks laid across them. There was a bridge some 20 m. lower down, but this was destroyed in 1894. In British territory there are no bridges, and the ferries are the same as those maintained before annexation. There are a great number of these ferries, but only a few are used, except by the local people. From Ta Hsang Le large trading boats ply regularly to Kyaukhnyat, whence the traders make their way by land over the hill to Papun, and so down the Yonzalin.

The chief tributaries of the Salween in British territory are the Nam Yu and the Nam Oi or Nam Mwe on the right bank, and the Hsipa Haw on the left. These are short but fair-sized streams. Near the Kunlong ferry the Nam Nim, on the right bank, and the Nam Ting, on the left, are considerably longer, and the Nam Ting is navigable by native craft for considerable stretches up to Meng Ting and farther. To the S. the next tributary is the Nam Kyek, on the right bank, down the valley of which the railway will reach the Salween. Below this are two streams called Nam Ma, one entering on the right bank, the other on the left, at no great distance from one another, but of no great length. A little below is the Nam Nang, on the left bank, coming from the Wa country. The Nam Kao enters in a cascade of nearly 200 ft. in the cold weather from the right, and then there are no affluents till the Nam Hka comes in on the left.

This has a great volume of water, but is unnavigable because of its steep gradient and many gorges. After the Hwe Long, entering from the left at Ta Kaw, is passed, the Nam Pang comes in 22 m. lower down on the right bank. This is probably the largest tributary of the Salween ; some distance above its mouth, at Keng Hkam, it is 400 yds. wide and quite unfordable. The next important tributary is the Nam Hsim, on the left bank, rising in the latitude of Keng Tung. It is a large but quite unnavigable stream. Except the Me Sili and Me Sala, from opposite sides, and the Nam Hang, which burrows its way through a range of hills from the E., and the Nam Pan, coming from the W., there is no considerable tributary till 19° 52′ N., where the Nam Teng comes in on the right from the central Shan States. This is a considerable river, and navigable for long stretches in its upper course, but the last few miles before it enters the Salween are little better than a cataract. Below this the only large affluent is the Nam Pawn, which drains all Karenni and a considerable por- tion of the Shan States, but is quite unnavigable. Below this the tributaries are again only mountain streams till the Thaung-yin comes in from the S.E. Thirty m. lower down is Kyodan, the great timber depot. Here a cable, stretched across the river, catches all the timber, which is then made up into rafts and floated down to Kado, near Moulmein, where the revenue is collected. The Yonzalin enters the Salween from the right about 10 m. below Kyodan. Boats can ply from Kyodan S., and light draught steamers ascend as far as Shwegon, 63 m. from Moulmein. The Salween cuts the British Shan States nearly in half, and is a very formidable natural obstacle. It seems probable, however, that long stretches of it can be opened to trade. It is certainly no less navigable than the Middle Mekong or the Yangtsze-kiang above I-chang. (J. G. Sc.)

SALWEEN, a district in the Tenasserim division of Lower Burma. Area, 2666 sq.m. Pop. (1001) 37,837, consisting largely of aboriginal tribes, Karens (33,448) and Shans (2816). Nearly the whole district is a maze of mountains intersected by deep ravines, the only level land of any considerable extent being found in the valley of the Yonzalin, while the country is covered with dense forest, of which 1 28 sq. m. are reserved. The district is drained by three principal rivers, the Salween, Yonzalin and Bilin, fed by mountain torrents. The Yonzalin, which rises in the extreme N., is navigable with some difficulty in the dry season as far as Papun; the Bilin is not navigable within the limits of the district except by small boats and rafts. The district is in charge of a superintendent of police, with head- quarters at Papun. The total rainfall in 1905 was 114-48 in., recorded at Papun. Apart from cotton-

weaving, there are no manufactures. A considerable trade is carried on with Siam by bridle paths across the mountains.

SALYANY, a town of Russian Transcaucasia, in the govern- ment of Baku, 80 m. S.S.W. from Baku, on the river Kura, and on an island of the same name. In 1897 its population was 10,168, chiefly Tatars. It is a fishing centre, where thousands of workers gather from all parts of Russia during the season. Salyany was annexed to Russia in the 18th century, but was retaken by the Persians, and only became Russian finally in 1813.

SALYES (Gr. SctXues: also Sallyes, Salyi, Salluvtt), in ancient geography, a people occupying the plain S. of the Druentia (Durance) between the Rhone and the Alps. According to Strabo (iv. p. 203) the older Greeks called them Ligyes, and their territory Ligystike. By some authorities they were con- sidered a mixed race of Galli and Ligurians (hence Celtoligyes) ; by others a purely Celtic people, who subjugated the Ligures in the Provincia. They are said to have been the first transalpine people subdued by the Romans (Florus iii. 2). In 154 B.C. the inhabitantsof Massilia, who had been connected with the Romans by ties of friendship since the second Punic war, appealed for aid against the Oxybii and Decietes (or Deciates). These people, called by Livy (Epit. 47) ” transalpine Ligurians,” were perhaps two smaller tribes included under the general name of Salyes. They were defeated by Quintus Opimius. In 125-124 hostilities broke out between the Romans and the Salyes from the same cause. The successful operations of Marcus Fulvius Flaccus were continued by Gaius Sextius Calvinus (123-122), who definitely subdued the Salyes, destroyed their chief town, and founded near its ruins the colony of Aquae Sextiae (Aix). Part of their territory was handed over to the Massaliots. Their king, Tuto- motulus (or Teutomalius), took refuge with the Allobroges. From this time the Salyes practically disappear from history. Among other important Roman towns in their territory may be

mentioned Tarusco or Tarasco (Tarascon), Arelate (Aries), Glanum (St Remy) and Ernaginum (St Gabriel).

For ancient authorities see A. Holder, Altceltischer Sprachschatz, ii. (1904).

SALZA, HERMANN VON (c. 1170-1239), Master of the Teu- tonic Order, and councillor of the emperor Frederick II., was a scion of the family of Langensalza in Thuringia. He entered the Teutonic Order in early life, became very intimate with Frederick II., took part in the expedition to Damietta in 1221, and accom- panied the emperor on

the crusade of 1228, which was joined by many princes owing to his influence. About 12 10 he was ap- pointed master of the Teutonic Order, and was offered, in 1226, the province of Kulm by Conrad I., duke of Masovia, in return for help against the Prussians; this he accepted and obtained the investiture from Frederick. In 1230 the conquest of Prussia was begun by the Order, although not under his immediate leadership. In i225hereconciledValdemarII.,kingof Denmark, with Henry I., count of Schwerin, and thus won again the land on the right bank of the Elbe for the Empire, and the recognition of imperial superiority over Denmark. Trusted by Pope Gregory IX. and the emperor alike, he brought about the treaty of San Germano between them in 1230, was the only witness when they met in conference at Anagni in the same year, and it was he who, in 1235, induced Frederick's son, Henry, to submit to his father. He died on the 19th of March 1239 at Barletta in Apulia, and was buried there in the chapel of his Order.

Vide: A. Koch, Hermann von Salza, Meister des deutschen Ordens (Leipzig, 1885).

SALZBRUNN, a watering-place of Germany, in the Prussian province of Silesia, at the foot of a well- wooded spur of the Riesengebirge, 30 m. S.W. of Breslau, by the railway to Halber- stadt. Pop. (1905) 10,412. It consists of Ober-, Neu- and Nieder-Salzbrunn, has a Roman Catholic and an Evangelical church and manufactures of glass, bricks and porcelain. Its alkalo-saline springs, especially efficacious in pulmonary and urinary complaints, were known as early as 13 16, but fell into disuse until rediscovered early in the 19th century. The waters are used both for drinking and bathing, and of the two chief springs, the Oberbrunnen and the Kronenquelle, nearly two million bottles are annually exported. The number of summer visitors is about 7000 a year.

See Valentiner, Der Kurort Obersalzbrunn (Berlin, 1877); Biefel, Der Kurort Salzbrunn (Salzbrunn, 1872); and Deutsch, Schlesiens Heilquellen und Kurorte (Breslau, 1873).

SALZBURG, a duchy and crownland of Austria, bounded E. by Upper Austria and Styria, N. by Upper Austria and Bavaria, W. by Bavaria and Tirol and S. by Carinthia and Tirol. It has an area of 2762 sq. m. Except a small portion in the extreme N., near Bavaria, the country is mountainous and belongs to the N. and central zone of the Eastern Alps. It is divided into three regions; the region of the Hohe Tauern, extending S. of the Salzach, the region of the limestone Alps and the undulating foothill region. The Hohe Tauern contains many high lying

valleys, traversed by the streams which flow into the Salzach, as well as numerous depressions and passes, here called popularly Tauern. The deepest depression of the whole range is the Velber Tauern valley (8334 ft.) between the Velber and the Tauern, and the principal pass is the Niederer (Mallnitzer) Tauern (7920 ft.). This pass which leads from the Gastein valley to Carinthia is the oldest bridle-path over the Hoher Tauern. Between the passes is the ridge of Sonnblick, where a meteorological observatory was established in 1886 at an altitude of 10,170 ft. The region of the limestone Alps is composed of several detached groups: a portion of the Kitzbuhler Alps, which contain the famous Thurn pass (4183 ft.) ; then the Salz- burg Alps, which contain the Loferer Steinberge and the peak Birnhorn (8637 ft.) ; the Reitalm or the Reiteralpe with the peak Stadelhorn (7495 ft.) ; and the broad mass of the Schonfeldspitze (8708 ft.), from which the great glacier-covered block of the Ewiger Schnee, or Ubergossene Alps projects into the Salzach valley. Farther N. are the Hagengebirge (7844 ft.); the beauti- ful summit of the Hoher Goll (8263 ft.); trie Tennegebirge (7217 ft.); and the Untersberg, an outpost of the Berchtesgaden

group. Between the Hagengebirge and the Tennengebirge, which are situated on each side of the Salzach valley, is one of the most magnificent narrow passes of the Alps. It is below Werfen, and near its exit, just at the narrowest part, is the Lueg Pass, which was fortified as early as 13 16 and offered a firm resistance to the French in the years 1800, 1805 and 1809. A portion of the Ischler Alps, as well as of the Dachstein group, also belongs to Salzburg. The principal river of Salzburg is the Salzach. The Enns and the Mur also rise in this province. The four Krimmler falls, together 2085 ft. high, are the most important falls in the Eastern Alps. The two falls at Wildbad-Gastein (196 and 296 ft.); the fall, by which the Gasteiner Ache discharges itself into the Salzach, near Lend; the Tauern fall (660 ft.), formed by the Tauern Ache on the N. side of the Radstater Tauern; and the Gollinger fall (202 ft.) also deserve notice. Among the Klammen, i.e. narrow passages leading from the Salzach valley to the valleys of smaller rivers, the most celebrated are the Kitzloch Klamm and the Liechtenstein Klamm. The Kitzloch Klamm is formed by the Rauris Thai and the Liechtenstein Klamm by the Gross-Arle Thai. A path through the last Klamm leads to the magnificent fall (174 ft.) of the Gross-Arle river, which discharges itself in a series of cascades into the Salzach. The most important lake is the Zeller-see (2424 ft. above sea-level, 2 sq. m. in extent, 238 ft. deep), whose waters are carried off by

the Salzach. The Waller-see or Lake of Seekirchen (1653 ft. above sea-level), the Fuschl-see (209s ft.), the Hinter-see (2580 ft.), the Ober-Trumer-see and Nieder-Trumer-see are all situated in the Alpine foothill region. The Mond-see (1560 ft.) and Aber-see, or Lake St Wolfgang, are on the frontier between Salzburg and Upper Austria. The climate, although healthy, is very changeable, with great extremes of temperature and heavy rainfall, especially in the summer. The most settled season is the autumn. The annual mean temperature at Salzburg is 46°-4 F. The population of the duchy in 1900 was 193,247, which is equivalent to 69 inhabitants per square mile. It is the most sparsely populated province of Austria. Between 1880 and 1900 the population increased by 17-5%. The inhabitants are a handsome and powerfully built peasant race, very con- servative in religion, manners, customs and national costume. They are almost exclusively of German stock and are Roman Catholics. Elementary education is much more advanced here than in any other Alpine province. Although 13-71% of the soil is unproductive and 32-4% is covered with forests, Salzburg is one of the principal pastoral regions of Austria. Of its total area, 28-9% consists of Alpine pastures available during the summer months, 4-95% of lowland pasturages and 8-3% of meadows, while only 9-2% is arable. Cattle-breeding and dairy-farming are very developed and constitute the chief re- sources of the province. Next in importance comes the timber trade; game is also plentiful. The mineral wealth of Salzburg includes salt at Hallein, copper at Mitterberg, iron-ore at Werfen, marble in the Untersberg region and small quantities of gold near the Goldberg in the Rauris valley and at Bockstein in the Gastein valley. The duchy contains also a great number of mineral springs, as the celebrated springs at Gastein, alkaline springs at Mauterndorf and at St Wolfgang, and saline springs at Golling and Hallein. Commerce and manufacture are poorly developed. The duchy is divided into six departments, of which the capital, Salzburg, is one and its environs the second. The other four are Hallein, St Johann, Tamsweg and Zell-am-See. The local diet, of which the archbishop is a member ex-officio, is composed of 28 members, and the duchy sends 7 members to the reichsrat at Vienna. At Hallein, pop. (1900) 6608, with celebrated saline springs known since the beginning of the 12th century, in October 1809, encounters between the French and the Tirolese under Joachim Johann Haspinger took place. To the N.E. lies Adnet with extensive marble quarries, and to the N. Oberalm, with manufacture of marble articles. The ascent of the Hoher Goll is made from here. Zell-am-See (2473 ft.), pop. 1561, is a favourite tourist resort. To the E. is the Schmit- tenhohe (6455 ft.)., which is easily accessible. On the summit is a meteorological station. Sankt Johann (pop. 1343) was one

of the earliest settlements in the Salzach valley, and was a principal centre of Protestantism. Near it is the Liechtenstein Klamm.

For the history of the archbishopric and duchy see the article on the town of Salzburg (below).

SALZBURG, capital of the Austrian duchy and crownland of Salzburg and formerly of the archbishopric of the same name, 195 m. W. by S. of Vienna by rail. Pop. (1900) 32, 934. The city occupies a position of singular beauty on the Salzach which passes at this point between two isolated hills, the Monchsberg (1646 ft.) on the left and the Capuzinerberg (2132 ft.) on the right. In the lovely valley so formed, and stretching into the plain beyond, lies Salzburg. The older and main part of the city lies on the left bank of the Salzach, in a narrow semicircular plain at the base of the Monchsberg; the newer town is on the right bank at the foot of the Capuzinerberg, which is separated from the river by the narrow suburb of Stein. At the S. of the old town, below the Nonnberg, of S.E. spur of the Monchsberg, is the suburb of Nonnthal; and at the N. end is Miilln. The steep sides of the Monchsberg rise directly from amidst the houses of the town, some of which have cellars and rooms hewn but of the rock; and the ancient cemetery of St Peter, the oldest in Salzburg, is bounded by a row of vaults cut in the side of the hill. The narrowest part of the ridge, which has a length of above 2 m. is pierced by the Neu Thor, a tunnel 436 ft. long and 23 ft. broad, completed in 1767, to form a convenient passage from the town to the open plain. The S. end of the Monchsberg is occupied by the imposing Hohen-Salzburg, a citadel originally founded in the 9th century, though the present buildings, the towers of which rise 400 ft. above the town, date chiefly from 1496-1519. Its chapel contains statues of the twelve apostles in red marble. The citadel is now used for barracks. The streets in the older quarters are narrow, crooked and gloomy; but the newer parts of the city, especially those laid out since the removal of the fortifica- tions about 1861, are handsome and spacious. Owing to the frequent fires the private buildings of Salzburg are comparatively modern; and the existing houses, lavishly adorned with marble, are, like many of the public buildings, monuments of the gorgeous taste of the archbishops of the 17th and 18th centuries. From the style of the houses, the numerous open squares, and the abundant fountains which give an Italian aspect to the town, Salzburg has received the name of ” the German Rome.” Both sides of the river are bordered by fine promenades, planted with trees. The Salzach is spanned by four bridges, including a railway bridge.

Salzburg is full of objects and buildings of interest. The cathedral, one

of the largest and most perfect specimens of the_ Renaissance style in Germany, was built in 1614-1668 by the Italian architect Santino Solari, in imitation of St Peter's at Rome. On three sides it is bounded by the Dom-Platz, the Kapitel-Platz and the Residenz- Platz ; and opening on the N.E. and N.W. of the last are the Mozart- Platz and the Markt-Platz. In the Mozart-Platz .is a statue of Mozart by Schwanthaler erected in 1842. On one side of the Residenz-Platz is the palace, an irregular though imposing building in the Italian style, begun in 1592 and finished in 1725. It contains a picture-gallery and is now occupied by the grand-duke of Tuscany. Opposite is the Neu Bau, begun in 1588, in which are the govern- ment offices and the law courts. In the middle of the Residenz- Platz is a handsome fountain, the Residenz-Brunnen, 46 ft. high, executed in marble by Antonio Dario in 1 664-1 680. The palace of the present archbishop is in the Kapitel-Platz. Across the river, with its French garden adjoining the public park, is the Mirabell palace, formerly the summer residence of the archbishops. Built in 1607, and restored after a fire in 1818, it was presented to the town in 1867 by the emperor Francis Joseph. The town hall of Salzburg was built in 1407 and restored in 1675. Other interesting secular buildings are the Chiemseehof, founded in 1305 and rebuilt in 1697, formerly the palace of the suffragan bishop of Chiemsee, and now the meeting-place of the Salzburg diet and the Carolino-Augusteum- Museum, containing an interesting collection of antiquities and a library .of 20,000 volumes.

Of the twenty-five churches the majority are interesting from their antiquity, their architecture or their associations. Next to the cathedral, the chief is perhaps the abbey church of St Peter, a Romanesque basilica of the 12th century which was tastelessly restored in 1745, and which contains a monument to St Rupert. St Margaret's, in the midst of St Peter's churchyard, built in 1485, and restored in 1865, is situated near the cave in the side of the Monchsberg, said to have been the hermitage of St Maximus, who

was martyred by the pagan Heruli in 477. The Franciscan church, with an elegant tower built in 1866, is an interesting example of the transition style of the 13th century, with later baroque additions. St Sebastian's, on the right bank, built in 1505-1512 and restored in 18 1 2, contains the tomb of Paracelsus, who died here. The oldest and most important of the eight convents at Salzburg is the Bene- dictine abbey of St Peter founded by St Rupert as the nucleus of the city. It

was completely rebuilt in 1131 and contains a library of 40,000 volumes, besides MSS. The Capuchin monastery, dating from 1599, gives name to the Capuzinerberg. The oldest nunnery is that founded on the Nonnberg by St Rupert, the Gothic church of which dates from 1423 and contains some fine stained glass and some old frescoes. The single Protestant church in Salzburg was not built until 1865. A theological seminary is the only relic now left of the university of Salzburg, founded in 1623 and suppressed in 1810. The city is the see of an archbishop with a cathedral chapter and a consistory. Salzburg, situated at an altitude of 1 35 1 ft. above sea- level, has a healthy climate and is visited annually by over 60,000 tourists. It has a mean annual temperature of 46-4° F. and a mean annual rainfall of 45-59 in. The town carries on a variety of small manufactures, including musical instruments, iron-wares, marble ornaments. Other industries are brewing and book-binding. It was the birthplace of Mozart and of the painter Hans Makart (1840- 1884). The house in which Mozart was born has been transformed into a museum, which contains many interesting relics.

Numerous places of interest and beautiful spots are to be found round Salzburg. To the E. rises the Gaisberg (4206 ft.), which is ascended by a rack-and-pinion railway, which starts from Parsch. At the foot of the Gaisberg is Aigen, a renowned castle and park. Three miles S. of Salzburg is the palace of Hellbrunn, built about 1615, which contains a famous mechanical theatre and some fine fountains. . About 2 m. to the S.W. ef Salzburg is the castle of Leopoldskron, and from this point the Leopoldskroner Moos stretches S. to the base of the Untersberg. A few peat-baths, as the Ludwigsbad and the Marienbad, are in the neighbourhood of Leopoldskron. Three and a half miles N. of Salzburg, at an altitude of 1720 ft., stands the pilgrimage church of Maria Plain, erected in 1674.

The origin and development of Salzburg were alike ecclesiastical, and its history is involved with that of the archbishopric to which it gave its name. The old Roman town of Juvavum was laid in ruins, and the incipient Christianity of the district overwhelmed, by the pagan Goths and Huns. The nucleus of the present city was the monastery and bishopric founded here about 700 by St Rupert of Worms, who had been invited by Duke Theodo of Bavaria to preach Christianity in his land. The modern name of the town, due like several others in the district to the abundance of salt found there, appears before the end of the 8th century. After Charlemagne had taken possession of Bavaria in the 8th century, Bishop Arno of Salzburg was made an archbishop and papal legate. Thenceforward the dignity and power of the see steadily increased and in the course of time the archbishops obtained high

secular honours. In 1278 Rudolph of Habsburg made them imperial princes.

The strife between lord and people was always keen in Salzburg. Archbishop Leonhard II., who expelled the Jews from Salzburg in 1498, had to face a conspiracy of the nobles and was besieged in Hohen-Salzburg by the inhabitants in 1 5 1 1 . The Peasants' War also raged within the see in 1525 and 1526, and was only quelled with the aid of the Swabian League. From the beginning an orthodox stronghold of the Roman Catholic faith, Salzburg energetically opposed the Reformation. Under Archbishop Wolfgang Dietrich (d. 161 1) many Protestant citizens were driven from the town and their houses demolished. In spite, however, of rigorous persecution the new faith spread, and a new and more searching edict of expulsion was issued by Archbishop Leopold Anton von Firmian (d. 1744). The Protestants invoked the aid of Frederick William I. of Prussia, who procured for them permission to sell their goods and to emigrate ; and in 1731 and 1732 Salzburg parted with about 30,000 industrious and peaceful citizens, about 6000 of these coming from the capital. The last independent archbishop was Hieronymus von Colloredo (1732-1812), who ruled with energy and justice but without gaining popularity.

By the peace of LuneVille (1802) the see was secularized and given to the archduke of Austria and grand-duke of Tuscany in exchange for Tuscany, its new owner being enrolled among the electoral princes. In the redistribution following the peace of Pressburg in_ 1805, Salzburg fell to Austria. Four years later it passed to Bavaria, but after the peace of Paris it was restored to Austria in 1816, except a portion on the left bank of the Salzach. Under the designation of a duchy the territory formed the department of Salzach in Uppe' Austria until 1849, when it was made a separate crownland, and finally in 1861 the management of its affairs was entrusted to a local diet. The actual duchy does not correspond exactly with "the old bishopric. Salzburg embraced at the time of the peace of Westphalia (1648) an area of 382 1 sq. m. with a population of 190,000. A part of its territory was ceded to Bavaria in 1 814, and when Salzburg became a separate crownland in 1849 several of its districts were added to Tirol.

For the history of the archbishopric see Meiller, Regesta archi-episcoporum Salisburgensium, 1 106-1246 (Vienna, 1866); Dummler. Beilrdge zur Geschichte des Erzbistums von Salzburg im 9-12 Jafir-

hundert (Vienna, 1859); the Sahburger Urkundenbuch, edited by W. Hauthaler (Salzburg, 1809); Pichler, Salzburgs Landesgeschichte

(Salzburg, 1865) ; Doblhoff , Beitrdge zum QuelTenstudium Salzburgischer Landeskunde (Salzburg, 1 893-1 895); Greinz, .Die Erzdiozese Salzburg (Vienna, 1898) ; Rieder, Kurze Geschichte des Landes Salzburg (Vienna, 1905) ; E. Richter, Das Herzogtum Salzburg (1881) ; Thym, Das Herzogtum Salzburg (1901), and F. von Pichl, Kritische Abhandlungen uber die dlteste Geschichte Salzburgs (Innsbruck, 1889). For the town see Widmann, Geschichte Salzburgs (Gotha, 1907); F. von Zillner, Geschichte der Stadt Salzburg (Salzburg, 1 885-1 890); Trautwein, Salzburg (12th ed., Innsbruck, 1901); J. Meurer, Fuhrzr durch Salzburg (Vienna, 1889), and Purtscheller, Fiihrer durch Salzburg und Umgebung (Salzburg, 1905). See also C. F. Arnold, Die Ausrottung des Protestantismus in Salzburg unter Erzbischof Firmian (1900).

SALZKAMMERGUT, a district of Austria in the S.W. angle of the duchy of Upper Austria situated between Salzburg and Styria. It forms a separate imperial domain of about 250 sq. m. and is famous for its fine scenery, which has gained for it the title of the “Austrian Switzerland”; but it owes its name (literally ” salt-exchequer property “) and its economic import- ance to its valuable salt mines. It belongs to the region of the Eastern Alps, and contains the Dachstein group with the Dach- stein (9830 ft.) and the Thorstein (9657 ft.). In the Dachstein group are found the most easterly glaciers of the Alps, of which the largest is the Karls-Eisfeld, nearly 2j m. long and 15 m. broad; the Ischler Alps with the Gamsfeld (6640 ft.), the Hollengebirge with the great HollenkOgel (6106 ft.), and the Schafberg (5837 ft.), which is called the ” Austrian Rigi.” Then comes the Todtes Gebirge, with the Grosser Priel (8246 ft.) and the Traunstein (5446 ft.) on the E. shore of the Traun lake; the Pyhrgas group with the Grosser Pyhrgas (7360 ft.) and the Sengsen or Sensen group, with the Hoher Nock (6431 ft.). The chief lakes are the Traun-see or Lake of Gmunden (1383 ft. above sea-level, 9 sq. m. in extent, 623 ft. deep); the Hallstatter-see or Lake of Hallstatt (1629 ft. above sea-level, 35 sq. m. in extent, 409 ft. deep); the Atter-see or Kammer-see (1527 ft. above sea- level, 18 sq. m. in extent, 560 ft. deep), the largest lake in Austria; the Mond-see (1560 ft. above the sea, 9 sq. m. in extent, 222 ft. deep) and the Aber-see or Lake of St Wolfgang (1742 ft. above sea-level, 5 J sq. m. in extent, 369 ft. deep). Salzkammergut had in 1900 a population of over 18,000. The capital of the district is Gmunden, and other places of importance are Ischl, Hallstatt and Ebensee (7656), which are important salt-mining centres. The salt extracted in Salzkammergut amounts to nearly 30% of the total Austrian production. Cattle- rearing and forestry form the other principal occupations of the inhabitants.

See Kegele, Das Salzkammergut (Wien, 1897).

SALZWEDEL, a town in the Prussian province of Saxony, in a plain on the navigable Jeetze, a tributary of the Elbe, 32 m. N.W. of Stendal and 106 m. by rail N.W. of Berlin, on the line to Bremen. Pop. (1905) 11,122. Salzwedel is partly surrounded by medieval walls and gates. The church of St Mary is a fine Gothic structure of the 13th century with five naves and a lofty spire. The old town hall, burnt down in 1895, has been replaced by a modern edifice. The industries include linen and damask weaving, tanning, brewing and the manufacture of pins, chemicals and machinery, and a brisk river trade is carried on in agri- cultural produce.

Salzwedel, formerly Soltwedel, was founded by the Saxons, and was from 1070 to 11 70 the capital of the old or north Mark, also for a time called trie ” mark of Soltwedel,” the kernel of Brandenburg-Prussia. The old castle, perhaps founded by Charlemagne, was purchased in 1864 by the king of Prussia. Salzwedel was also a member of the Hanseatic League, and at the beginning of the 16th century seems to have transacted a great part of the inland commerce of North Germany.

See Pohlmann, Geschichte der Stadt Salzwedel (Halle, 181 1), and Danneil, Geschichte der koniglichen Burg zu Salzwedel (Salzwedel,

1865).

SAMAIN, ALBERT VICTOR (1858-1900), French poet, was born at Lille on the 4th of April 1858. He was educated at the lycee of that town, and on leaving it entered a bank as a clerk. He enjoyed no literary associations, and his talent developed slowly in solitude. About 1884 Samain went to Paris, having

obtained a clerkship in the Prefecture de la Seine, which he held for most of his life. He presently began to send poems to the Mercitre de France, and these attracted attention. In 1893 he allowed a friend to print his earliest volume of poems, Au Jardin de I’ infante, in a very small edition. This led to the sudden recog- nition of his talent, and to applause from critics of widely different schools. In 1897 this book was reprinted in a more popular form, with the addition of a section entitled L’Urne penchee. Samain’s second volume, Auxflancs du vase, appeared in 1 898. His health began to fail and he withdrew to the

country, where he died, in the neighbourhood of the village of Magny-les- Hameaux, on the 18th of August 1900. A third volume of his poems, Le Chariot d'or, appeared after his death, with a lyrical drama, Polyph'eme (rooi), which was produced at the Theatre de l'CEuvre in 1904. The fame of Samain rapidly advanced when he was dead, and the general public awakened to the fact that this isolated writer was a poet of rare originality. He cultivated a delicate, languid beauty of imagery and an exquisite sense of verbal melody without attempting any revolution in prosody or identifying himself with any theory. Samain had no great range of talent, nor was he ambitious of many effects. Samain's natural life was patiently spent in squalid conditions; he escaped from them into an imaginative world of the most exquisite refinement. He has been compared to Watteau and Schumann; in his own art he bore some resemblance to Charles Baudelaire, and to the English poet Arthur O'Shaughnessy.

See also R. Doumic, " Trois Poetes," in the Revue des deux mondes (Oct. 1900); L. Bocquet, Albert Samain, sa vie, son muvre (1905); and E. W. Gosse, French Profiles (1905). (E. G.)

SAMANA RANGE, a mountain ridge in Kohat district of the N.W. Frontier Province of India, commanding the S. boundary of Tirah. The ridge lies between the Khanki Valley on the N. and the Miranzai Valley on the S., and extends for some 30 m. W. from Hangu to the Samana Suk. It is some 6000 to 7000 ft. high. Beyond the Samana Suk lies the pass, known as the Chagru Kotal, across which the Tirah Expedition marched in 1897. On the opposite hill on the other side of this road is the famous position of Dargai (see Tirah Campaign). After the Miranzai Expedition of 1891 this range was occupied by British troops and eleven posts were established along its crest, the two chief posts being Fort Lockhart and Fort Gulistan. In 1897 all the forts on the Samana were attacked by the Orakzais, and this and the Afridi attack on the Khyber Pass were the two chief causes of the Tirah Expedition. When Lord Curzon reorganized the frontier in 1900, British garrisons were withdrawn from the Samana forts, which are now held by a corps of tribal police 450 strong, called the Samana Rifles.

SAMANIDS, the first great native dynasty which sprang up in the 9th century in E. Persia, and, though nominally provincial governors under the suzerainty of the caliphs of Bagdad, suc- ceeded in a very short time in establishing an almost independent rule over Transoxiana and the greater part of Persia. Under the caliphate of Mamun, Saman, a Persian noble of Balkh, who was a close friend of the Arab governor of Khorasan, Asad b. Abdallah, was converted from

Zoroastrianism to Islam. His son Asad, named after Asad b. Abdallah, had four sons who rendered distinguished services to Mamun. In return they all received provinces: Nuh obtained Samarkand; Ahmad, Ferghana; Yahya, Shash; Ilyas, Herat. Of these Ahmad and his second son Isma'il overthrew the Saffarids (q-v.) and the Zaidites of Tabaristan, and thus the Samanids established themselves with the sanction of the caliph Motamid in their capital Bokhara.

The first ruler (874) was Nasr I. (Nasr or Nasir b. Ahmad b. Asad. b. Saman). He was succeeded by his brother Isma'il b. Ahmad (892). His descendants and successors, all renowned for the high impulse they gave both to the patriotic feelings and the national poetry of modern Persia (see Persia: Literature), were Ahmad b. Isma'il (907-913); Nasr II. b. Ahmad, the patron and friend of the great poet Rudagi (913-942) ; Nuh I- b. Nasr (942-954) ; Abdalmalik I. b. Nuh (954-961); Mansur I. b. Nuh. whose vizier Bal'aml translated Tabari's universal history into Persian (961- 976); Nuh II. b. Mansur, whose court-poet Daqiqi (DaV'rip) began the Shahnama (976-997); Mansur II. b. Nuh (997-ˆ99) I and Abdalmalik II. b. Nuh (999), under whom the Samanid dynasty

was conquered by the Ghaznevids. The rulers of this powerful house, whose silver dirhems had an extensive currency during the loth century all over the N. of Asia, and were brought, through Russiancaravans, even so far as to Pomerania, Sweden and Norway, where Samanid coins have been found in great number, were in their turn overthrown by a more youthful and vigorous race, that of Sabuktagln, which founded the illustrious Ghaznevid dynasty and the Mussulman empire of India. Under Abdalmalik I. a Turkish slave, Alptagin, had been entrusted with the government of Bok- hara, but, showing himself hostile to Mansur I., he was compelled to fly and to take refuge in the mountainous regions of Ghazni, where he soon established a semi-independent rule, to which, after his death in 977 (367 a.h.), his son-in-law Sabuktagin, likewise a former Turkish slave, succeeded. Nuh II., in order to retain at least a nominal sway over those Afghan territories, confirmed him in his high position and even invested Sabuktagln's son Mahmud with the governorship of Khorasan, in reward for the powerful help they had given him in his desperate struggles with a confederation of dis- affected nobles of Bokhara under the leadership of Fa'iq and the troops of the Dailamites, a dynasty that had arisen on the shores of the Caspian Sea and wrested already from the hands of the Samanids all their western provinces. Unfortunately, Sabuktagin died in the same year as Nuh II. (997, 387 a.h.) ; and Mahmud {q,v.), confronted with an internal contest against his own brother Isma'il, had to withdraw his attention for a short time from the affairs in Khorasan and Transoxiana. This

interval sufficed for the old rebel leader Fa'iq, supported by a strong Tatar army under the Ilek Khan Abu'l Hosain Nasr I., to turn Nuh's successor Mansur II. into a mere puppet, to concentrate all the power in his own hand, and to induce even his nominal master to reject Mahmfld's application for a continuance of his governorship in Khorasan. Mahmfld refrained for the moment from vindicating his right; but, as soon as, through court intrigues, Mansur II. had been dethroned, he took possession of . Khorasan, deposed Mansur's successor Abdalmalik II., and assumed as an independent monarch for the first time in Asiatic history the title of " sultan." The last prince of the house of Saman, Montasir, a bold warrior and a poet of no mean talent, carried on for some years a kind of guerilla warfare against both Mahmud and the Ilek Khan, who had occupied Transoxiana, till he was assassinated in 1005 (395 a.h.). Transoxiana itself was annexed to the Ghaznevid realm eleven years later, 1016 (407 a.h.).

See S. Lane Poole, Mahommedan Dynasties (1894), pp. 131-133; Stockvis, Manuel d'histoire (Leiden, 1888), vol. i. p. 113; also articles Caliphate and Persia : History, section B, and for the later period Mahmud, Seljuks, Mongols.

SAMANIEGO, FELIX MARIA, DE (1745-1801), Spanish fabulist, was born at Laguardia (Alava) on the 1 2th of October 1745, and was educated at Valladolid. A government appoint- ment was secured for him by his uncle the count de Pefiaflorida. His Fdbulas (1781-1784), one hundred and fifty-seven in number, were originally written for the boys educated in the school founded by the Biscayan Society. In the first instalment of his fables he admits that he had taken Iriarte for his model, a statement which proves that he had read Iriarte's fables in manuscript; he appears, however, to have resented their publication in 1782, and this led to a rancorous controversy between the former friends. Samaniego holds his own in the matters of quiet humour and careless grace, and his popularity continues. He died at Laguardia on the nth of August 1801.

SAMARA, a government of S.E. Russia, on the W. side of the lower Volga, bounded on the N. by the governments of Kazan and Ufa, on the W. by Simbirsk and Saratov, on the E. by Ufa and Orenburg, and on the S. by Astrakhan, the Kirghiz Steppes and the territory of the Ural Cossacks. The area is 58,302 sq. m., and the population, in 1897, 2,763,478. A line drawn E. from the great bend of the Volga — the Samarskaya Luka — would divide the government into two parts, differing in orographical character. In the N. are flat hills and plateaus intersected by deep rivers. In their highest parts these elevations rise about 1000 ft. above the sea, while the level of the Volga at Samara is

only 43 ft. S. of the Samarskaya Luka the country assumes the character of a low, flat steppe, recently emerged from the post-Pliocene Aral-Caspian basin. The government is built up chiefly of Carboniferous sandstones, conglomerates, clay slates and limestones, representing mostly deep-sea deposits. The Permian formation appears along the rivers Sok and Samara, and is represented by limestones, sands and marls contain- ing gypsum, all of marine origin, and by continental deposits dating from the same period; sandstones impregnated with petroleum also occur. In the N. these deposits are covered with

" variegated marls " and with a variety of Triassic, Jurassic and Cretaceous deposits. The Tertiary formation (Eocene) appears only at Novo-uzensk; the remainder of a vast sheet of this formation, which at one time covered all the region between the Volga and the Urals, was removed during the Glacial period. Post-Tertiary Caspian deposits penetrate far into the government along the main valleys, and a thick layer of loess occurs in the N. Selenites, rock-crystal and agates are found, as also copper ores, rock-salt and sandstone extracted for building purposes. The soil is on the whole very fertile. All the N. of the government is covered with a thick sheet of black earth; this becomes thinner towards the S., clays — mostly fertile — cropping out from under- neath it; salt clays appear in the S.E.

Samara is inadequately drained, especially in the S. The Volga flows for 550 m. along its W. border. Its tributaries, the Great Cheremshan (220 m.), the Sok (195 m.), the Samara (340 m.), with its tributaries, are not navigable, partly on account of their shallowness and partly because of water-mills. When the water is high, boats can penetrate up some of them 15 to 30 m. The Great Irgiz alone, which has an exceedingly winding course of 335 m., is navigated to Kushum, and rafts are floated from Nikolayevsk. The banks of both Karamans are densely peopled. The Great and Little Uzefi drain S.E. Samara and lose themselves in the Kamysh sands before reaching the Caspian. Salt marshes occur in the S.E.

The whole of the region is rapidly drying up. The forests, which are disappearing, are extensive only in the N. Altogether they cover 8% of the surface; prairie and grazing land occupies 32%, and 12% is uncultivable.

The climate is one of extremes, especially in the steppes, where the depressing heat and drought of summer are followed in winter by severe frosts, often accompanied by snowstorms. The average temperature at Samara (53° n' N.) is only 39°-2 (January, o°-3; July, 7o°-4).

The population, which was 1,388,500 in 1853, numbered 2,763,478 in 1897, of whom 1,398,263 were women and 159,485 lived in towns. The estimated pop. in 1906 was 3,276,500. Great and Little Russians formed 69% of the inhabitants; Mordvinians 8-6%, Chuvashes and Votiaks 2-3%, Germans 8-i%, Tatars 3-6% and Bashkirs 2%. The Great Russians immigrated in compact masses. A special feature of Samara is its German colonists, from Wurttemberg, Baden, Switzerland and partly also from Holland and the Palatinate, whose immigra- tion dates from the time of Catherine II. in 1762. Favoured as they were by free and extensive grants of land, by exemption from military service and by self-government, they have developed into wealthy colonies of Roman Catholics, Protestants, Unitarians, Anabaptists, Moravians and Mennonites. As regards religion, the great bulk of the population are Orthodox Greeks; the Nonconformists, who are settled chiefly on both the rivers Uzefi, number officially 100,000, but their real numbers are higher; next come Mahommedans, 12%; various Protestant sects, 5%; "Roman Catholics, about 2%;' and some 4000 pagans. ' ' *

The chief occupation is agriculture — wheat, rye, oats, millet, oil-yielding plants, potatoes and tobacco being the principal crops. Owing to its great fertility, Samara usually has a surplus of grain for export, varying from ij to 4 million quarters (ex- clusive of oats) annually. Notwithstanding this production, the government is periodically liable to famine to such an extent that men die by thousands of hunger-typhus, or are forced to go by thousands in search of employment on the Volga. The population have no store of corn, or reserve capital for years of scarcity, and some 210,000 males have each an average of only four acres of arable and pasture land. But even this soil, al-though all taxed as arable, is often of such quality that only 50% to 55% of it is under crops, while the peasants are compelled to rent from two to two and a half million acres for tillage from large proprietors. Over 85 million acres, or not far short of one-quarter of the total area of the government, purchased from the crown or from the Bashkirs — very often at a few pence per acre — are in the hands of no more than 1704 persons. The

general impoverishment may be judged from the death-rate, 46 to 48 per thousand. Out of the total area, 4,143,800 acres belong to the crown, 7,979,000 to private persons and 22,486,700 acres to the

peasants, who rent, moreover, about 6j million acres. Water melons and sunflowers are extensively cultivated, and gardening is widely engaged in; mustard and inferior qualities of tobacco are grown. Hemp-seed, linseed, and other oil-seeds and bran are exported, as well as cereals and flour. Livestock are extensively bred. Bee-keeping is another pursuit that is widely followed. The export of poultry, especially of geese, has increased greatly. The principal manufactures are Hour- mills, tanneries, distilleries, candle and tallow works, breweries and sugar refineries. Petty domestic industries, especially the weaving of woollen cloth, are carried on in the S. Both the external and the internal trade are very flourishing, nearly 250 fairs being held in the government every year; the chief are those at Novo-uzensk and Bugulma. Owing to the efforts of the local zemslvos there are more than the average number of primary schools, namely, one for every 1810 inhabitants. The govern- ment is divided into seven districts, the chief towns of which are Samara, Bugulma, Buguruslan, Buzuluk, Nikolayevsk, Novo-Uzen and Stavropol. The Sergiyevsk sulphurous mineral springs, 57 m. from Buguruslan, are visited by numbers of patients.

The territory now occupied by Samara was until the 18th century the abode of nomads. The Bulgarians who occupied it until the 13 th century were followed by Mongols of the Golden Horde. The Russians penetrated thus far in the 16th century, after the conquest of the principalities of Kazan and Astrakhan. To secure communication between these two cities, the fort of Samara was erected in 1586, as well as Saratov, Tsaritsyn and the first line of Russian forts, which extended from Byelyi-yar on the Volga to the neighbourhood of Menzelinsk near the Kama. In 1670 Samara was taken by the insurgent leader Stenka Razin. In 1732 the line of forts was removed a little farther E., and the Russian colonists advanced E. as the forts were pushed forwards. In 1762, on the invitation of Catherine II., emigrants from various parts of Germany settled in this region, as also did the Raskolniks, whose communities on the Irgiz became the centre of a formidable insurrection in 1775 under Pugachev. At the end of the 18th century Samara became an important centre for trade. In the first half of the 19th century the region was rapidly colonized by Great and Little Russians. In 1847-1850 the government introduced about 120 Polish families; in 1857- 1859 Mennonites from Danzig founded settlements; and in 1859 a few Circassians were brought hither by government; while the influx of Great Russian peasants still goes on.

(P. A. K.; J. T. BE.)

SAMARA, a town of E. Russia, capital of the government of the same name, 305 m. by river S.S.E of Kazan and 261 m. by rail W.N.W of Orenburg. Its population, which was 63,479 in 1883, numbered 91,672 in 1897. Owing to its situation on the left bank of the Volga, at the convergence of the Siberian and Central Asian railways, it has great commercial importance, especially as a depot for cereals and a centre for flour-milling. A considerable trade is also carried on in animal products, par- ticularly hides. The other industries include iron-foundries, soap, candles, vehicles and glue factories, cooperages, tanneries, breweries and brick-works. The port is the best on the Volga. Three great fairs are held every year. The city, which gives title to a bishop of the Orthodox Greek Church, has three cathedrals, built in 1685, 1730-1735 and 1894 respectively, three public libraries, and a natural history and archaeological museum. It is famous for its kumis (mare's milk) cures. Its foundation took place in 1 586-1 59 1 for the purpose of protecting the Russian frontier against the Bashkirs, the Kalmucks and the Nogai Tatars.

SAMARIA, an ancient city of Palestine. The name Samaria is derived through the Gr. 2a/udp€ia from the Hebrew frqV, " an outlook hill," or rather from the Aramaic form \r®f, whence also comes the Assyrian form Samirina. According to 1 Kings xvi. 24, Omri, king of Israel, bought Samaria from a

certain Shemer (whose name is said to be the origin of that of the city), and transferred thither his capital from Tirzah. But the city, as a superficial inspection of the site shows, must have existed as a settlement long before Omri, as potsherds of earlier date lie scattered on the surface. The city was occupied by Ahab, who here built a temple to " Baal " (1 Kings xvi. 32) and a palace of ivory (1 Kings xxii. 39). It sustained frequent sieges during the troubled history of the Israelite kingdom. Ben-Hadad II. of Syria assaulted it in the reign of Ahab, but was repulsed and obliged to allow the Israelite traders to establish a quarter in Damascus, as his predecessor Ben-Hadad I. had done in Samaria (f Kings xx. 34). Ben-Hadad II. in the time of Jehoahaz again besieged Samaria, and caused a famine in the city; but some panic led them to raise the siege (2 Kings vi., vii.). The history of the city for the following 120 years is that of Israel (see Jews).

In 727 died Tiglath-Pileser, to whom the small kingdoms of W. Asia had been in vassalage; in the case of Israel at least since Menahem (2

Kings xv. 19). He was succeeded by Shal- maneser IV., and the king of Israel, with the rest, attempted to revolt. Shalmaneser accordingly invaded Syria, and in 724 began a three-years' siege of Samaria (2 Kings xvii. 5). He died before it was completed, but it was finished by Sargon, who reduced the city, deported its inhabitants, and established within it a mixed multitude of settlers (who were the ancestors of the modern Samaritans). These people themselves seem to have joined a revolt against the Assyrians, which was soon quelled. The next event we hear of in the history of the city is its conquest by Alexander the Great (331 B.C.), and later by Ptolemy Lagi and Demetrius Poliorcetes. It quickly recovered from these injuries: when John Hyrcanus besieged it in 120 B.C. it was " a very strong city " which offered a vigorous resistance (Jos. Ant. xiii. x. 2). It was rebuilt by Pompey, and restored by Aulus Gabinius: but it was to Herod that it owed much of its later glory. He built a great temple, a hippodrome and a street of columns surrounding the city, the remains of which still arrest the attention. It was renamed by him Sebasle, in honour of Augustus: this name still survives in the modern name Sebusteh. 1 Philip here preached the gospel (Acts viii. 5) . The rise of Neapolis (Shechem) in the neighbourhood caused the decay of Sebaste. It was quite small by the time of Eusebius. The crusaders did some- thing to develop it by establishing a bishopric with a large church, which still exists (as a mosque) ; here were shown the tombs of Elisha, Obadiah and St John the Baptist. From this time onward the village dwindled to the poor dirty place it is to-day.

The site of Samaria is an enormous mound of accumulation, one of the largest in Palestine. In some places it is estimated the debris is at least 40 ft. deep. The crusaders' church remains almost intact, and numerous fragments of carved stone are built into the village houses, beneath which in some places are some interesting tombs. The hippodrome remains in the valley below, and the columns of the street of columns are in very good order. The walls can be traced almost all round the town: at the end of the mound opposite the modern village are the dilapidated ruins of a large gate. The site stands in the very centre of Palestine, and, built on a steep and almost isolated hill, with a long and spacious plateau for its summit, is naturally a position of much strength, commanding two of the most important roads — the great N. and S. road which passes immediately under the E. wall, and the road from Shechem to the maritime plain which runs a little to the W. of the city. The hill of Samaria is separated from the surrounding mountains (Amos iii. 9) by a rich and well-watered plain, from which it rises in successive terraces of fertile soil to a height of 400 or 500 ft. Only on the E. a narrow saddle, some 200 ft. beneath the plateau, runs

across the plain towards the mountains; it is at this point that the traveller coming from Shechem now ascends the hill to the village of Sebusteh, which occupies only the extreme E. of a terrace beneath the hill-top, behind the crusaders' church, which is the first thing that attracts the eye as one approaches the town. The hiil-top, the longer axis of which runs W. from the village, rises 1450 ft. above the sea, and commands a superb view towards the Mediterranean, the mountains of Shechem and Mount Hermon. Excavations under the auspices of Harvard University began here in 1908. (R. A. S. M.)

1 Accentuated on the second syllable. Guide- and travel-books generally spell the name Sebastlyeh, which is not a correct rendering of the local pronunciation.

SAMARITANS. This term, which primarily means " in- habitants of Samaritis, or the region of Samaria," is specially used, in the New Testament and by Josephus, as the name of a peculiar religious community which had its headquarters in the Samaritan country, and is still represented by a few families at Nablus, the ancient Shechem. By the Jews they are called Shomronim, a gentilic form from Shomron = Samaria; among themselves they sometimes use the name Shemerem (=Heb. Shomerim) which is explained to mean " Keepers," sc. of the Law, but they usually style themselves " Israel " or " Children of Israel." They claim to be descendants of the ten tribes, and to possess the orthodox religion of Moses, accepting the Pentateuch and transmitting it in a Hebrew text which for the most part has only slight variations from that of the Jews. But they regard the Jewish temple and priesthood as schis- matical, and declare that the true sanctuary chosen by God is not Zion but Mount Gerizim, over against Shechem (St John iv. 20). The sanctity of this site they prove from the Pentateuch, reading Gerizim for Ebal in Deut. xxvii. 4. With this change the chapter is interpreted as a command to select Gerizim as the legitimate sanctuary (cf. verse 7). Moreover, in Exod. xx. 17 and Deut. v. 21 a commandment (taken from Deut. xxvii.) is found in the Samaritan text, at the close of the decalogue, giving directions to build an altar and do sacrifice on Gerizim, from which of course it follows that not only the temple of Zion but the earlier shrine at Shiloh and the priesthood of Eli were schismaticaL Such at least is the express statement of the later Samaritans: in earlier times, as they had no sacred books except the Penta- teuch, they probably ignored the whole history between Joshua and the captivity, thus escaping many difficulties.

According to modern views the books of Moses were not reduced to their present form till after the exile, when their regulations were

clearly intended to apply to the rebuilt temple of Zion. The Samaritans must in that case have derived their Pentateuch from the Jews after Ezra's reforms of 444 B.C. Before that time Samaritanism cannot have existed in the form in which we know it, but there must have been a community ready to accept the Pentateuch. The city of Samaria had been taken by Assyria (2 Kings xvii. 6 sqq. and xviii. 9-11) in 722 B.C., and the inhabitants deported, but in point of fact the district of Mount Ephraim was not entirely stripped of its old Hebrew population by this means. In the Annals of Sargon the number of the exiles is put at 27,290, representing no doubt the more prominent of the inhabitants, for this number cannot include the whole of N. Israel. The poorer sort must have remained on the land, and among them the worship of Jehovah went on as before – at the old shrines of N. Israel, but probably corrupted by the religious rites of the new settlers. The account of the country given in 2 Kings xvii. 25 seq. dwells only on the partial adoption of Jehovah-worship by the foreigners settled in the land, and by no means implies that these constituted the whole population. Josiah extended his reforms to Bethel and other Samaritan cities (2 Kings xxiii. 19), and the narrative shows that at that date things were going on at the N. sanctuaries much as they had done in the time of Amos and Hosea. To a considerable extent his efforts to make Jerusalem the sanctuary of Samaria as well as of Judah must have been successful, for in Jer. xli. 5 we find fourscore men from Shechem, Shiloh and Samaria making a pilgrimage to " the house of Jehovah," after the catastrophe of Zedekiah. It is therefore not surprising that the people of this district came to Zerubbabel and Jeshua after the restoration, claiming to be of the same religion with the Jews and asking to be associated in the rebuilding of the Temple. They were re- jected by the leaders of the new theocracy, who feared the result of admitting men of possibly mixed blood and of certainly questionable orthodoxy; and so the Jehovah-worshippers of Samaria were driven to the ranks of " the adversaries of Judah and Benjamin " (Ezra iv.). Nevertheless, down to the time of Nehemiah, the breach was not absolute; but the expulsion from Jerusalem in 432 B.C. of a man of high-priestly family (Neh. xiii. 28), who had married a daughter of Sanballat, made it so. It can hardly be doubted that this priest is the Manasseh of Josephus

(Ant. xi. 8), who carried the Pentateuch to Shechem, and for whom the temple of Gerizim was perhaps built. For, though the story in Josephus is put a century too late and is evidently based on a

confusion, it agrees with Neh. xiii. in essentials too closely to be altogether rejected, 1 and supplies exactly what is wanted to explain the existence in Shechem of a community bitterly hostile to the Jews, yet constituted in obedience to Ezra's Pentateuch.

It is remarkable that, having got the Pentateuch, they followed it with a fidelity as exact as that of the Jews, except in regard to the sanctuary on Mt Gerizim. The text of the sacred book was transmitted with as much conscientiousness as was observed by Jewish scribes; 2 and even from the unwilling witness of the Jews 3 we gather that they fulfilled all righteousness with scrupulous punctiliousness so far as the letter of the law was concerned. They did not however, receive the writings even of the prophets of N. Israel (all of which are preserved to us only by the Jews) nor the later oral law 4 as developed by the Pharisees.

But although these differences separated the two communities, their internal development and external history ran parallel courses till the Jewish state took a new departure under the Maccabees. The religious resemblance between the two bodies was increased by the institution of the synagogue, from which there grew up a Samaritan theology and an exegetical tradition. The latter is embodied in the Samaritan Targum, or Aramaic version of the Pentateuch, which in its present form is probably not much earlier than the 4th century a.d., but in general is said to agree with the readings of Origen's to Xanapevrutov. Whether the latter represents a complete translation of the Law into Greek may be doubted, but at any rate the Samaritans began already in the time of Alexander to be influenced by Hellenism. They as well as Jews were carried to Egypt by Ptolemy Lagi, and the rivalry of the two parties was continued in Alexandria (Jos. Ant. xii. 1.1), where such a translation may have been produced. Of the Samaritan contributions to Hel- lenistic literature some fragments have been preserved in the remains of Alexander Polyhistor. 5

'There are, however, many difficulties in the story, which is not rendered clearer by references to Sanballat in the documents from Elephantine (dated in 408/407 B.C.) published by Sachau in the Abhandlungen d. Kgl. preuss. Akad. d. Wiss. for 1907.

2 This appears by the frequent agreement of the Samaritan Pentateuch with the Septuagint. The Samaritan character is an independent development of the old Hebrew writing, as it was about the time when they first got the Pentateuch, and this in iUelf is an indication that from the first their text ran a separate course. Differences between MSS. existed down to the time of the Massoretes (see art. Hebrew),

and it was from one of these divergent texts that the Samaritan was derived, the Septuagint from another. But while the Jews constantly revised their text with skill and success, the rigid conservatism of the Samaritans prevented any changes except the corruptions naturally due to human infirmity. The story that they possess a copy of the Law written by Abisba, the great-grandson of Aaron, seems to have aroused a strangely widespread interest, so that tourists invariably ask to see it and usually claim to have succeeded in doing so. Considering the extreme reverence with which it is regarded, it may safely be said that this manuscript is never shown to them. The origin of the legend is no doubt due to a pious fraud. It is first mentioned by Abu‘1-fatb in 1355, from which year its ” invention ” dates. Obviously an old copy would be chosen for the purpose of such a discovery, but it is unlikely to be earlier than the 10th or nth century a.d.

3 Not, indeed, without exceptions, nor at all periods, but such is the general intention of the Massekheth Kuthim; see Montgomery, Samaritans, cap. x.

4 For details see Nutt, Fragments, p. 37, and more fully, Mont- gomery, I.e. No doubt, in addition to the legal ordinances, the Samaritans retained sx > me ancient traditional practices (cf. Gaster in Transactions of the 3rd Internat. Congr. for the History of Religions, i. p. 299, Oxford, 1908), or introduced some new observances. Their Passover, for instance, has some peculiar features, one of which, the application of the sacrificial blood to the faces of the children, has a parallel in the old Arabic ‘aqiqah. See the account of an eye- witness (Professor Socin) in Baedeker’s Palestine; Mills, Three Months’ Residence at Nablus (London, 1864), p. 248; Stanley, The Jewish Church i. app. iii.

6 Chiefly in quotations by Eusebius (Praep. Ev., ed. Gifford, Oxon., 1903, bk. ix. 17). See Freudenthal, Hellenistische Studien, i., ii. (Breslau, r875); Schiirer, History of the Jewish People in the Time of Jesus Christ (Eng. ed., 1891), ii. 3. p. 197.

The troubles that fell upon the Jews under Antiochus Epi- phanes were not escaped by the Samaritans (2 Mace. v. 23; vi. 2), for the account in Josephus (Ant. xii. 5. 5), which makes them voluntarily exchange their religion for the worship of the Grecian Zeus, is evidently coloured to suit the author’s hostility. Under the Maccabees their relations with Judaea became very bitter. They suffered severely at the hands of Hyrcanus, and the temple on Mt Gerizim was destroyed. Although this treat- ment established an unalterable enmity to the Jews, as we see in the New Testament, in Josephus and in

Jewish tradition, the two sects had too much in common not to unite occasionally against a common enemy, and in the struggles of the Jews with Vespasian the Samaritans took part against the Romans. They were not, however, consistent, for under Hadrian they helped the Romans against the Jews and were allowed to rebuild their temple on Mt Gerizim. They seem to have shared in the Jewish dispersion, since in later times we hear of Samaritans and their synagogues in Egypt, in Rome and in other parts of the empire. In the 4th century they enjoyed a certain degree of prosperity, according to their own chronicles, under Baba the Great, who (re-) established their religious and social organization. In 484, in consequence of attacks on the Christians, the Gerizim temple was finally destroyed by the Romans,' and an insurrection in 529 was suppressed by Justinian so effectively that, while retaining their distinctive religion, they became henceforth politically merged in the surrounding population, with a merely domestic history. They are mentioned in later times by the Jewish travellers Benjamin of Tudela (n 73) and Obadiah Bertinoro (1488 in Egypt), by Sir John Maundeville and others, but little was known of them in Europe till Scaliger opened communications with them in 1583. 6 In consequence of the interest thus aroused, the traveller Pietro della Valle visited them in 161 6 and succeeded in obtaining a copy of their Pentateuch and of their Targum. Towards the end of the same century Robert Huntington (after- wards bishop of Raphoe), who was chaplain to the Turkey merchants at Aleppo, interested himself in them 7 and acquired some interesting manuscripts now in the Bodleian Library at Oxford. Since his time there has been intermittently a good deal of correspondence with them, 8 and in recent years owing to the increased facilities for travelling they have been much visited by tourists, not altogether for their good, as well as by scholars. At the present day they live only at Nablus. (Shechem), about 150 in number, the congregations formerly existing in Gaza, Cairo, Damascus and elsewhere having long since died out. Politically they are under the Turkish governor of Nablus; their ecclesiastical head is the " Priest-levite " (in rpoo Jacob b. Aaron), who claims descent from Uzziel the younger son of Kohath (Exod. vi. 18). The line of the high-priests, so called as being descended from Aaron, became extinct in 1623.

In religion, since they recognize no sacred book but the Pentateuch, they agree with the Jews in such doctrines and observances only as are enjoined in the law of Moses. They do not therefore observe the feast of Purim, nor the fast of the 9th of Ab, nor any of the later rabbinical extensions or modifications of the law. It is this con- servatism which has caused them to be confused with the Sadducees,

who likewise rejected the later traditional teaching; but it is not correct to say that they deny the resurrection (as Epiphanius, Haeres. ix., and others) and the existence of angels (Leontius, de Sectis, ii. 8), or that they are entirely free from later religious de- velopments. Briefly summarized, their creed is as follows: (a) God is one, and in speaking of Him all anthropomorphic expressions are to be avoided: creation was effected by his word: divine appearances in the Pentateuch are to be explained as vicarious, by means of angels (so as early as the 4th century a.d.) ; (b) Moses is the only prophet: all who have since claimed to be so are deceivers; (c) the Law, which was created with the world, is the only divine revelation; (d) Mt Gerizim is the house of God, the only centre of worship; (e) there will be a day of judgment. Closely connected with this are the doctrines (also found in the 4th century) of a future life and of a messiah (Ta'eb), who shall end the period of God's displeasure (Fanuta) under which his people have suffered since the schism of Eli and the disappearance of the Ark, and shall restore Israel to favour (Re'uta, Ridwan).

6 See Eichhorn's Repertorium, xiii. p. 257.

7 See his letters ed. by T. Smith (London, 1704).

8 See especially de Sacy in Notices et extraits, xii. The later letters are of less interest.

SAMARIUM— SAMARKAND

in

The Samaritan language properly so called is a dialect of Palestinian Aramaic, of which the best examples are found in the literature of the 4th century a.d. An archaic alphabet, derived from the old Hebrew, was retained, and is still used by them for writing Aramaic, Hebrew and sometimes even Arabic. After the Moslem conquest of Syria in 632 the native dialect of Aramaic gradually died out, and by the nth century Arabic had become the literary as well as the popular language In the Liturgy Hebrew was no doubt used from the earliest times side by side with Aramaic, and after the nth century it became, in a debased form, the only language for new liturgical compositions.

The literature of the Samaritans is, like that of the Jews, almost entirely of a religious character Reference has been made above to Samaritan Hellenistic works which have perished except for a few fragments. According to Samaritan tradition, their books were destroyed under Hadrian and Commodus, but of the language and

contents of them nothing is recorded There can be no doubt that some, perhaps much, of the literature has been lost, for nothing r is extant which can be dated before the 4th century a.d The Targum, or Samaritan-Aramaic version of the Pentateuch was most probably written down about that time, though it was clearly based on a much older tradition and must have undergone various recensions. To the same period belong the liturgical compositions of Amram Darah and Marqah, and the latter's midrashic commentary (called the " Book of Wonders ") on parts of the Pentateuch, all in Aramaic. With the possible exception of one or two hymns there is nothing further till the nth century when there appears the Arabic version of the Pentateuch, usually ascribed to Abu Sa'id, but perhaps really by Abu'l-hasan 2 of Tyre, who also wrote three Arabic treatises, still extant, on theological subjects, besides some hymns. Of the same date (1053) is an anonymous commentary 3 on Genesis, preserved in the Bodleian Library at Oxford (MS. Opp. add. 4 , 99), interesting because it quotes from books of the Bible other than the Pentateuch. In the 12th century, Munajja 4 and his son Sadaqah wrote on theologv; the earlier part of the chronicle called al-Taulidah 6 was compiled, in Hebrew (1149); and about the same time treatises on Grammar 6 by Abu Sa'id and Abu Ishaq Ibrahim ibn Faraj. The next 100 years were rather barren. Ghazal ibn-al-Duwaik, who wrote on the story of Balak and on the restoration of the kingdom to Israel, is said to have lived in the 13th century, and another chronicle (in Arabic), called the Book of Joshua, is dated about the same time by T. W. J. Juynboll. 7 In the second half of the 14th century lived three important liturgical writers, Abisha b. Phinehas (ob. 1376), Abdallah b. Solomon and Sa'd-allah (or Sa'd-ed-din) b. Sadaqah: Abu'1-fath, who composed his chronicle 8 in 1355: a high priest Phinehas, author of a lexicon: and the anonymous writer of the commentary on the Kitab al-asatir, 9 a work, ascribed to Moses, containing legends of the Patriarchs. Another famous liturgist Abraham Qabazi lived in the early part of the 16th century, and. his pupil Isma'il Rumaihi in 1537 wrote a work on the praise of Moses. Probably about the same time, or a little later, is another anonymous commentary on Genesis in the Huntington Collection in the Bodleian Library (MS. Hunt. 301). Several members of the Danfi family were prominent in the 18th century as liturgists, among them Abraham b. Jacob, who also wrote a commentary 10 on Gen.-Num., and of the levitical family Ghazal ibn Abi Sarur, who commented on Gen.-Exod. Another Ghazal (=Tabiah n. Isaac), priest-levite, who died in 1786, was a considerable writer of liturgy. Subsequent authors are few and of little interest. Mention need only be made of the chronicle u written (i.e. compiled) in Hebrew by Ab Sakhwah (= Murjan 12) b. As'ad, of the Danfi family, in 1900,

chiefly on the basis of al-Taulidah and Abul-fath; an Arabic chronicle 13 by Phinehas b. Isaac (ob.

1 Except, of course, the Pentateuch itself (see Bible) which cannot be properly regarded as a Samaritan work.

2 So Kahle, see the bibliography.

3 See Xeubauer in Journ. asiat. (1873), p. 341.

4 See Wreschner, Samaritanische Traditionen (Berlin, 1888).

6 Ed. by Neubauer in Journ. asiat. (1869). The chronicle was continued in 1346, and was subsequently brought down to 1856-1857 bv the present priest.

6 See Noldcke, Gbtt. Gel. Nachr. (1862), Nos. 17, 20.

7 Chronicon Sam. . . . Liber Josuae (Lugd. Bat., 1848). It narrates the history from the death of Moses to the 4th century a.d. and is derived from sources of various dates. A Hebrew book of Joshua announced by Gaster in The Times of June 9, 1908, and published in ZDMG, vol. 62 (1908) pt. ii., is a modern compilation; see Yahuda in Sitzgsber. d. Kgl. Preuss. Akad. (1908), p. 887j and Gastcr's reply in ZDMG, 62, pt. iii.

8 Ed. by Vilmar (Gotha, 1865). Partly translated by Payne Smith in Heidenheim's Vierteljahrsschrift, vol. ii.

9 Translated by Leitner in Heid. Viert. iv. 184, &c.

1!) An account of the work (of which the only MS. is in Berlin) was given by Geiger in ZDMG, xx. p. 143 and later. Parts of it were published as dissertations by Klumel in 1902 and Hanover 1904.

11 Ed. by E. N. Adler and M. Seligsohn in the Revue des etudes juives, vols. 44-46.

15 The same who compiled Caster's book of Joshua.

13 Mentioned by Yahuda, op. oil. p. 895, as existing in a Berlin MS.

1898) of the levitical family; and a theological work, 14 also in Arabic, by the present priest-levite, Jacob b. Aaron.

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1902).

. Texts: the Pentateuch in the Paris and London Polyglotts; separately by Blayney (Oxford, 1790). A critical edition is in prepara- tion by the Freiherr von Gall. Targum in the Polyglotts; reprinted in square character by Brilll (Frankfurt, 1874-1879); with critical apparatus by Petermann and Vollers (Berolini, 1872-1891); cf. also Nutt, op. cit.; Kohn, ” Zur Sprache . . . der Samaritaner,” pt. ii. (Leipzig, 1876) (in Abhandlungen f. d. Kunde d. Morgenlandes, v. 4); Kahle, Textkritische . . . Bemerkungen . . . (Leipzig, 1898) and Zeitsch. f. Assyr. xvi., xvii. Arabic version, ed. by Kuenen (Gen.- Lev.), Lugd. Bat. (1851); cf. Bloch, Die Sam.-arab. Pent.iiberset zung, Deut. i.xi. (Berlin, 1901); Kahle, Die arab. Bibeliibersetzungen (Leipzig, 1904) ; Heidenheim, Der Commentar Marqahs (Weimar, 1896). Parts also in dissertations by Baneth (1888), Munk (1890), Emmerich (1897), Hildesheimer (1898). Various texts and transla tions, mostly liturgical, in Heidenheim’s Deutsche Vierteljahrsschrift (Gotha, 1864-1865, Zurich 1867- ?) often incorrect, cf. Geiger in ZDMG, xvi.-xxii. Cowley, The Samaritan Liturgy (Oxford, 1909), text and introduction. For editions of other works see the foregoing footnotes. (A. Cy.)

SAMARIUM [symbol Sm, atomic weight 150-4 (0 = i6)], a rare. earth metal (see Rare Earths). The separation has been worked at by A. v. Welsbach, L. de Boisbaudran, Urbain and Lacombe {Comptes rendus, 1903, 137, pp. 568, 792); Demarcay (ibid. 1000, 130, p. 1019); Benedicks; Feit and Przibylla (Zeit. anorg. Chem., 1905, 43, p. 202) and others. The metal may be obtained by reduction of its oxide with magnesium. It combines with hydrogen. to form a hydride. The salts are mostly of a yellowish colour. Tht chloride, SmCIs. 6H 2 0,is a deliquescent solid which when heated in hydrochloric acid gas to 180 C. yields the anhydrous chloride. This anhydrous chloride is reduced to a lower chloride, of composition SmCl 2 , when heated to a high temperature in a current of hydrogen or ammonia (Matignon and Cazes, Comptes rendus, 1906, 142, p. 183). The chloride, SmCl 2 , is a brown crystalline powder which is decom- posed by water with liberation of hydrogen and the formation of the oxide, Sm 2 03, and an oxychloride, SmOCl. The fluoride, SmF3.H 2 0, was prepared by H. Moissan by acting with fluorine on’ the carbide. The sulphate, Sm 2 (SO

SAMARKAND, a province of Russian Turkestan, formerly Zarafshan or Zerafshan. It is the ancient Sogdiana and was known as Sughd to the Moslems of the middle ages. It has on the N. and N.E. the province of Syr-darya, on the E. Ferghana, on the W. Bokhara and on the S. the khanates of Hissar, Kara- teghin and Darvaz. Its area is 26,627 sq. m. It is very hilly in the S.,' where it is intersected by ranges belonging to the Alai system. The Hissar range is the water-parting between the Zarafshan and the upper tributaries of the Amu-darya; another high range, the Zarafshan, runs between the two parallel rivers, the Zarafshan and its tributary, the Yagnob; while a third range, often called the Turkestan chain, stretches W. to E. parallel to the Zarafshan, on its N. bank. It is very probable that the three ranges referred to really possess a much more complicated character than is supposed. All three ranges are snow-clad, and their highest peaks reach altitudes of 18,500 ft. in the W. and 22,000 ft. in the E., while the passes over them, which are difficult as a rule, lie at altitudes of 12,000 ft. Several Alpine lakes, such as Iskander-kul, 7000 ft. high, have been found under the precipitous peaks.

The Alpine zone extends as far N. as the 40th parallel, beyond which the province is steppe-land, broken by only one range of mountains, the Nuratyn-tau, also known as Sanzar and Malguzar in the S.E. and as Kara-tau in the N.W. This treeless range stretches 160 m. N.W., has a width of about 35 m. and reaches altitudes of 7000 ft. It is pierced, in the Sanzar gorge, or Tamer- lane's Gate, by the railway leading from Samarkand to Tashkent. 14 Translated in Bibliotheca sacra (1906), p. 385, &c.

The other mountains in the province are well wooded, and it is estimated that nearly 4,500,000 acres are under forests. The N.W. portion is occupied by the Famine Steppe — which probably might be irrigated — and by the desert of Kyzyl-kum. The Famine or Hungry Steppe (not to be confounded with another desert of the same name, the Bek-pak-dala, to the W. of Lake Balkash) occupies nearly 5,000,000 acres, covered with loess-like clay. In the spring the steppe offers good pasture-grounds for the Kirghiz, but the grass withers as summer advances. Nearly 1,500,000 acres might, however, be irrigated and rendered available for the cultivation of cotton; indeed a beginning has been made in that direction. The Kyzyl-kum .Steppe, 88,000 sq. m., is crossed by rocky hills, reaching an altitude of 3500 ft., and consists in part of saline clays, patches of prairie land and

sand. The sand is especially prevalent on the margin, where the moving barkhans (crescent-shaped sandhills) invade the Kara-kul oasis of Bokhara. The vegetation is very poor, as a rule; grass and flowers (tulips, Rheum, various U mbelliferae) only appear for a short time in the spring. The barkhans produce nothing except Haioxylon ammodendron, Poligonum, Halimodendron, Atraphaxis and other steppe bushes; occasionally Stipa grass is seen on the slopes of the sandhills, while Artemisia and Tamarix bushes grow on the more compact sands. Water can only be obtained from wells, sometimes 140 ft. deep. A few Kirghiz are the sole inhabitants, and they are only found in the more hilly parts.

The chief river is the Zarafshan, which, under the name of Mach, rises in the Zarav glacier in the Kok-su mountain group. Navigation is only possible by rafts, from Penjikent downwards. The river is heavily drawn upon for irrigation; and to this it probably owes its name (" gold-spreading ") rather than to the gold which is found in small quantities in its sands. Over 80 main canals (ariks) water 1200 sq. m. in Samarkand, while 1640 sq. m. are watered in Bokhara by means of over 40 main canals. Beyond Lake Kara-kul it is lost in the sands, before reaching the Amu-darya to which it was formerly tributary. The N.E. of the province is watered by the Syr-darya. One of the lakes, the Tuz-kaneh (40 m. from Jizakh) yields about 1300 tons of salt annually.

The average temperature for the year is 55-4° F. at Samarkand, and 58 at Khojent and Jizakh; but the average temperature for the winter is only 34 , and frosts of 4 and n° have been experienced at Samarkand and Khojent respectively; on the other hand, the average temperature for July is 79° at Samarkand and 85 at Khojent and Jizakh. The total precipitation (includ- ing snow in winter) is only 6-4 in. at Khojent, 12 in. at Samarkand and 24 in. at Jizakh. The hilly tracts have a healthy climate, but malaria and mosquitoes prevail in the lower regions.

The estimated population in 1906 was 1,090,400. The Uxbegs form two-thirds of the population, and after them the Kirghiz and Tajiks (27%) are the most numerous; Jews, Tatars, Afghans and Hindus are also met with.

In 1898 nearly 1,000,000 acres were irrigated, and about 800,000 acres partly irrigated. The chief crops are wheat, rice and barley. Sorghum, millet, Indian corn, peas, lentils, haricots, flax, hemp, poppy, lucerne, madder, tobacco, melons and mushrooms are also grown. Two crops are often taken from the same piece of land in one season. Cotton is extensively grown, and 21,000 acres are under

vineyards. Sericulture prospers, especially in the Khojent district. Live-stock breeding is the chief occupation of the Kirghiz. Weaving, saddlery, boot- making, tanneries, oil works and metal works exist in many villages and towns, while the nomad Kirghiz excel in making felt goods and carpets. There are glass works, cotton-cleaning works, steam flour mills and distilleries. Some coal, sulphur, ammonia and gypsum are obtained. Trade is considerable, the chief exports being rice, raw cotton, raisins, dried fruit, nuts, wine and silk. The Central Asian railway crosses the province from Bokhara to Samarkand and Tashkent. The province is divided into four districts, the chief towns of which, with their populations in 1897, are: Samarkand (q.v), Jizakh (16,041), Kati-kurgan (10,083) and Khojent (30,076).

SAMARKAND, a city of Russian Central Asia, anciently Maracanda, the capital of Sogdiana, then the residence of the Moslem Samanid dynasty, and subsequently the capital of the Mongol prince Tamerlane, is now chief town of the province of the same name. It lies 220 m. by rail S.W. of Tashkent, and 156 m. E. of Bokhara, in 39 39′ N. and 66° 45′ E., 2260 ft. above the sea, in the fertile valley of the Zarafshan, at the point where it issues from the W. spurs of the Tian-shan before entering the steppes of Bokhara. The Zarafshan now flows 5 m. N. of the city. In 1897 the population numbered 40,000 in the native city, and 15,000 in the new Russian town, inclusive of the military (80% Russians). The total population was 58,194 in 1900, and of these only 23,194 were women.

Maracanda, a great city, was destroyed by Alexander the Great in 329 B.C. It reappears as Samarkand at the time of the conquest by the Arabs, when it was finally reduced by Kotaiba ibn Moslim in a.d. 711-712. Under the Samanids it became a brilliant seat of Arabic civilization, and was so populous that, when besieged by Jenghiz Khan in 1221, it is reported to have been defended by 110,000 men. Destroyed and pillaged by that chieftain, its population was reduced to one-quarter of what it had been. When Timur made it his residence (in 1369) the inhabitants numbered 150,000. The magnificent buildings of the successors of Timur, which still remain, testify to its former wealth. But at the beginning of the 18th century it is reported to have been almost without inhabitants. It fell under Chinese dominion, and subsequently under that of the amir of Bokhara. But no follower of Islam enters it without feeling that he is on holy ground; although the venerated mosques and beautiful colleges are falling into ruins, its influence as a seat of learning has vanished, and its very soil is profaned by infidels. It was not without a desperate struggle that the Mahommedans permitted the Russians to take their holy city.

The present city is quadrangular and is enclosed by a low wall 9 m. long. The citadel is in the W., and to the W. of this the Russians have laid out since 1871 a new town, with broad streets and boulevards radiating from the citadel.

The central part of Samarkand is the Righistan — a square fenced in by the three madrasahs (colleges) of Ulug-beg, Shir-dar and Tilla-kari; in its architectural symmetry and beauty this is rivalled only by some of the squares of certain Italian cities. An immense doorway decorates the front of each of these large quadrilateral buildings. A high and deep-pointed porch, reaching almost to the top of the lofty facade, is flanked on each side by a broad quadrilateral pillar of the same height. Two fine columns, profusely decorated, in turn flank these broad pillars. On each side of the high doorway are two lower archways connecting it with two elegant towers, narrowing towards the top and slightly inclined. The whole of the facade and also the interior courts are profusely decorated with enamelled tiles, whose colours — blue, green, pink and golden, but chiefly turquoise-blue — are wrought into the most fascinating designs, in striking harmony with the whole and with each part of the building. Over the interior are bulbed or melon-like domes, perhaps too heavy for the facade. The most renowned of these three madrasahs is that of Ulug-beg, built in 1434 by a grandson of Timur. It is smaller than the others, but it was to its school of mathematics and astronomy that Samarkand owed its renown in the 15th century.

A winding street, running N.E. from the Righistan, leads to a much larger square in which are the college of Bibikhanum on the W., the graves of Timur's wives on the S. and a bazaar on the E. The college was erected in 1388 by a Chinese wife of Timur. To the N., outside the walls of Samarkand, but close at hand, is the Hazret Shah-Zindeh, the summer-palace of Timur, and near this is the grave of Shah-Zindeh, or, more precisely, Kasim ibn Abbas, a companion of Timur. This was a famous shrine in the 14th century (Ibn Batuta's Travels, in. 52) ; it is believed that the saint will one day rise for the defence of his religion. The Hazret Shah-Zindeh stands on a terrace reached by forty marble steps. The decoration of the interior halls is marvellous. Another street running S.W. from the Righistan leads to the

Gur-Amir, the tomb of Timur. This consists of a chapel crowned with a dome, enclosed by a wall and fronted by an archway. Time and

earthquakes have greatly injured this fine building. The interior walls are covered with elegant turquoise arabesques and inscriptions in gold. The citadel (reconstructed in 1882 and preceding years) is situated on a hill whose steep slopes render it one of the strongest in Central Asia. Its walls, 3000 yds. in circuit and about 10 ft. high, enclose a space of about 90 acres. Within it are the palace of the amir of Bokhara — a vulgar modern building now a hospital — and the audience hall of Timur — a long narrow court, surrounded by a colonnade, and containing the kok-tash, or stone of justice. Ruins of former buildings — heaps of plain and enamelled bricks, among which Graeco-Bactrian coins have been found— occur over a wide area round the present city, especially on the W. and N. The name of Aphrosiab is usually given to these ruins. Five m. S.W. of Samarkand is the college Khoja Akrar; its floral ornamentation in enamelled brick is one of the most beautiful in Samarkand. Nothing but the ruins of a palace now mark the site of a once famous garden, Baghchi-sarai. Of the Graeco-Armenian library said to have been brought to Samarkand by Timur no traces have been discovered, and Vambery regards the legend as invented by the Armenians. Every trace of the renowned high school Kalinder-khaneh has also disappeared.

The present Moslem city is an intricate labyrinth of narrow, winding streets, bordered by dirty courtyards and miserable houses. The chief occupation of the inhabitants is gardening. There is a certain amount of industry in metallic wares, tallow and soap, tanneries, potteries, various tissues, dyeing, harness, boots and silver and gold wares. The best harness, ornamented with turquoises, and the finer products of the goldsmith's art, are imported from Bokhara and Afghanistan. The products of the local potteries are very fine. The bazaars of Samarkand are more animated and kept with much greater cleanliness than those of Tashkent and Namangan. The trade is very brisk, the chief items being cotton, silk, wheat and rice, horses, asses, fruits and cutlery. Wheat, rice and silk are exported chiefly to Bokhara; cotton to Russia, via Tashkent. Silk wares and excellent fruits are imported from Bokhara, and rock-salt from Hissar. (P. A. K.; J. T. Be.)

SAMBALPUR, a town and district of British India, in the Orissa division of Bengal. The town is on the left bank of the river Mahanadi, 495 ft. above sea-level, the terminus of a branch of the Bengal-Nagpur railway. Pop. (1901) 12,870. It contains a ruined fort with old temples. The garrison of native infantry was withdrawn in 1902. There is considerable trade, and hand- weaving of tussore silk and cotton cloth are carried on.

The District of Sambalpur has an area of 3773 sq. m. The Mahanadi,

which is the only important river, divides it into unequal parts. The greater portion is an undulating plain, with ranges of rugged hills running in every direction, the largest of which is the Bara Pahar, covering an area of 350 sq. m., and attaining at Debrigarh a height of 2267 ft. above the plain. The Mahanadi affords means of water communication for 90 m.; its principal tributaries in Sambalpur are the lb, Kelo and Jhira. To the W. of the Mahanadi the district is well cultivated. The soil is generally light and sandy. It is occupied for the greater part by crystalline metamorphic rocks; but part of the N.W. corner is composed of sandstone, limestone and shale. Gold dust and diamonds have been found near Hirakhuda or Diamond Island, at the junction of the lb and Mahanadi. The climate of Sambalpur is considered very unhealthy; the annual rainfall averages 50 in. The population in 1901 was 640,243, showing an increase of 3-2% in the decade. The registered death-rate for 1897 was only 30 per thousand, as against 68 for the province generally. This figure shows that Sambalpur entirely escaped the famine of 1896-1897, which indeed can be said to have brought prosperity to the district by causing high prices for a good rice crop, rice being the staple of cultivation. It was almost equally fortunate in 1900. The main line of the Bengal- Nagpur railway runs along the N. border of the district, with a branch S. to Sambalpur town.

Sambalpur lapsed to the British in 1849, and was attached to Bengal until 1862, when it was transferred to the Central Pro- vinces. The early revenue administration was not successful. On the outbreak of the Mutiny in 1857 a general rising of the chiefs took place, and it was not until the final arrest of Surandra Sa, in 1864, that tranquillity was restored. In October 1903 Sambalpur was transferred back again to Bengal, without the subdivisions of Phuljhar and Chandarpur-Padampur.

See Sambalpur District Gazetteer (Calcutta, 1909).

SAMBHAR LAKE, a salt lake in Rajputana, India, on the borders of the two states of Jodhpur and Jaipur. The town of the same name has a railway station S3 m. N.E. from Ajmer: pop. (1901) 10,873. The area of the lake when full is about 90 sq. m., but it usually dries up altogether in the hot season. Since 1870 the British government has worked the salt under a lease from the two states interested, supplying great part of N. and Central India. The annual output averages about 126,000 tons, yielding a profit of more than half a million sterling.

SAMBLAN£AY, or Semblancay, a French noble family of Touraine, sprung from the merchant class. The founder of the family was Jean

de Be aune (d. c. 1489), treasurer of Louis XL, who narrowly escaped death for conspiracy under Charles VIII. His son, Jacques de Beaune, baron de Samblancay, vicomte de Tours, became general of finances before 1497, and from 1518 was superintendent of finances. Convicted of peculation in connexion with the supplies for the army in Italy, he was executed at Montfaucon on the 9th of August 1527. His eldest son, Martin de Beatjne, who became archbishop of Tours in 1520, died in the same year as his father. Another son, Gtjillaume de Beaune, general of finances under his father, and banished from 1527 to r 53 5, was the father of the famous prelate, Renaud de Beaune (1527-1606), archbishop of Bourges (1581) and of Sens (1595). His efforts at pacification during the wars of religion culminated in the conversion of Henry IV., and it was he who presided at the ceremony of the king's abjuration of Protestantism on the 25th of July 1593. Renaud was one of the most famous orators of his time, and some of his productions have come down to us, as well as his Reformation de I'universite" de Paris (1605 and 1667). A less honourable descendant of Jacques de Beaune was Charlotte de Beaune-Samblanqay (c. 1 550-1617), a courtesan whom Catherine de Medici employed to discover the secrets of her courtly enemies. She counted among her lovers and dupes the king of Navarre (Henry IV.), the due d'Alencon (Henry III.), Henry I., due de Guise and others. The due de Guise was killed when leaving her apart- ments in the early morning of Christmas Day 1588. She was married early in life to Simon de Fizes, baron de Sauves, a secretary of state, and again in 1584 to Francois de la Tremoille, marquis de Noirmoutiers, by whom she had a son, Louis, 1st due de Noirmoutiers, a ducal line which became extinct in 1733. Charlotte died on the 30th of September 161 7.

SAMBOURNE, EDWARD LINLEY (1844-1910), English draughtsman, illustrator and designer, was born in London, on the 4th of January 1844. He was educated at the City of London School, and also received a few months' education at the South Kensington School of Art. After a six years' " gentleman apprenticeship " with John Penn & Son, marine engineers, Greenwich, his humorous and fanciful sketches made surreptitiously in the drawing-office of that firm were shown to Mark Lemon, editor of Punch, and at once secured him an invitation to draw for that journal. In April r867 appeared his first sketch, " Pros and Cons," and from that time his work was regularly seen, with rare exceptions, in the weekly pages of Punch. In 1871 he was called to the Punch " table." At the beginning he made his name by his " social " drawings and especially by his highly elaborated initial letters. He drew his first political cartoon, properly so-called, in 1884, and ten years later began regularly to design the weekly second cartoon,

following Sir John Tenniel as chief cartoonist in igor. Examples of his best work in book illustration are in Sir F. C. Burnand's New Sandford and Merton (1872), and in Charles Kingsley's Water Babies (1885), which contains some of his most delicate

and deKghtful drawings. The design for the Diploma for the Fisheries Exhibition (1883) is of its kind one of the most extra- ordinary things in English art. As a political designer, while distinguished for wit and force, he was invariably refined and good-humoured to the uttermost; yet it is essentially as an artist that he takes his highest place. He died on the 3rd of August

1910.

See M. H. Spielmann, The History of Punch (London, 1895).

SAMBUCA, Sambtjte, sambiut, Sambue, Sambuque, an ancient stringed instrument of Asiatic origin generally supposed to be a small triangular harp of shrill tone (Arist. Quint. Meib. ii. p. 101). The sambuca was probably identical with the Phoenician sabecha and the Aramaic sabka, the Greek form being aanfibx

In Tristan (7563-72) the knight is enumerating to King Marke all the instruments upon which he can play, the sambiut being the last mentioned:

" Waz ist daz, lieber mann? — Daz veste Seitspiel daz ich kann."

In a Latin-French glossary (M.S. at Montpelier, H. no, fol. 212 v.) Psalterium = sambue. During the later middle ages sambuca was often translated sackbut in the vocabularies, whether merely from the phonetic similarity of the two words has not yet been established. The great Eoulogne Psalter (xi. c.) contains, among other fanciful instruments which are evidently intended to illustrate the equally vague and fanciful descriptions of instruments in the apocryphal letter of S. Jerome, ad Dardanum, a Sambuca, which resembles a somewhat primitive sackbut (q.v.) without the bell joint. It is reproduced by Coussemaker, Lacroix and Viollet-le-Duc, and has given rise to endless discussions without leading to any satisfactory solution. (K. S.)

SAM LAND, a peninsula of Germany, in the province of East Prussia, on the Baltic. It separates the Frisches Haff on the W. from the

Kurisches Haff on the N.E., and is bounded on the S. by the river Pregel and on the E. by the Deime. Its shape is oblong; it is 43 m. long, and 18 broad, and has an area of 900 sq. m. The surface is mostly flat, but on the W. sand-hills rise to a height of 300 ft. The chief product is amber. The former episcopal see of Samland was founded by Pope Innocent IV. in 1249 and subordinated to the archbishop of Riga. Bishop Georg von Polentz embraced the Reformation in 1523, and in 1525 the district was incorporated with the duchy of Prussia.

See Reusch, Sagen des preussischen Samlandes (2nded., Konigs- berg, 1863); Jankowsky, Das Samland und seine Bevblkerung (Konigsberg, 1902) ; Hensel, Samland Wegweiser (4th ed., Konigs- berg, 1905) ; and the Urkundenbuch des Bistums Samland, edited by Wolky and Mendthal (Leipzig, 1891-1904).

‘See Michael Praetorius, Synt. Mus. (Wolfenbuttel, 1618), p. 248 and pi. 42, where the illustration resembles a tambourine, but the description mentions strings, showing that the author himself was puzzled.

SAMNAN, Simnan, or Semnan, a small province of Persia, which, including the city and district of-Damghan, is generally known as ” Samnan va Damghan. ” It is bounded on the W. by the districts of Khar (the ancient Choara) and Firuzkuh, on the N. by Mazandaran, and on the E. by Shahrud and Bostam. In the S. it extends beyond the oasis of Jendek in the desert N. of Yezd. Its northern part is still known as Komush or Komish, the ancient Commisene. The revenue amounts to about £7000 per annum.

Samnan, the capital of the province, is situated 145 m. E. of Teheran, on the high road thence to Meshed, at an altitude of 3740 ft. in 35 34′ N., 53° 22′ E. It has a population of about 10,000, post and telegraph offices, and a fine minaret, built in the 1 2th century. It exports pistachios, almonds and coarse tobacco. A dialect with many old Persian forms and resembling the Mazan- daran dialect is spoken.

A. Houtum-Schindler, ” Bericht liber d. Samnan Dialect,” Zeitsch. d. morgenl. Gesellschafl, vol. xxxii. (1878).

SAMNITES, the name given by the Romans to the warlike tribes inhabiting the mountainous centre of the S. half of Italy. The word Samnites was not the name, so far as we know, used by the Samnites themselves, which would seem rather to have been (the Oscan form of) the word which in Latin appears as Sabini (see below). The ending

of Samnites seems to be con- nected with the name by which they were known to the Greeks of the Campanian coast, which by the time of Polybius had become Sawirai; and it is in connexion with the Greeks of Cumae and Naples that we first hear of the collision between Rome and the Samnites. 2 We know both from tradition and from surviving inscriptions (see Osca Lingua and R. S. Conway, The Italic Dialects, pp. 169 to 206) that they spoke Oscan; and tradition records that the Samnites were an offshoot of the Sabines (see e.g. Festus, p. 326 Mueller). On two inscriptions, of which one is unfortunately incomplete, and the other is the legend on a coin of the Social War, we have the form Safinim, which would be in Latin *Sabinium, and is best regarded as the nominative or accusative singular, neuter or masculine, agreeing with some substantive understood, such as nummum (see R. S. Conway, ibid. pp. 188 and 216).

The abundance of the ethnica ending in the suffix no in all the Samnite districts classes them unmistakably with the great Safine stock, so that linguistic evidence confirms tradition (see further Sabini). The Samnites are thus shown to be intimately related to the patrician class at Rome (see Rome: history, ad init.) , so that it was against their own stock that the Romans had to fight their hardest struggle for the lordship of Italy, a struggle which might never have arisen but for the geographical accident by which the Etruscan and Greek settle- ments of Campania divided into two halves the Safine settle- ments in central Italy.

The longest and most important monument of the Oscan language, as it was spoken by the Samnites (in, probably, the 3rd century B.C.) is the small bronze tablet, engraved on both sides, known as the Tabula Agnonensis, found in 1848 at the modern village Agnone, in the heart of the Samnite district, not very far from the site of Bovianum, which was the centre of the N. group of Samnites called Pentri (see below). This inscription, now preserved in the British Museum, is carefully engraved in full Oscan alphabet, and perfectly legible (facsimile given by Mommsen, Unteritalische Dialekte, Taf. 7, and by I. Zvetaieff, Sylloge inscriptionum Oscarum). The text and com- mentary will be found in Conway, op. cit. p. 191: it contains a list of deities to whom statues were erected in the precinct sacred to Ceres, or some allied divinity, and on the back a list of deities to whom altars were erected in the same place. Among those whose names are immediately intelligible may be mentioned those of “Jove ihe Ruler ” and of ” Hercules Cerealis.” The other names are full of interest for the student of both the languages

2 For the difficult questions involved in the obscure and frag- mentary accounts of the so-called First Samnite War, which ended in 341 B.C., the reader is referred to J. Beloch, Campanien, 2nd ed., pp. 442 ff., and to the commentators on Livy vii. 29 ff.

and the religions of ancient Italy. The latest attempts at inter- I pretation will be found in R. S. Conway, Dialectorum Italicarum exempla selecta (s.v.) and C. D. Buck, Oscan and Umbrian Grammar, p. 254.

The Samnite towns in or near the upper valley of the Volturnus, namely, Telesia, Allifae, Aesernia, and the problematic Phistelia, learnt the art of striking coins from their neighbours in Campania, on the other side of the valley, Compulteria and Venafrum, in the 4th century B.C. (see Conway, op. cit. p. 196).

The Samnite alliance when it first appears in history, in the 4th century B.C., included those tribes which lay between the Paeligni to the N., the Lucani to the S., the Campani to the W., the Frentani and Apuli to the E. : that is to say, the Hirpini, Pentri and Caraceni, and perhaps also the Caudini (J. Beloch, Italischer Bund, p. 167, and R. S. Conway, The Italic Dialects, pp. 169 and 183); but with these are sometimes classed other friendly and kindred communities in neighbouring territory, like the Frentani and Atina (Liv. x. 39). But after the war with Pyrrhus the Romans for ever weakened the power of the Italic tribes by dividing this central mountainous tract into two halves. The territories of the Latin colony Beneventum (268 B.C.) and the Ager Taurasinus (Livy xl. 38, C.I.L., 1st ed., i. 30) united that of Saticula on the W. (313 B.C.) to that of Luceria on the E., and cut off the Hirpini from their kinsmen by a broad belt of land under Latin occupation (Velleius Pat. i. 14; Liv. Ix. 26). At the same time Allifae and Venafrum became prefectures (Fest. p. 233 M), and the Latin colony of Aesernia was founded in 263 B.C. in purely Samnite territory to command the upper Volturnus valley. We hear of no further resistance in the N. of Samnium till the general rising of Italy in 90 B.C.; but the more southerly Hirpini (q.v.) henceforth acted independently. (R. S. C.)

SAMOA, an archipelago in the Pacific Ocean, about 150 m. N. of Tonga and nearly midway between the New Hebrides and Tahiti, 1600 m. from Auckland (New Zealand), 2410 from Sydney and 4200

from San Francisco. (For Map, see Pacific Ocean.) It consists of 14 islands forming a slightly curved chain from W. by N. to E. by S., between 13 30′ and 14 3°’ S., 168 and 1 73 W. as follows: Savaii, Manono, Apolima, Upolu, Fanua- tapu, Manua, Nuutele and Nuulua, belonging to Germany, and Tutuila, Anua, Ofu, Olosenga, Tau and Rose, belonging to the United States of America. The principal of these are Savaii (area, 660 sq. m., pop. 13,200), Upolu (340 sq. m., pop. 18,400), Tutuila (54 sq. m., pop. 3800), and the Manua group, which includes Tau with Ofu and Olosenga (25 sq. m., pop. 2000). Some of the smaller islands are also thickly populated, so that the total population is about 39,000, whites numbering about 500. With the exception of Rose Island, which is an uninhabited coral islet 70 m. E. of its nearest neighbour, and therefore scarcely belongs geographically to the group, all the islands are considerably elevated, with several extinct or quiescent craters rising from 2000 ft. in Upolu to 4000 (Mua) in Savaii. Although there are no active cones, Upolu has in comparatively recent times been subject to volcanic disturbances, and according to a local tradition, outbreaks must have occurred in the 17th or 18th century. In 1866 a submarine volcano near the islet of Olosenga was the scene of a violent commotion, discharging rocks and mud to a height of 2000 ft. Earthquakes are not uncommon and sometimes severe. Coral reefs protect the coasts in many parts ; they are frequently interrupted, but the passages through them are often difficult of navigation. The whole group is abundantly watered, and the igneous soil is marvellously fertile. The scenery of the islands is extremely beautiful. Upolu is long and narrow; it has a backbone of mountains whose flanks are scored with lovely valleys, at the foot of which are flat cultivable tracts. Of its harbours Apia and Saluafata, both on the N. coast, are most important. Mount Vaea, which overlooks Apia and Vailima, the home of Robert Louis Stevenson, is his burial-place and bears a monument to his memory. Tutuila, the principal island belonging to the United States, resembles Upolu, and has on its S. side the harbour of Pago Pago or Pango Pango, the finest ,in the group.

Climate, Flora, Fauna. — The climate is moist and sometimes oppressively hot, though pleasant on the whole. A fine season extends from April to September; a wet season from October to March. The temperature is equable — at Apia the mean annual temperature is 78 F., the warmest month being December (8o°) and the coldest July (75°-76°). The prevalent winds, which temper the heat, are the S.E. trades, but W. winds supervene from January to March. The archipelago lies in the track of the fierce hurricanes which occur usually in this period. On the 16th of March 1889 the heavy tidal

waves created havoc in the harbour of Apia. The American warship ” Nipsic ” was cast upon the beach, but was afterwards floated and saved. Two other United States warships, ” Trenton ” and ” Vandalia,” were beaten to pieces on the coral reef; and the German warships ” Olga ” and ” Eber ” were wrecked with great loss of life. The British warship ” Calliope ” (Captain Pearson) was in the harbour, but succeeded in getting up steam and, standing out to sea, escaped destruction. In A Footnote to History R. L. Stevenson vividly describes the heroism of the captain and crew.

The Samoan forests are remarkable for the size and variety of their trees, and the luxuriance and beauty of tree-ferns, creepers and parasites. The coco-nut palm and bread-fruit are of peculiar value to the inhabitants; there are sixteen varieties of the one, and twenty of the other. Hand timber trees, of use in boat-building, &c, are especially characteristic of Savaii.

Of the extremely limited Samoan fauna, consisting mainly of an indigenous rat, four species of snakes and a few birds, the most interesting member is the Didunculus strigirostris , a ground pigeon of iridescent greenish-black and bright chestnut plumage, which forms a link between the extinct dodo and the living African Treroninae.

Natives. — The Samoans are pure Polynesians, and according to the traditions of many Polynesian peoples Savaii was the centre of dispersion of the race over the Pacific Ocean from Hawaii to New Zealand. Apart from tradition, Samoan is the most archaic of all the Polynesian tongues, and still preserves the organic letter s, which becomes h or disappears in nearly all the other archipelagos. Thus the term Savaii itself, originally Savaiki, is supposed to have been carried by the Samoan wanderers over the ocean to Tahiti, New Zealand, the Marquesas and Sandwich groups, where it still survives in such variant forms as Havaii, Hawaiki, Havaiki and Hawaii. In any case, the Samoans are the most perfect type of Polynesians, of a light brown colour, splendid physique, and hand- some regular features, with an average height of 5 ft. 10 in. Their mental and social standard is high among Pacific peoples; they are simple, honourable, generous and hospitable, but brave fighters. Their idolatry (polytheistic) was unaccompanied by human sacrifice. The dead were buried, and their spirits believed to travel to a world entered by a pool at the western extremity of Savaii. They have becomemainly Protestants, Catholics or Mormons, but retain many superstitions connected with their native religion. The women and children are well treated. A youth is not regarded as eligible to marry till tattooed from- the hips to the knees. The principal foods of the Samoans are vegetables, coco-nut, bread-

fruit, fish and pork. They are famous as sailors and boat-builders. The Samoan language is soft and liquid in pronunciation, and has been called ” the Italian of the Pacific.” It is difficult to learn thoroughly, owing to its many inflexions and accents, and its being largely a language of idioms. (See also Polynesia.)

Administration and Trade. — The German islands form a crown colony. There is an imperial governor, having under him a native high chief assisted by a native council; and there are both German and native judges and magistrates. The United States, on assuming sovereignty over Tutuila and the islands E. of it in 1900, with the written consent of the native chiefs, appointed a naval governor. Cultivation has been extended under European and American rule, and in 1904 the exports from the German islands had reached a value of £83,750, and those from the American islands of £4200. Copra and cocoa beans are_the chief articles of export.

History. — It is generally considered that the Manua group was sighted by the Dutch navigator Jacob Roggeveen in 1722, and named by him the Baaumann islands after the captain of one of his ships. Louis de Bougainville obtained a fuller acquaintance with the archipelago in 1768, and called them the Navigators’ Islands (ties des Navigateurs). This name is still used. La Perouse was among the islands in 1787, and on Tutuila lost some of his crew in a conflict with some natives of Upolu visiting the island. Subsequent explorers were Captain Edwards of the ” Pandora ” in 1791, and Otto von Kotzebue in 1824. In 1830 the respected missionary John Williams paid his first visit to Samoa. Surveys of the archipelago were made by the American explorer Charles Wilkes. The islands, especially Upolu, now began to attract American and European (mostly German) capitalists, and the Hamburg firm of J. C. Godeffroy & Son developed the trade of the island. Meanwhile a series of petty

civil wars greatly interfered with the prosperity of the native population, who grouped themselves into two opposing political parties. Americans and Europeans began to discuss the question of annexation, recognizing the importance of the geographical position of the islands. In 1877 the American consul hoisted his country’s flag, but the action was repudiated by his govern- ment, which, however, in 1878 obtained Pago Pago as a coaling station and made a trading treaty with the natives. In 1879 Germany obtained the harbour of

Saluafata. Great Britain followed suit, but under a political arrangement between the powers no single power was to appropriate the islands. But in 1887 and 1888 civil war prevailed on the question of the succession to the native kingship, the Germans supporting Tamasese, and the British and American residents supporting Malietoa. After the latter had been deported by the Germans, the British and American support was transferred to his successor, Mataafa. In the course of the fighting which ensued some fifty German sailors and marines were killed or wounded by the adherents of Mataafa. A conference between the three powers was thereupon held at Berlin, and a treaty was executed by those powers and by Samoa, on thei4thof June i88cj,by virtueof which the independence and autonomy of the islands were guaranteed, Malietoa was restored as king, and the three powers constituted themselves practically a protectorate over Samoa, and provided a chief justice and a president of the municipality of Apia, to be appointed by them, to aid in carrying out the provisions of the treaty. The government was administered under this treaty, but with considerable friction, until the end of 1898, when, upon the death of Malietoa, two rival candidates for the throne again appeared, and the chief justice selected by the three powers decided against the claims of Mataafa, and in favour of a boy, Malietoa Tanu, a relative of the deceased Malietoa. Civil war immediately ensued, in which several American and British officers and sailors were killed by the natives, the Germans upholding the claims of Mataafa, and the British and Americans supporting the rival candidate. The three powers thereupon sent a commission to Samoa to investigate and adjust the difficulties. The situation, however, was found to be so com- plicated and embarrassing that, early in 1900, the so-called Berlin treaty was abrogated, Great Britain withdrew her claims to any portion of the islands and received compensation from Germany by concessions in other parts of the world, and the United States withdrew from all the islands W. of Tutuila. In 1902 the king of Sweden, as arbitrator under a convention signed at Washington in 1899, decided that Great Britain and the United States were liable for injuries due to action taken by their representatives during the military operations of 1899.

See Robert Louis Stevenson, A Footnote to History (London, 1892), and Vailima Letters (London, 1895); G. Turner, Samoa a Hundred Years Ago and Long Before (London, 1884) ; W. B, Churchward, My Consulate in Samoa (London, 1887) ; J. B. Stair, Old Samoa (London, 1897); Mary S. Boyd, Our Stolen Summer (London, 1900); L. P. Churchill, Samoa ‘Uma (London, 1902); Journal des museums Godeffroy (Hamburg, 1871-1874) ; G. Kurze, Samoa, das Land, die

Leute und die Mission (Berlin, 1899); O. Ehlers, Samoa, die Pcrle der Siidsee (Berlin, 1900); F. Reinecke, Samoa (Berlin, 1901); A. Kramer, Die Samoa Inseln (Stuttgart, 1902 seq.) ; parliamentary papers, Correspondence respecting the Affairs of Samoa (London, 1899, &c), and 1902 (Samoa, Cd. 1083) for the arbitration of the king of Sweden.

SAMOS, one of the principal and most fertile of the islands in the Aegean Sea that closely adjoin the mainland of Asia Minor, from which it is separated by a strait of only about a mile in width. It is about 27 m. in length, by about 14 in its greatest breadth, and is occupied throughout the greater part of its extent by a range of mountains, of which the highest summit, near its western extremity, called Mount Kerkis, is 4725 ft. high. This range is in fact a continuation of that of Mount Mycale on the mainland, of which the promontory of Trogilium, immediately opposite to the city of Samos, formed the extreme point. Samos is tributary to Turkey in the sum of £2700 annually, but other- wise is practically an independent principality, governed by a prince of Greek nationality nominated by the Porte. As chief of the executive power the prince is assisted by a senate of four

members, chosen by him out of eight candidates nominated by the four districts of the island — Vathy, Chora, Marathocumbo and Carlovasi. The legislative power belongs to a chamber of 36 deputies, presided over by the metropolitan. The seat of the government is Vathy (6000). There is a telephone service. The island is remarkably fertile, and a great portion of it is covered with vineyards, the wine from the Vathy grapes enjoying a specially high reputation. There are three ports: Vathy, Tegani and Carlovasi. The population in 1900 was about 54,830, not comprising 15,000 natives of Samos inhabiting the adjoining coasts. The predominant religion is the Orthodox Greek, the metropolitan district including Samos and Icaria. In 1900 there were 634 foreigners on the island (523 Hellenes, 13 Germans, 29 French, 28 Austrians and 24 of other nationalities). _ History. — Concerning the earliest history of Samos literary tradi- tion is singularly defective. At the time of the great migrations it received an Ionian population which traced its origin to Epidaurus in Argolis. By the 7th century B.C. it had become one of the leading commercial centres of Greece. This early prosperity of the Samians seems largely due to the island's position near the end of the Maeander and Cayster trade-routes, which facilitated the importation of tex- tiles from inner Asia Minor. But the Samians also developed an extensive oversea commerce. They helped to open up trade with the Black Sea and with Egypt, and were credited with having been the first Greeks to reach the Straits of Gibraltar. Their commerce brought them into close relations with

Cyrene, and prob- ably also with Corinth and Chalcis, but made them bitter rivals of their neighbours of Miletus. The feud between these two states broke out into open strife during the Lelantine War (7th century B.C.), with which we may connect a Samian innovation in Greek naval warfare, the use of the trireme. The result of this conflict was to confirm the supremacy of the Milesians in eastern waters for the time being; but in the 6th century the insular position of Samos preserved it from those aggressions at the hands of Asiatic kings to which Miletus was henceforth exposed. About 535 B.C., when the existing oligarchy was overturned by the tyrant Polycrates (q.v.), Samos reached the height of its prosperity. Its navy not only protected it from invasion, but ruled supreme in Aegean waters. The city was beautified with public works, and its school of sculptors, metal-workers and engineers achieved high repute (see below). After Polycrates' death Samos suffered a severe blow when the Persians conquered and partly depopulated the island. It had regained much of its power when in 499 it joined the general revolt of the Ionians against Persia; but owing to its long-standing jealousy of Miletus it rendered indifferent service, and at the decisive battle of Lade (494) part of its contingent of sixty ships was guilty of downright treachery. In 479 the Samians led the revolt against Persia. In the Delian League they held a position of special privilege and remained actively loyal to Athens until 440, when a dispute with Miletus, which the Athenians had decided against them, induced them to secede. With a fleet of sixty ships they held their own for some time against a large Athenian fleet led by Pericles himself, but after a protracted siege were forced to capitulate and degraded to the rank of tributary state. At the end of the Peloponnesian War Samos appears as one of the most loyal dependencies of Athens ; it served as a base for the naval war against the Peloponnesians, and as a temporary home of the Athenian democracy during the revolution of the Four Hundred at Athens (411 B.C.), and in the last stage of the war was rewarded with the Athenian franchise. This friendly attitude towards Athens was the result of a series of political revolutions which ended in the establishment of a democracy. After the downfall of Athens Samos was besieged by Lysander and again placed under an oligarchy. In 394 the withdrawal of the Spartan navy induced the island to declare its independence and re- establish a democracy, but by the peace of Antalcidas (387) it fell again under Persian dominion. It was recovered by the Athenians in 366 after a siege of eleven months, and received a strong body of military settlers. After the Samian War (322), when Athens was deprived of Samos, the vicissitudes of the island can no longer be followed. For some time (about 275-270 B.C.) it served as a base for the Egyptian fleet, at other periods it recognized the overlordship of

Syria; in 189 B.C. it was transferred by the Romans to the kings of Pergamum. Enrolled from 133 in the Roman province of Asia, it sided with Aristonicus (132) and Mithradates (88) against its overlord, and consequently forfeited its autonomy, which it only temporarily recovered between the reigns of Augustus and Vespasian. Nevertheless, Samos remained comparatively flourishing, and was able to contest with Smyrna and Ephesus the title ” first city of Ionia “; it was chiefly noted as a health resort and for the manu- facture of pottery (see below). Under Byzantine rule Samos became the head of the Aegean theme (military district). After the 13th century it passed through much the same changes of government as Chios {q.v.), and, like the latter island, became the property of the Genoese firm of Giustiniani (1346-1566). At the time of theTurkish conquest it was severely depopulated, and had to be provided with new settlers, partly Albanians.

During the. Greek War of Independence Samos bore a conspicuous part, and it was in the strait between the island and Mount Mycale that Canaris set fire to and blew up a Turkish frigate, in the presence of the army that had been assembled for the invasion of the island, a success that led to the abandonment of the enterprise, and Samos held its own to the very end of the war. On the conclusion of peace the island was indeed again handed over to the Turks, but since 1835 has held an exceptionally advantageous position, being in fact self - governed, though tributary to the Turkish empire, and ruled by a Greek governor nominated by the Porte, who bears the title of” Prince of Samos,” but is supported and controlled by a Greek council and assembly. The prosperity of the island bears witness to the wisdom of this arrangement. Its principal article of export is its wine, which was celebrated in ancient times, and still enjoys a high reputation in the Levant. It exports also silk, oil, raisins and other dried fruits.

The ancient capital, which bore the name of the island, was situated on the S. coast at the modern Tigani, directly opposite to the promontory of Mycale, the town itself adjoining the sea and having a large artificial port, the remains of which are still visible, as are the ancient walls that surrounded the summit of a hill which rises immediately above it, and now bears the name of Astypalaea. This formed the acropolis of the ancient city, which in its flourishing times covered the slopes of Mount Ampelus down to the shore. The aqueduct cut through the hill by Polyenes may still be seen. From this

city a road led direct to the far famed temple of Hera, which was situated close to the shore, where its site is still marked by a single column, but even that bereft of its capital. This frag- ment, which has given to the neighbouring headland the name of Capo Colonna, is all that remains standing of the temple that was extolled by Herodotus as the largest he had ever seen, and which vied in splendour as well as in celebrity with that of Diana at Ephesus. Though so little of the temple remains, the plan of it has been ascertained, and its dimensions found fully to verify the assertion of Herodotus, as compared with all other Greek temples existing in his time, though it was afterwards surpassed by the later temple at Ephesus.

The modern capital of the island was, until recently, at a place called Khora, about 2 m. from the sea and from the site of the ancient city; but since the change in the political condition of Samos the capital has been transferred to Vathy, situated at the head of a deep bay on the N. coast, which has become the residence of the prince and the seat of government. Here a new town has grown up, well built and paved, with a convenient harbour.

Samos was celebrated in ancient times as the birth-place of Pytha- goras. His name and figure are found on coins of the city of imperial date. It was also conspicuous in the history of art, having produced in early times a school of sculptors, commencing with Rhoecus and Theodoras, who are said to have invented the art of casting statues in bronze. Rhoecus was also the architect of the temple of Hera. The vases of Samos are among the most characteristic products of Ionian pottery in the 6th century. The name Samian ware, often given to a kind of red pottery found wherever there are Roman settlements, has no scientific value. It is derived from a passage in Pliny, N.H. xxxv. 160 sqq. Another famous Samian sculptor was Pythagoras, who migrated to Rhegium.

See Herodotus, especially book iii. ; Thucydides, especially books i. and viii. ; Xenophon, Hellenica, books i. ii. ; Strabo xiv. pp. 636-639; L. E. Hicks and G. F. Hill, Greek Historical Inscriptions (Oxford, 1901), No. 81; B. V. Head, Historia Numorum (Oxford, 1887), pp. 515-518; Panofka, Res Samiorum (Berlin, 1822); Curtius, Urkunden zur Geschichte von Samos (Wesel, 1873); H. F. Tozer, Islands of the Aegean (London, 1890); J. Boshlan, Aus ionischen und italischen Nekropolen. (E. H. B. ; M. O. B. C. ; E. Gr.)

SAMOSATA (2o.iMo-a.Ta, -aroiv, Ptol. v. 15 § 11; Strabo xvi. 749), called in Arabic literature Sumeisat, 1 is now represented by the village of Samsat, occupying a corner of the ancient site. On a broad

plain 1 500 ft. above sea-level, Samosata practically marks the place where the mountain course of the Euphrates ends (see Mesopotamia). When the water is high enough it is possible to descend in a kelek in one day to Blrejik. The rocky banks contain many ancient cave-dwellings.

The stele found there and published by Humann and Puchstein (Reisen in Kleinasien u. Nord-Syrien, Atlas, plate xlix. 1-3) shows that it was at an early time a Hittite centre, probably marking an important route across the Euphrates: whether or not it was the place where later the Persian ” royal road ” crossed the Euphrates, in Strabo’s time it was connected by a bridge with a Seleucia on the Mesopotamian side, and it is now connected by road with Severek and Diarbekr and with Rakka, connecting further, through Edessa and Harran, with other eastward routes. The Hittite sculptured object referred to above

1 Not to be confused, as Yaqut remarks, with Shamshaˆ, the classical Arsamosata (Ptol. v. 13).

shows influences of an Assyrian type (P. Jensen, Hiltiter u. Armenier, 1898, 13) ; but no cuneiform text referring to Samosata by name seems yet to have been published. Kummukh, however, the district to which it belonged, was overrun by early Assyrian kings. In consequence of revolt it was made an Assyrian province in 708 B.C. When the Assyrian empire passed through the hands of Babylon and Persia into those of the successors of Alexander, Samosata was the capital of Kummukh, called in Greek Commagene. How soon it became a Greek city we do not know. Although its ruler Ptolemy renounced allegiance to Antiochus IV. the dynasty of Iranian origin which ruled at Samosata, described by Strabo (I.e.) as a fortified city in a very fertile if not extensive district, allied itself with the Seleucids, and bore the dynastic name of Antiochus. There, not long after the little kingdom was in a.d. 72 made a province by the Romans, and its capital received the additional name of Flavia (Suet. Vesp. 8; Eutrop. 8. 19), the celebrated Greek writer Lucian the Satirist was born in the 2nd century (see Lucian), and more than a century later another Lucian, known as the Martyr, and Paul called ” of Samosata.” The remains of a fine aqueduct that once brought water from the Kiakhta Chai, which begins some 6 m. above the town, are probably of the 3rd century a.d. (Geog. Journ. viii. 323). Under Constantine Samosata gave place as capital of Euphratensis to Hierapolis (Malal. Chron. xiii. p. 317). It was at Samosata that Julian had ships made in his expedition against Sapor, and it was a natural crossing-place in the struggle between Heraclius and Chosroes in the 7th century. Mas’udi

in the 10th century says it was known also as Kal'at at-TIn (" the Clay Castle "). It was one of the strong fortresses included in the county of Edessa (q.v.). In the 13th century, according to Yaqut, one of its quarters was exclusively inhabited by Armenians. It is now a Kurdish village, which in 1894 consisted of about 100 houses, three of which were Armenian (Geog. Joitm. viii. 322).

SAMOTHRACE (Turk. Semadrek), an island in the N. of the Aegean Sea, nearly opposite the mouth of the Hebrus, and lying N. of Imbros and N.E. of Lemnos. The island is a kaza of the Lemnos sanjak, and has a population of 3500, nearly all Greek. It is still called Samothraki, and though of small extent is, next to Mount Athos, by far the most important natural feature in this part of the Aegean, from its great elevation —the group of mountains which occupies almost the whole island rising to the height of 5240 ft. Its conspicuous character is attested by a well-known passage in the Iliad (xiii. 12), where the poet repre- sents Poseidon as taking post on this lofty summit to survey the plain of Troy and the contest between the Greeks and the Trojans. This mountainous character and the absence of any tolerable harbour — Pliny, in enumerating the islands of the Aegean, calls it " importuosissima omnium " — prevented it from ever attaining to any political importance, but it enjoyed great celebrity from its connexion with the worship of the Cabeiri (q.v.), a mysterious triad of divinities, concerning whom very little is known, but who appear, like all the similar deities venerated in different parts of Greece, to have been a remnant of a previously existing Pelasgic mythology. Herodotus ex- pressly tells us that the " orgies " which were celebrated at Samothrace were derived from the Pelasgians (ii. 51). The only occasion on which the island is mentioned in history is during the expedition of Xerxes (b.c. 480), when the Samothracians sent a contingent to the Persian fleet, one ship of which bore a conspicuous part in the battle of Salamis (Herod, viii. 90). But the island appears to have always enjoyed the advantage of autonomy, probably on account of its sacred character, and even in the time of Pliny it ranked as a free state. Such was still the reputation of its mysteries that Germanicus endeavoured to visit the island, but was driven off by adverse winds (Tac. Ann. ii. 54).

After visits by travellers, including Cyriac of Ancona (1444), Richter (1822), and Kiepert (1842), Samothrace was explored in 1857 by Conze, who published an account of it, as well as the larger neighbouring islands, in i860. The " Victory of Samothrace," set up by Demetrius Poliorcetes c. 305 B.C., was discovered in the

island in 1863, and is now in the Louvre. The ancient city, of which the ruins are called Palaeopoli, was situated on the N. side of the island close to the sea; its site is clearly marked, and considerable remains still exist of the ancient walls, which were built in massive Cyclopean style, as well as of the sanctuary of the Cabeiri, and other temples and edifices of Ptolemaic and later date. The modern village is on the hill above. A considerable sponge fishery is carried on round the coasts by traders from Smyrna. On the N. coast are much-frequented hot sulphur springs. In 1873 and 1875 excavations were carried out under the Austrian government.

Conze, Reise auf den Inseln des Thrakischen Metres (Hanover, i860); Conze, Hauser and Niemann, Archdologische Untersuchungen auf Samothrake (Vienna, 1875 and 1880) ; H. F. Tozer, Islands of the Aegean (London, 1890).

SAMOVAR (Russ. samovaru), an urn for making tea after the Russian fashion; it is usually of copper, and is kept boiling by a tube filled with live charcoal passing through the centre. The word is usually taken in Russia to mean ” self-boiler ” (samu, self, and bariti, boil), but it is more probably an adaptation of a Tatar word sanabar, a tea-urn.

SAMOYEDES, a tribe of the Ural-Altaic group, scattered in small groups over an immense area, from the Altai mountains down the basins of the Ob and Yenisei, and along the shores of the Arctic ocean from the mouth of the latter river to the’White Sea. The tribe may be subdivided into three main groups: (a) The Yuraks in the coast-region from the Yenisei to the White Sea; (b) the Tavghi Samoyedes, between the Yenisei and the Khatanga; (c) the Ostiak Samoyedes, intermingled with Ostiaks, to the S. of the others, in the forest regions of Tobolsk and Yeniseisk. Their whole number may be estimated at from 20,000 to 25,000. The so-called Samoyedes inhabiting the S. of the governments of Tomsk and Yeniseisk have been much under Tatar influence and appear to be of a different stock; their sub-groups are the Kamasin Tatars, the Kaibals, the Motors, the Beltirs, the Karagasses and the Samoyedes of the

middle Ob.

The proper place of the Samoyedes among the Ural-Altaians is very difficult to determine. As to their present name, signifying in its present Russian spelling ” self-eaters,” many ingenious theories have

been advanced, but that proposed by Schrenk, who derived the name ” Samo-yedes ” from ” Syroyadtsy,” or ” raw-eaters,” leaves much to be desired. Perhaps the etymology ought to be sought in quite another direction, namely, in the likeness to Suomi. The names assumed by the Samoyedes themselves are Hazovo and Nyanyaz. The Ostiaks know them under the names of Orghoy, or Workho, both of which recall the Ugrians; the name of Hui is also in use among the Ostiaks, and that of Yaron among the Syrgenians.

The language now spoken by the Samoyedes belongs to the Finno-Ugrian group, and is allied to Finnish but has a more copious system of suffixes (see Finnc-Ugric). It is a sonorous speech, pleasant to the ear. No fewer than three separate dialects and a dozen sub-dialects are known in it.

The conclusions deducible from their anthropological features — ■ apart from the general difficulty of arriving at safe conclusions on this ground alone, on account of the variability of the ethnological type under various conditions of life — are also rather indefinite. The Samoyedes are recognized as having the face more flattened than undoubtedly Finnish stocks; their eyes are narrower, their com-plexion and hair darker. Zuyev describes them as like the Tunguses, with flattened nose, thick lips, little beard and black, hard hair. At first sight they may be mistaken for Ostiaks — especially on the Ob— but they are undoubtedly different. Castren considers them as a mixture of Ugrians with Mongolians, and Zograf as brachy cephalic Mongolians. Quatrefages classes them, together with the Voguls, as two families of the Ugrian sub-branch, this last, together with the Sabmes (Lapps) , forming part of the Ugrian or Boreal branch of the yellow or Mongolic race.

It is probable that formerly the Samoyedes occupied the Altai mountains, whence they were driven N. by Turco-Tatars. Thus, the Kaibals left the Sayan mountains and took possession of the Abakan steppe (Minusinsk region), abandoned by the Kirghizes, in the earlier years of last century, and in N.E. Russia the Zyrians are still driving the Samoyedes farther N., towards the Arctic coast. Since the researches of Schrenk it may be regarded as settled that in historical times the Samoyedes were inhabitants of the so-called Ugria in the northern Urals, while Radlov considers that the number- less graves containing remains of the Bronze Period which are scattered throughout w. Siberia, on the Altai, and on the Yenisei in the Minusinsk region, are relics of Ugro-Samoyedes. According to his views this nation, very numerous at that epoch — which preceded

the Iron-Period civilization of the Turco-Tatars, — were pretty well acquainted with mining ; the remains of their mines, sometimes 50 ft. deep, and of the furnaces where they melted copper, tin and gold, are vety numerous; their weapons of a hard bronze, their pots (one of which weighs 75 lb), and their melted and polished bronze and golden decorations testify to a high development of artistic feeling and industrial skill, strangely contrasting with the low level reached by their earthenware. They were not nomads, but husbandmen, and their irrigation canals are still to be seen. They kept horses (though in small numbers), sheep and goats, but no traces of their rearing horned cattle have yet been found. The Turkish invasion of S. Siberia, which took place in the 5th century, drove them farther N., and probably reduced most of them to slavery.

The Samoyedes, who now maintain themselves by hunting and fishing on the lower Ob, partly mixed in the S. with Ostiaks, recall the condition of the inhabitants of France and Germany at the epoch of the reindeer. Clothed in skins, like the troglodytes of the Weser, they make use of the same implements in bone and stone, eat carnivorous animals — the wolf included — and cherish the same superstitions (of which those regarding the teeth of the bear are perhaps the most characteristic) as were current among the Stone- Period inhabitants of W. Europe. Their heaps of reindeer horns and skulls — memorials of religious ceremonies — are exactly similar to those dating from the similar period of civilization in N. Germany. Their huts often resemble the well-known stone huts of the Esqui- maux ; their graves are mere boxes left in the tundra. The religion is fetishism mixed with Shamanism, the shaman (tadji-bei) being a representative of the great divinity, the Num. The Yalmal peninsula, where they find great facilities for hunting, is especially venerated by the Ob Ostiak Samoyedes, and there they have one of their chief idols, Khese. They are more independent than the Ostiaks, less yielding in character, although as hospitable as their neighbours. They are said to be disappearing owing to the use of ardent spirits and the prevalence of smallpox. They still maintain the high standard of honesty mentioned by historical documents, and never will take anything left in the tundra or about the houses by their neighbours. The Yurak Samoyedes are courageous and warlike ; they offered armed resistance to the Russian invaders, and it is only since the beginning of the century that they have paid tribute. The exact number of the Ostiak Samoyedes is not known ; the Tavghi Samoyedes may number about 1000, and the Yuraks, mixed with the former, are estimated at 6000 in Obdorsk (about 150 settled), 5000 in European Russia in the tundras of the Mezen, and about 350 in Yeniseisk.

Of the S. Samoyedes, who are completely Tatarized, the Beltirs live by agriculture and cattle-breeding in the Abakan steppe. They profess Christianity, and speak a language closely resembling that of the Sagai Tatars. The Kaibals, or Koibals, can hardly be distin- guished from the Minusinsk Tatars, and support themselves by rear- ing cattle. Castren considers that three of their stems are of Ostiak origin, the remainder being Samoyedic. The Kamasins, in the Kansk district of Yeniseisk, are either herdsmen or agriculturists. They speak a language with an admixture of Tatar words, and some of their stems contain a large Tatar element. The interesting nomadic tribe of Karagasses, in the Sayan mountains, is disappear- ing; the few representatives are rapidly losing their anthropological features, their Turkish language and their distinctive dress. The Motors are now little more than a memory. One portion of the tribe emigrated to China and was there exterminated ; the remainder have disappeared among the Tuba Tatars and the Soyotes. The Samoyedes on the Ob in Tomsk may number about 7000; they have adopted the Russian manner of life, but have difficulty in carrying on agriculture, and are a poverty-stricken population with little prospect of holding their own.

The works of M. A. Castren are still the best authority on the Samoyedes. See Grammatik der samoyedischen Sprachen (1854); Dictionary (1855); Ethnologische Vorlesungen uber die altaischen Volker (1857); Versuch einer koibalischen und karagassischen Sprachlehre (1857). See also A. Middendorf, Reise in den aussersten Norden und Osten Sibiriens (1875).

SAMPAN, the name of the typical light boat of far Eastern rivers and coastal waters; it is usually propelled by a single scull over the stern, and the centre and after part is covered by an awning or screen of matting. The word is said to be Chinese, san, thin, and pan, board. Others take it to be of Malay origin.

SAMPIERDARENA {San Pier d' Arena, i.e. St Peter of the Sands), a town of Liguria, Italy, in the province of Genoa, 2% m. by rail W. of the city of that name, 16 ft. above sea-level. Pop. (1906) 37,582 (town); 43,654 (commune). It is practically a suburb of Genoa and contains a number of handsome palaces, including the Palazzo Spinola and the Palazzo Scassi, both probably built by G. Alessi. It has become a place of great industrial and commercial activity, the Ansaldo ship-building yard being the most important of its workshops. Near the

neighbouring town of Cornigliano is a bridge, where Massena signed the capitulation of Genoa.

SAMPLE (through the O. Fr. essemple, from Lat. exemplum; a doublet of ” example “), a small portion of merchandise taken from the whole to serve as a specimen or evidence of the whole; hence a pattern or model. Sale by sample obviates the necessity on the part of sellers of keeping large quantities of goods on premises unsuitable for storage, and on the part of buyers of having to make a special visit to inspect the goods in bulk. The sale of goods by sample is dealt with in England by the Sale of Goods Act 1893, s. 15, which provides that a contract of sale shall be a contract for sale by sample where there is a term in the contract, express or implied, to that effect. In the case of such a contract, there must be (a) an implied condition that the bulk shall correspond with the sample in quality; (b) an implied condition that the buyer shall have a reasonable opportunity of comparing the bulk with the sample; (c) an implied condition that the goods shall be free from any defect, rendering them unmerchantable, which would not be apparent on reasonable examination of the sample. (See also Sale of Goods.)

SAMPLER (from O. Fr. esscmplaire, with dropping of initial a, Late Lat. exemplariam, from exemplum, example; it is a doublet of ” examplar ” or ” exempler,” as ” sample ” is of ” example “), a model or pattern to be copied, particularly a small rectangular piece of embroidery worked on canvas or other material as a pattern or example of a beginner’s skill in needle- work, as a means of teaching the stitches. Down to compara- tively recent times every little girl worked her ” sampler,” and examples of 17th-century work are still found and have become the object of the collector’s search. They usually contained the alphabet, the worker’s name, the date, and Bible texts, verses, mottoes, the whole surrounded with some conventional design.

The earliest sampler in existence is dated 1643 and is in the Victoria and Albert Museum, South Kensington (see M. B. Huish, Samplers and Tapestry Embroideries, 1900, and List of Samplers in the Victoria and Albert Museum, South Kensington, Board of Educa- tion, South Kensington, 1906).

SAMPSON, WILLIAM THOMAS (1840-1902), American naval commander, was born at Palmyra, New York, on the 9th of February 1840, and graduated at the head of his class from the U.S. Naval Academy in 1861. In this year he was promoted to master, and in the following year was made lieutenant. He was executive officer in the ”

Patapsco ” when she was blown up in Charleston Harbor in January 1865. He served on distant stations and (1868-1871 and 1876-1878) at the Naval Academy, and became lieutenant-commander in 1866 and commander in 1874. He was a member of the International Prime Meridian and Time Conference in 1884, and of the Board of Fortifications in 1885-1886; was superintendent of the Naval Academy from 1886 to 1890; and was promoted to captain and served as delegate at the International Maritime Conference at Washington in 1889. He was chief of the Bureau of Ordnance in 1893-1897. About 95% of the guns employed in the Spanish- American War were made under his superintendence. His influence was felt decisively in the distribution of guns and armour, and in the training of the personnel of the navy. He superintended the gunnery training and prepared a new drill-book for the fleet. In February 1898 Sampson, then a captain, was president of Board of Inquiry as to the cause of destruction of the ” Maine.” At the outbreak of the war with Spain he was placed in charge of the N. Atlantic squadron, and conducted the blockade of Cuba. When it was known that Admiral Cervera, with a Spanish fleet, had left the Cape Verde Islands, Sampson withdrew a force from the blockade to cruise in the Windward Passage, and made an attack upon the forts at San Juan, Porto Rico. After his return to the coast of Cuba he conducted the blockade of Santiago, and the ships under his command destroyed the Spanish vessels when they issued from the harbor of Santiago and attempted to escape (see Spanish- American War). Sampson himself was not actually present at the battle, having started for Siboney just before it began to confer with General Shatter, commanding the land forces. He reached the scene

of battle as the last Spanish vessel surrendered, and the engage- ment was fought in accordance with his instructions. He was promoted to commodore in 1898, to rear-admiral on the 3rd of March 1899, and was made commandant of the Boston (Charlestown) Navy Yard in October of the same year. He died on the 6th of May 1902.

SAMSON (cf. Heb. shemesh, ” sun “), in the Bible, the antagonist of the Philistines, reckoned as one of the ” judges ” of Israel (Judg. xv. 20, xvi. 31); the story itself (Judg. xiii. 2-xvi. 31a), however, represents him not as a judge but as a popular hero of vast strength and sarcastic humour. He is consecrated from his birth to be a Nazarite or religious devotee (ch. xiii., cf. Samuel), and it is possible that this was conceived simply as a vow of revenge, which is the meaning it would have in an Arab story (W. R. Smith). But he is inspired by no serious religious or patriotic purpose, and becomes the enemy of the Philistines only from personal motives of revenge, the

one passion which is stronger in him than the love of women. The stories of his exploits are plainly taken from the mouths of the people and have all the appearance of folk-tales, not unmixed with mythical motives. Samson commenced his career by strangling a lion on his way to visit a Philistine woman. On his return he found that the carcase, like the skull of Onesilus (Herod, v. 114), was occupied by a swarm of bees; he took the honey and the incident suggested a riddle. The narrative of Samson's marriage and riddle is of peculiar interest as a record of manners; specially noteworthy is the custom of the wife remaining with her parents after marriage. 1 His next exploit, an act of revenge for the faithlessness of his wife, was to catch 300 foxes and set them loose in the fields with firebrands tied to their tails. (Analogous customs, e.g. the Roman Cerealia, are referred to in G. F. Moore's Commentary, p.' 341.) The Philistines retaliated by burning her and her father's household, and Samson in his turn smote them ; ' hip and thigh " and slew a thousand men with the jawbone of an ass. 2 The story has apparently been influenced by the existence of a rock, called by reason of its shape, " Ass's Jawbone," from which issued a fo'untain called En-hakkore, " the spring of the caller " (a name for the partridge). The well-known removal of the gates of Gaza to Hebron, 40 m. distant — " no journey of the Sabbath- day " (Milton, Samson Agonistes) — has been rendered still more marvellous by a later exaggeration (xvi. 2*) . Finally the Philis- tine Delilah {q.v.) worms out of Samson the secret of his strength, and by shaving his head 3 renders him an easy captive. He is blinded and put to menial work, and as his hair grows again his invincible strength returns. At a festival of Dagon he is led out before the Philistines in the temple, and by pulling down the house upon their heads kills more at his death than in all his life-time.

Points of similarity between Samson and the Babylonian Gilgamesh, the Egyptian Horus-Ra and Hercules, have been observed by many writers, and it has been inferred that the whole story of Samson is a solar myth. His name, and the proximity of Beth-shemesh (" house of the sun ") to his father's home, favour the view that mythical. elements have attached themselves to what may have been originally a legendary figure of the Danites, the tribe whose subsequent fortunes

1 In Judg. xiv. 1-10 the narrative has been revised; originally Samson went down alone to Timnath to contract his marriage. The metrical riddle and its answer are thus translated by G. F. Moore (Sacred Books of the Old Testament: Judges):

" Out of the eater came something to eat, And out of the strong came something sweet."

” If with my heifer ye did not plough, Ye had not found out my riddle, I’trow.”

No doubt the Hebrews, like the Arabs, were fond of enigmas; see I Kings x. 1, and Ency. Biblica, s.v. ” Riddle.”

2 The punning couplet of the original is thus rendered by G. F. Moore: “with the jawbone of an ass, I assailed my assailants” (more literally ” I piled them in heaps,” or perhaps ” flayed them clean “).

3 For the hair as the seat of strength cf. J. G. Frazer, Golden Bough, 2 iii. 390 seq. In ch. xiii. the consecration of the hair is regarded differently.

are narrated in the chapters immediately following (Judg.

xvii.-xviii.).

On the mythological interpretations, see further Ed. Stucken, Mitteil. d. vorderasiat. Gesells. (1902). iv. 54 (with references); Volter, Agyplen und die Bibel (Leiden, 1909), pp. 1 19-132; A. Jeremias, Alte Testament im Lichte des alien Orients (Leipzig, 1906), pp. 478 sqq., and the commentaries on the Book of Judges (q.v.). (S. A. C.)

SAMSON (1135-1211), abbot of St Edmund’s, was educated in Paris and became a teacher in Norfolk, the county of his birth. In 1166 he entered the great Benedictine abbey of St Edmund’s as a monk and was chosen abbot in February 1182. He was a careful and vigilant guardian of the property of the abbey, but he found time to attend royal councils and to take part in public business; also he was frequently entrusted with commissions from the pope. During the absence of Richard I. from England he acted with vigour against John and visited the king in his prison in Germany. He did some building at the abbey, where he died on the 30th of December 1211. Samson is famous for the encouragement which he gave to the town of Bury St Edmunds, the liberties of which he extended in spite of his own monks. His name is most familiar owing to the references to him in Carlyle’s Past and Present.

See the chronicle of Jocelyn of Brakeloud in vol. i. of the Memorials of St Edmund’s Abbey, edited by T. Arnold (1890); and J. R. Green, Stray Studies (1892).

SAMSON, JOSEPH ISIDORE (1793-1871), French actor and playwright, was born at St Denis on the 2nd of July 1793, the son of a restaurant keeper. He took the first prize for comedy at the Conservatoire in 181 2, married an actress with whom he toured France, and came to the Comedie Francaise in 1826. Here he remained until 1863, creating more than 250 parts. He became a professor at the Conservatoire in 1829, and under him Rachel, Rose Cheri (1824-1861), the Brohans and others were trained. He wrote several comedies, among them La Belle-Mere et le gendre (1826), and La Famille poisson (1846). Samson died in Paris on the 28th of March 1871.

SAMSUN (anc. A misus) , the chief town of the Janik sanjak of the Trebizond vilayet of Asiatic Turkey, situated on the S. coast of the Black Sea between the deltas of the Kizil and Yeshil Irmaks. Pop. about 15,000, two-thirds Christian. It is con- nected by metalled roads with Sivas and Kaisarieh, and by sea with Constantinople." It is a thriving town, and the outlet for the trade of the Sivas vilayet. Steamers lie about 1 m. from the shore in an open roadstead, and in winter landing is some- times impossible. Its district is one of the principal sources of Turkish tobacco, a whole variety of which is known as " Samsun." Samsun exports cereals, tobacco and wool. Both exports and imports are about stationary, the Angora railway having neutral ized any tendency to rise. Amisus, which stood on a promontory about 15 m. N.W. of Samsun, was, next to Sinope, the most flourishing of the Greek settlements on the Euxine, and under the kings of Pontus it was a rich trading town. By the 1st century a.d. it had displaced Sinope as the N. port of the great trade route from Central Asia, and later it was one of the chief towns of the Comneni of Trebizond. There are still a few remains of the Greek settlement. (D. G. H.)

SAMUEL, a prominent figure in Old Testament history, was born at Ramah and was dedicated to the service of Yahweh at the sanctuary of Shiloh where his youth was spent with Eli (q.v.). 1 Here he announced the impending fate of the priesthood and gained reputation throughout Israel as a prophet. Best known as " king-maker," two distinct accounts are preserved of his share in the institution of the monarchy. In one, the Philistines overthrow Israel at Ebenezer near Aphek, Eli's sons

1 The name Samuel (Shemuel), on the analogy of Penuel, Reuel, seems to mean " name {i.e. manifestation) of El " (God). Other interpretations are " posterity of God " or " his name (shemo; perhaps Yahweh's) is God." " Heard of God," based on I Sam. i. 20, is quite

impossible and the interpretation of the passage is really only appropriate to Saul (" the asked one "): the two names are sometimes confused in the Septuagint (Ency. ib. col. 4303, n. 3). Ramah is presumably er-Ram, 5 m. N. of Jerusalem (probably the Arimathaea of Matt, xxvii. 57), or Bet Rima, W. of Jiljilia (Gilgal), and N.W. of Beitin, i.e. Bethel (cf. the Ramathaim of 1 Mace. xi. 34).

are slain, and the ark is captured (1 Sam. iv.). After a period of oppression, Samuel suddenly reappears as a great religious leader of Israel, summons the people to return to Yahweh, and convenes a national assembly at Mizpah. 'The Philistines are defeated at Ebenezer (near Mizpah) through the direct inter- position of Yahweh, and Samuel rules peacefully as a theocratic judge (vii). But in his old age the elders demand a king, his sons are corrupt, a monarchy and a military leader are wanted (viii. 3, s, 20). The request for a monarchy is a deliberate offence against Yahweh (viii. 7, cf. x. 19, xii. 12); nevertheless, an assembly is called, and the people are warned of the drawbacks of monarchical institutions (viii. n-21; note the milder attitude inDeut. xvii. 14-20). At Mizpah, after another solemn warning, the sacred lot is taken and falls upon Saul of Benjamin, who, however, is not at first unanimously accepted (x. 17-270). About a month later (x. 276; see Revised Version, margin), Saul — with Samuel (xi. 7) — leads an army of Israel and Judah to deliver Jabesh-Gilead from the Ammonites, and is now recognized as king. Samuel in a farewell address formally abdicates his office, reviews the past history, and, after convincing the people of the responsibility they had incurred in choosing a king, promises to remain always their intercessor (xii., cf. Jer. xv. 1). So, according to one view, Samuel's death marks a vital change in the fortunes of Israel (xxv. 1, xxviii. 3, 6, 15). But, according to an earlier account, instead of a state of peace after the defeat of the Philistines (vii. 14) the people groan under their yoke, and the position of Israel moves Yahweh to pity. Samuel is a local seer consulted by Saul, and is bidden by Yahweh to see in the youth the future ruler. Saul is privately anointed and receives various signs as proof of his new destiny (ix. i-x. 16). Despite the straitened circumstances of Israel, an army is mustered, a sudden blow is struck at the Philistines, and, as before, super- natural assistance is at hand. The Hebrews who had fled across the Jordan (xiii. 7), or who had sought refuge in caverns (xiii. 6, xiv. n), or had joined the enemy (xiv. 21), rallied together and a decisive victory is obtained. That these two accounts are absolutely contradictory is now generally recognized by Biblical scholars, and it is to the former (and later) of them that the simple story of Samuel's youth at Shiloh will belong. Next we find that Samuel's interest on behalf of the Israelite king is transferred to David,

the founder of the Judaean dynasty, and it is his part to announce the rejection of Saul and Yahweh's new decision (xiii. 76-150, xv. 10-35, xxviii. 17), to anoint the young David, and, as head of a small community of prophets, to protect him from the hostility of Saul (xvi. 1-13, xix. 18-24).

All these features in the life of Samuel reflect the varying traditions regarding a figure who, like Elijah and Elisha, held an important place in N. Israelite history. That he was an Ephrathite and lived at Ramah may only be due to the incorporation of one cycle of specifically local tradition; the name of his grandfather Jeroham (or Jerahmeel, so Septuagint) suggests a southern origin, and one may compare the relation between Saul and the Kenites (1 Sam. xv. 6) or Jehu and the Rechabites (2 Kings x. 15). But, although his great victory in I Sam. vii. may imply that he was properly a secular leader, comparable to Othniel, Gideon or Jephthah (see I Sam. xii. 11, cf. Heb. xi. 32), the idea of non-hereditary rulers over all Israel in the pre-monarchical age is a later theory (see Judges). However, so epoch-making an event as the institution of the monarchy naturally held a prominent place in later ideas and encouraged the growth of tradition. The Saul who became the first king of N. Israel must needs be indebted to the influence of the prophet (cf. Jehu in 2 Kings ix.). While the figure of Samuel grows in grandeur, the disastrous fate of Saul invited explanation, which is found in his previous acts of disobedience (1 Sam. xv., xxviii. 16-18; cf. Ahab,

1 Kings xx. 35-43). Further, while on the one side the institution of the monarchy is subsequently regarded as hostile to the pre- eminence of Yahweh, Samuel's connexion with the history of David belongs to a relatively late stage in the history of the written tradi- tions where events are viewed from a specifically Judaean aspect. Samuel's name ultimately becomes a by-word for the inauguration and observance of religious custom (see I Chron. ix. 22, xxvi. 28,

2 Chron. xxxv. 18, Ps. xcix. 6, Ecclus. xlvi. 13 sqq.). According to the late post-exilic genealogies he was of Levitical origin (1 Chron. vi. 28, 33). See further David; Samuel, Books of; Saul.

(S. A. C.) SAMUEL OF NEHARDEA, usually called Mar Samuel or Yarhinai (c. 165-c. 257), Babylonian Rabbi, was born in Nahardea in Babylonia and died there c. 257. He is associated

with the fame of his great contemporary Rab (Abba Araka q.v.). Besides his mastery in the traditional Law, which added much to the growing reputation of the Rabbinic Academy of his native town, Samuel was famed for his scientific attainments. In particular his knowledge of astronomy was profound, and he was one of the first to compile a Calendar of the Jewish year, thus preparing the way for the fixation of the festivals by means of scientific calculations. But Samuel's fame rests on the service which he rendered in adapting the life of the Jews of the diaspora to the law of the land. " The law of the State is binding law," was the principle which Samuel enunciated, here carrying to its logical outcome the admonition of Jeremiah. When the king of Persia, Shapur, captured Mazaca-Caesarea, the Cappa- docian capital, Samuel refused to mourn for the 12,000 Jews who lost their lives in its defence. As Graetz says: " To Jeremiah and Mar Samuel Judaism owes the possibility of existence in a foreign country."

See Graetz, History of the Jews (English translation), vol. ii. ch. xix. (I. A.)

SAMUEL, BOOKS OF, two books of the Old Testament, which in the Jewish canon are ranked among the Former Prophets (Joshua-Kings), in contrast to the Latter Prophets ti P °' i 'd (I sa ' a h-Malachi). The division into two (like the two contents. Hebrew books of Kings) follows the Septuagint and the Vulgate, whose four books of " kingdoms " correspond to the Hebrew books of Samuel and Kings. Both Samuel and Kings, like Judges, are made up of a series of extracts and abstracts from various sources, worked over from time to time by successive editors, and freely handled by copyists down to a comparatively late date, as is shown by the numerous and often important variations between the Hebrew text and the Greek version (Septuagint). The main redaction of Judges and Kings was made under the influence of the ideas which characterize Deuteronomy, that is, after the reforms ascribed to Josiah (2 Kings xxiii.); but in Samuel the " Deuteronomistic " hand is much less prominent and the chronological system which runs through Judges and Kings occurs only sporadically. The book of Samuel completes the history of the " judges " of Israel, (nth century B.C.), and begins by relating the events which led to the institution of the monarchy under Saul, the part played by Samuel being especially prominent (1 Sam. i.-xiv.). The interest is then transferred to David, the founder of the Judaean dynasty, and his early life is narrated with great wealth of detail. As Saul loses the divine favour, David's position advances until, after the death of Saul and the overthrow of Israel, he gains the allegiance of a disorganized people (1 Sam. xv.-2 Sam. iv.), and Jerusalem becomes

the centre of his empire (v.-viii.) — c. 1000 B.C. A more connected narrative is now given of the history of David (ix.-xx.) , which is separated from the account of his death and Solomon's accession (1 Kings i. ii.) by an appendix of miscellaneous contents (xxi.-xxiv.). Three lines of interest are to be recognized: (a) that naturally taken by Israel (the northern kingdom) in the history of its first king, Saul; (b) the leading position of the prophets in the political and religious events; and © the superiority of the Judaean dynasty, a feature of paramount importance in the study of a book which has come ultimately through Judaean hands. (On the ambiguity of the name " Israel," see Jews, § 5.)

Proof of the diversity of sources is found in the varying character of the narratives (historical, romantic, &c.) ; in the different literary styles (annalistic, detailed and vivid, Deuteronomic) ; in the representation of different standpoints and tastes; in the concluding summaries, I Sam. xiv. 47-51 compared with xv., 2 Sam. viii. compared with x.; in the double lists in 2 Sam. viii. 15-18, xx. 23-26, &c. The religious views are so varied that a single writer or even a single age cannot be postulated; note especially 1 Sam. xv. 22 seq. con- trasted with the use of teraphim in xix. 13, and the different con- ceptions of Yahweh (1 Sam. xii. 21 seq., xv. 22 and xxvi. 19, &C.). 1

1 It is of course necessary to note carefully whether the religious ideas have any real chronological value. Thus, I Sam. xvii. 36, 46 seq. contain ideas of Yahweh characteristic of exilic and post-exilic writings (see T. K. Cheyne, Ency. Bib. col. 1755), but no proof of an early date is furnished by xxvi. 196 (cf. Ruth i. 16, I Kings xx. 23, 2 Kings xvii. 26 seq.) ; or 2 Sam. xxiv. 1 (cf. I Kings xxii. 20, Ezek. xlv. 9), or 2 Sam. xxi. 1 (note drought as the punishment for not

Unsystematic additions appear to have been made from time to time on a considerable scale, and we not seldom find two accounts of the same events which not only differ in detail but are certainly of very different date. Thus, the saying " Is Saul also among the prophets?" (1 Sam. x. 12) finds another explanation in xix. 18-24, where Samuel holds a new position as head of a community of prophets and the words are adapted to an incident in the history of David, who flees north (not south) and is wondrously preserved. The episode, with the interview between Saul and Samuel, and with its interesting attitude to Saul and to the prophets, was evi- dently unknown to the writer of xv. 35. Other and more profound differences relating to the rise of the monarchy (§2), the career of Saul (§ 3) and David's conquest of Jerusalem (§ 4) represent irre- concilable historical background.

The first part of the book is concerned with Samuel and Saul. The introductory account (i.iv. 10) of the birth, dedication and calling of the young prophet Samuel is a valuable 2 , institu picture of religious life at the sanctuary at Shiloh. tion of It is connected by the prophecy of the punishment themon- of the house of Eli (iii. n sqq.) with the defeat of the archy ‘ Israelites by the Philistines at Ebenezer near Aphek, the loss of the ark (iv. 16-22), and its subsequent fortunes (v.vii. 1). A Philistine oppression of twenty years ends when Samuel, here the recognized ” judge ” of Israel, gains a great victory at Ebenezer near Mizpah (vii.) . But the overthrow of the Philistines is also ascribed to Saul (xiv.), there is no room for both in the history of the prophet (see vii. 14), and it is now generally recognized that two conflicting representations have been com bined. In one (a) Samuel, after his victory, continues to rule peacefully as a theocratic judge over the Israelites, the people demand a king, and although their request is viewed as hostile to the worship of Yahweh the tribes are summoned at Mizpah and the sacred lot falls upon Saul of Benjamin (vii. viii. x. 17-27). But in the other (b) the Philistines have occupied the heart of the land, the Israelites are thoroughly disorganized, and their miserable condition moves Yahweh to send as a deliverer the otherwise unknown Saul, who is anointed by Samuel, a seer of local renown (ix. i-x. 16, xiii. xiv.). The conclusion of the former is found in Samuel’s farewell address (xii.) and the entire representation of Samuel’s position, Saul’s rise, and the character- istic attitude towards the monarchy (viii. 7, x. 19, xii. 12, cf. Deut. xvii. 14-20, Judg. viii. 22 seq., Hos. viii. 4, xiii. n), separate it sharply from the relatively fragmentary narrative in (b); see further Samuel. The former, now predominating, account (a) is that of the Deuteronomic school, and, although a runn- ing narrative, appears on closer inspection to be based upon earlier sources of different origin. The account of Eli, Shiloh and the ark (i.-iii.) is the tiatural prelude to iv.-vii. r, where, however, we lose sight of Samuel and the prophecy. The punishment of Eli and his sons (iv.) becomes a passing interest, and the fate of the ark is by no means so central an idea as its wonder-working in the Philistine territory. Moreover, the sequel of the defeat in iv. is not stated, although other allusions to the fall of Shiloh (Jer. vii. 12-15, xxvi. 6, 9, Ps. lxxviii. 60 sqq.), and the subsequent reappearance of the priestly family at Nob (xxi. seq.) have led most scholars to the conclusion that a fuller account of the events must have been extant. A narrative of Eli and the priesthood of Shiloh has probably been used to form an introduction to Samuel’s victory (vii.), and it has been supple- mented partly by the account of the early life of the future prophet and judge (note the present abrupt introduction of Eli in i. 3) and partly by narratives of the history of the ark (v. seq.). That this

section was handled at a relatively late period is clear not only from the presence of the Deuteronomic prophecy in ii. 27-36 (see § 6), but also from the insertion of Hannah's psalm (ii. 1-10) — the prototype of the " Magnificat " — a post- exilic passage, " probably composed in celebration of some national success " (Driver), the present suitability of which rests upon the interpretation placed on verse 5.

For the more fragmentary account of Saul's rise (ix. I-x. 16, xiii. 2-711, 156-23, xiv. 1-47), see above, page 194. Chapter xi., where he leads Israel and Judah to the rescue of their kinsmen of Jabesh-Gilead,

rebuilding the temple, Hag. i. Tabernacles, Zech. xiv. 16-19).

or for not attending the feast of

represents a situation which belongs to (a) rather than to the state of chaos represented in (ft) ; it describes how the newly-elected king proved his worth (cf. x. 27, xi. 12 seq.). The compiler has used a story in which Saul is a private individual of Gibeah, whither the messengers came in the course of their mission (xi. 4 seq.)- This valuable narrative is of quite distinct origin. Further, Samuel's speech includes himself among the past judges (xii. 11, cf..vii.), and refers to an Ammonite invasion (v. 12). The latter finds no place in the present history, although the local story of Jephthah's de- liverance of Gilead (Judg. xi.) has been treated as the occasion of a general Ammonite oppression, which leads to an Israelite gathering, also at Mizpah (Judg. x. 7, 9, 17). For other evidence of com- positeness in this section, see A. Lods, Jitudes de theologie (Paris, 1901), pp. 259-284, and below, § 6.

Saul. — Saul's reign is introduced in xiii. 1 where a blank has been left for his age at accession (some MSS. insert " thirty ") ;

the duration of his reign is also textually uncertain. kingdom The formula is parallel to that in 2 Sam. ii. 10 seq., of Saul. v. 4 seq., and frequently in the Book of Kings, with the

additional feature that the age at accession, there usually confined to the Judaean kings, is here given for the Israelite Saul and his son Ishbosheth (i.e. Ishbaal) . The summary in xiv. 47 sqq. is evidently by an admirer; it is immediately followed by a reference to the continuous Philistine warfare (v. 52, contrast vii. 13) which forms an

introduction to the life of David. This summary gives a picture of Saul's ability and position which differs so markedly from the subsequent more extensive narratives of David's history that its genuineness has sometimes been questioned; nevertheless it is substantiated by the old poem quoted from the Book of Jashar in 2 Sam. i. 19-27, and a fundamental divergence in the traditions may be assumed. Similarly in 2 Sam. ii. 8-ioa, the length of Ishbaal's reign conflicts with the history of David (ii. n and iv. i-v. 3), and the reorganization of (north) Israel with the aid of Abner does not accord with other traditions which represent David as the deliverer of (all?) Israel from the Philistine yoke (iii. 18, xix. 9). But ii. 8-100, in common with 1 Sam. xiii. 1, xiv. 47-51 (cf. also the introduction in 1 Sam. vii. 2 and the con- clusion vii. 15-17), are of a literary character different from the detailed narratives; the redactional or annalistic style is notice- able, and they contain features characteristic of the annals which form the framework of Kings. 1 In Kings the Israelite and Judaean records are kept carefully separate and the in- dependent standpoint of each is at once obvious. Here, however, much complication arises from the combination of traditions of distinct origin: independent records of Saul having been revised or supplemented by writers whose interest lay in David. Little old tradition of Saul is preserved. The disastrous over- throw of Israel in the north (xxxi.) finds its explanation in an interview with the dead Samuel (xxviii. 3-25, here a famous prophet), where the Israelite catastrophe is foreshadowed, and Saul learns that he has lost the favour of Yahweh, and that his kingdom will pass to David (w. 16-19). Allusion is made to his campaign against Amalek (mentioned in xiv. 48 apparently as an active enemy), the story of which contains another denuncia- tion and again a reference to the coming supremacy of David (xv. 28). This peculiar treatment of Saul's history by writers of the prophetical school (cf. Ahab in 1 Kings xx. 35-43) has been adapted to the life of David, and the Amalekite war (1 Sam. xv.) is now the prelude to the anointing of the youth of Bethlehem by Samuel (xvi. 1 sqq.) . Yet another account of Saul's rejection is found in xiii. 8-14, even before his defeat of the Philistines, and Saul is warned of the impending change (cf. v. 13 seq. with 2 Sam. vii. n-16). But the incident was evidently unknown to the author of chap, xv., and in this subordination of the history of Saul to that of David, in the reshaping of writings by specifically Judaean hands, we have a preliminary clue to the literary growth of the book.

The unambiguous allusions in xiii. 13 seq., xv 26-28, and the anointing of David by Samuel in xvi. are ignored in the narratives of the relations between David and Saul, of whose first meeting two

1 Characteristic expressions of Deuteronomic writers are found in 1 Sam. xiv. 47 seq. (cp. Judg. ii. 14 sqq.) ;' similarly in the (north) Israelite writer in 2 Kings xiii. 3 sqq. (see Kings).

contradictory accounts are given (contrast xvi. 21 sqq. and xvii. 55 sqq.). The independent stories of David place him in the south of Judah, an outlaw with a large following, or a vassal of the Philistines; and his raids upon south Judaean clans are treated as attacks upon Saul's kingdom (xxvii. 10-12). But the earlier stages are extremely confused. Two very similar narratives describe Saul's pursuit of David in the Judaean desert (xxiv. xxvi.) 2 The main points are Saul's confession and his recognition that David would prevail (xxvi. 21-25) ;, the latter is more emphatic when he foresees that David will gain the kingdom of Israel and he adjures him to spare his seed (xxiv. 20-22). This last feature is prominent in xxiii. 15-18 (the prelude to xxiv.), where a passage is inserted to describe the covenant between David and Saul's son Jonathan. The account of David's flight is equally intricate. The tradition that David slew Goliath, brought his head to Jerusalem, and deposited his sword in Nob (xvii., cf. xxi. 9, xxii. 10) is incompatible with the simpler notice in 2 Sam. xxi. 19 (1 Chron. xx. 5 seeks to avoid the discrepancy) ; and even if the name Goliath be a later addition to the story of some great exploit (A. R. S. Kennedy, Sam., pp. 122, 149), or a descriptive title (W. E. Barnes, .Chron., p. 104), it is surely difficult, on historical grounds, to reconcile David's recurring fights with the Philistines with his subsequent escape from Saul to Achish of Gath (xxvii.; already anticipated in xxi. 10-15); se e further § 6. Saul's jealousy, however, is in some way kindled, and there is already a hint at David's succession (xviii. 8 sqq., Septuagint omits 10 seq.). The stories of Merab (xviii. 17-19) and Michal (vv. 20 sqq.) are duplicate, and a number of internal difficulties throughout are only partially removed in the shorter text of the Septuagint. In xx. David has realized Saul's hatred ; but Jonathan scarcely credits it, although in xix. 1-7 Saul had instructed his attendants to slay the youth and his son had effected a reconciliation. This is ignored also in xix. 8-10 (cf. xviii. 10 seq., xx. 31 sqq.), and again in vv. 11-17 where David is saved by Michal his wife (see xxv. 44), and in vv. 18-24 (David with Samuel, see § I end). Even in xx. the urgent preparations for flight are delayed in vv. 11-17, where Jonathan entreats David's kindness for his descendants (see 2 Sam. ix. 1, below), and again in vv. 40-42, where the second meeting with a renewal of the covenant stultifies the preceding plans. 3

David. — All the stories of the relations between the founders of the respective monarchies are so closely interwoven that the disentanglement of distinct series of narratives is a task of the greatest

difficulty. 4 They reflect in varying i/„J*^ ro forms the popular interest in David and are of the of David. greatest value in illustrating current traditions, thought and styles of literature. Apart from the more detailed and con- tinuous history, there are miscellaneous passages in 2 Sam. v.-viii., with introduction (v. 1-3), and a concluding chapter rounding off his reign (viii.). A similar collection in xxi.-xxiv. severs the narratives in ix.-xx. from David's death in 1 Kings i.-ii. Their contents range over all periods, from the Amalekite war (viii. 12, cf. 1 Sam. xxx.) to David's "last words" (xxiii. 1, but see 1 Kings i. and ii. 1). In particular they narrate the capture of Jerusalem from the Jebusites (v. 6-10) and other fights in that district as far as Gezer (vv. 17-25), the purchase of land from a Jebusite for the erection of an altar (xxiv.; see 1 Chron. xxi.-xxii. 1, 2 Chron. iii. 1), and the remarkable story of the pacification of the Gibeonites (xxi. 1-14). With the conflicts in v. are closely connected the exploits in xxi. 15 sqq., xxiii. 8 sqq., and the probability of some disarrangement is supported by the repetition of the list of officials in viii. 15-18 and xx. 23-26, which many scholars (after Budde) attribute to the later insertion of ix.-xx. 22. On this view, at an earlier stage the two groups v.-viii. , 'xxi.-xxiv. were contiguous— though

2 It is difficult to decide which is the older ; for xxvi. see especially M. Lohr, Sam., p. xiv.; H. Gressmann, Schriften d. A. T., ad loc; for xxiv. see W. W. Guth, Journ. of Bibl. Lit. (1906), pp. 114 sqq.

3 The keen interest in Jonathan is also conspicuous at the very commencement of Saul's career, where the youth (in ix. Saul himself appears to be represented as an inexperienced youth) is the centre of the narrative (see xiii. 3, xiv. 1-14, 17, 21, 27-45), rather than the father who now achieves the task to which he was called by Yahweh. But the revision has been too complicated for any satisfactory dis- cussion of the literary stages.

4 On the attempts (especially of K. Budde, Richter u. Samuel, 1890, and elsewhere) to recover here the Yahwistic (or Judaean) and Elohistic (or Ephraimite) sources of the Hexateuch, see the criticisms of B. Stade, Theolog. Lit. Zeitung (1896), No. 1; Steuer- nagel, ib. (1903), No. 17; W. Riedel, Theol. Lit. Blatt (1904), No. 3, col. 28; also H. P. Smith, Journ. Bibl. Lit., 15 (1896), pp. 1-8; and W. W. Guth, Die alter e Schicht in den Erzdhlungen uber Saul u. David (1904) ; and " Unity of the Older Saul-David Narratives " (see note 2 above).

not necessarily in their present form or order. 1 Budde's further conclusion that 1 Kings i. ii. 1-9, 13 sqq. were likewise wanting (Sam. p. xi.) is also valuable, since (a) 2 Sam. v.-viii. (with xxi.-xxiv.) finds its natural continuation, on the analogy of the Deuteronomic compiler's framework in Kings, in 1 Kings ii. 10-12, iii. 2, and (b) 1 Kings v. 3seq. (also Deuteronomic) explicitly points back to the summary of the wars in 2 Sam. viii. It is commonly recognized that the compiler of 2 Sam. v.viii. has wrongly placed after the capture of Jerusalem (v. 6 sqq.) the conflict with the Philistines (v. 17 sqq.), where the " hold " is not Zion but some place of retreat, perhaps Adullam (cf. xxiii. 14). This being so, the conflicts in xxi. 15 sqq., xxiii. 8 sqq., which are located around Gath, Lehi (so read xxiii. 11), Pas dammim (so v. 9; see 1 Chron. xi. 13), Bethlehem, and the valley of Rephaim, should also precede the occupation of Jerusalem and the subsequent partition of territory among David's sons and others (e.g. xiii. 23, near Bethel). These passages combine to furnish a representation of the events leading to the capture of the capital which is distinct from and now superseded by the detailed narratives in ii. 12-iv. Here, Ishbaal is east of the Jordan, David's men are engaged in fighting Benjamin and Israel — even at Gibeon (about 6 m. N.W. of Jerusalem), the interest of the history is in David's former relations with Israel at Saul's court, and he is regarded as the future deliverer of the oppressed people. These stories are, in fact, of a stamp with the detailed narratives already noticed (§ 3), and they conflict with the fragmentary traditions of David's steps to Jerusalem as seriously as the popular narratives of Saul conflicted with older evidence. But already Josh. ix. 17, xv. 63; Judg. i. 21, 29, 35, xix. 10-12; 2 Sam. v. 6 (cf. xxi. 2), indicate the presence of a line of alien cities including Jerusalem itself, and would point to an important alien district, the existence of which obviously bears upon the trustworthiness of the group of narratives encircling Bethlehem of Judah and Gibeah of Benjamin, the traditional homes of David and Saul. 2 On the other hand, this would ignore the representation of (north) Israelite extension over Judah by Joshua and Saul, 3 and it may be inferred that we have to allow for absolutely different and conflicting standpoints in regard to the history of the district, and that the Judaean traditions of David once had their own independent account of the occupation of Jeru- salem and its neighbourhood. The fragments preserved in 2 Sam. v.-viii., xxi.-xxiv. are quite distinct from ii. 12-iv.; they throw another light upon David's relations to Saul's family (xxi. 1-14) ; and the stories of heroic conflicts with giant-like figures of Gath, &c. (xxiii. 9 seq., 18, cf. 1 Chron. xi. n, 20) find no place by the side of the more detailed records of David's sojourn under the protection of a king of Gath, one of a confeder- ation of Philistine

cities (1 Sam. xxvii., xxix.). It is probable that popular stories of the conquest of the earlier inhabitants have been applied to the Philistines; their general character associates them with the legends of the " sons of Anak " who enter into Judaean (perhaps originally Calebite) tradition elsewhere (Num. xiii. 22; Josh. xi. 21 seq., xv. 14; see Budde, Sam., p. 310 seq.). 4 Several intricate literary problems however at

1 Cornill, Nowack, Stenning and Kennedy (see Literature, below) accept Budde's suggestion that ix.xx. were inserted by a hand later than the first Deuteronomic editor of viii. ; but the further as sumption that this editor had deliberately omitted ix.-xx. from his edition cannot be proved, and deals with a literary stage too early for any confident opinion or even for any critical investigation of value.

2 " Jerusalem " in I Sam. xvii. 54 is usually treated as an anachronism, because of its occupation by the Jebusites, and Kirjath-jearim (vii. I, 2, perhaps Kiryat el-Enab, 9 m. W. of Jerusalem) is commonly admitted to be in alien hands. But it is clear that Nob (1 Sam. xxi. seq.), about 2 m. N. of the capital, on this view, was scarcely an Israelite city, yet the presence of the priests of Shiloh there is essential to the present structure of the book.

3 For Joshua, see the older portions of Josh, x., and for Saul, I Sam. xiv. 47-51 (his wars), xv. 4 (his Judaean army), xvii. 54 (Jerusalem), xxvii. 7-12 (south Judaean clans under Israelite suze- rainty) and 2 Sam. i. 12 (Septuagint).

4 For this cf. the " Anakim " of Gaza, Gath and Ashdod, &c, in Josh. xi. 21 seq., with the " Philistine " lords, ib. xiii. 3, and see Philistines,

once arise in connexion with the two series v.-viii., xxi.-xxiv., and ix.-xx., since, apart from their earlier literary growth as distinct units, they have undergone some revision and alteration when compilers brought them into their present form.

The story of David and Bathsheba, an incident placed in the account of the Ammonite campaign, upon which it now depends (x.-xii. ; with x. 15-19 cf. viii. 3-8), connects itself through the pro- phecy in xii. 10-12 with the subsequent family feuds, in particular with Absalom's rebellion (cf. xvi. 21 seq.), and again with 1 Kings i., where Adonijah's revolt rouses Bathsheba to persuade David to fulfil some promise of his to recognize her young son Solomon as his heir (i. 13, 17, 21, 29 seq.). The section is an admirable specimen of historiography. The whole is closely linked together for an ostensible purpose, a

chronological scheme runs throughout (xiii. 23, 38, xiv. 28 and xv. 7), 6 and the section concludes with an account both of David's death and of Solomon's accession (see further Solomon). But 2 Sam. xii. 10-12 is an insertion (Wellhausen, Cornill, Kittel, &c), even if xii. I- 15a itself be not of secondary origin (Winckler, Schwally, H. P. Smith, Nowack, Budde, Dhorme) ; and of the related passages, xv. 16 is a gloss (Budde), on xx. 3 see below, and the authenticity of xvi. 21-23 in its present context is not beyond doubt (see also Ahithophel). Although xxi. 1-14 and ix. are of entirely distinct standpoints, 6 both are presupposed in xvi. 5-14, xix. 16-23, and in xvi. 1-4, xix. 24-30 respectively; the gloss xxi. 7 evidently dates after the insertion of ix., while the opening words of ix. I point back, not to xxi. which is ignored, but rather to iv., from which it is now severed by the miscellaneous group of passages in v.-viii. 7 In view of a few recognized signs of diverse origin (contrast xiv. 27 with xviii. 18, and see Budde on xv. 24 sqq., xvii. 17), it is possible that xvi. 1-14, xix. 16-30 are also secondary. In any case the new revolt of Sheba (xx. 1-22), can hardly be the original sequel to Absalom's rebellion (Winckler, H. P. Smith, B. Luther, E. Meyer) ; there is no historical prelude to I Kings i. (note the opening verse, David's old age, and cf. 2 Sam. xxiii. 1), and the literary introduction to the story of Sheba is to be found in the closing scene of xix. , apparently at the point where David returns to the Jordan on his way to Gilgal (v. 40) . 8 It is to be noticed that the murder of Amasa (xx. 8 sqq.) is parallel to that of Asahel (ii. 12 sqq.), and the two (now preceding the separate groups v.-viii. and xxi.-xxiv.) are closely associated in 1 Kings ii. 5.

The miscellaneous groups, v.-viii., xxi.-xxiv., are also certainly not in their original form. The introduction in v. 1-3 is twofold (v. 3 and the incomplete v. 1 seq.), and the list in iii. 2-5 (note the resuming link v. 6 after v. 1) is similar in character to that in v. 13-16, and has probably been removed from the context of the latter (cf. I Chron. iii. 1-8). The presence of a late hand is also proved by the psalm in xxii. (Ps. xviii.) and by David's " last words," which sever xxi. 15-22 and xxiii. 8 sqq. These in turn part two related narratives in xxi. 1-14 and xxiv., and the latter (with which note the divergent features in I Chron. xxi.) shows several signs of later origin or re- vision. Chap. vii. is to be read in the light of I Kings v. 3-5, viii. 14 sqq., all Deuteronomic passages, though not of one stamp. Con- tinuous warfare prevented the building of the temple (1 Kings v. 3-5, cf. 2 Sam. viii.), and David's proposal to erect a house to Yahweh seems unnecessary after vi. 17 seq. ; but vii. I, 9, in fact, presuppose ch. viii., and the main object of the narrative is to emphasize Yahweh's promise to build David's house, i.e. his dynasty, vii. is connected with I Kings

viii. but an important variation (v. 16 contrast 2 Sam. vii. 6-8) illustrates the complexity of the Deutero- nomic sources. It is important to notice that, as in the account of the temple in the history of Solomon, the introduction to it in these chapters (2 Sam. vi. seq.) divides miscellaneous though closely- related material (see Kings). On their prelude in 1 Sam. vi. see below, § 6.

Thus, the account of David's conflicts with giant heroes and the conquest of Jerusalem and its district seems to belong to a cycle of Judaean tradition (cf. Num. xiii. 22, 28; s.Narra- Josh. xi. 21, xv. 14), which has been almost superseded ivesof by other traditions of the rise of the Hebrew monarchy Saul and and by the more popular narratives of early relations av ' between the Judaean David and the (north) Israelite king and

6 In xv. 7 we must read four for forty (the vow in this Verse refers to Absalom's exile some years previously).

6 On this and on the character of the detailed narratives in general, see B. Luther in E. Meyer, Israeliten u. ihre Nachbarstamme, pp. 184-199. See, generally, the studies by W. Caspari, Aufkommen u. Krise d. israel. Konigtums unter David (1909) and Theol. Stud. u. Krit. (1909), pp. 317 sqq., 619 sqq.; and also H. Gressmann (Literature, below).

7 Chap. ix. belongs to the joint traditions of David and Saul (cf. ii. 5~iv.) ; v. 13, which presupposes chap, v., appears to be an addition (see H. P. Smith, Dhorme).

8 xix. 40 (all Judah and half Israel) resumes v. 15 (where Israel is not mentioned). For the view that Absalom's revolt originally concerned Judah alone, see the related section in David. Dhorme, it may be observedˆ finds in ix.-xx. another source for x. 1-14, xii. 1-150, xv. 1-6, 10, 24-26, 29, xvi. 5-14, xvii. 27-29, xix. 16-23 and xx. 1-22.

people. The persistent emphasis upon such features as the rejection of Saul, his enmity towards David, the latter's chivalry, and his friendship for Jonathan, will partly account for the present literary intricacies; and, on general grounds, traditions of quite distinct origin (Calebite or Jerahmeelite; indigenous Judaean; North Israelite or Benjamite) are to be expected in a work now in post-exilic form. 1 David's history is handled independently of Saul in i Sam. xxv.; and

the narrative, now editorially connected with the context (v. i, see xxviii. 3, and v. 44, see 2 Sam. iii. 1 5) , gives a valuable picture of his life in the south of Palestine. 2 With this notice his relations with south Judaean cities in xxx. 26-31. His flight northwards to the Philistine king of Gath (xxvii.) is hardly connected with the preceding situations in xxiv. 17-22, xxv. or xxvi. 21-25, and his previous slaughter of the Philistines at Keilah (xxiii. 1-15) raises historical difficulties. This is not to mention his earlier successes over the same people, which are very explicitly ignored in xxix. 5, although the famous couplet there quoted now finds its only explanation in xviii. 7 after the death of Goliath and the defeat of the Philistines. The traditions of varying relations between Judah and the Philistines attached to David (cf . xxvii. 5 seq.) are quite distinct from the popular stories of giants of Gath, and now form part of the joint history of David and Saul. The independent narratives of the latter's fate seem to represent one of those disastrous attacks upon the north which are familiar in the later history of the northern kingdom (xxviii. 4, xxix; see Jews: History, § 12). The geographical data are confused by the stories of David (see 1 Sam. xxviii. 4, xxix. 1, and the commentaries), and, while the " Philistines " for once march north to Jezreel to deliver their attack, David's presence is not discovered until Aphek is reached (xxix.). His journey is the opportunity for an Amalekite raid (xxx. cf. xxvii. 8 seq.), and this new defeat of Amalek, ascribed to David, proves a more successful undertaking than that which led to the rejection of Saul (xv. 20 seq. 26-28). Similarly, Saul's disaster leaves Israel again in the hands of the " Philis- tines " (xxxi. 7, cf. xiii. 6 seq.), and it is for David to save the people of Israel out of their hands (2 Sam. iii. 18, cf. 1 Sam. ix. 16). 3 The sequel to the joint history has another version of Saul's death (2 Sam. i. 6-10, 13-16), and an Amalekite is the offender; contrast his death in i. 15 seq. with iv. 10 seq. The chapter explains the transference of the royal insignia from Israel to Judah. Here is quoted (from the " Book of Jashar ") the old poetical lament over the death of the valiant friends Saul and Jonathan, describing their successful warlike career, the wealth they brought the people, and the vivid sense of national misfortune (i. 19-27). It is utilized for the history of David, to whom its authorship is attributed. In general, it appears that those narratives wherein the histories of Saul and David are combined — very much in the favour of the latter — were originally distinct from those where (a) Saul's figure is more in accord with the old poem from the Book of Jashar. and (b) where David's victories over prehistoric giants and his war-like movements to Jerusalem pave the way for the founda- tion — from a particular Judaean standpoint — of his remarkably long dynasty.

The literary problems of the books 01 Samuel are those of the writing of the history of the monarchies from different points of

/ ft view ; and the intimate connexion of the books with

arvand tnose that precede and follow shows that a careful con- histoHcal s ‘deration of the internal literary and historical features problems °^ tnese a ^ 3 ° ‘ s necessary. The first step is the recognition of a specific Deuteronomic redaction in Joshua — Kings, an intricate process which extended into the post-exilic age. 4 Certain phenomena suggest that the first compilation was made outside Judah — in Israel, whereas others represent a Judaean and anti- Israelite feeling. The close interconnexion of Judg. x.- 1 Sam. xii. is as crucial as that of 2 Sam. v.-i Kings ii. The (probably

1 The late genealogy of Saul in I Chron. viii. 29 sqq., ix. 35 sqq., is evidence for a keen interest in the Saulidae in post-exilic times.

2 The chapter with the prophecy of Abigail may be of Calebite origin.

8 So also, David’s wars (2 Sam. viii.) bear a certain resemblance to those of Saul (1 Sam. xiv. 47).

- See G. F. Moore, Ency. Bib. ” Historical Literature,” § 6 seq. “Joshua,” §§ 5, 11; ” Judges,” § 14.

Deuteronomic) framework of Israelite history in Kings can be traced in Samuel, and it is a natural assumption that it should have gone back beyond the time of Jeroboam T. While the detailed history of Israelite kings and prophets in 1 Kings xvii.-2 Kings x. (Ahab to Jehu) finds more developed parallels in the narratives of Saul and Samuel, the peculiar treatment of the lives of David and Solomon (Judaean kings over a united Israel) and of the division of the monarchy has complicated the present sources. Although the contents of 2 Sam. v.- viii., xxi.-xxiv., 1 Kings ii. 10-12, iii. 2, appear to have been consecutive (in some form) at an earlier stage, the con- nexion has been broken by ix.-xx., 1 Kings i. ii. 1-9, 13 sqq., and the further vicissitudes can scarcely be recovered; and while there are clear signs of more than one Deuteronomic hand in the former group, the latter shows in 1 Kings ii. 2-4 a Deuteronomic revision, either of independent origin or in the combination of the sources in their present form. Moreover, Samuel’s farewell address (1 Sam. xii.) belongs to the Deuteronomic and later account of Saul’s rise, and closes the period of (a) the Israelite ” judges ” (see Judg. ii. 6-iii. 6, an extremely composite passage), and (b) the Ammonite and Philistine

oppression (ib. x. 6 sqq.). 6 The former follows upon Joshua's two concluding speeches, one given by a Deuteronomic writer in xxiii., and. the other incorporated by another though similar hand in xxiv. Although the pre-monarchical age is viewed as one of kinglike " judges," the chiefs are rather local heroes (so Ehud, Gideon, Jephthah), and the boisterous giant Samson (Judg. xiii.- xvi.), and the religious leaders Eli and Samuel are " judges " from other standpoints. Perplexity is caused, also, in the oldest account of Saul's rise (1 Sam. ix.) by the sudden introduction of a Philistine oppression which cannot be connected with vii. 2-viii., or even with 1 Sam. iv.-vii. 1.* On the other hand, Judg. x. 6 sqq. refers to a Philistine oppression which has no sequel. It may be conjectured that there was an original literary connexion between the two which has been broken by the insertion of traditions relating to Samuel and Saul. 7 This finds support (a) in the internal evidence for the later addition of Judg. xvii.xxi., and of certain portions of the opening chapters of I Samuel ; (b) in the absence of any con tinuity in the intervening history; and © in the material relation- ship between portions of the highly composite Judg. x. 6 sqq. and the rise of Saul. The literary processes thus involved find an analogy in the original connexion between 2 Sam. v.- viii. and xxi.-xxiv., or between Exod. xxxiii. seq. and Num. x. 29-36, xi. (see Saul).

The section I Sam. iv.vii. I forms the prelude to Samuel's great victory and belongs to the history of Shiloh and the priesthood of Eli. But the fall of this sanctuary scarcely belongs to this remote age (nth century) ; it was sufficiently recent to serve as a warning to Jerusalem in the time of Jeremiah (close of 7th century) This event of supreme importance to north Israel (cf. Judg. xviii. 30 seq.) is already connected with Samuel's prophecy in iii., but the latter is strengthened by the Deuteronomic passage, ii. 27-36, which links the disaster, not with the history of Samuel, but with the rise of the Zadokite Levites of Jerusalem, and thus represents a specifically Judaean standpoint. This is analogous to the Judaean adaptation of the prophetical treatment of Saul's life, and it also reflects certain priestly rivalries (see Levites). With the loss of Shiloh is explained the appearance of the priests at Nob outside Jerusalem (xxi. 1, xxii. 9), which is followed by their massacre, the flight of Abiathar (xxii.), and the transference of the sacred ephod to David (xxiii. 6). 8 Here, however, the emphasis laid upon the ephod brought by Abiathar, the survivor of the house of Eli (cf. ii. 28, xxi. 9), points away from what was once a common object of cult to the late and post- exilic restriction of its use to the Aaronite high priests (see Ephod).

Moreover, according to I Kings ii. 26, Abiathar bore the ark, and while

some traditions traced its history to Shiloh, or even found it at Bethel (Judg. xx. 27 seq.), others apparently ran quite another course, associated it with southern clans ultimately settled in Judah, and supposed that Jerusalem was its first resting-place. The author of 2 Sam. vii. 6 (cf. also I Chron. xxiii. 25 sq.) can scarcely have known 1 Sam. i.-iii. with its temple at Shiloh, and although 2 Sam. vi. finds its present prelude in I Sam. vi. 17-vii. 1, that passage actually brings the story of its fortunes to a close by relating the return of the ark from Philistine territory to the care of Abinadab and Eleazar at Kirjath-jearim (note the ” Levitical ” type of the names; Budde, Sam. p. 47). From Josh. ix. 17 (post-exilic source) it might indeed be argued that the district was not under Israelite jurisdiction (see Kennedy, Sam. p. 325 seq.), although to judge from the older.

5 With the length of office in I Sam. iv. 18 (cf. vii. 15) compare the similar notices in Judg. x. 2 seq., xii. 7 sqq., xv. 20, xvi. 31, and with the length of oppression in vii. 2, cf. Judg. iii. 8, 14, iv. 3, vi. I, x. 8, xiii. 1.

6 Nowack, p. 39; Riedel, Theolog. Lit. Blatt (1904), No. 3, col. 28.

7 S. A. Cook, Critical Notes, p. 127 seq. (cf. Dhorme, Rev. Bibl., 1908, p. 436; Godbey, Amer. Journ. Theol., 1909, p. 610).

8 Although writers sought to explain Saul’s disastrous end (cf. I Chron. x. 13), it is only Joscphus (Ant. vi. 14, 9) who refers to the atrocity at Nob. The significance of the tradition is unknown ; some connexion with Saul’s religious zeal at Gibeon has been conjectured (2 Sam. xxi. 2). That the actual murderer was an Edomite may perhaps be associated with other traditions of Edomite hostility.

traditions of Saul it was doubtless part of his kingdom. It may be that the narrative ijwhich presupposes some account of the fall of Shiloh) is part of an attempt to co-ordinate different traditions of the great palladium. 1

Consequently, the literary structure of the Book of Samuel is throughout involved with a careful criticism of the historical tradi- _ „ tions ascribed to the 1 1 th and beginning of the 10th century

‘ ” ‘ B.C. The perspective of the past has often been lost, earlier ‘ views have been subordinated to later ones, conflicting

standpoints have been incorporated. The intricacy of the Deuteronomic redactions still awaits solution, and the late insertion of earlier narratives (which have had their own vicissitudes) complicates the literary evidence. Greater care than usual was taken to weave into the canonical representation of history sources of diverse origin, and it is scarcely possible at present to do more than indicate some of the more important features in the composition of a book, one of the most important of all for the critical study of biblical history and theology.

The Hebrew text is often corrupt but can frequently be corrected with the help of the Septuagint. The parallel portions in Chronicles also sometimes preserve better readings, but must be used with caution as they may represent other recensions or the result of rewriting and reshaping. As a whole, Chronicles presents the period from a later ecclesiastical standpoint, presupposing (in contrast to Samuel) the fully developed ” Mosaic ” ritual (see Chronicles). After tribal and priestly lists (1 Chron. i.-ix.), Saul’s end is suddenly introduced (x., note v. 13 seq.). David appears no less abruptly, the sequence being 2 Sam. v. 1-3, 6-10, xxiii. 8-39 (with additions, xi. 41-47, and a list of his supporters at Ziklag and Hebron). To 2 Sam. vi. 2-1 1 there is a ” Levitical ” prelude (xiii. 1-5), then follow v. 1 1-25, and vi. 12-19, which is embedded in novel material. Next, 2 Sam. vii. seq., x., xi. 1, xii. 30 seq., xxi. 18-22, and finally xxiv. (Chron. xxi.). The last is the prelude to an account of the prepara- tion for the temple and the future sovereignty of Solomon, and ends’ with David’s army and government (Chron. xxvii.), and his conclud- ing acts (xxviii. seq.). The compiler was not ignorant of other sources (see x. 13, xii. 19, 21, 23), and, in general, carries out, though from a later standpoint, tendencies already manifest in Samuel. The latter in fact is no less the result of editorial processes and since it is now in post-exilic form, this is the starting-point for fresh criticism. The representation of the remote past in Samuel must be viewed, there- fore, in the light of that age when, after a series of vital internal and external vicissitudes in Judah and Benjamin, Judaism established itself in opposition to rival sects and renounced the Samaritans who had inherited the traditions of their land. See further Jews, §§ 6-8, 20-23, Palestine: Old Test. History, pp. 614-616.

Literature. — See further the commentaries of M. Lohr (1898); VV. Nowack, K. Budde (1902) ; H. P. Smith in the International Critical Commentary (1899), with his Old Testament History, pp. 107- 155, and the small but well-annotated edition of A. R. S. Kennedy in the Century Bible (1905). All these give fuller bibliographical information, for which see also S. R. Driver, Introduction to Literature of Old

Testament, and the articles by J. Stenning in Hastings's Dictionary and B. Stade in Ency. Bib. For the text, see especially J. Wellhausen's model Text-Bucher Sam. (1871); S. R. Driver, Text of Samuel (1890); K. Budde's edition in Haupt's Sacred Books of the Old Testament (1894); P. Dhorme, Livres de Samuel (1910). Of special value for the psychological character of the various narratives is H. Gressmann's Schriften d. A. T. in Auswahl, i.-iii. (Gottingen, 1 909-19 10). In so far as the present article takes other views of the results of literary analysis in the light of historical criticism, see S. A. Cook, American Journ. of Sem. Lang. (1900), pp. 145 sqq.; and Critical Notes on Old Testament History (1907) (passim). (S. A. C.)

SANA (Sena a), a town in S. Arabia, the capital of the Turkish vilayet of Yemen. It is situated in 15° 22′ N. and 44° 10′ E. in a broad valley running nearly N. and S., 7250 ft. above sea-level, on the E. slope of the great meridional range, over which the road runs to Hodeda, on the Red Sea coast 130 m. distant, crossing the Karn al Wa'l pass, over 9000 ft., about 25 m. W. of the city. The mean temperature of the year is 60° F., with a summer maximum of 77°, and a regular rainfall which falls chiefly during the S.W. monsoon from June to Sep- tember. The usual cereals, fruits and vegetables of the temperate zone, wheat, barley, apples, apricots, vines, potatoes, cabbages, beans, &c, are abundant and excellent.

The town consists of three parts — (1) the Medina, the old city, now the Arab quarter, on the E. containing the principal mosques, baths, &c, with the citadel, el Kasr, at its S.E. corner at the foot of Jebel Nukum on the crest of which 2000 ft. above the valley are the ruins of the old fort of el Birash, traditionally attributed to Shem the son of Noah, and the Mutawakkil,

1 This is on the usual assumption that there was only one ark in the history of Judah and Israel.

formerly containing the palace and gardens of the imams, cover- ing its W. face; (2) the Bir Azab W. of the city, consisting of detached houses and gardens, chiefly occupied by the higher Turkish officials, and (3) on the extreme W. the Ka'el Yahud or Jewish quarter. The city with the Kasr and Mutawakkil is surrounded by ramparts built of clay and sun-dried brick, 25 to 30 ft. high and of great thickness. The Bir Azab and Ka'el Yahud are enclosed in a similar enceinte but of more recent construction, connected with that of the city by the Mutawakkil; the whole forms a rough figure of eight, some 25 m. long from E. to W., and f m. in breadth. The walls are pierced by several gates; the principal are the Bab esh Shu'b and the Bab el Yemen in the

N. and S. faces of the city respec- tively, and the Bab es Sabah in its W. face leading into the Mutawakkil, and thence by a broad street through the Bir Azab and Ka'el Yahud to the Bab el Ka', the main entrance to the town from the Hodeda road. The city itself has narrow, paved streets, with massive, flat-roofed houses of several storeys, and many extensive groups of buildings, mosques, serais and baths. The Jami 'Masjid, or principal mosque, stands on the site of the Christian church built by Abraha ruler of Yemen during the period of Ethiopian domination, about a.d. 530. It consists of a great rectangular courtyard paved with granite, surrounded by a triple arcade, the domed roofs of which are supported by numerous columns of stone or brick; in the centre there is a model of the Ka'ba at Mecca covered with stone flags of various colours arranged chequer-wise. Among the other mosques, of which there are forty-eight in all, that of Salah ed din with its beautiful minaret is one of the finest. Of the Kasr Ghumdan and other ancient buildings, the splendours of which were sung by the poets of the early days of Islam, nothing but mutilated ruins remain; the old palace of the imams, the Mutawakkil, was destroyed during the years of anarchy preceding the Turkish occupation, and the site is now occupied by a military hospital standing in well-kept gardens. The houses consist generally of a ground floor built of dressed stone, surmounted by two or three storeys of burnt brick; as a rule the lower storey has no openings but an arched doorway; the facade of the upper storeys is pierced by long narrow window recesses, divided into three parts, the lowest of which forms a square window closed by carved wooden shutters, while the upper ones contain round or pointed window* fitted with coloured glass, or thin slabs.of alabaster which admit a subdued light.

The valley in which Sana lies is generally sterile, but in places where water is brought from the hill streams on the W. fields of barley, lucerne and market gardens are to be seen, particularly at Randa, the garden suburb, 6 m. N. of the town, and in the deep gorges of the Wadi Dhahr and W. Hadda, the terraced orchards of which are celebrated for their fine fruit-trees. The water supply of the town is derived from numerous wells, and from the Ghail Aswad, a small canal which supplies the military cantonment outside and S. of the walls, and runs through the gardens in the Mutawakkil.

The population was estimated by R. Manzoni in 1887 at 20,000 Arabs, 3000 Turks and 1700 Jews, or less than 25,000 altogether; H. Burchardt in 1891 put it at 50,000; the city has, however, suffered severely from the state of unrest which has been chronic in Yemen since 1893, and more particu- larly in 1905, when it was taken by the insurgents, and held by them for three months, and the actual

numbers at present do not probably exceed Manzoni's estimate.

Arabic writers give many discordant and fabulous traditions about the oldest history of Sana and its connexion with the ancient kingdom of Himyar. But most agree that its oldest name was Azal, which seems to be the same word with Uzal in Gen. x. 27. A Himy- arite nation of Auzalites occurs in a Syriac writer of the 6th century. The better-informed Arab writers knew also that the later name is due to the Abyssinian conquerors of Yemen, and that it meant in their language " fortified " (Bakri, p. 606; Noldeke, Gesch. d. Pers. u. Arab. p. 187). Sana became the capital of the Abyssinian Abraha (c. 530 A.D.) who built here the famous church (Kalis), which was destroyed two centuries later by order of the caliph Mansuf (Azraki, p. 91).

Authorities. — Niebuhr, Travels in Arabia (Amsterdam, 1774); R. Manzoni, II Yemen (Rome, 1884) ; D. Charnay and A. Deflers, Excursions au Yemen. Tour du monde (Paris, No. 24, 1898).

(R. A. W.)

SANA'I, the common name of Abulmajd Majdud b. Adam, the earliest among the great Sufic poets of Persia, was a native of Ghazni (in Afghanistan). He flourished in the reigns of the Ghaznevid sultans Ibrahim (1050-1099, 451-492 A.H.), his son Mas'ud (1099-1114), and his grandson Bahram (1118-1152). Persian authorities are greatly at variance as to the dates of the poet's birth and death. At any rate, he must have been born in the beginning of the second half of the nth century and have died between 1131 and 1150 (525 and 545 a.h.). He composed chiefly qasldas in honour of his sovereign Ibrahim and the great men of the realm, but the ridicule of a half-mad jester is said to have caused him to abandon the career of a court panegyrist and to devote his poetical abilities to higher subjects. For forty years he led a life of retirement and poverty, and, although Bahram offered him a high position at court and his own sister in marriage, he remained faithful to his austere and solitary life. But, partly to show his gratitude to the king, partly to leave a lasting monument of his genius behind him, he began to write his great double-rhymed poem on ethics and religious life, which served as model to the masterpieces of Farid-uddin 'Attar and Jelal ud-din Rumi, the Hadiqat ul-haqiqat, or " Garden of Truth " (also called Alkitab alfakhri), in ten cantos. This poem deals with such topics as : the unity of the Godhead, the divine

word, the excellence of the prophet, reason, knowledge and faith, love, the soul, worldly occupation and inattention to higher duties, stars and spheres and their symbolic lore, friends and foes, separation from the world. One of Sana'i's earliest disciples, Mahommed b. 'AH Raqqam, generally known as 'AH al-Raffa, who wrote a preface to this work, assigns to its composition the date 1131 (525 a.h.), and states besides that the poet died immediately after the completion of his task. Now, Sana 'I cannot possibly have died in 1131, as another of his mathnawls, the Tariq-i-tahqiq, or " Path to the Verification of Truth," was composed, according to a chronogram in its last verses, in 1134 (528 a.h.), nor even in 1140, if he really wrote, as the Atashkada says, an elegy on the death of Amir Mu'izzl; for this court-poet of Sultan Sinjar lived till 1 147 or 1148 (542 a.h.). It seems, therefore, that Taqi Kashi is right in fixing Sana'i's death in 11 50 (545 a.h.), the more so as 'AH al-Raffa. himself distinctly says in his preface that the poet breathed his last on the nth of Sha'ban, " which was a Sunday," and it is only in 1150 that this day happened to be the first of the week. Sana'i left, besides the Hadiqah and the Tariq-i-tahqiq, several other Sufic mathnawls of similar purport: for instance, the Sair ul'ibad ila'lma'dd, or " Man's Journey towards the Other World " (also called Kunuz-urrumiiz, " The Treasures of Mysteries"); the 'Ishqnama,or "Book of Love "; the ' Aqlnama or " Book of Intellect "; the Kama-ma, or " Record of Stirring Deeds," &c; and an extensive dlwan or collection of lyrical poetry. His tomb, called the " Mecca " of Ghazni, is still visited by numerous pilgrims.

See Abdullatif al-'Abbasi's commentary (completed 1632 and preserved in a somewhat abridged form in several copies of the India Office Library) ; on the poet's life and works, Ouseley, Biogr. Notices, 184-187; Rieu's and Fliigel's Catalogues, &c. ; E. G. Browne, Literary History of Persia (1906), ii. 317-322; H. Eth6 in W. Geiger's Grundriss der iranischen Philologie, ii. 282-284.

SAN ANTONIO, a city and the county-seat of Bexar county, Texas, U.S.A., about 80 m. S.S.W. of Austin, on the San Antonio river, at the mouth of the San Pedro. Pop. (1900) 53,321, of whom 18,880 were of foreign parentage, 9348 were foreign-born (including 3288 Mexicans and 3031 Germans) and 7538 were negroes; (1910 census), 96,614. San Antonio is the largest city of Texas. It is served by the Galveston, Harrisburg & San Antonio, the International & Great Northern, the San Antonio & Aransas Pass, and the Missouri, Kansas & Texas railways. The city lies at ˆ,n elevation of 610-750 ft. above the sea. The San Antonio river (which has a winding course of 13 m. within the city limits) and its affluent, the San Pedro (which is 10 m.

long in its course through San Antonio), divide the city into three main portions, and these water-courses and the Acequia (7 m. long) are spanned by 17 large iron bridges and about 2500 smaller bridges and culverts. Among the public buildings are the city hall in Military Plaza, the court-house on Main Plaza, the Federal building on the N. side of Alamo Plaza, the Carnegie library and the convention hall and market house on Milam Square. The most interesting building is the historic Alamo (named from the grove of Cottonwood — alamo, the Populus monilifera — in which it stands) on the E. side of the Alamo Plaza, E. of the San Antonio river; it was begun probably in 1744 and was the chapel of the Mission San Antonio de Valero (often called ” the Alamo mission “); in 1883 it was bought by the state and has since been maintained as a public monument. The San Fernando Cathedral 1 on Main Plaza was built in 1734, but there is very little of the original structure in the present building, which really dates from 1868-1873; the former governor’s palace, built in 1749, is at No. 105 Military Plaza; at 128 Soledad is the Veramendi Palace, the residence of Governor Veramendi, father-in-law of Colonel James Bowie, and in this palace Colonel B. R. Milam was killed on the 5th of December I 835 by a sharpshooter hidden in a cypress tree; there is a monument to Colonel Milam in Milam Square. One mile N. of the city on Government Hill is Fort Sam Houston (established in 1865), headquarters of the Department of Texas, with an army hospital (1885) and a tower 88 ft. high. There are several old missions near the city, notably the Mission La Purisima Concepcionde Acuna (the ” First Mission “), 2 m. S. of the city, built here in 1731-1752, having formerly been in E. Texas; the Mission San Jose de Aguayo (the ” Second Mission “), 4 m. S. of San Antonio, built in 17 20-1 731; the Mission San Juan de Capistrano (the ” Third Mission “), 6 m. S. of the Main Plaza built in 1731; and San Francisco de la Espada (the ” Fourth Mission,” also built in 1731 and also removed here from E. Texas), which is 8 m. S. of the Main Plaza and is now used for service by the local Mexicans. The city has 21 parks and plazas. Within the city limits in its N. central part is Brackenridge Park (200 acres) along the San Antonio; 1 m. N.E. of the city is San Pedro Park (40 acres), the source of the San Pedro river; in Travis Park is a Confederate monument; and 3 m. S. of the city are the International Fair Grounds, where in 1898 Colonel Theodore Roosevelt organized his ” Rough Riders,” and Riverside Park. The most notable of the plazas are Military, Main and Alamo. The anniversary of the Battle of San Jacinto, the 21st of April, is annually cele- brated by a ” Battle of Flowers.” Annually in October an International Fair is held, to which Mexico sends an exhibit of Mexican products and manufactures. The climate is mild with a mean summer temperature of 82 F. and a

winter average of 54 , and this and the dry purity of the air make it a health resort; it is also the winter home of many Northerners. There is good shooting (doves, quail, wild turkey and deer) in the vicinity; there are fine golf links and there is a large ranch for breeding and training polo ponies. In the southern suburbs two artesian wells, 1800-2000 ft. deep, discharge 800,000 gallons a day of strong sulphur water (temperature io3°-io6° F.), which is used for treating rheumatism and skin diseases. Near one of these wells is the South-western (State) Hospital for the Insane (1892). The city has a good public school system, including, besides the usual departments, departments of manual training and domestic science. In 1910 there were 30 schools — 26 for whites and 4 for negroes. Among the educational institutions in San Antonio are the San Antonio Female College (Methodist Episcopal, South; 1894), the West Texas Military Academy; Peacock Military School; St Mary's Hall (Roman Catholic); St Louis College; and the Academy of Our Lady of the Lake (under the Sisters of Divine Providence, who have a convent here). The city is the see of Protestant Episcopal and

1 The cathedral is the centre of the city according to the charter, which describes the city as including " six miles square, of which the sides shall be equi-distant from what is known as the cupo'a of the cathedral of San Fernando and three miles therefrom."

Roman Catholic bishops. Among the charitable institutions are the City Hospital (1886), the Santa Rosa Infirmary (1869), maintained by Sisters of Charity, a House of Refuge (1897), a Rescue Home (1895), a home for destitute children and aged persons (1897), the St Francis Home for the Aged (1893), St John's Orphan Asylum (1878), St Joseph's Orphan Asylum (187 1) and the Protestant Home for Destitute Children (1887).

The principal manufactures are malt liquors, flour and grist- mill products and steam railway cars. San Antonio is the commercial centre of a great live stock and farming region.

Under the charter of 1903, as amended in 1907, the municipal government consists of a city council, composed of the mayor, four aldermen, elected at large, and eight ward aldermen, all elected for a term of two years, as are the other elective officers; a city attorney, an assessor, a collector, a treasurer, an auditor and judge of the

Corporation Court. Any elective officer may be removed by the vote of eight members of the council. Other officers are appointed by the mayor with the confirmation of the council. The city water supply, owned by a private corpora- tion, is obtained from artesian wells with a capacity of 40,000,000 gallons a day. The city has a sewer-farm of 530 acres which the charter forbids it to sell.

San Antonio was the capital of Texas during the periods of Spanish and Mexican rule. The presidio of San Antonio de Bexar and the mission of San Antonio de Valero were founded in 1 7 18 under the direction of Martin de Alarcon, governor of Coahuila. San Antonio was accordingly from the beginning a combination of two of the three types of Spanish settlement, the military and the ecclesiastical (see Texas: History). To these was added the third, the civil type, in 1731, when the villa of San Fernando was established. Several missions were established in the neighbourhood, including those already mentioned and San Xavier de Naxera (1722), a new foundation. All of these missions decreased in importance with the disappear- ance of the Indians and by the close of the period of Spanish rule (182 1) had been abandoned. San Antonio was captured by the Magee-Gutierrez party in 1813, but was recovered by the Mexican royalists (see Texas: History). It was besieged by the Texan army under General Stephen F. Austin and Edward Burleson in 1835 and was finally taken early in December as the result of an attack led by Colonel Benjamin R. Milam. Its recapture by Santa Anna, February-March 1836, was dis- tinguished by the heroic defence of the mission (particularly the chapel of the Alamo) by Colonels William Barrett Travis, James Bowie and Davy Crockett, and 178 others against the attack of about 4000 Mexicans. After a bombardment lasting from the 23rd of February to the 6th of March, the Mexicans assaulted on the 6th, were twice beaten back, and then over- powered and slaughtered the garrison, the five survivors being subsequently bayonetted in cold blood. Three women, one a Mexican, two children and a negro servant were spared. ” Remember the Alamo ” became a war-cry of the Texans. The Mexicans again invaded Texas in 1842, and San Antonio was twice captured and held for short periods, first by General Vasquez and later by General Woll. After 1836 there was a large influx of Anglo-Americans and Germans, and the Mexican element long ago ceased to predominate. Charters of incorpora- tion were granted in 1837, 1842, 1852, 1856, 1870 and 1903. At San Antonio in February 1861 General David E. Twiggs (1790- 1862), a veteran of the Mexican War, surrendered the Depart- ment of Texas, without resistance, to the Confederate general, Ben McCulloch; for this General Twiggs was dismissed from the United States army, and in May he became a

major-general in the Confederate service. The rapid growth of San Antonio dates from 1878, when the first railway entered the city.

See William Corner, San Antonio de Bexar (San Antonio, 1890); The Quarterly of the Texas State Historical Association, ii. 217-226, viii. 277-352 ; and George P. Garrison, Texas (Boston and New York, 1903), in the ” American Commonwealths Series.”

SAN ANTONIO DE LOS BAfiOS, a small town in Havana Province, Cuba, about 23 m. (by rail) S.W. of Havana. Pop. (1907) 9125. San Antonio de los Bafios is served by the W.

branch of the United Railways of Havana. It is on the banks of the Ariguanabo river, which drains a lake of the same name, and is itself one of the many ” disappearing rivers ” of the island; it disappears in a cave near San Antonio. The town has mineral springs and baths, and is a summer resort of the people of Havana. Though spreading over hills, the plan of the town is regular. The tobacco of the Vuelta Abajo lands immediately around the city is famous. The pueblo arose in the middle of the 18th century as a camp for convicts from Mexico. It became a villa in 1794. Early in the 19th century refugees from Santo Domingo settled here and founded coffee estates that gave the place great prosperity until the expulsion of the French in 1809; subsequently the cultivation of tobacco renewed its prosperity.

SANATORIUM (a modern Latinism, formed from sanare, to cure, restore to health, sanus, whole, healthy, well; often wrongly spelled sanatarium or sanitarium), an establishment where persons suffering from disease, or convalescents, may be received for medical treatment, rest cures and the like; in recent modern usage particularly used for establishments where patients suffering from phthisis may undergo the open-air treatment (see Therapeutics). The mis-spellings of the word, sanitarium and sanatarium, are. due to a confusion of “sanatory,” i.e. giving health, from sanare, and ” sanitary,” pertaining to health, from sanitas, health.

SANATRUCES (Sinatruces, Pers. Sanatruk), Parthian king. In the troublous times after the death of Mithradates II. (c. 88 B.C.) he was made king by the Sacaraucae, a Mongolian tribe who had invaded Iran in 76 B.C. He was eighty years old and reigned seven years; his successor was his son Phraates III. (Lucian, Macrob. 15; Phlegon, fr. 12 ap. Phot. cod. 97; Appian, Mithr. 104; Dio Cass, xxxvi. 45). Another Sanatruces (Sana- trucius) is mentioned as an ephemeral Parthian king in a.d. 115 (Malalas, Chron. p. 270, 273). (Ed. M.)

SAN BERNARDINO, a city and the county-seat of San Bernard- ino county, California, U.S.A., about 60 m. E. of Los Angeles. Pop. (1900) 6150 (873 foreign-born); (1910) 12,779. It is served by the Atchison, Topeka & Santa Fe, the Southern Pacific and the San Pedro, Los Angeles & Salt Lake railways, and by an interurban electric line. The city is situated in a valley at an altitude of about 1050 ft., at the S. base of the San Bernardino mountain range and 20 m. W. of San Bernardino mountain (11,600 ft.). Among the public buildings are a Carnegie library (1903; the library was established in 1891), with 10,000 volumes in 1909, and the county court house. There are two public parks, Lugo, near the centre of the city, and Meadowbrook, on the E. outskirts. San Bernardino is one of several places (Redlands, Highland, Rialto, Colton – , Bloomington, Riverside, Pomona) that lie near together in part of the citrus fruit, alfalfa and grain region of S. California. The Santa Fe railway has extensive repair and construction shops here. San Bernardino is popularly known as the ” Gate City of Southern California.” Five miles N. of the city, and connected with it by electric railway, at the base of a mountain on whose side is a great blaze shaped like an arrow-head, are the Arrowhead Hot Springs (196 F.), resembling the Carlsbad waters; the hotel at the Springs is heated by their waters. Other hot springs near San Bernardino are the Urbita, ij m. S., and the Harlem, 4 m. N.E. About 1822 Spanish missionaries settled about 5 m. from the site of the present city and called their mission San Bernardino (from St Bernardin of Siena). In 1851 the Mormons established here a colony, which was abandoned in 1857. The county was organized in 1853 with the county-seat at San Bernardino, which was incorporated as a town in 1854. It was deprived of its charter in 1861, but re- ceived a new one in T864. The Southern Pacific in 1876 gave the city connexion with the ocean, and the Santa F6 in 1885 connected it with the East. Under a state enactment in 1905 San Bernardino adopted a new charter which provides for the ” recall ” by petition, the initiative and the referendum.

SANCERRE, a town of central France, capital of an arrondisse- ment in the department of Cher, 34 m. N.E. of Bourges by rail. Pop. (1906) 2232. Sancerre, which gives its name to the small district of Sancerrois, is situated on an isolated vine-clad hill

(iooo ft.) about i m. from the left bank of the Loire. It has a modern chateau, in the grounds of which there is a cylindrical keep of the

15th century, the only relic of an ancient stronghold. Prom 1037 to 1 1 52 the title of count of Sancerre was held by the counts of Champagne; from the latter year till 1640 it had its own counts, who were descended from Theobald IV. of Cham- pagne, but in 1226 came under the suzerainty of the crown. In 1640 it became the property of Henri de Conde, whose descendants possessed it till the Revolution. During the religious wars it was a stronghold of Protestantism, and in 1573 was besieged by the Catholics, who did not succeed in capturing it till after nearly eight months of siege. The town has a subprefecture, a tribunal of first instance and a communal college. Good wine is grown in the vicinity.

SANCHEZ. Three persons of this name enjoyed considerable literary celebrity: (1) Francisco Sanchez (Sanctius) (1523- 1601), successively professor of Greek and of rhetoric at Sala- manca, whose Minerva, first printed at that town in 1587, was long the standard work on Latin grammar. (2) Francisco Sanchez, a Portuguese physician of Jewish parentage, born at Tuy (in the diocese of Braga) in 1550, took a degree in medicine at Montpelher m 1574, became professor of philosophy and physic at Toulouse, where he died in 1623; his ingenious treatise (Quod nihil scitur, 1581) marks the high-water of reaction against the dogmatism of his time; he is said to have been distantly related to Montaigne. (3) Tomas Sanchez of Cordova (1551-1610), Jesuit and casuist, whose treatise De matrimonio (Genoa, 1592) is more notorious than celebrated.

SANCHI, a small village in India, at which there is now a railway station on the Bombay-Baroda line. It is famous as the site of what are almost certainly the oldest buildings in India now standing. They are Buddhist topes (Pali, thupa; Sanskrit, stupa), that is, memorial mounds, standing on the level top of a small sandstone hill about 300 ft. high on the left bank of the river Betwa. The number of topes on this and the adjoining hills is considerable. On the Sanchi hill itself are only ten, but one of these is by far the most important and imposing of all. All these topes were opened and examined by General Alexander Cunningham and Lieut.-Colonel Maisey in 1851; and the great tope has been described and illustrated by them and by James Fergusson. This is a solid dome of stone, about 103 ft. in diameter, and now about 42 ft. high. It must formerly have been much higher, the top of the tope having originally formed a terrace, 34 ft. in diameter, on which stood lofty columns. Cunningham estimates the original height of the building as about 100 ft. Round the base is a flagged pathway surrounded by a stone railing and entered at the four points of the compass by gateways some 18 ft. high. Both gateways and railing are elaborately covered with bas-reliefs and inscriptions. The latter give

the names of the donors of particular portions of the architectural ornamentation, and most of them are written in the characters used before and after the time of Asoka in the middle of the 3rd century b.c. The monuments are Buddhist, the bas-reliefs illustrate passages in the Buddhist writings, and the inscriptions make use of Buddhist technical terms. Some of the smaller topes give us names of men who lived in the Buddha's time, and others give names mentioned among the missionaries sent out in the time of Asoka. It is not possible from the available data to fix the exact date of any of these topes, but it may be stated that the smaller topes are probably of different dates both before and after Asoka, and that it is very possible that the largest was one of three which we are told was erected by Asoka himself. The monuments at Sanchi are now under the charge of the archaeological department; they are being well cared for, and valuable photographs have been taken of the bas-reliefs and inscriptions. The drawings in Fergusson's work entitled Tree and Serpent Worship are very unsatisfactory and his suggestion that the carvings illustrate tree and serpent worship is quite erroneous.

Bibliography.— Alex Cunningham, Bhilsa Topes (London,i8 54) ; James Fergusson, Tree and Serpent Worship (London, 1873) ; f>neral

Tt£jPf 1 T*Z , – S T :ht S nd ttS R ? mains (Lond on. 1892) ; Rhys Davids, Buddhist India (London, 1902). (T. W. R. D)

it SANCHUNIATHON (Gr. form of Phoenician Sakkun-yathon, the god Sakkun has given "), an ancient Phoenician sage, who belongs more to legend than to history. He is said to have flourished " even before the Trojan times," " when Semiramis was queen of the Assyrians." Philo Herennius of Byblus claimed to have translated his mythological writings from the Phoenician originals. According to Philo, Sanchuniathon derived the sacred lore from the mystic inscriptions on the 'Afifiowets (probably hammanim, "sun pillars," cf. Is. xxvii. 9, &c.) which stood in the Phoenician temples. That any writings of Sanchuniathon ever existed it is impossible to say. Philo drew his traditions from various sources, adapted them to suit his purpose, and conjured with a venerable name to gain credit for his narrative. Porphyry says that Sanchuniathon (here called a native of Byblus) wrote a history of the Jews, based on information derived from Hierombal (i.e. Jeruba'al), a priest of the god Jevo (i.e. Yahveh, Jehovah), and dedicated it to Abelbal or Abibal, king of Berytus. The story is probably a pure inven- tion; the reference to Berytus shows that it is late

– PP- SAN CRIST6BAL (formerly called San Cristobal de Los Llanos, Ciudad de Las Casas, and Ciudad Real), a town of Mexico, in the state of Chiapas, on a level tableland about 6700 ft • above sea-level and 48 m. E.N.E. of Tuxtla Gutierrez. Pop. (1892 estimate) 16,000. The surrounding country is fertile and healthful and is populated chiefly with Indians. The town possesses a cathedral, hospital and other public institutions. San Cristobal was founded in 1528 on the site of an Indian village and afterwards was famous as the residence of Las Casas, Bishop of Chiapas. It was the capital of Chiapas until near the end of the 19th century. There are traces of an early Indian civilization in the vicinity.

SANCROFT, WILLIAM (1616-1693), archbishop of Canterbury was 1 orn at Fressingfield in Suffolk 30th January 1616 and entered Emmanuel College, Cambridge, in July 1 634. He became M.A. in 1641 and fellow in 1642, but was ejected in 1649 for refusing to accept the ” Engagement.” He then remained abroad till the Restoration, after which he was chosen one of the univer- sity preachers, and in 1663 was nominated to the deanery of York. In 1664 he was installed dean of St Paul’s. In this situation he set himself to repair the cathedral, till the fire of London in 1666 necessitated the rebuilding of it, towards which he gave £1400. He also rebuilt the deanery, and improved its revenue. In 1668 he was admitted archdeacon of Canterbury upon the king’s presentation, but he resigned the post in 1670 In 1677, being now prolocutor of the Convocation, he was unexpectedly advanced to the archbishopric of Canterbury’ He attended Charles II. upon his deathbed, and ” made to him a very weighty exhortation, in which he used a good degree of freedom.” He wrote with his own hand the petition presented in 1687 against the reading of the Declaration of Indulgence which was signed by himself and six of his suffragans. For this they were all committed to the Tower, but were acquitted Upon the withdrawal of James II. he concurred with the Lords in a declaration to the prince of Orange for a free parliament and due indulgence to the Protestant dissenters. But, when that prince and his consort were declared king and queen, he refused to take the oath to them, and was accordingly suspended and deprived. From 5th August 1691 till his death on the 24th of November 1693, he lived a very retired life in his native place. He was buried in the churchyard of Fressingfield, where there is a Latin epitaph to his memory. Sancroft was a- patron of Henry Wharton (1664-1695), the divine and church historian, to whom on his deathbed he entrusted his manuscripts and the remains of Archbishop Laud (published in 1695).

He published Fur praedestinatus (1651), Modern Politics (i6«) and

Ihree Sermons (1694). Nineteen Familiar Letters to Mr North (afterwards Sir Henry North) appeared in 1757.

SANCTION (Lat. sanctio, from sancire, to decree or ordain), in jurisprudence, the means provided for the enforcement of a la-,v. According to T. E. Holland (Elements of Jurisprudence

1906, p. 85), ” the real meaning of all law is that, unless acts conform to the course prescribed by it, the state will not only ignore and render no aid to them, but will also, either of its own accord or if called upon, intervene to cancel their effects. This intervention of the state is what is called the ‘ sanction ‘ of law. ” So Justinian (Inst. ii. 1, 10), ” Legum eas partes quibus poenas constituimus adversus eos qui contra leges fecerint, sanctiones vocamus.” In general use, the word signifies approval or confirmation.

SANCTIS, FRANCESCO DE (1817-1883), Italian publicist, was born at Morra Irpino, and educated at the institute of the Marchese Basilio Puoti. Becoming a teacher in a private school of his own, he made a name as a profound student of literature; and after the troubles of the ‘48, when he held office under the revolutionary government and was imprisoned for three years at Naples, his reputation as a lecturer on Dante at Turin brought him the appointment of professor at Zurich in 1856. He returned to Naples as minister of public instruction in i860, and filled the same post under the Italian monarchy in 1861, 1878 and 1879, having in 1861 become a deputy in the Italian chamber. In 1871 he became professor at Naples Uni- versity. As a literary critic, De Sanctis took a very high place, notably with his Storia della letteratura italiana (2nd ed., 1873) and with his critical studies, published in several volumes, some of them since his death at Naples in 1883.

SANCTI SPIRITUS, an old Cuban city in Santa Clara province, situated on a sandy plain in an angle of the Yayabo river, which winds through the city. Pop. (1907) 17,440. It is connected by railway with Zaza del Medio, on the main railway line of the island, and with its port, Tunas de Zaza, 30 m. (by rail) to the S. The hill called Pan de Azucar (Sugar-loaf) is S.W. of the city. One church is said to be as old as the city, and others date from 1699, 1716, 1717, &c. The surrounding country is devoted principally to grazing. Sancti Spiritus was one of the seven cities founded by Diego Valasquez. Its settlement was ordered in 1514

and accomplished in 1516, and it is the fifth town of the island in age. The present city is about two leagues from the original site (Pueblo Viejo). In 1518, as a result of the war of the Comunidades of Castille, a mimic war broke out in Sancti Spiritus among its two score villagers. The place was sacked by French and English corsairs in 17 19. Illicit trade with Jamaica was the basis of local prosperity in the 18th century.

SANCTUARY (from the late Lat. sanctuarium, a sacred place), a sacred or consecrated place, particularly one affording refuge, protection or right of asylum; also applied to the privilege itself, the right of safe refuge. In Egyptian, Greek or Roman temples it was applied to the cella in which stood the statue of the god, and the Latin word for altar, ara, was used for protec- tion as well. In Roman Catholic usage sanctuary is sometimes applied to the whole church, as a consecrated building, but is generally limited to the choir. The idea that such places afforded refuge to criminals or refugees is founded upon the primitive and universal belief in the contagion of holiness. Hence it was sacrilege to remove the man who had gained the holy precincts; he was henceforth invested with a part of the sacredness of the place, and was inviolable so long as he remained there. Some temples had peculiar privileges in this regard. That of Diana at Ephesus extended its inviolability for a perimeter of two stadia, until its right of sanctuary was refused by the Romans. Not all Greek and Roman temples, however, had the right in an equal degree. But where it existed, the action of the Roman civil law was suspended, and in imperial times the statues and pictures of the emperors were a protection against pursuit. Tacitus says that the ancient Germans held woods, even lakes and fountains, sacred; and the Anglo-Saxons seem to have regarded several woods as holy and to have made sanctuaries of them, one of these being at Leek in Staffordshire.

The use of Christian churches as sanctuaries was not based

upon the Hebrew cities of refuge, as is sometimes stated. It

is part of the general religious fact of the inviolability attaching

to things sacred. The Roman law did not recognize the use of

Christian sanctuaries until toward the end of the 4th century, but the growing recognition of the office of bishop as intercessor helped much to develop it. By 392 it had been abused to such an extent that

Theodosius the Great was obliged to limit its application, refusing it to the publici debitores. Further evidence of its progress is given by the provision in 397 forbidding the reception of refugee Jews pretending conversion in order to escape the payment of debts or just punishment. In 398, according to contemporary historians, the right of sanctuary was completely abolished, though the law as we have it is not so sweeping. But next year the right was finally and definitely recognized, and in 419 the privilege was extended in the western empire to fifty paces from the church door. In 431, by an edict of Theodosius and Valentinian it was extended to include the church court-yard and whatever stood therein, in order to provide some other place than the church for the fugitives to eat and sleep. They were to leave all arms outside, and if they refused to give them up they could be seized in the church. Capital punishment was to be meted out to all who violated the right of sanctuary. Justinian's code repeats the regulation of sanctuary by Leo I. in 466, but Justinian himself in a Novel of the year 535 limited the privilege to those not guilty of the grosser crimes. In the new Germanic kingdoms, while violent molestation of the right of sanctuary was forbidden, the fugitive was given up after an oath had been taken not to put him to death (Lex. Rom. Burgund. tit. 2, § 5; Lex. Visigoth vi. tit. 5, c. 16). This legislation was copied by the church at the council of Orleans in 511; the penalty of penance was added, and the whole decree backed by the threat of excommunication. Thus it passed into Gratian's Decretum. It also formed the basis of legislation by the Frankish king Clotaire (51 1-588), who, however, assigned no penalty for its violation. Historians like Gregory of Tours have many tales to tell showing how frequently it was violated. The Carolingians denied the right of sanctuary to criminals already condemned to death.

The earliest extant mention of the right of sanctuary in England is contained in the code of laws issued by the Anglo- Saxon king yEthelberht in a.d. 600. By these he who infringed the church's privilege was to pay twice the fine attaching to an ordinary breach of the peace. At Beverley and Hexham 1 m. in every direction was sacred territory. The boundaries of the church frith were marked in most cases by stone crosses erected on the highroads leading into the town. Four crosses, each 1 m. from the church, marked the mile limits in every direction of Hexham Sanctuary. Crosses, too, inscribed with the word " Sanctuarium, "were common on the highways, serving probably as sign-posts to guide fugitives to neighbouring sanctuaries. One is still to be seen at Armathwaite, Cumberland; and another at St Buryan's, Cornwall, at the corner of a road leading down to some ruins known locally as " the Sanctuary." That such wayside crosses

were themselves sanctuaries is in most cases improbable, but there still exist in Scotland the remains of a true sanctuary cross. This is known as MacDuff's Cross, near Lindores, Fifeshire. The legend is that, after the defeat of the usurper,Macbeth, in 1057, and the succession of Malcolm Canmore as Malcolm III. to the Scottish throne, MacDuff, as a reward for his assistance, was granted special sanctuary privileges for his kinsmen. Clansmen within the ninth degree of relationship to the chief of the clan, guilty of unpremeditated homicide, could, on reaching the cross, claim remission of the capital sentence. Probably the privilege has been exaggerated, the fugitive kins- men were exempt from outside jurisdiction and liable only to the court of the earl of Fife.

The canon law allowed the protection of sanctuary to those guilty of crimes of violence for a limited time only, in order that some compensation {wergild) should be made, or to check blood-vengeance. In several English churches there was a stone seat beside the altar which was knoVn as the frith-stool (peace-stool), upon which the seeker of sanctuary sat. Examples of such sanctuary-seats still exist at Hexham and Beverley, and of the sanctuary knockers which hung on the church-doors one is still in position at Durham Cathedral. The procedure, upon seeking

sanctuary, was regulated in the minutest detail. The fugitive had to make confession of his crime to one of the clergy, to surrender his arms, swear to observe the rules and regulations of the religious houses, pay an admission fee, give, under oath, fullest details of his crime (the instrument used, the name of the victim, &c), and at Durham he had to toll a special bell as a formal signal that he prayed sanctuary, and put on a gown of black cloth on the left shoulder of which was embroidered a St Cuthbert's cross.

The protection afforded by a sanctuary at common law was this: a person accused of felony might fly for safeguard of his life to sanctuary, and there, within 40 days, go, clothed in sack- cloth, before the coroner, confess the felony and take an oath of abjuration of the realm, whereby he undertook to quit the king- dom, and not return without the king's leave. Upon confession he was, ipso facto, convict of the felony, suffered attainder of blood and forfeited all his goods, but had time allowed him to fulfil his oath. The abjurer started forth on his journey, armed only with a wooden cross, bareheaded and

clothed in a long white robe, which made him conspicuous among medieval way- farers. He had to keep to the king's highway, was not allowed to remain more than two nights in any one 'place, and must make his way to the coast quickly. The time allowed for his journey was not long. In Edward III.'s reign only nine days were given an abjurer to travel on foot from Yorkshire to Dover. Under the Norman kings there appear to have been two kinds of sanctuary; one general, which belonged to every church, and another peculiar, which had its force in a grant by charter from the king. This latter type could not be claimed by pre- scription, and had to be supported by usage within legal memory. General sanctuaries protected only those guilty of felonies, while those by special grant gave immunity even to those accused of high or petty treason, not for a time only but apparently for life. Of chartered sanctuaries there were at least 22: Abingdon, A/ mathwaite, Beaulieu, • Battle Abbey, Beverley, Colchester' Derby, Durham, Dover, Hexham Lancaster, St Mary le Bow (London), St Martin's le Grand (London), Merton Priory, North- ampton, Norwich, Ripon, Ramsey, Wells, Westminster, Win- chester, York (Soc. of Antiq. of London, Archaeologia, viii. 1-44, London, 1787. Sketch of the History of the Asylum or Sanctuary, by Samuel Pegge) . Sanctuary being the privilege of the church, it is not surprising to find that it did not extend to the crime of sacrilege; nor does it appear that it was allowed to those who had escaped from the sheriff after they had been delivered to him for execution.

Chartered sanctuaries had existed before the Norman invasion. About thirty churches, from a real or pretended antiquity of the privilege, acquired special reputation as sanctuaries, e.g. West- minster Abbey (by grant of Edward the Confessor) ; Ripon (by grant of Whitlase, king of the Mercians); St Buryans, Cornwall (by grant of ˆEthelstan); St Martin's le Grand, London,- and Beverley Minster. "The precincts, of the Abbey," says Dean Stanley, " were a vast cave of Adullam for all the distressed and discontented in the metropolis, who desired, according to the phrase of the time, to ' take Westminster.' " Elizabeth Woodville, queen of Edward IV., took refuge in the Abbey with her younger children from the hostility of Richard III. In the next reign the most celebrated sanctuary-seeker was Perkin Warbeck, who thus twice saved his neck, at Beaulieu and Sheen. John Skelton, tutor and afterwards court poet to Henry VIII., fearing the consequences of his caustic wit as displayed in an attack on Wolsey, took sanctuary at Westminster and died there in 1529.

The law of abjuration and sanctuary was regulated by numerous and intricate statutes (see Coke, Institutes, iii. 115); but grave abuses arose, especially in the peculiar sanctuaries. The attack on these seems

to have begun towards the close of the 14th century, in the reign of Richard II. During the 15th century violations of sanctuary were not uncommon; the Lollards were forced from churches; and Edward IV. after the battle of Tewkesbury had the duke of Somerset and twenty Lancastrian leaders dragged from sanctuary and beheaded.

At the Reformation general and peculiar sanctuaries both suffered drastic curtailment of their privileges, but the great chartered ones suffered most. By the reforming act of 1540 Henry VIII. established seven cities as peculiar sanctuaries These were Wells, Westminster, Northampton, Manchester, York, Derby and Launceston. Manchester petitioned against being made a sanctuary town, and Chester was substituted By an act of James I. (1623), sanctuary, as far as crime was concerned, was abolished throughout the kingdom. The privilege lingered on for civil processes in certain districts which had been the site of former religious buildings and which became the haunts of criminals who there resisted arrest— a notable example being that known as Whitefriars between Fleet Street and the Thames, E. of the temple. This locality was nicknamed Alsatia (the name first occurs in Shadwell's plays in Charles II. 's reign), and there criminals were able to a large extent to defy the law (see Sir Walter Scott's Fortunes of Nigel and Peveril of the Peak), arrests only being possible under writs of the Lord Chief Justice! So flagrant became the abuses here and in the other quasi- sanctuanes that in 1697 an act of William III., known as " The Escape from Prison Act," finally abolished all such alleged privileges. A further amending act of 1723 (George I.) completed the work of destruction. The privileged places named in the two acts were the Minories, Salisbury Court, Whitefriars Fulwood's Rents, Mitre Court, Baldwin's Gardens, The Savoy! The Clink, Deadman's Place, Montague Close, The Mint and Stepney. (See Stephen, History of Crim. Law, i. 113.)

In Scotland excommunication was incurred by any who attempted to arrest thieves within sanctuary. The most famous sanctuaries were those attaching to the Church of Wedale, now Stow, near Galashiels, and that of Lesmahagow, Lanark. All religious sanctuaries were abolished in the Northern Kingdom at the Reformation. But the debtor found sanctuary from diligence" in Holyrood House and its precincts until late in the 17th century. This sanctuary did not protect criminals, or even all debtors, e.g. not crown debtors or fraudulent bankrupts; and it was possible to execute a meditatio fugae warrant within the sanctuary. After twenty-four hours' residence the debtor had to enter his name in the record of the Abbey Court in order to entitle him to further protection. Under the Act 1696 c. 5 insolvency concurring with retreat to the sanctuary constituted notour bankruptcy (see Bell,

Commentaries, ii. 461). The aboli- tionˆ imprisonment for debt in 1881 practically abolished this privilege of sanctuary.

A presumptive right of sanctuary attached to the royal palaces, and ajrests could not be made there. In Anglo-Saxon times the king's peace extended to the palace and 3000 paces around it: it extended to the king himself beyond the precincts. At the present day Members of Parliament cannot be served with writs or arrested within the precincts of the Houses of Parliament, which extend to the railings of Palace Yard. During the Irish agitation of the 'eighties Parnell and others of the Irish members avoided arrest for some little while by living in the House and never passing outside the gates of the yard.

The houses of ambassadors were in the past quasi-sanctuaries. Phis was a natural corollary of their diplomatic immunities (see Diplomacy). The privilege was never strictly defined At one time it was insisted that the immunity accorded an ambassador included his house and those who fled to it. At an earlier date sanctuary had actually been claimed for the quarter of the town in which the house stood. At Rome this privilege was formally abolished by Innocent XI. (Pope 1676- 1689), and in 1682 the Spanish ambassador at the Papal Court renounced all right to claim immunity even for his house. His example was foUowed by the 'British ambassador in 1686. Portugal, Sweden, Denmark and Venice abolished by express ordinance in 1748 the asylum-rights of ambassadorial residences. In 1726 the Spanish government had forcibly taken the duke of Ripperda out of the hotel of the English ambassador at Madrid, although the Court of St James had sanctioned his reception there. At Venice, too, some Venetians who had betrayed state secrets to the French ambassador and had taken

refuge at his house were dragged out by troops sent by the senate.

In Europe, generally, the right of sanctuary survived under restrictions down to the end of the 18th century. In Germany the more serious crimes of violence were always excepted. Highwaymen, robbers, traitors and habitual criminals could not claim church protection. In 1418 sanctuary was further regu- lated by a bull of Martin V. and in 1504 by another of Julius II. In a modified form the German Asylrecht lasted to modern times, not being finally abolished till about 1780. In France le droit d'asile existed throughout the middle ages, but was

much limited by an edict of Francis I. in 1539, Ordonnance sur le faut de la justice. At the Revolution the right of sanctuary was entirely abolished.

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SANCY, NICOLAS DE HARLAY, Seigneur de (1546-1629), French soldier and diplomatist, belonged to the Protestant branch of the family of Harlay but adopted the Catholic religion in 1572 daring the massacres of the Huguenots. In 1589 he obtained in Geneva and Berne sums sufficient to raise an army of mercenaries for Henry III., partly by the sale of jewels, among them the " Sancy " diamond which in 1835 found its way to the Russian imperial treasure, and partly by leading the Swiss to suppose that the troops were intended for serious war against Savoy. Henry IV. made him superintendent of his finances in 1594, but in 1599 he was replaced by Sully. Meanwhile he had been a second time converted to Catholicism, but his influence at court waned, and he retired from public life in 1605. He survived until the 13th of October 1629, leaving a Discours sur I 'occurrence des affaires.

His son, Achille Harlay de Sancy, bishop of Saint Malo (1581-1646), was educated for the church but resigned his vocation for the career of arms on the death of his elder brother in 1601. For seven years, from 161 1 to 1618, he was ambassador at the Turkish court, where he amassed a fortune of some £16,000 sterling by doubtful means, and was bastinadoed by order of the sultan for his frauds. Harlay de Sancy was a learned man and a good linguist, who used his opportunities to acquire a valuable collection of oriental MSS., many of which are now in the Bibliotheque Nationale in Paris. On his return to France he joined the Oratorian Fathers, and when Marshal Bassompierre was sent to England in 1627 to regulate the differences between Henrietta Maria and her husband, Harlay de Sancy was attached to the queen's ecclesiastical household, but Charles I. secured his dismissal. He became bishop of St Malo in 1632, and died "«\ the 20th of November

1646.

SAND, GEORGE (1804-1876), the pseudonym of Madame Amandine Lucile Aurore Dudevant, nee Dupin, the most pro- lific authoress in the history of literature, and unapproached among the women novelists of France. Her life was as strange and adventurous as any of her novels, which are for the most part idealized versions of the multifarious incidents of her life. In her self-revelations she followed Rousseau, her first master in style, but while Rousseau in his Confessions darkened all the shadows, George Sand is the heroine of her story, often frail and faulty, but always a woman more sinned against than sinning. Thanks, however, to her voluminous correspondence that has recently been published and to family documents that her French biographers have unearthed, there are now full materials for tracing the history of her public and private career, and for forming a clear and unbiased estimate of her character and genius.

Her father was Maurice Dupin, a retired lieutenant in the army of the republic; her mother, Sophie Delaborde, the daughter

of a Paris bird-fancier. Their ill-assorted marriage took place only a month before the birth of the child (July 1, 1804; at Paris). Her paternal grandfather was M. Dupin de Francueil, a farmer-general of the revenue, who married the widow of Count Horn, a natural son of Louis XV., she in her turn being the natural daughter of Maurice de Saxe, the most famous of the many illegitimate children of Augustus the Strong, by the lovely countess of Konigsmarck. George Sand, who was a firm believer in the doctrine of heredity, devotes a whole volume of her autobiography {Histoire de ma vie, 1857 seq.) to the elaboration of this strange pedigree. She boasts of the royal blood which ran through her veins, and disregarding the bar sinister she claims affinity with Charles X. and Louis XVII., but she is no less frank in declaring that she is vilaine et tres vilaine, a daughter of the people, who shares by birth their instincts and sympathies. Her birth itself was romantic. Her father was playing a country dance at the house of a fellow officer, the future husband of Sophie's sister, when he was told that his wife, who had not long left the room, had borne him a daughter. " She will be fortunate," said the aunt, " she was born among the roses to the sound of music."

Passing by her infantine recollections, which go back further than even those of Dickens, we find her at the age of three crossing the Pyrenees to join her father who was on Murat's staff, occupy- ing with her parents a suite of rooms in the royal palace, adopted as the child

of the regiment, nursed by rough old sergeants, and dressed in a complete suit of uniform to please the general.

For the next ten years she lived at Nohant, near La Chatre in Berri, the country house of her grandmother. Here her character was shaped; here she imbibed that passionate love of country scenes and country life which neither absence, politics nor dissipation could uproot; here she learnt to understand the ways and thoughts of the peasants, and laid up that rich store of scenes and characters which a marvellously retentive memory enabled her to draw upon at will. The progress of her mind during these early years well deserves to be recorded. Education, in the strict sense of the word, she had none. A few months after her return from Spain her father was killed by a fall from his horse. He was a man of remarkable literary gifts as well as a good soldier. ” Character,” says George Sand, ” is in a great measure hereditary: if my readers wish to know me they . must know my father.” On his death the mother resigned, though not without a struggle, the care of Aurore to her grand- mother, Mme. Dupin de Francueil, a good representative of the ancien regime. Though her husband was a patron of Rousseau, she herself had narrowly escaped the guillotine, and had only half imbibed the ideas of the Revolution. In her son’s lifetime she had, for his sake, condoned the mesalliance, but it was im- possible for the stately chatelaine and her low-born daughter- in-law to live in peace under the same roof. She was jealous as a lover of the child’s affection, and the struggle between the mother and grandmother was one of the bitterest of Auroie’s childish troubles.

Next to the grandmother, the most important person in the household at Nohant was Deschatres. He was an ex-abb6 who had shown his devotion to his mistress when her life was threatened, and henceforward was installed at Nohant as factotum. He was maire of the village, tutor to Aurore’s half- brother, and, in addition to his other duties, undertook the education of the girl. The tutor was no more eager to teach than the pupil to learn. He, too, was a disciple of Rousseau, believed in the education of nature, and allowed his Sophie to wander at her own sweet will. At odd hours of lessons she picked up a smattering of Latin, music and natural science, but most days were holidays and spent in country rambles and games with village children. Her favourite books were Tasso, Atala and Paul et Virginie. A simple refrain of a childish song or the monotonous chaunt of the ploughman touched a hidden chord and thrilled her to tears. She invented a deity of her own, a mysterious Coramb6, half pagan and half Christian, and like Goethe erected to him a rustic altar of the greenest grass, the softest moss and the brightest pebbles.

From the free out-door life at Nohant she passed at thirteen to the convent of the English Augustinians at Paris, where for the first two years she never went outside the walls. Nothing better shows the plasticity of her character than the ease with which she adapted herself to this sudden change. The volume which describes her conventual life is as graphic as Miss Bronte s Villette, but we can only dwell on one passage of it. Tired of mad pranks, in a fit of home-sickness, she found herself one evening in the convent chapel.

" I had forgotten all; I knew not what was passing in me; with rr.y soul rather than my senses, I breathed an air of ineffable sweet- ness. All at once a sudden shock passed through my whole being, my eyes swam, and I seemed wrapped in a dazzling white mist. 1 heard a voice murmur in my ear, ' Tolle, lege.' I turned round, thinking that it was one of the sisters talking to me — I was alone. I indulged in no vain illusion; I believed in no miracle; I was quite sensible of the sort of hallucination into which I had fallen ; I neither sought to intensify it nor to escape from it. Only I felt that faith was laying hold of me — by the heart, as I had wished it. I was so filled with gratitude and joy that the tears rolled down my cheeks. I felt as before that I loved God, that my mind embraced and ac- cepted that ideal of justice, tenderness and holiness which I had never doubted, but with which I had never held direct communion, and now at last 1 felt that this communion was consummated, as though an invincible barrier had been broken down between the source of infinite light and the smouldering fire of my heart. An endless vista stretched before me, and 1 panted to start upon my way. There was no more doubt or lukewarmness. That I should repent on the'morrow and rally myself on my over-wrought ecstasy never once entered my thoughts. I was like one who never casts a look behind, who hesitates before some Rubicon to be crossed, but having touched the farther bank sees no more the shore he has just left."

Such is the story of her conversion as told by herself. It reads more like a chapter from the life of Ste Therese or Madame Guyon than of the author of Lelia. Yet no one can doubt the sincerity of her narrative, or even the permanence of her religious feelings under all her many phases of faith and aberrations of conduct. A recent critic has sought in religion the clue to her character and the mainspring of her genius. Only in her case religion must be taken in an even more restricted sense than Matthew Arnold's " morality touched by emotion." For her there was no categorical imperative, no moral code

save to follow the promptings of her heart. ” Tenderness ” she had abundantly, and it revealed itself not only in effusive sentimentality, as with Rousseau and Chateaubriand, but in active benevolence; ” justice ” too she had in so far as she sincerely wished that all men should share alike her happiness; but of ” holiness,” that sense of awe and reverence that was felt in divers kinds and degrees by Isaiah, Sophocles, Virgil and St Paul, she had not a rudimenatry conception.

Again in 1820 Aurore exchanged the restraint of a convent for freedom, being recalled to Nohant by Mme de Francueil, who had no intention of letting her granddaughter grow up a devote. She rode across country with her brother, she went out shooting with Deschatres, she sat by the cottage doors on the long summer evenings and heard the flax-dressers tell their tales of witches and warlocks. She was a considerable linguist and knew English, Italian and some Latin, though she never tackled Greek. She read widely though unsystematically, studying philosophy in Aristotle, Leibnitz, Locke and Condillac, and feeding her imagina- tion with Rene and Childe Harold. Her confessor lent her the Genius of Christianity, and to this book she ascribes the first change in her religious views. She renounced once for all the asceticism and isolation of the De imitalione for the more genial and sympathetic Christianity of Chateaubriand. Yet she still clung to old associations, and on her grandmother’s death was about to return to her convent, but was dissuaded by her friends, who found her a husband.

Casimir Dudevant, whom she married on the nth of December 1822, was the natural son of a Baron Dudevant. He had retired at an early age from the army and was living an idle life at home as a gentleman farmer. Her husband, though he afterwards deteriorated, seems at that time to have been neither better nor worse than the Berrichon squires around him, and the first years of her married life, during which her son Maurice and her daughter

Solange were born, except for lovers’ quarrels, were passed in peace and quietness, though signs were not wanting of the coming storm. Among these must be mentioned her friendship with Aurelien de Seze, advocate-general at Bourdeau. De Seze was a middle-aged lawyer with a philosophic turn of mind, and Madame Dudevant for two years kept up with him an intimate correspondence. The friendship was purely platonic, but the husband felt or affected jealousy, and resented an intimacy which he from his total lack of culture was unable to share. The breach quickly widened. He on his part was more and more repelled by a superior woman determined to live her own intel- lectual life, and she on hers discovered that she was mated, if not to a

clown, at least to a hobereau whose whole heart was in his cattle and his turnips. So long as the conventionalities were preserved she endured it, but when her husband took to drinking and made love to the maids under her very eyes she resolved to break a yoke that had grown intolerable. The last straw that determined action was the discovery of a paper docketed ” Not to be opened till after my death,” which was nothing but a railing accusation against herself. She at once quitted Nohant, taking with her Solange, and in 183 1 an amicable separation was agreed upon, by which her whole estate was surrendered to the husband with the stipulation that she should receive an allow- ance of £120 a year. She had regained her liberty, and made no secret of her intention to use it to the full. She endeavoured unsuccessfully to eke out her irregularly paid allowance by those expedients to which reduced gentlewomen are driven — fancy- work and painting fans and snuff-boxes; she lived in a garret and was often unable to allow herself the luxury of a fire. It was only as a last resource that she tried literature. Her first apprenticeship was served under Delatouche, the editor of Figaro. He was a native of Berri, like herself, a stern but kindly taskmaster who treated her much as Dr Johnson treated Fanny Burney. George Sand was methodical and had a ready pen, but she lacked the more essential qualities of a Parisian journalist, wit, sparkle and conciseness. At the end of a month, she tells us, her earnings amounted to fifteen francs. On the staff of Figaro was another compatriot with whom she was already intimate as a visitor at Nohant. Jules Sandeau was a clever and attractive young lawyer. Articles written in common soon led to a complete literary partnership, and 183 1 there appeared in the Revue de Paris a joint novel entitled Prima Donna and signed Jules Sand. Shortly after this was published in book form with the same signature a second novel, Rose et Blanche. The sequel to this literary alliance is best recounted in George Sand’s own words: ” I resisted him for three months but then yielded; I lived in my own apartment in an unconventional style.” Her first independent novel, Indiana (1832), was written at the instigation of Delatouche, and the world-famous pseu- donym George (originally Georges) Sand was adopted as a compromise between herself and her partner. The ” George ” connoted a Berrichon as ” David ” does a Welshman. The one wished to throw Indiana into the common stock, the other refused to lend his name, or even part of his name, to a work in which he had had no share. The novel was received with instant acclamation, and Sainte-Beuve only confirmed the judgment of the public when he pronounced in the Globe that this new author (then to him unknown) had struck a new and original vein and was destined to go far. Delatouche was the first to throw himself at her feet and bid her forget all the hard things he

had said of her. Indiana is a direct transcript of the author's personal experiences (the disagreeable husband is M. Dudevant to the life), and an exposition of her theory of sexual relations which is founded thereon. To many critics it seemed that she had said her whole say and that nothing but replicas could follow. Valentine, which was published in the same year, indicated that it was but the first chapter in a life of endless adventures, and that the imagination which turned the crude facts into poetry, and the fancy which played about them like a rainbow, were inexhaustible.

As a novel Valentine has little to commend it; the plot is I feeble and the characters shadowy. Only in the descriptions of

scenery, which here resemble too much purple patches, does George Sand reveal her true inspiration, the artistic qualities by which she will live. No one was more conscious than George Sand herself of her strength and of her weakness. In a preface to a later edition she tells us how the novel came to be written, and, though it anticipates events, this revelation of herself may best be given here.

" After the unexpected literary success of Indiana I returned to Berri in 1832 and found a pleasure in painting the scenes with which I had been familiar from a child. Ever since those early days 1 had f e!t the impulse to describe them, but as is the case with all profound emotions, whether intellectual or moral, what we most desire to realize to ourselves we are the least inclined to reveal to the world at large. This little nook of Berri, this unknown Vallee Noire, this quiet and unpretentious landscape, which must be sought to find it and loved to be admired, was the sanctuary of my first and latest reveries. For twenty-two years I have lived amongst these pollarded trees, these rutty roads, beside these tangled thickets and streams along whose banks only children and sheep can pass. All this had charms for me alone and did not deserve to be revealed to idle curiosity. Why betray the incognito of this modest country-side without historical association or picturesque sites to commend it to the antiquary or the tourist? The Vallee Noire, so it seemed to me, was part and parcel of myself, the framework in which my life was set, the native costume that I had always worn — what worlds away from the silks and satins that are suited for the public stage. If I could have foreseen what a stir my writings would make, I think I should have jealously guarded the privacy of this sanctuary where, till then, I perhaps was the only soul

who had fed the artist's visions and the poet's dreams. But I had no such anticipation; I never gave it a thought. I was compelled to write and I wrote. I let myself be carried away by the secret charm of the air I breathed ; my native air, I might almost call it. The descriptive parts of my novel found favour. The plot provoked some lively criticism on the anti- matrimonial doctrines that I was alleged to have broached before in Indiana. In both novels I pointed out the dangers and pains of an ill-assorted marriage. I thought I had simply been writing a story, and discovered that I had unwittingly been preaching Saint-Simon- ianism. I was not then at an age for reflecting on social grievances. I was too young to do more than see and note facts, and thanks to my natural indolence and that passion for the concrete, which is at once the joy and the weakness of artists, I should perhaps always have remained at that stage if my somewhat pedantic critics had not driven me to reflect and painfully search after the ultimate causes of which till then I had only grasped the effects. But I was so shrewdly taxed with posing as a strong-minded woman and a philosopher that one fine day I said to myself, ' What, I wonder, is philosophy?' "

Her liaison with Jules Sandeau, which lasted more than a year, was abruptly terminated by the discovery in their apart- ment on an unexpected return from Nohant of une blanchisseuse quelconque. For a short while she was broken hearted:—" My heart is a cemetery!" she wrote to Sainte-Beuve. " A necro- polis," was the comment of her discarded lover when years later the remark was repeated to him.

Her third novel, Lelia (1833), is in the same vein, a stronger and more outspoken diatribe against society and the marriage law. Lelia is a female Manfred, and Dumas had some reason to complain that George Sand was giving them " du Lord Byron au kilo."

But a new chapter in her life was now to open. In her despair she turned for comfort and counsel to Sainte-Beuve, now con- stituted her regular father confessor. This ghostly Sir Pandarus recommended new friendships, but she was hard to please. Dumas was " trop commis-voyageur," Jouffroy too serenely virtuous and Musset " trop dandy." Merimee was tried for a week, but the cool cynic and the perfervid apostle of women's rights proved mutually repulsive. Alfred de Musset was intro- duced, and the two natures leapt together as by elective affinity. The moral aspect has been given by Mr Swinburne in an epigram : — " Alfred was a terrible flirt and George did not behave as a perfect gentleman."

Towards the end of 1833 George Sand, after winning the reluctant

consent of Musset's mother, set out in the poet's company for Italy, and in January 1834 the pair reached Venice, staying first at the H6tel Danieli and then in lodgings. At first it was a veritable honeymoon; conversation never flagged and either found in the other his soul's complement. But there is a limit to love-making, and George Sand, always practical,

set to work to provide the means of living. Musset, though he depended on her exertions, was first bored and then irritated at the sight of this terrible vache a ecrire, whose pen was going for eight hours a day, and sought diversion in the cafes and other less, reputable resorts of pleasure. The con- sequence was a nervous illness with some of the symptoms of delirium tremens, through which George Sand nursed him with tenderness and care. But with a strange want of delicacy, to use the mildest term, she made love at the same time to a young Venetian doctor whom she had called in, by name Pagello. The pair went off and found their way eventually to Paris, leaving Musset in Italy, deeply wounded in his affections, but, to do him justice, taking all the blame for the rupture on himself. George Sand soon tired of her new love, and even before she had given him his conge was dying to be on again with the old. She cut off her hair and sent it to Musset as a token of penitence, but Musset, though he still flirted with her, never quite forgave her infidelity and refused to admit her to his deathbed. Among the mass of romans a. clef and pamphlets which the adventure produced, two only have any literary importance, Musset's Confessions d'un enfant du siecle and George Sand's Rile et lui. In the former woman appears as the serpent whose trail is over all; in the latter, written twenty-five years after the event, she is the guardian angel abused and maltreated by men. Lui et elle, the rejoinder of the poet's brother Paul de Musset, was even more a travesty of the facts with no redeeming graces of style.

It remains to trace the influence, direct or indirect, of the poet on the novelist. Jacques was the first outcome of the journey to Italy, and in precision and splendour of style it marks a distinct progress. The motive of this and of the succeeding novels of what may be called her second period is free (not to be confounded with promiscuous) love. The hero, who is none other than George Sand in man's disguise, makes confession of faith: — " I have never imposed constancy on myself. When I have felt that love was dead, I have said so without shame or remorse and have obeyed Providence that was leading me elsewhere." And the runaway wife writes to her lover: — ■ " O my dear Octave, we shall never pass a night together without first kneeling down and praying for Jacques." Love is a divine instinct: to love is to be virtuous; follow the dictates of your heart and you cannot

go wrong — such is the doctrine that George Sand preached and practised.

In Les Lettres d'un voyageur, which ran in the Revue des deux mondes between 1834 and 1836, we have not only impres- sions of travel, but the direct impressions of men and things not distorted by the exigencies of a novel. They reveal to us the true and better side of George Sand, the loyal and devoted friend, the mother who under happier conditions might have been reputed a Roman matron. We could not choose a more perfect specimen of her style than the allegory under which she pictures the " might have been."

" I care little about growing old; I care far more not to grow old alone, but I have never met the being with whom I could have chosen to live and die, or if I ever met him I knew not how to keep him. Listen to a story and weep. There was a good artist called Watelet, the best aquafortis engraver of his day. He loved Marguerite Lecomte, and taught her to engrave as well as himself. She left husband and home to go and live with him. The world con- demned them; then, as they were poor and modest, it forgot them. Forty years afterwards their retreat was discovered. In a cottage in the environs of Paris called Le Moulin joli, there sat at the same table an old man engraving and an old woman whom he called his meuniere also engraving. The last design they were at work upon represented the Moulin joli, the house of Marguerite, with the device Cur voile permutem Sabina divitias operosiores? It hangs in my room over a portrait the original of which no one here has seen. For a year the person who gave me this portrait sat with me every night at a little table and lived by the same work. At daybreak we consulted together on our work for the day, and at night we supped at the same little table, chatting the while on art, on sentiment, on the future. The future broke faith with us. Pray for me, O Marguerite Lecomte ! ' '

The Everard of the Lettres introduces us to a new and for the time a dominant influence on the life and writings. Michei de Bourges was the counsel whose eloquent pleadings brought

the suit for a judicial separation to a successful issue in 1836. 1 Unlike her former lovers, he was a man of masterful will, a budge philosopher who carried her intellect by storm before he laid siege to her heart. "He preached republicanism to her by the hour, and even

locked her up in her bedroom to reflect on his sermons. She was but half converted, and fled before long from a republic in which art and poetry had no place. Other celebrities who figure in the Lettres under a transparent disguise are Liszt and Mme d'Agoult (known to literature as Daniel Stern), whom she met in Switzerland and entertained for some months at Nohant. Liszt, in after years when they had drifted apart, wrote of her: " George Sand catches her butterfly and tames it in her cage by feeding it on flowers and nectar— this is the love period. Then she sticks her pin into it when it struggles — that is the conge and it always comes from her. Afterwards she vivisects it, stuffs it, and adds it to her collection of heroes for novels." There is some truth in the satire, but it wholly misrepresents her rupture with Chopin.

To explain this we must open a new chapter of the life in which George Sand appears as the devoted mother. The letters to her daughter Solange, which have recently been published, irresistibly recall the letters of Mme de Sevigne to Mme de Grignan. Solange, who inherited all her mother's wild blood with none of her genius, on the eve of a marriage that had been arranged with a Berrichon gentleman, ran away with Clesinger, a sculptor to whom she had sat for her bust. George Sand not only forgave the elopement and hushed up the scandal by a private marriage, but she settled the young couple in Paris and made over to them nearly one-half of her available property. Clesinger turned out a thankless scapegrace and George Sand was at last compelled to refuse to admit him to Nohant. In the domestic quarrel that ensued Solange, who was a very Vivien, got the ear of Chopin. He upbraided the mother with her hard- heartedness, and when she resented his interference he departed in a huff and they never met again.

The mention of Liszt has led us to anticipate the end of the story, and we must revert to 1836, when the acquaintance began. She was then living in Paris, a few doors from her friend Mme d'Agoult, and the two set up a common salon in the Hotel de France. Here she met two men, one of whom indoctrin- ated her with religious mysticism, the other with advanced socialism, Lamennais and Pierre Leroux. In the case of Lamen- nais the disciple outstripped the master. She flung herself into Lamennais's cause and wrote many unpaid articles in his organ, Le Monde, but they finally split on the questions of labour and of women's rights, and she complained that Lamennais first dragged her forwards and then abused her for going too fast. The Lcllres d Marcie (1837) are a testimony to his ennobling and spiritualizing personality. Socialism was a more lasting phase, but her natural good sense revolted at the extravagant mum- meries of Pere Enfantin and she

declined the office of high priestess.

It was doubtless a revulsion of feeling against the doctrinaires and in particular against the puritanic reign of Michel that made her turn to Chopin. She found the maestro towards the end of 1837 dispirited by a temporary eclipse of popularity and in the first stage of his fatal malady, and carried him off to winter with her in the south. How she roughed it on an island unknown to tourists is told in Un hiver d Majorque (1842), a book of travel that may take rank with Heine's Reisebilder. In nearly all George Sand's loves there was a strong strain of motherly feeling. Chopin was first petted by her like a spoilt darling and then nursed for years like a sick child.

During this, her second period, George Sand allowed herself to be the mouthpiece of others — " un echo qui embellissait la voix," as Delatouche expressed it. Spiridion (1838) and Les Sept cordes de la lyre (1840) are mystic echoes of Lamennais. Le Compagnon du tour de France (1841), Les Maltres mosaistes

1 The final settlement was concluded in 1836. Mme Dudevant was granted sole legal rights over the two children and her Paris home was restored to her. In return she made over to her husband 40,000 fr. vested in the funds.

and Le Meunier d'Angibault (1845), Le PSchS de M. Antoine (1847) are all socialistic novels, though they are much more, and good in spite of the socialism. Consuelo (1843-1844) and its sequel La Comtesse de Rudolstadt (1843-1845) are fantaisies d, la Chopin, though the stage on which they are played is the Venice of Musset. Chopin is the Prince Karol of Lucrezia Floriani (1847), a self-portraiture unabashed as the Tagebuch einer Verlorenen and innocent as Paul et Virginie.

An enumeration of George Sand's novels would constitute a Homeric catalogue, and it must suffice to note only the most typical and characteristic. She contracted with Buloz to supply him with a stated amount of copy for the modest retaining fee of £160 a year, and her editor testifies that the tale of script was furnished with the punctuality of a notary. She wrote with the rapidity of Walter Scott and the regularity of Anthony Trollope. For years her custom was to retire to her desk at 10 p.m. and not to rise from it till 5 a.m. She wrote a la diable, starting with some central thesis to set forth or some problem to investigate, but with no predetermined plot or plan of action. Round this nucleus her characters (too often mere puppets) grouped them- selves, and the story gradually crystallized. This

unmethodical method produces in her longer and more ambitious novels, in Consuelo for instance and its continuation, a tangled wilderness, the clue to which is lost or forgotten; but in her novelettes, when there is no change of scenery and the characters are few and simple, it results in the perfection of artistic writing, ” an art that nature makes.”

From novels of revolt and tendency novels George Sand turned at last to simple stories of rustic life, the genuine pastoral. It is here that she shows her true originality and by these she will chiefly live. George Sand by her birth and bringing-up was half a peasant herself, in M. Faguet’s phrase, “un paysan qui savait parler.” She had got to know the heart of the peasant — his superstitions, his suspiciousness and low cunning, no less than his shrewdness, his sturdy independence and his strong domestic attachments.

Jeanne (1844) begins the series which has been happily called the Bucolics of France. To paint a Joan of Arc who lives and dies inglorious is the theme she sets herself, and through most of the novel it is perfectly executed. The last chapters when Jeanne appears as the Velida of Mont Barbot and the Grande Pastoure are a falling off and a survival of the romanticism of her second manner. La Mare au diable (1846) is a clear-cut gem, perfect as a work of Greek art. Francois le champi and La Petite Fadetle are of no less exquisite workmanship. Les Maltres sonneurs (1853) — the favourite novel of Sir Leslie Stephen — brings the series of village novels to a close, but as closely akin to them must be mentioned the Contes d’une grande-mere, delight- ful fairy tales of the Talking Oak, Wings of Courage and Queen Coax, told to her grandchildren in the last years of her life.

The revolution of 1848 arrested for a while her novelistic activities. She threw herself heart and soul into the cause of the extreme republicans, composed manifestos for her friends, addressed letters to the people, and even started a newspaper. But her political ardour was short-lived; she cared little about forms of government, and, when the days of June dashed to the ground her hopes of social regeneration, she quitted once for all the field of politics and returned to her quiet country ways and her true vocation as an interpreter of nature, a spiritualizer of the commonest sights of earth and the homeliest household affections. In 1849 she writes from Berri to a political friend: ” You thought that I was drinking blood from the skulls of aristocrats. No, I am studying Virgil and learning Latin !”

In her latest works she went back to her earlier themes of romantic and unchartered love, but the scene is shifted from Berri, which she

felt she had exhausted, to other provinces of France, and instead of passionate manifestos we have a gallery of genre pictures treated in the spirit of Francois le champi, ” Vous faites,” she said to her friend Honore de Balzac, ” la comedie humaine; et moi, c’est l’eglogue humaine que j’ai voulu faire.”

A word must be said of George Sand as a playwright. She

was as fond of acting as Goethe, and like him began with a puppet stage, succeeded by amateur theatricals, the chief entertainment provided for her guests at Nohant. Undaunted by many failures, she dramatized several of her novels with moderate success— Francois le champi, played at the Odeon in 1849, and Les Beaux Messieurs de Bois-Dore (1862) were the best; Claudie, produced in 1851, is a charming pastoral play, and Le Marquis de Villemer (1864) (in which she was helped by Dumas fils) was a genuine triumph. Her statue by Clesinger was placed in the foyer of the Theatre Francais in 1877.

Of George Sand’s style a foreigner can be but an imperfect judge, but French critics, from Sainte-Beuve, Nisard and Caro down to Jules Lemaitre and Faguet, have agreed to praise her spontaneity, her correctness of diction, her easy opulence — the lactea ubertas that Quintilian attributes to Livy. The language of her country novels is the genuine patois of middle France rendered in a literary form. Thus in La Petite Fadelte, by the happy device of making the hemp dresser the narrator, she speaks (to quote Sainte-Beuve) as though she had on her right the unlettered rustic and on her left a member of the Academie, and made herself the interpreter between the two. She hits the happy mean between the studied archaism of Courier’s Daphnis et Cloe and the realistic patois of the later kailyard novel which for Southerners requires a glossary. Of her style generally the characteristic quality is fluidity. She has all the abandon of an Italian improvisatore, the simplicity of aBernardin de St Pierre without his mawkishness, the sentimentality of a Rousseau without his egotism, the rhythmic eloquence of a Chateaubriand without his grandiloquence.

As a painter of nature she has much in common with Words- worth. She keeps her eye on the object, but adds, like Words- worth, the visionary gleam, and receives from nature but what she herself gives. Like Wordsworth she lays us on the lap of earth and sheds the freshness of the early world. She, too, had found love in huts where

poor men dwell, and her miller, her bagpipers, her workers in mosaic are as faithful renderings in prose of peasant life and sentiment as Wordsworth's leech- gatherer and wagoners and gleaners are in verse. Her psychology is not subtle or profound, but her leading characters are clearly conceived and drawn in broad, bold outlines. No one has better understood or more skilfully portrayed the artistic temperament — the musician, the actor, the poet — and no French writer before her had so divined and laid bare the heart of a girl. She works from within outwards, touches first the mainspring and then sets it to play. As Mr Henry James puts it, she inter- views herself. Rarery losing touch of earth, and sometimes of the earth earthy, she is still at heart a spiritualist. Her final word on herself rings true, " Toujours tourmentee des choses divines."

Unlike Victor Hugo and Balzac, she founded no school, though Fromentin, Theuriet, Cherbuliez, Fabre and Bazin might be claimed as her collateral descendants. In Russia her influence has been greater. She directly inspired Dostoievski, and Tur- genieff owes much to her. In England she has found her warmest admirers. Elizabeth Barrett Browning wrote sonnets to " the large-brained woman and large-hearted man, self-named George Sand." To Thackeray her diction recalled the sound of village bells falling sweetly and softly on the ear, and it sent a shiver through John Stuart Mill, like a symphony of Haydn or Mozart. Leslie Stephen advised Thomas Hardy, then an aspiring contri- butor to the Comhill, to read George Sand, whose country stories seemed to him perfect. " The harmony and grace, even if strictly inimitable, are good to aim at." He pronounced the Histoire de ma vie about the best biography he had ever read. F. W. H. Myers claimed her as anima naturaliter Christiana and the inspired exponent of the religion of the future.

George Eliot by her very name invites and challenges com- parison with George Sand. But it was as a humble follower, not as a rival, that she took George Sand as sponsor. Both women broke with social conventions, but while George Sand (if the expression may be allowed) kicked over the traces, George Eliot was impelled all the more emphatically, because of her

exceptional circumstances, to put duty before inclination and to uphold the reign of law and order. Both passed through phases of faith, but while even Positivism did not cool George Eliot's innate religious fervour, with George Sand religion was a passing experience, no deeper than her republicanism and less lasting than her socialism, and she lived and died a gentle savage. Rousseau's Confessions was the favourite book of both (as it was of Emerson), but George Eliot

was never converted by the high priest of sentiment alism into a belief in human per- fectibility and a return to nature. As a thinker George Eliot is vastly superior; her knowledge is more profound and her psychological analysis subtler and more scientific. But as an artist, in unity of design, in harmony of treatment, in purity and simplicity of language, so felicitous and yet so unstudied, in those qualities which make the best of George Sand's novels masterpieces of art, she is as much her inferior.

Mr Francis Gribblehas summed up her character in" a scornful, insular way " as a light woman. A truer estimate is that of Sainte-Beuve, her intimate friend for more than thirty years, but never her lover. " In the great crises of action her intellect, her heart and her temperament are at one. She is a thorough woman, but with none of the pettinesses, subterfuges, and mental reservations of her sex; she loves wide vistas and boundless horizons and instinctively seeks them out; she is concerned for universal happiness and takes thought for the improvement of mankind — the last infirmity and most innocent mania of generous souls. Her works are in very deed the echo of our- times. Wher- ever we were wounded and stricken her heart bled in sympathy, and all our maladies and miseries evoked from her a lyric wail."

George Sand died at Nohant on the 8th of June 1876. To a youth and womanhood of storm and stress had succeeded an old age of serene activity and then of calm decay. Her nights were spent in writing, which seemed in her case a relaxation from the real business of the day, playing with her grandchildren, gardening, conversing with her visitors — it might be Balzac or Dumas, or Octave Feuillet or Matthew Arnold — or writing long letters to Sainte-Beuve and Flaubert. " Calme, toujours plus de calme," was her last prayer, and her dying words, " Ne detruisez pas la verdure."

Bibliography. — The collected edition of George Sand's works was published in Paris (1 862-1 883) in 96 volumes, with supplement 109 volumes; the Histoire de ma vie appeared in 20 volumes in 1854-1855. The &ude bibliographique sur les ozuvres de George Sand by " le bibliophile Isaac " (vicomte de Spoelberck) (Brussels, 1868) gives the most complete bibliography. Of Vladimir Karenin's (pseudonym of Mine Komarova) George Sand, the most complete life, the first two volumes (1899-1901) carry the life down to 1839. There is much new material in George Sand et safille, by S. Rocheblave (r 9°5)> Correspondance de G. Sand et d' 'Alfred de Musset (Brussels, 1904), Correspondance entre George Sand et Gustave Flaubert (1904), and Lettres d Alfred de Musset et a Sainte-Beuve (1897). E. M. Caro's

George Sand (1887) is rather a critique than a life. Lives by Mirecourt (1855) and by Haussonville (1878) may also be consulted. Of the numerous shorter studies may be mentioned those of Sainte-Beuve in the CauserieS du lundi and in Portraits contentporains ; Jules Lemaitre in Les Contentporains, vol. iv. ; E. Faguet, XIX" Steele; F. W. H. Myers, Essays Ancient and Modern (1883); Henry James in North American Review (April 1902) ; Matthew Arnold, Mixed Essays (1879). See also Rene Doumic's George Sand (1909), which has been translated into English by Alys Hallard as George Sand: Some Aspects of her Life and Writings (1910). (F. S.)

SAND. When rocks or minerals are pulverized by any agencies, natural or artificial, the products may be classified as gravels, sands and muds or clays, according to the size of the individual particles. If the grains are so fine as to be impalpable (about 3-bVj in. in diameter) the deposit may be regarded as a mud or clay; if many of them are as large as peas the rock is a gravel. Sands may be uniform when they have been sorted out by some agency such as a gentle current of water or the wind blowing steadily across smooth arid lands, but usually they vary much both in the coarseness of their grains and in their mineral com- position. The great source of natural sands is the action of the atmosphere, frost, rain, plants and other agencies in breaking up the surfaces of rocks and reducing them to the condition of fine powder; in other words sands are ordinarily the product of the agencies of denudation operating on the rocks of the earth's

crust. Not all, however, are of this kind, for a few are artificial, like the crushed tailings produced in the extractions of metals from their ores; there are also volcanic sands which have originated by explosions of steam in the craters of active volcanoes.

A great part of the surface of the globe is covered by sand. In fertile regions the soil is very often of a sandy nature; though most soils are mixtures of sand with clay or stones, and may be described as loams rather than as sands. Pure sandy soils are found prin- cipally near sea-coasts where the sand has been blown inwards from the shore, or on formations of soft and friable sandstone like the Greensand. The soil of deserts also is often arenaceous, but there the finer particles have been lifted and borne away by the wind. Accumulations of sand are found also in some parts of the courses of our rivers, very often over wide stretches of the seashore, and more particularly on the sea bottom,

where the water is not very deep, at no great distance from the land.

Of the rock-making minerals which are common on the earth's crust only a limited number occur at all frequently in sand deposits. For several reasons quartz is by far the commonest ingredient of sands. It is a very abundant mineral in rocks and is comparatively hard, so that it is not readily worn down to a very fine muddy paste. It also possesses practically no cleavage, and does not split up natur- ally into thin fragments. If we add to this that it is nearly insoluble in water and that it does not decompose, but preserves its freshness unaltered after long ages of exposure to weathering, we can see that it has all the properties necessary for furnishing a large portion of the sandy material produced by the detrition of rock masses. With quartz there is often a small amount of felspar (principally micro- cline, orthoclase and oligoclase), but this mineral, though almost as common as quartz in rocks, splits up readily on account of its cleavage, and decomposes into fine, soft, scaly aggregates of mica and kaolin, which are removed by the sifting action of water and are deposited as muds or clays. Small plates of white mica, which, though soft and very fissile, decompose very slowly, are often mingled with the quartz and felspar. In addition to these, all sands contain such minerals as garnet, tourmaline, zircon, rutile and anatase, which are common rock-forming minerals, both hard and resistant to decomposition. Among the less common ingredients are topaz, staurolite, kyanite, andalusite, chlorite, iron oxides, biotite, horn- blende and augite, while small particles of chert, felsite and other fine-grained rocks appear frequently in the coarser sand deposits.

Shore sands and river sands, which have not been transported for any great distance from their parent rocks, often contain minerals that are too soft or too readily decomposed to persist. In the Lizard district of Cornwall the sands at the base of cliffs of serpentine are rich in olivine, augite, enstatite, tremolite and chromite. Near volcanic islands such minerals as biotite, hornblende, augite and zeolites may form a large portion of the local sand deposits. In marine sands also organic substances are almost universally present, either fragments of plants or the debris of calcareous shells, in fact many sands consist almost entirely of such fragments (shell sands). Around coral islands there are often extensive deposits of comminuted coral (coral sands), mixed with which there is a varying proportion of broken skeletons of calcareous algae, sponge-spicules and other debris of organic origin. The Greensands which are widely distri- buted over the floor of the oceans, in places where the continental shelf merges into the greater depths, owe their colour to small rounded lumps of glauconite.

Among the accessory ingredients of sands which are of great value and interest are the precious metals, especially gold and platinum. These are found usually in the lower parts of the sand deposits resting on the bed-rock, because of their high specific gravity, and have been derived from the destruction of the rocks in which they originally occurred either in quartzose veins or as disseminated particles. Tinstone occurs also in this way (" stream-tin "), and in Ceylon, Burma, Brazil, South Africa, &c, precious stones such as the diamond, ruby, spinel, chrysoberyl and tourmaline are found in beds of sand and gravel (gem sands).

In general the sand grains have a rounded or oviform shape due to mutual attrition during transport. Those which have been carried farthest are most rounded; sands deposited at no great distance from their parent rock often consist largely of angular grains. The smaller fragments may be carried along in suspension in water, and may travel for many miles without being sensibly worn ; but coarse sands and fine gravels are swept along the bottom and are subjected to an intense grinding action. Something depends also on the hardness of the minerals present in the sands, yet even the diamonds and other gems found in sand deposits have often their corners worn and smoothed. Minerals with very perfect cleavage, such as mica, split up into thin plates under the shock of impact with adjacent grains, and are never rounded like quartz or tourmaline. In deserts the transport of the sands is effected by the wind, and owing to the low viscosity of air even the smallest gram" are not held in suspension but are rolled along the ground; hence very fine quartzose sands are sometimes met with in arid regions with every particle smoothed and polished. These sands flow almost like a liquid and are used in hour-glasses. Similar

" desert sands " occur among the sandstones of the Trias and were doubtless formed in the manner described.

In addition to river sands, shore sands, marine sand deposits and desert sands, there are many other types of sand deposits. Blown sands are usually found near the seashore, but occur also at the margin of some great lakes like those of N. America; desert sands belong in great part to this category. These sands have been blown into their present position by the wind, and unless fixed by vege- tation are constantly though slowly in movement, being in conse- quence a menace to agricultural land on their leeward sides. They may be shell sands, quartz sands or mixed sands, and often show very marked oblique stratification or " current bedding." The surface of blown sand deposits is generally marked by dunes. Glacial sands are common in districts like Britain and those parts of N. America which have been

covered by an ice-sheet. They are really water-borne and have been deposited by streams, though they occur in situations where rivers no longer flow. The waters produced by the melting of the ice-sheets flooded extensive tracts of country, laying down sand and mud deposits in temporary lakes. These sands are usually angular, because they have not been transported to any great distance. The old high-level terraces which border the lower courses of many rivers, though usually consisting of gravel, are often accompanied by considerable sand deposits.

Many of the Tertiary and some of the Secondary sandstone rocks are so incompletely consolidated by cementation that they are essentially sand rocks, and especially when weathered may be used as sources of sand. Thus in Britain there are Pliocene sands (St Erth, Cornwall, &c), Eocene sands (Bagshot sands and Thanet sands) ; and the Lower and Upper Greensand (Cretaceous) are often dug in pits, though sometimes firmly coherent and more properly described as sandstones (q.v.).

The economic uses of sands are very numerous. They are largely employed for polishing and scouring both for domestic and manu-facturing purposes. ” Bath bricks ” are made from the sand of the river Parrett near Bridgwater. Sand for glass-making was formerly obtained at Alum Bay in the Isle of Wight and at Lynn in Norfolk, but must be very pure for the best kinds of glass, and crushed quartz or flint is often preferred on this account. One of the principal uses of sand is for making mortar and cement: for this any good clean quartzose sand free from salts is suitable; it may be washed to remove impurities and sifted to secure uniformity in the size of the individual grains. Moulding sands, adapted for foundry purposes, generally contain a small admixture of clay. Sands are also em- ployed in brick-making, in filtering, and for etching glass and other substances by means of the sand blast. (J. S. F.)

SANDAL (from the Latinized form of Gr. cravdaXiov or aav5a\ov: this probably represents the Persian sandal, slipper; it is not to be referred to Gr. craws, board), the foot-covering which consists of a sole of leather or other material attached to the sole of the foot by a thong of leather passing between the great and second toe, crossed over the instep and fastened round the ankle (see Shoe and Costume, section Greek and Roman). Sandals are only worn regularly among the peoples of Western civilization by friars, though forms of them are found among the peasants in Spain and the Balkans. They have in recent times been adopted by the extreme advocates of hygienic dress, especially for young children. In the early part of the 19th century a form of low, light slipper fastened by a ribbon crossed over the instep

and round the ankle, and worn by women, was known as a sandal.

SANDALWOOD (from Fr. sandal, santal, Gr. ciwrakov, aavdaXov, Pers. sandal, chandan, Skt. chandana, the sandal tree; the form ” sanders ” is probably an English corruption), a fragrant wood obtained from various trees of the natural order Santalaceae, and principally from Santalum album, a native of India. The use of sandalwood dates as far back at least as the 5th century B.C. It is still extensively used in India and China, wherever Buddhism prevails, being employed in funeral rites and religious ceremonies. Until the middle of the 18th century India was the only source of sandalwood. The discovery of a sandalwood in the islands of the Pacific led to difficulties with the natives, often ending in bloodshed, the celebrated missionary John Williams (1796-1839), amongst others, having fallen a victim to an indiscriminate retaliation by the natives on white men visiting the islands. The loss of life in this trade was at one time even greater than in that of whaling, with which it ranked as one of the most adventurous of callings. In India sandalwood is largely used in the manufacture of boxes, fans and other ornamental articles of inlaid work, and to a limited extent in medicine as a domestic remedy for all kinds of pains and aches.

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The oil, obtained by distilling the wood in chips, is largely used as a perfume, few native Indian attars or essential oils being free from admixture with it. In the form of powder or paste the wood is employed in the pigments used by the Brahmans for their distinguishing caste-marks.

Red sandalwood, known also as red sanders wood, is the product of a small leguminous tree, Pterocarpus santalinus, native of S. India, Ceylon and the Philippine Islands. Afresh surface of the wood has a rich deep red colour, which on exposure, however, assumes a dark brownish tint. In medieval times red sandalwood possessed a high reputation in medicine, and it was valued as a colouring ingredient in many dishes. It is pharmacologically quite inert. Now it is little used as a colouring agent in pharmacy, its principal application being in wool-dyeing. Several other species of Pterocarpus, notably P. ir.dicus, contain the same dyeing principle and can be used as substitutes for red sandalwood. The barwood and camwood of the Guinea Coast of Africa, from Baphia nitida or an allied species, called santal rouge d’Afrique by the French, are also in all respects closely allied to the

red sandalwood of Oriental countries.

As a substitute for copaiba (q.v.), sandalwood oil, distilled from the wood of Santalum album, is more expensive and pleasanter to take, but it is less efficient, as it does not contain any analogue to the valuable resin in copaiba.

SANDARACH (Fr. sandaraque, Lat. sandaraca, Gr. aa.vhapa.Kt}, realgar or red sulphide of arsenic, cf. Pers. sandarus, Skt. sindura, realgar), in mineralogy realgar or native arsenic disulphide, but generally (a use found in Dioscorides) a resinous body obtained from the small coniferous tree Callitris quadrivalvis, native of the north-west regions of Africa, and especially char- acteristic of the Atlas mountains. The resin, which is procured as a natural exudation on the stems, and also obtained by making incisions in the bark of the trees, comes into commerce in the form of small round balls or elongated tears, transparent, and having a delicate yellow tinge. It is a little harder than mastic, for which it is sometimes substituted. It is also used as incense, and by the Arabs medicinally as a remedy for diarrhoea. It has no medicinal advantages over many of the resins employed in modern therapeutics. An analogous resin is procured in China from Callitris sinensis, and in S. Australia, under the name of pine gum, from C. Reissii.

SANDBACH, a market town in the Crewe parliamentary division of Cheshire, England, 5 m. N.E. of Crewe, on the London & North-Western and North Staffordshire railways. Pop. of urban district (1901) 5558. It lies on a headstream of the small river Wheelock, a tributary of the Weaver. The parish church of St Mary is Perpendicular, with a fine carved roof of the 17th century. A few old timbered houses, of the same period, remain. In the market-place are two remarkable crosses covered with rude carvings, and assigned by some to the 7 th century, being similar to those at Monasterboice and elsewhere in Ireland. There are boot and shoe factories, chemical works and a manu- factory of fustians, with salt-works and iron-works in the adjacent township of Wheelock.

SANDBERGER, KARL LUDWIG FRIDOLIN VON (1826-1898), German palaeontologist and geologist, was born at Dillenburg, Nassau, on the 22nd of November 1826. He was educated at the universities of Bonn, Heidelberg and Giessen, at the last of which he graduated Ph.D. in 1846. He then studied at the university of Marburg, where he wrote his first essay, TJbersicht der geologischen Verhaltnisse des Herzogtums Nassau (1847). In 1849 he became curator of the Natural History Museum at Wiesbaden, and began to study the Tertiary strata

of the Mayence Basin, and also the Devonian fossils of the Rhenish provinces, on which he published elaborate memoirs. In 1855 he was appointed professor of mineralogy and geology at the Poly- technic Institute at Karlsruhe, and he took part in the geological survey of Baden. From 1863 to 1896 he was professor of mineralogy and geology at the university of Wiirzburg. His great work Die Land- und Susswasser-Conchylien der Vorwelt was published in 1870-1875. Later he issued an authoritative work on mineral veins, Untersuchungen iiber Erzg&nge (1882-1885). He died at Wiirzburg on the nth of April 1898. His brother Guido Sandberger (1821-1869) was an authority on fossil cephalopoda, and together they published Die Versteinerungen des rheinischen Schichtensy stems in Nassau (1850-1856).

SANDBY, PAUL (1725-1809), English water-colour painter, was born at Nottingham in 1725. In 1746 he was appointed by the duke of Cumberland draughtsman to the survey of the Highlands. In 1752 he quitted this post and retired to Windsor, where he occupied himself with the production of water-colour drawings of scenery and architecture. Sir Joseph Banks com- missioned him to bring out in aquatint (a method of engrav- ing then peculiar to Sandby) forty-eight plates drawn during a tour in Wales. Sandby displayed considerable power as a caricaturist in his attempt to ridicule the opposition of Hogarth to the plan for creating a public academy for the arts. In 1768 he was chosen a foundation-member of the Royal Academy and appointed chief drawing-master to the Royal Military Academy at Woolwich. He held this situation till 1799. Sandby is best remembered, however, by his water-colour paintings. They are topographical in character, and, while they want the richness and brilliancy of modern water-colour, he nevertheless impressed upon them the originality of his mind. His etchings, such as the Cries 0} London and the illustrations to Ramsay's Gentle Shepherd, and his plates, such as those to Tasso's Jerusalem Delivered, are numerous and carefully executed. He died in London on the 9th of November 1809.

SANDEAU, LEONARD SYLVAIN JULIEN [Jules] (1811- 1883), French novelist, was born at Aubusson (Creuse) on the 19th of February 181 1. He was sent to Paris to study law, but spent much of his time with unruly students. He met Madame Dudevant (George Sand) at Le Coudray in the house of a friend, and when she came to Paris in 1831 she joined Sandeau. The intimacy did not last long, but it produced Rose et Blanche (1831), a novel written in common under the pseudonym Jules Sand, from which George Sand took the idea of her famous nom de guerre.

Sandeau continued for nearly fifty years to produce novels and to collaborate in plays. His best works are Marianna (1839), in which he draws a portrait of George Sand; Le Docteur Herbeau (1841); Catherine (1845); Mademoiselle de la Seigliere (1848), a successful picture of society under Louis Philippe, dramatized in 1851; Madeleine (1848); La Chasse au roman (1849); Sacs et parchemins (1851) ; La Maison dePenaroan (1858) ; LaRoche aux mouettes (1871). The famous jilay of Le Gendre de M.Poirier is one of several which he wrote with Emile Augier — the novelist usually contributing the story and the dramatist the theatrical working up. Meanwhile Sandeau had been made conservateur of the Mazarin library in 1853, elected to the Academy in 1858, and next year appointed librarian of St Cloud. At the suppression of this latter office, after the fall of the empire, he was pensioned. He died on the 24th of April 1883. He was never a very popular novelist, and the quiet grace of his style, and his refusal to pander to the popular taste in the morals and incidents of his novels, may have disqualified him for popularity.

See G. Planche, Portraits litteraires (1849), vol. i.; J. Claretie, /. Sandeau (1883) ; F. Brunetiere in the Revue des deux mondes

(1887).

SAND-EEL, or Sand-Launce. The fishes known under these names form a small family (Ammodytidae) now included with the Scombresocidae in the sub-order Percesoces. They were formerly placed in the Anacanthini and supposed to be allied to the Gadidae, but a fossil form Cobitopsis has recently been described in which the pelvic fins are present, and are abdominal in position as in Belone and Scombresox.

Their body is of an elongate-cylindrical shape, with the head terminating in a long conical snout, the projecting lower jaw forming the pointed end. A low long dorsal fin, in which no distinction between spines and rays can be observed, occupies nearly the whole length of the back, and a long anal, composed of similar short and delicate rays, commences immediately behind the vent, which is placed about midway between the head and caudal fin. The caudal is forked and the pectorals are short. The total absence of ventral fins indicates the burrowing habits of these fishes. The scales, when present, are very small ; but generally the development of scales has only proceeded to the formation of oblique folds of the integuments. The eyes are lateral and of moderate size; the denti- tion is quite rudimentary.

Sand-eels are small littoral marine fishes, only one species attain- ing a length of 18 in. (Ammodytes lanceolatus) . They live in shoals at various depths on a sandy bottom, and bury themselves in the sand on the slightest alarm. Other shoals live in deeper water. When they are surprised by fish of prey or porpoises they are frequently driven to the surface in such dense masses that numbers of them can be scooped out of the water with a bucket or hand-net. Sand-

eels destroy a great quantity of fry and other small creatures, such as the lancelet (Amphioxus), which lives in similar localities. They are excellent eating, and are much sought after for bait- They are captured by small meshed seines, as well as by digging in the sand. The eggs of sand-eels are small, heavier than sea-water and slightly adhesive: they are scattered among the grains of sand in which the fishes live, and the larvae and young at various stages of growth may be taken with the row-net in sandy bays in summer.

Sand-eels are common in the N. Atlantic; a species scarcely distinct from the European common sand-launce occurs on the Pacific side of N. America, another on the E. coast of S. Africa. On the British coasts three species are found : the greater sand-eel (Ammodytes lanceolatus) , distinguished by a tooth-like bicuspid prominence on the vomer; the common sand-launce (A. tobianus), from 5 to 7 in. long, with unarmed vomer, even dorsal fin, and with the integuments folded; and the southern sand-launce (.4. siculus), with unarmed vomer, smooth skin, and with the margins of the dorsal and anal fins undulated. The last species is common in the Mediter- ranean, but local farther N. It has been found near the Shetlands at depths from 8o to ioo fathoms.

SANDEFJORD, the oldest and most famous spa in Norway, in Jarlsberg-Laurvik ami (county), 86 m. S.S.W. of Christiania by the Skien railway. Pop. (iooo) 4847. The springs are sulphurous, saline and chalybeate. Specimens of jaettegryder or giant's cauldrons may be seenatGaardaasenandVindalsbugt, some upwards of 23 ft. in depth.

SANDEMAN, SIR ROBERT GROVES (1835-1892), Indian officer and administrator, was the son of General Robert Turnbull Sandeman, and was born on the 25th of February 1835. He was educated at Perth and St Andrews University, and joined the 33rd Bengal Infantry in 1856. When that regiment was disarmed at Phillour by General Nicholson during the Mutiny in 1857, he took part in the final capture of

Lucknow as adjutant of the nth Bengal Lancers. After the suppression of the Mutiny he was appointed to the Punjab Commission by Sir John Lawrence. In 1866 he was appointed district officer of Dera Ghazi Khan, and there first showed his capacity in dealing with the Baluch tribes. He was the first to break through the close-border system of Lord Lawrence, by extending British influence to the independent tribes beyond the border. In his hands this policy worked admirably, owing to his tact in manag- ing the tribesmen and his genius for control. In 1876 he negoti- ated the treaty with the khan of Kalat, which subsequently governed the relations between Kalat and the Indian govern- ment; and in 1877 he was made agent to the governor-general in Baluchistan, an office which he held till his death. During the second Afghan War in 1878 his influence over the tribesmen was of the utmost importance, since it enabled him to keep intact the line of communications with Kandahar, and to control the tribes after the British disaster at Maiwand. For these services he was made K.C.S.I. in 1879. In 1889 he occupied the Zhob valley, a strategic advantage which opened the Gomal Pass through the Waziri country to caravan traffic. Sandeman ‘s system was not so well suited to the Pathan as to his Baluch neighbour. But in Baluchistan he was a pioneer, a pacificator and a successful administrator, who converted that country from a state of complete anarchy into a province as orderly as any in British India. He died at Bela, the capital of Las Bela state, on the 29th of January 1892, and there he lies buried under a handsome tomb.

See T. H. Thornton, Sir Robert Sandeman (1&95) ; and R. I. Bruce, The Forward Policy (1900).

SANDERS, DANIEL (1819-1896), German lexicographer, was born on the 12th of November 1819 at Altstrelitz in Mecklen- burg, of Jewish parentage. He was educated at the ” Gymnasium Carolinum ” in the neighbouring capital Neustrelitz, and the universities of Berlin and Halle, where he took the degree of doctor philosophiae. From 1842 to 1852 he conducted with success the school at Altstrelitz.

In 1852 he subjected Grimm’s Deutsches Worterbuch to a rigorous examination, and as a result published his dictionary of the German language, Worterbuch der deutschen Sprache (3 vols., 1859-1865). This was followed by his Erganzungsworterbuch der deutschen Sprache (1 878-1 885). Among others of his works in the same field are Fremdworterbuch (Leipzig, 1871; 2nd ed., 1891), Worterbuch der Hauptschwierigkeiten in der deutschen Sprache (1872; 22nd ed., 1892) and Lehrbuck der deutschen Sprache fur Schulen (8th ed., 1888). Sanders laid down his views in his Katechismus der deutschen

Orthographie (1856, 4th ed., 1878), and was an active member of the orthographical conference in Berlin in 1876. He published a translation in verse of the5ong of Songs(i866) , and wrote some poems f orthe young, Heitere Kinderwelt (1868). In 1887 he founded the Zeitschrij l fiir die deutsche Sprache, which he conducted almost down to his death at Altstrelitz on the nth of March 1897.

See Friedrich Diisel, Daniel Sanders (1886; 2nd ed., 1890); A. Segert-Stein, Daniel Sanders, ein Gedenkbuch (1897).

SANDERS, NICHOLAS (c. 1530-1581), Roman Catholic agent and historian, born about 1530 at Charlwood, Surrey, was a son of William Sanders, once sheriff of Surrey, who was descended from the Sanders of Sanderstead. Educated at Winchester and New College, Oxford, he was elected fellow in 1548 and graduated B.C.L. in 1551. The family had strong Catholic leanings, and two of Nicholas's sisters, who must have been much older than he was, became nuns of Sion convent before its dis- solution. Nicholas was selected to deliver the oration at the reception of Cardinal Pole's visitors by the university in 1557, and soon after Elizabeth's accession he went to Rome where he was befriended by Pole's confidant, Cardinal Morone; he also owed much to the generosity of Sir Francis Englefield (

His expectations of the cardinalate were disappointed by Pius V.'s death in 1572, and Sanders spent the next few years at Madrid trying to embroil Philip II., who gave him a pension of 300 ducats, in open war with Elizabeth. " The state of Christendom," he wrote, " dependeth upon the stout assailing of England." His ardent zeal was sorely tried by Philip's cautious temperament ; and Sir Thomas Stukeley's projected Irish expedition, which Sanders was to have accompanied with the blessings and assistance of the pope, was diverted to Morocco where Stukeley was killed at the battle of Al Kasr al Kebir in 1578. Sanders, however, found his opportunity in the following year, when a force of Spaniards and Italians was despatched to Smerwick to assist James Fitzmaurice and his Geraldines in stirring up an Irish rebellion.. The Spaniards were, however, annihilated by Lord Grey in 1580, and after nearly two years of wandering in Irish woods and bogs Sanders died of cold and starvation in the spring of 158 1. The English exiles were disgusted at the waste of such material: " Our Sanders," they exclaimed, " is more to us than the whole of Ireland." His writings have been the basis of all Roman Catholic histories of the English Reformation. The most important was his De Origine ac Progressu schismatis Anglicani, which was continued after 1558 by Edward Rishton, and printed at Cologne in 1585; it has been often re-edited and translated, the best

English edition being that by David Lewis (London, 1877). Its statements earned Sanders the nickname of Dr Slanders in England ; but a considerable number of the ” slanders ” have been confirmed by corroborative evidence, and others, e.g. his story that Ann Boleyn was Henry VIII. ‘s own daughter, were simply borrowed by Sanders from earlier writers. It, is not a more untrustworthy account than a vehement controversialist engaged in a life and death struggle might be expected to write of his theological antagonists.

See Lewis’s Introduction (1877); Calendars of Irish, Foreign and Spanish State Papers, and of the Carew MSS.; Knox’s Letters of Cardinal Allen; T. F. Kirby’s Winchester Scholars; R. Bagwell’s Ireland under the Tudor s; A. O. Meyer’s England und die katholische Kirche unter Konigin Elisabeth (19 10); and T. G. Law in Diet. Nat. Biogr. i. 259-261 where a complete list of Sanders’s writings is given.

(A. F. P.)

SANDERSON, ROBERT (1 587-1663), English divine, was born probably at Sheffield, Yorkshire, in September 1587. He was educated at Rotherham grammar school and at Lincoln College, Oxford, took orders in 161 1, and was promoted successively

to several benefices. On the recommendation of Laud he was appointed one of the royal chaplains in 163 1, and was a favourite preacher with the king, who made him regius professor of divinity at Oxford in 1642. The Civil War kept him from entering the office till 1646; and in 1648 he was ejected by the Parliamentary visitors. He recovered his position at the Restoration, was moderator at the Savoy Conference, 1661, and was promoted to the bishopric of Lincoln. He died two years later on the 29th of January 1663.

His most celebrated work is his Cases of Conscience, deliberate judgments upon points of morality submitted to him. They are distinguished by moral integrity, good sense and learning. His practice as a college lecturer in logic is better evidenced by these ” cases ” than by his Compendium of Logic, first published in 1618. A complete edition of Sanderson’s works (6 vols.) was edited by William Jacobson in 1854. It includes the Life by Izaak Walton, revised and enlarged.

SANDFORD, JOHN DE (d. 1294), archbishop of Dublin, was probably an illegitimate son of the baronial leader, Gilbert Basset (d. 1241), or

of his brother Fulk Basset, bishop of London from 1 24 1 until his death in 1259, a prelate who was prominent during the troubles of Henry III.‘s reign. John was a nephew of Sir Philip Basset (d. 1271), the justiciar. He first appears as an official of Henry III. in Ireland and of Edward I. in both England and Ireland; he was appointed dean of St Patrick’s, Dublin, in 1275. In 1284 he was chosen archbishop of Dublin in succes- sion to John of Darlington; some, however, objected to this choice and Sandford resigned his claim; but was elected a second time while he was in Rome, and returning to Ireland was allowed to take up the office. In 1288, during a time of great con- fusion, the archbishop acted as governor of Ireland. In 1290 he resigned and returned to England. Sandford served Edward I. in the great case over the succession to the Scottish throne in 1292 and also as an envoy to the German king, Adolph of Nassau, and the princes of the Empire. On his return from Germany he died at Yarmouth on the 2nd of October 1 294.

Sandford’s elder brother, Fulk (d. 1271), was also archbishop of Dublin. He is called Fulk de Sandford and also Fulk Basset owing to his relationship to the Bassets. Having been arch- deacon of Middlesex and treasurer and chancellor of St Paul’s Cathedral, London, he was appointed archbishop of Dublin by Pope Alexander IV. in 1256. He took some slight part in the government of Ireland under Henry III. and died at Finglas on the 4th of May 1271.

SANDGATE, a watering-place of Kent, England, on the S.E. coast, 13 m. W. of Folkestone, on the South-Eastern & Chatham railway. Pop. of urban district (1901) 2023. It is connected with Hythe, 3 m. W., by a tramway belonging to the railway company. It is included in the parliamentary borough of Hythe. Sandgate Castle was built by Henry VIII. , but on the formation of a camp here in 1806 it was considerably altered. The camp of Shorncliffe lies N. of the town on a plateau.

SAND-GROUSE, the name 1 by which are commonly known the members of a small group of birds frequenting sandy tracts, and having their feet more or less clothed with feathers after the fashion of grouse (q.v.), to which they were originally thought to be closely allied; the species first described were by the earlier systematists invariably referred to the genus Telrao. Their separation therefrom is due to C. J. Temminck, who made for them a distinct genus which he called Pterocles? Further investigation of the osteology and pterylosis of the sand-grouse revealed still greater divergence from the normal Gallinae (to which the true grouse belong), as well as several curious resem- blances to the pigeons; and in the Zoological Society’s Proceed- ings for 1868 (p. 303) T. H. Huxley proposed to regard them, under

the name of Pteroclomorphae, as forming a group equivalent to the Alectoromorphae and Peristeromorphae. They are now

1 It seems to have been first used by J. Latham in 1783 {Synopsis, iv. p. 751) as the direct translation of the name Telrao arenarius given by Pallas.

2 He states that he published this name in 1809; but hitherto research has failed to find it used until 1815.

generally regarded as forming a separate sub-order Pterocles of Charadriiform birds, allied to pigeons (see Birds).

The Pteroclidae consist of two genera — Pterocles, with about fifteen species, and Syrrhaptes, with two. Of the former, two species inhabit Europe, P. arenarius, the sand-grouse proper,, and that which is usually called P. alchata, the pin-tailed sand-grouse. The European range of the first is practically limited to Portugal, Spain and S. Russia, while the second inhabits also the S. of France, where it is generally known by its Catalan name of Ganga, or locally as Grandaulo, or, strange to say, Perdrix d'Angleterre. Both species are also abundant in Barbary, and have been believed to extend E. through Asia to India, in most parts of which country they seem to be only winter-visitants; but in 1880 M. Bogdanow pointed out to the Academy of St Petersburg (Bulletin, xxvii. 164) a slight difference of coloration between eastern and western examples of what had hitherto passed as P. alchata; analogy would suggest that a similar difference might be found in examples of P. arenarius. India, moreover, possesses five other species of Pterocles, of which, however, only one, P. fasciatus, is peculiar to Asia, while the others inhabit Africa as well, and all the remaining species belong to the Ethiopian region — one, P. personatus, being peculiar to Madagascar, and four occurring in or on the borders of the Cape Colony.

The genus Syrrhaptes, though in general appearance resembling Pterocles, has a conformation of foot quite unique among birds, the three anterior toes being encased in a common " podotheca," which is clothed to the claws with hairy feathers, so as to look much like a fingerlcss glove. The hind toe is wanting. The two species of Syrrhaptes are S. tibetanus — the largest sand-grouse known— inhabiting the country whence its trivial name is derived, and 5. paradoxus, ranging from N. China across Central Asia to the confines of Europe, which it occasionally invades. Though its attempts at colonization in the extreme W. have failed, it would seem to have established itself in the neighbourhood of Astrakhan (Ibis, 1882, p.

220). It appears to be the ” Barguerlac” of Marco Polo (ed. Yule, i. p. 239) ; and the ” Loung-Kio ” or ” Dragon’s Foot,” so unscientifi- cally described by the Abbe Hue (Souvenirs d’un Voyage dans la Tartaric, i. p. 244), can scarcely be anything else than this bird.

The sand-grouse assimilates in general colour to that of the ground, being above of a dull ochreous hue, more or less barred or mottled by darker shades, while beneath it is frequently varied by belts of deep brown intensifying into black. Lighter tints are, however, exhibited by some species and streaks or edgings of an almost pure white relieve the prevailing sandy or fawn-coloured hues that especially character- ize the group. The sexes seem always to differ in plumage, that of the male being the brightest and most diversified. The expression is decidedly dove-like, and so is the form of the body, the long wings contributing also to that effect, so that among Anglo-Indians these birds are commonly known as ” rock-pigeons.” The long wings, the outermost primary of which in Syrrhaptes has its shaft produced into an attenuated filament, are in all the species worked by ex- ceedingly powerful muscles, and in several forms the middle rectrices are likewise protracted and pointed, so as to give to their wearers the name of Pin-tailed Sand-Grouse. * The nest is a shallow hole in the sand. Three seems to be the regular complement of eggs, but there are writers who declare that the full number in some species is four. These eggs are almost cylindrical in the middle and nearly alike at each end, and are of a pale earthy colour, spotted, blotched or marbled with darker shades, the markings being of two kinds, one superficial and the other more deeply seated in the shell. The young are hatched fully clothed in down (P.Z.S., 1866, pi. ix. fig. 2), and appear to be capable of locomotion soon after birth. The remains of an extinct species of Pterocles, P. sepultus, intermediate apparently between P. alchata and P. gutturalis, have been recognized in the Miocene caves of the Allier by A. Milne-Edwards (Ois. foss. de la France, p. 294, pi. clxi., figs. 1-9); and, in addition to the other authorities on this very interesting group of birds already cited, reference may be made to D. G. Elliot’s ” Study ” of the Family (P.Z.S., 1878, pp. 233-264) and H. F. Gadow, ” On Certain Points in the Anatomy of Pterocles ” (op. cil., 1882, pp. 312-332). (A. N.)

SANDHURST, a town in the Wokingham parliamentary division of Berkshire, England, 9 m. N. of Aldershot. Pop. (1901) 2386. Two miles south-east of the town, near the villages of Cambridge Town and York Town, and the railway stations of Blackwater and Camberley on the South-Eastern and Chatham and South-Western lines, is the Sandhurst Royal Military College. It was settled here in 181 2, having been already removed by its founder, the duke of York, from High

Wycombe, where it was opened in 1799, to Great Marlow in 1802. It stands in beautiful grounds, which contain a large lake. Wellington College station on the South-Eastern branch line to Reading, near Sandhurst itself, serves Wellington College, one of the principal modern public schools of England, founded in memory

3 These were separated by Bonaparte (Comptes rendus, xlii. p. 880) as a distinct genus, Pteroclurus, which later authors have justly seen no reason to adopt.

of the great duke of Wellington, g,nd incorporated in 1853. Its primary object was the education of the sons of deceased army officers. In the vicinity is Broadmoor Prison for criminal lunatics.

SAN DIEGO, a city, port of entry and the county-seat of San Diego county, in S. California, U.S.A., on the Pacific Ocean, about 10 m. N. of the Mexican border, and about 126 m. (by rail) S.E. of Los Angeles. Pop. (1880) 2637; (1890) 16,159; (1900) 17,700, of whom 3768 were foreign-born; (1910 census) 39,578. It is served by numerous steamship lines and by the Atchison, Topeka & Santa Fe, the Los Angeles & San Diego Beach, the San Diego Southern, and the San Diego, Cuyamaca & Eastern railways. A railway between Yuma, Arizona, and San Diego was under construction in 19 10. The harbour, next to that of San Francisco the best in California, has an area of some 22 sq. m. The Federal government has made various improvements in the harbour, building a jetty 7500 ft. long on Zuninga Shoal at the entrance and making a channel 225 ft. wide and 27-28 ft. deep at low tide. The city site, which is a strip of land 25 m. long and 2 to 4 m. wide, is nearly level near the bay. San Diego is the seat of a State Normal School and has a Carnegie library. There is a coaling station of the United States Navy, and the United States government maintains a garrison in Fort Rosecrans. At Coronado (pop. 1900, 935) across the bay are Coronado Beach, and the Hotel del Coronado, with fine botanical and Japanese gardens; on the beach people live in tents except in the stormier season. Within the city, on the top of Point Loma, is the Theosophical Institution of the " Universal Brotherhood." San Diego has one of the most equable climates in the world, and there are several sanatoriums here. The economic interests centre in fruit culture, especially the raising of citrus fruits and of raisin grapes. There are also warehouses, foundries, lumber yards, saw-mills and planing-mills — logs are rafted here from Washington and Oregon. National City (pop. 1900, 1086), adjoining San Diego on the S. and the S. terminus of the Atchison, Topeka & Santa Fe system, has large interests in lemon packing and the manufacture of oil, citric acid and other lemon by-products. In 1905 the total value of the factory products of the city was $1,974,430 (194-8 % more than in 1900).

San Diego is under the commission form of government; in 1905 the city secured as a charter right the power to " recall " by petition any unsatisfactory city official and to elect another in his place, and the initiative and referendum were incorporated in the charter, but were practically inoperative for several years. By a charter amendment of 1909, the city is governed by a commission of a mayor and five councilmen, elected at large.

About 4 m. N. of the business centre of San Diego is the site of the first Spanish settlement in Upper California. It was occupied in April 1769;

a Franciscan ” mission ” (the earliest of twenty-one established in California) was founded on the 16th of July, and a military presidio somewhat later. San Diego began the first revolution against Governor M. Victoria and Mexican authority in 1831, but was intensely loyal in opposition to Governor J. B. Alvarado and the northern towns in 1836. It was made a port of entry in 1828. In 1840 it had a population of 140. It was occupied by the American forces in July 1846, and was reoccupied in November after temporary dispossession by the Californians, no blood being shed in these disturbances. In 1850 it was incorporated as a city, but did not grow, and lost its charter in 1852. In 1867 it had only a dozen inhabitants. A land promoter, A. E. Horton (d. 1909), then laid out a new city about 3 m. S. of the old. Its population increased to 2300 in 1870, and this new San Diego was incorporated in 1872, and was made a port of entry in 1873. The old town still has many ruined adobe houses, and the old ” mission ” is fairly well pre- served. The prosperity of 1867-1873 was followed by a disastrous crash in 1873-1874, and little progress was made until 1884, when San Diego was reached by the Santa Fe railway system. After 1900 the growth of the city was again very rapid.

SANDOMIR, or Sedomierz, a town of Russian Poland, in the government of Radom, 140 m. S.S.E. of Warsaw by river

and on the left bank of the Vistula, opposite the confluence of the San. Pop. (1881) 6265, or, including suburbs, 14,710; (1897) 6534. It is one of the oldest towns of Poland, being mentioned as early as 1079; from 1139 to 1332 it was the chief town of the principality of the same name. In 1240, and again in 1259, it was burned by the Mongols. Under Casimir III. it reached a high degree of prosperity. In 1429 it was the seat of a congress for the establishment of peace with Lithuania, and in 1570 the ” Consensus Sandomiriensis ” was held here for uniting the Lutherans, Calvinists and Moravian Brethren. Subsequent wars, and especially the Swedish (e.g. in 1655) ruined the town even more than did numerous conflagrations, and in the second part of the 18th century it had only about 2000 inhabitants. Here in 1 702 the Polish supporters of Augustus of Saxony banded together against Charles XII. of Sweden. The beautiful cathedral was built between 1120 and 1191; it was rebuilt in stone in 1360, and is one of the oldest monuihents of Polish architecture. Two of the churches are fine relics of the. 13th century. The castle, built by Casimir III. (14th century), still exists. The city gives title to an episcopal see (Roman Catholic) .

SANDOWAY, a town and district in the Arakan division of Lower Burma. The town (pop. 1901, 12,845) is very ancient, and is said to

have been at one time the capital of Arakan. The district has an area of 3784 sq. m.; pop. (1901) 90,927, showing an increase of 16 % in the decade. The country is mountainous, the Arakan range sending out spurs which reach the coast. Some of the peaks in the N. attain 4000 and more ft. The streams are only mountain torrents to within a few miles of the coast; the mouth of the Khwa forms a good anchorage for vessels of from 9 to 10 ft. draught. The rocks in the Arakan range and its spurs are metamorphic, and comprise clay, slates, ironstone and indurated sandstone; towards the S., ironstone, trap and rocks of basaltic character are common; veins of steatite and white fibrous quartz are also found. The rainfall in 1905 was 230-49 in. Except a few acres of tobacco, all the cultivation is rice. Sandoway was ceded to the British, with the rest of Arakan, by the treaty of Yandabo in 1826.

SANDOWN, a watering-place in the Isle of Wight, England, 65 m. S. of Ryde by rail. Pop. of urban district (1901) 5006. It is beautifully situated on rising ground overlooking Sandown Bay and the English Channel, on the S.E. coast of the island, There is a wide expanse of sandy shore, and bathing is excellent.

SANDPIPER (Ger. Sandpfeifer), the name applied to nearly all the smaller kinds of the group Limicolae which are not Plovers (q.v.) or Snipes (q.v.), but may be said to be intermediate between them. According to F. Willughby in 1676 it was the name given by Yorkshiremen to the bird popularly known in England as the " Summer-Snipe," — the Tringa hypoleucos of Linnaeus and the Totanus hypoleucus of later writers, — but probably even in Willughby's time the name was of much wider signification. Placed by most systematists in the family Scolopacidae, the birds commonly called Sandpipers seem to form three sections, which have been often regarded as Subfamilies — Totaninae, Tringinae and Phalaropodinae, the last indeed in some classifica tions taking the higher rank of a Family — Phalaropodidae. This section comprehends three species only, known as Phalaropes or swimming sandpipers, which are distinguished by the mem- branes that fringe their toes, in two of the species forming marginal lobes, 1 and by the character of their lower plumage, which is as close as that of a duck. The most obvious distinctions between Totaninae and Tringinae may be said to lie in the acute or blunt form of the tip of the bill (with which is associated a less or greater development of the sensitive nerves running almost if not quite to its extremity, and therefore greatly in- fluencing the mode of feeding) and in the style of plumage — the Tringinae, with blunt and flexible bills, mostly assuming a summer-dress in which some tint of chestnut or reddish-brown

1 These are Phalaropus fulicarius and P. (or Lobipes) hyperboreus, and were thought by some of the older writers to be allied to the Coots (q.v.). The third species is P. (or Steganopus) wilsoni. All are natives of the higher parts of the N. hemisphere, and the last is especially American, though perhaps a straggler to Europe.

is prevalent, while the Totaninae, with acute and stiffer bills, display no such lively colours. Furthermore, the Tringinae, except when breeding, frequent the sea-shore much more than do the Totaninae. 1 To the latter belong the Greenshank (q.v.) and Redshank (q.v.), as well as the Common Sandpiper, the ” Summer-Snipe ” above-mentioned, a bird hardly exceeding a skylark in size, and of very general distribution throughout the British Islands, but chiefly frequenting clear streams, especially those with a gravelly or rocky bottom, and most generally breeding on the beds of sand or shingle on their banks. It usually makes its appearance in May. The nest, in which four eggs are laid with their pointed ends meeting in its centre (as is usual among Limicoline birds), is seldom far from the water’s edge, and the eggs, as well as the newly-hatched and down-covered young, closely resemble the surrounding pebbles. The Common Sandpiper is found over the greater part of the Old World. In summer it is the most abundant bird of its kind in the extreme N. of Europe, and it extends across Asia to Japan. In winter it makes its way to India, Australia and the Cape of Good Hope. In America its place is taken by a closely kindred species, which is said to have also occurred in England — T. macularius, the ” Peetweet,” or Spotted Sandpiper, so called from its usual cr}’, or from the almost circular marks which spot its lower plumage. In habits it is very similar to its congener’ of the Old World, and in winter it migrates to the Antilles and to Central and South America.

Of other Totaninae, one of the most remarkable is that to which the inappropriate name of Green Sandpiper has been assigned, the Totanus or Helodromas ochropus of ornithologists, which differs (so far as is known) from all others of the group both in its osteology 2 and mode of nidification, the hen laying her eggs in the deserted nests of other birds, — Jays, Thrushes or Pigeons, — but nearly always at some height (from 3 to 30 ft.) from the ground (Proc. Zool. Society, 1863, pp. 529-532). This species occurs in England the whole year round, and is presumed to have bred there, though the fact has never been satisfactorily proved, and knowledge of its erratic habits comes

from naturalists in Pomerania and Sweden. This sandpiper is characterized by its dark upper plumage, which contrasts strongly with the white of the lower part of the back and gives the bird as it flies much the look of a very large house-martin. The so-called wood-sandpiper, T. glareola, which, though much less common, is known to have bred in England, has a considerable resemblance to the species last mentioned, but can be distinguished by the feathers of the axillary plume being white barred with greyish-black, while in the green sandpiper they are greyish-black barred with white. It i9 an abundant bird in most parts of northern Europe, migrating in winter very far to the southward.

Of the section Tringinae the best known are the Knot (q.v.) and the Dunlin, T. alpina. The latter, often also called Ox-bird, Plover's Page, Purre and Stint, — names which it shares with some other species, — not only breeds commonly on many of the elevated moors of Britain, but in autumn resorts in countless flocks to the shores. In winter of a nearly uniform ash-grey above and white beneath, in summer the feathers of the back are black, with deep rust-coloured edges, and a broad black belt occupies the breast. The Dunlin varies considerably in size, examples from N. America being almost always recognizable from their greater bulk, while in Europe tjiere appears to be a smaller race which has received the name of T. schinzi. In the breeding-season the male Dunlin utters a most peculiar and far- sounding whistle, somewhat resembling the continued ringing of a high-toned musical bell.

Next to the Dunlin and Knot the commonest British Tringinae are the Sanderling, Calidris arenaria (distinguished from every other bird of the group by wanting a hind toe), the Purple Sandpiper, T. striata or maritima, the Curlew- Sandpiper, T. subarquala and the Little and Temminck's Stints, T. minuta and T. temmincki. T. minutilla, the American stint, is darker, with olive feet, and ranges from the Arctic New World to Brazil. T. fuscicollis, Bonaparte's sandpiper, with white upper tail-coverts inhabits Arctic America, but reaches the greater part of South America in winter, whilst T. bairdi, with brownish median tail-coverts, extends over nearly all North America, breeding towards the north.

1 There are no English words adequate to express these two sections. By some British writers the Tringinae have been indicated as " Stints," a term cognate with Stunt and wholly inapplicable to many of them, while American writers have restricted to them the name of " Sandpjper," and call the Totaninae, to which that name is especially appropriate, " Willets."

2 It possesses only a single pair of posterior ” emarginations ’” on irs sternum, in this respect resembling the Ruff (q.v.). Among the Plovers and Snipes other similarly exceptional cases may be found.

The broad-billed sandpiper, T. platyrkyncha, of the Old World, seems to be more snipe-like than any that are usually assigned to this section. The spoon-billed sandpiper, Eurinorhynchus pygmaeus, breeds in north-eastern Asia and N.W. America, and ranges to China and Burma in winter. (A. N.)

SANDRART, JOACHIM VON (1606-1688), German art- historian and painter, was born at Frankfort, and after studying in Germany, Holland and England, went in 1627 to Italy, where he became famous as a portrait-painter. He subsequently revisited Holland and then settled in Nuremberg, where he died. His ” Peace-Banquet, 1649 ” is in the town hall there. He is best known as the author of books on art, some of them in Latin, and especially for his historical work, the Deutsche Akademie (1675-1679), of which there is a modern edition by Sponsel (1896).

SANDRINGHAM, a village in the N.W. parliamentary division of Norfolk, England, 3 m. from the shore of the Wash, and z\ from Wolferton station on the Great Eastern railway. Sandring- ham House was a country seat of King Edward VII., acquired by him when Prince of Wales by purchase in 1861. Ten years later the mansion then existing was replaced by the present picturesque building in brick and stone in Elizabethan style. The estate, of some 7000 acres, includes a park of 200 acres, entered by fine wrought iron gates constructed at Norwich. The church of St Mary Magdalene contains many memorials of the royal family.

SANDSTONE, in petrology, a consolidated sand rock built up of sand grains held together by a cementing substance. The size of the particles varies within wide limits and in the same rock may be uniform or irregular: the coarser sandstones are called grits, and form a transition to conglomerates (q.v.), while the finer grained usually contain an admixture of mud or clay and pass over by all stages into arenaceous shales and clay rocks. Greywackes (q.v.) are sandstones belonging to the older geological systems, such as the Silurian’ or Cambrian, usually of brown or grey colour and very impure.

The minerals of sandstones are the same as those of sands. Quartz is the commonest; with it often occurs a considerable amount of felspar, and usually also seme white mica. Chlorite, argillaceous matter, calcite and iron oxides, are exceedingly common in sandstones, and in

some varieties are important constituents; garnet, tourmaline, zircon, epidote, rutile and anatase are often present though rarely in any quantity. Accord- ing to their composition we may distinguish siliceous sandstones (some of these are so pure that they contain 99% of silica, e.g. Craigleith stone and some gannisters), felspathic sandstones or arkoses (less durable and softer than the siliceous sandstones) ; micaceous sandstones, with flakes of mica lying along the bed- ding planes; argillaceous sandstones; ferruginous sandstones, brown or red in colour with the sand grains coated with red haematite or brownish yellow limonite; impure sandstones, usually in the main consisting of quartz with a large addition of other minerals.

The cementing material is often fine chalcedonic silica, and exists in such small quantity that it is difficult to recognize even with the microscope. In some of the cherty sandstones of the Greensand the chalcedonic cement is much more abundant: these rocks also contain rounded grains of glauconite, to which they owe their green colour. Crystalline silica (quartz) is deposited interstitially in some sandstones, often in regular parallel crystalline growth on the original sand grains, and when there are cavities or fissures in the rock may show the development of regular crystalline facets. By this process the rock becomes firmly compacted, and is then described as a quartzite (q.v.). A calcareous cement is almost equally common: it may be derived from particles of shells or other calcareous fossils originally mixed with the sand and subsequently dissolved and re- deposited in the spaces between the other grains. In Fontainebleau sandstone and some British Secondary rocks the calcite is in large crystalline masses, which when broken show plane cleavages mottled with small rounded sand grains; in the French rock external rhombohedral faces are present and the crystals may be of consider- able size. Manj' of the British Jurassic and Cretaceous sandstones (e.g. Kentish Rag, Spilsby Sandstone) are of this calcareous type. In ferruginous sandstones the iron oxides usually form only a thin pellicle coating each grain, but sometimes, in the greensands, are more abundant, especially in concretionary masses or segregations. In argillaceous sandstones the fine clayey material, compacted by pressure, holds, the sand grains together, and rocks of this kind are

soft and break up easily when exposed to the weather or submitted to crushing tests. Among other cementing materials may be men- tioned, dolomite, barytes, fluorite and phosphate of lime, but these are only

locally found.

Many sandstones contain concretions which may be several feet in diameter, and are sometimes set free by weathering or when the rock is split open by a blow. Most frequently these are siliceous, and then they interfere with the employment of the rock for certain purposes, as for making grindstones or for buildings of fine dressed stone. Argillaceous concretions or clay galls are almost equally common, and nodules of pyrites or marcasite; the latter weather to a brown rusty powder, and are most undesirable in building stones. Phosphatic, ferruginous, barytic and calcareous concretions occur also in some of the rocks of this group. We may also mention the presence of lead ores (the Eifel, Germany), copper ores (Chessy and some British Triassic sandstones) and manganese oxides. In some districts (e.g. Alsace) bituminous sandstones occur, while in N. America many Devonian sandstones contain petroleum. Many Coal-Measures sandstones contain remains of plants preserved as black impressions.

The colours of sandstones arise mostly from their impurities; pure siliceous and calcareous sandstones are white, creamy or pale yellow (from small traces of iron oxides). Black colours are due to coal or manganese dioxide; red to haematite (rarely to copper oxide) ; yellow to limonite, green to glauconite. Those which contain clay, fragments of shale, &c, are often grey (e.g. the Pennant Grit of S. Wales).

Sandstones are very extensively worked, mostly by quarries but sometimes by mines, in all districts where they occur and are used for a large variety of purposes. Quarrying is facilitated by the presence of two systems of joints, developed approximately in equal perfection, nearly at right angles to one another and perpendicular to the bedding planes. Sometimes this jointing determines the weathering of the rock into square pillar-like forms or into mural scenery (e.g. the Quader Sandstein of Germany). As building stones sandstones are much in favour, especially in the Carboniferous districts of Britain, where they can readily be obtained. They have the advantage of being durable, strong and readily dressed. They are usually laid ” on the bed,” that is to say, with their bedding surfaces horizontal and their edges exposed. The finer kinds of sandstone are often sawn, not hewn or trimmed with chisels. Pure siliceous sandstones are the most durable, but are often very ex- pensive to dress and are not obtainable in many places. Sandstones are also used for grindstones and for millstones. For engineering purposes, such as dams, piers, docks and bridges, crystalline rocks, such as granite, are often preferred as being obtainable in larger blocks and having a higher crushing strength. Very pure siliceous sandstones (such as the gannisters of the north of

England) may be used for lining furnaces, hearths, &c. As sandstones are always porous, they do not take a good polish and are not used as ornamental stones, but this property makes them absorb large quantities of water, and consequently they are often important sources of water supply (e.g. the water-stones of the Trias of the English Midlands). Silver is found in beds of sandstone in Utah, lead near Kommern in Prussia, and copper at Chessy near Lyons. (J. S. F.)

SANDUR, or Sundoor, a petty state of S. India, surrounded by the Madras district of Bellary. Area, 161 sq. m. Pop. (1901), n,2oo;estimatedrevenue, £3500. The raja is a Mahratta of the Ghorpade family. On the western border is a hill range, which contains the military sanatorium of Ramandrug. Manganese and hematite iron ore have been found, both of unusual purity.

SANDUSKY, a city, port of entry, and the county-seat of Erie county, Ohio, U.S.A., on Sandusky Bay, an arm of Lake Erie, about 56 m. W. by S. of Cleveland. Pop. (1890), 18,471; (1000), 19,664, of whom 4002 were foreign-born and 295 were negroes; (1910 U.S. census) 19,989. Sandusky is served by the Lake Shore & Michigan Southern, the Cleveland, Cincinnati, Chicago & Saint Louis, the Pennsylvania, the Baltimore & Ohio, and the Lake Erie & Western railways, by several interurban electric lines, and by steamboats to the principal ports on the Great Lakes. Among the public buildings are the United States Government Building and the Court House. The city has a Carnegie library (1897), and is the seat of the Lake Laboratory (biological) of the Ohio State University, and of the Ohio Soldiers' and Sailors' Home (26 buildings).

At the entrance to Sandusky Bay is Cedar Point, with a beach for bathing. At the mouth of the harbour is Johnson's Island, where many Confederate prisoners were confined during the Civil War. A few miles farther N. are several fishing resorts, among them Lakeside and Put-in-Bay; at the latter the United States govern- ment maintains a fish hatchery, and out of the bay Oliver Hazard Perry and his fleet sailed on the morning of the 10th of September 1813 for the Battle of Lake Erie. Sandusky has a good harbour, which has been greatly improved by the United States government;

and its trade in coal, lumber, stone, cement, fish, fruit, ice, wine and beer is extensive; in 1908 the value of its exports, chiefly to Canada, was $580,191 and the value of its imports $57,762. The value of its factory products increased from $2,833,506 in 1900 to $4,878,563 in 1905, or 72-2%.

English traders were at Sandusky as early as 1749, and by 1763 a fort had been erected ; but on the 16th of May of that year, during the Pontiac rising, the Wyandot Indians burned the fort. The first permanent settlement was made in 1817, and in 1845 Sandusky was chartered as a city.

SANDWICH, EDWARD MONTAGU, or MOUNTAGU, ist

Earl of (1625-1672), English admiral, was a son of Sir Sidney Montagu (d. 1644) of Hinchinbrook, who was a brother of Henry Montagu, ist earl of Manchester, and of Edward Montagu, ist Lord Montagu of Boughton. He was born on the 27th of July 1625, and although his father was a royalist, he himself joined the parliamentary party at the outbreak of the Civil War. In 1643 he raised a regiment, with which he distinguished himself at the battles of Marston Moor and Naseby and at the siege of Bristol. Though one of Cromwell's intimate friends, he took little part in public affairs until 1653, when he was appointed a member of the council of state. His career as a seaman began in 1656, when he was made a general-at-sea, his colleague being Robert Blake. Having taken some part in the operations against Dunkirk in 1657, he was chosen a member of Cromwell's House of Lords, and in 1659 he was sent by Richard Cromwell with a fleet to arrange a peace between Sweden and Denmark. After the fall of Richard he resigned his command and joined with those who were frightened by the prospect of anarchy in bringing about the restoration of Charles II. Again general-at-sea early in 1660, Montagu carried the fleet over to the side of the exiled king, and was entrusted with the duty of fetching Charles from Holland. He was then made a knight of the Garter, and in July 1660 was created earl of Sandwich. His subsequent naval duties included the conveyance of several royal exiles to England and arranging for the cession of Tangier and for the payment of £300,000, the dowry of Catherine of Braganza.

During the war with the Dutch in 1664-1665 Sandwich commanded a squadron under the duke of York and distinguished himself in the battle off Lowestoft on the 3rd of June 1665. When the duke retired later in the same year he became commander-in- chief, and he directed an unsuccessful attack on some Dutch merchant ships which were sheltering in the Norwegian port of Bergen; however, on his homeward voyage he captured some valuable prizes, about which a great deal of trouble arose on his return. Personal jealousies were intermingled with charges of irregularities in dealing with the captured property, and the upshot was that Sandwich was dismissed from his command, but as a solatium was sent to Madrid as ambassador extraordinary. He arranged a treaty with Spain, and in

1670 was appointed president of the council of trade and plantations. When the war with the Dutch was renewed in 1672 Sandwich again commanded a squadron under the duke of York, and during the fight in Southwold Bay on the 28th of May 1672, his ship, the ” Royal George,” after having taken a conspicuous part in the action, was set on fire and was blown up. The earl’s body was found some days later and was buried in Westminster Abbey. Edward (d. 1688) the eldest of his six sons, succeeded to the titles; another son, John Montagu (c. 1655-1728) was dean of Durham.

Lord Sandwich claimed to have a certain knowledge of science, and his translation of a Spanish work on the Art of Metals appeared in 1674. Many of his letters and papers are in the British Museum, the Bodleian Library at Oxford, and in the possession of the present earl of Sandwich. He is mentioned very frequently in the Diary of his kinsman, Samuel Pepys. See also J. Charnock, Biographia Navalis, vol. i. (1794) ; John Campbell, Lives of the British Admirals, vol. ii. (1779) ; and R. Southey, Lives of the British Admirals, vol. v.

(1840).

SANDWICH, JOHN MONTAGU, 4TH Earl of (1718-1792), was born on the 3rd of November 17 18 and succeeded his grand- father, Edward, the 3rd earl, in the earldom in 1729. Educated at Eton and at Trinity College, Cambridge, he spent some time in travelling, and on his return to England in 1739 he took his

seat in the House of Lords as a follower of the duke of Bedford. He was soon appointed one of the commissioners of the admiralty under Bedford and a colonel in the army. In 1746 he was sent as plenipotentiary to the congress at Breda, and he continued to take part in the negotiations for peace until the treaty of Aix-la-Chapelle was concluded in 1748. In February 1748 he became first lord of the admiralty, retaining this post until he was dismissed by the king in June 1751. In August 1753 Sandwich became one of the principal secretaries of state, and while filling this office he took a leading part in the prosecution of John Wilkes. He had been associated with Wilkes in the notorious fraternity of Medmenham, and his attitude now in turning against the former companion of his pleasures made him very unpopular, and, from a line in the Beggar’s Opera, he was known henceforward as ” Jemmy Twitcher.” He was post- master-general in 1768, secretary of state in 1770, and again first lord of the admiralty from 1771 to 1782. For corruption and incapacity Sandwich’s

administration is unique in the history of the British navy. Offices were bought, stores were stolen and, worst of all, ships, unseaworthy and inadequately equipped, were sent to fight the battles of their country. The first lord became very unpopular in this connexion also, and his retirement in March 1782 was hailed with joy. Sandwich married Dorothy, daughter of Charles, 1st viscount Fane, by whom he had a son John (1743-1814), who became the 5th earl. He had also several children by the singer Margaret, or Martha, Ray, of whom Basil Montagu (1770-1851), writer, jurist and philanthropist, was one. The murder of Miss Ray by a rejected suitor in April 1779 increased the earl's unpopu- larity, which was already great, and the stigmas of the prosecu- tion of Wilkes and the corrupt administration of the navy clung to him to the last. He died on the 30th of April 1792. The Sandwich Islands (see Hawaii) were named after him by Captain Cook. His Voyage round the Mediterranean in the Years 1738 and 1739 was published posthumously in 1799, with a very flattering memoir by the Rev. J. Cooke; the Life, Adventures, Intrigues and Amours of the celebrated Jemmy Twitcher (1770), which is extremely rare, tells a very different tale. See also the various col- lections of letters, memoirs and papers of the time, including Horace Walpole's Letters and Memoirs and the Bedford Correspondence.

SANDWICH, a market town, municipal borough, and one of the Cinque Ports in the St Augustine's parliamentary division of Kent, England, 12 m. E. of Canterbury, on the South-Eastern & Chatham railway. Pop. (1901), 3170. It is situated 2 m. from the sea, on the river Stour, which is navigable up to the bridge for vessels of 200 tons. The old line of the walls on the land side is marked by a public walk. The Fisher Gate and a gateway called the Barbican are interesting; but the four principal gates were pulled down in the 18th century. St Clement's church has a fine Norman central tower, and St Peter's (restored), said to date from the reign of King John, has interest- ing medieval monuments. The curfew is still rung at St Peter's. A grammar school was founded by Sir Roger Manwood in 1 564, but the existing school buildings are modern. There are three ancient hospitals; St Bartholomew's has a fine Early English chapel of the 12th century. The establishment of the railway and of the St George's golf links (1886) rescued Sandwich from the decay into which it had fallen in the earlier part of the 19th century. The links are among the finest in England.

Richborough Castle, ij m. N. of Sandwich, is one of the finest relics of Roman Britain. It was called Rutupiae, and guarded one of the harbours for continental traffic in Roman times, and was in the 4th century a fort of the coast defence along the Saxon shore.

The situation of Sandwich on the Wantsum, once a navigable channel for ships bound for London, made it a famous port in the time of the Saxons, who probably settled here when the sea receded from the Roman port of Richborough. In 973 Edgar granted the harbour and town to the monastery of Christ Church, Canterbury, and at the time of the Domesdav Survey Sandwich supplied 40,000 herrings each year to the monks. As one of the Cinque Ports, Sandwich owed a service of five ships to the king, and shared the privileges granted to the Cinque Ports from the

reign of Edward the Confessor onwards. At the end of the 13th century the monks granted the borough, with certain reserva- tions, to Queen Eleanor; a further grant of their rights was made to Edward III. in 1364, the crown being thenceforward lord of the borough. A charter of Henry II. confirmed the customs and rights which Sandwich had previously enjoyed, and this charter was confirmed by John in 1 205, by Edward II. in 13 13 and by Edward III. in 1365. The town was a borough by prescription, and was governed in the 13th century by a mayor and jurats; a mayor was elected as early as 1226. The governing charter until 1835 was that granted by Charles II. in 1684. During the middle ages Sandwich was one of the chief ports for the continent, but as the sea gradually receded and the passage of the Wantsum became choked with sand the port began to decay, and by the time of Elizabeth the harbour was nearly useless. In her reign Walloons settled here and introduced the manufacture of woollen goods and the cultivation of vegetables; this saved the borough from sinking into unimport- ance. Three fairs to be held at Sandwich were granted to Queen Eleanor in 1290; Henry VII. granted two fairs on the 7th of February and the 5th of June, each to last for thirty days, and in the governing charter two fairs, on the 1st of April and the 1 st of October, were granted; these all seem to have died out before the end of the 18th century. A corn market on Wednesday and a cattle market on every alternate Monday are now held. Representatives from the Cinque Ports were first summoned to parliament in 1265; the first returns for Sandwich are for 1366, after which it returned two members until it was dis- franchised in 1885. Sandwich is governed by a mayor, 4 alder- men and 12 councillors. Area, 707 acres.

See W. Boys, Collections for History of Sandwich (1792) ; E. Hasted, History of Kent (1778-1799); Victoria County History (Kent).

SANDYS, SIR EDWIN (1561-1629), British statesman and one of the founders tof the colony of Virginia, was the second son of Edwin

Sandys, archbishop of York, and his wife Cecily Wilford. He was born in Worcestershire on the 9th of December 1 561. He was educated at Merchant Taylors' school, which he entered in 1371, and at Corpus Christi College, Oxford, where he was sent in 1577. He became B.A. in 1579 and B.C.L. in 1589. In 1582 his father gave him the prebend of Witwang in York Minster, but he never took orders. He was entered in the Middle Temple in 1589. At Oxford his tutor had been Hooker, author of the Ecclesiastical Polity, whose life-long friend and executor he was. Sandys is said to have had a large share in securing the Mastership of the Temple for Hooker. From 1593 till 1599 he travelled abroad. When in Venice he became closely connected with Fra Paolo Sarpi, who helped him in the composition of the treatise on the religious state of Europe, known as the Europae speculum. In 1605 this treatise was printed from a stolen copy under the title, A Relation of the State of Religion in Europe. Sandys procured the suppression of this edition, but the book was reprinted at the Hague in 1629. In 1599 he resigned his prebend, and entered active political life. He had already been member for Andover in 1 586 and for Plympton in 1589. After 1599, in view of the approaching death of Queen Elizabeth, he paid his court to King James VI., and on James's accession to the throne of England in 1603 Sandys was knighted. He sat in the king's first parliament as member for Stockbridge, and distinguished himself as one of the assailants of the great monopolies. He endeavoured to secure to all prisoners the right of employing counsel, a proposal which was resisted by some lawyers as subversive of the administration of the law. He had been connected with the East India Company before 1614, and took an active part in its affairs till 1629. His most memorable services were, however, rendered to' the (London) Virginia Company, to which he became treasurer in 1619. He promoted and supported the policy which enabled the colony to survive the disasters of its early days, and , he continued to be a leading influence in the Company till his death. Sir Edwin Sandys sat in the later parliaments of James I. as member for Sandwich in 1621, and for Kent in 1624. Hib

tendencies were towards opposition, and he was suspected of hostility to the court; but he disarmed the anger of the king by professions of obedience. He was member for Penrhyn in the first parliament of Charles I. in 1625. He died in October

1629.

See Alex. Brown's Genesis of the United States (London^ 1890).

SANDYS, FREDERICK (1832-1904), English painter and draughtsman, was born at Norwich on the 1st of May 1832, and received his earliest lessons in art from his father, who was himself a painter. His early studies show that he had a natural gift for careful and beautiful drawing, and that he sought after absolute sincerity of presentment. Sandys worked along the same lines as Millais, Madox Brown, Holman Hunt and Rossetti. He first met Rossetti in 1857, and carried away with him the impression of the painter-poet's features, which he reproduced so cleverly in " A Nightmare," a caricature of " Sir Isumbras at the Ford," by Millais. Both the picture and the skit upon it by Sandys attracted much attention in 1857. The caricaturist turned the horse of Sir Isumbras into a donkey labelled " J. R., Oxon." (John Ruskin). Upon it were seated Millais himself, in the character of the knight, with Rossetti and Holman Hunt as the two children, one before and one behind. Rossetti and Sandys became intimate friends, and for about a year and a quarter, ending in the summer of 1867, Sandys lived with Rossetti at Tudor House (now called Queen's House) in Cheyne Walk, Chelsea. By this time Sandys was known as a painter of remark- able gifts. He had begun by drawing for Once a Week, the Comhill Magazine, Good Words and other periodicals. He drew only in the magazines. No books illustrated by him can be traced. So his exquisite draughtsmanship has to be sought for in the old bound-up periodical volumes which are now hunted by collectors, or in publications such as Dalziel's Bible Gallery and the Comhill Gallery and books of drawings, with verses attached to them, made to lie upon the drawing-room tables of those who had for the most part no idea of their merits. Every drawing Sandys made was a work of art, and many of them were so faithfully engraved that they are worthy of the collector's portfolio. Early in the 'sixties he began to exhibit the paintings which set the seal upon his fame. The best known of these are "Vivien" (1863), "Morgan le Fay" (1864), "Cassandra" and " Medea." Sandys never became a popular painter. He painted little, and the dominant influence upon his art was the influence exercised by lofty conceptions of tragic power. There was in it a sombre intensity and an almost stern beauty which lifted it far above the ideals of the crowd. The Scandinavian Sagas and the Morte d' Arthur gave him subjects after his own heart. " The Valkyrie " and " Morgan le Fay " represent his work at its very best. He made a number of chalk drawings of famous men of letters, including Tennyson, Browning, Matthew Arnold, and James Russell Lowell. Sandys died in Kensington on the 20th of June 1904.

See also Esther Wood, The Artist (Winter number, 1896).

SANDYS, GEORGE (15 7 8-1 644), English traveller, colonist and poet, the seventh and youngest son of Edwin Sandys, archbishop of York, was born on the 2nd of March 1578. He studied at St Mary Hall, Oxford, but took no degree. On his travels, which began in 1610, he first visited France; from North Italy he passed by way of Venice to Constantinople, and thence to Egypt, Mt. Sinai, Palestine, Cyprus, Sicily, Naples and Rome. His narrative, dedicated, like all his other works, to Charles (either as prince or king), was published in 1615, and formed a substantial contribution to geography and ethnology. He also took great interest in the earliest English colonization in America. In April 1621 he became colonial treasurer of the Virginia Company and sailed to Virginia with his niece's husband, Sir Francis Wyat, the new governor. When Virginia became a crown colony, Sandys was created a member of council in August 1624; he was reappointed to this post in 1626 and 1628. In 1631 he vainly applied for the secretaryship to the new special commission for the better plantation of Virginia; soon after this he returned to England for

good. In 1621 he had already published an English translation of part of Ovid's Metamorphoses; this he completed in 1626; on this mainly his poetic reputation rested in the 17th and 18th centuries. He also began a version of Virgil's Aeneid, but never produced more than the first book. In 1636 he issued his famous Paraphrase upon the Psalms and Hymns dispersed throughout the Old and New Testaments; in 1640 he translated Christ's Passion from the Latin of Grotius; and in 1641 he brought out his last work, a Paraphrase of the Song of Songs. He died, un- married, at Boxley, near Maidstone, Kent, in 1644. His verse was deservedly praised by Dryden and Pope; Milton was some- what indebted to Sandys' Hymn to my Redeemer (inserted in his travels at the place of his visit to the Holy Sepulchre) in his Ode on the Passion.

See Sandys' works as quoted above; the travels appeared as The Relation ofa Journey begun an. Dom. 1610, in four books (1615) ; also the Rev. Richard Hooper's edition, with memoir, of The Poetical Works of George Sandys; and Alexander Brown's Genesis of the United States, pp. 546, 989, 992, 994-995, 1032, 1063; article, " Sandys, George," in Dictionary of National Biography.

SAN FERNANDO, a seaport of southern Spain, in the province of Cadiz, on the Isla de Leon, a rocky island among the salt marshes which line the southern shore of Cadiz Bay. Pop. (1900), 29,635. San Fernando is one of the three principal naval ports of Spain; together with Ferrol and Cartagena it is governed by an admiral who has the distinctive title of captain- general. The town is connected with Cadiz

(4! m. N.W.) by a railway, and there is an electric tramway from the arsenal (in the suburb of La Carraca) to Cadiz. The principal buildings are government workshops for the navy, barracks, a naval academy, observatory, hospital, bull-ring and a handsome town hall. In the neighbourhood salt in largely produced and stone is quarried; the manufactures include spirits, beer, leather, esparto fabrics, soap, hats, sails and ropes; and there is a large iron-foundry.

San Fernando was probably a Carthaginian settlement. On a hill to the S. stood a temple dedicated to the Tyrian Hercules; to the E. is a Roman bridge, rebuilt in the 15th century after partial demolition by the Moors. The arsenal was founded in 1 790. During the Peninsular War the cortes met at San Fernando (1810), but the present name of the town dates only from 1813; it was previously known as Isla de Leon.

SAN FRANCISCO, the chief seaport and the metropolis of California and the Pacific Coast, the tenth city in population (1910) of the United States, and the largest and most important city W. of the Missouri river, situated centrally on the coast of the state in 37 47′ 22-55″ N. and 122° 25′ 40-76″ W., at the end of a peninsula, with the ocean on one side and the Bay of San Francisco on the other. Pop. (1850), 34,000; (1890), 298,997; (1900), 342,782, of whom 116,885 were foreign-born and 17,404 coloured (mainly Asiatics); (1910) 416,912.

General Description. — The peninsula is from 6 to 8 m. broad within the city limits. The magnificent bay is some 50 m. long in its medial line, and has a shore-line of more than 300 m.; its area is about 450 sq. m., of which 79 are within the three- fathom limit, including San Pablo Bay. This great inland water receives the two principal rivers of California, the Sacra- mento and the San Joaquin. The islands of the bay are part of the municipal district, as are also the Farallones, a group of rocky islets about 30 m. out in the Pacific. The bay islands are high and picturesque. Several are controlled by the national government and fortified. On Alcatraz Island is the United States Prison, and on Goat Island the United States Naval School of the Pacific. The old Spanish ” presidio ” is now a United States military reservation, and another smaller one, the Fort Mason Government Reservation, is in the vicinity. The naval station of the Pacific is on Mare Island in San Pablo Bay, opposite Vallejo (q.v.). Between 1890 and 1900 the harbour entrance from the Pacific was strongly fortified; it lies through what is called the Golden Gate, a strait about 5 m. long and 1 m. wide at its narrowest point. The outlook from Mt Tamalpais (2592 ft.), a few miles N., gives a magnificent

view of the city and bay. The site of the city is very hilly and is completely dominated by a line of high rocky elevations that run like a crescent-formed background from N.E. to S.W. across the peninsula, culminating in the S.W. in the Twin Peaks (Las Papas, ” The Breasts “), 925 ft. high. Telegraph Hill in the extreme N.E., the site in 1849 of the criminal settlement called ” Sydney Town ” and later known as the ” Latin Quarter,” is 294 ft. high; Nob Hill, where the railway and mining ” kings ” of the ‘sixties and ‘seventies of the 19th century built their homes, which only in recent years has lost its exclusiveness, is 300 ft. high; Pacific Heights, which became the site of a fashionable quarter, is still higher; and in Golden Gate Park there is Strawberry Hill, 426 ft. Hilly as it remains to-day, the site was once much more so, and has been greatly changed by man. Great hills were razed and tumbled into the bay for the gain of land; others were pierced with cuts, to conform to street grades and to the checker-board city plan adopted in the early days. An effort to induce the city to adopt, in the rebuilding after the earthquake of 1906, an artistic plan failed, and reconstruction followed practically the old plan of streets, although the buildings which had marked them had been for the most part obliterated. Some minor suggestions for improvement in arrangement only were observed. Cable lines were first practically tested in San Francisco, in 1873; since the earthquake they have given place, with slight exceptions, to electric car lines. A drive of some 20 m. may be taken along the ocean front, through the Presidio, Golden Gate Park, and a series of handsome streets in the west end. Market Street, the principal business street, is more than 3 m. long and 1 20 ft. broad. For nearly its full extent, excepting the immediate water-front, and running westward to Van Ness Avenue, a distance of 2 m., the buildings lining it on both sides and covering the adjoining area, a total of some 2000 acres, or 514 blocks, equivalent to |- of the city plan, were reduced to ruins in the fire following the earthquake; only a few large buildings of so-called ” fire-proof ” construction remained standing on the street, and these had their interiors completely ” gutted.” Repairs on the buildings left standing on this street alone involved an outlay of $5,000,000. Almost the whole of this area was built up again by 1910. As the result of the reconstruction of this section, thousands of wooden buildings, which had been a striking architectural characteristic of the city, were replaced by structures of steel, brick, and, especially, reinforced concrete. Before the earthquake wood had been employed to a large extent, partly because of the accessibility, cheapness and general excellence of redwood, but

also because of the belief that it was better suited to withstand earthquake shocks. While the wooden buildings were little damaged by the shocks, the comparative non-inflammability of redwood proved no safeguard and fire swept the affected area irresistibly. In 1900 only one-thirteenth of the buildings in the city were of other material than wood. Of the 28,000 buildings destroyed in the disaster of 1906, valued approximately at $105,000,000, only 5000 were such as had involved steel, stone or brick in their construction. The new buildings, on which an estimated amount of $r 50,000,000 had been expended up to April 1909,' and numbering 25,000 at that date, were built under stringent city ordinances governing the methods of building employed, to reduce the danger from fire to a minimum. The use of rein- forced concrete as a building material received a special impetus in consequence. In size and value the new buildings generally exceed their predecessors, buildings eight to eighteen storeys in height being characteristic in the Market Street section. Owing to the complete reconstruction of its business section San Francisco is equalled by few cities in the possession of office and business buildings of the most modern type.

Buildings. — Among the buildings in the burned section restored since 1906, the Union Trust, Mutual Savings, Merchants Exchange, Crocker, Flood and the Call (newspaper) buildings are notable. Among business buildings built since the fire are the Phelan building (costing more than $2,000,000), the buildings of the Bank of Cali- fornia, the Alaska Commercial Company, the First National Bank and the San Francisco Savings Union, and the Chronicle (newspaper)

building. The architecture of the city until the earthquake and fire of 1906 was very heterogeneous. Comparatively few buildings were of striking merit. The old City Hall (finished in 1898), destroyed in 1906, was a great edifice of composite and original style, built of bricks of stucco facing (cost $6,000,000). Provision was made to erect a new building at a cost of $5,000,000. The Hall of Justice, which houses the criminal and police courts and the police depart- ment of the city, was another fine structure. Provision was made in 1909 to replace it by a new building. Since the fire of 1906 a new Custom House has been built, costing $1,203,319. The other Federal buildings are not architecturally noteworthy. The Post Office, which withstood the fire and has since undergone repairs, is a massive modern building of granite (original cost $5,000,000). The buildings of the church and college (St Ignatius) of the Jesuits cover more than a city block; those of the Dominicans are equally extensive, and are architecturally imposing. There are several magnificent hotels. The Palace, an enormous structure covering a city block (it had 1200 rooms and cost

more than $3,000,000), known as the oldest and most famous hostelry of the city, and architecturally interesting, was completely destroyed by the fire, but has been replaced by a new building. The St Francis, completely reconstructed since the fire, and the Fairmont are new. A revival of the old Spanish-Moorish ” mission ” (monastery) style has exercised an increasing influence and is altogether the most pleasing development of Californian architecture. Many buildings or localities, not in themselves re- markable, have interesting associations with the history and life of the city. Such are Pioneer Hall, the home of the Society of California Pioneers (1850), endowed by James Lick; Portsmouth Square, where the flag of the United States was raised on the 8th of July 1846, and where the Committee of Vigilance executed criminals in 1 851 and 1856; Union Square, a fashionable shopping centre, decorated with a column raised in honour of the achievements of the United States Navy in the Spanish- American War of 1898; also the United States Branch Mint, associated with memories of the early mining days (the present mint dates only from 1874).

Parks. — The parks of the city are extensive and fine. Golden Gate Park (about 1014 acres) was a waste of barren sand dunes when acquired by the municipality in 1870, but skilful planting and culti- vation have entirely transformed its character, ft is now beautiful with semi-tropic vegetation. The Government presidio or military reservation (1542 acres) is practically another city park, more favourably situated and of better land than Golden Gate Park, and better developed. A beautiful drive follows the shore, giving views of the Golden Gate and the ocean. Near the W. end of Golden Gate Park are the ocean beach, the Cliff House, repeatedly burned down and rebuilt, the last time in 1907 — a public resort on a rocky cliff overhanging the sea — the seal rocks, frequented all the year round by hundreds of sea-lions, Sutro Heights, the beautiful private grounds of the late Adolph Sutro, long ago opened to the public, and the Sutro Baths, one of the largest and finest enclosed baths and winter gardens of the world. Nearly in the centre of the city is the old Franciscan mission (San Francisco de Asis, popularly known as Mission Dolores), a landmark of San Francisco’s history (1776).

Libraries, Museums, &c. — The Public Library has more than 100,000 volumes (it had more than 165,000 volumes before the fire of 1906, but then lost all but about 25,000). That left to the city by Adolph Sutro had more than 200,000 volumes, but suffered from the fire and earthquake of 1906 and now has about 125,000. It included remarkable incunabula, 16th-century literature, and scientific literature; and among its special collections are Lord Macaulay’s library of British Parliamentary papers, a great collection of English

Commonwealth pamphlets, one on the history of Mexico, and other rarities. The Mechanics-Mercantile Library (35,000 volumes) was formed before the fire of 1906 (when the entire collection of 200,000 volumes was destroyed) by the merging of the Mechanics Institute Library (116,000 volumes) and the Mercantile Library (founded 1852; 80,000 volumes). The Law Library, the libraries of the San Francisco Medical Society, and the French library of La Ligue Nationale Francaise (1874), were destroyed in the fire of 1906 and re-established. The building of the California Academy of Sciences (founded 1853, endowed by James Lick with about $600,000) was destroyed in 1906. In Golden Gate Park is a museum owned by the city with exhibits of a wide range, including history, ethnology, natural history, the fine arts, &c. Very fine mineral exhibits by the State Mining Bureau, and California Agricultural and Pacific Coast commercial displays by the CaliforniaDevelopment Board, are housed in the Ferry Building, and there is a Memorial Museum in Golden Gate Park. The California School of Mechanic Arts was endowed by James Lick with $540,000. The San Francisco Institute of Art, conducted by the San Francisco Art Association (organized 1872), known until the fire of 1906 as the Mark Hopkins Institute of Art, was deeded (1893) to the Regents of the State University in trust for art purposes by a later owner. The building was totally destroyed and the institute was re-established under the new name on the same site. The school conducted by this institute had a fine collection of casts, presented to the city by the government of France. It is said to be the largest university art school of the country. The law, medical, dental, chemical and pharmaceutical departments of the State University are also in the city. Among other educational insti- tutions are the Cogswell Polytechnic College, the Wilmerding School

of Industrial Arts, and the California School of Design. In sculpture and painting not much has yet been done to adorn the city.

The self-sufficingness of San Francisco, long forced upon it by the great distance from the older culture of the Eastern States, has thus far shown itself particularly only in the general features of society. Few names belong by exclusive right to San Francisco's literary annals, — the most noteworthy being those of Bret Harte, Joaquin Miller and Henry George; but perhaps a score among the better known of the more recent writers in the country have done enough of their work here to connect them enduringly with the city. The B >hemian Club

is a famous centre of literary and artistic life. Among the daily newspapers the San Francisco Examiner (Independent- Democratic, 1865), the Chronicle (Republican, 1865), the Call (Republican, 1856) and the San Francisco Bulletin (Independent- Republican, 1855) are chiefly important.

Suburbs. — The city suburbs are partly across the bay and partly to the north and south on the peninsula. Oakland, Berkeley, the home of the State University (damaged by the earthquake), and Alameda, all eastward just across the bay; Burlingame, San Mateo, Menlo Park and Palo Alto, wealthy and fashionable towns south- ward on the peninsula; Sausalito and San Rafael, summer residence towns on the northern peninsula across the Golden Gate; all lie w;ll within an hour of San Francisco, and are practically suburbs of the metropolis. Many excursions into the surrounding country are very attractive. Mt. Tamalpais has already been referred to. The railroad in making this ascent makes curves equivalent to forty-two whole circles in a distance of 8f m., at one place paralleling its track five times in a space of about 300 ft.

Climate. — San Franciscan climate is breezy, damp and at times chilling; often depressing to the weakly, but a splendid tonic to others. In a period of 32 years, ending December 1903, the extremes of temperature were 29 ° and loo" F.; the highest monthly average 65 , the lowest 46 ; the average for January, March, June, Sep tember and December, respectively 50 , 54 , 59 °, 61°, and 51° F. The average rainfall was 22-5 in., falling mostly from November to March. Every afternoon, especially from October to May, a stiff breeze sweeps the city; every afternoon in the summer the fogs roll ever it from the ocean. Though geraniums and fuchsias bloom through the year in the open, an overcoat is often needed in summer.

Communications and Commerce. — San Francisco Bay is the most important as well as the largest harbour on the Pacific coast of the United States. There is a difference of a fathom in the mean height of the tides. Deep-water craft can go directly to docks within a short distance of their sources of supply, around the bay. In 1909 extensive improvements to the water front were under way, and land has been purchased west of Fort Mason for the construction of wharves and warehouses for the United States Transport Service. The largest craft can always enter and navigate the bay, and there are ample facilities of dry and floating docks. Steamer connexions are maintained with Australia, Hawaii, Mexico, Central and South America, the Philippines, China and Japan. San Francisco in 1909 had much the largest commerce of any of the Pacific ports. For 1909 the total

imports of merchandise for the port were valued at $31,468,597 and the exports at $31,100,309. _ From 1891 to 1900 San Francisco dropped from the fifth to the eighth rank among the customs districts of the United States in point of aggregate commerce (the ports of Puget Sound rising in the same period from the twentieth to the tenth place). From 1893 to 1903 the yearly imports averaged $37,968,152, exports $33,658,266, and duties collected $6,642,173. The vessel movement for 1909 amounted to 4,959,728 tons arrivals and 4,974,922 tons departures. The foreign trade is chiefly with British Columbia, South America, China and Japan, and there is a considerable trade with Europe, Australia and Mexico. Trade with the Philippine Islands and the Hawaiian Islands and Alaska is important, while the coastwise trade with Pacific ports exceeds all the rest in tonnage. Lumber, grain and flour, fruits and their pro- ducts, fish, tea and coffee are characteristic staples of commerce. While the export grain business had by 1909 shifted to ports in Oregon and Washington, San Francisco is the great receiving port for cereals on the Pacific Coast. San Francisco's permanence as one of the greatest ports of the country is assured by its magnificent position, the wealth of its " back country," and its command of trans-Pacific and trans-continental commercial routes. It is very nearly the shortest route, great circle sailing, from Panama to Yokohama and Hongkong; the Panama Canal will shorten the sea route from Liverpool and Hamburg by about 5500 m. and from New York by 7800. Three trans-continental railway systems — the Southern Pacific (with two trans-continental lines, the Southern and the old Central Pacific), the Atchison, Topeka & Santa Fe, and the Western Pacific — connect the city with the Eastern States; and besides these, it has traffic connexions with the three trans-continental lines of the north, the Canadian Pacific, Great Northern and Northern Pacific. Lines of the Southern Pacific and its branches connect the whole state with the city, a number of smaller roads — of which the most important is the North-Western Pacific — joining it with the surrounding districts. On the 1st of July 1900 the first train of the Santa Fe left. San Francisco for the East; a significant event, as there had before been practically only one railway corporation (the Southern Pacific) controlling trans-continental traffic at San Fran- cisco since 1869. Only one railway, the Southern Pacific's lower

coast route, actually enters the city. Some ten other roads, great and small, have their terminals around the bay.

Manufactures. — San Francisco in 1900 held twelfth place among the cities of the Union in value of output; in 1905 it ranked thirteenth. The total value of the factory products of tae city in 1905 was

$137,788,233 as against $107,023,567 in 1900. The leading products and their value in 1 905, where given, were : sugar and molasses refining; printing and publishing, $9,424,494 (of which $5,575,035 was for newspapers and periodicals) ; slaughtering and meat packing (wholesale), $8,994,992; shipbuilding; foundry and machine-shop products, $8,991,449; clothing, $4,898,095; canning and pre- serving, $4,151,414; iiquors (malt, $4,106,034; vinous, $53,511); coffee and spice roasting and grinding, $3,979,865; flour and grist- mill products, $3,422,672; lumber, planing and mill products, including sash, doors and blinds, $2,981,552; leather, tanning and finishing, $2,717,542; bags, $2,473,170; paints, $2,048,250. The development of the petroleum fields of the state has greatly stimulated manufactures, as coal has always been dear, whereas the crude oil is now produced very cheaply. The Union Iron Works on the peninsula is one of the greatest shipbuilding; plants of the country.

Government. — Charters were granted to the city in 1850, 1851 and 1856. By the last the city and county, which until then had maintained separate governments, were consolidated. Under this charter San Francisco throve despite much corruption, and it was because the provisions of the State Constitution of 1879 seemed likely to compel the adoption of another charter that the city decisively rejected that constitution. After many years of notorious ” boss ‘ rule, the city in 1896 elected a reform mayor. This was the most important movement for good government in its history since the Vigilance Committee of 1856. It was followed by the adoption (1898) of a new charter, which came into effect on the 1st of January 1900. Elections are biennial. The inclusion in the charter of the principle of the ” initiative and referendum ” enables a percentage of the voters to compel the submission of measures to public approval. The city’s control is centralized, great power being given to the mayor. He appoints and removes members of the fire, police, school, election, park, civil service, health and public works commissions of the city ; his veto may not be overcome by less than a five-sixths vote of the board of supervisors, and he may veto separate items of the budget. Taxation for ordinary municipal purposes is limited to 1 % on property values, extra taxes being allowed for unusual purposes; but the city cannot be bonded without the affirmative vote of two-thirds of the electorate. Civil service is also provided for. There is a highly developed license system. The board of public works, composed of engineers, controls streets, sewers, buildings and public improvements. In 1885 the assessed property valuation of the city, on a basis of 60% of the actual value, was $223,509,560; in 1905, $502,892,459 ; l in 1910 the total was $492,867,037. The net bonded debt on the 30th of June 1909 was

$10,130,062-32. The water-supply system was greatly improved after the earthquake of 1906; whereas before the earthquake one main supply pipe brougnt all the water to the city, there have since been installed five systems which work independently of each other. Provision is made for filling the mains with salt water from the bay if necessary in fighting fire. While the supply had been furnished by a private corporation, the city was in 1910 planning for the ownership of its water-system, the supply to be drawn from the Sierras at a cost of some $45,000,000. Water was at that time in remote parts of the city drawn from artesian wells. In 1903 almost ten-elevenths of the street railways were controlled by one Eastern corporation, which was involved in the charges of municipal corruption that were the most prominent feature of the recent political history of the city. The electric power and light are drawn from the Sierras, 140 m. distant.

Population. — The population of San Francisco increased in successive decades after 1850 by 67-6, 16-3, 56-5, 27-8, i4-6a_nd2i-6%. The population is very cosmopolitan. Germans and Irish are not so numerous here, relatively, as in various other cities, although in 1900 the former constituted 30-1 and the latter 13-6% of the total population. There is a large Ghetto, a so-called Latin Quarter, where Spanish sounds and signs are dominant, a Little Italy and a Chinese quarter of which no other city has the like. Chinatown, at the foot of Nob Hill, covers some twelve city blocks, and with its temples, rich bazaars, strange life and show of picturesque colours and customs, it is to strangers one of the most interesting portions of the city. It was completely destroyed in the fire of 1906, and its in- habitants removed temporarily across the bay to Oakland, but by 1910 the quarter had been practically rebuilt in an improved manner, yet retaining its markedly oriental characteristics. The. new China- town gained considerably in sanitation and in the housing of its commercial establishments. San Francisco has naturally been the centre of anti-Chinese agitation. The success of the exclusion laws is seen (though this is not the sole cause) in the decrease of the Chinese population from 24,613 to 13,954 between 1890 and 1900.

1 For the fiscal year 1906-1907 the assessed value was $375,932,447, indicating the drop in values immediately after the earthquake and fire, and, by comparison with the 1910 figures, the extent of recovery.

The Japanese numbered 1781 in 1900 and have very rapidly

increased. The question of their admission to the public schools, rivalry in labour and trade, and other racial antagonisms attendant on their rapid increase in numbers, created conflicts that at one time seriously involved the relations of the two countries. Two Chinese papers are published. More than half of the daily papers are foreign language.

History. — A Spanish presidio (military post), and the Francis- can mission of San Francisco de Asis, on the Laguna de los Dolores, were founded near the northern end of the peninsula in 1776. San Francisco was not one of the important settlements. Even the very important fact whether it was ever actually a pueblo — i.e. a legally recognized and organized town — was long a controverted question. Up to 1835 there were two settlements on the peninsula — one about the presidio, the other about the mission; the former lost importance after the practical abandon- ment of the presidio in 1836, the latter after the secularization of the mission, beginning in 1834. The year 1835-1836 marked the beginning of a third settlement destined to become the present San Francisco. This was Yerba Buena (" good herb," i.e. wild mint), founded on a little cove of the same name S.E. of Telegraph Hill, extending inland to the present line of Mont- gomery Street. (The cove was largely filled in as early as 1851.) The site of the city is very different from that of most American towns, and seemed a most unpromising location. The hills were barren and precipitous, and the interspaces were largely shifting sand-dunes; but on the E. the land sloped gently to the bay. In 1835-1839 " San Francisco " had an ayuntamiento (town-council) , and the different municipal officers seem to have been located at the same or different times at the mission, the presidio, or at Yerba Buena; the name San Francisco being applied indifferently to all three settlements. The ayuntamiento, apparently recognizing the future of Yerba Buena, granted lots there, and as the older settlements decayed Yerba Buena throve. In 1840 there were only a handful of inhabitants; in 1846, when (on the 9th of July) the flag of the United States was raised over the town, its prosperity already marked it as the future commercial " metropolis " of the coast. In this year a Mormon colony joined the settlement, making it for a time a Mormon town. The population in the year before the gold discovery probably doubled, and amounted to perhaps 900 in May 1848.

The first news of the gold discoveries of January 1848 was received with incredulity at San Francisco (to give Yerba Buena the name it formally assumed in 1847), and there was little excitement until April. In May there was an exodus. By the middle of June the hitherto thriving town had been abandoned by a large majority of its

inhabitants. Realty at first fell a half in value, labour rose many times in price. Newspapers ceased publication, the town council suspended sessions, churches and business buildings were alike empty. When the truth became known regarding the mines a wonderful ” boom ” began. The population is said to have been 2000 in February (in which month the first steamer arrived with immigrants from the East over the Isthmus), 6000 in August, and 20,000 by the end of the year. A city of tents and shanties rose on the sand-dunes. Realty values rose ten-fold in 1849. Early in 1850 more than 500 vessels were lying in the bay, most of them deserted by their crews. Many rotted; others were beached, and were converted into stores and lodging houses. Customs revenues rose from $20,000 in the first half of 1848 to $175,000 in the second half and to $4,430,000 in the year ending in June 1852. There was at first no idea of permanent settlement, and naturally no time whatever to improve the city. Great quantities of expensive merchandise glutted the market and were sunk in the liquid mud of the streets as tillage for the construction of sidewalks. Between December 1849 and June 1851 seven ” great ” fires, destroying in the aggregate property valued at twenty or twenty-five millions of dollars, swept the business district. Half of this was in the fire of the 4th of May 1851, which almost completely destroyed the city. These misfortunes led to a more general employment of brick and stone in the business quarter. It is characteristic of the vagaries of Californian

commerce in the early years that dressed granite for some build- ings was imported from China.

In these days the society of San Francisco was extraordinary. It was the most extreme of all democracies. Probably never before nor since in America was there a like test of self-develop- ment. Unusual courage and self-reliance were necessary for success. Amusements were coarse and unrestrained. Gambling was the fiercest passion. Property was at first, in San Francisco as in the mines, exceptionally secure; then insecure. Crime became alarmingly common, and the city government was too corrupt and inefficient to repress it. It was estimated (Bancroft) that up to 1854 there were 4200 homicides and 1200 suicides; in 1855 the records show 583 deaths by violence. There were almost no legal convictions and executions. Juries would not punish homicide with severity. In 1851 the first Committee of Vigilance was formed and served from June to September, when it disbanded; it was the nucleus of the second and greater committee, active from May to August of 1856. By these committees criminals were summarily tried, convicted and punished; suspicious characters were deported or intimidated. These vigilantes were the good citizens (the committee of 1851 included some 800 and that of 1856 some

6000-8000 citizens of all classes), who organized outside of law, ” not secretly, but in debate, in daylight, with sobriety and decorum,” to defend and establish, through defying, its rule. In this they were comparatively successful. Crime was never again so brazen and daring, and 1856 marks also the beginning of political reform. San Francisco’s action was widely imitated over the state. In 1877 during the labour troubles a Committee of Safety was again organized, but had a very brief existence.

The United States military authorities in August 1847 author- ized a municipal government. Under a municipal ordinance another was chosen in December 1848 to succeed it, but the parent government pronounced the election illegal; nevertheless the new organization continued to act, though another was chosen and recognized as legal. There were for a time at the end of 1848 three (and for a longer time two) civil governments and one military. Neither the military nor municipal organiza- tion was competent to give adequate law and peace to the community; and therefore in February 1849 the citizens elected a ” Legislative Assembly,” which they empowered to make laws not in ” conflict with the Constitution of the United States nor the common laws thereof.” This was proclaimed revolutionary by the military authorities, but such illegalities continued to spread over the state, until in June 1849 the Convention was called that framed the State Constitution, Cali- fornia being admitted in September 1850 to the Union. Pro- visional civil officers were elected throughout the state, and the Legislative Assembly came to an end. The charters of 1850, 1851 and 1856 have already been referred to.

The first public school was established in 1849. In 1855-1856 a disastrous commercial panic crippled the city; and in 1858, when at the height of the Fraser river gold-mine excitement it seemed as though Victoria, B.C., was to supplant San Francisco as the metropolis of the Pacific, realty values in the latter city dropped for a time fully a half in value. In 1859 foreign coin was first refused by the banks. Up to this time first gold dust, then private coins, and later money of various countries, had circulated in California. In i860 mail communication was established with the East by a pony express., the charge being $5.00 for a half-ounce.

Some reference must be made to the Mexican land-grant litigation. The high value of land in and about the city caused the fabrication of two of the most famous claims examined and rejected as fraudulent by the United States courts (the Limantour and Santillan claims). They involved 7 sq. leagues of land and many millions of dollars. Another land question already referred to (that whether San Francisco was

entitled as a pueblo to 4 sq. leagues of public land) was settled affirmatively in 1867, but the final land patents were not issued until 1884 by the national government.

When the Civil War came in 1861 the attitude of San Francisco

was at first uncertain, for the pro-slavery Democrats had controlled the state and city, although parties were remaking in the late ‘fifties. About 75,000 arms are supposed to have been surreptitiously sent to California by the secessionist Secre- tary of War, J. B. Floyd; and the pro-slavery party seems to have planned to try for union with the Confederacy, or to organize a Pacific Coast republic. Thomas Starr King (1824-1864), a Unitarian minister, was the heroic war-time figure of the city, the leader of her patriotism. Her money contributions to the Sanitary Funds were, it is said, greater than those of any city in the country; and in every other way she abundantly evidenced her love for the Union. The curious Chapman (or Asbury Harpending) case of 1863 was a Confederate scheme involving piracy on Federal vessels in the Pacific and an effort to gain the secession of the state. It had no practical importance.

From 1850-1877 was the ” silver era ‘* of San Francisco (see California). It paralleled the excitement and gambling of 1849, and despite losses was a great stimulus to the city’s growth. In September 1869 the Central Pacific line was completed to Oakland, and in the next four years there was a crash in real estate values inflated during the railway speculation. In 1876 railway connexion was made with Los Angeles. The ‘seventies were marked by the growth of the anti-Chinese movement, and labour troubles, culminating in 1877-1879 with the “sand- lots ” agitation and the formation of the Constitution of 1879 (see California), in all of which San Francisco was the centre. The feeling against the Chinese found expression sometimes in unjust and mean legislation, such as the famous ” queue ordin- ance ” (to compel the cutting of queues — the gravest insult to the Chinese) , and an ordinance inequitably taxing laundries. The Chinese were protected against such legislation by the Federal courts. The startling and romantic changes of earlier years long ago gave way to normal municipal problems and ordinary municipal routine. In the winter of 1894 the California Mid- winter International Exposition was held in Golden Gate Park. Since 1898 the governmental changes previously referred to, the location of a new trans-continental railway terminus

on the bay, and the new outlook to the Orient, created by the control of the Philippines by the United States, and increased trade in the Pacific and with the Orient, have stimulated the growth and ambitions of the city.

Special mention must be made of the two citizens to whom San Francisco, as it is to-day, owes so much, viz. James Lick (1796-1876), a cold man with few friends, who gave a great fortune to noble ends; and Adolph Sutro (1830-1898), famous for executing the Sutro Tunnel of the Comstock mines of Virginia City, Nevada, and the donor of various gifts to the city.

The partial destruction of San Francisco by earthquake and fire in 1906 was one of the great catastrophes of history. Earth- quakes had been common but of little importance in California until 1906. In more than a century there had been three shocks called ” destructive ” (1839, 1865, 1868) and four ” exceptionally severe ” at San Francisco, besides very many light shocks or tremors. The worst was that of 1868; it caused five deaths, and cracked a dozen old buildings. Heavy earthquake shocks on the morning of the 18th of April 1906, followed by a fire which lasted three days, and a few slighter shocks, practically destroyed the business section of the city and some adjoining districts. The heaviest shock began at 12 minutes 6 seconds past 5 o’clock a.m., Pacific standard time, and lasted 1 minute 5 seconds. Minor shocks occurred at intervals for several days. The earthquake did serious damage throughout the coast region of California from Humboldt county to the southern end of Fresno county, a belt about 50 m. wide. The damage by earthquake to buildings in San Francisco was, however, small in comparison to that wrought by the fire which began soon after the principal shock on the morning of the 18th. About half the population of the city, it was estimated, spent the nights while the fire was in progress out of doors, with practically no shelter. Some 200,000 camped in Golden Gate Park and 50,000 in the presidio military reservation. The difficulty of checking the fire was increased through the breaking of the

water-mains by the earthquake, draining the principal reservoirs. Traffic by street cars was made impossible by the twisting of the tracks.

To stop the fire rows of buildings were dynamited. In this way many fine mansions on Van Ness Avenue were destroyed, and the westward advance of the conflagration was stopped at Franklin Street, one block west. General Frederick Funston, in command at the presidio, with the Federal troops under him, assumed control, and the city was put

under military law, the soldiers assisting in the work of salvage and relief. On the 21st the fire was reported under control. A committee of safety was organized by the citizens and by the city authorities acting in conjunction with General Funston, and measures were adopted for the prevention of famine and disease, permanent camps being established for those who had been rendered homeless and not provided for by removal to other cities. Assistance with money and supplies was immediately given by the nation and by foreign countries, a committee of the Red Cross Society being put in charge of its administration. By the 23rd of April about $10,000,000 had been subscribed by the people of the United States; Congress voted $2,500,000 from the national treasury. The committee organized as the Red Cross Relief Corporation completed its work in 1908, having spent for the relief of the hungry, for the sick and injured, and for housing and rehabilita- tion of individuals and families, in round numbers $9,225,000. As the result of the earthquake and fire about 500 persons lost their lives; of those two were shot as looters. Buildings valued at approximately $105,000,000 were destroyed. The total loss in damage to property has been variously estimated at from $350,000,000 to $500,000,000. To cover the loss there was about $235,000,000 of insurance in some 230 companies. Reconstruction in the burned section began at once, with the result that it was practically rebuilt in the three years following the earthquake. Wages for men employed in building, owing in part to scarcity of labour but chiefly to action of the labour unions, rose enormously, masons being paid $12 a day for a day of 8 hours. High prices of materials and of haulage and freight rates added difficulty to the task of rebuilding, which was accom- plished with remarkable energy and speed. In May 1907 there was a street-car strike of large dimensions. Van Ness Avenue, which during the process of rebuilding had assumed the character of a business thoroughfare, did not maintain this status, the business centre returning to the reconstructed Market Street. A new retail business district developed in what is known as the mission district and in Fillmore Street. A new residence district known as Parkside was developed south of Golden Gate Park.

For description and general features, see Doxey's Guide to San Francisco and the Pleasure Resorts of California (San Francisco, 1897); and various guides and other publications of the California Development Board (formed by consolidation of the State Board of Trade and California Promotion Committee) in San Francisco. For economic interests and history see the bibliography of the article California. See also Frank Soule and others, Annals of San Francisco (San Francisco, 1858); John S. Hittell, A History of the City of San

Francisco (San Francisco, 1878); B. E. Lloyd, Lights and Shades of San Francisco (San Francisco, 1876) ; C. W. Stoddard, In the Footprints of the Padres (San Francisco, 1900); Bernard Moses, The Establishment of Municipal Government in San Francisco (Johns Hopkins University Studies, 1889). Many legal questions of interesting constitutional, treaty and common law import have been decided in the Federal (and state) courts in cases involving Chinese; see the collections of reports. For good accounts of the great earthquake and fire, see D. S. Jordan (ed.), The California Earthquake of 1906 (1906) ; F. W. Aitken and E. Hilton, History of the Earthquake and Fire in San Francisco (1907); G. K. Gilbert and others, San Francisco Earthquake and Fire (Washington, 1907).

SANGALLO, the surname of a Florentine family, several members of which became distinguished in the fine arts.

I. Giuliano di Sangallo (1445-1516) was an architect,

sculptor, tarslatore and military engineer. His father, Francesco

di Paolo Giamberti, was also an able architect, much employed

: by Cosimo de' Medici. During the early part of his life Giuliano

worked chiefly for Lorenzo the Magnificent, for whom he built

a fine palace at Poggio-a-Cajano, begun in 1485, between Florence and Pistoia, and strengthened the fortifications of Florence, Castellana and other places. Lorenzo also employed him to build a monastery of Austin Friars outside the Florentine gate of San Gallo, a nobly designed structure, which was destroyed during the siege of Florence in 1530. It was from this building that Giuliano received the name of Sangallo, which was afterwards used by so many Italian architects. While still in the pay of Lorenzo, Giuliano visited Naples, and worked there for the king, who sent him back to Florence with many handsome presents of money, plate and antique sculpture, the last of which Giuliano presented to his patron Lorenzo. After Lorenzo's death in 1492, Giuliano visited Loreto, and built the dome of the church of the Madonna, in spite of serious difficulties arising from its defective piers, which were already built. In order to gain strength by means of a strong cement, Giuliano built his dome with pozzolana brought from Rome. Soon after this, at the invitation of Pope Alexander VI.,

Giuliano went to Rome, and designed the fine panelled ceiling of S. Maria Maggiore. He was also largely employed by Julius II., both for fortification walls round the castle of S. Angelo, and also to build a palace adjoining the church of S. Pietro in Vincoli, of which Julius had been titular cardinal. Giuliano was much disappointed that Bramante was preferred to himself as architect for the new basilica of St Peter, and this led to his returning to Florence, where he did much service as a military engineer and builder of fortressses during the war between Florence and Pisa. Soon after this Giuliano was recalled to Rome by Julius II., who had much need for his military talents both in Rome itself and also during his attack upon Bologna. For about eighteen months in 1514-1515 Giuliano acted as joint-architect to St Peter's together with Raphael, but owing to age and ill-health he resigned this office about two years before his death.

II. Antonio di Sangallo (i455?-i534) was the younger brother of Giuliano, and took from him the name of Sangallo. To a great extent he worked in partnership with his brother, but he also executed a number of independent works. As a military engineer he was as skilful as Giuliano, and carried out important works of walling and building fortresses at Arezzo, Montefiascone, Florence and Rome. His finest existing work as an architect is the church of S. Biagio at Montepulciano, in plan a Greek cross with central dome and two towers, much resembling, on a small scale, Bramante's design for St Peter's. He also built a palace in the same city, various churches and palaces at Monte Sansavino, and at Florence a range of monastic buildings for the Servite monks. Antonio retired early from the practice of his profession, and spent his latter years in farming.

III. Francesco di Sangallo (1493-1570), the son of Giuliano di Sangallo, was a pupil of Andrea Sansovino, and worked chiefly as a sculptor. His works have for the most part but little merit — the finest being his noble effigy of Bishop Leonardo Bonafede, which lies on the pavement of the church of the Certosa, near Florence. It is simply treated, with many traces of the better taste of the 1 5th century. His other chief existing work is the group of the " Virgin and Child and St Anne," executed in 1526 for the altar of Or San Michele.

IV. Bastiano di Sangallo (1481-1551), sculptor and painter, was a nephew of Giuliano and Antonio. He is usually known as Aristotile, a nickname he received from his air of sententious gravity. He was at first a pupil of Perugino, but afterwards became a follower of Michelangelo.

V. Antonio di Sangallo, the younger (i485?-is46), another nephew of

Giuliano, went while very young to Rome, and became a pupil of Bramante, of whose style he was afterwards a close follower. He lived and worked in Rome during the greater part of his life, and was much employed by several of the popes. His most perfect existing work is the brick and travertine church of S. Maria di Loreto, close by Trajan's column, a building remarkable for the great beauty of its proportions, and its noble effect produced with much simplicity. The lower order is square in plan, the next octagonal; and the whole is surmounted by a fine dome and lofty lantern. The lantern is, however, a later

addition. The interior is very impressive, considering its very moderate size. Antonio also carried out the lofty and well- designed church of S. Giovanni dei Fiorentini, which had been begun by Jacobo Sansovino. The east end of this church rises in a very stately way out of the bed of the Tiber, near the bridge of S. Angelo; the west end has been ruined by the addition ofa later facade, but the interior is a noble example of a somewhat dull style. Great skill was shown in successfully building this large church, partly on the solid ground of the bank and partly on the shifting sand of the river bed. Antonio also built the Cappella Paolina and other parts of the Vatican, together with additions to the walls and forts of the Leonine City. His most ornate work is the lower part of the cortile of the Farnese palace, afterwards completed by Michelangelo, a very rich and well-proportioned specimen of the then favourite design, a series of arches between engaged columns supporting an entablature, an arrangement taken from the outside of the Colosseum. A palace in the Via Giulia built for himself still exists under the name of the Palazzo Sacchetti, much injured by alterations. Antonio also constructed the very deep and ingenious rock-cut well at Orvieto, formed with a double spiral staircase, like the well of Saladin in the citadel of Cairo.

See Raviolo, Notizie sui lavori . . . dei nove Da San Gallo (Rome, i860) ; G. Clausse, Les Sangallo (Paris, 1900-1901). (J. H. M.)

SANGER, JOHN (1816-1889), English circus proprietor, was born at Chew Magna, Somerset, in 1816, the son of an old sailor who had turned snowman. In 1845 he started with his brother George a conjuring exhibition at Birmingham. The venture was successful, and the brothers, who had been interested spectators of the equestrian performances at Astley's Amphi- theatre, London, then started touring the country with a circus entertainment consisting of a horse and pony and three or four human performers. This enterprise was a success from the beginning, and in due course John and George Sanger became lessees of the Agricultural Hall, London, and there produced a large number of elaborate spectacles. In 1871 the Sangers leased

Astley's where they gave an equestrian pantomime every winter, touring in the summer with a large circus. Subsequently the partnership was dissolved, each brother producing his own show. John Sanger died while touring, at Ipswich on the 22nd of August 1889, the business being continued by his son.

SANGERHAUSEN, a town of Germany, in the Prussian province of Saxony, situated on the Gonna, near the south base of the Harz mountains, 30 m. W. of Halle, on the main line of railway Berlin-Nordhausen-Cassel. Pop. (1905) 12,439. Among many medieval buildings, the church of St Ulrich, one of the finest specimens of Romanesque architecture in Germany, and the church of St James, with a magnificent altar screen and interesting tombs and effigies, are particularly noticeable. There are a gymnasium, two hospitals dating from the 14th century and an old town-hall. The industries include the manufacture of sugar, furniture, machinery, boots and buttons. Brewing and brickmaking are also extensively carried on, and there is a considerable agricultural trade.

Sangerhausen is one of the oldest towns in Thuringia, being mentioned in a document of 991 as appertaining to the estates of the emperor. By marriage it passed to the landgrave of Thuringia, and after 1056 it formed for a while an independent country. Having been again part of Thuringia, it fell in 1249 to Meissen, and in 1291 to Brandenburg. In 1372 it passed to Saxony and formed a portion of that territory until 1815, when it was united with Prussia.

See K. Meyer, Chronik des landratlichen Kreises Sangerhausen (Nordhausen, 1892); and F. Schmidt, Geschichte der Stadt Sanger-hausen (Sangerhausen, 1906).

SAN GERMAN, a city of the department of Mayaguez, Porto Rico, in the south-western part of the island, about 10 m. S.S.E. of the city of Mayaguez. Pop. of the city (1899) 3954; of the municipal district 20,246, of whom 10,715 were of mixed races. The city is served by the American railway of Porto Rico. It is situated near the Guanajibo river, in a fertile agricultural region which produces sugar, coffee, fruit, cacao and tobacco.

IS©

SAN GIMIGNANO— SAN JUAN

In one of the public squares is a Dominican church built in IS38.

San German was founded in 1517, was plundered by the French in

1528, was destroyed by corsairs in 1554, and was unsuccessfully attacked by the English in 1748. Until 1782 it was the seat of government of the western district of the island. It was made a city in 1877.

SAN GIMIGNANO, a town of Tuscany, Italy, in the province of Siena, 24 m. N.W. of Siena, at an elevation of 1089 ft. Pop. (1901) 4060 (town); 10,066 (commune). Being surrounded by its ancient walls, and retaining thirteen out of its original fifty towers, it is, with its predominantly Gothic architecture, a thoroughly medieval town in appearance. In the council chamber of the town-hall (1288-1323) is a fresco by Lippo Memmi of the Madonna enthroned of 1317, copied closely from the similar fresco (the ” Majestas “) by his master Simone di Martino in the Palazzo Pubblico at Siena; there is also a curious frescoed frieze of 1291, with knights in armour. The museum in the same building contains pictures and other objects of art. The tower is the highest in the town (174 ft.), while the Torre dell’ Orologio (167 ft.) close by marks the height beyond which private individuals might not build. In the same piazza is the Collegiata (the former cathedral) of the 12th century, enlarged after 1466 by Giu’iano da Maiano, whose brother Benedetto erected the chapel of S. Fina from his plans in 1468, and carved the fine marble altar, the original painting and gilding of which are still preserved. The marble ciborium, a small reproduction of the splendid one in S. Domenico at Siena, is also by Benedetto. The beautiful frescoes with scenes from the life of the saint (a local saint who died at the age of fifteen) are the earliest work of Domenico Ghirlandaio, completed before 1475. There are also some frescoes of his cousin Bastiano Mainardi (d. 1513). The cathedral contains other 14th-century and early Renaissance paintings, the former including some Passion scenes, the only certain work of Barna da Siena, and some fine choir stalls. S. Agostino (1 280-1 298) contains a famous series of seventeen frescoes by Benozzo Gozzoli, with scenes from the life of St Augustine (1463-1467). They have been to some extent restored. The altar of S. Bartoldus, by Benedetto da Maiano, is not unlike that in the Collegiata (1494). The town was independent in the 13th century, but in 1353, owing to the dissensions of the Salvucci (Ghibellines) and Ardinghelli (Guelphs), it fell into the hands of Florence.

See R. Pantini, San Gimignano e Certaldo (Bergamo, 1905).

SANGLI, a native state of India, in Bombay, ranking as one of the Southern Mahratta Jagirs. The territory is widely scattered among other native states and British districts. Area, 1112 sq. m. Pop. (1901) 226,128; estimated revenue, £ic,ooo. The river Kistna waters part of

the country, which is exceedingly fertile. Millet, rice, wheat and cotton are the chief crops, and cotton cloth is manufactured. The chief, whose title is Tatya Saheb Patwardhan, is a Brahman by caste. The town of Sangli, on the river Kistna, has a station on the Southern Mahratta railway, n m. from Miraj Junction. Pop. (1901)

16,829.

SANJO, SANETOMI, Prince (1 837-1 891), Japanese statesman, was one of the old court nobles (kuge) of Japan, and figured prominently among the little band of reformers who accom- plished the overthrow of feudalism and the restoration of the administration to the Mikado. He served as the first prime minister (daijo daijin) in the newly organized Meiji government.

SAN JOS£, a city and the county-seat of Santa Clara county, California, U.S.A., situated in the coast ranges, about 46 m. S.E. of San Francisco and 8 m. S.E. of the southern end of San Francisco Bay, in the; heart of the beautiful Santa Clara Valley. Pop. (1890) 18,060; (1900) 21,500, of whom 4577 were foreign- born; (1910 census) 28,946; land area (1906), about 6 sq. m. It is served by the Southern Pacific railway, which has car shops and terminal yards here. The city lies mainly on a gently rising plateau (altitude, 90 to 1 25 ft.) between the Coyote and Guadalupe rivers. It is a popular health resort.

Besides St James and City Hall parks in the city, San Jose has Alum Rock Canyon Park, a tract of 1000 acres, with sixteen mineral springs, in Penitencia Canyon, 7 m. east. This park is connected by electric railway with the city. San Jose is the seat of the University of the Pacific (Methodist Episcopal), which was founded at Santa Clara in 1851, removed to its present site just outside the city in 1871, and had 358 students in all departments in 1909-1910; of the College of Notre Dame (1851; Roman Catholic), and of a State Normal School. Among charitable institutions are a Home of Benevolence (1878) for orphans and abandoned children, the Notre Dame Institute (for orphans) under the Sisters of Notre Dame, and the O'Connor Sanatorium. The Lick Observatory, opened in 1888 on the top of Mount Hamilton (4209 ft.) with a legacy of $700,000 left by James Lick (1796-1876) of San Francisco, is 26 m. distant by road, and the New Almaden quicksilver mine (the greatest producer in California and long among the greatest in the world) is about 14 m. south. The Santa Clara Valley has many vegetable and flower-seed farms ; it is one of the most fertile of the fruit regions of California, prunes, grapes, peaches and apricots being produced in especial abundance. More than half the prune crop of California comes from Santa Clara county. In 1905 the total value of

the factory product of San Jose 1 was $6,388,445 (94-1 % more than in 1900) ; nearly one- half ($3,039,803) was the value of canned and preserved fruits and vegetables, $619,532 of planing-mill products, and $518,728 of malt liquors — much barley is grown in the Santa Clara Valley.

San Jose de Guadalupe (after 1836 for a time ” de Alvarado ” in honour of Governor J. B. Alvarado) was founded in November 1777, and was the first Spanish pueblo of California. The mission of Santa Clara was founded in the vicinity in January 1777, and the mission of San Jose, about 12 m. north-east, in 1797. Near the original site of the former, in the town of Santa Clara (pop. 1900, 3650), a suburb of San Jose, now stands Santa Clara College (Jesuit; founded 1851, chartered 1855). Throughout the Spanish-Mexican period San Jose was a place of considerable importance. In 1840 its population was about 750. In the last years of Mexican dominion it was the most prominent of the northern settlements in which the Hispano-Californian element predominated over the new American element. The town was occupied by the forces of the United States in July 1846; and a skirmish with the natives occurred in its vicinity in January 1847. San Jose was the first capital of the state of California (1840-1851), and in 1850 was chartered as a city.

SAN JOSE, or San Jose de Costa Rica, the capital of the republic of Costa Rica, and of the department of San Jose; in the central plateau of the country, 3868 ft. above sea-level, and on the transcontinental railway from the Pacific port of Puntarenas to the Atlantic port of Limon. Pop. (1908) about 26,500. San Jos6 is an episcopal see, the most populous city in Costa Rica, and the centre of a rich agricultural region; its climate is temperate, its water-supply pure and abundant. The city was founded in 1738, and became the capital in 1823 (see Costa Rica: History). It is thoroughly modern in appearance, with macadamized streets lighted by electricity; its houses are one-storeyed so as to minimize the danger from earthquake. The suburbs consist chiefly of cane huts, tenanted by Indians and half-castes. The larger of two public gardens, the Morazan Park, contains a representative collection of the Costa Rican flora. The principal buildings are the cathedral, founded in the 1 8th century but restored after 1870, the hospital, govern- ment offices, institutes of law and medicine and of physical geography, training school for teachers, national bank, museum, library and barracks. The staple trade of San Jose is in coffee.

SAN JUAN, an Andine province of Argentina, bounded N. and E. by La Rioja, S. by San Luis and Mendoza, and W. by Chile, from which it is

separated by the Andean Cordilleras. Area, 33,715 sq. m.; pop. (1904, estimate) 99,955. It is roughly mountainous, and belongs to the closed drainage basin of western Argentina, centring in the province of Mendoza. It is traversed by several rivers, fed by the melting snows of the Andes and discharging into the swamps and lagoons in the S.E. part of the province, the largest of which are the Huanacache lagoons. The largest of these rivers are the Vermejo, Zanjon or Jachal and San Juan. They are all used for irrigation. The climate is extremely hot and dry in summer, but the winter temperature is mild and pleasant. Agriculture is the principal occupation of its inhabitants, though the soil is generally sterile

and the rainfall uncertain and very light. Cereals are grown in some localities, and there are large vineyards where irrigation is possible, from which excellent wine is made. The province contains gold, silver, copper, iron, lead, coal and salt, but mining has never been developed to any extent. Pastoral interests are largely in feeding cattle for the Chilean markets, for which large areas of alfalfa are grown in the irrigated valleys of the Andes. The Argentine Great Western railway connects Mendoza with the capital of the province, and with the principal cities of the republic.

The capital of the province is San Juan, once called San Juan de la Frontera (pop. 1904, estimate, 11,500), in a great bend of the San Juan river, 95 m. N. of Mendoza and 730 m. from Buenos Aires by rail. The great bend of the river affords easy irrigation, and the surrounding country is covered by a network of irrigating canals, even the paved streets of the town having streams of cool water running through them. The public buildings include a cathedral, three churches, and several schools, including the ” Escuela Sarmiento, ” a fine edifice with a Greek facade, named after President Domingo Faustino Sarmiento (1811-1886), who was a native of this city. There is also a botanical garden.

San Juan was founded in 1561 by Juan Yufre, a companion of Captain Castillo, the founder of Mendoza. Both came from Chile, to which these outlying colonies were at first subject. From 1776 to 1820 it was governed from Mendoza, and then a popular uprising made the province independent and the town its capital. It has suffered severely from political disorders, and in 1894 was nearly destroyed by an earthquake. The original settlement, now called Pueblo Viejo, 4 m. N., was abandoned on account of frequent inundations. The present town is situated about 2165 ft. above sea-level and is defended from

inundations by an embankment above the town, called the Murallon. San Juan exports wine, and has a profitable trade with Chile over the Patos and Uspallata passes.

SAN JUAN (San Juan Bautista de Puerto Rico), the capital and largest city of Porto Rico, on a small and narrow island which lies near the north coast, about 35 m. from the east end of Porto Rico, and is united to the mainland by the bridge of San Antonio. Pop. (1899) 32,048, including 5236 negroes and 11,529 of mixed races; (1910) 48,716. San Juan is served by the American railroad of Porto Rico and by steam- boats from New York and other ports. The harbour lies between the city and the mainland. It is capacious and landlocked, except on the north. A portion of it is 30 ft. in depth, and in 1907 Congress passed an Act for enlarging this area by dredging and especially for widening the entrance for large vessels; the work was virtuaLly completed in 1909. San Juan is noteworthy for its fortification's and public buildings, and is the only fortified city of Porto Rico.

On a bluff about 100 ft. high at the west end of the island and commanding the entrance to the harbour rise the battlements of Mono Castle, which was completed about 1584 arid in which there is a lighthouse. The Castle of San Cristobal (begun early in the 17th century, completed in 1 771) extends across the island in the rear portion ot the city. A wall on each side of the island connects the two castles. The Cafiuelo is an abandoned fort on an islet opposite the Morro and less than 1000 yds. from it, the main channel lying between the two ; and Forts San Antonio and San Geronimo protect the bridge of San Antonio. Inland rises a raifte of lofty mountains. Within the walls (which are 50-100 ft. high) the streets are narrcW, smoothly paved with glazed brick and well cleaned. Princessa, Covadonga and Puerta de Tierra are lined with shady trees and occasionally widen into refreshing plazas. Between streets the space is packed closely with massive, flat-roofed brick and stone buildings, the walls of which, like the fortifications, are covered with plaster of various colours — green, blue, white, brown, pink, yellow and vermilion ; red tile roofs add to the effect. Near Morro Castle is the Casa Blanca, a palace on land which belonged to the family of Ponce de Leon. The tomb of Ponce de Leon is in the Cathedral, and in the Plaza de San Jos6 is a bronze statue (said to have been cast from cannon taken from the English in 1797) to his memory. In the Plaza Colon is a marble and granite monument to Columbus. In the church of San Francisco are some good paintings by Jos6 Campeche (1752-1809), a local artist. Other churches are the severely beautiful Santo Domingo, the Santa Ana, the Cathedral, with a rich shrine of

Nuestra Senora de la Providencia, and the

church of San Jos£, which was formerly the Dominican convent. Among the prominent buildings and institutions are the custom-house, the executive mansion (formerly the palace of the governor-general) situated near the Casa Blanca, the archiepiscopal palace, a Seminary College, the City Hall, the Intendencia, the Post Office, the large barracks (Cuartel de Ballaja), the Penitentiary, the Military Hospital, the Presbyterian Hospital, two municipal hospitals (one surgical, one medical), a municipal bath-house and a small public library (the ” Cervantes “). At Rio Piedras, not far from San Juan, is the Normal School and Agricultural School of Porto Rico. Other suburbs are Marina, with wharves and piers, Puerta de Tierra and on the mainland, Santurce, with a country club, the Union Club, a beautiful market-place, two charity schools and some attractive villas. Industries are of little importance. The sanitation of the city has been installed since the American occupation ; sewers have been laid and a water-supply is piped from Rio Piedras.

From Caparra, established in 1508 by Juan Ponce de Leon and now known as Pueblo Viejo, the Spanish settlement removed in 1520 to San Juan or San Juan Bautista de Puerto Rico, nearer the coast. The new settlement became the capital of the eastern district of the island, to the whole of which the latter part of the name came to be applied. It was sacked by Sir Francis Drake in 1595, and captured by Admiral George Clifford, earl of Cumberland (1 558-1605), in 1597, but was abandoned by the conquerors on account of an epidemic. It was unsuccess- fully attacked by the English under Sir Ralph Abercromby in April 1797; and it was bombarded by an American fleet under Rear-Admiral William T. Sampson on the 12th of May 1898 during the Spanish-American war, and was blockaded by the auxiliary cruiser ” St Paul,” which on the 22nd of June drove back into the harbour the Spanish destroyer ” Terror ” and the gunboat ” Isabella II.”; but the city was not occupied by the Americans until after the suspension of hostilities.

SAN JUAN (or Haro) ISLANDS, an archipelago (San Juan, Orcas, Shaw, Lopez, Blakely, Cypress, &c.) lying between Vancouver Island and the mainland of North America. These islands were for many years the subject of dispute between the British and the United States governments, and were finally assigned to the latter country by the arbitration of the emperor of Germany (on the 21st of October 1872). Geographically the cluster certainly belongs to the mainland, from

which it is separated by Rosario Strait, generally much under 50 fathoms in depth, while Haro Strait, separating it from Vancouver Island, has depths ranging from 100 to 190 fathoms. In 1873 the islands, formerly considered part of Whatcom county, Washing- ton, were made the separate county of San Juan. Of the total area of 200 sq. m., about 60 are in San Juan, 60 in Orcas and 30 in Lopez.

See Papers relating to the Treaty of Washington, vol. v. (Washing- ton, 1872), and the map in Petermann's Mitteilungen (1873).

SANKARA ACHARYA {c. 789-820), Hindu theologian, was born about the year 789, probably at the village of Kaladi in Malabar. He belonged to the Nambudri class of Brahmins. He wandered far and wide, and engaged in much philosophical and theological debate. He taught the existence of the Supreme God and founded the sect of the Smarta Brahmins. His great achievement was the perfecting of the Mimansa or Vedanta philosophy. So great were his learning and piety that he was regarded as an incarnation of Siva, and his works (commentaries on the Vedanta Sutras, the Bhagavad Gita and the Upanishads) exercised a permanent influence on Hindu thought. He died at Kedarnata in the Himalayas when only 32 years of age.

See Sri Sankaracharya, by C. N. Krishnasurami Aiyar and Pandit Sitanath Tattvabhushan (Madras, 1902).

SANKT JOHANN, a town of Germany, in the Prussian Rhine province, on the right bank of the Saar, opposite Saarbriicken with which it is connected by three bridges. It is 49 m. N.E. from Metz and at the junction of lines from Trier, Bingerbruck and Zweibriicken. Pop. (1905) 24,140. Sankt Johann is the seat of extensive industries, the chief being the manufacture of railway plant and machinery, iron-founding, wire-drawing and brewing; its rapid industrial development is due mainly to the extensive railway system of which it is the centre.

Sankt Johann obtains its name from a chapel erected here. From 1321 to 1859 it formed a single town with Saarbriicken,

and then was united to form one municipality with Saarbriicken and Malstatt-Burbach (united population, 90,000).

SANKT POLTEN, an old town and episcopal see of Austria, in Lower Austria, 38 m. W. of Vienna by rail. Pop. (1900) 14,510. It is situated

on the Traisen, a tributary of the Danube, and contains an interesting old abbey church, founded in 1030 and restored in 1266 and again at the beginning of the 18th century. There are several religious educational institutions in the town, and a military academy for engineers. The industries include cotton spinning and milling, as well as the manufacture of iron and hardware, and small arms. Sankt Polten was an inhabited place in the Roman period. An abbey dedicated to St Hippolytus was founded here in the 9th century, around which the town developed. It was called Fanum Sancti Hippolyli, from which, by corruption, the actual name is derived. It was surrounded with walls and fortifications in the time of Rudolf of Habsburg, but these were demolished in modern times.

See Lampel, Urkundenbuch des Chorherrenstifts Sankt Pollen (Wien, 1891-1901, 2 vols.).

SAN LUCAR (or Sanltjcar de Barrameda), a fortified seaport of southern Spain, in the province of Cadiz; 27 m. by sea from Cadiz, on the left bank of the Guadalquivir estuary, and on the Puerto de Santa Maria-San Lucar and Jerez de la Frontera-Bonanza railways. Pop. (1900) 23,883. The town is divided into two parts, Alta (" upper ") and Baja (" lower "); for it is built partly on the flat foreshore, partly on the rising ground to the south. The upper part is the older; it culminates in the ruins of a Moorish citadel. On the outskirts are many villas surrounded by pine, palm and orange groves, and often occupied in summer by families from Seville, who come to San Lucar for the excellent sea-bathing. The 14th-century church and the palace of the dukes of Medina Sidonia contain many valuable pictures. The hospital of St George was established by Henry VIII. of England in 151 7 for English sailors. The Guadalquivir estuary is deep and sheltered, and lighted by four lighthouses. Bonanza, 2 m. by rail up the river, and on the same bank, is the headquarters of the shipping and fishing trades. It is named after a chapel dedicated here by the South American Company of Seville to the Virgin of Fair Weather {Virgen de la Bonanza). The fisheries and agricultural trade of San Lucar are considerable; there are flour mills in the town and a dynamite factory among the surrounding sandhills. Coal is imported from Great Britain, sulphur from France. The imports include sherry, manzanilla and other wines, salt, oats and fruit. _

Inscriptions: and ruins prove that San Lucar and Bonanza were Roman settlements, though the original names are unknown. San Lucar was captured from the Moors in 1264, after an occupa- tion lasting more than five and a half centuries. After 1492 it became an important centre of trade with America. From this port Columbus sailed across

the Atlantic in 1498, and Magellan started in 1519 to circumnavigate the world.

SAN LUIS, a province of Argentina, bounded N. by Rioja, E. by Cordoba, S. by the La Pampa territory and W. by Mendoza. Area, 28,535 S Q- m – P°P- (i9°4> estimated) 97,458. San Luis belongs partly to the semi-arid pampa region, and partly to the mountainous region of the eastern Andes and Cordoba whose ranges terminate between the 33rd and 34th parallels. It is one of the least important of the Argentine provinces because of its aridity and lack of available resources. The rough northern districts, where an occasional stream affords irrigation for a fertile soil, are noted for a remarkably uniform, dry, mild and healthful climate. The Rio Quinto has its sources in these ranges; the Desaguadero, or Salado, forms its western boundary; and the Conlara flows northward among its broken ranges to the great salinas of western Cordoba. Only in the mountains are these streams available, as they soon become impregnated with saline matter on the plains. The southern part of the province is a great, arid, saline plain, practically uninhabitable. Agri- culture and grazing occupy some attention in the north, but are handicapped by lack of water. The mountains are rich in

minerals, however, and a number of gold mines have been opened. The exports include cattle, hides, skins, wool and ostrich feathers. The capital is San Luis (pop. 1904, about 10,500) on the Arroyo Chorillos, a little S. of the cerro called Punta de los Venados, 374 m. by rail (the Argentine Great Western) W. of Rosario, and magnificently situated on a plateau 2490 ft. above sea-level. Next in importance is the town of Mercedes or Villa Mercedes (pop. 1904, about 6000) on the Rio Quinto, an important railway junction where the railways from Buenos Aires, Rosario, Mendoza and San Jose unite.

San Luis, the capital, was founded in 1697 by Martin de Loyola and was for nearly 200 years only a frontier outpost. It suffered much in the civil wars of 1831-1865.

SAN LUIS POTOSf, a central state of Mexico, bounded N. by Coahuila, E. by Nuevo Leon, Tamaulipas and Vera Cruz, S. by Hidalgo, Queretaro and Guanajuato, and W. by Zacatecas. Area, 25,316 sq. m. Pop. (1900) 575,432. The state belongs wholly to the high plateau region, with the exception of a small area in the S.E. angle, where the tableland breaks down into the tropical valley of the Panuco. The surface is compara- tively level, with some low mountainous wooded ridges. The eastern part borders on the Sierra Madre Oriental, where there are extensive forests. The mean elevation is about 6000 ft.,

insuring a temperate climate. The state lies partly within the arid zone of the north, the southern half receiving a more liberal rainfall through the influence of the ” northers ” on the Gulf coast. The rainfall, however, is uncertain and the state is poorly provided with rivers. The soil is fertile and in favourable seasons large crops of wheat, Indian corn, beans and cotton are grown on the uplands. In the low tropical valleys, sugar, coffee, tobacco, peppers and fruit are staple products. Stock- raising is an important industry and hides, tallow and wool are exported. Fine cabinet and construction woods are also exported to a limited extent. At one time San Luis Potosi ranked among the leading mining provinces of Mexico, but the disorders following independence resulted in a great decline in that industry. The Catorce district has some of the richest silver mines in the country. Other well-known silver mining districts are Pefion Blanco, Ramos and Guadalcazar. The development of Guadalcazar dates from 1620 and its ores yield gold, copper, zinc and bismuth, as well as silver. In the Ramos district, the Cocinera lode is said to have a total yield of over $60,000,000. Railway facilities are provided by the Mexican Central and Mexican National lines, the former crossing a corner of the state and having a branch from the capital to Tampico, and the latter passing through the state from N. to S. The capital is San Luis Potosi, and other towns, with their populations, are: Matehuala (13,101 in 1895), a mining town 20 m. E. by W. of Catorce, with which it is connected by a branch railway; ‘Catorce (9547 in 1895), an important mining town no m. N. (direct) of San Luis Potosi (capital) and 8 m. from its railway station on the Mexican National; at an elevation of 8780 ft., Santa Maria del Rio (8440m 1900), 37 m. S.E. of the capital; Venado (5750 in 1895), 45 m. N. of the capital; Rio Verde (5759 in 1900), an agricultural centre with a national agriculture experiment station in its vicinity; Soledad Diez Gutierrez (5730 in 1895), near the capital.

SAN LUIS POTOSf • a city of Mexico and capital of a state of the same name, near the head of the valley of the Rio Verde (a tributary of the Panuco), 215 m. by rail N.W. of the city of Mexico. Pop. (1900) 61,019. The city is served by the Mexican Central and the Mexican National railways. It is built on a broad level space, laid out regularly with straight well-paved streets and shady plazas. The altitude of the city, 6168 ft. above sea-level, gives it a cool temperate climate, though the sun temperatures are high. The water-supply was formerly very deficient, but two artesian wells have been drilled to a depth of 450 ft. and furnish 30,000 gallons a day each, in addition to which a large dam 3 m. above the city has been built, having a storage capacity of 7,500,000 cubic meters (1,650,000,000 gallons), or 18 months’

supply, which is used for irrigation and domestic purposes. The better class of residences are usually

two storeys high, and include many fine specimens of Spanish colonial architecture; but the suburbs consist chiefly of wretched hovels and stretch out over a large area. Among the more notable public buildings are the cathedral and government palace fronting on the Plaza Mayor, the latter conspicuous for its facade of rose-coloured stone; the churches of El Carmen, San Francisco and Guadalupe; the La Paz theatre, mint, penitentiary and the Instituto Cientifico, in which law, medicine and science are taught. San Luis Potosi is an important railway and distributing centre, with a considerable trade in cattle, tallow, wool, hides and minerals. Its proximity to the port of Tampico, with which it was connected by a branch of the Mexican Central railway in 1885, has greatly increased its commercial importance, though in earlier days it was also one of the principal centres of the diligence and pack-train traffic of this part of Mexico. The city has cotton and woollen factories using modern machinery, and the smelting works of the Metal- urgica Mexicana company, an American enterprise.

San Luis Potosi was founded in 1586. It was an important centre of colonial administration and played an important part in the civil wars and political disorders following Mexican independence. It was the seat of the Mexican government of Benito Juarez in 1863, but was soon afterwards captured by the French under Bazaine. It was recovered by Juarez in 1867, after the French had retired.

SAN MARINO, a republic in northern Italy, 14 m. S.W. of Rimini by road. Pop. (1001) about 1600 (town); 9500 (whole territory). It is the smallest republic in the world (32 sq. m. in area). According to tradition, the republic was founded by St Marinus during the persecutions under Diocletian, while his companion, St Leo, founded the village of that name 7 m. to the S.W., with La Rocca its old castle, now a prison, in which the impostor Cagliostro died in 1795. The history of S. Marino begins with the 9th century, the monastery of S. Marino having existed demonstrably since 885. In the 10th century a communal constitution was established. The republic as a rule avoided the faction fights of the middle ages, but joined the Ghibellines and was interdicted by the pope in 1 247-1 249. After this it was protected by the Montefeltro family, later dukes of Urbino, and the papacy, and

successfully resisted the attempts of Sigismondo Malatesta against its liberty. In 1503 it fell into the hands of Caesar Borgia, but soon regained its freedom. Other attacks failed, but civil discords in the meantime increased. Its independence was recognized in 163 1 by the papacy. In 1739 Cardinal Alberoni attempted to deprive it of its independ- ence, but this was restored in 1 740 and was respected by Napoleon. Garibaldi entered it in 1849, on his retreat from Rome, and there disbanded his army. The town stands on the north end of a precipitous rock (2437 ft.) which bears the name of Monte Titano; each of the three summits is crowned by fortifications — that on the north by a castle, the other two by towers. The arms of the republic are three peaks, each crowned with a tower. There are traces of three different enceintes, of the 14th, 15th and 1 6th centuries. The chief square, the Pianeilo, contains the new Palazzo del Governo in the Gothic style (1894) and a statue of Liberty (1876). The principal church (Pieve), in classical style, dates from 1826-1838, and contains the body of St Marinus. The old church, then demolished, is first mentioned in 1 1 13, but was several times restored. S. Francesco has some paintings by Niccolo Alunno of Foligno and other later artists, and a pretty loggia. The museum contains a few pictures of various schools and some Umbrian antiquities. Bartolommeo Borghesi, the epigraphist and numismatist, resided here from 1 82 1 until his death in i860. The Borgo at the base of the rock is a chiefly commercial village.

The supreme power of the republic resides in the general assembly {Arringo) which meets twice a year. It is governed by two Capitani Reggenti, selected twice a year from the 60 life-members of the Great Council, which is composed of 20 representatives of the nobility, 1 20 of the landowners and 20 of the citizens. They are assisted by a small committee of 12 of the 1 Not a few Italians possess titles of nobility of San Marino.

Great Council. The available armed forces of the republic form a total of about 1200 men, all citizens able to bear arms being technically obliged to do so from the age of 16 to 60 years. San Marino issues its own postage-stamps, and makes thereby a considerable income. It also issues its own copper coinage, which circulates in Italy also; but Italian money is current for the higher values. Most of the republic falls within the diocese of Montefeltro, a small portion within that of Rimini.

See C. Ricci, La Repubblica di San Marino (Bergamo, 1903). SAN MARTIN, JOSfi DE (1778-1850), South American soldier and statesman, was born at Yapeyu on the Uruguay river on the 25th of

February 1778. His father was a captain in the Spanish army, and young San Martin was taken to Madrid and educated for a military career. He served in the Moorish wars and in the great struggle against Napoleon, and his dis- tinguished conduct at the battle of Baylen brought him the rank of lieutenant-colonel. In 181 2 he offered his services to the government of Buenos Aires in the struggle for the independ- ence of Argentina. He was appointed early in 1814 to the command of the revolutionary army operating against the royalists on the borders of Upper Peru. But he soon resigned his command, realizing that for the permanent success of the revolutionary cause it was necessary first to oust the Spaniards from Chile and then to organize an expedition thence against the stronghold of Spanish power on Peru. With this end in view he secured his appointment to the governorship of the province of Cuyo, bordering on the Chilean Andes, and established him- self at Mendoza, where he prepared for the invasion of Chile. Assisted by Bernardo O'Higgins, he rallied the Chilean patriots who had fled across the mountains after their defeat at Rancagua; he enlisted the sympathies of the Argentine government, and after two years succeeded in raising a well-trained army of Chileans and Argentines and in collecting the material resources necessary for a crossing of the Andes. In January 181 7 he set out on his enterprise. By the swiftness of his movements and by a clever feint he evaded opposition, and he led his army, of about 3000 infantry and 1000 cavalry, together with artillery and large baggage trains, through a barren and difficult region, and over passes 13,000 ft. above sea-level. The victory of Chacabuco (Feb. 12, 1817) over the royalist army led to the re-establishment of a nationalist government at Santiago under Bernardo O'Higgins, as San Martin himself wished to prepare for the invasion of Peru; but in 18 18 he took command of the Chilean forces against a fresh royalist army, and by his victory at the river Maipo in April finally secured the independence of Chile. This left him free to organize the expedition against Peru, and assisted by O'Higgins and the Argentine government, he pro- cured the necessary fleet and the army. He set out in August 1820, landed his forces for a short time at Pisco, where he tried to enter into negotiations with the viceroy of Lima, and then transported his army with the help of the fleet to a point on the coast a little way north of Lima. Here he spent several months of inaction, hoping that the demonstration of force and the influence of popular feeling would lead to a peaceful withdrawal of the Spaniards. In July 182 1 the Spaniards evacuated Lima, San Martin entered the city, proclaimed the independence of Peru and assumed the reins of government with the title of Protector. His position, however, was far from secure. The royalist party, never having been decisively crushed, organized risings in the interior, and

San Martin was embarrassed by the jealousy which his authority roused among the patriots, and by the rivalry of Bolivar, who had arrived with an army on the northern frontier of Peru. San Martin resigned his authority on the 20th of September 1822 and left the country. He spent a short time in Chile and in Argentina, but his many enemies had embittered popular feeling against him, and constant attempts were made to involve him in political intrigues. Unable to live a peaceful private life, he was compelled to exile himself in Europe, where he lived, often in great poverty, till his death at Boulogne on the 17th of August 1850.

San Martin did more than any man for the cause of independence in the Argentine, Chile and Peru. He was not only an able soldier; in

the clearness with which he realized that the independence of each state could only be secured by the co-operation of all, and in the perseverance with which he carried his views into execution he showed himself a far-seeing and honest statesman.

See W. Pilling, Emancipation of South America (London, 1893), a translation of B. Mitre's life of San Martin; P. B. Figueroa, Diccionario biografico de Chile (Santiago, 1888) and J. B. Suarez, Rasgos biograficos de hombres notables de Chile (Valparaiso, 1886), both giving sketches of prominent characters in Chilean history. See also works on the period mentioned under Chile : Bibliography.

SANMICHELE, MICHELE (1484-1559), Italian architect, was born in San Michele near Verona. He learnt the elements of his profession from his father Giovanni and his uncle Barto- lommeo, who both practised as architects at Verona with much success. He went at an early age to Rome to study classic sculpture and architecture. Among his earliest works are the duomo of Montefiascone (an octagonal building surmounted with a cupola), the church of San Domenico at Orvieto, and several palaces at both places. He also executed a fine tomb in S. Domenico. He was no less distinguished as a military architect, and was much employed by the signoria of Venice, not only at home, but also in strengthening the fortifications of Corfu, Cyprus and Candia. One of Sanmichele's most graceful designs is the Cappella de' Peregrini in the church of S. Bernardino at Verona — square outside and circular within, of the Corinthian order. He built a great number of fine palaces at Verona, including those of Canossa,

Bevilacqua and Pompei, as well as the gracefid Ponte Nuovo. In 1527 Sanmichele began to transform the fortifications of Verona according to the newer system of corner bastions — a system for the advancement of which he did much valuable service. His last work, begun in 1559, was the round church of the Madonna di Campagna, ij m. from Verona on the road to Venice. Like most other distin- guished architects of his time he wrote a work on classic archi- tecture, / Cinque Ordini dell' architettura, printed at Verona

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See Ronzani and Luciolli, Fabbriche . . . di M. Sanmichele (Venice, 1832) ; and Selva, Elogio di Sanmichele (Rome, 1814).

SAN MIGUEL, the capital of the department of San Miguel, Salvador; 80 m. E. by S. of San Salvador, near the right bank of the Rio Grande, and at the foot of the volcano of San Miguel or Jucuapa (7120 ft.). Pop. (1905) about 25,000. San Miguel is an important and attractive city, although the extensive swamps in the Rio Grande Valley render malaria common. It possesses several handsome churches, municipal buildings, law courts and two well-equipped hospitals. Near it are the ruins of an ancient Indian town. San Miguel has a flourishing trade in indigo, grain, rubber and cattle. Its port is La Union (q.v.). San Miguel was founded in 1530 by Spanish settlers, and became a city in 1586. Its fairs formerly attracted merchants from all parts of Salvador, Guatemala and Honduras, and it is now third in size among the cities of the republic.

SAN MIGUEL DE MAYUMO, a town of the province of Bulacan, Luzon, Philippine Islands, about 40 m. N. of Manila. Pop. (1903) 14,919. In 1903, after the census had been taken, San lldefonso (pop. 5326) was annexed to San Miguel. It has a cool and very healthy climate, and commands a beautiful view of the surrounding country. The soil is very fertile, and many of the inhabitants have acquired much wealth from the cultiva- tion of rice. Sugar-cane, Indian corn and cotton are also produced in abundance, and cattle are raised. Near the town are iron mines and quarries of limestone, and on the neighbouring mountains are forests containing valuable hardwood timber. About 8 m. N.E. are the medicinal springs of Sibul, to which large numbers of patients from the neighbouring provinces come. The San Miguel river, which flows near, affords a means of transportation, and the town has considerable commerce. Some beautiful furniture is made out of the hardwood from the mountains, and cotton fabrics are woven in considerable quantities by the women. The principal language is Tagalog. The chief buildings were destroyed in 1901 in a fire started

by a band of thieves.

SAN MINIATO, a town and episcopal see of Tuscany, Italy, in the province of Florence, 26 m. W. by S. of Florence by the

railway to Pisa, 512 ft. above sea-level, on a hill 2 m. S. of the railway. Pop. (1901) 4421 (town); 20,242 (commune). Its cathedral dates from the 10th century. It was remodelled in 1488, and has a facade decorated with disks of majolica. It manufactures glass, olive oil, leather and hats. It has a castle of the emperor Frederick I., the residence of the imperial governors of Tuscany from 1226 to 1286, and from them bears the name of San Miniato al Tedesco.

SANNAZARO, JACOPO (1458-1530), Italian poet of the Renaissance, was born in 1458 at Naples of a noble family, said to have been of Spanish origin, which had its seat at San Nazaro near Pavia. His father died during the boyhood of Jacopo, who was brought up at Nocera Inferiore. He afterwards studied at Naples under Giovanni Pontanus, when, according to the fashion of the time, he assumed the name Acti'us Syncerus, by which he is occasionally referred to. After the death of his mother he went abroad — driven, we are told, by the pangs of despised love for a certain Carmosina, whom he has celebrated in his verse under various names; but of the details of his travels nothing is recorded. On his return he speedily achieved fame as a poet and place as a courtier, receiving from Frederick III. as a country residence the Villa Mergillina near Naples. When his patron was compelled to take refuge in France in 1501 he was accompanied by Sannazaro, who did not return to Italy till after his death (1504). The later years of the poet seem to have been spent at Naples. He died on the 27th of April 1530.

The_ Arcadia of Sannazaro, begun in early life and published in 1504, is a somewhat affected and insipid Italian pastoral, in which in alternate prose and verse the scenes and occupations of pastoral life are described. See Scherillo's edition (Turin, 1888). His now seldom read Latin poem De partu Virginis, which gained for him the name of the " Christian Virgil," appeared in 1526, and his collected Sonetti e canzoni in 1530.

SAN NICOLAS DE LOS ARROYOS, a town and river port of Argentina, in the province of Buenos Aires, on the W. bank of the Parana, 150 m. by rail N.W. of the city of Buenos Aires. Pop. (1904, estimate), 18,000. It is a flourishing commercial town, and a port of call both for river and ocean-going steamers of medium tonnage. It is a station on the Buenos Aires & Rosario, and the terminus of a branch from Pergamino

of the Central Argentine railway, and exports wheat, flour, wool and frozen mutton. The town is the judicial centre for the northern district of Buenos Aires. San Nicolas was founded in 1749 by Jose de Aguillar on lands given for that purpose by his wife (nee Ugarte). Its growth was very slow until near the end of the 19th century.

SAN _ PABLO, a town of the province of Laguna, Luzon, Philippine Islands, 9§ m. S. of Laguna de Bay and about 35 m. S.S.E. of Manila. Pop. (1903) 22,612. It is an important road centre, and in the vicinity are five small mountain lakes. Coco- nut palms grow in great abundance in the town and vicinity, and copra is the principal product; hemp and, to a less degree, rice, are grown here. The language is Tagalog.

SANQUHAR, a royal and police burgh of Dumfriesshire, Scotland. Pop. (1901) 1379. It is situated on the Nith, 26 m. N.W. of Dumfries by the Glasgow & South Western railway. It became a burgh of barony in 1484 and a royal burgh in 1596, and was the scene of the exhibition of the Covenanters' Declara tion, attached to the market cross in 1680 by Richard Cameron and in 1685 by James Renwick. The industries include coal- mining and the making of bricks and tiles, spades and shovels. The coal-field, measuring 7 m. long by 2§ m. broad, is the most extensive in the shire and is the main source of supply for Dumfries and other towns. The cattle and sheep fairs are important, and an agricultural show is held every May. Sanquhar Castle, on a hill overlooking the Nith, once belonged to the Crichtons, ancestors of the marquess of Bute, but is now a ruin. Eliock House, in the parish, was the birthplace of James (" the Admirable ") Crichton in 1560.

SAN REMO, a seaport of Liguria, Italy, in the province of Porto Maurizio, on the Riviera di Ponente, 9! m. E. of Venti- miglia by rail, and 84 m. S.W. of Genoa. Pop. (1901) 17,114 (town); 20,027 (commune). Climbing the slope of a steep hill

it looks south over a small bay, and, protected towards the north by hills rising gradually from 500 to 8000 ft., it is in climate one of the most favoured places on the whole coast, a fact which accounts for the great reputation as a winter resort which it has enjoyed since 1861. The older town, with its narrow steep streets and lofty sombre houses protected against earthquakes by arches connecting them, contrasts with the new visitors' town, containing all the public buildings, which

has grown up at the foot of the hill. The fort of S. Tecla protects the small harbour, sheltered by its sickle-shaped mole, 1300 ft. long. The promenade of San Remo is the Corso dell' Imperatrice, running from the main street, the Via Vittorio Emanuele, along the coast to the Giardino dell' Imperatrice; it is a broad road shaded by palm-trees, and was, like the garden, constructed at the expense of the empress Maria Alexandrovna of Russia (d. 1880). The Villa Thiem has a valuable picture-gallery, containing for the most part examples of the great 17th-century masters of the Netherlands. Besides the Gothic ex-cathedral of San Siro, the white-domed church of the Madonna della Costa, at the top of the old town, may be mentioned. In front of it is a large hospital. On the east of the harbour, the promenade along the coast is called the Passeggiata Imperatore Federico in memory of the German emperor Frederick, whose visit to the town in 1887-1888 greatly increased its repute as a winter resort. Flowers, especially roses and carnations, are extensively grown for export, and olives, lemons and palms are also cultivated.

San Remo appears to have been dependent on Genoa in its early days, but became independent in 1361. In 1544 the town was attacked by Barbarossa, and in 1625 by the French and Savoyards. The Genoese, against whose encroachments it had long defended its independence, subjugated it in 1753; in 1797 it was incorporated in the Ligurian republic, and in 1814 passed to Piedmont.

SAN SALVADOR, the capital of the republic of Salvador; situated in the valley of Las Hamacas, on the river Asalguate, at an altitude of 2115 ft., and 30 m. inland from the Pacific. Pop. (1005) about 60,000. San Salvador is connected by rail with Santa Ana on the north-west and with the Pacific ports of La Libertad and Acajutla. In addition to the government offices, its buildings include a handsome university, a wooden cathedral, a national theatre, an academy of science and litera- ture, a chamber of commerce, and astronomical observatory and a number of hospitals and charitable institutions. There are two large parks and an excellent botanical garden. In the Plaza Morazan, the largest of many shady squares, is a handsome bronze and marble monument to the last president of united Central America, from whom the plaza takes its name. San Salvador is the only city in the republic which has important manufactures; these include the production of soap, candles, ice, shawls and scarves of silk, cotton cloth, cigars, flour and spirits. The city is admirably policed, has an abundant water supply, and can in many respects compare favourably with the smaller provincial capitals of Europe and America. It was founded by Don Jorge de Alvarado in 1528, at a spot near the present site, to which it was transferred in 1539. Except for the year 1839-1840 it has been the

capital of the republic since 1834. It was temporarily ruined by earthquakes in 1854 and

i873- SANS-CULOTTES (French for ” without knee-breeches “), the

term originally given during the early years of the French Revolution to the ill-clad and ill-equipped volunteers of the Revolutionary army, and later applied generally to the ultra- democrats of the Revolution. They were for the most part men of the poorer classes, or leaders of the populace, but during the Terror public functionaries and persons of good education styled themselves citoyens sans-culotles. The distinctive costume of the typical sans-culotte was the pantalon (long trousers) — in place of the culottes worn by the upper classes — the carmagnole (short-skirted coat), the red cap of liberty and sabots (wooden shoes). The influence of the Sans-culottes ceased with the reaction that followed the fall of Robespierre (July 1794), and the name itself was proscribed. In the Republican Calendar the complementary days at the end of the year were at first called Sans-culottides; this name was, however, suppressed

by the Convention when the constitution of the year III. (1795) was adopted, that of jours complementaires being substituted.

SAN SEBASTIAN (Basque Iruchulo), a seaport and the capital of the Spanish province of Guipuzcoa, on the Bay of Biscay, and on the Northern railway from Madrid to France. Pop. (1900) 37,812. In 1886 San Sebastian became the summer residence of the court. The influx of visitors, attracted by the presence of the royal family, by the prolonged local festivities, the bull-fights and the bathing, increases the number of the inhabitants in summer to about 50,000. The city occupies a narrow sandy peninsula, which terminates on the northern or seaward side in a lofty mass of sandstone, Monte Urgull; it is flanked on the east by the estuary of the river Urumea, on the west by the broad bay of La Concha. The old town, rebuilt after the fire of 1813, lies partly at the foot of Monte Urgull, partly on its lower slopes. Until 1863 it was enclosed by walls and ramparts, and a strong fort, the Castillo de la Mola, still crowns the heights of Urgull. There are also batteries and redoubts facing landward and seaward below this fort; but the other defences have been either razed or dismantled. The Alameda, one of many fine avenues, was laid out on the site of the chief landward wall, and separates the old town from the new — in which the houses are uniformly modern, and built in straight streets or regular series of squares. The bay of La Concha has a broad sandy shore, the Playa de Banos, admirable for bathing and sheltered from sea-winds by the rocky islet of Santa Clara. Its centre is faced by the casino, a handsome building, and the summer palace and park of Miramar occupy the rising ground towards its western extremity. The other noteworthy buildings are the bull-ring, capable of seating 10,000 spectators, the theatre, fine provincial and municipal halls,

barracks, a hospital, a Jesuit college, the American International School for girls, and many other schools. There are numerous breweries, saw and flour mills, and manufactures of preserves, soap, candles, glass and paper, especially in the busy suburb that has sprung up on the right bank of the Urumea. The fisheries are important. The harbour consists of three artificial basins, opening into La Concha Bay, and situated in the midst of the old town; it is chiefly frequented by coasting and fishing vessels, and cannot accommodate large ships. From its position near the frontier San Sebastian was long a first-class fortress, and has sustained many sieges. Lhe last and most memorable was in August 1813, when the allied British, Portuguese and Spanish armies under Lord Wellington captured the city from the French, and then sacked and burned it.

SAN SEPOLCRO, or Borgo S. Sepolcro, a town and episcopal see of Tuscany, Italy, in the province of Arezzo, from which it is 28 m. N.E. by rail. Pop. (1901) 4537 (town); 9077 (com- mune). It is situated 1083 ft. above sea-level, on the Tiber. It was the birthplace of Piero della Francesca (1420-1492) and of Raffaello del Colle (1490-1540), a pupil of Raphael. The Romanesque cathedral and the picture-gallery contain works by both these artists.

SAN SEVERINO (anc. Septempeda) , a town and episcopal see of the Marches, Italy, in the province of Macerata, from which it is 18 m. W. by S. by rail. Pop. (1901) 3227 (town); 14,932 (commune). The lower town is situated 781 ft. above sea-level, and contains the new cathedral of S. Agostino, with a fine altar-piece by Pinturicchio (1489). The Palazzo Comunale has some interesting pictures by artists of the Marches. Lorenzo and Giacomo Salimbeni da San Severino, who painted an important series of frescoes in the oratory of S. Giovanni Battista at Urbino in 1416, were natives of the town. So was also the later master Lorenzo di Maestro Alessandro, of the end of the 15th century, whose pictures are mainly to be found in the Marches. The old cathedral of S. Severino is in the upper town (1129 ft. above sea-level); it contains frescoes by the two Salimbeni, while an altar-piece by Niccolo Alunno of Foligno (1468) has been removed hence to the picture gallery. The ancient Septempeda lay 1 m. below the modern town, on the branch road which ran from Nuceria Camellaria, on the Via Flaminiai and here the road divided — one branch going to

Ancona and the other through Tolentinum to Urbs Salvia and Firmum.

No ruins of the old town exist, but a considerable number of inscriptions have been found, from which it may be gathered that it was a colonia.

SAN SEVERO, a city in Apulia, Italy, in the province of Foggia, from which it is 17 m. N.N.W. by rail. Pop. (1901) 28,550. San Severo lies at the foot of the spurs of Monte Gargano, 292 ft. above sea-level. It is the see of a bishop (since 1580), and has some remains of its old fortifications. San Severo dates from the middle ages. It was laid in ruins by Frederick II., and in 1053 was the scene of a victory by Robert Guiscard over the papal troops under Leo IX. In 1799 the town was taken by the French and again almost entirely destroyed. The over- lordship was held in succession by the Benedictines of the abbey of Torre Maggiore, the Knights Templars, the crown of Naples and the Sangro family (commendatories of Torre Maggiore). In 1627, 1828 and 1851 the town suffered from earthquakes.

SAN-SHUI, a treaty port in the province of Kwang-tung, China, on the left bank of the West river, 99 m. from Canton, opened to foreign trade in 1897. Pop. about 5000: Its position is at the junction of the North and West rivers, and it is favourably situated as a distributing centre for foreign goods. Two lines of steamers converge at San-shui, from Canton and Hong-Kong respectively. The town is surrounded by a handsome wall built in the 16th century, but within this rampart the houses are mean. The foreign trade shows little signs of expansion. In 1902 the net foreign imports amounted in value to £474,175, and in 1904 to only £380,000, while the exports during the same two years amounted to £225,000 and £317,000 respectively. The direct foreign trade in 1908 was £507,827. There is a large junk traffic, and the local likin station is one of the richest in the province.

SANSKRIT, the name applied by Hindu scholars to the ancient literary language of India. The word sarnskrita is the past participle of the verb kar(kr), ” to make ” (cognate with Latin creo), with the preposition sam, “together” (cog. a/ua, ifiibs, Eng. ” same “), and has probably to be taken here in the sense of ” completely formed ” or ” accurately made, polished, refined ” — some noun meaning ” speech ” (esp. bhasha) being either expressed or understood with it. The term was, doubtless, originally adopted by native grammarians to distinguish the literary language from the uncultivated popular dialects — the forerunners of the modern vernaculars of northern India — which had developed side by side with it, and which were called (from the same root kar, but with a different preposition) Prakrita, i.e. either ” derived ” or ” natural, common ” forms of speech. This designation of the literary idiom, being intended to imply

a language regulated by conventional rules, also involves a distinction between the grammatically fixed language of Brah- manical India and an earlier, less settled, phase of the same language exhibited in the Vedic writings. For convenience the Vedic language is, however, usually included in the term, and scholars generally distinguish between the Vedic and the classical Sanskrit.

I. Sanskrit Language

The Sanskrit language, with its old and modern descendants, represents the easternmost branch of the great Indo-Germanic, or Aryan, stock of speech. Philological research has clearly established the fact that the Indo-Aryans must originally have immigrated into India from the north-west. In the oldest literary documents handed down by them their gradual advance can indeed be traced from the slopes of eastern Kabulistan down to the land of the five rivers (Punjab), and thence to the plains of the Yamuna (Jumna) and Ganga (Ganges). Numerous special coincidences, both of language and mythology, between the Vedic Aryans and the peoples of Iran also show that these two members of the Indo-Germanic family must have remained in close connexion for some considerable period after the others had separated from them.

The origin of comparative philology dates from the time when European scholars became accurately acquainted with the ancient language of India. Before that time classical scholars

had been unable to determine the true relations between the then known languages of our stock. This fact alone shows the importance of Sanskrit for comparative research. Though its value in this respect has perhaps at times been overrated, it may still be considered the eldest daughter of the old mother- tongue. Indeed, so far as direct documentary evidence goes, it may be said to be the only surviving daughter; for none of the other six principal members of the family have left any literary monuments, and their original features have to be reproduced, as best they can, from the materials supplied by their own daughter languages: such is the case as regards the Iranic, Hellenic, Italic, Celtic, Teutonic and Letto-Slavic languages. To the Sanskrit the antiquity and extent of its literary docu- ments, the transparency of its grammatical structure, the comparatively primitive state of its accent system, and the thorough grammatical treatment it has early received at the hand of native scholars must ever secure the foremost place in the comparative study of Indo-Germanic speech.

The Sanskrit alphabet consists of the following sounds : —

(a) Fourteen vowels, viz :

Ten simple vowels : a, a, i, 1, u, u, %, ?, / (J) ; and Alphabet. Four diphthongs : e, di, 0, du.

(b) Thirty-three consonants, viz. :

Five series of mutes and nasals :

guttural : k kh g gh h

palatal : c chj jh n

lingual : { th

dental : t ih d dh n

labial: p ph b bh m; Four semivowels : y r I v (w)

Three sibilants: palatal i ©, lingual s (sh), dental s; and A soft aspirate: h.

(c) Three unoriginal sounds, viz.

visarga (h), a hard aspirate, standing mostly for original s or r; and two nasal sounds of less close contact than the mute-nasals, viz. anusvara (tn) and anunasika (m).

As regards the vowels, a prominent feature of the language is the prevalence of a-sounds, these being about twice as frequent as all the others, including diphthongs taken Vowels. together (Whitney).

The absence of the short vowels e and from the Sanskrit alpha- bet, and the fact that Sanskrit shows the o-vowel where other vowels appear in other languages — e.g. bharantam = kpovTa, ferentem; janas= yevos, genus — were formerly considered as strong evidence in favour of the more primitive state of the Sanskrit vowel system as compared with that of the sister languages. Recent research has, however, shown pretty conclusively from certain indications in the Sanskrit language itself that the latter must at one time have possessed the same, or very nearly the same, three vowel-sounds, and that the differentiation of the original a-sound must, therefore, have taken place before the separation of the languages. Thus, Sans, carati, he walks, would seem to require an original Mreti (Gr. irc\« = queleti, Lat. colit), as otherwise the guttural k could not have changed to the palatal c (see below) ; and similarly Sa.ns.jdnu, knee, seems to stand

iorgenu (Lat. genu, Gi . ydvv). Not impossibly, however, this prevalence of pure a-sounds in Sanskrit may from the very beginning have been a mere theoretical or graphic feature of the language, the difference of pronunciation having not yet been pronounced enough for the early grammarians to have felt it necessary to clearly distinguish between the different shades of a-sounds.

The vowels e and 6, though apparently simple sounds, are classed as diphthongs, being contracted from original ai and au respectively, and liable to be treated as such in the phonetic modifications they have to undergo before any vowel except a.

As regards the consonants, two of the five series of mutes, the palatal and lingual series, are of secondary Coa- (the one of Indo-Iranian, the other of purely Indian) sonants. growth.

The palatals are, as a rule, derived from original gutturals, the modification being generally due to the influence of a neighbouring palatal sound i or y, or e (a). The surd aspirate ch, in words of Indo-Germanic origin, almost invariably goes back to original sk: e.g. chid- (chind-) = scindo,

The palatal sibilant i (pronounced sh) likewise originated from a guttural mute k, but one of somewhat different phonetic value from that represented by Sanskrit k or c. The latter, usually designated by W- (or q), is frequently liable to labialization (or dentalization) in Greek, probably owing to an original pronunciation kw (qu) : e.g. katara = ir6repos, uter; while the former (k 1) shows invariably k in Greek, and a sibilant in the Letto-Slavic and the Indo-Iranian languages: e.g. svan (sun) = icbwv (kw), cams, Ger. Hund; das”an = Seieo, decern, Goth, taihun.

LANGUAGE]

SANSKRIT

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Dectea-

The non-original nature of the palatals betrays itself even in Sanskrit by their inability to occur at the end of a word — e.g. ace. vacam = Lat. vocem, but nom. vdk = vox — and by otherwise frequently reverting to the guttural state.

The Unguals differ in pronunciation from the dentals in their being

uttered with the tip of the tongue turned up to the dome of the palate, while in the utterance of the dentals it is pressed against the upper teeth, not against the upper gums as is done in the English dentals, which to Hindus sound more like their own Unguals. The latter, when occurring in words of Aryan origin, are, as a rule, modifications of original dentals, usually accompanied by the loss of an r or other adjoining consonant; but more commonly they occur in words of foreign, probably non-Aryan, origin. Of regular occurrence in the language, however, is the change of dental n into lingual n, and of dental s into lingual s, when preceded in the same word by certain other letters. The combination ks seems sometimes to stand for ks (? kst) as in Sans, aksa, Gr. a£«c, axle; Sans, dakshina, Gr. 6e£ios (but Lat. dexter); sometimes for kt, e.g. Sans, kshiti, Gr. ktwis (but Sans, kshiti = Gr. (jSiais) ; Sans, takshan, Gr. tUtoiv.

The sonant aspirate h is likewise non-original, being usually de- rived from original sonant aspirated mutes, especially gh, e.g. harnsa = xv v (for xa«), anser, Ger. Gans; a}iam = t-yuv, ego, Goth. ik.

The contact of final and initial letters of words in the same sentence is often attended in Sanskrit with considerable euphonic modifica- Ph tic ti° ns l a “d we have no means of knowing how far the

oae practice of the vernacular language may have corresponded

changes. tQ t jj ese phonetic theories. There can be no doubt, how- ever, that a good deal in this respect has to be placed to the account of grammatical reflection ; and the very facilities which the primitive structure of the language offered for grammatical analysis and an insight into the principles of internal modification may have given the first impulse to external modifications of a similar kind.

None of the cognate languages exhibits in so transparent a manner as the Sanskrit the cardinal principle of Indo-Germanic word- formation by the addition of inflectional endings— either case-endings or personal terminations (themselves probably original roots) — to stems obtained, mainly by means of suffixes, from monosyllabic roots, with or without internal modifications.

There are in Sanskrit declension three numbers and seven cases, not counting the vocative, viz. nominative, accusative, instru- mental (or sociative), dative, ablative, genitive and locative. As a matter of fact, all these seven cases appear, however, only in the singular of a-stems and of the pronominal declension. Other noun-stems have only one case- form for the ablative and genitive singular. In the plural, the

ablative everywhere shares its form with the dative (except in the personal pronoun, where it has the same ending as in the singular), whilst the dual shows only three different case-forms — one for the nominative and accusative, another for the instrumental, dative, and ablative, and a third for the genitive and locative.

The declension of a-stems corresponding to the first and second Latin declensions is of especial interest, not so much on account of its being predominant from the earliest time, and becoming more and more so with the development of the language, but because it presents the greatest number of alternative forms, which supply a kind of test for determining the age of literary productions, a test which indeed has already been applied to some extent by Professor Lanman, in his excellent Statistical Account of Noun Inflexion in the Veda. These alternative case-forms are : —

1 . asas and as for the nominative plural masc. and fern. : e.g. asvasas and asvas = equi (equae). The forms in asas — explained by Bopp as the sign of the plural as applied twice, and by Schleicher as the sign of the plural as added to the nominative singular — occur to those in as (i.e. the ordinary plural sign as added to the o-stem) in the Rigveda in the proportion of 1 to 2, and in the peculiar parts of the Atharvaveda in that of I to 25, whilst the ending as alone remains in the later language.

2. o and ani for the nominative and accusative plural of neuters: as yuga, yugani = fvy6., juga. The proportion of the former ending to the latter in the Rik is 11 to 7, in the Atharvan 2 to 3, whilst the classical Sanskrit knows only the second form.

3. ebhis and ais for the instrumental plural masc. and neuter, e.g. devebhis, devais. In the Rik the former forms are to the latter in the proportion of 5 to 6, in the Atharvan of I to 5, while in the later language only the contracted form is used. The same con- traction is found in other languages; but it is doubtful whether it did not originate independently in them.

4. d and au for the nominative and accusative dual masc., e.g. ubhd, ubhdu = apxpu. In the Rik forms in a outnumber those in au more than eight times; whilst in the Atharvan, on the contrary, those in au (the only ending used in the classical language) occur five times as often as those in a.

5. a and ena (end) for the instrumental singular masc. and neut., as dana, ddnena = dono. The ending ena is the one invariably used in

the later language. It is likewise the usual form in the Veda; but in a number of cases it shows a final long vowel which, though it may be entirely due to metrical requirements, is more probably a relic of the normal instrumental ending a, preserved for prosodic reasons. For the simple ending a, as compared with that in ena, Professor Lanman makes out a proportion of about I to 9 in the

Verb system.

Rigveda (altogether 1 14 cases) ; while in the peculiar parts of the Atharvan he finds only 1 1 cases.

6. am and anam for the genitive plural, e.g. (asvam), asvdnam = ‘iiriruv, equum iequorum). The form with inserted nasal (doubt-, less for anam, as in Zend aspandm), which is exclusively used in the later language, is also the prevailing one in the Rik. There are, however, a few genitives of a-stems in original am (for a-am), which also appear in Zend, Professor Lanman enumerating a dozen in- stances, some of which are, however, doubtful, while others are merely conjectural.

The Sanskrit verb system resembles that of the Greek in variety and completeness. While the Greek excels in nicety and definite- ness of modal distinction, the Sanskrit surpasses it in primitiveness and transparency of formation. In this part of the grammatical system there is, however, an even greater difference than in the noun inflection between the Vedic and the classical Sanskrit. While the former shows, upon the whole, the full complement of modal forms exhibited by the Greek, the later language has practically discarded the subjunctive mood. The I ndo- Aryans never succeeded in working out a clear formative dis- tinction between the subjunctive and indicative moods; and, their syntactic requirements becoming more and more limited, they at last contented themselves, for modal expression, with a present optative and imperative, in addition to the indicative tense-forms, and a little-used aorist optative with a special ” precative ” or ” benedictive ” meaning attached to it.

Another part of the verb in which the later language differs widely from Vedic usage is the infinitive. The language of the old hymns shows a considerable variety of case-forms of verbal abstract nouns with the function of infinitives, a certain number of which can still be traced back to the parent language, as, for instance, such dative forms as jn)-a.se = viv-ere; sah-adhydi = txioBtu.; da’- mane = S6iitvat.; dd’-vane = 8ovvai. Further, ji-she, “to conquer,” for ji-se, apparently an aorist infinitive with the dative ending (parallel to the radical forms, such as yudh-e, “to fight,” drs’-e, “to see “), thus corresponding to the

Greek aorist infinitive XOo-oi (but cf. also Latin da-re, for dase, esse, &c). The classical Sanskrit, on the other hand, practically uses only one infinitive form, viz. the accusative of a verbal noun in tu, e.g. sthdtum, etum, corresponding to the Latin supinum datum, itv.m. But, as in Latin another case, the ablative (datu), of the same abstract noun is utilized for a similar purpose, so the Vedic language makes two other cases do duty as infinitives, viz. the dative in tave [e.g. ddtave, and the an- omalous etavii) and the gen.-abl. in tos (datos). A prominent feature of the later Sanskrit syntax is the so-called gerund or indeclinable participle in tvd, apparently the instrumental of a stem in tvd (prob- ably a derivative from that in tu), as well as the gerund in ya (or tya after a final short radical vowel) made from compound verbs. The old language knows not only such gerunds in tvd, using them, however, very sparingly, but also corresponding dative forms in tvdya (yuktvaya) and the curious contracted forms in tvi' (krtw, " to do "). And, besides those in ya and tya, it frequently uses forms with a final long vowel, as bhid-ya, i-tyd, thus showing the former to be shortened instrumentals of abstract nouns in i and ti.

The Sanskrit verb, like the Greek, has two voices, active and middle, called, after their primary functions, parasmai-pada, " word for another," and dtmane-pada, " word for one's self." While in Greek the middle forms have to do duty also for the passive in all tenses except the aorist and future, the Sanskrit, on the other hand, has developed for the passive a special present-stem in ya, the other tenses being supplied by the corresponding middle forms, with the exception of the third person singular aorist, for which a special form in i is usually assigned to the passive.

The present-stem system is by far the most important part of the whole verb system, both on account of frequency of actual occur- rence and of its excellent state of preservation. It is with regard to the different ways of present-stem formation that the entire stock of assumed roots has been grouped by the native grammarians under ten different classes. These classes again naturally fall under two divisions or " conjugations," with this characteristic difference that the one (corresponding to Gr. conj. in w) retains the same stem (ending in a) throughout the present and imperfect, only lengthening the final vowel before terminations beginning with v or m (not final) ; while the other (corresponding to that in /u) shows two different forms of the stem, a strong and a weak form, according as the accent falls on the stem-syllable or on the personal ending: e.g. 3 sing, bhdra-ti, epei — 2 pi. bhdra-tha, tfrkpere: but e-ti, elcri ■ — i-thd, ire (for Ire) : I sing, strno-mi, otSpvviu — I pi. strnu-mds (a-Topvvfiet) .

As several of the personal endings show a decided similarity to personal or demonstrative pronouns, it is highly probable that, as might indeed be a priori expected, all or most of them are of pronominal origin — though, owing to their exposed position and consequent decay, their original form and identity cannot now be determined with certainty. The active singular terminations, with the exception of the second person of the imperative, are unaccented and of comparatively light appearance; while those of the dual and plural, as well as the middle terminations, have the accent, being apparently too heavy to be supported by the stem-accent, either because, as Schleicher supposed, they are composed of two

different pronominal elements, or otherwise. The treatment of the personal endings in the modifying, and presumably older, conjugation may thus be said somewhat to resemble that of enclitics in Greek.

In the imperfect the present-stem is increased by the augment, consisting of a prefixed a. Here, as in the other tenses in which it appears, it has invariably the accent, as being the distinctive element (originally probably an independent demonstrative adverb ” then “)’ for the expression of past time. This shifting of the word-accent seems to haye contributed to the further reduction of the personal endings, and thus to have caused the formation of a new, or secondary, set of terminations which came to be appropriated for secondary tenses and mocds generally. As in Greek poetry, the augment is frequently omitted in Sanskrit.

The mood-sign of the subjunctive is a, added to (the strong form of) the tense-stem. If the stem ends already in a, the latter becomes lengthened. As regards the personal terminations, some persons take the primary, others the secondary forms, while others again may take either the one or the other. The first singular active, however, takes ni instead of mi, to distinguish it from the indicative. But besides these forms, showing the mood-sign a, the subjunctive (both present and aorist) may take another form, without any distinctive modal sign, and with the secondary endings, being thus identical with the augmentless form of the preterite.

The optative invariably takes the secondary endings, with some

peculiar variations. In the active of the modifying conjugation its mood-sign is yd, affixed to the weak form of the stem: e.g. root as — ■ syam = Lat. stem, slm (where Gr., from analogy to iarl, &c, shows irregularly the strong form of the stem, e'rji', for ia-a)-v. as in 1st sing, of verbs in m, it also has irregularly the primary ending, Xe(7i-oi/Lu = S. rece-y-am) ; whilein the a-conjugation and throughout the middle the mood-sign is I, probably a contraction of yd: e.g. bhdres = ipoi.s.

Besides the ordinary perfect, made from a reduplicated stem, with distinction between strong (active singular) and weak forms, and a partly peculiar set of endings, the later language makes large use of a periphrastic perfect, consisting of the accusative of a feminine abstract noun in a {-dm) with the reduplicated perfect forms of the auxiliary verbs kar, " to do," or as (and occasionally bhii), " to be." Though more particularly resorted to for the derivative forms of conjugation— viz. the causative (including the so-called tenth conjugational class), the desiderative, intensive and denominative — this perfect-form is also commonly used with roots beginning with prosodically long vowels, as well as with a few other isolated roots. In the Rigveda this formation is quite un- known, and the Atharvan offers a single instance of it, from a causative verb, with the auxiliary kar. In the Vedic prose, on the other hand, it is rather frequent, 1 and it is quite common in the later language.

In addition to the ordinary participles, active and middle, of the reduplicated perfect— e.g. jajan-v&n, yeyov-ix: bubudk-dnd, TreTrva-fiim — there is a secondary participial formation, obtained by affixing the possessive suffix vat (vant) to the passive past parti- ciple: e.g. krta-vant, lit. " having (that which is) done." A second- ary participle of this kind occurs once in the Atharvaveda, and it is occasionally met with in the Brahmanas. In the later language, however, it not only is of rather frequent occurrence, but has assumed quite a new function, viz. that of a finite perfect-form; thus krtavdn, krtavantas, without any auxiliary verb, mean, not " having done," but " he has done," " they have done."

The original Indo-Germanie future-stem formation in sya, with primary endings — e.g. dasydti = Swaa (for Siicrtn.) — is the ordinary tense-form both in Vedic and classical Sanskrit — a preterite of it, with a conditional force attached to it {dddsyat), being also common to all periods of the language.

Side by side with this future, however, an analytic tense-form makes its appearance in the Brahmanas, obtaining wider currency in the later

language. This periphrastic future is made by means of the nominative singular of a nomen agentis in tar (ddtar, nom. data = Lat. dator), followed by the corresponding present forms of as. ” to be ” {data-smi, as it were, daturus sum), with the exception of the third persons, which need no auxiliary, but take the respective nominatives of the noun.

The aorist system is somewhat complicated, including as it does augment-preterites of various formations, viz. a radical aorist, sometimes with reduplicated stem — e.g. dsiham=tart)v: srudhi = k \0#i; ddudrot; an o-aorist (or thematic aorist) with or without reduplication — e.g. dricas =

■ l Tt also shows occasionally other tense-forms than the perfect of the same periphrastic formation with kar.

in the older but more numerously in the later language — make their aorist-stem by the addition of sa — e.g. ddikshas = &>«£aj.

As regards the syntactic functions of the three preterites — the imperfect, perfect and aorist — the classical writers wake virtually no distinction between them, but use them quite indiscriminately. In the older language, on the other hand, the imperfect is chiefly used as a narrative tense, while the other two generally refer to a past action which is now complete — the aorist, however, more frequently to that which is only just done or completed. The perfect, owing doubtless to its reduplicative form, has also not infrequently the force of an iterative, or intensive, present.

The Sanskrit, like the Greek, shows at all times a considerable power and facility of noun-composition. But, while in the older language, as well as in the earlier literary products of the Wora . classical period, such combinations rarely exceed the / orlna y on limits compatible with the general economy of inflectional speech, during the later, artificial period of the language they gradually become more and more excessive, both in size and fre- quency of use, till at last they absorb almost the entire range of syntactic construction.

One of the most striking features of Sanskrit word-formation is that regular interchange of light and strong vowel-sounds, usually designated by the native terms of guna (quality) and vriddhi (in-crease). The phonetic process implied in these terms consists in the raising, under Certain conditions, of a radical or thematic light vowel i, u, r, I, by means of an inserted a-sound, to the diphthongal (guna) sounds ai (Sans, e), &u (Sans. 6), and the combination ar and al

respectively, and, by a repetition of the same process, to the (vriddhi) sounds di, au, ar, and dl respectively. Thus from root vid, ” to know,” we have veda, ” knowledge,” and therefrom vdidika; from yuj, ydga, ydugika. While the interchange of the former kind, due mainly to accentual causes, was undoubtedly a common feature of Indo-Germanic speech, the latter, or vpddhi-change, which chiefly occurs in secondary stems, is probably a later develop- ment. Moreover, there can be no doubt that the vriddhi-vowels are really due to what the term implies, viz. to a process of ” in- crement,” or vowel-raising. The same used to be universally as- sumed by comparative philologists as regards the relation between the guna-sounds ai (e) and au (o) and the respective simple i- and M-sounds. According to a more recent theory, however, which has been very generally accepted, we have rather to look upon the heavier vowels as the original, and upon the lighter vowels as the later sounds, produced through the absence of stress and pitch. The grounds on which this theory is recommended are those of logical consistency. In the analogous cases of interchange between r and ar, as well as / and al, most scholars have indeed been wont to regard the svllabic r and I as weakened from original ar and al, while the native grammarians represent the latter as produced from the former by increment. Similarly the verb as (es), ” to be,” loses its vowel wherever the radical syllable is unaccented, e.g. dsti, Lat. est — smds, s{u)mus; opt. syam, Lat. siem {slm). On the strength of these analogous cases of vowel-modification we are, therefore, to accept some such equation as this : — dsmi: smds — bkpKop.a.1’. %bp{a)Kov = Xei7rco: Xi-jrciy

= emi {tlin. t) : imds (I/iec for ip&v) ~ u/x&r(i), — the subsequent modifications in the radical and formative syllables being due to the effects of ” analogy ” (cf. G. Meyer, Griech. Gramm., § 487). Now, if there be any truth in the ” agglutination ” theory, according to which the radical and formative elements of Indo-Germanic speech were at one time independent words, we would have to be prepared for a pretty liberal allowance, to the parent language, of diphthongal mono-syllables such as deik neu, while simple combinations such as dik nu could only spring up after separate syllable-words had become united by the force of a common accent. But, whether the agglu- tinationists be right or wrong, a theory involving the priority of the diphthongal over the simple sounds can hardly be said to be one of great prima facie probability; and one may well ask whether the requirements of logical consistency might not be satisfied in some other, less improbable, way.

Now, the analogous cases which have called forth this theory turn upon the loss of a radical or suffixal a (e), occasioned by the shifting

of the word-accent to some other syllable, e.g. ace. mdtdram, instr. matra; irkrotiai, kirTbp.i\v. SipKonai, iSp{a)Kov: dsmi, smds. Might we not then assume that at an early stage of noun and verb inflection, through the giving way, under certain conditions, of the stem-o (e), the habit of stem-gradation, as an element of inflection.

LITERATURE!

SANSKRIT

came to establish itself and ultimately to extend its sphere over stems with i- and tt-vowels, but that, on meeting here with more resistance 1 than in the o (e)-vowel, the stem-gradation then took the shape of a raising of the simple vowel, in the ” strong ” cases and verb-forms, by that same o-element which constituted the distinctive element of those cases in the other variable stems? In this way the above equation would still hold good, and the corre- sponding vowel-grades, though of somewhat different genesis, would yet be strictly analogous. At all events in the opinion of the present writer, the last word has not yet been said on the important point of Indo-Germanic vowel-gradation.

The accent of Sanskrit words is marked only in the more important Vedic texts, different systems of notation being used in different works. Our knowledge of the later accentuation of words is entirely derived from the statements of gram- marians. As in Greek, there are three accents, the udutta (” raised,” i.e. acute), the anudatta (” not raised,” i.e. grave), and the svarita (” sounded, modulated,” i.e. circumflex). The last is a combination of the two others, its proper use being confined almost entirely to a vowel preceded by a semivowel y or v, repre- senting an original acuted vowel. Hindu scholars, however, also include in this term the accent of a grave syllable preceded by an acuted syllable, and itself followed by a grave.

The Sanskrit and Greek accentuations present numerous coinci- dences. Although the Greek rule, confining the accent within the last three syllables, has frequently obliterated the original likeness, the old features may often be traced through the later forms. Thus, though augmented verb-forms in Greek cannot always have the accent on the augment as in Sanskrit, they have it invariably as little removed from it as the accentual restrictions will allow; e.g. dbharam, ifepov. dbhardma, tykponev: dbharamahi, iep6p.d)a.

The most striking coincidence in noun declension is the accentual distinction made by both languages between the ” strong ” and ” weak ” cases of monosyllabic nouns — the only difference in this respect being that in Sanskrit the accusative plural, as a rule, has the accent on the case-ending, and consequently shows the weak form of the stem; e.g. stem pad, iroS: pidam, irbSa: padas, xo56s: padi, irobl: padas, Tr66es: padds, ir65a.s: pad&m, iroSwv: paisu, iroal. – In Sanskrit a few other classes of stems (especially present participles in ant, at), accented on the last syllable, are apt to yield their accent to heavy vowel (not consonantal) terminations; compare the analogous accentuation of Sanskrit and Greek stems in tar : pitdram, iraripa: pilre, irarpos’. pitdras, irarepes: pitfshu, irarp(a)at:

The vocative, when heading a sentence (or verse-division), has invariably the accent on the first syllable; otherwise it is not accented.

Finite verb-forms also, as a rule, lose their accent, except when standing at the beginning of a sentence or verse-division (a vocative not being taken into account), or in dependent (mostly relative) clauses, or in conjunction with certain particles. Of two or more co-ordinate verb-forms, however, only the first is unaccented.

• In writing Sanskrit the natives, in different parts of India, generally employ the particular character used for writing their own vernacular. .ˆ The character, however, most widely understood and

irVf employed by Hindu scholars, and used invariably in characters. £ uro p ean editions of Sanskrit works (unless printed in Roman letters) is the Nagari, or ” town-script,” also commonly called Devanagari, or nagari of the gods.

The origin of the Indian alphabets is still enveloped in doubt. The oldest hitherto known specimens of Indian writing are a number of rock-inscriptions, containing religious edicts in Pali (the Prakrit used in the southern Buddhist scriptures), issued by the emperor Asoka (Piyadasi) of the Maurya dynasty, in 253-251 B.C., and scattered over the area of northern India from the vicinity of Pesha- war, on the north-west frontier, and Girnar in Gujarat, to Jaugada and Dhauli in Katak, on the eastern coast. The most western of these inscriptions — those found near Kapurdagarhi or Shahbaz- garhi, and Mansora — are executed in a different alphabet from the others. It reads from right to left, and is usually called the Arian Pali alphabet, it being also used on the coins of the Greek and Indo-Scythian princes of Ariana; while the other, which reads from left to right, is called the Indian Pali alphabet. The former — also called Kharoshfhi or Gandhara alphabet (lipi)—

which is manifestly derived from a Semitic (probably Aramaean) source, has left no traces on the subsequent development of Indian writing. Thelndo- Pali (or Brahml) alphabet, on the other hand, from which the modern Indian alphabets are derived, is of more uncertain origin. The similarity, however, which several of its letters present to those of the old Phoenician alphabet (itself probably derived from the Egyptian hieroglyphics) suggests for this alphabet also the probability of a Semitic origin, though, already at Asoka's time, the In dians had worked it up to a high degree of perfection an d wonder-

1 We might compare the different treatment in Sanskrit of an and in bases (murdhdni-murdhnA ; vadini-vadina) ; for, though the latter are doubtless of later origin, their inflection might have been expected to be influenced by that of the former. Also a comparison of such forms as {devd) devinam (agni) agnlnAm, and (dhenu) dhenunAm, tells in favour of the i- and «-vowels, as regards power of resistance, inasmuch as it does not require the accent in order to remain intact.

fully adapted it to their peculiar scientific ends. The question as to the probable time and channel of its introduction can scarcely be expected ever to be placed beyond all doubt. The late Professor Buhler has, however, made it very probable that this alphabet was introduced into India by traders from Mesopotamia about 800 B.C. At all events, considering the high state of perfection it exhibits in the Maurya and Andhra inscriptions, as well as the wide area over which these are scattered, it can hardly be doubted that the art of writing must have been known to and practised by the Indians for various purposes long before the time of Asoka. The fact that no. reference to it is found in the contemporary literature has probably to be accounted for by a strong reluctance on the part of the Brahmans to commit their sacred works to writing.

As regards the numeral signs used in India, the Kharoshthi inscriptions of the early centuries of our era show a numerical system in which the first three numbers are represented by as many vertical strokes, whilst 4 is marked by a slanting cross, and 5-9 by 4() I, &c, to 4()4()l; then special signs for 10, 20 and 100, the intervening multiples of 10 being marked in the vigesimal fashion, thus 50 = 2o(f)2o()lo. This system has been proved to be' of Semitic, probably' Aramaic, origin. In the Brahml in- scriptions up to the end of the 6th century of our era, another system is used in which 1-3 are denoted by as many horizontal strokes, and thereafter by special syllabic signs for 4-9, the decades 10-90, and for 100 and 1000. This system was most likely derived from hieratic sources of Egypt. The decimal system of cipher notation, on the other hand, which is first found used on a Gujarat

inscription of A.D. 595, seems to be an invention of Indian astronomers or mathematicians, based on the existing syllabic (or word) signs or equivalents thereof.

The first two Sanskrit grammars published by Europeans were those of the Austrian Jesuit Wesdin, called Paulinus a Sancto Bartholomaeo (Rome, 1790-1804). These were followed by those of H. C. Colebrooke (1805; based on Panini's system), Carey (1806), Wilkins (1808), Forster (1810), F. Bopp (1827), H. H. Wilson, Th. Benfey, &c. These, as well as those of Max Miiller, Monier Williams and F. Kielhorn, now most widely used, deal almost exclusively with classical Sanskrit; whilst that of W. D. Whitney treats the whole language historically; as does also J. Wackernagel's not yet completed Altindische Grammatik.

The first Sanskrit dictionary was that of H. H. Wilson (1819; 2nd ed., 1832), which was followed by the great Sanskrit-German Worterbuch, published at St Petersburg in 7 vols, by Professors Bohtlingk and Roth. Largely based on this great thesaurus are the Sanskrit-English dictionaries by Sir M. Williams (2nd ed., 1899), Th. Benfey, A. A. Macdonell, &c. On the history of the Indian alphabets, cf. G. Buhler, Indische Palaographie (1896); A. C. Burnell, Elements of South Indian Palaeography (2nd ed., 1878), R. Cust's resume 1 in Jour. Roy. As. Soc, n.s. vol. xvi.

II. Sanskrit Literature

The history of Sanskrit literature labours under the same disadvantage as the political history of ancient India from the total want of anything like a fixed chronology. In that vast range of literary development there is scarcely a work of importance the date of which scholars have fixed with absolute certainty. The original composition of most Sanskrit works can indeed be confidently assigned to certain general periods of literature, but as to many of them, and these among the most important, scholars have but too much reason to doubt whether they have come down to us in their original shape, or whether they have not undergone alterations and additions so serious as to make it impossible to regard them as genuine witnesses of any one phase of the development of the Indian mind. Nor can we expect many important chronological data from new materials brought to light in India. Though by such discoveries a few isolated spots may be lighted up here and there, the real task of clearing away the mist which at present obscures our view, if ever it can be cleared away, will have to be performed by patient research and a more minute critical examination of the multitudinous writings which have been handed down from the remote past. In the following sketch it is

intended to take a rapid view of the more important works and writers in the several departments of literature.

In accordance with the two great phases of linguistic develop- ment referred to, the history of Sanskrit literature readily divides itself into two principal periods — the Vedic and the classical. These periods partly overlap, and some of the later Vedic work are included in that period on account of the subjects with which they deal, and for their archaic style, rather than for any just claim to a higher antiquity than may have to be assigned to the oldest works of the classical Sanskrit.

[VEDIC PERIOD

i. The Vedic Period 1

The term veda — i.e. ” knowledge,” (sacred) ” lore ” — embraces a body of writings the origin of which is ascribed to divine Samhitas. revelation (sruti, literally “hearing”), and which forms the foundation of the Brahmanical system of religious belief. This sacred canon is divided into three or (according to a later scheme) four co-ordinate collections, likewise called Veda: (i) the Rig-veda, or lore of praise (or hymns); (2) the Sama-veda, or lore of tunes (or chants) ; (3) the Yajur-veda, or lore of prayer (or sacrificial formulas); and (4) the Atharva-veda, or lore of the Atharvans. Each of these four Vedas consists primarily of a collection (samhita) of sacred, mostly poetical, texts of a devotional nature, called mantra. This entire body of texts (and particularly the first three collec- tions) is also frequently referred to as the trayi vidya, or threefold wisdom, of hymn (rich 2), tune or chant (saman), and prayer (yajus) — the fourth Veda, if at all included, being in that case classed together with the Rik.

The Brahmanical religion finds its practical expression chiefly in sacrificial performances. The Vedic sacrifice requires for its proper performance the attendance of four officiating priesis! ° P” ests > eacri °f whom is assisted by one or more (usually three) subordinate priests, viz.: (1) the Hotar (or hotri, i.e. either ” sacrificer,” or ” invoker “), whose chief business is to invoke the gods, either in short prayers pronounced over the several oblations, or in liturgical recitations (sastra), made up of various hymns and detached verses; (2) the Udgatar (udgatri), or chorister, who has to perform chants (stotra) in connexion with the hotar’s recitations; (3) the Adhvaryu, or

offering priest par excellence, who performs all the material duties of the sacrifice, such as the kindling of the fires, the preparation of the sacrificial ground and the offerings, the making of • oblations, &c. ; (4) the Brahman, or chief “priest,” who has to superintend the performance and to rectify any mistakes that may be committed. Now, the first three of these priests stand in special relation to three of the Vedic Samhitas in this way: that the Samhitas of the Samaveda and Yajurveda form special song and prayer books, arranged for the practical use of the udgatar and adhvaryu respectively; whilst the Rik-samhita, though not arranged for any such practical purpose, contains the entire body of sacred lyrics whence the hotar draws the material for his recitations. The brahman, however, had no special text-book assigned to him, but was expected to be familiar with all the Samhitas as well as with the practical details of the sacrificial performance (see Brahman and Brahmana). It sometimes happens that verses not found in our version of the Rik-samhita, but in the Atharvaveda- samhita, are used by the hotar; but such texts, if they did not actually form part of some other version of the Rik — as Sayana in the introduction to his commentary on the Rik-samhita assures us that they did— were probably inserted in the liturgy subsequent to the recognition of the fourth Veda.

The several Samhitas have attached to them certain theological prose works, called Brahmana, which, though subordinate in authority to the Mantras or Samhitas, are like them held to be divinely revealed and to form part of the canon. The chief works of this class are of an exegetic nature, — their purport being to supply a dogmatic exposition of the sacrificial ceremonial and to explain the mystic import of the different rites and utterances included therein (see Brahmana).

More or less closely connected with the Brahmanas (and in a few exceptional cases with Samhitas) are two classes of treatises, called Aranyaka and Upanishad. The Aranyakas, i.e. works ” relating to the .forest,” being intended to be read by those who have retired from the world and lead the life of anchorites, do not greatly differ in character and style from the Brahmanas,

1 J. Muir’s Original Sanskrit Texts (5 vols., 2nd ed.) forms the most complete general survey of the results of Vedic research.

2 The combination ch, used (in conformity with the usual English practice) in this sketch of the literature, corresponds to the simple c — as ri does to r — in the scheme of the alphabet.

Brah- manas,

but like them are chiefly ritualistic, treating of special cere- monies not dealt with, or dealt with only imperfectly, in the latter works, to which they thus stand in the relation Aranyakas of supplements. The Upanishads, however, are of a and purely speculative nature, and must be looked upon as u ˆ a ”’~ the first attempts at a systematic treatment of meta- physical questions. The number of Upanishads hitherto known is very considerable (about 170); but, though they nearly all profess to belong to the Atharvaveda, they have to be assigned to very different periods of Sanskrit literature — some of them being evidently quite modern productions. The oldest treatises of this kind are doubtless those which form part of the Samhitas, Brahmanas and Aranyakas of the three older Vedas, though not a few others which have no such special connexion have to be classed with the later products of the Vedic age. 3

As the sacred texts were not committed to writing till a much later period, but were handed down orally in the Brahmanical schools, it was inevitable that local differences of reading should spring up, which in course of time recen . gave rise to a number of independent versions. Such slons. different text-recensions, called Sakha (i.e. branch), were at one time very numerous, but only a limited number have survived. As regards the Samhitas, the poetical form of the hymns; as well as the concise style of the sacrificial formulas, would render these texts less liable to change, and the dis- crepancies of different versions would chiefly consist in various readings of single words or in the different arrangement of the textual matter. But the diffuse ritualistic discussions and loosely connected legendary illustrations of the Brahmarias offered scope for very considerable modifications in the tradi- tional matter, either through the ordinary processes of oral transmission or through the special influence of individual teachers.

Besides the purely ceremonial matter, the Brahmanas also contained a considerable amount of matter bearing on the correct interpretation of the Vedic texts; and, indeed, vedsngas. the sacred obligation incumbent on the Brahmans of handing down correctly the letter and sense of those texts necessarily involved a good deal of serious grammatical and etymological study in the Brahmanical schools. These literary pursuits could not but result in the accumulation of much learned material, which it would become more and more desirable to throw into a systematic form, serving at the same time as a guide for future research. These practical requirements were met by a class of treatises, grouped under six different heads or subjects,

called Veddngas, i.e. members, or limbs, of the (body of the) Veda. None of the works, however, which have come down to us under this designation can lay any just claim to being considered the original treatises on their several subjects; they evidently represent a more or less advanced stage of scientific development. Though a few of them are composed in metrical form — especially in the ordinary epic couplet, the anushtubh sloka, consisting of two lines of sixteen syllables (or of two octosyllabic padas) each — the majority belong to a class of writings called sutra, i.e. ” string,” consisting of Sutras. strings of rules in the shape of tersely expressed aphorisms, intended to be committed to memory. The Sutras form a connecting link between the Vedic and the classical periods of literature. But, although these treatises, so far as they deal with Vedic subjects, are included by the’ native authorities among the Vedic writings, and in point of language may, generally speaking, be considered as the latest products of the Vedic age, they have no share in the sacred title of Sruti or revelation. They are of human, not of divine, origin. Yet, as the production of men of the highest standing, profoundly versed in Vedic lore, the Sutras are regarded as works of great authority, second only to that of the revealed Scriptures; and their relation to the latter is expressed in the generic title of Smriti, or Tradition, usually applied to them.

3 Cf. P. Deussen, The Philosophy of the Upanishads (Edinburgh, 1906), where these treatises are classified ; Jacob, A Concordance to the Principal Upanishads and Bhagavadglta (Bombay S.S., 1891).

The six branches of Vedic science, included under the term Vedanga, are as follows: —

1. Siksha, or Phonetics. — The privileged position of representing this subject is assigned to a small treatise ascribed to the great

grammarian P&nini, viz. the Paitinlya siksha, extant Phonetics. in tWQ different (Rik and Yajus) recensions. But neither this treatise nor any other of the numerous sikshas which have recently come to light can lay claim to any very high age. Scholars, however, usually include under this head certain works, called Prdtisakhya, i.e. ” belonging to a certain Sakha or recension,” which deal minutely with the phonetic

peculiarities of the several Samhitas, and are of great importance for the textual criticism of the Vedic Samhitas.

2. Chhandas, or Metre. — Tradition makes the Chhandah-sulra of Pingala the starting-point of prosody. The Vedic metres, however,

occupy but a small part of this treatise, and they are metre. evidently dealt with in a more original manner in the Nidana-sutra of the Samaveda.and in a chapter of theRik-pratisakhya. For profane prosody, on the other hand, Pingala's treatise is rather valuable, no less than 160 metres being described by him.

3. Vyakarana, or Grammar. — Panini's famous grammar is said „ to be the Vedanga; but it marks the culminating point of

r * grammatical research rather than the beginning, and besides treats chiefly of the post-Vedic language.

4. Ntrukta, or Etymology. — Yaska's Nirukta is the traditional representative of this subject, and this important work certainly Ei mo/o deals entirely with Vedic etymology and explanation. It

y sy ' consists, in the first place, of strings of words in three chapters: (1) synonymous words; (2) such as are purely or chiefly Vedic ; and (3) names of deities. These lists are followed by Yaska's commentary, interspersed with numerous illustrations. Yaska, again, quotes several predecessors in the same branch of science; and it is probable that the original works on this subject consisted merely of lists of words similar to those handed down by him.

5. Jyotisha, or Astronomy. — Although astronomical calculations are frequently referred to in older works in connexion with the

performance of sacrifices, the metrical treatise which has Astronomy. come ˆ own ro us j n t wo different recensions under the title of Jyotisha, ascribed to one Lagadha, or Lagata, seems indeed to be the oldest existing systematic treatise on astrono- mical subjects. With the exception of some apparently spurious verses of one of the recensions, it betrays no sign of the Greek influence which shows itself in Hindu astronomical works from about the 3rd century of our era; and its date may therefore be set down as probably not later than the early centuries after Christ.

6. Kalpa, or Ceremonial. — Tradition does not single out any special work as the Vedanga in this branch of Vedic science; but

the sacrificial practice gave rise to a large number of ˆ ere ” systematic sutra-manuals for the several classes of priests.

moaial. ˆhe most important of these works have come down to us, and they occupy by far the most prominent place among the literary productions of the sutra-period. The Kalpa-sutras, or rules of ceremonial, are of two kinds: (1) the Srauta-siitras, which are based on the sruti, and teach the performance of the great sacrifices, requiring three sacrificial fires; and (2) the Smarta-sutras, or rules based on the smriti or tradition. The latter class again includes two kinds of treatises: (1) the Grihya-sutras, or domestic rules, treating of ordinary family rites, such as marriage, birth, name- giving, &c, connected with simple offerings in the domestic fire; and (2) the Samaydcharika- (or Dharma-) sutras, which treat of customs and temporal duties, and are supposed to have formed the chief sources of the later law-books. Besides, the Srauta-siitras of the Yajurveda have usually attached to them a set of so-called Sulva- sutras, i.e. ” rules of the cord,” which treat of the measure- ment by means of cords, and the construction, of different kinds of altars required for sacrifices. These treatises are of special interest as supplying important information regarding the earliest geometrical operations in India. Along with the Sutras may be classed a large number of supplementary treatises, usually called Parisishfa (Trapa\i.T6fiiva) , on various subjects connected with the sacred texts and Vedic religion generally. ˆ

After this brief characterization of the various branches of Vedic literature, we proceed to take a rapid survey of the several Vedic collections.

A. Rigveda.’ — The Rigveda-samhita has come down to us in the

1 The Rigveda has been edited, together with the commentary of Sayana (of the 14th century), by Max Miiller (6 vols., London, 1849-1874; 2nded., 4vols., 1890-1892). The same scholar has published an edition of the hymns, both in the connected (samhita) and the disjoined (pada) texts, 1873-1877. An edition in Roman transliteration was published by Th. Aufrecht (Berlin, 1861-1863, 2nd ed. 1877). Part of an English translation (chiefly based on Sayana’s interpretation) was brought out by the late Professor H. H.Wilson (vols, i.-iii., 1850-1857) and completed by Professor E. B. Cowell (vols, iv.-vi., 1866-1888). We have also the first volume of a translation, with a running

recension of the Sakala school. Mention is made of several other versions; and regarding one of them, that of the Bashkalas, we have some further information, according to which it seems, „. . however, to have differed but little from the Sakala text. f «-

The latter consists of 1028 hymns, including eleven sa ™ a ” so-called Vdlakhilyds, which were probably introduced into the collection subsequently to its completion. The hymns are composed in a great variety of metres, and consist, on an average, of rather more than 10 verses each, or about 10,600 verses altogether. This body of sacred lyrics has been subdivided by ancient authorities in a twofold way, viz. either from a purely artificial point of view, into eight ashfakas of about equal length, or, on a more natural principle, based on the origin of the hymns, and invariably adopted by Euro- pean scholars, into ten books, or mandalas, of unequal length. Tradition (not, however, always trustworthy in this respect) has handed down the names of the reputed authors, or rather inspired ” seers ” (rishi), of most hymns. These indications have enabled scholars to form some idea as to the probable way in which the Rik-samhita originated, though much still remains to be cleared up by future research.

Mandalas ii.-vii. are evidently arranged on a uniform plan. Each of them is ascribed to a different family of rishis, whence they are usually called the six “family-books”: ii., the Gritsamadas; iii., the Visvamitras or Kusikas; iv., the Vamadevyas; v., the Atris; vi., the Bharadvajas; and vii., the Vasishthas. Further, each of these books begins with the hymns addressed to Agni, the god of fire, which are followed by those to Indra, the Jupiter Pluvius, whereupon follow those addressed to minor deities — the Visve Devah (“all-gods”), the Maruts (storm-gods), &c. Again, the hymns addressed to each deity are arranged in a descending order, according to the number of verses of which they consist.

Mandala i., the longest in the whole Samhita, contains 191 hymns, ascribed, with the exception of a few isolated ones, to sixteen poets of different families, and consisting of one larger (50 hymns) and nine shorter collections. Here again the hymns of each author are arranged on precisely the same principle as the ” family-books.” Mandalas viii. and ix., on the other hand, have a special character of their own. To the Samaveda-samhita, which, as we shall see, consists almost entirely of verses chosen from the Rik for chanting purposes, these two mandalas have contributed a much larger proportion of verses than any of the others. Now, the hymns of the eighth book are ascribed to a number of different rishis, mostly belonging to the Kanva family. The productions of each poet are usually, though not always, grouped

together, but no other principle of arrangement has yet been discovered. The chief peculiarity of this mandala, however, consists in its metres. Many of the hymns are composed in the form of stanzas, called pragatha (from ga, ” to sing “), consisting of two verses in the brihati and. satobrihatl metres; whence this book is usually known under the designation of Praga- thas. The other metres met with in this book are likewise such as were evidently considered peculiarly adapted for singing, viz. the gayatri (from ga, ” to sing “) and other chiefly octosyllabic metres. It is not yet clear how to account for these peculiarities; but further research may perhaps show either that the Kanvas were a family of udgatars, or chanters, or that, before the establishment of a common system of worship for the Brahmanical community, they were accustomed to carry on their liturgical service exclusively by means of chants, instead of using the later form of mixed recitation and chant. One of the rishis of this family is called Pragatha Kanva; possibly this surname ” pragatha ” may be an old, or local, synonym of udgatar, or perhaps of the chief chanter, the so-called Prastotar, or precentor. Another poet of this family is Medhatithi Kanva, who has likewise assigned to him twelve hymns in the first and largest groups of the first book. The ninth mandala, on the other hand, consists entirely of hymns (114) addressed to Soma, the deified juice of the so-called ” moon-plant ” (Sarcostemma viminale, or Asclepias acida), and ascribed to poets of different families. They are called pavamarii, ” purificational,” because they were to be recited by the hotar while the juice expressed from the soma plants was clarifying. The first sixty of these hymns are arranged strictly according to their length, ranging from ten down to four verses; but as to the remaining hymns no such principle of arrangement is observable, except perhaps in smaller groups of hymns. One might, therefore, feel inclined to look upon that first section as the body of soma hymns set apart, at the time of the first redaction of the Samhita, for the special purpose of being used as pavamanyas, — the remaining hymns having been added at subsequent redactions. It would not, however, by any means follow that all,

commentary, by M. Miiller, containing 12 hymns to the Maruts or storm-gods (1869). These were reprinted, together with the re-maining hymns to the Maruts, and those addressed to Rudra, Vayu and Vara, Vedic Hymns I. in S.B.E., vol. xxxii. (1891); where (vol. xlvi.) H. Oldenberg has also translated the hymns to Agni, in mandalas 1-5. A metrical English translation was published by R. H. T. Griffith (2 vols., Benares, 1896-1897). Complete German translations have been published, in verse, by H. Grass- mann (1876-1877) and, in

prose, with comm., A. Ludwig (1876- 1888). Cf. also Kaegi, The Rigveda (Eng. trans, by Arrowsmith, Boston, 1886).

or even any, of the latter hymns were actually later productions, as they might previously have formed part of the family collections, or might have been overlooked when the hymns were first collected. Other mandalas (viz. i. viii. and x.) still contain four entire hymns addressed to Soma, consisting together of 58 verses, of which only a single one (x. 25, 1) is found in the Samaveda-samhita, as also some 28 isolated verses to Soma, and four hymns addressed to Soma in conjunction with some other deity, which are entirely unrepre- sented in that collection.

Mandala x. contains the same number of hymns (191) as the first, which it nearly equals in actual length. The hymns are ascribed to many rishis, of various families, some of whom appear already in the preceding mandalas. The traditional record is, however, less to be depended upon as regards this book, many names of gods and fictitious personages appearing in the list of its fishis. In the latter half of the book the hymns are clearly arranged according to the number of verses, in decreasing order — occasional exceptions to this rule being easily adjusted by the removal of a few apparently added verses. A similar arrangement seems also to suggest itself in other portions of the book. This mandala stands somewhat apart from the preceding books, both its language and the general character of many of its hymns betraying a more recent origin. In this respect it comes nearer to the level of the Atharvaveda sarnhita, with which it is otherwise closely connected. Of some 1350 Rik-verses found in the Atharvan, about 550, or rather more than 40%, occur in the tenth mandala. In the latter we meet with the same tendencies as in the Atharvan to metaphysical specula- tion and abstract conceptions of the deity on the one hand, and to superstitious practices on the other. But, although in its general appearance the tenth mandala is decidedly more modern than the other books, it contains not a few hymns which are little, if at all, inferior, both in respect of age and poetic quality, to the generality of Vedic hymns, being perhaps such as had escaped the attentions of the former collectors.

It has become the custom, after Roth's example, to call the Rik-

samhita (as well as the Atharvan) an historical collection, as compared with the Samhitas put together for purely ritualistic pur- poses. And indeed, though the several family collections which make up the earlier mandalas may originally have served ritual ends, as the hymnals of certain clans or tribal confederacies, and although the Samhita itself, in its oldest form, may have been intended as a common prayer-book, so to speak, for the whole of the Brahmanical community, it is certain that in the stage in which it has been finally handed down it includes a certain portion of hymn material (and even some secular poetry) which could never have been used for purposes of religious service. It may, there- fore, be assumed that the Rik-samhita contains all of the nature of popular lyrics that was accessible to the collectors, or seemed to them worthy of being preserved. The question as to the exact period when the hymns were collected cannot be answered with any ap-

C roach to accuracy. For many reasons, however, which cannot e detailed here, scholars have come to fix on the year 1000 B.C. as an approximate date for the collection of the Vedic hymns. From that time every means that human ingenuity could suggest was adopted to secure the sacred texts against the risks connected with oral transmission. But, as there is abundant evidence to show that even then not only had the text of the hymns suffered corruption, but their language had become antiquated to a considerable extent, and was only partly understood, the period during which the great mass of the hymns were actually composed must have lain con- siderably farther back, and may very likely have extended over the earlier half of the second millenary, or from about 2000 to 1500 B.C.

As regards the people which raised for itself this imposing monument, the hymns exhibit it as settled in the regions watered by the mighty Sindhu (Indus), with its eastern and western tributaries, the land of the five rivers thus forming the central home of the Vedic people. But, while its advanced guard has already debouched upon the plains of the upper Ganga and Yamuna, those who bring up the rear are still found loitering far behind in the narrow glens of the Kubha (Cabul) and Gomati (Gomal). Scattered over this tract of land, in hamlets and villages, the Vedic Aryas are leading chiefly the life of herdsmen and husbandmen. The numerous clans and tribes, ruled over by chiefs and kings, have still constantly to vindicate their right to the land but lately wrung from an inferior race of darker hue; just as in these latter days their Aryan kinsmen in the Far West are ever on their guard against the fierce attacks of the dispossessed red-skin. Not unfrequently, too, the light-coloured Aryas wage internecine war with one another — as when the Bharatas, with allied tribes of the Panjab,

goaded on by the royal sage Visva- mitra, invade the country of the Tritsu king Sudas, to be defeated in the ” ten kings’ battle,” through the inspired power of the priestly singer Vasishtha. The priestly office has already become one of high social importance by the side of the political rulers, and to a large extent an hereditary profession; though it does not yet present the baneful features of an exclusive caste. The Aryan housewife shares with her husband the daily toil and joy, the privilege of worshipping the national gods and even the triumphs of song- craft, some of the finest hymns being attributed to female seers. The religious belief of the people consists in a system of natural

symbolism, a worship of the elementary forces of nature, regarded as beings endowed with reason and power superior to those of man. In giving utterance to this simple belief, the priestly spokesman has, however, frequently worked into it his own speculative and mystic notions. Indra, the stout-hearted ruler of the cloud-region, receives by far the largest share of the devout attentions of the Vedic singer. His ever-renewed battle with the malicious demons of darkness and drought, for the recovery of the heavenly light and the rain-spending cows of the sky, forms an inexhaustible theme of spirited song. Next to him, in the affections of the people, stands Agni (ignis), the god of fire, invoked as the genial inmate of the Aryan household, and as the bearer of oblations, and mediator between gods and men. Indra and Agni are thus, as it were, the divine representatives of the king (or chief) and the priest of the Aryan community; and if, in the arrangement of the Samhita, the Brahmanical collectors gave precedence to Agni. it was but one of many avowals of their own hierarchical pretensions. Hence also the hymns to Indra are mostly followed, in the family collections, by those addressed to the Visve Dev&h (the ” all-gods “) or to the Maruts, the warlike storm-gods and faithful companions of Indra, as the divine impersonations of the Aryan freemen, the vis or clan. But, while Indra and Agni are undoubtedly the favourite figures of the Vedic pantheon, there is reason to believe that these gods had but lately supplanted another group of deities who play a less prominent part in the hymns, viz. Father Heaven (Dyaus Pitar, Zeus irariip, Jupiter) ; Varuna (probably ouparas), the all-embracing (esp. nocturnal) heavens; Mitra (Zend. Mithra), the genial light of day; and Savitar, the quickener, and Surya OHXtos), the vivifying sun.

Of the Brahmanas that were handed down in the schools of the Bahvrichas (i.e. ” possessed of many verses “), as the followers of the Rigveda are called, two have come down to us, viz. g r gh. those of the Aitareyins and the Kaushitakins. The m anas of Aitareya-brahmana 1 and the Kaushitaki-^ (or San- Ri/Leda. khayana-) brahmana evidently

have for their groundwork the same stock of traditional exegetic matter. They differ, however, considerably as regards both the arrangement of this matter and their stylistic handling of it, with the exception of the numerous legends common to both, in which the discrepancy is comparatively slight. There is also a certain amount of material peculiar to each of them. The Kaushitaka is, upon the whole, far more concise in its style and more systematic in its arrangement — features which would lead one to infer that it is probably the more modern work of the two. It consists of thirty chapters (adhyaya) ; while the Aitareya has forty, divided into eight books (or pentads, panchaka), of five chapters each. The last ten adhyayas of the latter work are, however, clearly a later addition — though they must have already formed part of it at the time of Panini (c. 400 B.C. ?), if, as seems probable, one of his grammatical sutras, regulating the formation of the names of Brahmanas, consisting of thirty and forty adhyayas, refers to these two works. In this last portion occurs the well-known legend (also found in the Sankhayana-sutra, but not in the Kaushitaki-brahmana) of Sunahsepa, whom his father Ajigarta sells and offers to slay, the recital of which formed part of the inauguration of kings. While the Aitareya deals almost exclusively with the Soma sacrifice, the Kaushitaka, in its first six chapters, treats of the several kinds of haviryajna, or offerings of rice, milk, ghee, &c, whereupon follows the Soma sacrifice in this way, that chapters 7-10 contain the practical ceremonial and 11-30 the recitations (sastra) of the hotar. Sayana, in the introduction to his commentary on the work, ascribes the Aitareya to the sage Mahidasa Aitareya {i.e. son of Itara), also mentioned elsewhere as a philosopher; and it seems likely enough that this person arranged the Brahmana and founded the school of the Aitareyins. Regarding the authorship of the sister work we have no information, except that the opinion of the sage Kaushitaki is frequently referred to in it as authoritative, and generally in opposition to the Paingya — the Brahmana, it would seem, of a rival school, the Paingins. Probably, therefore, it is just what one of the manuscripts calls it — the Brahmana of Sankhayana (composed) in accordance with the views of Kaushitaki.

Each of these two Brahmanas is supplemented by a ” forest- book,” or .Sranyaka. The Aitareyaranyaka 3 is not a uniform production. It consists of five books (dranyaka), three of which, the first and the last two, are of a liturgical nature, treating of the ceremony called mahavrata, or great vow. The last of these books, composed in sutra form, is, however, doubtless of later origin, and is, indeed, ascribed by native authorities either to Saunaka or to Asvala- yana. The second and third books, on the other hand, are purely speculative, and are

also styled the Bahvricha-brahmana-upanishad. Again, the last four chapters of the second book are usually singled

‘Edited, with an English translation, by M. Haug (2 vols., Bombay, 1863). An edition in Roman transliteration, with extracts from the commentary, has been published by Th. Aufrecht (Bonn,

1879).

2 Edited by B. Lindner (Jena, 1887).

3 Edited, with Sayana’s commentary, by Rajendralala Mitra, in the Bibliotheca Indica (1875-1876). The first three books have been translated by F. Max Miiller in S.B.E. vol. i. A new edition of the work was published, with translation, by A. B. Keith (Oxford, 1909).

Mut as the Aitareyopanishad, 1 ascribed, like its Brahmana (and the first book), to Mahidasa Aitareya; and the third book is also referred to as the Samhita-upanishad. As regards the Kaushltaki- aranyaka? this work consists of fifteen adhyayas, the first two (treating of the mahavrata ceremony) and the seventh and eighth of which correspond to the first, fifth, and third books of the Aitareyaranyaka respectively, whilst the four adhyayas usually inserted between them constitute the highly interesting Kaushitaki- (brahmana-) upanishad, 3 of which we possess two different re- censions. The remaining portions (9-15) of the Aranyaka treat of the vital airs, the internal Agnihotra, &c, ending with the vamsa, or succession of teachers. Of Kalpa-siitras, or manuals of sacrificial Sutras of ceremor ” a ‘> 4 composed for the use of the hotar priest, Rizveda two 4iff erent sets are in existence, the Asvalayana- and • ‘ the Sankhayana-sutra. Each of these works follows one

of the two Brahmanas of the Rik as its chief authority, viz. the Aitareya and Kaushltaka respectively. Both consist of a Srauta- and a Grihya-sutra. Asvalayana seems to have lived about the same time as Panini (? c. 400 B.C.) — his own teacher, Saunaka, who completed the Rik-pratisakhya, being probably intermediate between the great grammarian and Yaska, the author of the Nirukta. Saunaka himself is said to have been the author of a Srauta-sutra (which was, however, more of the nature of a Brahmana) and to have destroyed it on seeing

his pupil's work. A Grihya-sutra is still quoted under his name by later writers. The Asvalayana Srauta-sutra 5 consists of twelve, the Grihya of four, adhyayas.

Regarding Sankhayana still less is known; but he, too, was doubtless a comparatively modern writer, who, like Asvalayana, founded a new school of ritualists. Hence the Kaushitaki-brahmana, adopted (and perhaps improved) by him, also_goes under his name, just as the Aitareya is sometimes called Asvalayana-brahmana. The Sankhayana Srauta-sutra consists of eighteen adhyayas. The last two chapters of the work are, however, a later addition, 6 while the two preceding chapters, on the contrary, present a compara- tively archaic, brahmana-like appearance. The Grihya-sutra 7 consists of six chapters, the last two of which are likewise later appendages. The Sambavya Grihya-sutra, of which a single MS. is at present known, seems to be closely connected with the preceding work. Professor Buhler also refers to the Rigveda the Vdsishfha- dhirmasdstra* composed of mixed sutras and couplets.

A few works remain to be noticed, bearing chiefly on the textual form and traditionary records of the Rik-samhita. In our remarks on the Vedangas, the Pratiskhyas have already been referred to as the chief repositories of siksha or Vedic phonetics. Among these works the Rik-pratisakhyaˆ occupies the first place. The original composition of this important work is ascribed to the same Sakalya from whom the vulgate recension of the (Sakala) Samhita takes its name. He is also said to be the author of the existing Pada- patha (i.e. the text-form in which each word is given unconnected with those that precede and follow it), which report may well be credited, since the pada-text was doubtless prepared with a view to an examination, such as is presented in the Pratisakhya, of the phonetic modifications undergone by words in their syntactic combination. In the Pratisakhya itself, Sakalya's father (or Sakalya the elder) is also several times referred to as an authority on phonetics, though the younger Sakalya is evidently regarded as having improved on his father's theories. Thus both father and son probably had a share in the formulation of the rules of

1 Edited and translated by Dr Roer, in the Bibl. Ind. The last chapter of the second book, not being commented upon by Sayana, is probably a later addition.

2 Translated by A. B. Keith (1908), who has also published (as an appendix to his ed. of the Aitareyaranyaka) the text of adhy. 7-15; whilst W. F. Friedlander edited adhy. I and 2 (1900). Cf. Keith, J.R.As.S. (1908), p. 363 sqq., where the date of the first and more

original portion (adhy. 1-8) is tentatively fixed at 6oo~ 550 B.C.

3 Text, commentary and translation published by E. B. Cowell, in the Bibl. Ind. Also a translation by F. Max Miiller in S.B.E. vol. i.

‘ Cf. A. Hillebrandt, ” Ritual-Litteratur,” in Buhler’s Grundriss

0897).

6 Both works have been published with the commentary of 3argya Narayana, by native scholars, in the Bibl. Ind. Also the text of the Grihya, with a German translation, by A. Stenzler.

6 See A. Weber’s analysis, Ind. Studien, ii. 288 seq. The work was edited by Hillebrandt, in Bibl. Ind.

7 Edited, with a German translation, by H. Oldenberg [Ind. Stud. vol. xv.), who also gives an account of the Sambavya Grihya. An English translation in S.B.E. vol. xxix. by the same scholar, who would assign the two_sutra works to Sarvajna San- khayana, whilst the Brahmana (and Aranyaka) seem to him to have been imparted by Kahola Kaushitaki to Gunakhya Sankhayana.

s Text with Krishnapandita’s commentary, published at Benares; also critically edited by A. A. Fiihrer (Bombay, 1883); translation by G. Btihler in S.B.E. vol. xiv.

9 Edited, with a French translation, by A. Regnier, in the Journal Asiatique (1856-1858); also, with a German translation, by M. Miiller (1869).

pronunciation and modification of Vedic sounds. The completion or final arrangement of the Rik-pratisakhya,_in its present form, is ascribed to Saunaka, the reputed teacher of Asvalayana. Saunaka, however, is merely a family name (” descendant of Sunaka “), which is given even to the rishi Gritsamada, to whom nearly the whole ,of the second mandala of the Rik is attributed. How long after Sakalya this particular Saunaka lived we do not know; but some generations at all events would seem to lie between them, considering that in tKe meantime the Sakalas, owing doubtless to minor differences on phonetic points in the Samhita text, had split into several branches, to one of which, the Saisira (or Saisiriya) school, Saunaka belonged. While Sakalya is referred, to both by Yaska and Panini, neither of these writers mentions Saunaka. It seems, nevertheless, likely, for several reasons, that Panini was acquainted with Saunaka’s work, though the point has by no means been definitely settled. The Rik-

pratisakhya is composed in mixed slokas, or couplets of various metres, a form of com- position for which Saunaka seems to have had a special predilection. Besides the Pratisakhya, and the Grihya-sutra mentioned above, eight other works are ascribed to Saunaka, viz. the Brihaddevata, 10 an account, in epic slokas, of the deities of the hymns, which supplies much valuable mythological information ; the Rig-vidhdna, 11 a treatise, likewise in epic metre, on the magic effects of Vedic hymns and verses ; the Pada-vidhdna, a similar treatise, apparently no longer in existence ; and five different indexes or catalogues (anukramanl) of the rishis, metres, deities, sections (anuvaka) and hymns of the Rig- veda. It is, however, doubtful whether the existing version of the Brihaddevata is the original one; and the Rigvidhana would seem to be much more modern than Saunaka's time. As regards the Anukramanis, they seem all to have been composed in mixed slokas ; but, with the exception of the Anuvakanukramanl, they are only known from quotations, having been superseded by the Sarvanu- kramani, n or complete index, of Katydyana. Both these indexes have been commented upon by Shadgurusishya, towards the end of the 12th century of our era.

B. Sdma-veda. — The term saman, of uncertain derivation, denotes a solemn tune or melody to be sung or chanted to a rich or verse. The set chants (stotra) of the Soma sacrifice are as a rule s&tna- performed in triplets, either actually consisting of three ve da» different verses, or of two verses which, by the repetition samhita, of certain parts, are made, as it were, to form three. The three verses are usually chanted to the same tune ; but in certain cases two verses sung to the same tune had a different saman enclosed between them. One and the same saman or tune may thus be sung to many different verses; but, as in teaching and practising the tunes the same verse was invariably used for a certain tune, the term " saman," as well as the special technical names of samans, are not infrequently applied to the verses themselves with which they were ordinarily connected, just as one would quote the beginning of the text of an English hymn, when the tune usually sung to that hymn is meant. For a specimen of the way in which samans are sung, see Burnell, Arsheyabrdhmana, p. xlv. seq.

The Indian chant somewhat resembles the Gregorian or Plain Chant. 13 Each saman is divided into five parts or phrases (prastdva, or prelude, &c), the first four of which are distributed between the several chanters, while the finale (nidhana) is sung in unison by all of them.

In accordance with the distinction between r.ich or text and saman or tune, the saman-hymnal consists of two parts, viz. the Sdmaveda-

samhitd, or collection of texts (rich) used for making up saman-hymns, and the Gdna, or tune-books, song-books. The textual matter of the Samhita consists of somewhat under 1600 different verses, selected from the Rik-samhita, with the exception of some seventy-five verses, some of which have been taken from Khila hymns, whilst others which also occur in the Atharvan or Yajurveda, as well as such not otherwise found, may perhaps have formed part of some other recension of the Rik. The Samaveda- samhita 14 is divided into two chief parts, the purva— (first) and ths uttara- (second) archika. The second part contains the texts of the saman-hymns, arranged in the order in which they are actually required for the stotras or chants of the various Soma sacrifices. The first part, on the other hand, contains the body of tune-verses, or verses used for practising the several samans or tunes upon — the tunes themselves being given in the Grdma-geya-gdna {i.e. songs to be sung in the village), the tune-book specially belonging to the Purvarchika. Hence the latter includes all the first verses of those triplets of the second part which had special tunes peculiar to them, besides the texts of detached samans occasionally used outside the regular ceremonial, as well as such as were perhaps

‘“Edited, with translation, by A. A. Macdonell (2 vols.), in the Harvard Or. series (1904).

11 Edited R. Meyer (Berlin, 1878).

12 Edited, with commentary, by A. A. Macdonell (Oxford, 1886).

13 Burnell, Arsheyabrdhmana, p. xli.

“Edited and translated by J. Stevenson (1843); a critical edition, with German translation and glossary, was published by Th. Benfey (1848); also an edition, with the Ganas and Sayana’s commentary, by Satyavrata Samasrami, in the Bibl. Ind. in 5 vols. ; and Eng. trans, by R. H. T. Griffith (Benares, 1893).

no longer required but had been so used at one time or other. The verses of the Purvarchika are arranged on much the same plan as the family-books of the Rik-samhita, viz. in three sections con- taining the verses addressed to Agni, Indra and Soma (pavamana) respectively —

each section (consisting of one, three, and one adhyayas respectively) being again arranged according to the metres. Hence this part is also called Chhandas- (metre) archika. Over and above this natural arrangement of the two archikas, there is a purely formal division of the texts into six and nine prapaˆh'akas respectively, each of which, in the first part, consists of ten .decades (dasat) of verses. We have two recensions of the Samhita, belonging to the Ranayaniya and Kauthuma schools, the latter of which is but imperfectly known, but seems to have differed but slightly from the other. Besides the six prapathakas (or five adhyayas) of the Purvarchika, some schools have an additional " forest " chapter, called the Aranyaka-samhita, the tunes of which — along with others apparently intended for being chanted by anchorites — are partly contained in the Aranya-g&na. Besides the two tune-books belonging to the Purvarchika, there are two others, the tjha-gana (" modification-songs ") and Uhya-gana, which follow the order of the Uttararchika, giving the several saman- hymns chanted at the Soma sacrifice, with the modifications the tunes undergo when applied to texts other than those for which they were originally composed. The Saman hymnal, as it has come down to us, has evidently passed through a long course of develop- ment. The practice of chanting probably goes back to very early times; but the question whether any of the tunes, as given in the Ganas, and which of them, can lay claim to an exceptionally high antiquity will perhaps never receive a satisfactory answer.

The title of Brahmana is bestowed by the Chhandogas, or followers of the Samaveda, on a considerable number of treatises. In accord- ance with the statements of some later writers, their SMma- number was usually fixed at eight; but within the last veda- f ew y ears one new Brahmana has been recovered, while

bran- at i eas t two others which are found quoted may yet be

manas. brought to light in India. The majority of the Samaveda-brahmanas present, however, none of the characteristic features of other works of that class ; but they are rather of the nature of sutras and kindred treatises, with which they probably belong to the same period of literature. Moreover, the contents of these works — as might indeed be expected from the nature of the duties of the priests for whom they were intended — are of an extremely arid and technical character, though they all are doubtless of some importance, either for the textual criticism of the Samhita or on account of the legendary and other information they supply. These works are as follows: (1) the Taitdya-mahd- (or Praudha-) brahmana 1 or " great " Brah- mana — usually called Panchavimfa-brahmana from its " consisting of twenty-

five ” adhyayas — which treats of the duties of the udgatars generally, and especially of the various kinds of chants; (2) the Shadvimia”- or ” twenty-sixth,” being a supplement to the preceding work — its last chapter, which also bears the title of Adbhula-brah- mana, 3 or ” book of marvels,” is rather interesting, as it treats of all manner of portents and evil influences, which it teaches how to avert by certain rites and charms; (3) the Samavidhana, 1 analogous to the Rigvidhana, descanting on the magic effects of the various samans ; (4) the A rsheya-brahmana, a mere catalogue of the technical names of the samans in the order of the Purvarchika, known in two different recensions; (5) the Devatadhyaya, which treats of the deities of the samans; (6) the Chhdndogya-brahmana, the last eight adhyayas (3-10) of which constitute the important Chhandogyopanishad ; 6 (7) the Samhitopanishad-brdhmana, treating of various subjects con- nected with chants; (8) the Vamsa-brdhmana, a mere list of the Sama- veda teachers. To these works has to be added the Jaiminiya- or Talavakara-brahmana, which, though as yet only known by extracts, 6 seems to stand much on a level with the Brahmanas of the Rik and Yajurveda. A portion of it is the well-known Keria- (or Talavakdra-) upanishad, 7 on the nature of Brahma, as the supreme of deities.

If the Samaveda has thus its ample share of Brahmana-literature, though in part of a somewhat questionable character, it is not less richly supplied with sutra-treatises, some of which prob- ably belong to the oldest works of that class. There are three Srauta-sutras, which attach themselves more or less sutras. closely to the Panchavimsa-brahmana : Masaka’s Arsheya- kalpa, which gives the beginnings of the samans in their sacrificial

1 Edited, with Sayana’s commentary by Anandachandra Vedan- tavaglsa, in the Bibl. Ind. (1869-1874).

2 Ed. J. Vidyasagara (1881); also, with German translation, K. Klemm (1894).

J A. Weber, “Omina et Portenta,” Abhandlungen of Berlin Royal Academy of Sciences (1858).

4 The works enumerated under (3), (4), (5), (7), (8) have been edited by A. Burnell; (8) also previously by A. Weber, Ind. St. vol. iv. ; whilst 7 was translated by Sten Konow (Halle, 1893).

6 Edited and translated by Dr Rcier, Bibl. Ind.; also translated by M. Miiller, S.B.E. vol. i., text, with German translation, by O. v. Bohtlingk (1889).

• Given by Burnell (1878), and (with translation) by H. Oertel, /. Am. Or. S. vol. xvi. See also Whitney's account of the work, Proceedings of Am. Or. Soc. (May 1883).

7 Transl. by F. M. Miiller, S.B.E. vol. i.

Sama < veda-

order, thus supplementing the Arsheya-brahmana, which enumerates their technical names; and the Srauta-sutras of Ld(yayana s and Drahyayana, of the Kauthuma and Ranayaniya schools respectively, which differ but little from each other, and form complete manuals of the duties of the udgatars. Another sutra, of an exegetic character, the Anupada-sutra, likewise follows the Panchavimsa, the difficult passages of which it explains. Besides these, there are a considerable number of sutras and kindred technical treatises bearing on the prosody and phonetics of the sama-texts. The more important of them are — the Riktantraf apparently intended to serve as a Prati- sakhya of the Samaveda ; the Niddna-sutra, 10 a treatise on prosody ; the Pushpa- or Phulla-sutra, ascribed either to Gobhila or to Vara- ruchi, and treating of the phonetic modifications of the rich in the samans ; and the Sdmatantra, a treatise on chants of a very technical nature. Further, two Grihya-sutras, belonging to the Samaveda, are hitherto known, viz. the Drdhyayana-grihya, ascribed to Khradira, and that of Gobhila u (who is also said to have composed a srauta- sutra), with a supplement, entitled Karmapradlpa, by Katyayana. To the Samaveda seems further to belong the Gautama-dharmaUdstra.™ composed in sutras, and apparently the oldest existing compendium of Hindu law.

C. Yajur-veda. — This, the sacrificial Veda of the Adhvaryu priests, divides itself into an older and a younger branch, or, as they are usually called, the Black (kr.ishna) and the White (sukla) Yajurveda. Tradition ascribes the foundation of the *(•?, r" Yajurveda to the sage Vaisampayana. Of his disciples tf , \L three are specially named, viz. Katha, Kalapin and Yaska Ya i urve ° a – Paingi, the last of whom again is stated to have communicated the sacrificial science to Tittiri. How far this genealogy of teachers may be authentic cannot now be determined ; but certain it is that in accordance therewith we have three old collections of Yajus- texts, viz. the Kdthaka, 13 the Kalapaka or Maitrayanl Samhita, 1 * and the Taittiriya-samhita. 15 The Kathaka and Kalapaka are fre- quently mentioned together; and the author of the " great com- mentary " on Panini once remarks that these works were taught in every village. The Kathas and Kalapas are often referred to under the collective name of Charakas, which apparently means " wayfarers " or itinerant scholars; but according to a later

writer (Hemachandra) Charaka is no other than Vaisampayana himself, after whom his followers would have been thus called. From the Kathas proper two or three schools seem early to have branched off, the Prachya- (eastern) Kathas and the Kapishthala- Kathas, the text-recension of the latter of whom has recently been discovered in the Kapishthala-kalha-samhita, and probably also the Charayaniya-Kathas. The Kalapas aiso soon became sub- divided into numerous different schools. Thus from one of Kalapin's immediate disciples, Haridru, the Haridraviyas took their origin, whose text-recension, the Hdridravika, is quoted together with the Kathaka as early as in Yaska's Nirukta; but we do not know whether it differed much from the original Kalapa texts. As regards the Taittiriya-samhita, that collection, too, in course of time gave rise to a number of different schools, the text handed down being that of the Apastambas; while the contents of another recension, that of the Atreyas, are known from their Anukramani, which has been preserved.

The four collections of old Yajus texts, so far known to us, while differing more or less considerably in arrangement and verbal points, have the main mass of their textual matter in common. This common matter consists of both sacrificial prayers (yajus) in verse and prose, and exegetic or illustrative prose portions (brah- mana). A prominent feature of the old Yajus texts, as compared with the other Vedas, is the constant intermixture of textual and exegetic portions. The Charakas and Taittiriyas thus do not recognize the distinction between Samhita and Brahmana in the sense of two separate collections of texts, but they have only a Samhita, or collection, which includes likewise the exegetic or Brahmana portions. The Taittiriyas seem at last to have been impressed with their want of a separate Brahmana and to have set about supplying the deficiency in rather an awkward fashion: instead of separating from each other the textual and exegetic portions of their Samhita, they merely added to the latter a supplement (in three books), which shows the same mixed condition, and applied to it the title of Taittiriya-brahmana. 16 But, though'the main'body of

8 Arsheyakalpa, ed. W. Caland (1908) ; Latyayana-sutra, with Agnisvamin's commentary and the vv. II. of the Drahyayana-sutra, by Anandachandra Vedantavagisa, Bibl. Ind. (1872).

9 Ed. and trans., A. Burnell (Mangalore, 1879).

10 Two chapters published by A. Weber, Ind. St. vol. viii.

11 Edited, with a commentary, by Chandrakanta Tarkalankara, Bibl. Ind. (1880); also ed. and trans, by F. Knauer (1884-1887); Eng. trans,

by H. Oldenberg, S.B.E. vol. xxx.

12 Edited by A. Stenzler; translated by G. Buhler, S.B.E. vol. ii.

13 Books I., II., ed. by L. v. Schroder (Leipzig, 1900, 1909).

14 Ed. by L. v. Schroder (Leipzig, 1 881-1886).

16 With Sayana's commentary, by E. Roer, E. B. Cowell, &c, in Bibl. Ind.; also, in Roman character, by A. Weber, Ind. Stud. xi., xii.

18 Edited, with Sayana's commentary, by Rajendralala Mitra, Bibl. Ind.; N. Godabole, Anand. Ser. (1898).

this work is manifestly of a supplementary nature, a portion of it may perhaps be old, and may once have formed part of the Samhita, considering that the latter consists of seven ashtakas, instead of eight, as this term requires, and that certain essential parts of the ceremonial handled in the Brahmana are entirely wanting in the Samhita. Attached to this work is the Taittiriya-aranyaka, 1 in ten books, the first six of which are of a ritualistic nature, while of the remaining books the first three (7-9) form the Taittinyopanishad 2 (consisting of three parts, viz. the Sikshavalll or Sarnhitopanishad, and the Anandavalii and Bhriguvalli, also called together the Varunl-upanishad), and the last book forms the Narayaniya- (or Yajniki-) upanishad.

The Maitrayani Samhita, the identity of which with the original Kalapaka has been proved pretty conclusively by Dr L. v. Schroder, who attributes the change of name of the Kalapa-Maitrayanlyas to Buddhist influences, consists of four books, attached to which is the Maitri- (or Maitrayani) upanishad. 3 The K&thaka, on the other hand, consists of five parts, the last two of which, however, are per- haps later additions, containing merely the prayers of the hotar priest, and those used at the horse-sacrifice. There is, moreover, the beautiful Katha- or Kdthaka-upanishad,* which is also, and more usually, ascribed to the Atharvaveda, and which seems to show a decided leaning towards Sankhya-Yoga notions.

The defective arrangement of the Yajus texts was at last remedied by a

different school of Adhvaryus, the Vajasaneyins. The reputed originator of this school and its text- recension is Yajna- twhH valkya Vajasaneya (son of Vajasani). The result of the ° , _ e rearrangement of the texts was a collection of sacrificial veda' mantras, the V&jasaneyi-samhita, and a Brahmana, the

Satapatha. On account of the greater lucidity of this arrangement, the Vajasaneyins called their texts the White (or clear) Yajurveda — the name of Black (or obscure) Yajus being for opposite reasons applied to the Charaka texts. Both the Sarnhita and Brahmana of the Vajasaneyins have come down to us in two different recensions, viz. those of the Madhyandina and Kanva schools; and we find besides a considerable number of quotations from a Vajasaneyaka, from which we cannot ˆdoubt that there must have been at least one other recension of the Satapatha-brahmana. The difference between the two extant recensions is, on the whole, but slight as regards the subject-matter; but in point of diction it is quite sufficient to make a comparison especially interesting from a philological point of view. Which of the two versions may be the more original cannot as yet be determined; but the phonetic and grammatical differences will probably have to be accounted for by a geographical separation of the two schools rather than by a difference of age. In several points of difference the Kanva recension agrees with the practice of the Rik-samhita, and there probably was some connexion between the Yajus school of Kanvas and the famous family of rishis of that name to which the eighth mandala of the Rik is attributed.

The Vajasaneyi-samhita b consists of forty adhyayas, the first eighteen of which contain the formulas of the ordinary sacrifices. The last fifteen adhyayas are doubtless a later addition — as may also be the case as regards the preceding seven chapters. The last adhyaya is commonly known under the title of Vajasaneyi-samhita (or Isavasya-) upanishad. 6 Its object seems to be to point out the fruitlessness of mere works, and to insist on the necessity of man's acquiring a knowledge of the supreme spirit. The sacrificial texts of the Adhvaryus consist, in about equal parts, of verses (rich) and prose formulas (yajus). The majority of the former occur likewise in the Rik-samhita, from which they were doubtless extracted. Not infrequently, however, they show considerable discrepancies of reading, which may be explained partly from a difference of recension and partly as the result of the adaptation of these verses to their special sacrificial purpose. As regards the prose formulas, though only a few of them are actually referred to in the Rik, it is quite possible that many of them may be of high antiquity.

The Satapatha-brahmana,' 1 or Brahma na of a hundred paths, derives its name from the fact of its consisting of 100 lectures (adhyaya), which are divided by the MSdhyandinas into fourteen, by

Brihmana ot White

the Kanvas into seventeen books (kanda). The first nine Yalur- books of the former, corresponding to the first eleven of

veda t '? e Kanvas, and consisting of sixty adhyayas, form a

kind of running commentary on the first eighteen books of the Vaj. - Samhita; and it has been plausibly suggested by Professor Weber that this portion of the Brahmana may be referred to in the Mahabhashya on Pan. iv 2, 60, where a Satapatha and

1 EdTR. Mitra, Bibl.Tnd. ; H. N. Apte,' Anand. Ser. (1898).

2 Trans, by F. M. Milller, S.B.E. vol. xv.

3 Text and translation published by E. B. Cowell, Bibl. Ind. Also trans, by F. M. Miiller, S.B.E. vol. xv.

4 Text, commentary and translation published by E. Roer, Bibl. Ind.; also translation by F. M. Miiller, S.B.E. vol. xv., and others.

6 Edited in the Madhyandina recension, with the commentary of Mahidhara, and the vv. U ot the Kanva text, by A. Weber (1849) ; trans, by R. H. T. Griffitn (Benares, 1899).

'Translation by E. Roer, Bibl. Ind.; by F. M. Miiller, S.B.E. vol. i.

'Edited by A. Weber, who also translated the first chapter into German. English translation (5 vols.) by J. Eggeling, in S.B.E.

a. Shashti-patha (i.e. " consisting of 60 paths ") are mentioned together as objects of study, and that consequently it may at one time have formed an independent work. This view is also supported by the circumstance that of the remaining five books (10-14) of the Madhyandinas the third is called the middle one (madhyama) ; while the Kanvas apply the same epithet to the middlemost of the five books (12-16) preceding their last one. This last book would thus seem to be treated by them as a second supplement, and not without reason, as it is of the Upanishad order, and bears the special title of Brihad- (great) aranyaka? the last six chapters of which are the Brihadaranyaka-upanishad, 9 the most important of all Upani- shads. Except in books

6-10 (M.), which treat of the construction of fire-altars, and recognize the sage Sandilya as their chief authority, Yajnavalkya's opinion is frequently referred to in the Satapatha as authoritative. This is especially the case in the later books, part of the Brihad-aranyaka, being even called Yaj fiavalklya- kanda. As regards the age of the Satapatha, the probability is that the main body of the work is considerably older than the time of Panini, but that some of its latter parts were considered by Panini's critic Katya- yana to be of about the same age as, or not much older than, Panini. Even those portions had probably been long in existence before they obtained recognition as part of the canon of the White Yajus. The contemptuous manner in which the doctrines of the Charaka- adhvaryus are repeatedly animadverted upon in the Satapatha betrays not a little of the odium theologicum on the part of the divines of the Vajasaneyins towards their brethren of the older schools. Nor was their animosity confined to mere literary war- fare, but they seem to have striven by every means to gain ascendancy over their rivals. The consolidation of the Brahmanical hierarchy and the institution of a common system of ritual worship, which called forth the liturgical Vedic collections, were doubtless consum- mated in the so-called Madhya-desa, or " midland," lying between the Sarasvati and the confluence of the Yamuna and Ganga; and more especially in its western part, the Kuru-kshetra, or land of the Kurus, with the adjoining territory of the Panchalas, between the Yamuna and Ganga. From thence the original schools ot Vaidik ritualism gradually extended their sphere over the adjacent parts. The Charakas seem for a long time to have held sway in the western and north-western regions; while the Taittiriyas in course of time spread over the whole of the peninsula south of the Narmada (Ner- budda), where their ritual has remained pre-eminently the object of study till comparatively recent times. The Vajasaneyins, on the other hand, having first gained a footing in the lands on the lower Ganges, chiefly, it would seem, through the patronage of King Janaka of Videha, thence gradually worked their way westwards, and eventu- ally succeeded in superseding the older schools north of the Vindhya, with the exception of some isolated places where even now families of Brahmans are met with which profess to follow the old Samhitas. In Kalpa-siitras the Black Yajurveda is particularly rich ; but, owing to the circumstances just indicated, they are almost entirely confined to the Taittiriya school.' The only Srauta-sutra of a Charaka school which has hitherto been recovered is Sutras ot that of the Manavas, a subdivision of the Maitrayaniyas. *f The Manava-srauta-sutra™ seems to c'onsist of eleven re " a – books, the first nine of which treat of the sacrificial ritual, while the tenth contains the Sulva-sutra; and the eleventh is made up of a number of supplements (pari-sishta). The

Manava-grihya-sutra 11 is likewise in existence; but so far nothing is known, save one or two quotations, of a Manava-dharma-siitra, the discovery of which might be expected to solve some important questions regarding the de- velopment of Indian law. Of sutra-works belonging to the Kathas, a single treatise, the (Charayaniya-) Kathaka-grihya-siitra, is known; while Dr Jolly considers the Vishnu-smriti,™ a compendium of law, composed in mixed sutras and slokas, to be nothing but a Vaishnava recast of the Kathaka-dharma-sutra, which, in its original form, seems no longer to exist. As regards the Taittiriyas, _the Kalpa- sutra most widely accepted among them was that of Apastamba, to whose school, as we have seen, was_also due our existing recension of the Taittiriya-samhita. The Apastamba-kalpa-sutra consists of_ thirty prasna (questions); the first twenty-five of these con- stitute the Srauta-sutra; 13 26 and 27 the Grihya-sutra; 14 28 and 29 the Dharma-sutra ; 15 and the last the Sulva-sutra. Professor Buhler has tried to fix the date of this work somewhere between the 5th and 3rd centuries B.C. ; but it can hardly yet be considered as definitely settled. Considerably more ancient than this work are the'

8 The text, with Sankara's commentary, and an English trans- lation, published by E. Roer, Bibl. Ind.

9 Trans, by F. M. Miiller, S.B.E. vol. xv., and others.

10 See P. v/Bradke, Z.D.M.G. vol. xxxvi. A MS. of a portion of the Srauta-sutra, with the commentary of the famous MImamsist Kumarila, has been photo-lithographed by the India Office, under Goldstiicker's supervision.

11 Edited by F. Knauer (Leipzig, 1897).

12 Edited and translated by J. Jolly.

13 Edited by R. Garbe, in Bibl. Ind.

14 Ed. M.Winternitz (Vienna, 1887); trans. H. Oldenberg, S.B.E. vol. XXX.

15 G. Buhler has published the text with extracts from Haradatta's commentary, Bombay Sansk. Ser. ; also a trans, in S.B.E.

Baudhdyana-kalpa-siitra, 1 which consists of the same principal divisions, and the Bharadvaja-sutra, of which, however, only a few portions have as yet been discovered. The Hiranyakesi-siitra? which is more modern than that of Apastamba, from which it differs bu>-little, is likewise fragmentary, as is also the Vaikhanasa-sGtra ; 3 while several other Kalpa-sQtras, especially that of Laugakshi, are found quoted. The recognized compendium of the White Yajus ritual is the Srauta-sutra of Katyayana, 4 in twenty-six adhyayas. This work is supplemented by a large number of secondary treatises, likewise attributed to Katyayana, among which may be mentioned the Charana-vyuhaf a statistical account of the Vedic schools, which unfortunately has come down to us in a very unsatisfactory state of preservation. A manual of domestic rites, closely connected with Katyayana's work, is the Katiya-grihya-sutra," ascribed to Paraskara. To Katyayana we further owe the Vajasaneyi-prati- Sakhya, 7 and a catalogue (anukramani) of the White Yajus texts. As regards the former work, it is still doubtful whether (with Weber) we have to consider it as older than Panini, or whether (with Gold- stucker and M. Miiller) we are to identify its author with Panini's critic. The only existing Pratisakhya 8 of the Black Yajus belongs to the Taittiriyas. Its author is unknown, and it confines itself entirely to the Taittiriya-samhita, to the exclusion of the Brahmana andAranyaka.

D. Atharva-veda. — The Atharvan was the latest of Vedic col- lections to be recognized as part of the sacred canon. That it is also the youngest Veda is proved by its language, which Atuarva- both from a lexical and a grammatical point of view, ve a " marks an intermediate stage between the main body of

samnua. ˆ p,ˆ an(j t j le B r g,hmana period. In regard also to the nature of its contents, and the spirit which pervades them, this Vedic collection occupies a position apart from the others. Whilst the older Vedas seem clearly to reflect the recognized religious notions and practices of the upper, and so to speak, respectable classes of the Aryan tribes, as jealously watched over by a priesthood deeply interested in the undiminished maintenance of the traditional observances, the fourth Veda, on the other hand, deals mainly with all manner of superstitious practices such as have at all times found a fertile soil in the lower strata of primitive and less advanced peoples, and are even apt, below the surface, _ to maintain their tenacious hold on the popular mind in comparatively civilized com- munities. Though the constant intermingling with the aboriginal tribes may well be believed to have exercised a deteriorating in- fluence on the Vedic

people in this respect, it can scarcely be doubted that superstitious practices of the kind revealed by the Atharvan and the tenth book of the Rik must at all times have obtained amongst the Aryan people, and that they only came to the surface when they received the stamp of recognized forms of popular belief by the admission of these collections of spells and incantations into the sacred canon. If in this phase of superstitious belief the old gods still find a place, their character has visibly changed so as to be more in accordance with those mystic rites and magic performances and the part they are called upon to play in them, as the promoters of the votary's cabalistic practices and the averters of the malicious designs of mortal enemies and the demoniac influences to' which he would ascribe his fears and failures as well as his bodily ailments. The fourth Veda may thus be said to supplement in _a remarkable manner the picture of the domestic life of the Vedic Aryan as pre- sented in the Grihya-sutras or house-rules; for whilst these deal oniy with the orderly aspects of the daily duties and periodic ob- servances in the life of the respectable householder, the Atharvayeda allows us a deep insight into " the obscurer relations and emotions of human life "; and, it may with truth be said that " the literary diligence of the Hindus has in this instance preserved a document of priceless value for the institutional history of early India as well as for the ethnological history of the human race " .(M. Bloomfield). It is worthy of note that the Atharvaveda is practically unknown in the south of India. 9

This body of spells and hymns is traditionally associated with two old mythic priestly families, the Atharvans and Angiras, their names, in the plural, serving either singly or combined (Atharvan-

J The Sulva-sutra has been published, with the commentary of Kapardisvamin, and a translation by G. Thibaut, in the Benares Pandit (1875). The Dharma-stitra has been edited by E. Hultzsch (Leipzig, 1884), and translated by G. Biihler, S.B.E. xiv.

'The H. Grihya-sutra, ed. J. Kirste (Vienna, 1889); trans. H. Oldenberg, S.B.E. vol. xxx.

3 An account of the Vaikh. Dharmasutra given by T. Bloch (Vienna, 1896).

4 Edited by A. Weber, 1858. s Weber, Ind. Stud. iii.

6 Text and German translation by A. Stenzler.

' Edited, with Uvata's commentary, and a German translation, by A.

Weber, Ind. Stud', iv.; another ed. in Benares_ Sansk. Ser. (1888).

"The work has been published by W. D. Whitney, with a trans. lation and a commentary by an unknown author, called Tribhash- yaratna, i.e. " jewel of the three commentaries," it being founded on three_ older commentaries by Vararuchi (? Katyayana), Mahisheya and Atreya.

•A. Burnell, Classif. Index of Tanjore Sansh. MSS. p. 37.

girasas) as the oldest appellation of the collection. The two families or classes of priests are by tradition connected with the service of the sacred fire; but whilst the Atharvans seem to have devoted themselves to the auspicious aspects of the fire-cult and the per- formance of propitiatory rites, the Angiras, on the other hand, are represented as having been mainly engaged in the uncanny practices of sorcery and exorcism. Instead of the Atharvans, another mythic family, the Bhrigus, are similarly connected with the Angiras (Bhrigvangirasas) as the depositaries of this mystic science. In course of time the lore of the Atharvans came also to have applied to it the title of Brahmaveda; a designation which was apparently meant to be understood both in the sense of the Veda of the Brahman priest or superintendent of the sacrifice, and in that of the lore of the Brahma or sacred (magic) word, and the supreme deity it is sup- posed to embody. The current, text of the Atharva-samhita 10 — apparently the recension of the Saunaka school — consists of some 750 different pieces, about five-sixths of which is in various metres, the remaining portion being in prose. The whole mass is divided into twenty books. The principle of distribution is for the most part a merely formal one, in books i.-xiii. pieces of the same or about the same number of verses being placed together in the same book. The next five books, xiv.-xviii., have each its own special subject: xiv. treats of marriage and sexual union ; xv., in prose, of the Vratya, or religious vagrant; xvi. consists chiefly of prose formulas of conjuration; xvii. of a lengthy mystic hymn; and xviii. contains all that relates to death and funeral rites. Of the last two books no account is taken in the Atharva-pratisakhya,'and they indeed stand clearly in the relation of supplements to the original collection. The nineteenth book evidently was the result of a subsequent gleaning of pieces similar to those of the earlier books, which had probably escaped the collectors' attention; while the last book, consisting almost entirely of hymns to Indra, taken from the Rik- samhita, is nothing more than a liturgical manual of recitations and chants required at the Soma sacrifice ; its only original portion being the ten so-called huntapa hymns (127-136), consisting partly of laudatory recitals of generous patrons of sacrificial priests and partly of riddles and didactic subjects.

The Atharvan has come down to us in a much less satisfactory state of preservation than any of the other Sarphitas, and its inter- pretation, which offers considerable difficulties on account of numer- ous popular and out-of-the-way expressions, has so far received comparatively little aid from native sources. Less help, in this respect, than might have been expected, is afforded by a recently published commentary professing to have been composed by Sayapa Acharya; serious doubts have indeed been thrown on the authenti- city of its ascription to the famous Vedic exegetic. Of very con- siderable importance, on the other hand, was the discovery in Kashmir of a second recension of the Atharva-samhita, contained in a single birch-bark MS., written in the Sarada character, and lately made available by an excellent chromo-photographic repro- duction. This new recension, 11 ascribed in the colophons of the MS. to the Paippalada school, consists likewise of twenty books (kanda), but both in textual matter and in its arrangement it differs very much from the current text. A considerable portion of the latter, including the whole of the eighteenth book, is wanting; while the hymns of the nineteenth book are for the most part found also in this text, though not as a separate book, but scattered over the whole collection. The twentieth book is wanting, with the exception of a few of the verses not taken from the Rik. As a set-off to these shortcomings the new version offers, however, a good deal of fresh matter, amounting to about one-sixth of the whole. From the Mahabhashya and other works quoting as the beginning of the Atharva-samhita a verse that coincides with the first verse of the sixth hymn of the current text, it has long been known that at least one other recension must have existed ; but the first leaf of the Kashmir MS. having been lost, it cannot be determined whether the new recension (as seems all but certain) corresponds to the one referred to in those works.

The only Brahmaija of the Atharvan, the Goj > alha-brahmana, n is doubtless one of the most modern and least important works of its class. It consists of two parts, the first of which AtIlarv contains cosmogonic speculations, interspersed with _ a ”

legends, mostly adapted from other Brahmanas, and %* = ?’ general instructions on religious duties and observances; “»*?«. while the second part treats, in a very desultory manner, of various points of the sacrificial ceremonial.

10 Edited by Professors Roth and Whitney (1856); with Sayana’s commentary, by Shankar P. Pandit (4 vols., Bombay, 1895-1898). Index verborum, by Whitney, in J. Am. Or. S. vol. xii., Eng. trans, by R. H. T. Griffith (in verse) (2 vols., Benares, 1897); by W. D. Whitney

(with a critical and exegetical commentary), revised and edited by Ch. R. Lanman (2 vols., Harvard Or. Ser., 1905) ; and (with some omissions) by M. Bloomfield, S.B.E. vol. xlii. ; cf. also Bloom- field, " The Atharvaveda," in Biihler's Encycl. (1899).

11 The first account of a copy of it was given by Professor R. v. Roth, in his academic dissertation, " Der Atharvaveda in Kaschmir " (1875). The reproduction on 544 plates, edited by M. Bloomfield and R. Garbe (Baltimore, 1901).

12 Edited in the Bill. Ind. by Rajendralala Mitra.

Atharva'

veda*.

sBtras.

doctrine.

Upanl- shads.

The Kalpa-sutras belonging to this Veda comprise both a manual of srauta rites, the Vaitdna-sutra, 1 and a manual of domestic rites, the Kausika-siitra. 2 The latter treatise is not only the more interesting of the two, but also the more ancient, being actually quoted in the other. The teacher Kausika is repeatedly referred to in the work on points of ceremonial Connected with this Sutra are upwards of seventy Parisish- tas, z or supplementary treatises, mostly in metrical form, on various subjects bearing on the performance of grihya rites. The last sutra- work to be noticed in connexion with this Veda is the Saunaklya Chaturadhyayika, 1 being a Pratisakhya of the Atharva-samhita, so called from its consisting of four lectures (adhyaya). Although Saunaka can hardly be credited with being the actual author of the work, considering that his opinion is rejected in the only rule where his name appears, there is no reason to doubt that it chiefly em- bodies the phonetic theories of that teacher, which were afterwards perfected by members of his school. Whether this Saunaka is identical with the writer of that name to whom the final redaction o! the Sakalapratisakhya of the Rik is ascribed is not known; but it is worthy

of note that on at least two points where bakalya is quoted by Panini, the Chaturadhyayika seems to be referred to rather than the Rik-pratisakhya. Saunaka is quoted once in the Vajasaneyi-pratisakhya ; and it is possible that Katyayana had the Chaturadhyayika in view, though his reference does not quite tally with the respective rule of that work.

Another class of writings already alluded to as traditionally connected with the Atharvaveda are the numerous Upanishads 6 which do not specially attach themselves to one or other of the Sarnhitas or Brahmanas of the other Vedas. The Atharva na-upanishads, mostly composed in siokas, may be roughly divided into two classes, viz. those of a purely speculative or general pantheistic character, treating chiefly of the nature of the supreme spirit, and the means of attaining to union therewith, and those of a sectarian tendency. Of the former category, a limited number — such as the Prasna, Mundaka, and Mandukya-upanishads — have probably to be assigned to the later period of Vedic literature ; whilst the others presuppose more or less distinctly the existence of some fully developed system of philosophy, especially the Vedanta or the Yoga. The sectarian Upanishads, on the other hand — ■ identifying the supreme spirit either with one of the forms of Vishnu (such as the Narayana, Nrisimha-tapaniya, Rama-tapanlya, Gopala- tapaniya Upanishads), or with Siva (e.g. the Rudropanishad), or with some other deity — belong to post-Vedic times.

2. The Classical Period

The Classical Literature of India is almost entirely a product of artificial growth, in the sense that its vehicle was not the language of the general body of the people, but of a small and educated class. It would scarcely be possible, even approxi- mately, to fix the time when the literary idiom ceased to be understood by the common people. We only know that in the 3rd century B.C. there existed several dialects in different parts of northern India which differed considerably from the Sanskrit; and Buddhist tradition states that Gautama Sakyamuni himself, in the 6th century B.C., used the local dialect of Magadha (Behar) for preaching his new doctrine. Not unlikely, indeed, popular dialects, differing perhaps but slightly from one another, may have existed as early as the time of the Vedic hymns, when the Indo-Aryans, divided into clans and tribes, occupied the Land of the Seven Rivers; but such dialects must have sprung up after the extension of the Aryan sway and language over the whole breadth of northern India. But there is no reason why, even with the existence of local dialects, the literary language should not have kept in touch with the

people in India, as else- where, save for the fact that from a certain time that language remained altogether stationary, allowing the vernacular dialects more and more to diverge from it. Although linguistic research had been successfully carried on in India for centuries, the actual grammatical fixation of Sanskrit seems to have taken place about contemporaneously with the first spread of Buddhism; and

1 Text and a German translation published by R. Garbe (1878) ; German trans, by W. Caland (1910).

2 This difficult treatise has been published with extracts from commentaries by Professor Bloomfield. Two sections of it had been printed and translated by A. Weber, ” Omina et Portenta ”

(1859).

3 These tracts have been edited by G. M. Boiling and J. v. Negelein, part i. (1909).

4 Edited and translated by W. D. Whitney.

5 For a full list of existing translations of and essays on the Upanishads, see Introd. to Max Miiller’s ” Upanishads,” S.B.E. i. Cf. also P. Deussen, Sechzig Upanishads (1897).

The

national

epics.

indeed that popular religious movement undoubtedly exercised a powerful influence on the linguistic development of India. A. Poetical Literature.

1. Epic Poems. — The Hindus, like the Greeks, possess two great national epics, the Mahdbhdrata and the Ramayana. The Mahabhdrata, 6 i.e. ” the great (poem or tale) of the Bharatas,” is not so much a uniform epic poem as a miscellaneous collection of poetry, consisting of a heterogeneous mass of legendary and didactic matter, worked into and round a central heroic narrative. The author- ship of this work is aptly attributed to Vyasa, ” the arranger,” the personification of Indian diaskeuasis. Only the bare outline of the leading story can here be given.

In the royal line of Hastinapura (the ancient Delhi) — claiming descent from the moon, and hence called the Lunar race (soma-varnsa), and counting among its ancestors King Bharata, after whom India is called Bharata-varsha (land of the Bharatas) — the succession lay between two brothers, when Dhritarashtra, the elder, being blind, had to make way for his brother Pandu. After a time the latter retired to the forest to pass the remainder of his life in hunting; and Dhritarashtra assumed the government, assisted by his uncle Bhishma, the Nestor of the poem. After some years Pandu died, leaving five sons, viz. Yudhishthira, Bhima and Arjuna by his chief wife KuntI, and the twins Nakula and Sahadeva by Madri. The latter having burnt herself along with her dead husband, KuntI returned with the five princes to Hastinapura, and was well received by the king, who offered to have his nephews brought up together with his own sons, of whom he had a hundred, Duryodhana being the eldest. From their great-grandfather Kuru both families are called Kauravas; but for distinction that name is more usually applied to the sons of Dhritarashtra, while their cousins, as the younger line, are named, after their father, Pandavas. The rivalry and varying fortunes of these two houses form the main plot of the great epopee. The Pandu princes soon proved themselves greatly superior to their cousins; and Yudhishthira, the eldest of them all, was to be appointed heir-apparent. But, by his son's advice, the king, good-natured but weak, induced his nephews for a time to retire from court and reside at a house where the unscrupulous Duryodhana meant to destroy them. They escaped, however, and passed some time in the forest with their mother. Here Draupadi, daughter of King Drupada of Panchala, won by Arjuna in open contest, became the wife of the five brothers. On that occasion they also met their cousin, Kunti's nephew, the famous Yadava prince Krishna of Dvaraka, who ever afterwards remained their faithful friend and confidential adviser. Dhrita- rashtra now resolved to divide the kingdom between the two houses ; whereupon the Pandavas built for themselves the city of Indraprastha (on the site of the modern Delhi). After a time of great prosperity, Yudhishthira, in a game of dice, lost everything to Duryodhana, when it was settled that the Pandavas should retire to the forest for twelve years, but should afterwards be restored to their kingdom if they succeeded in passing an additional year in disguise, without being recognized by any one. During their forest-life they met with many adventures, among which may be mentioned their encounter with King Jayadratha of Chedi, who had carried off Draupadi from their hermitage. After the twelfth year had expired they leave the forest, and, assuming various disguises, take service at the court of King Virata of Matsya. Here all goes well for a time till the queen's brother

Kichaka, a great warrior and commander of the royal forces, falls in love with Draupadi, and is slain by Bhima. The Kauravas, profiting by Kichaka's death, now invade the Matsyan kingdom, when the Pandavas side with King Virata, and there ensues, on the field of Kurukshetra, during eighteen days, a series of fierce battles, ending in the annihilation of the Kauravas. Yudhishthira now at last becomes yuva-raja, and eventually king — Dhritarashtra having resigned and retired with his wife and Kunti to the forest, where they soon after perish in a conflagration. Learn- ing also the death of Krishna, Yudhishthira himself at last becomes tired of life and resigns his crown; and the five princes, with their faithful wife, and a dog that joins them, set out for Mount Meru, to seek admission to Indra's heaven. On the way one by one drops off, till Yudhishthira alone, with the dog, reaches the gate of heaven ; but, the dog being refused admittance, the king declines entering

6 Three complete Indian editions, the handiest in 4 vols., includ- ing the Harivamsa (Calcutta, 1834-1839); a Bombay edition, with Nilakantha's commentary (1863) ; and a third, in Telugu characters, containing the Southern recension (Madras, 1855-1860). Another Southern edition, in Nagari, is now appearing at Bombay, edited by Krishnacharya and Vyasacharya of Kumbakonam. An English translation has been brought out at Calcutta by Pratap Chundra Roy (1883-1894); and another by M. N. Dutt (5 vols., Calcutta, 1896); whilst numerous episodes have been printed and translated by European scholars. For a critical analysis of this epic consult A. Holtzmann, Das Mahdbhdrata (4 vols., Kiel, 1892-1895); W. Hopkins, The Great Epic of India (New York, 1902).

without it, when the dog turns out to be no other than the god of Justice himself, having assumed that form to test Yudhishthira's constancy. But, finding neither his wife nor his brothers in heaven, and being told that they are in the nether world to expiate their sins, the king insists on sharing their fate, when this, too, proves a trial, and they are all reunited to enjoy perpetual bliss.

The complete work consists of upwards of 100,000 couplets — its contents thus being nearly eight times the bulk of the Iliad and Odyssey combined. It is divided into eighteen books, and a

supplement, entitled Harivamsa, or genealogy of the god Hari (Krishna- Vishnu). In the introduction, Vyasa, being about to dictate the poem, is made to say (i. 81) that so far he and some of his disciples knew 8800 couplets; and farther on (i. 101) he is said to have composed the collection relating to the Bharatas (bhdrata-samhitd) , and called the Bhdratam, which, not including the episodes, consisted of 24,000 slokas. Now, as a matter of fact, the portion relating to the feud of the rival houses con- stitutes somewhere between a fourth and a fifth of the work; and it is by no means improbable that this portion once formed a separate poem, called the Bhdrata. But, whether the former statement is to be understood as implying the existence, at a still earlier time, of a yet shorter version of about one-third of the present extent of the leading narrative, cannot now be determined. While some of the episodes are so loosely connected with the story as to be readily severed from it, others are so closely inter- woven with it that their removal would seriously injure the very texture of the work. This, however, only shows that the original poem must have undergone some kind of revision, or perhaps repeated revisions. That such has indeed taken place, at the hand of Brahmans, for sectarian and caste purposes, cannot be doubted. According to Lassen's opinion, 1 which has been very generally accepted by scholars, the main story of the poem would be based on historical events, viz. on a destructive war waged between the two neighbouring peoples of the Kurus and Pan- chalas, who occupied the western and eastern parts of the Madhyadesa (or " middle land " between the Ganges and Jumna) respectively, and ending in the overthrow of the Kuru dynasty. On the original accounts of these events— perhaps handed down in the form of lays or sagas — the Pandava element would subsequently have been grafted as calculated to promote the class interests of the Brahmanical revisers. It is certainly a strange coincidence that the five Pandava princes should have taken to wife the daughter of the king of the Panchalas, and. thus have linked their fortunes to a people which is represented, in accordance with its name, to have consisted of five (pancha) tribes.

The earliest direct information regarding the existence of epic poetry in India is contained in a passage of Dion Chryspstom (c. a.d. 80), according to which " even among the Indians, they say, Homer's poetry is sung, having been translated by them into their own dialect and tongue "; and " the Indians are well acquainted with the sufferings of Priam, the lamentations and wails of Andromache and Hecuba, and the prowess of Achilles and Hector." Now, although these allusions would suit either poem, they seem to correspond best to certain incidents in the Mahabharata, especially as no direct mention

is made of a warlike expedition to a remote island for the rescue of an abducted woman, the resemblance of which to the Trojan expedition would naturally have struck a Greek becoming acquainted with the general outline of the Ramdyana. Whence Uion derived his information is not known; but as many leading names of the Mahabharata and even the name of the poem itself 2 are mentioned in Panini's grammatical rules, not only must the Bharata legend have been current in his time (? c. 400 B.C.), but most probably it existed already in poetical form, as undoubtedly it did at the time of Patanjali, the author of the " great commentary " on Panini (c. 150 B.C.). The great epic is also mentioned, both as Bhdrata and Mahabharata, in the Grihya-sulra of Asvalayana, whom Lassen supposes to have lived about 350 B.C. Nevertheless it must remain uncertain whether the poem was then already in the form in which we

1 Lassen, Indische Altertumskunde, i. 733 sqq.

2 Viz. as an adj., apparently with " war " or " poem " understood.

now have it, at least as far as the leading story and perhaps some of the episodes are concerned, a large portion of the episodical matter being clearly of later origin. It cannot, how- ever, be doubted that long before that time heroic song had been diligently cultivated in India at the courts of princes and among Kshatriyas, the knightly order, generally. In the Mahabharata itself the transmission of epic legend is in some way connected with the Sutas, a social class which, in the caste- system, is defined as resulting from the union of Kshatriya men "with Brahmana women, and which supplied the office of charioteers and heralds, as well as (along with the Magadhas) that of professional minstrels. Be this as it may, there is reason to believe that, as Hellas had her doiSot who sang the xXea av8p&v, and Iceland her skalds who recited favourite sagas, so India had from olden times her professional bards, who delighted to sing the praises of kings and inspire the knights with warlike feelings. If in this way a stock of heroic poetry had gradually accumulated which reflected an earlier state of society and manners, we can well understand why, after the Brahmanical order of things had been definitely established, the priests should have deemed it desirable to subject these traditional memorials of Kshatriya chivalry and prestige to their own censorship, and adapt them to their own canons of religious and civil law. Such a revision would doubtless require considerable skill and tact; and if in the present version of the work much remains that seems contrary to the Brahmanical code and pretensions — e.g. the polyandric union of Draupadi and the Pandu princes — the reason probably is that such features were too firmly rooted in the popular tradi- tion to be readily

eliminated; and all the revisers could do was to explain them away as best they could. Thus Draupadl's ab- normal position is actually accounted for in five different ways, one of these representing it as an act of duty and filial obedience on the part of Arjuna who, on bringing home his fair prize and announcing it to his mother, is told by her, before seeing what it is, to share it with his brothers. Nay, it has even been seriously argued that the Brahmanical editors have completely changed the traditional relations of the leading characters of the story. For, although the Pandavas and their cousin Krishna are con- stantly extolled as models of virtue and goodness, while the Kauravas and their friend Karna — a son of the sun-god, borne by KuntI before her marriage with Pandu, and brought up secretly as the son of a Suta — are decried as monsters of depravity, these estimates of the heroes' characters are not unfrequently belied by their actions — especially the honest Kama and the brave Duryodhana (i.e. " the bad fighter," but formerly called Suyo- dhana, " the good fighter ") contrasting not unfavourably with the wily Krishna and the cautious and somewhat effeminate Yudhishthira. These considerations, coupled with certain peculiarities on the part of the Kauravas, apparently suggestive of an original connexion of the latter with Buddhist institutions, have led Dr Holtzmann to devise an ingenious theory, viz. that the traditional stock of legends was first worked up into a connected narrative by some Buddhist poet — most likely at the time of the emperor Asoka (c. 250 B.C.), whom the Kaurava hero Suyodhana might even seem to have been intended to represent — and that this poem, showing a decided predilection for the Kuru party as the representatives of Buddhist principles, was afterwards revised in a contrary sense, at the time of the Brahmanical reaction, by votaries of Vishnu, when the Buddhist features were generally modified into Saivite tendencies, and prominence was given to the divine nature of Krishna, as an incarnation of Vishnu. As this theory would, however, seem to involve the Brahmanical revision of the poem having taken place subsequent to the decline of Buddhist predominance, it would shift the completion of the work to a considerably later date than would be consistent with other evidence. From inscriptions we know that by the end of the 5th century a.d. the Mahabharata was appealed to as an authority on matters of law, and that its extent was practically what it now is, including its supplement, the Harivamsa. Indeed, everything seems to point to the probability of the work having been complete by about a.d. 200. But, whilst Bharata and Kuru heroic lays may, and probably

do, go back to a much earlier age, it seems hardly possible to assume that the Pandava epic in its present form can have been composed before the Greek invasion of India, or about 300 B.C. Moreover, it is by no means impossible that the epic narrative was originally composed — as some other portions of the works are — in prose, either continuous or mixed with snatches of verse. Nay, in the opinion of some scholars, this poem (as well as the Ramayana) may even have been originally composed in some popular dialect, which would certainly best account for the irregular and apparently prakritic or dialectic forms in which these works abound. The leading position occupied in the exist- ing epic by Krishna (whence it is actually called karshipa veda, or the veda of Krishna), and the Vaishnava spirit pervading it, make it very probable that it assumed its final form under the influence of the Bhagavata sect with whom Vasudeva (Krishna), originally apparently a venerated local hero, came to be regarded as a veritable god, and incarnation of Vishnu. Its culminating point this sectarian feature attains in the Bhagavad-gUa {i.e. the upanishad), ” sung by the holy one ” — the famous theosophic episode, in which Krishna, in lofty and highly poetic language, expounds the doctrine of faith (bhakti) and claims adoration as the incarnation of the supreme spirit. Of the purely legendary matter incorporated with the leading story of the poem, not a little, doubtless, is at least as old as the latter itself. Some of these episodes — especially the well-known story of Nala and DamayantI, and the touching legend of Savitri — form themselves little epic gems of considerable poetic value.

The Ramayana, i.e. poem ” relating to Rama,” is ascribed to the poet Valmiki; and, allowance being made for some later additions, the poem indeed presents the appearance of being the work of an individual genius. In its present form it consists of some 24,000 slokas, or 48,000 lines of sixteen syllables, divided into seven books.

(I.) King Dasaratha of Kosala, reigning at Ayodhya (Oudh), has four sons borne him by three wives, viz. Rama, Bharata and the twins Lakshmana and Satrughna. Rama, by being able to bend an enormous bow, formerly the dreaded weapon of the god Rudra, wins for a wife Sita, daughter of Janaka, king of Videha (Tirhut). (II.) On his return to Ayodhya he is to be appointed heir-apparent (yuva-raja, i.e. juvenis rex) ; but Bharata’s mother persuades the king to banish his eldest son for fourteen years to the wilderness, and appoint her son instead. Separation from his favourite son soon breaks the king’s heart; whereupon the ministers call on Bharata to assume the reins of

government. He refuses, however, and, betaking himself to Rama's retreat on the Chitrakuta mountain (in Bundelkhund), implores him to return; but, unable to shake Rama's resolve to complete his term of exile, he consents to take charge of the kingdom in the meantime. (III.) After a ten years' residence in the forest, Rama attracts the attention of a female demon (rakshasi) ; and, infuriated by the rejection of her advances, and by the wounds inflicted on her by Lakshmana, who keeps Rama company, she inspires her brother Ravana, demon- king of Ceylon, with love for Sita, in consequence of which the latter is carried off by him to his capital Lanka. While she resolutely rejects the Rakshasa's addresses, Rama sets out with his brother to her rescue. (IV.) After numerous adventures they enter into an alliance with Sugriva, king of the monkeys; and, with the assistance of the monkey-general Hanuman, and Ravana's own brother Vibhishana, they prepare to assault Lanka. (V.) The monkeys, tearing up rocks and trees, construct a passage across the straits — ■ the so-called Adam's Bridge, still designated Rama's Bridge in India. (VI.) Having crossed over with his allies, Rama, after many hot encounters and miraculous deeds, slays the demon and captures the stronghold ; whereupon he places Vibhishana on the throne of Lanka. To allay Rama's misgivings as to any taint she might have incurred through contact with the demon, Sita now successfully undergoes an ordeal by fire; after which they return to Ayodhya, where, after a triumphal entry, Rama is installed. (VII.) Rama, how- ever, seeing that the people are not yet satisfied of SIta's purity, resolves to put her away ; whereupon, in the forest, she falls in with Valmiki himself, and at his hermitage gives birth to two sons. While growing up there, they are taught by the sage the use of the bow, as well as the Vedas, and the Ramayana as far as the capture of Lanka and the royal entry into Ayodhya. Ultimately Rama discovers and recognizes them by their wonderful deeds and their likeness to himself, and takes his wife and sons back with him.

The last book, as will be noticed from this bare outline, presents a somewhat strange appearance. There can be little doubt that it is a later addition to the work ; and the same is apparently the case as regards the first book, with the exception of certain

portions which would seem to have formed the beginning of the original poem. In these two books the character of Rama appears changed: he has become deified and identified with the god Vishnu, whilst in the body of the poem his character is simply that of a perfect man and model hero. As regards the general idea underlying the leading story, whilst the first part of the narrative can hardly be said to differ materially from other historical and knightly romances, the

second part — the expedi- tion to Lanka — on the other hand has called forth different theories, without, however, any general agreement having so far been arrived at. Whilst Lassen and Weber would see in this warlike expedition a poetical representation of the spread of Aryan rule and civilization over southern India, Talboys Wheeler took the demons of Lanka, against whom Rama's campaign is directed, to be intended for the Buddhists of Ceylon. More recently, again, Professor Jacobi 1 of Bonn has endeavoured to prove that the poem has neither an allegorical nor a religious tendency, but that its background is a purely mythological one — Rama representing the god Indra, and Sita — in accordance with the meaning of the name — the personified " Furrow," as which she is already invoked in the Rigveda, and hence is a tutelary spirit of the tilled earth, wedded to Indra, the Jupiter Pluvius. Moreover, from a comparison of the narrative of the poem with a popular version of it, contained in one of the Pali " birth- stories," the Dasaratha-jataka, which lacks the second part of the story, Professor Weber tried to show that the expedition of Lanka, cannot have formed part of the original epic, but was probably based on some general acquaintance with the Troy legend of Greek poetry.

A remarkable feature of this poem is the great variation of its textual condition in different parts of the country, amounting in fact to at least three different recensions. The text most widely prevalent both in the north and south has been printed repeatedly, with commentary, at Bombay, and was taken by Mr R. T. H. Griffith as the basis for his beautiful poetical transla- tion. 2 The so-called Gauda or Bengal recension, on the other hand, which differs most of all, has been edited, with an Italian prose translation, by G. Gorresio; 3 whilst the third recension, recognized chiefly in Kashmir and western India, is so far known only from manuscripts. The mutual relation of these versions will appear from the fact that about one-third of the matter of each recension is not found in the other two; whilst in the common portions, too, there are great variations both in regard to the order of verses and to textual readings. To account for this extraordinary textual diversity, it has been suggested that the poem was most likely originally composed in a popular dialect, and was thence turned into Sanskrit by different hands trying to improve on one another; whilst Professor Jacobi would rather ascribe the difference to the fact that the poem was for a long time handed down orally in Sanskrit by rhap- sodists, or professional minstrels, when such variations might naturally arise in different parts of the country. Yet another version of the same story, with, however, many important variations of details, forms an episode of the Mahabhdrata, the Rdmopakhyana, the

relation of which to Valmiki's work is still a matter of uncertainty. In respect of both versification and diction the Ramayana is of a distinctly more refined character than the larger poem; and, indeed, Valmiki is seen already to cultivate some of that artistic style of poetry which was carried to excess in the later artificial Kavyas, whence the title of ddi-kavi, or first poet, is commonly applied to him. Though the political conditions reflected in the older parts of the Ramayana seem to correspond best to those of pre-Buddhistic times, this might after all only apply to the poetic material banded down orally and eventually cast into its present form. To characterize the Indian epics in a single word: though often disfigured by grotesque fancies and wild exaggerations, they are yet noble works, abounding in passages of remarkable descriptive power,

1 Das Ramayana (Bonn, 1893).

2 London, 1870-1874; there is also an English prose translation by M. N. Dutt (Calcutta, 1894) > an d a condensed version in English verse by Romesh Dutt (London, 1899).

3 Turin, 1 843-1 867.

intense pathos, and high poetic grace and beauty; and while, as works of art, they are far inferior to the Greek epics, in some respects they appeal far more strongly to the romantic mind of Europe, namely, by their loving appreciation of natural beauty, their exquisite delineation of womanly love and devotion, and their tender sentiment of mercy and forgiveness.

2. Pur anas and Tantras. — The Puranas' 1 are partly legendary partly speculative histories of the universe, compiled for the purpose of promoting some special, locally prevalent " * form of Brahmanical belief. They are sometimes styled a fifth Veda, and may indeed in a certain sense be looked upon as the scriptures of Brahmanical India. The term purana, signifying " old," applied originally to prehistoric, especially cosmogonic, legends, and then to collections of ancient traditions generally. The existing works of this class, though recognizing the Brahmanical doctrine of the Trimurti, or triple manifestation of the deity (in its creative, preservative and destructive activity), are all of a sectarian tendency, being intended to establish,

on quasi-historic grounds, the claims of some special god, or holy place, on the devotion of the people. For this purpose the compilers have pressed into their service a mass of extraneous didactic matter on all manner of subjects, whereby these works had become a kind of popular encyclopaedias of useful know- ledge. It is evident, however, from a comparatively early definition given of the typical Purana, as well as from numerous coincidences of the existing works, that they are based on, or enlarged from, older works of this kind, more limited in their scope and probably of a more decidedly tritheistic tendency of belief. Thus none of the Puranas, as now extant, is probably much above a thousand years old, though a considerable propor- tion of their materials is doubtless much older, and may perhaps in part go back to several centuries before the Christian era.

In legendary matter the Puranas have a good deal in common with the epics, especially the Mahdbhdrata — the compilers or revisers of both classes of works having evidently drawn their materials from the same fluctuating mass of popular traditions. They are almost entirely composed in the epic couplet, and indeed in much the same easy flowing style as the epic poems, to which they are, however, as a rule greatly inferior in poetic value.

According to the traditional classification of these works, there are said to be eighteen (Mahd-, or great) Puranas, and as many Upa-puranas, or subordinate Puranas. The former are by some authorities divided into three groups of six, according as one or other of the three primary qualities of external existence — goodness, darkness (ignorance), and passion — is supposed to prevail in them, viz. the Vishnu, Naradiyp, Bhagavata, Garuda, Padma, Varaha — Matsya, Kurma, Linga, Siva, Skanda, Agni — Brahmanda, Brahma- vaivarta, Markandeya, Bhavishya, Vamana and Bra.hma-Pura.nas. In accordance with the nature of the several forms of the Trimurti, the first two groups chiefly devote themselves to the commenda- tion of Vishnu and Siva respectively, whilst the third group, which would properly belong to Brahman, has been largely appropriated for the promotion of the claims of other deities, viz. Vishnu in his sensuous form of Krishna, Devi, Ganesa, and Surya. As Professor Baneriea has shown in his preface to the Markandeya, this seems to have been chiefly effected by later additions and interpolations. The insufficiency of the above classification, however, appears even from the fact that it omits the Vayu-purana, probably one of the oldest of all, though some MSS. substitute it for one or other name of the second group. The eighteen principal Puranas are said to consist of together 400,000 couplets. In northern India the Vaish- nava Puranas, especially the Bhagavata and Vishnu, 1 are by far the most popular. The Bhagavata

was formerly supposed to have been composed by Vopadeva, the grammarian, who lived in the 13th century. It has, however, been shown * that what he wrote was a synopsis of the Purana, and that the latter is already quoted in a work by Ballala Sena of Bengal, in the nth century. It is certainly held in the highest estimation, and, especially through the vernacular

1 Cf. H. H. Wilson, Essays on the Religion of the Hindus, ii. pp. 67 sqq.

2 There are several Indian editions of these two works. The Bhagavata has been partly printed, in an Edition de luxe, with a French translation at Paris, in 3 vols., by E. Burnouf, and a fourth by M. Hauvette-Besnault. Of the Vishnu, there is a translation by H. H. Wilson, 2nd ed., enriched with valuable notes by F. Hall. This and most other Puranas have been printed in India, especially in the Bibl. Ind. and the ” Anand. series.”

1 Rajendralala Mitra, Notices of Sansk. MSS. ii. 47.

versions of its tenth book, treating of the story of Krishna, has powerfully influenced the religious belief of India.

From the little we know regarding the Upa-puranas, their char- acter does not seem to differ very much from that of the principal sectarian Puranas. Besides these two classes of works there is a large number of so-called Sthala- puranas, or chronicles recounting the history and merits of some holy ” place ” or shrine, where their recitation usually forms an important part of the daily service. Of much the same nature are the numerous Mahatmyas (literally “relating to the great spirit “), which usually profess to be sections of one or other Purana. Thus the Dem-mahatmya, which celebrates the victories of the great “goddess ” over the Asuras, and is daily read at the temples of that deity, forms a section, though doubtless an interpolated one, of the Markandeya-purana. Similarly the Adhyatma-RamSyana, a kind of spiritualized version of Valmlkl’s poem, forms part of the Brahmanda-purana which (like the Skanda) seems hardly to exist in an independent form, but to be made up of a large number of Mahatmyas.

The Tantras 4 have to be considered as partly a collateral and partly a later development of the sectarian Puranas; though, unlike these, they can hardly lay claim to any intrinsic poetic value. These works are looked upon as their sacred writings by the numerous Sdktas, or worshippers of the female energy (hakti) of some god, especially the wife of Siva, in one of her many forms (Parvati, Devi,” Kali, Bhavani, Durga, &c). This worship of a female representation of the divine

power appears already in some of the Puranas; but in the Tantras it assumes quite a peculiar character, being largely intermixed with magic performances and mystic rites, partly, indeed, of a grossly immoral nature (see Hinduism) . Of this class of writings no specimen would appear to have as yet been in existence at the time of Amarasimha (6th century), though they are mentioned in some of thePuranas. They are usually in the form of a dialogue between Siva and his wife. The number of original Tantras is fixed at sixty-four, but they still await a critical examination at the hands of scholars. Among the best known may be mentioned the Rudraydmala, Kuldrnava, Sydmd-rahasya and Kalika-tantra.

3. Artificial Epics and Romances. — In the early centuries of the Christian era a new class of epic poems begins to make its appearance,differing widely in character from those that had preceded it. The great national epics, composed epics. though they were in a language different from the ordinary vernaculars, had at least been drawn from the living stream of popular tradition, and were doubtless readily under- stood and enjoyed by at least the educated classes of the people. The later productions, on the other hand, are of a decidedly artificial character, and must necessarily have been beyond the reach of any but the highly cultivated. They are, on the whole, singularly deficient in incident and invention, their subject matter being almost entirely derived from the old epics. Nevertheless, these works are by no means devoid of merit and interest; and a number of them display considerable descriptive power and a wealth of genuine poetic sentiment, though unfortunately often clothed in language that deprives it of half its value. The simple heroic couplet has mostly been discarded for various more or less elaborate metres; and in accordance with this change of form the diction becomes gradu- ally more complicated — a growing taste for unwieldy compounds, a jingling kind of alliteration, or rather agnomination, and an abuse of similes marking the increasing artificiality of these productions.

The generic appellation of such works is kavya, which, meaning “poem,” or the work of an individual poet (kavi), is, as we have seen, already applied to the Ramayana. Six poems of this kind are singled out by native rhetoricians as standard works, under the title of MahdkSvya, or great poems. Two of these are ascribed to the famous dramatist Kalidasa, the most prominent figure of this period of Indian literature and truly a master of the poetic art. In a com- paratively modern couplet he is represented as having been one of nine literary ” gems ” at the court of a king Vikramaditya, who was supposed to have originated the so-called Vikrarria era, dating from 56-57 B.C. Recent research has, however, shown that this name was only applied to the

era from about A.D. 800, and that the latter was already used in inscriptions of the 5th century under the name of the Malava era. Hence also Fergusson's theory that it was founded by King Vikramaditya Harsha of Ujjayini (Ujjain or

4 Cf. H. H. Wilson, Essays on the Religion of the Hindus, ii. pp.

77 sqq-

Oujein) in a.d. 544 and ante-dated by 600 years, falls to the ground ; and with it Max Miiller's theory l of an Indian Renaissance in- augurated during the reign of that king. Though Kalidasa's date thus remains still uncertain, the probability is that he nourished at Ujjayini about 440-448 a.d. Of the principal poets of this class, whose works have come down to us, he appears to be one of the earliest ; but there can be little doubt that he was preceded in this as in other departments of poetic composition by many lesser lights, eclipsed by the sun of his fame, and forgotten. Thus the recently discovered Buddhacharita, 2 a Sanskrit poem on the life of the re- former, which was translated into Chinese about a.d. 420, and the author of which, Asvaghosha, is placed by Buddhist tradition as early as the time of Kanishka (who began to reign in A.D. 78), calls itself, not without reason, a "mahakavya"; and the panegyrics contained in some of the inscriptions of the 4th century 3 likewise display, both in verse and ornate prose, many of the characteristic features of the kavya style of composition. Indeed, a number of quotations in the Mahabhashya, 4 the commentary on Panini, go far to show that the kavya style was already cultivated at the time of Patanjali, whose date can hardly be placed later than the 1st century of the Christian era, though it may, and probably does, go back to the 2nd century B.C.

Of the six universally recognized " great poems " here enumerated the first two, and doubtless the two finest, are those attributed to Kalidasa. (1) The Raghuvamsa, 6 or " race of Raghu," celebrates the ancestry and deeds of Rama. The work, consisting of nineteen cantos, is manifestly incomplete; but hitherto no copy has been discovered of the six additional cantos which are supposed to have completed it. (2) The Kumara-sambhava, 6 or " the birth of (the war-god) Kumara " (or Skanda), the son of Siva and Parvati, con- sists of seventeen cantos,

the last ten of which were, however, not commented upon by Mallinatha, and are usually omitted in the MSS. ; whence they are still looked upon as spurious by many scholars, though they may only have been set aside on account of their amorous character rendering them unsuitable for educational purposes, for which the works of Kalidasa are extensively used in India; the 8th canto, at any rate, being quoted by Vamana (c. A.D. 700). Another poem of this class, the Nalodaya, 1 or ” rise of Nala ” — describing the restoration of that king, after having lost his king- dom through gambling — is wrongly ascribed to Kalidasa, being far inlerior to the other works, and of a much more artificial character. (3) The Kirdtarjunxya? or combat between the Pandava prince Arjuna and the god Siva, in the guise of a Kirata or wild moun- taineer, is a poem in eighteen cantos, by Bharavi, who is mentioned together with Kalidasa in an inscription dated A.D. 634. (4) The Sisupala-badha, or slaying of Sisupala, who, being a prince of Chedi, reviled Krishna, who had carried off his intended wife, and was killed by him at the inauguration sacrifice of Yudhishthira, is a poem consisting of twenty cantos, attributed to Magha, 9 whence it is also called Mdghakdvya. ($) The Ravanabadha, or ” slaying of Ravana,” more commonly called Bhatfikdvya, to distinguish it from other poems (especially one by Pravarasena) , likewise bearing the former title, was composed for the practical purpose of illustrating the less common grammatical forms and the figures of rhetoric and poetry. In its closing couplet it professes to have been written at Vallabhi, under Sridharasena, but, several princes of that name being men- tioned in inscriptions as having ruled there in the 6th and 7th centuries, its exact date is still uncertain. Bhatri, apparently the author’s name, is usually identified with the well-known grammarian Bhartrihari, whose death Professor M. Miiller, from a Chinese statement, fixes at A.D. 650, while others make him Bhartrihari’s son. (6) The Naishadhlya, or Naishadha-charita, the life of Nala, king of Nishadha, is ascribed to Sri-Harsha (son of Hira), who is supposed to have lived in the latter part of the 12th century. A small portion of the simple and noble episode of the Mahdbhdrata is here retold in highly elaborate and polished stanzas, and with a degree of lasciviousness which (unless it be chiefly due to the poet’s exuberance of fancy) gives a truly appalling picture of social corruption. Another highly esteemed poem, the Rdghava-pandamya, composed by Kaviraja (” king of poets “) — whose date is uncertain,

1 Propounded in Note G of his India, What can it Teach Us ?

2 Ed. by E. B. Cowell (Oxford, 1893); trans, by the same, S.B.E.

3 See G. Biihler, ” Die indischen Inschriften und das Alter der

indischen Kunstpoesie," in Sitzungsber. Imp. Ac. (Vienna, 1890).

4 Collected by F. Kielhorn, Ind. Ant. vol. 16.

6 Edited with a Latin trans, by F. Stenzler; also text, with commentary, by S. P. Pandit; also repeatedly in India with and without translation.

'Text and Latin trans, of cantos 1-7 published by F. Stenzler; an English trans, by R. T. H. Griffith ; also several Indian editions, with comm.

7 Text with comm. and Latin trans., edited by F. Benary; with Eng. trans., in verse, by W. Yates; also repeatedly ed. in India.

8 Editions of this and the three following poems have been published in India.

9 Magha probably lived in the 9th century, though Bhao Daji, in his paper on Kalidasa, would make him " a contemporary of the Bhoja of the nth century."

some scholars placing him about a.d. 800, others later than the 10th century — is characteristic of the trifling uses to which the poet s art was put. The well-turned stanzas are so ambiguously worded that the poem may be interpreted as relating to the leading story of either the Rdmdyana or the Mahdbhdrata. Less ambitious in composition, though styling itself a mahakavya, is the Vikramdnka- devacharita, 1 " a panegyric written about a.d. 1085 by the Kashmir poet Bilhana, in honour of his patron the Chalukya king Vikra- maditya of Kalyana, regarding the history of whose dynasty it supplies some valuable information.

In this place may also be mentioned, as composed in accordance with the Hindu poetic canon, the Rdjatarangini, il or " river of kings," being a chronicle of the kings of Kashmir, and the only important historical work in the Sanskrit language, though even here considerable allowance has to be made for poetic licence and fancy. The work was composed by the Kashmirian poet Kalhana about 1 1 50, and was afterwards continued by three successive supple- ments, bringing down the history of Kashmir to the time of the emperor Akbar. Worthy of mention, in this place, are also two Works on the life of Buddha, which may go back to the 1st century of the Christian era, viz. the Lalitavistara 12 and the Mahavastu, 13 written in fairly correct Sanskrit prose mixed with stanzas (gatha) composed in a hybrid, half Prakrit, half Sanskrit form of language.

Under the general term ” kavya ” Indian critics include, however, not only compositions in verse, but also certain kinds of prose works composed in choice diction richly embellished with flowers of rhetoric. The feature generally regarded by writers on poetics as the chief mark of excellence in this ornate prose style is the frequency and length of its compounds; whilst for metrical compositions the use of long compounds is expressly discouraged by some schools of rhetoric. Moreover, the best specimens of this class of prose writing are not devoid of a certain musical cadence adapting itself to the nature of the subject treated. Amongst the works of this class the most interesting are four so-called kathds (tales) or dkhydyikds (novels). The oldest of these is the Daiakumdracharita, 14 or ” ad- ventures of the ten princes ” — a vivid, though probably exaggerated, picture of low-class city life — by Dandin, the author of an excellent manual of poetics, the Kavyadarsa, who most likely lived in the 6th century. Probably early in the 7th century, Subandhu composed his tale Vdsavadattd, 11 taking its name from a princess of Ujjayini (OujeLn), who in a dream fell in love with Udayana, king of Vatsa, and, on the latter being decoyed to that city and kept in captivity by her father, was carried off by him from a rival suitor. The remaining two works were composed by Bana, the court poet of King Harshavardhana of Thanesar and Kanauj — who ruled over the whole of northern India, A.D. 606-648, and at whose court the Chinese pilgrim Hiuen Thsang resided for some time during his sojourn in India (630-646) — viz. the Kadambarl, 16 a romantic tale of a princess of that name; and the apparently never completed Harshacharita,” intended as an historical novel, but practically a panegyric (prasasti) in favour of the poet’s patron, supplying, however, a valuable picture of the life of the time. Whilst these tales have occasionally stanzas introduced into them, this feature of mixed (misra) verse and prose is especially prominent in another popular class of romances, the so-called Champils. Of such works, which seem to have been rather numerous, it must suffice to mention two specimens, viz. the Bhdrata-champu, in twelve cantos, by Ananta Bhatta; and the Champu-rdmdyana, or Bhoja-champu, in seven books, the first five of which are attributed, doubtless by way of compliment, to King Bhojaraja of Dhara.

4. The Drama. 1 *— The early history of the Indian drama is enveloped in obscurity. The Hindus themselves ascribe the origin of dramatic representation to the sage Bharata, who is fabled to have lived in remote antiquity, and to have received this science directly from the god Brahman, by whom it was extracted from the Veda. The term bharata— (?) i.e. one who is kept, or one who sustains(a part) — also signifies ” an actor “; but it is doubtful which of the two is the

earlier —

10 Edited by G. Biihler.

11 The Calcutta edition (1835) an d that °f A. Troyer, with a French trans., based on insufficient material, have been superseded by M. A. Stein's ed. (Bombay, 1892), trans, by Y. C. Datta (Calcutta,

1898).

12 Ed. and trans. Raj. Mitra, Bibl. Ind.; trans. S. Lefmann.

13 Ed. E. Senart.

14 Ed. H. H. Wilson; again (Bombay Skt. Ser.) pt. i., G. Biihler; ii., P. Peterson; freely trans, by P. W. Jacob.

15 Ed. Fitzedw. Hall (Bibl. Ind.) ; with comm. J. Vidyasagara (Calcutta, 1874).

16 Ed. P. Peterson (Bomb. S.S.); with comm. M. R. Kale (1896); trans, with some omissions, C. M. Ridding.

17 Ed. J. Vidyasagara (Calcutta, 1883); with comm. (Jammu, 1879; Bombay, 1892); trans. E. B. Cowell and F. W. Thomas

(1897).

18 Cf . H. H. Wilson, Select Specimens of the Theatre of the Hindus (3rd ed., 2 vols., 1871) ; Sylvain Levi, Le Thedtre indien (Paris, 1890).

the appellative use of the word, or the notion of an old teacher of the dramatic art bearing that name. There still exists an extensive work, in epic verse, on rhetoric and dramaturgy, entitled Nd ya-sdstra, 1 and ascribed to Bharata. Though this is probably the oldest theoretic work on the subject that has come down to us, it can hardly be referred to an earlier period than several centuries after the Christian era. Not improbably, however, this work, which presupposes a fully developed scenic art, had an origin similar to that of some of the metrical law-

books, which are generally supposed to be popular and improved editions of older sutra-works. We know that such treatises existed at the time of Panini, as he mentions two authors of Nata-sutras, or " rules for actors, " viz. Silalin and Krisasva. Now, the words nata and natya — as well as nataka, the common term for " drama " — being derived (like the modern vernacular " Nautch " = nritya) from the root nat (nrt) " to dance, " seem to point to a pantomimic or choral origin of the dramatic art. It might appear doubtful, therefore, in the absence of any clearer definition in Panini's grammar, whether the " actors' rules " he mentions did not refer to mere pantomimic performances. Fortunately, however, Patanjali, in his " great com- mentary," speaks of the actor as singing, and of people going " to hear the actor." Nay, he even mentions two subjects, taken from the cycle of Vishnu legends — viz. the slaying of Kamsa (by Krishna) and the binding of Bali (by Vishnu) — which were represented on the stage both by mimic action and declamation. Judging from these allusions, theatrical entertainments in those days seem to have been very much on a level with the old religious spectacles or mysteries of Europe, though there may already have been some simple kinds of secular plays which Patanjali had no occasion to mention. It is not, however, till some five or six centuries later that we meet with the first real dramas, which mark at the same time the very culminating point of Indian dramatic composition. In this, as in other departments of literature, the earlier works have had to make way for later and more perfect productions; and no trace now remains of the intermediate phases of development. Thus we know of at least five predecessors of Kalidasa from whom nothing but a few quotations have been preserved.

Here, however, the problem presents itself as to whether the existing dramatic literature has naturally grown out of such popular religious performances as are alluded to by Patanjali, or whether some foreign influence has intervened at some time or other and given a different direction to dramatic composition. The question has been argued both for and against the probability of Greek influence; but it must still be considered as sub judice; the latest investigator, M. Sylvain Levi, having given a decided opinion against outside influence. There are doubtless some curious points of resemblance between the Indian drama and the Modern Attic (and Roman) comedy, viz. the prologue, the occasional occurrence of a token of recognition, and a certain correspondence of characteristic stage figures— especially the Vidushaka, or jocose companion of the hero, presenting a certain analogy to the servus of the Roman stage, as does the Vita, the hero's dissolute, though accomplished, boon-companion, of some plays, to

the Roman parasite — for which the assumption of some acquaintance with the Greek comedy on the part of the earlier Hindu writers would afford a ready explanation. On the other hand, the differences between the Indian and Greek plays are perhaps even greater than their coincidences, which, moreover, are scarcely close enough to warrant our calling in question the originality of the Hindus in this respect. Certain, however, it is that, if the Indian poets were indebted to Greek playwrights for the first impulse in dramatic composition, in the higher sense, they have known admirably how to adapt the Hellenic muse to the national genius, and have produced a dramatic literature worthy to be ranked side by side with both the classical and our own romantic drama. It is to the latter especially that the general character of the Indian play presents a striking resemblance, much more so than to the classical drama. The Hindu dramatist has little regard for the ” unities ” of the

1 Ed., in KBvyamala (Bombay, 1894) ; by Grosset (Lyons, 1897).

classical stage, though he is hardly ever guilty of extravagance in his disregard of them. Unlike the Greek dramatic theory, it is an invariable rule of Indian dramaturgy, that every play, however much of the tragic element it may contain, must have a happy ending. The dialogue is invariably carried on in prose, plentifully interspersed with those neatly turned lyrical stanzas in which the Indian poet delights to depict some natural scene, or: some temporary physical or mental condition. The most striking feature of the Hindu play, however, is the mixed nature of its language. While the hero and leading male characters speak Sanskrit, women and inferior male characters use various Prakrit dialects. As regards these dialectic varieties, it can hardly be doubted that at the time when they were first employed in this way they were local vernacular dialects; but in the course of the development of the scenic art they became permanently fixed for special dramatic purposes, just as the Sanskrit had, long before that time, become fixed for general literary purposes. Thus it would happen that these Prakrit dialects, having once become stationary, soon diverged from the spoken vernaculars, until the difference between them was as great as between the Sanskrit and the Prakrits. As regards the general character of the dramatic Prakrits, they are somewhat more removed fiom the Sanskrit type than the Pali, the language of the Buddhist canon, which again is in a rather more advanced state than the language of the Asoka inscriptions (c. 250 B.C.). And, as the Buddhist sacred books were committed to writing about 80 B.C., the state of their language is attested for that period at latest; while the grammatical fixation of the scenic Prakrits has probably to be referred to the early centuries of the Christian era.

The existing dramatic literature is not very extensive. The number of plays of all kinds of any literary value will scarcely amount to fifty. The reason for this paucity of dramatic produc- tions doubtless is that they appealed to the tastes of only a limited class of highly cultivated persons, and were in consequence but seldom acted. As regards the theatrical entertainments of the common people, their standard seems never to have risen much above the level of the religious spectacles mentioned by Patanjali. Such at least is evidently the case as regards the modern Bengali jdtrds (Skt. yatrds) — described by Wilson as exhibitions of some incidents in the youthful life of Krishija, maintained in extempore dialogue, interspersed with popular songs — as well as the similar rasas of the western provinces, and the rough a'nd ready performances of the bhanrs, or professional buffoons. Of the religious drama Sanskrit literature offers but one example, viz. the famous Clta- govinda? composed by Jayadeva in the 12th century. It is rather a mytho-lyrical poem, which, however, in the opinion of Lassen, may be considered as a modern and refined specimen of the early form of dramatic composition. The subject of the poem is as follows: Krishna, while leading a cowherd's life in Vnndavana, is in love with Radha, the milkmaid, but has been faithless to her for a while. Presently, however, he returns to her " whose image has all the while lingered in his breast," and after much earnest entreaty obtains her forgiveness. The emotions appropriace to these situations are expressed by the two lovers and a friend of Radha in melodious and passionate, if voluptuous, stanzas of great poetic beauty. Like the Song of Solomon, the Gitagovinda, more- over, is supposed by the Hindu commentators to admit of a mystic interpretation; for, " as Krishija, faithless for a time, discovers the vanity of all other loves, and returns with sorrow and longing to his own darling Radha, so the human soul, after a brief and frantic attachment to objects of sense, burns to return to the God from whence it came " (Griffith).

The Mrichchhakafikd, 3 or " little clay cart," has been usually placed at the head of the existing dramas; but, though a certain clumsiness of construction might seem to justify this distinction, the question of its relative antiquity remains far from being definitively settled. Indeed, the fact that neither Kalidasa, who mentions three predecessors of his, or Bana, in reviewing his literary precursors, makes any allusion to the author of this play, as well as other points, seem rather to tell against the latter's priority. But seeing that Vamana quotes from the Mrichchhakatika, this play must at any rate have been in existence in the latter part of the 8th century. According to several stanzas in the prologue, the play was ram posed by a king Sudraka, who is there stated to have, through Siva's

2 Edited, with a Latin translation, by C. Lassen ; English transla- tion by E.Arnold.

3 Edited by F. Stenzler; with commentary, by K. P. Parab (Bombay), and several times at Calcutta; translated by H. H. Wilson; also into English prose and verse by A. W. Ryder (Harvard Or. Ser., 1905); German by O. v. Bohtlingk and L. Fritze; French by P. Regnaud.

favour, recovered his eyesight, and, after seeing his son as king, to have died at the ripe age of a hundred years and ten days. Accord- j- . . ing to the same stanzas, the piece was enacted after the buarana. k ; ng – s d eat h ; but it is probable that they were added for a subsequent performance. In Bana's novel Kddambari (c. A.D. 630), a king Sudraka is represented as having resided at Biˆisa (Bhilsa) — ■ some 130 m. east of Ujjayini (Ujjain), where the scene of the play is laid. Charudatta, a Brahman merchant, reduced to poverty, and Vasantasena, an accomplished courtezan, meet and fall in love with each other. This forms the main plot, which is interwoven with a political underplot, resulting in a change of dynasty. The con- nexion between the two plots is effected by means of the king's rascally brother-in-law, who pursues Vasantasena with his addresses, as well as by the part of the rebellious cowherd Aryaka, who, having escaped from prison, finds shelter in the hero's house. The wicked prince, on being rejected, strangles Vasantasena, and accuses Charudatta of having murdered her; but, just as the latter is about to be. executed, his lady love appears again on the scene. Meanwhile Aryaka has succeeded in deposing the king, and L having himself mounted the throne of Ujjain, he raises Vasantasena to the position of an honest woman, to enable her to become the wife of Charudatta. The play is one of the longest, consisting of not less than ten acts, some of which, however, are very short. The interest of the action is, on the whole, well sustained; and, altogether, the piece presents a vivid picture of the social manners of the time, whilst the author shows himself imbued with a keen sense of humour, and a master in the delineation of character.

In Kalidasa the dramatic art attained its highest point of perfec- tion. From this accomplished poet we have three well-constructed plays, abounding in stanzas of exquisite tenderness and fine Kalidasa.

descriptive passages, viz. the two well-known mytho- pastoral dramas, Sakuntald in seven and Vikramomasi x in five acts, and a piece of court intrigue, distinctly inferior to the other two, entitled Malavikagnimitra 2 in five acts. King Agnimitra, who has two wives, falls in love with Malavika, maid to the first queen. His wives endeavour to frustrate their affection for each other, but in the end Malavika turns out to be a princess by birth, and is accepted by the queens as their sister.

Srl-Harshadeva — identical with the king (Siladitya) Harshavar- dhana of Kanyakubja (Kanauj) mentioned above.who ruled in the first £' – H half of the 7th century — has three plays attributed to him ;

h'n ar " though possibly only dedicated to him by poets patronized snadeva. ˆy him. This at least commentators state to have been the case as regards the RatndvoU, the authorship of which they assign to Bana. Indeed, had they been the king's own productions, one might have expected the Chinese pilgrims (especially I-tsing, who saw one of the plays performed) to mention the fact. The Ratnavali, 3 " the pearl necklace," is a graceful comedy of genteel domestic manners, in four acts, of no great originality of invention ; the author having been largely indebted to Kalidasa's plays. A decided merit of the poet's art is the simplicity and clearness of his style. Ratnavali, a Ceylon princess, is sent by her father to the court of King Udayana of Vatsa to become his second wife. She suffers shipwreck, but is rescued and received into Udayana's palace under the name of Sagarika, as one of Queen Vasavadatta's attendants. The king falls in love with her, and the queen tries to keep them apart from each other- hut, on learning the maiden's origin, she becomes reconciled, and ~ecognizes her as a " sister." According to H. H. Wilson, " the manners depictured are not influenced by lofty principle or pro- found reflection, but they are mild, affectionate and elegant. It may be doubted whether the harems of other eastern nations, either in ancient or modern times, would afford materials for as favourable a delineation." Very similar in construction, but distinctly in- ferior, is the Priyadariika, in four acts, having for its plot another amour of the same king. The scene of the third play, the Ndgdnanda,* or " joy of the serpents " (in five acts), on the other hand, is laid in semi-divine regions. Jimutavahana, a prince of the Vidyadharas, imbued with Buddhist principles, weds Malayavatl, daughter of the king of the Siddhas, a votary of Gauri (Siva's wife). But, learning that Garuda, the mythic bird, is in the habit of consuming one snake daily, he resolves to offer himself to the bird as a victim, and finally succeeds in converting Garuda to the principle of ahimsa, or ab- stention from doing injury to living beings; but he himself is about

1 Both these plays are known in different repensions in different parts of India. The Bengali recension of the Sakuntald was trans- lated by Sir W. Jones, and into French, with the text, by Chezy, and again edited by R. Pischel, who has also advocated its greater antiquity. Editions and translations of the western (Devanagari) recension have been published by O. Bflhtlingk and Mon. Williams. The Vikramorvasi has been edited critically by S. P. Pandit, and the southern text by R. Pischel. It has been translated by H. H. Wilson and E. B. Cowell.

2 Edited critically by S. P. Pandit; translated by C. H. Tawney (1875), and into German by A. Weber (1856), and L. Fritze (1881).

3 Edited by Taranatha Tarkavachaspati, and by C. Cappeller in Bohtlingk's Sanskrit-Chrestomathie; with commentary (Bombay, 1895); translated by H. H. Wilson.

4 Edited by Madhava Chandra Ghosha and translated by P. Boyd, with a preface by E. B. Cowell.

to succumb from the wounds he has received, when, through the timely intervention of the goddess Gauri, he is restored to his former condition. The piece seems to have been intended as a compromise between Brahmanical (Saiva) and Buddhist doctrines, being thus in keeping with the religious views of king Harsha, who, as we know from Hiuen Thsang, favoured Buddhism, but was very tolerant to Brahmans. It begins with a benedictory stanza to Buddha, and concludes with one to Gauri. The author is generally believed to have been a Buddhist, but it is more likely that he was a Saiva Brahman, possibly Bana himself. Nay, one might almost feel inclined to take the hero's self-sacrifice in favour of a Naga as a travesty of Buddhist principles. In spite of its shortcomings of construction the Nagananda is a play of considerable merit, the characters being drawn with a sure hand, and the humorous element introduced into it of a very respectable order.

Bhavabhuti, surnamed Sri-kantha, "he in whose throat there is beauty (eloquence)," 6 was a native of Padmapura in the Vidarbha country (the Berars), being the son of the Brahman nfiava- Nilakantha and his wife Jatukarni. He passed his hhntl literary life chiefly at the court of Yasovarman of Kanauj, who must have reigned in the latter part of the 7th century, seeing that, after a successful reign, he suffered defeat at the hands of Laladitya of Kashmir, who had mounted his throne in A.D. 695. Bhavabhuti was the author of three plays, two of which, the Maha- mracharita 6 (" life of the great hero ") and the Uttarardmacharita' 1 (" later life of Rama ")', in seven acts each, form

together a drama- tized version of the story of the Ramdyana. The third, the Mdlafi- mddhavaf is a domestic drama in ten acts, representing the fortunes of Madhava and Malati, the son and daughter of two ministers of neighbouring kings, who from childhood have been destined for each other, but, by the resolution of the maiden's royal master to marry her to an old and ugly favourite of his, are for a while threatened with permanent separation. The action of the play is full of life, and abounds in stirring, though sometimes improbable, incidents. The poet is considered by native critics to be not only not inferior to Kalidasa, but even to have surpassed him in his Uttararama- charita, which certainly contains many fine poetic passages instinct with pathos and genuine feeling. But, though he ranks deservedly high as a lyric poet, he is far inferior to Kalidasa as a dramatic artist. Whilst the latter delights in depicting the gentler feelings and tender emotions of the human heart and the peaceful scenes of rural life, the younger poet finds a peculiar attraction in the sterner and more imposing aspects of nature and" the human character. Bhavabhuti's language, though polished and felicitous, is elaborate and artificial compared with that of Kalidasa, and his genius is sorely shackled by a slavish adherence to the arbitrary rules of dramatic theorists.

Bhatta Narayana, surnamed Mrigaraja or Simha, " the lion," the author of the Venisarnhdra* (" the binding up of the braid of hair "), is a poet of uncertain date. Tradition_makes Bhatta him one of the five Kanauj Brahmans whom king Adisura \a f s.

of Bengal, desirous of establishing the pure Vaishnava "

doctrine, invited to his court, and from whom the modern ■ '

Bengali Brahmans are supposed to be descended. But be this as it may, a copperplate grant was issued to our poet in a.d. 840; and, besides, he is quoted in Anandavardhana's Dhvanyaloka, written in the latter part of the 9th century. The play, consisting of six acts, takes its title from an incident in the story of the Mahabhardta when Draupadi, having been lost at dice by Yudhishthira, has her braid of hair unloosened, and is dragged by the hair before the assembly by one of the Kauravas; this insult being subsequently avenged by Bhima slaying the offender, whereupon Draupadi's braid is tied up again, as beseems a married woman. The piece is composed in a style similar to that of Bhavabhuti's plays, but is inferior to them in dramatic construction and poetic merit, though valued by critics for its strict adherence to the rules of the dramatic theory.

The Hanuman-ndfaka 10 is a dramatized version of the story of Rama, interspersed with numerous purely descriptive poetic passages. It consists of fourteen acts, and on account of its length is also called the Mahd-ndtaka, or great drama. Contrary to the general practice, it has no prologue, and Sanskrit alone is employed in it. Tradition relates that it was composed by Hanuman, the monkey general, and inscribed on rocks; but, Valmiki, the author of the Ramdyana,

6 This is the commentator's explanation of the name, whilst M. Levi would render it by " the divine throat."

6 Edited by F. H. Trithen (1848) ; with commentary, A. Barooah (Calcutta, 1877) and Parab (Bombay, 1892); translated by J. Pickford (1871).

7 Edited with commentary and translation (Nagpur, 1895); with commentary, Aiyar and Parab (1899); translation by H. H. Wilson and C. H. Tawney.

8 Edited by R. G. Bhandarkar (1876); translated by H. H. Wilson. Whether, as M. S. Levi suggests, the fact of the play con- sisting of ten acts points to its having been composed in imitation of the Mrichchhakafikd must remain uncertain.

9 Edited by J. Grill (1871); twice with commentary (Bombay); English translation by S. M. Tagore (Calcutta).

10 Printed with Mohanadasa's commentary (Bombay, 1861).

being afraid lest it might throw his own poem into the shade, Hanu- man allowed him to cast his verses into the sea. Thence frag- ments were ultimately picked up by a merchant, and brought to King Bhoja, who directed the poet Damodara Misra to put them together and fill up the lacunae; whence the present composition originated. Whatever particle of truth there may be in this story, the ” great drama ” seems certainly to be the production of different hands. ” The language,” as Wilson remarks, ” is in general very harmonious, but the work is after all a most disjointed and non- descript composition, and the patchwork is very glaringly and clumsily put together.” It is nevertheless a work of some interest, as compositions of mixed dramatic and declamatory passages of this kind may have been common in the early stages of the dramatic art. The connexion of the poet with King Bhoja, also confirmed by the Bhoja-prabandha, would bring the composition, or final redaction, down to about the loth ox I Ith century. A Mahanafaka is, however, already referred to by Anandavardhana (9th century) ; and, besides, there are two different recensions of the work, a shorter one commented upon by Mohanadasa, and a longer one arranged by Madhusudana. A Damodara Gupta is mentioned as having lived under Jayapida of Kashmir (755-786) ; but this can scarcely be the same as the writer connected with this work.

The Mudrdrdkshasa, 1 or ” Rakshasa (the minister) with the signet,” is a drama of political intrigue, in seven acts, partly based on historical events, the plot turning on the reconciliation of Rak- shasa, the minister of the murdered king Nanda, with the hostile party, consisting of Prince Chandragupta (the Greek Sandrocottus, 315-291 B.C.), who succeeded Nanda, and his minister Chanakya. The plot is developed with considerable dramatic skill, in vigorous, if not particularly elegant, language. The play was composed by Visakhadatta, prior, at any rate, to the I Ith century, whilst Professor Jacobi infers from astronomical indications that it was written in A.D. 860.

The Prabodha-chandrodaya? or ” the moon-rise of intelligence^” composed by Krishnamisra about the 12th century, is an allegorical play, in six acts, the dramatis personae of which consist entirely of abstract ideas, divided into two conflicting hosts.

Of numerous inferior dramatic compositions we may mention as the best — the Anarghya-raghava, by Murari; the B8.la-rama.yava, one of

six plays (four of which are known) by Rajasekhara, s and the Prasanna-raghava, 1 by Jayadeva, the author of the rhetorical treatise Chandraloka. Abstracts of a number of other pieces are given in H. H. Wilson's- Hindu Theatre, the standard work on this subject. The dramatic genius of the Hindus may be said to have exhausted itself about the 14th century.

5. Lyrical, Descriptive and Didactic Poetry. — Allusion has already been made to the marked predilection of the medieval

Indian poet for depicting in a single stanza some poetry peculiar physical or mental situation. The profane

lyrical poetry consists chiefly of such little poetic pictures, which form a prominent feature of dramatic composi- tions. Numerous poets and poetesses are only known to us through such detached stanzas, preserved in native anthologies or manuals of rhetoric, and enshrining a vast amount of descrip- tive and contemplative poetry. Thus the Saduktikarnamrita,'' or " ear-ambrosia of good sayings, " an anthology compiled by Sridhara Dasa in 1205, contains verses by 446 different writers; while the Sdrngadharapaddhati* of the 14th century, contains some 6000 verses culled from 264 different writers and works; and Vallabhadeva's Subhashitdvali, 7 another such anthology, consists of some 3500 verses ascribed to some 350 poets. These verses are either of a purely descriptive or of an erotic character; or they have a didactic tendency, being intended to convey, in an attractive and easily remembered form, some moral truth or useful counsel. An excellent specimen of a longer poem, of a partly descriptive, partly erotic character, is Kalidasa's Megha- d-tita,* or " cloud messenger, " in which a banished Yaksha

1 Edited (Bombay, 1884, 1893) by K. T. Telang, who discusses the date of the work in his preface; transl. H. H. Wilson; German, L. Fritze; French, Victor Hehn.

2 Translated by J. Taylor (1810) ; by T. Goldstiicker into German (1842). Edited by H. Brockhaus (1845) ; also Bombay (1898).

5 Another play, composed entirely in Prakrit, by Rajasekhara (c. A.D. 900), the Karpuramanjarl, has been critically edited by Sten Konow, with English translation by Ch. R. Lanman, Harvard Or. Ser. (1901).

4 Ed. Shivarama Raoji Khopakar (Bombay, 1894).

6 Rajendralala Mitra, Notices, iii. p. 134. •Ed. P Peterson (Bombay, 1888).

7 Ed P. Peterson and Durgaprasada (Bombay, 1886).

‘Text and translation by H. H. Wilson; with vocabulary by S. Johnson; with German vocabulary by Stenzler (1874); often, with commentary, in India.

Didactic poetry.

(demi-god) sends a love-messagˆe across India to his wife in the Himalaya, and describes, in verse-pictures of the stately manda-krantS. metre the various places and objects over which the messenger, a cloud, will have to sail in his airy voyage. This little masterpiece has called forth a number of more or less successful imitations, such as Lakshmldasa’s Suka-sandeSa, or ” parrot-message,” lately edited by the maharaja of Travancore. Another much-admired descriptive poem by Kalidasa is the Ritu-samhdra* or “collection of the seasons,” in which the attractive features of the six seasons are successively set forth. As regards religious lyrics, the fruit of sectarian fervour, a large collection of hymns and detached stanzas, extolling some special deity, might be made from Puranas and other works. Of independent productions of this kind only a few of the more important can be mentioned here. Sankara Acharya, the great Vedantist, who seems to have flourished about a. d. 800, is credited with several devotional poems, especially the Ananda-lahari, or ” wave of joy,” a hymn of 103 stanzas, in praise of the goddess Parvati. The Surya-iataka, or century of stanzas in praise of Surya, the sun, is ascribed to Maytira, the contemporary (and, according to a tradition, the father-in-law) of Bana (in the early part of the 7th century). The latter poet himself composed the Chandikastotra, a hymn of 102 stanzas, extolling Siva’s consort. The Khaˆdaprakasti, a poem celebrating the ten avataras of Vishnu, is ascribed to no other than Hanuman, the monkey general, himself. Jayadeva’s beautiful poem Gitago- vinda, which, like most productions concerning Krishna, is of a very sensuous character, has already been referred to.

The particular branch of didactic poetry in which India is especially rich is that of moral maxims, expressed in single stanzas or couplets, and forming the chief vehicle of the Niti-Sdstra or ethic science. Excellent collections of such aphorisms have been published — in Sanskrit and German by 0. v. BQhtlingk, and in English by John Muir. Probably the oldest original collection of this kind is that ascribed to Chanakya, — and entitled Rajanitisatnuchchaya, 10 ” collection on the conduct of kings ” — traditionally connected with the Machiavellian minister of Chandragupta, but (in its present form) doubtless much later — of which there are several recensions,

especially a shorter one of one hundred couplets, and a larger one of some three hundred. Another old collection is the Kaman- dakiya-Nitisdra, 11 ascribed to Kamandaki, who is said to have been the disciple of Chanakya. Under the name of Bhartrihari have been handed down three centuries of sententious couplets, 12 one of which, the nita-Sataka, relates to ethics, whilst the other two, the Sringdra- and vairdgya-iatakas, consist of amatory and devotional verses respectively. The Nlti-pradipa, or " lamp of conduct," consisting of sixteen stanzas, is ascribed to Vetala- bhatta who is mentioned as one of " nine gems." The Amarii- Sataka, 11 consisting of a hundred stanzas, ascribed to a King Amaru (sometimes wrongly to Sankara); the Bhamini-vildsa, 1 * or " dalliance of a fair woman," by Jagannatha; and the Chaura- suratapanchaSikd, 16 by Bilhana (nth century), are of an entirely erotic character.

6. Fables and Narratives. — For purposes of popular instruction stanzas of an ethical import were early worked up with existing prose fables and popular stories, probably in imitation of the Buddhist jdtakas, or birth-stories. A collection pa ˆ saaa of this kind, intended as a manual for the guidance of tlves. princes (in usum delphini) , was translated into Pahlavl in the reign of the Persian king Chosru Nushirvan, A.D. 531-579; 8 The first Sanskrit book published (by Sir W. Jones), 1792. Text and Latin translation by P. v. Bohlen, edited, with notes and translation, by S. Ayyar (Bombay, 1897); partly translated, in verse, by R. T. H. Griffith, Specimens of Old Indian Poetry.

10 Ed. Klatt (1873); German transl. O. Kressler (1906).

11 Edited by Rajendralala Mitra, Bibl. Ind. ; with translation and notes (Madras, 1895).

12 Translation, in English verse, by C. H. Tawney.

13 Ed. R. Simon (1893).

14 Edited, with French translation, by A. Bergaigne (1872); with English translation, by Sheshadri Iyar (Bombay, 1894).

16 Edited by P. v. Bohlen (1833); with German translation, W. Solf (1886) ; English translation by Edwin Arnold (1896).

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but neither this translation nor the original is any longer extant. A Syriac translation, however, made from the Pahlavl in the same century, under the title of ” Qualilag and Dimnag ” — from the Sanskrit ” Karataka and Damanaka,” two jackals who play an important part as the lion’s counsellors — has been discovered and published. The Sanskrit original, which probably consisted of fourteen chapters, was afterwards recast — the result being the Panchalantra, 1 or ” five books ” (or headings), of which several recensions exist. A popular summary of this work, in four books, the HitopadeSa, 2 or ” Salutary Counsel,” has been shown by Peterson to have been composed by one Narayana. Other highly popular collections of stories and fairy tales, interspersed with sententious verses, are: the Vetala- panchavimiati, 3 or ” twenty-five (stories) of the Vetala ” (the original of the Baital Pachlsi), ascribed either to Jambhala Datta, or to Sivadasa (while Professor Weber suggests that Vetala-bhatta may have been the author), and at all events older than the nth century, since both Kshemendra and Soma- deva have used it; the Suka-saptati* or “seventy (stories related) by the parrot,” the author and age of which are un- known; and the Simhdsana-dvdtrirnsika t b or “thirty-two (tales) of the throne,” being laudatory stories regarding Vikramaditya of Avanti, related by thirty-two statues, standing round the old throne of that famous monarch, to King Bhoja of Dhara. to discourage him from sitting down on it. This work is ascribed to Kshemankara, and was probably composed in the time of Bhoja (who died in 1053) from older stories in the Maharashtra dialect. The original text has, however, undergone many modifications, and is now known in several different recen- sions. Of about the same date are two great-houses of fairy tales, composed entirely in slokas, viz. the rather wooden and careless Brihat-katkd-manjari, 6 or ” great cluster of story,” by Kshemendra, also called Kshemankara, who wrote, c. 10 20-1040, under King Ananta of Kashmir; and the far superior and truly poetical Katha-sarit-sagard, 1 or “ocean of the streams of story,” composed in some 21,500 couplets by Somadeva, early in the 1 2th century, for the recreation of Ananta’s widow, Suryavati, grandmother of King Harshadeva. Both these works are based on an apparently lost work, viz. Gunadhya’s Brihat-katha, ox ” great story,” which was composed in some popular dialect, perhaps as early as the 1st or 2nd century of our era, and which must have rivalled the Mahabharata in extent, seeing that it is stated to have consisted of 100,000 slokas (of 32 syllables each). B. Scientific and Technical Literature I. Law (Dharma).* — Among the technical treatises of the later Vedic period, certain portions of the Kalpa-sutras, or manuals of ceremonial,

peculiar to particular schools, were referred to • as the earliest attempts at a systematic treatment of law

subjects. These are the Dharmasutras, or ” rules of (religious) law,” also called Sdmaydchariha-sutras, or ” rules of conventional usage (samaya-achara).” It is doubtful whether such treatises were at any time quite as numerous as the Grihyasutras, or rules of domestic or family rites, to which they are closely allied, and of which indeed they may originally have been an outgrowth. That the number of those actually extant is comparatively small is, however, chiefly due to the fact that this class of works was supplanted by another of a more popular kind, which covered the same ground. The Dharmasutras consist chiefly of strings of terse rules, containing the essentials of the science, and intended to be committed to memory, and to be expounded orally by the teacher — thus forming, as it were, epitomes of class lectures. These rules are interspersed

1 Edited by Kosegarten, by G. Biihler and F. Kielhorn; translated by Th. Benfey, E. Lancereau, L. Fritze; edited in Purnabhadra’s recension by J. Hertel, in Harv. Or. Ser. (1908).

2 Ed- and transl. F. Johnson, ed. P. Peterson and others in India. J Ed. H. Uhle (Leipzig, 1881); cf. R. F. Burton, Vikram and

the Vampire (new ed., 1893).

4 Edited, with German translation, R. Schmidt (Leipzig, 1893), and translation of some stories of a larger recension (1896).

B German translation, with introduction, A. Weber, Ind. Stud, xv.

6 Edited, with translation and notes, by L. v. Mankowski (Leipzig, 1892); chapters 1-8 edited and translated by Sylvain L6vi, Journ. As. (1886); cf. F. Lac6te, Essai sur Gun&dhya et la Brihatkatha (1909), where part of a Nepalese version is given.

7 Edited by H. Brockhaus (1839-1862) ; by Durgapratapa (Bombay, 1889); translated by C. H. Tawney, Bibl. Ind. (1880-1886).

8 Cf. J. Jolly’s exhaustive treatise, Recht und Sitte, in Biihler’ s Grundriss (1896).

with stanzas or ” gathas,” in various metres, either composed by the author himself or quoted from elsewhere, which generally give the substance of the preceding rules. One can well understand why such couplets should gradually have become more popular, and should

ultimately have led to the appearance of works entirely composed in verse. Such metrical law-books did spring up in large numbers, not all at once, but over a long period of time, extending probably from about the beginning of our era, or even earlier, down to well-nigh the Mahommedan conquest; and, as at the time of their first appearance the epic impulse was particularly strong, other metres were entirely discarded for the epic sloka. These works are the metrical Dharma-sastras, or, as they are usually called, the Smriti, " recollection, tradition," — a term which, as we have seen, belonged to the whole body of Sutras (as opposed to the Sruti, or revelation), but which has become the almost exclusive title of the versified institutes of law (and the few Dharmasutras still extant). Of metrical Smritis about forty are hitherto known to exist, but their total number probably amounted to at least double that figure, though some of these, it is true, are but short and in- significant tracts, while others are only different recensions of one and the same work.

With the exception of a few of these works — such as the Agni-, Yama- and Vishnu- Smritis — which are ascribed to the respective gods, the authorship of the Smptis is attributed to old „

rishis, such as Atri, Kanva, Vyasa, Sandilya, Bharadvaja. _ ana ‘ It is, however, extremely doubtful whether in most cases this attri- bution is not altogether fanciful, or whether, as a rule, there really existed a traditional connexion between these works and their alleged authors or schools named after them. The idea, which early suggested itself to Sanskrit scholars, that Smritis which passed by the names of old Vedic teachers and their schools might simply be metrical recasts of the Dharma- (or Gphya-) sfltras of these schools, was a very natural one, and, indeed, is still a very probable one, though the loss of the original Sutras, and the modifications and additions which the Smritis doubtless underwent in course of time, make it very difficult to prove this point. One could, how- ever, scarcely account for the disappearance of the Dharmasutras of some of the most important schools except on the ground that they were given up in favour of other works ; and it is not very likely that this should have been done, unless there was some guarantee that the new works, upon the whole, embodied the doctrines of the old authorities of the respective schools. Thus, as regards the most important of the Smptis, the Manava-Dharmasastra? there exist both a Srauta- and a Gphya-sutra of the Manava school of the Black Yajus, but no such Dharmasutra has hitherto been discovered, though the former existence of such a work has been made all but certain by Professor Btihler’s discovery of quotations from a Mana- vam, consisting partly of prose rules, and partly of couplets, some of which occur literally in the Manusmriti,

whilst others have been slightly altered there to suit later doctrines, or have been changed from the original trishtubh into the epic metre. The idea of an old law-giver Manu Svayambhuva — ” sprung from the self-existent (svayam-bhu) ” god Brahman (m.) — reaches far back into Vedic antiquity : he is mentioned as such in early texts ; and in Yaska’s Niruhta a sloka occurs giving his opinion on a point of inheritance. But whether or not the Manava-Dharmasutra embodied what were supposed to be the authoritative precepts of this sage on questions of sacred law we do not know; nor can it as yet be shown that the Manusmriti, which seems itself to have undergone considerable modifications, is the lineal descendant of that Dharmasutra. It is, however, worthy of note that a very close connexion exists between the Manusmriti and the Vishnusastra ; and, as the latter is most likely a modern, only partially remodelled, edition of the Sutras of the Black Yajus school of the Kathas, the close relation between the two works would be easily understood, if it could be shown that the Manusmriti is a modern development of the Sutras of another school of the Charaka division of the Black Yajurveda.

The Manava Dharmasastra consists of twelve books, the first and last of which, treating of creation, transmigration and final beatitude, are, however, generally regarded as later additions. In them the iegendary sage Bhpgu, here called a Manava, is introduced as Manu’s disciple, through whom the great teacher has his work promulgated. Why this intermediate agent should have been con- sidered necessary is by no means clear. Except in these two books the work shows no special relation to Manu, for, though he is occa- sionally referred to in it, the same is done in other Smritis. The question as to the probable date of the final redaction of the work cannot as yet be answered. Dr Burnell has tried to show that it was probably composed under the Chalukya king Pulakesi, about a.d. 500, but his argumentation is anything but convincing. From several slokas quoted from Manu by Varahamihira, in the 6th cen- tury, it would appear that the text which the great astronomer had before him differed very considerably from our Manusmriti. It is, however, possible that he referred either to the Brihat-Manu (Great

9 The standard edition is by G. C. Haughton, with Sir W. Jones’s translation (1825); the latest translations by A. Burnell and G. Biihler. There is also a critical essay on the work by F. Johantgen. On the relation between the Dharmasutras and Smritis see especially West and Biihler, Digest of Hindu Law (3rd ed.), i. p. 37 seq.

M.) or the Vriddha-Manu (Old M.)> who are often found quoted, and apparently represent one, if not two, larger recensions of this Smriti. The oldest existing commentary on the Manava-Dharmasastra is by Medhatithi, who is first quoted in 1200, and is usually supposed to have lived in the 9th or 10th century. He had, however, several predecessors to whom he refers as purve, ” the former ones.” The most esteemed of the commentaries is that of Kulluka Bhatta, composed at Benares in the 15th century.

Next in importance among Smritis ranks the Yajnavalkya Dharma-Sastra?- Its origin and date are not less uncertain — except that, in the opinion of Professor Stenzler, which has never been

YBjna-

questioned, it is based on the Manusmriti, and represents a

NBrada smriti.

yaUiy more advanced stage of legal theory and definition than

that work. Yajnavalkya, as we have seen, is looked upon as the founder of the Vajasaneyins or White Yajus, and the author of the Satapatha-brahmana. In the latter work he is represented as having passed some time at the court of King Janaka of Videha (Tirhut) ; and in accordance therewith he is stated, in the introductory couplets of the Dharmasastra, to have propounded his legal doctrines to the sages, while staying at Mithila (the capital of Videha). Hence, if the connexion between the metrical Smritis and the old Vedic schools be a real one and not one of name merely, we should expect to find in the Yajnavalkya-smriti special coincidences of doctrine with the Katiya-sutra, the principal Sutra of the Vajasaneyins. Now, some sufficiently striking coincidences between this Smriti and Paraskara’s Kdfiya-Gr.ihyasUtra have indeed been pointed out ; and if there ever existed a Dharmasutra belonging to the same school, of which no trace has hitherto been found, the points of agreement between this and the Dharmasastra might be expected to be even more numerous. A connexion between this Smriti and the Manava-grihyasutra seems, however, likewise evident. As in the case of Manu, slokas are quoted in various works from a Brihat- and a Vriddha- Yajnavalkya. The Yajnavalkya-smriti consists of three books, corresponding to the three great divisions of the Indian theory of law: achara, rule of conduct

(social and caste duties) ; vyavahara, civil and criminal law; and prayaichitta, penance or expiation. There are two important commentaries on the work: the famous Mitakshard* by Vijfianesvara, who lived under the Chalukya king Vikramaditya of Kalyana (1076-1127); and another by Apararka or Aparaditya, a petty Silara prince of the latter half of the 12th century.

The Naradlya-Dharmasastra, or Ndradasmriti, 3 is a work of a more practical kind ; indeed, it is probably the most systematic and business- like of all the Smritis. It does not concern itself with religious and moral precepts, but is strictlyconfined to law. Of this work again there are at least two different recensions. Besides the text translated by Dr Jolly, a portion of a larger recension has come to light in India. This version has been commented upon by Asahaya, ” the peerless ” — a very esteemed writer on law who is supposed to have lived before Medhatithi (? 9th century) — and it may therefore be considered as the older recension of the two. But, as it has been found to contain the word dindra, an adaptation of the Roman denarius, it cannot, at any rate, be older than the 2nd century; indeed, its date is probably several centuries later.

The Parasara-smriti* contains no chapter on jurisprudence, but treats only of religious duties and expiations in 12 adhyayas. The „ / deficiency was, however, supplied by the famous exegete

Parisara. jyigˆhava (in the latter half of the 14th century), who made use of Parasara’s text for the compilation of a large digest of religious law, usually called Parasara-mddhaviyam, to which he added a third chapter on vyavahara, or law proper. Besides the ordinary text of the Parasara-smriti, consisting of rather less than 600 couplets, there is also extant a Brihat-Pardsarasmriti, probably an amplification of the former, containing not less than 2980 (accord- ing to others even 3300) slokas.

Whether any of the Dharmasastras were ever used in India as actual ” codes of law ” for the practical administration of justice is very doubtful; indeed, so far as the most prominent works of this class are concerned, it is highly improbable. 6 No doubt these works were held to be of the highest authority as laying down the principles of religious and civil duty; but it was not so much any single text as the whole body of the Smriti that was looked upon as the embodiment of the divine law. Hence, the moment the actual work of codification begins in the nth century, we find the jurists engaged in practically showing how the Smritis confirm and supple- ment each other, and. in reconciling seeming contradictions between them. This new phase of

Indian jurisprudence commences with Vijfianesvara's Mitakshard, which, though primarily a commentary on Yajnavalkya, is so rich in original matter and illustrations from other Smritis that it is far more adapted to serve as a code of law than the work it professes to explain. This treatise is held in high esteem all over India, with the exception of the Bengal or Gauriya

1 Edited, with a German translation, by F. Stenzler.

2 Translated by H. T. Colebrooke.

3 Ed. (Bibl. Ind., 1885) J. Jolly, trsl. S.B.E. xxxiii.

4 Edited in Bombay Sansk. Ser. (1893) ; translated Bibl. Ind. (1887). The chapter on inheritance (daya-vibhaga) translated by- A. C. Burnell (1868).

5 See West and Biihler, Digest, i. p. 55. A different view is ex- pressed by A. Burnell, Ddyavibhaga, p. xiii.

school of law, which recognizes as its chief authority the digest of its founder, Jimutavahana, especially the chapter on succession, entitled Dayabhaga. 6 Based on the Mitakshara are the Smriti- chandrikd, 7 a work of great common-sense, written by Devanda Bhatta, in the 13th century, and highly esteemed in Southern India; and the Viramitrodaya, a compilation consisting of two chapters, on achara and vyavahara, made in the first half of the 17th century by Mitramisra, for Raja Vlrasirnha, or Birsinh Deo of Orchha, who murdered Abul Fazl, the minister of the emperor Akbar, and author of the Ain i Akbari. There is no need here to enumerate any more of the vast number of treatises on special points of law, of greater or less merit, the more important of which will be found mentioned in English digests of Hindu law.

II. Philosophy. 8 — The contemplative Indian mind shows at all times a strong disposition for metaphysical speculation. In the old religious lyrics this may be detected from the very first. Not to speak of the abstract nature of some even of the oldest Vedic deities, this propensity betrays itself in a certain mystic symbolism, tending to refine and spiritualize the original purely physical character and activity of some of the more prominent gods, and to impart a deep and subtle import to the rites of the sacrifice. The primitive worship of more or less isolated elemental forces and phenomena had evidently ceased to satisfy the religious wants of the more thoughtful minds. Various syncretist tendencies show the drift of religious thought

towards some kind of unity of the divine powers, be it in the direction of the pantheistic idea, or in that of an organized poly- theism, or even towards monotheism. In the latter age of the hymns the pantheistic idea is rapidly gaining ground, and finds vent in various cosmogonic speculations; and in the Brahmana period we see it fully developed. The fundamental conception of this doctrine finds its expression in the two synonymous terms brahman (neutr.) , probably originally ” mystic effusion, devotional utterance,” 9 then ” holy impulse,” and atman 10 (masc), ” breath, self, soul.”

The recognition of the essential sameness of the individual souls, emanating all alike (whether really or imaginarily) from the ultimate spiritual essence (parama-brahman) ” as sparks issue from the fire,” and destined to return thither, involved some important problems. Considering the infinite diversity of individual souls of the animal and vegetable world, exhibiting various degrees of perfection, is it conceivable that each of them is the immediate efflux of the Supreme Being, the All-perfect, and that each, from the lowest to the highest, could re-unite therewith dir/sctly at the close of its mundane exist- ence ? The difficulty implied in the latter question was at first met by the assumption of an intermediate state of expiation and purification, a kind of purgatory; but the whole problem found at last a more comprehensive solution in the doctrine of transmigration (samsara). Some scholars have suggested u that metempsychosis may have been the prevalent belief among the aboriginal tribes of India, and may have been taken over from them by the Indo- Aryans. This, no doubt, is possible; but in the absence of any positive proof it would be idle to speculate on its probability; the more so as the pantheistic notion of a universal spiritual essence would probably of itself sufficiently account for the spontaneous growth of such a belief. In any case, however, we can only assume that speculative minds seized upon it as offering the most satisfactory (if not the only possible) explanation of the great problem of pheno- menal existence with its unequal distribution of weal and woe. It is certainly a significant fact that, once established in Indian thought, the doctrine of metempsychosis is never again called in question — that, like the fundamental idea on which it rests, viz. the essential sameness of the immaterial element of all sentient beings, the notion of samsara has become an axiom, a universally conceded principle of Indian philosophy. Thus the latter has never quite risen to the heights of pure thought ; its object is indeed jijnasa, the search for knowledge ; but it is an inquiry (mimdmsS) into the nature of things undertaken not solely for the attainment of the truth, but with a view to a specific object — the discontinuance of samsara, the cessation of mundane existence after

the present life. Every sentient being, through ignorance, being liable to sin, and destined after each existence to be born again in some new form, dependent on the actions committed during the immediately preceding life, all mun- dane existence thus is the source of ever-renewed suffering ; and the task of the philosopher is to discover the means of attaining moksha, ” release ” from the bondage of material existence, and union with the Supreme Self — in fact, salvation. It is with a view to this,

6 Translated by H. C. Colebrooke (1810).

7 The section on inheritance has been translated by T. Kristna- sawmy Iyer (1866).

8 Cf. F. Max Miiller, Six Systems of Indian Philosophy (1899) ; R. Garbe, Philosophy of Ancient India (Chicago, 1897).

9 The etymological connexion of brahman (from root varh, vardh) with Latin verbum, English word (corresponding to a Sanskrit vardha), assumed by some scholars, though doubtful, is not impossible. The development of its meaning would be somewhat like that of X670S.

10 The derivation of atman (Ger. Atem) from root an, to breathe (or perhaps av, to blow) seems still the most likely. A recent attempt to connect it with airds can scarcely commend itself.

11 See, e.g. A. E. Gough, The Philosophy of the Upanishads, p. 24; A. A. Macdonell, Hist, of Sanskrit Lit. p. 387.

and to this only, that the Indian metaphysician takes up the great problems of life — the origin of man and the universe, and the relation between mind and matter.

It is not likely that these speculations were viewed with much favour by the great body of Brahmans engaged in ritualistic practices. Not that the metaphysicians actually discountenanced the ceremonial worship of the old mythological gods as vain and nugatory. On the contrary, they expressly admitted the propriety of sacrifices, and commended them as the most meritorious of human acts, by which man could raise himself to the highest degrees of mundane existence,

to the worlds of the Fathers and Devas. But, on the other hand, metaphysical speculation itself had gradually succeeded in profoundly modifying the original character of the sacrificial ritual: an allegorical meaning had come to be attached to every item of the ceremonial, in accordance with the strange monotheistic-pantheistic theory of the Brahmanas which makes the performance of the sacrifice represent the building up of Praja- pati.the Purusha or "world man," and thus the creation of repro- duction of the universe.' In the Satap. Br. (vii. 3, 4, 41) he is said to be the whole Brahman (n.), and (vii. I, 2, 7; xi. 1, 6, 17) he is represented as the breath or vital air (prana), and the air_being his self (atman). It needed but the identification of the Atman, or individual self, with the Brahman or Paramatman (supreme self), to show that the final goal lay far beyond the worlds hitherto striven after through sacrifice, a goal unattainable through aught but a perfect knowledge of the soul's nature and its identity with the Divine Spirit. " Know ye that one Self," exhorts one of those old idealists, 1 " and have done with other words; for that (knowledge) is the bridge to immortality!" Intense self-contemplation being, moreover, the only way of attaining the all-important knowledge, this doctrine left little or no room for those mediatorial offices of the priest, so indispensable in ceremonial worship; arid indeed we actually read of Brahman sages resorting to Kshatriya princes 2 to hear them expound the true doctrine of salvation. But, in spite of their anti-hierarchical tendency, these speculations continued to gain ground; and in the end the body of treatises propounding the pantheistic doctrine, the Upanishads, were admitted into the sacred canon, as appendages to the ceremonial writings, the Brahmanas. The Upanishads 3 thus form literally "the end of the Veda," the Vedanta; but their adherents claim this title for their doctrines in a metaphorical rather than in a material sense, as " the ultimate aim and consummation of the Veda." In later times the radical dis- tinction between these speculative appendages and the bulk of the Vedic writings was strongly accentuated in a new classification of the sacred scriptures. According to this scheme they were supposed to consist of two great divisions — the Karma-kdnda, i.e. " the work- section," or practical ceremonial (exoteric) part, consisting of the Samhitas and Brahmanas (including the ritual portions of the Aranyakas), and the Jndnakdnda, " the knowledge-section," or speculative (esoteric) part. These two divisions are also called respectively the Purva- (" former ") and Uttara- (" latter," or higher 4) kanda; and when the speculative tenets of the Upanishads came to be formulated into a regular system it was deemed desirable that there should also be a special system corresponding to the older and larger portion of the Vedic writings. Thus arose the two systems — the Purva- (or Karma-) mimdmsa, or" prior (practical) speculation,"

and the Uttara- (or Brahma-) mimdmsa, or higher inquiry (into the nature of the godhead), usually called the Vedanta philosophy.

It is not yet possible to determine, even approximately, the time when the so-called Darsanas (literally ” demonstrations “), or systems of philosophy which subsequently arose, hi were first formulated. And, though they have certainly

sophlcal developed from the tenets enunciated in the Upanishads, sys ems. t here is some doubt as to the exact order in which these systems succeeded each other. Of all the systems the Vedanta has indeed remained most closely in touch with the specu- lations of the Upanishads, which it has further developed and systematized. The authoritative exposes of the systems have, however, apparently passed through several redactions; and, in their present form, these sutra-works 6 evidently belong to a com-

1 Mundaka-upanishad, ii. 2, 5.

2 From such allusions, or statements, in the Upanishads, some scholars have actually gone the length of claiming the origin of this cardinal doctrine of Vedanta philosophy for the Kshatriyas. It seems to us, however, very much more likely that these anecdotes were introduced by the Brahmanical sages of set purpose to win over their worldly patrons from their materialistic tendencies to their own idealistic views. Kapila, the author of the materialistic Sankhya, is supposed to have been a Kshatriya, and so, we know, was the Sakya Muni.

3 Cf. P. Deussen, The Philosophy of the Upanishads (Edinburgh,

1906).

4 Cf. Mundaka-upanishad, i. 4, 5, where these two divisions are called ” the lower (apara) and the higher (para) knowledge.”

6 These works have all been printed with commentaries in India ; and they have been partly translated by J. Ballantyne and by K. M. Banerjea. The best general view of the systems is to be obtained from H. C. Colebrooke’s account, Misc. Essays, i. (2nd ed.), with Professor Cowell’s notes. Compare also the brief abstract

paratively recent period, none of them being probably older than the early centuries of our era. By far the ablest general review of the philosophical systems (except the Vedanta) produced by a native scholar is the Sarva-darsana-sangraha® (” summary of all the Darsanas”), composed in the 14th century, from a Vedantist point of

view, by the great exegete Madhava Acharya.

Among the different systems, six are generally recognized as orthodox, as being (either wholly or for the most part) consistent with the Vedic religion — two and two of which are again more closely related to each other than to the rest, viz. :

(1) Purva-mimamsd (Mimdmsa), and (2) Uttara-mimamsd (Ve- danta) ;

(3) Sankhya, and (4) Yoga;

(5) Nydya, and (6) Vaiseshika.

1. The (Purva-) Mimdmsa is not a system of philosophy in the proper sense of the word, but rather a system of dogmatic criticism and scriptural interpretation. It maintains the eternal _ _ existence of the Veda, the different parts of which mmamsa ~ are minutely classified. Its principal object, however, is to ascertain the religious (chiefly ceremonial) duties enjoined in the Veda, and to show how these duties must be performed, and what are the special merits and rewards attaching to them. Hence arises the necessity of determining the principles for rightly inter- preting the Vedic texts, as also of what forms its only claim to being classed among speculative systems, viz. a philosophical examination of the means of, and the proper method for, arriving at accurate knowledge. The foundation of this school, as well as the composition of the Sutras or aphorisms, the Mimdmsd-darsana,” which constitute its chief doctrinal authority, is ascribed to Jaimini. The Sutras were commented on by Sahara Svamin; and further annotations (varttika) thereon were supplied by the great theologian Kumarila Bhatta, who is supposed to have lived about a.d. 700 and to have worked hard for the re-establishment of Brahmanism. The most approved general introduction to the study of the Mimarnsa is the metrical Jaiminiya-Nyaya-mdld-vislara* with a prose commentary, both by Madhava Acharya. This distinguished writer, who has already been mentioned several times, was formerly supposed, from frequent statements in MSS., to have been the brother of Sayana, the well-known interpreter of the Vedas. The late Dr Burnell 9 has, however, made it very probable that these two are one and the same person, Sayana being his Telugu and Madhava- charya his Brahmanical name. In 1331 he became the jagadguru, or spiritual head, of the Smartas (a Vedantist sect founded by Sankaracharya) at the Math of Sringeri, where, under the patronage of Bukka, king of Vidyanagara, he composed his numerous works. He sometimes passes under a third name, Vidyaranya,-svamin, adopted by him on

becoming a sannydsin, or religious mendicant.

2. The Vedanta philosophy, in the comparatively primitive form in which it presents itself in most of the older Upanishads, con- stitutes the earliest phase of sustained metaphysical v h~ t speculation. In its essential features it remains to this e an a ‘ day the prevalent belief of Indian thinkers, and enters largely into the religious life and convictions of the people. It is an idealistic monism, which derives the universe from an ultimate conscious spiritual principle, the one and only existent from eternity — the Atman, the Self, or the Purusha, the Person, the Brahman. It is this primordial essence or Self that pervades all things, and gives life and light to them, ” without being sullied by the visible outward im- purities or the miseries of the world, being itself apart “—and into which all things will, through knowledge, ultimately resolve them- selves. ” The wise who perceive him as being within their own Self, to them belongs eternal peace, not to others.” 10 But, while the commentators never hesitate to interpret the Upanishads as being in perfect agreement with the Vedantic system, as elaborated in later times, there is often considerable difficulty in accepting their ex- planations. In these treatises only the leading features of the pantheistic theory find utterance, generally in vague and mystic, though often in singularly powerful and poetical language, from which it is not always possible to extract the author’s real idea on fundamental points, such as the relation between the Supreme Spirit and the phenomenal world — whether the latter was actually evolved from the former by a power inherent in him, or whether the process is altogether a fiction, an illusion of the individual self. Thus the Katha-upanishad 11 offers the following summary: ” Beyond the senses [there are the objects: beyond the objects] there is the mind (manas) ; beyond the mind there is the intellect (buddhi); beyond the intellect there is the Great Self. Beyond the Great One there is the Highest Undeveloped (avyaktam) ; beyond

given in Goldstiicker’s Literary Remains, vol. i. A very useful classified index of philosophical works was published by F. Hall

(1859).

6 Edited in the Bibl. Ind. ; translated by E. B. Cowell and A. E. Gough (1882).

7 Text and Commentary, Bibl. Ind.

8 Edited by Th. Goldstiicker, completed by E. B. Cowell; also ed. Ahand-Ser. (Bombay, 1892).

9 Vamsa-brdhmana, Introd.

10 Katha-upanishad, ii. 5, 12.

11 Katha-up., i. 3, 10; ii. 6, 7.

the Undeveloped there is the Person (purusha), the all-pervading, characterless (alinga). Whatsoever knows him is liberated, and attains immortality." Here the Vedantist commentator assures us that the Great Undeveloped, which the Sankhyas would claim as their own primary material principle (pradhana, prakriti), is in reality Maya, illusion (otherwise called Avidya, ignorance, or Sakti, power) , the fictitious energy which in conjunction with the Highest Self (Atman, Purusha) produces or constitutes _ the Isvara, the Lord, or Cosmic Soul, the first emanation of the Atman, and himself the (fictitious) cause of all that seems to exist. It must remain doubtful, however, whether the author of the Upanishad really meant this, or whether he regarded the Great Undeveloped as an actual material principle or substratum evolved from out of the Purusha, though not, as the Sankhyas hold, coexisting with him from eternity. Besides passages such as these which seem to indicate realistic or materialistic tendencies of thought, which may well have developed into the dualistic Sankhya and kindred systems, there are others which indicate the existence even of nihilist theories, such as the Bauddhas — the sunya-vadins , or affirmers of a void or primordial nothingness — profess. Thus we read in the Chhandogya-upanishad : l "The existent alone, my son, was here in the beginning, one only, without a second. Others say, there was the non-existent alone here in the beginning, one only, without a second — and from the non-existent the existent was born. But how could this be, my son? How could the existent be born from the non-existent? No, my son, only the existent was here in the beginning, one only, without a second."

The foundation of the Vedanta system, as " the completion of the Veda," is naturally ascribed to Vyasa, the mythic arranger of the Vedas, who is said to be identical with Badarayana the reputed author of the Brahma- (or Sarlraka-) sutra, the authoritative, though highly obscure, summary of the system. The most distinguished interpreter of these, aphorisms is the famous Malabar theologian a . Sankara

Acharya, 2 who also commented on the principal

*” * Upanishads and the Bhagavadgita, and is said to have spent the greater part of his life in wandering all over India, as far as Kashmir, and engaging in disputations with teachers — whether of the Saiva, or Vaishnava, or less orthodox persua- sions — with the view of rooting out heresy and re-establishing the doctrine of the Upanishads. His controversial triumphs (doubtless largely mythical) are related in a number of treatises current ,in South India, the two most important of which are the Sankara-dig-vijaya (” Sankara’s world-conquest “), ascribed to his own disciple Anandagiri, and the Sankara-vijaya, by Ma- dhavacharya. In Sankara’s philosophy 3 the theory that the material world has no real existence, but is a mere illusion of the individual soul wrapt in ignorance, — that, therefore, it has only a practical or conventional (vydvahdrika) but not a transcendental or true (paramarthika) reality, — is strictly enforced. In accordance with this distinction, a higher (para) and a lower (apard) form of knowledge is recognized; the former being concerned with the Brahman (n.), whilst the latter deals with the personal Brahma, the Isvara, or lord and creator, who, however, is a mere illusory form of the divine spirit, resulting from ignorance of the human soul. To the question why the Supreme Self (or rather his fictitious de- velopment, the Highest Lord) should have sent forth this phantasma- gory this great thinker (with the author of the Sutras 4) can return no better answer than that it must have been done for sport (Hid), without any special motive — since to ascribe such a motive to the Supreme Lord would be limiting his self-sufficiency — and that the process of creation has been going on from all eternity. Sankara’s Sdriraka-mimdmsd-bhdshya* has given rise to a large number of exegetic treatises, of which Vachaspati-misra’s 6 exposition, entitled Bhdmatt, 7 is the most esteemed. Of numerous other commentaries „ˆ _ . on the Brahma-sutras, the Srl-bhashya, by Ramanuja, Kamaauja. <ˆ e f ounc j er f tne Sri- Vaishnava sect, is the most note- worthy. This religious teacher, who flourished in the first half of the 1 2th century, caused a schism in the Vedanta school. Instead of adhering to Sankara's orthodox advaila, or non-duality, doctrine, he interpreted the obscure Sutras in accordance with his theory of visishiddvaita, i.e. non-duality of the (two) distinct (principles), or, as it is more commonly explained, non-duality of that which is qualified (by attributes). According to this theory the Brahman is neither devoid of form and quality, nor is it all things; but it is endowed with all good qualities, and matter is distinct from it; whilst bodies consist of souls (chit) and matter (achit) ; and God is the soul. On the religious side, Ramanuja adopts the tenets of the ancient Vishnuite Pancharatra sect, and,

identifying the Brahman with Vishnu, combines with his theory the ordinary Vaishnava doctrine of periodical descents (avatdra) of the deity, in various

1 vi. 2. 1.

2 Die Sutras des Vedanta, text and commentary translated by P. Deussen (Leipzig, 1887); English translation by G. Thibaut, S.B.E.

3 P. Deussen, Das System des Vedanta (1883). A. E. Gough, The Philosophy of the Upanishads, also follows chiefly Sankara's interpretation.

4 Brahmasutra, iii. 1. 32-34.

'Translated by G. Thibaut, S.B.E. ; German, P. Deussen. • Professor Cowell assigns him to about the 10th century. ' Bibl. Ind.

forms, for the benefit of creatures; and allowing considerable play to the doctrine that faith (bhakti), not knowledge (vidya), is the means of final emancipation. This phase of Indian religious belief, which has attached itself to the Vedanta theory more closely than to any other, makes its appearance very prominently in the Bha- gavadgita, the episode of the Mahdbharata, already referred to — where, however, it attaches itself to Sankhya-yoga rather than to Vedanta tenets — and is even more fully developed in some of the Puranas, especially the Bhagavata. Some scholars would attribute this doctrine of fervid devotion to Christian influence, but it is already alluded to by Panini and in the Mahdbhdshya. In the Sdndilya- (Bhakti-) sutrafi the author and date of which are unknown, the doctrine is systematically propounded in one hundred aphorisms. According to this doctrine mundane existence is due to want of faith, not to ignorance; and the final liberation of the individual soul can only be effected by faith. Knowledge only contributes to this end by removing the mind's foulness, unbelief. Its highest phase of development this doctrine probably reached in the Vaishnava sect founded, towards the end of the 15th century, by Chaitanya, whose followers subsequently grafted the Vedanta speculations on his doctrine. In opposition both to Sankara's theory of absolute unity, and to Ramanuja's doctrine of qualified unity — though leaning more towards the latter — Madhva Acharya, or Purnaprajna (a. d. 1118-1198), started his dvaita, or duality doctrine, according to which there is a difference between God and the human soul (jiva), as well as between God and nature; whilst the individual souls, which are innumerable, eternal, and indestructible, are likewise different from one another; but, though

distinct, are yet united with God, like tree and sap, in an indissoluble union. This doctrine also identifies the Brahman with Vishnu, by the side of whom, likewise infinite, is the goddess Lakshmi, as Prakriti (nature), from whom inert matter (jada) derives its energy. Here also bhakti, devotion to God, is the saving element. A popular summary of the Vedanta doctrine is the Vedanta-sdra by Sadananda, which has been frequently printed and translated. 9

3. The Sankhya 10 system seems to derive its name from its systematic enumeration (sankhya) of the twenty-five principles (tattva) it recognizes — consisting of twenty-four material and an in- „_ . . dependent immaterial principle. In opposition to the aa ya ‘ Vedanta school, which maintains the eternal coexistence of a spiritual principle of reality and an unspiritual principle of unreality, the Sankhya assumes the eternal coexistence of a material first cause, which it calls either milla-Prakriti (fern.) , “prime Originant” (Nature) , or Pradhana, ” the principal ” cause, and a plurality of spiritual ele- ments or Selves, Purusha. The system recognizes no intelligent creator (such as the Ifaara, or demiurgus, of the Vedanta) — whence it is called nirisvara, godless; but it conceives the Material First Cause, itself unintelligent, to have become developed, by a gradual process of evolution, into all the actual forms of the phenomenal universe, excepting the souls. Its first emanation is buddhi, intelli- gence; whence springs ahamkdra, consciousness (or “conscious mind-matter,” Davies) ; thence the subtle elements of material forms, viz. five elementary particles (tanmdtra) and eleven organs of sense; and finally, from the elementary particles, five elements. The souls have from all eternity been connected with Nature, — having in the first place become invested with a subtle frame (linga-, or sukshma-, farira), consisting of seventeen principles, viz. intelligence, con- sciousness, elementary particles, and organs of sense and action, including mind. To account for the spontaneous development of matter, the system assumes the latter to consist of three constituents (guna) which are possessed of different qualities, viz. sattva, of pleas- ing qualities, such as’ ” goodness,” lightness, luminosity; rajas, of pain-giving qualities, such as “gloom,” passion, activity; and tamas, of deadening qualities, such as ” darkness,” rigidity, dullness, and which, if not in a state of equipoise, cause unrest and develop- ment. Through all this course of development, the soul itself remains perfectly indifferent, its sole properties being those of purity and intelligence, and the functions usually regarded as ” psychic ” being due to the mechanical processes of the internal organs themselves evolved out of inanimate matter. Invested with its subtle frame, which accompanies it through the cycle of trans- migration, the soul, for the sake of fruition, connects itself ever anew with Nature,

thus, as it were, creating for itself ever new forms of material existence ; and it is only on his attaining perfect knowledge, whereby the ever-changing modes of intelligence cease to be reflected on him, that the Purusha is liberated from the miseries of Saipsara, and continues to exist in a state of absolute unconsciousness and detachment from matter. The existence of God, on the other hand, is denied by this theory, or rather considered as incapable of proof; the existence of evil and misery, for one thing, being thought incompatible with the notion of a divine origin of the world.

The reputed originator of this school is the sage Kapila, to whom tradition ascribes the composition of the fundamental text-book,

8 Text, with Svapnesvara's commentary, edited by J. R. Ballan- tyne; translated by E. B. Cowell.

9 Last by G. A. Jacob.

10 E. Roer, Lecture en the Sankhya Philosophy (Calcutta, 1854); B. St Hilaire, Memoire sur le Sankhya (1852); R. Garbe, Sankhya Philosophic (Leipzig, 1894); Sankhya and Yoga (Strassburg, 1896).

the (Sankhya- sutra, or) Sankhya-pravachana, i as well as the Tattva-samdsa, a mere catalogue of the principles. But, though the founder would seem to have promulgated his system, in some form or other, at a very early period, these works, in their present form, have been shown to be quite modern productions, going probably not farther back than the 14th century of our era. Probably the oldest existing work is Isvarakrishna's excellent Sankhya-kdrikd, 2 which gives, in the narrow compass of sixty-nine slokas, a lucid and com- plete sketch of the system. Though nothing certain is known regarding its author, 3 this work must be of tolerable antiquity, considering that it was commented upon by Gaudapada, 4 the preceptor o,f Govinda, who, on his part, is said to have been the teacher of Sankaracharya. Of the commentaries on the Sutras, the most approved are those of Aniruddha 6 and Vijnana Bhikshu, 6 a writer probably of the latter part of the 1 6th century, who also wrote an independent treatise, the Sankhya-sdra, 7 consisting of a prose and a verse part, which is probably the most useful com- pendium of Sankhya doctrines.

4. The Yoga system is merely a schismatic branch of the preceding school, holding the same opinions on most points treated in common

in their Sutras, with the exception of one important point, °^ a ‘ the existence of God. To the twenty-five principles

(tattva) of the Nirisvara Sankhya, the last of which was the Purusha, the Yoga adds, as the twenty-sixth, the Nirguna Purusha, or Self devoid of qualities, the Supreme God of the system. Hence the Yoga is called the Sesvara (theistical) Sankhya. But over and above the purely speculative part of its doctrine, which it has adopted from the sister school, the theistic Sankhya has developed a complete system of mortification of the senses — by means of prolonged apathy and abstraction, protracted rigidity of posture, and similar practices, — many of which are already alluded to in the Upanishads, — with the view of attaining to complete concentration (yoga) on, and an ecstatic vision of, the Deity, and the acquisition of miraculous powers. It is from this portion 01 the system that the school derives the name by which it is more generally known. The authoritative Sutras of the Yoga, bearing the same title as those of the sister school, viz. Sankhya-pravachana, but more commonly called Yoga- Sastra, are ascribed to Patafijali, who is perhaps identical with the author of the ” great commentary ” on Panini. The oldest com- mentary on the Sutras, the Pdtanjala-bhdshya, is attributed to no other than Vyasa, the mythic arranger of the Veda and founder of the Vedanta. Both works have again been commented upon by Vachaspati-misra, Vijnana-bhikshu, and other writers.

5, 6. The Nyaya* and Vaiseshika are but separate branches of one and the same school, which supplement each other and the N – doctrines of which have virtually become amalgamated WW into a single system of philosophy. The special part ff .. _ taken by each of the two branches in the elaboration of

..f e ” the system may be briefly stated in Dr Roer’s words: —

” To the Nyaya belong the logical doctrines of the forms of syllogisms, terms and propositions; to the Vaiseshikas the systematical explanation of the categories (the simplest meta- physical ideas) of the metaphysical, physical and psychical notions — ■ which notions are hardly touched upon in the Nyaya-sutras. They differ in their statement of the several modes of proof — the Nyaya asserting four modes of proof (from perception, inference, analogy and verbal communication), the Vasieshikas admitting only the two first ones.” The term Nyaya (ni-dya, ” in-going,” entering), though properly

meaning ” analytical investigation,” as applied to philo- sophical inquiry generally, has come to be taken more Logic. commonly in the narrower sense of ” logic,” because this

school has entered more thoroughly than any other into the laws and processes of thought, and has worked out a formal system of reasoning which forms the Hindu standard of logic.

The followers of these schools generally recognize seven categories (paddrtha) : substance (dravya), quality (guna), action (karma), generality (sdmdnya), particularity (visesha), intimate relation (samavaya) and non-existence or negation (abhdva). Substances, forming the substrata of qualities and actions, are, of two kinds: eternal (without a cause), viz. space, time, ether, soul and the atoms of mind, earth, water, fire and air; and non-eternal, com- prising all compounds, or the things we perceive, and which must have a cause of their existence. Causality is of three kinds: that of intimate relation (material cause) ; that of non-intimate relation (between parts of a compound) ; and instrumental causality (effect –

1 Translated by J. R. Ballantyne; 2nd ed. by F. Hall.

2 Edited by C. Lassen (1832). Translations by H. T. Colebrooke and J. Da vies.

3 A writer makes him the pupil of Panchasikha, whilst another even identifies him with Kalidasa ; cf . F. Hall, Sdnkhyasara, p. 29.

4 Translated by H. H. Wilson. A Chinese translation of a com- mentary resembling that of Gaudapada is said (M. Mtiller, India, p. 360) to have been made during the Ch’en dynasty (a.d. 557-583).

6 Translated by R. Garbe, Bibl. Ind.

6 Edited by Garbe (Harvard, 1895); translated (Leipzig, 1889).

7 Edited by F. HalK

8 Besides Colebrooke’s Essay, with Cowell’s notes, see Ballantyne’s translation of the Tarka-sangraha and the introduction to Roer’s translation of the Bhdshdparichheda, and his article, Z.D.M.G. xxi.

ing the union of component parts). Material things are thus composed of atoms (anu), i.e. ultimate simple substances, or units of space, eternal, unchangeable and without dimension, characterized only by ” particularity (visesha).” It is from this predication of ultimate ”

particulars ” that the Vaiseshikas, the originators of the atomistic doctrine, derive their name. The ‘Nyaya draws a clear line between matter and spirit, and has worked out a careful and ingenious system of psychology. It distinguishes between individual or living souls (jivdtman), which are numerous, infinite and eternal, and the Supreme Soul (Paramdtman), which js one only, the seat of eternal knowledge, and the maker and ruler (Isvara) of all things. It is by his will and agency that the unconscious living souls (soul-atoms, in fact) enter into union with the (material) atoms of mind, &c, and thus partake of the pleasures and sufferings of mundane existence. On the Hindu syllogism compare Professor Cowell’s notes to Colebrooke’s Essays, 2nd ed., i. p. 314.

The original collection of Nyaya-sutras is ascribed to Gotama, and that of the VaUeshika-sutras to Kanada. The etymological meaning of the latter name seems to be ” little-eater, particle- eater,” whence in works of hostile critics the synonymous terms Kana-bhuj or Kana-bhaksha are sometimes derisively applied to him, doubtless in allusion to his theory of atoms. He is also occasion; ally referred to under the name of Kasyapa. Both sutra-works have been interpreted and supplemented by a number of writers, the commentary of Visvanatha on the Nyaya and that of sankara-misra on the Vaiseshika-sutras being most generally used. There are, moreover, a vast number of separate works on the doctrines of these schools, especially on logic. Of favourite elementary treatises on the subject may be mentioned Kesava-misra’s Tarka-bhdshd, the Tarka-sangraha 9 and the Bhdshd-parichchheda. 10 A large and im- portant book on logic is Gangesa’s Chintdmani, which formed the text-book of the celebrated Nuddea school of Bengal, founded by Raghunatha-siromani about the beginning of the 1 6th century. An interesting little treatise is the Kusumdnjali, 11 in which the author, Udayana Acharya (about the 12th century, according to Professor Cowell), attempts, in 72 couplets, to prove the existence of a Supreme Being on the principles of the Nyaya system.

As regards the different heretical systems of Hindu philosophy, there is no occasion, in a sketch of Sanskrit literature, to enter into the tenets of the two great anti-Brahmanical sects, the „ . . Jainas and Buddhists. While the original works, of the fT former are written mostly in a popular (the Ardha *J’ s ‘ ems> magadhl) dialect, the northern Buddhists, it is true, have produced a considerable body of literature, 12 composed in a kind of hybrid Sanskrit, but only a few of their sacred books have as yet been published ; 13 and it is, moreover, admitted on all hands that for the pure and authentic Bauddha doctrines we have rather to look to the Pali scriptures of the southern branch. Nor can we do more here than briefly allude to the theories of

a few of the less prominent heterodox systems, however interesting they may be for a history of human thought.

The Charvakas, an ancient sect of undisguised materialism, who deny the existence of the soul, and consider the human person (purusha) to be an organic body endowed with sensibility and with thought, resulting from a modification of the component material elements, ascribe their origin to Brihaspati; but their authoritative text-book, the Bdrhaspatya-sutra, is only known so far from a few quotations.

The Pdncharatras, or Bhagavatas, are an early Vaishnava sect, in which the doctrine of faith, already alluded to, is strongly developed. Hence their tenets are defended by Ramanuja, though they are partly condemned as heretical in the Brahma-sutras. Their recognized text-book is the Ndrada-Pdnchardtra, 1 ‘ whilst the Bhaga- vadgltd is also supposed to have had some connexion with this sect. According to their theory the Supreme Being (Bhagavat, Vasudeva, Vishnu) became four separate persons by successive production. While the Supreme Being himself is indued with the six qualities of knowledge, power, strength, absolute sway, vigour and energy, the three divine persons successively emanating from him and from one another represent the living soul, mind and consciousness respectively.

The Pdiupatasˆ one of several Saiva (Mahesvara) sects, hold the Supreme Being (Isvara), whom they identify with Siva (as pa§u-pati, or ” lord of beasts “), to be the creator and ruler of the world, but not its material cause. With the Sankhyas they admit the notion of a plastic material cause, the Pradhdna; while they follow Patafijali in maintaining the existence of a Supreme God.

III. Grammar (Vydkarana). — We found this subject enumerated as one of the six ” limbs of the Veda,” or auxiliary sciences, the study

9 Edited and translated by J. R. Ballantyne.

10 Edited and translated, with commentary, by E. Roer.

11 Edited and translated, with commentary, by E. B.’ Cowell.

12 See B. H. Hodgson, The Languages, Literature and Religion of Nepal and Tibet.

13 Lalita-vistara, ed. and partly transl. Rajendralala Mitra; ed. S. Lefmann (1908); Mahdvastu, edited E. Senart; Vajra-parichchheda, edited M. Miiller; Saddharma-pundarlka, translated by E. Burnouf (” Lotus de la bonne loi “); and H. Kern, Sacred Books of the East.

14 It consists of six Sarnnitas, one of which has been edited by K. M. Banerjea, Bibl. Ind.

of which was deemed necessary for a correct interpretation of the sacred Mantras, and the proper performance of Vedic rites. Linguistic inquiry, phonetic as well as grammatical, was Grammar. mc j eec j early resorted to both for the purpose of elucidating the meaning of the Veda and with the view of settling its textual form. The particular work which came ultimately to be looked upon as the ” vedanga ” representative of grammatical science, and has _. ever since remained the standard authority on Sanskrit

Panml. grammar in India, is Panini’s Ash(ddhydyi, 1 so called from its ” consisting of eight lectures (adhydya),” of four padas each. For a comprehensive grasp of linguistic facts, and a penetrating in- sight into the structure of the vernacular language , this work stands probably unrivalled in the literature of any nation — though few other languages, it is true, afford such facilities as the Sanskrit for a scientific analysis. Panini’s system of arrangement differs entirely from that usually adopted in our grammars, viz. according to the so-called parts of speech. As the work is composed in aphor- isms intended to be learnt by heart, economy of memory- matter was the author’s paramount consideration. His object was chief!}’ attained by the grouping together of all cases exhibiting the same phonetic or formative feature, no matter whether or not they be- longed to the same part of speech. For this purpose he also makes Use of a highly artificial and ingenious system of algebraic symbols, consisting of technical letters (anubandha), used chiefly with suffixes, and indicative of the changes which the roots or stems have to undergo in word-formation.

It is self-evident that so complicated and complete a system of linguistic analysis and nomenclature could not have sprung up all at once and in the infancy of grammatical science, but that many generations of scholars must have helped to bring it to that degree of perfection which it exhibits in Panini’s work. Accordingly we find Panini himself making reference in various places to ten different grammarians, besides two schools, which he calls the ” eastern (prdiichas)” and ” northern (udanchas)” grammarians. Perhaps the

most important of his predecessors was Sakatayana, 2 also mentioned by Yaska — the author of the Nirukta, who is likewise supposed to have preceded Panini — as the only grammarian (vaiya- karana) who held with the etymologists (nairukta) that all nouns are derived from verbal roots. Unfortunately there is little hope of the recovery of his grammar, which would probably have enabled us to determine somewhat more exactly to what extent Panini was indebted to the labours of his predecessors. There exists indeed a grammar in South Indian MSS., entitled Sabdanusdsana, which is ascribed to one Sakatayana ; 3 but this has been proved 4 to be the production of a modern Jaina writer, which, however, seems to be partly based on the original work, and partly on Panini and others. Panini is also called Dakshlputra, after his mother Dakshi. As his birthplace the village Salatura is mentioned, which was situated some few miles north-west of the Indus, in the country of the Gan- dharas, whence later writers also call him Salaturiya, the formation of which name he himself explains in his grammar. Another name sometimes applied to him is Salanki. In the Katha-saritsagara, a modern collection of popular tales mentioned above, Panini is said to have been the pupil of Varsha, a teacher at Pataliputra, under the reign of Nanda, the father (?) of Chandragupta (315-291 B.C.). The real date of the great grammarian is, however, still a matter of uncertainty. While Goldstiicker 5 attempted to put his date back to ante-Buddhist times (about the 7th century B.C.), Professor Weber held that Panini's grammar cannot have been composed till some time after the invasion of Alexander the Great. This opinion is chiefly based on the occurrence in one of the Sutras of the word yavanani, in the sense of " the writing of the Yavanas (Ionians)," thus implying, it would seem, such an acquaintance with the Greek alphabet as it would be impossible to assume for any period prior to Alexander's Indian campaign (326 B.C.). But, as.it is by no means certain 6 that this term really applies to the Greek alphabet, it is scarcely expedient to make the word the corner-stone of the argument regarding Panini's age. If Patafijali's "great commentary" was written, as seems most likely, about the middle of the 2nd century B.C., it is hardly possible to assign to Panini a later date than about 400 B.C. Though this grammarian registers numerous words and formations as peculiar to the Vedic hymns, his chief concern is with the ordinary speech {bhdsha) of his period and its literature ; and it is noteworthy, in this respect, that the rules he lays down on some important points of syntax (as pointed out by Professors Bhandarkar and Kielhorn) are in accord with the practice of the Brahmanas rather than with that of the later classical literature.

Panini's Sutras continued for ages after to form the centre of

grammatical activity. But, as his own work had superseded those of his predecessors, so many of the scholars who devoted themselves

1 Printed, with a commentary, at Calcutta; also, with notes, indexes and an instructive introduction, by O. Bohtlingk (1839- 1840); and agarn with a German translation (1887).

“■ I.e. son of Sakata, whence he is also called Sakatangaja.

3 Compare G. Biihler’s paper, Orient und Occident, p. 691 seq.

4 A. Burnell, On the Aindra School of Sanskrit Grammarians. 6 Panini, his Place in Sanskrit Literature (1861).

6 See’ Lassen, Ind. Alt. i. p. 723; M. Miiller, Hist, of A.S. Lit. p. 521 ; A. Weber, Ind. Stud. v. p. 2 seq.

to the task of perfecting his system have sunk into oblivion. The earliest of his successors whose work has come down to us (though perhaps not in a separate form) is Katyayana, the K t„a author of a large collection of concise critical notes, called Katyg Varttika, intended to supplement and correct the Sutras, or yana. give them greater precision. The exact date of this writer is likewise unknown; but there can be little doubt that he lived at least a century after Panini. During the interval a new body of literature seems to have sprung up ‘ — accompanied with considerable changes of language — and the geographical knowledge of India extended over large tracts towards the south. Whether this is the same Katyayana to whom the Vajasaneyi-pratisakhya (as well as the Sarvanukrama) is attributed, is still doubted by some scholars. 8 Katyayana being properly a family or tribal name, meaning ” the descendant of Katya,” later works usually assign a second name Vararuchi to the writers (for there are at least two) who bear it. The Kathasaritsagara makes the author of the Viirttikas a fellow- student of Panini, and afterwards the minister of King Nanda; but, though this date might have fitted Katyayana well enough, it is impossible to place any reliance on the statements derived from such a source. Katyayana was succeeded again, doubtless after a considerable interval, by Patanjali, the author of the (Vy’&karana-) Maha-bhashya? or Great Commentary. Patanjali. For the great variety of information it incidentally supplies regarding the literature and manners of the period, this is, from an historical and antiquarian point of view, one of the most important works of the classical Sanskrit literature. Fortunately the author’s date has been fairly settled by synchronisms implied in two passages of his work. In one of them the use of the imperfect — as the tense referring to an

event, known to people generally, not witnessed by the speaker, and yet capable of being witnessed by him — is illustrated by the statement, ” The Yavana besieged Saketa,” which there is reason to believe can only refer to the Indo-Bactrian king Menander (144- c. 124 B.C.), who, according to Strabo, extended his rule as far as the Yamuna. 10 In the other passage the use of the present is illustrated by the sentence, ” We are sacrificing for Pushpamitra ” — this prince (178-c. 142 B.C.), the founder of the Sunga dynasty, being known to have fought against the Greeks. 10 We thus get the years 144-142 B.C. as the probable time when the work, or part of it, was composed. Although Patanjali probably gives not a few traditional grammatical examples mechanically repeated from his predecessors, those here mentioned are fortunately such as, from the very nature of the case, must have been made by himself. The Mahabhashya is not a continuous commentary on Panini’s grammar, but deals only with those Sutras (some 1720 out of a total of nearly 4000) on which Katyayana had proposed any Varttikas, the critical discussion of which, in connexion with the respective Sutras, and with the views of other grammarians expressed thereon, is the sole object of Patafijali’s commentatorial remarks. Though doubts have been raised as to the textual condition of the work, Professor Kielhorn has clearly shown that it has probably been handed down in as good a state of preservation as any other classical Sanskrit work. Patanjali is also called Gonardiya — which name Professor Bhandarkar takes to mean ” a native of Gonarda,” a place, according to the same scholar, probably identical with Gonda, a town some 20 m. north-west of Oudh — and Gonikaputra, or son of Gonika. Whether there is any connexion between this writer and the reputed author of the Yoga- sastra is doubtful. The Mahabhashya has been commented upon by Kaiyata, in his Bhashyapradipa, and the latter again by Nagoji- bhatta, a distinguished grammarian of the earlier part of the 1 8th century, in his Bhdshya-pradlpoddyota.

Of running commentaries on Panini’s Sutras, the oldest extant and most important is the Kasika Vritti, 11 or ” comment of Kasi (Benares),” the joint production of two Jaina writers of

probably the first half of the 7th century, viz. Tayaditya and Vamana, each of whom composed one half (four

Ksilkt VrlttL

adhyayas) of the work. The chief commentaries on this work are Haradatta Misra’s Padamanjari, which also embodies the substance of the Mahabhashya, and Jinendra-buddhi’s Nydsa. 12

Educational requirements in course of time led to the appear- ance of grammars, chiefly of an elementary character, constructed

7 F. Kielhorn, Katyayana und Patanjali (1876). The Sangraha, a huge metrical work on grammar, by Vyadi, which is frequently referred to, doubtless belonged to this period.

“E.g. A. Weber. Goldstiicker and M. Miiller take the opposite view.

9 Part of this work was first printed by Ballantyne ; followed by a lithographed edition, by two Benares pandits (1871); and a photo-lithographic edition of the text and commentaries, published by the India Office, under Goldstilcker’s supervision (1874); finally, a critical edition by F. Kielhorn. For a review cf the literary and antiquarian data supplied by the work, see A. Weber, Ind. Stud. xiii. 293 seq. The author’s date has been frequently discussed, most thoroughly and successfully, by R. G. Bhandarkar in several papers. See also A. Weber, Hist, of I.L. p. 223.

10 Lassen, Ind. Alt. ii. 341, 362.

11 Edited by Pandit Bala Sastri (Benares, 1 876-1 878).

12 As it is quoted by Vopadeva it cannot be later than the I2th century.

on a more practical system of arrangement — the principal heads under which the grammatical matter was distributed usually „ being : rules of euphony (sandhi) ; inflection of nouns

e ™ (naman), generally including composition and secondary gramtn rs. j er i va (i ves ; the verb (dkhydta) ; and primary (krid-anla) derivatives. In this way a number of grammatical schools 1 sprang up at different times, each recognizing a special set of Sutras, round which gradually gathered a more or less numerous body of com-mentatorial and subsidiary treatises. As regards the grammatical material itself, these later grammars supply comparatively little that is not already contained in the older works — the difference being mainly one of method, and partly of terminology, including modifi-cations of the system of technical letters (anubandha). Of the Chandra.

S> rammars OI tn ‘ s description hitherto known, the Chdndra-vydkarana is probably the oldest — its author Chandra Acharya having flourished under King Abhimanyu of Kashmir, who is supposed to have lived towards the end of the 2nd century, 2 and in whose reign that grammarian is stated, along with others, to have revived the study of the Mahabhashya in Kashmir. Only portions of this grammar, with a commentary by Anandadatta, have, however, as yet been recovered.

The Katantra, 3 or Kdlapa, is ascribed to Kumara, the god of war, whence this school is also sometimes called Kaumdra. The real „-author probably was Sarva-varman, who also wrote the

original commentary (vrjtti), which was afterwards recast by Durgasimha, and again commented upon by the same writer, and subsequently by Trilochana-dasa. The date of the Katantra is unknown, but it will probably have to be assigned to about the 6th or 7th century. It is still used in many parts of India, especially in Bengal and Kashmir. Other grammars are — the Sdrasvati Prakriya, by Anubhuti Svarupacharya ; the Sankshipta-sdra, com- posed by Kramadlsvara, and corrected by Jumara-nandin, whence it is also called Jaumara; the Haima-vydkarana,* by the Jaina writer Hemachandra (1088-1172, according to Dr Bhao Daji) ; the Mugdha-bodha, 6 composed, in the latter part of the 13th century, by Vopadeva, the court pandit of King Mahadeva (Ramaraja) of Devagiri (or Deoghar) ; the Siddhdnta-kaumudi, the favourite text-book of Indian students, by Bhattoji Dikshita (17th century); and a clever abridgment of it, the Laghu- (Siddhdnta-) kaumudt,* by Varadaraja.

Several subsidiary grammatical treatises remain to be noticed. The Paribhdshds are general maxims of interpretation presupposed by the Sutras. Those handed down as applicable to Subsidiary p:j n j n ;’ s svs tem have been interpreted most ably by gra ‘ticjif Nagojibhatˆa, in his Paribdshendusekhara. 7 In the case of Treatises ru ‘ es a PP’y m g to whole groups of words, the complete lists (gana) of these words are given in the Ganapatha, and only referred to in the Sutras. Vardhamana’s Ganaratna- mahodadhi,* a comparatively modern recension of these lists (a.d. 1 140), is valuable as offering the only available commentary on the Ganas which contain many words of unknown meaning. The Dhdtupathas are complete lists of the roots (dkdtu) of the language, with their general meanings. The lists handed down under this title, 8 as apparently arranged by Panini himself, have been com- mented upon, amongst others, by Madhava. The Unddi-sutras are rules on the formation of irregular derivatives. The oldest work of this kind, commented upon by Ujjvaladatta, 10 is by

some writers ascribed to Katyayana Vararuchi, by others even to Sakatayana. The oldest known treatise on the philosophy of grammar and syntax is the Vdkya-padiya, n composed in verse, by Bhartrihari (? 7th century), whence it is also called Harikdrikd. Of later works on this subject, the Vaiyakarana-bhushana, by Kondabhatta, and the Vaiydkarana-siddhdnta-manjilshd, by Nagojibhatta, are the most important.

IV. Lexicography.— Sanskrit dictionaries {kosha), invariably composed in verse, are either homonymous or synonymous, or partly the one and partly the other. Of those hitherto published, Sasvata's Anekdrtha-samuchchaya, 12 or " collection of homonyms," is probably the oldest. While in the later homonymic vocabularies the words are usually arranged according to the alphabetical order of the final (or sometimes the initial) letter, and then according to the number of syllables, Sasvata's principle

Hema- chandra,

Dlciion* aries.

1 Dr Burnell, in his Aindra School, proposes to apply this term to all grammars arranged on this plan.

2 Professor Bhandarkar, Early History of the Dehhan, p. 20, pro- poses to fix him about the end of the 3rd century.

3 Edited, with commentary, by J. Eggeling.

- The Prakrit part edited and translated by R. Pischel. 6 Edited by O. Bohtlingk (1847).

6 Edited and translated by J. R. Ballantyne. For other modern grammars see Colebrooke, Essays, ii. p. 44; Rajendralala Mitra, Descriptive Catalogue, i., Grammar.

7 Edited and translated by F. Kielhorn.

8 Edited by T. Eggeling.

9 Edited by N. L. Westergaard ; also given in Bohtlingk's edition of Panini.

10 Text and commentary, edited by Th. Aufrecht.

11 Edited, with commentaries, at Benares.

of arrangement — viz. the number of meanings assignable to a word — seems to be the more primitive. The work probably next in time is the famous Amara-kosha 13 ("immortal treasury") by Amara- simha, one of " the nine gems," who probably lived early in the 6th century. This dictionary consists of a synonymous and a short homonymous part; whilst in the former the words are distributed in sections according to subjects, as heaven and the gods, time and seasons, &c, in the latter they are arranged according to their final letter, without regard to the number of syllables. This Kosha has found many commentators, the oldest of those known being Kshira- svamin. 14 Among the works quoted by commentators as Amara's sources are the Trikdn4a and Utpalini-koshas, and the glossaries of Rabhasa, Vyadi, Katyayana, and Vararuchi. A Kosha ascribed to Vararuchi — whom tradition makes likewise one of the nine literary " gems " — consisting of ninety short sections, has been printed at Benares (1865) in a collection of twelve Koshas. The A bhidhdna- ratnamdld, u by Halayudha; the Visvaprakasa, by Mahesvara (11 11); and the Abhidhdna-chintdmani 16 (or Haima-kosha), by the Jaina Hemachandra, seem all three to belong to the 12th century. Some-what earlier than these probably is Ajaya Pala, the author of the (homonymous) Ndndrtha-sangraha, being quoted by Vardhamana (a.d. 1 140). Of more uncertain date is Purushottama Deva, who .wrote the Trikanda-sesha, a supplement to the Amarkosha, besides the Hdrdvall, a collection of uncommon words, and two other short glossaries. Of numerous other works of this class the most important is the Medini, a dictionary of homonyms, arranged in the first place according to the finals and the syllabic length, and then alphabeti-cally. Two important dictionaries, compiled by native scholars of the last century, are the Sabdakalpadruma by Radhakanta Deva, and the Vdchaspatya, by Tara.na.tha Tarka-vachaspati. A full account of Sanskrit dictionaries is contained in the preface to the first edition of H. H. Wilson's Dictionary, reprinted in his Essays on Sanskrit Literature, vol. iii.

V. Prosody (Chhandas). — The oldest treatises on prosody have already been referred to in the account of the technical branches of the later Vedic literature. Among more modern » . treatises the most important are the Mrita-sanjivam, a _ y ' commentary on Pingala's Sutra, by Halayudha (perhaps identical with the author of the glossary above referred to) ; the Vritta- ratndkara, or " jewel-mine of metres," in six chapters, composed before the 13th century by Kedara Bhatta, with several commen- taries; and the Chhando-manjarl, likewise in six chapters, by Gangadasa. The Srutabodha, ascribed, probably wrongly,

to the great Kalidasa, is a comparatively insignificant treatise which deals only with the more common metres, in such a way that each stanza forms a specimen of the metre it describes. The Vritta-darpana treats chiefly of Prakrit metres. Sanskrit prosody, which is probably not surpassed by any other either in variety of metre or in harmoniousness of rhythm, recognizes two classes of metres, viz. such as consist of a certain number of syllables of fixed quantity, and such as are regulated by groups of breves or metrical instants, this latter class being again of two kinds, according as it is or is not bound by a fixed order of feet. A pleasant account of Sanskrit poetics is given in Colebrooke's Essays, vol. ii. ; a more complete and syste- matic one by Professor Weber, Ind. Stud. vol. viii.

VI. Music (Sangita). — The musical art has been practised in India from early times. The theoretic treatises on profane music now extant are, however, quite modern productions. „ . The two most highly esteemed works are the Sangita- us ratnahara (" jewel-mine of music "), by Sarngadeva, and the Sanglta- darpana (" mirror of music "), by Damodara. Each of these works consists of seven chapters, treating respectively of — (1) sound and musical notes {svara) ; (2) melodies (rdga) ; (3) music in connexion wijh the human voice (prakirnaka) ; (4) musical compositions (prabandha) ; (5) time and measure (tola) ; (6) musical instruments and instrumental music (vddya) ; (7) dancing and acting (nritta or nritya). The Indian octave consists like our own of seven chief notes (svara) ; but, while with us it is subdivided into twelve semi- tones, the Hindu theory distinguishes twenty-two intervals (iruti, audible sound). There is, however, some doubt as to whether these Srutis are quite equal to one another — in which case the intervals between the chief notes would be unequal, since they consist of either two or three or four irutis, — or whether, if the intervals between the chief notes be equal, the srutis themselves vary in duration between quarter-, third-, and semi-tones. There are three scales (grama), differing from each other in the nature of the chief intervals (either as regards actual duration, or the number of srutis or sub- tones). Indian music consists almost entirely in melody, instrumental accompaniment being performed in unison, and any attempt at harmony being confined to the continuation of the key-note. A

13 Edited by H. T. Colebrooke (1808), and by L. Deslongchamps

(1839-1845).

14 A grammarian of this name is mentioned as the tutor of King Jayapida of Kashmir (a.d. 755-786) ; but Kshira, the commentator on

Amara, is placed by Professor Aufrecht between the nth and 1 2th centuries, because he quotes the Sabdanusasana ascribed to Bhojaraja.

16 Edited by Th. Aufrecht (1861).

16 Edited by 0. Bohtlingk and C. Rieu (184.7).

number of papers, by various writers, have been reprinted with additional remarks on the subject, in Sourindro Mohun Tagore's Hindu Music (Calcutta, 1875). Compare also Bh. A. Pingle, Indian Music, 2nd ed. (Bombay 1898).

VII. Rhetoric (Alankara-sastra). — Treatises on the theory of literary composition are very numerous. Indeed, a subject of this Bh tnric description — involving such nice distinctions as regards

the various kinds of poetic composition, the particular subjects and characters adapted for them, and the different senti- ments or mental conditions capable of being both depictured and called forth by them — could not but be congenial to the Indian mind. H. H. Wilson, in his Theatre of the Hindus, has given a detailed account of these theoretic distinctions with special reference to the drama, which, as the most perfect and varied kind of poetic production, usually takes an important place in the theory of literary com- position. The Bharata-Sastra has already been alluded to as pro- bably the oldest extant work in this department of literature. Another comparatively ancient treatise is the Kavyadarsa, 1 or " mirror of poetry," in three chapters, by Dandin, the author of the novel Dasakumaracharita, who probably flourished towards, the end of the 6th century. The work consists of three chapters, treating — (1) of two different local styles (riti) of poetry, the Gaudi or eastern and the Vaidarbhl or southern (to which later critics add four others, the Pafichali, Magadhi, Lati, and Avantika) ; (2) of the graces and ornaments of style, as tropes, figures, similes; (3) of alliteration, literary puzzles and twelve kinds of faults to be avoided in com- posing poems. Another treatise on rhetoric, in Sutras, with a commentary entitled Kavyalankara-vritti, 2 is ascribed to Vamana of probably the 8th century. The Kavyalankara, by the Kashmirian Rudrata, was probably composed in the 9th century, a gloss on it (by Nami), which professes to be based on older commentaries, having been written in 1068. Dhananjaya, the author

of the DaJa- rupa, 1 or ” ten forms (of plays),” the favourite compendium of dramaturgy, appears to have flourished in the 10th century. In the concluding stanza he is stated to have composed his work at the court of King Munja, who is probably identical with the well- known Malava prince, the uncle and predecessor of King Bhoja of Dhara. The Dasarupa was early commented upon by Dhanika, possibly the author’s own brother, their father’s name being the same (Vishnu). Dhanika quotes Rajasekhara, who is supposed to have flourished about A.D. iooo, 4 but may after all have to be put somewhat earlier. The Sarasvati-kanthabharana, ” the neck-orna- ment of SarasvatI (the goddess of eloquence),” a treatise, in five chapters, on poetics generally, remarkable forits wealth of quotations, is ascribed to King Bhoja himself (nth century), probably as a compliment by some writer patronized by him. The Kavya-prakaia, 6 ” the lustre of poetry,” another esteemed work of the same class, in ten sections, was probably composed in the 12th century — the author, Mammata, a Kashmirian, having been the maternal uncle of Sri-Harsha, the author of the Naishadhiya. The Sahitya-darpana,” or ” mirror of composition,” the standard work on literary criticism, was composed in the 15th century, on the banks of the Brahmaputra, by Visvanatha Kaviraja. The work consists of ten chapters, treating of the following subjects: — (1) the nature of poetry; (2) the sentence; (3) poetic flavour (rasa) ; (4) the divisions of poetry ; (5) the func- tions of literary suggestion ; (6) visible and audible poetry (chiefly on dramatic art); (7) faults of style; (8) merits of style; (9) dis- tinction of styles; (10) ornaments of style.

VIII. Medicine (Ayur-veda, Vaidya-sastra). — Though the early cultivation of the healing art is amply attested by frequent allusions

in the Vedic writings, it was doubtless not till a much later Medicine. p er ; oc j t hat t jj e me dical practice advanced beyond a certain degree of empirical skill and pharmaceutic routine. From the simultaneous mention of the three humours (wind, bile, phlegm) in a varttika to Panini (v. I, 38), some kind of humoral pathology would, however, seem to have been prevalent among Indian physicians several centuries before our era. The oldest existing work is supposed to be the Charaka-sarnhita,” a bulky cyclo- paedia in slokas, mixed with prose sections, which consists of eight chapters, and was probably composed for the most part in the early centuries of our era. Whether the Chinese tradition which makes Charaka the court physician of King Kanishka (c. A.D. 100) rests on fact is very doubtful. Of equal authority, but doubtless some- what more modern, is the Susruta (-samhita) , 8 which Susruta is said to have received from Dhanvantari, the Indian Aesculapius, whose name, however, appears

also among the ” nine gems.” It consists

‘ 1 Edited, with commentary, by Premachandra Tarkabagisa, Bibl. Ind. ; with German translation by O. v. Bohtlingk (1890).

2 Edited by Capeller (1875).

3 Edited by Fitzedw. Hall, Bibl. Ind. (1865) ; with commentary (Bombay, 1897).

4 R. Pischel, Gott. Gel. A. (1883) ; G. Buhler, Ind. Ant. (1884), p. 29. 6 Edited by Mahesa Chandra Nyayaratna (1866).

6 Text and translation in Bibl. Ind. ; edited by Jibananda Vidya-sagara (1897).

7 Edited by Jibananda Vidyasagara (Calcutta, 1877). Cf. A. F. R. Hoernle, ” Studies in Anc. Indian Medicine ” (J. Roy. As. S. 1906-9).

8 Edited by Madhusudana Gupta (1835-1837), and by Jibananda Vidyasagara (i8”3).

of six chapters, and is likewise composed in mixed verse and prose — the greater simplicity of arrangement, as well as some slight attention paid in it to surgery, betokening an advance upon Charaka. Both works are, however, characterized by great prolixity, and contain much matter which has little connexion with medicine. The late Professor E. Haas, in two very suggestive papers, 9 tried to show that the work of Susruta (identified by him with Socrates, so often confounded in the middle ages with Hippocrates) was probably not composed till after the Mohammedan conquest, and that, so far from the Arabs (as they themselves declare) having derived some of their knowledge of medical science from Indian authorities, the Indian Vaidyasastra was nothing but a poor copy of Greek medicine, as transmitted by the Arabs. But even though Greek influence may be traced in this as in other branches of Indian science, there can be no doubt, 10 at any rate, that both Charaka and Susruta were known to the Arab Razi (c. A.D. 932), and to the author of the Fihrist (completed A.D. 987), and that their works must therefore have existed, in some form or other, at least as early as the 9th century. Among the numerous later medical works published and greatly esteemed in India, the most important general compendiums are Vagbhata’s Ashtdnga-hridaya, ” the heart of the eight-limbed (body of medical science),” supposed to have been written in the 9th century, or still earlier; and Bhava ,Misra’s Bhava-prakas’a, probably of the early part of the 16th century; while of special treatises may be

mentioned Madhava's system of pathology, the Rugvinischaya, or Madhava-Nidana, of the 8th or 9th century; and Sarngadhara's compendium of therapeutics, the Sarngadhara- samhita, composed before 1300, having been commented upon by Vopadeva. Materia medica, with which India is so lavishly en- dowed by nature, is a favourite subject with Hindu medical writers, the oldest treatise being apparently the Dhanvantari-nighanfu, of uncertain, but not very high, age; besides which may be mentioned Madanapala's Madanavinoda, written A.D. 1374; the more modern Raja-nighanfu, by the Kashmirian Narahari; besides other, still more recent esteemed works of this class, to which may be added the valuable medical dictionary V aidyakasabdasind.hu by Umesa- chandra Gupta. A useful general view of this branch of Indian science is contained in T. A. Wise's Commentary on Hindu Medicine (1845), and in his History of Medicine, vol. i. (1867) ; but the subject has since then been treated in a much fuller and more critical way in Professor J. Jolly's " Medicin " in Biihler's Grundriss der indo- arischen Philologie.

IX. Astronomy and Mathematics. — Hindu astronomy may be broadly divided into a pre-scientific and a scientific period. While the latter clearly presupposes a knowledge of the re- searches of Hipparchus and other Greek astronomers, Astronom it is still doubtful whether the earlier astronomical and . y

astrological theories of Indian writers were entirely of Matne . home growth or partly derived from foreign sources. mjflcS| From very ancient (probably Indo-European) times chronological calculations were based on the synodical revolutions of the moon — the difference between twelve such revolutions (making together 354 days) and the solar year being adjusted by the insertion, at the time of the winter solstice, of twelve additional days. Besides this primitive mode the Rigveda also alludes to the method prevalent in post- Vedic times, according to which the year is divided into twelve (sdvana or solar) months of thirty days, with a thirteenth month intercalated every fifth year. This quinquennial cycle (yuga), is explained in the Jyotisha, regarded as the oldest astro- nomical treatise. An institution which occupies an important part in those early speculations is the theory of the so-called lunar zodiac, or system of lunar mansions, by which the planetary path, in accordance with the duration of the moon's rotation, is divided into twenty-seven or twenty-eight different stations, named after certain constellations (nakshatra) which are found alongside of the ecliptic, and with which the moon (masc.) was supposed to dwell successively during his circuit. The same institution is found in China and Arabia; but it is still doubtful 11 whether the Hindus, as some scholars hold, or the Chaldaeans, as Professor Weber

thinks, are to be credited with the invention of this theory. Professor G. Thibaut, 12 who has again thoroughly investigated the problem, comes to the conclusion that it is improbable that the nakshatra-theory arose independently in India, but that it is still doubtful whence the Hindus derived it. The principal works of this period are hitherto known from quotations only, viz. the Gargl Samhita, which Professor Kern would fix at c. 50 B.C., the NaradT, Samhita and others.

The new era, which the same scholar dates from c. A.D. 250, is marked by the appearance of the five original Siddhantas (partly extant in revised redactions and in quotations), the very names of two of which suggest Western influence, viz. the Paitamaha-, Surya-, 1 ‘ Vasishtha-, Romaka- (i.e. Roman) and Paulisa-s iddhantas. Based

9 Z.D.M.G. (1876), p. 617 seq.; (1877), p. 647 seq.

10 See Professor Aug. Muller’s paper, Z.D.M.G. (1880), p. 465.

11 See especially Professor Whitney’s essay on the Lunar Zodiac, in his Oriental and Linguistic Studies. _ i(,

12 G. Thibaut, ” Astronomie, Astrologie und Mathematik,” in Biihler’s Grundriss.

13 The Surya-siddhanta, translated by (W. D. Whitney and) E. Burgess (i860).

on these are the works of the most distinguished Indian astronomers, viz. Aryabhata, 1 probably born in 476; Varaha-mihira, 2 probably 505-587; Brahma-gupta, who completed his Brahma- siddhanta in 628; Bhatta Utpala (10th century), distinguished especially as com- mentator of Varaha-mihira; and BhaskaraAcharya,who,bornin 1114, finished his great course of astronomy, the Siddhanta-siromani, in 1 1 50. In the works of several of these writers, from Aryabhata on- wards, special attention is paid to mathematical (especially arith- metical and algebraic) computations; and the respective chapters of Bhaskara’s compendium, viz. the Lllavati and Vija-ganita, s still form favourite text-books of these subjects. The question whether Aryabhata was acquainted with the researches of the Greek algebraist Diophantus (c. a.d. 360) remains still unsettled, but, even if this was the case, algebraic science seems to have been carried by him beyond the point

attained by the Greeks.

On Sanskrit literature generally may be consulted Max Miiller, History of Ancient Sanskrit Literature; A Weber, History of Indian Literature; A. A. Macdonell, History of Sanskrit Literature. (J. E.)

SANSON, CHARLES HENRI (b. 1739), public executioner of Paris from 1788 to 1795, was the son of Charles Sanson or Longval, who received in 1688 the office of exicuieur des hautes ceuvres de Paris, which became hereditary in his family. Sanson's brothers exercised the same trade in other towns. In the last days of 1789 Gorsas in the Courrier de Paris accused Sanson of harbouring a Royalist press in his house. Sanson was brought to trial, but acquitted, and Gorsas withdrew the accusation. After the execution of Louis XVI., a statement by Sanson was inserted in the Thermom'etre politique (13th February 1793) in contradiction of the false statements made in respect of the king's behaviour when confronted with death. He surrendered his office in 1795 to his son Henri, who had been his deputy for some time, and held his father's office till his death in 1840. There is no record of the elder Sanson's death. Henri's son Clement Henri was the last of the family to hold the office.

The romantic tales told of C. H. Sanson have their origin in the apocryphal Memoires pour servir d. I'histoire de la Revolution Francaise par Sanson (2 vols., 1829; another ed., 1831), of which a few pages of introduction emanate from Balzac, and some other matter from Lheritier de l'Ain. Other Memoires of Sanson, edited by A. Gregoire (ps. for V. Lombard) in 1830, and by M. d'Olbreuze (6 vols., 1862- 1863) are equally fictitious. The few facts definitely ascertainable are collected by G. Len6tre in La Guillotine pendant la Revolution (1893). Cf. M .Tourneux, Bibliographie de I'histoire de Paris . . . (1890, &c), vol. i. Nos. 3963-3965, and vol. iv., s.v. " Sanson."

SANSON, NICOLAS (1600-1667), French cartographer, wrongly termed by some the creator of French geography, was born of an old Picardy family of Scottish descent, at Abbeville, on the 20th (or 31st) of December 1600, and was educated by the Jesuits at Amiens. In 1627 he attracted the attention of Riche- lieu by a map of Gaul which he had constructed (or at least begun) while only eighteen. He gave lessons in geography both to Louis XIII. and to Louis XIV. ; and when Louis XIII., it is said, came to Abbeville, he preferred to be the guest of Sanson (then em- ployed on the fortifications), instead of occupying the lodgings provided by the town. At the conclusion of this visit the king made Sanson a councillor of state. In 1647 Sanson accused the

Jesuit Labbe of plagiarizing him in his Pharus Galliae Antiquae; in 1648 he lost his eldest son Nicolas, killed during the Fronde. Among the friends of his later years was the great Conde. He died at Paris on the 7th of July 1667. Two younger sons, Adrien (d. 1708) and Guillaume (d. 1703), succeeded him as geographers to the king.

Sanson's principal works are : Galliae antiquae descrlptio geographica (1627) ; Graeciae antiquae descriptio (1636) ; L'Empire romain (1637) ; Britannia, ou recherches de I'antiquite a" Abbeville (1638), in which he seeks to identify Strabo's Britannia with Abbeville; La France (1644); Tables methodiques pour les divisions des Gaules . . . (1644); L'Angleterre, I'Espagne, Vltalie et I'AUemagne (1644); Le Cours du Rhin (1646); In Pharum Galliae antiquae Phihppi Labbe disquisiliones (1647-1648) ; Remarques sur la carte de Vancienne Gaule de Cesar (1651); L'Asie (1652); Index geographicus (1653); Geographia sacra (1653) ; L'Afrique (1656). In 1692 Hubert Jaillot collected Sanson's maps in an Atlas nouveau. See also Niceron,

1 The Aryabhapya, edited by H. Kern (1874).

- The Brihat-samhita and Yogayatra, edited and translated by H. Kern; the Laghu-jdtaka, edited by A. Weber and H. Jacobi.

- A translation of both treatises, as well as of the respective chapters of Brahma-gupta's work, was published (1817) by H. T. Colebrooke, with an important " Dissertation on the Algebra of the Hindus," reprinted in the Misc. Essays, ii. pp. 375 seq.

MSmoires, vols. xiii. and xx. ; the 18th-century editions of some of Sanson's works on Delamarche under the titles of Atlas de geographie ancienne and Atlas britannique; and the Catalogue des cartes et livres de geographie de Sanson (1702).

SANSOVINO, ANDREA CONTUCCI DEL MONTE (1460-1529), Florentine sculptor, was the son of a shepherd called Niccolo di Domenico Contucci, and was born at Monte Sansavino near Arezzo, whence he took his name, which is usually softened to Sansovino. He was a pupil of Antonio Pollaiuolo, and at first worked in the purer style of 15th-century Florence. Hence his early works are by far the best, such as the terra-cotta altarpiece in Santa Chiara at Monte Sansavino, and the marble reliefs of the " Annunciation," the " Coronation of the Virgin," a " Pieta," the " Last Supper," and various statuettes in the Corbinelli chapel of S. Spirito at Florence, all executed between the years 1488 and 1492. From 1491 to 1500 Andrea worked in Portugal for the king, and some pieces of sculpture

by him still exist in the monastic church of Coimbra. (See Raczinski, Les Arts en Portugal, Paris, 1846, p. 344.) These early reliefs show strongly the influence of Donatello. The beginning of a more pagan style is shown in the statues of ” St John baptizing Christ ” over the east door of the Florentine baptistery. This group was, however, finished by the weaker hand of Vincenzo Danti. In 1502 be executed the marble font at Volterra, with good reliefs of the ” Four Virtues “and the “Baptism of Christ.” In 1505 Sansovino was invited to Rome by Julius II. to make the monuments of Cardinal Ascanio Maria Sforza and Cardinal Girolamo della Rovere for the retro-choir of S. Maria del Popolo. The architect- ural parts of these monuments and their sculptured foliage are extremely graceful and executed with the most minute delicacy, but the recumbent effigies show the beginning of a serious decline in taste. These tombs became models which for many years were copied by most later sculptors with increasing exaggerations of their defects. In 151 2, while still in Rome, Sansovino executed a very beautiful group of the ” Madonna and Child with St Anne,” now over one of the side altars in the church of S. Agostino. From 1513 to 1528 he was at Loreto, where he cased the outside of the Santa Casa in white marble, covered with reliefs and statuettes in niches between engaged columns; a small part of this sculpture was the work of Andrea, but the greater part was executed by Montelupo, Tribolo and others of his assistants and pupils. Though the general effect is rich and magnificent, the individual pieces of sculpture are both dull and feeble. The earlier reliefs, those by Sansovino himself, are the best.

SANSOVINO, JACOPO (1477-1570), Italian sculptor, was called Sansovino after his master Andrea, his family name being Tatti. He became a pupil of Andrea in 1500, and in 1510 accompanied him to Rome, devoting himself there to the study of antique sculpture. Julius II. employed him to restore damaged statues, and he made a full-sized copy of the Laocoon group, which was afterwards cast in bronze, and is now in the Uffizi at Florence. In 1 51 1 he returned to Florence, and began the statue of St James the Elder, which is now in a niche in one of the great piers of the Duomo. He carved a nude figure of ” Bacchus and Pan,” now in the Bargello, near the “Bacchus” of Michelangelo, from the contrast with which it suffers much. Soon afterwards Jacopo returned to Rome, and designed for his fellow-citizens the grand church of S. Giovanni dei Fiorentini, which was carried out by Antonio Sangallo the younger. A marble group of the ” Madonna and Child,” heavy in style, now at the west of S. Agostino, was his next important work. In 1527 Jacopo fled from the sack of Rome to Venice, where he was welcomed by Titian and Pietro Aretino; henceforth till

his death he was occupied in adorning Venice with magnificent buildings and many second-rate pieces of sculpture Among the latter Jacopo's poorest works are the colossal statues of "Neptune " and " Mars " on the grand staircase of the ducal palace. His best are the bronze doors of the sacristy of St Mark, cast in 1562; inferior to these are the series of six bronze reliefs round the choir of the same church. In 1565 he completed a small bronze gate with a graceful relief of " Christ surrounded by Angels"; this gate shuts off the altar of the Reserved Host in the choir of St Mark's.

Jacopo's chief claim to distinction rests upon the numerous fine Venetian buildings which he designed, such as the public library, the mint, the Scuola della Misericordia, the Palazzo de' Cornari and the Palazzo Delfino, with its magnificent staircase — the last two both on the grand canal. Among his ecclesiastical works the chief were the church of S. Fantino, that of S. Martino, near the arsenal, the Scuola di S. Giovanni degli Schiavoni and, finest of all, the church, now destroyed (see Venice), of S. Gemi- niano, a very good specimen of the Tuscan and Composite orders used with the graceful freedom of the Renaissance.

In 1545 the roof of the public library, which he was then con- structing, fell in; on this account he was imprisoned, fined and dismissed from the office of chief architect of the cathedral, to which he had been appointed by a decree of the signoria on the 7 th of April 1529. Owing to the intervention of Titian, Pietro Aretino and others, he was soon set at liberty, and in 1549 he was restored to his post. He did good service for St Mark's by encircling its failing domes with bands of iron. Sansovino's architectural works have much beauty of proportion and grace of ornament, a little marred in some cases by an excess of sculp- tured decoration, though the carving itself is always beautiful, both in design and execution. He used the classic orders with great freedom and tasteful invention. His numerous pupils were mostly men of but little talent.

SANTA ANA, a city and the county-seat of Orange county, southern California, U.S.A., 34 m. S.E. of Los Angeles. Pop. (1900) 4933 (506 foreign-born); (1910) 8429. It is served by the Atchison, Topeka & Santa Fe, the Southern Pacific and the Pacific Electric railways. The city is situated about 10 m. from the ocean, in the lower western foothills of the Santa Ana moun- tains. There are numerous artesian

wells in the surrounding region, and there is a good irrigation system. (For a description of the irrigation canal see Aqueduct.) Santa Ana is in the orange, lemon and walnut region of southern California, and in the only important celery -growing district of the state; the celery is grown in great quantities in the large district known as the ” Peatlands ” (about 9 m. from the city), which is underlaid by a deposit of peat from 1 to 100 ft. deep. Other important products of the county are petroleum, barley, sugar beets, apricots and lima beans. Santa Ana was first platted in 1869 and was incorporated in 1888. Its growth since 1900 has been rapid.

SANTA ANA, the capital of the department of Santa Ana, Salvador, 50 m. by rail N.W. of San Salvador. > Pop. (1905) about 48,000. It,is situated about 2100 ft. above sea-level, in a valley surrounded by high mountains, which are covered by coffee and sugar plantations and woods. It is the second city of the republic in size, and has broad shady streets and fine open squares. The municipal offices, hospital, literary institute and barracks are noteworthy buildings, and the parish church, Doric in style, is generally regarded as one of the finest in Central America. Cigars, pottery, starch, spirits, sugar and various textiles are manufactured, and the export trade in coffee and sugar has developed rapidly since the opening in 1900 of a railway to San Salvador and the Pacific port of Acajutla.

SANTA-ANNA, ANTONIO LOPEZ DE (1795-1876), Mexican soldier and politician, was born at Jalapa in the province of Vera Cruz on the 21st of February 1795. He was neither a general nor a statesman, nor even an honest man, but he was the most conspicuous and continuously active of the military adventurers who filled Spanish America with violence during the first two generations of its independence. He entered the colonial army of Spain as a cadet in 1810, and served as one of the Creole supporters of the Spanish government till 1821. In that year Mexico fell away from the mother country. Iturbide, who was master of the country for the time, made Santa-Anna brigadier and governor of La Vera Cruz. Till about 1S35 he pursued the policy of keeping his hold on his native province of Vera Cruz, and influencing the rest of the country by alternately supporting and upsetting the central government. He first helped to ruin Iturbide, who wished to make himself emperor. He proclaimed the Republic, and was then a supporter of the successful federal

party. Federalism suited him very well since it left him in command of Vera Cruz. In 1829 he defeated a foolish attempt of the Spaniards to reassert their authority in Mexico. He kept himself in reserve till events gave him a chance to upset the president of the day,

Bustamente, whom he defeated at Casas Blancas on the 12th of November 1832. He could now have become president himself, but preferred to rule through dummies. Now that he saw an opportunity to become master he became reactionary and abolished the federal constitution. This led to the revolt of Texas, which was full of settlers from the United States. Santa-Anna invaded Texas and gained some successes, but was surprised and taken prisoner at San Jacinto on the 21st of April 1836. The Texans had a good excuse for shooting him, as he conducted war in a ferocious way. They preferred to let him save his life by ordering his troops to evacuate the country. He was released in February 1837, and had for a time to ” retire to his estates ” in Vera Cruz. In 1838 the French govern- ment made an attack on the town, and Santa-Anna, by a display of his redeeming virtue of personal courage, lost a leg but regained his influence. He became military dictator in 184 1, and governed by violence till he was driven into exile by mutiny in 1845. He fled to Cuba, but was recalled to command against the invading, army from the United States in 1846. The Americans beat him, and once more (1848) he went into exile. In 1853 he was recalled and named president for life, with the title of Serene Highness. In less than two years he was again overthrown and had to go abroad in August 1855. For the rest of his life Santa-Anna was hanging on the outskirts of Mexico, endeavouring to find an opening to renew his old adventures. He tried the emperor Maximilian, the French and the United States to see if they would serve his turn. But he had outlived his time. The ‘empty title of grand-marshal given by Maximilian was all he gained. When in 1867 he attempted to head a rising, he was captured, and condemned to death, but spared on the ground that he was in his dotage. At last, worn out by age, he accepted an amnesty and returned to the city of Mexico, where he died in obscurity on the 20th of June 1876.

See H. H. Bancroft, History of the Pacific States of North America, vols. viii. and ix. (San Francisco, 1882-1890).

SANTA BARBARA, a city and the county-seat of Santa Barbara county, in southern California, U.S.A., on the coast- plain on the southern slope of the Santa Ynez Mountains. Pop. (1900) 6587(1143 foreign-born); (1910) 11,659. It i s served by the Coast Line of the Southern Pacific railway system. With picturesque surroundings, excellent bathing beach and ideal climate, Santa Barbara is one of the most popular of the health and pleasure resorts of California. The monthly average of the mean temperatures for 23 years (1881-1903 inclusive) varied from 53 in January to 67 in August. Nowhere in California is plant life more varied and beautiful; in the vicinity are walnut, olive, lemon and orange groves. North-west of the city are the valuable oil

fields of Santa Barbara county, notably the Santa Maria field, 6 m. S. of Santa Maria, and the region between Lompoc and Santa Maria, first developed in 1903. A presidio (Spanish military post) was established here in 1782, and a Franciscan mission, by Junipero Serra, about four years later. The mission building is well preserved, and is probably the greatest single attraction of Santa Barbara. It is now the Franciscan headquarters of the Pacific coast, and near it is a Franciscan college. Immediately behind it is the picturesque Mission Canyon. Santa Barbara took part in the revolution of 1829, and in the sectional struggles following leaned to the side of Monterey and the North. It was occupied by the Americans in August 1846, then (without bloodshed) by the Calif ornians in October, and again definitively by the American forces on the 27th of November 1846. In 1850 it was incorporated as a city, though already long a Mexican ” ciudad.” It remained off the railway route until 1887.

SANTA BARBARA, a town of Iloilo province, island of Panay, Philippine Islands, on the S.E. coast, on the Jalaur river, a few miles N. of Iloilo, the capital of the province. Pop. (1903), after the annexation of Zarragk, Lucena, Pavia and Leganes,

37,621; subsequently Pavia (pop. in 1903, 5700) was annexed to Jaro. There are 87 barrios or villages in the town, only three of these had a population in 1903 exceeding 1000. The language is Visayan. The principal industries are the cultivation of sugar cane, Indian corn, rice, cacao, coco-nut palm and tobacco, and the raising of cattle.

SANTA CATHARINA, a southern maritime state of Brazil, bounded N. by Parana, E. by the Atlantic, S. by Rio Grande do Sul, and W. by Rio Grande do Sul and the Misiones territory of Argentina. Pop. (1900) 320,289; area 28,633 sc l- m – The Serra do Mar rises not far from the coast and leaves only a narrow coast zone, and the plateau above is much broken with irregular ranges of mountains. The coast region, though in the temperate zone, is hot and humid. It is densely forested, is broken by swamps and lagoons, and is crossed by numerous short streams from the wooded slopes of the serras. The plateau is less densely wooded, but has some highly fertile plains, the open campos being partly devoted to stock raising. Except in the malarious coast zone, the climate is temperate, bracing and exceptionally healthy. The drainage is westward to the Parana, the rivers being tributaries of the Iguassu, which forms its northern boundary, and of the Uruguay,

which forms its southern boundary. A number of prosperous German colonies — the largest and best known of which are Blumenau, Dona Francisca, Joinville, Itajahy, Brusque, Dom Pedro and Sao Bento — are devoted chiefly to agriculture. There is no cultivation on a large scale, as in Sao Paulo and the northern provinces. Coffee is produced to a limited extent. Indian corn, beans, onions, fruit and mandioca are the principal products. A prominent industry is the gathering and preparation of mate or Paraguayan tea {Ilex paraguayensis) , which is an article of export. The mineral resources include coal, iron, silver, gold and petroleum, the first alone is mined. The only railway of the state, the Dona Thereza Christina, runs from Laguna, at the mouth of a lagoon of that name on the southern coast, northward to the port of Imbituba (about 4 m.) and thence westward up the valley of the Rio Tubarao to the coal fields of that name (69 m.). The coal is of inferior quality and the development of the mines, which were discovered in 1841, has not been a success. A later investigation shows that there are beds of better coal at a greater depth extending from Rio Grande do Sul to Sao Paulo. The capital of the state is Florianopolis (q.v.) also called Santa Catharina and Desterro, and its other towns are Blumenau, Lages (9356), Laguna (7282), Joinville (13,996), Itajahy (8875), Brusque (8094), Sao Jose (11,820), opposite Florianopolis, Tubarao (5495) and Sao Francisco (5583), a good port in the northern part of the state in direct communication with a majority of the German colonies.

SANTA CLARA (or Villa-Clara), the capital of Santa Clara province, Cuba, about 185 m. (by rail) E.S.E. of Havana. Pop. (1907) 16,702. It is situated near the centre of the island, on a plateau, between two small streams, and is served by the United Railways of Havana and by the Cuba and the Cuba Central railways, the last connecting the east and west lines with the north and south coasts. The streets are straight and wide, and there are many fine buildings. The oldest church is of the last third of the 18th century. The city is surrounded by fertile plains, which are cultivated in cane or devoted to grazing. Santa Clara was founded in 1689 by a band of schismatics from Remedios.

SANTA CRUZ, ALVARO DE BAZAN, ist MARquis of (1526- 1588), Spanish admiral, was born at Granada on the 12th of December 1 5 26, of an ancient family originally settled in the valley of Baztan in Navarre, from which they are said to have taken their name. His grandfather, Alvaro de Bazan, took part in the conquest of Granada from the Moors in 1492, and his father, who had the same Christian name, was distinguished in the service of Charles V., by whom he was made general of the galleys — or commander-in-chief of the naval forces of the crown of Spain in the Mediterranean. The future admiral

followed his father in his youth, and was early employed in high commands. He was a member of the military order of St Iago. In 1564 he aided

in the capture of Velez de Gomera, commanded the division of galleys employed to blockade Tetuan, and to suppress the piracy carried on from that port. The service is said to have been successfully performed. Bazan certainly earned the confidence of Philip II., by whom he was appointed to command the galleys of Naples in 1568. This post brought him into close relations with Don John of Austria, when the Holy League was formed against the Turks in 1570- During the operations which preceded and followed the battle of Lepanto (7th of October 1571), Bazan was always in favour of the more energetic course. In the battle he commanded the reserve division, and his prompt energy averted a disaster when Uluch Ali, who commanded the left wing of the Turks, outmanoeuvred the commander of the Christian right, Giovanni Andrea Doria, and broke the allied line. He accompanied Don John of Austria at the taking of Tunis in the following year. When Philip II. enforced his claim as heir to the crown of Portugal in 1580-1581, Santa Cruz held a naval command. The prior of Crato, 1 an illegitimate representative of the Portuguese royal family, who conducted the popular resistance to the annexation of the country by Philip, continued however, to hold the island possessions of Portugal in the Atlantic. He was supported by a number of French adventurers under Philip Strozzi, a Florentine exile in the service of France, Santa Cruz was sent as admiral of the Ocean to drive the pretender and his friends, away in 1583. His victory off Terceira over the Portuguese, and a loose confederation of adventurers and semi-pirates, French and English, decided the struggle in favour of Spain. Santa Cruz, who recognized that England was the most formidable opponent of Spain, became the zealous advocate of war. A letter written by him to King Philip from Angla in Terceira, on the 9th of August 1583, contains the first definite suggestion of the Armada. Santa Cruz himself was to have commanded. His plans, schemes and estimates occupy a conspicuous place in the documents concerning the Armada collected by Don Cesareo Duro. The hesitating character of the king, and his many embarrassments, political and financial, caused many delays, and left Santa Cruz unable to act with effect. He was at Lisbon without the means of fitting out his fleet, when Drake burnt the Spanish ships at Cadiz in 1587. The independence of judgment shown by Santa Cruz ended by offending the king, and he was held responsible for the failures and delays which were the result of the bad management of his master. His death, which occurred on the 9th of February 1588 at Lisbon, was said to have been hastened by the

unjustified reproaches of the king. The marquis de Santa Cruz was the designer of the great galleons which were employed to carry the trade between Cadiz and Vera Cruz in Mexico.

The documents relating to' the Armada have been collected by Don Cesareo Duro in La Armada Invenciblc, and he gives a biography of the marquis in his Conquista de las Idas Azores. A separate life has been published by Don x\ngel de Altolaguirre. There are various notices of Santa Cruz in Sir W. Stirling Maxwell's Don John of Austria. (D. H.)

SANTA CRUZ, an eastern department of Bolivia, bounded N. by El Beni, E. by Brazil, S. by Chuquisaca and W, by Chuquisaca and Cochabamba. Area 141,368 sq. m. Pop. (1900) 209,592; (1906 estimated) 234,743. It is only partly explored. It consists of a great plain extending eastward from the base of the Andes to the frontiers of Brazil, broken by occasional isolated hills, and in the N.E. by a detached group of low sierras known collectively under the name Chiquitos, which belong to the Brazilian highlands rather than to the Andes. On the western side of the department is an upland zone belonging to the eastern slope of the Andes, and here the Bolivian settlements are chiefly concentrated. The Chiquitos contain a number of old missions, now occupied almost exclusively by Indians. The great plains, whose general elevation is about 900 ft. above the sea, are so level that the drainage does not carry oft' the water in the rainy season, and immense areas are flooded for months at a time. Extensive areas are permanently swampy. There are forests in the N. and W., but the larger part of the department consists of open grassy plains, suitable for grazing. The Llanos 1 A priory of the Maltese knights of St John of Jerusalem.

de Chiquitos, adjacent to the sierras of that name, have long been used fer this purpose. There are two river systems, one belonging to the Amazon and the other to the La Plata basins. The first includes the Guapay or Rio Grande, Piray or Sara, Yapacani and Maraco, upper tributaries of the Mamore, and the San Miguel, Blanco, Baures and Paragua, tributaries of the Guapore— both draining the western and northern parts of the department. In the extreme east a number of streams flow eastward into the Paraguay, the largest of which is the Otuquis; their channels are partly hidden in swamps and lagoons. The climate of the plains is hot and malarial, and the rainfall heavy. On

the Andean slopes the temperature is more agreeable. Stock- raising is followed to some extent on the plains. Other products of the western districts are sugar, rum, cacao, rice, cotton, coffee and indigo. Rubber and medicinal products are also exported. The Guapay is navigable for small boats in high water, and also the lower courses of the other rivers named, but they are of little service except in the transport of rubber. The principal markets for Santa Cruz products are in the Bolivian cities of the Andes where sugar, rum, cacao and coffee find a ready sale. There is a trade route across the plains from Santa Cruz de la Sierra to Puerto Suarez, on the Paraguay, and the Bolivian government contracted in 1008 for a railway between these two points (about 497 m.) but the traffic is inconsiderable.

The capital and only large town of the department is Santa Cruz de la Sierra (pop., in 1900, 15,874; in 1906, estimated, 20,535), on the Piray, a tributary of the Mamore, 1450 ft. above sea-level, about 160 m. in a straight line N.E. of Sucre. It is situated on a lower terrace of the Andean slope in a highly fertile district, devoted to sugar-cane and stock-raising. It is a dusty, straggling, frontier town with rough habitations and a half- civilized population, chiefly Indians and mestizos. It is the seat of a bishop and has a partly finished cathedral, seminary atid mission station for the Indians. It has also a national college. There are flour mills, sugar mills, distilleries, tanneries and leather manufactories. The original site of Santa Cruz de la Sierra was in the uplands, but it was removed to its present site about 1 590, the phrase ” de la Sierra ” being kept. It has been used as a centre for missionary work among the Indians and as a centre of trade. Expeditions to the Brazilian frontier or to the Chiquitos missions are fitted out here, and it is the objective point for expedi- tions entering Bolivia from Matto Grosso, Brazil, and Paraguay. SANTA CRUZ, a city and the county-seat of Santa Cruz county, California, U.S.A., on the northern headland of the Bay of Monterey, about 75 m. S. of San Francisco. Pop. (1900) 5659 (11 23 foreign-born); (1910) ir,i46. It is served by the Southern Pacific railway. Santa Cruz is a popular seaside resort. The site of the city, which spreads back over bluffs and terraces to the foothills of the mountains (2000-3800 ft. in altitude), is very picturesque, and the scenery in the environs beautiful. Hills nearly enclose the city, protecting it from the ocean fogs. Monterey Bay has a remarkable variety of fish; and there is a large fish hatchery near the city. Fruits in great variety are grown in the valley and foothills. The mountains are covered with one of the noblest redwood forests of the state — the only one south of San Francisco; two groves, the Sempervirens Park (4000 acres) and the Fremont Grove of Big Trees, 5 m. from Santa Cruz, have been permanently preserved by the state. A

Franciscan mission was established at Santa Cruz in i79r and secularized in r834, but was later destroyed. A pueblo or villa called Branciforte, one of the least important of the Spanish settlements (now a suburb of Santa Cruz), was founded in the vicinity in 1797, and before the American conquest was merged with the settle- ment that had grown up about the mission. The flag of the United States was raised over Santa Cruz in July 1846. The city was chartered in 1876.

SANTA CRUZ, an archipelago of the Pacific Ocean, in the division of Melanesia, belonging to Great Britain. It is a scattered group of small volcanic islands, irregularly disposed from N.W. to S.E. between 8° 31′ and 11° 40′ S., 165 38′ and 168 E. The total land area is 380 sq. m., and the population is estimated at 5000.

At the north-western extremity, separated by a deep channel from the Solomon Islands, the following islands are clustered : the Duff and Matema or Swallow groups, Analogo, Tinakula or Volcano Island and others; from these a single chain curves S.E. and then E., consisting of Nitendi or Santa Cruz, the largest island, Tupua or Edgecombe, vanikoro (Recherche), Tucopia, Anuda (Cherry) and Fataka (Mitie). In Vanikoro there are volcanic mountains up to 3030 ft. in height, and Tinakula is a constantly active volcano of 2200 ft. Nitendi is of less elevation (1215 ft. at the highest). Coral reefs are not extensive, excepting those surrounding Vanikoro. The islands are densely wooded, and have a flora akin to that of New Guinea. The land fauna is very scanty; that of the sea ex- tremely rich and valuable to the natives, who are skilled fishermen and navigators. The climate is hot and humid, and storms are frequent. The natives are of Papuan stock, with an intermixture of other blood ; but an exception is found in the Duff group, Tucopia and Anuda, which are inhabited by pure Polynesians. The natives live in villages (sometimes fortified). In the past they have proved treacherous, and cannibalism is not extinct. The work of mission- aries, however, has borne good fruit. The islands are included in the British protectorate of the Southern Solomons. Some trade in copra is carried on.

The islands were discovered by the Spaniard Alvaro Mendana in 1595, in which year he attempted to found a colony on Nitendi, but died there on the 18th of October. In 1767 Philip Carteret visited the archipelago, and called it the Queen Charlotte Islands, a name still sometimes used. During the next century, owing to the practice of kidnapping them as labourers, the natives became so much embittered against foreigners that in 1871 they murdered Bishop John Coleridge Patteson on Nukapu, one of the Swallow group. In 1875 James Graham Goodenough, commodore of the Australian station, was shot

with a poisoned arrow on Nitendi during a cruise, and died of his wound. Patteson's murder, however, had roused public feeling in England; steps were taken to regulate the labour traffic, and subsequently Bishop John Selwyn was able to establish friendly relations with the natives. He erected the cross which com- memorates his predecessor on Nukapu. The British protectorate was declared in 1898.

SANTA CRUZ, chief town and capital of the province of La Laguna, Luzon, Philippine Islands, on the S.E. shore of Laguna de Bay, about 35 m. S.E. of Manila. Pop. of the municipality (1903) 12,747. Santa Cruz has numerous fine buildings and a large trade with Manila by way of the lake and Pasig river. Agriculture and manufacturing are important pursuits, the town being noted for its manufacture of palm wine. The language is Tagalog.

SANTA CRUZ DE TENERIFE, or De Santiago, a seaport and the capital of Teneriffe and of the Canary Islands; in 2 8° 28′ N. and 1 6° r 5′ W., on the east coast. Pop. (1900) 38,419. Santa Cruz is the residence of the governor-general of the Canaries, the civil lieutenant-governor of the Teneriffe district, and the military governor of the island. It occupies a small plain bounded by rugged volcanic rocks, and seamed by watercourses which are dry almost throughout the year. Scarcely any vegetation, except cactuses and euphorbias, is to be seen in the neighbour- hood. Almost the entire town was rebuilt in the 19th century, when its population more than trebled. The houses are generally low, with flat roofs; those of the better class are large, with a courtyard in the middle, planted with shrubs in the Spanish fashion. There are many good public buildings, including a school of navigation, technical institute, library, natural history museum and hospital. An aqueduct 5 m. long brings pure water from the mountains of the interior. Dromedaries from the adjacent islands of Lanzarote and Fuerteventura are used to convey merchandise and in agricultural operations. The town is defended by modern forts, but its ancient batteries have also been preserved. It was bombarded by the British fleet under Blake in 1657, and by Nelson, who lost his arm during the attack, in 1797. Some British flags lost on that occasion hang in one of the churches. The anchorage is good, and a mole facilitates landing. Santa Cruz is an important coaling station and com- mercial centre. (See Canary Islands.)

SANTA Ft, the capital of New Mexico, U.S.A., and the county- seat of Santa Fe county, about 20 m. E. of the Rio Grande, and S^g m. N. of El Paso, Texas, Pop. (1900) 5603, (256 foreign-

born and 466 Indians); (1010) 5072. Santa F6 is served by the Atchison, Topeka & Santa Ft, the Denver & Rio Grande, and the New Mexico Central railways. The city lies about 7000 ft. above the sea, at the foot of the southern extremity of the Rocky Mountains, in the Sangre de Cristo range. Its climate is dry, equable and healthy; the mean annual temperature is 49 F., and the mean annual rainfall i4‘2 in. The hills surrounding the city on all sides shelter it from the sandstorms which afflict some parts of New Mexico, and its pleasant climate, attractive moun- tain scenery and historical interest make it a favourite resort.

Santa Fe is built round a plaza or square. Crooked streets, bordered with low adobe houses, are characteristic of the older part of the city and give an impression of antiquity. Around the plaza and elsewhere in the city, however, the Mexican style of architecture has given way to the American. The plaza itself had been con- verted from a barren, sandy square into a well-shaded park, through the efforts of the Woman’s Board of Trade, an unique institution, which also controls the public library, housed in a brick and stone building (1907) in the Mission style of architecture. Within the plaza are a monument to the soldiers who fell in New Mexico during the Civil War and the Indian wars, a stone marking the spot where the first American flag was raised by General Kearny in 1846, and a bronze drinking fountain erected as a memorial to John Baptist Lamy (1814-1888), the first Roman Catholic bishop (1853) and archbishop (1875) of Santa Fe. Facing the plaza is the old Governor’s Palace, a low, spreading, adobe structure, erected early in the 17th century, but partially destroyed in the Pueblo revolt of 1680 and later restored. It was occupied continuously by the Spanish, Mexican and American governors of New Mexico until 1909, and nouses the historical museum of the Historical Society of New Mexico (founded in 1859, incorporated in 1880), the School of American Archaeology and the New Mexico Museum of Archaeology. In this building General Lew Wallace (governor 1878-1881) wrote the concluding chapters to Ben Hur. San Miguel chapel was built probably in the middle of the 17th century, was destroyed in 1680, and was rebuilt in 1 7 10, but has been greatly altered in recent times. The church of Nuestra Senora de Guadalupe (modernized with a shingle roof and a wooden steeple) contains interesting paintings and antique wood-carvings. The cathedral of San Francisco, though not completed, has been used as a place of worship since about 1880. In its walls is incorporated part of a church erected,

it is thought, in 1627. Also of interest are the Rosario chapel; the ruined earthworks of Fort Marcy, north of the city, constructed by General Kearny in 1846; the ruins of the Garita, an old Spanish fortification used as a custom house under the Mexican government ; the so-called ” oldest house,” a dilapidated adobe structure claimed to be the oldest building, continuously inhabited, in the United States; the state library; and the national cemetery, in which 1022 American soldiers are buried.

Among the public buildings and institutions are the state capitol, the executive mansion (1909), the Federal building (in front of which is a monument to Kit Carson), the county court house, a National Guard armoury, a Federal industrial boarding school for Indians (with 300 pupils in 1908) and Saint Catherine’s Industrial School for Indians (Roman Catholic). About 7 m. east of the city is the Pecos Forest Reserve, across which the Territory undertook the building, with convict labour, of a ” scenic highway ” from Santa Fe to Las Vegas. In Pajarito Park, 20 m. west of Santa Fe, are many prehistoric cave, cliff and communal dwellings, and near the city are several prehistoric mounds.

The chief manufactures of Santa Fe are brick, pottery (made by Pueblo Indians), and filigree jewelry (made by Mexican artisans). The surrounding country is devoted to agriculture and mining, chiefly for coal.

Santa Fe is considered the oldest city save one (St Augustine, Florida) in the United States. A settlement, known as San Gabriel, was planted at the junction of the Rio Chama and the Rio Grande by Juan de Ofiate in 1598, and about 1605,’ some 30 m. S.E., Santa Fe, officially the Villa Real de Santa Fe de San Francisco, was founded on the site of a deserted Indian pueblo and became the seat of the government of New Mexico. In 1630 it contained a population of 250 Spaniards, 700 Indians and about 50 half-breeds. In August 1680 the Pueblo Indians, embittered by the exactions of the civil and ecclesiastical authorities, revolted (see New Mexico : History) . Four hundred Spaniards were massacred, and the remainder took refuge in Santa Fe, where they were closely besieged. On the 21st of August, while the Indians were demoralized by a sortie from the garrison, the town was evacuated, and the inhabitants made a

1 The exact date of the founding of Santa Fe is not known, but the best ooinion has fixed the date between 1604 and 1608, and favours the year 1605.

six weeks' journey down the Rio Grande to the mission of Guadalupe, near the modern El Paso, Texas. The Indians then took possession, destroyed the crops, churches and archives, and revived their pagan ceremonies. Several unsuccessful attempts were made to regain the town, but finally, in September 1692, Diego de Vargas quietly secured the fresh submission of the Indians. In December 1693 a new Spanish colony of about 800 persons arrived. There were two other Indian revolts, in 1694 and in 1696. During the 18th century a considerable trade in sheep, wool, wine and pelts developed, chiefly with Chihuahua and with the Indians of the plains. After the independence of Mexico Santa Fe became the centre of a growing commerce with the United States, conducted at first by pack animals, and later by wagon trains over the old Santa Fe Trail leading south-west from Independence, Kansas City, and, in earlier years, other places in Missouri, to Santa Fe. On the 18th of August 1846, soon after the outbreak of the war between the United States and Mexico, Santa Fe was occupied by an American force under General S. W. Kearny. The Mexicans revolted a few months later, and the newly appointed governor, Charles Bent, and a number of American sympathizers were assassinated; but the rising was quickly suppressed. In 1847 the nrst English news- paper in New Mexico was established at Santa Fe, and an English school was founded in 1848. Santa Fe remained the capital when a Territorial government was inaugurated in 1851. The arrival of the first railway train, on the 9th of February 1880, marked a new epoch in the history of Santa Fe, which until then had remained essentially a Mexican town; but with the discontinuance of the wagon caravans over the old trail, it lost its importance as the entrepot for the commerce of the South-west.

See the sketch by F. W. Hodge in Historic Towns of the Western States (New York, 1901), edited by Lyman P. Powell; H. H. Ban- croft, History of Arizona and New Mexico (San Francisco, 1884) ; and Henry Inman, The Old Santa Fe Trail (New York, 1897).

SANTA F& a central province of Argentina, bounded N. by the Chaco territory, E. by Entre Rios and Corrientes, S. by Buenos Aires, and W. by Cordoba and Santiago del Estero. Area, 50,916 sq. m. Pop. (1895) 397,188, (1904 estimated) 640,755. Santa Fe belongs to the great pampa region of Argen- tina, and has no wooded districts in the south except on the river courses. In the N. which is borderland to the Gran Chaco region, there are extensive forests, intermingled with grassy campos. The surface is a level alluvial plain, with a saline substratum at no great depth. Salt is found on the surface over large areas, and throughout the province the water is brackish 1 5 to 20 ft. below the surface. The soil, however, produces wheat, corn, alfalfa, linseed and

other crops in abundance. Stock- raising (cattle, horses, sheep and swine) is also an important industry, with the related industries of butter and cheese-making, meat-curing and lard-refining. Many colonies have been made, especially near the provincial capital. It is one of the most productive provinces in the republic, in spite of notorious mis- government. The Parana forms its eastern boundary for about 435 m., and provides unfailing transport facilities. The great river is broken into many channels, forming islands and sand bars which are constantly changing their outlines. It receives two large tributaries flowing across the province — the Salado, the upper course of which is called the Pasage and Juramento (the last given to commemorate the circumstance that the oath to wrest their independence from Spain was sworn on its banks in 18 16), and which enters the Santa Fe channel of the Parana near the capital; and the Carcarana, or Carcaranai, whose sources are in the Cordoba sierras. The northern districts are well watered by numerous tributaries of the Salado. The railway communications of the province are good, comprising the trunk lines of the Buenos Aires and Rosario railway with its extension to Tucuman, which crosses the province from S.E. to N.W.; the Central Argentine from Rosario to Cordoba, and to Buenos Aires; the Cordoba Central; Santa Fe to Tucu- man; and the Provincia de Santa Fe; a network of small lines connects all the important towns; and the Buenos Aires and Pacific which crosses near its southern boundary. The river

ports having railway connexions are Reconquista, Santa Fe, Colastine, Coronda, Puerto Gomez, San Lorenzo, Rosario and Villa Constitution. The capital is Santa Fe, and other important towns are Rosario, Esperanza (pop. 1904 estimated 10,000), San Lorenzo (7000), Rafaela, Ocampo, Galvez, Canada de Gomez and Villa Casilda.

SANTA FE\ a city of Argentina and capital of the province of that name, on the Santa Fe channel of the Parana near the mouth of the Salado, about 299 m. N.W. of Buenos Aires. Pop. (1895) 24,755, (!9°4 estimated) 33,200. It is built on a sandy plain little above the river level. It is regularly laid out and contains a cathedral, bishop's palace, Jesuits' college and church dating from 1654, the cabildo or town hall facing on the principal square and provincial government buildings. The town is less modern in appearance than Rosario, and has a number of old residences and educational and charitable institutions. It is a port of call for small river steamers and is in ferry

communication with Parana on the opposite bank of the Parana. Its shipping port for larger steamers is at Colastine, on a deeper channel, with which it is connected by rail. Santa Fe also has railway communication with Rosario, Cordoba, Tucuman and the frontier of the Chaco.

Santa Fe was founded by Juan de Garay in 1573, and was designed to secure Spanish communications between Asuncion and the mouth of the La Plata. It has been the centre of much political intrigue, but its growth has been very slow. In 1852 a constituent congress met there, and in i860 a national con- vention for the revision of the constitution.

SANTAL (or Sonthal) PARGANAS, THE, a district of British India, in the Bhagalpur division of Bengal. Area 5470 sq. m.

In the east a sharply defined belt of hills stretches for about 100 m. from the Ganges to the river Naubil; west of this a rolling tract of long ridges with intervening depressions covers about 2500 sq. m. ; while there is a narrow strip of alluvial country about 170 m. long, lying for the most part along the loop line of the East Indian railway. The Rajmahal hills occupy an area of 1366 sq. m.; they nowhere exceed 2000 ft. There are several other hill ranges which with few exceptions are covered almost to their summits with dense jungle ; they are all difficult of access. There are, however, numerous passes through all the ranges. Coal and iron are found in almost all parts, but of inferior quality. The alluvial tract has the damp heat and moist soil characteristic of Bengal, while the undulating and hilly portions are swept by the hot westerly winds of Behar, and are very cool in the winter months. The annual rainfall averages 52 in. In 1901 the population was 1,809,737, showing an increase of 3 % in the decade.

The Santals, who give their name to the district, are the most numerous aboriginal tribe in Bengal; they work the coal-mines of Raniganj and Karharbari and migrate to the tea-gardens of Assam. In 1832 officials were deputed to demarcate with solid masonry pillars the present area of the Daman-i-Koh, or ” skirts of the hills.” The permission to Santals to settle in the valleys and on the lower slopes stimulated Santal immigration to an enormous extent. The Hindu money-lender soon made his appearance among them, and caused the rebellion of 1855-56. The insurrection led to the establishment of a form of administra- tion congenial to the immigrants; and a land settlement has since been carried out on conditions favourable to the occupants of the soil. The Church Missionary Society and the Scandinavian Home Mission have been very successful, especially in promoting education. The district is traversed by both the chord and

loop lines of the East Indian railway. It contains the old Mahommedan city of Rajmahal and the modern commercial mart of Sahibganj, both on the Ganges; and also the Hindu place of pilgrimage of Deogarh, which is important enough to have a branch railway. The administrative headquarters are at Dumka, or Naya Dumka: pop. (1901) 5326.

See F. B. Bradley-Birt, The Story of the Indian Upland (1905).

SANTALS, an aboriginal tribe of Bengal, who have given their name to the Santal Parganas (q.v.). Their early history is un- known; but it is certain that they have not occupied their present home for longer than a century, having migrated from Hazaribagh, and they are still moving on into Northern Bengal. Their total number in all India is nearly two millions. They speak a language of the Munda or Kolarian family.

The Santals as a race care little for permanent homes. They are not true nomads, but they like to be " on the move," In the low- lands they are agriculturists; in the jungles and on the mountains they are skilful hunters, bows and arrows being their chief weapons; on the highlands they are cattle breeders. But if fond of change the Santals like comfort, and their villages are neat, clean and well built, usually in an isolated position. Their social arrangements are patriarchal. In every village is a headman supposed to be a de- scendant of the founder of the village. A deputy looks after details ; a special officer has charge of the children's morals, and there is a watchman. Physically the Santals are not prepossessing. The face is round and blubbery; the cheekbones moderately prominent; eyes full and straight, nose broad and depressed, mouth large and lips full, hair straight, black and coarse. The general appearance approximates to the negroid type. They are somewhat below the average height of the Hindus. They are divided into twelve tribes. In character they are a bright, joy-loving people, hospitable and seizing every chance of a feast. " They have neither the sullen disposition nor the unconquerable laziness of the very old hill- tribes of central India," writes Sir W. W. Hunter in Annals of Rural Bengal (1868). " They have carried with them from the plains a love of order, a genial humanity, with a certain degree of civilization and agricultural habits. Their very vices are the vices of an op- pressed and driven-out people who have lapsed from a higher state, rather than those of savages who have never known better things." Each village has its priest who has lands assigned to him; out of the profits he must twice a year feast the people. At the Sohrai feast — the " harvest-home " — in December, the headman entertains the villagers, and the cattle are anointed and daubed with vermilion and a share of the rice-beer is given to each

animal. The Santals have many gods whose attributes are ill-defined, but whose festivals are strictly observed. Marang Buru, the great spirit, is the deity to whom sacrifices are made at the Sohrai. Among some Santals, e.g. in Chota Nagpur, Sing Bonga, the sun, is the supreme deity to whom sacrifices are made. Generally there is no definite idea of a beneficent god, but countless demons and evil spirits are propitiated, and ancestors are worshipped at the Sohrai festival. There is a vague idea of a future life where the spirits of the dead are employed in the ceaseless toil of grinding the bones of past generations into a dust from which the gods may recreate children. In some villages the Santals join with the Hindus in celebrating the Durga Puja festival. In the eastern districts the tiger is worshipped. For a Santal to be sworn on a tiger-skin is the most solemn of oaths. The Santals are omnivorous, but they will not touch rice cooked by a Hindu. Santal parents undergo purification five days after childbirth. Santals have adopted as a rite the tonsure of children. Child marriage is not practised, and the young people make love matches, but the septs are exogamous as a rule. Santals seldom have more than one wife and she is always treated kindly. An open space in front of the headman's house is set apart for dancing, which is very elaborate and excellent. The flute, upon which they play well, is the chief Santal instrument. The Santals burn their dead, and the few charred bones remaining are taken by the next of kin in a basket to the Damodar, the sacred river of the Santals in Hazaribagh district, and left where the current is strongest to be carried to the ocean, the traditional origin and resting place of the Santal race.

See E. Tuite Dalton, Descriptive Ethnology of Bengal (Calcutta, 1872); F. B. Bradley-Birt, The Story of an Indian Upland (1905).

SANTA MARIA (Da Bocca do Monte), an inland town of Brazil, in Rio Grande do Sul, 162 m. by rail W. of Margem do Taquary, the railway terminus for Porto Alegre (1908), about 80 m. by water N.W. of that city. Pop. (1900) 13,628. Santa Maria, which lies 382 ft. above the sea, is the commercial centre of a rich district on the slopes of short mountain ranges, one of which, the Serra do Pinhal, forms the water parting between the eastern and western river systems of the state. 1 There are prosperous colonies in its vicinity, including one founded by the Jewish Colonisation Association under the provisions of the Hirsch Fund. The industries of this region include the cultiva- tion of wheat, Indian corn, rice, mandioca, beans, grapes (for wine), nuts, olives and tobacco, and stock-raising. The town derives its chief importance, however, from its becoming the junction of the Porto Alegre to Uruguayana, and the Santa Maria to Passo Fundo railways. In 1905 the national and state governments leased to the " Compagnie

Auxiliaire de Chemin de Fer au Bresil" the Rio Grande to Bage, the Porto Alegre to Uruguayana, the Santa Maria to Passo Fundo, and the Porto Alegre to Nova Hamburgo railways, with their branches and connexions, and it was decided to establish the general administration offices for the whole system at Santa Maria. The shops and offices of the Porto Alegre to Uruguayana line had been removed to that place in 1902.

SANTA MARIA DILICODIA, a village of Sicily, in the province of Catania, 18 m. N.W. of Catania by rail, on the S.W. slopes of Mount Etna. Pop. (1901) 4101. It is believed to occupy the site of the ancient Aetna, a settlement founded by the colonists whom Hiero I. had placed at Catania after their expulsion by the original inhabitants in 461 B.C., which absorbed or incorporated an already existing Sicel town named Inessa. Its subsequent history is uneventful, though it suffered from the exactions of Verres; and its inscriptions are unimportant. A large hoard of coins was found here in 1891. Near it, in a district called Civita, is a large elliptical area of about 1300 by 380 yds., en- closed by a wall of masses of lava, which is about 28 ft. wide at the base, and n ft. high. The ground is covered with fragments of tiles and pottery of the classical period, and it is probably a hastily built encampment of historic times rather than a primitive fortification, as there are no prehistoric traces (Orsi in Notizie degli scavi, 1903, 442).

See Casagrandi, 5m due antiche tilth sicule Vessa ed Inessa (Acireale, 1892).

SANTA MARTA, a city and port of Colombia and the capital of a department of the same name, on a small bay 40 m. E.N.E. of the mouth of the Magdalena river. Pop. (1908) about 6500. It is built partly on the beach and partly on the slopes of the Sierra Nevada de Santa Marta towards the S.E. Though small, the harbour is one of the best and safest on the coast, as no river flows into it to fill its anchorage with silt. The depth ranges from 18 to 19 fathoms at the entrance to &,\ fathoms along the inner shore line. The city is an episcopal see and has a cathedral. A railway (23 m.) runs southward a little beyond Cienaga (on a large lagoon of the same name), connects with steamers running to Barranquilla (50 m. farther) by way of the lagoon and inland channels, and is to be extended to San Carlos, farther S., as the fruit-growing industry of this region is developed.

Santa Marta was founded by Rodrigo de Bastidas in 1525, and became an important port and centre of trade during the Spanish colonial era. It was also a base of operations in the exploration and conquest of the interior.

SANTA MAURA, or Leucadia (AevKaSa, ancient Aevnas), one of the Ionian Islands, with an area of no sq. m. and a population of about 30,000. It lies off the coast of Acarnania (Greece), immediately south of the entrance to the Gulf of Arta. The shallow strait separating it from the mainland is liable to be blocked by sand-banks; a canal was cut through these in the 7th century B.C. by the Corinthians, and was again after a long period of disuse opened up by the Romans.

During the British occupation a canal for boats of 4 to 5 ft. draught was formed from Fort Santa Maura to the town, but the 16 ft. deep ship canal which it was proposed (1844) to carry right across the lagoon or submerged isthmus to Fort Alexander was only partially excavated. In 1903, however, a canal was completed rendering navigable the channel between the island and the main- land. Its breadth is 50 ft. and its depth 17. ft. Santa Maura, measuring about 20 m. from north to south and 5 to 8 m. in breadth, is a rugged mass of limestone and bituminous shales (partly Tertiary), rising in its principal ridges to heights of 2000 and 3000 ft. and presenting very limited areas of level ground. The grain crop suffices only for a few months' local consumption; but considerable quantities of olive oil of good quality are produced. The vineyards (in the west especially) yield much red wine (bought mainly by Rouen, Cette, Trieste and Venice); the currant, introduced about 1859, has gradually come to be the principal source of wealth (the crop averaging 2,500,000 lb); and small quantities of cotton, flax, tobacco, valonia, &c, are also grown. The salt trade, formerly of importance, has suffered from' Greek customs regulations. The chief town (5000 inhabitants), properly called Amaxikhi or Hamaxichi but more usually Santa Maura, after the neighbouring fort, is situated at the N.E. end of the island opposite the lagoon. In the S.W. is the village of Vasiliki, whence the currant crop is exported.

Remains of Cyclopean and polygonal walls exist at Kaligoni (south of Amaxikhi), probably the site of the ancient acropolis of Neritus (or Nericus), and of the later and lower Corinthian settlement of Leucas. From this point a Roman bridge seems to have crossed to the mainland. Between the town and Fort Santa Maura extends a remarkably fine Turkish aqueduct partly destroyed along with the town by the earthquake of 1825.

Forts Alexander and Constantine commanding the bridge are relics of the Russian occupation; the other forts are of Turko- Venetian origin. The magnificent cliff, some 2000 ft. high, which forms the southern termination of the modern island still bears the substructions of the temple of Apollo Leucatas (hence the modern name Capo Ducato). At the annual festival of Apollo a criminal was obliged to plunge from the summit into the sea, where, however, an effort was made to pick him up; and it was by the same heroic leap that Sappho and Artemisia, daughter of Lygdamis, are said to have ended their lives.

A theory has been proposed by Professor Dorpfeld that Leucas is the island described in the Odyssey under the name of Ithaca ; in support of this theory he quotes the fact that the Homeric description of the island and its position, and also the identifica- tion of such sites as the palace of Odysseus, the harbour of Phorcys, the grotto of the Nymphs and the island Asteris, where the suitors lay in wait for Telemachus, suit Leucas far better than the island called Ithaca in classical and modern times.

See under Corfu; also P. Goessler, Leukas-Ithaka (Stuttgart,

1904).

SANTANDER.‘a maritime province of northern Spain, bounded N. by the Bay of Biscay, E. by the province of Biscay, S. by Burgos and Palencia, and W. by Leon and Oviedo. Pop. (1900) 276,003; area 2108 sq. m. The province is traversed from east to west by the Cantabrian Mountains (q.v.) , which in the Pefias de Europa reach a height of over 8600 ft., and send off numerous branches to the sea. On the north side of the range the streams are all short, the principal being the Ason, the Miera, the Pas, the Besaya, the Saja and the Nansa, which flow into the Bay of Biscay; part of the province lies south of the watershed, and is drained by the upper Ebro (q.v.). The province is traversed from north to south by the railway and high road from Santander by Palencia to Madrid; the highest point on the railway (Venta de Pazozal) is 3229 ft. above the sea. Other railways connect Santander with Bilbao on the east and with Cabezona de la Sal on the west; there are also many good state, provincial and municipal roads, besides several narrow-gauge mining railways.

Santander was part of the Roman province of Cantabria, which, after passing under the empire of the Goths, became the principality of Asturias (q.v.). The portion called Asturia de Santa Juliana, or Santillana, was included in the kingdom of Old Castile, and, on the subdivision of the old provinces of Spain in 1833, became the

province of Santander.

SANTANDER (ancient Portus Blendium or Fanum S. Andreae), the capital of the Spanish province of Santander, the seat of a bishop and one of the chief seaports of Spain; 316 m. by rail N. of Madrid, in 43°ˆ7′ N. and 3 47′ W., on the Bay of Santander, an inlet of the Bay of Biscay. Pop. (1900) 54,564. It is situated on the inside of a rocky peninsula, Cabo Mayor, which shelters a magnificent harbour from 2 to 3 m. wide and 4 m. long. The entrance is at the eastern extremity of the promontory, and is deep, broad, and illuminated by lighthouses on Cabo Mayor and the rocky islet of Mouro. Santander is the terminus of railways from Valladolid and Bilbao, of a branch line from Cabezona de la Sal, and of several mining railways. It is divided into an upper and a lower town. The cathedral, originally Gothic of the 13th century, has been so altered that little of the old work remains. In the crypt, or Capilla del Cristo de Abajo, is an interesting font of Moorish workmanship. The castle of San Felice contains a prison, which was one of the first examples of the radiating system of construction. The city is essentially modern; its principal buildings are the markets, barracks, theatre, bull-ring, clubs, civil and military governors' residences, custom house, hospitals, nautical school, ecclesiastical seminary, and training school for teachers. Many of the houses on the bay front and public buildings were restored after the catastrophe of the 3rd of November 1893, when the steamer " Cabo Machi- chaco," laden with 1 700 cases of dynamite, blew up near the quay. The harbour was greatly improved during the second half of the 19th century. In the same period the population nearly trebled, and there was a corresponding development of commerce and manufactures.

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SANTAREM— SANTA ROSA

The port was in 1753 made one of the puertos habilitados, or ports privileged to trade with America, and in 1755 it received the title of city. Charles V. landed here in 1522 when he came to take possession of the Spanish crown, and from this port Charles I. of England embarked on his return from his visit in search of a wife (1623). The city was sacked by the French under Soult in 1808.

SANTAREM, the capital of the district of Santarem, Portugal; on the right bank of the river Tagus, 51 m. by rail N.E. of Lisbon. Pop. (1900) 8628. The older part of the city is built on high ground overlooking the Tagus; it contains the ruined castle of Alcacova, famous in the middle ages as a royal residence, and is partly enclosed by ruined

walls. Below is Ribeira de Santarem, a comparatively modern river-port, and on the opposite bank is Almeirim, a village which was also a royal residence until 1755, when it was almost entirely destroyed by earthquake. Santarem has some trade in fish and agricultural produce, including wine and olive oil. Its chief buildings are an ecclesiastical seminary, the largest in Portugal; the late Gothic church of the Convento da Graca, which contains the tomb of Pedro Alvares Cabral, the first Portuguese to visit South America (1502); the Igreja do Milagro, an early Renaissance church; the chapel of Santa Rita, with a painting by Ignatius Xavier, who was born here in 1724; the church of Santa Maria, built in 1244, but with Manoellian additions made early in the 16th century; the secularized 13th- century church of San Francisco; the church of Sao Joao, which has a Moorish minaret for a belfry, and has been converted into an archaeological museum; and the church of Santa Irfa (St Irene), from which the name of the city is derived. There is a fine bridge across the Tagus.

Santarem is the Roman Scallabis, renamed Praesidium Julium by Julius Caesar. From its position in the Tagus valley it became an important fortress during the wars between the Moors, Portu- guese and Spaniards. Alphonso VI. of Castile first took it from the Moors in 1093, but it was recaptured and occupied by them until 1 147, when Alphonso I. of Portugal recovered it. The Almohades endeavoured to win it back in 1184, but were defeated. At Santarem King Diniz died in 1325; the murderers of Inez de Castro (q.v.) were executed in 1357; and Prince Alphonso, only son of John II., was drowned in 1491. Here the 15th- century navigator John of Santarem was born, and here the Cardinal-King Henry (1512-1580) was born, abdicated and died. The Miguelites were defeated here in 1834 (see Portugal: History). In 1868 Santarem was raised to the rank of a city.

The administrative district of Santarem coincides with the eastern part of the ancient province of Estremadura (q.v.); pop. (1900) 283,154; area 2555 sq. m.

SANTAREM, a city of Brazil in the state of Para, on the right bank of the Tapajos, near its entrance into the Amazon. Pop. (1890) of the town and municipio, 12,062. It is one of the most important towns of the Amazon between Para and Manaos, and is a port of call for all river steamers, and a station on the Amazon cable line. The national government has made it a station in its system of wireless telegraphy in the Amazon valley. Seen from the river the town is attractive in appearance, and consists of a European (white) and an Indian quarter, the latter of palm- thatched huts. Ruins remain of a fort built in colonial times to protect the population against hostile Indians. Its

principal public buildings are a municipal hall and tribunal, a large municipal warehouse, a market (1897), theatre and two churches. The productions of the neighbourhood are cacao, Brazil nuts, rubber, tobacco, sugar-cane and cattle; and the rivers furnish an abundance of fish, which are cured here at the season of low-water, when turtle eggs are gathered up stream for the manufacture of oil and butter. The Tapajos is navigable for steamers to the rapids, 170 m. above Santarem, and for small boats nearly to Diamantino, Matto Grosso, and a considerable trade comes from Matto Grosso and the settlements along its banks. After the American Civil War a colony of Americans settled in the vicinity, but were unsuccessful in founding a permanent colony. Santarem was founded by a Jesuit mission- ary in 1661 as an Indian aldeia, and became a city in 1848.

SANTAROSA, ANNIBALE SANTORRE DI ROSSI DE POMAROLO, Count of (1783-1825), Piedmontese insurgent,

and leader in the revival (Resorgimento) of Italy, was born at Savigliano near Coni on the 18th of November 1783. He was the son of a general officer in the Sardinian army who was killed at the battle of Mondovi in 1796. The family had been recently ennobled and was not rich. Santarosa entered the service of Napoleon during the annexation of Piedmont to France, and was sub-prefect of Spezia from 181 2 to 1814. He remained, however, loyal in sentiment to the house of Savoy, and, after the restoration of the king of Sardinia in 1814, he continued in the public service. During the brief campaign of the Sardinian army on the south-eastern frontier of France in 18 15 he served as captain of grenadiers, and was afterwards employed in the ministry of war. The revolutionary and imperial epoch had seen a great development of Italian patriotism, and Santarosa was aggrieved by the great extension given to the Austrian power in Italy in 181 5, which reduced his own country to a position of inferiority. The revolutionary outbreak of 1820, which extended from Spain to Naples, seemed to afford the patriots an opportunity to secure the independence of Italy. When in 18 21 the Austrian army was moved south to coerce the Neapolitans, Santarosa entered into a conspiracy to obtain the intervention of the Piedmontese in favour of the Neapolitans by an attack on the Austrian lines of communication. The con- spirators endeavoured to obtain the co-operation of the prince of Carignano, afterwards King Charles Albert, who was known to share their patriotic aspirations. On the 6th of March 1821 Santarosa and three associates had an interview with the prince, and on the 10th they carried out the military ” pronuncia- miento ” which proclaimed the Spanish constitution. The movement had no real popular support, and very soon collapsed. During the brief predominance of his party

Santarosa showed great decision of character. He was arrested and would have died on the scaffold if sympathisers had not rescued him. He fled to France, and lived for a time in Paris under the name of Conti. Here he wrote in French and published in 1822 his La revolution piimontaise, which attracted the notice of Victor Cousin, by whom he was aided and concealed. The French government discovered his hiding-place, and he was imprisoned and expelled from Paris. After a short stay first at Alencon and then in Bourges, he passed over to England, where he found refuge in London with Ugo Foscolo, and made a few English friends. He went to Nottingham, in the hope of being able to support himself by teaching French and Italian. The miseries of exile rather than any hope of advantage led him to accompany his countryman Giacinto Collegno to Greece in November 1824. The Italians were ill-treated by the Greeks and were not well looked on by the Philhellene committees, who thought that their presence would offend the powers. Santarosa was killed, apparently because he was too miserable and desperate to care to save his life, when the Egyptian troops attacked the island of Sphacteria, near Navarino, on the 8th of May 1825.

See Atto Vannucci, J Martin della liberta italiana (Milan, 1877), and vol. ix. of the series called / Contemporanei italiani (Turin), in which there is a life by Angelo Degubernatis. Santarosa's corre- spondence was edited by Signor Bianchi, Lettere di Santorre Santarosa (Turin, 1877). A personal description of him by Victor Cousin will be found in the Revue des deux mondes for the 1st of March I840. Cousin dedicated to him the fourth volume of his translation of Plato, and the long dedication is a compressed biography.

SANTA ROSA, a city and the county-seat of Sonoma county, California, U.S.A., situated in a broad valley (altitude about 180 ft.) among the Coast Ranges, about 52 m. N. of San Francisco. Pop. (1900) 6673, (1029 foreign-born); (1910) 7817. It is served by the North-Western Pacific and the Southern Pacific rail- ways. Santa Rosa is in a region admirably adapted to the growing of hops — the city is an important hop market — and of fruit and grain, and the handling of these products is a leading industry. Poultry and dairying interests are also important. It was the home of Luther Burbank (b. 1849), the originator of many new flowers, fruits and vegetables, including the Burbank potato, the pineapple quince, and the stoneless prune. Santa Rosa was first settled about 1838, was laid out and incor- porated in 1853, replaced Sonoma as the county-seat in 1854,

and was chartered as a city in 1867. In the earthquake of the 1 8th of April 1906 it suffered severely.

SANTERRE, ANTOINE JOSEPH (1752-1 809), French revolu- tionist, was born in Paris on the 16th of March 1752. Like his father, he was a brewer, and gained great popularity in faubourg St Antoine by his beneficence. In 1789 he was given the com- mand of a battalion of the National Guard, and took part in the storming of the Bastille. After the affair of the Champ de Mars (July 17th, 1 791) a warrant was issued for his arrest, and he went into hiding. He emerged again in the following year, and took part in the events of the 20th of June and the 10th of August 1792, when he led the people of the faubourg St Antoine to the assault of the Tuileries. He, however, protected the royal family against the violence of the mob and, on the 7th of August, even attempted to bring about a reconciliation, but his efforts were frustrated by Marie Antoinette. He was made commander- in-chief of the National Guard, and appointed by the Convention warder to the king, in which position he did all in his power to alleviate Louis's captivity. He notified Louis of the sentence of death, and was present at the execution. Accounts differ as to his conduct at the execution, some stating that he ordered a roll of drums to drown the king's voice. The family tradition, how- ever, is that he silenced the drums to enable Louis to speak to the people, and that General J. F. Berruyer, who was in sole command, ordered the drums to beat and thus drowned the last words of the king's speech. Santerre was appointed marechal de camp on the 23rd of October 1792, and subsequently general of division. In May 1793 he was temporarily replaced as com- mander of the National Guard in Paris, so that he might take command of a force which he had organized to operate in La Vendee. As a military commander he was not a conspicuous success, his debut being signalized by the defeat of the republicans at Saumur. He was variously reported to have been wounded and killed in this affair, and the wits of the reactionary party circulated his epitaph:

Ci-gtt le general Santerre

Qui n'eut de Mars que la Here.

He was scarcely more popular among the sans-culottes of his army. Wounded soldiers, returned to Paris, reported that he was living la-bas, " in Oriental luxury," and complained that, since their defeat had been due either to his treason or his incom- petence, he should have

been either guillotined ” like other generals ” or superseded. He was, however, not in supreme command, and therefore not responsible for the ill conduct of the war; he distinguished himself in various actions; and when, in October, he returned to Paris his popularity in the faubourg St Antoine was undiminished. But his report on this expedition, in which he drew attention to the evil plight of the republican arms in the Vendee, aroused suspicion. He was accused of ” Orleanism ” and imprisoned, and was not released until after the fall of Robespierre. He then gave in his resigna- tion as general, and returned to commerce; but his brewery was ruined, and after many vicissitudes of fortune he died in poverty in Paris on the 6th of February 1809.

See A. Carro, Santerre general de la republique francaise (Paris, 1847), compiled from Santerre’s MS. notes; P. Robiquet, Le Per- sonnel municipal de Paris pendant la Revolution (Paris, 1890); C. L. Chassin, La Vendee et la Chouannerie (Paris, 1892 seq.); ” L’fitat des services de Santerre dresse par lui-mgme,” in the third volume of Souvenirs et memoires (1899), published by Paul Bonnefon.

SANTERRE, Jean Baptiste (1650-17 17), French painter, was born at Magny, near Pontoise, and was a pupil of Bon Boulogne. He began life as a portrait-painter, and enjoyed for half a century a great reputation as a painter of the nude. He died at Paris on the 21st of November 1717. His ” Portrait of a Lady in Venetian Costume ” (Louvre), and his ” Susanna at the Bath” (Louvre, engraved by Porporati), the diploma work executed by him in 1704, when he was received into the Academy, give a good impression of Santerre’s taste and of his elaborate and careful method.

SANTIAGO, or Santiago de Chile, a city of Chile, capital of the republic and chief town of a province of the same name, on the Mapocho river, a small tributary of the Maipu or Maipo,

115 m. W. of Valparaiso, in 33° 26′ 42″ S., 70° 40′ 36″ W. Pop. (1895) 256,413, (1900) 269,886, (1902, estimated) 322,059. It is built on a wide, beautiful plain about i860 ft. above sea- level, between the main range of the Andes and the less elevated heights of Cuesta del Prado. In the centre of the city rises the rocky hill of Santa Lucia, once forming its citadel, but now converted into a pleasure-ground, with winding walks, picturesque views, theatres, restaurants and monuments. Immediately N.N. W. and N.E. are other hills, known as Colina, Renca and San Cristobal, and overshadowing all are the snow-clad Andean peaks of La Chapa and Los Amarillos, visible from all parts of the city. The Mapocho, once the cause of destructive

inundations (especially in 1609 and 1783), was enclosed with solid embankments during the administration of Ambrosio O'Higgins, and is now crossed by several handsome bridges ; the oldest (1767-1779) of these has eleven arches. Santiago is laid out with great regularity, and its comparatively broad straight streets forˆn parallelograms and enclose several handsome public squares, the Plaza de la Independencia, the Campo de Marte and others. The principal streets have been repaved with asphalt instead of the old cobblestone and Belgian block pavements; water is brought in through an aqueduct (1865) 5 m. long; and there are tramway lines on all the principal streets.

The cathedral, facing on the Plaza de la Independencia, is the oldest of the churches. Originally erected by Pedro de Valdivia, it was rebuilt by Garcia Hurtado de Mendoza, was destroyed by the earthquake of 1647 and was rebuilt on a new plan subsequent to 1748. It is 351 ft. long and 92 ft. wide, has only one tower and is not striking in appearance. Its interior decorations, however, are rich and in good taste. Among the other ecclesiastical buildings are the church of San Augustin, erected in 1595 by Cristobal de Vera, and in modern times adorned with a pillared portico; the churches of San Francisco, La Merced and Santo Domingo, dating from the 1 8th century; the church of the Reformed Dominicans, rich in monolithic marble columns; the Carmen Alto, or church of the Carmelite nunnery, an elegant little Gothic structure ; the Augustine nunnery, founded by Bishop Medellin in 1576; the episcopal palace; and the chapel erected in 1852 to the memory of Pedro de Valdivia next to the house in which he is reputed to have lived. There are two fine cemeteries — one exclusively Roman Catholic and the other secularized. Mural interment is the custom in Santiago. '

Among the secular buildings the more noteworthy are the Capitol, with its rows of massive columns and surrounded with beautiful gardens; the Moneda, or executive residence, which contains the offices of the cabinet ministers also; the municipal palace; the courts, or palace of justice; the post office and telegraph depart- ment; the exposition palace in the Quinta Normal, which houses the national museum; the university of Chile, dating from 1842; the national library with over 100,000 volumes; the School of Arts and Trades (Lyceo de Artes y Oficios) ; the national conservatory of music; the medical school; the astronomical observatory; the national institute; the mint; and a municipal theatre. There are also a military school, a school of agriculture, mining school, normal schools and a number of charitable institutions. The old Universi- dad de San Felipe, founded in 1747, was closed in 1839, ana – was succeeded three years later by

the present national university. Facing the Capitol, which includes the two halls of Congress, is a small park and commemorative shaft, marking the spot where stood the Jesuits' church, burned down on the night of the 8th of December 1868, and with it " two thousand victims, more or less," chiefly women.

There is railway communication with Valparaiso, with Los Andes and the international tunnel and with the provincial capitals of the south.

Santiago was founded in 1541 by Pedro de Valdivia, who was engaged in the conquest of Chile, and it received the title of Santiago del Nuevo Estremo. It has suffered from earthquakes and from political disorder. After the defeat of the royalists at Chacabuco (Feb. 12th, 1817), it was occupied by the revolu- tionary forces under General Jose de San Martin. Though the scene of many revolutionary outbreaks, it has never been subjected to a regular siege.

The province of Santiago, bounded N. by Aconcagua, W. by Mendoza, S. by O'Higgins and Colchagua and W. by Valparaiso and the Pacific, has an area of 5665 sq. m. and a population (1895) of 415,636. It forms part of the "Vale of Chile," celebrated for its fertility and fine climate.

SANTIAGO DE COMPOSTELA, or Santiago (formerly written in English St Jago de Compostetta and sometimes Compostello),

a city of N.W. Spain, in the province of Corunna;"at the northern terminus of a railway from Tuy, near the confluence of the Sar and Sarela rivers, and 32 m. S. by W. of the city of Corunna. Pop. (1900) 24,120. Santiago is built on the eastern slope of Monte Pedroso, surrounded by the mountains which draw down the incessant rain that gives the granite buildings of its deserted streets an extra tint of melancholy and decay. Its annual rainfall is 66 in., a total rarely exceeded on the mainland of Europe. The city was formerly the capital of Galicia; it gives its name to one of the four military orders of Spain, which rank as follows: Compostela, Calatrava, Alcantara and Montesa; and it is still the seat of a university and of an archbishopric, which long disputed the claim of Toledo to the primacy of all Spain. In the middle ages its shrine, which contained the body of St James the Great, was one of the most famous in Europe; so numerous were the pilgrims that the popular Spanish name' for the Milky Way is El

Camino de Santiago, or ” The Santiago Road.” The city became, in fact, the focus of all the art and chivalry of neighbouring Christendom, and a spot where con- flicting interests could meet on neutral ground. The Congrega- tion of Rites declared in 1884 that the cathedral still enshrines the veritable body of the apostle, and few places of pilgrimage in Europe are more frequented. The city contains many hospitals and other charitable institutions, which are open to the pilgrims. In 1900 its ecclesiastical buildings numbered forty-six. Its chief industries, apart from agriculture, are brewing, distillation of spirits and the manufacture of linen, paper, soap, chocolate and matches. The city has also been long celebrated for its silver- smiths’ work.

The belief that St James had preached in Spain was certainly current before a.d. 400. The relics of the saint were said, though the tradition cannot be traced back farther than to the 12th century, to have been discovered in 835 by Theodomir, bishop of Iria, who was guided to the spot by a star. Hence Compostela is regarded by some authorities as a corruption of Campus Stellae, ” Plain of the Star “; others derive it from San Jacome Apostol. According to the legend a chapel was forthwith erected, and the bishopric was transferred thither by a special bull of Pope Leo III. A more substantial building was begun in 868, but was totally destroyed in 997 by the Moors, who, however, respected the sacred relics. On the reconquest of the city by Bermudo III. the roads were improved, and pilgrims began to flock to the shrine, which fast grew in reputation.

In 1078 the erection of the present cathedral was begun during the episcopate of Diego Pelaez, and was continued until 1 188, when the western doorway was completed. Minor additions prolonged the work until 121 1, when the cathedral was consecrated. It is a cruciform Romanesque building, and keeps its original form in the interior, but is disfigured externally by much poor late work. Besides the classic dome and clock-tower, the two western towers have been raised to a height of 220 ft. and crowned with cupolas, and between them has been erected a classic portico, above which is a niche containing a statue of St James. The facade was the work of Fer- nando Casas y Noboa in 1738, and the statue was by Ventura Rodriguez in 1764. The design is mediocre, and’ gains its chief effect from forming part of an extended architectural composition on the Plaza Mayor, a grand square surrounded by public buildings. The ground rises to the cathedral, which is reached by a magnificent quadruple flight of steps, flanked by statues of David and Solomon. Access to the staircase is through some fine wrought-iron gates, and in the centre, on the level of the Plaza, is the entrance to a Roman- esque chapel, La Iglesia Baja,

constructed under the portico and contemporary with the cathedral. To the north and south, and in a line with the west front, are dependent buildings of the 18th century, grouping well with it. Those to the south contain a light and elegant arcade to the upper windows, and serve as a screen to the cloisters, built in 1533 by Fonseca, afterwards archbishop of Toledo. They are said to be the largest in Spain, and are a fair example of the latest Gothic. The delicate sculpture over the heads of the windows arid along the wall of the cloister is very noticeable. On the north of the cathedral is the Plazuela S. Juan, where the peasants collect t° d° the . ir marketing. Here is the convent of S. Martin, built in 1636, which, after serving as a barrack, is now used as an ecclesi- aS j C t' ;f minar y> restored to the church. It has a tolerable cloister and bell-tower. The north side of the cathedral is much overlaid by the ugly and extravagant ornamentation styled, after its chief Spanish exponent Churriguera (d. 1715), Churrigueresque work. I he same treatment has been applied to the east end, where is the Fuerta Santa; this gate is kept closed, except in jubilee years, when

it is openea by the archbishop. The corner of the south transept on the Plaza de los Plateros has been mutilated by the erection of the clock-tower, but the facade is intact. Perhaps the chief beauty of the cathedral, however, is the Portico de la Gloria, behind the western classic portal. It is a work of the 12th century, and probably the utmost development of which round-arched Gothic is capable. The shafts, tympana and archivolts of the three doorways which open on to the nave and aisles are a mass of strong and nervous sculpture The design is a general representation of the Last Judgment, and the subjects are all treated with a quaint grace which shows the work of a real artist. Faint traces of colour remain and give a tone to the whole work. It is probable that, until the erection of the present grand staircase, the portico could not be reached from the Plaza, but stood open to the air. There are no marks of doors in the iambs, and the entrance to the chapel beneath would have been blocked by any staircase which differed much in plan from the present one. The interior of the church is one of the purest and best examples of Romanesque work to be met with in Spain. The absence of a clerestory throws an impressive gloom over the barrel-vaulted roof, which makes the building seem larger than it is. A passage leads from the north transept to the Parroquia of San Juan, or LaCorticela, a small but interesting portion of the original foundation. Many fine examples of metal work are in the cathedral, as, for instance, the two bronze ambos in the choir by Juan B. Celma of 1563, the gilt chandeliers of 1763 and the enamelled shrines of Sts Cucufato and

Fructuoso. The great censer which hangs from the cathedral roof, and is swung by an iron chain, is about 6 ft. high. In the Capilla del Relicario are a gold crucifix, dated 874, containing a piece of the true cross, and a silver gilt custodia of 1544.

The Hospicio de los Reyes, on the north of the Plaza Mayor, for the reception of pilgrims, was begun in 1504 by Enrique de Egas under Ferdinand and Isabella. It consists of two Gothic and two classic courtyards with a chapel in the centre. The gateway is fine, and there is some vigorous carving in the courtyards, one of which contains a graceful fountain. The suppressed Colegio de Fonseca and the adjoining convent of S. Geronimo have good Renaissance doorways. The university, which was created in 1504 by a bull of Pope Julius II., has a library containing 60,000 volumes and several MSS., many valuable and one dating from 788. Those of the Semi- nario (1777) have no merit. The chapel of the convent of S. Fran- cisco, the cloisters of the half-ruined S. Augustin, the belfry of S. Domingo, the church of S. Feliz de Celorio, modernized 14th century, and the facades of several houses of the 12th and 13th centuries are also good examples of different architectural styles.

SANTIAGO DE CUBA, a city and seaport of Cuba, on the S. coast of the E. end of the island, capital of the province of Oriente, and next to Havana the most important city of the Republic. Pop. (1907) 45,47°, of whom 56-7% was coloured and 13-6% was foreign-born. It is connected by the Cuba railway with Havana, 540 m. to the W.N.W.; short railways extend into the interior through gaps in the mountains north- ward; and there are steamer connexions with other Cuban ports and with New York and Europe.

Santiago is situated about 6 m. inland on a magnificent land- locked bay (6 m. long and 3 m. wide), connected with the Caribbean Sea by a long, narrow, winding channel with rocky escarpment walls, in places less than 200 yds. apart. The largest vessels have ready entrance to the harbour — which has a periphery of 15 m. or more in length — but direct access to the wharves is impossible for those of more than moderate draft (about 14 ft.). Smith Key, an island used as a watering-place, divides it into an outer and an inner basin. To the E. of the sea portal stand the Morro, a picturesque fort (built 1633 seq.), on a jutting point 200 ft. above the water, and the Estrella; and to the W. the Socapa. West of the harbour are low hills, to the E. precipitous cliffs, and N. and N.E., below the superb background of the Sierra Maestra, is an amphitheatre of hills, over which the city straggles in tortuous streets. The houses are almost all of one storey, built in the quaint style of southern Spain, with red-tile roofs, and the better ones

with verandas and court gardens. There is a promenade along the harbour and a botanical garden. Facing the Plaza de Cespedes (once Plaza de la Reina and then Plaza de Armas) are hotels and clubs, the large municipal building — formerly the governor's palace (1855 seq.) — and the cathedral. In the cathedral, which is in better taste than the cathedral of Havana, Diego Velazquez (c. 1460-1524), conqueror of Cuba, was buried. It has suffered much from earthquakes and has been extensively repaired. Probably the oldest building in Cuba is the convent of San Francisco (a church since the secularization of the religious orders in 1841), which dates in part from the first half of the 16th century. The 18th-century Filarmonia theatre is" now dilapidated. The other public buildings are hardly noteworthy. Great improvements have been made in the city since the end of colonial rule, especially as regards the streets, the water-supply and other public works, and sanitation. On a hill overlooking the city is a beautiful school-house of native limestone, erected by the American military government as a model for the rest of the island. Santiago is the hottest city of Cuba (mean temperature in winter

about 82 F., in summer about 88°), owing mainly to the mountains that shut off the breezes from the E. There is superb mountain scenery on the roads to El Caney and San Luis (pop. 1907, 3441), in the thickly populated valley of the Cauto. In the barren mountain- ous country surrounding the city are valuable mines of iron, copper and manganese. On these the prosperity of the province largely depends. There are also foundries, soap-works, tan-yards and cigar factories. The city has an important trade with the interior, with other Cuban ports, and to a less extent with New York and European ports. Mineral ores, tobacco and cigars, coffee, cacao, sugar and rum and cabinet-woods are the main articles of export. Copper ore was once exported in as great quantities as 25,000 tons annually, but the best days of the mines were in the middle of the 19th century. The mines of Cobre, a few miles W. of Santiago, have an interesting history. They were first worked for the government by slaves, which were freed in 1799.

History. — Santiago is less important politically under the Republic than it was when Cuba was a Spanish dependency. The place was founded in 15 14 by Diego Velazquez, and the capital of the island was removed thither from Baracoa. Its splendid bay, and easy communication with the capital of Santo Domingo, then the seat of government of the Indies, determined its original importance. From Santiago in 1518-1519 departed the historic expeditions of Juan de Grijalva, Hernan Cortes and Pamfilo de Narvaez — the last of 18

vessels and 1100 men of arms, excluding sailors. So important already was the city that its ayuntamiento had the powers of a Spanish city of the second class. In 1522 it received the arms and title of ciudad, and its church was made the cathedral of the island (Baracoa losing the honour). But before 1550 the drain of military expeditions to the continent, the quarrels of civil, military and ecclesiastical powers, and of citizens, and the emigration of colonists to the Main (not in small part due to the abolition of the encomiendas of the Indians) , produced a fatal decadence. In 1589 Havana became the capital. Santiago was occupied and plundered by French corsairs in 1553, and again by a British military force from Jamaica in 1662. The capture of that island had caused an immigration of Spanish refugees to Santiago that greatly in- creased its importance; and the illicit trade to the same island — mainly in hides and cattle — that flourished from this time on- ward was a main prop of prosperity. From 1607 to 1826 the island was divided into two departments, with Santiago as the capital of the E. department — under a governor who until 1801 in political matters received orders direct from the crown. After 1826 Santiago was simply the capital of a province. In July 1741 a British squadron from Jamaica under Admiral Edward Vernon and General Thomas Wentworth landed at Guantanamo (which they named Cumberland Bay) and during four months operated unsuccessfully against Santiago. The climate made great ravages among the British, who lost perhaps 2000 out of 5000 men. The bishopric became an archbishopric in 1788, when a suffragan bishopric was established at Havana. J. B. Vaillant (governor in 1788-1796) and J. N. Quintana (governor in 1 796-1 799) did much to improve the city and encourage literature. After the cession of Santo Domingo to France, and after the French evacuation of that island, thousands of refugees settled in and about Santiago. They founded coffee and sugar plantations ‘and gave a great impulse to trade. The population in 1827 was about 27,000. There were destructive earthquakes in 1675, 1679, 1766 and 1852. Dr Francesco Antommarchi (1780-1838), the physician who attended Napoleon in his last illness, died in Santiago, and a monument in the cemetery commemorates his benefactions to the poor. In the 19th century some striking historical events are associated with Santiago. One was the ” Virginius ” affair. The ” Virginius ” was a blockade-runner in the Civil War; it became a prize of the Federal government, by which it was sold in 1870 to an American, J. F. Patterson, who immediately registered it in the New York Custom House. It later appeared that Patterson was merely acting for a number of Cuban insurgents. On the 31st of October, then commanded by Joseph Fry, a former officer of the Federal and Confederate navies, and having a crew of fifty- two (chiefly Americans

and Englishmen) and 103 passengers (mostly Cubans), she was captured off Morant Bay, Jamaica, by the Spanish vessel “Tornado,” and was taken to Santiago, where, after a summary xxiv. 7

court-martial, 53 of the crew and passengers, including Fry and some Americans and Englishmen, were executed on the 4th, 7th and 8th of November. Relations between Spain and the United States became strained, and war seemed imminent; but on the 8th of December the Spanish government agreed to surrender the ” Virginius ” on the 16th, to deliver the survivors of the crew and passengers to an American war-ship at Santiago, and to salute the American flag at Santiago on the 25th if it should not be proved before that date that the ” Virginius ” was not entitled to sail under American colours. The ” Virginius ” foundered off Cape Hatteras as she was being brought to the United States. The Attorney-General of the United States decided before the 25th that the ” Virginius ” was the property of General Quesada and other Cubans, and had had no right to carry the American flag. Under an agreement of the 27th of February 1875, the Spanish government paid to the United States an indemnity of $80,000 for the execution of the Americans, and an indemnity was also paid to the British government. 1 The most notable military and naval events (in Cuba) of the Spanish-American War (q.v.) of 1898 took place at and near Santiago. Monuments commemorate the actions at El Caney and San Juan Hill.

SANTIAGO DE LAS VEGAS, an inland city of Havana province, Cuba, about 12 m. S. of Havana. Pop. (1907) 6462. Tobacco is the principal industry. An agricultural experiment station is maintained here by the Cuban government. The town dates from 1688, when a church was built for a colony of tobacco cultivators of the neighbourhood. In 17 21 it received the title and privileges of a villa, and in 1824 those of a ciudad.

SANTIAGO DEL ESTERO, a province of Argentina, bounded N. by Salta and the Chaco territory, E. by the Chaco and Santa Fe, S. by Cordoba, and W. by Catamarca, Tucuman and Salta. Area 39,764 sq. m.; pop. (1895) 161,502; (1904, estimated) 186,205, chiefly Christianized Indians. The surface of the province is flat and low, chiefly open plains thinly covered with grass. There are forests in the W. and N., extensive swamps along the river courses and large saline areas, especially in the S.W. The Salado (called Pasage, and Juramento in Salta) crosses the province from N.W. to S.E. and empties into the Parana, and the Duke, or Saladillo, which has its sources in the Sierra de Aconquija, crosses the province in the same general direction, and is lost in the great saline swamps of Porongos, on the Cordoba

frontier. The climate is extremely hot, the maximum temperature being in° (Mulhall), minimum 32°, and the mean annual 71°, with an annual rainfall of 25 in. Sugar, wheat, alfalfa, Indian corn, tobacco and hides are the principal products, and cotton, which was grown here under the Incas, is still produced. The province is traversed by the Tucuman extension of the Buenos Aires and Rosario railway, by a French line from Santa Fe to Tucuman, and by a branch of the Central Northern (Cordoba section) railway.

The provincial capital, Santiago del Estero, is on the left bank of the Rio Dulce, 745 m. N.W. of Buenos Aires, with which it is connected by rail. Pop. (1904, estimated) 12,000, chiefly of Indian descent. The city stands on a level open plain, 520 ft. above sea-level, and in the vicinity of large swamps (esleros) bordering the Rio Dulce, from which its name is derived. There are a number of interesting old buildings in the city — a government house, several churches, a Jesuit college, a Franciscan convent and a girls' orphanage. The city was founded in 1553 by Francisco de Aguirre and was the first capital of the province of Tucuman, the earliest settled of the La Plata provinces. In 1 6 1 5 the cathedral was accidentally burnt and the bishop removed to Cordoba. The city has suffered much through inundations from the Rio Dulce, and from frequent local revolutions caused by misgovernment and the struggles of rival factions. In 1663 an inundation carried away half the capital, and the population was so reduced that in 1680 the seat of government was removed to San Miguel, now Tucuman. In 1820 Santiago del Estero became a separate province.

1 See F. E. Chadwick, The Relations between Hie United States and Spain: Diplomacy (New York, 1909).

SANTILLANA, ifflGO LOPEZ DE MENDOZA, Marquis or (1398-1458), Castilian poet, was born at Carrion de los Condes in Old Castile on the 19th of August 1398. His father, Diego Hurtado de Mendoza, grand admiral of Castile, having died in 1405, the boy was educated under the eye of his mother, Dofia Leonor de la Vega, a woman of great strength of character. From his eighteenth year onwards he became an increasingly prominent figure at the court of Juan II. of Castile, distinguishing himself in both civil and military service; he was

created marques de Santillana and conde del Real de Manzanares for the part he took in the battle of Olmedo (19th of May 1455). In the struggle of the Castilian nobles against the influence of the constable Alvaro de Luna he showed great moderation, but in 1452 he joined the combination which effected the fall of the favourite in the following year. From the death of Juan II. in 1454 Mendoza took little part in public affairs, devoting himself mainly to the pursuits of literature and to pious meditation. He died at Guadalajara on the 25th of March 1458.

Mendoza shares with Juan de Villalpando the distinction of introducing the sonnet into Castile, but his productions in this class are conventional metrical exercises. He was much more successful in the serranilla and vaqueira — highland pastorals after the Provencal manner. His rhymed collection of Proverbios de gloriosa doctrina e fructuosa ensenanza was prepared for the use of Don Enrique, the heir-apparent. To the same didactic category belong the hundred and eighty stanzas entitled Didlogo de Bias contra Fqrtuna, while the Doctrinal de Privados is a bitter denunciation of Alvaro de Luna. The Comedieta de Ponza is a Dantesque dream-dialogue, in octave stanzas (de arte mayor), founded on the disastrous sea-fight off Ponza in 1425, when the kings of Aragon and Navarre and the Infante Enrique were taken prisoners by the Genoese. The three last-named compositions are the best of Santillana's more ambitious poems, but they are deficient in the elegant simplicity of the serranillas. These unpretentious songs are in every Spanish antho- logy, and are familiar even to uneducated Spaniards.

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SANTINI, GIOVANNI (1787-1877), Italian astronomer, was born on the 30th of January 1787 at Caprese, in the province of Arezzo. He was from 1813 professor of astronomy at the university and director of the observatory at Padua. He wrote Elementi di astronomia (2 vols. 1820, 2nd ed. 1830), Teoria degli stromenti ottici (2 vols. 1828), and many scientific memoirs and notices, among which are five catalogues of tele- scopic stars between +io° and – 15 declination, from observations made at the Padua observatory. He died on the 26th of June 1877.

See Astronomische Nachrichten, No. 90; Month. Not. Roy. Astr. Soc,

SANTLEY, SIR CHARLES (1834-), English vocalist, son of an organist at Liverpool, was born on the 28th of February 1834. He was given a thorough musical education, and having determined to adopt the career of a singer, he went in 1855 to Milan and studied under Gaetano Nava. He had a fine baritone voice, and while in Italy he began singing small parts in opera. In 1857 he returned to London, and on 16th November made his first appearance in the part of Adam in The Creation at St Martin's Hall. In 1858, after appearing in January in The Creation, he sang the title-part in Elijah in March, both at Exeter Hall. In 1859 he sang at Covent Garden as Hoel in the opera Dinorah, and in 1862 he appeared in Italian opera in 77 Trovatore. He was then engaged by Mapleson for Her Majesty's, and his regular connexion with the English operatic stage only ceased in 1870, when he sang as Vanderdecken in The Flying Dutchman. His last appearance in opera was in the same part with the Carl Rosa Company at the Lyceum Theatre in 1876. Meanwhile, in 1861 he sang Elijah at the Birmingham Festival, and in 1862 was engaged for the Handel Festival at the Crystal Palace. At the musical festivals and on the concert stage his success was immense. In such songs as " To Anthea," " Simon the Cellarer " or " Maid of Athens," he was unapproachable, and his oratorio singing carried on the finest

traditions of his art. He was knighted in 1907. In 1858 Santley married Gertrude Kemble, and their daughter, Edith Santley, had a great success as a concert singer.

SANTO DOMINGO [San Domingo, Dominican Republic, or officially Republica Dominicana], a state in the West Indies. It occupies two-thirds of the island of Haiti (q.v.) and has an area of about 18,045 sq. m. The administration is in the hands of three co-ordinate " powers " — the executive, the legislative and the judicial. Under the constitution of 1844, modified in 1879, 1880, 1881, 1887, 1896, and 1908, the president is the head of the executive. He is chosen by an electoral college and serves for six years, and he is assisted by a cabinet of seven ministers. The legislature, called the National Congress, con- sists of a Senate of 12 members, and a Chamber of Deputies of 24 members elected for four years by a limited suffrage. The Supreme Court comprises a chief-justice, six justices appointed by the Congress, and one justice appointed by the president. The republic is divided into six provinces and six maritime districts. Each province and district is administered by a governor appointed by the Cabinet. There is a small army, most of which is stationed at the City of Santo Domingo, and military service is compulsory in the event of foreign

war. The navy consists of one small gun-boat. Primary education is free and compulsory : elementary schools are supported largely by the local authorities, and the higher, technical and normal schools by the government. There is a professional school with the character and functions of a university. The Roman Catholic is the state religion, but all others are allowed under certain restrictions. The monetary unit is a silver coin of the value of a franc, called the dominicano, but in 1897 the United States gold dollar was adopted as the standard of value. The roads in the interior are primitive, but the government encourages the construction of railways. A line runs between Sanchez and La Vega, and another between Santiago and Porto Plata. The republic joined the Postal Union in 1880. The exports include tobacco, coffee, cacao, sugar, mahogany, logwood, cedar, satinwood, hides, honey, gum and wax. The collection of the customs and other revenues specially assigned to the secur- ance of bonds was in the hands of an American company until 1899, when this defaulted in the payment of interest and the government took over the collection. In 1905, to forestall foreign intervention for securing payment of the State debt, President Roosevelt made an agreement with Santo Domingo, under which the United States undertook to adjust the republic's foreign obligations, and to assume charge of the customs houses. A treaty was ratified by the United States Senate in 1907, and an American citizen is temporarily receiver of customs. In June 1907 the debts amounted to $17,000,000.

Santo Domingo has the finest sugar lands in the West Indies; tobacco and cacao flourish; the mountain regions are especially suited to the culture of coffee, and tropical fruits will grow any- where with a minimum of attention. During the earlier years of the Spanish occupation gold to the value of £90,000 was sent annually to Spain, besides much silver. Platinum, manganese, iron, copper, tin, antimony, opals and chalcedony are also found. In the Neyba valley there are two remarkable hills, composed of pure rock salt. Only an influx of capital and an energetic population are needed to develop these resources.

Santo Domingo, the capital of the republic, is situated on the south coast. At a distance of 45 m. N. lies the town of Azua (pop. 1500) founded in 1504 by Diego Columbus. It stands in a plain, rich in salt and asphalt, which was the scene of the first planting of sugar in the West Indies. Santiago (pop. 12,000), the capital of the Vega Real, stands on the banks of the Yaqui river, 160 m. N.W. of the capital, in the richest agricultural district in the state. It controls the tobacco trade which is chiefly in German and Dutch hands. Its portˆ Porto Plata (pop. 15,000), is the outlet of the entire Vega .Real district. La

Vega, perhaps the most beautiful city of Santo Domingo, lies in the midst of a lovely savanna, or plain, surrounded by well- wooded hills, and has a magnificent old cathedral. Six miles away is the Cerro Santo, a hill 787 ft. in height, rising abruptly from the plain, on the summit of which Columbus planted a great cross on his first visit in 1493. Seybo (5000), Monti Cristi (3000) and Samatia (1500) are the only other towns of any size. The population of the republic is about 500,000. The people are mainly mulattoes of Spanish descent, but there are a considerable number of negroes and whites of both Creole and European origin. Politically the

whites have the predominating influence. The people, on the whole, are quiet, lazy and shiftless, but subject at times to great political excitement. They are Spanish in their mode of life and habits of thought. Spanish toe is the common language, though both French and English are spoken in the towns.

History. — After the downfall of Toussaint l'Ouverture (see Haiti) there followed the initiation of the black Haitian Empire under Jean Jacques Dessalines in 1803. Spain, however, estab- lished herself anew on the eastern end of the island in 1806, Haiti remaining independent. Santo Domingo continued thus a Spanish possession until 182 1, when, under the authority and flag of Colombia, a republic was proclaimed, and the Spaniards withdrew. In the following year the Haitian president Boyer invaded Santo Domingo, joined it to Haiti and ruled the entire island till his fall in 1843. The Spanish part of the island again became independent of Haiti in 1844, when the Dominican Republic was founded, and since that time the two political divisions have been maintained, and their respective inhabitants have grown more and more estranged. The earlier years of the new republic were marked by the struggles between Pedro Santana and Buenaventura Baez, who with the exception of a few months under Jiminez, occupied the presidency in turn until 1 86 1. In that year Santana, with the consent of the people, proclaimed the annexation of Santo Domingo by Spain. The Spaniards, however, did not long enjoy their sovereignty, for the harshness of their rule provoked a successful revolution under Jose Maria Cabral in 1864; and in the following year they withdrew all claim to the country. Baez was again chosen president, but was driven out by Cabral after a year of power.

From 1868 to 1873 Baez was once again in office, and during this term overtures were made to the United States with a view to annexation. General O. E. Babcock was despatched by President Grant to report on the condition and resources of Santo Domingo, and while there, in 1869, he negotiated a treaty by which the republic was to become part of the United States. Although ratified by the Dominican Senate, this treaty was opposed in the United States Senate, under the leadership of Charles Sumner, and was finally rejected. In 187 1 three com- missioners were appointed by President Grant to report further, but although their report was favourable to annexation, no action was taken.

Baez was succeeded by Gonzalez (1873-1879), under whom the country enjoyed a period of tranquillity. Great political agitation followed, which terminated in 1882 with the election of Ulises Heureaux, a negro, and capable statesman. Under his despotic rule of nearly 17 years, the republic enjoyed greater prosperity and tranquillity than it had ever known. He was assassinated in July 1899, and was succeeded by Jiminez, who was driven out by General Vasquez in 1902. Vasquez, in turn, was deposed by a revolution headed by General Wos y Gil, who became president in 1903, but was overthrown by Jiminez in November of that year. In 1904 Jiminez was expelled and C. F. Morales became president. Ramon Caceres was installed in 1906, and in 1908 a new constitution was proclaimed and Caceres was elected for the term 1908-1914.

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SANTO DOMINGO, the capital of the republic of the same name, in the island of Haiti, West Indies. Pop. about 25,000. It is situated on the S. coast, at the mouth of the river Ozama. Founded in 1496, it is the oldest existing settlement of white men in the New World, and perhaps the most perfect example of a Spanish colonial town of the 16th century. It is surrounded by ancient walls with bastions. The

streets are straight, narrow,

and intersect at right angles. The massive houses are built of stone with coloured walls pierced with huge doors and windows. The cathedral, in the Spanish Renaissance style, dates from 1 51 2, and contains the reputed tomb of Columbus (q.v.). The cell in which he and his brother were confined by order of Bobadilla is still shown in the old fortress. The city is the seat of an archbishop. It has a small and rather poor harbour, but the river is navigable for 4 m. from its mouth. The climate is healthy and cool.

SANTONIN, a drug used in the U.S.P. and B.P., consisting of colourless flat prisms, turning slightly yellow from the action of light and soluble in alcohol, chloroform and boiling water. It is derived from santonica which is the unexpanded flower-heads of Artemisia maritima. The dose is 2 to 5 grs. The only B.P. preparation is the trochiscus santonini, but the preparation sodii santoninas is official in the U.S.P. Santonin is an anthel- mintic used to poison the round worm Ascaris lumbricoides. It has no influence on tape-worms. It must be administered fasting and be followed by a purgative in order to expel the worm. The most convenient mode of administration is in capsules. For thread worms which infest the anus of young children, a suppository containing 2 to 3 grs. of santonin and used on alter- nate nights for three nights is effective. The U.S. preparation sodii santoninas is useless as a vermifuge and is used in diseased conditions of the optic nerve. Even small doses of santonin cause disturbances of vision, usually yellow vision or perhaps green (xanthopsia or chromatopsia). The urine also turns yellow and finally purple or red. These effects usually pass off in a few days. Large doses, however, produce toxic effects, aphasia, muscular tremors and epileptiform convulsions, and the disturbances of vision may go on to total blindness.

SANTORIN (corruption of St Irene; anc. Thera), a volcanic island in the Aegean Sea, the southernmost of the Sporades. In shape Santorin forms a crescent, and encloses a bay on the north, east and south, while on the western side lies the smaller island of Therasia. The encircling wall thus formed, which is elliptical in shape and 18 m. round in its inner rim, is broken in two places — towards the north-west by a strait a mile in breadth, where the water is not less than 1100 ft. deep, and towards the south-west by an aperture about 3 m. wide, where the water is shallow, and an island called Aspronisi or White Island lies in the middle. The cliffs rise perpendicularly from the bay, in some places to the height of 1000 ft.; but towards the open sea, both in Santorin and Therasia, the ground slopes gradually away,

and has been converted into broad level terraces, every- where covered with tufaceous agglomerate, which, though bare and ashen, produces the famous Santorin wine. Towards the south-east rises the limestone peak of Mount Elias, the highest point of the island (1910 ft.); this existed before the volcano was formed. In the middle of the basin lie three small islands, which are the centre of volcanic activity, and are called Palaea, Mikra and Nea Kaumene, or the Old, the Little and the New Burnt Island; the highest of these, Nea Kaumene, is 351 ft. above the sea. Owing to the depth of the water there is no anchorage, and vessels have to be moored to the shore, except at one point in the neighbourhood of the modern town, where there is a slight rim of shallow bottom. The cliffs of Santorin and Therasia are marked in horizontal bands by black lava, white porous tufa, and other volcanic strata, some parts of which are coloured dark red. The modern town of Thera (or Phera, as it is more commonly pronounced) is built at the edge of these, overlooking the middle of the bay at a height of 900 ft. above the water, and the foundations of the houses and in some cases their sides also, are excavated in the tufa, so that occasionally they are hardly traceable except by their chimneys. Owing to the absence of timber — for, except the fig, cactus and palm, there are hardly any trees in the island — they are roofed with barrel vaults of stone and cement. Both wood and water have occasionally to be imported from the neighbouring islands, for there are no wells, and the rain water, collected in cisterns, does not always suffice. The largest of the other villages is I Apanomeria, near the northern entrance, which is crowded

together in a white mass, while the rocks below it are the reddest in the island.

Santorin is closely connected with the earthquake movements to which the countries in the neighbourhood of the Aegean are subject. It is hardly accurate to speak of the basin which forms the harbour as a crater, for most geologists support the view that the whole of this space was once covered by a single volcanic cone, the incline of which is represented by the outward slope of Santorin and Therasia, while the position of the crater was that now occupied by the Kaumene Islands; and that owing to a volcanic explosion and the subsidence of the strata the basin was formed. The Kaumene Islands arose subsequently, and that of Palaea Kaumene is con- sidered to have been prehistoric. The principal eruptions that have taken place within

historic times are that of 196 B.C., when, as we learn from Strabo (i. 3, § 16, p. 57), flames rose from the water half- way between Thera and Therasia for four days; that of A.D. 726, during the reign of the Emperor Leo the Isaurian (on both these occasions islands were thrown up, but it is supposed that they after- wards disappeared); that of 1570, when Mikra Kaumene arose; that of 1650, which destroyed many lives by noxious exhalations, and ended in the upheaval of an island in the sea to the north-east of Santorin, which afterwards subsided and became a reef below sea-level; that of 1707, when Nea Kaumene arose; and that of 1866, when Nea Kaumene was extended towards the south and en- larged threefold.

In the southern parts both of Santorin and Therasia pre- historic dwellings have been found at some height above the sea, and there is no doubt that these date from a period antecedent to the formation of the bay. This is proved by their position underneath the layer of tufa which covers the islands, and by these layers of tufa being broken off precipitously, in the same way as the lava-rocks, a fact which can only be explained by the supposition that they all fell in together. The foundations of the dwellings rested, not on the tufa, but on the lava below it; and here and there between the stones branches of wild olive were found, according to a mode of building that still prevails in the island, in order to resist the shocks of earthquakes. Very few implements of metal were found. Some of the vases found were Cretan ware which had been imported; and the correspond- ence between these and various specimens of the native pottery proves that to some extent this primitive art was derived from Crete.

In Greek legend the island of Thera was connected with the story of the Argonauts, for it was represented as sprung from a clod of earth which was presented to those heroes by Triton (Apollon., Argonaut., iv., 1551 sq., 1731 sq.). According to Herodotus (iv. 147), a Phoenician colony was established there by Cadmus. Subsequently a colony from Sparta, including some of the Minyae, was led thither by Theras, who gave the island his own name, in place of that of Calliste which it had borne before. But the one event which gave importance to Thera in ancient history was the planting of its famous colony of Cyrene on the north coast of Africa by Battus in 631 B.C., in accordance with a command of the Delphic oracle.

The ancient capital, which bore the same name as the island, occupied a site on the eastern coast now called Mesavouno, between Mount Elias and the sea. Since 1895 this place has been excavated by Baron Hiller von Gartringen and other German explorers. There are extensive ancient cemeteries. A steep ascent leads from a Heroum of

Artemidorus to the Agora; in its neighbourhood were the Stoa Basilice, a vast hall with a row of pillars; a temple of Dionysus and the Ptolemies, which at a later period was dedicated to the Caesars; and the barrack of the garrison of the Ptolemies and a gymnasium. The names which occur here remind us that Thera, as a member of the League of the Cyclades, was from B.C. 308 to 145 under the protectorate of the Ptolemies. The main street has narrow lanes diverging from it to right and left; one of these leads to the sanctuary of the Egyptian gods. Near the street there is a small theatre, beneath the seats of which a vast cistern was constructed, arranged so that rain-water should drain into it from the whole of the auditorium. The way then descends south-eastwards first to the temple of Ptolemy Euergetes III., and then to that of. Apollo Carneius; finally, at the point where the rocks fall precipitously, there is a gymnasium of the Ephebi. Numerous rock-carvings and inscriptions have been discovered,

as well as statues and vases of various periods. Near the western foot of Mount Elias is the temple of Thea Basileia, which, though very small, is perfect throughout even to the roof. It is now dedicated to St Nicolas Marmorites.

Tournefort mentions that in his time nine or ten chapels were dedicated to St Irene, the patron saint of the place; the name Santorin was given to the island after the fourth crusade, when the Byzantine empire was partitioned among the Latins, and the island formed a portion of the duchy of the Archipelago. Santorin is prosperous, for, in addition to the wine trade, there is a large export of pozzolana, which, when mixed with lime, forms a hard cement. Santorin (officially Thera) is a province in the department of the Cyclades. It is divided into 9 communes (see Cyclades), with a total population of 19,597 in 1907.

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(H. F. T.)

SANTOS, a city and seaport of Brazil, in the state of Sao Paulo, about 230 m. W.S.W. of Rio de Janeiro, and 49 m. by rail S.E. of Sao Paulo

city. Pop. (1890) 13,012; (1902 estimate) 35, 000. Santos covers an alluvial plain on the inner side of an island (called Sao Vicente) formed by an inland tidal channel sometimes called the Santos river. The commercial part of the city is some miles from the mouth of the channel, but the residential sections extend across the plain and line the beach facing the sea. The city is only a few feet above sea-level, the island is swampy, and deep, cement-lined channels drain the city. The Santos river is deep and free from obstructions, and in front of the city widens into a bay deep enough for the largest vessels. The water front, formerly beds of mud and slime, the source of many epidemics of fever, is now faced by a wall of stone and cement. Vessels moor alongside this, quay, which is lined with warehouses and provided with railway tracks, &c. Formerly coffee was transported in -carts from the railway station to the warehouses, thence loaded into lighters by porters, and from these transferred to vessels anchored in midstream. The improvements were planned by an American engineer, William Milnor Roberts (1810-1881). The thorough drainage of the city has made Santos comparatively healthy. The heavy rainfall (885 in. per annum), neighbouring swamps, rank vegetation and great heat give rise to malarial and intestinal disorders, rheum- atism and other diseases. Beri-beri and smallpox are also common, and bubonic plague has appeared since 1900. The temperature ranges from 41 to 101-3° F. in the shade.

The development of coffee production in the state of Sao Paulo during the closing years of the 19th century has made Santos the largest coffee shipping port in the world, the exports amounting to 5,849,114 bags, of 132 ft each, in 1900, and 8,940,144 bags in 1908. The other exports include sugar, rice, rum, fruit, hides and manufactured goods. Bananas are grown in the vicinity for the River Plate markets. The most popular suburb in the vicinity of Santos is the bathing resort of Guaruja. The Sao Paulo railway, an English double-track line, provides communication with the interior, ascending the steep wooded slopes of the Serra do Mar by a series of inclines up which the cars are drawn by stationary engines on the old line, ˆnd by a series of gradients on the new line.

The first settlement on the Sao Paulo coast was that of Sao Vicente in 1532, about 6 m. S. of Santos on the same island. Other settlements soon followed, among them that of Santos in 1 543-1 546, and later on the small fort at the entrance to its harbour, which was used for protection against Indian raids from the north. . Sao Vicente did not prosper, and was succeeded (1681) by Sao Paulo as the capital and by Santos as the seaport of the colony. It was captured by the English privateer, Thomas Cavendish, in 1591, when Sao Vicente was burned. The growth of the town was slow down to the end of the 19th century, because of insanitary conditions and epidemics.

SANUTO (Sanudo), MARINO, the elder, of Torcello (c. 1260- 1 33ˆ 1), Venetian statesman, geographer, &c. He is best known

for his life-long attempts to revive the crusading spirit and movement; with this object he wrote his great work, the Seer eta (or Liber Seeretorum) Fidelium Cruets, otherwise called Historia Hierosolymitana, Liber de expedilione Terrae Sanctae, and Opus Terrae Sanclae, the last being perhaps the proper title of the whole treatise as completed in three parts or ” books.” This work has much to say of trade and trade-routes as well as of political and other history; and through its accompanying maps and plans it occupies an important place in the development of cartography. It was begun in March 1306, and finished (in its earliest form) in January 1307, when it was offered to Pope Clement V. as a manual for true Crusaders who desired the reconquest of the Holy Land. To this original Liber Seeretorum Sanuto added largely; two other ” books ” were composed between December 13 12 and September 13 21, when the entire work was presented by the author to Pope John XXII., together with a map of the world, a map of Palestine, a chart of the Mediterranean, Black Sea and west European coasts, and plans of Jerusalem, Antioch and Acre. A copy was also offered to the king of France, to whom Sanuto desired to commit the military and political leadership of the new crusade. Marino himself tells us that he had spent the best part of his life in Romania, the lands of the Eastern empire; of the Morea he had especially intimate knowledge; he had also visited Cyprus, Rhodes, parts of the Syrian, Cilician and Egyptian coasts, France, Flanders and north Germany, both west and east of Denmark. He had been in Acre, Alexandria, Constantinople, Avignon, Bruges and Sluys, as well as (apparently) in Hamburg, Liibeck, Wismar, Rostock, Stralsund,

Greifswald and Stettin. Among his friends and correspondents were Guglielmo Bernardi de Furvo, a Venetian nobleman who had travelled extensively in Moslem and Mongol lands (to Tabriz, Bagdad, Damascus and Cairo), Bishop Jerome of Kaffa, in the Crimea, who in 1312 had been sent to reinforce the Catholic mission in China, and perhaps Peter, the English-born bishop of Sevastopolis or Sukhum Kale in western Caucasia, who makes an appeal for aid to the prelates of England in 1330. Marino Sanuto's ancestor, Marco, had founded the greatness of his family after the Fourth Crusade as duke of the Archipelago and conqueror of Naxos, Paros, &c. (from 1207); and his descendant wrote with a personal interest in the question of crushing Moslem power in

The crusading plans of the Secreta are double: first, Egypt and the Moslem world on the side towards Europe (Syria, Asia Minor, the Barbary States, Granada, &c.) are to be ruined by the absolute stoppage of all Christian trade with the same. By such an interdict Sanuto hopes that Egypt, dependent on its European and other imports of metals, provisions, weapons, timber, pitch and slaves, would be fatally weakened, and the way thus prepared for the second part of the campaign — the armed attack of the crusading fleet and army on the Nile delta. With the aid of the Mongol Tatars of Asia, natural allies of western Christendom, and of the Nubian Christians, the conquest of the Delta and of all Egypt was to be followed by that of Palestine, invaded and held from Egypt. Sanuto deprecates any other route for the crusade, and unfolds his plan of campaign, his bases of supply, his sources for the supply of good seamen, with great detail. Not only Mediterranean seaports, but the lakes of North Italy and central Europe, and the Hanseatic ports, are enumerated as nurseries of crusading mariners and marine skill. Finally, after the conquest of Egypt, Marino designs the establishment of a Christian fleet in the Indian Ocean to dominate and subjugate its coasts and islands. He also gives a sketch of the trade-routes crossing Persia and Egypt, as well as of the course of Indian trade from Coromandel and Gujarat to Ormuz and the Persian Gulf, and to Aden and the Nile. The maps and plans which illustrate the Secreta are probably (in the main, at least) the work of the great portolano-draughtsman Pietro Vesconte: practically the whole of this map-work corresponds with what Vesconte has left under his own name; much of it is indistinguishable. Among the plans that of Acre is of peculiar interest, being the most complete representation known of the great crusading fortress on the eve of its destruction, with the quarters of all its contingents of defenders (Templars, &c.) indicated. The chart of the Mediterranean and Euxine and of the Atlantic coasts of Europe is composed of five

map-sheets, which together form a good example of the earliest scientific design or portolano ; in the world-map a portolano of the Mediterranean world is combined with work of pre-portolan type in remoter regions. Here the shore-lines of the countries well known to Italian mariners, from Flanders to Azov, are well laid down ; the Caspian and the north German and Scandinavian coasts appear with an evident,

though far slighter, relation to practical knowledge; and some idea is shown of the great continental rivers of the north, such as the Don, Volga, Vistula, Oxus and Syr Daria. Africa, away from the Mediterranean, is conventional, with its south-east projected, after the manner of Idrisi, so as to face Indian Asia, and with a western Nile traversing the continent to the Atlantic. Chinese and Indian Asia show little trace of the new knowledge which had been imparted by European pioneers from the Polos' time, and which appears so strikingly in the Catalan Atlas of 1375. Sanuto's Palestine map is remarkable for its space-defining network of lines, which roughly answer to a kind of scheme of latitude and longitude, though properly speaking they are not scientific at all. Of the Secreta, twenty-three MSS. exist, of which the chief are: (1) Florence, Riccardian Library, No. 237, 162 fols. (Secreta and Letters), with maps and plans on fols. 141, V.-144, r. ; (2) London, British Museum, Addt. MSS., 27,376, 178 fols. with maps, &c. on fols. 180, V.-190, r. ; (3) Paris, National Library, MSS. Lat. 4939, with maps, &c. on fols. 9, r.-n, r. 27, 98-99. All these are of the 14th century. The Secreta has only once been printed entire, by Bongars, in Gesta Dei per Francos, vol. ii. pp. 1-288 (Hanover, 161 1).

See also Friedrich Kunstmann, " Studien iiber Marino Sanudo den alteren, mit einem Anhange seiner ungedruckten Briefe " in Abhandlungen der historisch. Classe der Konigl. Bayerisch. Akademie der Wissenschaflen, vol. vii. pp. 695-819 (Munich, 1855) ; Foscarini, Letteratura Veneziana; Tiraboschi, Storia delta Letteratura Italiana, vol. v.; Postansque, De Marino Sanuto (Montpellier, 1856); C. R. Beazley, Dawn of Modern Geography, iii. 309-319, 391-392, 520-521, 549, 555- (C R. B.)

SANUTO (or Sanudo), MARINO, the younger (1466-1533), Venetian historian, was the son of the senator, Leonardo Sanuto, and was born on the 2 2nd of May 1466. Left an orphan at the age of eight, he lost his fortune owing to the bad management of his guardian, and was for many years hampered by want of means. In 1483 he accompanied his cousin Mario, who was one of the three sindici inquisitori deputed to hear appeals from the decisions of the reitori, on a tour through Istria

and the mainland provinces, and he wrote a minute account of his experiences in his diary. Wherever he went he sought out learned men, examined libraries, and copied inscriptions. The result of this journey was the publication of his Itinerario in terra ferma and a collection of Latin inscriptions. Sanuto was elected a merriber of the Maggior Consiglio when only twenty years old (the legal age was twenty- five) solely on account of his merit, and he became a senator in 1498; he noted down everything that was said and done in those assemblies and obtained permission to examine the secret archives of the state. He collected a fine library, which was especially rich in MSS. and chronicles both Venetian and foreign, including the famous Altino chronicle, the basis of early Venetian history, and became the friend of all the learned men of the day, Aldo Mannzio dedicating to him his editions of the works of Angelo Poliziano and of the poems of Ovid. It was a great grief to Sanuto when Andrea Navagero was appointed the official historian to continue the history of the republic from the point where Marco Antonio Sabellico left off, and a still greater mortification when, Navagero having died in 1529 without executing his task, Pietro Bembo was appointed to succeed him. Finally in 1 53 1 the value of his work was recognized by the senate, which granted him a pension of 150 gold ducats per annum. He died

in 1533-

His chief works are the following: Itinerario in terra ferma, published by M. Rawdon Brown in 1847; / commentarit delta guerra di Ferrara, an account of the war between the Venetians and Ercole d'Este, published in Venice in 1829; La Spedizione di Carlo VIII. (MS. in the Louvre) ; Le Vite dei Dogi, published in vol. xxii. of Muratori's Rerum Italicarum Scriptores (1733); the Diarii, his most important work, which cover the period from the 1st of January 1496 to September 1533, and fill 58 volumes. The publication of these records was begun by Rinaldo Fulin, in collaboration with Federigo Stefani, Guglielmo Berchet, and Niccolo Barozzi; the last volume was published in Venice in 1903. Owing to the relations of the Venetian republic with the whole of Europe and the East it is practically a universal chronicle, and is an invaluable source of information for all writers on that period.

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SAN VICENTE, the capital of the department of San Vicente, Salvador; 30 m. E. of San Salvador, on the river Acahuapa, a left-hand tributary of the Lempa. Pop. (1905) about 18,000.

San Vicente is situated in a volcanic region abounding in hot springs and geysers. The volcano of San Vicente, the highest in the department, reaches an altitude of more than 7000 ft. The city is surrounded by indigo and tobacco plantations, and has considerable commerce, a large portion of which is transacted at the All Saints' fair, held annually on the 1st of November. Shoes, hats, cloth, silk, spirits and cigars are manufactured here. San Vicente was founded in 1634 on the site of Tehuacan, an ancient Indian city. For one year (1839-1840) it was the capital of the republic.

SAO FRANCISCO, a river of eastern Brazil rising in the S.W. part of the state of Minas Geraes, about 20 30′ S., 46 40′ W., near the narrow valley of the Rio Grande, a tributary of the Parana, and within 240 m. of the coast W. of Rio de Janeiro. It flows in a general N.N.E. direction across the great central plateau of Brazil to about lat. o° 30′ S., long. 42 W., where it turns N.E. axd then S.E. in a great bend, entering the Atlantic in lat. 10° 29′ S. It has a total length of about 1800 m. and a fall of 2700-2800 ft. It is navigable from the Atlantic to Piranhas (148 m.) and is nearly 1 m. wide at Penedo, 22 m. from the sea. Above Piranhas, about 193 m. from its mouth, are the falls of Paulo Affonso where the river plunges through a narrow gorge — in one place only 51 ft. wide — and over three successive falls, all together 265 ft. The obstructed part of the river is about 190 m. long and consists of a series of rapids above the falls and a deep canon with whirlpools for some distance below. The Brazilian government has built a railway around these falls from Piranhas (151 ft. elevation) to Jatoba (978 ft.) with an extension of 71 m. Above Jatoba there is another series of rapids called the Sobradinho nearly 90 m. above the lower rapids, which are navigable at high water, and above these an un- obstructed channel for light-draught river boats up to Pirapora a little above the mouth of the Rio das Velhas, a distance of 984 m. Here the river runs through a barren, semi-arid region, sparsely settled. There are no tributaries of consequence along a large part of this region, and the few people living beside the river are dependent on its annual floods for the fertilization of its sandy shores on which their scanty plantations of Indian corn and beans are made. The rapids of Pirapora are 17 m. above the mouth of the Rio das Velhas, and this point, the

head of navigation on the river, and 1742 ft. above sea-level, is the objective point of the Central do Brazil railway, the purpose being to create by rail and river a central route from Rio de Janeiro to the northern ports of Bahia and Recife. The principal tributaries of the Sao Francisco are: on the right, the Para, Paraopeba, Velhas, and Verde-Grande; on the left, the Indaya, Abaet6, Paracatu, Urucuya, Carinhanha, Corrente and Grande. Several of these tributaries are navigable for long distances by small boats — the aggregate being a little over 1000 m. Some authorities give the aggregate navigable channels of the Sao Francisco as 43 50 m. The upper valley of the Sao Francisco is partly forested, has a temperate climate, with a mean annual temperature of 8 5 and a rainfall of T637 millimetres. The rainy season is from December to March, but on the lower river the rainfall is light and the season much shorter, sometimes varied by droughts covering several years.

An admirable description of this great river is given by Richard Burton in The Highlands of Brazil (2 vols., London), and a more technical description by E. Liais in Hydrographie du Haut San- Francisco et du Rio das Velhas (Rio de Janeiro, 1865).

SAO LEOPOLDO, a city of the state of Rio Grande do Sul, Brazil, on the left bank of the Rio dos Sinos, 20J m. by rail N. of Porto Alegre. It is the chief town of a tnunicipio (commune) of the same name, having an area of about 347 sq. m. and in- habited chiefly by German colonists. Pop. (1900) of the city, 11,015; °f the municipio, 32,600. Sao Leopoldo has river and railway communication with Porto Alegre. It is a prosperous industrial town, with broad straight streets and substantial buildings. It has good schools, and its Jesuits' college ranks high throughout northern Rio Grande. Among its manufactures are matches, hats, boots and shoes, soap, liqueurs and artificial drinks, leather and leather-work and earthenware. In the sur-

rounding districts cattle and hogs are raised, and jerked beef, hides, pork, lard, potatoes, beans, farinha de mandioca (cassava flour), Indian corn, tobacco and a great variety of vegetables and fruits are produced.

The city was originally a German colony founded by the emperor Pedro I. in 1824 and established at a place known as the Feitoria Real de Canhamo (Royal flaˆ factory). The first colonists (26 families and 17 unmarried persons, or 126 souls) arrived on the 25th of June 1825, and were followed a few months later by another party of 909 colonists. These were the first German colonists in Rio Grande do Sul. Up to 1830 the arrivals numbered 3701, but the civil war which broke

out in 1835 checked further arrivals and nearly ruined the colony, its inhabitants being forced to serve in the contending forces and their property being seized. Sao Leopoldo was occupied by the revolutionists for some years and was practically ruined at the termination of the war in 1844. The introduction of colonists was immediately resumed, however, and the colony was soon as prosperous as ever. The early colonists were engaged in Germany by a representative of the Brazilian government, and were given free transportation, 130 acres of land each, farming implements, seeds, and a subsidy of 320 reis a day for the first year and half that for the second year. Subsequent settlers received less, but the system of assisting colonists and making contracts with companies and individuals for their introducton became the settled policy of the national and provincial governments.

SAO LUIZ, or in full, SAo Luiz de Maranhao (also spelt Maranham), a seaport of northern Brazil, capital of the state of Maranhao, on the W. side of an island of the same name, in 2° 30′ S., 44 17′ W., about 300 m. E.S.E. of Belem (Para). Pop. of the whole island (1890) 29,308; (1908, estimate) 32,000. An important part of the population is made up of the planters of the state, who live in town and leave their estates to the care of overseers. The island of Maranhao lies off the mouths of the rivers Mearim and Itapicuru, between the Bay of Sao Marcos on the W. and the Bay of Sao Jose on the E., and is separated from the mainland by a small channel called the Canal do Mosquito. It is irregular in outline, its greatest length from N.E. to S.W. being 34 m., and its greatest breadth 19 m. Its surface is broken by a number of low hills and short valleys. The city is built upon alongue of land between two small estuaries, Anil and Bacanga, which unite and open upon the Bay of Sao Marcos. It covers two low hills and the intervening valley, the transverse streets sloping sharply to the estuary on either side. These slopes make it difficult to use vehicles in the streets, but they afford a natural surface drainage which makes Sao Luiz cleaner and more healthy than the coast towns of tropical Brazil usually are. The city is regularly laid out with com- paratively wide longitudinal, and steep, narrow transverse streets, roughly paved and provided with sidewalks. The build- ings are of the old Portuguese type, with massive walls of broken stone and mortar, having an outside finish of plastef or glazed tiles and roofs of red tiles. The principal public buildings are the cathedral, a large and severely plain structure, the episcopal palace, the Carmelite church, the government palace, town hall, custom-house, hospital, and a number of asylums, convents and charitable schools. An excellent lyceum and a church seminary are the most important educational institutions, and Sao Luiz long enjoyed a

high reputation in Brazil for the culture of its in- habitants. The trade of Sao Luiz was once very important, but the commercial activity of Para and Fortaleza, the decay of agricultural industry in the state, and the silting up of its harbour, have occasioned a decline in its commerce. Its exports comprise cotton, sugar and rice. Communication with the mainland and interior towns is by means of small steamers.

Sao Luiz was founded in 161 2 by La Rivardiere, a French officer commissioned by Henri IV. to establish a colony in this vicinity. The French colony was expelled in 1615 by the Portuguese, who, in turn, surrendered to the Dutch in 1641. In 1644 the Dutch abandoned the island, when the Portuguese resumed possession and held the city to the end of their colonial rule in Brazil. I The city became the seat of a bishopric in 1679.

SAONE, a river of eastern France, rising in the Faucilles mountains (department of Vosges), 15 m. W.S.W. of Spinal at a height of 1300 ft. and uniting with the Rhone at Lyons. Length, 301 m.; drainage area, 11,400 sq. m. The oldest Celtic name of the river was Arar. In the 4th century another name appears, Sauconna, from which the modern name is derived. The Saone, moving slowly in a sinuous channel, has its course in the wide depression between the Plateau of Langres, the C6te d'Or and the mountains of Charolais and Beaujolais on the west and the western slopes of the Vosges and Jura and the plain of Bresse and the plateau of Dombes on the east. In the depart- ment of Sa6ne-et-Loire, the Saone unites with the Doubs, an affluent rivalling the Sa6ne in volume and exceeding it in length at this point. At the important town of Chalon-sur-Saone the river turns south, and passes Macon. Below Treveux its valley, now narrower, winds past the Mont d'Or group and joins the Rhone just below the Perrache quarter of Lyons. The Sa6ne is canalized from Corre to Lyons, a distance of 233 m., the normal depth of water being 6 ft. 6 in. At Corre (confluence with the Coney) it connects with the southern branch of the Eastern Canal, at Heuilley (below Gray) with the Sa6ne-Marne Canal, at St Symphorien (above St Jean-de-Losne) with the Rhone-Rhine Canal, and at St Jean-de-Losne with the Canal de Bourgogne and at Chalon with the Canal du Centre.

SAONE-ET-LOIRE, a department of east-central France formed from the districts of Autunois, Brionnais, Chalonnais, Charollais and

Maconnais, previously belonging to Burgundy. It is bounded N. by the department of C6te d'Or, E. by that of Jura, S.E. by Ain, S. by Rh6ne and Loire, W. by Allier and Nievre. Pop. (1906) 613,377. Area, 3330 sq. m. Of the two rivers from which the department takes its name the Loire forms its south-western boundary, and the Saone traverses its eastern region from north to south. On the left bank of the Sadne the department forms part of the wide plain of Bresse; on its right bank the centre of the department is occupied by the northern Cevennes, here divided by the river Grosne into two parallel ranges — the mountains of Maconnais to the east, and the mountains of Charollais to the west. The general direction of these ranges is from south, where their altitude is greatest, to north. The north-west region of Sa6ne-et-Loire is occupied by the southern portion of Morvan, which includes the highest point in the department — the Bois du Roi (2959 ft.). South-east of the Morvan lies the hilly region of Autunois, consisting of the basin of the Arroux, a right affluent of the Loire, and divided from the Charollais mountains by the Bourbince, a tributary of the Arroux. Besides those mentioned, the chief rivers of the department are the Doubs, which joins the Saone in the extreme north-east, the Seille, also an affluent of the Saone, and the Arconce, a tributary of the Loire watering the Charollais. The average temperature at Macon (52 or 53 F.), the most temperate spot in the department, is slightly higher than at Paris, the winter being colder and the summer hotter. At the same town the yearly rainfall is about 33 in., but both the rigour of the climate and the amount of rain increases in the hilly districts, reaching their maximum in the mountains of Morvan.

Agriculture prospers in Sa6ne-et-Loire. Wheat, oats and maize are the cereals most cultivated; potatoes, clover and other fodder, and mangold-wurzels are important crops, and beetroot, hemp, colza and rape are also grown. Excellent pasture is found in the valleys of the Sa6ne and other rivers. The vine, one of the principal resources of the department, is cultivated chiefly in the neighbourhood of Chalon and Macon. Of the wines of Maconnais, the vintage of Thorins is in high repute. The white Charollais oxen are one of the finest French breeds; horses, pigs and sheep are reared, and poultry farming is a thriving occupation in the Bresse. The industrial im- portance of the department is great, chiefly owing to its coal and iron mines; the chief coal mines are those in the vicinity of Creusot, Autun and Chapelle-sous-Dun. A pit at Epinac is over 2600 ft. in depth. Iron is mined at Mazenay and Change, and manganese is found at Romaneche and there are quarries of various kinds. There are well-known warm mineral springs containing chloride of sodium and iron at Bourbon-Lancy. The iron and engineering works of Schneider & Company at Le

Creusot are the largest in France. The department also has numerous flour-mills and distilleries, together with potteries, porcelain- works (Digoin), tile- works, oil- works and glass factories, and carries on various branches of the

textile, chemical, ‘leather and wood-working industries. It exports coal, metals, machinery, wine, Charollais cattle, bricks, pottery, glass. Its commerce is facilitated by navigable streams — the Loire, Sa6ne, Doubs and Seille, — the Canal du Centre, which unites Chalon-sur-Saˆne with Digoin on the Loire, and the canal from Roanne to Digoin and t,he lateral Loire Canal, both following the main river valley. The chief railway of the department is the Paris-Lyon- Mediterranee. Sa6ne-et-Loire forms the diocese of Autun; it is part of the district of the VIII. army corps (Bourges) ; its educa- tional centre is Lyons and its court of appeal that of Dijon. It is divided into 5 arrondissements — Macon, Chalon-sur-Sa6ne, Autun, Charolles, Louhans — 50 cantons, and 589 communes.

Macon, Chalon, Autun, Le Creusot, Cluny, Montceau-Les-Mines, Tournus, Paray-le-Monial, Louhans and Charolles are the most note-worthy towns in the department and receive separate treatment. Other places of interest are St Marcel-les-Chalon, where there is a Romanesque church, once attached to an abbey where Abelard died ; Anzy, which has a Romanesque church and other remains of an important monastery; St Bonnet-de-Joux and Sully, both of which have chateaus of the 16th century; and Semur-en-Brionnais and Varennes-1′ Arconce, with fine Romanesque churches. Prehistoric remains of the stone age have been found at Solutr6 near Macon.

SAO PAULO, a state of Brazil extending from 19 54′ to 25° 15′ S. lat. and bounded N. by Matto Grosso and Minas Geraes, E. by Minas Geraes, Rio de Janeiro and the Atlantic, S. by the Atlantic and Parana, and W. by Parana and Matto Grosso. Pop. (1900) 2,282,279; area, 112,312 sq. m. The state has a coast-line 373 m. long, skirted closely by the Sierra do Mar, below which is a narrow coastal zone broken by lagoons, tidal channels and mountain spurs. Above is an extensive plateau (1500 to 2200 ft. above sea-level) with a mild temperate climate. The southern and eastern borders are broken by mountain chains, and isolated ranges of low elevation break the surface elsewhere, but in general the state may be described as a tablelan4 with an undulating surface sloping westward to the Parana. The extreme eastern part, however, has an eastward slope and belongs to the Parahyba basin. The state is traversed by a number of large rivers, tributaries of the Parana, the largest of which are the Rio Grande, a part of the N. boundary, Dourados, Tiete, Aguapehy, Tigre, and, a part

of the S. boundary, the Paranapanema. The Parana forms the W. boundary of the state. The basins of the Pardo and the Tiete include some of the richest coffee estates of Brazil. The state is well wooded, especially on the slopes of the Serra do Mar, but there are extensive grassy campos (plains) on the plateau. A large part of western Sao Paulo is still unsettled. The coastal zone is hot and generally malarial, with heavy rainfall. On the plateau the rainfall is sufficiently abundant, but the air is drier and more bracing, the sun temperature being high and the nights cool. The open country is singularly healthy, but the river courses are generally malarial. Some of the cities have suffered from fever epidemics, due to bad drainage and insanitary conditions.

The great industries are agricultural, and the most conspicuous is coffee production. Sao Paulo produces more than one-half the ttrtal Brazilian crop and its one great port, Santos, is the largest coffee-shipping port in the world. The terra roxa (red earth) lands of the central and northern parts of the state, especially in the basins of the Tiet6 and Pardo, are peculiarly favourable. This soil is ferruginous, pasty, deep red in colour, and free from stone, and it covers the higher surface of the plateau with a thick layer. The best plantations . are on the high divides between the river courses, and not in their eroded valleys. The Rio Pardo (Brown river) probably derives its name from this soil. . For the crop- year (July to June) of 1805-1896 the production was 3,053,804 bags, and in 1905-1906 it was 6,977,175 bags — these figures being the deliveries at Santos for exportation and not includ- ing the reserves on the plantations and the home consumption. The crop for the last year mentioned was not a maximum, however, for the deliveries at Santos in 1901-1902 were 10,165,043 bags and in 1902-1903, 8,349,828 bags. These immense crops were produced in spite of appeals to producers not to increase production, and even of a special tax on new plantations imposed by the state in 1903. Over-production was keeping the price below a remunerative figure and threatened to ruin the industry. In 1906 the state entered into an accord, known as the ” Convenio de Taubata,” with the states of Rio de Janeiro and Minas Geraes, to maintain the home selling price of Type No. 7 at 55 to 65 francs gold per bag of 60 kilogrammes (other types in proportion) for the first year, and then to increase this price to 70 francs, according to the state of the market ; and to check as far as possible the exportation of coffees inferior to Type

No. 7, which was a grade largely exported to the United States for the roasted coffee package trade, although large quantities of inferior grades were used in the same trade. In addition to the suspension or limitation of the export of grades below Type No. 7, coffee was to be bought and stored until it could be sold through accredited agents abroad at a satisfactory price. To do this, the state of Sao Paulo was authorized to float a loan of £15,000,000. Failing to accomplish this by itself, the state secured the endorsement of the national congress in December 1908, guaranteeing the above loan, to meet the service of which a surtax of 5 francs per bag was decreed. The guarantee was to endure for ten years, during which time all the transactions of the combination, which undertook to limit the sales abroad to 500,000 bags in 1910, 600,000 bags in 191 1, 700,000 bags in 1912, 800,000 bags in 1913 and 700,000 per annum thereafter, were to be subject to the approval of the national government. Another measure was the imposition of an additional tax of 20% on all exports for the year above 9,500,000 bags. At the time this guarantee was obtained the state of Sao Paulo already held nearly 7,000,000 bags of coffee, the larger part on storage in foreign markets, and had apparently reached the limit of its resources, as the foreign markets had failed to respond to its expectations. At the end of the follow- ing year this reserved stock had increased to 8,400,000 bags, and the position had become desperate. The loan of £15,000,000 was floated in 1909, and the pressure was relieved, but the situation was then further complicated by a movement among the coffee planters to have the 9,500,000 bags limit on annual sales removed, and the loan service tax of 5 francs a bag reduced. There had been some improvement in the commercial situation in 1909, but the influence of a reserve of over 8,000,000 bags, increasing crops, and the reckless purpose of planters to realize on their crops regardless of the effect on the government, all conspired to make the situation critical.

The other agricultural products of the state include sugar, cotton, rice, tobacco, Indian corn, beans, mandioca, grapes, bananas and other fruits, and many of the vegetables of the temperate zone. Cereals can be grown, but climatic conditions have been considered unfavourable. Sugar cane was the first exotic to be cultivated in Sao Paulo, and was its principal product in colonial times. Cotton was largely produced, especially during the American Civil War, but the industry nearly disappeared, and now is again improving because of the demand for fibre by the national cotton factories. The cultivation of rice also is increasing, under the stimulus of protective duties. Although Sao Paulo is not classed as a pastoral region, the state possesses large herds of cattle, which are being improved by the importation of pure-

bred stock from Europe. Butter and cheese are produced to a limited extent, and the supply of fresh milk to the cities is attracting some attention. Attention is also given, to a limited extent, to the breeding of horses and mules. The most general and profitable of the animal industries is the breeding of swine, which thrive remarkably on the plateau. The state has an excellent agricultural school and experiment station at Piracicaba, and there is also a zootechnic station near the capital.

The principal manufactures are cotton and woollen textiles, jute bagging, aramina fabrics, furniture, iron and bronze, coffee machinery and agricultural implements, beer, artificial liquors, mineral waters, biscuits, macaroni, conserves, chocolate and other food products, glass bottles, glassware, earthenware, soap, gloves, boots and shoes, trunks and musical instruments. Steam power is generally used, though both electric and hydraulic power are employed. There are several large cotton factories, which are chiefly employed in the manufacture of the coarser grades of cloth for the working classes. The iron mines and works at Ypanema, near Sorocaba, are one of the oldest industries of the state, dating back to the first quarter of the 19th century. It is a government enterprise and has absorbed an immense sum of money, but has never reached a self-supporting stage.

Sao Paulo is well provided with railways, which include the pioneer line from Santos to Jundiahy (an English enterprise) which has a double track from Santos to the city of Sao Paulo, the Paulista lines which are a continuation of the English line into the interior, the Mogyana lines running northward from Campinas through rich coffee districts to Uberaba in Minas Geraes and farther on toward Goyaz, the Sorocabana running south-westward from Sao Paulo toward the Parana frontier, the Sao Paulo branch of the Central do Brazil line which passes through the E. part of the state and provides communication with the national capital, and the Sao Paulo and Rio Grande which is designed to cross the states of Parana and Santa Catharina to connect with the railways of Rio Grande do Sul.” All these lines except the two last are tributary to the English line and the port of Santos. In addition to these many of the large planta- tions have private railways, of the Decauville type, for the transport- ation of produce and material to and from the nearest railway station, and all the large cities have tramway lines, many using electric traction. The ports of the state are Santos, which is visited by large steamers in the foreign trade, and Cananea, Iguape, Sao Sehastiao and Ubatuba which are engaged in the coasting trade only. Cananea and Iguape are chiefly known for the rice grown in their vicinity. Ubatuba, near the E. end of the Sao Paulo coast, has a fine, almost landlocked bay, but is

without good communication with the interior.

An important contributory element to the prosperity of the state

is the large number of immigrants. Between 1827 and 1900 the arrivals numbered 969,230, of which seven-tenths were Italians. A considerable part of the immigrant movement consists of itinerant labourers who go to Sao Paulo for the coffee-picking, just as they go to Argentina for the wheat harvest.

The capital of the state is Sao Paulo (q.v.) and its principal port and second city in importance is Santos (q.v.). The chief cities and towns, with populations in 1890 where not otherwise stated, are as follows, the enumeration being for municipalities, or parishes, in- cluding large rural areas and sometimes including separate villages: Campinas (g.f.); Guarantingueta (30,690; estimate 45,000 in 1906), on the Parahyba, 120 m. E.N.E. of Sao Paulo; Piracicaba (25,275),

85 m. N.W. of Sao Paulo; Limeira (21,605), m a fertile thickly- settled district; Rio Claro (20,843), T 35 m – N.W. of Santos, on a branch of the Paulista railway, in a fertile coffee-producing region, 2030 ft. above the sea; Taubat6 (20,773), one of the oldest cities of the state, on the Parahyba 80 m. E.N.E. of the capital, in a rich agricultural district, with works for refining oil from the petroleum- bearing shales in the vicinity; Braganza, or Braganca (19,787), 50 m. N. of Sao Paulo in a fertile country partly devoted to sugar production and stock; Sao Jos6 dos Campos (18,884); Tiet6 (18,878), on the Tiete river N.W. of S. Paulo; Pindamonhangaba (17,542 ; estimate 25,000 in 1906), on the Parahyba river and Central do Brazil railway 105 m. N.E. of Sao Paulo in a long settled district, 1770 ft. above the sea, producing coffee, sugar, rice, Indian corn, beans, rum and cattle; Sorocaba (17,068; estimate 30,000 in 1906), a prosperous manufacturing and commercial town on the Rio Sorocaba and Sorocabana railway, 50 m. W. of Sao Paulo; Itu, or Ytu (13,790) about 70 m. W.N.W. of Sao Paulo on the Tiete river and Ituana railway, with water power derived from the Salto (falls) de Itu, and with important manufactures; Sao Carlos do Pinhal (12,651); Casa Branca (13,482), in the N. coffee region; Parahybuna (13,395) ;, Pirassununga (12,494); Batataes (12,438); Franca (12,425) ; ‘Jacarehy (12,279); Botucatii (12,089) ; Jundiahy (12,051),

86 m. N. of Santos, an important manufacturing town and railway junction, 2320 ft. above sea-level; Ribeirao Preto (12,033), 197 m – N. of Campinas on the Mogyana railway in a fertile coffee-producing region; Iguape (11,888), a port on the southern coast of the state, on a

tidewater channel of sufficient depth for coastwise steamers, with exports of rice and timber; Lorena (10,342), 130 m. N.E. of Sao Paulo, beautifully situated, 1760 ft. above the sea, % a station on the Central do Brazil railway, and the junction of a branch railway to the Campos do Jordao where the national government has established a military sanatorium because of its dry, bracing climate; and Cruzeiro (8883).

Sao Paulo was settled in 1532 by the Portuguese under Martim Affonso de Souza, who established a colony near Santos, at Sao Vicente, now an unimportant village. It was originally called the capitania of Sao Vicente (organized 1534) and covered the whole of southern Brazil from Rio de Janeiro south. After the suppression of the captaincy grants, parts of this enormous territory were cut off from time to time to form other captaincies, from which developed the present states of Rio de Janeiro, Minas Geraes, Matto Grosso, Parana, Santa Catharina and Rio Grande do Sul. In 1681 Sao Paulo succeeded Sao Vicente as the capital of the captaincy, and the original name of the latter gradually fell into disuse. The people of the state have always been distinguished for their energy and enterprise, especially during the colonial period. The early population was largely composed of half breeds, known as Mamelucos, and the exploration of the greater part of the interior of Brazil is due to them. Their exploring parties, called bandeiras, dis- covered the first gold mines of Minas Geraes and Matto Grosso, drove the Jesuit missions from Parana, and traversed the interior northward into Piauhy, north-westward almost to Quito, westward into Bolivia and southward into Rio Grande and Paraguay. They were slave-hunters by profession, and were noted for cruelty as well as energy.

SAO PAULO, a city of Brazil, capital of a state of the same name, and seat of a bishopric, on the Tiete river 49 m. by rail N.W. of the port of Santos and 308 m. by rail W. of Rio de Janeiro. Pop. (1890) 64,934; (1902, estimate) 332.000. Sao Paulo is connected with Santos, its port, by a double-track railway built, owned and worked by a British company (S. Paulo Railway Co.); with Rio de Janeiro, by the Sao Paulo branch of the Central do Brazil line; with Campinas and other inland cities by the Sao Paulo and Paulista railways; with the N.E. part of the state, Minas Geraes, and Goyaz by the Mogyana line starting from Campinas; and with Sorocaba and the southern parts of the state, Parana, and with Santa Catharina and Rio Grande, by the Sorocabana line and the Sao Paulo and Rio

Grande line. In great part the city occupies an elevated open stretch of tableland commanding extensive views of the surround- ing country; and a small part of it is in the low alluvial land bordering the Tiete. The upper part has several slight elevations forming healthy residential districts. The elevations above sea-level are 2382 ft. at the Central do Brazil railway station in the lower town, 2418 ft. at the Sao Paulo railway station, 2841 ft. in the Consolafao suburb, and 2953 ft. in Villa Mariana. The city is just within the tropics, but its elevation above the sea gives it a temperate climate, bracing in the cool season and yet with high sun temperatures in summer. The broad eroded bed of the Tiete is swampy and is subject to extensive inundations causing malarial and intestinal disorders; otherwise the city is singularly healthy, thopgh its sanitary condition is poor. The picturesqueness of the city is heightened by the ravine of a small stream passing through it and spanned by viaducts and bridges. The city squares are commonly open places with an occasional statue but without ornamental gardens. The Public Garden, near the Sao Paulo railway station in the Luz section, is a recreation ground embellished with tropical plants and an artificial lake. The streets are well paved and lighted with gas and electricity, and have electric tramways. Although there are still many old structures and residences to be seen in the old town, most of the public and business buildings and private residences are of the modern Italian and French type. Brick is used to some extent, but the building material most used is broken stone and mortar, plastered outside, and covered with stucco mouldings and ornaments. The private residences of the city are the finest in the republic. There is much wealth in the state, especially among the large coffee planters, and the city is their favourite residence. Some of their palatial dwellings are surrounded with beautiful gardens and parks. The water- supply is derived from Cantareira hills, and there is a modern sewerage system, constructed by an English company. The more important public buildings are the new government palace, the palaces of agriculture, finance and justice, the executive residence, the immense Polytechnic School, the Normal School, the School of Agriculture, the public hospital called the Isola- mento, the charity hospital, the Sao Paulo railway station with a beautiful stone tower, and the theatre, rivalling some of the best in Europe. Like other Brazilian cities Sao Paulo has a number of old religious buildings. There are also several excellent educational and scientific institutions which are in great part supported by the state, among which are the Mackenzie College, created through the gift of an American capitalist, a school of law, a Pasteur Institute, and a bacteriological institute. The police force of the state is a military organization and con- sists of a brigade of about 5000 men (infantry, cavalry, civic guards, firemen,

and a body of hospital attendants for public emergency cases), under a colonel of the regular army. Manu- factures include textiles, footwear, clothing, food products, beer, artificial liquors, furniture, domestic utensils, &c. The Sao Paulo Light and Power Co., whose works are situated at the falls of the Tiete a considerable distance N.W. of the city, supplies about 8000 horse-power to local industries in addition to what is needed for the electric railway (108 m.), the oldest enterprise of this character in Brazil. The city has a large Italian population and many Italian shops and industries.

Sao Paulo was founded by the Jesuits under Manoel de Nobrega in 1554 and at first bore the name of Piratininga. In 1 68 1 it succeeded Sao Vicente as the capital of the captaincy. The declaration of Brazilian independence occurred on Sept. 7, 1822, on the plain of Ypiranga, near the city, where a monument commemorates the event.

SAP. (1) Juice, the circulating fluid of plants (see Plants, § Physiology). The word appears in Teutonic languages, cf. Ger. Saft, and may be connected ultimately with the root seen in Lat. sapere, taste, hence to know, cf. sapientia, wisdom, cf. Gr. s, wise. On the other hand it may, like Fr. sive, Span, saba, have come direct from Lat. sapa, must, new wine, itself also from the same root. The Gr. &kck is represented in Lat. by sucus. (2) A military term for a trench dug by a

besieging force for the purpose of approach to the point of attack when within range, hence ” to sap,” to undermine, dig away the foundations of a wall, &c. The word is derived through the Old Fr. from the Med. Lat. sapa, sappa, a spade, entrenching tool, Gr. oKairavr), ckL-kthv, to dig. (See Fortification and Siege-craft.)

SAPAN WOOD (Malay sapang), a soluble red dyewood from a tree belonging to the leguminous genus Caesalpinia, a native of tropical Asia and the Indian Archipelago. The wood is somewhat lighter in colour than Brazil wood and its other allies, but the same tinctorial principle, brazilin, appears to be common to all.

SAPPHIC METRE, Sapphics, an ancient form of quantitative verse, named after the Aeolian poetess Sappho, who is supposed to have invented it, and who certainly used it with unequalled skill. A sapphic line consists of five equal beats, of which the central one alone is of three syllables, while the others consist of two each. The original Greek sapphic was of this type: —

— kj — O — t_/ \j — ■ \j — ~ Troua I ~hb9pov’ I iffavar’ | ‘Apo |

Sira The sapphic strophe consists of three of these lines followed by an adonic, thus:—

Horace adopted, and slightly adapted, this form of verse, for some of his most engaging metrical effects. The Greek poets had per- mitted the caesura to come where it would, but Horace, to give solidity to the form, introduced the practice of usually ending a word on the fifth syllable :

jam satis terris nivis atque dirae, the second half of the sapphic leaping off, as it were, with a long syllable which connects it with the first half. This is a typical example of the Latin sapphic strophe : —

Inte[ger vi]tae sceler]isque j purus non e|get Maur[is jacu|lis ne]que arcu, nee ve|nena|tis gravi|da sa|gittis, Fusee, phar|etra. Before the days of Horace, Catullus had used this form in Latin, and afterwards sapphics were introduced by the pseudo-Seneca into his tragedies. In the middle ages the sapphic strophe was frequently employed in the Latin hymns, especially by Gregory the Great. Later on, considerable laxity was introduced, and a dactyl was frequently substituted for the first trochee; this quite destroys the true character of the measure. It makes it a more easy metre, however, for those who write modern accentuated verse. We see a loose but effective specimen of it in the famous

Needy knife | grinder! | whither | are you | going?

Rough is the | road, your | wheel is | out of [order. But nearer to the effect of the antique verse would be :

Needy | grinder! | whither oh! [are you | going?

Rough the | road ; your | destitute | wheel is | broken, although this certainly does not suit English versification so well. English sapphics were written by the Elizabethan poet, Thomas Campion (q.v.) , and by William Cowper. Mr Swinburne has attempted to create the effect of the ancient Aeolian metre in a daring and brilliant stanza. Sapphics have been written more successfully in German than in any other modern language. The earliest original German poem in the form is said to be an anonymous hymn to St Mary Magdalene, dated 1500. Voss kept strictly to the metrical scheme of the Latin in his famous translation of the Odes of Horace (1806), and among German poets who have cultivated sapphics are to be mentioned Klopstock, Platen, Hamerling and Geibel.

SAPPHIRE, 1 a blue transparent variety of corundum, or native

alumina, much valued as a gem-stone. It is essentially the same mineral as ruby, from which it differs chiefly in colour. The colour of the normal sapphire varies from the palest blue to deep indigo, the most esteemed tint being that of the blue cornflower. Many of the crystals are parti-coloured, the blue being distributed in patches in a colourless or yellow stone; but by skilful cutting, the deep-coloured portion may be caused to im- part colour to the entire gem. As the sapphire crystallizes in the hexagonal system it is dichroic, but in pale stones this character may not be well marked. In a deep-coloured stone the colour may be resolved, by the dichroscope, into an ultramarine

1 Indirectly from Gr. hpos, but there seems no doubt that this term, like the Hebrew sapir of the Old Testament, was formerly applied to what is now called lapis lazuli ; the modern sapphire was probably known as icuav9os (hyacinthus).

blue and a bluish or yellowish green. In blue tourmaline and in iolite — stones sometimes mistaken for sapphire — the dichroism is much more distinct. The blue colour in sapphire has been variously referred to the presence of oxides of chromium, iron or titanium, whilst an organic origin has also been suggested. On exposure to a high temperature, the sapphire usually loses colour, but, unlike ruby, it does not regain it on cooling. A. Verneuil succeeded in imparting a sapphire-blue colour to artificial alumina by addition of 1-5% of magnetic oxide of iron and 0-5% of titanic acid (Comptes rendus, Jan. 17, 1910). According to F. Bordas, the blue colour of sapphire exposed to the action of radium changes to green and then to yellow.

Under artificial illumination many sapphires appear dark and inky, whilst in some cases the blue changes to a violet, so that the sapphire seems to be transformed to an amethyst. According to lapidaries the hardness of sapphire slightly exceeds that of ruby, and it is also rather denser. Notwithstanding its hardness it has been sometimes engraved as a gem.

Ceylon has for ages been famous for sapphires. They occur, with many other gem-stones, as pebbles or rolled crystals in alluvial deposits of sand and gravel; the gem-gravel being known locally as Mam. The principal localities are Ratnapura, Rakwana in the province of Sabara-Gamawa and Matara. Some of the slightly- cloudy Ceylon sapphires,

usually of greyish-blue colour, display when cut with a convex face a chatoyant luminosity, sometimes forming a luminous star of six rays, whence they are called ” star- sapphires ” (see Asteria). The asterism seems due to the presence of microscopic tubular cavities, or to enclosure of crystalline minerals, arranged in a definite system. In 1875 sapphires were discovered in deposits of clay and sand in Battambang (Siam), where they have been worked on a considerable scale. They occur also with rubies in the provinces of Chantabun and Krat. Many of the Siamese sapphires are of very dark colour, some being so deeply tinted as to appear almost black by reflected light. In Upper Burma sapphires occur in association with rubies, but are much less important (see Ruby). Sapphires are also found in Kashmir, where they occur, associated with tourmaline, in the Zanskar range, especially near the village of Soomjam. Madagascar yields sapphires generally of very deep colour, occurring as rolled crystals. Sapphire is widely distri- buted through the gold-bearing drifts of Victoria, New South Wales and Queensland, but the blue colour of the Australian stones is usually dark, and it is notable that green tints are not infrequent. The Anakie sapphire-fields of Queensland are situated near Anakie station on the Central railway, to the west of Emerald and east of the Drummond Range. Sapphire occurs also in Tasmania. Coarse sapphire is found in many parts of the United States, and the mineral occurs of gem quality in North Carolina and Montana. The great corundum deposits of CorundumHill, Macon county,N.C.,have yielded good sapphires, and they are found also at Cowee Creek in the same county. In Montana, sapphires were discovered as far back as 1865, and have been worked on a large scale. They were originally found in washing for gold. The rolled crystals of sapphire occur, with garnet and other minerals, in glacial deposits, and have probably been derived from dykes of igneous rocks, like andesite and lamprophyre. They display much variety of colour, and exhibit peculiar brilliancy when cut, but are often of pale tints. The principal localities are at Missouri Bar, Ruby Bar and other places near Helena, where they were first worked, and also at Yogo Gulch, near Utica. The Helena crystals are of tabular habit, being com- posed of the basal pinacoid with a very short hexagonal prism, whilst at Yogo Gulch many of the crystals affect a rhombohedral habit. The Montana sapphires and the matrix have been described by Dr G. F. Kunz, Professor L. V. Pirsson and Dr J. H. Pratt (Amer. Jour. Sc, ser. 4, vol. iv., 1897). The sapphire occurs also in Europe, being found in the Iserweise of Bohemia and in the basalt of the Rhine valley and of Le-Puy-en-Velay in France, but the European ptones have no interest as gems.

Although the term sapphire is primarily applied to blue corundum, it

is often used in a general sense so as to include all corundum of gem quality, regardless of colour. Hence clear colourless corundum is known as white sapphire or ” leucosapphire. ” Such stones have been occasionally cut as lenses for microscopes, being recommended for such use by their high refractivity, weak dispersion and great hardness. White topaz is sometimes called ” water-sapphire,” a name which should, however, be restricted to iolite (?.».). Yellow corundum is not uncommon in Ceylon and is termed yellow sapphire or ” oriental topaz,” the prefix ” oriental ” being often applied to corundum. When of pale yellowish-green colour the sapphire is called ” oriental chrysolite,’ when greenish-blue ” oriental aqua- marine,” when of brilliant green colour ” oriental emerald,” and when violet ” oriental amethyst.” (For figure of crystal of sapphire see Corundum and for artificial sapphire see Gem, § Artificial.)

The so-called ” Hope sapphires “of trade have been shown to be artificial blue spinels, coloured by cobalt.

Sapphirine is a rare mineral, not related to sapphire except in

colour. It is a silicate, containing aluminium, magnesium and iron, brought originally from Greenland, and since found in a rock from the Vizagapatam district in India. (F. W. R.*)

SAPPHO (7th-6th centuries B.C.), Greek poetess, was a native of Lesbos, contemporary with Alcaeus, Stesichorus and Pittacus, in fact, with the culminating period of Aeolic poetry. One of her brothers, Charaxus, fell in love with a courtesan named Doricha upon whom he squandered his property. Sappho wrote an ode, in which she severely satirized and rebuked him. Another brother, Larichus, was public cup-bearer at Mytilene — a position for which it was necessary to be well born, It is said that she had a daughter, named after her grandmother Cleis, and she had some personal acquaintance with Alcaeus. He addressed her in an ode of which a fragment is preserved: ” Violet-weaving (or dark-haired), pure, sweet-smiling Sappho, I wish to say somewhat, but shame hinders me”; and she answered in another ode: ” Hadst thou had desire of aught good or fair, shame would not have touched thine eyes, but thou wouldst have spoken thereof openly.” The story of her love for the disdainful Phaon, and her leap into the sea from the Leucadian promontory, together with that of her flight from Mytilene to Sicily, has no confirmation; we are not even told whether she died of the leap or not. Critics again are agreed that Suiidas was simply gulled by the comic poets when he tells of her husband, Cercolas of Andros. Both the aspersions which these poets cast on her character and the embellishments with which they

garnished her life passed for centuries as undoubted history. Six comedies entitled Sappho and two Phaon, were produced by the Middle Comedy; but, when we consider, for example, the way in which Socrates was caricatured by Aristophanes, we are justified in putting no faith whatever in such authority. We may conclude that Sappho was not utterly vicious, though by no means a paragon of virtue. All ancient tradition and the character of her extant fragments show that her morality was what has ever since been known as " Lesbian."

At Lesbos she was head of a great poetic school, for poetry in that age and place was cultivated as assiduously and appar- ently as successfully by women as by men. Her most famous pupils were Erinna of Telos and Damophyla of Pamphylia. In antiquity her fame rivalled that of Homer. She was called " the poetess," he " the poet." Different writers style her " the tenth Muse," " the flower of the Graces," " a miracle," " the beautiful," the last epithet referring to her writings, not her person, which is said to have been small and dark.

Her poems were arranged in nine books, on what principle is un- certain; she is said to have sung them to the Mixo-Lydian mode, which she herself invented. The perfection and finish of every line, the correspondence of sense and sound, the incomparable command over all the most delicate resources of verse, and the exquisite sym- metry of the complete odes. which are extant, raise her into the very first rank of technical poetry at once, while her painting of passion, which caused Longinus to quote the ode to Anactoria as an example of the sublime, has never been since surpassed, and only approached by Catullus and in the Vita Nuova. Her fragments also bear witness to a profound feeling for the beauty of nature. The ancients also attributed to her a considerable power in satire, but in hexameter verse they considered her inferior to her pupil Erinna.

The fragments of Sappho have been preserved by other authors incidentally. Three fragments ascribed to her have been found on Egyptian papyri within recent years. The first two were published by W. Schubart in Sitzungsberichte d. konigl. preuss. Akademie d. Wissenschaften (1902), i. 195 and re-edited (with bibliography) in the Berliner Klassikertexte, v. 2 (1907) ; the third, discovered in 1879, and attributed to Sappho by Blass, is re-edited in the Berlin. Klass. v. For these three fragments see especially J. M. Edmonds, in Classical Review (June, 1909), pp. 99-104 (text, trans., comment.) and on the text of the " Ode to the Nereids " in Classical Quarterly (October, 1909). The poems were separately edited with translation by Wharton (3rd ed., 1895) ; also in H. Weir Smyth's Greek Melic Poets (1900).

See also P. Brandt, Sappho (Leipzig, 1905); B. Steiner, Sappho (1907). (J. A. PL.)

SAPPORO, the official capital of the island of Yezo, Japan, situated in 43 4′ N. and 141° 21′ E. Pop. 39,000. It was chosen in 1870, and owed its prosperity at the outset chiefly to the public institutions established by the Japanese government in con- nexion with the colonization bureau, which had for its object the development of the resources of Yezo. It is now a garrison town

and has an agricultural college, a museum, saw-mills, flour-mills, breweries, and hemp and flax factories.

SARABAND (Ital. Sarabanda, Zarabanda; Fr. Sarabaride), a slow dance, generally believed to have been imported from Spain in the earlier half of the 16th century, though attempts have been made to trace it to an Eastern origin. The most probable account of the word is that the dance was named after Zarabanda, a celebrated dancer of Seville. During the 16th and 17 th centuries the saraband was exceedingly popular in Spain, France, Italy and England. Its music was in triple time — generally with three minims in the bar— and almost always con- sisted of two strains, each beginning upon the first beat, and most frequently ending on the second or third. Many very fine examples occur in the Suites and Partitas of Handel and J. S. Bach; by far the finest is that which Handel first composed for his overture to Almira, and afterwards adapted to the words ” Lascia, ch’io pianga,” in Rinaldo.

SARACCO, GIUSEPPE (1821-1907), Italian politician and financier, and knight of the Annunziata, was born at Bistagno on the 9th of October 182 1, and, after qualifying as an advocate, entered the Piedmontese parliament in 1849. A supporter of Cavour until the latter’s death he joined the party of Rattazzi and became under-secretary of state for public works in the Rattazzi cabinet of 1862. In 1864 he was appointed, by Sella, secretary-general of finance, and after being created senator in 1865, acquired considerable fame as a financial authority. In 1879 he succeeded in postponing the total abolition of the grist tax, and was throughout a fierce opponent of Magliani’s loose financial administration. Selected as minister of public works by Depretis in 1887, and by Crispi in 1893, he contrived to mitigate the worst consequences of Depretis’s corruptly extravagant

policy, and introduced a sounder system of govern- ment participation in public works. In November 1898 he was elected president of the senate, and in June 1900 succeeded in forming a ” Cabinet of pacification ” after the Obstructionist crisis which had caused the downfall of General Pelloux. His term of office was clouded by the assassination of King Humbert (29th July 1900), and his administration was brought to an end in February 1901 by a vote of the chamber condemning his weak attitude towards a great dock strike at Genoa. After his fall he resumed his functions as president of the senate; but on the advent of the third Giolitti cabinet, he was not reappointed to that position. He died on the 19th of January 1907. He received the supreme honour of the knighthood of the Annunziata from King Humbert in 1898.

SARACENS, the current designation among the Christians in the middle ages for their Moslem enemies, especially for the Moslems in Europe. In earlier times the name Saraceni was applied by Greeks and Romans to the nomad Arabs of the Syro-Arabian desert who harassed the frontier of the empire. XapaKijvfi, a district in the Sinaitic peninsula, is mentioned by Ptolemy (v. 16). Its inhabitants, though unknown to Arab tradition, made themselves notorious in the adjacent Roman provinces. Thus all Bedouins in that region came to be called Saraceni, in Aramaic Sarkaje, usually with no very favourable meaning. The latter form occurs in a dialogue concerning Fate written about a.d. 210 by a pupil of Bardesanes (Cureton, Spicilegium Syriacum, 16 ult.). The appellation then became general, and occurs frequently in Ammianus Marcellinus. The name ” Saracen ” continued to be used in the West in later times, probably rather through the influence of literature than by oral tradition, and was applied to all Arabs, even to all Moslems.

SARAGHARI, a small signalling post on the Samana Range in the North-West Frontier Province of India between Forts Lockhart and Gulistan. It is memorable for the stout defence made by its garrison of 21 sepoys of the 36th Sikhs in 1897. Saraghari, a mere mud block-house with a wooden door and a dead-angle, was held for six and a half hours against seven or eight thousand Orakzais, till the 21 Sikhs were finally over- whelmed and killed to a man. A memorial in commemoration was unveiled at Ferozepore in 1904.

SARAGOSSA (Zaragoza), an inland province of northern Spain, one of the three into which Aragon was divided in 1833; bounded on the N. by Logrono and Navarre, N.E. and E. by Huesca, S.E. by Lerida and Tarragona, S. by Teruel and Guadala- jara and W. by Soria. Pop. (1900) 421,843; area, 6726 sq. m. Saragossa belongs wholly to the

basin of the Ebro (q.v.). The main valley is bounded on the south-west by the Sierra de Moncayo (with the highest elevation in the province, 7707 ft.), and is continued in a south-easterly direction by the lower sierras of La Virgen and Vicor; on the north-west are the spurs of the Pyrenees. The principal tributaries of the Ebro within the province are the Jalon {q.v.), Huerva and Aguas on the right and the Arba and Gallego on the left; the Aragon also, which flows principally through Navarre, has part of its course in the north of this province. At its lowest point, where the Ebro quits it, Saragossa is only 105 ft. above sea-level. There are large tracts of barren land, but where water is abundant the soil is fertile; its chief productions are wheat, rye, barley, oats, hemp, flax, oil and wine. Silkworms are bred; and on the higher grounds sheep are reared. The manufactures are less important than the agricultural interests. Since 1885, however, the Aragonese have bestirred themselves, especially since the extremely protectionist policy of 1890 gave great impetus to native industries all over Spain. The industries include iron- founding and manufactures of paper, leather, soap, brandies, liqueurs, machinery, carriages of all sorts, railway material, pianos, beds, glass, bronze, chocolate, jams and woollen and linen goods. Much timber is obtained from the Pyrenean forests; the chief exports are live stock, excellent wines, flour, oil and fruit. The province contains important mineral resources, the bulk of which, however, await development.

Saragossa is traversed by the Ebro Valley Railway ,“which connects Miranda with LeYida, Barcelona and Tarragona, and has a branch to Huesca; it also communicates via Calatayud with Madrid and Sagunto; and there are local lines to Carinena (south-west from Saragossa) and to Tarazona and Borja (near the right bank of the Ebro). The only towns with upwards of 5000 inhabitants in 1900 were Saragossa (99, 1 1 8)and Calatayud (n ,526) (see separate articles) ; Tarazona (8790), an episcopal see, with a curious 13th-century cathedral; Caspe (7735); and Borja (5701), the original home of the celebrated family of Borgia (q.v.). (For an account of the imperial canal, and of the inhabitants and history of this region, see Aragon.)

SARAGOSSA (Zaragoza), the capital of the Spanish province of Saragossa and formerly of the kingdom of Aragon, seat of an archbishop, of a court of appeal, and of the captain-general of Aragon; on the right bank of the river Ebro, 212 m. by rail N.E. of Madrid. Pop. (1900) 99,118. Saragossa is an important railway junction; it is connected by direct main lines with Valladolid, Madrid and Valencia in the west and south, and by the Ebro Valley Railway with Catalonia and the Basque Pro- vinces; it is also the starting-point of railways to the northern districts of Aragon and to Carinena on the south-west.

The city is built in an oasis of highly cultivated land, irrigated by a multitude of streams which distribute the waters of the Imperial Canal, and surrounded by an arid plain exposed to the violent gales which blow down, hot in summer and icy in winter, from the Castilian plateau. The monthly range of temperature frequently varies by as much as 50° Fahr., and the climate is rarely pleasant for many consecutive days except in spring, when warm easterly winds blow from the Mediterranean. The city is surrounded by gardens, farms and country-houses (locally known as torres, ” towers “). Seen from a distance it has a fine appearance owing to the number of its domes and towers; on a nearer approach it presents a remarkable contrast between the older streets, narrow, gloomy, ill-paved and lined with the fortress-like palaces of the old Aragonese nobility, and the business and residential quarters, which are as well built as any part of Madrid or Barcelona. Saragossa is thus in appear- ance at once one of the oldest and one of the newest of Spanish cities.

One of its two stone bridges, the seven-arched Puente de Piedra, dates from 1447; there is also an iron bridge for the railway to Pamplona. Beside the river there are public walks and avenues of poplar; the suburb On the left bank is named Arrabal. The two most important buildings of Saragossa are its cathedrals, to each of

which the chapter is attached for six months in the year. La Seo (” The See “) is the older of the two, dating chiefly from the 14th century ; its prevailing style is Gothic, but the oldest portion, the lower walls of the apse, is Byzantine. The Iglesia Metropolitana del Pilar is the larger building, dating only from the latter half of the 17th century; it was built after designs by Herrera el Mozo, and owes it name to one of the most venerated objects in Spain, the ” pillar ” of jasper on which the Virgin is said to have alighted when she manifested herself to St James as he passed through Saragossa. It has little architectural merit; externally its most conspicuous features are its cupolas, which are decorated with rows of green, yellow and white glazed tiles. The church of San Pablo dates mainly from the 13th century. The Torre Nueva, an octangular clock tower in diapered brickwork, dating from 1504, was pulled down in 1892; it leaned some 9 or 10 ft. from the perpendicular, owing to faulty foundations, which ultimately rendered it unsafe. Among other conspicuous public buildings are the municipal build- ings, the exchange (Lonja), and the civil and military hospitals and almshouse (Hospicio provincial), which are among the largest in

Spain. The university was founded in 1474, but its history has not been brilliant. To the west of the town is the Aljaferia or old citadel, originally built as a palace by the Moors and also used as such by its Christian owners. Late in the 15th century it was assigned by Ferdinand and Isabella to the Inquisition, and has since been used as a military hospital, as a prison and as barracks. Saragossa is the headquarters of a large agricultural trade; its industries include iron-founding, tanning, brewing, distillation of spirits, and manu- factures of machinery, candles, soap, glass and porcelain.

History. — Saragossa (Celtiberian, Salduba) was made a colony by Augustus at the close of the Celtiberian War (25 B.C.), and renamed Caesar ea Augusta or Caesaraugusta, from which ” Saragossa ” is derived. Under the Romans it was a highly privileged city, the chief commercial and military station in the Ebro valley, and the seat of one of the four conventus juridici (assizes) of Hither Spain. It is now, however, almost destitute of antiquities dating from the Roman occupation. It was captured in 452 by the Suebi, and in 476 by the Visigoths, whose rule lasted until the Moorish conquest in 712, and under whom Saragossa was the first city to abandon the Arian heresy. In 777 its Moorish ruler, the viceroy of Barcelona, appealed to Charlemagne for aid against the powerful caliph of Cordova, Abd-ar-Rahman I. Charlemagne besieged the Cordovan army in Sarkosta, as the city was then called; but a rebellion of his Saxon subjects compelled him to withdraw his army, which suffered defeat at Roncesvalles (q.v.), while recrossing the Pyrenees. The Moors were finally expelled by Alphonso I. of Aragon in 11 18, after a siege lasting nine months in which the defenders were reduced to terrible straits by famine. As the capital of Aragon, Saragossa prospered greatly until the second half of the 15th century, when the marriage between Ferdinand and Isabella (1469) resulted in the transference of the court to Castile. In 1710 the allied British and Austrian armies defeated the forces of Philip V. at Saragossa in the war of the Spanish Succession; but it was in the Peninsular War (q.v.) that the city reached the zenith of its fame. An ill-armed body of citizens, led by Jose de Palafox y Melzi (see Palafox), whose chief lieutenants were a priest and two peasants, held the hastily-entrenched city against Marshal Lefebvre from the 15th of June to the 15th of August 1808. The siege was then raised in consequence of the reverse suffered by the French at Bailen (q.v.), but it was renewed on the 20th of December, and on the 27th of January the invaders entered the city. Even then they encountered a desperate resistance, and it was not until the 20th of February that the defenders were compelled to capitulate, after more than three weeks of continuous street fighting. About 50,000 persons, the

majority non-combatants, perished in the city, largely through famine and disease. Among the defenders was the famous ” Maid of Saragossa,” Maria Agustin, whose exploits were described by Byron in Childe Harold (1, 55 sqq.).

SARAGOSSA, COUNCILS OF (Concilia Caesaraugustana). In or about 380 a council of Spanish and Aquitanian bishops adopted at Saragossa eight canons bearing more or less directly on the prevalent heresy of Priscillianism. A second council, held in 592, solved practical problems incident to the recent conversion of the West Goths from Arianism to orthodox Christianity. The third council, in 691, issued five canons

on discipline. In 13 18 a provincial synod proclaimed the elevation of Saragossa to the rank of an archbishopric; and from September 1565 to February 1566 a similar synod made known the decrees of Trent.

H. T. Bruns, Canones apostolorum et conciliorum saeculorum iv., v., vi., vii., pars altera (Berlin, 1839) ; P. B. Gams, Die Kirchengeschichte von Spanien (Regensburg, 1862-1879). (W. W. R.*)

SARAN, a district of British India, in the Tirhut division of Bengal. Area, 2674 sq. m. It is a vast alluvial plain, possess- ing scarcely any undulations, but with a general inclination towards the south-east, as indicated by the flow of the rivers in that direction. The principal rivers, besides the Ganges, are the Gandak and Gogra, which are navigable throughout the year. The district has long been noted for its high state of cultivation. It yields large crops of rice, besides other cereals, pulses, oil seeds, poppy, indigo and sugar-cane.

The population in 1901 was 2,409,509, showing a decrease of 2-2 , compared with an increase of 7-4 in the previous decade. The average density of population, 901 per square mile, is the, highest rate for all India. The indigo industry, formerly of the first import- ance, has declined, and sugar refining has in great part taken its place. Some saltpetre is produced, and shellac is manufactured, Saran is exposed to drought and flood. It suffered from the famine of 1874, and again in 1896-1899. An irrigation scheme from the river Gandak, started in 1878, proved a failure, after’ a capital ex- penditure of Rs. 7,00,000. The Bengal North-Western railway runs through the south of the district. The administrative headquarters are at Chapra.

See Saran District Gazetteer (Calcutta, 1908).

SARAPUL, a town of N. Russia, in the government of Vyatka, on the

river Kama, 333 m. by river E.N.E. of Kazan and 266 m. S.W. of Perm. Pop. (1855) 12,367; (1897) 21,395. Boots, shoes and ‘gloves are manufactured, the first-named being mostly exported to Siberia, Caucasia and Turkestan. It has also tanneries, flax mills, distilleries, ironworks and rope-works, and is a busy river-port, trafficking in corn and timber. There are a lace-making school and a municipal library.

SARASATE Y NAVASCUES, PABLO MARTIN MELITON DE (1844-1908), Spanish violinist, was born at Pamplona on the 10th of March 1844. From his early years he displayed his aptitude for the violin, and at the age of 12 he began to study under Alard at the Paris Conservatoire. His first public appear- ance as a concert violinist was in i860. He played in London in 1861, and in the course of his career he visited all parts of Europe and also both North and South America. His artistic pre-eminence was due principally to the purity of his tone, which was free from any tendency towards sentimentality and rhapsodic mannerism, and to the astonishing facility of execution which made him in the best sense of the word a virtuoso. Al- though in the Beethoven and Mendelssohn concertos, and in modern French and Belgian works, his playing was unrivalled, his qualities were most clearly revealed in the solos which he himself composed, which were ” the spirit of Spanish dance translated into terms of the violin virtuoso.” Sarasate died at Biarritz on the 20th of September 1908.

SARASIN, or Sarrazin, JEAN FRANCOIS (16117-1654), French author, son of Roger Sarasin, treasurer-general at Caen, was born at Hermanville near Caen. He was educated at Caen, and settled in Paris. As a writer of vers de sociite he rivalled Voiture, but he was never admitted to the inner circle of the h6tel de Rambouillet. He was on terms of intimate friendship with Scarron, with whom he exchanged verses, with Menage, and with Pellisson. In 1639 he supported Georges de Scudery in his attack on Corneille with a Discours de la tragidie. He accompanied Leon Bouthillier, comte de Chavigny, secretary of state for foreign affairs, on various diplomatic errands. He was to have been sent on an embassy to Rome, but spent the money allotted for the purpose in Paris. This weakened his position with Chavigny, from whom he parted in the winter of 1643-1644. To restore his fallen fortunes he married a rich widow, but the alliance was of short duration. He joined in the pamphlet war against Pierre de Montmaur, against whom he directed his satire, Bellum parasiticum (1644). He was accused of writing satires on Mazarin, and for a short time gave up the practice of verse. In 1648, supported by the cardinal

de Retz and Madame de Longueville, he entered the household of Armand de Bourbon, prince de Conti, whose marriage with Mazarin's niece he helped to negotiate. He died of fever at Pezenas, in Languedoc on the 5th of December 1654. His biographers have variously stated on inadequate evidence that his death was caused by the prince de Conti in a moment of passion, or that he was poisoned by a jealous husband. The most considerable of his poems were the epic fragments of Rollon conquerant, la guerre espagnole, with Dulot vaincu and the Pompe funebre in honour of Voiture. As a poet he was overrated, but he was the author of two excellent pieces of prose narration, the Hisloire du siege de Dunkerque (1649) and the unfinished Conspiration de Walstein (1651). The Walstein has been compared for elegance and simplicity of style to Voltaire's Charles XII.

His CEuvres appeared in 1656, Nouvelles CEuvres (2 Vols.) in 1674. His Poesies were edited in 1877 by Octave Uzanne with an introductory note. Much of his correspondence is preserved in the library of the Arsenal, Paris. See Albert Mennung's Jean Francois Sarasins Leben und Werke (2 vols., Halle, 1902-1904).

SARASUATI, in early Hindu mythology, a river-goddess; in later myths the wife of Brahma, goddess of wisdom and science, mother of the Vedas, and inventor of the Devanagari letters. There has been much dispute as to the stream of which she is a personification. Some have identified it with the Avestan river, Haragaiti, in Afghanistan, while others think the term a general one for any great river, and in particular the sacred name for the Indus, Sindhu being the popular one.

Two small but sacred rivers in India are still called Saraswati, one in the Punjab and the other in Gujarat, both of which ultimately lose themselves in the sand. According to one legend, the Punjab river reappears to unite with the Ganges and Jumna at Allahabad. From this river is derived the name of the Sarswat Brahmans, the most numerous and influential of the priestly class in the Punjab, with whom the Gaur Sarswats or Shenvis of the Konkan claim connexion.

SARATOGA, BATTLES OF. The British campaign for the year 1777 in America (see American War of Independence) involved the operations of two armies moving from opposite and distant points. The lack of co-operation between the two led to the loss of one of them. This was General Burgoyne's force of 7000 men which marched from Canada in June 1777 with the view of reaching the upper Hudson and

combining with British troops from New York to isolate New England from the colonies below. Lord Howe, commander-in-chief of the British in America, who had received no instructions binding him in detail to co-operate with Burgoyne, moved southward and captured Philadelphia. In drawing Washington after him he claimed to be assisting Burgoyne. Burgoyne pushed down by way of Lakes Champlain and George and approached the American army under General Horatio Gates in its fortified camp near Stillwater on the W. bank of the Hudson, about 24 m. N. of Albany. On the 19th Burgoyne attacked the American left under General Benedict Arnold. The battle, fought in densely wooded country till nightfall, was severe but indecisive. The British suffered heavy losses, especially in officers. This is variously known as the First Battle of Saratoga, the Battle of Freeman's Farm, the First Battle of Bemis Heights or the First Battle of Stillwater. Burgoyne fortified himself on the site of the action, and on October 7th made another attempt to turn the American left. An engagement still more severe than that of the 19th, known as the Second •Battle of Saratoga, followed, in which the Americans under Benedict Arnold, E. Poor and D. Morgan drove the enemy into their works. Among many British officers killed was Brigadier-General Simon Fraser, who had been the life of the expedition. Crippled to an alarming extent, Burgoyne re- treated. He was closely followed and harassed, and on the 16th of October nearly surrounded. On the 17th he surrendered, with about 6000 men, near the present village of Saratoga Springs.

See W. L. Stone, Campaign of Lieut.-Gen. John Burgoyne (Albany,

1877).

SARATOGA SPRINGS, a village of Saratoga county, New York, U.S.A., about 38 m. N. of Albany, and about 12 m. W. of the Hudson river. Pop. (1900) 12,409, of whom 1684 were foreign-born and 619 were negroes; (1910) 12,693.

Saratoga Springs is served by the Delaware & Hudson and the Boston & Maine railways and by several interurban electric lines. The village is in a region of great historic interest, is famous for its medicinal mineral springs, and has long been one of the most popular watering places in America. Its hotels accommo- date more than 20,000 guests. Of the hotels, the best known are the United States, Congress Hall, the Grand Union and the American-Adelphi. The springs, of which there are more than forty, were known in colonial times.

The waters, all having the same ingredients but in varying pro-

portions, are heavily charged with carbonic acid gas, and contain considerable quantities of bicarbonates of lime and magnesium, and chloride of sodium. They rise in a stratum of Potsdam sandstone, underlaid by Laurentian gneiss, &c, and reach the surface after passing through a bed of blue clay. The most noteworthy springs are Congress, Vichy, Arondack, Hathorn, Patterson, High Rock, Put- nam, Star, Red, Lincoln, Victoria, Carlsbad and Geyser. Some of the springs originally rose above the surface by their own force, but with the boring of new springs and the pumping for carbonic acid gas south of the village the pressure was greatly lessened; the courts interfered to stop the pumping and it was prohibited by the state legislature. These measures, however, were not effective, and in May 1909 an act was passed establishing a state reservation at Saratoga, creating a commission of three to select the lands to be taken over by the state, and providing for an issue of bonds for $600,000 to buy the springs. Saratoga Lake, a beautiful body of water 6 m. long and I m. wide, 33 m. south-east of the village, is a favourite resort.

The streets are well-shaded and broad, with side stretches of lawn between the sidewalk and the curb. There is a speedway and a famous race-track, where there are annual running races. In the village are Woodlawn Park (1200 acres), a town-hall, a state armoury, a public library, several theatres and a number of private hospitals and sanatoriums. The Convention Hall has been the meeting place of many conventions; near it is a re- production of the House of Pansa at Pompeii, built by Franklin W. Smith. The principal business is the bottling and shipping of the mineral waters which are sold in large quantities and exported to many foreign countries. Among the manufactures are patent medicines, druggists' preparations and chemicals, silk gloves, textiles, foundry products and boilers and engines. In 1905 the value of the factory product was $1,709,073, an increase of 28-1% since 1900.

The Saratoga country was a favourite summer camping ground of the Iroquois, particularly the Mohawks, who were attracted thither by the medicinal value of the springs long before Europeans visited the region. The Indian name, " Sa-ragh-to-ga " or " Se-rach-ta-gue," is said to have meant " hillside country of the great water " or " place of the swift water." The district became during the colonial wars a theatre of hostilities between the French and English colonists and their Indian allies. In 1693 a French expedition was checked in a sharp conflict near Mt M°Gregor by an English and colonial force under Governor Benjamin Fletcher and Peter Schuyler. Early in the 18th century the region along the upper Hudson began to be settled, the settlement on the Hudson at the mouth of the Fishkill, directly east of the present

Saratoga Springs, being known first as Saratoga (later ” Old Saratoga “) and finally as Schuylerville (pop. in 1905, 1529), in honour of the Schuyler family. Upon the settlement the French and Indians descended in 1745, and massacred many of the inhabitants. After the close of the Seven Years’ War, there was a new influx of settlers. Near Stillwater (pop. in 1905, 973), about 5 m. south-east of the present village, the battles of Saratoga (q.v.) were fought during the War of Independence. On the site of the present village a small log lodging house for the reception of visitors was built in 1771. After the close of the War of Independence, the fame of the Springs as a health resort spread abroad, and many sought them annually. In 1791 Gideon Putnam (1764-1812), a nephew of Major-General Israel Putnam, bought a large tract of land here; he built the first inn (on the site of the present Grand Union Hotel). Other hotels were erected within the next few years; between 1820 and 1830, by which time the Springs had become one of the most popular of American resorts, several large barn- like wooden hotels were constructed; and Saratoga Springs was incorporated as a Village in 1826.

See G. G. Scott and J. S. L’Amoreaux, History of Saratoga County (New York, 1876), N. B. Sylvester, History of Saratoga County (Philadelphia, 1878), and G. B. Anderson, Saratoga County (New York, 1899).

SARATOV, a government of south-eastern Russia, on the right bank of the lower Volga, having the governments of Penza and Simbirsk on the N., Samara and Astrakhan on the E. and the Don Cossacks territory and the governments of Voronezh and Tambov on the W. The area is 32,614 sq. m. The govern- ment has an irregular shape; and a narrow strip 140 m. long and 20 to 45 m. wide, extending along the Volga as far south as its Sarepta bend, separates the river from the territory of the Don Cossacks.

Saratov occupies the eastern part of the great central plateau of Russia, which slopes gently towards the south until it merges im- perceptibly into the steppe region ; its eastern slope, deeply cut into by ravines, falls abruptly towards the Volga. As the higher parts of the plateau range from 700 to 900 ft. above the sea, while the Volga flows at an elevation of only 20 ft. at Khvalynsk in the north, and is 48 ft. below sea-level at Sarepta, the steep ravine-cut slopes of the plateau give a hilly aspect to the banks of the river In the south, and especially

in the narrow strip above mentioned, the country assumes the characteristics of elevated steppes, intersected by waterless ravines.

Every geological formation from the Carboniferous up to the Miocene is represented in Saratov; the older formations are, how- ever, mostly concealed under the Cretaceous, whose fossiliferous marls, flint-bearing clays and iron-bearing sandstones cover ex- tensive areas. The Jurassic deposits seldom crop out from beneath them. Eocene sands, sandstones and marls, abounding in marine fossils and in fossil wood, extend over wide tracts in the east. The boulder-clay of the Finland and Olonets ice-sheet penetrates as far south-east as the valleys of the Medvyeditsa and the Sura; and extensive layers of loess and other deposits of the Lacustrine or Post- Glacial period emerge in the south-east and elsewhere above the Glacial deposits. Iron-ore is abundant ; chalk, lime and white pottery clay are extracted to a limited extent. The mineral waters at Sarepta, formerly much visited, have been superseded in public favour by those of Caucasia.

Saratov is well drained, especially in the north. The Volga separates it from the governments of Samara and Astrakhan for a length of 560 m. ; its tributaries are but small, except the Sura, which rises in Saratov, and serves for the northward transit of timber. The tributaries of the Don are more important : the upper Medvyeditsa and the Khoper ; which both have a southward course parallel to the Volga and drain Saratov each for about 200 m., are navigated notwithstanding their shallows, ready-made boats being brought in separate pieces from the Volga. The Ilovlya, which flows in the same direction into the Don, is separated from the Volga by a strip of land only 15 m. wide; Peter the Great proposed to utilize it as a channel for connecting the Don with the Volga, but the idea has never been carried out, and the two rivers are now connected by the railway (45 m.) from Tsaritsyn to Kalach which crosses the southern extremity of Saratov. The region is rapidly drying up, and the forests diminishing. In the south, about Tsaritsyn, they have almost wholly disappeared. In the north they still occupy more than a third of the surface, the aggregate area under wood being reckoned at nearly 13 % of the total. The remainder is distri- buted as follows: arable land, 58%; prairies and pasture lands, 19 %. Such is the scarcity of timber that the peasants' houses are made of clay, the corner posts and door and window frames being largely shipped from the wooded districts of the middle Volga. The climate is severe and continental. The average yearly tempera- tures are 41-5° at Saratov (January, 12-4°; July, 71-5°) and 44-4° at Tsaritsyn (January, 13-2 ; July, 74-6). The average range of temperature is as much as 1 19°. The Volga is frozen for an average of 162 days at Saratov and 153 days at Tsaritsyn. The soil is very fertile, especially in the north,

where a thick sheet of black-earth covers the plateaus; sandy clay and saline clay appear in the south.

The population numbered 2,113,077 in 1882 and 2,419,884 in 1897. The density in the different districts in 1897 varied from 55 to 107 inhabitants per sq. m., and the urban population amounted to 319,918; the female population numbered 1,230,957. The estimated population in 1906 was 2,862,600. There are a few Germans, a fair number of Mordvinians, Chuvashes and Tatars, but nearly all the rest are Russians; 83% belong to the Orthodox Greek Church, 5 % are Nonconformists, 6 % Lutherans and 2 % Roman Catholics. The government is divided into ten districts, the chief towns of which, with their populations in 1897, are Saratov (?.».), Atkarsk (9750), Balashov (12,160), Kamyshin (16,834), Khvalynsk (15,455), Kuznetsk (21,740), Petrovsk {13,212), Serdobsk (12,721), Tsaritsyn (67,650 in 1900) and Volsk (27,572 in 1900). Education makes some progress: in

1897, 40% of the military recruits were able to read, as against 21% in 1874. The proportion of illiterate women, however, continues very large. Of the total area, 52% belonged to the peasants in 1896, 38% to. private landowners, 5% to the crown and 5% to the imperial family and the municipal authorities; the peasants, however, are constantly buying land in considerable quantities. Green crops are being cultivated more widely, both on the private estates and among the peasants. Agriculture suffers, however, very much from droughts, and the attacks of marmots, mice and insects. The principal crops are wheat, rye, oats, barley, potatoes and beetroot, with some tobacco and fruit. Oil-yielding plants are cultivated; linseed in all districts except Tsaritsyn; and mustard, both for grain and oil, exten- sively about Sarepta and in the Kamyshin district. Gardening is a considerable source of income around Saratov, Volsk, Atkarsk and Kamyshin, the cucumbers, melons and water-melons being specially famous. Fishing and the preparation of caviare are of some importance at Kamyshin and elsewhere. Live-stock breeding is declining. On the other hand, the export trade in poultry, especially geese, has developed greatly. The factories comprise mainly steam flour-mills, oil-works, distilleries, oil- mills, timber-mills, tanneries, fur-dressing works and tobacco factories. Weaving, the fabrication of agricultural machinery and pottery, boot-making, &c, are carried on in the villages. The fairs of the government have lost much of their importance; that at Bekovo, however, in the district of Serdobsk, has held its ground, especially as regards cattle and animal products. The peasants are no better off than those of the other govern- ments of south-east Russia (see Samara). Years of scarcity are common, and many peasants leave their homes in search of work on the Volga and elsewhere. An active trade is carried

on in corn, hides, tallow, oils, exported; the merchants of Saratov, moreover, are intermediaries in the trade between south- east Russia and the central governments. The chief ports are Saratov, Tsaritsyn, Kamyshin and Khvalynsk. The German colony of Sarepta is a lively little town with 5650 inhabitants, which carries on an active trade in mustard, woollen cloth and manufactured wares.

The district of Saratov has been inhabited since at least the Neo- lithic period. The inhabitants of a later epoch have left nunlerous bronze remains in their kurgans (burial-mounds), but their ethno- logical position is still uncertain. In the 8th and 9th centuries the semi-nomad Burfases peopled the territory and recognized the authority of the Khazar princes. Whether the Burtases were the ancestors of the Mordvinians has not yet been determined. At the time of the Mongol invasion in 1239-1242, the Tatars took possession of the territory, and one of their settlements around the khan's palace at Urek, 10 m. from Saratov, seems to have had some im- portance, as well as those about Tsaritsyn and Dubovka. The Crimean Tatars devastated the country in the 15th century, and after the fall of Kazan and Astrakhan the territory was annexed to Moscow. Saratov and T sar itsyn, both protected by forts, arose in the second half of the 1 6th century. Dmitrievsk (now Kamyshin) and Petrovsk were founded about the end of the 17th century, and a palisaded wall was erected between the Volga and the Don. Regular colonization may be said to have begun only at the end of the 18th century, when Catherine II. called back the runaway dis- senters, invited German colonists and ordered her courtiers to settle here their serfs, deported from central Russia.

(P. A. K.; J. T. Be.)

SARATOV, a town of Russia, capital of the government of the same name, on the right bank of the Volga, 532 m. by rail S.E. of Moscow. It is one of the most important cities of eastern Russia, and is picturesquely situated on the side of hills which come close down to the Volga. One of these, the Sokolova (560 ft.), is liable to frequent landslips, and is a continual source of danger. The city is divided into three parts by two ravines; the outer two may be considered as suburbs. A large village, Pokrovsk (pop. 20,000), situated on the opposite bank of the Volga, though in the government of Samara, is in reality a suburb of Saratov. Apart from this suburb, Saratov had in 1882 a population of 112,430 (49,660 in 1830, and 69,660 in 1859), and 143,431 in 1900. It is the see of an Orthodox Greek bishop and of a Roman Catholic bishop, and is better built than many towns of central Russia. Its old cathedral (1697) is a very plaip structure, but the new one, completed in 1825, is fine, and has a

striking campanile. The theatre and the railway station are also fine buildings. The streets are wide and regular, and there are several broad squares. A new fine-art gallery was erected in 1884 by the painter Bogolubov, who bequeathed to the city his collection of modern pictures and objects of art. A school of drawing and the public library are in the same building, the Radishchev Museum.

Agriculture and gardening support a section of the population. The cultivation of the sunflower deserves special mention. Of the manufacturing establishments the distilleries rank first in import- ance ; next come the liqueur factories, flour-mills, oil-works, railway workshops and tobacco-factories. The city has a trade not only in corn, oil, hides, tallow, woollen cloth, wool, fruits and various raw produce exported from Samara, but also in salt from the Crimea and Astrakhan, in iron from the Urals and in wooden wares from the upper Volga governments. Saratov also supplies south-eastern Russia with manufactured articles and grocery wares imported from centra! Russia. The shallowness of the Volga opposite the town and the immense shoals along its right bank are, however, a great drawback to its usefulness as a river-port.

The town of Saratov was founded at the end of the 16th century, on the left bank of the Volga, some 7 m. above the present site, to which it was removed about 1605. The place it now occupies (Sary-tau or Yellow Mountain) has been inhabited from remote antiquity. Although founded for the maintenance of order in the Volga region, Saratov was several times pillaged in the 17th and 18th centuries. The peasant leader Stenka Razin took it, and his followers kept it until 1671 ; the insurgent Cossacks of the Don pillaged it in 1708 and the rebel Pugachev in 1774.

SARAVIA, ADRIAN (1531-1613), theologian, was born at Hesdin, Pas-de-Calais, of a Spanish father and Flemish mother, both Protestants. He entered the ministry at Antwerp, had a hand in the Walloon Confession and gathered a Walloon con- gregation in Brussels. He migrated to the Channel Islands early in the reign of Elizabeth; and, after a. period as schoolmaster, officiated (1564-1566) at St Peter's, Guernsey, then under Presbyterian discipline. Subsequently he held the mastership of the grammar school at Southampton, and in 1582 was professor of divinity and minister of the reformed church at Leiden. From Leiden he wrote (9 June 1585) to Lord Burghley

advising the assumption of the protectorate of the Low Countries by Elizabeth. He became domiciled in England in 1587—1588, leav- ing Holland on the discovery of his complicity in a political plot, and was appointed (1 588) rector of Tattenhall, Staffordshire. His first work, De diversis gradibus ministrorum Evangelii (1590; in English, 1592, and reprinted), was an argument for episcopacy, which led to a controversy with Theodore Beza, and gained him incorporation (9 June 1590) as D.D. at Oxford, and a prebend at Gloucester (22 Oct. 1591). On 6th December 1595 he was admitted to a canonry at Canterbury (which he resigned in 1602), and in the same year to the vicarage of Lewisham, Kent, where he became an intimate friend of Richard Hooker, his near neighbour, whom he absolved on his deathbed. He was made prebendary of Worcester (1601) and of Westminster (5 July 1601). In 1604, or early in 1605, he presented to James I. his Latin treatise on the Eucharist, which remained in the Royal Library unprinted, till in 1885 it was published (with translation and introduction) by Archdeacon G. A. Denison. In 1607 he was nominated one of the translators of the Authorised Version of

161 1, his part being Genesis to end of Kings ii. On the 23rd of March 1610 he exchanged Lewisham for the rectory of Great Chart, Kent. He died at Canterbury on the 15th of January

161 2, and was buried in the cathedral on the 19th of January. See the particulars collected in Denison's " Notice of the Author "

prefixed to De sacra eucharislia. (A. Go. *)

SARAVIA, a town of the province of Negros Occidental, island of Negros, Philippine Islands, on the N.W. coast and the coast road, 16 m. N.N.E. of Bacolod, the capital. Pop. (1903) 13,132. The town is in a rich sugar-producing region, and sugar culture is the only important industry. The language is Panay- Visayan.

SARAWAK, a state situated in the north-west of Borneo; area , 55,000 sq. m.; pop. about 500,600. The coast line extends from Tanjong Datu, a prominent cape in 2 3′ N., northwards to the mouth of the river Lawas 5 10′ N. and 1 1 5 30′ W., the whole length of the coast line being about 440 m. in a straight line;

but a tract, 80 m. in length, of Brunei territory still remains between the mouths of the Baram and Limbang rivers. The frontier of the southern portion of Sarawak is formed by the Serang, Kelingkang and Batang Lupar ranges of mountains.

The inland or eastern boundary is formed by the broken range of mountains which constitutes the principal watershed of the island. Of these the highest peaks are: Batu Puteh (5400 ft.), Tebang (10,000 ft.), Batu Bulan (7000 ft.), Ubat Siko (4900 ft.), Bela Lawing (7000 ft.) and Batu Leihun (6000 ft.), from which the Rejang and Baram rivers, on the Sarawak side, and the Koti and Balungun rivers, on the Dutch side, take their rise. North of Sarawak is the Pamabo mountain range (8000 ft.), whence flow the rivers Limbang and Trusan, and the mountains Batu Lawei (8000 It.) and Lawas (6000 ft.). The interior is mountainous, the greatest elevations being Mount Mulu (9000 ft.), of limestone formation, Batu Lawei (8000 ft.), Pamabo (8000 ft.), Kalulong, Dulit, Poeh and Penrisam. The Rejang is the largest river, the Baram ranking second, the Batang Lupar third and the Limbang fourth. The Rejang is navigable for small steamers for about 160 m., the Baram for about 100 m., but there is a formidable bar at the mouth of the Baram. The chief town of Sarawak, Kuching, with a population of about 30,000, is situated on the Sarawak river 20 m. from its mouth, and can be reached by steamers of a thousand tons.

The fauna is rich. The most important mammals are the maias, or orang utan, the gibbon, the proboscis, semnopithecus and macacus monkeys; lemurs, cats, otters, bears, porcupines, wild pigs, wild cattle, deer and pangolin. Bats, shrews, rats and squirrels are in- cluded among the smaller mammals, while sharks, porpoises and dugongs are found along the coast. Of birds, Sarawak has over five hundred species; fish and reptiles are abundant ; the jungle swarms with insect life, and is rich in many varieties of fern and orchid.

The mineral wealth gives promise of considerable development. The Borneo Company for some years have successfully worked gold from the quartz reefs at Bau, on the Sarawak river, by the cyanide process, as well as antimony and cinnabar. Antimony occurs in pockets in various localities, notably at Sariki, in the Rejang district, and at Burok Buang and Telapak, in the Baram district and in the river Atun. Cinnabar has also been found in small quantities at Long Liman and in the streams about the base of Mount Mulu. Sapphires of good quality, but too small to be of commercial value, are found in large numbers in the mountain streams of the interior. Coal is worked at Sadong and Brooketon, and shipped to Singapore. The great coal-field of Selantik, along the Kelingkang range in the Batang Lupar district, is being developed. Indications of coal seams have also been found in the river Mukah ; at Pelagus in the Rejang; at Similajau and Tutau and on Mount Dulit, in the Baram district. Timber is one of the most valuable products, but with the ex- ception of bilian (iron wood) from the river Rejang, little is exported. The most important timbers are bilian,

merebo, rasak, kruin, tapang, kranji, benaga, bintangor, gerunggang, medang, meranti and kapor. Except near the banks of the rivers, which have been cleared by the natives for farming purposes, the whole country is thickly clothed with timber. The industrial establishments also comprise sago- mills, brick-works, cyanide-works and saw-mills.

In 1904 the total trade of Sarawak (Foreign and Coastwise) reached a value of $16,466,241 as compared with $4,564,200 in 1890. The remarkable increase in trade is shown by the following table : —

1900. I9°4-

Gold . . . $84,370 $1,819,200 Pepper . . 125,442 2,611,478

Sago flour . 75,026 830,319

Rubber . . 35,i8i 35i > 735

Gutta . . 78,829 637,348

Gambier . 20,060 !73.5oo

The revenue increased from $457,596 in 1894 to $1,321,879 in 1904; and the expenditure increased in the same period from $486,533 to $1,225,384. The Public Debt of Sarawak on the 1st of January 1905 was $25,000.

The population of the state, in addition to a small number of Europeans, government officials and others, a few natives of British India, and a large number of Chinese traders and pepper planters, consists of semi-civilized Malays in the towns and villages of the coast districts and of a number of wild tribes of Indonesian affinities in the interior. Of these the most important are the Dyaks, Milanaus, Kayans, Kenyahs, Kadayans and Muruts. No census has ever been taken. ” Without the China- man,” said the Raja (Pall Mall Gazette, 19th September 1883), ” we could do nothing. When not allowed to form secret societies he is easily governed, and this he is forbidden to do on pain of death.” The Milanaus, who live in the northern districts, have adopted the Malay-dress, and in many cases have become Mahommedans; they are a contented and laborious people. Slavery has been abolished, except among certain of the inland tribes among whom it stiU obtains in a very mild form:

head-hunting has been entirely suppressed by the government, save for occasional outbreaks among the Dyaks.

The government consists of the raja (the succession is hereditary) who is absolute, assisted by a supreme council of seven, consisting of the three chief European officials and four Malay magistrates, nominated by him. There is also a general council of fifty which meets every three years. It includes, besides European and Malay officials, native chiefs chosen from all the principal tribes of the country. The whole country comprises four administrative divisions, each of these being subdivided into several districts. The first division consists of Sarawak proper, which comprises the districts of the river Sarawak, and those of Lundu and Sadong. The second division is formed by the Batang Lupar, Saribas and Kelakah districts. The third division consists of the Rejang, Mukah, Oya and Bintulu; the fourth of the Baram, Limbang, Trusan and Lawas districts. The military force — some 250 men, Dyaks and Sikhs— is under the control of an English command- ant. There is also a small police force, and the government possesses a few small steam vessels. The civil service is regularly organized and pensioned. The superior posts, about 50 in number, are filled by Englishmen. There are both Roman Catholic and Protestant missions in Sarawak, the latter forms part of the see of the bishop of Singapore. Sarawak is easily accessible from Singapore, whence the passage occupies about forty-six hours: steamers run at intervals of seven days. The coast is well lighted, lighthouses having been built and maintained in good order at Tanjong Po, Sirik, Mukah, Oya, Tanjong, Kidurong, Baram Mouth and Brooketon. The climate is equable, the daily temperature ranging on the average between 70 and 90 . The nights are generally cool. The rainfall averages about 200 in. annually, it is heaviest during the north-east monsoon (October-March), but continues through the south- west monsoon, which blows for the rest of the year.

History. — In 1839-1840 Sarawak (which then comprised only the districts now constituting the first and second divisions), the most southern province of the sultanate of Brunei, was in rebellion against the tyranny of the Malay officials, insufficiently controlled by the raja Muda Hassim. The insurgents held out at Blidah fort in the Siniawan district, and there Sir James Brooke first took part in the affairs of the territory. By his assistance the insurrection was suppressed, and on September 24th Muda Hassim resigned in his favour and he became raja of Sarawak. In 1843-1844 Captain (afterwards Admiral Sir Henry) Keppel (q.v.) and Raja Brooke expelled the Malay and Dyak pirates

from the Saribas and Batang Lupar rivers, and broke up the fleets of Lanun pirates, which, descending from the Sulu Islands and the territory which is now British North Borneo, had long been the scourge of the seas.

In 1857 the Chinese, who for many generations had been working the alluvial deposits of gold in Upper Sarawak, sacked Kuching, killed two or three of the English residents and seized the govern- ment; Raja Brooke narrowly escaping with his life. His nephew, afterwards raja, quickly raised a force of Malays and Dyaks in the Batang Lupar district and suppressed the insurrection, driving the main body of the rebels out of the Sarawak territory. Raja Sir Charles Johnson Brooke (b. 1829) succeeded his uncle at his death in 1868 ; in 1888 he was created G.C.M.G. and Sarawak was made a British Protectorate, and in 1904 the position of his highness as raja of Sarawak was formally recognized by King Edward. His eldest son, the raja Muda (Charles Vyner Brooke, b. 1874), has for some years taken part in the administra- tion of the country.

The extent of the raj of Sarawak, at the time when Sir James Brooke became its ruler, was not more than 7000 sq. m.; since that time the basins of the four rivers, Rejang, Muka, Baram and Trusan, have been added. The sultan of Brunei, who claimed suzerainty over them, ceded them on succes- sive occasions in consideration of annual money payments. A few years after these cessions had been made many of the people of the river Limbang rose in rebellion against the sultan, and their territory was annexed by Sarawak, with the subsequent

approval of the British government. In 1905 the basin of yet another river, the Lawas, was added to the northern end of Sarawak, the territory being acquired by purchase from the British North Borneo Company.

See Charles Brooke, Ten Years in Sarawak (1866) ; Gertrude L. Jacob, The Raja of Sarawak (1876); Spencer St John, Life in the Forests of the Far East (1862), and Life of Sir James Brooke (1879); “Notes on Sarawak” in Proc.Roy.Geogr.Soc. (1881), by W.M.Crocker; ” In the Heart of Borneo,” Proc. Roy. Geogr. Soc. (July 1900), by Charles Hose; and The Far Eastern Tropics (1905), by Alley ne Ireland. (C. H.)

SARCASM, an ironical or sneering remark or taunt, a biting or satirical expression. The word comes through the Latin from the Greek aapKaˆew, literally to tear flesh (ffdp£) like a dog; hence, figuratively, to bite the lips in rage, to speak bitterly (cf. Stobaeus, Eclog. ii. 222). The etymology of this may be paralleled by the English ” sneer,” from

Dan. snarre, to grin like a dog, cognate with ” snarl,” to make a rattling r sound in the throat, Ger. schnarren, and possibly also by ” sardonic.” This latter word appears in Greek in the form aapSavios, always in the sense of bitter or scornful laughter, in such phrases as aaphaviov ye\av, ye\ois

SARCEY, FRANCISQUE (1827-1899), French journalist and dramatic critic, was born at Dourdan (Seine-et-Oise), on the 8th of October 1827. He spent some years as schoolmaster, but his temperament was little fitted to the work. In 1858 he devoted himself to journalism. He contributed to the Figaro, L’ Illustration, Le Gaulois, Le XIX” Siecle and other periodicals; but his chief bent was towards dramatic criticism, of which he had his first experience in L’Opinion nationale in 1859. In 1867 he began to contribute to Le Temps the ” feuilleton ” with which his name was associated till his death. His position as dictator of dramatic criticism was unique. He had the secret of taking the public into his confidence, and his pronouncements upon new plays were accepted as final. He was a masterly judge of acting and of stage effect; his views as to the drama itself were somewhat narrow and indifferent to the march of events. He published several miscellaneous works, of which the most interesting are Le Siege de Paris, an account compiled from his diary (1871), Comidiens et comediennes (1878-1884), Souvenirs de jeunesse (1884) and Souvenirs d’dge micr (1892; Eng. trans., 1893). Quarante ans de thidtre (1900, &c.) is a selec- tion from his dramatic feuilletons edited by A. Brisson. He died in Paris, on the 16th of May 1899.

SARCOCARP (Gr. crap!-, flesh, napiros, fruit), a botanical term for the succulent and fleshy part of a fruit.

SARCODINA, a principal group or phylum of Protista, defined by O. Butschli as those which during their active and motile existence discharge the functions of motion and nutrition by simple flowing movements of their protoplasm or by the extension of simple pseudopods, which merge without trace into the proto- plasmic body (Bronn’s Tierreich, vol. i. pt. i., 1882). Thus defined, it is co-extensive with the older group Rhizopoda (Dujardin), and comprises five classes: Proteomyxa (Lankester), Rhizopoda (Dujardin), Foraminifera (d’Orbigny), Heliozoa (Haeckel) and Radiolaria (Haeckel).

The delimitation of Sarcodina is not unattended with difficulties. A very few of those we include possess in addition to the pseudo- pods one or more flagella, such as Dimorpha and Myriophrys (Heliozoa), Arcuotkrix (Rhizopoda), and might equally be referred to the Flagellata (q.v.). The Sporozoa differ in that their active state is

usually (not always, e.g. Haemosporidia, &c.) a wriggling, sickle-shaped cell, that growth takes place in the whole surface of the body, and not by ingestion of food and consequently without the active deformations that characterize Sarcodina,

and that the life-cycle embraces at least two alternating modes of brood formation.

The subdivision of the phylum is no less difficult. The char- acter of the pseudopods (see Amoeba) is the most obvious one to select, as it appears to be fairly constant. The surface may be a ” precipitation-pellicle,” not wetted by water, and the cytoplasm immediately within (” ectosarc “) free from granules, so that no streaming movement is visible at the surface of the pseudopods, which are blunt or taper sharply to a point (Rhizopoda Lobosa); or the cytoplasm has no such protective outer layer, and the granules extend to the surface where they show a constant streaming, and the pseudopods are fine-pointed, and taper very slowly to the tip, as in all the other groups. For convenience, however, from general similarity of habit, habitat and general structure, we have been obliged to give a minor importance to this character within Rhizopoda. The divisions then stand thus: —

1 . P roteom YX A. — Pseudopods fine granular, not branching freely ; fission usually multiple, in a cyst; no conjugation process known.

2. Rhizopoda. — Simple forms, sometimes with a simple shell, chitinous, siliceous or of cemented particles, never calcareous; pseudopods lobose, in the tapering and branching never either stiff or reticulate.

3. Heliozoa. — Pseudopods granular, finely radiate, and gradually tapering, stiff ; skeleton variable, never calcareous nor of cemented particles.

4. Foraminifera. — Pseudopods branching freely and anastomos- ing, flexible except in a few pelagic forms where they are more radiate; shell variable, mostly of cemented sand-grains, calcare- ous, very rarely siliceous in a few deep-sea forms, not generically separable from

5. Radiolaria. — Cytoplasm divided into a central and a peri- pheral region by a perforated membranous central capsule; pseudo- pods

radiate flexible branching or not ; skeleton either of a proteid (?) substance (” a canthin “) or siliceous, of spicules or forming an elegant lattice, more rarely continuous.

6. Labyrinthulidea. — Body a reticulate Plasmodium, formed by cells more or less coalescent, and connected by a network of anastomosing threadlike pseudopods. Cells aggregated into loose networks without distinct boundaries, the minor aggregates con- nected by fine threadlike pseudopodia.

7. Myxomycetes. — Cells at first free, finally aggregated to form a coalescent fructification, usually preceded by a continuous or fenestrated Plasmodium stage in which all cytoplasmic boundaries may be lost.

The reproduction processes of the Sarcodina are (1) Binary fission, equal or nearly so. (2) Multiple fission or ” sporulation ” (also termed ” brood formation “). Conjugation (equal or unequal) usually occurs between cells produced by the latter mode (microgametes) ; or if not, there are antecedent processes suggesting that brood formation has been lost. Conjugation is entirely unknown in Proteomyxa, Labyrinthulidea and Myxo- mycetes, even at stages where it occurs in other groups, and it has only been definitely made out in a very limited number of genera in the remaining groups. The zygote or product of cell fusion is usually here, as in the majority of types of conjugation, a resting cell. (See the separate articles on the classes.)

The young of the Sarcodina, formed from the outcome of multiple fission, or single resting cells (spores), may be provided with pseudopodia from the first (myxopods or amoebulae), or come into active life for a short time with flagella (mastigopods or flagellulae) .

Literature. — Btitschli in Bronn’s Tierreich, vol. i. pt. i. (1882); Y. Delage and E. HeYouard, Traiti de zoologie concrete, vol. i., La Cellule et les protozoaires (1896) ; A. Lang, Handb. der Zoologie, ed. 2, pt. i. ” Protozoen ” (1902) ; M. Hartog, Cambridge Natural History, vol. i. (1906) ; in the first four books full bibliographies are given.

(M. Ha.)

SARCOPHAGUS (Gr. ayos, literally ” flesh-eating,” from ayeiv, to eat), the name given to a coffin in stone, which on account of its caustic qualities, according to Pliny (H.N. xxxvi. 27), consumed the body in forty days; also by the Greeks to a sepulchral chest, in stone or other material, which was more or less enriched with ornament and

sculpture. One of the finest examples known is the sarcophagus of Seti, the second king of the XIX. Egyptian dynasty (1326-1300 B.C.), which is carved out of a block of Aragonite or hard carbonate of lime, now in the Soane Museum; of later date are the green

porphyry sarcophagus and the terra-cotta sarcophagus from Clazomenae; both of these date from the early 6th century B.C., and are in the British Museum. The finest Greek examples are those found at Sidon in 1887 by Hamdy Bey, which are now in the Imperial Museum at Constantinople (see Greek Art). Of Etruscan sarcophagi there are numerous examples in terra- cotta; occasionally they are miniature representations of temples, and sometimes in the form of a couch on which rest figures of the deceased; one of these in the British Museum dates from 500 B.C. The earliest Roman sarcophagus is that of Scipio in the Vatican (3rd century B.C.), carved in peperino stone. Of later Roman sarcophagi, there is an immense series enriched with figures in high relief, of which the chief are the Niobid example in the Lateran, the Lycomedes sarcophagus in the Capitol, the Penthesilea sarcophagus in the Vatican, and the immense sarcophagus representing a battle of the Romans and the barbarians in the Museo delle Terme. In later Roman work there was a great decadence in the sculpture, so that in the following centuries recourse was had to the red Egyptian porphyry, of which the sarcophagi of Constantia (a.d. 355) and of the empress Helena (a.d. 589), both in the Vatican, are fine examples. Of later date, during the Byzantine period, there is a large series either in museums or in the cloisters of the Italian churches. They are generally decorated with a series of niches with figures in them, divided by small attached shafts with semicircular or sloping covers carved with religious emblems, one of the best examples being the sarcophagus of Sta Barbara, dating from the beginning of the 6th century, at Ravenna, where there are many others. The term sarcophagus is sometimes applied also to an altar tomb.

SARD, a reddish-brown chalcedony much used by the ancients as a gem-stone. Pliny states that it was named from Sardis, in Lydia, where it was first discovered; but probably the name came with the stone from Persia (Pers. sered, yellowish- red). Sard was used for Assyrian cylinder-seals, Egyptian and Phoenician scarabs, and early Greek and Etruscan gems. The Hebrew odem (translated sardius), the first stone in the High Priest's breastplate, was a red stone — probably sard, but perhaps carnelian or red jasper (see J. Taylor, " Sardius," in Hastings's Diet. Bibl.). Some kinds of sard closely resemble carnelian, but are usually rather harder and tougher, with a duller and more hackly fracture. Mineralogically the two stones pass into each other, and

indeed they have often been regarded as identical, both being chalcedonic quartz coloured with oxide of iron. The range of colours in sard is very great, some stones being orange-red, or hyacinthine, and others even golden, whilst some present so dark a brown colour as to appear almost black by reflected light. The hyacinthine sard, resembling certain garnets, was the most valued variety among the ancients for cameos and intaglios. Dark-brown sard is sometimes called " sardoine," or "sardine"; whilst certain sards of yellowish colour were at one time known to collectors of engraved gems as "beryl."

SARDANAPALUS, or Sardanapallus, according to Greek fable, the last king of Assyria, the thirtieth in succession from Ninyas. The name is derived from that of Assur-danin-pal, the rebel son of Shalmaneser II., whose reign ended with the fall of Nineveh in 823 B.C. (or perhaps from that of Assur-dan III., the last king but one of the older Assyrian dynasty); his character is that ascribed to Assur-bani-pal. He was the most effeminate and corrupt of a line of effeminate princes; hence Arbaces, satrap of Media, rebelled and, with the help of Belesys, the Babylonian priest, besieged Nineveh. Sardanapalus now threw off his sloth and for two years the issue was doubtful. Then, the Tigris having undermined part of the city wall, he collected his wives and treasures and burned them with himself in his palace (880 B.C.). His fate is an echo of that of Samas- sum-yukin, the brother of Assur-bani-pal (q.v.).

See J. Gilmore, Fragments of the Persika of Ktesias (1888).

(A. H. S.)

SARDARPUR, a British station in Central India, within the state of Gwalior, on the Mahi river, 58 m. by road E. of Mhow,

pop. (iooi) 2783. It is the headquarters of the political agent for the Bhopawar agency, and of the Malwa Bhil corps, originally raised in 1837 and recently converted into a military police battalion.

SARDHANA, a town of British India, in Meerut district of the United Provinces, 12 m. by rail N.W. of Meerut. Pop. (1001), 12,467. Though now a decayed place, Sardhana is historically famous as the residence of the Begum Samru (d. 1836). This extraordinary woman was a Mussulman married to Reinhardt or Sombre (Samru), the perpetrator of the massacre of British prisoners at Patna in 1763. On his death in

1778 she succeeded to the command of his mercenary troops. Ultimately she was baptized into the Roman Catholic Church, and bequeathed an immense fortune to charitable and religious uses. She built in Sardhana a Roman Catholic cathedral, a college for training priests, and a handsome palace.

SARDICA, COUNCIL OF, an ecclesiastical council convened in 343 by the emperors Constantius and Constans, to attempt a settlement of the Arian controversies, which were then at their height. Of the hundred and seventy bishops assembled, about ninety were Homousians — principally from the West — while on the other side were eighty Eusebians from the East. The anticipated agreement, however, was not attained; and the result of the council was simply to embitter the relations between the two great religious parties, and those between the Western and Eastern halves of the Empire. For as Athanasius and Marcellus of Ancyra appeared on the scene, and the Western bishops declined to exclude them, the Eusebian bishops of the East absolutely refused to discuss, and contented themselves with formulating a written protest addressed to numerous foreign prelates. That they instituted a rival congress of their own in Philippopolis is improbable. The bishops, however, who remained in Sardica (mod. Sofia in Bulgaria) formed themselves into a synod, and naturally declared in favour of Athanasius and Marcellus, while at the same time they anathema- tized the leaders of the Eusebian party. The proposal to draw up a new creed was rejected.

Especial importance attaches to this council through the fact that Canons 3-5 invest the Roman bishop with a prerogative which became of great historical importance, as the first legal recognition of his jurisdiction over other sees and the basis for the further de- velopment of his primacy. ” In order to honour the memory of St Peter,” it was enacted that any bishop, if deposed by his provincial synod, should be entitled to appeal to the bishop of Rome, who was then at liberty either to confirm the first decision or to order a new investigation. In the latter case, the tribunal was to consist of bishops from the neighbouring provinces, assisted — if he so chose — by legates of the Roman bishop. The clauses thus made the bishop of Rome president of a revisionary court; and afterwards Zosimus unsuccessfully attempted to employ these canons of Sardica, as decisions of the council of Nice, against the Africans. In the middle ages they were cited to justify the claim of the papacy to be the supreme court of appeal. Attacks on their authenticity have been conclusively repelled.

The canons are printed in C. Mirbt, Quellen zur Geschichte des Papsltums (Tubingen, 1901), p. 46 f. ; Hefele, Conciliengeschichte, ed.

2, i. 533 sqrj. See also, J. Friedrich, Die Unechlheit der Canones von Sardika (Vienna, 1902) ; on the other side F. X. Funk, ” Die Echtheit der Canones von Sardica,” Historisches Jahrbuck der Gorresgesellschaft, xxiii. (1902), pp. 497-516; ibid. xxvi. (1905), pp. 1-18, 255-274; C. H. Turner, ” The Genuineness of the Sardican Canons,” The Journal of Theological Studies, iii. (London, 1902), PP-370-397- (C M.)

SARDINIA (Gr. ‘Ixfovaa, from a fancied resemblance to a footprint in its shape, Ital. Sardegna), an island of the Mediter- ranean Sea, belonging to the kingdom of Italy. It lies 75 m. S. of Corsica, from which it is separated by the Strait of Bonifacio, which is some 50 fathoms deep. The harbour of Golfo degli Aranci, in the north-eastern portion of the island, is 138 m. S.W. of Civitavecchia, the nearest point on the mainland of Italy. Sardinia lies between 8° 7′ and 9 49′ E., and extends from 3 8° 52′ to 41 15′ N. The length from Cape Teulada in the S.W. to Punta del Falcone in the N. is about 160 m., the breadth from Cape Comino to Cape Caccia about 68 m. The area of the island is 9187 sq. m. — that of the department (compartimento) , including the small islands adjacent, being 9294 sq. m. It ranks sixth

in point of size (after Sicily) among the islands of Europe, but it is much more sparsely populated.

The island is mountainous in the main, almost continuously so, indeed, along the east coast, and very largely granitic, with a number of lofty upland plains in the east, and volcanic in the west. The highest point in the north-east group of the island (called Gallura) is Monte Limbara (4468 ft.), S.E. of Tempio. This mountain group is bounded on the S.E. and S.W. by valleys, which are followed by the railways from Golfo degli Aranci to Chilivani, and from Chilivani to Sassari. The north-western portion of the island, called the Nurra, lies to the west of Sassari and to the north of Alghero, and is entirely volcanic; so are the mountains to the south of it, near the west coast; the highest point is the Monte Ferru (3448 ft.). East of the railway from Chilivani to Oristano, on the other hand, the granitic mountains continue. The highest points are Monte Rasu (4127 ft.), S. of Ozieri, in the district called Logudoro, on the chain of the Marghine, which runs to Macomer, and, farther S., in the region called Barbargia, the Punta Bianca Spina, the highest summit of the chain of Gennargentu (6016 ft.). These two groups are divided by the deep valley of the Tirso, the only real river in Sardinia, which has a course of 94 m. and falls into the sea in the Gulf of Oristano. South of Gennargentu, in the district of the Sarcidano, is the Monte S. Vittoria (3980 ft.), to the west of which is the deep valley of the Flumendosa, a stream 76 m. long, which rises

south of Gennargentu, and runs S.E., falling into the sea a little north of Muravera on the east coast. Still farther W. is the volcanic upland plain of the Giara (1998 ft.) and south of the Sarcidano are the districts known as the Trexenta, with lower, fertile hills, and the Sarrabus, which culminates in the Punta Serpeddi (3507 ft.), and the Monte dei Sette Fratelli (3333 ft.), from the latter of which a ridge descends to the Capo Carbonara, at the S.E. extremity of the island. South of Oristano and west of the districts last described, and traversed by the railway from Oristano to Cagliari, is the Campidano (often divided inordinary nomenclature into the Campidano of Oristano and the Campidano of Cagliari), a low plain, the watershed of which, near S. Gavino, is only about 100 ft. above sea-level. It is 60 m. long by 7-14 broad, and is the most fertile part of the island, but much exposed to malaria. South-west of it, and entirely separated by it from the rest of the island, are the mountain groups to the north and south of Iglesias, the former culminating in the Punta Perda de Sa Mesa or Monte Linas (4055 ft.), and the latter, in the district known as the Sulcis, reaches 3661 ft. It is in this south-western portion of the island, and more particularly in the group of mountains to the north of Iglesias, that the mining industry of Sardinia is carried on.

The scenery is fine, but wild and desolate in most parts, and of a kind that appeals rather to the northern genius than to the Italian, to whom, as a rule, Sardinia is not attractive. The rail- way between Mandas and Tortoli traverses some of the boldest scenery in the island, passing close to the Monte S. Vittoria. The mountains near Iglesias are also very fine.

Coast. — The coast of Sardinia contains few seaports, but a good proportion of these are excellent natural harbours. At the north-eastern extremity is a group of islands, upon one of which is the naval station of La Maddalena : farther S.E. is the well-protected Gulf of Terranova, a part of which, Golfo degli Aranci, is the port of arrival for the mail steamers from Civitavecchia, and a port of call of the British Mediterranean squadron. To the south of Terranova there is no harbour of any importance on the east coast (the Gulf of Orosei being exposed to the E., and shut in by a precipitous coast) until Tortoli is reached, and beyond that to the Capo Carbonara at the south-east extremity, and again along the south coast, there is no harbour before Cagliari, the most important on the island. In the south-west portion of Sardinia the island of S. Antioco, joined by a narrow isthmus and a group of bridges to the mainland, forms a good natural harbour to the south of the isthmus, the Golfo di Palmas ; while the north portion of the peninsula, with the island of S. Pietro, forms a more or less protected basin, upon the shores of which are several small harbours

(the most important being Carlo- forte), which are centres of the export of minerals and of the tunny fishery. Not far from the middle of the west coast, a little farther S. than the Gulf of Orosei on the east coast, is the Gulf of Oristano, exposed to the west winds, into which, besides the Tirso, several

streams fall, forming considerable lagoons. For some way beyond the only seiport is Bosa, which has only an open roadstead ; and at the southern extremity of the Nurra come the Gulf of Alghero and the Porto Conte to the W., the latter a fine natural harbour but not easy of ingress or egress. The northern extremity of the Nurra, the Capo del Falcone, is continued to the N.N.E. by the island of Asinara, about II m. in length, the highest point of which, the Punta della Scomunica, is 1339 ft. high. This small island serves as a quarantine station. On the mainland, on the south shore of the Golfo dell' Asinara, is the harbour of Porto Torres, the only one of any importance on the north-west coast of Sardinia.

Geology. — Geologically Sardinia consists of two hilly regions of Pre-Tertiary rock, separated by a broad depression filled with Tertiary deposits. This depression runs nearly from north to south, from the Gulf of Asinara to the Gulf of Cagliari. Physically its continuity is broken by Monte Urticu and several smaller hills which rise within it, but these are all composed of volcanic rock and are the remains of Tertiary volcanoes. It is in the south that the depression remains most distinct and it is there known as the Campidano. In the north it forms the plain of Sassari. Both to the east and to the west of this depression the Archean and Palaeozoic rocks which form the greater part of the island are strongly folded, with the excep- tion of the uppermost beds, which belong to the Permian system. In the eastern region this was the last folding which has affected the country, and the Mesozoic and Tertiary beds are almost undisturbed. In the western region, on the other hand, all the' Mesozoic beds are involved in a later system of folds; but here also the Tertiary beds lie nearly horizontal. There were, therefore, two principal epochs of folding in the island, one at the close of the Palaeozoic era which affected the whole of the island, and one at the close of the Mesozoic which was felt only in the western region. Corresponding with this difference of structure there is also a difference in the geological succession. In the western region all the Mesozoic systems, in- cluding the Trias, are well developed. The Trias does not belong, as might have been expected, to the Alpine or

Mediterranean type; but resembles that of Germany and northern Europe. In the eastern region the Trias is entirely absent and the Mesozoic series begins with the Upper Jurassic.

Granite and Archean schists form nearly the whole of the eastern hills from the Strait of Bonifacio southwards to the Flumendosa river, culminating in Monti del Gennargentu. The Palaeozoic rocks form two extensive masses, one in the south-east and the other in the south-west. They occur also on the extreme north-western coast, in the Nurra. Cambrian, Ordovician and Silurian beds have been recognized, the Upper Cambrian consisting of a limestone which is very rich in metalliferous ores (especially galena and calamine). The Permian, which contains workable coal seams, lies uncon- formably upon the older beds and seems to have been deposited in isolated basins (e.g. at Fondu Corrongiu and San Sebastiano), like those of the Central Plateau of France. The Mesozoic beds are limited in extent, the most extensive areas lying around the Gulf of Orosei on the east and west of Sassari in the north. The Tertiary deposits cover the whole of the central depression, where they are associated with extensive flows of lava and beds of volcanic ash. The most widely spread of the sedimentary beds belong to the Miocene period. 1

Climate. — -The climate of Sardinia is more extreme than that of Italy, but varies considerably in different districts. The mean winter temperature for Sassari for 1871-1900 was 48 F., the mean summer temperature 73 F., while the mean of the extremes reached in each direction were 99 F. and 31-5° F. The island is subject to strong winds, which are especially felt at Cagliari owing to its position at the south-east end of the Campidano, and the autumn rains are sometimes of almost tropical violence. The lower districts are hot and often unhealthy in the summer, while the climate of the mountainous portion of the island is less oppressive, and would be still cooler if it possessed more forest. There are comparatively few streams and no inland lakes. Snow hardly ever falls near the coast, but is abundant in the higher parts of the island, though none remains throughout the summer. The rainfall in the south-west portion of the island is considerably greater than in other districts. The mean annual rainfall for Sassari for 1 871-1900 was 24-45 > n > the average number of days on which rain fell being 109, of which 37 were in winter and only 8 in summer — the latter equal with Palermo, but lower than any other station in Italy.

Malaria. — The island has a bad reputation for malaria, due to the fact that it offers a considerable quantity of breeding places for the Anopheles claviger, the mosquito whose bite conveys the infection.

Such are the various coast lagoons, formed at the mouths of streams

‘See A. de la Marmora, Voyage en Sardaigne, vol. iii. (1857); J. C. Bornemann, ” Die Versteinerungen des Cambrischen Schichten-systems der Insel Sardinien,” Nova Acta k. L-C. Akad. Naturf. vol. li. (1886), pp. 1-148, pis. i.-xxxiii., and ib. vol. lvi. (1891), pp. 427-528, pis. xix.-xxviii. ; A. Tornquist, ” Ergebnisse einer Bereisung der Insel Sardinien,” Sitz. k. preuss. Akad. Wiss. (1902), pp. 808-829, and ” Der Gebirgsbau Sardiniens und seine Beziehungen zu den jungen, circum-mediterranen Faltenzugen,” ib. (1903), pp. 685-699; A. Dannenberg, ” Der Vulkanberg Mte Ferru in Sardinien,” Neues Jahrb.f. Min. Beil. Bd. xxi. (1906), pp. 1-62, pi. i.

for lack of proper canalization, while much of the harm is also due to the disforestation of the mountains, owing to which the rains collect in the upland valleys, and are brought down by violent torrents, carrying the soil with them, and so impeding the proper drainage and irrigation of these valleys, and encouraging the formation of un-healthy swamps; moreover, the climate has become much more tropical in character. The mortality from malaria in 1902 was higher than for any other part of Italy — 1037 persons, or 154 per 100,000 (Basilicata, 141; Apulia, 104; Calabria, 77; Sicily, 76; province of Rome, 27).

Customs and Dress. — The population of Sardinia appears (though further investigation is desirable) to have belonged in ancient times, and to belong at present, to the -so-called Mediter- ranean race (see G. Sergi, La Sardegna, Turin, 1 907) . In the aeneo- lithic necropolis of Anghelu Ruju, near Alghero, of 63 skulls, 53 belongtothe” Mediterranean ” dolico-mesocephalic type and toto a Eurasian brachycephalic type of Asiatic origin, which has been found in prehistoric tombs of otjter parts of Europe. The race has probably suffered less here than in most parts of the Mediter- ranean basin from foreign intermixture, except for a few Catalan and Genoese settlements on the coast (Alghero and Carloforte are respectively the most important of these); and the popula- tion in general seems to have deteriorated slightly since pre- historic times, the average cranial capacity of the prehistoric skulls from the Anghelu Ruju being 1490 c.c. for males and 1308 for females, while among the modern population 60% of males and females together fall below 1250 c.c; and the stature is generally lower than in other parts of Italy, as is shown by the measurements of the recruits (R. Livi, Antropometria Militare, Rome 1896). Anthropologists, indeed, have recently observed a large proportion of individuals of exceptionally small stature, not found in Sardinia only, but elsewhere in south Italy also; though in

Sardinia they are distributed over the whole island, and especially in the southern half. In the province of Cagliari 2 9 – 99% ˚f the recruits born in 1862 were under 5 ft. 1 in., and in that of Sassari 21-99%, the percentage for ten provinces of south Italy being 24 – 3S- These small individuals present appar- ently no other differences, and Sergi maintains that the difference is racial, these being the descendants of a race of pygmies who had emigrated from central Africa. But the lowness of stature extends to the lower animals — cattle, horses, donkeys, &c. — and this may indicate that climatic causes have some part in the matter also, though Sergi denies this.

The dialects differ very much in different parts of the island, so that those who speak one often cannot understand those who speak another, and use Italian as the medium of communication. They contain a considerable number of Latin words, which have remained unchanged. The two main dialects are that of the Logudoro in the north and that of Cagliari in the south of the island.

The native costumes also vary considerably. In the south-east they have largely gone out of use, but elsewhere, especially in the mountainous districts, they are still habitually worn. In the Barbargia the men have a white shirt, a black or red waistcoat and black or red coat, often with open sleeves; the cut and decorations of these vary considerably in the different districts. They have a kind of short kilt, stiff, made of black wool, with a band from back to front between the legs ; under this they wear short linen trousers, which come a little below the knee, and black woollen leggings with boots. They wear a black cap, about ij ft. long, the end of which falls down over one side of the head. In other districts the costume varies considerably, but the long cap is almost universal. Thus at Ozieri the men wear ordinary jackets and trousers with a velvet waistcoat ; the shepherds of the Sulcis wear short black trousers without kilt and heavy black sheepskin coats, and the two rows of waistcoat buttons are generally silver or copper coins. The costume of the women is different (often entirely so) in each village or district. Bright colours (especially red) are frequent, and the white chemise is an integral part of the dress. The skirts are usually of the native wool (called orbacia). For widows or deep mourning the peculiar cut of the local costume is preserved, but carried out entirely in black. _ The native costume is passing out of use in many places (especially among the women, whose costume is more elaborate than that of the men), partly owing to the spread of modern ideas, partly owing to its cost ; and in the Campidano and in the mining districts it is now rarely seen. The curious customs, too, of which older writers tell us, are gradually dying out. But the festivals, especially those of mountain villages or of pilgrimage churches, attract

in the summer a great concourse of people, all in their local costumes. There may be seen the native dances and break-neck horse-races — the riders bareback — through the main street of the village. The people are generally courteous and kindly, the island being still

comparatively rarely visited by foreigners, while Italians seem to regard it as almost a place of exile. They have the virtues and defects of a somewhat isolated mountain race — a strong sense of honour and respect for women, of hospitality towards the stranger, and a natural gravity and dignity, accompanied by a considerable distrust of change and lack of enterprise. Despite their poverty begging is practically unknown. The houses are often of one storey only. Chimneys are unknown in the older houses; the hearth is in the centre of the chief room, and the smoke escapes through the roof. In the mountain villages the parish priest takes the lead among his people, and is not infrequently the most important person.

Agriculture. — The rest of the island is mainly devoted to agricul- ture ; according to the statistics of 1901, 151,853 individuals out of a total rural population of 708,034 (i.e. deducting the population of Cagliari and Sassari) are occupied in it. Of these 41,661 cultivate their own land, 15,408 are fixed tenants, 24,031 are regular labourers, and no less than 72,753 day labourers; while there are 35,056 shepherds. Emigration is a comparatively new phenomenon in Sardinia, which began only in 1896, but is gaining ground. A con- siderable proportion of the emigrants are miners who proceed to Tunis, and remain only a few years, but emigration to America is increasing.

Much of the island is stony and unproductive; but cultivation has not been extended nearly as much as would be possible, and the implements are primitive. Where rational cultivation has been introduced, it has almost always been by non-Sardinian capitalists. Two-fifths of the land belongs to the state, and two-fifths more to the various communes; the remaining fifth is minutely subdivided among a large number of small proprietors, many of whom have been expropriated from inability to pay the taxes, which, considering the low value of the land, are too heavy; while the state is unable to let a large proportion of its lands. Comparatively little grain is now produced, whereas under the republic Sardinia was one of the chief granaries of Rome. The Campidano and other fertile spots, such as the so-called Ogliastra on the east side of the island, inland of Tortoli, the

neighbourhood of Oliena, Bosa, &c, produce a con- siderable quantity of wine, the sweet, strong, white variety called Vernaccia, produced near Oristano, being especially noteworthy. Improved methods are being adopted for protecting vines against disease, and the importation of American vines has now ensured immunity against a repetition of former disasters. The cultivation of the vine prevails far more in the province of Cagliari than in that of Sassari, considerable progress having been made both in the extent of land under cultivation and in the ratio of produce to area. The entire island produced 28,613,000 gallons of wine in the year 1899 and 19,809,000 in 1900. In 1902 the production fell to 13,491,517 gallons; in 1903 it was 26,997,680; in 1904 it reached the pheno- menal figure of 63,105,577 gallons, of which the province of Cagliari produced 53,995,362 gallons; in 1905 it fell to 36,700,000, of which the province of Cagliari produced 32,500,000 gallons. Though much land previously devoted to grain culture has been planted with vines, the area under wheat, barley, beans and maize is still considerable. Most of the soil, except the rugged mountain regions, is adapted to corn growing. In 1896 the grain area was 380,000 acres, a slight diminution having taken place since 1882. The yield of corn varies from six to ten times the amount sown. In 1902 the total production of wheat in the island was 2,946,070 bushels, but in 1903 it rose to 4,823,800 bushels, in 1904 it fell to 4,015,020, and in 1905 rose again to 4,351,987 bushels, j% of the whole production of Italy. The cultivation of olives is widespread in the districts of Sassari, Bosa, Iglesias, Alghero and the Gallura. The government, to check the decrease of olive culture in Sassari, has offered prizes for the grafting of wild olive trees, of which vast numbers grow throughout the island. Tobacco, vegetables and other garden produce are much cultivated ; cotton could probably be grown with profit.

The houses of the Campidano are mostly built of sun-dried un- baked bricks. The ox-wagons with their solid wheels, and the curious water-wheels of brushwood with earthenware pots tied on to them and turned by a blindfolded donkey, are picturesque. Both European and African fruit trees grow in the island; there are in places considerable orange groves, especially at Milis, to the north of Oristano. The olive oil produced is mainly mixed with that from Genoa or Provence, and placed on the market under the name of the latter. Among the natural flora may be noted the wild olive, the lentisk (from which oil is extracted), the prickly pear, the myrtle, broom, cytisus, the juniper. Large tracts of mountain are clothed with fragrant scrub composed of these and other plants. 1 The higher regions produce cork trees, oaks, pines, chestnuts, &c, but the forests have been largely destroyed by

speculators, who burned the trees for charcoal and potash, purchasing them on a large scale from the state. This occurred especially in the last half of the 19th century, largely owing to the abolition of the so-called beni adem- privili. These were lands over which, in distinction from the other feudal lands, rights of pasture, cutting of wood, &c. &c, existed. When, in 1837, the baronial fiefs were suppressed by Charles Albert, and the land transferred to the state, the ademprivio was maintained on the lands subject to it, and it was thus to the interest of all that

•The herba Sardoa, said to cause the risus Sardonicus (sardonic laugh), cannot be certainly identified (Pausanias x. 17, 13).

the woods should be maintained. In 1865, however, it was sup- pressed, and one half of the beni ademprivili was assigned to the state, the other half being given to the communes, with the obliga- tion of compensating those who claimed rights over these lands. The state, which had already sold not only a considerable part of the domain land, but a large part of the beni ademprivili, continued the process, and the forests of Sardinia were sacrificed ; and, as has been said, the necessity of reafforestation, of the regulation of streams, and of irrigation 2 is urgent. Laws to secure this object have been passed, but funds are lacking for their execution on a sufficiently large scale. Another difficulty is that Italian and foreign capitalists, have produced a great rise in prices which has not been compensated by a rise in wages. Native capital is lacking, and taxation on un- remunerative lands is, as elsewhere in Italy, too heavy in proportion to what they may be expected to produce, and not sufficiently elastic in case of a bad harvest.

Live-Stock. — A considerable portion of Sardinia, especially in the higher regions, is devoted to pasture. The native Sardinian cattle are small, but make good draught oxen. A considerable amount of cheese is manufactured, but largely by Italian capitalists. Sheep's milk cheese (pecorino) is largely made, but sold as the Roman product. Horses are bred to some extent, while the native race of donkeys is remarkably small in size. Pigs, sheep and goats are also kept in considerable numbers. Whereas in 188 1 Sardinia was estimated to possess only 157,000 head of cattle, 478,000 sheep and 165,000 goats, the'numbers in 1896 had increased to 1,159,000 head of cattle, 4,960,000 sheep and 1,780,000 goats. The nomadic system prevails in the island. Breeding is unregulated and natural selection prevails. A more progressive form of pastoral industry is that of the tanche (enclosed holdings), in which the owner is both agriculturist and cattle raiser. On these farms the cultivation of the soil and the rearing

of stock go hand in hand, to the great advantage of both. Nevertheless the idea of the value of improving breeds is gaining ground. Good cattle for breeding purposes are being imported from Switzerland and Sicily, and efforts are likewise being made to improve the breed of horses, which are bought mainly for the army. The opportunity of utilizing the wool for textile industries has not yet been taken, though Sardinian women are accustomed to weave strong and durable cloth. Everywhere capital and enterprise are lacking. Agricultural products require perfecting and fitting for export.

Of wild animals may be noted the moufflon (Ovis Ammon), the stag, and the wild boar, and among birds various species of the vulture and eagle in the mountains, and the pelican and flamingo (the latter coming in August in large flocks from Africa) in the lagoons.

Fisheries. — The tunny fishery is considerable; it is centred principally in the south-west. The sardine fishery, which might also be important, at present serves mainly for local consumption. Lobsters are exported, especially to Paris. The coral fishery — mainly on the west coast — has lost its former importance. Neither the tunny nor the coral fishery is carried on by the Sardinians themselves, who are not sailors by nature ; the former is in the hands of Genoese and the latter of Neapolitans. The unhealthy lagoons contain abundance of fish. The mountain streams often contain small but good trout.

In Roman times Sardinia, relatively somewhat more prosperous than at present, though not perhaps greatly different as regards its products, was especially noted as a grain-producing country. It is also spoken of as a pastoral country (Diod. v. 15), but we do not hear anything of its wine. Solinus (4, § 4) speaks of its mines of silver and iron, Suidas (s.v.) of its purple and tunny fisheries, Horace (Art Poet. 375) of the bitterness of its honey. Pausanias (x. 17, § 12) mentions its immunity from wolves and poisonous snakes — which it still enjoys, — but Solinus (I.e.) mentions a poisonous spider, called solifuga, peculiar to the island.

Minerals. — The mining industry in Sardinia is confined in the main to the south-western portion of the island. The mines were known to the Carthaginians, as discoveries of lamps, coins, &c. (now in the museum at Cagliari), testify. The Roman workings too, to judge from similar finds, seem to have been considerable. The centre of the mining district (Metalla of the itineraries) was probably about 5 m. south of Fluminimaggiore, in a locality known as Antas, where are the remains of a Roman temple (Corpus Inscr. Lot. x. 7539)> dedicated to an emperor, probably Commodus — but the inscription is only in part

preserved. A pig of lead found near Fluminimaggiore bears the imprint Imp. Caes. Hadr. Aug. (C.I.L. x. 8073, 1, 2). After the fall of the Roman Empire the workings remained abandoned until the days of the Pisan supremacy, 3 and were again given up under the Spanish government, especially after the discovery of America. When the island passed to Savoy, in 1 720, the mines passed to the state. The government let the mines to contractors for forty years and then took them over; but in the period from 1720 to 1840 only 14,620 tons of galena were extracted and 2772 of lead. In 1840 the freedom of mining was introduced,

2 By the law of 1906 the state has not assumed the responsibility of the construction of reservoirs for irrigation.

3 The Pisan workings are only distinguished from the Roman by the character of the small objects (lamps, coins, &c.) found in them.

the state giving perpetual concessions in return for 3 % of the gross production. In 1904-1905, 14,188 workmen were employed in the mines of the province of Cagliari. The following table (from the consular report of 1905) shows the amount and value of the minerals extracted, the whole amount being exported :

Tons.

Value £ .

99.749

466,070

26,051

135.569

24,798

140,534

167

5.012

2.362

3,36o

1,005

4,700

15.429

8,778

577

586

98

445

Zinc —

Calamine .

Blende Lead …. Silver …. Manganese . Antimony Lignite Anthracite Copper

170.236 765.054

The chief mines are those of Gennamare and Ingurtosu and others of the group owned by the Pertusola Company, Monteponi and Montevecchio. The mining and washing plant is extremely good and largely constructed at Cagliari. The most important minerals are lead and zinc, obtained in lodes in the forms of galena and calamine respectively. In most cases, owing to the mountainous character of the country, horizontal galleries are possible. The Monteponi Company smelts its own zinc, but the lead is almost all smelted at the furnaces of Pertusola near Spezia. Silver has also been found in the district of Sarrabus, iron at S. Leone to the west of Cagliari, and antimony and other metals near Lanusei, but in smaller quantities than in the Iglesias district, so that comparatively little mining has as yet been done there. Lignite is also mined at Bacu Abis, near Gonnesa, and Anthracite in small quantities near Seui.

The salt-pans at Cagliari and of Carloforte are of considerable im-oortance; they are let by the government to contractors, who have the sole right of manufacture, but are bound to sell the salt necessary for

Sardinian consumption at 35 centesimi (3id.) per cwt. ; the government does not exercise the salt monopoly in Sardinia any more than in Sicily, but in the latter island the right of manufacture is unrestricted. The total production in 1905 was 149,431 tons; the average price of salt for the island in 1905 was 2jd. per cwt. (unground), and is. per cwt. ground; whereas for Italy, where the government monopoly exists, the price is £1, 12s. the cwt.

Commerce. — The total exports of the province of Cagliari in 1905 attained a value of £1,388,735, of which £550,023 was foreign trade, while the imports amounted to £1,085,514, of which £360,758 was foreign trade. Among the exports may be noticed minerals, wines and spirits, tobacco, hides, live animals; and among the imports, groceries, cotton and cereals. The tonnage of the shipping entering and clearing the ports of the province in 1905 was 1,756,866, of which 352,992 was foreign.

Communications. — The railway system of Sardinia is in the hands of two companies — the Compagnia Reale delle Ferrovie Sarde, and the Compagnia delle Ferrovie Secondarie della Sardegna. The former company's lines (of the ordinary gauge) run from Cagliari, past Macomer, to Chilivani (with a branch at Decimomannu for Iglesias and Monteponi). From Chilivani the line to Sassari and Porto Torres diverges to the N.W., and that to Golfo degli Aranci to the N.E. The latter company owns narrow-gauge lines from Cagliari to Mandas (whence lines diverge N. to Sorgono and E. to Tortoli, the latter having a short branch from Gairo to Ierzu),from Macomer E. to Nuoro and W. to Bosa, from Sassari S.W. to Alghero, from Chilivani S. to Tirso (on the line between Macomer and Nuoro), and from Monti (on the line from Chilivani to Golfo degli Aranci) N.W. to Tempio. In the south-western portion of the island are several private railways belonging to various mining companies, of which the lines from Monteponi to Portoscuso, and from S. Gavino to Montevecchio, are sometimes available for ordinary passengers. There is also a steam tramway from Cagliari to Quartu S. Elena. The trains are few and the speed on all these lines is moderate, but the gradients are often very heavy.

Communication is thus most wanted with the northern and south-eastern extremities of the island, and between Tortoli and Nuoro, and Nuoro and Golfo degli Aranci. The main road system, which dates from 1828, previous to which there were only tracks, is good, and the roads well engineered; many of them are traversed daily by post vehicles. Some road motor services have been instituted. The total length of the railways is 602 m., and of the roads of all classes 3101

m., i.e. 596 yds. per sq. m.

There is daily steam communication (often interrupted in bad weather) with Civitavecchia from Golfo degli Aranci (the mail route), and weekly steamers run from Cagliari to Naples, Genoa (via the east coast of the island), Palermo and Tunis, and from Porto Torres to Genoa (calling at Bastia in Corsica and Leghorn) and Leghorn direct. A fortnightly line also runs along the west coast of the island from Cagliari to Porto Torres. All these lines (and also the minor lines from Golfo degli Aranci to La Maddalena and from Carloforte to Porto Vesme and Calasetta) are in the hands of the Navigazione Generate Italiana, there being no Sardinian steamship companies. There is also a weekly French service between Porto Torres and Ajaccio in Corsica.

Administration. — Sardinia is divided into two provinces — Cagliari and Sassari; the chief towns of the former (with their communal population in 1901) are: Cagliari (53,057); Iglesias (20,874); Quartu S. Elena (8510), really a large village; Oristano (7107); Flurninimaggiore (9647); Lanusei (3250); and the total population of the province is 486,767: while the chief towns of the latter are Sassari (38,053); Alghero (10,741); Ozieri (9555); Nuoro (7051); Tempio Pausania (14,573); Terranova Pausania (4348); Porto Torres (4225); and the total population of the province 309,026. The density of popula- tion is 85-38 per sq. m. (294-55 for the whole of Italy), by far the lowest figure of any part of Italy.

The archiepiscopal sees of the island are: Cagliari (under which are the suffragan sees of Galtelli-Nuoro, Iglesias and Ogliastra), Oristano (with the suffragan see of Ales and Terralba) and Sassari (under which are the suffragan sees of Alghero, Ampurias and Tempio, Bisarchio and Bosa). The number of monastic institutions in the island is very small.

Education. — The number of scholars in the elementary schools for 1901-1902 was 59-09 per 1000 (Calabria 42-27, Tuscany 67-09, Piedmont 118-00); the teachers are 1-34 per 1000, a total of 1084 of both sexes (among whom only one priest) (Calabria 1-18, Tuscany 1-29, Piedmont 2-0), while the rural schools are not buildings adapted for their purpose. In some of the towns, however, and especially at Iglesias, they are good modern buildings. Still, the percentage of those unable to read and write is 72-8, while for the whole of Italy it is 56-0. The male scholars at the secondary schools amounted in 1900 to 2-74 per 1000 inhabitants. The university of Cagliari, which in 1874-1875 had only 60 students, had 260 in 1902-1903. At Sassari in the same year there were 162. There are besides in the island 10

gymnasia, 3 lycees, 6 technical and nautical schools and institutes (including a school of mines at Iglesias), and a other institutes for various branches of special education. A tendency is growing up towards the extension of technical and commercial education in place of the exclusively classical instruction hitherto imparted. To the growth of this tendency the excellent results of the agricultural schools have especially contributed.

Crime. — For the years 1897-1901 statistics show that Sardinia has more thefts and frauds than any other region of Italy (1068-15 for Sardinia and 210-56 per 100,000 inhabitants per annum for the rest of Italy). This is no doubt accounted for by the extreme poverty which prevails among the lower classes, though beggars, on the other hand, are very few, the convictions being 8-95 per 100,000 against 258-15 per 100,000 for the province of Rome. Sardinia has less convictions for serious crimes than any other compartimento of south Italy. Public security is considerably improved, and regular brigandage (as distinct from casual robbery) hardly exists. The vendetta, too, is now hardly ever heard of.

Finance. — In 1887 a severe banking crisis occurred in Sardinia. Though harmful to the economic condition of the island, it left agriculture comparatively unaffected, because the insolvent institutions had never fulfilled the objects of their foundation. Agri- cultural credit operations in Sardinia are carried on by the Bank of Italy, which, however, displays such caution that its action is almost imperceptible. An agricultural loan and credit company has been formed on the ruins of the former institutions, but hitherto no charter has been granted it. Institutions possessing a special character are the monti frumentarii, public grain deposits, founded for the purpose of supplying peasant proprietors with seed corn, debts being paid in kind with interest after harvest. But they, too, lack funds sufficient to assure extensive and efficient working, even after the law of 1906. Meantime much evil arises from usury in the poorer districts. It is estimated that Sardinia pays, in local and

general, direct and indirect taxation of all kinds, 23,000,000 lire (£920.000), a sum corresponding to 35-44 lire per head.

History and Archaeology. — The early history of Sardinia is entirely unknown. 1 The various accounts of Greek writers of the early

colonizations of the island cannot be accepted, and it appears rather to have been the case that though there were various schemes formed by Greeks for occupying it or parts of it (e.g. that recorded by Herodotus i. 170, when it was proposed, after the capture of Phocaea and Teos in 545 B.C., that the remainder of the Ionian Greeks should emigrate to Sardinia) none of them ever came to anything.

On the other hand, the island contains a very large number of important prehistoric monuments, belonging to the Bronze Age, N rashl during which it must have been comparatively well ‘ populated. The most conspicuous and important of these are the nuraghi (the word is said to be a corruption of muraglie, i.e. large walls, but. it is more probably a native word). Of

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From Papers of the British School at Rome, v. 92, fig. 1 .

Fig. 1. — Nuraghe of Voes (Plans and Sections). these there are, as has been estimated, as many as 6000 still traceable in the island. The nuraghe in its simplest form is a circular tower about 30 ft. in diameter at the base and decreasing in diameter as it ascends; it is built of rough blocks of stone, as a rule about 2 ft. high (though this varies with the material employed) ; they are not mortared together, but on the inside, at any rate, the gaps between them were often filled with clay. The entrance almost in- variably faces south, and measures, as a rule, 5 or 6 ft. in height by 2 in width. The architrave is flat, and there is a space over it, serving both to admit light and to relieve the pressure on it from above, and the size decreases slightly from the bottom to the top. Within the doorway is, as a rule, a niche on the right, and a stair- case ascending in the thickness of the wall to the left; in front is another similar doorway leading to the chamber in the interior, which is circular, and about 15 ft. in diameter; it has two or three niches, and a conical roof formed by the gradual inclination of the walls to the centre. It is lighted by the two doorways already mentioned. The staircase leads either to a platform on the top of the nuraghe or, more frequently, to a second chamber con- centric with the first, lighted by a window which faces, as a rule, in the same direction as the main doorway. A third chamber above the second does not often occur. The majority perhaps of the nuraghi of Sardinia present this simple type; but a very large number, and, among them, those best preserved, have considerable additions. The construction varies with the site, obviously with a view to the best use of the

ground from a strategic point of view. Thus, there may be a platform round the nuraghe, generally with two, three or four bastions, each often containing a chamber; or the main nuraghe may have additional chambers added to it. In a few cases, indeed, we find very complicated systems of fortification — a wall of circum- vallation with towers at the corners, protecting a small settlement of nuraghe-like buildings, as in the case of the Nuraghe Losa near Abbasanta and the Nuraghe Saurecci near Guspini; 2 or, as in the

1 It has been widely believed that the Shardana, who occur as foreign mercenaries in Egypt from the time of Rameses II. down- wards, are to be identified with the Sardinians; but the question is uncertain. There were certainly no Egyptian colonies in Sardinia; the Egyptian objects and their imitations found in the island were brought there by the Phoenicians (W. H. Roscher, Lexikon der griechischen und romischen Myihologie, ii. 392).

J In neither of these cases have the subsidiary buildings been fully traced out. The plan of the former is given by Pinza (op. cit.), and that of the latter by La Marmora (op. cit.). The latter seen from a distance resembles a medieval castle crowning a hill-top.

Nuraghe Lugheras near Paulilatino, or the Nuraghe de S'Orcu near Domusnovas, the entrance may be protected by a regular system of courtyards and subsidiary nuraghi. Roughness of construction cannot be regarded as a proof of antiquity, inasmuch as in some, cases we find the additions less well built than the original nuraghe; and it is often clear from the careful work at points where it was necessary that the lack of finer construction was often simply economy ol labour. That the simpler forms, on the other hand, preceded those of more complicated plan is probable. The manner of their arrange- ment seems to indicate clearly that they were intended to be fortified habitations, not tombs or temples. The niche at the entrance, which is rarely wanting, served, no doubt, for the sentry on guard

• section ■ ka Fig. 2.

From Papers of the British School at Rome, v. 97, fig. 3.

Fig. 3. — Nuraghe Aiga (Plan and Section).

and would be on the unprotected side of any one coming in; the door, too, is narrow and low, and closed from within. The approach is, as we have seen, often guarded by additional constructions ; the fact that the door and window face south is another argument in favour of this

theory, and the access from one part of the interior to another is sometimes purposely rendered difficult by a sudden vertical rise of 5 or 6 ft. in the stairs ; while the objects found in them — household pottery, &c. — and near them (in some cases silos contain- ing carbonized grain and dolia) point to the same conclusion. Numer- ous fragments of obsidian arrow-heads and chips are also found in and near them all over the island. The only place where obsidian is known to be found in Sardinia in a natural state is the Punta Trebina, a mountain south-east of Oristano. The choice of site, too, is decisive. Sometimes they occupy the approaches to tablelands, the narrowest points of gorges, or the fords of rivers; sometimes almost inaccessible mountain tops or important points on ridges; and it may be noticed that, where two important nuraghi are not visible from one another, a small one is interpolated, showing that there was a system of signalling from one to another. Or again, a group of them may occupy a fertile plain, a river valley or a tableland, 3 or they may stand close to the seashore. Generally there is, if possible, a water-supply in the vicinity; sometimes a nuraghe guards a spring, or there may be a well in the nuraghe itself.

A final argument is the existence in some cases of a village of circular stone buildings of similar construction to the nuraghi, but only 15 to 25 ft. in diameter, at the foot of a nuraghe, which, like the baronial castle of a medieval town, towered above the settlement.

3 Those of the Giara are fully described by A. Taramelli and F. Nissardi in Monumenti dei Lincei, vol. xviii. ; Nissardi's map of the Nurra, published by G. Pinza, ibid. vol. xi. sqq., may also be consulted.

SARDINIA

Plate.

Fig. i.— NURAGHE MELAS, NEAR GUSPINI.

Fig. 2.— NURAGHE LOSA, NEAR ABBASANTA.

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Fig. 3-NURAGHE MADRONE, NEAR SILANUS. Fig. 4.— NURAGHE OROLO, NEAR BORDIGHALI.

XXIV. sia. Photos by Dr T. Ashby.

Iney are distributed over the whole island, but are perhaps most frequent towards the centre and in the Nurra. They seem to be almost entirely lacking in the north-east extremity, near Terra- nova, and in the mountains immediately to the north of Iglesias, though they are found to the north of the Perda de sa Mesa. In the district of Gennargentu they occur, rarely, as much as 3600 ft. above sea-level. The tombs of their inhabitants are of two classes — the so-called tombe dei giganti, or giants' tombs, and the domus de gianas, or houses of the spirits. The former are generally found close to, or at least in sight of, the nuraghe to which they Tombs. belong. They consist of a chamber about 31 ft. or less in height and width, with the sides slightly inclined towards one another, and from 30 to 40 ft., or even more, in length ; the sides are composed sometimes of slabs, sometimes of rough walling, while the roof is composed of flat slabs; and the bodies were probablyˆ dis- posed in a sitting position. At the front is a large slab, sometimes carved, with a small aperture in it, through which offerings might be inserted. On each side of this is a curve formed of two rows of

SECTION ■ A A.

From Papers of Ike British School at Rome, v. p. ng, fig. 11.

Fig. 4. — Giant's Tomb of Srigidanu.

slabs or two small walls; the semicircular space thus formed has a diameter of about 45 ft., and was probably intended for sacrifices. The tomb proper was no doubt covered with a mound of earth, which has in most cases disappeared. Close to these tombs smaller round enclosures, about 4 ft. in diameter, covered with a heap of stones, like a small cairn, may sometimes be seen; these were possibly intended for the burial of slaves or less important members of the tribe. Dolmens (probably to be regarded as a simpler form of the tomba dei giganti, inasmuch as specimens with chambers elongated after their first construction have been found) and menhirs are also present in Sardinia, though the former are very rare — that known as Sa Perda e S'altare, near the railway to the south of Macomer is illustrated by A.

Taramelli in Bullettino di Paleoetnologia, xxxii. (1906), 268, but there are others. The latter, however, are widely distributed over the island, being especially frequent in the central and most inaccessible part. The domus de gianas, on the other hand, resemble closely the rock tombs of the prehistoric cemeteries of Sicily. They are small grottos cut in the rock. We thus have two classes of tombs in connexion with the nuraghi, and if these were to be held to be tombs also, habitations would be entirely wanting. 1

1 The whole question is well dealt with by F. Nissardi in Atti del Congresso delle Scienze Storiche (Rome, 1903), vol. v. (Archeologia), 651 sqq.; cf. Builder, May 18, 1907 (xcii. 589).

Among the most curious relics of the art of the period is a group of bronze statuettes, some found at Uta near Cagliari and others near Teti, west of Fonni, in the centre of the island, of which many specimens are now preserved in the museum at Cagliari.

It is thus clear that in the Bronze Age Sardinia was fairly thickly populated over by far the greater part of its extent; this may explain the lack of Greek colonies, except for Olbia, the modern Terranova, and Neapolis on the clans. west coast, which must from their names have been Greek, though we do not know when or by whom they were founded. Pausanias (x. 17. 5) attributes the foundation of Olbia to the Thespians and Athenians under Iolaus, while Solinus (i. 61) states that he founded other cities also. In any case the Phoenician settlements are the earliest of which we have any accurate knowledge. The date of the conquest by

Carthage may perhaps be fixed at about

500-480 B.C., following the chronology of Justin Martyr (xviii. 7), inasmuch as up till that period colonization by the Greeks seems to have been regarded as a possible enterprise. The cities which they founded — Cornus, Tharros, Sulci, Nora, Carales — are all on the coast of the island, and it is doubtful to what extent they penetrated into the interior. Even in the 1st century B.C. there were still traces of Phoenician influence (Cicero, Pro Scauro, 15, 42, 45). There are signs of trade with Etruria as early as the 7th century B.C. The Cartha- ginians made it into an important grain- producing centre; and the Romans set foot in the island more than once during the First Punic War.

In 238 B.C. the Carthaginian mercen- aries revolted, and the Romans took advantage of the fact to demand that the island should be given p

˚riod. up to them, which was done. The native tribes opposed the Romans, but were conquered after several campaigns; the island became a province under the government of .a praetor or propraetor, to whose jurisdiction Corsica was added soon afterwards. A rebellion in 215 B.C., fostered by the Carthaginians, was quelled by T. Manlius Torquatus (Livy xxiii. 40). After this the island began to furnish considerable supplies of corn; it was treated as a conquered country, not containing a single free city, and the inhabitants were *”” obliged to pay a tithe in corn and a further money contribution. It was classed with Sicily and Africa as one of the main sources of the corn-supply of Rome. There were salt-works in Sardinia too as early as about 150 B.C., as is attested by an inscription assigned to this date in Latin, Greek and Punic, being a dedication by one Cleon salari(us) soc(iorum) s(ervus) (Corp. Inscr. Lat. x. 7856). .We only hear of two insurrections of the mountain tribes, in 181, when no less than 80,000 Sardinian slaves 2 were brought to Rome by T. Sempronius Gracchus, and in 1 14 B.C., when M. Caecilius Metellus was proconsul and earned a triumph after two years’ fighting: but even in the time of Strabo there was considerable brigandage. Inscriptions record the boundaries of the territories of various tribes with outlandish names otherwise unknown to us (Corp. Inscr. Lat. x. 7889. 7930).

Some light is thrown on the condition and administration of the island in the 1st century B.C. by Cicero’s speech (of which a part only is preserved) in defence of M. Aemilius Scaurus (q.v.), praetor in 53 B.C. Cicero, speaking no doubt to his brief, gives them a very bad character, adding ” ignoscent alii viri boni ex Sardinia; credo enim esse quosdam ” (§ 43). In the division of provinces made by

2 The large number of slaves is said to have given rise to the phrase Sardi venales for anything cheap or worthless.

Augustus, Sardinia and Corsica fell to the share of the senate, but in a.d. 6, Augustus, owing to the frequent disturbances, took them over and placed them under a praefectus. Tiberius sent 4000 Jewish and Egyptian freedmen to the island to bring the brigands to sub- mission (Tac. Ann. ii. 85). Later on two cohorts were quartered there and also detachments of the Classis Misenas, as the discharge certificates {tabulae honestae missionis) of the former and tombstones of the latter found in the island 1 show (C.I.L. x. 777). In A.D. 67 Nero restored Sardinia to the senate (but not Corsica) in exchange for

Achaea, and the former was then governed by a legatus pro praetore; but Vespasian took it over again before a.d. 78, and placed it under an imperial procurator as praefectus. It returned to the senate, not before a.d. 83 but certainly before the reign of M. Aurelius, when we find it governed by a proconsul, as it was under Commodus; the latter, or perhaps Septimius Severus, took it over again and placed it under a procurator as praefectus once more (D. Vaglieri in Notizie degli scavi, 1897, 280).

A bronze tablet discovered in 1866 near the village of Esterzili is inscribed with a decree of the time of Otho with regard to the boundaries of three tribes, the Gallienses, Patulienses and Campani, who inhabited the eastern portion of the island. The former tribe had crossed the boundaries of the other two, and was ordered to withdraw immediately under pain of punishment (Corp. inscr. Lat. x. 7852). Carales was the only city with Roman civic rights in Sardinia in Pliny's time (when it received the privilege is unknown) and by far the most important place in the island; a Roman colony had been founded at Turris Libisonis (Porto Torres) and others, later on, at Usellis and Cornus.

We hear little of the island under the Empire, except as a granary and as remarkable for its unhealthiness and the audacity of its brigands. It was not infrequently used as a place of exile.

A number of Roman towns are known to us. Besides those already mentioned, including the Phoenician cities (all of which continued to Towns exist in Roman days) the most important were Bosa (q.v.), . Forum Traiani (mod. Fordungianus) (q.v.), Neapolis and

tribes Othoca (mod. Oristano, q.v.). An interesting group of

Roman houses was found in 1878 at Bacu Abis, 5 m. W. of Iglesias, but has been covered up again (F. Vivanet in Notizie degli scavi, 1878, 271). The name Barbaria for the mountainous district in the east centre of Sardinia, in the district of Nuoro, which still exists in the form Barbargia, goes back to the Roman period, the civitates Barbariae being mentioned in an inscription of the time of Tiberius (Corp. inscr. Lat. xiv. 2954). The Barbaricini are mentioned in the 6th century a.d. by Procopius, who wrongly derives the name from several thousand Moors and Numidians who were banished to the island by the Vandal kings, while Gregory the Great speaks of them in a letter (iv. 23) to Hospito, their chief, as a still pagan race, worshipping stocks and stones. The towns were connected by a considerable network of roads, with a total length of 958 Roman Ponds miles

according to the Itineraries, the most important of

which ran from Carales to Turris Libisonis (Porto Torres) through the centre of the island, passing Othoca (Oristano) and Forum Traiani. Its line is followed closely by the modern highroad and railway. A portion of its course, however, between Forum Traiani and the modern Abbasanta, is not so followed, and is still well preserved. Its width is as a rule about 24 ft. ; at present its surface is formed of rough cobbling, upon which there was probably a gravel layer, now washed away. Several milestones belonging to it have been discovered, including one of the time of Augustus and one of Claudius near Forum Traiani, and one of Nero near Turris Libisonis, though it was probably not completed right through until a later period (T. Mommsen in Corp. inscr. Lat. x. 833; cf. Eph. epigr. viii. 181-183). A branch from this road ran to Olbia (followed closely by the modern highroad and railway also), and was perhaps the main line of communication, though the itineraries state that the road from Carales to Olbia ran through the centre of the island by Biora, Valentia, Sorabile (near Fonni) and Caput Thyrsi.

Many milestones belonging to the road from Carales to Olbia have been found, but all but one of them (which was seen at Valentia) belong to the portion of the road within 12 m. of the latter place, so that they might belong to either line (see Olbia). The distance seems to be identical by either route. The itineraries give it as 176 m. — the exact distance in English miles by the modern railway! The difference between English and Roman miles would be compensated for by the more devious course taken by the railway. Turris Libisonis was also connected with Othoca by a road along the west coast, passing through Tharros, Cornus and Bosa; this road went on to Tibula 2 (Capo della Testa) at the north extremity of the island and so by the coast to Olbia. From Tibula another road ran inland to join the road from Carales to Olbia some 16 m. west of the latter.

1 The discharge certificates of sailors from the Classis Misenas and Classis Ravennatis belonged to Sardinians who had returned home after service in those fleets.

2 Excavations made in 1880 at Tibula and Sorabile resulted in the discovery at the former of a necropolis of the late Empire, in which the dead were buried in long amphorae, while at the latter Roman baths were explored (F. Vivanet in Notizie degli scavi, 1879, 350; 1881, 29 sqq.).

Carales was also connected with Olbia bya road along the east coast.

The south-west corner of the island was served by a direct road from Carales westward through Decimomannu (note the name Decimo, a survival, no doubt, of a Roman post-station ad decimum lapidem), where there is a fine Roman bridge over 100 yds. long of fourteen arches, still well preserved. The width of the roadway is only 1 1 ft. There is also a road through Nora and along the coast past Sulci to Metalla and Neapolis, and thence to Othoca.

After the time of Constantine, the administration of Sardinia was separated from that of Corsica, each island being governed by a praeses dependent on the vicarius urbis Romae. In 456 it was seized by Genseric. It was retaken P erˆ”” e for a short time by Marcellianus, but was not ‘ *

finally recovered until the fall of the Vandal kingdom in Africa in 534, by Cyril. In 551 it was taken by Totila, but reconquered after his death by Narses for the Byzantine Empire. Under Byzantium it remained nominally until the 10th century, when we find the chief magistrate still bearing the title of apxuv?

In the 8th century 4 (720) the period of Saracen invasion began; but the Saracens never secured a firm footing in the island. In 725 Luidprand purchased and removed to Pavia the body „ of St Augustine of Hippo from Cagliari, whither it had baracens ° been brought in the 6th century by the exiled bishop of Hippo. In 815 Sardinia submitted to Louis the Pious, begging for his pro- tection ; 5 but the Saracens were not entirely driven out, and about a.d. iooo the Saracen chief Musat established himself in Cagliari. Pope John XVIII. preached a crusade in 1004, promising to bestow the island (when or whether it had ever definitely passed into the power of the papacy is not absolutely clear) upon whoever should drive out the Saracens. The Pisans took up the challenge, and Musat was driven out of Cagliari with the help of the Genoese in 1022 for the third time. The Pisans and Genoese now disputed about the ownership of Sardinia, but the pope and the emperor decided in favour of Pisa. Musat returned to the island once more and made himself master of it, but was defeated and taken prisoner under the walls of Cagliari in 1050, when the dominion of Pisa was established.

The island had (probably since the end of the 9th century) been divided into four districts — Cagliari, Arborea, Torres (or Logudoro) and Gallura — each under a giudice or judge, in whom the dignity became hereditary. Judices are already mentioned as existing in the account of the mission sent by Nicholas I. in 864 (Duchesne, Liber pontifi- calis, ii. 162), as though the single authority of the Byzantine

apxuv was already weakened. The three apxovres who appear in the 10th-century inscriptions just mentioned bear alternately the names Torcotorius and Salusius; and, inasmuch as this is the case with the judices of Cagliari from the nth to the 13th century, there seems no doubt that they were the successors of these Byzantine apxovres, who were perhaps the actual founders of the dynasty. These names, indeed, continue even after the Pisan family of Lacon-Massa had by marriage succeeded to the judicature. The Greek language occurs in their official seals down to the 13th century. Intermarriage (sometimes illicit) was apparently freely used by the dominant families for the concentration of their power. Thus we find that after the failure of Musat members of the family of Lacon-Unali filled all the four judicatures of the island (Taramelli, Arch. star. Sard., cit. 105). In the continual struggles between Pisa and Genoa some of these princestook the side of the latter. In 1 164 Barisone, giudice of Arborea, was given the title of king of the whole island by Frederick Barbarossa, but his supremacy was never effective. In 1241 Adelasia, heiress of Gallura and Logudoro, was married as her third husband to Enzio, the natural son of Frederick II., who received the title of king of Sardinia from his father, but fell into the hands of the Bolognese in 1249, and

3 Three inscriptions of the middle of this century, set up by the fipxwc SapSrji'ias with the title protospatarius , are illustrated by A. Taramelli in Notizie degli scavi (1906), 123 sqq.; cf. Archivio storico Sardo (1907), 92; and there are a few churches of the Byzan- tine period and style, a considerable number of Byzantine inscrip- tions, dedications to Greek saints, and other traces of the influence of the Eastern Empire in the island.

4 Some authorities attribute to 774, others to 817, a donation of Sardinia to the papacy; we hear of Pope Nicholas I. sending legates in 865 to quell disturbances and check evil practices in the island.

' There is no authentic history for the intervening period ; the famous " pergamene d'Arborea," published by P. Martini in 1863 at Cagliari, have been shown to be modern forgeries.

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remained a prisoner at Bologna until his death. After this the Pisan supremacy of the island seems to have become more of a reality, but

Arborea remained independent, and after the defeat of the Pisans by the Genoese at the naval battle of Meloria in 1284 they were obliged to surrender Sassari and Logudoro to Genoa. In 1297 Boniface VIII. invested James II., the king of Aragon, with Sardinia; but it was not until 1323 that he attempted its conquest, nor until 1326 that the Pisans were finally driven out of Cagliari, which they had fortified in 1305- 1307 by the construction of the Torre di S. Pancrazio and the Torre dell' Elefante, and which became the seat of the Aragonese government. To the Pisan period belong a number of fine Romanesque churches, among which may be specially mentioned those of Ardara, S. Giusta near Oristano, La Trinita di Saccargia and Tratalias (see D. Scano, op. cit. infra).

The Aragonese enjoyed at first the assistance of the giudici of Arborea, who had remained in power; but in 1352 war broke out between Mariano IV. and the Aragonese, and was period. carried on by his daughter Eleonora, wife of Branca- leone Doria of Genoa, until her death in 1403. Peter IV. had meanwhile in 1355 called together the Cortes (parlia- ment) of the three estates (the nobles, the clergy and the representatives of the towns) for the first time after the model of Aragon. After 1403 the Aragonese became masters of Arborea also. The title of giudice was abolished and a feudal marquisate substituted. The carta de logu (del luogo) or code of laws issued by her was in 1421 extended to the whole island by the cortes under the presidency of Alphonso V., who visited Sardinia in that year. In 1478 the marquisate of Oristano was suppressed, and henceforth the island was governed by Spanish viceroys with the feudal regime of the great nobles under them, the Cortes being convoked once every ten years. Many of the churches show characteristic Spanish Late Gothic architecture which survived until a comparatively recent period. The Renaissance had little or no influence on Sardinian architecture and culture.

The island remained a Spanish province until the War of the Spanish Succession, when in 1708 Cagliari capitulated to an English fleet, and the island became Austrian; the status quo was confirmed by the peace of Utrecht in 1713. In 1717, however, Cardinal Alberoni retook Cagliari for Spain; but this state of things was short-lived, for in 1720, by the treaty of London, Sardinia passed in exchange for Sicily to the dukes of Savoy, to whom it brought the royal title. The population was at that time a little over 300,000; public security and education were alike lacking, and there were considerable animosities between different parts of the island. Matters improved considerably under Charles Emmanuel III., in whose reign of forty-three years (1 730-1 773) the prosperity of the island was much increased. The French

attacks of 1792- 1 793 were repelled by the inhabitants, Cagliari being unsuccess- fully bombarded by the French fleet, and the refusal by Victor Amadeus III. to grant them certain privileges promised in consideration of their bravery led to the revolution of 1 794-1 796. In 1799 Charles Emmanuel IV. of Savoy took refuge in Cagliari after his expulsion by the French, but soon returned to Italy. In 1802 he abdicated in favour of his brother Victor Emmanuel I., who in 1806 returned to Cagliari and remained there until 1814, when he retired, leaving his brother, Carlo Felice, as viceroy. Carlo was successful in repressing brigands, but had to deal with much distress from famine. In 1821 he became king of Savoy by the abdication of his brother, and the construction of the highroad from Cagliari to Porto Torres was begun (not without opposition on the part of the inhabitants) in 1822. Feudalism was abolished in 1836, and in 1848 complete political union with Piedmont was granted, the viceregal government being suppressed, and the island being divided into three divisions of which Cagliari, Sassari and Nuoro were the capitals. General A. La Marmora was appointed royal commissioner to supervise the transformation to the new regime.

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SARDIS, more correctly Sardes (at 2ap5«s) , the capital of the ancient

kingdom of Lydia, the seat of a conventus under the Roman Empire, and the metropolis of the province Lydia in later Roman and Byzantine times, was situated in the middle Hermus valley, at the foot of Mt. Tmolus, a steep and lofty spur of which formed the citadel. It was about 2J m. S. of the Hermus. The earliest reference to Sardis is in the Persae of Aeschylus (472 B.C.); in the Iliad the name Hyde seems to be given to the city of the Maeonian (i.e. Lydian) chiefs, and in later times Hyde was said to be the older name of Sardis, or the name of its citadel. It is, however, more probable that Sardis was not the original capital of the Maeonians, but that it became so amid the changes which produced the powerful Lydian empire of the 8th century B.C. The city was captured by the Cimmerians in the 7th century, by the Persians and by the Athenians in the 6th, and by Antiochus the Great at the end of the 3rd century. Once at least, under the emperor Tiberius, in a.d. 17, it was destroyed by an earthquake; but it was always rebuilt, and was one of the great cities of western Asia Minor till the later Byzantine time. As one of the Seven Churches of Asia, it was addressed by the author of the Apocalypse in terms which seem to imply that its population was notoriously soft and faint- hearted. Its importance was due, first to its military strength, secondly to its situation on an important highway leading from the interior to the Aegean coast, and thirdly to its commanding the wide and fertile plain of the Hermus.

The early Lydian kingdom was far advanced in the industrial arts (see Lydia), and Sardis was the chief seat of its manu- factures. The most important of these trades was the manu- facture and dyeing of delicate woollen stuffs and carpets. The statement that the little stream Pactolus which flowed through the market-place rolled over golden sands is probably little more than a metaphor, due to the wealth of the city to which the Greeks of the 6th century B.C. resorted for supplies of gold; but trade and the organization of commerce were the real sources of this wealth. After Constantinople became the capital of the East a new road system grew up connecting the provinces with the capital. Sardis then lay rather apart from the great lines of communication and lost some of its importance. It still, how- ever, retained its titular supremacy and continued to be the seat of the metropolitan bishop of the province of Lydia, formed in a.d. 295. It is enumerated as third, after Ephesus and Smyrna, in the list of cities of the Thracesian thema given by Constantine Porphyrogenitus in the 10th century; but in the actual history of the next four centuries it plays a part very inferior to Magnesia ad Sipylum and Philadelphia (see Ala-Shehr), which have retained their pre-eminence in the district. The Hermus valley began to suffer from the inroads of the

Seljuk Turks about the end of the nth century; but the successes of the Greek general Philocales in n 18 relieved the district for the time, and the ability of the Comneni, together with the gradual decay of the Seljuk power, retained it in the Byzantine dominions. The country round Sardis was frequently ravaged both by Christians and by Turks during the 13th century. Soon after 1301 the Seljuk amirs overran the whole of the Hermus and Cayster valleys, and a fort on the citadel of Sardis was handed over to

c,

them by treaty in 1306. Finally in 1390 Philadelphia, which had for some time been an independent Christian city, sur- rendered to Sultan Bayezid's mixed army of Ottoman Turks and Byzantine Christians, and the Seljuk power in the Hermus valley was merged in the Ottoman empire. The latest reference to the city of Sardis relates its capture (and probable destruction) by Timur in 1402. Its site is now absolutely deserted, except that a tiny village, Sart, merely a few huts inhabited by semi- nomadic Yuruks, exists beside the Pactolus, and that there is a station of the Smyrna & Cassaba railway 1 m. north of the principal ruins.

The ruins of Sardis, so far as they are now visible, are chiefly of the Roman time ; but though few ancient sites offered better hope of results, the necessity for heavy initial expenditure was a deterrent (e.g. to H. Schliemann). On the banks of the Pactolus two columns of a temple of the Greek period, probably the great temple of Cybele, are still standing. More than one attempt to excavate this temple, the last by G. Dennis in 1882, has been made and prematurely brought to an end by lack of funds. In 1904 a few trial pits were sunk by M. Mendel for the Constantinople Museum, and the site was ultimately conceded to an American syndicate, for whom H. C. Butler of Princeton University undertook the task of ex- cavation. The necropolis of the old Lydian city, a vast series of mounds, some of enormous size, lies on the north side of the Hermus,

or 5 m. from Sardis, a little south of the sacred Gygaean Lake,

oloe; here the Maeonian chiefs, sons, according to Homer, of the lake, were brought to sleep beside their mother. The series of mounds is now called Bin Tepe (Thousand Mounds). Several of them have been

opened by modern excavators, but in every case it was found that treasure-seekers of an earlier time had removed any articles of value which had been deposited in the sepulchral chambers.

See K. Buresch, Aus Lydien (1898); G. Radet, La Lydie (1893); Kybebe (1908); W. M. Ramsay, The Letters to the Several Churches (1904), and article in Hastings' Diet, of the Bible (1902). (D. G. H.)

SARDONYX, an ornamental' stone much used for seals and cameos. It usually consists of a layer of sard or carnelian with one of milk-white chalcedony, but it may present several alter- nating layers of these minerals. The sardonyx is therefore simply an onyx in which some of the bands are of sard or carnelian: if, however, the latter is present the stone is more appropriately called a " carnelian onyx." It was considered by ancient authorities that a fine Oriental sardonyx should have at least three strata — a black base, a white intermediate zone and a superficial layer of brown or red; these colours typifying the three cardinal virtues — humility (black), chastity (white) and modesty or martyrdom (red). The ancients obtained sardonyx from India, and the Indian locality, Mount Sardonyx, referred to by Ptolemy, is supposed to have been near Broach, where agates and carnelians are still worked. In the Revised Version of the Old Testament, Ex. xxviii. 18, " sardonyx " is given in the margin as an alternative reading for " diamond," the word by which the Hebrew yahaiom is usually translated. The stone known to the Romans as aegyptilla may have been a kind of sardonyx, or perhaps a nicolo, which is an onyx with a thin translucent milky layer on the surface. Imitations of sardonyx have been made by cementing together two or three stones of the required colours, while baser counterfeits have been pro- duced in paste. By coating a sard or carnelian with sodium carbonate and then placing the stone on a red-hot iron a white layer may be produced, so that a kind of sardonyx is obtained (see Carnelian). Most of the modern sardonyx is cut from South American agate, modified in colour by artificial treatment. (See Agate; Gem.)

SARDOU, VICTORIEN (1831-1908), French dramatist, was born in Paris on the 5th of September 1831. The Sardous were settled at Le Cannet, a village near Cannes, where they owned an estate, planted with olive trees. A night's frost killed all the trees and the family was ruined. Victorien's father, Antoine Leandre Sardou, came to Paris in search of employment. He was in succession a book-keeper at a commercial establishment, a professor of book-keeping, the head of a provincial school, then a private tutor and a schoolmaster in Paris, besides editing grammars, dictionaries and treatises on various subjects. With all these occupations, he hardly succeeded in making a

livelihood, and when he retired to his native country, Victorien was left on his own resources. He had begun studying medicine, but had

to desist for want of funds. He taught French to foreign pupils; he also gave lessons in Latin, history and mathematics to students, and wrote articles for cheap encyclopaedias. At the same time he was trying to make headway in the literary world. His talents had been encouraged by an old bas-bleu, Mme de Bawl, who had published novels and enjoyed some reputation in the days of the Restoration. But she could do little for her protege. Victorien Sardou made efforts to attract the attention of Mile Rachel, and to win her support by submitting to her a drama, La Reine Ulfra, founded on an old Swedish chronicle. A play of his, La Taverne des ttudiants, was produced at the Odeon on the 1st of April 1834, but met with a stormy reception, owing to a rumour that the debutant had been instructed and commissioned by the government to insult the students. La Taverne was withdrawn after five nights. Another drama by Sardou, Bernard Palissy, was accepted at the same theatre, but the arrangement was cancelled in consequence of a change in the management. A Canadian play, Flew de Liane, would have been produced at the Ambigu but for the death of the manager. Le Bossu, which he wrote for Charles Albert Fechter, did not satisfy the actor; and when the play was successfully produced, the nominal authorship, by some unfortunate arrangement, had been transferred to other men. M Sardou submitted to Adolphe Montigny (Lemoine-Montigny), manager of the Gymnase, a play entitled Paris d I'envers, which contained the love scene, after- wards so famous, in Nos Intimes. Montigny thought fit to consult Eugene Scribe, who was revolted by the scene in question.

Sardou felt the pangs of actual want, and his misfortunes culminated in an attack of typhoid fever. He was dying in his garret, surrounded with his rejected manuscripts. A lady who was living in the same house unexpectedly came to his assistance. Her name was Mile de Brecourt. She had theatrical connexions, and was a special favourite of Mile Dejazet. She nursed him, cured him, and, when he was well again, introduced him to her friend. Then fortune began to smile on the author. It is true that Candide, the first play he wrote for Mile Dejazet, was stopped by the censor, but Les Premieres Armes de Figaro, Monsieur Garat, and Les Pris Saint Gervais, produced almost in succession, had a splendid run, and Les Pattes de mouche (i860: afterwards anglicized as A Scrap of Paper) obtained a similar success at the Gymnase. Fedora (1882) was written expressly for Sarah Bernhardt, as were many of his later plays. He soon ranked with the two undisputed leaders of dramatic art, Augier and Dumas. He lacked the powerful humour, the eloquence and moral vigour of the former,

the passionate convic- tion and pungent wit of the latter, but he was a master of clever and easy flowing dialogue. He adhered to Scribe's constructive methods, which combined the three old kinds of comedy — the comedy of character, of manners and of intrigue — with the drame bourgeois, and blended the heterogeneous elements into a compact body and living unity. He was no less dexterous in handling his materials than his master had been before him, and at the same time opened a wider field to social satire. He ridiculed the vulgar and selfish middleˆclass person in Nos Intimes (1861: anglicized as Peril), the gay old bachelors in Les Vieux Gar cons (1865), the modern Tartuf es in Seraphine (1 868) , the rural element in Nos Bons Villageois (1866), old-fashioned customs and antiquated political beliefs in Les Ganaches (1862), the revolutionary spirit and those who thrive on it in Rabagas (1872) and Le Roi Carotte (1872), the then threatened divorce laws in DivorQons (1880).

He struck a new vein by introducing a strong historic element in some of his dramatic romances. Thus he borrowed TModora (1884) from Byzantine annals, La Haine (1874) from Italian chronicles, La Duchesse d' Athenes from the forgotten records of medieval Greece. Patrie (1869) is founded on the rising of the Dutch gueux at the end of the 16th century. The scene of La Sorciere (1904) was laid in Spain in the 16th century. The French Revolution furnished him with three plays, Les Merv&il- leuses, Thermidor (1891) and Robespierre (1902). The last named was written expressly for Sir Henry Irving, and produced at the Lyceum theatre, as was Dante (1903). The imperial

epoˆ was revived in La Tosca 1 (1887) and Madame Sans Gene (1893). Later plays were La Piste (1905) and Le Drame des poisons (1907). In many of these plays, however, it was too obvious that a thin varnish of historic learning, acquired for the purpose, had been artificially laid on to cover modern thoughts and feelings. But a few — Patrie and LaHaine (1874), for instance — exhibit a true insight into the strong passions of past ages.

M. Sardou married his benefactress, Mile de Brecourt, but eight years later he became a widower, and soon after the revolu- tion of 1870 was married a second time, to Mile Soulie, the daughter of the erudite Eudore Soulie, who for many years superintended the Musee de Versailles. He was elected to the French Academy in the room of the poet Joseph Autran (1813- 1877), and took his seat on the 22nd of

May 1878. He died at Paris on the 8th of November 1908.

See L. Lacour, Trois thedtres (1880); Brander Matthews, French Dramatists (New York, 1881); R. Doumic, £crivains d' aujourd' hui (Paris, 1895) ; F. Sarcey, Quarante ans de thedtre (vol. vi., 1901).

SARGASSO SEA, a tract of the North Atlantic Ocean, covered with floating seaweed (Sargassum, originally named sargaqo by the Portuguese). This tract is bounded approximately by 25° and 30 N. and by 38° and 6o° W., but its extent varies according to winds and ocean currents. By these agencies the weed is carried and massed together, the original source of supply being probably the Caribbean Sea and Gulf of Mexico (see Algae). Similar circumstances lead to the existence of other similar tracts covered with floating weed, e.g. in the solitary part of the Pacific Ocean, north of the Hawaiian islands, between 30° and 40 N. and between 150 and 180 W. There is a smaller tract S.E. of New Zealand, and along a belt of the southern ocean extending from the Falkland Islands, south of Africa and south-west of Australia, similar floating banks of weed are encountered. The Sargasso Sea was discovered by Columbus, who on his first voyage was involved in it for about a fortnight. The widely credited possibility of ships becoming embedded in the weed, and being unable to escape, is disproved by the expedi- tion of the " Michael Sars, " under the direction of Sir John Murray and the Norwegian government, in 1910, which found the surface covered with weed only in patches, not continuously.

SARGENT, JOHN SINGER (1856-), American artist, son of a distinguished Boston physician, was born at Florence, Italy, on the 12th of January 1856. He was educated in Italy and Germany, and in 1874 entered the atelier of Carolus-Duran in Paris. He received an " honourable mention " in the Salon of 1878 for his " En route pour la peche," and in 1881 a second class medal for his " Portrait of a Young Lady " (made famous by Henry James's appreciation). In 1886 his "Carnation, Lily, Lily, Rose," exhibited at the Royal Academy, was bought for the Chantrey Bequest. He rapidly became known in London as a brilliant portrait painter, and year by year his Academy portraits were the leading features of its exhibitions. Though ef the French school, and American by birth, it is as a British artist that he won fame by his vogue as the most sought-after portrait painter of the day, his sitters including the men and women of greatest distinction in the literary, artistic and social life of Europe and America. While best known, and consequently busily employed, as a portrait painter, he had at the same time a disposition towards other, and especially decorative work; his paintings of Brittany, Venice and Eastern scenes

are less known, but his labour of love, the ornate decorations for the Boston public library (completed in 1903), ” The Pageant of Religion,” shows the other side of his genius. Among his pictures in public galleries not already mentioned are ” El Jaleo ” (exhibited 1882), in the Boston Art Museum; ” La Carmencita,” in the Luxembourg; ” Coventry Patmore,” in the National Portrait Gallery, London; and ” Henry Marquand ” (1887), in the Metropolitan Museum, New York. He was elected an A.R.A. in 1894, and R.A. in 1897; he was the recipient of various medals of honour, and was made a member of the chief artistic societies of Europe and America.

1 Adapted as an opera for the music of Puccini (Rome, 14th Jan.

1900).

SARGON, more correctly Sarru-Kinu (” the legitimate king,” Sargon being a hybrid formation from the Semitic sar and the Sumerian gina, ” established “), an Assyrian general who, on the death of Shalmaneser IV., during the siege of Samaria, seized the crown on the 12th of Tebet 722 B.C. He claimed to be the descendant of the early kings, and accordingly assumed the name of a famous king of Babylonia who had reigned about 3000 years before him. His first achievement was the capture of Samaria, 27,200 of its inhabitants being carried into captivity. Meanwhile Babylon had revolted under a Chaldaean prince, Merodach-baladan, who maintained his power there for twelve years. In 720 B.C. Yahu-bihdi of Hamath led Arpad, Damascus and Palestine into revolt: this was suppressed, and the Philistines and Egyptians were defeated at Raphia (mod. er-Rafa). In 719 B.C. Sargon defeated the Minni to the east of Armenia, and in 717 overthrew the combined forces of the Hittites and Moschi (Old Testament Meshech). The Hittite city of Carchemish was placed under an Assyrian governor, and its trade passed into Assyrian hands. The following year Sargon was attacked by a great confederacy of the northern nations — Ararat, the Moschi, Tibareni, &c. — and in the course of the campaign marched into the land of the Medes in the direction of the Caspian. In 7 1 5 B.C. the Minni were defeated, and one of their chiefs, Dayuku or Daiukku (Deioces), transported to Hamath. In 714 B.C. the army of Rusas of Ararat was annihilated, and a year later five Median chiefs, including Arbaku (Arbaces) became tributary. Cilicia and the Tibareni also submitted as well as the city ol Malatia, eastern Cappadocia being annexed to the Assyrian Empire. A league was now formed between Merodach-baladan and the princes of the west, but before the confederates could move, an Assyrian army was sent against Ashdod, and Edom, Moab and Judah submitted to Sargon, who was thus free to turn his attention to Babylonia, and

Merodach-baladan was accord- ingly driven from Babylon, where Sargon was crowned king. Shortly after this Sargon sent a statue of himself to Cyprus and annexed the kingdom of Commagene. He was murdered in 705 B.C., probably in the palace he had built at Dur-Sargina, now Khorsabad, which was excavated by P. E. Botta. (A.H. S.)

SARI, a town of Persia, in the province of Mazandaran, on the left bank of the Tejen river, 80 m. S.W. of Astarabad. Pop. 10,000. It is the seat of the governor of Mazandaran, and has post and telegraph offices. The town is picturesque but very unhealthy, has stone-paved streets and houses built of brick and covered with green and red glazed tiles.

SARIPUL, or Siripul, a town and khanate of Afghan Turkestan. The town lies 100 m. S.W. of Balkh; estimated pop. 18,000. Two-thirds of the people are Uzbegs and the rest Hazaras. The khanate, which lies between Balkh and Maimana, is one of the ” four domains ” which were in dispute between Bokhara and Kabul, and were allotted to the Afghans by the Anglo-Russian boundary agreement of 1873.

SARIPUTTA, one of the two principal disciples of Gotama the Buddha. He was born in the middle of the 6th century B.C. at Nala, a village in the kingdom of Magadha, the modern Behar, just south of the Ganges and a little east of where Patna now stands. His personal name was Upatissa; the name of his father, who was a brahmin, is unknown; his mother’s name was Sari, and it was by the epithet or nickname of Sariputta (that is ” Sari’s son “), that he was best known. He had three sisters, all of whom subsequently entered the Buddhist Order. When still a young man he devoted himself to the religious life, and followed at first the system taught by Safijaya of the Belattha clan. A summary of the philosophical position of this teacher has been preserved in the Dialogue called The Perfect Net.

According to this account his main tendency was to avoid com- mitting himself to any decided conclusion on any one of the numerous points then discussed so eagerly among the clansmen in the valley of the Ganges. Early in the Buddhist movement Sariputta had a conversation with one of the men who had just joined it; and the Buddhist quoted to him the now famous stanza, ” Of all the things that proceed from a cause, the Buddha the cause hath told ; and he tells too how each shall come to an end — such alone is the word of

the Sage." The result was that Sariputta, with his friend Kolita and other disciples of Sanjaya, asked for admission, and were re- ceived into the Buddhist Order. He rapidly attained to mastery in the Buddhist system of self-training, and is declared to have been the chief of all the disciples in insight. He was present at a dialogue between the Buddha and a Wanderer named Aggivessana on the nature of sensations; and at the end of that discourse he attained to Arahatship. He is constantly represented as discussing points, usually of ethics or philosophy, either with the Buddha himself, or with one or other of the more prominent disciples. One whole book of the Samyutta is therefore called after his name. A number of stanzas inscribed to him are preserved in the Songs of the Elders (Thera-gatha), and one of the poems in the Sutta Nipata is based on a question he addressed to the Buddha. Asoka the Great, in his Bhabra Edict, enjoins on the Buddhists the study of seven passages in the Scriptures selected for their especial beauty. One of these is called The Question of Upatissa, and this poem may be the passage referred to. Feeling his end approaching, he went home, and died just six months before the death of the Buddha, that is, approximately in 480 B.C. He was cremated with great ceremony, and the ashes placed in a tope or burial-mound. An inscribed casket in such a mound at Sanchi opened by Cunningham in February 1851 con- tained a portion of these ashes which had been removed to that spot, in General Cunningham's opinion by Asoka.

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(T. W. R. D.)

SARK, a small island of the Channel Islands, 7 m. E. of Guernsey, much visited on account of its magnificent cliff- scenery and caves. It is 3 m. long from N. to S. and 15 m. in extreme breadth. Area, 1274 acres; pop. (1901) 504. It is divided into two unequal parts, known as Great Sark (the more northern) and Little Sark, connected by the Coupee, a lofty isthmus so narrow at the summit that it bears only a roadway, artificially built up, and flanke.d by a precipice on either side. Many islets and detached rocks lie off the coast; Brechou Island to the west is large enough to have a few fields and a house upon it. Some of the rocks are very fine, such as the four lofty flat-topped

pillars called the Autelets (altars).

The harbour of Sark lies on the east coast, a tiny cliff-bound bay protected by a breakwater, communicating with the interior only through two tunnels, one of which is modern, while the other dates from 1588. The harbour is called Creux. This is a term of common use in the Channel Islands, applying primarily to natural funnels or pits, but extended also to clefts such as that which forms the harbour. The Creux du Derrible (Old French, a downfall of rocks) is a wide shaft opening from the summit of the cliff and communicating with the sea through a double cave, through which the sea rushes at high water. Of the many majestic caverns in the cliffs the Boutiques and the Gouliots, both on the west coast of Great Sark, may be specially mentioned. The marine fauna is very rich. On Great Sark are the majority of the houses, the church, and the seigneurie or manor-house. An ancient mill stands at the summit of the island (375 ft). Agriculture and fishing are carried on. In Little Sark a disused shaft marks a silver-mine, worked in 1835, but soon abandoned. The island is included in the bailiwick of Guernsey, but has a court of justice of feudal character,- the officers being appointed by the seigneur.

SARLAT, a town of south-western France, capital of an arrondissement in the department of Dordogne, 44 m. E. by N. of Bergerac on the railway to Aurillac. Pop. (1906) town 4018, commune 6195. The town grew up round a monastery founded in the 8th century and early in the 14th century became the seat of a bishopric which was suppressed in 1 790. The former cathedral and abbey-church preserves interesting architecture of the Romanesque and later periods and remarkable wood-carving of the 1 5th century. There is also a curious pyramidical structure of the 1 2th century, which was probably used as a burial-place. The house where Etienne de la Boetie (d. 1563), the moralist, was born, and other houses in the Gothic and Renaissance styles are to be seen. La Boetie has a statue in the town. There is a large trade in cattle. Distilling, the manufacture of tin- boxes, and the preparation of truffles, pates de foie gras and other delicacies and of nut-oil are carried on; there are coal and iron mines and stone-quarries in the vicinity.

SARMATAE, or Satjromatae (the second form is mostly used by the earlier Greek writers, the other by the later Greeks

and the Romans), a people whom Herodotus (iv. 21. 117) puts on the eastern boundary of Scythia (q.v.) beyond the Tanais (Don). He says expressly that they were not pure Scythians, but, being descended from young Scythian men and Amazons, spoke an impure dialect and

allowed their women to take part in war and to enjoy much freedom. Later writers call some of them the ” woman-ruled Sarmatae.” Hippocrates (De Acre, &c, 24) classes them as Scythian. From this we may infer that they spoke a language cognate with the Scythic. The greater part of the barbarian names occurring in the inscriptions of Olbia, Tanais and Panticapaeum are supposed to be Sarmatian, and as they have been well explained from the Iranian language now spoken by the Ossetes of the Caucasus, these are supposed to be the representatives of the Sarmatae and can be shown to have a direct connexion with the Alani (q.v.), one of their tribes. By the 3rd century B.C. the Sarmatae appear to have supplanted the Scyths proper in the plains of south Russia, where they remained dominant until the Gothic and Hunnish invasions. Their chief divisions were the Rhoxolani (q.v.), the Iazyges (q.v.), with whom the Romans had to deal on the Danube and Theiss,’ and the Alani. The term Sarmatia is applied by later writers to as much as was known of what is now Russia, including all that which the older authorities call Scythia, the latter name being transferred to regions farther east. Ptolemy gives maps of European and Asiatic Sarmatia. (E. H. M.)

SARMENTOSE (Lat. sarmentum, twigs), a botanical term for plants producing long runners.

SARNEN, the capital of the western half (or Obwalden) of the Swiss canton of Unterwalden. It stands 1558 ft. above sea- level, at the north end of the lake of Sarnen (3 sq. m. in extent) and on the river Aa. Pop. (1900) 3949. It has a large parish church and two convents. In the archives is preserved the famous MS. known from the colour of its binding as the White Book of Sarnen, which contains one of the earliest known versions of the Tell legend (see Tell). Sarnen is a station on the Brunig Railway, being t,\ m. from Alpnachstad, its port on the lake of Lucerne. (W. A. B. C.)

SARNIA, a town and port of entry, Ontario, Canada, capital of Lambton ‘county, 55 m.N.E. of Detroit, on the left bank of the river St Clair. Pop. (1901) 8176. It is on the Grand Trunk and Lake Erie & Detroit River railways, and is a port of call for steamers plying on the Great Lakes. It contains a large oil-refinery which handles the greater part of the product of the Ontario oil region. The Grand Trunk railway crosses the river at this point by the St Clair tunnel, 6025 ft. long or, includ- ing the approaches, i\ m., which connects the town with the American city of Port Huron (Michigan).

SARNO (anc. Sarnus), a town of Campania, Italy, in the province of Salerno, 15 m. N.E. from that city and 30 m. E. of Naples by the main

railway. Pop. (1901) 15,130 (town), 19,192 (commune). It lies at the foot of the Apennines, 92 ft. above sea-level, near the sources of the Sarno (anc. Sarnus), a stream connected by canal with Pompeii and the sea. Sarno has the ruins of a medieval castle, which belonged to Count Francesco Coppola, who took an important part in the conspiracy of the barons against Ferdinand of Aragon in 1485. Walter of Brienne is buried in the ancient church of S. Maria della Foce rebuilt in 1701. Paper, cotton, silk, linen and hemp are manufactured. The travertine which forms round the springs of the Sarno was used even at Pompeii as building material. Before its incorporation with the domains of the crown of Naples Sarno gave its name to a countship held in succession by the Orsini, Cappola, Suttavilla and Colonna families.

SARONNO, a town of Lombardy, Italy, in the province of Milan, from which city it is distant 13 m. N.N.W. by rail. Pop. (1901) 8729 (town), 9533 (commune). The pilgrimage church of the Madonna dei Miracoli, begun in 1498 by Vincenzo dell' Orto, has a dome of rich architecture externally; the campanile dates from 1516, the rest of the church is later. Internally it is decorated with fine frescoes by Gaudenzio Ferrari, representing a concert of angels, while those in the choir are by Bernardino Luini and are among his finest works (see F. Malaguzzi Valeri

in Rassegna d'arte, 1904, 69). The place is well known for its gingerbread (amarelli) and is also a manufacturing town. It is situated on one of the lines (Ferrovia Nord) from Milan to Como, and has branch lines to Seregno, Busto Arsizio and Varese.

SAROS, in Babylonian numeration, the number 3600, i.e. 60 times 60. In astronomy and chronology, a remarkable period of 18 years and 10 or 11 days, at the end of which every eclipse of the sun or moon recurs with little change as regards the time and the character of the eclipse. It is supposed to have afforded in ancient times the principal method of predicting eclipses (see Eclipse).

SARPEDON, in Greek legend, son of Zeus and Laodameia, Lycian prince and hero of the Trojan war. He fought on the side of the Trojans, and after greatly distinguishing himself by his bravery, was slain by Patroclus. A terrible struggle took place for the possession of his body, until Apollo rescued it from the Greeks, and by the

command of Zeus washed and cleansed it, anointed it with ambrosia, and handed it over to Sleep and Death, by whom it was conveyed for burial to Lycia, where a sanctuary (Sarpedoneum) was erected in honour of the fallen hero. Virgil (A en. i. 100) knows nothing of the removal of the body to Lycia. In later tradition, Sarpedon was the son of Zeus and Europa and the brother of Minos. Having been expelled from Crete by the latter, he and his comrades sailed for Asia, where he finally became king of Lycia. Euripides (Rhesus, 29) confuses the two Sarpedons.

See Homer, Iliad, v. 479, xii. 292, xvi. 419-683; Apollodorus iii. I, 2; Appian, Bell. civ. iv. 78; Herodotus i. 173, with Rawlinson's notes.

SARPI, PAOLO (1552-1623), Venetian patriot, scholar and church reformer, was born at Venice, on the 14th of August 1552, and was the son of a small trader, who left him an orphan at an early age. Notwithstanding the opposition of his relatives, he entered the order of the Servi di Maria, a minor Augustinian congregation of Florentine origin, at the age of thirteen. He assumed the name of Paolo, by which, with the epithet Servita, he was always known to his contemporaries. In 1 5 70 he sustained no fewer than three hundred and eighteen theses at a disputation in Mantua, with such applause that the duke made him court theologian. Sarpi spent four years at Mantua, applying himself to mathematics and the Oriental languages. After leaving Mantua, he repaired to Milan, where he enjoyed the protection of Cardinal Borromeo, but was soon transferred by his superiors to Venice, as professor of philosophy at the Servite convent. In 1579 he was sent to Rome on business connected with the reform of his order, which occupied him several years, and brought him into intimate relations with three successive popes, as well as the grand inquisitor and other persons of influence. Having successfully terminated the affairs entrusted to him, he returned to Venice in 1588, and passed the next seventeen years in study, occasionally interrupted by the part he was compelled to take in the internal disputes of his community. In 1601 he was recommended by the Venetian senate for the small bishopric of Caorle, but the papal nuncio, who wished to obtain it for a protege of his own, informed the pope that Sarpi denied the immortality of the soul, and had controverted the authority of Aristotle. An attempt to procure another small bishopric in the following year also failed, Clement VIII. professing to have taken umbrage at Sarpi V extensive correspondence with learned heretics, but more probably determined to thwart the desires of the liberal rulers of Venice. The sense of injury, no doubt, contributed to exasperate Sarpi's feelings towards the court of Rome. For the time, however, he tranquilly pursued his studies, writing those notes on

Vieta which establish his proficiency in mathematics, and a metaphysical treatise now lost, which, if Foscarini's account of it may be relied upon, anticipated the sensationalism of Locke. His anatomical pursuits probably date from a somewhat earlier period. They illustrate his versatility and thirst for knowledge, but are far from possessing the import- ance ascribed to them by his disciples. His claim to have anticipated Harvey's discovery rests on no better authority than a memorandum, probably copied from Caesalpinus or Harvey himself, with whom, as well as with Bacon and Gilbert, he

maintained a correspondence. The only physiological discovery which can be safely attributed to him is that of the contractility of the iris. It must be remembered, however, that his treatises on scientific subjects are lost, and only known from imperfect abstracts.

Clement died in March 1605; and Paul V. assumed the tiara with the resolution to strain papal prerogative to the uttermost. At the same time Venice was adopting measures to restrict it still further. The right of the secular tribunals to take cognizance of the offences of ecclesiastics had been asserted in two remark- able cases; and the scope of two ancient laws of the city of Venice, forbidding the foundation of churches or ecclesiastical congregations without the consent of the state, and the acquisition of property by priests or religious bodies, had been extended over the entire territory of the republic. In January 1606 the papal nuncio delivered a brief demanding the unconditional submission of the Venetians. The senate having promised protection to all ecclesiastics who should in this emergency aid the republic by their counsel, Sarpi presented a memoir, pointing out that the threatened censures might be met in two ways — de facto, by prohibiting their publication, and de jure, by an appeal to a general council. The document was received with universal applause, and Sarpi was immediately made canonist and theo- logical counsellor to the republic. When in the following April the last hopes of accommodation were dispelled by Paul's ex-communication of the Venetians and his attempt to lay their dominions under an interdict, Sarpi entered with the utmost energy into the controversy. He prudently began by republishing the anti-papal opinions of the famous canonist Gerson. In an anonymous tract published shortly afterwards (Risposta di un Dottore in Teologia) he laid down principles which struck at the very root of the pope's authority in secular things. This book was promptly put upon the Index, and the republication of Gerson was attacked by Bellarmine with a severity which obliged Sarpi to reply in an Apologia. The Consider azioni sulle censure and the Trattato dell' interdetto, the latter partly prepared under his direction by other theologians,

speedily followed. Numerous other pamphlets appeared, inspired or controlled by Sarpi, who had received the further appointment of censor over all that should be written at Venice in defence of the republic. Never before in a religious controversy had the appeal been made so exclusively to reason and history; never before had an ecclesi- astic of his eminence maintained the subjection of the clergy to the state, and disputed the pope's right to employ spiritual censures, except under restrictions which virtually abrogated it. Material arguments were no longer at the pope's disposal. The Venetian clergy, a few religious orders excepted, disregarded the interdict, and discharged their functions as usual. The Catholic powers refused to be drawn into the quarrel. At length (April 1607) a compromise was arranged through the mediation of the king of France, which, while salving over the pope's dignity, con- ceded the points at issue. The great victory, however, was not so much the defeat of the papal pretensions as the demonstration that interdicts and excommunications had lost their force. Even this was not wholly satisfactory to Sarpi, who longed for the toleration of Protestant worship in Venice, and had hoped for a separation from Rome and the establishment of a Venetian free church by which the decrees of the council of Trent would have been rejected, and in which the Bible would have been an open book. The republic rewarded her champion with the further distinction of state counsellor in jurisprudence, and, a unique mark of confidence, the liberty of access to the state archives. These honours exasperated his adversaries to the uttermost. On the 5th of October he was attacked by a band of assassins and left for dead, but the wounds were not mortal. The bravos found a refuge in the papal territories. Their chief, Poma, declared that he had been moved to attempt the murder by his zeal for religion, a degree of piety and self-sacrifice which seems incredible in a bankrupt oil-merchant. " Agnosco stylum Curiae Romanae," Sarpi himself pleasantly said, when his surgeon commented upon the ragged and inartistic character of the wounds, and the justice of the observation is as

incontestable as its wit. The only question can be as to the degree of complicity of Pope Paul V.

The remainder of Sarpi's life was spent peacefully in his cloister, though plots against him continued to be formed, and he occasionally spoke of taking refuge in England. When not engaged in framing state papers, he devoted himself to scientific studies, and composed several works. A Machiavellian tract on the funda- mental maxims of Venetian policy (Opinione come debba governarsi la repubblica di Venezia), used by his adversaries to blacken his memory, is undoubtedly not his. It has been attributed to a certain Gradenigo. Nor did he complete a reply which he had been ordered to prepare to the Squitinio delta liberti veneta, which he perhaps found unanswer- able. In 1610 appeared his History of Ecclesiastical Benefices, " in which," says Ricci, " he purged the church of the defilement intro- duced by spurious decretals." In 161 1 he assailed another abuse by his treatise on the right of asylum claimed for churches, which was immediately placed on the Index. In 1615 a dispute between the Venetian government and the Inquisition respecting the prohibition of a book led him to write on the history and procedure of the Venetian Inquisition ; and in 1619 his chief literary work, the History of the Council of Trent, was printed at London under the name of Pietro Soave Polano, an anagram of Paolo Sarpi Veneto. The editor, Marco Antonio de Dominis, has been accused of falsifying the text, but a comparison with a MS. corrected by Sarpi himself shows that the alterations are both unnecessary and unimportant. This memorable book, together with the rival and apologetic history by Cardinal Pallavicini, is minutely criticized by Ranke {History of the Popes, appendix No. 3), who tests the veracity of both writers by examining the use they have respectively made of their MS. materials. The result is not highly favourable to either; neither can be taxed with deliberate falsification, but both have coloured and suppressed. They write as advocates rather than historians. Ranke rates the literary qualities of Sarpi's work very highly. Sarpi never acknow- ledged his authorship, and baffled all the efforts of the prince de Conde to extract the secret from him. He survived the publication four years, dying on the 15th of January 1623, labouring for his country to the last. The day before his death he had dictated three replies to questions on affairs of state, and his last words were " Esto perpetua." His posthumous History of the Interdict was printed at Venice the year after his death, with the

disguised imprint of Lyons.

Great light has been thrown upon Sarpi's real belief and the motives of his conduct by the letters of Christoph von Dohna, envoy of Christian, prince of Anhalt, to Venice, published by Moritz Ritter in the Briefe und Aden zur Geschichte des dreissigjahrigen Krieges, vol. ii. (Munich, 1874). Sarpi told Dohna that he greatly disliked saying mass, and celebrated it as seldom as possible, but that he was compelled to do so, as he would otherwise seem to admit the validity of the papal prohibition, and thus betray the cause of Venice. This supplies the key to his whole behaviour; he was a patriot first and a religious reformer afterwards. He was " rooted " in what Diodati described to Dohna as " the most dangerous maxim, that God does not regard externals so long as the mind and heart are right before Him." Sarpi had another maxim, which he thus formulated to Dohna: Le falsita non dico mai mai, ma la verild non a ognuno. It must further be considered that, though Sarpi admired the English prayer-book, he was neither Anglican, Lutheran nor Calvinist, and might have found it difficult to accommodate himself to any Protestant church. On the whole, the opinion of Le Courayer, "qu'il etait Catholique en gros et quelque fois Protestant en detail," seems not altogether groundless, though it can no longer be accepted as a satisfactory summing up of the question. His scientific attain- ments must have been great. Galileo would not have wasted his time in corresponding with a man from whom he could learn nothing; and, though Sarpi did not, as has been asserted, invent the telescope, he immediately turned it to practical account by con- structing a map of the moon.

Sarpi's life was written by his enthusiastic disciple, Father Fulgenzio Micanzio, whose work is meagre and uncritical. Bianchi- Giovini's biography (1836) is greatly marred by digressions, and is inferior in some respects to that by Arabella Georgina Campbell (1869), which is enriched by numerous references to MSS. unknown to Bianchi-Giovini. T. A. Trollope's Paul the Pope and Paul the Friar (1861) is in the main a mere abstract of Bianchi-Giovini, but adds a spirited account of the conclave of Paul V. The incidents of the Venetian dispute from day to day are related in the con- temporary diaries published by Enrico Cornet (Vienna, 1859). Giusto Fontanini's Storia arcana della vita di Pietro Sarpi (1863), a bitter libel, is nevertheless important for the letters of Sarpi it contains, as Griselini's Memorie e aneddote (1760) is from the author's access to Sarpi's unpublished writings, afterwards unfortunately destroyed by fire. Foscarini's History of Venetian Literature is important on the same account. Sarpi's memoirs on state affairs remain in the Venetian archives. Portions of his correspondence have been printed at various times, and inedited letters from him are

of frequent occurrence in public libraries. The King's library in the British Museum has a valuable collection of tracts in the Interdict controversy, formed by Consul Smith.

[In addition to the above works see Balan, Fra Paolo Sarpi (Venice, 1887) and Pascolato, Fra Paolo Sarpi (Milan, 1893). Some hitherto unpublished letters of Sarpi were edited by Karl Benrath and published, under the title Paolo Sarpi. Neue Briefe, 1608-16×6 (at Leipzig in 1909).] (R. G.)

SARPSBORG, a seaport and manufacturing town of Norway, in Smaalenene ami (county), 68 m. S.S.E. of Christiania on the Gothenburg railway. Pop. (1900) 6888. It is the junction for an alternative line to Christiania following the Glommen valley. It sprang into importance through the utilization of the falls in the river Glommen for driving saw-mills and generating electric power. The Sarpsfos, south-east of the town, is a majestic fall, descending 74 ft. with a width of 1 20 ft. There are wood-pulp factories (one worked by an English company employ- ing over 1000 hands), factories for calcium carbide (used for manufacturing acetylene gas), paper and aluminium; and spinning and weaving mills. There are two large electric supply stations, and power and light are furnished from this point to Frederikstad, 9 m. S.W. The port is at Sannesund, 1 m. S.; its quays can be reached by vessels drawing 20 ft. The town was originally founded in the nth century, and destroyed by the Swedes in 1567. The existing town dates from 1839.

SARRACENIA, or Side-Saddle Flower, a genus of pitcher- plants with seven species native in the eastern states of North America. They are perennial herbaceous marsh-plants with a rosette of leaves from the centre of which springs a tall stalk bearing a large single nodding flower. The leaves are erect and in the form of long slender pitchers, with a longitudinal wing and a terminal hood, to which insects are attracted by the bright colouring of the upper parts and the nectar which is secreted there. The interior of the pitcher is half-filled with water and the wall is lined internally in the lower part with stiff downward pointing hairs, which prevent the escape of insects. The insects which are drowned in the pitcher become decomposed and digested by the fluid, and the products of digestion are ultimately absorbed by the walls of the pitcher and serve as a source of nitrogenous food. (See also Pitcher Plants.)

SARRAZIN, JACQUES (1588-1660), French painter, born at Noyon in 1588, went to Rome at an early age and worked there under a Frenchman named Anguille. Starting thus, Sarrazin speedily obtained

employment from Cardinal Aldobrandini at Frascati, where he won the friendship of Domenichino, with whom he afterwards worked on the high altar of St Andrea della Valle. His return to Paris, where he married a niece of Simon Vouet, was signalized by a series of successes which attracted the notice of Sublet des Noyers, who entrusted to him the work by which Sarrazin is best known, the decoration of the great portal and the dome of the western facade of the interior court of the Louvre. The famous Caryatides of the attic show the profound study of Michelangelo's art to which Sarrazin had devoted all the time he could spare from bread-winning whilst in Rome. He now executed many commissions from the queen, and was an active promoter of the foundation of the Academy. The mausoleum for the heart of the prince de Conde in the Jesuit church of the Rue Saint Antoine was his last considerable work (see Lenoir, Musee des monuments franqais, v. 5); he died on the 3rd of December 1660, whilst it was in progress, and the crucifix of the altar was actually completed by one of his pupils named Gros.

SARRETTE, BERNARD (1765-1858), founder of the Con- servatoire National de Musique et de Declamation in Paris, was born in Bordeaux on the 27th of November 1765, and died in Paris on the nth of April 1858. Forty-five musicians from the dep6t of the Gardes Francaises were gathered together by him after the 14th of July 1789, and formed the nucleus for the music of the Garde Nationale. In May 1790, the municipality of Paris increased the body to seventy-eight musicians. When the financial embarrassments of the commune necessitated the suppression of the paid guard, Sarrette kept the musicians near him and obtained from the municipality, in June 1792, the establishment of a free school of music. On the 18th of Brumaire in the year II. (Nov. 8, 1793) this school was converted

into the Institut National de Musique by decree of the convention, and by the law of the 16th of Thermidor in the year III. (Aug. 3, 1 795) it was finally organized under the name of Conservatoire. The motives for the imprisonment of Sarrette from the 25th of March to the 10th of May 1794, have been a source of historical controversy, nor is it possible to ascertain exactly what were his political views throughout this period of the French Revolution. But there is no longer foundation for the theory of Zimmermann, his biographer, that he was imprisoned for singing aloud Cretry's air, O Richard, d mon roil For the last forty years of his life Sarrette lived in retirement. The protection of

Napoleon I. was a source of disaster to him in 1815, when the conservatoire was closed; its subsequent history was watched by its founder as a mere spectator from outside.

See Constant Pierre, B. Sarrette et les origines du Conservatoire, (Paris, 1895).

SARSAPARILLA, a popular drug, prepared from the long fibrous roots of several species of the genus Smilax, indigenous to Central America, and extending from the southern and western coasts of Mexico to Peru. These plants grow in swampy forests, and, being dioecious and varying much in the form of leaf in different individuals, are imperfectly known to botanists, only two species having been identified with certainty. These are Smilax officinalis and S. medica, which yield respectively the so-called ” Jamaica ” and the Mexican varieties. They are large perennial climbers growing from short thick underground stems, from which rise numerous semi-woody flexuous angular stems, bearing large alternate stalked long-persistent and prominently net-veined leaves, from the base of which spring the tendrils which support the plant. The genus is a member of the natural order Smiliaceae, and constitutes the tribe Smila- coidide, characterized by its climbing habit, net-veined leaves and dioecious flowers.

The introduction of sarsaparilla into European medicine dates from the middle of the 16th century. Monardes, a physician of Seville, records that it was brought to that city from New Spain about 1536-1545. Sarsaparilla must have come into extensive use soon afterwards, for John Gerard, about the close of the century, states that it was imported into England from Peru in great abundance.

When boiled in water the root affords a dark extractive matter, the quantity of extract yielded by the root being used as a criterion of its quality. Boiling alcohol extracts from the root a neutral substance in the form of crystalline prisms, which crystallize in scales from boiling water. This body, which is named parillin, is allied to the saponin of quillaia bark, from which it differs in not exciting sneezing. The presence in the root of starch, resin and oxalate of lime is revealed by the use of the microscope. Sarsaparilla still has a popular reputation as an ” alterative,” but it has been examined and tested in every manner known to modern medical science, and is profession- ally regarded as ” pharmacologically inert and therapeutically useless.”

The varieties of sarsaparilla met with in commerce are the follow- ing: Jamaica, Lima, Honduras, Guatemala, Guayaquil and Mexican. Of

these the first-named yields the largest amount of extract, viz. from 33 to 44%; it is the only kind admitted into the British pharmacopoeia. On the Continent, especially in Italy, the varieties having a white starchy bark, like those of Honduras and Guatemala, are preferred. ” Jamaica ” sarsaparilla derives its name from the fact that Jamaica was at one time the emporium for sarsaparilla, which was brought thither from Honduras, New Spain and Peru. Sarsaparilla is grown to a small extent in Jamaica, and is occasionally exported thence to the London market in small quantities, but its orange colour and starchy bark are so different in appearance from the thin reddish-brown bark of the genuine drug, that it does not meet with a ready sale. The Jamaica sarsaparilla of trade is collected on the Cordilleras of Chiriqui, in Panama, where the plant yielding it grows at an elevation of 4000 to 8000 ft. The root bark is reddish-brown, thin and shrivelled, and there is an abundance of rootlets, which are technically known by the name of ” beard.” Lima sarsaparilla resembles the Jamaica kind, but the roots are of a paler brown colour. In Honduras sarsaparilla the roots are less wrinkled, and the bark is whiter and more starchy, than in the Jamaica kind. It is exported from Belize. Guatemala sarsa- parilla is very similar to that of Honduras, but has a more decided

orange hue, and the bark shows a tendency to split off. Guayaquil sarsaparilla is obtained chiefly in the valley of Alausi, on the western side of the equatorial Andes. The bark is thick and furrowed, and of a pale fawn colour internally; the rootlets are few, and the root itself is of larger diameter than in the other kinds. Sometimes there is attached to the rootstock a portion of stem, which is round and not prickly, differing in these respects from that of Smilax officinalis, which is square and prickly. Mexican sarsaparilla has slender, shrivelled roots nearly devoid of rootlets. It is collected on the eastern slope of the Mexican Andes throughout the year, and is the produce of Smilax medica.

The collection of sarsaparilla root is a very tedious business; a single root takes an Indian half a day or sometimes even a day and a half to unearth. The roots extend horizontally in the ground on all sides for about 9 ft., and from these the earth has to be carefully scraped away and other roots cut through where such come across them. A plant four years old will yield 16 lb of fresh root, and a well-grown one from 32 to 64 lb, but more than half the weight is lost in drying. The more slender roots are generally left, and the stem is cut down near to the ground, the crown of the root being covered with leaves and earth. Thus treated, the plant continues to grow, and roots may again be cut from it after the lapse of two years, but the yield will be smaller and the roots more slender and less starchy. In some varieties, as the

Guayaquil and Mexican, the whole plant, including the rootstock, is pulled up.

In several species of Smilax the roots become thickened here and there into large tuberous swellings 4 to 6 in. long, and 1 or 2 in. in thickness. These tubers form a considerable article of trade in China, but are used to a limited extent only on the Continent, under the name of China root, although introduced into Europe about the same time as sarsaparilla. China root is obtained from S. China and is a native of Cochin China, China and Japan, and extensively im- ported into India, also from 5. glabra and S. lanceaefolia, natives of India and China, the tubers of which closely resemble those of 5. China. A similar root is yielded by S. pseudo-China and 5. tamnoides in the United States from New Jersey southwards; by S. balbisiana, in the West Indies, and by 5. Japicanga and 5. syring- oides, and 5. brasiliensis in South America. The name of Indian sarsaparilla is given to the roots of Hemidesmus indicus, an Asclepia- daceous plant indigenous to India. These roots are readily dis- tinguished from those of true sarsaparilla by their loose cracked bark and by their odour and taste, recalling those of melilot.

SARSFIELD, PATRICK (? -1693), titular earl of Lucan, Irish Jacobite and soldier, belonged to an Anglo-Norman family long settled in Ireland. He was born at Lucan, but the date is unknown. His father Patrick Sarsfield married Anne, daughter of Rory (Roger) O'Moore, who organized the Irish rebellion of 1641. The family possessed an estate of £2000 a year. Patrick, who was a younger son, entered Dongan's regiment of foot on the 9th of February 1678. In his early years he is known to have challenged Lord Grey for a supposed reflection on the veracity of the Irish people (September 1681), and in the December of that year he was run through the body in a duel in which he engaged as second. During the last years of the reign of King Charles II. he saw service in the English regiments which were attached to the army of Louis XIV. of France. The accession of King James II. led to his return home.

He took part in the suppression of the Western rebellion at the battle of Sedgemoor on the 6th of July 1685. In the following year he was promoted to a colonelcy. King James had adopted the dangerous policy of remodelling the Irish army so as to turn it from a Protestant to a Roman Catholic force, and Sarsfield, whose family adhered to the church of Rome, was selected to assist in this re- organization. He went to Ireland with Richard Talbot, afterwards earl of Tyrconnel (q.v.), who was appointed commander-in-chief by the king. In 1688 the death of his elder brother, who had no son, put him in possession

of the family estate, which in those troubled times can have been of small advantage to him. When the king brought over a few Irish soldiers to coerce the English, Sarsfield came in command of them. As the king was deserted by his army there was no serious fighting, but Sarsfield had a brush with some of the Scottish soldiers in the service of the prince of Orange at Wincanton. When King Tames disbanded his army and fled to France, Sarsfield accompanied him. In 1689 he returned to Ireland with the king. During the earlier part of the war he did good service by securing Connaught for the Jacobites. The king, who is said to have described him as a brave fellow who had no head, promoted him to the rank of brigadier, and then major-general with some reluctance. It was not till after the battle of the Boyne (1st of July 1690), and during the siege of Limerick, that Sarsfield came prominently forward. His capture of a convoy of military stores at one of the two places called Ballyneety between Limerick and Tipperary, delayed the siege of the town till the winter rains forced the English to retire. This achievement, which is said by the duke of Berwick to have turned Sarsfield's head, made him the popular hero of the war with the

Irish. His generosity, his courage and his commanding height, had already commended him to the affection of the Irish. When the cause of King James was ruined in Ireland, Sarsfield arranged the capitulation of Limerick and sailed to France on the 22 nd of December 1691 with many of his countrymen who entered the French service. He received a commission as lieutenant-general (marechal de camp) from King Louis XIV. and fought with distinc- tion in Flanders till he was mortally wounded at the battle of Landen or Neerwinden, on the 19th of August 1693. He died at Huy two or three days after the battle. In 1691 he had been created earl of Lucan by King James. He married Lady Honora de Burgh, by whom he had one son James, who died childless in 1718. His widow married the duke of Berwick.

J. Todhunter, Life of Patrick Sarsfield (London, 1 895).

SARTAIN, JOHN (1808-1897), American artist, was born in London, England, on the 24th of October 1808. At the age of twenty-two he emigrated to America, and settled in Phila- delphia. He was the pioneer of mezzotint engraving in America. Early in his career he painted portraits in oil and made miniatures; he engraved plates in 1841-1848 for Graham's Magazine, pub- lished by George Rex Graham

(1813-1894); became editor and proprietor of Campbell's Foreign Semi-Monthly Magazine in 1843; and from 1840-1852 published with Graham Sariain's Union Magazine. He had charge of the art department of the Centennial Exhibition, Philadelphia, in 1876; took a prominent part in the work of the committee on the Washington Memorial, by Rudolf Siemering, in Fairmount Park, Philadelphia; designed medallions for the monument to Washington and Lafayette erected in 1869 in Monument Cemetery, Philadelphia; and was a member of the Pennsylvania Academy of the Fine Arts and a cavaliere of the Royal Equestrian Order of the Crown of Italy. He died in Philadelphia on the 25th of October 1897. His Reminiscences of a Very Old Man (New York, 1899) are of unusual interest. Of his children William Sartain (b. 1843), landscape and figure painter, was born at Philadelphia on the 21st of November 1843, studied under his father and under Leon Bonnat, Paris, was one of the founders of the Society of American Artists, and became an associate of the National Academy of Design. Another son, Samuel Sartain (1830- 1906), and a daughter, Emily Sartain (b. 1841), who in 1886 became principal of the Philadelphia School of Design for Women, were also American artists.

SARTHE, a department of north-western France, formed in 1790 out of the eastern part of Maine, and portions of Anjou and of Perche. Pop. (1906) 421,470. Area 2410 sq. m. It is bounded N. by the department of Orne, N.E. by Eure-et-Loir, E. by Loir-et-Cher, S. by Indre-et-Loire and Maine-et-Loire and W. by Mayenne. The Sarthe, a sub-tributary of the Loire, flows in a south-westerly direction through the department; and the Loire, which along with the Sarthe joins the Mayenne to form the Maine above Angers, traverses its southern borders. Broken and elevated country is found in the north and east of the department, which elsewhere is low and undulating. The highest point (on the boundary towards Orne) is 1115 ft. The Sarthe flows past Le Mans and Sable, receiving the Merdereau and the Vegre from the right, and the Orne Saosnoise and the Huisne from the left. The Loir passes La Fleche, and along its chalky banks caves have been hollowed out which, like those along the Cher and the Loire, serve as dwelling-houses and stores. The mean annual temperature is 51 to 52 Fahr. The rainfall is between 25 and 26 in.

The majority of the inhabitants live by agriculture. There are three distinct districts: — the corn lands to the north of the Sarthe and the Huisne ; the region of barren land and moor, partly planted with pine, between those two streams and the Loir; andthe wine- growing country to the south of the Loir. Sarthe ranks high among French departments in the production of barley, and more hemp is grown

here than in any other department. The raising of cattle and of horses, notably those of the Perche breed, prospers, and fowls and geese are fattened in large numbers for the Paris market. Apples are largely grown for cider. The chief forests are those of Berce in the south and Perseigne in the north, but the department owes its well-wooded appearance in a great measure to the hedges planted with trees which divide the fields. Coal, marble and free- stone are among the mineral products. The staple industry is the weaving of hemp and flax, and cotton and wool-weaving are also carried on. Paper and cardboard are made in several localities.

Iron-foundries, copper and bell foundries, factories for provision-preserving, marble- works at Sable, potteries, tile-works, glass-works and stained-glass manufactories, currieries, machine factories, wire-gauze factories, flour-mills and distilleries are also prominent in-dustrial establishments, a great variety of which are found at Le Mans. Flour, agricultural products, live stock and poultry form the bulk of the exports. The department is served by the Western, the Orleans and the State railways, and the Sarthe and Loir provide about 100 m. of waterway, though the latter river carries little traffic.

The department forms the diocese of Le Mans and part of the ecclesiastical province of Tours, has its court of appeal at Angers, and its educational centre at Caen, and constitutes part of the territory of the IV. army corps, with its headquarters at Le Mans. The four arrondissements are named from Le Mans, the chief town, La Fleche; Mamers and St Calais. The principal places are Le Mans, La Fleche, La Ferte Bernard, Sable and Solesmes, which receive separate treatment. Besides these places, those of chief architectural interest are Le Lude, which has a fine chateau of the Renaissance period, Sille-le-Guillaume, where there is a Gothic church and a stronghold of the 15th century, and St Calais, the church of which dates from the 14th to the 17th centuries.

SARTI, GIUSEPPE (1729-1802), Italian composer, was born at Faenza on the 28th of December 1729. He was educated by Padre Martini, and appointed organist of the cathedral of Faenza before the completion of his nineteenth year. Resigning his appointment in 1750, Sarti devoted himself to the study of dramatic music, becoming director of the Faenza theatre in 1752. In 1751 he produced his first opera, Pompeo, with great success. His next works, II Ri Pastore, Medonte, Demofoonle and L'Olimpiade, assured him so brilliant a reputation that in 1 753 King Frederick V. of Denmark invited him to Copenhagen, with the appointments of Hofkapellmeister and director of the opera. Here he produced his Ciro riconsosciuto. In 1765 he

travelled to Italy to engage some new singers; meanwhile the death of King Frederick put an end for the time to his engage- ment. In 1769 he went to London, where he could only contrive to exist by giving music lessons. In 1770 he obtained a post in Venice as music master at the Conservatorio dell' Ospedaletto. In 1779 he was elected maestro di cappella at the cathedral of Milan, where he remained until 1784. Here he exercised his true vocation — composing, in addition to at least twenty of his most successful operas, a vast quantity of sacred music for the cathedral, and educating a number of clever pupils, the most distinguished of whom was Cherubini. In 1784 Sarti was invited by the empress Catherine II. to St Petersburg. On his way thither he stopped at Vienna, where the emperor Joseph II. received him with marked favour, and where he made the acquaintance of Mozart. He reached St Petersburg in 1785, and at once took the direction of the opera, for which he com- posed many new pieces, besides some very striking sacred music, including a Te Deum for the victory of Ochakov, in which he introduced the firing of real cannon. He remained in Russia until 1801, when his health was so broken that he solicited permission to return. The emperor Alexander dismissed him in 1802 with a liberal pension; letters of nobility had been granted to him by the empress Catherine. His most successful operas in Russia were Armida and Olega, for the latter of which the empress herself wrote the libretto. Sarti died at Berlin on the 28th of July 1802.

Sarti's opera I Due Litiganti has been immortalized by Mozart, who introduced an air from it into the supper scene in Don Giovanni. It should be noted that Mozart's Nozze di Figaro owed a great deal to the influence of this opera, which was performed in Vienna in 1784. The admirable libretto by Da Ponte, author of the libretti of Figaro and Don Giovanni, shows similar situations, and the complicated finale of the first act served as a model to Mozart for the finale of the last act of Figaro.

SARZANA, a town and episcopal see of Liguria, Italy, in. the province of Genoa, 9 m. E. of Spezia, on the railway to Pisa, at the point where the railway to Parma diverges to the north, 59 ft. above sea-level. Pop. (1901) 6531 (town); 11,850 (commune). The handsome cathedral of white marble in the Gothic style, dating from 1355, was completed in 1474. It contains two elaborately-sculptured altars of the latter period. The former

citadel (now gaol), built by the Pisans, was demolished and re-erected by Lorenzo de' Medici. The castle of Sarzanello was built by Castruccio Castracani (d. 1328), whose tomb by the Pisan Giovanni di Balducci is in S. Francesco. The Palazzo del Capitano, by Giuliano da Maiano (1472), has been entirely altered. Sarzana has one of the most important glass-bottle factories in Italy, also brick-works and a patent fuel factory.

Sarzana was the birthplace of Pope Nicholas V. Its position at the entrance to the valley of the Magra (anc. Macro), the boundary between Etruria and Liguria in Roman times, gave it military importance in the middle ages. It arose as the successor of the ancient Luna, 3 m. S.E.; the first mention of it is found in 083, and in 1202 the episcopal see was transferred hither. A branch of the Cadolingi di Borgonuovo family, lords of Fucecchio in Tuscany from the 10th century onwards, which had acquired the name of Bonaparte, had settled near Sarzana before 1264; in 151 2 a member of the family took up his residence in Ajaccio, and hence, according to some authorities, was de- scended the emperor Napoleon I. Sarzana, owing to its position on the frontier, changed masters more than once, belonging first to Pisa, then to Florence, then to the Banco di S. Giorgio of Genoa and from 1572 to Genoa itself. In 1814 it was assigned to the kingdom of Sardinia, the frontier between Liguria and Tuscany being now made to run between it and Carrara.

SASANA VAMSA, a history of the Buddhist order in Burma, which was composed, in that country, by Panna-sami in 1851. It is written in Pali prose; and is based on earlier documents, in Pali or Burmese, still extant, but not yet edited. The earlier part of the work deals with the history of Buddhism outside of Burma. This is based on the Mahavamsa, and other well-known Ceylon works; and has no independent value. The latter part of the work, about three-fifths of the whole, deals with Buddhism in Burma, and contains information not obtainable elsewhere. Down to the nth century the account is meagre, legendary and incredible. After that date it is sober, intelligible and in all probability mostly accurate. This portion occupies about one hundred pages 8vo in the excellent edition of the text prepared for the Pali Text Society in 1897 by Dr Mabel Bode. It shows a continuous literary effort through the eight and a half centuries, and constantly renewed ecclesiastical controversy. The latter is concerned for the most part with minor questions relating to rules of the order, there being a tendency, as relaxations of the rules crept in with the lapse of time, to hark back to the original simplicity. Of differences in matters of doctrine there is no mention in this manual. Dr Bode has prefixed to her edition a detailed summary of the

contents of the book. (T. W. R. D.)

SASARAM, a town of British India, in the Shahabad district of Bengal, with a station on the East Indian railway, 406 m. N.W. from Calcutta. Pop. (1901) 23,644. It is famous as containing the tomb of the Afghan Sher Shah, who defeated Humayun and became emperor of Delhi (1540-1545). The tomb, which is the finest example of Mahommedan architecture in Bengal, stands on an island in the middle of an artificial lake. Close by is the tomb of Sher Shah's father.

SASH. (1) A framework of wood in which glass is fixed for a window, particularly a framework for large panes of glass in two parts which open and shut by sliding up or down. The word is a corruption of the Fr. chassis, chdsse, Lat. capsa, box, case, capere, to hold. The word is, therefore, a doublet of " case " and " cash " (qq.v.). (2) A long band of silk or other fine or ornamented material worn round the waist or over the shoulders as part of a woman's or child's dress, or as a sign or badge of office, or as part of an official costume or uniform. The word is an adaptation of the Arab, shdsh, muslin, especially used (of the soft muslin or silken bands used for wrapping round the head in the form of a turban). In its early uses in English it appears as a term used by oriental travellers and writers on the East as an equivalent for a Mahommedan.

SASKATCHEWAN, a province of Western Canada, lying

between the two provinces of Alberta and Manitoba. Area,

250,650 sq. m. The south-eastern portion is chiefly prairie,

being the continuation of the second prairie steppe found in

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Manitoba. About 104° W. the Missouri Coteau, an elevation of several hundred feet, probably an old glacial moraine, crosses the southern boundary and runs north-westward, being the eastern escarpment of the third prairie steppe which runs to the Rocky Mountains. Several elevations of note are found in the southern half of the province. On the central part of the southern boundary is Wood Mountain, a succession of clay hills. On the lower level is Moose Mountain, and north of it Beaver

?mcry Walker so

Hills and Touchwood Hills. These are elevations of morainal or glacial

deposits. The river Saskatchewan (q.v.) gives its name to the province. • In central Saskatchewan near the south bend of the South Saskatchewan begins the river Qu'Appelle (" Who Calls? "), which runs eastward, and crossing the western boundary of Manitoba falls into the Assiniboine river. Farther to the south rises the Souris river, which flows parallel to the Missouri Coteau, passes southward into N. Dakota, and again entering the province of Manitoba finds its way at length into the Assiniboine river. North of the Saskatchewan river the

surface of the province becomes heavily wooded, and this great forest continues through the broken Laurentian and Cambrian region, becoming dwarfed as it goes north. In this portion of the province are found Reindeer Lake, and north-west of this the easterly portion of Lake Athabasca, which is on the pro- vincial boundary line of Alberta.

Climate. — Extending as the province does from north to south for more than 750 m., it may be readily seen that, as in the case of Alberta, there will be a great range of climate and temperature. The south-western part of the province is influenced much by the chinook winds which from the Rocky Mountain valleys come through Alberta. The climate here is dry, and portions of the country need irrigation. In south-eastern Saskatchewan the prairie lies on a lower level, there is more moisture, and the climate in winter is more steady. The whole province of Saskatchewan, except the south-western part, is well watered. As in the case of Alberta, the southern third of Saskatchewan has a moderate and changeable climate; in the central third ranging from Regina to Prince Albert it is steady, while in the northern third, through the Laurentian region to 60° N., it is severe. Compare the following table : —

Maple Creek . Swift Current Regina . Prince Albert Battleford

Elevation.

Mean Temperature.

Average Precipitation.

Summer.

Winter.

2495 ft.

2423 ..

1885 „ 1402 „

1615 ,.

62° 60°

5 °°o 54-6°

61 -4°

° 4 ■09°

7-1°

10-18 in.

17-04 – 9-03 .. 14-45 -.

13-62 „

The animal life of Saskatchewan resembles that of Alberta (g.fl.), excepting the mountain lion, mountain sheep and mountain goat, which belong to the Rocky Mountains. The plant life of Saskat- chewan is much like that of eastern Alberta. The Douglas fir and several varieties of pine found in the Rocky Mountains do not occur.

Population. — By the census of 1906 the population of Saskat- chewan was found to be 257,763. It had grown from 91,279 in 1901 (the area of the province being in 1906 somewhat greater than in 1901). The population is to a large extent Canadian, and the immigration has been largely from (1) the British Isles; (2) the United States; (3) the continent of Europe. Several large bodies of foreigners are found. There is a community of upwards of 8000 Doukhobors — a sect of Russian Quakers. Their tenets are peculiar, involving opposition to form in religion, to marriage and to submission to governmental requirements. They desire to hold their land in common. The Russian writer Tolstoy was a promoter of this immigration. Considerable bodies of Galicians are also found in the province. On the Indian popula- tion there were 9049 in 1901; and of Indian half-breeds 7949 in the same year. The Indians of Saskatchewan are chiefly Plain or Wood Crees, with a mixture among them of Saulteaux. To- ward the south small bands of Assiniboines are found, and here and there small

companies of refugee Sioux from the United States. All the Indians are on government reserves. In these reserves along the Qu'Appelle river are presented many examples of the successful management of the Indians by the Dominion government. These reserves are largely self-supporting; the Indians have comfortable houses, grow considerable crops of grain, make large quantities of hay and possess herds of cattle. At Regina, Qu'Appelle, Crooked Lakes and other industrial schools, young Indians— both male and . female — receive a practical education. Many of these are making excellent farmers.

Government, &c. — Throughout the province the municipal system of self-government, especially in the cities, towns and villages, is being introduced. There are two cities in the province, (1) Regina (pop. 9804 in 1907), the capital; (2) Moose Jaw (pop. 6249). The latter is a divisional point on the Canadian Pacific railway, and owes its importance chiefly to its railway connexions. In the northern portion of the province are two considerable towns (1) Prince Albert (pop. 3005) , on the banks of the North Saskatchewan river, giving promise of becoming a manufacturing centre, having as it has the great forest on the north side of the Saskatchewan river, adjoining it. (2) Saskatoon (pop. 301 1), on the South Saskatchewan river. This, though a new town, bids fair to become a great railway centre. Here the Canadian Pacific, the Canadian Northern and the Grand Trunk Pacific railways all cross the great river of the province, and tributary to this town is a large area of arable and prairie land.

The Saskatchewan is to some extent navigated, but a serious obstacle, the Grand Rapids, near the mouth of the river, requires a canal to allow the entrance of steamers into Lake Winnipeg. The southern part of the province is being covered by railways, the Canadian Pacific railway having its main line generally parallel to the international boundary line, at a distance of one hundred to one hundred and fifty miles. This railway has south of its main line two important branches: (1) The " Soo " line from Moose Jaw to Estevan, and connecting with the United States' system of railways. (2) The Areola branch from the south-eastern corner of the province running to Regina. Another branch leaves the main line for the north at Kirkella, and this will make a direct communication with Edmonton, while another branch line enters the province at Harrowby and runs westward to join the Kirkella branch on its way to Saskatoon and Edmonton. The Canadian Northern railway has a line which enters the province at Togo and following the Saskatchewan leaves the province at Lloydminster and pushes on to Edmonton. The Grand Trunk Pacific railway follows a direct line from Winnipeg to Edmonton, entering the province at 51° 25′ N. and leaving it at 52° 35′ N. for the west.

The chief industries of Saskatchewan are cattle-rearing in the northern part and grain growing in the south of the province. Coal is found on the Saskatchewan, and a light variety of lignite on the Souris river near the international boundary. The province follows in general the plan of government found in the other provinces of the Dominion. The capital of the province is Regina (q.v.). A provincial governor lives at Regina and he has a cabinet of four ministers. The legislature consists of twenty-five members. The province has adopted a public schools act, which has a proviso for the establishment of separate schools, but this is so surrounded by restrictions as to be almost non-effective, every such school being required in all particulars to follow the public school model. The system covers both secondary and primary public schools. A normal school is in operation at Regina.

The religions of the people are similar to those in the other western provinces of Canada. The principal denominations were in 1901 as follows : —

Presbyterians

17.151

Baptists .

2618

Roman Catholics

17,116

Doukhobors .

8700

Church of England

16,418

Greek Church .

2579

Methodists Lutherans

11,528 12,098

Mennonites .

History. — The history of Saskatchewan gathers round the Hudson's Bay Company. The open plains of the south were the home of the buffalo and few posts were established here, but the Saskatchewan river was the great line of communication for the fur-traders. It was first reached by the Montreal fur-traders in 1766, and by the Hudson's Bay Company from Hudson Bay in 1772. By this route the traders reached the great fur country of Mackenzie river, and the forts on the Saskatchewan river were notable. These were Fort Cumberland, Fort Carlton and Edmonton House. Alexander Mackenzie in 1789 left Edmonton and Fort Chipewyan (on Lake Athabasca) and going northward discovered Mackenzie river and reached the Arctic Sea. On his second voyage, leaving Fort Chipewyan, he gained the Peace river, and by means of this crossed the Rocky Mountains and reached the Pacific coast (July 22nd, 1793), being first of white men, north of Mexico, to cross the continent. The Saskatchewan and Mackenzie river basins were the real fur country of the traders. The northern portion of the province of Saskatchewan is still the home of the fur-trader.

SASKATCHEWAN (Cree: " Rapid River "), a river of Alberta and Saskatchewan provinces, Canada. Two large streams known as the North and South Saskatchewan unite near Prince Albert, and thence flow E. into Lake Winnipeg. The North Saskatchewan rises in the Rocky Mountains in 52° 07′ N. and 117° 06′ W., and flows east, though with many windings, receiving several important tributaries, including the Clearwater, Brazeau and Battle. The South Saskatchewan is formed by the union of the Bow and the Belly, the former and larger of which rises in western Alberta in one of the highest districts of the Rockies. Flowing east in an extremely tortuous course, it receives the waters of the Red Deer, and farther on turns abruptly north to its junction with the other branch. The length of the united Saskatchewan is about 300 m.; shallow draught steamers ascend from its mouth to Edmonton on the North Branch, a distance of about 850 m.

SASSANID, or Sassanian Dynasty (or Sasanian), the ruling dynasty of the neo-Persian empire founded by Ardashir I. in

a.d. 226 and destroyed by the Arabs in 637. The dynasty is named after Sasan, an ancestor of Ardashir I. For a list of the kings and the

history of the empire see Persia: Ancient History, section viii.; for its fall see also Caliphate, section A, § 1.

SASSARI, a town and archiepiscopal see of Sardinia, capital of the province of Sassari, situated in the N.W. corner of the island, 12J m. by rail S.E. of Porto Torres on the north coast, and 215 m. N.W. of Alghero on the west coast, 762 ft. above sea-level. Pop. (1906) 34,897 (town); 41,638 (commune). The Aragonese castle and the Genoese walls have been demolished in recent times, and the town has a modern aspect, with spacious streets and squares. The cathedral has a baroque facade; but traces of Romanesque work (12th century) can be seen at the sides and in the campanile. The see was transferred from Porto Torres in 1441. S. Maria di Betlemme has a good facade and Romanesque portal of the end of the 13th (?) century (D. Scano, in L' Arte, 1905, 134). In the municipal collection are a few pictures of interest. The museum in the university has an inter- esting collection of antiquities, largely formed by G. Spano, from al! parts of the island, and belonging to the prehistoric, Phoenician and Roman periods. To the east of the town is the Fontana eel Rosello, which supplied the town with water before the construction of the aqueduct, the water being brought up in small barrels by donkeys. Sassari is connected by rail by a branch (285- m. E.S.E. to Chilivani) with the main line from CagHari to Golfo degli Aranci, and with Porto Torres and Alghero. To the district near Sassari belong some of the most picturesque costumes of the island.

The date of the origin of the town is uncertain; but it was no doubt founded as the result of migrations from Porto Torres. This can hardly have occurred during the nth century, when we find the giudici of Torres or Logudoro residing either at Porto Torres or at Ardara; but it must have occurred before 121 7, when a body of Corsicans, driven out of their island by the cruelties of a Visconti of Pisa, took refuge at Sassari, and gave their name to a part of the town. About this time we find one of the giudici residing at Sassari for a whole summer, no doubt to escape the malaria. The giudici continued to exist at least until 127s, and perhaps till 1284, but about 1260 Sassari seems to have shaken itself free, and in 1275 and 1286 we find Pisa treating Sassari as a free commune. In 1 288, four years after the defeat of Meloria, Pisa ceded Sassari to Genoa; but Sassari enjoyed internal autonomy, and in 1316 published its statutes (still extant), which are perhaps in part the reproduction of earlier ones. These, however, did not last long, for in 1323 Sassari submitted to the Aragonese king, and lost its independence. Sassari was sacked by the French in 1527, and disastrous pesti- lences are recorded in 1528, 1580 and 1652. In 1795 Sassari was the centre of the reaction of the barons against the

popular ideas sown by the French Revolution; an insurrection of the people led by one Angioi lasted only 3. short while, and led to reactionary measures.

See P. Satta-Branca, II Comune di Sassari nei secoli XIII e XIV (Rome, 1885). (T. As.)

SASSINA (or Sarsina, the modern form), an ancient town of Umbria, Italy, on the left bank of the river Sapis (Savio), 16 m. S. of Caesena (Cesena). In 266 B.C. both consuls, on different dates, celebrated a triumph over the Sassinates, as is recorded in the Fasti, and in the enumeration of the Italian allies of the Romans in 225 B.C. the Umbri and Sassinates are mentioned, on an equal footing, as providing 20,000 men between them. It is possible that the tribus Sapinia (the name of which is derived from the river Sapis) mentioned by Livy in the account of the Roman marches against the Boii in 201 and 196 B.C. formed a part of the Sassinates. The poet Plautus was a native of Sassina (b. 254 B.C.). The town was of some importance, as inscriptions show; these are preserved in the local museum. Remains of several buildings, one of which was probably the public baths, have been found (A. Santarelli in Notizie degli scavi, 1892, 370; A. Negrioli, ibid., 1900, 392). Its milk is frequently mentioned — no doubt it was the centre of a pasture district — and it provided a number of recruits for the praetorian guard.

An episcopal see was founded here in the 3rd century a.d. and still exists. The present town has 2291 inhabitants (commune,

3861).

SASSOON, SIR ALBERT ABDULLAH DAVID, Bart. (1818- 1896), British Indian philanthropist and merchant, was born at Bagdad on the 25th of July 1818, a member of a Jewish family settled there since the beginning of the 16th century, and previ- ously in Spain. His father, a leading Bagdad merchant, was driven by repeated Anti-Semitic outbreaks to remove from Bag- dad to Bushire, Persia, and, in 1832, he settled in Bombay where he founded a large banking and mercantile business. Albert Sassoon was educated in India, and on the death of his father became head of the firm. He was a great benefactor to the city of Bombay, among his gifts being the Sassoon dock, completed in 1875, and a handsome proportion of the cost of the new Elphinstone High School. In 1867 he was made a C.S.I., and in 1872 a Knight of the Bath. In 1873 he visited England and received the freedom of the city of London. Shortly afterwards he settled in England, and was made a baronet in 1890. He died at Brighton on the

24th of October 1896.

SATARA, a town and district of British India, in the Central division of Bombay. The name is derived from the ” seventeen ” walls, towers and gates which the fort was supposed to possess. The town is 2320 ft. above sea-level, near the confluence of the rivers Kistna and Vena, 56 m. S. of Poona. Pop. (1901) 26,022.

The District or Satara has an area of 482 5 sq. m. It contains two hill systems, the Sahyadri, or main range of the Western Ghats, and the Mahadeo range and its offshoots. The former runs through the district from north to south, while the Mahadeo range starts about 10 m. north of Mahabaleshwar and stretches east and south-east across the whole breadth of the district. The Mahadeo hills are bold, presenting bare scarps of black rock like fortresses. Within Satara are two river systems — the Bhima system in a small part of the north and north-east, and the Kistna system throughout the rest of the district. The hill forests have a large store of timber and firewood. The whole of Satara falls within the Deccan trap area; the hills consist of trap intersected by strata of basalt and topped with laterite, while, of the different soils on the plains, the commonest is the black loamy clay containing carbonate of lime. This when well watered is capable of yielding heavy corps. Satara contains some important irrigation works, including the Kistna canal. In some of the western parts of the district the average annual rainfall exceeds 200 in. ; but on the eastern side water is scanty, the rainfall varying from 40 in. in Satara town to less than 1 2 in. in some places farther east. The population in 1901 was 1,14?, 559, showing a decrease of 6% in the preceding decade. The principal crops are millet, pulse, oil-seeds and sugar-cane. The only manufactures are cotton cloth, blankets and brass-ware. The district is traversed from north to south by the Southern Mahratta railway, passing 10 m. from Satara town. The Satara agency comprises the two feudatory states of Phaltan and Aundh. Total area 844 sq.m.; pop. (1901) 109,660.

On the overthrow of the Jadhav dynasty in 13 12 the district passed to the Mahommedan power, which was consolidated in the reign of the Bahmani kings. On the decline of the Bahmanis towards the end of the 15th century the Bijapur kings finally asserted themselves, and under these kings the Mahrattas arose and laid the foundation of an independent kingdom with Satara as its capital. Intrigues and dissensions in the palace led to the ascendancy of the Peshwas, who removed the capital to Poona in 1749, and degraded the raja of Satara into the position of a political prisoner. The war of 181 7 closed the career of the peshwas, and the British then restored the titular raja,

and assigned to him the principality of Satara, with an area much larger than the present district. In consequence of political intrigues, he was deposed in 1839, and his brother was placed on the throne. This prince dying without male heirs in 1848, the state was resumed by the British government.

SATELLITE (from theLat. safeties, an attendant), in astronomy, a small opaque body revolving around a planet, as the moon around the earth (see Planet). In the theory of cubic curves,

Arthur Cayley defined the satellite of a given line to be the line joining the three points in which tangents at the intersections of the given (primary) line and curve again meet the curve.

SATIN-SPAR, a name given to certain fibrous minerals which exhibit, especially when polished, a soft satiny or silky lustre, and are therefore sometimes used as ornamental stones. Such fibrous minerals occur usually in the form of veins or bands, having the fibres disposed transversely. The most common kind of satin-spar is a white finely-fibrous gypsum not infre- quently found in the Keuper marls of Nottinghamshire and Derbyshire, and used for beads, &c. Other kinds of satin-spar consist of calcium carbonate, in the form of either aragonite or calcite, these being distinguished from the fibrous gypsum by greater hardness, and from each other by specific gravity and optical characters. The satin-spar of Alston, Cumberland, is a finely-fibrous calcite occurring in veins in a black shale of the Carboniferous series. Fibrous calcite is known sometimes to German mineralogists as Atlasspath.

SATIN-WOOD, a beautiful light-coloured hard wood, having a rich, silky lustre, sometimes finely mottled or grained, the produce of a moderate-sized tree, Chloroxylon Swietenia (natural order Meliaceae), native of India and Ceylon. A similar wood, known under the same name, is obtained in the West Indies, the tree being probably a species of Zanthoxylum (natural order Rutaceae). Satin-wood was in request for rich furniture about the end of the 18th century, the fashion then being to ornament panels of it with painted medallions and floral scrolls and borders. It is used for inlaying and small veneers, in covering the backs of hair and clothes-brushes and in making small articles of turnery.

SATIRE (Lat. satira, satura; see below). Satire, in its literary aspect, may be defined as the expression in adequate terms of the sense of amusement or disgust excited by the ridiculous or unseemly, provided that humour is a distinctly recognizable element, and that the utterance is invested with literary form. Without humour, satire is invective; without literary form, it is mere clownish jeering. It is indeed exceedingly difficult to define the limits between satire and the regions of literary sentiment into which it shades. The first exercise of satire was no doubt coarse and boisterous. It must have con- sisted in gibing at personal defects; and Homer's description of Thersites, the earliest example of literary satire that has come down to us, probably conveys an accurate delineation of the first satirists. The character reappears in the heroic romances of Ireland and elsewhere ; and it is everywhere implied that the licensed backbiter is a warped and distorted being, readier with his tongue than his hands. To dignify satire by rendering it the instrument of morality or the associate of poetry was a develop- ment implying considerable advance in the literary art. The latter is the course adopted in the Old Testament, where the few passages approximating to satire, such as Jotham's parable of the bramble and Job's ironical address to his friends, are embellished either by fancy or by feeling. An intermediate stage between personal ridicule and the correction of faults and follies seems to have been represented in Greece by the Margites, attributed to Homer, which, while professedly lampooning an individual, practically rebuked the meddling sciolism imper- sonated in him. In the accounts that have come down to us of the writings of Archilochus, the first great master of satire, we seem to trace the elevation of the instrument of private animosity to an element in public life. Though a merciless assailant of individuals, Archilochus was also a distinguished statesman, naturally for the most part in opposition, and his writings seem to have fulfilled many of the functions of a news- paper press. Their merit is attested by Quintilian; and Gorgias's comparison of them with Plato's persiflage of the Sophists proves that their virulence must have been tempered by grace and refinement. Archilochus also gave satiric poetry its accepted form by the invention of the iambic trimeter, slightly modified into the scazonic metre by .his successors. Simonides of Amorgus and Hipponax were distinguished like Archilochus for the bitterness of their attacks on individuals, with which the former

combined a strong ethical feeling and the latter a bright active fancy. All three were restless and turbulent, aspiring and- discontented, impatient of abuses and theoretically enamoured of liberty; and the loss of their writings, which would have thrown great light on the

politics as well as the manners of Greece, is to be lamented. With Hipponax the direct line of Greek satire is interrupted; but two new forms of literary composition, capable of being the vehicles of satire, almost simultaneously appear. Fable is first heard of in Asiatic Greece about this date; and, although its original intention does not seem to have been satirical its adaptability to satiric purposes was soon discovered. A far more important step was the eleva- tion of the rude fun of rustic merrymakings to a literary status by the evolution of the drama from the Bacchic festival. The means had now been found of allying the satiric spirit with exalted poetry, and their union was consummated in the comedies of Aristophanes.

A rude form of satire had existed in Italy from an early date in the shape of the Fescennine verses, the rough and licentious pleasantry of the vintage and harvest, which, lasting down to the 16th century, inspired Tansillo's Vendemmiatore. As in Greece, these eventually, about 364 B.C., were developed into a rude drama, originally introduced as a religious expiation. This was at first, Livy tells us (vii. 2), merely pantomimic, as the dialect of the Tuscan actors im- ported for the occasion was not understood at Rome. Verse, " like to the Fescennine verses in point of style and manner," was soon added to accompany the mimetic action, and, with reference to the variety of metres employed, these probably improvised composition were entitled Saturae, a term denoting miscellany, and derived from the satura lanx, " a charger filled with the first-fruits of the year's produce, anciently offered to Bacchus and Ceres." The Romans thus had originated the name of satire, and, in so far as the Fescennine drama consisted of raillery and ridicule, possessed the thing also; but it had not yet assumed a literary form among them. Livius Andronicus (240 B.C.), the first regular Latin dramatic poet, appears to have been little more than a translator from the Greek. Satires are mentioned among the literary productions of Ennius (200 B.C.) and Pacuvius (170 B.C.), but the title rather refers to the variety of metres employed than to the genius of the composition. The real inventor of Roman satire is Gaius Lucilius (148-103 B.C.), whose Satirae seem to have been mostly satirical in the modern acceptation of the term, while the subjects of some of them prove that the title continued to be applied to miscellaneous collections of poems, as was the case even to the time of Varro, whose " Saturae " included prose as well as verse, and appear to have been only partially satirical. The fragments of Lucilius preserved are scanty, but the verdict of Horace, Cicero and Quintilian demonstrates that he was a con- siderable poet. It is needless to dwell on compositions so universally known as the Satires of Lucilius's successor Horace, in whose hands this class of composition received a

new development, becoming genial, playful and persuasive. “Arch Horace strove to mend.” The didactic element preponderates still more in the philosophical satires of Persius. Yet another form of satire, the rhetorical, was carried to the utmost limits of excellence by Juvenal, the first example of a great tragic satirist. Nearly at the same time Martial, improving on earlier Roman models now lost, gave that satirical turn to the epigram which it only exceptionally possessed in Greece, but has ever since retained. About the same time another variety of satire came into vogue, destined to become the most important of any. The Milesian tale, a form of entertainment probably of Eastern origin, grew in the hands of Petronius and Apuleius into the satirical romance, immensely widening the satirist’s field and exempting him from the restraints of metre. Petronius’s ” Supper of Trimalchio ” is the revelation of a new vein, never fully worked till our days. As the novel arose upon the ruins of the epic, so dialogue sprang up upon the wreck of comedy. In Lucian comedy appears adapted to suit the exigencies of an age in which a living drama had become impossible. With him antique satire expires as a distinct branch of literature, — though mention should be made of the sarcasms and libels with which the population of Egypt were for centuries ac- customed to insult the Roman conqueror and his parasites. A denunciation of the apostate poet Hor-Uta — a kind of Egyptian ” Lost Leader ” — composed under Augustus, has been published by M. Revillout from a demotic papyrus.

After the great deluge of barbarism has begun to retire, one form of satire after another peeps forth from the receding flood, the order of development being determined by the circumstances of time and place. In the Byzantine empire, indeed, the link of continuity is unbroken, and such raillery of abuses as is possible under a despotism finds vent in the pale copies of Lucian published in Adolf Ellissen’s Analekten. The first really important satire, however, is a product of western Europe, recurring to the primitive form of fable, upon which, nevertheless, it constitutes a decided advance. Reynard the Fox, a genuine expression of the shrewd and homely Teutonic mind, is a landmark in literature. It gave the beast-epic a development of

which the ancients had not dreamed, and showed how ridicule could be conveyed in a form difficult to resent. About the same time, probably, the popular instinct, perhaps deriving a hint from Rabbinical literature, fashioned Morolf, the prototype of Sancho

Panza, the incarnation of sublunar mother-wit contrasted with the starry wisdom of Solomon; and the Till Eulenspiegel is a kindred Teutonic creation, but later and less significant. Piers Ploughman, the next great work of the class, adapts the apocalyptic machinery of monastic and anchoritic vision to the purposes of satire, as it had often before been adapted to those of ecclesiastical aggrandizement. The clergy were scourged with their own rod by a poet and a Puritan too earnest to be urbane. Satire is a distinct element in Chaucer and Boccaccio, who nevertheless cannot be ranked as satirists. The mock-heroic is successfully revived by Luigi Pulci, and the political songs of the 14th and 15th centuries attest the diffusion of a sense of humour among the people at large. The Renaissance, restoring the knowledge and encouraging the imitation of classic models, sharpened the weapons and enlarged the armoury of the satirist. Partly, perhaps, because Erasmus was no poet, the Lucianic dialogue was the form in the ascendant of his age. Erasmus not merely employed it against superstition and ignorance with infinite and irresistible pleasantry, but fired by his example a bolder writer, un- trammelled by the dignity of an arbiter in the republic of letters. The ridicule of Ulric von Hutten's Epistolae obscurorum virorum is annihilating, and the art there for the first time fully exemplified though long previously introduced by Plato, of putting the ridicule into the mouth of the victim, is perhaps the most deadly shaft in the quiver of sarcasm. It was afterwards used with even more pointed wit though with less exuberance of humour by Pascal, the first modern example, if Dante may not be so classed of a great tragic satirist. Ethical satire is vigorously represented by Sebastian Brant and his imitator Alexander Barclay; but in general the metrical satirists of the age seem tame in comparison with Erasmus and Hutten, though including the great name of Machiavelli. Sir Thomas More cannot be accounted a satirist, but his idea of an imaginary commonwealth embodied the germ of much subsequent satire.

In the succeeding period politics take the place of literature and religion, producing in France the Satyre MenippSe, elsewhere the satirical romance as represented by the Argents of Barclay, which may be defined as the adaptation of the style of Petronius to state affairs. In Spain, where no freedom of criticism existed, the satiric spirit took refuge in the novela picaresca, the prototype of Le Sage and the ancestor of Fielding; Quevedo revived the medieval device of the vision as the vehicle of reproof; and Cervantes's immortal work might be classed as a satire were it not so much more. About the same time we notice the appearance of direct imitation of the Roman satirists in English literature in the writings of Donne, Hall and Marston, the

further elaboration of the mock-heroic by Tassoni, and the culmination of classical Italian satire in Salvator Rosa. The prodigious development of the drama at this time absorbed much talent that would otherwise have been devoted to satire proper. Most of the great dramatists of the 17th century were more or less satirists, Moliere perhaps the most consummate that ever existed ; but, with an occasional exception like Les Precieuses ridicules, the range of their works is too wide to admit of their being regarded as satires. The next great example of unadulterated satire is Butler's Hudibras, and perhaps one more truly representative of satiric aims and methods cannot easily be found. At the same period dignified political satire, bordering on invective, received a great develop- ment in Andrew Marvell's Advices to a Painter, and was shortly afterwards carried to perfection in Dryden's A bsalom and Achitophel ; while the light literary parody of which Aristophanes had given the pattern in his assaults on Euripides, and which Shakespeare had handled somewhat carelessly in the Midsummer Night's Dream, was effectively revived in the duke of Buckingham's Rehearsal. In France Boileau was long held to have attained the ne plus ultra of the Horatian style in satire and of the mock-heroic, but Pope was soon to show that further progress was possible in both. The polish, point and concentration of Pope remain unsurpassed, as do the amenity of Addison and the daring yet severely logical imagination of Swift ; while the History of John Bull and the Pseudologia place their friend Arbuthnot in the first rank of political satirists.

The 1 8th century was, indeed, the age of satire. Serious poetry had for the time worn itself out ; the most original geniuses of the age, Swift, Defoe and Richardson, are decidedly prosaic, and Pope, though a true poet, is less of a poet than Dryden. In process of time imaginative power revives in Goldsmith and Rousseau ; meanwhile Fielding and Smollett have fitted the novel to be the vehicle of satire and much beside, and the literary stage has for a time been almost wholly engrossed by a colossal satirist, a man who has dared the universal application of Shaftesbury's maxim that ridicule is the test of truth. The world had never before seen a satirist on the scale of Voltaire, nor had satire ever played such a part as a factor in impending change. As a master of sarcastic mockery he is un- surpassed ; his manner is entirely his own ; and he is one of the most intensely national of writers, notwithstanding his vast obligations to English humorists, statesmen and philosophers. English humour also played an important part in the literary regeneration of Germany, where, after Liscow and Rabener, imitators of Swift and the essayists,

Lessing, imbued with Pope but not mastered by him, showed how

powerful an auxiliary satire can be to criticism — a relation which Pope had somewhat inverted. Another great German writer, Wieland, owes little to the English, but adapts Lucian and Petronius to the 1 8th century with playful if somewhat mannered grace. Kortum's Jobsiad, a most humorous poem, innovates successfully upon established models by making low life, instead of chivalry, the subject of burlesque. Goethe and Schiller, Scott and Wordsworth, are now at hand, and as imagination gains ground satire declines. Byron, who in the 18th century would have been the greatest of satirists, is hurried by the spirit of his age into passion and descrip- tion, bequeathing, however, a splendid proof of the possibility of allying satire with sublimity in his Vision of Judgment. Moore gives the epigram a lyrical turn ; Beranger, not for the first time in French literature, makes the gay chanson the instrument of biting jest; and the classic type receives fresh currency from Auguste Barbier. Courier, and subsequently Cormenin, raise the political pamphlet to literary dignity by their poignant wit. Peacock evolves a new type of novel from the study of Athenian comedy. Miss Edgeworth skirts the confines of satire, and Miss Austen seasons her novel's with the most exquisite satiric traits. Washington Irving revives the manner of The Spectator, and Tieck brings irony and persiflage to the dis- cussion of critical problems. Two great satiric figures remain — one representative of his nation, the other most difficult to class. In all the characteristics of his genius Thackeray is thoroughly English, and the faults and follies he chastises are those especially character- istic of British society. Good sense and the perception of the ridiculous are amalgamated in him ; his satire is a thoroughly British article, a little over-solid, a little wanting in finish, but honest, weighty and durable. Posterity must go to him for the humours of the age of Victoria, as they go to Addison for those of Anne's. But Heine hardly belongs to any nation or country, time or place. He ceased to be a German without becoming a Frenchman, and a Jew without becoming a Christian. Only one portrait really suits him, that in Tieck's allegorical tale, where he is represented as a capricious and mischievous elf ; but his song is sweeter and his command over the springs of laughter and tears greater than it suited Tieck's purpose to acknowledge. In him the satiric spirit, long confined to established literary forms, seems to obtain unrestrained freedom to wander where it will, nor have the ancient models been followed since by any considerable satirist except the Italian Giusti. The machinery employed by Moore was indeed transplanted to America by James Russell Lowell, whose Biglow Papers represent perhaps the highest moral level yet attained by satire.

In no age was the spirit of satire so generally diffused as in the 19th

century, but many of its eminent writers, while bordering on the domains of satire, escape the definition of satirist. The term cannot be properly applied to Dickens, the keen observer of the oddities of human life; or to George Eliot, the critic of its emptiness when not inspired by a worthy purpose; or to Balzac, the painter of French society ; or to Trollope, the mirror of the middle classes of England. If Sartor Resartus could be regarded as a satire, Carlyle would rank among the first of satirists; but the satire, though very obvious, rather accompanies than inspires the composition. The number of minor satirists of merit, on the other hand, is legion. Poole, in his broadly farcical Little Pedlington, rang the changes with inexhaustible ingenuity on a single fruitful idea; Jerrold's comedies sparkle with epigrams, and his tales and sketches overflow with quaint humour; Mallock, in his New Republic, made the most of personal mimicry, the lowest form of satire; Samuel Butler (Rrewhon) holds an in- verting mirror to the world's face with imperturbable gravity; the humour of Bernard Shaw has always an essential character of satire — the sharpest social lash. One remarkable feature of the modern age is the union of caricature (g.f.) with literature. (R. G.)

SATISFACTION (Lat. salisfacerc, to satisfy), reparation for an injury or offence; payment, pecuniary or otherwise, of a debt or obligation; particularly, in law, and equitable doctrine of much importance. It may operate either as between strangers or as between father and child. As between strangers: it was laid down in Talbot v. Duke of Shrewsbury, 17 14, Pr. Ch. 394, that where a debtor bequeaths to his creditor a legacy as great as, or greater than the debt, the legacy shall be deemed a satisfac- tion of the debt. This rule, however, has fallen under a consider- able amount of discredit, and very small circumstances are required to rebut the presumption of satisfaction. If the debt was incurred after the execution of the will, there is no satisfac- tion, nor is there where the will giving the legacy contains a direction to pay debts. As between parent and child, the doctrine operates (a) in the satisfaction of legacies by portions, and (b) of portions by legacies. In the case of (a), it has been laid down that where a parent, or one acting in loco parentis, gives a legacy to a child, without stating the purpose for which he gives it, it will be understood as a portion; and if the father afterwards advance a portion on the marriage., or preferment

in life, of that child, though of less amount, it is a satisfaction of the

whole, or in part. This application of the doctrineis based on the maxim that ” equality is equity,” as is also the rule (6) that where a legacy bequeathed by a parent, or one in loco parentis, is as great as, or greater than, a portion or provision previously secured to the child, a presumption arises that the legacy was intended by the parent as a complete satisfaction. In each of the above cases, of course, the presumption may be rebutted by evidence of the testator’s intentions.

In theology, the doctrine of satisfaction is the doctrine that the sufferings of Christ are accepted by the divine justice as a substitute for the punishment due for the sins of the world (see Atonement).

SATNA, a British station in Central India, within the state of Rewah, with a station on the East Indian railway, 102 m. S.W from Allahabad. Pop. (1901) 7471. It is the headquarters of the political agent for Baghelkhand, and an important centre of trade.

SATPURA, a range of hills in the centre of India. Beginning at the lofty plateau of Amarkantak (about 82° E.), the range extends westward almost to the W. coast. From Amarkantak an outer ridge runs S.W. for about 100 m. to a point known as the Saletekri hills in Balaghat district. As it proceeds westward the range narrows from a broad tableland to two parallel ridges enclosing the valley of the Tapti, as far as the famous hill-fortress of Asirgarh. Beyond this point the Khandesh hills, which separate the valley of the Nerbudda from that of the Tapti, complete the chain as far as the Western Ghats. The mean elevation is about 2500 ft.; but the plateaus of Amarkantak and Chauradadar in the east of Mandla district rise to nearly 3500 ft., and many of the peaks and some of the tablelands exceed this altitude. The hill of Khamla in Betul district is 3700 ft., which is also the general height of the Chikalda hills overlooking the Berar plain, while the Pachmarhi hills east of Betul, rising abruptly from the Nerbudda valley, culminate in Dhokgarh at an elevation of 4500 ft. Just east of Asirgarh there is a break in the range, through which passes the railway from Bombay to Jubbulpore, the elevation at this point being about 1240 ft. The extreme length of the range is about 600 m.; the breadth, which is 100 m. at its head across Balaghat and Mandla, diminishes to the narrow ridges of Nimar.

SATRAE, in ancient geography, a Thracian people, inhabiting part of Mount Pangaeus between the rivers Nestus (Mesta) and Strymon (Struma). According to Herodotus, they were inde- pendent in his time, and had never been conquered within the memory of man. They dwelt on lofty mountains covered with forests and snow, and on the highest of these was an oracle of Dionysus, whose utterances were

delivered by a priestess. They were the chief workers of the gold and silver mines in the district. Herodotus is the only ancient writer who mentions the Satrae, and Tomaschek regards the name not as that of a people but of the warlike nobility among the Thracian Dii and Bessi. J. E. Harrison and others identify them with the Satyri (Satyrs), the attendants and companions of Dionysus in his revels, and also with the Centaurs. The name Satrokentae, a Thracian tribe according to Hecataeus (quoted in Stephanus of Byzantium), seems to support the second identification.

See Herodotus vii. 110-112; J. E. Harrison, Prolegomena to Greek Religion (1903), p. 379; W. Tomascheck, Die alten Thraker (1893).

SATRAP [Pers. Khshatrapavan,i.e .” protector (superintendent) of the country (or district),” Heb. sakkshadrapan, Gr. e&uTpcwnjs (insc. of Miletus, Silzungsber. Berl. Ak. 1900, 112), kl-aifipaTeboiv (insc. of Mylasa, Dittenberger, Sylloge, 95), hˆarpairris (insc. of MylasaLebasiii. 388,Theopompp. in), shortened into aa.Tpa.wris], in ancient history, the name given by the Persians to the governors of the provinces. By the earlier Greek authors (Herodotus, Thucydides and often in Xenophon) it is rendered by farapxos ” lieutenant, governor,” in the documents -from Babylonia and Egypt and in Ezra and Nehemiah by pakha, ” governor “; and the satrap Mazaeus of Cilicia and Syria in the time of Darius III. and Alexander (Arrian iii. 8) calls himself on his coins ” Mazdai, who is [placed] over the country beyond the Euphrates

and Cilicia.” Cyrus the Great divided his empire into provinces; a definitive organization was given by Darius, who established twenty great satrapies and fixed their tribute (Herodot. iii. 89 sqq.) The satrap was the head of the administration of his province; he collected the taxes, controlled the local officials and the subject tribes and cities, and was the supreme judge of the province to whose ” chair ” (Nehem. iii. 7) every civil and criminal case could be brought. He was responsible for the safety of the roads (cf. Xenophon, Anab. i. 9. 13), and had to put down brigands and rebels. He was assisted by a council of Persians, to which also provincials were admitted; and was controlled by a royal secretary and by emissaries of the king (esp. the ” eye of the king “). The regular army of his province and the fortresses were independent of him and commanded by royal officers; but he was allowed to have troops in his own service (in later times mostly Greek mercenaries). The great provinces were divided into many smaller districts, the governors of which are also called satraps and hyparchs. The distribution of the great satrapies was changed occasionally, and often two of them were given to the same man.

When the empire decayed, the satraps often enjoyed practical independence, especially as it became customary to appoint them also as generals in chief of their army district, contrary to the original rule. Hence rebellions of satraps became frequent from the middle of the 5th century; under Artaxerxes II. occasionally the greater part of Asia Minor and Syria was in open rebellion. The last great rebellions were put down by Artaxerxes III. The satrapic administration was retained by Alexander and his successors, especially in the Seleucid empire, where the satrap generally is designated as slrategus; but their provinces were much smaller than under the Persians.

In later times the cult of a god Satrapes occurs in Syrian inscriptions from Palmyra and the Hauran; by Pausanias vi. 25, 6, Satrapes is mentioned as the name of a god who had a statue and a cult in Elis and is identified with Korybas. The origin of this god is obscure; perhaps it arose from a cult con- nected with a statue or a tomb of some satrap.

See further under Persia: Ancient History, from the Achaemenid period onwards, and works there quoted (especially section v. § 2).

(Ed. M.)

SATRICUM (mod. Conca), an ancient town of Latium, situated some 30 m. to the S.E. of Rome, in a low-lying region to the S. of the Alban Hills, to the N.W. of the Pomptine Marshes. It was accessible direct from Rome by a road running more or less parallel to the Via Appia, to the S.W. of it. It is said to have been an Alban colony: it was a member of the Latin league of 499 B.C. and became Volscian in 488. It was several times won and lost by the Romans, and twice destroyed by fire. After 346 B.C. we hear of it only in connexion with the temple of Mater Matuta. A. Nibby (Analisi Sella carta del dintorni di Roma, Rome, 1848, iii. 64) was the first to fix the site upon the low hill, surrounded by tufa cliffs, on which were still scanty remains of walling in rectangular blocks of the same material, which is now occupied by the farm-house of Conca. One mile W.N.W., on the hill above Le Ferriere, remains of an archaic temple, ascribed to Mater Matuta, were discovered by excavation in 1896. The work was begun under the direction of Professor H. Graillot of the University of Bordeaux, member of the French School of Rome, but after two weeks' work was suspended by order of the Italian government, and then resumed under the supervision of their own officials. The objects discovered are in the Museo di Papa Giulio at Rome. Another Satricum lay on the right bank of the Liris, not far from Arpinum.

See H. Graillot in Melanges de I'ecolefrancaise de Rome (1896), 131 ; and Notizie degli scavi (1896), passim. (T. As.)

SATSUMA ISLANDS, a group of islands belonging to Japan, lying westward of the province of Satsuma (31 40′ N. and 129 40′ E.). The two principal are Kami-Koshiki-shima (245 m. by 55) and Shimo-Koshiki-shima (8j m. by 5J).

SATTERLEE, WALTER (1844-1908), American figure and

genre painter, was born in Brooklyn, New York, on the 18th of

January 1844. He graduated at Columbia University in 1863,

I studied in the National Academy of Design, and with Edwin

White, in New York, and in 1878-1879 under Leon Bonnat in Paris. He first exhibited at the National Academy in 1868, was elected an associate of the Academy in 1879, and received its Thomas B. Clarke prize in 1886. He was a member of the American Water Color Society and of the New York Etching Club, and was an excellent teacher. Satterlee died in Brooklyn on the 28th of May 1908. Among his favourite subjects were Arab life and figures in the costume of the colonial period.

SATURN [Saturnus], a god of ancient Italy, whom the Romans, and till recently the moderns, identified with the Greek god Cronus.

1. Cronus was the youngest of the Titans, the children of Sky (Uranus) and Earth (Gaea). Besides the Titans, Sky and Earth had other children, the Cyclopes and the Hundred-handers. When the Cyclopes and the Hundred-handers proved trouble- some, Sky thrust them back into the bosom of Earth. This vexed Earth, and she called on her sons to avenge her on their father Sky. They all shrank from the deed save Cronus, who waylaid and mutilated his father with a sickle or curved sword. From the drops of blood which fell to the earth sprang the Furies and the Giants. Cronus now reigned in room of Sky. His wife was Rhea, who was also his sister, being a daughter of Sky and Earth. Sky and Earth had foretold to Cronus that he would be deposed by one of his own children, so he swallowed them one afteranother as soon as they were born. Thus he devoured Hestia, Demeter, Hera, Hades and Poseidon. But when Rhea had brought forth Zeus, the

youngest, 1 she wrapped up a stone in swaddling clothes and gave it to Cronus, who swallowed it instead of the babe. When Zeus, who had been hidden in Crete, grew up, he gave his father a dose which compelled him to disgorge first the stone and then the children whom he had swallowed. The stone was preserved at Delphi; every day it was anointed and on festivals it was crowned with wool. Zeus and his brothers now rebelled against Cronus, and after a ten years' struggle they were victori- ous. Cronus and the Titans were thrust down to Tartarus, where they were guarded by the Hundred-handers. According to others, Cronus was removed to the Islands of the Blest, where he ruled over the departed heroes, judging them in conjunction with Rhadamanthus. Plutarch (De Def. Orac. 18) mentions a story that the dethroned monarch of the gods slept on an island of the northern seas guarded by Briareus and surrounded by a train of attendant divinities. The reign of Cronus was supposed to have been the golden age, when men lived like gods, free from toil and grief and the weakness of old age (for death was like sleep) ; and the earth brought forth abundantly without cultiva- tion. There are few traces of the worship of Cronus in Greece. Pausanias, in his description of Greece, mentions only one temple of Cronus ; it stood at the foot of the Acropolis at Athens and was sacred to Cronus and Rhea jointly. The Athenians celebrated an annual festival in his honour on the 12th of Hecatombaeon. A mountain at Olympia was called after him, and on its top annual sacrifices were offered to him at the spring equinox.

The idea that Cronus was the god of time seems to have arisen from a simple confusion between the words Cronus and Chronus (" time ")• Curtius derives Cronus from the root kra, meaning " to accomplish." Cronus may have been a god of some aboriginal half- savage tribe which the Greeks conquered. Hence the savage traits in his legend, his conquest by Zeus and the scanty traces of his worship in Greece. The myth of the mutilation of Sky by Cronus may be a particular form of the widespread story of the violent separation of Sky and Earth by one of their children. Other forms of this myth are found in New Zealand, India and China. Parallels to the swallowing and disgorging incident are to be found in the folk- lore of Bushmen, Kaffres, Basutos, Indians of Guiana and Eskimo.

2. Saturn and his wife Ops were amongst the oldest deities of ancient Italy. He is said to have had an altar at the foot of the Capitol before Rome was founded. Saturn was a god of agriculture, his name being derived from serere, " to sow." 2 The identification of Saturn with Cronus 3 gave rise to the legend that after his deposition by Zeus (Jupiter) Saturn wandered to

1 So Hesiod. But, according' to Homer, Zeus was the eldest of the children of Cronus and Rhea.

2 He was also known by the epithet of Stercutus or Sterculius, the god of fertilizing manure.

3 Cronus himself was a harvest god under one of his aspects.

Italy, where he ruled as king in the golden age and gave the name Saturnia to the country. 4 Janus, another of the most ancient gods of Italy, is said to have welcomed him to Rome, and here he settled at the foot of the Capitol, which was called after him the Saturnian Hill. His temple stood at the ascent from the Forum to the Capitol and was one of the oldest buildings in Rome, but the eight remaining columns of the temple probably formed a portion of a new temple built in the imperial times. The image of Saturn in this temple had woollen bands fastened round its feet all the year through, except at the festival of the Saturnalia; the object of the bands was probably to detain the deity. Similarly there was a fettered image of Enyalius (the War God) at Sparta, and at Athens the image of Victory had no wings, lest she might fly away. The mode of sacrifice at this temple was so far peculiar that the head of the sacrificer was bare as in the Greek ritual, instead of being covered, as was the usual Roman practice. Legend said that the Greek ritual was intro- duced by Hercules, who at the same time abolished the human sacrifices previously offered to Saturn. Others said that the rule had been observed by the Pelasgians before. Under or behind the temple was the Roman treasury, in which the archives as well as the treasures of the state were preserved. Dionysius Halicarnassensis (Ant. Rom. i. 34) tells that there were many sanctuaries of Saturn in Italy and that many towns and places, especially mountains, were called after him. The oldest national form of verse was known as the Saturnian. Like many other figures in Roman mythology, Saturn is said to have vanished at last from earth. His emblem was a sickle. The substitution of a great scythe for the sickle, and the addition of wings and an hour-glass, are modern. 6 Ops (" plenty "), wife of Saturn, was an earth-goddess, as appears from the custom observed by her suppliants of sitting and carefully touching the earth while they made their vows to her. As goddess of crops and the harvest she was called Consiva, and under this name had a sanctuary at Rome, to which only the Vestals and the priest were admitted. As Saturn was identified in later times with Cronus, so was Ops with Rhea. Another goddess mentioned as wife of Saturn was Lua, a goddess of barrenness. She was one of the deities to whom after a victory the spoils of the enemy were sometimes dedicated and burned.

Saturnalia. — This, the great festival of Saturn, was celebrated on the 19th, but after Caesar's reform of the calendar on the 17th, of December. Augustus decreed that the 17th should be sacred to Saturn and the 19th to Ops. 6 Henceforward it appears that the 17th and 1 8th were devoted to the Saturnalia, and the 19th and 20th to the Opalia, a. festival of Ops. 7 Caligula added a fifth day, "the day of youth" (dies juvenalis), devoted no doubt to the sports of the young. But in popular usage the festival lasted seven days. The woollen fetters were taken from the feet of the image of Saturn, and each man offered a pig. During the festival schools were closed; no war was declared or battle fought; no punishment was inflicted. In place of the toga an undress garment (synthesis) was worn. Distinctions of rank were laid aside : slaves sat at table with their masters or were waited on by them, and the utmost freedom of speech was allowed them. Gambling with dice, at other times illegal, was now permitted. 8 All classes exchanged gifts, the commonest being wax tapers and clay dolls. These dolls were especially given to children, and the makers of them held a regular fair at this time. Varro thought these dolls represented original sacrifices of human beings to the infernal god. There was, as we have seen, a tradition that human sacrifices were once offered to Saturn, and the Greeks and Romans gave the name of Cronus and Saturn toa cruel Phoenician Baal, to whom, e.g. children were sacrificed at Carthage. The Cronus to whom human sacrifices are said to have been offered in Rhodes was probably a Baal, for there are traces of Phoenician worship in Rhodes. It may be conjectured that the Saturnalia was originally a celebration of the winter solstice. Hence

4 He is said to have taught the inhabitants of Latium agriculture, the art of navigation and the use of stamped pieces of metal for money.

B During the first centuries of the Christian era, Saturn was one of the chief popular divinities of northern Africa, representing the Carthaginian Baal under the title of Dominus Saturnus ; see Toutain, De Saturni dei in Africa Romana cultu (1894).

6 There was also a special festival, Opeconsiva, on Aug. 25.

7 The fourth day of the festival was added by some one unknown.

8 It is curious to find a similar rule with a similar exception in Nepal. See H. A. Oldfield, Sketches from Nepal, vol.ii. pp. 353 sq.

the legend that it was instituted by Romulus under the name of the Brumalia {bruma — winter solstice). The prominence given to candles at the festival points to the custom of making a new fire at this time. The custom of solemnly kindling fires at the summer solstice (Eve of St John) has prevailed in most parts of Europe, notably in Germany, and there are traces (of which the yule-log is one) of the observance of a similar custom at the winter solstice. In ancient Mexico a new fire was kindled, amid great rejoicings, at the end of every period of fifty-two years.

The designation of the planets by the names of gods is at least as old as the 4th century B.C. The first certain mention of the star of Cronus (Saturn) is in Aristotle (Metaphysics, p. 1073 b. 35). The name also occurs in the Epinomis (p. 987 b), a dialogue of uncertain date, wrongly ascribed to Plato. In Latin, Cicero (1st century B.C.) is the first author who speaks of the planet Saturn. The application of the name Saturn to a day of the week (Saturni dies, Saturday) is first found in Tibullus (i. 3, 18). (J. G. Fr.; X.)

SATURN, in astronomy, the sixth major planet in the order of distance from the sun, and the most distant one known before the discovery of Uranus in 178 1. Its symbol isT? . Its periodic time is somewhat less than 30 years, and the interval between oppositions is from 12 to 13 days greater than a year. It appears as a star of at least the first magnitude, but varies much in brightness with its orbital position, owing to the varying phases of its rings. It seems to resemble Jupiter in its physical constitution, but the belts and cloud-like features so conspicuous 1 on that planet are so faint on Saturn that they can be seen only in a general way as a slight mottling. In colour the planet has a warmish tint, not dissimilar to that of Arcturus. Its density is the smallest known among the planets, being only 0-13 that of the earth, and therefore less than that of water.

Owing to the difficulty of distinguishing any individual feature, the rotation of the planet has been observed only on a few rare occasions when a temporary bright spot appeared and continued during several days. The first observation of such a spot was made by the elder Herschel, who derived a rotation period of 10 h. 16 m. In December 1876 a bright spot appeared near the equator of the planet, which was observed by Asaph Hall at Washington for more than a month. It gradually spread out in longitude, and finally faded away. The time of rotation found by Hall was 10 h. 14 m. 24 s. A third spot appeared in 1903 on the northern hemisphere, and had a rotation period of about

10 h. 38 m. The deviation of this period from the others indicates that, as in the case of Jupiter and the sun, the time of rotation is least at the equator, and increases toward the poles. Both from this difference and from the appearance presented by the planet it is clear that the visible surface is not a solid, as in the case of Mars, but consists of a layer of cloudy or vaporous matter, which conceals from view the solid body of the planet, if any such exists. Owing to the rapid rotation the figure of the disk is markedly elliptical, but when, owing to the rings being seen edgewise, the entire disk is visible, the latter sometimes seems to have the form of a square with its edges rounded off. This may be an illusion.

The most remarkable feature associated with Saturn is its magnificent system of ring and satellites. The former is unique in the solar system. The ring, the seeming ends of which were first seen by Galileo as handles to the planet, was for some time a mystery. After Galileo had seen it at one or two oppositions, it faded from sight, a result which we now know was due to the advance of the planet in its orbit, bringing our line of sight edgeways, to the ring. When it reappeared, Galileo seems to have abandoned telescopic observation, but the ” ansae” of Saturn remained a subject of study through a generation of his successors without any solution of their mystery being reached. The truth was at length worked out in 1656 by Huygens, who first circulated his solution in the form of an anagram. When arranged in order the letters read:

” Annulo cingitur tenui, piano, nusquam cohaerente, ad eclipticam inclinato.”

This designation of a plain thin ring surrounding the planet, but disconnected from it, and inclined to the ecliptic, is accurate and as complete as the means of observation permitted.

The varying phases presented by the ring arise from its having an inclination of 27 to the orbit of the planet, while its plane remains

invariable in direction as t*ie planet performs its orbital revolution. There are therefore two opposite points of the orbit, at each of which the plane of the ring passes through the sun, and is seen nearly edgeways from the earth. At the two intermediate points the ring is seen as opened out at an angle of 27°. The apparent illuminated surface which it then presents to us exceeds that presented by the planet, so that the brightness of the entire system to the naked eye is more than double.

In 1665 William Ball or Balle, joint-founder and first treasurer of the Royal Society, discovered that the ring was apparently formed of two concentric rings, separated by a fine dark line. This was afterwards independently discovered by G. D. Cassini at the Paris Observatory. As the telescope was improved, yet other shaded lines concentric with the ring itself were found. These were some- times regarded as divisions, but if they are such they are by no means complete and sharp. The universal rule is that, if we con- sider any portion of the ring contained between two circles con- centric with the ring itself, the general aspect and brightness of this circular portion are alike through its whole circumference. That is to say, if the brightness of different parts of the ring be compared, it is found to be constant when the parts compared are equally distant from the centre, but subject to variation as we pass from the circumference towards the centre. The inner and broader of the two rings is brightest near the outer part and shades off toward the planet, gradually at first, and more rapidly afterwards. Its inner portion is so dark that it was at one time regarded as separate, and called the ” crape ” or ” dusky ” ring. This supposed discovery of an inner ring was made independently by W. R. Dawes of England and G. P. Bond of the Harvard Observatory, though J. G. Galle at Berlin noticed the actual appearance at an earlier date. The more powerful telescopes of the present time show this dusky ring to be continuous with the inner portions of the main ring, and transparent, at least near its inner edge.

The physical constitution of the rings is unlike that of any other object in the solar system. They are not formed of a continuous mass of solid or liquid matter, but of discrete particles of unknown minuteness, probably widely separated in proportion to their individual volumes, yet so close as to appear continuous when viewed from the earth. This constitution was first divined by Cassini early in the 1 8th century. But, although the impossibility that a continuous ring could surround a planet without falling upon it was shown by Laplace, and must have been evident to all in- vestigators in celestial mechanics, Cassini’s explanation was for- gotten until 1848. In that year James Clerk Maxwell, in an essay which was the first to gain the newly-founded Adams prize of the university of Cambridge, made an exhaustive mathematical in- vestigation of the satellite constitution, showing that it alone could fulfil the conditions of stability. Although this demonstration placed the subject beyond doubt, it was of great interest when J. E. Keeler at the Allegheny Observatory proved this constitution by spectroscopic observation in 1895. He found by measuring the velocity of different parts of the ring to or from the earth that, as we pass from the outer to the inner regions of the ring,

the velocity of revolution around the planet increases, each concentric portion of the ring having the speed belonging to a satellite revolving in a circular orbit at the same distance from the planet.

A remarkable feature of the rings is that they are so thin as to elude measurement and nearly disappear from view when seen edgeways even in powerful telescopes. As this can happen only at tne rare moments when the plane of the ring passes accurately through the earth, precise observations of the phenomenon with powerful telescopes are few. But before or after the epochs at which the plane passes through the sun, there is sometimes a period of several weeks, during which the sun shines on one face of the ring while the other is presented to the earth. In October 1907 the appearance presented by the rings was studied by W. W. Campbell at the Lick Observatory, and E. E. Barnard at the Yerkes Ob- servatory. The position of the ring as seen against the planet is marked by a dark line stretching across the equator, which is the thin shadow of the ring, on which the sun shines at a very acute angle.

An interesting question still open is the nature of the so-called divisions of the rings. Are these divisions real or are they simply apparent, arising from a darker colour in the matter which composes them? In the case of the sharpest and best-known division, to which the name of Cassini has been given from its first observer, there would seem to “be little doubt that the division is real. But there is some doubt in the case of the other divisions. While many excellent observers have sometimes thought they saw a complete separation between the bright and the crape rings, no such pheno- menon has been seen in the great telescopes of our times, and it is almost certain that the dark colour of the crape ring arises merely from its tenuity and transparency. From Barnard’s observation of the passage of Japetus through the shadow of Saturn and its rings it appears that the transparency gradually diminishes from the centre of this ring to its line of junction with the bright ring. If there should ever be a transit of Saturn centrally past a bright star, many questions as to the constitution of the rings may be settled by noting the times at which the star was seen through the divisions of the ring.

SATURNIA— SATURNINUS

ˆ33

Elements of the Satellites of Saturn

-

Mean Longitude.

Epoch Greenwich Mean Noon.

Mean Daily Motion.

Mean Distance.

Eccentricity.

Long, of Pericentre.

Mass Saturn.

Mimas .

127 19-0′

1889, April

381-9945°

26-814″

Small

Doubtful

16,340,000

Enceladus

199 19-8

272-73199

34-401

»»

i >

4,000,000

Tethys .

284 31-0

*f

190-69795

42-586

1*

»»

921,500

Dione

253 51-4

＞i

I3I-534975

54-543

»»

j»

536,000

Rhea .

358 23-8

79-690087

76-170

».

»»

250,000

Titan

260 25-1

1890, Jan.

22-5770093

I76-578

•02886

276 15′ + 31-7″

4,700

Hyperion

304 31-8

16-919983

213-92

•1043

255 47 – 18-663°’

unknown

Japetus . Phoebe .

75 26-4

1885, Sept. 1

4-537997

5H-59

•02836

354 30 + 7-9 ‘

100,000

343 9-o

1900, Jan.

-0-65398

1871-6

•1659

291 2 — 0-27 ‘

unknown

Satellites of Saturn. Saturn is surrounded by a system of nine or (perhaps) ten satellites. The brightest of these was discovered by Huygens in 1665 while pursuing his studies of the ring. The following table shows the names, distances, times of revolution, discoverer and date of discovery of the nine whose orbits are well established :

Name.

Dis- tance.

Periodic Time.

Discoverer.

Date of Discovery.

I Mimas

3″ 1

d. h.

23

W. Herschel

1789, Sept. 17

2 Enceladus

4-0

I 9

1789, Aug. 28

3 Tethys

5-o

1 21

G. D. Cassini

1684, March

4 Dione .

6-3

2 18

,,

1684, March

5 Rhea .

8-9

4 12

,,

1672, Dec. 23

6 Titan .

20-5

15 23

Huygens

1655, Mar. 25

7 Hyperion .

25-1

21 7

W. C. Bond

1848, Sept. 16

8 Japetus

9 Phoebe

59-6

79 8

J. D. Cassini

1 67 1, October

209-3

546 12

W. H. Pickering

1898, August

The five inner satellites seem to form a class by themselves, of which the distinguishing feature is that the orbits are so nearly circular that no eccentricity has been certainly detected in them, and that the planes of their orbits coincide with that of the ring and, it may be inferred, with the plane of the planet's equator. Thus, so far as the position of the planes of rotation and revolu- tion are concerned, the system keeps together as if it were rigid. This results from the mutual attraction of the various bodies. A remarkable feature of this inner system is the near approach to commensurability in the periods of revolution. The period of Tethys is nearly double that of Mimas, and the period of Enceladus nearly double that of Dione. The result of this near approach to commensurability is a wide libration in the longi- tudes of the satellites, having periods very long compared with the times of revolution.

Each of the four outer satellites has some special feature of interest. Titan is much the brightest of all and has therefore been most accurately observed. Hyperion is so small as to be visible only in a powerful telescope, and has a quite eccentric orbit. Its time of revolution is almost commensurable with that of Titan, the ratio of the period being 3 to 4. The result is that the major axis of the orbit of Hyperion has .a retrograde motion of 1 8° 40′ annually, of such a character that the conjunction of the two satellites always occurs near the apocentre of the orbit, when the distance of the orbit from that of Titan is the greatest. This is among the most interesting phenomena of celestial mechanics. Japetus has . the peculiarity of always appearing brighter when seen to the west of the planet than when seen to the east. This is explained by the supposition that, like our moon, this satellite always presents the same face to the central body, and is darker in colour on one side than on the other.

In studying a series of photographs of the sky in the neighbour- hood of Saturn, taken at the branch Harvard observatory at Are- quipa, Peru, W. H. Pickering found on each of three plates a very faint star which was missing on the other two. He concluded that these were the images of a satellite moving around the planet. The latter was then entering the Milky Way, where minute stars were so numerous that it was not easy to confirm the discovery. When the planet beˆan to emerge from the Milky Way no difficulty was found in relocating the object, and proving that it was a ninth satellite. Its motion was found to be retrograde, a conclusion confirmed by Frank E. Ross. This phenomenon may be regarded as unique in the solar system, for, although the motion of the satellite of Neptune is retrograde, it is the only known satellite of that planet.

Another extremely faint satellite has probably been established by Pickering, but its orbit is still in some doubt.

The conclusions from the spectrum of Saturn, and numerical particulars relating to the planet, are found in the article Planet.

The planes of the orbits of the inner six satellites are coincident with the plane of the ring system, of which the elements are as follow :

Longitude of ascending node on ecliptic . . 167° 43′ 29*

Inclination

Exterior diameter of outer ring, in miles

Interior ,, „ „

Exterior ,, inner ring ,,

Interior ,, „ ,,

Interior ,, dark ring „

Breadth of outer bright ring „

Breadth of division between the rings, in miles

Breadth of inner bright ring

Breadth of dark ring

Breadth of system of bright rings

Breadth of entire system of rings

Space between planet and dark rings

28° 10′ 22″

166,920 147,670 144,310 109,100 91,780

9.625

1,680 17-605

8,660 28,910 37.570

9,760

(S. N.)

SATURNIA (mod. Saturnia), an ancient town of Etruria Italy, about 23 m. N.E. of Orbetello and the coast. Dionysius of Halicarnassus enumerates it among the towns first occupied by the Pelasgi and then by the Tuscans. A Roman colony was conducted there in 183 B.C., and it was a praefectura, but other- wise little is known about it. Remains of the city walls, in the polygonal style, still exist, to which Roman gates were added. Roman remains have also been discovered within the town, and remains of tombs outside, originally covered by tumuli, which have now disappeared, so that Dennis wrongly took them for megalithic remains. Pitigliano, some 12 .m. to the S.W., is another Etruscan site.

See G. Dennis, Cities and Cemeteries of Etruria (London, 1883), i. 496; ii. 275; A. Pasqui in Notizie degli scavi (1882), 52.

(T. As.)

SATURNIAN METRE (Lat. Saturnius, i.e. which relates to Saturn), the name given by the Romans to the crude and irregular measures of the oldest Latin folk-songs. The scansion is generally of the following type:

with which Macaulay compares the nursery rhyme, ” The Queen was in her parlour, eating bread and honey.” There was, however, considerable licence in the scansion, and we can gather only that the verse was generally of this type, and had a light and vivacious movement. It occurs in a few inscriptions (the verses on the tombs of the Scipios: cf. Biicheler, Anthologia Latina, 1895) in fragments, Livius Andronicus and the Bellum Punicum of Naevius. Subsequently it was

ousted by Greek metres. The question as to whether it depended upon accent or upon quantity has been much discussed.

See Keller, Der saturnische Vers (Prague, 1883 and 1886) ; Thurneysen, Der Saturnier (Halle, 1885); Havet, De saturnio Latinorum versu (Paris, 1880) ; M tiller, Der saturnische Vers und seine Denkmaler (1885); Leo, Der saturnische Vers (1905); Du Bois, Stress Accent in Roman Poetry (New York, 1906); also Mommsen, Hist, of Rome, i. chap. xv.

SATURNINUS, LUCIUS APPULEIUS, Roman demagogue. As quaestor (104 B.C.) he superintended the importation of corn at Ostia, but had been removed by the Senate (an unusual proceeding), and replaced by M. Aemilius Scaurus (q.v.), one of the chief members of the government party. He does not appear to have been charged with incapacity or mismanagement,

and the injustice of his dismissal drove him into the arms of the popular party. In 103 he was elected tribune. He entered into an agreement with C. Marius, and in order to gain the favour of his soldiers proposed that each of his veterans should receive an allotment of 100 jugera of land in Africa. He was also chiefly instrumental in securing the election of Marius to his fourth consulship (102). An opportunity of retaliating on the nobility was afforded him by the arrival (1 o 1) of ambassadors from Mithra- dates VI. of Pontus, with large sums of money for bribing the senate; compromising revelations were made by Saturninus, who insulted the ambassadors. He was brought to trial for violating the law of nations, and only escaped conviction by an ad miseri- eordiam appeal to the people. To the first tribunate of Saturninus is probably to be assigned his law on majestas, the exact provi- sions of which are unknown, but its object was probably to strengthen the power of the tribunes and the popular party; it dealt with the minuta majestas (diminished authority) of the Roman people, that is, with all acts tending to impair the integrity of the Commonwealth, being thus more comprehensive than the modern word ” treason.” One of the chief objects of Saturninus’s hatred was Q. Caecilius Metellus Numidicus, who, when censor, endeavoured to remove Saturninus from the senate on the ground of immorality, but his colleague refused to assent. In order to ingratiate himself with the people, who still cherished the memory of the Gracchi, Saturninus took about with him Equitius, a paid freedman, who gave himself out

to be the son of Tiberius Gracchus. Although the mother of the Gracchi refused to acknowledge him, the people stoned Metellus because he would not admit his claim to citizenship. Equitius was afterwards elected tribune. Marius, on his return to Rome after his victory over the Cimbri, finding himself isolated in the senate, entered into a compact with Saturninus and his ally C. Servilius Glaucia, and the three formed a kind of triumvirate, supported by the veterans of Marius and the needy rabble. By the aid of bribery and assassination Marius was elected (100 consul for the sixth time, Glaucia praetor, and Saturninus tribune for the second time. Saturninus now brought forward an agrarian law, an extension of the African law already alluded to. It was proposed that all the land north of the Padus (Po) lately in possession of the Cimbri, including that of the 'inde- pendent Celtic tribes which had been temporarily occupied by them, should be held available for distribution among the veterans of Marius. This was unjust, since the land was really the property of the provincials who had been dispossessed by the Cimbri. Colonies were to be founded in Sicily, Achaea and Macedonia, on the purchase of which the " Tolosan gold," the temple treasures embezzled by Q. Servilius Caepio (praetor no), was to be employed. Further, Italians were to be admitted to these colonies, and as they were to be burgess colonies, the right of the Italians to equality with the Romans was thereby partially recognized. This part of the bill was resented by many citizens, who were unwilling to allow others . to share their privileges. A clause provided that, within five days after the passing of the law, every senator should take an oath to observe it, under penalty of being expelled from the senate and heavily fined. All the senators subsequently took the oath except Metellus, who went into exile. Saturninus also brought in a bill, the object of which was to gain the support of the rabble by supplying corn at a nominal price. The quaestor Q. Servilius Caepio l declared that the treasury could not stand the strain, and Saturninus's own colleagues interposed their veto. Saturninus ordered the voting to continue, and Caepio dispersed the meeting by violence. The senate declared the proceedings null and void, because thunder had been heard; Saturninus replied that the senate had better remain quiet" otherwise the thunder might be followed by hail. The bills {leges Appuleiae) were finally passed by the aid of the Marian veterans.

Marius, finding himself overshadowed by his colleagues and compromised by their excesses, thought seriously of breaking with them, and Saturninus and Glaucia saw that their only hope

1 According to some, the son of the Caepio mentioned above. But chronological reasons make the relationship doubtful.

of safety lay in their retention of office. Saturninus was elected tribune for the third time for the year beginning the 10th of December 100, and Glaucia, although at the time praetor and therefore not eligible until after the lapse of two years, was a candidate for the consulship. M. Antonius the orator was elected without opposition; the other government candidate, Gaius Memmius, who seemed to have the better chance of success, was beaten to death by the hired agents of Saturninus and Glaucia, while the voting was actually going on. This produced a complete revulsion of public feeling. The senate met on the following day, declared Saturninus and Glaucia public enemies, and called upon Marius to defend the State. Marius had no alternative but to obey. Saturninus, defeated in a pitched battle in the Forum (Dec. 10), took refuge with his followers in the Capitol, where, the water supply having been cut off, they were forced to capitulate. Marius, having assured them that their lives would be spared, removed them to the Curia Hostilia, intending to proceed against them according to law. But the more impetuous members of the aristocratic party climbed on to the roof, stripped off the tiles, and stoned Saturninus and many others to death. Glaucia, who had escaped into a house, was dragged out and killed.

Bibliography.— -Appian, Bell. civ. i. 28-33; Diod. Sic. xxxvi. 12; Plutarch, Marius, 28-30; Livy, Epit. 69; Florus iii. 16; Veil. Pat. ii. 12; Auctor ad Herennium i. 21; Aurelius Victor, De viris illustribus, 73; Orosius v. 17; Cicero, Pro Balbo, 21, 48, Brutus, 62, De oratore, ii. 49, De haruspicum responsis, 19, Pro Sestio, 47, Pro Rabirio, passim ; Mommsen, Hist, of Rome(Eng. trans.), bk. iv. ch. 6; G. Long, Decline of the Roman Republic, ii. ch. 10; E. Klebs in Pauly-Wissowa's Realencyclopadie, ii. 1 (1896); see further Rome: History, II., " The Republic," Period C.

SATYRS (SATYRi),in Greek mythology, spirits, half man half beast, that haunted the woods and mountains, companions of Pan and Dionysus. They are not mentioned in Homer; in a fragment of Hesiod they are called brothers of the mountain nymphs and Curetes, an idle and worthless race. Fancy represented them as strongly built, with flat noses, pointed ears, small horns growing out of the forehead, and the tails of horses or goats. They were a roguish but faint-hearted folk, lovers of wine and women, roaming to the music of pipes and cymbals, castanets and bagpipes, dancing with the nymphs or pursuing them and striking terror into men. They had a special form of dance calles Sikinnis. In earlier Greek art they appear as old and ugly, but in later art, especially in works of the Attic school, this savage character is softened into a more youthful and graceful aspect. There is a famous statue supposed to be a copy of a work of Praxiteles,

representing a graceful satyr leaning against a tree with a flute in his hand. In Attica there was a species of drama known as the Satyric; it parodied the legends of gods and heroes, and the chorus was composed of satyrs. Euripides's play of the Cyclops is the only extant example of this kind of drama. The older satyrs were called Sileni, the younger Satyrisci. By the Roman poets they were often confounded with the Fauns. The symbol of the shy and timid satyr was the hare. In some districts of modern Greece the spirits known as Calicantsars offer points of resemblance to the ancient satyrs; they have goats' ears and the feet of asses or goats, are covered with hair, and love women and the dance. The herdsmen of Parnassus believe in a demon of the mountain who is lordof hares and goats.

In the Authorized Version of Isa. xiii. 21, xxxiv. 14 the word "satyr " is used to render the Hebrew se'lrtm, " ha'ry ones." A kind of demon or supernatural being known to Hebrew

Satyr hi art important.

folk-lore as inhabiting waste places is meant; a practice

of sacrificing to the se'irim is alluded to in Lev. xvii. 7,

where E. V. has " devils." They correspond to the

" shaggy demon of the mountain-pass " iazabb al-'akaba) of old

Arab superstition.

SAUCE, flavouring or seasoning for food, usually in a liquid or semi-liquid state, either served separately or mixed with the dish. The preparation of suitable sauces is one of the essentials of good cookery. The word comes through the Fr. from the Lat. salsa, salted or pickled food {salire, to season or sprinkle with sal, salt). The same Latin word has also given " saucer," properly a dish for sauce, now a small flat plate with a depressed centre to hold a cup and so prevent the spilling of liquid, and

"sausage" (0. Fr. saulcisse, Late Lat. salsicium), minced seasoned meat, chiefly pork, stuffed into coverings of skin. The colloquial use of " saucy," impertinent, " cheeky" is an obvious transference from the tartness or pungency of a sauce, and has a respectable literary

ancestry; thus Latimer {Misc. Sel.) ” when we see a fellow sturdy, lofty and proud, men say this is a saucy fellow.”

SAUERLAND, a mountainous district of Germany, in the Prussian province of Westphalia, between the Sieg and the Ruhr, separated by the former from the Westerwald on the S., and by the latter from the coal formation of Ardey on the N. It is a well-wooded plateau of the Devonian formation, diversified by deep valleys and tracts of heather land. The district is a favourite tourist resort.

See F. W. Grimme, Das Sauerland und seine Bewohner (2nd ed., Paderborn, 1886); Fricke, Der Tourist im Sauerland (Bielefeld, 1892), and’Kneebusch, Reisefiihrer durch das Sauerland (Dortmund, 18Q9).

SAUGOR, or Sagar, a town and district of British India, in the Jubbulpore division of the Central Provinces. The town, in a picturesque situation on a spur of the Vindhyan hills, 1758 ft. above sea-level, has a station on the Indian Mid- land railway. Pop. (1901) 42,330. It has long ceased to be a growing place, though it if still third in importance in the province. It was founded in 1660, but owes its importance to having been made the capital of the Mahratta governor who established himself here in 1735. The cantonments contain a battery of artillery, a detachment of a European regiment, a native cavalry and a native infantry regiment. The town is handsomely built, and is an emporium of trade.

The District of Satjgor has an area of 3962 sq. m. It is an extensive, elevated and in parts tolerably level plain, broken in places by low hills of the Vindhyan sandstone. It is traversed by numerous streams, chief of which are the Sunar, Beas, Dhasan and Bina, all flowing in a northerly direction towards the valley of the Ganges. In the southern and central parts the soil is black, formed by decaying trap; to the north and east it is a reddish-brown alluvium. Iron ore of excellent quality is found and worked at Hirapur, a small village in the extreme north-east. The district contains several densely wooded tracts, the largest of which is the Ramna teak forest preserve in the north.

The population in 1901 was 469,479, showing a decrease of 20% in the decade, due to the results of famine. The principal crops are wheat, millet, pulse, oil-seeds and a little cotton. The main line of the Indian Midland railway crosses the district, with a branch from Bina to Katni on the East Indian system.

By a treaty concluded with the Mahratta Peshwa in 1818, the greater part of the present district was made over to the British ; and the town

became the Capital of the Saugor and Nerbudda Territories, then attached to the North-western Provinces. During the Mutiny of 1857 the whole district was in the possession of the rebels, excepting the town and fort, in which the Europeans were shut up for eight months, till relieved by Sir Hugh Rose. The rebels were totally defeated and order was again restored by March 1858.

See the Saugor District Gazetteer (Allahabad, 1907).

SAUJBULAGH, or Sujbulak, the principal town of the Mukri district, in the province of Azerbaijan in Persia, in a fertile valley, between 30 and 40 m. S. of Lake Urmia, at an elevation of 4270 ft. It has post and telegraph offices, and a population of about 7000, mostly Kurds of the Mukri tribe, and exports dried fruit, grain and tobacco. There are many more localities with this name (Turkish, meaning ” cold stream,” or ” cold spring “) in Persia, the most notable, after the above-mentioned Kurdish city, being a district of the province of Teheran, with many villages. The place was temporarily occupied by Turkish troops in January 1908.

SAUL (Heb. shd’ill, ” asked “), in the Old Testament, son of Kish, and king of Israel. 1 His history is closely interwoven with that of the prophet Samuel and the Judaean king David. Two distinct accounts are given of his rise. In one Samuel, after de- feating the Philistines, rules as the last “judge” of Israel; the people demand a king, and Saul, a young giant of Benjamin, is chosen by lot; the choice is confirmed when he delivers

1 On the name Saul, also that of an Edomite king (Gen. xxxvi. 37 see;.), see Samuel note 1. Kish seems to be identical with the Arabic personal and god-name Kais.

Jabesh-Gilead from the Ammonites (1 Sam. i.-viii., x. 17-27, xi., xii.). In the other, Saul is raised up by Yahweh to deliver Israel from a sore Philistine oppression. Samuel, a seer of local fame, previously unknown to Saul, gives him the divine conir mission, and ultimately a complete victory is gained which is celebrated by the erection of an altar (ix. i-x. 16, xiii. seq.). See further Samuel. Once king, Saul achieves conquests over the surrounding states, and the brief summary in 1 Sam. xiv. 47-51 may be supplemented by 2 Sam. i. 19 sqq., where the brave deeds of the loving pair Saul and his son Jonathan, and their untimely death, form the subject of an old poem which vividly describes the feelings of a prostrate nation. Saul and his sons fell in the battle on Mt. Gilboa in the north and the land was thrown into confusion (1 Sam. xxxi.). Jabesh-Gilead, mindful of its debt, secretly

carried away the dead bodies (cf. 2 Sam. xxi. 1 2 seq.) , and Abner the commander hurriedly removed the surviv- ing son, Ishbosheth, 2 to Mahanaim and at length succeeded in establishing his power over all Israel north of Jerusalem (2 Sam. ii 8 seq.). But the sequel is lost in the more popular accounts of the rise of David.

Little old tradition is preserved of the house of Saul. The interest now lies in the prominence of Samuel, and more particu- larly in the coming supremacy of the Judaean king David (see the introductory verse 1 Sam. xiv. 5 2) ; as a result of this Saul is depicted in less sympathetic colours, his pettiness and animosity stand in strong contrast to David's chivalry and resignation, and in the melancholy Benjamite court with its rivalry and jealousy, the romantic attachment between David and Jonathan forms the one redeeming feature. The great Israelite disaster is fore- shadowed in a thrilling narrative of Saul's visit to the since famous Witch of Endor (1 Sam. xxviii.). Israel had lost its mainstay through the death of Samuel (cf. xii. 23), and the king, uneasy at the approach of the enemy, invoked the shade of the prophet only to learn that his cause was lost through his own sin. The incident is now connected with David's nearing supremacy, and refers to a previous act of disobedience in his Amalekite campaign. In a detailed account of Saul's expedition we learn that his failure to carry out Yahweh's commands to the letter had brought the prophet's denunciation (cf. Ahab, 1 Kings xx. 42), and that he had lost the divine favour (xv.)._ This in turn ignores an earlier occasion when Saul is condemned and the loss of his kingdom foretold ere he had accomplished the task tp which he had been called (xiii. 8-14) . 3

This later tendency to subordinate the history of Saul to that of David appears especially in a number of detailed and popular narratives encircling Judah and Benjamin, superseding other traditions which give an entirely different representation of David's move from the south to Jerusalem. Consequently it proves impossible to present a consistent outline of the history. Instead of the sequel to Ishbaal's recovery of power, and instead of David's incessant conflicts north of Hebron, ending with the capture of Jerusalem and its district from a strange people (2 Sam. v. xxi. 15-22, xxiii. 8 sqq.), we meet with the stories of the war with Benjamin and Israel, of the intrigue of Abner (q.v.) and the vengeance of Joab (q.v.). While Saul's death had left Israel in the hands of the Philistines, it is David who accomplishes the deliverance of the people (2 Sam. iii. 18, xix. 9). So, also, in accordance with his generous nature, David takes vengeance upon the Amalekite who had slain Saul (2 Sam. i. 6-10, contrast the details in 1 Sam. xxxi.), and upon the treacherous aliens who had murdered Ishbaal (iv.). When king at Jerusalem (seven years after Saul's death)

he seeks out the survivors of Saul in order to fulfil his covenant with Jonathan. Jonathan's son Mephibosheth 4 is found in safe-keeping east of the Jordan

2 Ishbosheth, i.e. Ishbaal, " man of Baal," cf. 1 Chron. viii. 33.

3 For other explanations see I Chron. x. 13 seq. (which refers to I Sam. xxviii.), and Josephus, Ant. vi. 14, 9 (a reference to Saul!s massacre of the priests at Nob, I Sam. xxii., a crime which is nt/t brought to his charge in biblical history and probably belongs lb one of the latest traditions).

4 Perhaps Meribaal, " man of Baal," or Meribbaal, " Baal Con- tends " ; for the intentional alteration of the name cf. note 2 above, and see Baal.

and is installed at court (ix.). Another impression is given by the relations between David and Saul's daughter, Michal (vi. 16 sqq., cf. also the "wives" in xii. 8), and we learn from yet another source that he handed over Saul's sons to the Gibeonites who had previously suffered from the king's bloodthirsty zeal (xxi. 1-14). On this occasion (the date is quite uncertain) the remains of Saul and Jonathan were removed from Jabesh-Gilead and solemnly interred in Benjamin. During Absalom's revolt, Mephibosheth entertained some hopes of reviving the fortunes of his house (xvi. 1-4, xix. 24-30), and two Benjamites, Shimei and Sheba, appear (xvi. 5 sqq., xix. 16-23, xx). But there is no concerted action; the three are independent figures whose presence indicates that Judaean supremacy over Israel was not accepted without a protest, and that the spilt blood of the house of Saul was laid upon the shoulders of David. Henceforth Saul's family disappears from the pages of history. But a genealogy of his descendants (1 Chron. viii. 33-40, ix. 39-44) tells of " mighty men of valour, archers," who with their sons number 150 strong, and this interesting post-exilic list is sug- gestive for the vitality of the traditions of their ancestors.

In surveying the earlier traditions of Saul's rise, it is clear that the desperate state of Israel leaves little room for the quiet picture of the inexperienced youth wandering around in search of his father's asses, or for the otherwise valuable representation of popular cult at the local sanctuaries (1 Sam. ix.). Since it is Saul who is commis- sioned to

deliver Israel, it is disconcerting to meet his grown-up son who slays the Philistine ” garrison ” (rather ” officer “) in Geba (Gibeah, xiii. 3 seq.), and takes the initiative in overthrowing the Philistines (xiv. I- 1 6); yet the account wnich follows of Jonathan’s violation of Saul’s hasty vow and its consequences pre- pares us for the subsequent stories of the unfriendly relations between the two. Finally the absence of any prelude to the Philistine oppression is perplexing. On the other hand, Judg. x. 6 sqq. (now the introduction to the Gileadite Jephthah and the Ammonites) contain references (now obscure) to the distress caused by the Philistines, the straitened circumstances of the people, and their penitent appeal to Yahweh. When at length Yahweh ” could bear the misery of Israel no longer,” it is evident that in the original con- nexion some deliverer was raised. But the sequel cannot be found in the Danite Samson, the priest Eli, or the seer Samuel, and it is only in the history of Saul that Yahweh’s answer to the people’s cry leads to the appointment of the saviour. The traces of the older accounts of Saul’s rise and the fragments in the highly composite introduction in Judg. x. (w. 7a, 86, 10-16) agree so materially that unless both the prelude to the former and the sequel to the latter have been lost it is probable that the two were once closely con- nected, but have been severed in the course of the literary growth of the traditions. See further Samuel, Books, § 6.

The development of views regarding the pre-monarchical ” judges,” the rise of the monarchy and its place in the religion of Yahweh have been factors quite as powerful as the growth of national tradition of the first king of Israel and the subordination of the narratives in order to give greater prominence to the first king of the Judaean dynasty. Although a considerable body of native tradition encircled the great Israelite heroes (cf. Ahab, Jehu, the wars of Aramaeans and Ammonites), Saul is pre-eminently a Benjamite figure. From the biblical evidence alone it is far from certain that this is the earliest phase. Saul’s deliverance of Jabesh-Gilead from Ammon and his burial may suggest (on the analogy of Jephthah) that Gilead re- garded him as its own. Some connexion between Gilead and Benjamin may be inferred from Judg. xxi., and, indeed, the decima- tion of the latter (see ibid. xx. 4, 7, xxi. 13 seq.) seems to link the appearance of the tribe in the earlier history with its new rise under Saul. But the history of the tribe as such in this period is shrouded in obscurity, and the Benjamite cycle appears to represent quite secondary and purely local forms of the great founder of the Israelite monarchy, whose traditions contain features which link him now with another founder of Israel — the warrior Joshua, and now with the still more famous invader and conqueror Jacob.

See S. A. Cook, Critical Notes on 0. T. History (Index, s.v.), and art. Jews, §§ 6-8, Samuei (Books). (S. A. C.)

SAULT SAINTE MARIE, a city and the county-seat of Chippewa county, Michigan, U.S.A., on Saint Mary's river, at the outlet of Lake Superior and at the E. end of the upper peninsula. Pop. (1890) 5760; (1900) 10,538, of whom 5329 were foreign- born; (1910 census), 12,615. It is served by the Canadian Pacific, the Duluth, South Shore & Atlantic, and the Minneapolis, Saint Paul & Sault Sainte Marie railways. A railway bridge (3607 ft. long, completed in 1887) and steam ferries connect it with the Canadian town of Sault Sainte Marie (pop. 1901, 7169) on the opposite side of the river. The principal buildings are the Court House, City Hall, Post Office, Custom House and

Carnegie Library (1905). Fort Brady, in the south-western part of the city, is an infantry garrison; the old Ft. Brady (built about 1822) in another part of the city is still standing.

The river is here nearly 1 m. wide and falls 20 ft. in three-fourths of a mile; it has been made navigable by lock canals for vessels drawing 20 ft. of water. The North West Fur Company built a lock here in 1 797-1 798. A canal 5700 ft. long, navigable for vessels of 1 1 5 ft. draught, was completed by the state in 1855. Between 1870 and 1881 the Federal government widened the canal to 100 ft., made the draught 16 ft., and built the Weitzel lock, 515 ft. long, 80 ft. wide, 60 ft. at gate openings, with a lift of 18-20 ft.; in 1896 the Poe lock (on the site of the old state locks), having a lift of 18-20 ft., and measuring 800 ft.X 100 ft., was opened, and the canal and its approaches were deepened. In 1908 the government began the widening of the canal above the locks and the construction of a new lock, 1350 ft. long between gates and having a draft of 24-5 ft. at extreme low-water. The estimated cost of this lock and approaches is $6,200,000. In 1907 the commerce passing here during the navigation season of eight months and twenty-three days amounted to 58,217,214 tons of freight, valued at more than $600,000,000; the commerce passing through the canals at this point is larger than that of any other canal in the world. There is a ship canal (if m. long) on the Canadian side of the river, which was completed in 1895 at a cost of $3,750,000. From the rapids opposite the city two water- power plants (of 50,000 and 10,000 h.p. respectively) derive their power; the larger, a hydraulic water-power canal (costing, with power equipment, $6,500,000) is ii m. long, and extends from the lake above to a power-house below the rapids; in this power-house are 320 turbines. The total value of the factory product in 1904 was $2,412,481, an increase of 231-3 % over that of

1900. Much hay and fish are packed and shipped here.

The place was long a favourite fishing-ground of the Chippewa Indians. It was visited by the French missionaries Rambault and Jogues in 1641 and by Pere Rene Menard in 1660. In 1668 Jacques Marquette founded a mission here. In 167 1 the governor-general of New France called a great council of the Indians here and in the name of the king of France took formal possession of all the country S. to the Gulf of Mexico and W. to' the Pacific. The mission was abandoned in 1689; but as a trading post of minor importance — for a time protected by a palisade fort — the settlement was continued. In 1879 Sault Sainte Marie was incorporated as a village; in 1887 it was chartered as a city.

For an account of the mission see Antoine I. Rezek, History of the Diocese of Sault Ste Marie and Marquette (2 vols., Houghton, Mich., 1906-1907); see also A. B. Gilbert's "A Tale of Two Cities" in Historical Collections, vol. 29 (Lansing, 1901) of the Michigan Pioneer and Historical Society.

SAUMAREZ, JAMES SAUMAREZ [or Sausmarez], Baron de (1757-1836), English admiral, was descended from an old family, and was born at St Peter Port, Guernsey, nth of March 1757. Many of his ancestors had. distinguished themselves in the naval service, and he entered it as midshipman at the age of thirteen. For his bravery at the attack of Charleston in 1776 on board the "Bristol" he was raised to the rank of lieutenant, and he was promoted commander for his gallant services off the Dogger Bank, 5th of August 1781, when he was wounded. In command of the " Russell," 70, he contributed to Rodney's victory over De Grasse (12th of April 1782). For the capture of " La Reunion," a French frigate, in 1793, he was knighted. While in command of a small squadron he was on the 5th of June 1794 attacked by a superior French force on the way from Plymouth to Guernsey, but succeeded in gaining a safe anchorage in Guernsey harbour. After being promoted to the " Orion," 74, in 1795, he took part in the defeat of the French fleet off Lorient, on the 2 2nd of June, distinguished himself in the battle of Cape St Vincent in February 1797, and was present at the blockade of Cadiz from February 1797 to April 1798, and at the battle of the Nile, where he was wounded. On his return from Egypt he received the command of the " Caesar," 84, with orders to watch the French fleet off Brest during the winters of 1799 and 1800. In 1801 he was raised to the rank of rear- admiral of the blue, was created a baronet, and received the command of a small squadron which was destined to watch the movements of the Spanish fleet at Cadiz. Between the 6th and 1 2th of July he performed a brilliant piece of service, in which after a first repulse at Algeciras he routed a much superior combined force of French and Spanish ships. For his services

Saumarez received the order of the Bath and the freedom of the city of London- In 1803 he received a pension of £1200 a year. On the outbreak of the war with Russia in 1809 he was given command of the Baltic fleet. He held it during the wars preceding the fall of Napoleon, and his tact was conspicu- ously shown towards the government of

Sweden at the crisis of the invasion of Russia. Charles XIII. (Bernadotte) bestowed on him the grand cross of the military order of the Sword. At the peace of 1814 he attained the rank of admiral; and in 1819 he was made rear-admiral, in 1821 vice-admiral of Great Britain. He was raised to the peerage as Baron de Saumarez in 183 1, and died at Guernsey on the 9th of October 1836.

See Memoirs of Admiral Lord de Saumarez, by Sir John Ross (2 vols., 1838).

SAUMUR, a town of western France, capital of an arrondisse- ment in the department of Maine-et-Loire, 28 m. S.E. of Angers on the railway to Tours. Pop. (1906) 14,747. Saumur is well situated on the left bank of the Loire, which here receives the Thouet, and on an island in the river. A large metal bridge connects the Tours-Angers railway with that of Montreuil- Bellay, by which Saumur communicates with Poitiers and Niort. Two stone bridges (764 and 905 ft. long) unite the town on the island with the two banks of the river. Several of the Saumur churches are interesting. St Pierre, of the 12th century, has a 17th-century facade and a Renaissance nave; and Notre-Dame of Nantilly, often visited by Louis XL, who rebuilt portions of it, has a remarkable though greatly damaged facade, a doorway and choir of the 12th century, and a nave of the nth. Both these churches contain curious tapestries, and in the latter, fixed in the wall, is the copper cross of Gilles de Tyr, keeper of the seals to St Louis. St Jean is a small building in the purest Gothic style of Anjou. St Nicolas-du-Chardonnet, in the Gothic style of the 1 2th century, has a fine modern spire. Notre-Dame of Ardilliers, of the 16th century, was enlarged in the following century by Richelieu and Madame de Montespan. The hotel de ville, containing a museum and library, is an elegant 16th century edifice; and the whole town is rich in examples of the domestic architecture of the 15th, 16th and 17th centuries. The house known as the Maison de la Reine Cecile (1 5th century) was built by Rene, duke of Anjou. The castle, built between the nth century and the 13th, and remodelled in the 16th, is used as an arsenal and powder magazine. There is also an interesting alms- house, with its chambers in part dug out in the rock. The famous cavalry school of Saumur was founded in 1768 and is used for the special training of young officers appointed to cavalry regiments on leaving the cadet school of St Cyr. Other public institutions are the sub-prefecture, tribunals of first instance and of commerce, a chamber of commerce, a branch of the Bank of France, colleges for both sexes and a horticultural garden, with a school of vines. Saumur prepares and carries on a large trade in the sparkling white wines grown in the neighbourhood, as well as in brandy, grain, flax and hemp; and it manufactures enamels and

rosaries and carries on liqueur-distilling.

The Saumur caves along the Loire and on both sides of the valley of the Thouet must have been occupied at a very remote period. The Tour du Tronc (9th century), the old stronghold of Saumur, served as a place of refuge for the inhabitants of the surrounding district during foreign invasions (whence perhaps the name Saumur, from Salons Murus) and became the nucleus of a monastery built by monks from St Florent le Vieil. On the same site rose the castle of Saumur two hundred years later. The town fell into the hands of Foulques Nerra, duke of Anjou, in 1025, and passed in the 13th century into the possession of the kings of France. The English failed to capture it during the Hundred Years' War. After the Reformation the town became the metropolis of Protestantism in France and the seat of a theological seminary. The school of Saumur, as opposed to that of Sedan, represented the more liberal side of French Protestantism (Cameron, Amyraut, &c). In 1623 the fortifications were dismantled ; and the revocation of the edict of Nantes reduced the population by more than one half. In June 1793, the town was occupied by the Vendeans, against whom it soon afterwards became a base of operations for the republican army.

SAUNDERSON, EDWARD JAMES (1837-1906), Irish politician, was born at Castle Saunderson, Co. Cavan, on the 1st of October 1837. He was the son of Alexander Saunderson, M.P. for Cavan (d. 1857), his mother being a daughter of the 6th Baron

Farnham. The Irish Saundersons were a 17th century branch of an old family, originally of Durham; a Lincolnshire branch, the Saundersons of Saxby, held the titles of Viscount Castleton (Irish: cr. 1628) and Baron Saunderson (British: cr. 1714) up to 1723. Edward Saunderson was educated abroad, and, having succeeded to the Cavan estates, married in 1865 a daughter of the 3rd Baron Ventry, and in the same year was elected M.P. for the county as a Palmerstonian Liberal. He lost his seat in 1874, and by 1885, when he again entered parliament for North Armagh, he had become a prominent Orangeman and a Conservative; the question of Irish home rule had now come to the front, and Saunderson's political career as a representative Irish Unionist had begun. He had entered the Cavan militia (4th battalion Royal Irish Fusiliers) in 1862, and was now major (1875), becoming colonel in 1886 and in command of the battalion from 1 89 1 to 1893. Almost from the first he became leader of the Irish Unionist party in the House of Commons, his uncom- promising speeches being fuE of force and humour. In 1898 his services were recognized by his being made a privy councillor. He died on the 21st of October 1906. In

private life Colonel Saunderson was well known as a keen yachtsman; his character was deeply marked by stern religious feeling, and his fine sincerity, while endearing him to his friends, never lost him the respect of his opponents.

See the Memoir by Reginald Lucas (1908).

SAUNDERSON, or Sanderson, NICHOLAS (1682-1739), English mathematician, was born at Thurlstone, Yorkshire, in January 1682. When about a year old he lost his sight through smallpox; but this did not prevent him from acquiring a know- ledge of Latin and Greek, and studying mathematics. In 1707 he began lecturing at Cambridge on the principles of the New- tonian philosophy, and in November 171 1 he succeeded William Whiston, the Lucasian professor of mathematics in Cambridge. He was created doctor of laws in 1728 by command of George II., and in 1736 was admitted a member of the Royal Society. He died of scurvy, on the 1 9th of April 1739.

Saunderson possessed the friendship of many of the eminent mathematicians of the time, such as Sir Isaac Newton, Edmund Halley, Abraham De Moivre and Roger Cotes. His senses of hearing and touch were extraordinarily acute, and he could carry on mentally long and intricate mathematical calculations. He devised a calcu- lating machine or abacus, by which he could perform arithmetical and algebraical operations by the sense of touch; this method is sometimes termed his palpable arithmetic, an account of which is given in his elaborate Elements of Algebra (2 vols., Cambridge, 1740). Of his other writings, prepared for the use of his pupils, the only one which has been published is The Method of Fluxions (1 vol., Lon- don, 1756). At the end of this treatise there is given, in Latin, an explanation of the principal propositions of Sir Isaac Newton's philosophy.

SAUNTER, to loiter, lounge, walk idly or lazily. The deriva- tion of the word has given rise to some curiously far-fetched guesses; thus it has been referred to the Holy Land, La Sainte Terre, where pilgrims lingered and loitered, or to the supposed tendency to idle propensities of those who possess no landed property, sans terre. The most probable suggestions are (1) that of Wedgwood, who connects it with a word in exactly the English sense which appears in various forms in Scandinavian languages, Icel. slentr, Dan. slentre, Swed. slentra, cf. slen, sloth, slunt, lout; this derivation assumes the disappearance of the I. (2) That supported by Skeat, and first propounded by Blackley {Word Gossip, 1869), which connects it with the Middle Eng. aunter, adventure; it may represent the Fr. s'aventurer, to go out on an adventure, and the sense-development would be from the idle and

apparently objectless expeditions of knights-errant in search of adventure.

SAUROPSIDA. This name was introduced by T. H. Huxley in his Introduction to the Classification of Animals (1869), to designate a province of the Vertebrata formed by the union of the Aves with the ReplUia. In his Elements of Comparative Anatomy (1864) he had used the term ” Sauroids” for the same province. The five divisions of the Vertebrata — Pisces, Amphibia, Reptilia, Aves, and Mammalia — are all distinctly definable, but their relations to one another differ considerably in degree. Whilst it

was Huxley’s great merit to emphasize by the term Sauropsida the close and direct relationship between the classes of reptiles and birds, it was an unfortunate innovation to brigade the Amphibia and fishes as Ichthyopsida, thereby separating the Amphibia much more from the reptiles than is justifiable, more than perhaps he himself intended. The great gulf within the recent Vertebrata lies between fishes, absolutely aquatic creatures with internal gills and ” fins ” on the one side, and on the other side all the other, tetrapodous creatures with lungs and fingers and toes, for which H. Credner has found the excellent term of Tetrapoda. Another drawback of Huxley’s divisions resulted in the tendency of alienating the Mammalia, the third division, from the reptiles whilst trying to connect their ancestry with the Amphibia, a view which even now has some vigorous advocates.

The characters which distinguish the Sauropsida, that is, which are common to birds and reptiles, and not found combined in the other classes, have been thus summarized by Huxley: no branchiae at any period of existence; a well-developed amnion and a-llantois present in the embryo; a mandible composed of many bones and articulated to the skull by a quadrate bone; nucleated blood- corpuscles; no separate parasphenoid bone in the skull; and a single occipital condyle. In addition to these principal characters others exist which are found in all birds and reptiles, but are not exclusively confined to them. The oviduct is always a Mullerian duct separate from the ovary and opening from the body cavity. The adult kidney is a metanephros with separate ureter; the mesonephros and mesonephric duct become in the adult male the efferent duct of the testis. The intestine and the reproductive and urinary ducts open into a common cloaca. There is usually an exoskeleton in the form of scales; in the birds the scales

take the form of feathers. There are two aortic arches in reptiles, in birds only one — the right. The heart is usually trilocular, becoming quadrilocular in crocodiles and birds. In all the eggs are mero- blastic and large, possessing a large quantity of yolk; in all the egg is provided in the oviduct with a layer of albumen and outside this with a horny or calcareous shell. In a few cases the egg is hatched in the oviduct, but in these cases there is no intimate connexion between the embryo and the walls of the duct. Fertilization takes place internally, occurring at the upper end of the oviduct previously to the deposition of the albuminous layer and egg shell.

Comparative anatomy clearly shows that birds are closely allied to reptiles; enthusiasts even spoke of them as ” glorified reptiles,” and this view seemed to receive its proof by the discoveries of Archaeopteryx (g.tf.), and the numerous “bipedal Dinosaurs. But Archaeopteryx was after all a bird, although still somewhat primitive, and the question, what group of reptiles has given rise to the birds? is still unanswered. By irony of fate, mere lack of the fossil material, it has come to pass that the bridges between Amphibia and reptiles and from them to Mammals are in a fairer way of re- construction than is that between reptiles and birds, the very two classes of which we know that they ” belong together.” (H. F. G.)

SAUSSURE, HORACE BENEDICT DE (i 740-1 709), Swiss physicist and Alpine traveller, was born at Geneva on the 17th of February 1740. 1 Under the influence of his father and his maternal uncle, Charles Bonnet, he devoted himself to botany. In 1758 he made the acquaintance of Albrecht von Haller, and in 1762 he published his first work, Observations sur I’ecorce des feuilles et des pitales. Tha same year he was chosen professor of philosophy at the academy of Geneva, and retained this chair till 1786. His health began to fail in 1791, when too he suffered great pecuniary losses. But he was able to complete his great work in 1796, before his death on the 22nd of January 1799. He became a F.R.S. after his visit to England (autumn of 1768), and in 1772 founded the Societe pour l’Avancement des Arts at Geneva. His early devotion to botanical studies naturally led him to undertake journeys among the Alps, and from 1773 on- wards he directed his attention to the geology and physics of that great chain. Incidentally, he did much to clear up the topography of the snowy portions of the Alps, and to attract the attention of pleasure travellers towards spots like Chamonix and Zermatt. In 1760 he first visited Chamonix, and offered a reward to the man who should first succeed in reaching the summit of Mont Blanc (then unsealed). He made an unsuccessful 1 His father, Nicolas de Saussure (1709-1790), an agriculturist of unusually liberal opinions, resided all his life at his

farm of Conches, on the Arve, near Geneva. As a member of the council of Two Hundred he took part in public affairs. Most of his writings bear on the growth and diseases of grain and other farm produce. His last work Le Feu, principe de la fecondite des plantes et de la fertility de la terre (17-82), wSs more speculative in its nature.

attempt himself in 1785, by the Aiguille du Gouter route. Two Chamonix men attained the summit in 1786, by way of the Grands Mulets, and in 1787 Saussure himself had the delight of gaining the summit (the third ascent). In 1788 he spent 17 days in making observations on the crest of the Col du Geant (11,060 ft.). In 1774 he mounted the Crammont, and again in 1778, in which year he also explored the Valsorey glacier, near the Great St Bernard. In 1776 he had ascended the Buet (10,201 ft.). In 1789 he visited the Pizzo Bianco (near Macugnaga) and made the first traveller's passage of the St Theodule Pass (10,899 ft.) to Zermatt, which he was the first traveller to visit. On that occasion he climbed from the pass up the Klein Matterhorn (12,750 ft.), while in 1792 he spent three days on the same pass (not descending to Zermatt), making observations, and then visited the Theodulhorn (11,392 ft.). In 1780 he climbed the Roche Michel, above the Mont Cenis Pass. The descriptions of seven of his Alpine journeys (by no means all), with his scientific observations gathered en route, were published by him in four quarto volumes, under the general title of Voyages dans les Alpes (1 770-1 796; there was an octavo issue in eight volumes, issued 1 780-1 796, while the non-scientific portions of the work were first published in 1834, and often since, under the title of Partie piitoresque des ouvrages de M. de Saussure).

The Alps formed the centre of Saussure's investigations. They forced themselves on his attention as the grand key to the true theory of the earth, and among them he found opportunity for studying geology in a manner never previously attempted. The inclination of the strata, the nature of the rocks, the fossils and the minerals- received his closest attention. He acquired a thorough knowledge of the chemistry of the day; and he applied it to the study of minerals, water and air. Saussure's geological observations made him a firm believer in the Neptunian theory : he regarded all rocks and minerals as deposited from aqueous solution or suspension, and in view of this he attached much importance to the study of meteoro- logical conditions. He carried barometers and boiling-point ther- mometers to the summits of the highest mountain's, and estimated the relative humidity of the atmosphere at different heights, its temperature, the strength of solar radiation, the composition of air and its transparency. Then, following the precipitated moisture, he investigated the temperature of the earth

at all depths to which he could drive his thermometer staves, the course, conditions and temperature of streams, rivers, glaciers and lakes, even of the sea. The most beautiful and complete of his subsidiary researches is described in the Essai sur I'hygrometrie, published in 1783. In it he records experiments made with various forms of hygrometer in all climates and at all temperatures, and supports the claims of his hair- hygrometer against all others. He invented and improved many kinds of apparatus, including the magneto-meter, the cyanometer for estimating the blueness of the sky, the diaphanometer for judging of the clearness of the atmosphere, the anemometer and the mountain eudiometer. His modifications of the thermometer adapted that instrument to many purposes: for ascertaining the temperature of the air he used one with a fine bulb hung in the shade or whirled by a string, the latter form being converted into an evaporometer by inserting its bulb into a piece of wet sponge and making it revolve in a circle of known radius at a known rate ; for experiments on the earth and in deep water he employed large ther- mometers wrapped in non-conducting coatings so as to render them extremely sluggish, and capable of long retaining the temperature once they had attained it. By the use of these instruments he showed that the bottom water of deep lakes is uniformly cold at all seasons, and that the annual heat wave takes six months to penetrate to a depth of 30 ft. in the earth. He recognized the immense advantages to meteorology of high-level observing stations, and whenever it was practicable he arranged for simultaneous observations being made at different altitudes for as long periods as possible. It is perhaps as a geologist (it is said that he was the first to use the term "geology " — see the " Discours preliminaire" to voh i. of his Voyages, publ. in 1779) that Saussure worked most; and although his ideas on matters of theory were in many cases very erroneous he was instrumental in greatly advancing that science.

See Lives by J. Senebier (Geneva, 1801), by Cuyier in the Bio- graphic universelle, and by Candolle in Dicade philosophique, No. xv. (trans, in the Philosophical Magazine, iv. p. 96) ; articles by E. Naville in the Bibliotheque universelle (March, April, May 1883), and chaps, v.-viii. of Ch. Durier's Le Mont-Blanc (Paris, various editions between 1877 and 1897). (W. A. B. C.)

SAUSSURE, NICOLAS THEODORE DE (1767-1845), eldest son of Horace Benedict de Saussure, was born on the 14th of October 1767, at Geneva, and is known chiefly for his work on the chemistry of vegetable physiology. He lived quietly and avoided society; yet like his ancestors he was a member of the

Genevan representative council, and gave much attention to public affairs. In the latter part of his life he became more of a recluse than ever, and died at Geneva on the 18th of April 1845. When a young man Nicolas Theodore accompanied his father in his Alpine journeys and assisted him by the careful determination of many physical constants. He was attracted to chemistry by Lavoisier's brilliant conceptions, but he did not become great as an originator. He took a leading share in improving the processes of ultimate organic analysis; and he determined the composition of ethyl alcohol, ether and some other commonly occurring substances. He also studied fermentation, the conversion of starch into sugar, and many other processes of minor importance. The greater number of his 36 published papers dealt with the chemistry and physiology of plants, the nature of soils, and the conditions of vegetable life, and were republished under the title Recherches chimigues sur la vegetation.

SAUVAL, HENRI (1623-1676), French historian, son of an advocate in the Parlement, was born in Paris, and baptized on the 5th of March 1623. He devoted most of his life to researches among the archives of his native city, and in 1656 even obtained a licence to print his Paris ancien et moderne; but on his death (2 1 st March 1676) the whole work was still in manuscript. A long time afterwards it appeared, thanks to his collaborator, Claude Bernard Rousseau, under the title of Histoire et recherches des antiquMs de la ville de Paris (1724), but remodelled, with the addition of long and dull dissertations which were not by Sauval. The work was not without merits, and it was re-issued in 1733 and 1 750. The original manuscript first belonged to Montmerque, and then passed into the possession of Le Roux de Lincy, who prepared an annotated edition; unfortunately this material, together with the original MS., was lost in the incendiary fires which took place under the Commune (1871). There remain, however, Le Roux de Lincy's researches, a series of articles on Sauval which appeared in the Bulletin du bibliophile et du bibliothecaire in 1862, 1866 and 1868. See also the Bibliographic de Paris avant 17&Q, by the Abbe Valentin Dufour (1882).

SAVAGE, MINOT JUDSON (1841-), American Unitarian minister and author, was born in Norridgewock, Maine, on the 10th of June 1841. He graduated at the Bangor Theological Seminary in 1864, and for nine years was in the Congregational ministry, being a home missionary at San Mateo and Grass Valley, California, until 1867, and

holding pastorates at Framing- ham, Mass. (1867-1869), and Hannibal, Missouri (1869-1873). He then became a Unitarian, and was pastor of the Third Unitarian Church of Chicago in 1873-1874, of the Church of the Unity in Boston in 1874-1896, and of the Church of the Messiah in New York City in 1 896-1 906.

He wrote many books, including Christianity, the Science of Man- hood (1873), The Religion of Evolution (1876), The Morals of Evolution (1880), The Religious Life (1885), My Creed. (1887), The Evolution of Christianity (1892), Our Unitarian Gospel (1898), The Passing and the Permanent in Religion (1901), Life Beyond Death (1901), Can Tele- pathy Explain? (1902), Life's Dark Problems (1905), and, besides other volumes in verse, America to England (1905).

SAVAGE, RICHARD (d. 1743), English poet, was born about 1697, probably of humble parentage. A romantic account of his origin and early life, for which he at any rate supplied the material, appeared in Curll's Poetical Register in 17 19. On this and other information provided by Savage, Samuel Johnson founded his Life of Savage, one of the most elaborate of the Lives. It was printed anonymously in 1744, and has made the poet the object of an interest which would be hardly justified by his writings. In 1698 Charles Gerrard, 2nd earl of Macclesfield, obtained a divorce from his wife, Anna, daughter of Sir Richard Mason, who shortly afterwards married Colonel Henry Brett. Lady Maccles- field had two children by Richard Savage, 4th earl Rivers, the second of whom was born at- Fox Court, Holborn, on the 16th of January 1697, and christened two days later at St Andrews, Holborn, as Richard Smith. Six months later the child was placed with Anne Portlock in Covent Garden; nothing more is positively known of him. In 17 18 Richard Savage claimed to be this child. He stated that he had been cared for by Lady Mason, his grandmother, who had put him to school near St Albans, and by his godmother, Mrs Lloyd. He said he had been pursued by the relentless hostility of his mother, Mrs Brett, who

had prevented Lord Rivers from leaving £6000 to him and had tried to have him kidnapped for the West Indies. His statements are not corroborated by the depositions of the witnesses in the Macclesfield divorce case, and Mrs Brett always maintained that he was an impostor. He was wrong in the date of his birth ; moreover, the godmother of Lady Macclesfield's son was Dorothea Ousley (afterwards Mrs Delgardno), not Mrs Lloyd. There is nothing to show that Mrs Brett was the cruel and vindictive woman he describes her to be, but abundant evidence that she provided for her illegitimate children. Discrepancies in Savage's story made Boswell suspicious, but

the matter was thoroughly investigated for the first time by W. Moy Thomas, who published the results of his researches in Notes and Queries (second series, vol. vi., 1858). Savage, impostor or not, blackmailed Mrs Brett and her family with some success, for after the publication of The Bastard (1728) her nephew, John Brownlow, Viscount Tyrconnel, purchased his silence by taking him into his house and allowing him a pension of £200 a year. Savage's first certain work was a poem satiiizing Bishop Hoadly, entitled The Convocation, or The Battle of Pamphlets (1717), which he afterwards tried to suppress. He adapted from the Spanish a comedy, Love in a Veil (acted 1718, printed 1719), which gained him the friendship of Sir Richard Steele and of Robert Wilks. With Steele, how- ever, he soon quarrelled. In 1723 he played without success in the title role of his tragedy, Sir Thomas Overbury (pr. 1724), and his Miscellaneous Poems were published by subscription in 1 7 2 6. In 1 7 2 7 he was arrested for the murder of James Sinclair in a drunken quarrel, and only escaped the death penalty by the intercession of Frances, countess of Hertford (d. 1754).

Savage was at his best as a satirist, and in The Author to be Let he published a quantity of scandal about his fellow-scribblers. Proud as he was, he was servile enough to supply Pope with petty gossip about the authors attacked in the Dunciad. His most considerable poem, The Wanderer (1729), shows the in- fluence of Thomson's Seasons, part of which had already appeared. Savage tried without success to obtain patronage from Walpole, and hoped in vain to be made poet-laureate. Johnson states that he received a small income from Mrs Oldfield, but this seems to be fiction. In 1732 Queen Caroline settled on him a pension of £50 a year. Meanwhile he had quarrelled with Lord Tyrconnel, and at the queen's death was reduced to absolute poverty. Pope had been the most faithful of his friends, and had made him a small regular allowance. With others he now raised money to send him out of reach of his creditors. Savage went to Swansea, but he resented bitterly the conditions imposed by his patrons, and removed to Bristol, where he was imprisoned for debt. All his friends had ceased to help him except Pope, and in 1743 he, too, wrote to break off the connexion. Savage died in prison on the 1 st of August 1743.

See Johnson's Life of Savage, and Notes and Queries as already quoted. He is the subject of a novel, Richard Savage (1842), by Charles Whitehead, illustrated by John Leech. Richard Savage, a play in four acts by J. M. Barrie and H. B. Marriott- Watson, was presented at an afternoon performance at the Criterion theatre, London, in 1891. The dramatists took considerable liberties with the facts of Savage's career. See also S. V. Makower, Richard Savage, a Mystery in

Biography (1909).

SAVAGE, a word by derivation meaning belonging to the wilds or forests (0. Fr. salvage, mod. sauvage, Late Lat. silvaticus, silva, wood, forest), hence wild, uncultivated, barbarian, and so used of races in an uncivilized or barbarous condition, or of animals or human beings generally, untamed, ferocious.

SAVAH, a small province of central Persia, north of Irak and south-west of Teheran, comprising the districts of Savah, Khalejistan (inhabited by the Turkish Khalej tribe), Zerend and Karaghan. It pays a yearly revenue of about £5000. The capital is the ancient city of Savah, which has a population of about 7000, and is 72 m. S.W. of Teheran, at an elevation of 3380 ft., in 35 4′ N., 50° 30′ E. The soil is very fertile, is well watered, and produces much wheat, barley and rice. It is occasionally joined to the province of Teheran to facilitate the governor's arrangements for supplying the capital of Persia I with grain.

SAVANNA or Savannah (Span, sdiiana, a sheet; Late Lat. sabanum, Gr. aafiavov, a linen cloth), a term applied either to a plain covered with snow or ice, or, more generally, to a treeless plain. Its use in English, more frequent formerly than now, is most common in application to the great plains of central North America, in which it is practically the equivalent of " prairie " (q.v.). In this application it was first used (accented thus— savdna) by the Spanish historian Gonzalo de Oviedo y Valdes in the 16th century.

SAVANNAH, a city, a port of entry, and the county-seat of Chatham county, Georgia, U.S.A., on the right (south) bank of the Savannah river, about 18 m. from the Atlantic Ocean. Pop. (1890) 43,189; (1900) 54,244, of whom 28,090 were negroes and 3434 were foreign-born; (1910, census) 65,064. It is served by the Atlantic Coast Line, the Central of Georgia, the Southern, and other railways; by river steamers to Augusta; by coastwise steamers to Baltimore, Philadelphia, New York and Boston; and by transatlantic steamers to European ports.

The city is situated on a plateau some 40 ft. above the Savannah river and covers about 6-3 sq. m. Savannah owes its regular form, with streets intersecting each other at right angles, to James Edward

Oglethorpe, its founder, but the monotony is slightly relieved by 42 small parks and squares, whose total area is 166-79 acres. The larger parks are the Daffin, the Colonial, on Oglethorpe Avenue (formerly South Broad Street), and Forsyth, on Gaston Street, with fine tropical and semi-tropical flora. The smaller parks or squares are mostly in five series parallel to the Savannah river. On account of the large number of its shade trees Savannah has been called the ” Forest City.” Bonaventure Cemetery, about 4 m. east of the city, has avenues of fine live-oaks, draped with Spanish moss. In the principal commercial street, Bay Street, are the new City Hall (1906), on the site of the old City Hall built in 1779, the Custom House, completed in 1850, the Cotton Exchange, and a granite seat marking the spot where Oglethorpe first pitched his tent; and in Bull Street, a fashionable promenade, named in honour of William Bull (1683-1755), a military officer who aided Oglethorpe in his survey of the city, are Chatham Academy, a marble post-office building, the county court house, and the Savannah theatre (established in 1818, remodelled in 1895, rebuilt in 1906), one of the oldest playhouses in the United States. In Johnson Square, a little south of the City Hall and Custom House, stands a plain dignified monument, in the design of a Roman sword, erected in 1829 in memory of General Nathanael Greene, to whom a tract of land near Savannah was given by Congress in recognition of his service in the War of American Independence, and who was buried in a vault in the old cemetery in South Broad Street (now Oglethorpe Avenue) ; his remains were transferred to the monu- ment in 1900. In Monterey Square there is a monument and statue by the German sculptor Robert Eberhard Launitz (1806-1870), in honour of Count Casimir Pulaski, who was mortally wounded during the siege of Savannah in 1779. The corner-stones of these monuments were laid by General La Fayette in 1825. In Madison Square, north of Monterey Square, there is a monument to Sergeant William Jasper (1750-1779), a hero of the War of Independence, who replaced the fallen colours on Fort Moultrie in the face of a galling fire during the battle of Charleston Harbour (June 28th, 1776), rescued a band of American prisoners from British guards at Jasper Spring, 2 m. from Savannah, and was fatally wounded during the siege of the city in 1779. In Chippewa Square there is a bust of Major-General Lafayette McLaws (1821-1897). The Ladies’ Memorial Association erected a Confederate Soldiers Monument in the ” Parade Ground,” which forms an extension to Forsyth Park, in the south central part of the city; and in honour of Tomochichi, an Indian chief who was the staunch friend of the early settlers, a large granite boulder has been placed in Wright Square, where he was buried. At the corner of Anderson and Bull Streets there is a memorial to Major-General Alexander Robert Lawton

(1818-1896), state senator in 1854-1861, who seized Fort Pulaski in 1861 upon the governor's orders, served through the Civil War in the Confederate Army, and was U.S. minister to Austria-Hungary in 1887-1889.

Since the founding of Georgia as a bulwark against the Spaniards and French, Savannah has had an ardent martial spirit, and there are five military organizations — the Chatham Artillery, formed in 1786, one of the oldest military companies in the United States; the Savannah Volunteer Guards, organized in 1802 as an infantry corps, now a coast artillery corps of four companies ; the Georgia Hussars, formed after the War of 1812 by the consolidation of two other companies; the First Volunteer Regiment of Georgia, composed of five companies, organized respectively in 1808, 1843, 1846, i860 and 1861, and a division of naval militia organized in 1895. The most prominent clubs are the Oglethorpe, the Guards, the Hussars and the Harmonic Among the pleasure resorts in the vicinity are Tybee Island, at the mouth of the Savannah river, a popular bathing resort, and Thunderbolt, Isle of Hope, White Bluff and Montgomery, distant 5 m., 6 m., 8 m. and 9 m. respectively.

Among the religious corporations in Savannah, the oldest is Christ • Church, whost first building was erected in 1740-1750 and whose present edifice was built in 1838. Its third rector was John Wesley, who is said to have established a Sunday School (still in existence) in Savannah almost half a century before Robert Raikes established such a school in England. The first African Baptist Church, or- ganized in 1788, is the oldest religious society of negroes in the United States. The Convent of St Vincent de Paul was founded in 1842; the Cathedral of St John the Baptist was dedicated in 1876, was destroyed by fire in 1898, but was subsequently rebuilt; and a Jewish synagogue was erected in 1878. Savannah is the see of a Roman Catholic and of a Protestant Episcopal bishop. There are several hospitals and charitable institutions in or near Savannah, including the Bethesda Orphan Asylum, about 8 m. from the city, founded by George Whitefield in 1740 and now owned by the Union Society, and the Savannah Female Asylum (1750). In 1885 the Tel- fair Academy of Arts and Sciences (near Telfair Square or Telfair Place), endowed by Miss Mary Telfair, was opened; in its collections are Wilhelm von Kaulbach's "Peter Arbues of Epila " and Joseph von Brandt's " Ein Gefecht." The Georgia Historical Society,- organized in 1839 ail d in 1847 united with the Savannah Library Society, has a handsome building (Hodgson Hall) at the intersection of Whitaker and Gaston Streets, and a library of about 35,000 volumes; it published six volumes of Collections between 1840 and 1904. The Georgia Industrial College (1890), for negroes, is near

the city. The Chatham Academy was chartered and en- dowed with some of the confiscated property of Loyalists in 1788.

Savannah harbour has permanent seacoast defences, and is the most important Atlantic seaport south of Baltimore. The port is nearer the Panama Canal than either New Orleans or Galveston; and after the completion of harbour improvements by the United States government, begun in 1902, the depth of the river from its mouth to the city was 28 ft. There are great wharves and piers on the water front ; more than 4 m. of wharves are occupied by railway terminals. In 1909 Savannah's exports were valued at $66,932,973; its imports at $2,664,079. Of the exports naval stores rank first, Savannah being first among the world markets of naval stores; cotton comes second, but the relative position of the city as a cotton centre has declined because of the greater increase in that of Galveston and New Orleans. Other important exports are fertilizers, rice and lumber. Savannah is the business and shipping centre of the surrounding fruit and truck growing country.- The principal manufactures are fertilizers and cars, and, of less importance, lumber and planing-mill products, and foundry and machine-shop products. The city's rice-mills and cotton compresses are commonly visited by tourists. The total value of the city's factory products in 1905 was $6,340,004 (69-1 % more than in 1900).

The city government is vested in a council, consisting of a mayor and twelve aldermen, elected for two years in January of odd- numbered years; the council's committees act as heads of several of the administrative departments; the mayor is head of the police; and the council appoints other city officers. The board of aldermen may pass a measure by a two-thirds vote over the mayor's veto. The city board of education was incorporated in 1866 and took over the powers of the board of education of Chatham county; it is self-perpetuating and practically non-partisan. A free school had been established as early as 1816. In 1909 the assessed value of real estate was $35,147,580 and of personal property $12,828,673, and the bonded debt was $2,701,050 ($218,050 due in 1913 and $2,483,000 due in 1959) ; the rate of taxation was $1-39 per $100.

The first European settlement in Georgia was made at Savannah in February 1733 by James Edward Oglethorpe. Among the early inhabitants were Charles and John Wesley, who arrived in 1735, but returned to England in 1736 and 1737 respectively, and George Whitefield, who lived in Savannah in 1738 and 1740. Savannah was the seat of government of Georgia until the capture of the city by the British in 1778. Here, on the 1st of January 1755, met the first

legislature of Georgia. In the years preceding the War of Independence the political issues excited much partisanship. Riots almost completely prevented the execution of the Stamp Act, and the stamps were reloaded on the ship that brought them to Savannah. In 1769 the merchants agreed not to import any articles mentioned in the Townshend Acts of 1767.

On the 1 8th of January 1775 the first Provincial Congress was convened here; on the night of the nth of May the powder magazine was robbed of all its ammunition, part of which was sent to Boston and, according to tradition, was used at Bunker Hill; and on the 22nd of June the people of the city elected a Council of Safety. On the 4th of July the same Provincial Congress again met, and soon the royal administration collapsed. Probably the first naval capture of the War of Independence was made off Tybee Island on the 10th of July, when a schooner,

the first vessel chartered by the Continental Congress, seized a British ship and its cargo of 14,000 lb of powder. Yet the Loyalists were strong in Savannah, and many families were divided among themselves.

In October 1776-February 1777 the convention which framed the first constitution of Georgia was held in Savannah, and the first state legislature assembled here in May 1778; but the British captured the city on the 29th of December in that year, and the seat of the state government was then transferred to Augusta. In 1779 Savannah was unsuccessfully besieged by a French fleet under Comte d'Estaing and land forces under General Benjamin Lincoln, but in May 1 782 it was evacuated after a short siege by General Anthony Wayne. It once more became the capital, but in 1783 the seat of the state government was again transferred to Augusta. Savannah soon became the commercial rival of Charleston, South Carolina. It was chartered as a city in 1789. As early as 1817 the Savannah Steamboat Company, which ran a steamer to Charleston, was organized, and in 1819 the " Savannah," the first vessel fitted with steam- engines to cross the Atlantic, 1 owned by Savannah capitalists but built in the North, sailed from Savannah to Liverpool in 25 days. In 1861 the state convention which adopted the ordin- ance of secession met in Savannah. A blockade of the port was instituted by the Federal government in 1861, and on the 12th of December 1862 Fort Pulaski (on Cockspur Island, at the

mouth of the Savannah river), which commanded the channel, and had been seized by the state at the outbreak of the war, was forced to surrender. Savannah was the objective of General W. T. Sherman's " march to the sea," and on the 21st of December 1864 surrendered to him after futile opposition by General William J. Hardee (1818-1873) with a force very inferior in numbers. The city limits were extended in 1879, 1883 and

1901.

SAVARY, ANNE JEAN MARIE RENE, Duke of Rovigo (1 774-1833), French general and diplomatist, was born at Marcq in the Ardennes on the 26th of April 1774. He was educated at the college of St Louis at Metz and entered the royal army in 1 790. His first campaign was that waged by General Custine against the retreating forces of the duke of Brunswick in 1792. He next served in succession under Pichegru and Moreau, and dis- tinguished himself during the skilful retreat of the latter from an untenable position in the heart of Swabia. He became chef d'escadron in 1797, and in 1798 served under General Desaix, in the Egyptian campaign, of which he left an interesting and valuable account. He also distinguished himself under Desaix at Marengo (14th of June 1800). His fidelity and address while serving under Desaix, who was killed at Marengo, secured him the confidence of Bonaparte, who appointed him to command the special body of gendarmes charged with the duty of guarding the First Consul. In the discovery of the various ramifications of the Cadoudal-Pichegru conspiracy Savary showed great skill and activity. He proceeded to the cliff of Biville in Normandy, where the plotters were in the habit of landing, and sought, by imitating the signals of the royalist plotters, to tempt the comte d'Artois (afterwards Charles X.) to land. In this he was un- successful. He was in command of the troops at Vincennes when the due d'Enghien (q.v.) was summarily executed. Hullin, who presided at the court-martial, afterwards accused Savary, though not by name, of having intervened to prevent the despatch to Bonaparte of an appeal for mercy which he (Hullin) was in the act of drawing up. Savary afterwards denied this, but his denial has not generally been accepted. In February 1805 he was raised to the rank of general of division. Shortly before the battle of Austerlitz (2nd of December 1805) he was sent by Napoleon with a message to the emperor Alexander I. with a request for an armistice, a device which caused that monarch all the more eagerly to strike the blow which brought disaster to the Russians. After the battle Savary again took a message to Alexander, which induced him to treat for an armistice. In the campaign of 1806

1 The " Savannah " did not make the entire voyage under steam; she

was fitted with sails and used them in rough weather, unshipping her paddle-boxes.

Savary showed signal daring in the pursuit of the Prussians after the battle of Jena. Early in the next year he received command of a corps, and with it gained an important success at Ostrolenka (16th of February 1807).

After the treaty of Tilsit (7th of July 1807) Savary proceeded to St Petersburg as the French ambassador, but was soon re- placed by General Caulaincourt (q.v.), another accessory to the execution of the due d'Enghien. The repugnance of the empress dowager to Savary is said to have been one of the reasons of his recall, but it is more probable that Napoleon felt the need of his gifts for intrigue in the Spanish affairs which he undertook at the close of 1807. With the title of duke of Rovigo (a small town in Venetia), Savary set out for Madrid when Napoleon's plans for gaining the mastery of Spain were nearing completion. With Murat Savary made skilful use of the schisms in the Spanish royal family (March-April 1808), and persuaded Charles IV., who had recently abdicated under duresse, and his son Ferdinand VII., the de facto king of Spain, to refer their claims to Napoleon. Savary induced Ferdinand to cross the Pyrenees and proceed to Bayonne — a step which cost him his crown and his liberty until 1814. In September 1808 Savary accompanied the emperor to the famous interview at Erfurt with the emperor Alexander. In 1809 he took part, but without distinction, in the campaign against Austria. On the disgrace of Fouche (q.v.) in the spring of 1810, Savary received his appointment, the ministry of police. There he showed his wonted skill and-devotion to Napoleon; and this office, which the Jacobinical Fouche had shorn of its terrors, now became a veritable inquisition. Among the incidents of/his time may be cited the cynical brutality with which Savary carried out the order of Napoleon for the exile of Mme de Stael and the destruction of her work De V AUemagne. Savary 's wariness was, however, at fault at the time of the strange con- spiracy of General Malet, two of whose confederates seized him in his bed and imprisoned him for a few hours (23rd of October 1812). Savary's reputation never quite recovered from the ridicule caused by this event. He was among the last to desert the emperor at the time of his abdication (nth of April 1814) and among the first to welcome his return in 181 5, when he became inspector-general of gendarmerie and a peer of France. After Waterloo he accompanied the emperor to Rochefort and sailed with him to Plymouth on H.M.S. " Bellerophon." He was not allowed to accompany him to St Helena, but underwent several months' " internment " at Malta. Escaping thence, he proceeded to Smyrna, where he settled for a time. Afterwards he

travelled about in more or less distress, but finally was allowed to return to France and regained civic rights; later he settled at Rome. The July revolution (1830) brought him into favour and in 1831 he received the command of the French] army in Algeria. Ill- health compelled him to return to France, and he died at Paris in June 1833.

See Memoires du due de Rovigo (4 vols., London, 1828; English edition also in 4 vols., London, 1828); a new French edition annotated by D. Lacroix (5 vols., Paris, 1900) ; Extrait des memoires de M. leduc de Rovigo concernant le catastrophe de M. le due d'Enghien (London, 1823); Le Due de Rovigo juge par lui-meme et par ses contemporains, by L. F E. . . (Paris, 1823); and A. F. N. Macquart, Refutation de I'ecrit de M. le due de Rovigo (1823). (J. Hl. R.)

SAVE, or Sava (Ger. Sau; Hungarian Szdva; Lat. Savus), one of the principal right-bank affluents of the Danube. It runs almost parallel with the other great tributary of the Danube, the Drave, both having about the same length. The Save rises in the Triglav group in Carniola from two sources, the Wurzener Save and the Wocheiner Save, which join at Radmannsdorf. It then takes a south-easterly course, and flows through Carniola and Croatia-Slavonia — forming from Jasenovac the frontier-line between it and Bosnia and Servia — and joins the Danube at Belgrade. The Save has a length of 442 m., the area of its basin being 34,000 sq. m. It is navigable for steamers from Sissek to its mouth, a distance of 360 m., but navigation is greatly hindered by shifting sandbanks and other obstructions. Its principal affluents are, on the right, the Sora, Laibach, Gurk, Kulpa, Una, Vrbas, Bosna and Drina; and on the left, the Ranker, Feistritz, Sann, Sotla, Krapina, Lonja and Orljava.

SAVI, PAOLO (1798-1871), Italian geologist, was born at Pisa. Assistant-lecturer on zoology at the university of his native city when twenty-two years of age, he' was appointed professor in 1823, and lectured also on geology. He devoted great attention to the museum of the university, and formed one of the finest natural history collections in Europe. He was regarded as the father of Italian geology. His first paper related to the Bone- caves of Cassano (1825). He studied the geology of Monte Pisano and the Apuan Alps, explaining the metamorphic origin of the Carrara marble; he also contributed essays on the Miocene strata and fossils of Monte Bambolo, the iron-ores of Elba and other subjects. With Giuseppe Meneghini (1811-1889) he

published memoirs on the stratigraphy and geology of Tuscany (1850-1851). He became eminent also as an ornithologist, and was author of a great work on the birds of Italy. He died in May 1871.

SAVIGLIANO, a town of Piedmont, Italy, in the province of Cuneo, 32 m. S. of Turin by rail, 1053 ft. above sea-level. Pop. (r90i) 9895 (town), 17,340 (commune). It has important ironworks, foundries, locomotive works and silk manufactures, as well as sugar factories, printing works and cocoon-raising establishments. It retains some traces of its ancient walls, demolished in 1707, and has a fine collegiate church (S. Andrea, in its present form comparatively modern), and a triumphal arch erected in honour of the marriage of Charles Emmanuel I. with Catherine of Austria.

SAVIGNY, FRIEDRICH KARL VON (1779-1861), German jurist, was born at Frankfort-on-Main on the 21st of February 1779. He was descended from an ancient family, which figures in the history of Lorraine, and which derived its name from the castle of Savigny near Charmes in the valley of the Moselle. Left an orphan at the age of 13, he was brought up by his guardian until, in 1795, he entered the university of Marburg, where, though suffering at times severely from ill-health, he studied under Professors Anton Bauer (1 772-1843) and Philipp Friedrich Weiss (1766-1808), the former one of the most conspicuous pioneers in the reform of the German criminal law, the latter distinguished for his knowledge of medieval jurisprudence. After the fashion of German students, Savigny visited several universities, notably Jena, Leipzig and Halle; and returning to Marburg, took his doctor's degree in 1800. At Marburg he lectured as Privatdozent on criminal law and the Pandects. In 1803 he published his famous treatise, Das Recht des Besitzes (the rights of possession). It was at once hailed by the great jurist Thibaut as a masterpiece; and the old uncritical study of Roman law was at an end. It quickly obtained a European reputation, and still remains a prominent landmark in the history of juris- prudence. In 1804 Savigny married Kunigunde Brentano, the sister of Bettina von Arnim and Clemens Brentano the poet, and the same year started on an extensive tour through France and south Germany in search of fresh sources of Roman law. In this quest, particularly in Paris, he was successful.

In 1808 he was appointed by the Bavarian government ordinary professor of Roman law at Landshut, where he remained a year and a half. In 1810 he was called, chiefly at the instance of Wilhelm von Humboldt, to fill the chair of Roman law at the new university of Berlin. Here one of his services was to create, in connexion with the faculty of law, a " Spruch-Collegium," an extraordinary tribunal

competent to deliver opinions on cases remitted to it by the ordinary courts; and he took an active part in its labours. This was the busiest time of his life. He was engaged in lecturing, in the government of the university (of which he was the third rector), and as tutor to the crown prince in Roman, criminal and Prussian law. Not the least important consequence of his residence in Berlin was his friendship with Niebuhr and Eichhorn. In 1814 appeared his pamphlet Vom Beruf unserer Zeit fiir Gesetzgebung und Rechtswissenschaft (new edition, 1892). It was a protest against the demand for codifica- tion, and was intended as a reply to Thibaut's pamphlet urging the necessity of forming a code for Germany which should be independent of the influence of foreign legal systems. In this famous pamphlet Savigny did not oppose the introduction of

new laws, or even a new system of laws, but only objected to the proposed codification on two grounds: (1) that the damage which had been caused by the neglect of former generations of jurists could not be quickly repaired, and that time was re- quired to set the house in order; and (2) that there was great risk of the so-called natural law, with its " infinite arrogance " and its " shallow philosophy " ruining such a scheme. Indeed, the enduring value of this pamphlet is that it saved jurisprudence for all time from the hollow abstractions of such a work as the Institutiones juris naturae et gentium of Christian Wolff (1679- 1754), and conclusively proved that a historical study of the positive law was a condition precedent to the right understanding of the science of all law.

In 1815 he founded, with Karl Friedrich Eichhorn, and Johann Friedrich Ludwig Goschen (1778-1837), the Zeitschrift fiir geschichtliche Rechtswissenschaft, the organ of the new histori- cal school, of which he was the representative. In this periodical (vol. iii. p. 129 seq.) Savigny made known to the world the discovery at Verona, by Niebuhr, of the lost text of Gaius, pronouncing it, on the evidence of that portion of the MS. sub- mitted to him, to be the work of Gaius himself and not, as Niebuhr suggested, of Ulpian. The record of the remainder of Savigny's life consists of little else than a list of the merited honours which he received at the hands of his sovereign, and of the works which he published with indefatigable activity. In 1815 appeared the first volume of his Geschichte des romischen Rechts im Mittelaller, the last of which was not published until 1831. This work, to which his early instructor Weiss had first prompted him, was originally intended to be a literary history of Roman law from Irnerius to the present time. His design was in some respect narrowed; in others it was widened. He saw fit not to continue the narrative beyond the 16th century, when the separation of nationalities

disturbed the foundations of the science of law. His treatment of the subject was not merely that of a biblio- grapher; it was philosophical. It raised the veil which had hung over the history of Roman law, from the breaking up of the empire until the beginning of the 12th century, and showed how, though considered dead, the Roman law yet lived on through these dark centuries, in local customs, in towns, in ecclesiastical doctrines and school teachings, until it blossomed out once more in full splendour in Bologna and other Italian cities. This history was the parent of many valuable works in which Savigny published the result of his investigations. 1 In 181 7 he was appointed a member of the commission for organizing the Prussian provincial estates, and also a member of the department of justice in the Staatsrath, and in 1819 he became a member of the supreme court of appeal for the Rhine Provinces. In 1820 he was made a member of the commission for revising the Prussian code. In 1822 a serious nervous illness attacked him, and compelled him to seek relief in travel. In 1835 he began his elaborate work on contemporary Roman law, System des heutigen romischen Rechts (8 vols., 1840-1849). His activity as professor ceased in March 1842, when he was appointed ” Grosskanzler ” (High Chancellor), the title given by Frederick II. in 1746 to the official at the head of the juridical system in Prussia, as in this position he carried out several important law reforms in regard to bills of exchange and divorce. He held the office until 1848, when he resigned, not altogether to the regret of his friends, who had seen his energies withdrawn from jurisprudence without being able to flatter themselves that he was a great statesman. In 1850, on the occasion of the jubilee of his obtaining his doctor’s degree, appeared in five volumes his Vertnischte Schriften, con- sisting of a collection of his minor works published between 1 800 and 1 844. This event gave rise to much enthusiasm through- out Germany in honour of ” the great master ” and founder of modern jurisprudence. In 1853 he published his treatise on Contracts (Das Obligationenrecht) , a supplement to his work on modern Roman law, in which he clearly demonstrates the necessity for the historical treatment of law. Savigny died at Berlin on the 25th of October 1861. His son, Karl Friedrich

1 See von Mohl’s Staatswissenschaft, vol. iii. p. 55. For a some- what less favourable view, see Gans’s Vertnischte Schriften.

von Savigny (1814—1875), was Prussian minister of foreign affairs in 1849. He represented Prussia in important diplomatic transactions,

especially in 1866.

Savigny belongs to the so-called historical school of jurists, though he cannot claim to be regarded as its founder, an honour which belongs to Gustav Hugo. In the history of jurisprudence Savigny's great works are the Recht des Besitzes and the Beruf unserer Zeit fur Gesetzgebung above referred to. The former marks an epoch in jurisprudence. Professor Jhering says: " With the Recht des Besitzes the juridical method of the Romans was regained, and modern jurisprudence born." It marked a great advance both in results and method, and rendered obsolete a large literature. Savigny sought to prove that in Roman law possession had always reference to " usucapion " or to " interdicts" ; that there is not a right to continuance in possession but only to immunity from interference; possession being based on the consciousness of unlimited power. These and other propositions were maintained with great acuteness and unequalled ingenuity in interpreting and harmonizing the Roman jurists. The con- troversy which has been carried on in Germany by Jhering, Baron, Gans and Bruns shows that many of Savigny's con- clusions have not been accepted. 1 The Beruf unserer Zeit, in addition to the more specific object the treatise had in view, which has been already treated, expresses the idea, unfamiliar in 1 8 14, that law is part and parcel of national life, and combats the notion, too much assumed by French jurists, especially in the 1 8th century, and countenanced in practice by Bentham, that law might be arbitrarily imposed on a country irrespective of its state of civilization and past history. Of even greater value than his services in consolidating " the historical school of jurisprudence " is the emphatic recognition in his works of the fact that the practice and theory of jurisprudence cannot be divorced without injury to both.

See Biographies by Stinzing (1862) ; Rudorff (1867) ; Bethmann-Holweg (1867) ; and Landsberg (1890).

SAVILE, SIR GEORGE (1726-1784), English politician, was the only son of Sir George Savile, Bart. (d. 1743), of Rufford, Nottinghamshire, and was born in London on the 18th of July 1 7 26. He entered the House of Commons as member for York- shire in 1759. In general he advocated views of a very liberal character, including measures of relief to Roman Catholics and to Protestant dissenters, and he defended the action of the American colonists. He refused to take office and in 1783 he resigned his seat in parliament. He died unmarried in London on the 10th of January 1784. Horace Walpole says Savile had " a large fortune and a larger mind," and Burke had also a very high opinion of him. He bequeathed Rufford and some of

his other estates to his nephew, Richard Lumley (17 57-183 2), a younger son of Richard Lumley Saunderson, 4th earl of Scar- borough (1725-1782). Richard took the additional name of Savile, but when on his brother's death in 1807 he became 6th earl of Scarborough the Savile estates passed to his brother John (1760-1835), afterwards the 7th earl. John's son and heir was John Lumley Savile, 8th earl of Scarborough (1788-1856). The 8th earl was never married, but he left four natural sons, the eldest of whom was John Savile (181 8-1896), the diplomatist, who was created Baron Savile of Rufford in 1888. He entered the foreign office in 1841, was British envoy at Dresden and at Berne, and from 1883 to 1888 represented his country in Rome. Although the eldest son, he did not inherit Rufford and his father's other estates until after the deaths of two of his younger brothers. He made a fine collection of pictures and died at Rufford on the 28th of November 1896, when his nephew John Savile Lumley Savile (b. 1854) became the 2nd baron.

SAVILE, SIR HENRY (1549-1622), warden of Merton College, Oxford, and provost of Eton, was the son of Henry Savile of Bradley, near Halifax, in Yorkshire, a member of an old county family, the Saviles of Methley, and of his wife Elizabeth, daughter of Robert Ramsden. He was educated at Brasenose College, Oxford, where he matriculated in 1561. He became a fellow of Merton in 1565, proceeded B.A. in 1566, and 1 See Windscheid, Lehrbuch des Pandektenrechts, i. 439.

M.A. in 1570. He established a reputation as a Greek scholar and mathematician by voluntary lectures on the Almagest, and in 1575 became junior proctor. In 1578 he travelled on the continent of Europe, where he collected manuscripts and is said to have been employed by Queen Elizabeth as her resident in the Low Countries. On his return he was named Greek tutor to the queen, and in 1535 was established as warden of Merton by a vigorous exercise of the interest of Lord Burghley and Secretary Walsingham. He proved a successful and auto- cratic head under whom the college flourished. A translation of four Books of the Histories of Tacitus, with a learned Com- mentary on Roman Warfare in 1591, enhanced his reputation. On the 26th of May 1 596 he obtained the provostship of Eton, the reward of persistent begging. He was not qualified for the post by the statutes of the college, for he was not in orders, and the queen was reluctant to name him. Savile insisted with con- siderable ingenuity that the queen had a right to dispense with statutes, and at last he got his way. In February 1601 he was put under arrest on suspicion of having been concerned in the rebellion of the earl of Essex. He was soon released and his friendship with the faction of Essex went far to gain him the favour of James I. So no doubt did the views he had

maintained in regard to the statutes of Eton. It may have been to his advantage that his elder brother, Sir John Savile (1 545-1607), was a high prerogative lawyer, and was one of the barons of the exchequer who in 1606 affirmed the right of the king to impose import and export duties on his own authority. On the 30th of September 1604 Savile was knighted, and in that year .he was named one of the body of scholars appointed to prepare the authorized version of the Bible. He was entrusted with parts of the Gospels, the Acts of the Apostles and the Book of Revela- tion. In 1604 died the only son born of his marriage in 1592 with Margaret Dacre, and Sir Henry Savile is thought to have been induced by this loss to devote the bulk of his fortune to the promotion of learning, though he had a daughter who survived him and who became the mother of the dramatist Sir Charles Sedley. His edition of Chrysostom in eight folio volumes was published in 1610-1613. It was printed by the king's printer, William Norton, in a private press erected at the expense of Sir Henry, who imported the type. The Chrysostom, which cost him £8000 and did not sell well, was the most considerable work of pure learning undertaken in England in his time. At the same press he published an edition of the Cyropaedia in 161 8. In 1619 he founded and endowed his professorships of geometry and astronomy at Oxford. He died at Eton on the 19th of February 1622. Sir Henry Savile has been sometimes confounded with another Henry Savile, called "Long Harry" (1570-1617), who gave currency to the forged addition to the Chronicle of Asser which contains the story that King Alfred founded the university of Oxford.

A brother, Thomas Savile (d. 1593), was also a member of Merton College, Oxford, and had some reputation as a scholar.

See W. D. Macray, Annals of the Bodleian Library (London, 1868) ; Sir N. C. Maxwell-Lyte, History of Eton College (3rd ed., London, 1899) ; and John Aubrey, Lives of Eminent Men (London, 1898).

SAVINGS BANKS (Fr. caisses d'epargne; Ger. Sparkassen), institutions for the purpose of receiving small deposits of money and investing them for the benefit of the depositors at compound interest. They originated in the latter part of the 18th century — a period marked by a great advance in the organization of pro- vident habits in general (see Friendly Societies). They seem, however, to have been first suggested by Daniel Defoe in 1697. The earliest institution of the kind in Europe was one established at Brunswick in 1765; it was followed in 1778 by that of Ham- burg, which still exists, in 1786 by one at Oldenburg, in 1790 by one at Loire, in 1792 by that of Basel, in 1794 by one at Geneva, which had but a short existence, and in 1796 by

one at Kiel in Holstein. In Great Britain, in 1797, Jeremy Bentham revived Defoe's suggestion under the name of " Frugality Banks," and in 1799 the Rev. Joseph Smith put it in action at Wendover. This was followed in 1801 by the addition of a savings bank to the friendly society which Mrs Priscilla Wakefield had established

in 1798. Savings banks were shortly after established in London, Bath, Ruthwell in Dumfriesshire by the Rev. H. Duncan (1774- 1846), Edinburgh, Kelso, Hawick, Southampton and many other places. By 181 7 they had become numerous enough to claim the attention of the legislature, and many acts of parliament were passed from time to time for the management of these institutions in Great Britain, culminating in the establishment on a very broad basis of the Post Office savings banks (see Post and Postal Service). The promotion of thrift, at the end of the 18th century an experiment by a few far-seeing individuals, was by the 20th century almost universally adopted, and was regarded practically as an adjunct to the institutions of every civilized community. Friendly societies, co-operative societies, trade societies and other agencies are all based on this same principle.

The progress of savings banks and the large amount that the deposits have now reached are evidence of the general fitness of the organization for its purpose. So far as regards trustee savings banks, the' provisions of the acts of 181 7 are still to a great extent the same as those by which they are now regulated, though the law has been frequently amended in matters of detail. The acts relating to trustee savings banks are referred to as the Trustee Savings Banks Acts 1863 to 1904, a title given by s. 16(2) of the act of 1904. They comprise the Trustee Savings Banks Act 1863 (26 & 27 Vict. c. 87), the Trustee Savings Banks Act 1887 (50 & 51 Vict. c. 47) and so much of the following acts as applies to trustee savings banks: the Post Office Savings Bank Act 1863, the Savings Banks Act 1880, the Savings Banks Act 1887, the Savings Banks Act 1891, the Savings Banks Act 1893, and the Savings Banks Act 1904.

The main feature is the requirement that the whole of the funds should be invested with the government through the Commissioners for the Reduction of the National Debt. The local management of the banks has been left entirely to the trustees, who are precluded from receiving any remuneration for their services or making any profit.

They are, however, required to furnish the commissioners with periodical returns of their transactions. This blending of private management with state control has had many advantages in knitting together class and class. A new savings bank requires for its establishment the consent of the National Debt Commissioners and the certificate of the registrar of friendly societies to its rules.

The legislation of 1817, among other inducements to thrift, offered that of a bounty to the savings bank depositor in the shape of a rate of interest in excess of that given to the ordinary public creditor, or — which is the same thing — in excess of that which could be earned by the investment of the deposits in the purchase of government stock. The interest offered in the first instance was 3d. per day, or £4, I is. 3d. % per annum ; and that rate continued to be granted until the passing of the Act of 1828 (9 Geo. IV. c. 92). That act reduced the rate of interest allowed to the trustees of savings banks to 2jd. per day, or £3, 16s. oˆd. per annum, and prohibited them from allowing more to their depositors than 2jd. per day, or (5. 8s. $\d. per annum, requiring them to pay the surplus, if any, into 1 separate fund held by the National Debt Commissioners, but bear- ing no interest. In 1844 the interest to trustees was further reduced to 2d. per day, or £3, 5s. %, the maximum to be allowed to de- positors being fixed at £3, os. iod. In 1880 the interest to trustees was reduced to £3, and that to depositors to £2, 15s. and again in 1888 to £2, 15s. and £2, 10s. respectively.

The result of the bonus on thrift offered by the earlier statutes was a loss to the state, which ought to have been made good by an annual vote. Between 1817 and 1828 the difference between the interest credited and that earned amounted to £744,363; and this led to the reduction in the rate of interest effected by the act of the latter year. The deficiency, instead of being paid off, was allowed still to accumulate, and as the price of stock rose and the deposits increased fresh deficiencies arose, so that by 1844 the deficiency, which would have been l| millions by the mere accumulation of merest on the previous £744,363, had become £3,179,930. The i-eduction of interest in 1844 was about enough to make the fund self-supporting, though savings banks are always liable to loss from the fact that deposits are in excess when the funds are high and withdrawals when they are low; but the past deficiency was still allowed to accumulate, although in 1863 nearly 2 millions was voted by parliament to make good part of the deficiency; from 1876 income deficiency was met annually as it arose, while in 1880 there was created to meet the capital deficiency a terminable annuity to expire in 1908, but which by the act of 1904 was extended to 1917.

The offer of a bonus on thrift was of necessity accompanied by

provisions to guard against its being used by others than the classes it was intended to encourage. This was done by limiting the amount that each depositor should be permitted to pay in. The limit has been varied from time to time, but by the Savings Banks Act 1891, s: 1 1(1), the maximum amount standing in the name of any depositor must not exceed £200, nor must interest be allowed on any sum in excess of that amount. By the act of 1893 the maximum deposit in any one year must not exceed £50, but a depositor may, not more than once, replace the amount of any withdrawal made in one entire sum in the course of a year. The replacement may be effected in one or more sums.

When a person comes with his first deposit to a savings bank he is required to sign a declaration, setting forth his name, address and occupation, that he desires to become a depositor on his own account, and that he has no money in any other savings bank. 1 If this declaration be not true, the deposits are liable to be forfeited; but it is to be feared that few depositors take the trouble to read what they are signing, or think much about the meaning of it. If the depositor cannot write, the actuary of the savings bank will usually ask him a few questions, such as his age, mother's maiden name, &c, which may tend to identify him, or defeat any attempt to personate him for the purpose of withdrawal.

Among the benefits conferred by the legislature upon depositors in savings banks has been that of exemption from the jurisdiction of the ordinary courts of law in cases of dispute with the trustees. By the Acts of 18 17 disputes were to be settled by arbitration. By that of 1828 the barrister appointed to certify the rules of the savings banks was made umpire in case of difference of opinion between the arbitrators. By that of 1844 the arbitrators were abolished, and an original and final jurisdiction was conferred upon the barrister. By an Act of 1876 the functions of the barrister in this respect were conferred upon the registrar of friendly societies. This in effect made no change in the law, for the offices of barrister and registrar had been always held by the same persons. As early as 1832 it was determined in the case of Crisp v. Bunbury (8 Bing. 394) that the effect of these enactments is to oust the jurisdiction of all the superior courts of law and equity (see also Cardiff S.B. v. Aberdare District of Oddfellows, F. S. Rept., 1887, pt. A., p. 70). This jurisdiction has been highly beneficial to depositors in savings banks. The costs of the award are limited by treasury warrant to a few shillings, never exceeding £l. The procedure is simple and elastic, and the results are

satisfactory. The central office, acting as registrar, determines law and fact, and adjusts all the equities of each case. Reference to the index to the registrar's decisions ap- pended to the chief registrar's annual reports will show that many interesting questions of law have had to be determined with regard to so small a matter as the ownership of a savings bank deposit.

Many of the old trustee savings banks which were put on a systematic basis in 181 7, have been absorbed by the Post Office, but while the total amount of their deposits increases, the number of their depositors remains about the same. In 1863 there were 622 of these banks carrying on operations with 1,558,000 depositors, and deposits amounting to £40,563,000. In 1889 the number of banks had decreased to 380, with 1,500,000 depositors, and £45,000,000 of deposits; while in 1905 they had still further decreased in number to 224, but the depositors had increased to 1,730,331, and their deposits to £52,723,435. The reason for this is that the smaller trustee savings banks, open often only once a week for a short time, cannot give such facilities as the Post Office, which is open every day Further than this, owing to the break-up of the Cardiff bank in 1886, and other smaller irregularities, a select committee of the House of Commons was appointed to inquire into these banks. By the recommenda- tions of this committee, an independent and permanent inspec- tion committee was appointed, which has carried on its work of inspection ever since, and reports annually to parliament. This action has rather tended to merge the smaller trustee savings banks in the Post Office. At the same time the large banks continue to do a great business, and have become in many ways similar to ordinary joint stock banks, affording to persons of smaller means daily facilities for saving.

Those who have studied the habits of thrift among the people have usually come to the conclusion that its development depends largely on the ready facilities which exist for its exercise. To this fact may perhaps be attributed the efforts that have been made in various directions for establishing some means of saving i close to the places where wages are paid. To carry out this

1 By the Post Office Savings Bank (Public Trustee) Act 1908, the regulations as to declaration by a depositor and the prohibition of a depositor having more than one account do not apply to the public trustee.

idea, some of the large railway corporations have obtained powers in special acts of parliament to establish savings banks for those in their employment. The success of these banks has been great, though it has varied much, and it is difficult to trace any general rule of progress. Thirteen such institutions return their operations to the Registrar of Friendly Societies. The total amount held was, by the return for 1905, £5,513,207 in 60,427 accounts. In these banks the interest paid, as well as the deposits, are really guaranteed by the whole assets of the companies. Further, in order to encourage thrift among their employes, the companies have formally agreed and bound themselves, by the provisions of their special acts, that the rate of interest paid shall be higher than can be obtained in the open market on the same security.

Other efforts have been made to establish savings banks at factories, to be open at the time wages are paid. One great diffi- culty, however, has been the objection many of those employed have to their employers knowing of their savings, and their fear lest it may affect their rate of pay. To get over this objection the plan has been tried of employing an outside agency to hold the savings bank. This has not been much more successful, as the suspicion that accounts may be looked at by employers is difficult to overcome. It is found that the most successful savings banks are those which are carried on as a business, where the trans- actions are so numerous that the individual feels that his own private account is not likely to become known.

Another class of savings bank which of late years has developed considerably, is the penny bank. These banks have a twofold object: one to provide facilities for putting by ex- bjLaks. tremely small sums for those whose means are very limited, and the other to attract children in their earliest years so as to train them to habits of thrift and the realization of the importance and use of even quite small savings. Some form of penny bank now exists in nearly every district, and indeed in nearly every parish. No returns have been collected, but it may be safely said that there are tens of thousands in operation. Many of these penny banks are feeders to the Post Office, which gives them special advantages to invest in that institution. Not only is the gross amount of money thus taken large, but (what is more important) the habit of thrift and of husbanding resources is being taught to the young in all parts of the United Kingdom. This has been one cause of the large extension of the Post Office savings bank itself, and has no doubt led to considerable change in the habits of the people. In a few cases successful efforts have been made to establish permanently these penny banks on a commercial basis, as in the case of the Yorkshire Penny Bank, which has 858 branches, nearly 500,000 depositors and

deposits of nearly £16,000,000; and the National Penny Bank, which has 13 branches in London, most of them open from 9 in the morning till 9 at night, with 155,768 depositors, and over £2,000,000 in deposits. The establishment of penny banks in schools has been carried on for many years, and it is difficult to exaggerate the useful work they have done in inculcating habits of thrift in the children, and in adding depositors to the Post Office savings banks when the children start in life. In England and Wales there are over 7000 of these savings banks held in the various elementary schools inspected by the Education Department. The London County Council has done much to promote this movement by instituting penny banks in its various schools. Although the financial result is not large, the educational effect of these banks is con- siderable. It has been found that many children open accounts at outside penny banks in preference to going to those carried on at their own schools, but it is probable that the idea of so doing is often suggested by the school savings bank.

With a view of bringing the savings bank still nearer the door of the people, efforts have been made to establish collecting savings banks. In these the collector calls at fixed periods for the deposits. This scheme has grown out of the investigations of a committee of the Charity Organization Society, and is based on the idea, which undoubtedly is the fact, that many people will make contributions when the money is called for, who will

not take the trouble to walk a few yards themselves to make the same deposit. That this is so is proved most conclusively by the Post Office life insurance experience, a branch of the Post Office which is scarcely used by the people, while at the same time collecting life insurance companies (which of course must charge a considerable extra premium for collecting) do business to the extent of millions. In most of these banks no interest is given, but facilities and encouragements are afforded for the transfer of each individual account to the Post Office as soon as it is large enough to earn interest.

Closely allied, though essentially different, are the very numerous sharing-out clubs which may be called temporary savings banks. These nearly all take a weekly subscription from their members, and, should any member die, his representa- tive receives a certain sum, the balance left being divided at Christmas equally among the survivors, in proportion to the weekly subscriptions. Some of these clubs are registered, and at a rough estimate they number about 900, with some 120,000 members. The unregistered are, however, much more numerous, though no official information is to be had of them, and it

is certain that hundreds of thousands of pounds are divided in this way each Christmas.

The attempt to induce sailors and soldiers to exercise habits of thrift by the establishments of naval savings banks under the act of 1866, and military savings banks under the act of 1859, should be mentioned. The amount in the naval savings bank is generally about £300,000. As might be expected the amount does not grow. This is accounted for by the fact that the depositors leave the service and draw out their savings. About £200,000 a year, however, goes in and out of the naval banks, and £80,000 in the army banks. This sum represents a good deal of self-denial, when the margin within which it is possible to save among sailors and soldiers is considered.^

Closely allied to savings banks are a number of societies which need only be briefly referred to here. The largest of them are building societies (q.v.) under the Act of 1874, which are a very popular form of saving, especially in certain localities. The contributions to the shares of these societies, which are paid by instalments, differ but little from the periodical payments into savings banks ; and although the money is not so readily repaid, notice and other forms having to be gone through, large numbers of persons pay in and draw out money, and receive the interest on the shares in much the same way as they do on deposits in savings banks without any idea of building or buying houses. In 1906 the receipts were £43,219,548 in the United Kingdom, and the accumulated capital more than £70,000,000, with a membership of 612,424. The action of industrial and provident societies regulated under the act of parliament of 1893, must also be mentioned with reference to that part of their business which is closely allied to savings banks. These societies are divided into three classes: — (a) ordinary co-operative societies; (b) societies for carrying on various businesses, including loan and banking; (c) land and building societies. Most of these societies, indirectly or directly, act as savings banks, and have had considerable influence in the growth of thrift in the United Kingdom. (See Friendly Societies.) In the co-operative societies the sales in 1905 amounted to more than £71,000,000, and the profits to over £5,000,000. These profits are divided in different ways among the members, and they form a saving fund of large dimensions. The societies for carrying on various businesses, such as working men's clubs, loan and banking organizations, registered under the 1893 act, numbered 286, with total receipts £2,020,569. These are not rapidly increasing, but they must be included as one exhibition of the savings of the people, and they are practically used as savings banks. The land and building societies under the act of 1893 are not the same as those above re- ferred to,

though their action as regards savings is similar. They are not under the act of 1874, but carry on a trade or business, including dealings of any kind in land. Their operations are slightly increasing. They received £336,424 from subscriptions and other sources, ac- cording to a return of 1905, and the value of the land and mortgages was £982,900. Two other classes of institutions should be referred to, the friendly and trade societies, which exist for special purposes, namely, to make provision in sickness, for death, for a want of em- ployment, and to a limited extent for old age. They differ essentially from savings banks, as the subscriptions are parted with and cannot be withdrawn. But as the subscriptions are for certain definite needs, almost certain to be required by each member, which but for those societies would have to be provided for by direct savings in banks, they must be mentioned in treating of the subject as a whole. The amount held by the friendly societies is estimated at £50,459,060, subscribed by 13,978,790 members.

It was once stated with truth that the national debt was held by a

very small proportion of the population; but this is not so now. The various agencies which may be described as savings banks in different forms hold over £200,000,000, which is a considerable share of the national debt of Great Britain.

British Colonies. — In New South Wales there are both state and trustee institutions for savings purposes The Government Savings Bank was established in 1871 and the Savings Bank of New South Wales in 1832. In both, sums of one shilling and any multiple of that amount may be deposited. The Government Savings Bank does not allow interest on the excess of deposits exceeding £300 except in the case of charitable institutions, friendly societies and trade unions, while the Savings Bank of New South Wales does not allow interest on the excess of deposits over the sum of £200 made by any one individual, but allows the interest on the full deposit in the case of charitable institutions, or a legally established friendly or other society. The rate of interest in the Government Savings Bank is 3 %, and in the Savings Bank of New South Wales 3J %. The following table shows the growth of depositors and deposits : — ■

must not be less than $1 or exceed $1000 in any one year; nor must the total amount in deposit exceed $3000. There are 961 branches of

the post office savings bank and 23 offices of the government savings bank. The following table shows the number of depositors and amount of deposits: —

Year.

Post Office.

Government (other than Post Office).

Depositors.

Amount standing to

Credit of Depositors.

Depositors.

Amount standing to

Credit of Depositors.

1895 1900

1905

No.

120,628

150,987 165,518

Dollars.

26,805,542 37,507,456 45,367,761

No.

54,932 45,773 48,165

Dollars.

17,644,956 15,642,267 16,649,136

\ear.

Government Savings Bank.

Savings Bank of New South Wales.

Total.

Number of Depositors.

Amount of Deposits.

Number of Depositors.

Amount of Deposits.

Number of Depositors.

Amount of Deposits.

Average Amount per Depositor.

1885

1895 1900

1905

57.538 131,703 198,014 270,082

£

1,471,894 4,121,700 6,045,622 8,883,651

49,977

71,099

84,629

101.383

£

2,016,656 3,951,875 4,855,760 5,545,367

107,515 202,802 282,643 372,365

£

3,488,550 8,073,575

10,901,382 14,429,018

£ s. d.

32 8 11 39 16 2 38 11 5 38 15

The Savings Bank of New South Wales was originally administered by nine trustees, one of whom was vice-president, but by an act of 1902 the number may be extended up to eighteen. The funds of the institution, unlike those of the Government Savings Bank, can be applied to investments of a general nature, such as mortgages, government and municipal securities, &c. Victoria and South Australia have not developed the postal system, but show the largest amount per head of population of deposits. In trustee savings banks in Victoria the number of depositors in 1900-1901 was 393,026, in 1905-1906 466,752; thˆ- amount of deposits in the same years £9,662,006 and £11,764,179, showing an average amount per de- positor of £24, 1 is. 8d. and £25, 4s. id. In South Australia the total number of depositors in savings banks in 1900-1901 was 126,032, of this number 1 1 1 ,537 were depositors in trustee savings banks, having an amount of deposits standing to their credit of £3,782,575 out of a total of £3,795,631. The average amount per depositor was £30, 2s. 4d. In 1905-1906 there were 152,487 depositors with a total amount of deposits of £4,766,907, giving an average amount per head of £31, 5s. 3d. On the other hand, Queensland and West Australia rely almost exclusively on the post office system. In Queensland there were 81,025 depositors in 1900-1901, and 88,026 in 1905-1906. Deposits amounted to £3,896,170 in 1900-1901 and to £4,142,791 in 1905-1906, giving an average per depositor of £48, is. 9d. and £47, is. 3d. respectively. In Western Australia in 1900-1901 there were 39,318 depositors and in 1905-1906 63,573. The deposits amounted to £1,618,359 in 1900-1901 and to £2,316,161 in 1905- 1906, giving an average per depositor of £41, 3s. 3d. and £36, 8s. 8d. In Tasmania the amount of deposits (including those of two joint stock companies) was in 1900-1901 £1,009,097 and in 1905-1906 £ I ,33 2 ,546. The depositors numbered 42,509 and 50,731, giving an average per depositor of £23, 14s. 9d. and £26, 5s. 4d. The following table shows deposits per head of population : —

State.

1900-1901.

1 905-1 906.

£ s. d.

£ s. d.

N. S. Wales

803

10 8

Victoria ….

806

10 6 10

Queensland

7 15 2

876

South Australia

10 10

13 15

West Australia

8 11 3

9 19 3

Tasmania ….

5 16 9

884

In New Zealand there were in 1900-1901 212,436 post office depositors with an amount standing to their credit of £6,350,013 and in 1905- 1906 276,066 depositors with deposits of £8,662,023. There are five savings banks in New Zealand not connected with the post office; in these the total amount standing to the credit of depositors in 1905- 1906 was £1,111,931.

Canada. — In Canada post office savings banks were established in

1867, but government savings banks, under the management of the Finance Department, had been established in the maritime provinces some years previously. The Canadian government is pursuing the policy of transferring the accounts from the savings banks under the control of the Finance Department to the Post Office Department, the transfer taking place as the position of superintendent of each place becomes vacant. In both kinds of savings banks a deposit

In addition to the post office and government savings banks there are special savings banks, such as the Caisse d'economie of Quebec and Montreal City and District Savings Banks. The chartered banks also have sav- ings branches, but they do not make a separate return to the government of the amounts on deposit in these branches. In India, the Straits Settlements, Orange River Colony, Transvaal, Gold Coast, Sierra Leone and the Bahamas the savings banks are under the post office; in Mauritius, Seychelles, Basutoland, Falk- land Islands, Natal, St Helena, Southern Nigeria, Newfoundland, St Lucia, St Vincent, Turks and Caicos Islands, Jamaica, Barbados, Grenada, St Christopher, Nevis, Antigua, Montserrat, Dominica, Virgin Islands, Bermuda, British Honduras, Cyprus, Trinidad, Tobago, Gibraltar and Malta there are government savings banks; in Gambia, treasury savings banks; in Ceylon and British Guiana there are both government and post office savings banks, while in the Cape of Good Hope, in addition to the post office savings banks, there are private savings banks, but their business is small.

France. — In France the first savings bank was instituted in Paris by royal ordinance in 1818. It was quickly imitated in all the principal departments. Some of those so started were independent undertakings, but several were founded on the initiative of municipal councils, three (Nancy, Metz, Avignon) being attached to monts-de- piete% These communal savings banks are now the rule and private banks the exception. They are regulated by a law of 1835, amended in several particulars by later legislation. They are created by decree of the president on the advice of the council of state, and at the initiative of the municipal council. Their administration is in the hands of a council consisting of the mayor of the commune and its directors, none of whom receive remuneration for their services. The funds of these institutions are, with the exception of a certain amount allowed to be retained for independent investment, handed over to the Caisse des dep6ts et consignations (created in 1816 for the administration of the investment of private funds). Interest of 3i % is allowed by the Caisse des dep6ts, but out of that the savings banks retain from i to |% for administrative expenses and the providing of a reserve fund. Both in the private and the post office savings banks the maximum amount

standing in the name of a depositor must not exceed 1500 fr.

The following statement shows the progress of private savings banks 1 since 1835 : —

Number of

Year.

Banks including

Number of

Amount of

Per Head of

Branches.

Depositors.

Deposits.

Population.

£

s. d.

1840

430

351,308

7,695,337

4 7

1850

565

565,995

5,396,680

3 2

i860

649

1,218,122

15,090,839

8 8

1870

1 165

2,079,141

25,289,617

13 10

1880

1405

3,841,104

51,208,107

28 10

1890

1599

5,761,408

116,468,894

63 5

1900

1845

7,116,462

130,559,773

70 7

1905

2042

7,557,133

135,061,740

72 2

Germany. — In Germany the postal savings bank has not been adopted to any extent, but there is an elaborate system of state insurance, which includes life, accident and old-age policies, and to a certain extent even protection against involuntary idleness (see Germany).

See the official publications of the various countries, and J. H. Hamilton, Savings and Savings Institutions (New York, 1902). (G. C. T. B. ; T. A. I.)

1 For statistics of the post office savings banks see Post Office.

United States

There are in the United States four kinds of savings banks: (1) Mutual or Trustee Savings Banks; (2) Stock Savings Banks; (3) Postal Savings Banks; (4) School Savings Banks.

1. Mutual Savings Banks are organized under state laws, B,nd are under the supervision of an officer usually appointed by the governor. They have no capital, and do a strictly investment business. All their earnings go to the depositors, either as dividends, or to a surplus fund, which, in the event of liquidation, also belongs to the depositors. Their management is vested in a board of trustees, a self-perpetuating body who serve without pay, except for specific service such as appraising property. Executive officers and clerks are paid moderate salaries. The proportion of annual expense to each dollar of assets is sometimes less than 0025. The rate of interest on deposits usually ranges from 3 to 4%. Depositors have no voice in the management, except as citizens of the state, through their representatives in the

state legislature. Nearly all the states limit investments carefully, though a few permit con siderable latitude: in New York the deposits in saving banks are considered next to government bonds as safe investments. In that state the deposits in savings banks are exempt from taxation, but a franchise tax of 1 % annually is imposed upon the surplus. In most other states the deposits are taxed for state purposes. The amount which each person may deposit in any year or half year is sometimes limited by the by-laws, and the total sum to be received from any one depositor is usually limited by state law. Deposits are in practice generally payable on demand, though the banks reserve the right to require notice, generally from sixty to ninety days, and sometimes enforce this right in times of panic. The first savings bank incorporated in the United States was the Provident Institution for Savings, incorporated in Boston in 1816. The oldest in New York is the Bank for Savings, of New York City, incorporated in 1819. The largest deposit of any bank of this kind in the United States, $108,720,523-82, was in 1910 that of the Bowery Savings Bank of New York. Mutual savings banks are confined chiefly to the states in the eastern portion of the country. The only mutual banks outside the north-eastern states were in 1010 three in Ohio, five in Indiana, fourteen in Minnesota, one in West Virginia, one in California and two in Wisconsin.

Though the laws governing mutual banks vary in the different states, the following abstract of the New York Savings Bank Law of 1875, re-enacted in 1892, and subsequently amended, gives the main principles on which they are organized.

Thirteen or more persons may incorporate a savings bank, two- thirds of whom shall be residents of the county where the proposed bank is to be situated. When the certificate of organization is filed with the superintendent of banks, who exercises supervision over all banks chartered by the state, he is required to ascertain whether the bank is in fact needed in the community where it is to be organized, and to investigate the character and general fitness of the trustees. The present superintendent of banks requires that the incorporators of a savings bank shall defray personally the expenses of the institu- tion until its earnings are sufficient to meet such expenses, and also return dividends at the rate of not less than 3 %. The board of trustees have entire control of the management of the bank. They elect the president and other officers. A trustee who borrows any of the bank's funds, or who becomes a surety for any other borrower, forfeits his office. Bankruptcy or an unsatisfied judgment of ninety days' standing will also void his office. Trustees are not allowed to have any interest in the profits, or to borrow the deposits or funds.

The trustees of any savings bank may invest the moneys deposited therein and the income derived therefrom as follows: (1) In the stocks or bonds or interest-bearing notes or obligations of the United States, or those for which the faith of the United States is pledged, including the bonds of the District of Columbia. (2) In the stock or bonds or interest-bearing obligations of this state. (3) In the stocks or bonds or interest-bearing obligations of any of the United States which has not within ten years defaulted in the payment of any part of any debt authorized by its legislature. (4) In the stocks or bonds of any city, county, town or village, school district bonds and union free school district bonds, issued for school purposes, or in the interest-bearing obligations of any city or county of this state. (5) In the stocks or bonds of a number of specified cities without the state, subject to the condition that if at any time the indebtedness of any of said cities, less its water debts and sinking fund, shall exceed 7 % of its valuation for purposes of taxation, its bonds and stocks shall cease

to be an authorized investment. (6) In bonds and mortgages on unencumbered real property situated in this state, to the extent of 60 % of the value of such property. Not more than 65 % of the whole amount of deposits shall be so lent or invested. If the loan is on unimproved and unproductive real property, the amount lent thereon shall not be more than 40 % of its actual value. No invest- ment in any bond and mortgage shall be made by any savings bank, except upon the report of a committee of its trustees. (7) Also, by virtue of a law passed by the legislature of 1898: In the first mort- gage bonds of any railway corporation of this state, or in the mortgage bonds of any such railway corporation of an issue to retire all prior mortgage debt of such railway corporation, provided the bonds satisfy certain precautionary conditions. Not more than 25% of the assets of any savings banks shall be loaned or invested in railroad bonds. There are other limitations of the amounts to be loaned or invested in the securities of any one railway. Street railway corpora- tions shall not be considered railway corporations within the meaning of this section. An act passed in 1900 permits the investment of deposits in the bonds of certain railways situated in other states. These investments must conform to conditions assuring safety.

Savings banks in New York are preferred creditors of insolvent state banks and trust companies. In 1901 a law was passed providing for a tax of I % on the surplus of savings banks, computed on the par value of their securities. On July I, 1910, deposits in the savings banks amounted to 81,526,935,581-84, distributed amongst 2,886,910 depositors; interest credited for the preceding year amounted to $53,828,625-03; expenses for the year 1909 were $5,000,053-55 or

$2-90 for each $1000 of resources. Loans on real estate, secured by bond and mortgage, amounted to $805,053,044-63, and investments in stocks and bonds, market value, $658,872,348-85.

Other important items in the assets of these banks are: State bonds, $43,719,111-66; city bonds, $305,695,035-71; railroad bonds, $250,346,600. Deposits received for the year 1909 were

$390,709,469-44-

According to reports made to the Comptroller of the Currency there were on April 28,1909, a total of 642 Mutual Savings Banks in the United States, with $3,394,926,005 aggregate resources. The loans and mortgages of these banks amounted to $1,590,181,366-19, and their investments to $1,599,532,371, classified as follows:

United States bonds 133,353,576- 12

State, county and municipal bonds . . 685,099,502-18

Railroad bonds 743,425,893-93

Other stocks and bonds, including rail- road and bank stocks . . . 137,653,399-71 These banks had, on the date named, a surplus fund of $202,065,316-85, and $3,144,584,874 individual deposits. The Mutual Savings Banks hold more than 22 % of the aggregate individual deposits of all the banks in'the country.

2. Stock Savings Banks are found in the more purely agri- cultural parts of the country, the southern, Mississippi Valley and western states, where only a small proportion of people earn wages in manufactures and commerce; suitable investments are not numerous, the benefits of mutual savings banks are not familiar, and the people are unwilling to accept a low rate of interest. In some states having stock banks there are no laws relating to banking, and in others the savings banks carry on their business under the same laws as commercial banks. Several of the states restrict the investments of the stock savings banks. Prior to 1865, when the issue of circulating notes by state banks was suppressed by a prohibitory tax, there was a distinction between state banks and stock savings banks; the former could issue notes, while the latter, as a rule, could not. Stock savings banks are conducted frequently as adjuncts of state and national banks, occupying the same rooms and being under the same management. Many of the national banks chartered by the Federal government maintain " savings departments," though the deposits received in these departments are on the same legal footing as other

deposits and are not specially invested. Similar departments are also to be found in many trust companies and state banks of discount.

The law of the state of Iowa is typical of those states where stock banks are under public supervision. A savings bank may be organized by not less than five persons. In towns of ten thousand inhabitants or less it must have a capital of $10,000, and in towns or cities with more than ten thousand inhabitants $50,000. The usual corporate powers are granted. The amount of deposits is limited to twenty times the capital and surplus. The usual provisions for repayments of deposits are made, and in addition the savings banks are given the privilege of requiring sixty days' notice for the withdrawal of savings deposits.

The banks are allowed to invest their funds in the following securities: (i) Stocks, bonds or interest-bearing notes of the United States. (2) Stocks- bonds or evidences of debt-bearing interest of the

state of Iowa. (3) Stocks, bonds and warrants of any city, town, village or school district, or drainage district, in the state regularly issued, but the investments of any savings bank should not consist of such bonds or warrants to a greater amount than 25 % of the assets. (4) Mortgages or debts on unencumbered real estate within the state worth at least twice the amount lent. (5) It is lawful for such banks to discount, purchase, sell and make loans upon personal or public security, except shares of their own capital stock.

Property acquired by foreclosure of mortgages, &c, may not be held more than ten years. The rate of interest to be paid is left to the discretion of the trustees, and the profits, after the payment of such interest and expenses, go to capital stock. Stockholders are liable to the creditors/ for double their stock, and such liability continues for six months after the transfer of any stock. Directors receive no compensation. Officers and directors of the bank are required to give the same security for loans that is required of others, and such loans can only be made by the board in the absence of the party applying. The savings banks are prohibited from lending to any individual or firm more than 20 % of tne capital stock. All savings banks are required to make a quarterly statement to the auditor of the state, giving in detail the statement of condition upon a given day. This statement is made under oath of the officers, and is re- quired to be

published. The state auditor is given the power to examine any savings bank at any time, and must make an examina- tion at least once a year; and should the conditions warrant, he is required to report to the attorney-general, who institutes proceedings under the law relating to insolvent corporations. Provision is made for increasing the capital stock by a two-thirds' vote of the existing shares. The corporate existence of the banks is placed at fifty years. Michigan affords a good example of banks doing a commercial and savings bank business under a single organization, but with the savings deposits entirely segregated from other deposits and separ- ately invested. The system has worked successfully and satis- factorily. There has been much discussion among bankers through- out the country in recent years of the proprietv of enacting laws specifically providing (a) for the creation of savings departments in national banks, with the segregation of savings deposits, and (6) for the enactment of similar state laws to be applicable to state banks and trust companies maintaining savings departments. Other proposals have been made for a government (or state) guaranty of deposits, and this plan has been adopted in a few of the states.

On April 28, 1909, there were 1061 stock savings banks reporting, with aggregate resources of $677,784,099-95. Their capital was •59.506.420, and surplus and undivided profits $38,112,716-60. Individual deposits subject to check, $100,708,410-57; savings deposits, or deposits in interest or savings departments, $366,167,901-61; other deposits, including amount due banks and bankers, $109,911,859-91.

Number of Savings Banks in the United States, Number of Depositors, Amount of Savings Deposits, &c, iqoo-iqoq.

Average

Year.

Number

Number of

Average

per Capita in the

of Banks.

Depositors.

Deposits.

due each

Depositor.

United States.

1900

1002

6,107,083

2,449.547,885

$401-10

$31-78

1901

1007

6,358,723

2,597.094.580

408-30

33‘45

1902

1036

6,666,672

2,750,177,290

412-53

34-89

1903

1078

7,035,228

2,935.204,845

417-21

36-52

1904

“57

7,305,443

3,060,178,611

418-89

37-52

1905

1237

7,696,229

3,261,236,119

42374

39-17

1906

1319

8,027,192

3.482,137,198

433-79

4 I-I 3

1907

1415

8,588,811

3,690,078,945

429-04

42-87

1908

1453

8,705,848

3.660,553,945

420-47

41-84

1909 1

1703 2

8,831.863

3.7I3.405.7IO

420-45

41-75

1 Population estimated at 88,926,000, June 30, 1909.

2 Not including 339 state banks and trust' companies of Illinois with $204,908,505 savings deposits credited to 641,634 savings depositors. Including Illinois savings deposits and depositors the average due each depositor is $413-60 and average per capita

$44-06. or r

On May 3, 1909, a statement was issued by Wm. Hanhart, Secretary of the Savings Bank Section of the American Bankers Association showing " actual savings deposits in the savings banks, national banks, Trust Companies and private banks in United States "

$5,560,837,016.

3. Postal Savings Banks. —By an act of the Federal Congress, approved June 25, 1910, Postal Savings Banks were first authorized in the United States. The management of these banks is vested in a board of trustees composed of the postmaster- general, secretary of the treasury, and attorney-general. The board of trustees shall designate such post-offices as it deems proper to be postal savings depository offices. Any

person ten years or over may be a depositor; the minimum deposit is one dollar, and not more than $100 may be deposited by any one person in any one month; the maximum balance to the credit of any depositor (exclusive of interest) shall not exceed $500. Interest, 2% annually; deposits payable on demand without notice. The deposits in the postal savings depositories are to be deposited in banks subject to national or state super- vision at not less than 2j% interest; 65% of the deposits may be so redeposited in these banks; 30% invested in United States securities, and 5% held as a reserve in the United States treasury. But the 65% fund on deposit with the banks may be withdrawn for investment in bonds or other securities of the United States, but only by direction of the president, and only when, in his judgment, the general welfare and the interests of the United States so require. At the option of the depositor, deposits may be converted into United States government bonds. In making deposits cf the funds in national or state banks, the Federal government requires of those banks security in the form of public bonds or other securities as the board of trustees may prescribe. The faith of the United States is solemnly pledged to the payment of the deposits.

4. School Savings Banks were first established in the United States in 1885 by J. H. Thiry, at Long Island City, New York. On January 1, 1910, the system was in use in 1168 schools, distributed throughout 118 cities or villages. Out of 632,665 pupils registered in these schools, 203,458 have saved $5,051,644-60, of which $4,180,948-59 have been withdrawn, leaving a balance of $870,696-01 due depositors. (B. R. *)

SAVOIE, a frontier department of France, formed in i860 of the old provinces of Haute Savoie, Savoie, the Tarentaise and the Maurienne, which constituted the southern portion of the duchy of Savoy. It is bounded N. by the department of Haute Savoie, E. and S.E. by Italy, S.W. by the department of the Hautes Alpes, and W. by those of the Isere and the Ain. Pop. (1901) 254,781; area 2224 sq. m. It is mainly made up of the basin of the Isere. The upper course of that river flows through the Tarentaise, receiving (right) the Arly and later (left) the Arc, which flows through the Maurienne, which is to a large extent

traversed by the Mont Cenis railway. Probably the Isere formerly communicated with the Rhone past Chambery and the Lac du Bourget. The sources of the Isere and of the Arc are separated by the ridge of the Col du Mont Iseran (9085 ft.). The loftiest points in the department are the Grande Casse (12,668 ft.), the culminating summit of the Vanoise group, the Mont Pourri (12,428 ft.), the Pointe de Charbonel (12,336 ft.), the Aiguille de la Grande Sassiere (12,323 ft.), the Dent Parrachee (12,179 ft.), the Levanna (11,943 ft.) and the Aiguilles d'Arves (11,529 ft.). A small portion of the department (including both shores of the Lac du Bourget) is in the part of the duchy of Savoy neutralized in 1815. It is divided into 4 arrondissements (Chambery, the chief town, Albertville, Moutiers-Tarentaise, and St Jean de Maurienne), 29 cantons and 329 communes. It forms the dioceses of Chambery (an archbishopric), Moutiers and St Jean de Maurienne. The best place known to foreigners is Aix les Bains (q.v.), while other sulphur springs rise at Marlioz and at Challes, those of Salins being saline, and those of Brides (the best known after Aix) alkaline.

See J. J. Vernier, Dictionnaire topographique du dep. de la Savoie (Chambery, 1897). (w. A. B. C.)

SAVONA, a seaport and episcopal see of Liguria, Italy, in the province of Genoa, 27 m. W.S. W. of Genoa by rail, 33 ft. above sea-level, and after Genoa and Nice the most important of the cities of the Riviera. Pop. (1906) 43,836 (town); 46,778 (commune). The greater part of the town is now modern. It is surrounded with green-clad hills and luxuriant orange groves. On the Rock of St George stands the castle built by the Genoese in 1542, on the area of the old cathedral and now used as a military prison.. The cathedral (1 589-1 604) is a late Renaissance building with a modern dome and early Renaissance choir-stalls, puplit, &c. In the Cappella Sistina, to the north, stands the simple, finely carved tomb erected by Sixtus IV. to his parents. Facing the cathedral is the Delia Rovere palace erected by

Cardinal Giulio della Rovere (Julius II.) from the plans of Giuliano da Sangallo as a kind of university, and now occupied by the prefecture, the post-office and law-courts. S. Maria di Sastello has a large altarpiece by Foppa and Brea (of 1490). There is a municipal picture-gallery in the hospital of St Paul. The Teatro Chiabrera was erected in 1853 in honour of the lyric poet Chiabrera, who was born and. buried

in Savona. Four and a half miles W. is a pilgrimage church of the Madonna della Misericordia, founded in 1536. The modern harbour, dating from 181 5, has since 1880 been provided with a dock excavated in the rock, 986 ft. long, 460 ft. wide and 23 ft. deep. Savona is one of the chief seats of the Italian iron industry, having iron-works and foundries, shipbuilding, railway work- shops, engineering shops, brass foundry, tinplate works, sulphur mills and glass-works. It imports commodities to the value of nearly £2,000,000 yearly, half of which is coal, with petroleum, iron, cereals, &c. In 1906, 777,000 tons of shipping, of which about half was British, and most of the rest Italian, entered. There is a small export trade, chiefly in iron sheets, chemicals, wood and candied fruits. The potteries export their earthenware to all parts of Italy. There is a railway through the mountains from Savona to Turin (91 m. N.N.W.).

Savona is the ancient Savo, a town of the Ingauni (see Albenga), where, according to Livy, Mago stored his booty in the Second Punic War. A buried Roman bridge lies near the stream, which has now changed its course. The place was never of importance in Roman times, the traffic passing to Vada Sabatia (Vado), 4 m. to the W., which was a harbour, and the point to which the coast road from Rome was reconstructed in 109 B.C., and from which a road diverged across the Apennines to Placentia. In 1191 it bought up the territorial claims of the marquesses Del Carretto. Its whole history is that of a long struggle against the preponderance of Genoa. As early as the 1 2th century the Savonese built themselves a sufficient harbour; but in the 16th century the Genoese, fearing that Francis I. of France intended to make it a great seat of Mediterranean trade, rendered it useless by sinking at its mouth vessels filled with large stones. In 1746 it was captured by the king of Sardinia, but it was restored to Genoa by the treaty of Aix-Ia-Chapelle. Columbus, whose ancestors came from Savona, gave the name of the city to one of the first islands he discovered in the Antilles.

SAVONAROLA, GIROLAMO (1452-1498), Italian monk and martyr, was born at Ferrara on the 21st of September 1452, the third child of Michele Savonarola and his wife Elena Bonac- cossi of Mantua. His grandfather, Michele Savonarola, a Paduan physician of much repute and learning, had settled in Ferrara, and gained a large fortune there. The younger Michele was a mere courtier and spendthrift, but Elena seems to have been a woman of superior stamp. She was tenderly loved by her famous son, and his letters prove that she retained his fullest confidence through all the vicissitudes of his career.

Girolamo was a precocious child, with an early passion for learning.

His first tutor was his grandfather, the physician; and, in the hope of restoring their fallen fortunes, his Years. parents intended him for the same profession. Even as a boy he had intense pleasure in reading St Thomas Aquinas and the Arab commentators of Aristotle, was skilled in the subtleties of the schools, wrote verses, studied music and design, and, avoiding society, loved solitary rambles on the banks of the Po. Ferrara was then a gay and bustling town of 100,000 inhabitants, its prince Borso d'Este a most magnificent potentate. To the mystic young student all festivities were repulsive, and although reared in a courtier-household he early asserted his individuality by his contempt for court life. At the age of nineteen, however, he had no thought of renouncing the world, for he was then passionately in love with the daughter of a neighbour, a Strozzi exiled from Florence. His suit was re- pulsed with disdain; no Strozzi, he was told, might stoop to wed a Savonarola. This blow probably decided his career; but he endured two years of misery and mental conflict before resolving to abandon his medical studies and become a monk. He was full of doubt and self -distrust ; disgust for the world did not seem to him a sufficient qualification for the religious life, and his daily prayer was, " Lord! teach me the way my soul should walk." But in 1474 his doubts were dispelled by a sermon heard at Faenza. He secretly stole away to Bologna, entered

the monastery of St Domenico and then acquainted his father with his reasons for the step. The world's wickedness was intolerable, he wrote; throughout Italy he beheld vice triumph- ant, virtue despised. Among the papers he had left behind at Ferrara was a treatise on " Contempt of the World," inveighing against the prevalent corruption and predicting the speedy vengeance of Heaven. His novitiate was marked by a fervour of humility. He sought the most menial offices, and did penance for his sins by the severest austerities. According to con- temporary writers he was worn to a shadow. His gaunt features were beautified by an expression of singular force and benevo- lence. Luminous dark eyes sparkled and flamed beneath his thick, black brows, and his large mouth and prominent nether lips were as capable of gentle sweetness as of power and set resolve. He was of middling stature and dark complexion. His manners were simple, his speech unadorned and almost homely. His splendid oratorical power was as yet unrevealed; but his intellectual gifts being recognized his superiors charged him with the instruction of the novices. He passed six quiet years in the convent, but his poems written during that period are ex- pressive of burning indignation against the corruptions of the church and profoundest soirow for the calamities of his country.

In 1482 he reluctantly accepted a mission to Ferrara, and, regarding

earthly affections as snares of the evil one, tried to keep aloof from his family. His preachings attracted slight attention there, no one — as he later remarked — Removal being a prophet in his own land. An outbreak of Florence. hostilities between Ferrara and Venice, fomented by Pope Sixtus IV., soon caused his recall to Bologna. Thence he was despatched to St Mark's in Florence. Lorenzo the Magnifi- cent was then (1482) at the height of his power and popularity. At first Savonarola was enchanted with Florence. His cloister, sanctified by memories of St Antonine and adorned with the inspired paintings of Fra. Angelico, seemed to him a fore-court of heaven. But his content speedily changed to horror. The Florence streets rang with Lorenzo's ribald songs (the " canti carnascialeschi ") ; the smooth, cultured citizens were dead to all sense of religion or morality; and the spirit of the fashionable heathen philosophy had even infected the brotherhood of St Mark. In 1483 Savonarola was Lenten preacher in the church of St Lorenzo, but his plain, earnest exhortations attracted few hearers, while all the world thronged to Santo Spirito to enjoy the elegant rhetoric of Fra. Mariano da Genazzano. Discouraged by this failure in the pulpit, Savonarola now devoted himself to teaching in the convent, but his zeal for the salvation. of the apathetic townsfolk was soon to stir him to fresh efforts. Con- vinced of being divinely inspired, he had begun to see visions, and discovered in the Apocalypse symbols of the heavenly vengeance about to overtake this sin-laden people. In a hymn to the Saviour composed at this time he gave vent to his prophetic dismay. The papal chair was now filled by Innocent VIII., whose rule was even more infamous than that of his predecessor Sixtus IV.

Savonarola's first success as a preacher was gained at St Gemignano (1484-1485), but it was only at Brescia in the follow- ing year that his power as an orator was fully revealed. In a sermon on the Apocalypse he shook men's souls by his terrible threats of the wrath to come, and drew tears from their eyes by the tender pathos of his assurances of divine mercy. A Brescian friar relates that a halo of light was seen to flash round his head, and the citizens remembered his awful prophecies when in 151 2 their town was put to the sack by Gaston de Foix. Soon, at a Dominican council at Reggio, Savonarola had occasion to display his theological learning and subtlety. The famous Pico della Mirandola was particularly impressed by the friar's attain- ments, and is said to have urged Lorenzo de' Medici to recall him from Lombardy.

When Savonarola returned to Florence in 1490, his fame as an orator had gone there before him. The cloister garden was too small for the crowds attending his lectures, and on the 1st of August 1490 he gave

his first sermon in the church of St Mark. To quote his own words, it was ” a terrible sermon,” and legend

adds that he foretold he should preach for eight years. And now, for the better setting forth of his doctrines, to silence pedants, and confute malignant misinterpretation, he published a collection of his writings. These proved his knowledge of the ancient philosophy he so fiercely condemned, and showed that no ignor- ance of the fathers caused him to seek inspiration from the Bible alone. The Triumph of the Cross is his principal work, but everything he wrote was animated by the ardent spirit of piety evidenced in his life. Savonarola’s sole aim was to bring mankind nearer to God.

In 149 1 he was invited to preach in the cathedral, Sta Maria

del Fiore, and his rule over Florence may be said to begin from

that date. Lorenzo sent leading citizens to him to

Di’lnr nf Irf

Mark’s ur S e him t0 show more respect to the head of the state.

Savonarola rejected their advice and foretold the impending deaths of Lorenzo, of the pope and of the king of Naples. In the July of the same year he was elected prior of St Mark’s. As the convent had been rebuilt by Cosimo, and enriched by the bounty of the Medici, it was considered the duty of the new superior to present his homage to Lorenzo. Savonarola, however, refused to conform to the usage. His elec- tion was due to God, not Lorenzo; to God alone would he promise submission. Upon this the sovereign angrily exclaimed: ” This stranger comes to dwell in my house, yet will not stoop to pay me a visit.” Nevertheless, disdaining to recognize the enmity of a mere monk, he tried, but in vain, conciliatory measures. The Magnifico then sought to undermine his pop- ularity, and Fra. Mariano was employed to attack him from the pulpit. But the preacher’s scandalous accusations missed their mark, and disgusted his hearers without hurting his rival. Savonarola took up the challenge; his eloquence prevailed, and Fra Mariano was silenced. But the latter, while feigning indifference, was thenceforth his rancorous and determined foe.

In April 1492 Lorenzo de’ Medici was on his death-bed at Careggi.

Oppressed by the weight of his crimes, he summoned the unyielding prior to shrive his soul. Savonarola reluctantly came, and offered absolution upon three conditions. Lorenzo asked in what they consisted. First, ” You must repent and feel true faith in God’s mercy.” Lorenzo assented. Secondly, ” You must give up your ill-gotten wealth.” This, too, Lorenzo promised, after some hesitation; but upon hearing the third clause, ” You must restore the liberties of Florence,” Lorenzo turned his face to the wall and made no reply. Savonarola waited a few moments and then went away. And shortly after his penitent died unabsolved.

Savonarola’s influence now rapidly increased. Many adherents of the late prince came over to his side, disgusted by the violence

and incompetency of Piero de’ Medici’s rule. The vi Ions same year witnessed the fulfilment of Savonarola’s

second prediction in the death of Innocent VIII. (July 1492); men’s minds were full of anxiety, an anxiety increased by the scandalous election of Cardinal Borgia to the papal chair. The friar’s utterances became more and more fervent and impassioned. It was during the delivery of one of his Advent sermons that he beheld the celebrated vision, recorded in contemporary medals and engravings, that is almost a symbol of his doctrines. A hand appeared to him bearing a flaming sword inscribed with the words: ” Gladius Domini supra terram cito et velociter.” He heard supernatural voices pro- claiming mercy to the faithful, vengeance on the ‘guilty, and mighty cries that the wrath of God was at hand. Then the sword bent towards the earth, the sky darkened, thunder pealed, lightning flashed, and the whole world was wasted by famine, bloodshed and pestilence. It was probably the noise of these sermons that caused the friar’s temporary removal from Florence at the instance of Piero de’ Medici. He was presently addressing enthusiastic congregations at Prato and Bologna. In the latter city his courage in rebuking the wife of Bentivoglio, the reigning lord, for interrupting divine service by her noisy entrance nearly cost him his life. Assassins were sent to kill him in his cell; but awed, it is said, by Savonarola’s words and demeanour they fled dismayed from his presence. At the close of his last sermon

the undaunted friar publicly announced the day and hour of his departure from Bologna; and his lonely journey on foot over the Apennines was safely accomplished. He was rapturously welcomed by the community of St Mark’s, and at once proceeded to re-establish the discipline of the order and to sweep away abuses. For this purpose he obtained, after much difficulty, a papal brief emancipating the

Dominicans of St Mark from the rule of the Lombard vicars of that order. He thus became an independent authority, no longer at the command of distant superiors. He relegated many of the brethren to a quieter retreat outside the city, only retaining in Florence those best fitted to aid in intellectual labour. To render the convent self-supporting, he opened schools for various branches of art, and promoted the study of Oriental languages. His efforts were successful; religion and learning made equal progress; St Mark's became the most popular monastery in Florence, and many citizens of noble birth flocked thither to take the vows.

Meanwhile Savonarola continued to denounce the abuses of the church and the guilt and corruption of mankind, and thundered forth predictions of heavenly wrath. In 1494 the duke of Milan demanded the aid of France, and King Charles VIII. brought an army across the Alps. Piero de' Medici, made alliance with the Neapolitan sovereign whose kingdom was claimed by Charles. Then, repenting this ill-judged step, he hurried in person to the French camp at Pietra Santa and humbled himself before the king. Not content with agreeing to all the latter's demands, he further promised large sums of money and the surrender of the strongholds of Pisa and Leghorn. This news drove Florence to revolt. But even at this crisis Savon- arola's influence was all-powerful, and a bloodless revolution was effected. Piero Capponi's declaration that " it was time to put an end to this baby government " was the sole weapon needed to depose Piero de' Medici. The resuscitated republic instantly sent a fresh embassy to the French king, to arrange the terms of his reception in Florence. Savonarola was one of the envoys, Charles being known to entertain the greatest veneration for the friar who had so long predicted his coming and declared it to be divinely ordained. He was most respectfully received at the camp, but could obtain no definite pledges from the king, who was bent on first coming to Florence.

Returning full of hope from Pietra Santa, Savonarola might well have been dismayed by the distracted state of public affairs. Nevertheless, with the aid of Capponi, he guided the bewildered city safely through these critical days. Charles entered Florence on the 17th of November 1494, and the citizens' fears evaporated in jests on the puny exterior of the " threatened scourge. " But the exorbitance of his demands soon showed that he came as a foe. Disturbances arose, and serious collision with the French troops seemed inevitable. The signory resolved to be rid of their dangerous guests; and, when Charles threatened to sound his trumpets unless the sums exacted were paid, Capponi tore up the treaty in his face and made the memorable reply: " Then we will ring our bells." The monarch was cowed, accepted

moderate terms, and, yielding to Savonarola's remonstrances, left Florence on the 24th of November.

After seventy years' subjection to the Medici Florence had forgotten the art of self-government, and felt the need of~a strong guiding hand. So the citizens turned to the patriot monk whose words had freed them of King Charles, and Savonarola became the lawgiver of Florence. The first thing done at his instance was to relieve the starving populace within and without the walls; shops were opened to give work to the unemployed; all taxes, especially those weighing on the lower classes, were reduced; the strictest administration of justice was enforced, and all men were exhorted to place their trust in the Lord. And, after much debate, as to the constitution of the new republic, Savonarola's influence carried the day in favour of Soderini's proposal of a universal or general government, with a great council on the Venetian plan. The great council consisted of 3200 citizens of blameless reputation and over twenty-five years of age, a third of the number sitting for six months in turn in the hall of the Cinquecento expressly built for the purpose. There was also an

of Florence.

upper council of eighty, which in conjunction with the signory decided all questions of too important and delicate a nature for discussion in the larger assembly. These institutions were approved by the people, and gave a fair promise of justice. Savonarola's programme of the new government was comprised in the following formula: — (1) fear of God and purification of manners; (2) promotion of the public welfare in preference to private interests; (3) a general amnesty to political offenders; (4) a council on the Venetian model, but with no doge. At first the new machinery acted well; the public mind was tranquil, and the war with Pisa— not as yet of threatening proportions — was enough to occupy the Florentines and prevent internecine feuds.

Without holding any official post in the commonwealth he had created, the prior of St Mark's was the real head of the state, the dictator of Florence, and guarded the public weal "Dictator w ;(.jj extraordinary political wisdom. At his instance the tyrannical system of arbitrary imposts and so- called voluntary loans was abolished, and replaced by a tax of 10% {la decima) on all real property. The laws

and edicts of this period read like paraphrases of Savonarola's sermons, and indeed his counsels were always given as addenda to the religious exhortations in which he denounced the sins of his country and the pollution of the church, and urged Florence to cast off iniquity and become a truly Christian city, a pattern not only to Rome but to the world at large. His eloquence was now at the flood. Day by day his impassioned words, filled with the spirit of the Old Testament, wrought upon the minds of the Florentines and strung them to a pitch of pious emotion never before — and never since — attained by them. Their fervour was too hot to be lasting, and Savonarola's uncompromising spirit roused the hatred of political adversaries as well as of the degraded court of Rome. Even now, when his authority was at its highest, when his fame filled the land, and the vast cathedral and its precincts lacked space for the crowds flocking to hear him, his enemies were secretly preparing his downfall.

Pleasure-loving Florence was completely changed. Abjuring pomps and vanities, its citizens observed the ascetic regime of the cloister; half the year was devoted to abstinence and few dared to eat meat on the fasts ordained by Savonarola. Hymns and lauds rang in the streets that had so recently echoed with Lorenzo's dissolute songs. Both sexes dressed with Puritan plainness; husbands and wives quitted their homes for convents; marriage became an awful and scarcely permitted rite; mothers suckled their own babes; and persons of all ranks — nobles, scholars and artists — renounced the world to assume the Domini- can robe. Still more wonderful was Savonarola's influence over children, and their response to his appeals is a proof of the magnetic power of his goodness and purity. He organized the boys of Florence in a species of sacred militia, an inner republic, with its own magistrates and officials charged with the enforce- ment of his rules for the holy life. It was with the aid of these youthful enthusiasts that Savonarola arranged the religious carnival of 1496. when the citizens gave their costliest possessions in alms to the poor, and tonsured monks, crowned with flowers, sang lauds and performed wild dances for the glory of God. In the same spirit, and to point the doctrine of renunciation of worldly enjoyments, he celebrated the carnival of 1497 by the famous " burning of the vanities " {i.e. masks and other objects pertaining to the carnival festivities, indecent books and pictures, &c.) in the Piazza della Signoria. A Venetian merchant is known to have bid 22,000 gold florins for the doomed vanities, but the scandalized authorities not only rejected his offer but added his portrait to the pile. Nevertheless the artistic value of the objects consumed has been greatly exaggerated by some writers. There is no proof that any book or painting of real merit was sacrificed, and

Savonarola was neither foe to art nor to learning. On the contrary, so great was his respect for both that, when there was a question of selling the Medici library to pay that family's debts, he saved the collection at the expense of the convent purse.

Meanwhile events were taking a turn hostile to the prior, Alet-*jider VI. had long regretted the enfranchisement of St

Mark's from the rule of the Lombard Dominicans, and now, having seen a transcript of one of Savonarola's denunciations of his crimes, resolved to silence this daring preacher. Bribery was the first weapon employed, and a car- wl ˆ h tbe dinal's hat was held out as a bait. But Savonarola Pope. indignantly spurned the offer, replying to it from the pulpit with the prophetic words: " No hat will I have but that of a martyr, reddened with my own blood. " So long as King Charles remained in Italy Alexander's concern for his own safety prevented vigorous measures against the friar. But no Borgia ever forgot an enemy. He bided his time, and the trans- formation of sceptical Florence into an austerely Christian republic claiming the Saviour as its head only increased his resolve to crush the man who had wrought this marvel. The potent duke of Milan, Ludovico Sforza, and other foes were labouring for the same end, and already in July 1495 a papal brief had courteously summoned Savonarola to Rome. In terms of equal courtesy the prior declined the invitation, nor did he obey a second, less softly worded, in September. Then came a third, threatening Florence with an interdict in case of renewed refusal. Savonarola disregarded the command, but went to preach for a while in other Tuscan cities. But in Lent his cele- brated sermons upon Amos were delivered in the duomo, and again he urged the necessity of reforming the church, striving by ingenious arguments to reconcile rebellion against Alexander with unalterable fidelity to the Holy See. All Italy recognized that Savonarola's voice was arousing a storm that might shake even the power of Rome. Alive to the danger, the pope knew that his foe must be crushed, and the religious carnival of 1496 afforded a good pretext for stronger proceedings against him. The threatened anathema was deferred, but a brief uniting St Mark's to a new Tuscan branch of the Dominicans now deprived Savonarola of his independent power. However, in the beginning of 1497 the Piagnoni were again in office, with the prior's staunch friend, Francesco Valori, at their head. In March the aspect of affairs changed. The Arrabbiati and the Medicean faction merged political differences in their common hatred to Savona- rola. Piero de' Medici's fresh attempt to re-enter Florence failed; nevertheless his followers continued their intrigues, and party spirit increased in virulence. The citizens were growing weary of the monastic austerities imposed on them, and Alex-

ander foresaw that his revenge was at hand.

A signory openly hostile to Savonarola took office in May, and on Ascension Day his enemies ventured on active insult. His pulpit in the duomo was defiled, an ass's skin spread over the cushion, and sharp nails fixed in the board aankated. on which he would strike his hand. The outrage was discovered and remedied before the service began; and, although the Arrabbiati half filled the church and even sought to attempt his life, Savonarola kept his composure and delivered an impressive sermon. But the signory, in feigned anxiety for the public peace, besought him to suspend his discourses. Shortly afterwards the threatened bull of excommunication was launched against him, and Fra, Mariano was in Rome stimulating the pope's wrath. Savonarola remained undaunted. The sentence was null and void, he said. His mission was divinely inspired; and Alexander, elected simoniacally and laden with crimes, was no true pope. Nevertheless the reading of the bull in the duomo with the appropriate, terrifying ceremonial made a deep im- pression on the Florentines. And now, the Arrabbiati signory putting no check on the Compagnacci, the city returned to the wanton licence of Lorenzo's reign. But in July Savonarola's friends were again in power and did their best to have his ex- communication removed. Meanwhile party strife was stilled by an outbreak of the plague. During this time Rome was horror- struck by the mysterious murder of the young duke of Gandia, and the bereaved pope mourned his son with the wildest grief. Savonarola addressed to the pontiff a letter of condolence, boldly urging him to bow to the will of Heaven and repent while there was yet time.

The plague ended, Florence was plunged in fresh troubles from Medicean intrigues, and a conspiracy for the restoration

of Piero was discovered. Among the five leading citizens concerned in the plot was Bernardo del Nero, a very aged man of lofty talents and position. The gonfalonier, Francesco Valori, used his strongest influence to obtain their condemnation, and all five were put to death. It is said that at least Bernardo del Nero would have been spared had Savonarola raised his voice, but, although refraining from any active part against the prisoners, the prior would not ask mercy for them. This silence proved fatal to his popularity with moderate men, gave new adherents to the Arrabbiati, and whetted the fury of the pope, Sforza and all potentates well disposed to the Medici faction. He was

now interdicted from preaching even in his own convent and again summoned to Rome. As before, the mandate was disobeyed. He refrained from public preaching, but held con- ferences in St Mark's with large gatherings of his disciples, and defied the interdict on Christmas Day by publicly celebrating mass and heading a procession through the cloisters.

The year 1498, in which Savonarola was to die a martyr's death, opened amid seemingly favourable auspices. The Piag- noni were again at the head of the state, and by their request the prior resumed his sermons in the duomo, while his dearest disciple, Fra Domenico Buonvicini, filled the pulpit of St Lorenzo. For the last time the carnival was again kept with strange religious festivities, and some valuable books and works of art were sacrificed in a second bonfire of " vanities." But menacing briefs poured in from Rome; the pope had read one of Savona- rola's recent sermons on Exodus; the city itself was threatened with interdict, and the Florentine ambassador could barely obtain a short delay. Now too the Piagnoni quitted office; the new signory was less friendly, and the prior was persuaded by his adherents to retire to St Mark's. There he continued to preach with unabated zeal; and, since the women of Florence deplored the loss of his teachings, one day in the week was set apart for them. The signory tried to conciliate the pope by relating the wonderful spiritual effects of their preacher's words, but Alexander was obdurate. The Florentines must either silence the man themselves, or send him to be judged by a Roman tribunal.

Undismayed by personal danger, Savonarola resolved to appeal to all Christendom against the unrighteous pontiff, and despatched letters to the rulers of Europe adjuring them to assemble a council to condemn this antipope. The council of Constance, and the deposition of John XXIII. , were satisfactory precedents still remembered by the world. One of these letters being intercepted and sent to Rome by the duke of Milan (it is said) proved fatal to the friar. The papal threats were now too urgent to be disregarded, and the cowed signory entreated Savonarola to put an end to his sermons. He reluctantly obeyed, and concluded his last discourse with the tenderest and most touching farewell.

The government now hoped that Alexander would be appeased and Florence allowed to breathe freely. But although silenced the prophet was doomed, and the folly of his disciples precipitated his fate. A creature of the Arrabbiati, a Franciscan friar named Francesco di Puglia, chal- lenged Savonarola to prove the truth of his doctrines by the ordeal of fire. At first the prior treated the provocation with merited contempt, but his too zealous disciple Fra Domenico accepted the challenge. And, when the Franciscan declared that he would enter the fire with Savonarola alone, Fra Domenico protested his willingness to enter it with any one in defence of his master's cause. As Savonarola resolutely declined the trial, the Franciscan deputed a convert, one Giuliano dei Rondinelli, to go through the ordeal with

Fra Domenico. There were long preliminary disputes. Savonarola, perceiving that a trap was being laid for him, discountenanced the ” experiment ” until his calmer judgment was at last overborne by the fanaticism of his followers. Aided by the signory, which was playing into the hands of Rome, the Arrabbiati and Compagnacci pressed the matter on, and the way was now clear for Savonarola’s destruc- tion. On the 7 th of April 1498 an immense throng gathered in the

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Piazza della Signoria to enjoy the barbarous sight. Two thick banks of combustibles 40 yds. long, with a narrow space between, had been erected in front of the palace, and five hundred soldiers kept a wide circle clear of the crowd. Some writers aver that the piles were charged with gunpowder. The Dominicans from one side, the Franciscans from the other, marched in solemn pro- cession to the Loggia dei Lanzi, which had been divided by a hoarding into two separate compartments. The Dominicans were led by Savonarola carrying the host, which he reverently deposited on an altar prepared in his portion of the loggia. The magistrates signalled to the two champions to advance. Fra Domenico stepped forward, but neither Rondinelli nor Fra Francesco appeared. The Franciscans began to urge fantastic objections, and, when Savonarola insisted that his champion should bear the host, they cried out against the sacrilege of exposing the Redeemer’s body to the flames. All was turmoil and confusion, the crowd frantic. And, although Rondinelli had not come, the signory sent angry messages to ask why the Dominicans delayed the trial. It was now late in the day, and a storm shower gave the authorities a pretext for declaring that heaven was against the ordeal. The Franciscans slipped away unobserved, but Savonarola raising the host attempted to lead his monks across the piazza in the same solemn order as before. On this the popular fury burst forth. Defrauded of their bloody diversion, the people were wild with rage. Fra Girolamo’s power was suddenly at an end. Neither he nor his brethren would have lived to reach St Mark’s but for the devoted help of Salviati and his men. Against the real culprits, the Franciscans, no anger was felt; the zealous prior, the prophet and lawgiver of Florence, was made the popular scapegoat. Notwithstanding the anguish that must have filled his heart, the fallen man preserved his dignity and calm. Mounting his own pulpit in St Mark’s he quietly related the events of the day to the faithful assembled in the church, and then withdrew to his cell, while the mob on the square outside was clamouring for his blood.

The next morning, the signory having decreed the prior's banishment, Francesco Valori and other leading Piagnoni hurried to him to concert measures for his safety. Meanwhile the government decided on his arrest, and Arrest no sooner was this made public than the populace Trial. rushed to the attack of the convent. The doors of St Mark's were hastily secured, and Savonarola discovered that his adherents had secretly prepared arms and munitions and were ready to stand a siege The signory sent to order all laymen to quit the cloister, and a special summons to Valori. After some hesitation the latter obeyed, hoping by his influence to rally all the Piagnoni to the rescue. But he was murdered in the street, and his palace sacked by the mob. The monks and their few remaining friends made a most desperate defence. In vain Savonarola besought them to lay down their arms. When the church was finally stormed Savona- rola was seen praying at the altar, and Fra Domenico, armed with an enormous candlestick, guarding him from the blows of the mob. A few disciples dragged their beloved master to the inner library and urged him to escape by the window. He hesitated, seemed about to consent, when a cowardly monk, one Malatesta Sacramoro, cried out that the shepherd should lay down his life for his flock. Thereupon Savonarola turned, bade farewell to the brethren, and, accompanied by the faithful Domenico, quietly surrendered to his enemies. Later, betrayed by the same Malatesta, Fra Silvestro was also seized. The prisoners were conveyed to the Palazzo Vecchio, and Savonarola was lodged in the tower cell which had once harboured Cosimo de' Medici.

Now came an exultant brief from the pope. His well-beloved Florentines were true sons of the church, but must crown their good deeds by despatching the criminals to Rome. Sforza was equally rejoiced by the news, and the only potentate who could have perhaps saved Savonarola's life, Charles of France, had died on the day of the ordeal by fire. Thus another of the friar's prophecies was verified, and its fulfilment cost him his sole protector. The signory refused to send their prisoners to Rome,

but they did Rome's behests. Savonarola's judges were chosen from his bitterest foes. Day after day he was tortured, and in his agony, with a frame weakened by constant austerity and the mental strain of the past months, he made every admission demanded by his tormentors. But directly he was released from the rack he always withdrew the confessions uttered in the delirium of pain. These being too incoherent

to serve for a legal report, a false account of the friar's avowals was drawn up and published.

Though physically unable to resist torture, Savonarola's clearness of mind returned whenever he was at peace in his cell. So long as writing materials were allowed him he employed himself in making a commentary on the Psalms, in which he restated all his doctrines. Alexander was frantically eager to see his enemy die in Rome. But the signory insisted that the false prophet should suffer death before the Florentines whom he had so long led astray. The matter was finally compromised. A second mock trial was held by two apostolic commissioners specially appointed by the pope. One of the new judges was a Venetian general of the Dominicans, the other a Spaniard. Meanwhile the trial of Brothers Domenico and Silvestro was still in progress. The former remained faithful to his master and himself. No extremity of torture could make him recant or extract a syllable to Savonarola's hurt; he steadfastly repeated his belief in the divinity of the prior's mission. Fra Silvestro on the contrary gave way at mere sight of the rack, and this seer of heavenly visions owned himself and his master guilty of every crime laid to their charge.

The two commissioners soon ended their task. They had the pope's orders that Savonarola was to die " even were he a second John the Baptist." On three successive days they " examined " the prior with worse tortures than before. But he now resisted pain better, and, although more than once a promise to recant was extorted from him, he reasserted his innocence when un- bound, crying out, " My God, I denied Thee for fear of pain." On the evening of the 22nd of May sentence of death was pro- nounced on him and his two disciples. Savonarola listened unmoved to the awful words, and then quietly resumed his interrupted devotions. Fra, Domenico exulted in the thought of dying by his master's side; Fra. Silvestro, on the contrary, raved with despair.

The only favour Savonarola craved before death was a short interview with his fellow victims. This the signory unwillingly granted. The memorable meeting took place in the hall of the Cinquecento. During their forty days of confinement and torture each one had been told that the others had recanted, and the false report of Savonarola's confession had been shown to the two monks. The three were now face to face for the first time. Fra, Domenico's loyalty had never wavered, and the weak Silvestro's enthusiasm rekindled at sight of his chief. Savonarola prayed with the two men, gave them his blessing, and exhorted them by the memory of their Saviour's crucifixion to submit meekly to their fate. Midnight was long past when Savonarola

was led back to his cell. Jacopo Niccolini, one of a religious fraternity dedicated to consoling the last hours of condemned men, remained with him. Spent with weakness and fatigue he asked leave to rest his head on his companion's lap, and quickly fell into a quiet sleep. As Niccolini tells us, the martyr's face became serene and smiling as a child's. On awaking he addressed kind words to the compassionate brother, and then prophesied that dire calamities would befall Florence during the reign of a pope named Clement. The carefully recorded prediction was verified by the siege of

1529.

The execution took place the next morning. A scaffold, connected by a wooden bridge with the magistrates' rostrum, had been erected on the spot where the piles of the doau ordeal had stood. At one end of the platform was a

huge cross with faggots heaped at its base. As the prisoners, clad in penitential haircloth, were led across the bridge, wanton boys thrust sharp sticks between the planks to wound their feet. First came the ceremonial of degradation. Sacer- dotal robes were thrown over the victims, and then roughly

stripped off by two Dominicans, the bishop of Vasona and the prior of Sta Maria Novella. To the bishop's formula, " I separate thee from the church militant and the church triumphant," Savonarola replied in firm tones, " Not from the church triumph- ant; that is beyond thy power." By a refinement of cruelty Savonarola was the last to suffer. His disciples' bodies already dangled from the arms of the cross before he was hung on the centre beam. Then the pile was fired. For a moment the wind blew the flames aside, leaving the corpses untouched. "A miracle," cried the weeping Piagnoni; but then the fire leapt up and ferocious yells of triumph rang from the mob. At dusk the martyrs' remains were collected in a cart and thrown into the Arno.

Savonarola's party was apparently annihilated by his death, but, when in 1529-1530 Florence was exposed to the horrors predicted by him, the most heroic defenders of his beloved if ungrateful city were Piagnoni who ruled their lives by his precepts and revered his memory as that of a saint.

Savonarola's writings may be classed in three categories: — (1) numerous sermons, collected mainly by Lorenzo Violi, one of his most enthusiastic hearers; (2) an immense number of devotional and moral

essays and some theological works, of which 11 Trionfo della Croce is the chief ; (3) a few short poems and a political treatise on the government of Florence. Although his faith in the dogmas of the Roman Catholic Church never swerved, his strenuous protests against papal corruptions, his reliance on the Bible as his surest guide, and his intense moral earnestness undoubtedly connect Savonarola with the movement that heralded the Reformation.

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SAVORY, SIR WILLIAM SCOVELL, Bart. (1826-1895), British surgeon, was born on the 30th of November 1826, in London. He entered St Bartholomew’s Hospital in 1844, becoming M.R.C.S. in 1847, and F.R.C.S. in 1852. From 1849 to 1859 he was demonstrator of anatomy and operative surgery at St Bartholomew’s, and for many years curator of the museum, where he devoted himself to pathological and physio- logical work. In 185,9 he succeeded Sir James Paget as lecturer on general anatomy and physiology. In 186 1 he became assistant surgeon, and in 1867 surgeon, holding the latter post till 1891; and from 1869 to 1889 he was lecturer on surgery. In the College of Surgeons he was a man of the greatest influence, and was president for four successive years, 1885-1888. As Hunterian professor of comparative anatomy and physiology (1859-1861), he lectured on ”

General Physiology ” and the ” Physiology of Food.” In 1884 he delivered the Bradshaw Lecture on the ” Pathology of Cancer.” In 1887 he delivered the Hunterian Oration. In 1879, at Cork, he had declared against ” Listerism ” at the meeting of the British Medical Association, ” the last public expression,” it has been said, ” by a prominent surgeon against the now accepted method of modern surgery.” In 1887 he became surgeon-extraordinary to Queen Victoria, and. in 1890 he was made a baronet. Savory, who was an able operator, but averse from exhibitions of brilliancy, was a powerful and authori- tative man in his profession, his lucidity of expression being almost as valuable as his great knowledge of physiology and anatomy. He died in London on the 4th of March 1895.

SAVOY, HOUSE OF

Oddoae.

SAVOY, HOUSE OF, a dynasty which ruled over the territory of Savoy and Piedmont for nine centuries, and now reigns over the kingdom of Italy. The name of Savoy was known to the Romans during the decline of the empire. In the 5th century the territory was conquered by the Burgundians, and formed part of their kingdom; nearly a hundred years later it was occupied by the Franks. It was included in Charlemagne’s empire and was divided by him into counties, which evolved there as elsewhere into hereditary fiefs; but after the .break-up of Charlemagne’s empire, the Burgundian kingdom revived and Savoy was again absorbed in it. After the collapse of that monarchy its territories passed to the German kings, and Savoy was divided between the counts of Provence, of Albon, of Gex, of Bresse, of the Genevois, of Maurienne, the lords of Habsburg, of Zahringen, &c, and several prelates.

The founder of the house of Savoy is Umberto Biancamano (Humbert the White-handed), a feudal lord of uncertain but probably Teutonic descent, who in 1003 was count of H h”whu Salmourenc in the Viennois, in 1017 of Nyon on the handed. ‘ Lake of Geneva, and in 1024 of the Val d’Aosta on the eastern slope of the Western Alps. In 1034 he obtained part of Maurienne as a reward for helping King Conrad the Salic to make good his claims on Burgundy. He also obtained the counties of Savoy, Belley, part of the Tarantaise, and the Chablais. With these territories Umberto commanded three of the great Alpine passes, viz. the Mont Cenis and the two St Bernards. In the meanwhile his son Oddone married Adelaide, eldest daughter and

heiress of Odelrico Manfredi, marquess of Susa, a descendant of Arduino of Ivrea, king of Italy, who ruled over the counties of Turin, Auriate, Asti, Bredulo, Vercelli, &c, correspond- ing roughly to modern Piedmont and part of Liguria (1045). Umberto died some time after 1056 and was succeeded by his son, Amadeus I., at whose death the country passed to Oddone, the husband of the countess Adelaide. Oddone thus came to rule over territories on both sides of the Alps, a fact which was to dominate the policy of Savoy until i860; its situation between powerful neighbours accounting for its vacillating attitude, whence arose the charges of duplicity levelled against many of its rulers, while its dominion over the Alpine passes brought many advantages. Oddone died in 1060, and was succeeded by his widow Adelaide; but before her death in 1001 his son, Peter I., became count, and subsequently the latter's brother, Amadeus II. Under Humbert II. (1080) occurred the first clash with the Piedmontese communes, but he and his successors, Amadeus III. (who died on his way home from the crusades) and Thomas I. (1189), adopted a policy of conciliation towards them. Thomas, who reigned until 1222, was a Ghibelline in politics and greatly increased the importance of Savoy, for he was created Imperial Vicar and acquired important extensions of territory in the Bugey, Vaud and Romont to the west of the Alps, and Carignano, Pinerolo, Moncalieri and Vigoneto the east; he also exercised sway over Geneva, Albenga, Savona and Saluzzo. At his death these territories were divided among his sons, Thomas II. obtaining Piedmont, Aimone the Chablais, Peter and Philip other fiefs, and Amadeus IV., the eldest, Savoy and a general overlordship over his brothers' estates. Peter visited England several times, one of his nieces, Eleanor of Provence, being the wife of the English king Henry III., and another, Sancha, wife of Richard, earl of Cornwall. Henry conferred great honours on Peter, creating him earl of Richmond, and gave him a palace on the Thames, known as Savoy House. Count Peter also acquired fresh territories in Vaud, and defeated Rudolph of Habsburg at Chillon. Thomas's other sons received fiefs and bishoprics abroad, and one of them, Boniface, was made archbishop of Canterbury. Thomas II., after capturing several cities and castles in Piedmont, lost them again and was made prisoner by the citizens of Turin, but was afterwards liberated. He alone of the sons of Thomas I. left male heirs, and his son Amadeus V. (1285-1323) reunited the scattered dominions of his house. When Amadeus succeeded to the throne these were divided into the county of Savoy (his own territory) , the princi-

Thomas /.

pality of Piedmont ruled by his nephew Philip, prince of Achaea (a

title acquired through his wife, Isabella of Villehardouin, heiress of Achaea and the Morea), and Vaud ruled by his brother Louis. But although this division was formally recognized in 1295, Amadeus succeeded in enforcing his own supremacy over the whole country and making of it a more unified state than before, and by war, purchase or treaty he regained other fiefs which his predecessors had lost. He fought in many campaigns against the dauphins of Viennois, the counts of Genevois, the people of Sion and Geneva, the marquesses of Saluzzo and Mont- ferrat, and the barons of Faucigny. He also acted as peacemaker between France and England, accompanied the emperor Henry VII. of Luxemburg on his expedition to Italy, reorganized the finances of the realm and reinforced the Salic law of succession. He was succeeded by his sons, Edward (1323-1329), known as ” the Liberal,” on account of his extravagance, and Aimone, the Peaceful (1329-1343), who strove to repair the harm done to the state’s exchequer by his predecessor and proved one of the best princes of his line. Amadeus VI. (1343- yi. 1383), son of the latter (known as the Conte Verde or Green Count because of the costume he habitually wore at tourneys), succeeded at the age of nine. He won a reputation as a bold knight in the fields of chivalry and in the crusades, and he inaugurated a new policy for his house by devoting more attention to his Italian possessions than to those on the French side of the Alps and in Switzerland. In 1366 he led an expedition to the East against the Turks; and he arbitrated between Milan and the house of Montferrat (1379), between the Scaligeri and the Visconti, and between Venice and Genoa after the ” War of Chioggia ” (1381). Amadeus was the first sovereign to introduce a system of gratuitous legal assistance for the poor. He un- fortunately espoused the cause of Louis, duke of Anjou, and while aiding that prince in his attempt to recover the kingdom of Naples he died of the plague, leaving his realm to his son, Amadeus VII., the Conte Rosso or ” Red Count ” (1383-1391); the latter added Nice (1388) and other territories to his domains.

During the reign of Amadeus VIII. (1391-1440), Savoy prospered in every way. The count extended his territories both in Savoy itself and in Italy, and in 1416 was created duke by the emperor Sigismund. He was A ˆ aeus distinguished for his wisdom and justice, and in 1430 he promulgated a general statute of laws for the whole duchy, in spite of the opposition of the nobles and cities whose privileges were thereby curtailed. In 1434 he retired to the hermitage of Ripaille on the Lake of Geneva, but continued to conduct the chief affairs of the state and to mediate between foreign Powers, leaving matters of less importance to his son Louis. Five years later the council of Basel by a strange

decision elected Amadeus pope, in spite of his not being a priest, and deposed Eugenius IV. Amadeus accepted the dignity, assuming the style of Felix V., and abdicated the dukedom. For nine years he remained pope, although he never went to Rome and one-half of Christendom regarded him as an anti-pope. On the death of Eugenius (1447) Thomas of Sarzana was elected as Nicholas V., and in 1449 Amadeus abdicated and returned to his hermitage at Ripaille, where he died two years later (see Felix V.).

Under Louis Savoy began to decline, for he was indolent, incapable, and entirely ruled by his wife, Anne of Lusignan, daughter of the king of Cyprus, an ambitious and intriguing woman; she induced him to fit out an expensive expedition to Cyprus, which brought him no advantage save the barren title of king of Cyprus, Jerusalem and Armenia. He neglected to make good the claims which he might have enforced to the duchy of Milan on the death of Filippo Maria, the last Visconti (1447). His latter years were troubled by conspiracies and dissensions on the part of the nobles and even of his own son, Philip, count of Bresse. He went to France to seek aid of King Louis XL, but died there in 1465. In spite of his incapacity he acquired the city of Freiburg and the homage of the lords of Monaco. He was succeeded by his son, Amadeus IX. (1455-1472), who on account of ill-health left the duchy in the hands of his wife, Yolande, sister of Louis XL This led to feuds and intrigues

on the part of the French king and of Philip of Bresse, and Savoy would probably have been dismembered but for the patriotic action of the States General. On Amadeus's death, his son Philibertl. (1472-1482) succeeded, but as he was aminor the States General appointed his mother Yolande regent. Wars and civil commotions occupied the period of his minority and Savoy lost Freiburg and many other territories. Yolande died in 1472, and the regency was disputed by various claimants; Philip of Bresse having obtained it by force, he carried off Philibert, who died in 1482 at Lyons. He was succeeded by his brother Charles I. (1482-1490), who, freed by Louis XL from the danger- ous protection of Philip of Bresse and by death from that of the French king, crushed the rebellious nobles and seized Saluzzo (1487). He did much to raise the falling fortunes of his house, but died at the age of thirty-one. Under his successor Charles II. (1490-1496), an infant in arms, the duchy was again distracted by civil war and foreign invasions. Charles died at an early age, and, having no male

heirs, the aged Philip of Bresse succeeded, but reigned only for one year. Philibert II. (1497-1 504) followed, but he was devoted only to pleasure and left the helm of state to his half-brother, Renato, and later to his wife, Margaret of Austria. He died without heirs and was succeeded by his brother, Charles III. During his reign Savoy abandoned its attitude of subserviency to France, adopting a policy of greater independence, and became more friendly to Austria.

Under Charles III. (1504-1553), the duchy suffered a series of misfortunes. Although the duke strove after peace at almost

any price, he was nearly always involved in war and Philibert. l° st m any possessions, including Geneva and Vaud.

At his death the whole country was overrun by the hostile armies of Francis I. of France and of the Emperor Charles V., while his son and successor, Emmanuel Philibert (15 53-1 580), was serving in the Spanish armies. Emmanuel could not take possession of the duchy at once, but continued to serve the emperor as governor-general of the Low Countries. By his victory at St Quentin over the French in 1557 he proved himself one of the first generals of the day, and by the terms of the subsequent treaty of Cateau Cambresis he was reinstated in most of his hereditary possessions (1559). Under Emmanuel Philibert Savoy lost all traces of constitutional government and became an absolute despotism of the type then predominating throughout the greater part of Europe. At the same time he raised his country from ruin and degradation into a prosperous and powerful monarchy. He induced both France and Spain to evacuate the fortresses which they still held in Piedmont, made a profitable exchange of territory with the Bernese, and acquired an extension of seaboard by the purchase of Tenda

and Oneglia (see Emmanuel Philibert of Savoy). Charles jji s son an(j successor, Charles Emmanuel L, surnamed /, the Great, strengthened the tendency of Savoy to

become less of a French and more of an Italian Power. In 1588 he wrested Saluzzo from the French, but his expeditions to Provence and Switzerland were unsuccessful. In the war between France and Spain after the accession of Henry IV., he took the Spanish side, and at the peace of Lyons (1601), although he gave up all his territories beyond the Rhone, his possession of Saluzzo was confirmed. His attempt to capture Geneva by treachery (1602) failed, and although on the death of Francesco Gonzaga, duke of Mantua and Montferrat, he seized the latter city (161 2) he was forced by Spain and her allies to relinquish

it. The Spaniards invaded the duchy, but after several years of hard fighting the peace of 1618 left his territory almost intact. In 1628 he sided with Spain against France; the armies of the latter overran the duchy, and Charles Emmanuel died in 1630 (see Charles Emmanuel). His son, Victor Amadeus I. (1630-1637), succeeded to little more than a title, but by his alliance with France — his wife Christina being a daughter of Henry IV. — he managed to regain most of his territories. He proved a wise and popular ruler, and his early death was much deplored. His eldest son, Francis Giacinto, a minor, lived only a year, and his second son, Charles Emmanuel II., also a minor, remained under the regency of his mother.

That princess, in spite of her French origin, resisted the attempts of France, then dominated by Cardinal Richelieu, to govern Savoy, but her quarrels with her brothers-in-law led to civil war, in which the latter obtained the help of Spain, and Christina that of France. In the end the duchess succeeded in patching up these feuds and saving the dynasty, and in 1648 Charles Emmanuel II. assumed the government. The war between France and Spain continued to rage, and Savoy, on whose territory much of the fighting took place, suffered severely in consequence. By the treaty of the Pyrenees (1669) the war came to an end and Savoy regained most of the towns occupied by France. Charles died in 1675 and was succeeded by his only son, Victor Amadeus II. (1675-1732). The . c °T latter's minority was passed under the regency of his //. able but imperious mother, Jeanne of Savoy-Nemours. He married Anne of Orleans, daughter of Henrietta of England and niece of Louis XIV. of France. The French king treated Victor Amadeus almost as a vassal, and obliged him to persecute his Protestant (Waldensian) subjects. But the young duke, galled by Louis's overbearing arrogance, eventually asserted his independence and joined the league of Austria, Spain and Venice against him in 1690. The campaign was carried on with varying success, but usually to the advantage of Louis, and the French victory at Marsiglia and the selfish conduct of the allies induced Victor to come to terms with France, and to turn against the imperialists (1696). By the treaty of Ryswick a general peace was concluded. In the war of the Spanish Succession (1700) we find Victor at first on the French side, until, dissatisfied with the continued insolence of Louis XIV. and of Philip of Spain, he went over to the Austrians in 1704. The French invaded Piedmont, but were totally defeated at the siege of Turin by Victor Amadeus and Prince Eugene of Savoy (1706), and eventu- ally driven from the country. By the treaty of Utrecht (1713) Victor received the long-coveted Montferrat and was made king of Sicily; but in 17 18 the powers obliged him to exchange that kingdom for Sardinia, which

conferred The king- on the rulers of Savoy and Piedmont the title subse- sariUnia quently borne by them until they assumed that of kings of Italy. In 1730 he abdicated in favour of his son, Charles Emmanuel, retired to Chambery, and married the countess of San Sebastiano (afterwards Marchioness of Spigno) . His wife's ambitions induced him to try to regain the crown, but his son had him arrested, and he died in prison in 1732 (see Victor Amadeus II.).

Charles Emmanuel III. (1730-1773) was a born soldier and took part in the war of the Polish Succession on the side of France against Austria, and for his victory at Guastalla (1734) was awarded the duchy of Milan, which, however, he was forced to relinquish at the peace of Vienna (1736), retaining only Novara and Tortona. In the war of the Austrian Succession, which broke out on the death of the Emperor Charles VI., he took the side of Maria Theresa (1742). By the peace of Aix-la-Chapelle in 1748, following on the defeat of the French, Savoy gained some further accessions of territory in Piedmont. The reign of Charles's son, Victor Amadeus III. (1773-1796), was a period of decadence; the king was incapable and extravagant, and he chose equally incapable ministers. On the outbreak of the French Revolution he sided with the royalists and was eventually brought into conflict with the French republic. The army being demoralized and the treasury empty, the kingdom The fell an easy prey to the republican forces. Savoy French became a French province, and, although the Pied- occupa- montese troops resisted bravely for four years in the tlon ' face of continual defeats, Victor at last gave up the struggle as hopeless, signed the armistice of Cherasco, and died soon after- wards (1796). He was succeeded in turn by his three sons, Charles Emmanuel IV., Victor Emmanuel I., and Charles Felix. Charles Emmanuel (1796-1802), believing in Bonaparte's promises, was induced to enter into a confederation with France and give up the citadel of Turin to the French, which meant the end of his country's independence. Realizing his folly he abdicated on the 6th of December 1796, and retired to Sardinia,

GENEALOGICAL TABLE OF THE HOUSE OF SAVOY.

Humbert the Whitehanded (Umberto Biancamano) (d. after 1056).

Amadeus I. (d. c. 1056).

1

Oddone or Otto = Adelaide, heiress of Turin (d. logi).

Peter I. (d. 1078).

Amadeus

II. (d.

I

1080).

Bertha = Emperor Henry IV.

Humbert II. the Fat (d. 1103).

Amadeus III. fd. 1 148 or 1149).

Humbert III. the Saint (d. nSg).

Thomas I. (d. 1222).

Alice or Adelaide = Louis VI. of France.

Amadeus IV (d. 1253). Boniface (d. 1263).

i

Peter II.,

earl of Richmond

fd. 1268).

Philip I. (d. 1285)

Thomas II.,

count of Piedmont

(d. 1259).

Boniface,

archbishop of Canterbury

(d. 1270),

Louis I. of Vaud (d. 1302).

Edward the Liberal (d. 1329).

Aimone the Peaceful (d. 1343).

Amadeus V. the Great (d. 1323).

■ 1343). VI. (d.

Anne = the eastern emperor, Andronicus III.

i Thomas III. K d. 1282).

Philip,

prince of Achaea

(d. 1334).

Amadeus VI. (d. 1383).

Amadeus VII. (d. 1391).

Amadeus VIII.,

first duke of Savoy,

afterwards Pope Felix V.

(d. 1451).

James

1334,

(A. 1.

1

367).

Amadeus (d. 1402).

Louis (d. 1418).

Louis (d. 1465).

Philip, count of Geneva (d. 1444).

.J

Amadeus IX. (d. 1472).

Philip II. (d. 1497).

Louis, king of Cyprus fd. 1482).

Philibert I. (d. 1482).

Charles I. (d. 1490).

Charles II. (d. 1496).

Philibert II. (d. 1504).

Charles III. (d. 1553).

Emmanuel

Philibert (d. i*8o).

Charles Emmanuel I.

(d. 1630).

Philip, founder of the

house of Nemours

(d. 1533).

Louise = Charles, count of AngoulSme

Francis I. of France.

Victor Amadeus I. = Christina,

daughter of Henry IV. of France

(d. 1637).

Thomas Francis,

prince of Carignano

(d. 1656).

Francis Hyacinth (d. 1638).

Charles Emmanuel II. (d. 1675).

Victor Amadeus II. fd. 1733).

King of Sardinia, 1720;

abdicated 1730 =

Anne of Orleans, granddaughter

of Charles I. of England.

Charles Emmanuel III. (d. 1773).

Victor Amadeus III. (d. 1796).

Charles Emmanuel IV.

fa. 1819); abdicated

1802.

Victor Emmanuel I.

(d. 1824); abdicated

1821.

Charles Felix Cd. 1831).

Emmanuel Philibert (d. 1709).

Victor Amadeus (d. 1741).

Louis Victor (d. 1778).

Victor Amadeus (d. 1780).

Charles Emmanuel (d. 1800).

Charles Albert (d. 1849). King of Sardinia; abdi- cated 1840.

Eugene Maurice,

count of Soissons

(d. 1673).

Eugene,

the famous general

(d. 1736).

Victor Emmanuel II. (d. 1878). King of Italy, 1861.

Ferdinand, duke of Genoa (d. 1855).

Humbert (d. 1900), king of Italy = > Margherita of Savoy-Genoa.

Victor Emmanuel III.,

king of Italy (b. 1869} =

Elena Montenegro

(b. 1S73).

J ,

Amadeus (d. 1890),

duke of Aosta.

King of Spain, 1870-73.

ClothiIde =

Prince Napoleon (d. 1801).

Maria Pia (b. 1847) = Louis, king of Portugal.

Margherita =* Humbert, king of Italy.

Thomas duke o? Genoa (b. 1854),

Emmanuel Philibert,

duke of Aosta

(b. 1869).

Victor Emmanuel,

count of Turin

(b. 1870).

Louis Amadeus,

duke of Abruzzi

(b. 1873).

Humbert, count of Salemi

(b. 1889).

Yolanda Mafalda Humbert, Giovanna

Margherita (b.1002). prince of Piedmont, (b. 1907). jg. 1 001). heir to the throne

(b. 1904).

Amadeus, Aimone,

duke of Puglia duke of Spoleto

(b. 1898). (b. 1900).

Ferdinand,

prince of Udine

(b. 1884).

Philibert,

duke of Pistoia

ilbert,

1

Maria Bona Adalbert, Eugene

Margherita duke of Bergamo (b. igoi) (b. 1896). (b. 1898).

Humbert.

while the French occupied the whole of Piedmont. After the defeat of the French by the Austro-Russian armies during Bonaparte's absence in Egypt, Charles Emmanuel landed at Leghorn, hoping to regain his kingdom; but Napoleon returned, and by his brilliant victory at Marengo he reaffirmed his position

in Italy. The king retired to Naples, abdicated once J* e more (1802), and entered the Society of Jesus; he

tfon- " died in Rome in 1819. Victor Emmanuel I. (1802-

1820) remained in Sardinia until by the Final Act of the Congress of Vienna (June 9, 181 5) his dominions were restored to him, with the addition of Genoa.

From this time the fortunes of the house of Savoy are bound up with those of Italy (see Italy, History). Victor Emmanuel I. abdicated in 1821 in favour of his brother Charles Felix (1821- 183 1). The latter being without, a son, the succession devolved upon Charles Albert, of the cadet line of the princes of Carignano, who were descended from Thomas, youngest son of Charles Emmanuel I. Charles Albert abdicated, on the evening of his defeat at Novara (April 20, 1849), in favour of his son Victor Emmanuel II. (1849-1878), who on the 18th of February 1861 was proclaimed king of Italy. Victor Emmanuel had married in 1842 Maria Adelaide, daughter of the archduke Rainer, who bore him several children, viz. Princess Clothilde (b. 1843), who married Prince Napoleon; Humbert, prince of Piedmont (1844); Amadeus, duke of Aosta (b. 1845); Oddone, duke of Montferrat (b. 1846); and Princess Maria Pia (b. 1847). Humbert, who

in 1868 had married Princess Margherita of Savoy,

daughter of Victor Emmanuel's brother, the duke of Genoa, became king of Italy on his father's death in 1878. In July 1900 he was assassinated by an anarchist at Monza. He

was succeeded by his only son, Victor Emmanuel III., victor korn in 1869, who during his father's lifetime had UL borne the title of prince

of Naples. The new king had

married Princess Elena of Montenegro in 1896, by whom he has had four children, viz. Princess Yolanda Margherita (b. 1901), Princess Mafalda (b. 1902), Humbert, prince of Pied- mont (b. 1904), and Princess Giovanna (b. 1907).

The second son of Victor Emmanuel II., Amadeus, duke of Aosta, was offered the crown of Spain by the Cortes in 1870, which he accepted, but, finding that his rule was not popular, he voluntarily abdicated in 1873 rather than cause civil war. In 1867 he married Princess Maria Vittoria dal Pozzo della Cisterna, who bore him three sons, viz. Emmanuel Philibert, duke of Aosta (b. 1869), commanding an Italian army corps; Victor Emmanuel, count of Turin; and Louis Amadeus, duke of Abruzzi, an Italian naval officer and a distinguished traveller, explorer and man of science. Amadeus's first wife having died in 1876, he married Princess Maria Letizia Bonaparte in 1888, who bore him a son, Humbert, count of Salemi (b. in 1889).

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SAW, a tool for cutting wood or other material, consisting of a blade with the edge dentated or toothed and worked either by hand or by steam, water, electric or other power (see Tools). The word in O. Eng. is saga and appears, in such forms as Dutch zaag, Dan. sav, Ger. Sage, in Teutonic languages. The root is sag-, to cut, which is seen in Lat. secare. It is also the base of such English words as scythe, sickle, &c. It must be dis- tinguished from " saw," a maxim, proverb, which is etymologic- ally and in meaning a " saying," from the Teutonic base sag-, to say; cf. " Saga," Ger. sagen.

SAWANTWARI, or Savantvadi, a native state of Bombay, India. Area, 925 sq. m. Pop. (1901) 217,732, showing an increase of 13% during the preceding decade. The surface is xxiv. 9

broken and rugged, interspersed with densely- wooded hills; in the

valleys are gardens and groves of cocoa-nut and betel-nut palms. Sawantwari has no considerable rivers; the chief streams are the Karli on the north and the Terakhol on the south, both navigable for small craft. The climate is humid and relaxing, with an average annual rainfall of 150 in. The esti- mated revenue is £28,000. The chief, whose title is sar desai, is a Mahratta of the Bhonsla family, who traces back his descent to the 16th century. There are special manufactures of orna- ments carved out of bison-horn, painted and inlaid lacquer-work, and gold and silver embroidery. The town of Sawantwaki, or Vadi, is picturesquely situated on the bank of a large lake, 17 m. E. of the seaport of Vengurla. Pop. (1901) 10,213.

Before the establishment of Portuguese power Sawantwari was the highway of a great traffic between the coast and the interior; but during the 16th and 17th centuries trade suffered much from the rivalry of the Portuguese, and in the disturbances of the 18th century it almost entirely disappeared. In conse- quence of piracy, the whole coast-line (including the port of Vengurla) was ceded to the British in 1812.

SAW-FLY, the name given to the members of a well-known subdivision (Symphyta) of the Hymenoptera characterized by possessing a sessile abdomen which hides the base of the posterior legs. The antennae vary in their structure and in the number of their joints. Two of the processes of the ovipositor are modified to form saws, which when at rest lie in a sheath formed of two other processes which are modified into protective structures or valves. The larvae are usually caterpillars, but may be distinguished from the caterpillars of Lepidoptera (moths and butterflies) by the greater number of their abdominal pro- legs; usually 6 to 8 pairs are present. When alarmed they roll<| themselves up in a spiral fashion; some also dis- charge a thin fluid from lateral pores

situated above the

Turnip Saw-Fly (Athalia spinarum). Saw-

spiracles. The ply (magnified, with lines to left showing natural females place size), caterpillars, pupa and pupa-case, their eggs in small

incisions made by means of their saws in the soft parts of leaves. Usually one egg is placed in each slit. Some species merely attach their eggs in strings to the exterior of the leaves. With each incision a drop of fluid is usually excreted, which serves to excite a flow of sap

to the wounded part. The egg is said to absorb this sap, and so to increase in size. One genus (Nemaius) alone forms galls. These occur in the young leaves of the willow, a tree which the true gall-flies do not attack. Nematus ventricosus resembles the bees and wasps in the fact that the parthenogenetic ova produce only males; as a rule in the animal kingdom the absence of fertilization results in the production of females.

The injury which the saw-flies inflict upon crops or young trees is almost entirely brought about by the voracious habits of the larvae. These possess well-developed mouth-appendages, by means of which they gnaw their way out of the leaf in which they have been hatched, and then eat it. In this way the turnip saw-fly {Athalia spinarum), not to be confused with the turnip ” fly , ” a beetle (Phyllotreta nemorum) , attacks the leaves of the turnip, often completely consuming the leafage of acres at a time. The pine saw-fly {Lophyrus pint) causes great damage to plantations of young Scotch firs, devouring the buds, the leaves and even the bark of the young shoots. Other species infest currant and gooseberry bushes, consuming the soft parts of the leaves, and leaving only the tough veins. The only remedy in most cases is to collect and kill the larvae when they first appear, or to spray the plants with some arsenical wash. The best known family of saw-flies is that of the Tenthredinidae, most of whose caterpillars feed on leaves. The larvae of other families—the Cephidae and Siricidae — are internal feeders, burrowing in succulent

or woody stems, and their limbs are in an extremely reduced condition.

SAWTREY, WILLIAM (d. 1401), English Lollard, was a priest at Lynn who was summoned before the bishop of Norwich for heresy in 1399. He does not appear at this time to have been seriously punished, and at the beginning of 1401 he is found in London, where his preaching again attracted the notice of the ecclesiastical authorities. The statute De haeretico comburendo had just been introduced for the purpose of stamping out heresy, but it had not become law when Sawtrey was summoned to St Paul’s and was charged with denying transubstantiation, with refusing to adore the cross except as a symbol, and with six other heresies. He defended himself ably against

Archbishop Thomas Arundel, but in February he was condemned and was degraded from the priesthood. Being the first Lollard to be put to death he was burned at St Paul's Cross in March 1401.

SAWYER, SIR ROBERT (1633-1692), English lawyer, a younger son of Sir Edmund Sawyer, auditor of the city of London, was educated at Magdalene College, Cambridge, where he dis- tinguished himself in classical learning, being the first Craven Scholar in 1648. He acquired a good practice at the bar, and in 1673 he was elected to the House of Commons, where for a short time in 1678 he was speaker. He inclined to the side of the court in politics, but was a strong opponent of concession to the Roman Catholics, and was one of the draftsmen of the Exclusion Bill. About the same time he began to appear as counsel in important state trials; he prosecuted Sir George Wakeman and others accused of complicity in the Popish plot in 1679; in 1681, having been in that year appointed attorney-general, he appeared for the crown in the prosecutions of Stephen College and Lord Shaftesbury; in the following year in the proceedings against the charter of the city of London; and in 1683 against Lord Russell and Algernon Sidney for complicity in the Rye House plot; and he conducted the case against Titus Oates for perjury in 1685. Although James II. retained him as attorney-general, he proved himself by no means a complacent instrument of the royal prerogative; he advised the king against the legality of the dispensing power, and objected to signing the patents appointing Roman Catholics to office from which they were excluded by law. He was dismissed from the attorney-generalship in 1687, and in the following year he appeared as leading counsel for the defence of the seven bishops, whose acquittal he secured. On the flight of James II., Sawyer main- tained that the throne had thereby been abdicated, and took a prominent part in the debates on the constitutional questions then brought to the front. Owing to an attack upon him in 1690 in relation to his conduct in the case of Sir Thomas Arm- strong in 1684, Sawyer was expelled from the House of Commons, but was returned again for Cambridge University shortly after- wards. He died on the 30th of July 1692. Sawyer's only daughter married Thomas Herbert, 8th earl of Pembroke.

See State Trials, vols, vii.-xii. ; Laurence Eachard, History of England (3 vols., London, 1707-17 18), especially- for Sawyer's defence of the seven bishops; Narcissus Luttrell, Brief Relation of State Affairs, 16/8-1714 (Oxford, 1857) ; Gilbert Burnet, History of His Own Times (6 vols., Oxford, 1833) ; and the Histories of England by Hallam and.Lord Macaulay.

SAX, ANTOINE JOSEPH, known as Adolphe (1814-1894), maker of musical instruments, was born at Dinant in Belgium on the 6th of November 1814 and died in Paris in 1894. In 1835 he perfected a bass clarinet superior to any that had preceded it. He came to Paris in 1842 and succeeded in interest- ing many eminent men, including Berlioz and Halevy. He set up a workshop in the Rue St Georges and studied acoustics, discovering a new principle in the manufacture of wind instru- ments, viz. that it is the proportions given to a column of air vibrating in a sonorous tube, and these alone, that determine the character of the timbre produced: the material of the walls of the tube is not of the slightest importance so long as it offers enough resistance. Together with his genius for mechanical invention Sax seems to have combined a knowledge of self- advertisement, and his name was often prefixed to successful types of instrument for the invention of which he was not

primarily responsible. In 1845 he patented his saxhorn and a family of cylinder instruments called saxotrombas. On the 22nd of June 1846 he registered the saxophone. He also effected various improvements in piston instruments, of which the most important was the substitution of a single ascending piston for a number of descending ones.

See J. P. O. Cornettant, Histoire d'un inventeur (i860) ; C. Pilard, Les Inventions Sax (1869).

SAXE, JOHN GODFREY (1816-1887), American poet, was born at Highgate, Vermont, on the 2nd of June 1816. He graduated at Middlebury College in 1839, and was admitted to the bar at St Albans, Vermont, in 1843. From 1850 to 1856 he edited the Burlington (Vermont) Sentinel, in 1859 and in i860 was the candidate of the Democratic party for governor of Vermont, in i860 removed to New York,, and after 1872 edited the Evening Journal at Albany, New York, where he died on the 31st of March 1887. He was best known as a writer of humorous verse and a lecturer. His travesties and satires found many readers or listeners, and some of his love lyrics and other poems combine sparkle with real feeling. His " Rhyme of the Rail," " The Proud Miss McBride," " I'm Growing Old " and " Treasures in Heaven " were once very popular. Among his published collections are Humorous and Satirical Poems (1850), The Times, The Telegraph, and other Poems (1865), and Leisure Day Rhymes

(1875).

SAXE, MAURICE, Comte de (1696-1750), marshal of France, was the natural son of Augustus II. of Saxony and the countess Aurora

Konigsmark, and was born at Goslar on the 28th of October 1696. In 1698 the countess sent him to Warsaw to his father, who had been elected king of Poland in the previous year, but on account of the unsettled condition of the country the greater part of his youth was spent outside its limits. This separation from his father made him independent of control and had an important effect on his future career. At the age of twelve he was present, with the army of Eugene, at the sieges of Tournay and Mons and the battle of Malplaquet, but the achievements ascribed to him in this campaign are chiefly fabulous. A proposal to send him at the close of it to a Jesuit college at Brussels was relinquished on account of the protests of his mother; and, returning to the camp of the allies in the beginning of 17 10, he displayed a courage so impetuous as to call forth from Eugene the friendly admonition not to confound rashness with valour. He next served under Peter the Great against the Swedes. After receiving in 1711 formal recognition from his father, with the rank of count, he accompanied him to Pomerania, and in 171 2 he took part in the siege of Stralsund. In manhood he bore a strong resemblance to his father, both in person and character. His grasp was so powerful that he could bend a horse-shoe with his hand, and to the last his energy and endurance were scarcely subdued by the illnesses resulting from his many excesses. In 1 7 14 a marriage was arranged between him and one of the richest of his father's subjects, Johanna Victoria, Countess von Loeben, but he dissipated her fortune so rapidly that he was soon heavily in debt, and, having given her more serious grounds of complaint against him, he consented to an annulment of the marriage in 1721. Meantime, after serving in a campaign against the Turks in 171 7, he had in 17 19 gone to Paris to study mathematics, and in 1720 obtained a commission as marechal de camp. In 1725 negotiations were entered into for his election as duke of Courland, at the instance of the duchess Anna Ivanovna, who offered him her hand. He was chosen duke in 1726, but declining marriage with the duchess found it impossible to resist her opposition to his claims, although, with the assistance of £30,000 lent him by the French actress Adrienne Lecouvreur, whose story forms the subject of Scribe and Legouve's tragedy, he raised ,a force by which he maintained his authority till 1727, when he withdrew and took up his residence in Paris. On the outbreak of the war in 1734 he served under Marshal Berwick, and for a brilliant exploit at the siege at Philippsburg he was in August named lieutenant-general. On the opening of the Austrian Succession War in 1741, he took command of a division of the army sent to invade Austria, and

on the 19th November surprised Prague during the night, and took it by assault before the garrison were aware of the presence of an enemy, a coup de main which made him famous throughout Europe. After capturing the strong fortress of Eger on the 19th April 1742, he received leave of absence, and went to Russia to push his claims on the duchy of Courland, but obtaining no success he returned to his command. His exploits had been the sole redeeming feature in an unsuccessful campaign, and on 26th March 1743 his merits were recognized by his promotion to be marshal of France. From this time he became one of the first generals of the age. In 1744 he was chosen to command the expedition to England in behalf of the Pretender, which assembled at Dunkirk but did not proceed farther. After its abortive issue he received an independent command in the Netherlands, and by dexterous manoeuvring succeeded in continually harassing the superior forces of the enemy without risking a decisive battle. In the following year he besieged Tournai and inflicted a severe defeat on the relieving army of the duke of Cumberland at Fontenoy (q.v.), a battle of which the issue was due entirely to his constancy and cool leadership. During the battle he was unable on account of dropsy to sit on horseback except for a few minutes, and was carried about in a wicker chariot. In recogni- tion of his brilliant achievement the king conferred on him the castle of Chambord for life, and in April 1746 he was naturalized as a French subject. Thenceforward to the end of the war he continued to command in the Netherlands, always with success. Besides Fontenoy he added Rocoux (1746) and Lawfeldt or Val (1747) to the list of French victories, and it was under his orders that Marshal Lowendahl captured Bergen-op-Zoom. He himself won the last success of the war in capturing Maestricht in 1748. In 1747 the title formerly held by Turenne, ” Marshal general of the King’s camps and armies,” was revived for him. But on the 30th of November 1750 he died at Chambord “of a putrid fever.” In 1748 there had been born to him a daughter, one of several illegitimate children, whose great-granddaughter was George Sand.

Saxe was the author of a remarkable work on the art of war, Mes Reveries, which though described by Carlyle as “a strange military farrago, dictated, as I should think, under opium,” is in fact a classic. It was published posthumously in 1757 (ed. Paris, 1877). His Letlres et memoires choisis appeared in 1794. His letters to his sister, the princess of Holstein, preserved at Strassburg, were de- stroyed by the bombardment of that place in 1870; thirty copies had, however, been printed from the original. Many previous errors in former biographies were corrected and additional information supplied in Carl von

Weber's Moritz, Graf von Sachsen, Marschall von Frankreich, nach archivalischen Quellen (Leipzig, 1863), in St Ren6 Taillandier's Maurice de Saxe, etude historique d'apres les documents des archives de Dresde (1865) and in C. F. Vitzthum's Maurice de Saxe (Leipzig, 1861). See also the military histories of the period, especially Carlyle's Frederick the Great.

SAXE-ALTENBURG (Ger. Sachsen- Altenburg), a duchy in Thuringia, forming an independent member of the German Empire and consisting of two detached and almost equal parts, separated from each other by a portion of Reuss, and bounded on the S. and W. by the grand duchy of Saxe-Weimar-Eisenach, on the N. by Prussia, and on the E. by the kingdom of Saxony. There are in addition twelve small exclaves. The total area is 511 sq. m., of which 254 are in the east, or Altenburg, division, and 257 in the west, or Saal-Eisenberg, division. The eastern district, traversed by the most westerly offshoots of the Erzge- birge and watered by the Pleisse and its tributaries, forms an undulating and fertile region, containing some of the richest agricultural soil in Germany. The western district, through which the Saale flows, is rendered hilly by the foothills of the Thuringian Forest, and in some measure makes up by its fine woods for its comparatively poor soil. The mineral wealth of Saxe-Altenburg is scanty; lignite, the chief mineral, is worked mainly in the eastern district. Nearly 60% of the entire duchy is occupied by arable land, and about 26% by forests, mainly consisting of conifers. Oats, rye, wheat and potatoes are the chief crops. Cattle-raising and horse-breeding are of considerable importance. About 35% of the population are directly sup- ported by agriculture. The manufactures of the duchy are

varied, though none is of first-rate importance; woollen goods, gloves, hats, porcelain and earthenware, bricks, sewing-machines, paper, musical instruments, sausages and wooden articles are the chief products. Trade in these, and in horses, cattle and agricultural produce, is brisk. The chief seats of trade and manufacture are Altenburg the capital, Ronneburg, Schmolln, Gossnitz and Meuselwitz in the Altenburg division; and Eisen- berg, Roda and Kahla in the Saal-Eisenberg division. Besides these there are the towns of Lucka, Orlamunde and Russdorf in an exclave. The duchy includes one of the most densely inhabited districts in the Thuringian states. The population in 1905 was 206,508, of whom 200,511 were Protestants and 5449 Roman Catholics. In the west division the population is wholly Teutonic, but in the east there is a strong Wendish or Slavonic element, still to be traced in the peculiar manners and costume of the country-people, though these are gradually disappearing. The Altenburg peasants are industrious and prosperous; they are said to be

avaricious, but to love pleasure, and to gamble for high stakes, especially at the card game of Skat (q.v.), which many believe to have been invented here. Their holdings are rarely divided, and a common custom is the inheritance of landed property by the youngest son. They are decreasing in numbers.

Saxe-Altenburg is a limited hereditary monarchy, its con- stitution resting on a law of 183 1, subsequently modified. The diet consists of 32 members, elected for 3 years, of whom 9 are returned by the highest taxpayers, 1 1 by the towns and 1 2 by the country districts. The franchise is enjoyed by all males over 25 years of age who pay taxes. The duke has considerable powers of initiative and veto. The executive is divided into four departments, justice, finance, the interior, and foreign and ecclesiastical affairs. The annual revenue and expenditure stand at about £230,000 each. There was a public debt in 1909 of £44,370. Saxe-Altenburg has one vote in the Reichstag and one in the Bundesrat (federal council).

History. — The district now forming the duchy of Saxe-Alten- burg came into the possession of the margrave of Meissen about 1329, and later with Meissen formed part of the electorate of Saxony. On the division of the lands of the Wettins in 1485 it was assigned to the Albertine branch of the family, but in 1554 it passed by arrangement to the Ernestine branch. In 1603 Saxe-Altenburg was made into a separate duchy, but this only lasted until 1672, when the ruling family became extinct and the greater part of its lands was inherited by the duke of Saxe- Gotha. In 1825 the family ruling the duchy of Saxe-Gotha- Altenburg became extinct and another division of the Saxon lands was made. Frederick (d. 1834) exchanged the duchy of Saxe-Hildburghausen, which he had ruled since 1780, for Saxe- Altenburg, and was the founder of the present reigning house. In answer to popular demands a constitution was granted to Saxe-Altenburg in 1831, and greater concessions were extorted by the more threatening disturbances of 1848. In November of this year Duke Joseph abdicated and was succeeded by his brother George. Under George's son Ernest (1826-1908), who became duke in 1853, a period of reaction began and the result was that the constitution was made less liberal. In 1874 a long dispute over the public domains was settled, two-thirds of these being assigned to the duke in lieu of a civil list. In 1908 Ernest was succeeded by his nephew Ernest (b. 1871).

See Frommelt, Sachsen-altenburghische Landeskunde (Leipzig, 1838-1841); L. von Braun, Erinnerungsblatter aus der Geschichte Allenburgs 1525-1826 (Altenburg, 1876); Malzer, Die Landwirt- schaft im Herzogtum Altenburg (Stuttgart, 1907); Albrecht, Das

Domdnenwesen im Herzogtum Saxe-Altenburg (Jena, 1905); and E. Lohe, Altenburgica (Altenburg, 1878).

SAXE-COBURG-GOTHA (Ger. Sachsen-Koburg-Gotha), a sovereign duchy of Germany, in Thuringia, and a constituent member of the German empire, consisting of the two formerly separate duchies of Coburg and Gotha, which lie at a distance of 14 m. from each other, and of eight small scattered exclaves, the most northerly of which. is 70 m. from the most southerly. The total area is 764 sq. m., of which about 224 are in Coburg and 540 in Gotha. The duchy of Coburg is bounded on the S.E., S., and S.W. by Bavaria, and on the other sides by Saxe-

Meiningen, which, with part of Prussia, separates it from Gotha. The considerable exclave of Konigsberg in Bavaria, 10 m. south, belongs to Coburg. Lying on the south slope of the Thuringian Forest, and in the Franconian plain, the duchy of Coburg is an undulating and fertile district, reaching its highest point in the Senichshohe (1716 ft.) near Mirsdorf. Its streams, the chief of which are the Itz, Biberach, Steinach and Rodach, all find their way into the Main. The duchy of Gotha, more than twice the size of Coburg, stretches from the south borders of Prussia along the northern slopes of the Thuringian Forest, the highest summits of which (Der grosse Beerberg, 3225 ft.; Schneekopf, 3179 ft.; and Inselsberg, 2957 ft.) rise within its borders. The more open and level district on the north is spoken of as the ” open country ” (das Land) in contrast to the wooded hills of the ” forest ” (der Wald). The Gera, Horsel, Unstrut and other streams of this duchy flow to the Werra, or to the Saale. The climate is that of the other central states of Germany, temperate in the valleys and plains and somewhat inclement in the hilly regions.

Industries and Population. — In both duchies the chief industry is agriculture, which employs about 30% of the entire popula- tion. According to the returns for 1905, about 50% of the area was occupied by arable land, 10% by meadow-land and pasture and 30% by forest. In the same year the chief crops were oats, barley, rye, wheat, potatoes and hay. A small quantity of hemp and flax is raised, but a considerable quantity of fruit and vegetables is annually produced, and some wine, in the Coburg district of Konigsberg. Cattle-breeding is important, especially in Gotha and the Itz valley in Coburg. Beehives are numerous and produce excellent honey, and

poultry is reared in large numbers for export. The mineral wealth of Saxe-Coburg-Gotha is insignificant, small quantities of coal, lignite, ironstone and millstone being annually raised. There are also salt-works, and some deposits of potter's clay.

The manufactures of the duchies, especially in the mountainous parts less favourable for agriculture, are tolerably brisk, but there is no large industrial centre in the country. Iron goods and machinery, glass, earthenware, chemicals and wooden articles, including large quantities of toys, are produced; and various branches of textile industry are carried on. Coburg (pop. 1905, 24,289) and Gotha (36,893) are the chief towns of the duchies, to which they respectively give name; the latter is the capital of the united duchy. There are nine other small towns, and 320 villages and hamlets. Friedrichroda and Ruhla, the Inselsberg and the Schneekopf and other picturesque points, annually attract an increasing number of summer visitors and tourists. The population in 1905 was 242,432 (117,224 males and 125,208 females), or about 290 to the square mile. Of these 71,512 were in Coburg and r 70,920 in Gotha; the relative density in either duchy being about equal. In Coburg the people belong to the Franconian and in Gotha to the Thuringian branch of the Teutonic family, and, according to religious confessions, almost the entire population is Lutheran, Roman Catholics only number- ing some 3000 and Jews about 700.

Constitution and Administration. — Saxe-Coburg-Gotha is a limited hereditary monarchy, its constitution resting on a law of 1852, modified in 1874. For its own immediate affairs each duchy has a separate diet, but in more important and general matters a common diet, formed of the members of the separate diets and meeting at Coburg and Gotha alternately, exercises authority. The members are elected for four years. The Coburg diet consists of eleven members and the Gotha diet of nineteen. The franchise is extended to all male taxpayers of twenty-five years of age and upwards. The ministry has special departments for each duchy, but is under a common president. There is a sub-department for the control of ecclesiastical affairs, which are locally managed by ephories, twelve in number. The united duchy is represented in the imperial Bundesrat by one member and in the Reichstag by two members, one for each duchy. By treaty with Prussia in 1867 the troops of the duchy are incor- porated with the Prussian army. The budget is voted in either duchy for four years, a distinction being made between domain revenue and state revenue. Taking both together the receipts

into the exchequer on behalf of Coburg were estimated for 1909- 1910

at about £100,000 and those for Gotha at about £200,000, while the common state expenditure amounted to about the same sum. The civil list of the reigning duke is fixed at £15,000 a year, in addition to half the proceeds of the Gotha domains, after £5000 has been deducted and paid into the state exchequer, and half the net revenue of the Coburg domains. Besides the civil list the duke of Saxe-Coburg-Gotha enjoys a very large private fortune, amassed chiefly by Ernest I., who sold the principality of Lichtenberg, which the congress of Vienna had bestowed upon him in recognition of his services in 1813, to Prussia for a large sum of money.

History. — The district of Coburg came into the possession of the family of Wettin in the 14th century, and after the Wettins had become electors of Saxony this part of their lands fell at the partition of 1485 to the Ernestine branch of the house. In 1572 Gotha was given to John Casimir, a son of the Saxon duke John Frederick, but when he died childless in 1633 it passed to another branch of the family. In 1680, as Saxe-Coburg, it was formed into a separate duchy for Albert, one of the seven sons of Ernest I., duke of Saxe-Gotha (d. 1675), but he died childless in 1699, when his possessions were the subject of vehement conten- tions among the collateral branches of the Saxon house. Eventu- ally it was assigned to Albert's youngest brother, John Ernest (d. 1729), who called himself duke of Saxe-Coburg-Saalfeld, and who left two sons, Christian Ernest and Francis Josiah, who ruled the land together, the principle of primogeniture being introduced by the survivor of the two, Francis Josiah. Under this duke and his son and successor, Ernest Frederick, the land was plunged into bankruptcy and a commission was appointed to manage its finances. The measures adopted to redeem the country's credit were successful, but they imposed much hardship on the people and a rising took place which was only quelled by the aid of troops from electoral Saxony. Duke Francis died in December 1806 and was succeeded by his son Ernest, although the country was occupied by the French from 1807 to 18 16.

Also an early possession of the Wettins, Gotha fell at the partition of 1485 to the Albertine branch of the family, but was transferred to the Ernestine branch by the capitulation of Wittenberg of 1547. In 1554 it became a separate duchy, its line of rulers being founded by Duke John Frederick, a son of the dispossessed elector of Saxony, John Frederick, and becoming extinct in 1638. In 1640 Saxe-Gotha came into the possession of Ernest the Pious, and after his death in 1675 its duke was his eldest son Frederick (d. 1691), whose family, having inherited Altenburg, became extinct in February 1825 with the death of Duke Frederick IV. This event was followed in 1826 by a re-

distribution of the Saxon lands. Ernest, duke of Saxe-Coburg* Saalfeld, exchanged Saalfeld for Gotha, took the title of duke of Saxe-Coburg-Gotha and became the founder of the present ruling house.

Ernest II. (1818-1893) succeeded to the duchy in 1844, and during his long reign various reforms were achieved and the union of the two parts of the duchy was made closer. This duke had no issue, and the succession passed to the children of his brother Albert, the English prince consort. In 1855 his second son, Prince Alfred, had been declared heir to the duchy, and he succeeded his uncle in 1893. When he died without sons in July 1900, the succession having been renounced by his brother, the duke of Connaught and his issue, Saxe-Coburg passed to Charles Edward, duke of Albany (b. 1884), a nephew of the late duke. For many years there had been trouble between the ruler and the people over the ownership of the extensive crown lands, it being evidently feared at one time that an English prince might renounce the throne and yet claim the lands. The matter was settled by a law of 1905, on the lines mentioned in the earlier section of this article.

See Fleischmann, Zur Geschichte des Herzogtums Sachsen-Coburg (Hildburghausen, 1880); A. Lotz, Koburgische Landesgeschichte (Coburg, 1892).

SAXE-MEININGEN (Ger. Sachsen-Meiningen), a duchy in Thuringia, forming an independent member of the German

empire and consisting chiefly of an irregular crescent-shaped territory, which, with an average breadth of 10 m., stretches for over 80 m. along the south-west slope of the Thuringian Forest. The convex side rests upon the duchy of Coburg and is in part bounded by Bavaria, while the concave side, turned towards the north, contains portions of four other Thuringian states and Prussia between its horns, which are 46 m. apart. The districts of Kranichfeld, 15 m. N.W., and Kamburg, 22 m. N. of the eastern horn, together with a number of smaller scattered exclaves, comprise 74 of the 953 sq. m. belonging to the duchy. The surface on the whole is hilly and is partly occupied by offshoots of the Thuringian Forest; the highest summits are found in the eastern half, where the Kieferle reaches 2849 ft. and the Blessberg 2835 ft. The chief streams are the Werra, which traverses the south and east of the duchy, and various tributaries of the Main and the

Saale, so that Saxe-Meiningen belongs to the basins of the three great rivers Weser, Rhine and Elbe.

The soil is not very productive, although agriculture flourishes in the valleys and on the level ground; grain has to be imported to meet the demand. Only 41% of the total area is devoted to agriculture, while meadow-land and pasture occupy 11%. The chief grain crops are oats, rye and wheat, and the cultivation of potatoes is general. Tobacco, in the Werra district, hops and flax are also raised. The Werra valley and the other fertile valleys produce large quantities of fruit. The raising of cattle, pigs and sheep is a fairly important branch of industry throughout the duchy; horses are bred in Kamburg. The extensive and valuable forests, of which 75% consist of coniferous trees, occupy 42% of the entire area. About 42% of the forests belong to the state and about 33 % to public bodies and institu- tions, leaving only 25% for private owners. The mineral wealth of the duchy is not inconsiderable. Iron, coal and slate are the chief products, and copper and cobalt may be added. There are salt-works at Salzungen and Neusulza, the former the most important in Thuringia; and the mineral water of Fried-richshall is well known. The manufacturing industry of Saxe-Meiningen is active, especially in the districts of Sonneberg, Grafenthal and Saalfeld. Iron goods of various kinds, glass and pottery, school slates, pencils and marbles are produced; the abundant timber fosters the manufacture of all kinds of wooden articles, especially toys; and the textile industry and the manufacture of leather goods, papier mache and sewing-machines are also carried on.

The capital of the duchy is Meiningen; the other principal towns are Salzungen, Hildburghausen, Eisfeld, Sonneberg, Saalfeld, Possneck and Kamburg. In 1905 the population was 268,916, of whom 30% live in communities of more than 2000. As in the other Saxon duchies the population is almost exclu- sively Protestant; in 1905, 262,243 belonged to the Lutheran confession, 4845 were Roman Catholics and 1256 Jews.

Saxe-Meiningen is a limited monarchy, its constitution resting on a law of 1829, subsequently modified. The diet, elected for six years, consists of 24 members, of whom 4 are elected by the largest landowners, 4 by those who pay tax on incomes of £150 or more, and 16 by the other electors. The franchise is enjoyed by all domiciled males over twenty-five years of age who pay taxes. The government is carried on by a ministry of five, with departments for the ducal house and foreign affairs, home affairs, justice, education and public worship and finance. The revenue, £190,000 of which is drawn from the state domains, stands at about £480,000 a year. The expenditure, including

a civil list of £20,000, stands at £445,000. In 1909 the state had a debt of £302,270. Saxe-Meiningen has one vote in the German federal council (Bundesrat) and sends two members to the Reichstag.

History. — The duchy of Saxe-Meiningen, or more correctly Saxe-Meiningen-Hildburghausen, was founded in 1681 by Bernard, the third son of Ernest the Pious, duke of Saxe-Gotha, and consisted originally of the western part of the present duchy, the district around Meiningen. Bernard was succeeded in 1706 by his three sons, Ernest Louis, Frederick William and Anton

Ulrich, but after 1746 the only survivor was the youngest, Anton Ulrich, who reigned alone from this date until his death in 1763. By this time the duchy had increased considerably in extent, but petty wars with the other Saxon princes combined with the extravagance of the court and the desolation caused by the Seven Years' War to plunge it into distress and bankruptcy. A happier time, however, was experienced under Charlotte Amalie, Anton's widow, who ruled as regent for her sons, Charles (d. 1782) and George (d. 1806). Under the latter prince the country prospered greatly, and having introduced the principle of primogeniture, he died and was succeeded by his infant son, Bernard Ernest Freund (1800-1882), whose mother, Eleanora of Hohenlohe-Langenburg, governed in his name until 182 1. The war with France at the beginning of this reign, with its attendant evils, quartering of troops, conscription and levies of money, joined with cattle disease and scanty harvests in plunging the land again into distress, from which it recovered very slowly.

In 1825 the extinction of the family ruling Saxe-Gotha made a rearrangement of the Saxon duchies necessary, and Saxe- Meiningen benefited greatly by the settlement of 1826, its area being more than doubled by the receipt of 530 sq. m. of territory. The additions consisted of the duchy of Saxe-Hildburghausen, founded in 1680 by Ernest, the sixth son of Ernest the Pious; the duchy of Saxe-Saalfeld, founded by John Ernest, the seventh son of Ernest the Pious, which had been united with Saxe-Coburg in 1 73 5 ; and the districts of Themar, Kranichfeld and Kamburg. In 1823 Bernard had granted a liberal constitution to his duchy, but these additions made further changes inevitable and a new constitution was granted in 1829. Saxe-Meiningen had entered the confederation of the Rhine in 1807, but had joined the allies in 18 13 and became a member of the German confederation ini8i5. In 1866, unlike the other Saxon duchies, Saxe-Meiningen declared for Austria in the war with Prussia; at once the land was occupied by Prussian troops, and in September 1866 Duke Bernard abdicated and was succeeded by his son George (b. 1826),

who immediately made peace with Prussia and joined the North German Confederation, his land becoming a member of the new-German empire in 1871. In 1871 the dispute which had been carried on since 1831 between the duke and the diet about the rights of each to the state domains was settled by a compromise, each party receiving a share of the revenues. The heir-apparent Prince Bernard (b. 1851) has no sons, so by a law of 1896 the succession is settled upon the sons of his half-brother Prince Frederick (b. 1861).

See Statistik des Herzoglums Sachsen- Meiningen (Meiningen, 1892 fol.); Bruckner, Landeskunde des Herzoglums Sachsen-Meiningen (Meiningen, 1853) ; Goeckel, Das Staatsrecht des Herzoglums Sachsen-Meiningen (Jena, 1904) ; Anschiitz, Industrie, Handel und Verkehr im Herzogtum Sachsen-Meiningen (Sonneberg, 1904); and the publications of the Verein fur sachsen-meiningische Geschichte und Landeskunde (Hildburghausen, 1888 fol.).

SAXE-WEIMAR-EISENACH (Ger. Sachsen-Weimar-Eisenach), a grand duchy of Germany and a sovereign and constituent state of the German empire. It is the largest of the Thuringian states, and consists of the three chief detached districts of Weimar, Eisenach and Neustadt, and twenty-four scattered exclaves, of which Allstedt, Oldisleben and Ilnienau belonging to Weimar, and Ostheim belonging to Eisenach, are the chief. The first and last named of these exclaves are 70 m. apart; and the most easterly of the other exclaves is 100 m. from the most westerly. The total area of the grand-duchy is 1397 sq. m., of which 678 are in Weimar, 465 in Eisenach and 254 in Neustadt. The population in 1905 was 388,095 (189,422 males and 198,673 females), on an average 271 to the square mile, of whom the greatest bulk are Lutherans, the Roman Catholics only numbering about 18,000, and Jews and those of other confessions about 1500 in all. Of the population about 47% live in towns or communes exceeding 2000 inhabitants, and about 53% are rural.

The district of Weimar, which is at once the largest division

and the geographical and historical kernel of the grand-duchy.

I is a roughly circular territory, situated on the plateau to the

north-east of the Thuringian Forest. It is bounded on the N. and E. by Prussia, and on the S. and W. by Schwarzburg and detached portions

of Saxe-Altenburg, and lies 23 m. east of the nearest part of Eisenach, and 7 m. north-west of the nearest part of Neustadt. The exclaves of Allstedt and Oldisleben lie in Prussian territory 10 m. to the north and north-west respectively; Ilmenau as far to the south-west. The surface is undulating and destitute of any striking natural features, although the valleys of the Saale and Ilm are picturesque. The Kickelhahn (2825 ft.) and the Hohe Tanne (2641 ft.) rise in Ilmenau; but the Grosser Kalm (1814 ft.) near Remda, in the extreme south, is the highest point in the main part of Weimar. The Saale flows through the east of the district and is joined by the Ilm, the Elster and the Unstrut. The chief towns are Weimar, the capital, on the Ilm; Jena, with the common uni- versity of the Thuringian states, on the Saale; Apolda, the " Manchester of Weimar," to the east; and Ilmenau, lying among the hills on the edge of the Thuringian Forest to the S.W. of Weimar.

Eisenach, the second district in size, and the first in point of natural beauty, stretches in a narrow strip from north to south on the extreme western boundary of Thuringia, and includes parts of the church lands of Fulda, of Hesse and of the former countship of Henneberg. It is bounded on the N.and W. by Prussia, on the S. by Bavaria (which also surrounds the exclave of Ostheim) and on the E. by Saxe-Meiningen and Saxe-Gotha. The north is occupied by the rounded hills of the Thuringian Forest, while the Rhon mountains extend into the southern part. The chief summits of the former group, which is more remarkable for its fine forests and picturesque scenery than for its height, are the Wart burgberg (1355 ft.), the north- western termination of the system, Ottowald (2103 ft-), the Wachstein (1900 ft.) and the Ringberg (2290 ft). The chief river is the Werra, which flows across the centre of the district from east to west, and then bending suddenly northwards, re-enters from Prussia, and traverses the north-eastern parts in an irregular course. Its chief tributaries in Eisenach are the Horsel and the Ulster. Eisenach is the only town of importance in this division of the grand-duchy.

Neustadt, the third of the larger divisions, is distinguished neither by picturesque scenery nor historical interest. It forms an oblong territory, about 24 m. long by 16 broad, and belongs rather to the hilly district of the Vogtland than to Thuringia. It is bounded on the N. by Reuss (junior line) and Saxe-Altenburg, on the W. by Saxe-Meiningen and a Prussian exclave, on the S. by the two Reuss principalities and on the E. by the kingdom of Saxony. The Kesselberg (1310 ft.), near the town of Neustadt, is the chief eminence. This district lies in the basin of the Saale, its chief streams being the White (Weisse) Elster, the Weida and the Orla. Neustadt, Auma and Weida are the principal towns.

Agriculture forms the chief occupation of the inhabitants in all parts of the duchy, though in Eisenach and around Ilmenau a large proportion of the area is covered with forests. According to the return for 1900 about 55% of the entire surface was occupied by arable land, 26 % by forest and 9 % by pasture and meadow-land. Only about 5% was unproductive soil or moorland. In 1900 the chief crops were oats, barley, rye, wheat, potatoes, hay, beet (for sugar), flax and oil-yielding plants. Fruit grows in abundance, especially around Jena, and vines are cultivated with great success on the banks of the Saale. Of the forests, about 38 % are deciduous and 62 % coniferous trees, and the greater part of the former belong to the government. Cattle-raising is carried on to a considerable extent, especially in Eisenach and Neustadt, while the sheep-farming centres in Weimar. Poultry is also reared in considerable quantities. Although iron, copper, coal and lignite are worked, the mineral wealth is trifling. There are salt springs at Berka and Stadtsulza.

The manufacturing industries in the grand-duchy are consider- able; they employ 41 % of the population. The most important is the textile industry, which centres in Apolda. The production of woollen goods (stockings, cloth, underclothing) forms the leading branch of this industry; but cotton and linen weaving and yarn- spinning are also carried on. Large quantities of earthenware and crockery are made, especially at Ilmenau. The optical instruments of Jena and the scientific instruments of Ilmenau are well known. Leather, paper, glass, cork and tobacco are among the less prominent manufactures. There are numerous breweries in the duchy. The

volume of trade is not very great, although some of the productions are exported all over Europe, and in some cases to other continents as well.

Constitution. — Saxe- Weimar-Eisenach is a limited hereditary monarchy, and was the first state in Germany to receive a liberal constitution. This was granted in 1816 by Charles Augustus, the patron of Goethe, and was revised in 1850 and again in 1906. The diet consists of one chamber with thirty-eight members, of whom five are chosen by owners of land worth at least £150 a year, five by those who derive a similar income from other sources, five by the university of Jena and other public bodies, and twenty-three by the rest of the inhabitants. The deputies are elected for six years. The franchise is enjoyed by all domiciled citizens over twenty-one years of age. The government is carried on by a ministry of three, holding the portfolios of finance; of home and foreign affairs; and of religion, education and justice, with which is combined the ducal house- hold. The duchy is

represented by one vote in the Bundesrat and by two members in the Reichstag.

The Saxe- Weimar family is the oldest branch of the Ernestine line, and hence of the whole Saxon house. By a treaty with Prussia in 1867, which afterwards became the model for similar treaties between Prussia and other Thuringian states, the troops of the grand-duchy were incorporated with the Prussian army.

The budget is voted by the chamber for a period of three years. That from 1908 to 1910 estimated an annual income and an annual expenditure of about £620,000. A large income is derived from the state forests. The public debt amounted to £145,000 in 1908, but it is amply secured by real estate and invested funds. Justice is administered by two high courts (Landesgerichte), at Weimar and Eisenach respectively; the district of Neustadt falling under the jurisdiction of the Landes- gericht at Gera; while the supreme court of appeal for the four Saxon duchies, Schwarzburg-Rudolstadt and Reuss, together with portions of Prussia, is the Oberlandesgericht at Jena.

History. — In early times Weimar with the surrounding district belonged to the counts of Orlamiinde, and from the end of the 10th century until 1067 it was the seat of the counts of Weimar. In the 14th century it passed to the elector of Saxony, falling at the partition of 1485 to the Ernestine branch of the Wettin family. Although John Frederick the Magnanimous was de- prived of the electorate in 1547 his sons retained Weimar; and one of them, John William (d. 1573), may be regarded as the founder of the present ruling house, but it was not until 1641 that Saxe-Weimar emerged into an independent historical position. In this year, having just inherited Coburg and Eisenach, the three brothers William, Albert and Ernest founded the three principalities of Saxe-Weimar, Saxe-Eisenach and Saxe-Gotha. Eisenach fell to Saxe-Weimar in 1644, and although the enlarged principality of Saxe- Weimar-Eisenach was temporarily split up into the lines Saxe-Weimar, Saxe-Eisenach and Saxe-Jena, it was again united under Ernest Augustus, who began to reign in 1728, and the adoption of the principle of primogeniture about this time secured it against further divisions. Ernest Augustus II., who succeeded in 1748, died in 1758, and his young widow, Anna Amelia, was appointed regent of the country and guardian of her infant son Charles Augustus. The reign of this prince, who assumed the govern- ment in 1775, is the most brilliant epoch in the history of Saxe- Weimar. An intelligent patron of literature and art, he attracted to his court the leading scholars in Germany; Goethe, Schiller and Herder were members of this illustrious band, and the little state, hitherto obscure, attracted

the eyes of all Europe. 1

The war between France and Prussia in 1806 was fraught with danger to the existence of the principality, and after the battle of Jena it was mainly the skilful conduct of the duchess Louise, the wife of Charles Augustus, that dissuaded Napoleon

1 See Goethe's famous lines, Epigramme (35) : —

" Klein ist unter den Fflrsten Germaniens freilich der meine ; Kurz und schmal ist sein Land, mascig nur, was er vermag. Aber so wende nach innen, so wende nach aussen die Krafte_ Jeder; da war' esein Fest, Deutscher mit Deutschen m sein."'

from removing her husband from his place as a reigning prince. In 1807 Saxe-Weimar-Eisenach entered the Confederation of the Rhine and in the subsequent campaigns it suffered greatly. The Congress of Vienna in 1815 added about 660 sq. m. to its area and gave its ruler the title of grand-duke. Just after the conclusion of peace Charles Augustus gave a liberal constitution to his land; freedom of the press was also granted, but after the festival of the Wartburg on the 18th of October 181 7 this was seriously curtailed. The next grand-duke, Charles Frederick, who succeeded in 1828, continued his father's work, but his reforms were not thorough enough nor rapid enough to avert disturbances in 1848, when power was given to a popular ministry and numerous reforms were carried through. Reaction set in under Charles Alexander, who became grand-duke in 1853, and the union of the crown lands and the state lands was undone, although both remained under the same public manage- ment. In 1866 the grand-duchy joined Prussia against Austria, although its troops were then garrisoning towns in the interests of the latter power; afterwards it entered the North German Confederation and the new German empire. Charles Alexander died in January 1901 and was succeeded by his grandson William Ernest (b. 1876).

See C. Kronfeld, Landeskunde des Grossherzogtums Sachsen- Weitnar-Eisenach (Weimar, 1 878-1 879); and the official Staats- handbuch fur das Grossherzogtum Sachsen (Weimar, 1904).

SAXHORN, the generic name of a family of brass wind instru- ments (not horns but valve-bugles) with cup-shaped mouthpieces, invented by Adolphe Sax and in use chiefly in French and Belgian military

bands and in small wind-bands. The saxhorns earner into being in 1843, when Sax applied a modification of the valve system invented in Germany in 181 5 to the keyed bugle. The saxhorn consists of a conical tube of a calibre greater than that of French horn and trumpet, but smaller than that of the tubas or bombardons, and capable therefore of producing by overblowing the members of the harmonic series from the 2nd to the 8th, in common with the cornets, bugles, valve-trombones and the Wagner tubas. The he

m

saxhorns are furnished with

three valves, by means of which 2 3 ” 7 s 6 7

the compass is rendered chromatic, and which act as in other valve instruments, lowering the pitch of the instrument when depressed, respectively 1 tone, a semitone and ij tones; and further, when used in combination, 2 tones, 2ˆ tones and 3 tones. . The Flugelhorns, the euphonium, the bom- bardon and the tubas are sometimes erroneously classed as saxhorns. The difference between saxhorns and bombardons or tubas consists in the calibre of the bore, which in the latter is sufficiently wide in proportion to the length to produce the fundamental note of the harmonic series an octave below the lowest note of the saxhorns. The consequence of this structural difference is important, for whereas the tube of the tubas is theoretically of the same length as an open organ pipe of the same pitch, the saxhorns require a tube twice that length to produce the same scale. For instance, a euphonium sounding 8 ft. C only needs a tube 8 ft. long, whereas the corresponding bass saxhorn requires one 16 ft. long. In Germany these structural differences have given rise to a classification of brass wind instru- ments as whole or half instruments {Ganze or Halbe), 1 according to whether the whole or only the half of the length of tubing is of practical use. The members of the saxhorn family are the small saxhorn in Eb, the soprano in Bb, the alto in Eb, the tenor in Bb, the bass in Bb (an octave lower), the low bass in Eb, the contra- bass in Bb, three octaves below the soprano. All the saxhorns are treated as transposing instruments. 2 A similar family, con- structed with rotary valves and conical tubes of larger calibre than the saxhorns, but having the same harmonic scale, is known in Germany as Fliigelhorn. (K. S.)

1 See Dr Emil Schafhautl’s article on musical instruments in sect. iv. of Bericht der Beurteilungscommission bei der allg. deutschen Industrieausstellung, 1854 (Munich, 1855), pp. 169-170.

2 Georges Kastner, in Manuel general de musique militaire (Paris, 1848), gives full information on the saxhorns, pp. 230 et seq., 246-247, and Pis. xxii. and xxiii.

SAXIFRAGACEAE, in botany, a small natural order of Dicotyledons belonging to the sub-class Polypetalae and con- taining 27 genera with about 350 species distributed through the Arctic and north temperate zone, often alpine. It is repre-

Fig. 1. — Saxifraga umbrosa, London Pride, about half natural size. 1, Flower enlarged. 2, Vertical section of ovary with sepals, more enlarged.

sented in Britain by its largest genus Saxifrage (q.v.), Chryso- splenium (golden saxifrage) and Pamassia (grass of Parnassus). The plants are herbs, generally with scattered exstipulate leaves with a broad leaf-base. , The small flowers are generally arranged in cymose inflorescences and are

bisexual, regular and hypogynous,

perigynous or more frequently more

or less epigynous, this variation in

the relative position of the ovary

occurring in one and the same genus

Saxifraga (fig. 1). The flowers are

5-merous, more rarely 4-merous,

having 5 (or 4) sepals, 5 (or 4) free

petals, two 5- or 4-merous whorls of

free stamens which are obdiploste-

monous, i.e. those of the outer whorl

are opposite to the petals, and two

carpels (see fig. 2). The carpels are sometimes free, more

generally united at the base, or sometimes completely joined

to form a one- or two-chambered ovary with two free styles.

The fruit is a many-seeded capsule.

More than half the species (200) are contained in the genus Saxi- frage (g.v.) . Chrysosplenwm, with 39 species, two of which are British,

Fig. 2. — Diagram of a saxifrage (Saxifraga tridac- tylites). The calyx and corolla each consist of five parts, there are ten stamens in two series, and a pistil of two carpels.

has a very similar distribution. The North American genus Heuchera has sometimes apetalous flowers. Astilbe has 6 species in temperate Asia and north-eastern North America; A. japonica is commonly grown in the spring as a pot-plant, and often misnamed Spiraea.

The order is frequently much extended to include other groups of genera differing in habit and more or less in general conformation from those to which the order is here confined, and which are then regarded as forming one of several tribes. Among these is the order Ribesiaceae, comprising one single genus Ribes, to which belong the gooseberry (R. Grossularia) and currants of gardens. These are shrubs with racemes of flowers which have only one whorl of stamens (isostemonous), an inferior unilocular ovary with two parietal placentas, and fruit a berry. Another is the Hydrangeaceae, to which belong Hydrangea (q.v.), Deutzia and Philadelphus , all well- known garden plants; P. coronarius is the so-called Syringa or mock-orange. They are shrubs or trees with simple generally opposite leaves, 5-merous flowers with epigynous stamens and a 3- to 5-locular ovary.

Escallonia, which represents a small group of genera with leathery gland-dotted leaves, is also often included.

SAXIFRAGE (Saxifraga), a genus of plants which gives its name to the order of which it is a member. There are nearly 200 species distributed in the temperate and arctic parts of the northern hemisphere, frequently at considerable heights on the mountains, and also found on the Andes. They are mostly herbs with perennial rootstocks and leaves in tufts or scattered on the flower-stalks. The arrangement of the flowers is very various, as also are the size and colour of the flowers themselves. They have a flat or more or less cup-shaped receptacle, from the margin of which spring five sepals, five

petals and ten (or rarely five) stamens. The pistil is often partly adherent to the recep- tacle, and is divided above into two styles; the ovules are numerous, attached to axile placentas; and the seed-vessel is capsular. Fifteen species are natives of Britain, some alpine plants of great beauty {S. oppositijolia, S. nivalis, S. aizoides, &c), and others, like S. granulata, frequenting meadows and low ground, while S. tridactylites may be found on almost any dry wall. 5. umbrosa is London Pride or St Patrick's Cabbage, a common garden plant, a native of the Spanish Peninsula and also of the mountains of W. and S.W. Ireland. Many species are in cultivation, including the Bergenias or Megaseas with their large fleshy leaves and copious panicles of rosy or pink flowers, the numerous alpine species, such as 5. pyramidalis, S. cotyledon, &c, with tall panicles studded with white flowers, and many others, most of them adapted for rockwork.

SAXO GRAMMATICUS (c. 1150-c. 1206), Danish historian and poet, belonged to a family of warriors, his father and grand- father having served under Valdemar L, king of Denmark (d. 1 182). Brought up for the clerical profession, Saxo entered the service of Archbishop Absalon about 11 80, and remained in that capacity until the death of Absalon in 1201. It was at the archbishop's instigation that he began, about 1185, to write the history of the Danish Christian kings from the time of Sweyn Astridson (d. 1076), but later Absalon prevailed on"him to write also the history of the earlier heathen times, and to combine both into a great work, Gesta Danoru-m, or Historia Danica. The archbishop died before the work was finished, and therefore the preface, written about 1 208, dedicates the work to his successor Archbishop Andreas, and to King Valdemar II. Nothing else is known about Saxo's life and person; a chronicle of 1265 calls him " mirae et urbanae eloquentiae clericus"; and an epitome of his work from about 1340 describes him as " egregius gram- maticus, origine Sialandicus." That he was a native of Zealand is probably correct, inasmuch as, whereas he often criticizes the Jutlanders and the Scanians, he frequently praises the Zealanders. The surname of " Grammaticus " is probably of later origin, scarcely earlier than 1500, apparently owing to a mistake. The title of " provost of Roskilde," given him in the 16th century, is also probably incorrect, the historian being confounded with an older contemporary, the provost of the same name. Saxo, from his apprenticeship as the archbishop's secretary, had acquired a brilliant but somewhat euphuistic Latin style, and wrote fine Latin verses, but otherwise he does not seem to have had anˆ very great learning or extensive reading. His models of style were Valerius Maximus, Justin and Martianus Capella, especially

the last. Occasionally he mentions Bede, Dudo of St Quentin and

Paulus Diaconus, but he does not seem to have studied them or any other historical works thoroughly. His sources are partly Danish traditions and songs, partly the statements of Archbishop Absalon, partly the accounts of Icelanders and, lastly, some few earlier sources, lists of Danish kings and short chronicles, which furnished him with some reliable chronological facts. He considered traditions as history, and therefore made it his chief business to recount and arrange these, and his work is a loosely connected series of biographies of Danish kings and heroes.

The first nine books of the Gesta Danorum comprise traditions of kings and heroes of the half-mythical time up to about 950. Here we have traditions about Fredfrode, about Amleth (Hamlet) and Fenge, about Hrolfr Kraki, Hadding, the giant Starkather, Harald Hildetann and Ragnarr Lodbrok. In this earlier history Saxo has also embodied myths of national gods who in tradition had become Danish kings, for instance, Balder and Hother, and of foreign heroes, likewise incorporated in Danish history, as the Gothic Jarmunrik (A.S. Eormenric), the Anglian Vermund (A.S. Garmund) and Uffe (AS. Off a), the German Hedin and Hild, and others. Frequently the narrative is interrupted by translations of poems, which Saxo has used as authentic sources, although they are often only a few generations older than himself. In the later books (x.-xvi.) of his work he follows to a greater extent historical accounts, and the more he approaches his own time the fuller and the more trustworthy his relation becomes; especially brilliant is his treatment of the history of King Valdemar and of Absalon. But his patriotism often makes him partial to his countrymen, and his want of critical sense often blinds him to the historical truth.

Saxo's work was widely read during the middle ages, and several extracts of it were made for smaller chronicles. It was published for the first time, from a MS. afterwards lost, in Paris, 1 514, by the Danish humanist Christiern Pedersen; this edition was reprinted at Basel, 1 534, and at Frankfort, 1576. Of later editions may be mentioned that of Stephen Stephanius (Soro, 1644), the second volume of which contains the little-known, but valuable, Stepkanii notae uberiores in historiam Danicam Saxonis Grammatici, and which was reproduced, though without the notes, by C. A. Klotz (Leipzig, 1 771); and that of P. E. Miiller completed by J. M. Velschow (Copenhagen, 1839-1858). The last complete edition is that of Alfred Holder (Strassburg, 1886), while a large part was edited by G. Waitz in the Mon. Germ. historica, xxix. pp. 43-161 (1892). No complete MS. any longer exists; yet of late small fragments have been found of three MSS. The most remarkable of these is the fragment found at

Angers, in France, written in the later part of the 13th century. It is now in the library of Copenhagen.

There are Danish translations by A. G. Vedel (Copenhagen, 1575, and again 1851), and by F. Winkel-Horn (1896-1898). There is an English translation by O. Elton and F. Y. Powell (London, 1894).

See A. Potthast, Bibliotheca historica medii am (Berlin, 1896), where full references will be found.

SAXONS, a Teutonic people mentioned for the first time by Ptolemy about the middle of the 2nd century. At that time they are said to have inhabited the neck of the Cimbric peninsula, by which we have probably to understand the modern province of Schleswig, together with three islands lying off its western coast. We next hear of them in connexion with piratical expeditions in the North Sea about the year 286. These raids became more frequent during the 4th century, and at the beginning of the 5th century the northern coast of Gaul and the south-east coast of Britain were known as litora Saxonica, owing either to their liability to the attacks of the Saxons or, as some think, to the establishment of Saxon colonies there. During the same period the Saxons appear to have conquered a consider- able portion of north-west Germany. According to their own traditions they landed at Hadeln in the neighbourhood of Cux- haven and seized the surrounding districts from the Thuringians. It is clear that by the middle of the 4th century they had advanced

westwards into the basin of the Yssel, from whence they drove the Frankish Salii into Batavia. In the following centuries we find them in possession of the whole of the basin of the Ems, except the coast district, while that of the Weser with all its tributaries belonged to them as far south as the Diemel, where they bordered on the Hessian Franks, the ancient Chatti. The conquest of the Boructuari who dwelt between the Lippe and the Ruhr marks the extent of their progress towards the south-west. This took place shortly before the end of the 7th century. They frequently came into conflict with the Franks and on several occasions had to submit to their supremacy, notably after their defeat by Clothaire I. in 553. No thorough conquest was, however, carried out until the time of Charlemagne, who, between the years 772 and 785, annexed the whole region as far as the Elbe, destroying in 772 the Irminsul, their great sanctuary, near Marsberg

on the Diemel. Up to this time they had remained entirely heathen. In the 8th century and later we find the Saxons divided into three geographical districts known as Westfalahi (a name preserved in Westphalia), Angrarii and Ostfalahi, each of which had in several respects special customs of its own. They were ruled by a number of independent princes, but it is said that they had a national council which met annually at a place called Marklo on the Weser. At the beginning of the following century Charles also conquered the Saxons known as Nordalbingi in western Holstein, a district which had perhaps been occupied by a southward movement from the original home of the tribe.

It is doubtful how far the Saxons who invaded Britain Were really distinct from the Angli, for all their affinities both in language and custom are with the latter and not with the Saxons (Old Saxons) of the continent. During the 5th century we hear also of Saxon settlements on the coasts of Gaul. The most important were those at the mouth of the Loire founded in the time of Childeric, Clovis's father, and at Bayeux, in a district which remained in their possession until towards the close of the 6th century. From the 6th century onwards, however, we hear practically nothing of the Saxons as a seafaring people. Almost all the southern coast of the North Sea had now come into the possession of the Frisians, and one can hardly help concluding that most of the maritime Saxons had either volun- tarily or by conquest become incorporated in that kingdom.

See Ptolemy ii. 11; Eutropius ix. 21; Zosimus iii. 6; Ammianus Marcellinus xxvi. 4. 5, xxvii. 8. 5, xxviii. 2. 12, 7. 8, xxx. 5. I and 4; Notitia dignitatum; Gregory of Tours, Historia Francorum, ii. 19, iv. 10. 14, v. 27, x. 9; Bede, Hist. Reel. v. 10 ff. ; Annates Einhardi; Translaho S. Alexandria Hucbald, Vita S. Lebuini; Widukind, Res Gestae Saxonicae, i. I ff. (F. G. M. B.)

SAXONY, a kingdom of Germany, ranking among the con- stituent states of the empire, fifth in area, third in population and first in density of population, bounded on the S. by Bohemia, on the W. by Bavaria and the Thuringian states and on the W., N. and E. by Prussia. Its frontiers have a circuit of 760 m. and, with the exception of the two small exclaves of Ziegelheim in Saxe-Altenburg and Liebschwitz on the border of the princi- pality of Reuss, it forms a compact whole of a triangular shape, its base extending from N.E. to S.W., and its apex pointing N.W. Its greatest length is 130 m.; its greatest breadth 93 m., and the total area is 5787 sq. m. Except in the south, towards Bohemia, where the Erzgebirge forms at once the limit of the kingdom and of the empire, the boundaries are entirely political. Physical

Features. — Saxony belongs almost entirely to the central mountain region of Germany, only the districts along the north border and around Leipzig descending into the great north-European plain. The average elevation of the country, however, is not great, and it is more properly described as hilly than as mountainous. The chief mountain range is the Erzgebirge, stretching for 90 m. along the south border, and reaching in the Fichtelbergs (3979 ft. and 3953 ft.) the highest elevation in the kingdom. The west and south-west half of Saxony is more or less occupied by the ramifications and subsidiary groups of this range, one of which is known from its position as the Central Saxon chain, and another lower group still farther north as the Oschatz group. The south-east angle of Saxony is occupied by the mountains of Upper Lusatia (highest summit 2600 ft.), which form the link between the Erzgebirge and Riesenge- birge in the great Sudetic chain. North-west from this group, and along both banks of the Elbe, which divides it from the Erzgebirge,

extends the picturesque mountain region known as the Saxon Switzerland. The action of water and ice upon the soft sandstone of which the hills here are chiefly composed has produced deep gorges and isolated fantastic peaks, which, however, though both beautiful and interesting, by no means recall the characteristics of Swiss scenery. The highest summit attains a height of 1830 ft.; but the more interesting peaks, as the Lilienstein, Konigstein and the Bastei, are lower. With the trifling exception of the south-east of Bautzen, which sends its waters by the Neisse to the Oder, Saxony lies wholly in the basin of the Elbe, which has a navigable course of 72 m. from south-east to north-west through the kingdom. Com- paratively few of the numerous smaller streams of Saxony flow directly to the Elbe, and the larger tributaries only join it beyond the Saxon borders. The Mulde, formed of two branches, is the second river of Saxony; others are the Black Elster, the White Elster, the Pleisse and the Spree. There are no lakes of any size, but mineral springs are very abundant. The best known is at Bad Elster in the Vogtland.

Climate. — The ciimate of Saxony is generally healthy. It is mildest in the valleys of the Elbe, Mulde and Pleisse and severest in the Erzgebirge, where the district near Johanngeorgenstadt is known as Saxon Siberia. The average temperature, like that of central Germany as a whole, varies from 48 to 50 Fahr. ; in the Elbe valley the mean in summer is from 62 ° to 64° and in the winter about 30 ; in the Erzgebirge the mean temperature in summer is from 55 to 57°, and in winter 23° to 24 . The Erzgebirge is also the rainiest district, 275 to 33! in. falling yearly; the amount decreases as one proceeds northward, and Leipzig, with an average annual rainfall of 17 in.,

enjoys the driest climate.

Population. — In 1905 the population of Saxony was 4,508,601, or 7-4% of the total population of the German empire, on 2-7% of its area. Except the free towns, Saxony is the most densely peopled member of the empire, and its population is increasing at a more rapid rate than is the case in any of the larger German states. The growth of the population since 1815, when the kingdom received its present limits, has been as follows: (1815) 1,178,802; (1830)

1,402,066; (1840) 1,706,275; (1864) 2,344,094; (1875) 2,760,586;

(1895) 3,787,688; (1900) 4,202,216. The preponderating industrial activity of the kingdom fosters the tendency of the population to concentrate in towns, and no German state, with the exception of the Hanseatic towns, has so large a proportion of urban population, this forming 52-97% of the whole. The people of Saxony are chiefly of pure Teutonic stock; a proportion are Germanized Slavs, and to the south of Bautzen there is a large settlement of above 50,000 Wends, who retain their peculiar customs and language.

The following table shows the area and population of the whole kingdom and of each of the five chief governmental districts, or Kreishauptmannschaften, into which it is divided: —

Governmental District.

Area in Eng. sq. m.

Pop. 1900.

Pop. 1905.

Density per sq. m.,1905.

Dresden . Leipzig . Bautzen . Chemnitz Zwickau .

Total

1674

1378

953

799

983

1,216,489

1 ,060,632

405.173

792,393

727,529

1,284,397 1,146,423

426,420

851,130

800,231

767-2 832

447-4

1065-2

814-1

5787

4,202,216

4,508,601

779-1

The chief towns are Dresden (pop. 1905, 514,283), Leipzig (502,570), Chemnitz (244,405), Plauen (105,182), Zwickau (68,225), Zittau (34,679), Meissen (32,175), Freiberg (30,869), Bautzen (29,372), Meerane (24,994), Glauchau (24,556), Reichenbach (2-4,911), Crimmitzschau (23,340), Werdau (19,476), Pirna (19,200).

Communications. — The roads in Saxony are numerous and good. The first railway between Leipzig and Dresden, due entirely to private enterprise, was opened in part in April 1837, and finished in 1840, with a length of 71 m. In 1850 there were 250; in 1870, 685; in 1880, 1 1 84; and in 1905, 1920 m., together with 25 m. of private line, all

worked by the state. There are no canals in the kingdom, and the only navigable river is the Elbe.

Agriculture. — Saxony is one of the most fertile parts of Germany, and is agriculturally among the most advanced nations of the world. The lowest lands are the most productive, and fertility diminishes as we ascend towards the south, until on the bleak crest of the Erzgebirge cultivation ceases altogether. Saxon agriculture, though dating its origin from the Wends, was long impeded by antiquated customs, while the land was subdivided into small parcels and sub- jected to vexatious rights. But in 1 834- a law was passed providing for the union of the scattered lands belonging to each proprietor, and that may be considered the dawn of modern Saxon agriculture. The richest grain districts are near Meissen, Grimma, Bautzen, Dobeln and Pirna. The chief crop is rye, but oats are hardly second to it. Wheat and barley are grown in considerably less quantity. Very large quantities of potatoes are grown, especially in the Vogt- land. Beet is chiefly grown as feeding stuff for cattle, and not for sugar. Flax is grown in the Erzgebirge and Lusatian mountains,

where the manufacture of linen was at one time a flourishing domestic industry. Saxony owes its unusual wealth in fruit partly to the care of the elector Augustus I., who is said never to have stirred abroad without fruit seeds for distribution among the peasants and farmers. Enormous quantities of cherries, plums and apples are annually borne by the trees round Leipzig, Dresden and Colditz. The cultiva- tion of the vine in Saxony is respectable for its antiquity, though the yield is insignificant. Wine is said to have been grown here in the nth century; the Saxon vineyards, chiefly on the banks of the Elbe near Meissen and Dresden, have of late years, owing to the ravages of the phylloxera, become almost extinct.

Live Stock. — The breeding of horses is carried on to a very limited extent in Saxony. Cattle rearing, which has been an industry since the advent of the Wends in the 6th century, is important on the ex- tensive pastures of the Erzgebirge and in the Vogtland. In 1 765 the regent Prince Xaver imported 300 merino sheep from Spain, and so improved the native breed by this new strain that Saxon sheep were eagerly imported by foreign nations to improve their flocks, and ” Saxon electoral wool ” became one of the best brands in the market. Sheep farming, however, has considerably declined within the last few

decades. Swine furnish a very large proportion of the flesh diet of the people. Geese abound particularly round Leipzig and in Upper Lusatia, poultry about Bautzen. Bee-keeping flourishes on the heaths on the right bank of the Elbe.

Game and Fish. — Game is fairly abundant; hares and partridges are found in the plains to the north-west, capercailzie in the neighbourhood of Tharandt and Schwarzenberg, and deer in the forests near Dresden. The Elbe produces excellent pike, salmon and eels, its tributaries trout in considerable quantities, while the marshy ponds lying on thejeft bank furnish a good supply of carp, a fish held in great esteem by the inhabitants.

Forests. — The forests of Saxony are extensive and have long been well cared for both by government and by private proprietors. The famous school of forestry at Tharandt was founded in 1811. The Vogtland is the most densely wooded portion of the kingdom, and next comes the Erzgebirge. About 857,000 acres, or 85 % of the whole forest land, are planted with conifers; and about 143,000 acres, or 15 %i with deciduous trees, among which beeches and birches are the commonest. About 35 % of the total belongs to state.

Mining. — Silver was raised in the 12th century, and argentiferous lead is still the most valuable ore mined; tin, iron and cobalt rank next, and coal is one of the chief exports. Copper, zinc and bismuth are also worked. The country is divided into four mining districts: Freiberg, where silver and lead are the chief products; Altenberg, where tin is mainly raised; Schneeberg, yielding cobalt, nickel and ironstone; and Johanngeorgenstadt, with ironstorte and silver mines. There were, in 1907, 143 mines, including coal, in operation, employing 31,455 hands. The total value of metal raised in Saxony in 1907 was £7,036,000; in 1870 it was £314,916. The coal is found principally in two fields — one near Zwickau, and the other in the governmental district of Dresden. Brown coal or lignite is found chiefly in the north and north-west, but not in sufficiently large quantities to be exported; the total value of the output in 1907 was nearly £3,500,000. Peat is especially abundant on the Erzgebirge. Immense quantities of bricks are made all over the country. Ex- cellent sandstone for building is found on the hills of the Elbe. Fine porcelain clay occurs near Meissen, and coarser varieties else- where. A few precious stones are found among the southern mountains.

Industries. — The central-European position of the kingdom has fostered its commerce; and its manufactures have been encouraged by the abundant water-power throughout the kingdom. Nearly one-half

of the motive power used in Saxon factories is supplied by the streams, of which the Mulde, in this respect, is the chief. The early foundation of the Leipzig fairs, and the enlightened policy of the rulers of the country, have also done much to develop its com- mercial and industrial resources. Next to agriculture which supports about 20% of the population, by far the most important industry is the textile. Saxony carries on 26 % of the whole textile industry in Germany, a share far in excess of its proportionate population. Prussia, which has more than nine times as many inhabitants, carries on 45 %, and no other state more than 8 % . The chief seats of the manufacture are Zwickau, Chemnitz, Glauchau, Meerane, Hohen- stein, Kamenz, Pulsnitz and Bischofswerda. The centre of the cotton manufacture (especially of cotton hosiery) is Chemnitz; cotton-muslins are made throughout the Vogtland, ribbons at Pulsnitz and its neighbourhood. Woollen cloth and buckskin are woven at Kamenz, Bischofswerda and Grossenhain, all in the north- east, woollen and half-woollen underclothing at Chemnitz, Glauchau, Meerane and Reichenbach; while Bautzen and Limbach produce woollen stockings. Linen is manufactured chiefly in the mountains of Lusatia, where the looms are still to some extent found in the homes of the weavers. The coarser kinds only are now made, owing to the keen English competition in the finer varieties. Damask is produced at Gross-Schonau and Neu-Sch6nau. Lace-making, dis- covered or introduced by Barbara Uttmann in the latter half of the 16th century, and now fostered by government schools, was long. an important domestic industry among the villages of the Erzgebirge, and has attained to a great industry in Plauen. Straw-plaiting occupies 6000 hands on the mountain slopes between Gottleuba.and

Lockwitz. Waxcloth is manufactured at Leipzig, and artificial flowers at Leipzig and Dresden. Stoneware and earthenware are made at Chemnitz, Zwickau, Bautzen and Meissen, porcelain (” Dresden china “) at Meissen, chemicals in and near Leipzig. Dtibeln, Werdau and Lossnitz are the chief seats of the Saxon leather trade; cigars are very extensively made in the town and district of Leipzig, and hats and pianofortes at Leipzig, Dresden and Chemnitz. Paper is made chiefly in the west of the kingdom, but does not keep pace with the demand. Machinery of all kinds is pro- duced, from the sewing-machines of Dresden to the steam-locomotives and marine-engines of Chemnitz. The last-narned place, though the centre of the iron-manufacture of Saxony, has to import every pound of iron by railway. The leading branch is the machinery used in the industries of the country — mining, paper-making and weaving. The very large printing trade of Leipzig encourages the manufacture of printing-presses in that city. In

1902-1903 Saxony contained 601 active breweries and 572 distilleries. The smelting and refining of the metal ores is also an important industry.

The principal exports are wool, woollen, cotton, linen goods, machinery, china, pianofortes, cigarettes, flannels, stockings, curtains and lace, cloth from Reichenbach and Zittau, watches of superlative value from Glashutte and toys from the Vogtland.

Constitution. — Saxony is a constitutional monarchy and a member of the German empire, with four votes in the Bundesrath (federal council) and twenty-three in the Reichstag (imperial diet). The constitution rests on a law promulgated on the 4th of September 1831, and subsequently amended. The crown is hereditary in the Albertine line of the house of Wettin, with reversion to the Ernestine line, of which the duke of Saxe- Weimar is now the head. The king enjoys a civil list of 3,674,927 marks or about £185,000, while the appanages of the crown, including the payments to the other members of the royal house, amount to £29,544 more.

The legislature (Standeversammlung) is bicameral — the constitu- tion of the co-ordinate chambers being finally settled by a law of 1868 amending the enactment of 1831. The first chamber consists of the adult princes of the blood, two representatives of theLutheran and one of the Roman Catholic Church, a representative of Leipzig university, the proprietor (or a deputy) of the Herrschaft of Wildenfels, a proprietor of the mediatized domains, two of Standesherrschaften, one of those of four estates in fee, the superintendent at Leipzig, a deputy of the collegiate institution at Wurzen, 12 deputies elected by owners of nobiliar estates, ten landed proprietors and five other members nominated by the king and the burgomasters of eight towns. The second chamber consists of 43 members from the towns and 48 from the country, elected for six years. All male citizens twenty-five years old and upwards who pay 3 marks per annum in taxes have the suffrage; and all above thirty years of age who pay 30 marks in annual taxes are eligible as members of the lower houses With the exception of the hereditary and some of the ex-officib members of the first chamber, the members of the diet are entitled to an allow- ance for their daily expenses, as well as their travelling expenses. The executive consists of a responsible ministry (Gesammt Minis- terium), with the six departments of justice, finance, home affairs, war, public worship and education, andf foreign affairs. The minister of the royal household does not belong to the cabinet. The constitu- tion also provides for the formation of a kind of privy council (Staats- rat), consisting of the cabinet ministers and other members appointed by

the king.

For administrative purposes Saxony is divided into five Kreishauptmannschaften, or governmental departments, subdivided into twenty-seven Amtshauptmannschaften. The cities of Dresden, Leipzig, Chemnitz, Plauen and Zwickau, form departments by themselves. The supreme court of law for both civil and criminal cases is the Oberlandesgericht at Dresden, subordinate to which are seven other courts in the other principal towns. The German imperial code was adopted by Saxony in 1879. Leipzig is the seat of the supreme court of the German empire.

The Saxon army is modelled on that of Prussia. It forms the XII. and XIX. army corps in the imperial German army, with head- quarters at Dresden and Leipzig respectively.

Church. — About 94 % of the inhabitants of Saxony are Protestants ; about 12,500 are Jews, and about 4-7 % , including the royal family, are Roman Catholics. The Evangelical-Lutheran, or State, church has as its head the minister de evangelicis so long as the king is Roman Catholic; and its management is vested in the Evangelical Con- sistory at Dresden. Its representative assembly consisting of. 35 clergymen and 42 laymen is called a synod (Synode). The Reformed Church has consistories in Dresden and Leipzig. The Roman Catholic Church has enjoyed the patronage of the reigning family since 1 697, though it was only the peace of Posen in 1806 which placed it on a level with the Lutherans. By the peace of Prague, which transferred Upper Lusatia to Saxony in 1635, stipulations were made _ in favour of the Roman Catholics of that region, who are ecclesiastically in the jurisdiction of the cathedral chapter of St Peter at Bautzen, the dean of which has ex-officio a seat in the first chamber

of the diet. The other districts are managed by an apostolic vicar at Dresden, under the direction of the minister of public worship. Two nunneries in Lusatia are the only conventual establishments in Saxony, and no others may be founded. Among the smaller religious sects the Moravian Brethren, whose chief seat is at Herrnhut, are perhaps the most interesting. In 1868 civil rights were declared to be independent of religious confession.

Education. — Saxony claims to be one of the most highly educated

countries in Europe, and its foundations of schools and universities were among the earliest in Germany. Of the four universities founded by the Saxon electors at Leipzig, Jena, Wittenberg, later transferred to Halle, and Erfurt, now extinct, only the first is in- cluded in the present kingdom of Saxony. The endowed schools (Fiirstenschulen) at Meissen and Grimma have long enjoyed a high reputation. There are over 4000 schools; and education is com- pulsory. Saxony is particularly well-equipped with technical schools, the textile industries being especially fostered by numerous schools of weaving, embroidery and lace- making; but the mining academy at Freiberg and the school of forestry at Tharandt are probably the most widely known. The conservatory of music at Leipzig enjoys a world-wide reputation; not less the art collections at Dresden.

Finance. — The Saxon financial period embraces a space of two years. For 1908-1909 the ” ordinary ” budget showed an income of £17,352,833, balanced by the expenditure. The chief sources of income are taxes, state-railways and public forests and domains. The chief expenditure was on the interest and sinking fund of the national debt. The national debt, incurred almost wholly in making and buying railways and telegraphs, and carrying out other public works, amounted at the end of 1909 to £44,841,880.

See the annual Jahrbuch fur Statistik des Konigreichs Sachsen (Dresden); P. E. Richter, Literatur des Landes und Volkskunde des Konigreichs Sachsen (Dresden, 1903); Zemmrich, Landeskunde des Konigreichs Sachsen (Leipzig, 1906); and Pelz, Geologie des Konigreichs Sachsen (Leipzig, 1904).

History. — The name of Saxony has been borne by two distinct blocks of territory. The first was the district in the north-west of Germany, inhabited originally by the Saxons, which became a duchy and attained its greatest size and prosperity under Henry the Lion in the 12th century. In 11 80 it was broken up, and the name of Saxony disappeared from the greater part of it, remaining only with the districts around Lauenburg and Witten- berg. Five centuries later Lauenburg was incorporated with Hanover, and Wittenberg is the nucleus of modern Saxony, the name being thus transferred from the west to the east of Germany. In 1423 Meissen and Thuringia were united with Saxe- Wittenberg under Frederick of Meissen, and gradually the name of Saxony spread over all the lands ruled by this prince and his descendants.

The earlier Saxony was the district lying between the Elbe and the Saale on the east, the Eider on the north and the Rhine on the west, with a fluctuating boundary on the south. During the 8th century it was inhabited by the Saxons (q.v.), and about this time was first called Saxonia, and afterwards Saxony. For many years the Saxons had been troublesome to the Franks, their neighbours to the east and south, and the intermittent campaigns undertaken against them by Charles Martel and Pippin the Short had scarcely impaired their independence. This struggle was renewed by Charlemagne in 772, and a warfare of thirty-two years' duration was marked by the readiness of the Saxons to take advantage of the difficulties of Charles in other parts of Europe, and by the missionary character which the Frankish king imparted to the war. The subjugation of the Saxons, who were divided into four main branches, was rendered more difficult by the absence of any common ruler, and of a central power answerable for the allegiance of the separate tribes. Einhard, the friend and biographer of Charles, sums up this struggle as follows: — " It is hard to say how often the Saxons, conquered and humbled, submitted to the king, promised to fulfil his commands, delivered over the required hostages without delay, received the officials sent to them, and were often rendered so tame and pliable that they gave up the service of their heathen gods and agreed to accept Christianity. But just as quickly as they showed themselves ready to do this, did they also always break their promises, so that one could not really say which of these two courses may truly have been easier to them, and from the beginning of the war scarcely a year passed without bringing such change of mind."

In 772 the war was decided upon, and Charles marched from

Worms into the land of the Engrians or Angrians. The frontier fortress of Eresburg which stood on the site of the modern Marburg was taken, the Irminsul was destroyed, and the treasures of gold and silver were seized. The Irminsul was a wooden pillar erected to represent the world-sustaining ash Yggdrasil, and was the centre of the worship of the whole Saxon people. Having received hostages Charles left the country; but in 774 while he was in Italy the Saxons retook Eresburg, and crossing the frontier attacked the church of St Boniface at Fritzlar and ravaged the land of the Franks. The king retaliated by sending troops of cavalry to devastate Saxony, and declared at Quierzy he would exterminate his foes unless they accepted Christianity. In pursuance of this resolve he marched against them early in 775, captured the fortress of Sigiburg on the Ruhr, regained and rebuilt Eresburg and left Frankish garrisons in the land. The Engrians,

together with the Eastphalians and the Westphalians who dwelt on either side of them, made a formal submission and many of them were baptized; but about the same time some Frankish troops met with a serious reverse at Lubbecke near Minden. Charles thereupon again took the field, and after ravaging Saxony returned home under the impression that the war was over. In 776, however, the Saxons were again in arms and retook Eresburg; but they failed to capture Sigiburg, and showed themselves penitent when the king appeared among them. Eresburg was regarrisoned, a new fortress named Carlsburg was erected on the banks of the Lippe, and terms of peace were arranged. In 777 Charles held an assembly at Paderborn; henceforth his headquarters during this war, which was attended by .most of the Saxon chiefs. Hostages were given, oaths of fealty renewed, while many accepted Christianity, and the rudiments of an ecclesiastical system were established. The peace did not last long. A certain Widukind, or Wittekind, who had doubtless taken part in the earlier struggle, returned from exile in Denmark, and under his leadership the Saxon revolt broke out afresh in 778. The valley of the Rhine from Coblenz to Deutz was ravaged, and the advance of winter prevented Charles from sending more than a flying column to drive back the Saxons. But in 779 he renewed the attack, and after an important Frankish victory at Bocholt the Westphalians again did homage. The civil and ecclesiastical organization of the country was improved, and in 782 the king held an assembly at the source of the Lippe and took further measures to extend his influence. The land was divided into counties, which, however, were given to Saxon chiefs to administer, and it was probably on this occasion that the capitulatio de partibus Saxoniae was issued. This capitulary ordered the celebration of baptism and other Christian rites and ceremonies in addition to the payment of tithes, and forbade the observance of pagan customs on pain of death.

This attack on the religion and property of the Saxons aroused intense indignation, and provoked the rising of 782 which marks the beginning of the second period of the war. The work of devastation was renewed, the priests were driven out, and on the Suntel mountains near Minden, the Frankish forces were almost annihilated. Charles collected a large army, and by his orders 4500 men who had surrendered were beheaded at Verden. This act made the Saxons more furious than ever, but in 783 Charles inflicted two defeats upon them at Detmold and on the river Hase, and ravaged their territory from the Weser to the Elbe. This work was continued during the following year by the king and his eldest son Charles, and the Christmas of 784 was spent by the royal family at Eresburg, whence Charles directed various

plundering expeditions. The work of conversion was renewed, and an important event took place in 785 when Widukind, assured of his personal safety, surrendered and was baptized at Attigny together with many of his companions. Saxony at last seemed to be subdued, and Saxon warriors took service in the Frankish armies. But in 792 some Frankish troops were killed at the mouth of the Elbe, and a similar disaster in the following year was the signal for a renewal of the ravages with great violence, when churches were destroyed, priests killed, or driven away, and many of the people returned to

heathenism. These events compelled Charles to leave the Avar war and return to Saxony in 794; and until 799 each year had its Saxon campaign. At the same time in 794, as a fresh experiment in policy, every third man was transported; while the king was assisted in his work of conquest by the Abotrites who inhabited a district east of the Elbe. The resistance Charles met with was not serious, and these expeditions took the form of plundering raids. Oaths and hostages were exacted; and many Saxon youths were educated in the land of the Franks as Christians, and sent back into Saxony to spread Christianity and Frankish influence. The southern part of the country was now fairly tranquil, and the later campaigns were directed mainly against the Nordalbingians, the branch of the Saxons living north of the Elbe, who suffered a severe reverse near Bornhoved in 798. Further transportations were carried out, and in 797 Charles issued another capitulary which mitigated the severe provisions of the capitulary of 782; and about 802 the Saxon law was committed to writing. The Nordalbingians were still restless, and it is recorded that their land was devast- ated in 802. Two years later a final campaign was undertaken, when a large number of these people were transported into the country of the Franks and their land was given to the Abotrites. The conversion of the Saxons to Christianity, which during this time had been steadily progressing, was continued in the reign of the emperor Louis I., the Pious, who, however took very little interest in this part of his empire. Bishoprics were founded at Bremen, Miinster, Verden, Minden, Paderborn, Osnabriick, Hildesheim and Hamburg, and one founded at Seligen- stadt was removed to Halberstadt. Some of these bishoprics were under the authority of the archiepiscopal see of Cologne, others under that of Mainz, and this arrangement was unaltered when in 834 Hamburg was raised to an archbishopric. In 847 the bishopric of Bremen was united with Hamburg, but the authority of this archbishopric extended mainly

over the districts north and east of the Elbe. The abbey of Corvey, where rested the bones of St Vitus, the patron saint of Saxony, soon became a centre of learning for the country, and the Saxons undertook with the eagerness of converts the conversion of their heathen' neighbours. After a period of tranquillity a reaction set in against Frankish influences, and in 840 the freemen and liti separated themselves from the nobles, formed a league, or stellinga, and obtained a promise from the emperor Lothair I. that he would restore their ancient constitution. This rising, which was probably caused by the exaction of tithes and the oppression of Frankish officials, aimed also at restoring the heathen religion, and was put down in 842 by king Louis the German, who claimed authority over this part of the Carolingian empire.

The influences of civilization and the settlement of Frankish colonists in various parts of Saxony facilitated its incorporation with the Carolingian empire, with which its history is for some time identified. By the treaty of Verdun in 843 Saxony fell to Louis the German, but he paid little attention to the northern part of his kingdom which was harassed by the Normans and the Slavs. About 850, however, he appointed a margrave to defend the Limes Saxoniae, a narrow strip of land on the eastern frontier, and this office was given to one Liudolf who had large estates in Saxony, and who was probably descended from an Engrian noble named Bruno. Liudolf, who is sometimes called " duke of the East Saxons," carried on a vigorous warfare against the Slavs and extended his influence over other parts of Saxony, He died in 866, and was succeeded by his son Bruno, who was killed fighting the Normans in 880. Liudolf's second son, Otto the Illustrious, was recognized as duke of Saxony by King Conrad I., and on the death of Burkhard, margrave of Thuringia in 908, obtained authority over that country also. He made himself practically independent in Saxony, played an important part in the affairs of the Empire, and is said to have refused the German throne in 911. He died in 912 and was succeeded by his son Henry I., the Fowler. Between this prince and Conrad I., who wished to curb the increasing power of the Saxon duke, a quarrel took place; but Henry not only retained his hold over Saxony and Thuringia, but on Conrad's death in 919 was elected

German king. He extended the Saxon frontier almost to the Oder, improved the Saxon forces by training and equipment, established new marks, and erected forts on the frontiers for which he provided regular garrisons. Towns were walled, where it was decreed markets and assemblies should be held, churches and monasteries were founded, civilization was extended and learning encouraged. Henry's son, Otto the Great, was crowned emperor in 962, and his descendants

held this dignity until the death of the emperor Otto III. in 1002. Otto retained Saxony in his own hands for a time, though in 938 he had some difficulty in suppressing a revolt led by his half-brother Thankmar. The Slavs were driven back, the domestic policy of Henry the Fowler was continued, the Saxon court became a centre of learning visited by Italian scholars, and in 968 an archbishopric was founded at Magdeburg for the lands east of the Elbe. In 960 Otto gave to a trusted relative Hermann, afterwards called Billung, certain duties and privileges on the eastern frontier, and from time to time appointed him as his representative in Saxony. Hermann gradually extended his authority, and when he died in 973 was followed by his son Bernard I., who was undoubtedly duke of Saxony in 986. When Henry II. was chosen German king in 1002 he met the Saxons at Merseburg, and on promising to observe their laws Bernard gave him the sacred lance, thus entrusting Saxony to his care. Bernard was succeeded by his son Bernard II., who took up a hostile attitude towards the German kings, Conrad II. and Henry III. His son and successor Ordulf, who became duke in 1059, carried on a long and obstinate struggle with Adalbert, archbishop of Bremen, who was compelled to cede one-third of his possessions to Ordulf's son Magnus in 1066. The emperor Henry III. sought to win the allegiance of the Saxons by residing among them, and built a castle at Goslar and the Harzburg; and the emperor Henry IV. also spent much time in Saxony.

In 1070 Otto of Nordheim, duke of Bavaria, who held large estates in this country, being accused of a plot to murder Henry, was placed under the ban, his possessions were declared forfeited and his estates plundered. Otto, in alliance with Magnus, won considerable support in Saxony, but after some fighting both submitted and were imprisoned; and Magnus was still in confinement when on his father's death in 1072 he became titular duke of Saxony. As he refused to give up his duchy he was kept in prison, while Henry confiscated the estates of powerful nobles, demanded the restoration of ducal lands by the bishops, and garrisoned newly-erected forts with Swabians, who provisioned themselves from the surrounding country. These proceedings aroused suspicion and discontent, which were increased when the emperor assembled an army, ostensibly to attack the Slavs. The Saxon nobles refused to join the host until their grievances were redressed, and in 1073 a league was formed at Wormesleben. When the insurgents under Duke Otto were joined by the Thuringians, Henry was compelled in 1074 to release Magnus and to make a number of concessions as the price of the peace of Gerstungen; which, however, was short-lived, as the peasants employed in pursuance of its terms in demolishing the forts, desecrated the churches and violated the ducal

tombs. Henry, having obtained help from the princes of the Rhineland, attacked and defeated the Saxons at Hohen- burg near Langensalza, rebuilt the forts, and pardoned Otto, whom he appointed administrator of the country. The Saxons, however, were not quite subdued; risings took place from time to time, and the opponents of Henry IV. found considerable support in Saxony. During the century which followed the death of Hermann Billung, there had been constant warfare with the Slavs, but although the emperors had often taken the field, the Saxons had been driven back to the Elbe, which was at this time their eastern boundary. In 1 106 Magnus died, and the German king Henry V. bestowed the duchy upon Lothair, count of Supplinburg, whose wife Richenza inherited the Saxon estates of her grandfather Otto of Nordheim, on the death of her brother Otto in 1 1 16. Lothair quickly made himself independent, defeated Henry at Welfesholz in 1115, and prosecuted the war against the Slavs with vigour. In 112; he became German

king, and in 113 7 gave Saxony to Henry the Proud, duke of Bavaria, who had married his daughter Gertrude, and whose mother Wulfhild was a daughter of Magnus Billung. The succeeding German king Conrad III. refused to allow Henry to hold two duchies, and gave Saxony to Albert the Bear, margrave of Brandenburg, who like his rival was a grandson of Magnus Billung. Albert's attempts to obtain possession failed, and after Henry's death in 1139 he formally renounced Saxony in favour of Henry's son, Henry the Lion (q.v.). The new duke improved its internal condition, increased its political importance, and pushed its eastern frontier towards the Oder. In 1180, however, he was placed under the imperial ban and Saxony was broken up. Henry retained Brunswick and Luneburg; West- phalia, as the western portion of the duchy was called, was given to Philip, archbishop of Cologne, and a large part of the land was divided among nine bishops and a number of counts who thus became immediate vassals of the emperor. The title duke of Saxony was given to Bernard, the sixth son of Albert the Bear, together with the small territories of Lauenburg and Wittenberg, which were thus the only portions of the former duchy which now bore the name of Saxony. Bernard, whose paternal grandmother, Eilicke, was a daughter of Magnus Billung, took a prominent part in German affairs, but lost Lauenburg which was seized by Waldemar II., king of Denmark. Dying in 1212, Bernard was succeeded in Wittenberg by his younger son Albert I., who recovered Lauenburg after the defeat of Waldemar at

Bornhoved in 1227. Albert died in 1260, and soon after his death his two sons divided his territories, when the elder son John took Lauenburg which was sometimes called lower Saxony, and the younger, Albert II., took Witten- berg or upper Saxony. Both retained the ducal title and claimed the electoral privilege, a claim which the Lauenburg line refused to abandon when it was awarded to the Wittenberg line by the Golden Bull of 1356.

Saxe-Lauenburg was governed by John until his death in 1285, when it passed to his three sons John II., Albert III. and Eric I. As Albert had no sons the duchy was soon divided into two parts, until on the death of duke Eric III., a grandson of John II., in 1401, it was reunited by Eric IV., a grandson of Eric I. When Eric IV. died in 1412 he was succeeded by his son Eric V., who made strenuous but vain efforts to obtain the electoral duchy of Saxe-Wittenberg, which fell vacant on the death of the elector Albert III. in 1422. Eric died in 1436 and was followed by his brother Bernard IV., whose claim to exercise the electoral vote was quashed by the electors in 1438; and who was succeeded by his son John IV. in 1463. The next duke, John's son Magnus I., spent much time in struggles with the archbishop of Bremen and the bishop of Ratzeburg; he also assisted the progress of the Reformation in Lauenburg. Magnus, who was formally invested with the duchy by the emperor Charles V. in 1530, was the first duke to abandon the claim to the electoral privilege. After his death in 1 543 his son Francis I. reigned for the succeeding twenty-eight years, and his grandsons, Magnus II. and Francis II., until 1619. Francis, who did something to improve the administration of his duchy, was succeeded in turn by his two sons and his two grandsons; but on the-death of Julius Francis, the younger of his grandsons, in 1689 the family became extinct.

Several claimants to Saxe-Lauenburg thereupon appeared, the most prominent of whom were George William, duke of Liineburg-Celle, and John George III., elector of Saxony. George William based his claim upon a treaty of mutual succession madein 1369 between his ancestor Magnus II., dukeof Brunswick, and the reigning dukes of Saxe-Lauenburg. John George had a double claim. Duke Magnus I. had promised that in case of the extinction of his family Lauenburg should pass to the family of Wettin, an arrangement which had been confirmed by the emperor Maximilian I. in 1507. Secondly, John George himself had concluded a similar treaty with Julius Francis in 1 67 1. In 1689 the elector received the homage of the people of Lauenburg. George William, however, took Ratzeburg, and held it against the troops of a third claimant, Christian V.,

king of Denmark; and in 1702 he bought off the claim of John George, his successor being invested with the duchy in 1728. Since that date its history has been identified with that of Hanover (q.v.).

In Saxe-Wittenberg Albert II. was succeeded in 1298 by his son Rudolph I., who in 13 14 gave his vote to Frederick, duke of Austria, in the disputed election for the German throne between that prince and Louis of Bavaria, afterwards the emperor Louis IV.; and when the latter ignored his claims on the margraviate of Brandenburg Rudolph shared in the attempt to depose him, and to elect Charles of Luxemburg, afterwards the emperor Charles IV., as German king. Rudolph was followed in 1356 by his son Rudolph II., who had fought at the battle of Crecy; and who in turn was succeeded in 1370 by his half- brother Wenceslaus. This prince succeeded after some fighting in temporarily obtaining the duchy of Luneburg for his house; he took part in the election of Wenceslaus as German king in 1376; and was followed in 1388 by his eldest son Rudolph III. Lavish expenditure during the progress of the council of Constance reduced Rudolph to poverty, and on the death in 1422 of his brother Albert III., who succeeded him in 1419, this branch of the Ascanian family became extinct.

A new era in the history of Saxony dates from 1423, the year when the emperor Sigismund bestowed the vacant electoral duchy of Saxe-Wittenberg upon Frederick, margrave of Meissen. Frederick was a member of the family of Wettin, which since his day has played a prominent part in the history of Europe, and he owed his new dignity to the money and other assistance which he had given to the emperor during the Hussite war. The new and more honourable title of elector of Saxony now superseded his other titles, and the name Saxony gradually spread over his other possessions, which included Meissen and Thuringia as well as Saxe-Wittenberg, and thus the earlier history of the electorate and kingdom of Saxony is the early history of the mark of Meissen, the name of which now lingers only in a solitary town on the Elbe.

Frederick's new position as elector, combined with his personal qualities to make him one of the most powerful princes in Germany, and had the principle of primogeniture been estab- lished in his country, Saxony and not Prussia might have been the leading power to-day in the German empire. He died in 1428, just before his lands were ravaged by the Hussites in 1429 and 1430. The division of his territory between his two sons, the elector Frederick II. and William, occasioned a destructive internecine war, a kind of strife which had many precedents in the earlier history of Meissen and Thuringia. It

was in 1455 during this war that the knight Kunz von Kaufungen carried into execution his daring plan of stealing the two sons of the elector Frederick, Ernest and Albert, but he was only moment- arily successful, the princes soon escaping from his hands. These two sons succeeded to their father's possessions in 1464, and for twenty years ruled together peaceably. The land prospered rapidly during this respite from the horrors of war. Encouraged by an improved coinage, trade made great advances, and other benefits also accrued from the discovery of silver on the Schneeberg. Several of the important ecclesiastical princi- palities of North Germany were about this time held by members of the Saxon ruling house, and the external influence of the electorate corresponded to its internal prosperity. But matters were not allowed to continue thus. The childless death of their uncle William in 1482 brought Thuringia to the two princes, and Albert insisted on a division of their common possessions. The important partition of Leipzig accordingly took place in 1485, and resulted in the foundation of the two main lines of the Saxon house. The lands were never again united. Ernest, the elder brother, obtained Saxe-Wittenberg with the electoral dignity, Thuringia and the Saxon Vogtland; while Albert received Meissen, Osterland being divided between them. Something was still held in common, and the division was probably made intricate to render war difficult and dangerous.

The elector Ernest was succeeded in i486 by his son, Frederick the Wise, one of the most illustrious princes in German history.

Under him Saxony was perhaps the most influential state in the Empire, and became the cradle of the Reformation. He died in 1525 while the Peasants' War was desolating his land, and was succeeded by his brother John, who was an enthusiastic supporter of the reformed faith and who shared with Philip, landgrave of Hesse, the leadership of the league of Schmalkalden. John's son and successor, John Frederick the Magnanimous, who became elector in 1532, might with equal propriety have been surnamed the Unfortunate. He took part in the war of the league of Schmalkalden, but in 1547 he was captured at Muhlberg by the emperor Charles V. and was forced to sign the capitulation of Wittenberg. This deed transferred the electoral title and a large part of the electoral lands from the Ernestine to the Albertine branch of the house, whose astute representa- tive, Maurice, had taken the imperial side during the war. Only a few scattered territories were reserved for John Frederick's sons, although these

were increased by the treaty of Naumburg in 1554, and on them were founded the Ernestine duchies of Saxe-Gotha, Saxe-Weimar, Saxe-Coburg, Saxe-Meiningen and Saxe-Altenburg. For the second time in the history of the Saxon electorate the younger line secured the higher dignity, for the Wittenberg line was junior to the Lauenburg line. The Albertine line is now the royal line of Saxony.

Maurice, who became elector of Saxony in consequence of the capitulation of Wittenberg, was a grandson of Albert, the founder of his line. His predecessors in ruling Albertine Saxony had been his father, Henry, who only reigned for two years, and his uncle George: The latter, a zealous Roman Catholic, had vainly tried to stem the tide of the Reformation in his dominions; Henry, on the other hand, was an equally devoted Protestant. Maurice, who .succeeded his father in i54i,wasalso a Protestant, but he did not allow his religious faith to blind him to his political interests. His ruling motive was ambition to increase both his own power and the importance of his country. He Tefused to join the other Protestant princes in the league of Schmalkalden, but made a secret treaty with Charles V. Then suddenly invading the Ernestine lands while the elector John Frederick was campaigning against the imperialists on the Danube, he forced that prince to return hastily to Saxony, and thus weakened the forces opposed to the emperor. Although compelled to retreat, his fidelity to Charles V. was rewarded, as we have already seen, by the capitulation of Wittenberg. All the lands torn from John Frederick were not, however, assigned to Maurice; he was forced to acknowledge the superi- ority of Bohemia over the Vogtland and the Silesian duchy of Sagan. Moreover, Roman Catholic prelates were reinstated in the bishoprics of Meissen, Merseburg and Naumburg-Zeitz. Recognizing now as a Protestant prince that the best alliance for securing his new possessions was not with the emperor, but with the other Protestant princes, Maurice began to withdraw from the former and to conciliate the latter. In 1552, suddenly marching against Charles at Innsbruck, he drove him to flight and then extorted from him the religious peace of Passau. Thus at the close of his life he came to be regarded as the champion of German national and religious freedom.

Amid the distractions of outward affairs, Maurice had not neglected the internal interests of Saxony. To its educational advantages, already conspicuous, he added the three Fursten- schtilen at Pforta, Grimma and Meissen, and for administrative purposes, especially for the collection of taxes, he divided the country into the four circles of the Electorate, Thuringia, Meissen and Leipzig. During his reign coal-mining began in Saxony. In another direction over two hundred religious houses were suppressed, the funds being partly applied to

educational purposes. The country had four universities, those of Leipzig, Wittenberg, Jena and Erfurt; books began to, increase rapidly, and, by virtue of Luther's translation of the Bible, the Saxon dialect became the ruling dialect of Germany.

Augustus I., brother and successor of Maurice, was one of the best domestic rulers that Saxony ever had. He increased .the area of the country by the " circles " of Neustadt and the Vogtland, and by parts of Henneberg and the silver-yielding

Mansfeld, and he devoted his long reign to the development of its resources. He visited all parts of the country himself, and personally encouraged agriculture; he introduced a more economical mode of mining and smelting silver; he favoured the importation of finer breeds of sheep and cattle; and he brought foreign weavers from abroad to teach the Saxons. Under him lace-making began on the Erzgebirge, and cloth- making flourished at Zwickau. With all his virtues, however, Augustus was an intolerant Lutheran, and used very severe means to exterminate the Calvinists; in his electorate he is said to have expelled in Calvinist preachers in a single month. Under his son Christian I., who succeeded in 1586, the chief power was wielded by the chancellor Nikolas Crell (q.v.), who strongly favoured Calvinism; but, when Christian II. came to the throne in 1591, Crell was sacrificed to the Lutheran nobles. The duke of Saxe-Weimar was made regent, and continued the persecution of crypto-Calvinism. Christian II. was succeeded in 161 1 by his brother John George I., under whom the country was devastated by the Thirty Years' War. John George was an amiable but weak prince, totally unfitted to direct the fortunes of a nation in time of danger. He refused the proffered crown of Bohemia, and, when the Bohemian Protestants elected a Calvinist prince, he assisted the emperor against them with men and money. The edict of restitution, however, in 1629, opened his eyes to the emperor's projects, and he joined Gustavus Adolphus. Saxony now became the theatre of war. The first battle on Saxon soil was fought in 1631 at Breitenfeld, where the bravery of the Swedes made up for the flight of the Saxons. Wallenstein entered Saxony in 1632, and his lieutenants plundered, burned and murdered through the length and breadth of the land. After the death of Gustavus Adolphus at the battle of Liitzen, not far from Leipzig, in 1632, the elector, who was at heart an imperialist, detached himself from the Swedish alliance, and in 1635 concluded the peace of Prague with the emperor. By this peace he was con- firmed in the possession of Upper and Lower Lusatia, a district of 180 sq. m. and half a million inhabitants, which had already been pledged to him as a reward for his services against the Bohemians.

Saxony had now to suffer from the Swedes a repetition of the devastations of Wallenstein. No other country in Germany was so scourged by this terrible war. Immense tracts were rendered desolate, and whole villages vanished from the map; in eight years the population sank from three to one and a half millions. When the war was ended by the peace of Westphalia in 1648, Saxony found that its influence had begun to decline in Germany. Its alliance with the Catholic party deprived it of its place at the head of the Protestant German states, which was now taken by Brandenburg. John George's will made the decline of the electorate even more inevitable by detaching from it the three duchies of Saxe-Weissenfels, Saxe-Merseburg and Saxe- Zeitz as appanages for his younger sons. By 1 746, however, these lines were all extinct, and their possessions had returned to the main line. Saxe-Neustadt was a short-lived branch from Saxe-Zeitz, extinct in 17 14. The next three electors, who each bore the name of John George, had uneventful reigns. The first made some efforts to heal the wounds of his country; the' second wasted the lives of his people in foreign wars against the Turks; and the third was the last Protestant elector of Saxony. John George IV. was succeeded in 1694 by his brother Frederick Augustus I., or Augustus the Strong. This prince was elected king of Poland as Augustus II. in 1697, but any weight which the royal title might have given him in the Empire was more than counterbalanced by the fact that he became a Roman Catholic in order to qualify for the new dignity. The connexion with Poland was disastrous for Saxony. In order to defray the expenses of his wars with Charles XII. Augustus pawned and sold large districts of Saxon territory, while he drained the electorate of both men and money. For a year before the peace of Altranstadt in 1706, when Augustus gave up the crown of Poland, Saxony was occupied by a Swedish army, which had to be supported at an immense expense.

The wars and extravagance of the elector-king, who regained the Polish crown in 1709, are said to have cost Saxony a hundred million thalers. From this reign dates the privy council (Geheimes Kabinet), which lasted till 1830. The caste privileges of the estates (Stande) were increased by Augustus, a fact which tended to alienate them more from the people, and so to decrease their power. Johann Friedrich Bottger made his famous discovery in 1710, and the manufacture of porcelain was begun at Meissen, and in this reign the Moravian Brethren made their settlement at Herrnhut. Frederick Augustus II., who succeeded his father in the electorate in 1733, and

was afterwards elected to the throne of Poland as Augustus III., was an indolent prince, wholly under the influence of Count Heinrich von Briihl (q.v.). Under his ill-omened auspices Saxony sided with Prussia in the First Silesian War, and with Austria in the other two. It gained nothing in the first, lost much in the second, and in the third, the Seven Years' War (1756-1763), suffered renewed miseries. The country was deserted by its king and his minister, who retired to Poland. By the end of the war it had lost 90,000 men and a hundred million thalers; its coinage was debased and its trade ruined; and the whole country was in a state of frantic disorder. The elector died seven months after his return from Poland; Briihl died twenty-three days later. The connexion with Poland was now at an end. The elector's son and successor, Frederick Christian, survived his father only two months, dying also in 1763, leaving a son, Frederick Augustus III., a boy of thirteen. Prince Xaver, the elector's uncle, was appointed guardian, and he set himself to the work of healing the wounds of the country. The foundation of the famous school of mining at Freiberg, and the improvement of the Saxon breed of sheep by the importation of merino sheep from Spain, were due to his care.

Frederick assumed the government in 1768, and in his long and eventful reign, which saw the electorate elevated to the dignity of a kingdom, though deprived of more than half its area, he won the surname of the Just. As he was the first king of Saxony, he is usually styled Frederick Augustus I. The first ten years of his active reign passed in peace and quiet; agri- culture, manufactures and industries were fostered, economical reforms instituted, and the heavy public debt of forty million thalers was steadily reduced. In 1770 torture was abolished. When the Bavarian succession fell open in 1777, Frederick Augustus joined Prussia in protesting against the absorption of Bavaria by Austria, and Saxon troops took part in the bloodless " potato-war." The elector commuted his claims in right of his mother, the Bavarian princess Maria Antonia, for six million florins, which he spent chiefly in redeeming Saxon territory that had been pawned to other German states. When Saxony joined the Fiirstenbund in 1785, it had an area of 15,185 sq. m. and a population of nearly 2,000,000, but its various parts had not yet been combined into a homogeneous whole, for the two Lusatias, Querfurt, Henneberg and the ecclesiastical foundations of Naumburg and Merseburg had each a separate diet and government, independent of the diet of the electorate proper. In 1791 Frederick declined the crown of Poland, although it was now offered as hereditary even in the female line. He remembered how unfortunate for Saxony the former Polish connexion had been, and he mistrusted the attitude of Russia towards the proffered kingdom. Next

year saw the beginning of the great struggle between France and Germany. Frederick's first policy was one of selfish abstention, and from 1793 until 1796, when he concluded a definite treaty of neutrality with France, he limited his contribution to the war to the bare contingent due from him as a prince of the Empire. When war broke out in 1806 against Napoleon, 22,000 Saxon troops shared the defeat of the Prussians at Jena, but the elector immediately afterwards snatched at Napoleon's offer of neutrality, and abandoned his former ally. At the peace of Posen (nth December 1806) Frederick assumed the title of king of Saxony, and entered the Confederation of the Rhine as an independent sovereign, promising a contingent of 20,000 men to Napoleon.

No change followed in the internal affairs of the new kingdom, except that Roman Catholics were admitted to equal privileges

with Protestants. Its foreign policy was dictated by the will of Napoleon, of whose irresistibility the king was too easily convinced. In 1807 his submission was rewarded with the duchy of Warsaw (to. which Cracow and part of Galicia were added in 1809) and the district of Cottbus, though he had to surrender some of his former territory to the new kingdom of Westphalia. The king of Saxony's faith in Napoleon was shaken by the disasters of the Russian campaign, in which 21,000 Saxon troops had shared; when, however, the allies invaded Saxony in the spring of 1813, he refused to declare against Napoleon and fled to Prague, though he withdrew his contingent from the French army. Whatever misgivings he may have had were, however, removed by Napoleon's victory at Liitzen (May 2, 1813), and the Saxon king and the Saxon army were once more at the disposal of the French. After the battle of Bautzen, Napoleon's headquarters were successively at Dresden and Leipzig. During the battle of Leipzig in October 1813, the popular Saxon feeling was displayed by the desertion of the Saxon troops to the side of the allies. Frederick was taken prisoner in Leipzig, and the government of his kingdom was assumed for a year by the Russians. Saxony was now regarded as a conquered country. Nothing but Austria's vehement desire to keep a powerful neighbour at a distance from her boundaries preserved it from being completely annexed by the Prussians, who had succeeded the Russians in the government. At the congress of Vienna the claim of Prussia to annex the whole kingdom was supported by Russia, and opposed by Austria, France and Great Britain, the question all but leading to a complete break-up of the alliance (see Vienna, Congress or). As it was, the congress assigned the northern portion, consisting of 7800 sq. m., with 864,404 inhabitants, to Prussia, leaving 5790 sq. m., with a population of 1,182,744, to Frederick,

who was permitted to retain his royal title. On the 8th of June 181 5 King Frederick joined the new German Confederation.

From the partition in 18 15 to the war of 1866 the history of Saxony is mainly a narrative of the slow growth of constitutional- ism and popular liberty within its limits. Its influence on the general history of Europe ceased when the old Empire was dissolved. In the new German Empire it is too completely overshad'owed by Prussia to have any objective importance by itself. Frederick lived twelve years after the division of his kingdom. The commercial and industrial interests of the country continued to be fostered, but only a few of the most unavoidable political reforms were granted. Religious equality was extended to the Reformed Church in 181 8, and the separate diet of Upper Lusatia was abolished. Frederick Augustus was succeeded in 1827 by his brother Antony, to the great disappointment of the people, who had expected a more liberal era under Prince Frederick Augustus, the king's nephew. Antony announced his intention of following the lines laid down by his predecessor. He accorded at first only a few trifling reforms, which were far from removing the popular discontent, white he retained the unpopular minister, Count Detlew von Einsiedel (i 773 _ i86i), and continued the encouragement of the Roman Catholics. The old feudal arrangement of the diet, with its inconvenient divisions, was retained, and the privy council continued to be the depository of power. An active opposition began to make itself evident in the diet and in the press, and in 1830, under the influence of the July revolution in Paris, riots broke out in Leipzig and Dresden. Einsiedel was now dismissed, Prince Frederick Augustus, son of Maximilian, who resigned the succession, became co-regent, and a constitution was promised. After consultation with the diet the king promul- gated, on the 4th of September 1831, a new constitution which is the basis of the present government. An offer from Metternich of Austrian arms to repress the discontent by force had been refused. The feudal estates were replaced by two chambers, largely elective, and the privy council by a responsible ministry of six departments. Bernhard von Lindenau was the head of the first responsible cabinet, and the first constitutional assembly sat from the 27 th of January 1833 till the 30th of October

1834.

While Saxony's political liberty was thus enlarged, its com- merce and

credit were stimulated by its adhesion to the Prussian Zolherein and by the construction of railways. Antony had died in 1836, and Frederick Augustus II. became sole king. Growing interest in politics produced dissatisfaction with the compromise of 1831, and the Liberal opposition grew in numbers and influence. The burning questions were the publicity of legal proceedings and the freedom of the press; and on these the government sustained its first crushing defeat in the lower chamber in 1842. In 1843 Lindenau was forced by the action of the aristocratic party to resign, and was replaced by Julius Traugotte von Konneritz (1 792-1866), a statesman of reactionary views. This increased the opposition of the Libera] middle classes to the government. Religious considerations arising out of the attitude of the government towards the ” German Catholics,” and a new constitution for the Protestant Church, began to mingle with purely political questions, and Prince John, as the supposed head of the Jesuit party, was insulted at a review of the communal guards at Leipzig in 1845. The military rashly interfered, and several innocent spectators were shot. The bitterness which this occurrence provoked was intensified by a political reaction which was initiated about the same time under Konneritz. Warned by the sympathy excited in Saxony by the revolutionary events at Paris in 1848, the king dismissed his reactionary ministry, and a Liberal cabinet took its place in March 1848. The disputed points were now conceded to the country. The privileges of the nobles were curtailed; the administration of justice was put on a better footing; the press was unshackled; publicity in legal proceedings was granted; trial by jury was introduced for some special cases; and the German Catholics were recognized. The feudal character of the first chamber was abolished, and its members made mainly elective from among the highest tax-payers, while an almost universal suffrage was introduced for the second chamber. The first demand of the overwhelmingly democratic diet returned under this reform bill was that the king should accept the German constitution elaborated by the Frankfort parliament. Frederick, alleging the danger of acting without the concurrence of Prussia, refused, and dissolved the diet. A public demonstra- tion at Dresden in favour of the Frankfort constitution was prohibited as illegal on the 2nd of May 1849. This at once awoke the popular fury. The mob seized the town and barricaded the streets; Dresden was almost destitute of troops; and the king fled to the Konigstein. The rebels then proceeded to appoint a provisional government, consisting of Tzschirner, Heubner and Todt, though the true leader of the insurrection was the Russian Bakunin. Meanwhile Prussian troops had arrived to aid the government, and after two days’ fierce street fighting the rising was quelled. The bond with Prussia now became closer, and Frederick

entered with Prussia and Hanover into the temporary ” alliance of the three kings.” He was not sincere, however, in desiring to exclude Austria, and in 1850 accepted the invitation of that power to send deputies to the restored federal diet at Frankfort. The first chamber imme- diately protested against this step, and refused to consider the question of a pressing loan. The king retorted by dissolving the diet and summoning the old estates abolished in 1848. When a quorum, with some difficulty, was obtained, another period of retrograde legislation set in. The king himself was carried away with the reactionary current, and the people remained for the time indifferent. Beust became minister for both home and foreign affairs in 1852, and under his guidance the policy of Saxony became more and more hostile to Prussia and friendly to Austria.

The sudden death of the king, by a fall from his carriage in Tirol in 1854, left the throne to his brother John, a learned and accomplished prince, whose name is known in German literature as a translator and annotator of Dante. His brother’s ministers kept their portfolios, but their views gradually became somewhat liberalized with the spirit of the times. Beust, however, still retained his federalistic and philo-Austrian views. When war was declared between Prussia and Austria in 1866, Saxony

declined the former’s offer of neutrality, and, when a Prussian force crossed the border, the Saxon army under the king and the crown prince joined the Austrians in Bohemia. The entire kingdom, with the solitary exception of the Konigstein, was occupied by the Prussians. On the conclusion of peace Saxony lost no territory, but had to pay a war indemnity of ten million thalers, and was compelled to enter the North German Confederation.

During the peace negotiations Beust had resigned and entered the Austrian service, and on the 15th of November the king in his speech from the throne announced his intention of being faithful to the new Confederation as he had been to the old. On the 7th of February 1867 a military convention was signed with Prussia which, while leaving to Saxony a certain control in matters of administration, placed the army under the king of Prussia; from the 1st of July it formed the XII. army corps of the North German Confederation under the command of Crown-Prince Albert. The postal and telegraph systems were also placed under the control of Prussia, and the representation of the Saxon crown at foreign courts was merged in that of the Confederation. A new electoral law of the same year reformed the Saxon diet by abolishing the old distinction between the various ” estates ” and lowering the qualification for the franchise; the result

was a Liberal majority in the Lower House and a period of civil and ecclesiastical reform. John was succeeded in 1873 by his elder son Albert (1832-1902) who had added to his military reputation during the war of 1870. Under this prince the course of politics in Saxony presented little of general interest, except perhaps the spread of the doctrines of Social Democracy, which was especially remarkable in Saxony. The number of Social Democratic delegates in a diet of 80 members rose from sini885toi4ini89S. So alarming did the growth appear, that the other parties combined, and on the 28th of March 1896 a new electoral law was passed, introdu- cing indirect election and a franchise based on a triple division of classes determined by the amount paid in direct taxation. This resulted in 1901 in the complete elimination of the Socialists from the diet. On the 7th of June 1902 King Albert died, and was succeeded by his brother as King George. The most con- spicuous event of his reign was the flight in December 1902 of the crown-princess Louise with a M. Giron, who had been French tutor to her children, which resulted in a grave scandal and a divorce. More important, however, was the extraordinary situation created by the electoral law of 1896. This law had in effect secured the misrepresentation of the mass of the people in the diet, the representation of the country population at the expense of that of the towns, of the interests of agriculture as opposed to those of industry. A widespread agitation was the outcome, and the temper of the people, of what became known as the " Red Kingdom," was displayed in the elections of 1903 to the German imperial parliament, when, under the system of universal suffrage, of 23 members returned 22 were Social Democrats. This led to proposals for a slight modification in the franchise for the Saxon diet (1904), which were not accepted. In the elections of 1906, however, only 8 of the Social Democrats succeeded in retaining their seats. In 1907 the government announced their intention of modifying the electoral system in Saxony by the adding of representation for certain professions to that of the three classes of the electorate. This was, however, far from satisfying the parties of the extreme Left, and the strength of Social Democracy in Saxony was even more strikingly displayed in 1909 when, in spite of plural voting, under a com- plicated franchise, 25 Socialist members were returned to the Saxon diet.

King George died on the 15th of October 1904 and was suc- ceeded by his son as King Frederick Augustus III.

The Saxon Duchies. — The political history of the parts of Saxony left by the capitulation of Wittenberg to the Ernestine line, which occupy the region now generally styled Thuringia (Thuringen), is mainly a recital of partitions, reunions, redivisions and fresh com binations of

territory among the various sons of the successive dukes. The principle of primogeniture was not introduced until the end of the 17th century, so that the Protestant Saxon dynasty, instead of

building up a single compact kingdom for itself, has split into four petty duchies, of no political influence whatever. In 1547 the ex-elector John Frederick the Magnanimous was allowed to retain Weimar, Jena, Eisenach, Gotha, Henneberg and Saalfeld. Altenburg and a few other districts were added to the Ernestine possessions by the treaty of Naumburg in 1554, and other additions were made from other sources. John Frederick, who had retained and transmitted to his descendants the title of duke of Saxony, forbade his sons to divide their inheritance; but his wishes were respected only until after the death of his eldest son in 1565. The two survivors then f ounded separate jurisdictions at Weimar and Coburg, though arrange- ments were made to exchange territories every three years. In 1596 Saxe-Coburg gave off the branch Saxe-Eisenach ; and in 1603 Saxe- Weimar gave off Saxe-Altenburg, the elder Weimar line ending and the younger beginning with the latter date. By 1638 Weimar had absorbed both Coburg and Eisenach; Altenburg remained till 1672. John, duke of Saxe-Weimar, who died in 1605, is regarded as the common ancestor of the present Ernestine lines. In 1640 his three surviving sons ruled the duchies of Weimar, Eisenach and Gotha. Eisenach fell in in 1644 and Altenburg in 1672, thus leaving the dukes of Saxe-Weimar and Saxe-Gotha to become the ancestors of the modern ruling houses. Saxe-Weimar was still repeatedly divided; in 1668 a Saxe-Marksuhl appears, and about 1672 a Saxe-Jena and a new Saxe-Eisenach. All these, however, were extinct by 1 741, and their possessions returned to the main line, which had adopted the principle of primogeniture in 1719.

Saxe-Gotha was even more subdivided ; and the climax was reached about 16S0, when Gotha, Coburg, Meiningen, Romhild, Eisenberg, Hildburghausen and Saalfeld were each the capital of a duchy. By the beginning of 1825 only the first three of these and Hildburghausen remained, the lands of the others having been divided after much quarrelling. In that year the Gotha line expired, and a general redistribution of the lands of the ” Nexus Gothanus,” as this group of duchies was called, was arranged on the 12th of November 1826. The duke of Hildburghausen gave up his lands entirely for Altenburg and became duke of Saxe-Alt;nburg; the duke of Coburg exchanged

Saalfeld for Gotha and became duke of Saxe-Coburg-Gotha; and the duke of Saxe-Meiningen received Hildburghausen, Saalfeld and some other territories, and added Hildburghausen to his title. The existing duchies are separately noticed.

The chief authority for the early history of Saxony is Widukind, whose Res gestae Saxonicae is printed, together with the works of other chroniclers, in the Monumenta Germanica historica, Scriptores. Modern authorities are C. W. Bottiger, Geschichte des Kurstaates und Konigreichs Sachsen, new ed. by T. Flathe (1867-1873); Sturmhofel, Geschichte der sachsischen Lande und ihrer Herrscher (Chemnitz, 1897-1898); and Tutzschmann, Atlas zur Geschichte der sachsischen Lander (Grimma, 1852). Collections which may be consulted are: Codex diplomaticus Saxbniae regiae (Leipzig, 1 862-1 879); the Archiv fiir die sdchsische Geschichte, edited by K. von Weber (Leipzig, 1862-1879) ; and the Bibliothek der sdchsische Geschichte und Landeskunde, edited by G. Buchholz (Leipzig, 1903). See also Germany: Biblio- graphy, and the articles on the various dukes, electors and kings of Saxony.

SAXONY (Ger. Provinz Sachsen), one of the central provinces of the kingdom of Prussia, consists mainly of what was formerly the northern part of the kingdom of Saxony, which was ceded to Prussia in 1815, but also comprises part of the duchy of Magde- burg and other districts, the connexion of which with Prussia is of earlier date. The area of the province is 9751 sq. m. It is bounded W. by Hesse-Nassau, Hanover and Brunswick, N. by Hanover and Brandenburg, E. by Brandenburg and Silesia, and S. by the kingdom of Saxony and the small Thuringian states. It is, however, very irregular in form, entirely surrounding parts of Brunswick and the Thuringian • states, and itself possessing several exclaves, while the northern portion is almost severed from the southern by the duchy of Anhalt.

The major part belongs to the great North-German plain, but the western and south-western districts include parts of the Harz, with the Brocken, its highest summit, and the Thuringian Forest. About nine-tenths of Prussian Saxony belongs to the basin of the Elbe, the chief feeders of which within the province are the Saale, with its tributary the Unstrut, and the Mulde, but a small district on the west drains into the Weser.

Saxony is on the whole the most fertile province of Prussia and excels all the others in its produce of wheat and beetroot for sugar, but the nature of its soil is very unequal. The best crop-produ- cing districts lie near the base of the Harz Mountains, such as the ” Magdeburger Borde

” (between Magdeburg and the Saale) and the ” Goldene Aue,” and rich pasture lands occur in the river valleys, but the sandy plains of the Altmark, in the/north part of the province, yield but a scanty return.

Of the total area 61 % is occupied by arable land, 8% by meadows and pastures and 21 % by forests. Wheat and rye are exported in considerable quantities. The beetroot for sugar is grown chiefly in

the district to the north of the Harz, as far as the Ohre, and on the banks of the Saale; and the amount of sugar produced is nearly as much as that of all the rest of Prussia together. Flax, hops and oil-seeds are also cultivated, and large quantities of excellent fruit are grown at the foot of the Harz and in the valleys of the Unstrut and the Saale. The market-gardening of Erfurt and Quedlinburg is well known throughout Germany. The province is comparatively poor in timber, though there are some fine forests in the Harz and other hilly districts. Cattle-rearing is carried on with success in the river valleys, and more goats are met with here than in any other part of Prussia.

The principal underground wealth of Prussian Saxony consists of its salt and its brown coal, of both of which it possesses larger stores than any other part of the German empire. The chief rock-salt mines and brine springs are at Stassfurt, Schonebeck and Halle. The brown coal region extends from Oschersleben by Kalbe to Weissenfels; it is also found in the neighbourhood of Aschersleben, Bitterfeld and Wittenberg. Prussian Saxony also possesses three- fourths of the wealth of Germany in copper. The copper mines are found chiefly in the Harz district. The other mineral resources in- clude silver (one-third of the total German yield), pit-coal, pyrites, alum, plaster of Paris, sulphur, alabaster and several varieties of good building-stone. Numerous mineral springs occur in the Harz.

In addition to the production of sugar the most important industries are the manufactures of cloth, leather, iron and steel wares, chiefly at Erfurt, Suhl and SSmmerda; spirits at Nordhausen, chemicals at Stassfurt and Schonebeck, and starch. Beer is also brewed extensively. Trade is facilitated by the great waterway of the Elbe as well as by a complete system of railways. The chief articles are wool, grain, sugar, salt, lignite and the principal manu- factured products named above.

The population of the province of Saxony in 1905 was 2,979,221, an average of 305 persons to the square mile; they were almost equally divided between urban population and rural. There were 2,730,098 Protestants, 230,860 Roman Catholics and 8050 Jews. The bulk of the

inhabitants are of unmixed German stock, but many of those in the east part have Wendish blood in their veins.

Prussian Saxony is divided into the three government districts of Magdeburg, Merseburg and Erfurt. The principal towns are Magdeburg, Halle, Erfurt, Halberstadt, Nordhausen, Muhlhausen, Aschersleben, Weissenfels and Zeitz. Magdeburg is the headquarters of an army corps. The provincial chambers meet at Merseburg. The province sends twenty members to the Reichstag and thirty-eight to the Prussian Abgeordnetenhaus (house of representatives) . Magdeburg is the seat of an Evangeli- cal consistory; the Roman Catholics belong to the diocese of Paderborn. The university of Halle holds high rank among German seats of learning.

See the Handbuch der Provinz Sachsen (Magdeburg, 1900) ; and Jacobs, Geschichte der in der preussischen Provinz Sachsen vereinigten Gebiete (Gotha, 1884).

SAXOPHONE (Ger. Saxophon, Ital. sassofone), a modern hybrid musical instrument invented by Adolphe Sax, having the clarinet mouthpiece with single reed applied to a conical brass tube. In general appearance the saxophone resembles the bass clarinet, but the tube of the latter is cylindrical and of wood; both instruments are doubled up near the bell, which is shaped somewhat like the flower of the gloxinia. The mouthpiece in both is fixed to a serpentine tube at right angles to the main bore. On the saxophone, owing to its conical bore, the produc- tion of sound materially differs from that of the clarinet, and resembles that of the oboe. The reed mouthpiece in combination with a conical tube allows the performer to give the ordinary harmonic series unbroken, which means in practice that the octave or second member of the harmonic series is first overblown when the pressure of the breath and the tension of the lips on the reed are proportionally increased. The saxophone is there- fore one of the class known as octave instruments. The funda- mental note given out by the tube when the lateral holes are closed is that of an open organ pipe of thesame length, whereas when, as in the clarinet family, the reed mouthpiece is combined with a cylindrical bore, the tube behaves as though it were closed at one end, and its notes are an octave lower in pitch. Hence the bass clarinet to give the same note as a bass saxophone would need to be only half as long. The closed pipe, moreover, can only overblow the uneven numbers of the harmonic series, and therefore first gives the 12 th instead of the octave, which

The sopranino in F The soprano in C . The alto in F . . The tenor in C . . The baryton in F . The bass in C . .

necessitates an entirely different arrangement of holes and keys and a different scheme of fingering.

The bore of the saxophone is large, and there are from 18 to 20 keys covering holes of large diameter to produce the fundamental scale. The first 15 semitones are obtained by opening successive keys, the rest of the compass by means of _g— – — octave keys enabling the performer to sound the harmonic octave of the funda- mental scale. The compass of the various saxophones extends over 2 octaves and a fifth with chromatic intervals, being one octave less than the clarinet. The complete family consists of the accompanying members. The treble clef is used in notation, and all saxophones are transposing instruments, the music being written in a higher key, according to the difference in pitch between the funda- mental note of the instrument and the standard C of the

notation. The keys given above are of the orchestral saxophones; the instruments used in military bands are a tone lower. The quality of tone of this family of instruments is inferior to that of the clarinets and has affinities with that of the harmonium'. According to Berlioz it has vague analogies with the timbre of 'cello, clarinet and cor anglais, with, how- ever, a brazen tinge. To a clock- maker of Lisieux named Desfon- tenelles, who made a clarinet with a conical bore and an upturned bell in 1807, is due the combina- tion of single reed mouthpiece with a conical tube. In 1840 Adolphe Sax, in trying to produce a clarinet that would overblow an octave like the flute and oboe, in- vented the saxophone, which at once leapt into popularity in France and Belgium, where the alto, tenor and baryton have super- (B * C T rH "i seded the bassoon in almost all

" " the military bands. Many modern

French composers, Meyerbeer, Massenet, Ambroise Thomas and others, have scored for it in their operas. Kastner introduced it into the orchestra in Paris in 1844 in Le Dernier Roi de Juda. The saxophone has been adopted in England at the Royal Military School of Music at Kneller Hall. (K. S.)

SAY, JEAN BAPTISTS (1767-1832), French economist, was born at Lyons on the 5th of January 1767. His father, Jean Etienne Say, was

of a Protestant family which had originally belonged to Nimes, but had removed to Geneva for some time in consequence of the revocation of the edict of Nantes. Young Say was intended to follow a commercial career, and was sent, with bis brother Horace, to England, and lived first at Croydon, in the house of a merchant, to whom he acted as clerk, and afterwards in 'London, where he was in the service of another employer. When, on the death of the latter, he returned to France, he was employed in the office of a life assurance company directed by E. Claviere, afterwards known in politics. Claviere called his attention to the Wealth of Nations, and the study of that work revealed to him his vocation. His first literary attempt was a pamphlet on the liberty of the press, published in 1 789. He worked under Mirabeau on the Courrier de Provence. In 1792 he took part as a volunteer in the campaign of Cham- pagne; in 1793 he assumed, in conformity with the Revolu- tionary fashion, the pre-name of Atticus, and became secretary to Claviere, then finance minister. He married in 1793 Mile Deloche, daughter of a former avocat au conseil; the young pair were greatly straitened in means in consequence of the deprecia- tion of the assignats. From 1794 to 1800 Say edited a periodical

entitled La Decade philosophique, litliraire, et politique, in which he expounded the doctrines of Adam Smith. He had by this time established his reputation as a publicist, and, when the consular government was established in the year VIII (1799), he was selected as one of the hundred members of the tribunate, and resigned, in consequence, the direction of the Decade. He published in 1800 Olbie, ou essai sur les moyens de reformer les moeurs d'une nation.

In 1803 appeared his principal work, the Traits d'iconomie politique. In 1804, having shown his unwillingness to sacrifice his convictions for the purpose of furthering the designs of Napoleon, he was removed from the office of tribune, being at the same time nominated to a lucrative post, which, however, he thought it his duty to resign. He then turned to industrial pursuits, and, having made himself acquainted with the processes of the cotton manufacture, founded at Auchy, in the Pas de Calais, a spinning-mill which employed four or five hundred persons, principally women and children. He devoted his leisure to the improvement of his economic treatise, which had for some time been out of print, but which the censorship did not permit him to republish; and in 1814 he availed himself (to use his own words) of the sort of liberty arising from the entrance of the allied powers into France to bring out a second edition of the work, dedicated to the emperor Alexander, who had professed himself his pupil. In the same year the French government sent him to study the

economic condition of Great Britain. The results of his observations during his journey through England and Scotland appeared in a tract De V Angleterrt et des Anglais; and his conversations with distinguished men in those countries contributed to greater correctness in the exposition of principles in the third edition of the Traitt, which appeared in 181 7. A chair of industrial economy was founded for him in 1819 at the Conservatoire des Arts et Metiers. In 1 83 1 he was made professor of political economy at the College de France. He published in 1828-1830 his Cours complet d'economie politique pratique, which is in the main an expansion of the Traits, with practical applications. In his later years he became subject to attacks of nervous apoplexy. He lost his wife in January 1830; and from that time his health con- stantly declined. When the revolution of that year broke out, he was named a member of the council-general of the department of the Seine, but found it necessary to resign. He died at Paris on the 15th of November 1832.

Say was essentially a propagandist, not an originator. His great service to mankind lay in the fact that he disseminated throughout Europe by means of the French language, and popularized by his clear and easy style, the economic doctrines of Adam Smith. It is true that his French panegyrists (and he is not himself free from censure on this score) are unjust in their estimate of Smith as an expositor and extol too highly the merits of Say. On the side of the philosophy of science his observations are usually commonplace or superficial. Thus he accepts the shallow dictum of Condillac that toute science se reduit_ a une langue bien faite. He recognizes political economy and statistics as alike sciences, and represents the distinc- tion between them as having never been made before him, though he quotes what Smith had said of political arithmetic. While deserving the praise of honesty, sincerity and independence, he is inferior to his predecessor in breadth of view on moral and political questions. In his general conception of human affairs there is a tendency to regard too exclusively the material side of things, which made him pre-eminently the economist of the French liberal bourgeoisie. He is inspired with the dislike and jealousy of governments so often felt and expressed by thinkers formed in the social atmosphere of the 1 8th century. Soldiers are for him not merely unproductive labourers, as Smith called them; they are rather "destructive labourers." Taxes are uncompensated payments; they may be described as of the nature of robbery.

Say is considered to have brought out the importance of capital as a factor in production more distinctly than the English econo- mists, who unduly emphasized labour. The special doctrines most commonly mentioned as due to him are — (1) that of " immaterial products,"

and (2) what is called his ” theorie des debouchfe.” Objecting, as Germain Gamier had, to Smith’s distinction between productive and unproductive labour, he maintains that, production consisting in the creation or addition of a utility, all useful labour is productive. He is thus led to recognize immaterial products, whose characteristic quality is that they are consumed immediately and are incapable of accumulation; under this head are to be ranged the services rendered either by a person, a capital or a portion of

land, as, e.g., the advantages derived from medical attendance, or from a hired house or from a beautiful view. But in working out the consequences of this view Say is not free from obscurities and inconsistencies; and by his comprehension of these immaterial products within the domain of economics he is confirmed in the error of regarding that science as filling the whole sphere which really belongs to sociology. His ” theorie des debouches ” amounts to this, that, products being, in last analysis, purchased only with products, ‘the extent of the markets (or outlets) for home products is proportional to the quantity of foreign productions; when the sale of any commodity is dull, it is because there is not a sufficient number, or rather value, of other commodities produced with which it could be purchased. Another proposition on which Say insists is that every value is consumed and is created only to be consumed. Values can therefore be accumulated only by being reproduced in the course or, as often happens, by the very act of consumption ; hence his distinction between reproductive and unproductive con- sumption. We find in him other corrections or new presentations of views previously accepted, and some useful suggestions for the improvement of nomenclature.

Say’s writings occupy vols, ix.-xii. of Guillaumin’s Collection des principaux economistes. Among them are, in addition to those already mentioned, Catechisme d’economie politique (1815); Petit Volume conlenant quelques apercus des hommes et de la societe, lettres d Malthus sur diff evens sujets d’economie politique (1820); Hpitome des principes de I’economie politique (1831). A volume of Melanges et correspondance was published posthumously by Charles Comte, author of the Traite de legislation, who was his son-in-law. To the above must be added an edition of Storch’s Cours d’economie politique, which Say published in 1823 without Storch’s authorization, with notes embodying a ” critique amere et virulente,” a pro-

ceeding which Storch justly resented.

The last edition of the Traite d'economie politique which appeared during the life of the author was the 5th (1826); the 6th, with the author's final corrections, was edited by the eldest son, Horace Emile Say, himself known as an economist, in 1846. The work was translated into English " from the 4th edition of the French " by C. R. Prinsep (1821), into German by Ludwig Heinrich von Jakob (1807) and by C. Ed. Morstadt (1818 and 1830), and, as Say himself informs us, into Spanish by Jose Queypo. The Cours d'economie politique pratique, from which Morstadt had given extracts, was translated into German by Max Stirner (1845). The Catechisme and the Petit Volume have also been translated into several European languages. An English version of the Lettres d. Malthus appears in vol. xvii. of the Pamphleteer (1821). See also Jean Baptiste Say, by A. Liesse (Paris, 1901). (J. K. I.)

SAY, [JEAN BAPTISTE] LEON (1826-1896), French statesman and economist, was born in Paris on the 6th of June 1826. The family was a most remarkable one. His grandfather Jean Baptiste Say (q.v.) was a well-known economist. His brother Louis Auguste Say (1774-1840), director of a sugar refinery at Nantes, wrote several books against his theories. His son Horace Ehile Say (1 794-1860), the father of Leon Say, was educated at Geneva, and had travelled in America before establishing himself in business in Paris, where he became president of the Chamber of Commerce in 1848. His careful investigations into the condition of industry at Paris gained for him a seat in the Academy of political and moral sciences,

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Leon Say thus inherited zeal for economic studies, of which he gave proof by publishing at the age of twenty-two a brief Hisloire de la caisse d'escompte. He was at first destined for the law, next entered a bank, and finally obtained a post in the administration of the Chemin de fer du Nord. Meanwhile he became a regular contributor to the Journal des dSbats, where he established his reputation by a series of brilliant attacks on the financial administration of the prefect of the Seine, Haussmann. He displayed talent for interesting popular audiences in economic questions. His sympathies, like those of his grandfather, were with the British school of economists ; he was, indeed, the hereditary defender of free-trade principles in France. He had, moreover, an intimate acquaintance with the English language and institutions, and translated into French Goschen's Theory of Foreign Exchanges. He was one of the pioneers of the co-operative

movement in France. Elected to the Assembly of 1871 by the departments of Seine and Seine- et-Oise, he adopted the former, and took his seat among the Moderate Liberals, to whose principles he adhered throughout his life. He was immediately chosen as reporter of the com- mission on the state of the national finances, and in this capacity

prepared two elaborate statements. Thiers, though opposing their publication on grounds of public expediency, was much struck by the ability displayed in them, and on the 5th of June appointed Say prefect of the Seine. The fall of the empire, the siege of Paris, and the Commune had reduced the administra- tion of the capital to chaos, and the task of reconstruction severely tried the new prefect's power of organization. This was, however, a gift with which he was pre-eminently endowed; and he only quitted his post to assume, in December 1872, the ministry of finance — a remarkable tribute to his abilities from Thiers, who himself held strongly protectionist views. In all other respects Say regarded himself as the disciple of Thiers, who, in his last public utterance, designated Say as one of the younger men who would carry on his work. He fell from office with Thiers on the 24th of May 1873, and was elected president of the Left Centre group, as whose candidate he unsuccessfully contested the presidency of the Chamber with Buffet. In spite of their divergence of views, he consented, at the urgent request of President MacMahon, to take office in March 1875 in the Buffet Cabinet; but the reactionary policy of the premier led to a dispute between him and Say both in the press and in the constituencies, and brought about Buffet's resignation. Say continued to hold the ministry of finance under Dufaure and Jules Simon, and again in the Dufaure ministry of December 1877, and its successor, the Waddington ministry, till December 1879. During this long period, in which he was practically the autocratic ruler of the French finances, he had first to com- plete the payment of the war indemnity — an operation which, thanks largely to his consummate knowledge of foreign exchanges, was effected long before the prescribed time. It was at a con- ference held between Say, Gambetta and M. de Freycinet in 1878 that the great scheme of public works introduced by the latter was adopted. Say's general financial policy was to ameliorate the incidence of taxation. As a pendant to his free-trade principles, he believed that the surest way of enriching the country, and therefore the Treasury, was to remove all restrictions on internal commerce. He accordingly reduced the rate of postage, repealed the duties on many articles of prime utility, such as paper, and fought strongly, though unsuccess- fully, against the system of octrois. On the 30th of April 1880 he accepted the post of ambassador

in London for the purpose of negotiating a commercial treaty between France and England, but the presidency of the Senate falling vacant, he was elected to it on the 25th of May, having meanwhile secured a pre- liminary understanding, the most important feature of which was a reduction of the duty on the cheaper class of French wines. In January 1882 he became minister of finance in the Freycinet Cabinet, which was defeated in the following July on the Egyptian question. Say's influence over the rising generation grew less ; his " academic Liberalism " was regarded as old-fashioned ; Socialism, which he never ceased to attack, obtained even greater power, and fjee-trade was discarded in favour of M. Meline's policy of protection, against which Say vainly organized the Ligue contre le rencherissement du pain. He had, however, a large share in the successful opposition to the income-tax, which he considered likely to discourage individual effort and thrift. In 1889 he quitted the Senate to enter the Chamber as member for Pau, in the belief that his efforts for Liberalism were more urgently needed in the popular Assembly. Throughout his career he was indefatigable both as a writer and as a lecturer on economics, and in both capacities exerted a far wider influence than in parliament. Special mention must be made of his work, as editor and contributor, on the Dictionnaire des finances and Nouveau Dictionnaire d'iconomie politique. His style was easy and lucid, and he was often employed in drawing up important official documents, such as the famous presidential message of December 1877. He was for many years the most prominent member of the Academie des Sciences Morales et Politiques, and in 1886 succeeded to Edmond About's seat in the Academie Francaise. He died in Paris on the 21st of April 1896. A selection of his most important writings and speeches has since been published in four volumes under the title of

Les Finances de la France sous la troisieme rSpublique (1898-

1901).

See Georges Michel, Leon Say (Paris, 1899); Georges Picot, Leon Say, notice historigue (Paris, 1901), with a bibliography.

SAY, a town on the right bank of the river Niger in 13 4′ N. and 2° 30′ E., in the French colony of Upper Senegal and Niger. In the agreement of 1890 between Great Britain and France for the delimitation of their respective spheres of in- fluence in West Africa, Say was taken as the

western end of an imaginary line which ran eastward to Barrua on Lake Chad. To the north the ” light soil ” of the Sahara— a phrase used by Lord Salisbury in explaining the nature of the agreement in the House of Lords — was recognized as French; to the south the Sokoto empire (northern Nigeria) fell to Great Britain. By the convention of 1898 Say, however, and a considerable tract of territory south and east of the town were ceded to France. (See Africa, §5.)

SAYAD, a descendant of Ali, the son-in-law of Mahomet, by Fatima, Mahomet’s daughter. Many of the Pathan tribes in the North-West Frontier Province of India, such as the Bangash of Kohat and the Mishwanis of the Hazara border, claim Sayad origin. The apostles who completed the conversion of the Pathans to Islam were called Sayads if they came from the west, and Sheikhs if they came from the east; hence doubtless many false claims to Sayad origin. In Afghanistan the Sayads have much of the commerce in their hands, as their holy character allows them to pass unharmed where other Pathans would be murdered.

The Sayads gave a short-lived dynasty to India, which reigned at Delhi during the first half of the 15th century. Their name again figures in Indian history at the break up of the Mogul empire, when two Sayad brothers created and dethroned emperors at their will (1714-1720). In 1901 the total number of Sayads in all India was returned at 1,339,734. They include many well-known and influential families. The first Mahom- medan appointed to the Council of India and the first appointed to the Privy Council were both Sayads.

SAYAN MOUNTAINS, a range of Asia, forming the eastern continuation of the Sailughem or Altai range, stretching from 89 E. to 106 E. Orographically they are the N. border-ridge of the plateau of N.W. Mongolia, and separate that region from Siberia. The geology is imperfectly known. While the general elevation is 7000 to 9000 ft., the individual peaks, consisting largely of granites and metamorphic slates, reach altitudes of 10,000 ft. and 11,450 ft., e.g. in MunkoSardyk; while the principal passes lie 6000 to 7500 ft. above the sea, e.g. Muztagh 7480 ft., Mongol 6500 ft., Tenghyz 7480 ft. and Obo-sarym 6100 ft. In 92° E. the system is pierced by the Bel-kem or upper Yenisei, and in 106 , at its eastern extremity, it terminates above the depression of the Selenga-Orkhon valley. From the Mongolian plateau the ascent is on the whole gentle, but from the plains of Siberia it is much steeper, despite the fact that the range is masked by a broad belt of subsidiary ranges of an Alpine character, e.g. the Usinsk, Oya, Tunka, Kitoi and Byelaya ranges. Between the breach of the Yenisei and the Kosso-gol (lake) in 100° 30′ E. the

system bears also the name of Yerghik-taiga. The flora is on the whole poor, although the higher regions carry good forests of larch, pitch pine, cedar, birch and alder, with rhodo- dendrons and species of Berberis and Ribes. Lichens and mosses clothe many of the boulders that are scattered over the upper slopes.

SAYBROOK, a township of Middlesex county, Connecticut, U.S.A., at the mouth and on the W. bank of the Connecticut river, about 100 m. E.N.E. of New York City and about 40 m. S. of Hartford. Pop. (1900) 1634; (1910) 1907. The post office of the township is named Deep River. Mainly confined to Saybrook Point, jutting out into the river, is the township of Old Saybrook (pop. in 1910, 1516), separated from the township of Saybrook in 1852, but actually the mother colony; its post village is called Saybrook. It is served by the New York, New Haven & Hartford railway, the Valley branch of which here separates from the Shore Line branch. It is a beautiful place,

with several old buildings, notably the Hart mansion built about 1783 by Captain Elisha Hart, whose seven daughters here enter- tained Washington Irving, J. R. Drake and Fitz-Greene Halleck. Com. Isaac Hull and his nephew Joseph Bartine Hull married two of the daughters, and the younger of these in 1874 left the house to the township of Old Saybrook, which refused the gift. Fenwick (pop. in 1910, 34), the smallest borough in the state, is a part of Old Saybrook township, in which there are summer residences. The first settlement was made on Saybrook Point late in 1635 by John Winthrop, commissioned governor for one year by the company of which the principal shareholders were Lord Saye and Sele, Lord Brooke, Sir Richard Saltonstall, John Pym and John Hampden, and which had a grant from the earl of Warwick. The English settlers forestalled the Dutch, who attempted to land here in November. A palisade was built across the narrowest part of the neck of the point by Lion Gardiner, who built a fort (burned in 1647) and planned a settlement, to which for a time it was thought Lord Saye and Sele, Lord Brooke, John Hampden, Oliver Cromwell, and other independents would immigrate. Gardiner called the place Saybrook from the names of its principal proprietors. He had practical control until 1639, when he was displaced by George Fenwick (d. 1657), whose wife, called Lady Fenwick (she was the widow of Sir John Botelier), died here in 1646, and who in 1644 sold 1 to Connecticut the proprietors' rights.

In 1646 the First Church of Christ was organized; a church build- ing was erected in 1647, and in 1680-1681 another, in which in September 1708, at the call of the General Assembly, met a Congre- gational Synod of 16 members which reaffirmed the Savoy Con-

fession of Faith and the Heads of Agreement adopted in England in 1 69 1 by Congregationalists and Presbyterians, and drew up the Saybrook Platform of discipline, providing for the promotion of harmony and order, the regular introduction of candidates into the ministry and the establishment of associations and consociations, the latter being tribunals with final and appellate jurisdiction. This platform was approved by the General Assembly, and churches organized under it were declared to be established by law. This establishment continued in full force until 1784. A granite boulder (1901) marks the site of the first home of Yale University, established here in 1701 as the Collegiate School of Connecticut; until 1716, when it was removed to New Haven, most of the school's commence- ments were held here and all its exercises after 1 707-1 708, before which time most of the actual teaching was done in Killingworth, now Clinton, Connecticut. Saybrook was the home of David Bushnell (1742-1824), who devised in 1776 a submarine torpedo and a tortoise-shaped diving boat, the " American Turtle," which were tried without success against the British in the War of American Independence.

The original township of Saybrook contained the present town- ships of Old Saybrook, Westbrook (1840), Essex (1854, taken from Old Saybrook), Saybrook and Chester (1836), and, on the east side of the river, parts of the present Lyme (1665), Old Lyme (1855, from Lyme), and East Lyme (1839, from Lyme and Waterford).

SAYCE, ARCHIBALD HENRY (1846-), British Orientalist, was born at Shirehampton on the 25th of September 1846, son of the Rev. H. S. Sayce, vicar of Caldicot. He was educated at Bath, and at Queen's College, Oxford, of which he became fellow in 1869. In 1891 he was elected professor of Assyriology at Oxford. He threw his whole energies into the study of biblical and other Oriental subjects, and though his conclusions have in a number of cases been considerably modified (e.g. in chron- ology and transliteration) by the work of other scholars (see, e.g. Babylonia and Assyria) it is impossible to overestimate his services to Oriental scholarship. He travelled widely in the East and continued in later life annual trips up the Nile. An interesting example of the importance of his pioneer work is the fact that there has been a strong tendency to revert to the views which he advanced on the question of the Hittites in his early Oxford lectures. He was a member of the Old Testament Revision Company in 18 74-1 884; deputy professor of com- parative philology in Oxford 1876-1890; Hibbert Lecturer 1887; Gifford Lecturer 1900-1902.

1 The sale was probably illegal as it was never confirmed ; and it does

not appear that the earl of Warwick had ever had title to the land to convey to the company of which Fenwick was agent. For a conjectural explanation of the history of the Warwick patent see Forrest Morgan, ” The Solution of an Old Historic Mystery,” in the Magazine of History for July, August, September and October 1969.

Of his numerous publications the following are of special importance: — Assyrian Grammar for Comparative Purposes (1872); Principles of Comparative Philology (1874) I Babylonian Literature (1877); Introduction to the Science of Language (1879); Monuments of the Hittites (1881); Herodotus i.-iii. (1883); Ancient Empires of ike East (1884); Introduction to Ezra, Nehemiah and Esther (1885); Assyria (1885); Hibbert Lectures on Babylonian Religion (1887); The Hittites (1889); Races of the Old Testament (1891); Higher Criticism and the Verdict of the Monuments (1894); Patriarchal Palestine (1895); The Egypt of the Hebrews and Herodotus (1895); Early History of the Hebrews (1897); Israel and the Surrounding Nations (1898); Babylonians and Assyrians (1900); Egyptian and Babylonian Religion (1903) ; Archaeology of the Cuneiform Inscr. (1907). He also contributed important articles to the 9th, 10th and nth editions of the Encyclopaedia Britannica and edited a number of Oriental works.

SAYE AND SELE, WILLIAM FIENNES, ist Viscount (1582- 1662), was the only son of Richard Fiennes, 7th Baron Sayeand Sele, and was descended from James Fiennes, Lord Saye and Sele, who was lord chamberlain and lord treasurer under Henry VI. and was beheaded by the rebels under Jack Cade on the 4th of July 1450. Born on the 28th of May 1582 Fiennes, like many of his family, was educated at New College, Oxford; he succeeded to his father’s barony in 1613, and in parliament opposed the policy of James I., undergoing a brief imprisonment for objecting to a benevolence in 1662; and he showed great animus towards Lord Bacon. In 1624, owing probably to his temporary friend- ship with the duke of Buckingham, he was advanced to the rank of a viscount, but notwithstanding this he remained during the early parliaments of Charles I. champion of the popular cause, and was in Clarendon’s words ” the oracle of those who were called Puritans in the worst sense, and steered all their counsels and designs.” Afterwards his energies found a new outlet in helping to colonize Providence Island, and in interesting himself in other and similar enterprises in America. Although Saye resisted the levy of ship-money, he accompanied Charles on his march against the Scots in

1639; but, with only one other peer, he refused to take the oath binding him to fight for the king to “the utmost of my power and hazard of my life. ” Then Charles I . sought to win his favour by making him a privy councillor and master of the court of wards. When the Civil War broke out, however, Saye was on the committee of safety, was made lord- lieutenant of Gloucestershire, Oxfordshire and Cheshire, and raising a regiment occupied Oxford. He was a member of the committee of both kingdoms; was mainly responsible for passing the self-denying ordinance through the House of Lords; and in 1647 stood up for the army in its struggle with the parliament. In 1648, both at the treaty of Newport and elsewhere, Saye was anxious that Charles should come to terms, and he retired into private life after the execution of the king, becoming a privy councillor again upon the restoration of Charles II. He died at his residence, Broughton Castle near Banbury, on the 14th of April 1662. On several occasions Saye outwitted the advisers of Charles I. by his strict compliance with legal forms: He was a thorough aristocrat, and his ideas for the government of colonies in America included the establishment of an hereditary aristo- cracy. His eldest son James (c. 1603-1674) succeeded him as 2nd viscount; other sons were the parliamentarians Nathaniel Fiennes (q.v.) and John Fiennes. The viscounty of Saye and Sele became extinct in 1781, and the barony is now held by the descendants of John Twisleton (d. 1682) and his wife Elizabeth (d. 1674), a daughter of the 2nd viscount. Saybrook (q.v.) in Connecticut is named after Viscount Saye and Lord Brooke.

SAYER (or Sayers), JAMES (1748-1823), English cari- caturist, was a native of Yarmouth, and son of a merchant captain. He began as clerk in an attorney’s office, and was for a time a member of the borough council. In 1780 the death of his father put him in possession of a small fortune, and he came to London. As a political caricaturist he was a supporter of William Pitt. His plate of ” Carlo Khan’s triumphal entry into Leadenhall Street ” was allowed by C. J. Fox, against whom it was directed, to have damaged him severely in public opinion. Indeed Sayer was always at his best when attacking Fox, whose strongly marked features he rendered with remarkable power, and always so as to make them convey expressions of defiant

impudence or of anger. Pitt, who showed no wish to help literature or art in any other case, provided Sayer with a place as marshal of the Exchequer court. He died in Curzon Street, Mayfair, on the 20th of April 1823.

Sayer’s ” Carlo Khan ” has been frequently reproduced. But he can only be judged with confidence after examining the collection in the

British Museum, or other public libraries. His drawings, made originally with pencil on oil paper, were etched for him by the Brethertons. They were then sold in collections of the size of a large octavo copybook, under such titles as Illustrious Heads (1794) or Outlines of the Opposition (1795). Sayer left a complete gallery of small full-length pictures of the public men of his time, slightly caricatured. In his great plates he is inferior to Gillray, and he never has the grace of Rowlandson, but he is less exaggerated than either, and nearer the truth.

SAYERS, TOM (1826-1865), English pugilist, was born at Brighton on the 25th of May 1826. By trade a bricklayer, he began his career as a prize fighter in 1849 and won battle after battle, his single defeat being at the hands of Nat Langham in October 1853. In 1857 he gained the championship. His fight with the American, John C. Heenan, the Benicia Boy, a much heavier man than himself, is perhaps the most famous in the history of the English prize ring. It took place at Farnborough on the 17th of April i860 and lasted two hours and six minutes, thirty-seven rounds being fought. After Sayers's right arm had been injured the crowd pressed into the ring and the fight was declared a draw. £3000 was raised by public subscription for Sayers, who withdrew from the ring and died on the 8th of November 1865. The champion was 5 ft. 83 in. in height and his fighting weight was under 1 1 stone. An account of the fight between Sayers and Heenan is given by Frederick Locker- Lampson in My Confidences (1896).

SAYRE, a borough of Bradford county, Pennsylvania, U. S. A., on the North Branch of the Susquehanna river, about 95 m. (by rail) N.N.W. of Wilkes-Barre, and just S. of the New York state boundary. Pop. (1900) 5243 (337 foreign-born); (1910) 6426. Sayre is served by the main line and by a branch of the Lehigh Valley railway, and is connected by electric railway with Waverly, New York, and with the adjacent borough of Athens, Pennsylvania (pop. in 1910, 3796), which manufactures furniture, carriages and wagons. Sayre, Athens, South Waverly and Waverly form virtually one industrial community. The borough of Sayre is the seat of the Robert Packer Hospital (1885) and has two parks. It is the trade centre of an agricultural and dairying region, and has metal works and other factories; but its industrial importance is due primarily to the locomotive and car shops of the Lehigh Valley railway. It was named in honour of Robert Heysham Sayre (1824-1907), long chief- engineer of this railway. Sayre was settled in 1880 and was incorporated as a borough in 1891.

SAYYID AHMAD KHAN, SIR (1817-1898), Mahommedan educationist and reformer, was born at Delhi, India, in 1817. He belonged to a

family which had come to India with the Mahommedan conquest, and had held important offices under the Mogul emperors. Although his imperfect acquaintance with English prevented his attainment of higher office than that of a judge of a small cause court, he earned the title of the recognized leader of the Mahommedan community. To the British he rendered loyal service, and when the. mutiny reached Bijnor in Rohilkand in May 1857 the British residents owed their lives to his courage and tact. His faithfulness to his religion was pronounced, and in 1876 he defended the cause of Islam in A Series of Essays on Mahommed, written in London. He used these advantages to act as interpreter between the Mahom- medans and their rulers, and to rouse his co-religionists to a sense of the benefits of modern education. The task was no light one; for during the first half of the 19th century the Mahommedans had kept themselves aloof from English educa- tion, and therefore from taking their proper part in the British administration, being content to study Persian and Arabic in their own mosques. Sayyid Ahmad set himself to alter their resolution. He established a translation society, which became the Scientific Society of Aligarh. He wrote letters from England to draw the hearts of the East to the West. In 1873 he founded

the Mahommedan Anglo-Oriental College at Aligarh, and raised funds for the buildings of which Lord Lytton laid the foundation- stone. He stimulated a similar movement elsewhere, and among other cities Karachi, Bombay and Hyderabad caught the infection of his spirit. Thus he effected a revolution in the attitude of Mahommedans towards modern education. He was made K.C.S.I., and became a member of the legislative councils of India and Allahabad, and of the education commission. He died at Aligarh on the 2nd of March 1898.

See Lieut.-Colonel G. F. I. Graham, The Life and Work of Sir Saiyad Ahmed Khan (1885). (W.. L.-W.)

SBEITLA (anc. Sufettdd), a ruined city of Tunisia, 66 m. S.W. of Kairawan. Long buried beneath the sand, this is the most beautiful and extensive of the Roman cities in the regency. It stands at the foot of a hill by a river, here perennial, but at a short distance beyond lost in the sands. The chief ruin is a rectangular walled enclosure, 238 ft. by 198 ft., known as the Hieron, having three small and one large entrance. The great gateway is a fine monumental arch in fair preservation, with an inscription to Antoninus Pius. Facing the arch,

within the Hieron, their rear walls forming one side of the enclosure, are three temples, connected with one another by arches, and forming one design. The length of the entire facade is 1 1 8 f t. The principal chamber of the central temple, which is of the Composite order, is 44 ft. long; those of the side temples, in the Corinthian style, are smaller. The walls of the middle temple are ornamented with engaged columns; those of the other buildings with pilasters. The porticos have fallen, and their broken monolithic columns, with fragments of cornices and other masonry, lie piled within the enclosure, which is still partly paved. (In 1901 a violent storm further damaged the temples and forced the gateway out of the perpendicular.) The other ruins include a triumphal arch of Constantine, a still serviceable bridge and a square keep or tower of late date.

The early history of Sufetula is preserved only in certain inscrip- tions. Under Antoninus and Marcus Aurelius it appears to have been a flourishing city, the district, now desolate, being then very fertile and covered with forests of olives. It was partly rebuilt during the Byzantine occupation and became a centre of Christianity. At the time of the Arab invasion it was the capital of the exarch Gregorius, and outside its walls the battle was fought in which he was slain; his daughter, who is said by the Arab historians to have fought by the side of her father, became the wife of one of the Arab leaders. The invaders besieged, captured and sacked Sufetula, and it is not afterwards mentioned in history. It was not until the close of the 1 9th century that the ruins were thoroughly examined by French savants. See A. Graham, Roman Africa (London, 1902) ; Sir R. L. Playfair, Travels in the Footsteps of Bruce (London, 1877).

SCABBARD, the sheath of a sword. The early forms of the word given in the Promptorium parvulorum are scauberk, scaubert or scauberd. The termination is certainly from the Teutonic bergen, to protect, as seen in ” hauberk,” ” hawberk ” (i.e. halsberg) , literally a protection for the neck and shoulders, hence the ” long tunic of mail ” of the 12th century (see Arms and Armour). The first part is doubtful; Skeat takes it as representing the O. Fr. escale, mod. icaille, shell. Ger. Schale; the word would therefore mean an outer sheath or shell that covers or protects.

SCABBLING, or Scappling, in building, the process of reducing a stone to a rough square by the axe or hammer; in Kent the rag-stone masons call this knobbling (see Masonry).

SCABIES, or Itch, a skin disease due to an animal parasite, the Sarcoptes scabei (see Mite), which burrows under the epidermis at any

part of the body, but hardly ever in the face or scalp of adults; it usually begins at the clefts of the fingers, where its presence may be inferred from several scattered pimples, which will probably have been torn at their summits by the scratching of the patient, or have been otherwise converted into vesicles or pustules. The remedy is soap and water, and sulphur ointment.

SCAEVOLA, the name of a famous family of ancient Rome, the most important members of which were: —

1. Gaius Mucius Scaevola, a legendary hero, who volunteered to assassinate Lars Porsena when he was besieging Rome. Making his way through the enemy's lines to the royal tent,

but not knowing Porsena by sight, he slew his secretary by mistake. Before the royal tribunal Mucius declared that he was one of 300 noble youths who had sworn to take the king's life, and that he had been chosen by lot to make the attempt first. Threatened with death or torture, Mucius thrust his right hand into the fire blazing upon an altar, and held it there until it was consumed. The king, deeply impressed and dreading a further attempt upon his life, ordered Mucius to be liberated, made peace with the Romans and withdrew his forces. Mucius was rewarded with a grant of land beyond the Tiber, known as the " Mucia Prata " in the time of Dionysius of Halicarnassus, and received the name of Scaevola (" left-handed "). Dionysius says nothing of the incident of the fire, and attributes Porsena's alarm partly to the loss of a band of marauders in an ambuscade. The story is presumably an attempt to explain the name Scaevola, coloured by national and family vanity (Livy ii. 12; Dion. Halic. v. 27-30). The Mucius of the legend is described as a patrician; the following were undoubtedly plebeians.

2. Publius Mucius Scaevola, Roman orator and jurist, consul 133 B.C. during the time of the Gracchan disturbances. He was not opposed to moderate reforms, and refused to use violence against Tiberius Gracchus, although called upon in the senate " to protect the state and put down the tyrant." After the murder of Gracchus, however, he expressed his approval of the act. He was an opponent of the younger Scipio Africanus, for which he was attacked by the satirist Lucilius (Persius i. 115; Juvenal i. 154). In 130 he succeeded his brother Mucianus as pontifex maximus. During his tenure of office he published a digest in 80 books of the official annals kept by himself and his predecessors, which were afterwards discontinued as unnecessary, their place being taken by the works of private annalists. He was chiefly distinguished for his knowledge of law, which he held

to be indispensable to a successful pontifex. Cicero frequently mentions him as a lawyer of repute, and he is cited several times by the jurists whose works were used in the compilation of the Digest. He was also a famous player at ball and the game called Duodecim Scripta; after he had lost a game, he was able to recall the moves and throws in their order. 1 1

See A. H. J. Greenidge, History of Rome.

3. Quintus Mucius Scaevola, son of (2), usually called ” Pontifex Maximus,” to distinguish him from (4), consul in 95 B.C. with his friend L. Licinius Crassus the orator. He and his colleague brought forward the lex Licinia Mucia ie civibus regundis, whereby any nonˆburgess who was convicted of having usurped the rights of citizenship was to be expelled from Rome, and any non-burgess was forbidden under pain of a heavy penalty to apply for the citizenship. Its object was undoubtedly to purify the elections and to prevent the undue influence of the Italians in the comitia. The indignation aroused by it was one of the chief causes of the Social War (see Mommsen’s Hist, of Rome). After his consulship Scaevola was governor of the province of Asia, in which capacity he distinguished himself by his just dealing and his severe measures against the un- scrupulous farmers of taxes (publicani). The latter, finding themselves unable to touch Mucius, attacked him in the person of his legate, Publius Rutilius Rufus (

1 Some authorities hold that Quintilian {Inst. Oral. xi. 2, 38) refers to Scaevola (3).

value upon the gods, while people of intellect had no need of religion at all. He was proscribed by the Marian party, and in 82, when the younger Marius, after his defeat by Sulla at Sacri- portus, gave orders for the evacuation of Rome and the massacre of the chief men of the opposite party, Scaevola, while attempting to reconcile the opposing factions, was slain at the altar of Vesta and his body thrown into the Tiber. He had already escaped an attempt made upon his life by Gaius Fimbria at the funeral of the elder Marius in 86.

Scaevola was the founder of the scientific study of Roman law and the author of a systematic treatise on the subject, in eighteen books, frequently quoted and followed by subsequent writers. It was a

compilation of legislative enactments, judicial precedents and authorities, from older collections, partly also from oral tradition. A small handbook called “Opoi (Definitions) is the oldest work from which any excerpts are made in the Digest, and the first example of a special kind of judicial literature (libri definitionum or regularum) . It consisted of short rules of law and explanations of legal terms and phrases. A number of speeches by him, praised by Cicero for their elegance of diction, were in existence in ancient times.

4. Quintus Mucius Scaevola (c. 159-88 B.C.), uncle of (3), from whom he is distinguished by the appellation of ” Augur.” He was instructed in law by his father, and in philosophy by the famous Stoic Panaetius of Rhodes. In 121 he was governor of Asia. Accused of extortion on his return, he defended himself and, though no orator, secured his acquittal by his legal know- ledge and common sense. In 117 he was consul. He did not take a prominent part hi the Senate, but his brief, unpolished remarks sometimes made a great impression. He was a great authority on law, and at an advanced age he gav£ instruction to Cicero and Atticus. He had a high appreciation of Marius, and when Sulla assembled the senate, to obtain from it a declara- tion that Marius was the enemy of his country, Scaevola refused his assent. He married Laelia (the daughter of Gaius Laelius, the friend of the younger Scipio), by whom he had a son and two daughters, one of whom became the wife of Licinius Crassus the orator. Scaevola is one of the interlocutors in Cicero’s De oratore, De amicitia and De republica.

For the legal importance of the Scaevolas, see A. Schneider, Die drei Scaevola Ciceros (Munich, 1879), with full references to ancient and modern authorities.

SCAFELL (pronounced and sometimes written Scaw Fell), a mountain of Cumberland, England, in the Lake District. The name is specially applied to the southern point (3162 ft. in height) of a certain range or mass, but Scafell Pike, separated from Scafell by the steep narrow ridge of Mickledore, is the highest point in England (3210 ft.). The ridge continues N.E. to Great End (2984 ft.), which falls abruptly to a fiat terrace, on which lies Sprinkling Tarn. The terrace is traversed by the path between Sty Head Pass (1600 ft.) and Esk Hause (2490 ft.). The range thus denned may be termed the Scafell mass. North- west from the Pike the lesser height of Lingmell (2649 ft-) is thrown out like a bastion, and the steep flank of the range, scored with the deep gully of Piers Gill, sweeps down to the head of Wasdale. On the east an even steeper wall, with splendid crags, falls to Eskdale. Above Mickledore ridge Scafell rises nearly sheer, the rock scored with bold

clefts; here are some of the ascents most in favour with the mountaineers. Some of these tax climbers to the utmost; and the mountain has been the scene of several accidents.

SCAFFOLD, Scaffolding (from the O. Fr. escafaut, originally escafalt, modern echafaud, a corruption of the Italian or Spanish catafalco, a platform, especially a canopy over a bier, a cata- falque; this word is composed of O. Span, catar, O. Ital. calare, to view, Lat. caplare, to watch, observe, and balco, balcony), properly a platform or stage, particularly one of a temporary character erected for viewing or displaying some spectacle, and hence applied to the raised structure on which the execution of a criminal or condemned person is carried out. (See Capital Punishment, &c). The word ” scaffold ” or ” scaffolding ” is used in a technical sense of an obstruction formed in a blast furnace by the fitting together of lumps which form a com- paratively solid skeleton mass inside the furnace, preventing the charge from descending properly. The most general modern

application of the word, however, is, in building, to the tem- porary structure of platforms erected or suspended at convenient heights to afford workmen easy access to their work. Such scaffolds may be divided into four principal classes — bricklayers’ scaffolds, masons’ scaffolds, gantries and derrick towers or stages. The first two are constructed with upright and horizontal poies lashed together. Gantries and derricks are built up of squared timber, and the different members are connected by iron bolts and dogs.

The bricklayers’ scaffold is constructed of standards, ledgers and putlogs, and the connexions are made with lashings of rope, though wire ropes or chains are sometimes used. The Brick- standards are a series of upright fir poles 30 to 50 ft. layers’ in length, either (1) sunk about 2 ft. into the ground, s < :atf old. (2) fixed in barrels filled with earth lightly rammed, or (3) placed upon a " sole plate " of timber with a square formed of small fillets of wood round the base to prevent movement. The standards are placed 6 to 9 ft. apart, and about 5 ft. away from the building. At every 5 ft. ledgers are tied to the standards to support the putlogs, which in turn support the platform of planks. The ledgers are poles lashed horizontally to the standards; upon these, putlogs, usually of birch wood 3 in. square in section, are laid about 3 or 4 ft. apart, with one end resting on the ledger and the other in a recess in the wall. The outer end should be lashed to the ledger. Boards are then laid upon these putlogs parallel with the face of the wall. Two thicknesses of boards are laid when the work is heavy. If the scaffold is erected in an exposed position or is more than 30 ft. high, it should be stiffened by cross braces of poles

running diagonally across the face of the structure and firmly lashed to all the main timbers touched. Ties should also be taken back from the face of the scaffold through apertures in the walls of the building and firmly secured. These ties should be connected with every fourth standard and start at a height between 20 and 30 ft. from the ground. Instead of, or in addition to, these ties light shores may be taken from the face of the scaffold out- wards from the building. As the work is carried up the boarding and many of the putlogs are removed to the stage above, some putlogs, however, being left tied to the lower ledgers to stiffen the scaffold. In the case of thick walls a scaffold is required inside as well as outside the building, and when this is the case the two structures are tied together and stiffened by short connecting poles through the window and door openings.

The mason requires an independent scaffold. He cannot rest the inner ends of his putlogs in the wall as the bricklayer does, for this would disfigure the stonework, so he erects another and parallel framework of standards and gˆtold. ledgers within a few inches of the wall-face upon which to support them. The two portions are tied together with cross braces, and the whole of the timbering is made capable of taking heavier weights than are required in the case of the bricklayer.

Scaffolding poles are of Northern pine obtained chiefly from the Baltic ports. They consist of small treet, up to 30 to 40 ft. long and of not more than 9 in. in diameter. They are sold with the bark on, but this should be removed before use. materials. Such material forms the standards and ledgers. The putlogs are usually pieces of birch from 3 to 4 in. square in section, and 5 to 6 ft. long. In order to have the fibres uncut they should be split, not sawn. Scaffold boards are made in 8-to 12-ft. lengths, 7 or 9 in. wide, and 1 1 in. or 2 in. thick. They should be of yellow deal, but they are more often cut from spruce. The corners are cut off and the ends bound with stout hoop-iron to prevent splitting. The cords used for lashing are made of jute and hemp fibre. The best and strongest cords are those of white Manilla hemp. The fibres for scaffold cords are often dipped in hot tar before being made up into rope. The ropes generally used by the scaffolder are either ” shroud laid,” having three strands of fibres wound tightly arounda core, or ” three strand,” which are similar but without a core.

The erection of scaffolding demands nerve and physical strength, as well as skill and discretion. The timbers near the ground are fixed by hand labour alone; the higher poles are raised Erection. by pulley and rope. The wedges used for tightening cordage are driven in between the pole and the rope. They should be of oak or other hard wood, about 12 in. long and semicircular in cross section, and should taper

off from one end to the other. Practic- ally the only tool uged by the scaffolder is his hatchet, made with a

Gantries.

hammer-head for driving spikes and wedges; the wooden handle he often uses as a lever to tighten knots and cords. Scaffolds should not be too heavily loaded, and the weight of materials should be distributed as much as possible. This applies especially to brick-layers' scaffolds, for heavy concentrated loads, even if not sufficient to cause the scaffold to fail, tend to injure the brickwork.

In Scotland and the north of England much work is done from inside by means of platforms of boards placed upon the floor joists. When the work gets so advanced that it cannot be reached from the floor, trestles and platforms are used. For executing special external features, such as stone carving or plaster moulding, a scaffold will be thrown out on cantilevers projecting through openings in the wall and tied down inside the building. The materials are usually hoisted by derrick cranes.

" Gantry " is the term applied to a staging of squared timber used for the easy transmission of heavy material. The name has, however, come to be used generally for strong stagings of squared timber whether used for moving loads or not. Taking the general meaning of the term, gantries may be divided into three classes: (i) Gantries supporting a traveller; (2) Travelling gantries, in which the whole stage moves along rails placed on the ground; (3) Elevated platforms which serve as a base upon which to erect pole scaffolding.

A gantry to support a traveller (fig. 1) consists of two sets of framing placed at a convenient distance apart, say 8 ft. or more, and standing independently of each other. These frames consist of standards or uprights standing upon a sleeper or sill resting in a continuous line upon the ground. The tops of the standards are levelled to receive the head or runner. Struts are taken from cleats fixed at a convenient point in the sides of the standards, and meet in pairs under the middle of the head; sometimes a straining-piece is introduced between them. Struts are also taken outwards from the uprights and bedded on foot-blocks or bolted to small piles driven into the ground. The space between the two frames must be kept free from struts and ties of any

description so as to leave a free passage for the material while being lifted and moved. The different members are connected by iron dogs and bolts; dogs are used wherever possible, as they form a strong connexion and do not spoil the

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6 to 12 in. squared in section, and the heads and sills are of similar size; the struts and braces are usually somewhat smaller. The traveller consists usually of two wood girders trussed with iron rods and mounted on flanged wheels so as to run along the

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Headpiece orcorbeJ

Fig. 1.

wood for other purposes as bolt-holes do. They should be placed on both sides of the timbers to be connected. The size of the timbers varies according to the height of the structure and the weight intended to be carried. The standards may be from

Fig. 2.

rails fixed to the head-piece. Along each girder also, a rail is provided upon which moves the hoisting gear; this is worked either by hand or steam power. The ends of the rails are turned up to form a stop for the traveller or crab.

A travelling gantry (fig. 2) runs along rails placed on the ground, and consists of two strong trusses braced and bolted together and supporting the two trussed girders which take the crab- winch. The latter is mounted on wheels, and by simple gearing is caused to run along the rails fixed on the upper side of the girders. This is a most useful form of gantry, and requires a very small amount of timber for its construction. The travelling frame is, however, very heavy, and such an apparatus is usually fitted with a steam winch, the power from which, besides lifting the materials, can also be applied to move the traveller. Gantries built on this principle have been used successfully in building or repairing lofty and wide-spanned steel or other roofs. After the collapse of the steel ” bow- string ” roof of Charing Cross station (London) in December 1905, huge travelling gantries run- ning along rails laid upon the station platforms were employed, and these

provided an efficient and economical means of access to the damaged portions; as section by section the work was removed the gantries were shifted along to the next bay. These gantries were 60 ft. in height. One, used to Strip and remove the coverings of the roof, was 32 ft. deep, weighed 200 tons and moved upon 24 steel flanged wheels; the other, 40 ft. deep and with 32 wheels, weighed 250 tons and was used to take down the structural steel work of the roof. Four cranes were erected upon the staging to lower the material as it was removed. The amount of timber used in these gantries was 22,400 cubic ft. In the erection of the Williamsburg Bridgeover the East river, New York, for which 19,000 tons of steel were used,. ” framed timber falsework ” was built up of squared timber to a height of 100 ft. and 90 ft. wide at the top. The span was 355 ft. The timber- ing was in three storeys or stages, and each ” bent ” had 8 vertical and 4 battering posts. The bents were 20 ft. apart and were connected

Derrick towers.

at the top by 10 lines of 12-in. by 14-in. stringers, and the lower sills were 12 in. square. The cross braces were 8 by 10 in. and 6 by 12 in. The vertical standards or posts rested on sills, and under each one also at its base was a timber foundation 4 ft. square. Two travelling gantry towers, 22 ft. by 25 ft. and 40 ft. high, mounted on double-flanged wheels, ran on rails at the top of the falsework and carried long derrick booms fitted with pulleys for raising the materials necessary for the bridge. Beside the cranes they carried cars with the power plant, gasoline tank, water tanks and air compressor and apparatus for the pneumatic riveting hammers.

” Elevated platforms ” are generally used in conducting building operations in towns where the importance of the traffic renders it necessary to keep the footway clear. They consist of two sets of standards, sill and head, one set being erected close to the building and the other about 8 or 10 ft. away. These stages are formed of square timber, framed and braced in a similar manner to gantries designed to support a traveller, but, instead of external shores or braces the uprights are braced across to each other, care being taken to fix the braces at such a height as to allow free passage beneath them. Joists are placed across from head to head, and a double layer of scaffold boards is laid to form the floor, the double thickness being necessary to prevent materials dropping through the joints upon the

heads of passers-by. When the gantry abuts on the road, a heavy timber fender splayed at each end should be placed so as to ward off the traffic. Sometimes the scaffold is carried up several stages in this way and is then called ” staging,” but more often the gantry consists of only one stage and forms the foundation upon which light pole or other scaffolding is erected. At the level of the platform a fanguard is often thrown out for a distance of about 6 ft. or more and closely boarded to protect the public from falling materials and the workmen from accident.

Derrick ” gantries ” or ” towers ” (fig. 3) are skeleton towers of timber erected in a central position on a site to support a platform at such a height as to enable an electric or steam power derrick crane placed upon it to clear the highest portions of the building. The crane revolves upon a base through nearly three parts of the circum- ference of a circle, and in addition to this the jib of the crane is capable of an ” up and down ” motion which enables it to command any spot within a radius of three-quarters of the length of the jib. For a single crane, a derrick tower with three legs is built, and the crane is placed over one of these, stayed back to the other two and then counterbalanced by heavy weights. Each leg is usually from 6 ft. to 10 ft. square on plan, the ” king ” leg (that is, the leg supporting the crane) being larger than the ” queen ” legs. The three legs are placed from 20 to 30 ft. apart in the form of an equilateral or isosceles triangle. When two cranes are used, as is the case when important operations are to be conducted over the entire area of a circle, a four-legged square derrick tower is constructed, and a crane set upon a platform over each of two opposite legs. The ground upon which it is proposed to erect the towers must be well chosen for its solidity, and often requires to be well rammed. The foundation usually consists of a platform of o-in. by 3-in. deals under each leg. The corner posts may be of three o-in. by 3-in. deals bolted together, but those for the king leg may advantageously be larger. They are connected at every 8 or 10 ft. of their height by means of cross pieces or transoms from 9 by 3 in. to 9 by 6 in. in size, and each bay thus formed is filled in on all four sides with diagonal bracing of the same or slightly smaller timber. Up the centre of the king leg, from the bottom to the top, is carried an extra standard of timber to take the weight of the crane. It may be a balk of whole timber, 12 or 14 in. square, or may consist of deals bolted together up to 16 in. square. This central standard must be well braced and strutted from the four corners to prevent any tendency to bending.

When the towers have reached the desired height the king leg is connected to each of the queen legs by a trussed girder, the two queen

legs may be connected with each other either by a similar trussed girder or by a single balk of timber which can be suppoited by struts if the span is considerable. For the connecting girders a balk of timber reaching from king to queen legs is placed on each of the two topmost transoms, which may be from 4 to 8 ft. apart, the depth of the top bays often being modified to the required depth of the connecting beams. Upright struts are fixed at intervals of about

5 ft. between the two balks, which are also connected by long iron bolts and cross braces filled into each bay. The top balks project

6 or 10 ft. beyond the king leg and form the support for a working platform of deals. Struts are thrown out from the sides of the leg to support the ends of the balks. Upon the platform are laid two ” sleepers ” of balk timber extending from beneath the bed of the

crane and passing over the centre of each queen leg. The ” mast,” a vertical member composed either of a single timber or two pieces strutted and braced, is erected upon the revolving crane bed, and the ” jib,” which is similar in construction to the mast, is attached to the base of the latter by a pivoted hinge. The jib is raised and lowered by a rope fixed near the end of the jib and running to the engine by way of a pulley wheel at the top of the mast. The rope or chain used for lifting the materials passes over a pulley at the end of the jib and thence to the winch over a pulley at the top of the mast. In the operation of lifting it is obvious that a great strain is put upon the mast and a considerable overturning force is exerted by the leverage of the weight lifted at the end of the jib. To counter- balance this, two timber ” stays ” or ” guys ” are taken from the mast head, one to the centre of each queen leg, and there secured. From these points two heavy chains are taken down the centre of

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Fig. 3.

each queen leg and anchored to the platform at their bases, which are each loaded with a quantity of bricks, stone or other ,heavy material equal in weight to at least twice any load to be lifted by the crane. A coupling screw link should be provided in the length of each anchor chain so that it may be kept at a proper tension, for if allowed to get slack a sudden jerk might cause it to snap. The coupling screws should be placed in an accessible place near the ground, where they may

easily be seen and tightened when necessary. The legs of the structure should be cross braced with each other, either by ties of steel bars with tightening screws, or, as is more usual, with scaffold-pole or squared timber-braces crossing each other at right angles and lashed or bolted to the framework.

In the case of a three-towered gantry it is necessary to ballast only the two queen legs. The weighting of the king leg, as is sometimes done, is quite unnecessary, and even injurious, for in soft or moder- ately hard ground the added weight combined with that of the crane engine and load may cause a serious settlement. With a square gantry having four legs, all four should be weighted, and in calculating

Cradles and

swinging scaffolds.

auapcrefed erode, or bodt

Fig. 4.

the ballast necessary for the crane towers the weight of the engine should be considered. Access to the platform is obtained by ladders fixed either inside or outside one of the queen legs. With the ex- ception of the boards forming the working platform, which are usually spiked down, the timbers of a tower gantry should all be connected by screw bolts and nuts.

Swinging scaffolds are useful for executing light repairs to a building. Perhaps the simplest form of swinging scaffold is the ” boatswain’s boat,” so called from its being chiefly used for the painting or examination of the sides of ships, but it is dangerous to work from and a light wind will cause it to swing to and fro, and owing to the extremely awkward position occupied by the workman there is difficulty in doing good work from it. A better, safer and more comfortable arrangement, the ” painter’s boat ” (fig. 4), is suspended by blocks and falls from two cantilever ” jibs ” fixed

in the upper part of the building. The positions of the jibs are altered as re- quired. The ends of the suspen- sion ropes are fastened securely to the cradle, and by altering their length the workmen can ad- just it to the proper height for working. These boats are usually constructed

with a framework of iron and fitted with edge boards and guard rails all round. Like the ” boatswain’s boat ” they sway considerably in the wind.

An improved form of cradle has been patented which is swung on block runners working along a tight wire cable stretched between two jibs. Block tackle is used to raise or lower the cradle, and horizontal movement also is obtained by light guy lines working over pulleys at the jibs and secured to the tops of the suspension ropes. All adjustments can be made from the cradle with perfect safety. The guy lines steady the boat to some extent and prevent it from swinging in the wind.

Tall chimney shafts may be erected by internal scaffolding only, or by a combination of external and internal staging. The latter method is often adopted when the lower part of the shaft Scaffold’ j s ˆsigned w jth ornamental brickwork, string courses, hi panels, &c, and it is important that this work should be

e oeys. clire (}J \y finished. An external scaffold is therefore carried up until plain work not more than 2 or 2j bricks thick is reached, when the remainder can be completed by ” overhand ” work from an internal scaffold. The offsets made in the brickwork on the inside are used to support the timbering. For the repair of tall chimneys, light ladders are erected one above the other by a steeplejack and his assistants, each being lashed to the one below it and secured to the brickwork by dog-hooks driven in the joints. When the top of the chimney is reached balk timbers are raised by pulleys and laid across the top. From these are swung cradles from which the defective work is made good. If the work or weather demand a more stable scaffold, a light but strong framework of putlogs held together with iron bolts is fixed on each side of the shaft with iron holdfasts, and a platform of boards is laid upon them. For circular chimneys pieces of timber cut to a curve to fit the brickwork are clamped with iron to the putlogs to prevent them from bending when the bolts connecting the two frames are screwed up.

In England, the Factory and Workshop Act of 1901 empowers the secretary of state to make regulations respecting any dangerous ” machinery, plant, process, or descrip- tion of manual labour.” No regulations affecting the building trade have been made, however, but a memorandum was issued in 1902 by the Home Office with the following suggestions for the prevention of scaffold accidents: —

I. All working platforms above the height of 10 ft., taken from the

adjacent ground level, should, before employment takes place thereon, be provided throughout their entire length, on the outside and at the ends,

(a) with a guard rail fixed at a height of 3 ft. 6 in. above the scaffold boards. Openings may be left for workmen to land from the ladders and for the landing of materials ;

(6) with boards fixed so that their, bottom edges are resting on or abutting to the scaffold boards. The boards so fixed should rise above the working platform not less than 7 ins. Openings may be left for the landing of the workmen from the ladders.

2. All ” runs ” or similar means of communication between different portions of a scaffold or building should be not less than 18 in. wide. If composed of two or more boards they should be fastened together in such a manner as to prevent unequal sagging.

3. Scaffold boards forming part of a working platform should be supported at each end by a putlog, and should not project more than 6 in. beyond it unless lapped by another board, which should rest partly on or over the same putlog and partly upon putlogs other than those upon which the supported board rests.

In such cases where the scaffold boards rest upon brackets, the foregoing suggestion should read as if the word bracket replaced the word putlog.

N.B. Experiments have shown that a board with not more than a 6 in. projection over a putlog can be considered safe from trapping or tilting.

4. All supports to centring should be carried from a solid founda- tion.

5. In places where the scaffolding has been sublet to a contractor, the employer should satisfy himself, before allowing work to proceed thereon, that the foregoing suggestions have been complied with, and that the material used in the construction of the scaffold is sound.

See J. F. Hurst, Tredgold’s Carpentry; A. G. H. Thatcher, Scaffolding. (J. Bt.)

SCALA NUOVA (Turk. Kush-Adasi), also known as New Ephesus, a well-protected harbour on the west coast of Asia Minor in the vilayet of Aidin, opposite Samos. The site of the ancient Marathesium is close by on the S. It is connected with the railway station of Ayassoluk by a

diligence service. Before the opening of the Smyrna-Aidin railway its roadstead was frequented by vessels trading with the Anatolian coast, and it has often been proposed to connect it with the railway system by a branch line, and thus enable it to compete with Smyrna. In the absence of this the' town is rapidly on the decline. The population is not over 7000. The trade is of merely local interest. (D. G. H.)

SCALD, an ancient Scandinavian bard who recited or sang at feasts compositions in honour of chiefs and famous men and their deeds. This word represents the Icel. skald, Dan. skald, Swed. skjald, the regular term for a poet. Authorities differ as to its derivation. It seems certain that the word was originally derogatory in sense; some connect' it with skdlda, a pole, on which libels were cut. Others, e.g. Skeat, refer it to Swed. skalla, Icel. skjalla, to make a loud noise or clatter, and take the original sense to have been a " loud talker." This would link the word with " scold," to rail at, find fault with, which is formed from Dutch schold, past tense of scheldan, cf. Ger. schelten, in the same sense.

Of different origin is the verb " scald," to burn or injure the skin or flesh by hot liquid or steam (see Burns and Scalds); also to cleanse an object, or to remove hair, bristles, feathers &c, from an animal, by exposure to moist heat, such as boiling water, steam, &c. This word is derived from the O. Fr. escalder, eschauder, mod. Schauder, Lat. excaldare, to wash with hot water {caldus, calidus, hot).

SCALE (1) A small thin flake, plate or shell. The word in O. Eng. is sceale, so bean-sceale, the husk or pod of a bean; cognate forms are found in Ger. Schale, O.H.G. Scale, from which the O. Fr. escale, modern Scale, is borrowed. The ultimate root is seen in the closely allied " shell," and also in skull, scalp, shale and skill, and means to peel off, separate, divide. The word is used specifically (1) in botany, of the rudimentary flakeˆ like leaf forming the covering of the leaf-buds of deciduous trees and of the bracts of the cone in conifers; (2) in zoology, of the flat, hard structures of the epidermis or exoskeleton in fishes, reptiles. Thus in ichthyology the various types of scales are classed as cycloid (Gr. kvkKos, circle), where the growth is in layers, equally from the anterior and posterior edges; ctenoid (Gr. Krrjv, comb), where the posterior edge is toothed; ganoid (Gr. yavos, shining), with a hard enamelled surface and usually rhomboidal in shape, and placoid (Gr. 7rX

of the wings of lepidoptera consists of minute scales, really modi- fications of hairs, covered with fine lines, giving the bright colours. Another form in O. Eng. scdle is found glossing the Lat. lanx, flat bowl or dish, and is thus used of the dishes or cups of a balance (Manx), the instrument itself being also called ” scales.”

2. Properly a ladder, flight of steps, now only used in the derived ” scaling ladder.” The word is derived from the Lat. scala (originally scandla, from scandere to climb). There are many transferred senses of the word, e.g. the distinguishing marks for purposes of measurement on a rule or other measuring instrument; hence a graduated measure or a system of pro- portional measurement or numeration, and particularly, in music, a series of tones at definite standard intervals (see Har- mony, Musical Notation).

SCALE INSECT, a name given to insects belonging to the family Coccidae of the homopterous division of the Hemiptera and deriving their name from the formation by the females of a waxy secretion which often hardens into a protective scale beneath which the insects live. Honey-dew, a sweet sticky substance is also secreted by some members of the family. The females are always wingless, but are provided with antennae, legs and well-developed mouth-parts. In some cases these organ; are retained, in some they are lost in the encysted con- dition. The males, on the contrary, although sometimes wingless, are, as a rule, provided with a pair of large forewings and greatly reduced hind wings; their antennae and legs are longer than in the other sex, but the mouth-parts are reduced and functionless (see Economic Entomology).

SCALIGER, the Latinized name of the great Delia Scala family (see Verona). It has also been borne by two scholars of extraordinary eminence.

1. Julius Caesar Scaliger (1484-1558), so distinguished by his learning and talents that, according to A. de Thou, no one of the ancients could be placed above him and the age in which he lived could not show his equal, was, according to his own account, a scion of the house of La Scala, for a hundred and fifty years princes of Verona, and was born in 1484 at the castle of La Rocca on the Lago de Garda. At the age of twelve his kinsman the emperor Maximilian placed him among his pages. He remained for seventeen years in the service of the emperor, distinguishing himself as a soldier and as a captain. But he was unmindful neither of letters, in which he had the most eminent scholars of the day as his instructors, nor of art, which he studied with considerable success under Albrecht Diirer. In 151 2 at the battle of

Ravenna, where his father and elder brother were killed, he displayed prodigies of valour, and received the highest honours of chivalry from his imperial cousin, who conferred upon him with his own hands the spurs, the collar and the eagle of gold. But this was the only reward he obtained. He left the service of Maximilian, and after a brief employment by another kinsman, the duke of Ferrara, he decided to quit the military life, and in 1514 entered as a student at the university of Bologna. He determined to take holy orders, in the expectation that he would become cardinal, and then pope, when he would wrest from the Venetians his principality of Verona, of which the republic had despoiled his ancestors. But, though he soon gave up this design, he remained at the university until 1510. The next six years he passed at the castle of Vico Nuovo, in Piedmont, as a guest of the family of La Rovere, at first dividing his time between military expeditions in the summer, and study, chiefly of medicine and natural history, in the winter, until a severe attack of rheumatic gout brought his military career to a close. Henceforth his life was wholly devoted to study. In 1525 he accompanied M. A. de la Rovere, bishop of Agen, to that city as his physician. Such is the outline of his own account of his early life. It was not until some time after his death that the enemies of his son first alleged that he was not of the family of La Scala, but was the son of Benedetto Bordone, an illuminator or school-master of Verona; that he was educated at Padua, where he took the degree of M.D.; and that his story of his life and adventures before arriving at Agen was a tissue of fables. It certainly is supported by no other evidence than his own state-

ments, some of which are inconsistent with well-ascertained facts (see below ad fin.).

The remaining thirty-two years of his life were passed almost wholly at Agen, in the full light of contemporary history. They were without adventure, almost without incident, but it was in them that he achieved so much distinction that at his death in 1558 he had the highest scientific and literary reputation at any man in Europe. A few days after his arrival at Agen he fell in love with a charming orphan of thirteen, Andiette de Roques Lobejac. Her friends objected to her marriage with an unknown adventurer, but in 1528 he had obtained so much success as a physician that the objections of her family were overcome, and at forty-five he married Andiette, who was then sixteen. The marriage proved a complete success; it was followed by twenty- nine years of almost uninterrupted happiness, and by the birth of fifteen children.

A charge of heresy in 1538, of which he was acquitted by his friendly

judges, one of whom was his friend Arnoul Le Ferron, was almost the only event of interest during these years, except the publication of his books, and the quarrels and criticisms to which they gave rise. In 1531 he printed his first oration against Erasmus, in defence of Cicero and the Ciceronians. It is a piece of vigorous invective, displaying, like all his sub- sequent writings, an astonishing command of Latin, and much brilliant rhetoric, but full of vulgar abuse, and completely missing the point of the Ciceronianus of Erasmus. The writer's indignation at finding it treated with silent contempt by the great scholar, who thought it was the work of a personal enemy — Aleander — caused him to write a second oration, more violent, more abusive, with more self-glorification, but with less real merit than the first. The orations were followed by a prodigious quantity of Latin verse, which appeared in successive volumes in 1533, 1534, *539, 1546 and 1547; of these, a friendly critic, Mark Pattison, is obliged to approve the judgment of Huet, who says, " par ses poesies brutes et informes Scaliger a des-honore le Parnasse "; yet their numerous editions show that they commended themselves not only to his contemporaries, but to succeeding scholars. A brief tract on comic metres {De comicis dimensionibus) and a work De causis linguae Latinae — the earliest Latin grammar on scientific principles and following a scientific method — were his only other purely literary works published in his lifetime. His Poetice appeared in 1561 after his death. With many paradoxes, with many criticisms which are below contempt, and many indecent displays of personal animosity — especially in his reference to fitienne Dolet, over whose death he gloated with brutal malignity — it yet contains acute criticism, and showed for the first time what such a treatise ought to be, and how it ought to be written.

But it is as a philosopher and a man of science that J. C. Scaliger ought to be judged. Classical studies he regarded as an agreeable relaxation from severer pursuits. Whatever the truth or fable of the first forty years of his life, he had certainly been a close and accurate observer, and had made himself acquainted with many curious and little-known phenomena, which he had stored up in a most tenacious memory. His scientific writings are all in the form of commentaries, and it was not until his seventieth year that (with the exception of a brief tract on the De insomniis of Hippocrates) he felt that any of them were sufficiently complete to be given to the world. In 1556 he printed his Dialogue on the De plantis attributed to Aristotle, and in 1557 his Exercitatiohes on the work of Jerome Cardan, De subtililale. His other scientific works, Commentaries on Theophrastus' De causis plantarum and Aristotle's History of Animals, he left in a more or less unfinished state, and they were not printed until after his death. They

are all marked by arrogant dogmatism, violence of language, a constant tendency to self- glorification, strangely combined with extensive real knowledge, with acute reasoning, with an observation of facts and details almost unparalleled. But he is only the naturalist of his own time. That he anticipated in any manner the inductive philosophy cannot be contended; his botanical studies did not lead him, like his contemporary Konrad von Gesner, to any idea of a

natural system of classification, and he rejected with the utmost arrogance and violence of language the discoveries of Copernicus. In metaphysics and in natural history Aristotle was a law to him, and in medicine Galen, but he was not a slave to the text or the details of either. He has thoroughly mastered their principles, and is able to see when his masters are not true to themselves. He corrects Aristotle by himself. He is in that stage of learning when the attempt is made to harmonize the written word with the actual facts of nature, and the result is that his works have no real scientific value. Their interest is only historical. His Exercitationes upon the De subtilitate of Cardan (1 557) is the book by which Scaliger is best known as a philosopher. Its numerous editions bear witness to its popularity, and until the final fall of Aristotle's physics it continued a popular text- book. We are astonished at the encyclopaedic wealth of know- ledge which the Exercitationes display, at the vigour of the author's style, at the accuracy of his observations, but are obliged to agree with G. Naude that he has committed more faults than he has discovered in Cardan, and with Charles Nisard that his object seems to be to deny all that Cardan affirms and to affirm all that Cardan denies. Yet Leibnitz and Sir William Hamilton recognize him as the best modern exponent of the physics and metaphysics of Aristotle. He died at Agen on the 21st of October 1558.

2. Joseph Justus Scaliger (1540-1609), the greatest scholar of modern times, was the tenth child and third son of Julius Caesar Scaliger and Andiette de Roques Lobejac. Born at Agen in 1 540, he was sent when twelve years of age, with two younger brothers, to the college of Guienne at Bordeaux, then under the direction of Jean Gelida. An outbreak of the plague in 1555 caused the boys to return home, and for the next few years Joseph was his father's constant companion and amanuensis. The composition of Latin verse was the chief amusement of Julius in his later years, and he daily dictated to his son from eighty to a hundred lines, and sometimes more. Joseph was also required

each day to write a Latin theme or declamation, though in other respects he seems to have been left to his own devices. But the companionship of his father was worth more to Joseph than any mere instruction. He learned from him to be not a mere scholar, but something more — an acute observer, never losing sight of the actual world, and aiming not so much at correcting texts as at laying the foundation of a science of historical criticism.

After his father's death, he spent four years at the university of Paris, where he began the study of Greek under Turnebus. But after two months he found he was not in a position to profit by the lectures of the greatest Greek scholar of the time. He determined to teach himself. He read Homer in twenty-one days, and then went through all the other Greek poets, orators and historians, forming a grammar for himself as he went along. From Greek, at the suggestion of G. Postel, he proceeded to attack Hebrew, and then Arabic; of both he acquired a respect- able knowledge, though not the critical mastery which he possessed in Latin and Greek. .The name of Jean Dorat then stood as high as that of Turnebus as a Greek scholar, and far higher as a professor. As a teacher he was able not only to impart knowledge, but to kindle enthusiasm. It was to Dorat that Scaliger owed the home which he found for the next thirty years of his life. In 1563 the professor recommended him to Louis de Chastaigner, the young lord of La Roche Pozay, as a companion in his travels. A close friendship sprang up between the two young men, which remained unbroken till the death of Louis in 1595. The travellers first went to Rome. Here they found Marc Antoine Muretus, who, when at Bordeaux and Toulouse, had been a great favourite and occasional visitor of Julius Caesar at Agen. Muretus soon recognized Scaliger's merits, and introduced him to all the men that were worth knowing. After visiting a large part of Italy, the travellers passed to England and Scotland, taking as it would seem La Roche Pozay on their way, for Scaliger's preface to his first book, the Conjectanea in Varronem, is dated there in December 1564. Scaliger formed an unfavourable opinion of the English. Their inhuman disposition, and inhospitable treatment of foreigners,

especially impressed him. He was also disappointed in finding few Greek manuscripts and few learned men. It was not until a much later period that he became intimate with Richard Thompson and other Englishmen. In the course of his travels he had become a Protestant. On his return to France he spent three years with the Chastaigners, accompanying them to their different chateaux in Poitou, as the calls of the civil war required. In 1570 he accepted the invitation of Cujas, and proceeded to Valence to study jurisprudence under the greatest

living jurist. Here he remained three years, profiting not only by the lectures but even more by the library of Cujas, which filled no fewer than seven or eight rooms and included five hundred manuscripts.

The massacre of St Bartholomew — occurring as he was about to accompany the bishop of Valence on an embassy to Poland — induced him with other Huguenots to retire to Geneva, where he was received with open arms, and was appointed a professor in the academy. He lectured on the Organon of Aristotle and the De finibus oi Cicero with much satisfaction to the students but with little to himself. He hated lecturing, and was bored with the importunities of the fanatical preachers; and in 1574 he returned to France, and made his home for the next twenty years with Chastaigner. Of his life during this period we have interesting details and notices in the Leltres frangaises inSdites de Joseph Scaliger, edited by M Tamizey de Larroque (Agen, 1881). Constantly moving through Poitou and the Limousin, as the exigencies of the civil war required, occasionally taking his turn as a guard, at least on one occasion trailing a pike on an expedition against the Leaguers, with no access to libraries, and frequently separated even from his own books, his life during this period seems most unsuited to study. He had, how- ever, what so few contemporary scholars possessed — leisure, and freedom from pecuniary cares. It was during this period of his life that he composed and published the books which showed that with him a new school of historical criticism had arisen. His editions of the Catalecta (1575), of Festus (1575), of Catullus, Tibullus and Propertius (1577), are the work of a man who not only writes books of instruction for learners, but is determined himself to discover the real meaning and force of his author. He was the first to lay down and apply sound rules of criticism and emendation, and to change textual criticism from a series of haphazard guesses into a ” rational procedure subject to fixed laws ” (Pattison). But these works, while proving Scaliger’s right to the foremost place among his contemporaries as Latin scholar and critic, did not go beyond mere scholarship. It was reserved for his edition of Manilius (1579), and his De emendatione lemporum (1583), to revolutionize all the received ideas of ancient chronology — to show that ancient history is not confined to that of the Greeks and Romans, but also comprises that of the Persians, the Babylonians and the Egyptians, hitherto neglected as absolutely worthless, and that of the Jews, hitherto treated as a thing apart, and that the historical narratives and fragmentsof each of these, and their several systems of chronology, must be critically compared, if any true and general conclusions are to be reached. It is this which places Scaliger on so im- measurably higher an eminence than any of his contemporaries. Yet,

while the scholars of his time admitted his pre-eminence, neither they nor those who immediately followed seem to have appreciated his real merit, but to have considered his emendatory criticism, and his skill in Greek, as constituting his claim to special greatness. His commentary on Manilius is really a treatise on the astronomy of the ancients, and it forms an introduction to the De emendatione temporum, in which he examines by the light of modern and Copernican science the ancient system as applied to epochs, calendars and computations of time, showing upon what principles they were based.

In the remaining twenty-four years of his life he at once corrected and enlarged the basis which he had laid in the De- emendatione. With incredible patience, sometimes with a happy audacity of conjecture which itself is almost genius, he succeeded in reconstructing the lost Chronicle of Eusebius — one of the most precious remains of antiquity, and of the highest value for ancient chronology. This he printed in 1606 in his

Thesaurus temporum, in which he collected, restored and arranged every chronological relic extant in Greek or Latin. When in 1590 Lipsius retired from Leiden, the university and its protectors, the states-general of Holland- and the prince of Orange, resolved to obtain Scaliger as his successor. He declined their offer. He hated lecturing, and there were those among his friends who erroneously believed that with the success of Henry IV. learning would flourish, and Protestantism be no bar to advancement. The invitation was renewed in the most nattering manner a year later. Scaliger would not be required to lecture. The university only wished for his presence. He would be in all respects the master of his time. This offer Scaliger provisionally accepted. About the middle of 1593 he started for Holland, where he passed the remaining thirteen years of his life, never returning to France. His reception at Leiden was all that he could wish. A handsome income was assured to him. He was treated with the highest consideration. His rank as a prince of Verona was recognized. Placed midway between The Hague and Amsterdam, he was able to obtain, besides the learned circle of Leiden, the advantages of the best • society of both these capitals. For Scaliger was no hermit buried among his books; he was fond of social intercourse and was himself a good talker.

For the first seven years of his residence at Leiden his reputa- tion was

at its highest point. His literary dictatorship was unquestioned. From his throne at Leiden he ruled the learned world; a word from him could make or mar a rising reputation; and he was surrounded by young men eager to listen to and profit by his conversation. He encouraged Grotius when only a youth of sixteen to edit Capella; the early death of the younger Douza he wept as that of a beloved son; Daniel Heinsius, from being his favourite pupil, became his most intimate friend. But Scaliger had made numerous enemies. He hated ignorance, but he hated still more half-learning, and most of all dishonesty in argument or in quotation. Himself the soul of honour and truthfulness, he had no toleration for the disingenuous arguments and the mis-statements of facts of those who wrote to support a theory or to defend an unsound cause. His pungent sarcasms were soon carried to the persons of whom they were uttered, and his pen was not less bitter than his tongue. He resembles his father in his arrogant tone towards those whom he despises and those whom he hates, and he despises and hates all who differ from him . He is conscious of his power, and not always sufficiently cautious or sufficiently gentle in its exercise. Nor was he always right. He trusted much to his memory, which was occasionally treacherous. His emendations, if frequently happy, were some- times absurd. In laying the foundations of a science of ancient chronology he relied sometimes upon groundless, sometimes even upon absurd hypotheses, frequently upon an imperfect induction of facts. Sometimes he misunderstood the astronomical science of the ancients, sometimes that of Copernicus and Tycho Brahe. And he was no mathematician. But- his enemies were not merely those whose errors he had exposed and whose hostility he had excited by the violence of his language. The results of his system of historical criticism had been adverse to the Catholic controversialists and to the authenticity of many of the documents upon which they had been accustomed to rely. The Jesuits, who aspired to be the source of all scholarship and criticism, perceived that the writings and authority of Scaliger were the most formidable barrier to their claims. It was the day of conversions. Muretus in the latter part of his life professed the strictest orthodoxy; J. Lipsius had been reconciled to the Church of Rome; Casaubon was supposed to be wavering; but Scaliger was known to be hopeless, and as long as his supremacy was unquestioned the Protestants had the victory in learning and scholarship. A determined attempt must be made, if not to answer his criticisms, or to disprove his statements, yet to attack him as a man, and to destroy his reputation. This was no easy task, for his moral character was absolutely spotless.

After several scurrilous attacks by the Jesuit party, in which

coarseness and violence were more conspicuous than ability, in

1607 a new and more successful attempt was made. Scaliger's weak point was his pride. In 1594, in an evil hour for his happi- ness and his reputation, he published his Epistola de vetustatt et splendore gentis Scaligerae et J. C. Scaligeri vita. In 1607 Caspar Scioppius, then in the service of the Jesuits, whom he afterwards so bitterly libehed, published his Scaliger hypo- bolimaeus (" The Supposititious Scaliger "), a quarto volume of more than four hundred pages, written with consummate ability, in an admirable and incisive style, with the entire disregard for truth which Scioppius always displayed, and with all the power of his accomplished sarcasm. Every piece of scandal which could be raked together respecting Scaliger or his family is to be found there. The author professes to point out five hundred lies in the Epistola de vetustate of Scaliger, but the main argu- ment of the book is to show the falsity of his pretensions to be of the family of La Scala, and of the narrative of his father's early life. " No stronger proof," says Mark Pattison, " can be given of the inpressions produced by this powerful philippic, dedicated to the defamation of an individual, than that it has been the source from which the biography of Scaliger, as it now stands in our biographical collections, has mainly flowed." To Scaliger the blow was crushing. Whatever the case as to Julius, Joseph had undoubtedly believed himself a prince of Verona, and in his Epistola had put forth with the most perfect good faith, and without inquiry, all that he had heard from his father. He immediately wrote a reply to Scioppius, entitled Confutatio fabulae Burdonum. It is written, for Scaliger, with unusual moderation and good taste, but perhaps for that very reason had not the success which its author wished and even expected. In the opinion of the highest authority, Mark Pattison, " as a refutation of Scioppius it is most complete "; but there are certainly grounds for dissenting, though with diffidence, from this judgment. Scaliger undoubtedly shows that Scioppius committed more blunders than he corrected, that his book literally bristles with pure lies and baseless calumnies; but he does not succeed in adducing a single proof either of his father's descent from the La Scala family, or of any single event narrated by Julius as happening to himself or any member of this family prior to his arrival at Agen. Nor does he even attempt a refuta- tion of the crucial point, which Scioppius had proved, as far as a negative can be proved — namely, that William, the last prince of Verona, had no son Nicholas, the alleged grandfather of Julius, nor indeed any son who could have been such grandfather. But whether complete or not, the Confutatio had no success; the attack of the Jesuits was successful, far more so than they could possibly have hoped. Scioppius was wont to boast that his book had killed Scaliger.

It certainly embittered the few remaining months of his life, and it is not improbable that the mortification which he suffered may have shortened his days. The Confutatio was his last work. Five months after it appeared, ” on the 21st of January 1609, at four in the morning, he fell asleep in Heinsius’s arms. The aspiring spirit ascended before the Infinite. The most richly stored intellect which had ever spent itself in acquiring knowledge was in the presence of the Omniscient ” (Pattison).

Of Joseph Scaliger the only biography in any way adequate is that of Jacob Bernays (Berlin, 1855). It was reviewed by Mark Pattison in the Quarterly Review, vol. cviii. (i860), since reprinted in the Essays, i. (1889), 132-195. Pattison had made many manuscript collections for a life of Joseph Scaliger on a much more extensive scale, which he left unfinished. In writing the above article, Pro- fessor Christie had access to and made much use of these MSS., which include a life of Julius Caesar Scaliger. The fragments of the life of Joseph Scaliger have been printed in the Essays, i. 196-243. For the life of Joseph, besides the letters published by M. Tamizey de Larroque (Agen, 1881), the two old collections of Latin and French letters and the two Scaliger ana are the most -important sources of information. For the life of Julius Caesar the letters edited by his son, those subsequently published in 1620 by the President de Maussac, the Scaligerana, and his own writings, which are full of autobiographical matter, are the chief authorities. M. de Bourousse de Laffore’s Etude sur Jules Cesar de Lescale (Agen, i860) and M. Magen’s Documents sur Julius Caesar Scaliger et sa famille (Agen, 1873) add important details for the lives of both father and son. The lives by Charles Nisard — that of Julius in Les Gladiateurs de la ripublique des lettres, and that of Joseph in

Le Triwnvirat littiraire au seizihme sikcle — are equally unworthy of their author and their subjects. Julius is simply held up to ridicule, while the life of Joseph is almost wholly based on the book of Sciop- pius and the Scaligerana. A complete list of the works of Joseph will be found in his life by Bernays. See also J. E. Sandys, History of Classical Scholarship, ii. (1908), 199-204. (R. C. C; J. E. S.*)

SCALP (O. Dutch schelpe, a shell), in anatomy, the whole covering of the top of the head from the skin to the bone. Five layers are recognized in the scalp, and these, from without inward, are: (1) skin, (2) superficial fascia, (3) aponeurosis or epicranium, (4) lymph space,

(5) periosteum or pericranium.

The skin of the scalp is thick and remarkable for the large number of hair follicles contained in it. The superficial fascia consists of dense bundles of fihrous tissue which pass from the skin to the third layer or aponeurosis and bind the two structures together so closely that when one of them is moved the other must needs be moved too. The fibrous bundles are separated by pellets of fat, and it is in this second layer that the vessels and nerves of the scalp are found. Here, as elsewhere, the vessels are arteries, veins and lymphatics, and the arteries are specially remarkable, firstly, for their tortuosity, which is an adaptation to so movable a part; secondly, for their anastomos- ing across the middle line with their fellows of the opposite side, an arrangement which is not usual in the body; and, thirdly, for the fact that, when cut, their ends are held open by the dense fibrous tissue already spoken of, so that bleeding is more free in the scalp than it is from arteries of the same size elsewhere in the body.

The veins do not follow the twists of the arteries but run a straight course; for this reason there is often a considerable distance between an artery and its companion vein. Accom- panying the veins are the larger lymphatic vessels, though there are no lymphatic glands actually in the scalp. From the forehead region the lymphatics accompany the facial vein down the side of the face and usually reach their first gland in the submaxillary region, so that in the case of a poisoned wound of the forehead sympathetic swelling or suppuration would take place below the jaw. From the region of the temple the lymphatics drain into a small gland lying just in front of the ear, while those from the region behind the ear drain into some glands lying close to the mastoid process. In the occipital region a small gland (or glands) is found at the edge of the scalp close to the point at which the occipital artery reaches it, that is to say about a third of the distance from the external occipital protuberance to the tip of the mastoid process (see Skull).

The nerve supply of the scalp in its anterior part is from the fifth cranial or trigeminal nerve (see Nerves, Cranial) ; in the forehead region the supratrochlear and supraorbital branches come out of the orbit from the first or ophthalmic division of the fifth, while farther back, in the anterior part of the temporal region, the temporal branch of the second or maxillary division of the same nerve is found. Farther back still, in front of the ear, is the area of the auriculo -temporal nerve, a branch of the third or mandibular division of the fifth cranial.

Behind the ear the scalp is supplied with sensation by two branches of

the cervical plexus of nerves, the great auricular and the small occipital (see Nerves, Spinal), while behind these, and reaching as far as the mid line posteriorly, the great occipital, derived from the posterior primary division of the second cervical nerve, is distributed. Sometimes the posterior primary division of the third cervical nerve reaches the scalp still nearer the middle line behind.

The third layer of the scalp or epicranium is formed by the two fleshy bellies of the occipito-frontalis muscle and the flattened tendon or aponeurosis between them. Of these two bellies the anterior {frontalis) is the larger, and, when it acts, throws the skin of the forehead into those transverse puckers which are characteristic of a puzzled frame of mind. The much smaller {occipitalis or posterior) belly usually merely fixes the aponeurosis for the frontalis to act, though some people have the power of alternately contracting the two muscles and so wagging their scalps backward and forward as monkeys do. Both fleshy

bellies of the occipito-frontalis are innervated by the seventh or facial nerve which supplies all the muscles of expression.

Deep to the occipito-frontalis and its aponeurosis or epicranium is the fourth layer, which consists of very lax areolar tissue constituting what is now known in anatomy as a lymph space. The length and laxity of this tissue allow great freedom of move- ment to the more superficial layers, and it is this layer which is torn through when a Red Indian scalps his foe. So lax is the tissue here that any collection of blood or pus is quickly dis- tributed throughout its whole area, and, owing to the absence of tension as well as of nerves, very little pain accompanies any such effusion.

The fifth and deepest layer of the scalp is the pericranium- or the external periosteum of the skull bones. This, until the sutures of the skull close in middle life, is continuous with the dura mater which forms the internal periosteum, and for this reason any subpericranial effusion is localized to the area of the skull bone over which it happens to lie. Moreover, any sup- purative process may extend through the sutures to the meninges of the brain. (F. G. P.)

Surgery of the Scalp.— In connexion with the treatment of surgical and other wounds of the scalp, it used to be thought that it was dangerous to treat them by suturing, because of the risk of the intervention of abscess or erysipelas. Now that one knows, how- ever, that these two conditions are dependent upon the presence of septic micro-organisms, the surgeon deals with the scalp as with other parts

of the body, cleansing the surface before performing an operation upon it, and doing his best to free the region of all germs when he is called upon to treat a wound already inflicted on it. Unless the surgeon could render the scalp aseptic, it would be almost impossible for him to undertake any operation upon the interior of the skull. Before opening the skull, therefore, the scalp is cleanly shaved and dealt with by turpentine, soap and water and other antiseptics. A large horse-shoe shaped flap is then turned down by an incision right to the bone, and on the conclusion of the opera- tion the flap is replaced in position and secured by stitches.

As the result of septic infection by an accidental wound, abscess is likely to form beneath the scalp, and if it is left to increase in size unchecked it may detach a large area of the scalp. As soon, there- fore, as it is thought that matter is forming beneath the scalp, an incision should be made down to the bone, and provision taken for insuring free drainage.

Naevi of the scalp are best treated by electrolysis or by removal by dissection. If they are supplied by large blood-vessels, each artery should be under-pinned or tied before the removal by dis- section is undertaken.

Sebaceous cysts of the scalp should be removed by incision under the ether-spray whilst they are still small, the whole of the cyst- wall being torn out, for unless the cyst is entirely removed, the tumour is likely to reform. If the sebaceous cyst is left it may cause a thinning of the overlying skin and, effecting its own dis- charge, may become the source of chronic suppuration. In some cases the chronic abscess of a sebaceous cyst becomes the starting- point of malignant disease. (E. O.*)

SCALPING, the custom of removing the skin of the skull, with hair attached. Though generally associated with the North American Indians, the practice has been common in Europe, Asia and Africa. The underlying idea, as of similar mutilations of those slain in battle, is the warrior's wish to preserve a portable proof or trophy of his prowess. Scalping was the usual form of mutilation from the earliest times. Herodotus (iv. 64) describes the practice among the Scythians. The Abbe Emmanuel H. D. Domenech {Seven Years' Residence in the Great Desert of North America, ch. 39) quotes the decalvare of the ancient Germans, the capillos et cutem detrahere of the code of the Visigoths, and the Annals of Flodoard, to prove that the Anglo-Saxons and the Franks still scalped about a.d. 879. In Africa it was, and doubtless is, as prevalent as are all barbarous mutilations.

Among the North American Indians scalping was always in the nature of a rite. It was common to those tribes east of the Rocky Mountains, in the south-west and upper Columbia; but unknown apparently among the Eskimo, along the north- west coast, and on the Pacific coast west of the Cascade range and the Sierras, except among some few Californian tribes, or here and there in Mexico and southward. Properly the scalp could only be taken after a fair fight ; in more recent times there seems to have been no such restriction. To facilitate the opera- tion the braves wore long war-locks or scalping-tufts, as an

implied challenge. These locks were braided with bright ribbons or ornamented with a feather. After the successful warrior's return the scalp or scalps captured were dried, mounted and consecrated by a solemn dance. Some tribes hung the scalps to their bridles, others to their shields, while some ornamented with them the outer seams of their leggings. Scalping was some- times adopted by the whites in their wars with the Redskins, and bounties have been offered for scalps several times in American history.

SCAMILLI IMPARES ("unequal steps," Fr. escabeaux inegales; Ger. Schutzstege) , in architecture, a term quoted by Vitruvius when referring to the rise given to the stylobate in the centre of the front and sides of a Greek temple. His explana- tion is not clear; he states (iii. 4) that, if set out level, the stylobate would have the appearance of being sunk in the centre, so that it is necessary that there should be an addition by means «>f small steps {scamilli impares). In book v. chap. 9, he again refers to the addition on the stylobate. The interpretation of his meaning by Penrose and other authorities is generally assumed to be the addition which it was necessary to leave on the lower frusta of the Doric column, or on the lower portion of the base of the Ionic column, so as to give them a proper bearing on the curved surface of the stylobate; when levelling ground, however, it is sometimes the custom to fix at intervals small bricks or tiles which are piled up until the upper surfaces of all of them are absolutely level. If, as an alternative, these piles were so arranged as to rise towards the centre, instead of a level a slightly curved surface might be obtained, and the term "unequal steps" would apply to them. This was the opinion of M. Bernouf, a French author, who points out that scamillus is a diminutive of scamnum, a small step (Fr. petit banc), which in some parts of France is employed when levelling the surface of areas or courts. According to Penrose the rise of the curved stylobate of the Parthenon had already been obtained in the stereobate carrying it, long before the problem of bedding the columns on the curve had

arisen.

SCAMMONY, a plant, Convolvulus scammonia (Gr. aKapxcvia) , native to the countries of the eastern part of the Mediterranean basin; it grows in bushy waste places, from Syria in the south to the Crimea in the north, its range extending westward to the Greek islands, but not to northern Africa or Italy. It is a twining perennial, bearing flowers like those of Convolvulus arvensis, and having irregularly arrow-shaped leaves and a thick fleshy root. The dried juice, ” virgin scammony,” obtained by incision of the living root, has been used in medicine as .scammonium, 1 but the variable quality of the drug has led to the employment of scammoniae resina, which is obtained from the dried root by digestion with alcohol.

The active principle is the glucoside scammonin or jalapin, C 3 4H M Oi6. The dose of scammonium is 5 to 10 grains, of scammony resin 3 to 8 grains. Like certain other resins, scammony is inert until it has passed from the stomach into the duodenum, where it meets the bile, a chemical reaction occurring between it and the taurocholate and glycocholate of sodium, whereby it is converted into a powerful purgative. Its action is essentially that of a hydra- gogue, and is exercised upon practically the entire length of the alimentary canal. The drug is not a cholagogue, nor does it markedly affect the muscular coat of the bowel, but it causes a great increase of secretion from the intestinal glands. It acts in about four hours. In large doses it is, of course, a violent gastro- intestinal irritant. In consonance with the statement that scam- mony acts only after admixture with the bile, is the fact that hypo- dermic or intravenous injection of the drug produces no purgation, or indeed any other result. The drug frequently kills both the round-worm and the tape-worm, especially the former, and is therefore an anthelmintic. It is not largely used, but is very effective in the treatment of severe constipation, especially in children.

SCAMP, an idle, worthless rascal; in earlier (18th cent.) usage especially applied as a cant term for a highway robber, a foot-pad, later of one who incurs debts and decamps without paying them. The word appears to be derived from a shortened form of ” scamper,” to run away, decamp, to move quickly or nimbly; which is generally taken to be a military slang word

1 It was formerly called diagrydion, probably from SaKpv, a tear, in allusion to the manner in which the juice exudes from the incised root.

adapted from Dutch schampen, to escape; O.Fr. escamper; Ital. scampare; Lat. ex, out of, campus, field of battle, hence a vaga- bond deserter. This word must be distinguished from ” scamp,” to do work in a hasty, careless manner, which is apparently a variant of ” skimp,” ” skimpy,” and is to be referred to the root seen in O. Nor. skammr, short; Ehg. ” scant.”

SCANDAL, disgrace, discredit, shame, caused by the report or knowledge of wrongdoing, hence defamation or gossip, especially malicious or idle; or such action as causes public offence or dis- repute. (For the law relating to scandal, more generally termed ” defamation” see Libel and Slander.) The Greek word o-Kav5a\ov, stumbling-block, cause of offence or temptation, is used in the Septuagint and the New Testament. Classical Greek had the word aKavSaXridpov only, properly the spring of a baited trap; the origin probably being the root seen in Latin scandere, to climb, get up. While the Latin scandalum has given such direct derivatives as Spanish and Portuguese escandalo, Dutch schandaal, Eng. ” scandal,” &c, it is also the source of the synonymous ” slander,” Middle Eng. sclaundre, O. Fr. esclandre, escandle.

A particular form of defamation was scandalum magnatum. ” slander of great men,” words, that is, spoken defaming a peer spiritual or temporal, judge or dignitary of the realm. Action lay for such defamation under the statutes of 3 Edw. I. c. 34, 2 Rich. II. c. 5, and 12 Rich. II. c. II whereby damages could be recovered, even in cases where no action would lie, if the defamation wwe of an ordinary subject, and that without proof of special damage. These statutes, though long obsolete, were only abolished in 1887 (Statute Law Revision Act).

SCANDER6E6, or Iskender Bey (1403-1467), known also as ” the Dragon of Albania,” the national hero of the Albanians, was the son of John (Giovanni) Castriota, lord of Kroia and of the Mirdite country in northern Albania, and of a Servian princess named Vaisava. His actual name was George (Giorgio) Castriota, and the name of Iskender Bey (Prince Alexander) was given to him by the Turks in complimentary reference to Alexander the Great. In 1423, when Murad II. invaded Epirus, George Castriota, with his three brothers, was handed over as a hostage to the Turks and sent to be trained in the service of the seraglio. His brilliant qualities of mind and body at once gained *him the favour of the sultan; he became a Mussulman, was promoted to high military command and, though barely nineteen years of age, to the government of a sanjak. He remained in the Ottoman service for twenty years, dissembling his resentment when, on the death of his

father, his principality was annexed and his brothers poisoned. In 1443, however, his opportunity came with Janos Hunyadi's victory at Nish. He seized Kroia by stratagem, proclaimed himself a Christian, and gathered the wild Albanian clansmen about him. In the inaccessible fastnesses of Albania he maintained a guerilla warfare against the Turks during nearly twenty-five years, easily routing the armies sent against him, and is said to have slain three thousand Turks with his own hand. In 1461 Murad's successor Mahommed II. acknowledged him by a temporary truce as lord of Albania and Epirus. He died in 1467 at Alessio, and his tomb was long the object of a superstitious veneration on the part of the Turks.

Scanderbeg's resistance to the Turkish advance was invaluable to the cause of Christianity, but the union which he had main- tained in Albania did not survive him. He was succeeded in Kroia by his son, Giovanni Castriota, who in 1474 sold the princi- pality to the Venetians, by whom four years later it was re-sold to the Turks.

See Georges T. Petroyitch, Scander-beg (Georges Castriota) ; Essai de bibliograpkie raisonnSe; Ouvrages sur Scander-beg icrits en langues francaise, anglaise, allemande, latine, italienne, &c. (Paris, 1881); Pisko, Skanderbeg, historische Studie (Vienna, 1895).

SCANDINAVIAN CIVILIZATION. The date of man's first appearance in Scandinavia, is still an open question. But for all practical purposes Scandinavian archaeology only begins with the Neolithic or Later Stone Age, since the country must have been covered with ice during the preceding period, the Palaeo- lithic or Early Stone Age, when parts of Europe were already inhabited. Thus the expressions Earlier and Later Stone Age in Scandinavian archaeology merely refer to subdivisions

of the Neolithic Period. Men have left traces of their occupation of Denmark from the time when firs were still the prevail- ing trees in that country, and a few tools of elk and reindeer horn appear to belong to an even earlier period. Sweden and Norway were probably not inhabited until later, though it seems that men were present in Sweden while the Baltic was still a fresh-water lake. The dates assigned to this period vary very greatly: S. Miiller suggests before 3000 B.C., while 0. Montelius places it at 8000 years before our era. Besides the elk- and reindeer-horn tools mentioned above, a few rough

flint imple- ments seem to be the earliest traces of man in Scandinavia. In Norway and Sweden these are only found in the extreme south. The kjQkkenmQddinger or skaldynger, variously called in English kitchen-middens, refuse-heaps, or shell-mounds, are characteristic of Denmark in the next period. In these we find remains of primitive meals, consisting chiefly of oyster, mussel and other shells, and the bones of various fish, birds and animals, including deer, wild boar, seals, wolves and aurochs. It appears that the race which left these relics must have lived by hunting and fishing, and that they were probably semi-nomadic. They were evidently unacquainted with agriculture and had no domestic animals other than the dog. These refuse heaps are almost always found by the sea-shore or close to a lake. Some of them extend over an area of as much as 700 yds. by 20 yds. width, but their depth is usually not more than 3 to 10 ft. There are frequent traces of fire and hearth places, so that we may conclude that the food was both prepared and eaten on the spot. The flint implements consist of flakes or knives, awls and axes of various kinds, all made by a process of rough chipping. These are supplemented by articles of bone, horn and clay, including arrow or spear points, axes of horn, and bone combs. Earthen- ware vessels must have been much used, but only fragments have been found, made, of course, without the use of the wheel. Rare attempts at decoration consist of a few cuts or impressions round the top. The only ornaments found are the pierced teeth of animals and shells. In Norway and Sweden implements similar to those of the Danish shell-mounds have been found, but usually without the organic remains, except at Viste, near Stavanger, excavated in 1907. The first Swedish shell-mound was discovered in the north of Bohuslan in 1905, but is of a later type than the Danish. The remains at Nostvet in the Christiania fjord show traces of a considerable population. Ground slate implements are found scattered along the coasts of Norway and Sweden, and are attributed to a nomadic people, whose arctic culture persisted much longer in these countries than in the much earlier flint civilization of the Kitchen-middens in Denmark. To this race are attributed a few rock-carvings and other sculp- tured representations of animals in a highly naturalistic style, almost equal to that of the palaeolithic cave-carvings of France, and showing close affinity with the artistic productions of the regions on the eastern side of the Baltic.

Later Stone Age. — The remains of the Later Stone Age show a very much more advanced civilization of a pastoral and later of an agricultural type, with domestic animals, such as cattle, horses, pigs, sheep and goats. As the number of ” transition ” finds, snowing a gradual development from the older forms, is very small, and as,

moreover, settlements of the kitchen-midden type are known to have existed right through the later Stone Age, or even longer, there is some ground for assuming that the earlier flint implements of Denmark were the product of an aboriginal race, gradually ousted and driven north by Aryans, immigrating with a superior culture.

By far the greatest proportion of the remains of the Stone Age are found in Denmark. While there are not more than five to six hundred Stone-Age graves known in Sweden, and only two or three in Norway, there are between three and four thousand on the island of Seeland alone. Besides Seeland, Lolland, Falster and the north-eastern part of Jutland appear to have been thickly inhabited during the Later Stone Age. In Sweden the southern- most part, Skane and Bohuslan, were probably the first to be inhabited: and then Vestergotland and Dal. Skane has yielded more than three-fourths of all the Later Stone Age objects found

in Sweden. Norway is not, as might be supposed from the absence of graves, entirely deficient in the objects of this period, but they are comparatively few in number, though quite on a par in technique with those of Sweden. As already indicated, the great difference between the culture of the shell-mounds and that of the Later Stone Age is the method of disposing of the dead. The dead of the former period, it is assumed, were pfaced in. simple graves in the earth, while characteristic of the latter period are the megalithic graves found in profusion in Denmark and Sweden.

The earliest form, and that most common in Denmark, is the four-sided dolmen, formed by four or six large upright stones on which rests a huge rock, the whole being partly covered by a mound. These graves usually contain a number of skeletons. The next is the passage grave, a chamber approached by a passage, both built of great blocks of rough-hewn rock. The roof of the largest of these, near Falkoping in Sweden, is formed of nine blocks of granite, and the whole attains a length of nearly 60 ft. Later again are stone cists, consisting of a comparatively small space walled in and roofed by thin blocks of stone, surrounded by a low mound. These graves seldom contain more than one skeleton, and mark the end of the Stone Age. Inhumation was practised throughout the period, though the bones found in the great graves are often marked by fire owing to the practice, apparently prevalent, of lighting fires in the grave chambers. The chambers are often full of remains up to within a foot of the roof, and in some cases parts of as many as a hundred skeletons have been found.

In the mounds surrounding the tombs animal bones and shells are frequently found, indicating feasts and sacrifices. It seems as if many of the graves, especially in Sweden, had at some time been considered as places for sacrifice, to judge by the saucerlike hollows constantly found on the upper side of the covering stones. The finds of tools, weapons, ornaments and pottery contribute greatly to our knowledge of the period, but probably the best specimens were not placed in graves, as we find the finest work elsewhere. The pottery is of good material and form, though still made without the aid of the potter's wheel. The indentations of the pattern are frequently filled in with a white chalklike substance. Many of the vessels are rounded at the bottom, and perforations or handles show that they are meant to hang. Wood was no doubt much used, but it is only by a fortunate chance that wooden vessels and a wooden spoon have been preserved to us in Denmark. It is probable that wool was used as well as skins for clothing, but if so it must be supposed that the spinning and weaving implements were of too perishable a material to have come down to us. Awls are constantly found, but not needles. Bone pins were used for fastening the clothes. The ornaments were chiefly pierced teeth of various wild animals, and objects of amber and bone, many of them in the form of minute axes. Amber was much used during the earlier part of this age, but it is seldom found later on, probably because its value as an article of export had by then been realized. The Swedish archaeologist, O. Montelius, distinguishes four sub- divisions in this period, towards the end of which the implements show a mastery over material unequalled in the rest of Europe, but it must not be supposed that this was attained at once. The tools include chisels, borers, knives, saws and axes, but the finest workmanship seems to have been reserved for weapons. Arrow-heads and spear-points of flint have chipped blades of marvellous fineness and symmetry. Daggers with handle and blade all made of one piece of flint are characteristic of the Northern Stone Age, and show how much weight was laid on ornamental appearance, since wooden handles would have been equally effective and far less troublesome to make. The battle- axes are of many forms, perfectly symmetrical and beautifully ground and polished. Those of other stone than flint have holes bored through them for the shaft. Wooden shafts were usually attached at right angles to the flint axes. Of these latter the thin-necked axe is the most characteristic. The distribution of flint implements reveals a considerable trading activity, as Hint-bearing strata only occur in certain parts of Denmark and in Skane, whence it must have been distributed over the whole of Southern Sweden through the channels of commerce. Con- siderable commercial activity must also have prevailed between the Scandinavians and their

southern neighbours.

SCANDINAVIAN CIVILIZATION

Plate I.

t.— STONE AXE. Liter Stone Age, Sweden.

3— BELT ORNAMENT. Utter part of earlier Bronze Age.

5. — SWORD. Second period of earlier Bronze Age.

7. — FIBULAE. Earlier and later forms, Bronze Age, Norway.

8.— BRONZE KNIVES OR RAZORS. Later Bronze Age, earlier and later forms.

6 ._ TOP OF A SMALL BRONZE

CASKET

Latter part of earlier Bronze Age.

FbotQ, B. S. PkiUpotls. o.ˆPART OF A ROCK CARVING (the grooves are

-BRONZE CLAST. Later Bronze Age, Norway.

filled in with chalk). Bronze Age. n – ROCK CARVINGS. Sweden, Later Bronze Age.

Fig. 1 from O. MonteUus, CMliwtim 0/ Sweden: Figs. 2-6, 10, 1 1 from S. Mullet, Vor IMIid and Urseschlcile Europas; Figs. 7, 8, ,2 from G. Gustafson, Norses Olilid.

Plate II.

SCANDINAVIAN CIVILIZATION

rj.— BROOCH SET WITH GARNETS.

Post-Roman Period, Denmark.

10.— SILVER GILT BROOCH (length over i; inch..). Period of National Migrations, Norway.

12.— GOLD BKACTEATE, “barbarian” imitation of a Roman Coin. First period of Later Iron Age, Sweden.

, 8, 9, u trom S. Miillcr, Vor Oldlid; Figs, i, 7, 12 from O. Montclius, Civ. Sweden; rig, w from G. Gustation, Xorgcs Oldlid.

Traces of dwelling-houses with hearth-places show that the usual form was a round ‘or slightly oval hut, constructed of wattles, plastered inside and out with clay. The floor was usually partly or entirely paved.

The Bronze Age. — Towards the close of the Later Stone Age a few objects of copper are found in the North. Copper is, however, soon superseded by bronze, which was probably imported ready . alloyed into Scandinavia, though the special Scandinavian forms, as well as the presence of a number of moulds, conclusively prove that the casting of the metal was done in the North. It is supposed that the Bronze Age, which can be divided into two main periods, began in Scandinavia about 2000-1750 B.C. The earliest implements are clearly copies of the Stone Age work, betraying the ignorance of the makers as to the adaptability of the new material. Some bronze axes are exactly the shape of stone axes, but gradually we see the blade grow wider, the neck narrower, the outer sides of the haft turn back over the wooden shaft, which is still cloven, and finally before the end of the earlier period we have the ” socketed celt,” in which the tongue has disappeared and the wooden shaft is fixed in a cylinder of bronze, with a metal loop at the side through which the fastening passed. The unsocketed celt has also undergone modifications. By the end of the earlier period swords have been evolved from daggers, and brooches and clasps, besides beautiful vases and hanging vessels, are made of the metal. Gold is also known and used. Fine linear decoration, usually in spirals or zig-zags, is applied. The forms are extremely artistic, and the technique higher than in almost any other European country. Perhaps the most magnificent relic of this earlier period is the bronze “sun-chariot” and horse from Trundholm in Seeland. The disk supposed to represent the sun is overlaid with gold and beautifully decorated with spiral designs. The later period is clearly marked off from the earlier by the method of disposing of the dead, since in the earlier period the dead were still buried unburned, often in stone cists or oak coffins, while in the latter period cremation was practised, and the remains placed in small stone or wooden boxes, or in plain earthenware urns. Some of these urns are clearly imitations of the house of the period, and show that it was still round in form. The graves are covered by a cairn or mound. Miniature weapons are often

found in the urns, but the objects placed in or beside the urn reveal little care in their selection: it is obvious that a few gifts were deposited with the dead, rather than the complete outfit of necessaries which are found in earlier periods. During this period decoration becomes more complicated: the spirals are often fringed with tangential lines, and the ends of knives, rings, &c, are frequently rolled up into spiral volutes. Bands of wavy lines are a common form of ornament. Amber and a dark-brown resinous matter are often inlaid. Ornaments show a tendency to exaggeration of size, as is seen in the massive neck and arm-rings, the brooches, pins and clasps.

We are fortunate in knowing more about the Scandinavian Bronze Age than the mere remains, plentiful though they are, could tell. us. In some parts of Sweden and Norway rude carvings on bare granite rocks, executed in a stiff and conventional style, have been identified as belonging to this period, and from these, in com- bination with the finds, we can deduce a considerable fund of in- formation. Horses were used for riding, driving and ploughing. From the impress left on earthenware vessels we find that wheat, barley and oats were cultivated. Large boats, almost invariably without mast or sail, are very frequently depicted. The human figures on the carvings are unfortunately represented in such a primitive -manner that little could be known of the details of their clothing but for some unique finds in Denmark, where the oak coffins of the earlier period have preserved hair and clothing for over 3000 years. Thus we know that the garb of the Bronze Age man consisted of a thick glossy cap, replaced by a helmet in time of war, a woollen tunic which left the shoulders bare, a cloak and leather shoes fastened on by strips of cloth crossed up the ankle. A buckle for the belt, pins for the cloak, and one bracelet were his only ornaments. From the small bronze knife and the tweezers found in men's graves it has been deduced that shaving was usual, and a small pointed instrument also found in the graves is regarded as evidence for tattooing. The women wore a fine hair net and comb, a curiously clumsily-cut bodice with sleeves to the elbow, and a long skirt gathered round the waist by a belt with a large ornament in front. A heavy necklace, two bracelets and a dagger appear to

have been usual. The people were tall and had light hair. With regard to the distribution of Bronze Age finds, it may be said that Gotaland, Skine and the district round Stockholm yield the richest harvest in Sweden, while in Norway the mass of finds are in the Christiania and the Stavanger districts. A notable feature of the period is the number of finds made in bogs. Many were clearly buried there for safe

keeping, but others are usually explained as votive offerings.

Iron Age. — The approximate date for the first beginnings of this period in the North is still a matter of controversy; Montelius placing it at about 500 B.C., while Sophus Muller, of Denmark, would put it at least a century and a half later. It has been divided into four main subdivisions, of which the first, lasting till about the beginning of our era, is usually called the Pre-Roman Period. The beginnings of this age are most clearly traced on the island of Bornholm, where cemeteries are found containing from 10 to 1000 graves. These graves, called Brand- pletter, are closely similar to the contemporary graves on the Continent, and consist of burnt bones embedded in charcoal and black mould. In this are found iron brooches (of the safety- pin type), buckles and a few fragments of pottery. More typi- cally Northern cemeteries show small mounds covering each grave, in which an urn contains the burnt bones. These graves also yield but few remains, and the wealth of objects from this period come from bog and field finds, as for instance some magnificent chariots, overlaid with decorated bronze plates, from a bog near Ringkjobing, Denmark. Ornaments were usually of massive bronze or occasionally of iron, and gold seems to have been com- paratively scarce, perhaps owing to the disturbed state of central Europe. All but the very beginning of the period shows the influence of the La-Tene (q.v.) civilization. The succeeding Roman period begins in the 1st century a.d. and extends, according to Swedish and Norwegian archaeologists, to about 400. In Denmark the latter half of the period is termed that of ” National Migrations.” A number of Roman objects are found — coins, glass and bronze vessels, &c. From the fact that Skane, Bornholm, Oland and Gotland are the chief finding-places, it appears that most of the objects must have been brought, through war or trade, from the south-east, by way of the great trade-route along the Vistula. Gotland alone has yielded nearly four thousand Roman coins, while Bornholm equals the whole of the rest of Denmark with 500, and Norway has only yielded three. A certain number of Roman objects seem, however, to have reached Denmark from the Rhine Provinces. The graves show a variety new to Scandinavia: in some parts Cremation continues to be practised, in other localities, notably in Jutland and Seeland, inhumation reappears. Characteristic of both forms of burial is the practice of placing a number of vessels containing food and drink in the grave. Weapons are seldom found in graves, but a complete knowledge of them is afforded by such finds as that at Thorsbjerg in Schleswig and Vimose in Fiinen, the latter yielding no less than 3500 objects to the National Museum. These are the debris of great battlefields from about the 4th century, and it is usually supposed that the victors

dedicated the spoil to some god, as everything was left almost untouched.

From this ample evidence we learn that the spear or lance was the most common weapon, and after that the sword, used now for striking as well as thrusting, and with a short cross-piece. The hilt is often superbly decorated, frequently with silver, which is now much used. Coats of ring-mail are found. Helmets and shields are extraordinarily thin, almost flimsy, possibly in imitation of the inferior Roman goods of the period, possibly in the case of the shields, at any rate, because they were only intended to protect from arrows or spears flung from a distance, or because dependence was mainly placed on the strength of the boss. Numbers of bits and other fragments of harness prove the use of horses in war. A similar find at Nydam in Schleswig yielded two of the oldest boats that have come down to us: one of oak, 75 ft. long, built for 28 rowers, and another of firwood. The timbers were fastened with iron nails, but some early boats from Norway and Sweden show a more primitive method of attaching the timbers with fastenings of baste.

Besides the deserted battlegrounds, the more usual type of votive offering is found, such as the silver cauldron from Gundestrup, or the two magnificent gold horns, one more than 2 ft. in length, discovered at Gallehus in Schleswig. Further indications of religious

customs are afforded by a curious find in Jutland, where between 20 and 30 earthenware vessels each contained a slaughtered lamb. With these were found remains of rude altars.

Of domestic arts, weaving and dyeing seem to have been carried to a high degree of perfection. The art of pottery has also advanced, especially in Jutland, where we find a multiplicity of forms, with decoration in bands of slanting lines. It was during this period that the Scandinavians acquired the Runic alphabet from the southern Germanic tribes. The specifically Northern variant of this alphabet does not appear till later. Inscriptions from this period, cut into stone monuments, are found in Norway and Sweden.

The next period (the first of the Later Stone Age), called in Denmark the Post-Roman, and in Sweden and Norway the ” Period of National

Migrations," brings us from a.d. 400 to about 700. In Denmark these centuries are very obscure, owing to the fact that the graves there are usually difficult to find, being without mounds and unfurnished with goods. Bornholm, where inhumation is greatly on the increase, is again the chief centre for grave-finds. Some few graves contain the personal equipment of the dead: sword, spear, axe, shield, knife and whetstone, and occasionally the skeletons of horse and dog. The vessels for food and drink are no longer found. At Old Upsala, Vendel and Ultuna, all in Upland, great interest attaches to the first ship-graves. These become common in Norway, fairly frequent in Sweden, and even in Finland, but only one grave containing remains of a boat has so far been found in Den- mark. The details of the earlier Swedish ship-burials are some- what obscured for us because the ship and all its contents have been burnt, but we can see that in these the dead man sits at the stern, as if about to set forth on a journey, while in later graves of the Viking Period, both burnt and unburnt, the corpse seems to have been laid on a bed in a chamber built amidships for the purpose. All the larger ship-burials are remarkable for the large number of animal bones found, including those of horses, oxen, pigs, sheep and fowls.

The gold ornaments of the period are its chief glory: indeed the wealth of gold, especially in Sweden, has suggested the title " Gold Age " for these centuries. The favourite ornaments of the period were the so-called bracteates, worn as pendants, and imitated from Roman coins, but often stamped on one side only and decorated in the Northern style. Magnificent brooches of engraved or filigree work, some with a plate at the hinge end at right angles to the pin, others oval, often representing an animal seen from above, are among the finest productions of the time. The decoration of conventionalized animal forms is a marked feature, and, though characteristic of all the Germanic races at this time, is best executed in the north. When worked in filigree the animals' limbs become more and more attenuated and snake-like, or, on the other hand, when engraved, show less and less connexion with each other, but the artist's aim, a good decorative effect, is attained, even though there is a certain barbaric absence of restraint in design.

In the Viking Age, from about 800 to the introduction of Christianity in the 10th and nth centuries, Norway, hitherto the poorest in antiquities, springs into prominence. A wealth of objects is found in the graves, and especially in some of the larger ship-graves, such as those of Gokstad, Tune, Mykle- bostad and Oseberg (also in the Norwegian ship-grave at Groix, Brittany). Fortunately a number of these ships are unburnt, and in view of the importance of seafaring in

the Viking Age, it is worth noting that a mast with square sail of woollen material is common. One ten-oared vessel from this period is of exactly the same build as those used to this day in the district where it was excavated. A number of shield bosses are often found in the vessels, and it is clear that shields were hung round the bul- warks exactly as Icelandic sources describe. The prow and stern-post are often beautifully carved. Sometimes the remains of as many as 1 2 horses are found in one of these graves, besides those of a number of dogs. The presence of anvils, pincers and other tools, as well as weapons and ornaments, is noteworthy, indicating that the art of metal-work was held in esteem even among chiefs, as indeed is known from literary sources. During this period, moreover, iron ore was extracted, smelted and worked in Scandinavia. The weapons found are swords, knives, sickles, battle-axes, spears and arrows. The sword is two-edged, with a wooden hilt often beautifully decorated with silver. The axe is very broad-bladed, and evidently of great importance, being often the only weapon found in graves. Helmets and coats

of mail are not found in Norway, but are comparatively common in Sweden.

We owe much of our knowledge of this period to the unburnt burials which were fortunately usual. In Denmark grave-chambers of wood, such as those at Jellinge, stand nearest to the ship-graves. In Sweden the great number of graves surrounding the ancient town of Birka (mod. Bjorko), should be noticed. Most graves have a round, oblong or triangular howe raised over them. A feature of the period are the tall, rudely-hewn bauta-stones, set up over graves containing burnt bones, or sometimes merely to the memory of the dead. Large upright stones are sometimes set round a grave in a circle, or in the shape of a ship, with pointed bow and stern. It is noticeable that the graves are often in close proximity to the modern cemeteries. In this period women are also occasionally buried in a boat or ship, as in the case of one of the finest ship-graves, that at Oseberg. Women's graves often contain splendid ornaments, though gold and silver are rare in grave-finds, and the large oval- headed pins and the oblong or trefoil-shaped clasps found in them are usually of bronze, while in other finds silver ornaments are common. Silver is as characteristic of this period as gold of the preceding one, Denmark alone yielding no less than 25 important silver finds, some of them consisting of necklaces of very fine filigree work, or of dexterously woven silver wires. The style of decoration is the same as the preceding period, but bolder, less refined and often heavy. Ornaments are often set with garnets. The influence of Irish art is discernible, as in the spirals which terminate the limbs of the animal forms, and in the frequent interlacing designs ; and we are

not surprised to find a number of objects of Irish manufacture in Norway. On the other hand, English leaf decoration is imitated, and Carolingian models appear to have served for certain grotesque forms, such as dragons, winged lions, &c. Sweden shows the same influences at work, though the Swedes still had most dealings with the eastern Baltic countries, and with the Scandinavian kingdom of Novgorod. ” Cufic ” coins, struck in Persia and Turkestan, are found together with those of Germany and England. It is clear proof of Gorland’s commercial importance that it is still the richest treasure-ground in this respect, even for English coins. Evidence for the eastern communications of Sweden is afforded by Runic inscriptions, some of which state that the chief whom the stone com- memorates fell in Finland or Esthonia. Runic inscriptions with the later, entirely Northern alphabet are now common all over Scandin- avia. The stones, especially the later Swedish ones, are often carved with spiral and animal designs, and some represent mythical scenes such as the adventures of Sigurd Fafnisbane, depicted on a stone from Sodermannland. The houses of this period were usually built of wood, and consisted, as we know from literary evidence, of a large hall with various outbuildings. The descriptions in Icelandic sagas of tapestry hangings are borne out by the discovery of traces of hangings in grave-chambers, especially those at Jellinge in Denmark. Some fragments of cloth, showing designs in various colours, testify to a considerable degree of skill in weaving, and figured silk material is found in some of the ship-graves. Traces of feather mattresses and wooden beds are found in some of these graves, and dice and playing-pieces resembling draughtsmen frequently occur. The remains of humbler dwellings have been found, some of them re- sembling a type of cottage still to be seen in southern Sweden, built of wattles, plastered inside and out.

Another feature of the Viking Age consists in the great earthworks, many of them standing to this day. Such are the famous Danevirke, stretching right across Schleswig, the work of Queen Thyra, who lies in one of the great howes at Jellinge, and the so-called bygdeborge in Norway, some of which are assigned to Viking times.

Authorities. — 0. Montelius, Kulturgeschichte Schwedens von den dltesten Zeilen (Leipzig, 1906). An earlier Swedish edition of this book has been translated into English by F. H. Woods: Civiliza- tion of Sweden in Heathen Times (London, 1888); S. Miiller, Nordische Alterthumskunde ; Deutsche Ausgabe, von 0. L. Jiriczek (Strassburg, 1897), and Ordnung af Danmarks Oldsager, Systime Prehistorique du Danemark (Copenhagen and Paris) ; J. J. Worsaae, The Industrial Arts of Denmark (London, 1882) ; G. Gustafson, Norges Oldtid (Christiania,

1906) ; O. Rygh, Nor- wegian Antiquities (French and Norwegian text) (London and Christiania, 1880) ; A. Hansen, Landndm i Norge (Christiania, 1904) ; E. Vedel, Bomholms Oldtidsminder (Copenhagen, 1886) ; J. Undset, Das Erste Auftreten des Eisens in Nord-Europa; J. Mestorf, Urnen- friedhofe in Schleswig-Holstein (Hamburg, 1886) and Vorgeschichtliche Alterthtimer aus Schleswig-Holstein (Hamburg, 1885); B. Salin, Die altgermanische Thierornamentik, ubersetzt von J. Mestorf (Stockholm, 1904). Also articles by the above, and by H. Schetelig, H. Hilde- brand, H. Stolpe and others, in various periodicals, especially Bergens Museums Aarbog (Bergen), Aarsberelninger fra Foreningen tilnorske Fortidsmindesmaerkers Bevaring (Christiania), A arboger for nordisk Oldkyndighed (Copenhagen), Antiqvarisk Tidskrift for Sverige (Stockholm), the M&nadsblad of the Kgl. Vitterhets Historie och Antiqvitets Akademie (Stockholm), Fornvdnnen, published since 1906 by the same society, Svenska Fornminnesforeningens Tidskrift (Stockholm), Ymer (Stockholm). The guides to the various Scandinavian museums are of great value. Some of them can be obtained in English. The importance of the Kiel Museum, with its

SCANDINAVIAN CIVILIZATION

Plate III.

I.—TVPTCAL MOTIF, ANIMAL FORM

AN U SNAKE, from bronze clasp.

Vikmg Age, Denmark,

Pho’o lent by Pmf. G. II. Gmtti^tt.

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?>r»v?v?; ..‘i’J vr??°v^’ K , X0BF0R 7.-SCENES I’ROM THE LIFE OF SIGURD AND RUNIC INSCRIPTION,

P ;i\yS G HARNESS, Viking Age. Norway. Viking Age, Sweden,

8.— RUNIC STONE, from Jellinge,

Jutland, showing Christian

influence.

SILVER “THOR’S HAMMER.” Viking Age, Sweden. ■• ro.-BROOCH.

Viking Age, Norway.

Figs, r, 2, S, from S. Mailer, Vlir (mid; Figs. 3, 4, 5, 6, 10 from G. Gustafson, Norse: Otitid; Fig-,. 7, 9 from O. Montelius, Civ. Smd.

guide by J. Mestorf, Vorgeschichtliche Alterthumer aus Schleswig-Holstein, should not be overlooked. The Saga Book of the Viking Club (London) contains excellent articles, chiefly by H. Schetelig and H. Kisr. (B. S. P.)

SCANDINAVIAN LANGUAGES. 1 By this expression we understand the closely allied languages which are and have been spoken by the Teutonic population in Scandinavia, and by the inhabitants of the countries that have been wholly or partially peopled from it. The territory of these languages embraces: Sweden, except the most northerly part (chiefly Lapland and inland parts of Vesterhotten, where Finnish and Lappish exclusively or chiefly prevail); certain islands and districts on the coast of western and southern Finland, as well as Aland; a small tract on the coast of Esthonia, where Swedish is spoken, as it is also to some extent in the Esthonian islands of Dago, Nargo, Nukko, Odensholm, Ormso and Rago; Gammal- svenskby (" Galsvenskbi ") in southern Russia (government of Kherson), a village colonized from Dago; the Livonian island of RunOj where Swedish is spoken, as it formerly was on the islands of Kyno, Manno, Moon and Osel; Norway, except certain regions, especially in the northern part of the country, peopled by Finns and Lapps (mainly in the diocese of Tromso) ; Denmark, with the Faeroes, Iceland and Greenland, where, however, Danish is only spoken by a very small part of the population; the northern half of Schleswig; and, finally, several Scandinavian colonies in the United States of North America (especially in Minnesota and Illinois). Scandinavian dialects have besides been spoken for varying periods in the following places: Norwegian in certain parts of Ireland (a.d. 800-1250) and northern Scotland, in the Isle of Man (800-1450), the Hebrides (800-1400), the Shetland Islands (800-1800) and the Orkneys (800-1800); Danish in the whole of Schleswig, in the north- eastern part of England (the Danelagh, q.v., 875-1175), and in Normandy (900-1100, or a little longer); Swedish in Russia (862-1300, or a little longer); 2 Icelandic in Greenland (985-about 1450).

At what epoch the Teutonic population settled in Scandinavia we cannot as yet even approximately decide. It is quite certain, however, that it already existed there before the Christian era — most probably as early as the beginning of the so-called Later Stone Age (5000 B.C., but see Scandinavian Civilization), if not still earlier. If this view be correct, the Scandinavian languages have had an existence of seven thousand years at least. But it is only from the beginning of the Christian era that we can get any information concerning the language of the old Scandinavians, which seems by that time not only to The Primi- nave spread over Denmark and great parts of southern the Scan- and middle Sweden and of Norway, but also to have diaaviao reached Finland (at least Nyland) and Esthonia. In aaguage. S pj te f j ts ex t ens i n over this considerable geo- graphical area, the language appears to have been fairly homo- geneous throughout the whole territory. Consequently, it may be regarded as a uniform language, the mother of the younger Scandinavian tongues, and accordingly has been named the primitive Scandinavian (urnordisk) language. The oldest sources of our knowledge of this tongue are the words which were borrowed during the first centuries of the Christian era by the Lapps from the inhabitants of central Sweden and Norway, and by the Finns from their neighbours in Finland and Esthonia (partly, it is true, also from their Gothic neighbours in Russia and the Baltic provinces), and which have been preserved in Finnish and Lappish down to our own days. 3 These borrowed words, denoting chiefly utensils belonging to a fairly advanced stage of culture, amount to several hundreds, with a phonetic form of a very primitive stamp; as Finn, terva (O. Swed. ticera, Ger. teer), tar; airo (O. Swed. ar.), oar; kansa (O.H.G. hansa),

1 For details see A. Noreen, ” Geschichte der nordischen Sprachen ” (Grundriss der germanischen Philologie, 2nd ed., 1897).

2 V. Thomsen, The Relations between Ancient Russia and Scandinavia (1877).

3 W. Thomsen, t)ber den Einfluss der Germ. Sprachen auf die Finnisch-Lappischen (1870); E. N. Setala, ” Zur Herkunft und Chronologie der alteren germanischen Lehnworter” in Journal de la Societi Finno-ougrienne, xviii. (1906).

Age.

society; napakaira (O.H.G. nabagtr, 0. Swed. navar), auger;

ansas (Got. ans, O. Swed. as), beam; Lapp sajet (Got. saian, O.

Swed. sa), sow; garves (O.H.G. garawir, O. Sw. gor),

finished; divres (O. Sax. diuri, O. Swed. dyr), dear; won j s .

saipo (O.H.G. seifa), soap. These words, with those

mentioned by contemporary Roman and Greek authors, as well as

the most ancient runic inscriptions mentioned below,are the oldest

existing traces of any Teutonic language. Wrested from their

context, however, they throw but little light on the nature of

the original northern tongue. But an equally old series of

linguistic monuments has come down to us dating from

a little before the end of the so-called Early Iron Age

(about a.d. 400) — the knowledge and the use of the oldest

runic alphabet (with twenty-four characters) having at that

period been propagated among the Scandinavians by the southern

Teutonic tribes. In fact we still possess, preserved _

j .. • v A. • Rank la-

down to our own times, primitive northern runic a6 riF„f/ 011s ,

inscriptions, the oldest upon the utensils found at Vi in Schleswig and Thorsbjerg in Denmark, dating back to about a.d. 250-300, which, together with the MS. fragments of Ulfilas' Gothic translation of the Bible, about two hundred years later in date, constitute the oldest genuine monuments of any Teutonic tongue.

These runic inscriptions are for the most part found on stone monuments (sometimes on rocks) and bracteates (gold coins stamped on one side and used for ornaments), as well as on metallic and wooden utensils, weapons and ornaments. 4 Up to 1908 there had been discovered more than one hundred, but of these only about one-half give us any information concerning the language, and most of them are only too short. . The longest of those satisfactorily interpreted, the stone-monument of Tune, in south-eastern Norway, contains only sixteen words. Their language is perhaps somewhat later in character

than that of the oldest words borrowed by the Lapps and Finns, voiced s, for example, is changed into a kind of r (cf. dagaR = Goth dags, day; but Finn. armas = Goth, arms, poor). On the other hand, in all essential matters it is much earlier in character than the language of contemporary Gothic manuscripts, and no doubt ap- proaches more nearly than any Teutonic idiom the primitive form of the Teutonic tongue For the sake of comparison, we give a Gothic translation of one of the oldest of the primitive Scandinavian inscriptions, that on the golden horn of Gallehus, found on the Danish-German frontier, and dating from about a.d. 300. —

Scand.: ek hlewagasti.R. holtinga.R. horna. tawido;

Goth. : ik Hliugasts Hultiggs haurn tawida;

Engl. : I, HlewagastiR, from Holta, made the horn; as well as the inscription on the stone monument of Jarsberg in western Sweden, which is about 250 years later: —

Scand.: UBA.R HITE. harabana.R wit iah Ekerila.Z? runoJ? waritu;

Goth.: Ubs Hita, Hrabns wit j ah ik Airils r&nbs writu;

Engl.: UbaR (erected the monument in memory of) HitaR. We both, HarabanaR and I ErilaR, wrote the runes.

Although very brief, and not yet thoroughly interpreted, 6 these primitive Scandinavian inscriptions are nevertheless sufficient to enable us to determine with some certainty the relation which the language in which they are ˆ e, *f!° a written bears to other languages. Thus it is proved languages. that it Delongs to the Teutonic family of the Indo- European stock of languages, of which it constitutes an inde- pendent and individual branch. Its nearest relation being the Gothic,these two branches were formerly sometimes taken together under the general denomination Eastern Teutonic, as opposed to the other Teutonic idioms (German, English, Dutch, &c), which were then called Western Teutonic.

The most essential point of correspondence between the Gothic and Scandinavian branches is the insertion in certain cases of gg before w and j (gg; in Gothic was changed into ddj), as in gen. plur. O.H.G. zweiio, O. Eng. twela (two), compared with O. Icel., O. Norw. tueggia, O. Swed., O. Dan. twceggiae, Goth, twaddje; and, still, in German treu, Eng. true, compared with Swed., Norw., Dan. trygg, Icel. tryggr, Goth.

4 See the plates in G. Stephens's Handbook of Old Northern Runic Monuments (1884), and S. Bugge's Norges Indskrifter med de oddrt Runer I. (1891-1903).

6 For the interpretations we are principally indebted to Prof. S. Bugge's ingenious investigations, who in 1865 satisfactorily succeeded in deciphering the inscription of the golden horn, and by this means gained a fixed starting-point for further researches. A short review of their most important results is given by A. Noreen, Altisldndische Grammatik (3rd ed., 1903), appendix.

triggws. However, even in the primitive Scandinavian age the difference between Gothic and Scandinavian is more clearly marked than the resemblance; thus, for example — just to hint only at some of the oldest and most essential differences — Goth. nom. sing, ending in -5 corresponds to primitive Scandinavian -or, -ir (as Goth, dags, day, gasts, guest = Scand. dagaR, gasttR); Goth. gen. sing, in -is to Scand. -as (as Goth, dagis, day's = Scand. dagas) ; Goth. dat. sing, in -a to Scand. -e (as Goth, kaurna, corn = Scand. kurne); Goth. 1st pers. sing. pret. in -da to Scand. -do (as Goth, tawida, did = Scand. tawido).

Already before the beginning of the so-called Viking period _ _ (since about a.d. 800) the primitive Scandinavian formation, language had undergone a considerable transformation, as is proved, for example, by the remarkable runic stone at Istaby in the south of Sweden, with the inscription (about a.d. 650) : —

afAtr hariwulAfA haJiuwulAfjR haeruwulAfi/J wArait

RUNAK pAIAK;

Engl.: In memory of HariwulfR, HafpuwulfR, son of HeruwulfR, wrote these runes. Here, e.g. we find nom. sing, in -or changed into -r (cf . ha] > uwulafR with holtingaR on the golden horn), and the plural ending -or into ■or (cf. runaR with runoR on the Jarsberg-stone). At the beginning of the Viking period the Scandinavian language seems to have under- gone an extraordinarily rapid development, which almost com- pletely transformed its character. This change is especially notice- able in the dropping of unaccented vowels, and in the introduction of a certain vowel harmony of different kinds (Umlaut, vowel changes, caused by a following i (j) or u (w), as kwceSi for kwafti, poem, and " Brechung," as healpa instead of helpa

to help), different assimila- tions of consonants (as 11, nn for fy, n\> ; //, nn, rr and ss for Ir, mr, rR and sr), dropping of w before and u (as orS, ulfr for worfS, word, wuIjr, wolf)(simplified inflection of the verbs, a new passive formed by means of affixing the reflexive pronoun sik or seR to the active form (as kalla-sk, kalla-ss, to call one's self, to be called), &c.

At this epoch, therefore, the primitive Scandinavian language must be considered as no longer existing. The centuries

a.d. 700-1000 form a period of transition as regards transition. tne language as well as the alphabet which it employed.

We possess some inscriptions belonging to this period in which the old runic alphabet of twenty-four characters is still used, and the language of which closely resembles that of the primitive Scandinavian monuments, as, for example, those on the stones of Stentoften (about 700) and Bjorketorp (about 750), both from southern Sweden, being the longest inscriptions yet found with the old runic alphabet. On the other hand, inscriptions have come down to us dating from about a.d. 800, in which the later and exclusively Scandinavian alphabet of sixteen characters has almost completely superseded the earlier alphabet from which it was developed, while the language not only differs widely from the original Scandinavian, but also exhibits dialectical peculiarities suggesting the existence Dialects. °^ a Danish-Swedish language as opposed to Norwegian,

as the form ruulf on the stone at Flemlbse in Denmark, which in a Norwegian inscription would have been written hruulf corresponding to Hrolf in Old Norwegian literature. These differences, however, are still unimportant, and the Scandinavians still considered their language as one and the same throughout Scandinavia, and named it Dqnsk tunga, Danish tongue. But when Iceland was colonized (c. 900), chiefly from western Norway, a separate (western) Norwegian dialect gradually sprang up, at first of course only differing slightly from the mother-tongue. It was not until the definitive introduction of Christianity (about a.d. iooo) that the language was so far differentiated as to enable us to distinguish, in runic inscriptions and in the literature which was then arising, four different dialects, which have ever since existed as the four literary languages — Icelandic, Norwegian, Swedish and Danish. Of these the latter two, often comprehended within the name of Eastern Scandinavian, as well as the former two, Western Scandinavian, or, to use the Old Scandinavians' own name, Norrfant mdl, Northern tongue, are very nearly related to each other. The most important differences between

the two branches, as seen in the oldest preserved documents, are the following: (1) In. E. Scand. far fewer cases of ” Umlaut,” as vare, W. Scand. vdere, were; land, W. Scand. lond (from landu), lands; (2) E. Scand. ” Brechung ” of y into iu (or to) before

ng(w), nk(w), as siunga, W. Scand. syngua (from singwa), to sing; (3) in E. Scand. nip, nk, nt are in many cases not assimilated into pp, kk, it, as krumpin, W. Scand. kroppenn, shrunken; cenkia, W. Scand. ekkla, widow; ?^ rences bant, W. Scand. batt, he bound; (4) in E. Scand. the £a S f ern dative of the definite plural ends in -umin instead of and W. Scand. -onom, as in handumin, hqndonom, (to) the Western hands; (5) in. E. Scand. the simplification of the na ” iaa ‘ verbal inflectional endings is far further advanced, and the passive ends in -s(s) for -sk, as in kallasis), W. Scand. kallask, to be called. In several of these points, and indeed generally speaking, the Western Scandinavian languages have preserved the more primitive forms, which also are found in the oldest Eastern Scandinavian runic inscriptions, dating from a period before the beginning of the literature, as well as in many modern Eastern Scandinavian dialects. For, having regard to the Scandinavian dialects generally, we must adopt quite a different classification from that indicated by the dialects which are represented in the literature. We now pass on to review the latter and their history.

I. Icelandic. — In ancient times Icelandic was by far the most important of the Scandinavian languages, in form as well as in literature. To avoid ambiguity, the language before the Reforma- tion (about 1530) is often called Old Icelandic.

I. Old Icelandic was spoken not only in Iceland, but also in Greenland, where, as already mentioned, Icelandic colonists lived for a lengthened period. Our knowledge of its character qi# is almost exclusively derived from the remarkably Icelandic. voluminous literature, 1 dating from the first half of the 1 2th century, and written in the Latin alphabet, adapted to the special requirements of this language. No traces are found of any older runic literature. Indeed, Old Icelandic possesses only very few runic monuments (about forty-five), all of them almost worthless from a philological point of view. The oldest, the inscriptions on the church door of ValfpjofstaSur, and that of a tombstone at HjarSarholt, date from the beginning of the 13th century, and they are consequently later than the oldest preserved manuscripts 2 in the Latin alphabet, some of which are as old as the last half of the 12th century. A small fragment (Cod. AM. 237, fol.) of a Book of Homilies (of which a short specimen is given below) is considered the oldest of all. About contemporary with this is

the oldest part of an inventory entitled Reykjaholts mdldagi. From the end of the 12th century we possess a fragment (Cod. Reg. old sign. 1812) of the only existing Old Icelandic glossary, and from the first years of the 13th century the Stockholm Book of Homilies (Cod. Holm. 15, 4to), which from a philological point of view is of the greatest importance, chiefly on account of its very accurate orthography, which is especi- ally noticeable in the indication of quantity ; from the early part of the same century comes the fragment (Cod. AM. 325, 2, 4to) entitled A grip (" abridgment " of the history of Norway), probably a copy of a Norwegian original, also orthographically important. Among later manuscripts we may mention, as philologically interesting, the Annates Regii (Cod. Reg. 2087) from the beginning of the 14th century, orthographically of great value; the rich manuscript of miscellanies, Hauksbok (Codd. AM. 371, 544, 675, 4to), a great part of which is written with Haukr Erlendsson's (d. 1334) own hand ; and, above all, three short essays, in which some Icelanders have tried to write a grammatical and orthographical treatise on their own mother-tongue, all three appearing as an appendix to the manuscripts of the Prose Edda. The oldest and most important of these essays (preserved in the Cod. Worm, from the last half of the 14th century) is by an unknown author of about 1 140, the second (the oldest known manuscript of which is preserved in the Cod. Ups., c. 1300) is by an unknown author of about 1250; the third (the oldest manuscript in Cod. AM. 748, 4to, of the beginning of the 14th century) is by Snorri's nephew Olafr Hvitaskald (d. 1259), and is no doubt based partly upon a lost work of the first grammarian of Iceland, Poroddr Runameistari (who flourished at the beginning of the 12th century), partly and chiefly upon Priscian and Donatus. 3

1 A complete catalogue of the literature edited hitherto is given by Th. Mobius, Catalogus Librorum Islandicorum et Norvegicorum Aetatis Mediae (1856), and Verzeichniss der . . . altislandischen und altnorwegischen . . . von 1855 bis l8?Q erschienenen Schriften (1880). Cf. Iceland.

2 An account of the oldest Icelandic manuscripts (to about 1230) is given by J. Hoffory in the Gott. Gel. Anz. (1884), p. 478 sq.

3 A short review of the most important Old Icelandic manuscripts (and their editions), classed according to subjects, is given by 0. Brenner, Altnordisches Handbuch, pp. 13 sq. The principal collections of manuscripts are — (1) the Arnamagnaean (AM.) in Copenhagen, founded by Ami Magnusson (d. 1730) ; (2) the collection of the Royal Library (Reg.) in Copenhagen, founded by T. Torfaeus

Form of the language.

The oldest form of the Icelandic language is, however, not pre- served in the above-mentioned earliest manuscripts of the later half of the 12th century, which are written in the language of their own age, but in far later ones of the 13th century, which contain poems by the oldest Icelandic poets, such as the renowned Egill Skallagrfmsson (about 950) and the unknown authors of the so-called Edda-songs. In spite of the late date of the manuscripts, the metrical form has been the means of preserving a good deal of the ancient language. But, as already remarked, during the loth and nth centuries this dialect differs but little from Norwegian, though in the 12th this is no longer the case.

We may here contrast a specimen of the above-mentioned oldest Icelandic manuscript with an almost contemporary Norwegian one (Cod. AM. 619; see below):—

Icel. — En fat es Norw. — En pat er Engl. — And that is

vitanda, at allt ma vitanda, at allt ma to be known that all

andlega merkiasc oc andlega merkiasc oc that is needed for the

fyllasc i oss, fat es fyllasc i os, pat er decoration of the

til kirkio bunings til kirkiu bunings church or the service

epa p ionosto part at e3a til pionasto barf may, spiritually, be

haua, ef ver liuom at hafa, ef ver lifum found and imitated

sva hreinlega at ver sva raeinlega, at ver within us, if we live

sem verper at callasc sem verSir at kallasc so cleanly that we are

gops mustere. guSs mysteri. worthy to be called

God’s temple.

Apart from the fact that the language is, generally speaking, archaic, we find in the Icelandic text two of the oldest and most essential characteristics of Icelandic as opposed to Norwegian, viz. the more complete vowel assimilation (pionosto, hionasto; cf. also, e.g. Icel. kqllopom, Norw. kallaSum, we called) and the retention of initial h before r (hreinlega, rceinlega), I and n. Other differences, some of which occur at this period, others a little later, are — in Icel. lengthening of a, o, u before //, Ig, Ik, Im and Ip (as Icel. hdlfr, Norw. and oldest Icel. halfr, half) ; later still, also of a, i, u and y before ng and nk; Icel. m and ey for older jzf and y (as in Icel. d<£ma, heyra, Norw. and oldest Icel. dqima, to deem, hyra, to hear) ; Icel. termination of 2nd plur. of verbs in -3 (p) or -t, but Norw. often in -r (as Icel. takiS, -t, Norw. takir, you take). These points may be sufficient to characterize the language of the earlier ” classical ” period of Icelandic (about 1 150-1350). At the middle of the 13th century the written language undergoes material changes, owing in a great measure, perhaps, to the powerful influence of Snorri Sturloson. Thus in unaccented syllables i now appears for older e, and u (at first only when followed by one or more con- sonants belonging to the same syllable) for 0; the passive ends in -z for sk. The other differences from Norwegian, mentioned above as occurring later, are now completely established. . With the be ginning of the 14th century there appear several new linguistic phenomena: a u is inserted between final r and a preceding con- sonant (as in rikur, mighty) ; o (pronounced as an open 0) passes into 6 (the character 6 was not introduced till the 16th century), or before ng, nk into au (as Iqng figll, pronounced laung fibll) ; e before ng, nk passes into ei; a little later S passes into ie, and the passive changes its termination from -z, oldest -sk, into -zt (or -zst) (as in kallazt, to be called). The post-classical period of Old Icelandic (I 35 (> ” 1 53)> which is, from a literary point of view, of but little importance, already shows marked differences that are characteristic of Modern Icelandic; kn has, except in the northern dialects, passed into hn, as in knutr, knot; as early as the 15th century we find ddl for II and rl (asfalla, pronounced faddla, to fall), ddn for nn and rn (as horn, pron. hoddn, horn), and a little later the passive ends in -st, e.g. kallast, to be called.

Although dialectical differences are not altogether wanting, they do not occur to any great extent in the Old Icelandic literary ni led language. Thus, in some manuscripts we find ft replaced by fst (oft, ofst, often) ; in manuscripts from the western part of the island there appears in the 13th and 14th centuries a tendency to change //, rf

into lb, rb (tolf, tolb, twelve ; \10rf, porb, want), &c. To what extent the language of Greenland differed from that of Iceland we cannot judge from the few runic monuments which have come down to us from that colony.

Apart from the comparatively inconsiderable attempts at a grammatical treatment of Old Icelandic in the middle ages which we have Gram- mentioned above, grammar as a science can only be said mattcaJ to nave De g un in the 17th century. The first grammar, treatment. wr itten by the Icelander Runolphus Jonas (d. 1654), dates from 1651. His contemporary and compatriot Gudmund Andreae (d. 1654) compiled the first dictionary, which was not, however, edited till 1683 (by the Dane Petrus Resenius, d. 1688). The first scholars who studied Old Icelandic systematically were R. K. Rask (1787-1832), whose works 1 laid the foundation to our

(d. 1719) and Brynjolfr Sveinsson (d. 1674) ; (3) the Delagardian collection (Delag. or Ups.) at Upsala, founded in 1651 by Magnus Gabriel de la Gardie; (4) the Stockholm collection (Holm.), founded by Jon Rugman (in 1662) and Jon Eggertson (in 1682).

1 E.g. Veiledning til det Islandske sprog (181 1); in a new, much-improved Swedish edition, Anvisning til Isldndskan (1818).

knowledge of the language, and his great contemporary Jac. Grimm, in whose Deutsche Grammatik (1819 seq.) particular attention is paid to Icelandic. Those who since the time of Rask and Grimm have principally deserved well of Icelandic grammar are — among the Norwegians, the ingenious and learned P. A. Munch (d. 1863), to whom we really owe the normalized orthography that has hitherto been most in use in editing Old Icelandic texts, and the solid worker at the syntax, M. Nygaard; the learned Icelander K. Gislason (d. 1891), whose works are chiefly devoted to phonetic researches; 2 the Danish scholars, K. J. Lyngby (d. 1871), the author of an essay which is of fundamental importance in Icelandic orthography and phonetics, and L. F. A. Wimmer, who has rendered great services to the study of the etymology. The latest and greatest Icelandic grammar is by the Swede A. Noreen. 3 As lexicographers the first rank is held by the Icelanders S. Egilsson (d. 1852), i G. Vigfiisson (d. 1889), 6 and J. Porkelsson (d. 1904), 6 the Norwegian J. Fritzner (d. 1893), 7 the Swede L. Larsson, 8 and the German H. Gering. 9

2. Modern Icelandic is generally dated from the introduction of the Reformation into Iceland; the book first printed, the New Testament of 1540, may be considered as the earliest „ . Modern Icelandic

document. Although, on account of the / °i jL exceedingly conservative tendency of Icelandic ortho- ce an ‘ graphy, the language of Modern Icelandic literature still seems to be almost identical with the language of the 17th century, it has in reality undergone a constant and active development, and, phonetic- ally regarded, has changed considerably. Indeed, energetic efforts to bring about an orthography more in accordance with phonetics were made during the years 1835-1847 by the magazine entitled Fjblnir, where we find such authors as Jonas Hallgrimsson and Konr. Gislason ; but these attempts proved abortive. Of more remarkable etymological changes in Modern Icelandic we may note „ the following : y,

about 1650), ai (about 1700), ou, e.g. mdl, language, mdla, to speak, stfill, chair; g before i, j is changed into dj (after a consonant) or j (after a vowel), e.g. liggia, to lie, eigi, not; in certain other cases g has passed into gw or w, e.g. Idgur, low, ljuga, to lie ; initial g before n is silent, e.g. (g)naga, to gnaw; ps, pt have passed into /$, //; bb, dd, gg are pronounced as bp, dt, gk, and //, rl, nn, rn now in most positions (not, however, before d, t and s, and in pet names) as dtl, dtn, as j jail, mountain, bjbrn, bear;/ before n is now pronounced as bp, as hrafn, raven, &c. Both in vocabulary and syntax we find early, e.g. in the lawbook Jonsbok, printed in I578, Danish exercising an important influence, as might be expected from political circumstances. In the 18th century, however, we meet with purist tendencies. As one of the leading men of this century may be mentioned the poet Eggert Olafsson (d. 1768), whose poems were not printed till 1832. Worthy of mention in the history of Modern Icelandic language are the learned societies which appeared in the same century, of which the first, under the name of ” HiS osynilega,” was established in 1760. At this time archaic tendencies, going back to the Old Icelandic of the 13th and 14th centuries, were continually gaining ground. In the 19th century the following won especial renown in Icelandic literature: Bjarne porarensen (d. 1841), Iceland’s greatest lyric poet, and Jonas Hallgrimsson (d. 1845), perhaps its most prominent prose-author in modern times.

The dialectical differences in Modern Icelandic are comparatively trifling and chiefly phonetic. The Westland dialect has, for example, preserved the Old Icelandic long a, while the other „. .ˆ dialects have changed it to the diphthong au; in the s ‘

Northland dialect initial kn is preserved, in the others changed into hn ; in the northern and western parts of the island Old Icelandic hv appear*, as kv, in a part of south-eastern Iceland as x, in the other dialects as xˆ 1 . e.g. hvolpur, whelp. As a matter of curiosity it may be

noted that on the western and eastern coasts traces are found of a French-Icelandic language, which arose from the long sojourn ot French fishermen there.

Owing to the exclusive interest taken in the ancient language, but little attention is given even now to the grammatical treatment of Modern Icelandic. Some notices of the language of the „ 17th century may be obtained from the above-mentioned ˆJˆIi grammar of Runolphus Jonas (1651), and for the language t rea j meB t of the 18th from Rask's grammatical works. For the language of our own time there is hardly anything to refer to but F. Jonsson's very short Islandsh Sprogltzre (1905) ; cf . also B. Magnusson Olsen's valuable paper " Zur neuislandischen Gram- matik " (Germania, xxvii., 1882). A dictionary of merit was that of

2 Especially Um frumparta islenzkrar tungu i fornbld (1846).

3 Altisldndische und altnorwegische Grammatik unter Beriicksichti- gung des Vrnordischen (1884), 3 Aufl. (1903).

1 Lexicon poeticum (1854-1860).

6 An Icelandic-English Dictionary, based on the MS. collections of the late R. Cleasby (1869-1874).

6 Supplement til Islandske ordbtpger (1876, 1879-1885 and 1899).

7 Ordbog over det Gamle Norske sprog (1862-1867, new ed. 1883, seq.).

8 Ordforr&deti de alsta isldndska handskrifterna (1891).

9 Vollstandiges Worterbuch zu den Liedern der Edda (1903).

Old Nor- wegian,

Bjorn Haldorsen (d. 1794), edited in 1814 by Rask. Cleasby-Vigfiisson's dictionary mentioned above also pays some attention to the modern language. A really convenient Modern Icelandic dictionary is still wanting, the desideratum being only partly supplied by J. Thorkelsson's excellent Supplement til islandske ordbpger, iii.

(1890- 1 894).

II. Norwegian or Norse. — Tlie Old Norwegian language (till the Reformation) was not, like the modern language, con- fined – to Norway and the Faeroes, but was, as already stated, for some time spoken in parts of Ireland and the north of Scotland, the Isle of Man, the Hebrides, Shetland and Orkney (in the last two groups of islands it con- tinued to survive down to the end of the 18th century), and also in certain parts of western Sweden as at present defined (Bohuslan, Sarna in Dalarna, Jamtland and Harjedalen).

Our knowledge of it is due only in a small measure to runic in- scriptions, for these are comparatively few in number (about 150), and of trifling importance from a philological point of view, especially as they almost wholly belong to the period between 1050 and 1350, 1 and consequently are contemporary with or at least not much earlier than the earliest literature. The most important are the detailed one of Karlevi on Oland, wherein a Norwegian poet (towards 1000) in so- called ” drottkuaftt ” metre celebrates a Danish chief buried there, and that of Froso in Jamtland, which (about 1050) mentions the christianizing of the province. The whole literature preserved is written in the Latin alphabet. The earliest manuscripts are not much later than the oldest Old Icelandic ones, and of the greatest interest. On the whole, however, the earliest Norwegian literature is in quality as well as in quantity incomparably inferior to the Icelandic. It amounts merely to about a score of different works, and of these but few are of any literary value. A small fragment (Cod. AM. 655. 4to, Fragm. ix., A, B, c), a collection of legends, no doubt written a little before 1200, is regarded as the earliest extant manuscript. From the very beginning of the 13th century we have the Norwegian Book of Homilies (Cod. AM. 619, 4to) and several fragments of law-books (e.g. the older Gula\ringslaw and the older Ei’Ssiva])ingslaw). Of later manuscripts the so-called legendary Olafssaga (Cod. Delag. 8, fol.), from about 1250, deserves mention. The chief manuscript (Cod. AM. 243 B., fol.) of the principal work in Old Norwegian literature, the Speculum regale or Konungsskuggsid (” Mirror for Kings,”) is again a little later. The masses of charters which — occurring throughout the whole middle age of Norway from the beginning of the 13th century — afford much information, especially concerning the dialectical differences of the language, are likewise of great philological importance.

As in Old Icelandic so in Old Norwegian we do not find the most primitive forms in the oldest MSS. that have come down to us; for that purpose we must recur to somewhat later ones, con- taining old poems from times as remote as the days of . porbiorn Hornklofi (end of the 9th century). It has

already been stated that the language at this epoch differed so little from other Scandinavian dialects that it could scarcely yet be called by a distinctive name, and also that, as Icelandic separated itself from the Norwegian mother-tongue (about 900), the difference between the two languages was at first infinitely small — as far, of course, as the literary language is concerned. From the 13th century, however, they exhibit more marked differences; for, while Icelandic develops to a great extent independently, Norwegian, owing to geographical and political circumstances, is considerably influ- enced by the Eastern Scandinavian languages. The most important differences between Icelandic and Norwegian at the epoch of the oldest MSS. (about 1200) have already been noted. The tendency in Norwegian to reduce the use of the so-called M-Umlaut has already been mentioned. On the other hand, there appears in Norwegian in the 13th century another kind of vowel-assimilation, almost un- known to Icelandic, the vowel in terminations being in some degree influenced by the vowel of the preceding syllable. Thus, for instance, we find in some manuscripts (as the above-mentioned legendary Olafssaga) that the vowels e, 0, and long a, ce are followed in terminations by e, 0; i, u, y, and short a, a, on the other hand, by «', u — as in borleifr) , GvSlceifm (GuUeifr). About the beginning of the 15th century initial kv occurs for old hv (not, however, in pronouns, which take kv only in

Form

of the

1 The latest rune-stones are from the end of the 14th century. Owing to influence of the learned, such stones appear again in the 17th century, e.g. in Telemarken.

western Norway), as the local name Qviteseift (hvitr, white). During the 15th century, Norway being united with Denmark, and at intervals also with Sweden, a great many Danisms and a few Suecisms are imported into the language. As Suecisms we may mention the termination -in of the 2nd pers. plnr. instead of -ir, -iS (as vilin, you will). The most important Danisms are the following: b, d and g are substituted for p, t and k — as in the local names Nab0 (earlier Napa), Tvedce sogn (\weita sokn); -a in terminations passes into -e — as hfire (hfiyra) to hear, sfighe (sfikia), to seek; single Danish words are introduced — as iek (e.k), I, se (sid), to see; spfirge (spyria), to ask, &c. Towards the end of the middle ages the Danish influence shows an immense increase, which marks the gradual decline of Norwegian literature, until at last Norwegian as a literary language is completely supplanted by Danish. During the 15th century Norway has hardly

any literature except charters, and as early as the end of that century by far the greatest number of these are written in almost pure Danish. In the 16th century, again, charters written in Norwegian occur only as rare exceptions, and from the Reformation onward, when the Bible and the old laws were translated into Danish, not into Norwegian, Danish was not only the undisputed literary language of Norway, but also the colloquial language of dwellers in towns and of those who had learned to read.

Dialectical differences, as above hinted, occur in great number in the Norwegian charters of the 13th, 14th and 15th centuries. Especially marked is the difference between the language .. . , of western Norway, which, in many respects, shows a development parallel to that of Icelandic, and the language of eastern Norway, which exhibits still more striking correspondences with contemporary Old Swedish. The most remarkable charac- teristics of the eastern dialects of this epoch are the following: — a is changed into ce in the pronouns]>cenn, this, \ozl, that, and the particle beer, there (the latter as early as the 13th century), and later on (in the 14th century) also in terminations after a long root syllable — as sendee, to send, kyr(B, to hear (but gera, to do, Ma, to know) ; ia passes (as in Old Swedish and Old Danish) into ice— as hicerta (Icel. hiarta), heart; y sometimes passes into iu before r, I — as hiurder, shepherd, lykiul, key, instead of hyr&ir, lykyl (older still, hirSir, lykill; see above); final -r after a consonant often passes into -ar, -cer, sometimes only into -a, -ce — as prestar (prestr), priest; bfikar (b0kr), books; dat. sing. br$8a (br0Sr), (to a) brother; tl passes into tsl, si — as lisla (litla), (the) little, the name Atsle, Asle (Alle); rs gives a “thick” s-sound (written Is) — as Bcerdols, genitive of the name Berg\>6rr; nd, Id are assimilated into nn, 11 — as bann (band), band, the local name Vestfoll (Vestfold); and (as far back as the 13th century) traces occur of the vowel assimilation, ” tiljaevning,” that is so highly characteristic of the modern Nor- wegian dialects — as vuko, vuku, for vaku (Icel. voko, -u), accusative singular of vaka, wake, mykyll for mykill, much. On the other hand, as chai»cteristics of the western dialects may be noted the following: final -r after a consonant passes into -ur, -or, or -ir, -er — as vetur (vetr), winter, . rettur (rettr), right, aftor (aftr), again; si passes into tl — as sylla (sy”sla), charge; hw is changed into kw also in pronouns — as kuer (huerr), who. kuassu (huersu), how.

This splitting of the language into dialects seems to have continued to gain ground, probably with greater rapidity as a Norwegian literary language no longer existed. Thus it is very likely that the present dialectical division was in all essentials accomplished about the year 1600; for, judging from the first work on Norwegian dialectology, 2

the S0ndfjord (Western Norway) dialect at least possessed at that time most of its present features. A little clog- calendar of the year 1644 seems to prove the same regarding the Valders (Southern Norway) dialect. How far the Old Norwegian dialects on the Faeroes, in Ireland and Scotland, on the Scottish islands, and on the Isle of Man differed from the mother-tongue it is impossible to decide, on account of the few remnants of these dialects which exist apart from local names, viz. some charters (from the beginning of the 15th century onward) from the Faeroes, Shetland and the Orkneys, and a few runic inscriptions from the Orkneys (thirty in number), and the Isle of Man (about thirty in number). 3 These runic inscriptions, however, on account of their imperfect orthography, throw but little light on the subject. Of the Orkney dialect we know at least that initial hi, hn, hr still preserved h in the 13th century — that is, at least two hundred years longer than in Norway.

Old Norwegian grammar has hitherto always been taken up in connexion with Old Icelandic, and confined to notes and appendices inserted in works on Icelandic grammar. A systematic treatise on Old Norwegian grammar is still wanting, with ~ a fj'li the exception of a short work by the Danish scholar ,,,,,.,,,,._, N. M. Petersen (d. 1862), which, although brief and treatmeau decidedly antiquated, deserves all praise. Among those who in recent days have above all deserved well for the investigation of the Old Norwegian may be mentioned, as to the grammar, the Swede E. Wadstein and the Norwegian M. Haegstad; as to the lexicography, the Norwegian E. Hertzberg, for the law terms, and O. Rygh (d. 1899), for the local names, while the personal names are collected by the Swede E. H. Lind. A most valuable collection of materials

2 C. Jensen's Norsk dictionarium eller glosebog (1646).

3 See P. M. C. Kermode, Manx Crosses (1907).

for judging of the dialectical varieties exists in the Norwegian charters, carefully and accurately edited by the Norwegian scholars C. Lange (d. 1861), C. R. Unger (d. 1897) and H. J. Huitfeldt-Kaas. 1

III. Swedish.— The Pre-Reformation language is called Old Swedish.

1 . Old Swedish. — The territory of the Old Swedish comprehended — • (1) Sweden, except the most northerly part, where Lappish (and n , .

Finnish?) was spoken, the most southerly (Skane, Halland

Swedish anc * Blunge) and certain parts of western Sweden; (2) extensive maritime tracts of Finland, Esthonia and Livonia, with their surrounding islands; and (3) certain places in Russia, where Swedish was spoken for a considerable time. The oldest but also the most meagre sources of our knowledge of Old Swedish are those words, almost exclusively personal names (nearly one hundred), which were introduced into the Russian language at the foundation of the Russian realm by Swedes (in 862), and which are for the most part somewhat influenced by Russian phonetic laws, preserved in two Russian documents of the years 911 and 944- — as Igor. (O. Sw. Ingvar), Rurik (Hrfirikr), Oleg (Hialge, secondary form of Helge), Olga (Hialga, Helga). Of about the same date, but of an infinitely greater importance, are the runic inscriptions, amounting in number to about two thousand, which have been found cut on stones (rarely wood, metal or other materials) almost all over Sweden, though they occur most frequently (about half of the total number) in the province of Uppland, next to which come Sodermanland, with nearly three hundred inscriptions, then Ostergotland, and Gotland, with more than two hundred each. For the most part they occur on tombstones or monuments in memory of deceased relatives; rarely they are public notices. Their form is often metrical, in part at least. Most of them are anonymous, in so far that we do not know the name of the engraver, though, as a rule, the name of the man who ordered them is recorded. Of the engravers named, about seventy in number, the three most productive are Ubir, Bali and Asmundr Karasun, all three principally working in Upland ; the first-mentioned name is signed on nearly eighty, the others on about thirty and forty stones respectively. These inscriptions vary very much in age, belonging to all centuries of Old Swedish, but by far the greatest number of them date from the nth and 12th centuries. From heathen times — as well as from the last two centuries of the middle ages — wc have comparatively few. The oldest are perhaps the Ingelstad inscription in Ostergot- land, the Sparlosa inscription in Vastergotland, and the Gursten one found in the north of Smaland, all probably, from the end of the 9th century. The rune-stone from Rok in Ostergotland probably dates from about a.d. 900. Its inscription surpasses all the others both in length (more than 750 runes) and in the importance of its contents, which are equally interesting as regards philology and the history of culture; it is a fragment (partly in metrical form) of an Old Swedish heroic tale. From about the year 1040 we possess the inscriptions of Asmundr Karasun, and the so-called Ingvar monuments (more than twenty in number), erected most of them in Sodermanland, in honour of the men who fell

in a great war in eastern Europe under the command of a certain Ingvar; the stones cut by Bali belong to the time c. 1060. Somewhat later are the inscriptions cut by Ubir, and from the beginning of the 12th century is the remarkable inscription on the door-ring of the church of Forsa in Helsingland, containing the oldest Scandinavian statute now preserved, as well as other inscriptions from the same province, written in a particular variety of the common runic alphabet, the so-called ” staflosa ” (staffless, without the perpendicular staff) runes, as the long genealogical inscription on the Malstad-stone. The inscriptions of the following centuries are of far less philological interest, because after the 13th century there exists another and more fruitful source for Old Swedish, viz. a literature in the proper sense of the word. Of runic literature nothing has been preserved to our days. The literature in the Latin letters is both in quality and extent incomparably inferior to Old Icelandic, though it, at least in quantity, considerably surpasses Old Norwegian. In age, however, it is inferior to both of them, beginning only in the 13th century. The oldest of the extant manuscripts is a fragment of the Older Vastgotalaw, written about the year 1250. A complete codex (Cod. Holm. B 59) of the same law dates from about 1285, and is philologically of the greatest importance. Of other works of value from a philological point of view we only mention a codex of the Sodermannalaw (Cod. Holm. B 53) of about 1325, a codex of the Upplandslaw (Cod. Ups. 12), the two manuscripts containing a collection of legends generally named Cod. Bureanus (written a little after 1350) and Cod. Bildstenianus (between 1420 and 1450), and the great Oxenstiernian manuscript, which consists chiefly of a collection of legends written for the most part in 1385. The very numerous Old Swedish charters, from 1343 downwards, are also of great importance. 2

1 Diplomatarium Norvegicum (1847, sqq.), 16 vols, have appeared.

2 The Old Swedish monuments are foi the most part published in the following collections: — Svenska fornskriftsdllskapets sam- lingar, 132 parts (1844-1907); C. J. Schlyter, Samling af Sveriges gamla lagar, vols, i.-vii. and x.-xii. (1827-1869); Svenskt Diplo- matarium (6 vols., 1829-1878, new series, 4 vols., 1875-1904).

Old Swedish, during its earliest pre-literary period (800-1225), retains quite as original a character as contemporary Form Old Icelandic and Old Norwegian. The first part of the of the inscription of the Rokstone running thus — language.

AFT UAMUj) STANTA RUNAi?])AR . IN UARIN FAj>I FA|)I.R AFT FAIKIAN SUNU, 3

and probably pronounced —

aft Wamoo standa runaR JaR ; en Warinn fadi fa5iR aft fseighiˆn sunu, would, no doubt, have had the same fcrm in contemporary Icelandic, except the last word, which would probably have had the less original form sun. The formal changes of the Swedish language during this period are, generally speaking, such as appear about the same time in all the members of the group — as the change of soft R into common r (the Rok-stone runaR, later runar, runes; this appeared earliest after dental consonants, later after an accented vowel), and the change of s] > into st (in the 10th century rais\ii, later rozisti, raised); or they are, at least, common to it with Nor- wegian — as the dropping of h before /, n and r (in the 10th century hrauK, younger, rfir, cairn), and the changing of nasal vowels (the long ones latest) into non-nasalized. But the case is altogether different during what we may call the classical period of Old Sv/edish (1225-1375), the time of the later runic inscriptions and the oldest literature. During this period the language is already distinctly separate from the (literary) Icelandic-Norwegian (though not yet very much from Danish). The words of the Older Vastgotalaw —

FALDER KLOCK/E NIDER I HOVOf) MANNI, BOTI SOPCN MARCHUM J) RIM, EN HAN FAR BANˆE AF i

would in contemporary Icelandic be —

fellr klukka nior i hofu5 mauni, baeti sokn morkum |rim, ef nann fair bana af. These few words exhibit instances of the following innovations in Swedish: — d is inserted between II (nn) and a following r (as b between m and /, r, and p between m and t, n — as hambrar, Icel. hamrar, hammers, sampt, Icel. samt, together with) ; an auxiliary vowel is inserted between final r and a preceding consonant; a in terminations is often changed into ce; a u in the final syllable causes no change of a preceding a ; the present tense takes the vowel of the infinitive (and the preterite subjunctive that of preterite indicative plural). Other important changes, appearing at the same time, but probably, partly at least, of a somewhat_older date, are the following: — all diphthongs are contracted (as 0gha, Icel. auga, eye; drfima, Icel. dreyma, to dream; sten, Icel. steinn, stone-ˆ- traces of which we find as early as the 12th century); e has passed into <£ (as knee, Icel. kne, knee) ; ia into ii, to God, til salu, for sale, but i gar\e, in the court, for visso, assuredly), and the forms of the dative and the accusative of pro- nouns gradually became the same. The number of borrowed words is as yet very limited, and is chiefly confined to ecclesiastical words of Latin and Greek origin, introduced along with

Christianity (as kors, cross, bref, epistle, skole, school, prcester, priest, altnosa, alms). At the middle of the 14th century the literary language undergoes a remarkable reform, developing at the same time to a " riksspr dk," a uniform language, common to a certain degree to the whole country. The chief characteristics of this later Old Swedish (1375- 1526) are the following: — the long a has passed into & (that is, an open 0), and io (except before g, k, rdh, rt) into i (as sifi, sea, lake), g and k (sk) before palatal vowels are softened into dj and tj (stj) ; k and t in unaccented syllables often pass into gh, dh (as Swerighe for Swerike, Sweden, titedh for litit, a little) ; the articles thorn, (or hin), the, and (a little later) en, a, come into use; the dual pronouns vanish; the relative cer, that, is changed with sum; the present participle takes a secondary form in -5 (as gangandis, beside gangande, going). A little later the following changes appear: — a short vowel is lengthened before a single consonant, first when the consonant belongs to the same syllable (as hat, hate), afterwards also when it belongs to the following one (as hata, to hate) ; an auxiliary vowel is inserted between I or n and a preceding consonant (as gavel, gable, 0ken, desert); short i often passes into e (as leva, to live); th passes into t; a new conjugation is formed which has no infinitive termination, but doubles the sign of the preterite (as bo, bodde, bolt, to dwell, dwelt, dwelt). Owing to the political and commercial state of the country the language at this period is deluged with borrowed words of Low German origin, mostly social and industrial terms, such as the great number of verbs in -era (e.g. hantera, to

3 In memory of W&mod these runes stand; and Warinn, his father, wrote them in memory of his son (by destiny) condemned to death.

I 4 If the bell fall down on anybody's head, the parish pays a fine

I of three marks should he die from it.

Forngut- nl&ka.

handle), the substantives in -en (revert, robbery), -inna (f0rstinna, princess) , hit (Jromhet, piety), be (betala, to pay), and a great many others (Men, weak, smaka, to taste, grover, big, pung, purse, tukt, discipline, bruka, to use, twist, quarrel, sttfvel, boot, arbeta, to work, frokoster, lunch, &c). Owing to the political circumstances, we find towards the end of the period a very powerful Danish influence, which

extends also to phonetics and etymology, so that, for example, nearly all the terminal vowels are supplanted by the uniform Danish e, the hard consonants p, t, k by 6, d, g as in Danish, the second person plural of the imperative ends in -er, besides -en (as tagher, for taghen, older takin).

Dialectical differences incontestably occur in the runic inscriptions as well as in the literature; in the former, however, most of them Dialects. are hidden from our eyes by the character of the writing, which is, from a phonetic point of view, highly unsatis- factory, indicating the most different sounds by the same sign (for example, 0, u, y and 6 are denoted by one and the same rune) ; in the literature again they are reduced to a minimum by the awakening desire to form a uniform literary language for the whole country, and by the literary productivity, and consequent predominant influence of certain provinces (as Ostergotland) . Only one distinct dialect has been handed down to us, that of the island of Gotland, which differs so essentially from the Old Swedish of the mainland that it has with good reason been charac- terized, under the name Forngutniska, as in a certain sense a separate language. Materials for its study are very abundant: on one hand we possess more than two hundred runic inscriptions, among them a very remarkable one from the beginning of the 13th century, counting upwards of four hundred runes, cut on a font (now in Aakirkeby on the island of Bornholm), and representing the life of Christ in a series of pictures and words; on the other hand a literature has been preserved consisting of a runic calendar from 1328, the law of the island (the oldest manuscript is from about 1350), a piece of traditional history and a gild statue. The language is distinguished from the Old Swedish of the mainland especially by the following characteristics: — the old diphthongs are preserved (e.g. auga, eye, droyma, to dream, stain, stone), and a triphthong has arisen by the change of iu into iau (as fliauga, to fly) ; the long vowels **have passed into e and J> (as mela, to speak, dyma, to deem) ; short o rarely occurs except before r, being in other positions changed into u;‘w is dropped before r (as raipi, wrath); the genitive singular of feminines in -o ends in -ur for -u (as kirkiur, of the church). Owing to the entire absence of documentary evidence it is impossible to determine how far the dialects east of the Baltic, which no doubt had a separate individuality, differed from the mother-tongue.**

The first to pay attention to the study of Old Swedish 1 was the Swedish savant J. Buraeus (d. 1652), who by several works (from The study l $99 onwards) called attention to and excited a lively

of Old interest in the runic monuments, and, by his edition

Swedish (l6 34) °f tne excellent Old Swedish work Urn Styrilse Kununga ok Hfifpinga, in Old Swedish literature also. His no longer extant Specimen Primariae Linguae Scantzianae (1636) gave but a very short review of Old Swedish inflections, but is remarkable as the first essay of its kind, and is perhaps the oldest attempt in modern times at a grammatical treatment of any old Germanic language. The study of runes was very popular in the 17th century; M. Celsius (d. 1679) deciphered the " staffless " runes and J. Hadorph (d. 1693), who also did good work in editing Old Swedish texts, copied more than a thousand runic inscriptions, published by J. Goransson as Bautil (1750). During the 18th century, again, Old Swedish was almost completely neglected; but in the 19th century the study of runes was well represented by the collection (Runurkunder, 1833) of the Swede Liljegren (d. 1837) and by the Norwegian S. Bugge's ingenious interpretation and grammati- cal treatment of some of the most remarkable inscriptions, especially that of Rok. Old Swedish literature has also been made the object of grammatical researches. A first outline of a history of the Swedish language is to be found in the work of N. M. Petersen (1830), and a scheme of an Old Swedish grammar in P. A. Munch's essay, Forn-swenskans och Fornnorskans sprdkbyggnad (1849); but Old Swedish grammar was never treated as an independent branch of science until the appearance of I. E. Rydqvist's (d. 1877) monumental work Svenska sprdkets lagar (in 6 vols., 1850-1883), which was followed in Sweden by a whole literature on the same subject. Thus phonetics, which were comparatively neglected by Rydqvist, have been in- vestigated with great success, especially by L. F. Laffler and A. Kock; while the other parts of grammar have been treated of above all by K. F Soderwall. His principal work, Ordbok ofver Svenska medeltidssprdket (1884 sq.), gives the list of words in the later Old Swedish language, and — taken along with the Ordbok till samlingen af Sveriges gamla lagar (1877), by C. J. Schlyter, the well- known editor of Old Swedish texts, which contains the vocabulary of the oldest literature — it worthily meets the demand for an Old Swedish dictionary. An Old Swedish grammar, answering the requirements of modern philology, is edited by A. Noreen. 2

1 See A. Noreen, " Apercu de l'histoire de la science linguistique suedoise " (he Museon, ii., 1883).

2 Altschwedische Crammatik (1897-1904).

2. Modern Swedish. — The first complete translation of the Bible, edited in 1 541 by the brothers Olaus and Laurentius Petri, and generally called the Bible of Gustavus I., may be regarded as the earliest important monument of this. Owing to Modern religious and political circumstances, and to the learned Swedish influence of humanism, theological and historico-political works preponderate in the Swedish literature of the following period, which therefore affords but scanty material for philological research. It is not until the middle of the 17th century that Swedish literature adequately exemplifies the language, for at that period literature first began to be cultivated as a fine art, and its principal representa- tives, such as Stiernhielm, Columbus and Spegel, were in reality the first to study it as a means of expression and to develop its resources. Amongst the authors of the 1 8th century we have to mention in the first place Dalin, who was to some extent the creator of the prose style of that epoch; while of the end of the century Kellgren and Bellman are the most noteworthy examples, repre- senting the higher and the more familiar style of poetry respectively. The language of the 19th century, or at any rate of the middle of it, is best represented in the works of Wallin and Tegner, which, on account of their enormous circulation, have had a greater influence than those of any other authors.

As to the language itself the earliest Modern Swedish texts, as Gustavus I.‘s Bible, differ considerably from the latest Old Swedish ones.* We find a decided tendency to exterminate p orm Danisms and reintroduce native and partially antiquated of tne forms. At the same time there appear several traces of a language. later state of the language: all genitives (singular and plural), e.g., end in s, which in earlier times was the proper ending of certain declensions only. In spite of the archaistic efforts of many writers, both in forms and in vocabulary, the language nevertheless underwent rapid changes during the 16th and 17th centuries. Thus sj and stj (original as well as derived from sk before a palatal vowel) assimilate into a simple sh sound; dj (original as well as derived from g before a palatal vowel) , at least at the end of the 17th century, dropped its d-sound (compare such spellings as diufwer, gidttar, envoge, for jufver, udder, jattar, giants, envoye, envoy) ; hj passes into j (such spellings are found asjort for hjort, hart, and hjdrpe (orjdrpe, hazel grouse) ; b and p inserted in such words as himblar, heavens, hambrar, hammers, jdmpn, even,.sampt, together with, are dropped; the first person plural of the verb takes the form of

the third person (as vifara, foro, for vijarom, forom, we go, went) ; by the side of the pronoun I, you, there arises a secondary form Ni, in full use in the spoken language about 1650; the adjective gradually loses all the case-inflections; in substantives the nominative, dative and accusative take the same form as early as the middle of the 17th century; in the declension with suffixed article the old method of expressing number and case both in the substantive and the article is changed, so that the substantive alone takes the number-inflection and the article alone the case-ending ; neuter substantives ending in a vowel, which previously had no plural ending, take the plural ending -n, some -er — as bi-n, bees, bageri-er, bakeries. About the year 1700 the Old Swedish inflection may, in general, be considered as almost completely given up, although a work of such importance in the history of the language as Charles XII. 's Bible (so-called) of 1703, by a kind of conscious archaism has preserved a good many of the old forms. To these archaistic tendencies of certain authors at the end of the 17th century we owe the great number of Old Swedish and Icelandic borrowed words then introduced into the language — as fager, fair, harja, to ravage, later, manners, snille, genius, tarna, girl, tima, to happen, &c. In addition to this, owing to humanistic influence, learned expressions were borrowed from Latin during the whole 16th and 17th centuries; and from German, chiefly at the Reformation and during the Thirty Years' War, numberless words were introduced — as tapper, brave, prakt, magnificence, hurtig, brisk, &c. ; among these may be noted especially a great number of words beginning in an-, er-, for- and ge-. Owing to the constantly increasing political and literary predominance of France, French words were largely borrowed in the 17th century, and to an equally great extent in the 18th; such are affdr, business, respekt, respect, talang, talent, charmant, charming, &c. In the 19th century, espe- cially about the middle cf it, we again meet with conscious and ener- getic efforts after purism both in the formation of new words and in the adoption of words from the old language (id, diligence, mala, to speak, jylking, battle-array, &c), and from the dialects (bliga, to gaze, flis, flake, skrabbig, bad, &c). Consequently the present vocabulary differs to a very great extent from that of the literature of the 17th century. As for the sounds and grammatical forms, on the other hand, comparatively few important changes have taken place during the last two centuries. In the 18th century, however, the aspirates dh and gh passed into d and g (after I and r into j)— as lag for lagh, law, brod for brodh, bread ; hw passed into v (in dialects already about the year 1400) — as

valp for hwalper, whelp; Ij like- wise into j — thus ljuster, leister, occurs written juster. In our time rd, rl, rn, rs and rt are passing into simple sounds (" supradental "

3 The printed characters are also considerably changed by the introduction of the new letters & (with the translation of the New Testament of 1526), and a, (both already in the first print in Swedish of 1495) for aa, .

d, I, n, s and /), while the singular of the verbs is gradually supplant- ing the plural. A vigorous reform, slowly but firmly carried on almost uniformly during all periods of the Swedish language, is the throwing back of the principal accent to the beginning of the word in cases where previously it stood nearer the end, a tendency that is characteristic of all the Scandinavian languages, but no doubt especially of Swedish. In the primitive Scandinavian age the accent was removed in most simple words; the originally accented syllable, however, preserved a musically high pitch and stress. Thus there arose two essentially different accentuations — the one, with un- accentuated final syllable, as in Icel. stigr (Gr.

The scientific study of Modern Swedish 1 dates from Sweden's glorious epoch, the last half of the 17th century. The first regular Th t rfir Swedish grammar was written in 1684 (not edited till mesiuay .aa-viri Latin by E. Aurivillius; the first in Swedish is

"sˆedlsh" b y N- Tiallman (1696). But little, however, of value was w s ' produced before the great work of Rydqvist mentioned above, which, although chiefly dealing with the old language, throws a flood of light on the modern also. Among the works of late years we must call special attention to the researches into the history of the language by K. F. Soderwall, F. A. Tamm, A. Kock and E. Hellquist. The grammar of the modern language is, as regards certain parts, treated in a praiseworthy manner by, among others, J. A. Aur6n, J. A. Lyttkens and F. A. Wulff (in several common works), E. Tegner, G. Cederschiold and F. A. Tamm (d. 1905). A good though short account of phonology and inflections is given in H. Sweet's essay on " Sounds and Forms of Spoken Swedish " (Trans. Phil. Soc, 1877-1879). A comprehensive and detailed grammar (V&rt sprdk) has been edited (since 1903)

by A. Noreen. Attempts to construct a dictionary were made in the 16th century, the earliest being the anonymous Variarum rerum vocabula cum Sueca interpre- tations, in 1538, and the Synonymorum libellus by Elaus Petri Helsingius, in 1587, both of which, however, followed German originals. The first regular dictionary is by H. Spegel, 1712; and in 1769 J. Ihre (d. 1780), probably the greatest philological genius of Sweden, published his Glossarium Suiogoticum, which still remains one of the most copious Swedish dictionaries in existence. In the 19th century the diligent lexicographer A. F. Dalin published a useful work. The Swedish Academy has been editing (since 1893) a gigantic dictionary on about the same plan as Dr Murray's New English Dictionary. Another such large work is Sverges Ortnamn (the local names of Sweden) edited since 1906 by the Royal Committee for investigation of the Swedish place-names.

IV. Danish, like Swedish, is divided into the two great Pre- and Post-Reformation epochs of Old and Modern Danish.

I. Old Danish. — The territory of Old Danish included not only the present Denmark, but also the southern Swedish provinces of Halland, Skane and Blekinge, the whole of Schleswig, and. as stated above, for a short period also a great part of England, and parts of Normandy. The oldest monu- ments of the language are runic inscriptions, altogether about 225 in number. 2 The oldest of them" go as far back as to the beginning of the 9th century, the Snoldelev-stone, for instance, on Sealand, and the Flemls*e-Ftone on Funen. From about the year 900 date the very long inscriptions of Tryggevaelde (Zealand) and Glavendrup (Funen) : from the 10th century we have the stones of Jaellinge (Jutland), in memory of two of the oldest historical kings of Denmark (Gorm and Harald) ; while from about 1000 we have a stone at Dannevirke (Schleswig), raised by the conqueror of England, Sven Tjuguskaegg. Relics of about the same age are the words that were introduced by the Danes into English, the oldest of which date from the end of the 9th century, the time of the first Danish settlement in England; most of these are to be found in. the early English work Ormulum. 3 No Danish literature arose before the 13th century. The oldest manuscript that has come down to us dates from the end of that century, written in runes and containing the law of Skane. From about the year 1300 we possess a manuscript written in Latin characters and containing the so-called Valdemar's and Erik's laws of Zealand, the Flensborg manuscript of the law of Jutland, and a manuscript of the municipal laws of Flensborg. These three manu- scripts represent three different dialects — that, nam ely, of Skan e,*

1 See A. Noreen, ” Apercu,” &c; V&rt sprdk, i. 181 sqq.

1 See L. F. A. Wimmer, De Danske runemindesmcerker (4 vols.,

1895-1905).

- *See E. Brate, ” Nordische Lehnworter im Ormulum ” (Paul Braune’s Beitrage, x., 1884); E. Bjorkman, Scandinavian Loan- word: in Middle English (2 vols., 1900, 1902) in ” Studien zur engli- schen Philologie,” vii. and xi. Also Orm.*

Old Danish,

Halland and Blekinge, that of Zealand and the other islands, and that of Jutland and Schleswig. There existed no uniform literary language in the Old Danish period, although some of the Dialects most important works of the 15th century, such as the clerk Michael’s Poems (since 1496) and the Rhymed Chronicle (the first book printed in Danish, in 1495), on account of their excellent diction, contributed materially to the final preponderance of their dialect, that of Zealand, towards the Reformation.

As to the form of the language, it hardly differs at all during the period between A.D. 800 and 1200 from Old Swedish. It is only in the oldest literature that we can trace any marked differ- Porm ences; these are not very important, and are generally f tne

attributable to the fact that Danish underwent a little

language.

earlier the same changes that afterwards took place in Swedish (e.g. h in hw and hj in Danish was mute as early as the end of the 14th century. The laws referred to above only agree in differ- ing from the Swedish laws in the following points: the nominative already takes the form of the accusative (as kalf, calf, but Old Sw. nom. kalver, ace. kalf) ; the second person plural ends in ce (as ktfpce, but Old Sw. kyfpin, you buy); in the subjunctive no differ ences are expressed between persons and numbers. Among them- selves, on the contrary, they show considerable differences; the law of Skane most nearly corresponds with the Swedish laws, those of Zealand keep the middle place, while the law of Jutland exhibits the most distinctive individuality. The Skane law, e.g., retains the vowels a, i, u in terminations, which otherwise in Danish have become uniformly ce; the same law inserts b and d between certain conson- ants (like Old Sw.), has preserved the dative, and in the present tense takes the

vowel of the infinitive; the law of Jutland, again, does not insert b and d, and has dropped the dative, while the present tense (undergoing an Umlaut) has by no means always accepted the vowel of the infinitive; in all three characteristics the laws of Zealand fluctuate. After 1350 we meet an essentially altered language, in which we must first note the change of k, p, t after a vowel into g, b, d (as tag, roof, l$be, to run, aide, to eat) ; th passes into / (as ting, thing) , gh into w (as law for lagh, gild) or into i (as vet for wcegh, way) ; Id, nd are pronounced like //, nn ; j is the general genitive ending in singular and plural, &c. The vocabulary, which in earlier times only borrowed a few, and those mostly ecclesiastical, words, is now — chiefly owing to the predominant influence of the Hanse towns — inundated by German words, such as those beginning with be-, bi-, ge-,for- and und-, and ending in -hid, and a great number of others, as blive, to become, she, to happen, jri, free, krig, war, buxer, pantaloons, ganske, quite, &c.

An Old Danish grammar is still wanting, and the preparatory studies which exist are, although excellent, but few in number, being chiefly essays by the Danes K. J. Lyngby and _ L. F. A. Wimmer. N. M. Petersen's treatise Det Danske, %,£". Norske, og Svenske sprogs historic, vol. i. (1829), one of the treatment. first works that paid any attention to Old Danish, which till then had been completely neglected, is now surpassed by V. Dahlerup's Gesr.hichte der ddnischen Sprache (1904). A dictionary on a large scale covering the whole of Old Danish literature, except the very oldest, by O. Kalkar, has been in course of publication since 1881; older and smaller is C. Molbech's Dansk Glossarium (1857-*

1866).

2. Modern Danish. — -The first important monument of this is the translation of the Bible, by C. Pedersen, Peder Palladius and others, the so-called Christian III.'s Bible (1550), famous for the unique purity and excellence of its language, the dialect Danish of Zealand, then incontestably promoted to be the Ian- sources. guage of the kingdom. The first secular work deserving of the same praise is Vedel's translation of Saxo (1575). The succeed- ing period until 1750 offers but few works in really good Danish; as perfectly classical, however, we have to mention the so-called Christian V.'s Law of Denmark (1683). For the rest, humanism has stamped a highly Latin-French character on the literature, striking even in the works of the principal writer of this period, Holberg. But about the year 1750 there begins a new movement, characterized by a reaction against the language of the preceding period and by purist

tendencies, or, at least, efforts to enrich the language with new-formed words (not seldom after the German pattern), as omkreds, periphery, selvstcendighed, independence, valgsprog, devise, digter, poet. The leading representatives of these tendencies were Eilschow and Sneedorf. From their time Danish may be said to have acquired its present essential features, though it cannot be denied that several later authors, as J. Ewald and Ohlen- schlager, have exercised a considerable influence on the poetical style. As the most important differences between the gram- Form matical forms of the 18th and 19th centuries on one hand e fthe and those of the 16th and 17th centuries on the other, may language. be noted the following: most neuter substantives take a plural ending; those ending in a vowel form their plural by adding -r (as riger, for older rige, plural of rige, kingdom), and many of thost ending in a consonant by adding -e (as huse for hus, of hus, house) ; substantives ending in -ere drop their final -e (as domtner for dommere, judge); the declension with suffixed article becomes simplified in the same way as in Swedish ; the plural of verbs takes the singular form (as drak for drukke, we drank) ; and the preterite subjunctive is supplanted by the infinitive (as var for vaare, were).

Gram- matical

The first Modern Danish grammar is by E. Pontoppidan, 1668, but in Latin ; the first in Danish is by the famous Peder Syv, 1685. The works of the self-taught J. H0jsgaard (e.g. Accentueret og raisonneret grammatica, 1747) possess great treatment. mer ;t r an(j are f especial importance as regards accent and syntax. The earlier part of the 19th century gave us Rask's grammar (1830). A thoroughly satisfactory Modern Danish grammar does not exist ; the most detailed is that by K. M ikkelsen (1 894) . The vocabu- lary of the 16th and 17th centuries is collected in Kalkar's Ordbog, mentioned above; that of the 18th and 19th centuries in the voluminous dictionary of Videnskabernes Selskab (1793-1905), and in C. Molbech's Dansk Ordbog (2nd ed., 1859) ; that of our days in B. T. Dahl's and H. Hammer's Dansk Ordbog for folket (1903 seq.).

As already mentioned, Danish at the Reformation became the language of the literary and educated classes of Norway and remained so for three hundred years, although it cannot be Dano-Nor- denied that many Norwegian authors even during this wegian. p er ;

d wrote a language with a distinct Norwegian colour, as for instance the prominent prose-stylist Pcder Clauss0n Friis (d. 1614), the popular poet Petter Dass (d. 1708), and, in a certain degree, also the two literary masters of the 18th century, Holberg and VVessel. But it is only since 1814, when Norway gained her independence, that we can clearly perceive the so-called Dano- Norwegian gradually developing as a distinct offshoot of the general Danish language. The first representatives of this new language are the writer of popular life M. Hansen (d. 1842), the poets H. Wergeland (d. 1845) and J. S. C. Welhaven (d. 1873), but above all the tale- writers P. C. Asbj0rnsen (d. 1885) and J. Moe (d. 1882). More recently it has been further developed, especially by the great poets Ibsen (d. 1906) and Bj0rnson and the novelist Lie; and it has been said, not without reason, to have attained its classical perfection in the works of the first-named author. This language differs from Danish particularly in its vocabulary, having adopted very many Norwegian provincial words (more than 7000), less in its inflections, but to a very great extent in its pronunciation. The most striking differences in this respect are the following: Norwegian p, t, k answer to Danish b, d, g in cases where they are of later ?"? date (see above) — as l$pe, Danish l0be, to run, liten, D,

the Ian- m en< little, bak, D. bag, back; to Danish k, g before guage. palatal vowels answer Norwegian tj, j; r (point-trill, not

back-trill as in Danish) is assimilated in some way with following t (d), l,n, and sinto so-called supradental sounds; both the primitive Scandinavian systems of accentuation are still kept separate from a musical point of view, in opposition to the monotonous Danish. There are several other characteristics, nearly all of which are points of correspondence with Swedish. 1 Dano- Norwegian is in our days grammatically and lexically treated, especially by H. Falk and A. Torp (e.g. Etymologisk Ordbog, 1903, 1906).

At the middle of the 19th century, however, far more advanced pretensions were urged to an independent Norwegian language. By the study of the Modern Norwegian dialects and their mother language, Old Norwegian, the eminent philologist J. Aasen (d. 1896) was led to undertake the bold project of con- structing.by the study of these two sources, and on the basis of his native dialect (S0ndm0re), a Norwegian-Norwegian ("Norsk-Norsk ") language, the so-called " Landsmal." In 1853 he ex- hibited a specimen of it, and, thanks to such excellent writers as Aasen himself, the poets O. Vinje and K. Janson, the novelists A. Garborg and J. Tvedt, as well as a zealous propagandism of the society Det Norske Samlag

(founded in 1868) there has since arisen a valuable though not very large literature in the " Landsmal." Since 1892 it is also legally authorized to be, alternatively, used in the church and by teachers of the public schools. But still it is nowhere colloquially used. Its grammatical structure and vocabulary are exhibited in Aasen's Norsk grammalik (1864) and Norsk Ordbog (1873), supple- mented by H. Ross's Norsk Ordbog (1895; with supplement, 1902). The local names of Norway are treated in the large work Norske Gaardnavne, by O. Rygh (1897 seq.).

Scandinavian Dialects. — As above remarked, the Scandinavian dialects are not grouped, so far as their relationship is concerned, as might be expected judging from the literary languages. Dialects. Leaving out of account the Icelandic dialects and those of the Faeroes, each of which constitutes a separate group, the remainder may be thus classified : —

I. West Norwegian Dialects — spoken on the western coast of Norway between Langesund and Molde.

•2. North Scandinavian — the remaining Norwegian and the Swedish dialects of Uppland, Vastmanland, Dalarna, Norrland, Finland and Russia.

3. The dialects on the island of Gotland.

4. Middle Swedish — spoken in the rest of Sweden, except the southernmost parts (No. 5).

5. South Scandinavian — spoken in the greater part of Smaland and Halland, the whole of Skane, Blekinge and Denmark, and the • Danish-speaking part of Schleswig. This group is distinctly divided

into three smaller groups — the dialects of southern Sweden (with the

Nor- wegian- Nor- wegian.

1 See A. Western, " Kurze Darstellung des norwegischen Laut- aystems " in PhoneHsche Studien II. ; I. C. Poestion, Lehrbuch der norwegischen Sprache (2. Aufl., 1900).

island of Bornholm), of the Danish islands and of Jutland (and Schleswig).

The study of the Modern Scandinavian dialects 2 has been very

unequally prosecuted. Hardly anything has been done towards the investigation of the Icelandic dialects, while those of the Faeroes have been studied chiefly by V. U. Hammershaimb, J. Jakobsen, and A. C. Evensen. The Norwegian dialects have been thoroughly examined, first by Aasen, whose works give a general account of them; then by J. Storm, who has displayed an unwearying activity, especially in the minute investigation of their phonetic constitution, to which Aasen had paid but . scant attention ; in our own days by H. Ross and A. B. Larsen. 3 For the study of Danish dialects less has been done. Molbech's Dialect-Lexicon of 1841 is very deficient. The Schleswig dialect has been admirably treated of by E. Hagerup (1854), K. J. Lyngby (1858) and others. H. F. Feilberg's great dictionary (1886 seq.) of the dialect of Jutland is in every respect an excellent work. A dialect map on a large scale, and containing the whole territory, is (since 1898) being edited by V. Bennike and M. Kristensen. Finally, several dialect monographs by P. K. Thorsen may be mentioned as being especially valuable. A phonetic alphabet for the purpose of dialectal investigations is worked out by O. Jespersen and published in the journal Dania, vol. i. (1890). There is, however, no country in which the dialects have been and are studied with greater zeal and more fruitful results than in Sweden during the last hundred and 'fifty years. Archbishop E. Benzelius the younger (d. 1743) made collections of dialect words, and on his work is based the dialectical dictionary of Ihre of 1766. An excellent work considering its age is S. Hof 's Dialectus Vestrogothica (1772). The energy and zeal of C. Save (d. 1876; essays on the dialects of Gotland and Dalarna) inspired these studies with extra- ordinary animation at the middle of the 19th century; in 1867 J. E. Rietz (d. 1868) published a voluminous dialect dictionary; the number of special essays, too, increased yearly. From 1872 so-called " landsmalsforeningar " (dialect societies) were founded among the students at the universities of Upsala, Lund and Helsing- fors (thirteen at Upsala alone) for a systematic and thorough in- vestigation of dialects. We find remarkable progress in scientific method — especially with regard to phonetics — in the constantly increasing literature; special mention may be made of the detailed descriptions of the dialects of Varmland, Gotland and Dalarna by A. Noreen (1877 seq.), A. F. Freudenthal's and H. Vendell's mono- graphs of the Finnish and Esthonian-Swedish dialects, as well as O. F. Huffman's (1894) and B. Hesselman's (1902 seq.) excellent comparative treatment of certain dialect groups. Since 1879 the Swedish dialect societies have published a magazine on a com- prehensive plan, De Svenska Landsm&len, edited by J. A. Lundell, who has invented for this purpose an excellent phonetic alphabet

(partially based on C. J. Sundevall's work, Om phonetiska bokstdfver, 1855). " (A. No.)

SCANDIUM [symbol Sc, atomic weight 44-1 (0=i6)], one of the rare earth metals. It was isolated in 1879 by L. F, Nilson and was shown by Cleve to be identical with the ekaboron predicted by D. Mendeleeff. The separation of scandium from wolframite (which contains 0-14-0-16% of rare earths) is given by R. J. Meyer (ZeiU anorg. Chem. 1908, 60, p. 134), but it seems impossible to obtain a perfectly pure specimen of the oxide. The salts of scandium are all colourless, the chloride and bromide corresponding in composition to Sc2X 6 T2H 2 0; the fluoride is anhydrous. The sulphate com- bines with the alkaline sulphates .to form double salts of the type Sc 2 (S04)3-3K 2 S0 4 . A large number of salts, both of in- organic and organic acids, have been described by Sir W. Crookes (Phil. Trans. 1908, 209, A. p. 15); those of the fatty acids are in most cases more soluble in cold than in hot water.

SCANTLING, measurement or prescribed size, dimensions, particularly used of timber and stone and also of vessels. In regard to timber the scantling is the thickness and breadth, the sectional dimensions; in the case of stone the dimensions of thickness, breadth and length; in shipbuilding the collective dimensions of: the various parts. The word is a variation of " scantillon," a carpenter's or mason's measuring tool, also used of the measurements taken by it, and of a piece of timber of small size cut as a sample. The O. Fr. escantillon, mod. echantillon, is usually taken to be related to Ital. scandaglio, sounding-line (Lat. scandere, to climb; cf. scansio, the metrical scansion). It was probably influenced by cantel, cantle, a small piece, a corner piece. The English form " scantling " was no*

2 Cf J. A. Lundell, " Skandinavische Mundarten " (Grundriss der germanischen Philologie; 2. Aufl. 1901).

8 The substance of these researches was presented in a magazine, called Norvegia (1887), which employed an alphabet invented by Storm.

doubt partly due to a confusion with " scant," stinted, of short I measure; this is for scamt, cf. " skimpy," " scamp " (q.v.)., and is related to O.N. skammr, short, brief.

SCAPHOPODA, the third of the five classes into which the Phylum Mollusca is divided. 1 The Scaphopoda are marine Molluscs with the body, especially the foot, adapted to a burrow- ing life in sand. The structure is bilaterally symmetrical, the body and shell elongated along the antero-posterior axis and nearly cylindrical. The right and left margins of the mantle are united ventrally, leaving an anterior and posterior aperture to the mantle cavity. The shell has therefore the form of a tube open at both ends. The head is somewhat rudimentary and without eyes, but bears two dorsal appendages produced into numerous long filaments. Buccal mass and radular apparatus are present, but ctenidia are entirely wanting. The foot is cylindrical. At first supposed to be tubicolous Annelids, Dentalium and its allies were afterwards placed among the Gastropoda, to which recent authorities consider them to be closely related. In r8s7 Lacaze-Duthiers raised them to the rank of a division equal to Lamellibranchia. This view is now generally adopted. The shell is narrower at the posterior end and is slightly curved to the dorsal side. Both the vernacular name, " tooth shell," and the Latin name, Dentalium, refer to the resemblance of the shell to a long tooth.

The animal grows at the anterior end, and therefore the shell at the posterior end is older and thicker. The edge of the mantle at the anterior aperture is very thick and muscular; at the posterior aperture also there is a circular muscle, and here the edge is interrupted by a ventral sinus and is provided internally with a dorsal and ventral valve which can be applied to each other so as to close the aperture.' The living animal buries itself in the sand with only the posterior extremity projecting into the

Siphonopodiidae. At the base of the head dorsally are a pair of flat tentacular lobes from the edges of which the cephalic filaments or captacula arise. These captacula are of unequal length, highly contractile and extensile, easily thrown off and regenerated. They are ciliated, and their extremities are enlarged and have a small lateral depression in each. The captacula are tactile and prehensile and can be protruded from the anterior aperture of the mantle. The foot is elongated and cylindrical, and can be protruded from the anterior aperture to serve as a burrowing organ. In Dentaliidae it is pointed at the end and has an oblique projecting fold on either side behind the extremity. In Siphonopodiidae it ends in a disk with papillated margins, and in Pulsellum there is a filament in the centre of the disk. Two retractor muscles pass back from the base of the foot to the dorsal side of the shell.

Internal Anatomy. — The cavity within the head leads into a true

buccal cavity situated within the body at the base of the foot. This buccal sac is provided with a dorsal mandible and a ventral radula. The latter is short and carries five teeth in each transverse row. The intestine is short and forms several loops all situated close behind the foot. The stomach is small ; into it open a small pyloric caecum and the ducts of the liver, paired in Dentaliidae, one on the left only in Siphonodentalium. The anus opens just behind the base of the foot. The liver is placed entirely behind the intestine in the middle of the body, and behind it the rest of the body is occupied by the unpaired gonad. The vascular system is very rudimentary. Heart and blood-vessels are entirely absent ; the blood is contained in sinuses which have no distinct walls or endothelial lining, and the principal of which are the perianal, the pedal, the visceral and the pallial. It is remarkable that in Scaphopoda only among Mollusca the blood-spaces are in communication with the external medium: a pair of apertures near the renal openings lead from the perianal sinus to the exterior and allow the blood to escape during violent contractions of the body. There are no special respiratory organs, their function is carried on by the internal surface of the mantle.

*From Lankester's Treatise on Zoology**

Fig. 2. — Diagram of the Organization of Dentalium, Left-side View,

a,

ca,

eg,

/.

go,

in,

k,

Anus.

Captacula.

Cerebral ganglion.

Foot.

Gonad.

Intestine.

Left kidney.

la.c, Labial commissure. li, Liver. m, Mouth.

0, Orifice leading into the perianal sinus.

Oesophagus.

Mantle.

oe, pa,

Fig. 1 .—Dentalium vulgar -e, Da C. (after Lacaze Duthiers).

A, Ventral view of the animal

removed from its shell.

B, Dorsal view of the same.

C, Lateral view of the same.

D, The shell in section.

E, Surface view of the shell with

gill-tentacles exserted as in a, Mantle. [life.

a', Longitudinal muscle. a", Fringe surrounding the an-

terior opening of the

mantle-chamber. a'", The posterior appendix of the

mantle.

muscle of

of

Anterior circular

the mantle. Posterior do. c', Longitudinal muscle

mantle. Liver. Gonad.

Buccal mass (showing through the mantle). q. Left nephridium. s', Club-shaped extremity of the

foot. w, w', Longitudinal blood-sinus of the Vnantle.

water, so that the posterior aperture of the mantle cavity is both inhalant and exhalant.

The head is situated on the dorsal side of the body anteriorly within the anterior aperture of the mantle, from which it cannot be protruded. It is a small somewhat cylindrical projection with the mouth at its anterior end. In the Dentaliidae the mouth is surrounded by eight small lobes, but these are absent in the

1 For a discussion of its relationship to the other classes of the Phvlum see Mollusca.

p.g, Pedal ganglion, with

otocyst. pl.g, Pleural ganglion. po, Posterior orifice of

the mantle. ra, Radular sac. st.g, Stomato-gastric ganglion.

The renal organs are a pair of short wide sacs with folded walls lying on either side of the anterior end of the liver. They open to the exterior on either side of the anus. ' The pericardium ' being absent, there are no reno-pericardial apertures.

The nervous system resembles that of Gastropoda and Lamelli-branchia. A pair of cerebral ganglia lie on the dorsal side of the oesophagus : they innervate the proboscis or head and its tentacular lobes and captacula. Close to each cerebral ganglion is a pleural ganglion, and each is connected by a long nerve with the pedal ganglion of the same side, the two connectives of either side being united in the distal part of their course. The pedal ganglia are situated in the middle of the foot. The pleural ganglia are also united by a long visceral commissure as in Lamellibranchs, and this' commissure bears two ganglia lying close beneath the epidermis fh front of the anus. There is also a stomatogastric system arising from the cerebral ganglia.

Eyes are absent; attached to the pedal ganglia are a pair of otocysts. They are innervated from the cerebral ganglia. The buccal cavity contains a sense-organ on the ventral side called the sub-radular organ. It consists of ciliated epithelium, beneath which are two ganglia connected with the labial commissure by nerves. The only

other sense-organs are the captacula, which are tactile and olfactory. Each contains a terminal ganglion connected with sensory cells in the lateral pit.

The sexes are separate. The gonad, whose position has already been mentioned, is divided into transverse lobes; its duct is anterior, and single, and diverges to the right to open into the right kidney as in primitive Gastropods and Lamellibranchs.

Development. — The ova are laid separately and develop in the sea-

water. One large cell, or megamere, remains for some time unsegmented but is finally segmented and forms the endoderm cells which are invaginated. The gastrula thus formed has a large blastopore, which is at first posterior but afterwards gradually moves towards the anterior end of the ventral surface. The velum is peculiar, being reflected backwards over the body and bearing, besides an apical tuft, three or four rings of cilia. The shell-gland is formed on the dorsal surface, and the mantle arises as two lateral lobes which afterwards unite by their ventral edges to form the tubular mantle of the adult. The anus is not formed till a very late period of the development. The foot arises as a prominence on the ventral surface and grows forward, and at the end of five or six days the velum atrophies and the foot becomes the organ of locomo- tion ; the animal then ceases to swim and sinks to the bottom.

Habits and Distribution. — Scaphopoda

feed on the lowest marine organisms such

as Diatoms, Protozoa, &c. There are 150

living and about 275 known fossil species.

f The former occur in all seas from the shore

Dentalium, aged one and to a depth of 2500 fathoms. Fossil remains

half davs- ventral are found in the Silurian, but become

After Kowalewsky, in tester's Treatise on Zoology.

Fig. 3. — Larva

Lan-

aspect.

I, Foot.

II, mantle.

III, Velum forming

sort of test.

from the Cretaceous

most abundant onwards.

Classification. — Fam. I. Dentaliidae. Foot conical with a laterally expanded and dorsally interrupted circular fold. Shell curved with greatest diameter at anterior aperture and diminishing gradually to posterior. Dentalium: posterior aperture of shell entire, without incision. Antalis: posterior aperture with short incision. Fissi-denlalium: posterior aperture with long fissure on ventral side; abyssal. Fusliaria. Schizodentalium : ventral border of posterior aperture with a series of small holes in a straight line. Heterochisma. Fam. 2. Siphonopodiidae. Foot expanded distally into a sym-metrical disk with a crenate edge or simple and vermiform without well-developed lateral processes; shell often contracted towards the anterior aperture. Siphonodentalium : foot ending in a median disk without a median appendage. Cadulus. Dischides. Pulsellum: terminal disk of foot with a median appendage. Entalina.

See F. J. H. Lacaze-Duthiers, ” Histoire de l’organisation et du developpement du Dentale,” Ann. Sci. Nat. Zool. (4), vi., vii. (1856-1857); A. Kowalewsky, “Etude sur l’embryog<5nie du Dentale,' Ann. Musee d'Histoire Natur. (Marseille, Zool. I. 1883); Boissevain, " Beitrage zur Anatomie und Histologic von Dentalium," Jenaische Zeitschr. xxxviii. (1904); Paul Pelseneer, Mollusca; Lankester's Treatise on Zoology, pt. v. (1906). (J. T. C.)

SCAPOLITE (Gr. oKairos, rod, A£0os, stone), a group of rock-forming minerals composed of aluminium, calcium and sodium silicate with chlorine. The variations in composition of the different members of the group may be expressed by the isomorphous mixture of the molecules CajAleSieO^s and NaiAUSigCtaG, which are referred to as the meionite (Me) and marialite (Ma) molecules respectively, since they predominate in these two end-members of the

series. Wernerite, or common scapolite (MesMai to MdMa2)and mizzonite (MeiMa2 to MdMas) are intermediate members. The tetragonal crystals are hemi- hedral with parallel faces (like scheelite), and usually have the form of square columns, some- times of considerable size. There are distinct cleavages parallel to the prism-faces. Crystals are usually white or greyish-white and opaque, though meionite is found as colourless glassy crystals in the ejected limestone blocks of Monte \>v^<>— y Somma, Vesuvius. The hardness is 5-6, and the -\^^ specific gravity varies with the chemical com- position between 2-74 (meionite) and 2-56 (marialite). The scapolites are especially liable to alteration by weathering processes, with the development of mica, kaolin, &c, and this is the cause of the usual opacity of the crystals. Owing to this alteration, and to the variations in composition, numerous varieties have been distinguished by special names. Scapolite is commonly a mineral of metamorphic origin, occur- ring usually in crystalline limestones, but also with pyroxene in schists and gneisses. The long slender prisms abundant in the crystalline limestones and schists in the Pyrenees are known as " dipyre " or " couzeranite." Large crystals of common scapolite

(wernerite) are found in the apatite deposits in the neighbourhood of Bamle near Brevik in Norway, and have resulted from the alteration of the plagioclase felspar of a gabbro. (L. J. S.)

Scapolite Rocks. According to their genesis the scapolite rocks fall naturally into four groups.

1. The scapolite limestones and contact rocks. As silicates rich in lime, it is to be expected that these minerals will be found where impure limestones have been crystallized by contact with an igneous magma. Even meionite (the variety richest in soda) occurs in this association, being principally obtained in small crystals lining cavities in ejected blocks of crystalline limestone at Vesuvius and the craters of the Eifel in Germany. Scapolite and wernerite are far more common at the contacts of limestone with intrusive masses. The minerals which accompany them are calcite, epidote, vesuvianite, garnet, wollastonite, diopside and amphibole. The scapolites are colourless, flesh-coloured, grey or greenish; occasionally they are nearly black from the presence of very small enclosures of graphitic material. They are not in very perfect crystals, though sometimes incomplete octagonal sections are visible; the tetragonal cleavage, strong double refraction and uniaxial interference figure distinguish them readily from other minerals. Commonly they weather to micaceous aggregates, but sometimes an isotropic substance of

unknown nature is seen replacing them. In crystalline limestones and calc-silicate rocks they occur in small and usually inconspicuous grains mingled with the other components of the rock. Large, nearly idiomorphic crystals are sometimes found in argillaceous rocks (altered calcareous shales) which have suffered thermal meta- morphism. In the Pyrenees there are extensive outcrops of lime- stone which are penetrated by igneous rocks described as ophites (varieties of diabase) and lherzolites (peridotites). At the contacts scapolite occurs in a great number of places, both in the limestones and in the calcareous shales which accompany them. In some of these rocks large crystals of one of the scapolite minerals (an inch or two in length) occur, usually as octagonal prisms with imperfect terminations. In others the mineral is found in small irregular grains. It is sometimes clear, but often crowded with minute en- closures of augite, tourmaline, biotite and other minerals, such as constitute the surrounding matrix. From these districts also a black variety is well known, filled with minute graphitic enclosures, often exceedingly small and rendering the mineral nearly opaque. The names couzeranite and dipyre are often given to this kind of scapolite. Apparently the presence of chlorine in small quantities, which may often be detected in limestones, to some extent deter- mines the formation of the mineral.

2. In many basic igneous rocks, such as gabbro and diabase, scapolite replaces felspar by a secondary or metasomatic process. Some Norwegian scapolite-gabbros (or dioritea) examined micro- scopically furnish examples of every stage of the process. The chemical changes involved are really small, one of the most important being the assumption of a small amount of chlorine in the new mole- cule. Often the scapolite is seen spreading through the felspar, portions being completely replaced, while others are still fresh and unaltered. The felspar does not weather, but remains fresh, and the transformation resembles metamorphism rather than weathering. It is not a superficial process, but apparently takes place at some depth under pressure, and probably through the operation of solutions or vapours containing chlorides. The basic soda-lime felspars (labradorite to anorthite) are those which undergo this type of alteration. Many instances of scapolitization have been de- scribed from the ophites (diabases) of the Pyrenees. In the un- altered state these are ophitic and consist of pyroxene enclosing lath- shaped plagioclase felspars; the pyroxene is often changed to uralite. When the felspar is replaced by scapolite the new mineral is fresh and clear, enclosing often small grains of hornblende. Ex- tensive recrystallization often goes on, and the ultimate product is a spotted

rock with white rounded patches of scapolite surrounded by granular aggregates of clear green hornblende : in fact the original structure disappears.

3. In Norway scapolite-hornblende rocks have long been known at Oedegarden and other localities. They have been called spotted gabbros, but usually do not contain felspar, the white spots being entirely scapolite while the dark matrix enveloping them is an aggregate of green or brownish hornblende. In many features they bear a close resemblance to the scapolitized ophites of the Pyrenees. It has been suggested that the conversion of their original felspar (for there can be no doubt that they were once gabbros, consisting of plagioclase and pyroxene) into scapolite is due to the percolation of chloride solutions along lines of weakness, or planes of solubility, filling cavities etched in the substance of the mineral. Subsequently the chlorides were absorbed, and pari passu the felspar was trans- formed into scapolite. But it is found that in these gabbros there are veins of a chlorine-bearing apatite, which must have been de- posited by gases or fluids ascending from below. This suggests that a pneumatolytic process has been at work, similar to that by which, around intrusions of granite, veins rich in tourmaline have been

laid down, and the surrounding rocks at the same time permeated by that mineral. In the composition of the active gases a striking difference is shown, for those which emanate from the granites are mainly fluorine and boron, while those which come from the gabbro are principally chlorine and phosphorus. In one case the felspar is replaced by quartz and white mica (in greisen) or quartz and tourma- line (in schorl rocks) ; in the other case scapolite is the principal new product. The analogy is a very close one, and this theory receives much support from the fact that in Canada (at various places in Ottawa and Ontario) there are numerous valuable apatite vein- deposits. They lie in basic rocks such as gabbro and pyroxenite, and these in the neighbourhood of the veins have been extensively scapolitized, like the spotted gabbros of Norway.

4. In many parts of the world metamorphic rocks of gneissose character occur containing scapolite as an essential constituent. Their origin is often obscure, but it is probable that they are of two kinds. One series is essentially igneous (orthogneisses) ; usually they contain pale green pyroxene, a Variable amount of felspar, sphene,

iron oxides. Quartz, rutile, green hornblende and biotite are often present, while garnet occurs sometimes; hypersthene is rare. They occur along with other types of pyroxene gneiss, hornblende gneiss, amphibolites, &c. In many of them there is no reason to doubt that the scapolite is a primary mineral. Other scapolite gneisses equally metamorphic in aspect and structure appear to be sedimentary rocks. Many of them contain calcite or are very rich in calc-silicates (wollastonite, diopside, &c), which suggests that they were originally impure limestones. The frequent association of this type with graphitic-schists and andalusite-schists makes this correlation in every way probable. Biotite is a common mineral in these rocks, which often contain also much quartz and alkali felspar. (J. S. F.)

SCARAB (Lat. scarabaeus, connected with Gr. /cdpa/3oj), literally a beetle, and derivatively an Egyptian symbol in the

form of a beetle. The Egyptian hieroglyph

pictures a

dung beetle {scarabaeus sacer) , whjch lays its egg in a ball of dung, and may be seen on sandy slopes in hot sunshine compacting the pellet by pushing it backward uphill with its hind legs and allowing it to roll down again, eventually reaching a place of deposit. Whatever the Egyptians may have understood by its actions, they compared its pellet to the globe of the sun. The beetle is common on both shores of the Mediterranean; the Egyptian name was kheperer, kheperi, and the sign spelt the verb khopi(f) meaning " become " and perhaps " create," also the substantive " phenomenon " or " marvel." The insect was sacred to the sun-god in his form kheperi at Heliopolis, and has been found mummified. A colossal scarabaeus of granite in the British Museum probably came from the temple of Heliopolis. The scarabaeus was much used in Egyptian religions, appearing sometimes with outstretched wings or with a ram's head and horns as ihe vivifying soul. It is often seen in this guise on coffins of the New Kingdom and later, when it also became the custom to place in the bandages of the mummy a large stone scarab engraved with a chapter of the Book of the Dead. This chapter, the 64th, identified the object with the heart of the deceased and conjured it not to betray him in the judgment before Osiris. A winged scarab might also be laid on the breast; and later a number of scarabs were placed about the body. These are often of hard stone and of fine workmanship. Another and even more important class of Egyptian antiquities is in the form of scarabs, pierced longitudinally for a swivel or for threading, and having the bases flat and engraved with

designs. These were intended principally for seals, but might also be used as beads or ornaments. They are thus found, engraved or plain, strung on necklaces, and amethyst scarabs with plain bases are common articles of Middle Kingdom jewelry. But the employment of scarabs as seals is proved by the impressions found on sealed documents of the Middle and New Kingdom; on several occasions the impressed clay seals alone have been found hardened and preserved by the fire which had destroyed the archives themselves. The seal type of scarabaei is extremely abundant, and the designs engraved beneath them show endless variety. Some have inscriptions carefully executed, but frequently corrupted by illiterate copying until they became meaningless. The inscriptions are sometimes " mottoes " having reference to places, dehies, &c, or containing words of good omen or friendly wishes, e.g. " Memphis is mighty for ever," " Ammon protecteth," " Miit give thee long life," " Bubastis grant a good New Year,"

" May thy name endure and a son be born thee." Such are of the New Kingdom or later. Names and titles of officials appear, most commonly in the Middle Kingdom.

Historically the most valuable class is of those which bear royal arms, ranging from Cheops of the IVth dynasty to the end of the XXVIth dynasty. Certain great kings are commemorated on scarabs of periods long subsequent to them. Thus Cheops (Khufu) may appear on an example of the latest Pharaonic age, and Tethmosis III. is found at all times after the XVIIIth dynasty. But as a rule the royal names are of contemporary workmanship, and the differences of style and pattern make it possible to group unknown kings with those who are known historically; the names of the Hyksos kings have been princi- pally recovered from collections of scarab-seals. Scarab-shaped seals are traceable as far back as about the Vlth dynasty. They became abundant under the XHth and continued until almost the end of the native rule. As seals they took the place of the earlier cylinders. Considering the life-history of the scarabaeus and its meaning as a hieroglyph, it may well be that the scarab impressing the clay had a symbolic significance; however that may be, the oval form was well adapted for seal-stones and for the bezels of finger rings. In this situation the scarabs were often mounted with a rim of gold or silver round the edge. Rings of stone, glass or metal, with engraved bezels of the same material, and eventually Greek gem rings, gradually displaced them.

A series of exceptionally large scarabs was engraved in the reign of Amenophis 111.,'c. 1450 B.C., all being inscribed with his name

together with that of Queen Taia and her parentage. At present five varieties are known. The simplest commemorates his queen and the north and south limits of his empire; another dated in the first year, a great battue of wild cattle; the third, the arrival of the princess Gilukhipa of Mitanni in the tenth year; the fourth (many specimens), the number of lions slain by the king down to his tenth year; the last, the cutting of the lake of Zarukhe in the eleventh year.

Egyptian scarabs were carried by trade to most of the islands and shores of the eastern Mediterranean and to Mesopotamia. The Greeks, especially in their Egyptian colony of Naucratis (q.v.), imitated them in soft paste. The finest Etruscan gems of the 6th and 5th centuries B.C. are in the form of scarabs, perhaps suggested by the Egyptian. The forgers of antiquities have carried on a brisk trade in scarabs for more than a century.

See P. E. Newberry, Scarabs (London, 1906); also art. Gem, especially for later scarabaeoid gems. (F. Ll. G.)

SCARAMOUCH, properly a buffoon, used later colloquially for a ne'er-do-well. The name was that of a stock character in 17th-century Italian farce, Scaramuccia (i.e. literally "skir- mish "), who, attired usually in a black Spanish dress, burlesquing a " don," was beaten by Harlequin for his boasting and cowardice. The part was played in London in 1673 by a well-known Italian actor, Tiberic Fiurelli, and became popular. There are many instances of the use of the word in the New English Dictionary.

SCARBOROUGH, a municipal and parliamentary borough and fashionable seaside resort in the North Riding of Yorkshire, England, 231 m. N. of London, on the North-Eastern railway. Pop. (1801) 33,776; (1901) 38,161. From the bold and picturesque coast a hammer-like peninsula (285 ft.) projects, separating North Bay from South Bay, and the modern extension of the town fringes both of these. The peninsula is crowned by a 1 2th- century castle, though this naturally strong position was probably occupied earlier. There is a moat (Castle Dyke) on the landward side, and a wall with towers also protects the castle in this direction. The keep, a lofty ruined tower, is of Norman date. The peninsula is much exposed to encroachment by the sea. In 1 190 the plateau forming the castle yard was stated by William of Newburgh to be 60 acres in extent; it is now about 17. The list of the governors of the castle covers the period from 1136 to 1832. Near the landward side of the dike is the church of St Mary, finely situated, occupying the site of a Cistercian monastery of 1 198. It is transitional Norman and Early English,

with later additions. The choir was occupied by the Roundheads during the Commonwealth, and was wrecked by the castle guns. The tower fell later, and was in part rebuilt in the 17th century.

The development of Scarborough as a watering-place dates from the discovery in 1620 by Mrs Farren, a resident, of mineral

springs, These springs, of which there are two, occur hear the shore of the South Bay, and a handsome Spa House in pleasant gardens contains them. The south spring is aperient, but contains some iron; while the north or chalybeate spring is more tonic in its properties. They are still in use, though of less importance than formerly in comparison with the other attractions of the town. The sea-bathing is very good, both bays having a sandy foreshore. Well-planted grounds fringe the steep slope down to the North Bay, in which there is a promenade pier; the South Cliff is similarly adorned. It is approached from the north by a lofty bridge over a ravine, to the west of which lies a pleasant park. The southern part of the town is the more fashionable portion. The principal buildings of entertainment are the aquarium (also used as a concert hall); the museum, a rotunda in Doric style, containing excellent antiquarian and natural history collections; two theatres, and the assembly rooms attaching to the Spa House. The promenades and drives are extensive, and there is an in- clined tramway leading from summit to foot of the South Cliff. A great marine drive, 4200 ft. long, was opened in 1908. The neighbouring country is exceedingly picturesque, with high- lying moors intersected by narrow, well-wooded valleys. The hydrography of the district is remarkable, the Derwent, which flows S.W. to the Ouse and so to the Humber, having one of its sources near Scarborough within 2 m. of the sea. The climate is healthy and temperate; average temperature, 59-2° F. in July, and in January, 37-7.

The chief buildings of Scarborough apart from those already considered are the town hall, market hall and public hall, several modern churches and chapels, and charitable and benevolent institutions. The harbour, enclosed by piers and divided into two basins, lies on the south side of the castle peninsula. It is dry at low tide, but is accessible at spring tides to vessels of 13 ft. draught. It is largely used by fishing boats. The parliamentary borough, falling within the Whitby division of the county, returned two members until

1885, one since that date. The town is governed by a mayor, 6 aldermen and 18 councillors. Area, 2373 acres.

Although there is no mention of Scarborough (Scardeburc, Escardebuc, Scardeburg, Scardeburk, Scartheburg, Schardeburg) in the Domes- day Survey the remains of Roman roads leading to the town indicate that it was in early times a place of importance. The castle was built during the 12th century by William le Gros, earl of Albemarle, who chose the site on the top of a steep cliff now called the " Scaur." Henry II. added greatly to its strength. From this time it was in the hands of a line of distinguished nobles appointed by the king. Scarborough is a borough by prescription. Its first charter of 1181 granted that the burgesses should possess all liberties in the same way as the citizens of York. They were also to render to the king yearly 4d. for every house whose gable was turned to the way, and 6d. for those whose sides were turned to the way. This charter was confirmed with various alterations and extensions by most of the succeeding monarchs. Henry III. in 1253 granted that a court of pleas should be held at Scarborough by the justices who went to hold common pleas at York; he also gave the corporation a gild merchant. Edward II. caused the town to be taken away from the burgesses " for certain causes," but it was restored to them by Edward III. in 1327. The charter of Edward III. in 1356 sets forth and confirms the privileges of the borough. Richard III. by his charter of 1485 appointed that the town should be governed by a mayor, sheriff and twelve aldermen, and also granted amongst other extensive privileges that this town with the manor of Whallesgrave should be a county of itself. However, on the death of Richard III. the charter took no effect, and the corporation returned to its ancient mode of government. In 1684 a mayor, 12 aldermen and 31 common councilmen were nominated as governors. Scarborough returned two members to parliament from 1 295 to 1885. It is said that Henry II. held a market here which he granted to the burgesses, but of this there is no mention in subsequent charters. In 1253 Henry III. granted a yearly fair lasting from the Assumption of St Mary to the following Michaelmas. This fair was originally held pn the sands. Jet was formerly an important manufacture.

See Thomas Hinderwell, History of Scarborough (Scarborough, 1832); J. B. Baker, History of Scarborough (London, 1882).

SCARF, a narrow wrap for the neck or shoulders; the term is a wide one, ranging from a light band of silk, muslin or other material worn by women as a decorative part of their costume to a warm knitted muffler of wool to protect the throat from coid. The O. Eng. scearfe

meant a piece or fragment of any-

thing, and is to be referred ultimately to the root ska?-, to cut, seen in Dutch scherf, shred, Ger. Scherbe, potsherd, " scrap," a piece or fragment; "scrip," a piece of leather, hence a pouch or wallet. The particular meanings in English are to be referred to Fr. escharpe, pilgrim's wallet, also scarf. The ecclesiastical " scarf " was originally a loose wrap or muffler (band) to be worn round the neck out of doors. In the English Church, in post-Reformation times, the minister wore over the surplice the " scarf," which was a broad band of black silk with fringed ends arranged like the stole round the neck, but falling nearly to the feet. Its use has been almost entirely replaced by that of the stole (?.».), with which it has sometimes been wrongly confused.

Ultimately from the same root, but directly adapted from the Scandinavian, cf, Swed. skarf, joint, is the use of the word " scarf," in carpentry and joinery, for a joint by which two timbers are fastened together longitudinally so as to form a continuous piece (see Joinery),

SCARLATTI, ALESSANDRO (1659-1725), Italian musical composer, was born in Sicily, either at Trapani or Palermo, in 1659. He is generally said to have been a pupil of Carissimi in Rome, and there is reason to suppose that he had some con- nexion with northern Italy, since his early works show the influence of Stradella and Legrenzi. The production at Rome of his opera Gli Equivoci nell' amore (1679) gained him the protection of Queen Christina of Sweden, and he became her Maestro di Cappella. In February 1684 he became Maestro di Cappella to the viceroy of Naples, through the intrigues of his sister, an opera singer, who was the mistress of an influential noble in that city. Here he produced a long series of operas, remarkable chiefly for their fluency, as well as other music for state occasions. In 1702 he left Naples and did not return until the Spanish domination had been superseded by that of the Austrians. In the interval he enjoyed the patronage of Ferdinand III. of Tuscany, for whose private theatre near Florence he composed operas, and of Cardinal Ottoboni, who made him his Maestro di Cappella, and procured him a similar post at the church of S Maria Maggiore in Rome (1703). After visiting Venice and Urbino in 1707, he took up his duties at Naples again in 1708, and remained there until 1717. By this time Naples seems to have become tired of his music ; the Romans, however, appreciated it better, and it was at the Teatro Capranica in Rome that he produced some of his finest operas (Telemaco, 1718; Marco Attilio Regolo, 1719; Griselda, 1721), as

well as some noble specimens of church music, including a mass for chorus and orchestra, composed in honour of St Cecilia for Cardinal Acquaviva in 1721. His last work on a large scale appears to have been the unfinished serenata for the marriage of the prince of Stigliano (1723); he died at Naples on the 24th of October 1725.*

Scarlatti's music forms the most important link between the tentative " new music " of the 17th century and the classical school of the 1 8th, which culminated in Mozart. His early operas (Gli Equivoci net sembiante (1679); L' Honesta negli amori (1680); Pompeo (1683), containing the well-known airs "O cessate di piagarmi " and " Toglietemi la vita ancor," and others down to about 1685) retain the older cadences in their recitatives, arid a considerable variety of neatly constructed forms in their charming little arias, accompanied sometimes by the string quartet, treated with careful elaboration, sometimes by the harpsichord alone. By 1686 he had definitely established the " Italian overture " form (second edition of Dal male il bene), and had abandoned the ground bass and the binary air in two stanzas in favour of the ternary or da capo type of air. His best operas of this period are La Rosaura (1690, printed by the Gesellschaft fur Musikforschung), and Pirro e Demelrio (1694), in which occur the songs " Rugiadose, odorose," " Ben ti sta, traditor." From about 1697 onwards [La- Caduta dei decemviri), influenced partly perhaps by the style of Bononcini and probably more by the taste of the viceregal court, his opera songs become more conventional and commonplace in rhythm, while his scoring is hasty and crude, yet not without brilliancy (Eraclea, 1700), the oboes and trumpets being frequently used, and the violins often playing in unison. The operas composed for Ferdinand de Medici are lost; they would probably have given us a more favourable idea of his style, his correspondence with the prince showing that they were composed with a very sincere sense of inspiration. Mitridate Eupalore, composed for Venice in 1707,

contains music far in advance of anything that Scarlatti had written for Naples, both in technique and in intellectual power. The later Neapolitan operas (L 'Amor volubile e liranno (1700); La Princi- pessa fedele (1712); Tigrane, 1715, &c.) are showy and effective rather than profoundly emotional; the instrumentation marks a great advance on previous work, since the main duty of accompany- ing the voice is thrown upon the string quartet, the harpsichord being

reserved exclusively for the noisy instrumental ritornelli. His last group of operas, composed for Rome, exhibit a deeper poetic feeling, a broad and dignified style of melody, a strong dramatic sense, especially in accompanied recitatives, a device which he himself had been the first to use as early as 1686 {Olimpia vendi- cata) and a much more modern style of orchestration, the horns appearing for the first time, and being treated with striking effect.

Besides the operas, oratorios {Agar et Ismaele esiliati, 1684; Christmas Oratorio, c. 1705; 5. Filippo Neri, 1714; and others) and serenatas, which all exhibit a similar style, Scarlatti composed upwards of five hundred chamber-cantatas for a solo voice. These represent the most intellectual type of chamber-music of their period, and it is to be regretted that they have remained almost entirely in MS., since a careful study of them is indispensable to any one who wishes to form an adequate idea of Scarlatti's development. His few remaining masses (the story of his having composed two hundred is hardly credible) and church music in general are comparatively unimportant, except the great St Cecilia Mass (1721), which is one of the first attempts at the style which reached its height in the great masses of Bach and Beethoven. His instrumental music, though not without interest, is curiously antiquated as compared with his vocal works.

Scarlatti's greatest claim to remembrance lies in the fact that he practically created the language of classical music. He extended the old forms, and filled them with melody unrivalled for purity and serenity, based on a far-reaching foundation of modern harmony and tonality, combined with a remarkable power of thematic de- velopment. That his great qualities have been little recognized is due partly to the wonderful mastery with which he avoided all appearance of difficulty, and partly to the fact that he carried out in his operas and cantatas the structural methods which the present age considers to be suitable to instruments alone, but which were indeed admirably suited to vocal music in an age when the singer was technically and intellectually far in advance of all other musicians.

His eldest son, Domenico Scarlatti (1685-1757), also a composer, was born at Naples on the 26th of October 1685. Presumably he studied first under his father, but he was in all probability also a pupil of Gaetano Greco. In 1704 he remodelled Pollaroli's Irene for performance at Naples. Soon after this his father sent him to Venice, where he studied under Gasparini, and became intimate with Thomas Roseingrave. Domenico was already a harpsichord-player of eminence, and at a trial of skill with Handel at the palace of

Cardinal Ottoboni in Rome he was adjudged his equal on that instrument, although inferior on the organ. In 1709 Domenico entered the service of Marie Casimire, queen of Poland, then living in Rome, and composed several operas for her private theatre. He was Maestro di Cappella at St Peter's from 1715 to 1719, and in the latter year came to London to direct his opera Narciso at the King's Theatre. In 1720 or 1721 he went to Lisbon, where he taught music to the princess Magdalena Theresia. He was at Naples again in 1725, but in 1729 went to Madrid as music master to the princess, who had married into the Spanish royal house. He remained in Spain for some twenty-five years, holding various honourable appointments, and devoting himself entirely to the harpsichord, for which he composed over four hundred pieces. He is supposed to have 'died in 1757, either at Naples or in Spain.

Like his fattier, Domenico Scarlatti was a composer of great fertility, intellectual rather than emotional, presenting us with an example of steady development of style up to the end of a long life. His operas and cantatas are of no importance, but his harpsichord pieces are the most original productions of their time. Little known until the beginning of the 19th century, their technical difficulties have caused them to be regarded as mere studies in virtuosity, and modern pianoforte technique owes much to their influence; but considered from a purely musical point of view they display an audacity of harmony and modulation, a freshness and variety of invention, a perfection of workmanship and a vigorous intellectuality in thematic development that places them almost on a level with the sonatas of Beethoven.

Modern Printed Editions. — Clementi's Practical Harmony; Czerny's edition; Farrenc, he Tresor des pianistes. Of recent editions the most accurate and complete is by Alessandro Longo (Ricordi, Milan ; 6 vols., published 1906). ' (E. J. D.)

SCARLET, a vivid, bright red colour, somewhat inclined to orange. The word appears in most European languages; cf. Ger. Scharlach, Swed. skarlakan, Ital. scarlatto, &c; the English form is an adaptation of the O. Fr. escarlate, mod. ecarlate. The origin of these is to be found in the Persian saglan, meaning " broad-cloth." There are various forms, sagalal, sigalat, suglat; this cloth was chiefly used for dresses, flags, large tents and trappings, and was frequently scarlet in colour, and hence its name became applied to the colour.

SCARLET FEVER, or Scarlatina, names applied indifferently to an acute infectious disease, characterized by high fever, accompanied

with sore throat and a diffuse red rash upon the skin (see Parasitic Diseases). This fever appears to have been first accurately described by Sydenham in 1676, before which period it had evidently been confounded with smallpox and measles. Klein in 1885 isolated a streptococcus which he termed the streptococcus scarlatinae. The scarlatinal throat is the chief habitat of the organism, though it has been found both by Klein and other observers in the discharges from the ears of scarlet fever patients. Mervyn Gordon also isolated from cases the streptococcus conglomerulatus. It is possible that septic cases of scarlet fever are the result of a mixed infection. The serum of patients has been found to contain agglutins to streptococci from cases of erysipelas, septicaemia and puerperal fever, as well as to the streptococci scarlatinae. F. B. Mallory in 1904 published his discovery of " protozoonlike " bodies in the cells of the epidermis. Other observers have found them in the skin of fatal cases, but failed to find them in the living. The contagion of scarlet fever takes place from a previous case either by the skin during the early stages of the disease or by the nasal or aural discharges of a patient. It may be conveyed by any article of clothing or furniture or by any person that has been in contact with a scarlet fever patient. Infectivity may also take place through a contaminated milk supply, as in the Marylebone epidemic, 1885. Klein hen found disorder in cows which he considers analogous to scarlatina and communicable to man.

The period of incubation in scarlet fever may be as short as one or two days, but in most instances it is probably less than a week. The invasion of this fever is generally sudden and sharp, consisting in rigors, vomiting and sore throat, together with a rapid rise of temperature and increase in the pulse. Occasionally, especially in young children, the attack is ushered in by convulsions. These premonitory symptoms usually continue for about twenty-four hours, when the characteristic eruption makes its appearance. It is first seen on the neck, chest, arms and hands, but quickly spreads all over the body, although it is not distinctly marked on the face. This rash consists of minute thickly-set red spots, which coalesce to form a general diffuse redness, in appearance not unlike that pro- duced by the application of mustard to the skin. In some instances the redness is accompanied with small vesicles containing fluid. In ordinary cases the rash comes out completely in about two days, when it begins to fade, and by the end of a week from its first appear- ance it is usually gone. The severity of a case is in some degree measured by the copiousness and brilliancy of the rash, except in the malignant varieties, where there may be little or no eruption. The tongue, which at first was furred, becomes about the fourth or fifth day denuded of

its epithelium and acquires the peculiar " straw- berry " appearance characteristic of this fever. The interior of the throat is red and somewhat swollen, especially the uvula, soft palate and tonsils, and a considerable arrfount of secretion exudes from the inflamed surface. There is also tenderness and slight swelling of the glands under the jaw. In favourable cases the fever departs with the disappearance of the eruption and convalescence sets in with the commencement of the process of " desquamation " or peeling of the cuticle, which first shows itself about the neck, and proceeds slowly over the whole surface of the body. Where the skin is thin the desquamation is in the form of fine branny scales; but where it is thicker, as about the hands and feet, it comes off in large pieces, which sometimes assume the form of casts of the fingers or toes. The duration of this process is variable, but it is rarely complete before the end of six or eight weeks, and not unfrequently goes or for several weeks beyond that period. It is during this stage that complications are apt to appear.

Scarlet fever shows itself in certain well-marked varieties, of which the following are the chief: — •

1. Scarlatina Simplex is the most common form; in this the

symptoms, both local and general, are moderate, and the case usually

runs a favourable course. In some rare instances it would seem that

I the evidences of the disease are so slight, as regards both fever and

I rash, that they escape observation and only become known by the

patient subsequently suffering from some of the complications associated with it. In such cases the name latent scarlet fever (scar-latina latens) is applied.

2. Septic Scarlatina or Scarlatina Anginosa is a more severe form of the fever, particularly as regards the throat symptoms. The rash may be well marked or not, but it is often slow in developing and in subsiding. There is intense inflammation of the throat, the tonsils, uvula and soft palate being swollen and ulcerated, or having upon them membranous patches not unlike those of diphtheria, while

externally the gland tissues in the neck are enlarged and indurated and not unfrequently become the seat of abscesses. There is difficulty in opening the mouth; an acrid discharge exudes from the nostrils and excoriates the lips; and the countenance is pale and waxy-looking. This form of the disease is marked by great exhaustion and the gradual development o f the symptoms of acute septicaemia, with sweating, albuminuria, delirium and septic rash.

3. Toxic or ataxic scarlatina (scarlatina maligna). In this form the gravity of the condition is due to intense poisoning, and the patient may even die therefrom before the typical symptoms of the disease have had time to manifest themselves.

The typically malignant forms are those in which the attack sets in with great violence and the patient sinks from the very first. In such instances the rash either does not come out at all or is of the slightest amou.it and of livid rather than scarlet appearance, while the throat symptoms are often not prominent. A further example of a malignant form is occasionally observed in cases where the rash, which had previously been well developed, suddenly recedes, and convulsionr or other nervous phenomena and rapid death supervene.

The complications and effects of scarlet fever are among the most important features in this disease, although their occurrence is exceptional. The most common and serious of these is inflammation of the kidneys, which may arise during any period in the course of the fever, but is specially apt to appear in the convalescence, while desquamation is in progress. Its onset is sometimes announced by a return of feverish symptoms, accompanied with vomiting and pain in the loins ; but in a large number of instances it occurs without these and comes on insidiously. One of the most prominent symptoms is slight swelling of the face, particularly of the eyelids, which is rarely absent in this complication. If the urine is examined it will probably be observed to be diminished in quantity and of dark smoky or red appearance, due to the presence of blood ; while it will also be found to contain a large quantity of albumen. This, together with the microscopic examination which reveals the presence of tube casts containing blood, epithelium, &c, testifies to a condition of acute inflammation of the kidney (glomerular and tubal nephritis). Occasionally this condition does not wholly pass off, and consequently lays the foundation for Bright's disease. Muco-purulent rninorrhoea and also rheumatism are others of the more common complications or results of scarlet fever, while suppuration of the ears is due to the extension of the inflammatory process from the throat along the Eustachian tube into the middle ear. This not unfrequently leads to

permanent ear-discharge, with deafness from the disease affecting the inner ear and temporal bone, a condition implying a degree of risk from its proximity to the brain. Other maladies affecting the heart, lungs, pleura, &c, occasionally arise in connexion with scarlet fever, but they are of less common occurrence than those previously mentioned.

In the treatment of scarlet fever, one of the first requirements is the isolation of the case, with the view of preventing the spread of the disease. In convalescence, with the view of preventing the transmission of the desquamated cuticle, the inunction of the body with carbolized oil (1 in 40) and the frequent use of a bath containing soda, are to be recommended. With respect to the duration of the infective period, it may be stated generally that it is seldom that a patient who has suffered from scarlet fever can safely go about before the expiry of eight weeks, while on the other hand the period may be considerably prolonged beyond this, should any nasal or aural discharge continue. As to general management during the progress of the fever, in favourable cases' little is required beyond careful nursing and feeding. The diet all through the fever and convalescence should be of light character, consisting mainly of milk food. Soups and solid animal food should as far as possible be avoided owing to the frequency of nephritis. During the febrile stage a useful drink may be made by a weak solution of chlorate of potash in water (1 drachm to the pint), and of this the patient may partake freely. The fauces should be irrigated every few hours with a mild antiseptic solution, and sucking ice often relieves local discomfort. Should the lymphatic glands be enlarged and tender, they should be fomented. If suppuration threatens they must be opened. In septic cases the nasofaucial passages must be cleansed with a more powerful anti- septic. Insomnia, restlessness and high temperature may be re- lieved by tepid sponging, and acute hyperpyrexia by cold baths. The treatment of kidney complications is similar to that of acute Bright's disease. A hot-air bath or wet pack is often useful. Otitis may be troublesome, and when otorrhoea is established the canal must be kept as aseptic as possible. The ears should be care- fully syringed every four hours with an antiseptic solution and dried, and a little iodoform inserted into the meatus. Complications such as mastoid disease require special treatment. Recently a method of treatment introduced by Dr Robert Milne, and consisting of the

inunction of the entire body with eucalyptus oil from the first day of the disease, together with swabbing the tonsils with a solution of I in 10 of carbolic oil, has been advocated as rendering the patient absolutely non-infectious as well as limiting the severity of the

disease. The method is still on its trial, but it is possible it may revolutionize our mode of treatment.

Setumtherapy. — Marmorek's original antistreptococci serum has been on the whole disappointing in its results, but polyvalent serums have been much more successful. Dr Besredka prepared a serum from the blood of fatal cases, and in the serum prepared at the Pasteur Institute no less than twenty separate strains of streptococci are used. In using serums, early and large dosage is necessary. Palmirski and Zebrowski have also prepared a serum from the streptococcus conglomerulatus, which has been used with consider- able success in the children's hospital at Warsaw.

SCARLETT, SIR JAMES YORKE (1799-1871), British general, was the second son of the 1st Baron Abinger. Educated at Eton and Trinity College, Cambridge. He entered the army as a cornet in 1818, and in 1830 became major in the 5th Dragoon Guards. From 1836 until 1841 he was Conservative member of Parliament for Guildford. In 1840 he obtained the command of his regiment, which he held for nearly fourteen years. In the Crimean War the 5th Dragoon Guards formed part of the Heavy Cavalry Brigade (of which Scarlett was appointed brigadier); it was sent to the Black Sea in 1854, and suffered very heavily from cholera in the camps of Varna. Scarlett underwent his baptism of fire before Sebastopol. On the 25th of October 1854 occurred the battle of Balaklava, at which the Heavy Brigade achieved a magnificent success against the Russian cavalry, and had the brigadier (who in the previous charge had been in the thickest of the melee) been allowed to advance as he wished, might have converted the disastrous charge of the Light Brigade into a substantial success (see Balaklava and Crimean War). For his services on this day Scarlett was promoted major-general, and in 1855 was made K.C.B. After a short absence in England he returned to the Crimea with the local rank of lieutenant-general to command the British cavalry. After the Peace of Paris Sir James Scarlett commanded the cavalry at Aldershot until i860, and was adjutant-general of the army from i860 to 1865. In the latter year he became commander of the Aldershot Camp, a post which he held until his retirement in 1870. He died in 1871. In 1869 he had been made G.C.B.

SCARRON, PAUL (1610-1660), French poet, dramatist, novelist and husband of Madame de Maintenon, was baptized on the 4th of July 16 10. His father, of the same name, was a member of the parlement of Paris. Paul the younger became an abbi when he was nineteen, and in 1633 entered the service of Charles de Beaumanoir, bishop of

Le Mans, with whom he travelled to Rome in 1635. Finding a patron in Marie de Hautefort, he became a well-known figure in literary and fashion- able society. An improbable story is told on the authority of La Beaumelle (Memoires . . . de Mme de Maintenon) that — when in residence at his canonry of Le Mans — he once tarred and feathered himself as a carnival freak and, being obliged to take refuge from popular wrath in a swamp, was crippled from rheumatism. What is certain is that Scarron, after having been in perfect health for nearly thirty years, passed twenty more in a state of miserable deformity and pain. His head and body were twisted, and his legs became useless. He bore up against his sufferings with invincible courage, though his circumstances were further complicated by a series of lawsuits with his step- mother over his father's property, and by the poverty and misconduct of his sisters, whom he supported. Scarron returned to Paris in 1640, and in 1643 appeared a Recueil de quelques vers burlesques, and in the next year Typhon oti la gigantomachie. At Le Mans he had conceived the idea of the Roman comique, the first part of which was printed in 1651 . In 1645 was performed the comedy of Jodelet, ou le mallre valet, the name of which was derived from the actor who took the principal part. Jodelet was the first of many French plays in which the humour depends on the valet who takes the part of master, an idea that Scarron borrowed from the Spanish. After a short visit to Le Mans in 1646, he returned to Paris, and worked hard for the bookseller Quinet, calling his works his " marquisat de Quinet." He had

also a pension from Fouquet, and one from the queen, which was withdrawn because he was suspected of Frondeur sentiments. When Mazarin received the dedication of Typhon coldly, Scarron changed it to a burlesque on the minister. In 1651 he definitely took the side of the Fronde in a Mazarinade, a violent pamphlet. He now had no resources but his " marquisat."

In his early years he had been something of a libertine. In 1649 a penniless lady of good family, Celeste Palaiseau, kept his house in the Rue d'Enfer, and tried to reform the gay company which assembled there. But in 1652, sixteen years after he had become almost entirely paralysed, he married a girl of much beauty and no fortune, Francoise d'Aubigne, afterwards famous as Madame de Maintenon (q.v.). Scarron had long been able to endure life only by the aid of constant doses of opium, and he died on the 6th of October

1660.

Scarron's work is very abundant and very unequal. The piece most famous in his own day, his Virgile travesti (1648-1653), is now thought a somewhat ignoble waste of singular powers for burlesque. But the Roman comique (1651-1657) is a work the merit of which is denied by no competent judge. Unfinished, and a little desultory, this history of a troop of strolling actors is almost the first French novel, in point of date, which shows real power of painting manners and character, and is singularly vivid. It is in the style of the Spanish picaresque romance, and furnished Theophile Gautier with the idea and with some of the details of his Capitalize Fracasse. Scarron also wrote some shorter novels: La Precaution inutile, which inspired Sedaine's Gageure imprevue; Les Hypocrites, to which Tartuffe owes something, and others. Of his plays Jodelet (1645) a'nd Don Japhet d'Armenie (1653) are the best.

The most complete edition of his works is by La Martiniere, J737 (IO vols., Amsterdam). The Roman comique and the Eneide travestie were edited by Victor Fournel in 1857 and 1858. Among the contemporary notices of Scarron, that contained in the Historiettes of Tallemant des Reaux is the most accurate. The most important modern works on the subject are Scarron et le genre burlesque (1888) by Paul Morillot; a biography by J. J. Jusserand in English, prefixed to his edition of The Comical Romance and other tales by Paul Scarron, done into English by Tom Brown of Shifnal, John Savage and others (2 vols., 1892) ; and Paul Scarron et Francoise d'Aubigni d'aprls des documents nouveaux (1894) by A. de Boislisle.
SCAUP, the wild-fowler's ordinary abridgment of Scaup-Duck, meaning a duck so called " because she feeds upon Scaup, i.e. broken shell-fish," as may be seen in F. Willughby's Ornithology (P- 3 5); but it would be more proper to say that the name comes from the " mussel-scaups," or " mussel-scalps," the beds of rock or sand on which mussels are aggregated. It is the Anas marila of Linnaeus and Fuligula marila of modern systematic writers, a very abundant bird around the coasts of most parts of the northern hemisphere, repairing inland in spring for the purpose of reproduction, though so far as is positively known hardly but in northern districts, as Iceland, Lapland, Siberia and the fur-countries of America. The scaup-duck has consider- able likeness to the pochard (q.v.), both in habits and appearance; but it much more generally affects salt-water, and the head of the male is black, glossed with green; hence the name of " Black- head," by which it is commonly known in North America, where, however, a second species or race, smaller than the ordinary one, is also found, the Fuligula affinis. The female scaup-duck can be

readily distinguished from the dunbird or female pochard by her broad white face. (A. N.)

SCAURUS, MARCUS AEMILIUS (c. 163-88 B.C.), Roman statesman, was a member of a great patrician family which had sunk into obscurity. His father had been a coal-dealer, and he himself had thought of becoming a money-changer, but finally decided in favour of a political career. Having served in the army in Spain and Sardinia, he became curule aedile, praetor and (after an unsuccessful attempt in 117) consul in 115. During his consulship he celebrated a triumph for his victory over certain Alpine tribes. In 112 he was one of the commissioners sent to Africa to arrange the dispute between Jugurtha and Adherbal. When a special committee was appointed to examine the charges of venality in their dealings with Jugurtha brought against the Roman repre- sentatives, Scaurus, who was equally guilty with the rest, was especially active in promoting the establishment of the committee, and even managed to get himself put at the head of it. He thus saved himself, but his intercession on behalf of the

other offenders was of no avail. In 109 Scaurus was censor, and constructed the Via Aemilia and restored the Mulviau bridge. 1 In 104 he superseded Saturninus (q.v.) in the manage- ment of the corn supply at Ostia.

During all his life Scaurus was a firm adherent of the moderate aristocratical party, which frequently involved him in quarrels with the representatives of the people and the extremists on his own side. Though not a great orator, his speeches were weighty and im- pressive. His wife was Caecilia Metella, who after his death married the dictator Sulla. His daughter Aemilia was the wife of Manius Acilius Glabrio, and subsequently of Pompey, the triumvir.

See Sallust, Jugurtha; Orelli's Onomasticon Tullianum; Asconius, In Scaurum; Aurelius Victor, De viris illustribus, 72; A. H. J. Greenidge, Hist, of Rome, i. 296; and M. G. Bloch, Milanges d'histoire ancienne, i. (1909).

Marcus Aemilius Scaurus, his son, served during the third Mithradatic War (74-61 b.c.) as quaestor to Pompey, by whom he was sent to Judaea to settle the quarrel between Hyrcanus and Aristobulus. Scaurus decided in favour of the latter, who was able to offer more money. On his arrival in Syria, Pompey reversed the decision, but, ignoring the charge of bribery brought against Scaurus, left him in command of the district. An incidental campaign against

Aretas, king of the Nabataeans, was ended by the payment of 300 talents by Aretas to secure his possessions. This agreement is represented on coins of Scaurus — Aretas kneeling by the side of a camel, and holding out an olive branch in an attitude of supplication. As curule aedile in 58, Scaurus celebrated the public games on a scale of magnificence never seen before. Animals, hitherto unknown to the Romans, were exhibited in the circus, and an artificial lake (euripus) was made for the reception of crocodiles and hippopotamuses. One of the greatest curiosities was a huge skeleton brought from Joppa, said to be that of the monster to which Andromeda had been exposed. A wooden theatre was erected for the occasion, capable of holding 80,000 spectators. In 56 Scaurus was praetor, and in the following year governor of Sardinia. On his return to Rome (54) he was accused of extortion in his province. Cicero and five others (amongst them the famous Q. Hortensius) undertook his defence, and, although there was no doubt of his guilt, he was acquitted. During the same year, however (according to some, two years later, under Pompey 's new law), Scaurus was condemned on a charge of illegal practices when a candidate for the consulship. He went into exile, and nothing further is heard of him.

See Josephus, Antiq. xiv. 3-5, Bell. Jud. i. 7; Appian, Syr. 51, Bell. civ. ii. 24; Pliny, Nat. Hist, xxxvi. 24; Cicero, Pro Sestio, 54, fragments of Pro Scauro, numerous references in the Letters; Asconius, Argumentum in Scaurum. See also, for both the above, Aemilius (Nos. 140, 141) in Pauly-Wissowa's Realencyclopadie der classischen Altertumswissensckaft, i. pt. 1. (1894), and Smith's Dictionary of Greek and Roman Biography, s.v. Scaurus.

SCAURUS, QUINTUS TERENTIUS, Latin grammarian, flourished during the reign of Hadrian (Aulus Gellius xi. 15). He was the author of an ars grammatica and commentaries on Plautus, Virgil's Aeneid and probably Horace. Under his name two fragments are extant — the longer from his work on orthography (De orthographia) , the shorter (chiefly on the use of prepositions) from another grammatical work.

SCAVENGER, now one who cleans the streets, removes refuse, generally a workman employed by the local public health authority (see Public Health). The name is properly " scava- ger " or " scaveger " (the n being intrusive as in " passenger " and " messenger "), an official who was concerned with the receipt of custom duties and the inspection (scavage) of im- ported goods. The " scavagers " are found with such officials of the City of London as aleconners, beadles, &c, in the Liber Albus (Munimenta Gildhallae Londoniensis,

ed. Riley). These officials seem to have been charged also with the cleaning of the streets, and the name superseded the older rakyer for those who performed this duty. Skeat takes " scavage " to be a Low French corruption of " showage," spelled variously as schewage, scevage, &c, and, therefore, to be derived from " show," to exhibit for inspection.

1 The view that he was consul again in 108 is disproved by Bloch (see bibliog.).

SCAVENGER'S DAUGHTER (corruption of Skevington's or Skeffington's Daughter), an instrument of torture in use during the 1 6th century in England. It was invented by Sir W. Skeving- ton, lieutenant of the. Tower in the reign of Henry VIII. It consisted of a wide iron hoop which by means of screws was tightened round the victim's body until the blood was forced from the nose and ears, and sometimes even from the hands and feet.

SCENE (Fr. scene, Lat. scaena, Gr. aKt\vi\, a tent or booth, a stage or scene), a word of which the various applications, figur- ative or otherwise, are derived from its original meaning of the stage or platform in the Greek or Roman theatre together with the structure that formed the background. Thus " scene " was formerly used, as " stage " is to-day, of the actor's profession or of dramatic art ; and of the actual performance or representation on the stage, still surviving in such phrases as " the scene opens " or " closes." It is also applied, actually and figuratively, to the place where the action of a play or any series of events take place, and so of any episode or situation in a novel or other narrative or description of events; from this the transition to an excited or violent exhibition of feeling between two or more persons is easy.

Of the specific applications of the word to the drama the main examples are (i) to a division of the play, marked by the fall of the curtain, the " scene " being a subdivision of an " act," where the play is thus divided, or where there are no acts, of the divisions themselves ; (2) to the material which forms the view of the place where the action is supposed to occur, that is, the painted cloths, slides and other apparatus, known as the " scenery, ' a word which has thus been transferred to a view generally, the appearance of the feature of a natural landscape. Allied words are " scena," used only

in music, of a composition consisting mainly of recitative with accompaniment, forming part of an opera or as an individual composition; and " scenario," a full outline of a play or opera, giving details of the acts, scenes, actors, situations, stage-business, &c.

SCENT, an odour or smell, particularly a fragrant liquid distilled from flowers, &c, used as a perfume (see Perfumery). The word should be properly spelled " sent," and is derived from the Mid. Eng. verb senten, to scent, to perceive by the sense of smell, Fr. sentir, Lat. senlire, perceive by the senses. The intrusive c appears in the 17th century, and is paralleled by the same in " scythe " for sythe. For the physical causes of the sensation caused by a scent see Smell, and for the anatomy of the organs concerned see Olfactory System.

SCEPTICISM (

Trust, not distrust, is the primitive attitude of the mind. . What is put before us, whether by the senses or by the

statements of others, is instinctively accepted as a appear veracious report, till experience has proved the possi- aaces. bility of deception. In the history of philosophy

affirmation precedes negation; dogmatism goes before scepticism. And this must be so, because the dogmatic systems are, as it were, the food of scepticism. Accordingly, we find that sceptical thought did not make its appearance till a succession of mutually inconsistent theories as to the nature of the real had suggested the possibility that they might all alike be false.

The Sophistic epoch of Greek philosophy was, in great Sophists. P art > sucn a negative reaction against the self-confident

assertion of the nature-philosophies of the preceding age. Though scepticism as a definite school may be said to date only from the time of Pyrrho (g.v.) of Elis, the main currents of Sophistic thought were sceptical in the wider sense of that term. The Sophists (q-v.) were the first in Greece to dissolve knowledge into individual and momentary opinion (Protagoras), or dia- lectically to deny tne possibility of knowledge (Gorgias). In these two examples we see how the weapons forged by the

dogmatic philosophers to assist in the establishment / their own theses are sceptically turned against philosophy in general. As every attempt to rationalize nature implies a certain process of criticism and interpretation to which the data of sense are subjected, and in

which they are, as it were, transcended, the antithesis of reason and sense is formulated early in the history of speculation. The opposition, being taken as absolute, implies the impeachment of the veracity of the senses in the interest of the rational truth proclaimed by the philosophers in question. Among the pre-Socratic nature-philosophers of Greece, Hera- clitus and the Eleatics are the chief representatives of this polemic. The diametrical opposition of the grounds on which the veracity of the senses is impugned by the two philosophies (see Heraclitus, Parmenides, Eleatic School) was in itself suggestive of sceptical reflection. Moreover, the arguments by which Heraclitus supported this theory of the universal flux are employed by Protagoras to undermine the possibility of objective truth, by dissolving all knowledge into the momentary sensation or persuasion of the individual. The idea of an objective flux, or law of change constituting the reality of things, is abandoned, and subjective points of sense alone remain — which is tanta- mount to eliminating the real from human knowledge.

Still more unequivocal was the sceptical nihilism expressed by Gorgias (?.».): — (1) nothing exists; (2) if anything existed, it would be unknowable; (3) if anything existed and were knowable, the knowledge of it could not be communicated. His arguments were drawn from the dialectic which the Eleatics had directed against the existence of the phenomenal world. But they are no longer u?ed as indirect proofs of a universe of pure and unitary Being. The pro- minence given by most of the Sophists to rhetoric, their cultivation of a subjective readiness as the essential equipment for life, their substitution of persuasion for conviction, all mark the sceptical undertone of their teaching. This attitude of indifference to real knowledge passed in the younger and less reputable generation into a corroding moral scepticism which recognized no good but pleasure and no right but might.

The scientific impulse communicated by Socrates was sufficient to drive scepticism into the background during the great age of Greek philosophy (i.e. the hundred years preceding Socrates. Aristotle's death, 323 B.C.). The captious logic of the Megarian school (q.v.) was indeed in some cases closely related to sceptical results. The school has been considered with some truth to form a connecting link with the later scepticism, just as the contemporary Cynicism and Cyrenaicism may be held to be imperfect preludes to Stoicism and Epicureanism. The extreme nominalism of some of the Cynics also, who denied the possibility of any but identical judgments, must be similarly regarded as a solvent of knowledge. But with these insignificant exceptions it holds true that, after the sceptical wave

marked by the Sophists, scepticism does not reappear till after the exhaus- tion of the Socratic impulse in Aristotle.

Scepticism, as a distinct school, begins with Pyrrho of Elis, who maintained that knowledge of things is impossible and that we must assume an attitude of reserve («rox‘7). The .

Pyrrhonists were consistent enough to extend their doubt even to their own principle of doubt. They thus attempted to make their scepticism universal, and to escape the reproach of basing it upon a fresh dogmatism. Mental imperturbability (drapaˆta) was the result to be attained by cultivating such a frame of mind. The happiness or satisfaction of the individual was the end which dominated this scepticism as well as the con- temporary systems of Stoicism and Epicureanism, and all three philosophies place it in tranquillity or self-centred indifference. It is men’s opinions or unwarranted judgments about things, say the sceptics, which betray them into desire, and painful effort and disappointment. From all this a man is delivered who abstains from judging one state to be preferable to another. But, as complete inactivity would have been synonymous with death, it appears to have been admitted that the sceptic, while retaining his consciousness of the complete uncertainty envelop- ing every step, might follow custom in the ordinary affairs of life.

The scepticism of the New Academy (more strictly of the Middle Academy, under Arcesilaus and Carneades) differed very little from that of the Pyrrhonists. The differences

asserted by later writers are not borne out on investigation. But the attitude maintained by the Academics was chiefly that of a negative criticism of the views of others, in par- Academy. ticular of the somewhat crude and imperious dogmatism of the Stoics. They also, in the absence of certainty, allowed a large scope to probability as a motive to action, and defended their doctrine on this point with greater care and skill. The whole position was stated with more urbanity and culture, and was supported, by Carneades in particular, by argumentation at once more copious and more acute. It seems also true that the Academics were less overborne than the Pyrrhonists by the practical issue of their doubts (imperturbability); their interest was more purely intellectual, and they had something of the old delight in mental exercitation for its own sake (see

Arcesilaus, Carneades, Aenesidemus, Agrippa and Sextus Empiricus).

Both Zeller and Hegel remark upon the difference between the calm of ancient scepticism and the perturbed state of mind Ancient evinced by many modern sceptics. Universal doubt and was the instrument which the sceptics of antiquity

modern recommended for the attainment of complete peace f pU " of mind. By the moderns, on the other hand, doubt is portrayed, for the most part, as a state of unrest and painful yearning. Even Hume, in various passages of his Treatise, speaks of himself as recovering cheerfulness and mental tone only by forgetfulness of his own arguments. His state of universal doubt he describes as a " malady " or as " philosophical melancholy and delirium." The difference might easily be interpreted either as a sign of sentimental weak- ness on the part of the moderns or as a proof of the limitation of the ancient sceptics which rendered them more easily satisfied in the absence of truth. It seems to prove, at all events, that the ancient sceptics were more thoroughly convinced than their modern successors of the reasonableness of their own attitude.

It may be doubted whether the thoroughgoing philosophical scepticism of antiquity has any exact parallel in modern times, with the single exception possibly of Hume's Treatise on Human Nature. It is true we find many thinkers who deny the com- petency of reason when it ventures in any way beyond the sphere of experience, and such men are not unfrequently called sceptics. This is the sense in which Kant often uses the term, and the usage is adopted by others — for example, in the following definition from Ueberweg's History of Philosophy: "The principle of scepticism is universal doubt, or at least doubt with regard to the validity of all judgments respecting that which lies beyond the range of experience." The last character- istic, however, is not enough to constitute scepticism, in the ancient sense. Scepticism, to be complete, must hold that even within experience we do not rationally conclude but are irration- ally induced to believe. " In all the incidents of life," as Hume puts it, " we ought still to preserve our scepticism. If we believe that fire warms, or water refreshes, 'tis only because it costs us too much pains to think otherwise" (Treatise, bk. i. iv. 7). This tone, which fairly represents the attitude of ancient sceptics, is rare among the moderns, at least among those who are professed philosophers. It is more easily matched in the unsystematic utterances of a man of the world like Montaigne.

2. One form of scepticism, however, may be claimed as an

exclusively modern growth, namely, philosophical scepticism Scepti- in the interests of theological faith. These sceptics cism in the are primarily Apologists. Their scepticism is simply interest of a me ans to the attainment of a further end. They 3 ‘ find that the dogmas of their church have often been

attacked in the name of reason, and it may be that some of the objections urged have proved hard to rebut. Accordingly, in an access of pious rage, as it were, they turn upon reason to rend her. They endeavour to show that she is in contra- diction with herself, even on matters non-theological. Thus the ” imbecility ” of reason becomes their warrant for the recep- tion by another organ — i.e. faith — of that to which reason had raised objections. The Greeks had no temptation to divide man in two in this fashion. Their scepticism was an end in itself. But this line of argument was latent in Christian thought

Pascal.

from the time when St Paul spoke of the ” foolishness ” of preach- ing. So Tertullian: ” Crucifixus est Dei films; non pudet, quia pudendum est. Et mortuus est Dei Alius; prorsus credibile est, quia ineptum est. Et sepultus resurrexit; certum est, quia impossibile est.” But, as Christianity became firmly established, Christian writers x became more tolerant of specula- tion, and laboured to reduce the doctrines of the church to a rational system. This was the long task essayed by Scholasticism; and, though the great Schoolmen of the 13th century refrained from attempting to rationalize such doctrines as the Trinity and the Incarnation, they were far from considering Theory of them as essentially opposed to reason. It was not till the two’ towards the close of the middle ages that a sense toU nature of conflict between reason and revelation became ottntin – widely prevalent and took shape in the essentially sceptical theory of the twofold nature of truth. Philosophical truth, as deduced from the teaching of Aristotle, it was said, directly contradicts the teaching of the church, which determines truth in theology; but the contradiction leaves the authority of the latter unimpaired in its own sphere. It is difficult to believe that this doctrine was ever put forward sincerely; in the most of those who professed it, it was certainly no more than a veil by which they sought to cover their heterodoxy and evade its consequences. Rightly divining as much, the church condemned the doctrine as early as 1276. Nevertheless, it was openly professed during the period of the break up of Scholastic Aris- totelianism (see Pomponazzi).

The typical and by far the greatest example of the Christian sceptic is Pascal (1623-1662). The form of the Pensees forbids the attempt to evolve from their detached utterances a completely coherent system. For, though he declares at times " Le pyrrhonisme est le vrai," " Se moquer de la philosophic c'est vraiment philosopher," or, again, " Humiliez- vous, raison impuissante, taisez-vous, nature imbecile," other passages might be quoted in which he assumes the validity of reason within its own sphere. But what he everywhere emphatic- ally denies is the possibility of reaching by the unassisted reason a satisfactory theory of things. Man is a hopeless enigma to himself, till he sees himself in the light of revelation as a fallen creature. The fall alone explains at once the nobleness and the meanness of humanity; Jesus Christ is the only solution in which the baffled reason can rest. These are the two points on which Pascal's thought turns. Far from being able to sit in judgment upon the mysteries of the faith, reason is unable to solve its own contradictions without aid from a higher source. In a somewhat similar fashion, Lamennais (in the first stage of his speculations, represented by the Essai sur I'indifference en matiere religieuse, 1817-1821) endeavoured to destroy all rational certitude in order to establish the principle of authority; and the same profound distrust of the power of the natural reason to arrive at truth is exemplified (though the allegation has been denied by the author) in Cardinal Newman. In a different direction and on a larger scale, Hamilton's philosophy of the conditioned may be quoted as an example of the same religious scepticism (see Hamilton, Sir William). The theological application and development of Hamilton's arguments in Mansel's Bampton Lectures On the Limits of Religious Thought marked a still more determined attack, in the interests of theology, upon the competency of reason.

Passing from this particular vein of sceptical or semi-sceptical thought, we find,, as we should expect, that the downfall of Scholasti- cism, and the conflict of philosophical theories and re- sceotica ligious confessions which ensued, gave a decided impetus . ? 6t _ to sceptical reflection. One of the earliest instances of a . jˆ this spirit is afforded by the book of Agrippa of Nettesheim centuries (1487-1535), De incertitudine et vanitate scientiarum.

1 This turn of thought is not confined, however, to Christian thinkers; it appears also in the Arabian philosophy of the East. Ghazali (q.v.) in his Tahdfot al-Filasifa (" The Collapse of the Philosophers ") is the advocate of complete philosophical scepticism in the interests of orthodox Mahommedanism — an orthodoxy which passed, however, in his own case into a species of mysticism. He did

his work of destruction so thoroughly that Arabian philosophy died out after his time in the land of its birth.

SCEPTICISM

Sceptical reflection rather than systematic scepticism is what meets us in Michel de Montaigne (1533-1592), though the elaborate presentation of sceptical and relativistic arguments in his " Apologie de Raimond-Sebond " (Essais, ii. 12), and the emblem he recommends — a balance with the legend, " Que scay-je ? " — might allowably be adduced as evidence of a more thoroughgoing Pyrrhonism. In his " tesmoynages de nostre imbecillite " he follows in the main t!ie lines of the ancients, and he sums up with a lucid statement of the two great arguments in which the sceptical thought of every age resumes itself— the impossibility of verifying our faculties, and the relativity of all impressions. In the concluding lines of this essay, Montaigne seems to turn to " nostre foy chrestienne " as man's only succour from his native state of helplessness and uncertainty. But undoubtedly his own habitual frame of mind is better represented in his celebrated saying—" How soft and healthful a pillow are ignorance and incuriousness. . . for a well-ordered head." More inclined than Montaigne to give a religious turn to his reflections was his friend Pierre Charron (1541-1603), who in his book De la sagesse systematized in somewhat scholastic fashion the train of thought which we find in the Essais. Francois Sanchez (1562-1632), professor of medicine and philosophy in Toulouse, combated the Aristotelianism of the schools with much bitterness, and was the author of a book with the title Quod nihil scitur. Of more or less isolated thinkers may be mentioned Francois de la Mothe le Vayer (1588-1672), whose Cinq Dialogues appeared after his death under the pseudonym of Orosius Tuberor Samuel Sorbiere (1615-1670), who translated the Hypotyposes Pyrrhoneae of Sextus Empiricus; Simon Foucher (1644-1696), canon of Dijon, who wrote a History of th'e Academics, and combated Descartes and Malebranche from a sceptical standpoint. The work of Hieronymus Hirnhaim of Prague (io 37 -i 679), De typho generis humani sive scientiarum humanarum inani ac ventoso tumore, was written in the interests of revelation. This is still more the case with the bitter polemic of Daniel Huet (1630-172 1), Censura philosophiae Cartesianae, and his later work, Traite philosophique de lafaiblesse de I' esprit humain. The scepticism of Joseph Gianvill (q.v.), which is set forth in his two works The Vanity of Dogmatizing (1661) and Scepsis scientifica (1665), has more interest for Englishmen. More celebrated than any

of the above was Pierre Bayle (1647-1706), whose scepticism lay more in his keen negative criticism of all systems and doctrines which came before him as literary historian than in any theoretic views of his own as to the possibility of knowledge. Bayle also paraded the opposition between reason and revelation; but the argument in his hands is a double-edged weapon, and when he extols the merits of submissive faith his sincerity is at least questionable.

3. Hume is the most illustrious and indeed the typical sceptic of modern times. His scepticism is sometimes placed, as we Hume ˆ ave seen ˆ ‘ s ky Kant, in his distrust of our ability and right to pass beyond the empirical sphere. But it is essential to the sceptical position that reason be dethroned within experience as well as beyond it, and this is undoubtedly the result at which Hume finally arrives. The Treatise is a reductio ad absurdum of the principles of Lockianism, inasmuch as these principles, when consistently applied, leave the structure of experience entirely ” loosened ” (to use Hume’s own expression) , or cemented together only by the irrational force of custom. Hume’s scepticism thus really arises from his thoroughgoing empiricism. Starting with ” particular perceptions ” or isolated ideas let in by the senses, he never advances beyond these ” distinct existences.” Each of them exists on its own account; it is what it is, but it contains no reference to anything beyond itself. The very notion of objectivity and truth therefore dis- appears. Hume’s analysis of the conceptions of a permanent world and a permanent self reduces us to the sensationalistic relativism of Protagoras. He expressly puts this forward in various passages as the conclusion to which reason conducts us. The fact that the conclusion is in ” direct and total opposi- tion ” to the apparent testimony of the senses is a fresh justification of philosophical scepticism. For, indeed, scepticism with regard to the senses is considered in the Inquiry to be sufficiently justified by the fact that they lead us to suppose ” an external universe which depends not on our perception,” whereas ” this universal and primary opinion of all men is soon destroyed by the slightest philosophy.” Scepticism with regard to reason, on the other hand, depends on an insight into the irrational character of the relation which we chiefly employ, viz. that of cause and effect. It is not a real relation in objects, but rather a mental habit of belief engendered by frequent repetititon or custom. This point of view is applied in the Treatise universally. All real connexion or relation, therefore, and with it all possibility of an objective system, disappears; it is, in fact, excluded by

Hume ab initio, for ” the mind never perceives any real connexion among distinct existences.” Belief, however, just because it rests, as

has been said, on custom and the influence of the imagination, survives such demonstrations. ” Nature,” as Hume delights to reiterate, ” is always too strong for principle.” ” Nature, by an absolute and uncontrollable necessity, has determined us to judge as well as to breathe and feel.” The true philosopher, therefore, is not the Pyrrhonist, trying to maintain an impossible equilibrium or suspense of judgment, but the Academic, yielding gracefully to the impressions or maxims which he finds, as matter of fact, to have most sway over himself. 1

The system of Kant, or rathenthat part’of his system expounded in the Critique of Pure Reason, though expressly distinguished by its author from scepticism, has been included by sceptkal many writers in their survey of sceptical theories, sideot The difference between Kant, with his system of pure KantUm- reason, and any of the thinkers we have passed in review tsm ‘ is obvious; and his limitation of reason to the sphere of. experience suggests in itself the title of agnostic or positivist rather than that of sceptic. Yet, if we go a little deeper, there is substantial justification for the view which treats agnosticism of the Kantian type as essentially sceptical in its foundations and in its results. For criticism not only limits our knowledge to a certain sphere, but denies that our knowledge within that sphere is real; we never know things as they actually are, but only as they appear to us. But this doctrine of relativity really involves a condemna- tion of our knowledge (and of all knowledge), because it fails to realize an impossible and self-contradictory ideal. The man who impeaches the knowing faculties because of the fact of relation which they involve is pursuing the phantom of an apprehension which, as Lotze expresses it, does not apprehend things, but is itself things; he is desiring not to know but to be the things themselves. If this dream or prejudice be exploded, then the scepticism originating in it — and a large proportion of recent sceptical thought does so originate — loses its raison d’itre The prejudice, however, which meets us in Kant is, in a somewhat different form, the same prejudice which Prejudices is found in the tropes of antiquity — what Lotze calls on which the ” inadmissible relation of the world of ideas to «wp*fc<« a foreign world of objects." For, as he rightly points TesU – out, whether we suppose idealism or realism to be true, in neither case do the things themselves pass into our knowledge. No standpoint is possible from which we could compare the world of knowledge with such an independent world of things, in order to judge of the conformity of the one to the other. But the abstract doubt " whether after all things may not be quite other in themselves than that which by the laws of*

our thought they necessarily appear " is a scepticism which, though admittedly irrefutable, is as certainly groundless. No arguments can be brought against it, simply because the scepticism rests on nothing more than the empty possibility of doubting. This holds true, even if we admit the " independent " existence of such a world of things. But the independence of things may with much greater reason be regarded as itself a fiction or pre- judice. The real " objective " to which our thoughts must show conformity is not a world of things in themselves, but the system of things as it exists tor a perfect intelligence. Scepticism is deprived of its persistent argument if it is seen that, while our individual experiences are to be judged by their coherence with the context of experience in general, experience as a whole does not admit of being judged by reference to anything beyond itself.

To the attack upon the possibility of demonstration, inas- much as every proof requires itself a fresh proof, it may quite fairly be retorted that the contradiction really lies in the demand

1 Much the same conclusion is reached in what is perhaps the ablest English exposition of pure philosophic scepticism since Hume — A. J. Balfour's Defence of Philosophic Doubt (1879).

2 It may be as well to add that the sceptical side of Kantianism is mainly confined to the Critique of Pure Reason, but this side of Kantian thought has been most widely influential. The remarks made above would not apply to the coherent, system of idealism which may be evolved from Kant's writings, and which many would con-

I sider alone to deserve the name of Kantianism or Criticism.

for proof of the self-evident, on which all proof must ultimately depend. It is of course always possible that in any particular case we may be deceived; we may be assuming as self evidently true what is in reality not so. But such incidental lapses are found to correct themselves by the consequences in which they involve us, and they have no power to shake our trust in the general validity of reason. It may, however, be granted that the possibility of lapse throws us open to the objections, in genuous or disingenuous, of the sceptic; and we must remain exposed to them so long as we deal with our first principles as so many isolated axioms or intuitions. But the process

of self- correction referred to points to another proof — the only ultimately satisfactory proof of which first principles admit. Their evidence lies in their mutual interdependence and in the coherence of the system which they jointly constitute.

Of a scepticism which professes to doubt the validity of every reasoning process and every operation of all our faculties it is, of course, as impossible as it would be absurd to offer of'sceou- an y refutation. This absolute scepticism, indeed, chat. can hardly be regarded as more than empty words;

the position which they would indicate is not one which has ever existed. In any case, such scepticism is at all times sufficiently refuted by the imperishable and justifiable trust of reason in itself. The real function of scepticism in the history of philosophy is relative to the dogmatism which it criticizes. And, as a matter of fact, it has been seen that many so-called sceptics were rather critics of the effete systems which they found cumbering the ground than actual doubters of the possibility of knowledge in general. And even when a thinker puts forward his doubt as absolute it does not follow that his successors are bound to regard it in the same light. The progress of thought may show it to be, in truth, relative, as when the nerve of Hume's scepticism is shown to be his thoroughgoing empiricism, or when the scepticism of the Critique of Pure Reason is traced to the unwarrantable assumption of things-in-themselves. When the assumptions on which it rests are proved to be baseless, the particular scepticism is also overcome. In like manner, the apparent antinomies on which such a scepticism builds will be found to resolve themselves for a system based on a deeper insight into the nature of things. The serious thinker will always repeat the words of Kant that, in itself, scepticism is " not a permanent resting-place for human reason." Its justification is relative, and its function transitional.

Authorities. — Ancient scepticism is fully treated in the relative parts of Zeller's Philosophie der Griechen. See also works quoted in the biographical articles; Brochard, Les Sceptiques grecs (1887); Ed. Caird, Evolution of Theology in the Greek Philosophers (1904) ; Norman MacColl, Grsek Sceptics from Pyrrho to Sextus (1869); Haas, De philosophorum scepticorum successionibus (1875). Among other works may be mentioned Staudlin, Geschichte und Geist a. Scepticismus, vorziiglich in Rucksicht auf Moral u. Religion (1794); Tafel, Geschichte d. Scepticismus (1834); E. Saisset, Le Scepticisme: ALnesideme, Pascal, Kant (1875). For a modern view see A. J. Balfour, Defence of Philosophic Doubt (1879). All histories of philosophy deal with scepticism, and general accounts will be found in J.

M. Robertson's Short History of Free Thought and A. W Benn's History of Modern Rationalism. See also Agnosticism, Rationalism.

(AS. P.-P.;X.)

SCEPTRE. A rod or staff has always been regarded as a token of authority. Among the early Greeks the sceptre (o-Kryirrpov) was a long staff used by aged men (//. xviii. 416, Herod. 1. 196), and came to be used by judges, military leaders, priests and others. It is represented on painted vases as a long staff tipped with a metal ornament, and is borne by some of the gods. Among the Etruscans sceptres of great magnificence were used by kings and upper orders of the priesthood, and many representations of such sceptres occur on the walls of the painted tombs of Etruria. The British Museum, the Vatican and the Louvre possess Etruscan sceptres of gold, most elaborately and minutely ornamented. The Roman sceptre was probably derived from the Etruscan. Under the Republic an ivory sceptre (sceplrum eburneum) was a mark of consular rank It was also used by victorious generals who received the title of imperator, and it may be said to survive in the marshal's baton. Under the empire the sceptrum Augusti was specially used by the emperors, and

was often of ivory tipped with a golden eagle. It is frequently shown on medallions of the later empire, which have on the obverse a half-length figure of the emperor, holding in one hand the sceptrum Augusti, and in the other the orb surmounted by a small figure of Victory.

With the advent of Christianity the sceptre was often tipped with a cross instead of the eagle, but during the middle ages the finials on the top of the sceptre varied considerably. In England from a very early period two sceptres have been concurrently used, and from the time of Richard I. they have been distinguished as being tipped with a cross and a dove respectively. In France the royal sceptre was tipped with a fleur de lys, and the other, known as the main de justice, had an open hand of benediction on the top. Sceptres with small shrines on the top are sometimes represented on royal seals, as on the great seal of Edward III., where the king, enthroned, bears such a sceptre, but it was an unusual form ; and it is of interest to note that one of the sceptres of Scotland, preserved at Edinburgh, has such a shrine at the top, with little images of Our Lady, St Andrew and St James in it. This sceptre was, it is believed, made in France about 1536, for James V. Great seals usually represent the sovereign enthroned, holding a sceptre (often the second in dignity) in the right hand, and the orb and cross in the left. Harold is so depicted on the Bayeux

tapestry.

The earliest coronation form of the 9th century mentions a sceptre {sceptrum), and a staff (baculum). In the so-called coronation form of Ethelred II. a sceptre {sceptrum), and a rod (virga) are named, and this is also the case with a coronation order of the 12th century. In a contemporary account of Richard I.'s coronation the royal sceptre of gold with a gold cross, and the gold rod (virga) with a gold dove on the top, are mentioned for the first time. About 1450 Sporley, a monk of Westminster, compiled a list of the relics there. These included the articles used at the coronation of St Edward the Confessor, and left by him for the coronations of his successors. A golden sceptre, a wooden rod gilt and an iron rod are named. These survived till the Commonwealth, and are minutely described in an inventory of the whole of the regalia drawn up in 1649, when everything was destroyed.

For the coronation of Charles II. new sceptres were made, and though slightlv altered, are still in use. They are a sceptre with a cross called St Edward's sceptre, a sceptre with a dove, and a long sceptre or staff with a cross of gold on the top called St Edward's staff. To these, two sceptres for the queen, one with a cross, and the other with a dove, have been subsequently added.

See Cyril Davenport, The English Regalia; Leopold Wickham- Legg, English Coronation Records; The Ancestor, Nos. 1 and 2 (1902); Menin, The Form, &c, of Coronations (English translation,

1727).

SCEVE, MAURICE (c. 1500-1364), French poet, was born at Lyons, where his father practised law. Besides following his father's profession he was a painter, architect, musician and poet. He was the centre of the Lyonnese coterie that elaborated the theory of spiritual love, derived partly from Plato and partly from Petrarch, which was enunciated in Antoine Heroet's Parfaicle Amye.

Serve's chief works are Delie, objet de plus haulte vertu (1544); two eclogues, Arion (1536) and La Saulsaye (1547); and Le Micro-cosme (1562), an encyclopaedic poem beginning with the fall of man. Delie consists of 450 dizaines and about 50 other poems in praise of his mistress. These poems, now little read, were even in Sceve's own day so obscure that his enthusiastic admirer Etienne Dolet confesses he could not understand them. Scfeve was a musician as well as a poet, and cared very much for the musical value of the

words he used. In this and in his erudition he forms a link between the school of Marot and the Pleiade. DUie (an anagram for I'idie) set the fashion of a series of poems addressed to a mistress real or imaginary, followed by Ronsard in Cassandre and by Du Bellay in Olive. The Lyonnese school of which Scfrve was the leader included his friend Claude de Taillemont and many women writers of verse, Jeanne Gaillarde — placed by Marot on an equality with Christine de Pisan — Pemette du Guillet, Ctemence de Bourges and the poet's sisters, Claudine and Sibylle Sceve. Sceve died in 1564. See also Labe, Louise).

See E. Bourciez, La Literature polie et les moeurs de cour sous Henri II (Paris, 1886) ; Pernetti, Recherches pour servir a Vhistoir.e de Lyon (2 vols., Lyons, 1757), and F. Brunetiere, " Un Prteurseur de la Pleiade, Maurice Sceve," in his Etudes critiques, vol. vi. (1899).

SCHACK, ADOLF FRIEDRICH, Graf von (181 5-1894), German poet and historian of literature, was born at Briisewitz near Schwerin on the 2nd of August 181 5. Having studied jurisprudence (1834-1838) at the universities of Bonn, Heidel- berg and Berlin, he entered the Mecklenburg State service and was subsequently attached to the " Kammergericht " in Berlin. Tiring of official work, he resigned his appointment, and after travelling in Italy, Egypt and Spain, was attached to the court

of the grand duke of Oldenburg, whom he accompanied on a journey to the East. On his return he entered the Oldenburg government service, and in 1849 was sent as envoy to Berlin. In 1852 he retired from his diplomatic post, resided for a while on his estates in Mecklenburg and then travelled in Spain, where he studied Moorish history. In 1855, he settled at Munich, where he was made member of the academy of sciences, and here collected a splendid gallery of pictures, containing masterpieces of Genelli, Feuerbach, Schwind, Bocklin, Lenbach, &c, and which, though bequeathed by him to the Emperor William II., still remains at Munich and is one of the noted galleries in that city. He died at Rome on the 14th of Apiil 1894.

Schack was a most productive author; he wrote lyric poems (Gedichte, 1867, 6th ed. 1888); novels in verse, Durch alle Wetter (1870, 3rd ed. 1875) and Ebenbiirtig (1876); the dramatic poem Helidor (1878); the tragedies Die Pisaner (1872) and Walpurga and

Der Johanniter (1887); and the political comedies, Der Kaiserbote and Cancan (1873). As an historian of literature- and art, he published Geschichte der dramatischen Liter alur und Kunstin Spanien (3 vols. 1845-1846, 2nd ed. 1854), Poesie und Kunst der Araber in Spanien und Sicilien (1865, 2nd ed. 1877), which are valuable con- tributions to literary history. He also produced some excellent translations, e.g. Spanisches Theater (1845) ; Heldensagen des Firdusi (1851) and Stimmen vom Ganges (1857, 2nd ed. 1877). He also com- piled the catalogue and history of his own picture gallery, Meine Gemaldesammlung (7th ed., 1894). His collected works, Gesammelte Werke, were published in six volumes (1883, 3rd ed. in 10 vols. 1897-1899). Nachgelassene Dichtungen were edited by G. Winkler (1 896) . See his autobiography, Ein halbes Jahrhundert, Erinnerungen und Aujzeichnungen (3 vols. 1887, 3rd ed. 1894). Cf. further the accounts of Schack by F. W. Rogge (1883), E. Zabel (1885), E. Brenning (1885), W. J. Mannsen (from the Dutch, 1889), and also L. Berg, Zwischen swei Jahrhunderten (1896).

SCHADOW, a distinguished name in the annals of German art.

I. Johann Gottfried Schadow (1764-1850), sculptor, was born and died in Berlin, where his father was a poor tailor. His first teacher was an inferior sculptor, Tassaert, patronized by Frederick the Great; the master offered his daughter in marriage, but the pupil preferred to elope with a girl to Vienna, and the father-in-law not only condoned the offence but furnished money wherewith to visit Italy. Three years' study in Rome formed his style, and in 1788 he returned to Berlin to succeed Tassaert as sculptor to the court and secretary to the Academy. Over half a century he produced upwards of two hundred works, varied in style as in subjects.

Among his ambitious efforts are Frederick the Great in Stettin, Bliicher in Rostock and Luther in Wittenberg. His portrait statues include Frederick the Great playing the flute, and the crown-princess Louise and her sister. His busts, which reach a total of more than one hundred, comprise seventeen colossal heads in the Walhalla, Ratisbon ; from the life were modelled Goethe, Wieland and Fichte. Of church monuments and memorial works thirty are enumerated; yet Schadow hardly ranks among Christian sculptors. He is claimed by classicists and idealists: the quadriga on the Brandenburger Thor and the allegorical frieze on the facade of the Royal Mint, both in Berlin, are judged among the happiest studies from the antique. Schadow, as director of the Berlin Academy, had great influence. He wrote on the proportions of the human figure, on national

physiognomy, &c. ; and many volumes by himself and others describe and illustrate his method and his work.

II. His eldest son, Rudolph Schadow (1786-1822), sculptor, was born in Rome, and had his father at Berlin for his first master. In 1810 he went to Rome and received kindly help from Canova and Thorvaldsen. His talents were versatile; his first independent work was a figure of Paris, and it had for its companion a spinning girl.

Embracing the Roman Catholic faith, he produced statues of John the Baptist and of the Virgin and Child. In England he became known by bas-reliefs executed for the duke of Devonshire and for the marquis of Lansdowne. His last composition, commissioned by the king of Prussia, .was a colossal group, Achilles with the Body of Penthesilea ; the model, universally admired for its antique character and the largeness of its style, had not been carried out in marble when in 1822 the artist died in Rome.

III. Friedrich Wilhelm Schadow (1780-1862), painter, was the second son of Johann Gottfried Schadow. In 1806- 1807 he served as a soldier; in 1810 he went with his elder brother Rudolph to Rome. He became one of the leaders among the German pre-Raphaelites. Following the example of Overbeck

and others, he joined the Roman Catholic Church, and held that an artist must believe and live out the truths he essays to paint. The sequel showed that Schadow was qualified to shine less as a painter than as a teacher and director.

The Prussian consul, General Bartholdi, befriended his young compatriots by giving them a commission to decorate with frescoes a room in his house on the Pincian Hill. The artists engaged were Schadow, Cornelius, Overbeck and Veit; the subject selected was the story of Joseph and his brethren, and two scenes, the Bloody Coat and Joseph in Prison, fell to the lot of Schadow. Schadow was in 1819 appointed professor in the Berlin Academy, and his ability and thorough training gained devoted disciples. To this period belong his pictures for churches. In 1826 the professor was made director of the Dusseldorf Academy. The high and sacred art matured in Rome Schadow transplanted to Dusseldorf; he re- organized the Academy, which in a few years grew famous as a centre of Christian art to which pupils flocked from all sides. In 1837 the director selected, at request, those of his scholars best qualified to decorate the chapel of St Apollinaris on the Rhine with frescoes, which when finished were accepted as the fullest and purest manifestation of the Dusseldorf

school on its spiritual side. To 1842 belong the " Wise and Foolish Virgins," in the Stadel Institute, Frankfort; this large and important picture is carefully considered and wrought, but lacks power. Schadow's fame indeed rests less on his own creations than on the school he formed. In Dusseldorf a reaction set in against the spiritual and sacerdotal style he had established; and in 1859 the party of naturalism, after a severe struggle, drove the director from his chair. Schadow died at Dusseldorf in 1862, and a monument in the platz which bears his name was raised at the jubilee held to commemorate his directorate. (J. B. A.)

SCHAFARIK (Czech, Safafik), PAVEL JOSEF (1795-1861), Slavonic philologist, was born of Slovak parents at Kobeljarova, a village of northern Hungary, where his father was a Protestant clergyman. His first production was a volume of poems in Czech entitled The Muse of Tatra with a Slavonic Lyre (Levocza, 1 814). In 181 5 he began a course of study at the university of Jena, and while there translated into Czech the Clouds of Aristo- phanes and the Maria Stuart of Schiller. In 181 7 he removed to Prague and joined the literary circle of which Dobrovsky, Jungmann and Hanka were members. From 1819 to 1833 he was head master of the high school at Neusatz in the south of Hungary. There he studied Servian literature and antiquities, acquired many rare books and manuscripts, and published a collection of Slovak folk-songs in collaboration with Kollar and others (1823-1827). In 1826 his Geschichte der slawischen Sprache und Literatur nach alien Mundarten appeared at Budapest (2nd ed., 1869). This book was the first attempt to give any- thing like a systematic account of the Slavonic languages as a whole. In 1833 he returned to Prague, where he spent the remainder of his life. There he published his Serbische Lesekorner oder historisch-kritische Beleuchtung der Serbischen Mundart, and in 1837 his great work SlovanskS Staroiitnosti ("Slavonic Antiquities "). The " Antiquities " have been translated into Polish, Russian and German; a second edition (1863) was edited by J. Jirecek. In 1840 he published in conjunction with Palacky Die altesten Denkmaler der bohmischen Sprache. In 1837 poverty compelled him to accept the uncongenial office of censor of Czech publications, which he abandoned in 1847 on becoming custodian of the Prague public library. In 1842 he published his Slovansky' Ndrodopis, in which he sought to give a complete account of Slavonic ethnology. He was ■also for some time conductor of the " Journal " of the Bohemian Museum, and edited the first volume of the Vybor, or selections from old Czech writers, which appeared under the auspices of the Prague literary society in 1845. To this he prefixed a grammar of the Old

Czech language, Pocdtkovi staroieske mluvnice. In 1848 he was made professor of Slavonic philology in the university of Prague, but resigned in 1849. He was then made keeper of the university library. In 1857 he published Glagotitische Fragmente in collaboration with HofJer; but in the same year, as a result of overwork, ill health and family anxieties, he became insane. He was nevertheless continued in his appointment until his death in 1861.

*Schafarik's collected works, Seb*an& Spisy, were published at Prague. 1862-1865; his Geschichte der siidslawischen Literatuf was edited by Jirecek in 3 vols. (1864-1865).*

SCHAFF, PHILIP (1819-1893), American theologian and church historian, was born in Chur, Switzerland, on the 1st of January 1819. He was educated at the gymnasium of Stuttgart, and at the universities of Tubingen, Halle and Berlin, where he was successively influenced by Baur and Schmid, by Tholuck and Julius Mixller, by Strauss and, above all, Neander. In 1842 he was Privatdozent in the university of Berlin, and in 1843 he was called to become professor of church history and Biblical literature in the German Reformed Theological Seminary of Mercersburg, Pennsylvania, then the only seminary of that church in America. On his journey he stayed six months in England and met Pusey and other Tractarians. His inaugural address on The Principle of Protestantism, delivered in German at Reading, Pennsylvania, in 1844, and published in German with an English version by J. W. Nevin (q.v.), by its Neander-like view that Romanism and Protestantism were only stages in the divinely appointed development of the Christian Church, aroused fierce opposition in the Reformed Church and Schaff was characterized as " Puseyistic " and "semi-papistical"; in 1845 he was tried for heresy and found not guilty by the Synod. Opposition to him soon died out within his own denomination: it was more particularly directed against his polemic champion, Nevin, and it had its source more in the Dutch (than in the German) Reformed Church, and even there was confined more to the New Brunswick school (i.e. the church- men of the Dutch Reformed Theological Seminary in New Brunswick, New Jersey) and its English and Scottish members, — as late as 1856 J. J. Janeway of New Brunswick published his Antidote to the Poison of Popery in the Writings and Conduct of Professors Nevin and Schaff. Schaff's broad views strongly influenced the German Reformed Church, through his teaching at Mercersburg,

through his championship of English in German Reformed churches and schools in America, through his hymnal (1859), through his labours as chairman of the committee which prepared a new liturgy, and by his edition (1863) of the Heidelberg Catechism. His History of the Apostolic Church (in German, 1851; in English, 1853) and his History of the Christian Church (7 vols., 1858-1890), opened a new period in American study of ecclesiastical history. After 1864 his home was in New York City, where he was until 1869 secretary of the New York Sabbath Committee (which fought the " continental Sunday "), and was corresponding secretary of the American Evangelical Alliance, of which he was in 1866 a founder. In 1865 he founded the first German Sunday School in Stuttgart. In 1862-1867 he lectured on church history at Andover, and after 1869 taught at the Union Theological Seminary — as instructor in church history in 1869-1870, and professor of theological cyclopaedia and Christian symbolism in 1870-1873, of Hebrew and cognate languages in 1873-1874, of sacred literature in 1874-1887, and of church history in 1 887-1 893. The English Bible Revision Committee in 1870 requested him to form a co-operating American Committee, of which he became president in 1871. He died in New York City on the 20th of October 1893. Working with the Evangelical Alliance and the Chicago (1893) World's Parliament of Religions, and in Germany, through the monthly Kirchenfreund, he strove earnestly to promote Christian unity and union; and it was his hope that the pope would abandon the doctrine of infallibility and undertake the reunion of Christianity. He recognized that he was a " mediator between German and Anglo-American theology and Christianity "; his theology was broad rather than definite, though he sharply dissented from Nevin's mystical doctrine of the union in the eucharist of the believer with Christ's glorified body as well as His glorified soul. He edited (1 864-1 880) the American transla- tion and revision of Lange's Bibelwerk, the great Schaff-Herzog Encyclopaedia of Religious Knowledge (1884, 3rd ed. 1891); the first seven volumes of the Nicene and Post-Nicene Church Fathers in English (1886-1894); and the International Illustrated Commentary on the New Testament (4 vols., 1879-1883) and the International Revision Commentary (5 vols. 1881-1884), as far as the Epistle to Romans. His Bibliotheca symbolica ecclesiae universalis: the Creeds of Christendom (3 vols. 1877, 6th ed. 1893)

was a pioneer work in English in the field of symbolics. His History of the Christian Church, already mentioned, resembled Neander's work, though less biographical, and was pictorial rather than philosophical. He wrote, besides, biographies, catechisms and

hymnals for children, manuals of religious verse, lectures and essays on Dante, &c.

His son, David Schley Schaff (1852-), was professor of church history in Lane Theological Seminary in 1897-1903, and after 1903 in Western Theological Seminary at Allegheny, Pa. He wrote a Commentary on the Book of Acts (1882) and a Life of Philip Schaff (New York, 1897).

SCHAFFHAUSEN (Fr. Schaff house), the most northerly of the Swiss cantons, and the only one wholly (excepting the small hamlet of Burg, a suburb of Stein) north of the Rhine. It is divided into three detached portions by the grand-duchy of Baden, which surrounds it on all sides save that of the Rhine, which separates it from the cantons of Thurgau and of Zurich: by far the largest part is the region near the chief town, Schaff- hausen, while to the south is the small isolated district of Riidlingen and Buchberg (purchased in 1520), and to the east the more extensive tract around the old town of Stein on the Rhine (ceded by Zurich in 1798). Within the territory of Schaffhausen are two " enclaves," belonging politically to Baden — the village of Biisingen (just east of the chief town) and the farm of Verenahof, near Btittenhardt. The total area of the canton is 113-5 sq. m., of which 108-4 S(J- m – are classed as " productive " (forests covering 46 sq. m., and vineyards 4 sq. m.). The main portion of the canton consists of the gently inclined plateau of the Randen (its highest point, c. 3000 ft., is at its north edge) that slopes towards the Rhine, and is inter- sected by several short glens, separated by rounded ridges. The most important of these glens is that of the Klettgau, to the west of the chief town. There are only intermittent torrents in the canton, apart from the broad stream of the Rhine, which, about ijiti. below the town, forms the celebrated Falls of the Rhine (first mentioned about 1122), which are rather rapids (only 60 ft. in height) than a cascade proper, though the mass of water is very great.

The direct railway line from Constance to Basel, along the right and (generally) non-Swiss bank of the Rhine, passes through the canton for some 16 m., while there is a branch line (entirely within the canton) from Schaffhausen to Schleitheim (iOj m.), and two lines join the chief town with the Swiss territory to the south, Zurich being thus 29 m. or 35 J m. distant. In 1900 the population was 41,454, of whom 40,290 were German-speaking, while 34,046 were Protestants, 7403 Romanists and 22 Jews. The inhabitants are devoted chiefly to agriculture (particularly fodder stuffs and fruits) and to wine-growing (Hallauer is the best-known red wine). There

are tile factories in the Reiath region (N.E. of the capital). The canton is divided into six administrative districts, which com- prise thirty-six communes. The cantonal constitution dates in its main features from 1876. The legislature or Grossrat is composed of members elected for four years in the proportion of one to every 500 (or fraction over 250) of the population, but only communes with more than 250 inhabitants form separate electoral circles, the smaller being united for electoral purposes with their greater neighbours. The executive or Regierungsrat of five members is also elected for four years by a popular vote, as are the two members of the Federal Stdnderat and of the Federal Nationalrat. One thousand citizens have the right of " initiative " as to legislative projects and important financial matters as well as to the revision of the cantonal constitution. Since 1895 the "obligatory referendum" for all legislative projects has prevailed, as well as a curious institution (formerly existing in several cantons) by which the legislature can consult the people on certain questions involving principles and not merely on fully drafted legislative projects. The taxes are very small, while the property of the canton is the most considerable in Switzerland, so that from a financial point of view Schaffhausen is the most favoured in the country, and till recently it had no public debt at all. The numerous forests are well managed and bring in much money.

The canton arose from acquisitions made at various dates from 146 1 to 1798 by the town, which at the time of the Reforma- tion obtained possession of the outlying estates of the ecclesi- astical foundations then suppressed. The most interesting spot in the canton is the little town of Stein, with its Benedictine monastery (1005-1526), now a sort of medieval museum, and the castle of Hohenklingen towering above it. (W. A. B. C.)

SCHAFFHAUSEN, the capital of the Swiss canton of that name, situated entirely (for its suburb, Feuerthalen, is in the canton of Zurich) on rising ground above the right bank of the Rhine. Its streets are narrow (save in the modern quarters), while it is dominated by the fortress of Unnoth (wrongly called Munoth). It is by rail 31m. W. of Constance and 59 m. W. of Basel. It is a city of contrasts, medieval architecture of the true Swabian type and modern manufactures mingling curiously together. Three of the sixteen town gates survive, and many aid houses, though few have preserved

traces of the frescoes which formerly adorned their external walls. The chief ancient building in the town is the Munster (now Protestant) of All Saints, formerly a Benedictine monastery. It was consecrated in 1052, and is a good specimen of the " sternest and plainest Romanesque, finished with a single side tower near the east end, that is architecturally connected both with Italian cam- paniles and the so-called Anglo-Saxon towers of England " (E. A. Freeman). Close to it is deposited the famous 15th- century bell that suggested Schiller's Song of the Bell and the opening of Longfellow's Golden Legend. The castle of Unnoth, above the town, dates in its present form from the second half of the 16th century. It has enormously thick casemates and a tower, the platform of which (now used as a restaurant) is reached by a spiral ascent. The museum contains antiquarian and natural history collections, as well as the town library, which possesses the MSS. and books of the Swiss historian J. von Miiller (q.v.). A monument to his memory is on the promenade of the Fasenstaub, west of the town. Opposite is a building constructed in 1864 by a citizen (G. C. im Thurn) who had made his fortune in London. It is named after him the Imthurneum, and houses a theatre, a picture gallery, concert rooms and the school of music. There are a number of factories in the town, while at Neuhausen, its suburb, are aluminium works, railway rolling stock works and a manufactory of playing cards and railway tickets. Industrial development has been furthered by the hydraulic works for the utilization of the forces in the Rhine; founded 1863-1866 by H. Moser (1805-1874), a wealthy citizen, these are now the property of the town and since 1900 are worked by electricity. In 1900 the town had 15,275 inhabitants (14,684 German-speaking), while there were 11,144 Protestants, 4085 Roman Catholics and 21 Jews.

The spot is first mentioned in 1045, " Villa Scafhusun," while in 1050 we hear of the " ford " there across the Rhine. Hence it is probable that the name is really derived from scapha, a skiff, as here goods coming from Constance were disembarked in consequence of the falls of the Rhine a little below. Some writers, however, prefer the derivation from Schaf (a sheep), as a ram (now a sheep) formed the ancient arms of the town, derived from those of its founders, the counts of Nellenburg. About 1050 those counts founded here the Benedictine monastery of All Saints, which henceforth became the centre of the town. Perhaps as early as 1190, certainly in 1208, it was an imperial free city, while the first seal dates from 1253. The powers of the abbot were gradually limited and in 1277 the emperor Rudolf gave the town a charter of liberties. It ran considerable risk of becoming a part of the private estates of the Habsburgs, as the

emperor Louis of Bavaria pledged it in 1330 to that family, which held it till Duke Frederick with Empty Pockets was placed under the ban of the empire in 141 5, its freedom being finally purchased in 1418, while from 141 1 the trade gilds ruled the town. But it was much harassed by the neighbouring Austrian nobles, so that in 1454 it made an alliance with six of the Swiss confederates (Uri and Unterwalden coming in in 1479), by whom it was received as an " ally," being finally admitted a full member in 1501. The Reformation was adopted in 1524, finally in 1529. The town suffered much in the Thirty Years' War from the passage of Swedish and Bavarian troops. It was not till the early 19th century that the arrested industrial development of the town took a fresh start.

Authorities. — F. L. Baumann, Das Kloster Atterheiligen in Schaffhausen (vol.iii.of the " Quellen z. Schweizer Geschichte ") (Basel, 1881); Beitrage z. vaterlandisch. Geschichte (5 parts, 1863-1884);

E. Im-Thurn, Der Kanton Schaffhausen (St Gall and Bern, 1840); A. Pfaff, Das Staatsrecht d. alien Eidgenossenschaft (Schaff- hausen, 1870) (pp. 89-97 contain a history of Schaffhausen). In 1901 there appeared at Schaffhausen two elaborate historical " Festschriften," one for the canton and one for the town, while in 1906-1907 there were published at Schaffhausen two parts (from 987 to 1530) of an official Urkundenregister fur den Kanton Schaff- hausen. (W. A. B. C.)

SCHAFFLE, ALBERT EBERHARD FRIEDRICH (1831-1903), German statesman and political economist, was born at Niirtingen in Wiirttemberg on the 24th of February 1831, and in 1848 became a student at the university of Tubingen. From 1850 to i860 he was attached to the editorial staff of the Schwabische Merkur in Stuttgart, and in the latter year accepted a call to the chair of political economy at Tubingen. From 1862 to 1864 Schaffle was a member of the Wiirttemberg diet, and in 1868 he received a mandate to the German Zollparlament. This year he was appointed professor of political science at the university of Vienna, and in 187 1 he entered the cabinet of Karl Siegmund Graf von Hohenwart as minister of commerce for Austria. But the government fell in the same year, and Schaffle withdrew to Stuttgart, where he took up his residence, devoting himself entirely to literary work. He died at Stuttgart on the 25th of December 1903. Among his numerous writings must be mentioned Das Gesellschaftliche System der tnenschlichen Wirthschaft (new ed., 1873); Die N ationalokonomische Theorie der ausschliessenden Absatzverhdltnisse

(1867); Bau und Leben des socialen Korpers (2nd ed. 1896); Ein Votum gegen den neuesten Zolltarif (Tubingen, 1901); Die agrarische Gefahr (Berlin, 1902); Gesammelte Aufsdtze (1885-1887). From 1892 to 1901 Schaffle was the sole editor of the Zeitschrift fiir die gesamte Staatswissenschaft.

See Biermann, Schaffle und der Agrarismus (Bonn, 1902) and his autobiography, Aus meinem Leben (Berlin, 1905).

SCHALCKEN, GODFRIED (1643-1706), Dutch genre and portrait painter, was born at Dort in 1643, and studied under Hoogstraten, and afterwards under Gerhard Douw, whose works his earlier genre-pictures very closely resemble. He visited England and painted several portraits, of which the half-length of William III., now in the Museum, Amsterdam, is a good example. In this work he shows an effect of candle- light, which he also introduced — frequently with fine effect — in many of his subject-pictures. These may be studied in the collections at Buckingham Palace, the Louvre, Vienna and Dresden. His Scriptural subjects are of very indifferent merit. He died at The Hague in 1706.

SCHALL, JOHANN ADAM VON (1591-1666), Jesuit missionary in China, born of noble parents in Cologne. At the age of twenty he joined the Society of Jesus, and in 1628 went out to China. Apart from successful missionary work, he became the trusted counsellor of the emperor, was created a mandarin, and held an important post in connexion with the mathematical school. His position enabled him to procure from the emperor permission for the Jesuits to build churches and to preach throughout the country. Proselytes to the number of 100,000 are said to have been obtained within fourteen years. The emperor, however, died in 1661, and Schall's circumstances at once changed. He was imprisoned and condemned to death. The sentence was not carried out, but he died after his release owing to the privations he had endured. A collection of his MS. remains was deposited in the Vatican Library.

SCHANDAU, a town of Germany, in the kingdom of Saxony, situated on the right bank of the Elbe, at the mouth of the little valley of the Kirnitsch. It is 4 m. from the Bohemian frontier, 20 m. S.E. of Dresden on the railway to Bodenbach, and has a branch to Niederneukirch, which is carried from the railway station lying on the right bank across the Elbe by an iron bridge. Pop. (1905) 3373. Schandau has an Evangelical parish church, a hydropathic establishment and a school of river navigation. The position of Schandau in the heart of the romantic " Saxon Switzerland " has

made it a place of importance, and thousands of tourists make it their headquarters in summer. For their accommodation numerous hotels and villas have been

erected. The chief manufactures of the town are artificial flowers and furniture.

See Schafer, Fuhrer durth Schandau und seine Umgebung (Dresden,

1907).

SCHANDORPH [or Skamdrup], SOPHUS CHRISTIAN

FREDERICK (1836-1901), Danish poet and novelist, was born at Ringsted in Zealand on the 8th of May 1836. In 1855 he entered the university of Copenhagen. In 1862 he published his first volume of poetry, written in the romantic style and giving little indication of the ultimate direction that his talent was to take. Other books followed, but his gifts first found full expression in a volume of rustic tales entitled Fra Provinsen (1876), in which he described provincial character and life with much frankness of detail and a great deal of wit. In 1878 his novel, Uden Midtpunkt (" Without a Centre "), recast later in dramatic form, attracted great attention by its exposure of contemporary failings. Among the more famous of his later novels are: Thomas Friis' Historie (2 vols., 1881), Dei gamle Apothek (" The Old Apothecary ") (1855) and Helga (1900); but his most characteristic work is to be found in his various volumes of short sketches. He published his own Recollections (Oplevelser) in 1889. He died after a long illness at Frederiksberg on New Year's Day 1901.

See an article by V. M oiler in C. F. Bricka's Dansk Biografisk Lexikon (vol. xv., 1901).*

SCHARF, SIR GEORGE (1820-1895), British art critic, was born in London on the 16th of December 1820, the son of George Scharf, a Bavarian miniature painter who settled in England in 1 816 and died in i860. He studied in the schools of the Royal Academy. In 1840 he accompanied Sir Charles Fellows to Asia Minor, and in 1843 acted as draughtsman to a government expedition to the same country. After his return he devoted himself with great industry and success to the illustration of books relating to art and antiquity, of which the

best known are Macaulay's Lays of Ancient Rome (1847); Milman's Horace, (1849); Kugler's Handbook of Italian Painting (1851); and Dr Smith's classical dictionaries. He also engaged largely in lecturing and teaching, and took part in the formation of the Greek, Roman and Pompeian courts at the Crystal Palace. He acted as art secretary to the great Manchester Art Treasures Exhibition of 1857, and in that year was appointed secretary and director to the newly founded National Portrait Gallery. The remainder of his life was given to the care of that institution. Scharf acquired an unrivalled knowledge of all matters relating to historic portraiture, and was the author of many learned essays on the subject. In 1885, in recognition of his services to the Portrait Gallery, he was made C.B., and on his resignation, early in 1895, K.C.B. and a trustee of the Gallery. He died on the 19th of April of the same year.

SCHARNHORST, GERHARD JOHANN DAVID VON (1755- 1813), Prussian general, was born at Bordenau near Hanover, of a farmer stock, on the 12th of November 1755. He succeeded in educating himself and in securing admission to the military academy of Wilhelmstein, and in 1778 received a commission in the Hanoverian service. He employed the intervals of regimental duty in further self-education and literary work. In 1783 he was transferred to the artillery and appointed to the new artillery school in Hanover. He had already founded a military journal which under various names endured till 1805, and in 1788 he designed, and in part published, a Handbuch fiir Offiziers in den anwendbaren Theilen der Kriegswissenschaften. He also published in 1792 his Militarische Taschenbuch filr den Gebrauch im Felde. The income he derived from his writings was his chief means of support, for he was still a lieutenant, and though the farm of Bordenau produced a small sum annually he had a wife (Clara Schmalz, sister of Theodor Schmalz, first director of Berlin University) and family to maintain. His first campaign was that of 1 793 in the Netherlands, in which he served under the duke of York with distinction. In 1794 he took part in the defence of Menin and commemorated the escape of the garrison in his Vertheidigung der Stadt Menin (Hanover, 1803), which, next to his paper Die Ursachen des Gliicks

der Franzosen im Revolutionskrieg, is his best-known work. Shortly after this he was promoted major and employed on the staff of the Hanoverian contingent.

In 1795, after the peace of Basel, he returned to Hanover. He was by now so well known to the armies of the various allied states that from several of them he received invitations to transfer his services.

This in the end led to his engaging himself to the king of Prussia, who gave him a patent of nobility, the rank of lieutenant-colonel and a pay more than twice as large as that he had received in Hanover (1801). He was employed, almost as a matter of course, in important instructional work at the War Academy of Berlin, he had Clausewitz (q.v.) as one of his pupils, and he was the founder of the Berlin Military Society. In the mobilizations and precautionary measures that marked the years 1804 and 1805. and in the war of 1806 that was the natural consequence, Scharnhorst was chief of the general staff (lieutenant-quartermaster) of the duke of Brunswick, received a slight wound at Auerstadt and distinguished himself by his stern resolution during the retreat of the Prussian army. He attached himself to Bliicher in the last stages of the disastrous campaign, was taken prisoner with him at the capitulation of Ratkau, and, being shortly exchanged, bore a prominent and almost decisive part in the leading of L'Estocq's Prussian corps which served with the Russians. For his services at Eylau, he received the order pour le merite.

It was now evident that Scharnhorst was more than a brilliant staff officer. Educated in the traditions of the Seven Years' War, he had by degrees, as his experience widened, divested his mind of antiquated forms of war, and it had been borne in upon him that a " national " army and a policy of fighting decisive battles alone responded to the political and strategical situation created by the French Revolution. The steps by which he con- verted the professional long-service army of Prussia, wrecked at Jena, into the national army as we know it to-day, based on universal service, were slow and laboured. He was promoted major-general a few days after the peace of Tilsit, and placed as the head of a reform commission, to which were appointed the best of the younger officers such as Gneisenau, Grolman and Boyen. Stein himself became a member of the commission and secured Scharnhorst free access to the king by causing him to be appointed aide-de-camp-general. But Napoleon's suspicions were quickly aroused, and the king had repeatedly to suspend or to cancel the reforms recommended. In 1809 the war between France and Austria roused premature hopes in the patriots' party, which the conqueror did not fail to note. By direct application to Napoleon, Scharnhorst evaded the decree of the 26th of September 1810, whereby all foreigners were to leave the Prussian service forthwith, but when in 1811-1812 Prussia was forced into an alliance with France against Russia and despatched an auxiliary army to serve under Napoleon's orders, Scharnhorst left Berlin on unlimited leave of absence. In retirement he wrote and published a work on firearms, Uber die Wirkung des Feuergewehrs (1813). But

the retreat from Moscow at last sounded the call to arms for the new national army of Prussia. Scharnhorst was recalled to the king's headquarters, and after refusing a higher post was made chief of staff to Bliicher, in whose vigour, energy and influence with the young soldiers he had complete confidence. The first battle Liitzen or Gross- Gorschen was a defeat, but a very different defeat from those which Napoleon had hitherto been accustomed to inflict. In it Scharnhorst received a wound in the foot, not in itself grave, but soon made mortal by the fatigues of the retreat to Dresden, and he succumbed to it on the 8th of June at Prague, whither he had been sent to negotiate with Schwarzenberg and Radetzky for the armed intervention of Austria. Shortly before his death he had been promoted to the rank of lieutenant-general. Frederick William III. erected a statue in memory of him, by Rauch, in Berlin.

See C. von Clausewitz, tfber das Leben und den Charakter des General v. Scharnhorst; H.'v. Boyen, Beitrdge zur Kenntnis des General v. Scharnhorst; lives by Schweder (Berlin, 1865), Klippel (Leipzig, 1869); M. Lehmann (Leipzig, 1886- 1888, an important

work in two volumes); also Max Jahns, Gesch. der Kriegswissen-schaften, iii. 2154; Weise, Scharnhorst und die Durchfiihrung der allgemeinen Wehrpflicht (1892); A. von Holleben, Der Fruh-jahrsfeldzug, 1813 (1905); and F. N. Maude, The Leipzig Campaign

(1908).

SCHAUMBURG-LIPPE, a principality forming part of the German Empire, consisting of the western half of the old countship of Schaumburg, and surrounded by Westphalia, Harover and the Prussian part of Schaumburg. Area, 131 sq. m. Its northern extremity is occupied by a lake named the Steinhuder Meer. The southern part is hilly (Wesergebirge), but the remainder consists of a fertile plain. Besides husbandry, the inhabitants practise yarn-spinning and linen-weaving, and the coal-mines of the Biickeberg, on the south-eastern border, are very productive. The great bulk of the population (in 1905, 44,992), are Lutherans. The capital is Biickeburg, and Stadthagen is the only other town. Under the constitution of 1868 there is a legislative diet of 15 members, 10 elected by the towns and rural districts and 1 each by the nobility, clergy and educated classes, the remaining 2 nominated by the

prince. Schaumburg-Lippe sends one member to the Bundesrat (federal council) and one deputy to the reichstag. The annual revenue and expenditure amount each to about £41,000. The public debt is about £23,000.

SCHEDULE, originally a written strip or leaf of paper or parchment, a label or ticket, especially when attached to another document, as explaining or adding to its contents, hence any additional detailed statement such as cannot conveniently be embodied in the main statement. The word occurs first (14th century) as cedule, or sedule, representing the Fr. ced-ule (mod. cedule, cf. Ital. cedola, Ger. Zettel, &c), which is derived from Late Lat. scedida or schedula, dim. of sceda, a written strip of parchment (late Gr. (rxe&j), probably from scindere, to cleave, cf. scindala, a shingle. The original pronunciation in English was sedule, the modern pronunciation is shedule; American usage has gone back to the original Latin or Greek, and adopts skedule.

SCHEELE, KARL WILHELM (1742-1786), Swedish chemist, was born at Stralsund, the capital of Pomerania, which then belonged to Sweden, on the 19th of December 1742. He was apprenticed at the age of fourteen to an apothecary in Gothen- burg, with whom he stayed for eight years. His spare time and great part of his nights were devoted to the experimental ex- amination of the different bodies which he dealt with, and the study of the standard works on chemistry. He thus acquired a large store of knowledge and great practical skill and manipula- tive dexterity. In 1765 he removed to Malmo, and in 1768 to Stockholm. While there he wrote an account of his experiments with cream of tartar, from which he had isolated tartaric acid, and sent it to T. O. Bergman, the leading chemist in Sweden. Berg- man somehow neglected it, and this caused for a time a reluctance on Scheele's part to become acquainted with that savant, but the paper, through the instrumentality of Anders Johann Retzius (1742-1821), was ultimately communicated to the Academy of Sciences at Stockholm. He left Stockholm in 1770 and took up his residence at Upsala, where through the agency of Johann Gottlieb Gahn (1 745-1818) , assessor of mines at Fahlun, he made the personal acquaintance of Bergman. A friendship, of mutual advantage, soon sprang up between the two men, and it has been said that Scheele was Bergman's greatest discovery. In 1775, the year in which he was elected into the Stockholm Academy of Sciences, he left Stockholm for Koping, a small place on Lake Malar, where he became provisor and subsequently proprietor of a pharmacy. The business, however, was not what he had been led to expect, and it took him several years to put it on a sound footing. Yet

in spite of his business cares he found time for an extraordinary amount of original research, and every year he published two or three papers, most of which contained some discovery or observation of importance. His unremitting work, it is said, especially at night, exposing him to cold and draughts, induced a rheumatic attack which brought about his death. He had intended, as soon as his circumstances permitted him, to marry the widow of his predecessor, but his illness

increased so rapidly that it was only on his death-bed, on the 19th of May 1786, that he carried out his design. Two days later he died, leaving his wife what property he had acquired.

Scheele's power as an experimental investigator has seldom if ever been surpassed, and his accuracy is most remarkable when his primitive apparatus, his want of assistance, his place of residence, and the undeveloped state of chemical and physical science in his time, are all taken into account. Research was at once his occupation and his relaxation, and his natural endow- ments were cultivated by unceasing practice and unwearied attention. Study of his original papers shows that his dis- coveries were not made at haphazard, but were the outcome of experiments carefully planned to verify inferences already drawn, and successfully designed to settle the point at issue in the simplest and most direct manner. He left nothing in doubt if experiment would decide it, and he evidently did not consider that he had fully investigated any compound until he could both unmake and remake it. His record as a discoverer of new sub- stances is probably unequalled. The analysis of manganese dioxide in 1774 led him to the discovery of chlorine and baryta; to the description of various salts of manganese itself, including the manganates and permanganates, and to the explanation of its action in colouring and decolourizing glass. In 177 5 he investigated arsenic acid and its reactions, discovering arseniuretted hydrogen and " Scheele's green " (copper arsenite), a process for preparing which on a large scale he published in 1778. Papers published in 1776 were concerned with quartz, alum and clay and with the analysis of calculus vesicae from which for the first time he obtained uric acid. In 1778 he proposed a new method of making calomel and powder of algaroth, and he got molybdic acid from mineral molybdaena nitens which he carefully distinguished from ordinary molybdena (plumbago or black lead of commerce) . In the follow- ing year he showed that plumbago consists essentially of carbon, and he published a record of estimations of the proportions of oxygen in the atmosphere, which he had carried on daily during the whole of 1778 — three years before Cavendish. In 1780 he proved that the acidity

of sour milk is due to what was after- wards called lactic acid; and by boiling milk sugar with nitric acid he obtained mucic acid. His next discovery, in 1781, was the composition of the mineral tungsten, since called scheelite (calcium tungstate), from which he obtained tungstic acid. In 1782 he published some experiments on the formation of ether, and in 1783 examined the properties of glycerine, which he had discovered seven years before. About the same time he showed by a wonderful series of experiments that the colouring matter of Prussian blue could not be produced without the presence of a substance of the nature of an acid, to which the name of prussic acid was ultimately given; and he described the com- position, properties and compounds of this body, and even ascertained its smell and taste, quite unaware of its poisonous character. In the last years of his life he returned to the vegetable acids, and investigated citric, malic, oxalic and gallic acids. His only book, on Air and Fire, was published in 1777, but was written some years before. The manuscript was in the hands of the printers in 1775, and most of the experimental work for it was done before 1773. Although it starts from the erroneous basis of the phlogistic theory, it contains much matter of per- manent value. One of the chief observations recorded in it is that the atmosphere is composed of two gases — one which supports combustion and the other which prevents it. The former, " fire-air," or oxygen, he prepared from " acid of nitre," from saltpetre, from black oxide of manganese, from oxide of mercury and other substances, and there is little doubt but that he obtained it independently a considerable time before Priestley. Incidentally in 1777 Scheele prepared sulphuretted hydrogen, and noted the chemical action of light on silver compounds and other substances.

A list of Scheele's papers is given in Poggendorff's Biographisch-literarisches Handworterbuch (Leipzig, 1863). They were collected and published in French as Memoires de chymie (Paris, 1 785-1 788); in English as Chemical Essays, by Thomas Beddoes (London, 1786)1 in Latin as Opuscula, translated by Schafer, edited by Hebenstreit (Leipzig, 1788-1789); and in German as Sdmmtliche Werke, edited*

by Hermbstadt (Berlin, 1793). The treatise on Air and Fire appeared in German, Leipzig and Upsala in 1777, and again in 1782; in English, by J. R. Forster (London, 1780); and in French, by Dietrich

(Paris, 1781).

SCHEELITE, a mineral consisting of calcium tungstate, CaW0 4 . It was early known as " tungsten " (meaning in Swedish, " heavy stone "), and is the mineral in which K. W. Scheele discovered tungstic acid, hence the name scheelite. Well-developed crystals are not infrequent ; they usually have the form of acute tetragonal bipyramids (P in fig.); sometimes other pyramid-faces are present, and these (g and n) being developed on only one side of P indicate the parallel-faced hemihedrism of the crystals. Compact and granular masses also occur. The colour is usually yellowish white or brownish, the crystals sometimes transparent to translucent; the lustre vitreous to adamantine. The hardness is 45, the specific gravity 6-o. Molybdenum is usually present, replacing an equivalent amount of tungsten; and in a green variety known as " cupro-scheelite " part of the calcium is replaced by copper.

Scheelite usually occurs with topaz, fluor, apatite, wolframite, &c, in tin- bearing veins; and is sometimes found in association with gold. Fine crystals have been obtained from Caldbeck Fells in Cumberland, Zinnwald and Elbogen in Bohemia , Guttannen in Switzerland, the Riesengebirge in Silesia, Dragoon Mountains in Arizona and elsewhere. At Trumbull in Connecticut and Kimpu-san in Japan large crystals of scheelite completely altered to wolframite have been found: those from Japan have been called " reinite."

SCHEEMAKERS, PETER (1 691-17 70), Flemish sculptor, was born in Antwerp, and learnt his art from his father and from Delvaux. After visiting Denmark and walking thence to Rome for purposes of study, he returned on foot to the port of embarca- tion for England, but stayed in London but a short while. From 1728 to 1735 he again sojourned in Rome and then settled in England, where he remained from 1735 to 1770, returning in the latter year to his native city where he died a few months afterwards. He worked for a time with Francis Bird, the pupil of Grinling Gibbons. Fifteen of his works — monuments, figures and busts — are in Westminster Abbey, two executed in collabo- ration with his master Delvaux: the " Hugh Chamberlen " (d. 1728, and therefore perhaps produced during his first visit to London) and " Catherine, duchess of Buckinghamshire." He is best, though not most creditably, known to fame by his monu- ment to Shakespeare (1740), but as this work was designed by Kent the blame for the errors of taste therein displayed must not be laid to Scheemakers' account. In addition to these may be mentioned the monuments to Admiral Sir Charles Wager, Vice-Admiral Watson, Lieut.-General Percy Kirk, George Lord Viscount Howe, General

Monck, and Sir Henry Belasye. His busts of John Dryden (1720) and Dr Richard Mead (1754), also in the Abbey, are among the best of his smaller works. The most important of his monuments elsewhere, as mentioned by Walpole, are those to the 1st and 2nd dukes of Ancaster at Edenham, Lincolnshire; Lord Chancellor Hardwicke at Wimpole, Cambridgeshire; the duke of Kent, his wives and daughters, at Fletton, Bedfordshire; the earl of Shelburne, at Wycombe, Bucks; and the figure on the sarcophagus to Montague Sherrard Drake, at Amersham. Although less esteemed as an artist than Rysbrack and Roubiliac, Scheemakers was a very popular and widely-employed sculptor in his day, whose influence was considerable; he was the master of Nollekens, and left a son, Thomas Scheemakers, who produced a considerable amount of work, and exhibited in the Royal Academy from 1782-1804.

See Walpole's Anecdotes of Painting, vol. 3 (ed. 1876), and Dictionary of National Biography.

SCHEFER, LEOPOLD (1784-1862), German poet and novelist, was born at Muskau in Lower Lusatia on the 30th of July 1784,

and educated at the gymnasium of Bautzen. In 1813, he was appointed manager of the estates of Prince Piickler-Muskau (q.v.) . The prince, recognizing the literary abilities of the young man, encouraged his early poetical efforts and gave him the means to travel. After visiting England, Italy, Greece and Turkey, Schefer returned in 1820 to Muskau, where he lived in easy circumstances and with abundant leisure for his literary pursuits, until his death on the 16th of February 1862. Schefer wrote a large number of short stories which appeared in several series, Novellen (5 vols., 1825-1829); Neue Novellen (4 vols., 1831- 1835); Lavabecher (2 vols., 1833); Kleine Romane (6 vols., 1836- 1837). The historical novel Die Grdfin Ulfeld (2 vols., 1834), and the piquant satire, Die Sibylle von Mantua (1852), were published separately. But Schefer is less known for his novels which are lacking in plastic power and creative imagination, than for a volume of charming poems, Laienbrevier (1834-1835). These, owing to their warmth of feeling and fascinating descrip- tions of the beauties of nature, at once established his fame as a poet. This vein, in close imitation of his friend the poet Richard Georg Spiller von Hauenschild, known under the pseudonym Max Waldau (1822-1855), he followed in later years with the poems Vigilien (1843), Der Weltpriester (1846), and Hausreden (1869). His Hafis in Hellas (Hamburg, 1853) and Koran der Liebe (Hamburg, 1855) contain with their glowing descriptions of the East, original poetry of a high order.

A selection of Schefer's works, Ausgewahlte Werke, in 12 vols., was published in 1845 (2nd ed., 1857). See J. Schmidt, Geschichte der deutschen Literatur im 19. Jahrhundert, vol. ii. ; E. Brenning Leopold Schefer (1884) ; and L. Geiger in Dichter und Frauen (1896).

SCHEFFEL, JOSEPH VIKTOR VON (1826-1886), German poet and novelist, was born at Karlsruhe on the 16th of : February 1826. His father, a retired major in the Baden army, was a civil engineer and member of the commission for regulating the course of the Rhine; his mother, nee Josephine Krederer, the daughter of a prosperous tradesman at Oberndorf on the Neckar, was a woman of great intellectual powers and of a romantic disposition. Young Scheffel was educated at the lyceum at Karlsruhe and afterwards (1843-1847) at the universities of Munich, Heidelberg and Berlin. After passing the state examina- tion for admission to the judicial

service, he graduated doctor juris and for four years (1848-1852) held an official position at Sackingen. Here he wrote his poem Der Trompeter von Sackingen (1853), a romantic and humorous tale which immediately gained extraordinary popularity. It has reached more than 250 editions. Scheffel next undertook a journey to Italy. Returning home in 1853 he found his parents more than ever anxious that he should continue his legal career. But in 1854, defective eyesight incapacitated him; he quitted the government service and took up his residence at Heidelberg, with the intention of preparing himself for a post on the teaching staff of the university. His studies were, however, interrupted by eye- disease, and in search of health he proceeded to Switzerland and took up his abode on the Lake of Constance, and elaborated the plan of his famous historical romance Ekkehard (1857); (Eng. trans, by S. Delffs, Leipzig, 1872). The first ideas for this work he got from the Monumenta Germaniae. It gained popularity hardly inferior to that of the Trompeter von Sackingen. In 1901 it had reached the 179th edition. Scheffel next returned to Heidelberg, and published Gaudeamus, Lieder aus dem Engeren und Weiteren (1868), a collection of joyous and humorous songs, the matter for which is taken partly from German legends, partly from historical subjects. In these songs the author shows himself the light-hearted student, a friend of wine and song; and their success is unexampled in German literature and encouraged numerous imitators. For two years (1837-1859) Scheffel was custodian of the library of Prince Egon von Fiirsten- berg at Donaueschingen, but giving up his appointment in 1859, visited Joseph Freiherr von Lassberg, at Meersburg on the Lake of Constance, stayed for a while with the grand duke Charles Alexander of Saxe- Weimar at the Wartburg in Thuringia, then, settling at Karlsruhe, he married in 1864 Caroline von Malzen, and, in 1872, retired to his Villa Seehalde near Radolfzell

on the lower lake of Constance. On the occasion of his jubilee (1876), which was celebrated all over Germany, he was granted a patent of hereditary nobility by the grand duke of Baden. He died at Karlsruhe on the 9th of April 1886.

His works, other than those already mentioned, are FrauAventiure. Lieder aus Heinrich von Ofterdingens Zeit (1863); Juniperus, Ge- schichte eines Kreuzfahrers (1866) ; Bergpsalmen (1870) ; Waldeinsam- keit (1880) ; Der Heini von Steier (1883); and

Hugideo, eine alte Ge- schichte (1884). Volumes of Reisebilder (1887); Episteln (1892); and Briefe (1898) were published posthumously. Scheffel's Gesam- melle Werke have been published in six volumes (1907). Cf. also A. Ruhemann, Joseph Victor von Scheffel (1887); G. Zemin, Erin- nerungen an Joseph Victor von Scheffel (1887) ; J. Prolss, Scheffels Leben und Dichten (1887); L. von Kobell, Scheffel und seine Frau (1901) ; E. Boerschel, /. V. von Scheffel und Emma Heim (1906).

SCHEFFER, ARY (1795-1858), French painter of Dutch extraction, was born at Dort on the 10th of February 1795. After the early death of his father, a poor painter, Ary was taken to Paris and placed in the studio of Guerin by his mother, a woman of great energy and character. The moment at which Scheffer left Guerin coincided with the commencement of the Romantic movement. He had little sympathy with the directions given to it by either of its most conspicuous representatives, Sigalon, Delacroix or Gericault, and made various tentative efforts — " Gaston de Foix " (1824), " Suliot Women " (1827)— before he found his own path. Immediately after the exhibition of the last-named work he turned to Byron and Goethe, selecting from Faust a long series of subjects which had an extraordinary vogue. Of these, we may mention " Margaret at her Wheel "; " Faust Doubting "; " Margaret at the Sabbat "; " Margaret Leaving Church "; the " Garden Walk "; and lastly, perhaps the most popular of all, " Margaret at the Well." The two " Mignons " appeared in 1836; and " Francesca da Rimini," which is on the whole Scheffer's best work, belongs to the same period. He now turned to religious subjects: " Christus Consolator " (1836) was followed by " Christus Remunerator," " The Shepherds Led by the Star " (1837), " The Magi Laying Down their Crowns," " Christ in the Garden of Olives," " Christ bearing his Cross," " Christ Interred" (1845), " St Augustine and'Monica " (1846), after which he ceased to exhibit, but, shut up in his studio, continued to produce much which was first seen by the outer world after his death, which took place at Argenteuil on the 15th of June 1858. At the posthumous exhibition of his works there figured the " Sorrows of the Earth," and the " Angel Announcing the Re- surrection, ' ' which he had left unfinished. Amongst his numerous portraits those of La Fayette, Beranger, Lamartine and Marie Amelie were the most noteworthy. His reputation, much shaken by this posthumous exhibition, was further undermined by the sale of the Paturle Gallery, which contained many of his most celebrated achievements; the charm and facility of their com- position could not save them from the condemnation provoked by their poor and earthy colour and vapid

sentiment. Scheffer, who married the widow of General Baudrand, was only made commander of the Legion of Honour in 1848— that is, after he had wholly withdrawn from the Salon. His brother Henri, born at the Hague on the 27th of September 1798, was also a fertile painter.

See Vitet's notice (1861) prefixed to Bingham's publication of works of A. Scheffer; Etex, Ary Scheffer; Mrs Grote, Life of A. Scheffer (i860).

SCHELANDRE, JEAN DE (c. 1585-1635), Seigneur de Saumazenes, French poet, was born about 1585 near Verdun of a Calvinist family. He studied at the university of Paris and then joined Turenne's army in Holland, where he gained rapid advancement. He was the author of a tragedy, Tyr el Sidon, on les funestes amours de Belcar et Mttiane, published in 1608 under the anagram-name Daniel d'Ancheres, and reprinted with numerous changes in 1628 under the author's own name. In defiance of all rules the action proceeds alternately at Tyre, where Belcar, prince of Sidon, is a prisoner, and at Sidon where Leonte, prince of Tyre, is a prisoner and pursues his gallant adventures. The play, which was divided into two days and ten acts, had a complicated plot and contained 5000 lines. It required an immense stage on which the two towns should

be represented, with a field between, where the contests should take place. It is noteworthy as an attempt to introduce the liberty of the Spanish and English drama into France, thus anticipating the romantic revolt of the 19th century. It has been suggested that Schelandre was directly acquainted with Shakespearian drama, but of this thers is no direct proof, although he appears to have spent some time in England and to have seen James I. Tyr et Sidon is reprinted in the 8th volume of the Ancien Theatre frangais. Schelandre was also the author of a Stuartide (16 n), and of Les Sept Excellents Travaux de la penitence de Saint Pierre (1636). He pursued his military career to the end of his life, dying at Saumazenes in 1635 from wounds received in the German campaign of Louis d'Epernon, Cardinal de la Valette.

See Ch. Asselineau, Jean de Schelandre (Paris, 1854).

SCHELDT (Fr. Escaut, Flem. Schelde), a river rising near Catelet in France, entering Belgium near Bleharies in Hainaut, and flowing past Tournai, Oudenarde, Ghent and Termonde till it reaches Antwerp. Some distance below Antwerp, in front of the island Beveland, where the river divides into two channels, respectively north and south of

the island, both banks belong to Holland. Of the two channels named, the southern, which reaches the sea at Flushing, is the more important and is used for ocean commerce. The Scheldt has a length of 250 m., of which, by a skilful arrangement of locks, not less than 207 rn. are navigable. The principal tributaries are the Lys and the Dender. By the treaty of Munster in 1648 the Dutch obtained the right to close the Scheldt to navigation, and they clung tenaciously to it for over two centuries. In 1839 on the final dissolution of the kingdom of the Netherlands, Holland gave definite form to this right by fixing the toll, and by obtaining the assent of the powers to the arrangement which fettered the trade of Antwerp. In 1863 alter l° n S negotiations Belgium bought up this right — each of the powers interested in the trade contributing its quota— and the navigation of the Scheldt was then declared free.

SCHELER, JEAN AUQUSTE ULRIC (1810-1890), Belgian philologist, was born at Ebnat, Switzerland, in 1819. His father, a German, was chaplain to King Leopold I. of Belgium, and Jean Scheler, after studying at Bonn and Munich, became King's librarian and professor at the Brussels Free University. His investigations in Romance philology earned him a wide reputation. He died at Ixelles, Belgium, in 1800.

The most important of his numerous philological works are: Memoire sur la conjugaison francaise ccnsideree sous le rapport Uymologique (Brussels, 1 84.7), Dictionnaire d'etymologie francaise d'apres les resultats de la science moderne (Brussels, 1862), Etude sur la transformation francaise des mots latins (Ghent, 1869). He also edited the fourth edition of Diez's Etymologisches Worterbuch der romanischen Sprachen (Bonn, 1878), and completed Grandgagnage's Dictionnaire Uymologique de la langue ivallonne (Louvain, i8<3o). He also published several critical editions of middle ages texts, including one of Les Poesies de Froissart (Brussels, 1870-1872), and a monograph Sur le sejour de Vapoire saint Pierre & Rome (Brussels, 1845), which was translated into German and English.

SCHELLING, FRIEDRICH WILHELM JOSEPH VON (1775- 1854), German philosopher, was born on the 27th of January 1775. at Leonberg, a small town of Wurttemberg. He was educated at the cloister school of Bebenhausen, near Tubingen, where his father, an able Orientalist, was chaplain and professor, and at the theological seminary at Tubingen, which he was specially allowed to enter when he was threo years under the prescribed age. Among his (elder) contemporaries were Hegel and Holderlin. In 1 792 he graduated in

the philosophical faculty. In 1793 he contributed to Paulus's Memorabilien a paper " t)ber Mythus, historische Sagen, und Philosopheme der altesten Welt"; and in 1795 his thesis for his theological degree was De Marcione Paullinarum epistolarum emendatore. Meanwhile a much more important influence had begun to operate on him, arising out of his study of Kant and Fichte. The Review of Aenesidemus and the tractate On the Notion of Wissen-schaftslehre found in his mind most fruitful soil. With character- istic zeal and impetuosity Schelling had no sooner grasped the leading ideas of Fichte's amended form of the critical philosophy than he put together his impressions of it in his Uber die Moglichkeit

einer Form der Philosophic iiberhaupt (1794). There was nothing original in the treatment, but it showed such power of appreciat- ing the new ideas of the Fichtean method that it was hailed with cordial recognition by Fichte himself, and gave the author immediately a place in popular estimation as in the foremost rank of existing philosophical writers. The more elaborate work, Vom Ich als Princip der Philosophic, oder ilber das Unbedingle im pienschlichen Wissen (1795), which, still remaining within the limits of the Fichtean idealism, however, exhibits unmistak- able traces of a tendency to give the Fichtean method a more objective application, and to amalgamate with it Spinoza's more realistic view of things.

After two years as tutor to two youths of noble family, Schelling was called as extraordinary professor of philosophy to Jena in midsummer 1798. He had already contributed articles and reviews to the Journal of Fichte and Niethammer, and had thrown himself with all his native impetuosity into the study of physical and medical science. From 1796 date the Brief e ilber Dogmatismus und Kriticismus, an admirably written critique of the ultimate issues of the Kantian system; from 1797 the essay entitled New Deduction des Naturrechts, which to some extent anticipated Fichte's treatment in the Grundlage des Naturrechts, published in 1796, but not before Schelling's essay had been received by the editors of the Journal. 1 His studies of physical science bore rapid fruit in the Ideen zu einer Philosophic der Natur (1797), and the treatise Von der Weltseele

(1798).

The philosophical renown of Jena reached its culminating point

*during the years (1798-1803) of Schelling's residence there. His intellectual sympathies united him closely with some of the most active literary tendencies of the time. With Goethe, who viewed with interest and appreciation the poetical fashion of treating fact characteristic of the Naturphilosophie, he continued on excellent terms, while on the other hand he was repelled by Schiller's less expansive disposition, and failed alto- gether to understand the lofty ethical idealism that animated his work. He quickly became the acknowledged leader of the Romantic school whose impetuous litterateurs had begun to tire of the cold abstractions of Fichte. In Schelling,*es3entially a self-conscious genius, eager and rash, yet with undeniable power, they hailed a personality of the true Romantic type. With August Wilhelm Schlegel and his gifted wife Caroline, herself the embodiment of the Romantic spirit, Schelling's relations were of the most intimate kind, and a marriage between Schelling and Caroline's young daughter, Auguste Bohmer, was vaguely contemplated by both. Auguste's death in 1800 (due partly to Schelling's rash confidence in his medical know- ledge) drew Schelling and Caroline together, and Schlegel having removed to Berlin, a divorce was, apparently with his consent, arranged. On the 2nd of June 1803 Schelling and Caroline were married, and with the marriage Schelling's life at Jena came to an end. It was full time, for Schelling's undoubtedly overweening self-confidence had involved him in a series of disputes and quarrels at Jena, the details of which are important only as illustrations of the evil qualities in Schelling's nature which deface much of his philosophic work.*

From September 1803 until April 1806 Schelling was professor at the new university of Wurzburg. This period was marked by considerable changes in his views and by the final breach on the one hand with Fichte and on the other hand with Hegel. In Wurzburg Schelling had had many enemies. He embroiled himself with his colleagues and also with the government. In Munich, to which he removed in 1806, he found a quiet residence. A position as state official, at first as associate of the academy of sciences and secretary of the academy of arts, afterwards as secretary of the philosophical section of the academy of sciences, gave him ease and leisure. Without resigning his official position he lectured for a short time at Stuttgart, and

1 The reviews of current philosophical literature were afterwards collected, and edited under the title " Abhandlungen zur Erlauterung des Idealismus der Wissenschaftslehre " in Schelling's Philos. Schriften, vol. i. (1809).

during seven years at Erlangen (1820-1827). In 1809 Caroline died,

and three years later Schelling married one of her closest friends, Pauline Gotter, in whom he found a faithful companion. During the long stay at Munich (1806-1841) Schelling's literary activity seemed gradually to come to a standstill. The " Aphorisms on Naturphilosophie " contained in the Jahrbiicher der Medicin als Wissenschaft (1806-1808) are for the most part extracts from the Wurzburg lectures; and the Denkmal der Schrift von den gottlichen Dingen des Herrn Jacobi was drawn forth by the special incident of Jacobi's work. The only writing of significance is the " Philosophische Untersuchungen iiber das Wesen der menschlichen Freiheit," which appeared in the Philosophische Schriften. vol. i. (1809), and which carries out, with increasing tendency to mysticism, the thoughts of the previous work, Philosophic und Religion. In 1815 appeared the tract Uber die Gottheiten zu Samothrake, ostensibly a portion of a great work, Die Weltalter, frequently announced as ready for publication, of which no great part was ever written. Probably it was the overpowering strength and influence of the Hegelian system that constrained Schelling to so long a silence, for it was only in 1834, after the death of Hegel, that, in a preface to a translation by H. Beckers of a work by Cousin, he gave public utterance to the antagonism in which he stood to the Hegelian and to his own earlier conceptions of philosophy. The antagon- ism certainly was not then a new fact; the Erlangen lectures on the history of philosophy (Sammt. Werke, x. 124-125) of 1822 express the same in a pointed fashion, and Schelling had already begun the treatment of mythology and religion which in his view constituted the true positive complement to the negative of logical or speculative philosophy. Public attention was power- fully attracted by these vague hints of a new system which promised something more positive, as regards religion in parti- cular, than the apparent results of Hegel's teaching. For the appearance of the critical writings of Strauss, Feuerbach and Bauer, and the evident disunion in the Hegelian school itself had alienated the sympathies of many from the then dominant philosophy. In Berlin particularly, the headquarters of the Hegelians, the desire found expression to obtain officially from Schelling a treatment of the new system which he was understood to have in reserve. The realization of the desire did not come about till 1841, when the appointment of Schelling as Prussian privy councillor and member of the Berlin Academy, gave him the right, a right he was requested to exercise, to deliver lectures in the university. The opening lecture of his course was listened to by a large and appreciative audience. The enmity of his old foe, H. E. G. Paulus, sharpened by Schelling's apparent success, led to the surreptitious publication of a verbatim report of the lectures on the

philosophy of revelation, and, as Schelling did not succeed in obtaining legal condemnation and suppression of this piracy, he in 1845 ceased the delivery of any public courses. No authentic information as to the nature of the new positive philosophy was obtained till after his death (at Bad Rogaz, on the 20th of August 1854), when his sons began the issue of his collected writings with the four volumes of Berlin lectures: vol. i. Introduction to the Philosophy of Mythology (1856); ii. Philosophy of Mythology (1857); iii. and iv. Philosophy of Revelation (1858).

Philosophy. — Whatever judgment one may form of the total worth of Schelling as a philosopher, his place in the history of that important movement called generally German philosophy is unmistakable and assured. It happened to him, as he himself claimed, to turn a page in the history of thought, and one cannot ignore the actual advance upon his predecessor achieved by him or the brilliant fertility of the genius by which that achievement was accomplished. On the other hand he nowhere succeeds in attaining to a complete scientific system. His philosophical writings are the successive manifestations of a restless highly endowed spirit, striving unsuccessfully after a solution of its own problems. Such unity as they possess is a unity of tendency and endeavour; in some respects the final form they assumed is the least satisfactory. Hence it has come about that Schelling remains for the philosophic student but a moment of historical value in the development of thought, and that his works have for the most part ceased now to have more than historic interest.

It is not unfair to connect the apparent failings of Schelling's

philosophizing with the very nature of the thinker and with the historical accidents of his career. In his early writings, for example, more particularly those making up Naturphilosophie , one finds in painful abundance the evidences of hastily acquired knowledge, impatience of the hard labour of minute thought, over-confidence in the force of individual genius, and desire instantaneously to present even in crudest fashion the newest idea that has dawned upon the thinker. Schelling was prematurely thrust into the position of a foremost productive thinker ; and when the lengthened period of quiet meditation was at last forced upon him there un- fortunately lay before him a system which achieved what had dimly been

involved in his ardent and impetuous desires. It is not possible to acquit Schelling of a certain disingenuousness in regard to the Hegelian philosophy; and if we claim for him perfect disinterestedness of view we must accuse him of deficient insight.

At all stages of his thought he called to his aid the forms of some other system. Thus Fichte, Spinoza, Jakob Boehme and the Mystics, and finally, the great Greek thinkers with their Neoplatonic, Gnostic, and Scholastic commentators, give respectively colouring to particular works. But Schelling did not merely borrow, he had genuine philosophic spirit and no small measure of philosophic insight, and under all the differences of exposition which seem to constitute so many differing systems, there is one and the same philosophic effort and spirit. But what Schelling did want was power to work out his ideas methodically. Hence he could only find expression for himself in forms of this or that earlier philosophy, and hence too the frequent formlessness of his own thought, the tendency to relapse into mere impatient despair of ever finding an adequate vehicle for transmitting thought. It is fair in dealing with Schelling's development to take into account the indications of his own opinion regarding its more significant momenta. In his own view the turning points seem to have been — (i) the transition from Fichte's method to the more objective conception of nature — the advance, in other words, to Naturphilosophie \ (2) the definite formulation of that which implicitly, as Schelling claims, was in- volved in the idea of Naturphilosophie, viz. the thought of the identical, indifferent, absolute substratum of both nature and spirit, the advance to Identitdtsphilosophie; (3) the opposition of negative and positive philosophy, an opposition which is the theme of the Berlin lectures, though its germs may. be traced back to 1804. Only what falls under the first and second of the divisions so indicated can be said to have discharged a function in developing philosophy; only so much constitutes Schelling's philosophy proper.

I. Naturphilosophie. — The Fichtean method had striven to exhibit the whole structure of reality as the necessary implication of self-consciousness. The fundamental features of knowledge, whether as activity or as sum of apprehended fact, and of conduct had been deduced as elements necessary in the attainment of self-consciousness. Fichtean idealism therefore at once stood out negatively, as abolishing the dogmatic conception of the two real worlds, subject and object, by whose interaction cognition and practice arise, and as amending the critical idea which retained with dangerous caution too many fragments of dogmatism; positively, as insisting on the unity of philosophical interpretation and as supplying a key to the form or

method by which a completed philosophic system might be constructed. But the Fichtean teaching appeared on the one hand to identify too closely the ultimate ground of the universe of rational conception with the finite, individual spirit, and on the other hand to endanger the reality of the world of nature by regarding it too much after the fashion of subjective idealism, as mere moment, though necessitated, in the existence of the finite thinking mind. It was almost a natural consequence that Fichte never succeeded in amalgamating with his own system the aesthetic view of nature to which the Kritik of Judgment had pointed as an essential component in any complete philosophy.

From Fichte's position Schelling started. From Fichte he derived the ideal of a completed whole of philosophic conception and also the formal method to which for the most part he continued true. The earliest writings tended gradually towards the first important advance. Nature must not be conceived as merely abstract limit to the infinite striving of spirit, as a mere series of necessary thoughts for mind. It must be that and more than that. It must have reality for itself, a reality which stands in no conflict with its ideal character, a reality the inner structure of which is ideal, a reality the root and spring of which is spirit. Nature as the sum of that which is objective, intelligence as the complex of all the activities making up self-consciousness, appear thus as equally real, as alike exhibiting ideal structure, as parallel with one another. The philosophy of nature and transcendental philosophy are the two complementary portions of philosophy as a whole.

Animated with this new conception Schelling made his hurried rush to Naturphilosophie, and with the aid of Kant and of frag- mentary knowledge of contemporary scientific movements, threw off in quick succession the Ideen, the Weltseele, and the Erster Enhuurf. Naturphilosophie has had scant mercy at the hands of modern science. Schelling had neither the strength of thinking nor the acquired knowledge necessary to hold the balance between the abstract treatment of cosmological notions and the concrete researches of special science. His efforts after a construction of natural reality are bad in themselves, and gave rise to wearisome and useless

physical speculation. Yet it would be unjust to ignore the many brilliant and sometimes valuable thoughts that are scattered throughout the writings on Naturphilosophie — thoughts to which Schelling himself is but too frequently untrue. Regarded merely as a criticism of the notions with which scientific interpretation proceeds, these writings have still importance and might have achieved more had

they been untainted by the tendency to hasty, ill-considered, a priori anticipations of nature.

Nature, as having reality for itself, forms one completed whole. Its manifoldness is not then to be taken as excluding its funda- mental unity; the divisions which our ordinary perception and thought introduce into it have not absolute validity, but are to be interpreted as the outcome of the single formative energy or complex of forces which is the inner aspect, the soul of nature This we are in a position to apprehend and constructively to exhibit to ourselves in the successive forms which its development assumes, for it is the same spirit, though unconscious, of which we become aware in self-consciousness. It is the realization of spirit. Nor is the variety of its forms imposed upon it from without; there is neither external teleology in nature, nor mechanism in the narrower sense. Nature is a whole and forms itself; within its range we are to look for no other than natural explanations. The function of Naturphilosophie is to exhibit the ideal as springing from the real, not to deduce the real from the ideal. The incessant change which experience brings before us, taken in conjunction with the thought of unity in pro- ductive force of nature, leads to the all-important conception of the duality, the polar opposition through which nature, expresses "tself in its varied products. The dynamical series of stages in nature, the forms in which the ideal structure of nature is realized, are matter, as the equilibrium of the fundamental expansive and con- tractive forces; light, with its subordinate processes — magnetism, electricity, and chemical action; organism, with its component phases of reproduction, irritability and sensibility. 1

Just as nature exhibits to us the series of dynarnical stages of processes by which spirit struggles towards consciousness of itself, so the world of intelligence and practice, the world of mind, exhibits the series of stages through which self-consciousness with its inevit- able oppositions and reconciliations develops in its ideal form. The theoretical side of inner nature in its successive grades from sensation to the highest form of spirit, the abstracting reason which emphasizes the difference of subjective and objective, leaves an unsolved problem which receives satisfaction only in the practical, the individualizing activity. The practical, again, taken in con- junction with the theoretical, forces on the question of the recon- ciliation between the free conscious organization of thought and the apparently necessitated and unconscious mechanism of the objective world. In the notion of a teleological connexion and in that which for spirit is its subjective expression, viz. art and genius, the sub- jective and objective find their point of union.

2. Nature and spirit, Naturphilosophie and Transcendentalphilosophie, thus stand as two relatively complete, but complementary parts of the whole. It was impossible for Schelling, the animating principle of whose thought was ever the reconciliation of differences, not to take and to take speedily the step towards the conception of the uniting basis of which nature and spirit are manifestations, forms, or consequences. For this common basis, however, he did not succeed at first in finding any other than the merely negative expression of indifference. The identity, the absolute, which underlay all difference, all the relative, is to be characterized simply as neutrum, as absolute undifferentiated self-equivalence. It lay in the very nature of this thought that Spinoza should now offer himself to Schelling as the thinker whose form of presentation came nearest to his new problem. The Darstellung meines Systems, and the more expanded and more careful treatment contained in the lectures on System der gesammten Philosophic und der Naturphilosophie insbeson- dere given in Wiirzburg, 1804 (published in the Sammtliche Werke, vol. vi. pp. 131-576), are thoroughly Spinozistic in form, and to a large extent in substance. They are not without value, indeed, as extended commentary on Spinoza. With all his efforts, Schelling does not succeed in bringingˆ his conceptions of nature and spirit into any vital connexion with the primal identity, the absolute indifference of reason. No true solution could be achieved by resort to the mere absence of distinguishing, differencing feature. The absolute was left with no other function than that of removing all the differences on which thought turns. The criticisms of Fichte, and more particularly of Hegel (in the " Vorrede " to the Phano- menologie des Geistes), point to the fatal defect in the conception of the absolute as mere featureless identity.

3. Along two distinct lines Schelling is to be found in all his later writings striving to amend the conception, to which he re- mained true, of absolute reason as the ultimate ground of reality. It was necessary, in the first place, to give to this absolute a char- acter, to make of it something more than empty sarrjeness; it was necessary, in the second place, to clear up in some way the relation in which the actuality or apparent actuality of nature and spirit

1 The briefest and best account in Schelling himself of Natur- philosophie is that contained in the Einleitung zu dem Ersten Entwurf (S.W. iii.). A full and lucid statement of Naturphilosophie is that given by K. Fischer in his Gesch. d. n. Phil., vi. 433-692.

stood to the ultimate real. Schelling had already (in the System der ges. Phil.) begun to endeavour after an amalgamation of the Spinozistic conception of substance with the Platonic view of an ideal realm, and to find therein the means of enriching the bareness of absolute reason. In Bruno, and in Philos. u. Religion, the same thought finds expression. In the realm of ideas the absolute finds itself, has its own nature over against itself as objective over against subjective, and thus is in the way of overcoming its abstractness, of becoming concrete. This conception of a difference, of an internal structure in the absolute, finds other and not lc:s obscure expressions in the mystical contributions of the Menschliche Freiheit and in the scholastic speculations of the Berlin lectures on mythology. At the same time it connects itself with the second problem, how to attain in conjunction with the abstractly rational character of the absolute an explanation of actuality. Things — nature and spirit — have an actual being. They exist not merely as logical consequence or development of the absolute, but have a stubbornness of being in them, an antagonistic feature which in all times philosophers have been driven to recognize, and which they have described in varied fashion. The actuality of things is a defection from the absolute, and their existence compels a reconsideration of our conception of God. There must be recognized in God as a completed actuality, a dim, obscure ground or basis, which can only be described as not yet being, but as containing in itself the impulse to externalization, to existence. It is through this ground of Being in God Himself that we must find explanation of that independence which things assert over against God. And it is easy to see how from this position Schelling was led on to the further statements that not in the rational conception of God is an explanation of existence to be found, nay, that all rational conception extends but to the form, and touches not the real — that God is to be conceived as act, as will, as something over and above the rational conception of the divine. Hence the stress laid on will as the realizing factor, in opposition to thought, a view through which Schelling connects himself with Schopenhauer and Von Hartmann, and on the ground of which he has been recognized by the latter as the reconciler of idealism and lealism. Finally, then, there emerges the opposition of negative, i e. merely rational philosophy, and positive, of which the content is the real evolution of the divine as it has taken place in fact and in history, and as it is recorded in the varied mythologies and religions of mankind. Not much satisfaction can be felt with the exposition of either as it appears in the volumes of Berlin lectures.

Schelling's works were collected and published by his sons, in 14 vols. (1856-1861). The individual works appeared as follows: — ■ Uber die Moglichkeit einer Form der Philosophie uberhaupt (Tubingen, 1794); Ideen zu einer Philosophie der Natur (Leipzig, 1797, ed. 1803); Von der Weltseele (Hamburg, 1798, 3rd ed. 1809); Erster Entwurf eines Systems der Naturphilosophie (Jena, 1 799); Einleitung zu seinem Entwurf der Naturphilosophie (ib. 1 799) ; System des transcendentalen Idealismus (Tubingen, 1800); Bruno, oder uber das gbttliche und natiirliche Prinzip der Dinge (Berlin, 1802, ed. 1843) ; Vorlesungen uber die Mcthode des akademischen Studiums (Tubingen, 1803, ed. Braun, 1907); Tiber das Verhdltniss der bildenden Kiinste zu der Natur (Munich, 1807); Uber die Goltheiten von Samothrake (Stuttgart, 1815). His Munich lectures were published by A. Drews (Leipzig, 1902). For the life good materials are to be found in the 3 vols., A us Schelling's Leben in Briefen (3 vols., 1869-1870), in which a biographic sketch of the philosopher's early life is given by his son, and in J. Waitz, Karoline (2 vols., 1871). An interesting little work is Klaiber, Holderlin, Hegel, u. Schelling in ihren schwdbischen Jugendjahren (1877). The biography in Kuno Fischer's Gesch. der neueren Philosophie, vol. vii. (3rded., 1902) is complete and admirable. See further Schelling als Personlichkeit. Brief e, Reden, Aufsatze, ed. Otto Braun (1908), who also wrote Schellings geistige Wandlungen in den Jahren 1800-1810 (1906); Rosenkranz, Schelling (1843); L. Noack, Schelling und die Philosophie der Romantik (2 vols., 1859) ; G. A. C. Frantz, Schelling's Positive Philosophie (3 vols., 1879-1880) ; Watson, Schelling's Transcendental Idealism (1882); Groos, Vie reine Vernunftwissenschaft. Systematische Darstellung von Schellings ...Philosophie (1889); E. von Hartmann, Schelling's philos. System (1897); Delbos, De posteriore Schellingii philosophia quatenus Hegelianae doctrinae adversatur (1902) ; Koeber, Die Grundprinzipien der Schellingschen Naturphilosophie (1882); G. Mehlis, Schellings Geschichtsphilosophie in den Jahren 17Q9-1&04 (1907); H. Sueskind, Der Einfluss Schellings auf die Entwicklung von Schleiermachers System (1909). (R. Ad.; J. M. M.)

SCHELLING, KAROLINE (1763-1809), one of the most intellectual German women of her age, was born at Gottingen on the 2nd cf September 1763, the daughter of the orientalist Michaelis. She married, in 1784, a district medical officer, one Bohmer, in Clausthal in the Harz, and after his death, in 1788, returned to Gottingen. Here she entered into close relations to the poet Gottfried August Burger and the critic of the Romantic school, August Wilhelm Schlegel. In 1791 she took up her residence in Mainz, joined the

famous society of the Clubbists (Klubbisten) , and suffered a short period of imprison-

ment on account of her political opinions. In 1796 she married Schlegel, was divorced in 1803, and then became the wife of the philosopher Friedrich Wilhelm Joseph von Schelling. She died at Maulbronn on the 7th of September 1809. Karoline Schelling played a considerable role in the intellectual movement of her time, and is especially remarkable for the assistance she afforded Schlegel in his translation of Shakespeare's works. She published nothing, however, in her own name.

See G. Waitz, Caroline: Briefe an ihre Geschwister, &c. (2 vols., 18/1), and, by the same author, Caroline und ihre Freunde (1882); further, J. Janssen, Eine Kulturdame und ihre Freunde, Zeit- und Lebensbilder (1885), and Mrs. A. Sidgwick, Caroline Schlegel and her Friends (London, 1899).

SCHEME (Lat. schema, Gr. ixpa, figure, form, from the root

SCHENECTADY, a city and the county-seat of Schenectady county, New York, U.S.A., about 16 m. N.W. of Albany, on the Mohawk river and the Erie Canal. Pop. (1890) 19,902; (1900) 31,682, of whom 7169 were foreign-born; (1910, census) 72,826. Schenectady is served by the New York Central & Hudson River, and the Delaware & Hudson railways, and by interurban electric lines connecting with Albany, Troy, Saratoga, Amsterdam, Johnstown and Gloversville. The city has a fine situation about 230 ft. above the sea. It, is a place of much historic interest, and has many examples of quaint Dutch colonial and early American architecture. There is an Indian monument on the site of the " old fort." Schenectady is the seat of Union College (undenominational), which grew out of the Schenectady Academy (1784), was chartered in 179S, and comprises the academic and engineering departments of Union University, the medical (1838), law (1851) and pharmacy (1881) departments of which are at Albany, where also is the Dudley Observatory (1852), which is under the control of the university. Schenectady is a manufacturing centre of growing importance; here are the main works of the General Electric Company, manufacturers of electrical implements, apparatus, motors and supplies, and of the American Locomotive Company. Together they give employ- ment to about 80% of the wage-earners of the city. Among other manufactures are hosiery and knit goods, overalls and suspenders, hardware, lumber, oils and varnishes, gasoline fire engines, mica insulators, agricultural implements, and wagons and carriages. The

capital invested in manufacturing industries in 1905 was $22,050,746, and the value of the factory product was $33,084,431, an increase of 87-9% since 1900.

According to tradition Schenectady stands on the site of the chief village of the Mohawk Indians, and its name, of which there are many different spellings in early records, is probably of Indian origin; on an early map (1665) it appears as Scanacthade. Arendt Van Corker, or Curler (d. 1667) , l while manager of the estates of his cousin, the patroon, Killian Van Rensselaer, visited the site in 1642, and in 1662, being dissatisfied with conditions on the Manor, he led a band of settlers here. Their allegiance was directly to the Dutch West India Company, and they enjoyed

'Van Corlaer had emigrated to America about 1630; while manager of Rensselaerwyck he had earned the confidence of the Indians, among whom " Corlaer " became a generic term for the English governors, and especially the governors of New York.

a greater degree of freedom, especially commercial freedom, than had been possible on the Manor. The land was purchased from the Mohawks. To each of the fifteen original proprietors, except Van Corlaer, who received a double portion, was assigned a village lot 200 ft. sq., a tract of bottom-land for farming purposes, a strip of woodland, and common pasture rights. Many of the early settlers were well-to-do and brought their slaves with them, and for many years the settlement was reputed the richest in the colony. It received a serious set-back in 1690, when on the 9th of February a force of French and Indians surprised and burned the village, massacred sixty of the inhabitants and carried thirty into captivity. The village was rebuilt in the following year, and a military post was established. About 1700 there was a considerable influx of English settlers. In 1748 the French and Indians again descended on the region and killed many of the inhabitants of the outlying settlement at Beukendaal, 3 m. N.W. of Schenectady. Schenectady became a chartered borough in 1765 and a city in 1798. The first newspaper, the Gazette, was established in 1799. For some years after the completion of the Erie Canal, Schenectady, which had formerly been an important depot of the Mohawk river boat trade to the westward, suffered a decline. The first two railways in the state made Schenectady their terminus, the Mohawk & Hudson opening to

Albany in September 1831 and the Saratoga & Schenectady in July 1832; the original station of the Mohawk & Hudson is still standing. It was not, however, until its new manufacturing era began, about 1880, that Schenectady's modern growth and prosperity began.

See Jonathan Pearson, A History of Schenectady Patent in the Dutch and English Times (Albany, 1883); G. S. Roberts, Old Schenectady (Schenectady, 1904); and G. R. Howell and J. H. Munsell, History of the County of Schenectady (Albany, 1887).

SCHENKEL, DANIEL (1813-1885), Swiss Protestant theo- logian, was born at Dagerlen in the canton of Zurich on the 21st of December 1813. After studying at Basel and Gottingen he was successively pastor at Schaffhausen (1841), professor of theology at Basel (1849); and at Heidelberg professor of theology (1851), director of the seminary and university preacher. At first inclined to conservatism, he afterwards became an exponent of the mediating theology (Vermittelungs-theologie) , and ultimately a liberal theologian and advanced critic. Asso- ciating himself with the " German Protestant Union " (Deutsche Protestanten-verein), he defended the community's claim to autonomy, the cause of universal suffrage in the church and the rights of the laity. From 1852 to 1859 he edited the Allgemeine Kirchenzeitung, and from 1861 to 187 2 the Allgemeine Kirchliche Zeitschrift, which he had founded in 1859. In 1867, with a view to popularizing the researches and results of the Liberal school, he undertook the editorship of a Bibel-Lexicon (5 vols., 1869- 1875), a work which was so much in advance of its time that it is still useful. In his Das Wesen des Protestantismus aus den Quellen des Rejormationszeitalters beleuchtet (3 vols. 1846-1851, 2nd ed. 1862), he declares that Protestantism is a principle which is always living and active, and not something which was realized once and for all in the past. He contends that the task of his age was to struggle against the Catholic principle which had infected Protestant theology and the church. In his Christliche Dogmatik (2 vols., 1858-1859) he argues that the record of revelation is human and was historically conditioned: it can never be absolutely perfect; and that inspiration, though originating directly with God, is continued through human instrumentality. His Charakterbild Jesu (1864, 4th ed. 1873; Engl, trans, from 3rd ed., 1869), which appeared almost simul- taneously with D. Strauss's Leben Jesu, met with fierce opposition. The work is considered too subjective and fanciful, the great fault of the author being that he lacks the impartiality of objec- tive historical insight. Yet, as Pfleiderer says, the work " is full of a passionate enthusiasm for the character of Jesus." The author rejects all the miracles except those of healing, and these he explains

psychologically. His main purpose was to modernize and reinterpret Christianity; he says in the preface to the third edition of the book: " I have written it solely in the service of evangelical truth, to win to the truth

those especially who have been most unhappily alienated from the church and its interests, in a great measure through the fault of a reactionary party, blinded by hierarchical aims." Schenkel died on the 18th of May 1885.

Other works: — Friedrich Schleiermacher. Ein Lebens- und Charakterbild (1868); Christentum und Kirche (2 vols., 1867-1872); Die Grundlehren des Christentums aus dem Bewusstsein des Glauben's dargestellt (1877); and Das Christusbild der Apostel und der nachapostohschen Zeit (1879). See Herzog-Hauck, Realencyklopddie, Otto Pfleiderer Development of Theology (1890); and F. Lichtenberger, History of German Theology (1889). (M. A. C.)

SCHERER, EDMOND HENRI ADOLPHE (1815-1889), French theologian, critic and politician, was born in Paris on the 8th of April 181 5. After a course of legal studies he spent several years in theological study at Strassburg, where he graduated doctor in theology in 1843, and was ordained. In 1843 he was appointed to a professorship in the Ecole Evangelique at Geneva, but the development of his opinions in favour of the Liberal move- ment in Protestant theology led to his resigning the post six years later. He founded the Anti-Jisuite, afterwards the Reformation au XI X e siecle, in which he advocated the separa- tion of the Church from the State; but he gradually abandoned Protestant doctrine. In thought he became a pronounced Hegelian. Eventually he settled in Paris, where he at once attracted attention by brilliant literary criticisms, at first chiefly on great foreign writers, contributed to the Revue des deux mondes. He was elected municipal councillor at Versailles in 1870, deputy to the National Assembly for the department of Seine-et-Oise in 1871 and senator in 1875. He supported the Republican party. Towards the end of his life he devoted himself mainly to literary and general criticism, and was for many years one of the ablest contributors to Le Temps. He was a frequent visitor to England, and took a lively interest in English politics and literature. He died at Versailles on the 16th of March 1889.

His chief works are: Dogmatique de I'figlise riformie (1843), De litat actuel del'Eglise reformee en France (1844), Esquisse d'une theorie de lEghse chretienne (1845), La Critique et la -fox (iSso) Alexandre Vinet (1853), Lettres a mon cure (1853), Etudes critiques sur la

htterature contemporaine (1863-1889), Etudes critiques de literature (1876), Diderot (1880), La Democratic et la France (1881) Etudes sur la Htterature au XVIII' siecle (1891).

A memoir of him, by V. C. O. Greard, appeared in 1890. See also an article by Professor E. Dowden in the Fortnightly Review (April

1889).

SCHERER, WILHELM (1841-1886), German philologist and historian of literature, was born at Schonborn in Lower Austria on the 26th of April 1841. He was educated at the academic gymnasium at Vienna and afterwards at the university, where he was the favourite pupil of the distinguished Germanist, Karl Viktor Mullenhoff (1818-1884). Having taken the degree of doctor philosophiae, he became Privatdozent for German language and literature in 1864. In 1868 he was appointed ordinary professor, and in 1872 received a call in a like capacity to Strass- burg, and in 1877 to Berlin, where in 1884 he was made member of the Academy of Sciences. He died at Berlin on the 6th of August 1886.

Scherer's literary activity falls into three categories: in Vienna he was the philologist, at Strassburg the professor of literature and in Berlin the author. His earliest work was a biography of the great philologist Jakob Grimm (1865, 2nd ed. 1885); he next, in con- junction with his former teacher Mullenhoff, published Denkmaler deutscker Poesie und Prosa aus dem 8. bis 12. Jahrhundert (1864, 3rd ed. 1892). His first great work was, however, Zur Geschichte der deutschen Sprache (Berlin, 1868; 3rd ed., 1890), being a history of the German language with especial reference to phonetic laws. He contributed the section on Alsatian literature to O. Lorenz's Geschichte des Elsasses (1871, 3rd ed. 1886). Other important works are Geistliche Poeten der deutschen Kaiserzeit (Strassburg, l8 74"-i875); Geschichte der deutschen Dichlung im 11. und 12. Jahrhundert (1875); and Vortrage und Aufsatze zur Geschichte des geishgen Lebens in Deutschland und Osterreich (1874). Scherer's best-known work is his history of German literature, Geschichte der deutschen Literatur (Berlin, 1883; 10th ed., 1905; English translation by Mrs F. C. Conybeare, 1883; new ed., 1906). This work is dis- tinguished by the clearness with which details are co- ordinated with a general and comprehensive survey of German literature from the beginning to the death of Goethe. Besides many other philological treatises, Scherer wrote largely on Goethe (Aus Goethes FrUhzeit

1879; Aufsatze iiber Goethe, 1886), and took an active part in the foundation of the Goethe archives at Weimar. A small treatise on Poetik, a biography of Karl Miillenhoff, and two volumes of Kleine Schriften were published after his death.

See V. Basch, Wilhelm Scherer et la philologie allemande (Paris, 1889), and the article by Eduard Schroder in Allgemeine deutsche Biographie.

SCHERR, JOHANNES (1817-1886), German man of letters and novelist, was born at Hohenrechberg in the kingdom of Wurttemberg on the 3rd of October 181 7. After studying philosophy and history at the university of Tubingen (1837-1840), he became master in a school conducted by his brother Thomas in Winter- thur. In 1843 he removed to Stuttgart, and, entering the political arena with a pamphlet Wiirttemberg im Jahr 1843, was elected in 1848 a member of the Wiirttemberg House of Deputies; became leader of the democratic party in south Germany and, in con- sequence of his agitation for parliamentary reform in 1849, was obliged to take refuge in Switzerland to avoid arrest. Con- demned in contumaciam to fifteen years' hard labour, he estab- lished himself in Zurich as Privatdozent in 1850, but removed in 1852 to Winterthur. In i860 he was appointed professor of history and Helvetian literature at the Polytechnicum in Zurich, in which city he died on the 21st of November 1886.

Scherr was a voluminous writer in the field of historical investigation into the civilization, literature, and manners and customs of his country. His works have largely a political bias, but are characterized by clearness of exposition and careful research. Noteworthy among his books are the following: Geschichte der deutschen Kultur und Sitte (1852-1853, new ed. 1897); Schiller und seine Zeit (1859, new ed. 1876); Geschichte der deutschen Frauenwelt (i860, 4th ed. 1879); Allgemeine Geschichte der Liter atur (1851, 9th ed. 1895-1896); Geschichte der englischen Literatur (1854, 2nd ed. 1883); Blucher, seine Zeit und sein Leben (1862, 4th ed. 1887). Scherr also wrote the humorous Sommertagebuch des weiland Dr Gastrosophiae, Jeremia Sauerampfer (1873); as a novelist he published the historical novels, Schiller (1856), and Michel, Geschichte eines Deutschen unserer Zeit (1858) which have passed through several editions.

With the exception of some of his stories (Novellenbuch, 10 vols. 1 873-1 877) Scherr's works have not appeared in a collected edition.

SCHERZO (Italian for " a joke "), in music, the name given to a quick movement evolved from the minuet and used in the position thereof in the sonata forms. The term is occasionally applied otherwise, as a mere character name. Haydn first used it for a middle movement quicker than a minuet, in the compara- tively early set of six quartets known sometimes (for that reason) as Gli Scherzi, and sometimes as the Russian quartets (Op. 33). He never used the term again, though his later minuets, especially those in the Salomon symphonies, and the last completed quartets (Op. 77), are in a very rapid tempo and on a larger scale than any of the earlier scherzos of Beethoven. Haydn wished to see the minuet made more worthy of its position in large sonata works; but he did not live to appreciate (though he might possibly have heard) the great scherzos of his pupil Beethoven, which brought the element of the sublime into what may be generically termed the dance movement of the sonata style.

With rare exceptions Beethoven not only retained the dance character in lively middle movements, but accentuated it to the utmost in terms of what we have elsewhere called " dramatic " as distinguished from " decorative " music. He took those features of minuet form and style which most contrast the minuet with the larger and more highly organized movements, and he devised a form that emphasized them as they have never been emphasized before or since. The distinctive external feature in the minuet and trio is the combination of melodic binary forms with an exact da capo of the minuet after the trio; no other movement in the sonata admitting of so purely decorative a symmetry. The form of Beethoven's typical scherzo purposely exaggerates this feature. Mozart had frequently enriched minuets by giving them two or even three trios, with the minuet da capo after each. Beethoven does not do this; for, the general structure and texture of his scherzos being more continuous and highly organized, the variety of themes thereby produced would tend to give the form an elaborate rondo character which would not have differentiated it sufficiently XXIV. 11

from finales. But after Beethoven's mature scherzo has run through the stages of scherzo, trio and scherzo da capo, it goes through the same trio and da capo again; and perhaps even tries to do so a third time, as if it could not find a way out, and is then playfully and abruptly stopped.

This form lends itself to high-spirited humour, and differentiates the

scherzo from the more highly organized movements by drama- tically emphasizing its formal and dancelike character. The earliest example is the seventh of the pianoforte Bagatelles (Op. 33) where its " round-and-round " effect is realized with a mastery which alone suffices to dispose of Thayer's belief that these bagatelles belong, in their finished form, to Beethoven's boyhood. 1 As a rule Beethoven did not find the pianoforte a favourable instrument for his characteristic scherzo style; and his only other typical examples for pianoforte are the second movements of the sonatas Op. 27, No. I, and Op. 106 (in neither of which is the trio repeated) and the fifth of the Six Bagatelles Op. 126.

The scherzo of the Eroica symphony is too long for Beethoven to allow it to go twice round; and that of the 9th symphony is so enormous that the main body of the scherzo is like a complete first movement of a sonata, from which it differs only in its comparative uniformity of texture and its incessant onrush, which not even the startling measured pauses and the changes from 4-bar to 3-bar rhythm can really interrupt. Beethoven directs as many repetitions of its sub-sections as possible, and his coda consists of a most im- pressive attempt to begin the trio again, dramatically cut short. In the 4th, 6th and 7th symphonies, the great pianoforte trio in B flat (Op. 97) and the string quartets in E flat (Op. 74), F minor (Op. 95) and C sharp minor (Op. 131), the round-and-round form is developed to the utmost, though in performance the necessary repetitions are too often omitted where Beethoven has only indicated them by a direction instead of writing them in full. The scherzo of the C minor symphony was originally meant to go twice round; and a certain pair of superfluous bars, which caused controversy for thirty years after Beethoven's death, were due simply to traces of the difference between the prima volta and seconda volta being left in the score.

Beethoven also used other types of quick middle movement in the place of the scherzo. In one case, that of the second allegretto of the E flat trio (Op. 70, No. 2), the round-and-round form is developed to the utmost in an exceedingly luscious and placid movement, very remote from the fiery humours of his typical scherzo style.

Modern custom uses the name of scherzo as a mere technical term for quick middle movements, and in this sense we may speak of the second movement of Beethoven's F major string quartet (Op. 59, No. 1) as a unique example; it being a very highly developed application of binary form with the utmost humour and unexpectedness of detail and style. It is possible that this gigantic movement, occurring in a

work which was an especial favourite of Mendelssohn's, may have been the inspiring source of the Mendelssohnian scherzo which is one of the most distinctive new types of sonata movement since Beethoven, and is independent of the notion of an alternating trio, whether in the single or the round-and-round form. The scherzos in Mendelssohn's Midsummer Night's Dream music, in the Scotch Symphony and in the string quartets in E minor and E flat major (Op. 44, Nos. 2 and 3) are splendid examples. Even Berlioz shows their influence at the height of his power, in the " Queen Mab " scherzo of his Romeo et Juliette. The round-and- round form has remained peculiar to Beethoven; perhaps because with the modern scherzo it would be too long, and because it is easier nowadays to manage a scherzo with two trios.

Of Brahms's scherzos there are many distinct types. His largest, such as that of the trio Op. 8, are greatly influenced by Beethoven; but there are several great quick movements in the usual form which are not called scherzos, and are as far from being jokes as is the third movement of Beethoven's F minor quartet. The third movement of Brahms's fourth symphony is perhaps the most gigantic scherzo since Beethoven's time. It lasts hardly seven minutes, but is a fully developed blend of rondo and first-movement forms, with a coda containing one of the greatest climaxes in symphonic art.

Chopin produced a new type of scherzo; independent of the sonata, but still in the quick triple time (one beat in a bar) which is Beethoven's typical scherzo rhythm. Chopin's form is traceable

'The autograph date, 1783, tallies neither with the handwriting nor with the style, but it may well refer to the raw material. Beethoven sometimes kept back his ideas for thirty years before executing them.

co the classical of scherzo and trio, and the style is dramatic- ally capricious and romantic, but far too impressive to suggest humour. The same may be said of many classical scherzos, though Beethoven uses the title only where the humorous character of the movement lies on the surface. Even then Beethoven's only mature instances of the title (except in the form of scherzando as a mark of expression) are those of the Eroica symphony, the B flat trio Op. 97 and the B flat sonata Op. 106. It is, however, correct to call any energetic move- ment a scherzo when it occupies the position thereof in a

sonata scheme. (D. F. T.)

SCHETKY, JOHN CHRISTIAN (1778-1874), Scottish marine painter, descended from an old Transylvanian family, was born in Edinburgh on the nth of August 1778. He studied art under Alexander Nasmyth, and after having travelled on the continent he settled in Oxford, and taught for six years as a drawing- master. In 1808 he obtained a post in the military college, Great Marlow, and three years later he was appointed professor of drawing in the naval college, Portsmouth, where he had ample opportunities for the study of his favourite marine subjects. From 1836 to 1855 he held a similar professorship in the military college, Addiscombe. To the Royal Academy exhibitions he contributed at intervals from 1805 to 1872, and he was represented at the Westminster Hall competition of 1847 by a large oil- painting of the Battle of La Hogue. He was marine painter to George IV., William IV. and Queen Victoria. Among his published works are the illustrations to Lord John Manners's Cruise in Scotch Waters, and a volume of photographs from his pictures and drawings issued in 1867 under the title of Veterans of the Sea. One of his best works, the ' ' Loss of the Royal George," painted in 1840, is in the National Gallery, London, and the United Service Club possesses another important marine subject from his brush. He died in London on the 28th of January 1874. A memoir by his daughter was published in 1877.

His younger brother, John Alexander Schetky (1785-1824), studied medicine in Edinburgh university and drawing in the Trustees' Academy. As a military surgeon he served with distinction under Lord Beresford in Portugal. He contributed excellent works to the exhibitions of the Royal Academy and of the Water-Colour Society, and executed some of the illustra- tions in Sir W. Scott's Provincial Antiquities. He died at Cape Coast Castle on the sth of September 1824, when preparing to follow Mungo Park's route of exploration.

SCHEUCHZER, JOHANN JAKOB (1672-1733), Swiss savant, was born at Zurich on the 2nd of August 1672. The son of the senior town physician (or Archiater) of Zurich, he received his education in that place, and in 1692 went to the university of Altdorf nearNuremberg, being intended for the medical profession. Early in 1694 he took his degree of doctor in medicine at the university of Utrecht, and then returned to Altdorf to complete his mathematical studies. He went back to Zurich in 1696, and was made junior town physician (or Poliater), with the promise of the professorship of mathematics; this he obtained in 1 7 10, being promoted to the chair of physics, with the office of senior town physician, in January

1733, a few months before his death on the 23rd of June.

His published works (apart from numerous articles) were estimated at thirty-four in number. His historical writings are mostly still in MS. The more important of his published writings relate either to his scientific observations (all branches) or to his journeys, in the course of which he collected materials for these scientific works. In the former category are his Beschreibung der Naturgeschichte des Sckweitzerlandes (3 vols., Zurich, 1706-1708, the 3rd volume containing an account in German of his journey of 1705; a new edition of this book and, with important omissions, of his 1 723 work, was issued, in 2 vols., in 1746, by J. G. Sulzer, under the title of Naturgeschichte des SchvHeitzerlandes sammt seinen Reisen Hber die schweitzerischen Geburge), and his Helvetiae historia naturalis oder Naturhistorie des Schweitzerlandes (published in 3 vols., at Zurich, 1716-1718, and reissued in the same form in 1752, under the German title just given). The first of the three parts of the last-named work deals with the Swiss mountains (summing up all that was then known about them, and serving as a link between Simler's work of 1574 and Gruner's of 1760), the second with the Swiss rivers, lakes and mineral baths, and the third with Swiss meteorology and geology. Scheuchzer's works, as issued in 1746 and in 1752, formed

(with Tschudi's Chronicum Helvelicum) one of the chief sources for Schiller's play of Wilhelm Tell (1804). In 1704 Scheuchzer was elected a F.R.S. ; he published many scientific notes and papers in the Philosophical Transactions for 1 706-1 707, 1709 and 1 727-1 728. In the second category are his Itinera alpina tria (made in 1702- 1704), which was published in London in 1708, and dedicated to the Royal Society, while the plates illustrating it were executed at the expense of various fellows of the society, including the president, Sir Isaac Newton (whose imprimatur appears on the title-page), Hans Sloane, Dean Aldrich, Humfrey Wanley, &c. The text is written in Latin, as is that of the definitive work describing his travels (with which is incorporated the 1708 volume) that appeared in 1723 at Leiden, in four quarto volumes, under the title of Itinera per Helvetiae alpinas regiones facta annis 1702-1711. These journeys led Scheuchzer to almost every part of Switzerland, particularly its central and eastern districts. Apropos of his visit (1705) to the Rhone glacier, he inserts a full account of the other Swiss glaciers, as far as they were then known, while in 1706, after mentioning certain wonders to be seen in the museum at Lucerne, he adds reports by'-men of good faith who had seen dragons in Switzerland. He doubts their existence, but illustrates the reports by fanciful repre-

sentations of dragons, which have led some modern writers to depreciate his merits as a traveller and naturalist, for the belief in dragons was then widely spread. In 1712 he published a map of Switzerland in four sheets (scale 1/290,000), of which the east portion (based on his personal observations) is far the most accurate, though the map as a whole was the best map of Switzerland till the end of the 1 8th century. At the end of his 1723 book he gives a full list (covering 27 4to pages) of his writings from 1694 to 1721.

See F. X. Hoeherl, J. J. Scheuchzer, der Begrilnder d. phys. Geographic d. Hochgebirges (Munich, 1901), a useful little pamphlet, conveniently summarizing Scheuchzer's scientific views.

(W. A. B. C.)

SCHEVENINGEN, a fishing port and watering-place of Holland, on the North Sea, in the province of South Holland, about 2 m. N. of the Hague, with which it is connected by tramways. It is situated in the dunes at the extremity of the woods which separate it from the Hague. The development of Scheveningen as a fashionable seaside resort dates from modern times, but the fishing village is of ancient origin and once stood farther seaward. To prevent coast erosion a stone wall was built along the sea front in 1896-1900, and below this lies the fine sandy beach stretching for miles on either side. The first bathing establish- ment here dates from 1818, and was also the first in Holland. Overlooking the sea from the top of the dunes on either side are villas, hotels, and the pavilion (1826) belonging to the family of Prince von Wied. The costumes of the fishing community are picturesque, the men having silver buttons and wide trousers, the women wide skirts and brass helmets. There is a large harbour for the fishing fleet at the mouth of the Hague- Scheveningen canal. Among the historical memories associated with Scheveningen are the defeat of the combined French and English fleets by Admiral de Ruyter in 1673, and the flight and subsequent return of William I., king of the Netherlands, in 1813, at the beginning and end of the French occupation. This is commemorated by an obelisk (1865). The town has a rapidly growing population of about 23,000.

SCHIAPARELLI, GIOVANNI VIRGINIO (1835-1910), Italian astronomer and senator of the kingdom of Italy, was born on the 14th of March 1835 at Savigliano in Piedmont. He entered Turin university in 1850, and graduated in 1854. Two years later he went to Berlin to study astronomy under Encke, and in 1859 was appointed assistant observer at Pulkova, a post which he resigned in i860 for a similar one at Brera, Milan. On the death of Francesco

Cariini (b. 1783) in 1862, Schiaparelli succeeded to the directorship, a position which he held until 1900. He died at Milan on the 4th of July 1910.

Schiaparelli was primarily an observer — his first discovery was of the asteroid Hesperia in 1861 — but he had also considerable mathematical gifts, as is shown in his treatment of orbital motions, published in 1 864, and in other papers. His great contribution to astronomy dates from 1866, when he showed that meteors or shooting stars traverse space in cometary orbits, and, in particular, that the orbits of the Perseids and Comet III., 1862, and of the Leonids and Comet I., 1866, were practically the same. These discoveries, sub- sequently amplified in his Le Stelle cadenti (1873) and in his Norme per le osservazioni dellestelle cadenti dei bolidi (1896) gained for him the Lalande prize of the Academy of Sciences, Paris, in 1868, and the gold medal and foreign associateship of the Royal Astronomical Society in 1872. He next worked on the double stars, but his result! have only been partially published. This labour was followed in

1877 by observations of the surface of Mars, whereon he detected, among other peculiar characters, certain streaky markings or canah, the nature and origin of which is still controversial (see Mars). Mercury and Venus were also studied, and he concluded that these planets rotated on their axes in the same time as they revolved about the sun ; but these views are questioned. He also discussed many other problems, such as stellar distribution, the extent of the universe, &c, whilst at Brera. On his retirement he turned to the astronomy of the Hebrews and Babylonians; his earlier results are given in his L' Astronomia nell' antico Testamenlo (1903), a work which has been translated into English and German, whilst later ones are to be found in various journals, the last being in Scientia

(1908).

SCHIAVONE, the Italian name of the basket-hilted sword of the 17th century, resembling what is erroneously called the " claymore " of modern Highland regiments. The " schiavone " was the sword of the Slavonic guards (Schiavoni) of the doges of Venice, whence the name (see Sword).

SCHIAVONETTI, LUIGI (1765-1810), Italian engraver, was born at Bassano in Venetia on the 1st of April 1765. After having studied art for several years he was employed by Testolini, an engraver of very indifferent abilities, to execute imitations of Bartolozzi's works, which he passed off as his own. In 1790 Testolini was invited by Bartolozzi to join him in England, and, it having been discovered that Schiavonetti, who accompanied him, had executed the plates in question, he was employed by Bartolozzi and became an eminent engraver in both the line and the dot manner. Among his early works are four plates of subjects from the French Revolution, after Benazech. He also produced a " Mater Dolorosa " after Vandyck, and Michelangelo's cartoon of the " Surprise of the Soldiers on the Banks of the Arno." From 1805 to 1808 he was engaged in etching Blake's designs to Blair's Grave, which, with a portrait of the artist engraved by Schiavonetti after T. Phillips, R.A., were published in 1808. The etching of Stothard's " Canterbury Pilgrims " was one of his latest works, and on his death on the 7th of June 1810 the plate was taken up by his brother Niccolo, and finally completed by James Heath.

SCHICHAU, FERDINAND (1814-1896), German engineer and shipbuilder, was born at Elbing, where his father was a smith and ironworker, on the 30th of January 1814. He studied engineering at Berlin and then in England, and returning to Elbing in 1837 started works of his own, which from small begin- nings eventually developed into an establishment employing some 8000 men. He began by making steam engines, hydraulic presses and industrial machinery, and, by concerning himself with canal work and river or coast improvement, came to the designing and construction of dredgers, in which he was the pioneer (1841), and finally to the building of ships.

His " Borussia," in 1855, was the first screw-vessel constructed in Germany. Schichau began to specialize in building torpedo- boats and destroyers (at first for the Russian government) at an early date. From 1873 he had the co-operation of Carl H. Ziese, who married his daughter. Ziese introduced compound engines into the first vessels built by Schichau for the German navy, the gun- boats " Habicht " and " Mowe," launched in 1879, and also designed in 1 88 1 the first triple-expansion machinery constructed on the continent, supplying these engines to the torpedo-boats built by Schichau for the German navy in 1884, the first of some 160 that by the year 1909 were provided for Germany out of the Elbing yards. Torpedo-boats were also built for China, Austria and Italy. Meanwhile Elbing had become insufficient for the increased output demanded. In 1889

Schichau established a floating dock and re- pairing shops at Pillau, and soon afterwards, by arrangement with the government, started a large shipbuilding yard at Danzig, for the purpose of constructing the largest ships of war and for the mercantile marine. He died on the 23rd of January 1896; but Ziese carried on the work, and not only made the Danzig yard the chief cradle of the new German fleet, rivalling the finest English establishments, but also largely developed the equipment at Elbing. The Schichau works have made the name of their originator to rank with that of Krupp.

SCHIEDAM, a town and river port of Holland, in the province of South Holland, on the Schie, near its confluence with the Maas, and a junction station 3 m. by rail and steam tramway W. of Rotterdam. Pop. (1905) 29,227. The public buildings of interest are the Groote or Janskerk, the old Roman Catholic shurch, the synagogue, the town-hall, the exchange, the concert- hall and a ruined castle. Schiedam is famous as the seat of a

great gin manufacture, which, carried on in more than three hundred distilleries, gives employment besides to malt-factories, cooperages and cork-cutting establishments, and supplies grain refuse enough to feed about 30,000 pigs, as well as sufficient yeast to form an important article of export. Other industries include shipbuilding, glass-blowing and the manufacture of stearine candles.

SCHIEFNER, FRANZ ANTON (1817-1879), Russian linguist, was born at Reval, in Russia, on the 18th of July 181 7. His father was a merchant who had emigrated from Bohemia. He was educated first at the Reval grammar school, matriculated at St Petersburg as a law student in 1836, and subsequently devoted himself at Berlin, from 1840 to 1842, exclusively to Eastern languages. On his return to St Petersburg in 1843 he was employed in teaching the classics in the First Grammar School, and soon afterwards received a post in the Imperii! Academy, where in 1852 the cultivation of the Tibetan language and literature was assigned to him as his special function. Simultaneously he held from i860 to 1873 the professorship of classical languages in the Roman Catholic theological seminary. From 1854 till his death he was an extraordinary member of the Imperial Academy. He visited England three times for purposes of research — in 1863, 1867 and 1878. He died on the 16th of November 1879.

Schiefner made his mark in literary research in three directions. First, he contributed to the Memoirs and Bulletin of the St Petersburg Academy, and brought out independently a number of valuable

articles and larger publications on the language and literature of Tibet. He possessed also a remarkable acquaintance with Mongolian, and when death overtook him had just finished a revision of the New Testament in that language with which the British and Foreign Bible Society had entrusted him. Further, he was one of the greatest authorities on the philology and ethnology of the Finnic tribes. He edited and translated the great Finnic epic Kalevala; he arranged, completed and brought out in twelve volumes the literary remains of Alexander Castren, bearing on the languages of the Samoyedic tribes, the Koibal, Karagass, Tungusian, Buryat, Ostiak and Kottic tongues, and prepared several valuable papers on Finnic mythology for the Imperial Academy. In the third place, he made himself the exponent of investigations into the languages of the Caucasus, which his lucid analyses placed within reach of European philologists. Thus he gave a full analysis of the Tush language, and in quick succession, from Baron P. Uslar's investigations, comprehensive papers on the Awar, Ude, Abkhasian, Tchetchenz, Kasi-Kumuk, Hiirkanian and Kiirinian languages. He had also mastered Ossetic, and brought out a number of translations from that language, several of them accompanied by the original text.

SCHILL, FERDINAND BAPTISTA VON (17 76-1 809), Prussian soldier, was born in Saxony. Entering the Prussian cavalry at the age of twelve, he was still a subaltern of dragoons when he was wounded at the battle of Auerstadt. From that field he escaped to Kolberg, where he played a very prominent part in the celebrated siege of 1807, as the commander of a volunteer force of all arms. After the peace of Tilsit he was promoted major and given the command of a hussar regiment formed from his Kolberg men. In 1809 the political situation in Europe appeared to Schill to favour an attempt to liberate his country from the French domination. Leading out his regiment from Berlin under pretext of manoeuvres, he raised the standard of revolt, and, joined by many officers and a company of light infantry, marched for the Elbe. At the village of Dodendorf (5th of May 1809) he had a brush with the Magdeburg garrison, but was soon driven northwards, where he hoped to find British support. The king of Prussia's proclamations prevented the patriots from receiving . any appreciable assistance, and with little more than his original force Schill was surrounded by 5000 Danish and Dutch troops in the neighbourhood of Wismar. He escaped by hard fighting (action of Damgarten, 24th of May) to Stralsund, and attempted to put the crumbling fortifications in order. The Danes and Dutch soon hemmed him in, and by sheer numbers overwhelmed the defenders (May 31). Schill himself was killed. Some parties escaped to Prussia, where the

officers were tried by court-martial, cashiered and imprisoned. A few escaped to Swinemunde, but the rest were either killed or taken. Handed over to the French, the soldiers Were sent to the galleys, and the eleven officers shot at Wesel on the 16th

of September. The body of Schill was buried at Stralsund, his head sent to Loiden, where it remained until 1837. Monuments were erected at Brunswick, Stralsund and Wesel, and the 1st Silesian Leift-Hussars have borne Schill's name since 1889.

See Haken, Ferdinand von Schill (Leipzig, 1824); Barsch, Ferdinand von Schill's Zue und Tod (Leipzig, 1860), and F. von Schill, ein Charaklerbild (Potsdam, i860) ; Petrich, Pommer'sche Lebensbilder, vol. ii. (Stettin, 1884); Francke, Aus Stralsunds Franzosenzeit

(1890).

SCHILLER, JOHANN CHRISTOPH FRIEDRICH VON (1759- 1805), German poet, dramatist and philosopher, was born at Marbach on the Neckar, on the 10th of November 1759. His grandfather had been a baker in the village of Bittenfeld, near Waiblingen; his father, Johann Kaspar (1723-1796), was an army-surgeon, who had settled in Marbach and married the daaghter of an innkeeper, Elisabeth Dorothea Kodweis (1732- if 02). In 1757 Schiller's father again took service in the army aad ultimately rose to the rank of captain. The vicissitudes of his profession entailed a constant change of residence; but at Lorch and at Ludwigsburg, where the family was settled for longer periods, the child was able to receive a regular education. In 1773 the duke Karl Eugen of Wiirttemberg claimed young Schiller as a pupil of his military school at the " Solitude " near Ludwigs- burg, where, instead of his chosen subject of study, theology, he was obliged to devote himself to law. On the removal of the school in 1775 to Stuttgart, he was, however, allowed to exchange this subject for the more congenial study of medicine. The strict military discipline of the school lay heavily on Schiller, and intensified the spirit of rebellion, which, nurtured on Rousseau and the writers of the Sturm und Drang, burst out in the young poet's first tragedy; but such a school-life had for a poet of Schiller's temperament advantages which he might not have known had he followed his own inclinations; and it afforded him glimpses of court life invaluable for his later work as a dramatist. In 1776 some specimens of Schiller's

lyric poetry had appeared in a magazine, and in 1777-1778 he completed his drama, Die Rauber, which was read surreptitiously to an admiring circle of schoolmates. In 1780 he left the academy qualified to practise as a surgeon, and was at once appointed by the duke to an ill-paid post as doctor to a regiment garrisoned in Stuttgart. His discontent found vent in the passionate, unbalanced lyrics of this period. Meanwhile Die Rauber, which Schiller had been obliged to publish at his own expense, appeared in 1 78 1 and made an impression on his contemporaries hardly less deep than Goethe's Gbtz von Berlichingen, eight years before. The strength of this remarkable tragedy lay, not in its inflated tone or exaggerated characterization — the restricted horizon of Schiller's school-life had given him little opportunity of knowing men and women— but in the sure dramatic instinct with which it is constructed and the directness with which it gives voice to the most pregnant ideas of the time. In this respect, Schiller's Rauber is one of the most vital German dramas of the 18th century. In January 1782 it was performed in the Court and National Theatre of Mannheim, Schiller himself having stolen secretly away from Stuttgart in order to be present. The success encouraged him to begin a new tragedy, Die Verschworung des Fiesco zu Genua, and he edited a lyric Anthologie auf das Jahr 1782, to which he was himself the chief contributor. A second surreptitious visit to Mannheim came, however, to the ears of the duke, who was' also irritated by a complaint from Switzerland about an uncomplimentary reference to Graubiinden in Die Rauber. He had Schiller put under a fortnight's arrest, and forbade him to write any more " comedies " or to hold intercourse with any one outside of Wiirttemberg. Schiller, embittered enough by the uncongenial conditions of his Stuttgart life, resolved on flight, and took advantage of some court festivities in September 1782 to put his plan into execution. He hoped in the first instance for material support from the theatre in Mannheim, and its intendant, W. H. von Dalberg; but nothing but rebuffs and disappoint- ments were in store for him. He did not even feel secure against extradition in Mannheim, and after several weeks spent mainly in the village of Oggersheim. where his third drama, Luise

Millerin, or, as it was subsequently renamed, Kabale und Liebe, was in great part written, he found a refuge at Bauerbach in Thuringia, in the house of Frau von Wolzogen, the mother of one of his former schoolmates. Here Luise Millerin was finished and Don Carlos begun. In July 1783 Schiller received a definite appointment for a year as " theatre poet " in Mannheim, and here both Fiesco and Kabale und Liebe were performed in 1784. Neither play is as spontaneous or

inspired as Die Rauber had been; but both mark a steady advance in characterization and in the technical art of the playwright. Kabale und Liebe, especially, is an admirable example of that " tragedy of common life " which Lessing had introduced into Germany from England and which bulked so largely in the German literature of the later 18th century. In this drama Schiller's powers as a realistic portrayer of people and conditions familiar to him are seen to best advantage. Although Schiller failed to win an established position in Mannheim, he added to his literary reputation by his address on Die Schaubuhne als eine moralische Anstalt betrachtet (1784), and by the publication of the beginning of Don Carlos (in blank verse) in his journal, Die rheinische Thalia (1785). He had also the opportunity of reading the first act of the new tragedy before the duke of Weimar at Darmstadt in December 1784, and, as a sign of favour, the duke conferred upon him the title of " Rat."

In April 1785 Schiller, whose position in Mannheim had, long before this, become hopeless, accepted the invitation of four un- known friends — C. G. Korner, L. F. Huber, and their fiancees Minna and Dora Stock — with whom he had corresponded, to pay a visit to Leipzig. He spent a happy summer mainly at Gohlis, near Leipzig, his jubilant mood being reflected in the Ode an die Freude; and in September of the same year he followed his new friend Korner to Dresden. As Korner's guest in Dresden and at Loschwitz on the Elbe, Schiller completed Don Carlos, wrote the dramatic tale, Der Verbrecher aus Infamie (later entitled Der Verbrecher aus verlorener Ehre, 1786) and the unfinished novel, Der Geisterseher (1789). The Rheinische Thalia was continued as the Thalia (1786-1791 ; in .1792, again renamed Die neue Thalia), and in this journal he published most of his writings at this time. Korner's interest in philosophy also induced Schiller to turn his attention to such studies, the first results of which he published in the Philosophische Brief e (1786). Don Carlos, meanwhile, appeared in book form in 1787, and added to Schiller's reputation as a poet. In adopting verse instead of prose as a medium of expression, Schiller showed that he was pre- pared to challenge comparison with the great dramatic poets of other times and other lands; but in seeking a model for this higher type of tragedy he unfortunately turned rather to the classic theatre of France than to the English drama which Lessing, a little earlier, had pronounced more congenial to the German temperament. The unwieldiness of the plot and its inconsistencies show, too, that Schiller had not yet mastered the new form of drama; but Don Carlos at least provided him with an opportunity of expressing ideas of political and intellectual freedom with which, as the disciple of

Rousseau, he was in warm sympathy.

A new chapter in Schiller's life opened with his visit to Weimar in July 1787. Goethe was then in Italy, and the duke of Weimar was absent from Weimar; but the poet was kindly received by Herder and Wieland, by the duchess Amalie and other court notabilities. The chief attraction for Schiller was, however, Frau von Kalb with whom he had been passionately in love in Mannheim ; but not very long afterwards he made the acquaintance at Rudolstadt of the family von Lengefeld, the younger daughter of which subsequently became his wife. Meanwhile the preparation for Don Carlos had interested Schiller in history, and in 1788 he published the first volume of his chief historical work, Geschichte des Abfalls der vereinig- ten Niederlande von der spanischen Regierung, a book which at once gave him a respected position among the historians of the 18th century. It obtained for him, on the recommendation of Goethe, a professorship in the university of Jena, and in November 1789 he delivered his inaugural lecture. Was heisst und zu welchem Ende studiert man Universalgeschichte? in February of the following year he married Charlotte von Lengefeld. Schiller's other historical writings comprise a, Samnlung historischer Memoires, which he began to publish in 1790, and the Geschichte des dreissigjahrigen Krieges (1791-1703). The latter work is more perfunctory in execu- tion and written for a wider public than his first history, but the narrative is dramatic and vivid, the portraiture is sympathetic, and the historical events are interpreted by the light of the rational- istic optimism of the later 18th century.

Before, however, the History of the Thirty Years' War was finished, Schiller had turned from history to philosophy. A year after his marriage he had been stricken down by severe illness, from the effects of which he was never completely to recover; financial cares followed, which were relieved unexpectedly by the generosity of the

hereditary prince of Holstein-Augustenburg and his minister, Graf Schimmelmann, who conferred upon him a pension of 1000 talers a year for three years. Schiller resolved to devote the leisure of these years to the study of philosophy. In the summer of 1790 he had lectured in Jena on the aesthetics of tragedy, and in the following year he studied carefully Kant's treatise on aesthetics, Kritik der Urteilskraft, which had just appeared and appealed powerfully to

Schiller's mind. The influence of these studies is to be seen in the essays Vber den Grund unseres Vergniigens an tragischen Gegenstdnden and Vber tragische Kunst (1792), as well as in his correspondence with his friend Korner. Here Schiller arrives at his definition of beauty, as Freiheit in der Erscheinung, which, although it failed to remove Kant's difficulty that beauty was essentially a subjective conception, marked the beginning of a new stage in the history of German aesthetic theory. Vber Anmut und Wiirde, published in 1793, was a further contribution to the elucidation and widening of Kant's theories; and in the eloquent Brief e iiber die asthetische Erziehung des.Menschen (1795), Schiller proceeded to apply his new standpoint to the problems of social and individual life. These remarkable letters were published in Die Horen, a new journal, founded in 1794, which was the immediate occasion for that intimate friendship with Goethe which dominated the remainder of Schiller's life. The two poets had first met in 1788, but at that time Goethe, fresh from Italy, felt little inclination towards the author of the turbulent dramas Die Rduber, Kabale und Liebe and Don Carlos. _ By degrees, however, Schiller's historical publications, and, in a higher degree, the magnificent poems, Die Gotler Griechenlands (1788) and Die Kiinstler (1789), awakened Goethe's respect, and in 1794, when the younger poet invited Goethe to become a collaborator in the Horen, the latter responded with alacrity. In a very few weeks the two men had become friends. In the meantime a holiday in Schiller's Wiirttemberg home had brought renewed health and vigour. An immediate outcome of the new friendship was Schiller's admirable essays, published in the Horen (1 795-1 796) and collected in 1800 under the title Uber naive und sentimenlalische Dichlung. Here Schiller applied his aesthetic theories to that branch of art which was most peculiarly his own, the art of poetry; it is an attempt to classify literature in accordance with an a priori philosophic theory of " ancient " and " modern," " classic " and " romantic," " naive and " sentimental " ; and it sprang from the need Schiller himself felt of justifying his own " sentimental " and " modern " genius with the " naive " and " classic " tranquillity of Goethe's. While Schiller's standpoint was too essentially that of his time to lay claim to finality, it is, on the whole, the most concise statement we possess of the literary theory which lay behind the classical literature of Germany.

For Schiller himself this was the bridge that led back from philosophy to poetry. Under Goethe's stimulus he won fresh laurels in that domain of philosophical lyric which he had opened with Die Kiinstler; and in Das Ideal und das Leben, Die Macht des Gesanges,

Wiirde der Frauen, and Der Spaziergang, he pro- duced masterpieces of reflective poetry which have not their equal in German literature. These poems appeared in the Musenalmanach, a new publication which Schiller began in 1796, the Horen, which had never met with the success it merited, coming to an end in 1797. In the Musenalmanach were also published the ■" Xenien " (1797), a collection of distichs by Goethe and Schiller, in which the two friends avenged themselves on the cavilling critics who were not in sympathy with them. The Almanack of the following year, 1798, was even more noteworthy, for it contained a number of Schiller's most popular ballads, " Der Ring des Polykrates," " Der Handschuh," " Ritter Toggenburg," " Der Taucher," " Die Kraniche des Ibykus " and " Der Gang nach dem Eisenhammer;" " Der Kampf mit dem Drachen " following in 1799, and " Das Lied von der Glocke " in 1800. As a ballad poet, Schiller's popularity has been hardly less great than as a dramatist; the bold and simple outline, the terse dramatic characterization appealed directly to the popular mind, which did not let itself be disturbed by the often artificial and rhetorical tone into which the poet falls. But the supreme importance of the last period of Schiller's life lay in the series of master-dramas which he gave to the world between 1799 and 1804. Just as Don Carlos had led him to the study of Dutch history, so now his occupation with the history of the Thirty Years' War supplied him with the theme of his trilogy of Wallenstein (1 798-1 799). The plan of Wallenstein was of long standing, and it was only towards the end, when Schiller realized the impossibility of saying all he had to say within five acts, that he decided to divide it into three parts, a descriptive prologue, Wallensteins Lager, and the two dramas Die Piccolomini and Wallensteins Tod. Without entirely break-

ing with the pseudo-classic method he had adopted in Don Carlos — the two lovers, Max Piccolomini and Thekla, are an obvious concession to the tradition of the French theatre — Wallenstein shows how much Schiller's art had benefited by his study of Greek tragedy; the fatalism of his hero is a masterly application of an antique motive to a modern theme. His whole conception of life and character had deepened since Don Carlos, and under the influence of Kant's philosophy the drama became the embodiment of ethical problems that are essentially modern. The success of Wallenstein, with which Schiller passed at once into the front rank of European dramatists, was so encouraging that the poet resolved to devote himself with redoubled ardour to dramatic poetry. Towards the end of 1799 he took up his residence permanently in Weimar, not only to be near his friend, but also that he might have the advantage of

visiting regularly the theatre of which Goethe was director.

Wallenstein was followed in 1800 by Maria Sttiart, a tragedy, which, in spite of its great popularity in and outside of Germany, was felt by the critics to follow too closely the methods of the lachrymose " tragedy of common life " to maintain a high position among Schiller's works. It is a serious flaw in the play that the fate of the heroine is virtually decided before the curtain rises, and the poet is obliged to create by theatrical devices the semblance of a tragic conflict which, in reality, does not exist. A finer production in every way is Schiller's "romantic tragedy," Die Jungfrau von Orleans (1801). The resplendent medieval colouring of the subject, the essentially heroic character of Joan of Arc, gave Schiller an admirable opportunity for the display of his rich imagination and rhetorical gifts; and by an ingenious alteration of the historical tradition, he was able to make the drama a vehicle for his own imperturbable moral optimism. In unity of style and in the high level of its dramatic diction, Die Jungfrau von Orleans is unsurpassed among Schiller's works. Between this drama and its successor, Die Braut von Messina, Schiller translated and adapted to his classic ideals Shakespeare's Macbeth (1801) and Gozzi's Turandot (1802). With Pie Braut von Messina (1803) he experimented with a tragedy on purely Greek lines, this drama being as close an approximation to ancient tragedy as its medieval and Christian milieu permitted of. If the experiment cannot be regarded as successful, the fault lies in the difficulty of reconciling the artificial conventions of the Greek theatre, the chorus and the oracle— here represented by dreams and superstitions — with the point of view of the poet's own time. As far as the diction itself is concerned, the lyric outbursts of the chorus gave Schiller's genius an opportunity of which he was not slow to avail himself. In the poet's last completed drama, Wilhelm Tell (1804), he once more, as in Wallenstein, chose a historical subject involving wide issues. Wilhelm Tell is the drama of the Swiss people; its subject is less the personal fate of its hero than the struggle of a nation to free itself from tyranny. This is the reason for the epic breadth of the work, its picturesque and panoramic character. It also justifies the idealization of the hero, on the one hand, and, on the other, the introduction of episodes which have but little re- lation to his personal fate, or even put his character in a directly unfavourable light. Wilhelm Tell was an attempt to win for the German drama a new field, to widen the domain of dramatic poetry. Besides writing Tell, Schiller had found time in 1803 and 1804 to translate two French comedies by Picard, and to pre- pare a German version of Racine's Phedre; and in the last months of his life he

began a new tragedy, Demetrius, which gave every promise of being another step forward in his poetic achievement. But Demetrius remains a fragment of hardly two acts.

Schiller died at Weimar on the 9th of May 1805. His last years were darkened by constant ill-health; and indeed it is marvellous that he was able to achieve so much. A visit to Leipzig in 1801, and to Berlin — where there was some prospect of his being invited to settle — in 1804, were the chief outward events of his later years. He was ennobled in 1802, and in 1804 the duke of Weimar, unwilling to lose him, doubled his meagre salary of 400 talers. Schiller's art, with its broad, clear lines, its unambigu- ous moral issues, and its enthusiastic optimism, has appealed with

peculiar force to the German people, especially in periods of political despondency. But since the re-establishment of the German empire in 1871 there has been, at least in intellectual circles, a certain waning of his popularity, the Germans of to-day realizing that Goethe more fully represents the aspirations of the nation. In point of fact, Schiller's genius lacks that universality which characterizes Goethe's; as a dramatist, a philosopher, an historian, and a lyric poet, he was the exponent of ideas which belong rather to the Europe of the period before the French Revolution than to our time; we look to his high principles of moral conduct, his noble idealism and optimism, rather as the ideal of an age that has passed away than as the expression of the more material ambitions of the modern world.

The first edition of Schiller's Sdmtliche Werke appeared in 1812-1815 in 12 vols, and was edited by Schiller's most intimate friend, C. G. Korner. Of the countless subsequent editions mention need only be made here of the historisch-kritische Ausgabe by K. Goedeke and others (15 vols., 1867-1876); the edition published by Hempel and edited by R. Boxberger and W. von Maltzahn (16 vols., 1868-1874); that in Kiirschner's Deutsche Nationalliteratur, vols. 118-129 (1 882-1 890), edited by R. Boxberger and A. Birlinger; and the latest Cotta edition (Sdkularausga.be), edited by E. von der Hellen and others (17 vols., 1904-1905). A critical edition of Schiller's Brief e was published by F. Jonas (7 vols.) in 1892-1896; the chief collections of his correspondence are : Briefwechsel zwischen Schiller und Goethe (1828-1829, edited by F. Muncker, 4 vols., 1893); Briefwechsel zwischen Schiller und W. von Humboldt (1830, edited

by F. Muncker, 1893) ; Schillers Briefwechsel mit Korner (1847, edited by L. Geiger, 1893); Schiller und Lotte (1856, 4th ed. 1893); Briefwechsel zwischen Schiller und Cotta, ed. by W. Vollmer (1876). The chief biographies of Schiller are the following: T. Carlyle, Life of Friedrich Schiller (1824, German translation with an intro- duction by Goethe, 1830); Caroline von Wolzogen, Schillers Leben (1830, 5th ed. 1876, cheap reprint, 1884); K. Hoffmeister, Schillers Leben (1838-1842); G. Schwab, Schillers Leben (1840, 2nd ed. 1844); E. Palleske, Schillers Leben und Werken (1858- 1859, 14th ed. 1894, Eng. trans. 1885); H. Viehoff, Schillers Leben (1875, new ed. 1888); H. Diintzer, Schillers Leben (1881); J. 'Sime, Schiller (1882); R. Weltrich, F. Schiller (vol. i., 1890); O. Brahm, Schiller (vols, i.-ii., 1888-1892); J. Minor, Schiller, sein Leben und seine Werke (vols, i.ii., 1890); J. Wychgram, Schiller (1895, 3rd ed. 1898, popular ed. 1905) ; O. Harnack, Schiller (1898, 2nd ed. 1905); L. Bellermann, Schiller (1901); C. Thomas, Life and Works of Schiller (1901); K. Berger, Schiller (vol. i., 1905); E. Kiihnemann, Schiller (1905). See also E. Boas, Schillers Jugend jahre (1856); E. Miiller, Schillers Mutter (1894); by the same, Schillers Jugenddichtung und Jugendleben (1896) ; A. Streicher, Schillers Flucht von Stuttgart (1836, reprint, 1905) ; E. Miiller, Regesten zu Schillers Leben und Werken (1900); A. Kontz. Les Drames de lajeunesse de Schiller (1899) ; E. Kiihnemann, Kants und Schillers Beeriindung der Asthetik (1895); V. Basch, La Poetiaue de Schiller (1902) ; K. Tomaschek, Schiller in seinem. Verhaltmsse zur Wissenschaft (1862); F. Uberweg, Schiller als Historiker und Phttosoph (1884); O. Harnack, Die klassische Asthetik der Deutschen (1892); W. Fielitz, Studien zu Schillers Dramen (1876); L. Beller- mann, Schillers Dramen: Beitrage zu ihrem Verstandnis (2 vols., 1888-1891; 2nd ed. 1898); K. Werder, Vorlesungen iiber Schillers Wallenslein (1889); A. Kostar, Schiller als Dramaturg (1891); L. Belling, Schillers Metrik (1883); K. Fischer, SchiUer-Schnften (1891-1892); J. W. Braun, Schiller im Vrteile seiner Zeitgenossen (3 vols., 1882) ; J. G. Robertson, Schiller after a Century (1905).

(J. G. R.) SCHILTBERGER, JOHANN or HANS (1381-1440?), German traveller and writer, was born of a noble family in 1381 (May 9th?), probably at Hollern near Lohof, half way between Munich and Freising, on what was then a property of his family. In 1394 he joined the suite of Lienhart Richartinger, and went off to fight under Sigismund, king of Hungary (afterwards emperor) , against the Turks on the Hungarian frontier. At the battle of Nicopolis (Sept. 28th, 1396) he was wounded and taken prisoner: when he had recovered the use of his feet, Sultan Bayezid I. (Ilderim)

took him into his service as a runner (i396-T402)l During this time he .seems to have accompanied Ottoman troops to certain parts of Asia Minor and to Egypt. On Bayezid's overthrow at Angora (July 20th, 1402), Schiltberger passed into the service of Bayezid's conqueror Timur: he now appears to have followed Themurlin to Samarkand, and perhaps also to Armenia and Georgia. After Timur's death (February 17th, 1405) his German runner first became a slave of Shah Rukh, the ablest of Timur's sons; then of Miran Shah, a brother of Shah Rukh; then of Abu Bekr, a son of Miran Shah, whose camp

roamed up and down Armenia. He next accompanied Chekre, a Tatar prince living in Abu Bekr's horde, on an excursion to Siberia, of which name Schiltberger gives us the first clear mention in west European literature. He also probably followed his new master in his attack on the Old Bulgaria of the middle Volga, answering to the modern Kazan and its neighbourhood. Wan- derings in the steppe lands of south-east Russia; visits to Sarai, the old capital of the Kipchak Khanate on the lower Volga and to Azov or Tana, still a trading centre for Venetian and Genoese merchants; a fresh change of servitude on Chekre's ruin; travels in the Crimea, Circassia, Abkhasia and Mingrelia; and finally escape (from the neighbourhood of Batum) followed. Arriving at Constantinople, he there lay hid for a time; he then returned to his Bavarian home (1427) by way of Kilia, Akkerman, Lemberg, Cracow, Breslau and Meissen After his return he became a chamberlain of Duke Albert III., probably receiving this appointment in the first instance before the duke's accession in 1438.

Schiltberger's Reisebuch contains not only a record of his own experiences and a sketch of various chapters of contemporary Eastern history, but also an account of countries and their manners and customs, especially of those countries which he had himself visited. First come the lands " this side " of Danube, where he had travelled; next follow those between the Danube and the sea, which had now fallen under the Turk; after this, the Ottoman dominions in Asia; last come the more distant regions of Schilt- berger's world, from Trebizond to Russia and from Egypt to India. In this regional geography the descriptions of Brusa; of various west Caucasian and Armenian regions; of the regions around the Caspian, and the habits of their peoples (especially the Red Tatars) ; of Siberia ; of the Crimea with its great Genoese colony at Kaffa (where he once spent five months); and of Egypt and Arabia, are particularly worth notice. His allusions to the Catholic missions still persisting in Armenia and in other regions beyond the Euxine, and to (non-Roman ?) Christian

communities even in the Great Tatary of the steppes are also remarkable. Schiltberger is perhaps the first writer of Western Christendom to give the true burial place of Mahomet at Medina: his sketches of Islam and of Eastern Christendom, with all their shortcomings, are of remarkable merit for their time: and he may fairly be reckoned among the authors who contributed to fix Prester John, at the close of the middle ages, in Abyssinia. His work, however, contains many inaccuracies; thus in reckoning the years of his service both with Bayezid and with Timur he unaccountably multiplies by two. His account of Timur and his campaigns is misty, often incorrect, and sometimes fabulous: nor can von Hammer's parallel between Marco Polo and Schiltberger be sustained without large reservations.

Four MSS. of the Reisebuch exist: (1) at Donaueschingen in the Fiirstenberg Library, No. 481; (2) at Heidelberg, University Library, 216; (3) at Nuremberg, City Library, 34; (4) at St Gall, Monast. Library, 628 (all of 15th century, the last fragmentary). The work was first edited at Augsburg, about 1460; four other editions appeared in the 15th century, and six in the 1 6th; in the 19th the best were K. F. Neumann's (Munich, 1859), P. Bruun's (Odessa, 1866, with Russian commentary, in the Records of the Imperial University of New Russia, vol. i.), and V. Langmantel's (Tubingen, 1885); " Hans Schiltbergers Reisebuch," in the 172nd volume of the Bibliothek des literarischen Vereins in Stuttgart. See also the English (Hakluyt Society) version, The Bondage and Travels of Johann Schiltberger . . ., trans, by Buchan Telfer with notes by P. Bruun (London, 1879); von Hammer, " Berechtigung d. orien- talischen Namen Schiltbergers," in Denkschriften d. Konigl. Akad. d. Wissenschaften (vol. ix., Munich, 1823-1824); R. Rohricht, Bibliotheca geographica Palaestinae (Berlin, 1890, pp. 103-104); C. R. Beazley, Dawn of Modern Geography, iii. 356-378, 550, 555.

(C. R. B.)

SCHIMMEL, HENDRIK JAN (1825-), Dutch poet and novelist, was born on the 30th of June 1825, at 'S Graveland, in the province of North Holland, where his father was a notary and the burgomaster. From 1836 to 1842 Schimmel served in his father's office, and upon his death he was taken into the office of the agent of the Dutch Treasury in Amsterdam, ex- changing in 1849 for a post with the Dutch Trading Company there. In 1863 he became a director of the Amsterdam Credit Association. His first volume of poems appeared in 1852; but it was as a writer of historical dramas in blank verse and one of the regenerators of the Dutch stage that his literary

position was made. His finest production was Struensee (1868), which was preceded by Napoleon Bonaparte (1851) and Juffrouw Serklaas (" Mrs Serklaas," 1857). Among his other dramatic works may be mentioned Joan Woutersz (a drama, 1847), Twee

Tudors (" Two Tudors," 1847), Gondelbald (1848), Schuld en Boete (" Guilt and Retribution," a drama, 1852), Het Kind van Staat (" The State Child," a dramatic fragment, 1859); Zege na Slrijd (" Struggle and Triumph," a drama, 1878). Schimmel's renderings of Casimir de la Vigne's Louis XI., Geibel's Sophonisbe, and Ponsard's Lucrece are also still acted in the Netherlands. His novels are distinguished by their vigorous style and able characterization. The earlier, better-known ones betray the writer's English proclivities. The plots of Mary Hollis (i860, 3 vols., English translation, London 1872, under the title of " Mary Hollis, a Romance of the Days of Charles II. and William, Prince of Orange," 3 vols.) and of Mylady Carlisle (1864, 4 vols.) are laid in England, whereas those of his Sinjeur Semeyns (1875, 3 vols.), a powerful picture of the terrible year 1672, and of De Kapitein van de Lijf garde (1888, 3 vols., English adaptation, 1896, under the title of " The Lifeguardsman," 1 vol.), a continuation of " Master Semeyns," are almost entirely centred in Holland. He had many points of style and manner in common with Madame Bosboom- Toussaint, though both remained highly original in their treat- ment. Both finally reverted to essentially national subjects. To the earlier romances of Schimmel belong: Bonaparte en zyn Tyd (" Bonaparte and his Time," 1853), De Eerste Dag eens Nieuwcn Levens (" The First Day of a New Life," 2 vols., 1855), Sproken en Vertellingen (" Legends and Tales," 1855), Een Haagsche Jojfer (" A Hague Damsel," 1857), De Vooravond der Revolutie (" The Eve of the Revolution," 1866). Schimmel was an early collaborator of Potgieter on the Gids staff. His dramatic works appeared in a collected edition in 1885-1886 at Amsterdam (3 vols.), followed by a complete and popular issue of his novels (Schiedam, 1892).

SCHINKEL, KARL FRIEDRICH (1781-1841), German architect and painter, and professor in the academy of fine arts at Berlin from 1820, was born at Neuruppin, in Brandenburg, on the 13th of March 1781. He was a pupil of Friedrich Gilly, the continuation of whose work he undertook when his master died in 1800. In 1803 Schinkel went to Italy, returning to Berlin in 1805. The Napoleonic wars

interfered seriously with his work as architect, so that he took up landscape painting, displaying a talent for the romantic delineation of natural scenery. In 1810 he drew a plan for the mausoleum of Queen Louise and in 1819 a brilliant sketch for the Berlin cathedral in Gothic style. From 1808 to 1814 he painted a number of dioramas for Gropins. From 1815 he devoted much time to scene painting, examples of his work being still in use in the royal theatres of Germany. Schinkel's principal buildings are in Berlin and its neighbourhood. His merits are, however, best shown in his unexecuted plans for the transformation of the Acropolis into a royal palace, for the erection of the Orianda Palace in the Crimea and for a monument to Frederick the Great. These and other designs may be studied in his Sammlung architektonischer Entwiirfe (1820-1837, 3rd ed.- 1857-1858) and his Werke der hbheren Baukunst (1845-1846, new ed. 1874).

See the biographies by Kugler, Bottischer, Quast, H. Grimm, Waagen, Woetmann, Pecht, Dohme, and vol. xxviii. of the Kiinstler-monographie, by Ziller (Leipzig, 1897).

SCHIRMER, FRIEDRICH WILHELM (1802-1866), German landscape artist, was born in Berlin. As a youth he painted flowers in the royal porcelain factory; afterwards he became a pupil of F. W. Schadow in the Berlin Academy, but his art owed most to Italy. He went to Italy in 1827; his sojourn extended over three years; he became a disciple of his country- man Joseph Koch, who built historic landscape on the Poussins, and is said to have caught inspiration from Turner. In 1831 Schirmer established himself in Berlin in a studio with scholars from 1839 to 1865 he was professor of landscape in the academy.

Schirmer's place in the history of art is distinctive: his sketches in Italy were more than transcripts of the spots; he studied nature with the purpose of composing historic and poetic landscapes. On the completion of the Berlin Museum of Antiquities came his opportunity: upon the walls he painted classic sites and temples, and elucidated the collections by the landscape scenery with which they were historically associated. His supreme aim was to make his art the poetic interpretation of nature and he deemed technique

secondary to conception. His pictures appeal to the mind by the ideas they embody, by beauty of form, harmony of line, significance of light and colour. In this constructional landscape German critics discover " motive," " inner meaning," " the subjective," " the ideal." And Schirmer thus formed a school.

SCHIRMER, JOHANN WILHELM (1807-1865), German land- scape painter, was born at Jiilich in Rhenish Prussia. This artist, a namesake of F. W. Schirmer, had a similar aim and career. He first was a student, and subsequently became a professor in the academy of Diisseldorf. In 1854 he was made director of the art school at Carlsruhe, where he died. He travelled and sketched in Italy, and aimed at historic landscape after the manner of the Poussins. His Biblical landscapes with figures are held in good esteem.

SCHISM, a division, especially used of a formal separation from a church or religious body, a sect, or church formed by such separation. The Greek axioˆa, a cleft, split, from crxtf uv, to cleave, is used in the New Testament of an actual rent in a garment (Matt. ix. 16) and also several times of divisions or differences of opinion as to the teaching and message of Christ (John vii. 43) or of dissension in the church (1 Cor. xi. 18) In the early Christian Church, as defined by the Fathers, and later, the offence of " schism " is distinguished from that of " heresy "; it refers not to differences of belief or doctrine, but to the promotion, or the state, of divisions of organisation, and to the formation of bodies separate from the true church, or to dissensions and separations due to disputes over matters of discipline or authority (see Heresy). The dispute which lecl to the separation of the Latin and Greek Churches is known as the " Great Schism," and the division over the election to the Papacy of Urban VI. and Clement VII. as the " Great Schism of the West " (1378-1417) (see Papacy and Church History).

SCHISTS (Gr. <7x'f e »'j to split), in petrology, metamorphic rocks which have a fissile character. In all of them there is at least one mineral which crystallizes in platy forms (e.g. mica, talc, chlorite, haematite), or in long blades or fibres (antho- phyllite, tremolite, actinolite, tourmaline), and, when these have a well marked parallel arrangement in definite bands or folia, the rock will break far more easily along the bands than across them. The platy minerals have also a perfect cleavage parallel to their flat surfaces, while the fibrous species often have two or more cleavages following their long axes; hence a schistose rock may split not only by separation of the mineral plates from one another but also by cleavage of the parallel minerals through their substance.

Schists in the common acceptance of that term are really highly crystalline rocks; fissile slates, shales or sandstones, in which the original sedimentary structures are little modified by recrystallization, are not included in this group by English petrologists, though the French sckistes and the German Schiefer are

used to designate also rocks of these types. The difference between schists and gneisses is mainly that the latter have less highly developed foliation; they also, as a rule, are more coarse grained, and contain far more quartz and felspar, two minerals which rarely assume platy or acicular forms, and hence do not lead to the production of a fissile character in the rocks in which they are important constituents. Schists, as a rule, are found in regions composed mainly of metamorphic rocks, such as the Central Alps, Himalayas, and other mountain ranges, Saxony, Scandinavia, the Highlands of Scotland and north-west of Ireland. They are typical products of " regional " metamorphism, and are in nearly all cases older than the fossiliferous sedimentary rocks. Transitions between schists and normal igneous or sedimentary rocks are often found. The Silurian mica-schists of Bergen in Norway are fossiliferous; in the Alps it is believed that even Mesozoic rocks pass laterally into mica-schists and calc-schists. These changes are regarded as having been produced by the operation of heat, pressure and folding. It is often taught that gneisses are the further stages of the crystallization of schists and belong to a deeper zone Where the pressures and the tempera- tures were greater. Igneous rocks also may be converted readily into schists (e.g. serpentine into talc-schist, dolerite into horn- blende-schist) by the same agencies.

There are two great groups of schists, viz. those derived from sedimentary and those derived from igneous rocks, or, as they have been called, the " paraschists " and the " orthoschists." The first group is the more important and includes some of the commonest metamorphic rocks. In the paraschists, though fossils are ex- ceedingly rare, sedimentary structures such as bedding and the alternation of laminae of fine and coarse deposit may frequently be preserved. The foliation is often parallel to the bedding, but may cross it obliquely or at right angles; or the bedding may be folded and contorted while the foliation maintains a nearly uniform orientation. When the foliation is undulose or sinuous the rocks are said to be crumpled, and have wavy splitting surfaces instead of nearly plane ones. The development of foliation in shaly rocks is undoubtedly closely akin to the production of cleavage in slates.

The sedimentary schists or paraschists have three great sub- divisions, the mica-schists and chlorite-schists (which correspond in a general way to shales or clay rocks) the calc-schists (impure

limestones) and the quartz-schists (metamorphosed sandstones). In the mica-schists of this group biotite or muscovite may be the principal mineral and often both are present in varying proportions ; the mica has developed from the argillaceous matter of the original rock; in addition there is always quartz and sometimes telspar (albite or oligoclase). A large number of minerals may occur as accessories, e.g. garnet, tourmaline, staurolite, andalusite, actinolite, chloritoid or ottrelite, epidote, haematite, and if any of these is abundant its presence may be indicated by the name given the rock, e.g. staurolite-mica-schist. The phyllites (q.v.) form a middle term between this group and the slates; they consist usually of quartz, white mica and chlorite, and have much of the foliation and schistosity of the mica-schists. Those rocks which contain andalusite and staurolite are sometimes found in such associations as show that they are due to contact action by intrusive igneous masses. The chlorite-schists are often of igneous derivation, such as ash-beds or fine lavas which have been metamorphosed. . Many of them con- tain large octahedra of magnetite. Others are probably sedimentary rocks, especially those which contain much muscovite. Calc-schists are usually argillaceous limestones in which a large development of biotite or phlogopite has occasioned foliation. Often they contain quartz and felspar, sometimes pyroxene, amphibole, garnet or epidote. Pure limestones do not frequently take on schistose facies. The quartz-schists consist of quartz and white mica, and are intimately related to quartzites. Many of them have been originally micaceous or felspathic sandstones. We may mention also graphitic-schists containing dark scaly graphite (often altered forms of carbonaceous shales), and haematite-schists which may represent beds of ironstone.

The orthoschists are white mica-schists produced by the shearing of acid rocks, such as felsite and porphyry. Some of the " porphy- roids " which have grains of quartz and felspar in a finely schistose micaceous matrix are intermediate between porphyries and mica-schists of this group. Still more numerous are orthoschists of hornblendic character (hornblende-schists) consisting of green hornblende with often felspar, quartz and sphene (also rutile, garnet, epidote or zoisite, biotite and iron oxides). These are modified forms of basic rocks such as basalt, dolerite and diabase. Every transition can be found between perfectly normal ophitic dolerites and typical hornblende-schists, and occasionally the same dike or sill will provide specimens of all the connecting stages. A few hornblende-schists are metamorphosed gabbros; others have developed from dikes or sills of lamprophyre. Under extreme crushing these basic

rocks may be converted into dark biotite-schists, or greenish chlorite-schists. Tremolite-schist and anthophyllite-schist are in nearly all cases the representatives of the ultra-basic igneous rocks such as peridotite in regions of high metamorphism. Talc-schists are of the same category. They are soft and lustrous, with a peculiarly smooth feel, and though often confounded with mica-schists may be distinguished by their richness in magnesia ; many of them contain tremolite or actinolite; others have residual grains of olivine or augite; and here also every gradation can be found between the unmodified igneous types and the perfectly metamorphic schists. Occasionally serpentines become sheared without yielding talcose minerals; they are then known as serpentine-schist and antigorite-schist, the latter being tough leek-green rocks, more or less trans-parent.

SCHLAGINTWEIT, the name of five German scientific ex- plorers or students of foreign countries. They were brothers, and were named Hermann (1826-1882, who became known as Hermann von Schlagintweit Sakunliinski) , Adolf (1829-1857), Eduard (1831-1866), Robert (1833-1885), and Emil (1835- 1904). Hermann was born at Munich on the 13th of May 1826. His first scientific labours were studies in the Alps, carried on between 1846 and 1848 in association with his brother Adolf (born at Munich on the 9th of January 1829). The publication of the Untersuchungen iiber die physikalische Geographie der Alpen in 1850 (Leipzig) founded the scientific reputation of the two brothers, and their reputation was increased by subsequent

investigations in the same field, in which Robert (born at Munich on the 27th of October 1837) also took part. Soon after the publication of the Neue Untersuchungen iiber die phys. Geog. u. Geol. der Alpen (Leipzig, 1854), the three brothers received, on the recommendation of Alexander von Humboldt, a commission from the East India Company to travel for scientific purposes in their territory, and more particularly to make observations on terrestrial magnetism. During 1854-1857 they travelled, some- times in company, sometimes separately, in the Deccan and in the region of the Himalayas, prosecuting their investigations beyond the frontiers of the company's territory into the region of the Karakorum and Kuen-lun mountains. Hermann and Robert were the first Europeans who crossed the Kuen-lun, and in honour of that achievement the former had the title or surname of Sakiinliinski bestowed upon him (in 1864). Robert returned to Europe early in 1857; Hermann, after a visit to Nepal, joined him on his homeward journey; but Adolf, who remained to prosecute his explorations in Central Asia, was put to death by the

amir of Kashgar on the 26th of August. Hermann and Robert published in four volumes .the Results of a Scientific Mission to India and High Asia (Leipzig, 1860-1866). They had, moreover, made extensive ethnographical and natural history collections. Hermann spent the last years of his life chiefly in literary and scientific activity, partly at Munich, partly at the castle of Jagernburg near Forchheim. He died at Munich on the 19th of January 1882. Robert was appointed professor of geography at Giessen in 1863. He paid several visits to America, which furnished him with material for such works as Die Pacific- Eisenbahn (1870), Die Mormonen (1874), Die Prdrien (1876), &c, all published at Cologne. He died at Giessen on the 6th of June 1885. Eduard, born on the 23rd of March 1831, killed in battle at Kissingen in 1866, made himself known by an account of the Spanish expedition to Morocco in 1859-1860. Emil, born on the 7th of July 1835, wrote several learned works relating to India and Tibet. He died on the 29th of October

1904.

SCHLAN (Czech, Slani), a town of Bohemia, 37 m. N.W. of Prague by rail. Pop. (1900) 9491, mostly Czech. The most notable churches are St Gotthard (14th century, remodelled in 1782) St Mary, attached to the Piarist college (1655-1658), the chapel of St Lawrence (13th century) and the church of the Holy Trinity belonging to the Franciscan friary (1655). There are extensive coal-fields and important iron, metal and machine industries, together with the manufacture of chemicals and corn-milling.

Schlan — probably the name of a castle — occurs in documents of the 10th century. The town was probably founded in the 13th century by Ottakar II. In the Hussite wars it took the utraquist side, was occupied in 1420 by King Sigismund, but retaken the next year by the troops of Prague. These were expelled, in 1425, after a desperate resistance by the Taborites and Orphans. The town now remained faithful to the Taborite cause till its collapse in 1434. The place was re-fortified between 1460 and 1472. After the battle of the White Hill (1620), Schlan was granted to Jaroslaus Bofita of Martinic, lord of Smecno, whose descendants still own the lordship.

SCHLANGENBAD, a watering-place of Germany, in the Prussian province of Hesse-Nassau, pleasantly situated in a deep and well-wooded valley of the Taunus range, 6 m. N.W. of Wiesbaden, 4J m. S. of Langenschwalbach, and 5 m. E. of Eltville on the Rhine, with which it is connected by a steam tramway. Its eight thermal springs are mostly used for bathing, and are efficacious in nervous

complaints and feminine disorders. There is a handsome kursaal connected with the principal bathing establishment. Permanent population (1905) 400, while the number of visitors numbers about 2 500 annually.

See Baumann, Schlangenbad, mit besonderer Beriicksichtigung seiner Kur- und Bade-Anstalten (new ed., Wiesbaden, 1894) ; and Bertrand, Schlangenbad und seine Warmquellen (Heidelberg, 1878).

SCHLEGEL, AUGUST WILHELM VON (1767-1845), German poet, translator and critic, was born on the 8th of September, 1767, at Hanover, where his father, Johann Adolf Schlegel (1 721-1793), was a Lutheran pastor. He was educated at the Hanover gymnasium and at the university of Gottingen. Having spent some years as a tutor in the house of a banker at

Amsterdam, he went to Jena, where, in 1796, he married Karoline, the widow of the physician Bohmer (see Scheixing, Karoline) and in 1798 was appointed extraordinary professor. Here he began his translation of Shakespeare, which was ultimately completed, under the superintendence of Ludwig Tieck, by Tieck's daughter Dorothea and Graf W. H. Baudissin. This rendering is one of the best poetical translations in German, or indeed in any language. At Jena Schlegel contributed to Schiller's periodicals the Horen and the Musenalmanach; and with his brother Friedrich he conducted the Athenaeum, the organ of the Romantic school. He also published a volume of poems, and carried on a rather bitter controversy with Kotzebue. At this time the two brothers were remarkable for the vigour and freshness of their ideas, and commanded respect as the leaders of the new Romantic criticism. A volume of their joint essays appeared in 1801 under the title Charakteristiken und Kritiken. In 1802 Schlegel went to Berlin, where he delivered lectures on art and literature; and in the following year he published Ion, a tragedy in Euripidean style, which gave rise to a suggestive discussion on the principles of dramatic poetry. This was followed by Spanisches Theater (2 vols., 1803-1809), in which he presented admirable translations of five of Calderon's plays; and in another volume, Blumenstrausse italienischer , spanischer und portnguesischer Poesie (1804), he gave translations of Spanish, Portuguese and Italian lyrics. In 1807 he attracted much attention in France by an essay in the French language, Comparaison enlre la Phedre de Racine et celle

d' Euripide, in which he attacked French classicism from the standpoint of the Romantic school. His lectures on dramatic art and literature {Uber dramatische Kunst und Literatur, 1809-1811), which have been translated into most European languages, were delivered at Vienna in 1808. Meanwhile, after a divorce from his wife Karoline, in 1804, he travelled in France, Germany, Italy and other countries with Madame de Stael, who owed to him many of the ideas which she embodied in her work, De V Allemagne. In 1813 he acted as secretary of the crown prince of Sweden, through whose influence the right of his family to noble rank was revived. Schlegel was made a professor of literature at the university of Bonn in 1818, and during the remainder of his life occupied himself chiefly with oriental studies, although he continued to lecture on art and literature, and in 1828 he issued two volumes of critical writings (Kritische Schriften). In 1823- 1830 he published the journal Indische Bibliothek (3 vols.) and edited (1823) the Bhagavad-Gita with a Latin translation, and (1829) the Ramdyana. These works mark the beginning of Sanskrit scholarship in Germany. After the death of Madame de Stael Schlegel married (1818) a daughter of Professor Paulus of Heidelberg; but this union was dissolved in 1821. He died at Bonn on the 12th of May 1845. As an original poet Schlegel is unimportant, but as a poetical translator he has rarely been excelled, and in criticism he put into practice the Roma.ntic principle that a critic's first duty is not to judge from the stand- point of superiority, but to understand and to " characterize " a work of art.

In 1846-1847 Schlegel's Sdmtliche Werke were issued in twelve volumes by E. Bocking. There are also editions by the same editor of his CEuvres ecrites en franqais (3 vols., 1846), and of his Opuscula Latine scripla (1848). Schlegel's Shakespeare translations have been often reprinted; the edition of 1 871 1872 was revised with Schlegel's MSS. by M. Bernays. See M. Bernays, Zur Entstehungs geschichte des Schlegelschen Shakespeare (1872); R. Genee, Schlegel und Shakespeare (1903). Schlegel's Berlin lectures of 1801-1804 were reprinted from MS. notes by J. Minor (1884). A selection of the writings of both A. W. and Friedrich Schlegel, edited by O. F. Walzel, will be found in Kilrschner's Deutsche Nationalliteratur, 143 (1892). See especially R. Haym, Romantische Schule, and the article in the Allg. deutsche Biographie by F. Muncker.

SCHLEGEL, JOHANN ELIAS (17 10-1749), German critic and dramatic poet, was born at Meissen on the 28th of January 1719. He was educated at Schulpforta and at the university of Leipzig, where he studied law. In 1743 he became private secretary to his relative,

von Spener, the Saxon ambassador at the Danish court. Afterwards he was made professor extra- ordinary at the academy of Seroe, where he died on the 13th

of August 1749. Schlegel was a contributor to the Bremer Beitrage and for some time, while he was living in Denmark, edited a weekly periodical, Der Fremde. With his dramas as well as with his critical writings he did much to prepare the way for Lessing, by whom his genius was warmly appreciated. He wrote two lively and well-constructed comedies, Der Triumph der guten Frauen and Die stumme Schonheit, the former in prose, the latter in alexandrines. Hermann and Canut (in alexandrines) are generally considered his best tragedies.

His works were edited (in 5 vols., 1761-1770) by his brother, J. H. Schlegel (1724-1780), who had a considerable reputation as a writer on Danish history. Another brother, J. Adolf Schlegel (1721-1793), an eminent preacher, and author of some volumes of verse, was the father of August Wilhelm and Friedrich von Schlegel. J. E. Schlegel's Asthetische und dramaturgische Schriften have been edited by J. von Antoniewicz (1887). and a selection of his plays by F. Muncker in Bremer Beitrage, vol, ii. (Kilrschner's Deutsche Nationalliteratur, vol. xliv., 1899). See, besides the biography by his brother in the edition of his works, E. Wolff, Johann Elias Schlegel (1889); and J. Rentsch, Johann Elias Schlegel als Trauer- spieldichter (1890).

SCHLEGEL, KARL WILHELM FRIEDRICH VON (1772-1829;, German poet, critic and scholar, was the younger brother of August Wilhelm von Schlegel. He was born at Hanover on the 10th of March 1772. He studied law at Gottingen and Leipzig, but ultimately devoted himself entirely to literary studies. He published in 1797 the important book Die Griechen und Romer, which was followed by the suggestive Geschichte der Poesie der Griechen und Romer (1798). At Jena, where he lectured as a Privatdozent at the university, he contributed to the Athenaeum the aphorisms and essays in which the principles of the Romantic school are most definitely stated. Here also he wrote Lucinde (1799), an unfinished romance, which is interest- ing as an attempt to transfer to practical ethics the Romantic demand for complete individual freedom, and Alarcos, a tragedy (1802) in which, without much success, he combined romantic and classical elements. In 1802 he went to Paris, where he edited the review Europa (1803), lectured on philosophy and carried on Oriental studies, some results of which he embodied in an epoch-making book, Uber die Sprache und Weisheit der Indier (1808). In the same year in which this work appeared, he and his wife Dorothea

(1 763-1839), a daughter of Moses Mendelssohn, joined the Roman Catholic Church, and from this time he became more and more opposed to the principles of political and religious freedom. He went to Vienna and in 1809 was appointed imperial court secretary at the headquarters of the archduke Charles. At a later period he was councillor of legation in the Austrian embassy at the Frankfort diet, but in 1818 he returned to Vienna. Meanwhile he had published his collected Gedichte (1809) and two series of lectures, Uber die neuere Geschichte (1811) and Geschichte der alien und neuen Literatur (181 5). After his return to Vienna from Frankfort he edited Concordia (1820-1823), and began the issue of his Sdmtliche Werke. He also delivered lectures, which were re- published in his Philosophie des Lebens (1828) and in his Philo- sophie der Geschichte (1829). He died on the nth of January 1829 at Dresden. A permanent place in the history of German literature belongs to Friedrich Schlegel and his brother August Wilhelm as the critical leaders of the Romantic school, which derived from them most of its governing ideas as to the charac- teristics of the middle ages, and as to the methods of literary expression. Of the two brothers, Friedrich was unquestionably the more original genius. He was the real founder of the Romantic school; to him more than to any other member of the school we owe the revolutionizing and germinating ideas which influenced so profoundly the development of German literature at the beginning of the 19th century.

Friedrich Schlegel's wife, Dorothea, was the author of an unfinished romance, Florentin (1801), a Sammlung romantischer Dichtungen des Mittelalters (2 vols., 1804), a version of Lother und Mailer (1805), and a translation of Madame de StaePs Corinne (1807-1808) — all of which were issued under her hus- band's name. By her first marriage she had a son, Philipp Veit, who became an eminent painter.

Friedrich Schlegel's Sdmtliche Werke appeared in 10 vols. (1822-1825); a second edition (1846) in 15 vols. His Prosaische Jugend-schriften (1794-1802) have been edited by J. Minor (1882, 2nd ed. 1906) ; there are also reprints of Lucinde, and F. Schleiermacher's Vertraute- Briefe iiber Lucinde, 1800 (1907). See R. Haym, Die romantische Schule (1870); I. Rouge, F. Schlegel et la genese du romantisme allemand (1904) ; by the same, Erlduterungen zu F. Schlegels Lucinde (1905) ; M. Joachimi, Die Weltanschauung der

Romantih (1905); W. Glawe, Die Religion F. Schlegels (1906);

E. Kircher, Philosophie der Romantik (1906). On Dorothea Schlegel see J. M. Raich, Dorothea von Schlegel und deren Sbhne (1881);

F. Diebel, Dorothea Schlegel als Schriftsteller im Zusammenhang mil der romantischen Schule (1905).

SCHLEICHER, AUGUST (1 821-1868), German philologist, was born at Meiningen on the 19th of February 1821, the son of a medical practitioner. He attended (1835-1840) the gymnasium at Coburg. In the autumn of 1840 he entered the university of Leipzig as a student of theology, but exchanged Leipzig in the spring of 1841 for Tubingen. Here he remained two years, and under the influence of the famous orientalist Ewald, relinquished the study of theology for that of languages. Proceeding to the university of Bonn in 1843, he took his doctor's degree in 1846 and established himself as Privatdozent for comparative philology. In 1850 he was appointed extraordinary professor of classical philology at the university of Prague, and in 1853 was advanced as ordinary professor to the chair of German and comparative philology and Sanskrit. While at Prague he commenced the study of Slavonic languages, and with the assistance of the Vienna academy of sciences undertook in 1852 a journey of scientific research into Prussian Lithuania, the fruits of which were the first scientific examination and description of the character of the Lithuanian language. In 1857 he became professor of philology at Jena, where he lived and worked until his death on the 6th of December 1868. Next to Franz Bopp (?.».), the founder on the science of language, no German savant left a more enduring stamp of his personality upon this science than did Schleicher.

His first scientific work, Zur vergleichenden Sprachgeschichle (1848), was followed by Die Sprachen Europas (1850) ; but the book by which he is best known is Kompendium der vergleichenden Gram- malik der indogermanischen Sprachen (2 pts., 1861, 1864; 4th ed., 1876), and a supplementary volume, Indogermanische Chrestomathie (1869). Among his minor writings are " Zur Morphologie der Sprache " (in the Memoires de I'academie de St, Petersbourg, 1859) ; Die Dar- winsche Theorie und die Sprachwissenschaft (1863, new ed. 1873), tJber die Bedeutung der Sprache fur die Naturgeschichte des Menschen (1865); while in the department of Slavonic and Lithuanian languages the following may be mentioned : Formenlehre der kirchen- slavischen Sprache (1852); Handbuch der litauischen Sprache (with grammar, reader and glossary, 1856-1857). Besides Lithuanian legends he published an

edition of Christian Donaleitis' Litauische Dichtungen (1865).

See S. Lefmann, August Schleicher (1870) and Zeitschrift fur vergleichende Sprachforschung, vol. xviii.

SCHLEIDEN, MATTHIAS JAKOB (1804-1881), German botanist, was born at Hamburg on the 5th of April 1804. He studied law at Heidelberg and • practised as an advocate in Hamburg till 1831, but not succeeding he studied botany and medicine at Gottingen and Berlin, and in 1839 graduated at Jena, where he was appointed extraordinary professor of botany, becoming honorary professor in 1846 and ordinary professor in 1850. In 1863 he was called to Dorpat, but resigned the following year and returned to Germany, where he lived as a private teacher. He died at Frankfort-on-Main on the 23rd of June 1881. His title to remembrance is twofold. Uniting the labours of two centuries of workers in vegetable histology, he proved that a nucleated cell is the only original constituent of the plant embryo, and that the development of all vegetable tissues must be referred to such cells, thus preparing the way for the epoch-making cell theory of Theodor Schwann (q.v.); and his Principles of Scientific Botany (1842-1843), which went through several editions, did much to shake the tyranny of the purely systematic Linnean school, whose accumulations he was accustomed irreverently to describe as "hay." Despite a certain inability to criticize and verify hisown hypotheses, he gave, both by his speculative activity and by the introduction of improved technical methods, so vivid an impulse to the younger

botanists of his time as to have earned from Anton de Bary the title of reformer of scientific botany. His botanical labours practically ceased after 1850, when he entered on various philo- sophical and historical studies.

SCHLEIERMACHER, FRIEDRICH DANIEL ERNST (1768- 1834), theologian and philosopher, was the son of a Prussian army chaplain of the Reformed confession, and was born on the ,21st of November 1768 at Breslau. He was educated in a Moravian school at Niesky in upper Lusatia, and at Barby near Halle. Moravian theology, however, soon ceased to satisfy him, and his doubts rapidly took definite shape. Reluctantly his father gave him permission to leave Barby for the university of Halle, which had already (1787) abandoned pietism and adopted the rationalist spirit of Wolf and Semler (see Rational- ism) . As a student he pursued an independent course of reading and neglected to his permanent loss the study of the Old Testa- ment and the Oriental languages. But he frequented

the lectures of Semler and of J. A. Eberhard, acquiring from the former the principles of an independent criticism of the New Testament and from the latter his love of Plato and Aristotle. At the same time he studied with great earnestness the writings of Kant and Jacobi. He acquired thus early his characteristic habit of forming his opinions by the process of patiently examining and weighing the positions of all thinkers and parties. But with the receptivity of a great eclectic he combined the reconstructive power of a profoundly original thinker. While yet a student he began to apply ideas gathered from the Greek philosophers in a recon- struction of Kant's system. At the completion of his three years' course at Halle he was for two years private tutor in the family of Count Dohna-Schlobitten, developing in a cultivated and aristocratic household his deep love of family and social life. In 1796 he became chaplain to the Charite Hospital in Berlin. Having no scope for the development of his powers as a preacher, he sought mental and spiritual satisfaction in the cultivated society of Berlin, and in profound philosophical studies. This was the period in which he was constructing the framework of his philosophical and religious system. It was the period, too, when he made himself widely acquainted with art, literature, science and general culture. He was at that time profoundly affected by German Romanticism, as represented by his friend Friedrich Schlegel. Of this his Confidential Letters on Schlegel's Lucinde {Vertrauten Briefe iiber Schlegel's "Lucinde," 1801; ed. 1835; by Jonas Frankel, 1907; R. Frank, 1907), as well as his perilous relation to Eleonore Grunow, the wife of a Berlin clergyman, are proof and illustration. Though his ultimate principles were unchanged he gained much from the struggle. It showed him much of the inner truth of human feeling and emotion, and enriched his imagination and life with ideals ancient and modern, which gave elevation, depth and colour to all his thought. Meantime he studied Spinoza and Plato, and was profoundly influenced by both, though he was never a Spinozist; he made Kant more and more his master, though he departed on fundamental points from him, and finally re-modelled his philosophy; with some of Jacobi's positions he was in sympathy, and from Fichte and Schelling he accepted ideas, which in their place in his system, however, received another value and import. The literary fruit of this period of intense fermentation and of rapid development was his "epoch- making " book, Reden iiber die Religion (1799; ed. Gottingen, 1906), and his " new year's gift " to the new century, the Mono- logen (1800; ed. 1902). In the first book he vindicated for re- ligion an eternal place amongst the divine mysteries of human nature, distinguished it from all current caricatures of it and allied phenomena, and described the perennial

forms of its manifestation and life in men and society, giving thereby the programme of his subsequent theological system. In the Monologen he threw out his ethical manifesto, in which he proclaimed his ideas as to the freedom and independence of the spirit, and as to the relation of the mind to the world of sense and imperfect social organizations, and sketched his ideal of the future of the individual and society. From 1802 to 1804, Schleiermacher was pastor in the little Pomeranian town of Stolpe. These years were full of literary

work, as well as rich in personal and moral progress. He relieved Friedrich Schlegel entirely of his nominal responsibility for the translation of Plato, which they had together undertaken (vols. 1-5, 1804-1810; 3rd ed., 1855-1861; vol. 6, Repub. 1828; 2nd ed., 1855-1862). At the same time another work, Grundlinien einer Kritik der bisherigen Sittenlehre (1803; 2nd ed. 1834), the first of his strictly critical and philosophical productions, occupied him. This work is a severe criticism of all previous moral systems, especially those of Kant and Fichte, Plato's and Spinoza's finding most favour; its leading principles are that the tests of the soundness of a moral system are the completeness of its view of the laws and ends of human life as a whole and the harmonious arrangement of its subject-matter under one fundamental principle; and, though it is almost exclusively critical and negative, the book announces clearly the division and scope of moral science which Schleiermacher subsequently adopted, attaching prime importance to a " Giiterlehre," or doctrine of the ends to be obtained by moral action. But the obscurity of the style of the book as well as its almost purely negative results proved fatal to its immediate success. In 1804 Schleiermacher removed as university preacher and professor of theology to Halle, where he remained until 1807, and where he quickly obtained a reputation as professor and preacher, and exercised a powerful influence in spite of the contradictory charges of his being atheist, Spinozist and pietist. In this period he wrote his dialogue the Weih- nachtsfeter (1806; 4th ed. 1850), a charming production, which holds a place midway between his Reden and his great dogmatic work, Der christliche Glaube, and presents in the persons of its speakers phases of his growing appreciation of Christianity as well as the conflicting elements of the theology of the period. After the battle of Jena he returned to Berlin (1807), was soon appointed pastor of the Trinity Church there, and the next year

married the widow of his friend Wiilich. At the foundation of the Berlin university (1810), in which he took a prominent part, he was called to a theological chair, and soon became secretary to the Academy of Sciences. He was thus placed in a position suited to his powers and in domestic and social surround- ings adapted to meet the wants of his rich nature. At the same time he approved himself in the pulpit and elsewhere as a large-hearted and fearless patriot in that time of national calamity and humiliation, acquiring a name and place in his country's annals with Arndt, Fichte, Stein and Scharnhorst. He took a prominent part too in the reorganization of the Prussian church, and became the most powerful advocate of the union of the Lutheran and Reformed divisions of German Protestantism. The twenty-four years of his professional career in Berlin were opened with his short but important outline of theological study (Kurze DarstellungdeslheologischenSludiums, 181 1 ; 2nd ed. 1830), in which he sought to do for theology what he had done for religion in his Reden. While he preached every Sunday, he also gradually took up in his lectures in the university almost every branch of theology and philosophy — New Testament exegesis, introduction to and interpretation of the New Testament, ethics (both philosophic and Christian), dogmatic and practical theology, church history, history of philo- sophy, psychology, dialectics (logic and metaphysics), politics, pedagogy and aesthetics. His own materials for these lectures and his students' notes and reports of them are the only form in which the larger proportion of his works exist — a circumstance which has greatly increased the difficulty of getting a clear and harmonious view of fundamental portions of his philo- sophical and ethical system, while it has effectually deterred all but the most courageous and patient students from reading these posthumous collections. As a preacher he produced a powerful effect, yet not at all by the force of his oratory but by his intellectual strength, his devotional spirit and the philo- sophical breadth and unity of his thought. In politics he was an earnest friend of liberty and progress, and in the period of reaction which followed the overthrow of Napoleon he was charged by the Prussian government with " demagogic agita- tion " in conjunction with the great patriot Arndt. At the same

time he prepared for the press his chief theological work Der christliche Glaube nach den Grundsdtzen der evangelischen Kirche (1821-1822; 2nd ed., greatly altered, 1830-1831; 6th ed., 1884). The fundamental principle of this classical work is, that religious feeling, the sense of absolute dependence on God as communicated by Jesus Christ through the church, and not the creeds or the letter of

Scripture or the rationalistic under- standing, is the source and law of dogmatic theology. The work is therefore simply a description of the facts of religious feeling, or of the inner life of the soul in its relations to God, and these inward facts are looked at in the various stages of their development and presented in their systematic connexion. The aim of the work was to reform Protestant theology by means of the fundamental ideas of the Reden, to put an end to the unreason and superficiality of both supernaturalism and rational- ism, and to deliver religion and theology from a relation of dependence on perpetually changing systems of philosophy. Though the work added to the reputation of its author, it naturally aroused the increased opposition of the theological schools it was intended to overthrow, and at the same time Schleier- macher's defence of the right of the church to frame its own liturgy in opposition to the arbitrary dictation of the monarch or his ministers brought upon him fresh troubles. He felt himself in Berlin more and more isolated, although his church and his lecture-room continued to be largely attended. But he prose- cuted his translation of Plato and prepared a new and greatly altered edition of his Christliche Glaube, anticipating the latter in two letters to his friend Lucke (in the Studien und Kriliken, 1829), in which he defended with a masterly hand his theological position generally and his book in particular against opponents on the right and the left. The same year he lost his only son — a blow which, he said, " drove the nails into his own coffin." But he continued to defend his theological position against Hengstenberg's party on the one hand and the rationalists von Colin and D. Schulz on the other, protesting against both subscription to the ancient creeds and the imposition of a new rationalistic formulary. In the midst of such labours, and enjoying still full bodily and mental vigour, he was carried off after a few days' illness by inflammation of the lungs, on the 1 2 th of February 1834.

Philosophical System. — A great antithesis lies at the basis of all thought and life — that of the real and the ideal, of organism, or sense, and intellect. But the antithesis is not absolute, for in life and being both elements are united — though without its presence life and thought would be impossible. In the actual world the antithesis appears as reason and nature, in each of which, however, there is a combination of its two elements — the ideal and the real — the reason having a preponderance of the first and nature a pre- ponderance of the second. At the basis of nature lies universal reason as its organizing principle, and when reason becomes a con- scious power in man it finds itself in conflict as well as in harmony with external nature. The whole effort and end of human thought and

action is the gradual reduction of the realm and the power of this antithesis in the individual, the race and the world. Though the antithesis is real and deep, the human mind cannot admit its absolute nature; we are compelled to suppose a transcendental reality or entity in which the real and the ideal, being and thought, subject and object, are one. Consciousness itself involves the union of. the antithetic elements, and prior to moral action nature is found organized and reason manifested or symbolized therein. We are ourselves proofs of the unity of the real and the ideal, of thought and being, for we are both, our self-consciousness supplying the expression of the fact. As we have in ourselves an instance of the identity of thought and being, we must suppose a universal identity of the ideal and real behind the pntithesis which constitutes the world. This supposition is the basis of all knowledge, for thought becomes knowledge only when it corresponds to being. The supposition may be called a belief, but it is so only in the sense in which belief appears in the religious department, where it is the ultimate ground of all action. The supposition is the basis of all ethics, for without the conviction of the correspondence of thought and reality action would be fruitless and in the end impossible. It is above ail the substance of religious feeling, which is the immediate conscious- ness of the unity of the world, of the absolute oneness behind the infinite multiplicity of contrasts; indeed, it is the religious con- viction of the unity which is the best guarantee of the truth of the suppositions of philosophy. It is " the religious consciousness of the unity of the intellectual and physical world in God " which is to overcome the scepticism of the critical philosophy. But, though

this unity must be laid down as the basis of knowledge, it is absolute and transcendental. In contrast with the " world," as the totality of being in its differentiation, this absolute unity, or God, in whom the real as manifold, and the spirit as one, find their unifying base, by its very nature is unphenomenal, indefinable and inconceivable. The idea is outside the boundary of thought, though its necessary postulate, and it is no less inaccessible to religious feeling, though it is its life and soul. Neither member of the antithesis of the real and the ideal must be conceived as producing the other; they are both equally existent and equally constituent elements of the world ; but in God they are one, and therefore the world must not be identi- fied with Him. The world and God are distinct, but correlative, and neither can be conceived without the other. The world without God

would be " chaos," and God without the world an empty " phantasm." But though God is transcendent and unknowable He is immanent in the world. In self-consciousness God is present as the basis of the unity of our nature in every transition from an act of knowledge to an act of will, and vice versa. As far as man is the unity of the real and the ideal, God is in him. He is also in all things, inasmuch as in everything the totality of the world and its transcendental basis is presupposed by virtue of their being and correlation. The unity of our personal life amidst the multiplicity of its functions is the symbol of God's immanence in the world, though we may not conceive of the Absolute as a person. The idea of the world as the totality of being is, like the correlative idea of God, only of regulative value; it is transcendent, as we never do more than make approaches to a knowledge of the sum of being. The one idea is the transcendental terminus a quo and the other the transcendental terminus ad quern of all knowledge. But though the world cannot be exhaustively known it can be known very extensively, and though the positive idea of God must always remain unattainable we are able to reject those ideas which involve a contradiction of the postulate of the Absolute. Thus the pan- theistic and the theistic conceptions of God as the supreme power, as the first cause, as a person, are alike unallowable, since they all bring God within the sphere of antithesis and preclude His absolute Unity. On the other hand, the world can be known as the realm of antithesis, and it is the correlative of God. Though He may not be conceived as the absolute cause of the world, the idea of absolute causality as symbolized in it may be taken as the best approximate expression of the contents of the religious conscious- ness. The unbroken connexion of cause and effect throughout the world becomes thus a manifestation of God. God is to be sought only in ourselves and in the world. He is completely immanent in the universe. It is impossible that His causality should have any other sphere than the world, which is the totality of being. " No God without a world, and no world without God." The divine omni- potence is quantitatively represented by the sum of the forces of nature, and qualitatively distinguished from them only as the unity of infinite causality from the multiplicity of its finite phenomena. Throughout the world — not excepting the realm of mind — absolute necessity prevails. As a whole the world is as good and perfect as a world could possibly be, and everything in it, as occupying its necessary place in the whole, is also good, evil being only the necessary limitation of individual being.

Schleiermacher's psychology takes as its basis the phenomenal dualism of the ego and the non-ego, and regards the life of man as

the interaction of these elements with their interpenetration as its infinite destination. The dualism is therefore not absolute, and, though present in man's own constitution as composed of body and soul, is relative only even there. The ego is itself both body and soul — the conjunction of both constitutes it; our "organization" or sense nature has its intellectual element, and our " intellect " its organic element. There is no such thing as " pure mind " or " pure body." The one general function of the ego, thought, becomes in relation to the non-ego either receptive or spontaneous action, and in both forms of action its organic, or sense, and its intellectual energies co-operate; and in relation to man, nature and the universe the ego gradually finds its true individuality by becoming a part of them, " every extension of consciousness being higher life." The specific functions of the ego, as determined by the relative predominance of sense or intellect, are either functions of the senses (or organism) or functions of the intellect. The former fall into the two classes of feelings (subjective) and perceptions (objective) ; the latter, accord- ing as the receptive or the spontaneous element predominates, into cognition and volition. In cognition being is the object and in volition it is the purpose of thought: in the first case we receive (in our fashion) the object of thought into ourselves; in the latter we plant it out into the world. Both cognition and volition are functions of thought as well as forms of moral action. It is in those two functions that the real life of the ego is manifested, but behind them is self-consciousness permanently present, which is always both subjective and objective — consciousness of ourselves and of the non-ego. This self-consciousness is the third special form or function of thought — which is also called feeling and immediate knowledge. In it we cognize our own inner life as affected by the non-ego. As the non-ego helps or hinders, enlarges or limits, our inner life, we feel pleasure or pain. Aesthetic, moral and religious feelings are respectively produced by the reception into conscious- ness of large ideas — nature, mankind and the world; those feelings

are the sense of being one with these vast objects. Religious feeling therefore is the highest form of thought and of life; in it we are conscious of our unity with the world and God; it is thus the sense of absolute dependence. Schleiermacher's doctrine of knowledge accepts the fundamental principle of Kant that knowledge is bounded by experience, but it seeks to remove Kant's scepticism as to know- ledge of the Ding an sich. or Sein, as Schleiermacher's term is. The idea of knowledge or scientific thought as distinguished from the passive form of thought — of aesthetics and religion — is thought which is produced by all thinkers in the same form and which corresponds to

being. All knowledge takes the form of the concept (Begriff) or the judgment (Urtheil), the former conceiving the variety of being as a definite unity and plurality, and the latter simply connecting the concept with certain individual objects. In the concept therefore the intellectual and in the judgment the organic or sense element predominates. The universal uniformity of the production of judgments presupposes the uniformity of our relations to the outward world, and the uniformity of concepts rests similarly on the likeness of our inward nature. This uniformity is not based on the sameness of either the intellectual or the organic functions alone, but on the correspondence of the forms of thought and sensation with the forms of being. The essential nature of the concept is that it combines the general and the special, and the same combination recurs in being; in being the system of sub- stantial or permanent forms answers to the system of concepts and the relation of cause and effect to the system of judgments, the higher concept answering to " force " and the lower to the pheno- mena of force, and the judgment to the contingent interaction of things. The sum of being consists of the two systems of substantial forms and interactional relations, and it reappears in the form of concept and judgment, the concept representing being and the judgment being in action. Knowledge has under both forms the same object, the relative difference of the two being that when the conceptual form predominates we have speculative science and when the form of judgment prevails we have empirical or historical science. Throughout the domain of knowledge the two forms are found in constant mutual relations, another proof of the funda- mental unity of thought and being or of the objectivity of know- ledge. It is obvious that Plato, Spinoza and Kant had contributed characteristic elements of their thought to this system, and directly or indirectly it was largely indebted to Schelling. for fundamental conceptions.

Ethics. — Next to religion and theology it was to the moral world, of which, indeed, the phenomena of religion and theology were in his systems only constituent elements, that he specially devoted himself. In his earlier essays he endeaVoured to point, out the defects of ancient and modern ethical thinkers, particularly of Kant and Fichte, Plato and Spinoza only finding favour in his eyes. He failed to discover in previous moral systems any necessary basis in thought, any completeness as regards the phenomena of moral action, any systematic arrangement of its parts and any clear and distinct treatment of specific moral acts and relations. His own moral system is an attempt to supply these deficiencies. It connects the moral world by a deductive process with the fundamental idea of

knowledge and being; it offers a view of the entire world of human action which at all events aims at being exhaustive; it presents an arrangement of the matter of the science which tabulates its constituents after the model of tht physical sciences; and it supplies a sharply defined treatment of specific moral phenomena in their relation to the fundamental idea of human life as a whole. Schleiermacher defines ethics as the theory of the nature of the reason, or as the scientific treatment of the effects produced by human reason in the world of nature and man. As a theoretical or speculative science it is purely descriptive and not practical, being correlated on the one hand to physical science and on the other to history. Its method is the same as that of physical science, being distinguished from the latter only by its matter. The ontological basis of ethics is the unity of the real and the ideal, and the psycho- logical and actual basis of the ethical process is the tendency of reason and nature to unite in the form of the complete organization of the latter by the former. The end of the ethical process is that nature (i.e. all that is not mind, the human body as well as external nature) may become the perfect symbol and organ of mind. Conscience, as the subjective expression of the presupposed identity of reason and nature in their bases, guarantees the practicability of our moral vocation. Nature is preordained or constituted to become the symbol and organ of mind, just as mind is endowed with the impulse to realize this end. But the moral law must not be conceived under the form of an " imperative " or a " Sotten "; it differs from a law of nature only as being descriptive of the fact that it ranks the mind as conscious will, or zweckdenkend, above nature. Strictly speaking, the antitheses of good and bad and of free and necessary have no place in an ethical system, but simply in history, which is obliged to compare the actual with the ideal, but as far as the terms " good " and " bad " are used in morals they express the rule or the contrary of reason, or the harmony or the contrary of the particular and the general. The idea of " free " as opposed to necessary expresses simply the fact that the mind can propose to itself ends, though a man cannot alter his own nature. In contrast to Kant and Fichte and modern moral philosophers

Schleiermacher reintroduced and assigned pre-eminent importance to the doctrine of the summum bonum, or highest good. It repre- sents in his system the ideal and aim of the entire life of man, sup- plying the ethical view of the conduct of individuals in relation to society

and the universe, and therewith constituting a philosophy of history at the same time. Starting with the idea of the highest good and of its constituent elements (Giiter) , or the chief forms of the union of mind and nature, Schleiermacher's system divides itself into the doctrine of moral ends, the doctrine of virtue and the doctrine of duties; in other words, as a development of the idea of the subjection of nature to reason it becomes a description of the actual forms of the triumphs of reason, of the moral power mani- fested therein and of the specific methods employed. Every moral good or product has a fourfold character: it is individual and universal ; it is an organ and symbol of the reason, that is, it is the product of the individual with relation to the community, and represents or manifests as well as classifies and rules nature. The first two characteristics provide for the functions and rights of the individual as well as those of the community or race. Though a moral action may have these four characteristics at various degrees of strength, it ceases to be moral if one of them is quite absent. All moral products may be classified according to the predominance of one or the other of these characteristics. Universal organizing action produces the forms of intercourse, and universal symbolizing action produces the various forms of science; individual organizing action yields the forms of property and individual symbolizing action the various representations of feeling, all these constituting the relations, the productive spheres, or the social conditions of moral action. Moral functions cannot be performed by the in- dividual in isolation but only in his relation to the family, the state, the school, the church, and society — all forms of human life which ethical science finds to its hand and leaves to the science of natural history to account for. The moral process is accomplished by the various sections of humanity in their individual spheres, and the doctrine of virtue deals with the reason as the moral power in each individual by which the totality of moral products is obtained. Schleiermacher classifies the virtues under the two forms of Gesinnung and Fertigkeit, the first consisting of the pure ideal element in action and the second the form it assumes in relation to circumstances, each of the two classes falling respectively into the two divisions of wisdom and love and of intelligence and application. In his system the doctrine of duty is the description of the method of the attain- ment of ethical ends, the conception of duty as an imperative, or obligation, being excluded, as we have seen. No action fulfils the conditions of duty except as it combines the three following antitheses: reference to the moral idea in its whole extent and likewise to a definite moral sphere; connexion with existing con- ditions and at the same time absolute personal production; the fulfilment of the entire moral vocation every moment

though it can only be done in a definite sphere. Duties are divided with reference to the principle that every man make his own the entire moral problem and act at the same time in an existing moral society. This condition gives four general classes of duty : duties of general association or duties with reference to the community (Rechtspflicht), and duties of vocation (Berufspfiicht) — both with a universal re- ference, duties of the conscience (in which the individual is sole judge), and duties of love or of personal association. It was only the first of the three sections of the science of ethics — the doctrine of moral ends — that Schleiermacher handled with approximate completeness; the other two sections were treated very summarily. In his Christian Ethics he dealt with the subject from the basis of the Christian consciousness instead of from that of reason generally ; the ethical phenomena dealt with are the same in both systems, and they throw light on each other, while the Christian system treats more at length and less aphoristically the principal ethical realities — church, state, family, art, science and society. Rothe, amongst other moral philosophers, bases his system substantially, with important departures, on Schleiermacher's. In Beneke's moral system his fundamental idea was worked out in its psychological relations.

Religious System. — From Leibnitz, Lessing, Fichte, Jacobi and the Romantic school he had imbibed a profound and mystical view of the inner depths of the human personality. The ego, the person, is an individualization of universal reason; and the primary act of self-consciousness is the first conjunction of universal and individual life, the immediate union or marriage of the universe with incarnated reason. Thus every person becomes a specific and original repre- sentation of the universe and a compendium of humanity, a micro- cosmos in which the world is immediately reflected. While therefore we cannot, as we have seen, attain the idea of the supreme unity of thought and being by either cognition or volition, we can find it in our own personality, in immediate self-consciousness or (which is the same in Schleiermacher's terminology) feeling. Feeling in this higher sense (as distinguished from " organic " sensibility, Emp- findung), which is the minimum of distinct antithetic consciousness, the cessation of the antithesis of subject and object, constitutes likewise the unity of our being, in which the opposite functions of cognition and volition have their fundamental and permanent background of personality and their transitional link. Having its seat in this central point of our being, or indeed consisting in

the essential fact of self-consciousness, religion lies at the basis of all thought and action. At various periods of his life Schleier- macher

used different terms to represent the character and relation of religious feeling. In his earlier days he called it a feeling or intuition of the universe, consciousness of the unity of reason and nature, of the infinite and the eternal within the finite and the temporal. In later life he described it as the feeling of absolute dependence, or, as meaning the same thing, the consciousness of being in relation to God. In our consciousness of the world the feelings of relative dependence and relative independence are found ; we are acted upon, but we also react. In our religious conscious- ness the latter element is excluded, and everything within ana without us is referred to its absolute cause, that is, God. But, when we call this absolute cause God, the name stands solely as indicating the unknown source of our receptive and active existence ; on the one hand it means that the world upon which we can react is not the source of the feeling, on the other, that the Absolute is not an object of thought or knowledge. This feeling of absolute dependence can arise only in combination with other forms of con- sciousness. We derive the idea of a totality by means of its parts, and the transcendental basis of being comes to us through the agency of individual phenomena. As in every affection of our being by individual phenomena we are brought into contact with the 'whole universe, we are brought into contact with God at the same time as its transcendental cause. This religious feeling is not know- ledge in the strict sense, as it is purely subjective or immediate; but it lies at the basis of all knowledge. As immediate knowledge, however, it is no more than the consciousness of the unity of the world, a unity which can never be reached by human inquiry. Religious truths, such as the determination of all things by God, are simply the implications of the feeling of absolute dependence. While that feeling is the characteristic of religion generally, this assumes various forms as the religions of the world. The so-called natural as distinguished from positive religion, or the religion of reason, is a mere abstraction. All religions are positive, or their characteristics and value are mainly determined by the manner in which the world is conceived and imagined. But these varying conceptions with their religious meaning become religiously pro- ductive only in the souls of religious heroes, who are the authors of new religions, mediators of the religious life, founders of religious communities. For religion is essentially social. It everywhere forms churches, which are the necessary instruments and organs of its highest life. The specific feature of Christianity is its mediatorial element, its profound feeling of the striving of the finite individual to reach the unity of the infinite whole, and its conception of the way in which Deity deals with this effort by mediatorial agencies, . which are both divine and human. It is the religion of mediatorial

salvation, and, as Schleiermacher emphatically taught in his riper works, of salvation through the mediation of Christ; that is, its possessors are conscious of having been delivered by Jesus of Nazareth from a condition in which their religious consciousness was overridden by the sense-consciousness of the world and put into one in which it dominates, and everything is subordinated to it. The conscious- ness of being saved in this sense is now transmitted and mediated by the Christian church, but in the case of Jesus, its originator, it was an entirely new and original factor in the process of religious de- velopment, and in so far, like every new and higher stage of being, a supernatural revelation. It was at the same time a natural attainment, in as far as man's nature and the universe were so con- stituted as to involve its production. The appearance of the Saviour in human history is therefore as a divine revelation neither absolutely supernatural nor absolutely beyond reason, and the controversy of the 1 8th century between the rationalists and supernaturalists rests on false grounds, leads to wrong issues, and each party is right and wrong (see Rationalism), As regards Christian theology, it is not its business to formulate and establish a system of objective truth, but simply to present in a clear and connected form a given body of Christian faith as the contents of the Christian consciousness. Dogmatic theology is a connected and accurate account of the doc- trine he_ld at a particular time in a given section of the Christian church. But such doctrines as constitute no integral part of the Christian consciousness — e.g. the doctrine of the Trinity — must be excluded from the theological system of the evangelical theologian. As regards the relation of theology and philosophy, it is not one of dependence or of opposition on either side, but of complete inde- pendence, equal authority, distinct functions and perfect harmony. Feeling is not a mental function subordinate to cognition or volition, but of equal rank and authority ; yet feeling, cognition and volition alike conduct to faith in the unknown Absolute, though by different paths and processes.

The marked feature of Schleiermacher's thought in every department is the effort to combine and reconcile in the unity of a system the antithetic conceptions of other thinkers. He is realistic and idealistic, individualistic and universalistic, monistic and dualistic, sensationalist and intellectualist, naturalist and supernaturalist, rationalist and mystic, gnostic and agnostic. He is the prince of the Vertnitller in philosophy, ethics, religion and theology. But he does not seek to reconcile the antitheses of thought and being by weakening and hiding the points of difference; on the contrary, he brings them out in their sharpest outlines. His method is to

distinctly define the opposing elements and then to seek their harmonious combination by the aid of a deeper conception. Apart from the positive and permanent value of the higher unities which he succeeds in establishing, the light and suggestiveness of his discussions and treatment of the great points at issue in all the principal fields of human thought, unsatisfactory as many of his positions may be considered, make him one of the most helpful and instructive of modern thinkers. And, since the focus of his almost universal thought and inquiry and of his rich culture and varied life was religion and theology, he must be regarded as the classical repre- sentative of modern effort to reconcile science and philosophy with religion and theology, and the modern world with the Christian church.

Schleiermacher's collected works were published in three sections : (i) Theological (n vols.); (2) Sermons (10 vols., ed. 1873-1874, 5 vols.) ; (3) Philosophical and Miscellaneous (9 vols., Berlin, 1835-1864). His Pddagogische Schriften were separately published by Platz (3rd ed., 1902). Of lives of him the best are his own correspondence. Aus Schleiermachers Leben in Briefen, published by W. Dilthey (Berlin, 1858-1863, in 4 vols., Eng. trans, by Rowan); Leben Schleiermachers by Dilthey (vol. i., 1870, the period from 1 768-1 804); Friedrich Schleiermacher, ein Lebens- u. Charakterbild, by D. Schenkel (Elberfeld, 1868); a selection of the letters by M. Rade (Jena, 1906). See also E. von Willick, Aus Schleiermachers Hause, Jugenderinnerungen seines Stiefsohnes (1909). The accounts and critiques of his philosophy, ethics and theology are numerous; some of the most valuable are: J. Schaller, Vorlesungen iiber Schleiermacher (Halle, 1844); G. Weisenborn, Darstellung und Kritik der Schleiermacher' schen Glaubenslehre (1849) ; F.

Vorlander, Schleiermachers Sittenlehre (Marburg, 1851); W. Bender, Schleier- machers Theologie mit ihren philosophischen Grundlagen (1876- 1878); O. Ritschl, Schleiermachers Stellung zum Christentum in seinen Reden iiber die Religion (1888); and Schleiermachers Theorie von der Frommigkeit (1897) ; O. Kirn, Schleiermacher und die Roman- tik (1895); H. Bleek, Die Grundlagen der Chrislologie Schleiermachers (1898); M. Fischer, Schleiermacher (1899); Liilmann, Das Bild des Christentums bei den grossen deutschen Idealisten (igoi),and Schleier- macher der Kirchenvater der iq. Jahrhunderts (1907) ; Stephan, Die Lehre Schleiermachers von der Erlosung (1901); Theile, Schleier- machers Theologie und ihre Bedeutung fur die Gegenwart (1903) ; G. Thimme, Die religionsphilosophischen Prdmissen der Schleier- macher' schen Glaubenslehre (1901); H. Sueskind, Der Einfluss Schillings auf die Entwicklung von Schleiermachers System (1909): F. Kattenbusch, Von Schleiermacher zu Ritschl (1903) ; E. Cramaus- sel, La Fhilosophie religieuse de Schleiermacher (1909). See also the histories of philosophy and theology by Zeller, Ueberweg, Chalybaus, Dorner, Gass, Lichtenberger (Eng. trans., 1889), Pfleiderer (Eng. trans., 1890), and the articles in Herzog-Hauck's Realencyk. (O. Kirn), and Allgem. deutsche Biog. (W. Dilthey). (J. F. S.; X.)

SCHLEIZ, a town of Germany, second capital of the princi- pality of Reuss, Younger Line, situated in a fertile district on the river Wiesenthal, 20 m. by rail N.W. of Plauen. Pop. (1905) 5577. It has a palace, with a chapel and a library, three churches, one of them containing the burial vaults of the princes, several educational establishments, and various small industries such as the manufacture of hosiery, toys, sweetmeats and lamps. It has a market for cattle and pigs.

Schleiz was originally a Slav settlement, but received civic privileges in 1359. There was a settlement of the Teutonic Order here, and for some years previous to 1848 the town was the capital of the small principality of Reuss-Schleiz. In the vicinity a battle was fought, on the 9th of October 1806, between the French and the Prussians.

See Alberti, Aus vergangenen Tagen des Reussenlandes und der Stadt Schleiz (Schleiz, 1896).

SCHLESWIG (Dan. Slesvig), a town of Germany,- capital of the Prussian province of Schleswig-Holstein. It is situated at the west end of the long narrow arm of the sea called the Schlei, 30 m. to the N.W. of Kiel on the railway from Hamburg to Vamdrup, on the Danish frontier. Pop. (1905) 19,032. The town consists mainly of a

single street, 35 m. long, forming a semicircle round the Schlei, and is divided into the old town (Altstadt), Holm, Lollfuss, and Friedrichsberg. The church of St Peter, erected about n 00 and renewed in the Gothic style in the 15th century, has a lofty steeple (365 ft.) and contains a very fine carved oak reredos by Hans Briigge- mann, which is regarded as the most valuable work of art in Schleswig-Holstein. Between Friedrichsberg and Lollfuss on an island between the Schlei and Burg See is the old chateau of Gottorp, now used as barracks. The former commercial importance of the town has disappeared, and the Schlei now

affords access to small vessels only. Fishing, tanning, flour- milling and brewing are the chief industries.

Schleswig (ancient forms Sliesthorp, Sliaswic,_ i.e. the town or bay of the Slia or Schlei) is a town of very remote origin, and seems to have been a trading place of considerable importance as early as the 9th century. It served as a medium of com- mercial intercourse between the North Sea and the Baltic, and was known to the Arabian geographers. The first Christian church in this district was built here by Ansgarius (d. 865), and it became the seat of a bishop about a century later. The town, which obtained civic rights in 1200, also became the seat of the dukes of Schleswig, but its commerce gradually dwindled owing to the rivalry of Liibeck, the numerous wars in which the district was involved, and the silting up of the Schlei. At the partition of 1544 the old chateau of Gottorp, originally built in 1 160 for the bishop, became the residence of the Gottorp line of the Schleswig-Holstein family, which remained here till expelled by the Danish king Frederick IV. in 1713. From 1731 to 1846 it was the seat of the Danish governor of the duchies. In the wars of 1848 -and 1864 Schleswig was an important strategical point on account of its proximity to the Dannewerk (q.v.) and was occupied by the different contending parties in turn. It has been the capital of Schleswig-Holstein since its incorporation by Prussia in 1864.

See Sach, Geschichte der Stadt Schleswig (Schleswig, 1875) ; and Jensen, Schleswig und Umgebung (Schleswig, 1905).

SCHLESWIG-HOLSTEIN, a province in the north-west of Prussia, formed out of the once Danish duchies of Schleswig, Holstein and Lauenburg, and bounded W. by the North Sea, N. by Denmark (Jutland), E. by the Baltic Sea, Liibeck and Mecklenburg, and S. by the lower course of the Elbe (separating it from Hanover). It thus consists of the southern half of the Cimbric peninsula, and forms the

connecting link between Germany and Denmark. (For map, see Denmark.) In addition to the mainland, which decreases in breadth from south to north, the province includes several islands, the most important being Alsen and Fehmarn in the Baltic, and Rom, Sylt and Fohr of the North Frisian chain in the North Sea. The total area of the province is 7338 sq. m., 450 of which belong to the small duchy of Lauenburg in the S.E. corner, while the rest are divided almost equally between Holstein to the south of the Eider and Schleswig to the north of it. From north to south the province is about 140 m. long, while its breadth varies from 90 m. in Holstein to 35 m. at the narrower parts of Schleswig.

Schleswig-Holstein belongs to the great North-German plain, of the characteristic features of which it affords a faithful reproduction in miniature, down to the continuation of the Baltic ridge or plateau by a range of low wooded hills skirting its eastern coast and culminating in the Bungsberg (538 ft.), a little to the north of Eutin. This hilly district contains the most productive land in the province, the soil consisting of diluvial drift or boulder clay. The central part of the province forms practically a continuation of the great Luneburg Heath, and its thin sandy soil is of little use for cultivation. Along the west coast extends the " Marshland," a belt of rich alluvial soil formed by the deposits of the North Sea, and varying in breadth from 5 to 15 m. It is seldom more than a few feet above the sea- level, while at places it is below it, and it has consequently to be defended by an extensive system of dykes or embankments re- sembling those of Holland.

The more ancient geological formations are scarcely met with in Schleswig-Holstein. The contrast between the two coast-lines of the province is marked. The Baltic coast has generally steep well- defined banks and is irregular, being pierced by numerous long and narrow inlets (Fohrden) which often afford excellent harbours. The islands of Alsen and Fehmarn are separated from the coast by narrow channels. The North Sea coast is low and flat, and its smooth outline is interrupted only by the estuary of the Eider and the peninsula of Eiderstedt. Dunes or sand-hills, though rare on the protected mainland, occur on Sylt and other islands, while the small flat islands called Halligen are being washed away where not defended by dykes. The numerous islands on the west coast probably formed part of the peninsula at no remote period, and the sea between them and the mainland is shallow and full of sandbanks.

The climate of Schleswig-Holstein is mainly determined by the proximity of the sea, and the mean annual temperature, varying

from 45° F. in the north to 49° F. in the south, is rather higher than is usual in the same latitude. Rain and fog are frequent, but the climate is on the whole healthy. The Elbe forms the southern boundary of Holstein for 65 m., but the only river of importance

within the province is the Eider, which rises in Holstein, and after a course of 120 in. falls into the North Sea, forming an estuary 3 to 12 m. in breadth. It is navigable from its mouth as far as Rendsburg, which is on the Kaiser Wilhelm (Kiel-Elbe) canal, which intersects Holstein. There are numerous lakes in north-east Holstein, the largest of which are the Ploner See (12 sq. m.) and the Selenter See (9 sq. m.).

Of the total area of the province 57 % is occupied by tilled land, 22 % by meadows and pastures, and barely 7 % by forests. The ordinary cereals are all cultivated with success and there is generally a considerable surplus for export. Rape is grown in the marsh lands and flax on the east coast, while large quantities of apples and other fruit are raised near Altona for the Hamburg and English markets. The marsh lands afford admirable pasture, and a greater proportion of cattle (65 per 100 inhabitants) is reared in Schleswig-Holstein, mainly by small owners, than in any other Prussian province. Great numbers of cattle are exported to England. The Holstein horses are also in request, but sheep-farming is comparatively neglected. Bee-keeping is a productive industry. The hills skirting the bays of the Baltic coast are generally pleasantly wooded, but the forests are nowhere of great extent except in Lauenburg. The fishing in the Baltic is productive; Eckernforde is the chief fishing station in Prussia. The oysters from the beds on the west coast of Schleswig are widely known under the misnomer of " Holstein natives." The mineral resources are almost confined to a few layers of rock- salt near Segeberg. The more important industrial establishments, such as iron foundries, machine works, tobacco and cloth factories, are mainly confined to the large towns, such as Altona, Kiel and Flensburg. The shipbuilding of Kiel and other seaports, however, is important ; and lace is made by the peasants of north Schleswig. The commerce and shipping of Schleswig-Holstein, stimulated by its position between two seas, as well as by its excellent harbours and waterways, are much more prominent than its manufactures. Kiel is one of the chief seaports of Prussia, while oversea trade is also carried on by Altona and Flensburg. The main exports are grain,

cattle, horses, fish and oysters, in return for which come timber, coal, salt, wine and colonial produce.

The population of the province in 1905 was 1,504,248, com- prising 1,454,526 Protestants, 41,227 Roman Catholics and 3270 Jews. The urban and rural communities are in the proportion of 4 to 6. The great bulk of the Holsteiners and a large pro- portion of the Schleswigers are of genuine German stock, but of the 148,000 inhabitants in the north part of Schleswig 139,000 are Danish-speaking. Among the Germans the prevalent tongue is Low German, but the North Frisians on the west coast of Schleswig and the North Sea islands (about 19,000 in all) still speak a Frisian dialect, which, however, is dying out. The peninsula of Angeln, between the Gulf of Flensburg and the Schlei, is supposed to have been the original seat of the English, and observers profess to see a striking resemblance between this district and the counties of Kent and Surrey. The peasants of Dithmarschen in the south-west also retain many of their ancient peculiarities. The boundary between the Danish and German languages is approximately a line running from Flensburg south-west to Joldelund and thence north-west to Tondern and the North Sea coast; not more than 15% of the entire popula- tion of the province speak Danish as their mother-tongue, but the proportion is far larger for Schleswig alone, where there is also a considerable bilingual population. The chief educational institution in Schleswig-Holstein is the university of Kiel.

Schleswig is the official capital of the province, but Altona and Kiel are the largest towns, the latter being the chief naval station of Germany. Kiel and Friedrichsort are fortified, but the old lines of Diippel have been dismantled. The province sends 10 members to the Reichstag and 19 to the Prussian Abgeordnetenhaus (house of deputies) . The provincial estates meet in Rendsburg.

For the history of the duchies of Schleswig and Holstein see Schleswig-Holstein Question below.

SCHLESWIG-HOLSTEIN QUESTION, the name given to the whole complex of diplomatic and other issues arising in the 19th century out of the relations of the two " Elbe duchies," Schleswig and Holstein, to the Danish crown on the one hand and the German Confederation on the other, which came to a crisis with the extinction of the male line of the reigning house of Denmark by the death of King Frederick VII. on the 15th of November 1863. The central question was whether the two duchies did or did not constitute an integral part of the dominions of the Danish crown,

with which they had been more or less intimately associated for centuries. This involved the purely legal question,

raised by the death of the last common male heir to both Denmark and the duchies, as to the proper succession in the latter, and the constitutional questions arising out of the relations of the duchies to the Danish crown, to each other, and of Holstein to the German Confederation. There was also the national question : the ancient racial antagonism between German and Dane, in- tensified by the tendency, characteristic of the 19th century, to the consolidation of nationalities. Lastly, there was the inter- national question: the rival ambitions of the German powers involved, and beyond them the interests of other European states, notably that of Great Britain in preventing the rise of a German sea-power in the north.

To take the racial question first, from time immemorial the country north of the Elbe had been the battle-ground of Danes and Germans. Danish scholars point to the prevalence of Danish place-names 1 far southward into the German-speaking districts as evidence that at least the whole of Schleswig was at one time Danish; German scholars claim it, on the other hand, as essenti- ally German. That the duchy of Schleswig, or South Jutland (Sonderjylland), had been from time immemorial a Danish fief was, indeed, not in dispute, nor was the fact that Holstein had been from the first a fief of the Germano-Roman Empire. The controversy in the 19th century raged round the ancient ” in- dissoluble ” union of the two duchies, and the inferences to be drawn from it; the ” Eider Danes ” 2 claimed Schleswig as an integral part of the Danish monarchy, which, on the principle of the union, involved the retention of Holstein also; the Germans claimed Holstein as a part of Germany and, therefore, on the same historic principle, Schleswig also. The history of the relations of Schleswig and Holstein thus became of importance in the practical political question.

Though the designation of Schleswig-Holstein, implying the fusion of the duchies of Schleswig and Holstein in a single Prussian province, only dates from 1866, the history of the duchiee a . 4 . has since the 14th century been so closely interwoven that it is impossible to treat them separately. Some-

has since the 14th century been so closely interwoven t fih that it is impossible to treat them separately. Some- j” 3 !, *thing must, however, be said about their origins and ” uc/,/es **

their separate history up to the time of their first union under the

Holstein counts.

When it first appears in history South Jutland was inhabited by mingled Cimbri, Angles, Jutes and Frisians, upon whom the Danes exercised an unceasing pressure from the north. To the south of Schleswig what is now Holstein was in- "J of habited mainly by Saxons, pressed upon from the east Scb ' esm te- by the Wends and other Slavonic races. These Saxons were the last of their nation to submit to Charlemagne (804), who put their country under Frankish counts, the limits of the Empire being pushed in 810 as far as the Schlei in Schleswig. Then began the secular struggle between the Danish kings and the German emperors, and in 934 the German king Henry I. established the Mark of Schleswig {Limes Danarum) between the Eider and the Schlei as an outpost of Germany against the Danes. South of this raged the contest between Germans and Slavs. The latter, conquered and Christianized, rose in revolt in 983, after the death of the emperor Otto II., and for a while reverted to paganism and independence. The Saxon dukes, however, continued to rule central Holstein, and when Lothair of Siipplingenburg became duke of Saxony (1106), on the extinction of the Billung line, he invested C°" ot shlp Adolf I. of Schauenburg with the countship of Holstein. Holstein. Adolf I.'s son, Adolf II. (1128-1164), succeeded in recon- quering the Slavonic Wagri and founded the city and see of Lubeck to hold them in check. Adolf III. (d. 1225), his successor, received Dithmarschen in fee from the emperor Frederick I., but in 1203 the fortunes of war compelled him to surrender Holstein to Valdemar II. of Denmark, the cession being confirmed by the emperor Frederick II. in 1214 and the pope in 1217. Valdemar appointed Albert of Orlamiinde his lieutenant in Holstein, and the Schleswig-Holstein question might have been thus early settled but for Valdemar's ill fortune in being taken prisoner in 1223. During his captivity Albert of Orlamiinde was beaten at Molln by Count Adolf III., to whom Valdemar restored his countship as the price of his own release. A papal dispensation from oaths taken under duress excused a new war; but Valdemar himself was beaten at Born- hovede on the 22nd of July 1227, and Holstein was permanently secured to the house of Schauenburg. After the death of Adolf IV.

1 I.e. place-names according to popular usage, not the official names given in German maps (e.g. Haderslev for Hadersleben). See La Question du Slesvig, p. 61 seq., " Noms de lieux."

2 I.e. the party at Copenhagen which aimed at making the Eider, the southern boundary of Schleswig, the frontier of the Danish kingdom proper.

in 1261, Holstein was split up into several countships by his sons and grandsons : the lines of Kiel, Plon, Schauenburg-Pinneberg and Rendsburg.

In 1232 King Valdemar II., who had retained the former German

Mark north of the Eider, erected South Jutland (Schleswig) into a

. duchy for his second son, Abel. On the death of the

Sjf, , latter's descendant, Duke Eric, in 1319, Christopher II.

Soulb* of Denmark attempted to seize the duchy, the heir of which ,

Jutland Valdemar V., was a minor; but Valdemar's guardian

and uncle, Gerhard III. of Holstein-Rendsburg (1304- 1340), surnamed " the Great " and a notable warrior, drove back the Danes and, Christopher having been expelled, succeeded in procuring the election of Valdemar to the Danish throne. His reward was the duchy of Schleswig and the famous charter, known as the Constitutio Valdemariana, which laid down the principle

that the duchy of South Jutland was never to be incor-

tHau"' P° ra ted in the kingdom of Denmark or ruled by the same

fJJjSr ° sovereign (7 June 1326). Thus Schleswig and Holstein

J\ were for the first time united. The union was, indeed, as

™«j *' yet precarious. In 1330 Christopher II. was restored to his

throne and Valdemar V. to his duchy, Gerhard having to be content with the reversion in the case of the duke dying without issue. Gerhard, however, was assassinated in 1340 by a Dane, and it was not till 1375, when the male lines both in the kingdom and the duchy became extinct by the deaths of King Valdemar IV. and Duke Valdemar V., that the counts of Holstein seized on their inheritance, assuming at the same time the style of " lords of Jutland." In 1386 Queen Margaret allowed their claim in return For the usual homage and promise of feudal service, and directed that

one of their number should be elected duke of Schleswig.

SaM hr ˆ ne cno ‘ ce le ” on Gerhard VI., grandson of Gerhard III.

eswig o j Rgnjjgburg, w ho after the extinction of the line of Kiel

Holstein (“39°) obtained in 1403 the whole of the countship of

Holstein, except the small Schauenburg territories. With this begins the history of the union of Schleswig and Holstein.

Gerhard VI. died in 1404, and soon afterwards war broke out between his sons and Eric of Pomerania, Margaret’s successor on the throne of Denmark, who claimed South Jutland as an integral part of the Danish monarchy, a claim formally recognized by the emperor Sigismund in 1424. 1 It was not till 1440 that the struggle ended with the investiture of Count Adolf VIII., Gerhard’s son, with the hereditary (duchy of Schleswig by Christopher III. of Denmark. On the death of Christopher eight years later, Adolf’s influence secured the election of his nephew Count Christian of Oldenburg to the vacant throne.

On the death of Adolf in 1459 without issue, King Christian I., though he had been forced to swear to the Constitulio Valdemariana, „. succeeded in asserting his claim to Schleswig in right of

&uk~ 1 ms mot her, Adolf’s sister. Instead of incorporating theOlden- South Jutland with the Danish kingdom, however, he burr line ‘ P re f erre d to take advantage of the feeling of the estates ‘ ‘ in Schleswig and Holstein in favour of union to secure both countries. On Schleswig the Schauenburg counts had no claim ; their election in Holstein would have separated the countries ; and it was easy therefore for Christian to secure his election both as

duke of Schleswig and count of Holstein (5 March 1460)

*1Mb ‘l460 ˆ ne P r ‘ ce ne P a ‘d ˆas a charter of privileges, issued first The” In- ‘ at R’be an< ˆ afterwards at Kiel, in which he promised dissoluble *° P reserve the countries for ever as " one and indivisible," union." an ˆ conceded to the estates the right to refuse to elect as count and duke any Danish prince who should not undertake, on becoming king, to confirm their privileges. By these privileges the union between South Jutland and Holstein, established under the Schauenburg line, was officially recognized. For external affairs the two countries were to be regarded as one, the bishop of Lilbeck and five " good men " elected by the estates of each country*

forming an advisory and executive council under the duke-count. For internal affairs duchy and county were to retain their separate estates and peculiar customs and laws. Above all, Holstein remained a German, Schleswig a Danish fief. The claims of the Schauenburg counts were surrendered for a money payment ; D . . it was not till 1640, however, that the extinction of their "^ ^\° line brought Schauenburg itself to the Danish crown. 1472 e '" Fi" al 'yt in '47 2 the emperor Frederick III. confirmed Christian I.'s overlordship over Dithmarschen, and erected Dithmarschen, Holstein and Stormarn into the duchy of Holstein.

On the death of King Frederick I. (1523-1533), under whom the Reformation had been introduced into the duchies,' occurred the SabdlvU ^ rst °^ sev ? ra l partitions of the inheritance of the house slonot'tbe °^ Oldenburg; the elder son, Christian III., succeeding duchies. as king °^ Denmark, the younger, Adolphus (Adolf) I., founding the line of the dukes of Gottorp. In 1581 a further partition was made, by a compact signed at Flensburg, between King Frederick II. and his uncle Duke Adolphus I., under

1 Question du Slesvig, p. 78.

l The Church (Lutheran) was organized under a Probst (provost) and consistory, the king himself assuming the jurisdiction of summus episcopus.

The

dukes 0/ Gottorp.

Russia

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1767,

1773.

which the rights of overlordship in the various towns and territories of Schleswig were divided between them; the estates, however,

remained undivided, and the king and duke ruled the country alternately. To make confusion worse confounded, Frederick II. in 1582 ceded certain lands in Hardersleben to his brother John, who founded the line of 'Schleswig-Sonderburg, and John's grand- sons again partitioned this appanage, Ernest Gunther (1609-1689), founding the line of Schleswig-Sonderburg- Augustenburg, and Augustus Philip (1612-1675) that of Schleswig-Beck-Gliicksburg (known since 1825 as Holstein-Sonderburg-Glucksburg).

Meanwhile the Gottorp dukes were making themselves a great position in Europe. Frederick III., duke from 1616 to 1659, established the principle of primogeniture for his line, and the full sovereignty of his Schleswig dominions was secured to him by his son-in-law Charles X. of Sweden by the convention of Copenhagen (12 May 1658) s and to his son Christian Albert (d. 1694) by the treaty of Oliva, though it was not till after years of warfare that Denmark admitted the claim by the convention of Altona (30 June 1689). Christian Albert's son Frederick IV. (d. 1702) was again attacked by Denmark, but had a powerful champion in Charles XII. of Sweden, who secured his rights by the treaty of Travendal in 1700. Frederick was killed at the battle of Klissow in 1702, and his brother Christian Augustus acted as regent for his son Charles Frederick until 1718. In 1713 the regent broke the stipulated neutrality of the duchy in favour of Sweden and Frederick IV. of Denmark seized the excuse, to expel the duke by force of arms. Holstein was restored to him by the peace of Frederiksborg in 1 720, but in the following year Frederick IV. was recognized as sovereign of Schleswig by the estates and by the princes of the Augustenburg and Gliicksburg lines.

The situation was ultimately simplified by the marriage of Duke Charles Frederick with the tsarevna Anna Pavlovna, and the recognition in 1742 of their son Charles Peter Ulrich as cesarevitch by the empress Elizabeth of Russia. For Peter as duke of Gottorp, Adolphus Frederick, bishop of Ltibeck, son of Christian Augustus, acted as regent until 1745; in 1751 he became king of Sweden. 4 But the rulers of Russia had no interest in maintaining their part of Holstein and their confused and disputed common rights in Jutland, and in 1767 the empress Catherine II. resigned them, by the treaty of Copenhagen, in the name of her son Paul, who confirmed this action on coming of age in 1773. Olden- burg and Delmenhorst, surrendered by the Danish king in com- Eensation, were handed over to Frederick Augustus, bishop of flbeck, the second son of Christian Augustus, who thus founded the younger line of the house of Gottorp. Schleswig and Holstein were thus once more united under the Danish

king.

On the abolition of the Holy Roman Empire in 1806, Holstein was practically, though not formally, incorporated in Denmark. Under the administration Of the Danish prime minister Count Bernstorff, himself from Schleswig, many reforms were carried out in the duchies, e.g. abolition of torture and of serfdom ; at the same time Danish laws and coinage were introduced, and Danish was made the official language for communication with Copenhagen. Since, however, the Danish court itself at the time was largely German in language and feeling, this produced no serious expressions of resentment.

The Congress of Vienna, instead of settling the questions involved in the relations of the duchies of Denmark once for all, 5 sought to stereotype the old divisions in the interests of Germany. „ The settlement of 1806 was reversed, and while Schleswig Jfyfen 3 . remained as before, Holstein and Lauenburg were in- I8l – ” ‘ eluded in the new German Confederation. The opening up of the Schleswig-Holstein question thus became sooner or later inevitable. The Germans of Holstein, influenced by the new national enthusiasm evoked by the War of Liberation, resented more than ever the attempts of the government of Copenhagen to treat them as part of the Danish monarchy and, encouraged by the sympathy of the Germans in Schleswig, early tried to reassert in the interests of Germanism the old principle of the unity of the duchies. The political atmosphere, however, had changed at Copenhagen also; and their demands were met by the Danes with a nationalist temper as intractable as their own. Affairs were ripe for a crisis, which the threatened failure of the common male heirs to the kingdom and the duchies precipitated.

3 The king by a convention of the same date secured the full sovereignty for his own particular appanage in Schleswig. The attempt of the dukes of Gottorp to partition the actual government of the duchy broke on the opposition of the estates.

4 Adolphus Frederick had renounced his rights in Schleswig by an agreement with the Danish king signed on the 25th of April

!75°-

6 The best solution, which afterwards had the support of Napoleon III., would have been to partition Schleswig on the lines of nationality, assigning the Danish part to Denmark, the German to

Holstein. This idea, which subsequently had supporters both among Danes and Germans, proved impracticable later owing to the intractable temper of the majority on both sides. See La Question de Slesvig, p.' 135 seq., " Historique de l'idee d'un partage du Slesvig."

When Christian VIII. succeeded his father Frederick VI. in 1839 the elder male line of the house of Oldenburg was obviously on the point of extinction, the king's only son and heir ofthe"" having no children. Ever since 1834, when joint succession, consultative estates had been re-established for the duchies, the question of the succession had been debated in this assembly. To German opinion the solution seemed clear enough. The crown of Denmark could be inherited by female heirs; in the duchies the Salic law had never been repealed and, in the event of a failure of male heirs to Christian VIII., the succession would pass to the dukes of Augustenburg. 1 Danish opinion, on the other hand, clamoured for a royal pro- nouncement proclaiming the principle of the indivisibility of the monarchy and its transmission intact to a single heir, in accord- ance with the royal law. To this Christian VIII. yielded so far as to issue in 1846 letters patent declaring that the royal law in the matter of the succession was in full force so far as Schleswig was concerned, in accordance with the letters patent of August 22, 1 72 r, the oath of fidelity of September 3, 17 2.1, the guarantees given by France and Great Britain in the same year and the treaties of 1767 and 1773 with Russia. As to Holstein, he stated that certain circumstances prevented him from giving, in regard to some parts of the duchy, so clear a decision as in the case of Schleswig. The principle of the independence of Schleswig and of its union with Holstein were expressly reaffirmed. An appeal against this by the estates of Holstein to the German diet received no attention. The revolutionary year 1848 brought matters to a head. On the 28th of January, Christian VIII. issued a rescript proclaiming a new constitution which, while preserving the autonomy of the different parts of the country, incorporated them for common purposes in a single organiza- tion. The estates of the duchies replied by demanding the incorporation of Schleswig-Holstein, as a single constitutional state, in the German Confederation. Frederick VII., who had succeeded his father at the end of January, declared (March 4) that he had no right to deal in this way with Schleswig, and, yielding to the importunity of the Eider-Danish party, withdrew the rescript of January (April 4) and announced to the people of Schleswig (March

27) the promulgation of a liberal constitu- tion under which the duchy, while preserving its local autonomy, would become an integral part of Denmark.

Meanwhile, however, the duchies had broken out into open insurrection; a provisional government had been established at Kiel; and the duke of Augustenburg had hurried Prussian t0 g er]; n t0 secure the assistance of Prussia in asserting tioa, I84S. his rights. This was at the very crisis of the revolution in Berlin, and the Prussian government saw in the proposed intervention in Denmark in a popular cause an excellent opportunity for restoring its damaged prestige. Prussian troops were accordingly marched into Holstein; and, the diet having on the 1 2th of April recognized the provisional government of Schleswig and commissioned Prussia to enforce its decrees, General Wrangel was ordered to occupy Schleswig also.

*The principles which Prussia was commissioned to enforce as the mandatory of Germany were: (1) that they were inde- pendent states, (2) that their union was indissoluble, ofthe * (s} t ˆ at ˆey were hereditary only in the male line. powers. But the Germans had reckoned without the European powers, which were united in opposing any dismember- ment of Denmark, even Austria refusing to assist in enforcing the German view. Swedish troops landed to assist the Danes; Nicholas I. of Russia, speaking with authority as representing the elder Gottorp line, pointed out to King Frederick William IV. the risks of a collision; Great Britain, though the Danes rejected her mediation, threatened to send her fleet to assist in preserving the status quo. Frederick William new ordered Wrangel to withdraw his troops from the duchies; but the general refused to obey, on the plea that he was under the command not of the king of Prussia but of the regent of Germany,*

1 This was the argument of Karl Samwer, the German jurist, in his Die Staatserbfolge der Herzogthumer Schleswig und Holstein, published in 1844 at the instigation of the duke of Augustenburg.

and proposed that, at least, any treaty concluded should be presented for ratification to the Frankfort government. This the Danes refused; and negotiations were broken off. Prussia was now confronted on the one side by the German nation urging her clamorously to action, on the other side by the European powers with one voice threatening the worst consequences should she persist. After painful Convea- hesitation, Frederick William chose what seemed Maimoe. the lesser of two evils and, on the 26th of August 1848, Prussia signed at Maimoe a convention which yielded

practically all the Danish demands. The Holstein estates appealed to the German parliament, which hotly took up their cause; but it was soon clear that the central government had no means of enforcing its views, and in the end the convention was ratified at Frankfort.

The convention was only in the nature of a truce establishing a temporary modus vivendi, and the main issues, left unsettled, continued to be hotly debated. At a conference held in London in October, Denmark suggested an arrangement on the basis of a separation of Schleswig from Holstein, which was about to become a member of the new German empire, Schleswig to have a separate constitution under the Danish crown. This was supported by Great Britain and Russia and accepted by Prussia and the German government (27th January 1849). The negotiations broke down, however, on the refusal of Denmark to yield the principle of the indissoluble union with the Danish crown; on the 23rd of February the truce was at an end, and on the 3rd of April the war was renewed. At this point the tsar intervened in favour of peace; and Prussia, conscious of her restored strength and weary of the intractable temper of the Frankfort government, determined to take matters into her own hands. On the 10th of July 1849 another truce was signed; Schleswig, until the peace, was to be administered separately, under a mixed commission, Holstein was to be governed by a vicegerent of the German empire — an arrangement equally offensive to German and Danish sentiment. A settlement seemed as far off as ever; the Danes still clamoured for the principle of succession in the female line and union with Denmark, the Germans for that of succession in the male line and union with Holstein. In utter weariness Prussia proposed, in April 1850, a definitive peace on the basis of the status quo ante helium and the postponement of all questions as to mutual rights. To Palmerston the basis seemed meaningless, the proposed settle- ment to settle nothing. The emperor Nicholas, openly disgusted with Frederick William's weak-kneed truckling to the Revolu- tion, again intervened. To him the duke of Augustenburg was a rebel; Russia had guaranteed Schleswig to the Danish crown by the treaties of 1767 and 1773; as for Holstein, if the king of Denmark was unable to deal with the rebels there, he himself would intervene as he had done in Hungary. The threat was reinforced by the menace of the European situation. Austria and Prussia were on the verge of war, and the sole hope of preventing Russia from throwing her sword into the scale of Austria lay in settling the Schleswig-Holstein question in the sense desired by her. The only alternative, an alliance with " the devil's nephew," Louis Napoleon, who already dreamed of acquiring the Rhine frontier for

France at the price of his aid in establishing German sea-power by the cession of the duchies, was abhorrent to Frederick William. On the 2nd of July 1 850 was signed at Berlin a treaty of T ˆm ° peace between Prussia and Denmark. Both parties /gso. ‘ reserved all their antecedent rights; but for Denmark it was enough, since it empowered the king-duke to restore his authority in Holstein with or without the consent of the German Confederation.*

Danish troops now marched in to coerce the refractory duchies; but while the fighting went on negotiations among the powers continued, and on the 2nd of August 1850 Great Britain, France, Russia and Norway-Sweden signed a protocol, to which Austria subsequently adhered, approving the principle of restoring the integrity of the Danish monarchy. The Copenhagen govern- ment, which in May 185 r made an abortive attempt to come

to an understanding with the inhabitants of the duchies by convening an assembly of notables at Flensburg, issued on the 6th of December 1851 a project for the future organization of the monarchy on the basis of the equality of its constituent states, with a common ministry; and on the 28th of January 1852 a royal letter announced the institution of a unitary state which, while maintaining the fundamental constitution of Denmark, would increase the parliamentary powers of the estates of the two duchies. This proclamation was approved by Prussia and Austria, and by the German federal diet in so far as it affected Holstein and Lauenburg. The question of the succession was The next approached. Only the question of the Augus-

Successloa tenburg succession made an agreement between the Protocol of powers impossible, and on the 31st of March 1852 the London, duke of Augustenburg resigned his claim in return for a money payment. Further adjustments followed. After the renunciation by the emperor of Russia and others of their eventual rights, Charlotte, landgravine of Hesse, sister of Christian VIII., and her son Prince Frederick transferred their rights to the latter’s sister Louise, who in her turn trans- ferred them to her husband Prince Christian of Gliicksburg. This arrangement received international sanction by the protocol signed in London on the 8th of May 1852 by the five great powers and Norway and Sweden. 1 On the 3rst of July 1853 King Frederick VII. gave his assent to a law settling the crown

*on Prince Christian, " prince of Denmark," and his heirs male. The protocol of London, while consecrating the principle of the integrity of Denmark, stipulated that the rights of the German Confederation in Holstein and Lauenburg should remain unaffected. It was, in fact, a compromise, and left the fundamental issues unsettled. The German federal diet had been unrepresented in London, and the terms of the- protocol were regarded in Germany as a humiliation. As for the Danes, they were far from being satisfied with the settlement, which they approved only in so far as it gave them a basis for a more vigorous prosecution of their unionist schemes. On the 15th of February and the nth of June 1854 the king of Denmark, after consulting the estates, promulgated special constitutions for Schleswig and Holstein respectively, under which the pro- vincial assemblies received certain very limited powers. On the 26th of July 1854 he published a common constitution Danish * or t ' le wn °l e monarchy; this, which was little more Unitary than a veiled absolutism, was superseded on the 2nd CoostHu- of October 1855 by a parliamentary constitution of tionof a modified type. The legality of this constitution " was disputed by the two German great powers, on the*

ground that the estates of the duchies had not been consulted as promised in the royal letter of the 6th of December 1851; the diet of the Confederation refused to admit its validity so far as Holstein and Lauenburg were concerned (nth February

1858).

The question was now once more the subject of lively inter- national debate; but the European situation was no longer so favourable as it had been to the Danish view. The Crimean War had crippled the power of Russia, and Nicholas I. was dead. France was prepared to sell the interests of Denmark in the duchies to Prussia in return for " compensations " to herself elsewhere. Great Britain alone sided with the Danes; but the action of British ministers, who realized the danger to British supremacy at sea of the growth of German sea-power in the Baltic, was hampered by the natural sympathy of Queen Victoria and the prince consort with the German point of view. 2 The result was that the German diet, on the motion of Bismarck, having threatened federal intervention (July 29), King Frederick VII. issued a proclamation abolishing the general constitution so far as it affected Holstein and Lauenburg, while retaining it for Denmark and Schleswig (November 6) .

1 Hertslet, Map of Europe, ii. 1151.

'See Queen Victoria to Lord Malmesbury, 1st of Mav 1858, in Letters (pop. ed., 1908), iii. 280. Compare the letters to Palmerston of 21st of June 1849, ii. 222, and 22nd of June 1850, ii. 279, with Palmerston to Russell, 23rd of June 1850, and Queen Victoria to Russell, ii. 250.

Though even this concession violated the principle of the " indissoluble union " of the duchies, the German diet, fully occupied at home, determined to refrain from further action till the Danish parliament should make another effort to pass a law or budget affecting the whole kingdom without consulting the estates of the duchies. This contingency arose in July i860, and in the spring of the following year the estates were once more at open odds with the Danish government. The German diet now prepared for armed intervention; but it was in no condition to carry out its threats, and Denmark decided, on the advice of Great Britain, to ignore it and open negotiations directly with Prussia and Austria as independent powers. These demanded the restoration of the union between the duchies, a question beyond the competence of the Confederation. Denmark replied with a refusal to recognize the right of any foreign power to interfere in her relations with Schleswig; to which Austria, anxious to conciliate the smaller German princes, responded with a vigorous protest against Danish infringements of the compact of 1852. Lord John Russell now intervened, on behalf of Great Britain, with a proposal for a settlement of the whole question on the basis of the independence of the duchies under the Danish crown, with a decennial budget for common expenses to be agreed on by the four assemblies, and a supreme council of state consisting in relative proportion of Danes and Germans. 3 This was accepted by Russia and by the German great powers, and Denmark found herself isolated in Europe. The international situation, however, favoured a bold attitude, and she met the representations of the powers with a flat defiance. The retention of Schleswig as an integral part of the monarchy was to her a matter of life and death; the German Confederation had made the terms of the protocol of 1852, denning the intimate _ .

relations between the duchies, the excuse for un- repudiates warrantable interference in the internal affairs of the Denmark; and on the 30th of March 1863 a royal i 8 proclamation was published at Copenhagen repudia- ting the compacts of 1852, and, by defining the separate position of Holstein in the Danish monarchy, negativing once for all the claims of Germany upon Schleswig. 4*

The reply of the German diet to this move was to forward a note to

Copenhagen (July 9) demanding, on pain of federal execution, the withdrawal of the proclamation and the Danish grant of a fresh constitution, based on the compacts Constltu- of 1852 or on the British note of the 24th of September t,on ot 1862. Instead, King Frederick VII. issued on the '

28th of September 1863 a new constitution for " our kingdom of Denmark-Slesvig." The diet now resolved on federal execu- tion; but action was delayed, partly through British efforts at mediation, partly because Bismarck judged the time for a satisfactory solution of the whole question had not yet come. Encouraged by this hesitating attitude, the Danish parliament passed the new constitution on the 13th of November. Two days later Frederick VII. died.

*The " Protocol-King," Christian IX., who now ascended the throne, was in a position of extraordinary difficulty. The first sovereign act he was called upon to perform was to Accession sign the new constitution. To sign was to violate the of terms of the very protocol which was his title to reign; c * r,s< ' a " to refuse to sign was to place himself in antagonism '" to the united sentiment of his Danish subjects. He chose what seemed the remoter evil, and on the 18th of November signed the constitution. The news was received in Germany with violent manifestations of excitement and anger. Frederick, duke of Augustenburg, son of the prince who in 1852 had renounced the succession to the duchies, now claimed his rights on the ground that he had had no share in the renunciation. In Holstein an agitation in his favour had begun from the first, and this was extended to Schleswig on the terms of the new Danish constitution becoming known. His claim was enthusiastically*

3 Note of Sept. 24, 1862. For the diplomatic correspondence on the duchies see Pari. Papers, lxxiv. (1863).

4 For this and later correspondence see Pari. Papers, lxiv. (1864), p. 40 seq.

supported by the German princes and people, and in spite of the negative attitude of Austria and Prussia the federal diet decided

to occupy Holstein " pending the settlement of the Decree ot succession." On the 24th of December Saxon and execution.

Hanoverian troops marched into the duchy in the

name of the German Confederation, and supported by their presence and by the loyalty of the Holsteiners the duke of Augustenburg assumed the government under the style of Duke Frederick VIII. With this " folly " — as Bismarck roundly termed it — Austria and Prussia, in the teeth of violent public opinion, would have nothing to do, for neither wished to risk Attitude a European war. It was clear to Bismarck that the of Austria two powers, as parties to the protocol of 1852, must 'id uphold the succession as fixed by it, and that any

Prassla – action they might take in consequence of the violation of that compact by Denmark must be so " correct " as to deprive Europe of all excuse for interference. The publication of the new constitution by Christian IX. was in itself sufficient to justify a declaration of war by the two powers as parties to the signature of the protocol. As to the ultimate outcome of their effective intervention, that could be left to the future to decide. Austria had no clear views. King William wavered between his Prussian feeling and a sentimental sympathy with the duke of Augusten- burg. Bismarck alone knew exactly what he wanted, and how to attain it. " From the beginning," he said later (Reflections , ii. 10), " I kept annexation steadily before my eyes."

The protests of Great Britain and Russia against the action of the German diet, together with the proposal of Count Beust, on behalf of Saxony, that Bavaria should bring forward in that assembly a formal motion for the recognition of Duke Frederick's claims, helped Bismarck to persuade Austria that immediate action must be taken. On the 28th of December a motion was introduced in the diet by Austria and Prussia, calling on the Confederation to occupy Schleswig as a pledge for the observance by Denmark of the compacts of 1852. This implied the recognition of the rights of Christian IX., and was indignantly rejected; whereupon the diet was informed that the Austrian and Prussian governments would act in the matter as independent European powers. The agreement between them was signed on the 16th of January 1864. An article drafted by Austria, intended to safeguard the settlement of 1852, was replaced at Bismarck's instance by another which stated that the two powers would decide only in concert on the relations of the duchies, and that they would in no case determine the question of the succession save by mutual consent.

- At this stage, had the Danes yielded to the necessities of the situation and withdrawn from Schleswig under protest, the

European powers would probably have intervened, a aa a congress would have restored Schleswig to the Danish

*Prussia crown, and Austria and Prussia, as European powers, occupy the wou i(j have had no choice but to prevent any attempt x *' upon it by the duke of Holstein. To prevent this possibility Bismarck made the Copenhagen government believe that Great Britain had threatened Prussia with inter- vention should hostilities be opened, " though, as a matter of fact, England did nothing of the kind." The cynical stratagem succeeded; Denmark remained defiant; and on the 1st of February 1864 the Austrian and Prussian forces crossed the Eider.*

An invasion of Denmark itself had not been part of the original programme of the allies; but on the 18th of February some

*Prussian hussars, in the excitement of a cavalry D * , '°" skirmish, crossed the frontier and occupied the village develop- °f Kolding. Bismarck determined to use this circum- ments stance to revise the whole situation. He urged upon duringthe Austria the necessity for a strong policy, so as to settle*

once for all not only the question of the duchies but

the wider question of the German Confederation; and Austria reluctantly consented to press the war. On the 5th of March a fresh agreement was signed between the powers, under which the compacts of 1852 were declared to be no longer valid, and the position of the duchies within the Danish monarchy

Danish War.

as a whole was to be made the subject of a friendly understanding. Meanwhile, however, Lord John Russell on behalf of Great Britain, supported by Russia, France and Sweden, had intervened with a proposal that the whole question should once more be submitted to a European conference. 1 The German powers agreed on condition that the compacts of 1852 should not be taken as a basis, and that the duchies should be bound to Den- mark by a personal tie only. But the proceedings of the conference, which opened at London on the 25th of April, only revealed the inextricable tangle of the issues involved. Beust, on behalf of the Confederation, demanded the recognition of the Augusten- burg claimant; Austria leaned to a settlement on the lines of that of 1852; Prussia, it was increasingly clear, aimed at the acquisition of the duchies. The first step towards the realization of

this latter ambition was to secure the recognition of the absolute independence of the duchies, and this Austria could only oppose at the risk of forfeiting her whole influence in Germany. The two powers, then, agreed to demand the complete political independence of the duchies bound together by common institutions. The next move was uncertain. As to the question of annexation Prussia would leave that open, but made it clear that any settlement must involve the complete military sub- ordination of Schleswig-Holstein to herself. This alarmed Austria, which had no wish to see a further extension of Prussia's Tbe already overgrown power, and she began to champion powers the claims of the duke of Augustenburg. This con- and tingency, however, Bismarck had foreseen and himself Augusten- offered to support the claims of the duke at the con- arg ' ference if he would undertake to subordinate himself in all naval and military matters to Prussia, surrender Kiel for the purposes of a Prussian war- harbour, give Prussia the control of the pro- jected North Sea Canal, and enter the Prussian Customs Union. On this basis, with Austria's support, the whole matter might have been arranged without — as Beust pointed out {Mem. i. 272) — the increase of Prussia's power beyond the Elbe being any serious menace to Austrian influence in Germany. Fortunately, however, for Bismarck's plans, Austria's distrust and jealousy of Prussia led her to oppose this settlement and at her instigation the duke of AugUstenburg rejected it.

On the 25th of June the London conference broke up without having arrived at any conclusion. On the 24th, in view of the end of the truce, Austria and Prussia had arrived at a new agreement, the object of the war being now Treaty of declared to be the complete separation of the duchies 1864% from Denmark. As the result of the short campaign that followed, the preliminaries of a treaty of peace were signed on the 1st of August, the king of Denmark renouncing all his rights in th£ duchies in favour of the emperor of Austria and the king of Prussia. The definitive treaty was signed at Vienna on the 30th of October 1864. By Article XIX., a period of six years was allowed during which the inhabitants of the duchies might " opt " for Danish nationality and transfer themselves and their goods to Denmark; and the right of " indigenacy " was guaranteed to all, whether in the kingdom or the duchies, who enjoyed it at the time of the exchange of ratifications of the treaty. 2

The Schleswig-Holstein Question from this time onward became merged in the larger question of the general relations of Austria and Prussia, and its later developments are The last sketched in the article Germany: History. So far as phase of Europe was concerned it was settled by the decisive the result of the war of 1866. It survived,

however, as ques between Danes and Germans, though narrowed down to the question of the fate of the Danish population of the northern duchy. This question is of great interest to students of international law and as illustrating the practical problems involved in the assertion of the modern principle of " nationality."

1 Pari. Papers (1864), lxv. 124 seq. Beust {Mem. i. 252) says that Queen Victoria personally intervened to prevent British action in favour of Denmark.

2 The full text of the treaty is in La Question du Slesvig, p. 173 et seq.

The position of the Danes in Schleswig after the cession was determined, so far as treaty rights are concerned, by two instruments — the Treaty of Vienna (October 30, 1864) and the Treaty of Prague (August 23, 1866). By Article XIX. of the former treaty The Danish subjects domiciled in the ceded territories had the right, "op- within six years of the exchange of ratifications, of opting

iants." for the Danish nationality and transferringthemselves, their families and their personal property to Denmark, while keeping their landed property in the duchies. The last paragraph of the Article ran: " Le droit d'indigenat, tant dans le royaume de Danemark que dans les Duches, est conserve a tous les individus qui le possedent a l'6poque de l'echange des ratifications du present TraiteV' By Article V. of the Treaty of Prague Schleswig was ceded by Austria to Prussia with the reservation that " the popula- tions of the North of Schleswig shall be again united with Denmark in the event of their expressing a desire so to be by a vote freely exercised." Taking advantage of the terms of these treaties, about 50,000 Danes from North Schleswig (out of a total population of some 150,000) opted for Denmark and migrated over the frontier, pending the plebiscite which was to restore their country to them. But the plebiscite never came. Its inclusion in the treaty had been no more than a diplomatic device to save the face of the em- peror Napoleon III.; Prussia had from the first no intention of surrendering an inch of the territory she had conquered; the out- come of the Franco-German War made it unnecessary for her even to pretend that she might do so; and by the Treaty of Vienna of October 11, 1878, the clause relating to the plebiscite was formally abrogated with the assent of Austria.

Meanwhile the Danish " optants," disappointed of their hopes, had begun to stream back over the frontier into Schleswig. By doing so they lost, under the Danish law, their rights as Danish citizens, without acquiring those of Prussian subjects; and this disability was transmitted to their children. By Article XIX. of the Treaty of 1864, indeed, they should have been secured the rights of " indigenacy," which, while falling short of complete citizenship, implied, according to Danish law, all the essential guarantees for civil liberty. But in German law the right of Indigenat is not clearly differentiated from the status of a subject; and the supreme court at Kiel decided in several cases that those who had opted for Danish nationality had forfeited their rights under the Indigenat paragraph of the Treaty of Vienna. There was thus created in the frontier districts a large and increasing class of people who dwelt in a sort of political limbo, having lost their Danish citizenship through ceasing to be domiciled in Denmark, and unable to acquire Prussian citizenship because they had failed to apply for it within the six years stipulated in the Treaty of 1864. Their exclusion from the rights of Prussian subjects was due, however, to causes other than the letter of the treaty. The Danes, in spite of every discouragement, never ceased to strive for the preservation and extension of their national traditions and language; the Germans were equally bent on effectually absorbing these recalcitrant " Teutons into the general life of the German empire; and to this end the uncertain status of the Danish optants was a useful means. Danish agitators of German nationality could not be touched so long as they were careful to keep within the limits of the law; pro- Danish newspapers owned and staffed by German subjects enjoyed immunity in accord- ance with the constitution, which guarantees the liberty of the press. The case of the " optants " was far other. These unfor- tunates, who numbered a large proportion of the population, were subject to domiciliary visits, and to arbitrary perquisitions, arrest and expulsion. When the pro-Danish newspapers, after the ex- pulsion of several " optant " editors, were careful to appoint none but German subjects, the vengeance of the authorities fell upon " optant " type-setters, printers and printers' devils. The Prussian police, indeed, developed an almost superhuman' capacity for de- tecting optants: and since these pariahs were mingled indistinguish- ably with the mass of the people, no household and no business was safe from official inquisition. One instance out of many may serve to illustrate the type of offence that served as excuse for this syste- matic official persecution. On the 27th of April 1896 the second volume for 1895 of the Sonderjyske Aarboger was confiscated for having used the historic term Sonderjylland (South Jutland) for Schleswig. To add to the misery,

the Danish government refused to allow the Danish optants expelled by Prussia to settle in Denmark, though this rule was modified by the Danish Nationality Law of 1898 in favour of the children of optants born after the passing of the lav/. It was not till the signature of the treaty between Prussia and Denmark on the nth of January 1907 that these intolerable Treaty of conditions were ended. By this treaty the German January government undertook to allow all children born of //, 1907. Danish optants before the passing of the new Danish Nationality Law of 1898 to acquire Prussian nationality on the usual conditions and on their own application. This provision was not to affect the ordinary legal rights of expulsion as exercised by either power, but the Danish government undertook not to refuse to the children of Schleswig optants who should not seek to acquire or who could not legally acquire Prussian nationality per- mission to reside in Denmark. The provisions of the treaty apply not only to the children of Schleswig optants, but to their direct descendants in all degrees.

This adjustment, brought about by the friendly intercourse between the courts of Berlin and Copenhagen, seemed to close the last phase of the Schleswig question. Yet, so far from allaying, it apparently only served to embitter the inter-racial feud. The " autochthonous Germans of the Northern Marches " regarded the new treaty as a betrayal, and refused " to give the kiss of peace " to their hereditary enemies. For forty years Germanism, backed by all the weight of the empire and imposed with all the weapons of official persecution, had barely held its own in North Schleswig; in spite of an enormous emigration, in 1905, of the 148,000 in- habitants of North Schleswig 139,000 spoke Danish, while of the German-speaking immigrants it was found that more than a third spoke Danish in the first generation; and this in spite of the fact that, from 1864 onward, German had gradually been substituted for Danish in the churches, the schools, and even in the playground. But the scattered outposts of Germanism could hardly be expected to acquiesce without a struggle in a situation that threatened them with social and economic extinction. Forty years of dominance, secured by official favour, had filled them with a double measure of aggressive pride of race, and the question of the rival nationalities in Schleswig, like that in Poland, remained a source of trouble and weakness within the frontiers of the German empire.

Authorities. — The literature on the subject is vast. From the German point of view the most comprehensive treatment is in C. Jansen and K. Samwer, Schleswig-Holsteins Befreiung (Wiesbaden, 1897) ; see also H. C. L. von Sybel, Foundation of the German Empire (Eng.

trans., New York, 1890-1891); Bismarck's Reflections and Reminiscences, and L. Hahn, Bismarck (5 vols., 1878-1891). The Danish point of view is ably and moderately presented in La Question du Slesvig, a collection of essays by various writers edited by F. de Jessen (Copenhagen, 1906), with maps and documents. (W. A. P.)

SCHLETTSTADT, a town of Germany, in the imperial province of Alsace-Lorraine, on the 111; 26 m. S. of Strassburg by the railway to Basel. Pop. (1905) 9700. It possesses two fine Roman Catholic churches, a Protestant church, numerous remains of its old walls and some quaint houses of the 15th and 1 6th centuries. It has a theatre, a municipal library, a gym- nasium, and other educational establishments. The Roman Catholic churches are the cathedral church of St George, a fine Gothic building founded in the 13 th century, and the church of St Fides, dating from the nth century. Its industries comprise wire-drawing, tanning and saw-milling, and there is a considerable trade in wine, fruit and other agricultural produce.

Schlettstadt is a place of very early origin. It was a royal residence in Carolingian times and became a free town of the Empire in the 13 th century. In the 15th century it was the seat of a celebrated academy, founded by the humanist Rodolphus Agricola, which contributed not a little to the revival of learning in this part of Germany; Erasmus of Rotterdam was one of its students. In 1634 the town came into the possession of France, and it was afterwards fortified by Vauban. It offered little resistance, hefwever, to the Germans in 1870, and the fortifications have since been razed. The Hoh-Konigsburg, a great castle standing at an elevation of 2475 ft., was presented to the emperor William II. by the town of Schlettstadt in 1899, and was com- pletely restored in 1908. The site is first mentioned as bearing a castle in the 8th century.

See Naumann, Die Eroberung von Schlettstadt (Berlin, 1876); and J. Geny, Die Reichstadt Schlettstadt 14QO-1536 (Freiburg i. B. 1900).

SCHLEY, WINFIELD SCOTT (1839- 1911), American naval officer, was born at Richfields, near Frederick, Maryland, on the 9th of October 1839. He graduated at the United States Naval Academy in i860, and during the Civil War was in active service as a lieutenant until July 1863. In 1867-1869 he was an in- structor in the U.S. Naval Academy. He took part in Rear- Admiral John Rodgers's expedition to Korea in 1871, and was adjutant of the American land forces in the attack on the Korean forts on Salee river on the 10th

and nth of June. In 1872-1875 he was head of the department of modern languages in the U.S. Naval Academy. He was promoted commander in June 1874; in 1876-1879 commanded the " Essex," most of the time in the South Atlantic, and then until October 1883 was inspector of the second lighthouse district. In February 1884, after the failure in 1883 of the second expedition (under Lieut. E. A. Garlington) for the relief of the Lady Franklin Bay Expedition commanded by Lieut. A. W. Greely, Schley was appointed to command the third Greely relief expedition; and near Cape Sabine on the 22nd of June rescued Greely and six (of his twenty-four) companions. He was chief of the bureau of equipment and recruiting

in 1 885-1 889; and in April 1888 was promoted captain. He commanded the " Baltimore " in Rear-Admiral George Brown's squadron off the coast of Chile in 1891. Early in 1892 he was again transferred to the lighthouse bureau, and until February 1895 was inspector of the third lighthouse district; and in 1 89 7- 1 898 he was a member (and chairman) of the Lighthouse Board. He was commissioned commodoreon the 6th of February 1898, and on the 24th of March, although lowest on the list of commodores, he was put in command of the " flying squadron," with the " Brooklyn " as his flagship, for service in the war with Spain. The command of the fleet off Santiago de Cuba was taken from Schley by Acting Rear-Admiral W. T. Sampson on the 1st of June. In the battle of Santiago on the 3rd of July Schley, in Sampson's absence, was the senior officer and the " Brooklyn " did especial service, with the " Oregon," in over- hauling and disabling the " Cristobal Colon." On the 10th of August Schley was advanced six numbers and was made rear-admiral for " eminent and conspicuous conduct in battle." On the 19th he was appointed a commissioner of the United States to arrange the evacuation of Porto Rico. When the Navy Department recommended that Sampson be promoted eight numbers and over the head of Schley, who had ranked him for forty-two years, there was a bitter controversy, and the Senate did not confirm the promotion. On the 14th of April 1899 Schley was commissioned rear-admiral, ranking as major-general. In November 1899 he was put in command of the South Atlantic Station, and in October 1901 he retired from active service upon reaching the age limit. At his request, because of the charges made against him in E. S. Maclay's History of the Navy, a court of inquiry investigated Schley's conduct before and during the battle of Santiago, on the 13th of December

1901 the court pronounced Schley guilty of delay in locating Cervera's squadron, of carelessness in endangering the " Texas " by a peculiar " loop " movement or turn of the "Brooklyn" which blanketed the fire of other American vessels, and of disobedience to a departmental order of the 25th of May, but it recommended that no action be taken. Admiral Schley filed a protest against the court's findings, which, however, were approved by the Secretary of the Navy.

Schley wrote, with James Russell Soley, The Rescue of Greely (New York, 1885). See Schley's Forty-five Years under the Flag (New York, 1904).

SCHLIEMANN, HEINRICH (182 2-1 890), German archaeo- logist, was born on the 6th of January 1822 at Neu Buckow in Mecklenburg-Schwerin, the son of a poor pastor. He has stated in his autobiography that through all his early years of struggle, when he was successively grocer's apprentice at Furstenberg, cabin-boy on the " Dorothea " bound for Venezuela, and, after her wreck, office attendant and then book-keeper in Amsterdam, he nourished a passion for the Homeric story and an ambition to become a great linguist. In the end, thanks to an unusually powerful memory and determined energy, he acquired a knowledge of seven or eight tongues besides his own, including ancient and modern Greek. The house of B. H. Schroder of Amsterdam sent him in 1846 to St Petersburg, where he estab- lished a business of his own and embarked in the indigo trade. He made a fortune at the time of the Crimean War, partly as a military contractor. Happening to be in California when made a state of the Union, in 1850, he became and remained an American citizen. After travels in Greece, Tunisia, India, China and Japan, and writing a short sketch of the last two countries, he took his large fortune to Greece in 1868, and proceeded to visit Homeric sites. In an ensuing book — Ithaka, der Peloponnes, und Troja — he propounded two theories which he was destined eventually to test in practice, viz. that Hissarlik, not Bunarbashi, was the site of Troy, and that the Atreid graves, seen by Pausanias at Mycenae, lay within the citadel wall. Two years later he took up Calvert's work on the former site, and, convinced that Troy must be on the lowest level, hewed his way down, regard- less of the upper strata, wherein lay unseen the remains of which he was really in search. By 1873 he had laid bare considerable fortifications and other remains of a burnt city of very great

antiquity, and discovered a treasure of .gold jewelry. We now know this city to have belonged to the middle pre-Mycenaean period, long

prior to the generation of Homer's Archaeans; but Schliemann far and wide proclaimed it " Troy," and was backed by Gladstone and a large part of the European public. Trying to resume his work in February 1874, he found himself inhibited by the Ottoman government, whose allotted share of the gold treasure had not been satisfactory, and it was not till April 1876 that he obtained a firman. During the delay he issued his Troy and its Remains (1875), and betook himself to Mycenae. There in August 1876 he began work in the Dome- tombs and by the Lion Gate, and opened a large pit just within the citadel. The famous double ring of slabs and certain stone reliefs came to light. Schliemann, thinking it was only a plat- form levelled as a place of Achaean assembly, paused, and did not resume till November. Then, resolved to explore to the rock, he cleared away some three feet more of earth and stones, and lighted on the five shaft graves which have placed him first among fortunate excavators. A sixth grave was found im- mediately after his departure. The immense treasure of gold, silver, bronze, fine stone and ivory objects, which was buried with the sixteen corpses in this circle, is worth intrinsically more than any treasure-trove known to have been found in any land, and it revealed once for all the character of a great civiliza- tion preceding the Hellenic. The find was deposited at Athens, and gradually cleaned and arranged in the Polytechnic; and the discoverer, publishing his Mycenae in English in 1877, had his full share of honours and fame. He had now settled in Athens, where he married a Greek lady, and built two splendid houses, which became centres of Athenian society. In 1878 he dug unsuccessfully in Ithaca, and in the same year and the following resumed work at Hissarlik, and summed up his results in a discursive memoir, Ilios, upon which a sequel, Troja, issued in 1884, after Wilhelm Dorpfeld, associated in 1882, had intro- duced some archaeological method into the explorations, was a considerable improvement.

In 1880 and 1881 Schliemann cleared out the ruined dome- tomb of Orchomenus, finding little except remains of its beautiful ceiling; and in 1885, with Dorpfeld, he laid bare the upper stratum on the rock of Tiryns, presenting scholars with a complete ground plan of a Mycenaean palace. This was his last fortunate excavation. While Tsountas, for the Greek Archaeological Society, picked up his work at Mycenae in 1886, and gradually cleared the Acropolis, with notable results, Schliemann tried for traces of the Caesareum at Alexandria, of the Palace of Minos at Knossos, in Crete, and of the Aphrodite temple at Cythera (1888); but he was not successful, meeting in the two former enterprises with a local opposition which

his wealth was unable to bear down. In 1889 he entertained at Hissarlik a committee of archaeological experts, deputed to examine Botticher's absurd contention that the ruins represented not a city, but a cremation necropolis; and he was contemplating a new and more extensive campaign on the same site when, in December 1890, he was seized at Naples with an illness which ended fatally on the morning of Christmas Day. His great wealth was left mainly to the two families that he had in Russia and Greece; but a sum was reserved for Hissarlik, where Dorpfeld in 1891 and 1892, by clearing away the debris of the former excavations, exposed the great walls of the sixth stratum which Schliemann had called Lydian, and proved their synchron- ism with Mycenae, and identity with Mycenaean remains; that is to say, with Homer's Troy, if Troy ever was.

Schliemann was on several occasions in England, in 1883 to receive honours from the great universities, and in 1886 to confute, at a special gathering of the Hellenic Society, the assertion of Stillman and Penrose that the Tirynthian palace was posterior to the Christian era. Nowhere was he better appreciated, and most of his books were first issued in English. (D. G. H.)

SCHLIPPE'S SALT, or sodium thioantimoniate, Na 3 SbS4-9H 2 0, named after K. F. Schlippe (1799-1867), is prepared by dissolv- ing the calculated quantities of antimony trisulphide, sulphur

and sodium hydroxide in water, or by fusing sodium sulphate (16 parts), antimony sulphide (13 parts) and charcoal (4-5 parts), dissolving the melt in water and boiling the solution with 25 parts of sulphur. The liquid is then filtered and evaporated. The salt crystallizes in large tetrahedra, which are easily soluble in water, and have a specific gravity 1-806. The anhydrous salt melts easily on heating, and in the hydrated condition, on exposure to moist air becomes coated with a red film. It combines with sodium thiosulphate to form Na 3 SbS4-Na 2 S 2 03-20H 2 0.

SCHLOSSER, FRIEDRICH CHRISTOPH (1 776-1861), German historian, was born at Jever in East Friesland on the 17th of November 1776. He took up the study of theology, mainly at Gottingen, and began life as a private tutor. Turning to the study of history, he carried with him the tendency to construct his syntheses

upon the scanty basis of 18th-century generaliza- tions; yet in spite of the growing scientific school he became and remained for a quarter of a century the most popular German historian. In 1807, inspired by his study of Dante, he published his first work Abdlard und Dulcin, a defence of scholasticism and medieval thought. Two years later biographical studies of Theodore Beza and Peter Martyr Vermili (Leben des Theodor de Beza und des Peter Martyr Vermili, Heidelberg, 1809) revealed more genuine scholarship. In 181 2 appeared his History of the Iconoclastic Emperors of the East {Geschichte der bilderstiir- menden Kaiser des oslromischen Reichs), in which he contro- verted some points in Gibbon and sought to avoid painting the past in present-day colours. His own strong predispositions prevented him from accomplishing this, however, and the history remains open to grave scientific criticism. But it won for him the favour of Archbishop Karl Theodor Dalberg, and secured for him a professorship in the Frankfort Lyceum. He left Frankfort in 1819 to become professor of history at Heidel- berg, where he resided until his death on the 23rd of September

1861.

In 1815 appeared the first volume of his World History (W eltgeschichte in zusammenhdngender Erzdhlung). This work, though never completed, was extended through many volumes, bespeaking an inexhaustible energy and a vast erudition. But it lacks both accuracy of fact and charm of style, and is to-day deservedly quite forgotten. On the other hand a translation of the pedagogical handbook of Vincent of Beauvais and the accompanying monograph are still of value. The next note- worthy work was a history of antiquity and its culture (Universal- historische Ubersicht der Geschichte der alien Welt und ihrer Kultur, 1st part, 1826; 2nd part, 1834), which, while revealing little knowledge of the new criticism of sources inaugurated by F. A. Wolf and B. G. Niebuhr, won its way by its unique handling of the subject and its grand style. In 1823 he published in two volumes a Geschichte des i8ten Jahrhunderts; then, enlarged and improved, this work appeared in six volumes as . Geschichte des i8ten Jahrhunderts und des igten biszum Sturzdes franzbsischen Kaiserreichs (1836-1848). The history had a most extraordinary success, especially among the common people, owing, not to its scientific qualities, but to the fact that the author boldly and sternly sat in judgment upon men and events, and in his judgments voiced the feelings of the German nation in his day. For this very reason it is no longer read. It has been translated into English by D. Davison (8 vols., 1843-1852). Finally, Schlosser undertook a popular World History for the German People {W

eltgeschichte filr das deutsche Volk, 1844-1857), which also enjoyed the favour of those for whom it was written.

Schlosser stands apart from the movement towards scientific history in Germany in the 19th century. Refusing to limit himself to political history, as did Ranke, he never learned to handle his literary sources with the care of the scientific historian. History was to him, as it had been to Cicero, a school for morals; but he had perhaps a juster conception than Ranke of the breadth and scope of the historian's field.

See G. G. Gervinus (Schlosser's pupil), F. C. Schlosser, ein Nekrolog (1861); G. Weber, F. C. Schlosser, der Historiker, Erinnerungsblatter (Leipzig, 1876) ; and O. Lorenz, F. C. Schlosser (Vienna, 1878).

SCHLOTHEIM, ERNST FRIEDRICH, Baron von (1764- 1832), German palaeontologist, was born in Grafschaft Schwarz- burg on the 2nd of April 1764. He was Privy Councillor and President of the Chamber at the court of Gotha. Becoming interested in geology he gathered together a very extensive collection of fossils. In 1804 he published descriptions and illustrations of remarkable remains of (Carboniferous) plants, Ein Beitrag zur Flora der Vorwelt. His more important work was entitled Die Petrefactenkunde (1820). In this he incorporated the plates used in his previous memoir and supplemented it by a folio atlas (1822), in which he illustrated his collection " of petrified and fossil remains of the animal and vegetable kingdom of a former world." For the first time in Germany the fossils were named according to the binomial system. The specimens are preserved in the Berlin Museum. He died at Gotha on the 28th of March 1832.

SCHLOZER, AUGUST LUDWIG VON (1735-1809), German historian, was born at Gaggstedt, in the county of Hohenlohe-Kirchberg, on the 5th of July 1735. Having studied theology and oriental languages at the universities of Wittenberg and Gottingen, he went in 1755 as a tutor to Stockholm, and after- wards to Upsala; and while in Sweden he wrote in Swedish an Essay on the General History of Trade and of Seafaring in the most Ancient Times (1758). In 1759 he returned to Gottingen, where he began the study of medicine. In 1761 he went to St Petersburg with Gerhardt Friedrich Miiller, the Russian historio- grapher, as Miiller's literary assistant and as tutor in his family. Here Schlozer learned Russian and devoted himself to the study of Russian history. In 1762 a quarrel with Miiller placed him in a position of some difficulty from which he was delivered by an introduction to Count Rasumovski, who

procured his appointment as adjunct to the Academy. In 1765 he was appointed by the empress Catherine an ordinary member of the Academy and professor of Russian history. In 1767 he left Russia on leave and did not return. He settled at Gottingen, where in 1764 he had been made professor extraordinarius, and doctor honoris causa in 1766, and in 1769 he was promoted to an ordinary professorship. In 1804 he was ennobled by the emperor Alexander I. of Russia and made a privy councillor. He retired from active work in 1805 and died on the 9th of September 1809.

Schlozer's activity was enormous, and he exercised great influence by his lectures as well as by his books, bringing historical study into touch with political science generally, and using his vast erudition in an attempt to solve practical questions in the state and in society. He was " a journalist before the days of journalism, a traveller before that of travelling, a critic of authorities before that of political oppositions." His most important works were his Allgemeine nordische Geschichte, 2 vols. (Halle, 1772) and his translation of the Russian chronicler Nestor to the year 980, 5 vols. (Gottingen, 1 802-1 809). He awoke much intelligent interest in universal history by his W eltgeschichte im Auszuge und Zusammenhange, 2 vols. (2nd ed., Gottingen, 1 792-1801); and in several works he helped to lay the founda- tions of statistical science. He also produced a strong impression by his political writings, the Brief wechsel, 10 vols. (1 776-1 782) and the Staatsanzeigen, 18 vols. (1782-1793).

Schlozer, who in 1769 married Caroline Roederer, daughter of Johann Georg Roederer (1726-1763), professor of medicine at Gottingen and body physician to the king of England, left five children. His daughter Dorothea, born on the 10th of August 1770, was one of the most beautiful and learned women of her time, and received in 1787 the degree of doctor. She was re- cognized as an authority on several subjects, especially on Russian coinage. After her marriage with Rodde, the burgomaster of Liibeck, she devoted herself to domestic duties. She died on the 12th of July 1825 (see Reuter, Dorothea Schlozer, Gottingen, 1887). Schlozer's son Christian (1774-1831) was a professor at Bonn, and published Anfangsgriinde der Staatswirthschaft (1 804-1 806) and his father's Ojfentliches und Prival-Leben aus Originalurkunden (1828). The youngest son, Karl von Schlozer, a merchant and Russian consul-general at Liibeck, was the father of Kurd von Schlozer (1822-1894), the historian

and diplomatist, who in 187 1 was appointed German ambassador to the United States and in 1882 to the Vatican, when he was instrumental in healing the breach between Germany and the papacy caused by the " May Laws."

See Zermelo, August Ludwig Schliizer (Berlin, 1875); Wesendpnck, Die Begriindung der neuern deutschen Geschichtsschreibung durch Gatterer und SMozer (Leipzig, 1876) and F. Frensdorff in Allgemeine deutsche Biog. vol. xxxi.

SCHLUSSELBURG, a town of Russia, in the government of St Petersburg, situated on low ground surrounded by marshes, at the issue of the river Neva from Lake Ladoga, 40 m. by steamer E. of the city of St Petersburg. Pop. (1897) 5285. It was founded in 1323 by the Novgorodians, and though after- wards lost by Russia, was reconquered by Peter the Great in 1702. It has a cathedral and a fortress, built on an island in the Neva, which is now used as a political prison.

SCHLUTER, ANDREAS (1664-17 14), German sculptor and architect, was born in Hamburg. Much of his activity as a sculptor was exercised in Warsaw, but in 1694 he was summoned to Berlin. Two years later he began his designs for the rebuilding of the royal palace. The execution of these occupied him from 1699 to 1706, and the palace became a conspicuous example of barocco style in Germany. In 17 13 Schluter went to St Peters- burg, where he did architectural work for Peter the Great. His principal works in Berlin are the monument of the great elector Frederick William and the 21 masks of dying warriors in the courtyard of the arsenal,, the tombs of King Frederick I. and his wife, and the marble pulpit in the Marienkirche.

See C. Gurlitt, Andreas Schluter (1891); C. F. von Kloeden, Andreas Schluter (1855).

SCHM ALKALDEN, a town of Germany, in the Prussian province of Hesse-Nassau, situated in a narrow valley at the south- western slope of the Thuringian forest, 30 m. S.W. of Erfurt, on the railway Wernshausen-St Blasii. Pop. (1905) 9529- It has a Gothic parish church, a palace — Schloss Wilhelmsburg — ■ with an interesting chapel and a collection of antiquities, and possesses a Gothic town hall in which the important Protestant League of Schmalkalden, or Smalkald, was concluded in 1531, and also the house in which the

articles of Schmalkalden were drawn up in 1537 by Luther, Melanchthon and other reformers. It has three other Evangelical churches, a Roman Catholic church and several schools. Its industries are chiefly connected with ironwares, but leather, beer, soap and toys are also manu- factured. Karl Wilhelms (1815-1873), the composer of " Die Wacht am Rhein," was born here, and there is a memorial of him in the market-place. Schmalkalden, which was first mentioned in 874, came wholly into the possession of Hesse in 1583, having been a town since 1335.

See Wagner, Geschichte der Stadt und Herrschaft Schmalkalden (Marburg, 1849); and Wilisch, Schmalkalden und seine Umgebungen (Schmalkalden, 1884).

SCHMERLING, ANTON VON (1 805-1 893), Austrian statesman, was born on the 23rd of August 1805 at Vienna, where his father held a high position on the judicial side of the civil service. After studying law at Vienna, in 1829 Tie entered the public service, and during the next eighteen years was constantly occupied, chiefly in Lower Austria. In 1847, as a member of the lesser nobility, he entered the Estates of Lower Austria, and took an active part in the Liberal movement for administra- tive and constitutional reform of which they were the centre. On the outbreak of the revolution in Vienna in March 1848, when the mob broke into the Assembly, Schmerling was one of the deputation which carried to the palace the demands of the people, and during the next few days he was much occupied in organizing the newly formed ˆNational Guard. At the end of the month he was sent by the ministry to Frankfort as one of the men of " public confidence." He soon succeeded Count Colleredo as president of the Diet, and in this capacity officially transferred to the archduke John, who had been elected regent of Germany, the powers of the Diet. For this he was violently attacked in the German parliament by the extreme Radicals; but on this and other occasions (he had himself been elected to the parliament) he defended moderate and constitutional principles, all the more

effectively because he depended not on eloquence but on a recognition of what has been called the " irony of facts "— to which the parliament as a whole was so blind. He was the first and the most influential member of the ministry which the regent formed; he held the ministry of the interior and, later, also that of foreign affairs, and it was almost entirely due to him that at least for a short time this phantom government maintained some appearance of power and dignity. A defeat in the parliament when he defended the armistice of Malmo led to his resignation; but he was immediately called to office

again, with practically dictatorial power, in order to quell the revolt which broke out in Frankfort on the 18th of September. His courage and resolution averted what nearly became a terrible catastrophe. It was his hope to establish in Germany the supremacy of a Liberal and reformed Austria. This brought him into opposition to the party of Prussian supremacy; and when they attained a majority, he resigned, and was succeeded by Gagern. He remained at Frankfort, holding the post of Austrian envoy, and was the leader of the so-called Great German party until the dissolution of the Austrian parliament showed that the forces of reaction had conquered at Vienna and shattered all hopes of Austria attaining the position he had hoped for her.

After the abortive election of the king of Prussia to be emperor, he, with the other Austrians, left Frankfort. On his return to Vienna he became minister of justice, and the reforms which he carried out added to his reputation. His popularity among all Liberals was increased by his resignation in 185 1, as a protest against the failure of the government to establish the constitution they had promised. During the next few years he was judge of the supreme court of appeal. When his forecast was fulfilled, and the system of absolutism broke down, he became minister in January 1862. His first act was the publication of the con- stitution by which the whole of the empire was to be organized as a single state with a parliamentary government. The experi- ment failed, chiefly because of the opposition of the Croatians and Magyars, whom he bitterly offended by his celebrated saying that " Hungary could wait." Faults of manner, natural in a man whose life had been spent as an official and a judge, pre- vented him from keeping together the German Liberals as a strong and united party; he was opposed by a powerful faction at court, and by the Clerical leaders. After the first few months the emperor gave him only a very lukewarm support; and with his retirement in 1865 the attempt to carry out the ideals of Joseph II. to Germanize while he liberalized the whole of the empire, and to compel Hungarians, Poles, Czechs and Croatians to accept a system in which the government of the whole should be carried on by a German-speaking parliament and bureaucracy, failed. The constitution of 1862, though suspended on Schmer- ling's fall, was still regarded as legally valid for the cis-Leithan territories, and is the basis on which the present constitution for half the empire was framed. On his retirement he returned to his judicial duties; in 1867 he was made life-member of the Upper House in the Reichsrath, of which he became vice- president, and in 187 1 president. This post he laid down in 1879, and came forward as leader of the Liberal

German opposition to the administration of Count Taaffe. In 1891 he retired from public life, and died at Vienna on the 23rd of May 1893.

Schmerling married, in 1835, Pauline, daughter of Field- Marshal-Lieutenant Baron von Koudelka. Frail von Schmerling, who was distinguished by literary and artistic abilities, at that time rare in the Austrian capital, died in 1840, leaving two daughters.

See Arneth, Anton v. Schmerling (Prague, 1895). This contains a full account of Schmerling's life during I 848-1849, but does not deal with his later life. Wurzbach, Biographisches Lexicon des Kaiser-thums Osterreich; Friedjung, Der Kampf ton die Vorherrschaft in Deulschland; Rogge, Geschichte Osterreichs. (J. W. He.)

SCHMIDT, HEINRICH JULIAN (1818-1886), German journalist and historian of literature, was born at Marienwerder in East Prussia on the 7th of March 1818, and after studying history and philosophy at the university of Konigsberg was appointed, in 1842, to a mastership in the Luisenstadt Realschule in Berlin. In 1847 he joined the editorial staff of the Grenzboten

in Leipzig, and in the following year became, with Gustav Freytag, joint owner of that periodica). In 1861 he removed to Berlin as editor-in-chief of the Berliner allgemeine Zeitung, and in 1878 was rewarded for the journalistic services rendered to the government, by a pension from the emperor William I. He died at Berlin on the 27th of March 1886.

Julian Schmidt's principal contributions to literary history are Geschichte der Romantik im Zeitaller der Revolution una Reslauration (1848); Geschichte der deutschen Nationalliteratur im 19. Jahrhundert (1853) ; Geschichte des geistigen Lebens in Deutschland von Leibniz bis auf Lessings Tod (1861-1863). These works subsequently appeared as Geschichte der deutschen Literatur von Leibniz bis auf unsere Zeit (4 vols., 1886-1896) ; Schmidt also wrote a Geschichte der franzosischen Literatur seit der Revolution (1857), and a biography of Schiller (1859).

SCHMIDT, KARL VON (1817-1875), Prussian cavalry general, was born at Schwedt on the Oder, on the 12th of January 181 7, and entered the 4th Ulans as a second lieutenant in 1834. His long

regimental service was varied by staff service and instruc- tional work, and in the mobilization of 1859 he had the command of a landwehr cavalry regiment. In 1863 he was made colonel of the 4th Cuirassiers, which he commanded in the, for the cavalry arm, uneventful campaigns of 1864 and 1866. He then com- manded a newly raised regiment of Schleswig-Holstein troops, the 1 6th Hussars, but at the outbreak of the Franco-German War he was still an obscure and perhaps a mistrusted officer, though his grasp of every detail of cavalry work was admitted. But an opportunity for distinction was grasped in the cavalry fighting around Mars-la-Tour (Aug. 16), in which he temporarily led a brigade and was severely wounded. He was soon promoted major-general and succeeded to the temporary command of his division on the disablement of its leader. In this post he did brilliant work in the campaign on the Loire, and even in the winter operations towards Le Mans, and earned a reputation second to none amongst the officers and men of his arm. After the war he took a leading part in the reorganization of the Prussian cavalry, which in ten years raised its efficiency to a point far beyond that of any other cavalry in Europe. In 1875, though his health was failing, he refused to give up the conduct of certain important cavalry manoeuvres with which he had been entrusted. But a few days of heavy work in the field brought on a fatal illness, and he died at Danzig on the 25th of August 1875. In 1889 the 4th Ulans, in which his regimental service was almost entirely spent, were given the name " Von Schmidt."

His drill and manoeuvre instructions were codified and published after his death by his staff officer, Captain von Vollard Bockelberg, who was authorized by Prince Frederick Charles to do so. An English translation, Instructions for Cavalry, has been published by the War Office. Von Schmidt himself wrote a pamphlet, Auch ein Wort uber die Ausbildung der Cavallerie (1862). The original German edition of the Instructions for Cavalry is prefaced by a memoir of Von Schmidt's life and services, written by Major Kaehler.

SCHMIDT, WILHELM ADOLF (1812-1887), German historian, was born in Berlin on the 26th of September 181 2. He became in 185 1 professor of history at Zurich, and nine years later professor at Jena, where he died on the 10th of April 1887. He was a member of the Frankfort parliament in 1848, and of the German Reichstag from 1874 to 1876. His historical works deal mainly with modern German history, and the most important of them are: —

Preussens deutsche Politik (Berlin, 1850, and other editions) ; Geschichte der preussisch-deutschen Unionsbestrebungen (Berlin,

1851) ; Zeitgenossische Geschichten (Berlin, 1859) ; Elsass und Lothringen (Leipzig, 1859 and 1870); and Geschichte der deutschen Verfassungs- frage wdhrend der Befreiungskriege und des Wiener Kongresses (Stuttgart, 1890), which was published after his death by A. Stern. Schmidt also wrote : Tableaux de la Revolution FranQaise publies sur les papiers inedits du departement de la police secrete de Pans (Leipzig, 1867-1870) ; Pariser Zustdnde wdhrend der Revolutionszeit (Jena, 1874-1876), translated 'into French by P. Viollet (Paris, 1880-1885); Das Perikleische Zeitalter (Jena, 1877-1879); Handbuch der griechi- schen Chronologie (Jena, 1888) ; and Abhandlungen zur alten Geschichte (Leipzig, 1888).

See H. Landwehr, Zur Erinnerung an Adolf Schmidt (Berlin, 1887).

SCHMOLLER, GUSTAV (1838-), German political economist, was born at Heilbronn on the 24th of June 1838. He studied political science, philosophy and history at the university

of Tubingen from 1857 to 1861, when he obtained an appointment at the Wurttemberg Statistical Department. In 1864 Schmoller became extraordinary — and in the following year, ordinary — professor of political economy and science at Halle, was trans- ferred in a like capacity to Strasburg in 1872 and finally in 1882 to Berlin. In 1884 he was admitted a member of the Prussian Staatsrath, in 1887 a member of the Prussian Academy of Sciences, and in 1899 was called to the Prussian Herrenhaus (Upper Chamber) as representative of the university of Berlin. Schmoller is famous for his researches in the field of the history of political economy and is one of the founders of the Verein fiir Social Politik (Social Political Society).

Among his numerous scientific works must be specially mentioned : Der franzosiche Handelsvertrag und seine Gegner (1862); Zur Geschichte des deutschen Kleingewerbes im igten Jahrhundert (1869); Uber einige Grundfragen des Rechts und der Volkswirtschaft (1875). In late years Schmoller concentrated his attention more upon the history of Prussian administration, and besides editing the Jahrbuch fiir preussische Geschichte und Landeskunde, published the result of his labours in this department in the Umrisse und Untersuchungen zur Verfassungs-, Verwaltungs- und Wirtschafts geschichte, besonders des preussischen Staates, im iyten und 18 ten Jahrhundert (1898).

For an estimate of'Schmoller's work cf. Stampfer, Gustav Schmoller

(1901).

SCHNEEBER6, a town of Germany, in the kingdom of Saxony, in the Erzgebirge, 14 m. S.E. from Zwickau by rail. Pop. (1905) 9034. It contains a handsome Gothic parish church, one of the largest ecclesiastical buildings in Saxony, dedicated to St Wolfgang, with an altar-piece by Lucas Cranach the elder, and numerous tombs; a gymnasium; a school of lace-making and a hospital. Hand-made lace and silver mining, formerly its two most important industries, have greatly declined. The first has been almost entirely superseded by machine-made goods, while the second appears to have languished owing to exhaustion of the mines. Cobalt, bismuth and nickel are worked and yield satisfactory results, and machine-made lace, embroidery, porcelain, corsets, shoes and colours are among the chief of its other industrial products. Schneeberg is also noted for a snuff made of aromatic herbs, which commands a ready sale in the district.

See Lehmann, Chronik von Schneeberg (Schneeberg, 1837-1840).

SCHNEEKOPPE, a mountain of Germany, on the Silesian Bohemian frontier, the highest peak (5100 ft.) of the Riesen- gebirge, situated immediately above the town of Schmiedeberg, 8 m. S. from Hirschberg. From the crest, which is about 50 yds sq. and across which runs the frontier line between Silesia and Bohemia, a magnificent view is obtained across the Oder plain to Breslau on the north and over Bohemia to the south- west. Just below the ridge, on the Prussian side, lies the chapel of St Lawrence, which was used as a hospice for travellers from 1824 to 1850, when a new hostel was erected. Since 1900 a meteorological station has been established here.*

See Zetzmann, Panorama Von der Schneekoppe (Berlin, 1903).

SCHNEIDEMUHL (Polish Pila), a town of Germany, in the Prussian province of Posen, situated on the Cuddow, 60 m. N. of Posen and 145 m. N.E. of Berlin on the main line to Konigsberg, and at the junction of lines to Stargard and Thorn. Pop. (1905), 21,624. It has five churches, a classical school and a Roman Catholic teachers' seminary. Schneidemuhl carries on a trade in wood, grain and potatoes, and possesses an iron foundry, several glass works and machine-shops, and other industrial establishments. Considerable damage was done to the town in 1893 by a violent overflow of water from a deep artesian well.

SCHNEIDER, JOHANN GOTTLOB (1750-1822), German classical scholar and naturalist, was born at Kollmen in Saxony on the 18th of January 1750. In 1774, on the recommendation of Heyne, he became secretary to the famous Strassburg scholar, R. F. Brunck, and in 1811 professor of ancient languages and eloquence at Breslau (chief librarian, 1816) where he died on the 1 2th of January 1822. Of his numerous works the most im- portant was his Kritisches griechisch-deutsches Handworterbuch (1 797-1 708), the first independent work of the kind since Stephanus's Thesaurus, and the basis of F. Passow's and all succeeding Greek lexicons. A special improvement was the

introduction of words and expressions connected with natural history and science. The scientific writings of ancient authors especially attracted him. He published editions of Aelian, De natura animalium; Nicander, Alexiphartnaca and Theriaca; the Scriptores ret rusticae; Aristotle, Historia animalium and Politica; Epicurus, Physica and Meteorologica; Theophrastus, Eclogae phy sitae; Oppian, Halieutica and Cynegetica; the complete works of Xenophon and Vitruvius; the Argonautica of the so-called Orpheus (for which Ruhnken nicknamed him " Orpheomastix "); an essay on the life and writings of Pindar and a collection of his fragments. His Eclogae physicae is a selection of extracts of various length from Greek and Latin writers on scientific subjects, containing the original text and commentary, with essays on natural history and science in ancient times.

See F. Passow, Opuscula academica (1835) ; C. Bursian, Geschichte der classischen Philologie in DeutscUand (1883).

SCHNEIDER, LOUIS (1805-1878), German actor and author, was born at Berlin on the 29th of April 1805, the son of George Abraham Schneider (1770-1839). At an early age he was engaged at the Royal Theatre, Berlin, where he soon rose to play leading comedy parts. His reputation as a comedian grew with his success in such r61es as Zierl in the Einfahrt vom Lande, Peter in the Kapellmeister von Venedig, Schikaneder in the Schauspieldirektor and Basileo in Figaro's Hochzeit, and he became the favourite of Berlin. In 1845 he was appointed head of the Royal opera in Berlin. But his bold patriotic couplets and impromptus during the revolutionary year 1848 necessitated his retirement, and thereafter he translated and adapted for the stage Mozart's Cosi fan tutti; published, under the pseudonym " L. W. Both," Das Buhnenrepertoire des Auslandes; and founded, as a result of his experiences as a soldier in the Danish war of 1849, the periodical Der Soldaten- freund. He also wrote Geschichte der Oper und des Opernhauses in Berlin (1845-1852). Soon after his retirement he was ap- pointed reader to King Frederick William IV. of Prussia, and subsequently he received the title of Geheimen Hofrat. He continued to enjoy the favour of the court, and, as correspondent of the Staatsanzeiger, was attached to the headquarters' staff of the Prussian army during the campaign of 1866; and, by special invitation, accompanied the emperor William during the war of 1870. Schneider also wrote a novel. Das bose Glilck, and several volumes of reminiscences: Kbnig Wilhelm (1869), Kaiser Wilhelm, 1867-1871 (1875). He died at Potsdam on the 16th of December 1878.

See his posthumous memoirs, Aus meinem Leben (Berlin, 1879-1880), and Aus dem Leben Kaiser Wilhelms (1888), which caused some sensation on their publication.

SCHNEIDEWIN, FRIEDRICH WILHELM (1810-1856), German classical scholar, was born at Helmstedt on the 6th of June 1 8 10. In 1833 he became a teacher at the Brunswick gymnasium, in 1837 extraordinary and in 1842 ordinary professor of classical languages and literature in the university of Gottingen, where he died on the nth of January 1856. Schneidewin's work on Sophocles and the Greek lyric poets is of permanent value. His most important publications are: Ibyci Rhegini reliquiae (1833), severely criticized by G. Hermann; Simonidis Cei reliquiae (1835); Delectus poesis Graecorum elegiacae, iambicae, melicae (1838-1839), in which the fragments of the lyric poets were for the first time published in a convenient form; Paroe- miographi graeci (1839, with E. von Leutsch); Sophocles' (184Q- 1854, revised after his death by A.

Nauck). He also edited the fragments of the speeches of Hypereides on behalf of Euxenippus and Lycophron (already published by Churchill Babington from a papyrus discovered in Egyptian Thebes in 1847) and a Latin poem on rhetorical figures by an unknown author (Incerti auctoris de figuris vel scliematibus versus heroici, 1841), found by Jules Quicherat in MS. in the Paris library. Schneidewin was also the founder of Philologus (1846), a journal devoted to classical learning, and dedicated to the memory of K. O. Miiller.

See A. Baumeister in Allgemeine deutsche Biographie; E. von Leutsch in Philologus, x. ; and M. 'Lechner, Zur Erinnerung an K. F. Hermann, F. W. Schneidewin (1864).

SCHNORR VON KAROLSFELD, JULIUS (1794-1872), German painter, was born in 1794 at Leipzig, where he received his earliest instruction from his father Johann Veit Schnorr (1 764-1841) , a draughtsman, engraver and painter. At seventeen he entered the Academy of Vienna, from which Overbeck and others who rebelled against the old conventional style had been expelled about a year before. In 18 18 he followed the founders of the new school of German pre-Raphaelites in the general pilgrimage to Rome. This school of religious and romantic art abjured modern styles and reverted to and revived the principles and practice of earlier periods. At the outset an effort was made to recover fresco painting and " monumental art," and Schnorr found opportunity of proving his powers, when commissioned to decorate with frescoes, illustrative of Ariosto, the entrance hall of the Villa Massimo, near the Lateran. His fellow-labourers were Cornelius, Overbeck and Veit. His second period dates from 1825, when he left Rome, settled in Munich, entered the service of King Ludwig, and transplanted to Germany the art of wall-painting learnt in Italy. He showed himself qualified as a son of poet-painter to the Bavarian court; he organized a staff of trained executants, and set about clothing five halls in the new palace with frescoes illustrative of the Nibelungenlied. Other apartments his prolific pencil decorated with scenes from the histories of Charlemagne, Frederick Barbarossa and Rudolph of Habsburg. These interminable compositions are creative, learned in composition, masterly in drawing, but exaggerated in thought and extravagant in style.*

Schnorr's third period is marked by his " Bible Pictures " or Scripture History in 180 designs. The artist was a Lutheran, and took a broad and unsectarian view which won for his Pictorial Bible ready currency throughout Christendom. Fre- quently the compositions are crowded and confused, wanting in harmony of line and symmetry in

the masses; thus they suffer under comparison with Raphael's Bible. The style is severed from the simplicity and severity of early times, and surrendered to the florid redundance of the later Renaissance. Yet through- out are displayed fertility of invention, academic knowledge with facile execution; and modern art has produced nothing better than " Joseph Interpreting Pharaoh's Dream," the " Meeting of Rebecca and Isaac " and the " Return of the Prodigal Son." Bib- lical drawings and cartoons for frescoes formed a natural prelude to designs for church windows. The painter's renown in Germany secured commissions in Great Britain. Schnorr made designs, carried out in the royal factory, Munich, for windows in Glasgow cathedral and in St Paul's cathedral, London. This Munich glass provoked controversy: medievalists objected to its want of lustre, and stigmatized the windows as coloured blinds and picture transparencies. But the opposing party claimed for these modern revivals " the union of the severe and excellent drawing of early Florentine oil-paintings with the colouring and arrangement of the glass-paintings of the latter half of the 16th century." Schnorr died at Munich in 1872. His brother Ludwig Ferdinand (1789-1853) was also a painter.

SCHOFIELD, JOHN MCALLISTER (1831-1906), American soldier, was born at Gerry, Chautauqua county, New York, on the 29th of September 1831. He graduated at West Point in 1853, served for two years in the artillery, was assistant pro- fessor of natural and experimental philosophy at West Point in 1855-1860, and while on leave (1860-1861) was professor of physics at Washington university, St Louis. When the Civil War broke out, he became a major in a Missouri volunteer regi- ment and served as chief of staff to Major-General Nathaniel Lyon until the death of that officer. (In 1892 he received a Congressional medal of honour for " conspicuous gallantry at the battle of Wilson's Creek.") In 1861-1863 he performed various military duties in Missouri. In April 1863 he took command of a division in the Army of the Cumberland, and in 1864, as com- mander of the Army of the Ohio, he took part in the Atlanta campaign under Major-General W. T. Sherman. In October 1864 Schofield was sent to Tennessee to join Major-General G. H. Thomas in opposing General J. B. Hood, and on the 30th of November he fought with General Hood the desperate and

indecisive battle of Franklin. Two weeks later he took part in

Thomas's crowning victory at Nashville. For his services at Franklin he was awarded the rank of brigajdier-general (November 1864) and the brevet rank of major-general (March 1865) in the regular army. Being ordered to co-operate with Sherman in North Carolina, Schofield moved his corps by rail and sea to Fort Fisher, North Carolina, in seventeen days, occupied Wilmington on the 22nd of February 1865, fought the action at Kinston on the 8-ioth of March, and on the 23rd joined Sherman at Golds- boro. After the war he was sent on a special diplomatic mission to France, on account of the presence of French troops in Mexico; and from June 1868 to March 1869 he served as secretary of war under President Andrew Johnson, after the retirement of E. M. Stanton (q.v.). From 1876 to 1881 he was superintendent of the Military Academy at West Point, and from 1888 until his retire- ment in 1895 he was commanding general of the United States army. He had become major-general in March 1869, and in February 1895 he was made lieutenant-general. He died at St Augustine, Florida, on the 4th of March 1906. General Schofield published Forty-six Years in the Army (New York,

1897).

SCHOLAR, SCHOLARSHIP. The term "scholar," primarily meaning a " learner," is secondarily applied to one who has thoroughly learnt all that " the school " can teach him, one who by early training and constant self culture has attained a certain maturity in precise and accurate knowledge. Hence the term " scholarship " in the sense of the knowledge or method of a scholar. Similarly " classical scholarship " may be defined as the sum of the mental attainments of a classical scholar. Scholar ship is sometimes identified with classical learning or erudition; it is more often contrasted with it. The contrast is thus drawn by Donaldson in his Classical Scholarship and Classical Learning (1856), and by Mark Pattison, in his Essay on Oxford Studies (1855). "I maintain," says Donaldson, "that not all learned men are accomplished scholars, though any accomplished scholar may, if he chooses to devote the time to the necessary studies, become a learned man " (p. 149). " It is not a know- ledge," writes Mark Pattison, " but a discipline, that is required; not science, but the scientific habit; not erudition, but scholar- ship " (Essays, i. 425).

The expression " a scholarship " is also used in England for a money payment made by a school, college or university, as a prize (either for one year or a series of years) to the successful competitors at an examination at which one or more such scholar- ships are to be awarded; and the successful candidate is called a " scholar," as the

holder of a " scholarship." In this sense the word is almost synonymous with " an exhibition," but the latter is usually considered inferior in merit and dignity, if not in amount.

On the general history of classical scholarship, see Classics: Greek and Latin.

SCHOLASTICISM, the name usually employed to denote the most typical products of medieval thought. After the centuries of intellectual darkness which followed upon the closing of the philosophical schools in Athens (529), and the death of Boetius, the last of the ancient philosophers, the first symptoms of renewed intellectual activity appear contempor- aneously with the consolidation of the empire of the West in the hands of Charlemagne. He endeavoured to attract to his court the best scholars of Britain and Ireland, and by imperial decree (787) commanded the establishment of schools in con- nexion with every abbey in his realms. Peter of Pisa and Alcuin of York were his advisers, and under their care the opposi- tion long supposed to exist between godliness and secular learning speedily disappeared. Besides the celebrated school of the Palace, where Alcuin had among his hearers the members of the imperial family and the dignitaries of the empire as well as talented youths of humbler origin, we hear of the episcopal schools of Lyons, Orleans and St Denis, the cloister schools of St Martin of Tours, of Fulda, Corbie, Fontenelle and many others, besides the older monasteries of St Gall and Reichenau. These schools became the centres of medieval learning and speculation,

and from them the name Scholasticism is derived (cf,, Sandys Hist, of Class. Schol., i. 471, 1906). They were designed to communicate instruction in the seven liberal arts which con- stituted the educational curriculum of the middle ages (see Trivium). The name doctor scholasticus was applied originally to any teacher in such an ecclesiastical gymnasium, but gradually the study of dialectic or logic overshadowed the more elementary disciplines, and the general acceptation of " doctor " came to be one who occupied himself with the teaching of logic. The philosophy of the later' Scholastics is more extended in its scope; but to the end of the medieval period philosophy centres in the discussion of the same logical problems which began to agitate the teachers of the 9th and 10th centuries.*

Scholasticism in the widest sense thus extends from the 9th to the end of the 14th or the beginning of the 15th century — from Erigena to Occam and his followers. The belated Scholastics who lingered beyond the last mentioned chrono- date served only as marks for the

obloquy heaped limits. upon the schools by the men of the new time. Erigena is really of the spiritual kindred of the Neoplatonists and Christian mystics rather than of the typical Scholastic doctors, and, in fact, the activity of Scholasticism is mainly confined within the limits of the nth and the 14th centuries. It is divisible into two well-marked periods — the first extend- ing to the end of the 12th century and embracing as its chief names Roscellinus, Anselm, William of Champeaux and Abelard, while the second extended from the beginning of the 13th century to the Renaissance and the general distraction of men's thoughts from the problems and methods of Scholasti- cism. In this second period the names of Albertus Magnus, Thomas Aquinas and Duns Scotus represent (in the 13th century and the first years of the 14th century) the culmination of Scholastic thought and its consolidation into system.

Prantl says that there is no such thing as philosophy in the middle ages; there are only logic and theology. The remark overlooks two facts — -firstly that the main objects of theology and philosophy are identical, though the theoiaw. method of treatment is different, and secondly that logical discussion commonly leads up to metaphysical problems, and that this was pre-eminently the case with the logic of the Schoolmen. But the saying draws attention to the two great in-fluences which shaped medieval thought — the tradition of ancient logic and the system of Christian theology. Scholasticism opens with a discussion of certain points in the Aristotelian logic; it speedily begins to apply its logical distinctions to the doctrines of the church; and when it attains its full stature in St Thomas it has, with the exception of certain mysteries, rationalized of Aristotelianized the whole churchly system. Or we might say with equal truth that the philosophy of St Thomas is Aristotle Christianized. The Schoolmen contemplate the universe of nature and man not with their own eyes but in the glass of Aristotelian formulae. Their chief works are in the shape of commentaries upon the writings of "the philosopher." 1 Their problems and solutions alike spring from the master's dicta — from the need of reconciling these with one another and with the conclusions of Christian theology.

*The fact that the channels of thought during the middle ages were determined in this way is usually expressed by saying that reason in the middle age is subject to authority, It has not the free play which characterizes its activity R e * soa in Greece and in the philosophy of modern times. Its authority. conclusions are predetermined, and the initiative of the individual thinker is almost confined, therefore, to formal details in the treatment of his thesis. To the church, reason is the handmaid of faith (ancilla fidei) . But this principle of the*

subordination of the reason wears a different aspect accord- ing to the century and writer referred to. In Scotus Erigena, at the beginning of the Scholastic era, there is no such subordina- tion contemplated, because philosophy and theology in his work are in implicit unity. " Conficitur inde veram esse philosophiam veram religionem, conversimque veram religionem esse veram

1 The common designation of Aristotle in the middle ages.

philosophiam " (De divina praedestinatione, Proem). Reason in its own strength and with its own instruments evolves a system of the universe which coincides, according to Erigena, with the teaching of Scripture. For Erigena, therefore, the speculative reason is the supreme arbiter; and in accordance with its results the utterances of Scripture and of the church have not infre- quently to be subjected to an allegorical or mystical interpreta- tion. But this is only to say again that Erigena is more of a Neop'atonist than a Scholastic. Hence Cousin suggested in respect of this point a threefold chronological division — at the outset the absolute subordination of philosophy to theology, then the period of their alliance, and finally the beginning of their separation. In other words, we note philosophy gradually extending its claims. Dialectic is, to begin with, a merely secular art, and only by degrees are its terms and distinctions applied to the subject-matter of theology. The early results of the application, in the hands of Berengarius and Roscellinus, did not seem favourable to Christian orthodoxy. Hence the strength with which a champion of the faith like Anselm insists on the subordination of reason. To Bernard of Clairvaux and many other churchmen the application of dialectic to the things of faith appears as dangerous as it is impious. Later, in the systems of the great Schoolmen, the rights of reason are fully established and acknowledged. The relation of reason and faith remains external, and certain doctrines — an increasing number as times goes on — are withdrawn from the sphere of reason. But with these exceptions the two march side by side; they establish by different means the same results. For the conflicts which accompanied the first intrusion of philosophy into the theological domain more profound and cautious thinkers with a far ampler apparatus of knowledge had substituted a harmony. " The constant effort of Scholasticism to be at once philosophy and theology" 1 seemed at last satisfactorily realized. But the further progress of Scholastic thought consisted in a

with- drawal of doctrine after doctrine from the possibility of rational proof and their relegation to the sphere of faith. Indeed, no sooner was the harmony apparently established by Aquinas than Duns Scotus began this negative criticism, which is carried much farther by William of Occam. But this is equivalent to a confession that Scholasticism had failed in its task, which was to rationalize the doctrines of the church. The Aristotelian form refused to fit a matter for which it was never intended; the matter of Christian theology refused to be forced into an alien form. The end of the period was thus brought about by the internal decay of its method and principles quite as much as by the variety of external causes which contributed to transfer men's interests to other subjects.

But, although the relation of reason to an external authority thus constitutes the badge of medieval thought, it would be Scfio/as- unjust to look upon Scholasticism as philosophically ticlsm not barren, and to speak as if reason, after an interregnum unpm- of a thousand years, resumed its rights at the Renais-

gresstve.

sance. Such language was excusable in the men of

the Renaissance, fighting the battle of classic form and beauty and of the manysidedness of life against the bar- barous terminology and the monastic ideals of the schools, or in the protagonists of modern science. The new is never just to the old. In the schools and universities of the middle age the intellect of the semi-barbarous European peoples had been trained for the work of the modern world. But we may go further and say that, in spite of their initial acceptance of authority, the Scholastics are not the antagonists of reason; on the contrary they fight its battles. The attempt to establish by argument the authority of faith is in reality the unconscious establishment of the authority of reason. Reason, if admitted at all, must ultimately claim the whole man. Anselm's motto, Credo ut intelligam, marks well the distance that has been traversed since Tertullian's Credo quia absurdum est. The claim of reason has been recognized to manipulate the data of faith, at first blindly and immediately received, and to weld them into a system such as will satisfy its own needs. Scholasticism that 1 Milman's Latin Christianity, ix. 101.

has outlived its day may be justly identified with obscurantism, but not so the systems of those who, by their intellectual force alone, once held all the minds of Europe in subjection. The scholastic

systems are not the free products of speculation; in the main they are summae theologiae, or they are modified versions of Aristotle. But each system is a fresh recognition of the rights of reason, and Scholasticism as a whole may be regarded as the history of the growth and gradual emancipa- tion of reason which was completed in the movements of the Renaissance and the Reformation.

In speaking of the origin of Scholasticism — name and thing — it has been already noted that medieval speculation takes its rise in certain logical problems. To be more precise, it is the nature of " universals " which forms the versais." central theme of Scholastic debate (see Nominalism, Realism). This is the case almost exclusively during the first period, and only to a less extent during the second, where it reappears in a somewhat different form as the difficulty concerning the principle of individuation. The controversy was between Nominalists and Realists; and, exclusively logical as the point may at first sight seem to be, adherence to one side or the other is an accurate indication of philosophic tendency. The two opposing theories express at bottom, in the phraseology of their own time, the radical divergence of pantheism and individualism — the two extremes between which philosophy seems pendulum- wise to oscillate, and which may be said still to await their perfect reconciliation. First, however, we must examine the form which this question assumed to the first medieval thinkers, and the source from which they derived it. A single sentence in Porphyry's Isagoge or " introduc- t

tion " to the Categories of Aristotle furnished the ˆffoora" text of the discussion. The treatise of Porphyry deals with the notions of genus, species, difference, property and accident (see Predicables) ; and he mentions, but declines to discuss, the various theories that have been held as to the ontological import of genera and species. In the Latin translation of Boetius, in which alone the Isagoge was then known, the sentence runs as follows: —

" Mox de generibus et speciebus illud quidem sive subsistant, sive in solis nudis intellectibus posita sint, sive subsistentia corporalia sint an incorporalia, et utrum separata a sensibilibus an in sensi- bilibus posita et circa haec consistentia, dicere recusabo ; altissimum enim negotium est hujusmodi et majoris egens inquisitionis."

This passage indicates three possible positions with regard to universals. It may be held that they exist merely as conceptions in our minds; this is Nominalism or Conceptualism (q.v.). It may be held that they have a substantial existence of their own, independent

of their existence in our thoughts. This is Realism, which may be of two varieties, according as the sub- stantially existent universals are supposed to exist apart from the sensible phenomena or only in and with the objects of sense as their essence. The first form of Realism corresponds to the Platonic theory of the transcendence of the ideas; the second reproduces the Aristotelian doctrine of the essence as inseparable from the individual thing. But, though he implies an ample previous treatment of the questions by philosophers, Porphyry gives no references to the different systems of which such dis- tinctions are the outcome, nor does he give any hint of his own opinion on the subject, definite enough though that was. He simply sets the discussion aside as too difficult for a preliminary discourse, and not strictly relevant to a purely logical inquiry. Porphyry, the Neoplatonist, the disciple of Plotinus, was an unknown personage to those early students of the Isagoge. The passage possessed for them a mysterious charm, largely due to its isolation and to their ignorance of the historic specula- tions which suggested it. And accordingly it gave rise to the three great doctrines which divided the medieval schools: Realism of the Platonic type, embodied in the formula universalia ante rem; Realism of the Aristotelian type, universalia in re; and Nominalism, including Conceptualism, expressed by the phrase universalia post rem, and also claiming to be based upon the Peripatetic doctrine.

*To form a proper estimate of the first stage of Scholastic discussion it is requisite above all things to have a clear idea of the appliances then at the disposal of the writers. What was the extent Extent ot of their knowledge of ancient philosophy? To begin with, ScA**/. we know that till the 13th century the middle age was , ” ignorant of Greek, and possessed no philosophical works in knowledge tne i r Greekoriginal(seeCLASsics). Intranslationstheyhad only the Categories and the De interpretatione of Aristotle in the versions of Boetius, the Timaeus of Plato in the version of Chalcidius, and Boetius’s translation of Porphyry’s Isagoge. Some general information as to the Platonic doctrines (chiefly in a Neo- platonic garb) was obtainable from the commentary with which Chalcidius (6th century) accompanied his translation, from the work of Apuleius (2nd century) De dogntate Platonis, and indirectly from the commentary of Macrobius (c. 400) on the Somnium Scipionis of Cicero, and from the writings of St Augustine. As aids to the study of logic, the doctors of this period, beside the commentaries and*

treatises of Boetius (q.v.), possessed two tracts attributed to St Augus- tine, the first of which, Principia dialecticae, is probably his, but is mainly grammatical in its import. The other tract, known as Categoriae decern, and taken at first for a translation of Aristotle's treatise, is really a rapid summary of it, and certainly does not belong to Augustine. To this list must be added: (1) the Satyricon of Martianus Capella (q.v.), the greater part of which is a treatise on the seven liberal arts, the fourth book dealing with logic ; (2) the De artibus ac disciplinis liberalium literarum of Cassiodorus (q.v.); (3) the Origines of Isidore of Seville (ob. 636), which is little more than a reproduction of (2). The above constitutes the whole material which the earlier middle age had at its disposal.

The grandly conceived system of Erigena (see Erigena and Mysticism) stands by itself in the 9th century like the _. product of another age. John the Scot was still

acquainted with Greek, seeing that he translated the work of the pseudo-Dionysius; and his speculative genius achieved the fusion of Christian doctrine and Neoplatonic thought in a system of quite remarkable metaphysical complete- ness. It is the only complete and independent system between the decline of ancient thought and the system of Aquinas in the 13th century, if indeed we ought not to go further, to modern times, to find a parallel. Erigena pronounces no express opinion upon the question which was even then beginning to occupy men's minds; but his Platonico-Christian theory of the Eternal Word»as containing in Himself the exemplars of created things is equivalent to the assertion of universalia ante rem. His whole system, indeed, is based upon the idea of the divine as the exclusively real, of which the world of individual existence is but the theophany; the special and the individual are immanent, therefore, in the general. And hence at a much later date (in the beginning of the 13th century) his name was invoked to cover the pantheistic heresies of Amalrich of Bena.

Erigena does not separate his Platonic theory of pre-existent exemplars from the Aristotelian doctrine of the universal as in the individuals. As Ueberweg points out, his theory is rather a result of the transference of the Aristotelian conception of substance to the Platonic Idea, and of an identification of the relation of accidents to the substance in which they inhere with that of the individuals to the Idea of which, in the Platonic doctrine, they are copies (Hist, of Philosophy, i. 363, Eng. trans.). Hence it may be said that the universals are in the individuals, constituting their essential reality (and it is an express part of Erigena's system that the created but

creative Word, the second division of Nature, should pass into the third stage of created and non-creating things) ; or rather, perhaps, we ought to say that the individuals exist in the bosom of their universal. At all events, while Erigena's Realism is pronounced, the Platonic and Aristotelian forms of the doctrine are not distinguished in his writings. Prantl has professed to find the head-stream of Nominalism also in Scotus Erigena; but beyond the fact that he discusses at considerable length the categories of thought and their mutual relations, occasionally using the term voces to express his meaning, Prantl appears to adduce no reasons for an assertion which directly contradicts Erigena's most fundamental doctrines. Moreover, Erigena again and again declares that dialectic has to do with the stadia of a real or divine classification: " In- telligitur quod ars,illa, quae dividit genera in species et species in genera resolvit, quae SiaXacruc^ dicitur, non ab humanis machinationi- bus sit facta, sed in natura rerum ab auctore omnium artium, quae verae artes sunt, condita et a sapientibus inventa " (De divisione naturae, iv. 4).

The immediate influence of Erigena's system cannot have been great, and his works seem soon to have dropped out of notice in the centuries that followed. The real germs of Realism and Nominalism are to be found in the 9th century, in scattered commentaries and glosses noon the statements of Porphyry and

Influence of

Boetius. Boetius in commenting upon Porphyry had already started the discussion as to the nature of universals. He is definitely anti-Platonic, and his language sometimes takes even a nominalistic tone, as when he declares that the species is nothing more than a thought or Boetius. conception gathered from the substantial similarity of a number of dissimilar individuals. The expression " sub- stantial similarity" is still, however, sufficiently vague to cover a multitude of views. He concludes that the genera and species exist as universals only in thought; but, inasmuch as they are collected from singulars on account of a real resemblance, they have a certain existence independently of the mind, but not an existence disjoined from the singulars of sense. " Sub- sistuntergo circa sensibilia, intelliguntur autem praeter corpora." Or, according to the phrase which recurs so often during the middle ages, " universale intelligitur, singulare sentitur." Boetius ends by declining to adjudicate between Plato and Aristotle, remarking in a semi-apologetic style that, if he has expounded Aristotle's opinion by preference, his course is justified by the fact that he is commenting upon an introduction to Aristotle. And, indeed, his discussion cannot claim to be more than semi-

popular in character. The point in dispute has not in his hands the all-absorbing importance it afterwards attained, and the keenness of later distinctions is as yet unknown. In this way, however, though the distinctions drawn may still be comparatively vague, there existed in the schools a Peripatetic tradition to set over against the Neoplatonic influence of John the Scot, and amongst the earliest remains of Scholastic thought we find this tradition asserting itself somewhat vigorously. There were Nominalists before Roscellinus among these early thinkers.

Alcuin (q.v.) does nothing more in his Dialectic than abridge Boetius and the other commentators. But in the school of Fulda, presided over by his pupil Hrabanus Maurus (776-856), there are to be found some fresh contribu- Maams. tions to the discussion. The collected works of Hrabanus himself contain nothing new, but in some glosses on Aristotle and Porphyry, first exhumed by Cousin, there are several noteworthy expressions of opinion in a Nominalistic sense. The author interprets Boetius's meaning to be " Quod eadem res individuum et species et genus est, et non esse univer- salia individuis quasi quoddam diversum." He also cites, apparently with approval, the view of those who held Porphyry's treatise to be not de quinque rebus, but de quinque vocibus. A genus, they said, is essentially something which is predicated of a subject; but a thing cannot be a predicate (res enim non praedicatur) . These glosses, it should be added, however, have been attributed by Prantl and Kaulich, on the ground of diver- gence from doctrines contained in the published works of Hrabanus, to some disciple of his rather than to Hrabanus himself. Fulda had become through the teaching of the latter an intellectual centre. Eric or Heiricus, who studied there under Haimon, the successor of Hrabanus, and after- wards taught at Auxerre, wrote glosses on the margin of his copy of the pseudo-Augustinian Categoriae, which have been published by Cousin and Haureau. He there says in words which recall the language of Locke (Essay, iii. 3) that because proper names are innumerable, and no intellect or memory would suffice for the knowing of them, they are all as it were comprehended in the species. Taken strictly his words state the position of extreme Nominalism; but even if we were not forbidden to do so by other passages, in which the doctrine of moderate Realism is adopted (under cover of the current distinction between the singular as felt and the pure universal as understood), it would still be unfair to press any passage in the writings of this period. As Cousin says, " Realism and Nominalism were undoubtedly there in germ, but their true principles with their necessary consequences remained profoundly unknown; their connexion with

all the great questions of religion and politics was not even suspected. The two systems were nothing more as yet than two different ways of interpreting a phrase of Porphyry, and they remained unnoticed in the

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obscurity of the schools. … It was the nth century which gave Nominalism to the world." 1

Remigius of Auxerre, pupil of Eric, became the most celebrated professor of dialectic in the Parisian schools of the icth century. As he reverted to Realism, his influence, first at " Rheims and then in Paris, was doubtless instrumental in bringing about the general acceptance of that doctrine till the advent of Roscellinus as a powerful disturbing influence. " There is one genus more general than the rest," says Remi (J. B. Haureau, Histoire de la philosophic scolastique, i. 146), " beyond which the intellect cannot rise, called by the Greeks oiia'ia, by the Latins essentia. The essence, indeed, comprehends all natures, and everything that exists is a portion of this essence, by participation in which everything that is hath its existence." And similarly with the intermediate genera. " Homo est multorum hominum substantialis unitas." Remigius is thus a Realist, not so much in the sense of Plato as in the spirit of Parmenides, and Haureau applies to this form of Realism Bayle's description of Realism in general as " le Spinosisme non developpe." The ioth century as a whole is especially marked out as a dark age, being partly filled with civil troubles and partly characterized by a reaction of faith against reason. In the monastery of St Gall there was considerable logical activity, but nothing of philosophical interest is recorded. The chief name of the century is that of Gerbert (died as Pope Silvester II. in 1003). His treatise De rationali et ratione uti is more interesting as a display of the logical acquirements of the age than as possessing any direct philo- sophical bearing. The school of Chartres, founded in 990 by Fulbert, one of Gerbert's pupils, was distinguished Chartres. ˆ or near ly two centuries not so much for its dialectics and philosophy as for its humanistic culture. The account which John of Salisbury gives of it in the first half of the 1 2th century, under the presidency of

Theodoric and Bernard, affords a very pleasant glimpse into the history of the middle ages. Since then, says their regretful pupil, " less time and less care have been bestowed on grammar, and persons who profess all arts, liberal and mechanical, are ignorant of the primary art, without which a man proceeds in vain to the rest. For albeit the other studies assist literature, yet this has the sole privilege of making one lettered." 2

Hitherto, if dialectical studies had been sometimes viewed askance by the stricter churchmen, it was not because logic Applies- nac ˆ dared to stretch forth its hands towards the tion of ark of God, but simply on the ground of the old opposi- logkto tion between the church and the world. But now theology, bolder spirits arose who did not shrink from applying the distinctions of their human wisdom to the mysteries »f theology. It was the excitement caused by their attempt, and the heterodox conclusions which were its first result, that lifted these Scholastic disputations into the central position which they henceforth occupied in the life of the middle ages. The next centuries show that peculiar combination of logic and theology which is the mark of Scholasticism, especially in the period before the 13th century.

*One of the first of these attacks was made by Berengarius of Tours (990-1088) upon the doctrine of transubstantiation; _ __ he denied the possibility of a change of substance garius. * n tne bread and wine without some corresponding change in the accidents. M de Remusat characterizes his view on the Eucharist as a specific application of Nominalism. More intimately connected with the progress of philosophical thought was the tritheistic view of the Trinity propounded by Roscellinus as one of the results of his Nominalistic theory Roscel- °ˆ knowing an d being. The sharpness and onesidedness llnua. w i tn which he formulated his position were the im-*

mediate occasion of the contemporaneous crystalliza- tion of Realism in the theories of Anselm and William of Champeaux. Henceforth discussion is carried on with a full

1 Victor Cousin, Outrages inedits d'Abelard, Introd. p. Ixxxv. 1 Metalogicus, i. 27, quoted in Poole's Illustrations of Medieval Thought.

consciousness of the differences involved and the issues at stake; and, thanks to the heretical conclusion disclosed by Roscellinus, Realism became established for several centuries as the orthodox

philosophical creed. Roscellinus (d. c. n 25) was looked upon by later times as the originator of the sententia vocum, that is to say, of Nominalism proper. From the scanty and ill-natured notices of his opponents (Anselm and Abelard), we gather that he refused to recognize the reality of anything but the individual; he treated " the universal substance," says Anselm, as no more than "■ flatum vocis," a verbal breathing or sound; and in a similar strain he denied any reality to the parts of which a whole, such as a house, is commonly said to be composed. The parts in the one case, the general name or common attributes in the other, are only, he seems to have argued, so many subjective points of view from which we choose to regard that which in its own essence is one and indivisible, existing in its own right apart from any connexion with other individuals. This pure individualism, consistently interpreted, involves the denial of all real relation whatsoever; for things are related and classified by means of their general characteristics. Accordingly, if these general characteristics do not possess reality, things are reduced to a number of characterless and mutually indifferent points. It is possible, as Haureau maintains, that Roscellinus meant no more than to refute the extreme Realism which asserts the substantial and, above all, the independent existence of the universals. Some of the expressions used by Anselm in controverting his position favour this idea. He upbraids Roscellinus, for example, because he was unable to conceive whiteness apart from its existence in something white. But this is precisely an instance of the hypostatization of abstrac- tions in exposing which the chief strength and value of Nominal- ism lie. Cousin is correct in pointing out, from the Realistic point of view, that it is one thing to deny the hypostatization of an accident like colour or wisdom, and another thing to deny the foundation in reality of those " true and legitimate universals " which we understand by the terms genera and species. It is not to be supposed that the full scope of his doctrine was present to the mind of Roscellinus; but Nominalism would hardly have made the sensation it did had its assertions been as innocent as Haureau would make them. Like most innovators, Roscellinus stated his position in bold language, which emphasized his opposition to accepted doctrines; and his : words, if not his intentions, involved the extreme Nominalism which, by making universality merely subjective, pulverizes existence into detached particulars. And, though we may acquit Roscellinus of consciously propounding a theory so subversive of all knowledge, his criticism of the doctrine of the Trinity is proof at least of the determination with which he was prepared to carry out his individualism. If we are not prepared to say that the three Persons are one thing — in which case the Father and

the Holy Ghost must have been incarnate along with the Son — then, did usage permit, he says, we ought to speak of three Gods.

This theological deduction from his doctrine drew upon Roscellinus the polemic of his most celebrated opponent, Anselm of Canterbury (1033-1109). Roscellinus appears at first to have imagined . that his tritheistic theory had the sanction of Lanfranc Anselm. and Anselm, and the latter was led in consequence to compose his treatise De fide Trinitatis. From this may be gathered his views on the nature of universals. " How shall he who has not arrived at understanding how several men are in species one man comprehend how in that most mysterious nature several persons, each of which is perfect God, are one God? " The manner in which humanity exists in the individual was soon to be the subject of keen discussion, and to bring to light diverging views within the Realistic camp; but St Anselm does not go into detail on this point, and seems to imply that it is not surrounded by special difficulties. In truth, his Realism was of a somewhat uncritical type. It was simply accepted by him in a broad way as the orthodox philosophic doctrine, and the doctrine which, as a sagacious churchman, he perceived to be most in harmony with Christian theology. Anselm's natural element was theology, and the high metaphysical questions which are as it were the obverse of theology. On the other hand, as the first to formulate the qnto-logical argument (in his Proslogion) for the existence of God, he joins hands with some of the profoundest names in modern philosophy. To Anselm specially belongs the motto Credo ut intelligam, or, as it is

otherwise expressed in the sub-title of his Proslogion, Fides quaerens tntellectum. He endeavoured to give a philosophical demonstration not only of the existence of God but also of the Trinity and the Incar-nation, which were placed by the later Scholastics among the " mysteries." The Christological theory of satisfaction expounded in the Cur Deus Homo falls beyond the scope of the present article. But the Platonically conceived proof of the being of God contained in the Monologion shows that Anselm's doctrine of the universals as substances in things (universalia in re) was closely connected in his mind with the thought of the universalia ante rem, the exemplars of perfect goodness and truth and justice, by participation in which all earthly things are judged to possess these qualities. In this way he rises like Plato to the absolute Goodness, Justice and Truth, and then

proceeds in Neoplatonic fashion to a deduction of the Trinity as involved in the idea of the divine Word (see further Anselm).

Besides its connexion with the speculations of Anselm, the doctrine of Roscellinus was also of decisive influence within the schools in crystallizing the opposite opinion. Will-am William of Champeaux (1070-1121), who is reputed %au". mi tne founder of a definitely formulated Realism, much as Roscellinus is regarded as the founder of Nominalism, was instructed by Roscellinus himself in dialectic. Unfortunately none of William's philosophical works have survived, and we depend upon the statements of his opponent Abelard, in the Hisloria calamitatum mearum, and in certain manuscripts discovered by Cousin. From these sources it appears that he professed successively two opinions on the nature of the universals, having been dislodged from his first position by the criticism of Abelard, his quondam pupil. There is no obscurity about William's first position. It is a Realism of the most uncompromising type, which by its reduction of individuals to accidents of one identical substance seems to tremble on the very verge of Spinozism. He taught, says Abelard, that the same thing or substance was present in its entirety and essence in each individual, and that individuals differed no whit in their essence but only in the variety of their accidents. Thus " Socratitas " is merely an accident of the substance " humanitas," or, as it is put by the author of the treatise De generibus et speciebus, 1 " Man is a species, a thing essentially one (res una essentialiter) , which receives certain forms which make it Socrates. This thing, remaining essentially the same, receives in the same way other forms which constitute Plato and the other individuals of the species man; and, with the exception of those forms which mould that matter into the individual Socrates, there is nothing in Socrates that is not the same at the same time under the forms of Plato. . . . According to these men, even though rationality did not exist in any individual, its existence in nature would still remain intact " (Cousin, Introduction, &c, p. cxx.). Criticism was speedily at work upon William of Champeaux's position. He had said expressly that the universal essence, by the addition of the individual forms, was individualized and present secundum totam suam quanlitatem in each individual. But if homo is wholly and essentially present in Socrates, then it is, as it were, absorbed in Socrates; where Socrates is not, it cannot be, consequently not in Plato and the other individua hominis. This was called the argument of the homo Socraticus; and it appears to have been with the view of obviating such time and space difficulties, emphasized in the criticism of Abelard, that William latterly modified his form of expression. But his second position is enveloped

in considerable obscurity. Abelard says, " Sic autem correxit sententiam, ut deinceps rem eamdem non essentialiter sed individualiter diceret." In other words, he merely sought to avoid the awkward consequences of his own doctrine by substituting " individualiter " for " essenti- aliter " in his definition. If we are to put a sense upon this new expression, William may probably have meant to recall any words of his which seemed, by locating the universal in the entirety of its essence in each individual to confer upon the individual an independence which did not belong to it — thus leading in the end to the demand for a separate universal for

1 This treatise, first published by Cousin in his Ouvrages inedits d' Abelard, was attriouted by him to Abelard, and he was followed in this opinion by Haureau ; but Prantl adduces reasons which seem satisfactory for believing it to be the work of an unknown writer of somewhat later date (see Prantl. Geschichte d. Logik, ii. 143).

each individual. In opposition to this Nominalistic view, which implied the reversal of his whole position, William may have meant to say that, instead of the universal being multiplied, it is rather the individuals which are reduced to unity in the universal. The species is essentially one, but it takes on in- dividual varieties or accidents. If, however, we are more ill- natured, we may regard the phrase, with Prantl, as simply a meaningless makeshift in extremities; and if so, Abelard's account of the subsequent decline of William's reputation would be explained. But there is in some of the manuscripts the various reading of " indifferenter " for " individualiter," and this is accepted as giving the true sense of the passage by Cousin and Remusat (Haureau and Prantl taking, on different grounds, the opposite view). According to this reading, William sought to rectify his position by asserting, not the numerical identity of the universal in each individual, but rather its sameness in the sense of indistinguishable similarity. Ueberweg cites a passage from his theological works which apparently bears out this view, for William there expressly distinguishes the two senses of the word " same." Peter and Paul, he says, are the same in so far as they' are both men, although the humanity of each is, strictly speaking, not identical but similar. In the Persons of the Trinity, on the other hand the relation is one of absolute identity.

Whether this view is to be traced to William or not, it is certain that the theory of " indifference " or " non-difference " (indifferentia) was a favourite solution in the Realistic schools soon after his time. The inherent difficulties of Realism led to a f e ,° y variety of attempts to reach a more satisfactory formula. juufJL™- John of*

Salisbury, in his account of the controversies of these days (Metalogicus, ii. 17) reckons up nine different views which were held on the question of the universals, and the list is extended by Prantl (ii. 1.18) to thirteen. In this list are included of course all shades of opinion, from extreme Nominalism to extreme Realism. The doctrine of indifference as it appears in later' writers certainly tends, as Prantl points out, towards Nominalism, inasmuch as it gives up the substantiality of the universals. The universal consists of the non-different elements or attributes in the separate individuals, which alone exist substantially. If we restrict attention to these non-different elements, the individual becomes for us the species, the genus, &c. ; everything depends on the point of view from which we regard it. " Nihil omnino est praeter individuum, sed et illud aliter et aliter attentum species et genus et generalissimum est." Adelard of Bath (whose treatise De eodem et diverso must have been written between 1105 and 1 117) was probably the author or at all events the elaborator of this doctrine, and he sought by its means to effect a reconciliation between Plato and Aristotle : — •' ' Since that which we see is at once genus and species and individual, Aristotle rightly insisted that the universals do not exist except in the things of sense. But, since those universals, so far as they are called genera and species, cannot be perceived by any one in their purity withbut the admixture of imagination, Plato maintained that they existed and could be beheld beyond the things of sense, to wit, in the divine mind. Thus these men, although in words they seem opposed, yet held in reality the same opinion." Prantl distinguishes from the system of indifference the •' status " doctrine attributed by John of Salisbury to Walter of Mortagne (d. 1 174), according to which the universal is essentially united to the individual, which may be looked upon, e.g. as Plato, man, animal, &c, according to the " status " or point of view which we assume. But this seems only a different expression for the same position, and the same may doubtless be said of the theory which employed the outlandish word " maneries " (Fr. maniere) to signify that genera and species represented the different ways in which individuals might be regarded. The con- cessions to Nominalism which such views embody make them repre- sentative of what Haureau calls " the Peripatetic section of the Realistic school."

Somewhat apart from current controversies stood the teaching of the school of Chartres, humanistically nourished on the study of the ancients, and important as a revival of Platonism in .

opposition to the formalism of the Aristotelians. Bernard 5?ˆ? of Chartres, at the beginning of the 12th century, en- litres. deavoured, according to John of Salisbury, to reconcile Plato and Aristotle ; but

his doctrine is almost wholly derived from the former through St Augustine and the commentary of Chalcidius. The universalia in re have little place in his thoughts, which are directed by preference to the eternal exemplars as they exist in the super- sensible world of the divine thought. His Megacosmus and Micro- cosmus are little more, than a poetic gloss upon the Timaeus. William of Conches, a pupil of Bernard's, devoting himself to psycho- logical and physiological questions, was of less importance for the specific logico-metaphysical problem. But Gilbert de la Porree, according to Haureau, is the most eminent logician of the Realistic

school in the 12th century and the most profound metaphysician of either school. The views which he expressed in his commentary on the pseudo-Boetian treatise, De Trinitate, are certainly much more important than the mediatizing systems already referred to. The most interesting part of the work is the distinction which Gilbert draws between the manner of existence of genera and species and of substances proper. He distinguishes between the quod est and the quo est. Genera and species certainly exist, but they do not exist in their own right as substances. What exists as a substance and the basis of qualities or forms (quod est) may be said subslare; the forms on the other hand by which such an individual substance exists qualitatively (quo est) subsistunt, though it cannot be said that they substant. The intellect collects the universal, which exists but not as a substance (est sed non substat), from the particular things which not merely are (sunt) but also, as subjects of accidents, have sub- stantial existence (substant), by considering only their substantial similarity or conformity. The universals are thus forms inherent in things — " native forms," according to the expression by which Gilbert's doctrine is concisely known. The individual consists of an assemblage of such forms; and it is individual because nowhere else is exactly such an assemblage to be met with. The form exists concretely in the individual things (sensibilis in re sensibili), for in sensible things form and matter are always united. But they may be conceived abstractly or non-sensuously by the mind (sed mente concipitur insensibilis) , and they then refer themselves as copies to the Ideas their divine exemplars. In God, who is pure form without matter, the archetypes of material things exist as eternal immaterial forms. In this way Gilbert was at once Aristotelian and Platonist. The distinctions made by him above amount to a formal criticism of categories, and in the same spirit he teaches that no one of the

categories can be applied in its literal sense to God (see further Gilbert de la Porree).

But the outstanding figure in the controversies of the first half of the 12th century is Abelard. There is considerable difference of opinion as to his system, some, like Ritter and Erdmann, regarding it as a moderate form of Realism — a return indeed to the position of Aristotle — while others, like Cousin, Remusat, Haureau and Ueberweg, consider it to be essentially Nominalistic, only more prudently and perhaps less consistently expressed than was the case with Roscellinus. His position is ordinarily designated by the name Conceptualism (q-v.), though there is very little talk of concepts in Abelard's own writings. There can be no doubt, at all events, that Abelard himself intended to find a compromise. As against Realism he maintains consistently Res de re non praedicatur; genera and species, therefore, which are predicated of the individual subject, cannot be treated as things or substances. This is manifestly true, however real the facts may be which are designated by the generic and specific names; and the position is fully accepted, as has been seen, by a Realist like Gilbert, who perhaps adopted it first from Abelard. Abelard also perceived that Realism, by separating the universal substance from the forms which in- dividualize it, makes the universal indifferent to these forms, and leads directly to the doctrine of the identity of all beings in one universal substance or matter — a pantheism which might take either an Averroistic or a Spinozistic form. Against the system of non-difference Abelard has a number of logical and traditional arguments to bring, but it is sufficiently condemned by his fundamental doctrine that only the individual exists in its own right. For that system still seems to recognize a generic substance as the core of the individual, whereas, according to Cousin's rendering of Abelard's doctrine, " only individuals exist, and in the individual nothing but the individual." Holding fast then on the one hand to the individual as the only true substance, and on the other to the traditional definition of the genus as that which is predicated of a number of individuals (quod praedicatur de pluribus), Abelard declared that this definition of itself condemns the Realistic theory; only a name, not a thing, can be so predicated — not the name, however, as a flatus vocis or a collection of letters, but the name as used in discourse, the name as a sign, as having a meaning — in a word, not vox but sermo. Sermo est praedicabilis.

By these distinctions Abelard hoped to escape the consequences of extreme Nominalism, from which, as a matter of history, his doctrine has been distinguished under the name of Conceptualism, seeing that

it lays stress not on the word as such but on the thought which the word is intended to convey. Moreover, Abelard evidently did not mean to imply that the distinctions of genera

and species are of arbitrary or merely human imposition. His favourite expression for the universal is " quod de pluribus natum est praedicari " (a translation of Aristotle, De inter- pretatione, 7), which would seem to point to a real or objective counterpart of the products of our thought; and the traditional definitions of Boetius, whom he frequently quotes, support the same view of the concept as gathered from a number of individuals in virtue of a real resemblance. What Abelard combats is the substantiation of these resembling qualities, which leads to their being regarded as identical in all the separate individuals, and thus paves the way for the gradual undermining of the individual, the only true and indivisible substance. But he modifies his Nominalism so as to approach, though somewhat vaguely, to the position of Aristotle himself. At the same time he has nothing to say against the Platonic theory of universalia ante rem (see Idealism). Abelard's discussion of the problem (which it is right to say is on the whole incidental rather than systematic) is thus marked by an eclecticism which was perhaps the source at once of its strength and its weakness. But his brilliant ability and restless activity made him the central figure in the dialectical as in the other discussions of his time. To him was indirectly due, in the main, that troubling of the Realistic waters which resulted in so many modifications of the original thesis; and his own somewhat eclectic ruling on the question in debate came to be tacitly accepted in the schools, as the ardour of the disputants began to abate after the middle of the century.

Abelard's application of dialectic to theology betrayed the Nominalistic basis of his doctrine. He zealously combated the Tritheism of Roscellinus, but his own views on the Trinity were condemned by two councils (at Soissons aalrvauXi in 11 21 and at Sens in 1140). Of the alternatives — three Gods or una res — which his Nominalistic logic presented to Roscellinus, Roscellinus had chosen the first; Abelard recoiled to the other extreme, reducing the three Persons to three aspects or attributes of the Divine Being (Power, Wisdom and Love). For this he" was called to account by Bernard of Clairvaux (1091-1153), the recognized guardian of orthodoxy in France. Nor can it be said that the instinct of the saint was altogether at fault. The germs of Rationalism were unquestion- ably present in several of. Abelard's opinions, and still more so, the traditionalists must have thought, in his general attitude towards theological questions. " A doctrine is believed," he said, " not

because God has said it, but because we are convinced by reason that it is so." "Doubt is the road to inquiry, and by inquiry we perceive the truth." The application of dialectic, tp theology was not new. Anselm had made an elaborate employ- ment of reason in the interest of faith, but the spirit of pious subordination which had marked the demonstrations of Anselm seemed wanting in the argumentations of this bolder and more restless spirit; and the church, or at least an influential section of it, took alarm at the encroachments of Rationalism. Abelard's remarkable compilation Sic et Non was not calculated to allay their suspicions. In bringing together the conflicting opinions of the fathers on all the chief points of Christian dogmatics, it may be admitted that Abelard's aim was simply to make these contradictions the starting point of an inquiry which should determine in each case the true position and via media of Christian theology. Only such a determination could enable the doctrines to be summarily presented as a system of thought. The book was undoubtedly the precursor of the famous Books of Sentences of Abelard's own pupil Peter Lombard and others, and of all the Summae theologiae with which the church was presently to abound. But the antinomies, as they appeared in Abelard's treatise, without their solutions, could not but seem to insinuate a deep-laid scepticism with regard to authority. And even the proposal to apply the unaided reason to solve questions which had divided the fathers must have been resented by the more rigid churchmen as the rash intrusion of an over-confident Rationalism.

Realism was in the beginning of the 1 2th century the dominant doctrine and the doctrine of the church; the Nominalists were the innovators and the especial representatives of the Rationalistic

and the Summists,

tendency. In order to see the difference in this respect between the schools we have only to compare the peaceful and fortunate life of William of Champeaux (who enjoyed the friendship of St Bernard) with the agitated and persecuted existence of Roscellinus and, in a somewhat less degree, of Abelard. But now the greater boldness of the dialecticians awakened a. spirit of general distrust in the exercise of reason on sacred subjects, and we find even a Realist like Gilbert de la Porree arraigned by Bernard and his friends before a general council on a charge of heresy (at Rheims, 1148). Though Gilbert was

acquitted, the fact of his being brought to trial illustrates the growing spirit of suspicion. Those heresy-hunts show us the worst side of St Bernard, yet they are in a way just the obverse of his deep mystical piety. The same attitude is maintained by the mystical Hugo of school of St Victor. Hugo of St Victor (1007-1141) St victor declares that " the uncorrupted truth of things cannot be discovered by reasoning." The perils of dialectic are manifold, especially in the overbold spirit it engenders. Nevertheless Hugo, by the composition of his Summa sententi- arum, endeavoured to give a methodical or rational presentation of the content of faith, and was thus the first of the so-called Summists. Richard of St Victor, prior of the monastery from 1 162 to 1 173, is still more absorbed in mysticism, and his successor Walter loses his temper altogether in abuse of the dialecticians and the Summists alike. The Summists have as much to say against the existence of God as for it, and the dialecticians, having gone to school to the pagans, have forgotten over Aristotle the way of salvation. Abelard, Peter Lombard, Gilbert de la Porree and Peter of Poitiers he calls the " four labyrinths of France."

This anger and contempt may have been partly justified by the discreditable state into which the study of logic had fallen. The speculative impulse was exhausted which marks logic the end of the nth and the first half of the 1 2th century

— a period more original and more interesting in many ways than the great age of Scholasticism in the 13th century. By the middle of the century, logical studies had lost to a great extent their real interest and application, and had degenerated into trivial displays of ingenuity. On the other hand, the Summists 1 occupied themselves merely in the systematizing of authorities. The mystics held aloof from both, and devoted themselves to the practical work of preaching and edification. The intellect of the age thus no longer exhibited itself as a unity. And it is significant of this that the ablest and most cultured representative of the second half of the century was rather an historian of opinion than himself a philosopher or a Salisbury, theologian. John of Salisbury (Johannes Sarisberiensis) was educated in France in the years 1136-1148. The autobiographical account of these years contained in his Meta- logicus is of the utmost value as a picture of the schools of the time; it is also one of the historian's chief sources as a record of the many-coloured logical views of the period. John recoiled from the idle casuistry which occupied his own logical contemporaries; and, mindful probably of their aimless ingenuity, he adds the caution that dialectic, valuable and necessary as it is, is " like the sword of Hercules in a pigmy's hand " unless there be added to it the accoutrement of the other

sciences. Catholic in spirit rather than dogmatic, John ranks himself at times among the Academics, " since, in those things about which a wise man may doubt, I depart not from their footsteps." It is not fitting to subtilize overmuch, and in the end John of Salisbury's solution is the practical one, his charitable spirit pointing him in particular to that love which is the fulfilling of the law.

'Among these may be mentioned Robert Pulleyn (d. 1 1 50), Peter Lombard (d. 1164), called the Magister sententiarum, whose work became the text-book of the schools, and remained so for centuries. Hundreds of commentaries were written upon it. Peter of Poitiers, the pupil of Peter the Lombard, flourished about 1160- II 70. Other names are Robert of Melun, Hugo of Amiens, Stephen Langton and William of Auxerre. More important is Alain de Lille (Alanus de Insulis), who died at an advanced age in 1203. His De arte seu de articulis catholicae fidei is a Summa of Christian theology, but with a greater infusion than usual of philosophical reasoning. Alanus was acquainted with the celebrated Liber de causis.

*The first period of Scholasticism being thus at an end, there is an interval of nearly half a century without any noteworthy philosophical productions. The cause of the new development of p x f e „ s i on Scholasticism in the 13th century was the acquisition for /4 nojr . the first time of the complete works of Aristotle (see j ea * xe „/ Classics and Arabian Philosophy). The doctrines and the works the works of Aristotle had been transmitted by the ofArls- Nestorians to the Arabs, and among those kept alive by a totle. succession of philosophers, first in the East and afterwards in the West. The chief of these, at least so far as regards the influence which they exerted on medieval philosophy, were Avicenna, Avem- pace and Averroes. The unification by the last-mentioned of Aristotle's active intellect in all men, and his consequent denial of individual immortality are well known. The universal human in- tellect is made by him to proceed from the divine by a series of Neo- platonic emanations. In the course of the 12th century the writings of these men were introduced into France by the Jews of Andalusia, of Marseilles and Montpellier. " These writings contained," says Haureau, " the text of the Organon, the Physics, the Metaphysics, the Ethics, the De anima, the Parva naturalia and a large number of other treatises of Aristotle, accompanied by continuous commentaries. There arrived besides by the same channel the glosses of Theophrastus, of Simplicius, of Alexander of Aphrodisias, of Philoponus, annotated in the same sense by the same hands. This was the rich but danger- ous present made by the Mussulman school to the Christian " (i. 382). To these must be added the Neoplatonically inspired Fons Vitae of the Jewish*

philosopher and poet Ibn Gabirol (q.v.), or Avicebron.

By special command of Raimund, archbishop of Tolede, the chief of these works were translated from the Arabic through the Castilian into Latin by the archdeacon Dominicus Gonzalvi with the aid of Johannes Avendeath (=ben David), a converted Jew, about 1150. About the same time, or not long after, the Liber de causis became known — a work destined to have a powerful influence on Scholastic thought, especially in the period immediately succeeding. Ac- cepted at first as Aristotle's, and actually printed in the first Latin editions of his works, the book is in reality an Arabian compilation of Neoplatonic theses. Of a similar character was the pseudo-Aris- totelian Theologia which was in circulation at least as early as 1200.

The first effects of this immense acquisition of new material were markedly unsettling on the doctrinal orthodoxy of the time. The apocryphal Neoplatonic treatises and the Ffrs< views of the Arabian commentators obscured for the effects 0/ first students the genuine doctrine of Aristotle, and the <« "ew 13th century opens with quite a crop of mystical knowledge. heresies. The mystical pantheism taught at Paris by Amalrich of Bena (d. 1207; see Amalric and Mysticism), though based by him upon a revival of Scotus Erigena, was doubtless connected in its origin with the Neoplatonic treatises which now become current. The immanence of God in all things and His incarnation as the Holy Spirit in themselves appear to have been the chief doctrines of the Amalricans. They are reported to have said, " Omnia unum, quia quicquid est est Deus." About the same time David of Dinant, in a book De tomis (rendered by Albertus De divisionibus) , taught the identity of God with matter (or the indivisible principle of bodies) and nous (or the indivisible principle of intelligences) — an extreme Realism culminating in a materialistic pantheism. If they were diverse, he argued, there must exist above them some higher or common element or being, in which case this would be God, nous, or the original matter. The spread of the Amalrican doctrine led to fierce persecutions, and the provincial council which met at Paris in 1209 expressly decreed " that neither the books of Aristotle on natural philo- sophy, nor commentaries on the same, should be read, whether publicly or privately, at Paris." In 1215 this prohibition is renewed in the statutes of the university of Paris, as sanctioned by the papal legate. Permission was given to lecture on the logical books, both those which had been known all along and those introduced since n 28, but the veto upon the Physics is extended to the Metaphysics and the summaries of the Arabian com- mentators. By 1 23 1, however, the fears of the church were beginning to be allayed. A bull of Gregory IX. in that year makes no*

mention of any Aristotelian works except the Physics. Finally, in 1254, we find the university officially prescribing how many hours are to be devoted to the explanation of the Meta- physics and the principal physical treatises of Aristotle. These dates enable us to measure accurately the stages by which the church accommodated itself to, and as it were took possession of, the Aristotelian philosophy. Growing knowledge of Aristotle's works and the multiplication of translations enabled students to

distinguish the genuitK Aristotle from the questionable accom- paniments with which he had made his first appearance in Western Europe. Fresh translations of Aristotle and Averroes had already been made from the Arabic (Htpira f <£aiaropieu from the Hebrew) by Michael Scot, and Hermannus Alamannus, at the instance of the emperor Frederick II.; so that the whole body of Aristotle's works was at hand in Latin translations from about 1 210 to 1225. Soon afterwards efforts began to be made to secure more literal translations direct from the Greek. Robert Grosseteste (d. 1253) was one of the first to stir in this matter, and he was followed by Albertus Magnus and Thomas Aquinas. Half a century thus sufficed to remove the ban of the church, and soon Aristotle was recognized on all hands as " the philosopher" par excellence, the master of those that know. It even became customary to draw a parallel between him as the praecursor Christi in naturalibus and John the Baptist, the praecursor Christi in gratuitis.*

This unquestioned supremacy was not yielded, however, at the very beginning of the period. The earlier doctors who avail themselves of Aristotle's works, while bowing to his authority implicitly in matters of logic, are generally found defending a Christianized Platonism against the doctrine of the Metaphysics. So it is with Alexander of Hales (d. 1245), the first Scholastic who was acquainted with the whole of the Aristotelian works and the Alexander Arabian commentaries upon them. He was more of a of Hales theologian than a philosopher; and in his chief work, Summa universae theologiae, he simply employs his in- creased philosophical knowledge in the demonstration of theological doctrines. So great, however, did his achievement seem that he was honoured with the titles of Doctor irrefragabilis and Theologorum monarcha. Alexander of Hales belonged to the Franciscan order, and it is worth remarking that it was the mendicant orders Mendicant w h' c h now came forward as

the protagonists of Christian .. learning and faith and, as it were, reconquered Aristotle

for the church. During the first half of the 13th century, when the university of Paris was plunged in angry feuds with the municipality, feuds which even led at one time (1229) to the flight of the students in a body, the friars established teachers in their con- vents in Paris. After the university had settled its quarrels these continued to teach, and soon became formidable rivals of the secular lecturers. After a severe struggle for academical recognition they were finally admitted to all the privileges of the university by a bull of Alexander IV. in 1253. The Franciscans took the lead in this intellectual movement with Alexander of Hales and Bonaventura, but the Dominicans were soon able to boast of two greater names in Albert the Great and Thomas Aquinas. Still later Duns Scotus and Occam were both Franciscans. Alexander of Hales was succeeded John of m ^' s c hair of instruction by his pupil John of Rochelle, Rochelle. wno d '. ed in I2 7 l but taught only till 1253. His treatise ' De anima, on which Haureau lays particular stress, is interesting as showing the greater scope now given to psychological discussions. This was a natural result of acquaintance with Aristotle's De anima and the numerous Greek and Arabian com- mentaries upon it, and it is observable in most of the writers that have still to be mentioned. Even the nature of the universals is no longer discussed from a purely logical or metaphysical point of view, but becomes connected with psychological questions. And, on the whole, the widening of intellectual interests is the chief feature by which the second period of Scholasticism may be distinguished from the first. In some respects there is more freshness and interest in . the speculations which burst forth so ardently in the end of character- th e I "h and the first half of the 12th century. Albert and Istlcsof Aquinas no doubt stood on a higher level than Anselm second anc ' Abelard, not merely by their wider range of knowledge period. kut also by the intellectual massiveness of their achieve- ments; but it may be questioned whether the earlier writers did not possess a greater force of originality and a keener talent. Originality was at no time the strong point of the middle ages, but in the later period it was almost of necessity buried under the mass of material suddenly thrust upon the age, to be assimilated. On the other hand, the influence of this new material is everywhere evident in the wider range of questions which are discussed by the doctors of the period. Interest is no longer to the same extent con- centrated on the one question of the universals. Other questions, says Haureau, are " placed on the order of the day — the question of the elements of substance, that of the principle of

individuation, that of the origin of the ideas, of the manner of their existence in the human understanding and in the divine thought, as well as various others of equal interest ” (i. 420). Some of these, it may be said, are simply the old Scholastic problem in a different garb; but the ex- tended horizon of which Haureau speaks is amply proved by mere reference to the treatises of Albert and St Thomas. They there seek to reproduce for their own time all the departments of the Aristotelian system.

XXIV. 12

Grosse- teste.

John of Rochelle was succeeded in 1253 by John Fidanza, better known as Bonaventura (q.v.), who also had been a pupil of Alexander of Hales. But the fame of ” the Seraphic Doctor “is „ connected more closely with the history of mysticism (see V entura Mysticism) than with the main stream of Scholastic thought. Like his master, he defended Plato — or what he considered to be the Platonic theory — against the attacks of Aristotle. Thus he defended the universalia ante rem as exemplars existent in the divine intelligence, and censured Aristotle’s doctrine of the eternity of the world. Among the earlier teachers and writers of this century we have also to name William of Auvergne (d. 1249), ■u,im a „/ whose treatises De universo and De anima make extensive A„ ve ~ ae use of Aristotle and the Arabians, but display a similar ˆ

Platonic leaning. The existence of intellections in our minds is, he maintains, a sufficient demonstration of the existence of an intelligible world, just as the ideas of sense are sufficient evidence of a sensible world. This archetypal world is the Son of God and true God. Robert Grosseteste, important in the sphere of ecclesi- astical politics, has been already mentioned as active in procuring translations of Aristotle from the Greek. He also wrote commentaries on logical and physical works of Aristotle. Michael Scot, the renowned wizard of popular tradition, Michael earned his reputation by numerous works on astrology s . and alchemy. His connexion with philosophy was chiefly in the capacity of a translator. Vincent of Beauvais (d. 1264) was the author of an encyclopaedic work called yi ncen t f Speculum majus, in which, without much independent Beauvais. ability, he collected the opinions of ancient and medieval writers on the most diverse points, transcribing the fragments of their works which he deemed most interesting.

Albertus Magnus introduces us at once to the great age of

Scholasticism (n 93-1 280). The limits of his long life include that of his still greater pupil, Thomas Aquinas (1227- 1274). For this reason and because the system of A qu i nas . Thomas is simply that of Albert rounded to a greater completeness and elaborated in parts by the subtle intellect of the younger man, it will be convenient not to separate the views of master and scholar, except where their differences make it necessary. Albert was " the first Scholastic who repro- duced the whole philosophy of Aristotle in systematic order with constant reference to the Arabic commentators, and who re-modelled it to meet the requirements of ecclesiastical dogma " (Ueberweg, i. 436). On this account he was called " the Universal Doctor." But in Albert it may be said that the matter was still too new and too multifarious to be thoroughly mastered. In St Thomas this is no longer so. The pupil, entering into his master's labours, was able from the first to take a more com- prehensive survey of the whole field; and in addition he was doubtless endowed with an intellect which was finer, though it might not be more powerful, than his master's.

The monotheistic influence of Aristotle and his Arabian commentators shows itself in Albert and Aquinas, at the outset, in the definitive fashion in which the " mysteries " „ „ of the Trinity and the Incarnation are henceforth teries" detached from the sphere of rational or philosophical excluded theology. So long as the Neoplatonic influence remained trom P aa ' strong, attempts were still made to demonstrate the doctrine of the Trinity, chiefly in a mystical sense as in Erigena, but also by orthodox churchmen like Anselm. Orthodoxy, whether Catholic or Protestant, has since generally adopted Thomas's distinction. The existence of God is maintained by Albert and Aquinas to be demonstrable by reason ; but here again they reject the ontological argument of Anselm, and restrict themselves to the a posteriori proof, rising after the manner of Aristotle from that which is prior for us to that which is prior by nature or in itself. God is not fully comprehensible by us, says Albert, because the finite is not able to grasp the infinite, yet he is not altogether beyond our knowledge; our intellects are touched by a ray of his light, and through this contact we are brought into communion with him. God, as the only self- subsist ent and necessary being, is the creator of all things. Here the Scholastic philosophy comes into conflict with Aristotle's doctrine of the eternity of the world. Albert and Aquinas alike maintain the beginning of the world in time; time itself only exists since the moment of this miraculous creation. But Aquinas, though he holds the fact of creation to be rationally demonstrable, regards the beginning of the world in time as only

an article of faith, the philosophical arguments for and against being inconclusive.

The question of universals, though fully discussed, no longer forms the centre of speculation. The great age of Scholasticism presents, indeed, a substantial unanimity upon this vexed point, maintaining at once, in different senses, the existence of the universals ante rem, in re and post rem. Albert and Aquinas both profess the moderate Aristotelian Realism which treats genera and species only as substantias secundae, yet as really inherent in the individuals, and constituting their form or essence. The universals, therefore, have no existence, as universals, in rerum natura; and Thomas endorses, in this sense, the polemic of Aristotle against Plato's hypostatized abstractions. But, in the Augustinian sense of ideas immanent in the divine mind, the universal ante rem may well be admitted as possessing real existence. Finally, by abstraction from the individual things of sense, the mind is able to contemplate the universal apart from its accompaniments (animal sine homine, asino, et aliis ' specie- bus) ; these subjective existences are the universalia post rem of the Nominalists and Conceptualists. But the difficulties which embarrassed a former age in trying to conceive the mode in which the universal exists in the individual reappear in the systems of the present period as the problem of the principium indi- ' e viduationis. The universal, as the form or essence of the*

11 m individual, is called its quidditas (its " what-ness " or " " nature); but, besides possessing a general nature and v ua on. answer ; n g (- a general definition (i.e. being a " what "), every man, for example, is this particular man, here and now. It is the question of the particularity or " this-ness " (haecceitas, as Duns Scotus afterwards named it) that embarrasses the Scholastics. Albert and Aquinas agree in declaring that the principle of indi- viduation is to be found in matter, not, however, in matter as a formless substrate but in determinate matter (materia signata), which is explained to mean matter quantitatively determined in certain respects. " The variety of individuals," says Albert, " de- pends entirely upon the division of matter," and Aquinas says " the principle of the diversity of individuals of the same species is the quantitative division of matter," which his followers render by the abbreviated phrase

materia quanta. A tolerably evident shortcoming of such a doctrine is that, while declaring the quantitative deter- mination of matter to be the individual element in the individual, it

ives no account of how such quantitative determination arises.

“et the problem of the individual is really contained in this prior question; for determinate matter already involves particularity or this-ness. This difficulty was presently raised by Duns Scotus and the realistically-inclined opponents of the Thomist doctrine. But, as Ueberweg points out, it might fairly be urged by Aquinas that he dees not pretend to explain how the individual is actually created, but merely states what he finds to be an invariable condition of the existence of individuals. Apart from this general question, a diffi- culty arises on the Thomist theory in regard to the existence of spirits or disembodied personalities. This affects first of all the existence of angels, in regard to whom Aquinas admits that they are immaterial or separate forms (formae separatae). They possess the principle of individuation in themselves, he teaches, but plurality of individuals is in such a case equivalent to plurality of species (in eis tot sunt species quot sunt individua). The same difficulty, however, affects the existence of the disembodied human spirit. If individu- ality depends in matter, must we not conclude with Averroes that individuality is extinguished at death, and that only the universal form survives ? This conclusion, it is needless to say, is strenuously opposed both by Albert and by Aquinas. It is still admissible, however, to doubt whether the hateful consequence does not follow consistently from the theory laid down. Aquinas regards the souls of men, like the angels, as immaterial forms; and he includes in the soul-unit, so to speak, not merely the anima rationales of Aristotle, but also the vegetative, sensitive, appetitive and motive functions. The latter depend, it is true, on bodily organs during our earthly sojourn, but the dependence is not necessary. The soul is created by God when the body of which it is the entelechy is prepared for it.

It is the natural state of the soul to be united to a body, but being immaterial it is not affected by the dissolution of the body. The soul must be immaterial since it has the power of cognizing the

universal; and its immortality is further based by St Thomas on the

natural longing for unending existence which belongs to a being

whose thoughts are not confined to the ” here ” and ” now,” but

are able to abstract from every limitation.

Thomism, which was destined to become the official philosophy of the Roman Catholic Church, became in the first instance the

accepted doctrine of the Dominican order, who were Scotus. presently joined in this allegiance by the Augustinians.

The Franciscan order, on the other hand, early showed their rivalry in attacks upon the doctrines of Albert and Aquinas. One of the first of these was the Reprehensorium seu correctorium fratris Thomae, published in 1285 by William Lamarre, in which the Averroistic consequences of the Thomist doctrine of individua- tion are already pressed home. More important was Richard

of Middletown (d. c. 1300), who anticipated many of the objec- tions urged soon after him by Duns Scotus (q.v.). His system is conditioned throughout by its relation to that of Aquinas, of which it is in effect an elaborate criticism. The chief character- istic of this criticism is well expressed in the name bestowed on Duns by his contemporaries — Doctor subtilis. It will be sufficient therefore to note the chief points in which the two antagonists differ. In general it may be said that Duns shows less confidence in the power of reason than Aquinas, and to that extent Erdmann and others are right in looking upon his system as the beginning of the decline of Scholasticism. For Scholasticism, as perfected by Aquinas, implies the harmony of reason and faith, in the sense that they both teach the same truths. To this general position Aquinas, it has been seen, makes several important exceptions; but the exceptions are few in number and precisely defined. Scotus extends the number of theological doctrines which are not, according to him, susceptible of philosophical proof, including in this class the creation of the world out of nothing, the immortality of the human soul, and even the existence of an almighty divine cause of the universe (though he admits the possibility of proving an ultimate cause superior to all else). His destructive criticism thus tended to reintroduce the dualism between faith and reason which Scholasticism had laboured through centuries to overcome, though Scotus himself, of course, had no. such sceptical intention. But the way in which he founded the leading Christian doctrines (after confessing his inability to rationalize them) on the arbitrary will of God was undoubtedly calculated to help in the work of disintegration. And it is significant that this primacy of the undetermined will (voluntas superior intellectu) was the central contention of the Scotists against the Thomist doctrine. Voluntary action, Aquinas had said, is action originat- ing in self or in an

internal principle. The freedom here spoken of is a freedom from the immediacy of impulse — a freedom based upon our possession of reason as a power of comparison, memory and forethought. Nothing is said of an absolute freedom of the will; the will is, on the contrary, subordinated to the reason in so far as it is supposed Fl ??? om to choose what reason pronounces good. Accordingly, wU1 ˆ the Thomist doctrine may be described as a moderate determinism. To this Scotus opposed an indeterminism of the extremest type, describing the will as the possibility of determin- ing itself motivelessly in either of two opposite senses. Trans- ferred to the divine activity, Aquinas's doctrine led him to insist upon the perseitas boni. The divine will is, equally with the human, subject to a rational determination; God commands what is good because it is good. Scotus, on the other hand, following out his doctrine of the will, declared the good to be so only by arbitrary imposition. It is good because God willed it, and for no other reason; had He commanded precisely the opposite course of conduct, that course would have been right by the mere fact of His commanding it. Far removed from actuality as such speculations regarding the priority of intellect or will in the Divine Being may seem to be, the side taken is yet a sure index of the general tendency of a philosophy. Aquinas is on the side of rationalism, Scotus on the side of scepticism.

While agreeing with Albert and Thomas in maintaining the three-fold existence of the universals, Duns Scotus attacked the Thomist doctrine of individuation. The distinction of the universal essence and the individualizing determinations in the individual does not coincide, he maintained, with the distinction between form and matter. The additional determinations are as truly " form " as the universal essence. If the latter be spoken of as quidditas, the former may be called haecceitas. Just as the genus becomes the species by the addition of formal determinations called the difference, so the species becomes the individual by the addition of fresh forms of difference. As animal becomes homo by the addition of humanitas, so homo becomes Socrates by the addition of the qualities signified by Socratitas. It is false, therefore, to speak of matter as the principle of individuation; and if this is so there is no longer any foundation for the Thomist view that in angelic natures every individual con- stitutes a species apart. Notwithstanding the above doctrine, how- ever, Scotus holds that all created things possess both matter and form— the soul, for example, possessing a matter of its own before its

union with the body. But the matter of spiritual beings is widely different from the matter of corporeal things. In his treatment of the conception of matter, Duns shows that he inclined much more to the Realism which makes for pantheism than was the case with the Aristotelianism of Thomas. A perfectly formless matter {materia prima) was regarded by him as the universal substratum and common element of all finite existences. He expressly intimates in this connexion his acceptance of Avicebron's position.

In the end of the 13th century and the beginning of the 14th the Thomists and Scotists divided the philosophical and theo- logical world between them. Among the Thomists Thomists ma y k e namec j j on n of Paris, Aegidius of Lessines Scotists. (wrote in 1278), Bernard of Trilia (1240-129 2) and Peter of Auvergne. More important was Aegidius of Colonna (1 247-1316), general of the Augustinian order, surnamed Doctor Fundatissimus or Fundamentarius. Hervaeus Natalis (d. 1323) and Thomas Bradwardine (d. 1349) were determined opponents of Scotism. Siger of Brabant and Gottfried of Fontaines, chancellor of the university of Paris, taught Thomism at the Sorbonne; and through Humbert, abbot of Prulli, the doctrine won admission to the Cistercian order. Among the disciples of Duns Scotus are mentioned John of Bassolis, Francis of Mayrone (q.v.), Antonius Andreae (d. c. 1320), John Dumbleton and Walter Burleigh (Burley) (b. 1275) of Oxford, Nicolaus (q.v.) of Lyra, Peter of Aquila and others. Henry Goethals or Henry of Ghent (Henricus Gandavensis, 1217-1293), surnamed Doctor solennis , occupied on the whole an independent and pre-Thomist position, leaning to an Augustinian Platonism (see Henry of Ghent). Gerard of Bologna (d. 13 17) and Raoul of Brittany are rather to be ranked with the Thomists. So also is Petrus Hispanus (Pope John XXI.), who is chiefly important, however, as the author of the much-used manual Summulae logicales, in which the logic of the schools was expanded by the incorporation of fresh matter of a semi-grammatical character. Petrus Hispanus had predecessors, however, in William of Shyreswood (died 1249 as chancellor of Lincoln) and Lambert of Auxerre, and it has been hotly disputed whether the whole of the additions are not originally due to the Byzantine Synopsis of Psellus. By far the greatest disciple of Aquinas is Dante Alighieri, in whose Divina Commedia the theology and philosophy of the middle ages, as fixed by Saint Thomas, have received the immortality which poetry alone can bestow. Two names stand apart from the others of the century — Raimon Lull (1234-1315) and Roger Bacon (1214-1294). The Ars magna of the former professed by means of a

species of logical machine to give a rigid demonstration of all the fundamental Christian doctrines, and was intended by its author as an unfailing instrument for the conversion of the Saracens and heathen. Roger Bacon was rather a pioneer of modern science than a Scholastic, and persecution and imprisonment were the penalty of his opposition to the spirit of his time.

The last stage of Scholasticism preceding its dissolution is marked by the revival of Nominalism in a militant form. This doctrine is already to be found in Petrus Aureolus (q.v.), a Fran- ciscan trained in the Scotist doctrine, and in William Durand of St Pourcain (d. 1332), a Dominican who passed over from Thomism to his later position. But the name with which the Nominalism of the 14th century is historically associated is that of the " Invincible Doctor," William of Occam Occam! (?•"■) 1 wn O) as the author of a doctrine which came to be almost universally accepted, received from his followers the title Venerabilis inceptor. The hypostatizing of abstractions is the error against which Occam is continually fighting. The Realists, he considers, have greatly sinned against this maxim in their theory of a real universal or common element in all the individuals of a class. From one abstraction they are led to another, to solve the difficulties which are created by the realization of the first. Thus the great problem for the Realists is how to derive the individual from the universal. But the whole inquiry moves in a world of unrealities. Everything that exists, by the mere fact of its existence, is individual (Quaelibct res, eo ipso quod est, est haec res). It it absurd, therefore,

to seek for a cause of the individuality of the thing other than the cause of the thing itself. The individual is the only reality, whether the question be of an individual thing in the external world or an individual state in the world of mind. It is not the individual which needs explanation but the universal. Occam reproaches the " modern Platonists " for perverting the Aristotelian doctrine by these speculations, and claims the authority of Aristotle for his own Nominalistic doctrine. The universal is not anything really existing; it is a terminus or pre- dicable (whence the followers of Occam were at first called Terminists). It is no more than a " mental concept signifying univocally several singulars." It is a natural sign representing these singulars, but it has no reality beyond that of the mental act by which it is produced and that of the singulars of which it is predicated. As regards the existence (if we may so speak) of the universal in mente, Occam indicates his preference, on the ground of simplicity, for the view which identifies the concept with the actus intelligendi, rather than for that which treats ideas as distinct entities within the mind. And in a similar spirit he explains the

universalia ante rem as being, not substantial existences in God, but simply God's knowledge of things — a knowledge which is not of universals but of singulars, since these alone exist realiter. Such a doctrine, in the stress it lays upon the singular, the object of immediate perception, is evidently inspired by a spirit differing widely even from the moderate Realism of Thomas. It is a spirit which distrusts abstractions, which makes for direct observation, for inductive research. Occam, who is still a Scholastic, gives us the Scholastic justification of the spirit which had already taken hold upon Roger Bacon, and which was to enter upon its rights in the 15th and 16th centuries. Moreover, there is no denying that the new Nominal- ism not only represents the love of reality and the spirit of induction, but also contains in itself the germs of that empiricism and]sensualism so f requentlyassociated with the forrher tendencies. Aquinas had regarded the knowledge of the universal as an intellectual activity which might even be advanced in proof of the immortality of the soul. Occam, on the other hand, maintains in the spirit of Hobbes that the act of abstraction does not presuppose any activity of the understanding or will, but is a spontaneous secondary process by which the first act (perception) or the state it leaves behind {habitus derelictus ex primo ac2w = Hobbes's " decaying sense ") is naturally followed, as soon as two or more similar representations are present.

In another way also Occam heralds the'dissolution of Scholasticism. The union of philosophy and theology is the mark of the middle ages, but in Occam their severance is complete. A pupil of _,. Scotus, he carried his master's criticism farther, and "~. M denied that any theological doctrines were rationally T°th demonstrable. Even the existence and unity of God were ,ruth – to be accepted as articles of faith. The Centilogium theologlcum has often been cited as an example of thoroughgoing scepticism under a mask of solemn irony. But if that were so, it would still remain doubtful, as Erdmann remarks, whether the irony is directed against the church or against reason. The most interesting example of this method is seen in the Tractatus de Sacramento altaris where Occam accepts the doctrine of Real Presence as a matter of Faith, and sets forth a rational theory of the Eucharist (afterwards adopted by Luther) known as " Consubstantiation." On the whole, there is no reason to doubt Occam's honest adhesion to each of the two guides whose contrariety he laboured to display. None the less is the position in itself an untenable one and the parent of scepticism. The principle of the twofold nature of truth 1 thus embodied in Occam's system was unquestionably adopted by many merely to cloak their theological

unbelief; and it is significant of the internal dissolution of Scholasticism. Occam denied the title of a science to theology, emphasizing, like Scotus, its practical character. He also followed his master in laying stress on the arbitrary will of God as the foundation of morality.

Nominalism was at first met by the opposition of the church and the constituted authorities. In 1339 Occam's treatises were put under a ban by the university of Paris, and in the following year Nominalism was solemnly condemned. Never- theless the new doctrine spread on all hands. Dominicans like

1 This principle appeared occasionally at an earlier date, for example in Simon of Tournay about 1200. It was expressly censured by Pope John XXI. in 1276. But only in the period following Occam did it become a current doctrine.

Armand cie Beauvoir (d. 1334) and Gregory of Rimini accepted it. It was taught in Paris by Albert of Saxony (about 1350- d f x 3 6 °) and Marsilius of Inghen (about 1364-1377, after- NoZtoid- wards at Heidelberg), as well as by Johannes Buridanus, ism. rector of the university as early as 1327. We find, how-

ever, as late as 1473 the attempt made to bind all teachers in the university of Paris by oath to teach the doctrines of Realism; but this expiring effort was naturally ineffectual, and from 1481 onward even the show of obedience was no longer exacted. Pierre d'Ailly (1350-1425) and John Gerson (Jean Charlier de Gerson, 1363-1429), both chancellors of the university of Paris, and the former a cardinal of the church, are the chief figures among the later Nominalists. Both of them, however, besides their philosophical writings, are the authors of works of religious edification and mystical piety. They thus combine temporarily in their own persons what was no longer combined in the spirit of the time, or rather they satisfy by turns the claims of reason and faith. Both are agreed in placing repentance and faith far above philosophical knowledge. They belong indeed (Gerson in particular) to the history of mysticism rather than of Scholasticism, and the same may be said of another cardinal, Nicolaus of Cusa (1401-1464), who is sometimes reckoned among the last of the Scholastics, but who has more affinity with The "last Erigena than with any intervening teacher. The of the title " last

of the Scholastics " is commonly given to

Schol- ˆ Gabriel Biel (q.v.), the summarizer of Occam's doctrine. astks." The tit j e £ s no(. actua ny correc t ; an d m ight be more

fitly borne by P'rancisco Suarez (q.v.), who died in 1617. But after the beginning of the 1 5th century Scholasticism was divorced from the spirit of the time, and it is useless to follow its history further. As has been indicated in the introductory remarks, the end came both from within and from without. The harmony of reason and faith had given place to the doctrine of the dual nature of truth. While this sceptical thesis was embraced by philosophers who had lost their interest in religion, the spiritually minded sought their satisfaction more and more in a mysticism which frequently cast itself loose from ecclesiastical trammels. The 14th and 15th centuries were the great age of German mysticism, and it was not only in Germany that the tide set this way. Scholasticism had been the expression of a universal church and a common learned language. The university of Paris, with its scholars of all nations numbered by thousands, was a symbol of the intellectual unity of Christendom; and in the university of Paris, it may almost be said, Scholasticism was reared and flourished and died. But the different nations and tongues of modern Europe were now beginning to assert their individuality, and men's interests ceased to be predominatingly ecclesiastical. Scholasticism, therefore, which was in its essence ecclesiastical, had no longer a proper field for its activity. It was in a manner deprived of its accustomed subject-matter and died of inanition. Philosophy, as Haureau finely says, was the passion of the 13th century; but in the 15th humanism, art and the beginnings of science and of practical discovery were busy creating a new world, which was destined in due time to give birth to a new philosophy.

Authorities. — Besides the numerous works quoted in articles on the individual philosophers, see Haureau, Histoire de la philosophic scolastique (2 vols., 1850; revised and expanded in 1870 as Histoire de la phil. scol.), Kaulich, Geschichte d. schol. Philosophie; Stockl, Gesch. der Phil, des Miltelalters; Karl Werner, Die Scholastik des spdteren Mitlelaltcrs ; and, on a smaller scale, de Wulf's Histoire de la phil. medievale (1900). Supplementary details are given in Haureau's Singularity historiques et litteraires (1861) and in R. L. Poole's Illustrations of the History of Mediaeval Thought (1884), while much light is thrown upon the minuter history of the period by the Chartularium Universitatis Parisiensis edited by Denirfe and Chatelain in 1894, by Haureau's Notices et extraits de quelques MS. latins de la Bibliffiheque Nationale (6 vols., 1 890-1 895) and by the

Beitrdge zur Geschichte d. Phil. d. Miltelalters, in course of publication since 1891 by Baeumker and others. A critical survey of recent literature on Scholasticism is given by Baeumker in the Archiv filr Geschichte der Philosophie, vols. v. and x. The accounts of medieval thought given by Ritter, Erdmann and Ueberweg in their general histories of philosophy are exceedingly good. That of Windelband, though going less into detail, is a remarkably fresh treatment of the problems involved. There are also notices of the leading systems in Milman's History of Latin Christianity; and the same writers are

considered from the theological side in many works devoted to theology, and the history of dogma. The psychology of the Schol astic writers is ably dealt with in Siebeck's Die Psychologie von Aristoteles bis zu Thomas von Aquino (1885). Jourdain's Recherches critiques sur I'dge et I'origine des traductions latines d'Aristote (Pans, 1819; 2nd ed. 1843); Rousselot's Etudes sur la philosophie dans le moyen &ge (1 840-1 842), Cousin's Introduction to his Ouvrages medits d'Abelard (1836), and Prantl's Geschichte der Logik im Abendlande (4 vols., 1855-1870) are invaluable aids in studying the history of medieval thought. (A. S. P.-P. ; X.)

SCHOLEFIELD, JAMES (1 789-1853), English classical scholar, was born at Henley-on-Thames on the 15th of November 1789. He was educated at Christ's Hospital and Trinity College, Cambridge, and was in 1825 appointed professor of Greek in the university and canon of Ely (1849). He was for some time curate to Charles Simeon, the evangelical churchman, and his low church views involved him in disputes with his own parishioners at St Michael's, Cambridge, of which he was perpetual curate from 1823 till his death at Hastings on the 4th of April 1853. Scholefield was an excellent teacher. His most useful work was his edition of the Adversaria of P. P. Dobree {q.v.), his predecessor in the chair of Greek. He also published editions of Aeschylus (1828), in which he dealt very conservatively with the text, and of Porson's four plays of Euripides. His Hints for an improved Translation of the New Testament met with considerable success. He was one of the examiners in the first Classical Tripos (1824). The Scholefield Theological Prize at Cambridge was established in commemoration of him in 1856.

See Memoirs of James Scholefield (1855), by his wife, Harriet Scholefield; Gentleman's Magazine (June 1853, p. 644).

SCHOLIUM 1 (axSKiov) , the name given to grammatical, critical

and explanatory notes, extracted from existing com- mentaries and inserted on the margin of the MS. of an ancient author. These notes were altered by successive copyists and owners of the MS. and in some cases increased to such an extent that there was no longer room for them in the margin, and it became necessary to make them into a separate work. At first they were taken from one commentary only, subsequently from several. This is indicated by the repetition of the lemma (" catchword "), or by the use of such phrases as " or thus," " or otherwise," " according to some," to introduce different explanations. The name of " the first scholiast " has been given to Didymus of Alexandria (q.v.), and the practice of compiling scholia continued till the 15th or 16th century a.d. The word oxohwv itself is first met with in Cicero (Ad Alt. xvi. 7). The Greek scholia we possess are for the most part anonymous, the commentaries of Eustathius on Homer and Tzetzes on Lycophron being prominent exceptions. Although frequently trifling, they contain much information not found elsewhere, and are of considerable value for the correction and interpretation of the text. The most important are those on Homer (especially the Venetian scholia on the Iliad, discovered by Villoison in 1781 in the library of St Mark), Hesiod, Pindar, Sophocles, Aristo- phanes and Apollonius Rhodius; and, in Latin, those of Servius on Virgil, of Aero and Porphyrio on Horace, and of Donatus on Terence.

See E. F. Grafenhan, Geschichte der classischen Philologie, iii. (1843-1850); W. H. Suringar, Historia critica scholiastarum Lati- norum (1835).

SCHOLL, AURELIEN (1833-), French author and journalist, was born at Bordeaux on the 13th of July 1833. He was successively editor of the Voltaire and of the Echo de Paris. He wrote largely for the theatre, and also a number of novels dealing with Parisian life.

SCHOLTEN, JAN HENDRIK (1811-1885), Dutch Protestant theologian, was born at Vleuter near Utrecht on the 17th of August 181 1. After studying at Utrecht University, he was appointed professor of theology at Franeker. From Franeker in 1843 he went to Leiden as professor extraordinarius, and in 1845 was promoted to the rank of ordinarius. Through Scholten, A. Kuenen became interested in theology; Scholten was not then the radical theologian he became later. The two scholars in course of time created a movement resembling that of the

1 To be distinguished from scolium (v), an after-dinner song.

Tubingen Schoo/ in Germany. Pursuing first the study of dogmatic theology and the philosophy of religion, Scholten published a work on the Principles of the Theology of the Reformed Church (2 vols., 1848-1850, 4th ed. 1861-1862). He then gave special attention to the New Testament, and wrote A Critical Study of the Gospel of John (1864, in German 1867). He died on the 10th of April 1885.

Scholten's other works include: Historical and Critical Introduc- tion to the New Testament (1853-1856); The Oldest Witnesses to the Writings of the New Testament (1866) ; The Oldest Gospel (1868) ; and The Pauline Gospel (1870). An account of his theological develop- ment is given in Afscheidsrede bij het Neerleggen van het Hoogleeraar- sambt (1881), and in the biography written by A. Kuenen, Levens- bericht van J. Henricus Scholten (1885).

SCHOMANN, GEORG FRIEDRICH (1703-1870), German classical scholar, was born at Stralsund in Pomerania on the 28th of June 1793. In 1827 he was appointed professor of ancient literature and eloquence in the university of Greifswald, where he died on the 25th of March 1879. Schomann's attention was chiefly devoted to the constitutional and religious antiquities of Greece. His first works on the subject were Be comitiis Athenicnsium (18 19), the first independent account of the forms of Athenian political life, and a treatise De sortitione judicum apud Athenienses (1820). In conjunction with M. H. E. Meier, Schomann wrote Der ottische Process (1824, revised ed. by J. H. Lipsius, 1883-1887), which, although in some respects out of date, still has considerable value.

Among his other works are: — editions of Isaeus (1831) and Plutarch's Agis and Cleomenes (1839, important for the Attic law of inheritance and the history of the Spartan constitution) ; A nti- quitales juris publici Graecorum (1838) ; a critical examination of Grote's account of the Athenian constitution (1854, Eng. trans, by B. Bosanquet, 1878) from a conservative point of view; and lastly, GriechiscJie Alterthumer (1855-1859; 4th ed. by J. H. Lipsius, 1897- 1902; Eng. trans, of vol. i. by E. G. Hardy and J. S. Mann, 1880), treating of the general historical development of the Greek states, followed by a detailed account of the constitutions of Sparta, Crete and Athens, the cults and international relations of the Greek tribes. The question of the religious institutions of the Greeks, which he considered an essential part of their public life, had early engaged

his attention, and he held the opinion that everything really religious was akin to Christianity, and that the greatest intellects of Greece produced intuitively Christian, dogmatic ideas. From this point of view he edited the Theogony of Hesiod (1868), with a commentary, chiefly mythological, and Cicero's De natura deorum (1850, 4th ed. 1876); translated with introduction and notes Aeschylus's Prometheus Bound, and wrote a Prometheus Unbound (1844), in which Prometheus is brought to see the greatness of his offence and is pardoned by Zeus. Of his contributions on grammatical subjects special mention may be made of Die Lehre von den Redetheilen nach den Alten dargestellt (1862), an introduction to the elements of the science of grammar. His many-sidedness is shown in his Opuscula academica (4 vols., 1856-1871).

See F. S(usemihl) in C. Bursian's Biog. Jahrbuch fur Altertumskunde (1879); A. Baumeister in Allgemeine deutsche Biographie, xxxii. ; C. Bursian, Gesch. der class. Philologie in Deutschland (1883), and J. E. Sandys, Hist, of Classical Scholarship, iii. (1908), p. 165.

SCHOMBERG (originally Schonberg), FRIEDRICH HERMANN (or Frederic Armand), Duke of (c. 161 5-1690), marshal of France and English general, was descended froni an old family of the Palatinate, and was born in December 161 5 or January 16 16, at Heidelberg, the son of Hans Meinard von Schonberg (1 582-1616) and Anne Sutton, daughter of the 9th Lord Dudley. An orphan within a few months of his birth, he was educated by various friends, among whom was the " Winter King," Frederick V. of the Palatinate, in whose service his father had been. He began his military career under Frederick Henry, prince of Orange, and passed about 1634 into the Swedish service, whence he entered that of France in 1635. His family, and the allied house of the Saxon Schdnbergs had already attained eminence in France. 1 After a time he retired to his family estate at Geisenheim on the Rhine, but in 1639 he re-

1 Of the Misnian Schonbergs in French history may be named Gaspard de Schomberg, count of Nanteuil (d. 1599), French soldier and statesman, his son, Henri, count of Nanteuil and Duretal, marquis d'Espinoy (1575-1632) grandmaster of the artillery, marshal of France, and Henri's son Charles (d. 1656), who by marriage became due d'Halluin, and was marshal of France and also, during the war with Spain, viceroy of Catalonia. Of the Palatinate family, Theo- doric (d. 1590) was killed at Ivry in the service of Henry IV.

entered the Dutch army, in which, apparently, with a few intervals

spent at Geisenheim, he remained until about 1650. He then rejoined the French army as a general officer (marechal de camp), served under Turenne in the campaigns against Conde, and became a lieutenant-general in 1665, receiving this rapid promotion perhaps partly owing to his relationship with the due d'Halluin, but mainly because he was looked upon as the eventual successor of the great generals then at the height of their fame.

After the peace of the Pyrenees (1659) the independence of Portugal being again menaced by Spain, Schomberg was sent as military adviser to Lisbon with the secret approval of Charles II. of England (who knew him personally and about this time created him baron of Tetford) and Louis XIV., who in order not to infringe the treaty just made with Spain, deprived Schomberg of his French offices. After meeting in the three first campaigns many difficulties from the insubordination of many of the Portuguese officers, Schomberg won the victory of Montes Claros on the 17th of June 1665 over the Spaniards under the prince of Parma. After participating with his army in the revolution which deposed the reigning king in favour of his brother dom Pedro, and ending the war with Spain, Schomberg returned to France, became a naturalized Frenchman and bought the lordship of Coubert near Paris. He had been rewarded by the king of Portugal, in 1663, with the rank of Grandee, the title of count of Mertola and a pension of £5000 a year. In 1673 he was invited by Charles to England, with the view of taking command of the army, but sentiment was so strong against the appointment, as savouring of French influence, that it was not carried into effect. He therefore again entered the service of France. His first operations in Catalonia were unsuccessful owing to the disobedience of subordinates and the rawness of his troops, but he retrieved the failure of 1674 by retaking Bellegarde in 1675. For this he was made a marshal, being included in the promotion that followed the death of Turenne. The tide had now set against the Huguenots, and Schomberg's merits had been long ignored on account of his adherence to the Protestant religion. The revocation of the edict of Nantes (1685) compelled him to quit his adopted country. Ultimately he became general-in-chief of the forces of the elector of Brandenburg, and at Berlin he was the acknowledged leader of the thousands of Huguenot refugees there. Soon afterwards, with the elector's consent, he joined the prince of Orange on his expedition to England in 1688, as second in command to the prince. The following year he was made a knight of the Garter, was created successively baron, marquis and duke, was appointed master-general of the ordnance, and received from the House of Commons a vote of £100,000 to compensate him for the*

loss of his French estates, of which Louis had deprived him. In August he was appointed commander-in-chief of the expedition to Ireland against James II. After capturing Carrickfergus he marched unopposed through a country desolated before him to Dundalk, but, as the bulk of his forces were raw and undisciplined as well as inferior in numbers to the enemy, he deemed it imprudent to risk a battle, and entrenching himself at Dundalk declined to be drawn beyond the circle of his defences. Shortly afterwards pestilence broke out, and when he retired to winter quarters in Ulster his forces were more shattered than if they had sustained a severe defeat. His conduct was criticized in ill-informed quarters, but the facts justified his inactivity, and he gave a striking example of his generous spirit in placing at William's disposal for military purposes the £100,000 recently voted him. In the spring he began thecampaign with the capture of Charlemont, but no advance southward was made until the arrival of William. At the Boyne (July 1, 1690) Schomberg gave his opinion against the determination of William to cross the river in face of the opposing army. In the battle he commanded the centre, and while riding through the river without his cuirass to rally his men, was surrounded by Irish horsemen and instantly killed. He was buried in St Patrick's cathedral, Dublin, where there is a monument to him, erected in 1731, with a Latin inscription by Dean Swift.

His eldest son Charles, the second duke in the English peerage, died in the year 1693 of wounds received at the battle of Marsaglia.

The most important work on Schomberg's life and career is Kazner's Leben Friedrichs von Schomberg oder Schonberg (Mannheim, 1789). The military histories and memoirs of the time should also be consulted.

SCHOMBURGK, SIR ROBERT HERMANN (1804-1865), British traveller, was born at Freiburg, Prussian Saxony, on the 5th of June 1804, the son of a Protestant minister. In 1829 he went to the United States, but in 1830 left for Anegada, one of the Virgin Isles. He surveyed the island at his own expense, and sent to the Royal Geographical Society, London, a report which created such an impression that, in 1835, he was entrusted by that body with the conducts of an exploring expedition to British Guiana. He fulfilled his mission with great success, incidentally discovering the Victoria Regia lily. In 1841 he returned to Guiana to survey the colony and

fix the boundary for the British Government. The result was the provisional boundary between British Guiana and Venezuela known as the " Schomburgk Line," for which see the articles on those two countries. On his return to England he was knighted. In 1848 he was appointed British consul to St Domingo, and, in 1857, British consul to Bangkok. While holding these posts he continued his geographical surveys. He retired from the public service in 1864, and died at Berlin on the nth of March 1865. He was the author of a Description of British Guiana and a History of Barbadoes.

SCHONBEIN, CHRISTIAN FRIEDRICH (1799-1868), chemist, was born at Metzingen, Swabia, on the 18th of October 1799, and died at Sauersberg, near Baden Baden, on the 29th of August 1868. After studying at Tubingen and Erlangen, he taught chemistry and physics, first at Keilhau, Thuringia, and then at Epsom, England, but most of his life was spent at Basel, where he undertook the duties of the chair of chemistry and physics in 1828 and was appointed full professor in 1835. His name is chiefly known in connexion with ozone, which he began to in- vestigate in 1839, and with guncotton, which he prepared and applied as a propellant in fire-arms early in 1846. He was a most prolific writer, 364 papers appearing under his name in the Royal Society's Catalogue, and he carried on a large corre- spondence with other men of science, such as Berzelius, Faraday, Liebig and Wohler.

Many of his letters together with a life will be found in G. W. A. Kahlbaum's Monographien aus der Geschichte der Chemie, vols. iv. and vi. (1899 and 1901).

SCHONEBECK, a town of Germany, in the province of Prussian Saxony, on the left bank of the Elbe, 9 m. S. of Magdeburg by the railway to Halle and Leipzig. Pop. (1905) 17,786. It contains manufactories of chemicals, machinery, starch, white lead and various other articles, but is chiefly noted for its extensive salt springs and works, which produce about 75,000 tons of salt per annum. Large beds of rock-salt also occur in the neighbour- hood, in which shafts have been sunk to a depth of more than 1 200 ft. There is a harbour on the Elbe here, and a brisk trade is carried on in coal, grain and timber.

See Magnus, Geschichte der Stadt Schonebeck (Berlin, 1880).

SCHONEBERG, a town of Germany, in the Prussian province of Brandenburg, forming a suburb of Berlin, which it adjoins on the south-west. Pop. (1905) 141,010. It has four churches, a statue of

the emperor William I. and several educational establishments. It contains the railway station of the military line to Zossen and is connected with the metropolis by electric trams and omnibuses. Its chief manufactures are railway plant, cigars, soap, paper and chemicals. The foundation of Alt-Schoneberg is ascribed to Albert the Bear, margrave of Brandenburg, in the 12th century, while Neu-Schoneberg was founded by Frederick the Great in 1750 to accommodate some Bohemian weavers exiled for their religion. It was made a town in 1898.

SCHONFELD, EDUARD (1828-1891), German astronomer, was born at Hildburghausen, in the duchy of Meiningen, on the 22nd of December 1828. He had a distinguished career at the

gymnasium of his native town, and on leaving desired to devote himself to astronomy, but abandoned the idea in deference to his father's wishes. He went first to Hanover, and afterwards to Cassel to study architecture, for which he seems to have had little inclination. In 1849 we find him studying chemistry under Bunsen at Marburg, where his love for astronomy was revived by Gerling's lectures. In 185 1 he visited the Bonn Observatory and studied astronomy under Argelander. In 1853 he was appointed assistant, and in the following year won a doctor's degree with his treatise Nova elementa Thetidis. At Bonn he took an important part in preparing the Durchmusterung of the northern heavens. He took up the investigation of the light- changes in variable stars, devoting to this work nights which, on account of moonlight, were unsuitable for zone observations. The results of these researches are published in the Sitz. Berich. Wien. Akad. vol. xlii. For a short time he was a Privatdozent at Bonn, but in 1859 he was appointed director of the Mannheim Observatory. The instrumental equipment of that observatory was somewhat antiquated, his largest telescope being a small refractor of 73 lines aperture, but he selected a line of work to suit the instruments at his disposal, observing nebulae and vari- able stars and keeping a watch on comets and new planets. The results of his observations of nebulae are contained in two catalogues published in the Astronomische Beobachtungen der Grossherzoglichen Sternwarte zu Mannheim, 1st and 2nd parts (1862 and 1875), and those of his variable star observations appeared in the Jahresberichte des Mannheimer Vereins filr Naturkunde, Nos. 32 and 39 (1866 and 1875). On the death of Argelander, which occurred on February 17th 1875, Schonfeld was appointed to succeed him as director of the Bonn Observatory, and soon after his appointment he began his last and greatest piece of work, the extension, on Argelander's plan, of the survey of the*

heavens down to 23 of south declination. The experience gained on the northern survey under Argelander's direction enabled Schonfeld to introduce some improvements in the methods employed, which increased the accuracy of this work, which was practically accomplished in March 1881, some revision only remaining to be done. These zone observations afforded 363,932 separate places of stars, and form the groundwork of the catalogue of 133,659 stars between 2° and 23 south declina- tion, which was published in 1886 as the eighth volume of the Bonn observations.

Schonfeld was a member of the Astronomische Gesellschaft from its foundation in 1863, being a member of Council up to 1869, and in 1875 becoming editor of its publications and secretary in conjunction with Winnecke. In 1878 he was elected a Foreign Associate of the Royal Astronomical Society. He died on the 1st of May 1891. (A. A. R.)*

SCHONGAUER (or Shon), MARTIN (c. 144 5-c. 1488), the most able engraver and painter of the early German school. His father was a goldsmith named Casper, a native of Augsburg, who had settled at Colmar, where the chief part of Martin's life was spent. 1 Schongauer established at Colmar a very important school of engraving, out of which grew the " little masters" of the succeeding generation, and a large group of Nuremberg artists. ' As a painter, Schongauer was a pupil of the Flemish Roger van der Weyden the Elder, and his rare existing pictures closely resemble, both in splendour of colour and ex- quisite minuteness of execution, the best works of contemporary art in Flanders. Among the very few paintings which can with certainty be attributed to him, the chief is a magnificent altar- piece in the church of St Martin at Colmar. The Colmar Museum

1 The date of Schongauer's birth is usually given wrongly as c. 1420 ; he was really born twenty-five or thirty years later, and is mentioned by A. Diirer as being a young apprentice in 1470. His portrait in the Munich Pinakothek is now known to be a copy by Burgkmair, painted after 1510, from an original of 1483 — not 1453 as has been supposed. The date (1499) for Schongauer's death.written on the back of the panel by Burgkmair, is obviously a blunder; see Hensler in Naumann' s Arc'niv (1867), p. 129, and Wurzbach, M. Schongauer (Vienna, 1880). These contradict the view of Goutzwiller, in his Martin Schongauer et son ecole (Paris, 1875). Cf. Schnaase, " Gesch. M. Schongauers," in the Mittheil. der K. K. Commission (1863), No. 7.

possesses eleven panels by him, and a small panel of ” David with Goliath’s Head” in the Munich Gallery is attributed to him. The miniature painting of the ” Death of the Virgin ” in the English National Gallery is probably the work of some pupil. 1 In 1488 Schongauer died at Colmar, according to the register of St Martin’s church. Other authorities state that his death occurred in 149 1.

The main work of Schongauer’s life was the production of a large number of beautiful engravings, which were largely sold, not only in Germany, but also in Italy and even in England. Vasari says that Michelangelo copied oneof hisengravings — the “Trial of St Anthony.” 2 Schongauer was known in Italy by the names ” Bel Martino ” and ” Martino d’Anversa.” His subjects are always religious; more than 130 prints from copper by his hand are known, and about 100 more are the production of his bottega. 3 Most of his pupils’ plates as well as his own are signed M+S. Among the most beautiful of Schongauer’s engravings are the series of the”Passion”and the “Death and Coronation of the Virgin,” and the series of the “Wise and Foolish Virgins.” All are remarkable for their miniature-like treatment, their brilliant touch, and their chromatic force. Some, such as the ” Death of the Virgin ” and the ” Adoration of the Magi ” are richly- filled compositions of many figures, treated with much largeness of style in spite of their minute scale.

The British Museum possesses a fine collection of Schongauer’s prints. Fine facsimiles of his engravings have been produced by Armand-Durand with text by Duplessis (Paris, 1881).

SCHONINGEN, a town of Germany, in the duchy of Brunswick, 29 m. by rail W. of Magdeburg. Pop. (1905) 9298. It has three churches, and manufactures of chemicals, machinery and sausages. The place is mentioned as early as 747 and received municipal rights in 1370. It has the remains of a ducal residence and some interesting wooden houses.

SCHOOLCRAFT, HENRY ROWE (1 793-1864), American traveller, ethnologist and author, was born on the 28th of March 1793 at what is now Guilderland, New York, and died at Washington on the 10th of December 1864. After studying chemistry and mineralogy in Union College he had several years’ experience of their application, especially at a glass- factory of which his father was manager, and in

1817 published his Vitreology. In the following year he collected geological and mineralogical specimens in Missouri and Arkansas, and in 18 19 he published his View of the Lead Mines of Missouri. In 1820 he accompanied General Lewis Cass as geologist in his expedition to the Upper Mississippi and the Lake Superior copper region, and in 1823 he was appointed Indian agent for the Lake Superior country. More than sixteen millions of acres were ceded by the Indians to the United States in treaties which he negotiated. He married the granddaughter of an Indian chief; and during several years' official work near Lake Superior, and later under authorisation of an Act of Congress of 1847, he acquired much information as to institutions, &c, of the American natives. From 1828 to 1831 Schoolcraft was an active member of the Michigan legislature. In 1832, when on an embassy to some Indians, he ascertained the real source of the Mississippi to be Lake Itasca.

In 1825 he published Travels in the Central Portions of the Mississippi Valley, and in 1839 appeared his Algic Researches, containing Indian legends, notably, " The Myth of Hiawatha and other Oral Legends." He composed a considerable quantity of poetry and several minor prose works, especially Notes on the Iroquois (1846); Scenes and Adventures in the Ozark Mountains (1853). His principal book, Historical and Statistical Information respecting the Indian Tribes of the United States, illustrated with 336 plates from original drawings, in part a compilation, was issued under the patronage of Congress in six quarto volumes, from 1851 to 1857.

1 Another painting of the same subject in the Doria Palace in Rome (usually attributed to Durer) is given to Schongauer by Crowe and Cavalcaselle, Flemish Painters (London, 1872), p. 359; but the execution is not equal to Schongauer's wonderful touch.

2 An interesting example of Schongauer's popularity in Italy is given by the lovely Faenza plate in the British •MFuseum, on which is painted a copy of Martin's beautiful engraving ot the " Death of the Virgin."

3 See Bartsch, Peintre Graveur, and Willshire, Ancient Prints, best edition of 1877. According to a German tradition Schongauer was the inventor of printing from metal plates; he certainly was one of the first who brought the art to perfection. See an interesting article by Sidney Colvin in the Jahrbuch der k. preussischen Kunstsammlung, vi. p. 69 (Berlin, 1885).

SCHOOLS. As is the case with so many of the institutions of modern

civilization, so with schools; the name, the thing, the matter, the method have been derived from Greece through Rome. A strange fortune has converted the Greek word cxokh, which originally meant leisure, particularly the " retired leisure that in trim gardens takes his pleasure " of men, into the proper term for the modern school.

Greek Schools. — The term and the institution date, not from the great or what may be called the Hellenic age of Greece, but from the later Macedonian or Hellenistic period. The account given by K. I. Freeman in his Schools of Hellas (1907) may be summed up in the statement, " There were no schools in Hellas." That is, there were no schools in our sense, where, during boyhood and youth, boys spent their whole time in a continuous course of instruction. There were professional teachers of three kinds: (1) the grammatistes, who taught reading, with writing and perhaps arithmetic, in the grammateion; (2) the citharistes, who taught music, i.e. playing and singing to the cithara — it is significant that there was no word for the music school; (3) the paedotribes, who taught gymnastic, wrestling, boxing, running, jumping, throwing the javelin, &c, in the palaistra. To these teachers the boys were taken by slaves, called boy-leaders (ircuSayioyol, whence our pedagogues), as single pupils, and they were taught not in classes but singly.

That all boys did not go through all three schools is clear. For we hear of Socrates, when he was grown up, repairing to a lyre-school to learn music, because he thought his education was not complete without it. Roughly, the age for the grammar- school and song-school was 7 to 14, for the gymnastic school 12 to 18. A certain amount of literature was imparted, as, especially in the song-school, Homer and other early poets, the very Bibles of Hellas, were learnt by heart. In later days, under the Sophists, and Socrates, " the greatest of the Sophists," 450-400 B.C., something approaching to secondary education was developed. But it was wholly unorganized, though a similar division of labour between separate private tutors took place as in primary education. The orators or rhetoricians taught oratory, and the learning that was considered necessary to the political orator, a smattering of Greek history, constitutional law and elementary logic. The philosophers, such as Protagoras, discoursed vaguely on natural science, " things in the heavens above and the earth beneath," and divinity, " whether there are gods or not," mathematics and ethics, or any subject which attracted them, while the lawyers, in the same unsystematic way, taught what law was necessary in a state where the con- stitution was at the mercy of chance majorities in a sovereign assembly of 30,000 people, and trials at law were settled by 600 jurymen-judges. The orators and

sophists were popular lecturers, here to-day and gone to-morrow. There was no co- ordination between them, no regular curriculum, and the youths wandered from one to another as their own or their parents' prejudices and purses dictated.

In the next generation, the orators and the philosophers, by settling down in fixed places, began to establish something more like schools. Plato, though like his master Socrates he taught without asking fees, was the first to give a regular educa- tional course extending over three or four years, and in a fixed place, the Academy. The gymnasium was originally a parade or practice ground for the militia or conscript army of the state, which derived its name from the exercises being in that climate performed naked (yv/j,vos). At the age of 15 or 16 the boys left the palaestra, or private gymnasium, for this public training school, maintained at the public expense, preparatory to their admission as youths (e$7j/3oi), to take the oath of citizenship and undergo two years' compulsory training in regiments on the frontier. After those two years were over, they still required continuous exercise to keep themselves in training; consequently men of all ages, from 16 to 60, were to be found in the gymnasium. Though the gymnasium was free, the teachers and trainers in gymnastics were paid, and as the poorer citizens had to earn their own living, the Athenian gymnasium, like the modern university, was for educational purposes chiefly frequented

by the well-to-do. So the Academy became a fashionable lounge, and here developed the walking and talking clubs, which became the Platonic or Academic Schools. Logic and ethics, built on a foundation of geometry and mathematics, seem to have been the staple subjects. An inner circle met, and dined together in Plato's private house and garden, close to the Academy. Plato devised the house and garden to his successor Speusippus, who passed them on to Xenocrates. They thus became the first endowment of the first endowed college, which grew very rich and lasted till the disestablishment and disendow- ment of the old learning by Justinian in a.d. 529. Aristotle, a pupil of Plato for twenty years, set up a school of his own in the Lyceum, another public gymnasium, where he lectured twice a day, in the morning esoterically to the inner circle of regular attendants, in the afternoon to the public. From these two institutions three nations of Europe have derived three different terms for a school, the Germans their gymnasium, the

French their lycee, and the Scotch their academy. Yet neither of the originals was a school in any real sense of the word. In the days of their founders they were like discussion forums; at the most, courses of lectures. In later years, the gilded youth who flocked to Athens from the whole Greco-Roman world were enrolled among the ephebi, and the so-called "university of Athens" was evolved (Dumont, L'EphSbie attique).

Meanwhile the intellectual hegemony of Greece had for a time passed with the political hegemony from Athens to Alexandria. It is to the Alexandrines, either to Antiodorus or to Eratos- thenes, c. 250 (J. E. Sandys, Hist, of Classical Scholarship, 7), that grammar, as a term and a science, which included literary criticism and scholarship, and the grammar school are due. The earliest extant treatise on grammar is by Dionysius of Thrace (born c. 146), a pupil of the Homeric critic, Aristarchus. It defines grammar as "the practical knowledge of the usage of writers of poetry and prose " and includes exegesis or explana- tion of the author in the widest sense as well as mere verbal or syntactical grammar. It was from the term thus understood that the grammar school (scola grammaticalis) , the term which described the typical secondary school from that day to 1869, derived its denotation and its connotation. For a true con- ception of the history of secondary schools it cannot be repeated too often and too emphatically that to this day the true title of the greatest English "public schools" is grammar school. Winchester and Eton are the grammar schools of the colleges of the Blessed Mary of Winchester and of Eton respectively, and Westminster is the grammar school of the collegiate church of St Peter, Westminster. Throughout the thirteen centuries which intervened between Dionysius Thrax and Dr Kennedy, Dionysius's grammar was the standard work and the foundation, directly or indirectly, of all other grammars, while the grammar school has always meant, and, in the hands of the better class of teachers, has always been, not a gerund-grinding machine, but a place for the training and exercise of the mind by the study of literature. The word " school," as well as the word " grammar," seems to be due to Alexandria. Plato in the Laws had spoken of a learned discussion or teaching, the product of leisure, as a schole. But it does not appear that the word was transferred to the place where such discussion took place before the Alexandrian epoch. The first known use of it in that sense seems to be in Dionysius Halicarnassus' Letter to Ammaeus, c. 30 B.C. But as Plautus (c. 210) uses the corresponding Latin term, Indus literarius, some two centuries earlier, we may safely infer that he used it, not on the principle of Indus a non ludendo, but as a translation of grammar

school.

Roman Schools. — At Rome schools began with intercourse with Greeks. According to Suetonius, the emperor Hadrian's secretary, who wrote The School Masters (De grammaticis) about a.d. 140, literary teaching and the science of grammar began with Livius Andronicus, a Greek from Magna Graecia in the south of Italy, who, being brought to Rome as a slave in 272 B.C., became a freed man, translated the Odyssey into Latin, and taught both Greek and Latin. Ennius, the first Latin poet, was also half- Greek, and came to Rome in 209 B.C., where he also taught

both languages. According to Plutarch (Quaest. Rom. 59) the first grammar school {grammatodidaskaleion) was opened by Spurius Carvilius, a freedman of Carvilius, who was the first Roman to divorce his wife. Like master, like man. These two innovations in morals and manners took place about 230 B.C. According to Suetonius, Crates of Mallus in Cilicia, who about 169 B.C. came to Rome as ambassador from Attalus, king of Pergamum, a great centre of learning, and was kept there by a broken leg, occupied himself in giving lectures. His example was soon followed by Romans. Schools of grammar, in which, even as late as Cicero's time, the Laws of the Twelve Tables were the chief text-book and were learnt by heart, were kept by Greeks or freedmen. These seem to have been of the nature of elementary schools. But at Rome, as at Athens, the working- classes were for the most part slaves; and elementary schools were like English preparatory schools rather than public elemen- tary schools. The teachers were called litteratores, a translation of the Greek ypafiy.aTi.crToX. Schools of rhetoric, which were more like secondary schools, were also opened after the model of that of Isocrates at Athens. Their teachers were called litter ati, corresponding to the Greek ypaniio.ri.Kol. Suetonius says that " the early litteratores also taught rhetoric, and we have many of their treatises which include both sciences." In 92 B.C. schools of Latin rhetoric were put down as an innovation. Yet among the treatises written by Cato, the praiser of the past at the expense of the present, was one on public speaking, the chief rule in which was " take care of the sense, and the sounds will take care of themselves." Cicero learned to declaim both in Greek and Latin, and the Gracchi had studied rhetoric under Greek teachers. Neither the gymnasium or palaestra, nor the music school, flourished at Rome. As at Athens, so at Rome the boys were sent to school in charge of a slave, a pedagogus, comes or custos. But it would seem that at Rome the peda- gogus, generally a Greek slave, often himself gave elementary instruction. In Varro's much-debated phrase, " Educat nutrix,

instituit pedagogus, docet magister," " the nurse brings up, the pedagogue instils the elements, the master teaches." Magister, which in English became "maister" and then " master," remained the term for the teacher of the public school from that day to this, though attempts were made at the time of the Reformation to introduce the Greek word didascalus in its place.

The Roman school was very much like the modern school. All the methods of torture which have made the service of the Muses for most boys a veritable slavery were in full vogue. Instruction was now in a foreign language, and grammar became prominent. Early rising, loud speaking and hard flogging were in the ascendant. Martial curses the master of a neighbouring school whose shouts and blows woke him up at cock crow. Horace assures us that he admires the old Latin poets in spite of their having been hogged into him by the pedagogus, Orbilius, whose name has become pro- verbial. The staple of instruction in the Roman schools was the works of the poets, Greek and Latin, Homer and Virgil, Hesiod and Aesop, Menander and Terence. Horace says (Ep. i. 19. 40) " that he was not thought worthy of going the round of the schoolmasters' desks "; but it was a fate not long delayed, and the writings of the poets of the silver age, Lucan and Statius, became school-books in their own lifetimes.

Our knowledge of the Roman curricula is mainly due to Quintilian's Institutio oratoria, c. A.D. 91. Fabius Quintilianus, born on the banks of the Ebro, was not only the son of a man who kept a rhetoric school, but himself kept one, and is said by St Jerome to have been the first who kept a public school, in the sense that he was the first who received a stipend from the emperor. In endeavouring to create the perfect orator, Quintilian discusses the whole of educa- tion from the cradle upwards. It is clear from him that the grammar school had trenched on the rhetoric school. The latter was then restricted to actual oratory, the rules and practice of public speaking, whjle the grammar school gave much the same teaching as English grammar schools did until 1850.

The first definitely endowed school we hear of is one founded by Pliny the younger, a pupil of Quintilian, at his native place Como. In a letter to the historian Tacitus (iv. 12) he informs him that he found a Como boy was at school at Milan, because there were no teachers at Como, whereupon he lectured the parents on the " small additional expense " a day-school at Como would be, compared to the cost of boarding boys at Milan. He therefore offered to find a third of the cost, and would have found the whole did he not " fear that such an endowment might be corrupted … to private

interests, which he saw happen in many places where teachers are hired by the public " (preceptores publice conducuntur) . The choice of the master he left to the parents. Later historians say that the emperor Antoninus Pius (138-161) assigned offices and salaries (honores et solaria) for rhetoricians throughout the provinces; and that Alexander Severus did the same, and also established exhibitions for poor boys, with the limitation, curiously repeated a thousand years later in the statutes of All Souls College and of Eton, modo ingenuos, i.e. provided only that they should be free-born.

There were complaints that the masters were ill-paid. The only definite statement as to tuition fees appears to be a line of Horace (Sat. i. 6. 76), who says his father took him to school at Rome as he did not care to send him where the sons of his country neighbours went, at 8 asses a month, said to represent 4d. a month, equivalent to " about a shilling "; even this is founded on a disputed reading. Quintilian made a fortune by his school, but Juvenal calls him in this respect a white crow. As in modern times the winning jockey, so then the victorious charioteer, received more pay for a single race than the master for a whole year's labours.

Grammar and rhetoric schools spread throughout the Roman world and continued substantially unchanged in method and subject to the days of Gregory the Great and Augustine the apostle of the English. The Confessions of St Augustine of Hippo, a school- master at Carthage, Rome and Milan, before his baptism in the year 387, and the poems of his contemporary Ausonius, educated in the grammar school at Toulouse, and himself a schoolmaster at Bordeaux before becoming prefect of Illyria and of Gaul, show that the schools were much the same in the 4th century as in the first. Ausonius celebrated in verse all the Bordeaux schoolmasters, some coming from schools at Athens, Constantinople, Syracuse and Corinth, one the son of a Druid at Bayeux, others schoolmasters from Poitou, Narbonne, Toulouse, who went to Lerida and other places in Spain. Ausonius had for his pupil the emperor Gratian, who in 376 established a legal tariff for schoolmasters' salaries. " In every town which is called a metropolis, a noble professor shall be elected. ' The rhetoric master (rhetor) was to have at least 24 annonae (an annona being a year's wages of a working man) ; while the grammar masters were to receive half that. But at Trier, then the capital of the Western empire, the rhetor was to have 30, the Latin gram- marian 20, and

the Greek grammarian, if one can be found, 12 annonae {Cod. Theod. xiii. 3. 11). The works of Ennodius, bishop of Pavia, 513-521, preserve many school declamations delivered in Milan school. The same century saw Priscian, a schoolmaster at Constantinople, compose the Latin grammar, which, itself for the most part a mere translation from Greek, reigned without a rival till the Reformation, and is represented by over 1000 MSS. Venan- tius Fortunatus, educated in the grammar school at Treviso, wrote in 570 a life of St Martin of Tours in three books of hexameter verse, and lives of saints and bishops. His era was one of transition, and marks the passing of the schools from secular to ecclesiastical control. His contemporary Pope Gregory rates Desiderius, " bishop of Gaul," at Vienne (Ep. xi. 54), because " as we cannot relate without shame, it has come to our knowledge that your brotherhood teaches grammar to certain persons: which we take all the worse as it converts what we formerly said in your favour to lamentation and mourning, since the praise of Christ cannot lie in one mouth with the praise of Jupiter. Consider yourself what a crime it is for bishops to recite what would be improper for religiously minded laymen " — -words which are an adaptation of a sentiment of Jerome at his worst.

This letter is the more remarkable, because it ends with com- mending to Desiderius the monks whom Gregory was sending with Laurence the priest and Mellitus the abbot to Augustine of Canter- bury, thus bringing the grammar-school-teaching bishop into direct connexion with the conversion of the English, and the foundation of the first English school.

English Schools. — St Augustine of Canterbury landed in Kent in 596, and the king of Kent, Ethelbert, was christened two years later. He " did not defer giving his teachere a settled residence in his metropolis of Canterbury, with such possessions as were necessary for their subsistence," says Bede. We may therefore attribute the establishment of the Church of England and the first English school to the year 598. For as nowadays the first thing modern missionaries do is to establish a school, so did Augustine. Indeed a school was even more necessary then. Now the Scriptures are always translated into the native tongue, and services conducted in it. But in those days the converted heathen, to understand the church service and to read the Scriptures, had to learn Latin and begin with Latin grammar; and indeed as the kyrie, the creed and the gloria were still rendered in Greek, if he was thoroughly to comprehend it he had to learn some Greek.

The first actual mention of Canterbury school is in 631. Sigebert of

Essex, Bede tells us (Eccl. Hist. iii. 18, ed. Plummer,

162), while in exile in Gaul, was baptized. " On his return, as soon as he obtained the kingdom (of the East Saxons), wishing to imitate what he had seen well done in Gaul, he founded a grammar school (scolam in qua pueri litteris erudirenlur) , with the assistance of Bishop Felix, whom he had received from Kent, who provided them with ushers and masters (pedagogos el magistros) after the manner of the Canterburians (more Cantua- riorum) . " If the last words are translated Kentish folk the meaning is the same, as naturally the first and chief school of the Kentish folk was at Canterbury. Felix was a Burgundian, who had come over to Honorius, one of the last survivors of the original band of Augustine, who became archbishop in 627. The East Saxon see was placed at Dunnoc, now Dunwich, and the school there has been claimed by patriotic Suffolk historians as the first school in England. Though long before the Conquest Dunwich had ceased to be an episcopal see, being deposed in favour of Thetford, while half of it was swallowed up by the sea, yet, when between 1076 and 1083 the priory of Eye was founded by Robert Malet, he appropriated to it all the churches of Dunwich " the tithes of the whole town both of money and herrings . . . the school also of the same town." So the school of Sigebert and Felix was still existing 400 years afterwards. It afterwards perished at the dissolution of the priory, to which it had been handed over.

As the model must be older than the copy, Canterbury school must be allowed the primacy over Dunwich. Being spoken of as an existing institution, with no suggestion that it was then newly established, we need not doubt that it was founded by St Augustine as part of the cathedral establishment of Christ Church, Canterbury. This church was not then monastic, but like all other cathedrals, a college of priests, the monks being placed apart, outside the city walls in the abbey, first called St Paul's, afterwards known as St Augustine's. Enthusiastic "Grecians" have attributed Canterbury school rather to the Greek archbishop, the monk Theodore, who reached Canterbury on the 27th of May 669. " Soon after" he "travelled through the whole English parts of the island," and first established a united church of England, being " the first archbishop whom the whole English church consented to obey." He travelled with Hadrian, a Latin-African monk, who had been first offered the archbishopric, and was sent by the pope to look after Theo- dore " lest after the fashion of Greeks he should introduce something against the true faith. " " Because both were abundantly learned in sacred and profane literature, they collected crowds of disciples, and streams of saving knowledge daily flowed from them, as together with holy writ

they gave their hearers instruction both in the arts of metre and astronomy and ecclesiastical arithmetic," or, as the Anglo-Saxon transla- tion has it, " metercraft, tungolcraft and grammaticraft" (Bede, Eccl. Hist. iv. 2). " The proof is," says Bede, " that even to this day," c. 735, " some of their pupils survive who know Latin and Greek as well as their own language in which they were born." It is a strange misconception of this passage which has narrowed a triumphant record of the first metropolitical visitation of England, the very point of which is that the arch- bishop left Canterbury to travel to the farthest parts of the heptarchy, into the foundation of a school at Canterbury. Though it is clear that Theodore did not found, there is evidence that he did actually teach in the school at Canterbury, since Albinus, who succeeded Hadrian as abbot of St Paul's, is said to have been " the most learned man of his time in everything, having been educated in the church of Canterbury" (not, it may be noted, in the monastery of St Paul's) by Theodore and Hadrian. Tobias, who died bishop of Rochester in 726, is also described as " a most learned man, for he was a pupil of Theodore and Hadrian, and so, together with a knowledge of literature ecclesiastical and general, Greek and Latin were as familiar to him as his native tongue." We may therefore credit Rochester with its school at least as early as Toby's episcopate.

Of schools still existing, we must give the precedence after Canter- bury and Rochester to St Peter's school, the cathedral grammar I school at York. If it was originally started by Paulinus, the Roman

missionary, in 630 or 633, and there was no church or bishop there till the time of Wilfrid, c. 700, it cannot claim to be older than his day. Whoever may be the originator of York school, it is at all events earlier than Archbishop Egbert (Ecgberht), to whom it has been credited by many writers (cf. Diet. Christian Biog.). But their authority is a life of Alcuin by a French monk, in a MS. said to have existed at Reims in 1617, but never seen since, a mere piece of hagiology, and certainly not contemporary. It makes a mystic monastic chain of Greek learning from Theodore to Bede, Bede to Egbert, Egbert to Alcuin, Alcuin to Hrabanus Maurus, the monks of St Gall and so on. It is flattering to insular pride, as it makes England the mother of all continental schools. But the chain breaks at the second link. Egbert was neither a pupil of Bede's, nor Alcuin's master. Nor was Egbert ever a monk, and Alcuin only became one late in life. Had Bede been Egbert's master, he could not have failed to mention it in the well-known letter he wrote to him on becoming archbishop, in which he addresses him, not as a master might have written to a pupil, but as a rather humble but lecturing friend. Moreover, Alcuin himself, in the poem on the bishops and saints of the church of York (Hist. Ch. York., Rolls ser. i. 390), written when schoolmaster at York, only says of Egbert that he was of royal blood, an illustrious ruler of the church and an admirable teacher (egregius doctor) He finds no space for more about him, because his " muse hastens to the end of his song and the doings of his own master, who, after Egbert, received the insignia of the venerable see, Albert, called the wise." On Albert's merits, Alcuin descants in many verses. Nearly related to Egbert, Albert " was sent to the Minster to school in his boyish years and became a priest quite young, and by Egbert was made advocate of the clergy and preferred as master in the city of York." This phrase exactly describes the duties of the later chancellor of the Minster, who was the chief lawyer of the college of canons and also head of the school ; while it shows that the school was the school, not only of the church, but of the city, of the laity as well as of the clergy. Albert taught grammar, rhetoric, law, singing, playing on the flute and lyre, natural history and the church calendar: above all, theology. There were boarders. For " whatever youths he saw of eminent intelligence, these he joined to himself, taught, fed and loved, and so he had many pupils, advanced in various arts." Albert travelled abroad, went to Rome and was received " as the prince of doctors, and kings and princes invited him

to irrigate their lands with learn- ing." But he preferred to return home. Even when he became archbishop, he still continued to teach. Two years before his death he retired, and, of his two chief pupils, Eanbald succeeded him in the archbishopric. But " he gave the dearer treasures of his books to the other son, who was always close to his father's side, thirsting to drink the floods of learning. To the one the rule of the church, its treasures and lands; to the other the school (studium), the chair, the books." This other son was Alcuin himself. A catalogue of the books is given. Besides the " Fathers," including Boethius and Cassiodorus, Popes Leo and Gregory, there were Aldhelm of Sher- borne and Bede the wise. There were Pliny and Pompeius Trogus, Aristotle and Cicero (De oratore). Among poets, there were Virgil, Statius and Lucan. But of four lines full of the names of poets, these are the only ones whom the ordinary classical scholar has heard of. The rest were Christian poets, who versified various parts of the Bible; Juvencus (c. 330), Paulinus (353-431), Prosper of Aquitaine (379-431), Sedulius (c. 460), Venantius Fortunatus (535- 600), Arator (c. 550). Among grammarians were Valerius Probus, Donatus, Priscian, Servius (the great Virgilian commentator). Phocas (who wrote a life of Virgil in verse), Comminianus (probably Commodianus), of the 5th century. There were " many other masters eminent in the schools, in art, in oratory, who have written many a volume of sound sense, but whose names it seemed too long to write in verse." Alcuin himself wrote dialogues on grammar, rhetoric and dialectic. In the first, the speakers were an English boy of 15 and a Frank boy of 14; in the latter, Charlemagne and Alcuin himself. For Alcuin yielded to the temptation which his master, Albert, had resisted, and meeting Charlemagne, on a visit to Rome, accepted the headship of an itinerant school attached to his court, the so-called Palace School. Except for a short visit in 792-793, Alcuin deserted England for Frankland. But he continued to take an interest in the school of York, and in one of his poems expresses the hope that the youth of York will handle Virgil's bow and fill the Frisian ships with poems. When Eanbald II. was ap-

Cointed archbishop of York in 796 Alcuin wrote to congratulate im, and recommended him to divide the school and have different masters for grammar, for song and for writing ; and also to establish hospitals, which he calls by their Greek name (xenodochia) , one of the many proofs that he had a tincture of Greek learning. The advice seems to have been taken, as in later times we find here, as elsewhere, the song school under the precentor quite separate from the grammar school under the chancellor, and St Peter's hospital just outside the cathedral precinct, which was endowed by King

Athelstan, and afterwards known as St Leonard's hospital. In another letter Alcuin sends one of his pupils to King Offa of Mercia to act as master in the school Offa was establishing, and expresses his pleasure at Offa's intention to study and make the light of wisdom, which was extinct in so many places, shine in his kingdom. Whether this refers to the establishment of a school at Lichfield, or elsewhere,

does not appear. It is to be noticed that Alcuin, all the time he was master at York and master of the so-called palace school of Charlemagne, was not a monk but a secular clerk. He always describes himself as Alcuin the levite, or deacon, until in his old age he retired to an abbacy by way of retiring pension. So too Augustine himself, though a monk, when he became a bishop and set up a school, had been advised by Pope Gregory to abandon the monastic seclusion and live with his clergy like an ordinary bishop.

The recognition of this fact is vital to an understanding of the history of schools in England and other modern countries. The history of medieval and modern schools has, thanks to the superior industry and research of the French and Germans, started with Charlemagne and Alcuin. Though the schools of France came straight from the Roman grammar and rhetoric schools, and the English schools, by new importation, direct from Italy, it has always been assumed that their origin was monastic and that monks were the chief educators. This is because Charlemagne, largely it would seem under Alcuin's influence, did make a distinct effort to convert the monasteries practically into colleges and public schools. How far he succeeded in this is very doubtful, but if the monasteries ever did become the seats of public schools, or if the monks did anything for general education, it was only during his reign. Save for that short period, alike in England and on the continent general education and public schools were the exclusive duty and privilege of the secular clergy from the days of Augustine to the days of Laud. The monks from first to last were never public schoolmasters or educators, they never acted as teachers, and the monasteries never kept schools, except for their own novices, and they never, except incidentally as lords of manors or trustees, or transferees of the spiritual rights of secular colleges, even controlled schools.

The early monasteries and monks, as may be seen by the example of even Jerome, not only did not cultivate learning other than that of the scriptures, but even repudiated it as heathenish. It was not till Cassiodorus, about 550, composed his Institutions for the two monasteries he founded in Calabria, that the copying of MSS. and

reading came to be regarded as a monkish duty. The original Benedictine rule a few years earlier set apart only two hours a day for reading, except in Lent. Then, lack of food making the monks less able to labour with their hands, they had three hours' reading in the morning, and had to read one book through in the course of the 40 days. Even this rule was not absolute, special provision being made for work for those who were too lazy to read. There is not a word in the rule to suggest that education was one of the duties of monks or of the objects of a monastery. The only reference to boys is apropos of the reception of new brethren, boy novices ' ' offered ' ' (oblati) at he altar. The Celtic monasteries, according to Dr Skene (Celtic Scotland, ii. 75), became "great educational seminaries, in which the youth of the tribe were sent, not only to be trained to monastic life, but also for the purpose of receiving secular education." But the quotations given from the ancient laws of Ireland and the life of St Brendan in support of this statement by no means bear it out. It may be questioned whether even in Ireland, or its daughter settlement in Wales, at Iona in Scotland and at Lindisfarne in England, anyone other than sucking monks imbibed the milk of learning in the nurseries of the monasteries. Where, however, as in these communities, the church and secular clergy were practically swallowed up in the monastery and monks, where even the bishops became kept officials under an abbot, it is perhaps not possible to draw a distinction between the regular and the secular clergy. The mission of St Columban in 590 took the Celtic monastery to the borders of Alsace, while indirectly through Lindis- farne it may have been known to Alcuin, as it certainly was at Fulda (Skene, 43).

Charlemagne was perhaps consciously acting under Celtic influence when in the council of Aachen (Aix-la-Chapelle), on the 23rd of March 789-790, he entreated the congregations of monks as well as those of the secular canons " not only to get together children of slaves but also the sons of freemen, and take them into their societies," and directed that " schools of reading boys should be established in every monastery and cathedral, where psalms, music (notas), arithmetic and grammar, and the writing of good editions of books should be taught; not allowing the boys, however, to corrupt the gospels, psalters or mass books by reading or writing, but employing men of full age for that purpose." It must have been in pursuance of this design of turning the monasteries to account as schools, that the extant plan of the monastery of St Gall (see Abbey) was prepared. This plan shows an " inner " school of the novices, and an " outer " school for the young gentlemen. The novices' school is shown as a replica on a smaller scale of the monastery, complete

in itself with chapel, dormitory, refectory and infirmary. On the plan of it is written, " In this cloister the oblates are associated with the postu- lants," i.e. the boys offered to God, set apart for the monastic life from infancy, were brought up with the ordinary novices of riper years seeking for admission. This school was at the east end of the church, next to the infirmary of the monks. But the other school, the public school, stood on the north side of the church, as far as possible from the monks' quarters, which, at St Gall, as elsewhere when topography permitted, were on the south. This school was close to the guest hall for gentlemen, near the public entrance to the church from the street. It shows provision for about 150

boarders. The plan is credited to Charlemagne's son-in-law, Egin- hard. But it is known not to have been carried out in its entirety ; and whether any "outer" school was ever actually erected or carried on we do not know. But, if in Charlemagne's time the monasteries in general admitted lay or clerical boys even in a separate outer school, it is certain that the next generation saw them excluded again. A council at Aachen on the 9th of July 817 (Baluze, Capit. i. 581), attended by abbots and a large number of monks, decreed " No school shall be kept in a monastery except for oblates." That this was considered as binding, or at least was followed, in England, is clear from the decrees of this council being included with the rules of Benedict, Dunstan and Ethelwold in the great Saxon monastic collection now in the British Museum (Cott. Tib. A, iii.). In England, at all events from this time, we always find public schools taught not by the monks, but by the secular clergy.

The notion that schools were monastic and monasteries schools is partly due to a verbal confusion, ecclesiastical and monastic having been ignorantly treated as convertible terms. Education and schools were the province of the church, they were subject to the canon law, and every one connected with them was reckoned as a clerk with the privilege of clergy. The secular courts could take no cognizance of pleas concerning the conduct of schools or school- masters, as was emphatically reaffirmed in the Gloucester School Case in 1410, any more than they could as to churches or the conduct of rectors and vicars. Just as they could entertain suits about the .patronage of livings, so they could about the appointment of school- masters, patronage being regarded as property, and a temporal not a spiritual right, as was settled in a case against the Abbot of Battle in 1343.

Both these cases have unfortunately been misrepresented as establishing that the common law of England not only " allowed all to be taught but also controlled the administration of educational foundations " (J. E. G. de Montmorency, State Intervention in English Education, 1902, p. 16). In truth, that was solely the business of the clergy, and especially of the bishops as the ecclesiastical judges of first instance, with appeal to the court of Canterbury and thence to the supreme court of the pope at Rome. There is a decree of Pope Eugenius II. in a synod held in 826 (Dec. prima pars. Dist. xxxvil. c. 12) : " From certain places complaint is made to us that neither are masters found nor care taken for a school of letters (i.e. grammar school), wherefore let all care and diligence be taken by all bishops and their subjects, and in other places where necessary, that masters and teachers should be established to teach continually grammar schools (sludia litterarum) and the principles of the liberal arts, as in them chiefly are the divine commands set forth and declared." This canon only crystallized into statute what had for two centuries at least been the customary law of the church, that schools should be kept in every cathedral city, as we have seen they were at Canterbury, Dunwich and York.

After York the next place in England in which we have actual evidence of a school is at Winchester, to which intellectual superiority seems to have passed with the political suzerainty. In the history of education in the 9th century the name of Alfred takes the place of Alcuin in the 8th. Of Alfred's own education we have no real knowledge, as the tales of the so-called Asser are mere fairy stories (" The Real Alfred," The Times, London, 17 March 1898). But Asser's account of the education of Alfred's children may be accepted as applying to Winchester, and as at all events evidence that there was a public school there in the days when " Asser " wrote, about a hundred years after Alfred's death. Edward the eldest son and /Elfthryth the eldest daughter were bred in the king's court, " nor among their other pursuits appertaining to this life were they suffered to pass their time idly and unprofitably without liberal learning. For they carefully learn the Psalms and Saxon books, especially Saxon poems, and are continually in the habit of making use of books.' But " Ethelward the youngest, by the divine counsels and the admirable prudence of the king, was sent to the Grammar School {ludis liiterariae disciplinae), where with the children of almost all the nobility of the country, arid many also who were not noble, he prospered under the diligent care of his masters. Books in both languages, namely Latin and Saxon, were diligently read in the school. They also learned to write, so that before they were of an age

to practise manly arts, namely hunting and such pursuits as befit gentlemen {nobilibus), they became studious and clever in the liberal arts." This passage so entirely coincides with the description of York school given by Alcuin in its evidence that the grammar school was frequented by laymen as well as clerics, and it is so improbable that " Asser borrowed from Alcuin, that we may take it to be the normal thing that young Englishmen of good birth were brought up in the public grammar schools then as now.

Anglo-Saxon schools were not confined to bishops' sees. Apart from Malmesbury, the story of which has been so obscured by monastic writers as to make it impossible to ascertain whether it had a public school or not, there were public schools in all the principal centres of population, generally marked by being also the sites of collegiate churches. At least, wheiever Ethel- fleda, the Lady of the Mercians, and her brother, Edward the

Elder, are recorded as building " burhs" through the Midlands to consolidate their conquests from the Danes, there we find also collegiate churches of pre-Conquest origin and early grammar schools; e.g. at Stafford and Derby, Huntingdon, Bedford and Leicester, at Bridgenorth, Tamworth and Warwick.

It is perhaps only at the last place that the direct evidence of the continuance of the school from pre-Conquest to post-Con- quest times is preserved. There, in 11 23 (Leach, 'Hist. Warwick School, 1908), the earl of Warwick, having granted to the canons of St Mary's collegiate church in the town " the school of the church, that the service of God in the same may be improved by the attendance of scholars," the older church of All Saints in the castle appealed to the crown, and Henry I. issued a writ to " command that the church of All Saints have all its customs and ordeals … as fully as it used to have them in the time of King Edward and my father and brother and the school (scolas) in like manner." In the result the two collegiate churches were united, the canons of All Saints being transferred to St Mary's and " the school of W T arwick" confirmed to the united church, which was to enjoy the same liberties as London, Lincoln, Salisbury and York churches, i.e. be like a cathedral church of secular canons. That this included the maintenance of a school is clear from a reply to one of a number of questions as to their liberties and customs put by the Warwick chapter to the dean and chapter of Salisbury in 1155, viz. "the scholars to their own master stand and fall," i.e. the master not the chapter was to look after the boys.

Even the Danes became founders of churches and schools. Thus Herman, the historian of Bury, writing in 1098 (Mem. Bury St Edmunds, Rolls ser. i. 46), and speaking of Canute little more than a generation after his death, recalls his charities, how " when he came to a minster or fortified town, he handed over, to be taught at his own expense, for the clerical or the monastic order, not any chance boy of good birth, but the more select of the poor." Abbot Sampson, writing about a century later, c. 1180 (ibid. 126), credits Canute with " instituting public schools (publicas scolas; the earliest use probably of the term public school in any English writer) in the cities and towns, and, establishing masters at the state expense, sent to them boys of good promise to be taught grammar, including even freed sons of slaves." Canute is praised because he turned out the canons from Bury to put in monks. But the school, though it thus fell under the sway of the abbot, continued in the town, outside the precinct of the abbsy, and was served by secular masters. So when Earl, afterwards King, Harold founded the college of Holy Cross at Waltham, the chief officer next the dean was the schoolmaster, Master Athelard, imported from Liege, whose "lessons in grammar and verses and composition did not prevent equal knowledge of singing and divine service. The boys knew the psalter by heart, and entered the choir in procession from school, and on leaving choir returned to school with all the gravity of the regular canons " who in n 77 sup- planted the seculars. The secular canon, one of the expelled, who wrote the history about 1180, was himself the pupil of Master Peter, son of Athelard; for secular canons married and had children.

In the half century which followed the Conquest, the cathedral and many of the collegiate churches were reconstituted and en- larged, the normal number of seven canons being increased, and reaching in some cases as many as fifty. In this reconstitution schools were not forgotten. The statutes called " The Institution of St Osmund," said to have been made at the foundation of Salis- bury Cathedral in 1 091, are in almost identically the same words as the statutes of Lincoln, York and Wells, and they established, instead of two principal persons, provost or dean and schoolmaster, four, viz. dean, singer (cantor), schoolmaster or chancellor (can- cellarius) and treasurer. Of these, " the cantor ought to rule the choir as to singing; the treasurer in keeping the ornaments, the chancellor in teaching school (scolis regendis), correcting the books; the archiscola ought to hear the lessons and determine, carry the church seal, and compose letters and deeds, note the readers on the table as the cantor does the singers. ' The York statutes codified in 1307 expressly state that the

chancellor was " anciently called the schoolmaster " (magister scolarum, a variant of which was scolasticus). At St Paul's a series of documents relating to the chancellor are

endorsed " of the schoolmaster, now the chancellor." When he dropped the title of schoolmaster, the chancellor ceased himself to teach any school except the theological school, in which he continued to lecture until the Reformation, but he always remained the educational officer of the chapter. Thus at York in 1 307 he was bound to be a master in theology, i.e. D.D., and " to him belongs the collation to grammar schools; but the school of York, he ought to give to a regent in arts " (i.e. an M.A. who has not taken his degree more than two years) " to hold for three years, and not longer, except by grace for four years." The grammar schools outside York to which he was to appoint were probably those in York diocese, outside special liberties, such as Beverley (itself a collegiate church), but except for an appointment by the chapter, when the chancellorship was vacant, to Doncaster grammar school in 1351 (A. F. Leach, Early Yorks. Schools, i. 22), we do not know what they were. At Lincoln " no one can teach in the city of Lincoln without his (the chancellor's) licence and all the schools in Lincoln- shire he confers at his own pleasure " (Vict. County Hist.: Lines, ii.).

In London the chancellor was called schoolmaster until 1205. The original writ is still extant (Mem. St Paul's, A. ii. 25), in which, in 1 138, Henry of Blois, bishop of Winchester, acting as bishop of London, holding the see in commendam during a vacancy, enforced the exclusive privilege of Henry the Schoolmaster (scolarum magistro) of St Paul's, ordering the dean and archdeacon " to excommunicate those who without a licence from schoolmaster Henry presume to teach in the city of London, except those teaching the schools of St Mary le Bow and St Martin's le Grand." St Martin's le Grand was itself a collegiate church with a dean and chapter and the duty and right of keeping a grammar school, and St Mary le Bow was a " peculiar " of the archbishop of Canterbury and extra diocesan to London.

Precisely similar provisions prevailed at the great collegiate churches like Beverley and Ripon in Yorkshire, and Southwell in Nottinghamshire (A. F. Leach, Mem. of Southwell Minster, xli. ii. 13, 205), ali pre-Conquest churches and secondary cathedrals to the

vast diocese of York. At the former, where we hear (Hist. Ch. of York, Rolls ser., i. 281) a curious tale about the schoolmaster (scolasticus) , c. 1 100, falling in love with a girl he saw in church, the schoolmaster also became chancellor. In 1304-1306 we find a series of reported cases in which he enforced by excommunication the monopoly of the grammar schoolmaster he appointed against unlicensed rivals teaching in the chapter liberty (A. F. Leach, Beverley Chap. Act Book, i. 42, 48, 55, 102, 108, 114). Similarly the collegiate churches in the castles of Pontefract and Hastings (Vict. County Hist.: Sussex, ii.) had their grammar schoolmasters about 1 100. They were spread all over the kingdom.

The grammar school was a public school open to every one. It has been indeed repeatedly asserted that the cathedral schools were choristers' schools and taught nothing but the psalter and a little elementary Latin grammar. The assertion is founded on a complete misunderstanding. It is a question whether there were any choristers in the 12 th century or whether they are not a later introduction, the canons and their vicars choral or choir deputies at first doing the singing themselves. Choristers at Salisbury are not mentioned in the Institution of St Osmund, and they first appear in the 1220 edition of that document. At Lincoln we first find choristers mentioned in a statute of 1236, " To the Precentor belongs the instruction and discipline of the boys and their admission and ordering in choir." At York the 1307 edition of the statutes says " the collection (i.e. appoint- ment of masters) to song schools belongs to the singer," now called precentor, " and cases affecting them ought to be heard and decided by him, though execution belongs to the chapter " (Leach, Early Yorks. Schools, i. 12). At St Paul's there was no precentor till the 13th century and there is no mention of choristers till 1263, though school-boys (pueri scolarum) appear as witnessing a deed between 1142 and 1148 and receiving 4d. for cherries for doing so. It must be remembered also how very small the number of choristers was and how incapable of con- stituting a school. At St Paul's they were only eight until the 1 5th century, at York only seven in the 14th. So far from the grammar school being a school solely or even chiefly for choristers, there are several cases in which contests arose whether they had any right of admission to the grammar school. Thus the 14th century register of the almoner or almsgiver of St Paul's, who about 1 1 80 was given a house for the poor, in which later the choristers were boarded, records that the grammar school-master claimed five shillings a year for teaching them grammar. At Beverley in 1312 a contest between the grammar school- master and the song schoolmaster took place as to whether the grammar

schoolmaster was bound to admit all choristers

free, or only the original number of seven. It was held after evidence as to old custom that all must be admitted free. But there could have been no doubt if the grammar school had been for their sole or chief benefit. A contest at Warwick between the grammar schoolmaster and the music school- master, about 1 21 5 (or 1315), owing to the latter intruding on the domain of the former, was settled by the chapter on the basis that the latter was to teach no grammar, but only " those learning their letters, the psalter, music and song " (A. F. Leach, Hist. Warwick School, 62-66). Everywhere from the 13th century onwards the song or choristers' school was of the nature of an elementary school, like that attended by Chaucer's " litel clergeon " in the Prioress' Tale, in which the boy " sat in the scole at his prymer " but could not construe the Alma Re- demptoris because "I lerne song, I can (i.e. know) but smal grammere." Even in quite small places, as at Northallerton, Yorkshire, the distinction between the grammar school and the song school was at first strictly drawn, but tended to disappear in the dearth of M.A.s after the Black Death (Early Yorks. Schools, ii. 60-62). In the larger places the distinction was strictly maintained until the Reformation, when the song schools disappeared, except in the cathedrals and the few collegiate churches, including Winchester and Eton, which survived it, and at Newark and Coventry.*

The cathedral and collegiate church grammar schools under the control of the secular clergy in the person of the chancellor of the church furnished the chief, and perhaps in the 12th century the sole, supply of schools. There is, however, some excuse for the notion that monasteries kept them, in the fact that in England, differing from the rest of the world, the cathedral churches had, in many of the chief places, notably Canterbury, Winchester and Worcester, during the monastic outburst con- nected with the names of Ethelwold bishop of Winchester and Dunstan of Canterbury, been taken from the secular clergy, and monks placed in their room. In those places there was no chancellor. But so essentially was education regarded as the business) not of monks, but of the secular clergy, that even in these places the grammar schools were not placed under the monks but remained under the immediate care of the bishop, either personally or through his archdeacon, a secular. Thus we find at Winchester about 1 1 54 Master Jordan Fantosme and John Joichel (Jekyll), " clerks of the bishop of Winchester," carrying an appeal from the bishop about the right to teach the school at Winchester first to the Court of Arches and then to the pope, and as late as 1488 Bishop William Waynflete appointing a master to the grammar school "

called in the vulgar tongue, the High School "■ (A. F. Leach, Hist. Win. Coll.). This school was in Symonds Street outside the monastic precinct. So at Canterbury the grammar schoolmaster appears among lay witnesses in 1259; his right to excommunicate anyone assaulting his scholars or carrying on a rival school was allowed on appeal to the Court of Arches, on production of a confirma- tion by the archbishop of the right as already ancient in 1292, and appointments by the archbishops of the master in 1306, i3ir, 1375 and 1443 are preserved (The Times, Sept. 1897). Here also the school was outside the monastic precinct, by the parish church of St Alphege in the town (Guardian, 12 and 19 Jan. 1898). Similar evidence is forthcoming at Worcester, Norwich, Carlisle and elsewhere.

At the end of the nth and beginning of the 12th century a renewed movement began for the further extrusion of the secular clergy, on the ground of their wicked lives, the wicked- ness being that they insisted on the liberty to marry, and for the conversion of collegiate churches into monasteries of the new orders, first of Cluniac monks, then of Augustinian, Black or regular canons, who eschewed matrimony. Thus Dunwich School passed under the rule of Eye Priory (Cluniacs) between 1076 and 1083; and Thetford School to Thetford Priory (Cluniacs) in 1094, though it was released again to the secular dean of Thetford in n 14. Similarly the government of Glouce- ster School was handed over to Llanthony Abbey (Augus- tinians) in 1 137; Reading School was given to the newly-founded

Reading Abbey (Cluniacs) in 1139; Dunstable School to Dun- stable Priory in 1130; Derby School to Darley Priory (Augus- tinian) about 1150. Bedford collegiate church was converted into a priory and moved to Newnham, and its right to the school acknowledged by the archdeacon of Bedford in n 55. A similar acknowledgment is found at Christ Church, Hants, in 1161; while Bristol School was taken from the Kalenders Gild and handed to Keynsham Abbey in 1171; and Arundel School to Arundel Priory at some date unknown (see articles on " Schools " in Victoria County History for the several counties in which these places occur). But these transfers did not make the schools monastic in the sense that the schools were kept in the monasteries or taught, much less frequented, by monks. The schools remained secular, outside the monastic precincts, frequented by lay boys and secular clerks, and taught by secular clerks,

sometimes in holy orders — and at that time even sub- deacons were reckoned as holy orders — but more often only in minor orders, and not seldom married men. Thus in 1420 the Patent Rolls show us one Ralph Strode, master of the scholars of the city of Winchester, bringing an action with Dionysia his wife. All that was transferred to the monks was the right of appointing the schoolmaster and the power and duty of pro- tecting the authorized schoolmaster's monopoly. At Bury St Edmunds indeed the extrusion of seculars had gone so far that even the archdeaconry of Bury was vested in the monastery and exercised by the sacrist of it, subject to appeal to the abbot (Vict. County Hist.: Suffolk Schools, ii.). The substitution of regulars for seculars ceased in the latter part of the 12th century, owing chiefly to the secular clergy at length, under papal pressure, accepting the rule of celibacy, and to the growth of universities. The universities were developed out of the cathedral and collegiate church schools. In the days of Alcuin, as we saw, the one schoolmaster taught all subjects from the elements of grammar to theology and philosophy. In Italy the faculties of law and medicine had early in the 12th century developed schools of their own. In France theology similarly segregated itself, and, owing to the fortunate independence which the collegiate church of St Genevieve enjoyed from the jurisdiction of the scolasticus or chancellor of Notre Dame, much as in London the master of St Martin's le Grand did from that of the chancellor of St Paul's, rival schools of theology became possible, and the university of Paris, essentially a theological university, was born. The first university teaching in England came, not from France, but Italy, and was not in theology but law, and at Oxford the two collegiate churches of St Frideswide and St George's in the castle occupied much the same relative position as Notre Dame and St Genevieve at Paris. It is rather in their development and rivalry, not in a purely imaginary colony from Paris, that the origin of Oxford University must be sought. But the story of universities (q.v.) is told elsewhere. The im- portant thing for the schools was that the university movement made the cathedral schoolmasters devote themselves to theology and to grown-up students, to the exclusion of grammar and arts, and left the grammar school entirely for boys and youths to be instructed in classical literature, rhetoric and the elements of logic, preparatory for the university. Moreover, the move- ment for university colleges perhaps caused a new crop of collegiate churches to spring up, of which grammar schools formed an integral and important part. In the quinquennium 1260 to r265, the collegiate church of Howden was founded, on the Yorkshire estates of the bishop and priory of Durham at one end of the kingdom, and that of Glasney in Cornwall on the estate of the bishop

of Exeter at the other. These were ordinary colleges of secular canons with grammar schools at- tached, and the schools outlived the colleges at the Reformation. They were contemporary with the first university colleges. The college of St Nicholas, with 20 university students, was founded by Bishop Giles Bridport of Salisbury at Salisbury in 1 26 1, Merton College by Walter of Merton at Maiden in Surrey in 1265, and St Edmund's College at Salisbury by Bishop Wyly in T270, and Merton College was moved to Oxford in 1275. The difference between these colleges and the ordinary collegiate

churches was simply that the former were ad orandum et studen- dum, the latter ad studendum et orandum. So closely did Merton College follow the ordinary collegiate church model, that its chapel was an impropriated parish church and it contained the usual appendage of a grammar school, though it was limited to 13 boys, who were to be of the founder's kin. The master who taught them was called the " master of glomery," an odd corruption found also at Salisbury, Cambridge and Orleans A similar grammar school was found at Queen's College in 1340, but this from lack of endowment was never developed according to its founder's intentions. These two colleges formed a starting point for yet another new development, when William of Wyke- ham, in founding New College on a scale more than twice as large as Merton, separated the grammar students from the theological and legal students, and placed the former as the main object of a separate, though connected and more or less subordinate college, at Winchester in 1382. Though Winchester was the first boys' school-college, Oxford itself had been ap- parently the first place in medieval England at which grammar schools were maintained as separate entities, not attached to cathedrals or colleges, and practically as private adventure schools. The university apparently placed no limit on their number and rivalry, though retaining control and supervision over their efficiency, through two grammar school surveyors elected by convocation.

In the first quarter of the 14th century even the monasteries contributed to the spread of education by almonry schools, which were now built as quasi-separate institutions by, or just outside, their outer gates, under the management of the almoner or almsgiver of the house. The almonry boys were apparently introduced as choristers to sing in the Lady chapels, which had become almost necessary appendages to great churches. At Canterbury a staff of six secular priests with clerks and scholars was established in the Lady chapel to sing for the soul of Edward I. in 1319. The scholars were admitted at ten years old and might stay to twenty-five, but were

expected to be ordained sub-deacons and retire at twenty. They were lodged in a separate hall {Aula Puerorum), but waited on the sick and infirm monks who lived in the infirmary. At first they were taught wholly in the city or archbishop's grammar school. But by 1362 they had a separate grammar master, probably only as a house master, as the one mentioned in that year found Kingston school a better post, to which he had gone off without notice. The master was always a secular, and in 1451 was a married man. There is no evidence as to how many boys there were. At Westminster boys first appear in the almonry in 1354, and they first had a master in 1367, who from 1387 onwards, but not before, is called school- master. The boys numbered thirteen in 1373, twenty-eight in 1385, twenty-two in 1387. The normal number seems to have been twenty- four (A. F. Leach in Journal of Education, Jan. 1905). This almonry school for charity boys is the only school, other than the novices' school, which existed at Westminster Abbey before, on its con-version into a cathedral by Henry VIII., the present school with forty scholars and unlimited town boys was established On the model of the old cathedral grammar schools. At Durham the almonry school first occurs in 1352; their master is first called schoolmaster in 1362 (Ibid. Oct. 1905). At the dissolution there were thirty boys, who waited on the monks in the infirmary, prayed all night round dead monks, sang in the Lady chapel, were fed on the broken meats from the novices' table and lodged in a hospital or infirmary opposite but outside the great gate of the monastery. At Reading almonry boys first appear in 1346, and were ten in number. They seem to have attended the town grammar school. At St Albans statutes were made for apparently thirteen almonry boys in 1399, who lodged by the great gate but attended the grammar school in the town. At Coventry there were fourteen boys in the almonry school, and the town quarrelled with the prior in 1439 for trying to interfere with the town grammar school for the benefit of the almonry school. The Carthusian monastery at Coventry had twelve boys in its almonry. At St Mary's Abbey, York, the almonry had fifty boys who attended St Peter's, i.e. the city and cathedral grammar school (Early Yorks. Schools, i.).

Taken altogether these almonry schools provided for the education of, or gave exhibitions to, a large number of boys, probably not less than 1000 in all. But they were not " monastic "; the boys themselves were not novices or oblates, and were looked after and taught by seculars. Various efforts were made in the 14th century and onwards to make the monks themselves learned. By papal statute in 1337 the Benedictine monasteries were each to send 5% of their number to the

universities. Though Gloucester College had been established at Oxford in 1283 (reorganized in 1291) to receive them, not J % of the monks went there, for there is reason to think it never had more than sixty, and in 1537 had only thirty- two students (Vict. Co. Hist. : Gloucester, ii. 342) . Also the monasteries

were ordered to provide a grammar master who might be, and in fact nearly always was, to teach the young monks and novices. Yet in 1387 the Winchester cathedral monks were found by William of Wykeham to be ‘ wholly ignorant of grammar ” and to make the lessons in church unintelligible by wild false quantities. In the visitations of Norwich monasteries in the late 15th century (Dr Jessopp, Camd. Soc. 1892) hardly one had its grammar master as it ought to have had. In 1495 Osney Abbey provided for the monks a grammar master who was a secular (Boase, Oxford, Historic Towns). At Canterbury itself Archbishop Warham in 151 1 found the monks totally ignorant of the meaning of the mass and of the lessons which they read, and ordered them to have a grammar master to teach the young monks. In 1531 Bishop Longland of Lincoln issued injunctions to Messenden Priory in English ” for that ye be ignorant and have small understanding of Latin.” At the Dissolution a grammar master was teaching the monks at Winchester grammar, but he was not a monk but ex-second-master of Winchester College (Hist. Winchester Coll. 26), and other Wykehamists were to be found teaching grammar at the London Charterhouse and Netley Abbey, Hants. It is clear that the monks were by no means a learned body.

It is chiefly from the London and Oxford schools that we learn what grammar schools actually taught in the 12th to the 15th centuries. The local classicus is Fitzstephen’s Description of London (Mat. Hist. Becket, Rolls series, iii. 4), as it was in the youth of Thomas a Becket when about 1127 he attended St Paul’s school, “the city school,” before going to Paris university. Fitzstephen describes the contests of the scholars from it and the other two schools on saints’ days, when the elders contended in logic and rhetoric, and the boys ” vie with each other in verses, or in the principles of the art of grammar or the rules of preterites and supines, others in epigrams, rhymes and metres “; while on Shrove Tuesday, after a cock-fight in the morning, they had a great game of (foot?) ball in Smithfield. About a century later, 1267, Oxford University statutes show us that B.A.s had to read for their degree Priscian On Constructions twice, and Donatus’s

Barbarismus once; books which imply an advanced knowledge of Latin syntax. The Oxford grammar school statutes, not dated but of the 13th century, provide for grammar masters being examined in verse-making and prose composition and knowledge of Latin authors before being licensed to teach. The only authors actually mentioned, and that for the sake of being forbidden as improper, are Ovid's Art of Love and Pamphilus who wrote De Amore. Every fortnight the masters were to set a copy of verses and letters to write, which the boys were to do the next holiday, and show up on the following whole school- day. Special attention was to be paid to the smaller boys in hearing and examining them on their rules as to parts of speech and accidence. It was particularly ordered that they were to observe the rule in Latin and Roman (Romanis), i.e. translations were to be done not into English but Romance, i.e. French. For after the Conquest French was the vernacular language of the upper classes, and while the pre-Conquest school glossary of ˆElfric translated Latin into English, the post-Conquest glossaries, such as Neckam of St Albans school, give the translation in French. Though by the 13th century English was supplanting French, the schools as usual lagged behind, and the fiction was kept up that French was still the vernacular of England till after the victories of Edward III. John of Trevisa, translating the Polychronicon of Higden, who, writing in 1327, commented on the corruption of English due to the strange custom of boys in school being compelled to construe in French, tells us that this custom of construing into French " was changed after the first murrain (the Black Death of 1349) by John Cornwal, a ' mayster of gramere,' " followed by Richard Pencrych, so that " now, A.D. 1385, in al the gramer scoles of Engelond children leaveth Frensch and construeth and lurneth an Englysch," the advantage of which was that they learnt Latin quicker, but the disadvantage was that they knew " no more French than their left heel." Master John Cornwall was an Oxford grammar schoolmaster, being paid iod. in 1347 for " salary " of his school for the six founder's-kin boys at Merton ; and Pencrych was not, as supposed by Mr de Montmorency (State Intervention, 22) through a strange misunderstanding, a school- master at Penkridge in Staffordshire (though he no doubt took his name from that place), but was another Oxford man, living in 1367 in a hall by Merton, afterwards called Pencrych Hall. Though this very rational innovation thus began in Oxford, yet a new edition of the Oxford Grammar School Statutes in the late 14th or early 15th century provided that the masters should in construing teach the meaning of words by turns in English and French, " lest the French tongue should be utterly lost," as it came to be.

It is extremely difficult to ascertain what books were actually read in English schools before the 16th century. Whether the Christian poets such as Sedulius and Juvencus, the staple of Alcuin and recommended by Colet for St Paul's in 151 8, were much read in the intermediate times, is doubtful. Vincent of Beauvais, who wrote about 1245 " on the education of noblemen " for the queen of France, quotes Horace, Ovid, Apuleius and Valerius Maximus, but would like to substitute the Christians for the classics. But he was a Dominican friar. It is certain that classical authors were not expelled. In 1356 Bishop Grandison of Exeter abused the school-masters of his diocese for taking the boys, " as soon as they could

read the Lord's Prayer, the creed or matins and the hours of the Virgin, and before they could construe or parse them," to " other school books and poets as if they were heathens instead of Christians." Books of manners in verse were read in schools from the days of John de Garlandia, c. 1220, to the Quos decet in mensa of Sulpicius, a Roman schoolmaster of 1498, which was read in the lower forms of Winchester and Eton in 1535. The metrical grammar of Alexander of De villa Dei (Dol) was almost as popular as Donatua. In rhetoric Cicero De oratore was the staple work. In dialectic as logic successive manuals were founded on Boethius and Isidore of Seville. The 15th century saw a reaction against the logic, which, valuable as it was, was begun much too early and was strongly reprobated by Wayneflete, who at Magdalen School insisted that his " demyes," or scholars, should not go on to logic till perfect in grammar. The wide knowledge of the classics shown by Chaucer, who no doubt, like Becket before him and Milton after him, went to St Paul's school, indicates what the average laymen and cleric learnt in the average grammar school.

A question has been raised as to who attended the grammar schools. The answer appears to be, all classes. Theoretically, sons of slaves and villeins were excluded. But it seems certain that picked specimens even of this class were admitted. The bulk of early schools were then, as now, in cities and boroughs, where all were free. ˆElfric's Anglo-Saxon colloquies represent sons of smiths, huntsmen, cowherds, shepherds attending school and learning Latin. That villeins' sons did go to school is clear from two instances alone. In 13 12 Walter of Merton, fellow of Merton College, Oxford, a villein, was manumitted by the prior of Durham. In 1344 the manor rolls at Great Waltham, Essex, show a villein fined 3d. for sending his son to school without licence from the lady of the manor (Hist. Rev., July 1905). In 1391, after the Peasants' Revolt, the Commons sent up a bill to Richard II. '•' that no neif " (said to mean a female villein) "

or villein may henceforth send their children'to school (a escoles) for their advancement by clergy, and that for the maintenance and salvation of the honour of all the freemen of the realm." The petition was rejected. In 1406 the statute of artisans, while putting numerous restrictions on their freedom, adds, " provided always that every man or woman of whatever estate or condition shall be free to send their son or daughter to learn grammar (Mtterature) at any school in our kingdom." Henry VI., in the statutes of Eton, bears witness to the admission of the un- free to schools by inserting a reactionary prohibition against villeins (nativi) or illegitimate children being admitted scholars. Illegitimates were theoretically excluded from the priesthood, but the papal registers are crammed with indulgences to scholars who were illegitimate for admission to holy orders. As to the upper class, an erroneous inference that gentlemen's sons were not sent to school has been drawn from the passage of Higden above quoted, because, after saying that children in grammar schools learnt no French now, he adds that neither did gentlemen teach their sons French. But the two classes are not mutually exclusive. Elder sons, who were going to be knights or squires, did not as a rule go to school, but the younger sons did. The vast majority of bishops, and the higher clergy, were the younger sons of noblemen and gentlemen, and had certainly been to school. It is made a reproach against Bishop Grosseteste of Lincoln in his contest with his chapter that he was not a gentleman. We find Giffard, archbishop of York, son of a great Gloucestershire magnate, sending three wards to Beverley grammar school in 1276, and another archbishop of York, William Melton, ex-privy seal arid lord chancellor, sending two nephews to Newark school in 1338. The only known mention of the school of Taunton before the days of its wrongly-reputed founder, Bishop Fox, is preserved in an inquisition in 1310 to prove the age of a royal ward, Hugh, son and heir of Thomas de la Tour. John of Kent, 60 years old, knows Hugh's age because he had a son at the school of Taunton with him seventeen years before (The Genealogist, iii. 211). This cannot have been an isolated instance. William of Wykeham would not have provided for " 10 sons of noblemen and gentlemen, special friends of the college," being admitted as commensales or boarders with the scholars, nor have forbidden the scholars of Winchester and New College to quarrel as to whether their birth was noble or otherwise, nor would the earliest lists of scholars and commoners there contain the names

of sons of judges and masters in chancery and country gentlemen, like the Pophams of Dorset and the ffaringtons of Lancashire, if the gentle classes were not already in the habit of going to school. At Eton the number of noblemen and gentlemen commoners was doubled. The first or second headmaster and third provost of Eton, William Westbury, a Winchester and New College scholar, was almost certainly the son of the chief justice of that name. In 1464 Mr Thomas Bourchier, son of the earl of Essex and of Eu, nephew of the archbishop of Canterbury, was a commoner outside college at Winchester, and in 1479 the son of William Paston, the judge and Norfolk landowner, was^ writing verses at Eton in his letters home. In 1 502 Sir John Percy vale founded Maccles- field grammar school expressly for " gentlemen's and other good men's sons thereabout."

Tuition fees were normally paid in grammar schools. In 1277 the fee paid to the " master of glomery " at Oxford for five Merton founder's-kin boys was sod., or 4d. a head a term; in 1306 the " scolagium " of eight boys in the winter term was 3s., of seven boys in the Lent term 2s. lid. and in the summer term 2s. 4d., a variation from 4d. to 4fd. and 5d. a term, probably owing to varia- tion in the length of the term, and representing Jd. a week. In that year the dica of the usher was Jd. a term, and in 1310 the usher was paid 4d. for three terms for eight boys, or |d. a term. The usher must have been paid something by the master, as even in that age, when the majority of livings were under £3 a year, a halfpenny could hardly have been a living wage for eight weeks. Perhaps the usher got a share of the levy of 2d. a head for offerings to the light of St Nicholas, the school boys' patron saint. For at Worcester in 1 29 1 the bishop was called in to settle a quarrel between the school- master and the rector of St Nicholas church as to the right to the wax which guttered from St Nicholas' light, which the boys main- tained. An undated Oxford statute of the 15th century fixes the upward limit of grammar school fees at 8d. a term {Reg. Giffard, f. 341). The tariff settled by the bishop of Norwich, for Ipswich grammar school in 1476-1477 was iod. for grammarians, 8d. for psalterians, or those learning to read the psalter in Latin, and 6d. for primerians, or those learning the primer or accidence (Vict. Co. Hist., Suffolk, ii.). But the corporation rebelled against the fee of iod. for grammarians, and in 1482 cut it down to 8d. a term. This was certainly the normal fee. In the return of chantries at their dissolution in 1548, the school at Newland is reported (Leach, English Schools at the Reformation, 78) to have been founded in 1446, to be " half-free, that is to say, taking of scholars learning grammar 8d. the quarter, and of others learning to read 4d. a quarter."

At successive epochs there have been attempts to make education free (Journ. of Educ, June and July 1908). Hitherto after every attempt fees have crept back under some guise or other, as the endowments provided to ensure freedom were often inadequate to start with, and anyhow became inadequate by change in the value of money, while the inveterate habit of the rich in giving " tips " to secure special attention forced contribu- tions on others. The movement began under the Roman Empire, Pliny founding a practically free school at Como, while successive emperors from Vespasian onwards extended the area and pay of public schools at the state expense, both of rhetoric and grammar. There can be little doubt that the cathedral schools were intended to be free just as much as the church services. Yet it had become necessary by the Lateran Council in 1 1 79 for the canon law definitely to provide that, " to prevent the poor who could not be helped by their parents' means from being deprived of the opportunity of learning and advancement," every cathedral church should provide a competent benefice for a master to teach the clerks of the church and poor scholars gratis : and that in other churches if any endowment had been assigned for the purpose it should be restored, while no fees were to be exacted for licences to teach. At the next Lateran council in 12 1 5 this canon was recited and its non-observance in many places lamented. The canon was confirmed and extended from cathedrals to all churches of sufficient means, while the cathedrals were also directed to provide a theological lecturer. That the first canon was not everywhere a dead letter is proved by the grant about 11 80 of Archbishop Roger to the chapter of York of £5 a year " to the fee of your school," charged on the synodals of three archdeaconries, confirmed by Archbishop Geoffrey (1191-1212), and arrears demanded in a violent letter by the chancellor to Archbishop Giffard in 1271 (A. F. Leach, Early Yorkshire Schools, c. 12-16). So at Bury St Edmunds in 1180

Abbot Sampson, who had himself when a boy and a secular clerk been admitted to the grammar school free as a special personal favour, first made the grammar school free of fees for " school-hire ' ' by giving it a school house outside the abbey in the town, and a few years later endowed it with half of a living worth £5 a year, for which the master was to teach 40 boys free, relations of the monks being preferred. There were also many exhibition endow- ments, which made schools free or partially free for poor boys, such as the provision at St Cross Hospital, Winchester, founded in 1 130, of free meals daily for twelve boys from the High School, Winchester; and an endowment given to the Durham Abbey almoner about n 80 for board and lodging of three boys from Durham grammar school, while

at St Nicholas' Hospital, Ponte- fract, the custom was ancient in 1267 to provide 40 loaves a week " except in vacations " for the scholars of Pontefract school, which is mentioned about n 00 as granted to the collegiate church in the castle there. It is significant that while the inquisition which established this custom was taken in French in 1267 it was confirmed in a mixture of Latin and English in 1464. In con- nexion with Stapledon Hall, now Exeter College, Oxford, Bishop Stapledon about 1327 provided for twelve scholars of Exeter Cathedral grammar school being boarded and clothed gratis in St John's Hospital by one of the gates of the city. In 1441 St Anthony's school was established in St Anthony's Hospital, London. Later, as in the famous case of Banbury Hospital, under Stanbridge in 1501, hospitals were bodily con- verted into schools, a precedent frequently followed since. Henry VI., in 144.1, under the guidance of Chicheley and Wayneflete, copied Winchester down to the minutest particulars, and the wording of its statutes, but with the important difference that its school was declared, what Winchester was not, a free grammar school open to all from all parts of England. Another class of school, which if not free at first generally became so, was that of the grammar schools established by joint stock effort of the numerous gilds, or trades unions, which studded the towns. As the London City gilds still keep chaplains, so nearly every gild maintained one or more priests to perform the gild masses, say grace at the gild feasts, and bury the gild brethren and sisters and pray for their souls. Some of the larger ones converted parish churches, as at Boston, into little less than cathedrals in size and splendour, with a staff of priests and singing clerks as large as that of the greatest collegiate churches. Some of these priests or clerks kept schools of grammar and of song. There are unfortunately no accounts of such gilds preserved earlier than the 15th or 16th centuries. But there can be no doubt that they kept schools much earlier than that. The grammar schools at Louth and Boston, which appear, the former in the 15th century and the latter in the 14th, in gild documents, occur in other documents in 1276 and 1329 respectively. The school of the gild of Wisbech in Cambridgeshire is similarly mentioned in 1446. At Stratford-on-Avon the school appears in the earliest extant gild accounts, in 1402, but existed more than a century earlier, when, in 1295, its master or " rector " was ordained a subdeacon side by side with the rector of the parish church, William Gren- field, a future archbishop of York. It was converted into a free school by endowments given by one of the gild priests in 1482, and has continued without intermission to the present day (Vict. Co. Hist., Warwick, ii. 329).

Probably the most numerous schools were those kept by chantry priests, endowed by single benefactors to pray for their souls, who sometimes by express terms of the foundation, more often perhaps to occupy their time or eke out not too substantial endowments, kept schools. These were sometimes free, more often at first not. But we know scarcely anything of these schools before the 14th century, the foundation deeds of those isolated institutions not having been preserved like those of colleges. We find, however, Oswestry endowed as a free school by David Holbeach, a lawyer, about 1406; Middleton, Lancashire, by Bishop Langley of Durham, in 141 2; Durham itself by the same in 1414; Sevenoaks by William Sennock (Sevenock), a London grocer, the schoolmaster of which was " by no means to be in holy orders," in 1432; Newport, Shropshire, by Thomas Draper,

1442; Newland, Gloucestershire, by Robert Gryndour esquire, 1446; Alnwick, Northumberland, by William Alnwick, bishop of Lincoln, 1448; Deritend, now in Birmingham, 1448; Towcester by Archdeacon Sponne in 1449. There was somewhat of a stoppage of such foundations during the Wars of the Roses, but it was resumed with renewed vigour during the later years of Edward IV., and under Henry VII., and continued to the dissolution of monasteries. Among colleges may be noticed Acaster College for three schools of grammar, song and scrivener craft, i.e. writing and accounts, by ex-chancellor Bishop Stilling- fleet about 1472; Rotherham College with three similar schools by ex-chancellor Archbishop Rotherham, 1484; Ipswich by the chancellor Cardinal Wolsey, 1528; and among chantry schools, Hull, 1482; Long Melford, 1484; Chipping Camden and Stow on the Wold, 1487; Stockport, by ex-Lord Mayor Sir Edmund Shaa, 1487; Macclesfield, by ex-Lord Mayor Sir John Percival, 1502; Cromer, by ex-Lord Mayor Read, 1505; Week St Mary, by the ex-Lady Mayoress Percival, 1508; and so on. The re-endowment of the old St Paul's school, London, by Dean Colet in 1 5 10-15 1 2, with the property he inherited from Lord Mayor Colet, and its transfer under papal, episcopal, capitular and royal licence from the dean and chapter of St Paul's to the Mercers' Company, and its conversion into a school free for 153 boys, created no small stir. Especially was this so, because it is the first instance in which the teaching of Greek is mentioned in school statutes, though only in the tentative form of a direction that the high master should be learned in Latin " and also in Greek yf suyche may be gotten." Though Greek

was probably taught at Eton and Winchester under William Horman, head- master of Eton (1485) and Winchester (1494), whose Vulgaria, composed when headmaster, contains frequent references to Greek, and even to a Greek play seemingly prepared by the boys, it did not become a regular school subject till the reign of Eliza- beth. School exercises in Greek at Winchester under Edward VI. are preserved, but Sir Thomas Pope says it had been dropped at Eton under Mary. There is no evidence of it at St Paul's before Elizabeth's reign. At the time of the meeting of the Reformation parliament in 1535 there were between 300 and 400 grammar schools in England, the majority of which were free schools, charging no fees for teaching.

Free schools received a notable accession, on the dissolution of monasteries, in the schools attached to all the cathedrals " of the new foundation," except Winchester, by Henry VIII. in 1540, including Gloucester, Bristol, Peterborough, Chester and West- minster, which had not been cathedrals before. On the other hand, the list of free schools and endowed schools was much re- duced by the doctrine which treated the endowments of schools under the control of monasteries not only through the 12th century transfers but even by much later and known foundations as trustees, as included in the confiscation of the monastery itself. Coventry, St Albans, Eye, Reading, Bury St Edmunds, Abing- don, Faversham are some out of many which suffered from this doctrine, and if they did not in fact cease, were for a time deprived of their endowments and only revived with new ones. Reading school was actually granted to its master, an Eton and King's scholar. St Albans was restored by the munificence of its last and well -pensioned abbot; Bury St Edmunds, like a good many more, by grant of Edward VI.; Abingdon by a private donor; Faversham by restoration of the trust-property on cause shown. But many, like Dunwich, perished irretrievably.

Spite of the dissolution of monasteries, the creation of chantry schools and other grammar schools went on. In this very year, 1540, John Harmon (who is generally known by his assumed name Veysey or Voysey), bishop of Exeter, endowed Sutton Coldfield grammar school, and in 1544 made its gild the governors. One of the latest of great schools, that of Berkhamsted, was founded by John Incent, dean of St Paul's, in 1541; while archbishop Holgate of York founded three free grammar schools, though without any chantry provisions, at York, Malton and Hemsworth in 1 546. In 1 548 all the endowed schools in England , other than the cathedral schools, were threatened and the vast majority destroyed by the act for the dissolution of colleges and

chantries. Only Winchester, Eton and Magdalen College arhool were exempted, and they owed their exemption to being regarded as part of the universities with which (through New College, King's and Magdalen) they were connected; and even they had been included in the similar act passed in 1546, which was, however, permissive and lasted for Henry VIII. 's life only. The Chantries Act, while providing for the abolition of colleges, gilds and chantries, contained indeed provision for the continu- ance by special order of all schools attached to them, which were grammar schools by foundation, and for their increase and en- largement out of the confiscated lands. Unfortunately there was neither time nor money to spare for the purpose. A com- mission consisting of Sir Walter Mildmay, afterwards chancellor of the exchequer, and Robert Keylway, or Kelway, afterwards serjeant-at-law and author of Kelway's Reports, continued by warrant of the 20th of June 1548 " until further order " such schools as were clearly shown to be grammar schools by founda- tion, at the net income specifically enjoyed by the schoolmasters at the time. The " further order," which was to re-endow them with lands, never came. Only in a comparatively few places, where the inhabitants or powerful persons bestirred themselves to beg, or more often to buy, chantry lands from the Crown, were the schools restored and re-endowed. The few that were restored, and even by an irony of fate some of those which were deprived of their lands by Edward VI. but managed to struggle on, got the name of Free Grammar Schools of King Edward VI. So Edward VI. has been credited with being not only the founder of schools, estimated by various writers at 22, 30 and 44 in number, of which in the most favourable cases he increased the endowment, but also with being the promoter instead of the spoiler of a grammar school system. The earliest school actually restored by him was Berkhamsted, which was refounded by act of parliament in 1549; St Albans, Stamford and Pockling- ton being also refounded by acts of the same year. Acts of parliament were found too cumbrous. Some, as at Morpeth, Northumberland, and Saffron Walden in Essex, were refounded by grant to a town corporation of gild property with a grammar school attached. Most of the later refoundations were by letters patent. The first refoundation by patent for a school per se under a governing body created ad hoc was that of Sherborne, 13th of May 1550, Bury St Edmunds often, but wrongly, claimed as the first, not being till the 3rd of August 1550. The bulk were refounded in 15 51-15 53.

The notion that there was any great advance or change in the curriculum of schools at the Reformation is erroneous. There is

hardly any difference between the authors prescribed at Bury in 1550 and those at Ipswich in 1528; Cato's Moralia, Aesop, Terence, Ovid, Erasmus, Sallust, Caesar, Virgil and Horace appearing in the statutes of both. If anything Ipswich was the more advanced, as Wolsey directed his boys to be taught precis writing in English, and essays and themes, also apparently in English, which are not mentioned at Bury. But Ipswich was a school of the first grade with eight forms, whereas at Bury only five were contemplated. The reign of Mary did not affect the schools as such one way or the other. Several, like Basingstoke grammar school and St Peter's school, York, were re-endowed in her reign, the former by restoration of gild lands, the latter by appropriation of the endowment of a hospital for poor priests. " Heretic " masters were extruded, and occasion- ally, like the master of Reading school, Julian Palmer, burnt. Similar extrusions of Romanists followed on the accession of Elizabeth. In 1580 and subsequent years the bishops were ordered to inquire as to schoolmasters who did not attend church or had not licences from the ordinaries to teach. The visitations of the chapter of Southwell as ordinaries in their liberty show schoolmasters in many small towns and villages, some of them " popish recusants," and others inhibited until they had been duly licensed. How far they taught grammar schools and not elementary schools is not very clear. But one unfortunate result of the suppression of the song schools was that attempts were now made, as at Wellingborough in North-amptonshire, to make the grammar schools serve the two

Incompatible purposes of grammar and elementary schools, with the result too often that the grammar school was degraded and the elementary school inefficient.

The number of school foundations credited to Queen Elizabeth or her era is very much larger than the facts justify. The greatest of all, Westminster, which during the 18th century was facile princeps in the numbers, social rank and academic and literary achievement of its scholars, had in fact never ceased after its foundation, or refoundation, as a cathedral school under Henry VIII. Though Mary had restored the monks, the school went on throughout her reign 1 and until Elizabeth formally refounded it with the restored canons. It is more extraordinary to find St Albans, founded under act of parlia-ment of Edward VI., with Coventry, restored under patent of Henry VIII., and Lincoln, which had existed uninterruptedly from the nth

century, credited to her time. Similarly Bristol, Mansfield, Worcester, Darlington, Leicester, Eye, Bromyard, Richmond, Bodmin, Penryn, Fotheringay and others long previously existing and deriving no benefit from her or augmenta- tion in her time, are erroneously dubbed Elizabethan.

In the curriculum of the schools, the change made by the Re- formation has been much exaggerated. Already in 1446, in founding at Cambridge the college of God's House, now included in Christ's College, which was the first training college for grammar or secondary schoolmasters, Bingham had put forward the necessity of Latin, not only for translating the scriptures and carrying on the law and business of the realm, but also for communication with strangers and foreigners. In the Elizabethan schools the preparation for public life was slightly more emphasized. But methods and authors were little changed. The growth of Greek in all the great schools, and the attempt, as theological discussion grew keener towards the end of the reign, to acclimatize Hebrew, are the chief features. Under James I. and the Commonwealth the mention of Hebrew in statutes and the teaching of it in schools became quite common. It was advocated even by John Comenius, the Czech-German, who created a stir a few years before the Civil War by denouncing Latin as a subject of instruction except for boys going to the universities, and advocating the substitution of teaching in the vernacular language of each country instead.

There is one not wholly novel but notable feature which may be remarked in Elizabethan school foundations, mostly no doubt replacing old ones, and that is that many were the product of joint effort, partly in annual subscriptions and partly in donations of land or money down, not from one benefactor but from many persons. This is the case in many which have been attributed to the queen herself or to individual founders. Wakefield and Halifax in Yorkshire; Ashbourne, Derbyshire; Sandwich, Kent; Hexham, Northumberland; and St Saviour's and St Olave's, Southwark, are cases in which the evidence of joint stock enterprise has been fortunately preserved, as it has in that of Nottingham, which, after an existence of at least 300 years as a fee school, was refounded as a free school in 151 2. Another and less fortunate feature may be observed in the frequent attempt to make the grammar schools do double work, and supply the loss caused by the suppression of the song schools, by doing duty also as elementary schools to teach the three R's. It is an attempt which is being continually renewed and always results in failure; generally ending in degrading the secondary school while not making the elementary school efficient.

Welling- borough in Northamptonshire is a remarkable example of this. It is a school which, founded by joint effort and out of common town estate, always languished until in recent years it shook off the elementary school and became one of the most flourishing secondary schools in the county (Vict. Co. Hist., Northants., ii.).

During the Civil War and the Commonwealth, when new ideas on every subject were broached, education received new impetus, and under the fostering care of parliament schools were increased in numbers. Many new schools were created, many old schools obtained an increase of endowment and efficiency. Among the great schools it was during this time that Westminster, with a parliamentary committee of lords and commons substituted for the dean and chapter, under Busby, definitely placed itself in that position of pre-eminence which it retained till the first decade of the 19th century. It is signifi- 1 Nicholas Udal (q.v.) was master in 1555-1556.

cant that the two oldest extant school-lists are of this period, that for Winchester, which flourished under a Puritan warden and headmaster, for 1653, and that for Westminster for 1655. The care that parliament showed for schools was most con- spicuous, where it might have least been expected, in regard to the cathedral schools. On the 14th of October 1642 the estates of deans and chapters were ordered to be sequestered, subject to a direction that " allowances assigned for scholars, almsmen and other charitable uses might not be interrupted." On the 9th of October 1643 parliament extended to school- masters the functions of the Committee for Plundered Ministers, to remove those scandalous in life or doctrine or who had deserted their cures.

As the property of deans and chapters was gradually sequestrated in 1643-1646, power was given this committee to relieve poor ministers and schoolmasters out of the proceeds. By act of parlia- ment, on the 30th of April 1649, deans and chapters were abolished, but the schools were expressly saved by a clause that all payments from their revenues which before the 1st of December 1641 had been or ought to have been paid to the maintenance of any grammar school or scholars should continue to be paid. The temporal estates were ordered to be sold, but the spiritual property, i.e. livings and tithes, devolved on thirteen trustees, and afterwards on the University Reform Committee, for salaries and augmentations for preaching ministers and schoolmasters, of which £2000 a year was to go to the increase of the universities. Under these two provisions not only were all the cathedral grammar schools preserved intact, the existing masters being left in undisturbed possession where they attended to

their business and did not bear arms against parliament, but in many cases they received large increases of stipend. The chapters had kept the schoolmasters at the fixed amounts prescribed by Henry VIII. 's statutes or older custom, though their own incomes they had increased to many times the statutable amounts by dividing fines amongst themselves. They had not even properly maintained the school buildings. At Canterbury, parliament had at once to spend the large sum of £50 in repairing the school and masters' houses; and at Rochester similar amounts. The committee augmented salaries at Chester, the master from £22 to £36 and the usher from £10 to £19; at Salisbury the master from £10 to £20 and the usher from £5 to £15; at Chichester the masters from £20 to £30; at Rochester they doubled the former stipend of £13, 6s. 8d.; at Durham the allowance of £20 was doubled. So at St Anthony's school, London, which by a grievous error the local historians killed under Elizabeth though it survived till the Fire of London, the salary, paid by St George's, Windsor, settled in 1442, at the rate of £16, was now increased to £36 a year. Other schools paid from chapter or crown revenues received similar increases, Grimston £30; New- castle under Lyme £20; Bridport, Dorset, £15, 10s. Two of the most backward districts had each obtained a special " act for the propagation of the gospel and the maintenance of godly and able ministers and schoolmasters there," — Wales on the 22nd of February, and the four northern counties on the ist of March 1650. Under these acts, the school at Llanrwst was increased by £8 and at Aber- gavenny by £10 a year, while new schools were established at some twenty-four places, including Carnarvon, Cardiff, Cardigan, Mont- gomery and Denbigh, with salaries ranging from £10 a year at Glenberiog to £40 for the master and £25 for the usher at Wrexham. In fact, the act was an anticipation of the Welsh Intermediate Education Act 1888. So in the northern counties the stipends of the Durham Cathedral grammar schoolmasters were doubled; and the masters of Darlington grammar school and of Bishop Auckland grammar school each received an augmentation of £20 or more than double, and the master of Heighington of £10 a year; while new grammar schools were established at Barnard Castle and Ferry Hill. New schools, perhaps elementary, were erected at Stanhope, Staindrop, Brancepeth, Aycliffe and Whickham, while a new departure was taken in the erection of navigation schools at Sunderland and Nether Heworth. The greatest effort was the establishment of the university college of Durham, anticipating by near 200 years the present university, while an elaborate plan was published in 1647 for the establishment of a university of London. But none of the good work of parliament was allowed to stand at the Restoration, and the revenues appropriated

to education went back to the prebendaries whom Archbishop Cranmer wished to turn out of the hive as drones 100 years before. The master of Durham grammar school alone, on an express letter from the king, was allowed' to receive an augmentation of £20 a year.

A more permanent result of the abolition of bishops and chapters and their licensing powers was the immense develop- ment given to private schools all over the country, and not least in London. Among them, John Farnaby, a royalist, who had been employed to produce a revised Lilly's grammar in anticipation of Kennedy's Latin Primer of two centuries later, was the most famous and successful at the time; and John

Milton, though he was perhaps rather a private tutor than a schoolmaster, is the most famous now. Another of them, Charles Hoole, royalist and ex-master of Rotherham, who taught first close to Milton in Aldersgate Street and then in Tokenhouse Garden in Lothbury, produced a most novel and useful school book in his New Discovery of the Old Art of Teaching School, written in 1637 and published " after 14 years' diligent trial in practice in London " in 1660. There is no more illuminat- ing work for demonstrating the absurdity of the notion that thought and theorizing were not brought to bear on education in those days. Milton's Tractate on Education (1643) is but a series of vague generalities compared with Hoole's book, and is chiefly noticeable for its denunciation, not of education being wholly classical, which is assumed as a matter of course, but of the absurd method which devoted ten years to not learning a smattering of Latin when Italian or French were learnt in a year. But Milton's own idea of cramming the unfortunate boys with Varro and Columella, with agriculture and fishing, tactics and strategics in Greek and Latin authors, so that the pupils might learn things instead of words, was as visionary a one as could be conceived.

The Restoration parliament not only cut off the supply of new schools and new endowments, but by the Act of Uniformity in 1662 and the Five Mile Act in 1665, imposing prohibitory penalties on all teaching in public or private schools, except by rigid Church of England men, did its best to stop all advance. The very ferocity of the attempt in the long run defeated itself. By a series of decisions of the courts all the schools but the endowed grammar schools were (in

defiance, it must be ad- mitted, of the law and historical right) freed from the control of the bishops, and even some grammar schools. Thus in Bates's case, 1670, it was held that where a master was put in by lay patrons he could not be turned out for teaching without the licence of the ordinary, but only censured, and that the statutory penalty was a bar to proceedings in the ecclesiastical courts. Next year in Cox's case it was settled that the bishop's licence was only required in grammar schools. Private schools nomin- ally to teach writing, arithmetic, French, geography and naviga- tion were outside ecclesiastical cognizance and gradually monopo- lized the education of the middle classes. Singleton, expelled from the headmastership of Eton at the Restoration, is said to have had 300 boys in a school in St Mary Axe. Foubert, banished from France for Protestantism, had an academy in the Hay- market under royal patronage. No dissenter, however, could be a member of a governing body or master of an endowed school, and if a dissenter went as a scholar he had to go to church and learn the church catechism. The church was there- fore left in sole control of the endowed schools, with the result that at the end of the 18th century the schools were in a more decrepit condition than they were at any time in their long history. Only those which had great possessions and attracted the aristocracy flourished.

The post-Restoration period is distinguished, however, by one great innovation, the development of girls' schools. There were girls' schools at Hackney and at Chelsea, at Oxford and at Bicester, boarding-schools where " young gentlewomen learnt to play, dance and sing," and where needlework was usually taught. In 1673 Mrs Makin, who had a ladies' school at Totten- ham High Cross, and had been governess to the Princess Eliza- beth, published an " Essay to Revive the Antient Education of Gentlewomen," dedicated to the princess, afterwards queen, Mary. She advocates the education of girls in the same subjects as men, including Latin, though not by learning Lily's grammar by heart, but by learning grammar in English.

In the 18th century, with the progress of the means of com- munication, a few great schools, of which Westminster, Eton, Winchester, Harrow were the greatest, throve at the expense of the country grammar schools to which the local nobility and gentry used to resort. They were conducted, however, like private schools — the town boys at Westminster, the dames' houses at Eton, the Commoners' houses at Winchester, being in fact private ventures. The process was imitated at Harrow

from 1725, and Rugby from 1765, which emulated and some- times

surpassed the three old schools: while Charterhouse and Shrewsbury (which in the latter days of Elizabeth had been one of the largest schools in the country) also developed on the same lines. But there was little change even in their matter or method. In those schools in which French was taught and English poetry and prose were cultivated it was in a sort of amateur way and as a by-study. The serious work of scholar- ship was still confined to classics, though they were made the medium of excursions into history, geography and political science. The grammar schools in the country towns, with on the whole inferior teachers, clung more closely to the ancient ways. As the growth of commerce and manufactures brought into the ranks of the local aristocracy men mostly dissenters, the grammar schools, which refused to admit them either as governors or scholars, and which despised, if they did not, as they often did, wholly reject modern languages and modern subjects, were relegated to the free boys, who went there not for love of learning but because learning was free. Where some enterprising man got together a boarding-school his " young gentlemen," who paid relatively high fees, were carefully secluded even in work, still more in play, from the common herd of free boys.

Never probably since the 9th century was the condition of the public schools of England worse than in the years 1750 to 1840. In the Victoria County Histories, in Carlisle's Endowed Grammar Schools, in the reports of Lord Brougham's Commission of Inquiry concerning Charities (1818-1837), it may be read in the case of county after county and school after school how the grammar schools, where they still struggled to preserve a semblance of higher education, were often taught by the nearest vicar or curate, and were reduced to ten or even to no boys. Thus at Stamford in 1729 there were five boys; at Birmingham in 1734 none; at Moulton in 1744 none; at Wainfleet in 1753 none; at Oundle in 1762 one entry, in 1779 four in the school, in r785 none. At Repton between 1779 and 1800 fifteen boys were admitted; at Abingdon from 1792 to 1803 there were from three to ten boys; at Derby in 1826 four boys; at Chesterfield in 1827 four boys, and from 1832 to 1836 one boy constituted the whole school. Often for half a century no more than half a dozen boys had been known to attend the school; sometimes this was the case for a century, while a large proportion of the schools had been definitely converted into elementary schools, and bad ones at that. Great, if partial, improvement followed after the publication of the reports of Lord Brougham's com- mission and the suits in Chancery and private acts of parliament for the restitution of endowments of schools which followed them. But the Public Schools Commission Report of 1863

and the Schools Inquiry Report of 1868 revealed still a deplorable state of things. This has largely been remedied by the removal of religious disabilities, the introduction of the principle of representative government in the governing bodies of schools, and the widening of the curriculum through special commissions with drastic powers, in the case of the great public schools under the Public Schools Commission, and in the case of the lesser public schools by the Endowed Schools Commissioners and the Charity Commissioners under the Endowed Schools Act 1869, and the carving of endowed grammar or high schools for girls out of the old schools for boys.

It is satisfactory to end this review of the history of schools with the conclusion that however much might still require to be done, the conditions in 1910 showed a complete alteration. English schools of all grades had never been so full of pupils, so well equipped with buildings and appli- ances, or staffed with such devoted and active bands of teachers.

Elementary Schools. — Elementary' teaching prevailed in medieval England to an infinitely wider extent than has been commonly supposed. It was at first the duty of every parish priest. Its origin has been credited, even as lately as 1908 (Foster Watson, English Grammar Schools to 1660), to a decree of Theodulf, bishop of Orleans in France, in 787, and to a law

of King Ethelbert in England in 994 (De Montmorency, Stale Intervention in English Education, 1902): "mass priests ought always to have in their houses a school of disciples, and if any good man desires to commit his little ones to them for instruction they ought gladly to receive and kindly teach them." These decrees were, in fact, merely re-issues of the 5th canon of the 6th council of Constantinople: " Let priests throughout the towns and villages have schools, and if any of the faithful wish to commend their little ones to them to learn their letters, let them not refuse to receive them, exacting however no price nor taking anything from them, except what the parents volun- tarily offer," a phrase repeated again and again in the founda- tion documents of free schools, grammar or other, to the middle of the 1 8th century. The mass priests, however, neglected their duty. In 1295, John of Pontissera, bishop of Winchester, tried to recall those of his diocese to it by a synodal statute: " Let rectors, vicars and parish priests see that the sons of

their parishioners know the Lord's Prayer, Creed and Salutation of the Virgin . . . and the parents should be induced to let their boys, when they know how to read the psalter, learn singing also. " It may be observed that now the rectors are not required to teach boys themselves, but to see them taught. The duty of the parson had in fact been devolved on the clerk. In a decretal of Gregory IX., c. 1234, every parish priest was ordered to have a clerk to sing with him, read the epistle and lesson, and be able to keep school and warn the parishioners to send their sons to the church to learn the faith, whom he is to teach with all chastity (Decret. lib. iii., tit. i., c. iii.). This seems to be only an amplification of Leo IV., c. 850, omnis presbyter clericum habeat scholarem qui epistolam, &c. Many parish clerks duly did their duty in teaching. So we find in 1481 at St Nicholas, Bristol, " The clerks ought not to take no boke oute of the quere for childeryne to lerne in with owte licence of the procurators," i.e. the churchwardens. At Faversham in 1 506, " Item the said clarkis or one of theym as moche as in theym is shall endeavour theymself to teche children to rede and synge ... as of olde tyme hath be accustomed." But probably most neglected their duty, as we find in many places other provision for elementary instruction; sometimes by reading and writing schools, more often, as already stated, by the song schools. At Barnack, Northamptonshire, the rector had licence in 1359 from the bishop of Lincoln to establish a master to teach reading, song and grammar. A reading school is mentioned at Howden, Yorkshire, in 1394, but it had then become united to the song school, and a chaplain, i.e. a priest, was appointed to it (scholas tarn lectuales quam cantuales). In 1401 William Coke " alias clerk," probably because he was the parish clerk, not apparently in orders, was appointed to this joint song and reading school, a reservation, however, being made to one John Lowyke of the right to teach a reading school only (sludium lectuale) for 18 boys. Next year, 1402, William Lowyke, probably John's son, was appointed to the reading and song school, an appointment repeated in 141 2, while another person was appointed to the two schools in 1426. But in 1456 the reading school was com- bined with the grammar school under John Armandson, B.A. At Northallerton in 1426 the reading and song school are com- bined; the grammar school separate; but in 1440 reading, grammar and song schools were combined in the hands of John Leuesham, chaplain.

We owe our knowledge of these schools to the casual preservation in the British Museum of a letter book of the prior of Durham cathedral monastery, who was the " Ordinary " for the Yorkshire possessions of St Cuthbert, among which were the two places named. But they

can hardly have been as exceptional in fact as they are in records. Separate reading schools must have existed elsewhere. Nor can the two Yorkshire colleges of Acaster and Rotherham, founded about 1472 and 1484, be as unique as they appear to be in having, besides a grammar and song school, a writing school. At Acaster a " third [master] to teche to write and all such thing as belonged to scrivener craft," and at Rotherham " because that country produces many youths endowed with the light and acuteness of ability, but all do not wish to attain the dignity and height of the priesthood, that they may be the better fitted for the mechanical arts and other worldly concerns, a third fellow, knowing and skilled in the art of writing and accounts," was added to the grammar and

song masters (A. F. Leach, Early Yorkshire Schools, ii. 62, 84-87, 89. no, 151). At Aldwinkle, Northants, the chantry priest was by foundation ordinance of 1489 to teach six of the poorest boys spelling and reading {syllabilacione et lectura). At Barking, in Essex, a chantry priest was founded in 1392 to " teache the childerne to wrytte and read," while the chantry priest at Bromyard, Hereford-shire, was founded in 1394 to " brynge upe the childerne borne in the parish in reading, wrytynge and gramar." At Normanton, Yorkshire, the chantry of Our Lady was " for good educatcion as well in grammar as wrytinge," and at Burgh under Stainmore, Westmorland, the stipendiary priest was " to kepe a Free Grammar Schole and also to teche scholers to wryte." At Kingsley, Staffordshire, the chantry priest was also " to kepe scole and teche pore men's children of the said parishe grammar and to rede and singe." At Montgomery, on the other hand, it is made matter of complaint, in 1548, that the fraternity of Our Lady hired a " prest or lerned man to kepe scole " for thirty years past, but he now " taught but yonge begynners onelye to write and syng and to reade soo far as the accidens rules and noo grammer." At Farthinghoe, Northants, was apparently a purely elementary school, the chantry priest being directed by foundation in 1443 by a London mercer to teach the little ones (parvulos), later translated petits, freely. At Ipswich in 1477 the little ones called Apeseyes (ABC's) and Songe were not under the grammar schoolmaster but an independent teacher. The most elementary school was the ABC school. At Christ's College, Brecon, founded, or refounded, by Henry VIII., besides a grammar master a >- £13. 6s. 8d. a year and an usher at half that, there was a chaplain to sing mass and " to teache the yonge children resorting to the said scoole there ABC " at the same pay as the usher. This seems to have been really a song school. At the college of Glasney, Cornwall, founded, or refounded, in 1264, the bell-ringer had £2 a

year " as well for teachyng of pore mens children their ABC as for ringing "; while at Launceston the grammar master had £16 a year, and 13s. 4d. was " yerly distributed to an aged man chosen by the mayre to teache younge chylderne the ABC." At Saffron Walden, Essex, in 1423, it was settled after legal proceedings, that the chantry priests at the parish church might teach children the alphabet and graces, but not further. Anything more was the privilege of the gramma: – schoolmaster.

In 1542 an injunction of Bonner as bishop of London shows an attempt on Henry VIII. 's part to recall the clergy to the duty of teaching " every of you that be parsons, vicars, curates and also chantry priests and stipendiaries to . . . teach and bring up in learning the best ye can all such children of your parishioners as shall come to you, or at the least teach them to read English." The advisers of Edward VI. at first appear to have contemplated a similar development by an injunction in 1 547 that " all chauntry priests shall exercise themselves in teaching youth to read and write and bring them up in good manners and other virtuous exercises." But the Chantries Act next year swept all the chantries away by Easter 1548; and while professing to apply their endowments to education, struck a deadly blow at ele- mentary education by omitting any saving clause for elementary schools, whether song, reading, writing or ABC schools. The first duty of a song or of a reading school being " to teach a child to help a priest to sing mass," they were regarded as superstitious; and the rest were presumably looked on as tainted with the same poison. So of all the hundreds of song schools in the country, only two, outside the cathedrals and the university colleges and those of Winchester and Eton, Westminster and Windsor colleges, survived. These were the song school of the archdeacon Magnus foundation of a grammar school and song school at Newark in 1532; and that forming part of the grammar school in St John's Hospital, Coventry, established by John Hales under royal licence in 1545, though not legally settled till 1572. The gap left by these schools took long to fill, and probably the ignorance of the masses and of the lower middle classes in Eliza- bethan and Jacobean times was greater than before the Reforma- tion. In the big towns, like London, during the reign of Elizabeth, voluntary rates, or application of the rates, were made to partly fill the gap. Christ's Hospital in 1553 with its 280 foundling children had, besides its grammar schoolmaster and usher, " a teacher of pricksonge, a teacher to wrighte and two schoole masters for the Petties ABC." But in Mary's reign, Grafton the printer was " clapt in the Flete for two daies because he suffered the children to learne the Englishe prymer" for

“the Lattin abseies.” In Southwark, while St Saviour’s parish set up a grammar school in 1559, St Olave’s parish in 1 560 directed the churchwardens to ask the inhabitants ” watte they will gyve

towards the settyng up of a free skolle,” which was started next year to ” teche the cheldarne to write and rede and cast accompthe.” At St Lawrence Jewry in 1 568 a school was kept over the vestry. At St Ethelwyn’s in 1 589 Smy the ” the schoolmaster ” paid 10s. ” for kepinge scolein the belfry.” At Stevenage in 1 561- 1562 the old Brotherhood house and some endowment was bought by subscription for a school ” to teach scholars called pettits to read English, write, cast accounts and learn the accidence.”

Some of these and other like schools were rather junior or preparatory departments of the grammar school than independent elementary schools. The foundation of purely elementary schools was rare in Elizabeth’s reign. In Warwickshire, Alcester in 1582, Henley-in-Arden in 1586, in-Salop, Onibury in 1593, in Essex, Littlebury in 1595, appear to be pretty well all those known. Those mentioned in Mr de Montmorency’s ” State Intervention,” taken from the Digest of Schools of 1842, are mostly of charities afterwards applied to elementary education, not founded for the purpose. In most counties the earliest elementary endowed schools are of James I.‘s reign, such as Appleton, Berkshire, in 1604, Northiam, Sussex, in 1614, Sir William Borlase’s school at Great Marlow in Buckinghamshire (now a secondary school) in 1624. At great impetus was given to them by the Common- wealth, and many were founded by state action, only to be destroyed at the Restoration. Conspicuous among Common- wealth schools was that of Polesworth, Warwickshire, founded by deed of 10th March 1655, the first endowed school which provided for girls as well as boys, the boys under a master to learn to write and read English, the girls in a separate schoolroom under a mistress to learn to read and work with the needle. In Wales Thomas Gouge, an ejected minister, in 1672, started voluntary schools.

After 1670 there was a large increase in elementary school foundations. The reign of Queen Anne saw a new development take place of the charity schools. The movement was started in 1698 by the Society for Promoting Christian Knowledge, and taken up by the bishops with an organized propaganda for getting subscriptions. The

schools founded were commonly called blue or blue-coat schools, though there were red maids', green and even yellow schools. Many were boarding-schools on the model of Christ's Hospital, where slum children, girls and boys, in separate schools of course, were taken in and prepared for service and work. But there were many day schools. All, however, provided a uniform of the Christ's Hospital type. They were chiefly in the large towns, and still comprise some of the richest endowed elementary schools. Over 100 of them were established between 1698 and 17 15 in London and Westminster, and in 1729 there were 1658 schools with 34,000 children. In that year the curious development of " circulating schools " was started in Wales, the masters residing for a certain time in one district and then passing on to another. (This was a device known in medieval times, and notable examples of it were Sir Robert Hitcham's rotatory school for Earl's Colne and two other places in Essex during the Commonwealth.) Griffith Jones was the principal promoter, and at his death in 1761 there were 10,000 children in the schools. In 1801 the Lancasterian system of schools, not of a few boys or girls, but of several hundreds taught in classes of 60 or 80, chiefly by pupil teachers, was inaugurated in the Borough Road by Joseph Lancaster. Out of it grew the British and Foreign School Society. This was undenominational. In 18 1 1 the National Society adopted the similar, but rival, Bell or " Madras system " for Church of England teaching. The effect of these two organizations was to cover the country with elementary schools, partly endowed, chiefly supported by voluntary contributions and low fees. These completed the system, if system it could be called, of sporadic elementary schools. After the Reform Act of 1832 the state stepped in with grants and has gradually made elementary education universal. (A. F. L.)

See further under Education.

SCHOONER, a vessel rigged with fore and aft sails, properly with two masts, but now often with three, four and sometimes more masts; they are much used in the coasting trade, and

require a smaller crew in proportion to their size than square- rigged vessels (see Rigging and Ship). According to the story, which is probably true, the name arose from a chance spectator's exclamation " there she scoons," i.e. glides, slips free, at the launch of the first vessel of this type at Gloucester, Massachusetts, in 1 7 13, her builder being one Andrew Robinson. The spelling " schooner " is due to a supposed derivation from the Dutch schooner, but that and the other European equivalents, Ger. Schoner, Dan. skonnert, Span, and Portuguese escuna, &c, are all from English. " To scoon," according

to Skeat, is a Scottish (Clydesdale) dialect word, meaning to skip over water like a flat stone, and is ultimately connected with the root, implying quick motion, seen in shoot, scud, &c. In American colloquial usage " schooner " is applied to the covered prairie-wagons used by the emigrants moving westward before the construction of railways, and to a tall, narrow, lager-beer glass.

SCHOPENHAUER, ARTHUR (1788-1860), German philo- sopher, was born in Danzig on the 22nd of February 1788. His parents belonged to the mercantile aristocracy — the bankers and traders of Danzig. His father, Heinrich Floris Schopen- hauer, the youngest of a family to which the mother had brought the germs of mental malady, was a man of strong will and originality, and so proud of the independence of his native town that when Danzig in 1793 surrendered to the Prussians he and his whole establishment withdrew to Hamburg; At the age of forty he married Johanna Henrietta Trosiener, then only twenty, but the marriage owing to difference of temperament was unhappy. Their two children, Arthur and Adele (born 1796), bore the penalty of their parents' incompatibilities. They were burdened by an abnormal urgency of desire and capacity for suffering, which no doubt took different phases in the man and the woman, but linked them together in a common susceptibility to ideal pain. 1

In the summer of 1787, a year after the marriage, the elder Schopenhauer, whom commercial experiences had made a cosmopolitan in heart, took his wife on a tour to western Europe. It had been his plan that the expected child should see the light in England, but the intention was frustrated by the state of his wife's health. The name Arthur was chosen because it remains the same in English, French and German.

During the twelve years which followed the removal of the family to Hamburg (1793-1805) the Schopenhauers made frequent excursions. From 1797 to 1799 Arthur was a boarder with M. Gregoire, a merchant of Havre, and friend of the Hamburg house, with whose son Anthime he formed a fast friendship. Returning to Hamburg, for the next four years he had but indifferent training. When he reached the age of fifteen the scholarly and literary instincts began to awaken. But his father, steeped in the spirit of commerce, was unwilling that a son of his should worship knowledge and truth. Accord- ingly he offered his son the choice between the classical school and an excursion to England. A boy of fifteen could scarcely hesitate. In 1803 the Schopenhauers and their son set out on a lengthened tour, of which Johanna has given an account, to Holland,

England, France and Austria. Six months were spent in England. He found English ways dull and precise and the religious observances exacting; and his mother had — not for the last time — to talk seriously with him on his un- social and wilful character. At Hamburg in the beginning of 1805 he was placed in a merchant's office. He had only been there for three months when his father, who had shown

'Johanna Schopenhauer (1766-1838) was in her day an 'author of some reputation. Besides editing the memoirs of Fernow, she published Notes on Travels in England, Scotland and Southern France (1813-1817); Johann van Eyck and his Successors (1823); three romances, Gabriele (1819-1820), Die Xante (1823) and Sidonia (1828), besides some shorter tales. These novels teach the moral of renunciation (Entsagung). Her daughter Adele (1796-1849) seems to have had a brave, tender and unsatisfied heart, and lavished on her brother an affection he sorely tried. She also was an authoress, publishing in 1844 a volume of Haus-, Wald-, und Feld-Marchen, full of quaint poetical conceits, and in 1845 Anna, a novel, in two vols. See Laura Frost, Johanna Schopenhauer: ein Frauenleben

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symptoms of mental alienation, fell or threw himself into the canal. After his death the young widow (still under forty), leaving Arthur at Hamburg, proceeded with her daughter Adele in the middle of 1806 to Weimar, where she arrived only a fortnight before the tribulation which followed the victory of Napoleon at Jena. At Weimar her talents, hitherto held in check, found an atmosphere to stimulate and foster them; her aesthetic and literary tastes formed themselves under the influence of Goethe and his circle, and her little salon gained a certain celebrity. Arthur, meanwhile, became more and more restless, and his mother allowed him to leave his employment. He began his education again at Gotha, but a satire on one of the teachers led to his dismissal. He was then placed with the Greek scholar Franz Passow, who superintended his classical studies. This time he made so much progress that in two years he read Greek and Latin with fluency and interest.

In 1809 his mother handed over to him (aged twenty-one) the third

part of the paternal estate, which gave him an income of £150, and in October 1809 he entered the university of Gottingen. The direction of his philosophical reading was fixed by the advice of G. E. Schulze to study, especially, Plato and Kant. For the former he soon found himself full of rever- ence, and from the latter he acquired the standpoint of modern philosophy. The names of " Plato the divine and the marvellous Kant " are conjunctly invoked at the beginning of his earliest work. But even at this stage of his career the pessimism of his later writings began to manifest itself, together with a sus- ceptibility to morbid fears which led him to keep loaded weapons always at his bedside. He was a man of few acquaintances, amongst the few being Bunsen, the subsequent scholar-diploma- tist, and Bunsen's pupil, W. B. Astor, the son of Washing- ton Irving's millionaire hero. Even then he found his trustiest mate in a poodle, and its bearskin was an institution in his lodging. Yet, precisely because he met the world so seldom in easy dialogue, he was unnecessarily dogmatic in controversy; and many a bottle of wine went to pay for lost wagers. But he had made up his mind to be not an actor but an onlooker and critic in the battle of life; and when Wieland, whom he met on one of his excursions, suggested doubts as to the wisdom of his choice, Schopenhauer replied, " Life is a ticklish business; I have resolved to spend it in reflecting upon it."

After two years at Gottingen he took two years at Berlin. Here also he dipped into divers stores of learning, notably classics under Wolf. In philosophy he heard Fichte and Schleier- macher. Between 1811 and 1813 the lectures of Fichte (sub- sequently published from his notes in his Nachgelassene Werke) dealt with what he called the " facts of consciousness " and the " theory of science," and struggled to present his final conception of philosophy. These lectures Schopenhauer at- tended — at first, it is allowed, with interest, but afterwards with a spirit of opposition which is said to have degenerated into contempt, and which in after years never permitted him to refer to Fichte without contumely. Yet the words Schopen- hauer then listened to, often with baffled curiosity, certainly influenced his speculation.

In Berlin Schopenhauer was lonely and unhappy. One of his interests was to visit the hospital La Charite and study the evidence it afforded of the interdependence of the moral and the physical in man. In the early days of 1813 sympathy with the national enthusiasm against the French carried him so far as to buy a set of arms; but he stopped short of volunteering for active service, reflecting that Napoleon gave after all only concentrated and untrammelled utterance to that self-assertion and lust for more life

which weaker mortals feel but must per- force disguise. Leaving the nation and its statesmen to fight out their freedom, he hurried away to Weimar, and thence to the quiet Thuringian town of Rudolstadt, where in the inn " Zum Ritter," out of sight of soldier and sound of drum, he wrote, helped by books from the Weimar library, his essay for the degree of doctor in philosophy. On the 2nd of October 1813 he received his diploma from Jena; and in the same year from the press at Rudolstadt there was published — without

winning notice or readers — his first book, Vber die vierfache Wurzel des Satzes vom zureichenden Grunde, trans, in Bohn's Philological Library (1889).

In November 1813 Schopenhauer returned to Weimar, and for a few months boarded with his mother. But the strain of daily association was too much for their antagonistic natures. His splenetic temper and her volatility culminated in an open rupture in May 1814. From that time till her death in 1838 Schopenhauer never saw his mother again. During these few months at Weimar, however, he made some acquaintances destined to influence the subsequent course of his thought. Conversations with the Orientalist F. Mayer directed his studies to the philosophical speculations of ancient India. In 1808 Friedrich Schlegel had in his Language and Wisdom of the Old Hindus brought Brahmanical philosophy within the range of European literature. Still more instructive for Schopenhauer was the imperfect and obscure Latin translation of the Upani- shads which in 1801-1802 Anquetil Duperron had published from a Persian version of the Sanskrit original. Another friend- ship of the same period had more palpable immediate effect, but not so permanent. This was with Goethe, who succeeded in securing his interest for those investigations on colours on which he was himself engaged. Schopenhauer took up the subject in earnest, and the result of his reflexions (and a few elementary observations) soon after appeared (Easter 1816) as a monograph, Uber das Sehen. und die Farben (ed. Leipzig, 1854). The essay, which must be treated as an episode or digression from the direct path of Schopenhauer's development, due to the potent force of Goethe, was written at Dresden, to which he had transferred his abode after the rupture with his mother. It had been sent in MS. to Goethe in the autumn of 181 5, who, finding in it a transformation rather than an expan- sion of his own ideas, inclined to regard the author as an opponent rather than an adherent.

The pamphlet begins by re-stating with reference to sight the general theory that perception of an objective world rests upon an instinctive

causal postulation, which even when it misleads p ss „ on still remains to haunt us (instead of being, like errors of slsrhtaad reason, open to extirpation by evidence), and proceeds to colours. deal with physiological colour, i.e. with colours as felt (not perceived) modifications of the action of the retina. First of all, the distinction of white and black, with their mean point in grey, is referred to the activity or inactivity of the total retina in the gradu ated presence or absence of full light. Further, the eye is endowed with polarity, by which its activity is divided into two parts quali- tatively distinct. It is this circumstance which gives rise to the phenomenon of colour. All colours are complementary, or go in pairs; each pair makes up the whole activity of the retina, and so is equivalent to white; and the two partial activities are so con- nected that when the first is exhausted the other spontaneously succeeds. Such pairs of colour may be regarded as infinite in number; but there are three pairs which stand out prominently, and admit of easy expression for the ratio in which each contributes to the total action. These are red and green (each = §), orange and blue (2 : 1), and yellow and violet (3 : i). 1 This theory of comple- mentary colours as due to the polarity in the qualitative action of the retina is followed by some criticism of Newton and the seven colours, by an attempt to explain some facts noted by Goethe, and by some reference to the external stimuli which cause colour.

The grand interest of his life at Dresden was the composition of a work which should give expression in all its aspects to the idea of man's nature and destiny which had been gradually form- ing within him. Without cutting himself altogether either from social pleasures or from art, he read and took notes with regularity. More and more he learned from Cabanis and Helvetius to see in the will and the passions the determinants of intellectual life, and in the character and the temper the source of theories and beliefs. The conviction was borne in upon him that scientific explanation could never do more than systematize and classify the mass of appearances which to our habit-blinded eyes seem to be the reality. To get at this reality and thus to reach a stand- point higher than that of aetiology was the problem of his as of all philosophy. It is only by such a tower of speculation that an

1 In this doctrine, so far as the facts go, Schopenhauer is indebted to a paper by R. Waring Darwin in vol. lxxvi. of the Transactions of the Philosophical Society.

escape is possible from the spectre of materialism, theoretical and practical; and so, says Schopenhauer, " the just and good must all have this creed: I believe in a metaphysic." The mere, reasonings of theoretical science leave no room for art, and practical prudence usurps the place of morality. The higher life of aesthetic and ethical activity — the beautiful and the good — can only be based upon an intuition which penetrates the heart of reality. Towards the spring of 1818 the work was nearing its end, and Brockhaus of Leipzig had agreed to publish it and pay the author one ducat for every sheet of printed matter. But, as the press loitered, Schopenhauer, suspecting treachery, wrote so rudely and haughtily to the publisher that the latter broke off correspondence with his client. In the end of 1818, however, the book appeared (with the date 18 19) as Die Welt als Wille und Vorstellung, in four books, with an appendix containing a criticism of the Kantian philosophy (Eng. trans, by R. B. Haldane and J. Kemp, 1883). Long before the work had come to the hands of the public Schopenhauer had rushed off to Italy. He stayed for a time in Venice, where Byron was then living; but the two did not meet. At Rome he visited the art galleries, the opera, the theatre, and gladly seized every chance of conversing in English with Englishmen. In March 1810 he wˆnt as far as Naples and Paestum. About this time the fortunes of his mother and sister and himself were threatened by the failure of the firm in Danzig. His sister accepted a compromise of 70%, but Schopenhauer angrily refused this, and eventually recovered 9400 thalers.

After some stay at Dresden, hesitating between fixing himself as university teacher at Gottingen, Heidelberg or Berlin, he finally chose the last-mentioned. He was, however, not a good lecturer, and his work soon came to an end. His failure he attri- buted to Hegelian intrigues. Thus, except for some attention to physiology, the first two years at Berlin were wasted. In May 1822 he set out by way of Switzerland for Italy. After spending the winter at Florence and Rome, he left in the spring of 1823 for Munich, where he stayed for nearly a year, the prey of illness and isolation. When at the end of this wretched time he left for Gastein, in May 1824, he had almost entirely lost the hearing of his right ear. . Dresden, which he reached in August, no longer presented the same hospitable aspect as of old, and he was reluctantly drawn onwards to Berlin in May 1825.

The six years at Berlin were a dismal period in the life of Schopenhauer. In vain did he watch for any sign of recognition of his philosophic genius. Hegelianism reigned in the schools and in

literature and basked in the sunshine of authority. Thus driven back upon himself, Schopenhauer fell into morbid medita- tions, and the world which he saw, if it was stripped naked of its disguises, lost its proportions in the distorting light. The sexual passion had a strong attraction for him at all times, and, according to his biographers, the notes he set down in English, when he was turned thirty, on marriage and kindred topics are unfit for publication. Yet in the loneliness of life at Berlin the idea of a wife as the comfort of gathering age sometimes rose before his mind — only to be driven away by cautious hesitations as to the capacity of his means, and by the shrinking from the loss of familiar liberties. He wrote nothing material. In 1828 he made inquiries about a chair at Heidelberg; and in 1830 he got a shortened Latin version of his physiological theory of colours inserted in the- third volume of the Scriptores ophthalmologici minor es (edited by Radius).

Another pathway to reputation was suggested by some remarks he saw in the seventh number of the Foreign Review, in an article on Damiron's French Philosophy in the igth Century. With reference to some statements in the article on the import- ance of Kant, he sent in very fair English a letter to the writer, offering to translate Kant's principal works into English. He named his wages and enclosed a specimen of his work. His correspondent, Francis Haywood, made a counter-proposal which so disgusted Schopenhauer that he addressed his next letter to the publishers of the review. When they again referred him to Haywood, he applied to Thomas Campbell, then chairman of a company formed for buying up the copyright of meritorious

but rejected works. Nothing came of this application. 1 A translation of selections from the works of Balthazar Gracian> which was published by Frauenstadt in 1862, seems to have been made about this time. 2

In 1833 he settled finally at Frankfort, gloomily waiting for the recognition of his work, and terrified by fears of assassination and robbery. As the years passed he noted down every confirmation he found of his own opinions in the writings of others, and every instance in which his views appeared to be illustrated by new researches. Full of the conviction of his idea, he saw everything in the light of it, and gave each apercu a place in his alphabetically arranged note-book. Everything he published in later life may be called a commentary, an excursus or a scholium to his main book ; and many of them are decidedly of the nature of common- place books or collectanea of notes. But along with the ac- cumulation of

his illustrative and corroborative materials grew the bitterness of heart which found its utterances neglected and other names the oracles of the reading world. The gathered ill- humour of many years, aggravated by the confident assurance of the Hegelians, found vent at length in the introduction to his next book, where Hegel's works are described as three-quarters utter absurdity and one-quarter mere paradox— a specimen of the language in which during his subsequent career he used to advert to his three predecessors Fichte, Schelling, but above all Hegel. This work, with its wild outcry against the philosophy of the professoriate, was entitled fiber den Willen in der Natur, and was published in 1836 (revised and enlarged, 1854; Eng. trans., 1889).

In 1837 Schopenhauer sent to the committee entrusted with the execution of the proposed monument to Goethe at Frank- fort a long and deliberate expression of his views, in general and particular, on the best mode of carrying out the design. But his fellow-citizens passed by the remarks of the mere writer of books. More weight was naturally attached to the opinion he had advocated in his early criticism of Kant as to the importance, if not the superiority, of the first edition of the Kritik; in the collected issue of Kant's works by Rosenkranz and Schubert in 1838 that edition was put as the substantive text, with supple- mentary exhibition of the differences of the second.

In 1 84 1 he published under the title Die beiden Grundprobleme der Ethik two essays which he had sent in 1838-1839 in com- petition for prizes offered. The first was in answer to the question " Whether man's free will can be proved from self-consciousness," proposed by the Norwegian Academy of Sciences at Drontheim. His essay was awarded the prize, and the author elected a member of the society. But proportionate to his exultation in this first recognition of his merit was the depth of his mortification and the height of his indignation at the result of the second competition. He had sent to the Danish Academy at Copenhagen in 1839 an essay " On the Foundations of Morality " in answer to a vaguely worded subject of discussion to which they had invited candidates. His essay, though it was the only one in competition, was refused the prize on the grounds that he had failed to examine the chief problem {i.e. whether the basis of morality was to be sought in an intuitive idea of right), that his explanation was inadequate, and that he had been wanting in due respect to the sum-mi philosophi of the age that was just passing. This last reason, while probably most effective with the judges, only stirred up more furiously the fury in Schopen- hauer's breast, and his preface is one long fulmination against the

ineptitudes and the charlatanry of his bite noire, Hegel.

In 1844 appeared the second edition of The World as Will and Idea, in two volumes. The first volume was a slightly altered reprint of the earlier issue; the second consisted of a series of chapters forming a commentary parallel to those into which the original work was now first divided. The longest of these new chapters deal with the primacy of the will, with death and with the metaphysics of sexual love. But, though only a small edition was struck off (500 copies of vol. i. and 750 of vol. ii.),

1 It was not till 1841 that a translation of Kant's Kritik in English appeared.

2 He also projected a translation of Hume's Essays and wrote a I preface for it.

the report of sales which Brockhaus rendered in 1846 was unfavourable, and the price had afterwards to be reduced. Yet there were faint indications of coming fame, and the eagerness with which each new tribute from critic and admirer was wel- comed is both touching and amusing. From 1843 onwards a jurist named F. Dorguth had trumpeted abroad Schopenhauer's name. In 1844 a letter from a Darmstadt lawyer, Joh. August Becker, asking for explanation of some difficulties, began an intimate correspondence which went on for some time (and which was published by Becker's son in 1883). But the chief evangelist (so Schopenhauer styled his literary followers as distinct from the apostles who published not) was Frauenstadt, who made his personal acquaintance in 1846. It was Frauenstadt who succeeded in finding a publisher for the Parerga und Paralipomena, which appeared at Berlin in 1851 (2 vols., pp. 465, 531; sel. trans. by J. B. Saunders, 1889; French by A. Dietrich, 1909). Yet for this bulky collection of essays, philosophical and others, Schopenhauer received as honorarium only ten free copies of the work. Soon afterwards, Dr E. O. Lindner, assistant editor of the Vossische Zeitung, began a series of Schopenhauerite articles. Amongst them may be reckoned a translation by Mrs Lindner of an article by John Oxenford which appeared in the West- minster Review for April 1853, entitled " Iconoclasm in German Philosophy," being an outline of Schopenhauer's system. In 1854 Frauenstadt's Letters on the Schopenhauerean Philosophy showed

that the new doctrines were become a subject of dis- cussion — a state of things made still more obvious by the university of Leipzig offering a prize for the best exposition and examination of the principles of Schopenhauer's system. Besides this, the response his ideas gave to popular needs and feelings was evinced by the numerous correspondents who sought his advice in their difficulties. And for the same reason new editions of his works were called for — a second edition of his degree dissertation in 1847, of his Essay on Colours and of The Will in Nature in 1854, a third edition of The World as Will and Idea in 1859, and in i860 a second edition of The Main Problems of Ethics.

In 1854 Richard Wagner sent him a copy of the Ring of the Nibelung, with some words of thanks for a theory of music which had fallen in with his own conceptions. Three years later he received a visit from his old college friend Bunsen, who was then staying in Heidelberg. On his seventieth birthday congratula- tions flowed in from many quarters. In April i860 he began to be affected by occasional difficulty in breathing and by palpita- tion of the heart. Another attack came on in autumn (9th September), and again a week later. On the evening of the 18th his friend and subsequent biographer, Dr Gwinner, sat with him and conversed. On the morning of the 21st September he rose and sat down alone to breakfast; shortly afterwards his doctor called and found him dead in his chair. By his will, made in 1852, with a codicil dated February 1859, his property, with the exception of some small bequests, was devised to the above-mentioned institution at Berlin. Gwinner was named executor, and Frauenstadt was entrusted with the care of his manuscripts and other literary remains.

It is often said that a philosophic system cannot be rightly understood without reference to the character and circumstances of the philosopher. The remark finds ample application in the case of Schopenhauer. The conditions of his training, which brought him in contact with the realities of life before he learned the phrases of scholastic language, give to his words the stamp of self-seen truth and the clearness of original conviction. They explain at the same time the naivete which set a high price on the products his own energies had turned out, and could not see that what was so original to himself might seem less unique to other judges. Preoccupied with his own ideas, he chafed under the indifference of thinkers who had grown blasg in speculation and fancied himself persecuted by a conspiracy of professors of philosophy. It is not so easy to demonstrate the connexion between a man's life and doctrine. But it is at least plain that in the case of any philosopher, what makes him

such is the faculty he has, more than other men, to get a clear idea of what he himself

is and does. More than others he leads a second life in the spirit or intellect alongside of his life in the flesh — the life of knowledge beside the life of will. It is inevitable that he should be especially struck by the points in which the sensible and temporal life comes in conflict with the intellectual and eternal. It was thus that Schopenhauer by his own experience saw in the primacy of the will the fundamental fact of his philosophy, and found in the engrossing interests of the selfish epus the perennial hindrances of the higher life. For his absolute individualism, which recog- nizes in the state, the church, the family only so many superficial and incidental provisions of human craft, the means of relief was absorption in the intellectual and purely ideal aims which prepare the way for the cessation of temporal individuality altogether. But theory is one thing and practice another; and he will often lay most stress on the theory who is most conscious of defects in the practice. It need not, therefore, surprise us that the man who formulated the sum of virtue in justice and benevolence was unable to be just to his own kinsfolk and reserved his compassion largely for the brutes, and that the delineator of asceticism was more than moderately sensible of the comforts and enjoyments of life.

The philosophy of Schopenhauer, like almost every system of the 19th century, can hardly be understood without reference to the ideas of Kant. Anterior to Kant the gradual advance of idealism had been the most conspicuous feature in philo- sophic speculation. That the direct objects of knowledge, ™ l9S ophy the realities of experience, were after all only our ideas or \ˆ m . t perceptions was the lesson of every thinker from Descartes J'? _ to Hume. And this doctrine was generally understood ˆ.ˆff"' to mean that human thought, limited as it was by its own weakness and acquired habits, could hardly hope to cope suc- cessfully with the problem of apprehending the real things. The idealist position Kant seemed at first sight to retain with an even stronger force than ever. But it is darkest just before the dawn; and Kant, the Copernicus of philosophy, had really altered the aspects of the doctrine of ideas. It was his purpose to show that the forms of thought (which he sought to isolate from the peculiarities incident to the organic body) were not merely customary means for licking into convenient shape the data of perception, but entered as underlying elements into the constitution of objects, making ex- perience possible and determining the fundamental structure of nature. In other words, the forms of knowledge were the main factor in making objects. By Kant,

however, these forms are gener- ally treated psychologically as the action of the several faculties of a mind. Behind thinking there is the thinker. But in his suc- cessors, from Fichte to Hegel, this axiom of the plain man is set aside as antiquated. Thought or conception without a subject- agent appears as the principle — thought or thinking in its univer- sality without any individual substrata in which it is embodied: rd roiiv or vin\ais is to be substituted for roOs. This is the step of advance which is required alike by Fichte when he asks his reader to rise from the empirical ego to the ego which is subject-object {i.e. neither and both), and by Hegel when he tries to substitute the Begrijf or notion for the Vorstellung or pictorial conception. As spiritism asks us to accept such suspension of ordinary mechanics as permits human bodies to float through the air and part without injury to their members, so the new philosophy of Kant's immediate successors requires from the postulant for initiation willingness to reverse his customary beliefs in quasi-material subjects of thought.

But, besides removing the psychological slag which clung to Kant's ideas from their matrix and presenting reason as the active principle in the formation of a universe, his successors carried out with far more detail, and far more enthusiasm and historical scope, his principle that in reason lay the a priori or the anticipation of the world, moral and physical. Not content with the barren asser- tion that the understanding makes nature, and that we can construct science only on the hypothesis that there is reason in the world, they proceeded to show how the thing was actually done. But to do so they had first to brush away a stone of stumbling which Kant had left in the way. This was the thing as it is by itself and apart from our knowledge of it — the something which we know, when and as we know it not. This somewhat is what Kant calls a limit-concept. It marks only that we feel our knowledge to be inadequate, and for the reason that there may be another species of sensation than ours, that other beings may not be tied by the special laws of our constitution, and may apprehend, as Plato says, by the soul itself apart from the senses. But this limitation, say the successors of Kant, rests upon a misconception. The sense of inadequacy is only a condition of growing knowledge in a being subject to the laws of space and time; and the very feeling is a proof of its implicit removal. Look at reason not in its single temporal manifestations but in its eternal operation, and then this universal thought, which may be called God, as the sense-con- ditioned reason is called man, becomes the very breath and structure

of the world. Thus in the true idea of things there is no irreducible residuum of matter: mind is the Alpha and Omega, at once the initial postulate and the final truth of reality.

In various ways a reaction arose against this absorption of everything in reason. In Fichte himself the source of being is primeval activity, the groundless and incomprehensible deed-action (That-Handlung) of the absolute ego. The innermost character of that ego is an infinitude in act and effort. " The will is the living principle of reason," he says again. " In the last resort," says Schelling (1809), in his Inquiries into the Nature of Human Freedom. " there is no other being but will. Wollen ist Ursein (will is primal being) ; and to this alone apply the predicates fathomless, eternal, inde- pendent of time, self-affirming." It is unnecessary to multiply instances to prove that idealism was never without a protest that there is a heart of existence, life, will, action, which is presupposed by all knowledge and is not itself amenable to explanation. We may, if we like, call this element, which is assumed as the basis of all scientific method, irrational — will instead of reason, feeling rather than knowledge.

It is under the banner of this protest against rationalizing idealism that Schopenhauer advances. But what marks out his armament is its pronounced realism. He fights with the weapons of physical doctrine and on the basis of the material earth. He knows no reason but the human, no intelligence save what is exhibited by the animals. He knows that both animals and men have come into existence within assignable limits of time, and that there was an anterior age when no eye or ear gathered the life of the universe into perceptions. Knowledge, therefore, with its vehicle, the intellect, is dependent upon the existence of certain nerve-organs located in an animal system ; and its function is originally only to present an image of the interconnexions of the manifestations external to the individual organism, and so to give to the individual in a partial and reflected form that feeling with other things, or innate sympathy, which it loses as organization becomes more complex and characteristic. Knowledge or intellect, therefore, is only the surrogate of that more intimate unity of feeling or will which is the underlying reality — the principle of all existence, the essence of all manifestations, inorganic and organic. And the perfection of reason is attained when man has transcended those limits of individuation in which his know- ledge at first presents him to himself, when by art he has risen from single objects to universal types, and by suffering and sacrifice has penetrated to that innermost sanctuary where the euthanasia of

consciousness is reached — the blessedness of eternal repose.

In substantials the theory of Schopenhauer may be compared with a more prosaic statement of Herbert Spencer (modernizing _ . Hume). All psychical states may, according to him, be

open- t rea t ec j as incidents of the correspondence between the ll'rbrt or g ar >i sm an d its environment. In this adjustment the S encer l° west stage is taken by reflex action and instinct, where " the change of the organs is purely automatic. As the external complexity increases, this automatic regularity fails; there is only an incipient excitation of the nerves. This feeble echo of the full response to stimulus is an idea, which is thus only another word for imperfect organization or adjustment. But gradually this imperfect correspondence is improved, and the idea passes over again into the state of unconscious or organic memory. Intellect, in short, is only the consequence of insufficient response between stimulus and action. Where action is entirely automatic, feeling does not exist. It is when the excitation is partial only, when it does not inevitably and immediately appear as action, that we have the appearance of intellect in the gap. The chief and fundamental difference between Schopenhauer and Spencer lies in the refusal of the latter to give this " adjustment " or " automatic action " the name of will. Will, according to Mr Spencer, is only another aspect of what is reason, memory or feeling — the difference lying in the fact that as will the nascent excitation (ideal motion) is conceived as passing into complete or full motion. But he agrees with Schopenhauer in basing consciousness, in all its forms of reason, feeling or will, upon " automatic movement — psychical change," from which consciousness emerges and in which it dis- appears.*

What Schopenhauer professed, therefore, is to have dispelled the claims of reason to priority and to demonstrate the relativity „ . and limitation of science. Science, he reminds us, is

tendencies Dase d on final inexplicabilities ; and its attempts by of his theories of evolution to find an historical origin for

system. humanity in rudimentary matter show a misconception of the problem. In the successions of material states there can nowhere be an absolute first. The true origin of man, as of all else, is to be .sought in an action which is everlasting and which is ever present: nee te quaesiveris extra. There is a source of knowledge within us by which we know, and more intimately than we can ever know anything external, that we will and feel. That is the first and the

highest knowledge, the only knowledge that can strictly be called immediate; and to ourselves we as the subject of will are truly the " immediate object." It is in this sense of will — of will without motives, but not without conscious- ness of some sort — that reality is revealed. Analogy and experi- ence make us assume it to be omnipresent. It is a mistake to say will means for Schopenhauer only force. It means a great deal

more; and it is his contention that what the scientist calls force is really will. In so doing he is only following the line predicted by Kant 1 and anticipated by Leibnitz. If we wish, said Kant, to give a real existence to the thing in itself or the noumenon we can only do so by investing it with the attributes found in our own internal sense, viz. with thinking or something analogous thereto. It is thus that Fechner in his " day-view " of things sees in plants and planets the same fundamental " soul " as in us — that is, " one simple being which appears to none but itself, in us as elsewhere wherever it occurs self-luminous, dark for every other eye, at the least connecting sensations in itself, upon which, as the grade of soul mounts higher and higher, there is constructed the conscious- ness of higher and still higher relations." 2 It is thus that Lotze declares 3 that " behind the tranquil surface of matter, behind its rigid and regular habits of behaviour, we are forced to seek the glow of a hidden spiritual activity." So Schopenhauer, but in a way all his own, finds the truth of things in a will which is indeed unaffected by conscious motives and yet cannot be separated from some faint analogue of non-intellectual consciousness.

In two ways Schopenhauer has influenced the world. He has shown with unusual lucidity of expression how feeble is the spon- taneity of that intellect which is so highly lauded, and how over- powering the sway of original will in all our action. He thus re- asserted realism, whose gospel reads, " In the beginning was appetite, passion, will," and has discredited the doctrinaire belief that ideas have original force of their own. This creed of naturalism is dangerous, and it may be true that the pessimism it implies often degenerates into cynicism and a cold-blooded denial that there is any virtue and any truth. But in the crash of established creeds and the spread of political indifferentism and social disintegration it is probably wise, if not always agreeable, to lay bare the wounds under which humanity suffers, though pride would prompt their concealment. But Schopenhauer's theory has another side. If it is daringly realistic, it is no less audacious in its idealism. The second aspect of his influence is the doctrine of redemption of the soul from its sensual bonds, first by the medium of art and second by the path of

renunciation and ascetic life. It may be difficult in each case to draw the line between social duty and individual perfection. But Schopenhauer reminds us that the welfare of society is a temporal and subordinate aim, never to be allowed to dwarf the full realization of our ideal being. Man's duty is un- doubtedly to join in the common service of sentient beings; but his final goal is to rise above the toils and comforts of the visible creature into the vast bosom of a peaceful Nirvana.

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Schopenhauer's criticism (1910). (W. W.;X.)

SCHOPPE, CASPAR (1576-1649), German controversialist and scholar, was born at Neumarkt in the upper Palatinate on the 27th of May 1576 and studied at several German univer- sities. Having become a convert to Roman Catholicism about 1599, he obtained the favour of Pope Clement VIII., and, even

1 Kritik (Trans. Anal.), bk. ii. Appendix.

2 Uber die Seelenfrage, p. 9 (Leipzig, 1861).

3 Mikrokosmus, i. 408 (2nd ed.).

in an age of violent polemics, distinguished himself by the virulence of his writings against the Protestants. He became involved in a controversy with Joseph Justus Scaliger, formerly his intimate friend, and others, wrote Ecclesiasticus auctoritati Jacobi regis oppositus (1611), an attack upon James I. of England; and in Classicum belli scari (1619) urged the Catholic princes to wage war upon the Protestants. About 1607 Schoppe entered the service of Ferdinand, archduke of Styria, afterwards the emperor Ferdinand II., who found him very useful in rebutting the arguments of the Protestants, and who sent him on several diplomatic errands. According to Pierre Bayle, he was almost killed by some Englishmen at Madrid in 16 14, and again fearing for his life he left Germany for Italy in 161 7, afterwards taking part in an attack upon the Jesuits. Schoppe, as the long list of his writings shows, knew also something of grammar and philosophy, and had an excellent acquaintance with Latin. His chief work is, perhaps, his Grammatica philosophica (Milan, 1628). Schoppe died at Padua on the 19th of November 1649. In his Life of Sir Henry Wotton Izaac Walton, calling him Jasper Scioppius, refers to Schoppe as " a man of a restless spirit and a malicious pen."

Besides the works already noticed, he wrote De arte crilica (1597) ; De Antichristo (1605); Pro auctoritale ecclesiae in decidendis fidei controversiis libellus; Scaliger hypololymaeus (1607), a virulent attack on Scaliger ; and latterly the anti-jesuitical works, Flagellum Jesuiticum (1632); Mysleria palrum jesuilorum (1633); and Arcana societatis Jesu (1635). For a fuller list of his writings see J. P. Niceron Memoires, (1727-1745). See also C. Nisard, Les Gladiateurs de la republique des lettres (Paris, i860).

SCHORL, in mineralogy, the name given to coarse black varieties of tourmaline (q.v.). The schorl rocks are crystalline aggregates of quartz and tourmaline. They are granular and massive, not banded or foliated as a rule, grey of various shades, the darkest coloured being most rich in schorl. Some are very fine grained, but in most cases the individual crystals are easily discernible with the unaided eye. They are hard, splintery, and very resistant to weathering. Veined, brecciated, porous and banded varieties occur, but are less common than the granular massive rocks.

Schorl rocks occur practically always in association with tourmaline-bearing granites. Most of them are of igneous origin and, though there may be a few which are direct products of consolidation from a plutonic magma, in the vast majority of cases they originate by the action of gases and vapours on granites, porphyries and other rocks. All magmas contain vapours in solution and give them off more or less readily as they crystallize. Water, carbonic acid and hydrochloric acid (or chlorides) are the commonest dissolved substances, but fluorine, boron, lithium and phosphoric acid occur also, and as they pass outwards these last may act on the surrounding rocks, probably still at a high temperature and produce minerals of a special kind. This action is said to be pneumatolytic. Tourmaline contains boron and flourine, hence the presence of these elements in the emanations from the granite may be assumed. Schorl rocks often also contain varieties of white mica which are rich in fluorine and lithium; in addition apatite is usually present. Lastly, many of the rocks of this group contain tinstone or are associated with tin-bearing veins, and it is probable that the ores of this metal were brought up in solu- tion as fluorides or chlorides and deposited in the situations where now they are found.

Along the sides of fissures, through which, no doubt, the gases ascended, the granite is converted into schorl rock for a distance ranging from a fraction of an inch to several feet, and vein-like masses of grey schorl .rock branching and uniting are thus produced. In other places considerable areas of granite are changed in this way, principally near the margin of the granite, and an interrupted belt of this kind of rock encircles some of the larger outcrops of granite in Cornwall. A similar origin must be ascribed to greisen (q.v.), the aggregate of quartz and white mica commonly found in association with tin-bearing granites; there are complete gradations between schorl rock and greisen, according to the varying pro- portions of white mica and tourmaline which may be present in each specimen. Another mineral which is produced by the pneumato- lytic alteration of granite is topaz (a silicate and fluoride of alu-

minium) ; an aggregate of quartz and topaz is called topaz-fels or topaz rock, and is largely developed in some of the tin-mining districts of Germany, though not found in Cornwall.

As might be expected every stage of the conversion of granite into schorl rock can be found. Tourmaline may have been to some extent an original constituent of the granite, but most of it is of new formation and must have resulted from the alteration of the biotite and the felspar of the original rock, both of these minerals having disappeared when the metamorphosis was complete. It is commonly found that the schorl is of a brown colour in the interior of the crystals but blue at the edges ; probably the brown is primary or has been derived from biotite, but the blue principally from the replacement of felspar. The rock known as luxullianite, obtained near Luxullian village in Cornwall and used as an ornamental stone for the sarcophagus of the duke of Wellington's monument in St Paul's Cathedral, is a tourmaline granite in which the replacement of biotite and felspar by quartz and tourmaline can be seen in progress. The new tourmaline is in fine pointed needles which have a stellate or divergent arrangement, and is embedded in quartz: often these needles are planted on the surface of corroded crystals of primary brown schorl. This rock still contains a good deal of flesh-coloured felspar in large porphyritic crystals which contrast well with the dark matrix and give polished specimens a very handsome appearance. In the completely altered schorl rocks there are rarely needles of tourmaline, but this mineral occurs as irregular grains mingled in varying proportions with small crystals of quartz. In nearly all cases the structure of the granite has vanished, but at Trevalgan, St Austell, and other places in Cornwall there are schorl rocks which contain white pseudomorphs of quartz after porphyritic crystals of orthoclase.

In porphyries of " el vans " tourmalinization also is frequent, though not so common as greisening. Veins of quartz with stellate schorl needles may be seen spreading through the groundmass or when this has been previously converted into an aggregate of quartz and fine scaly white mica, the porphyritic crystals of felspar alone may be replaced by bunches of tourmaline embedded in quartz. Tinstone often makes its appearance in these rocks either in small crystals enclosed in quartz or lining fissures and cavities left by the removal of a portion of the rock in solution.

The same process goes on also in sedimentary rocks; a felspathic sandstone may yield a schorl rock which can hardly be distinguished from one derived from a fine-grained granite. In shales brown

tourmaline is often deposited in the vicinity of fissures, and the whole mass may be converted into a hard splintery aggregate of quartz and schorl (often containing also rutile and tinstone). But these rocks are always banded, like the original slate; their original structures (bedding and cleavage) are probably never completely effaced and the ultimate product has been called schorl-schist (tourmaline hornfels, cornubianite).

The stanniferous veins which in large numbers intersect the granites of Devon and Cornwall and the slates around them, and have yielded a large part of the world's supply of tin consist mostly of quartz, tourmaline and chlorite (with varying proportions of cassiterite). The veinstones are typically very fine grained, hard and dark blue or dark green in colour. The green varieties contain much chlorite, the blue are richer in tourmaline, and both kinds are known to the miners as " peach." Essentially aqueous deposits in lines of fissure, these rocks show that quartz and tourmaline were carried up in hot solutions at a late period in the cooling of the granite, and the changes above described are due to the operation of these solutions as they spread outwards through the surrounding rocks. Their tourmaline crystals are very small and usually of dark-blue shades, but owing to repeated movements of the walls of the veins the ore deposits have sometimes an intricate history, as microscopic studies show that the first infillings of the fissures have been broken up and cemented together again by a later material of slightly different character. (J. S. F.)

SCHOTTISCHE, the German for " Scottish," a name given to a dance, der schottische Tanz, introduced into England about 1850. It was a form of polka, with two figures. The " High- land Schottische " is a lively dance resembling a fling. What is known as the "barn dance" was first known in America as the " Military Schottische."

SCHOULER, JAMES (1839-), American lawyer and historian, was born in West Cambridge (now Arlington), Massa- chusetts, on the 20th of March 1839, the son of William Schouler (1814-1872), who from 1847 to 1853 edited the Boston Atlas, one of the leading Whig journals of New England. The son graduated at Harvard in 1859, studied law in Boston and was admitted to the bar there in 1862. In 1869 he removed to Washington, where for three years he published the United Stales Jurist. After his return to Boston, in 1874, he devoted himself to office practice and to literary pursuits. He was a lecturer in the law school of Boston University between 1885 and 1903, a non-resident professor and lecturer in the National

University Law School, Washington, D.C., in 1887-1909, and a lecturer on American history and constitutional law at Johns Hopkins University in 1891-1908. In 1896-1897 he was presi- dent of the American Historical Association. His legal treatises are The Law of Domestic Relations (1870), The Law of Personal Property (1872-1876; new ed., 1907), The Law of Bailments (1880), The Law of Executors and Administrators (1883),. The Law of Husband and Wife (1882) and The Law of Wills (1910). He is best known, however, as an historian; his most important work being a History of the United States under the Constitution, 1789-1865 (6 vols., 1880-1899). Among his other publications are A Life of Thomas Jefferson (1893); Historical Briefs (1896), containing a biography of Mr Schouler; Constitutional Studies, State and Federal (1897); a brief Life of Alexander Hamilton (1901); Americans of 1776 (1906); and Ideals of the Republic

(1908).

SCHRADER, EBERHARD (1836-1908), German orientalist, was born at Brunswick on the 7th of January 1836, and educated at Gottingen under Ewald. In 1858 he took a university prize for a treatise on the Ethiopian languages, and in 1863 became professor of theology at Zurich. Subsequently he occupied chairs at Giessen (1870) and Jena (1873), and finally became professor of oriental languages at Berlin. Though he turned first to biblical research, his chief achievements were in the field of Assyriology, in which he was a pioneer in Germany and acquired an international reputation. He died on the 4th of July 1908.

His publications include: Studien zur Kritik und Erkldrung der biblischen Urgeschichte (1863); the 8th edition of De Wette's Ein- leitung in das Alte Testament (1869) ; Die assyr.-babyl. Keilinschriften (1872); Die Keilinschriften und das Alt. Test. (1872; 3rd ed. by Zimmern and Winckler, 1901-1902) ; Keilinschriften und Ge- schichtsforschung (1878); Die Hollenfahrt der Istar (text, trans., notes, 1874) ; Zur Frage nach dent Ur sprung der altbabylonischen Kultur (1884) ; in conjunction with other scholars, Keilinschriftliche Bibliothek (1877).

SCHREIBER, LADY CHARLOTTE ELIZABETH (181 2- 1895), better known as Lady Charlotte Guest, Welsh scholar and connoisseur of

china, daughter of Albemarle Bertie, 9th earl of Lindsey, was born at Uffington House, Lincolnshire, on the 19th of May 1812. She married in 1833 Sir Josiah John Guest, manager and afterwards owner of the Dowlais iron- works near Merthyr Tydvil. Lady Charlotte Guest studied the Welsh language and literature, and published (3 vols., 1 838-1 849) The Mabinogion, from the Llyfr Coch o Hergest, and other ancient Welsh Manuscripts, with an English translation and notes. A second edition without the Welsh text appeared in 1877, and in 1881 The Boy's Mabinogion; being the earliest Welsh tales of King Arthur in the famous Red Book of Hergest, edited with an introduction by S. Lanier. Sir Josiah Guest died in 1852, and Lady Charlotte married in 1855 Charles Schreiber, M.P. for Cheltenham and Poole. She made a valuable collection of English porcelain and china, now in the South Kensington Museum, another of fans and fan leaves, presented to the British Museum, and a third of playing cards, part of which is in the British Museum. On all three subjects she left elaborate treatises. She died on the 15th of January 1895 at Canford Manor, Dorset, at the house of her eldest son Ivor Guest, Baron Wimborne.

Editions of Lady Charlotte Guest's translation of the Mabinogion are in The Temple Classics (1902), The Welsh Library (1902), &c.

SCHREIBERHAU, a village and climatic health resort of Germany, in the Prussian province of Silesia, situated in the valley of the Zacken in the Riesengebirge, 1900 ft. above the sea, 16 m. S.W. from Hirschberg by the railway to Griinthal. Pop. (1905) 4994. It has two Roman Catholic and two Evangeli- cal churches, and works for the making and polishing of glass. It is a popular resort, being visited by about 10,000 visitors annually.

See Kloidt, Schreiberhau im Riesengebirge (Breslau, 1893).

SCHREYER, ADOLF (1828-1899), German painter, was born at Frankfort-on-Main, and studied art first at the Staedel Institute in his native town, and then at Stuttgart, Munich, and Dusseldorf; but he formed his style in Paris, whilst he found his

favourite subjects in his travels in the East. He first accom- panied Prince Thurn and Taxis through Hungary, Wallachia, Russia and Turkey; then, in 1854, he followed the Austrian army across the Wallachian frontier. In 1856 he went to Egypt and Syria, and in 1861 to Algiers. In 1862 he settled in Paris, but returned to Germany in 1870; and settled at Cronberg near Frankfort, where he died in 1899. Schreyer was, and is still, especially esteemed as a painter of

horses, of peasant life in Wallachia and Moldavia, and of battle incidents. His work is remarkable for its excellent equine draughtsmanship, and for the artist's power of observation and forceful statement; and has found particular favour among French and American collectors. Of his battle-pictures there are two at the Schwerin Gallery, and others in the collection of Count Mensdorff-Pouilly and in the Ravene Gallery, Berlin. His painting of a " Charge of Artillery of Imperial Guard " was formerly at the Luxembourg Museum. The Metropolitan Museum, New York, owns three of Schreyer's oriental paintings: " Abandoned," " Arabs on the March " and " Arabs making a detour "; and many of his best pictures are in the Rockefeller, Vanderbilt, J. J. Astor, W. Astor, A. Belmont, and W. Walters collections. At the Kunsthalle in Hamburg is his " Wallachian Transport Train," and at the Staedel Institute, Frankfort, are two of his Wallachian scenes.

SCHRIJVER, PETER (1576-1660), Dutch author, better known as Sceiverius, was born at Haarlem on the 12th of January 1576. He was educated at the university of Leiden, where he formed a close intimacy with Daniel Heinsius. He belonged to the party of Oldenbarneveldt and Grotius, and brought down the displeasure of the government by a copy of Latin verses in honour of their friend Hoogerbeets. Most of his life was passed in Leiden, but in 1650 he became blind, and the last years of his life were spent in his son's house at Oudewater, where he died on the 30th of April 1660.

He is best known as a scholar by his notes on Martial, Ausonius, the Pervigilium Veneris; editions of the poems of Scaliger (Leiden, 1615), of the De re militari of Vegetius Renatus, the tragedies of Seneca (P. Scriverii collectanea veterum tragicorum, 1621), &c. His Opera anecdota, philologica, et poetica (Utrecht, 1738) were edited by A. H. Westerhovius, and his Nederduitsche Gedichten (1738) by S. Dockes. He made many valuable contributions to the history of Holland : Batavia Illustrata (4 parts, Leiden, 1609) ; Corte historische Beschryvinghe der Nederlandscher Oorlogen (161 2); Inferioris Germaniae . . . historia (1611, 4 parts); Beschryvinghe van Out Batavien (Arnheim, 1612); Het oude gontsche ■ Chronycxken van Hollandl, edited by him, and printed at Amsterdam in 1663; Principes Hollandiae Zelandiae et Frisiae (Haarlem, 1650), translated (1678) into Dutch by Pieter Brugman.

See Peerlkamp, Vitae Belgarum qui latina carmina scripserunt (Brussels, 1822), and J. H. Hoeufft, Parnassus latino-belgicus (Amsterdam, 1819).

SCHRODER, FRIEDRICH LUDWIG (1744-1816), German actor, manager and dramatist, was born in Schwerin on the 3rd of November 1744. Shortly after his birth, his mother, Sophie Charlotte Schroder (1714-1792), separated from her husband, and joining a theatrical company toured with success in Poland and Russia. Subsequently she married Konrad Ernst Acker- mann and appeared with, his company in many German cities, finally settling in Hamburg. Young Schroder early showed considerable talent, but his childhood was rendered so unhappy by his stepfather that he ran away from home and learnt the trade of a shoemaker. He rejoined his parents, however, in r759, and became an actor. In 1764 he appeared with the Ackermann company in Hamburg, playing leading comedy parts; but these he soon exchanged for the tragic r61es in which he became famous. These included Hamlet, Lear and Philip in Schiller's Don Carlos After Ackermann's death in 1771 Schroder and his mother took over the management of the Hamburg theatre, and he began to write plays — largely adaptations from the English, making his first success with the comedy Die Arglistige. In r78o he left Hamburg, and after a tour with his wife, Anna Christina Hart, a former pupil, accepted an engagement at the Court theatre in Vienna. In 1 785 Schroder again took over his Hamburg manage- ment and conducted the theatre with marked ability until his retirement in 1798. The Hamburg theatre again falling into decay, the master was once more summoned to assist in its*

rehabilitation, and in 1811 he returned to it for one year. He died on the 3rd of September 1816. As an actor Schroder was the first to depart from the stilted style of former tragedians; as a manager he raised the standard of plays presented and first brought Shakespeare before the German public. Schroder's Dramalische Werke, with an introduction by Tieck, were published in four volumes (Berlin, 1831).

See B. Litzmann, Friedrich Ludwig Schrqder (Hamburg, 1890-1894); R. Blum in the Allgemeines Theater-Lexikon (1842); and Brunier, Friedrich Ludwig Schroder (Leipzig, 1864).

SCHRODER, SOPHIE (1781-1868), German actress, was born at Paderborn on the 23rd of February 1781, the daughter of an actor, Gottfried Burger. She made her first appearance in opera at St Petersburg, in 1793. On Kotzebue's recommendation she was

engaged for the Vienna Court theatre in 1798, and here and in Munich and Hamburg she won great successes in tragic roles like Marie Stuart, Phedre, Merope, Lady Macbeth, and Isabella in The Bride of Messina, which gave her the reputation of being " the German Siddons." She retired in 1840 and lived in Augs- burg and Munich until her death on the 25th of February 1868. She had married, in 1795, an actor, Stollrners (properly Smets), from whom she separated in 1799. In 1804 she married the tenor Friedrich Schroder, and on his death in 1825, an actor, Kunst. Mme Schroder's eldest daughter was the opera singer, Wilhelmine Devrient-Schroder (q.v.).

See Ph. Schmidt, Sophie Schroder (Vienna, 1870) ; also Das Lexikon der deutscher Buhnen-Angehorigen.

SCHRODER – DEVRIENT, WILHELMINE (1804-1860), German operatic singer, was born on the 6th of December 1804, in Hamburg, being the daughter of the actress, Sophie Schroder (1781-1868). Her first impersonation was at the age of fifteen as Aricia in Schiller's translation of Racine's Phedre, and in 1 82 1 she was received with so much enthusiasm as Pamina in Mozart's Zauberflote that her future career in opera was assured. In 1823 she married Karl Devrient, but was separated from him in 1828, afterwards making two other marriages. Meanwhile she had maintained her popularity at Dresden and elsewhere. She made her first Paris appearance in 1830, and she sang in London in 1833 and 1837. As a singer she combined a rare quality of tone with dramatic intensity of expression, which was as remarkable on the concert platform as in opera. She died in Coburg on the 26th of January i860.

See E. von Gliimer, Erinnerungen an Wilhelmine Schroder-Devrient (Leipzig, 1862); and A. von Wolzogen, Wilhelmine Schroder-Devrient (Leipzig, 1863).

SCHROTER, JOHANN HIERONYMUS (1745-1816), German astronomer, was born at Erfurt on the 30th of August 1745. Having studied law at Gottingen, he became chief magistrate at Lilienthal, near Bremen, in 1788. Here he built an observatory, and, equipped in 1785 by a 7-ft. reflector by Herschel, and later by a 13-ft. reflector by Johann Gottlieb Friedrich Schrader of Kiel, he made his famous observations on the surface features of the moon and planets. His work was ruined in 181 3 by the French under Vandamme, who destroyed his books, writings and observatory; he never recovered from the catastrophe, and died on the 29th of August

1816.

SCHUBART, CHRISTIAN FRIEDRICH DANIEL (1739-1791), German poet, was born at Obersontheim in Swabia (now the kingdom of Wurttemberg) on the 24th of March 1739, and entered the university of Erlangen in 1758 as a student of theo- logy. He led a dissolute life, and after two years' stay was summoned home by his parents. After attempting to earn a livelihood as private tutor and as assistant preacher, his musical talents gained him the appointment of organist in Geislingen, and subsequently in Ludwigsburg; but in consequence of his wild life and blasphemy, which found expression in a parody of the litany, he was expelled the country. He then visited in turn Heilbronn, Mannheim, Munich and Augsburg. In the last- named town he made a considerable stay, began his Deutsche Chronik (1774-1778) and eked out a subsistence by reciting from the latest works of prominent poets. Owing to a bitter attack upon the Jesuits, he was expelled from Augsburg and fled to Ulm,

where he was arrested in 1777 and confined in the fortress of Hohenasperg. Here he met with lenient treatment, and he beguiled the time by a study of mystical works and in compos- ing poetry. His Samtliche Gedichte appeared in two volumes at Stuttgart in 1 785-1 786 (new edition by G. Hauff, Leipzig, 1884, in Reclam's Universal-Bibiiothek) ; in this collection most of the pieces are characterized by the bombast of the " Sturm und Drang "period. He was set at libertyin 1787, at the instance of Frederick the Great, king of Prussia, and expressed his gratitude in Hymnus auf Friedrich den Grossen. Schubart was now appointed musical director and manager of the theatre at Stutt- gart, where he continued his Deutsche Chronik and began his autobiography, Schubarts Leben und Gesinnungen (2 vols., i79i-i793),but[before its completion he died at Stuttgart on the 10th of October 1791. His Gesammelte Schriftenund Schicksale appeared in 8 vols. (Stuttgart, 1839-1840).

See D. F. Strauss, Schubarts Leben in seinen Briefen (2 vols., 1849; 2nd ed., 1878); G. Hauff, Christian Daniel Schubart (1885); and E. Nagele, Aus Schubarts Leben und Wirken (18 "'

SCHUBERT, FRANZ PETER (1797-1828), German composer, was born on the 31st of January 1797, in the Himmelpfortgrund, a small suburb of Vienna. His father, Franz, son of a Moravian peasant, was a parish schoolmaster; his mother, Elizabeth Fitz, had before her marriage been cook in a Viennese family. Of their fourteen children nine died in infancy; the others were Igraz (b. 1784), Ferdinand (b. 1794), Karl (b. 1796), Franz and a daughter Theresia (b. 1801).

The father, a man of worth and integrity, possessed some reputation as a teacher, and his school, in the Lichtenthal, was well attended. He was also a fair amateur musician, and transmitted his own measure of skill to his two elder sons, Ignaz and Ferdinand.

At the age of five Schubert began to receive regular instruction from his father. At six he entered the Lichtenthal school where he spent some of the happiest years of his life. About the same time his musical education began. His father taught him the rudiments of the violin, his brother Ignaz the rudiments of the pianoforte. At seven, having outstripped these simple teachers, he was placed under the charge of Michael Holzer, the Kapell- meister of the Lichtenthal Church. Holzer's lessons seem to have consisted mainly in expressions of admiration, and the boy gained more from a friendly joiner's apprentice, who used to take him to a neighbouring pianoforte warehouse and give him the opportunity of practising on a better instrument than the poor home could afford. The unsatisfactory character of his early train- ing was the more serious as, at that time, a composer had little chance of success unless he could appeal to the public as a per- former, and for this the meagre education was never sufficient.

In October 1808 he was received as a scholar at the Convict, which, under Salieri's direction, had become the chief music-i school of Vienna, and which had the special office of training the choristers for the Court Chapel. Here he remained until nearly seventeen, profiting little by the direct instruction, which was almost as careless as that given to Haydn at St Stephen's, but much by the practices of the school orchestra, and by associ- ation with congenial comrades. Many of the most devoted friends of his, after life were among his schoolfellows: Spaun and Stadler and Holzapfel, and a score of others who helped him out of their slender pocket-money, bought him music-paper which he could not buy for himself, and gave him loyal support and encourage- ment. It was at the Convict, too, that he first made acquaintance with the overtures and symphonies of Mozart — there is as yet no mention of Beethoven — and between them and lighter pieces, and occasional visits to the opera, he began to lay for himself some foundation of musical knowledge.

Meanwhile his genius was already showing itself in composition. A pianoforte fantasia, thirty-two close-written pages, is dated April 8- May 1, 1810: then followed, in 1811, three long vocal pieces written upon a plan which Zumsteeg had popularized, together with a " quintet-overture," a string quartet, a second pianoforte fantasia and a number of songs. His essay in chamber-music is noticeable, since

we learn that at the time a regular quartet-party was established at his home " on Sundays

and holidays," in which his two brothers played the violin, his father the 'celio and Franz himself the viola. It was the first germ of that amateur orchestra for which, in later years, many of his compositions were written. During the remainder of his stay at the Convict he wrote a good deal more chamber-music, several songs, some miscellaneous pieces for the pianoforte and, among his more ambitious efforts, a Kyrie and Salve Regina, an octet for wind instruments — said to commemorate the death of his mother, which took place in 181 2 — a cantata, words and music, for his father's name-day in 1813, -and the closing work of his school-life, his first symphony.

At the end of 1813 he left the Convict, and, to avoid military service, entered his father's school as teacher of the lowest class. For over two years he endured the drudgery of the work, which, we are told, he performed with very indifferent success. There were, however, other interests to compensate. He took private lessons from Salieri, who annoyed him with accusations of plagiarism from Haydn and Mozart, but who did more for his training than any of his other teachers; he formed a close friendship with a family named Grob, whose daughter Therese was a good singer and a good comrade; he occupied every moment of leisure with rapid and voluminous composition. His first opera — Des Teufels Lustschloss — and his first Mass — in F major — were both written in 1814, and to the same year belong three string quartets, many smaller instrumental pieces, the first movement of the symphony in Bb and seventeen songs, which include such masterpieces as Der Taucher and Gretchen am Spinn- rade. But even this activity is far outpaced by that of the annus mirabilis 181 5. In this year, despite his school-work, his lessons with Salieri and the many distractions of Viennese life, he produced an amount of music the record of which is almost incredible. The symphony in Bb was finished, and a third, in D major, added soon afterwards. Of church music there appeared two Masses, in G and Bb, the former written within six days, a new Dona nobis for the Mass in F, a Stabat Mater and a Salve Regina. Opera was represented by no less than five works, of which three were completed — Der Vierjahrige Posten, Fernando and Claudine von Villabella — and two, Adrast and Die beiden Freunde von

Salamanca, apparently left unfinished. Besides these the list includes a string quartet in G minor, four sonatas and several smaller compositions for piano, and, by way of climax, 146 songs, some of which are of considerable length, and of which eight are dated Oct. 15, and seven Oct. 19. " Here," we may say with Dryden, " is God's plenty." Music has always been the most generous of the arts, but it has never, before or since, poured out its treasure with so lavish a hand.

In the winter of 1814-1815 Schubert made acquaintance with the poet Mayrhofer: an acquaintance which, according to his • usual habit, soon ripened into a warm and intimate friendship. They were singularly unlike in temperament: Schubert frank, open and sunny, with brief fits of depression, and sudden out- bursts of boisterous high spirits; Mayrhofer grim and saturnine, a silent man who regarded life chiefly as a test of endurance; but there is good authority for holding that " the best harmony is the resolution of discord," and of this aphorism the ill-assorted pair offer an illustration. The friendship, as will be seen later, was of service to Schubert in more than one way.

As 181 5 was the most prolific period of Schubert's life, so 1 816 saw the first real change in his fortunes. Somewhere about the turn of the year Spaun surprised him in the composition of Erlkonig — Goethe's poem propped among a heap of exercise- books, and the boy at white-heat of inspiration " hurling " the notes on the music-paper. A few weeks later Von Schober, a law-student of good family and some means, who had heard some of Schubert's songs at Spaun's house, came to pay a visit to the composer and proposed to carry him off from school-life and give him freedom to practice his art in peace. The proposal was particularly opportune, for Schubert had just made an un- successful application for the post of Kapellmeister at Laibach, and was feeling more acutely than ever the slavery of the class- room. His father's consent was readily given, and before the end of the spring he was installed as a guest in Von Schober's

lodgings. For a time he attempted to increase the household resources by giving music lessons, but they were soon abandoned, and he devoted himself to composition. " I write all day," he said later to an inquiring visitor, " and when I have finished one piece I begin another. "

The works of 1816 include three ceremonial cantatas, one written for Salieri 's Jubilee on June 16; one, eight days later, for a certain Herr Watteroth who paid the composer an honorarium of £4 (" the first time," said the journal, " that I have composed for money "), and one, on a foolish philanthropic libretto, for Herr Joseph Spendou " Founder and Principal of the Schoolmasters' Widows' Fund." Of more importance are two new symphonies, No. 4 in C minor, called the Tragic, with a striking andante, No. 5 in Bb, as bright and fresh as a symphony of Mozart: some numbers of church music, fuller and more mature than any of their predecessors, and over a hundred songs, among which are comprised some of his finest settings of Goethe and Schiller. There is also an opera, Die Burgschajt, spoiled by an illiterate book, but of interest as showing how continually his mind was turned towards the theatre.

All this time his circle of friends was steadily widening. Mayrhofer introduced him to Vogl, the famous baritone, who did him good service by performing his songs in the salons of Vienna; Anselm Hiittenbrenner and his brother Joseph ranged themselves among his most devoted admirers; Gahy, an ex- cellent pianist, played. his sonatas and fantasias; the Sonn- leithners, a rich burgher family whose eldest son had been at the Convict, gave him free access to their home, and organized in his honour musical parties which soon assumed the name of Schuber- tiaden. The material needs of life were supplied without much difficulty. No doubt Schubert was entirely penniless, for he had given up teaching, be could e&rn nothing by public per- formance, and, as yet, no publisher would take his music at a gift; but his friends came to his aid with true Bohemian generosity — one found him lodging, another found him appli- ances, they took their meals together and the man who had any money paid the score. Schubert was always the leader of the party, and was known by half-a-dozen affectionate nicknames, of which the most characteristic is " kann er 'was? " his usual question when a new acquaintance was proposed.

1818, though, like its predecessor, comparatively unfertile in composition, was in two respects a memorable year. It saw the first public performance of any work of Schubert's — an overture in the

Italian style written as an avowed burlesque of Rossini, and played in all seriousness at a Jail concert on March 1. It also saw the beginning of his only official appointment, the post of music-master to the family of Count Johann Esterhazy at Zelesz, where he spent the summer amid pleasant and congenial surroundings. The compositions of the year include a Mass and a symphony, both in C major, a certain amount of four-hand pianoforte music for his pupils at Zelesz and a few songs, among which are Einsamkeit, Marienbild and the Litaney. On his return to Vienna in the autumn he found that Von Schober had no room for him, and took up his residence with Mayrhofer. There his life continued on "its accustomed lines. Every morning he began composing as soon as he was out of bed, wrote till two o'clock, then dined and took a country walk, then returned to composition or, if the mood forsook him, to visits among his friends. He made his first public appearance as a song-writer on February 28, 1819, when the Schafers Klage- lied was sung by Jager at a Jail concert. In the summer of the same year he took a holiday and travelled with Vogl through Upper Austria. At Steyr he wrote his brilliant piano quintet in A, and astonished his friends by transcribing the parts without a score. In the autumn he sent three of his songs to Goethe, but, so far as we know, received no acknowledgment.

The compositions of 1820 are remarkable, and show a marked advance in development and maturity of style. The unfinished oratorio Lazarus was begun in February; later followed, amid a number of smaller works, the 23rd Psalm, the Gesang der Geister, the Quartettsatz in C minor and the great pianoforte fantasia on Der Wanderer. But of almost more biographical interest is

the fact that in this year two of Schubert's operas appeared at the Karnthnerthor theatre, Die Zwillingsbriider on June 14, and Die Zauberharfe on August 19. Hitherto his larger compositions (apart from Masses) had been restricted to the amateur orchestra at the Gundelhof , a society which grew out of the quartet-parties at his home. Now he began to assume a more prominent position and address a wider public. Still, however, publishers held obstinately aloof, and it was not until his friend Vogl had sung Erlkonig at a concert in the Karnthnerthor (Feb. 8, 1821) that Diabelli hesitatingly agreed to print some of his works on com- mission. The first seven opus-numbers (all songs) appeared on these terms; then the

commission ceased, and he began to receive the meagre pittances which were all that the great publish- ing houses ever accorded to him. Much has been written about the neglect from which he suffered during his lifetime. It was not the fault of his friends, it was only indirectly the fault of the Viennese public; the persons most to blame were the cautious intermediaries who stinted and hindered him from publication.

The production of his two dramatic pieces turned Schubert's attention more firmly than ever in the direction of the stage; and towards the end of 182 1 he set himself on a course which for nearly three years brought him continuous mortification and disappointment. Alfonso und Estrella was refused, so was Fierrabras; Die Verschworenen was prohibited by the censor (apparently on the ground of its title) ; Rosamunde was withdrawn after two nights, owing to the badness of its libretto. Of these works the two former are written on a scale which would make their performances exceedingly difficult {Fierrabras, for instance, contains over 1000 pages of manuscript score), but Die Verschworenen is a bright attractive comedy, and Rosamunde contains some of the most charming music that Schubert ever com- posed. In 1822 he made the acquaintance both of Weber and of Beethoven, but little came of it in either case, though Beethoven cordially acknowledged his genius. Von Schober was away from Vienna; new friends appeared of a less desirable character; on the whole these were the darkest years of his life.

In the spring of 1824 he wrote the magnificent octet, "A Sketch for a Grand Symphony " ; and in the summer went back to Zelesz, when he became attracted by Hungarian idiom, and wrote the Divertissement d VHongroise and the string quartet in A minor. Most of his biographers insert here a story of his hopeless passion for his pupil Countess Caroline Esterhazy; but whatever may be said as to the general likelihood of the romance, the details by which it is illustrated are apocryphal, and the song I'Addio, placed at its climax, is undoubtedly spurious. A more debatable problem is raised by the grand duo in C major (op. 140) which is dated from Zelesz in the summer of this year. It bears no relation to the style of Schubert's pianoforte music, it is wholly orchestral in character, and it may well be a transcript or sketch of the " grand symphony " for which the octet was a preparation. If so, it settles the question, raised by Sir George Grove, of a " Symphony in C major " which is not to be found among Schubert's orchestral scores.

Despite his preoccupation with the stage and later with his official

duties he found time during these years for a good deal of miscellaneous composition. The Mass in Ab was completed and the exquisite " Unfinished Symphony " begun in 1822. The Miillerlieder, and several other of his best songs, were written in 1825; to 1824, beside the works mentioned above, belong the variations on Trockne Blumen and the two string quartets in E and Et>. There is also a sonata, for piano and " Arpeggione," an interesting attempt to encourage a cumbersome and now obsolete instrument.

The mishaps of the recent years were compensated by the prosperity and happiness of 1825. Publication had been moving more rapidly; the stress of poverty was for a time lightened; in the summer there was a pleasant holiday in Upper Austria, where Schubert was welcomed with enthusiasm. It was during this tour that he produced his " Songs from Sir Walter Scott," and his piano sonata in A minor (op. 42), the former of which he sold to Artaria for £20, the largest sum which he had yet received for any composition. Sir George Grove, on the authority

of Randhartinger, attributes to this summer a lost " Gastein " symphony which is possibly the same work as that already mentioned under the record of the preceding year.

From 1826 to 1828 Schubert resided continuously in Vienna, except for a brief visit to Graz in 1827. The history of his life during these three years is little more than a record of his compositions. The only events worth notice are that in 1826 he dedicated a symphony to the Gesellschaft der Musikfreunde, which voted him in return an honorarium of £10, that in the same year he applied for a conductorship at the opera, and lost it by refusing to alter one of his songs at rehearsal, and that in the spring of 1828 he gave, for the first and only time in his career, a public concert of his own works. But the compositions themselves are a sufficient biography. The string quartet in D minor, with the variations on " Death and the Maiden," was written during the winter of 1825-1826, and first played on Jan. 25. Later in the year came the string quartet ,in G major, the " Rondeau brilliant," for piano and violin, and the fine sonata in G which, by some pedantry of the publisher's, is printed without its proper title. To these should be added the three Shakespearian songs, of which " Hark! Hark! the Lark " and " Who is Sylvia?" were written on the same day, the former at a tavern where he broke his afternoon's walk, the latter on his return to his lodging in the evening. In 1827 he wrote the Winterreise, the fantasia for piano and violin, and the two piano trios: in 1828 the Song of Miriam, the C major symphony, the Mass in Et>, and the

exceedingly beautiful Tantum Ergo in the same key, the string quintet, the second Benedictus to the Mass in C, the last three piano sonatas, and the collection of songs known as Schwanengesang. Six of these are to words by Heine, whose Buck der Licder appeared in the autumn. Every- thing pointed to the renewal of an activity which should equal that of his greatest abundance, when he was suddenly attacked by typhus fever, and after a fortnight's illness died on Nov. 19 at the house of his brother Ferdinand. He had not completed his thirty-second year.

Some of his smaller pieces were printed shortly after his death, but the more valuable seem to have been regarded by the publishers as waste paper. In 1838 Schumann, on a visit to Vienna, found the dusty manuscript of the C major symphony and took it back to Leipzig, where it was performed by Mendels- sohn and celebrated in the Neue Zeitschrift. The most important step towards the recovery of the neglected works was the journey to Vienna which Sir George Grove and Sir Arthur Sullivan made in the autumn of 1867. The account of it is given in Grove's appendix to the English translation' of Kreissle von Hellborn; the travellers rescued from oblivion seven symphonies, the Rosamunde music, some of the Masses and operas, some of the chamber works, and a vast quantity of miscellaneous pieces and songs. Their success gave impetus to a widespread public interest and finally resulted in the definitive edition of Breit- kopf and Hartel. ,

Schubert is best summed up in the well-known phrase of Liszt, that he was " le musicien le plus poete qui fut jamais." In clarity of style he was inferior to Mozart, in power of musical construction he was far inferior to Beethoven, but in poetic impulse and suggestion he is unsurpassed. He wrote always at headlong speed, he seldom blotted a line, and the greater part of his work bears, in consequence, the essential mark of improvisation: it is fresh, vivid, spontaneous, impatient of restraint, full of rich colour and of warm imaginative feeling. He was the greatest songwriter who aver lived, and almost everything in his hand turned to song. In his Masses, for instance, he seems to chafe at the contrapuntal numbers and pours out his whole soul on those which he found suitable for lyrical treatment. In his symphonies the lyric and elegiac passages are usually the best, and the most beautiful of them all is, throughout its two movements, lyric in character. The standpoint from which to judge him is that of a singer who ranged over the whole field of musical composition and everywhere carried with him the artistic form which he loved best.

Like Mozart, whose influence over him was always considerable, he wrote nearly all the finest of his compositions in the last ten years of his life. His early symphonies, his early quartets, even his early masses, are too much affected by a traditional style to establish an enduring reputation. It is unfair to call them imitative, but at the time when he wrote them he was saturated with Mozart, and early Beethoven, and he spoke what was in his mind with a boy's frankness. The Andante of the Tragic Symphony (No. 4) strikes a more distinctive note, but the fifth is but a charming adaptation of a past idiom, and the sixth, on which Schubert himself placed little value, shows hardly any appreciable advance. It is a very different matter when we come to the later works. The piano quintet in A major (1819) may here be taken as the turning-point; then come the Unfinished Symphony, which is pure Schubert in every bar; the three quartets in A minor, D minor, and G major, full of romantic colour; the delightful piano trios; the great string quintet; and the C major symphony which, though diffuse, contains many passages of surprising beauty. Every one of them is a masterpiece, and a masterpiece such as Schubert alone could have written. The days of brilliant promise were over and were succeeded by the days of full and mature achievement.

His larger operas are marred both by their inordinate length and by their want of dramatic power. The slighter comedies are pretty and tuneful, but, except as curiosities, are not likely to be revived. We may, however, deplore the fate which has deprived the stage of the Rosamunde music. It is in Schubert's best vein; the en- tractes, the Romance, and the ballets are alike excellent, and it is much to be hoped that a poet will some day arise and fit the music to a new play.

Of his pianoforte compositions, the sonatas, as might be expected, are the least enduring, though there is not one of them which does not contain some first-rate work. On the other hand his smaller pieces, in which the lyric character is more apparent, are throughout interesting to play and extremely pleasant to hear. He developed a special pianoforte technique of his own — not always " orthodox," but always characteristic. A special word should be added on his fondness for piano duets, a form which before his time had been rarely attempted. Of these he wrote a great many— fantasias, marches, polonaises, variations — all bright and melodious with sound texture and a remarkable command of rhythm.

His concerted pieces for the voice are often extremely difficult, but they are of a rare beauty which would well repay the labour of rehearsal. The 23rd psalm (for female voices) is exquisite; so are the Gesang der Geister, the Nachthalle, the Nachtgesang im Walde (for male voices and horns), and that " dewdrop of celestial melody " which Novello has published with English words under the title of " Where Thou Reignest." Among all Schubert's mature works there are none more undeservedly neglected than these.

Of the songs it is impossible, within the present limits, to give even a sketch. They number over 600, excluding scenas and operatic pieces, and they contain masterpieces from the beginning of his career to the end. Gretchen am Spinnrade was written when he was seventeen, Erlkonig when he was eighteen; then there follows a continuous stream which never checks or runs dry, and which broadens as it flows to the MiUlerlieder , the Scott songs, the Shakesperian songs, the Winterreise, and the Schwanengesang. He is said to have been undiscriminating in his choice of words. Schu- mann declared that " he could set a handbill to music," and there is no doubt that he was inspired by any lyric which contained, though even in imperfect expression, the germ of a poetic idea. But his finest songs are almost all to fine poems. He set over 70 of Goethe's, over 60 of Schiller's; among the others are the names of Shakespeare and Scott, of Schlegel and Riickert, of Novalis and Wilhelm Miiller — a list more than sufficient to compensate for the triviality of occasional pieces or the inferior workmanship of personal friends. It was a tragedy that he only lived for a few weeks after the appearance of the Buck der Lieder. We may conjecture what the world would have gained if he had found the full complement of his art in Heine.

In his earlier songs he is more affected by the external and pictorial aspect of the poem; in the later ones he penetrates to the centre and seizes the poetic conception from within. But in both alike he shows a gift of absolute melody which, even apart from its meaning, would be inestimable. Neither Handel nor Mozart — his two great predecessors in lyric tune — have surpassed or even approached him in fertility and variety of resource. The songs in Acis are wonderful ; so are those in Zauberflbte, but they are not so wonderful as Litaney, and " Who is Sylvia?" and the Standchen. To Schubert we owe the introduction into music of a particular quality of romance, a particular "addition of strangeness to beauty"; and so long as the art remains his place among its supreme masters is undoubtedly assured. (W. H. Ha.)

SCHUCKING, LEVIN (1814-1883), German novelist, was born on

the estate of Klemenswerth, near Meppen, in Westphalia, on the 6th of September 1814. After studying law at Munich, Heidelberg and Gottingen, he wished to enter the government judicial service, but, confronted by serious difficulties, abandoned the legal career, and settling at Munster in 1837, devoted himself

to literary work. In 1841 he removed to Schloss Meersburg on the Lake of Constance, joined in 1843 the editorial staff of the Allgemeine Zeitung in Augsburg, and in 1845 that of the Kolnische Zeitung in Cologne. In 1852 he retired to his estate, Sassenberg near Munster, and died at Pyrmont on the 31st of August 1883. Among his numerous romances, which are distinguished by good taste and patriotic feeling, largely reflect- ing the sound, sturdy character of the Westphalians, must be especially mentioned: Ein Schloss am Meer (1843); Ein Sohn des Volkes (1849); Ein Staatsgeheimnis (1854); Ver- schlungene Wege (1867); Die Herberge der Gerechtigkeit (1879). Schiicking wrote a number of short stories: Aus den Tagen der grossen Kaiserin (1858) and Neue Novellen (1877). In Annette von Droste-Hiilshoff (q.v.) (1862) he gives a sketch of this poet and acknowledges his indebtedness to her beneficial influence upon his mind. There appeared posthumously, Lebenserin- nerungen (1886) and Briefe von Annette von Droste-Hiilsheff und Levin Schiicking (1893). His wife, Luise (1815-1855), daughter of the General Freiherr von Gall, in the Hessian service, published some novels and romances of considerable merit. Among the latter may be mentioned Gegen den Strom (1851) and Der neue Kreuzritter (1853).

Schucking's Gesammelte Erz&hlungen und Novellen appeared in 6 vols. (1859-1866); Ausgewdhlte Romane (12 vols., 1864; 2nd series, also 12 vols., 1874-1876).

SCHULTENS, the name of three Dutch Orientalists. The first and most important, Albert Schultens (1686-1750), was born at Groningen. He studied for the church at Groningen and Leiden, applying himself specially to Hebrew and the cognate tongues. His dissertation on The Use of Arabic in the Interpretation of Scripture appeared in 1706. After a visit to Reland in Utrecht he returned to Groningen (1708); then, having taken his degree in theology (1709), he again went to Leiden, and devoted himself to the study of the MS. collections there till in 171 1 he became pastor at Wassenaer. Disliking parochial work, in 17 13 he took the Hebrew chair at Franeker, which he held till 1729, when he was transferred to Leiden as rector of the collegium theologicum, or seminary for poor students. From 1732 till his death (at Leiden on the 26th of January

1750) he was professor of Oriental languages at Leiden. Schultens was the chief Arabic teacher of his time, and in some sense a restorer of Arabic studies, but he differed from J. J. Reiske and A. I. De Sacy in mainly regarding Arabic as a handmaid to Hebrew. He vindicated the value of comparative study of the Semitic tongues against those who, like Gousset, regarded Hebrew as a sacred tongue with which comparative philology has nothing to do. His principal works were Origines Hebraeae (2 vols., 1724, 1738), a second edition of which, with the De defectibus linguae Hebraeae (1731), appeared in 1761; Job (jˆy); Proverbs (1748); Vetus et regia via hebraezandi (1738); Monumenta vetustiora Arabum (1740), &c.

His son, John James Schultens (1716-1778), became professor at Herborn in 1742, and afterwards succeeded to his father's chair. He was in turn succeeded by his son, Henry Albert Schultens (1749-1793); who, however, left comparatively little behind him, having succumbed to excessive work while preparing an edition of Meidani, of which only a part appeared posthumously (1795).

SCHULTZ, HERMANN (1836-), German Protestant theologian, was born at Liichow in Hanover on the 30th of December 1836. He studied at Gottingen and Erlangen, became professor at Basel in 1864, and eventually (1876) professor ordinarius at Gottingen. Here he has also held the appointments of chief university preacher, councillor to the consistory (from 1881) and abbot of Bursfelde (1890). Professor Schultz's theological standpoint was that of a moderate liberal. " It is thought by many that he has succeeded in discover- ing the via media between the positions of Biblical scholars like Delitzsch on the one hand and Stade on the other " (Prof. J. A. Paterson). He is well known to British and American students as the author of an excellent work on Old Testament Theology (2 vols., 1869, 5th ed., 1896; Eng. trans., 2nd ed., 1895).

In his work on the doctrine of the Divinity of Christ (Die Lehre von der Gottheit Christi, 1881) he follows the method of Ritschl, and contends that the deity of Christ ought to be understood as the expression of the experience of the Christian community. In his own person and work Christ represents to the community a personal revelation of God. Faith in the divinity of Christ does not rest upon a miracle in nature, but upon a miracle in the moral world.

Schultz's other works include: Die Stellung des christi. Glaubens zur heiligen Schrift (1876; 2nd ed., 1877), Lehre vom heiligen Abendmahl (1886); Grundriss der evang. Dogmatik (1890; 2nd ed., 1892), Grundriss der evang. Ethik (2nd ed., 1897), and Grundriss der christi. Apologetik (2nd ed., 1902).

SCHULTZE, MAX JOHANN SIGISMUND (1825-1874), German microscopic anatomist, was born at Freiburg in Breisgau (Baden) on the 25th of March 1825. He studied medicine at Greifswald and Berlin, and was appointed extraordinary professor at Halle in 1854 and five years later ordinary professor of anatomy and histology and director of the Anatomical Institute at Bonn. He died at Bonn on the i6thr of January 1874. He founded, in 1865, and edited the important Archiv fur mikroskopische Anatomie, to which he contributed many papers, and he advanced the subject generally, by refining on its technical methods. His works included Beitrdge zur Naturgeschichte der Turbellarien (1851), tiber den Organismus der Polythalamien (1854), Beitrdge zur Kenntnis der. Landplanarien (1857), Zur Kenntnis der elek- trischen Organe der Fische (1858) and Zur Anatomie und Physio- logie der Retina (1866). His name is especially known for his work on the cell theory. Uniting F. Dujardin's conception of animal sarcode with H. von Mohl's of vegetable protoplasma, he pointed out their identity, and included them under the common name of protoplasm, denning the cell as " a nucleated mass of protoplasm with or without a cell-wall " (Das Proto- plasma der Rhizopoden und der Pjlanzenzellen ; tin Beitrag zur Theorie der Zelle, 1863).

SCHULZE-DELITZSCH, FRANZ HERMANN (1808-1883), German economist, was born at Delitzsch, in Prussian Saxony, on the 29th of August 1808. The place-name Delitzsch was added in 1848 to distinguish him from other Schulzes in the National Assembly. He studied law at Leipzig and Halle universities and, when thirty, he became an assessor in the court of justice at Berlin, and three years later was appointed patrimonialrichter at Delitzsch. Entering the parliament of 1848, he joined the Left Centre, and, acting as president of the commission of inquiry into the condition of the labourers and artisans, became impressed with the necessity of co-operation to enable the smaller trades- people to hold their own against the capitalists. He was a member of the Second Chamber in 1848-1849; but as matters ceased to run smoothly between himself and the high legal officials, he threw up his public appointments in October 1851, and with- drew to Delitzsch. Here he devoted himself to the organization and development of co-operation in Germany, and to the foundation of Vorschussvereine (people's banks), of which

he had established the first at Delitzsch in 1850. These developed so rapidly that Schulze-Deh'tzsch in 1858, in Die arbeitenden Klassen und das Assoziationswesen in Deutschland, enumerated twenty-five as already in existence. In 1859 he promoted the first Genossenschaftstag, 01 co-operative meeting, in Weimar, and founded a central bureau of co-operative societies. In 1 86 1 he again entered the Prussian Chamber, and became a prominent member of the Progressist party. In 1863 he devoted the chief portion of a testimonial, amounting to £7500, to the maintenance of his co-operative institutions and offices. This, however, was only to meet an exceptional outlay, for he always insisted that they must be self-supporting. The next three or four years were given to the formation of local centres, and the establishment of the Deutsche Genossenschafts-Bank, 1865.

The spread of these organizations naturally led to legislation on the subject, and this too was chiefly the work of Schulze- Delitzsch. As a member of the Chamber in 1867 he was mainly instrumental in passing the Prussian law of association, which was extended to the North German Confederation in 1868, and later to the empire. Schulze-Delitzsch also contributed to

uniformity of legislation throughout the states of Germany, in 1869, by the publication of Die Gesetzgebung fiber die privat- rechtliche Stettung der Erwerbs- und Wirthschaftsgenossenschaften, &c. His life-work was now complete ; he had placed the advantages of capital and co-operation within the reach of struggling tradesmen throughout Germany. His remaining years were spent in consolidating this work. Both as a writer and a member of the Reichstag his industry was incessant, and he died in harness on the 29th of April 1883 at Potsdam, leaving the reputation of a benefactor to the smaller tradesmen and artisans, in which light he must be regarded rather than as the founder of true co-operative principles in Germany. (See also Co-operation.) – . .', .

SCHUMACHER, HEINRICH CHRISTIAN (1780-1850), German astronomer, was born at Bramstedt in Holstein on the 3rd of September 1780. He was director of the Mannheim observatory from 1813 to 1815, and then became professor of astronomy in Copenhagen. From 181 7 he directed the triangulation of Holstein, to which a few years later was added a complete geodetic survey of Denmark (finished after his death). For the sake of the survey an observatory was established at Altona, and Schumacher resided there permanently, chiefly occupied with the publication of Ephemerides (n parts, 1822-1832) and of the journal Astronomische Nachrichten, of

which he edited thirty- one volumes. He died at Altona on the 28th of December 1850. His son, Richard Schumacher (1827-1902), was his assistant from 1844 to 1850 at the conservatory at Altona. Having become assistant to Carlos Guillelmo Moesta (1825-1884), director of the observatory at Santiago, in 1859, he was associated with the Chilean geodetic survey in 1864. Returning in 1869, he was appointed assistant astronomer at Altona in 1873, and afterwards at Kiel. .,

H. C. Schumacher's nephew, Christian Andreas Schu- macher (1810-1854), was associated with the geodetic survey of Denmark from 1833 to 1838, and afterwards (1844-1845) improved the observatory at Pulkowa.

SCHUMANN, ROBERT ALEXANDER (1810-1856), German musical composer, was born on the 8th of June 1810 in Zwickau in Saxony. His father was a publisher, and it was in the cultiva- tion of literature quite as much as in that of- music that his boyhood was spent. He himself tells us that he began to compose before his seventh year. At fourteen he wrote an essay on the aesthetics of music and also contributed to a volume edited by his father and entitled Portraits of Famous Men. While still at school in Zwickau he read, besides Schiller and Goethe, Byron (whose Beppo and Childe Harold had been translated by his father) and the Greek tragedians. But the most powerful as well as the most permanent of the literary influences exercised upon him, however, was undoubtedly that of Jean Paul Richter. This influence may clearly be seen in his youthful novels Junius- abende and Selene, of which the first only was completed (1826). In 1828 he left school, and after a tour, during which he met Heine at Munich, he went to Leipzig to study law. His interest in music had been stimulated when he was a child by hearing Moscheles play at Carlsbad, and in 1827 his enthusiasm had been further excited by the works of Schubert and Mendelssohn. But his father, who had encouraged the boy's musical aspirations, had died in 1826, and neither his mother nor his guardian' approved of a musical career for him. The question seemed to be set at rest by Schumann's expressed intention to study law, but both at Leipzig and at Heidelberg, whither he went in 1829, he neglected the law for the philosophers, and though— to use his own words — " but Nature's pupil pure and simple " began composing songs. The restless spirit by which he was pursued is disclosed in his letters of the period. At Easter 1830 he heard Paganini at Frankfurt. In July in this year he wrote to his mother, " My whole life has been a struggle between Poetry and Prose, or call it Music and Law," and by Christmas he was once more in Leipzig, taking piano lessons with his old master,

Friedrich Wieck. In his anxiety to accelerate the process by which he could acquire a perfect execution he permanently injured his right hand. His ambitions as a pianist being thus

suddenly ruined, he determined to devote himself entirely to composition, and began a course of theory under Heinrich Dorn, conductor of the Leipzig opera. About this time he contemplated an opera on the subject of Hamlet.

The fusion of the literary idea with its musical illustration, which may be said to have first taken shape in Papillons 'op. 2), is foreshadowed to some extent in the first criticism by Schumann, an essay on Chopin's variations on a theme from Don Juan, which appeared in the Allgemeine musikalische Zeitung in 1831. Here the work is discussed by the imaginary characters Florestan and Eusebius (the counterparts of Vult and Walt in Jean Paul's novel Flegeljahre), and Meister Raro (representing either the composer himself or Wieck) is called upon for his opinion. By the time, however, that Schumann had written Papillons (1831) he had gone a step farther. The scenes and characters of his favourite novelist had now passed definitely and consciously into the written music, and in a letter from Leipzig (April 1832) he bids his brothers " read the last scene in Jean Paul's Flegeljahre as soon as possible, because the Papillons are intended as a musical representation of that masquerade." In the winter of 1832 Schumann visited his rela- tions at Zwickau and Schneeberg, in both of which places was performed the first movement of his symphony in G minor, which remains unpublished. In Zwickau the music was played at a concert given by Wieck's daughter Clara, who was then only thirteen. The death of his brother Julius as well as that of his sister- in-law Rosalie in 1833 seems to have affected Schumann with a profound melancholy. By the spring of 1834, however, he had sufficiently recovered to be able to start Die neue Zeitschrift fur Musik, the paper in which appeared the greater part of his critical writings. The first number was published on the 3rd of April 1834. It effected a revolution in the taste of the time, when Mozart, Beethoven and Weber were being neglected for the shallow works of men whose names are now forgotten. To bestow praise on Chopin and Berlioz in those days was to court the charge of eccentricity in taste, yet the genius of both these masters was appreciated and openly proclaimed in the new journal.

Schumann's editorial duties, which kept him closely occupied during the summer of 1834, were interrupted by his relations with Ernestine von Fricken, a girl of sixteen, to whom he became engaged. She was the adopted daughter of a rich Bohemian, from whose variations on a theme in C# minor Schumann constructed his own Etudes symphoniques. The engagement was broken off by Schumann, for reasons which have always remained obscure. In the Carnaval (op. 9 = 1834), one of his most genial and most characteristic pianoforte works, Schumann commenced nearly all the sections of which it is composed with the musical notes signified in German by the letters that spell Asch, the town in which Ernestine was born, which also are the musical letters in Schumann's own name. By the sub-title " Estrella " to one of the sections in the Carnaval, Ernestine is meant, and by the sub- title " Chiarina " Clara Wieck. Eusebius and Florestan, the imaginary figures appearing so often in his critical writings, also occur, besides brilliant imitations of Chopin and Paganini, and the work comes to a close with a march of the men of David against the Philistines in which may be heard the clear accents of truth in contest with the dull clamour of falsehood. In the Carnaval Schu- mann went farther than in Papillons, for in it he himself conceived the story of which it was the musical illustration. On the 3rd of October 1835 Schumann met Mendelssohn at Wieck's house in Leipzig, and his appreciation of his great contemporary was shown with the same generous freedom that distinguished him in all his relations to other musicians, and which later enabled him to recognize the genius of Brahms when he was still obscure.

In 1836 Schumann's acquaintance with Clara Wieck, already famous as a pianist, ripened into love, and a year later he asked her father's consent to their marriage, but was met with a refusal. In the series Phantasiestilcke for the piano (op. 12) he once more gives a sublime illustration of the fusion of literary and musical ideas as embodied conceptions in such pieces as

" Warum " and " In der Nacht." After he had written the latter of these two he detected in the music the fanciful suggestion of a series of episodes from the story of Hero and Leander. The Kreisleriana, which he regarded as one of his most successful works, was written in 1838, and in this the composer's realism is again carried a step farther. Kreisler, the romantic poet brought into contact with the real world, was a character drawn from life by the poet E. T. A. Hoffmann (q.v.), and Schumann utilized him as an imaginary mouthpiece for the recital in music of his own personal experiences. The Phantasie (op. 17), written in the summer of 1836, is a work of the highest quality of passion. With the Faschingschwank aus Wien,

his most pictorial work for the piano, written in 1839, after a visit to Vienna, this period of his life comes to an end. As Wieck still withheld his consent to their marriage, Robert and Clara at last dispensed with it, and were married on the 12th of September at Schonefeld near Leipzig.

The year 1840 may be said to have yielded the most extra- ordinary results in Schumann's career. Until now he had written almost solely for the pianoforte, but in this one year he wrote about a hundred and fifty songs. Schumann's biographers represent him as caught in a tempest of song, the sweetness, the doubt and the despair of which are all to be attributed to varying emotions aroused by his love for Clara. Yet it would be idle to ascribe to this influence alone the lyrical perfection of such songs as " Friihlingsnacht," " Im wunderschonen Monat Mai " and " Schone Wiege meiner Leiden." His chief song-cycles of this period were his settings of the Liederkreis of J. yon Eichendorff (op. 39), the Frauenliebe und Leben of Chamisso (op. 42), the Dichterliebe of Heine (op. 48) and Myrthen, a collection of songs, including poems by Goethe, Riickert, Heine, Byron, Burns and Moore. The songs " Belsatzar " (op. 57) and " Die beiden Grenadiere " (op. 49), each to Heine's words, show Schumann at his best as a ballad writer, though the dramatic ballad is less congenial to him than the introspective lyric. As Grillparzer said, " He has made himself a new ideal world in which he moves almost as he wills." Yet it was not until long after- wards that he met with adequate recognition. In his lifetime the sole tokens of honour bestowed upon Schumann were the degree of Doctor by the University of Jena in 1840, and in 1843 a professorship in the Conservatorium of Leipzig. Probably no composer ever rivalled Schumann in concentrating his energies on one form of music at a time. At first all his creative impulses were translated into pianoforte music, then followed the miraculous year of the songs. In 1841 he wrote two of his four symphonies. The year 1842 was devoted to the composition of chamber music, and includes the pianoforte quintet (op. 44), now one of his best known and most admired works. In 1843 he wrote Paradise and the Peri, his first essay at concerted vocal music. He had now mastered the separate forms, and from this time forward his compositions are not confined during any particular period to any one of them. In Schumann, above all musicians, the acquisition of technical knowledge was closely bound up with the growth of his own experience and the impulse to express it. The stage in his life when he was deeply engaged in his music to Goethe's Faust (1844-1853) was a critical one for his health. The first half of the year 1844 had been spent with his wife in Russia. On returning to

Germany he had abandoned his editorial work, and left Leipzig for Dresden, where he suffered from persistent nervous prostration. As soon as he began to work he was seized with fits of shivering, and an apprehension of death which was exhibited in an abhorrence for high places, for all metal instruments (even keys) and for drugs. He suffered perpetually also from imagining that he had the note A sounding in his ears. In 1846 he had recovered and in the winter revisited Vienna, travelling to Prague and Berlin in the spring of 1847 and in the summer to Zwickau, where he was received with enthusiasm, gratifying because Dresden and Leipzig were the only large cities in which his fame was at this time appreciated.

To 1848 belongs his only opera, Genoveva, a work contain- ing much beautiful music, but lacking dramatic force. It is

interesting for its attempt to abolish the recitative, which Schumann regarded as an interruption to the musical flow. The subject of Genoveva, based on Tieck and Hebbel, was in itself not a particularly tuppy choice; but it is worth remembering that as early as 1842 the possibilities of German opera had been keenly realized by Schumann, who wrote, " Do you know my prayer as an artist, night and morning ? It is called ' German Opera.' Here is a real field for enterprise . . . something simple, profound, German." And in his notebook of suggestions for the text of operas are found amongst others: Nibelungen, Lohengrin and Till Eulenspiegel. The music to Byron's Manfred is pre-eminent in a year (1849) in which he wrote more than in any other. The insurrection of Dresden caused Schumann to move to Kreischa, a little village a few miles outside the city. In the August of this year, on the occasion of the hundredth anniversary of Goethe's birth, such scenes of Schumann's Faust as were already completed were performed in Dresden, Leipzig and Weimar, Liszt as always giving un- wearied assistance and encouragement. The rest of the work was written in the latter part of the year, and the overture in 1853. From 1850 to 1854 the text of Schumann's works is extremely varied. In 1850 he succeeded Ferdinand Hiller as musical director at Diisseldorf ; in 1851-1853 he visited Switzer- land and Belgium as well as Leipzig. In January 1854 Schumann went to Hanover, where he heard a performance of his Paradise and the Peri. Soon after his return to Diisseldorf, where he was engaged in editing his complete works and making an anthology on the subject of music, a renewal of the symptoms that

had threatened him before showed itself. Besides the single note he now imagined that voices sounded in his ear. One night he suddenly left his bed, saying that Schubert and Mendelssohn had sent him a theme which he must write down, and on this theme he wrote five variations for the pianoforte, his last work. On the 27th of February he threw himself into the Rhine. He was rescued by some boatmen, but when brought to land was found to be quite insane. He was taken to a private asylum in Endenich near Bonn, and remained there until his death on the 29th of July 1856. He was buried at Bonn and in 1880 a statue by A. Donndorf was erected on his tomb.

His wife, Clara Schumann (1819-1896), trained from an early age by Wieck, had a brilliant career as a pianist from the age of thirteen up to her marriage. In the various tours on which she accompanied her husband, she extended her own reputation beyond the borders of Germany, and it was thanks to her efforts that his compositions became generally known in Europe. From the time of her husband's death she devoted herself principally to the interpretation of her husband's works, but when in 1856 she first visited England the critics received Schumann's music with a chorus of disapprobation. She returned to London in 1865 and continued her visits annually, with the exception of four seasons, until 1882; and from 1885 to 1888 she appeared each year. In 1878 she was appointed teacher of the piano at the Hoch Conservatorium at Frankfurt, a post which she held until 1892, and in which she contributed greatly to the modern improvement in technique. As an artist she will be remembered, together with Joseph Joachim, as one of the first executants who really played like composers. Besides being remembered for her eminence as a performer of nearly all kinds of pianoforte music, at a time when such technical ability was considerably rarer than in the present day, she was herself the composer of a few songs and of some charming music, mainly for the piano, and the authoritative editor of her husband's works for Breitkopf and Hartel. The following are the chief compositions of Robert Schumann. Pianoforte Works.

Papillons (op. 2)

Etudes symphoniques (op. 13) –

Carnaval (op. 9)

Sonata in F sharp minor (op. 11)

Sonata in G minor (op. 22)

Kinderszenen (op. 15)

Fantasia in C (op. 17)

Fantasiestucke (op. 12) ....

1829-1831

• *1834*

1 834-1 835

• *1835*

1 833-1 835

■ *1836*

. *1836*

• *1837*

Kreisleriana (op. 16)

Novelletten (op. 21)

Faschingschwank aus Wien (op. 26) .

Songs and Choral Works.

1838 1838 1839

1840

1 841

Songs: — " Liederkreis " (Heine), nine songs (op. 24) .' " Myrthen," twenty-six songs (4 books) (op. 25) " Liederkreis" (Eichendorff) , twelve songs (op. 39). " Frauenliebe und Leben " (Chamisso), eight songs

(op. 42)

" Dichterliebe," sixteen songs from Heine's Buch der

Lieder (op. 48)

" Belsatzar," ballad (Heine) (op. 57) .

Song, ” Tragodie ” (Heine) from op. 64 . .

Ballad, ” Der Handschuh ” (Schiller). . probably 1851

Songs from Wilhelm Meister and Requiem for Mignon

for chorus (op. 98) 1849

Spanische Liebeslieder (op. 138) 1849

Choral and Dramatic Works: — ” Paradise and the

Peri,” for solos, chorus and orchestra (op. 50) . 1843

Faust music 1844-1853

” Genoveva,” opera 1848

Manfred music 1849

” Der Rose Pilgerfahrt ” (Moritz Horn), for solos,”!

chorus and orchestra (op. 112) . ” Der Konigssohn ” (Uhland), for solos, chorus and

orchestra (op. 103)

” Des Sangers Fluch ” (Uhland) for solos, chorus and

orchestra (op. 139)

Mass for four part chorus and orchestra (op. 148) . – ” Vom Pagen und der Konigstochter,” four ballads

(Geibel) for solos, chorus and orchestra (op. 135) ” Das Gliick von lidenhall,” ballad (Uhland), for 1

solos, chorus and orchestra (op. 143) . Festival overture on the Rheinweinlied for ”

orchestra and chorus (op. 123) . . . .

Chamber Music.

Three quartets for strings in A minor, F and A’

. (op- 4i)

Quintet for pianoforte and strings in E flat (op. 44) Quartet for pianoforte and strings in E flat (op. 47) Fantasiestucke for pianoforte, violin and violoncello

(op. 88)

Andante and variations for two pianofortes (op. 46) 1 Trio for pianoforte and strings in D minor (op. 63).) Trio for pianoforte and strings in F (op. 80) . . J Fantasiestucke for clarinet and pianoforte (op. 73). "1 Five " Stiicke im Volkston " for piano and violoncello I

(op. 102) r

Three Romances for oboe and piano (op. 94) . . J " Marchenbilder " for pianoforte and viola (op. 113) Sonata for pianoforte and violin in A minor (op. 105) Trio for pianoforte and strings in G minor (op. no). Sonata for pianoforte and violin in D minor (op. 121) " Marchenerzahlungen," four pieces for clarinet,

viola and pianoforte, probably written in .

1851

1852

1853

1842

1843 1847

Orchestral Works.

1 841

1846 1850

1841-1845

B flat Symphony (op. 38) . Fourth Symphony in D minor (op. 120) 2 Overture, Scherzo and Finale .... Second Symphony in C (op. 61) .... Third or " Rhenish " Symphony in E flat (op. 97)

Concertos and Concert-Stucke.

For Pianoforte in A minor (op. 54)

Concert-stuck for four horns (op. 86) .

Introduction and Allegro-appassionato for Piano- V 1849

forte (op. 92) J

Concerto for Violoncello (op. 126) 1852

Bibliography. — Wasielewski, Robert Schumann-, A. Reismann, Robert Schumanns Leben und Werke ; J. A. Fuller Maitland, Schumann (" Great Musicians" series); The Life of Robert Schumann told in his Letters (with a preface by J. G. Jansen), translated from the German by May Herbert ; Letters of R. Schumann, edited by Karl Storck (Eng. trans, by Hannah Bryant) ; V. Joss, Der Musikpdda-goge Friedrich Wieck und seine Familie ; Litzmann, Clara Schumann (1902) ; Moser's Joseph Joachim and the first volume of Kalbeck's Brahms contain much that is important as to Schumann's later years. See also W. H. Hadow, Studies in Modern Music, first series

(1894).

1 Originally for two pianofortes, two violoncellos and horn. The original version (which contains four additional variations) was published in 1893.

2 Revised 1851; original version published 1 89 1.

SCHORER, EMIL, German Protestant theologian, was born at Augsburg on the 2nd of May 1844. After studying at Erlangen, Berlin and Heidelberg from 1862 to 1866, he became in 1873 professor extraordinarius at Leipzig and eventually (1895) professor ordinarius at Gottingen. In 1876 he founded and edited the Theologische Literaturzeitung, and from 1881 to 1910 he edited it with Adolf Harnack. His elaborate work on the history of the Jews in the time of Christ (Geschichte des jiidischen Volks im Zeitalter Jesu Christi, 2 vols., 1886-1890; new ed. in 3 vols., 1901-1902; Eng. trans., 1890 ff.) made him in Great Britain and America one of the best known of modern German scholars. He died after a long illness on the 30th of April 1 9 10.

His other works include: Schleiermacher' s Religionsbegriff (1868); Lehrbuch der neutestamentlichen Zeitgeschichte (1874; an earlier form of Gesch. des jud. Volks), and Die Gemeindeverfassung der Juden in Rom (1879). See A. Harnack in the Theologische Literaturzeitung for May 14, 1910.

SCHURMAN, JACOB GOULD (1854-), American educa- tionist, was born at Freetown, Prince Edward Island, on the 22nd of May 1854, of Dutch descent, his Loyalist ancestors having left New York in 1784. While a student at Acadia College, Wolfville, Nova Scotia, in 1875, he won the Canadian Gilchrist scholarship in the University of London, from which he received the degree of B.A. in 1877 and that of M.A. in 1878, and in 1877-1880 studied in Paris, Edinburgh and (as Hibbert Fellow) in Heidelberg, Berlin and Gottingen. He was professor of English literature, political economy and psychology at Acadia College in 1880-1882, of metaphysics and English litera- ture at Dalhousie College, Halifax, N.S., in 1882-1886, and of philosophy (Sage professor) at Cornell University in 1886 -1892, being Dean of the Sage School of Philosophy in 1891-1892. In 1892 he became president of Cornell University. He was chairman of the First United States Philippine Commission in 1899, a nd wrote (besides a part of the official report to Congress) Philippine Affairs — A Retrospect and an Outlook (1902). With J. E. Creighton and James Seth he founded in 1892 The Philo- sophical Review. He also wrote Kantian Ethics and the Ethics of Evolution (1881); The Ethical Import of Darwinism (1888); Belief in God (1890), and Agnosticism and Religion (1896).

SCHURZ, CARL (1829-1906), German American statesman and reformer, was born in Liblar, near Cologne, on the 2nd of March 1829, the son of a school-teacher. He studied in the Jesuit Gymnasium of Cologne in 1840-1846, and then entered the University of Bonn, where he became a revolutionary, partly through his friendship with Gottfried Kinkel, professor of literature and art-history. He assisted Kinkel in editing the Bonner Zeitung, and on the outbreak of the Revolution of 1848 took the field, but when Rastatt surrendered he escaped to Zurich. In 1850 he returned secretly to Germany, rescued Kinkel from the prison at Spandau and helped him to escape to Scotland. Schurz went to Paris, but the police forced him to leave France on the eve of the coup d'etat, and until August 1852 he lived in London, making his living by teaching German. He married in July 1852 and removed to America, living for a time in Philadelphia.

In 1856 after a year in Europe he settled in Watertown, Wisconsin,

and immediately became prominent in the Republican party of that state. In 1857 he was an unsuccessful candidate for lieu' enant-governor on the Republican ticket. In the Illinois campaign of the next year between Abraham Lincoln and Stephen A. Douglas he took part as a speaker; and later in 1858 he was admitted to the Wisconsin bar and began to practise law in Milwaukee. In the state campaign of 1859 he made a speech attacking the Fugitive Slave Law and arguing for state's rights and thus injured his political standing in Wisconsin; and in April he delivered in Faneuil Hall, Boston, an oration on " True Americanism," which coming from an alien was intended to clear the Republican party of the charge of " nativism." The Germans of Wisconsin unsuccessfully urged his nomination for governor by the Republican party in 1859. In the Republican National Convention of i860 Schurz was chairman of the delegation from

Wisconsin, which voted for W. H. Seward ; he was on the committee which drew up the platform and served on the committee which announced his nomination to Abraham Lincoln. In spite of Secretary Seward's objection, grounded on Schurz's European record as a revolutionary, Lincoln sent him in 1861 as minister to Spain. He returned to America in January 1862, resigned his post, was commissioned brigadier-general of volunteers in April, and in June took command of a division under Fremont, and then in Sigel's corps, with which he took part in the second battle of Bull Run. He was promoted major-general of volunteers on the 14th of March and was a division commander at Chan- cellorsville of the Eleventh Corps, under General O. O. Howard, with whom he later had a bitter controversy over this battle. He was at Gettysburg and at Chattanooga. After the Eleventh and Twelfth Corps were united as the Twentieth he was put in command of a Corps of Instruction at Nashville, and saw no more active service except in the last months of the war when he was with Sherman's army in North Carolina. He resigned from the army immediately after the close of hostilities. In the summer of 1865 President Johnson sent him through the South to study conditions; the President quarrelled with Schurz because the latter approved General H. W. Slocum's order forbidding the organization of militia in Mississippi, and Schurz's valuable report (afterwards published as an executive document), sug- gesting the readmission of the states with complete rights and the investigation of the need of further legislation by a Con- gressional committee, was not heeded by the President. In 1866-1867 he was chief editor of the Detroit Post and then became editor and joint proprietor with Emil Praetorius (1827-1905) of the Westliche Post of St Louis. In the

winter of 1867-1868 he travelled in Germany — the account of his interview with Bis- marck is one of the most interesting chapters of his Reminiscences. He spoke against " repudiation " and for "honest money " during the Presidential campaign of 1868.

In 1869-1875 he was United States senator from Missouri, and made a great reputation (especially in 1873-1874) by his speeches on financial subjects. During this period he broke with the administration: he started the Liberal Republican movement in Missouri in 1870 which elected B. Gratz Brown governor; and in 1872 he presided over the Liberal Republican convention which nominated Horace Greeley for the presidency (Schurz's own choice was Charles Francis Adams or Lyman Trumbull) and which did not in its platform represent Schurz's views on the tariff, or Greeley's. He opposed Grant's Santo Domingo policy — after Fessenden's death Schurz was a member of the Committee on Foreign Affairs, — his Southern policy, and the government's selling arms and making cartridges for the French army in the Franco-Prussian War. But in 1875 he campaigned for Hayes, as the representative of sound money, in the Ohio gubernatorial campaign. In 1876 he supported Hayes in the contest for the presidency, and Hayes made him in 1877 his secretary of the interior, and followed much of his advice in other cabinet appointments and in his inaugural address. In this department Schurz put in force his theories in regard to merit in the Civil Service, permitting no removals except for cause, and requiring competitive examinations for candidates for clerkships; he reformed the Indian Bureau and successfully opposed a bill transferring it to the War Department; and he prosecuted land thieves and attracted public attention to the necessity of forest preservation. Upon his retirement in 1 881 he removed to New York City, and from the summer of 1881 to the autumn of 1883 was editor-in-chief and one of the pro- prietors of the New York Evening Post. In 1884 he was a leader in the Independent (or Mugwump) movement against the nomination of James G. Blaine for the presidency and for the election of Grover Cleveland. From 1888 to 1892 he was general American representative of the Hamburg American Steamship Company. In 1892 he succeeded George William Curtis as president of the National Civil Service Reform League and held this office until 1901. He succeeded Curtis as editorial writer for Harper's Weekly in 1892-1898, in which he did much for civil service reform and for Cleveland's nomination and election

in 1892. In 1895 he spoke for the Fusion anti-Tammany ticket in New York City. He opposed W. J. Bryan for the presidency in 1896, speaking for sound money and not under the auspices of the Republican party; in 1900 on the anti-imperialism issue he supported Bryan; and in 1904 he supported A. B. Parker, the Democratic candidate. He died in New York City on the 14th of May 1906.

Schurz published a volume of Speeches (1885); Henry Clay (1887) in the " American Statesmen " series, a standard biography; Abraham Lincoln (1889), a remarkable essay; and Reminiscences (New York, 3 vols., 1907-1908), in the third volume of which is a sketch of his life and public services from 1869 to 1906 by Frederic Bancroft and William A. Dunning. During the last twenty years of his life Schurz was perhaps the most prominent Independent in American politics, and even more notable than his great abilities was his devotion to his high principles. He was the first German-born American to enter the United States Senate, and was an able debater; and his command of the English language, written and spoken, was remarkable. A sense of humour added much to his campaign speeches.

SCHUTZENBERGER, PAUL (1829-1897), French chemist, was born on the 23rd of December 1829 at Strassburg, where his father Georges Frederic Schiitzenberger (1779-1859) was professor of law, and his uncle Charles Schiitzenberger (1809- 1881) professor of chemical medicine. He was intended for a medical career and graduated M.D. at Strassburg in 1855, but his interests lay in physical and chemical science. In 1853 he went to Paris as preparateur to J. F. Persoz (1805-1868), professor of chemistry at the Conservatoire des Arts et Metiers. A year later he was entrusted with a course of chemical instruction at Mulhausen, and he remained in that town till 1865 as professor at the Ecole Superieure des Sciences. He then returned to Paris as assistant to A. V. Balard at the College de France, in 1876 he succeeded that chemist in the chair of chemistry, and in 1882 he became directing professor at the municipal Ecole de Physique et de Chimie. The two latter chairs he held together until his death, which happened on the 26th of June 1897 at Mezy, Seine et Oise. During the period he spent at Mulhausen, Schiitzenberger paid special attention to industrial chemistry, particularly in connexion with colouring matters, but he also worked at general and biological chemistry which subsequently occupied the greater part of his time. He is known for a long series of researches on the constitution of alkaloids and of the albuminoid bodies, and for the preparation of several new series of platinum com- pounds and of hyposulphurous acid, H 2 S 2 4 . Towards the

end of his life he adopted the view that the elements have been formed by some process of condensation from one primordial substance of extremely small atomic weight, and he expressed the conviction that atomic weights within narrow limits are variable and modified according to the physical conditions in which a compound is formed.

His publications include Chimie appliquee (Lla physiologie et d, la pathologic animate (1863); TraM des matieres colorantes (1867); Les Fermentations (1875), which was translated into German, Italian and English ; and an excellent Traite de chimie generate in seven volumes (1880-1894).

SCHUYLER, PHILIP JOHN (1733-1804), American soldier, was born at Albany, New York, on the nth of November 1733. The Schuyler family was established in the New World by Philip Pieterse Schuyler (d. 1683), who migrated from Amsterdam in 1650, and whose son, Peter (1657-1724), was the first mayor of Albany and chairman of the board of Indian commissioners of the province. The family was one of the wealthiest and most influential in the colony and was closely related by marriage to the Van Rensselaers, Van Cortlandts and other representatives of the old Dutch aristocracy. Philip Schuyler served in the Provincial Army during the Seven Years' War, first as captain and later as deputy-commissary with the rank of major, taking part in the battles of Lake George (1755), Oswego River (1756), Ticonderoga (1758) and Fort Frontenac (1758). From 1768 to 1775 he represented Albany in the New York Assembly, and he was closely associated with the Livingston family in the

leadership of the Presbyterian or Whig party. He was a delegate to the second Continental Congress in May 1775, and on the 19th of June was chosen one of the four major-generals in the Con- tinental service. Placed in command of the northern department of New York, he established headquarters at Albany, and made preparations for an invasion of Canada. Soon after the expedi- tion started he was prostrated by rheumatic gout, and the actual command devolved upon General Richard Montgomery. Schuyler returned to Ticonderoga and later to Albany, where he spent the winter of 1 775-1 776 in collecting and forwarding supplies to Canada and in suppressing the Loyalists and their Indian allies in the Mohawk Valley. On the death of Mont- gomery and the failure to take Quebec the army retreated to Crown Point, and its commander, General John Sullivan, was superseded by General Horatio Gates. Gates claimed precedence over Schuyler and, on failing to secure

recognition, intrigued to bring about Schuyler's dismissal. The controversy was taken into Congress. The necessary withdrawal of the army from Crown Point in 1776 and the evacuation of Ticonderoga in 1777 were magnified by Schuyler's enemies into a retrograde move- ment, and, on the 19th of August 1777, he was superseded. A court martial appointed in 1778 acquitted him on every charge. He resigned from the army in April 1779. He was a delegate from New York to the Continental Congress in 1779-1781, and state senator in 1 781-1784, 1786'-! 790 and 1 792-1 797. In 1788 he joined his son-in-law Alexander Hamilton, John Jay and others in leading the movement for the ratification by New York of the Federal constitution. He served in the United States Senate as a Federalist from 1790 to 1791 and was again elected in 1797, but resigned in January 1798 on account of ill- health. He was also active for many years as Indian com- missioner and surveyor-general and helped to settle the New York boundary disputes with Massachusetts and Pennsylvania. He prepared plans for the construction of a canal between the Hudson river and Lake Champlain before 1776, and, in 1792- 1796, carried to a successful conclusion a more pretentious scheme for connecting the Hudson with Lake Ontario by way of the Mohawk, Oneida Lake and the Onondaga river. He died in Albany on the 18th of November 1804.

See Bayard Tuckerman, Life of General Philip Schuyler (New York,

1903)-

Other prominent members of the family were: Montgomery Schuyler (1814-1896) and his cousin Anthony (1816-1896), Protestant Episcopal clergymen; George Washington (1810- 1888), treasurer of New York State in 1863-1865 and of Cornell University in 1868-1874 and author of Colonial New York: Philip Schuyler and his Family (2 vols., 1885); his son Eugene (1840-1890), who was long in the consular and diplomatic service of the United States, and who translated some of the novels of Tourgeniev and Tolstoi and wrote Peter the Great (1884) and American Diplomacy and the Furtherance of Commerce (1886); and Montgomery (b. 1843), a son of Anthony, and a journalist and writer on architecture.

SCHWABACH, a town of Germany, in the kingdom of Bavaria, 9 m. by rail S. of Nuremberg. Pop. (1905) 10,342. It has the interesting Evangelical church of St John, built in the 15th century, with carvings by Veit Stoss, paintings by Wohlgemut, Martin Schon and others, and a ciborium by Adam Krafft; a fountain, the Schone Brunnen, and several schools. Schwa- bach is the chief seat of the

needle manufacture in Bavaria; its other industries include gold and silver wire work, brewing and the making of soap and earthenware. Schwabach was purchased in 1364 by the burgrave of Nuremberg.

See Petzoldt, Chronik der Stadt Schwabach (Schwabach, 1854).

SCHWABE, SAMUEL HEINRICH (1780-1875), German astronomer, was born on the 25th of October 1789 at Dessau, where he died on the nth of April 1875. At first an apothecary, he turned his attention to astronomy, and in 1826 commenced his observations on sun-spots. In 1843 he made the suggestion of a probable ten year period {i.e. that at every tenth year the number of spots reached a maximum), but it met with scant approval, and he continued his observations, which were

afterwards utilized in 1851 by Humboldt in the third volume of his Kosmos. The periodicity of sun-spots is now fully recog- nized (see Sun); and to Schwabe is thus due the credit of one of the most important discoveries in astronomy.

See H. H. Turner, Astronomical Discovery (1904).

SCHWALBACH, or Langenschwalbach, a favourite German health resort, in the Prussian province of Hesse-Nassau, pleasantly situated in a deep valley, near the junction of the Schwalbach with the Aar, 12 m. N.W. from Wiesbaden, on the railway Dotzheim-Dietz. Permanent population (1905) 2836. Besides a large kursaal, the town has four churches, two Evangelical, a Roman Catholic and an English, a syna- gogue and several schools. There are eight springs, which are largely impregnated in varying proportions with iron and carbonic acid, and are used both for drinking and bathing. They are especially efficacious in feminine disorders, and the greater number of visitors (about 6000 annually) are ladies. The public grounds are prettily laid out and there are numerous fashionable hotels.

See Frickhoffer, Die Eisenquellen zu Schwalbach (2nd ed., Schwal-bach, 1888), and A. Genth, Geschichte des Kurortes Schwalbach (3rd ed., Wiesbaden, 1884).

SCHWANN, THEODOR (1810-1882), German physiologist, was born at Neuss in Rhenish Prussia on the 7th of December 18 10. His father was a man of great mechanical talent; at first a goldsmith, he

afterwards founded an important printing establishment. Schwann inherited his father's tastes, and the leisure of his boyhood was largely spent in constructing little machines of all kinds. He studied at the Jesuits' college in Cologne and afterwards at Bonn, where he met Johannes Miiller, in whose physiological experiments he soon came to assist. He next went to Wiirzburg to continue his medical studies, and thence to Berlin to graduate in 1834. Here he again met Miiller, who had been meanwhile translated to Berlin, and who finally persuaded him to enter on a scientific career and appointed him assistant at the anatomical museum. Schwann in 1838 was called to the chair of anatomy at the Roman Catholic university of Louvain, where he remained nine years. In 1847 he went as professor to Liege, where he remained till his death on the nth of January 1882. He was of a peculiarly gentle and amiable character, and remained a devout Catholic throughout his life. It was during the four years spent under the influence of Miiller at Berlin that all Schwann's really valuable work was done. Miiller was at this time preparing his great book on physiology, and Schwann assisted him in the experi- mental work required. His attention being thus directed to the nervous and muscular tissues, besides making such histo- logical discoveries as that of the envelope of the nerve-fibres which now bears his name, he initiated those researches in muscular contractility since so elaborately worked out by Du Bois Reymond and others. He was thus the first of Miiller's pupils who broke with the traditional vitalism and worked towards a physico-chemical explanation of life. Miiller also directed his attention to the process of digestion, which Schwann showed to depend essentially on the presence of a ferment called by him pepsin. Schwann also examined the question of spontaneous generation, which he greatly aided to disprove, and in the course of his experiments discovered the organic nature of yeast. In fact the whole germ theory of Pasteur, as well as its antiseptic applications by Lister, is traceable to his influence. Once when he was dining with Schleiden in 1837, the conversation turned on the nuclei of vegetable cells. Schwann remembered having seen similar structures in the cells of the notochord (as had been shown by Miiller) and instantly realized the importance of connecting the two phenomena. The resemblance was confirmed without delay by both observers, and the results soon appeared in his famous Microscopic Investigations on the Accordance in the Structure and Growth of Plants and Animals (Berlin, 1839; trans. Syden- ham Society, 1847). The cell theory was thus definitely con- stituted. In the course of his verifications of the cell theory, in which he traversed the whole field of histology, he proved

the cellular origin and development of the most highly differentiated tissues, nails, feathers, enamels, &c. His generaliza- tion became the foundation of modern histology, and in the hands of Rudolf Virchow (whose cellular pathology was an inevitable deduction from Schwann) afforded the means of placing modern pathology on a truly scientific basis.

An excellent account of Schwann's life and work is that by L6on FrSdericq (Liege, 1884).

SCHWANTHALER, LUDWIG MICHAEL (1802-1848), German sculptor, was born in Munich on the 26th of August 1802. His family had been sculptors in Tirol for three centuries; young Ludwig received his earliest lessons from his father, and tht- father had been instructed by the grandfather. The last to bear the name was Xaver, who worked in his cousin Ludwig's studio and survived till 1854. For successive generations the family lived by the carving of busts and sepulchral monuments, and from the condition of mechanics rose to that of artists. From the Munich gymnasium Schwanthaler passed as a student to the Munich academy; at first he purposed to be a painter> but afterwards reverted to the plastic arts of his ancestors. His talents received timely encouragement by a commission for an elaborate silver service for the king's table. Cornelius also befriended him; the great painter was occupied on designs for the decoration in fresco of the newly erected Glyptothek, and at his suggestion Schwanthaler was employed on the sculp- ture within the halls. Thus arose between painting, sculpture, and architecture that union and mutual support which charac- terized the revival of the arts in Bavaria. Schwanthaler in 1826 went to Italy as a pensioner of the king, and on a second visit in 1832 Thorwaldsen gave him kindly help. His skill was so developed that on his return he was able to meet the extra- ordinary demand for sculpture consequent on King Ludwig's passion for building new palaces, churches, galleries and museums, and he became the fellow-worker of the architects Klenze, Gartner and Ohlmiiller, and of the painters Cornelius, Schnorr and Hess. Owing to the magnitude and multitude of the plastic products they turned out, over-pressure and haste in design and workmanship brought down the quality of the art. The works of Schwanthaler in Munich are so many and miscellaneous that they can only be briefly indicated. The new palace is peopled with his statues: the throne-room has twelve imposing gilt bronze figures 10 ft. high; the same palace is also enriched with a frieze and with sundry other decorations modelled and painted from his drawings. The sculptor, like his contemporary painters, received help from trained pupils. The same prolific artist also furnished the old Pinakothek with

twenty-five marbles, commemorative of as many great painters; likewise he supplied a composition for the pediment of the exhibition building facing the Glyptothek, and executed sundry figures for the public library and the hall of the marshals. Sacred art lay outside his ordinary routine, yet in the churches of St Ludwig and St Mariahilf he gave proof of the widest versatility. The Ruhmes- halle afforded further gauge of unexampled power of production; here alone is work which, if adequately studied, might have occupied a lifetime; ninety-two metopes, and, conspicuously, the colossal but feeble figure of Bavaria, 60 ft. high, rank among the boldest experiments. A short life of forty-six years did not permit serious undertakings beyond the Bavarian capital, yet time was found for the groups within the north pediment of the Walhalla, Ratisbon, and also for numerous portrait statues, including those of Mozart, Jean Paul Richter, Goethe and Shakespeare. Schwanthaler died at Munich in 1848, and left by will to the Munich academy all his models and studies, which now form the Schwanthaler Museum.

SCHWARTZE, TERESA (1852-), Dutch portrait painter, was born at Amsterdam, the daughter of Johan Georg Schwartze (1814-1874), from whom she received her first training, before studying for a year under Gabriel Max and Franz von Lenbach in Munich. In 1879 she went to Paris to continue her studies under Jean Jacques Henner. Her portraits are remarkable for excellent character drawing, breadth and vigour of handling and rich quality of pigment. She is one of the few women painters

ˆho have been honoured by an invitation to contribute their own portraits to the hall of the painters at the Uffizi Gallery in Florence. Some of her best pictures, notably a portrait of Piet J. Joubert, and ” Three Inmates of the Orphanage at Amsterdam,” are at the Ryks Museum, and one entitled ” The Orphan ” at the Boyman Museum in Rotterdam.

SCHWARZ (or Schwartz), CHRISTIAN FRIEDRICH (1726- 1798), German Protestant missionary to India, was born on the 8th of October 1726 at Sonnenburg, in the electorate of Brandenburg, Prussia. Having learned Tamil to assist in a translation of the Bible into that language, he was led to form the intention of becoming a missionary to India. He received ordination at Copenhagen on the 8th of August 1749, and, after spending some time in England to acquire the English language, embarked early in 1750 for India, and arrived at Trichinopoly on the 30th of July. Tranquebar was for

some time his headquarters, but he paid frequent visits to Tanjore and Trichinopoly, and in 1766 removed to the latter place. Here he acted as chaplain to the garrison, who erected a church for his general use. In 1769 he secured the friendship of the raja of Tanjore, who, although he never embraced Christianity, afforded him every countenance in his missionary labours. Shortly before his death he committed to Schwarz the education of his adopted son and successor. In 1779 Schwarz undertook, at the request of the Madras government, a private embassy to Hyder Ali, the ruler of Mysore. When Hyder invaded the Carnatic, Schwarz was allowed to pass through the enemy's camp without molestation. After twelve years in Trichinopoly he removed to Tanjore, where he spent the remainder of his life. He died on the 13th of February 1798. Schwarz's direct success in making converts exceeded that of any other Protestant missionary in India, in addition to which he succeeded in winning the esteem of Mahommedans and Hindus. The raja of Tanjore erected a monument, executed by Flaxman, in the mission church, in which he is represented as grasping the hand of the dying missionary and receiving his benediction. A splendid monument to Schwarz by Bacon was placed by the East India Company in St Mary's church at Madras.

See Remains of Schwarz, with, a sketch of his life (1826); Memoirs of Life and Correspondence, by H. N. Pearson (1834, 3rd ed. 1839); Life, by H. N. Pearson (1855).

SCHWARZ, KARL (181 2-1885), German Protestant theologian, was born at Wiek on the Isle of Rugen on the 19th of November 181 2. His father, Theodor Schwarz, pastor at Wiek, was well known as a preacher, and as the writer of a number of popular works (parables, romances, &c.) under the pseudonym " Theodor Melas." Karl Schwarz pursued the study of theology and philosophy at Halle, and afterwards at Bonn (183 1) and Berlin (1832-1834). At Berlin he came under the influence of Schleier- macher and Hegel, whose influences are seen in his work Das Wesen der Religion (1847). In 1837 he was imprisoned for six months on account of his advanced political opinions. After his release he helped (from 1838) with the Hallische Jahrbiicher. From 1843-1845 he lectured at Halle, and was then suspended by the government.. In 1849, however, he was appointed professor extraordinarius, and later received a number of dis- tinctions (in 1858 chief court preacher, &c). Schwarz took an important part in the founding and directing of the German Protestantenverein,'and became an eminent exponent of liberal theology. His work Zur Geschichte der neuesjen Theologie (1856, 4th ed. 1869) is a valuable source for the history of theology in

Germany. His other works include Lessing als Theologe (1854) and Grundriss der chrisfl. Lehre (1873, 5th ed. 1876). He died on the 25th of March 1885. In his memory a Karl- Schwarz-stiftung was founded in connexion with the theological faculty at Jena.

See G. Rudloff, Karl Schwarz (1887); F. Hummel, Ovt Bedeutung der Schrift von Karl Schwarz: Vber das Wesen der Reliiyon (1890); and Herzog-Hauck, Realencyklopadie.

SCHWARZBURG-RUDOLSTADT, a principality of Germany, an independent member of the German empire, and one of the Thuringian states (see Thuringi

consisting of the upper barony (Oberherrschaft) in Thuringia, on the Gera, Ilm and Saale, and the lower barony (Unterherr- schaft), an isolated district on the Wipper and Helbe, about 25 m. to the north, surrounded by the Prussian province of Saxony. As the dignity of prince is held in virtue of the Ober- herrschaft alone, a share of both baronies was given to each sub-line of the main house. The total area of Schwarzburg- Rudolstadt is 363 sq. m., of which 283 are in the upper and 80 in the lower barony; the chief towns in the former district are Rudolstadt (pop. 12,500 in 1905), the capital, and Blanken- burg (2000), and in the latter Frankenhausen (6374). Both baronies are hilly, the highest elevation being attained in the Grossfarmdenkopf, 2900 ft. The scenery of the Thuringian portion of Schwarzburg- Rudolstadt attracts many visitors annually, the most beautiful spots being the gorge of the Schwarza and the lovely circular valley in which the village of Schwarzburg nestles at the foot of a curiously isolated hill, crowned by the ancient castle of the princely line. Cattle-rearing and fruit-growing flourish in the lower barony, while the upper barony is finely wooded. Of the whole country 44% is under forest (mainly coniferous trees), and 50% is devoted to agriculture and pasture. The chief grain crops are rye, oats, barley and potatoes. Great attention is paid to poultry farming and bee- keeping, and the exports from these sources are considerable. About 14% of the population are engaged in agriculture and forestry, 21% in mining and cognate industries. Trade and manufactures are insignificant; iron, lignite, cobalt, alum and vitriol are among the mineral productions. In 1905 the population was 96,835 or about 265 to the square mile. Nearly all these were Protestants.

Schwarzburg-Rudolstadt is a limited hereditary monarchy, its constitution resting on laws of 1854 and 1870. A diet has met at intervals since 1816, and is now entitled to be summoned every three

years. The present diet consists of sixteen members elected for three years, four chosen by the highest assessed taxpayers, the others by general election. The troops of Schwarz- burg-Rudolstadt have been incorporated with the Prussian army since the convention of 1867. The principality has one vote in the Reichstag and one in the federal council.

Schwarzburg-Rudolstadt is the cadet branch of the house of Schwarzburg, descended from Albrecht VII. (1605). In 1710 the count was made a prince, in spite of the remonstrances of the elector of Saxony, although he was prevented from taking his seat in the imperial college at Regensburg until 1754. The principality entered the Confederation of the Rhine in 1807 and the German League in 181 5. In 18 19 it redeemed the Prussian claims of superiority by surrendering portions of its territory.

See Sigismund, Landeskunde des Fiirstentums Schwarzburg-Rudolstadt (2 vols., Rudolstadt, 1862-1863).

SCHWARZBURG-SONDERSHAUSEN, a principality of Ger- many, and constituent state of the German empire. It shares the old Schwarzburg lands with Schwarzburg-Rudolstadt. In general it may be said that while Schwarzburg-Rudolstadt forms the southern, Schwarzburg-Sondershausen occupies the northern portion of the lands once divided between them. The total area of the principality is 333 sq. m., of which 133 are in the upper and 200 in the lower barony. The chief towns are Arnstadt (pop. 16,275 in 1905), which at one time gave name to a line of counts, '

Schwarzburg-Sondershausen is a limited hereditary monarchy, its constitution resting on a law of 1857. The diet consists of five representatives elected by the highest taxpayers, five by general election, and five nominated for life by the prince. The first ten members are elected for four years, which is also the financial period. There is a ministry with five departments — for the prince's household, domestic affairs, finance, churches and schools, and justice. The budget for the years 1 908-191 1 estimates the income at £164,440 and the expenditure at the same. The state debt in 1909 was £167,970. The troops of Schwarzburg-Sondershausen have been incorporated with the Prussian army by convention since 1867. The principality has one vote in the Reichstag and one in the federal council.

The house of Schwarzburg is one of the oldest and noblest in Germany; and tradition traces its descent from Widukind and the kings of the Franks. Its historical ancestors were the counts of Kafernburg, from whom the counts of Schwarzburg sprang about the beginning of the 13th century. The name Giinther became the distinctive name for the members of this house (corresponding to Heinrich in the Reuss family), the various Giinthers being at first distinguished by numbers and afterwards by prefixed names. Various subdivisions and collateral lines were formed, but by 1599 all were extinct but the present two. Count Giinther XL., who died in 1552, was the last common ancestor of both lines. Schwarzburg-Sondershausen is the senior line, although its possessions are the smaller. In 1697 the aunt was raised to the dignity of imperial prince by the emperor Leopold I. The prince had to pay 7000 thalers to the elector of Saxony and 3500 to the duke of Saxe-Weimar, and numerous disputes arose in connexion with the superiorities thus indicated. In 1807 Schwarzburg-Sondershausen entered the Confederation of the Rhine and became a sovereign state. In 1816 it joined the German League, and redeemed with portions of its territory all rights of superiority claimed by Prussia. Its domestic govern- ment has gradually, though not very quickly, improved since that time — the oppressive game-laws in particular having been abolished. A treaty of mutual succession' was made between the two families in 1713. Prince Charles Giinther succeeded on the 17th of July 1880, his father having on account of eye disease renounced the throne in favour of his son. By a law, promulgated in 1896, Sizzo, prince of Leutenberg, was recognized as the heir- presumptive to this principality and, by treaty with Schwarz- burg-Rudolstadt, to that principality also.

See Apfelstedt, Heimatskunde des Fiirstentums Schwarzburg-Sondershausen (Sondersh., 1854-1857); Irmisch, Beitrdge zur schwarzburgischen Heimatskunde (Sondersh., 1905-1906).

SCHWARZENBERG, a princely family of Franconian origin, established in Bavaria and Austria, and carrying its present name since 1437. It was raised to princely rank in 1670. Besides Karl Philipp (see below) and Johann (1463-1528), a moralist and reformer who, as judge of the episcopal court at Bamberg, introduced a new code of evidence which amended the procedure then prevalent in Europe by securing for the accused a more impartial hearing, its best-known representative is Felix (1800- 1852), Karl Philipp's nephew, an important Austrian statesman.

After six years' service in the Austrian army Felix espoused a

diplomatic career at the instance of Metternich, and underwent a period of probation (1824-1848) at various European courts, in the course of which he confirmed his aristocratic aversion to popular government, but was led to acknowledge that absolutism needs to be justified by efficiency of administration. In 1848 he took an active part in the war against Piedmont and the insurgents in Vienna. On Nov. 21st of the same year he was appointed head of a reactionary ministry. Himself a soldier, he aimed at the ultimate restoration of the absolute monarchy by means of the army. At first he temporized, and on the 27 th of November a proclamation was issued stating the intention of the government to uphold constitutional principles, but at the same time maintaining its intention to keep the empire intact even at the cost of a separation from Germany. The removal of the Austrian parliament to Kremsier followed the abdication of the emperor Ferdinand, and on March 7th 1849 the proclamation

of a centralized constitution for the whole Austro-Hungarian monarchy, after the Austrian victory at Kopolna had seemed to Schwarzenberg to have crushed the Magyar power of resistance. This was followed by the declaration of Hungarian independence; and Schwarzenberg did not hesitate ultimately to call in the aid of Russia to put an end to the insurrection (November). This done, he was free to turn his whole attention to Germany. His refusal to incorporate only the German provinces of the monarchy in the proposed new German Empire had thrown the German parliament into the arms of Prussia. His object now was to restore the status quo ante of the Confederation, with the old predominance of Austria. His success in this respect was partly due to exterior circumstances, notably the mistimed exaggera- tions of the German revolutionists, but largely to his diplomatic skill, unscrupulousness and iron tenacity of purpose with which the weakness of Frederick William IV. and his ministers was unable to cope. His triumph came with the restoration of the old federal diet in May 1850 and the signature of the convention of Olmiitz on the 29th of November of the same year (see Germany: History).

See Berger, Felix, Fiirst zu Schwarzenberg (Leipzig, 1853); A. Beer, Fiirst Schwarzenberg' s Deutsche Politih bis zu den Dresdener Konferenzen (Historisches Taschenbuch, Leipzig, 1891). For Johann see W. Scheel, Johann, Freiherr von S. (Berlin, 1905).

SCHWARZENBERG, KARL PHILIPP, Prince zu (1771- 1820), Austrian field marshal, was born on the 15th of April 1771 at Vienna. 1 He entered the imperial cavalry in 1788, fought in 1789 under Lacy and Loudon against the Turks, distinguished himself by

his bravery, and became major in 1792. In the French campaign of 1793 he served in the advanced guard of the army commanded by Prince Josias of Coburg, and at Cateau Cambresis in 1794 his impetuous charge at the head of his regiment, vigorously supported by twleve British squadrons, broke a whole corps of the French, killed and wounded 3000 men, and brought off 32 of the enemy's guns. He was immediately decorated with the cross of the Maria Theresa order. After taking part in the battles of Amberg and Wiirzburg in 1796 he was raised to the rank of major-general, and in 1799 he was promoted lieutenant field marshal. At the defeat of Hohenlinden in 1800 his promptitude and courage saved the right wing of the Austrian army from destruction, and he was afterwards entrusted by the archduke Charles with the command of the rearguard. In the war of 1805 he held command of a division under Mack, and when Ulm was surrounded by Napoleon in October he was one of the brave band of cavalry, under the archduke Ferdinand, which cut its way through the hostile lines. In the same year he was made a commander of the order of Maria Theresa and in 1809 he received the Golden Fleece. When in 1808, in view of a new war with France, Austria decided to send a special envoy to Russia, Schwarzenberg, who was persona grata at the court of St Petersburg, was selected. He returned, however, in time to take part in the battle of Wagram, and was soon afterwards promoted general of cavalry. After the peace of Vienna he was sent to Paris to negotiate the marriage between Napoleon and the archduchess Maria Louisa. The prince gave a ball in honour of the bride on the 1st of July 1810, which ended in the tragic death of many of the guests, including his own sister-in-law, in a fire. Napoleon held Schwarzenberg in great esteem, and it was at his request that the prince took command of the Austrian auxiliary corps in the Russian campaign of 1812. The part of the Austrians was well understood to be politically rather than

1 The family of Schwarzenberg, of which many members are known to history, was derived from Erkinger von Seinsheim (b. 1362), a distinguished soldier under the emperor Sigismund, who bought the lordship of Schwarzenberg in Franconia in 1420. Count Adolf von Schwarzenberg (1547-1600) was a renowned general of the empire, whose sword, along with that of his descendant Prince Karl Philipp, is preserved in the arsenal of Vienna. He fought in the wars of religion, but was chiefly distinguished in the wars on the Eastern frontier against the Turks. He was killed in a mutiny of the soldiers at Papa in Hungary in 1600. Georg Ludwig, Count von Schwarzenberg (1586-1646), was an Austrian statesman in the

Thirty Years' War. Johann, Freiherr von Schwarzenberg und Hohenlandsberg (1463-1528), was a celebrated, jurist and a friend of Luther.

morally hostile, and Schwarzenberg gained some minor successes by skilful manoeuvres without a great battle; afterwards, under instructions from Napoleon, he remained for some months inactive at Pultusk. In 1813, when Austria, after many hesita- tions, took the side of the allies against Napoleon, Schwarzenberg, recently promoted to be field marshal, was appointed com- mander-in-chief of the allied Grand Army of Bohemia. As such he was the senior of the allied generals who conducted the campaign of 1813-1814 to the final victory before Paris and the overthrow of Napoleon. It is the fashion to accuse Schwarzen- berg of timidity and over-caution, and his operations can easily be made to appear in that colour when contrasted with those of his principal subordinate, the fiery Blucher, but critics often forget that Schwarzenberg was an Austrian general first of all, that his army was practically the whole force that Austria could put into the field in Central Europe, and was therefore not lightly to be risked, and that the motives of his pusillanimity should be sought in the political archives of Vienna rather than in the text-books of strategical theory. In any case his victory, how- ever achieved, was as complete as Austria desired, and his rewards were many, the grand crosses of the Maria Theresa and of many foreign orders, an estate, the position of president of the Hof- kriegsrath, and, as a specially remarkable honour, the right to bear the arms of Austria as an escutcheon of pretence. But shortly afterwards, having lost his sister Caroline, to whom he was deeply attached, he fell ill. A stroke of paralysis disabled him in 1817, and in 1820, when revisiting Leipzig, the scene of the V olkerschlacht that he had directed seven years before, he was attacked by a second stroke. He died there on the 15th of October.

His eldest son, Friedrich, Prince zu Schwarzenberg (1800- 1870), had an adventurous career as a soldier, and described his wanderings and campaigns in several interesting works, of which the best known is his W anderungen eines Lanzknechles (1844-1845). He took part as an Austrian officer in the campaigns of Galicia 1846, Italy 1848 and Hungary 1848, and as an amateur in the French conquest of Algeria, the Carlist wars in Spain and the Swiss civil war of the Sonderbund. He became a major- general in the

Austrian army in 1849, and died after many years of well-filled leisure in 1870. The second son, Karl Philipp (d. 1858), was a Feldzeugmeister; the third, Edmund Leopold Friedrich (1803-1873), a field marshal in the Austrian army. Of Schwarzenberg's nephews, Felix, the statesman, is separately noticed, and Friedrich Johann Josef Coelestin (1800-1885) was a cardinal and a prominent figure in papal and Austrian history.

See Prokesch-Osten, Denkwurdigkeiten aus dem Leben des Feld-marschatt's Fiirsten Schwarzenberg (Vienna, 1823) ; Berger, Das Fiirstenhaus Schwarzenberg (Vienna, 1866), and a memoir by the same hand in Streffleur's Ost. Militdrzeitschrift , 1863.

SCHWARZENBERG, a town of Germany, in the kingdom of Saxony, situated on the Schwarzwasser, 16 m. W. from Annaberg by rail. Pop. (1905) 4629. It has a handsome parish church, an old palace and some schools. It has some small industries and there are large iron-works in the vicinity.

SCHWECHAT, a market-town of Austria, in Lower Austria, 5 m. S.E. of Vienna by rail. Pop. (1900) 8241. Here is situated the Dreher brewery, the largest in the monarchy; and there are also important smelting and iron works, cotton-spinning, factories of electrical plant, &c. The meeting at Schwechat of the emperor Leopold I. with Sobieski in 1683, after the liberation of Vienna, is commemorated by an obelisk. The imperial troops defeated the Hungarian insurgents in a battle fought here in October

1848.

SCHWEDT, a town of Germany, in the Prussian province of Brandenburg, on the left bank of the Oder, 13 m. N.E. from Angermiinde by rail. Pop. (1905) 9530. It is a pleasant, well- built town, with broad streets and shady avenues. There are three Evangelical churches, a Roman Catholic church, a palace, built in 1580, and a gymnasium. The royal riding school was removed hence to Hanover in 1867. The industries include the manufacture 01 toDacco, cigars, machinery, vinegar, soap

and bricks, and there is a considerable trade by water in agricul-tural produce.

Schwedt is mentioned in chronicles as early as 1 138, and became a town in 1265. Towards the end of the 15th century it passed to Brandenburg, and, in 1684, after a great conflagration which laid it

in ruins, was handsomely rebuilt by the electress Dorothea. The lordship of Schwedt was in the possession of the counts of Hohenstein from 1481 to 1609, when it passed to Brandenburg. In 1689 it was given to Philip William, a younger son of the elector of Brandenburg, Frederick William, and he and his successors called themselves margrave of Brandenburg- Schwedt. When this line became extinct in 1784 the lordship reverted to Prussia, being claimed both by the king as personal property and by the state. The matter was not settled until 1872, when it was assigned to the state.

See Thoma,' Geschichte der Stadt und Herrschaft Schwedt (Berlin,

1873)-

SCHWEGLER, ALBERT (1819-1857), German philosopher and theologian, was born at Michelbach in Wurttemberg on the 10th of February 1819, the son of a country pastor. He entered the university of Tubingen in 1836, and was one of the earliest pupils of F. C. Baur, under whose influence he devoted himself to church history. His first work was Der Montanistnus u. die chrislliche Kirche des 2ten Jahrhunderts (1841), in which he pointed out for the first time that Montanism was much more than an isolated outbreak of eccentric fanaticism in the early church, though he himself introduced fresh misconceptions by connecting it with Ebionitism as he conceived the latter. This work, with other essays, brought him into conflict with the authorities of the church, in consequence of which he gave up theology as his professional study and chose that of philosophy. In 1843 he founded the Jahrbucher der Gegenwart, and became Privatdozent of philosophy and classical philology in Tubingen university. In 1848 he was made professor extraordinarius of Roman literature and archaeology, and soon afterwards professor ordinarius of history. He died on the 5th of January 1857.

His principal theological work was Das nachapostolische Zeitalter (2 vols., 1846). It was this book which first put before the world, with Schwegler's characteristic boldness and clearness, the results of the critical labours of the earlier representatives of the new Tubingen school in relation to the first development of Christianity. Schwegler published also an edition of the Clementine Homilies (1847), and of Eusebius's Ecclesiastical History (1852) ; in philosophy Vberselzung und Erlduterung der aristot. Metaphysik (4 vols., 1847- 1848), his excellent Geschichte der Philosophie im Umriss (1848, 14th ed. 1887; 10th edition of Eng. trans, by J. Hutchison Stirling, 1888), and a posthumous Geschichte der Griech. Philosophie (1859). In history he began a Rbmische Geschichte (vols, i.-iii., 1853-1858,

2nd ed. 1867-1872), which he brought down only to the laws of Licinius.

See Edward Zeller, Vortrdge, vol. ii. (1878), pp. 329-363; and the Allgemeine deutsche Biographic

SCHWEIDNITZ, a town of Germany, in the Prussian province of Silesia, picturesquely situated on the left bank of the Weistritz, 28 m. S.W. of Breslau by rail. Pop. (1905) 30,540. The town has wide streets and contains several old churches, one of which, a Roman Catholic church, built in the 14th century, has a tower 330 ft. high. It has an old town hall, a theatre and several statues of eminent men. The surrounding country is fertile and highly cultivated, and the large quantities of flax and hemp there raised encourage an active weaving industry in the town. Beetroot for sugar, grain and fruit are also grown. The manufacture of woollens, linens, hosiery, furniture, gloves, paper, machinery and tools, carriages, nuts and screws, needles and other hardware goods is carried on. The beer of Schweidnitz has long been famous under the name of " Schwarze Schops," and in the 16th century it was exported as far as Italy. Schweidnitz is the chief grain market of the district.

Schweidnitz, dating from about the nth century, received civic rights in 1250. About 1278 it became the capital of a principality, with an area of about 1000 sq. m., which belonged to Bohemia from 1353 till 1741, when it passed into the possession of Prussia. The " Polerei of Schweidnitz " is the name given to the riotous revolt of, the town, in 1520-1522, against a royal edict depriving it of the right of coining its own money. One of

the strongest towns in Silesia it was besieged several times during the 17th and 18th centuries. In 1807 it was captured by the French, who demolished the fortifications. Restored to Prussia in 1 8 16 it was again fortified, but in 1862 the fortifications were converted into a public park.

See F. J . Schmidt, Geschichte der Stadt Schweidnitz (2 vols., Schweid- nitz, 1846-1848).

SCHWEIGHAUSER, JOHANN (1742-1830), German classical scholar, was born at Strassburg on the 25th of June 1742. From an early age his favourite subjects were philosophy (especially Scottish

moral philosophy as represented by Hutchinson and Ferguson) and Oriental languages; Greek and Latin he took up later, and although he owes his reputation to his editions of Greek authors, he was always diffident as to his classical attainments. After visiting Paris, London and the principal cities of Germany, he became assistant professor of philosophy (1770) at Strassburg. When the French Revolution broke out, he was banished; in 1794 he returned, and after the reorganization of the Academy in 1809 was appointed professor of Greek. He resigned his post in 1824, and died on the 19th of January 1830.

His son, Johann Gottfried (1776-1844), was also a distin- guished scholar and archaeologist, joint-author with M. Golbery of Antiquites de V Alsace (1828).

Schweighauser's first important work was his edition of Appian (1785), with Latin translation and commentary, and an account of the MSS. On Brunck's recommendation, he had collated an Augs- burg MS. of Appian for Samuel Musgrave, who was preparing an edition of that author, and after Musgrave's death he felt it a duty to complete it. His Polybius, with translation, notes and special lexicon, appeared in 1789-1795. But his chief work is his edition of Athenaeus (1801-1807), in fourteen volumes, one of the Bipont editions. His Herodotus (1816; lexicon, 1824) is less successful; he depends too much on earlier editions and inferior MSS., and lacks the finer scholarship necessary in dealing with such an author. Mention may also be made of his Encheiridion of Epictetus and Tabula of Cebes £1798), which appeared at the time when the doctrines of the Stoics were fashionable; the letters of Seneca to Lucilius (1809); corrections and notes to Sui'das (1789); some moral philosophy essays. His minor works are collected in his Opuscula academica (1806).

See monographs by J. G. Dahler, C. L. Cuvier, F. J. Stievenart (all 1830), L. Spach (1868), Ch. Rabany (1884), the two last con- taining an account of both father and son.

SCHWEINFURT, a town of Germany, in the kingdom of Bavaria, situated on the right bank of the Main, which is here spanned by several bridges, 27 m. N.E. of Wurzburg by rail, and at the junction of lines to Kissingen, Bamberg and Gemunden. Pop. (1905) 18,416. The Renaissance town-hall in the spacious market-place dates from 1570; it contains a library and a collection of antiquities. St John's church is a Gothic edifice with a lofty tower ; St Salvator's was built about 1 7 20. Schwein- f urt is well furnished with benevolent and

educational institutions, including a gymnasium originally founded by Gustavus Adolphus in 1 63 1, and rebuilt in 1881. The chief manufacture is paint (" Schweinfurt green" is a well-known brand in Germany), introduced in 1809; but beer, sugar, machinery, soap and other drysalteries, straw-paper and vinegar are also produced. Cotton- spinning and bell-founding are carried on, and the Main supplies water-power for numerous saw, flour and other mills. Schwein- furt carries on an active trade in the grain, fruit and wine pro- duced in its neighbourhood, and it is the seat of an important sheep and cattle market. A monument was erected in 1900 to Friedrich Riickert the poet (1788-1866).

Schweinfurt is mentioned in 790, and in the 10th century was the seat of a margrave. It fell later to the counts of Henne- berg; but, receiving civic rights in the 13th century, it maintained its independence as a free imperial city with few interruptions until 1803, when it passed to Bavaria. Assigned to the grand duke of Wurzburg in 18 10, it was restored to Bavaria in 18 14. In the Thirty Years' War it was occupied by Gustavus Adolphus, who erected fortifications, remains of which are still extant.

See Beck, Chronik der Stadt Schweinfurt (2 vols., Schweinfurt, 1836-1841); and Stein, Geschichte der Reichstadt Schweinfurt (2 vols., Schweinfurt, 1900).

SCHWEINFURTH, GEORG AUGUST (1836-), German traveller in East Central Africa and ethnologist, was born at

Riga on the 29th of December 1836. He was educated at the universities of Heidelberg, Munich and Berlin (1856-1862), where he particularly devoted himself to botany and palaeon- tology. Commissioned to arrange the collections brought from the Sudan by Freiherr von Barnim and Dr Hartmann, his attention was directed to that region; and in 1863 he travelled round the shores of the Red Sea, repeatedly traversed the district between that sea and the Nile, passed on to Khartum, and returned to Europe in 1866. His researches attracted so much attention that in 1868 the Humboldt-Stiftung of Berlin entrusted him with an important scientific mission to the interior of East Africa. Starting from Khartum in January 1869, he went up the White Nile to\Bahr-el-Ghazal, and then, with a party of ivory dealers, through the regions inhabited by the Diur (Dyoor), Dinka, Bongo and Niam-Niam; crossing the Nile watershed he entered the country of the Mangbettu (Monbuttu) and discovered the river Welle (19th of March 1870), which by its westward flow he knew was independent of the Nile. Schwein- furth formed the

conclusion that it belonged to the Chad system, and it was several years before its connexion with the Congo was demonstrated. The discovery of the Welle was Schwein- furth's greatest geographical achievement, though he did much to elucidate the hydrography of the Bahr-el-Ghazal system. Of greater importance were the very considerable additions he made to the knowledge of the inhabitants and of the flora and fauna of Central Africa. He described in detail the cannibalistic practices of the Mangbettu, and his discovery of the pygmy Akka settled conclusively the question as to the existence of dwarf races in tropical Africa. Unfortunately nearly all his collections made up to that date were destroyed by a fire in his camp in December 1870. He returned to Khartum in July 1871 and published an account of the expedition, under the title of Im Herzen von Afrika (Leipzig, 1874; English edition, The Heart of Africa, 1873, new ed. 1878). In 1873-1874 he accom- panied Gerhard Rohlfs in his expedition into the Libyan Desert. Settling at Cairo in 1875, he founded a geographical society, under the auspices of the khedive Ismail, and devoted himself almost exclusively to African studies, historical and ethno- graphical. In 1876 he penetrated into the Arabian Desert with Paul Giissfeldt, and continued his explorations therein at intervals until 1888, and during the same period made geological and botanical investigations in the Fayum, in the valley of the Nile, &c. In 1889 he removed to Berlin; but he visited the Italian colony of Eritrea in 1891, 1892 and 1894.

The accounts of all his travels and researches have appeared either in book or pamphlet form or [in periodicals, such as Peter- manns Mitteilungen, the Zeitschrift fur Erdkunde, &c. Among his works may be mentioned Aries Africanae; Illustrations and Descriptions of Productions of the Industrial Arts of Central African Tribes (1875).

SCHWEITZER, JEAN BAPTISTA VON (1833-1875), German politician and dramatic poet, was born at Frankfort-on-the-Main on the 1 2th of July 1833, of an old aristocratic Catholic family. He studied law at Berlin and Heidelberg, and afterwards practised in his native city. He was, however, from the first more in- terested in politics and literature than in law. He was attracted by the social democratic labour movement, and after the death of Ferdinand Lassalle in 1864, he became president of the " General Working-men's Union of Germany," and in this capacity edited the Sozialdemokrat, which brought him into frequent trouble with the Prussian government. In 1867 he was elected to the parliament of the North German Federation, and on his failure to secure election to the German Reichstag in 187 1, he resigned the presidency of the Labour Union, and retired from political life. Schweitzer composed a

number of dramas and comedies, of which several for a while had con- siderable success. Among them may be mentioned Alcibiades (Frankfort, 1858); Friedrich Barbarossa (Frankfort, 1858); Canossa (Berlin, 1872); Die Darwinianer (Frankfort, 1875); Die Eidechse (Frankfort, 1876); and Epidemisch (Frankfort, 1876). He also wrote one political novel, Lucinde oder Kapital und Arbeit (Frankfort, 1864).

SCHWELM, a town of Germany, in the Prussian province of Westphalia, situated on the river of the same name, 4 m. E. of Barmen, with which it is connected by an electric tramway, and on the main line of railway, Diisseldorf-Hagen. Pop. (1905) 18,469. It has three churches and various schools and public institutions. Lying close to the Harkort iron and sulphur mines, and within the populous and rich mineral district on the lower Rhine, it carries on iron-founding, wire-drawing and the manu- facture of machinery of various kinds, besides an active trade in iron, steel and brass goods. Scarcely less important are its manufactures of ribbons, damask, cord, pianos and paper. In the neighbourhood is a hydropathic establishment. Schwelm is said to have existed as early as 1085, though it did not receive civic rights until 1590.

SeeTobien, Bilder aus der Geschichte von Schwelm (Schwelm, 1 890).

SCHWEKKFELD, KASPAR (1490-1561), of Ossing, German theologian, was born in 1490, and after studying at Cologne and other universities served in various minor courts of Silesia, finally entering the service of the duke of Liegnitz, over whom he had great influence. The writings of Tauler and Luther so impressed him, that in 1522 he visited Wittenberg, where he made the acquaintance of Andreas Carlstadt and Thomas Miinzer. On his return to Liegnitz he helped to spread the principles of the Reformation in the principality and in Silesia, while warning his colleagues against the abuse of the doctrine of justification by faith. The Protestant controversy on the Eucharist (1524) revealed his disagreement with Luther on that critical point. He sought to establish a via media between the doctrines of Luther and Zwingli, and vainly hoped to obtain for it Luther's acceptance. He as vainly sought to secure Luther's adoption of a strict rule of church discipline, after the manner of the Moravian Brethren. Meanwhile the Anabaptists obtained a footing in Silesia,

and suspicions of Schwenkfeld's sympathy with them were aroused. Letters and writings of his own (1527- 1528) proved him to hold strongly anti-Lutheran heresies, and both Catholics and Lutherans urged the duke of Liegnitz to dismiss him. He voluntarily left Liegnitz in 1529, and lived at Strasburg for five years amongst the Reformed clergy there. In 1533, in an important synod, he defended against Martin Bucer the principles of religious freedom as well as his own doctrine and life. But the heads of the church carried the day, and, more stringent measures being adopted against dissenters, Schwenkfeld left Strasburg for a time, residing in various cities of south Germany and corresponding with many nobles. In 1535 a sort of compromise was brought about between himself and the Reformers, he promising not to disturb the peace of the church and they not to treat him as a disturber. The compromise was of only short duration. His theology took a more distinctly heterodox form, and the publication (1539) of a book in proof of his most characteristic doctrine — the deification of the humanity of Christ — led to his active persecution by the Lutherans and his expulsion from the city of Ulm. The next year (1540) he pub- lished a refutation of the attacks upon his doctrine with a more elaborate exposition of it, under the title Grosse Confession. The book was very inconvenient to the Protestants, as it served to emphasize the Eucharistic differences between the Lutherans and Zwinglians at a moment when efforts were being made to reconcile them. An anathema was accordingly issued from Schmalkald against Schwenkfeld (together with Sebastian Franck) ; his books were placed on the Protestant "index"; and he himself was made a religious outlaw. From that time he was hunted from place to place, though his wide connexions with the nobility and the friendship of his numerous followers provided for him secure hiding-places and for his books a large circulation. An attempt in 1543 to approach Luther only in- creased the Reformer's hostility and rendered Schwenkfeld's situation still more precarious. He and his followers withdrew from the Lutheran Church, declined its sacraments, and farmed small societies of kindred views. He and they were frequently condemned by Protestant ecclesiastical and political authorities, especially by the government of Wurttemberg. His personal safety was more and more imperilled, and he was unable to

stay in any place for more than a short time. At last, in his seventy-second year, he died at Ulm, on the 10th of December 1561, surrounded by attached friends and declaring undiminished faith in his views.

Schwenkfeld, whose gentle birth and courtly manners won him many

friends in high circles, left behind him a sect (who were called subsequently by others Schwenkfeldians, but who called themselves " Confessors of the Glory of Christ ") and numerous writings to perpetuate his ideas. His writings were partially collected in four folio volumes, the first of which was published in the year 1564, containing his principal theological works. Erbkam states that his unprinted writings would make more than another four folios. His adherents were to be found at his death scattered throughout Germany. In Silesia they formed a distinct sect, which has lasted until the present time. In the 17th century they were associated with the followers of Jacob Bohme, and were undisturbed until 1708, when an inquiry was made as to their doctrines. In 1720 a commission of Jesuits was despatched to Silesia to convert them by force. Most of them fled from Silesia into Saxony, and thence to Holland, England and North America. Frederick the Great of Prussia, when he seized Silesia, extended his protection to those who re- mained in that province. Those who had fled to Philadelphia in Pennsylvania (1734) formed a small community under the name of Schwenkfelders; and Zinzendorf and Spangenberg, when they visited the United States, endeavoured, but with little success, to convert them to their views. This community still exists in Penn- sylvania and their views appear to be substantially those of the Quakers.

Schwenkfeld's mysticism was the cause of his divergence from Protestant orthodoxy and the root of his peculiar religious and theological position. It led him to oppose the Lutheran view of the value of the outward means of grace, such as the ministry of the word and the sacraments. He regarded as essential a direct and immediate participation in the grace of the glorified Christ, and looked on religious ordinances as immaterial. He distinguished between an outward word of God and an inward, the former being the Scriptures and perishable, the latter the divine spirit and eternal. In his Christology he departed from the Lutheran and Zwinglian doctrine of the two natures by insisting on what he called the Vergotterung des Fleisches Christi, the deification or the glorification of the flesh of Christ. The doctrine was his protest against a separation of the human and the divine in Christ, and was intimately connected with his mystical view of the work of Christ. He held that, though Christ was God and man from his birth from the Virgin, he only attained his complete deification and glorification by his ascension, and that it is in the estate of his celestial Vergotterung or glorification that he is the dispenser of his divine life to those who by faith become one with him. This fellowship with the glorified Christ rather than a less spiritual trust in his death and atonement is with

him the essential thing. His peculiar Christology was based upon profound theological and anthropological ideas, which contain the germs of some recent theological and Christological speculations.

See Arnoldt, Kirchen- und Ketzer-Historie (Frankfort, ed. 1700); Salig, Historie der Augsburg. Confession; W. H. Erbkam, Gesch. der prot. Sekten (1848); Dorner, Gesch. d. prot. Theol. (1867); also R. H. Grutzmacher's article in Hauck-Herzog's Realencyklopddie; Robert Barclay's Inner Life of the Religious Societies of the Commonwealth (1876), and C. Beard's Hibbert Lectures (1883), ch. vi.

SCHWERIN, KURT CHRISTOPH, Count von (1684-1757), Prussian general field marshal, was born at Lowitz in Pomerania, and at an early age entered the Dutch army, with which he served at the Schellenberg and at Blenheim. In 1707 he became a lieutenant-colonel in the army of the duke of Mecklenburg- Schwerin, and was present at Ramillies and Malplaquet, and with the Swedish commander Stenbock at Gadebusch. In 1 7 13 he was with Charles XII. of Sweden in his captivity at Bender, andin 1 718 was made major-general. In i7i9heopposed the Hanoverian army which invaded Mecklenburg (in the course of which he fought a brilliant action at Walsmuhlen on the 6th of March 17 19), and in the following year entered the service of the king of Prussia. At first he was employed in diplomatic missions, but in January 1722/3 he received the command of an infantry regiment. In 1730, as a major-general, he was a member of the court martial which tried the crown prince of Prussia (afterwards Frederick the Great) for desertion, and in 1733, at the head of a Prussian army, conducted with great skill the delicate and difficult task of settling the Mecklen- burg question. In the following year he became lieutenant-general and in 1739 general of infantry. During the life-time of King Frederick William, Schwerin was also employed in much admini- strative work. Frederick the Great, on his accession, promoted Schwerin to the rank of general field marshal and made him a

count. At the battle of Mollwitz (April 10th, 1741) he justified his sovereign's choice by his brilliant leading, which, when the king had disappeared from the field, converted a doubtful battle into a victory which decided for the time being the fate of Silesia. After the conclusion of the war he was governor of the important fortresses of Brieg and Neisse. In the Second Silesian War (1744-1745) Schwerin

commanded the army which, marching from Glatz, met the king's army under the walls of Prague, and in the siege and capture of that place he played a distinguished part (September 10th, 1644). Some time afterwards, the king being compelled to retreat from Bohemia, Schwerin again dis- tinguished himself, but, resenting a real or fancied slight, retired to his estate, to which, and its inhabitants, he devoted his energies during the years of peace. He reappeared on the field at the outbreak of the Seven Years' War (1756), and during the first campaign conducted the war on the Silesian side of Bohemia; and in 1757, following the same route as in 1744, again joined Frederick at Prague. On the 6th of May followed the battle of Prague. Leading on a regiment of the left wing to the attack with its colour in his hand, the old field marshal was shot dead. Frederick erected a statue on the Wilhelmsplatz to his foremost soldier, and a monument on the field of Prague commemorates the place where he fell. Since 1889 the 14th (3rd Pomeranians) Infantry of the German army has borne his name.

See Varnhagen von Ense, Biographische Denkmale, vol. vi. (3rd ed., Leipzig, 1873), and Leben Schwerins (Berlin, 1 841); Wollner, Ein Christ und ein Held, oder Nachrichten von Schwerin (Frankfurt a. O., 1758); Pauli, Lebcn Grosser Helden, i. (Halle, 1759); Gollmert, Gesch. des Geschlechts von Schwerin (Berlin, 1878); Schwebel, Die Herren und Grafen von Schwerin (Berlin, 1885).

SCHWERIN, a town of Germany, in the Prussian province of Posen, at the confluence of the Obra and the Warthe,' 28 m. by rail E. of Custrin. Pop. (1905) 6768. Its principal manufac- tures are cigars, furniture, bricks and starch. By river a brisk trade is carried on in agricultural produce.

SCHWERIN, a town of Germany, the capital of the grand duchy of Mecklenburg-Schwerin, prettily situated at the S.W. corner of the lake of Schwerin (14 m. long and 3? m. broad), 129 m. by rail N.W. of Berlin, and 20 m. S. of the Baltic. Pop. (1905) 41,638. The town is closely surrounded and hemmed in by a number of lakelets, with high and well-wooded banks, and the hilly environs are occupied by meadows, woods and pretty villas. The old and new towns of Schwerin were only united as one city in 1832; and since that date the suburb of St Paul and another outer suburb, known as the Vorstadt, have grown up. Though Schwerin is the oldest town in Mecklenburg, its aspect is comparatively modern, a fact due to destructive fires, which have swept away most of the ancient houses. The most con- spicuous of the many fine buildings is the ducal palace, a huge irregularly pentagonal structure with numerous

towers, built in 1844-1857 in the French Renaissance style. It stands on a small round island between Castle Lake and the lake of Schwerin, formerly the site of a Wendish fortress and of a later medieval castle, portions of which have been skilfully incorporated with the present building. The older and much simpler palace; the opera house, rebuilt after a fire in 1882; the government buildings, erected in 1825-1834 and restored in 1865 after a fire; and the museum, in the Greek style, finished in 1882, comprising a fine collection of paintings of the 17th century Dutch school; all stand in the " old garden," an open space at the end of the bridge leading to the new palace. Among the other secular buildings are the palace of the heir-apparent, built in 1779 and restored in 1878, the large arsenal, the ducal mews, the ducal library containing 180,000 volumes, the town hall, the artillery barracks and the military hospital. The cathedral was originally consecrated in 1 248, though the present building — a brick structure in the Baltic Gothic style, with an unfinished tower — dates for the most part from the 15th century. Among other religious edifices are St Paul's church, a Roman Catholic church and a synagogue. Schwerin is rich in educational institutions, which include a classical school, a veterinary college and a technical school. Since 1837 Schwerin has been once more the residence of the grand duke, and the seat of government, a fact

which has had considerable influence on the character of the town and the tone of its society. The chief industry is the making of furniture, and there are also some manufactures of dyes and soap.

Schwerin is mentioned as a Wendish stronghold in 1018, its name (Zwarin or Swarin) being a Slavonic word equivalent to " game-preserve." The Obotrite prince Niclot, whose statue is placed above the portal of the palace as the ancestor of the present reigning family, had his residence here. The town, found in 1 161 by Henry the Lion in opposition to this pagan fortress, received civic rights in 1166. From n 70 to 1624 it gave name to a bishopric; and it was also the capital of the duchy of Schwerin, which forms the western part of the grand-duchy of Mecklenburg-Schwerin. Destructive fires, the hardships of the Thirty Years' War, and the removal of the court to Ludwigslust in 1756 seriously depressed the town. It owes its revival and many of its chief buildings to the grand-duke Paid Frederick, to whom a statue by Rauch was erected in 1859.

See Fromm, Chronik der Haupt- und Resldenzstadt Schwerin (Schwerin, 1863, revised and continued by G. Quade, 1892); G. Quade, Vaterlandskunde (Wismar, 1894); and Worl, Fiihrer durch

Schwerin (1905).

SCHWERTE, a town of Germany, in the Prussian province of Westphalia, 9 m. by rail N.E. of Hagen, at the junction of the lines Aix-la-Chapelle-Holzminden and Schwerte-Cassel. Pop. (1905) 13,015. It has a Romanesque church, with a carved altar of 1523, and stained glass of the 14th and 15th centuries; and there is a 16th century town hall. The industries are practi- cally confined to the manufacture of iron and steel goods. Schwerte received civic rights in the 12th century.

SCHWETZ, a town of Germany, in the Prussian province of West Prussia, on the left bank of the Vistula, 29 m. by rail N.E. of Bromberg. Pop. (1905) 7747. It has an Evangelical church, two Roman Catholic churches, a synagogue and an old convent, now used as a lunatic asylum, and also the remains of a castle built in the 14th century by the Teutonic Order. The chief industries are the making of sugar and shoes, and there are also electrical works and saw-mills.

See Kotz, Geschichte der Stadt Schwetz seit 1772 (Marienwerder,

1904).

SCHWETZINGEN, a town of Germany, in the grand duchy of Baden, situated in a plain 9 m. by rail S.E. of Mannheim at the junction of lines to Carlsruhe, Heidelberg and Spires. Pop. (1905) 6858. It has a castle, formerly the residence of the electors palatine of the Rhine, built in 1656, destroyed by the French in 1 689, but afterwards rebuilt. Its gardens, which occupy 117 acres, were laid out in the middle of the 18th century in imitation of those of Versailles. Cigars, vinegar, beer, yeast and jam are manufactured, while tobacco and hops are cultivated. Schwetzingen became a town in 1833.

SCHWIEBUS, a town of Germany, in the Prussian province of Brandenburg, situated in a fertile plain, 47 m. E. of Frankfort- on-Oder by the railway to Posen. Pop. (1905) 9321. It is still in part surrounded by its medieval wall, and has an old market- place, a castle and many old houses. Velvet, cloth, machinery, bricks and candles are manufactured, and there are flour-mills, breweries, distilleries and lignite mines. The territory of Schwiebus originally belonged to the principality of Glogau, and in the 16th and 17 th centuries was a bone of conten- tion between the electors of Brandenburg and the emperors. A compromise was arrived at in 1686, by which the elector received the lordship of Schwiebus on

renouncing his claims to the principalities of Liegnitz, Brieg and Wohlau. The electoral prince Frederick, afterwards the elector Frederick III., had, however, in a private compact pledged himself to restore Schwiebus to the emperor Leopold I. when he became elector, and he did so in 1695, receiving £40,000 in exchange. By the peace of 1742, Frederick the Great regained Schwiebus with the rest cf Silesia, and it was incorporated with the department of Glogau.

SCHWIND, MORITZ VON (1804-1871), German painter, was born in Vienna in 1804. He received rudimentary training and led a joyous careless life in that gay capital; among his companions

was the composer Schubert, whose songs he illustrated. In 1828 he removed to Munich, and had the advantage of the friendship of the painter Schnorr and the guidance of Cornelius, then director of the academy. In 1834 he received the commission to decorate King Ludwig's new palace with wall paintings illustrative of the poet Tieck. He also found in the same place congenial sport for his fancy in a " Kinderf ries " ; his ready hand was likewise busy on almanacs, &c, and by his illustrations to Goethe and other writers he gained applause and much employment. In the revival of art in Germany Schwind held as his own the sphere of poetic fancy. To him was entrusted in 1839, in the new Carlsruhe academy, the embodiment in fresco of ideas thrown out by Goethe; he decorated a villa at Leipzig with the story of Cupid and Psyche, and further justified his title of poet-painter by designs from the Niebelungenlied and Tasso's Gerusalemme for the walls of the castle of Hohen- schwangau in Bavarian Tirol. From the year 1844 dates his residence in Frankfort; to this period belong some of the best easel pictures, pre-eminently the Singers' Contest in the Wartburg (1846), also designs for the Goethe celebration, likewise numerous book illustrations. The conceptions for the most part are better than the execution. In 1847 Schwind returned to Munich on being appointed professor in the academy. Eight years later his fame was at its height on the completion in the castle of the Wartburg of wall pictures illustrative of the Singers' Contest and of the history of Elizabeth of Hungary. The compositions received universal praise, and at a grand musical festival in their honour Schwind himself played among the violins. In 1857 appeared his exceptionally mature " cyclus " of the Seven Ravens from Grimm's fairy stories. In the same year he visited England to report officially to King Ludwig on the Manchester art

treasures. And so diversified were his gifts that he turned his hand to church windows and joined his old friend Schnorr in designs for the painted glass in Glasgow cathedral. Towards the close of his career, with broken health and powers on the wane, he revisited Vienna. To this time belong the " cyclus " from the legend of Melusine and the designs commemorative of chief musicians which decorate the foyer of the new opera house. Cornelius writes, " You have here translated the joyous- ness of music into pictorial art." Schwind's genius was lyrical; he drew inspiration from chivalry, folk-lore, and the songs of the people; his art was decorative, but lacked scholastic training and technical skill. Schwind died at Munich in 1871, and was buried in the old Friedhof of the same town.

SCHWYZ (modern spelling Schwiz), one of the forest cantons of central Switzerland. Its total area is 350-5 sq. m., of which 293-6 sq. m. are reckoned as "productive " (forests covering 649 sq. m. and vineyards -17 sq. m.), while of the rest 2ij sq. m. are occupied by lakes (nearly 9 sq. m. of that of Zurich, 8f sq. m. of that of Lucerne, 3! sq. m. of that of Zug, and the whole of the lake of Lowerz), and -5 sq. m. is covered by glaciers. Its loftiest point is the Boser Faulen (9200 ft.)., while the two highest summits of the Rigi (the Kulm, 5906 ft., and the Scheidegg, 5463 ft.) rise within its borders. The canton extends from the upper end of the lake of Zurich on the north to the middle reach of the lake of Lucerne on the south; on the west it touches at Kiissnacht, the northern arm of the same lake, and in the same direction the lake of Zug at Arth, mountain ridges dividing it from Glarus on the east and from Uri on the south. It is made up of two main valleys, those of the Muota, flowing through the older portion of the canton to the lake of Lucerne, and of the Sihl that passes near Einsiedeln on its way to Zurich. Less important are the Aa, that waters the Waggi glen before joining the lake of. Zurich, and the Biber, which receives the Alpbach that flows past Einsiedeln. It is thus a hilly rather than a mountainous region, and is all but wholly devoted to pastoral pursuits. It has not many railways, the principal being that portion of the main St Gotthard line between Kiissnacht and Sisikon (about 20 m.), while from Arth-Goldau a line runs past BiberbrUcke (where falls in the branch from Einsiedeln, 3 m.) towards Wadenswil. From Arth-Goldau a mountain line runs up to the Rigi Kulm, with a branch to the Rigi Scheidegg,

while from Arth-Goldau the line towards Zug runs for 5 J m. within the canton. There is also a mountain line from Brunnen to Axenstein. In 1900 the population was 55,385, of whom 53,834 were German-speaking, 1108 Italian-speaking, and 296 French-speaking, while 53,537 were Romanists, 1836 Protestants and 9 Jews. The most

populous town is Einsiedeln, with its famous Benedictine monastery, but Schwyz (the port of which is Brunnen) is the political capital.

There is a certain amount of industrial activity in the canton, particularly in the portion bordering on the lake of Zurich, while silk-weaving at home is widespread. There are many fruit trees, particularly cherry trees. But on the whole the region is essentially a pastoral one, and the local brown race of cattle is much esteemed and largely exported, mainly to north Italy. There are 417 mountain pastures or "alps" in the canton, capable of supporting 17,492 cows, and of an estimated capital value of 1,128,000 frs. Till 1814 the canton was included in the diocese of Constance, but it is now nominally part of that of Coire. There are six administrative districts in the canton, which comprise thirty communes. The cantonal constitution dates mainly from 1876, but was revised in 1898. The legislature (Kantonsrat) is composed of members elected in the proportion of one for every six hundred (or fraction over two hundred) inhabitants and holds office for four years — the elections in twelve (the larger) of the thirty electoral circles take place according to the principles of proportional representation. The executive {Regierungsrat) of seven members is elected by a popular vote, and holds office for four years. The two members of the federal Standerat and the three of the federal Nationalrat are also chosen by a popular vote. The " obligatory referendum " prevails in the case of all laws approved by the legislature and important financial measures, while two thousand citizens may claim a popular vote as to any decrees or resolutions of the legislature, and have also the right of " initiative " as to the revision of the cantonal constitution or as to legislative projects.

The valley of Schwyz is first mentioned in 972 under the form of " Suittes." Later, a community of freemen is found settled at the foot of the Mythen, possessing common lands, and subject only to the count of the Zurichgau, as representing the German king. Its early history consists mainly of disputes with the great monastery of Einsiedeln about rights of pasture. In 1240 the community obtained from the Emperor Frederick II. the privilege of being subject immediately to the empire. Its territory then included only the district round the village of Schwyz and the valley of the Mucta. But in 1269 it bought from Count Eberhard of Habsburg-Laufenburg (who in 1273 sold all his other rights to the head of the elder line of the Habs- burgs), Steinen and Rothenthurm. Schwyz took the lead in making the famous everlasting league of the 1st of August 1291, with the neighbouring districts of Uri and of Unterwalden, its position and political independence specially fitting it for this prominence. An

attack by Schwyz on Einsiedeln was the excuse for the Austrian invasion that was gloriously beaten back in the battle of Morgarten (November 15th, 1315). In the history of the league Schwyz was always to the front, so that its name in a dialectal form (Schweiz) was from the early 14th century onwards applied by foreigners to the league as a whole, though it formed part of its formal style only from 1803 onwards. Between 1319 and 1354 Schwyz secured posses- sion of Arth. But it was only after the victory of Sempach (1386) that it greatly extended its borders. An "alliance" with Einsiedeln in 1397 ended in 1434 with the assumption of the position of " protector " of that great house, between 1386 and 1436 the whole of the " March " (the region near the upper lake of Zurich) was acquired, in 1402 Kiissnacht was bought, and in 1440 the " Hofe," the parishes of Wollerau, Feusisberg and Freienbach, situated on the main lake of Zurich. All these districts were governed by Schwyz as " subject lands," the supreme power resting with the Lands gemeinde (or assembly of all male citizens of full age), which is first distinctly mentioned in 1294, though it seems to have already existed in 1281, when mention is also made of a common seal. Schwyz joined the

other forest cantons in opposing the Reformation and took part in the battle of Kappel (1531), in which Zwingli fell. In 1586 it became a member of the Golden or Borromean League, formed to continue the work of St Charles Borromeo in carrying out the counter reformation in Switzerland. In 1798 Schwyz, including Gersau (free from 1390), formed part of the Republique Telliane (or Tellgau) set up by the French, which a week later gave way to the Helvetic republic. The men of Schwyz, under Aloys Reding, offered a valiant resistance to the French, but they were forced to yield. Their land formed part of the vast canton of the Waldstatten, though the March and the Hofe were lost to that of the Linth. In 1799 a French occupation was successfully resisted, while later in the same year part of the canton was the scene of the disastrous retreat from Altdorf to Glarus over the Kinzigkulm and Pragel passes by the Russians under Suvarov in face of the French army. In 1803 the separate canton of Schwyz was again set up, the March and the Hofe being recovered, while Gersau now became part of it. In 1806 the great landslip from the Rossberg buried Goldau, causing great loss of life and of property. Later, Schwyz resisted steadily all proposals for the revision of the pact of 181 5, joined in 1832 the league of Sarnen, and in 1845 the Sonderbund, which was put down by a short

war in 1847. In 1832 the outer districts (Einsiedeln, the March, Kussnacht and Pfafnkon) formed themselves into a separate canton, an act which brought about a federal occupation of the old canton in 1833, thisending in the dissolution of the new canton, the constituent parts of which were put on an equal political footing with the rest. In 1838 a strife broke out in the older portion of the canton between the richer peasant proprietors (nicknamed the " Horns," as they owned so many cows) and the poorer men (dubbed the " Hoofs," as they possessed only goats and sheep) as to the use of the common pastures, which the " Horn " party utilized far more than the others. The " Horn " party finally carried the day at the Landsgemeinde held at Rothenthurm. The cantonal constitution of 1848 put an end to the ancient Lands- gemeinde; it was revised in 1876 (when membership of one of the 29 communes became the political qualification), and in 1898. Authorities. — J. J. Blumer, Staats- und Rechtsgeschichte d. schweiz. Demokratien (3 vols., St Gall, 1850-1859); J. C. Benziger, Die Ratsprotokolle des Kant. Schwyz, 15 48-1798 (Schwyz, 1 906); T. Fassbind, Geschichte d. Kant. Schwyz (5 vols., Schwyz, 1832-1838); Geschichtsfreund, from 1843; M. Kothing, Das Landbuch von Schwyz (Zurich and Frauenfeld, 1850); A. Liitolf, Sagen, Brduche, Legenden aus den funf Orte (Lucerne, 1852); G. Meyer von Knonau, Der Kanton Schwyz (St Gall, 1835) ; Mitteil. d. hist. Vereins d. Kant. Schwyz (from 1882); W. Oechsli, Die Anjdnge d. schweiz. Eidgenossenschaft (Zurich, 1891); R. von Reding-Biberegg, Der Zug Suworoffs durch die Schweiz in 1799 (Stans, 1895); H. Ryffel, Die schweiz. Lands gemeinden (Zurich, 1903) ; J. Sowerby, The Forest Cantons of Switzerland (London, 1892); D. Steinauer, Ge- schichte d. Freistaates Schwyz (1 798-1 861) (2 vols., Einsiedeln, 1861) ; A. Striiby and H. Schneebeli, Die Alpwirtschafi im Kant. Schwyz (Soleure, 1899); W. H. Vormann, Aus den Fremdenbiichern von Rigi-Kulm (Bern, 1883); K. Zay, Goldau und seine Gegend (Zurich, 1807). (W. A. B. C.)

SCHWYZ, the capital of the Swiss canton of that name, a picturesque little town, admirably situated, amid fruit trees, on a mountain terrace (at a height of 1706 ft.), commanding a glorious view, at the north-west foot of the conical peak of the Gross Mythen (6240 ft.), and at a considerable height above the valley of the Muota. Besides a stately 18th century parish church and several convents, it contains a i6tb century town hall (housing various precious MSS. and banners captured in various wars) , as well as several curious old patrician houses, such as that of the Reding family, a member of which, Aloys (1765-1818), headed the patriotic resistance to] the French in 1 798-1 799. _ Including the neighbouring hamlets of Ibach,

Rickenbach, &c, the parish had 7398 inhabitants in 1900, practically all German-speaking and Romanists. The town is connected by an electric tramway with the Schwyz-Seewen station on the St Gotthard railway, about 3 m. from Brunnen, the port of Schwyz on the lake of Lucerne.

SCIACCA, a town and episcopal see of Sicily, on the S. coast, in the province of Girgenti, 45 m. N.W. of Girgenti by road,

and about 30 m. direct. Pop. (1906) 24,645. It is surrounded by walls erected in 1400, and has two ruined castles, belonging to the Luna and Perollo families, whose hereditary feuds lasted from 1410 to 1529, some fine medieval palaces, and several interesting churches. The cathedral, founded in 1090, was largely reconstructed in 1686. The convent of Sta. Maria delle Giummare, with its battlemented walls, occupies the former palace of the Saracen governors, and contains a painting of the foundation of the convent by Count Roger. The town has only an open roadstead. It has an important trade in coral.

Three miles E. of the town is the Monte San Calogero (the ancient Mons Cronius) with sulphurous and saline springs and vapour baths, which are still frequented and were known in Roman times as Aquae Larodes or Thermae Selinuntiae (Sciacca is about 15 m. direct S.E. of Selinus). The name Sciacca is Arabic, but of uncertain meaning. The town is the birthplace of Tommaso Fazello (1498-1570), the father of Sicilian history.

SCIATICA (from a late Lat. corruption, sciaticas, of Gr. icrX'aStoKos, from ia%ˆov, the hip-joint), a form of neuralgia localized in the sciatic nerve, or its cords of origin; see Neur- algia.

SCIENCE (Lat. scientia, from scire, to learn, know), a word which, in its broadest sense, is synonymous with learning and knowledge. Accordingly it can be used in connexion with any qualifying adjective, which shows what branch of learning is meant. But in general usage a more restricted meaning has been adopted, which differentiates " science " from other branches of accurate knowledge. For our purpose, science may be defined as ordered knowledge of natural phenomena and of the relations between them; thus it is a short term for " natural science," and as such is used here technically in con- formity with a general modern convention.

The beginnings of physical science are to be sought in the slow and unconscious observation by primitive races of men of natural

occurrences, such as the apparent move- ments of the heavenly bodies, and in the gradually T1,e acquired mastery over the rude implements by the % f g s ˆ ieacc aid of which such men strove to increase the security and comfort of their lives. Biological science similarly must have begun with observation of the plants and animals useful to man, and with empirical medicine and surgery. It was only when a considerable progress had been made with ordered knowledge that men began to ask questions about the meaning and causes of the phenomena, and to discern the connexions between them.

In the earliest stage of development it seems that an anthropo-morphic or mythological explanation is always assigned to the phenomena of nature. With no clue to trace the regularity of sequence and connexion between those phenomena, an untutored mind inevitably refers the apparently capricious events which succeed each other to the direct and immediate intervention of some unseen being of a nature essentially similar to his own. The sun is the flaming chariot of the sun-god, driven day by day across the heavens; the clouds are cows from which milk descends as nourishing rain on the fruitful earth. We may regard such myths as childlike fancies, but they were doubtless an advance on the want of all explanation which preceded them; they supplied hypotheses which, besides giving rise to themes of beauty and suggestiveness for poetry and art, played the first and chief part of a scientific hypothesis in pointing the way for further inquiry. Much useful knowledge was acquired and much skill gained in logical analysis before these primitive explana- tions were proved insufficient. A false theory which can be compared with facts may be more useful at a given stage of development than a true one beyond the comprehension of the time, and incapable of examination by observation or experiment by any means then known. The Newtonian theory of gravitation might be useless to a savage, to whose mind the animistic view of nature brought conviction and helpful ideas, which he could test by experience.

The phenomena of the heavens are at once the most striking, I the most easily observed and the most regular of those which

Early as- tronomy .

are impressed inevitably on the minds of thinking men. Thus it is to

astronomy we must look for the first development of scientific ideas. The orientation of many prehistoric monuments shows that a certain amount of astro- nomical observation had been acquired at a very early age, and the Chaldeans seem to have gone so far as to recognize a law of periodicity even in eclipses. From the land of Asia the Greeks took their earliest ideas of science, and it is to the Ionian philosophers, of whom Thales of Miletus (580 B.C.) is regarded as the first, that we must turn for the earliest known example of an advance on the mythological view of nature. Anaximenes recognized the rotation of the heavens round the pole star, and saw that the dome overhead was but the half of a complete sphere. The earth was thus deprived of the base stretching to unfathomed depths imagined by the mythologists, and left free to float as a flattened cylinder at the centre of the celestial sphere. Anaximenes, too, seems to have grasped the doctrine of the uniformity of nature, teaching that all material transformations must have a true cause.

Next came the Pythagoreans, who simplified these conceptions by the suggestion that instead of a rotation of the vast sphere of the heavens the earth itself might be a sphere and revolve about a central fixed point, like a stone at the end of a string. The unin- habited side of the earth always faced the fixed point, and its in- habited side faced successively the different parts of the heavens. At the central fixed point they placed a " universal fire," which, like the fire on an altar, served as a centre for the circling of the worshipping earth. Mythology was losing its hold of science, but mystical symbolism still held sway. When, however, in the 4th century B.C. the growth of geographical discovery failed to disclose any trace of this central fire, the idea of its existence faded away, and was replaced by the conception of the revolution of the earth on its own axis. Finally, Aristarchus (280 B.C.), believing that the sun was larger than the earth, thought it unlikely that it should revolve round the earth, and developed a heliocentric theory. But the time was not ripe; no indisput- able evidence could be adduced, no general conviction followed, and to mankind the earth remained the centre of creation till many centuries later. Even to Lucretius, the visible universe consisted of the central earth with its attendant water, air and aether founded by the sphere of the heavens, which formed the flaming walls of the world — flammantia tnoenia mundi.

Simultaneously with the birth of astronomy the problem of

matter came into being. The old Ionian nature philosophers,

observing the sequence of changes from earth and

.. . water into the structure of plants and the bodies of

problem of . , . , , r . . . ,

matter. animals, and through them again into the original constituents, began to grasp the conception of the indestructibility of matter, and to put forward the idea that all forms of matter might ultimately consist of a single " element." But the conception of a single ultimate basis of matter was far in advance of the age. It is only now becoming a fertile working hypothesis in the light of all the gigantic increase in knowledge of the intervening two thousand years. At the time when it was put forward, the conception was of little use, and the immedi- ate pathof advance was foundin theideaof Empedocles(450B.c.) that the primary elements were four: earth, water, air and fire — a solid, a liquid, a gas and the flame which seemed to the ancients a type of matter of still rarer structure. This hypothesis served to interpret the phenomena of nature for many centuries, till, in modern days, the growth of chemistry disclosed the seventy or eighty elements of our text-books. Signs are not wanting that they too have served their turn as a conception of the ulti- mate nature of matter, while still maintaining their place as the proximate units of chemical action.

In the four elements of Empedocles we trace the germ of the ideas of the Atomists. Empedocles saw that, by combining his separate elements in different proportions, he could ofatoms! 3 ' explain all the endless differences in matter as known to the senses. Leucippus and Democritus developed the conception and gave to the world the theory of atoms, described at a later date by the Roman poet Lucretius. As

matter is subdivided does it keep its characteristic properties throughout? Is iron always iron, however finely we divide it; is water always water? Are the properties of any kind of matter ultimate facts of which no explanation — no description in simpler terms — is possible? To avoid answering this last question in the affirmative, and resigning all hope of an advance in knowledge, the atomic theory of the Greeks was framed.

To recognize the significance of the doctrines of the Greek Atomists, we must remove from our minds all sense of comparison with the atomic theory of to-day. The Greeks had none of the detailed physical and chemical knowledge on which that theory is founded, and which it was framed to explain. The object of Leucippus and Democritus was quite different from that of Dalton and Avogadro.

To the latter, the conception of atoms and molecules served as a means of explaining certain definite and detailed facts of chemical combination and gaseous volume in a more definite and exact way than any other hypothesis available at the time. To the Greek philosophers, the atomic theory was an attempt to make the universe intelligible. The particular explanation offered was not of so much importance as the idea that an explanation of some kind was possible. When we see the beliefs that held sway before their day, we realize the advance their ideas produced. The qualities of substances were thought to be of their essence — the sweetness of sugar was as much a reality as sugar itself, the black colour of water must survive all changes in its form, so that, to one who knew this doctrine, snow could never look white again. It was such con- fusion as this — such denial of facts if they failed to support a theory — that Democritus assailed: — " According to convention there is a sweet and a bitter, a hot and a cold, and according to convention there is colour. In truth there are atoms and a void." Atoms were many in size and shape, but identical in substance. All qualitative differences in substances were to be assigned to differences in size, shape, situation and movement of particles of the same ultimate nature. No attempt was made to examine into the nature of this ultimate substance; but one set of phenomena was expressed in terms of something simpler, and no " explanation " even of the most recondite observation by the most modern physicist can do more.

The atomic theory of the Greeks as transmitted to us by the poem of Lucretius presented a wonderfully consistent picture of nature within the limits of the knowledge of their day. It is easy to show where it fails in the light of the know- ledge of phenomena we now possess; it is easy to point to places where, as in its application to psychological problems, its authors passed in imagination over logical chasms without even seeing that a difficulty existed. But the attempt to frame an intelligible picture was a great step in advance, and a study of the flaws which we can now detect may serve to suggest the provisional nature of some of the theories by the aid of which knowledge is advancing so fast in our own day.

But the great difference between the position of the Greeks and that of ourselves in regard to natural knowledge consists in the small number of phenomena known to them contrasted with the enormous wealth of accumulated observation which is available for us, as the result of years of experiment with the aid of apparatus unknown to the ancients. When a new theory is put forward, it is now almost always possible to test its concordance with facts by the use of material already accumulated, or to suggest, in the light of such

material, experiments which will serve to refute it, or to lend it greater probability. Thus a theory which survives the trials that follow its birth has nowadays a fairly long expectation of life — probably the theory will serve to interpret phenomena discovered either by its means or in other ways for some time to come. But in the ancient world this was not so. To test a new theory, other phenomena were very rarely available than those which sug- gested it, or to explain which it was put forward. Thus thought was much more speculative, and, as is still the case with meta- physics, no general consensus of opinion was reached. Each philosopher had a system of his own in science, just as he still has in metaphysics — a system which, beginning from first

principles anew, raises on them a superstructure, which, even if it logically follows from them, can have no more validity than the premises on which it is based. When the premises are not accepted by other philosophers, the whole scheme becomes merely the doctrine of one man, and, if it lives at all, may oppress by the dead weight of authority the struggle of living thought beneath it.

The history of the atomic theory of Leucippus and Democritus illustrates the difficulties of a position where speculation has . . . a outstripped observation. The theory was nearer

what is now accepted as truth than any other of the ancient schemes of physics. Yet the grounds on which it was based were so insecure that Aristotle (c. 340 B.C.), who started with other preconceptions, was able to bring to bear such destruc- tive criticism that the theory ceased to occupy the foremost place in Greek thought. Although, with the knowledge then available, we can but admit that some of Aristotle's criticism was just, much of it consists of metaphysical arguments against the atomists, while in parts he rejects true conclusions owing to what he considers their impossibility. Democritus, for instance, had held that all things would fall with equal speed in a vacuum, and that the fact that heavy bodies were observed to fall faster than very light ones was due to the resistance of the air. Democritus's belief was true, though he was of course quite unconscious of the grounds on which it can alone be demonstrated — the universal attraction of gravity, and the remarkable and curious experimental fact that the weights of bodies are proportional to their masses. Aristotle agrees that in a vacuum

all bodies would fall at an equal rate, but the conclusion appears to him so inconceivable that he rejects the idea of the existence of any empty space at all, and with the " void " rejects the rest of the allied concepts of the atomic theory. If all bodies were composed of the same ultimate matter, he argues, they must all be heavy, and nothing would be light in itself and disposed to rise. A large mass of air or fire would then necessarily be heavier than a small mass of earth or water. This result he thinks impossible, for certain bodies always tend upwards and rise faster as their bulk increases. It will be seen that Aristotle has no idea of the con- ceptions we now call density and specific gravity, though clear views about the question why some things rise through water or air might have been obtained without the aid of physical apparatus. Aristotle's doctrine that bodies are essentially heavy or light in themselves persisted all through the middle ages, and did much to delay the attainment of more exact knowledge. It was not till Galileo Galilei (1 564-1642) dis- covered by actual experiment that, in cases where the resist- ance of the air is negligible, heavy things fall at the same speed as light ones, that the Aristotelian dogma was overthrown.

Turning to the biological sciences, we may trace a somewhat similar course of development. Owing to its practical im-

portance, medicine has left many records by which tiotogy. i ts progress can be traced. Just as primitive man

personified the sun and the moon, the wind and the sea, so he regarded disease as due to the action of some malignant demon or to the spells of some human enemy. Once more Greek literature enables us to trace the gradual decrease in the import- ance assigned to charms and magic, and the growth of more rational ideas among physicians. But here, as in the physical sciences, the philosophic range of the intellect of the Greeks led them astray. Assumptions as to the nature of man or the origin of organic life were too often made the starting point of a train of deductive reasoning, the consequences of which were not always compared with the results of observation and experiment, even where such comparison was possible. The Greek philosophers tried to make bricks without straw, usually in sublime unconsciousness that straw was necessary. Many centuries of humble observation and tentative fitting together of small parts of the great puzzle were needed before enough material was collected to make possible useful generalizations about the questions, answers to which the Greeks assumed as the very basis of their inquiries.

Among the multitude of their guesses, a few somewhat re- sembled

the views that are now again rising into prominence from the basis of definite and exact experiment. A good example of the strength and weakness of ancient speculation is found in the cosmogony of the atomists, both on its physical and on its biological side. Lucretius describes how the world was formed by the conjunction of streams of atoms, which con- densed into the earth, with its attendant water, air and aether, to form a self-contained whole. Unconscious of the mighty gap between inorganic matter and living beings, he proceeds to tell how, in the chances of infinite time, all possible forms of life appeared, while only those fittest to survive persisted and reared offspring. Here, surrounded by unsupported statements and false conclusions, we see dimly the germs of the ideas of the nebular hypothesis and the theory of natural selection, though Lucretius had the profoundest ignorance of the diffi- culties of the problem, and the vast stretches of time necessary for cosmical and biological development.

In those branches of biological science in which less ambitious theorizing and more detailed observation were forced on the Greeks, considerable progress was made. Aristotle compiled a laborious account of the animals known in his day, with many accurate details of their anatomical structure. Beginning from an earlier date, steady advance was made with geographical discovery. Maps of the known world, developed from the local maps invented by the Egyptians for the purposes of land- surveying, gave definiteness to the knowledge thus acquired, and showed its bearing on wider problems.

One of the most striking successes of Greek thought is seen in the development of geometry. Geometry has a twofold importance, as being itself the study of the properties _ . of the space known to our senses, and as teaching us methods and means of studying nature by unfolding the full logical consequences of any hypothesis: geometry is the best type of deductive reasoning. Based on axioms, the result of simple experience, it traces from the ideas of solids, surfaces, lines and points the properties of other figures defined in terms of those ideas. As an example to other sciences, the deductive geometry of Euclid (c. 300 B.C.) had, perhaps, an unfortunate influence in emphasizing the deductive method, and teaching men to neglect the need of verifying by experiment the theories put forward to explain the more complex phenomena of nature at the conclusion, and at each possible step, of the deduction. But, in itself, the science of Euclidian geometry was brought to such a state of perfection that no advance was made till modern times: no change even in form attempted till quite recently. Unlike some other branches of inquiry we have mentioned, Euclid's geometry carried universal conviction,

and represented a permanent step in advance which never had to be retraced.

Alongside the study of individual sciences, the Greeks paid even more attention to the laws of thought, and to the examina- tion of the essence of the methods by which knowledge in general is acquired. In opposition to Plato's theory Theories that all knowledge is but the unfolding and develop- knowledge. ment of forgotten memories of a previous state of existence, Aristotle taught that we learn to reach the generaliza- tions, which alone the Greeks regarded as knowledge, by remem- bering, comparing and co-ordinating numerous particular acts or judgments of sense, which are thus used as a means of gaining knowledge by the action of the innate and infallible nous or intellect. Neither Plato nor Aristotle could be satisfied without finding infallibility somewhere. Aristotle, it is true, investigated the logical processes by which we pass from particular instances to general propositions, and laid stress on the importance of observing the facts before generalizing about them, but he had little appreciation of the conditions in which observation and the induction based on it must be conducted in practice in order to obtain results where the probability of error is a minimum. Aristotle regarded induction merely as a necessary preliminary to true science of the deductive type best seen in geometry, and, in applying his principles, he never reached the " positive " stage, I in which metaphysical problems are evaded, if not excluded,

and a scheme of natural knowledge built up in a consistent manner, so that metaphysical ideas, though they may underlie the foundation of the ultimate conceptions, do not intrude between the parts of the building. Hence Aristotle's explanations often turn directly on metaphysical ideas such as form, cause, substance, terms which do not occur (in the Aristotelian sense) in modern scientific terminology.

A century later than the time of Aristotle, Archimedes of Syracuse (287 to 212 B.C.) formulated the fundamental concep- tions of hydrostatics and took what may be regarded The as the first step in the exact science of mechanics.

mechanics. The use of the lever must have been discovered at a very early date, and Archimedes set to work to in- vestigate its

quantitative laws by the application of principles learnt from the geometers. He begins by laying down two axioms: (1) Equal weights placed at equal distances from the point of support of a bar will balance: (2) Equal weights placed at unequal distances do not balance, but that which hangs at the greater distance descends. The ancient philosophers based such axioms as the first of these two on the " principle of sufficient reason." No motion can take place, because, from the symmetry of the system, there is no reason why the balance should descend on one side more than the other. Even if we grant the theoretical validity of this principle, it is impossible to make sure without trial that the system in any given case is really symmetrical. Electrification of the bar, for instance, though imperceptible to our senses, would cause one end to descend if an oppositely electrified body were placed near that end; we cannot assume without trial that the position of the sun, or the colour of the arms, will not affect the result. Archimedes based the second axiom on the sounder ground of direct experience. On these two axioms he proceeded to construct an elaborate deductive proof of the numerical law of the lever, but, in the course of it, he assumed as known the principle of the centre of gravity. In reality, this principle is identical with that of the lever, and assuming one, implicitly we assume the other. Nevertheless, Archimedes' proof is of use and interest. On the assumptions made, it shows the connexion between the general case of the lever with unequal arms, and the special and more familiar case when the arms are equal. Indeed; if we also treat the principle of the centre of gravity as an axiom known by experience, Archimedes' proof is a true type of all scientific " explanations "; it reduces an unfamiliar phenomenon to others already well known to our minds, which, creatures of habit as they are, regard the familiar cases as in no need of explanation. Nowadays we should treat the law of the lever of unequal arms as one that is verified by direct and familiar experiment, and use it, in its turn, as the starting point for further deduction.

Thus before the intellectual activity of Greece was absorbed by the utilitarianism of Rome, which, in its turn, was lost in the dark ages following the barbarian conquests, the seeds were sown which, germinating after the lapse cf centuries, developed in the more fruitful soil of the age of experiment. But for a time they were buried, and only remembered by compendiums written just before the ancient light was wholly lost. During the dark ages, the contents of secular learning, based on those compendiums, settled down into the elementary " trivium," consisting of grammar, rhetoric and dialectic, and the more advanced " quadrivium " music, arithmetic, geometry

and astronomy. Music included a half- mystical doctrine of numbers and the rules of plainsong; geo- metry consisted of a selection of the propositions of Euclid without the demonstrations; while arithmetic and astronomy were cultivated chiefly because they taught the means of finding Easter. Meanwhile, the early alchemists of Alexandria, by the aid of mystical analogies with the conceptions of astrology, were making primitive experiments on the transformations of various substances. It was probably from them that the " sacred science" passed to the Arabs, among whom Geber (c. a.d. 750) discovered many new chemical reactions and compounds.

With the intellectual revival which began in the 1 ith century, and the gradual recovery of some of the lost works of the ancient

The dark ages.

writers, we turn a new page. The controversy between Plato and Aristotle upon the doctrine of ideas fascinated the minds of the middle ages, saturated as they were with the logical subtleties of dialectic. This controversy originated i earn inst. the long debate on the reality of universals, which absorbed the intellectual energies of many generations of men. Did reality belong only to the idea or universal — to the class rather than to the individual — to the common humanity of mankind, for instance, rather than to each isolated being? Or were the individuals the reality, and the universals mere names? In this question, trivial, almost meaningless, as it seems at first sight, logical analysis disclosed to the medieval mind the whole theory of the universe. Either answer contained danger to theological orthodoxy as then understood; hence the fervour with which it was debated. But, as communication with the East was reopened early in the 13th century, Latin transla- tions of Aristotle's works gradually were recovered; the whole of Aristotle's philosophy was reimported into the schools of Europe, and reconciled and adopted by Christian theology. For three hundred years Aristotle reigned supreme in European thought, and exponents of the scholastic philosophy, ignoring their master's teaching on the need of experiment, settled questions of fact as well as those of opinion by an appeal to his books. But outside the academic schools of the newly founded universities, experiment was kept alive by the labours of the alchemists, who, early in the 13th century, caught their ideas from the Arabs, and began to search for an elixir vitae and for a means of transmuting baser metals into gold. But alchemy never quite squared its account with orthodox theology, and the " sacred science " of the Alexandrians became associated in the medieval mind with the " black art " of witchcraft. Even a man like Roger Bacon, who, with

some astrological mysticism, had a more modern idea of experiment both in chemical and physical problems, did not escape condemnation.

We now reach the period in the history of the world known as the Renaissance, when many converging streams of thought were given room to join by the increased material prosperity and improved political stability of the na i SS ance. 15th and 16th centuries. The Renaissance was not, as it is sometimes represented, a sudden break with medievalism and a birth of the modern world. But a number of conditions favourable to rapid development happened to coincide, and, in the course of a century, men's outlook on themselves and on nature became profoundly modified. The recovery of the Greek language, the voyages of Columbus, the decay of the Western and the passing of the Eastern empire, the temporary diminution in power of the papacy, the invention of printing, all tended to produce new ideas and to prepare men's minds to accept the more human and naturalistic view of the universe which had been current among the Greeks, in place of the mystical aspect which it wore to the medieval schoolmen and ecclesiastics. At first the tendency was to substitute the authority of the ancients for the authority of the schoolmen, but gradually more independence of thought was secured; men like Leonardo da Vinci (1452-1510) began to experiment and to record their results; Nicolaus Copernicus (1473-1543) revived the heliocentric theory, and showed how the accumu- lated mass of astronomical observations could be interpreted by its means; and anatomy began again to be studied in the schools of medicine, gradually making its way in face of the prejudice against mutilating the human body.

The philosophy of the new experimental methods was first studied deeply by Francis Bacon (1561-1626). Sensible of the confused and disjointed information which then con- stituted the only scientific knowledge, Bacon set Bacon' himself to describe a new method by which definite knowledge might be acquired with certainty. Warned by the failure of the scholastic methods, Bacon laid exclusive stress on experimental research, and it was perhaps natural that he should incline to the other extreme and ignore almost entirely the use of hypothesis and the deductive method. To arrive at the underlying causes, said Bacon, we must study the

natural history of the phenomena, collect and tabulate all observations which bear on them, notice which phenomena are related in such a way as to vary together, and then, by a merely mechanical process of exclusion, we discover the cause of any given phenomenon. As a corrective of the medieval philosophy Bacon's work was of the greatest value in the history of thought, and, from this point of view, it is perhaps but a small drawback that scientific discovery is seldom or never made by the pure Baconian method. The multitude of phenomena are too great for any subject to be attacked with success without the aid of hypothesis framed by the use of the scientific imagination. Facts are collected to prove or disprove the consequences deduced from the hypothesis, and thus the number of facts to be examined becomes manageable.

Even while Bacon was philosophizing, the true method was being used by Galileo Galilei (i 564-1642) to found the science a … of dynamics. We have seen how the Aristotelians

held the belief that every body sought its natural place, the place of heavy bodies being below and that of light ones above. Innate quab'ties of heaviness and lightness were thus invoked to explain why some things fell, and others, in similar circumstances, rose. Galileo, rightly rejecting the whole current point of view, set himself to examine not why, but how, things fell. This change of attitude was in itself one of his great achievements. Now a falling body starts from rest and falls with a speed which is increasing constantly. Galileo sought to find the law of increase. To isolate the real law out of all possible laws he made a guess at a simple law which seemed likely to be true. He assumed that the speed acquired is proportional to the distance fallen through. But, working out the consequences of this hypothesis, he soon convinced himself that it involved a contradiction. He abandoned the hypothesis and made another. He supposed that the speed was proportional to the time of fall. Again he deduced mathematically the consequences of this new hypothesis, and, finding no incon- sistencies, put some of his deductions to the test of experiment, and verified their accuracy. Thus Galileo proved mathemati- cally that, if the speed of fall is proportional to the time from the moment of starting, the space traversed by a falling body must be proportional to the square of the time of fall. To verify this result experimentally, Galileo convinced himself that a body falling down an inclined plane acquired a speed which is the same as that it would have attained in falling < through the same vertical height. He was able therefore to use a slow fall down a plane for his experiments instead of the unmanageably rapid course of a body falling freely. Nor was this all. From this stage to

the investigation another con- sequence of his results was found to spring. A ball after running down an inclined plane of a certain height will run up another plane of the same height irrespective of its inclination — that is, if friction be small. The second plane may be made very long, but still, if its final height be the same, the ball. will reach its end. Hence it is the height that matters; none of the speed of the ball is destroyed unless it rises. If the second plane be made horizontal, the ball will thus run on for ever unless stopped by friction or some other applied force. This fundamental result, put into definite words by Newton, is known as the first law of motion, and is the foundation of the whole science of dynamics. In Galileo's day it was an entirely new conception. It has been assumed that every motion required some cause or force to maintain it. Hence arose the need of hypothetical vortices to maintain planetary movements, and similar com- plications in astronomy and mechanics. But it now became evident that it was not the continuous motion of the planets which needed explanation, but the constant deflection of that motion from the straight path it would hold if no applied force were in action. The way was open for Newton.

Sir Isaac Newton (1642-1727) proved mathematically that the observed motion of the planets about the sun could be explained, and explained only, by the supposition that the sun exerted a force on each planet proportional inversely to the square of its distance from the planet. But

Newton.

the earth, at any rate, does attract bodies on or near its surface, the phenomenon being the familiar but mysterious gravity. Is this force competent to account for the motion of the moon round the earth? On the assumption of the law of inverse squares, Newton calculated what the known force of gravity would become at the distance of the moon. Owing to faulty data, his first result indicated that the force would be too great, and Newton put aside his calculations. Six years later a new determination of the size of the earth gave him a new basis for calculation, and, in an excitement so great that he could hardly see his figures, Newton found that the fall of a stone to the earth and the sweep of the moon in her orbit were due to the same cause. The mechanism by means of which the force is exerted remained unrevealed to Newton, and has baffled all inquirers since his day, but the discovery that all the move- ments of the heavens could be described by one simple physical law, represents the greatest achievement in the history of science.

Newton brought the existing state of the solar system within the cognizance of known dynamical principles, and the logical extension of such principles to explain the origin of , . that system was made by the speculations of Pierre Simon, marquis de Laplace (1749-1827), and developed by those who followed him. They imagined a primitive state of nebu- losity from which, by the action of known dynamical processes, the sun and planets would be evolved.

These speculations, isolated at first, coalesced with the more detailed conclusions of geology during the 19th century. The earlier conceptions of the origin of the rocks of the _ . earth imagined catastrophes of fire or water, processes alien to those of everyday experience. But the " uniformi- tarian " school, founded by James Hutton (1726-1797) and expounded by Sir Charles Lyell (179 7-1875), produced evidence to show that much, at any rate, of the structure of the surface of the globe was produced by the action of causes and processes still going on under our eyes. The deposition of material by the action of seas and rivers and other natural agencies, e.g. volcanoes, &c, was seen to need only time enough to produce beds of rock like those which make up our mountains. Com- parison of the fossil remains of plants and animals found in different kinds of rock then enabled geologists to classify the rocks, and place them in a chronological sequence. Moreover, it became evident that a series of animal and plant types was associated with the gradual formation of the rocks, and that the age both of the earth itself and of the organic life found on it was much greater than had been suspected. The few thousand years of received cosmogonies stretched out into untold millions, during which the same familiar laws described the phenomena of development. The remains and traces of man, found, it is true, only in the later sedimentary deposits of the earth, still were enough to prove his existence through ages beside which the dawn of history was but as yesterday. As Newton had extended known principles throughout the gigantic spaces of the heavens, so the later geologists pushed them back over enormous epochs of time. The extent of the kingdom of ordered knowledge expanded both in space and time to a degree truly marvellous.

The discovery by Sir George G. Stokes (1810-1903), R. W. Bunsen (1811-1898) and G. R. Kirchhoff (1824-1887), that the spectroscope gave a means of investigating the Tbe chemical composition of the sun and the stars, brought S f C ope. ' another set of phenomena under the control of ter- restrial experiment. Moreover, the differences in stellar spectra once more suggested the idea of cosmical development, familiar from the nebular hypothesis of Laplace.

Besides the direct extension of the dominion of science pro- duced by geology and spectroscopy the new results emphasized the idea of development, and prepared the way for narwta the biological work of Charles Darwin (1809-1882). The origin of living beings from a few ancestral types was an old conception, but Darwin first found an adequate intelligible cause in the slow action of sexual selection, joined to the pressure

Variation.

of the struggle for life, which allowed only those individuals most suited by favourable variation to the environment to survive and rear their offspring. The advantage thus given to beings with useful variations may develop into permanent modifications in the course of ages, and, when the parent types have disappeared, their common posterity may exhibit the marked differences characteristic of the separate and distinct species now existent. From the point of view of scientific thought, the significance of Darwin's theory lies in the new and vast extension it gives to the field in which causes intelligible to the human mind can be sought as explanations of phenomena. Thus evolution is co-ordinated in the history of thought with the Newtonian theory of gravitation, and with the uniformitarian theory of geology.

Both before and after the appearance of Darwin's work, biologists devoted their attention to the study of how the useful variations arise. Three views have been held. (1) Jean Baptiste, chevalier de Lamarck (1744-1829), regarded variation as due to the accumulated and inherited effect of use. Thus the giraffe acquires his long neck by the successive efforts of countless generations to browse on leaves just beyond their reach. (2) Darwin, while accepting changes in accordance with Lamarck's ideas as exceptional aids to variation, revolutionized biology by showing the primary importance of the struggle for life, when extended over long periods of time, in selecting useful variations which arise acci- dentally or in other ways. (3) Darwin also recognized the possible occasional effect of discontinuous variations or "sports," when a plant or an animal diverges from its parents in a marked manner. But of late years the study by Hugo de Vries, William Bateson and others, of discontinuous variations which arise spontaneously has pointed to the conclusion that in nature such sudden leaps are the normal cause

of development. If a " sport " has advantages over the parental type, it tends to survive, while, if it is not as fitted for its life struggle, it is destroyed by natural selection and never establishes itself. Such a theory avoids the difficulty of pure " Darwinism, " that organs useful, when fully developed, to an animal or plant are of no advantage in incipient stages. Statistical methods, too, suggest that a definite limit may exist to the amount of a given variation which proceeds by small steps, each insignificant in itself.

Closely connected with such problems is the question of inheritance. Lamarck's theory required the inheritance of characteristics acquired during the life of a parent. aoce. ' -But difficulties, such as that of seeing how such a change could affect the simple germ cells, has led some more recent biologists to pass to the other extreme, and to deny the possibility of any acquired characteristic being transmitted to offspring.

A new light has been thrown on the problem of inheritance by the recent re-discovery of the work of G. J. Mendel, abbot of Brunn (1822-1884). Certain characters in both plants and animals have been found to be separable, and some of these characters exist in pairs, so that the presence of one involves the absence of the other. To take a simple example. Blue Andalusian fowls do not breed " true. " " On the average, half the offspring of two blue parents are blue, while the remaining half are divided equally between black and white birds. Both black and white when mated with a consort of the same colour breed " true " and yield only offspring similar to the parents. A white bird mated with a black, however, produces invariably all blue chicks. White mated with blue gives half blue and half white, while black mated with blue gives half blue and half black. Such phenomena are explained if we suppose that of the germ cells of the blue birds half bear the black character and half the white. If, in reproduction, a " black " cell meets a " black " the resulting chick is black; if " white " meets "white " the chick is white; while if " white " meets " black " the chick possesses a mixture of the two char- acters which in this case yield blue colour. But the reproductive cells of this intermediate form are not intermediate in character;

MendeL

they possess the pure parental characters in equal numbers. Knowing these facts, it is evident that we can reproduce any of the results at will, and from the mixed blue type produce a pure true breed of either black or white birds. Experiments of this kind must lead to a

power of breeding new varieties of plants and animals hitherto undreamed of, and already have changed altogether our views of the problems of heredity. Instead of a vague mixture of all our ancestors, we possess definite characteristics of some of them only, though, like the blue Andalusian fowl, we may transmit to our children ancestral characters we do not ourselves exhibit. The family or race is more important in heredity than the individual parent. Thus the aristocratic theory of politics receives support from the experience of biology.

Simultaneously with the growth of geology, and the birth of the Darwinian hypothesis, a new development took place in physical science — the development of the conception of energy as a quantity invariable in amount through- theory 0/ out a series of physical changes. The genesis of the energy. idea in its modern form may be traced in the work of Newton and C. Huygens (1629-1695), who applied it to the problems of pure dynamics. But, in the middle of the 19th century, by the work of James Prescott Joule (1 818-1889), Lord Kelvin (1824-1907),!!. L. F. von Helmholtz (1821-1894), J. Willard Gibbs (1839-1903), R. J. E. Clausius (1822-1888) and others, it was extended to physical processes. The amount of heat produced by friction was found to bear a constant proportion to the work expended, and this experimental result led to the conception of an invariable quantity of something, to which the name of energy was given, manifesting itself in various forms such as heat or mechanical work. Energy thus took its place beside mass as a real quantity, conserved through- out a series of physical changes. Of late years, as we shall see below, evidence has appeared to show that mass is not absolutely constant, but may depend on the velocity when the velocity approaches that of light. Since the only essential quality of matter is its mass, this result seems to strike at the root of the metaphysical conception of matter as a real, invariable quantity. It remains to be seen whether the conception of energy as an invariable quantity will hold its place or give way to some similar modification as science develops. But, in the present state of knowledge, we may accept the principle of the conˆ servation of energy as one of the most firmly established of physical laws.

The amount of energy in an isolated system remains invariable, but, if changes are going on in the system, the energy tends continually to become less and less available for the performance of useful work. All heat engines require a difference of tempera- ture — a boiler and refrigerator, or their equivalents. We cannot continue to transform heat into mechanical work if all available objects are at a uniform temperature. But, if temperature differences exist, they tend to

equalize themselves by irreversible processes of thermal conduction, and it becomes increasingly difficult to get useful work out of the supplies of heat. In an isolated system, then, equilibrium will be reached when this process of " dissipation of energy " is complete, and, from this single principle, the whole theory of the equilibrium of physical and chemical systems was worked out by Willard Gibbs. Such a method avoids altogether the use of atomic and molecular conceptions. In fact, some supporters of the theory of " ener- getics " expressly disclaim the conceptions of natural atoms and molecules as unnecessary and misleading, and prefer to found all science on the idea of energy. Matter, they argue, is known to us only as a vehicle for energy, and may itself be but a manifestation of that energy.

But the other great line of advance in recent physics, although it may lead us in the end to somewhat similar conclusions, has been traced by a method which used atomic and The molecular conceptions in an extreme form. The theory ot passage of electricity through liquids had been ex- electric plained by Michael Faraday (1791-1867) and others as a transference of a succession of electric charges carried by

moving particles of matter or ions. At the end of the 19th century these ideas were extended, chiefly by the labours of J. J. Thomson, to elucidate also the conduction of electricity through gases. In 1897 Thomson discovered that, in certain cases, the moving particles which carried the electric current were of much smaller mass than the smallest chemical atom, that of hydrogen, and that these minute particles, to which he gave the name of corpuscles, were identical from whatever substance they were obtained. They enter into the structure of all matter, and form a common constituent of all chemical atoms. The only known properties of these corpuscles are their mass and their electric charge. Now, a charged body when set in motion spreads electromagnetic energy into the surrounding medium. Thus, more force is needed to produce a given acceleration than if the body were uncharged. The body acts as though its mass were greater than when it is uncharged. Now there is reason to believe that the whole apparent mass of the minute corpuscles to which we have referred is an effect of their electric charge. The idea of a material particle thus disappears with that of material mass, and the corpuscle becomes an isolated, unit of electricity — an electron. It is impossible to resist making the speculation that the whole of an atom is made up of electrons, and that mass is to be

explained in terms of electricity, though it must be pointed out that there is no conclusive evidence in favour of this hypothesis.

Another train of reasoning, starting from a different point, reinforces this result. The phenomena of the interference of beams of light in certain circumstances, to produce darkness or colour, indicate that light is some form of wave motion, and, to carry these waves, a hypothetical luminiferous aether was invented. The theoretical work of J. Clerk Maxwell (1831-1879) and the experiments of H. R. Hertz (1857-1894) showed that the properties and velocity of propagation of light and of electro- magnetic waves were identical and that their other properties differed only in degree. Thus light became an electromagnetic phenomenon. But light is started by some form of atomic vibra- tion, and to start an electromagnetic wave requires a moving electric charge. Thus electric charges must exist within the atom, and we are led again to the theory of electrons by the road opened up by H. A. Lorentz and Joseph Larmor. Such a theory suggests the occasional instability of the atom, and the phenomena of radioactivity, shown in a remarkable form by the substance radium, discovered by M. and Mme. Curie, have been explained satisfactorily by the theory of E. Rutherford and F. Soddy, who regard the energy liberated as due to the disintegration of the atom. The evolutionary view of nature, established in the biological and sociological sciences, is thus extended to physical science, not only in the development of planets and suns, but even in the chemical atoms, hitherto believed indestructible and eternal.

As we have seen, Francis Bacon described a new method of discovery in which exclusive attention was paid to the collection

and tabulation of facts, with a view to the detection of '' . relations between them, and the consequent reference of science, of " effects " to their proper " causes." Impressed by*

the barrenness of the a priori methods of the Schoolmen, Bacon in his philosophy went to the other extreme. The use of the Baconian method in its purity would be too laborious for success. Some guide is necessary in the collection of facts at an early stage of our investigations. Here the scientific imagination is brought into play, and some hypothesis is framed to explain the phenomena under investigation. The hypothesis may be suggested by the theories which are accepted at the time in cognate branches of knowledge, or it may be suggested by the few isolated facts already known or just discovered in the pheno- mena to be considered. From this new hypothesis, consequences are deduced by processes of logical

reasoning — consequences which may be put to the test by comparison with the results of observation or experiment. If agreement is found, the hypo- thesis is, so far, confirmed, and gains in authority with every fresh concordance discovered. If the deductions from the hypo- thesis do not agree with the accepted interpretation of facts, the

hypothesis may need modification, it may have to be abandoned altogether, or the want of concordance may point to some error or inconsistency in the fundamental concepts on which the hypothesis is based — the whole framework of that branch of science may need revision, as the idea of heat as a caloric sub- stance had to be abandoned under the pressure of the experiments of Joule on the equivalence between work done and heat developed. But the ultimate test of the validity of our know- ledge can only be the consistency with each other of the parts of the whole scheme. If the received interpretation of one set of phenomena is not consistent with that of another, one or other or both of the interpretations must be wrong if we make the assumption necessary for aU knowledge, namely, that the universe is intelligible to a mind capable of dealing with its complexity.

In early times, when the knowledge of nature was small, little attempt was made to divide science into parts, and men of science did not specialize. Aristotle was a master of all science ihe known in his day, and wrote indifferently treatises classifies- on physics or animals. As increasing knowledge made tlon ot tbe it impossible for any one man to grasp all scientific sc,ences ‘ subjects, lines of division were drawn for convenience of study and of teaching. Besides the broad distinction into physical and biological science, minute subdivisions arose, and, at a certain stage of development, much attention was given to methods of classification, and much emphasis laid on the results, which were thought to have a significance beyond that of the mere convenience of mankind.

But we have reached the stage when the different streams of knowledge, followed by the different sciences, are coalescing, and the artificial barriers raised by calling those sciences by different names are breaking down. Geology uses the methods and data of physics, chemistry and biology; no one can say whether the science of radioactivity is to be classed as chemistry or physics, or whether sociology is properly grouped with biology or economics. Indeed, it is often just where this coalescence of two subjects occurs, when some connecting channel between them is opened suddenly, that the most striking advances in knowledge take place. The accumulated

experience of one de- partment of science, and the special methods which have been developed to deal with its problems, become suddenly available in the domain of another department, and many questions insoluble before may find answers in the new light cast upon them. Such considerations show us that science is in reality one, though we may agree to look on it now from one side and now from another as we approach it from the standpoint of physics, physiology or psychology.

*Having traced the development of the most important of the fundamental conceptions of science, and followed the subdivision of natural knowledge into the various sections which rhephtto- for convenience mankind has made, let us now examine sophical the meaning of the knowledge thus acquired, and its * as/s ot relation to other branches of learning. sc ence '*

*By the slow and laborious methods of observation, hypothesis, deduction, and experimental verification, a scheme has been constructed which for the most part is consistent with itself, and bears the test of the comparison of one part with another. As a chart is drawn by the explorer of unknown seas to represent his discoveries in a conventional manner, so the scientific in- vestigator constructs a mental model of the phenomena he observes, and tests its consistency with itself and its concordance with the results of further experiment. The chart does not give a lifelike picture of the coast as does a painting, but it represents one aspect of it conventionally in a manner best adapted for the immediate purpose. So the conceptions of one branch of science — mechanics let us say — represent the phenomena of nature in the conventional aspect best suited for one particular line of inquiry. It does not follow necessarily that " nature " in reality resembles the particular mental chart which mechanical science enables us to construct. It does not even follow that there is any " reality " underlying phenomena and corresponding with any of our con- ceptions. The whole problem which mankind has to fac**

undoubtedly includes an inquiry into the ultimate nature of reality. But that inquiry lies in the province of metaphysics, and is not necessarily involved in the pursuit of natural science. Metaphysics uses the results of natural science, as of all other branches of learning, as evidence bearing en her own deeper and more difficult questions. But it does not follow that natural science must solve

metaphysical problems before being of use to man and enlarging the sphere of his knowledge. We need not ask whether the reality is represented accurately by our conven- tional model, whether indeed there be any reality at all, before using that model to introduce order into what would otherwise be mental confusion, and to enable us to make systematic and progressive use of natural resources. It is true that the possibility of constructing consistent schemes of scientific concepts is an argument in favour of the existence of a definite reality underly- ing phenomena resembling in some respects the pictures of it we draw. But metaphysicians are not agreed that it is a conclusive argument. The difficulty of making a scientific picture of the ultimate nature of reality may be illustrated by an example. Our first conception of a wooden stick involves the ideas of a certain long-shaped form, of smoothness, of hardness, of weight, of a certain brown colour, perhaps of some amount of elasticity. A microscope reveals a structure much more detailed than we imagined, and our mental model of the stick ceases to be smooth. It becomes co-ordinated with those of a number of other bodies which we know to be parts of trees, and study, as regards growth and structure, by the help of botany. From the results of observa- tion and experiment, physics teaches us that the properties of the stick can only be represented satisfactorily by imagining that the substance of it is not infinitely divisible, that it consists of discontinuous particles or molecules. Again, chemistry assures us that the molecules of the stick are made up of still smaller parts or atoms, which separate from each other when, for instance, the stick is burned, and afterwards can arrange themselves into new molecules. When we pursue our inquiries into the nature of these atoms, we find that they can be resolved, partly at any rate, into much smaller particles or corpuscles in con- tinual motion within the atom. These corpuscles themselves have been identified with isolated units of negative electricity or electrons, the vibrations of which within the atom sort out the electromagnetic radiation which falls on them and allow to reach our eyes those waves only which give us the sensation of brown colour. At present pioneers are attempting to explain electrons in terms of centres of elastic strain in a hypothetical aether. But we have travelled far from our original conception of the nature of the stick, and, should the problem last stated be solved, we should only find ourselves faced by the next one, the nature of the aether. But what constitutes reality? Where, in the endless chain of explanations discovered or to be discovered, can we stop and say: " Here is the true picture of what the stick is " ? But this impossibility does not prevent us from getting the full use of each conception in turn when used for its particular purpose. To the schoolboy, the effective and

deterrent con- ception of the stick is that of a hard, elastic, long-shaped solid. The botanist regards it as built up by the action of vegetable cells, which he refers to a particular kind of tree. To the chemist the stick is made up of atoms of carbon, hydrogen and oxygen, each with definite properties and arranged in certain combina- tions. The physicist sees these atoms composed of whirling electrons, each an ultimate electric unit not capable of further explanation, or possibly a centre of strain in an all-pervading aether of unknown nature. Each idea is useful in turn, and each corresponds truly with certain properties of the stick, corre- sponds with the stick itself in certain of its aspects.

Such considerations show us the meaning of the subdivisions into which science has been arranged for convenience of study and research. They represent different aspects of nature, different sections, as it were, cut through the solid model which stands for the sum of all our scientific knowledge of the universe.

A nerve-impulse may be regarded from a psychological aspect when we deal with the thought which accompanied it; from a physiological aspect when we examine its relation to other

changes in the body. But modern methods have co-ordinated it also with definite chemical and electrical changes, and are said sometimes to have " explained " the nerve-impulse in physical terms.

But, as always, an " explanation " proves to be simply a restatement of a phenomenon in terms of other phenomena which previously are familiar to the mind, and therefore appear to be better understood. Nevertheless, from our present point of view, no one of these possible aspects of the phenomenon — of the nerve- impulse — is essentially more fundamental than any other. To the psychologist the nerve-impulse is expressed in terms of thought, to the physicist by physical changes. The fact that a thought is accompanied by movement of matter or electricity does not make the thought less a fundamental conception.

But perhaps the best illustration is to be sought in the relation between the physical concepts of matter and electricity. As we have seen, J. J. Thomson discovered corpuscles which were common constituents of all matter, with masses smaller than those of any known atoms. One of these corpuscles represents a unit of negative electricity. An atom with a corpuscle in excess is an atom negatively electrified, an atom with one corpuscle less than the normal number is an atom positively electrified. In this scheme electricity is

described in terms of matter. But these corpuscles have been identified with the hypothetical electrons of Lorentz and Larmor, who consider matter to be composed of such isolated units of electricity. Such electrons, it has been shown, would possess mass by virtue of their electromagnetic properties. In this theory the idea of mechanical mass is eliminated altogether, and mass, and therefore matter, explained in terms of electricity. The view has been held by some that a mechanical explanation of a phenomenon is fundamental, and that a phenomenon so explained in terms of mechanical conceptions is fully understood. This idea may be traced to the familiarity with mechanical conceptions of our everyday experience. The mind obtains its concept of matter from the resistance which that matter manifests to forces tending to set it in motion when at rest, or to change its state of motion when travelling. This fundamental property of inertia is the measure of mass, and we reach the concept of mass by our muscular sense of the force needed to set mass in motion. Force seems to be a direct sense perception, though mathematically it is better to define force in terms of acceleration and mass — since mass is found normally to keep constant throughout a series of physical changes. The familiarity we feel, then, with the con- ception of matter is based on our familiarity with the conception of force. Our minds form this conception from their experience of a direct sense perception of muscular effort. This seems to be the basis of the whole feeling that mechanical conceptions are more fundamental than any others, and that, for instance, it is more intelligible to explain electricity in terms of mechanics than vice versa. But the fact that we have a special muscular sense is an accident of our bodies. It is possible that the electric fish, or torpedo, has a special electric sense, and that to such a fish- philosopher the perception of electromotive force is more real than that of mechanical force. Such a being might well argue that it is intelligible and satisfactory to explain the mysterious concept of mass, which he only reaches through the other equally mysterious concept of mechanical force, in terms of the familiar concept of electricity, well known to every torpedo from his direct sense perception of electromotive force. This instance may serve to show that it is quite as correct philosophically to explain matter in terms of electricity, as to explain electricity in terms of mass. The object of science is to find connexions between phenomena and thus to correlate them. At present a greater simplification may be reached by reducing all possible phenomena to mechanical conceptions than in any other way, but that only shows that the mechanical aspect of nature gives us a fuller view than any other at present known, not that mechanics is philo- sophically the most fundamental science.

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SCILLITAN MARTYRS, a company of early North African Christians who suffered under Marcus Aurelius in a.d. 180, and whose Acta are at once the earliest documents of the Church of Africa and the earliest specimen of Christian Latin. The martyrs take their name from Scilla (or Scillium), a town in Numidia. Their trial and execution took place in Carthage under the Pro-consul Vigellius Saturninus, whom Tertullian declares to have been the first persecutor of the Christians in Africa. The date of their martyrdom is the 17th of July a.d. 180. It is thus the concluding scene of the persecution under Marcus Aurelius, which is best known from the sufferings of the churches of Vienne and Lyons in South Gaul. Marcus Aurelius died on the 17th of March of the year in question, and persecution ceased almost immediately upon the accession of Commodus. A group of sufferers called the Madaurian martyrs seems to belong to the same period: for in the correspondence of St Augustine, Nam- phamo, one of their number, is spoken of as " archimartyr," which appears to mean protomartyr of Africa. We have in this martyrdom an excellent example of "Acts of Martyrs " properly so called. The document is in brief legal form, beginning with the date and the names of the accused, and giving the actual dialogue between them and their judge. It closes with the sentence, based on " obstinate " persistency in an illicit cult, and with the proclamation by the herald of the names of the offenders and the penalty. All this may quite well be a transcript of the Acta, or official report of the proceedings. A Christian appends the words: " And so they all together were crowned with martyrdom; and they

reign with the Father and the Son and the Holy Ghost, for ever and ever. Amen."

The Scillitan sufferers were twelve in all — seven men and five women. Two of these bear Punic names (Nartzalus, Cintinus), but the rest Latin names. Six had already been tried: of the remainder, to whom these Acta primarily relate, Speratus is the principal spokesman. He claims for himself and his companions that they have lived a quiet and moral life, paying their dues and doing no wrong to their neighbours. But when called upon to swear by the genius of the emperor, he replies: " I recognize not the empire of this world; but rather do I serve that God whom no man hath seen, nor with these eyes can see." Here he uses the language of 1 Tim. vi. 16; and it is interesting also to note that in reply to the question, " What are the things in your satchel ? " he says, " Books and letters of Paul, a just man." The martyrs are offered a delay of thirty days to reconsider their decision, but this they all alike refuse. These Acts have been long known in an expanded form, or rather in a variety of later recensions. The fame of the martyrs led to the building of a basilica in their honour at Carthage; and their annual com- memoration required that the brevity and obscurity of their Acts should be supplemented and explained, to make them suitable for public recitation.

The historical questions connected with these martyrs are treated by Lightfoot, Ignatius (1889, 2nd ed.), i. 524 ff. The Latin text, together with later recensions and a Greek version, is published in Texts and Studies, i. 2 (Passion of Perpetua, 1890) ; see also Analecta Bollandiana (1889), viii. 5; H. M. Gwatkin, Selections from Early Christian Writers, where, as in Ante-Nicene Fathers, ix. 285, there is an English translation. (J. A. R.)

SCILLY ISLES, a group of small islands, belonging to Cornwall, England, 25 m. W. by S. of Land's End. (For map, see England, Section VI.) They form an outlying portion of the granite high- lands of Cornwall; and contain a few metallifeious veins or lodes, which could never have yielded much ore. An old theory that the Stilly Isles could be identified with the " Cassiterides " or " Tin Islands " of Herodotus is abandoned, and the origin of

their name has never been authoritatively settled. The islands are wild and picturesque, with sheer cliffs and many large caves hollowed out by the Atlantic. Owing to the reefs and shoals by which these shores are surrounded, navigation becomes perilous in rough weather, and many disasters have occurred. In 1707 Sir Cloudesley

Shovel perished in the shipwreck of his flagship and two other men-of-war, while two fireships of his squadron were driven aground, and the remainder only narrowly escaped. The graveyard of an old Puritan church on St Mary's contains the bodies of 311 persons, drowned in the wreck of the " Schiller " in 1875; and a local proverb tells that for every man who dies a natural death on the islands the sea takes nine. Much, how- ever, has been done to minimise the danger, especially by lighting the coast. On St Agnes there is a lighthouse, and on an outlying rock to the south-west is the lonely Bishop Light, constructed with infinite difficulty in 1858, and rebuilt thirty years later.

The islands are composed wholly of granite — outliers of the granite highlands of Cornwall. Most of the granite is coarse and porphyritic, but towards the centre of the original igneous mass it is finer and non-porphyritic. The finer granite occurs on the north-west side of St Mary's, the southern part of Tresco, Bryher and Samson and the north-west side of Annet. Elvans of quartz-porphyry are found in the granite. On the north-east end of White Island a fragment of the altered killas, which once covered the whole area, is still visible. A gravel deposit with chalk flints and Greensand cherts which caps some of the higher ground on St Mary's may possibly be of Eocene age. Raised beach, blown sand, fragmental granitic waste or " head" and an iron-cemented glacial deposit are found resting upon the granite.

The climate of the islands is unusually mild, snow being rarely seen, and the temperature varying from about 46 F. in winter to 58° in summer. As a result, vegetation is luxuriant; fuchsias, geraniums and myrtles attain an immense size, and aloes, cactus and prickly pear flourish in the open. All these, together with palms, may be seen in the gardens of the governor on Tresco Island, which are quite subtropical in character, and, therefore, unique in the British Isles. Great flocks of sea-birds haunt the remoter parts, and on some of the islands there are deer. On Tean there is a war: en of white rabbits; and some of the rarer land-birds occasionally visit the islands, such as the golden oriole, which has been known to breed here.

The islands are served by steamers from Penzance, and telephone and telegraph communication is established with the mainland. The raising of early asparagus and other spring vegetables, and of flowers, has taken the place of potato culture as the principal industry. In spring the fields of narcissus and other flowers add greatly to the beauty of the islands. There is also a small coasting trade; and fishing is carried on to some extent, its most important

branch being the taking of lobsters for the London market.

The islands which may be distinguished from mere rocks number about 40, and the group has a total area of 4041 acres; but only five islands are inhabited — St Mary's, Tresco, St Martin's, St Agnes and Bryher. The total population in 1901 was 2092. Hugh Town in St Mary's is the capital, occupying a sandy peninsula crowned by the height known as the Garrison, with Star Castle, dating from the days of Elizabeth. The town possesses a harbour, which is used by the Penzance steamers, and a roadstead where large vessels can lie at anchor. The government of the islands is vested in a county council created in 1890, consisting of a' chairman, vice-chairman, 4 aldermen, and 18 councillors. For parliamentary purposes the isles are included in the St Ives division of Cornwall.

On Tresco there are the ruins of an abbey, and of two fortifica- tions called Oliver Cromwell's Tower and King Charles's Tower; and here also is a church built in 1882 and dedicated to St Nicholas. Numerous rude pillars and circles of stones, resemb- ling those of Cornwall, are to be noticed; and barrows are common, the most remarkable of these prehistoric remains being a barrow on the Isle of Samson, 58 ft. in girth, and containing.

amongst other relics, the only perfect " kistvaen," or sepulchral chamber of stone, which has been disinterred from any Cornish tomb.

Although the Scilly Isles have been regarded as the remains of Lyonesse, as identical with the Cassiterides, and as the object of an expedition and of conquest on the part of Athelstan in pursuance of a vow made at the shrine of St Burian, it is not until the reign of Henry I. that we have indisputable evidence concerning them. The king gave all the churches of Scilly and the land, as the hermits held it in the days of the Confessor, to the abbot and church of Tavistock. A confirmation of this grant and a further grant to the monks of all wrecks except whole ships and whales was made by Reginald, earl of Cornwall. In 1 180 the bishop of Exeter confirmed a grant by Richard de Wicha of tithes, hitherto withheld, and of rabbits. Secular priests were temporally substituted for regulars by the abbot of Tavistock in 1345. Sharing the dignity of lords of Scilly with the abbot, holding apparently the better half of St Mary's Island, which

was already furnished with a castle and a prison, and like the abbot practically beyond the jurisdiction of the hundred courts, the family of Blanchminster (de Albo Monas- terio), at the beginning of the 14th century, held of the earldom of Cornwall lands in Scilly at a yearly service of 6s. 8d. or 600 puffins. The Year Books tell us that in cases of felony the punishment under this family was for the convicted person to be taken to a certain rock in the sea with two barley loaves and one pitcher of water and to be left on the rock until drowned by the tide. The Blanchminsters resisted and imprisoned the coroner of Cornwall and in 13 19 were granted a coroner of their own. In 1345 they are found petitioning the king for a remedy owing to an invasion by 600 of the king's Welsh troops, who, being becalmed at Scilly, had carried away everything, and so impoverished the tenants that they were unable to pay their yearly rent of £40. In 1547 Silvester Danvers, as representing the Blanchminsters, being one of the coheirs, sold his moiety of Scilly to Sir Thomas Seymour, by whose attainder in 1549 this and probably the other moiety fell to the crown. The suppression of the religious houses had already placed the church's land and revenues at the king's disposal. During the Civil Wars, Hugh Town stood for the king, and in 1645 afforded a temporary shelter to Prince Charles, until his escape to Jersey. In 1649 the islands were occupied by a royalist, Sir Richard Grenville, and formed the base from which he swept the surrounding seas for two years, before a fleet under Admiral Blake and Sir John Ayscue forced him to surrender. In ancient times a haunt of pirates, the islands were afterwards notorious for smuggling. In 1687 the whole of Scilly was granted to Sidney Godolphin for eighty-nine years from the expiration of the lease for fifty years granted to Francis Godolphin in 1636 by Charles I. In 183 1 Augustus Smith succeeded the Godolphins as lessee or lord-proprietor, and under his and his nephew's wise autocracy the islands prospered.

SCIMITAR, the term generally used of all oriental single- edged curved or crescent-shaped swords (see Sword). The word has appeared in a variety of forms in English, due to Fr. cimetare, It. scimitarra or Span, cimitarra; it has even been corrupted into " smyter," as if connected with " smite." Most probably it represents an early Western corruption of the Persian word for a sabre, shamshir or shimshir, which means literally " lion's claw " (sher, lion, in Hindustani " tiger," and sham, nail, claw).

SCIOLIST, one who, with only a superficial knowledge or a smattering of knowledge on any particular subject, claims or pretends to a complete or profound learning. The Lat. sciolus, a

diminutive of scius, learned, from scire, to know, is only found in post-classical times, e.g. Hieronymus, a.d. 420, Epist. 48. 18. It first appears in English at the beginning of the 17th century.

SCIOMANCY (Gr. auk, shade, shadow, and fiavreia, sooth- saying, divination), a form of divination by means of supposed communication with the shades or spirits of the dead. The calling up of the spirit of Samuel by the Witch at Endor when consulted by Saul is the classical example (1 Sam. xxviii.).

SCION, a slip or cutting of a tree or plant used for grafting, hence a young shoot or twig. In a transferred sense the word is used of the heir or any young member of a family, a descendant. The word in O. Fr. was cion or syon, mod. scion, and the early forms in English are syon, cion or cyon. These forms seem to disprove the usual etymology, which connects it with Fr. scier, to cut, Lat. secare.

SCIPIO 1 ("staff"), the name of a patrician branch of the Cornelian gens, of which the following are the principal historical representatives : —

1. Publius Cornelius Scipio, father of the elder Africanus. He was consul in 218 B.C., the first year of the Second Punic War, and sailed with an army from Pisa to Massilia, with the view of arresting Hannibal's advance on Italy. Failing, however, to meet his enemy, he hastened to return by sea to Cisalpine Gaul, having sent back his army to Spain under the command of his brother Gnaeus, with instructions to hold the Carthaginian forces there in check. On his return to Italy he at once ad- vanced to meet Hannibal. In a sharp cavalry engagement in the upper valley of the Po, on the Ticinus, he was defeated and severely wounded. Again, in December of the same year, he witnessed the complete defeat of the Roman army on the Trebia, his colleague T. Sempronius Longus having insisted on fighting contrary to his advice. But he still retained the confidence of the Roman people; his term of command was extended, and we find him with his brother in Spain in the following year, winning victories over the Carthaginians and strengthening Rome's hold on that country, till 212 (or 211). The details of these campaigns are not accurately known, but it would seem that the ultimate defeat and death of the Scipios were due to the desertion of the Celtiberi,bribed byHasdrubal,Hannibal's brother.

See Polybius iii. ,'40; Livy xxi.-xxv.; Appian, Hannib. 5-8, Hisp. 14-16.

2. Publius Cornelius Scipio Africanus, the elder (237 s – 183 b.c), son of the above. He was present at the disastrous battles of the Ticinus (where, according to one tradition, he saved his father's life), the Trebia and Cannae. Even after the last of these he resolutely protested against several Roman nobles who advocated giving up the struggle and quitting Italy in despair (see Metellus, 2). The year after his father's death, he offered himself for the command of the new army which the Romans resolved to send to Spain. In spite of his youth, his noble demeanour and enthusiastic language had made so great an impression that he was unanimously elected. All Spain south of the Ebro in the year of his arrival (210 or 209) was under Carthaginian control, but fortunately for him the three Carthaginian generals, Hasdrubal and Mago (Hannibal's brothers), and Hasdrubal the son of Gisgo, were not disposed to act in concert and were preoccupied with revolts in Africa. Scipio, on landing at the mouth of the Ebro, was thus enabled to surprise and capture New Carthage, the headquarters of the Carthaginian power in Spain. He thus obtained a rich booty of war stores and supplies, and an excellent harbour. His kindly treatment of the Spanish hostages and prisoners brought many over to his side. In 209 he drove back Hasdrubal, from his position at Baecula, on the upper Guadalquivir, but was unable to hinder his march to Italy. After winning over a number of Spanish chiefs he achieved in 206 a decisive victory over the full Carthaginian levy at Ilipa (near Corduba), which resulted in the evacuation of Spain by the Punic commanders. With the idea of striking a blow at Carthage in Africa, he paid a short visit to the Numidian princes, Syphax and Massinissa, but at the court of Syphax he was foiled by the presence of Hasdrubal, the son of Gisgo, whose daughter Sophonisba was married to the Numidian chief. On his return to Spain Scipio had to quell a mutiny which had broken out among his troops. Hannibal's brother Mago had meanwhile sailed for Italy, and in 206 Scipio himself, having secured the Roman occupation of Spain by the capture of Gades, gave up his command and returned to Rome. In the following year he was unanimously

V 1 The first i is long — Scipio.

2 So Polybius : 235 according to Livy.

elected to the consulship, the province of Sicily being assigned to him. By this time Hannibal's movements were restricted to the south-

western extremity of Italy, and the war was now to be transferred to Africa. Scipio was himself intent on this, and his great name drew to him a number of volunteers from all parts of Italy, but the old-fashioned aristocracy of Rome, who disliked his luxurious tastes and his Greek culture, and still entertained a wholesome dread of Hannibal, opposed the idea; all Scipio could obtain was permission to cross over from Sicily to Africa, if it appeared to be in the interests of Rome. The introduction (205) of the Phrygian worship of Cybele and the transference of the image of the goddess herself from Pessinus to Rome (see Great Mother of the Gods) to bless the expedition no doubt had its effect on public opinion. A commission of inquiry was sent over to Sicily, and it found that Scipio was at the head of a well-equipped fleet and army. At the com- missioners' bidding he sailed in 204 and landed near Utica. Carthage meanwhile had secured the friendship of the Numidian Syphax, whose advance compelled Scipio to raise the siege of Utica and to entrench himself on the shore between that place and Carthage. Next year he destroyed two combined armies of the Carthaginians and Numidians. After the failure of peace negotiations in which Scipio displayed great moderation, he defeated Hannibal in a decisive battle near Zama (Oct. 19, 202; see Punic Wars). In the subsequent settlement with Carthage he upheld with success his comparatively lenient terms against the immoderate demands of many Roman aristo- crats. Scipio was welcomed back to Rome with the surname of Africanus, and had the good sense to refuse the many honours which the people would have thrust upon him. For some years he lived quietly and took no part in politics. In 193 he was one of the commissioners sent to Africa to settle a dispute between Massinissa and the Carthaginians. In 190, when the Romans declared war against Antiochus III. of Syria, Publius was at- tached as legate to his brother Lucius, to whom the chief com- mand had been entrusted. The two brothers brought the war to a conclusion by a decisive victory at Magnesia in the same year. Meanwhile Scipio's political enemies had gained ground, and on their return to Rome a prosecution was started (187) by two tribunes against Lucius on the ground of misappropriation of moneys received from Antiochus. As Lucius was in the act of producing his account-books his brother wrested them from his hands, tore them in pieces, and flung them on the floor of the senate-house. This created a bad impression; Lucius was brought to trial, condemned and heavily fined. Africanus himself was subsequently (185) accused of having been bribed by Antiochus, but by reminding the people that it was the anniversary of his victory at Zama he caused an outburst of enthusiasm in his favour. The people crowded round him and followed him to the Capitol to offer

thanks to the gods and beg them to give Rome more citizens like himself. He then retired to his native country seat at Liternum on the coast of Campania, where he died. By his wife Aemilia, daughter of the Aemilius Paullus who fell at Cannae, he had a daughter Cornelia, who became the mother of the two famous Gracchi.

Scipio was one of Rome's greatest generals. Skilful alike in strategy and in tactics, he had also the 'faculty of inspiring his soldiers with confidence. According to the story, Hannibal, who regarded Alexander as the first and Pyrrhus as the second among military commanders, confessed that had he beaten Scipio he should have put himself before either of them. He was a man of great intellectual culture and could speak and write Greek perfectly. He wrote his own memoirs in Greek. He also enjoyed the reputation of being a graceful orator. There was a belief that he was a special favourite of heaven and held actual communication with the gods. It is quite possible that he himself honestly shared this belief; to his political op- ponents he was often harsh and arrogant, but towards others singularly gracious and sympathetic. According to Gellius, his life was written by Oppius and Hyginus, and also, it was said, by Plutarch.

See Livy xxi.-xxxviii. and Polybius; Aulus Gellius iv. 18;

Val. Max. iii. 7; biography by F. D. Gerlach (1868); E. Berwick (1817), with notes and illustrations; also Punic Wars.

3. Publius Cornelius Scipio Aemilianus Africanus, the younger (185-129 B.C.), was the younger son of L. Aemilius Paullus, the conqueror of Macedonia. He fought when a youth of seventeen by his father's side at the battle of Pydna (168), which decided the fate of Macedonia and made northern Greece subject to Rome. He was adopted by P. Cornelius Scipio Africanus, the eldest son of Scipio Africanus the elder, and from him took the name Scipio with the surname Africanus. In 151, a time of defeat and disaster for the Romans in Spain, he volun- tarily offered his services in that country and obtained an influence over the native tribes similar to that which the elder Scipio, his grandfather by adoption, had acquired nearly sixty years before. In the next year an appeal was made to him by the Carthaginians to act as'arbiter between them and the Numidian prince Massinissa, who, backed up by a party at Rome, was incessantly encroaching on Carthaginian territory. In 149 war was declared by Rome, and a force sent to besiege Carthage. In the early operations of the war, which went altogether against the Romans, Scipio, though a subordinate officer, distinguished himself repeatedly, and in 147 he was elected consul, while yet under the

legal age, in order that he might hold the supreme command. After a year of desperate fighting and splendid heroism on the part of the defenders he carried the fortress, and at the senate's bidding levelled it to the ground. On his return to Rome he celebrated a splendid triumph, having also established a personal claim to his adoptive surname of Africanus. In 142, during his censorship, he endeavoured to check the growing luxury and immorality of the period. In 139 he was unsuccess- fully accused of high treason by Tiberius Claudius Asellus, whom he had degraded when censor. The speeches delivered by him on that occasion (now lost) were considered brilliant. In 134 he was again consul, with the province of Spain, where a demoralized Roman army was vainly attempting the conquest of Numantia ->n the Durius (Douro). After devoting several months to restoring the discipline of his troops, he reduced the city by blockade. The fall of Numantia in 133 established the Roman dominion in the province of Hither Spain. For his services Scipio received the additional surname of Numamtinus.

Scipio himself, though not in sympathy with the extreme conservative party, was decidedly opposed to the schemes of the Gracchi (whose sister Sempronia was his wife). When he heard of the death of Tiberius Gracchus, he is said to have quoted the line from the Odyssey (i. 47), " So perish all who do the like again " ; after his return to Rome he was publicly asked by the tribune C. Papirius Carbo what he thought of the fate of Gracchus, and replied that he was justly slain. This gave dire offence to the popular party, which was now led by his bitterest foes. Soon afterwards, in 1 29, on the morning of the day on which he had intended to make a speech in reference to the agrarian proposals of the Gracchi, he was found dead in bed. The mystery of his death was never cleared up, and there were political reasons for letting the matter drop, but there is little doubt that he was 'assassinated by one of the supporters of the Gracchi, probably Carbo, whose guilt is expressly stated by Cicero (see Gracchus).

The younger Scipio, great general and great man as he was, is for ever associated with the destruction of Carthage. The horror he expressed at its fate was a tardy repentance. Yet he was a man of culture and refinement; he gathered round him such men as the Greek historian Polybius, the philosopher Panaetius, and the poets Lucilius and Terence. At the same time he had all the virtues of an old-fashioned Roman, according to Polybius and Cicero, the latter of whom gives an appreciation of him in his De republica, in which Scipio is the chief speaker. As a speaker he seems to have been no less distinguished than as a soldier. He spoke remarkably good and

pure Latin, and he particularly enjoyed serious and intellectual conversation. After the capture of Carthage he gave back to the Greek cities of Sicily the works of art of which Carthage had robbed them. He did not avail himself of the many opportunities he must

have had of amassing a fortune. Though politically opposed to the Gracchi, he cannot be said to have been a foe to the interests of the people. He was, in fact, a moderate man, in favour of conciliation, and he was felt by the best men to be a safe political adviser, while he unfortunately contrived to offend both parties.

See Polybius xxxv. 4, xxxix. ; Veil. Pat. i. 12; Florus ii. 15, 17, 18; Appian, Punica, 72, 98, 1 13- 131, Hisp. 48-95, Bell. Civ. i. 19; Plutarch, Aemilius Paullus, 22, Tib. Gracchus, 21, C.Gracchus, 10; Gellius iv. 20, v. 19; Cicero, De orat. ii. 40; exhaustive life by E. Person (Paris, 1877) ; monograph by Lincke (Dresden,

1898).

4. Publius Cornelius Sctpio Nasica Serapio, consul 138 B.C., took a prominent part in the murder of Tiberius Gracchus. To save him from the vengeance of the people, he was sent by the senate on a pretended mission to Asia, where he died. The nickname Serapio was given him by the tribune C. Curiatius from his likeness to one Serapio, a dealer in sacrificial victims.

See Appian, Punica, 80 B.C., i. 16; Val. Max. ix. 14; Plutarch, Tib. Gracchus, 21.

SCIRE FACIAS, in English law, a judicial writ founded upon some record directing the sheriff to make it known {scire facias) to the party against whom it is brought, and requiring the latter to show cause why the party bringing the writ should not have the advantage of such record, or why (in the case of letters patent and grants) the record should not be annulled and vacated. Proceedings in scire facias are regarded as an action, and the defendant may plead his defense as in an action. The writ is now of little practical importance; its principal uses are to compel the appearance of corporations aggregate in revenue suits, and to enforce judgments against shareholders in such companies as are regulated by the Companies Clauses Act 1845, or similar private acts, and against garnishees in proceedings in foreign attachment in the lord mayor's court. Proceedings by scire facias to repeal letters patent for inventions were abolished by the Patents, Designs and Trademarks Act 1883, and a petition to the court substituted. It is not used in Scottish procedure.

SCISSORS, a cutting instrument, consisting of two crossed blades with the inner edges sharpened, pivoted at the crossing, and terminating with two looped handles for the insertion of the fingers of the person using them. The term is usually con- fined to small cutting implements, the larger being known as " shears " (q.v.). The modern form of the word points to a derivation from Lat. scindere, to cleave or cut, and is no doubt due to Lat. scissor, a cutter, which was used only of a carver, a butcher and a class of gladiators, never of a cutting instrument; but the earlier forms, cysowres, sisoures, cisors, cissers, sizars, &c, show, the origin to be found in O. Fr. cisoires, shears, mod. ciseaux, plural of ciseau, earlier cisel, a chisel, and therefore to be referred to Lat. caedere, to cut, cisorium, a cutting instrument.

SCLOPIS DI SALERANO, FEDERIGO (1 798-1878), Italian statesman and jurist. While still comparatively young he was

appointed attorney-general to the Sardinian senate, and took part in the compilation of the new codes. An advocate of liberal ideas and reform, he proclaimed the necessity for a constitution, and was himself one of the authors of the Statute, or Sardinian charter of 1848, which is to this day the constitution of the Italian kingdom; the introduction is entirely his work. Sdopis also wrote the proclamation in which Charles Albert announced to the people of Lombardy and Venetia his war against Austria. He was minister in the first Sardinian constitutional ministry under the presidency of Count Balbo, and afterwards president of the senate. In 1871 he was sent to Geneva as Victor Emmanuel's representative on the " Alabama " arbitration, and was chosen president of that tribunal; on his return to Italy the king con- ferred on him the Order of the Annunziata. The last years of his life were mainly occupied with municipal affairs and charitable administration at Turin. Between 1819 and 1878 he published over seventy works on history, jurisprudence, politics and literature, in Italian, Latin and French. At the age of thirty he was elected member of the Turin Academy of Sciences, of which he became life president in 1864; he was also foreign member

of the Institut de France. His most important work is his Storia della legislaziona Italiana dalle origini fino al 1847 (Turin, 1840), issued as a sequel to his Storia dell' antica legislazione del Pie- monte, published in 1833.

Among his other writings we may mention the following : Ricerche sui Longobardi in Italia (1827), Delle relazioni politiche fra la dinastia (Li Savoia e il governo Britahnico dal 1240 al 1815 (1853), Rimembranze sul Conte di Cavour (1876), and Consider azioni storiche suite antiche assemblee rappresentative del Piemonte e della Savoia (1878).

See E. Ricotti, Notizia biografica di F. Sclopis; A. Manno, Bibliografia degli scritti di F. Sclopis; M. Ricci, Necrologia di F. Sclopis (in the Archivio storico Italiano, ser. iv. torn. ii. p. 331 seq.).

SCOLD, one who scolds, i.e. chides, finds fault with or rebukes with violence or persistence or vituperation. It is usually a term applied to women, and a " common scold " (in Low Lat. communis rixatrix) was indictable in England at common law as a public nuisance, special instruments of punishment being devised in the " branks " or " scold's bridle," and the " cucking stool." The word is apparently an adaptation of the Norse skald, skald or scald, a poet, and according to the New English Dictionary the intermediate meaning through

which the sense develops is " libeller " or " lampooner." Skeat derives from Du. schold, schellen, and takes the word as originally meaning a loud talker, cf. Icel. skjalla, to clash, Ger. schallen. The Norse word is also to be connected in this case, the " skald " being one who talks loudly.

SCOLECITE, a mineral belonging to the zeolite group; a hydrated calcium silicate, CaAl 2 Si 3 Oio+3H 2 0. It is a lime-zeolite, and like the soda-zeolite natrolite and the soda-lime- zeolite mesolite, usually occurs as acicular and fibrous aggrega- tions. Although having nearly the same interfacial angles as the orthorhombic natrolite, it crystallizes in the monoclinic system, and, as shown by the etched figures and the pyro- electric character, in the hemihedral class of this system, there being a plane, but no axis, of symmetry. Scolecite can therefore be distinguished from natrolite by an optical examination, since the acicular crystals do not extinguish parallel to their length between crossed nicols. Twinning on the ortho-pinacoid is usually evident. The mineral is colourless or white, transparent, and vitreous in lustre: the hardness is 55, and the specific gravity 2-2. It is a mineral of secondary origin, and occurs with other zeolites in the amygdaloidal cavities of weathered volcanic rocks of basic composition. Fine divergent groups of prismatic crystals are found in the basalt of Berufjord near Djupivogr in Iceland and in the Deccan traps near Poona in India; hence the synonym poonahlite for this species. The name scolecite is derived from Gr. ckui\ti^, a worm, because the crystals sometimes curl up like worms when heated before the blowpipe. (L. J. S.)

SCONCE (Lat. absconsus, Fr. esconce), a word of many meanings, mostly signifying a covering or protection, or, by extension, that which is covered or protected. Its most familiar significance is that of a wall light, consisting of a metal bracket, with two or more socketed branches for candles. The word is .also used for the orifice of a candlestick into which the candle is fixed, and for the rim of metal, glass or china, placed round a candle to intercept grease droppings. Among its obsolete meanings is that of head or skull. At the English universities " to sconce " is still used as the term for imposing a penalty at dinner in the shape of a quart-pot of beer or cider.

SCONE (pron. Skoon; Gaelic, skene, "a cutting"), a parish of Perthshire, Scotland, containing Old Scone, the site of an historic abbey and palace, and New Scone, a modern village (pop. 1585), 2 m. N. of Perth, near the left bank of the Tay. Pop. of parish (1901) 2362. It became the capital of Pictavia, the kingdom of northern Picts, in succession to Forteviot. Parliaments occasionally assembled

on the Moot Hill, where the first national council of which we possess records was held (906). The Moot Hill was known also as the Hill of Belief from the fact that here the Pictish king promulgated the edict regulat- ing the Christian church. The abbey was founded in 1115 by Alexander I., but long before this date Scone had been a centre of ecclesiastical activity and the seat of a monastery. Kenneth

is alleged to have brought the Stone of Destiny, on which the Celtic kings were crowned, from Dunstaffnage Castle on Loch Etive, and to have deposited it in Scone, whence it was con- veyed to Westminster Abbey (where it lies beneath the Corona- tion Chair) by Edward I. in 1296. Most of the Scottish kings were crowned at Scone, the last function being held on the 1st of January 1651, when Charles II. received the crown. Ap- parently there was never any royal residence in the town, owing to the proximity of Perth. Probably the ancient House of Scone, which stood near the abbey, provided the kings with temporary accommodation. Both the abbey and the house were burned down by the Reformers in 1559, and next year the estates were granted to the Ruthvens. On the attainder of the family after the Gowrie conspiracy in 1600, the land passed to Sir David Murray of the Tullibardine line, who became 1st viscount Stormont (1621) and was the ancestor of the earl of Mansfield, to whom the existing house belongs. Sir David completed in 1606 the palace which the earl of Gowrie had begun. The 5th viscount — father of the 1st earl of Mansfield, the lord chief justice of England (b. at Scone 1705) — entertained the Old Pretender for three weeks in 17 16, and his son received Prince Charles Edward in 1746. The present palace, which dates from 1803, stands in a beautiful park. It contains several historic relics, the most interesting being a bed adorned with embroidery worked by Mary Queen of Scots during her im- prisonment in Lochleven Castle. The gallery in which Charles II. was crowned, a hall 160 ft. long, has been included in the palace. Two hundred yards east of the mansion is an ancient gateway, supposed to have led to the old House of Scone, and "near it stands the cross of Scone, removed hither from its original site in the town.

SCONE, the Scots name of a species of cake made of wheat or barley meal and baked on a griddle. The cakes are round and are usually cut into four pieces, thus giving the familiar shape of a wedge with circular edge. The broad lowland bonnet was called a " scone " or " scone-cap " from its shape. The word appears to have been a

shortened form of a Low Ger. Schonbrot, i.e. fine bread, explained in the Bremen Glossary (17 71), quoted in the New English Dictionary, as a sort of white loaf with two acute and two obtuse angles. The Hamburg dialect word schonroggen, fine rye, was adopted into Swedish and Icelandic in the sense of biscuit.

SCOOP (from M. L. Ger. or M. Du. schope, cf. Du. schoep, a bailing vessel, Ger. schopfen, and, from M. Du. schoppe, Ger. Schilppe, shovel), properly a utensil or implement for ladling or bailing out water or liquid from a vessel, and so used of the bucket of a water-wheel or of a dredger; in its most usual sense the word is applied to a small kind of shovel with a short handle and a sharply curved blade, often covered in towards the handle end, and used for the moving and lifting of loose materials or for cutting out a rounded piece from any substance. In journal- istic slang, originally American, a " scoop " is an exclusive piece of information obtained by a newspaper.

SCOPAS, probably of Parian origin, the son of Aristander, a great Greek sculptor of the 4th century B.C. Although classed as an Athenian, and similar in tendency to Praxiteles, he was really a cosmopolitan artist, working largely in Asia and Pelopon- nesus. The extant works with which he is associated are the Mausoleum of Halicarnassus, and the temple of Athena Alea at Tegea. In the case of the Mausoleum, though no doubt the sculpture generally belongs to his school, we are unable to single out any special part of it as his own. But we have good reason to think that the pedimental figures from Tegea, some of which are at Athens, while some are kept in the local museum, are Scopas' own work. The subjects of the pedimental compositions were the hunting of the Calydonian boar and the battle between Achilles and Telephus. Four heads remain, that of Hercules, that of Atalanta and two of warriors: also part of the body of Atalanta and the head of the boar. Unfortunately all these are in very poor preservation; but it is allowed that they are our best evidence for the style of Scopas. The head of a helmeted warrior (see Greek Art, Plate III. fig. 63) is especially valuable to us.

It is very powerful, with massive bony framework; the fore- head is projecting, the eyes deep-set and heavily shaded, the mouth slightly open and full of passion. It shows us that while in general style Scopas approached Praxiteles, he differed from him in preferring strong expression and vigorous action to repose and sentiment. The temple at Tegea was erected after 395 B.C.; and the advanced character of the sculpture seems to indicate a date at least twenty years later than this.

Attempts have been made, through comparison of these heads, to assign to Scopas many sculptures now in museums, heads of Heracles, Hermes, Aphrodite, Meleager and others. It is, however, very risky thus to attribute works executed in Roman times, and often thoroughly eclectic in character. Ancient writers give us a good deal of information as to works of Scopas. He made for the people of Elis a bronze Aphrodite, riding on a goat (copied on the coins of Elis) ; a Maenad at Athens, running with head thrown back, and a torn kid in her hands was ascribed to him; of this Dr Treu has published a probable copy in the Albertinum at Dresden {Melanges Perrot, p. 317). Another type of his was Apollo as leader of the Muses, singing to the lyre. The most elaborate of his works was a great group representing Achilles being conveyed over the sea to the island of Leuce by his mother Thetis, accompanied by Nereids riding on dolphins and sea-horses, Tritons and other beings of the sea, " a group," says Pliny (36. 25), "which would have been remarkable had it been the sole work of his life." He made also an Aphrodite which rivalled the creation of Praxiteles, a group of winged love-gods whom he distinguished by naming them Love, Longing and Desire, and many other works.

Jointly with his contemporaries Praxiteles and Lysippus, Scopas may be considered as having completely changed the character of Greek sculpture. It was they who initiated the lines of development which culminated in the schools of Pergamum, Rhodes and other great cities of later Greece. In most of the modern museums of ancient art their influence may be seen in three-fourths of the works exhibited. At the Re- naissance it was especially their influence which dominated Italian painting and through it modern art. (P. G.)

SCOPE (through Ital. scopo, aim, purpose, intent, from Gr. ckvkos, mark to shoot at, aim, oKorwiiv, to see, whence the termination in telescope, microscope, &c), properly that which is aimed at, purpose, intention; hence outlook, view, range of observation or action; more generally, the sphere or field over which an activity extends, room or opportunity for play or action.

SCORDISCI, in ancient geography, a Celtic tribe inhabiting the southern part of lower Pannonia between the Savus, Dravus and Danuvius. Some Roman authorities consider them a Thracian stock, because of their admixture with an older Thraco- Illyrian population. As early as 175 B.C. they came into collision with the Romans by assisting Perseus, king of Macedonia; and after Macedonia became a Roman province they were for many years engaged in hostilities with them. In 135 they were defeated by M. Cosconius in Thrace (Livy,

epit. 56); in 118, according to a memorial stone discovered near Thessalonica (W. Dittenberger, Sylloge inscriptionum Graecarum, i. No. 247, 1883 edition), Sextus Pompeius, probably the grandfather of th« triumvir, was slain fighting against them near Stobi. In 114 they surprised and destroyed the army of Gaius Porcius Cato in the Servian mountains, but were defeated by Q. Minucius Rufus in 107. Nevertheless, they still from time to time gave trouble to the Roman governors of Macedonia, whose territory they invaded in combination with the Maedi and Dardani. They even advanced as far as Delphi and plundered the temple; but Lucius Cornelius Scipio Asiaticus finally overcame them in 88 and drove them across the Danube. In Strabo's time they had been expelled from the valley of the Danube by the Dacians (Strabovii. pp. 293,313).

See Mommsen, Hist, of Rome (Eng. trans.), bk. iv. ch. 5, who puts the final conquest of the Scordisci by the Romans not later than 91. Also H. Porntow, " Die drei Brande des Tempels zu Delphi " in Rheinisches Museum, li. p. 369 (1896) ; A. Holder, Altceltischer Sprach- schatz, ii. (1904).

SCORE (O.E. scor, from sceran, to cut, notch, cf. " shear "), properly a notch or groove cut in a piece of wood, called a " tally " (q.v.), as a method of counting ; hence an account or reckoning made in this way. Either from a custom of keeping each series of twenty numbers or notches on a separate tally, or of marking the twentieth number by a longer or deeper mark, the word was early used to denote the number twenty; it is still used as a measure of weight, equivalent to 20 lb, com- puting the weight of animals sold for slaughtering for food. In music, a score is the written or printed copy of a composition on two or more staves, barred and braced together. For instru- mental and vocal music a " full score " has the parts for each class of voice and instrument on a separate staff.

SCORESBY, WILLIAM (1789-1857), English Arctic explorer, scientist and divine, was born near Whitby, Yorkshire, on the 5th of October 1789. His father, William Scoresby (1760- 1829), made a fortune in the Arctic whale fishery. The son made his first voyage with his father when he was eleven years of age, but on his return he was sent back to school, where he remained till 1803. After this he was his father's constant com- panion, and was with him on the 25th of May 1806, as chief officer of the whaler " Resolution," when he

succeeded in reach- ing 8i° 30′ N. lat. (i9°E. long.), for twenty-one years the highest northern latitude attained in the eastern hemisphere. During the following winter, Scoresby attended the natural philosophy and chemistry classes at Edinburgh university, and again in 1809. In his voyage of 1807 he began the study of the meteor- ology and natural history of the polar regions, among the earlier results of which are his original observations on snow and crystals; and in 1809 Robert Jameson brought certain Arctic papers of his before the Wernerian Society of Edinburgh, of which he was at once elected a member. In 181 1 his father resigned to him the command of the " Resolution," and in the same year he married the daughter of a Whitby shipbroker. In his voyage of 18 13 he established for the first time the fact that the temperature of the polar ocean is warmer at considerable depths than it is on the surface, and each subsequent voyage in search of whales found him no less eager of fresh additions to scientific knowledge. His letters of this period to Sir Joseph Banks, whose acquaintance he had made a few years earlier, no doubt gave the first impulse to the search for the North- West Passage which followed. In 1819 he was elected a fellow of the Royal Society of Edinburgh, and about the same time communicated a paper to the Royal Society of London " On the Anomaly in the Variation of the Magnetic Needle." In 1820 he published An Account of the Arctic Regions and Northern Whale Fishery, in which he gathers up the results of his own observations, as well as those of previous navigators. In his voyage of 1822 to Greenland he surveyed and charted with remarkable accuracy 400 m. of the east coast, between 69 30′ and 72° 30', thus contributing to the first real and important geographic knowledge of East Greenland. This, however, was the last of his Arctic voyages. On his return he was met by the news of his wife's death, and this event, with other influences acting upon his naturally pious spirit, decided him to enter the church. After two years of residence in Cambridge he took his degree (1825) and was appointed to the curacy of Bassingby, Yorkshire. Meantime had appeared at Edinburgh his Journal of a Voyage to the Northern Whale Fishery, including Researches and Discoveries on the Eastern Coast of Greenland (1823). The discharge of his clerical duties at Bassingby, and later at Liver- pool, at Exeter and at Bradford, did not prevent him from continuing his interest in science. In 1824 the Royal Society elected him a fellow, and in 1827 he was elected an honorary corresponding member of the Paris Academy of Sciences, while in 1839 he took the degree of D.D. From the first he was an active member and official of the British Association, and he contributed especially to the knowledge of terrestrial magnetism. Of his sixty papers in the Royal Society list

many are more or less connected with this department of research. But his observations extended into many other departments, including ■vcrtain oranches of optics. In order to obtain additional data

for his theories on magnetism he made a voyage to Australia in 1856, the results of which were published in a posthumous work — Journal of a Voyage to Australia for Magnetical Re- search, edited by Archibald Smith (1859). He made two visits to America, in 1844 and 1848; on his return home from the latter visit he made some valuable observations on the height of Atlantic waves, the results of which were given to the British Association. He interested himself much in social questions, especially the improvement of the condition of factory opera- tives. He also published numerous works and papers of a religious character. In 1850 he published a work urging the prosecution of the search for the Franklin expedition and giving the results of his own experience in Arctic navigation. He was twice married after the death of his first wife. After his third marriage (1849) he built a villa at Torquay, where he died on the 21st of March 1857.

See the Life by his nephew, Dr R. E. Scoresby-Jackson (1861).
SCORIA (Lat. scoria, slag), in geology, a name applied to lava when moderately vesicular and having a structure like that of a clinker. Ejected masses of scoriaceous lava are often called " cinders," a term conveniently used for all lumps of vesicular lava (see Volcano).

SCORPIO ("the Scorpion"), in astronomy, the 8th sign of the zodiac (q.v.), denoted by the symbol TTL- It is also a con- stellation, mentioned by Eudoxus (4th century B.C.) and Aratus (3rd century B.C.), and catalogued by Ptolemy (24 stars), Tycho Brahe (io),Hevelius (20). The Greeks fabled that Orion having boasted to Diana and Latona that he would kill every animal on the earth, these goddesses sent a poisonous reptile — a scorpion — which stung him so that he died. Jupiter raised the scorpion to heaven, and afterwards, at Diana's request, did the same for Orion. The chief star in this constellation is a Scorpii or Antares, a reddish star of the first magnitude, accompanied by a green companion of the seventh magnitude, n Scorpii is a spectroscopic binary; J Nova Scorpii is a " new " star dis- covered in i860 by G. F. Auwers in the cluster Messier 80.

SCORPION (Lat. scorpio), the common name for members of the class Arachnida (q.v.), distinguishable at a glance from all the other existing members by having the last five segments of the body

modified to form a highly flexible tail, armed at the end with a sting consisting of a vesicle holding a pair of poison glands, and of a sharp spine behind the tip of which the ducts of the glands open. Like spiders they have four pairs of walking legs; but the limbs of the second pair form a couple of powerful pincers, and those of the first pair two much smaller nippers. They feed entirely upon animal food, principally upon insects such as beetles or other ground species, although the larger kinds have been known to kill small lizards and mice. The large pincers are studded with highly sensitive tactile hairs, and the moment an insect touches these he is promptly seized by the pincers and stung to death, the scorpion's tail being swiftly brought over his back and the sting thrust into the struggling prey. Paralysis rapidly follows, and, when dead, the insect is pulled to pieces by the small nippers and its soft tissues sucked into the scorpion's mouth. Scorpions vary in size from about 1 in. to 8 in.; and the amount of poison instilled into a wound depends principally upon the size of the animal. But the poison is more virulent in some of the smaller than in the larger species. Upon mankind the effects of the poison are seldom fatal, though death has been known to follow in the case of patients in a poor state of health at the time. In small scorpions, like those belonging to the genus Euscorpius, which occurs in Italy and other countries of South Europe, the sting is said to be as bad as that of a wasp; but in many tropical species acute pain, accompanied by inflammation and throbbing of the wounded part, follows. But unless molested, scorpions are perfectly harmless, and only make use of the sting for the purpose of killing prey.

The belief that scorpions commit suicide by stinging them- selves to death when tortured by fire is of considerable antiquity and is prevalent wherever these animals occur. It is neverthe- less quite without foundation in fact; for it has been proved

experimentally of late years that the venom has no effect upon the individual itself, nor yet upon a member of the same species. Scorpions, however, are extraordinarily susceptible to heat, and succumb very rapidly when exposed either to the warmth of a fire or to that of the tropical sun. Moreover, when they feel the heat beating upon them they brandish their tails and strike right and left as if to drive off or destroy the unseen enemy ; and there can be no doubt that the belief above alluded to is traceable primarily to observation of the sequence of events just described, the final event being the

death of the animal, not, however, from a self-inflicted wound but from the heat which provoked the behaviour suggestive of suicidal purpose. It may be that under such circumstances a random stroke has now and again wounded

*the animal itself; but a wound so inflicted would be accidental, not intentional, and at most would contribute in a small measure to the creature's death. Scorpions are very easily rendered innocu- ous by scraping off the sharp point of the sting; and specimens, which are handled with impunity by Arabs and Der- vishes to impress the uninitiated with their super- human attributes, have generally been treated in Jiic/i.i *kis way. At the same time it has been shown that insensibility to the pain of the sting and immunity to the ill effects can be acquired by any one who has the courage to permit himself to be repeatedly stung.*

Like many poisonous animals, scorpions are for the most part rendered conspicuous by distinctive coloration of jet-black or black and yellow; and many of them are gifted with stridulat- ing organs, developed in various parts of the body which are functionally comparable to the rattles of rattlesnakes, porcupines and other noxious animals. In habits scorpions are cryptozoic and nocturnal, spending the daytime concealed under stones or fallen tree trunks or in burrows, and only venturing out after sunset in search of food. Amongst the burrowing kinds are the large African species belonging to the genera Pandinus and Opis- thophthalmus and to the eastern genus Palamnaeus. The yellow scorpions of the genus Buthus, which are common in Egypt and the Sahara, lurk on the watch for prey in shallow depressions which they excavate with their legs in the sand.

Unlike the majority of Arachnida, scorpions are viviparous. The young are born two at a time, and the brood, which consists of a dozen or more individuals, is carried about on its mother's back until the young are large and strong enough to shift for themselves. The young in a general way resemble their parents and undergo no metamorphosis with growth, which is accom- panied by periodical casting of the entire integument. Moulting is effected by means of a split in the integument which takes place just below the edge of the carapace all round, exactly as in king- crabs, spiders and Pedipalpi. Through the split the young scorpion gradually makes its way, leaving the old integument behind.

Scorpions are of great antiquity. In coal deposits of the Carboniferous Period their remains are not uncommonly found,

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African Scorpion {Pandinus heros).

and no essential structural difference has been discovered be- tween these fossils and existing forms — a fact proving that the group has existed without material structural modification for untold thousands of years. These Carboniferous scorpions, how- ever, were preceded by others, now occurring in marine Silurian deposits, which evidently lived in the sea and exhibit some anatomical differences marking them off as a group distinct from their Carboniferous and recent descendants and attesting affinity with the still earlier marine Arachnida referred to the group Gigantostraca. Their legs were short, thick, tapering, and ended in a single strong claw, and were well adapted, it seems, like the legs of shore-crabs, for maintaining a secure hold upon rocks or seaweed against the wash of waves. The method of breathing of these ancient types is not certainly known; but probably respiration was effected by means of gills attached to the ventral plates of the body. At all events no trace of respiratory stigmata has been detected even in well-preserved material. These Silurian scorpions, of which the best-known genus is Palaeophonus, were of small size, only i in. or 2 in. in length.

At the present time scorpions are almost universally dis- tributed south of about the 40th or 45th parallels of north latitude; and their geographical distribution shows in many particulars a close and interesting correspondence with that of the mammalia, their entire absence from New Zealand being not the least interesting point of agreement. The facts of their dis- tribution are in keeping with the hypothesis that the order originated in the northern hemisphere and migrated southwards into the southern continent at various epochs, their absence from the countries to the north of the above-mentioned latitudes being due, no doubt, to the comparatively recent glaciation of those areas. When they reached Africa, Madagascar was part of that continent; but their arrival in Australia was subsequent to the separation of New Zealand from the Austro-Malayan area to the north of it. Moreover, the occurrence of closely related forms in Australia and South America on the one hand, and in tropical Africa and the northern parts of South America on the other, suggests very forcibly that South America was at an early date connected with Australia by a transpacific bridge and with Africa by a more northern transatlantic tract of land.

In conformity with their wide dispersal, scorpions have become adapted to diverse conditions of existence, some thriving in tropical forests, others on open plains, others in sandy deserts, and a few even at high altitudes where the ground is covered with snow throughout the winter. In the tropics they aestivate at times of drought ; and in the Alps they pass the cold months of the year in a state of hibernation. (R. I. P.)

SCORPION-FLY, the popular name given to insects of the family Panorpidae, deriving the name from the fact that in the typical genus, Panorpa, the last two or three segments of the abdomen are narrow and can be flexed over the back like a scorpion's tail. The scorpion-flies are remarkable for the elonga- tion of the oral region of the head into a prominent beak. The larva is grub-like, beset with spines and generally furnished with eight pairs of abdominal pro-legs in addition to the legs on the thorax, which are short. They live in the soil or in rotten wood and are carnivorous. The species of the genus Bittacus are superficially strikingly similar to the Tipulidae or " daddy-long- legs "; while those referred to, Borens, are anomalous in being apterous and like small grasshoppers. They have usually been included in the order Neuroptera, but it is now generally con- sidered that they should form a distinct order, which is termed Panorpata or Mecaptera.

SCORZONERA (Scorzonera hispanica), a hardy perennial, native to central and southern Europe, and cultivated in gardens as a vegetable for its fleshy cylindrical roots, which resemble those of salsafy except in being black outside. They should be treated in every respect like salsafy. The genus is a member of the natural order Compositae, and nearly allied to Tragopogon, to which salsafy belongs.

SCOT, MICHAEL (? n 75-1 23 2), Scottish mathematician and astrologer. The dates of his birth and death are quite uncertain, the most probable being those here given. The efforts of Sir

Walter Scott and others to identify him with the Sir Michael Scot of Balwearie, who in 1290 was sent on a special embassy to Norway, must be considered unsuccessful, though he may have been a member of the family. Scot studied at Oxford and Paris, devoting himself to philosophy and mathematics. It appears that he had also studied

theology, and was ordained a priest, as Pope Honorius III. wrote to Stephen Langton on the 1 6th of January 1223/4, urging him to confer an English benefice on Scot, and actually himself nominated him archbishop of Cashel in Ireland. This appointment Scot refused to take up, but he seems to have held benefices in Italy from time to time. From Paris he went to Bologna, and thence, after a stay at Palermo, to Toledo. There he acquired a knowledge of Arabic. This opened up to him the Arabic versions of Aristotle and the multitudinous commentaries of the Arabians upon them, and also brought him into contact with the original works of Avicenna and Averroes. His own first work was done as a translator. He was one of the savants whom Frederick II. attracted to his brilliant court, and at the instigation of the emperor he superintended (along with Hermannus Alemannus) a fresh translation of Aristotle and the Arabian commentaries from Arabic into Latin. There exist translations by Scot himself of the Historia animalium, the De anima and De ■coelo, along with the commentaries of Averroes upon them. This connexion with Frederick and Averroes — both of evil reputation in the middle ages — doubtless contributed to the formation of the legend which soon enveloped Michael Scot's name. His own books, however, dealing as they do almost exclusively with astrology, alchemy and the occult sciences generally, are mainly responsible for his popular reputation. Chief among these are Super auctorem spherae, printed at Bologna in 1495 an d at Venice in 1631; De sole et luna, printed at Strassburg (1622), in the Theatrum chimicum, and containing more alchemy than astronomy, the sun and moon being taken as the images of gold and silver; De chiromantia, an opuscule often published in the 15th century; De physiognomia et de hominis procreatione, which saw no fewer than eighteen editions between 1477 and 1660. The Physiognomia (which also exists in an Italian translation) and the Super auctorem spherae expressly state that they were undertaken at the request of the emperor Frederick. Michael is said to have foretold (after the double-tongued manner of the ancient oracles) the place of Frederick's death, which took place in 1250. Around his own death many legends gathered. He was supposed to have fore- told that he would end by a blow from a stone of not more than two ounces in weight, and that to protect himself he wore an iron helmet, and that, raising this in church at the elevation of the host, the fatal stone fell on him from the roof. Italian tradition says he died in that country, while another legend is that he returned to his native land to die, and according to one account was buried at Holme Cultram in Cumberland; accord- ing to another, which Sir Walter Scott has followed in the Lay of the Last Minstrel, in Melrose Abbey. In the

notes to that poem, of which the opening of the wizard's tomb forms the most striking episode, Scott gives an interesting account of the various exploits attributed by popular belief to the great magi- cian. " In the south of Scotland any work of great labour and antiquity is ascribed either to the agency of Auld Michael, of Sir William Wallace or the devil." He used to feast his friends with dishes brought by spirits from the royal kitchens of France and Spain and other lands. His embassy to France alone on the back of a coal-black demon steed is also celebrated, in which he brought the French monarch to his knees by the results of the stamping of his horse's hoof: the first ringing the bells of Notre Dame and the second causing the towers of the palace to fall. Other powers and exploits are narrated in Folengo's Macaronic poem of Merlin Coccaius (1595). But Michael's reputation as a magician was already fixed in the age immediately following his own. He appears in the Inferno of Dante (canto xx. n 5-1 17) among the magicians and sooth- sayers. He is represented in the same character by Boccaccio, and is severely arraigned by Giovanni Pico della Mirandola in

his work against astrology, while Gabriel Naude finds it necessary to defend his good name in his Apologie pour les grands per- sonnages faussement accuses de magie.

For full details and analysis of all the legends attaching to Scot, see Rev. J. Wood Brown, Life and Legend of Michael Scot (1897).

SCOT AND LOT (O. Fr. escot, A.S. sceot, a payment; lot, a portion or share) , a phrase common in the records of English medieval boroughs, applied to those householders who were assessed' to any payment (such as tallage, aid, &c.) made by the borough for local or national purposes. They were usually members of a gild merchant. Previous to the Reform Act 1832 those who paid scot and bore lot were entitled to the franchise in virtue of this payment, and the rights of those living in 1832 were preserved by the act. The phrase is pre- served in the Disorderly Houses Act 1751, which empowers inhabitants of a parish or place paying scot and bearing lot therein (i.e. ratepayers) to require the constable of the parish to prosecute disorderly houses.

See D. P. Fry, " On the Phrase Scot and Lot," in Trans. Philological Society (1867), pp. 167-197; C. Gross, Gild Merchant, i. c. iv. ; Pollock and Maitland, Hist. Eng. Law, p. 647.

SCOTER, a word of doubtful origin, perhaps a variant of " Scout," one of the many local names shared in common by the guillemot

(q.v.) and the razorbill (q.v.), or perhaps primarily connected with coot (q.v.), 1 the English name of the Anas nigra of Linnaeus, a bird which with some allied species has been justifiably placed in a distinct genus, Oedemia (often misspelt Oidemia) — a name coined in reference to the swollen appearance of the base of the bill. The scoter is also very generally known around the British coasts as the " black duck " from the male being, with the exception of a stripe of orange that runs down the ridge of the bill, wholly of that colour. In the representative American form, Oe. americana, the protuberance at the base of the bill, black in the European bird, is orange as well. Of all ducks the scoter has the most marine habits, keeping the sea in all weathers, and rarely re- sorting to land except for the purpose of breeding. Even in summer small flocks of scoters may generally be seen in the tideway at the mouth of any of the larger British rivers or in mid-channel, while in autumn and winter these flocks are so increased as to number thousands of individuals, and the water often looks black with them. A second species, the velvet- duck, Oe. fusca, of much larger size, distinguished by a white spot under each eye and a white bar on each wing, is far less abundant than the former, but examples of it are occasionally to be seen in company with the commoner one, and it too has its American counterpart, Oe. velvetina; while a third, only known as a straggler to Europe, the surf-duck, Oe. perspicillata, with a white patch on the crown and another on the nape, and a curiously particoloured bill, is a not uncommon bird in North American waters. All the species of Oedemia, like most other sea-ducks, have their true home in arctic or subarctic countries, but the scoter itself is said to breed occasionally in Scotland (Zoologist, s.s. p. 1867). The females display little of the deep sable hue that characterizes their partners, but are attired in soot-colour, varied, especially beneath, with brownish white. The flesh of all these birds has an exceedingly strong taste, and, after much controversy, was allowed by the authorities to rank as fish in the ecclesiastical dietary (cf. Graindorge, Traiti de I'origine des macreuses, Caen, 1680; and Correspondence of John Ray, Ray Soc. ed., p. 148). (A. N.)

SCOTIA (Gr. owna, shadow or darkness), in architecture, a concave moulding most commonly used in bases, which pro- jects a deep shadow oil itself, and is thereby a most effective moulding under the eye, as in a base. (See Moulding.)

1 In the former case the derivation seems to be from the O. Fr. Escoute, and that from the Latin auscultate, but in the latter from the Dutch Koet, which is said to be of Celtic extraction — cwtiar. The Fr. macreuse, possibly from Lat. macer, indicating a bird that may be

eaten in Lent or on the fast days of the Roman Church, is of double signification, meaning in the south of France a coot and in the north a scoter. By the wild-fowlers of parts of North America scoters are commonly called coots.

SCOTLAND

[GEOGRAPHY

SCOTLAND, the name given in modern times to that portion of Great Britain which lies north of the English boundary; it also comprises the Outer and Inner Hebrides and other islands off the west coast, and the Orkney and Shetland islands off the north coast. With England lying to the south, it is thus bounded on the N. and W. by the Atlantic Ocean, and on the E. by the North Sea. It is separated from England by the Solway Firth, the Sark, Scotsdyke(an old embankment in 55°3′ N., connecting the Sark with the Esk), the Esk (for one mile), the Liddel, the Kershope, the Cheviot Hills, the Tweed and a small area known as the ” liberties ” of Berwick. The mainland lies between 58 40′ 30″ (at Dunnet Head in Caithness) and 54 38′ N. (Mull of Galloway in Wigtownshire), and 1° 45′ 32″ (Buchan Ness in Aberdeenshire) and 6° 14′ W. (Ardnamurchan Point in Argyll- shire). Including the islands, however, the extreme latitude north is 6o° 51′ 30″ (Out Stack in the Shetlands) and the extreme longitude west 8° 35′ 30″ (St Kilda). The greatest length from Cape Wrath in Sutherland to the Mull of Galloway is 274 m., and the greatest breadth from Buchan Ness to Applecross in the shire of Ross and Cromarty 154 m.,but from Bonar Bridge at the head of Dornoch Firth to the head of Loch Broom it is only 26 m. wide, and 30 m. from Grangemouth on the Forth to Bowling on the Clyde. The coast-line is estimated at 2300 m., the arms of the sea being so numerous and in several cases penetrating so far inland that few places are beyond 40 m. from salt water. The total area is 19,069,500 acres or 29,796 sq. m., exclusive of inland waters (about 608 sq. m.), the foreshore (about 498 sq. m.) and tidal water (about 608 sq. m.).

The name Scotland for this geographical area of northern Britain (the Caledonia of the ancients — a name still poetically used for Scotland) originated in the nth century, when (from the tribe of Scots) part of it was called Scotia (a name previously applied to what is now Ireland); and the name of Scotland became established in the 12th and 13th centuries. The name of Britain or North Britain is still firmly associated with Scot- land; thus English letters are

generally addressed, e.g. " Edin- burgh, N.B.," i.e. North Britain; and Scottish people have long objected to the conventional use south of the Tweed of the word " English," when it really means (as they correctly, but some- times rather pedantically, insist) " British."

I. Geography

Physically, Scotland is divided into three geographical regions — the " Highlands " (subdivided by Glen More into the North- western and South-Eastern Highlands); the Central Plain or " Lowlands " (a tract of south-westerly to north-easterly trend, between a line drawn roughly from Girvan to Dunbar and a line drawn from Dumbarton to Stonehaven); and the Southern Uplands.

The Highlands. — Nearly all this region is lofty ground, deeply trenched with valleys and sea lochs. The only considerable low- lying area embraces the eastern part of Aberdeenshire and the northern parts of Banff, Elgin and Nairn — tracts which, ethnologic- ally, do not fall within Highland territory. Along both sides of the Moray Firth a strip of level land lies between the foot of the hills and the sea, while the county of Caithness, occupying a wide plain, does not, strictly speaking, belong to the Highlands. Seen from Strathmore or the Firth of Clyde the Highlands present well-defined masses of hills abruptly rising from the Lowland plains, and from any of the western islands their sea front resembles a vast rampart indented by lochs and rising to a uniform level, which sinking here and there allows glimpses of still higher summits in the interior. The Highland hills differ from a mountain chain such as the Alps not merely in their inferior elevation but in configuration and structure. They are made up of a succession of more or less parallel confluent ridges, having in the main a trend from north-east to south-west. These ridges are separated by longitudinal and furrowed by trans- verse valleys. The portions of the ridge thus isolated rise into what are regarded as mountains, though they are really only loftier parts of the ridge, along which indeed the geological structure is continued. It is remarkable how the average level of the summits is maintained. Viewed from near at hand a mountain may seem to tower above the surrounding country, but from a distance it will be seen not to rise much above the general uniformity of elevation. There are no gigantic dominant masses obviously due to special terrestrial dis- turbance. A few apparent exceptions occur along the western seaboard of Sutherland, in Skye and elsewhere, but examination of their structure at once explains the reason of their prominence and

confirms the rule. The surface of the Highlands is rugged. The rocks

project in innumerable bosses and crags, which roughen the sides and crests of the ridges. The shape and colour of these rough- nesses depend on the nature of the underlying rock. Where it is hard and jointed, weathering into large quadrangular blocks, the hills are more especially distinguished for the gnarled bossy character of their declivities, as may be seen in Ben Ledi and the heights to the north-east of it. Where, on the other hand, the rock decays with smaller debris, the hills assume smoother contours, as in the slate hills running from the Kyles of Bute to Loch Lomond. But, regarded broadly, the Highland mountains are monuments of erosion, the relic of an old tableland, the upper surface and former inclinations of which are shown approximately by the summits of the existing masses and the direction of the chief water-flows.

The Highlands are separated into two completely disconnected and in some respects contrasted regions by the depression of the Great Glen, extending from Loch Linnhe to Inverness, by which the ancient plateau was severed. In the north-western section the highest ground is found along the Atlantic coast, mounting steeply from the sea to an average height of 2000 to 3000 ft. The watershed consequently keeps close to the western seaboard, and indeed in some places is not above a mile and a half from the shore. From these hills which catch the first downpour of the rains from the ocean, the ground falls eastward. Numerous eminences, however, prolong the mountainous features to the North Sea and south-eastward to Glen More. The difference of the general level on the two sides of the water-parting is reflected in the length of their streams. On the west the drainage empties itself into the Atlantic after flowing only a very few miles, on the east it has to run 30 or 40 m. At the head of Loch Nevis the western stream is but 3 m. long, while the eastern has a course of some 18 m. to the Great Glen. Throughout the north- western region uniformity of features characterizes the scenery, betokening even at a distance the general monotony of structure. But the sameness is relieved along the western coast of the shires of Sutherland and Ross and Cromarty by groups of cones and stacks, and farther south by the terraced plateaus and ahrupt conical hills of Skye, Rum and Mull.

The south-eastern region of the Highlands, having a more diversi-fied geological structure, offers greater variety of scenery. Most of the valleys, lakes and sea lochs run in a south-westerly and north-easterly direction, a feature strikingly exhibited in west Argyllshire. But there are also several important transverse valleys, those of the Garry and Tay being the most Conspicuous examples. The water-shed, too, is somewhat different. It first strikes eastwards round the

head of Loch Laggan and then swings southwards, pursuing a sinuous course till it leaves the Highlands on the east side of Loch Lomond. The streams flowing westward, however, are still short, while those running to the north-east, east and south-east have long courses and drain wide areas. There is a marked contrast between the configuration of the north-eastern district and the other parts of this region. In that area the Grampians rise into wide flat-topped heights or moors often more than 3000, and in a few places exceeding 4000 ft. in height, and bounded by steep declivities and sometimes by precipices. Seen from an eminence on their surface, the inference is irresistible that these plateaus are fragments of the original table- land, trenched into segments by the formation of the longitudinal and transverse valleys. Farther to the south-west, in the shires of Perth, Inverness and Argyll, they give place to the ordinary hummocky crested ridges of Highland scenery, which, however, in Ben Nevis and Aonach Beg reach a height of over 4000 ft.

Besides the principal tracts of low-lying ground in the Highlands already alluded to, there occur long narrow strips of flat land in the more important valleys. Most of the straths and glens have a floor of detritus which, spread out between the bases of the boundary hills, has been levelled into meadow land by the rivers and provides almost the sole arable ground in each district.

The Lowlands of Mid-Scotland, or the Central Plain, constitute a broad depression with south-westerly to north-easterly trend lying between the Highland line that runs from the head of the Firth of Clyde to Stonehaven and the pastoral uplands that stretch from Girvan to Dunbar. They may be regarded as a long trough of younger rocks let down by parallel dislocations between the older masses to the south and north. The lowest of these younger rocks are the various sedimentary and volcanic members of the Old Red Sandstone. These are covered by the successive formations of the Carboniferous system. The total thickness of both these groups of rock cannot be less than 30,000 ft. , and, as most of them bear evidence of having been deposited in shallow water, they.could only have been accumulated during a prolonged period of depression. The question arises whether this depression affected only the area of the midland valley, or extended also to the regions to the north and south; and so far as the evidence goes there is ground for the inference that, while the depression had its maximum along the line of the lowlands, it also involved some portion at least of the high grounds on either side. In other words, the Old Red Sandstone and Carboniferous rocks, though chiefly accumulated in the broad lowland valley, crept also over some part of the hills on either side,

where a few outliers tell of their former extension. The central Lowlands are thus of great geological antiquity. During and since the deposition of the rocks that underlie them the tract has been the scene of repeated

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SCOTLAND

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terrestrial disturbances. Long dislocations have sharply denned its northern and southern margins. By other fractures and unequal movements of upheaval or depression portions of the older rocks have been brought up within the bounds of the younger, and areas of the younger have been enclosed by the older. On the whole, these disturbances have followed the prevalent north-easterly trend, and hence a general tendency may be observed among the main ridges and valleys to run in that direction. The chains of the Ochil, Sidlaw, Pentland, Renfrew, Campsie and Fintry Hills, and the valleys of the Strathmore, Firth of Tay, and the basin of Midlothian may be cited as examples. But the dominant cause in the determination of the topographical prominences and depressions of the district has been the relative hardness and softness of the rocks. Almost all the eminences in the Lowlands consist of hard igneous rocks, forming not only chains of hills such as those just mentioned and others in Ayrshire and Lanarkshire, but isolated crags and hills like those on which stand the castles of Edinburgh and Stirling, and others conspicuous in the scenery of Fife and the Lothians.

Of the three chief valleys in the central Lowfands two, those of the Tay and the Forth, descend from the Highlands, and one, that of the

Clyde, from the Southern Uplands. Though on the whole transverse, these depressions furnish another notable example of that independence of geological structure already referred to.

The Southern Uplands extend from the North Channel in the south-west to St Abb's Head in the north-east and form a well-defined belt of hilly ground, and though much less elevated (their highest point is 2764 ft. above the sea) than the Highlands, rise with scarcely less abruptness above the lower tracts that bound them. Their north-western margin for the most part springs boldly above the fields and moorlands of the Central Plain, and its boundary for long distances continues remarkably straight. On the south and south-east their limits in general are less prominently defined, but are better seen west and south-west of the Nith from which they extend to the sea and Loch Ryan, terminating in the extreme south-west in a plateau of which the loftiest point is little over 1000 ft. above the sea. The Cheviots do not properly belong to the Uplands, from which they are separated by Liddesdale and other hollows and on which they abut abruptly. But though geologically the one set of mountains must be separated from the other, geographically it is convenient to include within the Southern Uplands the whole area between the Central Plain and the Border. A survey of the Uplands, therefore, presents in succession from south-west to north-east the Kirkcudbrightshire and Ayrshire mountain moors, the Lowthers, the Moffat hills, the Moorfoots and the Lammermuirs. Distinguished especially by the smoothness of their surface, they may be regarded as a rolling table-land or moorland, traversed by many valleys conducting the drainage to the sea. This character is well observed from the heights of Tweedsmuir. Wide, mossy moors, 2000 ft. or more above the sea, and sometimes level as a racecourse, spread out on all sides. Their continuity, however, is interrupted by numerous valleys separating them into detached flat-topped hills, which are comparatively seldom marked by precipices of naked rock. Where the rock projects it more usually appears in low crags and knolls, from which long trails of grey or purpb debris descend till they are lost among the grass. Hence, besides being smooth, the uplands are remarkably verdant. They form indeed excellent pasture-land, while the alluvial flats in the valleys and even some of the lower slopes are fitted for grain and green crops.

This uniformity of aspect is doubtless traceable to the prevalence of the same kind of rocks and the same geological structure. The Silurian greywackes and shales that underlie almost the whole of the Uplands weather generally into small angular debris, and at a tolerably uniform rate of disintegration. But slight differences may

readily be detected even where no feature interferes noticeably with the monotony. The bands of massive grit and coarse greywacke, for example, break up into larger blocks and from their greater hardness are apt to project above the general surface of the other softer rocks. Hence their line of trend, which like that of all the other strata is in a north-easterly direction, may be traced from hill to hill by their more craggy contours. Only in the higher tracts are there rugged features recalling the more savage character of Highland scenery. In the heights of Hartfell (2651 ft.) and Whitecoomb (2695), whence the Clyde, Tweed, Annan, and Moffat Water descend, the high moorlands have been scarped into gloomy corries, with crags and talus-slopes, which form a series of landscapes all the more striking from the abrupt and unexpected contrast which they offer to everything around them. In Galloway, also, the highest portions of the Uplands have acquired a ruggedness and wildness more like those of the Highlands than any other district in the south of Scot- land. For this, however, there is an obvious geological reason. In that region the Silurian rocks have been invaded by large bosses of granite and have undergone a variable amount of metamorphism which has in some places altered them into hard crystalline schists. These various rocky masses, presenting great differences in their powers of resisting decay, have yielded unequally to disintegration : the harder portions project in rocky knolls, crags and cliffs, while the softer parts have been worn down into more flowing outlines. The highest summit in the south of Scotland — Merrick (2764 ft.) — consists of Silurian strata much altered by proximity to the granite, while the rest of the more prominent heights (all in Kirkcudbrightshire) —

Rinns of Kells (2668 ft.), Cairnsmuir of Carsphairn (2612), and Cairnsmore of Fleet (2331) — are formed of granite.

The watershed of the Southern Uplands is of much interest in relation to their geological history. It runs from the mouth of Loch Ryan in a sinuous north-easterly direction, keeping near the northern limit of the region till it reaches the basin of the Nith, where it quits the Uplands altogether, descends into the lowlands of Ayrshire, and, after circling round the headwaters of the Nith, strikes south-eastwards across half the breadth of the Uplands, then sweeps north and eastwards between the basins of the Clyde, Tweed and Annan, and then through the moors that surround the sources of the Ettrick, Teviot and Jed, into the Cheviot Hills. Here again the longest slope is on the east side, where the Tweed bears the whole drainage of that side into the sea. Although the rocks throughout the Southern Uplands have a persistent north- easterly and south-westerly strike,

and though this trend is apparent in the bands of more rugged hills that mark the outcrop of hard grits and greywackes, nevertheless geological structure has been much less effective in determining the lines of ridge and valley than in the Highlands. On the southern side of the watershed, in Dumfries- shire and Galloway, the valleys run generally transversely from north-west to south-east. But in the eastern half of the Uplands the valleys do not appear to have any relation to the geological structure of the ground underneath.

Characteristic Features. — Though Scotland is pre-eminently a " land of mountain and of flood," yet its leading physical features are not the lofty ridges carved out of the primeval plateau valleys — apparently the dominant characteristic — but the valleys which have been opened through them by the agencies of water and weather, and which are therefore its fundamental topographical element. The longitudinal valleys, which run in the same general direction as the ridges — that is, north-east and south-west — have had their trend defined by geological structure, such as a line of dislocation (the Great Glen), or the plications of the rocks (Lochs Ericht, Tay and Awe, and most of the sea lochs of Argyllshire). The transverse valleys run north-west or south-east and are for the most part independent of . geological structure. The valley of the Garry and Tay crosses the strike of all the Highland rocks, traverses the great fault on the Highland border, and finally breaks through the chain of the Sidlaw Hills at Perth. The valley of the Clyde crosses the strike of the Silurian folds in the Southern Uplands, the boundary fault, and the ridges of the Old Red Sandstone, and pursues its north- westerly course across the abundant and often powerful dislocations of the Carboniferous system.

The crumpling of the earth's crust which folded the rocks of the Highlands and Southern Uplands probably upraised above the sea a series of longitudinal ridges having a general ncrth easterly direction. The earliest rain that fell upon these ridges would run off them, first in transverse watercourses down each short slope, and then in longitudinal depressions wherever such had been formed during the terrestrial disturbance. Afterwards the pathways of the streams would be gradually deepened and widened into valleys. Hence the valleys are of higher antiquity than the mountains that flank them. The mountains in fact have been hewn out of the original bulk of the land in proportion as the valleys have been excavated. The denudation would continue so long as the ground stood above the level of the sea; but there have been prolonged periods of de pression, when the ground, instead of being eroded, lay below the sea-level and was buried sometimes under thousands of feet of accumulated

sediment, which completely filled up and obliterated the previous drainage-lines. When the land reappeared a new series of valleys would at once begin to be eroded ; and the subsequent degradation of these overlying sediments might reveal portions of the older topography, as in the case of the Great Glen, Lauderdale, and other ancient valleys. But the new drainage-lines have usually little or no reference to the old ones. Determined by the inequalities of surface of the overlying mantle of sedimentary material, they would be wholly independent of the geological structure of the rocks lying below that mantle. Slowly sinking deeper and deeper into the land, they might eventually reach the elder rocks, but they would keep in these the lines of valley that they had followed in the overlying deposits. In process of time the whole of these deposits might be denuded from the area, and there might even remain no trace of the younger formations on which the valleys began and' which guided their excavation. This is probably the explanation of the striking independ- ence of geological structure exhibited by the Tweed and the Nith.

Among the valleys certain prevailing characteristics have been recognized in their popular names. Straths are broad expanses of low ground between bounding hills and are usually traversed by one main stream and its tributaries — e.g. Strath Tay, Strath Spey, Strath Conon. This name, however, has also been applied to wide tracts of lowland which embrace portions of several valleys, but are defined by lines of heights on each side; the best example is afforded by Strathmore — the " Great Strath "■ — between the southern margin of the Highlands and the line of the Sidlaw Hills. This long and wide depression, though it looks like one great valley, strictly speaking includes portions of the valleys of the Tay, Isla, North Esk and South Esk, all of which cross it. Elsewhere in central Scotland such a wide depression is known as a howe, as in the Howe of Fife between the Ochil and Lomond Hills. A glen is a narrower and rtf`e.Der-sider'

River- gorges.

valley than a strath, though the names have not always been applied with discrimination. Most of the Highland valleys are true glens,

Glencoe being the best-known example. The hills rise rapidly on each side, sometimes in grassy slopes, sometimes in rocky bosses and precipitous cliffs, while the bottom is occupied by a lake. In the south of Scotland the larger streams flow in wide open valleys called daks, as in Clydesdale, Tweeddale, Teviotdale, Liddesdale, Eskdale, Nithsdale. The strips of alluvial land bordering a river are known as haughs, and where in estuaries they expand into wide plains they are termed carses. The carses of the Forth extend seawards as far as Bo'ness and consist chiefly of raised beaches. The Carse of Gowrie is the strip of low ground intervening between the Firth of Tay and the Sidlaw Hills. Brae signifies the steep bank of a river, and so any slope or hill-side.

River-gorges are characteristic features in many of the valleys. In the Old Red Sandstone they are particularly prominent where that formation has lain in the pathway of the streams sweeping down from the Highlands. In the basin of the Moray Firth some fine examples may be seen on the Nairn and Findhorn, while on the west side of the Cromarty Firth some of the small streams descending from the high grounds of the east of the shire of Ross and Cromarty have cut out defiles in the Con- glomerates, remarkable for their depth and narrowness. Towards the south margin of the Highlands notable instances of true canyons in the Old Red Sandstone are to be seen where the Isla and North Esk enter that formation. The well-known gorge in which the Falls of Clyde are situated is the best example in the Lowlands. (For the chief rivers see the separate articles on them, and also the section on the physical features in the article on the different shires of Scotland.)

The topography of the country being the result of prolonged denudation.it is reasonable to infer that the oldest surfaces likely to Tvoesot preserved are portions of some of the platforms of

mountain eros ' on successively established by the wearing down of and hill. tne ' an d to the sea-level. Relics of these platforms occur both in the Highlands and among the Southern Uplands. Allusion has already been made to the flat-topped moorlands which in the eastern Grampians reach heights of 3000 to 4000 ft. above the sea. The most familiar example perhaps is the top of Lochnagar, where, at the level of 3500 ft., the traveller finds himself on a broad undulating moor, more than a mile and a half long, sloping gently towards Glen Muick and terminating on the north in a range of granite precipices. The top of Ben Macdhui stands upon nearly a square mile of moor exceeding 4000 ft. in elevation. These mountains lie within granite areas; but not less striking examples may be found among the schists. The

mountains at the head of Glen Clova and Glen Isla, for instance, sweep upwards into a broad moor some 3000 ft. above the sea, the more prominent parts of which have received special names — Driesh, Mayar, Tom Buidhe, Tolmount, Cairn na Glasha. It would hardly be an exaggeration to say that there is more level ground on the tops of these mountains than in areas of corresponding size in the valleys below. That these high plateaus are planes of erosion is shown by their independence of geological structure, the upturned edges of the vertical and contorted schists having been abruptly shorn off and the granite having been wasted and levelled along its exposed surface. Among the Southern Up- lands exist traces of a similar tableland of erosion. The top of Broad Law on the confines of Peeblesshire and Selkirkshire, for example, is a level moor comprising between 300 and 400 acres above the contour iine of 2500 ft. and lying upon the upturned edges of the greatly denuded Silurian grits and shales. An instructive example of the similar destruction of a much younger platform is to be found in the terraced plateaus of Skye, Eigg, Canna, Muck, Mull and Morven, which are portions of what was probably originally a continuous plain of basalt. Though dating back only to older Tertiary time, this plain has been so deeply trenched by the forces of denudation that it has been reduced to mere scattered fragments. Thousands of feet of basalt have been worn away from many parts of its surface ; deep and wide valleys have been carved out of it ; and so enormously has it been wasted, that it has been almost entirely stripped from wide tracts which it formerly covered and where only scattered outliers remain to prove that it once existed.

It is curious that broad flat-topped mountains are chiefly to be found in the eastern parts of the country. Traced westwards, these forms gradually give place to narrow ridges and crests. No contrast, for instance, can be greater than that between the wide elevated moors of the eastern Grampians, and the crested ridges of western Inverness-shire and Argyllshire — Loch Hourn, Glen Nevis, Glencoe — or that between the broad uplands of Peeblesshire and the pre- cipitous heights of Galloway. Geological structure alone will not account for these contrasts. Perhaps the cause is to be sought mainly in differences of rainfall. The western mountains, exposed to the fierce lash of the Atlantic rains, sustain the heaviest and most constant precipitation. Their sides are seamed with torrents which tear down the solid rock and sweep its detritus into the glens and sea lochs. The eastern heights,on the other hand, experience a smaller rainfall and con- sequently a diminished rate of erosion. No doubt, too, the preponder- ance of rainfall in the west has persisted for an

enormous period.

Regarding the existing flat-topped heights among the eastern Grampians as remnants of what was once the general character of the surface, we can trace every step in the gradual obliteration of the

tableland and in the formation of the most rugged and most individualized forms of isolated mountain. In fact, in journeying westwards across the tops of the Highland mountains we pass, as it were, over successive stages in the history of the origin of Highland scenery. The oldest types of form lie on the east side and the newest on the west. From the larger fragments of the denuded tableland we advance to ridges with narrow tops, which pass by degrees into sharp rugged crests. The ridges, too, are more and more trenched until they become groups of detached hills or mountains. In the progress of this erosion full scope has been afforded for the modifica- tion of form by variation in geological structure. Each ridge and mountain has been cut into its shape by denudation, but its outlines have been determined by the nature of the rocks and the manner in which they have yielded to decay. Every distinct variety of rock has impressed its own character upon the landscape. Hence, amid the monotonous succession of ridge beyond' ridge and valley after valley, diversity of detaifhas resulted from the varying composition and grouping of the rocks.

The process by which the ancient tablelands have been trenched into valleys and confluent ridges is most instructively displayed among the higher mountains, where erosion proceeds at an acceler- ated pace. The long screes or talus-slopes at the foot of every crag and cliff bear witness to the continual waste. The headwaters of a river cut into the slopes of the parent hill. Each valley is conse- quently lengthened at the expense of the mountain from which it descends. Where a number of small torrents converge in a steep mountain recess, they cut out a crescent-shaped hollow or half- cauldron, which in the Scottish Highlands is known as a corrie. It is doubtful whether the convergent action of the streams has been the sole agency in the erosion of these striking cavities, or whether snow and ghcier-ice have had a share in the work. No feature in Highland scenery is more characteristic than the corries, and in none can the influence of geological structure be better understood. Usually the upper part of a corrie is formed by a crescent of naked rock, from which long trails of debris descend to the bottom of the hollow. Every distinct variety of rock has its own type of corrie, the peculiarities being marked both in the details of the upper cliffs and crags, and in the amount, form and colour of the screes. The Scottish corries have

been occupied by glaciers. Hence their bottoms are generally ice-worn or strewn over with moraine stuff. Sometimes a small tarn fills up the bottom, ponded back by a moraine. It is in such localities that we can best observe the last relics of the glaciers that once overspread the country. Among these high grounds also the gradual narrowing of ridges into sharp, narrow, knife-edged crests and the lowering of these into cols or passes can be admirably studied. Where two glens begin opposite to each other on the same ridge, their corries are gradually cut back until only a sharp crest separates them. This crest, attacked on each front and along the summit, is lowered with comparative rapidity, until merely a low col or pass may separate the heads of the two glens. The various stages in this kind of demolition are best seen where the underlying rock is of granite or similarly tough material, which at the same time is apt to be split and splintered by means of its numerous transverse joints. The granite mountains of Arran furnish excellent illustrations. Where a rock yields to weather with considerable uniformity in all directions it is likely to assume conical forms in the progress of denudation. Sometimes this uniformity is attained by a general disintegration of the rock into fine debris, which rolls down the slopes in long screes. In other cases it is secured by the intersection of joints, whereby a rock, in itself hard and durable, is divided into small angular blocks, which are separated by the action of the elements and slide down the declivities. In many instances the beginning of the formation of a cone may be detected on ridges which have been deeply trenched by valleys. The smaller isolated portions, attacked on all sides, have broken up under weather. Layer after layer has been stripped from their sides, and the flat or rounded top has been narrowed until it has now become the apex of a cone. The mountain Schiehallion (3547 ft.) is an instance of a cone not yet freed from its parent ridge. Occasionally a ridge has been carved into a series of cones united at their bases, as in the chain of the Pentland Hills. A further stage in denudation brings us to isolated groups of cones completely separated from the rest of the rocks among which they once lay buried. Such groups may_ be carved out of a continuous band of rock extending into the regions beyond. The Paps of Jura, for instance, rise out of a long belt of quartzite which stretcher through the islands of Islay, Jura and Scarba. In many case- however, the groups point to the existence of some boss of rock c" greater durability than those in the immediate neighbourhood, as in the Cuchullins and Red Hills of Skye and the group of granite cones of Ben Loyal, Sutherland. The most impressive form of solitary cone is that wherein after vast denudation a thick overlying formation has been reduced to a single outlier, such as Morven in

Caithness, the two Bens Griam in Sutherland, and still more strikingly, the pyramids of red sandstone on the western margin of the shires of Sutherland and Ross and Cromarty. The horizontal stratification of some of these masses gives them a curiously architectural aspect, further increased by the effect of the numerous vertical joints by which the rock is cleft into buttresses and recesses along the fronts of the precipices and into pinnacles and finials along the summits. Solitary or grouped pyramids of red sandstone between 3000 and 4000 ft.

above the sea are mere remnants of a continuous sheet of red sandstone that once spread far and wide over the western Highlands.

Stratified rocks when they have not been much disturbed from their original approximate horizontality weather into escarpments. Such cliffs may run for many miles across a country, rising one above another into lofty terraced hills. In Scotland the rocks have been so dislocated and disturbed as to prevent the formation of continuous escarpments, and this form of rock-scenery is consequently almost entirely absent, except locally and for the most part on a comparatively small scale. The most extensive Scottish escarpments are found among the igneous rocks. Where lava has been piled up in successive nearly horizontal sheets, with occasional layers of tuff or other softer rock between them, it offers conditions peculiarly favour- able for the formation of escarpments, as in the wide basalt plateaus of the Inner Hebrides. The Carboniferous lavas of the Campsieand Fintry Hills and of the south of Dumfriesshire and Roxburghshire likewise rise in lines of bold escarpment.

The lakes and water-basins may be classified in four groups, each with its own peculiar scenery and distinct mode of origin — Lakes. ˆ ˆ en i a [c ˆ Sj (2) rock-tarns, (3) moraine-tarns, (4) lakes

of the plains.

1 . Glen lakes are those which occupy portions of glens. They are depressions in the valleys, not due to local heaping up of detritus, but true rock-basins, often of great depth. Much discussion has arisen as to their mode of origin, but it is probable they were caused by the erosive action of ice, since glaciers occupied the glens where they

occur and wore down the rocks along the sides and bottom; but it is a point of difficulty in this theory whether ice could have eroded the deepest of the hollows. In any circumstances the lakes must be of recent geological date. Any such basins belonging to the time of the folding of the crystalline schists would have been filled up and effaced long ago. Indeed, so rapid is the infilling by the torrents which sweep down detritus from the surrounding heights that even the existing lakes are visibly diminishing. Glen lakes are almost wholly confined to the western half of the Highlands, where they form the largest sheets of fresh water. Hardly any lakes are to be seen east of a line drawn from Inverness to Perth. West of that line, however, they abound in both the longitudinal and the trans- verse valleys. The most remarkable line of them is that which fills up much of the Great Glen, Loch Ness being the largest. Other im- portant longitudinal lakes are Lochs Tay, Awe, Ericht and Shiel. The most picturesque glen lakes, however, lie in transverse valleys, which being cut across the strike of the rocks present greater variety and, usually, abruptness of outline. Lochs Lomond, Katrine and Lubnaig in the southern Highlands, and Lochs Maree and More in the north, are conspicuous examples.

2. Rock-tarns are small lakes lying in rock-basins on the sides of mountains or the summits of ridges, and on rocky plateaus or plains. Unlike glen lakes, they have no necessary dependence upon lines of valley, but are scattered as it were broadcast, and are by far the most abundant of the Scottish lakes. Dispersed over all parts of the western Highlands, they are most numerous in the north-west, especially in the Outer Hebrides and in the west of the shires of Ross and Cromarty and Sutherland, where the surface of the Archean gneiss is so thickly sprinkled with them that many tracts consist nearly as much of water as of land. They almost invariably lie on strongly ice-worn platforms of rock, and are obviously hollows produced by

3. Moraine-tarns — small sheets of water ponded back by some of the last moraines shed by the retreating glaciers — are confined to the more mountainous tracts. Among the Southern Uplands the best-known and one of the most picturesque is the wild and lonely Loch Skene, lying in a recess of Whitecoomb at the head of Moffat Water. Others are sprinkled over the higher parts of the valleys in Galloway. None occurs in the Central Plain. In the Highlands they may be counted by hundreds, nestling in the bottoms of the corries. In the north-western counties, where the glaciers continued longest to descend to the sea-level, lakes retained by moraine-barriers may be found very little above the sea.

4. The Lakes of the Plains lie in hollows of the glacial detritus which is strewn so thickly over the lower grounds. As these hollows were caused by original irregular deposition rather than by erosion, they have no intimate relation to the present drainage-lines. The lakes vary in size from mere pools to sheets of water several square miles in area. As a rule they are shallow in proportion to their extent and surface. They were once more numerous than they are now, but some have disappeared through natural causes and others have been drained. The largest sheets of fresh water in the Low- lands are lakes of the plains as Loch Leven and the Lake of Menteith.

The eastern and western seaboards present a singular contrast. The eastern is indented by a series of broad arms of the sea — the firths of Forth and Tay, Moray and Dornoch firths — but is otherwise relatively unbroken. The land slopes gently to the sea or to the

Coast- line.

edge of cliffs that nave been cut back by the waves. The shores are for the most part low, with few islands in front of them, and culti- vation comes down almost to the tide-line. The western side, on the contrary, is from end to end intersected with long narrow sea lochs or fjords. The land shelves down rapidly into the sea and is fronted by chains and groups of islands. The explanation of this contrast must be sought in geological structure. The west side, as we have seen, has been more deeply eroded than the eastern. The glens are more numerous there and on the whole deeper and narrower. Many of them are prolonged under the sea; in other words, the narrow deep fjords are seaward con- tinuations of the glens. The presence of the sea in these fjords is an accident. If they could be raised out of the sea they would become glens, with lakes filling their deeper portions. That this has been their history hardly admits of question. They are submerged land- valleys, and as they run down the whole western coast they show that this side has subsided to a considerable depth beneath its former level. The Scottish sea lochs must be considered in connexion with those of western Ireland and Norway. The whole of this north- western coast-line of Europe bears witness to recent submergence. The bed of the North Sea, which at no distant date in geological history was a land surface across which plants and animals migrated freely into Great Britain, sank beneath the sea- level, while the Atlantic advanced upon the western margin of the continent and filled the seaward ends of what had previously been valleys open to the sun. In this view the Outer and Inner Hebrides were formerly one with themselves and the mainland, and the western isles therefore are truly grouped with the Highland province

of Scotland. Nearly the whole coast-line is rocky. On the east indeed, the shores of the estuaries are generally low, but the land between the mouths of these inlets is more or less precipitous. On the west the coast is mostly either a steep rocky declivity or a sea-wall, though strips of lower ground are found in the bays. The cliffs vary in character according to the nature of the rock. At Cape Wrath, precipices 300 ft. high have been cut out of the Archean gneiss. The varying texture of this rock, its irregular foliation and jointing, and its ramifying veins of pegmatite give it very unequal powers of resistance. Here it projects in irregular bastions and buttresses, there retires into deep recesses and tunnels, but shows everywhere a ruggedness of aspect eminently characteristic. In striking contrast to these precipices are those of the Cambrian red sandstone a few miles to the east. Vast vertical walls of rock shoot up to a height of 600 ft., cut by their perpendicular joints into quadrangular piers and projections; some of which stand out alone as cathedral-like islets in front of the main cliff. The sombre colouring is relieved by vegetation along the edges of the nearly flat beds which project like great cornices and serve as nesting-places for sea-fowl. On the west the most notable cliffs south of those of Cape Wrath and the Cambrian sandstones of Sutherland are to be found among the basaltic islands, particularly in Skye, where a magnificent range of precipices rising to 1000 ft. bounds the western coast-line. However, the highest cliffs are found among the Shetland and Orkney Islands. The sea-wall of Foula, in Shetland, and the western front of Hoy, in Orkney, rise like walls to heights of 1100 or 1200 ft. Caithness is one wide moor, terminating almost everywhere seaward in a range of precipices of Old Red Sandstone. Along the eastern coast most of the cliffs are formed of rocks belonging to this formation. Beginning at Stonehaven, an almost unbroken line of precipice varying up to 200 ft. in height runs to the mouth of the estuary of the Tay. On the east the Southern Uplands plunge abruptly into the sea near St Abb's Head in a noble range of precipices 300 to 500 ft. in height, and on the west terminate in a long broken line of sea-wall, which begins at the mouth of Loch Ryan, extends to the Mull of Galloway, and reappears again in the southern headlands of Wigtown and Kirkcudbright. Among the most picturesque features of Scottish sea-cliffs are the numerous stacks or columns of rock which during the demolition and cutting- back of the precipices have been isolated and left standing amidst the waves. These remnants attain their most colossal size and height on the cliffs of Old Red Sandstone. Thus the Old Man of Hoy in Orkney is a huge column of yellow sandstone between 400 and 500 ft. high, forming a conspicuous landmark in the north. The coa,st of Caithness abounds in outstanding pillars and

obelisks of flagstone. The low shores on the west coast are frequently occupied by sand- dunes, as on the western margin of North and South Uist, and in many bays from the north of Sutherland to the coast of Ayrshire. They are more abundant on the east coast, however, especially on the shores of Aberdeenshire, between the mouths of the two Esks in Forfarshire, on both sides of the mouth of the Firth of Tay, and at various places on the Firth of Forth. Raised sea-beaches likewise play a part in the coast scenery. These alluvial terraces form a strip of low fertile land between the edge of the sea and the rising ground of the interior, and among the western fjords sometimes supply the only arable soil in their neighbourhood, their flat green surfaces presenting a strong contrast to the brown and barren moors that rise from them. Most of the seaport towns stand upon platforms of raised beach. Considerable deposits of mud, silt and sand are ac- cumulating in many of the estuaries. In the Tay, Forth and Clyde, where important harbours are situated, great expense is involved in constantly dredging to remove the sediment continually brought down from the land and carried backwards and forwards by the tides.

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SCOTLAND

[GEOLOGY

While no islands except mere solitary rocks like May Island, the Bass Rock and Inchkeith diversify the eastern seaboard, the western presents a vast number, varying from such extensive tracts as Skye to the smallest stack or skerry. Looked at in the broadest way, these numerous islands may be regarded as belonging to two groups or series, the Outer and the Inner Hebrides. In the Outer Hebrides most of the ground is low, rocky and plentifully dotted over with lakes; but it rises into mountainous heights in Harris, some of the summits attaining elevations of 2000 ft. The general trend of this long belt of islands is north-north-east. The Inner Hebrides form a much less definite group. They may be regarded as beginning with the Shiant Isles in the Minch and stretching to the southern head- lands of I slay, and their irregularity has no doubt been chiefly brought about by the remarkable diversity of geological structure. Archean gneiss, Cambrian sandstone, Silurian quartzite, limestone and schist, Jurassic sandstone and limestone. Cretaceous sandstone, and Tertiary basalts, gabbros, and granitic rocks all enter into the com- position of the islands.

Influence of Topography. — The influence of the topography of the country on the history of its inhabitants has been all-important. How powerfully the configuration affects the climate is shown in the remarkable difference between the rainfall of the mountainous west and of the lowland east. This difference has necessarily modified the character and employment of the people, leading to the culti- vation of the soil on the one side and the raising of sheep and cattle on the other. The fertile low grounds on the east have offered facilities for the invasions of Romans, Norsemen and English, while the mountain fastnesses of the interior and the west have served as secure retreats for the older Celtic population. While, therefore, Teutonic people have spread over the one area, the earlier race has to this day maintained its ground in the other. Not only external con- figuration but geological structure also has profoundly influenced the progress of the inhabitants. In the Highlands no mineral wealth has been discovered to stimulate the industry of the natives or to attract labour and capital. These tracts remain still, as of old, sparsely inhabited and given over to the breeding of stock and the pursuit of game. In the Lowlands, on the other hand, rich stores of coal, iron, lime and other minerals have been found. The coal-fields have gradually drawn to them an ever-increasing share of the population. Villages and towns have suddenly developed and rapidly increased in size. Manufactures and shipbuilding have grown and commerce has advanced with accelerated pace. Other influences have of course contributed largely to the development of the country, but among them all the chief place must be assigned to that fortunate geological structure which, amid the revolutions of the past, has preserved in the centre of Scotland those fields of coal and ironstone which are the foundations of the national industry.

Geology.

Archean Rocks.— The oldest rocks of Scotland and of the British Isles are known, from their antiquity, as Archean, and consist chiefly of gneiss (called Fundamental, as lying at the foundation of the geological structure of the country, and Lewisian and Hebridean, because it is well developed in the island of Harris and the Outer Hebrides), which varies from a coarsely crystalline granitoid mass to fine schist. The coarse varieties are most abundant, intermingled with bands of hornblende-rock, hornblende-schist, pegmatite, eucrite, mica-schist, sericite-schist and other schistose accompaniments. In a few places limestone has been observed. No trace of any organism has ever been detected in any of these rocks. Over wide areas, particularly on the mainland, the bands of gneiss have a general north-west trend and undulate in frequent plications with variable

inclination to north-east and south-west. The largest tract of Archean rock is that which forms almost the whole of the Outer Hebrides, from Barra Head to the Butt of Lewis. Other areas more or less widely separated from each other run down the western parts of the shires of Sutherland and Ross and Cromarty, and are probably continued at least as far as the island of Rum.

Eastern or Younger Schists. — The central, southern and eastern Highlands are occupied by metamorphosed sedimentary and igneous rocks, to which has been provisionally assigned the name of Dalradian, from the old Celtic kingdom of Dalriada. Their true stratigraphical position has not yet been ascertained, and it may appear that more than one group of rocks is included in the series. Eastward of the Archean gneiss in the west of Sutherland the effect of enormous underground pressure has been to upraise masses of the ancient gneiss and Torridonian sandstone and thrust them westward over the younger rocks. It is not possible to say what was the original character of many of the disrupted materials, for they have been rearranged and re-crystallized into granulitic, flaggy gneisses and schists (Moine schists). They extend from the north-east of Sutherland as far south as the Sound of Mull. To the east of the dislocation of the Great Glen these puzzling rocks may also be met with, though in that tract most of the surface comprises sedimentary and igneous rocks, the metamorphism of which has varied much. Immense sheets of dolerite, gabbro, or allied basic rocks indicate eruptive materials intruded as sills or poured out as lavas contemporaneously with the sedimentary formations among which they lie. On the other hand, there occur bands of conglomerate, pebbly grit, quartzite,

graphitic shale and limestone in a certain ordered sequence and over a wide area. Traces of annelids have been detected in some of the quartzites, and some of the less changed parts of the limestones may be searched for fossils. This great series of metamorphic rocks, the geological age of which is still unsettled, has had a powerful effect on the scenery, especially along the Highland line. Where a thick group of coarse hard grits intercalated in the sedimentary rocks crops out it rises into a chain of lofty rugged hills, of which Ben Ledi and Ben Vorlich are examples. The slate hills, weathering more readily,

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assume gentle slopes and rounded ridges, as in the high land from Holy Loch to the Kyles of Bute. The quartzites rise in conical hills, such as those of Jura and Islay. And to the soil created by the decay of the limestones is due a greener verdure than that of the surround-

ing moors.

Torridonian Sandstone. — Above the Archean gneiss lies a series of red and chocolate-coloured sandstone (Torridon sandstone), which form a number of detached areas from Cape Wrath down the sea-board of the shires of Sutherland and Ross and Cromarty, across Skye, and as far as the island of Rum. They rise into prominent pyramidal mountains, which, as the stratification is usually, almost horizontal, present in their terraced sides a singular contrast tothe neighbouring heights, composed of highly plicated crystalline schists. In the Torridon district they can be seen towering bed above bed to a height of about 4000 ft., but they must be at least 10,000 ft. thick. They are not met with anywhere else in Scotland. Traces of annelids and probably other organisms have been found in the bands of_ shale occurring in the south-west of the shire of Ross and Cromarty, in the isle of Raasay, and at Cailleach Head, and are the oldest relics of animal life yet found in Great Britain.

Cambrian. — In the north-western Highlands masses of white quartzite, resting unconformably in Torridonian sandstone, run from Loch Eriboll to Skye, forming in places great conical hills and some-

times capping isolated mountains of red Torridon sandstone. They constitute the lowest group of the most interesting series of strata in the Highlands, and yield a large number of fossils. In descending order they embrace the following subdivisions, whose thickness in the district of Durness is estimated at about 2000 ft. : (e) limestones, dolomites and cherts, with numerous organic remains; (d) grit and ljuartzite, with Saltarella and Olenellus (Serpulite Grit) ; (c) calcare-sus shales and dolomites, with many annelid casts and sometimes Olenellus (Fucoid Beds) ; (b) Upper Quartzite, often crowded with annelid pipes (Pipe Rock Quartzite) ; (a) Lower Quartzite — their original upper limit can nowhere be seen, for they have been over-ridden by the Eastern Schists in those gigantic underground dis-turbances already referred to, by which these rocks, the Archean gneiss and Torridonian sandstone, were crumpled, inverted, dis-located and thrust over each other. The quartzites themselves have also been subjected to extraordinary horizontal displacement, amounting in places to not less than 10 m. The rocks overlying them

to the east of the line of disturbance in the shires of Sutherland and Ross and Cromarty are fine flaggy schists. The Cambrian system — • including the Upper (Durness-Eriboll Limestone) and the Lower (Serpulite grit, Fucoid Beds, Quartzite) — forms a narrow band which can be traced for 100 m. from the north coast of Sutherland to Skye. Rocks of Cambrian age have not been identified elsewhere in Scotland, though it may ultimately be shown that the quartzites and limestones of the Central Highlands are equivalents of those of the north-west coast.

Ordovician and Silurian.— In the Southern Uplands a great de velopment of Ordovician and Silurian rocks is found. In that belt they consist mostly of greywacke, grit, shale and other sedimentary rocks, but in the southwest of Ayrshire they include some thick lenticular bands of limestone. They have been thrown into many folds, the long axes of which run in a general north-easterly direction. It is this structure which has determined the trend of the southern Uplands. The plications of the Highlands and the chief dislocations of the country have followed the same general direction, and hence the parallelism and north-easterly trend of the main topographical features. Abundant fossils (grapholites principally) in certain parts of these rocks have shown that representatives of both the Ordovician and Upper divisions are present. By far the larger part of the Up- lands belongs to the former. The Upper Silurian shales and sand- stones appear only along the northern and southern margins. The coast on both sides of the country shows good sections of the rocks, the Berwickshire cliffs being particularly fine. Those of Ayrshire and Galloway are lower and more accessible, and permit of study of the plication of the strata. Among the best localities for fossils are Moffat Water, in Dumfriesshire, for graptolites, and the Pentlands, in Midlothian. Balmae, on the southern shore of Kirkcudbrightshire, the coast south of Girvan and the limestone quarries of the Stinchar and Girvan valleys, in Ayrshire, for shells, trilobites, corals, &c.

Old Red Sandstone. — Scotland is the typical European region for the deposits classed as Old Red Sandstone. These rocks are grouped in two divisions, Lower and Upper, both of which appear to have been deposited in lakes. The Lower, with its abundant intercalated lavas and tuffs, extends continuously as a broad belt along the northern margin of the Central Plain, reappears in detached tracts along the southern border, is found again on the south side of the Uplands in Berwickshire and the Cheviot Hills, occupies a tract of Lome (Oban and the vicinity) in Argyllshire, and on the north side of the Highlands underlies most of the low ground on both sides of the

Moray Firth, stretches across Caithness and through nearly the whole of the Orkney Islands, and is prolonged into Shetland. The Upper Old Red Sandstone covers a more restricted space in most of the areas just mentioned, its chief development being on the flanks of the north-eastern part of the Southern Uplands, where it spreads out over the Lammermuir Hills and the valleys of Berwick- shire and Roxburghshire. The Lower Old Red Sandstone is ri,ch in remains of plants and fishes, notably in the flagstones of Caithness, Orkney and Forfarshire. The volcanic rocks of this division form ranges of hills in the Lowlands, such as the Pentlands, Ochils and Sidlaws. They have in some places a thickness of 7000 ft. The lavas are usually porphyrites, which occur in sheets, with intercalated bands of volcanic tuff that are sometimes strongly felsitic. One of the vents by which such materials were ejected occurs in the Braid Hills on the south side of Edinburgh. Fossils are less common in the Upper Old Red Sandstone, though they are found — particularly fishes — in large numbers in certain spots, as at Dura Den, near Cupar-Fife. Traces of contemporaneous volcanic action exist in the Orcadian island of Hoy.

Carboniferous. — The areas occupied by Carboniferous rocks are almost entirely restricted to the Central Plain or Lowlands, but they are also found skirting the Southern Uplands from the mouth of the Tweed to that of the Nith. In the basins of the Forth and Clyde the following subdivisions are well marked: (5) Upper Red Sandstone scries (red and grey sandstones, fireclays, shales, marls) ; (4) Coal Measures (white and grey sandstones, dark shales, fireclays, coal seams, ironstones) ; (3) Millstone Grit (massive sandstones and grits, with fireclays, thin limestones and coal) ; (2) Carboniferous Lime-stone series — (c) sandstones and shales, with three or more seams of limestone; (b) sandstones, shales, coals and ironstones, but with no limestone bands; (a) sandstones, shales, fireclays, coals and iron-

stones, with thin limestones towards the top and the Hurlet (Renfrew- shire) limestone at the bottom; (1) Calciferous Sandstone series — (6) Upper or Cement Stone group, consisting of white and grey sandstones (of which the city of Edinburgh was built), black shales, thin limestones (Burdiehouse, near Edinburgh), and occasional coal seams; (a) Lower Red Sandstone group, with reddish and greenish marls and shales, passing down with the Upper Old Red Sandstone. The coal-fields contain two main groups of seams, the lower in the middle section of the Carboniferous Limestone, and the upper in the Coal Measures. The thin seams of the Calciferous Sandstone are not workable, but the bituminous shales in the Firth of

Forth basin are largely worked for the manufacture of mineral oil. The plant-life of the Carboniferous was exceedingly luxuriant and varied, and the system is rich also in fossils of fishes, crustaceans, mollusca, insects and other forms of animal life. There was great volcanic activity during the deposition of the Calciferous Sandstone, Carboniferous Limestone and Millstone Grit series. The two leading types of volcanic areas are the plateaus, in which sheets of porphyrites, basalts and even trachytes were emitted, sometimes with wide discharge of volcanic ashes, and the puys, or isolated vents, or scattered groups of vents, which discharged comparatively a small amount of lava and ashes. The Campsie, Kilpatrick and Dumbarton hills, the high ground from Greenock to Ardrossan, and the Carleton Hills in East Lothian are examples of the plateaus, while Arthur's Seat in Edinburgh and the Binn of Burntisland illustrate the puys. Most of the hills and crags in the Carboniferous area are volcanic, and many of them — such as the castle rocks of Edinburgh and Stirling, Binny . Craig in Linlithgowshire, North Berwick Law and the Bass Rock- mark the sites of actual events of eruption.

Permian. — Rocks assignable to the Permian system occupy only a few small areas in Scotland. They fill up the valley of the Nith for a few miles north of Dumfries, and, reappearing again in the same valley a little farther north, run up the narrow valley of the Carron to the Lowther Hills. Other detached tracts cover a considerable space in Annandale, one of them ascending the deep defile, known as the Devil's Beef Tub, at the head of that valley. Another isolated patch occurs among the Lead Hills; and lastly, a considerable space in the heart of the Ayrshire coal-field is occupied by Permian rocks. Throughout these separate basins the prevailing rock is a red sandstone, varied in the narrow valleys with intercalated masses of breccia. There can be no doubt that the valleys in which these patches of red rocks lie already existed in Permian time. They seem then to have been occupied by small lakes or inlets, not unlike fjords. Numerous amphibian tracks have been found in the red sandstone of Annandale and also near Dumfries, but no other traces of the life of the time. One of the most interesting features of the Scottish development of the Permian system is the occurrence of intercalated bands of contemporaneously erupted volcanic rocks in the Carron, Nithsdale and Ayrshire. The actual vents which were the sites of the small volcanoes still remain distinct, and the erupted lavas form high ground in the middle of Ayrshire.

Triassic. — The Triassic system is only feebly represented. The largest tract occurs in the south of Dumfriesshire between Annan and the head of the Solway Firth. To this division are assigned the yellow

sandstones of Elgin, which have yielded crocodilian and other reptilian remains, the discovery of which led to ,the rocks being separated from the Upper Old Red Sandstone, to which they had previously been thought to belong. There occur also below the Lias on some parts of the west coast unfossiliferous red sandstones, conglomerates and breccias, presenting lithological resemblance to the Rhaetic group of England. Such strata are well seen in the isle of Raasay and near Heast in Skye. Red sandstones and conglomerates, probably of the same age, attain a thickness of several hundred feet at Gruinard Bay on the west coast of the county of Ross and Cromarty. On the east side of Scotland, where so many fragments of the Secondary rocks occur as boulders in the glacial deposits, a large mass of strata was formerly exposed at Linksfield to the north of Elgin, containing fossils which appear to show it to belong to the Rhaetic beds at the top of the Trias. But it was not in place, and was probably a mass transported by ice. Rhaetic strata no doubt exist in situ at no great distance under the North Sea.

Jurassic. — The Jurassic system— comprising, in descending order, the subdivisions of Upper Oolites (Portlandian Kimmeridge Clay), Middle Oolites (coal limestones _; Oxford clay), Lower Oolites (Great Oolite series; Inferior Oolite series), Lias (Upper, Middle, Lower)— is well represented on both sides of the Highlands. Along the east coast of Sutherland good sections are exposed showing the succession of strata. Among these the Lower and Middle Lias can be identified by their fossils. The Lower Oolite is distinguished by the occurrence in it of some coal-seams, one of which, 35 ft. in thickness, has been worked at Brora. The Middle Oolite consists mostly of sandstones with bands of shale and limestones, and includes fossils which indicate the English horizons from the Kellaways Rock up to the Coral Rag. The lower part of the Kimmeridge Clay is probably represented by sandstones and conglomerates, forming the highest beds of the series in Sutherland. On the west side of the Highlands Jurassic rocks arc found in many detached areas from the Shiant Isles to the southern shores of Mull. Over much of this region they owe their preservation largely to the mass of lavas poured over them in Tertiary time. They have been uncovered, indeed, only at a comparatively recent

geological date. They comprise a consecutive series of deposits from the bottom of the Lias up to the Oxford Clay. The Lower, Middle and Upper Lias consist chiefly of shales and shelly limestones, with some sandstones, well seen along the shores of Broadford Bay in Skye and in some of the adjacent islands. The Lower Oolites are made up of sandstones and shales with some limestones, and are overlaid by several hundred feet of an estuarine series of deposits consisting chiefly of thick white sandstones, below and above which lie shales and shelly limestones. These rocks form a prominent feature underneath the basalt terraces of the east side of Skye, Raasay and Eigg. They form the highest members of the Jurassic series, representing probably some part of the Oxford Clay. The next Secondary rocks (Cretaceous) succeed them unconformably.

Cretaceous. — Rocks belonging to the Cretaceous system at one time covered considerable areas on both sides of the Highlands, but they have been entirely stripped off the eastern side, while on the western they have been reduced to a few fragmentary patches, which have survived because of the overlying sheets of basalt that have protected them. Some greenish sandstones containing recog- nizable and characteristic fossils are the equivalents of the Upper Greensand of the south of England. These rocks are found on the south and west coasts of Mull and on the west coast of Argyllshire. They are covered by white sandstones and these by white chalk and marly beds, which represent the Upper Chalk of England. Their existence under the basalt outlier of Ben Iadain in Morven, at a height of 1600 ft. above the sea, shows notably how extensively they have been denuded, but also over how large a portion of the Western Highland seaboard they may have spread. They are a prolongation of the Cretaceous deposits of Antrim (Ireland). Enormous numbers of flints and also less abundant fragments of chalk are found in glacial deposits bordering the Moray Firth. These transported relics show that the Chalk must once have been in place at no great distance, if indeed it did not actually occupy part of Aberdeenshire and the neighbouring counties.

Older Tertiary. — Above the highest Secondary rocks on the west coast come terraced plateaus of basalt, which spread out over wide areas in Skye, Eigg, Mull and Morven, and form most of the smaller islets of the chain of the Inner Hebrides. These plateaus are composed of nearly horizontal sheets of basalt — columnar, amorphous or amygdaloidal — which, in Ben More, in Mull, attain a thickness of more than 3000 ft. They are prolonged southwards into Antrim, where similar basalts overlying Secondary strata cover a large territory. Occasional beds of tuff are intercalated among these lavas,

and likewise seams of fine clay or shale which have preserved the remains of numerous land-plants. The presence of these fossils indicates that the eruptions were subaerial, and a comparison of them with those elsewhere found among Older Tertiary strata shows that they probably belong to the Oligocene stage of the Tertiary series of formations, and therefore that the basalt eruptions took place in early Tertiary time. The volcanic episode to which these plateaus owe their origin was one of the most important in the geological history of Great Britain. It appears to have resembled in its main features those remarkable outpourings of basalt which have deluged so many thousand square miles of the western area of the United States. The eruptions were connected with innumerable fissures up which the basalt rose and from numerous points on which it flowed out at the surface. These fissures with the basalt that solidified in them row form the vast assemblage of dykes which cross Scotland, the north of England and the north of Ireland. That the volcanic period was a prolonged one is shown by the great denudation of the plateaus before the last eruptions took place. In the Isle of Eigg, for example, the basalts had already been deeply eroded by river-action and into the river-course a current of glassy lava (pitch-stone) flowed. Denudation has continued active ever since, and now, owing to greater hardness and consequent power of resistance, the glassy lava stands up as the prominent and picturesque ridge of the Scuir, while the basalts which formerly rose high above it have been worn down into terraced declivities that slope away from it to the sea. A remarkable feature in the volcanic phenomena was the disruption of the basaltic plateaus by large bosses of gabbro and of various granitoid rocks. These intrusive masses now tower into conspicuous groups of hills — the Cuillins in Skye, the mountains of Rum and Mull, and the rugged heights of Ardnamurchan.

Post- Tertiary. — Under the Post-Tertiary division come the records of the Ice Age, when Scotland was buried under sheets of ice which ground down, striated and polished the harder rocks over the whole country, and left behind them the widespread accumulation of clay, gravel and sand known as Glacial Deposits. The Till or Boulder Clay, the most universal kind of Drift — which covers much of the Lowlands to a depth sometimes of 100 ft., and along the flanks of hills reaches a height of 2000 ft. or more — was pushed along by ice radiating from different centres, evidence of which is to be seen in the direction of the striae on the rocky surface of the country as well as in the dispersion of boulders and stones from recognizable districts. Thus remains of Highland schists have been borne across the Central Plain and deposited on the northern margin of the

Southern Uplands. Above the Boulder Clay are found sands and gravels, along with perched boulders which, by their source and position, indicate the direction and thickness of the ice that carried them. Moraines of the last of the glaciers are numerous throughout the Highlands.

Recent. — The youngest formations are the raised beaches — consisting sometimes of ledges cut in the rock, as on Lismore and other parts of Loch Linnhe, and sometimes of heaped-up beds of sand and gravel — river terraces, lake deposits, peat-mosses, tracts of blown sand — notably seen in the dunes of Culbin, Rattray Head, Aberdeen, Montrose and Tents Muir on the east coast, and at Stevenston, Troon, Ayr, Glenluce and along North and South Uist on the west. These are related to the present configuration of the land and contain remains of plants and animals still living on its surface. (A. Ge. ; J. A. M.)

Climate

In considering the climate of Scotland the first place must be assigned to the temperature of various districts during the months of the year, since this, and not the mean temperature of the whole year, gives the chief characteristics of climate. Thus, while the annual temperatures of the west and east coasts are nearly equal, the summer and winter temperatures are very different. At Portree (on the east coast of Skye) the mean temperatures of January and July are 39° and 56-8° F., whereas at Perth they are 37‘5° and 59-0 . The prominent feature of the isotherms of the winter months is their north and south direction, thus pointing not to the sun but to the warm waters of the Atlantic as the more powerful influence in determining the climate at this season through the agency of the prevailing westerly winds. In exceptionally cold seasons the ocean protects all places in its more immediate neighbourhood against the severe frosts which occur in inland situations. While this influence of the ocean is felt at all seasons, it is most strikingly seen in winter and is more decided in proportion as the locality is surrounded by the warm waters of the Atlantic. The influence of the North Sea is similarly apparent, but in a less degree. Along the whole of the eastern coast, from the Pentland Firth southwards, temperature is higher than what is found a little inland. In summer, everywhere, latitude for latitude, temperature is lower in the west than in the east and inland situations, but in winter the inland climates are the colder. The course of the isothermal lines in summer is very instructive. Thus the line of 59 passes from the Solway directly northwards to the north of Perthshire and thence curves round east-

ward to near Stonehaven. From Teviotdale to the Grampians temperature falls only one degree ; but for the same distance farther northwards it falls three degrees. The isothermal of 56 marks off the districts where the finer cereals can be successfully raised. This distribution of the temperature shows that the influence of the Atlantic in moderating the heat of summer is very great and is felt a long way into the interior of the country. On the other hand, the high lands of western districts by robbing the westerly winds of their moisture, and thus clearing the skies of eastern districts, exercise an equally striking effect in the opposite direction — in raising the temperature.

There is nearly twice as much wind from the south-west as from the north-east, but the proportions vary greatly in different months. The south-west prevails from July to October, and again from December to February; accordingly in these months the rainfall is heaviest. These are the summer and winter portions of the year, and an important result of the prevalence of these winds, with their accompanying rains, which are coincident with the annual extremes of temperature, is to imprint a more strictly insular character on the climate, by moderating the heat of summer and the cold of winter. The north-east winds acquire their greatest frequency from March to June and in November, which are accordingly the driest portions of the year.

The mountainous regions are mostly massed in the west and lie generally north and south, or approximately facing the rain-bringing winds from the Atlantic. Thus the climates of the west are essentially wet. On the other hand, the climates of the east are dry, because the surface is lower and more level; and the breezes borne thither from the west, being robbed of most of their superabundant moisture in crossing the western hills, are drier and precipitate a greatly diminished rainfall. It thus happens that the driest climates in the east are those which have to south-westwards the broadest extent of mountainous ground, and that the wettest eastern climates are those which are least protected by high lands on the west. The breakdown of the watershed between the Firths of Clyde and Forth exposes southern Perthshire, the counties of Clackmannan and Kinross, and nearly the whole of Fife to the clouds and rains of the west, and their climates are consequently wetter than those of any others of the eastern slopes of the country. The driest climates of the east are in Tweeddale about Kelso and Jedburgh, the low grounds of East Lothian, and those on the Moray Firth from Elgin round to Dornoch. In these districts the annual rainfall averages 26 in., whereas over extensive breadths in the west it exceeds 1 00 in., in Glencroe being

nearly 130 in., and on the top of Ben Nevis it may reach 150 in.

II. Economic Conditions, &c. Population. — At the end of the 15th century it is conjectured that the population of Scotland did not exceed 500,000 — Edinburgh having about 20,000 inhabitants, Perth about 9000, and Aberdeen, Dundee and St Andrews about 4000 each. By the Union with England (1707) the population is supposed to

POPULATION]

SCOTLAND

ˆ19

have grown to 1,000,000. In 1755, according to the returns furnished by the clergy to the Rev. Dr Alexander Webster (1 707-1 784), minister of the Tron Kirk, Edinburgh — who had been commissioned by Lord President Dundas to prepare a census for government,ˆit was 1,265,380. At the first govern- ment census (1801) it had reached 1,608,420. The increase at succeeding decades has been continuous though fluctuating in amount, and in 1901 the population amounted to 4,472,103 (females, 2,298,348). In 1902 the Registrar- General for Scotland calculated that if the rate of increase (11-09%) manifest during 1891-1901 were uniformly maintained, the population would double itself in the course of about 66 years. Table I. — Area and Population of Civil Counties in i8gi and igoi.

Population.

Pop. per

Civil Counties.

Area in

sq. m.

Acres.

1891.

1901.

1901.

I. Northern.

1. Shetland

352,889

28,711

28,166

51

2. Orkney

240,476

30,453

28,699

76

3. Caithness .

438,878

37,177

33,870

49

4. Sutherland II. North-Western.

1.297,849

21,896

21,440

11

2,330,092

118,237

112,175

31

5. Ross and

Cromarty

1.976,707

78.727

76,450

25

6. Inverness . III. North-Eastern.

2,695,037

90,121

90,104

21

4.671,744

168,848

166,554

23

7. Nairn .

103,429

9.155

9,291

57

8. Elgin (or

Moray) .

305,U9

43,471

44,800

94

9. Banff . . .

403.364

61,684

61,488

98

10. Aberdeen .

1,261,887

284,036

304,439

154

11. Kincardine IV. East Midland.

243,974

35,492

‘ 40,923

107

2,317.773

433.838

460,941

127

12. Forfar .

559.171

277.735

284,082

325

13. Perth .

1.595.774

122,185

123,283

49

14. Fife

322,844

190,365

218,840

434

15. Kinross

52,410

6,673

6,981

85

16. Clackmannan . V. West Midland.

34,927

33,140

32,029

587

2,565,126

630,098

665,215

166

17. Stirling

288,842

118,021

142,291

315

18. Dumbarton

157.433

98,014

113,865

463

19. Argvll .

1,990,471

74,085

73,642

24

20. Bute VI. South-Western.

139,658

18,404

18,787

86

2,576,404

308,524

348,585

87

21. Renfrew

153.332

2-50,812

268,-98o

1 123

22. Avr

724.523

226,386

254.468

225

23. Lanark VII. South-Eastern.

562,821

1,105,899

1.339.327

1523

1,440,676

1,563,097

1,862,775

827

24. Linlithgow

76,861

52,808

65,708

547

25. Edinburgh

234.339

434.276

488,796

1335

26. Haddington

171,011

37.377

38,665

145

27. Berwick

292,577

32,290

30,824

67

28. Peebles

222,599

14.750

15,066

43

29. Selkirk VIII. Southern.

170,762

27,712

23,356

88

1,168,149

599,213

662,415

363

30. Roxburgh .

426,060

53.5O0

48,804

73

31. Dumfries

686,302

74.245

72,571

68

32. Kirkcudbright

575,565

39.985

39,383

44

33. Wigtown .

311,609

36,062

32,685

67

Grand Total

1.999.536

203,792

193,443

62

Scotland

19,069,500

4,025,647

4.472,103

150

In 1901 there were 150 persons to each square mile, and 4-3 acres (excluding inland waters, tidal rivers and foreshore) to each person. The distribution of population is illustrated in the preceding table, which gives the names and areas of the counties and other particulars.

In the northern, north-western and southern divisions the population declined during the decade, the fifteen counties thus affected being, in the order of decrease, beginning with the shire in which it was smallest, Inverness, Banff, Argyll, Kirkcudbright, Shetland, Sutherland, Dumfries, Ross and Cromarty, Clackmannan, Berwick, Orkney, Roxburgh, Caithness, Wigtown and Selkirk. It will thus be seen that the far north and far south alike decreased in population, the decline being largely due to physical conditions, though it need not be supposed that the limit of population was reached in either area. The most sparsely inhabited county was Sutherland, the most densely Lanark. The counties in which there was the largest increase in the decennial period — with Linlithgow first, followed by Lanark, Stirling, Renfrew, Dumbarton and thirteen others — principally belonged to the Central Plain, or Lowlands, in which, broadly stated, industries and manufactures, trade, commerce and agriculture and educational facilities have attained their highest development. In every county the population increased between 1801 and 1841, the increase being more than 10 % in each county with the exception of Argylh Perth and Sutherland. After 1841, however, the population in several Highland shires— in which the clearance of crofters to make way for deer was one of the most strongly-felt grievances among the Celtic part of the people — in the islands, and in some of the southern counties, diminished. The next table affords a comparison of the numbers of the population as grouped in towns, villages and rural districts, and in the mainland and islands.

Table II. — Population in Towns, Villages and Rural Districts, Mainland and Islands, 18 gi and igoi.

Groups.

Population.

Percentage of Pop. in each to total Pop.

1891.

1901.

1891.

1901.

Towns l . Villages 1 . Rural districts .

2,631,298 465,836 928,513

3,120,241 466,053 885,809

65-37

“•57

23-06

69-77

10-42 19-81

Total

4,025,647

4.472,103

ioo-oo

IOO-OO

Mainland . Islands .

3,865,748 159.899

4.3i6,55i

155.552

96-03

3-97

96-52 3-48

Total

4,025,647

4,472,103

100-00

IOO-OO

1 Villages have populations of from 300 to 2000 ; towns from 2000 upwards.

Table III. gives the population of towns with more than 30,000 inhabitants.

Table III. — -Population in chief

Towns in 1881, i8gi and igoi.

Town.

1881.

1891.

1901.

Glasgow ....

Edinburgh ....

Dundee .... Aberdeen .... Paisley

Greenock ....

Coatbridge .... Kilmarnock Kirkcaldy ....

Perth

Hamilton .... Motherwell

551.415 228,357

140,239 105,189 55,638 59,485 50,492 66,704 27,410 24,812 23,901 23,632 28,980

18,517 12,904

565,839 (of enlarged

area, 658,198) 261,225 (of enlarged area)

153,330

121,623

166,425

67,700

63,625

63.423 36,538 30,034 28,447

27,151 29,899 24,859 . 18,726

760,468

316,523

160,878 153,503 79,354 76,668 76,350 67,672

54,28i

36,991

34,i65

34,063 32,886 .

32,775 30,418

The burghs in which the largest proportion of Scottish-born persons lived in 1901 were Kirkcaldy (with 95-997 in every 100 of its inhabitants), Aberdeen (with 94-997), Perth (with 94-442) and Kilmarnock (with 94-046). The largest proportion of English-born were found in Edinburgh (with 5-438)_ and Leith (with 4-481).

Irish-born were most in evidence in Coatbridge (with 15-158 in every 100), Partick (with 12-05) ar »d Govan (with 11-51). Welsh nationality was most marked in Motherwell (with 0-250). Those of British-Colonial birth were most numerous in Edinburgh (with 0-933 %), a "d foreigners in Glasgow (with 0-890), Leith (with 0-741) and Hamilton (with 0-720). In addition to the 17,654 resident foreigners there were 4973 foreigners casually in Scotland at the taking of the census in 1901 (1839 men and women on board foreign and British vessels), raising the total of foreigners actually enumerated

to 22,627 (males 14,448), of whom 10,373 were of Russian nationality, 4051 of Italian, and 3232 of German.

Table IV. shows the nationalities of the people in 1891 and 1901.

Table IV. — Illustrating Nationalities in 1891 and 1901.

Where Born.

Scotland, 1891.

Scotland, 1901.

Number.

Percentage of Pop.

Number.

Percentage of Pop.

Scotland .

Ireland

England

Wales

Isle of Man and] the Channel V Islands J

British Colonies .

British born"! abroad, byl naturalization [and at sea J

Foreigners

3,698,700

184,807

108,736

2,309

927

13,607

8,051

8,510

91-63 4-84 2-70 0-06

0-02

o-39

0-20 0-21

4,o85,755

205,064

131,350

2,673

1,058 15,907 12,642 17,654

9i-36i

4-585 2-937 0-060

0-024 0-355 0-283

o-395

Total

4,025,647

100

4,472,103

100

Table V. gives the number of persons, exclusive of children under three years of age, who spoke Gaelic only, and Gaelic and English, with their percentages to the population in 1901. The counties in which the highest percentages obtained of persons speaking Gaelic only were Ross and Cromarty with 15-92% (12,171 persons) and Inverness with 13-01 % (11,722 persons). But in no fewer than eighteen counties the proportion of Gaelic-speaking persons was under 1 %.

Table VI. — Births, Deaths, Marriages and Illegitimate Births,

1861-1900.

1861-1870

(inclusive) .

1871-1880

(inclusive).

1881-1890

(inclusive).

1891-1900

(inclusive).

Births . .

Deaths

Marriages

1,120,791 706,195 224,222

1,232,311 763,948 253.550

1,251,930 743.582 259,388

1,280,044 781,860 298,664

Illegitimate births .

110,061

108,260

102,128

90,981

The counties in which the highest percentages of illegitimate births were found were Wigtown, Dumfries, Kirkcudbright and Peebles in the south ; Elgin, Banff and Aberdeen in the north-east, and Caithness in the north; the shires showing the lowest percentages were Clackmannan, Dumbarton and Shetland.

Table VII. — Birth, Death and Marriage Ratio, 1861-1900, and Percentages of Illegitimacy to total Births.

Rate.

1861-1870

(inclusive).

1871-1880

(inclusive) .

1 88 i-i 890 (inclusive).

1891-1900

(inclusive).

Birth . . Death . . Marriage

3-48 0-19 0-69

3-47 2-15 0-71

3-22 1-91

o-66

3-01 1-84 0-70

Percentages 1 of illegiti mate births V to total births J

9-81

8-79

8-15

7-n

Table V. — Showing Number of Persons aged three years and upwards speaking Gaelic only and Gaelic and English in 1901.

Vital Statistics. — In Table VI. is shown the number of births, deaths, marriages and illegitimate births for the decades ending 1870, 1880, 1890 and 1900.

Table VII. gives the percentages to the population of the births, deaths and marriages in the four decades specified, along with the ratio of illegitimacy to the total number of births in the same periods.

Occupations of the People. — Table VI 1 1, divides the people according to occupations. The most noteworthy feature in this connexion is the great diminution that took place within the intercensal period (1891-1901) in the unpro- ductive class, which to some extent accounts for the increase in the number of the industrial and commercial classes.

Poor Relief. — Before the Reformation, relief of the poor had been the duty of the Church, for early legislation aimed at suppressing rather than aiding poverty. Those, indeed, who were absolutely dependent on alms might receive a licence to beg within the bounds of their own parish, but the able- bodied poor were severely dealt with. The act of 1579 directed the magistrates in towns and the justices in rural parishes to propose a register of the aged and impotent poor and to levy a tax on the inhabitants of every parish for their support. One con- sequence of the denial of relief to the able-bodied was that the workhouse, so familiar in the English poor-law system, was not established in Scotland, though almshouses are found in many Table VIII. — Occupation of the People in 1891 and 1901.

Area.

Population.

Gaelic only.

Percentage.

Gaelic and English.

Percentage.

Scotland ....

Northern portion Southern portion

Northern division . North-western „ North-eastern ,, East-midland ,, West-midland ,, South-western ,, South-eastern ,, Southern ,,

4,472,103

28,106

0-63

202-700

4-53

1.753.470 2,718,633

27.854 252

i-59

O-OI

160,915 41.785

9-18 1-54

112,175 166,554 460,941 665,215

348,585

1.862,775

662,415

193.443

489

23.893 20

95

3.357

162

89 1

o-43

14-34

O-OI O-OI

0-96

O-OI O-OI O-OO

17,084

82,573

5.125

13,818

42,315

34,289

7,002

494

15-23

49-58

i-ii

2-06

12-14 1-84 1-06 0-26

Occupations.

Number engaged in each Class of Occupation.

Percentage engaged in each Class of Occupation.

1891.

1901.

1891.

1901.

Males.

Females.

Total.

Males.

Females.

Total.

Males.

Females.

Males.

Females.

Total occupied and~| unoccupied (aged [10 years and up- f wards) J

1,446,209

1,599,453

3,045,662

1,656,081

1,790,242

3,446,323

100-00

IOO-OO

ioo-oo

100-00

Engaged in occu- pations

Retired or unoccu- pied . . .

1,203,909 242,300

543,828 1,055,625

1.747,737 1.297,925

I,39i,i88

264,893

591,624 1,198,618

1,982,812 1,463,511

83-25 16-75

34-00 66-00

84-00 16-00

33-05 66-95

Classes.

1. Professional .

2. Domestic

3. Commercial .

4. Agriculture and

Fishing .

5. Industrial

6. Unoccupied and

non-productive

59,053 29,163

174,558

205,827 735,308

242,300

23,051

190,057

10,276

30,018 290,426

1,055,625

82,104 219,220

184,834

235,845 1,025,734

1,297,925

67,827

26,755

221,579

196,581 878,446

i 264,893

33,234

174,475

24,136

40,730 319,049

1,198,618

101,061 201,230 245,715

237.3″ 1. 197.495

1,463,511

4-08

2-02

12-07

14-23 50-85

16-75

1-44

n-88

0-64

i-88

18-16

66-00

4-10

i-6i

13-38

11-87 53-04

16-00

i-86

9-75

i-35

2-27 17-82

towns, and poorhouses, where those indigent who are alone in the world without any one to care for them find food and shelter, began to be general in the 19th century. Hence arises the prevalence of out-relief, one of the distinctive features of the Scottish poor law. The act of 1579, however, proved largely inoperative. The provision of relief passed from the justices to the ministers and kirk-sessions, who by an edict of the Privy Council, in 1692, were required to draw up a list of the poor twice a year, and rates were levied only when collections in the church " plates " were insufficient. For 150 years nothing was done to systematize poor relief, and even in 1842 about half of the parishes were yet unassessed to the poor. The total in- adequacy of the voluntary system to cope with genuine distress, in respect both of contributions and the dispensing of alms, led in 1845 to the passing of an act which made the parish the poor-relief area, substituted the parochial board for the kirk- session where recourse was had to a rate, made the appointment of inspectors of the poor and medical officers compulsory, and set up a system of central administrative control known as the Board of Supervision for the Relief of the Poor, with headquarters in Edinburgh. The act did not provide for compulsory assess- ment, but this was virtually accomplished by the vigilance of the Board, which demanded of local authorities increased care and more liberal relief, with the result that in 1894 only 46 out of 848 parishes remained unassessed. In this year a change in the governing body was affected, the Local Government Board for Scotland being constituted and replacing the Board of Super- vision, while the parochial boards made way for parish councils. As the authorities cannot give relief to those able to work, there are no casual wards in Scotland, vagrants having to pay for their night's lodging, or find it in the police station or elsewhere. Every parish has to support its own poor, that is, natives or those who have acquired a settlement by living in it for five years, but relief is given in the parish in which it is applied for, the cost being recovered from the parish of birth or settlement afterwards. For the sick poor the larger towns provide hospitals and dispensaries, besides medical attendance at the homes of the poor, while in rural districts there are cottage hospitals, village sick-rooms, and sick wards in the poorhouses. The mentally afflicted are sent to the asylum if they are

dangerous, or kept in the licensed wards of poorhouses, or, if they are harm- less or imbecile, boarded out. The expense of pauper lunacy is only partially borne by the parish. The district lunacy board (practically a joint-committee of the county and burgh councils), aided by a parliamentary grant, is charged with the provision and upkeep of- the asylums, the poor-law authorities only defraying the maintenance of their own patients. Orphan or deserted children, or the children of paupers, are boarded out and reared like ordinary children, attending the public schools and growing up without the " pauper taint."

Police. — It was not till the middle of the 19th century that a regular police force was established in Scotland. Till then dwellers in rural districts had practically to provide for their own safety as best they could, while some towns maintained a paid watch and others enrolled volunteer constables, every citizen being expected to take his turn in patrolling the streets to protect person and property. At first an adoptive act was introduced, under which the Commissioners of Supply, who then managed county business— resident landowners in possession of landed estate to the annual value of £100 — were empowered to raise a police force in the counties; but the want of common policy and initiative led in 1857 to the compulsory institution of a police force throughout the country. Burghs having a popula- tion of more than 7000 might furnish their own police, and smaller burghs were policed as part of the county to which they belonged by the standing joint-committee (composed equally of Commissioners of Supply and members of the county council), but no new police burgh the population of which was under 20,000 was to be free to police itself. All the constabulary forces, excepting the Orkney and Shetland police, are annually inspected as to efficiency and reported on to the Secretary of State for Scotland.

Education, (a) Elementary Schools. — The system of schools which prevailed till the Education Act of 1872 dated from 1696,, when the Act for Settling of Schools was passed— one of the last but not the least of the achievements of the Scots Parlia- ment — providing for the maintenance of a school in every parish by the kirk-session and heritors, with power to the Commissioners of Supply to appoint a schoolmaster in case the primary authorities made default. The schoolmaster held his office for life, co-education was the rule from the first, and the school was undenominational. The various religious secessions in Scotland led to the founding of a large number of sectarian and sub- scription schools, and at the Disruption in 1843 the Free Church made provision for the secular as well as the religious instruction of the children of its members. The Education

Act of 1872 abolished the old management of the parish schools and provided for the creation of districts (burgh, parish or group of parishes) under the control of school boards, of which there are 972 in Scotland, elected every three years by the ratepayers, male and female. Since that date the most important changes effected in the elementary education system were the abolition, in 1886, of individual inspection of the lower standards — afterwards extended to the whole of the standards, the inspectors applying a collective test, the " block-grant " system, to the efficiency of a school — and the abolition of school fees (1889) for the com- pulsory standards, the loss being made up principally by a parliamentary grant, and partly by a proportion, earmarked for the purpose, of the proceeds of the Local Taxation (Customs and Excise) Act 1890, and the Education and Local Taxation Account (Scotland) Act 1892. The capitation grant in relief of fees is at the rate of 12s., of which 10s. is furnished by the parliamentary grant and 2s. by the other sources. King's Scholars, trained at one of the training colleges, and King's Students who attend one of the universities, form the chief source of supply of certificated teachers.

(b) Secondary Schools. — Records of the existence of schools in the chief towns occur as early as the 13th century. They were under the supervision of the chancellor of each diocese, and were mainly devoted to studies preparatory for the Church. Before the Reformation schools for general education were attached to many religious houses, and in 1496 the first Scottish act was passed requiring substantial householders to send their eldest sons to school from the time they were eight or nine years old until they were " competentlie founded and have perfite Latin." In 1560 John Knox propounded in his First Book of Discipline a comprehensive scheme of education from elementary to university, but neither this proposal nor an act passed by the privy council in 16 16 for the establishment of a school in every parish was carried into effect. In several burghs grammar schools have existed from a very early date, and some of them, such as the Royal High School of Edinburgh and the High School of Glasgow, reached a high standard of proficiency. They were largely supported by the town councils, who erected the buildings, kept them in repair, and usually paid the rector's salary. By the act of 1872 their management was transferred to the school boards, and they may be conveniently classified into higher-class public schools, such as the old grammar schools and the liberally endowed schools of the Merchant Company in Edinburgh, and higher grade schools, with a few years' preparatory course for the universities, while some of the ordinary schools have earned the

grant for higher education. In 1885 the Scottish Education Department, of which the secretary for Scotland is the virtual head, was reorganized. It was separated from the English Department, and undertook the inspection of higher class schools (public, endowed and voluntary), and two years later instituted a leaving certificate examination, the pass of which is accepted for most of the university and professional authorities in lieu of their preliminary examinations. In 1898 the functions of the Science and Art Department, as far as Scotland is concerned, were transferred to the Department, which makes substantial grants for instruction in those subjects for which science and art grants were formerly paid. A Technical Schools Act, passed in 1887, was applied by a few local authorities; but in 1890 funds

were by chance made available from an unexpected source, and devoted to the purposes of technical and secondary education. Parliament had introduced a measure of public-house reform along with a scheme for compensating such houses as lost their licence. This feature was so stoutly opposed that the bill did not pass, although the chancellor of the exchequer had provided the necessary funds. Government proposed to distribute this money among local authorities and expend the balance in relief rates, but a clause was inserted in this bill giving burgh and county councils the option of spending the balance on technical education as well as in relief of rates. Advantage was largely taken of this power, and the grant came to be succinctly described as the " Residue " grant (£97,000 a year). The Department established in each county a body known as the secondary edu- cation committee, chosen by the county council and the chair- men of the school boards, which is charged with the expenditure of its share of the grant. The committee exists also in a few of the largest burghs, the members being in this case appointed by the town council, school board, and sometimes the trustees of educational endowments. In virtue of a Continuation Class code, technical and specialized education is given in day and, chiefly, evening classes in various centres, the principal being the Heriot-Watt College, Edinburgh; the Edinburgh and East of Scotland College of Agriculture; the Glasgow and West of Scot- land Technical College; the Glasgow School of Art; the Glasgow Athenaeum Commercial College; the West of Scotland Agri- cultural College; the

Dundee Technical Institute; Gray's School of Art, Aberdeen; the Edinburgh Royal Institution School of Art, and the Edinburgh School of Applied Art; but well- equipped classes are held in most of the large- towns, and several county councils maintain organizers of technical instruction. As regards agricultural education, the county is found to be in most cases too small an area for efficient organization, and consequently several counties combine to support, for instance, the East of Scotland Agricultural College— a corporation con- sisting of the agricultural department in the University, the Heriot-Watt College and the Veterinary College in Edinburgh, — the West of Scotland Agricultural College, Glasgow, and the agricultural department in Aberdeen University. The leading public schools on the English model are Trinity College, Glenalmond, Perthshire; Loretto School, Musselburgh, and Fettes College, Merchiston Castle and the Academy in Edinburgh. (c) Universities and Colleges. — There are four universities in Scotland, namely (in the order of foundation), St Andrews (141 1), Glasgow (1450), Aberdeen (1494) and Edinburgh (1582), in which are the customary faculties of arts, divinity, law, medicine and science. In 1901 Mr Andrew Carnegie gave £2,000,000 to the universities. The administration of the fund was handed over to a body of trustees, who devote the annual income (£100,000) partly to the payment of students' fees and partly to buildings, apparatus, professorships and research. The court of each university is the supreme authority in regard to finance, discipline, and the regulation of the duties of professors and lecturers. The universities are empowered to affiliate other academical institutions, and women students are admitted on an equal footing with men. Under the act of 1899 the University College of Dundee was incorporated with St Andrews University, and Queen Margaret College became a part of the university of Glasgow, the buildings and endowments, used for women students exclusively, being handed over to the University Court. St Mungo's College, Glasgow, incorporated in 1889 under a Board of Trade licence, has medicinal and law faculties, and Anderson's College Medical School, Glasgow, was instituted in 1887. These are on the same basis as the extra-mural medical schools in Edinburgh, their medical curricula qualifying for licence only and not for Scottish university degrees. The United Free Church maintains colleges at Aberdeen, Edinburgh and Glasgow, and there is a Roman Catholic college at Blairs near Aberdeen, besides a monastery and college at Fort Augustus. The Church of Scotland and the United Free Church each possess their training colleges for teachers, the Episcopal Church supports one and the Roman Catholic Church one. The Edinburgh Museum

of Science and Art has been transferred to the Scottish Education Department.

Agriculture. — Though Scotland is a country of great estates, this circumstance possesses less significance from the agricultural than from the historical standpoint. The excessive size of the properties may to some extent be accounted for by the fact that most of the surface is so mountainous and unproductive as to be unsuitable for division into smaller estates, but two other causes have also co-operated, namely, first, the wide territorial authority of such Lowland families as the Scotts and Douglases, and such Highland clans as the Campbells of Argyll and Breadalbane, and the Murrays of Athol and the duke of Sutherland; and secondly, the stricter law of entail introduced in 1685. Thus the largest estates remain in the hands of the old hereditary families. The almost absolute power formerly wielded by the landlords, who within their own territories were lords of regality, hindered independent agricultural enterprise, and it was not till after the abolition of hereditable jurisdictions in 1748 that agriculture made real progress. The Society of Improvers in the Knowledge of Agriculture, founded in 1723, ceased to exist after the rebellion of 1745, and the introduction of new and improved methods, where not the result of private energy and sagacity, was chiefly due to the Highland and Agricultural Society, established in 1784. Further stimulus was also supplied by the high prices that obtained during the Napo- leonic wars, and, in spite of periods of severe depression since then, the science of agriculture has continued to advance. The system of nineteen years' leases had proved distinctly superior to the system of yearly tenancy so general in England, although prejudicially affected by customs and conditions which, for a coasiderable time, seriously strained therelationsbetweenlandlord and tenant. But the abolition of the law of hypothec in 1879 — under which the landlord had a lien for rent upon the produce of the land, the cattle and sheep fed on it, and the live stock and implements used in husbandry— the Ground Game Act of 1880, the several Agricultural Holdings Acts, and the construction of light railways improved matters and established a better under-standing. The period of general depression which set in before 1885 was surmounted in Scotland with comparatively little trouble. A large amount of capital was lost by tenants, and a few farms were thrown here and there upon the landlords' hands, but in no district was rent extinguished or were holdings abandoned. The sub-commissioners who reported to the Royal Commission on Agriculture in 1895 found nearly everywhere a demand, sometimes competition for farms, persisting throughout the crisis. In Banff, Nairn, Elgin and

several southern counties rent reductions varied from 25 to 30%. In Perth, Fife, Forfar and Aberdeen the average was 30%; but in nearly all the counties, towards the ond at least of the period of depression, the coexistent demand and competition for farms were observ- able. In some districts in the west rents fell very little; in others, especially sheep-farming districts, the fall was very severe. In Ayrshire the figure varied from 5 to 20%; for Dumfriesshire 16% was given as a fair average, but here too the distressed farmer was compelled to admit that if he gave up his holding there were others ready to take it. Afterwards, owing to the increased attention given to stock-fattening and dairying, and to a rise in prices, farming reached a condition of equilibrium, and the most noticeable residuum of the period of depression was the large intrusion of the butcher and grazier class into the farmer class proper. Caithness-shire was declared to be the greatest sufferer by the period of depression; rents fell in that county by 30 to 50% on large farms, 20 to 30% on medium, and 10 to 60% on small farms. Nevertheless, the decline in the value of land was serious. According to the reports of the Inland Revenue Commissioners, the gross income derived from the ownership of lands in Scotland was returned in 1879-1880 at £7.769,303. After that year a continuous fall set in, and in 1901-1902 the amount returned was only £5,911,836, a drop in twenty-five years of £1,857,467. These figures refer to land, whether cultivated or not, including ornamental grounds, gardens attached to houses when exceeding one acre in extent,

teinds or tithe-rent charge commuted under the Lands Com- mutation Acts, farm-houses and farm-buildings.

The crofters of the Highlands and islands had their grievances also. During the first half of the 19th century wholesale clear- ances had been effected in many districts, and the crofters were compelled either to emigrate or to crowd into areas already congested, where, eking out a precarious living by following the fisheries, they led a hard and miserable existence. At last after agitation and discontent had become rife, government appointed a royal commission to inquire into the whole question in 1883. It reported next year, and in 1886 the Crofters' Holdings Act was passed. Amending statutes of succeeding years added to the commissioners' powers of fixing fair rents and cancelling arrears, the power of enlarging crofts and common grazings. Since then political agitation has practically died

out, though the material condition of the class has not markedly improved, except where, with government aid, crofter fishermen have been enabled to buy better boats; but in some districts, even in the island of Lewis, substantial houses have been built. After the passing of the act (1886) the Crofters' Commission in 15 years considered applications for rent and revaluation of holdings which amounted to £82,790, and fixed the fair rent at £61,233, or an annual reduction of £21,557; of arrears of rent amount- ing to £184,962 they cancelled £124,180, and also assigned 48,949 acres in enlargement of holdings. Under the Congested Districts (Scotland) Act of 1897, £35,000 a year was devoted within certain districts of Argyll, Inverness, Ross and Cromarty, Sutherland, Caithness, Orkney and Shetland, to assisting migra- tion, improving the breeds of live stock, building piers and boat- slips, making roads and bridges, developing home industries, &c.

Table IX. — Classification of Holdings above 1 Acre

423

Table X. — Acreage under Cultivation — continued.

Total Area, including Inland Water, but excluding Foreshore and Tidal Water, 19,458,728 Acres.

Crops.

Potatoes ....

Turnips and Swedes Mangold ...

Cabbage, Kohl-Rabi and Rape Vetches or Tares) Other Crops { •

Total ....

Clover, Sainfoin and Grasses under Rotation —

For Hay

Not for Hay ..'.'.'

Total

Flax

Small Fruit Bare Fallow

Average

1871-1875.

Acres.

167,880

503,709

1,748

4.656

15.828

693,821

1,338,106

731 2 1 ,669

1905.

Acres.

144,265

445.306

2,389

H,725

8,557

2,699

617,941

427,686 1.130,591

1.558,277

4 6,493 6,943

Years.

1 to 5 Acres.

5 to 50 Acres.

50 to 300 Acres.

Above 300 Acres.

No.

Acres.

No.

Acres.

No.

Acres.

No.

Acres.

1895 1903

1905

20,150 19,560 18,685

65,891 63,961

33,921 34.018

34.673

608,390 610,669

22,802 23.075 23.055

2,935,184

2,97^325

2766 2730 2718

1,284,461 1,268,843

In Table IX. will be found a classification of the holdings in 1895, 1903 and 1905. The figures show that the holdings under 50 acres constituted fully two-thirds of the total holdings and that, though no very decided alteration in the size of farms was in progress, the larger portion of the cultivated land was held in farms of between 50 and 300 acres. The average holding in 1905 was 61-7 acres.

Table X. shows the total area, the cultivated area and the area under grain crops, green crops, grasses and miscellaneous crops. Comparison between 1905 and the average for 1871-1875 clearly demonstrates the change which Scottish agriculture had undergone. I hough practically the same amount of land was brought under the

Table X. — Acreage under Cultivation.

Total Area, including Inland Water, but excluding Foreshore and Tidal Water, 19,458,728 Acres.

Crops.

Average

1871-1875.

I905-

Acres.

Acres.

Total area under Crops and Grasses. Permanent Pasture —*

For Hay

Not for Hay .

Total ....

Arable Land ....

Grain Crops —

Wheat . – .

Barley or Bere

Oats ...

Rye ….

Beans

Peas

4,560,825

4,880,985

148,342 1,302,384

1,084,983

1,450,726

3,475,842

3,430,259

122,513

252,105

1.007,339

10,480

26,746

2,332

48,641

212,134

962,972

5.598

10,346

910

Total ….

1.421,515

1,240,601

t Not separately distinguished, plough, there was a considerable fall in the acreage under grain and green crops, but this was, rather more than balanced by the increased area under grass, showing that the tendency towards the raising ot live stock has become more widespread and more pronounced Only a little more than one : f ourth of the area of Scotland is cultivated, while in England only one-fourth is left un- cultivated; but it should be borne in mind that " permanent pasture " does not include the mountainous districts, which not only form so large a proportion of the surface but also, in their heaths and natural grasses, supply a scanty herbage for sheep and cattle, 9,104,388 acres being used for grazing in 1905. Oats remain the staple grain crop, and barley, though fluctuating from year to year, is steadied by the demands of the distillers. Wheat showed a marked decline in most years from 1893 to 1904. Table XL, how- ever, shows that in most cases, even when the acreage occupied by crops is smaller, the estimated yield to the acre shows a distinct improvement, the result of enhanced skill and industry, and the Table XL — Showing Yield of Chief Crops to the Acre.

- *Not including mountain and heath land.*

Crops.

Wheat— Bushels Barley ,, Oats ,,

Beans ,, Peas ,,

Potatoes — Tons Turnips and Swedes — Tons

Estimate Total Produce.

1885.

1,893,501

8,245,820

33,407,127

709,577

37.464

803,523

6,496,189

1905.

2,065,381

8,004,446

35.277.8o7

364,818

17,108

979.541

, 7,162,794

. Average Yield to the Acre.

1885.

34 33 34-72 31-93 30-67 21-41 5-39

15-39

Average Yield to the Acre.

I9P5-

42-46

37-73 36-63 36-76 27-16 6-97

16-08

adoption of more scientific methods. In 1905 the yield of hay from clover, sainfoin and rotation grasses amounted to 666,985 tons, or 31-19 cwts. to the acre, and from permanent pasture 209,908 tons, or 28-46 cwts. to the acre, or 876,893 tons of all kinds of hay from 575,220 acres.

Table XII. shows the number of live stock in 1905, with the average for the period 1871-1875, and illustrates the extent to which farmers have turned their attention to stock in preference to crops. The cattle stock has risen steadily, and a regular increase in the number under 2 years points to the healthy state of the breeding industry. The

breeds include the Ayrshire, noted milkers and specially adapted for dairy farms (which prevail in the south-west), which in this respect have largely supplanted the Galloway in their native district; the polled Angus or Aberdeen, fair milkers, but valuable for their beef-making qualities, and on this account, as well as their hardihood, in great favour in the north-east, where cattle- feeding has been carried to perfection ; and the West Highland or Kyloe breed, a picturesque breed with long horns, shaggy coats and decided colours— black, red, dun, cream and brindle — that thrives well on v'M and healthy pasture. The special breeds of sheep art

the fine-woolled of Shetland, the blackfaced of the Highlands, the Cheviots, natives of the hills from which they are named, a favourite breed in the south, though Border Leicesters and other English

Table XII. — Illustrating Increase of Live Stock.

Stock.

Average

1871-1875.

I905-

Horses —

Used for agricultural purposes, in- cluding mares kept for breeding . Unbroken

Total

Cattle- Cows and heifers in milk or in calf . Other cattle, 2 years and above Other cattle, under 2 years

Total

Sheep —

Ewes kept for breeding Other sheep, 1 year and above Other sheep, under 1 year.

Total

Pigs

156,520 49,668

178,652

206,188

392,252 267,920 467,165

437,138 276,330 513,827

1,127,337

1,227,295

4,735,oo8

2,426,114

2,918,544 1,383,200 2,722,467

7,161,122

7,024,211

166,148

130,214

breeds, as well as a variety of crosses, are kept for winter feeding on lowland farms. The principal breeds of horses are the Shetland and Highland ponies, and the Clydesdale draught.

Orchards and Forests. — The acreage devoted to orchards rose from 1562 in 1880 to 2482 in 1905. The chief areas for tree and small fruit are Clydesdale and the Carse of Gowrie, but there are also productive orchards in the shires of Haddington, Stirling, Ayr and Roxburgh, while market-gardening has developed in the neighbourhood of the larger towns. In 1812 woods and plantations occupied 907,695 acres, of which 501,469 acres were natural woods and 406,226 planted. Within sixty years this area had declined to 734,490 acres, but with renewed attention to forestry and encouragement of planting the area had grown in 1895 to 878,675 acres; by 1905, however, the acreage was practically unchanged.

Inverness, Aberdeen and Perth are naturally the best wooded shires. The modern plantations consist mostly of Scots fir with a sprinkling of larch.

Deer Forests and Game, &c. — Deer forests in 1900 covered 2,287,297 acres, an increase of 575,405 acres since 1 883. The red deer is peculiar to the Highlands, but the fallow deer is not uncommon in the hill country of the south-western Lowlands. The grouse moors occupy an extensive area and are widely distributed. Ptarmigan and black- cock are found in many districts, partridges and pheasants are care- fully preserved, and the capercailzie, once extirpated, has been restored to some of the Highland forests. Hares and rabbits, the latter especially, are abundant. Fox-hunting is fashionable in most of the southern shires, but otter-hunting is practically extinct. The bear, wolf and beaver, once common, have long ceased to be, the last wolf having been killed, it is said, in 1680 by Sir Ewen Cameron of Lochiel. The wild cat may yet be found in the Highlands, and the polecat, ermine and pine marten still exist, the golden eagle and the white-tailed eagle haunt the wilder and more remote mountainous districts, while the other large birds of prey, like the osprey and kite, are becoming scarce. The islands, rocks and cliffs and some inland lochs are frequented in multitudes by a great variety of water-fowl.

Fisheries. — The Scottish seaboard is divided for administrative purposes into twenty-seven fishery districts, namely, on the east coast, Eyemouth, Leith, Anstruther, Montrose, Stonehaven, Aberdeen, Peterhead, Fraserburgh, Banff, Buckie, Findhorn, Cromarty, Helmsdale, Lybster, Wick (15); on the north, Orkney, Shetland (2) ; on the west, Stornoway, Barra, Loch Broom, Loch Carron and Skye, Fort William, Campbeltown, Inverary, Rothesay, Greenock, Ballantrae (10). The whole of the fisheries are controlled by the Fishery Board for Scotland, which was established in 1882 in succession to the former Board of White Herring Fishery. In 1903 the number of fishermen directly employed in fishing was 36,162, there were 17,496 engaged in curing and preserving the fish landed, while 32,201 were employed in subsidiary industries on shore, making a total of 85,859 persons engaged in the fisheries and dependent industries. In 1905 the herring fishery yielded 5,342,777 cwts. (£l,343,o8o); in 1909, 4,541,297 cwts. The most prolific districts are Shetland in the north, Fraserburgh, Peterhead, Wick, Aberdeen and Anstruther in the east, and Stornoway in the west. The principal herring market is continental Europe, Germany and Russia being the largest consumers, and there has been a growing exportation to the United States. In 1905 the total catch of fish of all kinds (excepting

shell-fish) amounted to 7,856,310 cwts., and in 1907 (the highest recorded to IOlo), 9,018,154 cwts. (£3,149,127). The annual value of the shell-fish (lobsters, crabs, oysters, mussels, clams,

periwinkles, cockles, shrimps) is about £73,000. The weight of salmon carried by Scottish railways and steamers in 1894 was 2437 tons, and in 1903 it was 2047 tons. In 1894 the number of boxes of Scottish salmon delivered at Billingsgate market in London was 15,489, and in 1903 it was 15,103, being more than half of the salmon received then from all parts of Europe, including Irish and English consign- ments. In 1903 the Tay rentals came to £22,902, the highest then recorded. The other considerable rentals were the Dee £18,392, Tweed £15,389 and Spey £8146.

Roads. — In the 12 th century an act was passed providing that the highways between market-towns should be at least 20 ft. broad. Over the principal rivers at this early period there were bridges near the most populous places, as over the Dee near Aberdeen, the Esk at Brechin, the Tay at Perth and the Forth near Stirling. Until the 16th century, however, traffic between distant places was carried on chiefly by pack-horses. The first stage-coach in Scotland was that which ran between Edinburgh and Leith in 1610. In 1658 there was a fortnightly stage-coach between Edinburgh and London, but afterwards it would appear to have been discontinued for many years. Separate acts en- joining the justices of the peace, and afterwards along with them the commissioners of supply, to take measures for the maintenance of roads were passed in 1617, 1669, 1676 and 1686. These provisions had reference chiefly to what afterwards came to be known as " statute labour roads," intended primarily to supply a means of communication within the several parishes. They were kept in repair by the tenants and cotters, and, when their labour was not sufficient, by the landlords, who were re- quired to " stent " (assess) themselves, customs also being sometimes levied at bridges, ferries and causeways. By separate local acts the " statute labour " was in many cases replaced by a payment called " conversion money," and the General Roads Act of 1845 made the alteration universal. The Roads and Bridges (Scotland) Act of 1878 entrusted the control of the roads to royal and police burghs and in the counties to road trustees, from whom it was transferred by the Local Government Act of 1889 to county councils, the management, however, being in the hands of district committees. The Highlands had good military roads earlier than the rest of the country. The project, begun in 1725 under the direction of General George Wade, took ten years to complete, and the roads were afterwards kept in repair by an annual parliamentary grant. In the Lowlands the main

roads were constructed under the Turnpike Acts, the earliest of which was obtained in 1750. Originally they were maintained by tolls, but this method, after several counties had obtained separate acts for its abolition, was superseded in 1883 by the act of 1878.

Canals. — There are four canals in Scotland, the Caledonian, the Crinan, the Forth and Clyde and the Union, of which the Caledonian and Crinan are national property (see Caledonian Canal). The Forth and Clyde Navigation runs from Bowling on the Clyde, through the north-western part of Glasgow and through Kirkintilloch and Falkirk to Grangemouth on the Forth, a distance of 35 m. There is also a branch, 2j m. long, from Stockingfield to Port Dundas in the city of Glasgow, which is continued for the distance of 1 m. to form a junction with the Monkland canal. This last has a length of 12 \ m., and runs from the north-east of Glasgow through Coatbridge to Woodhall in the parish of Old Monkland. It was begun in 1 761 and opened for traffic in 1792. The Forth and Clyde canal was authorized in 1767 and opened from sea to sea in 1790. In 1846 its pro- prietors bought the Monkland canal, and in 1867 the combined undertaking passed into the hands of the Caledonian Railway Company. The Union canal, 31 j m. long, starts from Port Downie, on the Forth and Clyde canal near Falkirk, and runs to Port Hopetoun in Edinburgh. Begun in ˆ818 it was com- pleted in 1822, and in 1849 was vested in the Edinburgh and Glasgow Railway Company, which in turn was absorbed by the North British Railway Company in 1865. The Forth and Clyde canal has a revenue of about £120,000 a year, including receipts from the docks at Grangemouth, and the expenditure on manage- ment and maintenance is about £40,000. The Union canal earns between £2000 and £3000, and its expenditure is but little

less than its revenue. Three other canals formerly existed in Scotland. The Aberdeen canal, 181 m. long, running up the Don valley from Aberdeen to Inverurie was opened in 1807, but did not prove profitable and was ultimately sold to the Great North of Scotland Railway Company, by which it was abandoned. The Glasgow, Paisley and Johnstone canal, n m. long, was opened in 181 1 and was bought in 1869 by the Glasgow and South-Western railway, which in 1881 obtained statutory powers to abandon it as a

canal and use its site, so far as necessary, for a railway line. The Forth and Cart Junction canal was only half a mile long. It ran from the Forth and Clyde canal to the Clyde, opposite the river Cart, and was intended to allow vessels to pass direct from the east coast up that river to Paisley. The Caledonian railway, which acquired it together with the Forth and Clyde canal in 1867,- obtained powers to abandon it in 1893.

Railways. — The first railway in Scotland for which an act of parliament was obtained was that between Kilmarnock and Troon (gf m.), opened in 1812, and worked by horses. A similar railway, of which the chief source of profit was the passenger traffic, was opened between Edinburgh and Dalkeith in 1 83 1, branches being afterwards extended to Leith and Mussel- burgh. By 1840 the length of the railway lines for which bills were passed was 191J m., the capital being £3,i 22 ,i33- Th e chief companies are the Caledonian, formed in 1845; the North British, of the same date; the Glasgow and South-Western, formed by amalgamation in 1850; the Highland, formed by amalgamation in 1865; and the Great North of Scotland,

1846.

Table XIII. shows the advance in mileage, goods and passenger traffic and receipts, from both sources, since 1857.

Table XIII. — Illustrating Growth of Railway Business.

Passenger

Goods

Year.

Mileage.

Passengers.

Traffic Receipts.

Traffic Receipts.

Total.

1857

1243

H.733.503

£916,697

£1,584.781

£2,501,478

1874

2700

38,220,892

2.350,593

3,884,424

6,235.017

1884

2999

54.305.074

2,931.737

4,426,023

7.357.760

1888

3097

68,413,349

3.I63.I95

4.564.627

7,727,822

1900

3485

122,201,102

4.715.592

6,431.693

11,147,285

1905

3804

115.580,000

5,014,452

6,803,286

11,817,738

The total capital of all the Scots companies in 1888 was £114,120,110; by 1910 it exceeded £185,000,000. Since the passing of the Light Railways Act 1896, the Board of Trade has sanctioned several light railways. By 1910 the total railway mileage was 3844.

Mining Industry. — Coal and iron, generally found in con- venient proximity to each other, are the chief sources of the mineral wealth of Scotland. The principal coalfields are Lanark- shire, which yields nearly half of the total output, Fifeshire, Ayrshire, Stirlingshire and Midlothian, but coal is also mined in the counties (usually reckoned as forming part of one or other of the main fields) of Linlithgow, Haddington, Dumbarton, Clackmannan, Kinross, Dumfries, Renfrew, Argyll and Peebles, while a small quantity is obtained from the Oolite at Brora in Sutherlandshire. The earliest records concerning coalpits appear to be the charters granted, towards the end of the 12th century, to William Oldbridge of Carriden in Linlithgowshire, and in 1 291 to the abbot and convent of Dunfermline conferring the privilege of digging coal in the lands of Pittencrieff. The monks of Newbattle Abbey also dug coal at an early date from surface pits on the banks of the Esk. Aeneas Sylvius .(Pope Pius II.), who visited Scotland in the 15th century, refers to the fact that the poor received at church doors a species of stone which they burned instead of wood; and although the value of coal for smith's and artificer's work was early recognized it was not used for domestic purposes till about the close of the 16th century. In 1606 an act was passed binding

colliers to perpetual service at the works where they were employed, and they were not fully emancipated till 1 799. An act was passed in 1843 forbidding the employment of children of tender years and women in under- ground mines. In 1905 there were 492 coal and iron mines in operation, employing 109,939 hands (89,516 below ground and

20,423 above). The total output in that year amounted to 35,839,297 tons, valued at £10,369,433. The total quantity worked up to the end of 1898 was 1,514,062 tons, the quantity then remaining to work being estimated at 4,634,785,000 tons. The quantity of coal exported in 1905 from the principal Scottish ports was 7,863,511 tons, and the quantity shipped coast- wise to ports of the United Kingdom amounts annually to about 2 1 million tons in addition.

The rise of the iron industry dates from the establishment of the Carron ironworks near Falkirk in 1760, but it was the introduction of railways that gave the production of pig-iron its greatest impetus. In 1796 the quantity produced was 18,640 tons, which had only doubled in thirty -four years (37,500 tons in 1830). In 1840 this had grown to 241,000 tons, in 1845 to 475,000 tons and in 1865 to 1,164,000 tons, almost the height of its prosperity, for in 1905 the product of 101 blast furnaces only amounted to 1,375,125 tons, and in the interval there were years when the output was below one million tons. More than one-third of the iron ore (that chiefly worked being Black Band Ironstone) comes from mines which also yield coal. The iron- producing counties in the order of their output are Ayr, Lanark, Renfrew, Linlithgow, Dumbarton, Fife, Midlothian and Stirling, the first three being the most productive. In 1905 the quantity of ore raised was 832,388 tons, valued at £320,875 and yielding 249,716 tons of metal. The imports of ore in that year amounted to 1,862ˆ44 tons of the value of £1,420,379.

The oil shale industry is wholly modern and has attained to considerable magnitude since it was established (in 1851 and following years). Linlithgowshire yields nearly three-fourths of the total output, Midlothian produces nearly one-fourth, a small quantity is obtained from Lanarkshire, and there is an infinitesimal supply from Sutherland. The mineral is chiefly obtained from seams in the Calciferous Sandstone at the base of the Carboniferous rocks.

Fire-clay is produced in Lanarkshire, which yields nearly half of the total output, and Ayrshire and, less extensively, in Stirlingshire, Fifeshire, Renfrewshire, Midlothian and a few other shires. With the

exception of the counties of Orkney, Shetland, Caithness, Sutherland and Inverness, granite is quarried in every shire in Scotland, but the industry predominates in Aberdeenshire, and is of consider- able importance in Kirkcudbrightshire; limestone is quarried in half of the counties, but especially in Midlothian and Fife; large quantities of paving-stones are exported from. Caithness and Forfar- shire, and there are extensive slate quarries at Ballachulish and other places in Argyllshire, which furnishes three-fourths of the total supply. Sandstone, of which the total production in 1905 was 1,142,135 tons valued at £320,761, is quarried in nearly every county, but the industry flourishes particularly in the shires of Lanark, Dumfries, Ayr and Forfar. Lead ore occurs at Wanlockhead in Dumfriesshire and Leadhills in Lanarkshire. In 1905 there were produced 2774 tons of dressed lead ore, of the value of £25,823, yielding 2167 tons of lead in smelting and 1 1,409 oz. of silver. Gold has been found in the county of Ross and Cromarty. A small quantity of zinc is mined in Dumfriesshire and of barytes at Loch- winnoch in Renfrewshire. The precious metals were once worked at Abington in Lanarkshire and in the Ochils, and lead was mined at Tyndrum in Perthshire. In 1905 there were 66 mines apart from coal and iron, employing altogether 5329 hands, and 1 127 quarries employing 7390 persons inside the quarries and 4797 persons outside, or 12,187 in all. Alumina is treated at works near Foyers in the shire of Inverness, where abundant water power enables electricity to be generated cheaply. The Foyers installation is the largest water-power plant in the United Kingdom.

Iron and Steel.— -In 1901 the number of persons engaged in working of the raw material was 23,263, of whom 8258 were employed in steel smelting and founding, 7781 at blast furnaces in the manufacture of pig-iron, and 7224 at puddling furnaces and rolling mills. All the great iron foundries and er pneering works are situated in the Central Plain or Lowlands, in close proximity to the shipbuilding yards and coalfields, especially in the lower and part of the middle wards of Lanarkshire, in certain districts of Ayrshire and Renfrew shire, at and near Dumbarton, in south Stirlingshire and in some parts of East and Mid Lothian and Fife. In 1901 the number of persons employed in engineering and machine-making — including 24,122 ironfounders, 24,944 blacksmiths, 26,567 fitters, turners and erectors, 9767 boiler-makers and 18,618 undefined — amounted to 118,736. In miscellaneous metal trades, embracing tinplate goods, wire workers, makers of stoves, grates, ranges and fire-arms, makers of bolts, nuts, rivets, screws and staples, and those occupied in several subsidiary trades, the number of operatives in

1901 amounted to 13,200,. In the same year there were 7279 persons employed in the

making of cycles, motor cars, railway coaches and waggons and carriages and other vehicles. In the whole group of industries connected with the working in metals and the manufacture of machinery, implements and conveyances the total number of persons employed amounted in 1901 to 205,830.

Manufactures, (a) Wool and Worsted. — Although a company of wool weavers was incorporated by the town council of Edinburgh in 1475, the cloth worn by the wealthier classes down to the beginning of the 17th century was of English or French manufacture, the lower classes wearing " coarse cloth made at home," a custom still prevalent in the remoter districts of the Highlands. In 1601 seven Flemings were brought to Edinburgh to teach the manufacture of serges and broadcloth, and eight years later a company of Flemings was established in the Canongate (Edinburgh) for the manufacture of cloth under the protection of the king; but, notwithstanding also the establish- ment in 1681 of an English company for the manufacture of woollen fabrics near Haddington, the industry for long made little progress. In fact its importance dates from the introduction of machinery in the 19th century. The most important branch of the trade, that of tweeds, first began to attract attention shortly after 1830; though still having its principal seat in the district from which it takes its name, including Galashiels, Hawick, Innerleithen and Selkirk, it has extended to other towns, especially Aberdeen, Elgin, Inverness, Stirling, Bannock- burn, Dumfries and Paisley. Carpet manufacture has had its principal seat in Kilmarnock since 181 7, but is also carried on in Aberdeen, Ayr, Bannockburn, Glasgow, Paisley and else- where. Tartans are largely manufactured in Tillicoultry, Bannockburn and Kilmarnock, and shawls and plaids in several towns. Fingering and many other kinds of woollen yarns are manufactured at Alloa, the headquarters of the industry. In 1901 the number of operatives in the woollen industry (including combers and sorters, spinners, weavers and workers in other processes) amounted to 24,906. In 1850 the employed numbered

10,210.

(b) Flax, Hemp and Jute. — The manufacture of cloth from flax is of very ancient date, and towards the close of the 16th century Scottish linen cloths were largely exported to foreign countries, as well as to England. Regulations in regard to the manufacture were passed in 1641 and 1661. In a petition presented to the privy council in 1684, complaining of the severe treatment of Scotsmen selling linen in England, it was stated that 12,000 persons were engaged in the manufacture. Through the intercession of the secretary of state with the king these restrictions were removed. Further to encourage the trade it was enacted in 1686 that the bodies of all persons, excepting poor tenants and cotters, should be buried in plain linen only , spun and made within the kingdom. The act was renewed in 1693 and 1695, and in the former year another act was passed prohibiting the export of lint and permitting its import free of duty. At the time of the Union the annual amount of linen cloth manufactured in Scotland is supposed to have been about 1,500,000 yards. The Union gave a considerable impetus to the manufacture, as did also the establishment of the Board of Manufactures in 1727, which applied an annual sum of £2650 to its encouragement, and in 1729 established a colony of French Protestants in Edinburgh, on the site of the present Picardy Place, to teach the spinning and weaving of cambric. From the 1st of November 1727 to the 1st of November 1728 the amount of linen cloth stamped wa' 2,183,978 yds., valued at £103,312, but for the year ending the 1st of November 1822, when the regulations as to the inspection and stamping of linen ceased, it had increased to 36,268,530 yds., valued at £1,396,296. The counties in which the manufacture is now most largely carried on are Forfar, Perth, Fife and Aberdeen, but Renfrew, Lanark, Edinburgh and Ayr are also extensively associated with it. Dundee is the principal seat of the coarser fabrics, Dunfermline of the table and other finer linens, while Paisley is widely known for its sewing threads. The allied industry of jute is the staple industry of Dundee. In 1890 the number employed in the linen industry was 34,222, which had declined

in 1901 to 23,570. In 1890 the operatives in the jute and hemp industry numbered 39,885, and in 1901 they were (including workers in canvas, sacking, sailcloth, rope, twine, mats, cocoa fibre) 46,55°-

(c) Cotton. — The first cotton mill was built at Rothesay by an English company in 1779, though Penicuik also lays claim to priority. The Rothesay mill was soon afterwards acquired by David Dale, who was the agent for Sir Richard Arkwright, and had the invaluable aid of his counsel and advice. Dale also established cotton

factories in 1785 at New Lanark, after- wards so closely associated with the socialistic schemes of his son-in-law, Robert Owen. The counties of Lanark and Renfrew are now the principal seats of the industry. The great majority of the cotton factories are concentrated in Glasgow, Paisley and the neighbouring towns, but the industry extends in other districts of the west and is also represented in the counties of Aberdeen, Perth and Stirling. As compared with England, however, the manufacture has stagnated. The number of hands employed in 1850 was 34,325, in 1875 it was 35,652 and in 1901 (including bleachers, dyers, printers, calenderers, &c.) it was 34,057.

(d) Silk and other Textiles. — The principal seats of the silk manufacture are Paisley and Glasgow. In 1885 the number employed amounted to 600 and in 1901 to 2424. The weaving of lace curtains has made considerable progress, in 1878 only 45 hands being employed against 2875 in 1901. Hosiery manu- factures, a characteristic Border industry, with its chief seat at Hawick, employed 11,957 hands in 1901. The total number of persons working in textile fabrics in 1901, exclusive of 21,849 drapers, mercers and other dealers, but including 43,040 employed in mixed or unspecified materials (hosiery, lace, carpets, rugs, fancy goods, &c, besides a large number of " undefined " factory hands and weavers), amounted to 174,547 persons.

(e) Whisky and Beer. — Scotland claims a distinctive manu- facture in whisky. Though distillation was originally introduced from England, by 1771 large quantities of spirits were already being consigned to the English market. The legal manufacture of whisky was greatly checked in the earlier part of the 19th century by occasional advances in the duty, but after the reduc- tion of 2s. 4jd. per proof gallon in 1823 — the duty amounted in 1904 to ns. per proof gallon— the number of licensed distillers rapidly increased, to the discouragement of smuggling and illicit distillation. In 1824 the number of gallons made amounted to 5,108,373; by 1855 this had more than doubled; in 1884 it was 20,164,962; in 1900 it reached 31,798,465; and in 1904 it had receded to 27,110,977. More than four-fifths of the distilleries at work in the United Kingdom are situated in Scotland. The leading distilling counties are Argyll, Banff, Elgin, Inverness and Aberdeen, Perth and Ross and Cromarty, while the industry is found in seventeen other shires. In 1893- 1894 the total net duty received for home-made spirits amounted to £5,461,198 and in 1903-1904 to £7,276,125. The production has attained to colossal dimensions. In 1893-1894 the quantity of proof gallons in bond was 61,275,754, and in 1903-1904 it amounted to

121,397,951, the production having practically doubled itself within ten years. Ale was a common beverage as early as the 12th century, one or more breweries being attached to every religious house and barony. So general was its use even in the beginning of the 18th century that the threatened imposi- tion of a tax on malt in 1725 provoked serious riots in Glasgow and clamour for repeal of the Union; and sixty years afterwards Robert Burns in certain poems voiced the popular sentiment concerning the " curst restrictions " proposed by the Excise on beer and whisky. Though ale has been superseded by whisky as the national beverage, brewing is extensively carried on in Edinburgh, whose ales are in high repute, Leith, Alloa and else- where. In 1885 the number of barrels of beer, duty-paid, amounted to 1,237,323; in 1893-1894 to 1,733,407; and in 1903-1904101,877,978. In 1893-1894 the duty (6s. 3d. the barrel) yielded £473,311 and in 1903-1904 (7s. gd. the barrel) £649,080. After 1893-1894, when the numberof brewers licensed to brew for sale numbered 149, there was a steady fall to 117

in 1903-1904, alleged by the Inland Revenue Commissioners to be due to the disappearance of the small brewer. The practice of private brewing exhibits a still greater decline — from 272 to 84 in the years named. Notwithstanding the enormous turnover and output and the large capital invested, neither distilling nor brewing gives employment to many hands, the figures for 1901 being 1330 maltsters, 2052 brewers and 1970 distillers.

(J) Miscellaneous. — Paper, stationery and printing are in- dustries in which Scotland has always occupied a foremost position. A paper mill was erected in 1675 at Dairy on the Water of Leith in which French operatives were employed to give

Table XIV. — Showing Registered

regarding the number and tonnage of shipping are, however, lacking till the 18th century. From two reports printed by the Scottish Burgh Record Society in 1881, it appears that the number of vessels belonging to the principal ports — Leith, Dundee, Glasgow, Kirkcaldy and Montrose — in 1656 was 58, the tonnage being 3140, and that by 1692 they had increased to 97 of 5905 tons. These figures only

represent a portion of the total shipping of the kingdom. At the time of the Union in 1707 the number of vessels was 215 of 14,485 tons.

Table XIV. gives the figures of the registered tonnage in port in 1850 and later specified years, which are interesting as showing how,

Tonnage in Port in Specified Years.

Sailing vessels Steam vessels .

Total , .

1850.

i860.

1870.

1884.

1900.

1905-

No.

Tons.

No.

Tons.

No.

Tons.

No.

Tons.

No.

Tons.

No.

Tons.

3432 169

49L395

30,827

3172

3H

552,212 71,579

2715 582

727,942 209,142

2065 1403

827,295 866,780

1 104 1980

709,430 1,528,032

918 2330

578,340

3,r39,558

3601

522,222

3486

623,791

3297

937,084

3468

1,694,075

3084.

2,237,462

3248

3,717,898

instruction, with the result, in the words of the proprietors, that " grey and blue paper was produced much finer than ever was done before in the kingdom." Midlothian has never lost the lead then secured. The paper mills at Penicuik and elsewhere in the vale of the Esk and around Edinburgh are flourishing concerns, and the industry is also vigorously conducted near Aberdeen. Stationery is largely manufactured at Glasgow, Aberdeen and Edinburgh. In 1901 the number of persons employed in the paper and stationery industries amounted to 19,602. Ever since it was established by Table XV-

Andrew Myllar and Walter Chepman, early in the 1 6th century, the Edinburgh press has been renowned for the beauty and excellence of its typography, a large proportion of the books issued by London publishers emanating from the printing works of the Scottish capital. Printing is also extensively carried on in Glasgow and Aberdeen, and Cupar once enjoyed consider- able repute for its press. The number of persons engaged in the production of books and other printed matter (including lithographers, copper, steel plate and " process " printers, bookbinders, publishers, booksellers and distributors) amounted in 1901 to 24,139. The first sugar refinery was erected in 1765 at Greenock, which, despite periodical vicissitudes, has remained the principal seat of the industry, which is also carried on at Leith, Glasgow and Dundee. The making of preserves and confectionery flourishes in Dundee, Aberdeen, Paisley and Edinburgh. Kirkcaldy is the seat of the oil floor-cloth and linoleum industries, the latter introduced in 1877. The headquarters of the chemicals manufacture are situated in Glasgow and the vicinity, while explosives are chiefly manufactured at Stevenston and elsewhere in Ayrshire, and at certain places on the Argyll coast. Among occupations providing employment for large numbers were trades in connexion with building and works of construction (136,639 persons in 1901), and furniture and timber (39,000), while the conveyance of passengers, parcels and messages employed 163,102 (railway, 43,037; roads, 53,813; sea, rivers and canals, 20,451; docks, harbours and lighthouses, 10,659; and storage, porterage and messages, 35,142).

Commerce and Shipping. — That Scotland had a considerable trade with foreign countries at a very early period may be inferred from

the importation of rich dresses by Malcolm III. (d. 1093), and the enjoyment of Oriental luxuries by Alexander I. (d. 1 1 24). His successor, David I., receives the special praise of Fordun for enriching " the ports of his kingdom with foreign merchandise." In the 13th century the Scots had acquired a considerable celebrity in shipbuilding; and a powerful French baron had a ship specially built at Inverness in 1249 to convey him and his vassals to the Holy Land. The principal shipowners at this period were the clergy, who embarked the wealth of their religious houses in commercial enterprises. Definite statements

while sailing vessels declined during the half century to one-third of their number in 1850, steam vessels increased thirteenfold. It is true that the tonnage of the 91S sailing vessels of 1905 was considerably in excess of that of the 3432 sailing vessels of 1850, but even so it was a declining figure from a higher tonnage of the middle of the period. On the other hand, during fifty-five years the tonnage of steamers had grown to be a hundred times as large as it was in 1850. Table XV. illustrates the development that took place in the shipping trade with foreign countries and British possessions, as well as the expansion of the coasting trade, in 1855-1905, certain years being taken as types.

-Foreign and Colonial and Coastwise Trade: Tonnage of Vessels.

Year.

Coastwise.

Colonial and Foreign.

Total.

Entered.

Cleared.

Entered.

Cleared.

Entered.

Cleared.

1855 1880 1889 1898 1900 1905

1,963,552 6,628,853 7,188,763 9,256,233

7,213,574 9,928,674

2,057,936 5,691,136 6,998,516 8,937,481 6,791,959 9,500,160

668,078. 2,700,915 3,931,010 5,510,927 5,657,200 6,268,745

840,150 3,001,897 4,412,607

6,296,555 6,602,545

7,478,579

2,631,630 9,329,768

II,H9,773

14,767,160 12,870,774 16,197,419

2,898,086

8,693,033 11,411,123 15,234,036

V3.394.504

10,978,739

Table XVI. exhibits the growth of the foreign and colonial trade at specified dates since 1755, showing how it advanced by leaps and bounds during the latter part of the 19th century. Though the value of imports into Scotland is less than one-eleventh of that into England, this does not represent the due proportion of foreign wares used and

Table XVI. — Showing Growth of Foreign and Colonial Trade since 1755.

Year.

Imports.

Exports.

Year.

Imports.

Exports.

£

£

£

£

1755

464,411

535,576

1874

31,012,750

17,912,932

1790

1,688,337

1,235.405

1880

34,997,652

18,243,078

1795

1,268,520

976,791

1884

30,600,258

20,322,355

1800

2,212,790

2,340,069

1889

36,771,016

22,310,006

1815

3,447,853

6,997,709

1898

36,224,982

23,643,143

1825

4,994,304

5,842,296

1900

38,691,245

32,166,561

1851

8,921,108

5,016,116

1903

40,396,280

32,301,198

consumed in Scotland, for the obvious reason that large quantities of goods are brought into the country by rail, nearly all the tea, for

example, consumed in Great Britain being imported into London, while several ports have almost a monopoly of certain other im- ports. Foreign and colonial merchandise transhipped was valued at £989,289 in 1889 and at £746,246 in 1903. The customs revenue rose from £1,965,080 in 1894 to £3,399,141 in 1903. Judged by the combined value of their imports and exports the chief ports are as shown in the first section of Table XVII. Their status is modi- fied by the movements of shipping, and for purposes of comparison the entrance and clearance tonnage of the trade with British colonies and foreign countries and of the coastwise traffic are exhibited in the second and third sections of the same table. The favourable position occupied by Greenock in the third section is due to its preponderating share of the traffic with the west coast and the islands. Its share of the Irish and coasting trade likewise accounts for the position of Ardrossan in the same section. It should be added that on the figures of import and export value in 1909, Aberdeen had changed places with Methil, and Burntisland With Granton. The figure for Glasgow in that year was £41,238,867.

Table XVII.— Chief Ports U905).

Colonial

Imports

and

Coastwise

Port.

Order.

and Exports.

£

Order.

Foreign

Tonnage

In and Out.

Order.

Tonnage In and Out.

Glasgow

1

38,291,762

1

4,472,071

1

4,257,957

Leith . . .

2

17.975,978

2

2,210,015

4

1,410,160

Grangemouth . Dundee .

3

6,273,317

4

1,425,978

6

859,177

4

5-657,583

7

320,103

7

807,159

Greenock

5

2,046,457

10

202,336

2

3,348,928

Methil . . .

6

1,127,931

3

i,7i6,355

8

542,244

Aberdeen

7

1,035-233

8

217,410

3

1,613,966

Granton

8

933-480

9

202,901

10

, 230,458

Burntisland

9

846,741

5

1.305,945

9

294,261

Ardrossan .

10

651,124

6

326,356

5

1,094,439

Shipbuilding. — Many of the most important improvements in the construction of ships, especially steam vessels, are due to the enterprise and skill of the Clyde shipbuilders, who, from the time of Robert Napier of Shandon (1791-1876), who built and engined the first steamers for the Cunard Company, formed in 1840, have enjoyed an unrivalled reputation for the construction of leviathan liners, both as regards mechanical appliances and the beauty and convenience of the internal arrangements. The principal Clyde yards are situated in the Glasgow district (Govan, Partick, Fairfield, Clydebank, Renfrew), Dumbarton, Port Glasgow and Greenock. At several of the ports on the lower firth, as at Ardrossan and Fairlie, famous for its yachts, the industry is also carried on. On the east coast the leading yards are at Leith, Kirkcaldy, Grangemouth, Dundee, Peterhead and Aberdeen, which, in the days of sailing ships, was renowned for its clippers built for the tea trade. There are yards also at Inverness.

Postal Service. — Towards the end of the 16th century the practice arose of regular communication by letter between the magistrates of the larger towns and the seat of government in Edinburgh. After the accession of James VI. to the throne of England ˆ the necessity for an ordered method of intercourse between the Scottish capital and London became urgent, but the plans adopted involved extraordinary delay, for it not infrequently happened that there was an interval of two months between the despatch of a letter and the receipt of a reply. Such a leisurely fashion of transacting business soon grew intolerable, and in 1635 a system of relays was instituted which enabled the journey between the two cities to be accomplished in

three days, the charge for a letter being 8d. The service was reorganized in 1662, and in 1711 the postal establishments of the United Kingdom, hitherto conducted independently in each country, were consolidated into one. When this reform was effected the cost of a letter to London was reduced to 6d. Three years before this date a local penny post had been provided in Edinburgh by private enterprise, carried on by a staff of seven persons, and after the success of this effort had been demon- strated the concern was taken over by the post office. Subse- quently postal business stagnated, mainly owing to the greatly increased charges (the postage of a letter from London to Edin- burgh is stated to have cost is. 4sd.), until the system of uniform penny postage came into operation. The telephones are mainly conducted by the post office and the National Telephone Com- pany, but the corporation of Glasgow has a municipal service.

Religion. — The bulk of the population is Presbyterian, this form of Church government having generally obtained, in spite of persecution and other vicissitudes, since the Reformation. It is accepted equally by the Established Church, the United Free, the Free and other smaller Presbyterian bodies, the principal point distinguishing the first-named from the rest being that it accepts the headship of the sovereign. The Episcopal Church of Scotland, which is in communion with the Church of England, claims to represent the ancient Catholic Church of the country.

See Scotland, Church of; also Free Church of Scotland; United Presbyterian Church; Presbyterianism; and Scot- land, Episcopal Church of.

Parliamentary Government. — By the Act of Union in 1707 Scotland ceased to have a separate parlia- ment, and its government was assimilated to that of England. In the parliament of Great Britain its representation was fixed at sixteen peers elected in Holyrood Palace by the peers of Scotland at each new parliament in the House of Lords, and at forty-five members in the House of Commons, the counties returning thirty and the burghs fifteen. The power of the sovereign to create new Scottish peerages lapsed at the Union, and consequently their number is a diminishing quantity. By the Reform Act of 1832 the number of Scottish repre- sentatives in the Commons was raised to fifty-three, the counties under a slightly altered arrangement returning thirty members as before, and the burghs, reinforced by the erection of various towns into parliamentary burghs, twenty-three; the second Reform Act (1867) increased the number to sixty, the universities obtaining representation by two

members, while two additional members were assigned to the counties and three to the burghs; by the Redistribution of Seats Act in 1885 an addition of seven members was made to the representation of the counties and five to that of the burghs, the total representation being raised to seventy-two. The management of Scottish business in parliament has since 1885 been under the charge of the secretary for Scotland. 1

Law. — At the Union Scotland retained its old system of law and legal administration, a system modelled on that of France ; but since the Union the laws of England and Scotland have been on many points assimilated, the criminal law of the two countries being now practically identical, although the methods of procedure are in many respects different. The Court of Session, as the supreme court in civil causes is called, which is held at Edinburgh, dates from 1532, and was formed on the model of the parlement of Paris. Since the Union it has undergone certain modifications. It consists of thirteen judges, acting in an Inner and an Outer House. The Inner House has two divisions, with four judges each, the first being presided over by the lord president of the whole court, and the second by the lord justice clerk. In the Outer House five judges, called lords ordinary, sit in separate courts. Appeals may be made from the lords ordinary to either of the divisions of the Inner House, and, if the occasion demands, the opinion of all the judges of the Court of Session may be called for; but whether this be done or not the de- cision is regarded as a decision of the Court of Session. Appeals may be made from the Court of Session to the House of Lords. The lord justice general (lord president), the lord justice clerk and the other judges of the Court of Session form the High Court of Justiciary, instituted in 1672, for criminal cases, which sits at Edinburgh for the trial of cases from the three Lothians and of cases referred from the circuit courts. The latter meet for the south at Jedburgh, Dumfries and Ayr; for the west at Glasgow, Inveraray and Stirling; and for the north at Perth, Aberdeen, Dundee and Inverness. The law agents who undertake cases to be decided before the supreme courts are either solicitors before the supreme courts (S.S.C.) or writers to the signet (W.S.), the latter of whom possess certain special privileges. The lawyer authorized to plead before the supreme courts is termed an advocate. The principal law officer of the crown is the lord advocate, who is assisted by the solicitor-general and by advocates- depute. The practical administration of the law in a county is under the control of the sheriff-depute, who combines with his judicial duties certain administrative functions. The office, which once implied a much less restricted authority than at present, is as old as the reign of

Alexander I. (d. 1 124), when the greater part of the kingdom was divided into twenty-five sheriffdoms. In the latter part of the 13th century they numbered thirty-four, but now there are only fifteen sheriffs in all, who, excepting the sheriff for Lanark- shire, need not reside in the counties to which they are appointed and are not prohibited from private practice. They are assisted by sheriffs-substitute upon whom the bulk of the work falls, who must be residential and are debarred from private practice. At one time the functions of the sheriff-principal were confined to one county, but by an act passed in 1855 it was arranged that as sheriffdoms fell vacant certain counties should be grouped under the control of one sheriff-principal. Thus Aberdeen, Kincardine and Banff form one group, and the three Lothians with Peebles another. The public prosecutor for counties is the procurator-fiscal, who takes the

1 A separate secretary of state for Scotland was in existence after the Union, but this office was abolished in 1746. From 1782 to 1885 the secretary of state for the home department was responsible for the conduct of Scottish business, being advised in these matters by the lord advocate. The secretary for Scotland is not one of the principal secretaries of state.

initiative in regard to suspected cases of sudden death, although in this respect the law of Scotland is less strict than that of England. Justices of the peace, who are unpaid and require no special qualifica- tion, but as they are recommended by the lord-lieutenant, are generally persons of position in the county, once exercised a wider subordinate jurisdiction than now devolves upon them, their chief administrative function being to act along with certain members of the county councils, as the licensing authority for public-houses in the county and in police burghs, and as a court of appeal from the decisions of the bailies in royal and parliamentary burghs.

Local Government. — The largest administrative unit is that of the county, but the areas of counties may be adapted to meet various public or political requirements. They may be altered for the purposes of the registrar-general, and for police purposes part of the area of one county may be brought into the area of another. For parliamentary purposes some counties have been united, as Clack-

mannan and Kinross, Elgin and Nairn, Orkney and Shetland, and Peebles and Selkirk, and others divided, as Aberdeen, Ayr, Lanark, Perth and Renfrew, while others retain in certain respects their old subdivision, Lanarkshire for assessment purposes being still partitioned into the upper, middle and lower wards. Originally the counties were synonymous either with sheriffdoms or stewartries. Stewartries ceased with the abolition of hereditary jurisdictions in 1748, though Kirkcudbrightshire still bears the designation. The counties are thirty-three in number, Ross and Cromarty constituting one, while Edinburgh, Glasgow, Aberdeen and Dundee are each a county of a city. The highest county dignitary is the lord-lieutenant, the office dating from 1782. Nominated by the crown, he holds office aut vitam aut culpam, represents the crown in military matters, recommends for commissions of the peace, holds the position of high sheriff, and is a member of the standing joint committee. The office, however, is little more than honorary. In olden times there were three classes of burgh. Those created by charter directly from the crown were styled royal burghs: they number seventy in all, of which no fewer than seventeen belong to Fifeshire. Those holding their charters from a feudal superior and not from the crown were called burghs of regality, their magistrates and council being usually appointed by the overlord or his representative. Being small and unimportant, these burghs were not affected by the act of 1833, but in 1892 were required to adopt the constitution of police burghs. Towns that received their charters from bishops were burghs of barony, their magistrates and council being appointed by the superior. When the bishop's jurisdiction was abolished, the burghs as a rule assumed the position of royal burghs. Police burghs are wholly modern, dating from the middle of the 19th century. They were called into existence by the rapid growth of certain districts caused by the development of the coal and iron fields. The principle on which they are established may be briefly stated thus: towns with a minimum population of 800 can, on a poll demanded by the ratepayers showing a majority in favour of it, acquire the status of a police burgh subject to representations from neighbouring burghs, a proviso devised to check the growth of " parasitic " burghs in the immediate vicinity of a great centre of population and industry, enjoying all the public improvements initiated by their powerful neighbour and yet contributing nothing towards the cost and upkeep of them. It should be noted that, according to Scottish usage, " police " includes drainage, the suppression of nuisances, paving, lighting and cleansing, in addition to the provision of a constabulary force, and that in point of fact, paradoxical as it appears, the bulk of the police burghs do not manage their police. Royal burghs derive part of

their income from ancient corporate property known as " the Common Good " and consisting mostly of land and houses. It is devoted to objects for which the rates are not applicable. Glasgow, for example, might found a chair in the University from the Common Good but not from the rates, and Edinburgh maintains from the same source the city observatory and defrays part of the cost of the time-gun. Only Edinburgh, Glasgow, Dundee, Greenock, Aberdeen and Paisley have private and local acts, conferring powers exceeding the general law, to deal with, e.g. overcrowding, the ob- noxious display of advertisements, the compulsory acquisition of land for gas, water or electric-power enterprises, all the other burghs being governed by Public General Acts. This is in marked contrast with the practice in England, where almost every large borough has its own private act. The corporation of the burghs consists of the provost (or lord provost, in the cases of Edinburgh, Glasgow, Aberdeen and Dundee), bailies and councillors, with certain per- manent officials, of whom the town clerk is the most important. The course of reform may now be concisely summarized. In 1833 Scottish burghs were for the first time entitled to be governed by directly-elected bodies, and at various times since that date fuller

fowers of legal self-government were granted in different directions, n 1845 parochial boards were created for relief of the poor, their powers being afterwards extended to deal with the statutes concern- ing burial-grounds, the registration of births, deaths and marriages, vaccination, public health, public libraries and other matters. In 1872 school boards were set up throughout the country; county councils followed in 1889 and parish councils in 1894. These reforms profoundly modified and in some cases abolished older organizations which had grown inadequate to modern wants. The Commissioners of Supply, originally appointed to apportion and collect the national

revenue and afterwards entrusted with the regulation of the land tax, the control of the county police, the raising of the militia, and the levying of rates for county expenditure, were practically super- seded by the county councils, which are also the local authority under the Contagious Diseases (Animals) and the Public Health Acts in all parishes (burghs and police burghs excepted), perform the administrative duties formerly entrusted to the justices of the peace, and may also enforce the Rivers Pollution Act each within its own jurisdiction. The county councils are strengthened by certain special committees, such as the secondary education committee, whose duties have already been denned, and the standing joint committee — one half appointed by the county council, the other half by the

Com- missioners of Supply — which manages the county police and whose consent in writing must be obtained before the county council can undertake any work involving capital outlay. All but the smallest counties are subdivided into districts, and the Road Acts and Public Health Acts are administered in these areas by district committees, composed of members of the county council for the district and one representative of each parish council within the area. The act of 1894, as we have seen, not only established the Local Government Board, consisting of the secretary for Scotland, the solicitor-general, the under-secretary and three appointed members — a vice-president, a lawyer and a medical officer of public health — but also replaced the parochial boards by parish councils, empowered to deal among other things with poor relief, lunacy, vaccination, libraries, baths, recrea- tion grounds, disused churchyards, rights of way, parochial endow- ments, and the formation of special lighting and scavenging districts.

(J. A. M.)

III. Political History.

Scotland, to political observers of the middle of the 16th century, seemed destined by nature to form one homogeneous kingdom with England. The outward frontiers of both were the sea; no difficult physical barriers divided the two territories; the majority of Scots spoke an intelligible form of English, differing from northern English more in spelling and pronuncia- tion than in idiom and vocabulary; and after the Reformation the State religion in both countries was Protestant. Yet, in spite of these causes making for union, and in spite of the mani- fest advantages of union, it was by a mere dynastic accident that, in the defect of nearer heirs to the English throne, the crowns of both kingdoms were worn by James VI. (1603), while more than a century of unrest and war had to elapse before the union of England and Scotland into one kingdom in 1707. Even later there broke forth civil wars that, apart from dynastic sentiment, had no political aim except " to break the Union." Thus for seven hundred years the division of the isle of Britain was a constant cause of weakness and public distress. Nothing did more to bring the two peoples together than religion, after the Reformation, yet, by an unhappy turn of affairs, and mainly thanks to one man, John Knox, few causes were more potent than religious differences in delaying that complete union which nature herself seemed to desire.

The historical causes which kept the nations separate were mainly racial, though, from a very early period, the majority of the people

of Scotland were, if not purely English by blood, anglicized in language and, to a great extent, coˆiithas. in institutions. All questions of race are dim, for such a thing as a European people of pure unmixed blood is probably unknown in experience. In a.d. 78-82 Agricola, carrying the Eagles of Rome beyond the line of the historical border, encountered tribes and confederations of tribes which, probably, spoke, some in Gaelic, some in Brythonic varieties of the Celtic language. That the language had been imposed, in a remote age, by Celtic-speaking invaders, on a prior non-Celtic-speaking population, is probable enough, but is not demonstrated. There exist in Scotland a few inscriptions on stones, in Ogam, which yield no sense in any known Indo-European language. There are also traces of the persistence of descent in the female line, especially in the case of the Pictish royal family, but such survivals of savage institutions, or such a modification of male descent for the purpose of ensuring the purity of the royal blood, yield no firm ground for a decision as to whether the Picts were " Aryans " or " non-Aryans."

It is unnecessary here to discuss the Pictish problem (see Celt). That their rivals, the Scots, were a Gaelic-speaking people is certain. That the Picts were Teutons (Pinkerton) is no longer believed. That they were non-Aryan, the theory of

Sir John Rhys, seems improbable; for the non-English place- names of Scotland are either Gaelic or Brythonic (more or less Welsh), and the names of Pictish kings are either common to Gaelic and Welsh (or Cymric, or Brythonic), or are Welsh in their phonetics. Mr Skene held that the Picts were a Gaelic- speaking people, but the weight of philological authority is with Mr Whitley Stokes, who says that Pictish phonetics, "so far as we can ascertain them, resemble those of Welsh rather than of Irish " (see Zimmer, Das Mutterrecht der Pikten; Rhys, Royal Commission' s Report on Land in Wales, Celtic Britain, Rhind Lectures; Skene's Celtic Scotland; J. G. Frazer, Lectures on the Early History of the Kingship, p. 247; Macbain's edition, 1902, of Skene's Highlanders of Scotland).

The Roman occupation has left not many material relics in Scotland, and save for letting a glimmer of Christianity into the south-west, did nothing which permanently affected the in- stitutions of the partially

subjugated peoples. In a.d. 81-82 Agricola garrisoned the Roman frontier between Forth and Clyde, and in 84 he fought and won a great battle farther north, probably on the line of the Tay. His enemies were men of the early iron age, and used the chariot in war. They fought with courage, but were no match for Roman discipline; it was, however, impossible to follow them into their mountain fortresses, nor were the difficulties of pursuit thoroughly overcome till after the battle of Culloden in 1746. The most important Roman stations which have hitherto been excavated are those of Birrenswark, on the north side of Solway Firth; Ardoch, near the historical battlefield of Sheriffmuir (1715); and New- stead, a site first occupied by Agricola, under the Eildon hills. Roman roads extended, with camps, as far as the Moray Firth. It is not till a.d. 300 that we read of " the Caledonians and other Picts "; in the 4th century they frequently harried the Romans up to the wall of Hadrian, between Tyne and Solway. About the end of the century the southern Picts of Galloway, and tribes farther north, were partially converted by St Ninian, from the Candida casa of Whithern. The Scots, from Ireland, also now come into view, the name of Scotland being derived from that of a people really Irish in origin, who spoke a Gaelic (see Celtic) akin to that of the Caledonians, and were in a similar stage of higher barbarism. The Scots made raids, but, as yet, no national settlement.

The withdrawal of the Romans from Britain (410) left the northern part of the island as a prey to be fought for by warlike tribes, of whom the most notable were the Picts in the north, the Scots or Dalriads from Ireland in the west (Argyll), the Cymric or Welsh peoples in the south-west and between Forth and Tay, and the Teutonic invaders, Angles or English, in the south-east.

If the Picts had been able to win and hold Scotland as far south as the historic border, the fortunes of the country would probably have been more or less like those of Ireland. After the Norman Conquest, England would have subjugated the Celts and held Scotland by a tenure less precarious and disputed than they possessed in the western island. Scotland would have been, at most, a larger Wales. But in the struggle for existence it chanced that the early English invaders secured a kingdom, Bernicia, which stretched from the Humber into Lothian, or farther north, as the fortune of battle might at various times determine; and thus, from the centre to the south-east of what is now Scotland, the people had come to be anglicized in speech before the Norman Conquest, though Gaelic survived much later in Galloway. The English domain comprised, roughly speaking, the modern counties of Selkirkshire, Peebles- shire, Berwickshire,

Roxburghshire and most of the Lothians, while south of Tweed it contained Northumberland, Durham and Yorkshire to the Humber. In later days the Celtic kings of northern and western Scotland succeeded in holding, on vague conditions of homage to the English crown, the English-speaking region of historic Scotland. That region was the most fertile, had the best husbandry, and possessed the most civilized popu- lation, a people essentially English in language and institutions, but indomitably attached to the Celtic dynasties of the western

and northern part of the island. It was the English-speaking south-east part of Scotland, gradually extended so as to comprise Fife and the south-west (Lanarkshire, Dumfriesshire, Stirling- shire, Dumbartonshire, Ayrshire and Renfrewshire), which learned to adopt the ideas of western Europe in matters political, municipal and ecclesiastical, while it never would submit to the domination of the English crown. This English element, in a nation ruled by a Celtic dynasty, prevented Scotland from becoming, like Wales, a province of England.

On the west of the northern part of the English kingdom of Bernicia, severed from that by the Forest of Ettrick, and perhaps by the mysterious work of which traces remain in the " Catrail," was the Brython or Welsh kingdom of Strathclyde, which then included the territory and population, later anglicized, of Renfrew- shire, Ayrshire, Lanarkshire, Dumfriesshire, and, south of the historic border, Cumberland and Westmoreland to the Derwent. Strathclyde was essentially Welsh, and it may be noted that this region, centuries latˆr, was the centre of the recalcitrant Cove- nanters, a people enthusiastically religious in their own way. Later, this region was the hotbed or " revivals " and the cradle of Irvingism. Whether the influence of Cymric blood may be traced in these characteristics is a dubious question.

While southern Scotland was thus English and Cymric, the north, from Cape Wrath to Lochaber, in the west, and to the Firth of Tay, on the east, was Pictland; and the vernacular spoken there was the Gaelic. The west, south of Lochaber to the Mull of Kintyre, with the isles of Bute, Islay, Arran and Jura, was the realm of the Dalriadic kings, Scots from Ireland (503): here, too, Gaelic was spoken, as among the " Southern Picts " of the kingdom of Galloway. Such, roughly speaking, were the divisions of the country which arose as results of the obscure wars of the 5th, 6th and 7th centuries.

As regards Christianity in these regions, Protestantism,

Presbyterianism and patriotism find here a battle-ground. The mission of St Ninian (397) was that of a native of the Roman province of Britain, and the church which uaaky. he founded would bear the same relation to Rome as did the church in Britain. There are material relics of his church, bearing the Christian monogram, and there are stones with Latin epitaphs; these objects are wholly unlike the Irish crosses and inscriptions of the Gaelic church. If Bede is right in saying that Ninian was trained in Rome, then the early Christianity of Scotland was Roman.

In 431 the contemporary Chronica of Prosper of Aquitaine record that Palladius was ordained by Pope Celestine as the first bishop " to the believing Scots," that is, to the Irish. If there were " believing Scots " in Ireland before the first bishop was ordained, their ecclesiastical constitution cannot have been episcopal. Fordun, in the 14th century, supposed that the clergy, before Palladius, were presbyters or monks. As Hector Boece, " that pillar of falsehood," dubbed these presbyters " Culdees," " the pure Culdee," a blameless presbyterian, almost prehistoric, has been claimed as the ancestor of Scottish presbyterianism; and episcopacy has been regarded as a deplor- able innovation. The Irish church has paid more reverence to St Patricius than to Palladius (373-463), and the church of St Patricius, himself a figure as important as obscure, certainly abounded in bishops; according to Angus the Culdee there were 107 1, but these cannot have been bishops with territorial sees, and the heads of monasteries were more potent personages.

The Dalriadic settlers in Argyll and the Isles, the (Irish) Scots, were Christians in the Irish manner. Their defeat by the Picts, in 560, induced the Irish St Columba to endeavour to convert the conquering Picts. In 563-565 he founded his mission and monastery in the isle of Iona, and journeying to Inverness he converted the king of the Picts. About the same date (573), the king of Cymric Strathclyde summoned, from exile in Wales, St Kentigern, the patron saint of Glasgow, who restored a Chris- tianity almost or quite submerged in paganism, Celtic and English. The pagan English of Deira (603) routed under ˆEthelfrith the Christian Scots of Argyll between Liddesdale and North Tyne; and pagan English for more than a century held unopposed the

region from Forth to Humber. In 617 ˆthelfrith fell in battle with the English of East Anglia, and his sons, Eanfrid and Oswald, fled to the North. Eanfrid, by his marriage with a Pictish princess, became the father of the Pictish king Talorcan, while Oswald was baptized into the Columban church at Iona. In a season of war and turmoil Oswald won the crown of the north- east English kingdom, stretching to the Forth, with its capital at Eadwinsburgh (? Edinburgh, a dubious etymology), and in that kingdom St Aidan, from Iona, erected the Columban churches under the auspices of Oswald, whose brother Oswin dominated Strathclyde and Pictland up to the Grampians; the English element, for the time, extending itself and anglicizing more and more of the Scotland that was to be.

Thus the Dalriadic Scots had handed on the gift of Irish Christianity, with such literature as accompanied it in the shape of Latin, and reading and writing, to the northern English from Forth to Humber. The ecclesiastical constitution thus intro- duced was one of missionary monastic stations, settled in fortified villages. The Celtic church, unluckily, differed from the Roman on the question of the method of calculating the date of Easter, the form of the tonsure, and other usages, one of them apparently relating to a detail in the celebration of the Holy Communion. From a letter to Pope Boniface IV. of an Irish saint Columbanus, who led twelve Irish monks into Gaul and Burgundy, the Celtic church appears to have denied that the papal jurisdiction extended beyond the limits of the Roman empire. Consequently Rome would have no jurisdiction in the affairs of the Irish church established in Scotland and the north of England. The results would be the severance of these regions from the main current of western ecclesiastical ideas. Conceivably these sentiments of Columbanus never wholly died out in the Scottish kingdom of later history, whose kings were always apt to treat Rome in a cavalier manner, laughing at interdicts and excommunica- tions. A papal legate, in Bruce's time, was no more safe, if his errand was undesirable, than under John Knox, when Mary Stuart wore the crown. " All the world errs, Rome and Jerusalem err, only the Scoti and the Britones are in the right " is quoted as the opinion of the Scoti and Britones in 634. It appears that Scotland was naturally Protestant against Rome as soon as she was Christian.

Meanwhile Rome was too strong, and in 664, in a synod held at Whitby, St Wilfrid procured the acceptance of Roman as against Celtic doctrine in the questions then at issue. The English Christians overcame the Celtic divines of Iona, and in 710 even in Pictland they came into the customs of western Christianity. The church of the Celtic tribe thus yielded to the church of the Roman empire.

There followed an age of war in which the northern English were routed at Nectan's mere, in Forfarshire, and driven south of Forth. In the quarrels of Picts and of Scots of Wcfsand Argyll, tne Pictish king, Angus MacFergus (ob. 761), Scots. was victorious while in his prime, and then consolidated

Pictland; but (802-839) the Scandinavian sea-rovers began to hold large territories in Scotland, weakened the Picts, and made easy their conquest by Kenneth MacAlpine of Kintyre, the king of the Dalriad Scots of Argyll. In 860 this Scot became king of the Picts. Old legends represent him as having exterminated the Picts to the last man; and the Picts become, in popular tradition, a mythical folk, hardly human, to whom great feats, including the building of Glasgow cathedral, are attributed, as the walls of Tiryns and Mycenae in Greece were traditionally assigned to the energy of the Cyclopes. In 1814 Sir Walter Scott met a dwarfish traveller in the Orkneys, whom the natives regarded as a " Pecht " or Pict.

There was, of course, in fact, no extermination of the Picts, there was merely a change of dynasty, and alliance between Picts and Scots, and that change was probably made in accordance with Pictish customs of succession. Kenneth MacAlpine, though son of a Scottish father, was probably, , though not certainly, a Pict on the mother's side, and in Pictland the crown was in- herited in the female line. The consequence was that what had been Pictland came to be styled Scotland. The king of

Alban was a Scot in the paternal line. His conquest was not achieved at a blow, but his language, Gaelic, prevailed. Hence- forth, despite the incursions of the Scandinavians, and partly because of them, the ecclesiastical and royal centres of life are moved to the south and the east, though the king of Alban (Ardrigh) is not always master of his Ri, or subordinate princes of the seven provinces (Mortuath). His position is rather that of an overlord, or Bretwalda, like Agamemnon's among the Achaean anakles. He allies himself with Cymric Strathclyde, and by constant raids, and thanks to English weakness caused by Danish invasions, he extends his power over English Lothian. A marriage of the daughter of Kenneth MacAlpine with the Welsh prince of Strathclyde gives Scotland a footing in that region; in short, Scotland slowly advances towards and even across the historic border.

Through this contact with and actual tenure of English lands arose the various so-called " submissions " of kings of Scotland to the English crown. Thus (924) the English Chronicle c oa . asserts that

Constantine, king of Scotland, " chose anxious Edward King to father and lord." It is impossible wlth

here to analyse the disputes as to whether, in Freeman's

England.

words, " from this time to the 14th century " (he means, to Bannockburn) " the vassalage of Scotland was an essential part of the public law of the Isle of Britain." In fact this vassalage was claimed at intervals by the English kings, and was admitted by Scottish kings for their lands in England; but as regards Scotland, was resisted in arms whenever opportunity arose. Each submission " held not long," and the practical result was that (945) Malcolm acquired northern Strathclyde, "Cumberland, Galloway (?) and other districts," while another Malcolm (1018) took Lothian, the northern part of Northumbria, after winning a great battle at Carham on the Tweed.

The Celts, Scoto-Picts, of Alban, had thus annexed a great English-speaking region, which remained loyal to their dynasty, the more loyal from abhorrence of the Norman conquerors. The English or anglicized element in Scotland was never sub- jugated by England, save during the few years of the Cromwellian Commonwealth, and was supported (with occasional defections, and troubles caused by dynastic Celtic risings) by the Celtic element in the kingdom during the long struggle for national independence. Scotland, in short, was too English to be con- quered by England. Poor, distracted, threatened on occasion by the Celts on her flank and rear, anglicized Scotland preferred her poverty with independence, to the prosperity and peace which England would have given, if unresisted, but never could impose by war. Her independence, her resistance, curbed the conquering ambitions of England abroad; and it went for something in securing the independence of France, and the success of Protestantism, where it succeeded.

A sturdy and stoical temper was developed in the nation, which later helped parliamentary England in the struggle against the crown (1643- 1648). Habits of foreign adventure and of thrift were evolved, which were of advantage to the empire when, too long after the union of 1707, Scottish men were admitted to participate in its privileges and in its administration. Such were the consequences, in the sequel, of what seemed a disastrous event, the absorption, by a Celtic kingdom, of a large and fertile region of northern England.

The English element in the realm of Malcolm II. (1005-1034) was the conducting medium of western ideas which naturally appealed to the interests and the ambitions of that prince. On looking at the genealogical tree of the jˆ a i co i a r l dynasty of Kenneth MacAlpine, we see that from the //. date of his death (859) to the accession of Duncan on the death of Malcolm II. (1034) no monarch is succeeded by his own son or grandson. The same peculiarity appears in the list of the ancient kings of Rome, but these are entangled in mytho- logy. In the dynasty of Kenneth the succession to the crown alternated thus: he was succeeded by his brother Donald, who was followed by his nephew, Kenneth's son, Constantine; Constantine's brother, Aodh, followed; and henceforth till 957, the kings were alternately chosen from the houses of Constantine*

and Aodh. It was the custom to appoint the successor to the king, his "Tanist," at the same time as the king himself. Malcolm II. succeeded his own cousin, and, in accordance with the native system of royal inheritance, should have been followed by the unnamed grandson of his own predecessor, Kenneth III. But Malcolm is accused of putting his legitimate successor out of the way, and thus securing the succession of his own grandson, Duncan, a son of his daughter, Bethoc, and her husband Crinan, protector of the abbey (or lay abbot) of Dunkeld. Malcolm thus set the example of advance to the western system of royal successions, while in Crinan's lay tenure of the abbacy of Dunkeld we see the habit of appropriating ecclesiastical revenues which again became so common about a century before the Reformation.

The innovation of Malcolm II. brought no peace but a sword. Boedhe, son of Kenneth III., left a daughter, Gruach, who inherited the claims of the unnamed son of Boedhe slain by order of Malcolm. Gruach married Gilcomgain, and had issue male, Lulach. After the death of Gilcomgain, Gruach wedded Macbeth, Mormaor (or earl in later style) of the province or sub- kingdom of Moray; Macbeth slew Duncan, and ruled as pro- tector of the legitimate claims of Lulach. From Lulach descended a line of Celtic pretendants, and for a century the dynasty violently founded by Malcolm II. was opposed by claimants of the blood of Lulach, representing the Celtic customs adverse to the English and Norman ideas of the family in possession

of the throne. Thus Celtic principles, as opposed to the western principles of chartered feudalism, did not perish in Scotland without a long and severe struggle.

Meanwhile the dynasty of Malcolm II. was brought into close connexion with the English crown, and relied on English support, both before and after the Norman Conquest. The Caamore. g eIUUS ˚f Shakespeare, in his Macbeth, based on legendary materials borrowed by Hollinshed from Hector Boece, and on the dynastic myth of the descent of the Stuart kings from Banquo, has clouded the actual facts of history. To the Celts of Scotland, or at least to those of the great sub- kingship or province of Moray, Duncan, not Macbeth, was the usurper. Duncan left sons, Malcolm, called Canmore (great head), and Donald Ban; and in 1054 Siward, earl of North- umbria, defeated Macbeth, whether acting under the order of Edward the Confessor in favour of the claims of Malcolm Can- more, or merely to punish Macbeth for sheltering Norman fugitives from the Confessor's court. The latter casus belli is the more probable, though the chronicler, Florence of Worcester, asserts the protection of the sons of Duncan by England. Siward did not dethrone Macbeth, who was defeated and skin by Malcolm in 1057; Lulach fell obscurely in 1058, leaving claimants to his rights, though these did not trouble much the crowned king, Malcolm Canmore. His long reign (1058-1093), and his second marriage (1068) with Margaret, sister of Edgar ˆEtheling, of the ancient English royal blood — dispossessed by the Norman Conqueror — intensified the sway of English ideas in Scotland, and increased the prepotency of the English element in political, social and ecclesiastical affairs. The anarchic state of North- umberland and Cumberland after the Norman Conquest, which did not soon assimilate them, was Malcolm's opportunity. He held Cumberland (1070), and supported the claims of his brother- in-law, the ˆEtheling, while his relationship with Gospatric, earl of Northumbria, who retired into Scotland, gave him pre- texts for invading the north-east of England. William the Conqueror's earl of Northumberland, Robert de Comines, was slain at Durham in 1069, and the houses of Gospatric (earls of Dunbar and March) and of de Comines (the Comynsof Badenoch) were long puissant in Scottish history.

In 1072 William marched north and took a disputed homage of Malcolm at Abernethy, receiving as hostage the king's eldest son (by his first wife, Ingebiorge), named Duncan. As to the nature of Malcolm's homage, whether for Scotland (Freeman), or for manors and a subsidy in England(Robertson), historians disagree. Malcolm subdued " the King of Moray," son of Lulach, who died in far

Lochaber, though his family's claims to the

crown of Scotland did not lapse. In 1091 William Rufus renewed the treaty of Abernethy with Malcolm and fortified Carlisle, thereby cutting Malcolm off from Cumberland; Malcolm was summoned to meet Rufus at Gloucester; he went, but declined to accept the jurisdiction of the Anglo-Norman peers, or to " do right" to Rufus, except on the frontier of the two realms, wherever he may have supposed that frontier to be. He was an independent king, no vassal of England; as such (1093) he invaded Northumberland, and was slain at Alnwick. His wife, St Margaret, did not survive her sorrow; she died in the castle of Edinburgh. Her reforms in church matters had apparently made her unpopular with the Celts, but under cover of a mist her body was conveyed to and buried at Dunfermline.

Margaret, in fact, completed the reduction of the Celtic church in Scotland to conformity with western Christendom, and some recent presbyterian writers have not forgiven her. Beautiful, charitable and pious, she mollified the fierce manners of her husband, who, according to her director and biographer, Turgot, acted as interpreter between her and the Gaelic-speaking ecclesi- astics at their conferences. Certain obscure religious usages, as regards Lent, the Communion, the non-observance of Sunday, non-communicating at Easter, and the Forbidden Degrees in marriage, were brought into conformity with western Christen- dom. The last Celtic " bishop of Alban " died at this time; and when the dynasty of Malcolm Canmore was established after an interval of turmoil, English ecclesiastics began to oust the Celtic Culdees from St Andrews.

Malcolm would have been succeeded by his eldest son by Margaret, Edward, but he fell beside his father at Alnwick, and the succession was disputed between Duncan, son of Malcolm by his first wife; Edmund, eldest surviving son of Malcolm and Margaret; and Donald Ban, brother of Malcolm. The Celts (apart from the claimant of the blood of Lulach and the house of Moray) placed Donald Ban on the throne; England supported Duncan (by primogeniture Malcolm's heir, and a hostage in England); there was division of the kingdom till Duncan was slain, and Edgar, son of Malcolm and Margaret, was restored by Edgar iEtheling. He put out the eyes of his uncle, Donald Ban, and in unsaintly ways established the dynasty of the English St Margaret and of the Celtic Malcolm. In 1 103 Edgar's sister, Eadgyth (Matilda), married Henry I.; the dynasty of Scotland now shows, by the names of its members, that the English element in it was predominant. After Donald Ban no Scottish sovereign bears a Gaelic Christian name save Malcolm the Maiden; and perhaps no later king

knew Gaelic.

Edgar, before his death, established his brother, Alexander I., as king of Scotland, north of Forth and Clyde, with Edinburgh, which looks as if he considered Forth and Clyde the frontier of what was legally Scotland; while his aaderi younger brother, David, as earl, ruled Lothian and Cumbria. The reign of Alexander I. is marked by war with the northern Celts, and by the introduction of English bishops of St Andrews, while the claims of the see of York to superiority over the Scottish church were cleverly evaded at Glasgow (David's bishopric), as well as at St Andrews, where English Augustinian canons were now established, to the prejudice of the Celtic Culdees. We observe that the chief peers of Alex- ander, who signed the charter of his monastery at Scone, are Celts — Heth, earl of Moray (husband of the daughter of Lulach), Malise of Strathearn, Duf agan of Fife, and Rory. After the death of Alexander I. (1124) his successor, David I., is attended by men of Norman names, Moreville, Umfraville, Somerville, Bruce, FitzAlan (the ancestor of the Stewards of Scotland, and himself of an ancient Breton house), and so on.

David, educated in England by Normans, was the maker of a Scotland whereof the anglicized part at least was now ruled by Anglo-Norman feudalism and Anglo-Norman municipal laws in the burghs. Marrying Matilda, widow of Simon de St Liz and heiress of Waltheof, David received the earldom of Huntingdon and supposed himself to have claims over Northumberland, a cause of war for three generations. With Anglo-Norman aid he repelled a Celtic rising — the right qf

the claimants to represent the blood of Lulach is exquisitely com- plex and obscure in this case— but in the end David annexed to the crown the great old sub-kingdom or province of Moray, and made grants therein to English, Norman and Scottish followers.

Some of the most eminent of his southern allies could not stand by David when, in the reign of Stephen and in fidelity to the cause of his niece, the empress Matilda, daughter of Henry I., he invaded England. The towns of Northumberland and Cumberland opened their gates, but he and Stephen met in conference at Durham, and

David's son Henry, prince of Scot- land, received the Honour of Huntingdon, Carlisle, Doncaster " and all that pertains to them " (1135). Stephen's relations with Henry became unfriendly, and in January 1 138, in pursuance of Henry's claim to Northumberland, David again invaded. A holy war against him was proclaimed by the archbishop of York, and on the 22nd of August 1138 Bruce, Baliol, and others of David's southern allies renounced fealty to him, and he was defeated at the battle of the Standard, near Northallerton. David regained the shelter of Carlisle, a legate from Rome made peace, and Prince Henry received the investiture of Northumber- land, without the strong fortresses of Bamborough and Newcastle.

The anarchic weakness of the reign of Stephen enabled David to secure his hold of northern England to the Till, but the death of his gallant and gentle son Henry, in June 1152, left the suc- cession to his son, Malcolm the Maiden, then a child of ten, and David's death (24th of May 1153) exposed Scotland to the dangers of a royal minority.

David was, if any man was, the maker of Scotland. The bishoprics erected by him, and his many Lowland abbeys, Social Holyrood, Melrose, Dryburgh, Kelso, Jedburgh and and others, confirmed the freedom of the Scottish church

*p ° ; **Jf ; from the claims of the see of York, encouraged the ' improvement of agriculture and endowed the country with beautiful examples of architecture. His charters to land- owners and burghs (charters not being novel in Scotland, but now more lavishly conferred) substituted written documents for the unwritten customs of Celtic tenure, and converted the under kings of provinces into earls of the king, while vice-comites, or sheriffs, administered local justice in the king's name, though Celtic custom still prevailed, under a thin veneer of law, in the Celtic regions, as in Galloway. Where Anglo-Normans obtained lands in Moray and Renfrewshire, there seems to have been no displacement of the population: though a FitzAlan was dominant in Renfrewshire, the " good men," or gentry, still bore Gaelic names, till territorial names — " of " this or that place — came into use. In Lothian the place-names recorded in charters were already, for the most part, English. Beneath the freeholders and noblesse were free tenants, farmers paying rents, mainly in kind, and in services of labour and of war. Below these were the nativi, attached to the land, and changing masters when the land changed hands. These nativi were gradually emanci- pated, partly through the influence of the church, partly for economic reasons, partly through the rule that any vilein became free after a*

year's residence in a burgh.

Thus Scotland never saw a jacquerie or servile rising. The burghs were not actually the creations of David and William the Lion, but the rights, duties and privileges which had gradually developed in the towns were in the time of these kings codified and confirmed by charters; the towns had magistrates of their own election, courts, and legalized open markets. The greater burghers had a union, and made laws and regulations for muni- cipal affairs. ' In addition to royal burghs, there were burghs of nobles and of bishops, and the provostship was apt to become, by custom, almost hereditary in a local noble family, which protected the burgesses.

The germ of a parliament existed in the crown vassals and the royal officials — chancellor, steward, constable, marischal and the rest — with bishops, priors, earls, barons and other probi homines. The term lota communitas, " the whole community," appears to denote all freeholders of gentle birth, who might be present at any important assembly for the discussion of national affairs. Burgesses do not yet receive mention as present on such occasions.

Scotland was as yet, and in fact remained, destitute of con- stitutional history as it appears in England. There was, technic- ally speaking, no taxation. The king " lived on his own," on rent of crown lands, feudal fines and aids, wardships, marriages, and the revenues of vacant bishoprics. Opposition used the mechanism of conspiracies; and changes of administration were effected by the seizure of the king's person, especially during the many royal minorities.

In the matter of justice, royal succeeded to tribal authority. Offences were no longer against the individual and his kin, but against the king's peace, or against the peace of subordinate holders of courts — earls, thanes, barons, bishops and abbots. Compurgation, the ordeal, and trial by battle began to yield to Visnet, Jugement del Pais, the " good men of the country," giving their verdict, while sentence was passed by the judge, sheriff, alderman or bailiff. " The Four Pleas of the Crown," murder, arson, rape and robbery, were relegated to the king's court, under Alexander II. ruled by four grand justiciaries. While Roman law became the foundation of justice, a learned clerk was needed as assessor and developed into the Lord Justice Clerk. The vice-comes, or sheriff, as the king's direct representa- tive, was the centre of justice for shires, and his judicature tended to encroach on that of noble holders of courts. Royal authority, sheriffs, juries and witnesses gradually superseded ordeal, compurgation, and trial by battle, though even barons long retained the right of " pit and

gallows."

In the matter of education, the monasteries had their schools, as had the parish churches, and there were high schools in the burghs, and " song-schools." From the time of David to the death of Alexander III. Scotland was relatively peaceful, prosperous, and, in the south, anglicized, and was now in the general movement of western civilization.

Malcolm the Maiden, before his early death in 1165, had put down the menacing power of Somerled, lord of the Isles, a chief apparently of mixed Celtic and Scandinavian blood, the founder of the great clan of Macdonald, whose chiefs, the lords of the Isles, were almost royal; Malcolm also subdued the Celts of Galloway, sometimes called Picts, but at this time Gaelic in speech.

Malcolm's brother, William the Lion (1165-1214), initiated the French alliance, fondly ascribed to the time of Charlemagne. William's desire was to seize Northumberland; in 1 173 he was allied with Henry, the rebellious son of the L.ton. Henry II., himself in alliance with France. The capture of William at Alnwick, in July 1174, permitted a Celtic revolt in Galloway, and necessitated the Treaty of Falaise, by which for fifteen years Scotland was absolutely a fief of England, though the clergy maintained their independence of the see of York, which was recognized by Pope Clement III. in 1 188. In a quarrel of church and state the legate had been authorized to lay an interdict on Scotland; William and the country merely disregarded it; and in 1191 a new pope absolved the Scottish king. The Celtic risings now were made in defence of the royal claims of a descendant of Duncan, son of Malcolm Canmore; there were also MacHeth claimants to the old rights of Lulach; Galloway and the Celtic north were ceaselessly agitated.

After the death of Henry II. in 1189, Richard I. sold back to Scotland all that his father had gained by the Treaty of Falaise, and William only became Richard's man — for all the lands for which his predecessors had been liegemen to the English kings, a vague phrase but implying that the king of Scotland was not liegeman for Scotland. To John, William did homage (1200) salvo jure suo. In 1 209 he promised to purchase John's goodwill with 15,000 merks, and gave hostages. Peace was preserved till William died in 12 14.

In the reign of his successor, Alexander II., the risings of Celtic claimants died out; he converted Argyll into a sheriffdom, and (1237) resigned the claims to Northumberland, in exchange for

lands in the northern English counties a ˆ e ‘ r /// with a rental of £200 yearly. His death in 1249 left the crown to his son, Alexander III., a child of eight, in whose minority began the practice by which parties among the nobility seized the person of the sovereign. At the age of ten, Alexander,

at York, wedded a child bride, Margaret, daughter of Henry III. His boyhood was distracted by vague party strifes, but Henry did not attempt to administer his country. In 1261 his queen bore, at Windsor, a daughter, Margaret, who later, marrying Eric, king of Norway, became the mother of ” The Maid of Norway,” heiress of Alexander III.; the girl whose early death left the succession disputed, and opened the flood-gates of strife. Alexander (1260) won the western isles and the Isle of Man from Norway, paying 4000 merks, and promising a yearly rent of 100 merks. In 1279 Alexander did homage to Edward I. at Westminster, salvo jure suo, and through the lips of Bruce, earl of Carrick. The homage was vague, ” for the lands which he holds of the king of England,” or according to the Scottish version, ” saving my own kingdom.” On the death of Alexander’s daughter, Margaret of Norway (1283), and of his son, the prince of Scotland, without issue, the estates, at Scone, recognized Margaret’s infant daughter as rightful successor. At this assembly were Bruce, earl of Annandale; Robert de Brus, earl of Carrick (later king), his son; Comyn, earl of Buchan; John Baliol; and James the Steward of Scotland, of the house of FitzAlan. On the 19th of March 1286 Alexander died, in consequence of a slip made by his horse on a cliff near Kinghorn during a night ride. His death was the great calamity of Scotland, and is lamented in a famous fragment of early Scottish verse. The golden age of ” The Kings of Peace ” was ended.

The first step of the Scottish noblesse (mainly men of Norman names), after Alexander’s death, was to send a secret verbal

message to Edward of England. Six custodians of Ballot” l ˆ e rea l m were then appointed, including the bishop parties. of Glasgow (Wishart) and the bishop of St Andrews*

(Frazcr). Presently the nobles formed two hostile parties, that of the

Bruces and that of Baliol. The Bruce party took up arms, and from the terms of their " band," or agreement, obviously contemplated resistance to the rights of the Maid of Norway, while declaring their fealty to Edward. In 1 286-1 289 Scotland was on the verge of civil war. Edward procured a papal dispensation for the marriage of the Maid of Norway to his son Edward; the Scots were glad to consent, and preliminaries were adjusted by the Treaty of Birgham (18th of July 1290). All possible care was taken by the Scots to guard their national independence, but Edward succeeded in inserting his favourite clause, " saving always the rights of the King of England, which belonged, or ought to belong, to him." As the Bruce faction had asserted their fealty to Edward, the carefully patriotic attitude of the Scots may be ascribed to the two bishops, who did not consistently live on this level. In August Edward ventured a claim to the castles of Scotland, which was not admitted. By the 19th of August it was known that the child queen had arrived in the Orkneys. An assembly was being held at Scone; the Bruces did not appear, but, by the 7th of October, they arrived in arms, on a rumour of the queen's death. The bishop of St Andrews tells Edward of these events, and urges him to come to the border, to preserve peace. The bishop of St Andrews was for Baliol, he of Glasgow was for Bruce; and the Baliol party, the seven earls complain, was ravaging Moray. These seven earls appear to represent the old rulers of the seven provinces of Pictland, and asserted ancient claims to elect a king. The Bruces placed themselves under Edward's protection. In March 1291 he ordered search to be made for documents bearing on his claims in the English clerical libraries, and summoned his northern feudal levies to meet him at Norham on Tweed, fully armed, in June. Hither he called the repre- sentatives of Scotland for the 10th of May; on the 2nd of June the eight claimants' of the crown acknowledged him as Lord Paramount, despite a written protest of the communitas of Scotland; obscurely mentioned, and not easily to be under- stood. Edward took homage from all, including burgesses even, at Perth; his decision on the claims was deferred to the 2nd of June 1292 at Berwick.

The choice lay between descendants in the female line of David of Huntingdon, younger brother of William the Lion.

John Baliol was great-grandson of this David, through his eldest daughter; Bruce the old was grandson of David through his second daughter, and pleaded that, by Scottish custom, he was David's heir. He also pleaded a Ballot selection of himself as successor by Alexander II., crowned. before the birth of Alexander III., but of this he had no documentary evidence. On the 17th of November 1292

Edward decided, against Scottish custom (if such custom really existed), in favour of Baliol, who did fealty, and, amidst cries of dissent, was crowned at Scone on the 26th of December.

Edward instantly began to summon John to his courts, even on such puny matters as a wine-merchant's disputed bill. He appeared to aim at driving Baliol into rebellion and annexing his kingdom. In 1293 Edward refused to '^Jby"' obey a similar summons from the king of France, and England. in 1294 was fighting in Gascony. Baliol declined to follow his standard and negotiated for a French alliance. Edward ordered Baliol's English property to be confiscated; Baliol renounced his fealty, and English merchants were massacred at Berwick. The Comyns failed in an attack on Carlisle, and (30th of March 1296) Edward took Berwick, seized William Douglas (father of the Good Lord James), and massacred the male populace. A disorderly levy of Scots, appearing on the hills above Dunbar, left their strong position (like Leslie later) and were defeated with heavy loss. Robert Bruce was now of Edward's party; the nobles in a mass surrendered and Edward was unopposed. He seized the Black Rood, the coronation stone of Scone, St Margaret's fragment of the True Cross, and many documents; then he marched north as far as Elgin. The Ragman's Roll contains sworn submissions of all probi homines outside of the western thoroughly Celtic region; and, in October 1296, Edward returned to England, with Baliol his prisoner, leaving Scotland in the hands of the earl of Surrey as guardian, Cressingham as treasurer, and Ormsby as justiciary.

Agitation at once broke out, and, when Edward went abroad in June 1297, he left orders for suppression of assemblies (con- venticulae). Now Sir William Wallace came to the front, a younger son of Sir Malcolm Wallace of Elderslie, near Paisley. The family probably came from England with the FitzAlans, the hereditary Stewards of Scotland. The English chroniclers call Wallace latro, " a brigand," and he probably was a leader of broken men, discontented with English rule. Sir Thomas Gray, son of an English gentleman wounded in a rising at Lanark in May 1297, says that Wallace was chosen leader " by the commune of Scotland," and began operations by slaying Heselrig, sheriff of Clydesdale, at Lanark. The Lanercost contemporary chronicler writes that the bishop of Glasgow and the Steward began the broil, and called in Wallace as the leading brigand in the country-side. Wallace, in fact, was a gentleman of good education. Percy and Clifford led the English forces to suppress him, and (7th July) made terms with the bishop, the Steward and Robert Bruce, who submitted; but Wallace held out in Ettrick Forest. Sir William Douglas was kept a prisoner for life, but Andrew Murray

was out in Moray, with a large following. The nobles who had submitted made delays in pro- viding hostages, and Wafenne marched from Berwick against Wallace, who, by September 1297, was north of Tay.

On hearing of Warenne's advance, Wallace occupied the Abbey Craig at Stirling, commanding the narrow bridge over the Forth ; the Steward and Lennox attempted pacific negotiations; a brawl occurred; and next day (nth of September) the English crossed Stirling bridge, marched back again, recr6ssed, and were attacked in deploying from the bridge. The general, Warenne, was old and feeble, Cressingham was hasty and confident; counsels were confused, the manner of attack was rash, and the rout was sanguinary. Cressingham was slain, and Warenne fled to Berwick. Pursuing his victory, Wallace ravaged Cum- berland, most English writers say with savage ferocity; but Hemingburgh represents Wallace as courteous on one occasion, and as confessing that his men were out of hand.

By the 29th of March 1298 Wallace appears, in a charter granted by himself, as guardian of the kingdom, and, witi

Wallace.

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Andrew Murray, as army leader in the name of King John — that is, the captive Baliol. By June 1298 Robert Bruce is active in the service of Edward, in Galloway. Edward was moving on Scotland, and on the 22nd of July he found Wallace in force, and in a strong position, guarded by a morass, at Falkirk. The Scottish horsemen fled from the English cavalry, but the archers of Ettrick fought and died round Sir John Stewart of Bonhill, brother of the Steward. The schiltrons, or squares of Scottish spearmen, were unbroken by Edward's cavalry, till their ranks were thinned by the English bowmen and could no longer keep out the charging horse. Wallace had made the error of risking a general engagement in place of retiring into the hills; to do this had, it is said, been his purpose, but Edward surprised him, and Wallace disappears from the leadership, while the wavering Robert Bruce appears in command, with the new bishop of St Andrews, Lamberton; Lord Soulis; and the younger Comyn, " the Red Comyn "

of Badenoch. For want of supplies, Edward returned to England through Annandale, burning Bruce's castle of Lochmaben. Stirling still held out for England. There is certain evidence of fierce dissensions in some way connected with Wallace, among the Scottish leaders (August 1299). Wallace was going to France; the Scottish leaders were reconciled to each other, and took the castle of Stirling, which they entrusted to Sir William Oliphant. The Scottish cause seemed stronger than ever, under Bruce, the Steward, the Red Comyn and Lamberton, but in June 1300 Edward mustered a splendid array, and took Carlaverock castle, but, on the arrival of the archbishop of Canterbury with a letter from the pope approving of the Scottish cause, he granted a truce till Whitsuntide 1301. The barons of England angrily refused to submit to the papal interference, but nothing decisive was attempted by Edward, though Bruce had again entered his service. By 1303 France (which doubtless had moved the pope to his action) deserted the Scots in the Treaty of Amiens, and Edward, with little opposition, overran Scotland in 1303.

On the 9th of February 1304 Comyn with his companions submitted; they hunted Wallace, who had returned from the continent, and on the 24th of July the brave Oliphant surrendered Stirling on terms of a degrading nature. Among his officers we see the names of Napier, Ramsay, Haliburton and Polwarth.

The noblest names of Scotland now took part in the pursuit of Wallace, who, as great in diplomacy as in war, had visited Rome (he had a safe-conduct of Philip of France to that end), and had at least secured a respite for his country. It seems probable that Wallace remained consistently loyal to Baliol, and hostile to the party of the wavering Bruce. He was taken near Glasgow, in his own country, and handed over to England by Sir John Menteith, sheriff of Dumbartonshire. Menteith certainly received the blood-money, £100 yearly in land, and Wallace, like Montrose, was hanged, disembowelled and quartered (at London, August 1305). Tradition attributes to Wallace strength equal to his courage. His diplomacy in France proves him to have been a man of education, and his honour is un- impeached; he never wavered, he never was liegeman of Edward, while bishops, nobles, and, above all, Bruce, perjured themselves and turned their coats again and again. The martyr of an impossible loyalty, Wallace shares the illustrious immortality of the great Montrose, and is by far the most popular hero of his country's history. His victory at Stirling lit a fire which was never quenched, and began the long and cruel wars of inde- pendence on which Scotland now entered.

For an hour there seemed as if there might be no raising of the fallen standard of St Andrew. Edward had not yet alienated B the country by cruelty, save in the case of Wallace

and the massacre of Berwick. He aimed at a union of the two countries, and Scottish representatives were chosen to sit in the English parliament. The laws of David I. were to be revised. Eight justices were appointed, the sheriffs were mainly Scots of the kingdom; the bishop of St Andrews was one of the Scottish representatives. The country was being re- organized, ruined churches and bridges were being rebuilt. The " commons," the populace, were eager for peace; nobles

like Bruce were Edward's men. Bruce had been actively en- gaged in the siege of Stirling, and had succeeded his father as earl of Annandale. Yet, during the siege of Stirling (nth of June 1304) , Bruce had entered into a secret band with Lamberton, bishop of St Andrews, for mutual aid. Early in February 1306 he stabbed the Red Comyn before the high altar, in the church of the Franciscans at Dumfries: Comyn's uncle was also slain, and Bruce, from his castle of Lochmaben, summoned his party to arms; he was supported by the bishops of St Andrews and Glasgow, and by Sir James of Douglas, and was promptly crowned by the countess of Buchan, representing the clan MacDuff, at Scone.

The cause of the slaying of Comyn is unknown; the two men had long been at odds, but the evidence does not confirm the story that Comyn had betrayed Bruce to Edward. It is more probable that Comyn merely refused to be drawn by Bruce into a rising, and that the deed was unpremeditated. Be that as it may, Bruce had now no place of repentance for a saerilegioui homicide; he could not turn his tabard again; he was outlawed, forfeited and excommunicated. He had against him, not merely England, but the kith and kin of Comyn, including the potent clan of MacDowall or MacDougall in Galloway and Lome; on his own side he had his kinship, broken men, and the clergy of Scotland. Heedless of the excommunication they backed him, and the preaching friars proclaimed his to be a holy war.

Bruce was warring in Galloway when, in May 1306, Aymer de Valence led an English force to Perth. Bruce followed, and was defeated in Methven wood; the prisoners of rank, his brother Nigel, and Atholl, with others, were hanged, and his two bishops were presently secured. "All the Commons went him fra," says Barbour, the poet chronicler. His queen, with Lady Buchan and his sister, were imprisoned; and his castles were held against him. He took to the

heather, making for the western seas, hewing his way through the MacDougals at Tyn- drum and marching over the mountains to Loch Lomond, which he crossed in a canoe. Sir Nial Campbell of Lochow, founder of the house of Argyll, secured shipping for him, and he reached a castle of Macdonald of Islay (Angus Og), his ally, at Dunaverty in Kintyre. He was driven to an isle off the Irish coast; he thence joined Douglas in Arran, and by a sudden camisade he butchered the English cantoned under his own castle of Turnberry in Carrick. Two of his brothers were taken in Galloway and hanged at Carlisle, while King Edward, a dying man, lay with a great army at Carlisle, or at the neighbouring abbey of Lanercost. Aymer de Valence, Butetourte, Clifford, and Mowbray were sent to net and " drive " the inner wilds of Galloway, where Bruce lurked in the forests and caves of Loch Trool and Loch Dungeon. Now he evaded them, now he and his valiant brother Edward surprised and cut them up in detail, doing miracula, says a contemporary English chronicler. Douglas, an excellent guerilla leader, captured his own castle and butchered the English garrison. By the 15th of May 1307 a writer of a letter from Forfar says that if. Edward dies his cause in Scotland is lost. Bruce slipped into Ayrshire and defeated de Valence at Loudon Hill ; so Edward, a dying man, began to move against him with his whole force. He died (7 th of July 1307) at Burgh-on-Sands, leaving his incompetent son to ruin himself by his own follies, while ferocious hangings and dragging of men to death at horses' heels roused the Scottish Commons, and the men of Ettrick and Tweeddale, renouncing their new lord, de Valence, came over to the wandering knight who stood for Scotland.

In the winter of 1307 and in 1308 Bruce ruined Buchan, a Comyn territory, and won the castles of Aberdeen and Forfar, while Edward Bruce cleared the English out of Galloway. In the summer of 1309 Bruce fell on the MacDougals, on the right side of the Awe, where it rushes from Loch Awe at the pass of Brander, and, aided by a rear attack led by Douglas, seized the bridge and massacred the enemy. He then took the old royal castle of Dunstaffnage and drove the chief, John of Lome, into England; Menteith, the captor of Wallace, changed sides, and

Edward, after a feeble invasion in 1310, retreated from a land laid

desolate by the Scots.

In 13 1 1 Bruce carried the war into England, seconded by the most audacious if the least skilled of his captains, his daring brother Edward. For two years the north of England, as far south as Durham and Chester, was the prey of the Scots, and some English counties secured themselves by paying an in- demnity. The castles of Carlisle and Berwick, however, repelled the assailants, -but Perth was surprised, in January 1313, Bruce himself leading the advance. Randolph, earl of Murray, took the chief hold in the country, Edinburgh castle, by scaling the precipitous rock to the north, while a feigned attack was being made on the accessible southern front. In short almost every castle held by the English was captured, and the fortifications were destroyed.

In the spring of 13 13 Edward Bruce invested Stirling castle, the key of Scotland; on midsummer day he accepted a pact for the surrender of the place if not relieved within a year. This was a heedless piece of chivalry on Edward's part. It gave the English king, less opposed by his nobles since his favourite, Gaveston, was slain, time to muster a large army, which Bruce must meet, if at all, in the open field. Edward II. not only summoned English but Irish levies, and knights of Hainault, Bretagne, Gascony and Aquitaine crowded to his standard. The estimates of numbers by the old writers are usually much exaggerated; modern authorities reckon King Edward's army at 50,000 of whom 10,000 were cavalry. Old accounts put the infantry at 100,000, the horsemen at 40,000. Bruce had but five hundred horse, under Keith the Marischal; Douglas led the levies of his own district and Ettrick Forest; Randolph commanded the men of Moray; Walter Steward, those of the south-western shires; and Angus Og brought to the Scottish standard the light-footed men of the Isles, and, probably, of Lochaber, Moidart, and the western coast in general. Bruce commanded the people of Carrick and probably of his old earldom, Annandale.

Moving out from the Torwood forest, Bruce arrayed his force so as to guard either the Roman road through St Ninians, or the way through the Carse, which was then studded with marshes and small lakes. The former route appeared to be chosen by the English, and Bruce stationed his army in a position where it was defended by a cleugh, or ravine of the Bannockburn, and by two morasses between which was a practicable but narrow neck of firm land. Randolph, on Bruce's left, was to guard against a rush of English cavalry to relieve Stirling castle. The Macdonald tradition is that their clan was on the right wing, under Angus Og; the old accounts place them with Bruce's

reserves. Three hundred English horsemen appear to have stolen round Randolph's flank unseen by him, and Bruce is said to have warned him that " a rose had fallen from his chaplet." Randolph advanced with his footmen against the English horse, who unwarily accepted his challenge and were defeated by his spearmen. While Edward's army paused, Bruce, mounted on a palfrey, was attacked by Sir Henry Bohun. Bruce evaded his spear and slew him with an axe stroke; the axe shaft broke in his hand. The omens were evil for England; and her forces bivouacked, reserving the general attack for the following day. Bruce is said to have proposed retreat and a guerilla war, but his council were for fighting.

In the general engagement, next day, the English cavalry could not break the " impenetrable wood " of the Scottish spearmen, who, however, were galled by the arrows of the English bowmen, which had broken their formation at Falkirk. Bruce bade Keith, with his five hundred horse, charge the archers in flank: apparently they were unprotected by pikes; they were broken, and the great peril passed away. The Scottish archers charged with axe in hand, and the Scottish right front was protected by a mass of fallen English horses and fighting men; the rear ranks of the English, clogged and crowded, could not reach the foe, and the line of Scottish spears pressed steadily and slowly forward. Now a panic was caused by a

Bannock, burn.

rush of camp followers from the "gillie's hill": the English wavered; Bruce commanded an advance of his whole line: the English rout was general, and, had Bruce possessed cavalry, few would have escaped. The Bannockburn was choked with the fallen, and it was only by hard spurring that Edward and his guards reached Dunbar, whence he sailed to Berwick. An immense booty and many ransoms rewarded the Scots, whose victory was one of the decisive battles of the world. It was won by the generalship of Bruce and his captains; by the excel- lence of his position, by the steadiness of his men, and, obviously, by the reckless fury of the English cavalry, and by the folly which left their archers open to defeat by the Marischal's handful of horse (24th of June 13 14).

Bruce now swept the country, but Carlisle he could not take. He married his daughter, Marjory, to the Steward, and from this union came the Stewart (Stuart) dynasty. The invasion of Ireland by Edward Bruce failed (1315-1318), and Edward fell in battle: after which (13 18) parliament settled the crown in the Steward's line, failing male descendants of Robert Bruce. He disdained the pope's

efforts to make peace with England, except on terms of absolute independence for his country. He took and held Berwick, and (14th of October 1322) defeated Edward with heavy loss near Byland Abbey in Yorkshire, where the highlanders scaled a cliff and drove the English from a formidable position. A thirteen years' truce was arranged in 1323: the pope removed his excommunication from Bruce, and acknowledged him as king: a son, David, was born to him in 1324.

The murder of Edward II. (1327) was followed by successful Scottish raids in the north, and in May 1328 the Treaty of Northampton sealed the triumph of Scotland. David Bruce was to marry Joanna of England: Bruce was ™' s a recognized as king: former owners of forfeited lands, wor k, with three exceptions, were not to be restored. This led, after Bruce's death, to an invasion by the disinherited English ci-devant lords of lands in Scotland, and to a long war from which Scotland was only " saved as by fire." Bruce died, outworn by war and hardships, on the 7th of June 1329: his body was buried in Dunfermline abbey; his heart, which Douglas was bearing to the Holy Land, was brought home again, after Douglas's chivalrous death in battle with the Moors in Spain.

Bruce, previously so shifty, had never wavered or turned back since he smote the Red Comyn at Dumfries. In face of obstacles apparently insurmountable he had made a nation, consolidating all the forces which Wallace had stirred into life. There is, perhaps, nothing in the history of medieval Europe which so closely resembles a voice from ancient Greece as the reply of the nobles and the whole communitas of Scotland to the pope (parliament of Aberbrothock, 6th of April 1320). They will be liegemen of Bruce only so long as he resists England. As long as a hundred Scots are left alive, they will continue the war for freedom, " which no good man loses save with his life." They show that the barbarities of Edward I. (which he regarded as reprisals) have made it eternally impossible for Scotland to yield to an English king. Their excommunication by Rome does not trouble them at all. They are free from Rome, from England, from all alien powers. Henceforth, through good and evil fortune, this was the spirit of the nation.

The most important point in constitutional history was the action of a parliament at Cambuskenneth, near Stirling, in 1326. The representatives of the burghs were present: they made a grant of all tenths to the king during his life; while they coven- anted with him that he should collect no other taxes and should exercise the privileges of prisiae et cariagia with moderation. The long wars had

been adverse to commerce, for which ransoms and the booty of Bannockburn made inadequate compensation. But the great abbey church of St Andrews was, none the less, completed, to stand for some two hundred and forty years, and was dedicated in the presence of Bruce.

The brilliant and sustained effort which made Scotland in- dependent was almost paralysed by the deaths of Bruce and

the Good Sir James of Douglas, during the minority of David II. (crowned, 24th of November 1331). The disinherited lords, d u 11 deprived of their lands by Bruce, were headed by struggle Edward Baliol, claiming the crown of Scotland as heir with of John Baliol, and secretly backed by England. Ran-

ffYiT 1 dolph died in July 1332, and in August Edward Baliol, with the disinherited lord of Liddesdale, and Beaumont, the disinherited earl of Buchan, and the English claimant of the earldom of Atholl, landed a filibustering force in Forfarshire. They were opposed by the new regent of Scotland, the earl of Mar, who was routed with heavy loss and was slain, at Dupplin, on the 12th of August 1332. The English owed the victory to their archers, whose shafts rolled up a courageous charge by the Scots. Edward Baliol was enabled to seize and fortify Perth and was crowned at Scone, as Edward I. of Scotland (24th of September). On the 23rd of November, at Roxburgh, Baliol acknowledged Edward III. as his liege lord and promised to surrender Berwick and large lands in southern Scotland. The hands on the clock were then put back to the time of the reign of John Baliol. But the earl of Murray, son of Randolph, and Archibald, youngest brother of the Good Lord James of Douglas, surprised Baliol at Annan and drove him, half clad, into England.

The struggle was now (1333) for Berwick, which was besieged by Edward III. Archibald Douglas tried to relieve it, just as Relations Edward II. strove to relieve Stirling, and found his with Bannockburn on Halidon hill (19th of July 1333),

Edward where he was routed and slain, with many of the leaders of the Scots. Scotland was never again to hold Berwick for any length of time: meanwhile a few castles stood out, but the child king was

sent over to France for safe keeping. A parliament held by Baliol at Edinburgh (February 1334) ratified the promises made by him to England at Rox- burgh: the disinherited lords were in power and many patriots turned their coats. At Newcastle on the 1 2th of July Baliol surrendered to Edward III. the southern shires of Scotland with their castles: he had already done homage for the whole of Scotland; and Edward III. would have succeeded where Edward I. failed, had not the partisans of Baliol come to deadly feud over matters of their private interests and ambitions. Some took part with Sir Andrew Murray, son of a companion of Wallace, and with the Steward, who contrived to occupy the castle of Dunbarton, the key of western Scotland. These two men, with Campbell of Loch Awe, and Randolph's son, the earl of Moray, held up the national standard and were joined by the English claimant of the earldom of Atholl.

Randolph's daughter, too, the famous Black Agnes of Dunbar, brought over her wavering husband, the earl of March, to the side of the patriots, and there was a war of partisans, while Edward III. again and again invaded and desolated southern Scotland. In 1335-1336 the English party prevailed, and patriots began to come into the English peace: Atholl again changed his side, but the sister of Bruce held out. in Kildrummie castle. Andrew Murray, March and a Douglas, the Black Knight of Liddesdale, went to her relief and slew Atholl: Edward III. (1336) again waged a victorious summer campaign, from Perth as his base, and again found Scottish resistance revive in winter. His rupture with France in October 1337, caused by his claims to the French crown, tended to withdraw his attention from Scotland, .where, though the staunch Sir Andrew Murray died, Black Agnes drove the English besiegers from Dunbar (1338), while the Knight of Liddesdale recovered Perth. By 1342 Roxburgh, Stirling and Edinburgh castles were again in Scottish hands, though the Knight of Liddesdale captured and starved to death, in Hermitage castle, his gallant companion in arms, Sir Alexander Ramsay, who had relieved the garrison of Dunbar. With this Douglas, Knight of Liddesdale, a ruffian and a traitor, may be said to begin the long struggle between his too powerful house and the crown.

King David, a lad of eighteen, had returned from France and had removed this Douglas from the sheriffdom of Teviotdale, superseding him by Alexander Ramsay. Douglas revenged himself on Ramsay, as we have seen, and though David was

obliged to overlook the crime, the Knight of Liddesdale hence- forth was not to be trusted as loyal against England. It is probable that he

was intriguing for Baliol's restoration, and he certainly was securing the favour of Edward III. cˆLiluy An ill-kept truce of three years ended in October 1346, when David attempted to lead the whole force of his realm, including the levies of John, Lord of the Isles, and of the western Celts in general, against England. As the Celts marched south the earl of Ross slew Ronald Macdonald, whose inheritance was claimed by John of the Isles. As a result, the Islesmen went home: David, however, crossed the border, plundering and burning the marches. Near Durham he came into touch with English levies under Henry Percy and the archbishop of York. David was a knight of the French school of late chivalry: he was not a general like Bruce or Randolph. In this affair of Neville's Cross (17th of October 1346) he copied the mistakes of Edward II. at Bannockburn; his crowded division was broken by the English archers, and the king himself was wounded and captured. Moray, the last male representative of Randolph, with the Constable and Earl Marischal of Scotland, was slain; the Steward made his escape: and, henceforth, the childless David regarded his heir, the Steward, with jealousy and suspicion. The Steward, during the king's captivity, was regent, and the Douglas of Liddesdale (the son of Archibald and nephew of the Good Lord James) drove the English out of Douglasdale, Teviotdale and the forest of Ettrick. A truce till 1354 was arranged between England, France and Scotland, while the country strove to raise the royal ransom, and David, who preferred English ways to those of his own kingdom, acknow- ledged Edward III. as his paramount. It became David's policy to secure his own life interest on Scotland, while the crown, on his decease, should go to one of the English royal family. The more loyal William Douglas, in 1353, slew his kinsman, the shifty Knight of Liddesdale, on the braes of Yarrow, and a fragment of one of the oldest Scottish ballads deplores his fall.

In July 1354 an arrangement as to David's ransom was made: his price was 00,000 merks sterling (for the coinage of Scotland was already beginning to be debased). Negotiations David's were interrupted by the arrival of French reinforce- agreement ments in men and gold: Berwick was recaptured, only Jjjf to be recovered by England in 1356. In the same year Edward Baliol, after handing over his crown and the royalty of Scotland to Edward III., retired from active life, and Edward wasted the south in the raid of " The Burned Candlemas." In October 1357 David was permitted to return to Scotland, giving hostages and promising 100,000 merks in ten yearly payments. The country, crushed by inevitable taxation, was discontented, and not reconciled by Edward's grant of commercial*

privileges. In May 1363 David put down a rising headed by the Steward, and then, in October, went to London, where he and the earl of Douglas made arrangements by which the countries were to be united' under Edward III. if David died childless. Scotland was to be forgiven the ransom, receive the Stone of Scone and retain its independent title as a kingdom: her parliaments were to be held within her own borders; her governors and magistrates were to be Scots, freedom of trade was guaranteed, and the earl of Douglas was to be restored to his English estates, or to an equivalent.

This scheme would have saved Scotland from centuries of war and from a Stewart dynasty: there would have been a union of the crowns, as under James VI.; or (by an alternative plan of November, December 1363) a son of the king XfeˆdAy of England, not Edward III. himself, would succeed Scotland. to David. In March 1364 David laid the projects before a parliament at Scone, which firmly refused its assent. Possibly David had, as one motive for his scheme, the very dubious legitimacy of the children of the Steward, a probable cause of civil war and a disputed succession. He had also private reasons for disliking the Steward, who was on bad terms with the widow, Margaret Logie (by birth a Drummond), whom David had married on the death of his first wife. The country,

resolved to stand by the Steward and the blood of Bruce, pre- ferred the heavy taxation and the turbulence inevitable under such a king as David to union under an English prince. On the 20th of June 1365 Edward granted a four years' truce, with the ransom to be paid in yearly instalments of £4000. But the necessary taxation was resisted by various nobles, including John of the Isles (1368), who .had married a daughter of the Steward. John was in arms, divisions and distress were every- where, a famine prevailed, and Scotland had to face the prospect of yielding to Edward, when, in 1369, that prince proclaimed himself king of France, and, having his hands full of war, made a fourteen years' truce with his northern neighbour.

David was now free to subdue John of the Isles, to repudiate all his own debts contracted before 1368, and to make prepara- tions for a

crusade. From this crowning folly death delivered him on the 22nd of February 1371. The whole of his ransom was never paid, and his absurdities and misfortunes gave the Estates opportunity to strengthen their constitutional position. They established the rule that no official should put in execution any royal warrant " against the statutes and common form of law." The reign also saw the introduction of the committees, " elected by the Commons and the other Estates," which did the actual business of parliament, thus saving time and expense to the members. But these committees, later known as the Lords of the Articles, were to exercise almost the full powers of parlia- ment in accordance with the desires of the crown, or of the dominant faction, and they were among the grievances abolished after the revolution of 1688-1689. The whole reign was a period of wasteful turmoil, of party strife, of treachery, of reaction. But the promise of peace and prosperity in exchange for absolute independence was rejected with all the old resolution ; and the freedom which a Bruce desired to sell was retained by the first of the Stewart line, Robert II. ; for Mr Froude erred in alleging that James I. was the first Stewart king of Scotland. Robert II., the grandson of Robert Bruce, had lived hard, and when he came to the throne, was weary of fighting and of politics.

Nothing proves more clearly the firm adherence of the Stuart nation to the blood of Bruce, and the parliamentary

settlement of the crown in his female line, than the

line: Robert II.

undisputed acceptance of the Steward's children as heirs to the throne. Several of them had been born to Robert's mistress, Elizabeth Mure of Rowallan, before a papal dispensa- tion permitted, in 1349, a marriage which the canon law seemed to render impossible. The pope might have said, like a later pontiff on another day, " remittimus irremissibile." By a second marriage, undeniably legal, Robert had a family whose claims were not permitted to give trouble at his accession, though the earl of Douglas, the fellow conspirator of David II., would have caused difficulties if he had possessed the power. His eldest son, the earl who fell at Otterburn, was married to Robert's daughter, Isabella, but by her had no issue. The new prince of Scotland, John (an unlucky name, later changed to Robert), was a. faineant: the king's second son, Robert, earl of Fife (later first duke of Albany), was a man of energy and ambition, while the character of the third, Alexander, is expressed in his sobriquet, " The Wolf of Badenoch."

When the new reign opened, Edward III. made no secret of his claims to be king of Scotland, and the southern regions were still in English hands. From 1372 to 1383 Scotland was in truce with England; and Robert II. had no desire to aid France and accept from Rome a dispensation from the oaths of truce. The southern nobles, under the Douglases and March, kept up a semi- public feud with the Percy on the border, after the accession of Richard II., still a child, and piece by piece Scottish territory was recovered, mainly in Teviotdale and Liddesdale. In 1380 and 1381, Lancaster, uncle of Richard II., arranged truces, but difficulties were caused by the late proclamation, in Scotland, of a truce made with her ally, France, on the 26th of January 1384. With the tidings of this truce arrived, in April, a body of French knights who desired to enjoy fighting, and though dates are obscure they seem to have caused, by a raid in April, a retaliatory foray by the Percies in May or June. The king smoothed matters

Robert III.

over, but in 1385 a great band of French knights landed in Scotland, forced the king's hand, and penetrated England as far as Morpeth. Here they might have had fighting enough, as Lancaster led a force against them, while Richard II. followed with a large army. But Douglas, to the disgust of the French, refused battle, and allowed the English to do what mischief could be done in a thrice stripped country. The French deemed the Scots shabby, poor and avaricious: their grooms were killed by the peasantry when they went foraging: the nobles were churlish and inhospitable.

In August 1388 Douglas led the famous raid as far as Alnwick castle, which culminated in the battle of Otterburn, fought by moonlight. Here Douglas fell in the thickest of the melee, but his death was concealed and Henry Percy, with many other English knights, were captured and held to heavy ransom (rsth of August 1388). These battles were fought in the spirit of chivalry, and were followed, in 1389, by a three years' truce. The second son of King Robert, Albany, was appointed governor, his father being in ill-health and dying in 1390. He was succeeded (14th of August 1390) by his son Robert III., whose own health was so bad that, in the previous year, his brother Albany had been preferred before him as governor. The reign of a weakling was full of anarchy, complicated by the feud between his eldest son, the wayward duke of Rothesay, and his ambitious brother, now duke of Albany. These two are the first dukes in Scotland. There was peace with England till the death of Richard II. in 1399, and till the parliament of January 1399 Albany still

undertook the duties of the king.

Here commenced the tragedy of the Stuarts and of Scotland. For nearly two centuries each reign began with a long royal minority, increasing the power and multiplying the feuds of the nobles. The remainder of each reign was, nj /ff'" y therefore, a struggle to re-establish the central power, a struggle in which cruel deeds were done on all sides. Meanwhile, now England, now France, secured the alliance of the men in power, or out of power, and threatened the independence of the kingdom. The cause of the miseries of these two unhappy centuries was beyond human control: no Stuart sovereign, after Robert II., escaped from the inevitable evils of a long minority, while Robert II. himself was as weak as any child. Under his nominal rule, the Celts of the north and west, in 1385, became troublesome, while Robert's son, the Wolf of Badenoch, who was justiciary, with his own wild sons, rather fanned than extin- guished the flames. They slew the sheriff of Angus (1391-1392) in a battle, and then two clan-confederacies, quarrelling among themselves, put their cause to the ordeal of fight, in the famous combat of thirty against thirty, on the Inch of Perth (see Scott's Fair Maid of Perth).. Though we know the cost of fencing the lists, from entries in the treasury accounts, we are ignorant of the cause of the quarrel, and even of the clans engaged. The names are diversely given, but probably the combat was only one incident in the long wars of the Camerons with the great Clan Chattan confederacy. In 1397, at Stirling, the Estates denounced the anarchy " through all the kingdom," and, in 1398-1399, were full of grievances arising from universal misgovernment. By this parliament, David, prince of Scotland and duke of Rothesay, was made regent for three years; with his uncle, duke of Albany, as his coadjutor. Peace between Albany and the wayward Rothesay was impossible, and Rothesay, by breaking troth with the daughter of the earl of March, and marrying a daughter of the third earl of Douglas, added a fresh feud to the general confusion.

Meanwhile Scotland, to vex. Henry IV., adopted the cause of the " Mammet," the pretender to be Richard II. This enigmatic personage appeared in Islay, and rather had his pretences thrust on him than assumed them; he was half-witted. Meanwhile the insult to March caused him to seek alliance with Henry IV., who crossed the border — the last English king to do so — and appeared before Edinburgh castle. Rothesay held it in his contempt, and, as Albany declined a battle in the open, Henry returned with nothing gained.

James I.

In 1400 Albany, and the 4th earl of Douglas (brother-in-law of the duke of Rothesay) , confessed before the Estates that they had arrested the prince, and were cleared of the guilt of his sub- sequent death. They kept him, first in the castle of St Andrews, and then at Falkland, where he perished; some said of dysentery, others, of starvation.

Restored to the regency, Albany permitted his son, Murdoch, with Douglas, to retort on a successful raid by Percy and the traitor March. They were defeated by English archery, as usual, at Homildon hill: Murdoch and Douglas were captured. Percy, dissatisfied with Henry's treatment of him in the matter of ransoms, led an army into Scotland which was to have trysted at Cocklaw with Albany and the whole forces of the realm, and invaded England. But Douglas and Percy left Cocklaw before Albany came up, and hurried to join hands with the Welsh rebel, Glendower. The hostile forces met at Shrewsbury, and Shake- speare has made the result immortal. Percy was slain; Douglas was the prisoner of England.

The young prince of Scotland, the first James, was on his way to seek safety in France, during an interval of truce, but was captured on the high seas by English cruisers. (The dates are obscure, but James was in the Tower by February-March 1405-1406.) His father's death followed (4th of April 1406). Albany sent, within a year, envoys to plead for his release; and again, in 1409, but vainly. An interval of peace occurred, among a series of border battles, and the heresy of Lollardy was attacked by the clergy; Resby, who had been a priest in England, was burned in 1407 at Perth. The embers of Lollardy, not extinguished by the new central fountain of learning, the university of St Andrews, smouldered in the west till the Reformation.

" The wicked blood of the Isles," the Macdonalds, descendants of island kings, now made alliance with England; Donald, eldest son of the Lord of the Isles, having an unsatisfied claim on the earldom of Ross, which Albany strove to keep in his own family. The greatest of highland hosts met at Ardtornish castle, now a ruin on the sound of Mull : they marched inland and north, defeated the Mackays of Sutherland and were promised the plunder of Aberdeen. The earl of Mar, with a small force of heavily-armoured lowland cavaliers,

stopped and scattered the plaided Gael at Harlaw (1411). The knights lost heavily, but Donald did not plunder Aberdeen (see Elspeth's ballad of Harlaw, in The Antiquary). Next year Albany received the submission of Donald at Lochgilp in Knapdale, and the Celts were, for the moment, useless to their allies of England.

Time went on: Albany's son, Murdoch, was set free, but in 1410 the captive King James much resented Albany's neglect of himself. His letter is written in Scots. Albany died in 1420; his regency, with that of his son Murdoch, produced the anarchy which James, when free, combated at the cost of his life. Mean- while France demanded and received auxiliaries from Scotland, who fought gloriously for French freedom. Their great victory, where the duke of Clarence fell, was at Bauge Bridge (142 1), where the Stewarts and Kennedys, under Sir Hugh, were specially distinguished. In 1424 the Scots, with the earl of Buchan and the earl of Douglas, were almost exterminated at Verneuil, some five months after King James, already affianced to the Lady Jane Beaufort, was released. He never paid his ransom, and his noble hostages lived and died south of Tweed: one cause of his unpopularity.

Tradition tells that James vowed " to make the key keep the castle, and the bush keep the cow," even though he " lived a dog's life " in the endeavour. His reign was a struggle against anarchy and in the cause of the poor and weak. He instantly arrested Murdoch, son of Albany, and Fleming of Cumbernauld, met parliament, dismissed it, retaining a committee (" the Lords of the Articles "), and took measures with landlords, who must display their charters; appointed an inquest into lay and clerical property; and imposed taxes to defray his ransom. The money could not be collected, and the edicts against private wars and the maintenanceof armed retainers were hard to enforce. James next arrested Lennox and that Sir Robert Graham whose feud

proved fatal to the king. In March 1425 he met his second parliament, relying on a council of barons with no great earl but Mar. He next arrested Albany's secretary and the Lord Montgomery: the story, accepted by our historians, that he also seized twenty-six notables, has been finally disproved by Sir James Ramsay. No Scottish king ever embarked on such a coup d'etat as the arrest of " the whole Scottish House of Lords," and Knox, who attributes a much larger design to James V., must have been deceived by rumour. Albany (Murdoch), his son, and Lennox, were tried and executed: Albany's son, James, in revenge burned Dumbarton. The king appears to have been avenging his private wrongs, or destroying the

three nobles pour encourager les autres. Parliament now insisted on inquisition for heretics: an act was passed (which never took effect) against " bands " or private leagues among the nobles: the Covenant was called " the great band," by cavaliers in days to come. More important was the establishment of a new court of justice, the court of Session, to sit thrice in the year. Yeomen were bidden to practise archery, to which they much preferred football and golf.

The highlanders were next handled as the lowlanders had been; a parliament was held at Inverness and a number of chiefs who attended were seized, imprisoned or executed. The Lord of the Isles, when released, burned Inverness (1429), but, being pursued, he was deserted by Clan Chattan and Clan Cameron (probably the clans represented on the ordeal of battle on the Inch of Perth). The Lord of the Isles made submission, but Donald Balloch, his cousin, defeated Mar near Inverlochy, later fled to Ireland, and was reported dead, though he lived to give trouble. James was unjustly repressing highland anarchy: from the highlands came his bane.

James now granted his daughter, a child, to the Dauphin, later Louis XL; but, as Jeanne d'Arc said, " the daughter of the king of Scotland could not save Orleans," then (1428-1429) besieged in a desultory manner by the English. In February 1429 the Scots under the orifiamme were cut to pieces in " The Battle of the Herrings " at Rouvray. The surviving Scots fought under Jeanne d'Arc till her last success, at Lagny, under Sir Hugh Kennedy of Ardstinchar in Ayrshire, but James (May, June 1429) made a treaty of peace with Cardinal Beaufort, which enabled Beaufort to send large reinforcements into Paris, where the Maid, deserted by Charles VII., failed a few months later.

In October 1430 was born the prince destined to be James II. The king and the Estates were curtailing the judicial privileges and jurisdiction of the clergy; and the anti-pope, Peter de Luna, quarrelled with the country on this ground. Scotland then deserted his cause for that of Martin V., but quarrels between church and state did not cease, and a legate arrived to settle the dispute a few days before the king's murder. James had already threatened the Benedictines and Augustines for " im- pudently abandoning religious conduct," and had founded the Carthusian monastery in Perth, that the Carthusians might offer a better example. A reformation by the state seemed at hand, but the religious orders fell deeper in odium and contempt during the next hundred and thirty years. Doctrine, too, was en- dangered by heretics, one of whom, a Hussite named Paul Crawar, was burned at Perth in 1433.

In 1427 James seized, as a male fee, the earldom of Strathearn, gave the earl by female descent the title of Menteith, and sent him to England as a hostage for his ransom. He was nephew of the Sir Robert Graham whom James had arrested at the begin- ning of his reign: Graham's anger was thus rekindled. The earls of Mar and March also lost their lands, on one pretext or another: James's policy was plainly to break the power of the nobles.

The English translation (1440) of a lost contemporary Latin history of the events avers that Sir Robert Graham rose in parliament, denounced James as a tyrant and called on the barons to seize their king: Graham was taken, j ame si. was banished from court, was confiscated and fled to the Atholl hills. He thence intrigued with the old earl of Atholl (heir to the crown if the ancestors of James by Robert II.

and Elizabeth Muir were illegitimate), and he drew into the conspiracy the king's chamberlain, Atholl's grandson. By his aid 300 Highlanders were brought into the monastery of the Black Friars in Perth, where the king was keeping the Christmas of 1436, and there they slew James, who had fled into a vault. The conspirators were seized and tortured to death with unheard- of cruelties, but lawlessness had won the battle. James had failed, practically, even in his effort (142 7-1428) to anglicize parliament, by introducing the representative system; two " wise men " were to be chosen by each sheriffdom, and two Houses were to take the place of the one House in which all Estates were wont to meet. But constituents were averse to paying their members, no Speaker was elected, the reform never came into being. Till the Union, all estates sat in one room during parliament. The court of session was the most valuable and permanent of James's innovations, and his poem " The King's Quhair " attests his real genius. He had attempted to reform the country too hurriedly; and treachery, by all accounts, was one of his methods. He left a child as king, and the old round of anarchy began again; oppression, murder, feud, faction and private war. History repeats itself, and the evil practices were checked, not by the Reformation, but by the increased resources and entire safety enjoyed by James VI. when he succeeded to the crown of England.

Space forbids a record of the faction fights in the reign of James II. Coming to the crown at the age of seven, he was James u. use< ˆu ˆ e tne Great Seal, as a sanction of authority and passed from one party to another of the nobles, as each chanced to be the more dexterous or powerful (crowned 25th of March T437). The Crichtons and Livingstones held the king till the earl of Douglas died, being succeeded by his son, a boy. The queen-mother married Sir James Stewart of Lome, and their sons, Buchan and Atholl, mixed in the confused intrigues of the reign of James III., but the queen was treated with scant courtesy by the rival parties. From them the young earl Douglas and due de Touraine, the most powerful man in Scotland, stood apart, sullenly watching an unprecedented state of anarchy. Livingstone and Crichton, previously foes, invited him and his brother to dine with the child king in Edinburgh castle, and there served to him " the black dinner " bewailed in a fragment of an early ballad. The two young nobles, after a mock trial, were decapitated (November 1440).

Douglas was succeeded in his earldom by his grandfather, Sir James the Gross, an unwieldy veteran. On his death in 1443, his son, William, a lad of eighteen, became earl, and waged private war on Crichton, while he allied himself with Livingstone. Crichton lost the chancellorship: and the keys were given to Kennedy, bishop of St Andrews and founder of St Salvator's college in that university. Involved in secular feuds with Douglas, Livingstone and the earl of Crawford, Kennedy destroyed Crawford with a spiritual weapon, his Curse (23rd of January 1445-1446).

On the 3rd of July 1449 James married Marie of Gueldres, seized and imprisoned the Livingstones, and generally asserted royal power. He relied on Douglas, who (1450) was his constant companion, till the earl visited Rome (November 1450-April 1451). In June 145T he resigned his lands, in which he was at once reinstated. It appears, however, that he was, or was suspected of being, in treasonable alliance with the new earl of Crawford and the ever-turbulent Celtic lord of the Isles. It is certain, from documents, that Douglas was always in the royal entourage from June 1451 to January 1452, so that stories of insults and crimes committed by him at this period seem legendary. Nevertheless, on the 22nd of February 1452, James, who had invited Douglas, under safe-conduct, to visit him at Stirling, there dirked his guest with his own hand. The king was exonerated by parliament, on the score of Douglas's con- temptuous treatment of his safe-conduct, and because of his oppressions, conspiracies and refusal to aid the king against rebels, such as the new " Tiger Earl " of Crawford.

The brother of the slain Douglas defied his king, then made his submission, and visited London, where he probably intrigued

with the English government against his sovereign and country. In 1455 James made serious war against the " Black Douglases " of the south; his army being led by the " Red Douglas," the earl of Angus. The royal cause was successful, and the Black Douglas was attainted (10th of June 1455). He fled south and became the pensioner and ally of Edward IV., who reasserted the traditional claim to sovereignty over Scotland — " his rebels of Scotland!"

From 1457 to r45g a truce was made between Scotland and the Lancastrian party, then in power, but in July 1460, Henry VI. was defeated and taken, and his wife and son sought James's hospitality. Roxburgh castle was in English hands; James besieged it, and on the 3rd of August 1460 was slain by the bursting of one of his own huge siege guns. The castle was taken, but the second James died at the age of thirty, leaving a child to succeed him in his heritage of woe. James II. had overcome his nobles, but left a legacy of feuds to the coming reign.

The period of James III. is filled with the recurrent strife of the nobles among themselves and against law and order. Slowly and obscurely the Renaissance comes to Scotland; j ames m. its presence is indicated by the artistic tastes of the king, and, later, by the sweet and mournful poetry of Henryson. But the Renaissance, like the religious revivals initiated in Italy, arrived in Scotland weak and weary; hence the church did not share in the new enthusiasms of the faith of St Francis, and art was trampled on by the magnates who hated poetry and painting.

In politics, the queen-mother, who had the private guardian- ship of her boys, the king and the dukes of Albany and Ross, turned from the Lancastrian to the Yorkist side, while Kennedy and his party (Lancastrians) were accused of endangering Scotland to please France. This was the beginning of that movement away from the Ancient League to partisanship with England, which culminated in the success of the Protestant allies of England at the Reformation. This, then, is an important moment in the long and weary march to union with England.

In 1461 Henry VI. was driven to take sad shelter with Kennedy at St Andrews. In June 1461 Edward IV. was crowned, and at once made pact and alliance with the banished Douglas and the Celts of the west Highlands and the isles. From Ardtomish castle, John, lord of the

Isles, sent ambassadors to Westminster, where (1462) a treaty was made for an English alliance and the partition of Scotland between Douglas and the Celts. A marriage between the mother of James III. and Edward IV. was spoken of, but Kennedy would not meet the English, and in March 1463 the English treaty with Douglas and the Celts was ratified. Douglas invaded Scotland, in advance of an English army, but was defeated by an army under Bishop Kennedy. When France went over to the Yorkists, Kennedy, accepting an English pension, made a long truce between Scotland and England (October 1464). Peace might have been assured, but Kennedy died in r466. His tomb in his college chapel of St Salvator's at St Andrews, his college and his bridge over the river Eden, have survived as monuments of a good and great man; they passed unscathed through the ruin wrought by the reformers.

On his death the nobles, notably Fleming, Livingstone, Crawford, Hamilton and Boyd, made a band for securing power and place. Boyd, with some borderers, Hepburn and Ker of Cessford, seized the boy king, and Boyd had himself made governor, his son marrying the princess Mary, sister of James.

In July 1469 James, then about eighteen, married Margaret, daughter of King Christian of Norway, who pledged the Orkney and Shetland Isles for her dowry, which remains unpaid. The enemies of the Boyds instantly overthrew them, and the Hamil- tons, a race of English origin, arose on their ruins to their perilous place of possible heirs to the crown. The princess Mary was divorced from her Boyd husband and married Lord Hamilton. Their descendants were again and again kept from the royal succession only by the existence of a Stuart child, Mary, queen of Scots, or James VI. This fact, with the consequent feud of the Stewarts of Lennox, themselves claimants, governs the

dynastic intrigues during more than two centuries and gave impetus to the Reformation. Never was marriage so fruitful in tragedies as the wedding of Lord Hamilton and the princess Mary.

There followed ecclesiastical feuds, centring round Patrick Graham, the new bishop of St Andrews. These, to the present day, have been

misunderstood (see The Archbishops of St Andrews, by Herkless and Hannay, for details). It is not possible here to unravel the problem, but documents at St Andrews, now printed, demonstrate the error of the historians who regard Graham as a holy man, persecuted because he was half a premature Protest- ant. At Rome he procured, without royal or national assent, the archbishopric for St Andrews; he became insane and was succeeded by the learned Schevez. Glasgow also became an archbishopric.

James now followed a policy in which Louis XI. succeeded, but he himself failed utterly. He surrounded himself with men of low birth, such as Ireland, a scholar and diplomatist; Rogers, a great musician; and Cochrane, apparently an architect or sculptor — he is styled a mason or stone-cutter. This aroused the wrath of the nobles and the two princes of the blood, Albany and Mar. Mar was arrested on a charge of magic, and died, whether murdered or from natural causes is uncertain, while his accomplices are said to have been the protomartyrs of witch- craft, scarcely heard of in Scotland till the reformers began to burn old women. Albany was arrested for treason, escaped to France, and was under sentence of forfeiture.

Relations with England were now unfriendly, and parliament, in March 1482, denounced Edward IV. as " the reiver, Edward." By May the Douglases brought Albany from France to England, where he swore fealty to Edward, and was to be given the Scottish crown. The duke of Gloucester (later Richard III.) marched north and took Berwick, while the earl of Angus, with other nobles, hanged Cochrane and other favourites of James over Lauder bridge. The domestic mutiny and the English war ended in a compromise, Albany being restored to office and estates. He took Edinburgh castle, in which James was interned, and he was made lieutenant-general. Yet, aided by Angus, he continued to intrigue with Edward for the gift of the Scottish crown. By March 1483 he was reduced, we know not how; he laid down his office, and was forbidden to approach the court. On the death of Edward IV. he lost his chief supporter (9th of April 1483), and was forfeited while absent in England. He and Douglas entered Scotland with a small force (22nd of July 1484), and were defeated at Lochmaben: Albany escaped, went to France, and was slain in a tournament, leaving issue, but Douglas was captured and interned till his death in the monastery of Lindores.

Our information for this period is so scanty that we do not know how James reached his new position, how he overcame Albany and his other rebels. At peace with England, and allied with France, he quarrelled with the church, and it was decreed that the clergy who

obtained benefices from Rome were guilty of treason. He planned a set of royal marriages with England, and this was the ground of his subjects' charge against him of servility to England. " James IV. and James V. are constantly upbraided for not doing the very things which James III. is execrated for having done," namely, securing peace and amity with their powerful neighbour. James III. " died in his enemies' day," and such accounts as we have of him are written by the partisans of his unruly nobles, Argyll, Lennox and Angus.

They secured the crown prince, James, now aged fifteen, their motive being that under James III. the guilt of their murders and rebellion still hung over their heads. The Estates refused to give them an amnesty for seven years; and the arch rebel, Angus Bell the Cat, with Argyll, the young prince, Lennox and other malcontents, declared that he was deposed, and proclaimed his son as his successor and Argyll as chancellor. Doing what they falsely accused James of having done, they sent, or obtained from England leave to send, members of their party to intrigue with Henry VII. (1st of May 1488). After a half reconciliation,

James marched in force to Stirling, the key of the north, but the treacherous commander of the castle, Shaw of Sauchie, held the castle against him. James and his leaders, Atholl and Huntly, with their Stewarts and Gordons, and the levies of burgesses, and the mounted gentry of Fife, encountered the wild border spearmen of Hepburn and Home and the Galloway men, the whole being led by Angus and the rebel prince at Sauchie burn, near Bannockburn. How it chanced we know not; James's horse seems to have run away and thrown him (he was a bad horseman), and the story goes that he was taken into a cottage and stabbed by a priest. In fact, as his rebels put it, " he happinit to be slain " at Beaton's mill. He was accused of having accumulated great treasures. They were never found, or, if found, never accounted for by the finders.

His real history remains unknown; we have only Ferrerius, who is vague, and the late and slanderous gossip of the writers of the Reformation. We know that James was clement; that the middle and lower classes stood by him; that he was a great amateur in the arts; that he was betrayed again and again by those of his own house, finally by his own son. A hideous tale is told by Buchanan against his private morals, but it is certainly inaccurate in detail, and is uncorroborated, while it appears to turn on a confusion between an alleged royal mistress, " the Daisy," and Margaret (Daisy), the king's own sister. It is clear to any reader of Ferrerius, Lesley and Buchanan that they all drew from a common source, now unknown,

and this source may well have been a chronicle inspired by James's enemies. James

III. of Scotland has been almost as much the butt of slanderous charges as the Jacobite James III. of England and VIII. of Scotland, " The Old Pretender."

With James IV. we enter on the modern history of Scotland. The king escaped the evils of a long minority, was a " free king " and managed his own policy. He was tall, handsome, , lv strong and recklessly brave. He inherited his father's love of art and of nascent science; but this fault was forgiven him, as his manners were popular, his horsemanship good, and his bearing frank and free. The early Tudor policy of Henry VII. was not to make open war on Scotland, but to intrigue secretly, especially with the treacherous Douglas, earl of Angus, and with Ramsay, earl of Bothwell under James III., but soon dispossessed. They schemed to kidnap the king as vainly as Henry VIII. later planned to kidnap many of his foreign opponents. Under James

IV. the houses of Hepburn of Hailes, ancestor of Queen Mary's Bothwell; of the Huntly Gordons; and of the Kers of Fernie- hirst and Cessford, rose into new importance; while the Huntlys and Argylls were entrusted with the maintenance of order among the fighting clans of the west and ncfth. They aggrandized themselves at the expense of the Macleans, Macdonalds, Camerons and Clan Chattan, but their sway was far from being peaceful and orderly.

The king, reckless as he was, had more than his share of the Stuart melancholy. His parricidal rebellion lay heavy on his conscience; he practised asceticism at intervals, and dreamed of eastern pilgrimages. But he also fostered a navy, under Sir Andrew Wood, who swept the seas of the English pirates. James threw Scotland into the whirlpool of European politics, dealing with Spanish envoys and with the duchess of Burgundy, the patroness of the mysterious Perkin Warbeck, who claimed to be Richard, duke of York, son of Edward IV. Meanwhile, to balance the power of the primate, James purchased from Innocent VIII. an archbishopic for the bishop of Glasgow (1492), who laid information against the heretics of Kyle in Ayrshire. They had evolved or inherited anti-papal heresies much like those of the reformers of 1559, but James turned their trial into a jest. He made a secret treaty to defend France if she were attacked by England, but meanwhile a five years' truce was concluded (1491). In the following year James was in correspondence with Perkin, then in Ireland; in 1495 he received that pretendant, married him to a

daughter of Huntly, and in 1496 raided northern England in his company, — all this in contempt of the offered hand of a Tudor princess. In the autumn of 1497 an attempted raid by James ended in a seven

years' truce fostered by the Spanish envoy, Ayala, who has left a flourishing description of the king and his country. Mean- while Perkin had failed in Cornwall and been captured. Henry VII. kept offering the hand of his daughter Margaret, who was married to James at Holyrood in August 1503. From this wedding, disturbed by quarrels over the queen's jewels and dowry, was to result the union of the crowns on the head of Margaret's great-grandson, James VI., after a century of tragedies and turmoil.

In 1507 the pope failed to draw James into the league formed to check French aggression in Italy. A murder on the borders poisoned Scottish relations with England, and the death of Henry VII. (1509) left James face to face with his blustering brother-in-law, Henry VIII. The Holy League of 1511, against France, found James committed to the cause of the old French alliance. He strengthened his fleet, but his admiral, Sir Andrew Barton, fell in a fight with English privateers equipped by the earl of Surrey and commanded by his sons (15 n). Border homicides added their element of international irritation, and James renewed the ancient league with France. In 1513 Dr West, an envoy of Henry VIII., found James in the state of " a fey man," doomed, distracted, agitated and boastful. In May came the letter and ring of the French queen ordering James, as her knight, to strike a blow on English ground. He wrote to Henry none the less (24th May) with peaceful proposals, but on the 30th of June Henry invaded France.

Strange portents and warning phantasms did not check James: he sent forth a fleet of thirteen ships and 3000 men, which faded into nothingness :■ he declared war on Fioddea. Henry; and on the 22nd of August he crossed the border with all his force, including the highlanders and islesmen. After securing his flank and rear by taking Norham, Wark and Eitel castles, he awaited the approach of Surrey's army at Ford castle, behind which lies Flodden Edge, a strong position, which he presently occupied. Surrey, who was ill-

provisioned, challenged him to fight on the open field of Wooler Haugh. James declined to commit this chivalrous folly; but, for lack of scouts, permitted Surrey to out-manceuvre him and pass, concealed by a range of hills, across his front, to a position north of Flodden, on his lines of communication.

Next day, 9th of September, Surrey crossed the Till, unobserved, by Twizel bridge and Millford,and moved south against Branxton hill, the middle of three ridges on the Flodden slope. The ground was difficult from heavy rains, the English troops were weary and hungry, but James had lost touch of Surrey and knew nothing of his movements till his troops appeared on his rear towards evening. In place of retnaining in his position, James burned his camp and hurried his men down hill to the plateau of Branxton ridge. Home and Huntly, on the Scottish left, charged Edmund Howard's force; the Tynemouth men, under Dacre, did not support Howard, at first, but Dacre checked Home (whose later conduct is obscure) and drove off the Gordons. The Percys broke Errol's force; Rothes and Crawford fell, and the king led the centre, through heavy artillery fire, against Surrey. With Herries and Maxwell he shook the English centre, but while Stanley and the men of Cheshire drove the highlanders of Lennox and Argyll in flight (their leaders had already fallen), the admiral and Dacre fell on the flank of James's command, which Surrey, too wise to pursue the fleet highlanders, surrounded with his whole force. The Scottish centre fought like Paladins, and James, breaking out in their front, hewed his way to within a lance's length of Surrey, as that leader himself avers. There fell the king, riddled with arrows, his left hand hanging helpless, his neck deeply gashed by a bill-stroke. His peers surrounded his body, and night fell on " the dark impenetrable wood " of the Scottish spears. At dawn the survivors had retreated, only the light Border horse of Home hung about the field. The bishop of Durham accuses them of plundering both sides. (That Home's Borderers had but slight loss is argued by Colonel the Hon. FitzWiiliam Elliot, in The Trustworthiness of Border Ballads, pp. 136-138.) Among the dead were thirteen earls, and James's son, the archbishop of St Andrews. The king's death assured

Social progress.

the victory, which Surrey had not the strength to pursue, though the townsmen of Edinburgh built their famous Flodden Wall to resist him if he approached.

England never won a victory more creditable to the fighting and

marching powers of her sons than at the battle of Flodden. The headlong recklessness of James, remarked on by Ayala, gave the opportunity, but he nobly expiated his fault. The Scots had so handled their enemies that they could not or dared not pursue their advantage; on the other hand, it was long indeed before the memory of Flodden ceased to haunt the Scots and deter them from invading England in force.

Though Ayala's well-known letter certainly flatters the material progress of Scotland, the country had assuredly made great advances. While England was tuneless, with Dunbar and the other " Makers " Scotland was " a nest of singing birds." The good Bishop Elphinstone founded the university of Aberdeen in 1495; an d m 1496 parliament decreed compulsory education, and Latin, for sons of barons and freeholders. Prior Hepburn founded a new college, that of St Leonard's, in the university of St Andrews, and Scotland owes only one university, that of Edinburgh, to the learned enthusiasm of her reformed sons. Printing was introduced in 1507, «nd the march of education among the laity increased the gene/al contempt for the too common ignorance that pre- vailed among the clergy. The greater benefices were being conferred on young men of high birth but of little learning. The college of Surgeons was founded by the municipality of Edinburgh (1505), and in 1506 obtained the title of " Royal." The stimulus given to shipbuilding encouraged commerce, and freedom from war fostered the middle class, which was soon to make its influence felt in the Reformation. The burgesses, of course, had long been a relatively rich and powerful body: it is a fond delusion to suppose that they sprang into being under John Knox, though their attachment to his principles made them prominent among his disciples, while Flodden probably began to deter them from the ancient attachment to France. Protestantism, and the disasters of James V., with the regency of his widow, were to convert the majority of Scots to the English party.

The long minority of James V. was fatal to the Stuart dynasty. The intrigues of Henry VIII., the ambition of Angus, who married the king's mother (Margaret, sister of Henry VIII.) ; the counter intrigues of Albany, a resident in France, and son of the rebellious Albany, brother of James III.; the constantly veering policy and affections of the queen-mother; and the gold of England, filled fourteen years with distractions, murders, treasons and conspiracies. Already Henry VIII. was trying to kidnap the child king, who found, as he grew up, that his stepfather, Angus, was his master and was the paid servant of Henry. The nobles were now of the English, now of the French party; none could be trusted to be loyal except the clergy, and they

were factious and warlike. The result was that James threw off the yoke of his stepfather, Angus; drove him and his astute and treacherous brother, Sir George Douglas, into England (thereby raising up, like Bjruce, a fatal party of lords disinherited), and while he was alienated from Henry and his Reformation, threw himself into the arms of France, of the clergy and of Rome.

Meanwhile the many noble and dissatisfied pensioners of England adopted Protestantism, which also made its way among the barons, burgesses and clergy, so that, for political reasons, James at last could not but be hostile to the new creed; he bequeathed this anti-protestantism, with the French alliance, through his wife, Mary of Guise, and the influence of the house of Lorraine, to his unhappy daughter, Mary Stuart. The country, ever jealous of its independence, found at last that France threatened her freedom even more than did England, the ap- parent enemy; and thus, partly from Protestantism, partly from patriotism, the English party in Scotland proved victorious, and the Reformation was accomplished. Had Henry been honourable and gentle, had his sister not shared his vehement passions, James and Henry, nephew and uncle, might have been

united in peace; and the Scottish Reformation might have harmoniously blended with that of England.

It is impossible here fully to unfold the tortuous intrigues which darkened the minority of James. Who was to govern the young prince and the country? His wavering, intriguing mother, Margaret Tudor, or her sometimes friend, sometimes foe, Albany, arrived from France; or her discarded husband, Angus, the paid tool of Henry VIII. ? By June 1528 the young king settled the question. He had complained to Henry of the captivity in which he was held by his hated stepfather, Angus. In June Angus had prepared forces to punish the Border raiders, and James, rightly or wrongly, seems to have suspected that he was to be handed over bodily to his royal uncle. On the 27 th of May he was with Angus in the castle of Edinburgh; on the 30th of May, by a bold and dexterous ride, he was with his mother in the castle of Stirling, with Archbishop Beaton, Argyll and Maxwell. In July he mastered Edinburgh, and bade Angus

and his brother, Sir George Douglas, place themselves in ward north of Tay. This he announced to Henry, the paymaster of the Douglases, and the breach between the two kings was never healed. A war broke out between the Douglases and James, but a five years' peace, not including the restoration of Angus, was concluded in December 1528. Angus prolonged his outrages on the Scottish, border till 1529, when he entered England as a subsidized mischief-maker against Scotland. Not till James's death did the Douglases return to their own country. Meanwhile James visited the Border, hanged some brigand lairds, and reduced such English partisans as the Kers, Rutherfords, Stewarts of Traquair, Yeitches and Turnbulls. Johnny Armstrong of Gilnockie, famed in ballad and legend, was hanged, with forty of his clan, at Carlanrigg, in Teviotdale. The tale of royal treachery in his capture is popular; the best authorities for it seem to be the synoptic versions of a ballad and of the fabulous chronicler, Pitscottie.

When James V. became " a free King " the main problems before him were his relations with Henry VIII. and with the nascent Reformation. From 1535 Henry was anxious that James should meet him in England. Henry was notoriously treacherous; to kidnap was his ideal in diplomacy. His pen- sioner Angus (1531) was to have aided Bothwell in crowning Henry in Edinburgh. In 1535 Henry sent Dr Barlowe to convert James to his own religious ideas, Erastian, anti-papal, the seizure of the wealth of the church. James (1536) was willing enough to meet Henry in England, but his council, especially the clerical members, were opposed to the tryst. James desired to wed none but his mistress, Margaret Erskine, the mother of the Regent Moray. As Henry had once declared that he could only, meet a Scottish king, in England, as a vassal, James's council had good reason for their attitude. Had they consented, had James married Henry's daughter, Mary (called " The Bloody "), it is not plain that advantage would have come of the alliance.

In 1536 James sailed to France, and (1st of Jan. 1537) married Madeleine, daughter of Francis I. The die was cast; he was committed to France and to the ancient faith. This was the cardinal misfortune of the Stuarts, but who could trust Henry, and who could join in the fiery persecutions of the new pope-king ? In James's absence, Scottish heretics fled to England, while Henry's heretics fled to Scotland. Madeleine died on the 7th of July 1537. " Lady Glamis," as she was called, a Douglas lady, widow of Lord Glamis, was burned for abetting her brother Angus and devising the king's death by poison. The truth of this matter is obscure; our early historians of this age, Protestants like Knox and Pitscottie, with

Buchanan and the Catholic Lesley, are seldom to be trusted without documentary corroboration.

In 1538 James married a lady whom Henry desired to add to his list of wives, Mary of Guise, at this moment a young widow, Madame de Longueville. Mary shines like a good deed in a naughty world; but she was a Catholic, was of the house of Lorraine, and in diplomacy was almost as other diplomatists.

In 1539 David Beaton, the Cardinal, now aged forty-five, succeeded his uncle, James Beaton, as primate of Scotland.

He had been educated in Scotland and Paris, held the rich abbey of Arbroath, and for some twenty years at least lived openly with Mariotte Ogilvy, of the house of Airlie. He was a practised diplomatist, and necessarily of the French and Catholic party. His wealth, astuteness, experience and tenacity of purpose, were to baffle Henry's attacks on Scottish independence, till the daggers of pietistic cut-throats closed the long debate. Beaton was cruel: he had no more scruples than Henry about burning men for their beliefs. But the martyrs were few, compared with the numbers of people whom the reformed kirk burned for witchcraft. Some twelve martyrs at least perished in 1 539-1 540, and George Buchanan, whose satires on the Franciscans delighted the king, escaped to France, in circumstances which he described diversely on different occasions, as was his habit.

In May 1540 James visited the highlands, and later reduced the Macdonalds and annexed the lordship of the Isles to the crown. In 1541 he lost two infant sons, and the mysterious affair of the death of that aesthetic ruffian, Sir James Hamilton of Finnart, was supposed to lie heavy on his mind. There were disputes with Henry, who demanded the extradition of fugitive friars, which James refused. In 1541 he disappointed Henry, not meeting him at York, and this course, advised by his council and Francis I., rankled deeply, while Angus was making a large English raid on the Border in time of peace. The English fared ill, and Henry horrified his council by his usual proposal to kidnap the king of Scotland. Henry's men marauded on the Border, but a force which James summoned to Fala Moor (31st of October 1542) contained but one lord who would march with him — Napier of Merchistoun. About this date occurs the legend of a list of hundreds of heretics, whom the clergy asked James to proscribe. No king of Scotland could dream of execut- ing such a coup d'etat; the authority for it is that mythopoeic earl of Arran who later became regent, and told the fable to Henry's agent, Sir Ralph

Sadleyr.

Presently ensued the Scottish raid of Solway Moss and the capture of many of the Scottish nobles. The facts may be found in contemporary English despatches printed in the Hamilton papers. The fables are to be read in Knox's History of the Reformation in Scotland, and in Froude. The secret of the raid was sold by the brother of Angus, Sir George Douglas, and by other traitors. England was prepared, and on the 23rd of November routed and drove into Solway Moss a demoralized multitude of farm-burning Scots. The guns and some 1 200 men were taken; many men were drowned. James retired heart-broken from the Border to Edinburgh, where he executed busi- ness. He then dwelt for a week at Linlithgow with the queen, who was about to give birth to a child. Next he bore " the pageant of his bleeding heart " to Falkland, where he heard of the birth (8th of December) of his daughter, Mary Stuart. Uncomforted, he died on the 14th (15th?) of December. Accounts differ as to the date. Sheer grief and shame, and, it is said, sorrow for the failure in war of his favourite, Oliver Sinclair, were the apparent causes of his death. Knox appears to in- sinuate that a rumour declared Mary of Guise and the cardinal guilty of poisoning James, but an attempt had been made to put another sense on the words of this historian, who frequently hints that Mary was the mistress of the cardinal (Knox, vol. i. p. 92).

Again Scotland had to endure a long royal minority. The distraction of Scotland promised to Henry VIII. a good chance of annexing the kingdom, whether by the marriage of Edward, prince of Wales, to the infant queen, Mary, nary, or by acquiring, through treachery, her person and ˆcots ° the castles of the country. Sir George Douglas at once crossed the border. Angus soon followed, with the lords captured at Solway Moss, all bound more or less to work Henry's will. In Scotland the cardinal; Arran, who was next heir to the throne; Huntly and Murray were proclaimed regents. Knox and others speak of a will of James V., forged by the cardinal, but the stories are inconsistent, and rest mainly on the untrust- worthy evidence of Arran. His legitimacy was rather worse than dubious, and henceforth he sided with the party most

powerful at each crisis. Now the restored Douglases were most powerful; by the 28th of January 1543 they imprisoned the cardinal, but their party was already breaking up. In March a full parliament was held, the Bible in English was allowed to circulate, and envoys were sent to treat with Henry. But by the 22nd of March Beaton was a free man, liberated by Sir George Douglas. Arran's brother, later archbishop of St Andrews, arrived from France and worked on the wavering regent, while his rival, Lennox, came also from France, and failing to oust Arran, became Henry's pensioner in England. If Arran were illegitimate, Lennox was next heir to the throne, and the consequent Stewart-Hamilton feud was to ruin Mary Stuart. Sir George Douglas went to London and negotiated with Henry for the marriage of Mary and Prince Edward. But the people were still so. averse to England that Beaton's was the more popular party: they carried Mary to Stirling: the treaty with Henry was ratified, indeed, but a quarrel was picked over the arrest by England of six Scottish ships; and Arran, who had just given orders for the sack of monasteries in Edinburgh, suddenly (3rd of September) fled to Beaton and was reconciled to the church, just after he had (28th of August) proclaimed Beaton an outlaw.

At once the sacking of religious houses in Dundee, Lindores. and Arbroath had begun; the hour of religious revolution had struck; but the godly were put down when the regent and the cardinal were so suddenly reconciled. Arran must have per- ceived that Henry had infuriated the Scots and that the cardinal might adopt the claims of Lennox and proclaim Arran ille- gitimate. But Beaton could not keep both Arran, whom he had now secured, and Lennox, who betrayed him, and made for England. The cardinal, however, punished the church-sackers and imprisoned George Douglas, while Hertford in 1544 moved with a large army against Scotland, and Henry negotiated with a crew of discontented lairds and a man named Wishart for the murder or capture of Beaton. Hertford struck at Edinburgh in May, and in the leader's own words "made a jolly fire "and did mtich mischief. The suffering Commons now began to blame Beaton. Lennox presently married Margaret, Henry's niece, daughter of his sister, Margaret Tudor, by her husband, Angus. Their eldest son was the miserable Henry Darnley, second husband of Mary Stuart. In Scotland arose party divisions and reunions, the queen mother being in the hands of the Douglas faction, while Beaton's future murderers backed him and Arran. Then the Douglases allied themselves with the cardinal, and Henry VIII. tried to kidnap Angus and his brother, Sir George. For once true to their country, they helped Buccleuch to defeat a large English force at Ancram Moor in

February 1545, and Henry, seeking help from Cassilis, revived the plot to murder Beaton. Cassilis was a Protestant and the patron of Knox's friend and teacher, George Wishart; Cassilis would not commit himself formally, and the threads of the plot are lost, owing to a great gap in the records.

The Douglases continued to play the part of double traitors; Hertford, in autumn, again devastated the border and burned religious houses (whether he always burned the abbey churches is disputed), but Beaton never lost heart and had some successes. We lose trace of the plot to slay him from the 20th of October 1545 till the end of May 1546, the documents being missing; but on the 29th of May 1546 Beaton was cruelly murdered in his castle of St Andrews. On the 1st of March he had caused George Wishart, a man of austere life and a Protestant propa- gandist, to be strangled and then burned. To what extent re- venge for Wishart was the motive of the Kirkcaldys and Leslies and Melvilles who led the assassins, and how far they were paid agents of England, is unknown. These men had been alternately bitter enemies and allies of Beaton; in 1543 Kirkcaldy of Grange and the master of Rothes were offering their venal daggers to England, through a Scot named Wishart. The details of the final and successful plot were uncertain — the martyr Wishart cannot be identified with Wishart the would-be murderer — but with Beaton practically expired the chances of the French and Catholic party in Scotland. .

The death of Beaton brought the Douglases into resistance to Henry VIII. , who aided the murderers, now besieged in Beaton's castle of St Andrews. An armistice was arranged; the besieged begging for a remission from the pope, and also asking Henry to request the emperor to move the pope to refuse. The remission, however, arrived before the 2nd of April 1547, and was refused by the murderers.

Henry VIII. and Francis II. were now dead. In mid July French armed galleons approached St Andrews, and the castle surrendered as soon as artillery was brought to bear on it. With other captives, John. Knox was put aboard a French galley. In September the Protector Somerset (Hertford) invaded and utterly routed the Scots at Pinkie near Musselburgh. No result ensued, except Scottish demands for French aid, and a resolve to send Mary to France. Ferocious fighting, aided by French auxiliaries, followed: in 1550 the English abandoned all castles occupied by them in Scotland. Mary was now in France, the destined bride of the Dauphin; while Knox, released from the galleys, preached his doctrines in Berwick and Newcastle, and was a chaplain of Edward VI., till the crowning of

Mary Tudor drove him to France and Switzerland. Here he adopted, with political modifications of his own, the extremest form of Calvinism.

A visit of Mary of Guise to France (155°) ended in her acquiring the regency, which she administered mainly under French advice. The result was irritation, the nobles looking towards England as soon as Mary Tudor was succeeded revo ; a

On the 10th of May the brethren wrecked the monasteries of Perth, after a sermon by Knox,and the revolution was launched, the six or seven preachers already threatening the backward members of their party with excommunication. The movement spread to St Andrews, to Stirling, to Edinburgh, which the brethren entered, while Mary of Guise withdrew. She was still too strong for them, and on the 24th of July they signed a com- pact. They misrepresented its terms, broke them, and accused the regent of breaking them. Knox and William Kirkcaldy of Grange had been intriguing with England for aid, and for the marriage of the earl of Arran (son of the earl of Arran, now also due de Chatelherault, ex-regent) with Queen Elizabeth. He escaped from threatened prison in France, by way of Switzerland, and though Elizabeth never intended to marry him , the Hamiltons now deserted Mary of Guise for the Anglo-Protestant party. Maitland of Lethington, the Achitophel of his day, also deserted the regent; but in November the reformers were driven by the regent and her small band of French soldiers from Edinburgh to Stirling. They were almost in despair, but, heartened by Knox and Lethington, they resumed negotiations with Elizabeth, who had already supplied them with money. An English fleet suddenly appeared, and drove the French to retreat into Leith from an expedition to the west. In February 1560 a league was made at Berwick between Elizabeth and " the Congregation." France was helpless, the tumult of Ambroise alarmed the Guises for their own lives and power, and the regent, long in bad I health, was dying in Edinburgh castle. On the 10th of June

she expired, and hunger forced her French garrison in Leith, after a gallant and sanguinary defence, to surrender.

After an armistice, treaties of peace were concluded on the 6th of

July: the treaty, as far as it touched the rights of Mary Stuart, was not accepted by her, nor did she give her assent to the ensuing parliament or convention of Estates. Knox and the other preachers began to organize the new kirk, under " superintendents " (not bishops), whose rule was very brief. The Convention began business in August, crowded by persons not used to be present, and accepted a Knoxian " Confession of Faith." On the 24th of August three statutes abolished papal and prelatical authority and jurisdiction; repealed the old laws in favour of the church, and punished celebrants and attendants of the Mass — for the first offence by confiscation, for the second by exile, for the third by death. The preachers could get the statute passed, but the sense of the laity prevented the death penalty from being inflicted, except, as far as we know, in one or two instances. The Book of Discipline and the Book of Common Order express Knox's ideals, which, as far as they were noble, as in the matter of education and of provision for the poor, remained, in part or in whole, " devout imagina- tions." Not so the Knoxian claims for the power of ministers to excommunicate, with civil penalties, and generally to " rule the roast" in secular matters. The nobles and gentry clung to the wealth of the old church; the preachers, but for congre- gational offerings, must have starved.

Neglect as well as mob violence left the ecclesiastical buildings in a ruinous condition, but the authority of the preachers, with their power of boycotting (excommunication), became a theo- cracy. The supernatural claims of these pulpiteers to dominance in matters public or private were the main cause of a century of war and tumult. The preachers became, what the nobles had been, the opponents of authority; the Stuarts were to break them and be broken on them till 1688. In the hands of the ministers a Calvinism more Calvinistic than Calvin's was the bitter foe of freedom of life, of conscience, and of religious tolerance. On the other hand, unlike the corrupt clergy whom they dispossessed, they were almost invariably men of pure and holy life; stainless in honour; incorruptible by money; poor and self-sacrificing; and were not infrequently learned in the original languages of the scriptures. Many were thought to be possessed of powers of healing and of prediction; in fact a belief in their supernormal gifts, like those of Catholic saints, was part of the basis of their prestige. The lower classes, bullied by Sabbatarianism and deprived of the old revels, were restive and hostile; but the educated middle class was with the preachers; so were many lesser country gentry; and the nobles, securing the spoils of the church, were acquiescent.

The religious revolution in Scotland, after the work of destruc- tion

had been done, was the most peaceful that occurred in any European country. On the Catholic side there was as

tt't y et no P ower °f resistance. Huntly, the Catholic Scotland. " Cock of the North," had himself been compromised in the actions of the Congregation. How the Catholics of the west highlands took the change of creed we do not know, but they were not fanatically devout and attempted no Pilgrim- age of Grace. Life went on much as usual, and the country, with a merely provisional government, was peaceful enough under the guidance of Moray, Maitland of Lethington, and the other lay Protestant leaders. They wished, as we saw, to secure the hand of Elizabeth for the earl of Arran, a match which would practically have taken away the Scottish crown from Mary Stuart, unless she were backed by the whole force of France. But Elizabeth had seen Arran in London and had probably detected his hysterical folly. He actually became a suitor for Mary's hand, when the death of her husband the French king (5th of December 1560) left her a friendless exile. Her kinsmen, the Guises, fell from power, and were no longer to be feared by England, so that Elizabeth need not abandon her favourite, Lord Robert Dudley, in the hope of securing Scotland by her marriage with Arran. In the spring of 1561, Mary's brother, Lord James Stewart, lay prior of St Andrews, visited her in the

interest of the Scottish Protestant party, while Lesley, later bishop of Ross, brought the promises of Huntly. He would restore the Mass in the North and welcome the queen at Aberdeen if she would land there, but Mary knew the worth of Huntly's word, and preferred such trust as might be ventured on the good faith of her brother. She foiled the attempts of the English ambassador to make her ratify the treaty of Edinburgh, and, while Lethington, no worse a prophet than Knox, predicted " strange tragedies," Mary came home.

Young as she was, she came as no innocent novice to a country seething with all the perfidious ambitions that a religious revolu- tion brings to the surface. She was wise with the wisdom of the Guises, but sincere friends she had none, and with all her trained fascinations she made few, except in the circle of the Flemings, Beatons, Livingstones and Seatons. Lethington, who had deserted her mother, dreaded her arrival; she forgave him, and for a time, relying on him and her brother, contrived to secure a measure of tranquillity.

Scotland was, doubtless, in Mary's mind, a mere stepping- stone to England. There the Catholic party was strong but for its lack of a

leader, and to the English Catholics Mary seemed their rightful queen. By one way or other — by a Spanish marriage, by the consent of Elizabeth to recognize Mary as her heir, by the ambitions of her own nobles and the wit of Lething- ton, ever anxious to unite the island under one sovereign — Mary hoped to wear the three crowns. Catholicism she would restore if she could, but that was not her first object. It was commonly thought that, though she would never turn Calvinist, she might adopt the Anglican doctrine as understood by Elizabeth, if only she could be recognized as Elizabeth's successor. Till she became Elizabeth's captive there was always the possible hope of her conversion, and despite her professions to the pope there was at least one moment when the pope perceived this possibility. Meanwhile she only asked freedom of conscience for herself, and her mass in her own chapel. The bitter fanaticism of Knox on this point encountered the wiser policy of Lord James and of Lethington.

Mary had her mass, but the constant and cowardly attacks on her faith and on her priests embittered her early years of queenhood in her own country. The politicians hoped that Elizabeth might convert Mary to her own invisible shade of Protestantism if the sister sovereigns could but meet, and for two years the promise of a meeting was held up before Mary.

Meanwhile the needy and reckless Bothwell, a partisan of Mary of Guise, a Protestant and the foe of England, was accused by Arran f of proposing to him a conspiracy to seize the queen, but the ensuing madness of Arran left this plot a mystery, though Bothwell was imprisoned till he escaped in August 1562. Mary then undertook a journey to the north, which ended in a battle with the Gordons, the death of Huntly and the execution of one of his sons. This attack by a Catholic queen on the leader of the Catholic party has been explained in various ways. But Mary's heart was in the expedition and in the overthrow of Huntly; she was in the hands of her brother, to whom she had secretly given the earldom of Murray, coveted by Huntly, whose good faith she had never believed in, and whose power was apt to trouble the state and disturb her friendly relations with Eng- land. She was deliberately " running the English course," and she crushed a probable alliance between the great clans of the Gordons and Hamiltons.

The question of her marriage was all important, and her chances were not improved by the scandal of Chastelard, whether he acted as an emissary of the Huguenots, sent to smirch her character, or merely played the fatuous fool in his own conceit. He was executed on the 22nd of February 1563 at St Andrews. Lethington then went

to London to watch over Mary's interests, and either to arrange her marriage with Don Carlos, or to put pressure on Elizabeth by the fear of that alliance. Now, in March 1563, Elizabeth first drew before the Scottish queen the lure of a marriage with her favourite, Lord Robert Dudley, Mary to be acknowledged as her successor if Elizabeth died without issue. Later in the year, and after Lethington's diplomatic

mission to France, Elizabeth announced that a marriage of Mary with a Spanish, Imperial or French prince would mean war, while she still hinted at the Leicester marriage, or perhaps at a union with young Henry Darnley, son of Lennox. Elizabeth's real intention was merely " to drive time," to distract Scotland and to leave her rival isolated. The idea of a Spanish marriage excited the wrath of Knox, whose interviews with Mary did nothing but irritate both parties and alienate the politicians from the more enthusiastic Protestants. The negotiations for the Leicester marriage were prolonged till March 1565, when Elizabeth had let slip on Mary Henry Darnley (the young son of Lennox, who himself had been allowed to return to Scotland), and at the same time made it clear that she had never been honest in offering Leicester.

Till the spring of 1365, Mary, despite the insults to her religion and the provocations to herself, had remained attached to " the English course " and to the counsels of Moray and M VT iage Lethington. Her naturally high temper, wearied of Darnley. treacheries and brow-beatings, now at last overcame her. Darnley was esteemed handsome, though his portraits give an opposite impression; his native qualities of cowardice, perfidy, profligacy and overweening arrogance were at first concealed, and in mid April 1565 Lethington was sent to London, not to renew the negotiations with Leicester (as had been designed till the 31st of March), but to announce Mary's intended wedding with her cousin. Thus the cunning of Eliza- beth and Cecil had its reward. Darnley being a Catholic, as far as he was anything, the jealous fears of the Brethren under Knox reached a passionate height. The Hamiltons saw their Stuart enemies in power and favour. Murray knew that his day of influence was over, and encouraged by the promises of Elizabeth, who was remonstrating violently against the match into which she had partly beguiled and partly forced Mary, he assumed a hostile attitude and was outlawed

(6th of August 1565). A week earlier Mary, without waiting for the necessary papal dispensation (Pollen, Papal Negotiations with Mary Stuart) , had publicly married Darnley, who bore the title of king, but never received the crown matrimonial.

Mary now promised restoration to Huntly's son, Lord George; she recalled Bothwell, who had a considerable military reputa- tion, from exile in France; and she pursued Murray with his allies through the south of Scotland to Dumfries, whence she drove him over the English border in October. Here Elizabeth rebuked and disavowed him, and Mary's triumph seemed complete. Her valour, energy and victory over Elizabeth were undeniable, but she was now in the worst of hands, and ker career took its fatal ply. Lethington had not left her, but he was over- looked; Lennox and the impracticable Darnley were neglected; and the dangerous earl of Morton, a Douglas, had to tremble for his lands and office as chancellor, while Mary rested on her foreign secretary, the upstart David Riccio; on Sir James Balfour, noted for falseness even in that age; and on Bothwell.

As early as September 1565 gossips were busy over the indiscretion of Riccio's favour: Darnley had forfeited the good opinion of his wife; was angry because the Hamiltons were not wholly sacrificed to the ancient feud of Lennox and his clan; and Knox's party looked forward with horror to the parliament of March 1566, when Mary certainly meant " to do something tending to some good anent restoring the ancient religion." She was also supposed to have signed a Catholic league, which only existed in devout imaginations, but in February 1560 she sent the bishop of Dunblane to crave a large subsidy from the pope. Quite ignorant as to the real state of affairs, he raised the money and sent a nuncio, who never risked himself in Scot- land, but made the extraordinary proposal later, that Mary should execute or at least " discourt " her chief advisers.

Meanwhile the clouds of hatred gathered over the queen. Lethington fjth of February 1566), wrote to Cecil saying that l< we must chop at the very root," and Randolph, Elizabeth's ambassador, heard that measures against Mary's own person were being taken. Randolph was dismissed for supplying Murray with English gold; from Berwick he and Bedford

Riccio's murder.

reported to Cecil the progress of the conspiracy. While Mary was arranging a marriage between Bothwell and the late Huntly's daughter, Lady Jane Gordon, Darnley intrigued with Lord Ruthven

and George Douglas, a bastard kinsman of Morton, for the murder of Riccio, and for his own acquisition of the crown matrimonial. Morton and Lindsay were brought into the plot, while Murray, in England, also signed. He was to return to Edinburgh as soon as the deed of slaughter was done, and before parliament could proceed to his forfeiture.

Mary, according to Ruthven's published account, had herself unconstitutionally named the executive committee of parlia- ment, the Lords of the Articles, who were usually elected in various ways by the Estates themselves. While Mary was at supper, on the 9th of March, Darnley, with Ruthven, George Douglas and others, entered the boudoir in Holyrood, by his private stair, while Morton and his accomplices, mainly Douglases, burst in by way of the great staircase. There had been an intention of holding some mock trial of Riccio, but the fury of the crowd overcame them: Riccio was dragged from Mary's table and fell under more than fifty dagger wounds. While Mary, Darnley and Ruthven exchanged threats and taunts, Bothwell and Huntly escaped from the palace, but next day, Mary contrived to send letters to them and Atholl. On the following evening Murray arrived, and now even Murray was welcome to his sister. Darnley had taken on him (his one act of kingly power) to dismiss the parlia- ment, but he now found himself the mere tool of his accomplices. He denied — he never ceased to deny— his share in the guilt, and Mary worked on his vanity and his fears, and moulded his " heart of wax " to her will. On his assurances the lords, expecting an amnesty, withdrew their guards from the palace and next day found that the bird had flown to the strong castle of Dunbar. Hence Mary summoned the forces of the country, under Bothwell and Huntly; she forgave Murray; the murderers had no aid from the Protestants of Edinburgh, who as before failed them in their need. Knox himself fled to Kyle, though there is no evidence that he was privy to a deed which he calls " worthy of all praise," and Morton and Ruthven spurred to Berwick, while Lethington skulked in Atholl. His possessions were handed over to Bothwell. Darnley betrayed some obscure accomplices. He was now equally detested by Murray, by the new exiles and by the queen, while she reconciled Murray and Bothwell. She tried to assuage all feuds; in an inventory of her jewels she left many of them to Darnley, in case she and her child did not survive its birth. The infant, James, was born in the castle on the 19th of June.

On Mary's recovery, her aversion to Darnley, and her con- fidence in Bothwell, were unconcealed; and, early in September, she admitted Lethington to her presence. She had learned that Darnley meant to

leave the country: she met him before her Privy Council, who sided with her; he withdrew, and the lords, including Murray, early in October signed a " band " disclaiming all obedience to him. On the 7th or 9th of October, Mary went to Jedburgh on the affairs of Border justice, and a week later she rode with Murray to Hermitage castle, where for several days Bothwell had lain, wounded nearly to death by Eliot, a border reiver. On her return she fell into an almost fatal illness and prepared for her end with great courage and piety; Darnley now visited her, but was ill-received, while Bothwell was borne to Jedburgh from Hermitage in a litter. While Buchanan represents the pair as indulging in a guilty passion, the French ambassador, du Croc, avers that Mary was never in better repute with her subjects. On the 24th of November Mary was at Craigmillar castle, near Edinburgh, where undoubtedly she held a conference with her chief advisers that boded no good to Darnley; and there were rumours of Darnley 's design to seize the infant prince and rule in his name. The evidence on these points is disputable, but now, or not long after, Huntly, Bothwell, Lethington and Argyll signed a " band " for Darnley's murder.

Meanwhile, in December, Mary held the feasts for the baptism of her son by Catholic rites at Stirling (17th of December), while

Darnley stood aloof, in fear and anger. A week later, moved by Bedford, representing Elizabeth, and by Bothwell and her

*other advisers, Mary pardoned Morton and his amrter. * accomplices. She also restored Archbishop Hamilton*

to his consistorial jurisdiction, but withdrew her act, in face of presbyterian opposition. Darnley had retired to his father's house at Glasgow, where he fell ill of small-pox, and, on the 14th of January 1567 Mary, from Holyrood, offered to visit him, though he had replied by a verbal insult to a former offer of a visit from Stirling. About this week must have occurred the interview in the garden at the Douglas's house of Whittinge- hame, between Morton, Bothwell and Lethington, when Morton refused to be active in Darnley's murder, unless he had a written warrant from the queen. This he did not obtain. On the 20th of January 1567 Mary left Edinburgh for

Glasgow, her purpose being to bring Darnley back to Craigmillar. At this time (the 22nd-2 5th of January), she must have written the two first Casket Letters to Bothwell. Letter II. (really Letter I.) leaves no doubt, if we accept it, as to her murderous design (see Casket Letters). What followed must be read in Mary's biography: the end was the murder of Darnley in the house at Kirk o' Field, after the midnight of Sunday, the 9th of February.

Public and conspicuous as was the crime, the house being blown up with gunpowder, no secret has been better kept than

the details. The facts of Mary's lawless marriage wHh" with Botnwell > ner capture at Carberry Hill, her Bothwell • confinement in Loch Leven Castle, her escape, her*

defeat at Langside, and her fatal flight to an English prison, with the proceedings of the English Commissions, which uttered no verdict, must be read in her biography (see Mary Stuart).

Scotland was now ruled by her brother, the Regent Murray, in the name of her infant son, James VI. Murray arrested James vr.: Lethington, as accused of Darnley's murder, and internal Lethington was now lodged under ward in Edinburgh, Contea- but Kirkcaldy of Grange released him and gave him " ons " shelter in Edinburgh castle, which he commanded

(23rd of October). Lethington was to be tried, but his armed friends mustered in great numbers, and, secure in the castle, he and Kirkcaldy upheld the cause of Mary. Lethington's motive is obvious; in Mary's success lay his chance of safety: how he won over Kirkcaldy is unknown. The rebellion in the north of England failed, Northumberland was driven across the border, and it was Murray's idea to barter him for Mary, in the beginning of January 1570. But on the 23rd of January, Murray was shot dead, in the street of Linlithgow, by a Hamilton, with the approval and aid of Archbishop Hamilton and other heads of the house.

The contending parties, queen's men and king's men, now made approaches to each other; neither had a share in the Hamiltons' crime. But Randolph, sent to Edinburgh for the purpose, kept them apart; Elizabeth despatched Sussex to ravage the Scottish border, in revenge for a raid by Buccleuch, and in May Lennox entered Scotland with an English force and soon was appointed regent (17th of July). This meant a war of Stuarts against Hamiltons, and, generally, of " Queen's men" against " King's men." Truces and

empty negotiations merely protracted disorder. On the 2nd of April 1571 Mary's party lost Dumbarton castle, which Crawford of Jordanhill took by a daring night surprise; and Archbishop Hamilton, a prisoner, was hanged without trial. In May the Hamiltons entered Edinburgh, and later Lennox, in a parliament held at Leith, secured the forfeiture of Lethington. As the year passed by, Argyll, Cassilis, Eglintoun and Boyd went over to Lennox's party, and in an otherwise futile raid of Kirkcaldy's men on Stirling, Lennox was captured and was shot by a man named Calder. In England the Ridolphi-Norfolk plot was discovered, and at the end of 1571 Buchanan's " Detection" of Mary, with translations of the Casket Letters, was published. Though Mar was now regent, Morton was the man of action. In February 1572 he forced on the kirk an order of bishops, " Tulchan bishops," niters through which the remaining

wealth of the church trickled into the coffers of the state, or of the regent.

This was the beginning of the sorrows of more than a century. The kirk Presbyterian was founded on the Genevan model, and was intended to be a theocracy. She had claimed, since the riots at Perth in 1559, the Power of the Keys, Jiao'icirk. with the power of excommunicating even the king, a sentence practically equivalent to outlawry. These pretensions were incompatible with the freedom of the state and of individuals. It became the policy of the crown to check the preachers by means of the order of bishops, first reintroduced by Morton, and worthy of their origin. The kirk was robbed afresh, benefices were given to such villainous cadets of great families as Archibald Douglas, an agent in Darnley's murder; and though, under the scholarly but fierce Andrew Melville, the kirk purified herself afresh and successfully opposed the bishops, James VI. dominated her again, when he came to the English crown, and the result was the long war between claims equally exorbitant and intolerable, those of the crown and the kirk.

The death of Mar (28th of October 1572) left power in the stronger hands of Morton, and the death of Knox (24th of November) put the kirk for a while at the mercy of the new regent. Meanwhile Mary's party dwindled away; at a meeting in Perth (23rd of February 1573) her thanes fled from her, and Elizabeth at last reinforced Mary's enemies with men and artillery. On the 28th of May Edinburgh castle surrendered at discretion. Lethington, the heart of the long resistance, died, a paralytic, in prison, and Morton resisted the generous efforts made to save the gallant Kirkcaldy. Knox had prophesied that he would be hanged, and hanged he was.

Despite the ferocity of partisans in " the Douglas wars," an English envoy reported that the power of the country gentry and the boroughs had increased, while that of the great wavering nobles, Hamilton, Huntly and others, was diminishing. The " navy was so augmented as it is a thing alniost incredible," but none the less £100 sterling was worth as much, Drury wrote from Berwick, as £1000 Scots.

In 1575, at the General Assembly, Andrew Melville, now a man of thirty, and, with Buchanan, the foremost scholar of Scotland, especially in Greek, caused the lawfulness of bishops to be mooted. Thenceforward Scotland was engaged in a kind of " bishops' war." Meanwhile Morton found the old Marian party-feud reviving, and in 1 577, knowing his own guilt in Darnley's murder, he attempted to win the alliance of Mary for his own security.. In March 1578, a coalition of his public and private foes caused Morton to resign the regency, while the young earl of Mar became custodian of the boy king. On the 28th of May, Morton allied himself with Mar, who commanded Stirling castle, and after negotiations recovered power. Atholl was his chief opponent, but in April 1579 he died suddenly, after dining with Morton; poison was suspected. Morton, with Angus, attacked the Hamiltons, whose chiefs fled the country, accompanied by the worst of traitors, Sir James Balfour. Knowing all the secrets of Darnley's murder, Balfour revenged himself by raking up Morton's foreknowledge of the deed; and here he was helped by the influence exercised over the young king by his cousin Esme Stuart d'Aubigny (a son of Darnley's paternal uncle, John), who came to Scotland from France in September 1579. D'Aubigny allied himself with Knox's brother-in-law, James Stewart of the house of Ochiltree, captain of the King's Guards, an able, handsome, learned, but rapacious man. The Hamiltons, now in English exile, were forfeited; d'Aubigny received the earldom of Lennox; and, as after Darnley's death, placards, were posted urging the trial of Morton for that crime. As against the new Lennox, Morton was deemed a friend by the preachers, though Lennox professed to be reconciled to the kirk. Through- out 1580 Elizabeth encouraged Morton, with her wonted fickle treachery. In October she recalled her ambassador, and left Morton to his fate. Sir James Balfour secretly returned from France with his information, and Morton was accused and arrested on the last day of 1580. Elizabeth sent old Randolph to threaten and plead, but Lennox and James Stewart were too

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powerful. Morton was tried on the ist of June 1581, was found guilty, and, with one Binning, who had accompanied Archibald Douglas to the scene of Darnley 's murder, was executed. His title went to the Douglases of Lochleven. James Stewart received the Hamilton earldom of Arran, and under him and Lennox the young king began his long strife with the kirk and his half- hearted dealings with the Catholics and his mother.

It is impossible here to follow the course of the strife, in which the godly were led by the earls of Gowrie and Angus. Gowrie seized James, and power, at Ruthven (August 1582), a step approved of by the preachers. In June 1583, James escaped to St Andrews and was surrounded by his party. In November he made the son of Lennox, who had died in France, a duke; Arran was again in power, and Melville with other preachers fled to England in 1584, after the execution of Gowrie for high treason. The king and council were proclaimed judges in all cases; preachers were to submit to their judicature when accused of political offences, a standing cause of strife.

No longer needing Catholic assistance, James threw over his mother, with whom he had been intriguing, and sent the beautiful Master of Gray to betray Mary's secrets to Elizabeth. At the end of 1585, all James's exiled foes, Douglases, Hamiltons and others, returned across the border in force, caught the king at Stirling, drove Arran into hiding, restored the Gowrie family, and became the new administration. In 1586, the Babington plot was arranged, and discovered by those who had allowed it to be arranged. James practically did nothing to rescue his mother: one of his representatives in England was that Archi- bald Douglas who helped to slay his father.

The execution of Mary on the 8th of February left James " a free king " as far as his mother's claim to the throne was con- cerned, and he had his pension of £3000 or £4000 from M _ Elizabeth. Thus war between the two countries was avoided. Thenceforth, till James came to the throne of England, the history of Scotland was but a series of inchoate revolutions, intrigues that led to nothing definite and skirmishes in the war of kirk and state. The king had to do with preachers who practically held the doctrines of Becket as to priestly pretensions. James was " Christ's silly vassal," so Andrew Melville

told him, and " Christ" in practice meant the preachers who possessed the power of the keys, the power to bind and loose on earth and in heaven. The strange thing is that while Eliza- beth warned James against the pretensions of men who " would have no king but a presbytery," whenever he was at odds with the ministers and with the nobles who kept trying to seize his person with the approval of the ministers, Elizabeth secretly or openly backed the kirk.

The kirk was strong enough to compel James to march, more than once, against the Catholic earls, Huntly, Errol, Angus and others. They, again, constantly intrigued with Spain, and there were moments when James, driven desperate by the preachers, listened to their projects. He was anti-papal by conviction, yet hoped for help from Rome, and was so far implicated in the adventures of his Catholic subjects that, in the interest of his own character, he had to advance against them and drive them into exile. In 1590 he married Anne of Denmark: in 1592 his character suffered through the murder, by Huntly, of " the bonny earl o' Murray," suspected of favouring the mad- cap Francis Stewart, earl of Bothwell (nephew of Queen Mary's Bothwell), a man who made it his business to kidnap the king, and who presently, by the help of Gowrie's widow, seized him in Holyrood. In 1592 parliament " ratified the liberty of the true kirk," leaving little liberty for king and state, since, in the phrase of one preacher, " the king might be excommunicated in case of contumacy and disobedience to the will of God," as interpreted by the ministers. In the following year (23rd of July 1593) Bothwell, much favoured by the preachers, made his capture of James, but had net the power to hold him long, and a later revolutionary attempt in the same year, by Atholl and the young earl of Gowrie, was a failure.

Gowrie went abroad and passed some time at the university of Padua; to him the eyes of the preachers were hopefully turned

after 1596. As Bothwell had become a Catholic, they excom municated him in 1595:' in 1596 James resolved to recall the exiled Catholic peers; the commissioners of the General Assembly, alarmed and infuriated, met in Edinburgh, ordered a day of humiliation, decided to excommunicate the Catholic earls and established a kind of revolutionary committee of public safety. James insisted on his own authority; insisted that a secular court had a right to try a virulent preacher who declined the secular jurisdiction when accused of having denounced Queen Elizabeth as an atheist. The quarrel waxed: the gatherings summoned by the preachers were declared to be seditious; a meeting in a church ended in a threatening riot that raged round the Tolbooth, where James was sitting, and on the

following day he with his Court withdrew to Linlithgow (18th of December 1596). The Court of Session was also to be removed, and the burgesses, fearing loss of trade, laid down their arms. The leader of the clerical agitation, Mr Bruce, with a wild preacher named Balcanquhal, fled to England, and James returned in triumph to his capital on the ist of January 1597. He followed up his victory; a General Assembly at Perth was obedient to his will: the preachers were forbidden to criticize, from the pulpit, acts of parliament or of the privy council; they were forbidden to call conventions without the royal person or authority and to attack individuals in their sermons.

In the great towns, moreover, ministers might not be appointed to charges without the king's consent, and in this course James advanced, with but slight opposition, till he put the preachers under his feet. In a long series of crafty movements James managed to reintroduce episcopacy (1598-1600) by the aid of packed General Assemblies, later declared void by the Covenanters (1638). He increased Presbyterian emotion by the suspicion that he was intriguing with Catholic powers,. and by his book on the rights and duties of a king {Basilicon Boron), which fell into the hands of Andrew Melville. Some cryptic correspondence with the pope, whether actually by James or by Elphinstone, one of his ministers, came apparently to the knowledge of the English court; his secret relations with the earl of Essex were, if not known, suspected; the young earl of Gowrie, returned from a residence on the continent, was too effusively welcomed by Elizabeth in May 1600; and James made a tactless speech when asking parliament for money towards his " honourable entering to the crown of England after the death of the queen." He was in deep poverty, the Estates were chary of supplies, plotters in Scotland had been offering to Cecil to kidnap the king (1598), and his relations both with the English government and with his own subdued but struggling preachers were bitterly unfriendly.

It is not known whether the mysterious events that culminated in the slaying of the earl of Gowrie and his brother, by John Ramsay, in their own house in Perth, on the 5th of August 1600, had any connexion with James's attitude Qowrie to England and the kirk. The most probable ex- spiracy. planation is that Gowrie laid, with the utmost secrecy, a plot to lure James to Perth, kidnap him there, transport him to Fastcastle, a fortress of the profligate and intriguing Logan of Restalrig, on the Berwickshire coast, and then raise the Presby- terian party. If we could accept the evidence of a letter attri- buted to Logan and produced in 1608, this theory would be valid. But the ktter has been proved beyond question to be a forgery,

though it may very well be a forged copy of a genuine original (see The Gowrie Conspiracy Confessions of George Sprot, by A. Lang, Roxburghe Club, London, 1902). Certainly no plot was laid by James to entrap the Ruthvens, and the only question is, was the brawl in which they fell accidental, or had a plot hatched in deep secrecy been frustrated by unexpected circum- stances? (In James VI. and the Gowrie Conspiracy the writer argues in favour of the latter solution.) In any case the sceptic- ism of the Edinburgh ministers, especially of Bruce, encouraged the tendency of the people to think the worst, and led to the banishment, followed by other restrictions and sufferings, of Bruce himself. The house of Gowrie, so long hostile to Mary Stuart and James, was forfeited and ruined. Charles I. was

bom just after the trial of the deadRuthvens (19th of November 1600), and his mother was, as ususal, opposed to the king's recent proceedings.

In 1602 Cecil was engaged in dark plots against James; the rising of Essex (of which James probably was expectant) had James failed; but by the end of the year Cecil had entered becomes into a secret understanding with James to favour his king of claims to the English succession. Elizabeth's last England. i etter t0 t he king was of the 5th of January 1603; she died in the earliest hour of the 1st of April, and James, late on the 3rd of April, had the news from Carey. He entered London on the 6th of May, whence he henceforth, as he said, governed Scotland " by the pen." Entirely safe from the usual turbulent movements of Scottish opposition, and but ill ac- quainted with Scottish opinion, he could dictate measures which were oppressive to the preachers and unwelcome to the majority of the laity. He kept the kirk for two or three years without a General Assembly, to which they had a legal right, and (with at least a shadow of legal right) he proclaimed unlawful the assembly of Aberdeen (1605). Though the recalcitrants who held it were punished, James's own officials saw that he had gone too far. His bishops were already becoming odious to his nobles; his prorogation of General Assemblies continued, and the brothers Melville, called to England, were treated with unconstitutional harshness. Andrew, who behaved with injudicious violence, was banished to France, James to Newcastle; other preachers were confined to their parishes; and by a

mixture of chicanery (as at the pseudo assembly of Linlithgow) and of violence, the king established his tottering episcopacy, and sowed the dragon's teeth of civil war. Catholics were equally or more severely persecuted; and though the Borderers were brought into tranquillity, it was by measures of indiscriminate severity.

A scheme for complete union of England and Scotland, pro- moted by James and by Francis Bacon, was unwelcome to and rejected by the two jealous countries (1604-1606). But Post- nati, subjects born in Scotland after James's accession to the English throne, were allowed "to purchase and hold real property, and " to bring real actions for the same, " in England (1608).

In 1610 James had three Scottish bishops consecrated by three English bishops, ensuring for the northern country apostolic succession; and justices of the peace were created in Scotland. The "plantation" of Ulster by Scottish colonists was begun and flourished. Catholics were more and more persecuted, and in 1615 Father Ogilvie was executed, after abominably cruel treatment in which Spotiswoode, archbishop of Glasgow, took an unworthy share. In the same year the king's " Courts of High Commission" were consolidated, and an organ was actually placed in the royal chapel at Holyrood.

In 161 7 James visited his native land: ecclesiastical brawls at once broke out, and James vigorously pushed, in face of the disfavour even of his bishops, the acceptance of his famous Five Articles. They were accepted at Perth, in i6i8,.but were evaded wherever evasion was possible. Communicants were to kneel, not to sit, a thing that had, of all others, been odious to John Knox; Easter was to be observed, also Christmas, contrary to earnest consciences; confirmation was introduced; the Com- munion might be administered to the dying in their houses; and baptism must be on the first Sunday after the child's birth. These articles, harmless as they may seem to us, were the last straw that Scottish loyalty could bear. In 1621, they were earned in parliament by a fair majority; to the horror and bitter indignation of all men and women of the old leaven. Worse, the English liturgy was used in a college chapel of St Andrews on the 15th of January 1623. James tried to suppress the general irritation by a proclamation against conventicles, and a threat to take away the courts of law from Edinburgh, if people did not go to church on Christmas day. He postponed the threat till Easter 1625, but, says Calderwood, " The Lord removed him out of the way fourteen days before the Easter Communion." He died on the 27th of March. Encouraged by safety and adulation in England;

grasping at the Tudor ideal of kingship, determined to reduce to order the kirk from which

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he had suffered so many injuries and insults, he sowed the wind and his son reaped the whirlwind.

Only the chief moments in the struggle between Charles I. and the Scots can be touched on in this summary. James VI. had succeeded in his struggle with the preachers partly by satisfying the nobles with gifts out of old church lands. Charles I. reunited the kirk and the nobles by threatening, or seeming to threaten, to resume or impair these gifts, and also by his favour towards the universally detested bishops (1625-1629). Mr S. R. Gardiner speaks of the final shape of Charles's measure as " a wise and beneficent reform " ; and he did aim at recovering the " teinds " or tithes, and securing something like a satisfactory sustenance for ministers. But he had caused alarm, and he refused all demands for the withdrawal of the loathed articles of Perth. The younger bishops too were not " sound " in Calvinism; many were looked on as Arminians. Protests were uttered in 1633, when Charles entered Edinburgh and held a parliament. Above allj and most legitimately, the revival of General Assemblies, now long discussed, was demanded vainly.

By 1636, Charles and Laud had decided to introduce a liturgy, a slightly, but in Scottish apprehensions " idolatrously," modified version of the Anglican prayer-book. Anglicanism was a limb of Antichrist; extempore prayers were regarded as inspired: a liturgy was " a Mass-book." The procedure was purely despotic, and at the first attempt to use the liturgy in St Giles's there broke out the famous " Jenny Geddes " riot in the church (23rd of July 1637). The nobles of the country, the ministers and lairds, met in Edinburgh and sent a petition against the liturgy to Charles. In November were formed " The Tables," a standing revolutionary committee of all Estates.

Constant meetings hurled protestations against the bishops; no man was more active than the young Montrose. In February 1638 the Covenant, practically a " band " of the whole country, enforced on reluctant signers, was aˆeˆ 6 " launched. It made Scotland, like Israel," a covenanted people " for the defence and propagation of the old Presbyterian- ism of Andrew Melville, and many devotees held that it was for ever binding on the nation. Legists differ as to whether the band was legal or not, but revolutions make their own laws, and

the Covenant could not be more illegal than the imposure of the liturgy. Charles drove on the bishops, who better under- stood the situation, and he sent the half-hearted Hamilton to negotiate and threaten in Edinburgh, where the Covenanters were blockading the castle. But Charles did grant a General Assembly in Glasgow (21st of November), where, among unseemly uproar, the ecclesiastical legislation of James I. was rescinded, the law and custom of forty years were abolished, conformist clerics were expelled, and the earl of Argyll appeared as leader of the extreme party, while Montrose was the general of the armed Covenanters. In 163 9 he was as active in arms in the north as Hamilton, on the king's side, was dilatory and helpless in the south. By May the chief clerical leader, Henderson of Leuchars, was denouncing Royalists as " Amalekites," and by biblical precedent Amalekites receive no quarter. Prelacy was " Baal worship," and the kirk thus turned the strife in the direction of religious ferocity.

While Charles hung irresolute on the eastern border, the Covenanters, under Alexander Leslie, took heart, occupied Duns Law, and terrified Charles into negotiations (nth-i8th June). A hollow pacification was made: the assembly of August 1639 imposed the signing of the Covenant on all Scotsmen, A parliament (31st of August) demanded the loss of votes (fourteen) by bishops, and freedom of debate on bills formed by the Lords of the Articles, who had practically held all power; while Argyll carried a bill demanding for each estate the right to select its own representatives among these lords. Traquhair, as royal commissioner, prorogued parliament; negotiations with the king in London had no result; and in 1640 the prorogation was contemned, and though opposed by Montrose, the parliament constituted itself, with no royal warrant. War was at hand, but Montrose formed a party by " the band of Cumbernauld,"

to suppress the practical dictatorship of his rival and enemy, Argyll, who, he understood, was to be one of a triumvirate, and absolute north of Forth. Argyll allowed the committee of Estates to rule, as before, and bided his time. On the 20th of August Montrose was the first of the Covenanting army to cross the Tweed; Newcastle was seized, and Charles, unsupported by England, entered on the course of the Long Parliament and the slaying of Strafford. In Scotland the

secret of the Cumber- nauld band came out; Montrose, Napier and other friends were imprisoned on the strength of certain ambiguous messages to Charles, and on the 27th of July, being called before parliament, Montrose said — " My resolution is to carry with me honour and fidelity to the grave." Montrose kept his word, while Hamilton stooped to sign the Covenant. Montrose lay in prison while Charles I. visited Scotland and met the parliament, per- turbed by the dim and unintelligible plot called clJeat."' " The Incident " (October 1641), which seems to have aimed at seizing the persons of Argyll, Hamilton and his brother Lanark. All that is known of Montrose, in this matter, is that from prison he had written thrice to Charles, and that Charles had intended to show his third letter to Argyll, Hamilton and Lanark, on the very day when they, suspecting a plot, retired into the country (12th of October). An agitated inquiry which only found contradictory evidence was disturbed by the news of the Irish rebellion (28th of October). Charles heaped honours on his opponents (Argyll was the one marquis of his name), and hastened to England. The country was governed by fifty-six members of the Estate and by the dreaded commission of the General Assembly, for now the kirk dominated Scotland, denying even the right of petition to the lieges.

The English parliament, at war with the king, demanded aid from Scotland; it was granted under the conditions of the Solemn League and Covenant (1643), by which the Rebellion. Covenanters expected to secure the establishment of Presbyterianism in England, though the terms of agreement are dubious. Scotland, however, regarded herself as bound to war against " Sectaries," and so came into collision with Cromwell, to her undoing. In January 1644, a Scottish army crossed Tweed, to aid the parliament, with preachers to attend the synod of Westminster. Already some 2000 men from Ireland, mainly of Macdonalds and other clans driven into Ireland by the Argylls, were being despatched to the west Highland coast. Lanark, from Oxford, fled to join the Covenanters; Charles imprisoned Hamilton in Cornwall; Montrose was made a marquis; Leslie, with a large Scottish force and 4000 horse, besieged Newcastle. Montrose arrived a day too late for Marston Moor (2nd of July 1644) ; Rupert took his contingent; he entered Scotland in disguise, met the ill-armed Irish levies under Colkitto, raised the Gordons and Ogilvies, who supplied his cavalry, raised the fighting Macdonalds, Camerons and Macleans; in six pitched battles he routed Argyll and all the Covenanting warriors of Scotland, and then, deserted by Colkitto and the Gordons, and surprised by Leslie's cavalry withdrawn from England, was defeated at Philiphaugh near Selkirk, while men and

women of his Irish contingent were shot or hanged months after the battle.

The clamour of the preachers was now for blood, and gentlemen taken under promise of quarter were executed by command of the Estates at St Andrews, for to give quarter was " to violate the oath of the Covenant " — as interpreted by the clergy. It would have been wiser to put the revenges as reprisals for the undeniable horrors committed by Montrose's Irish levies. The surrender of Charles to the Scots, the surrender by the Scots of Charles to the English, for £200,000 of arrears of pay, with hopes of another £200,000 (February 1647), were among the conse- quences of Montrose's defeat. But the surrender of the king festered in Scottish consciences; for the country was far from acquiescing in the transaction.

Leslie, by the advice of one Nevoy, a preacher, massacred, on his return to Scotland, the Macdonalds in Dunaverty castle. A strife arose between Hamilton, who wished to disband the Covenanting army, and Argyll, and gradually the struggle was

between Hamilton and the sympathizers with the imprisoned king and Argyll at the head of (or under the heels of) the more fanatical preachers and Presbyterians. The Scottish commissioners in England, with Lauderdale, and with the approval of Hamilton's faction, signed, at the end of 1647, " The Engagement " with Charles, and broke away from the tyranny of the preachers. The Engagers had the majority in parliament, but were frantically cursed from the pulpits; they and their army mustered for the deliverance of their king. In August 1648, they crossed the border, leaving the fanatics to arm in their rear, but Cromwell, by a rapid march across the fells, caught and utterly routed them at Preston and on the line of the Ribble, taking captive the infantry and Hamilton, who was sent to the block.

This was the kirk's proudest triumph ; the countrymen of the preachers had been ruined on " St Covenant's Day." The preachers, with Lords Loudoun and Eglintoun, Argyll and Cassilis, armed and raised the godly, and occupied E xec " m Edinburgh. The parliamentary committee capitulated chariesl. with the extremists, who sent friendly messages to Cromwell, and Argyll met him on the Tweed. Thence Cromwell sent Lambert with seven regiments to Edinburgh, where he himself stayed for some time. A parliament in Argyll's and the preachers' interest met there in January 1649; only sixteen nobles were present, as against fifty-six in the previous year. The execution of Charles I. (30th of January 1649) left the extreme party in a quandary. How could they keep terms with " bloody

Sectaries " that had slain their king, in face of the protests of their envoys ? They did pass the Act of the Classes, disabling all " Engagers " from all manner of offices, military and civil, and dividing the distracted country into two hostile camps. On the 5th of February Charles II. was proclaimed king in Edinburgh, if he took the two Covenants. This meant war against England, and war in which the Engagers and Royalists could not take part. The situation developed into ruin under the strife of the wilder and the gentler preachers.

Communications with Charles II. at the Hague were opened, and the Scots accused the English of breach of the Solemn League and Covenant. Huntly, as a Royalist, was decapitated at Edinburgh; and the envoys of Charles, thanks to g^^^„ the advice of Montrose, failed to induce him to stamp himself a recreant and a hypocrite by signing any covenants. But Montrose (January 1650) was sent by Charles to " search his death," as he said, in an expedition to the north of Scotland, while, in the absence of his stainless servant, Charles actually signed the treaty of Breda (1st of May). In April Montrose was abandoned by his royal master, and was defeated at Carbiesdale, on the south side of the kyle, or estuary, of Shin and Oykel; he was betrayed, insulted, bullied by the preachers, and, going to his death like a bridegroom to the altar, was hanged at Edinburgh, on the 20th of May. " Great in life, Montrose was yet greater in his death." He had kept his word, he had " carried fidelity and honour to the grave " (Gardiner). His head was set on a spike and his quartered limbs were exposed in various places.

Charles came to Scotland; he signed the Covenants, while his tormentors well and duly knew that the action was a base hypocrisy, that they had tempted him to perjury. Cromwell, who now crossed the border, impressed this Royalist truth, as far as he might, on the preachers, who made Scotland. Charles sign declarations yet more degrading, to the dis- credit of his father and mother. Meanwhile David Leslie, with singularly excellent strategy, foiled and evaded Cromwell in the neighbourhood of Edinburgh, till the great cavalry leader was forced to retreat towards England. At Dunbar Leslie held Cromwell in the hollow of his hand, but his army had been repeatedly " purged " of all Royalist men of the sword by the preachers; they are said, and Cromwell believed it, to have constrained Leslie to leave his impregnable position and attack on the lower levels. Leslie appears to have intended a surprise, as at Philiphaugh, but " through our own laziness," he confesses, the surprise came from Cromwell's side, and few of the Scots except the mounted gentry escaped from the crushing defeat at

Dunbar (3rd of September). Of the prisoners an unknown number died of hunger in Durham cathedral, others were sold to slavery in the colonies.

Cromwell had occupied the country south of the Forth, while Argyll was Charles's master, extorting hard terms from the prisoner, who once ran away. The committee of Estates, on hard terms, gave an indemnity to Royalists whose swords they needed; many ministers acquiesced ("The Resolutioners"), the more fanatical dissidents were called " Remonstrants," and now the kirk was rent in twain by the disputes of these two factions. The Remonstrants, clerical and military (Guthrie and Strachan), would not support Charles while he was not "under conviction," and Strachan was excommunicated by the Resolu- tioners. On the 20th of July 1651 Lambert defeated the Royal- ists at Inverkeithing; Forth no longer bridled Cromwell; Leslie was sure to be outflanked, and, with Charles, he evaded Cromwell, marched into the heart of England (unaccompanied by Argyll) , and was defeated and taken, while Charles made a marvellous escape at Worcester (3rd of September 1651).

The conquest of Scotland was soon completed; at last she lay at an English victor's feet; the General Assembly was turned out into the street by " some rats of Musketeers storati'on. an0 ˆ a troup of horse," and the risings of Glencairn, Lome (eldest son of Argyll) and others in the high- lands were easily crushed. Argyll, deserted and detested, compromised himself by letters to Monk, containing intelligence as to the movements of the Royalists. While the rival bands of preachers squabbled, Cromwell, like Edward I., arranged that Scottish members should sit in Westminster, and, com- mercially, as in the administration of fair justice, and the peace of the country, Scotland prospered under English rule. But Monk withdrew his force to London in January 1660, and hurrying events brought the joyous Restoration of the 29th of May.

The festivities in Scotland were exuberant, but it was im- possible that tranquillity should be restored. The Remonstrants, that is, the clerical fanatics to whom toleration was more especi- ally abominable, are reckoned (Hume Brown) as the majority of the preachers, but exact statistics cannot be obtained. In their eyes, as

Charles had taken both Covenants, he was bound to remain a Presbyterian and to establish Presbyterianism in England, a thing impossible and entailing civil war in the attempt. Even the representatives of the Resolutioners urged Charles not to use the Anglican service, though they confided to Sharp, their agent in London, their opinion that, if the Re- monstrants (or Protesters) had any hand in affairs, " it cannot but breed continual distemper and disorders." Suppose that the kirk was restored by Charles to her position in 1592, with General Assemblies. With the violent party in a majority, refusing the jurisdiction of the state, insisting on the establish- ment of Presbyterianism in England, excommunicating and scolding, Scotland would be as much disturbed as in the days of Andrew Melville. " Neither fair nor other means are likely to do with them " (the fanatics), says Baillie, principal of Glasgow University, himself a Covenanter from the beginning. He wished to banish the Remonstrants to Orkney.

Historians do not usually seem to perceive that Charles was faced by the old quarrel of church and state, in which " fair means " were seen to be unavailing, while " unfair means " only succeeded, after some thirty years, in breaking down the old Presbyterian spirit so much that, after 1688, the state could hold her own. Charles, without first summoning the Estates, named his own privy council and ministers, of whom Lauderdale, long a Covenanter, came presently to be governor of Scotland. As Argyll, in face of all warnings, went to court, he was arrested, and during the session of parliament of January 1661 was tried for treason, and, on the ground of his letters to Monk, was convicted and executed, as was the leading Remonstrant preacher, James Guthrie, accused of holding an illegal conventicle, " tend- ing to disturbance, . . . and, if possible, rekindling a civil war."

The history of the country during the Restoration falls natur- ally into four periods.

*I. In the first (1660-1663) the royal commissioner to parliament was the earl of Middleton, a soldier of fortune who had been in arms for the Crown as late as 1655, who p otlr had been excommunicated by the kirk, and was periods determined to keep down the preachers. With him during the were the Cavalier party, anxious to recover their * es ' ora " losses during the civil war. All were impoverished,*

and greed ˆwas the dominant motive of the members of the privy council, the rulers of the country. Meanwhile, in London, the earl of Lauderdale, once a fervent Covenanter, was secretary for Scotland,

had the king's ear, and would have restored presby- tery, at least by way of experiment. The " creature " of Charles, as he called himself, this burly, violent scholar, buffoon and bully, was reckoned a patriot. As an " Engager " he had seen his country conquered by English arms. His policy was to keep Scotland in good humour by restoring presbytery; to raise in the country a militia strong enough to support Charles against the English parliament, and thus, in both countries, to make the royal prerogative absolute. The first parliament (1661-1663), under Middleton, was obsequious enough to grant the king £40,000 annually, to abolish the covenants and to rescind all but the private legislation of the revolutionary years (1638-1660). The Lords of the Articles were restored, mere nominees of government. Middleton, Tarbat and Claren- don overcame Charles's reluctance to restore episcopacy; Lauderdale fell into the background; The Rev. James Sharp, hitherto the agent of the Resolutioners, or milder party among the preachers, turned his coat, and took the archbishopric of St Andrews. Episcopacy being restored, some three or four hundred preachers were driven from their parishes (1663). " We made a waste," said Archbishop Leighton, " and stocked it with owls and satyrs," the detested " curates." The Shorter Catechism was taught; the liturgy was not brought in; the sole change was in kirk government.

Meanwhile the Cavalier party invented a system of heavily fining men who had been their opponents in the troubles. Middle- ton coveted the estates of the earl of Argyll, son of the late marquis, and on a trumped-up charge of " leasing making " (he had spoken in a private letter of " the tricks of parliament ") had him condemned to death. He was saved by the exertions of Lauderdale, and Tarbat suggested, while Middleton adopted, a»scheme for ostracizing, and making incapable of office, twelve of their opponents, including Lauderdale. But Lauderdale had the skill to turn the cards on Middleton, accusing him of tricking both parliament and king, and of usurping royal prerogative. Middleton and Tarbat were cashiered, and the able but profligate earl of Rothes united four or five of the highest offices in his own person, Lauderdale remaining at court as secretary for Scotland.

II. We come now to the years from 1664 to 1667. Middleton, with Archbishop Sharp, misgoverned the country, established a high court of commission, exiled the fiercest preachers to Holland, whence they worked endless mischief by agitation and a war of pamphlets; irritated the Covenanting shires, Fife and the south-west, by quartering troops on them to exact fines for Nonconformity, and so caused, during a war with Holland, the Pentland Rising (November

1666). This unconcerted move- ment arose out of an act of cruelty by soldiers in the remote Glenkens, and was unsupported by Holland, with which the Covenanters had been intriguing. Crushed at Rullion Green in the Pentlands, by General Dalziel, this movement left the Presbyterians the more angry, by reason of the cruelty of its suppression, and the use of torture to extract information from Mackail, a preacher, and Neilson of Corsack, a laird.

III. Lauderdale again saw his chance; Rothes was deprived of all offices save the chancellorship; Sharp was " snibbed " and disgraced, attempts at concession were begun, and the indulgence of 1669 licensed a number of Presbyterian ministers, under restrictions. The indulgence accentuated the division between those who accepted and those who rejected it. Out- rages on conformist ministers were frequent, and conventicles were accompanied by armed men. A popular book, Jus Populi

Vindicatum (1669), demanded the restoration of the covenants, which meant civil war, the hanging of the bishops, and even applauded assassination by men who had " a call," like Phinehas. In a parliament with Lauderdale as commissioner (1669-1673) " clanking acts " were passed against nonconformity, but the laws were too severe to be executed, save spasmodically, and were followed by a second indulgence (1672). Lauderdale having married the rapacious countess of Dysart, corruption was rife; his brother, Haltoun, was an example of reckless greed; opposition arose to a scheme of union, presently dropped, and by 1673 the duke of Hamilton and Sir George Mackenzie led an organized political opposition. Lauderdale's Militia Act gave Charles a force of 22,000 men, who would "go any- where " (that is, would invade England), at the king's com- mand, and in 1673-1675 Lauderdale was attacked in the English House of Commons. Charles stood by him, but his best allies, Kincardine and Sir Robert Murray, deserted him, while Sir George Mackenzie of Rosehaugh came over to his party, became king's advocate (1677), and till 1686 was the Achitopheland public prosecutor of the government. After an alleged attempt to negotiate through Argyll (1678) with the preachers, in view of the threatening increase of armed conventicles, Lauderdale resolved on suppression. Without money, and without any- thing like an adequate regular

force, he called out the clansmen of Atholl, Perth and other nobles, and quartered " the Highland host " on the disturbed districts. He would either put them down, or, what he preferred, bring rebellion to a head. The gentry, who had proclaimed their inability to suppress con- venticles, were ordered to sign a bond making them responsible for their tenants, and were bound over to keep the king's peace by " law burrows," a method common in private life but un- heard of between monarch and people. After six weeks the plundering clansmen were withdrawn, and in the spring of 1678, also of 1679, Hamilton with his allies carried their com- plaints to Charles. Mackenzie, in a controversy at Windsor (1679), proved to Charles that in Scotland he was as absolute as the kings of France and Spain, over church, state and all his subjects, and indeed, by various acts of James VI. and of his own reign, Charles really was a despot (British Museum, Additional MSS. 23,244, pp. 20-28).

Meanwhile, armed conventicles abounded, and the extreme faction openly denounced and separated themselves from t^he rapidly growing mass of the Indulged. Early in May 1679 Sharp was hacked to death on Magus Moor near St Andrews. The murderers rode to the west, joined the company of Robert Hamilton, defeated Graham of Claverhouse with a small force of horse at Drumclog, occupied Glasgow, and proved the total inability of the regular forces to cope with a rising. Charles might have been unable, in the frenzy of the popish plot of Titus Oates, to send forces from England, but as he chose the popular Protestant, the duke of Monmouth, to command them, he was allowed to despatch some regiments. The rebels, who were in two hostile parties, Indulged and Separatists, failed to hold Bothwell Bridge, and were easily routed. The duke of York was sent, in honourable banishment, to Scotland, and in the parliament of 1681 was royal commissioner.

IV. Here begins the fourth period (1680-1688), the domina- tion of the duke, Queensberry, Perth, and his brother, Drum- mond of Lundin (earl of Melfort). Lauderdale was out of favour, and died. Now " by concession " (a third indulgence) " and repression, the once mighty force of Scottish Presbyterianism had at length been broken " (Hume Brown). By " Presby- terianism " we are here to understand, not the Presbyterian form of church government — the kirk whose motto is Nee tamen consumebatur — but the pretensions of preachers to domi- nate the state by the mythical " power of the keys," by excom- munication with civil penalties and by the fiercest religious intolerance. Presbyterianism can exist and flourish without these survivals of the proudest pretensions of Romanism. To quote Dr Hume Brown again, " When the absolutism of the Stuarts was

succeeded by a more rational government (1689), the example of the Indulged ministers, who composed the great

mass of the Presbyterian clergy, was of the most potent effect in substituting the idea of toleration for that of the religious absolutism of Knox and Melville." Save for the fact that the ministers were as intolerant as ever of Nonconformists, Catholics and heretics, this is a just view, but Charles II. had to deal with a kirk in which the Remonstrants, the more fanatical ministers, were potent, whether the majority or not, while, after 1689, government found " the once mighty force of Presby- terianism broken." It was broken by the two last Stuart kings, who employed methods the most brutal and repulsive for the crushing of consciences trained in the theocratic ideas of Knox and Melville. The memory of the courage and devotion with which men, women and even children faced torture, death and ruin for an ideal impossible and undesirable is dear to the Scottish people.

On the side of the extremists, Cameron was happy enough to die in fair fight at Airs Moss (22nd of July 1680), after publicly disowning the king for his breach of the Covenant. Cargill next excommunicated the king, Dalziel and Mackenzie, and his followers separated themselves from " the ordinances dispensed by any Presbyterian minister." The followers of these two men, and of their successor, Renwick, who later was hanged, became the armed and organized " Societies," a large force of yeomen and farmers in south-western Scotland, usually styled Cameronians. After the Revolution, the government left them alone, and could afford to do so.

In 1681, parliament, under the duke of York as commissioner, passed a test act so drafted that no human being could honestly and logically take the test. The earl of Argyll, son of the marquis, added a qualifying clause; he would take the test, " as far as it was consistent with itself." By the influence of his countless creditors, who desired to be paid out of his estates, and in revenge for his seizure, on claims for debts, of the whole estates of clan Maclean (1674-1680), he was tried and was actually found guilty of treason. He escaped, but was condemned on the old charge after his later invasion of Scotland (1685).

In 1684, while Perth, and his brother, Melfort, who went over to Rome, were in power, Renwick emitted an " Apolo- getical Declaration," in which the active enemies of his sect were threatened with secret trials and with assassination (October), and a " curate," with some soldiers, was murdered. This, coming on the head of the Rye House murder plot (of which the Rev. Mr Carstairs, the agent of Argyll, and probably Argyll himself, then in Holland, were not ignorant), caused the govern- ment to demand, at the hands of the military, from all and sundry, an " Abjuration " of Renwick's anarchist utterances. Recusants were shot. The test was carefully framed so as to include no disavowal of religious principles, and was " univer- sally unscrupled, even by the generality of great professors and ministers too," says Sheilds, an advanced extremist. However, the peasantry found, in the abjuration, matter contrary to their consciences, and while some recusants were shot out of hand, a girl named Margaret Wilson, with an old woman, Margaret MacLauchlan, were tied to stakes and drowned by the in- coming tide, near Wigtown (13th of May 1685). How the penalty came to be inflicted, as the pair had what Wodrow calls " a material pardon," while there is no record of the withdrawal of the reprieve, remains a mystery. The guilt appears to attach to the local authorities at Wigtown.

In this cruel affair, Claverhouse, who caused to be shot the celebrated John Brown, " the Christian carrier," had no hand. To quote Dr Hume Brown, Claverhouse " kept strictly within the limits of his commission, and he carried out his orders with the distinct aim of saving blood in the end. To those who he thought had been led astray, it was his policy not to be un- merciful; for, in his own words, 'it renders three desperate where it gains one.' On the other hand, in the case of the obdurate, he showed a relentless precision, which gained for him his evil name, ' The Bloody Clavers,' the commissioned servant of the powers of darkness." As constable of

Dundee he secured the commutation of the death penalty on minor offenders under his jurisdiction, and his expressed maxim was

" in the greatest crimes it is thought wisest to pardon the multitude and punish the ringleaders." It is no exaggeration to say that, of the governors of Scotland under the Restoration, Claverhouse was the ablest, the most honourable, the least rapacious and even the most clement. But " Bluidy Claver- house " will continue to enjoy his traditional reputation in popular tracts and popular histories.

Charles II. had died on the 2nd of February 1685, and there were in Scotland some who wept for him. The year of his death was, par excellence, " The Killing Time," thanks to Ren- wick and his associates and the Rye House plotters. Now, too, came the attempts of Monmouth and of Argyll, who, owing to divided counsels in his camp, and want of support either from his clan or from the southern malcontents, failed in his invasion of Scotland, was taken, and was executed, suffering like his father with great courage and dignity. Many recusants were penned up, starved and cruelly treated, even tortured when they attempted escape, in the vaults of Dunottar Castle.

In 1686 James claimed and used the dispensing power as to penal laws against Catholics, in face of the opposition of two of the Scottish bishops (who were ejected from their sees) 0//6SS. "" an d °f parliament. Mackenzie, for his opposition, lost office. The privy council was opened to Catholics, but on the landing of William III. the populace, in 1688, wrecked the chapel of Holyrood and began to " rabble " conformist ministers, or " curates." Of the guard that defended Holyrood " the gentle- men and the rabble, when they saw all danger over, killed some and put the rest in prison, where many of them died of their wounds and hunger," a parallel to the Dunottar cruelties not usually mentioned by historians (" Balcarres Memoirs"). A Convention of Estates, without a royal commissioner, met at Edinburgh on the 14th of March 1689, and it is curious that Williamites and Jacobites were not unequally represented. For president, Hamilton, who had been in opposition from 1673 to 1682, was preferred to Atholl by a small majority, but it soon appeared that William's friends were in the ascendant.

Claverhouse, now Viscount Dundee, despairing of his party, and under apprehension of an attack in arms, rode northward with a handful of horse, and began to play the part of cr&nkle. Montrose, while the Convention offered the crown to William and Mary, adding the claim of right to de- throne a king who had infringed the laws. In May, William, in London, took the coronation oath, but firmly refused to accept, except in some sense of his own not easily understood, the clause, " to be careful to root out all heretics." The castle of Edinburgh was surrendered by Gordon, and Balcarres was put in that prison where, according to legend, he was visited by the wraith of Dundee, on the night of the battle of Killiecrankie. While Dundee was raising the clans and outmanoeuvring Mackay, a party in parliament was agitating for constitutional reforms, and especially for freedom from the Lords of the Articles. William opposed, and party war was furious, when news came of Dundee's complete victory at Killiecrankie. The terror of the Whigs turned to joy when they heard that Dundee himself had fallen in the arms of victory. Two murderers had been sent by the earl of Nottingham to " seize," that is to despatch, Dundee. They left London for Mackay's camp on the 19th of July. On the 27th of July Dundee was shot, and on the 21st of October Nottingham wrote that his emissaries " had done very good service to the King " (State Papers, " Domestic," July 17th, 18th, 19th, October 21st, 1689). Henceforth, for lack of a commander of Dundee's genius, there was no real danger from the clans, and absolutely no chance of a rising of the lowland Jacobites in their support. At Dunkeld the newly raised Cameronian regiment successfully repulsed the highlanders, ill led by General Cannon as they were. They were never again dangerous at this period, were scattered by Livingstone in a surprise at Cromdale haughs, and government began to attempt to buy from chiefs the peace of the clans.

Meanwhile complex intrigues occurred, and were betrayed, between " the Club " (the advanced constitutionalists) and the Jacobites. In 1690 an act restored the kirk to the legal position

of 1592, under sixty of the surviving ministers deprived in 1661. An act abolished civil penalties upon sentences of excommunica- tion, and thus broke the terrible weapon which the preachers had wielded so long. Nothing was said about the eternally binding Covenant, which continued to be the fetish of the Cameronians and of later seceders. The General Assemblies, henceforth, under the influence of the diplomatic Carstairs (who had. been cruelly tortured in 1684, to extract information about the Rye House Plot), did little to thwart government, though many " placed ministers " were, at heart,

attached to the ancient claims of Knox and Melville. Laws as to patronage, an inflammatory question, were made, abolished and remade, causing, from about 1730 onwards, passions which exploded in the great Disruption of 1842. The dealings with the clans culminated in the massacre of the Maclans of Glencoe (13th February 1692). Through military inefficiency the hill passes were not iMsssac/1e stopped, and the murders of a peaceful and hospitable aiencoe. population were relatively few. That Dalrymple arranged for actual extermination of the males of the clan is certain, but there is no proof that he knew of the modus operandi, the betrayal of hospitality, " murder under trust." It is con- ceivable that William signed the orders under the impression that a " punitive expedition " of the ordinary sort was alone intended, but remonstrance from the Estates brought no punishment on any man except the dismissal, later, of Dalrymple (Viscount Stair) from office.

In 1 693-1 694 the kirk was much irritated by William's de- mands for oaths of allegiance to himself, without the consent of the ecclesiastical courts. William gave way, but similar Hanoverian demands later caused great searchings of heart and divisions among the preachers. The Episcopal party among the ministers was excluded from a share in church government and tended to dwindle; the bishops had no territorial sees; and gradually Episcopalians came to be Jacobites, professing a strange loyalty to James, who had treated them so unjustly, and later to his son, " James VIII.," the Chevalier de St George (b. June 10, 1688).

Since the Cromwellian occupation the interest of Scottish men had slowly shifted from religion to commerce; but a tariff war between England and Scotland had checked manufacturing and other enterprises. One William scheme. Paterson, instrumental in founding the Bank of England, conceived the plan of a Scottish East India Company, which, in 1695, obtained a patent by act of parliament. William complained, later, that he had no notice of the terms of that patent till after it was passed (he was. fighting under Namur at the time), and the act not unnaturally aroused the jealousy of the rival English companies. It committed William to conditions which might readily produce a great naval war with Spain, for Paterson's real design was to establish an entrepot in Panama, at Darien, within the undeniable sphere of Spanish influence. The Scots invested very largely, for them, but their expeditions were ill-found and worse managed; the Spaniards seized one of their vessels with its crew; the colonists deserted the colony; a fresh expedition was expelled by Spain, and William refused to take up the Scottish quarrel

(1695-1700). The losses and the apparent injustice caused a frenzy of excitement in Scotland, and William could only express his regret and his desire for an incorporating Union of the two kingdoms. He died on the 7 th of March, when the project of Union was to be debated by the English parliament. Under William, Scotland was a constitu- tional country; the absolute despotism enjoyed by Charles II. ceased to be; a free debating parliament existed, and torture was inflicted only by decree of king and parliament. It was abolished two years after the Union of 1707.

Anne, from the beginning of her reign, advocated union, which, with the question of the succession, was the subject of constant and furious debates in the Scots parliament, till, on the 4th of March 1707, the act received the union. royal assent. Scotland was to have forty-five members and sixteen elected peers at Westminster; the holders of Darien stock were compensated; as a balance to equality of taxation a

pecuniary equivalent was to be paid, the kirk and Scottish courts cf justice were safeguarded (final appeal being to the British House of Lords), and Scots shared English facilities and privileges of trade, in name, for many years passed before Scotland really began to enjoy the benefits. Mar, Queensberry, Stair (of Glencoe) and Argyll (Red John of the Battles) were the leading statesmen of the Unionist party; being opposed by Hamilton, Atholl and Lockhart of Carnwath as Jacobites; by Fletcher of Saltoun as an independent patriot; by popular sentiment, by mob violence, and by many of the preachers, though not by the General Assembly. Every sentimental consideration was against a union with a prelatic kingdom, " an auld enemy," which drove a hard bargain by threats of excluding Scottish commodities. The negotiations were constantly disturbed by Jacobite intrigues with France in favour of James VIII.; by Scottish adherence to the Act of Security, which might give Scotland a king other than a Hanoverian in succession to Anne; and by the hanging of an Englishman, Captain Green, for piracy on a lost Scottish vessel (1705). The final debates of 1706 were conducted under apprehensions of an invasion of Edinburgh by highlanders and wild western fanatics of the Covenant; but the astuteness of Harley's agent in Edinburgh, de Foe, the resolution of Argyll and the tact of

Queensberry, who easily terrified the duke of Hamilton, carried the measure into haven. The Union was at first rich in causes of friction, and in nothing else; even as late as 1745 it was most unpopular, but Scotland had no choice. The nation would never accept a Catholic king, a Stuart, nor revert, as against England, to the ancient French alliance. The religious objection was insuperable; opportunities of com- mercial development were indispensable ; war with England was not to be contemplated by the common sense of the country; and thus, as de Foe wrote, " The Union was merely formed by the nature of things." In Lockhart's words, the 30th of April 1707 "was the last day that Scotland was Scotland. I may lament and weep," he adds, " but truly I have had admirable sport," with his greyhounds.

Friction about matters of trade was the instant sequel of the Union: so much ill-feeling was provoked that, in the general

opinion, had King James VIII. landed alone when failures. brought to the Scottish coast by Forbin's fleet in

March 1708, he would have carried Scotland with him. But Forbin was chased away from the Firth of Forth by a fleet under Sir George Byng; he refused to allow the young ad- venturer to land farther north, and the Jacobites doubted that France was never serious in the enterprise. The Jacobites also, through mistrust of each other — none could trust Hamilton — and finally through the intoxication of a pilot who failed to reach Forbin, led to the imbecile fiasco. In the English parlia- ment the Jacobites managed to secure a measure of toleration for the Episcopal clergy, after one of them, Mr Greenshields, bad long lain in prison for his. use of the liturgy (1711). The kirk was incensed by the growth of Episcopalianism and of Popery, the restoration of patronage, and the pressure to accept an oath abjuring James, which divided a church that was abso- lutely anti-Jacobite. Repeal of the Union was actually mooted in 1 71 2, and even Argyll was restive. The fatal duel in which Hamilton was slain by Mohun, when on the eve of going as ambassador to France, with the interests of James in his eye, was a blow to the Jacobites; as were the death of Anne, the fall of Bolingbroke and the unopposed succession of George I. (August 1714). Their king over the water had, in a manly and magnanimous letter to his adherents, refused to change his creed, and when Bolingbroke fled from England his evangelical efforts at proselytizing James were fruitless. Berwick and Bolingbroke were his ministers, but Berwick would not accompany him to Scotland, and Bolingbroke did not provide the necessary muni- tions of war. Through a series of confusions and blunders, Mar prematurely raised on the 16th of September 1715 the

standard of King James, and though in command of a much larger army than ever followed Montrose, was baffled by Argyll, who held Stirling with a very small force. Mar never crossed the Forth, and the command of Mackintosh, who did, was captured, with

his Northumbrian cavaliers, at Preston, on the very day (12th of November) when Argyll foiled Mar in the confused battle of Sheriffmuir. Mar's highlanders began to desert; his council was a confusion of opinions and discontents, and when, after many dangers and in the worst of health, James joined the Jacobites at Perth, it was only to discourage his friends by his gloom, and to share their wintry flight before Argyll to Montrose. Thence he furtively sailed with Mar to France, a broken man, leaving his army to shift for themselves. Many of his noble supporters escaped, he did his best to provide them with ships, others were executed, while the great Whig, Forbes of Culloden, protested against the bad policy of the repressive measures. Argyll, who had saved the country, was regarded as lukewarm, and lost the royal favour, while James, at Avignon, intrigued with Charles XII. of Sweden and with Argyll and his brother, the earl of Islay, till he was driven from France to take refuge in Italy. Spain backed him in 1719, but the death of Charles XII., and the utter failure of a Spanish expedition to Scotland in 1710, when the Jacobites were scattered, and the Spaniards taken, in a fight at Glensheil, ruined what had seemed a fair chance of success. Returning from Spain, James married Maria Clementina Sobieska, daughter of Prince James Sobieski, a pretty bride whom Charles Wogan rescued from durance in Innsbruck, an adventure of romantic gallantry. The marriage was unhappy; James was eternally occupied with the business of his cause and the feuds of his adherents; Clementina lost her gaiety and became causelessly jealous; and her retreat to a convent in 1725 was a greater blow to the cause than the failure of Atter- bury's plot (1720), the alleged treason of Mar and the splits in the Jacobite party. Clementina, however, was the mother of two sons, Charles Edward, the hope of his party, and Henry. The cause slumbered, till in 1 742-1 743 the outbreak of wars with France and Spain gave Prince Charles a chance of showing his mettle. The Jacobites surrounding James in Rome never ceased to weave at the endless tissue of their plot, but in Scotland nothing more substantial than the drinking of loyal healths was done, between the flight of Lockhart of Carnwath, the manager of the party, and the years of 173 7-1 744. The old Jacobites were dying out ; James never had a minister who was not baited by three-fourths of the party, and denounced as a favourite at best, at worst a traitor; and the Cause would have sunk into ashes but for the

promise of his eldest son, Prince Charles.

*In Scotland the kirk, as ever, was militant, but it could no longer' wage war on kings and their ministers, nor attempt to direct foreign and domestic policy. The preachers thus fell into parties, which attacked each other in a Parties brotherly way. The grounds of strife were the spread £j k * of " liberal " religious ideas; on one side heretical and anti-Calvinistic doctrines, and on the other a tendency to stretch Calvinistic principles till they were scarcely to be distinguished from Antinomianism. A Glasgow professor, the Rev. Mr Simson, was attacked for Arminianism and Socinianism as early as 1717; and the battle raged between the more severe Presbyterians — who still hankered after the Covenant, approved cf an old work The Marrow of Modern Divinity (1646), and were especially con- vinced that preachers must be elected by the people — and the Moderates, who saw that the Covenant was an anachronism, thought conduct more important than Calvinistic convictions, and supported in the General Assembly the candidates selected by patrons, as against those chosen by the popular voice. The Marrow was discouraged as verging on Antinomianism (1720); and in 1722 its protesting admirers were rebuked by the Assembly. The Marrow men put in protests, and were clearly on the way to secession from the kirk. The oath of abjuration of James was another cause of division, at least till it was watered down in 1719; and by 1726 a revival of the charges of heresy against Simson, with the increase of agitation against the majority of the Assembly who supported»patrons, lighted a flame which burned the slight bonds that kept the extremists in union with the kirk.*

In 1732 their leaders were the brothers Erskine, one of whom; Ebenezer, preached a sermon accusing professed Presbyterians

as guilty of " an attempt to jostle Christ out of his church." For this and other severe censures of his brethren, Mr Erskine would not apologize: he had " delivered the utterance given to him by the Lord ": his was the very attitude of the preachers who thundered against James VI. Mr Erskine was rebuked in the Assembly of 1733; he protested with three friends: they were deprived of their charges; they vowed that they were " the True Presbyterian Covenanted Church of

Scotland," and had the power of the keys. They constituted themselves a presbytery, and maintained that the covenants were perpetually binding. The Assembly went as far as was possible in offers of reconciliation, but the seceders were irreconcilable, and were deposed in 1740. In 1744 they made the " Taking of the Covenants " a term of ministerial and Christian communion. It is impossible here to follow the schisms which split the seceding body within itself: the Erskines themselves were handed over to Satan; their very families adopted opposite factions: there were " Burghers " and " Anti-Burghers," " New Lights " and "Old Lights"; besides the sects which in the 19th century merged in United Presbyterians, and merged themselves later with the Free Church of the Disruption, itself the parent of a small protesting body, popularly styled " The Wee Frees " (see Scotland, Church of). The whole movement, intended as a return to the kirk of Knox and Melville and the Covenanters, was a not unneeded protest against the sleepy " moderation," and want of spiritual enthusiasm, which invaded the established kirk in the latter part of the 18th century, a period in which she possessed such distinguished writers as John Home, author of the drama of Douglas, Robertson, the historian, and Dr Carlyle, whose amusing autobiography draws a perfect portrait of an amiable and highly educated " Moderate " and man of the world. Naturally the opposite party, whether seceders, or " High Flyers," as they were called, within the church, had most influence with the populace, so that " the Trew Universal Kirk " of Scotland was broken into several communions, differing but slightly in accepted doctrines, and not at all in mode of worship. Their tendency has been centripetal, and all the " Free Churches " are agreed in their views concerning the prolonged existence of " the Auld Kirk." The Episcopalians, in this period, were nearly as much perturbed as the Presbyterians, by questions as to the election of bishops in relation to their exiled king, and by the introduction of ritualism in the shape of " the usages." They passed through much persecution, in consequence of the rising of 1745, but, after the death of their King Charles, they became as loyal as any other religious body, managing their own affairs with no more turmoil than is caused by the co- existence of the Anglican and the Laudian prayer-books, with their different forms of the communion service.

As to civil matters, the country was troubled by riots against the Malt Tax, but the clans submitted to a very superficial disarmament; companies of highlanders were em- laadcfaiis. ployed to preserve order and check cattle-raiding; ' and one of these, " The Black Watch " (the Forty- Second), greatly distinguished itself at the battle of

Fontenoy. Wade drove his military roads through the highlands, and, poor as the country still was, the city of Glasgow throve on the tobacco and sugar trade with America and the West Indies. Yet Duncan Forbes of Culloden, president of the Court of Session, after the outbreak of the war with Spain, reported amazing scarcity of money in the country, and strenuously advised legislative checks on the taste for tea, which naturally diminished the profits of the excise on more generous beverages. The fact is that as English companies for foreign trade had long been in chartered existence, Scotsmen and Scottish, capital had no profitable outlets, while agriculture was conducted on slovenly medieval or prehistoric methods; and only the linen trade of the country was really flourishing. Thus, except in the case of the west coast trade with the colonies, Scotland had reaped little commercial benefit from the Union, and the loss of business caused by the abolition of the parliament, and the rush of noble families to London, was severely felt in Edinburgh. Yet there existed no dangerous political dissatisfaction. Though the chief

religions of the highlanders, the Episcopalian and Catholic forms, were depressed by persecution, and priests were few, the clans had long been accustomed to lack of religious functions and did not feel the want. But the hereditable jurisdictions and feudal powers, as of calling out tenants by the fiery cross and punishing the peaceful by burning their cottages, had never been abolished; the chief's will was law, and if the chiefs headed a rising, their clansmen would follow them, willingly or " forced out." They formed a remarkable militia, trained to the use of arms; wonderfully mobile and rapid on the march and daunt- lessly courageous.

The years 1737-1739 saw the germs of civil war beginning to take active life. Simon Fraser, Lord Lovat, an aged intriguer, conceived discontent against the government for the loss of his independent company, and began to intrigue ^?? oy with France and with James in Rome. In the same Charlie. year a young Tweedside laird, Murray of Broughton, visited Rome, fell in love with Prince Charles, then a handsome, wayward, stalwart and ambitious lad, with " a body made for war," and, returning home, Murray practically succeeded to the duties once performed by Lockhart of Carnwath, as Jacobite agent and organizer.

In 1738 the waning power of Walpole and the approaching war with Spain caused Forbes of Culloden to propose the raising of four or five highland regiments for foreign service. Walpole, urged by Lord Islay, brother of Argyll, is said to have approved, but nothing was done. The declaration of war with Spain and the certainty of war with

France promised to the Jacobites good fishing in turbid waters; and they entertained futile hopes of enlisting Argyll with his potent clan. Walpole entered into communication with James, who saw through the manoeuvre, and in 1741 a Jacobite association was formed, which included Lovat and Lochiel. Their agent was Drummond (Macgregor really) of Balhaldie, who in 1 741-1743 dealt with the English Jacobites, and persuaded France that they were powerful and eager. In fact the Scots were feebly organized, and the English Jacobites were not organized at all. Says Murray, " there was not the least ground for encouragement," but, thanks to Balhaldie, Louis XV. began to mobilize an invading force in November 1743. Balhaldie carried to James in Rome an invitation for Prince Charles to go to France, a verbal invitation, which James reluctantly accepted. Cardinal Tencin was not in the secret, and by the time Charles made his way to Paris in January 1744, James clearly perceived the duplicity of France. The Scottish Jacobites were left in ignorance of the French attempt to land in the mouth of the Thames (February-March 1744), an effort frustrated by a disastrous tempest, and by the slackness of the English conspirators.

Prince Charles was left in neglect and obscurity; till, un- checked by Murray, relying on hasty Jacobite promises brought by him, and encouraged by the French victory of Fontenoy, he ' started with seven companions for the west highland coast on the 21st of July 1745. His landing at Borradale on the 5th of August brought a few enthusiastic Macdonalds about him ; from a sense of honour Lochiel joined with the Camerons. Keppoch and Clanranald would not desert a prince with a reward of £30,000 on his head, but Macleod and Sleat held aloof; and Lovat wrecked the adventure by his doubts and delays. None the less a small ill-armed force of some 2000 men marched south; Cope did not oppose them, but evaded them and went to Inverness, leaving open the road to Edinburgh. At Perth Charles was joined by a skilled soldier, Lord George Murray, brother of the Whig duke of Atholl, a pardoned veteran who had been out in 1715 and 1719.

But Lord George's previous dealings with Cope inspired in Charles a distrust which was to prove fatal. Charles entered Edinburgh unopposed on the 16th of September, made his quarters in Holyrood, and on the 21st of September routed Cope at Prestonpans. But he had not the force to invade England, or to take the castle, and waited, collecting recruits and money, and encouraged by empty promises from France, till, as he wrote to James (26th of October), " I shall have one decisive.

stroke for 't, but unless the French land, perhaps none. As matters stand, I must either conquer or perish in a little." His English adherents did not come in, and, after marching to Derby, his council insisted that enough had been done for honour, that Wade was on their flank and rear, the duke of Cumberland in their front, and an army was gathered to defend London. A broken-hearted man, Charles was compelled to acquiesce in retreat (5th of December). If the chiefs had possessed informa- tion now accessible to us, they might not have made " the great refusal," but with only the intelligence which they possessed they could not have followed their audacious prince to the south. Their force was not more than 5000 men ; and they were wholly unskilled in the use of the guns which they had captured at Prestonpans. The retreat was admirably conducted; Lord George and Cluny fought a gallant and successful rear guard at Clifton; they escaped from Cumberland across the border, but Charles, against advice, left a doomed garrison in Carlisle. After a stay to re-fit at Glasgow, Charles moved to besiege Stirling castle, and to join a force from the north, almost as numerous as that with which he had invaded the heart of England.

Cumberland had returned to London,' but Hawley marched from Edinburgh with an army which Charles drove to the winds CuModca. on Falkirk Moor. Hawley's guns were never in action, the Macdonalds charged and scattered his cavalry on the right wing, but pursued too far, and as the pipers had gone in sword in hand, they could not be recalled. On the left the prince's men could not load their pieces, their powder being ruined by the tempestuous rain. They were checked by two steady regiments; many fled, all was darkness and confusion, but, on returning into Falkirk, Charles found that Hawley had decamped in a disgraceful rout. He could not pursue; the whereabouts of his right was unknown, and after the battle his best officers felt rather dismayed than encouraged by the con- spicuous lack of discipline. In place of advancing on Edinburgh, they dallied round Stirling castle in futile siege, and, on the news of Cumberland's advance, alarmed by desertions which they appear to have greatly exaggerated, the chiefs compelled Charles to a fresh retreat. His expostulations perhaps prove him to have been " the best general in his army," but he was dragged north- wards to Inverness, and with depleted ranks of starving men, outworn by the fatigue of a

long night's march to surprise Cumberland at Nairn, he stood on Culloden Moor in defence of Inverness, his base and only source of supplies (16th of April 1746). Charles had some 5000 men, Cumberland had nearly 9000 and eighteen well-served guns. Here for the first time the highlanders were under heavy fire of grape and roundshot, to which they could not reply, and though the right wing and centre, Camerons, Atholl men, Macleans, Clan Chattan, Appin Stewarts, under Lord George and Lochiel, fought with even more than their usual gallantry and resolution, the Macdonalds on the left, discouraged by the death of Keppoch, Scotus and other officers in the advance, never came to the shock. Though outflanked, enfiladed and met by heavy musketry fire in front, the right wing broke Barrel's regiment and passed the guns, but the attack was checked by the bayonets of the second line and a rapid retreat became general. Charles did not leave the field till all was lost; so much seems clear from Yorke's evidence; but the price on his head, and probably suspicions urged by some of his Irish officers, induced him to desert his army and hurry secretly to the west coast and the western isles. He was rewarded by five or six months of dangerous and distressful wanderings, and would certainly have been taken at one juncture but for the courageous and wise assistance of Flora Macdonald, while on all hands the highlanders displayed the most devoted loyalty.

Into the ferocious conduct displayed by Cumberland after the victory, and in the suppression of the clans, we need not enter; nor is the list of executions of rebels alluring. The spirit of the clans remained true indeed, but their prince became " a broken man " : his clemency, and courage, and all that had endeared him to his people, perished under the disgusts and vices engendered by many years of a secret fugitive existence, after he

was driven from France in 1749 (see A. Lang's Pickle, the Spy, and Life of Prince Charles).

As far as the rising had a political aim and reason for existence, apart from mere dynastic sentiment, that aim was " to break the Union "; in the prince's words, " to make Scotland once more a free and happy people." But the vast Scotland. majority of Scots, though not in love with the Union, preferred it to the rule of a Catholic king — Charles probably, for James had every desire to abdicate. The failure of Charles had, in fact, the result of assimilating Scotland much more closely to England. A disarming act, and the prohibition of the highland dress, did not indeed break, but it transferred to other fields the military spirit of the clans. The chiefs first raised the highland regiments which have covered themselves with glory from

Ticonderoga to Dargai and Elandslaagte. The reward which many of the clansmen of the Peninsula and Waterloo re- ceived may be appreciated by those who read the introduction to Scott's Legend of Montrose. They returned to glens desolate of men, deserted, first, by the voluntary emigrations of the clans, and later by forced emigrations in the interests of sheep farms and deer forests. The abolition of hereditable jurisdictions and of the claims of feudal superiors to military service, after Culloden, broke the bond between chiefs and clans, and introduced new social and economical conditions, bequeathing the Land Question to the 20th century. The " planting " of ministers in the highlands, which had since the Reformation been almost destitute of religious instruction, bred a populace singularly strict in the matter of " Sabbath observance," and, except in districts still Catholic or Episcopalian, eager supporters of the Free churches. In outlying places the old popular beliefs linger; second sight is common in some glens; and the interesting poetical traditions, like Jacobite sentiment, survive in the memories of the people, despite cheap newspapers and modern education.

With the failure of the last armed attempt to " break the Union," Scottish history is merged in that of Great Britain; it was a British force that routed the Jacobites at Culloden. After 1745 the men of letters of the country continued with intense eagerness the movement initiated by John Knox, when he wrote in English, not in the old Scots that he learned at his mother's knee. Hutchinson, David Hume, Home and Robertson were assiduous in avoiding Scotticisms as far as they might; even Burns, who summed up the popular past of Scotland in his vernacular poetry, as a rule wrote English in his letters, and when he wrote English verse he often followed the artificial style of the 1 8th century. The later famous men of letters, Scott, Carlyle and R. L. Stevenson, appealed as much to English readers as to their countrymen, patriotic as each of them was in his own way. As early as 1 730-1 740, the great English public schools and universities began to attract the Scottish youths of the wealthier classes, and now good Scots is seldom heard in conversation and is not always written in popular Scottish novels. Scotland and England, however, will always remain pleasantly distinct by virtue of their historical past and inherited traditions.

Bibliography. — The best general History of Scotland is that by Patrick Fraser-Tytler (1841-1843). It ends, however, with the Union of the crowns in 1603, and though it is based on thorough research in MSS., many documents now available, such as the despatches of Spanish ambassadors to England, were not accessible to the learned

author. The History by John Hill Burton (Edinburgh, 1867-1870) ends with the Jacobite Rising of 1746. It is of unequal merit, being best in places where the author was most imterested, especially in points of the development of law. Here the works of Cosmo Innes are valuable, Lectures on Scotch legal antiquities (Edinburgh, 1872); and Scotland in the middle ages (Edinburgh, i860). Burton's anti-Celticism, and scepticism as to archaeology, make his work inadequate in the earlier parts. On the Celtic beginnings the best books are E. W. Robertson's Scotland under her Early Kings (Edinburgh, 1862) and W. F. Skene's Celtic Scotland (Edinburgh, 1 876-1 880), with his Highlanders of Scotland in the edition edited by A. Macbain (Stirling, 1902) ; other views are maintained in Rhys's Celtic Britain (1884). David Stewart of Garth's Sketches of the Highlanders (Edinburgh, 1822) is interesting, though the author leans too much on tradition ; and Dr Gregory's History of the Highlands (1881) is excellent, but closes with the Union of the crowns. Scott's Tales of a Grandfather is, of course, full of interest, but is inevitably somewhat behind the mark of later years

of research. The Foreign Calendars of State Papers, especially J. Bain's Calendars (Edinburgh, 1881-1888), are useful indices, but not infrequently need to be checked by the manuscripts.

There is much new information among the documents published by the Historical Manuscripts Commission, by the Scottish History Society, and the Register of the Privy Council, edited by Professors Masson and Hume Brown. The volumes of the book clubs, Bannatyne, Maitland, Abbotsford and Spalding, are full of matter; also those of the Early Scottish Texts Society and the Wodrow Society, with the works of Knox, Calderwood and the History of the Sufferings by Wodrow (edited by the Rev. Robert Burns, 1837-1838). Knox, like Bishop Burnet, needs t5 be read critically and in the light of contemporary documents; especially those in the Hamilton Papers, The Border Papers and English State Papers (Foreign). The most recent general Histories of Scotland are those of P. Hume Brown (Cambridge, 1899), and on a larger scale, but ending at 1746, of A. Lang (Edinburgh, 1900-1907). Mathieson's works deal with the period of the Covenant and Civil War, and, like Mackinnon's, with the Union; while Sir H. Craik's A Century of

Scottish History (Edinburgh, 1901) gives a full account of the disruption of the Kirk. Many important manuscripts in muniment rooms are still un- calendared; those of the French Foreign Office are imperfect in places, and have been little consulted; and a complete calendar of the treasures of the Advocate's Library was only recently begun.

Among monographs, Six Saints of the Covenant and The Life of Mary Stuart (up to 1568), by D. Hay Fleming; the Life of Knox, by P. Hume Brown, and John Knox and the Reformation, by A. Lang ; Miss Shield's King over the Water and Martin Haile's James Francis Stuart (the old Chevalier) ; Omond's Lord Advocates of Scotland ; Willcock's The Great Marquess (of Argyll) ; Napier's Lives of Montrose and Dundee; Clarke and Foxcroft's Life of Bishop Burnet; Sir Herbert Maxwell's Robert Bruce and Book of Douglas, with all Sir W. Fraser's family histories, and Patrick's Statutes of the Scottish Church, may on various points prove serviceable. For Scottish constitutional history, what there is of it, Sanford Terry's Scottish Parliaments may be recommended. (A. L.)

IV. Scottish Literature

" Scottish Literature " is taken here in the familiar sense of the Teutonic vernacular of Scotland, not in the more compre- hensive sense of the literature of Scotland or of writings by men of Scottish birth, whether in Gaelic (see Celt) or Latin or Northern English. The difference between the two definitions, however, is of small practical concern. The Scottish-Gaelic literature, which is separately dealt with (see Celt: Literature) is, by comparison, of minor importance; and the Latin, though it has a range and influence in Scotland to which it is difficult to find a parallel in the history of the literatures of Europe, is (perhaps for the very reason of its persistency and extent) so bound up with the vernacular that it may be conveniently treated with that literature. It is true that down to the 15th century there were many Teutonic Scots who had difficulty in expressing themselves in " Ynglis," and that, at a later date, the literary vocabulary was strongly influenced by the Latin habit of Scottish culture; but the difficulty was generally academic, arising from a scholarly sensitiveness to style in the use of a medium which had no literary traditions; perhaps also from medieval and humanistic contempt of the vulgar tongue; in some cases from the cosmopolitan circumstance of the Scot and the special nature of his appeal to the learned world. The widespread use of Latin was, however, seldom or never antagonistic to the preservation of national sentiment. That it was used for other than literary purposes strengthened that sentiment

in a way which mere scholarly or literary interest could not have done. The Scottish timbre is rarely wanting, even in places where scholastic or classical custom might have claimed, as in other literatures, an exclusive privilege. And to say this implies no disrespect to the quality of early Scottish Latinity.

In a survey of the vernacular literature of Scotland it is advantageous to keep in mind that there are two main streams or threads running throughout, the one literary in the higher sense, expressing itself in " schools " of a more artificial or academic type; the other popular, also in the better sense of that term, more native, more rooted in national tradition, more persistent and conversely less bookish in fashion. The former is represented by the group known as the Scottish Chaucerians, by the 17th- century Court poets, by the " English " writings of literary Edinburgh of the 18th century; the latter by the domestic and " rustic " muse from Christis Kirk on the Grene to the work of

the 1 8th century revival begun in Ramsay. There is, of course, frequent interaction between these two movements, but recog- nition of their separate development is necessary to the under- standing of such contemporary contrasts as the Thrissil and the Rots and Peblis to the Play, Drummond and Montgomerie, Ramsay and Hume. In our own day, when the literary medium of Scotland is identical with that of England, the term Scottish literature has been reserved for certain dialectal revivals, more or less bookish in origin, and often as artificial and as unrelated to existing conditions as the most " aureate " and Chaucerian " Ynglis " of the 15th century was to the popular speech of that time.

This sketch is concerned only with the general process of Scottish literature. An estimate of the writings of individual authors will be found in separate articles, to which the reader is, in each case, referred.

I. Early Period (from the beginnings to the earlier decades of the 15th century). The literary remains of this period written in the vernacular, which is in its main characteristics " Northern English," are in the familiar medieval kinds of romance and rhymed chronicle. After the Wars of Independence a national or Scottish sentiment is discernible, but it does not colour the literature of this age as it does that of later periods when political and social conditions had suffered serious change.

The earliest extant verse has been associated with Thomas of

Ercildoune (q.v.), called The Rhymer, but the problem of the Scot's share in reworking the Tristrem saga is in some important points undetermined. Uncertainty also hangs round the later Huchown {q.v.), who continues in the 14th century the traditions of medieval romance. Contemporary with the work of the latter are a few anonymous fragments such as the verses on the death of Alexander II., first quoted by Wyntoun in the 15th century, and the snatches on the " Maydens of Englelonde " and " Long beerdys," quoted by Fabyan. The type of alliterative romance shown in the work ascribed to Huchown continued to be popular throughout the period {e.g. The Knightly Tale of'Golagros and Gawane), and lingered on in the next in The Buke of the Howlat by Holland {q.v.), the anonymous Rauf Coiftear of the third quarter of the 15th century, and in occasional pieces of burlesque by the " Chaucerian " makars.

Independent of this group of alliterative romances is the not less important body of historical verse associated with the names of John Barbour {q.v.), Andrew of Wyntoun {q.v.), and, in the middle period, Harry the Minstrel {q.v.). Barbour has been called the Father of Scottish Poetry, apparently for no other reason than that he is the oldest writer who has held place in popular esteem. Though his work shows some of the qualities of a poet, which are entirely lacking in the annalistic verse of Wyntoun, he is without literary influence. Later political fervour has grouped him with the author of the Wallace, and treated the unequal pair as the singers of a militant patriotism. That association is not only unjust to Barbour's literary claims, but a misinterpretation of the general terms of his political appeal. The " Scottish prejudice " which Burns tells us was " poured " into his veins from the Wallace is not obvious to the dispassionate reader of the Brus.

II. Middle Period (extending, roughly, throughout the 15th and 1 6th centuries). To this period belongs the important group of Middle Scots " makars " or poets who, in the traditional phrase of the literary historians, made their age " the Golden Age of Scottish Poetry"; it is in the writings of this time that we find the practice of the artificial literary dialect known as Middle Scots; but there is also in this period the first clear indications of other literary types of great prospective interest in the historical development of the literature of Scotland.

The prevailing influence in the writers of greater account is Chaucerian. These writers, to whom the name of " The Scottish Chaucerians " has been given, broke with the manner of 14th-century verse, and carried over from the south much of the verbal

habit and not a little of the literary sentiment of the master-poet. In both respects they are always superior to Lydgate, Occleve and other southern contemporaries; and not

rarely they approach Chaucer in sheer accomplishment. The first example of this new style is the Kingis Quair of James I. (q.v.), a dream-poem written in Troilus verse, and reminiscent of Chaucer's translation of the Romance of the Rose. The indebtedness to Chaucer, even when full allowance is made for the young poet's individuality, is direct and clear. The language, like that of the later Lancelot of the Laik and the Quare of Jelousy, represents no spoken dialect. Whether it is to be explained by the deliberate adoption of southern literary forms by the author, which his enthusiasm for Chaucer and the circumstances of his sojourn in England made inevitable, or whether the single text which is extant is a Scottish scribe's rendering of a text purely southern in character, is a nice academic question. The balance of evidence, and the presumption is strongly in favour of the former, which is the traditional view. When the linguistic forms of the other pieces in the Selden MS., presumably by the same scribe, have been carefully examined and compared, it should not be difficult to reach a final settlement.

The later Scots Chaucerian type is less directly derivative in its treatment of allegory and in its tricks of style, and less southern in its linguistic forms; but, though it is more original and natural, it nevertheless retains much of the Chaucerian habit. The greater poets who represent this type are Robert Henryson, William Dunbar, Gavin Douglas, and, to a large extent, Sir David Lyndsay — whose united genius has given high literary reputation to the so-called Golden Age. General opinion has exaggerated the importance of the minor writers who shared in this poetical outburst. There is, of course, some historical significance in the drawing up of such lists as we have in Dunbar's Lament for the Makaris, or in Douglas's Police of Honour, or in Lyndsay's Testament of the Papyngo, but it is at the same time clear that their critical importance has been exaggerated. Several of the writers named belong to an earlier period; of many of the others we know little or nothing; and of the best known, such as Walter Kennedy (q.v.) and Quintyn Schaw, it would be hard to say that they are not as uniformly dull as any of Occleve's southern

contemporaries.

The greater portion of this Middle Scots " Chaucerian " literature is courtly in character, in the literary sense, that it continues and echoes the sentiment and method of the verse of the cours d' amour type; and in the personal sense, that it was directly associated with the Scottish court and conditioned by it. All the greater writers, with the exception of Robert Henryson, were well born and connected with the Household, or in high office. Hence what is not strictly allegorical after the fashion of the Romaunt of the Rose or Chaucer's exercises in that kind, is for the most part occasional, dealing with courtiers' sorrow and fun, with the conventional plaints on the vanity of the world and with pious ejaculation. Even Henryson, perhaps the most original of these poets, is in his most original pieces strongly " Chaucerian " in method, notably in his remarkable series of Fables, and his Testament of Cresseid, a continuation of the story left untold by Chaucer. In his Robene and ' Makyne, on the other hand, he breaks away, and follows, if he follows anything, the tradition of the pastourelles. Dunbar often, and at times deliberately, recalls the older verse-habit, even in his vigorous shorter poems; and Douglas, in his Police of Honour and King Hart, and even in his translation of Virgil, is unequivocally medieval. Still later, amid the satire and Reformation heat of Lyndsay we have the old manner persisting in the Testaments and in the tale of Squyer Meldrum.

There are, as might be expected, points of contact between the work of the greater makars and the more native and " popular " material. It is remarkable that each of these poets has left one example of the old manner, shown in the alliterative romance- poem; but the fact that in each case their purpose is strongly burlesque is significant of the change in literary outlook.

The non- Chaucerian verse of this period is represented by (a) alliterative romance-poems and (b) verse of a rustic, domestic and " popular " character Of the historical romance-poem there is little or nothing beyond Henry the Minstrel's Wallace (supra). The outstanding type is shown in such pieces as

Holland's (q.v.) Buke of the Howlat, and in the anonymous poems Golagros and Gawane, The Awntyrs of Arthur at the Terne Walhelyne, Rauf Coillear and The Pistill of Susan. These, however, were already outworn forms, lingering on in a period which had chosen other ideals.

Strong as the Chaucerian influence was, it was too artificial to

change the native habit of Scots verse; and though it helps to explain much in the later history of Scots literature, it offers no key to the main process of that literature in succeeding centuries. Our knowledge of this non-Chaucerian material, as of the Chaucerian, is chiefly derived from the MS. collec- tions of Asloan, Bannatyne (q.v.) and Maitland (q.v.), supple- mented by the references to : ‘ fugitive ” and ” popular ” literature in Dunbar, Douglas, Lyndsay and, in especial, the prose Complaynt of Scotlande. Classification of this literature by traditional subdivision into genres is difficult, and, at the best, unprofitable. The historical student will be mainly interested in discovering anticipations of the later style and purpose of Ramsay, Fergusson and Burns, and in finding therein early evidence of what has been too often treated as the characteristics of later Scotticism. It would not be difficult to show that the reaction in the 18th century against literary and class affectation — however editorial and bookish it was in the choice of subjects and forms — was in reality a re-expression of the old themes in the old ways, which had never been forgotten, even when Middle Scots, Jacobean and early 18th-century verse-fashions were strongest. It is impossible here to do more than to point out the leading elements and to name the leading examples. These elements are, briefly stated, (1) a strong partiality for subjects dealing with humble life, in country and town, with the fun of taverns and village greens, with that domestic life in the rough which goes to the making of the earlier farces in English and French; (2) a whimsical, elfin kind of wit, delighting in extra-vagance and topsy-turviness; (3) a frank interest in the pleasures of good company and good drink. The reading of 1 5th- and 16th-century verse in the light of these will bring home the critical error of treating such poems as Burns’s Cottar’s Saturday Night, the Address to the Deil, and Scotch Drink as entirely expressions of the later poet’s personal predilection. Of the more serious, or ” ethical ” or ” theological ” mood which counts for so much in the modern estimate of Scottish literature, there is but little evidence in the popular verse of the middle period. Even in the deliberately religious and moral work of the more academic poets this seriousness is never more exclusive or oppressive than it is in any other literature of the time. If it becomes an obsession, of many of the post-Reformation writers, it becomes so by the force majeure of special circumstances rather than in the exercise of an old-established habit.

Outstanding examples of this rustic style are Peblis to the Play and Christis Kirk on the Grene, ascribed by some to James V. (q.v.), Sym and his Brudir, a satirical tale of two palmers, The Wyf of Auchtirmuchty, and the Wowing of J ok and Jynny. The more

imaginative, elfin quality, familiar in Dunbar's Ballad of Kynd Kittok and his Interlude of the Droichis Part appears in such pieces as Gyre Carting (the mother- witch), King Berdok, and Lichtounis Dreme. The convivial verse, at its best in Dunbar's Testament of Mr Andrew Kennedy, may be studied in Quhy sould nocht Allane honorit be, one of the many eulogies of John Barleycorn anticipatory of Burns's well-known piece.

In the collections there are few examples of the simple fabliau, the best being the Thrie Priestis of Peblis and The Dumb Wyf, or of the social variety of the same as shown in Rauf Coilˆear and John the Reeve. For the latter Sir David Lyndsay remains the chief exponent. Of historical and patriotic verse there are few specimens, but some of the lyrics and love-songs, more or less medieval in timbre and form, are of importance. Of these, Tayis Bank and The Murning Maiden are perhaps the best.

Vernacular prose was, as might be expected, and especially in Scotland, late in its appearance. The main work continued to be done in Latin, and to better purpose by Hector Boece (q.v.), John Major (q.v.) and George Buchanan (q.v.) than by the earlier annalists Fordun (q.v.) and Bower (q.v.). It is not till the middle

of the 15th century that we encounter any works seriously undertaken in the vulgar: before that time there is nothing but an occasional letter (e.g. that of the earl of March to Henry IV.), a few laws, and one or two scraps in the Asloan and other MSS., all of the plainest and without any effort towards style. Nor can it be said that the first works of a more extensive and deliberate character show any consciousness of pure art as we find it in contemporary writings in England, though the fact that they are translations has some prospective significance. The earliest books are Sir Gilbert Haye's Buke of the Law of Arms, Buke of the Order of Knighthood, and Government of Princes, preserved in a single MS. at Abbotsford. The dull treatise of John of Ireland (q.v.) lays claim to originality of a kind. The author's confession that, being " thretty 3eris nurist in Fraunce, and in the noble study of Paris in Latin toung," he " knew nocht the gret eloquens of Chauceir," and again that he had written another work in Latin, " the tounge that I knaw better," is valuable

testimony to the difficulties in the way of a struggling Scots prose. Other preliminary efforts are the Porluus of Nobilnes in the Asloan MS.; the Spectakle of Luf, translated by G. Mill (1492); and the Schort Memoriale of the Scottis Corniklis, an account of the reign of James II. In the early 16th century the use of the vernacular is extended, chiefly in the treatment of historical and polemical subjects, as in Murdoch Nisbet's version of Purvey (in MS. till 1001), a com- promise between northern and southern usage; Gau's (q.v.) Richl Vay, translated from Christiern Pedersen; Bellenden's (q.v.) translation of Livy and Scottish History; the Complaynt of Scotlande, largely a mosaic of translation from the French; Ninian Winzet's (q.v.) Tractates; Lesley's (q.v.) History of Scotland; Knox's (q.v.) History; Buchanan's (q.v.) Chamaeleon; Lindesay of Pitscottie's (q.v.) History; and the tracts of Nicol Burne and other exiled Catholics. In these works, and especially in Knox, the language is strongly southern. The Scriptures, which had an important bearing on the literary style, as on other matters, were, with the exception of Nisbet's version, which does not appear to have widely circulated, accepted in the southern text. It was not till the publication of Bassandyne's Bible in 1576-1579 that a Scottish version was used officially. Lynd- say in the midst of passages in Scots quotes directly from the Genevan version. The literary influence of the Bassandyne was unimportant. Of the prose books named the Complaynt of Scotlande is the most remarkable example of aureate Middle Scots, the prose analogue of the verse of the " Chaucerians." This characteristic is by no means strong in Scots prose, even at this time: the last, and most extravagant, example is the Rolment of Courtis by Abacuck Bysset, as late as 1622.

So far in our treatment of the Middle Period we have taken account of the " Chaucerian " and more popular verse and of the prose. There appear towards the close of the period certain verse-writers, who, despite points of difference with their Middle Scots predecessors, belong as much to this period .as to the next. In language they are still Scottish; if they show any southern affectations, it is (all echoes of the older aureate style notwith- standing) the affectation of Tudor and Elizabethan English. This poetry, like that of the early half of the period, is courtly; its differences are the differences between the atmosphere of the reigns of the first and fourth Jameses and that of the sixth. When the sixth James becomes the first of England, a more thorough transformation is discernible. In the centre of this group is King James (q.v.) himself, poet and writer of prose; but he yields in literary competence to Alexander Scott (q.v.) and Alexander Montgomerie (q.v.). Their interest on the formal side is retrospective,

but it is possible to find even in the persistent reiteration of medieval sentiment and methods, a fresh feeling for nature, and a lyrical quality of later timbre. With these may be named the minors, William Fowler (q.v.), Alexander Arbuthnot (q.v.) and John Rolland (q.v.), the last most strongly influenced by Douglas and the earlier " makars."

III. The third period begins with the 17th century, with the union of the English and Scottish crowns, if we seek the aid of political history for our literary finger-posts. Strict accuracy

would place the date of change earlier than 1600 or 1603, for there is evidence in the 16th century, even outside the region of diplomatic and official correspondence, of the intermingling of the north and south. It is, however, when James is established on his new throne that we have the clearest signs of the changes which had been at work and were ultimately to transform the entire literary habit of his ancient kingdom. The recital of the names of the Anglo-Scots poets will make this clear: Robert Ker, earl of Ancram, best known for his Sonnet in Praise of a Solitary Life; Sir David Murray of Gorthy, who wrote The tragicall Death of Sophonisba; Sir William Alexander (q.v.), afterwards earl of Stirling; William Drummond, laird of Hawthornden (q.v.); Sir Robert Aytoun (q.v.); James Grahame, marquess of Montrose; Patrick Hannay; and the covenanting Sir William Mure of Rowallan (q.v.); a group whose " courtly " style might be assumed, had the literary evidence been less ample than it is. So, too, in prose. There we have Drummond again, and that strange genius Sir Thomas Urquhart (q.v.); a crowd of polemical writers, mostly ecclesiastics; all the historians, including Spotswood and Calderwood. There is small room for the old vernacular here; and less when we take into account the still active Latinity, shown in the publication by the poet Arthur Johnston (q.v.) of the two volumes of Delitiae poelarum Scotorum hujils aevi illustrium (1637), and in the writings of John Barclay (q.v.) author of the Argenis, Sir Robert Aytoun (v.s.), Thomas Dempster (q.v.), the historian, David Hume of Godscroft, Sir John Scot of Scotstarvet, best known for his prose Staggering State, Sir Thomas Craig, author of the Jus Feudale, Andrew Melville and others represented in Johnston's volumes.

There is nothing in Scots to balance this English and Latin list. The play Philotus, a poor example in a genre rarely attempted in the north, is indebted to the south for more than its subject. The interesting philological tractate Of the Ortho- graphie and Congruitie of the Britan Tongue by Alexander Hume (not the verse writer, u.s.) is in its language a medley; and William Lithgow had travelled too

widely to retain his native speech in purity, even in his indifferent verse. Scraps may be unearthed as mediocre as the Answer to Curat Caddel's Satyr e upon the Whigs, which attempts to revive the mere vulgarity of the Scots " flyting." The only contributions which redeem these hundred years and more from the charge of disrespect to the native muse come from the pen of the Sempills (q.v.). And even here individual merit must yield to historical interest. We are attracted to Beltrees and his kinsmen less by their craftsmanship than by the fact that they supplied the leaders of the vernacular revival of the 18th century with many subjects and verse- models, and that by their treatment of these subjects and models, based on the practice of an earlier day, they complete the evidence of the continuity of the domestic popular type of Scots verse.

In the 1 8th century the literary union of the North and South is complete. The Scot, whatever dialectal habits marked his speech, wrote the English of Englishmen. The story of his triumphs belongs to the story of English literature: to it we leave James Thomson, Adam Smith, David Hume, James Boswell and Sir Walter Scott. If the work begun by Allan Ramsay, continued by Fergusson and completed by Burns, were matter for separate treatment, it would be necessary to show not only that the editorial zeal which turned these writers to the for- gotten vernacular and to " popular " themes was inspired by the general conditions of reaction against the artificiality of the century; but that it was because these poets were Scots, and in Scotland, that they chose this line of return to nature and naturalness, and did honour, partly by protest, to the slighted efforts of the " vulgar " muse. Yet even they did not abjure the " southern manner," and their work in it is matter of some critical significance, whatever may be said of its inferiority in spirit and craftsmanship.

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SCOTLAND, CHURCH OF. The purpose of this article is to trace the growth of the Scottish " Kirk " as a whole, defining the views on which it was based and the organization in which they took form. The controversies within the Church of Scotland have not arisen out of matters of faith but out of practical questions of church government and of the relation of church and state. Holding a church theory to which the rulers of the country were for a century strongly opposed, Scotland became the leading exponent of Presbyterianism (q.v.) ; and this note has been the dominant one in her religious history even in recent times.

The Scottish Reformation came out of a covenant in which the barons, inspired by John Knox, then abroad, bound them- selves in 1557 to oppose the Roman Catholic religion Scottish an(j t promote the cause of the Reformation. When tfon"™ 8 " parliament, on the 24th of August 1560, passed the acts abolishing the papal jurisdiction and the mass in Scotland, it was able, as Knox had been preparing for this crisis, to sanction a new confession of faith for the Reformed church. Other documents of the new system were b'"! t quickly forthcoming. The First Book of Discipline Discipline, set forth the whole of the proposed religious and educational constitution, and this book speaks of " the order of Geneva which is now in use in some of our churches." This order, afterwards with some modifications known as John Knox's Liturgy, and used in the church down to the reign of Charles I., is a complete directory of worship, with forms of all the services to be held in the church.

The type of religion found in these documents is that of Geneva, the unit being the self-governing congregation, and the great aim of the system the pure preaching of the Word. The congregation elect the minister; in no other way can he enter on his functions; but once elected and admitted he is recognized as a free organ of the divine spirit, not subject in spiritual things to any earthly authority but that of his fellow- ministers; the word of God is the supreme authority, and the spoken word of God the vital element of every religious act. The word of God is to prevail in all matters, in conduct as well as doctrine, and in the affairs of government as well as in the church. The terrible power of excommunication is claimed for the church; but

the council of the realm also is called to use the power given them by God to put down all religion but the reformed, and to further the aims and carry out the sentences of the church. It was a matter of course that saints' days and church festivals were abolished as having no warrant in Scrip- ture; Sunday alone remained, as the principal day of preaching. In towns a week-day was to be set apart for the " exercise " or public interpretation of Scripture, in which all qualified persons in the neighbourhood were to take part, as if the whole country were a school of the Bible.

The First Book of Discipline does not set forth any complete scheme of church government. Its arrangements are in part provisional. In addition to the minister, who is its most definite figure and proved to be the most permanent, it recognizes the superintendent, the lay elder and the reader. Ten or twelve superintendents were to be appointed, " a thing most expedient at this time." They were parish ministers and subject like their brethren to church courts; their added function was to plant churches, and place ministers, elders and deacons where required. This was also the duty of " commissioners " who were superintendents over smaller territories and for a shorter term. Whether the superintendents were meant to be per- manent in the church is not clear. The lay elder was very much what he is still. The reader was to conduct service when no

minister was available, reading the Scriptures and the Common Prayer. When there was preaching, it was accompanied by free prayer; the liturgy was not then called for. Of church courts the assembly is taken for granted, having existed from the first; the minor church courts are not yet defined, though the elements of each of them are present. A noble scheme of education was sketched for the whole country, but neither this nor the provision made for ministers' stipends was carried out, the revenues of the old church, from which the expenses of both were to be paid, being in the hands of the barons.

The system naturally took time to get into working order. The old clergy, bishops, abbots and priests were still on the ground, and were slow to take service in the new church. In 1574 there were 289 ministers and 715 readers; in the district of the presbytery of Auchterarder, which now has fifteen parishes, there were then four ministers and sixteen readers. As the ranks of the clergy slowly filled, questions arose which the Reformation had not settled, and it was natural that the old system with which the Country was familiar should creep in again. Presbytery was never much in favour with the crown — this was the case in other countries as well as in Scotland

— and when the crown, so weak at the Reformation, gained strength, encroachments were made on the popular character of the kirk; while the barons also had obvious reasons for not wishing the kirk to be too strong. The first parliament of the Regent Murray (1567), while confirming the establish- ment of the Reformed church as the only true church of Christ, settling the Protestant succession, and doing something to secure the right of stipend to ministers, reintroduced lay patronage, the superintendent being charged to induct the patron's nominee — an infringement of the Reformed system against which the church never ceased to protest. In 1572 a kind of Episcopacy was set up in the interest of the nobles, who in order to draw the income of the episcopal sees had to arrange with men possess- ing a legal title to them. These " tulchan " x bishops did not make the episcopal office respected in the country; but their appointment was not opposed by the church leaders. They had no episcopal ordination, nor did they exercise any authority over their brother ministers. Knox was called to preach the sermon at the admission of one of them, John Douglas, to the archbishopric of St Andrews, and while he denounced both patron and presentee for the corrupt bargain they had made, he did not protest against the office of bishop as contrary to the constitution of the church.

To this declaration, however, the church soon came. Andrew Melville (q.v.) came to Scotland at this time, and became the leader of the church in place of Knox, who died in 1572. He brought with him from Geneva, where he had been the colleague of Beza, a fervent hatred of ecclesiastical tyranny and a clear grasp of the Presbyterian church system. The Scottish church, hitherto without a definite constitution, soon espoused under his able leadership a logical and thorough Presbyterianism, which was expressed in the Second Book of Discipline, adopted by the assembly in 1577, and was never afterwards set aside by the church when acting freely. The"g eco " rf . assembly of 1575 decided that all ministers were Discipline. bishops; that of 1578 abolished the name of bishop as denoting an office in the church, and that of 1580 in spite of a royal remonstrance abolished Episcopacy, a decree to which all the bishops except five submitted. The Second Book of Discipline recognizes four kinds of office in the church, and no one can lawfully be placed in any of them except by being called to it by the members. Pastor, bishop and minister are all titles of the same office, that of those who preach the word and administer the sacraments, each to a particular congregation. The doctor is a teacher in school or university; he is an elder and assists in the work of government. Elders are rulers; their function also is spiritual, though practical and disciplinary. The

fourth office is that of the deacons, who have to do with

1 " Tulchan," a calf-skin filled with straw, supposed to induce the cow to give milk freely; hence a term of contempt for one who is used as a dummy for the advantage of another.

matters of property and are not members of church courts. Neither superintendent nor reader now appears; all the functions of bishops and superintendents are vested in the elderships, or church courts, and it is urged that the parts which still remain in Scotland of the old system should be cleared away and the sole jurisdiction of the kirk, as then constituted, recognized. The assembly is to have the right to fix its own time of meeting, and its decision in matters ecclesiastical is not to be subject to any review. Kirk-sessions and presbyteries are not named, but the principles are clearly laid down on which these institu- tions were to rest.

By committing herself to this system the Church of Scotland established between herself and the Church of England a division which became more and more apparent and was the Prvfby cause of much of her subsequent sufferings. It is no principle, doubt strange that she should have endured so much not for any great Christian principle, but for a question of church government. On the other hand, Presbyterianism stood in Scottish history for freedom, and for the rights of the middle and lower classes against the crown and the aristocracy; and it might not have been held with such tenacity or proved so incapable of compromise but for the opposition and persecution of the three Stuart kings. The history of the Scottish church for a century after the date of the Book of Discipline is that of a religious struggle between the people and the crown.

For some years after its inception Presbyterianism carried all before it. The presbyteries came quickly into existence; that of Edinburgh dates from 1 580. In that year it was found that there were 924 parishes in Scotland, but not nearly all supplied with ministers; it was proposed that there should be 50 presby- teries (in iqio there are 84) and 400 ministers. A great part of the country, especially in the north and west, had not yet been reached by the Reformation. At this time began the long series of attempts made by James VI. in the direction of curbing Presbyterian liberty and of the restoration of Episcopacy. In 1584 were passed the acts called the Black Acts,

which made it treason to speak ill of the bishops, declared the king to be supreme in all causes and over all persons, thus subverting the jurisdiction of the church, and made all conventions illegal except those sanctioned by the king. The bishops were to do what had hitherto been done by the assembly and presbyteries, and no attacks were to be made at religious meetings on the king or council. Other acts followed by which the episcopate was strengthened, though the act of 1587 annexing the temporalities of the bishops to the crown, while fatal to the old episcopate, made the prospects of the new more doubtful. In 1 588 a change took place. A Roman Catholic rising threw James into the arms of the kirk; in 1592 the acts of 1584 were abrogated, the Second Book of Discipline legalized and Presbytery established. The church was at the time very powerful, the people generally sympathizing with her system, and her assemblies being attended by many of the nobles and the foremost men. Discipline was strict; the temper of the church was in accordance with the Old rather than the New Testament.

Another sudden change took place a few years later, James falling out of humour with the church on the question of the restoration of the Roman Catholic lords and angered by the free criticism of some of the ministers. His Basilicon Boron, pub- lished in 1599, shows a determination to make the church episcopal. With this end assemblies, from which Melville was excluded, and which were otherwise tampered with and terror- ized, were got to agree that a number of ministers should sit in parliament, and to surrender the assembly's right of meeting. On his accession to the throne of England in 1603 James entered on a new set of attempts to assimilate the Scottish church to that of England. Melville was brought to London, imprisoned and sent abroad; other ministers who had acted or spoken too freely were banished. The powers of the bishops were increased, and their brethren brought in various ways under subjection to them, and in 1609 two courts of high commission were set up by the royal authority with plenary powers to enforce conformity to the new arrangements. In 1610 three ministers were called

to London to be consecrated as bishops, as if there had till now been no bishops in Scotland; these on their return consecrated ten others. In 1612 the act of 1592 which established Presbytery was rescinded, and Episcopacy became the legal church system of Scotland.

In all this it was the position and rights of the clergy that were assailed; and James showed kindness to the church in seeking to secure that stipends should be paid and that new churches should be

provided where required. f Perth. The people had been less interfered with; the change of church government involved no change in the conduct of worship. But the articles passed by the packed assembly of Perth in 16 18 touched on the religious habits and postures of the people, and in this it soon appeared that a crisis had been reached. These famous articles were: (1) That the communion should be received kneeling; (2) That it might be administered in private; (3) That baptism might be in the home; (4) That children of eight should be taken to the bishop for examination and his blessing; (5) That Christmas, Good Friday, Easter and Whitsunday should be observed. These articles were opposed in parliament and were strongly resented throughout the country. When Charles became king in 1625 he at once let it be known that the Articles of Perth were not to be abrogated, and that no meeting of the assembly was to be allowed. During the first years of his reign he was occupied in other directions; but when he came to Scotland in 1633 t0 be crowned, Laud came with him, and though like his father he showed himself kind to the clergy in matters of stipend, and adopted measures which caused many schools to be built, he also showed that in the matter of worship the policy of forcing Scotland into uniformity with England was to be carried through with a high hand. A book of canons and constitutions of the church which appeared in 1636, instead of being a digest of acts of assembly, was English in its ideas, dealt with matters of church furniture, exalted the bishops and ignored the kirk-session and elders. The liturgy was ordered to be used, which had not yet appeared, but which proved to be a version, with somewhat higher doctrine, of the Anglican Common Prayer. The introduction of this service book in St Giles's Church, Edinburgh, on the 16th of July 1637, occasioned the tumult of which Jenny Geddes will always figure as the heroine. The sentiment was echoed throughout Scotland. Petitions against the service book and the book of covenant. canons poured in from every quarter; the tables or committee formed to forward the petition rapidly became a powerful government at the head of a national movement, the action of the crown was temporizing, and on the 28th of February the National Covenant was signed in the famous scene in Grey- friars church and churchyard. This document consisted of three parts: (1) A covenant signed by King James and his household in 1580, to uphold Presbyterianism and to defend the state against Romanism; (2) A recital of all the acts of parliament passed in the reigns of James and Charles in pursuance of the same objects; and (3) The covenant of nobles, barons, gentlemen, burgesses, ministers and commons to continue in the reformed religion, to defend it and resist all contrary errors and corruptions. The Covenant was no doubt an act of revolt

against legal authority, and can only be justified on the ground that the crown had for many years acted oppressively and illegally in its attempt to coerce Scotland into a religious system alien to the country, and that the subjects were entitled to free themselves from tyranny. The crown was unable either to check the popular movement or to come to any compromise with it, and the Glasgow assembly of 1638, the first free assembly that had met for thirty years, proceeded to make the church what the Covenant required. A clean sweep was made of the legislation of the preceding period; the five articles of Perth, the service book and book of canons and the court of high commission were all condemned. The bishops were tried not for being bishops but on exaggerated charges of false doctrine and loose living; and all were deposed from the ministry. Many ministers were also deposed on the charge of Arminianism. It was by an assembly that the second reformation was effected; but the assembly contained the most

influential of the nobility and gentry, and was carried on the crest of a great national movement. The Covenant was accepted by parliament in 1639.

The succeeding decennium is the culminating period of Scottish Presbyterianism, when, having successfully resisted the crown, it not only was supreme in Scotland but exercised a decisive influence over England. The causes which brought about this state of affairs are to be sought to a large extent in the civil history of England. Presbytery was rapidly growing in that country, and the English parliament sought the alliance of the assembly, while the Independents, though in the event Presbytery was as little to their liking as Episcopacy, joined in the wish to get rid of the episcopal system. In its period of triumph the Presbyterianism of Scotland displayed its character. After the injustice and persecution it had suffered it could scarcely prove moderate or tolerant; it showed a vehement determination to carry out the truth it had vindicated with such enthusiasm, to the full extent and wherever possible. The Covenant, at first a standard of freedom, was immediately converted into a test and made the instrument of oppression and persecution. All policy was to be determined by the Covenant; the king and every official was to be obliged to take it. The mind of the nation being so preoccupied with the Covenant, it naturally followed that those who carried their fanaticism farthest were • ready to denounce and to unchurch those

who showed any inclination to moderation and political sanity, and that the beginnings of schism soon appeared in the ranks of the Covenanters.

In 1643, when the full legal establishment of Presbytery had just been consummated, the assembly, asked by the English West-parliament to arrange a league to be signed in both m luster countries for the furtherance of reformed religion, ">"- agreed, but asked that the league should be a religious*

tension. one rpjj e resu j(. was tjjg Solemn League and Covenant.

The league did not mention Presbyterianism; but the assembly had refused to hear of any recognition of independency; if religion were thoroughly reformed, they considered the result must be Presbyterianism in England as in Scotland. In the Westminster Standards also, which were the fruit of the Scottish desire for a religious uniformity, Scotland did not obtain by any means all it desired in its church documents. The Scottish divines in the Westminster Assembly were only five in number, while the assembly contained effective parties of Erastians and Independents. The Confession of Faith contains no approval of any system of church government, and when she adopted it in 1647 the kirk gave up her old confession in which the principles at least of true church order are laid down. In accepting in 1645 the Westminster Directory of Public Worship she tacitly gave up her own liturgy which had been in use till recently, and committed herself to a bald and uninviting order of worship, in which no forms of prayer were allowed to be used. So much did Scotland for the sake of uniformity accept from England. The metrical psalms also, which are still sung in Scottish churches, were adopted at this time; they are based mainly on the version, which had been approved by the Westminster Assembly, of Francis Rouse (1 579-1659), a member of the English House of Commons.

The engagement made with Charles, then a prisoner in the Isle of Wight in 1647, which promised him support on condition of his sanctioning the Solemn League and Covenant and pledging himself to set up after three years a church according to the Confession of Faith, was protested against by the assembly; and from this came the famous " Act of Classes " by which the Covenanters disqualified for public office and even for military service all who had been parties to the engagement. The rescinding of this act in 1651 led to a serious breach in the ranks of the Scottish clergy. The Resolutioners, or supporters of the resolution to rescind that act, were opposed by the

Protesters, the rigid adherents to the strictest interpretation of the Covenant. The period of the Commonwealth was filled with the strife between these two parties, its bitterness not lessened by the fact that the assembly dissolved in 1653 by Cromwell's soldiers was not

Struggle against Episco- pacy.

allowed to meet again in his protectorate. The Protesters, who were in favour with the common people, are chargeable with having brought into Scottish church life the observance of fast- days, and of the long and excited Communion services which were kept up for two and a half centuries and may still be witnessed in the Highlands.

If the mismanagement of Scottish religious affairs under James and Charles I. is a melancholy story, what took place under Charles II. is infinitely sadder. A series of blunders was committed in the attempt to compel Scotland to submit to the religion the government prescribed, and the failure of each measure was followed by more in- human severities. Detail is impossible here. From the first Charles showed himself determined to force Episcopalianism on Scotland, and not too scrupulous in the choice of methods for securing his ends. The attempt was nearly successful. In the greater part of the country little change took place in the religious services. The service book was not read nor kneeling at com- munion required, and it made no immediate difference to the people that the clergy should be under bishops. The inferior church courts still sat, though not the assembly. At the Restora- tion it was a question whether the bulk of the population was in favour of Presbytery or of Episcopacy. But the matter was handled in such a way in the west of Scotland that an extreme Covenanting spirit arose, nourished on intolerable grievances, and that the nation as a whole decided against the system which had been promoted by such means.

The Rescissory Act of 1661 swept away the legislation of the preceding twenty years, and so disposed of the Presbyterian polity of the church. Episcopacy was restored by a letter from the king on the 5th of September 1661. James Sharp (q.v.), Fairfoul, James Hamilton (1610-1674) and Robert Leighton (q.v.) were the new bishops; Sharp and Leighton having to be ordained as deacons, then as priests, before the consecration, and the party travelling to Scotland in state, though Leighton left them before crossing the border. An act requiring all ministers appointed during the period when patronage was abolished to get presentation from their patrons and institution from their bishops was applied in the west of Scotland in such a way that 300 ministers left their manses. Their places were

filled with less competent men whom the people did not wish to hear, and so conventicles began to be held. The attempts to suppress these, the harsh measures taken against those who attended them or connived at them, or refused to give infor- mation against them, the military violence and the judicial severities, the confiscations, imprisonments, tortures, expatria- tions, all make up a dreadful narrative. Indulgences were tried, and were . successful in bringing back about 100 ministers to their parishes and introducing a new cause of division among the clergy. On the other hand, the Covenanting spirit rose higher and higher among the persecuted till the armed risings took place and the formal rebellion of a handful of desperate men against the ruler of three kingdoms. The story of Richard Cameron (q.v.) is one of the highest romantic heroism; his name was perpetuated in that of the Cameronian body (" first-born of the Scottish sects "), which, as the Reformed Presbyterian Church, kept up a separate existence till 1876, when it united with the Free Church, and in that of the Cameronian regiment, originally formed from his followers after his death and distin- guished since in every part of the world. The proclamation of toleration in 1685 was intended mainly for Roman Catholics and excluded field preachers.

When William landed in England in 1688, the scene changed in Scotland. The soldiery was withdrawn from the west, and the people at once showed their feelings by the " rabbling " or ejection of the curates who occupied of l68Sm the manses of the ousted ministers, in which, however, no lives were lost. William would have decided for Episco- pacy in Scotland, as the great body of the nobles and gentry adhered to it, but only on condition that the Episcopalians agreed to support him and that they had the people with them. Neither of these conditions was fulfilled. On the 22nd of July

i68g the Convention which declared the throne vacant and called William and Mary to fill it, declared in its Claim of Right that prelacy and the superiority of any office in the church above ministers had been a great and insupportable grievance to Scotland. Effect was given to this; and in April 1690 the act was passed on which the establishment of the Church of Scotland rests, the Westminster Confession being recognized, the laws in favour of Episcopacy repealed, though the Rescissory Act remained on the statute book, and the assembly appointed to meet. The Covenants were not mentioned; at his coronation William had refused to be a

persecutor, and he desired that the church should embrace all who were willing to be in it. The Revolution church contained from the first men of different views. Its first assembly in 1690 received into the church the three remaining ministers of the Cameronians, though their followers refused to come with them. With regard to Episco- palian ministers, by whom the majority of parishes were served, there was more difficulty. The Presbyterians were not ready for union with them, and many of them were put out of their livings, ostensibly by way of discipline. The king and his representatives at the assembly pressed hard for their reception, and in 1693 the " Act for settling the quiet and peace of the Church " was passed, which provided for their admission on taking the oaths of allegiance and assurance, subscribing the Confession of Faith and acknowledging Presbyterian govern- ment. This act fixed the formula of subscription to be signed by all ministers.

From this time forward the church, while jealously asserting her spiritual independence, was on the side of the crown against the Jacobites, and became more and more an orderly and useful ally of the state. In 1697 the Barrier Act was passed, which provides that any act which is to be binding on the church is to come before the assembly as an overture and to be trans- mitted to presbyteries for their approval. The difficulties which threatened to arise about the union were skilfully avoided; the Act of Security provided that the Confession of Faith and the Presbyterian government should " continue without any alteration to the people of this land in all succeeding ages," and the first oath taken by Queen Anne at her accession was to preserve it. The Act of Toleration of 171 2 allowed Episco- palian dissenters to use the English liturgy. This had not hitherto been done, and the claim of the Episcopalians for this liberty had been the occasion of a bitter controversy. The same parliament restored lay patronage in Scotland, an act against which the church always protested and which was the origin of great troubles.

Presbytery, being loyal to the house of Hanover, while Episco- pacy was Jacobite, was now in enjoyment of the royal favour and was treated as a firm ally of the government. ˆ£ aage But while the church as a whole was more peaceful, caMies. more courtly, more inclined to the friendship of the world than at any former time, it contained two well- marked parties. The Moderate party, which maintained its ascendancy till the beginning of the 19th century, sought to make the working of the church in its different parts as syste- matic and regular as possible, to make the assembly supreme, to enforce on presbyteries respect for its decisions, and to render the judicial procedure of the church as exact and formal as that of the

civil courts. The Popular party, regarding the church less from the side of the government, had less sympathy with the progressive movements of the age, and desired greater strictness in discipline. The main subject of dispute arose at first from the exercise of patronage. Presbyteries in various parts of the country were still disposed to disregard the presenta- tions of lay patrons, and to settle the men desired by the people; but legal decisions had shown that if they acted in this way their nominee, while legally minister of the parish, could not claim the stipend. To the risk of such sacrifices the church, led by the Moderate party, refused to expose herself. By the new policy inaugurated by Dr William Robertson (1721-1793), which led to the second secession, the assembly compelled presbyteries to give effect to presentations, and in a long series

of disputed settlements the " call," though still held essential to a settlement, was less and less regarded, until it was declared that it was not necessary, and that the church courts were bound to induct any qualified presentee. The substitution of the word " concurrence " for " call " about 1764 indicates the subsidiary and ornamental light in which the assent of the parishioners was now to be regarded. The church could have given more weight to the wishes of the people; she professed to regard patronage as a grievance, and the annual instructions of the assembly to the commission (the committee representing the assembly till its next meeting) enjoined that body to take advantage of any opportunity which might arise for getting rid of the grievance of patronage, an injunction which was not discontinued till 1784. It is not likely that any change in the law could have been obtained at this period, and dis- regard of the law might have led to an exhausting struggle with the state, as was actually the case at a later period. Still it was in the power of the church to give more weight than she did to the feelings of the people; and her working of the patron- age system drove large numbers from the Establishment. A melancholy catalogue of forced settlements marks the annals of the church from 1749 to 1780, and wherever an unpopular presentee was settled the people quietly left the Establishment and erected a meeting-house. In 1763 there was a Ofowt f, i great debate in the assembly on the progress of schism, dissent. in which the Popular party laid the whole blame at the door of the Moderates, while the Moderates rejoined that patronage and Moderatism had made the church the dignified and powerful institution she had come to be. In 1764 the number of meeting-houses was 120, and in 1773 it had risen to 19c. Nor was a conciliatory attitude taken up towards the seceders. The ministers of the Relief desired to remain con- nected with the Establishment, but

were not suffered to do so. Those ministers who resigned their parishes to accept calls to Relief congregations, in places where forced settlements had taken place, and who might have been and claimed to be recog- nized as still ministers of the church, were deposed and forbidden to look for any ministerial communion with the clergy of the Establishment. Such was the policy of the Moderate ascendancy, or of Principal Robertson's administration, on this vital subject. It had the merit of success in so far as it completely established itself in the church. The presbyteries ceased to disregard presentations, and lay patronage came to be regarded as part of the order of things. But the growth of dissent steadily continued and excited alarm from time to time; and it may be questioned whether the peace of the church was not purchased at too high a price. The Moderate period is justly regarded as in some respects the most brilliant in the history of the church. Her clergy included many distinguished Scotsmen, among them Thomas Reid, George Campbell, Adam Ferguson, John Home, Hugh Blair, William Robertson and John Erskine. The labours of these men were not mainly in theology; in religion the age was one not of advance but of rest ; they gained for the church a great and widespread respect and influence.

Another salient feature of the Moderate policy was the con- solidation of discipline. It is frequently asserted that discipline was lax at this period and that ministers of scandalous lives were allowed to continue in their charges. It cannot, however, be shown that the leaders of the church at this time sought to procure the miscarriage of justice in dealing with such cases. That some offenders were acquitted on technical grounds is true; it was insisted that in dealing with the character and status of their members the church courts should proceed in as formal and punctilious a manner as civil tribunals, and should recognize the same laws of evidence; in fact, that the same securities should exist in the church as in the state for individual rights and liberties.

The religious state of the Highlands, to which at the period of the Union the Reformation had only very partially pene- trated, occupied the attention of the church during the whole of the 1 8th century. In 1725 the gift called the " royal bounty " was first granted — a subsidy amounting at first to ˆ1000

per annum, increased in George IV. 's reign to £2000, and continued

to the present day; its original object was to ReiMous ass ‘ st the reclamation of the Highlands from Roman condi- Catholicism by means of catechists and teachers. tioaof The Society for Propagating Christian Knowledge, Highlands. ; nc0 rporated in 1709, with a view partly to the wants of the Highlands, worked in concert with the Church of Scotland, setting up schools in remote and destitute localities, while the church promoted various schemes for the dissemina- tion of the Scriptures in Gaelic and the encouragement of Gaelic students. In these labours as well as in other directions the church was sadly hampered by poverty. The need of an increase in the number of parishes was urgently felt, and, though chapels began to be built about 1796, they were provided only in wealthy places by local voluntary liberality; for the supply of the necessities of poor outlying districts no one as yet looked to any agency but the state. In every part of the country many of the ministers were miserably poor; there were many stipends, even of important parishes, not exceeding £40 a year; and it was not till after many debates in the assembly and appeals to the government that an act was obtained in 1810 which made up the poorer livings to £150 a year by a grant from the public exchequer. The churches and manses were frequently of the most miserable description, if not falling to decay.

With the close of the 18th century a great change passed over the spirit of the church. The new activity which sprang

up everywhere after the French Revolution produced Haidanes. m Scotland a revival of Evangelicalism which has

not yet spent its force. Moderatism had cultivated the ministers too fast for the people, and the church had become to a large extent more of a dignified ruler than a spiritual mother. About this time the brothers Robert and James Haldane devoted themselves to the work of promoting Evangelical Christianity, James making missionary journeys throughout Scotland and founding Sunday schools; and in 1798 the eccentric preacher Rowland Hill visited Scotland at their request. In the journals of these evangelists dark pictures are drawn of the religious state of the country, though their censorious tone detracts greatly from their value; but there is no doubt that the efforts of the Haidanes brought about or coincided with a quickening of the religious spirit of Scotland. The assembly of 1799 passed an act forbidding the admission to the pulpits of laymen or of ministers of other churches, and issued a manifesto on Sunday schools. These acts helped greatly to discredit the Moderate party, of whose spirit they were the outcome; and that party further injured their standing in the country by attacking Leslie, afterwards Sir John Leslie, on

frivolous grounds — a phrase he had used about Hume's view of causation — when he applied for the chair of mathematics in Edinburgh. In this dispute, which made a great sensation in the country, the popular party success- fully defended Leslie, and thus obtained the sympathy of the enlightened portion of the community. In 1810 the Christian Instructor began to appear under the editorship of Dr Andrew Thomson, a churchman of vigorous intellect and noble character. It was an ably written review, in which the theology of the Haidanes asserted itself in a somewhat dogmatic and confident tone against all unsoundness and Moderatism, clearly proclaiming that the former things had passed away. The question of pluralities began to be agitated in 1813, and gave rise to a long struggle, in which Dr Thomas Chalmers (q.v.) took a notable part, and which terminated in the regulation that a university chair or principalship should not be held along with a parish which was not close to the university seat.

The growth of Evangelical sentiment in the church, along with the example of the great missionary societies founded

in the end of the 18th and the beginning of the 19th extension, century, led to the institution of the various missionary schemes still carried on, and their history forms the chief part of the history of the church for a number of years. The education scheme, having for its object the planting of schools in destitute Highland districts, came into existence in 1824. The foreign mission committee was formed in 1825, at the instance

of Dr John Inglis (1763-1834), a leader of the Moderate party; and Dr Alexander Duff (q.v.) went to India in 1829 as the first missionary of the Church of Scotland. The church extension committee was first appointed in 1828, and in 1834 it was made permanent. The colonial scheme was inaugurated in 1836 and the Jewish mission in 1838, Robert Murray M'Cheyne (1813- 1843) an d Andrew Alexander Bonar (1810-1892) setting out in the following year as a deputation to inquire into the condition of the Jews in Palestine and Turkey and on the continent of Europe. Of these schemes that of church extension has most historical importance. It was originally formed to collect in- formation regarding the spiritual wants of the country, and to apply to the government to build the churches found to be necessary. As the population of Scotland had doubled since the Reformation, and its distribution had been completely altered in many counties, while the number of parish churches remained unchanged, and meeting-houses had only been erected where seceding congregations required them, the need for

new churches was very great. The application to government for aid, how- ever, proved the occasion of a " Voluntary controversy," which raged with great fierceness for many years and has never com- pletely subsided. The union of the Burgher and the Anti- burgher bodies in 1820 in the United Secession — both having previously come to hold Voluntary principles— added to the influence of these principles in the country, while the political excitement of the period disposed men's minds to such dis- cussions. The government built forty-two churches in the Highlands, providing them with a slender endowment; and these are still known as parliamentary churches. Under Thomas Chalmers, however, the church extension committee struck out a new line of action. That great philanthropist had come to see that the church could only reach the masses of the people effectively by greatly increasing the number of her places of worship and abolishing or minimizing seat-rents in the poorer districts. In his powerful defence of establishments against the voluntaries in both Scotland and England, in which his ablest assistants were those who afterwards became, along with him, the leaders of the Free Church, he pleaded that an established church to be effective must divide the country territorially into a large number of small parishes, so that every corner of the land and every person, of whatever class, shall actually enjoy the benefits of the parochial machinery. This " territorial principle " the church has steadily kept in view ever since. With the view of realizing this idea he appealed to the church to provide funds to build a large number of new churches, and personally carried his appeal throughout the country. By 1835 he had collected £65,626 and reported the building of sixty-two churches in con- nexion with the Establishment. The keenness of the conflict as it approached the crisis of 1843 checked the liberality of the people for this object, but by 1841 £305,747 had been collected and 222 churches built.

The zealous orthodoxy of the church found at this period several occasions to assert itself. John M'Leod Campbell (q.v.), minister of Row, was deposed by the assembly of 1830 for teaching that assurance is of the essence of faith and that Christ died for all men. He has since been recognized as one of the profoundest Scottish theologians of the 19th century, although his deposition was never removed. The same assembly con- demned the doctrine put forth by Edward Irying, that Christ took upon Him the sinful nature of man and was not impeccable, and Irving was deposed five years later by the presbytery of Annan, when the outburst of supposed miraculous gifts in his church in London had rendered him still more obnoxious to the strict censures of the period. In i84r Thomas Wright of Borth-

wick (1785-1855) was deposed for a series of heretical opinions, which he denied that he held, but which were said to be contained in a series of devotional works of a somewhat mystical order which he had published.

The influence of dissent also acted along with the rapidly

rising religious fervour of the age in quickening in the church

that sense of a divine mission, and of the right and power to

I carry out that mission without obstruction from any worldly

*authority, which belongs to the essential consciousness of the Christian church. An agitation against patronage, the ancient root of evil, and the formation of. an anti- o*i&43.°" patronage society, helped in the same direction. The Ten Years' Conflict, which began in 1833 with the passing by the assembly of the Veto and the Chapel Acts, is treated in the articles Free Church of Scotland, and it is not necessary to dwell further in this place on the consequences of those acts. The assembly of 1843, from which the exodus took place, proceeded to undo the acts of the church during the preceding nine years. The Veto was not repealed but ignored, as having never had the force of law; the Strathbogie ministers were recognized as if no sentence of deposition had gone forth against them. The protest which the moderator had read before leaving the assembly had been left on the table; and an act of separation and deed of demission were received from the ministers of the newly formed Free Church, who were now declared to have severed their connexion with the Church of Scotland. The assembly addressed a pastoral letter to the people of the country, in which, while declining to " admit that the course taken by the seceders was justified by irresistible necessity," they coun- selled peace and goodwill towards them, and called for the loyal support of the remaining members of the church.*

Two acts at once passed through the legislature in answer to the claims put forward by the church. The Scottish Benefices Act of Lord Aberdeen, 1843, gave the people power to state objections personal to a presentee, and bearing on his fitness for the particular charge to which he was presented, and also authorized the presbytery in dealing with the objections to look to the number and character of the objectors. Sir James Graham's Act, 1844, provided for the

erection of new parishes, and thus created the legal basis for a scheme under which chapel ministers might become members of church courts.

The Disruption left the Church of Scotland in a sadly maimed condition. Of 1203 ministers 451 left her, and among these Develoo- were many of her foremost men. A third of her meat of membership is computed to have gone with them. the church In Edinburgh many of her churches were nearly s '°^ empty. The Gaelic-speaking population of the

northern counties completely deserted her. All her missionaries left her but one. She had no gale of popular enthusiasm to carry her forward, representing as she did not a newly arisen principle but the opposition to a principle which she maintained to be dangerous and exaggerated. For marly years she had much obloquy to endure. But she at once set herself to the task of filling up vacancies and recruiting the missionary staff. A lay association was formed, which raised large sums of money for the missionary schemes, so that their income was not allowed seriously to decline. The good works of the church, indeed, were in a few years not only continued but extended. All hope being lost that parliament would endow the new churches built by the church extension scheme of Dr Chalmers, it was felt that this also must be the work of voluntary liberality. Under Dr James Robertson, professor of church history in Edinburgh, one of the leading champions of the Moderate policy in the Ten Years' Conflict, the extension scheme was transformed into the endowment scheme, and the church accepted it as her duty and her task to provide the machinery of new parishes where they were required. 1 By 1854, 30 new parishes had been added at a cost of £130,000, and from this time forward the work of endowment proceeded still more rapidly. In 1843 the number of parishes had been 924; in 1909 it was 1437. By the Poor Law Act of 1845 parishes were enabled to remove the care of the poor from the minister and the kirk- session, in whom it was formerly vested, and to appoint a parochial board with power to assess the ratepayers. The

1 Those branches of the church extension scheme which dealt with church building, and with the opening of new missions to meet the wants of increasing populations, were taken up by a new department, called the Home Mission scheme. The home mission as the pioneer in opening up new fields of labour, and the endowment scheme which renders permanent the religious centres that the mission has founded, are both traceable to Dr Chalmers.

Education Act of 1872 severed the ancient tie connecting church and school together, and created a school board having charge of the education of each parish. At that date the Church of Scotland had 300 schools, mostly in the Highlands. The church continued till lately to carry on normal schools for the training of teachers in Edinburgh, Glasgow and Aberdeen; but these, along with the normal schools of the United Free Church, were recently made over to the state.

In 1874 patronage was abolished. The working of Lord Aberdeen's Act had given rise to many unedifying scenes and to lengthy struggles over disputed settlements, and it was early felt that some change at least was necessary in ˆ, boU ' f the law. The agitation on the subject went on in the pa tronage. assembly from 1857 to 1869, when the assembly by a large majority condemned patronage as restored by the Act of Queen Anne, and resolved to petition parliament for its removal. The request was granted, and the right of electing parish ministers was conferred by the Patronage Act 1874 on the congregation; thus a grievance of old standing, from which all the ecclesiastical troubles of a century and a half had sprung, was removed and the church placed on a thoroughly democratic basis. This act, combined with various efforts made within the church for her improvement, secured for the Scottish Establishment a large measure of popular favour, and in the last half of the 19th century she grew rapidly both in numbers and in j mprove . influence. This revival was largely due on the one ments in hand to the improvement of her worship which began public with the efforts of Dr Robert Lee (1804-1868), minister worsbl P- of Old Greyfriars, Edinburgh, and professor of Biblical criticism in Edinburgh university. By introducing into his church a printed book of prayers and also an organ, Dr Lee stirred up vehement controversies in the church courts, which resulted in the recognition of the liberty of congregations to improve their worship. The Church Service Society, having for its object the study of ancient and modern liturgies, with a view to the prepara- tion of forms of prayer for public worship, was founded in 1865; it has published eight editions of its " Book of Common Order," which, though at first regarded with suspicion, has been largely used by the clergy. Church music has been cultivated and improved in a marked degree; and hymns have been introduced to supplement the psalms and paraphrases; in 1898 a committee appointed by the Church of Scotland, the Free Church, the United Presbyterian Church and the Presbyterian Church in Ireland issued The Church Hymnary, which is authorized for use in all these churches alike. Architecture has restored many of the larger

churches from their disfigurement by partition walls and galleries — though much still remains to be done in this way — and has erected new churches of a style favourable to devotion. The cathedral churches of St Giles, Edinburgh, and of Brechin and Dunblane, the abbey church of Paisley and the Church of the Holy Trinity, St Andrews, have been restored; and the abbey of Iona, handed over to the Church of Scotland by the duke of Argyll, is now once more fitted up for worship.

The fervour of the church found a channel in the operations of a " Committee on Christian Life and Work," appointed in 1869 with the aim of exercising some supervision of CommHm the work of the church throughout the country, tee on stimulating evangelistic efforts and organizing the Christian labours of lay agents. This committee publishes a L ˆ e r i nd magazine of " Life and Work," which has a circulation of over 100,000, and has organized young men's gilds in connexion with congregations and revived the ancient order of deaconesses. It was to reinforce this element of the church's activity, as well .as to strengthen her generally, that James Baird (1802-1876) in 1873 made the munificent gift of £500,000. This fund is administered by a trust which is not under the control of the church, and the revenue is used mainly in aid of church building and endowment throughout the country.

The church has greatly increased of late years in width of view and liberality of sentiment, and shelters various tendencies of thought. A volume of Scotch Sermons, published in 1880 by ministers holding liberal views, brought out the fact that the

church would not willingly be led into prosecutions for heresy. After this, however, there was a revival on the part of some of the clergy of High Church and orthodox sentiment. ot 'heresy The Scottish Church Society was founded in 1892 with Dr John Macleod of Govan as president, " to defend and advance catholic doctrine as set forth in the ancient creeds and embodied in the standards of the Church of Scotland." In 1897, however, Alexander Robinson of Kilmun was deposed by the presbytery of Dunoon acting under the orders of the Assembly on account of the views contained in his book The Saviour in the Newer Light, in which the results of modern criticism of the Gospels were set forth with some ability. The National Church Union, of which Professor A. Menzies was president, was formed

after this event by ministers and elders who feared that the cause of free theological inquiry was in peril in the church. This body at once raised the question of the relaxation of subscription, which was in a few years seriously taken up by the church, and the National Church Union, feeling that in this, as well as in the growth of liberal opinion in the church its object had been attained, discontinued its operations. The Scottish Church Society still carries on its work.

The question of subscription has been more or less before the church for many years. The formula adopted by the assembly of 1 7 1 1 had still to be signed by ministers, and was felt to be much too strict. After debates extending over many years, the assembly of 1889 fell back on the words of the act of parliament 1693, passed to enable the Episcopalian clergy to join the estab- lishment, in which the candidate declared the Confession of Faith to be the confession of his faith, owned the doctrine therein contained to be the true doctrine and promised faithfully to adhere to it. This was accompanied by a Declaratory Act in which the church expressed its desire to enlarge rather than curtail the liberty hitherto enjoyed. Ten years later the assembly was again debating the question of subscription. A committee appointed in 1899 to inquire into the powers of the church in the matter reported that the power of the church was merely administrative — it was in her power as cases arose to prosecute or to refrain from prosecuting, but that she had no power to modify the confession in any way. Here the matter might have remained, but that the approach to parliament of the United and the Free Churches after the decision of the House of Lords in 1904 (see Free Church and United Free Church) offered an opportunity for asking parliament to remove a grievance the church herself had no power to deal with. The Scottish Churches Bill of 1905 afforded relief to all the Presbyterian churches. It did not do what the Church of Scotland asked, viz. allow the words of the act of 1690 to be used as the formula; but it removed that of 1693 and left it to the church to frame a new formula for her ministers and professors, an undertaking to which she is seriously addressing herself.

The agitation for disestablishment sprang up afresh after the passing of the Church Patronage Act (Scotland); each assembly of the Free Church passed a resolution in Attacks oa f av0 ur of it, and the United Free Church continued Usbment. tn ‘ s testimony. In 1890 Mr Gladstone declared for disestablishment, and under his government of 1892 a Disestablishment Bill was introduced in the House of Commons by Sir Charles Cameron, in two successive sessions, 1893-1894. After the defeat of the Liberal government in 1895, the church was for ten years relieved from this anxiety, nor had the

attack been renewed up to 191 1. A counter-movement was represented by a bill introduced into parliament in 1886 in order to declare the spiritual independence of the Church of Scotland, in the hope that the way might be opened to a reunion of the Presbyterian bodies. The act of 1905 has altered the circumstances of the churches in this regard. During the agitation the church was much occupied with the question of her own defence, and after it died down, various schemes were entertained for the improve- ment of her position without and within. She more than once expressed her willingness to confer with the daughter Presby- terian churches, with a view to their sharing with her the benefits of her position.

Scottish theo- logians.

Since 1908 the subject of the union of the churches has been much spoken of. The quarter-centenary of the birth of Calvin occurring at the time of the Church assemblies of 1909 brought the Church of Scotland and the United Free Church assembly together for a memorial service in St Giles's; and a committee on union, consisting of 105 representatives from each assembly, was appointed.

The Church of Scotland has made few contributions of importance to the movement of Biblical Criticism which has entered so deeply into the religious life of Scotland, but she has had dis- tinguished writers on theology. Robert Lee (1804-1868), minister of Old Greyfriars and professor of Biblical criticism in Edinburgh University, fought a long battle for the liberty and the improvement of worship, of which the churches generally now reap the advantage. He held clear views as to the necessity of reform in the doctrine of the church as well ; but these he died without publishing. Norman Macleod (q.v.), minister of the Barony Parish, Glasgow, a man of great natural eloquence and an ardent philanthropist, enjoyed the warm friendship of Queen Victoria and was beloved by his nation. John Caird (q.v.), professor of divinity and then principal of Glasgow University, wrote An Introduction to the Philosophy of Religion, exercised a deep influence as a teacher on Scottish thought, and was the most distinguished British preacher, of the intellectual order, of his day. John Tulloch (q.v.), principal of St Mary's College, St Andrews, wrote Theism, Leaders of the Reformation, Rational Theology and Christian Philosophy in England in the lyih century, and many other works, and was an effective champion of doctrinal liberty. He was succeeded at St Andrews and as Liberal leader in the assembly by John Cunningham (1819-1893), who wrote a very successful History of the Church of Scotland. Robert Herbert Story (1835-1906), principal after Caird of Glasgow University, stood by the side of Lee

and Tulloch in their assembly contendings and was an outspoken defender of the National Church against her spoliators from without. Of his works may be mentioned lives of his father Dr Story, of Carstairs, and of Robert Lee. His life was written by his daughters. Andrew K. H. Boyd (1825-1899), minister of St Andrews, was widely known by the numerous volumes of essays, especially the " Recreations of a Country Parson." His " Twenty-five Years of St Andrews " contains a good deal of information. Robert Flint (q.v.) published The Philosophy of History in Europe, Historical Philosophy in France; his volumes on Theism and Antitheistic Theories have passed through many editions.

The Church of Scotland in 1909 had 1437 parishes and 251 chapels and preaching stations. The General Assembly consisted of 741 members. The professors of divinity at the four Scottish „ universities must be ministers of the church, but a pro- i ' tatls " cs – posal has been made to throw the chairs open to ministers of any of the Presbyterian bodies. The foreign mission employs fifty- two ordained and about as many unordained, medical, industrial and other missionaries, with a large number of native agents, in India, East Africa and China. Jewish missions are kept up at five stations in the East, and the colonial committee supplies ordinances to emigrants from Scotland in many of the dependencies of the empire. The small-livings fund aims at bringing up to £200 a year all stipends which fall short of that sum, of which there are nearly 400. About £4000 a year was still required in 1910 to carry out the object of this scheme.

The parliamentary return of 1888 showed the value of the ceinds of 876 parishes to be £375,678 and the stipends paid to amount (exclusive of manses and glebes) to £242,330. The value of augmentations obtained since that date is more than balanced by the decline of fiars prices, so that the total revenue of the church from this source is about £220,000. The unexhausted teinds, according to the return in 1907, amounted to about £133,000. The exchequer pays to 190 poor parishes and 42 Highland churches, from church property in the hands of the crown, £17,040. From burgh and other local funds the church derives a revenue of £23,501. The church has herself added to her endowments, for the equipment of 453 new parishes, £1,681,330, yielding over £54,000 a year. The entire endowments of the church, including manses and glebes but not church buildings, is about £300,000.

For detailed accounts of the separate bodies — the United Presbyterian Church, the Free Church and the United Free Church — see the articles on each of these. The table on the following page

shows the material progress of the respective organizations in recent years.

In the absence of a religious census it is not possible to deduce from statistics supplied by the churches themselves any trustworthy conclusion as to the percentage of the population adhering to each church. The Communion rolls of the parish churches require to be kept with care, as in vacancies they form the register of those entitled to vote for the new minister. In the able statistical discussions in the reports of the United Free Church it is pointed out that in the figures furnished by the churches the numbers of members and the numbers of deaths are not in the same proportion as the population of the country and the general death-rate, and the conclusion is drawn that the number of members is in each case too great.

1879.

1899.

1909.

Congregations : —

Church of Scotland

1.337

i,447

1,687

Free Church

1.033

1,101

United Presbyterian .

533

577

United Free Church .

1,620

.Membership: —

Church of Scotland

518,146

648,476

706,653

Free Church

246,250

293,684

United Presbyterian .

172,150

195,498

United Free Church .

506,573

Income: —

Church of Scotland

£3H.378

£492,816

£554,145

Free Church

594.050

706,546

United Presbyterian .

367,915

392,116

United Free Church .

1,089,101

(for 1908)

The Free Church in 1909 had 1 50 congregations and 77 ministers ; its members and adherents are stated to number 60,000, and its income, apart from investments, is £22,542. The membership of the larger churches is that of communicants only; in the Highlands especially the adherents of these churches who do not communicate form a large proportion of those connected with the church.

According to the figures given above the communicants of the Church of Scotland represent 14-7 of the population and those of the United Free io-6. A study of the figures for many years past shows that the proportion of the people attached to these churches is not decreasing.

The Scottish Episcopal Church in 1909 numbered 388 charges with 52,029 communicants. Its charges are numerous in proportion to its membership, having an average of 134 members, while the Church of Scotland averages 497 and the United Free Church 313 members for each congregation. The adherents of each of these churches out-number their communicants in a ratio which is variously estimated. The Roman Catholic hierarchy 1 was restored in Scotland in 1878. There are six dioceses (two archbishops, one of Edinburgh and St Andrews and the other of Glasgow; and four suffragans, Aberdeen, Argyll and the Isles, Dunkeld and Galloway), with, in 1909, 550 priests; 398 churches, chapels and stations; and a Roman Catholic population estimated at about 519,000.

The original Secession Church has 5 presbyteries and 26 congregations ; and the remnant of the Reformed Presbyterian Church which did not join the Free Church in 1876, 2 presbyteries and 11 congregations. The Congregational and Evangelical Union (formed by the amalgamation of the Congregational and Evangelical Churches in 1896), has 183 churches; and the remnant of the Evangelical Union, 7 churches. The Baptist Union has 128 congregations and the Wesleyan Methodists 40 churches.

Literature. — For the earlier history of the kirk the outstanding authorities are the histories of Knox, Calderwood, Baillie's Letters,

and Wodrow's History: Knox's liturgy has been edited by Dr Sprott, and on the Westminster Standards the reader may consult Dr Mitchell's Minutes of the Westminster Assembly, and Baird lectures on the same subject. Modern histories of the church have been written by Cook, Hetherington and Principal Cunningham; Dr Story's Church of Scotland in 5 vols, contains information on every side of the subject. Among books professedly dealing with the Free Church question, the most valuable are Sydow's Die Schottische Kirchenfrage (Potsdam, 1845), and The Scottish Church Question (London, 1845); Buchanan's Ten Years' Conflict (1849); Hanna's Life of Chalmers (1852); and Taylor Innes on The Law of Creeds in Scotland (1867). See also Cockburn, Memorials of His Time (Continuation, 1874); Walker, Dr Robert Buchanan: an Ecclesiastical Biography (1877); Annals of the Disruption (published by authority of a committee of the Free Church (1876-1877). On the United Presbyterian Church see McKerrow, History of the United Secession Church (1841); Struthers, History of the Relief Church (1843); McKelvie, Annals and Statistics of the United Presbyterian Church (1873). For a concise account of all the Secessions and Unions, Logan, The United Free Church (1681-1906). (A. M.)*

SCOTLAND, EPISCOPAL CHURCH OF, a Scottish church (see above) m communion with, but historically distinct from, the Church of England, and composed of seven dioceses: Aber- deen and Orkney; Argyll and the Isles; Brechin; Edinburgh; Glasgow and Galloway; Moray, Ross and Caithness; and St Andrews, Dunkeld and Dunblane. All, except Edinburgh, founded by Charles I., are pre-Reformation sees. The bishops constitute the episcopal synod, the supreme court of appeal,

1 During the long period of proscription, the Roman Catholic Church in Scotland survived in scattered groups; after the Refor- mation it was at first under the jurisdiction of the English arch-priest, but from 1653 to 1 694 it was governed by prefects apostolic and from S6cu to 1878 by vicars apostolic appointed by the pope.

whose president, elected by the members from among them- selves, has the style, not the functions, of a metropolitan, being called primus. The legislature is the provincial synod, con- sisting of the bishops, at whose discretion it is summoned, and a lower chamber of presbyters. The canons have the authority of this synod. The representative church council, including laymen, administers finance. Each diocese has its synod of the clergy. Its dean is appointed by the bishop, and, on the voidance of the see, summons the clerical and lay electors, at the instance of the primus, to choose

a bishop, who is presented to the episcopal synod for confirmation and to the primus for consecra- tion. There are cathedrals at Perth, Inverness, Edinburgh and Cumbrae; the sees of Aberdeen, Brechin and Glasgow have no cathedrals. The Theological College was founded in 1810, incor- porated with Trinity College, Glenalmond, in 1848, and re- established at Edinburgh in 1876. There were 356 congregations, with a total membership of 124,335, an< i 3 2 4 working clergy in 1900. No existing ministry can claim regular historic continuity with the ancient hierarchy of Scotland, but the bishops of the Episcopal Church are direct successors of the prelates consecrated to Scottish sees at the Restoration. On the refusal of the bishops to recognize William III. (1689), the presbyterian polity was estab- lished in the kirk, the effect of which on its ecclesiastical status is a matter of theological opinion, but the Comprehension Act of 1690 allowed episcopalian incumbents, on taking the Oath of Allegiance, to retain their benefices, though excluding them from any share in the government without a further declaration of presbyterian principles. Many non-jurors also succeeded for a time in retaining the use of the parish churches. The extruded bishops were slow to organize the episcopalian remnant under a jurisdiction independent of the state, regarding the then arrange- ments as provisional, and looking forward to a reconstituted national kirk under a " legitimate " sovereign. A few prelates, known as college bishops, were consecrated without sees, to pre- serve the succession rather than to exercise a defined authority. But at length the hopelessness of the Stewart cause and the growth of congregations outside the establishment forced the bishops to dissociate canonical jurisdiction from royal prerogative and to reconstitute for themselves a territorial episcopate. The act of Queen Anne (171 2), which protects the "Episcopal Communion," marks its virtual incorporation as a distinct society. But matters were still complicated by a considerable, though declining, number of episcopalian incumbents holding the parish churches. Moreover, the Jacobitism of the non-jurors provoked a state policy of repression in 17 15 and 1745, and fostered the growth of new Hanoverian congregations, served by clergy episcopally ordained but amenable to no bishop, who qualified themselves under the act of 17 12. This act was further modified in 1746 and 1748 to exclude clergymen ordained in Scotland. These causes reduced the Episcopalians, who included at the Revolution a large section of the people, to what is now, save in a few corners of the west and north-east of Scotland, a small minority. The official recognition of George III. on the death of Charles Edward in 1788, removed the chief bar to pro- gress. The " qualified " congregations were gradually absorbed, though traces of this ecclesiastical solecism

still linger. In 1792 the penal laws were repealed, but clerical disabilities were only finally removed in 1864. In 1784 Seabury, the first American bishop, was consecrated at Aberdeen. The Book of Common Prayer, which came into general use at the Revolution, is now the authorized service book. The Scottish Communion Office, compiled by the non-jurors in accordance with primitive models, has had a varying co-ordinate authority, and the modifications of the English liturgy adopted by the American Church were mainly determined by its influence. Among the clergy of post- Revolution days the most eminent are Bishop Sage, a well-known patristic scholar; Bishop Rattray, liturgiologist; John Skinner, of Longside, author of Tullochgorum; Bishop Gleig, editor of the 3rd edition of the Encyclopaedia Britannica; Dean Ramsay, author of Reminiscences of Scottish Life and Character; Bishop A. P. Forbes; G. H. Forbes, liturgiologist; and Bishop Charles Wordsworth.

Authorities. — Carstares, State Papers; Keith, Historical Cata- logue of the Scottish Bishops (Russel's edition, 1824); Lawson, History of the Scottish Episcopal Church from the Revolution to the Present Time (1843) ; Stephen, History of the Church of Scotland from the Reformation to the Present Time (4 vols., 1843) ; Lathbury, History of the Nonjurors (1845); Grub, Ecclesiastical History of Scotland (4 vols., 1861); Dowden, Annotated Scottish Communion Office (1884). (J.G.Sl.)

SCOTT, ALEXANDER (fl. 1550), Scottish poet, was probably a Lothian man, but particulars of his origin and of his life are entirely wanting. It is only by gathering together a few scraps of internal evidence that we learn that his poems were written between 1545 and 1568 (the date of the Bannatyne MS., the only MS. authority for the text). Allan Ramsay was the first to bring Scott's work to the notice of modern readers, by printing some of the poems in his Ever Green. In a copy of verses ("Some Few of the Contents") on„the Bannatyne MS., he thus refers to Scott:

" Licht skirtit lasses, and the girnand wyfe,

Fleming and Scot haif painted to the lyfe.

Scot, sweit tunged Scot, quha sings the welcum hame

To Mary, our maist bony soverane dame;

How lyflie he and amorous Stuart sing!

Quhen lufe and bewtie bid them spred the wing."

The sketch is just, for Scott's poems deal chiefly with female character and with passion of a strongly erotic type. He is " sweit tunged," for his technique is always good, and his lyrical measures show remarkable accomplishment. In this respect he holds his own with the best of the " makars" represented in the Bannatyne MS. In what may appear excessive coarseness to present-day taste, he makes good claim to rival Dunbar and his contemporaries. The poems referred to by Ramsay are " Ane Ballat maid to the Derisioun and Scorne of Wantoun Wemen," " Ane New Yeir Gift to the Queen Mary quhen scho come first Hame, 1562," and some or all of his amorous songs (about 30 in number). Of these " To luve unluvit," " Ladeis, be war," and " Lo, quhat it is to lufe " are favourable examples of his style. No early Scots poet comes nearer the quality of the Caroline love-lyric. His Justing and Debait vp at the Drum betwix W[illiam] Adamsone and Johine Sym follows the literary tradition of Peblis lo the Play and Christis Kirk on the Crene. He has left verse-renderings of the 1st and 50th Psalms.

The first collected edition was printed by D. Laing in 1821; a second was issued privately at Glasgow in 1882. The latest edition is that by James Cranstoun (Scottish Text Society, 1 vol., 1896).

(G. G. S.)

SCOTT, DAVID (1806-1849), Scottish historical painter, brother of William Bell Scott, was born at Edinburgh in October 1806, and studied art under his father, Robert Scott, the en- graver. In 1828 he exhibited his first oil picture, the " Hopes of Early Genius dispelled by Death," which Was followed by " Cain, Nimrod, Adam and Eve singing their Morning Hymn," " Sarpedon carried by Sleep and Death," and other subjects of a poetic and imaginative character. In 1829 he became a member of the Scottish Academy, and in 1832 visited Italy, where he spent more than a year in study. At Rome he executed a large symbolical painting, entitled the " Agony of Discord, or the Household Gods Destroyed." The works of his later years include " Vasco da Gama encountering the Spirit of the Storm," a picture — immense in size and most powerful in conception — finished in 1842, and now preserved in the Trinity House, Leith; the " Duke of Gloucester entering the Water Gate of Calais" (1841); the "Alchemist" (1838), "Queen Elizabeth at the Globe Theatre " (1840) and " Peter the Hermit " (1845), remarkable

for varied and elaborate character- painting; and " Ariel and Caliban " (1837) and the " Triumph of Love " (1846), distinguished by beauty of colouring and depth of poetic feeling. The most important of his religious subjects are the " Descent from the Cross " (1835) and the " Crucifixion — the Dead Rising " (1844). Scott also executed several re- markable series of designs. Two of these — the Monograms of Man and the illustrations to Coleridge's Ancient Mariner — were etched by his own hand, and published in 1831 and 1837 respectively, while his subjects from the Pilgrim's Progress

and Nichol's Architecture of the Heavens were issued after his death. He died in Edinburgh on the 5th of March 1849.

See W. Bell Scott, Memoir of David Scott, R.S.A. (1850), and J. M. Gray, David Scott, R.S.A. , and his Works (1884).

SCOTT, SIR GEORGE GILBERT (1811-1878), English archi- tect, was born in 181 1 at Gawcott near Buckingham, where his father was rector; his grandfather, Thomas Scott (1747- 1821), was a well-known commentator on the Bible. In 1827 young Scott was apprenticed for four years to an architect in London named Edmeston-, and at the end of his pupildom acted as clerk of the works at the new Fishmongers' Hall and other buildings. In Edmeston's office he became acquainted with W. B. Moffat, a fellow-pupil, who possessed considerable talents for the purely business part of an architect's work, and the two entered into partnership. In 1834 they were appointed architects to the union workhouses of Buckinghamshire, and for four years were busily occupied in building a number of cheap and ugly unions, both there and in Northamptonshire and Lincolnshire. In 1838 Scott built at Lincoln his first church, the design for which won the prize in an open competition, and this was quickly followed by six others, all very poor buildings without chancels; church building in England had then reached , its very lowest point both in style and in poverty of construc- tion. About 1839 his enthusiasm was aroused by some of the eloquent writings of Pugin on medieval architecture, and by the various papers on ecclesiastical subjects published by the Camden Society. These opened a new world to Scott, and he thenceforth studied and imitated the architectural styles and principles of the middle ages with the utmost zeal and patient care. The first result of this new study was his design for the Martyrs' Memorial at Oxford, erected in 1840, a clever adapta- tion of the late 13th-century crosses in honour of Queen Eleanor. From that time Scott became the chief ecclesiastical architect in England, and in the next twenty-eight years completed a large number of new churches and " restorations,"

the fever for which was fomented by the Ecclesiological Society and the growth of ecclesiastical feeling in England.

In 1844 Scott won the first premium in the competition for the new Lutheran church at Hamburg, a noble building with a very lofty spire, designed strictly in the style of the 13th century. In the following year his partnership with Moffat was dissolved, and in 1847 he was employed to renovate and refit Ely cathedral, the first of a long series of English cathedral and abbey churches which passed through his hands. In 1851 he visited and studied the architecture of the chief towns in northern Italy, and in 1855 won the competition for the town- hrouse at Hamburg, designed after the model of similar buildings »l north Germany. In spite of his having won the first prize, another architect was selected to construct the building, after a very inferior design. In 1856 a competition was held for designs of the new government offices in London; Scott ob- tained the third place in this, but the work was afterwards given to him on the condition (insisted on by Lord Palmerston) that he should make a new design, not Gothic, but Classic or Renaissance in style. To this Scott very reluctantly consented, as he had little sympathy with any styles but those of England or France from the 13th to the 15th century. In 1862-1863 he was employed to design and construct the Albert Memorial, a costly and elaborate work, in the style of a magnified 13th- century reliquary or ciborium, adorned with many statues and reliefs in bronze and marble. On the partial completion of this he was knighted. In 1866 he competed for the new London law-courts, but the prize was adjudged to his old pupil, G. E. Street. In 1873, owing to illness caused by overwork, Scott spent some time in Rome and other parts of Italy. The mosaic pavement which he designed for Durham cathedral soon after- wards was the result of his study of the 13th-century mosaics in the old basilicas of Rome. On his return to England he resumed his professional labours, and continued to work almost without intermission till his short illness and death on the 27th of March 1878, He was buried in the nave of Westminster Abbey, and an engraved brass, designed by G. E. Street, was

placed over his grave. In 1838 Scott married his cousin, Caroline Oldrid, who died in 1870; they had five sons, two of whom adopted their father's profession.

An incomplete list of his works from 1847 in the Builder for 1878 (p. 360) ascribes to Scott 732 buildings with which he was connected as architect, restorer or the author of a report. These include 29 cathedrals, British or colonial, 10 minsters, 476 churches, 25 schools, 23 parsonages, 58 monumental works. 25 colleges or college chapels, 26 public buildings, 43 mansions and a number of small ecclesiastical accessories. While a member of the Royal Academy, Scott held for many years the post of professor of architecture, and gave a long series of able lectures on medieval styles, which were published in 1879. He wrote a work on Domestic Architecture, and a volume of Personal and Professional Recollections, which, edited by his eldest son, was published in 1879, and also a large number of articles and reports on many of the ancient buildings with which he had to deal.

SCOTT, MICHAEL (1789-183 5), British author, was born at Cowlairs, near Glasgow, on the 30th of October 1789, the son of a Glasgow merchant. In 1806 he went to Jamaica, first managing some estates, and afterwards joining a business firm in Kings- ton. The latter post necessitated his making frequent journeys, on the incidents of which he based his best known book, Tom Cringle's Log. In 1822 he left Jamaica and settled in Glasgow, where he engaged in business. Tom Cringle's Log began to appear serially in Blackwood's Magazine in 1829. Scott's second story, The Cruise of the Midge, was also first published serially in Blackwood' s in 1834-1835. The first appearance in book-form of each story was in Paris in 1834. Both stories were originally published anonymously, and their authorship was not known till after Scott's death at Glasgow, on the 7th of November 1835.

SCOTT, ROBERT (1811-1887), English divine and lexico- grapher, was born on the 26th of January 1811, at Bondleigh in Devonshire, where his father was rector. Educated at Shrewsbury School and Christ Church, Oxford, after a brilliant university career he was elected fellow of Balliol, where he was tutor from 1835 to 1840. After holding successively the college livings of Duloe and South Luffenham, in 1854 he was elected master of Balliol. This office he held, together (from 1861) with that of the professorship of the exegesis of Holy Scriptures, down to 1870, when he accepted the deanery of Rochester. As master of Balliol he kept the college up to the high level it had attained under his predecessor Dr Jenkyns. As a Greek scholar, he had few equals among his contemporaries. His great literary achievement, which may be said to constitute his life's work, was his collaboration with Dean Liddell in the Greek lexicon which bears their names. He died at Rochester on the 2nd of

December 1887.

SCOTT, SIR WALTER, Bart. (1771-1832), Scottish poet and novelist, was born at Edinburgh on the 15th of August 1771. His pedigree, in which he took a pride that strongly influenced the course of his life, may be given in the words of his own fragment of autobiography. " My birth was neither distin- guished nor sordid. According to the prejudices of my country it was esteemed gentle, as I was connected, though remotely, with ancient families both by my father's and mother's side. My father's grandfather was Walter Scott, well known by the name of Beardie. He was the second son of Walter Scott, first laird of Raeburn, who was third son of Sir William Scott, and the grandson of Walter Scott, commonly called in tradition Auld Watt of Harden. I am therefore lineally descended from that ancient chieftain, whose name I have made to ring in many a ditty, and from his fair dame, the Flower of Yarrow — no bad genealogy for a Border minstrel."

In a notice of John Home, Scott speaks of pride of family as " natural to a man of imagination," remarking that, " in this motley world,, the family pride of the north country has its effects of good and of evil." Whether the good or the evil preponderated in Scott's own case would not be easy to deter- mine. It tempted him into courses that ended in commercial ruin; but throughout his life it was a constant spur to exertion, and in his last years it proved itself as a working principle capable of inspiring and maintaining a most chivalrous con- ception of duty. If the ancient chieftain Auld Watt was, according to the anecdote told by his illustrious descendant,

once reduced in the matter of live stock to a single cow, and recovered his dignity by stealing the cows of his English neigh- bours, Scott's Border ancestry were sheep-farmers, who varied their occupation by " lifting " sheep and cattle, and whatever else was " neither too heavy nor too hot." The Border lairds were really a race of shepherds in so far as they were not a race of robbers. Scott may have derived from this pastoral ancestry an hereditary bias towards the observation of nature and the enjoyment of open-air life. He certainly inherited from them the robust strength of constitution that carried him successfully through so many exhausting labours. And it was his pride in their real or supposed feudal dignity and their rough marauding exploits that first directed him to the study of Border history and poetry, the basis of his fame as a poet and romancer. His father," Walter Scott, a writer to the signet (or attorney) in Edinburgh — the original of the elder Fairford in Redgauntlet — was the first of the family to adopt a town life or a learned profession.

His mother was the daughter of Dr John Ruther- ford, a medical professor in the university of Edinburgh, who also traced descent from the chiefs of famous Border clans. The ceilings of Abbotsford display the arms of about a dozen Border families with which Scott claimed kindred through one side or the other. His father was conspicuous for methodical and thorough industry; his mother was a woman of imagination and culture. The son seems to have inherited the best qualities of the one and acquired the best qualities of the other.

The details of his early education are given with great pre- cision in his autobiography. John Stuart Mill was not more minute in recording the various circumstances that shaped his habits of mind and work. We learn from himself the secret — as much at least as could be ascribed to definite extraneous accident — of the " extempore speed " in romantic composition against which Carlyle protested in his famous review of Lock- hart's Life of Scott. The indignant critic assumed that Scott wrote "without preparation"; Scott himself, as if he had foreseen this cavil, is at pains to show that the preparation began with his boyhood, almost with his infancy. The current legend when Carlyle wrote his essay was that as a boy Scott had been a dunce and an idler. With a characteristically conscientious desire not to set a bad example, the autobiographer solemnly declares that he was neither a dunce nor an idler, and explains how the misunderstanding arose. His health in boyhood was uncertain; 1 he was consequently irregular in his attendance

1 Dr Charles Creighton contributes the following medical note on Scott's early illness: — " Scott's lameness was owing to an arrest of growth in the right leg in infancy. When he was eighteen months old he had a feverish attack lasting three days, at the end of which time it was found that he ' had lost the power of his right leg ' — i.e. the child instinctively declined to move the ailing member. The malady was a swelling at the ankle, and either consisted in or gave rise to arrest of the bone-forming function along the growing line of cartilage which connects the lower epiphysis of each of the two leg-bones with its shaft. In his fourth year, when he had otherwise recovered, the leg remained ' much shrunk and contracted.' The limb would have been blighted very much more if the arrest of growth had taken place at the upper epiphysis of the tibia or the lower epiphysis of the femur. The narrowness and peculiar depth of Scott's head point to some more general congenital error of bone-making allied to rickets but certainly not the same as that malady. The vault of the skull is the typical ' scaphoid ' or boat-shaped formation, due to premature union of the two parietal bones along the sagittal suture.

When the bones of the cranium are universally affected with that arrest of growth along their formative edges, the sutures become prematurely fixed and effaced, so that the brain-case cannot expand in any direction to accommodate the growing brain. This universal synostosis of the cranial bones is what occurs in the case of microcephalous idiots. It happened to me to show to an eminent French anthropologist a specimen of a miniature or microcephalic skull preserved in the Cambridge museum of anatomy ; the French savant, holding up the skull and pointing to the ' scaphoid ' vault of the crown and the effaced sagittal suture, exclaimed ' Voila Walter Scott! ' Scott had fortunately escaped the early closure or arrest of growth at other cranial sutures than the sagittal, so that the growing brain could make room for itself by forcing up the vault of the skull bodily. When his head was opened after death, it was observed that ' the brain was not large, and the cranium thinner than it is usually found to be.' In favour of the theory of congenital liability it has to be said that he was the ninth of a family of whom the first six died in ' very early youth.' "

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SCOTT, SIR WALTER

at school, never became exact in his knowledge of Latin syntax, and was so belated in beginning Greek that out of bravado he resolved not to learn it at all.

Left very much to himself throughout his boyhood in the matter of reading, so quick, lively, excitable and uncertain in health that it was considered dangerous to press him and prudent rather to keep him back, Scott began at a very early age to accumulate the romantic lore of which he afterwards made such splendid use. As a child he seems to have been an eager and interested listener and a great favourite with his elders, ap- parently having even then the same engaging charm that made him so much beloved as a man. Chance threw him in the way of many who were willing to indulge his delight in stories and ballads. Not only his own relatives — the old women at his grandfather's farm at Sandy kno we, his aunt, under 'whose charge he was sent to Bath for a year, his mother — took an interest in the precocious boy's questions, told him tales of Jacobites and Border worthies of his own and other clans, but casual friends of the family — such as the military veteran at Prestonpans, old Dr Blacklock the blind poet, Home the author of Douglas, Adam Ferguson the martial historian of the Roman republic — helped forward his education in the direction in which the bent of his genius

lay. At the age of six he was able to define himself as "a virtuoso," "one who wishes to and will know everything." At ten his collection of chap-books and ballads had reached several volumes, and he was a connoisseur in various readings. Thus he took to the High School, Edin- burgh, when he was strong enough to be put in regular attend- ance, an unusual store of miscellaneous knowledge and an unusually quickened intelligence, so that his master " pro- nounced that, though many of his schoolfellows understood the Latin better, Gualterus Scott was behind few in following and enjoying the author's meaning."

Throughout his school days and afterwards when he was apprenticed to his father, attended university classes, read for the bar, took part in academical and professional debating societies, Scott steadily and ardently pursued his own favourite studies. His reading in romance and history was really study, and not merely the indulgence of an ordinary schoolboy's promiscuous appetite for exciting literature. In fact, even as a schoolboy he specialized. He followed the line of overpowering inclination; and even then, as he frankly tells us, "fame was the spur." He acquired a reputation among his schoolfellows for out-of-the-way knowledge, and also for story-telling, and he worked hard to maintain this character, which compensated to his ambitious spirit his indifferent distinction in ordinary school-work. The youthful " virtuoso," though he read ten times the usual allowance of novels from the circulating library, was carried by his enthusiasm into fields much less generally attractive. He was still a schoolboy when he mastered French sufficiently well to read through collections of old French romances, and not more than fifteen when, attracted by trans- lations to Italian romantic literature, he learnt the language in order to read Dante and Ariosto in the original. This willing- ness to face dry work in the pursuit of romantic reading affords a measure of the strength of Scott's passion. In one of the literary parties brought together to lionize Burns, when the peasant poet visited Edinburgh, the boy of fifteen was the only member of the company who could tell the source of some lines affixed to a picture that had attracted the poet's attention — a slijht but significant evidence both of the width of his reading and of the tenacity of his memory. The same thoroughness appears in another little circumstance. He took an interest in Scottish family history and genealogy, but, not content with the ordinary sources, he ransacked the MSS. preserved in the Advocates' Library. By the time he was one and twenty he had acquired such a reputation for his skill in deciphering old manu- scripts that his assistance was sought by professional antiquaries.

This early, assiduous, unintermittent study was the main secret, over and above his natural gifts, of Scott's extempore speed and fertility when at last he found forms into which to pour his vast accumulation of historical and romantic lore. H«

was, as he said himself, " like an ignorant gamester who keeps up a good hand till he knows how to play it." That he had vague thoughts from a much earlier period than is commonly supposed of playing the hand some day is extremely probable, if, as he tells us, the idea of writing romances first occurred to him when he read Cervantes in the original. This was long before he was out of his teens; and, if we add that his leading idea in his first novel was to depict a Jacobitic Don Quixote, we can see that there was probably a long interval between the first conception of Waverley and the ultimate completion.

Scott's preparation for painting the life of past times was probably much less unconsciously such than his equally thorough preparation for acting as the painter of Scottish manners and character in all grades of society. With all the extent of his reading as a schoolboy and a young man he was far from being a cloistered student, absorbed in his books. In spite of his lame- ness and his serious illnesses in youth, his constitution was natur- ally robust, his disposition genial, his spirits high : he was always well to the front in the fights and frolics of the High School, and a boon companion in the " high jinks " of the junior bar. The future novelist's experience of life was singularly rich and varied. While he liked the life of imagination and scholarship in sympathy with a few choice friends, he was brought into intimate daily contact with many varieties of real life. At home he had to behave as became a member of a Puritanic, somewhat ascetic, well-ordered Scottish household, subduing his own inclinations towards a more graceful and comfortable scheme of living into outward conformity with his father's strict rule. Through his mother's family he obtained access to the literary society of Edinburgh, at that time electrified by the advent of Burns, full of vigour and ambition, rejoicing in the possession of not a few widely known men of letters, philosophers, historians, novelists and critics, from racy and eccentric Monboddo to refined and scholarly Mackenzie. In that society also he may have found the materials for the manners and characters of St Ronan's Well. From any tendency to the pedantry of over-culture he was effectually saved by the rougher and manlier spirit of his pro- fessional comrades, who, though they respected belles lellres, would not tolerate anything in the shape of affectation or senti- mentalism. The atmosphere of the Parliament House (the law- courts of Edinburgh) had considerable influence on the tone of Scott's novels.

His peculiar humour as a story-teller and painter of character was first developed among the young men of his own standing at the bar. They were the first mature audience on which he experimented, and seem often to have been in his mind's eye when he enlarged his public. From their mirthful com- panionship by the stove, where the briefless congregated to discuss knotty points in law and help one another to enjoy the humours of judges and litigants, " Duns Scotus " often stole away to pore over old books and manuscripts in the library beneath; but as long as he was with them he was first among his peers in the art of providing entertainment. It was to this market that Scott brought the harvest of the vacation rambles which it was his custom to make every autumn for seven years after his call to the bar and before his marriage. He scoured the country in search of ballads and other relics of antiquity; but he found also and treasured many traits of living manners, many a lively sketch and story with which to amuse the brothers of " the mountain " on his return. His staid father did not much like these escapades, and told him bitterly that he seemed fit for nothing but to be a " gangrel scrape-gut." But, as the companion of " his Liddesdale raids " happily put it, " he was makin' himsell a' the time, but he didna ken maybe what he was about till years had passed: at first he thought o' little, I dare say, but the queerness and the fun."

His father intended him originally to follow his own business, and he was apprenticed in his sixteenth year; but he preferred the upper walk of the legal profession, and was admitted a member of the faculty of advocates in 1792. He seems to have read hard at law for four years at least, but almost from the first to have limited his ambition to obtaining some comfortable appointment such as would leave him a good deal of leisure for

literary pursuits. In this he was not disappointed. In 1799 he obtained the office of sheriff-depute of Selkirkshire, with a salary of £300 and very light duties. In 1806 he Obtained the reversion of the office of clerk of session. It is sometimes supposed, from the immense amount of other work that Scott accomplished, that this office was a sinecure. But the duties, which are fully described by Lockhart, were really serious, and kept him hard at fatiguing work, his biographer estimates, for at least three or four hours daily during six months out of the twelve, while the court was in session. He discharged these duties faithfully for twenty- five years, during the height of his

activity as an author. He did not enter on the emoluments of the office till 181 2, but from that time he received from the clerkship and the sheriffdom com- bined an income of £1600 a year, being thus enabled to act in his literary undertakings on his often-quoted maxim that "literature should be a staff and not a crutch." Scott's profession, in addition to supplying him with a competent livelihood, supplied him also with abundance of opportunties for the study of men and manners.

It was as a poet that he was first to make a literary reputation. According to his own account, he was led to adopt the medium of verse by a series of accidents. The story is told by himself at length and with his customary frankness and modesty in the Essay on Imitations of the Ancient Ballad, prefixed to the 1830 edition of his Border Minstrelsy, and in the 1830 introduction to the Lay of the Last Minstrel. The first link in the chain was a lecture by Henry Mackenzie on German literature, delivered in 1788. This apprized Scott, who was then a legal apprentice and an enthusiastic student of French and Italian romance, that there was a fresh development of romantic literature in German. As soon as he had the burden of preparation for the bar off his mind he learnt German, and was profoundly excited to find a new school founded on the serious study of a kind of literature his own devotion to which was regarded by most of his companions with wonder and ridicule. We must remember always that Scott quite as much as Wordsworth created the taste by which he was enjoyed, and that in his early days he was half-ashamed of his romantic studies, and pursued them more or less in secret with a few intimates. While he was in the height of his enthusiasm for the new German romance, Mrs Barbauld visited Edinburgh, and recited an English translation of Burger's Lenore. Scott heard of it from a friend, who was able to repeat two lines — " Tramp, tramp, across the land they speed ; Splash, splash, across the sea ! "

The two lines were enough to give Scott a new ambition; He could write such poetry himself! The impulse was strengthened by his reading Lewis's Monk and the ballads in the German manner interspersed through the work. He hastened to procure a copy of Burger, at once executed translations of several of his ballads, published The Chase, and William and Helen, in a thin quarto in 1796 (his ambition being perhaps quickened by the unfortunate issue of a love affair), and was much en- couraged by the applause of his friends. Soon after he met Lewis personally, and his ambition was confirmed. " Finding Lewis," he says, " in possession of so much reputation, and conceiving that if I fell behind him in poetical

powers, I considerably exceeded him in general information, I suddenly took it into my head to attempt the style of poetry by which he had raised himself to fame." Accordingly, he composed Glenfinlas, The Eve of St John, and the Gray Brother, which were published in Lewis's collection of Tales of Wonder (2 vols., 1 801). But he soon became convinced that "the practice of ballad-writing was out of fashion, and that any attempt to revive it or to found a poetical character on it would certainly fail of success." His study of Goethe's Gotz von Berlichingen, of which he published a translation in 1799, gave him wider ideas. Why should he not do for ancient Border manners what Goethe had done for the ancient feudalism of the Rhine? He had been busy since his boyhood collecting Scottish Border ballads and studying the minutest details of Border history. He began to cast about for a form which should have the ad- ■ vantage of novelty, and a subject which should secure unity

of composition. He was engaged at the time preparing a collec- tion of the Minstrelsy of the Scottish Border. The first instalment was published in two volumes in 1802; it was followed by a third next year, and by an edition and continuation of the old romance of Sir Tristram; and Scott was still hesitating about subject and form for a large original work. Chance at last threw in his way both a suitable subject and a suitable metrical vehicle. He had engaged all his friends in the hunt for Border ballads and legends. Among others, the countess of Dalkeith, wife of the heir-apparent to the dukedom of Buccleuch, interested herself in the work. Happening to hear the legend of a tricksy hobgoblin named Gilpin Horner, she asked Scott to write a ballad about it. He agreed with delight, and, out of compliment to the lady who had given this command to the bard, resolved to connect it with the house of Buccleuch. The subject grew in his fertile imagination, till incidents enough had gathered round the goblin to furnish a framework for his long-designed picture of Border manners. Chance also furnished him with a hint for a novel scheme of verse. Coleridge's fragment of Christabel, though begun in 1797 — when he and Wordsworth were discussing on the Quantock Hills the principles of such ballads as Scott at the same time was reciting to himself in his gallops on Mussel- burgh sands — was not published till 1816. But a friend of Scott's, Sir John Stoddart, had met Coleridge in Malta, and had carried home in his memory enough of the unfinished poem to convey to Scott that its metre was the very metre of which he had been in search. Scott introduced still greater variety into the four-beat couplet; but it was to Christabel that he owed the suggestion, as one line borrowed whole and many imitated rhythms testify.

The Lay of the Last Minstrel appeared in January 1805, and at once became widely popular. It sold more rapidly than poem had ever sold before. Scott was astonished at his own success, although he expected that " the attempt to return to a more simple and natural style of poetry was likely to be welcomed." Many things contributed to the extraordinary demand for the Lay. First and foremost, no doubt, we must reckon its simplicity. After the abstract themes and abstruse, elaborately allusive style of the 18th century, the public were glad of verse that could be read with ease and even with exhilaration, verse in which a simple interesting story was told with brilliant energy, and simple feelings were treated not as isolated themes but as in- cidents in the lives of individual men and women. The thought was not so profound, the lines were not so polished, as in The Pleasures of Memory or The Pleasures of Hope, but the " light- horseman sort of stanza " carried the reader briskly over a much more diversified country, through boldly outlined and strongly coloured scenes. No stanza required a second reading; you had not to keep attention on the stretch or pause and construe laboriously before you could grasp the writer's meaning or enter into his artfully condensed sentiment. To remember the pedi- grees of all the Scotts, or the names of all the famous chiefs and hardy retainers " whose gathering word was Bellenden," might have required some effort, but only the conscientious reader need care to make it. The only puzzle in the Lay was the goblin page, and the general reader was absolved from all trouble about him by the unanimous declaration of the critics, led by Jeffrey in the Edinburgh Review, that he was a grotesque excrescence, in no way essential to the story. It is commonly taken for granted that Scott acquiesced in this judgment, his politely ironic letter to Miss Seward being quoted as conclusive. This is hardly fair to the poor goblin, seeing that his story was the germ of the poem and determines its whole structure; but it is a tribute to the lively simplicity of the Lay that few people should be willing to take the very moderate amount of pains necessary to see the goblin's true position in the action. The supernatural element was Scott's most risky innovation. For the rest, he was a cautious and conservative reformer, careful not to offend established traditions. He was far from raising the standard of rebellion, as Wordsworth had done, against the great artistic canon of the classical school —

" True art is nature to advantage dressed."

To " engraft modern refinement on ancient simplicity," to preserve the energy of the old ballad without its rudeness and bareness of poetic ornament, was Scott's avowed aim. He adhered to the poetic diction against which Wordsworth pro- tested. His rough Borderers are " dressed to advantage " in the costume of romantic chivalry. The baronial magnificence of Branksome, Deloraine's " shield and jack and acton, " the elaborate ceremony of the combat between the pseudo-Deloraine and Musgrave, are concessions to the taste of the 18th century. Further, he disarmed criticism by putting his poem into the mouth of an ancient minstrel, thus pictorially emphasizing the fact that it was an imitation of antiquity, and providing a scapegoat on whose back might be laid any remaining sins of rudeness or excessive simplicity. And, while imitating the antique romance, he was careful not to imitate its faults of rambling, discursive, disconnected structure. He was scrupu- lously attentive to the classical unities of time, place and action. The scene never changes from Branksome and its neighbourhood; the time occupied by the action (as he pointed out in his preface) is three nights and three days; and, in spite of all that critics have said about the superfluity of the goblin page, it is not difficult to trace unity of intention and regular progressive development in the incidents.

The success of the Lay decided finally, if it was not decided already, that literature was to be the main business of Scott's life, and he proceeded to arrange his affairs accordingly. It would have been well for his comfort, if not for his fame, had he adhered to his first plan, which was to buy a small mountain- farm near Bowhill, with the proceeds of some property left to him by an uncle, and divide his year between this and Edinburgh, where he had good hopes, soon afterwards realized, of a salaried appointment in the Court of Session. This would have given him ample leisure and seclusion for literature, while his private means and official emoluments secured him against dependence on his pen. He would have been laird as well as sheriff of the cairn and the scaur, and as a man of letters his own master. Since his marriage in 1797 with Charlotte Charpentier, daughter of a French refugee, his chief residence had been at Lasswade, about six miles from Edinburgh. But on a hint from the lord- lieutenant that t,he sheriff must live at least four months in the year within his county, and that he was attending more closely to his duties as quartermaster of a mounted company of volunteers than was consistent with the proper discharge of his duties as sheriff, he had moved his household in 1804 to Ashestiel. When his uncle's bequest fell in, he determined to buy a small property on the banks of the Tweed within the limits of his sheriffdom. There, within sight of

Newark Castle and Bowhill, he proposed to five like his ancient minstrel, as became the bard of the clan, under the shadow of the great ducal head of the Scotts. But this plan was deranged by an accident. It so happened that an old schoolfellow, James Ballantyne (1772-1833), a printer in Kelso, whom he had already befriended, transplanted to Edinburgh, and furnished with both work and money, applied to him for a further loan. Scott declined to lend, but offered to join him as sleeping partner. Thus the intended purchase money of Broadmeadows became the capital of a printing concern, of which by degrees the man of letters became the overwrought slave, milch-cow and victim.

When the Lay was off his hands, Scott's next literary enterprise was a prose romance — a confirmation of the argument that he did not take to prose after Byron had " bet him," as he put it, in verse, but that romance writing was a long-cherished purpose. He began Waverley, but a friend to whom he showed the first chapters — which do not take Waverley out of England, and describe an education in romantic literature very much like Scott's own — not unnaturally decided that the work was deficient in interest and unworthy of the author of the Lay. Scott accordingly laid Waverley aside. We may fairly conjecture that he would not have been so easily diverted had he not been occupied at the time with other heavy publishing enterprises calculated to bring grist to the printing establishment. His active brain was full of projects for big editions, which he

undertook to carry through on condition that the printing was done by Ballantyne & Co., the " Co. " being kept a profound secret, because it might have injured the lawyer and poet professionally and socially to be known as partner in a commercial concern.

In 1806 he collected from different publications his Ballads and Lyrical Pieces. Between 1806 and 1812, mainly to serve the interests of the firm, though of course the work was not in itself unattractive to him, Scott produced his elaborate editions of Dryden (18 vols., 1808), Swift (19 vols., 1818), the Somers Tracts (13 vols., 1809-1815), and the State Papers and Letters of Sir Ralph Sadler (2 vols., 1809). Incidentally these laborious tasks contributed to his preparation for the main work of his life by extending his knowledge of English and Scottish history. Marmion, begun in November 1806 and published in February 1808, was written as a relief to " graver cares," though in this also he aimed at combining with a romantic story a solid picture of an historical period. It was even more popular than the Lay. Scott's resuscitation of the four-beat measure of the old

” gestours ” afforded a signal proof of the justness of their instinct in choosing this vehicle for their recitations. The four-beat lines of Marmion took possession of the public like a kind of madness: they not only clung to the memory but they would not keep off the tongue: people could not help spouting them in solitary places and muttering them as they walked about the streets. The critics, except Jeffrey, who may have been offended by the pronounced politics of the poet, were on the whole better pleased than with the Lay. Their chief complaint was with the ” introductions ” to the various cantos, which were objected to as vexatiously breaking the current of the story.

The triumphant success of Marmion, establishing him as facile princeps among living poets, gave Scott such a heeze, to use his own words, ” as almost lifted him off his feet.” He touched then the highest point of prosperity and happiness. Presently after, he was irritated and tempted by a combination of little circumstances into the great blunder of his life, the establishment of the publishing house of John Ballantyne & Co. A coolness arose between him and Jeffrey, chiefly on political but partly also on personal grounds. They were old friends, and Scott had written many articles for the Review, but its political attitude at this time was intensely unsatisfactory to Scott. To complete the breach, Jeffrey reviewed Marmion in a hostile spirit. A quarrel occurred also between Scott’s printing firm and Constable, the publisher, who had been the principal feeder of its press. Then the tempter appeared in the shape of Murray, the London publisher, anxious to secure the services of the most popular litterateur of the day. The result of negotiations was that Scott set up, in opposition to Constable, ” the crafty, ” ” the grand Napoleon of the realms of print, ” the publishing house of John Ballantyne & Co., to be managed by John Ballantyne (d. 182 1), James’s younger brother, whom Scott nicknamed ” Rigdumfunnidos, ” for his talents as a mimic and low comedian. Scott interested himself warmly in starting the Quarterly Review, and in return Murray constituted Ballantyne & Co. his Edinburgh agents. Scott’s trust in Rigdumfunnidos and his brother, ” Aldiborontiphos- cophornio, ” and in his own power to supply all their deficiencies, is as strange a piece of infatuation as any that ever formed a theme for romance or tragedy. Their devoted attachment to the architect of their fortunes and proud confidence in his powers helped forward to the catastrophe, for whatever Scott recommended they agreed to, and he was too immersed in multifarious literary work and professional and social engage- ments to have time for cool examination of the numerous rash speculative ventures into which he launched the firm.

The Lady of the Lake (May 18 10) was the first great publication by

the new house, and next year the Vision of Don Roderick followed. The Lady of the Lake was received with enthusiasm, even Jeffrey joining in the chorus of applause. It made the Perthshire Highlands fashionable for tourists, and raised the post-horse duty in Scotland. But it did not make up to .

Ballantyne & Co. for their heavy investments in unsound ventures. The Edinburgh Annual Register, meant as a rival to the Edinburgh Review, though Scott engaged Southey to write for it and wrote for it largely himself, proved a failure. In a very short time the warehouses of the firm were filled with unsaleable stock. By the end of three years Scott began to write to his partners about the propriety of " reefing sails." But apparently he was too much occupied to look into the accounts of the firm, and, so far from understanding the real state of their affairs, he considered himself rich enough to make his first purchase of land at Abbotsford. But he had hardly settled there in the spring of 1812, and begun his schemes for building and planting and converting a bare moor into a richly wooded pleasaunce, than his business troubles began, and he found himself harassed by fears of bankruptcy. Rigdumf unnidos concealed the situation as long as he could, but as bill after bill came due he was obliged to make urgent application to Scott, and the truth was thus forced from him item by item. He had by no means revealed all when Scott, who behaved with admirable good-nature, was provoked into remonstrating, " For heaven's sake, treat me as a man and not as a milch-cow." The proceeds of Rokeby (January 1813) and of other labours of Scott's pen were swallowed up, and bankruptcy was inevitable, when Constable, still eager at any price to secure Scott's services, came to the rescue. With his help three crises were tided over in 1813.

It was in the midst of these embarrassments that Scott opened up the rich new vein of the Waverley novels. He chanced upon the manuscript of the opening chapters of Waverley which he had written in 1805, and resolved to complete the story. Four weeks in the summer of 1814 sufficed for the work, and Waverley was published by Constable without the author's name in July. The notes and introductions first appeared in the edition of 1829. Many plausible reasons might be given and have been given for Scott's resolution to publish anonymously. The reason given by Lockhart is that he considered the writing of novels beneath the dignity of a

grave clerk of the Court of Session. Why he kept up the mystification, though the secret, which was formally divulged in 1827, was an open one to all his Edinburgh acquaintances, is easily understood. He enjoyed it, and his formally initiated coadjutors enjoyed it; it relieved him from the annoyances of foolish compliment; and it was not unprofitable — curiosity about " the Great Unknown " keeping alive the interest in his works. The secret was so well kept by all to whom it was definitely entrusted, and so many devices were used to throw conjecture off the scent, that even Scott's friends, who were certain of the authorship from internal evidence, were occasionally puzzled. He kept on producing in his own name as much work as seemed humanly possible for an official who was to be seen every day at his post and as often in society as the most fashionable of his professional brethren. His treatises on chivalry, romance and the drama, besides an elaborate work in two volumes on Border antiquities, appeared in the same year with Waverley, and his edition of Swift in nineteen volumes in the same week. In 181 3 he published the romantic tale of The Bridal of Triermain in three cantos, enlarged from an earlier poem, printed in the Edinburgh Annual Register of 1809. The Lord of the Isles was published in January 1815; Guy Mannering, written in " six weeks about Christmas," in February; and The Field of Waterloo in the same year. Paul's Letters to his Kinsfolk and The Antiquary appeared in 1816; the first series of the Tales of My Landlord, edited by " Jedediah Cleishbotham " — The Black Dwarf and Old Mortality — in the same year; Harold the Dauntless 1 in 181 7; the two volumes of The Border Antiquities of England and Scotland in 1814 and 181 7. No wonder that the most positive interpreters of internal evidence were mystified. It was not as if he had buried himself in the country for the summer half of the year. On the contrary, he kept open house at Abbotsford in the fine old feudal fashion and was seldom without visitors. His own friends and many

1 This poem, like the Bridal of Triermain, did not bear his name on the title-page, but the authorship was an open secret, although he tried to encourage the idea that the author was his friend Erskine.

strangers from a distance, with or without introductions, sought him there, and found a hearty hospitable country laird, entirely occupied to all outward appearance with local and domestic business and sport, building and planting, adding wing to wing, acre to acre, plantation to plantation, with just leisure enough for the free-hearted entertainment of his guests and the cultiva- tion of friendly relations with his humble neighbours. How could such a man find time to write two or three novels a year, besides what was published in his own

name? Even the few intimates who knew how early he got up to prepare his packet for the printer, and had some idea of the extraordinary power that he had acquired of commanding his faculties for the utiliza- tion of odd moments, must have wondered at times whether he had not inherited the arts of his ancestral relation Michael Scot, and kept a goblin in some retired attic or vault.

Scott's fertility is not absolutely unparalleled; Anthony Trollope claimed to have surpassed him in rate as well as total amount of production, having also business duties to attend to. But in speed of production combined with variety and depth of interest and weight and accuracy of historical substance Scott is unrivalled. On his claims as a serious historian, which Carlyle ignored in his curiously narrow and splenetic criticism, he was always, with all his magnanimity, peculiarly sensitive. A certain feeling that his antiquarian studies were undervalued seems to have haunted him from his youth. It was probably this that gave the sting to Jeffrey's criticism of Marmion, and that tempted him to the somewhat questionable proceeding of reviewing his own novels in the Quarterly upon the appearance of Old Mortality. He was nettled besides at the accusation of having treated the Covenanters unfairly, and wanted to justify himself by the production of historical documents. In this criticism of himself Scott replied lightly to some of the familiar objections to his work, such as the feebleness of his heroes, Waverley, Bertram, Lovel, and the melodramatic character of some of his scenes and characters. But he argued more seriously against the idea that historical romances are the enemies of history, and he rebutted by anticipation Carlyle's objection that he wrote only to amuse idle persons who like to lie on their backs and read novels. His apologia is worth quoting. Historical romances, he admits, have always been failures, but the failure has been due to the imperfect knowledge of the writers and not to the species of composition. If, he says, anachronisms in manners can be avoided, and " the features of an age gone by can be recalled in a spirit of delineation at once faithful and striking, . . . the composition itself is in every point of view dignified and improved; and the author, leaving the light and frivolous associates with whom a careless observer would be disposed to ally him, takes his seat on the bench of the historians of his time and country. In this proud assembly, and in no mean place of it, we are disposed to rank the author of these works. At once a master of the great events and minute incidents of history, and of the manners of the times he celebrates, as distinguished from those which now prevail, the intimate thus of the living and of the dead, his judgment enables him to separate those traits which are characteristic from

those that are generic; and his imagination, not less accurate and discriminating than vigorous and vivid, presents to the mind of the reader the manners of the times, and introduces to his familiar acquaintance the individuals of the drama as they thought and spoke and acted." This defence of himself shows us the. ideal at which Scott aimed, and which he realized. He was not in the least unconscious of his own excellence. He did not hesitate in this review to compare himself with Shakespeare in respect of truth to nature. " The volume which this author has studied is the great book of nature. He has gone abroad into the world in quest of what the world will certainly and abundantly supply, but what a man of great discrimination alone will find, and a man of the very highest genius will alone depict after he has discovered it. The characters of Shakespeare are not more exclusively human, not more perfectly men and women as they live and move, than those of this mysterious author."

The immense strain of Scott's double or quadruple life as

sheriff and clerk, hospitable laird, poet, novelist, and miscella- neous man of letters, publisher and printer, though the prosperous excitement sustained him for a time, soon told upon his health. Early in 1817 began a series of attacks of agonizing cramp of the stomach, which recurred at short intervals during more than two years. But his appetite and capacity for work remained unbroken. He made his first attempt at play-writing 1 as he was recovering from the first attack; before the year was out he had completed Rob Roy, and within six months it was followed by The Heart of Midlothian, which filled the four volumes of the second series of Tales of My Landlord, and has remained one of the most popular among his novels. The Bride of Lammermoor, The Legend of Montrose, forming the third series by " Jedediah Cleishbotham," and Ivanhoe (1820) were dictated to amanuenses, through fits of suffering so acute that he could not suppress cries of agony. Still he would not give up. When Laidlaw begged him to stop dictating he only answered, " Nay, Willie, only see that the doors are fast. I would fain keep all the cry as well as the wool to ourselves; but as to giving over work, that can only be when I am in woollen."

Throughout those two years of intermittent ill-health, which was at one time so serious that his life was despaired of and he took formal

leave of his family, Scott's semi-public life at Abbots- ford continued as usual — swarms of visitors coming and going, and the rate of production, on the whole, suffering no outward and visible check, all the world wondering at the novelist's prodigious fertility. The first of the series concerning which there were murmurs of dissatisfaction was The Monastery (1820), which was the first completed after the re-establishment of the author's bodily vigour. The failure, such as it was, was possibly due to the introduction of the supernatural in the person of the White Lady of Avenel; and its sequel, The Abbot (1820), in which Mary, Queen of Scots, is introduced, was generally hailed as fully sustaining the reputation of " the Great Unknown." Kenilworlh (1821), The Pirate (1822), The Fortunes of Nigel (1822), Peveril of the Peak (1822), Quentin Durward (1823), St Ronan's Well (1824), Redgauntlel (1824) followed in quick succession in the course of three years, and it was not till the last two were reached that the cry that the author was writing too fast began to gather volume. St Ronan's Well was very severely criticized and condemned. And yet Leslie Stephen tells a story of a dozen modern connoisseurs in the Waverley novels who agreed that each should write down separately the name of his favourite novel, when it appeared that each had without concert named St Ronan's Well. There is this certainly to be said for St Ronan's, that, in spite of the heaviness of some of the scenes at the " hottle " and the artificial melodramatic character of some of the personages, none of Scott's stories is of more absorbing or more brilliantly diversified interest. Contradictions between contemporary popular opinion and mature critical judgment, as well as diversities of view among critics themselves, rather shake confidence in individual judgment on the vexed but not particularly wise question which is the best of Scott's novels. There must, of course, always be inequalities in a series so prolonged. The author cannot always be equally happy in his choice of subject, situation and character. Naturally also he dealt first with the subjects of which his mind was fullest. But any theory of falling off or exhaustion based upon plausible general considerations has to be qualified so much when brought into contact with the facts that very little confidence can be reposed in its accuracy. The Fortunes of Nigel comes com- paratively late in the series and has often been blamed for its looseness of construction. Scott himself always spoke slightingly of his plots, and humorously said that he proceeded on Bayes's maxim, " What the deuce is a plot good for but to bring in good things ? " Yet some competent critics prefer The Fortunes of Nigel to any other of Scott's novels. An attempt might be 1 The Doom of Devorgoil. This and his other dramatic sketches, Macduff's Cross, Halidon Hill (1822) and Auchindrane, or The Ayrshire Tragedy,

printed wi.th Devorgoil in 1830, were slight com- positions, dashed off in a few days, and afford no measure of what Scott might have done as a dramatist if he had studied the conditions of stage representation.

made to value the novels according to the sources of their materials, according as they are based on personal observation, documentary history or previous imaginative literature. On this principle Ivanhoe and The Tales of the Crusaders (1825, containing The Betrothed and The Talisman) might be adjudged inferior as being based necessarily on previous romance. But as a matter of fact Scott's romantic characters are vitalized, clothed with a verisimilitude of life, out of the author's deep, wide and discriminating knowledge of realities, and his observa- tion of actual life was coloured by ideals derived from romance. He wrote all his novels out of a mind richly stored with learning of all kinds, and in the heat of composition seems to have drawn from whatever his tenacious memory supplied to feed the fire of imagination, without pausing to reflect upon the source. He did not exhaust his accumulations from one source first and then turn to another, but from first to last drew from all as the needs of the occasion happened to suggest.

During the years 1821-1825 he edited Richard Franck's Northern Memoirs (1821), Chronological Notes of Scottish Affairs from the Diary of Lord Fountainhall (1822), Military Memoirs of the Great Civil War (1822), and The Novelists' Library (10 vols., London, 1821-1824), the prefatory memoirs to which were separately published in 1828.

Towards the close of 1825, after eleven years of brilliant and prosperous labour, encouraged by constant tributes of admiration, homage and affection such as no other literary potentate has ever enjoyed, realizing his dreams of baronial splendour and hospitality on a scale suited to his large literary revenues, Scott suddenly discovered that the foundations of his fortune were unsubstantial. He had imagined himself clear of all embarrass- ments in r8i8, when all the unsaleable stock of John Ballantyne & Co. was bargained off by Rigdum to Constable for Waverley copyrights, and the publishing concern was wound up. Appar- ently he never informed himself accurately of the new relations of mutual accommodation on which the printing firm then entered with the great but rashly speculative publisher, and drew liberally for his own expenditure against the undeniable profits of his novels without asking any questions, trusting blindly in the solvency of his commercial henchmen. Un- fortunately, " lifted off their feet " by the wonderful triumphs of their

chief, they thought themselves exempted like himself from the troublesome duty of inspecting ledgers and balancing accounts, till the crash came. From a diary which Scott began a few days before the first rumours of financial difficulty reached him we know how he bore from day to day the rapidly unfolded prospect of unsuspected liabilities. " Thank God," was his first reflection, " I have enough to pay more than 20s. in 'the pound, taking matters at the worst." But a few weeks revealed the unpleasant truth that, owing to the way in which Ballantyne & Co. were mixed up with Constable & Co., and Constable with Hurst & Robinson, the failure of the London house threw upon him personal responsibility for £130,000.

How Scott's pride rebelled against the dishonour of bankruptcy, how he toiled for the rest of his life to clear off this enormous debt, declining all offers of assistance and asking no consideration from his creditors except time, and how nearly he succeeded, is one of the most familiar chapters in literary history, and would be one of the saddest were it not for the heroism of the enterprise. His wife died soon after the struggle began, and he suffered other painful bereavements; but, though sick at heart, he toiled on indomitably, and, writing for honour, exceeded even his happiest days in industrious speed. If he could have main- tained the rate of the first three years, during which he completed Woodstock (1826); Chronicles of the Canongale (1827), which included three tales— " The Highland Widow," "The Two Drovers" and "The Surgeon's Daughter"; The Fair Maid of Perth (1828, in the second series of Chronicles of the Canongate) ; Anne of Geierstein (1829); the Life of Napoleon (9 vols., 1827); part of his History of Scotland (2 vols., 1829-1830, for Lardner's Cabinet Cyclopaedia) ; the Scottish series of Tales of a Grandfather (four series, 1828-1820-1830-1831; inscribed to " Hugh Little- john," i.e. John Hugh Lockhart) , besides several magazine articles.

some of them among the most brilliant of his miscellaneous writings, and prefaces and notes to a collected edition of his novels — if he could have continued at this rate he might soon have freed himself from all his encumbrances. The result of his exertions from January 1826 to January 1828 was nearly £40,000 for his creditors. But the terrific labour proved too much even for his endurance. Ugly symptoms began to alarm his family in 1829, and in February of 1830 he had his first stroke of paralysis. Still he was undaunted, and not all the persuasions of friends and physicians could induce him to take rest. " During 1830," Lockhart says, " he covered almost as

many sheets with his MS. as in 1829," the new introductions to a collected edition of his poetry and the Letters on Demonology and Witchcraft being amongst the labours of the year. He had a slight touch of apoplexy in November and a distinct stroke of paralysis in the following April; but, in spite of these warnings and of other bodily ailments, he had two more novels, Count Robert of Paris and Castle Dangerous(constituting the fourth series of Tales of My Landlord), ready for the press by the autumn of 1831. He would not yield to the solicitations of his friends and consent, to try rest and a change of scene, till fortunately, as his mental powers failed, he became possessed of the idea that all his debts were at last paid and that he was once more a free man. In this belief he happily remained till his death. When it was known that his physicians recommended a sea voyage for his health, a government vessel was put at his disposal, and he cruised about in the Mediterranean and visited places of interest for the greater part of a year before his death. But, when he felt that the end was near, he insisted on being carried across Europe that he might die on his beloved Tweedside at Abbotsford, where he expired on the 21st of September 1832. He was buried at Dryburgh Abbey.

Scott's wife had died in 1826. His eldest son, Walter, succeeded to the baronetcy which had been conferred on his father in 1820, and the title became extinct on his death in 1847; the second son, Charles, died at Teheran in i84r, and the second daughter, Anne, died unmarried in 1833. Scott's elder daughter Charlotte Sophia (d. 1837) was the wife of his biographer, J. G. Lockhart (?.».); and their daughter Charlotte (d. 1858) married J. R. Hope-Scott (q.v.), and was the mother of Mary Monica, wife of the Hon. J. C. Maxwell, who in 1874 took the additional name of Scott on his marriage with the heiress of Abbotsford. Mrs Maxwell Scott inherited some of the family literary talent, and among other books wrote two volumes about Abbotsford (1893 and 1897).

Two busts of Scott were executed by Sir Francis Chantrey: one in 1820, which was presented to Scott by the sculptor in 1828; a second in 1828, which was sent by Chantrey to Sir Robert Peel about 1837, and is now in the National Portrait Gallery, London. The 1820 bust was duplicated by Chantrey for the duke of Wellington in 1827, and there is a copy in West- minster Abbey, erected in 1897. Henry Raeburn painted Scott's portrait for Archibald Constable in 1808; Scott sat to the same artist in 1809 for the portrait now at Abbotsford, and two or three times subsequently. Other notable portraits were executed by Sir Thomas Lawrence in 1820 for George IV.; by John Graham Gilbert in 1829 for the Royal Society of

Edinburgh; by Francis Grant for Lady Ruthven in 1831; and a posthumous portrait of Scott with his dogs in the Rhymer's Glen by Sir Edwin Landseer. The Scott monument in Princes Street, Edinburgh, erected in 1846, was designed by George Kemp, the statue being the work of John Steell.

Bibliography. — The Miscellaneous Prose Works of Sir Walter Scott (6 vols., Edinburgh, 1827) were subsequently printed in 30 vols. (London, 1834-1871) and in 3 vols. (1841-1847). The collected editions of the novels and tales are very numerous. Among them are that known as the " author's favourite edition " (48 vols., Edinburgh, 1829-1833), for which Scott wrote new prefaces and notes; an edition de luxe of the Waverley novels, illustrated by A. Lalauze, E.'Riou and others (25 vols., London, 1882-1898); the " Border" edition (48 vols., 1892-1894), with introductory essays and notes by A. Lang; and many modern cheap reprints. His Poetical Works were printed in 12 vols. (Edinburgh, 1820) ; they were edited by .1. G. Lockhart (12 vols., Edinburgh, 1833-1834), with 24 steel

engravings from illustrative drawings by Turner ; by F. T. Palgrave for the " Globe " edition (1866); by W. Minto (2 vols., Edinburgh, 1888); by J. Logie Robertson (Oxford complete edition, 1904). Many of the novels have been adapted for the stage, the most famous of these dramatizations being the libretto of Donizetti's Lucia di Lammermoor and the Ivanhoe of Sir Arthur Sullivan and J. R. Sturgis. His Minstrelsy of the Scottish Border (3 vols., 1802-1803) was edited (4 vols., 1902) by T. F. Henderson.

The standard life by his son-in-law, J. G. Lockhart, Memoirs of the Life of Sir Walter Scott (7 vols., Edinburgh, 1837-1838), left little new material for later biographers. It was supplemented by the publication (2 vols., 1890) of Scott's Journal, covering the years from 1825 to 1832, and of his Familiar Letters (2 vols., 1894), both edited by David Douglas. Some unpublished letters from Scott to the marchioness of Abercorn were sold at Sotheby's in 1909. Shorter lives, chiefly based on Lockhart, are by R. H. Hutton (" English Men of Letters," London, 1898) ; by C. D. Yonge (" Great Writers," ■ London, 1888), with bibliography by J. P. Anderson; by Robert Chambers (Edinburgh, 1871); by K. Elze (2 vols., Dresden, 1864); by G. E. B. Saintsbury (" Famous Scots" Series, 1897); by Andrew Lang (" Literary Lives," London, 1906), and by G. le Grys Norgate (London, 1906). For the Ballantyne controversy see also The Ballantyne Press and its Founders (1909), which should be taken

into account in considering Lockhart's attitude on the subject.

In the long list of critical essays on Scott and his works may be mentioned :— W. Bagehot, "The Waverley Novels," in Literary Studies (1879, vol. ii.); W. Hazlitt, in his Spirit of the Age (1825); James Hogg, The Domestic Manners and Private Life of Sir Walter Scott (Glasgow, 1834); A. Lang, in Letters to Dead Authors (1886) ; Catalogue of the Scott Exhibition held at Edinburgh in 1871, preface by Sir W. Stirling-Maxwell (Edinburgh, 1872); Sir Leslie Stephen, Hours in a Library (London, 1874) ; J. Veitch, The History and Poetry of the Scottish Border (Glasgow, 1878) ; L. Maigron, Le Roman historique a Vepoque romantique, Essai sur I'influence de Walter Scott (Paris, 1898). An account of the portraits of Scott, and a biblio- graphy of his works, are given in Sir W. Stirling-Maxwell's Catalogue of the Scott Exhibition, commemorating Scott's centenary at Edinburgh in July-August 1871. (W. M.; X.)

SCOTT, WILLIAM BELL (1811-1890), British poet and artist, son of Robert Scott (1777-1841), the. engraver, and brother of David Scott, the painter, was born in Edinburgh on the 1 2 th of September 181 1. While a young man he studied art and assisted his father, and he published verses in the Scottish magazines. In 1837 he went to London, where he became sufficiently well known as an artist to be appointed in 1844 master of the government school of design at Newcastle-on-Tyne. He held the post for twenty years, and did good work in organiz- ing art-teaching and examining under the Science and Art Department. He did much fine decorative work, too, on his own account, notably at Wallington Hall, in the shape of eight large pictures illustrating Border history, with life-size figures, supplemented by eighteen pictures illustrating the ballad of Chevy Chase in the spandrels of the arches of the hall. For Penhill Castle, Perthshire, he executed a similar series, illustrating The King's Quhair. After 1870 he was much in London, where he bought a house in Chelsea, and he was an intimate friend of Rossetti and in high repute as an artist and an author. His poetry, which he published at intervals (notably Poems, 1875, illustrated by etchings by himself and Alma-Tadema), recalled Blake and Shelley, and was considerably influenced by Rossetti; he also wrote several volumes of artistic and literary criticism, and edited Keats, " L.E.L.," Byron, Coleridge, Shelley, Shake- speare and Scott. He resigned his appointment under the Science and Art Department in 1885, and from then till his death (22nd November 1890) he was mainly occupied in writing his reminiscences, which were published posthumously in 1892, with a memoir by'Professor Minto. It is for his connexion with Rossetti's circle that Bell Scott will be chiefly

remembered.

SCOTT, WINFIELD (1786-1866), American general, was born near Petersburg, Virginia, on the 13th of June 1786. In 1 805 he entered the College of William and Mary, where he studied law, and he continued his studies in the law office of David Robertson in Petersburg. In 1807 he removed to Charles- ton, South Carolina, but as war with England seemed imminent he soon left for Washington and offered his services. In 1808 he was commissioned as a captain of artillery, recruited a company in Richmond and Petersburg, and was ordered to New Orleans. His criticism of his superior officer, General James Wilkinson, led to his being suspended for a year, but the

term was eventually reduced to three months. In July 1812, as a lieutenant-colonel of artillery, he was sent to the Niagara frontier and fought at Queenston, where he was taken prisoner. He was exchanged in January 1813, became colonel in the following March, in March 1814 was promoted to the rank of brigadier-general, and in July received the brevet of major- general. In the battles of Chippewa (5th July 1814) and Lundy's Lane (25th July) he took a conspicuous part, being twice wounded in the latter engagement. For his services he was presented with a gold medal by Congress and with a sword by the state of Virginia. Among the difficult tasks that he was called upon to perform between 1815 and 1861, for the last twenty years of which period he was the commanding general of the U.S. army, were: an expedition to the Middle West in 1832, where, after the end of the Black Hawk War, he negotiated treaties of peace with the Sauk, Fox, Winnebago, Sioux, and Menominee Indians; a journey to Charleston in the same year to watch the progress of the nullification movement, and to strengthen the garrisons of the forts in the harbour; an expedition in 1836 against the Seminole Indians in Florida; the supervision of the removal in 1838 of the Cherokee Indians from Georgia, North Carolina, Alabama and Tennessee to the reservation set apart for them by treaty W. of the Mississippi river; a visit to the Niagara river in the autumn and winter of 1838 to put an end to the acts by Canadian insurgents in violation of American neutrality; a similar mission to Maine in 1839 to restore tranquillity between the citizens of Maine and New Brunswick, who were disputing the possession of a tract of land along the Aroostook river; and a journey to the north-west in 1859 to adjust a dispute

between American and British officers concerning the joint occupation of San Juan Island in Puget Sound. His greatest achievement was the brilliant Mexican campaign of 1847. As the senior officer of the army, he was placed in command of the invading expedition, and after capturing Vera Cruz (March 29th, 1847), and winning victories at Cerro Gordo (April 18th), Contreras-Churubusco (August i9th-2 5th), Molino del Rey (September 8th), and Chapultepec (September 13th), he crowned his campaign by the capture, on the 14th of September, of the Mexican capital. In March 1848 he received a vote of thanks from Congress, which ordered a gold medal to be struck in commemoration of his services. Scott appeared to have an excellent opportunity for a political career; his nomination for the presidency by the Whigs had been suggested in 1839 and in 1848, and in 1852 he received it; but his candidacy was doomed to failure. The Whigs, divided on the slavery question, gave only half-hearted support to their compromise platform; and Scott made several extemporaneous addresses which did him harm. He received the electoral votes of only four states — Kentucky, Virginia, Massachusetts and Vermont. This defeat, however, detracted nothing from the esteem in which he was held, and in 1852 the brevet rank of lieutenant-general was created specially for him. Among the other honours conferred upon him were the degree of Master of Arts by Princeton in 1814, and the degree of Doctor of Laws by Columbia in 1850 and by Harvard in 1861. At the outbreak of the Civil War, though a Virginian, he remained at the head of the United States armies and directed operations from Washington until November 1861. He then visited Europe for a short time, and after returning wrote his Memoirs, published in 1864. He died at West Point, New York, on the 29th of May 1866.

See Memoirs of Lieutenant-General Scott, LL.D. (2 vols., New York, 1864); Raphael Semmes, The Campaign of General Scott in the Valley of Mexico (Cincinnati, 3rd ed., 1852); Edward D. Mansfield, Life and Military Services of General Scott (New York, 1862) ; and Marcus J. Wright ˆGeneral Scott (New York, 1894), in the " Great Commanders " series.

SCOUNDREL, a rogue, a rascal. Etymologists have referred the word to various sources; but Skeat (Etym. Diet.) refers it to the provincial or Scottish scunner (O. Eng. scunian, to shun), to shrink back in fear or loathing.

SCOURGE (Ital. scoriada, from Lat. excoriare, to flay, corium, skin), a whip or lash, especially one used for the infliction of punishment. The typical scourge (Lat. flagellum) has several

thongs or lashes attached to a single handle, as in the modern " cat-o'-nine-tails." The scourge or flail, and the crook, are the two symbols of power and domination depicted in the hands of Osiris in ancient Egyptian monuments; these show the unchanging form of the instrument throughout the ages.

SCOUT (from O. Fr. escouter, mod. ecouter, Lat. auscultate, to listen), a soldier sent out to watch the enemy and bring information of his numbers, movements, whereabouts, &c. The name has also been applied to a particular class of light speedy cruisers in the British navy. After the South African War of 1899-1902, the importance of military scouting received much attention in England in consequence of the prominence given to it by Major-General Baden-Powell, of Mafeking fame. Under the latter's auspices an unofficial attempt to foster the qualities required was made by the institution of the Boy Scouts, a voluntary organization which, starting in 1908, had by 1910 enrolled many hundreds of thousands of boys throughout the United Kingdom, with branches overseas.

Various birds of the auk family, such as the guillemot and the puffin, are known as " scouts." The name is also given colloqui- ally to college servants at Oxford and Harvard Universities. It then answers to the " gyp " of Cambridge, Trinity College, Dublin, and Durham, which has been variously explained as short for " gipsy," as taken from 711ˆ, vulture, from a supposed reference to a grasping character, or as representing an old word " gippo " (Fr. jupeau, tunic), used of a scullion or kitchen servant.

In the above senses, " scout" must be distinguished from the word meaning to flout, or reject with ridicule and scorn, which is derived from the Icel. skuta, taunt, jeer.

In the military sense, see Sir R. S. Baden-Powell, Scouting, and Scouting for Boys. The Boy Scouts' movement in England has official papers in the weekly Scout and monthly Headquarters Gazette.

SCRANTON, a city and the county-seat of Lackawanna county, Pennsylvania, U.S.A., at the confluence of the Lackawanna river and Roaring Brook, about 162 m. by rail N. by W. of Philadelphia and about 146′ m. W.N.W. of New York. Pop. (1890) 75,215; (1900) 102,026, of whom 28,973 were foreign-born (including 7193 Irish, 4704 Germans, 4621 Welsh and 3692 English) and 521 were negroes; (1910, census) 129,867. Scranton is served by the Erie, the Delaware, Lackawanna & Western, the Central of New Jersey, the New York, Ontario & Western, the Delaware & Hudson, and the

Lackawanna & Wyoming Valley railways. It occupies an area of about 20 sq. m. Among the principal public buildings are the United States Government building, the County Court House, the City Hall, the Albright Memorial building, housing the public library (55,800 vols, in 1908), the armoury of the 13th Regiment, State National Guard, the Board of Trade building, some fine churches and school-houses, a Young Men's Christian Association building and a Young Women's Christian Association building. Scranton is the see of a Roman Catholic bishop, has a good public school system, and is the seat of the International Correspondence Schools (1891), which give instruction by mail in the trades and professions to large numbers of students; Mt. St Mary's Seminary (1902) for girls, and the W. T. Smith (Memorial) Manual Training School (1905), a part of the public school system. The city has an Institute of History and Science, and the Everhart Museum of natural history, science and art (dedicated 1908), founded and endowed by Dr I. F. Everhart (b. 1840) of Scranton, a Soldiers' and Sailors' Monument, and monuments to the memory of Columbus and Washington. Scranton is the largest city in the great anthracite-coal region of the United States; and 17,525,995 long tons of coal were produced within the county in 1905. The chief manufactures are silk goods (21-6% of all in value) and other textiles, but large quantities of foundry and machine-shop products, malt liquors, flour, and planing mill products are also manu- factured. The total value of the city's factory products in 1905 was $20,453,285. The Delaware, Lackawanna & Western rail- way has since built large machine and car shops.

A permanent settlement was established within the present

limits of Scranton in 1788, and a primitive grist-mill, a saw-mill and a charcoal iron-furnace were erected during the next few years; but there was little further development until 1840, when the Lackaw T anna Iron Company was formed for the manufacture of iron here. The limestone and iron ore of the vicinity proved to be of inferior quality, and the failure of the enterprise was prevented only by the persistent efforts of George Whitefield Scranton (1811-1861), aided by his brother Selden T. Scranton and his cousin Joseph Hand Scranton. Under the leadership of George W. Scranton better grades of iron ore and of limestone were procured, and within a decade a rolling mill, a nail factory and a manufactory of steel rails were

established, and adequate facilities for railway transportation were provided. Scranton was incorporated as a borough in 1854, was chartered as a city of the third class in 1866, and became a city of the second class in 1901.

See B. H. Throop, A Half-Century in Scranton (Scranton, 1895).

SCREAMER, a bird inhabiting Guiana and the Amazon valley, so called in 1781 by T. Pennant (Gen. Birds, p. 37) " from the violent noise it makes " — the Palamedea cornuta of Linnaeus. First made known in 1648 by G. de L. Marcgrav under the name of " Anhima," it was more fully described and better figured by Buff on under that of Kamichi, still applied to it by French writers. Of about the size of a turkey, it is remarkable for the curious " horn " or slender caruncle, more than three inches long, it bears on its crown, the two sharp spurs with which each wing is armed, and its elongated toes. Its plumage is plain in colour, being of an almost uniform greyish black above, the space round the eyes and a ring round the neck being variegated with white, and a patch of pale rufous appearing above the carpal joint, while the lower parts of the body are white. Closely related to this bird is another first described by Linnaeus as a species of Parr a (see Jacana), to which group it certainly does not belong, but separated therefrom by Illiger to form the genus Chauna, and now known as C. chavaria, very generally in English as the " Crested Screamer," a name which was first bestowed on the Seriema (q.v.). This bird inhabits the lagoons and swamps of Paraguay and Southern Brazil, where it is called " Chaja " or " Chaka," and is smaller than the preceding, wanting its " horn," but having its head furnished with a dependent crest of feathers; while the plumage is grey. Its nest is a light con- struction of dry rushes, having its foundation in the water, and contains as many as six eggs, which are white tinged with buff. The young are covered with down of a yellowish-brown colour. A most singular habit possessed by this bird is that of rising in the air and soaring there in circles at an immense altitude, uttering at intervals the very loud cry of which its local name is an imitation. From a dozen to a score may be seen at once so occupying themselves. The young are often taken from the nest and reared by the people to attend upon and defend their poultry, a duty which is faithfully 1 and, owing to the spurs with which the chaka's wings are armed, successfully discharged. Another very curious property of this bird, which was observed by Jacquin, who brought it to the notice of Linnaeus, 2 is its emphysematous condition — there being a layer of air-cells between the skin and the muscles, so that on any part of the body being pressed a crackling sound is heard. In Central America occurs another species, C.

derbiana, chiefly distinguished by the darker colour of its plumage. For this a distinct genus, Ischyromis, was proposed, but apparently without necessity, by A. B. Reichenbach (Syst. Avium, p. xxi.).

The taxonomic position of the Palamedeidae, for all will allow to the screamers the rank of a family at least, has been much debated. Their anserine relations were pointed out by W. K. Parker in the Zoological Proceedings for 1863 (pp. 511-518, and in the same work for 1867 T. H. Huxley placed the family among his Chenomorphae; but this view was contravened in 1876 by A. H. Garrod, who said, " The screamers must have sprung from the primary avian stock as an independent offshoot

1 Hence J. Latham's name for this species is ■" Faithful Jacana " — he supposing it to belong to the genus in which Linnaeus placed it.

2 " Tacta manu cutis, sub pennis etiam lanosa, crepat ubique fortiter " tSust. Nat. ed. 12, i. p. 260).

at much the same time as did most of the other important families." P. L. Sclater in 1880 placed them In a distinct order, Palamedeae, which he, however, placed next to the true Anseres, and they are now generally regarded as forming a sub- order of anseriform birds.

SCREEN (usually, but very doubtfully, connected with Lat. scrinium, a box for holding books, from scribere, to write; a connexion with Ger. Schranke, barrier, has been suggested), in architecture, any construction subdividing one part of a building from another — as a choir, chantry, chapel, &c. The earliest screens are the low marble podia, shutting off the chorus can- tantium in the Roman basilicas, and the perforated cancelli enclosing the bema, altar, and seats of the bishops and presbyters. The chief screens in a church are those which enclose the choir or the place where the breviary services are recited. This is done on the continent of Europe, not only by doors and screen-work, but also, when these are of open work, by curtains, the laity having no part in these services. In England screens were of two kinds: one of open woodwork; the other, massive enclosures of stonework enriched with niches, tabernacles, canopies, pinnacles, statues, crestings, &c, as at Canterbury, York, Gloucester, and many other places both in England and abroad (see Rood and Jube).

As an article of furniture, the screen is an ornamental frame, usually of wood, but sometimes of metal, for protection from observation, draught, or the heat of a fire. Screens are made of all shapes and sizes, and may consist of leather, paper or textile materials fastened

to the framework; they may have several leaves or only one — thus a fourfold screen has four leaves. Fire- screens are usually small, with a single leaf — indeed in the Georgian period of English furniture they often took the form of a circular, oval, heart-shaped or oblong piece of framed embroidery fixed to a wooden pole or upright, upon which they could be raised or lowered. This variety, which was called a pole-screen, was more effective as an ornament than as a protection. The hand-screen was light and portable, as the name implies. At the present time fire-screens are often of glass set in metal frames. The larger type of screen, with several leaves, is of uncertain origin, but probably first came into use towards the end of the 16th century. The earlier examples were of stamped or painted Spanish leather or of some rich stuff such as tapestry; at a later date lacquer was extensively used. They were tall enough to conceal the person sitting behind them, and were frequently exceedingly handsome and stately.

SCREW (O.E. scrue, from O. Fr. escroue, mod. Scrou; ultimate origin uncertain; the word, or a similar one, appears in Teutonic languages, cf. Ger. Schraube, Dan. skrue, but Skeat, following Diaz, finds the origin in Lat. scrobs, a ditch, hole, particularly used in Low Latin for the holes made by pigs boring in the ground with their snouts), a cylindrical or conical piece of wood or metal having a groove running spirally round it. The surface thus formed constitutes an external or male screw, while a similar groove cut round the interior of a cylindrical hole, as in a nut, constitutes an internal or female screw. The ridge between successive turns of the groove is the " thread," and the distance between successive turns of the thread is the " pitch." Thepresent article will deal with the standard pitches in common use and with modern methods of manufacture, the earlier history of which, down to the time of Sir Joseph Whitworth, may be read in Holtzapffel's Turning and Mechanical Manipulation. For the screw as a mechanical power see Mechanics; for the screw used to propel steamships see Shipbuilding.

Standardization of Screws. — All screws made to-day are copies of pre-existing or master screws, which are familiarly known as " guide screws," " hobs " or " leaders," " chasers " or " comb tools," " taps," and " dies " in numerous forms. These are so standardized that a thread cut to a given standard in England fits its fellow thread cut to the same standard in America, Germany or elsewhere. At one time screws cut by one firm would not match those cut by another. Formerly there was no " tackle," but large screws were cut with chisel and file, and a nut was cast around them and used for correction, until gradually

the coarser errors were eliminated. Another method was that of the mathematical instrument makers, who used a screw and tangent wheel by which a cutter was moved along synchronously with the revolution of the screw blank, a method only suitable for short screws. The first attempt at securing uniformity in screw threads was made by Sir Joseph Whitworth, who com- municated a paper on the subject to the Institution of Civil Engineers in 1841. In the course of about twenty years the Whitworth system generally displaced the previous heterogeneous designs of threads, by the existence of which engineers' repairs had been rendered most inconvenient and costly, almost every establishment having its own " standard " set of screwing tackle. In fact it was suspected that firms thought their interest lay in this separation of practice in order to capture repairs, each of its own work.

When Whitworth began his work he made an extensive collection of screw bolts from the principal English workshops, and an average observed for diameters of j in., 5 in., 1 in., and 1 1 in. chiefly was taken and tabulated in exact numbers and equal fractional parts of threads per inch, the scale being after- wards extended to 6-in. diameter. In cases above an inch the same pitch is maintained for two sizes, the object being to avoid small fractions, and to simplify the construction of screwing apparatus. The system is therefore a practical compromise based on previous practice. The proportion between pitch and diameter varies throughout the series, and at the extremes the amount of power required to turn a nut is either in excess or insufficient.

When the Whitworth threads were accepted in England, Germany and the United States, it appeared as though they were established for ever in an impregnable position, as a unifica- tion evolved from chaos. Moreover, Great Britain at that time occupied a position of pre-eminence in manufacturing engineering, which was favourable to the establishment of an English system. But two things were wanting to permanence — the facts that the Whitworth threads were not based on the metric system, and that the United States was destined to come into rivalry with Great Britain. Metric systems became standardized on the continent of Europe and the Sellers thread in America overshadowed the Whitworth, though it is impossible to doubt that the Sellers like the Whitworth must in time be swallowed up by some one metric system.

It is easier to devise new standards than to induce manu- facturers to accept them. Change means the purchase of a very costly new equipment of screwing tackle, both hand and machine, besides the retention of the old for effecting repairs. There is no question of accommodating or bringing in the threads of one system to others nearly like them. They either fit or do not fit, they are right or wrong, so that a clean sweep has to be made of the entire screwing tackle in favour of the new. The two great attacks that have been made on the Whitworth thread came, one from the Franklin Institute in 1864, when the Sellers thread was adopted and recommended to American engineers, and the other in 1873, when Delisle of Carlsruhe initiated a metric system. As a result, after several years of effort, the Society of German Engineers took the matter up, and the appointment of a committee gave birth to the International Screw Thread Congress, which has met from time to time for the discussion of the matter. We have thus two broad lines of departure from the Whitworth standard.

The history of the battle of the screw threads in England, America, Germany, Switzerland and France would occupy a volume. The subject is highly technical, involving practical points concerned with manufacture as well as with questions of strength and durability. We can merely state the fact that the threads now recognized as standard are included in about eight great systems, out of about sixty that have been advocated and systematized. Their elements are shown by the diagram, fig. 1; but tables of dimensions are omitted, since they would demand too much space. •

Methods of Cutting Screws. — There are four methods employed for the cutting of screw threads – one by means of a single-edged tool

held in the saddle of the screw-cutting lathe, and traversed horizon- tally only, the cylinder which is to receive the thread revolving the while; another by means of short master screws, hobs or leaders, controlling chasers or comb tools; the third by means of screw taps

the Pi

In the lathe.

Fig. 1. — Sections of principal Screw Threads.

Formulae: p = pitch, or distance between centres of contiguous threads; d = depth of thread; h = total height of thread construc- tion; r = radius ;/= flat.

A. Whitworth thread. 6 = 0-9605 p; <2 = 0-64O3 p; leaving |th h to be rounded at top and bottom.

B. Sellers, or Franklin Institute, or U.S. standard thread. A = o-866 p\ ˆ = 0-6495 p;f — \th p.

C. Sharp Vee thread. <2 = o-866o p.

D. British Association standard thread. i = o-6 p; r = ˆ8 T th p.

E. C.E.I, or Cycle Engineers' Institute standard thread. fc = o-866 p; (2 = 0-5327 p; r = lth p.

F. Lowenherz or Delisle thread (metric, used largely on continent of Europe). h=p; ˆ = 0-75 h;f=ith h.

G. International standard thread (metric). ˆ = 0-6495 /=ith h\ r = Ath h.

H. Thury thread (metric), d = |th p; r = £th p; r' = |th p. J. Square thread, d = | p. K. Acme thread. i = § £+o-oio; 7=0-3707 p.

and dies, either the work or the tool being absolutely still. The fourth is by means of a milling cutter presented to the work in a special screw-milling machine, both the work and the cutter re- volving.

The problem of screw-cutting in the lathe in the simplest form resolves itself into the relative number of revolutions of the lathe spindle and of the lead screw (fig. 2). If the two rotate at the same speed, the thread cut on the spindle axis will be equal in pitch to that of the lead screw. If the spindle revolves more slowly than the lead screw, a thread coarser than that in the latter will result ; if it revolves more rapidly, one of finer pitch will be produced. The spindle is the first factor, being the driver, and the lead screw is driven therefrom through the change wheels — the variables — which determine the number of revolutions of the latter whether the same, or slower, or faster than the spindle. Screw- cutting in all its details is an extensive subject, including the cutting of what are termed odd or unequal pitches, that is, those which involve fractions, the catching of threads for successive traverses of the tool, the cutting of multiple threads and of right- and left-hand threads, which involve much practical detail. The principle of screw- cutting may be stated briefly thus: the pitch of the guide screw is to that of the screw to be cut as the number of teeth on the mandrel or (headstock) wheel is to the number of teeth on the lead screw wheel. It is therefore simply a question of ratio. Hence for cutting threads finer than that

of the lead screw, the guide screw must rotate more slowly than the lathe mandrel; and for cutting threads coarser than those of the guide screw, the lead screw must rotate faster than the lathe mandrel (fig. 2, C and D). When the ratios are ascertained, these facts indicate when the larger or the smaller wheels must be placed as drivers, or be driven. " Simple trains " are those which contain only one pair of change wheels; "compound trains " have two, three, four or more pairs (fig. 2), and are necessary when the ratio between the guide screw and the screw to be cut exceeds about six to one.

A device which has become very popular under the name of Hendey-Norton gears comprises a nest of twelve change wheels, mounted and keyed on the end of the lead screw. A stud wheel is made to engage through an intermediate wheel with any one of the twelve change gears, on the simple movement of a lever, giving twelve

different ratios for screw-cutting. These again are doubled or trebled by altering the ratios of other gears connected therewith, so

(h4u —

Fig. 2.

A, Simple train which rotates lead

screw in opposite direction to mandrel, and makes slide- rest feed away from the headstock.

B, Simple train with intermediate

wheel on stud, which rotates lead screw in same direction as mandrel, making slide-rest

feed towards the headstock. Intermediate on " stud " does not alter ratio.

C, Typical compound train ar-

ranged for cutting a screw finer than that of the lead screw.

D, Ditto for screw coarser than

that of the lead screw.

that for each position of engagement of the stud wheel, two, or in some cases three, pitches can be cut. This avoids the waste of time involved in setting up fresh wheels on the swing-plate as often as a screw of different pitch has to be cut.

Another step in the direction of economy depends on the removal of all screw-cutting, except those screws which are of several feet in length, from the ordinary lathe to the special chasing and screwing machines. The screw-cutting arrangement of an engineer's lathe is a cumbrous apparatus to fit up and set in motion for the cutting of screws of small dimensions. When there was no other method available except that of common dies operated by hand or carried in a screwing machine, there was good reason why a true cutting tool should be operated in the lathe through change wheels. But the

reason no longer exists, since for the single cutting tool of the lathe the two or three cutters of the chasing and screwing machines (figs. 3 and 4) are substituted, and the hollow mandrel embodied in the latter permits of screws being cut and parted from the solid bars of several feet in length. Except for the cutting of long screws and screws of odd pitches, the ordinary lathe is now a wasteful machine.

Fig. 3. — Bolt-Screwing Machine" (John Stirk & Sons, Ltd., Halifax).

A, Bed. B, Spindle.

C, Four-step belt pulley, driving

through triple spur gears D,

toB.

E, Opening die head.

F, Bolt carriage racked to or fro

along the bed by rotation of hand-wheel G. H, Handle for opening and closing vee-jaws at a for gripping and releasing bolts by means of a right- and left-hand screw.

J,

Handle for opening the dies.

K, Lever for automatically open- ing the dies, operating through J.

Rod having adjustable dog b, struck by carriage at a definite position of its travel, thus throwing the dies off the work.

M, Pump drawing lubricant from reservoir in bed.

L,

The second method of cutting screws is that by means of hobs or leaders, and either comb or single-edged tools. That is, 1 short

Fig. 4. — Opening Die-head for Screwing Machine.

A, Spindle end.

B, Sliding collar.

C, Ring boited to

grooves a, a. a chasers D.

B, and enclosing ring having three coned , set eccentrically to close in or let out the

E, Curled spring keeping chasers outwards in contact with a.

F, Piece screwed to end of A, and provided with three grooves to

carry the chasers.

G, Cover plate confining the chasers, and unscrewed from F when

changing chasers for other sizes.

standard screw is mounted somewhere on the lathe, at the rear, or in front, and a nut partly embracing this becomes a guide to . a bar which is attached to the tool slide directly. These By ho s. afe termec j c hasing lathes. Their value lies in the cutting of screws of but a few inches in length, of which large numbers are required, a familiar example being the screwed stays for the fire-boxes of steam boilers, hundreds of which are used in a single boiler.

The third method embodies the use of taps and dies in their numerous designs. The simpler forms used are those operated by B taos hand at the bench, from which all the machine taps and dies. an(ˆ dies have been elaborated. The tap is the solid screwed cylindrical tool which cuts an internal thread (fig. 5) ; the die is the hollow tool which cuts a thread on the outside of a cylinder (fig. 6).

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**\r*

Fig. 5. — Taps. A, Entering or taper tap; B, middle or second tap; D, bottoming or plug tap; E, machine tap; F, hob or master tap.

These taps and dies are, or should be, true cutting tools, and if we examine any of those of approved form we shall see that they are so in fact. But none of the early taps was in any sense a cutting tool. They ground, and scraped, and squeezed, but never cut. They were usually made of round steel rod, screwed, and having three or four flats filed down upon them. The angles therefore which abraded the work were always obtuse, and as proper backing off was often neglected, or insufficiently done, the labour not only of running them down, but also of running them back out of their holes, was very

the

C,

Fig. 6.-

A, Dies cut over hob of same size

as screw to be cut; the lead is bad, there is coincidence only at the completion of the thread, and they are seldom used except in solid screw plates.

B, Dies cut over hob one thread

deeper than the screw to be cut, the standard form; the lead is good and there is

great. This, combined with the inefficient form of solid screw plates used at the same time, made the work of fitting nuts and bolts one of constant trial and error, of easing and doctoring; and when this had been done, nuts and bolts were not interchangeable, but each nut was marked for its own bolt. The earliest screw plates were probably of the same forms which are used now for screws below T ˆ in. diameter — mere hardened plates of steel, having holes of graduated diameters, screwed to the various sizes required.

Dies.

coincidence at about middle of action. Dies cut over hob two threads deeper than screw to be cut, frequently used; the lead is good and there is coincidence at the beginning of action, a, dies at beginning of action, b, at completion.

D, Screw stock.

In all taps and dies the problem is to cut a screw, of which the angle of thread changes from point to root, with tools whose angle must remain constant. In taps there is no choice of angle, since they must be the exact counterparts of the tapped threads when finished. But in dies a compromise is made by cutting them with hobs, or master taps (fig. 5), one thread larger than the thread to be cut by the dies. Briefly, the practical effect is that the dies are only counterparts of the thread to be cut at about the middle part of their action (fig. 6, B).

Though the action of taps resembles in some respects that of common dies, the results achieved are better, partly because the backing off is generally superior, partly because taper taps are commonly used to start a screw hole. Tapered solid dies are also used in some kinds of turret work with the same object, namely, to facilitate the work of an inherently badly formed tool. With a tapered tap, or a tapered solid die, the full threads do not come into operation until after the tapered threads have started the cut. A properly made throughfare tap, or a tapered die, will cut an average- sized screw at one traverse, provided lubrication is ample. Taps are now made with very narrow edges and wider clearances than formerly, very different from the common taps with broad edges and narrow grooves. There is thus little friction, and there is plenty of clearance for the chips, essential conditions for cutting screws rapidly at a single traverse.

Dies are held in stocks. In the common die stocks one adjustable die is moved forward with a screw, which forms one of the handles of the stock, or a separate tightening screw is used at right angles with the handles, or the tightening screw is set diagonally in relation to the handle (fig. 6, D). Sir Joseph Whitworth's well known " guide " screw stock (fig. 7) is an example of the embodiment of the principle

Fig. 7. — Whitworth Guide-Screw Stock, o, Guide; b,b, cutters; c, adjusting bolt.

just stated, the dies being cut over a hob two depths of thread larger than the screw; one, a broad die, is used for guidance only, and two narrow dies do all the cutting. The guide-screw stock derives its name from the fact that it embodies a guide a distinct from the cutters b,b, the guide doing very little actual cutting ; it is one of the best tools for screw-cutting outside the lathe, but some of the American types of dies, such as in fig. 8, A and B, give very accurate results, especially when they are combined with a guide in advance of- the dies, to keep them truly parallel on the work. The common dies are inferior in operation to those used in the guide-screw stock. Nevertheless, the common die stocks are used most extensively. The reason is that, although they are of faulty construction regarded strictly from the mechanician's point of view, yet they do their work in a very satisfactory manner if moderate care be exercised in their construction and working.

Machine Work. — Hand tapping and screwing has long been confined to occasional pieces of work done by the fitter at the bench, the

A, Common split spring die, ad-

justed by taper screw, a.

B, Split die held in collet, b, and

expanded or contracted by turning in the taper-pointed

screw, c, and slackening the screws d,d, or vice versa. Spring die for lathes, adjusted to cut larger or smaller by means of the split ring e.

erecter and repairer. Screws and tapped holes required in quantities are done on machines which include numerous types, at a rate of production which would seem incredible were it not so common. For cutting common screws of no very great length the lathe has long been superseded by the various screwing machines. The earlier forms were provided with clutch mechanism for running the solid dies back

off the thread, in imitation of the action of the hands, and the dies could not cut a complete thread at one traverse, two or three traverses being necessary in the production of a full thread. In the modern screwing machines (fig. 3) the cutters are closed and released by cam mechanism, and all threads except those of large diameter are cut at a single traverse. Common bolts and nuts are cut in

machines of this kind, machine taps, which afe longer than hand operated taps, being employed in the same machines.

But the smaller screws made in large quantities, and screws which have to be cut on pieces of work on which other operations, as turning, boring, facing, knurling, have to be performed, are made in the numerous capstan or turret lathes, the dies or taps being held in the turrets. Often a cam-operated screwing plate is pulled into line with the work, operating independently of the turret head. But in most cases the dies (fig. 8) are held in a chuck which is inserted in one of the holes in the turret and which is better for the cutting of the finer screws. More valuable than any other single improvement is the automatic opening of many dies used in turret lathes, by which the running back of the die over the work is avoided. These opening die heads are of several designs. They are so beautifully contrived that contact with a stop, the position of which can be regulated, arrests the cutting action and causes the dies to fly open away from the screw, so that the turret can be slid away instantly, while the dies close in readiness for the next screw.

Sizing Taps are used for the finishing of threads which are required to be finished so uniformly as to be interchangeable one with the other. These are ordinary plug or second taps, generally short in length, and as they remove but a mere trifle of material they retain their size for a very long time. The case of sizing taps is more difficult than that of dies, because a die can be readily compressed to compensate for wear (fig. 8), but a tap has to be expanded. The result is that while plenty of adjustable dies are made, there are few expanding taps. Many have been designed, but they are used to a much less extent than the dies. A sizing tap is kept true as long as possible by careful use. and when it falls below the limit dimensions it is replaced by a new one.

Screw milling, the latest development in screw-cutting, involves the use of a special machine, something like the lathe in outline, the piece of work to be threaded being rotated in the axis of the machine. The cutter is carried in a head, with swivelling

Screw milling.

arrangements, to provide for variations in screw angles, and is rotated at speeds suitable for the metal or alloy being cut. The necessary traverse is imparted either to the work or to the cutter, according to the design of machine, by lead screw and change gears. This method is employed to a considerable extent, chiefly for cutting coarsely threaded screws and worms. The great advantage which the revolving cutter possesses over the single-edged tool is its rapidity of action, by which threads may be produced more quickly than in the lathe.

Testing Screws. — The screws cut in engineers' shops are sufficiently true for all practical purposes. But the fact remains that no guide screw yet made is true, and no true screw can be made apart from the use of devices which are unknown in the machine shop. Actually no screw ever has been, or probably ever will be, made perfect, but the variation from truth has been in some cases only 88 ,ˆ – q or » 0.0 00 part of an inch. The microscope is brought into requisition for testing standard screws, but commercial screws simply have to pass the test of gauges. A screw 21 ft. long was made by the Pratt & Whitney Co., and tested by Professor W. A. Rogers. A scale, the corrections of which were known to within g5 } ooi in., was mounted parallel with the axis of the screw. A microscope contain- ing a cross bar was mounted on the carriage actuated by the screw. The cross bar was furnished with a micrometer by which the devia- tions for any revolution of the screw could be measured. A reading was taken for each half inch in length of the screw. Special tests were made at various points by turning the screw through 45 at a time. The maximum error in the entire length of the screw was found to be less than T J B in.

The problem of producing a true screw has occupied investigators since the days of Henry Maudslay (1771-1831). The great difficulty is that of attaining accurate pitch, so that the distances between all the threads shall be uniform, and consequently that a nut on the screw shall move equably during the rotation. The importance of this point is felt in the dividing engines of various classes employed for ruling, and in measuring machines used for testing standards of length. The ordinary screw, cut by dies or in the screw-cutting lathe,

is found, on applying comparatively coarse tests, to be far from accurate in pitch, while the thread may be wavy or " drunken " and the diameter may not be uniform at all points. There are several methods of correcting the errors in screws; the principal one is that of retarding or accelerating the traverse motion of the screw-cutting tool by means of a compensating lever bearing on a compensating bar, which is formed after observations have been made on the degree of accuracy of the leading screw used to propel the tool carriage. The original errors in the leading screw are therefore eliminated as far as possible. The inspection of the screw is done by means of the microscope working in conjunction with a line measure fastened down parallel with the axis of the screw, so that the coincidence or otherwise of the screw pitches with the subdivisions of the measure may be compared. (J. G. H.)

Errors of Screws. — For scientific purposes the screw must be so regular that it moves forward in its nut exactly the same distance for each given angular rotation around its axis. As the mountings of a screw introduce many errors, the final and exact test of its accuracy can only be made when it is finished and set up for use. A large screw can, however, be roughly examined in the following

manner: — -(1) See whether the surface of the threads has a perfect polish. The more it departs from this, and approaches the rough torn surface as cut by the lathe tool, the worse it is. A perfect screw has a perfect polish. (2) Mount it between the centres of a lathe and then slip upon it a short nut which fits perfectly. If the nut moves from end to end with equal friction, the screw is uniform in diameter. If the nut is long, unequal resistance may be due to either an error of run or a bend in the screw. (3) Fix a microscope on the lathe carriage and focus its single cross-hair on the edge of the screw and parallel to its axis. If the screw runs true at every point its axis is straight. (4) Observe whether the short nut runs from end to end of the screw without a wabbling motion when the screw is turned and the nut kept from revolving. If it wabbles the screw is said to be drunk. One can see this error better by fixing a long pointer to the nut, or by attaching it to a mirroHand observ- ing an image in it with a telescope. The following experiment will also detect this error. (5) Put upon the screw two well-fitting and rather short nuts, which are kept from revolving by arms bearing against a straight-edge parallel to the axis of the screw. Let one nut carry an arm which supports a microscope focused on a line ruled on the other nut. Screw this combination to different parts of the screw. If during one revolution

the microscope remains in focus, the screw is not drunk; and, if the cross-hairs bisect the line in every position, there is no error of run. Where the highest accu- racy is needed, we must resort in the case of screws, as in all other cases, to grinding. A long solid nut, tightly fitting the screw in one position, cannot be moved freely to another position unless the screw is very accurate. If grinding material is applied and the nut is constantly tightened, it will grind out all errors of run, drunkenness, crookedness and irregularity of size. The condition is that the nut must be long, rigid and capable of being tightened as the grinding proceeds; also the screw must be ground longer than it will finally be needed, so that the imperfect ends may be removed.

The following process will produee a screw suitable for ruling gratings for optical purposes. Suppose it is our purpose to produce a screw which is finally to be 9 in. long, not including bearings, and 1 1 in. in diameter. Select a bar of soft Bessemer steel, which has not the hard spots usually found in case steel, about if in. in diameter and 30 in. long. Put it between lathe centres and turn it down to I in. diameter everywhere, except about 12 in. in the centre, where it is left a little over 1 1 in. in diameter for cutting the screw. Now cut the screw with a triangular thread a little sharper than 60 °. Above all, avoid a fine screw, using about 20 threads to the inch.

The grinding nut, about 1 1 in. long, has now to be made. Fig. 9 represents a section of the nut, which is made of brass, or better

d d

Fig. 9. — Section of Grinding Nut.

of Bessemer steel. It consists of four segments, a,a, which can be drawn about the screw by two collars, b,b, and the screw c. Wedges between the segments prevent too great pressure on the screw. The final clamping is effected by the rings and screws, d,d, which enclose the flanges, e, of the segments. The screw is now

C laced in a lathe and surrounded by water whose temperature can e kept constant to 1° C, and the nut placed on it. In order that the weight of the nut may not make the ends too small, it must either be counterbalanced by weights hung from a rope passing over pulleys in the ceiling, or the screw must be vertical during the whole process. Emery and oil seem to be the only available grinding materials, though a softer silica powder might be used towards the end of the operation to clean off the emery and prevent future wear. Now grind

the screw in the nut, making the nut pass backwards and forwards over the screw, its whole range being nearly 20 in. at first. Turn the nut end for end every ten minutes and continue for two weeks, finally making the range of the nut only about 10 in., using finer washed emery and moving the lathe slower to avoid heating. Finish with a fine silica powder or rouge. During the process, if the thread becomes too blunt, recut the nut by a short tap, so as not to change the pitch at any point. This must of course not be done less than five days before the finish. Now cut to the proper length ; centre again in the lathe under a microscope ; and turn the bearings. A screw so ground has fewer errors than from any other system of mounting. The periodic error especially will be too small to be discovered, though the mountings and graduation and centering of the head will introduce it; it must therefore finally be corrected.

Mounting of Screws. — The mounting must be devised most care-

fully, and is indeed more difficult to make without error than the screw itself. The principle which should be adopted is thav iio workmanship is perfect; the design must make up for its imperfections. Thus the screw can never be made to run true on its bearings, and hence the device of resting one end of the carriage on the nut must be rejected. Also all rigid connexion between the nut and the carriage must be avoided, as the screw can never be adjusted parallel to the ways on which the carriage rests. For many purposes, such as ruling optical gratings, the carriage must move accurately forward in a straight line as far as the horizontal plane is concerned, while a little curvature in the vertical plane produces very little effect. These conditions can be satisfied by making the ways V-shaped and grinding with a grinder somewhat shorter than the ways. By constant reversals, and by lengthening or shortenin|; the stroke, they will finally become nearly perfect. The vertical curvature can be sufficiently tested by a short carriage carrying a delicate spirit-level. Another and very efficient form of ways is V-shaped with a flat top and nearly vertical sides. The carriage rests on the flat top and is held by springs against one of the nearly vertical sides. To determine with accuracy whether the ways are straight, fix a flat piece of glass on the carriage and rule a line on it by moving it under a diamond; reverse and rule another line near the first, and measure the distance

apart at the centre and at the two ends by a micrometer. If the centre measure- ment is equal to the mean of the two end ones, the line is straight. This is better than the method with a mirror mounted on the carriage and a telescope. The screw itself must rest in bearings, and the end motion be prevented by a point bearing against its flat end, which is protected by hardened steel or a flat diamond. Collar bearings intro- duce periodic errors. The secret of success is so to design the nut and its connexions as to eliminate all adjustments of the screw and indeed all imperfect workmanship. The connexion must also be such as to give means of correcting any residual periodic errors or errors of run which may be introduced in the mountings or by the wear of the machine.

The nut is shown in fig. 10. It is made in two halves, of wrought iron filled with boxwood or lignum vitae plugs, on which the screw

is cut. To each half a long piece of sheet steel is fixed which bears against a guiding edge, to be described presently. The two halves are held to the screw by springs, so that each moves for- ward almost inde- pendently of the other, to the carriage, a ring is attached to the plane is vertical and which can turn axis. The bars fixed midway on the two nut bear against this ring at points 90 axis. Hence each half does its share in- the other in moving the carriage forward, parallelism between the screw and the tricity in the screw mountings thus the forward motion of the carriage. The which the steel pieces of the nut rest can form as to correct any small error of run the screw. Also, by causing it to move forwards periodically, the periodic error mountings can be corrected, gratings for optical purposes the periodic very perfectly eliminated, since the

To join the nut latter, whose round a vertical halves of the distant from its dependently of Any want of ways or eccen- scarcely affects guide against be made of such due to wear of backwards and of the head and In making error must be periodic dis- of an inch from in the spectrum, tive method of

FlG IO placement of the lines only one-millionth their mean position will produce "ghosts^' (See Diffraction.) Indeed this is the most sensi- detecting the existence of this error, and it is practically impossible to mount the most perfect of screws without introducing it. A very practical method of determining this error is to rule a short grating with very long lines on a piece of common thin plate glass; cut it in two with a diamond and superimpose the two halves with the rulings together and displaced sideways over each other one-half the pitch of the screw. On now looking at the plates in a proper light so as to

have the spectral colours show through it, dark lines will appear, which are wavy if there is a periodic error and straight if there is none. By measuring the comparative amplitude of the waves and the distance apart of two lines, the amount of the periodic error can be determined. The phase of the periodic error is best found by a series of trials after setting the corrector at the proper amplitude as determined above.

A machine properly made as above and kept at a constant temperature should be able to make a scale of 6 in. in length, with errors at no point exceeding luofirw of an inch. When, however,_a grating of that length is attempted at the rate of 14,000 lines to the inch, four days and nights are required and the result is seldom perfect, possibly on account of the wear of the machine or changes of temperature. Gratings, however, less than 3 in. long are easy to make. (H. A. R.)

SCREW-PINE, the popular name for plants of the genus Fandanus, which are shrubs or trees of peculiar habit, having

a main stem and a few branches at the ends of which is a tuft of long, stiff, narrow leaves closely arranged in three strongly twisted lines. The stem forms stout roots, which grow obliquely downwards to the soil, and owing to the decay of the lower part of the stem the plant is often supported merely by these strong prop-like roots. The ripe fruits are borne in often very large spherical or cylindrical heads, which are often extremely hard. The genus is the principal one of the family Pandanaceae, a small order of Monocotyledons, which is widely distributed through the tropics of the Old World, especially in the islands of the Malay Archipelago and of the Indian and Pacific Oceans.

SCRIBE, AUGUSTIN EUGENE (1701-1861), French dramatist, was born in Paris on the 24th of December 1791. His father was a silk merchant, and he was well educated, being destined for the bar. But, having a real gift for the theatre, a gift which unfortunately was not allied with a corresponding literary power, he very soon began to write for the stage. His first piece, Le Pritendu sans le savoir, was produced without his name at the Varietes in 1810, and was a failure. Numerous other plays, written in collaboration with various authors, followed; but Scribe achieved no distinct success till 1815, when Une Nuit de la garde nationale, written in collaboration with Delestre-Poirson, made him famous. Thenceforward his fertility was unceasing and its results prodigious. He wrote every kind of drama — vaudevilles, comedies, tragedies, opera-libretti. To the Gymnase

theatre alone he is said to have furnished a hundred and fifty pieces before 1830. This extraordinary fecundity is explained by the systematic methods of collaboration which he established. He had a number of co-workers, one of whom supplied the story, another the dialogue, a third the jokes and so on. He is said in some cases to have sent sums of money for " copyright in ideas " to men who were unaware that he had taken suggestions from their work. Among his collaborators were Jean Henri Dupin (1787-1887), Germain Delavigne, Delestre-Poirson, Meles- ville (A. H. J. Duveyrier), Marc-Antoine Desaugiers, Xavier Saintine and Gabriel Legouve. His debut in serious comedy was made at the Theatre Francais in 1822 with Valerie, the first of many successful pieces of the same kind. His industry was untiring and his knowledge both of the mechanism of the stage and of the tastes of the audience was wonderful. For purely theatrical ability he is unrivalled, and his plays are still regarded as models of dramatic construction. Moreover he was for fifty years the best exponent of the ideas of the French middle classes, so that he deserves respectful attention, even though his style be vulgar and his characters commonplace. He wrote a few novels, but none of any mark. The best-known of Scribe's pieces after his first successful one are Une Chaine (1842); Le Verre d'eau (1842); Adrienne Lecouvreur (1849), in conjunction with Legouve; Bertrand et Raton, ou I'art de conspirer; and the libretti of many of the most famous operas of the middle of the century, especially those of Auber and Meyerbeer. The books of La Muette de Portici, Fra Diavolo, Robert le Diable, and of Les Huguenots are wholly or in part by him. Scribe died in Paris on the 20th of February 1861.

His CEuvres completes appeared in seventy-six volumes in 1874-1885. See Legouve, Eugene Scribe (1874).

SCRIBES. The word "scribe" (from Lat. scribere, to write) means generally a writer; but it has a more special application as the English term for the Jewish class called in Hebrew Sopherim (Gr. -ypaftuciTeis) . Both the Hebrew and the Greek word are used to denote something equivalent to secretary of state or town-clerk in general; and through the influence of the law, revealed through Moses, upon the Jewish nation conceived as a theocracy, both words denote in particular one learned in Scripture. Jeremiah (for example) knew of Scribes who made the law of the Lord falsehood (viii. 8) , just as he knew of false prophets and profane priests (xxiii.). The function of writing belongs rather to the scribe or secretary in general than to the specifically Jewish scribe, whose primary business was to read and interpret the existing revelation of God's will, just as the town-clerk at Athens read public documents to

the assembly (Thuc. vii. 10). So Ezra, the most famous of the early

Scribes, is referred to as " the scribe of the commandments of the Lord and of his statutes to Israel " (Ezra vii. n), and again as " a ready scribe in the law of Moses which the Lord, the God of Israel, had given." As a Scribe he read the Law to the con- gregation of the children of Israel and the Levites recited a paraphrase to enable them to understand it (Nehemiah viii.). But even Jewish scribes were not only readers (as the old Greek version of 1 Esdras calls Ezra) but writers. Jeremiah (viii. 8) had a feud with the Scribes of his day, who wrote what they thought necessary as a compendium or supplement of the Law; but ben Sira, a Scribe himself, left such a book (Ecclesiasticus) , which is reckoned Apocryphal, indeed, but is on its merits worthy to be " read for example of life and instruction of manners " (Thirty-Nine Articles of Religion, vi.; following Jerome). The book contains the Scribes' ideal (xxxviii. 24-xxxix. n) as well as a typical performance. To be a Scribe requires a man's whole life; a ploughman (for example) has not leisure enough to acquire such wisdom — and here it is well to notice that experience taught the Jews the necessity of teaching all their children some handicraft, even if they were to be Scribes. But a Scribe must devote himself to the study of the law, the wisdom of the fathers and the prophets, i.e. the written law, and he must receive the oral tradition which will teach him to unlock its secrets. He must wander through the lands of the nations and explore things good and evil among men. So trained he will stand beside the rulers of his people because the law covers all the departments of their life. And he may be inspired to speak or write the wisdom he has gained. Ben Sira's grandson (natural or spiritual) in the prologue to the Greek version of this collection of such wisdom speaks of him as having been led forward to write it as an aid to the progressive fulfilment of God's law.

Such were the Scribes of the Jews, an order of learned theologians who practised applied theology, a succession of religious teachers and thinkers controlled in their speculations by their oral tradition to some extent and always by the principles of the law and the other scriptures so far as they accepted them and regarded them as consistent with the teaching of Moses. Their general aim was progress in knowledge of God's will, but apart from fundamental principles there were no tests or formularies to which their teaching must conform. Necessarily they differed from one another even in the

same generation according to their different temperaments and their different experiences, especially of foreign lands. And different generations had to adapt them- selves to different needs. In the time of Antiochus Epiphanes (for example) they had to face the problem, Was the law of the Sabbath to be broken, or was the whole nation to perish and leave none to keep the rest of the law and that part in happier days? A company of them decided with a unanimity rare in the history of the order that the Sabbath must be broken (1 Mace. ii. 40-42). Later these Hasidaeans deserted the Maccabean rebels, when some relief had been effected on the coming of a priest of the seed of Aaron (1 Mace. vii. 12-16). Their massacre, like the massacres which led to the suspension of the Sabbath law, was another fact to be assimilated for the guidance of posterity, and, as Scribes always did, they found and cited the prophecy which was thus fulfilled (Ps. lxxix. 2, 3; 1 Mace. vii. 17).

Later they are represented as falling generally into two classes, the Pharisees and the Sadducees, for it is obvious that the Sadducees needed doctors of the law to answer the Scribes of the Pharisees as long as they could, and as long as they dared to hold out against the Pharisaic tradition, backed as it was by the popularity of the Pharisees. But it must not be supposed that the Pharisees all held identical views or insisted upon all points in the tradition which accumulated and tended to crystallize as of equal importance. The Sadducean position was probably more definite and more commonly held by. individual Sadducees because it was mainly based on negations. The rivals may be compared roughly to theists and atheists of the present day so far as their relative solidarity is concerned. As an example of the broad and conspicuous divergences among the Pharisees it is enough to point to the Zealots; they had isolated precursors before the final coalition of Pharisees, who thought that the time

had come for the sword of Gideon as well as the sword of the Lord, with others who seemed to Josephus to love the bloodshed for its own sake. And the Talmud speaks of the Pairs of Scribes — – e.g. Hillel and Shammai — as contending with one another.

In the Gospel according to St John, which is wholly, and the Gospel of St Luke, which is partially in touch with the life of the time of our Lord, the different receptions which different Scribes accorded to the new teachers is clearly recognized. St Paul was of course a Scribe, and helped St Luke, it may fairly be supposed, to resist Christian prejudice against the whole order ■ — the mere name of Scribe — without any discrimination in favour of such men as Nathaniel,

Nicodemus and Gamaliel. The Gospel associated with the name of St Matthew has at any rate something of the intolerance with which a tax-gatherer might well regard those of the Pharisees (i.e. the Zealots, to use the term handed down) who condemned them as breakers of God's law. But in respect of its wholesale denunciations of " Scribes and Pharisees, hypocrites," it must be said that there were many Scribes and Pharisees who were not hypocrites, and were there- fore entitled to say, " Let the galled jade wince, our withers are unwrung." It appears that the parable of the Pharisee and the Publican ended originally with a question, " Which went home justified " — the Pharisee who thanked God because he had been saved from the grosser sins, or the Publican who recognized that his calling was in itself sinful, and without venturing to pass beyond the Court of the Gentiles whom he served — without even promising to abandon their service — prayed for mercy to the God whom he feared? The official text of St Luke has answered the question in one way: Christian practice is, on the •whole, in favour of the Pharisee.

Other views of the ancient Scribes are too notorious to need statement here. Broadly speaking they have no connexion with the real evidence, because they rest upon the denunciations of the First Gospel. If it is necessary to begin historical investiga- tion at the wrong end, it is advisable to take into account the whole evidence available. The Scribes of the 1st century a.d. preserved Judaism in spite of the destruction of the Temple, and this fact is enough to refute the view too commonly taken of them by Christians in spite of St Luke and St John. The common view is as reasonable and just as an account of the Prophets based on Jeremiah's denunciations would be — or an estimate of the Church of England which consisted of summary accounts of its criminous clerks.

See Schurer's History of the Jewish People, with full authorities.

(J. H. A. H.)

SCRIM, a light open texture, usually made of cotton or flax. It is used in bookbinding, upholstery and other industries. It is also used as a backing to strengthen paper, as in maps and packing paper. Sometimes jute scrims are made for the latter purpose, and the whole made impervious to moisture by the addition of some waterproof solution. Certain varieties of jute scrims or nets are used for supporting the branches of fruit trees, and for preventing birds from damaging the fruit.

SCRIP, properly any written document; the word is a corrup- tion of

" script " (Lat. scribere, to write), possibly from an assimilation with "scrip," a pilgrim's bag or wallet, which is borrowed from the Scandinavian (cf. Nor. skreppa, knapsack), and is ultimately cognate with " scrap," shred. In commercial usage, " scrip " is a document or certificate issued by a public company when instalments upon its shares are payable at different dates, or the whole amount to be paid has not been called up. Such a document entitles the person named to be treated as the allottee of the shares mentioned; it is transferable, and entitles the allottee on payment of all the calls to a share certificate. Scrip requires a penny stamp impressed upon it. The word is frequently loosely used for the share certificates or shares collectively.

SCROFULA (Lat. for " little sow "), or Struma, the general names formerly given to the disease now termed tuberculosis (q.v.) — " scrofulous," " strumous " and " tuberculous " being nearly interchangeable. The particular characters associated with " scrofula " have, therefore, varied at different periods.

when the real nature of the disease was misunderstood; but essentially what was meant was tuberculosis of the bones and lymphatic glands, with its attendant symptoms, and it is in this sense that the word survives. The old English popular name was " king's evil," so called from the belief that the sovereign's touch could effect a cure. This superstition can be traced back to the time of Edward the Confessor in England, and to a much earlier period in France. Samuel Johnson was touched by Queen Anne in 171 2, and the same prerogative of royalty was exercised by Prince Charles Edward in 1745.

SCROGGS, SIR WILLIAM (c. 1623-1683), lord chief justice of England, was the son of a butcher of sufficient means to give his son a university education. Scroggs went to Oriel College, and later to Pembroke College, Oxford, where he graduated in 1640, having acquired a fair knowledge of the classics. There is some evidence that he fought on the royalist side during the Civil War. In 1653 he was called to the bar, and soon gained a good practice in the courts. He was appointed a judge of the common pleas in 1676, and two years later was promoted to be lord chief justice, his advancement being due to his unfailing readiness to degrade the administration of justice to serve the purposes of the court. He was a man of

debauched life and coarse and violent manners; and these qualities were con- spicuous in his demeanour on the bench. As lord chief justice Scroggs presided at the trial of the persons denounced by Titus Oates for complicity in the " popish plot," and he treated these prisoners with characteristic violence and brutality, overwhelm- ing them with indecent sarcasm and abuse while on their trial, and taunting them with savage mockery when sentencing them to death. He may at first have been a sincere believer in the existence of a plot; if so he showed himself not less gullible than the ignorant multitude out of doors; at all events he did nothing to test the credibility of such perjured witnesses as Oates, Bedloe and Dangerfield. At the trial in February 1679 of the prisoners accused of the murder of Sir Edmund Godfrey he gave a characteristic exhibition of his methods, indulging in a vituperative tirade against the Roman Catholic religion, and loudly proclaiming his satisfaction in the guilt of the accused. It was only when, in July of the same year, Oates's accusation against the queen's physician, Sir George Wakeman, appeared likely to involve the queen herself in the ramifications of the plot, that Scroggs began to think matters were going too far; he was probably also influenced by the discovery that the court regarded the plot with discredit and disfavour, and that the country party led by Shaftesbury had less influence than he had supposed with the king. The chief justice on this occasion threw doubt on the trustworthiness of Bedloe and Oates, and warned the jury to be careful in accepting their evidence. This change of front inflamed public opinion against Scroggs, for the popular belief in the plot was still undiminished. Scroggs, however, was no less violent than before against Catholic priests who came before him for trial, as he showed when he sentenced Andrew Bromwich to death at Stafford in the summer of 1679; but his proposing the duke of York's health at the lord mayor's dinner a few months later in the presence of Shaftesbury indicated his determination not to support the Exclusionists against the known wishes of the king. Acting in the assurance of popular sympathy, Oates and Bedloe now arraigned the chief justice before the privy council for having discredited their evidence and misdirected the jury in the Wakeman case, accusing him at the same time of several other misdemeanours on the bench, including a habit of excessive drinking and bad language. In January 1680 the case was argued before the council and Scroggs was acquitted. At the trials of Elizabeth Cellier and of Lord Castle- maine in June of the same year, both of whom were acquitted, he discredited Dangerfield's evidence, and on the former occasion committed the witness to prison. In the same month he dis- charged the grand jury of Middlesex before the end of term in order to save

the duke of York from indictment as a popish recusant, a proceeding which the House of Commons declared to be illegal, and which was made an article in the impeach- ment of Scroggs in January 1681. The dissolution of parlia-

ment put an end to the impeachment, but in April Scroggs was removed from the bench with a pension; he died in London on the 25th of October 1683.

Scroggs was perhaps the worst of the judges who disgraced the English bench at a period when it had sunk to the lowest degradation; and although his infamy is less notorious than that of Jeffreys, his character exhibited fewer redeeming features. Scroggs was the author of a work on the Practice of Courts-Leet and Courts-Baron (London, 1701), and he edited reports of the state trials over which he presided. He was the subject of many contemporary satires.

See W. Cobbett, Complete Collection of State Trials (vols. i.-x. of State Trials, 33 vols., London, 1809); Roger North, Life of Lord Guilford, &c, edited by A. Jessopp (3 vols., London, 1890), and Examen (London, 1740); Narcissus Luttrell, A Brief Relation of State Affairs, 1678-1714 (6 vols., Oxford, 1857) ; Anthony a Wood, Alhenae Oxonienses, edited by P. Bliss (4 vols.. London, 1813-1820); Correspondence of the Family of Hatton, edited by E. M . Thompson (2 vols., Camden Soc. 22, 23, London, 1878); Lord Campbell, Lives of the Chief Justices of England (3 vols., London, 1849-1857); Edward Foss, The Judges of England (9 vols., London, 1848-1864); Sir J. F. Stephen, History of the Criminal Law of England (3 vols., London, 1883); Henry B. Irving, Life of Judge Jeffreys (London, 1898). (R. J. M.)

SCROLL, a strip or roll of paper, parchment, &c. The word in Mid. Eng. was scrow, and came from Fr. escrou, modern Scrou; the French form is preserved in the legal term " escrow " (see Deed); the French diminutive escrouel gave the English form " scroll." The Fr. escrou is of Teutonic origin and is connected with "shred," "shard" and "sherd"; and meant a " shred " of paper. The term is sometimes given in architecture to the volute of the Ionic capital, to the termination of the hand- rail of a staircase, and also to the wave-like decorations of Roman red glazed pottery, and more particularly in Samian ware.

SCROPE, the name of an old English family of Norman origin. Sir William le Scrope, of Bolton, in Wensleydale, Yorkshire, had two sons, Henry (d. 1336) and Geoffrey (d. 1340), both of whom were in succession chief justice of the king's bench and prominent supporters

of the court in the reign of Edward II. Henry was father of Richard le Scrope, 1st Baron Scrope of Bolton (c. 1327-1403), chancellor of England, an active adherent of John of Gaunt. Having been knight of the shire of Yorkshire in the parliament of 1364, he was summoned to the upper house as a baron by writ in 137 1, when he was made treasurer and keeper of the great seal. In 1378 Lord Scrope became chancellor, in which office he attempted to curb the extravagance of Richard II., an offence for which he was deprived of office in 1382. Scrope engaged in several disputes with regard to his armorial bearings, the most celebrated of which was with Sir Richard Grosvenor as to his right to the shield blazoned " Azure, a bend or," which a court of chivalry decided in his favour after a controversy extending over four years. Both as a soldier and a statesman Lord Scrope was a man of high attainments, his integrity and prudence being conspicuous. His eldest son William (c. 1350-1399) was created earl of Wiltshire in 1397 by Richard II., of whose evil government he was an active supporter. Wiltshire bought the sovereignty of the Isle of Man from the earl of Salisbury. In 1398 he became treasurer of England. His execution at Bristol was one of the first acts of Henry IV., and the irregular sentence of an improvised court was confirmed by that monarch's first parliament. Wiltshire's father, Lord Scrope, and his other sons were not included in the attainder, but received full pardon from Henry. Scrope, who was the builder of Bolton Castle, his principal residence, died in 1403. He was succeeded in the barony by his second son, Roger, whose descendants held it till 1630. Henry, 9th Baron Scrope of Bolton (1534-1592), was governor of Carlisle in the time of Elizabeth, and as such took charge of Mary Queen of Scots when she crossed the border in 1568; and he took her ta Bolton Castle, where she remained till January 1569. He was grandfather of Emmanuel Scrope, nth baron (1584-1630), who was created earl of Sunderland in 1627; on his death without legitimate issue in 1630 the earldom became extinct, and

the immense estates of the Scropes of Bolton were divided among his illegitimate children, the chief portion passing by- marriage to the marquis of Winchester, who was created duke of Bolton in 1689; to the Earl Rivers; and to John Grubham Howe, ancestor of the earls of Howe. The barony of Scrope of Bolton seems then to have become dormant; but the title might, it would appear, be claimed through the female line by the representative of Charles Jones (d. 1840) of

Caton, Lancashire. From Stephen, third son of the 1st Baron Scrope of Bolton, were descended the Scropes of Castle Combe, Wiltshire, the last of whom was William Scrope (1772-1852), an artist and author, who was an intimate friend of Sir Walter Scott. His daughter married George Poulett Thompson (1 797-1876), an eminent geologist and prolific political writer, who took the name of Scrope, and who after his wife's death sold Castle Combe, of which he wrote a history. Probably from the same branch of the family was descended Adrian Scrope, or Scroope (1601-1660), who was prominent on the parliamentarian side in the Civil War, and one of the signatories of Charles I.'s death warrant.

Sir Geoffrey le Scrope (d. 1340), chief justice of the king's bench as mentioned above, uncle of the first Baron Scrope of Bolton, had a son Henry (1315-1391), who in 1350 was summoned to parliament by writ as Baron Scrope, the designation " of Masham " being added in ths time of his grandson to distinguish the title from that held by the elder branch of the family. Henry's fourth son was Richard le Scrope (c. 1350- 1405), archbishop of York, who took part with the Percies in opposition to Henry IV., and was beheaded for treason in June 1405. Henry le Scrope, 3rd Baron Scrope of Masham (c. 1376-1415), was a favourite of Henry V., by whom he was made treasurer in 1410 and employed on diplomatic missions abroad. But in 141 5 he was concerned in a conspiracy to de- throne Henry and was executed at Southampton, when his title was forfeited. It was, however, restored to his brother John m x 455; an d it fell into abeyance on the death, in 1517, of Geoffrey, nth Baron Scrope of Masham, without male heirs.

See Sir N. H. Nicolas, The Scrope and Grosvenor Controversy (2 vols., London, 1832), containing much detailed information about the various branches of the Scrope family; J. H. Wylie, History of England under Henry IV. (4 vols., London, 1884-1898); Edward Foss, The Judges of England (9 vols., London, 1848-1864); G. P. Scrope, History of the Manor and Ancient Barony of Castle Combe, Wilts (London, 1852) ; G. E. C, Complete Peerage, vol. vii. (London, 1896). (R. J. M.)

SCROPE, GEORGE JULIUS POULETT (1 797-1876), English geologist and political economist, was born on the 10th of March 1797, the second son of J. Poulett Thompson of Waverley Abbey, Surrey. He was educated at Harrow, and for a short time at Pembroke College, Oxford, but in 1816 he entered St John's College, Cambridge, graduated B.A. in 1821, and through the influence of E. D.- Clarke and Sedgwick became interested in mineralogy and

geology. During the winter of 1816-1817 he was at Naples, and was so keenly interested in Vesuvius that he renewed his studies of the volcano in 1818; and in the following year visited Etna and the Lipari Islands. In 1821 he married the daughter and heiress of William Scrope of Castle Combe, Wiltshire, and assumed her name; and he entered parliament in 1833 as M.P. for Stroud, retaining his seat until 1868. Meanwhile he began to study the volcanic regions of Central France in 1821, and visited the Eifel district in 1823. In 1825 he published Considerations on Volcanos, leading to the establishment of a new theory of the Earth, and in the following year was elected F.R.S. This earlier work was subsequently amplified and issued under the title of Volcanos (1862): an authoritative text-book of which a second edition was published ten years later. In 1827 he issued his classic Memoir on the Geology of Central France, including the Volcanic formations of Auvergne, the Velay and the Viwrais, a quarto volume illustrated by maps and plates. The substance of this was reproduced in a revised and somewhat more popular form in The Geology and extinct Volcanos of Central France (1858). Scrope was awarded the Wollaston Medal by the Geological Society in 1867. Among his other works was the History of the Manor and Ancient

Barony of Castle Combe (printed for private circulation, 1852). He died at Fairlawn near Cobham in Surrey on the 19th of January 1876.

Biography (with portrait) in Geol. Mag. for May 1870.

SCROPHULARIACEAE, in botany, a natural order of seed- plants belonging to the sympetalous section of Dicotyledons, and a member of the series Tubiflorae. It is a cosmopolitan order containing about 180 genera with about 2000 species; the majority occur in temperate regions, the numbers diminishing rapidly towards the tropics and colder regions. About 30% of the species are annual herbs, such as eyebright (Euphrasia officinalis), cow- wheat (Melampyrum), and species of Veronica-

Fig. 1. — Foxglove (Digitalis purpurea).

1, Corolla cut open showing the

four stamens, rather more than J nat. size

2 , Unripe fruit cut lengthwise,

3,

showing the thick axial placenta bearing numerous small seeds. Ripe capsule split open.

more than 60% are biennial or generally perennial herbs and undershrubs, such as species of Veronica, mullein (Verbascum), foxglove (Digitalis; fig. 1), &c, while shrubs and trees are rare; Paulownia, a native of the mountains of Japan, a tree with large leaves and handsome panicles of violet flowers, is grown in European gardens.

The stem is sometimes prostrate and creeping, as in ivy-leaved toad-flax (Linaria Cymbalaria) and some of the native British Veronicas, but generally erect as in foxglove, figwort, mullein, &c. ; a few are climbers as Rhodochiton and Maurandia. The South African genera Hyobanche and Karveya are parasites almost devoid of chlorophyll with scale-like leaves; and many genera are semipara- sitic, having green leaves, but attaching themselves by root-suckers to roots of grass, &c., from which they derive part of their nourish- ment; such are Euphrasia, Rhinanthus, Pedicularis, &c. A few

genera are aquatic, e.g. Ambulia (old world tropics), and have much divided submerged leaves and entire aerial leaves. The leaf-arrange- ment varies ; the leaves are alternate as in Verbascum, or the lower leaves are opposite and the upper alternate as in Antirrhinum (snap-dragon), or all are opposite (Mimulus), or whorled (some Veronicas). All varieties of leaf-arrangement are found in the one genus Veronica (q.v.), in some New Zealand species of which the leaves are small and appressed to the stem. The flowers are solitary in the leaf axils, as in Mimulus, species of Linaria, &c, or form spikes or racemes which are terminal as in foxglove, species of Veronica, &c, or axillary as in Veronica (Chamaedrys section). Cymose inflorescences also occur, as in Verbascum, consisting of dichasia arranged in spikes, racemes or panicles. The flowers are hermaphrodite, hypogynous and zygo morphic in the median plane, being often more or less two-lipped, and having five sepals joined below and persisting in the fruiting stage five petals uniting to form a corolla of very various shape, generally four stamens, the fifth (posterior) being suppressed or represented by a rudiment, while the anterior pair are longer than the posterior, and two generally equal carpels in the median plane forming a two-celled ovary containing numerous anatropous ovules on a thick axile placenta, and bearing a

simple or bilobed style (fig. 2).

Fig. 2a.

Fig. 2b.

Fig. 2c.

Fig. 2. — Floral Diagrams of Scrophulariaceae. a, Linaria. b, Veronica, c, Verbascum. When a terminal flower is present it becomes regular as in toad- flax, where radial symmetry is produced by development of a spur to each petal — such flowers are termed peloric; all the flowers in a spike are sometimes peloric. In Euphrasia and many species of Veronica the posterior sepal is suppressed, and in Calceolaria the anterior petals are completely united. The form of the corolla shows great variety, depending on the length and breadth of the tube — which in Veronica is almost obsolete, while in foxglove it is large and almost bell-shaped — and the development of the limbs, which are spreading in Veronica, small and almost erect in figwort, or form a pair of closed lips as in Linaria and Antirrhinum. In Linaria the anterior petal is spurred ; in Calceolaria a very short tube is succeeded by a two-lipped limb, a smaller upper lip representing the two posterior petals and a larger, often very large, lower lip representing the three anterior petals. In Verbascum the five segments are almost equal, forming a nearly regular corolla; in Veronica the two posterior petals have united and the corolla is four-lobed. The approach to regularity in the corolla in Verbascum is associated with the presence of five fertile stamens, but the three posterior are generally larger than the two anterior. In Veronica, Calceolaria and other genera only two stamens are present. The anthers generally open introrsely by a longitudinal slit ; their form shows great variety. These differences in the form of the corolla, the position and length of the stamens and the form of the anthers, are associated with their pollination by insects which probe the flower for honey, which is secreted by a disk surrounding the base of the ovary or by special nectaries below it. Verbascum and Veronica with a short-tubed corolla represent an open type of flower with more exposed nectar; in foxglove the honey is at the base of the long tube, and a bee crawling to reach it will rub with its back the anthers or stigmas which are placed on the upper side of the bell. The closed flowers of Linaria and Antirrhinum can be visited only by insects which are strong enough to separate the lips. In Euphrasia and others the pollen is loose and powdery, and the anthers have appendages which when touched by the head of the insect-visitor cause the pollen to be scattered.

The fruit is generally a capsule surrounded at the base, or sometimes as in yellow-rattle (Rhinanthus) enveloped in the persistent calyx; it opens by two or four valves, or, as in Antirrhinum, by pores. Occasionally it is a berry. The seeds are generally small and numerous, rarely few and large as in Veronica. In Linaria Cymbalaria the fruit becomes buried by the stalks bending downwards when ripe.

The order is divided into tribes by characters derived from the number of fertile stamens present and the form of the corolla. It is well represented in Britain by 13 genera, viz. Verbascum (mullein), Linaria (toad-flax), Antirrhinum (snapdragon), Scrophularia (figwort), Limosella — a small creeping annual found on edges of ponds, Sibthorpia, a small herb with creeping thread-like stems, Digitalis (foxglove), Veronica (speedwell), Bartsia, Euphrasia (eyebright), Rhinanthus (yellow-rattle), Pedicularis (louse- wort) and Melampyrum (cow- wheat). An American species of Mimulus (M. Langsdorfii) has become naturalized by river-sides in many places. Several genera are well known in gardens; such are Calceolaria, an important genus in temperate South America, Collinsia, Pentstemon and Mimulus (musk), also American genera.

Scrophulariaceae are closely allied to Solanaceae {q.v.), from which they are distinguished by the median position of the carpels, and generally by the zygomorphic flower; Verbascum and its allies, in which the flower approaches regularity, form a connecting link. An anatomical distinction is found in the arrangement of the wood and bast in the stem, which is collateral, not bicollateral as in Solanaceae.

SCRUB-BIRD, the name of an Australian genus, one of the most curious ornithological types of the many furnished by that country. The first examples were procured between Perth and Augusta in West Australia, and were described by J. Gould in the Zoological Society's Proceedings for 1844 (pp. 1, 2) as forming a new genus and species under the name of Atrichia clamosa, the great peculiarity observed by that naturalist being the absence of any bristles around the gape, in which respect alone it seemed to differ from the already known genus Sphenura. Later, however, it was given its modern name Atrichornis clamosa, and on account of the discovery of its peculiar sternum (made by A. Newton) it was removed from Oscine division of the Passeres, and the family Atrichornithidae in the sub-oscine division of Passeres was made for the genus, the nearest ally

West-Australian Scrub-bird {Atrichornis clamosa).

being the lyre-bird (q.v.), now placed in the family Menuridae. Both the known species of scrub-bird are about the size of a small thrush — A. clamosa being the larger of the two. This species is brown above, each feather barred with a darker shade; the throat and belly are reddish white, and there is a large black patch on the breast; while the flanks are brown and the lower tail-coverts rufous. A. rufescens of New South Wales has the white and black of the fore-parts replaced by brown, barred much as is the upper plumage. Both species inhabit the thickest " scrub " or brushwood forest; but little has been ascertained as to their mode of life except that the males are noisy, imitative of the notes of other birds, and given to violent gesticulations. The nest and eggs seem never to have been found, and indeed no example of the female of either species is known to have been procured, whence that sex may be inferred to escape observation by its inconspicuous appearance and retiring habits. (A.N.)

SCRUPLE, a term used in the two senses of (1) perplexity, doubt, reluctance or hesitation, especially the moral doubt arising from the difficulties of conscience; (2) a unit of weight, tjSt part of the ounce in apothecaries' weight, = £ of a dram, 20 grains (1-296 grammes). The word is an adaptation of Fr. scrupule, Lat. scrupnlus, scrupulum, primarily a small sharp stone, also used in both the English meanings, dim. of scrupus, a rough stone, figuratively uneasiness of mind, probably to be connected with the root skar, to cut, cf. Gr. anvpov, stone- chippings, fypov, a razor.

SCRUTIN DE LISTE (Fr. scrutin, voting by ballot, and lisle, a list), a system of election of national representatives by which the electors of a department vote for ail the deputies to be elected in that department (compare the " general ticket " in the United States). It is distinguished from the scrutin d'arrondissement, under which the electors in each arrondisse- ment vote only for the deputy to be elected in it. See Repre- sentation.

SCRUTINY (Fr. scrutin, Late Lat. scrutinium, from scrutari, to search or examine thoroughly), careful examination or inquiry. The word is specifically applied in the early church to the ex- amination of the catechumens or those under instruction in the faith. They were taught the creed and the Lord's Prayer, examined therein, and exorcized prior to baptism. The days of scrutiny varied at different

periods from three to seven. From about the beginning of the 1 2th century, when it became usual to baptize infants soon after their birth instead of at stated times (Easter and Pentecost), the ceremony of scrutiny was incorporated with that of the actual baptism. Scrutiny is also a term applied to a method of electing a pope in the Roman Catholic church, in contradistinction to two other methods, acclamation and accession. (See Conclave.) In the law of elections, scrutiny is the careful examination of votes cast after the unsuccessful candidate has lodged a petition claiming the seat, and alleging that he has the majority of legal votes. Each vote is dealt with separately, notice being given beforehand by one party to the other of the votes objected to and the grounds of objection.

SCUDERY, the name of a family said to have been of noble Italian origin and to have transferred itself to Provence, but only known by the singular brother and sister who represented it during the 17th century.

Georges de Scudery (1601-1667), the elder of the pair, was born at Havre, whither his father had moved from Provence, on the 22nd of August 1601. He served in the army for some time, and, though in the vein of gasconading which was almost peculiar to him he no doubt exaggerated his services, there seems little doubt that he was a stout soldier. But he conceived a fancy for literature before he was thirty, and during the whole of the middle of the century he was one of the most characteristic figures of Paris. He gained the favour of Richelieu by his opposition to Corneille. He wrote a letter to the Academy criticizing the Cid, and his play, L' Amour tyrannique (1640), was patronized by the cardinal in opposition to Corneille. Possibly these circumstances had something to do with his appointment as governor of the fortress of Notre-Dame de la Garde, near Marseilles in 1643, and in 1650 he was elected to the Academy. During the troubles of the Fronde he was exiled to Normandy, where he made his fortune by a rich marriage. He was an industrious dramatist, but L' Amour tyrannique is practically the only piece among his numerous tragi-comedies and pastorals that has escaped oblivion. His other most famous work was the epic of Alaric (1655). He lent his name to his sister's first romances, but did little beyond correcting the proofs. He died at Paris on the 14th of May 1667. Scudery's swash- buckler affectations have been rather exaggerated by literary gossip and tradition. Although possibly not quite sane, he had some poetical power, a fervent love of literature, a high sense of honour and of friendship.

His sister Madeleine (1607-1701), born also at Havre on the 15th of

November 1607, was a writer of much more ability and of a much better regulated character. She was very plain and had no fortune, but her abilities were great and she was very well educated. Establishing herself at Paris with her brother, she was at once admitted to the Rambouillet coterie, afterwards established a salon of her own under the title of the SociUt du samedi, and for the last half of the 17th century, under the pseudonym of " Sapho " or her own name, was acknowledged as the first blue-stocking of France and of the world. She formed with Pellisson a close friendship only terminated by his death in 1693. Her lengthy novels, such as Artamene, ou le Grand Cyrus (10 vols. 1648-1653), CUlie (10 vols. 1654-1661),

Ibrahim, ou Villustre Bassa (4 vols. 1641), Almahide, ou I'esclave reine (8 vols. 1661-1663) were the delight of all Europe, including persons of the wit and sense of Madame de Sevigne. But neither in conception nor in execution will they bear criticism as wholes. With classical or Oriental personages for nominal heroes and heroines, the whole language and action are taken from the fashionable ideas of the time, and the personages can be identified either really or colourably with Mademoiselle de Scudery's contemporaries. In Clelie, Herminius represents Paul Pellisson; Scaurus and Lyriane were Paul Scarron and his wife (afterwards Mme de Maintenon); and in the description of Sapho in vol. x. of Le Grand Cyrus the author paints herself. It is in Clelie that the famous Carte de Tendre appeared, a description of an Arcadia, where the river of Inclination waters the villages of Billet Doux, Petits Soins and so forth. The interminable length of the stories is made out by endless conversations and, as far as incidents go, chiefly by successive abductions of the heroines, conceived and related in the most decorous spirit, for Mademoiselle de Scudery is nothing if not decorous. Nevertheless, although the books can hardly now be read through, it is still possible to perceive their attraction for a period which certainly did not lack wit. In that early day of the novel prolixity did not repel. " Sapho " had really studied mankind in her contemporaries and knew how to analyse and describe their characters with fidelity and point. Moreover her novels had the interest always attaching to the rotnan A clef. She was a real mistress of conversation, a thing quite new to the age as far as literature was concerned, and proportionately welcome. She had a distinct vocation as a pedagogue, and is compared by Sainte-Beuve to Mme de Genlis. She could moralize — a favourite employment of the time — with sense and propriety. Though she was incapable of the exquisite prose of Mme de Sevigne and some other of her contemporaries, her purely literary merits

were considerable. Madeleine survived her brother more than thirty years, and in her later days published numerous volumes of conversations, to a great extent extracted from her novels, thus forming a kind of anthology of her work. She outlived her vogue to some extent, but retained a circle of friends to whom she was always the " incomparable Sapho." She died in Paris on the 2nd of June 1701.

Her Life and Correspondence were published at Paris by MM. Rathery and Boutron in 1873. An amusing sketch of her is to be found in vol. iv. of Sainte-Beuve's Causeries du lundi. Georges de Scudery is sketched by Theophile Gautier in his Grotesques. See also V. Cousin, La Sociite francaise au X VII' siecle, vol. ii.

SCULL (the same word as " skull," cf. Swed. sk&l, basin, hufvud-skal, skull of the head), a light oar with blade more concave than the ordinary racing oar and with shorter helm, thus allowing the user to hold one in each hand. " Sculling " is therefore the propulsion of a boat by one person with a pair of sculls. The word is also applied to the propulsion of a boat by one scull worked over the stern, the blade being swept through the water from side to side, turning diagonally at each stroke; the sculler usually stands. The principles of sculling with a pair of sculls are the same as those of rowing (q.v.). For the type of boat used in racing see Boat. The Wingfield Sculls, a race which forms the English Amateur championship, was instituted in 1830. It is rowed from Putney to Mortlake. The Diamond Challenge Sculls, instituted in 1844, are rowed for at Henley Regatta. The earliest professional championship sculling race was rowed on the Thames in 183 1. Since 1876, when an Australian (E. Trickett, of Sydney) beat J. H. Sadler, the professional championship of the world has been held by Australians or Canadians; the principal Champions have been E. Hanlan (Toronto), 1880-1884, W. Beach (New South Wales), 1884-1887; other names are H. E. Searle, J. Stanbury, G. Towns and R. Arnst (New Zealand) . Most of the races have been rowed on the Paramatta river. In August 19 10 the race was rowed on the Zambezi between E. Barry of England and Arnst, the latter winning.

SCULLERY, a back-kitchen, the place where dishes, plates, kettles, &c, are washed and cleaned, and the rough work connected with the domestic service of a house is performed. The Med.

Lat. scutellarius, keeper of dishes and plates (scutella), became in O. Fr. escueillier or sculier, whence in English sculler, squiler, &c. A " sergeaunt-squylloure " is found amongst the officials of the royal household; and the Promptorium parvulorum, dating about 1400, glosses lixa, a sutler or camp-cook, by " squyllare, dysche-wescheare." " Scullion," a kitchen- wench, has been naturally connected with scullery, but is derived from O. Fr. escouillon, dish-cloth, cf . Span, escobillon, spring for a gun, ultimately from Lat. scopa, birch tree, scopae, broom of birch twigs.

SCULPTURE (Lat. sculptura, from sculpere, to carve, cognate with Gr. y\vav), a general term for the plastic art of carving, especially in stone and marble, but also in such materials as wood (see Wood-carving), ivory (see Ivory), metal (see Metal- work) and gems (see Gem).

The production of bronze statues by the cire perdue (anglice, " lost wax ") process is described in the article Metal-work; Technical unt 'l (since its revival) recent times but little practised methods in Europe outside of Paris, it has now invaded most of the countries where fine casting is appreciated, and where

sculptor, naturalistic rendering is desired. There are signs, however, of its being ousted for a certain class of handling by the " galvanoplastic " method — a system of copper deposit by an electrical process — whereby " going over " the work after it has been reproduced in metal is avoided.

For the execution of a marble statue the sculptor first models a finished preliminary sketch on a small scale in clay or wax. He then, in the case of a life-size or colossal statue, model. nas a sort °f ' ron skeleton set up, with stout bars for the arms and legs, fixed in the pose of the future figure. This is called the " armature." It is placed on a stand, called a chassis, with a revolving top, so that the sculptor can easily turn the whole model round and thus work with the light on any side of it. Over this iron skeleton well- tempered modelling-clay is laid and is modelled into shape by the help of wood and bone tools; without the sustaining assistance of the ironwork a soft clay figure, if more than a few inches high, would collapse with its own weight and squeeze the lower part out of shape. While the modelling is in progress it is necessary to keep the clay moist and plastic by squirting water on to it with a sort of garden syringe capped with a finely perforated rose. When the sculptor is not at work the whole figure is kept wrapped up in damp cloths. A modern improvement is to mix the modelling-clay, not with water, but with stearin and

glycerin; this, while keeping the clay soft and plastic, has the great advantage of not being wet, and so the sculptor avoids the chill and consequent risk of rheumatism which follow from a constant manipulation of wet clay. This method, however, has not been very exten- sively adopted. When the clay model is finished it is cast in plaster. A " piece-mould " 1 is formed by applying patches of wet plaster of Paris all over the clay statue in such a way that they can be removed piecemeal from the model, and then be fitted together again, forming a complete hollow mould. The inside is then rinsed out with plaster and water mixed to the consistency of cream till a skin of plaster is formed all over the inner surface of the mould, and thus a hollow cast is made of the whole figure. The " piece-mould " is then taken to pieces and the casting set free. If skilfully done by a good formalore or moulder the plaster cast is a perfect facsimile of the original clay, very slightly disfigured by a series of lines showing the joints in the piece-mould, the sections of which cannot be made to fit together with absolute precision. Many sculptors have their clay model cast in plaster before the modelling is quite finished, as they prefer to put the finishing touches on the plaster cast — good plaster being -a very easy and pleasant substance to work on.

The next stage is to copy the plaster model in marble. The model is set on a large block called a " scale stone," while the

1 Moulds made in one or few pieces, from which the cast can only be extracted by destroying the mould, are called " spoil-moulds." A large number of casts can be made from a " piece-mould," but only one from a " spoil-mould."

marble for the future statue is set upon another similar block. The plaster model is then covered with a series of marks, placed on all the most salient parts of the body, and the front of each " scale stone " is covered with another series of Pointing points, exactly the same on both stones. An ingenious marble. instrument called a pointing machine, which has arms ending in metal points or " needles " that move in ball-socket joints, is placed between the model and the marble block. Two of its arms are then applied to the model, one touching a point on the scale stone while the other touches a mark on the figure. The arms are fixed by screws in this position, and the machine is then revolved to the marble block, and set with its lower needle touching the corresponding point on the scale stone. The upper needle, which is arranged to slide back on its own axis, cannot reach the corresponding point on the statue because the marble block is in the way; a hole is then drilled into the block at the place and in the direction indicated by the needle, till the latter can slide forward

so as to reach a point sunk in the marble block exactly corresponding to the point it touched on the plaster mould. This process is repeated both on the model and on the marble block till the latter is drilled with a number of holes, the bottoms of which correspond in position to the number of marks made on the surface of the model. A comparatively unskilled scarpellino or " chisel-man " then sets to work and cuts away the marble till he has reached the bottoms of all the holes, beyond which he must not cut. The statue is thus roughly blocked out, and a more skilled scarpellino begins to work. Partly by eye and partly with the constant peuˆoT help of the pointing machine, which is used to give any required measurements, the workman almost completes the marble statue, leaving only the finishing touches to be done by the sculptor. In the opinion of many artists the use of the mechanical pointing-machine is responsible in a great measure for the loss of life and fire in much of modern sculpture.

Among the ancient Greeks and Romans and in the medieval period it was the custom to give the nude parts of a marble statue a considerable degree of polish, which really suggests the somewhat glossy surface of the human skin very marble ." much better than the full loaf-sugar-like surface which is left on the marble by most modern sculptors. This high polish still remains in parts of the pedimental figures from the Parthenon, where, at the back, they have been specially protected from the weather. The Hermes of the Vatican Belvidere is a remarkable instance of the preservation of this polish. Michel- angelo carried the practice further still, and gave certain parts of some of his statues, such as the Moses, the highest possible polish in order to produce high lights just where he wanted them ; the artistic legitimacy of this may perhaps be doubted, and in weak hands it might degenerate into mere trickery. It is, however, much to be desired that modern sculptors should to some extent at least adopt the classical practice, and by a slight but uniform polish remove the disagreeable crystalline grain from all the nude parts of the marble.

A rougher method of obtaining fixed points to measure from was occasionally employed by Michelangelo and earlier sculptors. They immersed the model in a tank of water, the water being gradually allowed to run out, and thus by its sinking level it gave a series of contour lines on any required number of planes. In some cases Michelangelo appears to have cut his statue out of the marble without previously making a model — a marvellous feat of skill.

In modelling bas-reliefs the modern sculptor usually applies the clay

to a slab of slate on which the design is sketched; the slate forms the background of the figures, and thus keeps the relief absolutely true to one plane. This Relief

method is one of the causes of the dulness and want ture.

of spirit so conspicuous in most modern sculptured reliefs. In the best Greek examples there is no absolutely fixed plane surface for the backgrounds. In one place, to gain an effective shadow, the Greek sculptor would cut below the average surface; in another he would leave the ground at a higher plane,

exactly as happened to suit each portion of his design. Other differences from the modern mechanical rules can easily be seen by a careful examination of the Parthenon frieze and other Greek reliefs. Though the word " bas-relief " is now often applied to reliefs of all degrees of projection from the ground, it should, of course, only be used for those in which the projection is slight; " basso," " mezzo " and " alto rilievo " express three different degrees Of salience. Very low relief is but little used by modern sculptors, mainly because it is much easier to obtain striking effects with the help of more projection. Donatello and other 1 5th-century Italian artists showed the most wonderful skill in their treatment of very low relief. One not altogether legitimate method of gaining effect was practised by some medieval sculptors: the relief itself was kept very low, but was " stilted " or projected from the ground, and then undercut all round the outline. A 15th-century tabernacle for the host in the Brera at Milan is a very beautiful example of -this method, which as a rule is not pleasing in effect, since it looks rather as if the figures were cut out in cardboard and then stuck on (see Relief).

The practice of most modern sculptors is to do very little to the marble with their own hands; some, in fact, have never

*really learnt how to carve, and thus the finished assistants. statue * s often very dull and lifeless in comparison*

with the clay model. Most of the great sculptors of the middle ages left little or nothing to be done by an assistant; Michelangelo especially did the whole of the carving with his own hands, and when

beginning on a block of marble attacked it with such vigorous strokes of the hammer that large pieces of marble flew about in every direction. But skill as a carver, though very desirable, is not absolutely necessary for a sculptor. If he casts in bronze by the cire perdue process he may produce the most perfect plastic works without touching anything harder than the modelling-wax. The sculptor in marble, however, must be able to carve a hard substance if he is to be master of his art. Unhappily some modern sculptors not only leave all manipulation of the marble to their workmen, but they also employ men to do their modelling, colloquially termed " ghosts," the supposed sculptor supplying little or nothing but his sketch and his name to the work. The practice, however, is less common nowadays than formerly ,owing mainly to one or two exposures which brought the matter sharply before the public. In some cases sculptors of ability who suffer under an excess of popularity are induced to employ aid of this kind on account of their undertaking more work than any one man could possibly accomplish — a state of things which is necessarily very hostile to the interests of true art. As a rule, however, the sculptor's scarpcllino, though he may and often does attain the highest skill as a carver and can copy almost anything with wonderful fidelity, seldom develops into an original artist. The popular admiration for pieces of clever trickery in sculpture, such as the carving of the open meshes of a, fisherman's net, or a chain with each link free and movable, or a veil over and half revealing the features of the face, would perhaps be diminished if it were known that such work as this is invariably done, not by the sculptor, but by . the scarpellino. Unhappily at the present day there is, especially in England, little apprecia- tion of what is valuable in plastic art ; there is probably no other civilized country where the State does so little to give practical support to the advancement of monumental and decorative sculpture on a large scale — the most important branch of the art — which it is hardly in the power of private persons to further.

It may here be well to say a few words on the technical methods employed in the execution of medieval sculpture, which in the

main were very similar in England, France and Germany. thd When bronze was used — in England as a rule only for me i the effigies of royal persons or the richer nobles — the metal

"m t rials was cast ˆY the delicate cire perdue process, and the whole ae ' surface of the figure was then thickly gilded. At Limoges in France a large number of sepulchral effigies were produced, especi- ally between 1300 and 1400, and exported to distant places. These

were not cast, but were made of hammered (repousse' — q.v.) plates of copper, nailed on a wooden core and richly decorated with champleve'

enamels in various bright colours. Westminster Abbey possesses a fine example, executed about 1 300, in the effigy of William of Valence (d. 1296). l The ground on which the figure lies, the shield, the border of the tunic, the pillow, and other parts are decorated with these enamels very minutely treated. The rest of the copper was gilt, and the helmet was surrounded with a coronet set with jewels, which are now missing. One royal effigy of later date at Westminster, that of Henry V. (d. 1422), was formed of beaten silver fixed to an oak core, with the exception of the head, which appears to have been cast. The whole of the silver disappeared in the time of Henry VIII., and nothing now remains but the rough wooden core; hence it is doubtful whether the silver was decorated with enamel or not; it was probably of English workmanship.

In most cases stone was used for all sorts of sculpture, being decorated in a very minute and elaborate way with gold, silver and colours applied over the whole surface. In order to give additional richness to this colouring the surface of the stone, often even in the case of external sculpture, was covered with a thin skin of gesso or fine plaster mixed with size; on this, while still soft, and over the drapery and other accessories, very delicate and minute patterns were stamped with wooden dies, and upon this the gold and colours were applied; thus the gaudiness and monotony of flat smooth surfaces covered with gilding or bright colours were avoided. 2 In addition to this the borders of drapery and other parts of stone statuesjwere frequently ornamented with crystals and false jewels, or, in a more laborious way, with holes and sinkings filled with polished metallic foil, on which very minute patterns were painted in trans- parent varnish colours; the whole was then protected from the air by small pieces of transparent glass, carefully shaped to the right sizt and fixed over the foil in the cavity cut in the stone. It is difficult now to realize the extreme splendour of this gilt, painted and jewelled sculpture, as no perfect example exists, though in many cases traces remain of all these processes, and show that they were once very widely applied. 3 The architectural surroundings of the figures were treated in the same elaborate way. In the 14th century in England alabaster came into frequent use for monumental sculpture; it too was decorated with gold and colour, though in some cases the whole surface does not appear to have been so treated. In his wide use of coloured decoration, as in other respects, the medieval sculptor came far nearer to the ancient Greek than do any

modern artists. Even the use of inlay of coloured glass was common at Athens during the 5th century B.C. — as, for example, in the plait-band of some of the marble bases of the Erechtheum — and five or six centuries earlier at Tiryns and Mycenae.

Another material much used by medieval sculptors was wood, though, from its perishable nature, comparatively few early examples survive; 4 the best specimen is the figure of George de Cantelupe (d. 1273) in Abergavenny church. This was decorated with gesso reliefs, gilt and coloured in the same way as the stone. The tomb of Prince John of Eltham (d. 1334) at Westminster is a very fine example of the early use of alabaster, both for the recumbent effigy and also for a number of small figures of mourners all round the arcading of the tomb. These little figures, well preserved on the side which is protected by the screen, are of very great beauty and are executed with the most delicate minuteness; some of the heads are equal to the best contemporary work of the son and pupils of Niccola Pisano. The tomb once had a high stone canopy of open work — arches, canopies and pinnacles — a class of architectural sculpture of which many extremely rich examples exist, as, for instance, the tomb of Edward II. at Gloucester, the de Spencer tomb at Tewkesbury, and, of rather later style, the tomb of Lady Eleanor Fitzalan de Percy at Beverley. This last is remarkable for the great richness and beauty of its sculptured foliage, which is of the finest Decorated period and stands unrivalled by any Continental example. The condition of this shrine (erected about 1335 to 1 340) is almost perfect.

On technical methods, see (specially for the explanation of modelling, &c.) Edward Lanteri, Modelling (London, vol. I, 1903, vol. 2, 1904, vol. 3, 1910), and Albert Toft, Modelling and Sculpture (London, 1910). These volumes give in detail every process and method of the sculptor's craft with a fulness to be found in no other works of their class in the English language.

1 Other effigies from Limoges were imported into England, but no other example now exists in the country.

2 In the modern attempts to reproduce the medieval polychromy these delicate surface reliefs have been omitted; hence the painful results of such colouring as that in Notre- Dame and the Sainte Chapelle in Paris and many other " restored " churches, especially in France and Germany.

3 On the tomb of Aymer de Valence (d. 1 326) at Westminster a

good deal of the stamped gesso and coloured decoration is visible on close inspection. One of the cavities of the base retains a fragment of glass covering the painted foil, still brilliant and jewel-like in effect.

4 The Victoria and Albert Museum possesses a magnificent colossal wood figure of an angel, not English, but Italian work of the 14th century. A large stone statue of about the same date, of French workmanship, in the same museum is a most valuable example of the use of stamped gesso and inlay of painted and glazed foil.

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SCULPTURE

[MEDIEVAL

History

The following general sketch of the history of sculpture is confined mainly to that of the middle ages and modern times. The philosophy and aesthetics of the subject — the relation of sculpture to the other arts and the nature of its appeal to the emotions — are treated in the article Fine Arts. What is known as " classical " sculpture is dealt with under Greek Art and Roman Art; see also, for other allied aspects, China, Art; Japan, Art; Egypt, Art; Byzantine Art; and articles on Metal- work, Ivory, Wood-carving, &c; the article Architecture and allied articles (e.g. Capital); and the articles on the several individual artists.

In the 4th century a.d., under the rule of Constantine's successors, the plastic arts in the Roman world reached the lowest point of degradation to which they ever fell. Christian. Coarse in workmanship, intensely feeble in design, and utterly without expression or life, the pagan sculpture of that time is merely a dull and ignorant imitation of the work of previous centuries. The old faith was dead, and the art which had sprung from it died with it. In the same century a large amount of sculpture was produced by Christian workmen, which, though it reached no very high standard of merit, was at least far superior to the pagan work. Although it shows no increase of technical skill or knowledge of the human form, yet the mere fact that it was inspired and its subjects supplied by a real living faith was quite sufficient to give it a vigour and a dramatic force, which raise it aesthetic- ally far above the expiring efforts of paganism. Apart from ivories (see Ivory), a number of large marble sarcophagi are the chief existing specimens of this early

Christian sculpture. In general design they are close copies of pagan tombs, and are richly decorated outside with reliefs. The subjects of these are usually scenes from the Old and New Testaments. From the former those subjects were selected which were supposed to have some typical reference to the life of Christ: the Meeting of Abraham and Melchisedec, the Sacrifice of Isaac, Daniel among the Lions, Jonah and the Whale, are those which most frequently occur. Among the New Testament scenes no repre- sentations occur of Christ's, sufferings; 1 the subjects chosen illustrate his power and beneficence: the Sermon on the Mount, the Triumphal Entry into Jerusalem, and many of his miracles are frequently repeated. The Vatican and Lateran museums are rich in examples of this sort. One of the finest in the former collection was taken from the crypt of the old basilica of St Peter; it contained the body of a certain Junius Bassus, and dates from the year 359. Many other similar sarcophagi were made in the provinces of Rome, especially Gaul; and fine specimens exist in the museums of Aries, Marseilles and Aix; those found in Britain are of very inferior workmanship.*

Sculpture in the round, with its suggestion of idol worship which was offensive to the Christian spirit, was practically non-existent during this and the succeeding centuries, although there are a few notable exceptions, like the large bronze statue of St Peter 8 in the nave of St Peter's in Rome, which is probably of sth-century workmanship and has much of the repose, dignity and force of antique sculpture.

Italian plastic art in the 5th century continued to create in the spirit of the 4th century, especially reliefs in ivory (to a certain extent imitations of the later consular diptychs), which were used to decorate episcopal thrones or the bindings of MSS. of the Gospels. The so-called chair of St Peter, still preserved (though hidden from sight) in his great basilica, is the finest example of the former class; of less purely classical style, dating from about 550, is'the ivory throne of Bishop Maximianus in Ravenna cathedral. Another very remarkable work of the

1 A partial exception to this rule is the scene of Christ before Pilate, which sometimes occurs.

8 See Dionysius, Sac. Vat. Bas. Cryp., and Bunsen, Besch. d. Stadt Rom (1840).

: There is no ground for the popular impression that this is an antique statue of Jupiter transformed into that of St Peter by the addition of the keys.

5th century is the series of small panel reliefs on the doors of S. Sabina on the Aventine Hill at Rome. There are scenes from Bible history carved in wood, and in them much of the old classic style survives. 4

In the 6th century, under the Byzantine influence of Justinian, a new class of decorative sculpture was produced, especially at Ravenna. Subject reliefs do not often occur, but large slabs of marble, forming screens, altars, pulpits and the like, were ornamented in a very skilful and original way with low reliefs of graceful vine-plants, with peacocks and other birds drinking out of chalices, all treated in a very able and highly decorative manner. Byzantium, however, in the main, became the birth- place and seat of all the medieval arts soon after the transference thither of the headquarters of the empire (see Byzantine Art). It was natural that love of splendour and sumptuousness in the Eastern capital found expression in colour and richness of material rather than in monumental impressiveness. The school of sculpture which arose at Byzantium in the 5th or 6th century was therefore essentially decorative, and not monu- mental; and the skill of the sculptors was most successfully applied to work in metals and ivory, and the carving of foliage on capitals and bands of ornament, possessed of the very highest decorative power and executed with unrivalled spirit and vigour. The early Byzantine treatment of the acanthus or thistle, as seen in the capitals of S. Sophia at Constantinople, the Golden Gate at Jerusalem, and many other buildings in the East, has never since been surpassed in any purely decorative sculpture; and it is interesting to note how it grew out of the dull and lifeless ornamentation which covers the degraded Corinthian capital used so largely in Roman buildings of the time of Constantine and his sons.

Till about the 12th century, and in some places much later, the art of Byzantium dominated that of the whole Christian world in a very remarkable way. The spread of this i n n ueace art was to a great extent due to the iconoclast riots of which not only led to the destruction of images and Byxantlae works of art, but threatened the very life of the artists and craftsmen, who thereupon sought refuge in foreign countries, especially at the court of Charlemagne, and for several centuries determined the course of European art. From Russia to Ireland and from Norway to Spain any given work of art in one of the countries of Europe might almost equally well have been designed in any other. Few or no local characteristics or peculiarities can be detected, except of course in the methods of execution, and even these were wonderfully similar everywhere. The dogmatic unity of the Catholic Church and its great monastic system, with constant

interchange of monkish craftsmen between one country and another, were the chief causes of this widespread monotony of style. An additional reason was the unrivalled technical skill of the early Byzantines, which made their city widely resorted to by the artist-craftsmen of all Europe— the great school for learning any branch of the arts.

The extensive use of the precious metals for the chief works of plastic art in this early period is one of the reasons why so few examples still remain— their great intrinsic value naturally causing their destruction. One of the most important existing examples, dating from the 8th century, is a series of colossal wall reliefs executed in hard stucco in the church of Cividale (Friuli) not far from Trieste. These represent rows of female saints bearing jewelled crosses, crowns and wreaths, and closely resembling in costume, attitude and arrangement the gift-bearing mosaic figures of Theodora and her ladies in S. Vitale at Ravenna. It is a striking instance of the almost petrified state of Byzantine art that so close a similarity should be possible between works executed at an interval of fully two hundred years. Some very interesting small plaques of ivory in the library of St Gall show a still later survival of early forms. The central relief is a figure of Christ in Majesty, closely resembling those in the colossal apse mosaic of S. Apollinare in Classe and other churches

4 Various dates have been assigned to these interesting reliefs by different archaeologists, but the costumes of the figures are strong evidence that they are not later than the 5th century. ,

of Ravenna; while the figures below the Christ are survivals of a still older time, dating back from the best eras of classic art. A river-god is represented as an old man holding an urn, from which a stream issues, and a reclining female figure with an infant and a cornucopia is the old Roman Tellus or Earth- goddess with her ancient attributes. 1

While the countries of the north could not altogether resist the rising tide of Byzantinism, in Scandinavia, and to a great Norse and extent in England, the autochthonous art was not Celtic in- altogether obliterated during the early middle ages. In Oueaces la England,

during the Saxon period, when stone buildings England. were rare an(j even large cathedrals were built of wood, the plastic arts were mostly confined to the use of gold, silver, and gilt copper. The earliest existing specimens of sculpture in stone are a number of tall churchyard crosses, mostly in the northern provinces and apparently the work of Scandinavian sculptors. One very remarkable example is a tall monolithic cross, cut in sandstone, in the churchyard of Gosforth in Cumberland. It is covered with rudely carved reliefs, small in scale, which are of special interest as showing a transitional state from the worship of Odin to that of Christ. Some of the old Norse symbols and myths sculptured on it occur modified and altered into a semi-Christian form. Though rich in decorative effect and with a graceful outline, this sculp- tured cross shows a very primitive state of artistic development, as do the other crosses of this class in Cornwall, Ireland and Scotland, which are mainly ornamented with those ingeniously intricate patterns of interlacing knotwork designed so skilfully by both the early Norse and the Celtic races. 4 They belong to a class of art which is not Christian in its origin, though it was afterwards largely used for Christian purposes, and so is thoroughly national in style, quite free from the usual widespread Byzantine influence. Of special interest from their early date — probably the nth century — are two large stone reliefs now in Chichester cathedral, which are traditionally said to have come from the pre-Norman church at Selsey. They are thoroughly Byzantine in style, but evidently the work of some very ignorant sculptor; they represent two scenes in the Raising of Lazarus; the figures are stiff, attenuated and ugly, the pose very awkward, and the drapery of exaggerated Byzantine character, with long thin folds. To represent the eyes pieces of glass or coloured enamel were inserted ; the treatment of the hair in long ropelike twists suggests a metal rather than a stone design.

The Romanesque period in art was essentially one of archi- tectural activity. The spirit of the time did not encourage that individual thought which alone can produce a great development of sculpture and painting. Thus sculpture. tne plastic art of the nth and 12th centuries, which was still entirely at the service and under the rule of the Church, was strictly confined to conventional symbols, ideas and forms. It is based, not on the study of nature, but on the late Roman reliefs. The treatment of the figures, though often rude and clumsy, and sometimes influenced by Byzantine stiffness, is on the whole dignified, solemn and serious, and bent upon the expression of the typical, and not of the individual. The tympana of the porches, the capitals of columns and the pulpits 'and choir-screens of the

Romanesque churches, and, on a smaller scale, the ivory carvings for book-covers and portable miniature altars, provided the field for the Romanesque sculptors' activity.

In Italy the strong current of hierarchal Byzantinism had never altogether supplanted the antique tradition, though the works based upon the latter, before Niccola Pisano revived

1 On early and medieval sculpture in ivory consult Gori, Thesaurus veterum diptychorum (Florence, 1759); Westwood, Diptychs of Consuls (London, 1862); Didron, Images ouvranles du Louvre (Paris, 1871); William Maskell, Ivories in the South Kensington Museum (London, 1872 & 1875); Wieseler, Diptychon Quirinianum zu Brescia (Gottingen, 1868); Wyatt and Oldneld, Sculpture in Ivory (London, 1856); Alfred Maskell, Ivories (London, 1905), one of the best treatises in the English language; E. Molinier, Les Ivoires; Die Elfenbeinbilder (Berlin Museum, 1903).

s See O'Neill, Sculptured Crosses of Ireland (London, 1857).

Roman'

esque

for a short while the true spirit of the antique, are of almost barbaric rudeness, like the bronze gates of S. Zeno at Verona, and the stone-carving of The Last Supper on the pulpit of S. Ambrogio, in Milan. The real home of Romanesque sculpture was beyond the Alps, in Germany and France, and much of the work done in Italy during the 12th century was actually due to northern sculptors — as, for example, the very rude sculpture on the facade of S. Andrea at Pistoia, executed about 1 186 by Gruamons and his brother Adeodatus, 3 or the relief by Benedetto Antelami for the pulpit of Parma cathedral of the year 11 78. Unlike the sculpture of the Pisani and later artists, these early figures are thoroughly secondary to the architecture they are designed to decorate; they are evidently the work of men who were architects first and sculptors in a secondary degree. After the 13th century the reverse was usually the case, and, as" at the west end of Orvieto cathedral, the sculptured decorations are treated as being Of primary importance — not that the Italian sculptor-architect ever allowed his statues or reliefs to weaken or damage their architectural surroundings, as is unfortunately the case with much modern sculpture. In southern Italy, during the 13 th century, there existed a school of sculpture resembling that of France, owing probably to the Norman occupation. The pulpit in the

cathedral of Ravello, executed by Nicolo di Bartolommeo di Foggia in 1272, is an important work of this class; it is enriched with very noble sculpture, especially a large female head crowned with a richly foliated coronet, and combining lifelike vigour with largeness of style in a very remarkable way. The bronze doors at Monreale (by Barisanus of Trani), Pisa and elsewhere are among the chief works of plastic art in Italy during the 12th century. The history of Italian sculpture of the best period is given to a great extent in the separate articles on the Pisani and other Italian artists. Here it suffices to say that sculpture never became as completely subservient to architecture, as it did in the north, and that with Giovanni Pisano the almost classic repose and dignity of his father Niccola's style gave way — probably owing to northern influences — to an increased sense of life and freedom and dramatic expression. Niccola' stands at the close of the Romanesque, and Giovanni on the' threshold of the Gothic period. During the 13th century Rome and the central provinces of Italy produced very few seulptors of ability, almost the only men of note being the Cosmati.

The power acquired by Germany under the Saxon emperors-, upon whom had descended the mantle of the Roman Caesars, was the chief reason that led to the great development of Romanesque art in Germany. It is true that, < ˆ etman in the nth century, Byzantine influences stifled the Vorfc spontaneous naivete" of the earlier work; but about the end of the 12th century a new free and vital art arose, based upon a better understanding of the antique, and fostered by the rise of feudalism and the prosperity of the cities. Next in importance to the numerous examples of German Romanesque ivory carvings are the works in bronze, in the technique of which the German craftsmen of the pre-Gothic period stand unrivalled. This is seen in the bronze pillar reliefs and other works, notably the bronze gates of Hildesheim Cathedral, produced by Bishop Bernward (d. 1022) after his visit to Rome. Hildesheim, Cologne and the whole of the Rhine provinces Were the most active seats of German sculpture, especially in metal, till the 1 2th century. Many remarkable pieces of bronze sculpture were produced at the end of that period, of which several speci- mens exist. The bronze font at Liege, with figure-subjects in relief of various baptismal scenes from the New Testament, by Lambert Patras of Dinant, cast about 1112, is a work of most wonderful beauty and perfection for its time; other fonts in Osnabrtick, by Master Gerhard, and Hildesheim cathedrals are surrounded by spirited reliefs, fine in conception, but inferior in beauty to those on the Liege font. Fine bronze candelabra exist in the abbey church of Combourg and at Aix-la-Chapelle,

3 The other finest examples of this early class of sculpture exist at Pisa, Parma, Modena and Verona; in most of them the old Byzantine influence is very strong.

France.

the latter of about 1165. Merseburg cathedral has a strange realistic sepulchral figure of Rudolf of Swabia, executed about 1 100; and at Magdeburg is a fine effigy, also in bronze, of Bishop Frederick (d. 1152), treated in a more graceful way. The last figure has a peculiarity which is not uncommon in the older bronze reliefs of Germany: the body is treated as a relief, while the head sticks out and is quite detached from the ground in a very awkward way. One of the finest plastic works of this century is the choir screen of Hildesheim cathedral, executed in hard stucco, one rich with gold and colours; on its lower part is a series of large reliefs of saints modelled with almost classical breadth and nobility, with drapery of especial excellence. In the 13th century German sculpture had made considerable artistic progress, but it did not reach the high standard of France. One of the best examples of the transition period from German Romanesque to Gothic is the " golden gate " of Freiburg cathedral, with sculptured figures on the jambs after the French fashion. The statues of the apostles on the nave pillars, and especially one of the Madonna at the east end (1260-1270), possess great beauty and sculpturesque breadth. Of the same period, and kindred in style and feeling, are the reliefs on the eastern choir-screen in Bamberg cathedral.

France is comparatively poor in characteristic examples of Romanesque sculpture, as the time of the greatest activity coincides with the beginnings of the Gothic style, so that in many cases, as for instance on the porches of Bourges and Chartres cathedrals, Romanesque and Gothic features occur side by side and make it impossible to establish a clear demarcation between the two. Among the most important Romanesque monuments of the early 12th century are the sculptures on the porch of the abbey church of Conques, repre- senting the Last Judgment; the somewhat barbaric tympanum of Autun cathedral (c. 1130); and that of the church of Moissac.

During the 12th and 13th centuries the prodigious activity of the cathedral builders of France and their rivalry to outshine each other in the richness of the sculptured decorations, led to the glorious development that culminated in the full flower of Gothic art. The facades of large cathedrals were completely covered with sculptured reliefs and thick-set rows of statues in niches. The whole of the front was frequently one huge composition of statuary, with only sufficient purely architectural work to form a background and frame for the sculptured figures. A west end treated like that of Wells cathedral, which is almost unique in England, is not uncommon in France. Even the shafts of the doorways and other architectural accessories were covered with minute sculptured decoration, — the motives of which were often, especially during the 12th century, obviously derived from the metal-work of shrines and reliquaries studded with rows of jewels. The west facade of Poitiers cathedral is one of the richest examples; it has large surfaces covered with foliated carving and rows of colossal statues, both seated and standing, reaching high up the front of the church. Of the same century (the 1 2th), but rather later in date, is the very noble sculpture on the three western doors of Chartres cathedral, with fine tympanum reliefs and colossal statues (all once covered with painting and gold) attached to the jamb-shafts of the openings. These latter figures, with their exaggerated height and the

long straight folds of their drapery, are designed with great skill to assist and not to break the main upward lines of the doorways. The sculptors have willingly sacrificed the beauty and proportion of each separate statue for the sake of the architectonic effect of the whole facade. The heads, however, are full of nobility, beauty, and even grace, especially those that are softened by the addition of long wavy curls, which give relief to the general stiffness of the form. The sculptured doors of the north and south aisles of Bourges cathedral are fine examples of the end of the 12th century, and so were the west doors of Notre Dame in Paris till they were hopelessly injured by " restoration." The early sculpture at Bourges is specially interesting from the existence in many parts of its original coloured decoration.

Romanesque sculpture in England, during the Norman period, was of a very rude sort and generally used for the tympanum reliefs over the doors of churches. Christ in Majesty, the Harrowing of Hell and St George period la and the Dragon occur very frequently. Reliefs of the England. zodiacal signs were a common decoration of the richly sculptured arches of the 12th century, and are frequently carved with much power. The later Norman sculptured orna- ments are very rich and spirited, though the treatment of the human figure is still very weak. 1

The best-preserved examples of monumental sculpture of the 12th century are a number of effigies of knights-templars in the round Temple church in London. 2 They are laboriously cut in hard Purbeck marble, and much resemble bronze in their treatment; the faces are clumsy, and the whole figures stiff and heavy in modelling; but they are valuable examples of the military costume of the time, the armour being purely chain-mail. Another effigy in the same church cut in stone, once decorated with painting, is a much finer piece of sculpture of about a century later. The head, treated in an

ideal way with wavy curls, has much simple beauty, showing a great artistic advance. Another of the most remarkable effigies of this period is that of Robert, duke of Normandy (d. 1134), in Gloucester cathedral, carved with much spirit in oak, and decorated with painting. The realistic trait of the crossed legs, which occurs in many of these effigies, heralds the near advent of Gothic art. Most rapid progress in all the arts, especially that of sculpture, was made in England in the second half of the 13th and the beginning of the 14th century, largely under the patronage of Henry III., who employed and handsomely rewarded a large number of English artists, and also imported others from Italy and Spain, though these foreigners took only a secondary position among the painters and sculptors of England. The end of the 13 th century was in fact the culminating period of English art, and at this time a very high degree of excellence was reached by purely national means, quite equalling and even surpassing the general average of art on the Continent, except perhaps in France. Even Niccola Pisano could not have surpassed the beauty and technical excellence of the two bronze effigies in Westminster Abbey modelled and cast by William Torell, a goldsmith and citizen of London, shortly before the year 1300. These are on the tombs of Henry III. and Queen Eleanor (wife of Edward I.), and, though the tomb itself of the former is an Italian work of the Cosmati school, there is no trace of foreign influence in the figures. At this time portrait effigies had not come into general use, and both figures are treated in an ideal way. 3 The crowned head of Henry III., with noble well-modelled features and crisp wavy curls, resemble? the conventional royal head on English coins of this and the following century, while the head of Eleanor is of remarkable, almost classic, beauty, and of great interest as showing the ideal type of the 13th century. In both cases the drapery is well conceived in broad sculpturesque folds, graceful and yet simple in treat- ment. The casting of these figures, which was effected by the cire perdue process, is technically very perfect. The gold em- ployed for the gilding was got from Lucca in the shape of the current florins of that time, which were famed for their purity. Torell was highly paid for this, as well as for two other bronze statues of Queen Eleanor, probably of the same design.

Although the difference between fully developed Gothic sculpture and Romanesque sculpture is almost as clearly marked as the difference between Gothic and Romanesque architecture —

'In Norway and Denmark during the nth and 12th centuries carved ornament of the very highest merit was produced, especially the framework round the doors of the wooden churches ; these are

formed of large pine planks, sculptured in slight relief with dragons and interlacing foliage in grand sweeping curves, — perfect masterpieces of decorative art, full of the keenest inventive spirit and originality.

2 See Richardson, Monumental Effigies of the Temple Church (London, 1843).

3 The effigy of King John in Worcester cathedral of about 1216 is an exception to this rule ; though rudely executed, the head appears to be a portrait.

indeed, the evolution of the two arts proceeded in parallel stages — the change from the earlier to the later style is so gradual and almost imperceptible, that it is all but impossible to follow it step by step, and to illustrate it by examples. What distinguishes the Gothic from the Romanesque in sculpture is the striving to achieve individual in the place of typical expression. This striving is as apparent in the more flexible and emotional treat- ment of the human figure,as it is in the substitution of naturalistic plant and animal forms for the more conventional ornamentation of the earlier centuries. Statuesque architectonic dignity and calmness are replaced by slender grace and soulful expression. The drapery, instead of being arranged in heavy folds, clings to the body and accentuates rather than conceals the form. At the same time, the subjects treated by the Gothic sculptor do not depart to any marked degree from those which fell to the task of the Romanesque workers, though they are brought more within the range of human emotions.

It is only natural that in France, which was the birthplace of Gothic architecture, the sister art of sculpture should have attained its earliest and most striking development. Oothic During the 13th century, the imagiers, or stone in France, sculptors, worked hand in hand with the great cathedral builders. This century may indeed be called the golden age of Gothic sculpture.

While still keeping its early dignity and subordination to its architectural setting, the sculpture reached a very high degree of graceful finish and even sensuous beauty. Nothing could surpass the loveliness of the angel statues round the Sainte Chapelle in Paris,

and even the earlier work on the facade of Laon cathedral is full of grace and delicacy. Amiens cathedral is especially rich in sculpture of this date, — as, for example, the noble and majestic statues of Christ and the Apostles at the west end; the sculpture on the south transept of about 1260-1270, of more developed style, is remarkable for dignity combined with soft beauty. 1 The noble row of kings on the west end of Notre Dame at Paris has, like the earlier sculpture, been ruined by " restoration," which has robbed the statues of both their spirit and their vigour. To the latter years of the 13th century belong the magnificent series of statues and reliefs round the three great western doorways of the same church, among which are no fewer than thirty-four life-sized figures. On the' whole, the single statues throughout this period are finer than the reliefs with many figures. Some of the statues of the Virgin and Child are of extraordinary beauty, in spite of their being often treated with a certain mannerism — a curved pose of the body, which appears to have been copied from ivory statuettes, in which the figure followed the curve of the elephant's tusk. The north transept at Rheims is no less rich: the central statue of Christ is a work of much grace and nobility of form; and some nude figures — for example, that of St Sebastian — show a knowledge of the human body which was very unusual at that early date. Many of these Reims statues, like those by Torell at Westminster, are quite equal to the best work of Niccola Pisano. The abbey church of St Denis possesses the largest collection of French 13th-century monumental effigies, a large number of which, with supposed portraits of the early kings, were made during the rebuilding of the church in 1264; some of them appear to be " archaistic " copies of older contemporary statues. 2

In the 14th century French sculpture began to decline, though much beautiful plastic work was still produced. Some of the reliefs on the choir screen of Notre Dame at Paris belong to this period, as does also much fine sculpture on the transepts of Rouen cathedral and the west end of Lyons. At the end of this century an able- sculptor from the Netherlands, Claus Sluter (who followed the tradition ofithe 14th-century school of Tournai, which is marked by the exquisite study of the details of nature and led to the brilliant development of Flemish realism), executed much fine work, especially at Dijon, under the patronage of Philip the Bold, for whose newly founded Carthusian monastery

•See Ruskin, The Bible of Amiens (1878).

' See Felibien, Histoire de I'Abbaye de Saint-Denys (Paris, 1706).

in 1399 he sculptured the great " Moses fountain " in the cloister, with six life-sized statues of prophets in stone, painted and gilt in the usual medieval fashion. Not long before his death in 141 1 Sluter completed a very magnificent altar tomb for Philip the Bold, now in the museum at Dijon. It is of white marble, surrounded with arcading, which contains about forty small ala- baster figures representing mourners of all classes, executed with much dramatic power. The recumbent portrait effigy of Philip in his ducal mantle with folded hands is a work of great power and delicacy of treatment. 3

Whilst in France there was a distinct slackening in building activity in the 14th century, which led to a corresponding decline in sculpture, Germany experienced a reawaken- a er man ing of artistic creative energy and power. That the 13th- Gothic style had taken root on German soil in the century preceding century, is proved by the fresh, mobile scu p ure ' treatment of the statues on the south porch of the east facade of Bamberg cathedral, and even more by the equestrian statue of Conrad III. in the market-place at Bamberg, which supported by a foliated corbel, exhibits startling vigour and originality, and is designed with wonderful largeness of effect, though small in scale. The statues of Henry the Lion and Queen Matilda at Brunswick, of about the same period, are of the highest beauty and dignity of expression. Strassburg cathedral, though sadly damaged by restoration, still possesses a large quantity of the finest sculpture of the 13th century. One tympanum relief of the Death of the Virgin, surrounded by the sorrowing Apostles, is a work of the very highest beauty, worthy to rank with the best Italian sculpture of even a later period. Of its class nothing can surpass the purely decorative carving at Strassburg, with varied realistic foliage studied from nature, evidently with the keenest interest and enjoyment.

But such works were only isolated manifestations of German artistic genius, until, in the next century, sculpture rose to new and splendid life, though it found expression not so much in the composition of extensive groups, as in the neighbouring France, but in the carving of isolated figures of rare and subtle beauty.

Nuremberg is rich in good sculpture of the 14th century. The church of St Sebald, the Frauenkirche, and the west facade of St Lawrence are lavishly decorated with reliefs and statues, very rich in effect, but showing the germs of that mannerism which grew so strong in Germany during the 15th century. Of special beauty are the statuettes which adorn the " beautiful fountain," which was formerly erroneously attributed to the probably mythical sculptor Sebald

Schonhofer, and is decorated with gold and colour by the painter Rudolf. 4 Of considerable importance are the statues of Christ, the Virgin, and the Apostles on the piers in the choir of Cologne cathedral, which were completed after 1350- They are particularly notable for their admirable polychromatic treatment. The reliefs on the high altar, which are of later date, are wrought in white marble on a background of black marble. Augsburg produced several sculptors of ability about this time; the museum possesses some very noble wooden statues of this school, large in scale and dignified in treatment. On the exterior of the choir of the church of Marienburg castle is a very remarkable colossal figure of the Virgin of about 1340-1350. Like the Hildesheim choir screen, it is made of hard stucco and is decorated with glass mosaics. The equestrian bronze group of St George and the Dragon in the market-place at Prague is excellent in workman- ship and full of vigour, though much wanting dignity of style. Another fine work in bronze of about the same date is the effigy of Archbishop Conrad (d. 1261) in Cologne cathedral, executed many years after his death. The portrait appeals truthful and the whole figure is noble in style. The military effigies of this time in Germany as elsewhere were almost unavoidably stiff and lifeless from the necessity of representing them in plate

3 See A. Kleinclausz, Claus Sluter (Paris, 1908).

4 See Baader, Beitrage zur Kunstgesch. Niirnbergs ; Rettberg, Number get Kunstleben (Stuttgart, 1854), and P. J. Ree, Nuremberg and its Art to the end of the 18th Century (London, 1905).

In England.

armour. The ecclesiastical chasuble, in which priestly effigies nearly always appear, is also a thoroughly unsculpturesque form of drapery, both from its awkward shape and its absence of folds. The Gunther of Schwarzburg (d. 1349) in Frankfort cathedral is a characteristic example of these sepulchral effigies in slight relief.

In England, much of the fine 13th-century sculpture was used to decorate the facades of churches, though, on the whole, ArchHec English cathedral architecture did not offer such great turai opportunities to the imagier as did that of France.

sculpture A notable exception is Wells cathedral, the west end of which, dating from about the middle of the century, is covered with more than 600 figures in the round or in relief, arranged in tiers, and of varying sizes. The tympana of the doorways are filled with reliefs, and above them stand rows of colossal statues of kings and queens, bishops and knights, and saints both male and female, all treated very skilfully with nobly arranged drapery, and graceful heads designed in a thoroughly architectonic way, with due regard to the main lines of the building they are meant to decorate. In this respect the early medieval sculptor inherited one of the great merits of the Greeks of the best period: his figures or reliefs form an essential part of the design of the building to which they are affixed, and are treated in a subordinate manner to their archi- tectural surroundings — very different from most of the sculpture on modern buildings, which frequently looks as if it had been stuck up as an afterthought, and frequently by its violent and incongruous lines is rather an impertinent excrescence than an ornament. 1 Peterborough, Lichfield and Salisbury cathedrals have fine examples of the sculpture of the 13th century: in the chapter-house of the last the spandrels of the wall-arcade are filled with sixty reliefs of subjects from Bible history, all treated with much grace and refinement. To the end of the same century belong the celebrated reliefs of angels in the spandrels of the choir arches at Lincoln, carved in a large massive way with great strength of decorative effect. Other fine reliefs of angels, executed about 1260, exist in the transepts of Westminster Abbey; being high from the ground, they are broadly treated without any high finish in the details. 2

Purely decorative carving in stone reached its highest point of excellence about the middle of the 14th century — rather later, that is, than the best period of figure sculpture. Wood-carving (q.v.), on the other hand, reached its artistic climax a full century later under the influence of the fully developed Perpendicular style.

The most important effigies of the iAth century are those in gilt bronze of Edward III. (d. 1377) and of Richard II. and his queen (made in 1395), all at Westminster. They are all portraits, but are decidedly inferior to the earlier work of William Torell. The effigies of Richard II. and Anne of Bohemia were the work of Nicolas Broker and Godfred Prest, goldsmith citizens of London. Another fine bronze effigy is at Canterbury on the tomb of the Black Prince (d. 1376); though well cast and with carefully modelled armour, it is treated in a somewhat dull and conventional way. The recumbent stone figure of Lady Arundel, with two angels at her head, in Chichester cathedral is remarkable for its calm peaceful pose and the beauty of

the drapery. Among the most perfect works of this description is the alabaster tomb of Ralph Nevill, first earl of Westmorland, with figures of himself and his two wives, in Staindrop church, county Durham (1426), removed, 1908, from a dark corner of the church into full light, a few feet away, where its beauty may now be examined. A very fine but more realistic work is the tomb figure of William of Wykeham (d. 1404) in the cathedral

1 The sculpture on the Paris opera house is a striking instance of this; and so, in a small way, are the statues in the reredos at West-minster Abbey and that at Gloucester cathedral. Another is afforded by the figures of modern soldiers inserted in the beautifully-designed Gothic Boer War Memorial (by G. F. Bodley, R.A.) set up in the cathedral close in York.

4 On the whole, Westminster possesses the most completely representative collection of English medieval sculpture in an un-broken succession from the 13th to the 16th century.

Spain.

at Winchester. The cathedrals at Rochester, Lichfield, York, Lincoln, Exeter and many other ecclesiastical buildings in England are rich in examples of 14th-century sculpture, used occasionally with great profusion and richness of effect, but treated in strict subordination to the architectural background.

The finest piece of bronze sculpture of the 15th-century is the effigy of Richard Beauchamp (d. 1439) in his family chapel at Warwick — a noble portrait figure, richly decorated with engraved ornaments. The modelling and casting were done by William Austen of London, and the gilding and engraving by a Netherlands goldsmith who had settled in London, named Bartholomew Lambespring, assisted by several other skilful artists.

The first Spanish sculptor of real eminence who need be considered is Aparicio, who lived and worked in the nth century. His shrine of St Millan, executed to the order of Don Sancho the Great is in the monastery of Yuso, and is a composition excellent, in its way, in design, grace and propor- tion. In the early medieval period the sculpture of northern Spain was much influenced by contemporary art in France. From the 12th to the 14th century many French architects and sculptors visited and worked in Spain. The cathedral of Santiago de Compostella possesses one of the grandest existing specimens in the world of late 12th-century architectonic sculpture;

this, though the work of a native artist, Mastei Mateo, 3 is thoroughly French in style; as recorded by an inscrip- tion on the front, it was completed in 1188. The whole of the western portal with its three doorways is covered with statues and reliefs, all richly decorated with colour, part of which still remains. Round the central arch are figures of the twenty-four elders, and in the tympanum a very noble relief of Christ in Majesty between Saints and Angels. As at Chartres, the jamb- shafts of the doorways are decorated with standing statues of saints— St James the elder, the patron of the church, being attached to the central pillar. These noble figures, though treated in a somewhat rigid manner, are thoroughly subordinate to the main lines of the building. Their heads, with pointed beards and a fixed mechanical smile, together with the stiff drapery arranged in long narrow folds, recall the Aeginetan pediment sculpture of about 500 B.C. This appears strange at first sight, but the fact is that the works of the early Greek and the medieval Spaniard were both produced at a somewhat similar stage in two far distant periods of artistic development. In both cases plastic art was freeing itself from the bonds of a hieratic archaism, and had reached one of the last steps in a development which in the one case culminated in the perfec- tion of the Phidian age, and in the other led to the exquisitely beautiful yet simple and reserved art of the end of the 13th and early part of the 14th century — the golden age of sculpture in France and England. In the cathedral of Tarragona are nine statues, in stone, executed by Bartolome in 1278 for the gate.

In the 14th century the silversmiths of Spain produced many works of sculpture of great size and technical power. One of the finest, by a Valencian called Peter Bernec, is the great silver retable at Gerona cathedral. It is divided into three tiers of statuettes and reliefs, richly framed in canopied niches, all of silver, partly cast and partly hammered.

In the 15th century an infusion of German influence was mixed with that of France, as may be seen in the very rich sculptural decorations which adorn the main door of Salamanca cathedral, the facade of S. Juan at Valladolid, and the church and cloisters of S. Juan de los Reyes at Toledo, perhaps the most gorgeous examples of architectural sculpture in the world. These were executed between 14ˆ8 and 1425 by a group of clever sculptors, among whom A. and F. Diaz, A. F. de Sahagun, A. Rodriguez and A. Gonzales were perhaps the chief. The marble altar-piece of the grand altar at Tarragona was begun

3 A kneeling portrait-statue of Mateo is introduced at the back of the central pier. This figure is now much revered by the Spanish peasants, and the head is partly worn away with kisses.

SCULPTURE

Plate I.

(Photo, Alinan

AVDREA PTSANO-Ths firrt bronz= door of the Baptistery , Florence.

DOXATELLO — Statue of St George, Florence.

-, rr ˆ r r ˆ r , /del>- iP Stoic, Anderson.)

MICHELANGELO -Head of Colossal David, Florence.

YEKROCnnO & LEOPARD! -linmxo. C Coiieoni, Venice.

(Photo, Anderson.) ;

{Photo, Anderson.) LL'CA 3)ELLA ROBBIA— Girls ami hoys playing on musical instruments and dancing (Museo deli' Opˆra, Florence).

Plate II.

SCULPTURE

(Photo, Alinarl) BENYEXUTO CELL1NT— Bronze Statue of Pt-rwus and Medusa, in the Loggia dei Lanzi, Florence.

PETER VTSCHER— Gilt Bronze Statue of King Arthur, Innsbruck.

(Pholo, Anderson.! -Apollo and Daphne (Borghese Gallery).

HOU DON— Voltaire fTacatn

(P)tolo, Giraudon.) Franjais, Paris).

COYSEVOX— Bust of himself,

(Phalo, Giraudon.) in the Louvre.

MEDIEVAL]

SCULPTURE

by P. Juan in 1426 and completed by G. De La Mota. The carved foliage of this period is of especial beauty and spirited execution; realistic forms of plant-growth are mingled with other more conventional foliage in the most masterly manner. The very noble bronze monument of Archdeacon Pelayo (d. 1490) in Burgos cathedral was probably the work of Simon of Cologne, who was also architect of the Certosa at Miraflores, 2 m. from Burgos. The church of this monastery contains two of the most magnificently rich monuments in the world, especially the altar-tomb of King John II. and his queen by Gil de Siloe — a perfect marvel of rich alabaster canopy-work and intricate under-cutting. The effigies have little merit. From the 16th century onwards wood was a favourite material with Spanish sculptors, who employed it for devotional and historical groups realistically treated, such as the" Scene from Taking of Granada" by El Maestre Rodrigo, and even for portraiture, as in the Bust of Turiano by Alonzo Berruguete (1480-1561).

During the 14th century Florence and the neighbouiing cities were the chief centres of Italian sculpture, and there numerous sculptors of successively increasing artistic Oothk power lived and worked, till in the 15th century the foˆtaly? c i tv na< i become the aesthetic capital of the world. But the Gothic sculptor's activity was by no means confined to Tuscany, for in northern Italy various schools of sculpture existed in the 14th century, especially at Verona and Venice, whose art differed widely from the contemporary art of Tuscany; but Milan and Pavia, on the other hand, possessed sculptors who followed closely the style of the Pisani. The chief examples of the latter class are the magnificent shrine of St Augustine in the cathedral of Pavia, dated 1362, and the some- what similar shrine of Peter the Martyr (1339), by Balduccio of Pisa, in the church of S. Eustorgio at Milan, both of white marble, decorated in the most lavish way with statuettes and subject reliefs. Many other fine pieces of the Pisan school exist in Milan. The well-known tombs of the Scaliger family at Verona show a more native style of design, and in general form, though not in detail, suggest the influence of transalpine Gothic. In Venice the northern and almost French character of much of the early 15th-century sculpture is more strongly marked, especially in the noble figures in high relief which decorate the lower story and angles of the doge's palace; 1 these are mostly the work of a Venetian named Bartolomeo Bon. A magnificent marble tympanum relief by Bon can be seen at the Victoria and Albert Museum; it has a noble colossal figure of the Madonna, who shelters under her mantle a number of kneeling

worshippers; the background is enriched with foliage and heads, forming a " Jesse tree," designed with great decorative skill. The cathedral of Como, built at the very end of the 15th century, is decorated with good sculpture of almost Gothic style, but on the whole rather dull and mechanical in detail, like much of the sculpture in the extreme north of Italy. A large quantity of rich sculpture was produced in Naples during the 14th century, but of no great merit either in design or in execution. The lofty monument of King Robert (1350), behind the high altar of S. Chiara, and other tombs in the same church are the most conspicuous works of this period. The extraordinary poverty in the production of sculpture in Rome during the 14th century was remarkable. The clumsy effigies at the north-east of S. Maria in Trastevere are striking examples of the degradation of the plastic art there about the year 1400; and it was not till nearly the middle of the century that the arrival of able Florentine sculptors, such as Filarete, Mino da Fiesole, and the Pollaiuoli, initiated a brilliant era of artistic activity, which, however, for about a century continued to depend on the presence of sculptors from Tuscany and other northern provinces. It was not, in fact, till the period of full decadence had begun that Rome itself produced any notable artists.

In Florence, the centre of artistic activity during the 15th as well as the 14th century, Giotto not only inaugurated the

■*See Ruskin, Stones of Venice; and Mothes, Gesch. der Ba.uk. u. Bildh. Venedigs (Leipzig, 1859) ; also H. v. d. Gabelentz, Mittelaltert. Plasiik in Venedig (Leipzig, 1902).*

modern era of painting, but in his relief sculpture, and more particularly by the influence he exercised upon Andrea Pisano, carried the art of sculpture beyond the point where it had been left by Giovanni Pisano. In Andrea we find something of Niccola's classic dignity grafted on to Giovanni's close observation of nature. His greatest works are the bronze south gate of the Baptistery, and some of the reliefs on Giotto's Campanile. The last great master of the Gothic period is Andrea di Cione, better known as Orcagna (1308? to 1368), who, like Giotto, achieved fame in the three sister arts of painting, sculpture and archi- tecture. His wonderful tabernacle at Or San Michele is a noble testimony to his efficiency in the three arts and to his early training as a goldsmith. Very beautiful sepulchral effigies in low relief were produced in many parts of Italy, especially at Florence. The tomb of Lorenzo Acciaioli, in the Certosa near Florence, is a fine example of about the year 1400, which has absurdly been attributed to Donatello. The similarity between the

plastic arts of Athens in the 5th or 4th century B.C. and of Florence in the 1 5th century is not one of analogy only. Though free from any touch of copyism, there are many points in the works of such men as Donatello, Luca della Robbia, and Antonio Pisano which strongly recall the sculpture of ancient Greece, and suggest that, if a sculptor of the later Fhidian school had been surrounded by the same types of face and costume as those among which the Italians lived, he would have produced plastic works closely resembling those of the great Florentine masters. Lorenzo Ghiberti may be called the first of the great sculptors of the Renaissance. But between him and Orcagna stands another master, the Sienese, Jacopo della Quercia 2 (1371-1438) who, although in some minor traits connected with the Gothic school, heralds at this early date the boldest and most vigorous and original achievements of two generations hence. Indeed, Jacopo, whose chief works are the Fonte Gaja at Siena (now reconstructed) and the reliefs on the gate of S. Petronio at Bologna, stands in his strong muscular treatment of the human figure nearer to Michelangelo than to his Gothic pre- cursors and contemporaries. Contemporaneously with Ghiberti, the sculptor of the world-famed baptistery gates, and with Donatello, and to a certain extent influenced by them, worked some men who, like Ciuffagni, were still essentially Gothic in their style, or, like Nanni di Banco, retained unmistakable traces of the earlier manner. Luca della Robbia, the founder of a whole dynasty of sculptors in glazed terra-cotta, with his classic purity of style and sweetness of expression, came next in order. Unsensual beauty elevated by religious spirit was attained in the highest degree by Mino da Fiesole, the tw r o Rossellini, Benedetto da Maiano, Desiderio da Settignano and other sculptors more or less directly influenced by Donatello. Through them the tomb monument received the definite form which it retained throughout the Renaissance period. Two of the noblest equestrian statues the world has probably ever seen are the Gattamelata statue at Padua by Donatello and the statue of Colleoni at Venice by Verrocchio and Leopardi. A third, which was probably of equal beauty, was modelled in clay by Leonardo da Vinci, but it no longer exists. Among other sculptors who flourished in Italy about the middle of the 15th century, are the Lucchese Matteo Civitali; Agostino di Duccio (1418-c. 1481), whose principal works are to be found at Rimini and Perugia; the bronze-worker Bertoldo di Giovanni (1420-1491); Antonio del Pollaiuolo, the author of the tombs of popes Sixtus IV. and Innocent VIII. at St Peter's in Rome; and Francesco Laurana (1424-1501?), a Dalmatian who worked under Brunelleschi and left many traces of his activity in Naples (Triumphal Arch), Sicily and southern France. Finally came Michelangelo, who raised

the sculpture of the modern world to its highest pitch of magnificence, and at the same time sowed the seeds of its rapidly approaching decline; the head of his David at Florence is a work of unrivalled force and dignity. His rivals and imitators, Baccio Bandinelli, Giacomo della Porta, Montelupo, Ammanati and Vincenzo de' Rossi (pupils of Bandinelli) and others, copied and exaggerated his faults 2 See Carl Cornelius, Jacopo della Quercia (Halle a. S., 1896).

without possessing a touch of his gigantic genius. In other parts of Italy, such as Pavia, the traditions of the 15th century lasted longer, though gradually fading. The statuary and reliefs which make the Certosa near Pavia one of the most gorgeous buildings in the world are free from the influence of Michelangelo, which at Florence and Rome was overwhelming. Though much of the sculpture was begun in the second half of the 15th century, the greater part was not executed till much later. The magnifi- cent tomb of the founder, Giovanni Galeazzo Visconti, was not completed till about 1560, and is a gorgeous example of the style of the Renaissance grown weak from excess of richness and from loss of the simple purity of the art of the 15th century. Everywhere in this wonderful building the fault is the same; and the growing love of luxury and display, which was the curse of the time, is reflected in the plastic decorations of the whole church. The old religious spirit had died out and was succeeded by unbelief or by an affected revival of paganism. Monuments to ancient Romans, such as those to the two Plinys on the facade of Como cathedral, or " heroa " to unsaintly mortals, such as that erected at Rimini by Sigismondo Pandolfo in honour of Isotta, 1 grew up side by side with shrines and churches dedicated to the saints. We have seen how the youthful vigour of the Christian faith vivified for a time the dry bones of expiring classic art, and now the decay of this same belief brought with it the destruction of all that was most valuable in medieval sculpture. Sculpture, like the other arts, became the bond-slave of the rich, and ceased to be the natural expression of a whole people. Though for a long time in Italy great technical skill continued to exist, the vivifying spirit was dead, and at last a dull scholasticism or a riotous extravagance of design

became the leading characteristics.

The 1 6th century was one of transition to this state of degrada- tion, but nevertheless produced many sculptors of great ability who were not wholly crushed by 'the declining taste of their time. John of Douai (1524-1608), usually known as Giovanni da Bologna, one of the ablest, lived and worked almost entirely in Italy. His bronze statue of Mercury flying upwards, in the Uffizi, one" of his finest works, is full of life and movement. By him also is the " Carrying off of a Sabine Woman " in the Loggia de' Lanzi. His great fountain at Bologna, with two tiers of boys and mermaids, surmounted by a colossal statue of Neptune, a very noble work, is composed of architectural features combined with sculpture, and is remarkable for beauty of proportion. He also cast the fine bronze equestrian statue of Cosimo de' Medici at Florence and the very richly decorated west door of Pisa cathedral, the latter notable for the overcrowding of its ornaments and the want of sculpturesque dignity in the figures; it is a feeble imitation of Ghiberti's noble production. One of Giovanni's best works, a group of two nude figures fighting, is now lost. A fine copy in lead existed till recently in the front quadrangle of Brasenose College, Oxford, of which it was the chief ornament. In r88i it was sold for old lead by the principal and fellows of the college, and was immediately melted down by the plumber who bought it — an irreparable loss, as the only other existing copy is very inferior; the destruction was an utterly inexcusable act of vandalism. The sculpture on the western facade of the church at Loreto and the elaborate bronze gates of the Santa Casa are works of great technical merit by Girolamo Lombardo and his sons, about the middle of the 16th century. Benvenuto Cellini (1500-1569), though in the main greater as goldsmith than as sculptor, produced one work of great beauty and dignity — the bronze Perseus in the Loggia de' Lanzi at Florence. His large bust of Cosimo de' Medici in the Bargello is mean and petty in style. A number of very clever statues and groups in terra-cotta were modelled by Antonio Begarelli of Modena (d. 1565), and were enthusiastically admired by Michelangelo; the finest are a " Pieta " in S. Maria Pomposa and a large " Descent from the Cross " in S. Francesco, both at Modena. The colossal bronze seated statue of Julius III. at Perugia, cast in 1555 by Vincenzio Danti, is one of the best portrait-figures of the time.

1 See Yriarte, Rim-'ni au XV" Steele (Paris, 1880).

The latter part of the 15th century in France was a time of transition from the medieval style, which had gradually been deteriorating, to

the more florid and realistic taste of the Renaissance. To this period belong a number The Re- of rich reliefs and statues on the choir-screen ™ftaaee. of Chartres cathedral. Those on the screen at Amiens are later still, and exhibit the rapid advance of the new style.

The transition from the Gothic to the Renaissance is to be noted in many tomb monuments of the second half of the 15th and the beginning of the 16th centuries, notably in Rouland de Roux's magnificent tomb of the cardinals of Amboise at Rouen cathedral. Italian motifs are paramount in the great tomb of Louis XII. and his wife Anne of Bretagne, at St Denis, by Jean Juste of Tours.

The influx of Italian artists into France in the reign of Francis I., who, with Leonardo da Vinci, Andrea del Sarto, Rosso, and Primaticcio, had summoned Benvenuto Cellini and other Italian sculptors to his court, naturally led to The the practical extinction of the Gothic style, though lattaeaoe. isolated examples of medievalism still occur about the middle of the 16th century. Such are the " Entombment " in the crypt of Bourges cathedral, and the tomb of Ren6 of Chalons in the church of St Etienne at Bar-Ie-Duc. But the main current of artistic thought followed the direction indicated by the found- ing of the italianizing school of Fontainebleau. Jean Goujon, (d. 1572) was the,ablest French sculptor of the time; he combined great technical skill and refinement of modelling with the florid and affected style of the age. His nude figure of " Diana reclining by a Stag," now in the Louvre, is a graceful and vigorous piece of work, superior in sculpturesque breadth to the somewhat similar bronze relief of a nymph by Cellini. Between 1 540 and 1552 Goujon executed the fine monument at Rouen to Duke Louis de Breze, and from 1555 to 1562 was mainly occupied in decorating the Louvre with sculpture. One of the most pleasing and graceful works of this period, thoroughly Italian in style, is the marble group of the " Three Graces " bearing on their heads an urn containing the heart of Henry II., executed in 1560 by Germain Pilon for Catherine de Medicis. The monument of Catherine and Henry II. at St Denis, by the same sculptor, is an inferior and coarser work. Maitre Ponce, probably the same as the Italian Ponzio Jacquio, chiselled the noble monument of Albert of Carpi (1535), now in the Louvre. Another very fine portrait effigy of about 1570, a recumbent figure in full armour of the duke of Montmorency, preserved in the Louvre, is the work of Barthelemy Prieur. Francois Duquesnoy of Brussels (1594-1644), usually known as II Fiammingo, was a clever sculptor, thoroughly French in style, though he mostly worked in Italy. His large statues are very poor, but his reliefs in ivory of boys and cupids are modelled with wonderfully soft realistic power and graceful

fancy.

To these sculptors should be added Jacques Sarrazin, well known for the colossal yet elegant caryatides for the grand pavilion of the Louvre; and Francois Augier, the sculptor of the splendid mausoleum of the due de Montmorency.

*In the Netherlands the great development of painting was not accompanied by a parallel movement in plastic art. Of the few monuments that claim attention, JT** we must mention the bronze tomb of Mary of Burgundy lands. at Notre-Dame, Bruges, executed about 1495 by Jan de Baker, and the less remarkable though technically more complete companion tomb of Charles the Bold (1558).*

The course of the Renaissance movement in German sculpture differs from that of most other countries in so far as it appears to grow gradually out of the Gothic style in the gˆnn/n direction of individual, realistic treatment of the ofthe figure which in late Gothic days had become somewhat Renais- conventional and schematic and idealized. Marked saacel ” physiognomic expression, careful rendering of move- ment, costume and details, and the suggestion of different textures, together with almost tragic emotional intensity, are the chief aims of the 15th-century sculptors who, on the whole,*

adhere to medieval thought and arrangement. The Italian influence, which did not make itself felt until the early days of the 16th century, led to brilliant results, whilst the workers retained their fresh northern individuality and keen observation of nature. But in the latter half of this century it began to choke these national characteristics, and led to somewhat theatrical and conventional classicism and mannerism.

One speciality of the 15th century was the production of an immense number of wooden altars and reredoses, painted and gilt in the most gorgeous way and covered with subject-reliefs and statues, the former often treated in a very pictorial style. 1 Wooden screens, stalls, tabernacles and other church-fittings of the greatest elaboration and clever workmanship were largely produced in Germany at the same time, and on into the 16th century. 2 Jorg

Syrlin, one of the most able of these sculptors in wood, executed the gorgeous choir-stalls in Ulm cathedral, richly decorated with statuettes and canopied work, between 1469 and 1474; his son and namesake sculptured the elaborate stalls in Blaubeuren church of 1496 and the great pulpit in Ulm cathedral. Another exceptionally important work of this type is the magnificent altar at St Wolfgang in Upper Austria, carved by the Tirolese, Michael Pacher, in 1481. Veit Stoss of Cracow, who later settled in Nuremberg, a man of bad character, was a most skilful sculptor in wood; he carved the high altar, the tabernacle and the stalls of the Frauenkirche at Cracow, between 1472 and 1494. One of his finest works is a large piece of wooden panelling, nearly 6 ft. square, carved in 149S, with central reliefs of the Doom and the Heavenly Host, framed by minute reliefs of scenes from Bible history. It is now in the Nuremberg town-hall. Wohlgemuth (1434-1519), the master of A. Diirer, was not only a painter but also a clever wood-carver, as was also Diirer himself (1471-1528), who executed a tabernacle for the Host with an exquisitely carved relief of Christ in Majesty between the Virgin and St John, which still exists in the chapel of the monastery of Landau. Diirer also produced miniature reliefs cut in boxwood and hone-stone, of which the British Museum (print-room) possesses one of the finest examples. Adam Krafft (c. 1455-1507) was another of this class of sculptors, but he worked also in stone; he produced the great Schreyer monument (1492) for St Sebald's at Nuremberg, — a very skilful though mannered piece of sculpture, with very realistic figures in the costume of the time, carved in a way more suited to wood than stone, and too pictorial in effect. He also made the great tabernacle for the Host, 80 ft. high, covered with statuettes, in Ulm cathedral, and the very spirited " Stations of the Cross " on the road to the Nurem- berg cemetery.

The Vischer family of Nuremberg for three generations were among the ablest sculptors in bronze during the 15th and 16th centuries. Hermann Vischer the elder worked mostly between 1450 and 1505, following the earlier medieval traditions, but without the originality of his son, Peter Vischer.

Next to Nuremberg, the chief centres of bronze sculpture were Augsburg and Ltibeck. Innsbruck possesses one of the finest series of bronze statues of the first half of the 16th century, namely twenty-eight colossal figures round the tomb of the emperor Maximilian, which stands in the centre of the nave, representing a succession of heroes and ancestors of the emperor. The first of the statues which was completed cost 3000 florins, and so Maximilian invited the help of Peter Vischer, whose skill was greater and whose work less

expensive than that of the local craftsmen. Most of them, however, were executed by sculptors of whom little is now known. They differ much in style, though all are of great technical merit. The finest is an ideal statue of King Arthur of Britain, in plate armour of the 14th or early 15th century, very remarkable for the nobility of the face and pose. That of Theodoric is also a very fine

1 This class of large wooden retable was much imitated in Spain and Scandinavia. The metropolitan cathedral of Roskilde in Den- mark possesses a very large and magnificent example covered with subject reliefs enriched with gold and colours.

1 See Waagen, Kunst und Kiinstier in Deutschl. (Leipzig, 1843-

1845)-

conception. Both are wrongly said to be the work of Peter Vischer himself. Of the others, the best, nine in number, are by Master Gilg. The others, which range from stiffness to exaggerated realism, are executed by inferior workers.

In the latter part of the 16th century the influence of the later Italian Renaissance becomes very apparent, and many elaborate works in bronze were produced, especially at Augsburg, where Hubert Gerhard cast the fine " Augustus fountain " in 1593, and Adrian de Vries made the " Hercules fountain " in 1599; both were influenced by the style of Giovanni di Bologna, as shown in his magnificent fountain at Bologna.

At the beginning of the 16th century sculpture in England was entering upon a period of rapid decadence, and to some extent had lost its native individuality. The finest Tbe series of statues of this period are those of life-size f/eaals- high up on the walls of Henry VII. 's chapel at West- sancein minster and others over the various minor altars. England, These ninety-five figures, which represent saints and doctors of the church, vary very much in merit: some show German influence, others that of Italy, while a third class are, as it were, " archaistic " imitations of older English sculpture. 3 In some cases the heads and general pose are graceful, and the drapery dignified, but in the main they are coarse both in design and in workmanship compared with the better plastic art of the 13th and 14th centuries. This decadence of English sculpture caused Henry VII. to invite the Florentine Torrigiano (i472?-i522) to visit England to model and cast the bronze figures for his own magnificent tomb, which still exist in almost perfect preservation. The recumbent

effigies of Henry VII. and his queen are fine specimens of Florentine art, well modelled with lifelike portrait heads and of very fine technique in the casting. The altar-tomb on which the effigies lie is of black marble, decorated with large- medallion reliefs in gilt bronze, each with a pair of saints — the patrons of Henry and Elizabeth of York — of very graceful design. The altar and its large baldacchino and reredos were the work of Torrigiano, but were destroyed during the 17th century. The reredos had a large relief of the Resurrection of Christ executed in painted terra-cotta, as were also a life-size figure of the dead Christ under the altar-slab and four angels on the top angles of the baldacchino; a number of fragments of these figures have recently been found in the " pockets " of the nave vaulting, where they had been thrown after the destruction of the reredos. Torrigiano's bronze effigy of Margaret of Richmond in the south aisle of the same chapel is a very skilful but too realistic portrait, apparently taken from a cast of the dead face and hands. Another terra-cotta effigy in the Rolls chapel is also, from internal evidence, attributed to the same able Florentine. Another talented Florentine sculptor, Benedetto da Maiano, was invited to England by Cardinal Wolsey to make his tomb; of this only the marble sarcophagus now exists and has been used to hold the body of Admiral Nelson in St Paul's Cathedral. Another member of the same family, named Giovanni, was the sculptor of the colossal terra-cotta heads of the Caesars affixed to the walls of the older part of Hampton Court Palace.

In Spain, in the early part of the 16th century, a strong Italian influence superseded that of France and Germany, partly owing to the presence there of the Florentine Torrigiano Spanish and other Italian artists. The magnificent tomb of Reaals- Ferdinand and Isabella in Granada cathedral is a fine sauce specimen of Italian Renaissance sculpture, somewhat p

similar in general form to the tomb of Sixtus IV. by Ant. Pollaiuolo in St Peter's, but half a century later in the style of its detail. It looks as if it had been executed by Torrigiano, but the design which he made for it is said to have been rejected. The statue of St Jerome, which he executed for the convent of Buenavista, near Seville, was declared by Goya to be superior to Michelangelo's " Moses." Some of the work of this period, though purely Italian in style, was produced by Spanish sculptors,

3 There were once no fewer than 107 statues in the interior of this chapel, besides a large number on the exterior; see J. T. Mickle-thwaite in Archaeologia, vol. xlvii. pi. x.-xii.

—for example, the choir reliefs at Toledo cathedral, and those in the Colegio Mayor at Salamanca by Alonzo Berruguete, sculptor, painter and architect, trained in Rome and Florence, and the greatest designer of Spain up to that time. He worked under Michelangelo and Vasari, and on his return to Spain in 1520 was appointed court painter and sculptor to Charles V. The same position was occupied under Philip II. by Gaspar Becerra (1520-1570), whose masterpiece is a figure of Our Lady of the Solitude, in Madrid. Esteban Jordan, Gregorio Hernandez and other Spanish sculptors produced a large number of elaborate retables, carved in wood with subjects in relief and richly decorated in gold and colours. These sumptuous masses of polychromatic sculpture resemble the 15th-century retables of Germany more than any Italian examples, and were a sort of survival of an older medieval style. J. Morlanes was the first of Spanish sculptors to adopt the style of Albert Dtirer, which afterwards became general. Philip de Vigarni, Christopher of Salamanca, and Paul de Cespedes, who was native of Cordova, are names of great prominence up to the end of the century. Alonzo Cano (1600-1667), the painter, was remarkable for clever realistic sculpture, very highly coloured and religious in style. Montanes, who died in 1614, was one of the ablest Spanish sculptors of his time. His finest works are the reliefs of the Madonna and Saints on an altar in the university church of Seville, and in the cathedral, in the chapel of St Augustine, a very nobly designed Conception, modelled with great skill.

In the 17th century sculpture in wood still prevailed. The statue of St Bruno of Montanez seems to have inspired others to repeat the subject in the same material: Juan de Juin (d. 1614) is a case in point. Pedro de Mena and Zarcillo achieved great success in this class of sculpture. A. Pujol of Catalonia and Peter Roldan carried on the Spanish tradition. The chief names in the x8th century are those of Don P. Duque Cornesso of Seville, Don J. de Hinestrosa, A. Salvador (known as " the Roman," d. 1766), Philip de Castro of Galicia, one of the most eminent sculptors of his time (d. 1775), and F. Gutierrez (d. 1782). 1

If the immediate followers of Michelangelo showed a tendency

to turn the characteristics of the master's style into exaggerated

mannerism, the beginning of the 17th century finds

Baroque Italian sculpture in a state of complete decadence,

sculpture ,. . , . . r '

in Italy. statuesque dignity having given way to violent fluttering movement and florid excesses, such as was revived in a later century. From Italy this " baroque " style spread over the whole continent of Europe and retained its hold for nearly two centuries. The chief sculptor and architect of this period was the Neapolitan, J. L. Bernini (1598-1680), who, with the aid of a large school of assistants, produced an almost incredible quantity of sculpture of the most varying degrees of merit and hideousness. His chief early group, the Apollo and Daphne in the Villa Borghese, is a work of wonderful technical skill and delicate high finish, combined with soft beauty and grace, though too pictorial in style. In later life Bernini turned out work of brutal coarseness, 2 designed in a thoroughly un-sculpturesque spirit. The churches of Rome, the colonnade of St Peter's, and the bridge of S. Angelo are crowded with his clumsy colossal figures, half draped in wildly fluttering garments, — perfect models of what is worst in the plastic art. And yet his works received perhaps more praise than those of any other sculptor of any age, and after his death a scaffolding was erected outside the bridge of S. Angelo in order that people might walk round and admire his rows of feeble half-naked angels. For all that, Bernini was a man of undoubted talent, and in a better period of art would have been a sculptor of the first rank; many

1 For the earlier history of Spanish sculpture, see Don Juan Augustin Cean Bermudez, Diccionario historico de los mas illustres professores de las bellas artes en Espagna (Madrid, 1800, 6 vols.). For the later sculptors, see B. Handke, Studien zur Geschichte der spanischen Plastik (Strasburg, 1900).

2 The Ludovisi group of Pluto carrying off Proserpine, now in the Borghese Gallery, is a striking example, and shows Bernini's deterioration of style in later life. It has nothing in common with the Cain and Abel or the Apollo and Daphne of his earlier years.

of his portrait-busts are works of great vigour and dignity, quite free from the mannered extravagance of his larger sculpture. Stefano Maderna (1571-1636) was the ablest of his contempo- raries; his

clever and much-admired statue, the figure of the dead S. Cecilia under the high altar of her basilica, is chiefly remarkable for its deathlike pose and the realistic treatment of the drapery. Another clever sculptor was Alessandro Algardi of Bologna (i5o8?-i654), who formed a school, which included G. Brunelli, D. Guidi and C. Mazza of Bologna.

In the next century at Naples Queirolo, Corradini and Sam- martinO produced a number of statues, now in the chapel of S. Maria de' Sangri, which are extraordinary examples The of wasted labour and neglect of the simplest canons classicist of plastic art. These are marble statues enmeshed in revlvaiin nets or covered with thin veils, executed with almost ,taly ' deceptive realism, perhaps the lowest stage of tricky degradation into which the sculptor's art could possibly fall. 3 In the 18th century Italy was naturally the headquarters of the classical revival, which spread thence throughout most of Europe. Canova (1757-1822), a Venetian by birth, who spent most of his life in Rome, was perhaps the leading spirit of this movement, and became the most popular sculptor of his time. His work is very unequal in merit, mostly dull and uninteresting in style, and is occasionally marred by a meretricious spirit very contrary to the true classic feeling. His group of the " Three Graces," the " Hebe," and the very popular " Dancing-Girls," copies of which in plaster disfigure the stairs of countless modern hotels and other buildings on the Continent, are typical examples of Canova's worst work. Some of his sculpture is designed with far more of the purity that , distinguished antique art ; his finest work is the colossal group of Theseus slaying a Centaur, at Vienna. Canova's attempts at Christian sculpture are singularly unsuccess- ful, as, for example, his pretentious monument to Pope Clement XIII. in St Peter's at Rome, that of Titian at Venice, and Alfieri's tomb in the Florentine church of S. Croce. Fiesole in the 19th century produced one sculptor of great talent, named Bastianini. He worked in the style of the great 15th-century Florentine sculptors, and followed especially the methods of his distinguished fellow-townsman Mino da Fiesole. Many of Bastianini's works are hardly to be distinguished from genuine sculpture of the 15th century, and in some cases great prices have been paid for them under the supposition that they were medieval productions. These frauds were, however, perpetrated without Bastianini's consent, or at least without his power to prevent them. Several of his best terra-cotta works may be seen in the Victoria and Albert Museum.

Whilst monumental sculpture in France during the 17th century continued to be influenced by Italy, the national tradition was

carried on to a certain extent by such . _ portraitists as the two Coustous and their master Coysevox (1640-1720), whose works are marked by a great sense of life and considerable technical skill. The exaggerated elegance in the treatment of the female figure, which became so marked a characteristic of French sculpture during this period, is the chief trait of Francois Girardon (1630-17 15), who was chiefly employed on the sculptural decorations at Versailles, and on the famous equestrian statue of Louis XIV., which was destroyed during the Revolution and for which hundreds of exquisite drawings and studies were made, now in the French national collection. Far more strength and grandeur mark the work of Pierre Puget (1622-1694), who is best known by his " Milo of Crotona " for Versailles. His training was entirely Italian, and in style considerably influenced by Bernini. He worked for some considerable time in Italy, particularly in Genoa. The same opposed movements which run side by side in French 18th-century painting, academic allegory and frivolous sensuality, can be traced in the sculpture of this period. Of

' In the 19th century an Italian sculptor named Monti won much popular repute by similar unworthy tricks; some veiled statues by him in the London Exhibition of 1851 were greatly admired; since then copies or imitations of them have enraptured the visitors who have crowded round the Italian sculpture stalls at every subsequent international exhibition.

the first, the chief representatives are Lemoyne and his pupil Fakonet, who executed the equestrian statue of Peter the Great at St Petersburg; of the other, Clodion, whose real name was Claude Michel (c. 1745-18 14). The latter worked largely in terra-cotta, and modelled with great spirit and invention, but in the sensual unsculpturesque manner prevalent in his time.

In the later part of the 18th century France produced two sculptors of great eminence in Jean-Baptiste Pigalle (1714-1785)

and Jean Antoine Houdon (1740-1828). Houdon ˆJauyf may be regarded as the precursor of the modern school

of French sculpture of the better sort. Towards the end of the 18th century a revolution was brought about in the style of sculpture by

the suddenly revived taste for antique art. A period of dull pseudo^classicism succeeded, which in most cases stifled all original talent and reduced the plastic arts to a lifeless form of archaeology. Regarded even as imitations the works of this period are very unsuccessful: the sculptors got hold merely of the dry bones, not of the spirit of classic art; and their study of the subject was so shallow and unintelligent that they mostly picked out what was third-rate for special admiration and ignored the glorious beauty of the best works of true Hellenic art. Thus in sculpture, as in painting and architecture, a study which might have been stimulating and useful in the highest degree became a serious hindrance to the development of modern art; this misconception and misdirection occurred not only in France but in the other countries of Europe. In France, however, the victories of Napoleon I. and his arrQgant pretension to create a Gaulish empire on the model of that of ancient Rome caused the taste for pseudo-Roman art to be more pronounced than elsewhere.

Among the first sculptors of this school were Antoine 5?jj r Chaudet (1763-1810) and Joseph Bosio (1769-1845).

century. The latter was much employed by Napoleon I.; he

executed with some ability the bronze spiral reliefs round the column of the Place Vend6me and the statue of Napoleon on the top, and also modelled the classical quadriga on the triumphal arch in the Place du Carrousel. Jacques Pradier of Geneva (1792-1862), produced the " Chained Prometheus " of the Louvre and the Niobe group (1822). He possessed great technical ability, but aimed in most of his works at a soft sensuous beauty which is usually considered to be specially unsuited to sculpture. Francois Rude (1784-1855), worked in a style modelled on Graeco-Roman sculpture treated with some freedom. His bronze Mercury in the Louvre, is a clever work and the enormous high-relief on the Arc de FEtoile in Paris, representing " The Song of Departure to Battle," is full of vigour and move- ment, but his statues of Marshal Ney in the Luxembourg Gardens and of General Cavaignac (1847) m the cemetery of Montmartre are conspicuously poor. The reliefs on the pediment of the Pantheon are by Pierre Jean David of Angers (1789-1856); his early works are of dull classic style, but later in life he became a realist and produced very unsculpturesque results. A bronze statue of a Dancing Fisher-lad modelled by Francois Joseph Duvet, now in the Luxembourg collection, is an able work of the genre class. Other French sculptors who were highly esteemed in their time were Ottin, Courtet, Simart, Etex and Carpeaux. The last was an artist of great ability, and produced an immense number of clever

but often, sculptur- esquely considered, offensive statues. He obtained the highest renown in France, and, hailed as a great innovator by those who welcomed a greater measure of naturalism, he was denounced by the " pure " and classic school as a typical example of the sad degradation of taste which prevailed under the rule of Napoleon III.

The modern schools of French sculpture are the most important in the world; they are dealt with in a separate section later. Technical skill and intimate knowledge of the human form are possessed by French artists to a degree which has probably never been surpassed. Many of their works have a similar fault to that of one class of French painters: they are much injured by an excess of sensual realism; in many cases nude statues are simply life-studies with all the faults and individual

peculiarities of one model. Very unsculpturesque results are produced by treating a statue as a representation of a naked person, — one, that is, who is obviously in the habit of wearing clothes, — a very different thing from the purity of the ancient Greek treatment of the nude. Thus the great ability of many French sculptors has been degraded to suit, or rather to illustrate, the taste of the voluptuary. An extravagance of attitude and an undignified arrangement of the figures do much to injure some of the large groups which are full of technical merit, and executed with marvellous anatomical knowledge. This is specially the case with much of the sculpture that decorates the buildings of Paris. The group of nude dancers by Carpeaux outside the opera-house is a work of astonishing skill and sensual imagina- tion, unsculpturesque in style and especially unfitted to decorate the comparatively rigid lines of a building. The egotism of modern French sculptors, with rare exceptions, has not allowed them, when professedly aiming at providing plastic decoration for buildings, to accept the necessarily subordinate reserve which is so necessary for architectonic sculpture. Other French works, on the other hand, have frequently erred in the direction of a sickly sentimentalism, or a petty realism, which is fatal to sculpturesque beauty; or they seek to render modern life, sometimes on the scale of life-size, even to the point of securing atmospheric effect. This exaggerated misconception of the function of sculpture can only be a passing phase; yet as any movement issuing from Paris finds adherents throughout other countries, the effect upon sculptors and upon public taste can hardly be otherwise than mischievous. The real power and merits of the modern French school make these faults all the 1 more conspicuous.

Whatever work of importance was produced by Netherlandish sculptors in the 17th and 18th centuries, was due entirely to Italian training and influence. Francois Duquesnoy (usually called "The Fleming") (1 594-1644) has ^^ already been mentioned; he worked principally in sculptors. Rome, in rivalry with Bernini, and most of his works have remained in Italy, but, inasmuch as his style is conspicu- ously French, he is here included in the French school. His pupil Arthur Quellinus is best known by his allegorical groups on the pediments of Amsterdam town-hall, and has also left some traces of his activity in Berlin. P. Buyster, native of Brussels (b. 1595), passed into France and is also often classed as a French sculptor.

By far the greatest sculptor of the classical revival was Bertel Thorwaldsen (1 770-1844), an Icelander by race, whose boyhood was spent at Copenhagen, and who settled in Rome in 1797, when Canova's fame was at its highest. The Sc "" ,lm Swedish sculptors Tobias Sergell and Johann Bystrom sculptors. belonged to the classic school; the latter followed in Thorwaldsen's footsteps. Another Swede named Fogelberg was famed chiefly for his sculptured subjects taken from Norse mythology. H. W. Bissen and Jerichau of Denmark produced some able works, — the former a fine equestrian statue of Frederick VII. at Copenhagen, and the latter a very spirited and widely known group of a Man attacked by a Panther.

During the troublous times of the Reformation, sculpture, like the other arts, continued to decline. Of 17th-century monumental effigies that of Sir Francis Vere (d. 1607) seven in the north transept at Westminster is one of the best, teenth though its design — a recumbent effigy overshadowed centuryin by a slab covered with armour, upborne by four fl "' kneeling figures of men-at-arms — is almost an exact copy of the tomb of Engelbert II. of Vianden-Nassau. 1 The finest bronze statues of this century are those of George Villiers. duke of Buckingham (d. 1628), and his wife at the north-east of Henry VII.'s chapel. The effigy of the duke, in rich armour of the time of Charles I., lies with folded hands in the usual medieval pose. The face is fine and well modelled and the casting very good. The allegorical figures at the foot are caricatures of the style of Michelangelo, and are quite devoid of merit, but the kneeling statues of the duke's children are designed with 1 See Arendt, Chateau de Vianden (Paris, 1884).

grace and pathos. A large number of very handsome marble and alabaster tombs were erected throughout England during the 17th century. The effigies are poor and coarse, but the rich architectural ornaments are effective and often of beautiful materials, alabaster being mixed with various richly coloured marbles in a very skilful way. Nicholas Stone (1586-1647), who worked under the supervision of Inigo Jones and was master- mason to King Charles I., was the chief English sculptor of his time. The De Vere and Villiers monuments are usually attributed to him. 1 One of the best public monuments of London is the bronze equestrian statue of Charles I. at Charing Cross, which was overthrown and hidden during the protectorate of Cromwell, but replaced at the Restoration in 1660; it is very nobly modelled and was produced under Italian influence by the French sculptor Hubert Le Sceur (d. 1670). The standing bronze statue of James II., formerly behind the Whitehall banqueting room, very poorly designed but well executed, was the work of Grinling Gibbons (1648-1721), a native of Holland, who was chiefly famed for his extraordinary skill in carving realistic fruit and flowers in pear and other white woods. Many rich and elaborate works of his exist at Trinity College, Oxford, at Cambridge, Chatsworth, and several other places in England. In the early part of the 18th century he worked for Sir Christopher Wren, and carved the elaborate friezes of the stalls and screens in St Paul's Cathedral and in other London churches.

During the 18th century English sculpture was mostly in the hands of Flemish and other foreign artists, of whom Roubiliac

(1695-1762), Peter Scheemakers (1601-1773), and Eighteenth j M R ys brack (1694-1770) were the chief. The "agiand. ridiculous custom of representing Englishmen of the

1 8th and 19th centuries in the toga or in the armour of an ancient Roman was fatal alike to artistic merit and eikonic truth; and when, as was often the case, the periwig of the Georgian period was added to the costume of a Roman general the effect is supremely ludicrous. Nollekens (1737-1823), a pupil of Scheemakers, though one of the most popular sculptors of the 1 8th century, was a man of very little real ability. John Bacon (1 740-1 799) was in some respects an abler sculptor. John Flaxman (1 755-1826) was in England the chief initiator of the classical revival. For many years he worked for Josiah Wedgwood, the potter, and designed for him an immense number of vases covered with delicate cameo-like reliefs. Many of

these, taken from antique gems and sculpture, are of great beauty, though hardly suited to the special necessities of fictile ware. Flaxman's large pieces of sculpture are of less merit, but some of his marble reliefs are designed with much spirit and classic purity. He modelled busts as well as small portrait medallions for production in Wedgwood's pottery. His illustra- tions in outline to the poems of Homer, Aeschylus and Dante, based on drawings on Greek vases, have been greatly admired, but they are unfortunately much injured by the use of a thicker outline on one side of the figures — an unsuccessful attempt to give a suggestion of shadow. Flaxman's best pupil was Baily (1788-1867), chiefly celebrated for his nude marble figure of Eve. On the whole the 17th and 18th centuries in Germany, as in England, were periods of great decadence in the plastic art;

little of merit was produced, except some portrait Modern figures. Among the rare exceptions mention must sculpture. De ma de of Andreas Schluter, of Hamburg (c. 1662-

17 14), who produced many decorative bronze reliefs for the royal castle in Berlin, and the famous colossal equestrian statue of the Great Elector on the bridge in Berlin. Another artist who approached greatness in a period of utter degradation was Rafael Donner, whose principal work is the large fountain with lead figures of-Providence and the four rivers of Austria (the Enns, Ybbs, Traun and March), in Vienna, a very remarkable

1 The Villiers monument is evidently the work of two sculptors working in very opposite styles. These monuments, however, are not included in the list of his works drawn up by Stone himself and printed in Walpole's Anecdotes of Painting, i. 239-243. This sculptor's receipts, recorded by his kinsman, Charles Stoakes, amounted to £10,889 — an enormous sum for an English sculptor and " tomb-maker " of those days.

example of baroque sculpture which to this day is known as the Donner fountain. In the second half of the 1 8th century there was a strong revival in sculpture, especially in the classic style; and since then Germany has produced an immense quantity of large and pretentious sculpture, mostly dull in design and second-rate in execution. Gottfried Schadow of Berlin (1764- 1850) finished a number of portrait figures, not in the customary antique guise, but in the costume of the period. Some of his works are ably modelled. He was followed by Christian Rauch (1777-1857), whose works are, however, mostly weak and senti- mental in style, as, for example, his recumbent statue of Queen Louisa at Charlottenburg (1813), and his

statues of generals Biilow and Scharnhorst at Berlin. Rauch became the leader of an important school in Berlin, but will be most honourably remembered by his splendid monument of Frederick the Great, in Berlin — an elaborate work, modern in feeling and of great technical accomplishment. Friedrich Drake was the ablest of Rauch's pupils, but he lived at a very unhappy period for the sculptor's art. His chief work is perhaps the colossal bronze equestrian statue of King William of Prussia at Cologne. Albert Wolff was a sculptor of more ability; he executed the equestrian portrait of King Ernest Augustus at Hanover, and a " Horseman attacked by a Lion " now in the Berlin Museum, Augustus Kiss (1802-1865) produced the companion group to this, the celebrated Amazon and Panther in bronze, as well as the fine group of St George and the Dragon in a courtyard of the royal palace at Berlin. The St George and his horse are of bronze; the dragon is formed of gilt plates of hammered iron. Kiss worked only in metal. The bad taste of the first half of the present century is strongly shown by many of the works of Theodore Kalide, whose " Bacchanal sprawling on a Panther's Back " is a marvel of awkwardness of pose and absence of any feeling for beauty. Ernst Rietschel (1804-1861) was perhaps the best German sculptor of this period, and produced wbrk superior to that of his contemporaries, such as Haagen, Wichmann, Fischer and Hiedel. Rietschel's career was marked by steady progress from a meaningless classicism to serious realism. It was his task to erect monuments in memory of some of the greatest intellectual heroes of Germany, such as his Lessing monument in Braun- schweig, the monument to Goethe and Schiller in Weimar, and that to Martin Luther at Worms. Some revival of a better style is shown in certain sculpture, especially reliefs, byHahnel, whose chief works are at Dresden. Schwanthaler (1802-1848), who was largely patronized by King Louis of Bavaria, studied at Rome and was at first a feeble imitator of antique classic art, but later in life he developed a more romantic and pseudo-medieval style. By him are a large number of reliefs and statues in the Glyptothek at Munich and in the Walhalla, also the colossal but feeble bronze statue of Bavaria, in point of size one of the most ambitious works of modern times. 2 Johannes Schilling (b. 1826) is the author of the colossal national monument on the Niederwald near Rudesheim, and Ernst Bandel of the imposing monument of Hermann Arminius in the Teutoburg Forest near Detmold. ■ i

It was Reinhold Begas (b. 183 1) who definitely broke away from the all-pervading classicist tradition. His art has more in common with that of the Rococo period than with that of Canova and his followers. Not only did he excel in the rendering of textures, and in

giving life and animation to his figures, but his earlier work was marked by unconventionality and great boldness of disposition. Unfortunately his rapid success, and the official favour that was shown to him, led him subsequently to hasty and what might almost be described as factory-like production. His work became pretentious, and though some of the reliefs and single figures on his monuments are remarkable for his keen gift of observation, the whole effect is frequently spoilt by the unnecessary introduction of disturbing decorative features, ill-disposed and singularly lacking in sculptural dignity. The monument of the emperor William I. with the two beautiful

2 In size, but not in merit, this enormous statue was surpassed by the figure of Liberty made in Paris by Bartholdi and erects^ as a beacon in the harbour of New York city.

reliefs of Peace and War, and the Neptune fountain, both in front of the imperial palace, and the Schiller monument before the royal theatre, all in Berlin, are perhaps his most successful works. The Bismarck in front of the Reichstag building suffers from the excessive use of allegorical motifs and from other errors of taste.

Of Begas's many pupils, who participated in the execution of the numerous statues that flank the Siegesallee in the Beilin Thiergarten, the most distinguished is Joseph Uphues (b. 1850), who is the creator of the Moltke monument in Berlin, and of the Frederick the Great in the Siegesallee, a replica of which is to be found in Washington. Adolf Briitt (b. 1855) and Gustav Eberlein should be mentioned among the most successful Berlin sculptors; Robert Dietz, as the founder of an important school in Dresden; and Wilhelm Ruemann (d. 1906) and Rudolf Maison among the modern sculptors of Munich.

The closing years of the 19th century were marked by an enormous advance, not only in public appreciation of sculpture but in productive activity. The younger generation of Berlin sculptors includes such distinguished artists as Fritz Klimsch, who is best known by " The Triumph of Woman " and " The Kiss "; Hugo Lederer, the designer of the Bismarck monument in Hamburg; August

Gaul, who excelled in statuettes of animals; Max Kruse, a woodcarver of great ability; and Louis Touaillon, who spent his early years in Rome, and became famous for the excellent anatomy and action of his equine studies. Karl Seffner, of Leipzig; August Hudler, of Dresden; Georg Weba, Fritz Christ, Erwin Kurz, Hermann Hahn, Theodor von Gosen and Hugo Kaufmann, all of Munich, should also here be men- tioned. Adolf Hildebrand (b. 1847) is best known by his Wittels- bach fountain in Munich and his Reinhard fountain in Strassburg. He has also executed some excellent medals and plaquettes. Franz Stuck, who has ranked among the leading painters of modern Germany, has also produced some powerful pieces of sculpture, such as the Beethoven, and the " Athlete holding a heavy Ball." Max Klinger (b. 1857), famous as painter and etcher, revived polychromatic sculpture in Germany. His Beethoven monument, at the Leipzig Museum, is the best known example of his work in this direction. The great composer is conceived as Jupiter enthroned, with the eagle at his feet. The work caused an enormous sensation on its first appearance before the public and became a veritable apple of discord around which a wordy war was waged by the different factions. The Leipzig Museum also owns his Cassandra and a rough-hewn portrait bust of Liszt. One of his most striking works is the Nietzsche bust at Weimar. At the Albertinum, in Dresden, is an important late work of his, a marble group of three beautifully modelled life-size figures, "The Drama." (J.H.M.; M.H.S.; P.G.K.)

*During the first half of the 19th century the prevalence of a cold, lifeless pseudo-classic style was fatal to individual talent, and robbed the sculpture of England of all real vigour Rrttfh anc * spirit- Francis Chantrey (1782-1841) produced sculpture. a g reat quantity of sculpture, especially sepulchral monuments, which were much admired in spite of their limited merits. Allan Cunningham and Henry Weekes, who excelled in busts of men, worked in some cases in conjunction with Chantrey, who was distinguished by considerable technical skill. John Gibson (1 790-1866) was perhaps after Flaxman the most successful of the English classic school, and produced some works of real merit. He strove eagerly to revive the polychromatic decoration of sculpture in imitation of the circumlitio of classical times. His " Venus Victrix," shown at the exhibition in London of 1862 (a work of about six years earlier), was the first of his coloured statues which attracted much attention. . The prejudice, however, in favour of white marble was too strong, and both the popular verdict and that of other sculptors were strongly adverse to the " tinted Venus." The fact is that Gibson's colouring was timidly applied: it was a sort of compromise between the two systems, and*

thus his sculpture lost the special qualities of a pure marble surface, without gaining the richly decorative effect of the polychromy either of the Greeks or of the medieval period. The other chief

sculptors of the same inartistic period were Banks, the elder Westmacott (who modelled the Achilles in Hyde Park), R. Wyatt (who cast the equestrian statue of Wellington, removed from London to Aldershot), Macdowell, Campbell, Calder Marshall, and Bell. Samuel Joseph (d. 1850), working in a naturalistic spirit, produced some excellent work, notably (in 1840) the remarkable statue of Samuel Wilberforce now in Westminster Abbey. The brilliant exception of its period is the Wellington monument in St Paul's cathedral, probably the finest plastic work of modern times. It was the work of Alfred Stevens (1817-1875), a sculptor of the highest talent, who lived and died almost unrecognized by the British public. The value of Stevens's work is all the more conspicuous from the feebleness of most of the sculpture of his contemporaries.

During the last quarter of the century a great change came over British sculpture — a change so revolutionary that it gave a new direction to the aims and ambitions of the artist, and raised the British school to a level wholly unexpected. It cannot be pretended that the school yet equals either in technical accomplishment, in richness or elasticity of imagination, or in creative freedom, the schools of France and Belgium, for these have been built up upon the example of national works of many generations of sculptors during several centuries. British sculptors, whose training was far less thorough and intelligent than that which is given abroad, found themselves practically without a past of their own to inspire them, for there existed no truly national tradition; with them it was a case of beginning at the beginning.

The awakening came from without, brought to England mainly by a Frenchman — Jules Dalou — as well as by Lord Leighton, Alfred Gilbert and, in a lesser degree, by Onslow Ford. To Carpeaux, no doubt — despised of the classicists — the new inspiration was in a great measure due; for Carpeaux, who infused life and flesh and blood into his marble (too much of them, as has been here shown, to please the lovers of purism), was to his classic predecessors and contemporaries much what in painting Delacroix was to David and the cold professors of his formal school. But it was to Jules Dalou that was chiefly due the remarkable development in Great Britain. A political refugee at the time of the Commune, he received a cordial welcome from the artists of England, and was invited to assume the mastership of the modelling classes at South Kensington. This post he

retained for some years, until the amnesty for political offenders enabled him to return to his native land; but before he left he had succeeded in making it clear that severe training is an essential foundation of good sculpture. This had been but partly understood — is not even now wholly realized; yet by the impression he made, Dalou improved the work in the schools beyond all recognition. The whole conception of sculpture seemed to be modified, and intelligent enthusiasm was aroused in the students. When he departed, he left in his stead Professor Lanteri, who became a naturalized Englishman, and who exercised a beneficent influence over the students equal to that of his predecessor. Meanwhile, the Lambeth Art Schools — where Mr W. S. Frith, a pupil of M. Dalou, was conducting his modelling class under the directorship of John Sparkes (d. 1907) — were being maintained with great success. At the Royal Academy, where in 1901 the professorship of sculpture was revived after many years, the inspiring genius of Alfred Gilbert aroused the students to an enthusiasm curiously contrast- ing with the comparative apathy, which passed as dignified restraint, of earlier days. British sculpture, therefore, when it is not coloured directly from the Italian Renaissance, is certainly influenced from France. But it is remarkable that in spite of this turning of British sculptors to romantic realism as taught by Frenchmen and Italians, and in spite of the fact that the spirit of colour and decoration and greater realism in modelling had been brought from abroad, the actual character of British sculpture, even in its most decorative forms, is not in the main other than British.

Nevertheless, there has been shown a tendency towards reviving the application of colour in sculpture which has not

met with universal approval. Although the polychromatic work of the Renaissance, for example, may keep its place, it is held to clash with the idea of sculptural art; for though there is no absolute approach to imitation, there is a very strong suggestion of it. The use of a variety of marbles and metals, or other materials, such as has been increasingly adopted, does not offend in the same measure, as the result is purely formal. Yet, in the final result, the work becomes not so much sculpture broadly seen, as an " object of art," amiably imagined and delicately wrought.

Indeed, the sculptor has been greatly reinforced by the artificer in metal, enamel, and the like. But the revival of metal-work, cut, beaten, and twisted, however fine in itself, does not help sculpture forward very much. It may even keep it back; for, popular and beautiful as it is, it really tends to divert the attention from form to design, and from light and shade, with planes, to ingenuity, in pleasing lines — a very beautiful and elevated art, but not sculpture. As an adjunct, it may be extremely valuable in the hands of a fine artist who does not mistake the mere wriggles and doublings which are the mark of the more extravagant phase of the so-called " New Art " for harmonious " line." But it must always suggest the man with the anvil, shears, and pincers, rather than the man with the clay and the chisel. It is mainly to Alfred Gilbert that is due the delightful revival of metal-work in its finest form wedded to sculpture, with the introduction of marbles, gems, and so forth, felicitous and elegant in invention and ornament, and so excellent in design and taste that in his hands, at least, it is subservient to the monumental character of his sculpture.

The first effectual rebellion against the Classic, and the birth of Individualism, dates back to Alfred Stevens. The picturesque fancy of the Frenchman Roubiliac (who practised for many years in England), with his theatrical arrangement and skilful technique, inherited from his master Coustou, had left little mark on the Englishmen of his day. They went on, for the most part, with their pseudo-classic tradition, which Flaxman carried to the highest point. But until Stevens, few in England thought of instilling real life and blood and English thought and feeling into the clay and marble. It was not only life that Stevens realized, but dignity, nobility of form, and movement, previously unknown in English work. Follower though he was of Michelangelo and the Italian Renaissance, he was entirely personal. He was no copyist, although he had the Italian traditions at his fingers' ends, and his feeling for architecture helped him to treat sculpture with fine decorative effect. Yet even Stevens and his brilliant example were powerless to weaken the passion for the Greek and Roman tradition that had engrossed English sculptors — with their cold imitations and lifeless art, pursued in the name of their fetish, " the Antique."

Until towards the close of the 19th century this pseudo-classic art was blindly pursued by a non-Latin race, and a public favourite like W. Calder Marshall (1813-1894; A.R.A., 1844; R.A., 1852) never attempted, except perhaps in the " Prodigal Son," now at the Tate Gallery, to break away towards originality of thought.

Thomas Woolner (1825-1892; A.R.A., 1871 ; R.A., 1874), who had represented a modern heroine as a Roman matron, and had shown in his monument to Bishop Jackson in St Paul's cathedral an archaic severity and dryness altogether excessive, sought elevation of conception such as brought him applause for his " Tennyson " in portraiture and for his classically-inspired relief " Virgilia lamenting the Banishment of Coriolanus " — probably his most admirable and most exquisitely touching work.

Meanwhile, Baron Carlo Marochetti (1809-1867; A.R.A., 1861 ; R.A., 1866), an Italian of French parentage, had tried to introduce a more modern feeling, and his " Richard Coeur de Lion " at Westminster evoked great enthusiasm. It is difficult, now, to admire without reserve the incongruity of the 12th-century king, mounted on a modern thoroughbred, and raising arm and weapon with an action lacking in vigour. The intention was excellent and fruitful, notwithstanding, and the statue is not without merit. It was he who cast for Landseer the lions of the Nelson monument in Trafalgar Square, London.

Later on Charles Bell Birch (1832-1893; A.R.A., 1880), with his German training, introduced a new picturesque element in his " Wood Nymph," " Retaliation," " The Last Call," and the " Memorial to Lieut. Hamilton, V.C., dying before Kabul "; but neither the vigour nor the individuality of his work influenced his contemporaries to any extent, doubtless on account of the strong Teutonic feeling it displayed.

Sir Joseph Edgar Boehm, R.A. (1834-1890), an Austrian by birth, was more successful, and his influence, helped by the talent of able studio-assistants (Professor LanteVi, Alfred Gilbert, and others), contributed somewhat to thaw the chill which the cold marble still seemed to shed around. There was not much inspiration

in his monument of " General Gordon " in St Paul's cathedral, and his " Wellington Memorial " is cold and empty, though correct enough; but the " Herdsman and Bull," among his ideal subjects, the " Carlyle " on Chelsea Embankment, among his portrait-statues, had

the right feeling in them. His busts were usually excellent.

J. H. Foley (1818-1874; A.R.A., 1849; R.A., 1858), who at first was all for " the unities " and a " pure style," seemed in his later years to throw his previous convictions to the winds, when he pro- duced the finely spirited equestrian statue of " General Sir James Outram," now erected in India, and the statue of Sir Joshua Reynolds in the Tate Gallery. This statue was welcomed with enthusiasm in the art world, and helped to remind the public that monuments need not be staid to dulness, nor stiff and dead in their imperturb- ability.

Meanwhile Henry Hugh Armstead (1828-1905; A.R.A., 1875; R.A., 1880), who had begun by devoting himself to the art of the silversmith, fashioning the " St George's Vase," " The Packington Shield," and " The Outram Shield," was working in the spirit of the younger school; he made his first appearance in the exhibitions in 1 85 1. He was carrying out commissions of considerable magnitude — in the Palace of Westminster, and in the Abbey itself, for which he executed the marble reredos with its many figures, the whole of the external sculptural decorations for the Colonial Office in White hall, as well as the eighty-four life-sized figures on two sides of the podium of the Albert Memorial, with the four bronze statues, " Chemistry," " Astronomy," " Medicine," and " Rhetoric." Portrait-figures of all ages are here classed together, and the work is a better-sustained piece of designing and carving than is commonly understood. The statue set up at Chatham of Lieutenant Wag- horn " is a good example of Armstead's sculpture, impressive by its breezy strength and picturesqueness ; but a more remarkable work, technically^'speaking, is the memorial to a son of the earl of Wemyss, " David and the Lion," now fixed in the Gnards' Chapel. It is in very flat relief; Ninevite in character of treatment, and carved wholly by the artist directly from the living model, it is, in point of technique, one of his best productions. His marble statuette of " Remorse," bought for the Chantrey Collection, is a remarkable example of combined intensity of expression and elevated purity of style. The work of Armstead is monumental in character — the quality which has been so rare among British sculptors, yet the finest quality of all ; and in almost everything he did there is a " bigness " of style which assures him his place in the British school.

Following the chronological order of the artists' first public appearance, as being the most convenient and the only consistent method that will prevent overlapping, we come to F. J. Williamson (b. 1853), who executed many, works for Queen Victoria; John Hutchison, R.S.A. (b. 1856), a Scottish sculptor of the Classic

school; and George A. Lawson, H. R.S.A. (1832-1904). Lawson. was a pupil of Alexander Ritchie, of the Royal Scottish Academy, and in a measure of Rome. He went to London in 1867, and soon proved himself one of the best sculptors Scotland has produced. " In the Arena" was his first striking group; " Daphms " is an excellent example of his Classic life-size work; and " Motherless " one of his greater successes in a more modern and pictorial spirit, a group full of pathetic pathos and free and sympathetic handling. " Callicles," " The Weary Danaid," " Old Marjorie," and the statue of " Robert Burns," erected at Ayr, are all in their way noticeable, Lawson's work, which only requires a little more animation to be fine, has the quality of " style," and is strong, manly, and full of distinction.

Sir Edwin Landseer (1802-1873) had exhibited in 1866 a "Stag at Bay," but his four colossal lions for the Nelson monument in Trafalgar Square, London, constitute his principal plastic works. They engaged him from 1859 to 1867, the year in which they were set up. The casting of them, as already stated, was carried out by Baron Marochetti. Each is 20 ft. in length and weighs 7 tons. They have great nobility and dignity of pose, and although they are not altogether sculptural in treatment, they are finely impressive with a good sense of style.

George Simonds (b. 1844) is a product of the foreign schools. He is the author of many monumental works and not a little decora- tive sculpture, but he is best recognized by ideal subjects, such as " Dionysus astride his Leopard " (his finest work), " The Goddess Gerd," " The Falconer " (in the Central Park, New York), " Cupid and Campaspe " and " Anemone, the Wind Flower." His treatment of the undraped female figure is refined and delicate, and there is an intellectual reality about his best work, as well as imagination in conception. A. Bruce-Joy (b. Dublin, 1842) has produced ideal work and statues of public men for public spaces, and many busts.

Thomas Brock (b. 1847; A.R.A., 1883; R.A., 1891), whose work is prodigious in amount as well as solid and scholarly, came to London from Worcester in 1866 and fell early under the influence of the sculptor Foley, who was soon to rebel against the formalism that prevailed. When his chief died, in 1874, Brock was appointed to carry out the great unfinished works in the studio — the ' O'Connell Monument " in Dublin, the " Lord Canning " in Calcutta, and several others. But he felt the foreign current; and even when h,ts style was formed, his career being already assured, he was perceptive enough to modify it, and, so developed, he left his master very far behind. The ideal work that marked this transition was "The

Moment of Peril," a fine, scholarly work representing a mounted Red Indian repelling the attack of a great serpent which has thrown his horse to earth. How greatly he improved in technical quality and in refinement of taste is to be seen in the life-sized marble statue called " The Genius of Poetry " — graceful where the " Moment of Peril " was violent in action, reposeful and harmonious where that was vigorous, and sculpturesque where that was anecdotal. A higher intellectual point was reached in " Song " and in the " Eve," now in the Tate Gallery in London, A similar advance is to be observed in Brock's portraiture. The statues of " Robert Raikes " (on the Thames Embankment) and " Sir Richard Temple " (in Bombay Town Hall), for.example, are finely treated, unconventional figures; but " The Rt. Rev. Henry Philpott, D.D., Bishop of Worcester," in which the inherent difficulty of a seated figure is happily surmounted, marks the progress. The skill with which the artist has given the drapery, especially of the sleeves, a lightness not commonly seen, is striking. There are no black holes of shadow: the depressions are shallow and of the right shape to hold light even while securing shadow; yet weakness, is avoided and crispness is secured by the sharpening of the edge of the folds— the principle which is established in the Pheidian group of "" The Fates," for example, among the Elgin Marbles. Other works of importance in the same class are the effigy of " Dr Benson, archbishop of Canter- bury," and the admirable statue of "Sir Richard Owen " in the Natural History Museum, South Kensington, and especially the " Thomas Gainsborough " in the Tate Gallery, are all of a high order whether as to character or handling. With these may be grouped the statue of " Sir Henry Irving," the tribute of British actors to the memory of the great dramatic artist (1910), and the seated marble statue of Lord Russell (1904). The bust of Queen Victoria is one of the noblest and most dignified works of its class executed in Eng- land; full of tenderness and of character, lovingly rendered; and with a delicate feeling for form, rightly realized. This head heralded the noble work by which the memory of Lord Leighton is to be kept green in the aisle of St Paul's cathedral. In proportion and in harmony of design and of line, alike in conception and in reticence, it is the sculptural expression of a well-ordered mind and taste. The effigy shows Leighton asleep, while figures personifying his arts, painting and sculpture, guard his sarcophagus at head arid foot. There is a note of triumph in the great

design for the " Queen Victoria Memorial," which provides London with its most elaborate sculptural effort, rising 70 ft. high on a plateau 200 ft. across, with numerous emblematical figures of great size and imposing arrange- ment. It is based on an elevated style, dignified, refined and monumental ; for Brock is a sculptor in the full sense of the term, and his lines are always good.

D. W. Stevenson, R.S.A. (1842-1904), in his general work showed but little sympathy with modern developments. The " Bronze Lectern " (in St Cuthbert's Church, Edinburgh) is perhaps the most decoratively effective; but his most ambitious work, called " The Pompeian Mother," is a modern adaptation of the " Niobe and her Daughter " by a follower of the school of Scopas in the Uffizi Gallery.

Although Horace Montford, modelling master at the Royal Academy, passed much time in the studio of Matthew Noble (1818- 1876), he did not thereby lose his sculptural taste. Not that he displayed it much in the share he had, as assistant to C. B. Birch, A.R.A., in the modelling of the notorious " City Griffin " at Temple Bar — a weird but spirited beast, the design for which had been supplied by the city architect, Sir Horace Jones. " A Hymn to Demeter," a life-size statue full of movement, and the statue of " Psyche and the Casket of Venus," may be named as typical of the style of Montford, whose work is usually broad and sculpturesque, distinguished by firmness and grace.

Sir Charles B. Lawes-Wittewronge (b. 1843) has produced three large works which have attracted attention: an elaborate and spirited equestrian group of a female Mazeppa — " They Bound me on " (1888); " The United States of America " (1890), decorative and not without elegance, and " The Death of Dirce." The last- named, of heroic size, in variously coloured bronze, was first exhibited at the Royal Academy in 1908, and again, in coloured marbles (yet not truly polychromatic in character) in colossal size, at the Franco-British Exhibition (1908). The complexity of the design, the skilful composition and arrangement of the elaborate group, the vigour of the modelling, and the impressiveness with which the work imposes itself upon the spectator, combine to render this perhaps the most important sculptured group of its kind exhibited in England. Sir Charles's work is always strong and robust, though occasionally somewhat lacking in repose.

W. Hamo Thornycroft (b. 1850; A.R.A., 1881; R.A., 1888) became a great influence for good in the British school. His tendency towards

the Greek has been a wholesome reminder of the danger of the over-enthusiasm for naturalism, and yet was never forced to conventionalism. Alike in ideal work, in monumental sculpture and in portraiture, his art is marked by refined taste and scholarship and a noble sense of beauty. It is strong, yet without undue display of power. In him we have to appreciate an unaffected sympathy with grandeur and style, and in all, a big, broad rendering of the human form, with something of the movement of the Greek sculptors and not a little of their repose, yet individual and unmistakably

belonging to the British order of mind. In his largest monumental group, however, the " National Memorial to W. E. Gladstone," erected in the Strand, London, there is little trace of the classic. In this work, as. in the bronze statue of Bishop Creighton in St Paul's Cathedral, there isa modern feeling entirely responsive to the feeling of the people. Mr Thornycroft's seated marble statue of Lord Tennyson (1909) in Trinity College, Cambridge, is one of his finest portrait figures, full of dignity and excellent in likeness — a worthy memorial of the poet.

J. Havard Thomas began in 1872 to exhibit portrait sculpture, and soon turned his attention to ideal work, but he did not attract widespread attention until 1886, when he produced " The Slave Girl." This marble nude was a curious contrast to most Slave Girls by other sculptors — that by Hiram Powers, for example. Somewhat stunted in form, she is nevertheless full of very human grace and well-felt realism, and is a good example of the artist's carving. Mr Thomas, indeed, is one of the few to carve his own marbles, often without taking the intermediate step of making a clay model. This of-course cannot be the case with his large sculpture, such as his great statue of " The Rt. Hon. W. E. Forster " at Bradford, and his " Samuel Morley, M.P.,"and " Edmund Burke, M-P-i" both at Bristol ; but the beautiful small heads of peasants and children — such as the Donatellesque " Pepinella " — of Capri, where he lived for years from 1889 onwards, are mostly carved direct from life. The beauty of his chisel work can be seen to perfection in the exquisite bust of Mrs Wertheimer in the Tate Gallery; the marble seems to turn to flesh under his chisel and to palpitate with life: it is, perhaps, too much like flesh. This is very far from the " Classic," with over-attention to which Mr Thomas has curiously and quite inaccurately been reproached. It is true that his much discussed statue " Lycidas " appears to be a distant echo of Myron; it is in truth archaistic, but with an aim altogether different from that of the Greek. It is Classic in a sense, full of life and wonderfully modelled, but the attainment of perfection of human beauty was not the intention of the sculptor,

and yet it appears to the un- obserying as but a rifacimento. There is a vivid sense of style in Mr Thomas's work, and sometimes a search for beauty in subjects which to the common eye may suggest the ugly. But Mr Thomas must be recognized as an artist of great power and originality and to the last degree conscientious. Sculptural subtleties he loves, and he works in a low key, quiet and unobtrusive, and severe though he is, he is a poet in sentiment with extreme refinement of taste. His reliefs are fine in rhythm, and by their accentuated definition, allied with delicacy, extremely telling.

From the year 1873 Edwin Roscoe Mullins (d.1905) produced numerous busts and statues, and his work was in the main ideal and decorative. His best figure is probably that of "Cain — My Punishment is Greater than I can Bear," executed in 1896; his latest work, " The Sisters " (1905), shows considerable grace. Mullins' work in architectural embellishment was good in style, appropriate and effective.

Joseph Swynnerton (d. 1910) was a sculptor who spent a good deal of his time in Rome and worked under her influence. His colossal fountain of flowers, zephyrs and splashing nymphs is, on the contrary, rather rococo in style, with charming passages. On the other hand, " Love's Chalice " is Classic in feeling. Generally speaking, Swynnerton's work has an appearance of strength, without common- ness or lack of effect.

E. Onslow Ford (1852-1901; A.R.A., 1888; R.A., 1895) was lost to British art before he had passed middle age. His seated statue of " Henry Irving as Hamlet " is a well-conceived piece of realism, with expression subtly marked, and verging upon the theatrical — which is precisely what an actor's character-portrait should be. Compared with this work, the later seated statue, that of " Huxley," keen and refined, is more strictly sculpturesque — for in it there is no " subject," and there are no ornaments to divert the attention and suggest a false appearance of decoration. The statue of " Gordon " mounted on a camel — reminding us too vividly of the " Arab Chief " by Barye — is more open to criticism on the score of the elaborateness of the ornamental details, which almost reach the boundary of what is allowable in sculpture. It is erected at Chatham, and a replica has been set up (1902) in Khartum. A finer memorial is that to the honour of " Shelley." It is, however, better in its parts than in its entirety, because the decorative scheme injures, rather than helps, the sculptural dignity of the drowned poet's exquisitely-rendered figure. Of Onslow Ford's other memorials, that of Queen Victoria at Manchester is perhaps the most discussed and the least to

be admired, for although the conception is dignified and characteristic, it does not rank by any means with the best of which the artist was capable. As a truthful portraitist Onslow Ford had few rivals. The sitter is before the spectator, without undue flattery, yet without ever showing the commoner side of the model. Flesh, bone, hair, clothing, are all in their true relation, and the whole is admirably realized. Idealism, or at least poetic realism, Onslow Ford cultivated in a series of small works. Of his last figure, " Glory to the Dead," it may be said that, although statuesque, it carries realism rather far in treatment. It may be objected that in funerary art, so to call it, the nude was never resorted to by the Greeks in such a relation ; but Onslow Ford felt that he was working, not for ancient Greeks, but for modern Englishmen, and that sentiment, and not

archaeology, must in such matters be the guide. There are, besides, the " Marlowe Memorial," set up in Canterbury — graceful and refined, but rather trifling in manner — and the " Jowett Memorial," a wall decoration, in the style of the Italian Renaissance. The work of Onslow Ford always charms, for he had a strong sense of the pictur- esque and a true feeling for beauty, but with insufficient power. But for his delight in decorative detail, he would have been greater than he was; for over-enrichment is in inevitable opposition to the greater qualities of the monumental and the dignified in glyptic art, and abundance of small details involves poorness of effect. But against Ford's taste, especially against his admirable dexterity, little can be said. The high degree of refinement, the charm of modelling, grace of line and composition, sweetness of feeling, which are the note of his work, are in a great measure a set-off against occasional weakness of design and character, and lack of monu- mental effect.

H. R. Hope Pinker is primarily a portrait-sculptor. Of all his works the seated statue of " Dr Martineau " is perhaps the best, for interest, refinement, and for technical qualities. His reliefs are as numerous as his statues, of which the most popular is the " Henry Fawcett " in the Market Place of Salisbury, but his most important work is the colossal statue of Queen Victoria executed for the government of British Guiana.

The most remarkable work executed by any British amateur- sculptor is the " Shakespeare Memorial," presented to the nation, by Lord Ronald Sutherland Gower, and set tip by him outside the Shakespeare Theatre at Stratford-on-Avon (1888). This monument, carried out in Paris, represents the poet on the summit, attended below by the four great characters—" Hamlet," " Henry V.," " Lady Macbeth " and " Falstaff," designed with singular ability and a happy display of symbolic inventiveness. Lord Ronald also modelled statues of " Marie Antoinette," " The Dying Guardsman," and other works which have secured wide attention.

In 1877 there burst upon the world a new sculptor, in the person of Sir Frederick (afterwards Lord) Leighton (1830-1896; A.R.A., 1864; R.A., 1868), who, in the following year, was to be the president of the Royal Academy. His first work was " An Athlete Struggling with the Python." No piece of sculpture of modern times made a greater stir on its appearance; for here was a work, by a painter, a work, it was declared, which would have done honour to the ancients, fine in style, noble in type and in form, learned in the knowledge of the figure it displayed, original and strong in pose, in action and movement; scholarly in execution and instinct, with the manner of the painter himself. The group was hailed as a masterpiece by one who was thought to be not yet even a student in sculpture, and it was declared by the most exacting critics to be worthy to rank with the best examples of all but the finest periods. Yet it is somewhat lacking in expression — in that kind of humanity which every really great masterpiece of art should exhibit; and connoisseurs applauded the technique, the surface qualities and the like, when they should have been caught by the sentiment. But as Leighton was seeking only the beauty and expression of form, to the neglect of sentiment, he was well content with the reception and world-wide recognition of his work. One day the model for the " Athlete," tired out, rose and stretched himself, and the sculptor was so enraptured by the pose that he forthwith began the model for the " Sluggard." This work is in its way of still higher accomplishment than the " Athlete." It is just as Greek as the other in its devotion to form and its worship of the beauty of the human frame. But it is a condition, a sensation, an idea, rather than an action, that is here recorded; and so it is the higher conception. And it has some of the mystery which is distinctive of the finest art of ancient times, in which modern sculpture is almost entirely deficient. Yet while the " Athlete " may be compared, in idea, with the relatively debased " Laocoon," which it seems in some degree to follow if not to challenge, the " Sluggard " belongs to a more elevated expression of a distinctly pagan art, and,

as it were, to a better period. Great as was the sensation made by these works, and by the charming little statue of " Needless Alarms " . (cast by the " lost- wax " process), Leighton seems to have left no direct follower or imitator among the younger men.

T. Stirling Lee, by natural ability as well as by cultivation, is an artist of unusual elevation of mind and excellence of execution, and in his composition he aims at securing beauty by the arrangement of his figures in the panel, rather than at enriching them with details, as a designer would do. He is an ascetic in choice of materials, so that his works generally remain beautiful studies of the human form, draped or undraped. It is for his power of telling a story beautifully in marble — as in his panels for St George's Hall, Liverpool, which are among the finest work of their kind in England — that Mr Lee will continue to be admired : he is, beyond almost all others, a sculptor's sculptor. His statue of " Cain," extremely simple in conception, is a masterpiece of expression.

John M. Swan (1847-1910; A.R.A., 1894; R.A., 1905); a pupil of the Royal Academy and of Ger6me and Fremiet, specialized as a sculptor of a particular class of subject. He is a stylist in a high degree, whose work is full of beauty and importance. For the most part, but by no means exclusively, his sculptures are studies of animals, mainly of the felidae; but he would pass from the accentuation of action to the covering of skin and hair, without seeking much to emphasize the bone and flesh, because they alone display, with the

fascinating expressiveness of their sinuous bodies, the whole range of the passions in the most concentrated form. In the " Leopard Playing with a Tortoise," " Leopard Running," " Puma and Macaw," and similar works, we have the note of his art — sinuosity, with tense muscles, stretched and folded skin, suppressed frenzy of enjoyment. The note of Barye, the great Frenchman, from whom in some measure Swan drew inspiration, is power and strength and decorative form, but his aim is rather at fine, grim, naturalistic studies of a great cat's crawl, with amazing vivacity and vitality. In certain groups, such as " Orpheus " and " Boy and Bear Cubs," the sculptor combines the human figure with animal forms. In the composition of these there is always the note of originality.

Another student of animal life is Harry Dixon, whose bronze " Wild Boar " is in the Tate Gallery. " A Bear Running," excellent alike in character, form and construction, and especially in move- ment, " Otters and Salmon," and the figure-subject called " The Slain Enemy " — a prehistoric man with a dead wolf — are among his chief

works.

Andrea C. Lucchesi is one of the few who, in spite of all discouragement, has not only persisted in concentrating his attention on ideal work, but has devoted most of it to the rendering of the female form. Prominent among his figures are those called " Destiny," " The Flight of Fancy," " The Mountain of Fame," " The Myrtle's Altar," " Carthage, 149 B.C.," and "Verity and Illusion." Mr Lucchesi's main excellence is in the treatment of nude forms, in which he has succeeded, through agreeable working out of idea and excellent execution, in interesting a public usually indifferent to this branch of sculpture.

Alfred Gilbert (b. 1854; A.R.A., 1887; R.A., 1892; resigned, 1909) is to be regarded as one of the greatest figures in British sculp- ture, not only as being a master of his art, but as having preached in his work a great movement, and in less than a decade effected more than any other man for the salvation of the British school, and inspired almost as much as Carpeaux or Dalou, the young sculptors of the country. Among his earlier works are two fine • heads of a man and a girl, pure in style and incisive in character, which were cast by the cire perdue, or " lost-wax," process, which he had learned in Naples. Its introduction into Great Britain — or, it may be more correct to say, its revival — had considerable influence on the treatment of bronze sculpture by British artists. In Gilbert's portraiture we have not merely likenesses in the round, but little biographies full of character, with a spiritual and decorative as well as a physical side, and the mental quality displayed with manly sympathy. Flesh and textures are perfectly realized, yet broad, simple, and modest. Many of these qualities are as obvious in his portrait-statues, such as the fine effigy set up to " John Howard " in the market-place of Bedford. The monument with which Gilbert's name will ever be associated is the " Statue of Queen Victoria " set up at Winchester, which, since its erection and re-erection in that city, has been irretrievably injured by depredations, and remains incomplete in its decorative details. The queen is shown with extra- ordinary dignity. Large in its masses, graceful in its lines, the person of the queen enveloped by all the symbolical figures and fanciful ornaments with which the artist has chosen to enrich it, the monument marks the highest level in this class to which any sculptor and metal-worker has reached for generations. The pro- fusion of an ardent and poetic imagination is seen throughout in the arrangement of the figure itself, in the exquisite " Victory " that used to surmount the orb, in the stately throne. Invention, originality, and inspiration are manifest in every part, and every detail is worked out with infinite care, and birth is

given to a score of dainty conceits, not all of them, perhaps, entirely defensible from the purely sculptural point of view. In a measure it suggests goldsmithry, to which the genius of Gilbert has so often yielded, as in the exquisite epergne presented to Queen Victoria on her jubilee in 1887, typifying Britannia's realm and sea power in endless poetic and dainty suggestions of beautiful devices. Among Gilbert's memorials, not mentioned elsewhere, are those to " Frank Holl, R.A.," and to " Randolph Caldecott," both in the crypt of St Paul's cathedral, London; the " Henry Fawcett " memorial in Westminster Abbey, which, with its row of expressive little symbolical figures, has been styled " a little garden of sculpture." The finest work of its kind in England is the " Tomb of the Duke of Clarence " in St. George's chapel, which in 1910 still awaited final completion. Perhaps his best composition expressive of emotion is the half- length group " Mors Janua Vitae," a terra-cotta group designed to be executed in bronze for the hall of the Royal College of Surgeons. Few artists in any age have shown greater genius as at once artificer and sculptor. Gilbert is fond of dealing with a subject which allows his fancy full play. His work is full of colour; it is playful and broad. The smallest details are big in treatment, and every part is carefully thought out and most ingenious in design. His playfulness has caused him at times to be somewhat too florid in manner; but his taste is so just, and his fancy so inexhaustible, that he has safely given rein to his imagination where another man would have run riot and come to grief.

Robert Stark is an animal sculptor who has usually attracted the notice of connoisseurs rather than of the greater public, and his fine bronze statuette of an " Indian Rhinoceros " is to be seen in the Chantrey Collection. Mr Stark has a profound knowledge of

SCULPTURE— British (a)

Plate III.

(Photo, London Stereoscopic Co .) ALFRED STEVENS— The Wellington Monument, St Paul's CaUedral, London.

SIR GEORGE FRAMPTON, R.A.- The Dr Batnardo Memorial.

[Photo, Mansell !r Co.) LORD LEIGHTON, P.R.A.— The Sluggard.

HARRY BATES, A.R.A.— Homer.

(Photo, Frederick Hollyer.)

H. H. ARMSTEAD, R.A.- Lieutenant Waghorn. XXIV. S04.

G. F. WATTS, R.A.-Hu K Ii Lm

A. GILBERT, M.V.O.— Icarus.

Plate IV.

sculpture—British (b

ALFRED DRURY, A.E.A.- Innocence.

F. DERWENT WOOD, A.R.A.— BERTRAM MACKENNAL, A.R.A.- Psyche. Diana Wounded.

ALBERT TOFT- Antigonc.

HAVARD THOMAS -Lycidas.

W. IIAMO TIIORNYCROIT, R.A.-Dean Colet.

W. COSCOMBE JOHN, R.A.—

St John the Baptist. 24

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animal anatomy; his range is considerable, and he is as easy with a rhinoceros as with a cart-horse or a hunter.

Conrad Dressier is best known for his busts of distinguished men, but his statue of ” A Girl Tying up her Sandal,” and his two large marble panels for St George’s Hall, Liverpool, assured him his position. There is a cleverness, a daring, in his marked style, vigour of treatment, and a tendency towards emphasis, especially in his decorative work, much of which is designed for execution in Delia Robbia ware. Since his return to pure sculpture he has executed some important work, including a bronze ” Bacchante.”

In the work of Harry Bates (1850-1899; A.R.A., 1892), especially in the reliefs, with its balance and dignity, its rhythmical line and fine expression, is to be seen a flexibility which few Englishmen had shown up to that time. Style and a genuinely modern treatment of classic form, which is not weakened by touches of naturalism were also to be recognized. Nor— in his ” Homer,” for example—ˆ does the background detract from the main subject: Homer and Humanity in front; and behind, a vision of the Parthenon and Pallas Athene,

and the great Sun of Art rising with the dawn of Poetry .'.' Ps y che " is more delicate in thought and treatment, but it has little of the originality or force of the " Homer," or of the classic style seen in the head called " Rhodope." The serene and reposeful statue of " Pandora," about to open her ivory casket, successfully achieves the purity of style at which the sculptor aimed. " Hounds in Leash " (the bronze of which belongs to the earl of Wemyss) is a vigorous group which was undertaken by Bates in response to the criticism that he could design no figures but such as are at rest. The plastic group is in the Tate Gallery, where it figures along with the "Pandora." In " Endymion " the sculptor seems to have united in some degree the sculptural ideas expressed in the " Homer " and the central relief of " Psyche ": there is in it a good deal of the grace of the one and of the decorative force of the other, together with a lofty sense of beauty. The portrait-busts of Harry Bates are good pieces of realism—strong, yet delicate in technique, and excellent in character.

Sir George Frampton (b. i860; A.R.A., 1894; R-A., 1902- knighted, .1998), pupil of the Royal Academy, the Lambeth Schools' and Mercie in Pans, is a particularly versatile and original artist, thoroughly in the " new movement " which he has done so much to direct. Highly accomplished, he is at home in every branch of his art, and covers the whole field. He first exhibited " Socrates Teaching " (1884), and followed this with " The Songster " (1887) " An Act of Mercy " (1888), " In Silence Prayeth She," " The Angel of Death " (1889), " Caprice " (1891), and in 1892 " The Children of the Wolf — his last ideal statue of the kind. It was followed by " Mysteriarch," heralding a class of work with which the artist has since identified himself; For being in open rebellion against " white sculpture," he thenceforward devoted himself to colour. " Mother and Child " is an experiment in polychromatic figure- work. The half-length figure called " Lamia," with ivory face, head, and neck, and in a quaint head-and-neck dress of bronze jewelled, is a further departure from the true reserve of sculpture, but beautiful and delightful in feeling. The statue of " Dame Alice Owen," in bronze and marble, and " King Edward VI." are original, notwithstanding the pseudo-medieval taste of their conception. Frampton is happiest in distinctly decorative sculpture. His prolific and inventive fancy has expressed itself in such works as the bronze " The Steamship " and " The Sailing Ship" tor Lloyd's Registry in London, and in the memorial " Monument to Charles Mitchell," at Newcastle-on- Tyne. Herein a new note is sounded, and we have some of the most striking features of Frampton's design. That is to say, he seeks to escape from the purely architectural forms, pediments and mouldings, introducing

his own inventions of curved lines, and frequently substituting tree-forms for columns or pilasters, with roots for bases, trunks for pillars, and branches and foliage for capitals. Besides these should be mentioned " The Vision " the seven heroines from the Morte d' Arthur, " My Thoughts are my Children," " Music " and " Dancing," and memorials and busts of

Charles Keene," " R. Stuart Poole," " Leigh Hunt," " Passmore Edwards, Ur Garnett, a colossal statue of " Queen Victoria " erected in Calcutta, and another, an extremely successful work for Leeds. His group of " Maternity " (1905) and the full-length seated statue of the marquess of Salisbury (1907) have added to his reputa- tion. There are always charm of arrangement, delicacy of work- manship, and daintiness of feeling, as well as considerable power of design, simplicity, and breadth in his work. Sir George Frampton has also produced a number of fine medals.

W. S. Frith, one of the most successful teachers of sculptors in England, is chiefly remarkable for the decorative quality of his work. (As in the monument to " Wheatstone, Inventor of the Tele- graph ' or again, the standard lamps at the Astor Estate Office on the Thames Embankment, the sculptor shows charm of thought and spirit of design, vigour, and richness of effect. His ideal statuary and portraiture are not his chief work, however; his decorative sculpture for ecclesiastical and secular buildings is vast in extent and has had good influence on the younger school. One of his chief works is the " Bishop Ellicott's Memorial," a tomb with recumbent figure, a design of considerable imagination.

Henry A. Pegram (b. 1862; A.R.A., 1904), a pupil of Hamo Ihornycroft and of the Royal Academy, attracted early attention

with " Death Liberating a Prisoner," and by the two high reliefs

Ignis Fatuus " (acquired for the Chantrey Collection) and " The Doom of Medusa." These were followed by " Eve," " Sibylla Fatidica," " The Last Song," "The Bather," "Labour," and

Fortune," by decorative work for the exterior of the Imperial Institute, and later by the great candelabra which flank the interior western end of St Paul's cathedral. " Into the Silent Land " (1905) is a group typical of the funerary sculpture on which his chisel was

engaged, in later years. His portraiture is also noteworthy, and his work generally is usually sculpturesque, with movement and life.

A. G. Walker has produced notable work in the class of pure sculpture, including the relief representing " The Last Plague: The Death of the Firstborn," " Adam and Eve: And They were Afraid " and " The Thorn " (exhibited in bronze in 1910), graceful and quaintly charming, with elegance in the pose and in the action. His chief decorative work includes the sculptural figures in Stam- ford Hill Church.

The name of Captain Adrian Jones was for many years chiefly associated with the spirited work called " Duncan's Horses," a group displaying great knowledge of equine anatomy, form and action; since then his equestrian statue of " The Duke of Cambridge," erected in Whitehall, London, outside the War Office, has been recognized as a vigorous performance. His most important work is the monumental quadriga designed to crown Burton's great Arch at Hyde Park Corner, London.

W. Reynolds-Stephens (b. 1862), more devoted to goldsmith's figure-work than to larger and more searching sculpture, must be considered less as a statuary than as " a poet who sings in metal " A relief, after Sir L. Alma-Tadema's " Wcmen of Amphissa " (1889), was followed by a " Wall Fountain," " Truth and Justice," and the

Sleeping Beauty," abas-relief, full of thought, invention, and dainty conceits. In the highly decorated " Launcelot and the Nestling/'

Guinevere and the Nestling," and similar works, the artist makes use of various coloured metals, ivory, gems and the like, with pretty symbolism. Apart from his choice of material, there is a delicate languor about the lines' .of his figures and reliefs, which display a charming feeling and refined taste. By two striking works he has re-entered the field of pure sculpture — the dramatic and somewhat too anecdotal " A Royal Game "and " The Scout in War," exhibited m A?r° 8 'j an ec l uestrian group of great refinement and excellence.

Alfred Drury (b. 1857 ; A.R.A., 1900) was a pupil of Dalou, whose assistant for a time he became. The first result was the curious echo of the master's style, " The Triumph of Silenus " (1885). " The Genius of Sculpture " and " The First Reflection " (bought by the queen of Saxony) and " The Evening Prayer " (1890, Manchester Corporation Gallery) were followed by the statue of " Circe " (1893), which, through its grace, elegance of line, and symbolical

realization of the subject, achieved a great popular success and was acquired by Leeds. The bronze head of " St Agnes " (1894) is one of the first examples of Mr Drury's later style, belonging to the higher order of conception which, generally speaking, he has since maintained, lhis may be seen also m " Griselda " (bought for the Chantrey Collection), The Age of Innocence," and other busts symbolical of childhood, and in the series of " The Months," at Barrow Court. For the decoration of the City Square at Leeds Drury executed the statue of Dr Priestly, consisting of the colossal figure entitled

Even. His colossal groups for the decoration of the War Office thepnonumental panels in high relief for the piers of Lambeth Bridge ^"?u th(; decorative sculpture for the facade of the new Victoria and Albert Museum, all in London, are works of considerable importance Among the latter are the figures of " Inspiration "and" Knowledge," executed in 1907. Drury's quiet, suave, and contemplative art lends itself well as decorative sculpture to architectural embellishment. His portraiture is also good, reticent, and full of character, and as a manipulator of clay he represents the highest contemporary standard of English sculptors.

Frederick W. Pomeroy (A.R.A., 1906), pupil of the Lambeth and Koyal Academy Schools, and of Mercie\ is of equal taste and ability. After 1888, when he exhibited the bronze statuette " Giotto " he produced many ideal works—" Love, the Conqueror " (Walker Art Gallery, Liverpool), "Pleasures are like Poppies Spread," "Boy riDine. Dionvsns " anH " Ths. Mvmnl, n (I nr .u 4..,„ " /1 – -

ttping, Dionysos, and " The Nymph of Loch Awe " (both in the Gallery), ' A Nymph Finding the Head of Orpheus," " Undine "

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*« *; ens6e ' „ and the clever study of the nude called •" The Potter.-"*

Perseus ^ is an inspiration from Benvenuto Cellini, but " The Spearman ' is an original and powerful work. " Feroniae " (1909) is a nude statue, in bronze, remarkable for grace and sculptural animation. In ideal portraiture he has produced the statues of « nr Blake ." " Dean Hook " (a colossal work for Leeds)

.. Ti I er V, romwe11 " (a,so coIossaI > for St Ives, Huntingdonshire), « ™° • Burns for Paisley, as well as " R. P.

Bonington " (1910),

Monsignor Nugent of Liverpool " (1905), an impressive groups and similar work, together with the life-size panel of " Archbishop lemple, in bronze, for St Paul's cathedral. In true portraiture Pomeroy executed the Liberal Memorial Statue of Mr Gladstone in the lobby of the Houses of Parliament, and the recumbent effigy of the Duke of Westminster, for Chester cathedral. His work is strong and sculpturesque, and his statues " stand " well. He sees nature in a big broad way, and his decoration is effective and well designed.

Albert Toft became known by his statue of " Lilith " (1889), and

emphasized the impression then created by " Fate-Led " (1892, Walker Art Gallery), " Age and the Angel of Death," " In the Sere and Yellow Leaf " (a remarkable study of old age), " The Goblet of Life," and " Hagar." " The Spirit of Contemplation " and " The Cup of Immortality " are more complete and display dignity and refinement. His memorials of the Boer War, at Cardiff and Birmingham, in design and silhouette, are among the most striking in the country. In " Mother and Child " (1903) and " Maternity " (1905) he has greatly raised the high-water mark of his achievement. Toft's busts, such as those of W. E. Gladstone and Philip Bailey, as well as his statue of Sir Charles Mark Palmer, at Jarrow, and similar works, have force and breadth of character; and in his ideal work there is an effort, well sustained and successful, after dignity, harmony, evenness of balance, and relation of the whole.

Professor Edouard Lanteri, a naturalized Englishman, to whom British sculpture owes much, employed his own striking gifts to teach rather than to produce. But " The Fencing Master,' " The Duet," and "A Garden Decoration" have exercised influence on the younger school through their fine sculptural qualities of vitality, richness, joyousness, sensuousness, and movement. His portrait busts are full of life and have that refinement and elegance pushed to the utmost length, which are characteristic of all his work; in his nude figure called " Pax " we have much of the severity, dignity, and placid repose of the Greek.

W. Birnie Rhind, R.S.A., has produced little work so important as the

elaborate decorations for the doorway of the Scottish National Portrait Gallery, but some of his statues and busts — " King James V. of Scotland," " Lord Salisbury," and others — show the influence of the modern school.

W. Goscombe John (b. i860; A.R.A., 1899, R.A., 1909) achieved an early reputation with a figure of " St John the Baptist," an austere creation of real importance. His other chief works are " Morpheus," " A Girl Binding her Hair," " A Boy at Play " (Tate Gallery), " The Glamour of the Rose," and " The Elf " — a weird creation of true comedy. In these are shown a love of the purity and refinement of nature, realized with delicacy and a feeling for beauty. In portraiture Mr John is not less successful. The colossal seated statue of " The Duke of Devonshire " at Eastbourne has been acknowledged by the best critics in France and England to be one of the finest things of its kind, good in design and quiet suggestion of power. Among his chief memorials are the tomb of the marquess of Salisbury in Westminster Abbey, the " Memorial of the King's Regiment " at Liverpool, the equestrian statue of "Viscount Tredegar " at Cardiff, the " Maharajah of Balrampur " at Lucknow, and the monument to Sir Arthur Sullivan in the Embankment Gardens, London. These all sustain the reputation of the sculptor who has from the first been loyally encouraged by his fellow-countrymen of Wales. The striking frieze " The Battle of Trafalgar," for the pedestal of the statue of Viscount Tredegar (1910), is a remarkable performance.

Bertram Mackennal (A.R.A., 1909), the son of a Scottish sculptor settled in Australia, acknowledges no school, but was chiefly influenced by study in Paris. In his early ideal works, such as " Circe " and " For She Sitteth on a Seat in the High Places of the City," there are boldness and a sense of drama, with a keen appreciation of elegance of form, not without severity and power of design. But they give little hint of the excellence that was to follow and to bring him to the very front rank of British sculptors, so that in 1910 he was selected to design the coinage of the new reign. His great pediment in the Local Government Offices in Whitehall is perhaps the finest work of its kind in the Kingdom. " Diana," 1908, bought for the Chantrey Collection in the same year, is a marble nude of extraordin- ary grace, beauty, and refinement; and his small " Earth and the Elements," similarly acquired in the preceding year for the Chantrey Collection, reveals a poetic beauty rare in these days. " The Mother " (1910) belongs to this group. The bronze statue of " The Dancer " (1904) is a work not less subtle, in which the learnedness of the sculptor is evident to every discerning eye, and " War," a colossal female bust, reveals a power, amounting almost to ferocity, not

disclosed in the other works. Among Mackennal's other important statuary are the War Memorial at Islington and statues of Queen Victoria for India, Australia, and Blackburn; in all of these the sculpture is marked by good style, with movement, vigour, grace and nervousness of treatment.

G. Herbert Hampton made his first appearance in the Paris Salon with " The Mother of Evil," and then the statues of " David " and Apollo " and " The Broken Vow," " A Mother and Child," " Narcissus," " Orpheus " and other works were seen in the London galleries. Portraiture of merit has come from Mr Hampton, but his greatest success, perhaps, has been achieved in decorative sculpture. F. E. Schenck (d. 1908) was similarly and more emphatically an architect's sculptor — one of those who have done much to embellish many of the numerous great buildings which during the last twenty years of the 19th and the opening decade of the present century sprang up all over Great Britain. The municipal buildings at Stafford and Oxford, the public library at Shoreditch, and the Scotsman offices in Edinburgh — involving groups of colossal figures bearing close relation to their architectural setting — are among the works which made his reputation. His defect was a " curliness " in his ornamental forms, which frequently detracts from the dignity and seriousness of his work.

J. Wenlock Robbins is another architectural sculptor of real power and individuality, whose work for the New General Hospital in Birmingham and for the Town Hall of Croydon is of a high order. His portraiture is also good, the colossal statue of " Queen Victoria " for Belfast being the most important of his achievements. Of ideal work, the statue called " Nydia " is the best known.

Henry C. Fehr (pupil at the Royal Academy and of T. Brock) contributed the group of " Perseus and Andromeda " to the Academy in 1893, when it was purchased for the Chantrey Collection (Tate Gallery). His subsequent ideal works, " Hypnos Bestowing Sleep upon the Earth," " The Spirit of the Waves," " St George and the Rescued Maiden," and " Ambition's Crown Fraught with Pain," confirmed the high opinion of his cleverness; but in some of them his exuberance tells somewhat against their general effect, in spite of their inherent grace and strength. On the other hand, the statue of "James Watt" for the City Square of Leeds exhibits those qualities needful for open-air portraiture ; and his busts and statues have character and life. " Isabella and the Pot of Basil "is free from this defect, and is an original treatment of the subject; and " The Briton " (1908), though full of vigour and imagination, shows restraint.

George Wade is essentially a sculptor of busts and statues; the most noteworthy of his works are the memorial to Sir John Mac- donald in Montreal, the seated figure for Madras of the native judge, Sir T. Aiyar Muthuswamy, and a number of ambitious monumental works.

Gilbert Bayes, at first a modeller in the flat of horses treated in a decorative manner, produced " Vanity," " A Knight-Errant," and similar picturesque bibelots on a large scale; and later still, such work as " The Fountain of the Zodiac," showing a talent at once more serious, ordered and graceful. " The Coming of Spring " (1904) and " The Gallopers " (1905) are reliefs noteworthy for the intelligence and the sculptural appropriateness they display. The equestrian " Sigurd " (1909 and 1910) is full of fancy and illustrates the personal talent of the sculptor : the latter group was acquired for the Chantrey Collection. He is the designer of the great seal (1910).

W-_ R. Colton (b. 1867; A.RiA., 1903) is a sculptor of strong individuality, capable equally of deep feeling and dainty fancy. " The Girdle," " The Image-Finder," " The Crown of Love," " The Wavelet " and the " The Spring-tide of Life " revealed a sculptor of exceptional ability, whose love of truth and life has sometimes inspired him to place a touch of rather awkward realism in a graceful and charming composition; the result is something unusual, yet quite natural, and because it imparts to the work a flavour of quaintness and originality, it is not only unobjectionable but wel- come. Later, Colton struck out another path especially in the monumental and statuary work executed in England and India. Among his principal efforts are the South African memorial to the Royal Artillery erected in the Mau\ London, during the summer of 1910, the statue of the Maharajah of Mysore (1906) and a monu- mental " Tiger " (1909) in bronze — a work of considerable power. His vigour of design and sense of style made him a force in the younger school of sculptors. He has acted as professor of sculpture at the Royal Academy.

David McGill first attracted attention with the relief of " Hero and Leander," following it with a series of figures, of which the most striking is " The Bather," a work at once of vigour and of humour. His work is good in pose and line, refined in drawing and feeling, and excellent in style.

Charles J. Allen belongs to the same group. " hove and the Mermaid " (Walker Art Gallery, Liverpool), " A Dream of Love," " Rescued " and " Love's Tangles " (1908) are works of high merit, in every case good in treatment, free in modelling and pleasing in design. His

important Queen Victoria memorial in Liverpool was unveiled in 1906, and the monument to " Rt. Hon. Samuel Smithj M.P.," and numerous busts have followed. " The Woman whom Thou gavest to be with me " is probably his completest ideal work.

F. M. Taubman,.who had both French and Belgian teaching, has produced a series of works which display his power of design and strength of technique. "The Angel of Sad Flowers," "Orpheus and Eurydice " and " Adam and Eve " reveal his strength in ideal work; and the statue of " Sir Sidney Wateriow " at Highgate is a good example of his monumental portraiture. In " The Sandal," a small nude kneeling figure, he has turned frankly to classic coldness, and even the purity of design and modelling cannot warm it into life.

J. Pittendrigh Macgillvray, R.S.A., belongs to the rather meagre Scottish group, of whom he is generally regarded as the chief. His chief work consists mainly of monuments and colossal memorials. The " Peter Low Memorial " in Glasgow cathedral, the " Robert Burns," the "Allan Family'Memorial," the fine relief of "Rhythm" and the " National Gladstone Memorial " for Scotland are his leading works. With these should be considered the " Dean Montgomery Memorial " in St Mary's cathedral, Edinburgh, and the " John Knox Memorial " in St Giles's cathedral.

F. Derwent Wood (A.R.A., 1910) is a sculptor of exceptional ability. His varied training — at the Royal College of Art, the Slade School, the Royal Academy schools, and under M. Rodin and Mr Brock — gave him a wide outlook without impairing his individuality. His merit was recognized as soon as he quitted his masters, and he forthwith won the competition for a series of statues

SCULPTURE— British ©

Plate V.

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W. R. COLTOM, A.R.A.— Maharajah of Mysore

SIR CHARLES LAWES-WITTEWRONGE- The Puaishmeot of Dirce.

G. F. WATTS, R.A.— Clytie

SIR J. EDGAR BOEHM, R.A.— Carlyle. XXIV. 506.

W. R. COLTON, A.R.A.-Tbe Crown of Love.

THOMAS BROCK. R.A.— The Genius of Toetry.

I>LATE Vt.

SCULPTURE— American

J. Q. A. WARD-George Washington.

D. C. FRENCH— Indian Corn; Bull by E. C. POTTER.

AUGUSTUS ST G-AUDENS— Memorial to Robert Gould Shaw.

FREDERICK MacMOXNIES— Nathan Hale.

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representing the arts for the Kelvingrove art gallery at Glasgow. A great mural tomb followed, with " Love Sacred and Profane " as its motif, together with a series of other works of growing artistic importance. " Cain " (1905), a vigorous, dramatic, yet wholly sculpturesque figure, is in powerful contrast to the three works that appeared in successive years: " Abundance " (a group of a woman and two children) and the marble statues " Atalanta " and " Psyche " — all of them the type of grace in pose and of beauty of face and form. At the same time Derwent Wood produced the two boy figures on the piers to the southward of the Queen Victoria Memorial in front of Buckingham Palace. There is marked individuality in all he does, sculpturesque character, firmness and delicacy of handling, with a richness of style and appreciation, of breadth and simplicity.

Paul Montford, the son of Horace Montford, after a brilliant

academic career made his mark in decorative sculpture. It is not by such work as " Court Favourites " (1906) that he sustains his reputation, but rather by the sculptural embellishments wherewith the archway connecting the Local Government offices with the Home Office in Whitehall is enriched. " The Spinning Girl " is one of his best ideal figures, and the 18th century " Viscount Boling- broke " and " The Storm Waves " are characteristic of his vigorous style and personal conception and execution.

John Tweed, who studied under Falguiere and Rodin, was in- fluenced more by the latter than by the former, and inclines rather to. the impressionistic school than to the academic. His statue of Cecil Rhodes has power and emphasis — it impresses rather than attracts. The statues of Queen Victoria at Aden, of van Riebeck at Cape Town, and the Wilson Memorial in Rhodesia are among his chief works. He was selected to " complete " Alfred Stevens's Wellington Memorial in St Paul's cathedral. Basil Gotto has not less force, and he is more exuberant in his realization of life— an exuberance which does not always make for refinement. " Brother Ruffino " has dignity and strength, and the " Bacchus " of 1907 is realistic enough to repel those who ask for elegance even in an unrefined subject. The work, however, is ably treated.

Henry Poole belongs to the same vigorous school, and has a true sense of the monumental, as is evident in his colossal group of "The Mermaids "; while his " Naiad " (1909) shows an innate refinement.

S. Nicholson Babb, for some years an assistant of Mr Brock, has produced an ambitious " War Memorial " and many able groups and figures, among which " The Coming of Spring " (1910) reveals the modern French influence.

Albert H. Hodge stands by himself. As a sculptor-decorator with special views on relief-work in which he adheres to the sentiment and character of the architecture it is to embellish, he adopts a convention which gives the appearance of high relief to what is really low, by sharpness of edges and by a learned use of light and shade. His panels of " Science and Art " (1904) and " Commerce " (1906) are good illustrations of this original kind of architectonic work, while his large equestrian group of " Prosperity " applies the same principles to the round. These three works were modelled for the town of Hull.

A man of similar force is Joseph Epstein, who replaces refinement by vigour, archaic simplicity, and primitiveness of outlook, as though

casting his vote in favour of the Garden of Eden as against the garden of the Tuileries. His work, in which he leans towards the modern German view, is mainly decoration for buildings; his most discussed productions are the statues (1907) on the topmost storey of the British Medical Association offices.

Richard Garbe, a sculptor of equal strength, was a pupil of the London County Council School of Arts and Crafts and began to exhibit in 1898. Rugged power both in subject and execution mark his productions. His ideal works, such as " The Egoist " (1906), " Man and the Ideal " (1907), " The Idealist " (1908.) and " Undine " (1909), illustrate his range of thought and reveal his uncommon vigour which amounts, it might be said, to well-controlled, idealistic brutality; they are broad and impressive, and are conceived in a monumental spirit.

Charles L. Hartwell has grace and strength combined. The nude figure representing " The Rising Tide " (1906), reminding us a little of Leighton's work, and " The Bathers " (1907), are both works of refinement and elegance, and " Dawn " (1909) displays unusual charm and, like the others, offers a silhouette of much interest. While much poetry of expression and grace of composition distinguish his " Sirens " (1910), vigour is the note of the small group " A Foul in the Giants' Race," which was acquired by the Chantrey trustees in 1908.

Benjamin Clemens, pupil of Professor Lant6ri and the Royal College of Art, i9 another member of this talented group. His life- size ideal figures, " Sappho " (1902), " Cain " (1904), " Eurydice " (1906), " Andromeda " (1907) and " Aurora " (1908), all made their mark when exhibited in the Royal Academy, and showed the sculptor to be possessed of the qualities of sensitiveness, elegance, and strength. The group of " Kephalos and Prokris " (1910) is his mo9t important and most striking work.

Harold Parker came to England from Australia in 1896 at the age of twenty-three, and after studying under W. S. Frith, made many Academic successes, and in 1904 exhibited his plaster life-size statue of " Ariadne," which, translated into marble and re-exhibited in 1908, was bought by the trustees of the Chantrey Collection and is

now in the Tate Gallery. His other more important works include " The Long, Long Dreams of Youth " (1905), " Narcissus " (1906), and " Prometheus " (1909). Without revealing any striking origin-ality, Parker displays very considerable accomplishment and a good

sense of the sculpturesque, and his busts are refined and good.

Oliver Wheatley, formerly assistant to Brock, and pupil of Aman-Jean, has done much decorative work. His life-size recumbent statue " Awakening " is among the best of his figures.

T. Tyrrell, who first attracted attention by his decorative figures on Professor Pite's house in Mortimer Street, London, has shown much graceful fancy in his " The Ideal, " such as " The Whisper "

(1906).

Reuben Sheppard has shown himself poetic and pleasing in symbolic suggestion in his striking half-length group " The Music of Death " (1907) ; and Oliver Sheppard, in his " Eve " of the same year, produced a graceful work.

The Irish sculptor, John Hughes, achieved a great success by his monument to Queen Victoria erected in Dublin. It is a fine com- , bination of sculptural and architectural effect and richness of group-ing, and although it reveals too great a love of ornament it is im-pressive alike in mass, design, silhouette, and general arrangement. There should also be mentioned, among the younger sculp- tors, Mortimer Brown (" St John the Baptist "), David B. Brown (" The Spirit of Ivy "), Bertram Pegram (" Down to the Sea "), the Scotsmen, McFarlane Shannan (" The Arcadian Shepherd's Dream "), Kellock Brown, and J. Crosland McLure (" Leicester War Memorial ") ; Herbert Ward (bronzes of South African savages, "The Idol Maker " and the like), Alfred Turner, Charles Pibworth, and F. Arnold Wright.

The women sculptors include such accomplished amateurs as H.R.H. the duchets of Argyll (" A Crucifix " — the Colonial Memorial in St Paul's cathedral) and Countess Gleichen. The principal recent names are those of Mary Pownall (Mrs Bromet), (" A Harpy "), E. M. Rope (" Springtime," relief), Ruby Levick (" Fishermen hauling a Net "), Margaret Winser (" Mourners," a relief), Esther Moore (" At the Gates of the Past "), Edith Maryon (" The Poet of Umbria "), and Gwendolen Williams ("The Lorelei," 1907, and charming groups of children).

The sculptor-decorators make a group of workers of striking fancy and ability. Lynn Jenkins, whose frieze, in bronze, ivory and mother-of-pearl at Lloyd's Registry is a remarkable' achievement, is one of the leaders. He has latterly devoted himself to pure sculpture, such as

the life-size bronze figure on a sarcophagus, " Destiny " (1909 and 1910) and bust portraits remarkable for exquisite feeling and delicacy of carving. Walter Crane designed for Manchester a mace that is remarkable for beauty of conception and felicity of symbolism. Alexander Fisher and Nelson Dawson should be included in the group. Other sculptors already mentioned, including Thorny- croft, Gilbert, Frampton, Pomeroy, Colton and Toft, have all de- voted themselves to sculptural decoration pure and simple, whether in metal, stone, or marble.

The painter-sculptors claim among them Alfred Stevens, Sir Edwin Landseer, Lord Leighton, J. M. Swan, W. Reynolds-Stephens, George Richmond, and G. F. Watts. George Richmond's real talent may be gauged by his "Monument to Bishop Blomfield " in St Paul's cathedral. His son, Sir William Richmond, K.C.B., has also practised in sculpture — the memorial tomb of Mr and Mrs Gladstone is his. Watts educated himself artistically on the Elgin Marbles, and he produced half a dozen pieces of sculpture which place him high among the world's finest sculptors of the 19th century. The recumbent effigy of " Bishop Lonsdale" in Lichfield cathedral was an epoch-marking work, not only in the technical matter of the bold treatment of the drapery, but in largeness and breadth and its noble sense of style, and the " Lord Lothian " in Bickling church is also very remarkable. The artist then produced the colossal equestrian group of " Hugh Lupus " for the duke of Westminster (Eaton Hall), a composition as imaginative and original as it is grand and sculpturesque. Then followed " Physical Energy," another equestrian group, which, after being about twenty years in progress, was cast in 1902; it was executed in duplicate; one copy has been set up in South Africa, to the memory of Cecil Rhodes, whose character it may be held to symbolize, and the other has been erected in Kensington Gardens, London, at the expense of the British government. In 1902 also, the statue of " Lord Tennyson "was completed. But the bust of " Clytie " is surpassed in bigness and classic purity of style and feeling by nothing ever produced in England ; it is a complete and noble thing. There is no sculptor who has come nearer to obtaining the grandeur of form which is so wonderful in the Greek masterpieces. Simple in line, immense in character, full and rich in modelling, Watts's work is instinct with vigour, breadth and movement. It sets the true standard, and is a constant and a noble warning to sculptors of the younger school not to be led away by the dainty and fanciful, however alluring. Especially it warns them against what has become a feature with a ; certain section — the devotion to metal- working, enamelling, and the like, and the free introduction of these

accessories into serious sculptural work. Irresistible in the hands of a great artist like Alfred Gilbert, such work, at all times attractive, is the goldsmith's and ironsmith's business rather than the sculptor's; and although it has coloured the work of some of the younger sculptors of the day, it is not likely to obtain any very wide hold, or

to exercise permanent influence for evil. The variety and independence of the British School are such that it is impossible to define any particular tendency in its practice other than towards an ever-increasing rise in the level of technical excellence and the power of design. There is, broadly speaking, a general stand against the " modernity " imported into sculpture by the younger members of the foreign schools, and a disinclination to bend the art to the illustration of everyday life and to the rendering of effects not hitherto considered to be the function of the plastic arts. (M. H. S.)

After 1870, when a great artistic movement marked the resuscitation of France after the Franco-German War, sculpture especially revived with exceptional vigour, and the last Rodent thirty years of the 19th century were a memorable sculpture, epoch in its history. Not that many new and unexpected men of genius suddenly arose, for most of the artists who then came to the front had already distinguished themselves by equally noble work; but sculpture, like the other arts, benefited by the pause for thought, and by the ripe and manly tone stamped on the national mind by the discipline of events. Intense ardour animated the admirable group of French sculptors: the oldest still found some lofty expression; the men in their prime showed their powers with unwonted force and fire; and the younger generations grew up in rapid succession, a close phalanx of sculptors whose number is still increasing, for if we include only living artists, and those who have taken honours in the Salons, we find a list of seven hundred exhibitors. The first generation of survivors of the war, who led the way in the new period, still boasted of such men as Dumont (1801- 1884), Cavelier (1814-1894), Bonnassieux (1810-1892), Jouffroy (1806-1882), Schoenewerck (1820-1885), Carrier-Belleuze (1824- 1887), Aime Millet (1819-1891) and Clesinger (1814-1883). These artists, born in the first quarter of the 19th century, were for the most part each the head of a studio, their teaching being carried on till the end of the century. Next to them

followed their immediate pupils, alrea,dy their rivals, and some indeed famous before the new era; such were Guillaume, Dubois and Fremiet; others, fresh from the Academy at Rome, at once rose to distinction, and all combined to form the remarkable group of artists to which the modern school of French sculpture owes its world-wide fame. At this time Eugene Guillaume (1822- 1905) was exhibiting his " Roman Marriage," his " Bust of Mgr Darboy," his " Orpheus," and " Andromache," works of learned skill and severe distinction. Paul Dubois (1829-1905) executed his " Narcissus," and the " Tomb of General Lamoriciere," on which the decorative figures of Charity, Faith, and Military Courage are popular favourites, full of grave and pathetic feeling. Chapu (1833-1891) executed his exquisite figure of " Youth " for the tomb of Henri Regnault, and that of " Thought " for the tomb of Daniel Stern, his monuments to Berryer and to Mgr Dupanloup. Barrias' (1841-1905) " First Interment " won him the medal of honour in 1878; besides his patriotic group of the " Defence of Paris." Falguiere (1831-1900) produced a remarkable series of statues, character- ized by their life-like power; some dignified or pathetic, as " St Vincent de Paul," " La Rochejacquelein," and " Cardinal Lavigerie "; some full of bold and dashing spirit, as his " Diana," his " Nereids," and " Hunting Nymphs." Mercie gave us " Gloria Victis," " Quand Meme," and his monuments, among which that called " Memory " must be mentioned; his pediment for the Tuileries; his " Genius of Art," &c. Delaplanche (1836-1890) produced his " Mother's Teaching," " Music," "The Virgin with a Lily," and "Aurora"; and Allar "The Death of Alcestis." To these names must be added those of Degeorge, who, with Chapu, gave so powerful an impetus to the art of the medallist; of Gautherin, Hiolle, Thomas, Crauck, Laf ranee, Maniglier and Moreau-Vauthier — one of the men who, with Gerome (the painter) and Fremiet, revived the taste for coloured sculpture, a style first attempted long before by Simart; besides many more. These artists created a supremely healthy and vital school of sculpture, dignified and elegant, learned and varied, fresh and charming, and, above all, as single-hearted and as well trained as in any period of history.

To understand, however, the position of contemporary sculpture in France, it will be necessary to look back even

further than 1870. It must be remembered that the whole history of French sculpture, as far back as the 17th century, is connected with the invasion of Italian influence in the 16th century, which remained paramount over French art for more than three hundred years. Statue-making, until then an art of expression — national, popular, human and Christian — lost its primitive character under the

dilettante refinement of an aristocratic society closely gathered round a king who made art subservient to his splendour or his pleasure; it sank into superficial and conventional beauty, and became almost ex- clusively the interpreter of trivial ingenuity or flattering allegories derived from the dead fables of heathen mythology. The best that would be expected from this was choice elegance of line, a harmonious treatment of mass and composition, a loving study of the nude — in short, a purely plastic type of art. And sculpture had become the art of the nobility and of the court, having no hold, as it had in the past, on the great human family — the nation. Still, even at the high tide of Louis XIV. 's reign, some dissatisfaction became evident, even some rebellion, in the great though solitary spirit of Puget, who strove to animate the marble with the passions of humanity. In the next century he found followers — Falconet, Pigalle and Houdon, who also asserted their right to infuse life and passion and movement into their statues, seeking them in the despised province of stern reality. The great cataclysm of the Revolution, which might have been expected to break the bonds of thought, turned men's minds to contemplate the Antique, and though it certainly modified the style of sculpture, was far from changing the source of its inspiration, since it sent it once more to the Antique. Indeed, at the beginning of the 19th century, when the teaching of David was paramount in spite of Gros, who, then in the master's studio, was unconsciously sowing the seed of romanticism in painting, a robust individuality was developing among French sculptors — a spirit somewhat rugged, independent, and partly trained, beyond the academic pale, prepared to carry on the tradition of Puget, and quite simply, without any revolu- tionary airs of innovation, to shake off torpid conventionality. By the mere force of a strong plebeian temperament Rude quite naturally happened on a style of art — high art — at once expressive and popular. He was the first to raise the cry of liberty in sculpture, and he left successors who bravely worked out what he had begun. Barye and Carpeaux were both in 1875 on the threshold of an era to which they bequeathed a fruitful influence. Barye carried on Rude's tradition of expression, and transformed what had previously been mere decorative carving into a new style and branch of art now adopted by a whole phalanx of admirable artists: the sculpture, namely, of animals, the first glance that sculpture had till then bestowed on nature apart from man. Carpeaux, who was much younger, was in his day — as Puget had been — an exceptional personality; he carried on the slow revolt of two centuries which was to break the narrow mould of school-training and infuse a soul of more ardent vitality into sculptured forms.

The importance of these two great artists in relation to contemporary art was not fully seen till after their death. In point of fact Painting had until now amply filled the new part assigned to Art; its vehement efforts had strongly influenced public opinion; and as, in the early years of the 19th century, it had largely extended the field of human vision over the remote past and the domains of feeling, with the promise of surveying all nature, space and time, the spirit of the age asked no more, and did not expect sculpture, too, to abandon old-world myths. It must also be said that those sculptors who at that time carried on the classical tradition had renewed its youth by their learned and enthusiastic love of it; they had reverted to the past, but it was the past of the really great masters, either of antiquity or of the early Florentine school, no less enamoured of life, beauty and nature. Guillaume and Paul Dubois, Chapu and Falguiere, Mercie, and Delaplanche were the rivals in sculpture of the great idealist painters — Puvis de Chavannes, Gustave Moreau, Ricard, Delaunay, Baudry, and Henner — who were working at the same time.

SCULPTURE— French (a)

Plate VII.

JUSTE BECQUER-St Sebastian. XXIV. soS.

L. GEROME -Bonaparte at Cai

L. MARQUESTE— Galatea.

Plate V1U.

SCULPTURE— French (6)

E. DE SA1NT-MARCEAUX— Genius guarding the Secret of the Tomb.

A. MERClfi-Souvenir.

A. RODIN— The Kiss.

MODERN FRENCHJ

SCULPTURE

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This it is which accounts for the fact that romanticism then found so little acceptance among sculptors. But in the next generation the

sowers of the seed might see their harvest, The pupils of Rude, of Barye and of Carpeauxj allied by school sympathies — the little drawing-school conducted by Lecoq de Boisbaudran, which, in despite of the studios of the Beaux Arts, created a group of independent and highly original artists — formed the centre of a distinct force which increased day by day. Young men, fresh from Rome, persistently kept up the spirit of the Antique. A galaxy of learned and refined artists was represented by such men as Hiolle (1 833-1887) (" Arion," "Orpheus"), Idrac (1840-1884) (""Mercury inventing the Caduceus," " Salammbo "), Marqueste (" Galatea," " Eros," " Perseus beheading the Gorgon," " The Rape of Europa "), and Coutan (" Eros," " A Woman carrying Loaves," " A Sergeant-at-Arms," &c), Lanson (" The Iron Age "), Longepied (1849-1888) ("Immortality"), Peinte ("Orpheus charming Cerberus to Sleep "), Gustave Michel (" In a Dream," " Medita- tion "), Carles (" Innocence," " Abel "), A. Boucher (" Earth," " Au but "), besides Carlier, Leonard and Turcan (1846-1895) — soon to be followed by another generation: Puech (" The Siren," " The Muse of Andre Chenier "), Verlet (" The Monument to Maupassant," " Orpheus "), Larche (" The Brook and the Meadow," " Violets "), Sicard (" Hagar and Ishmael "), and Dailion, Escoula, St Lami, and many more. In opposition to these there stood a group of sculptors, young and old, who sought their subjects in mythology, legend, history or poetry, or merely in the scenes of daily life, and aimed at presenting the ideal of their time under its external aspects, but more especially the deepest emotions of the modern mind. It was Fremiet, with his striking and vivid conceptions, who led the advance with new and dramatic subjects: primeval man and the fierce beasts with which he disputed his rule (" A She-Bear and a Man of the Stone Age," " An Oran-utan and a Savage," " Gorillas "), or embodiments of the heroes of the past (" Joan of Arc," " Saint Louis," "Saint George," "Louis of Orleans," &c); then followed Just Becquet (1829-1907), the excellent artist who represented the stricken figures of " Ishmael " and " Saint Sebastian "; Christophe (1827-1892), with his symbolical pre- sentments of " The Human Comedy," " Fortune " and " The Supreme Kiss"; Aube ("Monument to Gambetta," "Dante," " Bailly," &c.) ; A. Legros the naturalized English painter and sculptor, who executed some fine fountains for the duke of Portland; Injalbert, returned from Rome (" Hippomene," " Christ on the Cross," " The Herald ") ; and, younger than these, Desbois (" Leda "), Dampt (" A Grandmother's Kiss," " Melusine "), Alexandre Charpentier, Carries, Baffler, Pierre Roche, Madame Marie Cazin and many more.

The disruption of the Salons in 1890 showed very plainly the bent of

this group, who seceded to the Champ de Mars, where the leaders were Dalou and Rodin, and where Bartholome made an unexpected and original appearance. Foreigners added a contingent of the highest merit, such as the American St Gaudens, and, more especially, the Belgian Constantin Meunier, affiliated to France by their early training, to say nothing of descent. Meunier especially, with his statues and statuettes of labouring figures — miners, puddlers, hammerers, glass-blowers, and. the like — gave to his art a keynote new to France, which found a response even in academic circles. A broad democratic current was swaying public feeling. The questions which turn on the status of the working man had become the programme of every party, even of the most conservative. Art being the mirror of society, the novel, the drama and painting devoted themselves to the glorification of a new factor in modern life, namely, Labour. Sculpture now, in rivalry with painting, through which Millet had immortalized the peasant, and Courbet the working man, also sought inspiration from such themes; and at the same time the demands of the democratic movement called for monuments to the memory and deeds of great or useful men.

Sculpture, under this modern tendency, assumed an unexpected aspect; its highest expression is seen in the work of three men

very dissimilar: Dalou, Rodin, and Bartholome. In Belgium, as has been said, where modern social questions are strongly felt, Constantin Meunier had interpreted the democratic impulse in a very striking manner, under the influence, no doubt, of J. F. Millet. In France, Jules Dalou (1838-1902), with a broader view, aimed at creating an art which should represent the aspirations and dreams of this phase of society while adhering to the fine old traditions of the art of Louis XIV., stamped with magnificence and grandeur, but applied with graver, simpler and severer feeling to the glorification of the people. He revived the older style of sculpture, giving it greater power and truer dignity by a close study of life, supported by a scholarly and serious technique. In his " Triumph of the Republic," and the monuments to " Alphand," to " Delacroix," to " Floquet," to " Victor Hugo," and others, he strove to create a style apart from life, to which he is alien and indifferent, but based on life, the outcome of the needs of society, the impersonation of its characteristics, the expression in eloquent form of its nature, spirit, and moral idiosyncrasy.

Treading the same path, though in a different step, is Auguste Rodin. He disregards every contingent fact; even when he takes his subject from legend or history, whether " Eve " or " St John the Baptist," "

The Age of Bronze " or " The Burgesses of Calais," " Victor Hugo " or " Balzac," he avoids all the conventional details and attributes of his personages to embody the very essence of humanity as expressed in the quivering flesh. He, like Carpeaux, has gone back, to Dante and to Michel- angelo to force the " Gates of Hell " — the subject chosen for the entrance to the Musee des Arts Decoratifs— and to read the deepest mysteries of the human soul. His is the art of suffering, anguish and terror, of cruel and despairing pleasure — a wild cycle of proud and bitter melancholy. All the efforts made in the past to infuse life into Art, all that Puget, Falconet, Pigalle and Houdon tried to effect, and that Rude, Barye and Carpeaux strove for in their turn — all this was part of the endeavour of these their successors, but with a clearer purpose and more conscious aim. By good hap or providence they were greeted on their way by the voice of the most devoted apostle who was to preach the new doctrine, namely, Louis Courajod, the founder of the French sculpture gallery in the Louvre. From his professor's chair in the schools he cursed the Italian intruders of the 16th century for having debased French art with " noble attitudes," extravagant gestures and allegorical antics; and he carried his pupils and his hearers back to the great national period of French sculpture, which, in the dark medieval ages, had created the splendid stone images of the noble French cathedrals.

A marked individuality now appeared in protest against academic traditions — Albert Bartholome. He, after beginning as a painter, was tempted by sculpture, more particularly, in the first instance, by a wish to execute a monument to a comrade he had loved. From this first effort, carried out in his studio, without any school training, but with a firm determination to master technical difficulties and fulfil his dream, followed a broader purpose to execute a great expressive and vitally human work which should appeal to the heart of the populace. From this arose the idea of a " Monument to the Dead " in Pere Lachaise. Bartholome had started without a guide, but he instinctively turned to the great tradition of Northern Christ- ianity, which his mind subsequently associated with that of the antique race who had ever done most honour to Death, the people of Egypt.

Thus two currents contended, as it were, for the guidance of French sculpture, each claiming a descent from the historic past; one inheriting the classic tradition of the Renaissance, of Latin and Hellenic origin, to which the French school, since the time of Jean Goujon, has owed three centuries of glory. This is the pagan art of the South; its marks are balance, reasonableness and lucidity; it was the composer of apotheoses, the preserver of the ideal of beauty. The other, reverting, after centuries of resignation or of impotent

rebellion, to the genuine I French past which produced the noble works of the nth, 12th

and 13th centuries— to the tradition of Flanders and of Burgundy, which was smothered in the 16th century by Italian art — to the Christian and naturalistic art of the North, which renounced the canons of antiquity, and expressed itself by methods essentially human and mutable, living and suffering — appeals to all mankind. The immediate result of this antagonism was no doubt a period of agitation. The outcome, on the whole, is confusion. Still, however vexatious the chaos of form and movement may be, it is Life, a true reflection of the tumult of modern thought in its complexity and bewilderment; it is the reawakening of sculpture.

Monumental and decorative statuary found an extended sphere through the founding or restoration of public buildings after the events of 1870. Memorial sculpture obtained constant employment on patriotic or republican monuments erected in various parts of France, and not yet complete. Illustrious masters have done themselves honour in such work. Dalou, Mercie, Barrias, Falguiere, and many others less famous executed monuments to the glory of the Republic or in memory of the national defence, and figures of Joan of Arc as a symbol of patriotism, &c, as well as numberless statues erected in the market-places of humble towns, or even of villages, in com- memoration of national or local celebrities: politicians, soldiers, savants and artists — Thiers, Gambetta, Jules Ferry, Carnot, Pasteur, Claude Bernard, Delacroix, Ingres, Corot, Millet, Victor Hugo, Lamartine and many more. The garden of the Luxem- bourg alone has become a sort of Elysian Fields, where almost every day some fresh statue rises up in memory of contemporary French poets. The funereal style of monument, in which French art was at all times conspicuously distinguished, was also revived in sympathy with that general sentiment which regards reverence for the dead as a religion, and gave rise, as we have seen, to some splendid work by Chapu (the monuments to Regnault, to Daniel Stern, of Mgr Dupanloup); by Paul Dubois (the monument to General Lamoriciere) ; by Mercie (the tombs of Baudry, of Cabanel, of King Louis Philippe and his queen Marie Amelie) ; by Dalou (the monuments to Victor Noir, to Floquet and Blanqui) ; and by many more, with Bartholome'

at their head. The cemetery of Pere Lachaise is indeed one of the best spots to visit for a review of contemporary sculpture.

While man has been diligently studied in every class of sculpˆ ture, more particularly in portrait sculpture, which finds a more practical adaptation to daily uses by a bust or small statue, such as Theodore Riviere was the first to produce, by medallions, or by medals, closely related to statuary, nature now holds a place in the sculpture of animals — a place created, so to say, by Barye and carried on by Fremiet, Mene, Cain, and, with even greater vigour and a closer study of character, by Gardet (" Panthers," in the Luxembourg, " Lions " and " Dogs," at Chantilly, &c); Peter, Valton, Le Due, Isidore Bonheur, Peyrol, Cordier, Surand, Virion, Merite and others. Finally, the class of la petite sculpture — the statuette and small group — after long hesitation in the hands of the two men who first cultivated it, Fremiet and the painter Gerome, made a sudden start into life, due in no small measure to the success attending the charming and pathetic statuettes of Theodore Riviere (" Salammb6 and Maltho," " Ultimum feriens," " Charles VI. and Odette," " The Vow," " Fra Angelico," " The Shunammite Woman," &c). Riviere was wont to use — as Gerome did in his " Bellona," and subsequently in his small " Tamerlane " — materials of various colours, and even precious stones and metals, which he employed with great effect. A whole class of art was not, indeed, originated, but strongly vivified by this method of treatment. Claudius Marioton and Dampt, who always affected small and precious work, Agathon Leonard (e.g. a table decoration of " Dancers " in Sevres china), Laporte Blairsy, Ferrary, Levasseur, Belloc, E. Lafont, &c, utilized every process and every kind of material — marble and metal, wood and ivory, enchanced by the most costly goldsmiths' work and gems.

It would seem now that sculpture, thus endowed with new ideas and the most various means of expression, and adapted

to every comprehension and every situation, was fully on a level with the other graphic arts. What it had chiefly to fear was, in fact, the wealth of means at its disposal, and its competition or collaboration with other arts. And this the later generations seem to have understood — -the men who were the outcome of the two conflicting traditions: order and moderation on one side; character, life, and emotion on the other. Though very variously inspired by the facts or ideals of contemporary life, such young artists as Jean Boucher (" Evening," " The Antique and the Modern"), Roger Bloche ("Childhood," "Cold"), Derr6, Boverie, Hippolyte Lefebvre, Desruelles, Gaston Schnegg, Pierre Roche, Fix-Masseau, Couteilhas,

and others seem to show that French sculpture is about to assume a solid position on a sound foundation, while not ceasing to keep in' touch with the tastes, aspects and needs — in short, the ideal — of the day. Thus, while painting engaged the attention of the public by. its new departures, its daring, and its very extravagance, sculpture, which by the conditions of its technique is less exposed to transient influences, has, since the close of the 19th century, developed normally but with renewed vigour. If the brilliancy of the school was not so conspicuous and its works gave rise to little discussion or speculation, it is not the less certain that at the beginning of the 20th century the younger generation offered the encourag- ing prospect of a compact group of sculptors who would probably leave works of permanent merit. Yet sculpture too had gone through a crisis, and been deeply stirred by the currents which so violently agitated all modern thought. We have already spoken of its " state of mind," torn between the noble traditions of a glorious past which link it to the antique, and the craving to render in its own medium, with greater freedom and fuller force of expression, all those unuttered meanings of the universe and of contemporary thought which the other arts^ — painting, literature, the drama, and even music — have striven to identify and to record. But the acute stage of tentative and incoherent effort seemed in 1910 to be past; inspiration had returned to its normal channel and purely plastic expression.

The powerful individuality which had the most vital influence on modern sculpture in France, and, it may be added, on many foreign schools, is that of Rodin. During the ten years which followed the Great Exhibition in Paris (1900) and the special display of his works, his reputation spread throughout the countries of the world and his fame was fully established. The state liberally contributed to his triumph by commissions and purchases, and in the Luxembourg Gallery may be seen about five and twenty of his finest works. His productiveness was unbroken, but it was chiefly evolved in relation to his first great conception, "The Gate of Hell "; its leading features were taken up again, modified, expanded, and added to by their creator. But besides the numberless embodiments of voluptuous, impassioned, or pathetic ideas— of which there is need to name only " Les ombres " (the Shades) and " Le penseur " (the Thinker), now placed in front of the steps of the Pantheon; several monuments, as for instance to Victor Hugo, to Whistler, and to Puvis de Chavannes; besides a large number of portrait- busts. Enthusiastic literary men, and the critics of the day who upheld Rodin in his struggles, more from an instinct of pugnacity and a love of paradox than from conviction and real compre- hension of his prodigious and fertile

genius, have tended to give him a poetic and prophetic aspect, and make him appear as a sort of Dante in sculpture. Though his art is vehement in ex- pression, and he has revelled in the presentment of agonized suffering and the poignant melancholy of passion, it is by the methods of Michelangelo and essentially plastic treatment than power of modelling. His modelling is indeed the most wonderful that modern sculpture has to show, the most purely plastic technique, and this characteristic is always evident in his work, combined with reverence for the antique. Rodin made his home in the midst of Greek statues, a museum of the antique which he collected at Meudon ; and some of his own late work, such as the male torsos which he exhibited at .the Salon, has a direct relationship to the marbles of the Parthenon — the Ilyssus and the Theseus. It is the fuller understanding of these

SCULPTURE— French ©

Plate IX.

XXIV. sio.

ROGER BLOCHE-The Child.

GARDET— I'ijhling Taiitlicrs.

BARTHOLOME- Young Girl dressing her Hide.

Plate X.

SCULPTURE — Other Foreign Countries

SINDING -The Can (Danish.)

{Photo, W. Ti'.ˆutioler, Berlin.) KEINHOLD BEGAS— Statue and Memorial of Emperor William I. (German.)

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ETTORE XIMENES— Revolutio (Italian.)

A. QUEROL— Memorial to Alphonso XII. (From Ike Model.) (Spanish.)

M. ANTOKOLSKI— Satan. (Russian.)

JEF LAMBEAUX— The Human Passions. (Belgian.)

C. MEUNIER— Unloading. (Belgian.)

characteristics of Rodin's work, apart from some exaggeration of expression to which they have given rise, that has had the most valuable influence on the younger generation.

Nothing need be particularly noted as to the development of masters long since recognized, whatever branch of the school they belong to; such as Fremiet, Mercie, Marqueste, Injalbert, Saint- Marceaux and others already spoken of. The very distinct indi- viduality of Bartholome, after asserting itself in his crowning effort the " Monument of the Dead," found very delicate expression in numerous works on a more modest scale, nude figures, monumental groups, and portraits. His monument to Jean-Jacques Rousseau for the Pantheon (1909) is a fine example of his art.

We must not omit, after the elder generation, the name of Alfred Lenoir, who particularly distinguished himself in portrait-statues by dealing successfully with the difficult problem of modern dress, as in the monuments of Berlioz, to Cesar Franck, to Marshal Canrobert, in the bust of M. Moreau, &c. ; nor that of Gustave Michel, a spirit loftily inspired in his decorative compositions and figures for galleries, " Le reVe " (the Dream), " La pensee " (Thought) — both in the Luxembourg Gallery, — ■" Au soir de la vie " (in the Evening of Life), and " Automne." H. Greber, after some realistic works, such as " Le Grisou " (Fire-damp) and portrait-statuettes, as the tiny full-length figures of " Fremiet " and of " Gevine," distinguished himself in the Salon of 1909 by a statue of " Narcissus " at the edge of a fountain-pool, very elegant and Italian in feeling. And among the younger men of the school we must name Verlet, Gasq Vermare, Ernest Dubois, and Larche, all employed on important works.

It must indeed be said that in France, apart from the select com- mittees which have, with more or less success, peopled provincial towns with monumental statues, the government has always taken an interest in encouraging the art of sculpture. Any considerable work of that class could hardly be undertaken without its support. The former Council of Fine Arts in Paris foresaw the application of

sculpture to the decoration of the park of Saint Cloud; the present council has encouraged a strong competition among our sculptors by decorating the squares of the Carrousel and of the Champ de Mars, by carrying on the decorative work in the Pantheon, &c. They have thus given commissions to a group of rising artists, who quickly made a distinguished reputation. The names of these younger sculptors have already been recorded here; in the ten years 1901-1910 they came into the front rank of their contemporaries by their conspicuous talent and the firm expression of their ideals. The first fact to be noted about them is their determination to be men of their time. Many artists before them were indeed possessed by this idea : Legros, Dalou, the Belgian sculptor Constantin Meunier, the American St Gaudens, and among their immediate precursors Alfred Lenoir. But now this purposeful bias is more strongly marked ; the new men do not restrict themselves to the merely monumental or commemor- ative aspect, to the picturesque treatment of the miners or the tillers of the soil. Every type of the people, even of the middle-class citizen, is included in the programme. Alexandre Charpentier (d. 1909) was one of the earliest of these younger realists, and he gave it expression not only in sculpture proper, but in medal work, and bas-reliefs introduced into architecture, in decorative furniture and in every form of ornamental sculpture. Thus he produced the " Woman suckling her Infant " (1883) and a large bas-relief of " Bakers," executed in stone and placed in the square of St Germain des Pres, Paris; and, following in his footsteps, other artists gave expression to the same ideas. An instructive fact is that one of these men was a pupil of the Ecole des Beaux Arts and of the academy at Rome. Hippolyte Lefebvre devoted himself to proving that the common aspects of modern life are not an insuperable problem for the sculptor's art ; nay, that they actually afford him new subjects most suitable to his methods. He persisted in this purpose, and finally won the adhesion of his fellow-artists and the medal of honour for his " Jeunes aveugles " (Blind Boys), in the Luxembourg Gallery. We have also by him in this manner of the day, handled with truly synthetic breadth, " Summer," a youthful female figure in an ordinary walking dress carrying a parasol, her straw hat tilted over her eyes; " Winter," an old lady wrapped in furs, coming down snow-covered steps; " Spring," more accurately the " Age of Love," a group of six figures, and others. His comrade Roger Bloche has gone even further, asserting with no little pugnacity the same ideas in figures derived from the people, and in episodes of daily life, as in the " Accident," a recumbent figure surrounded by about twenty bystanders, drawn from every rank of society and rendered with that firm decision and breadth of treatment which alone constitute a work

of art. This work earned him a first prize in the Salon of 1909. These awards are an unmistakable sign of official recognition of these tendencies, so long ignored and disapproved. Such encourage- ment has borne fruit. Francois Sicard and Henri Bouchard, who both had won the prix de Rome, started boldly on the new road, one in his monumental sculpture (a " Monument of the War of 1870 " at Tours; " Monument to Barbey"; " Monument to Bertagna"; a pediment for a college for girls at Tours), the other in works recalling the feeling of Constantin Meunier by subjects of labour, in town or country, small figures in bronze, or large and important decorative groups, as " La Carriere " (the Quarry) and " Le Defrichement "

(Turning the Sod) , a group of six oxen led by two men. This was intended to decorate the Champ de Mars.

Meantime the study of beauty in the nude, far from being neglected, seemed to start on a new flight. Some students of the Roman school revived this tradition. Victor Segoffin and Maximilien Landowski, each in his own nervous, vivid and characteristic manner, and, borne on an independent current, Louis Convers and Aime Octobre show a feeling for grace and charm.

This is the normal and traditional heritage of the school; we see how strikingly it has renewed itself. In opposition to the followers of Rodin we find another group which represents an antagonistic school. Mademoiselle Camille Claudel, Jose de Charmoy and Henri Matisse typify the extremes of this manner; Emile Bourdelle, Aristide Maillot and Lucien Schnegg might be regarded as some of the artists who best deserved attention. With various characteristics and vehement or equable temperament they all reveal in the highest degree a fine sense of purely plastic qualities; in them we find no lapse into the pictorial, no purpose or arriere-pensee that is not of the essence of sculpture. Emile Bourdelle has given us busts of Beet- hoven, Carpeaux, Heracles (in the Luxembourg Gallery), Pallas Athena, and the large group of " Wrestlers of Tarn et Garonne " for completion in bronze. Maillot for his part prefers to work in marble and stone with large surfaces, after the tradition of the ancients ; he exhibited in the autumn Salons several heads of girls and of old women, a figure of a youth in bronze (1909) and a stooping nude female figure in plaster. Lucien Schnegg's (d. 1909) reputation would have been assured by one bust only from his hand, that, namely, of his pupil " Mademoiselle Jane Poupelet." This in marble is now in the Luxembourg Gallery, and is a masterpiece for grace and dignity in the best spirit of the antique.

Besides these there should be named Jean Boucher, who has executed a monument to Renan, the " Evening of Life " and " Ancient and Modern " ; E. Derre, an inventive decorator, with social tendencies and grateful emotional feeling; Max Blondat, lively and witty, as is seen in a fountain with frogs entitled " Jeunesse " (exhibited in the Royal Academy, 1910) and " Love " (in the Luxembourg Gallery) ; Abbal, Pierre Roche, who loves to handle very various materials — marble, stone and lead; Moreau- Vauthier, D. Poisson, Fix-Masseau, Gaudissard, David, Jacquot, Despiau, known by some fine busts, Drivier, Niclausse and Michel Cazin.

Sculpture on a small scale was effectively carried on by L. Dejean, Vallgren, Carabin, who carves in wood, Cavaillon and Feomont-Meurice. The sculpture of animals, since G. Gardet and P. Peter, has been brilliantly executed by Paul Jouve, Christophe, Navellier, Bigot, Perrault-Harry, Marie Gautier, Berthier and others. (L. Be.)

The inevitable reaction in Belgium following upon the long period of dry and lifeless academic sculpture is difficult to trace to any particular pioneer or leader. Nevertheless the three men who certainly mark this period of revolt ˆffY" are Guillaume Geefs, De Bay and Simonis. There sculpture, is, however, very little to be remembered of these men except that they were the best of their time. Geefs work was marred greatly by his frivolous and unessential details and poverty of thought, together with a frigid coldness of expression in his modelling. In his statue of General Belliard at Brussels, however, he shows the tendency to search for a broader and truer interpretation that warrants his being mentioned as belonging to the movement against the academic school. De Bay was a sculptor of a more artistic temperament, and though some of his works are charming and sympathetic when judged by the standard of his own day, few show evidence of advanced ideas. The work of Simonis is very different. Beyond the mere en- deavour to grasp something more true, his work is fresher and perhaps more honest, more bold and gifted with more life. Such qualities are shown in his " Young Girl," in the museum at Brussels, and " Godefroid de Bouillon," in the Place Royaje. Besides these three sculptors there was no man of note to strengthen the revival of sculptural art until Paul de Vigne (1843-1901). His early work bears the unmistakable influence of the Italian Renaissance, but after studying in Paris and in Rome he became a follower of the true classic ideal, not of the so-called classicism of Canova and his followers. He was a prolific artist, and from his numerous works it is difficult to pronounce one as his masterpiece. Perhaps that most generally considered his best is the sepulchral marble figure of " Immortality " in the museum at

Brussels. Almost its equal in beauty and truthful rendering are his two bronze groups, " The Triumph of Art," on the facade of the Palais des Beaux Arts at Brussels, and the monument to Breydel and De Koninck at Bruges. Among his other works are " Fra Angelico of Fiesole."

the bust of Professor Moke, at Antwerp, " Heliotrope " in the museum at Ghent, " Portrait of M. Charles van Hutten," the Wilson monument in the Musee Communal, Brussels, the statue of " Marnix de Sainte Aldegonde " in Brussels, the monument erected at Courtrai to Mgr de Hearne, the monument of Medde- penningen at Ghent, and the monument of the Gevaert family in the Communal Cemetery at Evere.

The art of Charles van der Stappen (b. 1843) is decorative in character, mostly applied to architecture, though he proved himself a versatile sculptor, producing many statues, reliefs, groups, monu- mental works, and statuettes. His works include a silver centre- piece executed for the town of Brussels, the statue of William the Silent in the Square du Petit Sablon, Brussels, a bust for the monu- ment of Edouard Agneesens in the cemetery of St Josse-ten-noode, St Michael in the Gothic hall of the H6tel de Ville, Brussels, the monument to Baron Coppens near Sheel, the Alexandre Gendebien monument at Brussels, statues for the Alhambra theatre and Caryatids for the architect De Curtis' house in the same city, and the group of tired workmen, called " The Builders of Cities."

The work of Thomas Vincptte is characterized chiefly by its vigour and vitality. Vincotte is classed by some authorities as belonging to the classic group, but his work is less graceful than that of de Vigne and more vigorous and life-like than Van der Stappen's. There is perhaps more movement in his work than in that of any of his con- temporaries. The many portraits he executed reveal the ability of grasping the essentials of portraiture as well as the discrimination necessary to discard everything that does not render the work alike and characteristic. Among his works are a statue of Giotto in the Brussels Museum, " Music," on the facade of the Palais des Beaux Arts, the Godecharles monument in the Park, the bronze group of the " Horsebreaker " in the Avenue Louise, and the statue " Agneessens "

in the Boulevard du Midi, all of them in Brussels. There is also a bronze group of horses and Tritons for the park of the Chateau d'Ardenne.

Few men have exercised such influence upon Belgian sculpture as Jef Lambeaux (1852-1908), the Flemish artist. He was born at Antwerp of poor and obscure parents. At an early age he showed great aptitude for drawing, and after a very meagre education he was apprenticed to a wood carver. While there he studied at the academy schools. At sixteen he completed his course and undertook his first important commission, that for two reliefs for the tympana of the French theatre. He was successful for a time in producing statuettes, but after a while his success waned and he was obliged to abandon sculpture and to take any work he could get. After a period devoted to odd employments — sometimes painting, sometimes modelling — he again saved money to enable him to produce some good works. The first of these, " The Kiss," was finished in 1880. It had a great success and was bought by the Antwerp Museum. This discovery of a sculptor of talent led the town of Antwerp to find the means for sending Lambeaux to Italy. After studying in Florence he returned to produce " La Folle Chanson," which by some is considered his masterpiece. The group of " Intoxication " produced later is less satisfactory. The figures show a curious and unpleasant development which the sculptor's previous work scarcely hinted at. A work which may be placed with his " Folle Chanson " is the " Fountain of Brabo " in front of the H&tel de Ville at Antwerp. This in fact is declared by many critics to be Lambeaux's chef- d'oeuvre; it is certainly his most imposing monument. Other works of his are " The Robber of the Eagle's Nest," the wonderful colossal relief, " The Passions of Humanity," " The Wrestlers " and " The Orgy."

Less bold and energetic than Lambeaux's is the work of Julien Dillens (b. 1849). Though it does not possess that sense of life and the directness which is found in his brother sculptor, his standard of excellence was steadier. He will be remembered as one of Belgium's finest decorative sculptors, for his best work has been done in architectural enrichment. His pediment for the Hospice des Trois Allies at Uccle is a successful treatment of the difficult dress of modern times. Dillen's masterpiece is without doubt the group of " Justice " in the Palais de Justice at Brussels. He is responsible for many other important works, the chief of which are the busts of De Pede and Rubens in the Brussels Museum, a statue of Van Orley in one of the squares of Brussels, " The Lansquenets," on the summit of the Royal Palace, (before its reconstruction), a statue of Jean de Nivelles on the front of the Palais de Justice at Nivelles, and the marble statues

of St Victor and St Louis at Epernay.

There is yet another artist who ranks as one of the greatest sculptors of Flanders.- This is Jules Lagae (b. 1862). He was a pupil of Jef Lambeaux. His work does not call for further distinc- tion from that of Dillens and Lambeaux, than that it is what may be termed " delicate " and possessed a distinctive charm of spontaneous freshness. His " Mother and Child," shown at Florence in 1891, is a good example of the first quality, while " The Kiss," a terra-cotta bust, shows his spontaneity.

In the Walloon provinces two sculptors have done much for the renaissance of the art, Achille Chainaye and Jean Marie Gaspar. Achille Chainaye (b. 1862) is not a prolific sculptor, but all his work

is inspired, it would seem, by similar motives and ideas to those which inspired the early sculptors of Florence. The scarcity of his works may be accounted for by the fact that his productions were received with ridicule and derision. Meeting with scant success, he abandoned sculpture and devoted himself to journalism.

The work of Jean Marie Gaspar (b. 1864) shows the inspiration of a whole gamut of emotions, but hardly the continuity of purpose necessary to carry to completion half of his conceptions. He studied under Lambeaux, and, while still in his master's studio, he produced a wonderful group, " The Abduction," two men on furious, plunging horses wrestling for the possession of a struggling woman. This group was shown at the Paris Exposition of 1889, and brought immediate fame to the then unknown sculptor. Of his other finished works may be cited " The Brave," an Indian on horseback; " Adolescents," a charming group of two nude children embracing; " The Young Girl on a Rock," and the " Panther," destined for the botanical gardens at Brussels.

From the death in 1904 of Constantin Meunier (b. 1831) up to the year 1910 no man had advanced beyond the standard set up by that great sculptor. At the outset 01 his career Meunier had, like all pioneers, to contend with the hostility and derision of the public and of the press. His work touched a hitherto unawakened note. His sympathies lay all with the people who, obscure and unsung, work for the enrichment of the nation. Thus we find his energies and love of work wrapped around the iron foundry, the mine, the field and the factory. His art is not the art of the pseudo-classic, nor is he influenced by the masters of the Renaissance. His work is free and straightforward, true almost to brutality, but withal inspired by a

love of doing homage to the workers of the people. He studied in the studio of Fraikin. But it is unlikely that he was much influenced by him, and he soon forsook sculpture for painting. He was for some years one of the group of independent painters, which included De Groux, Dubois, Boulanger, and Baron. When these artists fell apart, Meunier stood alone, painting where no painter had before ventured or given a thought, working amongst the machinery, the pits, and the great factory yards. He continued for twenty-five years to paint in this manner, ignoring public ridicule and neglect. Then Meunier suddenly returned to his old love and produced some small statuettes. One of these — a puddler seated in an attitude of weariness, hard and rough and muscular, clad in little beyond his leathern apron — attracted much attention at the exhibition of the " Society of the XX." at Brussels. The subject and the treatment, so different to the recognized precepts of the schools, created a vast amount of discussion. From that time Meunier continued on the road he had taken, and produced works which gained to him new believers and new friends. Among his chief productions are " Fire-damp," in the Brussels Museum, " The Mower," in the Jardin Botanique at Brussels, " The Glebe," and " Puddlers at the Furnace," both in the Luxembourg Museum, " The Hammerman," the statues on the fagade of Notre Dame de la Chapelle, and the monument to Father Damien at Louvain.

Jacques de Lalaing is the author of the masterly monument erected at Evere to the English officers and men who fell at Waterloo, an elaborate work full of imagination and sculptural force and originality. His statue to Robert Cavelier de la Salle, at Chicago, is also a noteworthy performance, and important decorative works by him are to be seen embellishing public gardens in Brussels. Among the leading sculptors of to-day is to be teckoned Charles Samuel, who leans towards the traditions of yesterday.

Canova so dominated the world of sculpture at the beginning of the 19th century that the pseudo-classic style which he introduced remained typical of all the Italian sculpture of note until Bartolini led the movement which ^°f. e ™ ultimately crushed it. In Rome Canova completely sculpture. overshadowed all other sculptors except perhaps Thorwaldsen, the Danish sculptor, who resided for some time in that city. It is true that Pompeo Marches! (1789-1858) at the outset of his career enjoyed great popularity, but at the time of his death he was well-nigh forgotten. The interval between the death of Canova and the rise of Bartolini and the new school was filled in by men of mediocre talent, in whose work the influence of the leader of classicism is strongly marked. ' Francesco Carradori

(1747-1824), Camillo Pacetti (1758-1826), Rinaldo Rinaldi (b. 1793) and Giuseppe Fabris (b. 1800) were all followers of Canova, the last three being pupils of that master.

Lorenzo Bartolini (1777-1850) became the leader of the movement towards naturalism. This was nothing . more nor less than the servile copying of form — both in natural forms and in dress. Nevertheless Bartolini must be remembered as the pioneer of a different kind of naturalism which was of far greater importance than the manner of treating forms and texture. His true originality lay in ■ his representations of character. In place of the classic subjects invariably treated

in his time, he applied himself to the study of actual life. Instead of the expressionless faces of the pseudo-classic, he gave vitality and energy.

A sculptor who was much talked of in his day was Pietro Tenerani (1789-1869), a native of Torano near Carrara. lie worked for some time as assistant to Thorwaldsen. Later these two sculptors jointly accepted a commission for the monument of Eugene Beauharnais, and as Thorwaldsen wished to suppress the younger man's name, they quarrelled and finally separated. Tenerani visited Munich and Berlin, where he enjoyed the patronage of Frederick William IV. During the disturbances of 1848 and 1840 he was obliged to leave Rome with his family, in consequence of his sympathy with the Papists and his friend- ship for Count Pellegrino Rossi, who was assassinated in 1848. Amongst Tenerani's works are a statue of Count Rossi, a, monu- ment to Pius VIII. in the sacristy of St Peter's, " The Angel of Resurrection " in the Friedenskirche at Potsdam, a low relief in the church at Castle-Ashby, Northamptonshire, and " The Descent from the Cross," in the Torlonia chapel in St John Lateran. The last-named reveals the close study of nature so characteristic of his work.

The most distinguished Piedmontese sculptor of this period was Marochetti, who is referred to above in connexion with the British school.

Although Vincenzio Vela (1820-1801) was Swiss by birth, he was

Italian both by adoption and in his sympathies. In 1838 he won the prize offered by the government to the students of the Lombard-Venetian provinces of Austria, and became known by his statue of Spartacus. His chief works are a statue of Bishop Luini at Lugano; Desolation,' at the Villa Gabrina, Lugano; William Tell, at Lugano; the Alfieri and statues of Dr Gallo at the university, and of Cesare Balbo, all at Turin; the statues of Tommaso Grossi and Gabrio Piola at the Brera, Milan; Dante and Giotto at Padua; Joachim Murat at the Certosa, Bologna; and Cavour at Genoa. His masterpiece is the seated figure of Napoleon at Versailles.

After Bartolini, sculpture in Italy slowly developed along the lines of " naturalism " suggested by that leader. Perhaps the greatest activity and advance are to be recorded around Naples, a city till then of subordinate importance in art. Tommaso Solari (b. 182O), who may be regarded as one of the group belonging to Naples, produced work which is hardly distinguishable from that of Vela. His statue of Carlo Poerio, which occupies an important position in Naples, is characteristic of his work. He was followed by several sculptors whose works betray but little originality except in some cases in the forcing of qualities they wished to accentuate,, and the selection of daring or dramatic subjects — qualities which reveal the true character of the Neapolitan. The work of Raffaele Belliazzi, another Neapolitan (b. 1835), like that of Solari, is full of conscientious study, but his naturalism shows no genius. Among his works are " The Sleeping Boy," in the Gallery of Modern Art, Rome ; " A Woman and Child, and two terra-cotta busts at Capodimonte. Emilio Franceschi (1839-1890) and ˆchille D'Orsi (b. 1845) both belonged to the Neapolitan group of sculptors. Though the former was not a native of N a ples, he resided there from 1869 until his death. But while Franceschi was influenced to a very large extent by the Neapolitan school, D'Orsi broke away from it and created a distinctive style of his own. He studied in Rome, and in 1876 returned to Naples, where he produced " II Cabalista," followed py " The Parasites," the latter establishing his fame by its singularity both of subject and treatment. It represents two gluttons in a state of extreme intoxication. The_ group is remarkable as showing D'Orsi' s powers of characterization.

A man of perhaps greater original thought was Francesco Jerace, who seems to have been entirely free from the " academic " small-ness which characterized the followers of the naturalistic movement. He was born at Polistena in Calabria in 1853. His work bears the impress of his personality and his rather marked aloofness from his contemporaries. He is the author of the monument to Mary Somer-

ville, the English mathematician, which is in the Protestant cemetery at Naples; Vittoria Colonna, exhibited at the Brera, Milan, in 1894; and the Beethoven exhibited at Venice, 1895. At Bergamo there is a statue of the musician Donizetti, which was placed there in

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Vincenzo Gemito was born at Naples in 1852 of parents in a very humble position. He picked up a living in various occupations until, at the age of fourteen, he entered the studio of Emanuele Caggiano (1866). He worked hard and to some purpose, for two years after he modelled " The Gamester," which is at Capodimonte. This work shows evidence of astounding precocity. His work is XXIV. II

realistic, but forcible and more alive than that of many sculptors of his day. Gemito was supremely confident of his powers, and in a manner this was justified by his early recognition both amongst critics and the public. He designed a statue of Charles V. for the facade of the Royal Palace at Naples. A small figure of a water-carrier upon a fountain is now in the Gallery of Modern Art at Rome; in the same gallery are his statuette of Meissonier and a terra-cotta figure of Brutus.

A sculptor of quite a different class of subject is Costantinc Barbella, born at Chieti in 1853, who gave his entire attention to pastoral subjects, dealing with the costumes, types and occupations of the folk among whom his early life was spent. In the Royal Villa at Monza is a replica of his three peasant girls — a group in terra-cotta. In the national gallery at Rome there are a group of " The Departure of the Conscript," " The Conscript's Return," and another called " April."

For some years the activity amongst what may be called the Sicilian group of sculptors was headed by Benedetto Civiletti (b. Palermo, 1846). Civiletti was a pupil of Duprt;, but his work bears little impress of his master's influence; it is characterized mostly by its force and meaning of gesture and facial expression. His statue of " The Youth Dante " at the moment of the first meeting with Beatrice, and his seated figure of " The Young Caesar " are both works which successfully show his power of pose and facial expres- sion. He is the author also of the famous Canaris group, " Christ in Gethsemane," " The Dead Christ," a group of the siege of Misso- longhi, and a group of seventeen life-size figures representing the last stand of the Italians at the massacre of Dogali.

The family of Ximenes of Palermo is noted on account of the three of

its members who each became well known in the world of art: Empedocle, the painter, Eduardo, the writer, and Ettore, the sculptor. Ettore was a pupil of Morelli. His earliest work of note was a boy balancing himself upon a ball which he called " Equili- brium." He also produced " La Rixe," " Le marmiton," " Cuore del Re," "The Death of Ciceruacchio," " Achilles," and many others. His statue of " Revolution " is one of his best works.

Giulio Monteverde's work is conspicuous for its gaiety and sparkle, but though he has had some influence upon the recent sculptors of Italy, his work follows the naturalistic precepts laid down by his predecessors. A group of his own children, full of vivacious merri- ment, is in the Palazzo Bianco at Genoa; a " Madonna and Child " is in the Camposanto, and a statue of Victor Emmanuel stands in the square in the centre of Bologna.

Ettore Ferrari of Rome (b. 1849) is another sculptor whose work shows remarkable care and love of what is called finish. He has produced the statues " Porcari," the medieval revolutionist, " Ovid," " JacopoOrtis," "A Roman Slave," "Giordano Bruno," in the Campo di Fiorii and " Abraham Lincoln," in the New York Museum.

To the Roman group of sculptors also belongs Ercole Rosa (b. 1846). That he was a man of considerable talent is shown by his group of the Cairoli at Rome and his monument of Victor Emmanuel near the cathedral at Milan. Emilio Gallori, who studied at the Florence academy, is the author of the colossal statue of St Peter on the facade of the cathedral at Florence. He won the competition for, and executed, the Garibaldi monument at Rome.

A sculptor who is looked upon as the leader of the Venetian school is Antonio dal Zotto (b. 1841), a follower of Ferrari, at whose hands he received much of his training. He won the prix de Rome offered by the academy, and in Rome he met and became a friend of Tenerani. Being a man of independent views, however, he was but little affected by Tenerani's work. He was then twenty-five years old, and after spending two years in Rome and in other centres of artistic interest, he returned to Venice, where he produced a statue of St Anthony of Padua, one of Petrarch and another of Galileo. In 1880 he completed his statue of Titian for the master's birth- place, Pieve di Cad ore, and in 1883 he finished the figure of Goldoni in Venice. He is author also of a statue of Victor Emmanuel and a monument of Tartini the violinist, the former in the memorial tower on the battlefield of S. Martino near Brescia, the latter in a public square at Pirano.

Turin boasts many sculptors who are known throughout the country. Chief of these is Odoardo Tabacchi (b. 1831). He is the joint author with Antonio Tantardini of the Cavour monument at Milan. He has modelled several subjects of a lighter type, such as " The Bather," exhibited in Milan in 1894. Lorenzo Bistolfi, a younger man, conquered recognition chiefly by his composition of " Grief Comforted by Memory." Amongst other Turin sculptors must be mentioned Luigi Belli, author of the Raphael monument at Urbino, and Davide Calandra, whose " L'Aratro " is in the national gallery at Rome.

As everywhere in western and central Europe, national sculpture in Austria during the first half of the 19th century was altogether influenced by the classicism of the Italian Canova— in Austria perhaps more than in A ° S ˆ D other countries, since two of Canova's most important sculptor works came to Vienna in the early years of the century: the famous tomb of Marie Christine in the Augustinerkirche,*

which was ordered by Duke Albrecht of Saxony, in 1805, at the price of 20,000 ducats; and the Theseus group, bought by the emperor Francis, in Rome, which is now in the Vienna Museum. Canova's pupil, Pompeo Marchesi, was the author of the emperor Francis monument, unveiled in 1846, in the inner court of the Hofburg.

The first national sculptor of note was the Tirolese Franz Zauner (1746-1822), who was knighted in 1807 (the year in which his Kaiser- Joseph monument was unveiled) and became director of the Vienna gallery and academy. Among his works are the tomb of Leopold II. in the Augustinerkirche; the tomb of General Laudon at Hadersdorf; the tomb of the poet Heinrich von Collin in the Karlskirche in Vienna; and a number of busts in the Empire style, which are by no means remarkable as expressions of artistic individuality. Leopold Kiesling (1770- 1827), another Tirolese, whose first work on a large scale is the Mars, Venus and Cupid, in the Imperial gallery, was sent by his patron, Count Cobenzl, to Rome, where he was more attracted by Canova than by the antique or the late Renaissance. Joseph Klieber (1773-1850), also Tirolese, enjoyed the protection of Prince Johann Liechtenstein, who employed

him in the plastic decoration of his town residence and country seats. His reputa- tion as sculptor of colossal figures for imperial triumphal arches and lofty tombs was so widespread that he was given the commission for the catafalque of Louis XVIII. in Paris. Many middle-class houses of the Empire period in Vienna were decor- ated by him with reliefs of children. The elaborate relief figures on the Andreas Hofer monument in Innsbruck are the work of his hand. His followers were less favoured by powerful protec- tion and were forced into a definite direction: among them must be mentioned Johann Martin Fischer (1740-1820), who succeeded Zauner as head of the academy. His best-known work is " The Muscle-man," which still serves as model to students.

Of the greatest importance for the development of Austrian sculpture in the second half of the 19th century was the influence of Joseph Daniel Boehm (1794-1865), director of the academy of coin-engravers, and discriminating collector of art treasures. He was the father of Sir Joseph Edgar Boehm, R.A. Emanuel von Max (1810-1900), who in conjunction with his brother Joseph modelled the Radetzky monument in Prague, wrote in his autobiography, concerning the year 1833 in Vienna: " Art, particularly sculpture, was at the lowest ebb. The appearance of a statuette or bust at an exhibition was considered an event." But a strong movement began towards the end of the 'fifties. Professor Franz Bauer, of the Vienna academy (1797-187 2), exercised a most stimulating influence upon the rising generation. Among the earlier artists, whose life overlaps into the new era, were Anton Dietrich (1799-1872), who is best known by " The Three Magi," on the porch of the church of St John, and by a very beautiful ivory crucifix; and Johann Preleuthner (b. i8ro).

The architectural rejuvenation of Vienna led to the rise of an original local school of sculpture. J. D. Boehm devoted himself almost entirely to goldsmith-work and medals, but with the aid of his great collections he taught the new generation and helped to develop original talent. Hans Gasser (1817-1868) owed him his introduction to society, for whom he produced many busts. He modelled the empress Elisabeth monument at the western railway station in Vienna, the Wieland monument in Weimar, and the famous " Donauweibchen " in the Vienna town park. His brother, Joseph Gasser von Wallhorn (b. 1816), was a sculptor of figures of saints, many of which decorate St Stephen's Cathedral and the Votive Church in Vienna. Anton Fernkorn (1813-1878), born at Erfurt, was Austrian by his art. He started as a metal worker, and studied in Munich, but not at the academy. His talent was only fully developed

after he settled in Vienna, which city owes to him the bold equestrian bronze monuments of Archduke Charles (1859) and Prince Eugene of Savoy (1865). He became director of the imperial bronze foundry, in which post he was followed by his pupil Franz Poenninger. Johann Meixner (b. 1819 in Bohemia) is the Creator of the marble figures on the Albrecht Fountain, one of the most famous and imposing monuments in Vienna. Vienna received a few of her most important monuments from the strong personality of the Westphalian Kaspar von Zumbusch (b. 1830), the Beethoven monument, and that of Maria Theresa, an imposing and skilfully designed work, which solves in admirable fashion the problem of placing a monument effectively between the heavy masses of the

two imperial museums. Munich owns his monument of King Maximilian II. Zumbusch's fame did not quite overshadow that of Karl Kundmann (b. 1838), to whose vigorous art Vienna owes the Tegetthoff monument (based on the Duilius column), the Schubert statue, the seated figure of Grillparzer, and the awkwardly placed " Minerva " in front of the houses of parliament. Joseph V. Mysl- beck (b. 1848) worked under Thomas Seidaus (1830-1890), and is the author of the equestrian figure of St Vaelav, of "The Crucified Saviour," and of the Sladkowsky tomb in Prague. The most successful of the younger school was Edmund Hellmer (b. 1850), who executed the group on the pediment of the houses of parliament; " Francis Joseph granting the Constitution"; the Turkish monument at St Stephen's; one of the wall fountains on the facade of the new Hofburg (Austria's land power) — the companion figure (" Sea Power ") is by Rudolf Weyr (b. 1847) ; — the animated Bacchus frieze of the Court Theatre; the statue of Francis Joseph in the polytechnic institute; and the reliefs of the Grillparzer monument.

Like Hellmer and Weyr, Victor Tilgner (1844-1896) was a pupil of F. Bauer; but he owed his training rather to Joseph von Gasser and Daniel Boehm. He produced a vast number of portrait busts of his most prominent contemporaries in Vienna. Among his most notable monuments are those to Mozart and Makart in Vienna, the Werndl figure at Steyr, Bilrgermeister Petersen in Hamburg, and a war memorial at Koniggratz, in addition to numerous monumental fountains. Artistically on a higher plane than Tilgner stands Arthur Strasser (b. 1854), who excelled in polychromatic work on a small scale. In the 'seventies his Japanese figures excited consider- able interest and attracted Makart's attention. He excelled in Egyptian and Indian genre figures, such as a praying Hindu between two elephants. An Arab leaning against a Sphinx and a classic female figure with a funeral torch were strikingly decorative. His green

patined bronze of " The Triumph of Antinous " with a team of lions was awarded a first medal at the Paris Exhibition of' 1900.

Vincenz Pilz (b. l8lt>) was the sculptor of the quadrigas and caryatids on the Vienna houses of parliament, and of the Kolnitz and Ttirck monuments. Contemporary with him were Karl Coste- noble (b. 1837), Alois Dull (b. 1843), Otto Konig (b. 1838), Anton Schmidgruber (b. 1837), the craftsman Franz Schonthaler, Johann Silbernagel (b. 1839) — the author of the Liebenberg monument in Vienna, and Anton Wagner (1834-1900), whose " Goose Girl " is one of the monumental features of the streets of Vienna. Classic form was represented by Johannes Benk, who did good work in groups for pediments. One of his latest productions is the Amerling monument in the Vienna town park. Theodor Friedel (1842-1899) excelled in decorative work on a large scale. His are " The Horse Tamers " in front of the Hof-Stallgebaude.

*Edmund Hofmann von Aspernburg (b. 1847) is the sculptor of the Friedrich Schmidt monument, of the bronze centaurs in front of the Vienna Academy of Fine Arts, and of the monument of Archduke Karl Ludwig. The Works of Stefan Schwartz (b. 1 851) are remarkable for their vigour. He excelled in a new technique of embossing Eortrait plaques in silver direct from life. He counts also among the est Viennese medallists, almost equalling Heinrich Natter (1844-1892). Hermann Klotz(b. 1850) became professor of sculpture in wood. The very talented statuette-maker Ludwig Dtirnbauer (1860-1895) ' died almost at the beginning of what promised to be a brilliant career. Other distinguished sculptors of statuettes and works on a small scale were Hans Rathausky (b. 1858) and Johann Scherpe (b. 1855), who was entrusted with the execution of the Anzengruber monument. They all were pupils of Kundmann, as was also the animal sculptor Lax. Karl Schwerzek is the author of the Lenau and Anastasias Griin busts in Vienna, and Franz Vogl (b. 1861) of the poet Raimund's monument. Among Zumbusch's pupils were Anton Brenck, the creator of the emperor Joseph II. monuments in Brtinn and Reichenberg; Emanuel Pendl, whose colossal marble statue of " Justice *' is placed in the law courts in Vienna; and Hans Bitterlich (b. i860), whose bust of Exner in the Vienna university is one of the most remarkable pieces of realistic portraiture in that city. Another work of his is the Gutenberg monument. Othmar Schimkowitz is remarkable for a strikingly original style.*

In the other provinces under the Austrian emperor's rule, the best-known sculptors are the Carniole Marcell Guicki (1830-1894), Lewandowski, Buracz, and the Tirolese Gurschner, Who follows the

modern French style of statuette sculptors.

In the art of the medallist, Professor Karl Radnitzky the elder (b. 1818) led the way after J. D. Boehm; but he was surpassed by his pupil Joseph Tautenhayn (b. 1837), whose large shield Struggle between the Centaurs and Lapithae " was the cause of his appointment as professor. More important still is Anton Scharff (b. 1845), a real master of the delicate art of the medallist.

*At the beginning of the 19th century the art of sculpture was practically dead in Spain — or at least was mainly confined to the mechanical production of images of saints. Spanish But towards the middle of the century the two brothers 19th- Agapito and Venancio Vallmitjana, of Barcelona, century encouraged by the enthusiasm with which some of aa "i' tor *- their works had been received by local connoisseurs, took part*

in the Paris Figaro competition for the figure which decorates the entrance to the offices of that journal, and carried off the second prize. They afterwards obtained the first prize in other competitions at Madrid and other Spanish centres. Their chief works are: " Beauty dominating Strength," " St Vincent de Paul," the large statue erected at Valencia to Don Jaime Conquistador, and groups of Queen Isabella with the Prince of the Asturias, and Queen Marie Christine with Alfonso XIII.

Another sculptor of distinction is Andres Aleu, professor of the Barcelona School of Fine Arts, whose principal works are the " St George and the Dragon " on the facade of the Barcelona Chamber of Deputies, and Marshal Concha, the equestrian statue in Madrid. Kosendo Novas, of Catalan birth, like most modern Spanish sculptors of eminence, is best known by his masterpiece, " The dead Torero." Manuel Oms, another Barcelona sculptor who leans to the naturalistic school, is the author of the monument to Isabella the Catholic, erected at the end of the Paseo de la Castellana in Madrid in 1883. Antonio Fabres, who at the beginning of his career was an eminent sculptor, devoted himself subsequently to painting. Agustin Querol, and Mariano Benlliure, of Valencia, were for many years the official favourites of the Spanish government, who entrusted them

with numerous important commissions, though their work was neither lofty in conception nor particularly remarkable as regards execution, and occasionally, as in Querol's monument of Alfonso XII. — especially in the completed sketch of it — baroque in the extreme. Indeed, the genius of the Spanish race at all times, and particularly in the 19th century, found its expression in painting rather than in sculpture. Querol's group called " Tradition " is well imagined and expressive, and a good example of the best work achieved by a school in which freedom is the chief note.

Towards the end of the 19th and in the early years of the 20th centuries, Joseph Llimona y Brugena ("The Communion") and Blay, both of Catalan birth, were the most distinguished sculptors of Spain. The fame of Blay, who was a pupil of Chapu in Paris, has extended beyond the frontiers of his native country. His style has at the same time strength and delicacy. His chief works are the Miners' monument at Bilbao, and a group of an old man seated on a bench protecting a little girl from the cold. He also produced a great number of delicately wrought marble busts before his career was prematurely cut short. Joseph Llimona is the most personal and distinguished of all modern Spanish sculptors. His art ranges from the greatest delicacy to real power. At the International Exhibition at Barcelona in 1907 he was awarded the grand prize of honour for a group intended for the monument to Dr Robert in that city; and for a small marble figure of Pain, a work in which he has been thought to rival the Florentines of the best period. Jos6 Alcoverro, Pages y Serratora, Jos6 Gragera, Fuxa y Leal, Miguel Embil, and the brothers Osle are prominent members of the younger school and aim at giving " the personal note." The vigour displayed by them illustrates the revivification and rejuvenation of Spanish sculpture.

Russian sculpture has practically no past to record. In its beginnings Russian art was entirely ruled by the Church, whose laws were inspired by Byzantinism, and who forced all sculpture. art ists to submit to strictly fixed rules as regards form and formula. Before the 18th century, Russian sculpture was practically non-existent, except in the form of peasant wood-carving. The early stone idols (Kamenyia baby) and primitive bas-reliefs belong to the sphere of archaeology rather than of art. Real sculpture Only appears at the end of the 1 8th century, when Peter the Great, to use his own expression, " opened a window upon Europe " and ordered, together with a radical change in Russian society, the introduction of western art in Russia.

From all European countries artists streamed into Russia and helped

to educate native talent, and at the same time the tsar sent young artists abroad to study in foreign art centres. Among the foreign artists of this period were Conrad Hausner, Egelgrener and Schpekle; among the Russians Koulomjin, Issaeiv and Woynow. About 1776 Falconet and his wife arrived in Russia; then Gillet, whose pupil Schubin ranks among Russia's most gifted artists. Among his best-known works is the monument of Catherine II. His fame was rivalled

by that of Schedrine. KOzlovski is known by his Souvorine monument. Other early sculptors of distinction were Demouth-Malinowski, the sculptor of the Soussaniev monument; Pimenow, Martos, and the medallist Count Theodore Tolstoi, who is also known as an able illustrator. Orlovsky, Vitali and the whole preceding group represent the pseudo-classic character acquired at foreign academies. Among animal sculptors Baron Klodt is known by his horses which decorate the Anitschkine bridge at St Petersburg.

About the beginning of the 19th century the sculptor Kamenski inaugurated a more realistic tendency by his work which was inspired by contemporary life. He entered the academy after having exhibited a series of sculptures among which the most interesting were " The First Step " and " Children in the Rain." His contemporary Tschigoloff began his career in brilliant fashion, but devoted himself subsequently to the execution of commissions which did not give full scope to his gifts.

The greatest talent of all was unquestionably Marc Antokolsky (1845-1902), a Jewish sculptor permitted to work outside the Pale, of whom the Paris correspondent of The Times wrote, about 1888, that French sculptors would benefit by study- ing under Antokolsky, and by learning from him the power of the inspiration drawn from the study of nature. The artist himself held his statue of Spinoza to be his finest achievement. " I have put into this statue," he wrote, " all that is best in me. In the hard moments of life I can find peace only before this work." Equally beautiful is " The Christian Martyr," in the creation of which Antokolsky definitely broke all the fetters of tradition and strove no longer to express linear beauty, but intense truth. The martyr is an ugly, deformed woman, tortured and suffering, but of such beautiful sentiment that under the influence of religious extasis her very soul seems to rise to the surface. Among his other works few are better known than " Mephistopheles " (which he wanted to call " The 19th Century ") and the powerful " Ivan the Terrible," which the Russian critic Starsoff called " The Torturer Tortured." The whole strange psychology of this ruler, whose compeer in history can only be found perhaps in the person of Louis

XL, is strikingly expressed by Antokolsky. Very beautiful is the statue of Peter the Great, which breathes strength, intelligence, genius and devouring activity. To the works already mentioned must be added the statues of Ermak and of Nestor. Antokolsky has left to the world a gallery of the most striking figures in Russian history, giving to each one among them his proper psychology. His technique is always marked by perfect sureness and frequently by dazzling bravura.

Antokolsky was twenty-one years of age when he left St Petersburg. The academy at that time was in a state of complete decadence, under the rule of worthy old professors who remained strangers to their pupils, just as their pupils remained strangers to them. When Professors Piminoff and Raimers died, soon after, the academy seemed quite deserted; but just at that time a number of very gifted students began to work with energy, learning all they could from one another, fired by the same purpose and spirit. Antokolsky was in close touch with his friend, the painter Repin, with whom he worked much, and so failed to come under the influence of the idealist M. V. Praklow, who soon began to deliver certain lectures on art which excited keen interest among the young workers. Anto- kolsky tried the Berlin Academy of Fine Arts, but finding it ruled by the same routine, he returned before long to St Petersburg, where within a short time he executed the statue of " Ivan the Terrible " to which he owed his fame. This epoch became the starting-point of Russian sculpture, so that Antokolsky deserves an eminent position in the history of Russian art.

Among his pupils was his faithful follower and friend Ilia Gins- bourg (b. 1859), who devoted himself to genre scenes and portraits in the spirit of his master, but with a degree of sincerity and enthu- siasm which save him from the reproach of plagiarism. Lancerˆ (1848-1887) is known by his military statuettes, Lib&ich (1828-1883) has left few remarkable works. Leopold Bernstamm always practised in Paris ; among his works are a great number of portraits and a few monuments that are not without merit. Among con- temporary sculptors, whose number is still restricted in Russia, and whose artistic merit remains stationary, without marked progress and with little evidence of evolution, are Beklemicheff, Bach, Brodsky, Mikechine, Tourgeneff, Auber and Bernstein. Prince Troubetzkoi, who is counted among the sculptors of Russia, though he was educated and worked in Italy, acquired some reputation by

his skill in the rapid execution of cleverly-wrought impressionist statuettes of figures and horses as well as busts. Their value lies in the vivid representation they give of Russian life and types. Among the most original modern Russian sculptors is Naoum Aronson (b. 1872), whose best-known work is his Beethoven monument at Bonn. At Godesberg is his Narcissus fountain, whilst other works of his are at the Berlin. St Petersburg and Dublin Museums.

(M. H.S.; P. G. K.)

The early names in American sculpture — Shem Drowne, the maker of weather-vanes; Patience Wright (1725-1785); William

Rush (1 765-1833), carver of portraitsand of figure-heads Stales. f° r ships; John Frazer (1790-1850), the stonecutter;

and Hezekiah Augur (1791-1858) — have the interest of chronicle at least. Hiram Powers (1805-1873) had a certain technical skill, and his statues of the " Greek Slave " (carved in 1843 in Rome and now at Raby castle, Darlington, the seat of Lord Barnard, with a replica at the Corcoran Gallery, Washing- ton, and others elsewhere) and " Eve before the Fall " were important agents in overcoming the Puritanic abhorrence of the nude. Horatio Greenough (1805-1852), Joel T. Haft (1810-1877), S. V. Clevenger (181 2-1843) and Clark Mills (1815-1883) all received many commissions but made no additions to the advancement of a true art-spirit. Thomas Crawford (1814-1857) began the bas-reliefs for the bronze doors of the Capitol, and they were finished by William H. Rinehart (1825-1874), whose " Latona " has considerable grace. Henry Kirke Brown (1814-1886) achieved, among less noteworthy works, the heroic " Washington " in Union Square, New York City. It is one of the noblest of equestrian statues in America, both in breadth and certainty of handling and in actual majesty, and reflects unwonted credit on its period. Erastus D. Palmer (1817-1904) was the first to introduce the lyrical note into American sculpture; his statue, " The White Captive," and still more his relief, " Peace in Bondage," may be named in proof. There is undeniable skill, which yet lacks the highest qualities, in the work of Thomas Ball (b. 1819). William Wetmore Story (1810-1896), whose " Cleopatra," though cold, shows power; Randolph Rogers (1825- 1892), best known for his blind " Nydia," and for his bronze doors of the Capitol at Washington; John Rogers (1820-1904), who struck out a new line in actuality, mainly of an anecdotal military kind; Harriet Hosmer

(1830-1908), a classicist, whose recumbent " Beatrice Cend " is perhaps her most graceful work; J. S. Hartley (b. 1845); Launt Thompson (1833-1894) are among the leaders of their day. The works of Olin L. Warner (1844-1896) and J. Q. A. Ward (1830-1910) reveal at times far greater originality than any of these. Warner's two graceful classical figures for a fountain in Portland, Oregon, and his admirable portrait statue of William Lloyd Garrison, reveal a nice discernment of the fitness of manner to matter. He was also successful in modelling medallions. Ward has a sturdiness, dignity, and individuality quite his own, and may be considered at the head of his own generation. In addition to these should be mentioned Larkin G. Mead (b. 1835), George Bissell (b. 1839), Franklin Simmons (b. 1839), Martin Milmore (1844-1883), Howard Roberts (1843-1900), Moses Ezekiel (b. 1844), all of whom are prominent in the history and development of sculpture in America. By their time the sculptors of America had wakened completely, artistically speaking, to a sense of their own nationality.

It was however later that came that inspired modernity, that sympathy with the present, which are in some senses vital to genuinely emotional art. American sculpture, like American painting, was awakened by French example. The leading spirit in the new movement was Augustus St Gaudens (q.v.), a great sculptor whose work is sufficiently dealt with in the separate article devoted to him. Two other Americans stand out, with St Gaudens, among their contemporaries, Daniel Chester French (q.v.) and Frederick Macmonnies (q.v.). French's " Gallaudet teaching a Deaf Mute " is an example of how a difficult subject can be turned into a triumph of grace. His " Death and the Young Sculptor " is a singularly beautiful rendering of the idea of the intervention of death. In collabora- tion with E. C. Potter he modelled various important groups,

particularly " Indian Corn " and the equestrian " Washington," in Paris. The "Bacchante" of Macmonnies, instinct with Renaissance feeling, is a triumph of modelling and of joyous humour; while his statue of " Nathan Hale " in City Hall Park, New York, his " Horse Tamers," and his triumphal arch decorations for the Soldiers' and Sailors' Memorial at Brooklyn, show the artist's power in the treatment of a serious theme.

The strenuous achievements of George Grey Barnard have both high skill and deep sincerity. His " Two Natures," his " Brotherly Love," his "Pan "and the design for a monumental Norwegian stove are among the strongest efforts of modern American statuary. Ranking with him, though different in thought and method, stands Paul

Wayland Bartlett. Success, too, artistically has been accorded to the fine works of John J. Boyle, William Couper, twenty years of whose life were passed in Florence, William O. Partridge, Hermon MacNeil and Lorado Taft. The beautiful busts of Herbert Adams; the thoroughly artistic miniature figures of Mrs Clio Hinton Bracken ; the graceful figurines of Mrs Potter Vonnoh; Edwin F. Elwell's " Egypt " and " Orchid "; and the work of F. Wellington Ruck- stuhl should also be mentioned ; also J. Massey Rhind, a Scotsman by birth and artistic education, John Donoghue, Charles H. Niehaus, Roland H. Perry (" Fountain of Neptune "), Andrew O'Connor, Jerome Conner, John H. Roudebush, and Louis Potter. Equally noteworthy are Bela L. Pratt (" General Benjamin F. Butler memorial), Cyrus E. Dallin (with Wild West subjects), Richard E. Brooks, Charles Grafly (" Fountain of Life "), Alexander S. Calder, Edmund A. Stewardson (" The Bather ") and Douglas Tilden (" Mechanics' Fountain," San Francisco). The leading " animaliers " include Edward Kemeys (representing the Southern states) , Edward C. Potter, Phimister Proctor, Solon H. Borglum, Frederick G. Roth, and Frederick Remington. Among the women sculptors are Mrs Kitson, Mrs Hermon A. MacNeil, Miss Helen Mears, Miss Evelyn Longman, Miss Elise Ward, Miss Yandell and Miss Katherine Cohen. (M. H. S.)

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Fraser's Mag. (April 1861). The subject of recent British sculpture has been curiously neglected, except in newspaper notices and occasional articles in the periodical press, such as Edmund Gosse's " Living English Sculptors " in the Century Magazine for July 1883. The only volume published is M. H. Spielmann's British Sculpture and Sculptors of To-day (London, 1901).

For American sculpture, see Henry T. Tuckerman, Book of the Artists: American Artist Life (New York, 1870, and later editions); Lorado Taft, American Sculpture (New York and London, 1903); William J. Clark, Jnr., Great American Sculptures (Philadelphia, 1877) ; Charles H. Caffin, American Masters of Sculpture (New York, 1903); Sadikichi Hartmann, Modern American Sculpture (New York).

SCURVY (Scorbutus), a constitutional disease, characterized by debility, morbid conditions of the blood, spongy gums, impairment of the nutritive functions, and the occurrence of haemorrhagic extravasations in the tissues of the body. In former times this disease was extremely common among sailors, and gave rise to a frightful amount of mortality. It is now, however, of rare occurrence at sea, the simple means of prevention being well understood. Scurvy has also frequently broken out among soldiers on campaign, in beleaguered cities, as well as among communities in times of scarcity, and in prisons, work- houses and other public institutions. In all such instances it has been found to depend closely upon the character of the food. The precise etiology is obscure, and the modern tendency is to suspect an unknown micro-organism; on the other hand, even among the more chemical school of pathologists, it is disputed whether the cause (or conditio sine qua non) is the absence of certain constituents in the food, or the presence of some actual poison. Sir Almroth Wright in 1895 published his conclusions that scurvy was due to an acid intoxication, while Torup of Christiania believes it to be a direct poisoning from damaged and badly preserved meat. Dr Jackson and Dr Harley support this latter view, contending that scurvy occurs when meat is eaten in this condition, even when lime juice and vegetables are given in conjunction with it. The palmy days of the disease were those when sailors and soldiers

had to fare on salt meat and " hard tack," or were deprived of fresh vegetables; and the fact that scurvy has been practically abolished by the supply of these latter has led to the association of this factor with the disease as a vera causa. But how the defect in vegetable diet produces scurvy is not quite clear; nor how far other conditions may

be involved.

The symptoms of scurvy come on gradually, and its onset is not marked by any special indications beyond a certain failure of strength, most manifest on making effort. Breathlessness and exhaustion are thus easily induced, and there exists a corresponding mental depression. The countenance acquires a sallow or dusky hue; the eyes are sunken; while pains in the muscles of the body and limbs are constantly present. The appetite and digestion may be unimpaired in the earlier stages and the tongue comparatively clean, but the gums are tender and the breath offensive almost from the first. These preliminary symptoms may continue for weeks, and in isolated cases may readily escape notice, but can scarcely fail to attract attention where they affect large numbers of men. In the further stages of the disease all these phenomena are aggra- vated in a high degree and the physical and mental prostration soon becomes extreme. The face looks haggard; the gums are livid, spongy, ulcerating and bleeding; the teeth are loosened and drop out; and the breath is excessively foetid. Extravasations of blood now take place in the skin and other textures. These may be small like the petechial spots of purpura (q.v.), but are often of large amount and cause swellings of the muscles in which they occur, having the appearance of extensive bruises and tending to become hard and brawny. These extravasations are most common in the muscles of the lower extremities; but they may be formed any- where, and may easily be produced by very slight pressure upon the skin or by injuries to it. In addition, there are bleedings from mucous membranes, such as those of the nose, eyes and alimentary or respiratory tracts, while effusions of blood-stained fluid take place into the pleural, pericardial or peritoneal cavities. Painful, exten- sive and destructive ulcers are also apt to break out jn the limbs. Peculiar disorders of vision have been noticed, particularly night- blindness (nyctalopia), but they are not invariably present, nor specially characteristic of the disease. The further progress of the malady is marked by profound exhaustion, with a tendency to syn- cope, and with various complications, such as diarrhoea and pulmonary or kidney troubles, any or all of which may bring about a fatal result. On the other hand, even in desperate cases, recovery may be hope- fully anticipated when the appropriate remedy can be obtained. The composition of the blood is materially altered in scurvy, particularly as regards its albumen and its red corpuscles, which are diminished, while the fibrine is increased.

No disease is more amenable to treatment both as regards prevention and cure than scurvy, the single remedy of fresh vegetables

or some equivalent securing both these ends. Potatoes, cabbages, onions, carrots, turnips, &c, and most fresh fruits, will be found of the greatest service for this purpose. Lime juice and lemon juice are recognized as equally efficacious, and even vinegar in the absence of these will be of some assistance. The regulated administration of lime juice in the British navy, which has been practised since 1795, has had the effect of virtually extinguishing scurvy in the service, while similar regulations introduced by the British Board of Trade in 1865 have had a like beneficial result as regards the mercantile marine. It is only when these regulations have not been fully carried out, or when the supply of lime juice has become exhausted, that scurvy among sailors has been noticed in recent times. Wright has proposed giving what he terms anti-scorbutic elements (Rochelle salt, calcium chloride or lactate of sodium) instead of raw materials such as lime juice and vegetables, as being more convenient to carry on voyages. Besides the administration of lime or lemon juice and the use of fresh meat, milk, cider, &c, which are valuable adjuvants, the local and constitutional conditions require the attention of the physician. The ulcers of the gums and limbs can be best treated by stimulating astringent applications; the hard swellings, which are apt to continue long, may be alleviated by fomentations and frictions; while the anaemia and debility are best overcome by the continued administration of iron tonics, aided by fresh air and other measures calculated to promote the general health.

Infantile Scurvy (Scurvy Rickets, Barlow's disease), a disease of childhood due to a morbid condition of the blood and tissues from defects of diet, was first observed in England in 1876 by Sir T. Smith, and later fully investigated by Sir Thomas Barlow. The chief symptoms are great and progressive anaemia, mental apathy, spongy gums, haemorrhages into various structures, particularly under the periosteum and muscles, with suggestive thickenings round the shafts of the long bones, producing a state of pseudo- paralysis.

SCUTAGE or Esctjage, the pecuniary commutation, under the feudal system, of the military service due from the holder of a knight's fee. Its name is derived from his shield (scutum). The term is sometimes loosely applied to other pecuniary levies on the basis of the knight's fee. It was supposed till recently

that scutage was first introduced in 1156 or on the occasion of

Henry II. 's expedition against Toulouse in 11 59; but it is now recognized that the institution existed already under Henry I. and Stephen, when it occurs as scutagium, scuagium or escuagium. Its introduction was probably hastened by the creation of fractions of knights' fees, the holders of which could only discharge their obligation in this fashion. The increasing use of mercenaries in the 1 2th century would also make a money payment of greater use to the crown. Levies of scutage were distinguished by the names of the campaigns for which they were raised, as " the scutage of Toulouse " (or " great scutage "), " the scutage of Ireland " and so forth. The amount demanded from the fee was a marc (13s. 4d.), a pound or two marcs, but anything above a pound was deemed abnormal till John's reign, when levies of two marcs were made in most years without even the excuse of a war. The irritation caused by these exac- tions reached a climax in 1 214, when three marcs were demanded, and this was prominent among the causes that led the barons to insist on the Great Charter (121 5). By its provisions the crown was prohibited from levying any scutage save by " the common counsel of our realm." In the reissue of the Charter in 121 7 it was provided, instead of this, that scutages should be levied as they had been under Henry II. In practice, however, under Henry III., scutages were usually of three marcs, but the assent of the barons was deemed requisite, and_jthey were only levied on adequate occasions.

Meanwhile, a practice had arisen, possibly as early as Richard I.'s reign, of accepting from great barons special " fines " for permission not to serve in a campaign. This practice appears to have been based on the crown's right to decide whether personal service should be exacted or scutage accepted in lieu of it. A system of special composition thus arose which largely replaced the old one of scutage. As between the tenants-in- chief, however, and their under-tenants, the payment of scutage continued and was often stereotyped by the terms of charters of subinfeudation, which specified the quota of scutage due rather than the proportion of a knight's fee granted. For the purpose of recouping themselves by levying from their under-tenants the tenant-in-chief received from the crown writs de scutagio habendo. Under Edward I. the new system was so completely developed that the six levies of the reign, each as high as two pounds on the fee, applied only in practice to the under-tenants, their lords compounding. with the crown by the payment of large sums, though their nominal assessment, somewhat mysteriously became much lower (see Knight Service). Scutage was rapidly becoming obsolescent as a source of revenue, Edward II. and Edward III. only

imposing one levy each and relying on other modes of taxation, more uniform and direct. • Its rapid decay was also hastened by the lengths to which subinfeudation had been carried, which led to constant dispute and litigation as to which of the holders in the descending chain of tenure was liable for the payment. Apart from its financial aspect it had possessed a legal importance as the test, according to Bracton, of tenure by knight-service, its payment, on however small a scale, proving the tenure to be " military " with all the consequences involved.

The best monograph on the subject (though not wholly free from error) is J. F. Baldwin's The Scutage and Knight Service in England (1897), a dissertation printed at the University of Chicago Press. Madox's History of the Exchequer was the standard authority formerly, and is still of use. The view now held was first set forth by J. H. Round in Feudal England (1895). In 1896 appeared the Red Book of the Exchequer (Rolls series), which, with the Testa de Nevill (Record Commission) and the Pipe Rolls (published by the Record Commis- sion and the Pipe Roll Society), is the chief record authority on the subject; but many of the scutages are wrongly dated by the editor, whose conclusions have been severely criticized by J. H. Round in his Studies on the Red Book of the Exchequer (privately issued) and his Commune of London and other Studies (1899). Pollock and Maitland's History of English Law (1895) should be consulted. M'Kechnie's Magna Carta (1905) is of value; and Scargill Bird's " Scutage and Marshal's Rolls " in Genealogist (1884), vol. i., is important for the later records. (J. H. R.)

SCUTARI (Turkish, Uskudar, anc. Chrysopolis), a town of Turkey in Asia, on the E. shore of the Bosporus, opposite Con-

stantinople of which it forms the 9th Cercle Municipale. Its painted wooden houses and white minarets piled upon the slopes of the shore and backed by the cypresses of the great cemetery farther inland present a very picturesque appearance from the sea. The town contains eight mosques, one of them, the Valideh Jami, built in 1547, of considerable beauty. Other remarkable buildings are the vast barracks of Selim III. and a hospital used during the Crimean War (see Nightingale, Florence). The chief industry of Scutari is the manufacture of silk, muslin and cotton stuffs. The population is estimated at 105,500, of which two-thirds are Mahommedan. The most striking feature of Scutari is its immense cemetery, the largest and most beautiful of all the cemeteries in and around Constantinople; it extends over more than 3 m. of undulating plain behind the town. Between Scutari and Haidar Pasha the English

army lay en- camped during the Crimean War, and in a cemetery on the Bosporus are buried the 8000 English who died in hospital. At Haidar Pasha is the terminus of the Angora, Konia and Smyrna railways. Chrysopolis (" Golden City "), the ancient name of Scutari, most probably has reference to the fact that there the Persian tribute was collected, as at a later date the Athenians levied there a tenth on the ships passing from the Euxine. Scutari was formerly the post station for Asiatic couriers (Uskudar = courier), as also down to the introduction of steam the terminus of the caravan routes from Syria and Asia.

SCUTARI (anc. Scodra, Slav. Skadar, Albanian Shkdder, or with the definite article Shkddr-a), the capital of the vilayet of Scutari and principal city of Albania, European Turkey; oji the south-eastern shore of Lake Scutari, near the confluence of the Drin and Boyana rivers, and 14 m. inland from the Adriatic Sea. Pop. (1905) about 32,000. The plain in which Scutari is built extends southwards to Alessio and northwards to the Montenegrin frontier. It is enclosed by lofty mountains on every side except where it adjoins the lake. It is very liable to be flooded, and this liability was greatly increased towards the close of the 19th century by the deflection of the Drin and its junction with the Boyana. Its bazaar and mosques give Scutari an oriental appearance, but the finest of its buildings are Italian — an old Venetian citadel on a high crag, and a Roman Catholic cathedral. The city is the seat of a Roman Catholic archbishop and a Jesuit college and seminary, which are subsidized by the Austrian government. The trade of Scutari tends to decline and to be diverted to Salonica and other ports connected with the main European railways. Grain, wool, hides and skins, tobacco and sumach are exported; arms and cotton stuffs are manufactured; and textiles, metals, pro- visions and hardware are imported. Large quantities of a kind of sardine, called scoranze by the Italians and seraga by the Albanians, are caught in the Boyana and cured for export or home consumption. The Boyana is navigable by small sea-going vessels as far as Oboti, 12 m. from its mouth; cargoes for Scutari are then transhipped into light river craft. The steamers of the Anglo-Montenegrin trading company ply on the lake.

Livy relates that Scodra was chosen as capital by the Illyrian king Gentius, who was here besieged in 168 B.C., and carried captive to Rome. In the 7th century Scutari fell into the hands of the Servians, from whom it was wrested by the Venetians, and finally, in 1479, the Turks acquired it by treaty.

Lake Scutari is almost bisected by the line of the Montenegrin

frontier. It occupies one of the depressions, known as polyes, which are common throughout the Illyrian Karst region. Its generally even margin is broken by the estuary of the river Moratcha, and by a long, narrow inlet which stretches towards the North Albanian Alps. The lake measures 135 sq. m. ; its maximum depth was long considered to be no more than 23 ft. But a series of soundings taken in 1901 by Dr Jovan Cvijic revealed the existence of a series of deep holes near the south-western shore, one of which attains a depth of 144 ft. The surface is 20 ft. above sea-level. The principal affluent of Lake Scutari is the Moratcha, which enters it, after forming two small lakes, near the Montenegrin port of Plavnitza. It is drained by the Boyana, which issues from its south- eastern extremity and flows to the Adriatic. Lake Scutari abounds in aquatic birds and fish ; its brilliantly clear water, its archipelago

of wooded islets, and its setting of rugged mountains, some of which are covered with snow during the greater part of the year, render it one of the most beautiful lakes in Europe.

SCUTTLE, a term formerly applied to a broad flat dish or platter; it represents the O. Eng. scutel, cognate with Ger. Schiissel, dish, derived from Lat. scutella, a square salver or tray, dim. of scutra, a platter, probably allied to scutum, the large oblong shield, as distinguished from the clypeus, the small round shield. The name survives in the coal-scuttle, styled " purdonium " in English auctioneers' catalogues, which now assumes various forms. " Scuttle " in this sense must be distinguished from the word meaning a small opening in the deck or side of a ship, either forming a hatchway or cut through the covering of the hatchway; from which to "scuttle " a ship means to cut a hole in the bottom so that she sinks. This word is an adaptation of O. Fr. escoutille, mod. Scoutille, from Span, escotilla, dim. of escoti, a sloping cut in a garment about the neck. The Spanish word is cognate with Du. sehoot, Ger. Schoss, lap, bosom, properly the flap or projecting edge of a garment about the neck, O. Eng. sceat, whence " sheet." The colloquial " scuttle," in the sense of hurrying away, is another form of " scuddle," frequentative of " scud," to run, which, like its variant " scoot," is another form of " shoot."

SCYLAX OF CARYANDA (in Caria), Greek historian, lived in the time of Darius Hystaspis (521-485 B.C.), who commis- sioned him to

explore the course of the Indus. He started from Caspatyrus (Caspapyrus in Hecataeus; the site cannot be identified: see V. A. Smith, Early Hist, of India, 2nd ed., 1908, 34 note), and is said by Herodotus (iv. 44) to have reached the sea. whence he sailed west through the Indian Ocean to the Red Sea. Scylax wrote an account of his explorations, referred to by Aristotle (Politics, vii. 14), and probably also a history of the Cariaa hero Heracleides, 1 prince of Mylasae, who distin- guished himself in the revolt against Darius (Herodotus v. 121). This work is the earliest known Greek history which centred round the achievements of a single individual. Suidas (s.v.) , who mentions the second work, confounds the older Scylax with a much later author, who wrote a refutation of the history of Polybius, and is presumably identical with Scylax of Hali- carnassus, a statesman and astrologer, the friend of Panaetius spoken of by Cicero (De div. ii. 42). Neither of these, however, can be the author of the Periplus of the Mediterranean, which has come down to us under the name of Scylax of Caryanda. This work is little more than a sailor's handbook of places and distances all round the coast of the Mediterranean and its branches, and then along the outer Libyan coast as far as the Carthaginians traded. Internal evidence shows that it must have been written long after the time of Herodotus, about 350 B.C.

Editions by B. Fabricius (1878) and C. Miiller in Geographici Graeci minores, i., where the subject is fully discussed; see also G. F. Unger, Philologus, xxxiii. (1874); B. G. Niebuhr, Kleine Schriflen, i. (1828); and E. H. Bunbury, History, of Ancient Geo- graphy, i.

SCYLLA AND CHARYBDIS. In Homer (Od. xii. 73, 235, 430) Scylla is a dreadful sea-monster, daughter of Crataeis, with six heads, twelve feet and a voice like the yelp of a puppy. She dwelt in a sea-cave looking to the west, far up the face of a huge cliff. Out of her cave she stuck her heads, fishing for marine creatures and snatching the seamen out of passing ships. Within a bowshot of this cliff was another lower cliff with a great fig- tree growing on it. Under this second rock dwelt Charybdis, who thrice a day sucked in and thrice spouted out the sea water. Between these rocks Odysseus sailed, and Scylla snatched six men out of his ship. In later classical times Scylla and Charybdis, whose position is not defined by Homer, were localized in the Straits of Messina — Scylla on the Italian, Charybdis on the Sicilian side (Strabo i. p. 24; vi. p. 268). The well-known line, Incidis in Scyllam cupiens vitare Charybdim, occurs in the Alexandreis of Gautier de Lille, a poet of the 12th century. In

1 This Heracleides is noticed in an Egyptian papyrus containing a

fragment of the historian Sosylus, which alludes, by way of comparison, to the tactical ability displayed by him at the battle of Artemisium (Wilcken in Hermes, xli., 1906, pp. 103 seq.).

Ovid (Metam. xiv. 1-74) Scylla appears as a beautiful maiden beloved by the sea-god Glaucus and other deities, and changed by the jealous Circe (or other rival) into a sea-monster; after- wards she was transformed into a rock shunned by fishermen. According to a late legend (Servius on Aeneid, iii. 420), Charybdis was a voracious woman who robbed Heracles of his cattle and was therefore cast into the sea by Zeus, where she retained her old voracious nature. In later poetry and art Scylla was con- ceived of as a maiden above, with dogs' or wolves' heads growing out of her body, and the tail of a fish.

Another Scylla, confounded by Virgil (Eel. vi. 74) with the sea-monster, was a daughter of Nisus (q.v.), king of Megara.

See O. Waser, Skytta und Charybdis in der Literatur und Kunst der Griechen und Romer (1894); and D. Jobst, SkyUa und Charybdis (Wurzburg, 1902), who endeavours to show that the Homeric description really referred, as the ancients assumed, to the Sicilian straits.

SCYMNUS of Chios, the name assigned to a Greek geographer of uncertain date, commonly taken to be the author of a frag- mentary anonymous Paraphrasis in verse describing the northern coasts of the Mediterranean and the shores of the Black Sea, a work which in the first edition (Augsburg, 1600) was ascribed to Marcianus of Heraclea. Meineke showed that this piece cannot be by Scymnus. It is dedicated to a King Nicomedes, probably Nicomedes III. of Bithynia (91-76 B.C.), and so would date from the beginning of the 1st century B.C. Its most valuable portions relate to the Euxine regions and to the Hellenic colonies, of those shores as well as of the coasts of Spain, Gaul and Italy.

See Meineke's edition (Berlin, 1846) ; C. Miiller, Geographi Graeci minores, vol. i., where the poem is edited with sufficient prolegomena, (pp. lxxiv.-lxxvii.) ; E. H. Bunbury, Ancient Geography, i. 99, 100, 102, 128, 183; ii. 26, 69-74.

SCYPHOMEDUSAE or Acalephae, one ot the two sub- divisions of the Hydrozoa (q.v.), the other being the Hydro- medusae (q.v.). The subclass Scyphomedusae contains a number of animals which in the adult condition are medusae or jelly- fishes (see Medusa), exclusively marine in habitat and found in all seas. They are chiefly

pelagic organisms, floating at or near the surface of the water, but occur also at great depths, and are sometimes fixed and sessile in habit. Many species attain a large size and by their brilliant coloration are very conspicuous objects to the mariner or traveller. In spite of the soft nature of their bodies, a number of Scyphomedusae have been found fossil; see especially Maas (7 and 12).

A scyphomedusa is distinguished from a hydromedusa chiefly by the following points. The umbrella has a lobed, indented margin, a character only seen amongst Hydromedusae in the order Narcomedusae, and it is without the characteristic velum of the Hydromedusae; hence the Scyphomedusae are sometimes termed Hydrozoa Acraspeda. The sense-organs are covered over by flaps of the umbrellar margin (hence " Steganophthal- mata "), and are always tentaculocysts, that is to say, reduced and modified tentacles, which bear usually both ocelli and otocysts, and are hollow. The gonads are formed in the endoderm (hence " Entocarpeae "), and the generative products are shed into the gastric cavity and pass to the exterior by way of the mouth. The development from the egg may be direct, or may take place with an alternation of generations (metagenesis), in which a non-sexual individual, the so-called scyphistoma or scyphopolyp, produces by budding the sexual medusae.

Morphology of the Scyphomedusa. — As already stated, a medusa of this order may be free-swimming or sessile in habit. Intermediate between these two types are species which have the power of temporal fixation by the exumbral surface. Such forms when undisturbed fix themselves to the bottom and rest with their mouths and tentacles uppermost. If disturbed they swim about like other medusae until a favourable opportunity presents itself for resuming the sedentary habit. A well-known example of a permanently sessile form is Lucernaria, common on the Atlantic coasts of Europe, especially in Zostera-beds, attached to the weed. It resembles in general appearance a polyp, lacking even the characteristic medusan sense-organs, which are present,

however, in the allied genus Haliclystus (fig. i), proving its medusan nature beyond all doubt.

The body-form of the Scyphomedusae varies from that of a conical or roughly cubical cap (fig. 4), to that of a shallow saucer or disk (fig. 2d). The tentacles vary in number from four, the primitive

The mouth may be a simple structure at the extremity of the manubrium, or may be four-cornered, with the corners drawn out into so-called oral arms, each of which bears on the inner side a groove continuing the angle of the mouth (fig. 2a). In some genera the oral arms are of great length, and in the suborder Rhizostomeae they undergo concrescence to form a proboscis (fig. 3, a), in such a way that the mouth becomes nearly obliterated, and is reduced to a system of fine canals opening to the exterior by small pores.

The mouth leads into the spacious stomach, which is typically four lobed (fig. 26, v). On the floor of the stomach are borne the conspicuous gonads {ov), and also tentacle-like processes termed gastric filaments or phacellae, projecting into the cavity of the stomach. The gonads are folds of the endoderm containing generative cells, and are primitively four in number, situated interradially, but each gonad may be divided into two by the partition which separates two adjacent lobes of the stomach, that is to say, by one of the areas of concrescence between exumbral and subumbral endoderm, whence arises a condition with eight gonads which is by no means uncommon. As a rule these medusae are of separate sexes, but hermaphrodite forms are known, for example, the conspicuous British (east-Atlantic) medusa Chrysaora (fig. 3, b).

Immediately below each gonad the subumbral ectoderm is pushed in, as it were, to form a pit or deep cavity (fig. 2a,

From Broun's Titrrach, ii. 2. "Coelenterata." by Carl Chun, by permission of C. F. Winter. Fig. i. — Haliclystus auricula. (After H. J. Clark.)

I. From the side. t',

II. From above.

III. From the side, with the umbrella kl,

drawn back and the mouth oc, thrust out.

IV. A tentaculocyst (" colleto-cysto- 0,

phore" or " marginal anchor ") se, seen from the subumbral side.

Stalk.

Subumbrella,

P.

su,

t.

ra,

Knobbed tentacles in eight

clusters. Tentaculocysts, four perradial,

four interradial.

Rudimentary tentacle of the tentaculocyst.

Glandular cushion.

Ocellus, and en, internal canal of the tentaculocyst.

Mouth.

Interradial septal ridges, passing into the taeniolae (J.t) in the stalk. gen, The eight adradial gonads on the subumbral walls of the four radial pouches, representing primitively four horse-shoe- shaped gonads each divided into two by an interradial septum.

number, to a very large number, but in one suborder, the Rhizo-stomeae, tentacles are absent altogether (fig. 3, a). Typically the tentacles have the form of long flexible filaments, hollow or solid, implanted singly on the margin of the umbrella (fig. 3, 6), but in some jpecies they occur in groups or tufts (fig. 15), and in Lucernaria and its allies a bunch of small capitate tentacles is found on each of the eight adradial lappets of the margin (fig. 1). A true velum is absent, as already stated, but in Charybdaea (fig. 4) a structure is found termed a velarium (Ve), which is a flap hanging down from the margin of the umbrella, and which consists of a fold of the subumbral ectoderm containing endodermal canals. A true velum, such as is found in Hydromedusae, never contains endoderm.

Fig. 20. — Surface view of the Subumbrella or oral aspect of Aurelia aurita, to show the position of the openings of the subgenital pits, GP. In the centre is the mouth, with four perradial arms

corresponding to its angles (compare fig. 11). The four sub-genital pits are seen to be interradial. x indicates the outline of the roof (aboral limit) of a subgenital pit; y, the outline of its floor or oral limit, in which is the opening.

**, y) opening by a wide aperture {GP). These cavities are known as the infundibular or subgenital cavities. They serve probably for the aeration of the gonads by admitting to their vicinity water with its dissolved oxygen; they never serve as genital ducts, since the generative products are always dehisced into the stomach and pass out by the mouth. In some genera, for instance, Cyanea and its allies the gonad as a whole protrudes through the subgenital cavity as if it had undergone a hernia, and hangs down in the subumbral space as if suspended by a mesentery (fig. 15). Usually the four subgenital cavities are distinct from each other (so-called tetrademnic condition), but in many Rhizostomeae, for example, Crambessa, the subgenital cavities join together under the subumbral floor of the stomach (so-called monodemnic condition) and coalesce to form a so-called subgenital portico placed on the oral side of the stomach, opening by four interradial apertures between the oral arms, that is to say, by the four primitive apertures of the subgenital pits. In Nausithoe_ subgenital pits are absent altogether, and the same condition may be found in Charybdaeidae.*

The gastrovascular system shows every degree of complexity from a very primitive to a highly elaborate type of structure. Taking as a starting-point the wide archenteric cavity which the medusa inherits primitively from the antecedent actinula-stage (see article Medusa), we find, in such a form as Tessera, four interradial areas of concrescence between the exumbral and subumbral layers of endoderm, four so-called septal nodes or " cathammata," subdividing the stomach into four wide, radially situated pouches which communicate with each other beyond the septal nodes by wide apertures constituting what is termed by courtesy a ring-canal. In other cases the areas of concrescence may extend as far as the margin of the umbrella, so I that the lobes of the stomach are completely separated from one

another, as in Charybdaea (fig. 4) , where there are four gastric pouches communicating with the central stomach by four so-called gastric ostia (fig. 4). A similar condition is seen in Pelagia, where the

number of gastric pouches is increased to sixteen. In forms such as Lucernana and Charyb- daea, in which the umbrella is of deep form

and the stomach- cavity consequently of great extent in the vertical direction, the concrescence-areas or septal nodes are drawn out into vertical partitions or taeniolae (fig. 4, L.o.c), resembling in their anatomical relations the mesenteries of the Anthopolyp. The phacellae are carried on the edges of the taeniolae (fig. 4, Gh). Finally in the majority of Scyphomedusae the primitively simple con- crescence-areas become in- creased in number and in extent, so that radial canals, ring-canals, &c, can be distin- guished in addition to stomach- pouches. Thus in Aurelia (figs. 2a and 2b), to take a familiar example, the digestive tract „ ,„.,,,, , begins with the mouth, of

t IG. 2b. — Hall of the lower surface which the four corners are of Amelia aurita. The transparent prolonged into the four long tissues allow the enteric cavities and oral arms, perradial in position, canals to be seen through them. The mouth leads into the (From Gegenbaur.) spacious stomach containing

Marginal lappets hiding ten- the four conspicuous horse- taculocysts. shoe-shaped gonads {ov) mark-

Oral arms. ing four stomach-pouches,

tentacles. which, however, are inter-

Axial or gastric portion of the radial in position. From the enteric cavity. stomach or its pouches arise

Radiating and anastomosing sixteen radial canals, four canals of the enteric system. perradial, four interradial and ov, Ovaries. The gastral filaments eight adradial (fig. 26). The near to these are not drawn. perradial and interradial canals _ , consist of a main stem giving

oft branches, and both stem and branches reach to the marginal ring-canal, the main stem ending in one of the eight tentaculocysts, which are lodged in the notches between the lobes of the umbrellar margin The adradial canals are unbranched and run to the middle point of one of the marginal lobes. The system of canals shows great variation even in the same species.

The muscular system of the Scyphomedusae is developed on the subumbral surface as a system of circularly disposed fibres which by their contraction make the umbrella more concave and diminish its

a,

b, t, v,

go

Fig. 3. — Scyphomedusae. a, Rhizostoma ptdmo; b, Chrysaora hysoscella.

cavity. The circular muscles usually form two chief portions, a peripheral wreath-muscle {Kranzmuskel) , subdivided into four, eight or sixteen areas, and an oral ring-muscle round the mouth. Endo- dermal muscles are found in the phacellae, and in such forms as Lucernana, longitudinal (vertical) muscular tracts or bands are found in the taeniolae, which, according to some authorities, are

of endodermal origin, but which, according to recent observations, are formed in the walls of the infundibular cavities, and are therefore of ectodermal origin.

The nervous system consists as in Hydromedusae of a diffuse plexus beneath the ectoderm, concentrated in certain places to form a central nervous system. In these medusae, however, the central nervous system does not form continuous rings, but occurs as four or eight separate con- centrations at the margin of the um- brella, centred each round one of the sense-organs (tenta- culocysts). Each nerve-centre controls its own antimere or segment of the body, receiving sensory im- pressions from the tentaculocyst and in- nervating its special subdivision of the muscular system. The separate nerve- centres are, as a rule, placed in communi- cation only by the general nerve-plexus, but in Charybdaea there is a zigzag marginal nerve con- necting them up.

The sense-organs of the Scyphomedusae are on the whole of a very uniform type. They are always tentaculocysts, as already stated, and they always have a hollow axis, unlike the tentaculocysts of Hydromedusae, in which group these organs, when they do occur (as in Trachy- linae) are always solid. Two types of tentaculocyst must be distinguished, the one occurring only ˆ in the order Stauro- g' medusae, the other ' in all orders of the q group. The second ' and commoner type p is known as a rho- ' palium (fig. 6) and consists of a short, $jj hollow rod, the wall Ma \ ManubriuL. of which is composed £ ˆ x , Axial enteron. pi the two body- Gh and F Gastral fii aments {phacellae). layers, ectoderm and CG Corner ve

endoderm, enclosing CR Corner rid a cavity continuous SR side ridge

ˆ h Jh a L° { t _ he J gas ” L.o.c, Endoderm lamella (line of concrescence of the walls of the enteric cavity of the umbrella, whereby its single chamber is broken up into four pouches).

Line of attachment of a genital band and band in section.

Enteric pouch of the umbrella, in the left-hand figure, points to the cavity uniting neighbouring pouches near the margin of the umbrella and giving origin to TCa, the tentacular canal.

Velarium.

Frenum of the velarium.

Tentaculocyst.

Fig.

(After

Charybdaea marsupialis. Claus.) Natural size. View of the margin of the umbrella,

natural size. Horizontal section through the umbrella

and manubrium. Vertical sections, to the left in the plane

of an interradius, to the right in the

plane of a perradius. Subumbrella.

trovascular system. At the apex of the rhopalium the en- doderm is greatly Q e thickened and con- ‘ sists of concrement- t?tj cells secreting ‘ otoliths {Con). The more proximal por- tion of the rhopalium usually bears one or y e more ocelli {oc). The p r ‘ rhopalia are lodged -p’ the notches ‘ ‘

in the notches be- tween the marginal lobes of the umbrella, and each rhopalium is covered over by a little protecting flap or lappet. On the external {i.e. exumbral) face of the lappet there is frequently a patch of sensory ciliated epithelium regarded as olfactory in function and termed the olfactory pit (fig. 6, A). Each rhopalium is a centre round which, as already stated, nervous tissue is concentrated.

The otoliths vary considerably in number and size. In Aurelia there are found numerous otoliths arranged irregularly. In Charyb- daea (fig. 7, otol) the otoliths are larger but fewer in number and have a definite arrangement. In Nausithoe a single large otolith is found.

The ocelli vary greatly both as regards number and complexity of structure. In some genera they are absent, as, for instance, in Pelagia, Cyanea and Rhizostoma. In Aurelia there are two on each rhopalium, a simple ocellus on the exumbral side, and a cupped ocellus on the subumbral side (not present in young individuals). In Charybdaea there are no less than six ocelli on each of the four rhopalia (fig. 7) ;

on the exumbral aspect there are two median ocelli (0c 1 , oc 2), a distal and a proximal, each of them a vesiculate ocellus with a lens, and on the sides of the rhopalium are two pairs of ocelli without lenses (oc. I) ; some- times also an addi- tional seventh ocellus occurs, a pit-like struc- ture without a lens, either between the two median ocelli, or placed asymmetrically near the median proximal ocellus.

The ocelli consist, as in Hydromedusae, of two kmds of elements: (1) visual cells, sensory ectodermal cells, which may develop terminal visual cones; (2) pigment-cells, usually ectodermal, but in one known instance endodermal. The simplest type of ocellus is exemplified by the exumbral ocellus of Aurelia, a simple patch of pigment-cells inter- spersed with visual cells, the whole on a level with the remaining ectodermal epithelium. In the next stage of complication, seen in the supernumerary (seventh) ocellus of Charybdaea, the patch of pig- mented and sensory epithelium is pushed in to form a little pit, in the

Fig. 5. — Scattered Nerve Ganglion Cells. c, From the subumbrella of Aurelia aurita. (After Schafer.)

Fig. 6. — Tentaculocyst and Marginal Lappets of Aurelia aurita. (After Eimer/

In the left-hand figure —

ML, Marginal lappets.

T, Tentaculocyst.

A , Superior or aboral olfactory pit._

MT, Marginal tentacles of the disc. The view is from the aboral surface, magnified about 50 diameters.

In the right-hand figure — A , Superior or aboral olfactory pit. Inferior or adoral olfactory pit.

B

••)

H, Bridge between the two marginal lappets forming the hood.

T, Tentaculocyst.

End, Endoderm.

Ent, Canal of the enteric system continued into the tentacu- locyst. [(auditory).

Con, Endodermal concretion

oc, Ectodermal pigment (ocel- lus). The drawing repre- sents a section, taken in a radial vertical plane so as to pass through the long axis of the tentaculocyst.

interior of which the pigment-cells secrete a gelatinous substance forming a rudimentary vitreous body. As a further advance, the pit becomes widened out into a cup, as in the lateral ocelli of Charybdaea. The culminating stage of evolution is seen in the median ocelli of Charybdaea (fig. 8); the primitively open cup has now closed over to form a vesicle lying beneath the ectoderm ; the outer wall of the vesicle becomes thickened to form a cellular lens (I), while the proximal wall consists of sensory and pigmented cells and fofms a retina. In this way the ocellus becomes a true eye, very similar in plan to the eyes of Gastropods and other molluscs. The ectoderm continued over the optic vesicle forms a transparent cornea (fig. 8, c) (better perhaps termed a conjunctiva), below which the spherical lens projects into the optic vesicle, imbedded in the vitreous humour (v.b) which fills it; the retina ® consists of visual cells with long cones (fig. 9) alternating with pigment -cells. The high development of the eyes of Charybdaea is very remarkable, and so is their close resemblance to the eyes found in other groups of the animal kingdom, with which they can have no genetic relation. Highly developed

the ectodermal visual project (Schewiakoff

eyes, with ectodermal pigment and lens, are found also on the rhopalia of Paraphyllina (Maas [8]).

The subumbral ocellus of Aurelia is found to be of the inverted type, with the visual cones turned away from the light, as in Tiaropsis amongst Hydromedusae, and here also the pigment is furnished by the endoderm, forming a cup into which cells

[I3D-

In the Stauromedusae tentaculocysts are either absent altogether, as in Lucernaria, or represented by peculiar structures termed " colletocystophores " or

" marginal anchors " (fig. 1, 6C\ IV.). Each such body has a basal hollow portion (en) sur- mounted by a glandular cushion (kl), from the centre of which projects a small, solid, club-shaped process or tentacle {t'). The basal por- OC 1 ' tion bears an ocellus (oc) of simple structure. The distal club corresponds to the*

u ,. u _ r, ~i-.j-.l_: After Wladimir Schewiakoff, simplified from

rhopalium, but bears a battery a co i OU red plate in Morphologisches Jahrbuch,

of nematocysts in place of the xv., 1889, by permission of Wilhelm Engel-

otoliths. These organs are mann.

said to be used for purposes Fig. 7. — Tentaculocyst of Charyb-

of adherence rather than to daea marsupialis, seen from the

have the function of sense- right side.

organs. st. Stalk.

The histological structure oc 1 , oc, Distal and proximal median of the Scyphomedusae is in ocelli,*

the main similar to that of oc.l, Lateral ocelli, the Hydromedusae (q.v.), but otol, Otoliths (" crystal-sac "). the mesogloea is more abun- dantly developed in the free-swimming forms, and contains special mesogloeal corpuscles, derived by immigration from the ectoderm, and generally occurring in the form of stellate or bipolar cells.

Development of the Scyphomedusae. — No adult Scyphomedusae are known to reproduce themselves by budding or by any method other

than the sexual one. The course of the development in this group is best made clear by taking as a type Aurelia, which, together with certain other common genera, such as Chrysaora and Cotylorhiza, has been studied in detail. Unfortunately the statements concerning some points are very contradictory.

Combined from three figures by Wladimir Schewiakoff in Morphologisches Jahrbuck, xv., 1889, by permission of Wilhelm Engelmann.

Fig. 8. — Vertical section of the Median Distal Ocellus (oc 1 of the preceding figure) of Charybdaea. c. Cornea; I, lens; v.b., vitreous body; r, retina.

The ova pass out of the mouth and are fertilized externally. In some cases the ova, after leaving the mouth, are lodged in the oral arms, and undergo the earliest phases of their development in this situation, accumulating in the grooves that continue the angles of the mouth, and bulging the wall of the groove into sacs or pockets.

The ovum undergoes total cleavage, giving rise to a bastula which forms a gastrula (fig. 10, A) by invagination (see article Hydrozoa). This is a type of germ-layer formation never found in the Hydro-medusae, though of universal occurrence in all groups of animals above the Coelentera. We may regard it as a form of unipolar immigration in which the immigrating cells pass into the interior in a connected epithelial layer, instead of going in singly and independently. The embryo is set free as a planula larva (fig. 10, B) in the gastrula stage, and the orifice of invagina-' tion or blastopore, which persists, is situated at the hinder pole. After a time the planula fixes itself by the anterior pole, with the blasto- pore uppermost. The larva after fixation changes into a polyp-like organism termed a scyphistoma or scyphopolyp (fig. 10, C, D). The body becomes in shape like a vase or urn attached by a narrow stalk, round which a chitinous membrane is secreted. From the edges of the vase the four primary tentacles grow out, each a slender filament with a solid endodermal axis. The tentacles border a broad, flattened peristome, from the centre of which arises the hypostome with the mouth at its ex- tremity ; the hypostome is at first low, but soon becomes a projecting, chimney-like tube. It has been sought to prove that the interior of the hypostome is lined by ectoderm, so as to form a

stomodaeum or ectodermal oesophagus similar to that of the Anthozoa, but this has been dis-

,ˆ.f.

After W. Schewiakoff, simplified from a coloured plate in Morphalogisches Jahrbuch. xv., 1 889, by permission of Wilhelm Engelmann.

Fig. 9. — Sensory , , , ...

cells from the retina proved by the most recent investigations of of Charybdaea Hein (4) and Friedemann (3), who have shown highly magnified! tnat tne m ˚uth at the extremity of the hypo- c, Visual cone- n stome represents the persistent blastopore of nucleus; n.f, nerve the gastrula stage.

nbril. The internal gastric cavity of the scyphistoma

*is not a simple space as in the hydropolyp, but is subdivided by four ridges or taeniolae, arising one in each interradius (fig. 11, B). Each taeniola is similar in its ana- tomical relations to the similarly named structures in Haliclystus (fig. 1), and becomes perforated in the same way at its outer side by a " septal ostium," forming as it were the rudiment of a ring-canal. Each taeniola bears a strongly developed longitudinal muscle-band, stated by Claus and Chun to be developed from the endoderm, like the retractor muscles of the anthopolyp, but by other investigators it is affirmed that each retractor muscle of the scyphi- stoma arises from the lining of a funnel-shaped ectodermal ingrowth (" Septaltrichter ") growing down from the peristome inside each taeniola, in a manner similar to the infundibular cavities of Lucernaria, which in their turn are homologous with the sub- *» genital cavities of*

""•" other Scypho

medusae. It is asserted, however, by Friedemann (3), a recent investi- gator of the subject, that the infundi- bular cavities ap- i pear late in the scyphistoma and have no relation either to the septal muscles or to the subgenital cavities of the adult. The muscle-bands are very contractile, rendering the scyphistoma one of the most difficult of all organisms to preserve in an ex- panded condition. By their contrac- tion the muscles of the taeniolae drag the hypostome down and so produce the appearances which have been interpreted as a stomodaeal invagination.

As the scyphistoma grows the tentacles increase in number, four interradial and eight adradial being formed in addition to the four primary perradial tentacles (fig. 11, A, B, C). The animal may produce its like by lateral budding, or by budding from a basal stolon. The scyphistoma of Nausitho'e forms a branching network which grows in the sponge Esperella and forms the colonial polypoid organism named by Schulze Spongicolafistularis, by Allman Stephano- scyphus mirabilis. Sooner or later, however, the scyphistoma produces free medusae by a process of transverse fission termed strobilization. In the simplest case one medusa, or at least one at a

Fig. 10. — Four stages in the development of Chrysaora. From Balfour, after Claus.

A, Diblastula stage.

B, Stage after closure of blastopore.

C, Fixed larva.

D, Later stage with mouth, short tentacles, &c. ep, Ectoderm.

hy, Endoderm. pe, Stomodaeum. m, Mouth. bl, Blastopore.

time, is produced in this way (monodisk strobilization) ; a circular furrow cuts off the upper, tentacle-bearing portion from the lower half of the scyphistoma (fig. 11, D, and fig. 12), and the upper part becomes detached and swims away, while the base regenerates a new crown. In most cases, however, many such furrows are formed (polydisk strobilization), so that the animal comes to resemble a pile of saucers one above the other (fig. 12). The uppermost saucers of the pile become detached successively and swim off. In this state the scyphistoma is termed a strobila.

The medusae produced by strobilization of the scyphistoma are of a peculiar type termed Ephyrae (fig. 11, E, F). As preparations

Fig. 11. — Later development of Chrysaora and Aurelia. (After Claus.)

A,

B,

C,

D,

Scyphistoma of Chrysaora, with four perradial tent- acles and horny basal perisarc.

Oral surface of later stage of scyphistoma of Aurelia, F, with commencement of four interradial tentacles. The quadrangular mouth is seen in the centre; the outline of the stomach wall, seen by transparency A , around it, is nipped in four Ad, places interradially to form F, the four gastric ridges. In,

Oral surface of a sixteen- JG, tentacled scyphistoma of JR- Aurelia. The four gastric interradial ridges are seen K, through the mouth. M,

First constriction of the Mst. Aurelia scyphistoma to Mw, form the pile of ephyrae or Ms, young medusae. The single 0, ephyra carries the sixteen P, scyphistoma tentacles, R 2 , which will atrophy and dis- R 3 , appear. The four longi- SG, tudinal gastric ridges are seen by transparency.

Young ephyra just liber- ated, showing the eight bifurcate arms of the disk and the interradial single gastral filaments. Ephyra developing into a medusa by the growth of the adradial regions. The gastral filaments have in- creased to three in each of the four sets.

Margin of the mouth.

Adradial radius.

Gastral filament.

Interradial radius.

Adradial gastral canal. = i? 3 , Adradial lobe of disk.

Lappet of a perradial arm.

Stomach wall.

Muscle of the gastral ridge.

Gastral ridge..

Mesogloea.

Tentaculocyst.

Perradial radius. Interradial radius.

Adradial radius. Commencement of lateral vessel.

the

for their formation the margin of the peristome of the scyphistoma grows out into eight lobes, four perradial, four interradial. The sixteen tentacles of the scyphistoma disappear, and in the place of the four perradial and four interradial tentacles, the eight tentaculocysts of the adult are formed as outgrowths of the subumbral margin, independently of the tentacles of the scyphistoma (Frieder mann). The septal ostia become widened and the gastral cavity flattened, whereby the taeniolae become comparatively shallow columns, similar to the septal nodes or cathammata of other forms. 1 The ephyra has a flat, disk-shaped body, with eight marginal lobes (four perradial, four interradial) ; a tentaculocyst is lodged in a deep notch at the apex of each lobe. Four groups of phacellae indicate the four interradii. The stomach has sixteen marginal pouches and the general anatomical structure recalls that of Pelagia. As the

1 The four primitive interradial cathammata disappear in the fully formed ephyra and become replaced by sixteen subradial concrescence-areas without any ostia or ring-canal at the margin.

ephyra grows in size it gradually takes on the form and structure of the young medusa. The adradial regions grow (fig. II, F) so as to change the star-like contour into one more evenly circular, the tentacles grow out, and the various parts become complicated and take on the structure of the adult medusa.

The course of development sketched out above is that which is typical of the higher forms of Scyphomedusae, and is by no means to be regarded as the most primitive type of development. The complicated alternation of generations seen in such a form as Aurelia does not occur in the more primitive genera. Thus in Pelagia the scyphistoma-stage is free-swimming and changes directly into the ephyra, which in its turn grows into the adult form. On the other hand, such a form as Lucernaria or Hali- clystus may be regarded simply as a scyphistoma which has become adult and mature. The comparison of the metagenetic type of development, such as that of Aurelia, with the more

primitive genera of Scypho- medusae, indicates clearly that the scyphistoma and ephyra are re- capitulative larval stages which are represented by the adult forms of primitive genera, making such allowances as are necessary when comparing adult and larval forms. The metagenesis has arisen through the scyphistoma-larva acquiring the power of larval proliferation by budding. A similar origin for metagenesis has been discussed under the Hydromedusae (q.v.).

The above comparison further indicates that the scyphistoma should not be regarded as a polyp but rather as a medusoid organism. The only certain criterion of a medusa-individual is the presence of definite sense-organs, but in cases where the organism is much reduced, this criterion may fail us, as it does in the genus Lucernaria. Nevertheless a comparison between Lucernaria and its close ally Hali- clyslus shows clearly that the absence of sense-organs in the former is the result of secondary reduction, so that a true medusa may lose its most characteristic feature. Hence the absence of sense-organs in the scyphistoma does not necessarily disprove its medusoid character, while its anatomical structure resembles that of a simple scyphomedusa, such as Lucernaria, rather than that of a polyp.

Affinities of the Scyphomedusae.— By some authorities the Scyphomedusae have been removed from the Hydrozoa and united with the Anthozoa in a common group termed Scyphozoa. The diagnostic features of the class Scyphozoa thus constituted are supposed to be (i) an ectodermal oesophagus or stomodaeum, (2) a gastric cavity subdivided by mesenteries, (3) gonads formed in the endoderm. It appears, however, that the first of these characters is non-existent, and that the so-called mesenteries are simply the concrescence-areas found in all medusae. There remains only the third feature, the endodermal gonads, as an argument for uniting the Scyphomedusae with the Anthozoa, against which must be set all the peculiarities of medusan organiza- tion in which the Scyphomedusae resemble the Hydromedusae. The fact that the Scyphomedusae have a number of well-marked peculiarities of form and structure is not incompatible with placing them in the Hydrozoa as a distinct sub-class, contrasting sharply in many ways with the Hydromedusae.

Classification or the Scyphomedusae Order I. Cubomedusae or Charybdaeida. — Medusae more or less cubical in form, with four perradial rhopalia alternating with

Fig. 12. — Development of Aurelia. Above to left, young scyphistoma with four per- radial tentacles. Below to left, scyphistoma with

sixteen tentacles and first constric- tion. To the right, strobila condition of the scyphistoma, consisting of thirteen meta- meric segments; the upper- most still possesses the sixteen tentacles of the scyphistoma; the remainder have no ten- tacles, but are ephyrae, each with eight bifid arms (pro- cesses of the disc). Each segment when detached be- comes an ephyra, such as that drawn in fig. II, E, F. (From Gegenbaur.)

four interradial tentacles or groups of tentacles; oral arms short; stomach a wide cavity bearing four interradial groups of phacellae and giving off four broad perradial pouches com- pletely separated from each other by four interradial septa (i.e. ring-canal absent); gonads divided each into two by the septa, hence eight in number; subgenital pits small or absent.

This order stands very much apart from the other orders of the Scyphomedusae. It has been proposed by Maas to divide the entire subclass Acraspeda into A, Charybdaeida and B, Acraspeda typica. The Charybdaeida comprise three families: —

1. Charybdaeidae. — With four interradial tentacles. Charybdaea marsupialis (fig. 4) is a familiar Mediterranean medusa ; the wonder- ful development of the sense-organs in this genus has already been described (figs. 7-9). The species of Charybdaea are stated to be quick and active in their movements and to be voracious feeders.

2. Chirodropidae. — With four interradial groups of tentacles. Chirodropus.

3. Tripedaliidae. — With four interradial groups of tentacles, three in each group. Tripedalia.

Order II. Stauromedusae or Lucernarida. — Medusae of deep pyramidal form, often sessile, attached by a stalk developed from the centre of the exumbral surface; rhopalia absent or repre- sented by colletocystophores. Four families: —

1. Lucernarid&e. — Sessile, stalked, with capitate tentacles arranged in groups on eight projecting marginal lobes. Eight gonads. Lucernaria, without, and Haliclystus (fig. 1) with colletocystophores, are two well-known genera.

2. Tesseridae. — Free, with eight or more tentacles, without tentaculocysts. Tessera, &c.

3. Depastridae. — Sessile, stalked, with eight shallow marginal lobes bearing one or more rows of tentacles ; without tentaculocysts ; with four gonads. Depastrum is a British genus.

4. Stenoscyphidae. — Sessile, with the margin undivided; with eight colletocystophores and eight adradial groups of capitate tentacles. Stenoscyphus inabai, from Japan.

Order III. Coronata. — Free medusae with rhopalia of the normal type; the exumbrella is divided by a circular, so-called coronal groove, into two parts, a central portion, which is conical, thimble-shaped, or domed in form, and a peripheral portion, the pedal zone, which bears the marginal lobes, tentacles and rhopalia; the pedal zone is subdivided into areas termed pedalia, from each of which arises a tentacle or rhopalium in the inter- space between two adjacent lobes of the margin. The order contains the following families: —

1. Periphyllidae. — With sixteen marginal lobes, four rhopalia and twelve tentacles; the rhopalia are interradial. Periphylla (fig. 13), a widely distributed deep-sea genus.

2. Paraphyllinidae. — With six- teen marginal lobes, four rhopalia and twelve tentacles; the rhopalia are perradial in position, corre-sponding to the angles of the stomach. Paraphyllina recent; Paraphyllites fossil [see Maas (8 and 12)].

3. Atorellidae. — With twelve marginal lobes, six rhopalia and six tentacles. Atorella.

4. Pericolpidae. — With eight marginal lobes, four rhopalia and four tentacles. Pericolpa.

5. Collaspidae (Atollidae). — With sixteen or thirty-two rhopalia, mar- . . – o-i'nnl InhpQ and tpntar-lps nftpn m Results of the "Albatross' Expedt- ginal loDes ana tentacles otten a Museum o[Comparative Zoology, very numerous. Atolla (fig. 14) is Cambridge, Mass., U.S.A.

a well-known deep-sea genus. „ _ … , „ . .

6. Ephyropsidae.-Whh sixteen , FlG – I 3\T P ?? / 'fe Ba T ? marginal lobes, eight rhopalia and {fTvf '■ ' eight tentacles. Nausithoe, a small halt llte – slze –

medusa of world-wide distribu-

tion, is the type of the subfamily Nausithoidae ; the subfamily Linergidae includes the genera Linerges, &c, medusae confined to tropical seas. By Maas and others the Nausithoidae and Linergidae are ranked as independent families.

Order IV. Discophora. — Medusae with umbrella flattened or disk-like, without coronal groove; lips always prolonged into long oral arms. The most prolific and dominant group of the Scyphomedusae, containing two suborders; the Semaeostomae, in which the oral arms remain separate, and the Rbizostomeae, in

Much simplified from a coloured plate"

which the oral arms become fused together to form a proboscis. Nine families, three of Semaeostomeae, six of Rhizostomeae: —

I. Pelagiidae. — Semaeostomeae with wide gastric pouches not united by a ring-canal. Pelagia, an oceanic genus with direct

development. Chr ysaora (fig. 36), a common British medusa, with a scyphistoma stage and alternation of generations. Dactylometra, a common American medusa of the Atlantic shores, differs from Chrysaora in small points.

2. Cyaneidae. — Semaeo- stomeae with sixteen gastric pouches sending off

Modified from a coloured plate in Prince of Monaco's series.

Fig.

14. — Atollabairdi. After O. Maas.

canals to the margin not united by a ring-canal ; tentacles in bunches on the margin. Cyanea (fig. 15), represented in the British fauna by two species.

3. Ulmaridae. — Semaeostomeae with gastric pouches relatively small, sending off branching canals to the margin, where they are united by a ring-canal. Ulmaris, from the South Atlantic, has only

Rhizostoma (Pilema) is a

After E. Haeckel. from System der Medusen, by permission of Gustav Fischer. Fig. 15. — Cyanea (Desmonema) anasethe, about two-thirds life-size.

eight adradial tentacles. Aurelia (fig. 2), with numerous marginal tentacles, is one of the commonest and most familiar of jelly- fishes.

4. Cassiopeidae. — Rhizostomeae with subumbral musculature arranged in feather-like arcades (Arcadomyaria, Maas); oral arms pinnate. Cassiopeia.

5. Cepheidae. — Rhizostomeae with subumbral musculature in radial tracts (Radiomyaria, Maas) ; oral arms bifid. Cephea, Cotylorhiza.

6. Rhizostomatidae (Pilemidae). — Rhizostomeae with subumbral musculature in circular bands (Cyclomyaria) ; oral arms bifid or

very complicated; sixteen radial canals, very common genus (fig. 3a).

7, 8, 9. The families Lychnorhizidae, Leptobrachidae and Cato-stylidae resemble the preceding in the arrangement of the muscula-ture. In Lychnorhizidae only eight of the sixteen radial canals reach the ring-canal ; the genus Crambessa is the best-known representative of the family. In the other two families there are eight radial canals, and between them a network of canals with many openings into the ring-canal.

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SCYROS, a small rocky barren island in the Aegean Sea, off the coast of Thessaly, containing a town of the same name. In 469 B.C. it was conquered by the Athenians under Cimon, and it was probably about this time that the legends arose which connect it with the Attic hero Theseus, who was said to have been treacherously slain and buried there. A mythic claim was thus formed to justify the Athenian attack, and Cimon brought back the bones of Theseus to Athens in triumph. The inhabitants of Scyros before the Athenian conquest were Dolopes (Thuc. 1. 98); but other accounts speak of Pelasgians or Carians as the earliest inhabitants. There was a sanctuary of Achilles on the island, and numerous traditions connect Scyros with that hero. He was concealed, disguised as a woman, in the palace of Lycomedes, king of the island, when his mother wished to keep him back from the Trojan War; he was discovered there by Odysseus, and gladly accompanied him to Troy. An entirely different cycle of legends relate the conquest of Scyros by Achilles. The actual worship on the island of a hero or god named Achilles, and the probable kinship of its inhabitants with a Thessalian people, whose hero Achilles also was, form the historical foundation of the legends. Scyros was left, along with Lemnos and Imbros, to the Athenians by the peace of Antalcides (387 B.C.). It was taken by Philip, and continued under Macedonian rule till 196, when the Romans restored it to Athens, in whose possession it remained throughout the Roman period. It was sacked by an army of Goths, Heruli and Peucini, in a.d. 269. The ancient city was situated on a lofty rocky peak, on the north-eastern coast, where the modern town of St George now stands. A temple of Athena, the chief goddess of Scyros, was on the shore near the town. The island has a small stream, called in ancient times Cephissus.

SCYTHAE (Gr. "SkWcli), in Herodotus (iv. 1-142) and Hippo- crates

(De aere, 24 sqq.), a definite nation giving its name to Scythia (q.v.) ; in later writers a general term for the inhabitants of that country without distinction of race.

SCYTHE, an implement for mowing grass or reaping corn or grain, consisting of a curved steel blade fastened to a long wooden handle with a slight double curve from which project two small pieces by which the handle is held. The handle is

technically known as the " snathe," " sned " or " snead " (sncedan to cut, cf. Ger. schneiden). The word in O.E. is sifte or si]>e M.E. sithe; the mis-spelling " scythe " is paralleled by " scent," and is possibly due to. the Fr. scier, saw; the word means " an instrument for cutting," and is derived from the root sak-, seen in Lat. secare, to cut, " saw " and " sickle," the oldest of reaping implements, with deep curved blade and short handle. The same root is seen in the " sedge," i.e. cutting or sword-grass, strictly applied to plants of the genus Carex, but loosely used of flags, rushes and other grasses growing in marshy places (see Reaping).

SCYTHIA (Gr. 2/oi0ia), originally (e.g in Herodotus iv. 1-142), the country of the Scythae or the country over which the nomad Scythae were lords, that is, the steppe from the Carpathians to the Don. With the disappearance of the Scythae as an ethnic and political entity, the name of Scythia gives place in its original seat to that of Sarmatia, and is artificially applied by geographers, on the one hand, to the Dobrudzha, the lesser Scythia of Strabo, where it remained in official use until Byzantine times; on the other, to the unknown regions of northern Asia, the Eastern Scythia of Strabo, the " Scythia intra et extra Imaum " of Ptolemy; but throughout classical literature Scythia generally meant all regions to the north and north-east of the Black Sea, and a Scythian (Scythes) any barbarian coming from those parts. Herodotus (I.e.), to whom with Hippocrates (De aere, &c. 24, sqq.) we owe our earliest knowledge (Homer, //. xiii. 5, speaks of "mare-milkers," and Hesiod, ap. Strabo vii. 3 (7) mentions Scythae) of the land and its inhabitants, tries to restrict this merely geographical usage and to confine the word Scyth to a certain race or at any rate to that race and its subjects, but even he seems to slip back into the wider use. Hence there is much doubt as to his exact meaning.

His account of the geography falls into two irreconcilable parts; one (iv. 99 sqq.), in connexion with the tale of the invasion of Darius, makes of Scythia a kind of chessboard 4000 stades square on which the combatants can make their moves quite unhindered by the great rivers: the other (16-20), founded on what he learned from Greeks of Olbia and supplemented by the tales of the 7th century traveller Aristeas of. Proconnesus, is not very far removed from first-hand information and can be made more or less to tally with the lie of the land. In accordance with this we can give the relative positions of the various tribes, and an excursus on the rivers (47-57) lets us define their actual seats. In western Scythia, starting from Olbia and going north- wards, we have Callippidae on the lower Hypanis (Bug), Alazones where the Tyras (Dniester) and Hypanis come near each other in their middle courses, and Aroteres (" Ploughmen ") above them. These tribes raised wheat, presumably in the river valleys, and sold it for export; in the eastern half from west to east were Georgi (perhaps the same as Aroteres) between the Ingul and the Borysthenes (Dnieper), nomad Scyths and Royal Scyths between the Borysthenes and the Tanais (Don). Above ail these stretched a row of non-Scythian tribes from west to east: on the Maris (Maros) in Transylvania the Agathyrsi; Neuri in Podolia and Kiev, Androphagi and Melanchlaeni in Poltava, (Ryazan) and Tambov. On the lower Don and Volga we have the Sauromatae, and on the middle course of the Volga the Budini with the great wooden town of Gelonus and its semi-Greek inhabitants. From this region started an important trade route eastward by the Thyssagetae among the southern Urals, the Iyrcae on the Tobol and Irtysh to the Kirgiz steppe, where dwelt other Scyths, regarded as colonists of those in Europe: then by the Argippaei in the Altai and the Issedones in the Tarym basin, to the one-eyed Arimaspi on the borders of China, who stole their gold from the watchful griffins, and who marched with goat-footed men and Hyperboreans reaching to the sea. To the south of Scythia the Crimean mountains were inhabited by a non-Sythic race, the Tauri. (See also articles on these tribes.)

Ethnology. — Herodotus expressly divides the Scythians into the Agriculturists, Callipidae, Alazones, Aroteres and Georgi in the western part of tie country, and the Nomads with the

Royal Scyths to the east.- The latter claimed dominion over all the rest. The question arises whether we have to do with the various tribes of one race in different stages of civilization, or with a mixed population called by foreigners after the ruling tribe. Thelatter seems by far the more probable. The affinities of this tribe have been sought in various directions, and the evidence suggests that it was itself of

mixed blood. We know that in the 2nd century A.D., when the steppes were dominated by the Sarmatae (q.v.) , the majority of the barbarian names in the inscriptions of Olbia, Tanais, and Panticapaeum were Iranian, and can infer that the Sarmatae spoke an Iranian language. Pliny speaks of their descent from the Medes. Now the Sarmatae are represented as half-caste Scyths speaking a corrupt variety of Scythian. Presumably, therefore, the Scyths also spoke an Iranian dialect. But of the Scythic words preserved by Herodotus some are Iranian, others, especially the names of deities, have found no satisfactory explanation in any Indo-European language. Indeed they rather suggest a Ugrian origin. Nevertheless, the general opinion has been that the Scyths were Iranian. The present writer believes that they were a horde which came down from upper Asia, conquered an Iranian-speaking people, and in time adopted the speech of its subjects. The settled Scythians would be the remains of this Iranian population, or the different tribes of them may have been connected with their neighbours beyond Scythian dominion — Thracian Getae and Arimaspi, Slavonic Neurit Finnish Androphagi and such like. The Cimmerians who preceded the Scythians used Iranian proper names, and probably represented this Iranian element in greater purity. Herodotus gives three legends of the origin of the Scyths (iv. 5-12); these, though they contradict each other, can be reconciled with the view stated above. Two of them seem to be the same story; one is very strongly Hellenized, the other, in more or less native shape, is shortly this. The tribe is autochthonous, claiming descent from a son of the river Borysthenes Targitaos, who lived a thousand years before. Of his three sons the youngest Colaxais is preferred by an ordeal of picking up certain objects which fell from heaven, — -a, plough, a yoke, an axe and a cup, — and becomes the ancestor of the ruling clan of Paralatae; from the other sons, Lipoxais and Harpoxais, are descended minor clans, and the name of the whole people is Scoloti, not Scythae, which is used by the Greeks alone. In this story the names make sense in Iranian, the tribes are not again mentioned except when this passage is copied, the objects are hardly such as would be held sacred by nomads, the form of ordeal is to be paralleled in Iranian legends, and the people say themselves that they are not really Scythae. Surely this is the national legend of the agricultural Scythians about Olbia, and the name Scoloti, by which careful modern writers designate the Royal Scyths, is the true designation of the subject race. The royal line of these is quite distinct from the true Royal Scyths, who, like most nomad conquerors, allowed their subjects to preserve their own organizations.

The third account fails chiefly in being too plausible, but there seems no reason to reject it as an artificial combination of unconnected facts. According to it the Scyths dwell in Asia, and were forced by the Massagetae over the Araxes (Volga ?) into the land of the Cimmerians. Aristeas says that the first impulse came from the Arimaspi, who displaced the Issedones, who in turn fell upon the Scyths. This comes to much the same thing, as the Massagetae seem to have contained an element which had come in from the land of the Issedones. The Scyths having fallen upon them from the north-east, the Cimmerians appear to have given way in two directions, towards the south- west, where the tombs of their kings were shown on the Tyras (Dniester) and one body joined with the Treres of Thrace in invading Asia Minor by the Hellespont; and towards the south-east where another body threatened the Assyrians, who called them Gimirrai (Hebrew Gomer; Gen. xi.). They were followed by the Scyths (Ashguzai, Heb. Ashkenaz) whom the Assyrians welcomed as allies and used against the Cimmerians, against the Medes and even against Egypt. Hence the references to the Scyths in the Hebrew prophets (Jer. iv. 3, vi. 7).: This

if. all put in the latter half of the 7th century B.C. Herodotus says that the Scyths ruled Media for twenty-eight years, and were then massacred or expelled. The Assyrian evidence is in the main a confirmation of Herodotus, though most writers think that the Scythians who troubled Asia were Sacae from the east of the Caspian (H. Winckler, Altorientalische Forschungen, p. 484 sqq.). If the Scyths came out of upper Asia, the Scythian colonists beyond the Iyrcae might be a division which had remained nearer the homeland, but in dealing with nomads we can suppose such a return as that of the Calmucks (Kalmuks) in the 18th century.

The physical features of the Scyths are not described by Herodotus, but Hippocrates (I.e.) draws a picture of them which makes them very similar to the Mongols as they appeared to the Franciscan missionaries in the 13th century. He says they are quite unlike any other race of men, and very like each other. The main point seems to be a tendency to slackness, fatness and excess of humours. The men are said to be in appear- ance very like eunuchs, and both sexes have a tendency to sexual indifference amounting in the men to impotence. When a man finds himself in this condition he assumes the women's dress and habits. Herodotus mentions the existence of

this class, called Enarees, and says that they suffer from a sacred disease owing to the wrath of the goddess of Ascalon whose shrine they had plundered. Reinegg describes a similar state of things in the Nogai in the 18th century. The whole account suggests a Tatar clan in the last stage of degeneracy. Hippocrates says that this only applies to the ruling class, not to the slaves, but gives as the reason the want of exercise among the former. The skulls dug up in Scythic graves throw no light on the question, some being round and some long. The representations of nomads on objects of Greek art show people with full beards and shaggy hair, such as cannot be reconciled with Hippocrates; but the only reliefs which seem to be accurate belong to a late date when the ruling clan was Sarmatian rather than Scythic.

Customs. — Herodotus gives a good survey of the customs of the Scyths: it seems mostly to apply to the ruling race. Again the closest analogy is the state of the Mongols in the 13th century, but too much weight must not be put on this, as the natural conditions of steppe-ranging nomads dictated the greater part of them. Still the correspondence of religion and of funeral rites is very close. The Scyths lived upon the produce of their herds of cattle and horses, their main food being the flesh of the latter, either cooked in a cauldron or made into a kind of haggis, and the milk of mares from which they made cheese and kumiss (a fermented drink resembling buttermilk). This necessitated their constantly moving in search of fresh pasture, spending the spring and autumn upon the open steppe, the winter and summer by the rivers for the sake of moisture and shelter. The men journeyed on horseback, the women in wagons with felt tilts. These were drawn by their cattle, and were the homes of each family. Hence the Greek names, Abii, Hippemolgi, Hamaxobii. The women were kept in subjection, and were far from enjoying the liberty granted them among the Sarmatae, among whom they rode on horseback and engaged in war. Polygamy was practised, the son inheriting his father's wives. Both men and women avoided washing, but there was something of the nature of a vapour bath, with which Herodotus has confused a custom of using the smoke of hemp as a narcotic. The women daubed themselves with a kind of ccsmetic paste. The dress of the men is well shown upon the Kul Oba and Chertomlyk vases, and upon other Greek works of art made for Scythic use. It must not be confused with the fanciful barbarian costumes that are so common upon the Attic pots. They wore coats confined by belts, trousers tucked into soft boots, and hoods or tall pointed caps. The women had flowing robes, tall pointed caps, and veils descending over most of the figure. Both sexes wore many

stamped gold plates sewn upon their clothes in lines or semis. Their horses had severe bits, and were adorned with nose pieces, cheek pieces and saddle cloths. True stirrups were unknown. In war the nation was divided ˆinto three sub- kingdoms, and these into companies, each with its commander. The companies had yearly feasts, at which the commander honoured warriors who had slain one or more of the enemy. As evidence of such prowess, and as a token of his right to a share of any spoil, the warrior was accustomed to scalp his enemy and adorn his bridle with the trophy. In the case of a special enemy or an adversary overcome in a private dispute before the king, he would make a cup of the skull, mounting it in bull's hide or in gold. The tactics in war were the traditional nomad tactics of harassing the enemy on the march, constantly retreating before him and avoiding a general engagement. Their weapons consisted of bow and arrows, short swords, spears and axes. The government was a despotism, but a

king who aroused the extreme dissatisfaction of his subjects was liable to be murdered.

Religion. — The religion of the Scyths was nature worship. Herodotus (iv. 59) gives a list of their gods, with the Greek deities corresponding, but we cannot tell what aspect of the Greek deity is in question. He says they chiefly reverence Tahiti (Hestia), next Papaeus and his wife Apia (Zeus and Ge), then Oitosyros (Apollo) and Argimpasa (Aphrodite Urania). These are common to all the Scythians, but Thamimasadas (Poseidon) is peculiar to the Royal Scyths. 1 They set up no images or altars or temples save to Ares only. To Ares they make a neap of faggots three stades square, with three sides steep and one inclined, and bring to it a hundred and fifty fresh loads of faggots every year. Upon the top is set up a sword which is the image of Ares; to this they sacrifice captives, pouring their blood over it. The account of the cult of Ares, for whom no Scythian name is given, appears to be an addition, and the mention of such masses of faggots suggests the wooded district of the agricultural Scythians, not the treeless steppe of the Royal tribe. The Scythian pantheon is not distinctive, and can be paralleled among the Tatars and among the Iranians. The Scyths had a method of divination with sticks, and the Enarees, who claimed to be soothsayers by grant of the goddess who had afflicted them, used another method by splitting bast fibres. They inter- vened in case of the king's falling sick, when it was assumed that some man had sworn by the king's hearth and broken his oath. If a man accused of this denies it, other diviners are called, and if these concur, he is beheaded and his sons slain and his goods given to the diviners. But

if a majority of diviners decide against the accusers, the latter are set upon a wagon-load of brushwood and burned to death. The burial rites are the most fully described. Private persons were merely carried about among their friends, who held wakes in their honour, and then buried forty days after death. But the funerals of the kings were much more elaborate. They exhibit the extreme development of the principle of surrounding the dead man with everything in which he found pleasure during his life. The tombs of the kings were in the land of Gerrhus near the great bend of the Dnieper where the chief tumuli have been excavated. The body was embalmed and filled with aromatic herbs, and then brought to this region, passing through the lands of various tribes. The Royal Scyths who followed the body were accustomed to cut about their faces and arms, and each tribe that the cortege met upon its way had to join it and conform to this expression of grief. Arrived at the place of burial, the body was set in a square pit with spears marking out its sides and a roof of matting. Then one of the king's concubines and his cup-bearer, cook, groom, messenger and horses were strangled and laid by him, and round about offerings of all his goods and cups of gold — no silver or bronze. After this they raised a great mound, striving to make it as high as possible. A year later they strangled fifty youths of the dead man's servants (all Scyths born) and fifty of the best horses, stuffed them and mounted them in a circle about the tomb.

Tombs. — The description is generally borne out by the evidence of the tombs opened in the Scythic area. None agrees in every point, but almost every detail finds a close parallel in some tomb or other. The chief divergence is in the presence of silver and copper objects, but the great quantity of gold is the most striking fact, and to say that there was nothing but gold seems merely an exaggeration; Tombs to which the name Scythic is generally applied form a well- defined class. They are preceded over the whole area by a much simpler form of burial marked by the practice of staining the bones with red ochre, and the presence of one or two rude pots and nothing more: yet that some were tombs of great chiefs is shown by the great size of the barrows heaped over them. They have been referred to the Cimmerians, but for this there is no clear evidence. The Scythic tombs can be roughly dated by the objects of Greek, art that they contain. They seem to begin about the 6th century B.C., and to continue till the 2nd century a.d. ; that is, they cover the period of the Scythic domination according to the account accepted above, and that of the Sarmatian, and so suggest that, as far as the archaeological evidence goes, there was little more than a change of name and perhaps the substitution of one ruling clan for another —

not a real change of population. The finest of the class were opened about the bend of the Dnieper, where we should put the land Gerrhus. Others are found to the south-west of the central area, and in the governments of Kiev and Poltava we have many tombs with Scythic characteristics, but a difference (e.g. the fewness of the horses) which makes us think of the settled tribes under Scythic domination. Others occur in the flat northern half of the Crimea, and even close to Kerch, where the famous Kul Oba seems to have held a Scythic chieftain who had adopted a veneer of Greek tastes, but remained a barbarian at heart. East of the Maeotis, especially along the river Kuban, are many groups of barrows showing the same culture as those of Gerrhus but in a purer form. Farther to the north and east the series seems to extend into Siberia, but in this region excavations have been few. Unfortunately very few of these barrows have come down to us unplundered, and we cannot find one complete example and ta ke it as a type. Soon after

1 The names are read in various ways ; it is impossible to establish the correct forms.

they were heaped up, before the beams supporting the central chamber had rotted, thieves made a practice of driving a mine into the mound straight to where the valuables were deposited, and it is only by the collapse of this mine and the crushing of the robber after he had thrown everything into confusion that the treasures of the Chertomlyk barrow, on the whole the most typical, were pre- served to us. This was 6o> f t. high and noo ft. round; about it was a stone plinth, and it was approached by a kind of stone alley. A central shaft descended 35 ft. 6 in. below the surface of the earth, and trom each corner of it at the bottom opened out side chambers. The north-west chamber communicated with a large irregular chamber into which the plunderer's mine opened. In the central pit all was in confusion, but here the king seems to have lain on a bier. His belongings, found piled up near the mine, seem to have included a combined bow-case and quiver and a sword sheath, each covered with plates of gold of Greek work, three swords with gold hafts, a hone with gold mounting, a whip, many other gold plates and a heap of arrow-heads. In the north-west chamber was a woman's skeleton, and she had her jewels, mostly of Greek work. She was attended by a man, and three other men were buried in the other chambers. They were supplied with simpler weapons and adornments, but even so

their clothes had hundreds of stamped gold plates and strips of various shapes sewn on to them. By every skeleton were drinking vessels. Store of wine was contained in six amphorae, and in two bronze cauldrons were mutton-bones. The most wonderful object of all was a great two-handled vase standing 3 ft. high and made to hold kumiss. The greater part of its body is covered by a pattern of acanthus leaves, but on the shoulder is a frieze showing nomads breaking in wild mares, our chief authority for Scythian costume. To the west of the main shaft were three square pits with horses and their harness, and by jthem two pits with men's skeletons. In the heap itself was found an immense quantity of pieces of harness and what may be remains of a funeral car. The Greek work would seem to date the burial as of the 3rd century B.C.

At Alexandropol in the same district was an even more elaborate tomb, but its contents were in even greater confusion. Another tomb in this region, Melgunov's barrow, found as long ago as 1760, contained a dagger-sheath and pommel of Assyrian work and Greek things of the 6th century. In the Kul Oba tomb mentioned above the chamber was of stone and the contents, with one or two excep- tions, of purely Greek workmanship, but the ideas underlying are the same — the king has his wife, his servant and his horse, his amphorae with wine, his cauldron with mutton-bones, his drinking vessels and his weapons, the latter being almost the only objects of barbarian style. One of the cups has a frieze with reliefs of natives supplementing that on the Chertomlyk vase.

East of the Maeotis on the Kuban we have many barrows; the most interesting are the groups called the Seven Brothers, and those of Karagodeuashkh, Kostromskaya, Ul and Kelermes, the latter remarkable for objects of Assyrian style, the others for the enormous slaughter of horses ; on the Ul were four hundred in one grave.

Art. — Certain of the objects which occur in these Scythic graves are of special forms typical for the Scythic area. Most interesting of these is the dagger or sword, always very short, save in the latest graves, and distinguished by a heart-shaped guard marking the juncture of hilt and blade; its sheath is also characteristic, having a triangular projection on one side and usually a separate chape: these peculiar forms were necessitated by a special way of hanging the dagger from two straps that it might not interfere with a rider's movements. Just the same form of short sword was used in Persia and is shown on the sculptures at Persepolis. Another special type is the bow-case, made to take a short curved bow and to accommodate anows'as well. Further, there is the peculiar cauldron on one conical foot, round

which the fire was built, the cylindrical hone pierced for suspension, and the cup with a rounded bottom. Assyrian and afterwards Greek craftsmen working for Scythic employers were compelled to decorate these outlandish forms, which they did accord- ing to their own fashion: but there was also a native style with conventionalized beast decoration, which was almost always em- ployed for the adornment of bits and horses' gear, and very often for weapons. This style and the types of dagger, cauldron, bit and two- looped socketed axehead run right across from Hungary to the upper Yenisei, where a special Bronze Age culture seems to have developed them. But even here it seems impossible to deny some influence .coming from the Aegean area, and Scythic beasts are very like certain products of Mycenaean and early Ionic art. Again, the Scythic style is interesting as being one element in the art of the barbarians who conquered the Roman Empire and the zoomorphic decoration of the early middle ages. –

The dominance from the Yenisei to the Carpathians of a distinct style of art which, whatever its original elements may have been, seems to have taken shape as far east as the Yenisei basin is an additional argument in favour of a certain movement of population from the far north-east towards the south Russian steppes. It would correspond in time with the movement of the Scyths of which Herodotus speaks, and it may be inferred that immigrants coming from those regions were rather allied to the Tatar family of nations than to the Iranian. Similar movements from the same regions Appear also to have penetrated Iran itself; hence the resemblance

between the dress and daggers of certain classes of warriors on the sculptures of Persepolis and those shown on the Kul Oba vase. An Iranian origin would not account for the presence of analogous types on the Yenisei.

History. — To sum up the history of Scythia, the oldest in- habitants of whom we hear in Scythia were the Cimmerii; the nature of the country makes it probable that some of them were nomads, while others no doubt tilled some land in the river valleys and in the Crimea, where they left their name to ferries, earthworks and the Cimmerian Bosporus. They were probably of Iranian race: among the Persians Herodotus describes a similar mixture of nomadic and settled tribes. In the 7th century B.C. these Cimmerians were attacked and partly driven out by a horde of newcomers from upper Asia called Scythae; these imposed their name and their yoke upon all that were left in the Euxine steppes, but probably their coming did not really change the basis of the population, which remained Iranian. The newcomers adopted the language of the conquered, but

brought with them new customs and a new artistic taste probably largely borrowed from the metal-working tribes of Siberia. About the same time similar peoples harassed the northern frontier of Iran, where they were called Saka (Sacae), and in later times Saka and Scyths, whether they were originally the same or not, were regarded as synonymous. It is difficult always to judge whether given information applies to the Sacae or the Scyths.

About 512 B.C. Darius, having conquered Thrace, made an invasion of Scythia, which, according to the account of Herodotus, he crossed as far as the Oarus, a river identified with the Volga, burned the town of Gelonus and returned in sixty days. In this march he was much harassed by the nomads, with whom he could not come to close quarters, but no mention is made of his having any difficulty with the rivers (he gets his water from wells), and no reason for his proceedings is advanced except a desire to avenge legendary attacks of Scyths upon Asia. After losing many men the Great King comes back to the place where he crossed the Danube, finds the Ionians still guarding the bridge in spite of the attempts of the Scyths to make them desert, and safely re-enters his own dominions. Ctesias says that the whole campaign only took fifteen days and that Darius did not get beyond the Tyras (Dniester). This is also the view of the reasonable Strabo; but it does not account for the genesis of the other story. It seems best to believe that Darius made an incursion in order to secure the frontier of the Danube, suffered serious reverses and retired with loss, and that this offered too good a chance to be missed for a moral tale about the discomfiture of the Great King by a few poor savages. The Greeks had been trading with the Scyths ever since their coming, and at Olbia there were other tales of their history. We can make a list of Scythian kings— Spargapeithes, Lycus, Gnurus, Saulius (whose brother, the famous Anacharsis (?.».), travelled over all the world in search of wisdom, was reckoned a sage among the Greeks and was slain among his own people because they did not like his foreign ways), and Idanthyrsus, the head king at the time of Darius, probably the father of Ariapeithes. This latter had three wives, a Greek woman from Istrus, Opoea a Scythian, and a Thracian daughter to the great chief Teres. Scyles, his son by the Greek mother, affected Greek ways, had a house in Olbia, and even took part in Bacchic rites. When this came to the knowledge of his subjects he was murdered, and Octamasadas, his son by the third wife, reigned in his stead. Herodotus adduces this to show how much the Scyths hated foreign customs, but with the things found in the graves it rather proves how strong was the attraction exercised upon the nomads by the higher culture of their neighbours. Octamasadas

died shortly before the time of Herodotus. We cannot place Ariantas, who made a kind of census of the nation by exacting an arrow-head from each warrior and cast a great cauldron out of the bronze, nor Taxacis and Scopasis, the under-kings in the time of Idanthyrsus. After the retreat of Darius the Scythians made a raid as far as Abydos, and even sent envoys to King Cleomenes III. of Sparta to arrange that they should attack the Persian Empire from the Phasis while the Spartans

should march up from Ephesus. The chief result of the embassy was that Cleomenes took to the Scythian habit of drinking his wine neat and went mad therefrom (Herodotus vi. 84). Hence- forward the Scyths appear as a declining power: by the middle of the 4th century their eastern neighbours the Sarmatae have crossed the Tanais (Don) and the pressure of the Scyths is felt on the Danube. Here Philip II. of Macedon defeated and slew their king Ateas in 339 B.C., and from this time on the repre- sentatives of the old Scythic power are petty chieftains in the western part of the country about Olbia, where they could still be dangerous, and about Tomi. Towards the second half of the 2nd century B.C. this kingdom seems to have become the nucleus of a great state under Scilurus, whose name appears on coins of Olbia, and who at the same time threatened Chersonese in the Crimea. Here, however, he was opposed by the might of Mithra- dates VI. of Pontus and his power was broken. Henceforward the name " Scythian " is purely geographical. Meanwhile Scythia had become the land of the Sarmatae (q.v.). These, as has been seen, spoke a cognate dialect, and the tombs which belong to their period show exactly the same culture with Greek and Siberian elements. It is probable that the Iranian element was stronger among the Sarmatae, whose power extended as the ruling clan of the Scyths became extinct; but it is quite likely that they in their turn were officered by some new horde from upper Asia. Like the Scyths they were pressed towards the west by yet newer swarms, and with the coming of the Huns Scythia enters upon a new cycle, though still keeping its old name in the Byzantine historians.

Authorities. — (1) Ancient: Herodotus iv. 1-142 (editions of Blakesley, Rawlinson, Macan); Hippocrates, De Aere, &c, c. 24 sqq.; for geography alone: Strabo vii. cc. 3, 4; xi. cc. 1, 2, 6; Pliny iv. 75 sqq.; Ptolemy, Sarmatia; Diodorus Sic. ii. 2, 43-47; and Justin i. cc. 1, 8; ii. 1, 4, do not seem to add anything of which we can be

certain. (2) Modern: E. H. Minns, Scythians and Greeks (Cambridge, 1909), gives a summary of various opinions and a survey of the subject from all points of view. See also for ethnological questions, Mongolian hypothesis: K. Neumann, Die Hellenen im Skythenlande (Berlin, 1855). Iranian hypothesis: K. Mtillenhoff, " Uber Herkunft und Sprache der Pontischen Skythen und Sar- maten," in Monatsber. d. Berl. Ah. (1866), reprinted in Deutsche Altertumskunde, vol. iii. For the archaeology: Kondakoff, Tolstoi and Reinach, Antiquites de la Russie Meridionale (Paris, 1892); more fully in Antiquites de la Russie d'HSrodote and Compte rendu de la commission archeologique de St-Petersbourg, passim. (E. H. M.)

SEA (in O. Eng. sae, a common Teutonic word; cf. Ger. See, Dutch Zee, &c; the ultimate source is uncertain), in its widest sense that part of the surface of the globe which consists of sak water, in distinction from dry land. The greater divisions of " the sea," in this sense, are called oceans, and are dealt with under the heading Ocean and Oceanography, the latter being the term now generally applied to the scientific study of the sea. The word " sea," however, is also used, in a restricted sense, in application to specific parts of the great oceans, more or less clearly defined by a partial land-boundary. Such are the Mediterranean Sea and the Caribbean Sea, connected with the Atlantic Ocean; the Arabian Sea, a division of the Indian Ocean, and the China and Japan Seas of the western Pacific Ocean. Subdivisions of great seas are similarly defined (e.g. the Adriatic Sea), and a few large bodies of salt water entirely land-locked are also called seas — e.g. the Caspian Sea, the Sea of Aral, the Dead Sea. Sea-level is the assumed mean level of the sea, serving as a datum from which to calculate the elevation of land in surveying (q.v.).

SEA, COMMAND OF THE, a technical term of naval warfare, which indicates a definite strategical condition. (For its difference

from " sea-power," see the separate article on that trom subject.) The term has been substituted sometimes

sover for the much older " Dominion of the sea " or " Sove- eigatyor reignty of the sea," a legal term expressing a claim, j>m a n, jf no t a right. It has also been sometimes treated as*

though it were identical with the rhetorical expression, " Empire of the sea." Captain A. T. Mahan, instead of it, uses the term " Control of the sea," which has the merit of precision, and is not likely to be misunderstood or mixed up with a form of words meaning something

different. The expression " Com-

mand of the sea," however, in its proper and strategic sense, is so firmly fixed in the language that it would be a hopeless task to try to expel it; and as, no doubt, writers will continue to use it, it must be explained and illustrated. Not only does it differ in meaning from " Dominion or Sovereignty of the Sea," it is not even truly derived therefrom, as can be briefly shown. " It has become an uncontested principle of modern international law that the sea,' as a general rule, cannot be subjected to appropriation " (W. E. Hall, Treatise on International Law, 4th ed., 1895, p. 146). This, however, is quite modern. Great Britain did not admit the principle till 1805; the Russians did not admit it till 1824; and the Americans, and then only tacitly, not till 1894. Most European nations at some time or other have claimed and have exercised rights over some part of the sea, though far outside the now well-recognized " three miles' limit." Venice claimed the Adriatic, and exacted a heavy toll from vessels navigating its northern waters. Genoa and France each claimed portions of the western Mediterranean. Denmark and Sweden claimed to share the Baltic between them. Spain claimed dominion over the Pacific and the Gulf of Mexico, and Portugal over the Indian Ocean and all the Atlantic south of Morocco (Hall, pp. 148-9). The claim which has made the greatest noise in the world is that once maintained by the kings of England to the seas surrounding the British Isles. Like other institutions, the English sovereignty of the sea was, and was admitted to be, beneficent for a long period. Then came the time when it ought to have been abandoned as obsolete; but it was not, and so it led to war. The general conviction of the maritime nations was that the Lord of the Sea would provide for the police of the waters over which he exercised dominion. In rude ages when men, like the ancients, readily " turned them- selves to piracy," this was of immense importance to trade; and, far from the right of dominion being disputed by foreigners, it was insisted upon by them and declared to carry with it certain duties. In 1299, not only English merchants, but also " the maritime people of Genoa, Catalonia, Spain, Germany, Zealand, Holland, Frisia, Denmark, Norway and several other places of the empire " declared that the kings of England had from time immemorial been in " peaceable possession of the sovereign lordship of the seas of England," and had done what was " needful for the maintenance of peace, right and equity between people of all sorts, whether subjects of another kingdom or not, who pass through those seas " (J. K. Laughton," Sovereignty of the Sea," Fortnightly Review, August 1866). The English sovereignty was not exercised as giving authority to exact

toll. All that was demanded in return for keeping the sea safe for peaceful traffic was a salute, enforced no doubt as a formal admission of the right which permitted the (on the whole, at any rate) effective police of the waters to be maintained. The Dutch in the 17th century objected to the demand for this salute. It was insisted upon. War ensued; but in the end the Dutch acknowledged by solemn treaties their obligation to render the salute. The time for exacting it, however, was really past. S. R. Gardiner (" The First Dutch War," Navy Records, vol. xiii., 1899) maintains that though the "question of the flag" was the occasion, it was not the cause of the war. There was not much, if any, piracy in the English Channel which the king of England was specially called upon to suppress, and if there had been the merchant vessels of the age were generally able to defend themselves, while if they were not their governments possessed force enough to give them the necessary protection. Great Britain gave up her claim to exact the salute in 1805.

The necessity of the foregoing short account of the " Sovereignty or Dominion of the Seas " will be apparent as soon as we corne to the consideration of the first struggle, or rather series of struggles, for the command of the sea. Gaining Attempts this was the result of England's wars with the Dutch command. in the 17th century. At the time of the first Dutch war, 1652-54, and probably of the later wars also, many people, and especially seamen, believed that the conflict was due to a deter- mination on her part to retain, and on that of the Dutch to put an end to, the English sovereignty or dominion. The obstinacy of the

Dutch in objecting to pay the old-established mark of respect to the English flag was quite reason enough in the eyes of most Englishmen, and probably of most Dutchmen also, to justify hostilities which other reasons may have rendered inevitable. The remarkable thing about the Dutch wars is that in reality what England gained was the possibility of securing an absolute command of the sea. She came out of the struggle a great, and in a fair way of becoming the greatest, naval power. It is this which prompted Vice-Admiral P. H. Colomb to hold that there are various kinds of command, such as " absolute or assured," " temporary," " with definite ulterior purpose," &c. An explana- tion that would make all these terms intelligible would be voluminous and is unnecessary here. It will be enough to say that the absolute command — of which, as Colomb tells us, the Anglo-Dutch

wars were the most complete example — is nothing but an attribute of the nation whose power on the sea is para- mount. It exists and may be visible in time of peace. The com- mand which, as said above, expresses a definite strategical condition is existent only in time of war. It can be easily seen that the former is essential to an empire like the British, the parts of which are bound together by maritime communications. Inability to keep these communications open can have only one result, viz. the loss of the parts with which communication cannot be maintained. Experience of war as well as reason will have made it evident that inability to keep open sea-communica- tions cannot be limited to any single line, because the inability must be due either to incapacity in the direction of hostilities or insufficiency of force. If Great Britain has not force enough to keep open all the communications of her widely extended empire, or if — having force enough — she is too foolish to employ it properly, she does not hold the command of the sea, and the empire must fall if seriously attacked.

The strategic command of the sea in a particular war of campaign has equal concern for all maritime belligerents. Before

seeing what it is, it will be well to learn on high authority command. wnat it is n °t- Mahan says that command, or, to use

his own term, " control of the sea, however real, does not imply that an enemy's single ships or small squadrons cannot steal out of port, cannot cross more or less frequented tracts of ocean, make harassing descents upon unprotected points of a long coast-line, or enter blockaded harbours. On the contrary, history has shown that such evasions are always possible, to some extent, to the weaker party, however great the inequality of naval strength " {Influence of Sea-Power on History, London, 1890, p. 14). The Anglo-French command of the sea in 1854- 1836, complete as it was, did not enable the Allies to intercept the Russian ships in the north-western Pacific, nor did that held by the Federals in the American Civil War put an early stop to the cruises of the Confederate vessels. What the term really does imply is the power possessed from the first, or gained during hostilities, by one belligerent of carrying out considerable over- sea expeditions at will. In the Russian war just mentioned the Allies had such overwhelmingly superior sea-power that the Russians abandoned to them without a struggle the command of the sea; and the landing in South Africa (1899-1902), more than six thousand miles away, of a large British army without even a threat of interruption on the voyage is another instance of unchallenged command. In wars between great powers and also

between secondary powers, if nearly equally matched, this absence of challenge is rare. The rule is that the command of the sea has to be won after hostilities begin. To win it the enemy's naval force must be neutralized. It may be driven into his ports and there blockaded or " masked," and thus ren- dered virtually innocuous; or it must be defeated and destroyed. The latter is the preferable, because the more effective plan. As was perceptible in the Spanish -American War of 1898, as long as one belligerent's fleet is intact or at large the other is reluctant to carry out any considerable expedition over-sea. In fact, the command of the sea has not been secured whilst the enemy continues to have a " fleet in being " (see Sea-Power).

In 1782 a greatly superior Franco-Spanish fleet was covering the siege of Gibraltar. Had this fleet succeeded in preventing

the revictualling of the fortress the garrison would have been starved into surrender. A British fleet under Lord Howe, though much weaker in numbers, had not been de- feated and was still at large. Howe, in spite of the i ns ˆ ces . odds against him, managed to get his supply-ships in to the anchorage and to fight a partial action, in which he did the allies as much damage as he received. There has never been a display of higher tactical skill than this operation of Howe's, though, curiously enough, he owes his fame much more to his less meritorious performance on the 1st of June. The revictualling of Gibraltar surpassed even Suffren's feat of the capture of Trincomalee in the same year. In 1798 the French, assuming that a temporary superiority in the Mediterranean had given them a free hand on the water, sent a great expedition to Egypt. Though the army which was carried succeeded in landing there, the covering fleet was destroyed by Nelson at the Nile, and the army itself was eventually forced to surrender. The French had not perceived that, except for a short time and for minor operations, you cannot separate the command of the Mediterranean or of any particular area of water from that of the sea in general. Local command of the sea may enable a belligerent to make a hasty raid, seize a relatively insignificant post or cut out a vessel; but it will not ensure his being able to effect anything requiring considerable time for its execution, or, in other words, anything likely to have an important influence on the course of the war. If Great Britain has not naval force enough to retain command of the Mediterranean she will certainly not have force enough to retain command of the English Channel. It can be easily shown why it should be so. In war danger comes less from conditions of locality than from the enemy's power to hurt. Taking up a weak position when confronting an enemy may help him in the exercise of his power, but it does not constitute it. A maritime enemy's power to

hurt resides in his fleet. If that can be neutralized his power disappears. It is in the highest degree inprobable that Great Britain could attain this end by splitting up her fleet into fragments so as to have a part of it in nearly every quarter in which the enemy may try to do her mischief. The most promising plan — as experience has often proved — is to meet the enemy when he shows himself with a force sufficiently strong to defeat him. The proper station of the British fleet in war should, accordingly, be the nearest possible point to the enemy's force. This was the fundamental principle of Nelson's strategy, and it is as valid now as ever it was. If Great Britain succeeds in getting into close proximity to the hostile fleet with an adequate seeking force of her own, her foe cannot obtain command the of the sea, or of any part of it, whether that part be enemy's the Mediterranean or the English Channel, at any rate ee ' until he has defeated her. If he is strong enough to defeat her fleet he obtains the command of the sea in general; and it is for him to decide whether he shall show the effectiveness of that command in the Mediterranean or in the English Channel.

In the smaller operations of war temporary command of a particular area of water may suffice for the success of an expedition, or at least will permit the execution of the preliminary movements. When the main fleet of a country is at „p e r™« ns a distance— which it ought not to be except with the object of nearing the opposing fleet — a small hostile expedition may slip across, say the English Channel, throw shells into a coast town or burn a village, and get home again unmolested. Its action would have no sort of influence on the course of the campaign, and would, therefore, be useless. It would also most likely lead to reprisals; and, if this process were repeated, the war would probably degenerate into the antiquated system of " cross-raiding," discarded centuries ago, not at all for reasons of humanity, but because it became certain that war could be more effectually waged in other ways. The power in command of the sea may resort to raiding to expedite the formal submission of an already defeated enemy, as Russia did when at war with Sweden in 1719; but in such a case the other side cannot retaliate. Temporary command of local waters will also permit of operation? rather more considerable than mere raiding attacks; but the

duration of these operations must be adjusted to the time available. If the duration of the temporary command is in- sufficient the

operation must fail. It must fail even if the earlier steps have been taken successfully. The command of the English Channel, which Napoleon wished to obtain when maturing his invasion project, was only temporary. It is possible that a reminiscence of what had happened in Egypt caused him to falter at the last; and that, quite independently of the pro- ceedings of Villeneuve, he hesitated to risk a second battle of the Nile and the loss of a second army. It may have been this which justified his later statement that he did not really mean to invade England. In any case, the British practice of fixing the station of their fleet wherever that of the enemy was, would have seriously shortened the duration of his command of the English Channel, even if it had allowed it to be won at all. Moreover, attempts to carry out a great operation of war against time as well as against the efforts of the enemy to prevent it are in the highest degree perilous.

In war the British navy has three prominent duties to dis- charge. It has to protect the maritime trade, to keep open the communications between the different parts of the empire and to prevent invasion. If Great Britain commands the sea these duties will be discharged effectually. As long as she does that, the career of cruisers sent to prey on her commerce will be precarious, because command of the sea carries with it the necessity of possessing an ample cruiser force. As long, as the condition mentioned is satisfied her ocean communications will be kept open, because an inferior enemy, who cannot obtain the command required, will be too much occupied in seeing to his own safety to be able to interfere seriously with that of any part of the British empire. This being so, it is evident that the greater operation of invasion cannot be attempted, much less carried to a successful termination, by the side which cannot make head against the opposing fleet. Command of the sea is the indispensable preliminary condition of a successful military expedition sent across the water. It enables the nation which possesses it to attack its foes where it pleases and where they seem to be most vulnerable. At the same time it gives to its possessor security against serious counter-attacks, and affords to his maritime commerce the most efficient protection that can be devised. It is, in fact, the main object of naval warfare.

Authorities for the above may be given as naval histories in general, placing in the first rank the well-known works of Captain A. T. Mahan, U.S.N. The book which must be specially referred to is Vice-Admiral P. H. Colomb's Naval Warfare (3rd ed., London, 1900). See also the article Navy. (C. A. G. B.)

SEABURY, SAMUEL (1729-1796), American Protestant Episcopal bishop, was born on the 30th of November 1729, in Ledyard, Groton, Connecticut. His father, Samuel Seabury (1706-1764), originally a Congregationalist minister in Groton, was ordained deacon and priest in the Church of England in 1731, and was a rector in New London, Conn., from 1732 to 1743, and in Hempstead, Long Island, from 1743 until his death. The son graduated at Yale in 1748; studied theology with his father; studied medicine at Edinburgh in 1752-1753; was ordained deacon by the bishop of Lincoln and priest by the bishop of Carlisle in 1753; was missionary in New Brunswick, New Jersey, in 1754-1757, and was rector in Jamaica, New York, in 1757-1766, and of St. Peter's, Westchester, New York, in 1766-1775. He was one of the signers of the White Plains protest of April 1775 against "all unlawful congresses and committees," in many other ways proved himself a devoted loyalist, and wrote the Free Thoughts on the Proceedings of the Continental Congress (1774) by " A. W. Farmer" {i.e. a Westchester farmer), which was followed by a second " Farmer's Letter," The Congress Canvassed (1774), answered by Alexander Hamilton in A Full Vindication of the Measures of the Congress, from the Calumnies of their Enemies. A third " Farmer's Letter " replied to Hamilton's View of the Controversy between Great Britain and her Colonies, in a broader and abler treatment than in the previous pamphlets. To this third pamphlet Hamilton replied with The Farmer Refuted (1775). These three " Farmer's Letters " — a fourth was advertised but apparently was never

published — were forcible presentations of the pro-British claim, written in a plain, hard-headed style; their authorship was long in question, but it is certain that Seabury claimed them in England in 1783 when he was seeking episcopal consecration. At the same time he claimed the authorship of a letter, not signed by the Westchester farmer, which under the title An Alarm to the Legislature of the Province of New York (1775) discussed the power of this the only legal political body in the colony. He was arrested in November 1775 by a mob of lawless Whigs, and was kept in prison in Connecticut for six weeks; his parochial labours were broken up, and after some time in Long Island he took refuge in New York City, where he was appointed in 1778 chaplain to the king's American regiment. On the 25th of March 1783 he was chosen their bishop by ten episcopal clergymen of Connecticut, meeting in Woodbury; as he could not take the British oath of allegiance, Seabury was shut out from consecration by the English bishops, and he was consecrated by Scotch bishops at Aberdeen on the 14th of November 1784. He returned to

Connecticut in 1785 and made New Haven his home, becoming rector of St James's Church there. The validity of his consecration was at first questioned by many, but was recognized by the General Convention of his church in 1789. In 1790 he took charge of the diocese of Rhode Island also. In 1792 he joined with Bishops William White and Samuel Provoost, who had received English consecration in 1787, and James Madison (1 749-181 2), who had received English consecration in 1790, in the consecration of Bishop Thomas J. Claggett of Maryland in 1792, thus uniting the Scotch and the English successions. He died in New London on the 25th of February 1796. He was a great organizer and a strict churchman: it is noteworthy that after his consecration he used the signature " Samuel Bp. Connect." Seabury's " Farmer's Letters " rank him as the most vigorous American loyalist controversialist and as one of the greatest masters of style of his period.

His son Charles (1 770-1844) was rector in various Long Island churches; and Charles's son Samuel (1801-1872), who graduated at Columbia in 1823, was rector of the Church of the Annunciation in New York in 1838-1868, and from 1862 professor of Biblical learning and the Interpretation of Scriptures in the General Theological Seminary. William Jones Seabury (b. 1837), son of the last named, was rector of the Church of the Annunciation from 1868 to 1898, professor of ecclesiastical polity and law in the G enera l Theological Seminary from 1873, and published a Manual for Choristers (1878), Lectures on Apostolic Succession (1893) an d An Introduction to the Study of Ecclesiastical Polity

(1894).

See E. Edwards Beardsley, Life and Correspondence of the Rt. Rev. Samuel Seabury (Boston, 1881).

SEADIAH (or Saadia; in Arabic Sa'id) BEN JOSEPH (892-942) was born in a.d. 892 at Dilaz in the Fayyum, whence he is often called al-Fayyumi. Although he is justly regarded as the greatest figure in the literary and political history of medieval Judaism, nothing certain is known of his father or of his early life. Even the names of his teachers, generally recorded in the case of Jewish scholars, are unknown, with the exception of a certain Abu Kathlr, who is himself obscure, and left no writings. Saadia's literary work is in fact the more remarkable since it suddenly appears at a time when learning seemed to be dead both in East and West. Since the completion of the Talmud very little of any literary importance, if we except certain midrashim, had been produced among the orthodox (Rabbanite)

Jews, although the Babylonian schools at Sura and Pumbeditha continued to enjoy a somewhat intermittent prosperity. On the other hand, learning was cultivated among the Qaraites (q.v.; see also Hebrew Literature), a sect of Jews who rejected the oral tradition, restricting their practice to the ordinances of scripture (miqra). It even seemed for a time as if conservative heresy would pre- vail against progressive orthodoxy. In Saadia, however, the Rabbanites found a powerful champion. Almost his first work, written at the age of twenty-three, was an attack on the teaching of 'Anan, the founder of Qaraism, who lived in the 8th century. This, like most of Saadia's polemical writings, is no longer extant,

but we can gather something of its contents from references in the author's other works, and from the statements of his opponents. The controversy turned largely on the calendar, which of course involved the dates of festivals, and, since the Rabbanite calendar had come down from ancient times, opened up the whole question of oral tradition and the authority of the Talmud. The conflict raged for many years, the chief repre- sentative of the other side being Solomon ben Yeruham, a virulent if not successful opponent. It was not, however, the only contro- versy in which Saadia was engaged. In 922 Ben Meir, a person of importance in Palestine, attempted to make alterations in the calendar, against the authority of the Babylonian schools. Saadia, who was then at Baghdad, warned him of his errors, refuted him in a work called Sefer ha-Mo K adim (the Book of the Festivals), and finally procured his excommunication by David ben Zakkai, the exilarch or head of the Jewish community in Babylonia. The vigorous action of Saadia seems to have brought him more prominently to the notice of the exilarch, and that at a time of more than usual difficulty. The honourable rivalry of the two schools of Sura and Pumbeditha, as the recognized authorities in matters of religion, had degenerated into jealousy and contention. The Gaon (q.v.) or President of Pumbeditha, taking advantage of his own position and of a vacancy in the Gaonate of Sura, wished to abolish the rivai school. The exilarch, however, no doubt in recognition of his recent services, appointed Saadia as Gaon of Sura, although it was against the usual custom to appoint a person who was not a member of the school. Un- fortunately this step did not lead to peace. Pumbeditha was jealous: the exilarch was weak and not very scrupulous. Money had to be raised not only for the support of the schools, but also to buy immunity from the government, and Saadia

was not the man to connive at the corruption and oppression practised by the exilarch to raise it. Within two years matters had come to a crisis, and the exilarch dismissed Saadia, while Saadia retorted by declaring the exilarch deposed (930). After three years of contention David succeeded in sufficiently bribing the new and needy Caliph (Qahir, 932-934; see Caliphate, § 19), who definitely forbade Saadia to act as Gaon. The next four years, spent in retirement at Baghdad, were devoted to literary labours, which had no doubt been impossible during the previous years of trouble, and in fact it was at this time that most of Saadia's work was produced. Eventually a reconciliation was effected with David, favoured probably by the new Caliph Radi (934-940; see Caliphate, § 20), and Saadia was reinstated as Gaon of Sura in 938. Under his rule the school attained the highest reputation among the Jewish communities of East and West — but it was not of long duration. His health had been impaired by the strenuous life he had led, and in his later years he suffered from melancholia. In 042 he died, two years after the exilarch.

That some of the many works of Saadia, in spite of their merits, have been neglected, and others partly or entirely lost, is not as surprising as it appears at first sight. They were for the most part written in Arabic, the vernacular of the Jews in the East, so that after the break-up of the Babylonian schools in the middle of the nth century, they would only be studied in Spain, the new centre of Jewish learning, and in Egypt. After the expulsion of the Jews from Spain, Arabic practically ceased to be used by them for literary purposes, and in the rest of Europe (except perhaps in S. Italy) it was never understood. Even some Hebrew works, of great interest to us now, must have been regarded at the time as of purely temporary value, such as e.g. the Sefer ha-Md'adim, fragments of which have only recently been recovered in the Geniza at Cairo. The anti-Qaraite works 1 against "Anan, Ibn Sakawaihi and Ben Zuta, the Kitab at-tamyiz, Kitab al-Shara'i, Kitab al-Ibbur (calendar) and a book on anthropomorphisms, all in Arabic, are now lost and only known from quotations. So also are the refutation of the sceptic Hlvl of Balkh, and the Sefer 'Orayoth (on prohibited marriage, against^Qaraites). Of the Sefer ha-Md'adim and Sefer ha-Galul

1 An excellent account of these is given by Poznanski in the Jewish Quarterly Review, x. 238 ff.

(against David ben Zakkai), both in Hebrew, some fragments have been recovered recently.

Closely allied to his polemical writings are his exegetical works. He translated most of the Bible into Arabic, and commented on at least some of the books. The memorial edition 2 contains (1) the version of the Pentateuch (1893), (3) of Isaiah (1896), (5) of Job (1899), (6) of Proverbs (1894), the last three with commentary. The translation of the 5 Meghilloth, and of Daniel (with commentary), usually ascribed to Saadia, is not really by him, but a genuine translation of Daniel, with commentary, exists in manuscript. There is also ascribed to him a midrashic work on the Decalogue. These all, no doubt, exhibit the defects necessary to the time in which their author lived. But it must be remembered that Saadia was a pioneer. Hayyuj, the father of Hebrew grammar, was not yet born, nor had the scientific and comparative study of the language begun. In this respect Saadia contributed little to the subject. Moreover, he shows a tendency, common at all times and perhaps due to a particular theory of inspiration, to get more out of the text than it contains, and to interpret it in accordance with preconceived philosophical opinions. At the same time both translations and commentaries are remarkable for their great learning, sound sense and : an honest endeavour to arrive at the true meaning of the original. They were thus admirably suited for their purpose, which was, like the earlier Targums and the later work of Moses Mendelssohn, to render the sacred text more intelligible to the faithful generally and to check the growth of error.

The grammatical work called Agron, a sort of dictionary, is now lost, as are also the Kulub al-Lughah and perhaps other treatises on Hebrew grammar. The explanation of the 70 (really 90) hapaxlegomena in the Bible is still extant, and a poem on the number of letters in the Bible.

On Talmudic subjects again little is preserved beyond the Kitab al-Mawarith, which was published as vol. ix. of the CEuvres completes, together with the short treatise in Hebrew on the 13 Middoth or canons of exegesis of R. Ishmael and some Responsa mostly in Hebrew. The translation of the Mishna, the introduc- tion to the Talmud and other works of the kind are known only by repute.

Of the Siddur or arrangement of the liturgy by Saadia, a large part exists in a single manuscript at Oxford, and several fragments have been recovered from the Cairo Geniza. Numerous other liturgical poems, or parts of them, have been obtained from the same source, and several have been published in periodicals. His Azharolh, a poetical enumeration of the 613 precepts, in Hebrew, is included in vol. ix. of the (Euvres completes.

His philosophical works are (1) a commentary on the Sefer Yezira, a mystical treatise ascribed to the patriarch Abraham, which, as the foundation of the Kabbala, had great influence on Jewish thought, and was the subject of numerous commen- taries; (2) the Kitab al-Amanat w'al-I'tiqdddt (Book of Beliefs and Convictions) , written in 933, called, in the Hebrew translation by Judah ibn Tibbon, Emunoth we-De'dth. Its system is based on reason in conjunction with revelation, the two being not opposed, but mutually complementary. It is thus concerned, as the title implies, with the rational foundation of the faith, and deals with creation, the nature of God, revelation, free will, the soul, the future life and the doctrine of the Messiah. It shows a thorough knowledge of Aristotle, on whom much of the argument is based, and incidentally refutes the views of Christians, Moslems, Brahmins and sceptics such as Hivi. From its nature, however, the work, although of great interest and value, never had the same wider influence as that of Ibn Gabirol (q.v.). The Arabic text was published by S. Landauer (Leiden-* 1880), the Hebrew version at Constantinople in 1562 and frequently since.

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2 CEuvres completes de R. Saadia, ed. by J. Derenbourg (Paris. 1893 ff.)-

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SEAFIELD, EARLS OF. The 1st earl of Seafield, in the Scottish peerage, was James- Ogilvy (1663-1730), son and heir of James Ogilvy, 3rd earl of Findlater. Although in the conven- tion parliament of 1689 he had spoken for James II., he took the oath of allegiance to William and Mary, and after filling some minor official

positions he was made secretary of state in 1696, and lord chancellor in 1702. In 1707 he was made chief baron in the court of exchequer. In 1701 he was created earl of Seafield, and in 1711 succeeded to his father's earldom of Findlater. When his great grandson, James, 7th earl of Findlater and 4th earl of Seafield died in October 181 1 the earldom of Findlater became dormant or extinct, while the earldom of Seafield passed to a cousin, Lewis Alexander Grant (1 767-1840), who was descended from Margaret, a daughter of the 2nd earl. He took the name of Grant-Ogilvy and was succeeded as 6th earl by his brother, Francis William Ogilvy-Grant (1778-1853), whose descendant, James Ogilvie-Grant (b. 1876) became the nth earl in 1888. The earl of Seafield is a peer of the United Kingdom as Baron Strathspey.

SEAFORD, an urban district and watering-place in the East- bourne parliamentary division of Sussex, England, 58 m. S. by E. from London by the London, Brighton & South Coast railway. Pop. (1901) 3355. In recent years there has been a considerable increase in the number of visitors. The climate is bracing, and the town is sheltered by high cliffs. There are golf links on the neighbouring downs. The church of St Leonard is Norman of various dates, but received large additions in the Perpendicular period. In former days the river Ouse entered the English Channel here, and the natural harbour so formed accounts for the origin of Seaford (Sefford, Safford, Seford), probably in Roman times.- In the " Domesday of Cinque Ports " (which existed in the reign of Edward III., but was lost before 1728), it stood first among the members of Hastings, and was doubtless of considerable importance until about the end of the 14th century, when its rapid decline began owing to the constant alteration of the sea-coast and the decay of the harbour. In the 16th century the town was finally deserted by the Ouse, which now runs into the sea at Newhaven, 2.m. westward, and no revival of its prosperity occurred until the early 19th century, when it began to be frequented as a watering-place. Fishing has always been the chief industry.

Seaford is not mentioned in Domesday Book, but evidently pertained to the lordship of the 1st Earl Warenne and his descendants, who were succeeded in 1347 by the earls of Arundel. It was probably a mesne borough in the 12th century, growing up under the protection of the earls of Warenne, and was certainly called a borough in 1236. Bailiffs are mentioned in the 14th century, but the town was not incorporated until 1544, when notwithstanding its decayed condition Henry VIII. annexed it to Hastings by charter, and incorporated it under the title of bailiff and commonalty, presumably as a reward for assisting the head port to provide its proportion of

ships to the crown. The corporation was dissolved by an act of 1883. The town returned two representatives to parliament from 1298 to 1399, and again from 1640 until 1832, when it was dis- franchised. In the 13th century the earls of Warenne held a market or fair, or both, apparently by prescriptive right. In 1792 the fair- days were Whit-Monday and the 10th of August, and the market- days Wednesdays and Saturdays, but no market or fair now exists.

SEAFORTH, Earl of, a Scottish title held by the family of Mackenzie from 1623 to 1716, and again from 1771 to 1781. The Mackenzies trace their descent to one Colin of Kintail (d. 1278), and their name is a variant of Mackenneth. Kenneth, the twelfth head of the clan, was made Lord Mackenzie of Kintail in 1609, and his son Colin, who succeeded his father as 2nd Lord Mackenzie in March 161 1, was created earl of Seaforth in 1623. Colin's successor was his half-brother George (d. 1651), who became the 2nd earl in 1633. George was alternately a royalist and a covenanter between 1636 and 1646, and was afterwards

in Holland with Charles II., who made him secretary of state for Scotland. His grandson, Kenneth, the 4th earl, followed James II. to France and was with the dethroned king in Ireland. Sent by James in 1690 to head a rising in Scotland, he was captured and imprisoned, but in 1697 he was released and he died in Paris in January 1701. His successor was his son William, who joined the Jacobite standard at Braemar in 1715, and then, having raised 3000 men, was present at the battle of Sherifimuir and was appointed lieutenant-general of the northern counties. He also took part in the Jacobite enterprise of 1719, being wounded at Glenshiel. In 17 16 he was attainted and his titles and estates forfeited; before his death in January 1740, he had been relieved of some of the penalties of his treason, although his titles were not restored. His son Kenneth (c. 1718-1761), who but for the attainder would have been the 6th earl, helped the English government during the rising of 1745, and was a member of parliament for some years. His son Kenneth (e. 1744- 1781) was created earl of Seaforth in 1771, but his peerage became extinct when he died in August 1781, although there were still heirs to the older earldom, which was under attainder. This earl raised the regiment of Highlanders, the 78th, known later as the 2nd battalion of the Seaforth Highlanders.

SEAHAM HARBOUR, a seaport and urban district, in the South-eastern parliamentary division of Durham, England, 6 m. S. of Sunderland by a branch of the North-Eastern railway. Pop. (1901) 10,163. The harbour was built (1828) by the third marquis of

Londonderry to facilitate the export of coal from the mines on his adjacent property. Besides the coal trade there are extensive bottle and chemical works.

SEA-HORSE. Sea-horses (Hippocampina) are small marine fishes which, with pipe-fishes (Syngnathina) , form the Lopho- branchiate division of the suborder Thoracostei. The gills of the members of this group are not arranged in leaf like series as in other fishes, but form a convex mass composed of small rounded lobes attached to the branchial arches, as shown in the accom panying figure (fig. 1) of the head of a sea-horse, in which the

Fig. 1. — Gills of Hippocampus abdominalis.

gill-cover has been pushed aside to show the interior of the gill-cavity. Sea-horses differ from pipe-fishes by having a prehensile and invariably finless tail; it is long, slender, tapering, quad- rangular in a transverse section, and, like the rest of the body, encased in a dermal skeleton, which consists of horny segments, allowing of ventral, and in a less degree of lateral, but not of dorsal, flexion. The typical sea-horse {Hippocampus) can coil up a great portion of its tail, and firmly attach itself by it to the stems of sea-weeds or similar objects. The body is compressed and more or less elevated, and the head terminates in a long tubiform snout, at the end of which is the small mouth. The configuration of the fore part of the body, as well as the peculiar manner in which the head is joined to the neck-like part of the trunk, bears a striking resemblance to a horse's head. Sea- horses are bad swimmers and are unable to resist currents. With the aid of their single dorsal fin, which is placed about the middle of the fish's body and can be put into a rapid undulatory motion, they shift from time to time to some object near them, remaining stationary among vegetation or coral where they find the requisite amount of food and sufficient cover. Their coloration and the tubercles or spines on the head and body, sometimes with the addition of skinny flaps and filaments, closely resemble their surroundings, and constitute the means by which these defence- less creatures escape detection by their enemies. These protective

structures are most developed in the Australian genus Phyllo- pteryx, one of the most singular types of littoral fishes.

Sea-horses belong to the tropics and do not extend so far north as pipe-fishes. They are abundant at suitable localities, chiefly on the coral-banks of the Indo-Pacific Ocean. Some forty species are known, of which the majority belong to the genus Hippocampus proper. They vary from 2 to 12 in. in length; but in China and

Fig. 2. — Phyllopteryx eques:

Australia a genus (Solenognathus) occurs, the species of which attain to a length of nearly 2 ft. ; they, however, in form resemble pipe-fishes rather than sea-horses. The species which may be sometimes seen in European aquaria is Hippocampus antiquorum, common in the Mediterranean and on the coasts of Portugal and France. It is rare on the south coast of England, but it has often been captured on the Essex coast. About 1885, according to Dr J. Murie, two Leigh fishermen when shrimping at Harwich during the summer season succeeded in procuring altogether between 100 and 120 specimens. The food of the sea-horses consists probably of very small invertebrates and the fry of other fishes. Like the other Lophobranchiates, they take great care of their progeny. The male Hippocampus carries the ova in a sac on the lower side of the tail, in which they are hatched; in the other genera no closed pouch is developed, and the ova are embedded in the soft and thickened integument of either the abdomen or the tail.

All that is known of the habits of these interesting fishes will be found summarized in a valuable paper by T. Gill, " The Life History of the Sea-Horses (Hippocampids)," in Proc. U.S. Nat. Mus. xxviii. (1905), P- 805.

SEA-KALE, Crambe maritime, a hardy perennial, a member of the natural order Cruciferae, which grows wild along the coasts of England, of Ireland and of the Scottish lowlands, along the western coasts of Europe, and on the Baltic, reappearing on the Black Sea.

In cultivation sea-kale prefers a light dry soil, and when manure is necessary it should consist of sea- weed or well-rotted dung; or a dressing of salt or of nitrate of soda may be given. When raised from seeds, they should be sown in March or April in rows I ft. asunder, the plants being thinned to 6 in. apart. In the following March these should be planted out in trenched well-prepared ground, 2 ft. asunder, in rows 2J to 3 ft. apart. The top with the crown buds should be cut off before planting to prevent them from running to seed. In the spring of the second year the young shoots if blanched will be fit for use, and therefore the summer growth should be

promoted by the use of water and liquid manure. Tolerably blanched stalks may be produced by plants only nine months old from the seed, and after two summers seedling plants will have acquired sufficient strength for general cropping. The seeds, instead of being sown in rows and transplanted, may be deposited in patches of three or four together, where they are to remain. In the autumn, after the leaves have been cleared off, the ground should be forked up, and 6 or 8 inches' depth of leaves or of light sandy soil laid over the plants, by either of which means they will be blanched, though not forced. The blanched sprouts should be cut for use whilst they are crisp, compact and from 3 to 6 in. in length, the stem being cut quite down to the base.

Sea-kale beds may be made from cuttings of the roots of very healthy plants, the extremities of the roots, technically called " thongs," being best adapted for this purpose. They should be taken up in autumn, cut into lengths of about 4 in., and laid in a heap of sand or earth till spring, when they should be planted out like the seedlings.

Forcing. — Sea-kale may be forced in the open beds by the aid of sea-kale pots or covers, which are contracted a little at top, with a movable lid. One of Jthe earthenware covers, or an inverted flower-

pot, is placed over each plant, or each patch of plants, and leaves of trees are closely packed round the pots, and raised to about 1 ft. above them. When fermentation commences, the temperature within should not exceed 60 ° F. If the crowns are thus covered up by about the end of October, the crop may be cut by about the third week of December, and by starting a batch at various times a supply may be kept up till the middle of May.

Strong plants may also be taken up and planted on hotbeds, the sashes being kept covered close; or they may be set thickly in boxes as recommended for rhubarb, and placed in any heated structure, or in the mushroom house; but, to have the shoots crisp and tender as well as blanched, light must be completely excluded. Besides the common purple-leaved, there is a green-leaved sort, which is said to blanch better.

SEAL, strictly speaking the name of the common European representative of that group of marine carnivorous mammals constituting the suborder Pinnipedia of the order Carnivora, but in a wider sense used to designate all the members of that group, except the walrus. The common seal (Phoca vitulina) is the typical representative not only of that group (see Carnivora) , but also of the

family Phocidae and the subfamily Phocinae, and it is to this latter group that the present article is re- stricted.

Although seals swim and dive with the greatest ease, often remaining as much as a quarter of an hour or more below the surface, and are dependent for their sustenance entirely on living prey captured in the water, all the species frequently resort to sandy beaches, rocks or ice-floes, either to sleep or to bask in the sun, and especially for the purpose of bringing forth their young. The latter appears to be the universal habit, and the young seals — of some species at least — take to the water at

Fig. 1. — Common Seal (Phoca vitulina).

first very reluctantly, and have to be taught to swim by their parents. The number of young produced is usually one annually, though occasionally two. They are at first covered with a coat of very thick, soft, nearly white fur, and until this falls off they do not usually enter the water. This occurs in the Greenland seal {Phoca groenlandica)a,nd the grey seal (Holichoerus grypus) when from two to three weeks old, but in the common seal the change takes place either in utero or at birth. The movements of the true seals upon the ground or ice are very different from those of the eared seals, or Otariidoe, which walk and run upon all four feet, the body being raised as in the case of ordinary quadrupeds. The hind limbs (by which seals mainly propel themselves through the water) are on land perfectly passive, stretched backwards, with the soles of the feet applied to each other, and often raised to avoid contact with the ground. Some- times the fore-limbs are equally passive, being placed close to the sides of the body; motion being then effected by a shuffling or wriggling action produced by the muscles of the trunk. When, however, there is necessity for more rapid progress, the animals

use the fore-paws, either alternately or simultaneously, pressing the palmar surface on the ground and lifting and dragging the body forwards in a succession of short jumps. In this way they can move so fast that a man has to step out beyond a walk to keep up with them; but such rapid action costs considerable effort, and they soon become exhausted. These various modes of progression appear to be common to all species so far as has been observed.

Most kinds of seals are gregarious and congregate, especially at the breeding season, in immense herds. Such is the habit of the Greenland seal, which resorts in the spring to the ice-floes of the North Sea, around Jan Mayen Island. Others, like the common seal of the British Islands, though having a wide geographical range, are never met with in such large numbers or far away from land. This species is stationary all the year round, but some have a regular season of migration, moving south in winter and north in summer. They are usually harmless, timid, inoffensive animals, though, being polygamous, the old males often fight desperately with each other, their skins being frequently found covered with wounds and scars. They are greatly attached to their young, and remarkably docile and easily trained when in captivity; indeed there is perhaps no wild animal which attaches itself so readily to the person by whom it is cared for and fed. They have much curiosity, and are strongly attracted by musical sounds. Their sense of smell is acute, and their voice varies from a harsh bark or grunt to a plaintive bleat. Seals feed chiefly on fish, of which they consume enormous quantities; some, however, subsist largely on crustaceans, especially species of Gam- marus, which swarm in the northern seas, also on molluscs, sea- urchins and even occasionally rsea-birds, which they seize when swimming or floating on the water.

Although the true seals do not possess the beautiful under-fur (" seal-skin " of the furriers) which makes the skin of the sea-bears or fur-seals so precious, their hides are still valuable as articles of commerce, and together with the oil yielded by their fat, subject them to a devastating persecution.

Two species of seal are met with regularly on the British coasts, the common seal and the grey seal. The former is a constant resident in all suitable localities round the Scottish, Irish and English coasts, from which it has not been driven away by man. Although the most secluded and out-of-the-way spots are selected as their habitual dwelling-places, there are few localities where these seals may not occasionally be seen. They frequent bays, inlets and estuaries, and

Fig. 2. — Skull of Common Seal, with one of the molars on a larger

scale.

are seen on sandbanks or mud-flats left dry at low tide. Unlike some of their congeners, they are not found on the ice-floes of the open sea, nor, though greganous, are very large numbers ever seen in one spot. The young are born at the end of May or beginning of June.

They feed chiefly on fish, and the destruction they occasion among salmon is well known to Scottish fishermen. The common seal is found not only on the European and American coasts border- ing the Atlantic, but also in the North Pacific. It is from 4 to 5 ft. in length, and variable in colour, though usually yellowish grey, with irregular spots of dark brown or black above and yellowish white beneath. According to Dr J. A. Allen, there is a marked differ- ence between the dentition of the male and female of the common seal. In the latter sex the teeth are much smaller than those of the male, and are inserted more obliquely in the jaw; they also differ by the reduction in the size and number of the accessory cusps, which are almost invariably absent on the inner side.

The grey seal {Halifhoerus grypus) is of considerably larger size, the males attaining when fully adult a length of 8 ft. from the nose to the end of the hind feet. The form of the skull and the simple characters of the molar teeth distinguish it generically from the common seal. It is of a yellowish grey colour, lighter beneath, and with dark grey spots or blotches, but, like most other seals, is liable to great variations of colour according to age. The grey seal appears to be restricted to the North Atlantic, having been rarely seen on the American coasts, but not farther south than Nova Scotia; it is chiefly met with on the coasts of Ireland, England, Scotland, Norway

and Sweden, including the Baltic and Gulf of Bothnia, and Iceland, though it does not appear to range farther north. It is not migratory, and its favourite breeding-places are rocky islands, the young being born in the end of September or beginning of October.

As the grey seal is sometimes confused with the bearded seal (Phoca barbata), the following account, by T. Southwell, of the distinctions between the two may be quoted : —

" As to the external features by which the grey seal may at any age be distinguished from the bearded seal, which it most resembles, in the first place the abnormal season of reproduction in this species is unique; it is the only seal which has its young in the late autumn. The large size is not a very trustworthy distinction, as it varies considerably in individuals; but a marked feature is the great length of the claws in the fore-flipper, the first two digits of which are nearly of equal length and extend beyond the others; those on the hind-flippers are small and weak, the margin of the skin extending beyond them, and the outer toes on each foot the longest. The long, scimitar-shaped, flattened and crenulated lip-bristles do not differ greatly from those of other species, except from those of the bearded

seal, the only species in which this curious impressed pattern is absent. The muzzle is broad and fleshy, and the upper lip and nose extend considerably beyond the lower jaw. Dr Edmondston calls special attention to this peculiarity, and states that in seizing its prey he has often seen it ' make a slight turn in the manner of a shark.' A captive young grey seal in taking fluid food always turned its head on one side and sucked it in through the side of the mouth. Another feature, which, so far as I know, is peculiar to this species, is the dog-like way in which, when on the alert, it carries its fore- flippers to the front.

" Dr Edmondston also mentions a curious disposal of the hair on the neck of the adult animals, which he attributes to there being four or five rings of hair a little longer than on the rest of the body, which, he says, give it the appearance when rearing its head some- what out of the water, as if several small ropes, encircled its neck. This is a sedentary species, seldom straying far from its chosen locality and rarely met with far from land.

"In the British seas the grey seal resorts to tide- washed rocks and lonely beaches, from Shetland and the Orkney Isles in the north to a few scattered localities along the east and south coasts, as far as Cornwall and even the Channel Islands; northward on the west coast to Wales, the outlying rocks in the Irish Sea and the Hebrides — a sufficiently comprehensive range, and in a few favoured spots it is still fairly numerous. It is seldom found far from land, and seems to be much attached to particular spots, to which it regularly returns as the state of the tide permits. In the breeding-season, which is the late autumn or early winter, its favourite resort is the inner recess of an ocean-cavern, often only to be approached under water; here, in October or November, it deposits its single young one on the small beach at the far end of the cave, beyond the reach of the tide, attend- ing it assiduously for several weeks, until it has shed its infant-coat, which is at first beautifully long, soft and white, offering a great contrast to the young of the common seal. The young are suckled for six weeks before they take to the water, and during that time they are practically land animals. From this time till maturity several successive changes of pelage in each sex take place."

Other species of seals inhabiting the nothern seas, of which stragglers have occasionally visited the British coasts, are the small ringed seal or " floe-rat " of the sealers {Phoca hispida), the Green- land or harp-seal {Phoca groenlandica), the hooded or bladder-nosed seal {Cystophora cristata) and the bearded seal {Phoca barbata).

See also Seal-Fisheries. (W. H.F.; R.L.)*

SEA LAWS, a title which came into use among writers on maritime law in the 16th century, and was applied by them to certain medieval collections of usages of the sea recognized as having the force of customary law, either by the judgments of a maritime court or by the resolutions of a congress of merchants and shipmasters. To the former class belong the sea laws of Oleron, embodying the usages of the mariners of the Atlantic; under the latter come the sea laws of Visby (Wisby), reflecting the customs of the mariners of the North Sea and of the Baltic.

The earliest collection of such usages received in England is described in the Black Book of the Admiralty as the " Laws of Oleron," whilst the earliest known text is contained in the Liber memorandorum of the corporation of the City of London, preserved in the archives of their Guildhall. These laws are in an early handwriting of the 14th century, and the title pre- fixed to them is La Charte d'Oleroun des juggemenlz de la mier. How and in what manner these " Judgments of the Sea " came to be collected is not altogether certain. Cleirac, a learned advocate in the parlement of Bordeaux, in the introduction to his work on Les Us et couslumes de la mer (Bordeaux, 1647), states that Eleanor of Aquitaine (

sea contained in The Book of the Consulate of the Sea (see Con- sulate or the Sea) was held in high repute in the Levant, directed on her return that a record should be made of the judgments of the maritime court of the island of Oleron (at that time a peculiar court of the duchy of Guienne), in order that they might serve as law amongst the mariners of the Western Sea. He states further that Richard I. of England, on his return from the Holy Land, brought back with him a roll of those judgments, which he published in England and ordained to be observed as law. Though R. G. Marsden doubts the story of Richard I. having brought back La Leye Olyroun to England, the general outline of Cleirac's account accords with a memorandum on the famous roll of 12 Edw. III., " De Superioritate Maris Angliae " (for many years preserved in the archives of the Tower of London, now deposited in the Public Record Office). According to this memorandum, the king's justiciaries were instructed to declare and uphold the laws and statutes made by the kings cf England, in order to maintain peace and justice amongst the

people of every nation passing through the sea of England.

The earliest version of these Oleron sea laws comprised certain customs of the sea which were observed in the wine and the oil trade, as carried on between the ports of Guienne and those of Brittany, Normandy, England and Flanders. No English trans- lation seems to have been made before the Rutter of the Sea, printed in London by Thomas Petyt in 1536, in which they are styled " the Lawes of ye Yle of Auleron and ye Judgementes of ye See." French was, in fact, a tongue familiar to the English high court of admiralty down to the reign of Henry VI. A Flemish text, however, appears to have been made in the latter part of the 14th century, the Purple Book of Bruges, preserved in the archives of Bruges, in a handwriting somewhat later than that of the Liber Memorandorum. Prefixed to this Flemish version is the title, " Dit es de Coppie van den Rollen van Oleron van den Vonnesse van der Zee." Certain changes, however, have been made in the Purple Book of Bruges in the names of the ports mentioned in the original Gascon text. For instance, Sluys is in several places substituted for Bordeaux, just as in the Rutter of the Sea London replaces Bordeaux. That these sea laws were administered in the Flemish maritime courts may be inferred from two facts. First, a Flemish transla- tion of them was made for the use of the maritime tribunal of Damme, which was the chief Flemish entrepot of the wine trade in the 13th century. The text of this translation has been published by Adriaen Verwer under the title of the Judgments of Damme. In the second place, there is preserved in the archives of the senate of Danzig, where there was a maritime court of old, an early manuscript of the 15th century, containing a Flemish reproduction of the Judgments of Oleron headed " Dit is Twater Recht in Vlaenderen." So far there can be no doubt that the Judgments of Oleron were received as sea laws in Flanders as well as in England in the 14th century. Further inquiry can trace them as they followed the course of the wine trade in the North Sea and the Baltic Sea. Boxhorn, in his Chronyk van Zeelande, has published a Dutch version of them, which van Leeuwen has reproduced in his Batavia Illustrata, under the title of the Laws of W est-Capell in Zealand. Verwer has also published a Dutch text of them in his Nederlant's See-Rechten, accompanied by certain customs of Amsterdam, of which other MSS. exist, in which those customs are described as usages of Stavoren, or as usages of Enkhuizen, both ports of active commerce in the 15th century. Of these customs of Amsterdam, or, as they were more generally styled, " Ordin- ances of Amsterdam," further mention is made below.

A new and enlarged collection of sea laws, purporting to be an

extract of the ancient laws of Oleron, made its appearance in the latter part of the 15th century in Le Grant routier de la mer, printed at Poitiers in France by Jan de Marnef, at the sign of the Pelican. The title-page is without a date, but the dedication, which purports to be addressed by its author, Pierre Garcie, alias Ferrande, to his godson, is dated from St Gilles on the last day of May 1483. It contains forty-seven articles, of which the first twenty-two are identical with articles of the " Judgments of the Sea," in the Liber Memorandorum, the remaining articles being evidently of more recent origin. A black-letter edition of this work in French, without

a date, is preserved in the Bodleian Library at Oxford, and to the last article this colophon is appended: " Ces choses precedentes sont extraictes du tres utille et profittable Roolle Doloyron par le diet Pierre Garcie alias Ferrande." An English translation is printed in the appendix to A View of the Admiral Jurisdiction, published in 1661 by Dr John Godolphin, in which the laws are described as " ais Extract of the Ancient Laws of Oleron rendered into English out of Garsias alias Ferrand." Although this new text had the recommendation of an advocate who had filled the office of judge of the Admiralty Court during the Commonwealth and been appointed king's advocate-general by Charles II., it seems to have been superseded in a short time by Cleirac's Us et coustumes de la mer, to which was appended the following clause of authentication: " Tesmoin le Seel de l'lsle d'OleVon, estably aux contracts de la dite Isle, le jour du Mardy apres la Feste Sainct Andre l'an mille deux cens soixant-six." Cleirac does not inform us from what source or under what circumstances he procured his text, nor on what authority he has adopted in certain articles readings at variance with those of Garcie, whilst he retains the same number of articles, to wit, forty-seven. The clause of authentication cannot be accepted as a warranty above suspicion, as the identical clause of authentication with the same date is appended to the early Norman and Breton versions of the rolls, which contain only twenty-six articles. Cleirac's version, however, owing probably to the superior style in which it was edited, and to the importance of the other treatises on maritime matters which Cleirac had brought together for the first time in a single volume, seems to have obtained a preference in England over Garcie's text, as it was received in the High Court of Admiralty during the judgeship of Sir Leoline Jenkyns, and an English translation of it was introduced into the English translation of the Black Book of the Admiralty made by John Bedford, the deputy registrar of the High Court. It seems to have been Bedford's intention to print this translation under the title of "Sea Laws"; but the manuscript passed

into the hands of Sir Leoline Jenkyns, who gave it to the College of Advocates in 1685. The Black Book itself, which was missing for a long time from the Admiralty registry, was dis- covered in the 19th century and replaced in the archives of the Admiralty Court. Of these two versions of the sea laws of Oleron the earlier obtained a world-wide reception, for it was translated into Castilian (Fuero de Layron) by order of King Alphonso X., and a Gascon text of it is still preserved in the archives of Leghorn, apparently in a handwriting of the 15th century, entitled " Asso es la copia deus Rolles de Leron de jucgemens de mar."

The parent stock of the Visby sea laws would appear to have been a code preserved in the chancery of Lfibeck, drawn up in the Old Saxon tongue, and dated 1240. This code contains amongst many others certain articles on maritime law which are identical with articles in the Gotland sea laws. This collection comprises sixty-six articles, and it is now placed beyond a doubt by modern researches, especially of Professor Schlyter of Lund, that these Gotland sea laws are a compilation derived from three distinct sources — a Lubeck, an OleVon and an Amsterdam source. A Saxon or Low German text of this collection was printed for the first time in 1505 at Copenhagen by Godfrey de Gemen, a native of Gouda in Holland, who is reputed to have set up the earliest printing-press in Copenhagen. This print has no title-page, and in this respect resembles the earliest known print of The' Consulate of the Sea; but upon a blank leaf, which occupies the place of a frontispiece in one of two copies of Godfrey de Gemen's text, both preserved in the royal library at Copenhagen, there has been inserted with a pen in alternate lines of black and red ink the title " Dat hogheste Gotlansche Water-Recht gedrucket to Koppenhaven Anno Domini m.d.Vi, " and there has also been inserted on the first page of the text the introductory title " Her beghynt dat hogheste Water-Recht " (here begins the supreme sea law). Professor Schlyter discovered a MS. (No. 3123) in the royal library at Copenhagen, which is written on parchment in a hand of the 15th century, and from which it seems probable that Godfrey de Gemen mainly derived his text, as it comprises the same number of articles, containing the same matter arranged in the same order, with this minor difference, that, whilst both the MS. and the print have the simple title " Water-Recht " prefixed to the first article, the MS. has also a similar title prefixed to the fifteenth. Further, as this article, together with those that follow it in the MS. appears to be in a handwriting different from that of the articles that precede, the fifteenth article may justly be considered as the first of a distinct series, more particularly as they are numbered in Roman characters,

beginning with § 1, and such characters are continued with a single interruption down to the end of the MS. Although, however, the numeration of the articles of this second series is continuous and the handwriting of the MS. from the fifteenth to the sixty-sixth article is unchanged, the text of the series is not continuous, as the fortieth article commences with an introductory clause — " This is the ordinance which the skippers and merchants have resolved amongst themselves as ship law." There is no diffi- culty in recognizing the first division of this second series of sea laws as a Low German version of the Judgments of Oleron, transmitted most probably through a Flemish text. This hypothesis would account for the substitution in several articles of Sluys for Bordeaux. On the other hand, the introductory clause which ushers in the fortieth article is identical with the title that is generally prefixed

to MSS. of the maritime Ordinances of Amsterdam, and the text of this and of the following articles down to the sixty-fifth inclusive is evidently of Dutch origin and more or less identical with Verwer's text of the usages of Amsterdamˆ M. Pardessus, in his valuable Collection de lots maritimes, published in Paris before Professor Schlyter made known the result of his researches, justly remarked that the provisions of several articles of this last division of the sea laws are inconsistent with the theory that they originated at Visby. It may be observed that the sixty-sixth article of the MS. is a Lubeck law identical with the first article of the first series, which is of Lubeck origin. No colophon is appended to this final article in the MS. Nevertheless, Godfrey de Gemen's edition of 1505, which breaks off in the middle of the sixty-sixth article of the MS., has the following colophon: " Here end the Gotland sea laws, which the community of merchants and skippers have ordained and made at Visby, that all men may regulate themselves by them. Printed at Copenhagen, a.d. M.D.v." The question naturally suggests itself, To what MS. was Godfrey de Gemen indebted for this colophon, or is the alterna- tive more probable that he devised it ? There is no known MS. of this collection of an earlier date to which an appeal can be made as an authority for this colophon ; on the contrary, the only known MSS. of which the date is earlier than Godfrey de Gemen's print, both of which are in the library of the university of Copenhagen, are without this colophon, and one of them, which purports to have been completed at Nykoping on the Eve of the Visitation of the Virgin in 1494, concludes with a colophon which

precludes all idea that anything has been omitted by the scribe, viz., " Here ends this book, and may God send us His grace, Amen." We are disposed to think that Gemen himself devised this colophon. He was engaged in printing for the first time other collections of laws for the Danish government, and, as Gotland was at that time a possession of Den- mark, he may have thus distinguished the sea laws from another collection, namely, of land laws. Professor Schlyter, however, believes Gemen may have borrowed it from a MS. which is lost, or at all events is not known. There is some support to this view in the fact that in the archives of the guildhall of Lubeck there is pre- served a MS. of 1533 which contains a Low German version of the same collection of sea laws, with a rubric prefixed to the first article announcing them to be " the water law or sea law, which is the oldest and highest law of Visby," and there are good reasons for supposing that the scribe of this MS. copied his text from a MS. other than the Copenhagen MS. The same observation will apply to a second MS. of a similar character preserved in the library of the gymnasium of Lubeck, which purports to have been written in 1537. But as regards the Visby sea laws little reliance can be placed on such rubrics or colophons as proofs of the facts recited in them, though they may be valuable as evidence of the reputed origin of the sea laws at the time when the scribe completed the MS. In illustration of this view it may be stated that in the same year in which the more recent of these two MSS. purports to have been completed— namely 1537 — there was printed at Lubeck an enlarged edition of the sea laws consisting of seventy-two articles, being a Low German translation of a Dutch text, in which six additional Dutch laws had been inserted which are not found in the Copenhagen MS., nor have a place in Gemen's text, yet to this edition is prefixed the title, " This is the highest and oldest sea law, which the community of merchants and shipmasters have ordained and made at Visby, that all persons who would be secure may regulate themselves by it." Further, it has an introductory clause to its thirty-seventh article—" This is the ordinance which the community of skippers and merchants have resolved upon amongst themselves as ship law, which the men of Zeeland, Holland, Flanders hold, and with the law of Visby, which is the oldest ship law." At the end of the seventy-second article there follows this colophon: " Here ends the Gotland sea law, which the community of merchants and mariners have ordained and made at Visby, that each may regulate himself by it. All honour be to God, mdxxxvii." Each article of this edition has prefixed to it after its particular number the word " belevinge " (judgment). It would thus appear that the Visby sea laws have fared like the Oleron sea laws : they have gathered bulk with increasing years.

The question remains to be answered, How did this collection of sea laws acquire the title of the " Visby sea laws " outside the Baltic ? for under such title they were received in Scotland in the 16th century, as may be inferred from extracts from them cited in Sir James Balfour's System of the more Ancient Laws of Scotland, which, although not printed till 1754, was completed before his death in 1583. The text of the Visby sea laws generally current in England is an English translation of a French text which Cleirac published in 1641 in his Us et coustumes de la mer, and is an abbreviated, and in many respects mutilated, version of the original sea laws. This inquiry, however, would open a new chapter on the subject of the northern sea laws, and the civilizing influence which the merchants of Visby exercised in the 13th century through their factories at Novgorod, linking thereby the trade of the Baltic to that of the Black Sea. (T. T.)

See Pardessus, Collection de lois maritimes anterieures au XVIII' Steele (6 vols., Paris, 1828-1845); Schlyter, Wisby Stadslag och Sjoratt, being vol. viii. of the Corpus Juris Sueco-Gotorum Antiqui (Lund, 1853); and The Black Book of the Admiralty, ed. by Sir Travers Twiss (4 vols., London, 1871-1876). An exhaustively

critical edition of the Rhodian sea law (given in vol. i. of Pardessus) by W. Ashburner, appeared in 1909 (Oxford, University Press). It contains valuable material not only on the Rhodian sea law, but on the various other sea laws in force on the Mediterranean coast.

SEAL-FISHERIES. Seals of all descriptions (see Seal)— whether belonging to the typical family Phocidae, or true seals, or to the Otariidae, or sea-lions and sea-bears — are of great commercial value. Whereas, however, the true seals and the sea-lions are hunted only for the sake of their hides and blubber, the sea-bears are sought on account of their valuable " seal skin " (see Carnivora; also Fur). Walruses (Odobaenidae) are hunted not only for their hides and blubber but also for the ivory of their tusks, which is, however, far less valuable than elephant-ivory. Among the more important species of sea- bears or fur-seals, which yield commercial " seal-skin," may be mentioned Otaria (Arctocephalus) austraiis of South America and the adjacent islands, including the Galapagos group and Tierra-del-Fuego; O. (A.) antarctica or pusilla of South Africa and the Crozets; O. (A.) gazella of Kerguelen Island; and O. (A.) Forsteri of the coasts of New Zealand and South-Western Australia. This group was widely distributed over the pelagic islands of the southern hemisphere, but is now practically extinct in the greater part of its habitat, although remnants of im- portance exist on Lobos Island in the mouth of the

river Plata in Uruguay, and on the islands off Cape Horn, both of which now receive protection from government. A second group is represented by Otaria (Callorhinus) ursina of the Commander Islands and Pribiloff Islands in Bering Sea, Robben Island and the Kurile Islands, Sea of Okhotsk, and other parts of the North Pacific; the forms from the different islands having received distinct specific names.

Of the southern herds little authentic information exists, but the records for the northern herds are fairly complete. At the period of its maximum development, 1870 to 1880, the herd of the Pribiloff Islands numbered about 25 million animals; that of the Commander Islands about one-half as many. The herd in the Sea of Okhotsk is one of minor importance, numbering in 1897 less than 1000 animals on Robben Island. All these herds became greatly reduced, and in 1896-1897 numbered in all not more than 600,000 animals. The typical adult male or bull (sikatch) of the second group attains maturity about the seventh year, and weighs from 400 to 500 lb. It is 6 ft. in length, with a girth of 45 ft. The fur is blackish or dark brown, with long yellowish-white hairs, especially long and firm on the back of the neck, forming the so-called " wig " or mane. The animal stands erect and runs or "lollops" along the ground when on land. The adult female, or cow (matka), is much smaller, averaging about 80 lb in weight, with length and girth in pro- portion. The fur is of varying shades of brown; she bears her first young at the age of three years.

The breeding-grounds are boulder-strewn beaches or rocky hill slopes near the shore. On these the sea-bears congregate in close-set masses called " rookeries." The unit of rookery life is the family group, or " harem," each bull collecting as many females as he can control. The number ranges from 1 to 100 or more, averaging about 30. The bulls reach the islands early in May and take up their places. The cows begin to arrive the first week in June. The number on the rookeries from day to day grows steadily to a climax about the middle of July, when about one-half are present, the number actually on the ground diminishing to about one-fourth at and after the close of the breeding season with the end of July. The single young, or pup (kotik), weighing 10 to 12 lb and jet black in colour, is born within six to forty-eight hours after the arrival of the cow. Within a week the latter is served by the bull, and by the end of another week she goes to sea to feed, returning at gradually lengthening intervals through the summer to nourish her you-ng, left in the meantime to care for itself on the rookeries. The bulls, having fasted since their arrival in May, go away in August to feed. The pups learn to swim at the age of

a month or six weeks, and in November, with the approach of winter, swim away with their mothers to the south. The winter migration of the

Pribiloff seals extends as far south as the latitude of southern California, the return course following the coast. The Com- mander seals reach the latitude of southern Japan and return on their course. The fur-seals find their food, chiefly squid, Alaska pollack, and especially a small smelt-like fish (Thero- bromus callorhini), in deep water, and their feeding-grounds in Bering Sea and on the migrations lie mainly along the 100- fathom curve.

The Commander Islands were discovered by Vitus Bering in 1 741, and our first knowledge of the northern fur-seal herds comes from the notes of Georg Wilhelm Steller, a German naturalist accompanying Bering's expedition. The Pribiloff Islands were discovered in 1786 and transferred with the territory of Alaska to the United States in 1867. Up to 1867 the catch taken by the Russian Company holding the Alaska monopoly was about 75,000 yearly. Between 1868 and 1897 the reported catch of seals from the Pribiloff herd on land was 2,440,213, and 651,282 were reported as taken by pelagic sealing; but the latter is certainly greatly under the truth. From 1867 to 1902 the fur-seal catch was worth, it has been estimated, about $35,000,000. From 1870 to 1890 the United States government leased the islands to the Alaska Commercial Company, and in 1890 the monopoly passed to the North American Commercial Company; this lease expired on the 1st of May 1910, and was not to be renewed. The catch was limited to 60,000 in 1890 and 1891; 7500 in 1892 and 1893; 20,000 in 1894; 15,000 in 1895, 20,000 in 1897; 30,000 in 1896, 1898-1903; and 15,000 in 1904, 1905 and 1906. The total number of skins shipped by the lessees from 1870 to 1906 was 2,135,248. From 1868 to 1906 the receipts from royalties on skins was $9,311,054-77, and the expenses of the United States were $1,353,015-53 (including $349,464-88 for agents, $254,051-49 for supplies to natives, $483,842-65 for Bering Sea awards and commission, and $41,000-31 for investigation of the fur-seal fisheries in 1898-1899); besides this, from 1890 to 1895 the government expended $1,410,722 for the policing of Bering Sea and the prevention of illegal pelagic hunting.

Land- killing and pelagic sealing.

The Russians worked out the principle, based on the polygamous habit of the animals, of affording absolute protection to the breeding female herd, and confining the killing to the superfluous males. The young males, or bachelors, " haul out " to rest and sleep on beaches adjacent to, but distinct from, the breeding-grounds. Here they are surrounded at night by the sealing gangs, rounded up in droves of from 1000 to 3000, and driven inland to the killing -grounds. The large droves are broken up into successive " pods,' or groups, of from 20 to 50, of which the " killable " seals (animals of three years of age or approximating to such in size) are knocked down with clubs, those too large or too small being allowed to escape. The skins are removed, salted in kenches and, when cured, are exported. The two important processes in dressing the skins are the removal of the long hairs which grow out through the short thick fur, and the dyeing of the fur itself black.

The decline in the fur-seal herds of Bering Sea is.due to the growth of a rival sealing industry — the hunting of the animals at sea with spear or shot-gun, known as pelagic sealing. 1 Stragglers from the migrating herd had from the earliest times been taken by the Indians of Cape Flattery and Vancouver Island, going out from the shore in their canoes, but the number so captured was small. In 1879, however, sailing vessels began to be used to carry the hunters and their canoes out to the main body of the herd, and to enable them to follow its movements. The industry developed rapidly, by 1892 employing a fleet of 122 sailing vessels, each with from five to twenty hunting crews. The catch at sea grew to a maximum in 1894 of 140,000 skins. The operations of the fleet gradually extended to cover the entire migration route of the herd, and in 1883 the sealers entered its summer feeding-grounds in Bering Sea. Pelagic hunting, necessarily indiscriminate, affected most seriously the herd of breeding females. Investigations carried on in Bering Sea in 1895 and 1896 show that from 62 to 84% of the pelagic catch were of this class, the death of the female involving the death of her unborn offspring, as well as that of the unweaned young. From 1870 to 1902 the " pelagic " catch has been estimated (Jordan) as 1,000,000, nearly half the corresponding total for the land-catch.

The abuse of pelagic sealing naturally created much indignation

in America. Under sanction of a claim made by Russia in 182 1 to exclusive jurisdiction in Bering Sea (a claim decided by the Paris Tribunal of 1893 to be untenable), the United States in 1886 seized

sealing vessels operating in that sea— among them Canadian vessels. This brought on a diplomatic discussion with the British government, which culminated in 1892 in a treaty by which it was agreed to submit to arbitration the claims of the United States to jurisdiction in Bering Sea in the interests of her fur-seal herd when beyond the ordinary territorial limits. The Tribunal of Arbitration met in Paris in 1893 (see Bering Sea Arbitration). Its decision was adverse to the contentions of the United States, and equally adverse to the life of the fur-seal herds. As agreed upon in such event, the tribunal formulated a set of rules for the regulation of pelagic sealing, with a view to the protection of the seals. These regulations provided for a close season in May, June and July, and a protected zone of 60 m. radius about the breeding islands. The regulations failed of their object, because the breeding females do not feed within the protected area, but far outside, and are therefore taken without restriction on the feeding-grounds in August and September, their young being left to starve.

In 1896 it was agreed between the United States and Great Britain that a new investigation of the facts of seal life should be made. At the close of this inquiry in 1897 the two Commissions met in Washington as a Joint Conference bf Fur Seal Experts, and after a discussion of the results of their labours, a substantial agreement was reached on all essential facts. On the basis of this agreement the fur-seal question passed into the hands of a Joint High Com- mission, representing Great Britain, the United States and Canada, called at Quebec in September 1898 to consider a number of questions at issue between the United States and Canada. There the matter rested. Meanwhile the herds continued to decline, and the pelagic catch itself fell rapidly with the depleted herds. ”’~. > .-.-f

The following is a summary of the fur skins from various sources over the period 1743 to 1897: —

From all sources prior to 1868

Land sealing, 1 868-1 897, Pribiloff herd

,, „ Commander herd

Pelagic sealing, 1868-1897, Pribiloff herd

,, „ Commander herd

Lobos Island skins

Cape Horn skins .....

Grand Total

3.I97.I54

2,440,213 942,736 651,283 312,247 316,746 122,390

7,982,768

1 A temporary cause for the shrinkage of the herd was the ravages of the Uncinaria, a worm which attacked the infant seals; in 1906 it seemed no longer to be present.

For a full account of the fur-seals and the fur-seal industries, reference should be made to the reports of D'Arcy W. Thompson, Commissioner for Great Britain, and his associates, for 1896 and 1897 (Parliamentary Papers, " United States," No. 3 [1897], and No. 1 [1898]), and especially to the final report of David S. Jordan, Commissioner for the United States, and his associates, for the same years (Treasury Department Document No. 2017, Fur Seals and Fur Seal Islands of North Pacific Ocean, 4 vols, and atlas, Wash- ington, 1898). Other papers of importance are: H. W. Elliott's " Monograph of the Seal Islands of Alaska," Bull. 147, U.S. Fish Commission (1882), and the report of C. H. Merriam and T. C. Mendenhall, the American Commissioners for 1891, Proc. Paris Arbitration, ii. 311-396.

SEALING WAX. In medieval times, when the principal use of sealing wax was for attaching the impression of seals to official documents, the composition used consisted of a mixture of Venice turpentine, beeswax and colouring matter, usually vermilion. The preparation now employed contains no wax. Fine red stationery sealing wax is composed of about seven parts by weight of shellac, four of Venice turpentine, and three to four of vermilion. The resins are melted together in an earthenware pot over a moderate fire, and the colouring matter is added slowly with careful stirring. The mass when taken from the fire is poured into oiled tin moulds the form of the sticks required, and when hard the sticks are polished by passing them rapidly over a charcoal fire, or through a spirit flame, which melts the superficial film. For the brightest qualities of sealing wax bleached lac is employed, and a proportion of perfuming matter — storax or balsam of Peru— is added. In the commoner qualities considerable admixtures of chalk, carbonate of magnesia, baryta white or other earthy matters are employed, and for the various

colours appropriate mineral pigments. In inferior waxes ordinary resin takes the place of lac, and the dragon gum of Australia (from Xanthorrhoea hastttis) and other resins are similarly substituted. Such waxes, used for bottling, parcelling and other coarser applications, run thin when heated, and are comparatively brittle, whereas fine wax should soften slowly and is tenacious and adhesive.

SEALS

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SEALS. The idea of testifying the personal presence or the agency of an individual on some particular occasion, by affixing the impression of his seal (Lat. sigillum, O. Fr. seel) to the record or object connected with the transaction of the moment, can be traced back among the nations of the old world when advanced only a comparatively short way on the path of civilization. In the East the custom which has prevailed for centuries, and which is a practice at the present day, of using the seal as a stamp wherewith to print its device in ink or pigment in authentication of a document is parallel to our western habit of inscribing a signature for the same purpose. In the West, too, the impression of the seal has, at certain periods, had the same value as the signature; and at all times the. connexion between the signature and the seal has been intimate in European practice (see Auto- graphs and Diplomatic). But the western method of obtaining the impression has differed from the eastern method. With us, the notion of a seal is an impression in relief, obtained from an incised design, either on a soft material such as wax or clay, or on a harder material such as lead, gold or silver. By common usage the word " seal " is employed as a term to describe both the implement for making the impression, and the impression itself ; but properly it should be confined to the latter, the graven implement being technically called the matrix.

The earliest examples of seals, both matrices and impressions, are found among the antiquities of Egypt, Babylonia and

Assyria. On the clay stoppers of wine jars of the sfjjfo remote age which goes by the name of the pre-dynastic

period, and which preceded the historic period of the first Pharaohs, there are seal impressions which must have been produced from matrices, like those of Babylonia and Assyria, of the cylinder type, the impress of the design having been repeated as the cylinder was

*rolled along the surface of the moist clay. Two such engraved cylinders of this archaic period are in the British Museum collections. The cylinder, however, seems to have been generally superseded in Egypt by the engraved scarab, or beetle-shaped object, which, it may be assumed, was used at an early time, as it certainly was in later Egyptian history, for sealing purposes, although its proper function was that of an amulet. Still, the fashion for cylinders appears to have revived at intervals, for they are found in the 6th, the 12th and the 18th dynasties. Even in the 1st dynasty, about 4500 B.C., the Egyptian Pharaohs had their official sealers, or, to use a modern expression, keepers of the Royal Seal. Egyptian signet- rings, which were used for sealing, date back to the 12 th dynasty. As already stated, the matrices of ancient Babylonian and Assyrian seals, usually cut on precious stones, are in cylinder form. Saby. The fine collection in the British Museum presents Ionian and us with Babylonian specimens of even archaic times, Assyrian followed by an historical series, the earliest of which M*ahu j s Q £ near i v 4 ,joo years B.C. The Assyrian series is*

not so full. The engraved subjects are chiefly mythological. Impressions are to be found on many of the cuneiform clay tablets. Early in the 7th century B.C. the cylinder seal gave place to the cone, the impression being henceforth obtained after the fashion followed to the present day.

The Phoenicians, as was only to be expected of those traders and artisans of the ancient world, appear to have adopted both

the cylinder of Assyria and the scarab of Egypt as clan seals. P at terns for their seals. Examples indeed are rare,

but that these people were acquainted with both forms is certain. Phoenician names are found cut both on cylinder matrices and on scarabs by the Phoenician engravers employed in Assyria and Egypt; and, when the cone-shaped matrix superseded the cylinder in Western Asia, the Phoenicians conformed to the change.

In Europe, the use of seals among the early Greeks is well known. Of the Mycenaean period numerous seal-impressions

in clay have been found. Also from ancient times seals. have survived the numerous engraved stones or

pebbles, technically called gems, which served as matrices and in most instances were undoubtedly mounted as finger-rings or were

furnished with swivels. At first' being

used in their natural forms, these pebbles or gems have been grouped as lenticular or bean-shaped, and glandular or of the sling-bolt pattern; later, from the 6th to the 4th century B.C., they were fashioned as scaraboids, that is, in the general form of the Egyptian scarab, but without the sculptured details of the beetle's body. To these, by a natural process, succeeded the matrix formed of only a thin slice of stone, which was more conveniently adapted for the bezel of the ring; and in this shape the engraved matrix passed on from the Greeks to the Romans. Signet-rings also with fixed metal bezels were in common use among the Greeks from about 600 B.C.

But while the scarab met with little favour in Greece, where, as just stated, the scaraboid was preferred, among the Etruscans its adoption was complete, and with them it became the commonest form of the seal-matrix, dating from seˆ 8 " the latter part of the 6th century B.C., engraved chiefly with subjects derived from Greek art.

Impressions of late Greekor Roman gems in clay have survived in a few instances. A series of impressions from Greek seals was found at Selinus in Sicily, dating before 249 B.C.; a small collection of sealed Greek documents on papyrus of the 4th and 3rd centuries B.C. has been discovered at Elephantine in Egypt. An interesting and very rare example of a Roman law deed sealed with gem impressions in clay is in the British Museum, recording the sale of a slave boy in a.d. 166.

It is not the object of this article to deal further with the history of antique seals (see Numismatics; also Gems, Jewelry and Ring), but to give some account of European seals of the middle ages, when the revival of their use for the authentication of documents resulted in their universal employment among all classes of society. Hence it is that we are in possession of the vast number of impressions still to be found in public museums and archives, and in private muniment rooms and antiquarian collec- tions, either attached to the original charters or other deeds which they authenticated, or as independent specimens. Hence, too, have survived a fairly large number of matrices.

The connecting link between the general use of the signet, which was required by the Roman law for legal purposes, but which had died out by the 7th century, and the revival of seals in the middle ages is to be found in the chanceries JL _■

of the Merovingian and Carolingian sovereigns, where seals. the

practice of affixing the royal seal to diplomas appears to have been generally maintained (see Diplomatic). Naturally, surviving examples of such seals are rare, but they are sufficient in number to' indicate the style adopted at different periods. The seal-ring of Childeric II. (d. 673) was found in his tomb, bearing a full-face bust and his name; and impressions of seals of later monarchs of the Merovingian line, engraved with their busts and names, have survived. Pippin the Short and the early Carolings made use of intaglios, both actual antiques and copies from them; their successors had seals of ordinary types usually showing their busts. One of the oldest matrices is an intaglio in rock crystal, now preserved at Aix-la-Chapelle, bearing a portrait head of Lothair II., king of Lorraine (a.d. 855-869), and the legend " Xpe [Ghrisle] Adiwa Hlotharium Reg." As time advanced there was a growing tendency to enlarge the royal seal. Under Hugh Capet there was (a.d. 989) a further develop- ment, the king being represented half-length with the royal insignia; and at last under Henry I. (a.d. 1031-1060) the royal seal of France was complete as the seal of majesty, bearing the full effigy of the king enthroned. In Germany, however, this full type had already been attained somewhat earlier in the seal of the emperor Henry II. (a.d. 1002-1024); and it had been used even earlier by Arnulf, count of Flanders, in 942. The royal seal thus developed as a seal of majesty became the type for subsequent seals of dignity of the monarchs of the middle ages and later, the inscription or legend giving the name and titles of the sovereign concerned.

All the early royal seals which have been referred to were

affixed to the face of the documents, that is, en placard; but in

the nth century the practice of appending the seal from thongs

I or cords came into vogue; by the 12th century it was universal.

Great seals.

Naturally, the introduction of the pendant seal invited an impression on the back as well as on the face of the disk of wax or other materia), employed. Hence arose the use of the counter- seal, which might be an impression from a matrix actually so ca.]\cd{contrasigillum) , or that of a signet or private seal

(secrelum) , such countersealing implying a personal corroboration of the sealing. The earliest seal of a sovereign of France to which a counterseal was added was that of Louis VII. (a.d. 1141), an equestrian effigy of the king as duke of Aquitaine being impressed on the reverse. When, in 1154, Aquitaine passed to the English crown, this counterseal disappeared, and eventually in subsequent reigns a fleur-de-lis or the shield of arms of France took its place. In the German royal seals the imperial eagle or the imperial shield of arms was the ordinary counterseal.

To turn to England: it appears that the kings of the Anglo- Saxon race, or at least some of them, imitated their Frankish Anglo-neighbours in using signets or other seals. There are Sa-xoa still extant an impression of the seal of Offa of Mercia ">y'i (a.d. 790) bearing a portrait head; and one of the seal of

seats. Edgar (A.D.960) , an intaglio gem. The first royal seal

of England which ranks as a " great seal " is that of Edward the Confessor, impressions of which are extant. This seal was furnished with a counterseal, the design being nearly identical with that of the obverse (fig. 1). William the Conqueror, as duke of Normandy, used an equestrian seal, representing him mounted and armed for battle. After

the conquest of England, he added a seal of majesty, copied from the seal of Henry I. of France, as a counterseal. In subsequent reigns the order of the two seals was reversed, the seal of majesty becoming the obverse, and the reverse being the equestrian seal: a pattern which has been followed, almost uniformly, down to the present day.

*Besides the two royal seals of Anglo-Saxon kings noticed above there are extant a few other seals, and there is documentary evidence of yet others, which were Anzio- used in England before the Norman Conquest; but Saxon the rarity of such examples is an indication that the private employment of seals could not have been very * eals common among our Anglo-Saxon forefathers. Berht-*

wald the thane, in 788, and ˆEthelwulf of Mercia, in 857, affixed their seals to certain documents. In the British Museum are the bronze matrices of seals of ˆEthilwald, bishop of Dunwich, about 800; of ˆElfric, alderman of Hampshire, about 985; and the finely carved ivory double matrix of Godwin the thane (on the obverse) and of the nun Godcythe (on the reverse), of the beginning of the nth century. In the Chapter Library of Durham there is the matrix of the

monastic seal of about the year 970; and in the British Museum, appended to a later charter (Harl. 45 A. 36), is the impression of the seal of Wilton Abbey of about 974.

The official practice of the Frankish kings, which, as we have seen, was the means of handing down the Roman tradition of the use of the signet, was gradually imitated by high officers of state. In the 8th century the mayors of the palace are found affixing their personal seals to royal diplomas; and, once the idea was started, the multiplication of seals naturally followed. From the end of the 10th century there was a growing tendency to their general use. From the 12th to the 1 5th century inclusive, sealing was the ordinary process of authenticating legal documents; and during that period an infinite variety of seals was in existence. The royal seals of dignity o.r great seals we have already noticed. The sovereign also had his personal seals: his privy seal, his signet. The

— Seal of Edward the Confessor.

Medieval veals.

Fig. 2.-

Antique as a

provinces, the public departments, the royal and public officers, the courts of law: all had their special seals. The numerous class of ecclesiastical seals comprised episcopal seals of all kinds, official and personal; seals of cathedrals and chapters; of courts and officials, &c. The monastic series is one of the largest, and, from an artistic point of view, one of the most important. The topographical or local series comprises the seals of cities, of towns and boroughs and of corporate bodies. Then come the vast collections of personal seals. Equestrian seals of barons and knights; the seals of ladies of rank; the armorial seals of the gentry; and the endless examples, chiefly of private seals, with devices of all kinds, sacred and profane, ranging from the finely engraved work of art down to the roughly cut merchant's mark of the trader and the simple initial letter of the yeoman, typical of the time when everybody had his seal.

*The ordinary shape of the medieval seal is round ; but there are certain exceptions. Ladies' seals and some classes of ecclesiastical and monastic seals are of pointed oval form, which is „. best adapted to receive the standing figure of lady, bishop, *« a P« s – abbot or saint: the common types in such classes. Fancifully shaped seals also*

occur, but they are comparatively rare.

In the_ middle ages the metal chiefly employed in the manufacture of matrices was bronze. Among the wealthy, silver was not uncommon; among the poor, lead was in general use. „

the 16th and 17th centuries. In the nth century a fairly large number of matrices were cut in ivory. The use of engraved gems in the early middle ages has already been noticed; but the taste for antique intaglios was not confined to any one period. In the later centuries also, particularly in the 14th century, they were set in seal matrices and finger rings. A fine GraeCo-Roman gem, bearing a female head, full face and set in a medieval setting, does duty for the head of Mary Magdalen, as seen in the accompanying cut (fig. 2).

The ordinary matrix of the middle ages was pro- vided with a ridge on the back (or, in some in- gem nse A stances, with a vertical handle), by which it could p r ; vate ^^j be held while being used for sealing, and which ^ might be pierced for suspension. Sockets for the insertion of handles are of comparatively late make. The matrix was in most instances simple, the design giving a direct impression once and for all. But there are examples of elaborate matrices composed of several pieces, from the impressions of which the seal was built up in an ingenious fashion, both obverse and reverse being carved in hollow work, through which figures and subjects impressed on an inner layer of wax are to be seen. Such examples are the seal matrix of the Benedictine priory of St Mary and St Blaise of Boxgrave in Sussex, of the 13th century, now in the British Museum (fig. 3) ; and the matrix of Southwick Priory in Hampshire, of the same period {Archaeologia, xxiii. 374). The matrix of one of the seals of Canterbury Cathedral was also constructed in the same manner.

It has usually been the custom to break up or deface the matrices of official seals when they have ceased to be valid, as, for example, at the commencement of a new reign. The seals of deceased bishops or abbots were solemnly broken in presence of the chapter or before the altar. But the legal maxim that corporations never die is well illustrated by the survival of the fine series, not-complete, indeed, but very full, of the matrices of English corporations, beginning with the close of the 1 2th century. A fine example is the corporate seal of Rochester, of the 13th century, showing the keep and battlements of the castle (fig. 4) in high relief.

The common material for re- ceiving the impressions from the matrices was beeswax, generally strengthened and hardened by

admixture with other substances, such as resin, pitch and even hemp and hair. The employment of chalk as an ingredient in many seals Waxe f ln,m of the 1 2 th century has caused them to become ex- P resstoas – tremely friable. It was a common practice to apply to such seals a coating of brown varnish. Besides the transparent yellowish-brown of the wax when used in its natural state, as it very frequently was used in the earlier middle ages, many other colours,

Fig. 3. — Seal of Boxgrave Priory : obverse.

Fig. 4. — Corporate Seal of Rochester.

especially red, dark green and dark brown, and even black, are found in medieval seals. Any attempt to classify examples by their colours fails, for, while at some periods the particular tints employed in certain chanceries may have been selected with a view

to marking the character of the documents so sealed, such practice was not con- sistently followed.

For the protection of the impression, in the 12th and 13th centuries, when it was an ordinary custom to im- press the seals on thick cakes of Wax, the surround- ing margin rising well above the field usually formed a suitable fender; at other times, as in the 14th and 15th centuries, a so-called wreath,) or twisted shred of parchment, or plaited grass or reed, was imbedded in the wax round the im- pression. But the most common process was to sew up the seal in a bag or piece of cloth or canvas, with the mistaken notion that this would ensure the seal's integrity; the ordinary result being that, on the assumption that seals thus protected needed no further care, they have been in most instances either broken or crushed to powder, fci later times, seals, especially great seals, have been frequently fitted in metal or wooden boxes.

The medieval seal may be said, in general, to be composed of two essential parts: the device, or type as it is sometimes called, and the _ . inscription or legend. It is the existence of the legend,

*j/ pe f" surrounding the device as with a border, that distinguishes **" " it from the antique engraved gem, which rarely bore an inscription and then only its field. Such antique gems as were adopted for matrices in the middle ages were usually set in metal*

mounts, on which the legends were engraved. The first and obvious reason for an inscription on a seal was to ensure identification of the owner; and therefore the names of such owners appear in the earliest examples. Afterwards, when the use of seals became com- mon, and when they were as often toys as signets, fanciful legends or mottoes appropriate to the devices naturally came into vogue. Examples of such mottoes will be given below.

A few words may be said regarding the different kinds of types or devices appropriate to particular classes or groups of medieval seals; and, although these remarks have special reference to English seals, it may be noted that there is a common affinity between the several classes of seals of all countries of western Europe, and that what is said of the seal-devices of one country may be applied in general terms to those of the rest. The types of the great seals of sovereigns have already been mentioned: a seal of majesty on the obverse, an equestrian seal on the reverse. Other royal official seals usually bear on the obverse the king enthroned or mounted, and the royal arms on the reverse. Among other official seals a very interesting type is that of the Lord High Admiral in the 15th century, several matrices of the seals of holders of the dignity having survived and being exhibited in the British Museum. That of John Holland, earl of Huntingdon, Admiral of England, Ireland and Aquitaine, 1435-

1442, is here given (fig. 5), having the usual device of a ship, on the mainsail of which are' the earl's ar- morial bearings. In ecclesi- astical seals generally, in the seals of religious foun- dations, cathedrals, monas- teries, colleges and the like, sacred subjects naturally find a place among other designs. Such subjects as the Deity, the Trinity, the Annunciation, the Nativity, the Crucifixion, the Cor- onation of the Virgin, are not uncommon. Episcopal seals more generally show the prelate prominently as a standing figure, or, less conspicuously, as kneeling in prayer before the Deity or patron saint ; the counter- seal also frequently represents him in the same posture of adoration. Chapter seals may bear the patron saint, or a representation, more or less conventional, of the cathedral; monastic seals may have figures of the Virgin Mary, or other patron saint, or of the founder, or of abbot or abbess; or the conventual building. If there be a counterseal, the figure of patron saint or founder may stand there,

Fig. 5.-

-Seal of Lord High Admiral Huntingdon.

while the building occupies the obverse. Each abbot, too, would have his own seal of dignity, generally showing him standing. Local seals of town or borough may have the image of a patron saint, or armorial device, or castle or bridge or other building (see fig. 4), or the town itself. A seaport will be indicated by a ship on the waves. The baronial seal bears the armed and mounted knight. On ladies' seals the owner is often gracefully depicted standing and holding flower or bird, or with shields of arms. After the 14th century, the figures of ladies, other than queens, vanish from seals. Armorial devices of the gentry first appear on seals at the close of the 1 2th century; and from that time there is a gradual develop- ment of the heraldic seal, which in the 14th century was often a work of fine decorative sculpture. And, lastly, the devices on fancy seals are without end in their variety.

As in all other departments of medieval art, the engraving of seals in the middle ages passed through certain well-marked developments and changes characteristic of different periods. Fine seal engraving is to be found in the productions of many of the continental nations; but in the best periods nothing can excel the work of English cutters. Beginning with the examples of the nth and 12th centuries, we find the subjects gener- ally of an archaic style, which is evidence of an early stage of the art. In the 13th century this un- developed stage has passed, and a fine, but still re- strained, quality of en- graving ensues, which, like all the allied arts of that century, charms with its simple and unpretending precision. For example, in the great seals of Henry III., something of the antique stiffness remains, but the general effect and the finish of the details are admirable. We may refer also again to the Boxgrave seal (fig. 3) as a fine specimen of 13th cen- tury architectural carving. But the most beautiful seal of this period, and in

many respects the most beautiful medieval seal in existence, is the monastic seal of Merton Priory, in Surrey, of the year 1 241. An engraving of the obverse, the Virgin and Child, is here given (fig. 6) . The Merton seal is the work of a master hand treating his subject with wonderful breadth and freedom. As the century advances, a more graceful movement in the figures is discernible. For instance, the great seal of Edward I. shows a de- parture from the severe simplicity of his pre- decessor in the addition of decorative architec- tural details, and in the easier action of the equestrian figure, which in this instance is of a strikingly fine type. Com- parable with it is the remarkable baronial equestrian seal of Robert Fitz-Walter (fig. 7), 1

298-1304, the silver matrix of which is in the British Museum collections.

The work of the 14th century is marked by a great develop- ment in decoration. Where the artist of the former century would have secured his effect by simple, firm lines, the new school trusted to a more superficial style, in which ornament rather than

Fig. 6. — Merton Priory Seal.

Fig. 7. — Seal of Robert Fitz-Walter.

form is the leading motive. The new style is conspicuous in the great seals and other official seals of Edward III., as well as in other classes. The 14th century is also the period of enriched canopies, of niches and pinnacles and of other details of monu- mental sculpture reproduced in its seals. A very beautiful and

typical example of the best work of this period is to be seen in the seal of Richard de Bury, bishop of Durham from 1333 to 1345 (fig. 8). It is to be remarked that the standing figure of the bishop in episcopal seals, of the abbot in monastic seals and of the lady in ladies' seals, which was so persistent from the 12th century onwards, proved to be the happy cause of the maintenance of the elegant oval shape in examples of these classes, wherein some of the best balanced de- signs are to be found.

The 1 5th century brought with it to seal- engraving, as it did to other departments of medieval art, the elements of decadence. The execution becomes of a more mechanical type; the strength of the 13th century and the gracefulness of the 14th century have passed; and, while examples of great elaboration were still produced, the tendency grows to overload the decoration. This defect is noticeable, for example, in the elaborate great seals of the Henries of the 15th century, as compared with the finer types of their predecessors. As a good example of the middle

Fig. 8. — Seal of Richard de Bury, late 14th century.

Mottoes.

Fig. 9. — Seal of King's College, Cambridge.

of the century, the seal of King's College, Cambridge, of about the year 1443, is here given (fig. 9), showing the Virgin in glory in the centre, between St Nicholas and King Henry VI.

With the rise of the period of the Renaissance, like other medieval arts, seal-engraving passed out of the range of the traditions of the middle ages and came under the influence of the derived classical or pseudo-classical sentiment. There is, therefore, no need to pursue the subject further.

We close this portion of the present article with specimens of the legends or mottoes which are to be found on the innumerable personal seals of the 13th, 14th and 15th centuries. They are of great variety, and many of them are very interesting, both on account of the devices which they accompany and the sentiments which they express. In English seals they are found composed in Latin, in French, and in the vernacular. First there are legends describing the quality of the seal or conveying a message to the recipient of the missive, as : — Priv6 su (suis); prive su et poi conu (peu connu); sigillum secreti; secreti nuntius; je su mute; lei (loial) ami muet; je su sel bon e leel; veici parti lei; clausa secreta tego; signo secreta signo; secreta gero; si frangis, revelo; f range, lege, tege; brusset, liset, et celet; accipe, f range, lege; claude, repone, tege; missa lege, lecta tege; tecta lege, lecta tege; briset, vaez, lisez, craez; tene fidem; tenet la foy; softe and fay re. Seals with love mottoes are numerous: — sigillum pacis et amoris; je suy damurs; je su seel damur lei; seel de saluz e damur; de li penset par ki me avet; jeo su ci en lu dami; penset de li par ki su ci; ase for the treweste; ami amet, car lei ami avet; amye amet, mon quer avet; mun quer avet, ben le garde; mun cuer avet, ne le deceve; penset de moi, e je de vus; mon quer jolye a vos doin, amye; je suy flur de lei amur; love me and I the; if the liket, mi love holde; poi vaut vivre sans lei ami. The lion is a not uncommon device: — Je su lion bon par avisoun; sum leo, quovis eo, non nisi uera veho; je su rey des bestes; leo tegit secretum. A lion dormant: — Ci repose le lion; ici dort le lion fort; wake me no man. A lion dormant on a rose, the symbol of secrecy:— Ben pur celer, gis sur roser; ici repose liun en la rose; de su la rose le lion repose. Rustic life is represented by a squirrel: — I crake notis; I krak nots; I bite notes: by a hare, or a hare riding a dog: — Sohou, sohou; sohou, mutel; sohou, Robin; sohou, je le voi; sohou, je lai trouve; je vois a bois; by a hare in a tree: — Sohou, scut, ware I cut: by a monkey riding a dog or goat: — Allone I ride, I hunt; allone I ride, have I no swayn: by a stag: — Alas, Bowles: by a dog: — hobbe, dogge, hobbe; garez ben le petit chen: by a hawk seizing a bird: —

Alas, je su pris. And more than one example bears the motto: — By the rood, women ar wood (mad).

Bullae. — As stated above, metal seals, as well as seals in soft materials, have been employed in European countries under certain conditions. These are technically called " bullae " (Lat. bulla, a boss, or circular metal ornament), and necessarily they were in all cases suspended from the documents, and they bore a design on both obverse and reverse. In the southern countries of Europe, where wax would be affected by the warmth of the climate, it was natural that a harder material should also be used. Hence the leaden bulla was a recognized form of seal during the middle ages in the Peninsula, in southern France, in Italy, and in the Latin East. The best-known series is the papal series of leaden seals which have lent their name to the documents of the papal chancery which they authenticate, popularly known as papal " bulls." The earliest extant example of this series is of the year 746 (see Diplomatic). Leaden seals were also used by the archbishops of Ravenna and other prelates of Italy; also to some extent by officials of a lower rank, and by certain communes. The official seals of the doges of Venice and of Genoa and of other dignitaries of those states were also of lead. The sovereigns of Spain, too, made use of the same material; and in the Byzantine empire leaden bullae seem to have been universally employed, not only by emperors and state officials but also by private persons. Even in the north, metal bullae were also occasionally in use. Certain Carolingian monarchs, probably copying the practice of the papal chancery, issued diplomas authenticated by leaden seals, examples of the reign of Charles the Bald being still extant. The fashion even spread to Britain, as is proved by the existence in the British Museum of a leaden bulla of Ccenwulf of Mercia, a.d. 800-810. In Germany, too, bishops occasionally made use of leaden seals. But, while lead was the ordinary material for the metal seal, a more precious substance was occasionally used. On special occasions golden bullae were issued by the Byzantine emperors, by the popes,

by the Carolings, although no actual examples of the last have survived, by the emperors of Germany, and by other sovereigns and rulers. Such specimens as have descended to us show that the golden bulla of the middle ages was usually hollow, being formed of two thin plates of metal stamped with the designs of obverse and reverse,

soldered together at the edges and padded with wax or plaster. On rare occasions it was of solid gold. The popes attached golden bullae to their confirmations of the elections of the emperors in the 12th and 13th centuries; and they issued them on such occasions as when Leo X. conferred on Henry VIII. the title of Defender of the Faith, in 1521; on the coronation of Charles V., 153°; on the erection of the arch- bishopric of Lisbon into a patriarchate in 17 16, &c; and quite recently papal golden bullae have been conferred on royal personages. Comparatively few examples of golden bullae have survived. The value of the metal sufficiently accounts for their scarcity. Some examples are in the British Museum, viz. of Baldwin II. de Courtenay, formerly emperor of Constantinople, attached to a charter of 1269; of Edmund, king of Sicily, son of Henry III. of England; and of the emperor Frederick III., 1452-1493. In the Public Record Office, of Alfonso X. of Castile, ceding Gascony to Edward, son of Henry III. of England, 1254; of Clement VII. confirming to Henry VIII. the title of Defender of the Faith, 1524 (this example being the work of Benvenuto Cellini); and of Francis I. of France, ratifying the treaty with Henry VIII., 1527 (the counterpart with Henry's bulla being in Paris).

Authorities. — W. de G. Birch, Catalogue of Seals in the British Museum (6 vols., 1887-1900); A. Wyon, The Great Seals of England (1887); G. Pedrick, Borough Seals of the Gothic Period (1904); H. Laing, Catalogue of Ancient Scottish Seals (1858, 1866); Douet d'Arcq, Collection de sceaux (Inventaires et documents des archives de I' Empire) (3 vols., 1863-1868); G. Demay, Inventaire des sceaux de la Flandre (2 vols., 1873), de I'Artois et de la Picardie (1877), de ta Nurrr.zv.die (1881); G. Schlumberger, Sigillographie de V empire byzantin (1884); I. von Pflugk-Hartung, Specimina selecta char- tarum pontificum Romanorum (for papal bullae) (1885-1887); Cata- logue of Engraved Gems in the Dept. of Greek and Roman Antiquities (British Museum, 1888); F. H. Marshall, Catalogue of the Finger- Rings, Greek, Etruscan, and Roman, in the British Museum (1907) ; E. Babelon, Histoire de la gravure sur gemmes en France (1902). There are also numerous papers on seals in Archaeologia and in the Proceedings of the Society of Antiquaries, and in the archaeological journals. Handbooks on diplomatic devote some attention to seals, e.g. A. Giry, Manuel de diplomatique (1894); H. Bresslau, Handbuch der Urkundenlehre fur Deutschland und Italien (1889). (E. M. T.)

SEALSFIELD, CHARLES, the pseudonym of Karl Anton Postl (1 793-1864), German novelist, who was born on the 3rd of March 1703 at Poppitz near Znaim in Moravia. His schooling completed, he

entered the Kreuzherrenorden in Prague, where he became a priest, but in the autumn of 1822 he fled to America, where he assumed the name of Charles Sealsfield. In 1826 he returned to Germany and published a book on America (Die Vereinigten Slaaten von Nordamerika) , which was followed by an outspoken criticism of Austria, written in English (Austria as i! is, 1828) and published anonymously in London. Meanwhile he had returned to America, where he published his first novel, also in English, Tokeah, or the White Rose (1828). He now turned journalist, first in New York and subsequently in Paris and London, as correspondent for various journals. In 1832 he settled in Switzerland, and in i860 purchased a small estate near Solothurn. Here he died on the 26th of May 1864. His will first revealed the fact that he was the former monk, Postl.

It is as a German novelist that he is best known. His Tokeah appeared in German under the title Der Legitime und die Republikaner (1838), and was followed by Der Virey und die Aristokraten (1835). Lebensbilder aus beiden Hemispharen (1835-1837), Sturm-, Land- und Seebilder (1838), Das Kajiltenbuch, oder.Nationale Charak- teristiken (1842). Sealsfield occupies an important position in the development of the German historical novel at a period when Scott's influence was beginning to wane. He endeavoured to widen the scope of historical fiction, to describe great national and political movements, without forfeiting the sympathy of his readers for the individual characters of the story.

Sealsfield's Gesammelte Werke appeared in 18 vols. (1 84.3- 1 846) ; his chief novels are also to be obtained in modern reprints. See KertWny, Erinnerungen an Sealsfield (1864); L. Schmolle, Charles

Sealsfield (1875); L. Hamburger, Sealsfield-Postl, bisher unveroffenl- lichte Brief e (1879) ; A. B. Faust, Charles Sealsfield, der Dtchter beider Hemispharen (1896).

SEAMAN, OWEN (1861-), English humorist and author, was educated at Shrewsbury school and Clare College, Cambridge, where he took a first-class in the classical tripos in 1883; in the next year he became a master at Rossall school; and in 1890 he was appointed professor of literature at the Durham College of Science, Newcastle-on-Tyne. He was called to the bar at the Inner Temple in 1897. He was introduced to Punch in 1894, with his " Rhyme of the Kipperling," a parody of Rudyard Kipling's " Rhyme of the Three Sealers." He also wrote for The National Observer and The World. In 1894 he published a volume of parodies which is a classic of its kind, Horace at Cambridge, followed by The Battle of the Bays (1896), In

Cap and Bells (1899), Borrowed Plumes (1902), A Harvest of Chaff (1904). He joined the staff of Punch in 1897, and shortly afterwards became assistant-editor, succeeding Sir F. C. Burnand as editor in 1906.

SEAMANSHIP, the general term for the art by which vessels of all classes and sizes are handled in all conditions of weather. It is commonly distinguished from " boatmanship," but the distinction is arbitrary. In ordinary speech it is frequently used as meaning the same thing as navigation (q.v.). But the two subjects are essentially different. Navigation is a science based on observation of the sun and stars in their apparent movements, on their bearings to one another, and the earth, and on time. It may be acquired from the study of books, and by a student who has never been in sight of the sea. Seamanship is an art. Its principles may be stated in literary form, but a mastery of it can only be acquired by actual practice on the sea. The art is far older than the science, but because of its practical character its history is much more difficult to trace. Navigation, being one form of the study of mathematics and astronomy, has been written about from the beginning. Seamanship has been practised in perfection by men who were perfectly illiterate for thousands of years before any treatise on it appeared. Sea- men have at all times been, as Clarendon noted, a people apart. Till recently they have believed in practice only, and being, jealous of, and hostile to, landsmen, have generally endeavoured to preserve their knowledge as an " art and mystery " to be handed down by oral instruction from master to apprentice. Sir Henry Manwayring, whose Seaman's Dictionary appeared in 1644, claimed that it was the first treatise on seamanship ever written. After explaining that a writer who had not acquired the art by practice could not expound it, he goes on: " And as for the professed Seamen, they either want ability and dexterity to express themselves, or (as they do generally) will, to instruct any Gentleman. If any will tell me why the vulgar sort of Seamen hate landmen so much, either he or I may give the reason why they are so unwilling to instruct them in their, art, whence it is that so many gentlemen go long voyages, and return (in a manner) as ignorant and as unable to do their country service as when they went out." Though the Seaman's Dictionary did not appear in print till 1644, it is described on the title-page as having been presented to George Villiers, duke of Buckingham, the lord high admiral of Charles I., who was murdered in 1628. Manwayring's book is therefore probably, if not the first treatise on seamanship written in English, at least as old as its only rival the Accidences, or the pathway to experience necessary for. all young seamen, published in

1626, by the famous Captain John Smith, of Virginia. On the continent of Europe, as in England, while works on navigation and gunnery were common, treatises on practical seamanship date from the 17th century. The books of Manwayring and Smith are rather glossaries of terms than expositions of principles.

We are therefore left with very few documents from which to learn what the seamanship of antiquity and the middle ages was. But such testimony as we have confirms the conclusion to be drawn from our general knowledge of the construction of their ships, and of the scientific learning of their times. The old seamen were coasters, who acted on the fisherman's adage—

" If you cannot steer by the compass, steer by the land," because they had no choice. War ship and merchant ship alike clung to the coast — or if they ventured out to sea, they did so for a voyage to be counted by the hour, as, for instance, from the south-west of Sicily to the opposite coast of Africa— or they relied on regular trade winds, like the seamen who sailed from the Red Sea to the coast of Malabar going and coming with the monsoons. In spite of exceptions, more apparent perhaps than real, such as the voyages of Irish anchorites to Iceland, and of the Norsemen to that island, and to Greenland, seamanship continued to be the art of the coaster till the close of the middle ages. Chaucer's sailor has hardly lost sight of the coast. Such treatises as were written for seamen were books of pilotage. Examples will be found at the end of the Hakluyt Society's edition of Hues Tractdtus de globis. The warships, Phoenician, Greek, Roman, Norse, Byzantine and Italian throughout the middle ages, used sails only when not in action. They were rowed in battle, and the mast was lowered, or left on shore. Whenever they could they avoided passing the night at sea. Their galleys were beached or anchored close to the shore and the men landed. We know from Thucydides' narrative of the expedition to Syracuse, that the crews were landed even for their meals; from the chronicle of Ramon de Muntaner, we know that this was also the case with the best Mediterranean squadrons at the end of the 13th century. The Athenians, clinging to the coast, spent two months in going from Athens to Syracuse. Roger di Lauria, the admiral of Aragon, when coming from Sicily in circumstances of great urgency to Catalonia, went round by the coast of Africa and Spain. When under sail the ships of war and of commerce alike had, at the outside, very few sails, and generally

only one great course (see Sails) square and slung by the middle of the yard. It could be trained fore and aft by bowlines, so as to enable the vessel to sail on the wind. Under these restrictions seamanship was necessarily a limited art. From Marco Polo we learn that the seamen of the China Sea and of the Indian Ocean were coasters like their European contemporaries.

Though the art of seamanship is distinct both from the art of shipbuilding and the science of navigation, it has naturally developed with them. The discovery of the mariner's compass, the advance of astronomical knowledge, the invention of the rude early instruments of navigation, the astrolabe, the back staff, the quarter staff, loosened the dependence of the sailor on the shore. Thence came the need for larger ships, and they demanded a more developed rigging (q.v.). Modern seamanship begins with the voyage of Columbus. The previous and con- temporary voyages of the Portuguese were coasting voyages round Africa. But Columbus struck across the ocean, and within thirty years Sebastian de Elcano, who accompanied Magellan, had sailed round the.world.

Many of the seamen wrote treatises for the benefit of their fellow-seamen, but, like the Brief Compendium of the Spaniard Martin Cortes, or the Seaman's . Secrets of the Englishman John Davis, and the so-called " Waggoners " (a corruption of the name of the Dutch author Waggenaer), they were devoted to navigation, or were " rutters," i.e. route books and sailing directions. A curious little volume named Six Dialogues about Sea Service between a High Admiral and a Captain at Sea, published in London in 1685, and written by Nathaniel Boteler, contains interesting details of the seamanship of the time, but is mainly concerned with naval organiza- tion. Such a well-known text-book as The Mariners' Magazine, of Captain Samuel Sturmy, reprinted in the 17th century, from which Swift took the sea phrases used in Gulliver's Travels, is de- voted to " the doctrine of Triangles, " " Navigation," " Dialling," " Gunnery," &c. Little attention is paid to pure seamanship, and the author practically confesses that his brother seamen regarded all book knowledge as superfluous if not actually injurious. The art continued in short to be purely empirical till the middle of the 1 8th century, and it suffered from adherence to rule of thumb and want of study of principles.

The first writer on seamanship who went beyond a glossary, and who looked at the way of a ship on the sea scientifically, was a Frenchman who was not a seaman — Pierre Bouguer, royal hydro- grapher for the ports of La Croisic and of Havre, member of the

Academie Royale des Sciences, and of the British Royal Society. In 1757 he published his book De la manoeuvre des vaissaux, ou traiti de meckanique et de dynamique, dans lequel on riduit h des

solutions tres simples les problemes de marine les plus difficiles qui ont pour objet le mouvement du navire. It is to be observed that Bouguer, even at this late date, notes the lack of treatises on seamanship as compared to the abundance of books on navigation. His treatment of the theme was too scientific to be intelligible by the average sea- faring man, but his influence was gradually spread by his pupils, French and foreign. He is quoted as the dominant authority in the edition of Falconer's Dictionary issued by 'Dr Burney in 1830. Bouguer had an English follower — William Hutchinson — a merchant skipper and privateer captain, who was for some time dock master of Liverpool. In 1777 he printed, probably at Liverpool, A Treatise on Practical Seamanship; with Hints and Remarks relating thereto: designed to contribute something towards fixing Rules upon Philo- sophical and Rational Principles; to make ships, and the Management of them; and also Navigation in general more perfect, and consequently less dangerous and destructive to Health, Lives, and Property. Darcy Lever, whose Young Officers' Sheet Anchor, or a Key to the leading of Rigging and to Practical Seamanship appeared in 1835, says that Hutchinson's was then the best treatise which had appeared in English; but it suffers from a defect to which the writer confesses with perfect candour — his want of education. His early training as " cook, cabin boy, and beer drawer for the men " had not prepared him to write clearly. Darcy Lever was the standard authority of the middle of the 19th century, when the art of seamanship in sailing ships had reached its fullest development.

What that art was can now be learnt only by the study of books. Before Darcy Lever's book appeared, steam and the use of metal for the construction of ships had already been introduced. Since 1835 a revolution has been carried out in shipbuilding and seaman- ship greater than had taken place in all the previous centuries. Even as regards the sailing ship the change from wood and hemp to soft-steel and wire, together with the employment of small engines to help in hauling the yards in the larger vessels, has made a vast difference. As between the steamer and the sailing ship, the differ- ence can hardly be said to be one of degree at all. A comparison of two incidents in the history of the British navy in the 19th century will serve to illustrate the unlikeness better than any generalities. They are the similar perils, and the very dissimilar escapes of the 74-gun ship " Magnificent " on the 16th of December 1812 in the Basque

roads on the French coast, and of the cruiser " Calliope " at Apia in Samoa on the 16th of March 1888. Both were in danger of being driven on shore by storms of extreme violence. The " Magnificent " was saved by the resource of her captain, John Hayes, who, by making an unprecedented use of his masts and sails, tacked the ship when within her own breadth of a reef. Everything was done by his order and under his eye (see Naval Chronicle, vol. xxix. p. 19). Captain Kane of the "Calliope" steamed to sea by the power of the machines of his ship, which were out of his sight, below the water-line, and were handled by the engineers. The old seamanship was concerned not only with directing the course of the vessel, but with the actual control of the machinery of her motive power, for masts and sails are, after all, machines. The new seamanship directs the Course. The motive power is exercised below, out of sight, and by men whose function is radically different from that of the members of the crew who are on deck.

The old seamanship did not retire before the new without a long resistance. Until very recently it continued to be an article of faith both in navies and in the merchant service, that the sailor could only be trained in a sailing vessel. Special vessels were maintained in navies to give the desired training to young seamen and officers. But the navies of the world have found that the brief period which can be spent by young men in a special masted ship did not give an equivalent for the old training. This was inevitable, if only because these ships were also pro- vided with engines, and recourse was had to the machinery at all times of difficulty or peril — when entering and leaving harbour, when rounding awkward headlands or working off a lee-shore. The name of " seamanship " still continues to be applied to the art of handling ships under sail, and has never been made the subject of a treatise in so far as it means the management of a steamer. Perhaps it never can be. The art of constructing and managing machines is really " engineering." It is by " navigation " that the course of a ship is laid. The modern seaman who steers and guides a steamer frcm the upper deck, or the bridge, must be able to navigate, and must have such a knowledge of engineering as will tell him what he may expect from the machinery and what he must not ask it to do. But he cannot see his engines, and must perforce leave to the engineers the responsibility of handling them and the initiative in the face of sudden peril. There remain to the captain, and the officers who direct the course, the superior command and the functions of the pilot. I In addition to the books already mentioned see R. H. Dana,

SEAMEN, LAWS RELATING TO

Seaman's Manual; containing a treatise on Practical Seamanship (London, 1841); B. J. Totten, Lieut. U.S.N., Naval Text-Book (Boston, 1841); N. Tinmouth, Inquiry relative to various important points of Seamanship (London, 1845); A. H. Alston, Lieut. R.N., Seamanship and its associated duties in the Royal Navy, with a treatise on Nautical Surveying (London, i860); R. Maxwell, Seamanship and Navigation required for the examination of the Local Marine Board (London, 1869). (D. H.)

SEAMEN, LAWS RELATING TO. In most legal systems legislation has interfered to protect the seaman from the con- sequences of that imprudence which is generally supposed to be one of his distinguishing characteristics. In the United Kingdom legislation has dealt with the interests of seamen with unusual fulness of detail, proving the care bestowed by a maritime power upon those to whom its commercial success is so largely due. How far this legislation has had the efficiency which was expected may be doubtful.

For legislative purposes seamen may be divided into three classes— seamen in the royal navy, merchant seamen, and fishermen.

Seamen in the Royal Navy. — It is still lawful to impress men for the naval service (see Impressment), subject to certain exemptions (13 Geo. II. c. 17, 1740) 1 . Among persons exempt are seamen in the merchant service. In cases of emergency officers and men of the coastguard and revenue cruisers, seamen riggers and pensioners may be required to serve in the navy (Naval Volunteers Act 1853). There appears to be no other instance (now that balloting for the militia is suspended) where a subject may be forced into the service of the crown against his will. The navy is, however, at the present day wholly re- cruited by voluntary enlistment (see the Naval Enlistment Acts, j 83 5 to 1884). Special advantages are afforded by the Merchant Shipping Act 1894 to merchant seamen enlisting in the navy. They are enabled to leave their ship without punish- ment or forfeiture in order to join the naval service. The dis- cipline of the navy is, unlike that of the army, for which an annual act is necessary, regulated by a permanent act of parliament, that now in force being the Naval Discipline Act 1866. In addition to numerous hospitals and infirmaries in the United Kingdom and abroad, the great charity of Greenwich Hospital is a mode of provision for old and disabled seamen in the navy. At present such seamen are out- pensioners only; the hospital has been for some years used as the Royal Naval College for officer students. The enactments of the

Merchant Shipping Act 1854 as to savings banks are extended to seamen in the navy by the Merchant Shipping Act 1894, s. 148. Enlistment without the licence of the crown in the naval service of a foreign state at war with another foreign state that is at peace with the United Kingdom is an offence punishable under the Foreign Enlistment Act 1870. Any person buying from a seaman or enticing a seaman to sell government property is liable to penalties under the Seamen's Clothing Act 1869 (see Navy).

Merchant Seamen. — Most of the acts dealing with this subject, commencing with 8 Eliz. c. 13, were repealed in 1854 and have since been consolidated and extended by the Merchant Shipping Acts 1894 and 1906, 1 the act of 1894 being the longest act on the statute roll. The main part of the legislation affecting seamen in the merchant service occurs in the second part of the act of 1894 and the fourth part of the act of 1906. The act of 1894 defines a seaman to be " every person (except masters, pilots, and apprentices duly indentured and registered) employed or engaged in any capacity on board any ship " (s. 742).

The act of 1894 is largely a re-enactment of the previous acts of

1854, 1862 and 1876. The law as to the engagement and discharge

of seamen has not been altered. These must take place

Engage- foeiore a superintendent only when the employment is

™ e " a ' 1 on a foreign-going ship. If the ship is a home-trade ship,

sc a J ge the signing on and discharge take place before a super-

' intendent only if the master so desire. But if the signing

on does not take place before a superintendent, the master must

cause the agreement to be read and explained to the seaman, and the

1 There are numerous Orders in Council dealing with seamen, especially as to the registration of fishing boats and the lights to be shown by them.

seaman must sign it in the presence of a witness; copies of all such agreements must be transmitted to the Board of Trade. A copy of

every agreement with the crew must be posted in some part of the ship accessible to the crew. In any British possession abroad other than that in which the ship is registered, a seaman must be engaged before a superintendent or officer of customs, and at any port abroad where there is a British consular officer, before such officer. Before a seaman can be discharged at any place abroad, the master must obtain the sanction, endorsed on the agreement with the crew, of the like officials or, in their absence, of merchants there resident. A seaman discharged in a foreign country is entitled to be provided with adequate employment on some other British ship bound to the port in His Majesty's dominions at which he was originally shipped, or to a port in the United Kingdom agreed to by the sea- man, or to be furnished with the means of returning to such port or of a passage home. The consul is charged with the duty of attending to the seamen's interests. It is a misdemeanour wrongfully to force a seaman on shore, or otherwise wrongfully leave him in any place before the completion of the voyage for which he was engaged, or the return of the ship to the United Kingdom. The only persons by whom seamen may be engaged or supplied in the United Kingdom are a superintendent, the master, the mate, a servant bona fide in the constant employ of the owner, and any person holding a licence from the Board of Trade.

At common law there was no obligation of the owner to provide a seaworthy ship, but by the act of 1876, now superseded by the act of 1894, part v., every person who sends or attempts to send, or is party to sending or attempting to send, a British ship to sea in such unseaworthy state that the life of any person is likely to be thereby endangered is guilty of a misdemeanour, unless he proves that he used all reasonable means to ensure her being sent to sea in a seaworthy state, or that her going to sea in such unseaworthy state was under the circumstances reasonable and justifiable. A master knowingly taking a British ship to sea in such unseaworthy state that the life of any person is likely to be thereby endangered is guilty of a misdemeanour. In every contract of service between the owner and the master or any seaman, and in every indenture of sea apprenticeship, an obligation is implied that the owner, master and agent shall use all reasonable means to ensure the seaworthiness of the ship. By the act of 1906 many of the provisions as to sea-worthiness was applied to foreign ships, and they may be detained in a proper case. A return of certain particulars, such as lists of crews and of distressed seamen sent home from abroad, reports on dis-charge, births and deaths at sea, must be made to the registrar-general of shipping and seamen, an officer of the Board of Trade.

The seaman is privileged in the matter of wills (see Will), and is exempt from serving in the militia (42 Geo. III. c. 90, s. 43). Assaults upon seamen with intent to prevent their working at their occupa- tion are punishable summarily by the Offences against the Person Act 1 86 1, s. 40. There are special enactments in favour of Lascars and foreign seamen on British ships, e.g. s. 125 of the act of

l8 94-

*In addition to this legislation directly in his interest, the seaman is indirectly protected by the provisions of the Merchant Shipping Acts requiring the possession of certificates of competence _ , by ships' officers, the periodical survey of ships by the „" * s ° Board of Trade, and the enactments against deck cargoes *? ers and overloading, as well as by other acts, such as the Seamen Chain Cables and Anchors Acts, enforcing a minimum strength of cables and anchors, and the Passenger Acts, under which a proper supply of life-boats and life-buoys must be provided. The duties of the seaman appear to be to obey the master in all lawful matters relating to the navigation of the ship and. to resist. enemies, to encourage him in which he may become entitled to prize money under 22 and 23 Car. II. c. n (see Prize). Any services beyond these would fall under the head of salvage service and be recompensed accordingly. There are certain offences for which the seaman is liable to be summarily punished under the act of 1894. They comprise desertion, neglect or refusal to join his ship or absence without leave, quitting the ship without leave before she is placed in security, wilful disobedience to a lawful command, either on one occasion or continued, assault upon a master or mate, combining to disobey lawful commands or to neglect duty, or to impede the navigation of the ship or the progress of the voyage, wilful damage to the ship, or embezzlement of or wilful damage to her stores or cargo and smuggling. The punishment varies from forfeiture of all or part of his wages to twelve weeks' imprisonment. Any offence committed on board is entered in the official log-book. Personation or forgery of a certificate of service or discharge is an offence punish- able by summary jurisdiction by the Seamen's and Soldiers' False Characters Act 1906.*

A master, seaman or apprentice, who by wilful breach of duty, or by neglect of duty, or by reason of drunkenness, does any act tending to the immediate loss, destruction or serious damage of the ship, or to immediately endanger the life or limb of any person belonging to or on board of the ship, or who by wilful breach of duty, &c, refuses or omits to do any lawful act proper and requisite to be done by him for preserving the ship from immediate loss, destruction, &c, is guilty of

a misdemeanour. A seaman is also punishable at common law for piracy and by statute for piracy and offences against

the Slave Trade Acts. A riotous assembly of seamen to prevent the loading or unloading of any ship or to prevent others from working is an offence under 33 Geo. III. c. 67. Deserters from Portuguese ships are punishable by 12 and 13 Vict. c. 25, and from any foreign ship by 15 and 16 Vict. c. 26, by virtue of conventions with Portugal and other foreign powers. The rating of seamen is now regulated by the Merchant Shipping Act 1894, s. 126. By that act a seaman is not entitled to the rating of " A.B." unless he has served four years before the mast, or three years or more in a registered decked fishing vessel and one year at sea in a trading vessel.

The act of 1894 enables contributions to seamen's refuges and hospitals to be charged upon the mercantile marine fund. There appears, however, to be no grant in support of seamen's hospitals out of any public funds. The principal seamen's hospital is that at Greenwich, established in 1821 and incorporated by 3 and 4 Will. IV. c. 9 under the name of " The Seaman's Hospital Society." Up to 1870 this hospital occupied the old " Dreadnought " at Greenwich, but in that year it obtained the infirmary of Greenwich Hospital from the Admiralty at a nominal rent, in return for which a certain number of beds is to be at the disposal of the Admiralty. This hospital with others is supported by voluntary contributions, in- cluding those of many foreign governments. At one time there was an enforced contribution of sixpence a month from the pay of masters and seamen towards the funds of Greenwich Hospital, levied under the powers of some of the Greenwich Hospital Acts. The payment of these contributions enabled them to receive annuities from the funds of the hospital. These " Greenwich Hospital six- pences," however, became the source of very considerable irritation and were discontinued. In their place a purely voluntary sea- men's provident fund was established, its object being to per- suade seamen to subscribe sixpence a month towards the seamen's hospital.

The remedies of the seaman for wages are an ordinary action in the king's bench division or plaint in a county court, an action in rem or in personam in the admiralty division of the High Remedies Court (in Scotland in the Court of Session), a colonial wa ˆ es ' court of admiralty, or a county court having admiralty jurisdiction, or

summary proceedings before justices, naval courts, or superintendents of mercantile marine offices. The master has now the same remedies as the seaman for his wages, under which are included all disbursements made on account of the ship. At common law he had only a personal action against the owner. He has the additional advantage of being able to ensure his wages, which a seaman cannot do. A county court having admiralty jurisdiction may entertain claims for wages where the amount claimed does not exceed £150 [County Courts (Admiralty Jurisdiction) Act 1868, s. 3]. Wages cannot be attached. They may be forfeited or reduced by desertion, smuggling, and other kinds of misconduct. In 0′ Neil v. Armstrong, 1895, 2 K.B. 418, it was held by the court of appeal that a seaman, though he had not completed the voyage, could recover his full wages where war breaking out added a risk to the employment which was not in his contemplation at the time of his engagement. In actions in all courts of admiralty jurisdiction the seaman has a maritime lien on the ship and freight, ranking next after claims for salvage and damage. The amount recoverable summarily before justices is limited to £50. Orders may be enforced by distress of the ship and her tackle. Proceedings must be taken within six months. A naval court on a foreign station may determine questions as to wages without limit of amount. 1 As a rule a seaman cannot sue abroad for wages due for a voyage to terminate in the United Kingdom. The superintendent of a mercantile marine office has power to decide any question whatever between a master or owner and any of his crew which both parties in writing agree to submit to him. These summary remedies are all preserved by the act of 1894. The act further provides that, where a question as to wages is raised before a superintendent, if the amount in question does not exceed £5, the superintendent may adjudicate finally, unless he is of opinion that a court of law ought to decide it. The Merchant Seamen Act 1880, by a section not repealed by the act of 1894, and the Workmen's Compensation Act 1906, put seamen on a level with other workmen. A county court or court of summary jurisdiction (the latter limited to claims not exceeding £10) may under the act of 1875 determine all disputes between an employer and workman arising out of their relation as such. The jurisdiction of courts of summary jurisdiction is protected by the enactment of the act of 1894, that no proceeding for the recovery of wages under £50 is to be instituted in a superior court unless either the owner of the ship is bankrupt, or the ship is under arrest or sold by the authority of such court, or the justices refer the case to such court, or neither owner nor master is or resides within 20 m. of the place where the seaman is put ashore. Claims upon allotment notes may be brought in all county courts and before

justices without any limit as to amount. In Scotland the sheriff court has concurrent jurisdiction with justices in claims for wages and upon allotment notes. The

1 In the absence of appeal the order of a naval court is conclusive. Hutton v. Ros S.S. Co., 1907, 1 K.B. 834. By s. 68 of the act of 1906 an appeal lies to the High Court of Justice.

representatives of a deceased seaman may claim damages for his death in cases within the Fatal Accidents Acts 1846 and 1864. It has been held that the action lies where the deceased is a foreign seaman on a foreign ship (Davidsson v. Hill, 1901, 2 K.B.

606).

Where a seaman is discharged before a superintendent in the United Kingdom, his wages must be paid through or in the presence of the superintendent, and in the case of home-trade ships may be so paid if the master or owner so desire. The master must in every case deliver either to the superintendent or to the seaman a full account, in a form approved by the Board of Trade, of the wages and of all deductions therefrom; such deductions will only be allowed if they have been entered by the master during the voyage in a book kept for that purpose, together with a statement of the matters in respect of which they are made. Where a seaman is left abroad on the ground of his unfitness or inability to proceed on the voyage, the account of wages must be delivered to the superintendent, chief officer of customs, consular officer, or merchants, from whom the master obtains the certificate without which he may not leave the seaman behind. To protect seamen from crimps, advance notes, or documents authorizing or promising the future payment of money on account of a seaman's wages conditionally on his going to sea from any port of the United Kingdom, and made before those wages had been earned, were from 1880 to 1889 wholly void. No money paid in respect of any such document could be deducted from a seaman's wages. Since 1889 this restriction has been removed to the extent of one month's wages, provided that the agreement with the crew contains a stipulation for such advance, but this does not extend to cases where the seaman is going to sea from any port not in the United Kingdom. In such cases there is no limitation upon the right to make any agreement for advances or to make advances to any amount.

As under the former law, the scale of provisions as amended by the act of 1906 must be entered in the agreement with the crew, and compensation made for short or bad provisions, and means are pro-

vided whereby the crew can raise complaints. In addition, in the case of ships trading or going from any port in the United Kingdom through the Suez Canal or round the Cape of Good Hope or Cape Horn, the provisions and water are put under inspection by the Board of Trade, and if they are deficient, the ship may be detained until the defects are remedied. By the act of 1906 a certificated cook must be provided for foreign-bound ships. If a seaman re- ceives hurt or injury in the service of the ship, the expense of medical attendance and maintenance, together with the cost of bringing him home, is to be borne by the owner of the ship, and cannot be deducted from wages.

The safety of the crew is aimed at by provisions which are de- signed to prevent overloading and undermanning, and generally to prevent ships from being sent to sea in an unseaworthy state. The stringency of these provisions has been much L '

increased. Life-saving appliances, according to a scale and rules prescribed by the Board of Trade, must be carried by every British ship. Except where the ship is under 80 tons register, employed solely in the coasting trade, or is employed solely in fishing, or is a pleasure yacht, the position of each deck above water must be marked by conspicuous lines, and the maximum load line in salt water, to which it shall be lawful to load the ship, must be marked at such level as may be approved by the Board of Trade below the deck line, and in accordance with tables and regulations prescribed by the Board of Trade. It is this load line which is commonly known as the Plimsoll mark. It is an offence to load a ship so as to submerge the load line, and a ship so loaded may be detained as unsafe. Dangerous goods, e.g. explosives, must not be shipped or carried without being distinctly marked as such. Timber must not be carried on deck in the winter months. In the carriage of grain cargoes, rules prescribed by the Board of Trade to prevent shifting must be complied with. The officers of the Board of Trade (subject to appeal to a court of survey from an order of final detention) have power to detain a ship which is, by reason of the defective condition of the hull, equipments or machinery, or of undermanning, overloading or improper loading, unfit to proceed to sea without serious danger to human life. Provision is made for the investigation of complaints by seamen that a ship is unfit to proceed to sea. The Public Health Act 1904 enables regulations to be made for carrying into effect international conventions as to insanitary vessels and conveyance of infection by vessels. By s. II of the Workmen's Compensation Act 1906, a ship may be detained by order of a court of record on allegation that a foreign owner is liable to pay com- pensation under the act.

The manning of British merchant ships has received much consideration, but has hitherto been little affected by statute law. The effect of the acts is thus given in the report, issued in 1896, by a Board of Trade committee on the Manning manning of merchant ships: " Since the final repeal ° ft /_£ # s of the Navigation Laws, which required that the master and three-fourths of the crew of every British ship should be British subjects, and reserved the coasting trade entirely to

Certifi- cates of masters, mates and engineers.

British ships and British seamen, the whole world has been open as a recruiting ground to British shipowners, who have not been hampered in their selection by any restriction as to colour, language, qualification, age or strength. Except with regard to certificates, which must be held by masters, officers, and engineers in certain cases, and which, moreover, may be obtained by men of any nationality, there is at present practically no bar to the employment of any person of any nationality in any capacity whatsoever on board any British ship." The Merchant Shipping Act 1897 gave power to the Board of Trade to detain ships unseaworthy by reason of undermanning, but prescribed no rules for determining when a ship is to be deemed to be under- manned. Apart from that act the law does not interfere with the number of qualifications of the crew. Nearly one-fourth the seamen employed on British ships are foreigners. Another fourth are Lascars. The figures in 1904, as given by Mr Lloyd- George in introducing the bill of 1906 in the House of Commons, were 176,000 British subjects, 39,000 aliens, 42,000 Lascars. Aliens serving on British ships may by a regulation of the home secretary (29th of April 1904) be naturalized without fee. The act of 1906 (s. 12) provided that after the 31st of December 1907 no seaman may be shipped who does not possess a sufficient knowledge of the English language to understand necessary orders, with an exception in favour of Lascars and inhabitants of a British protectorate. Pilotage certificates are not to be granted unless to British masters and mates (s. 73).

Certificates of competency as masters, mates, and engineers are granted by the Board of Trade. Such certificates are for the following grades, viz. master or first mate, or second mate, or only mate of a foreign-going ship, master or mate of a home- trade passenger ship,

first or second class engineer. By virtue of Orders in Council under section 102 of the act of 1894, certificates granted in many of the British colonies have the same force as if granted by the Board of Trade. The following are the requirements of the act as to the officers to be carried by ships : — Masters : A properly certificated master must be carried by every foreign-going ship and every home-trade passenger ship, whatever their tonnage. Mates: A mate, with the certificate of the grade of first or only mate, or master, must, in addition to the certificated master, be carried by every foreign-going ship of 100 tons or upwards, unless more than one mate is carried, in which case the first and second mates must have valid certificates appropriate to their several stations on such ship or of a higher grade; and a mate, with a certificate of the grade of first or only mate or master, must, in addition to the certificated master, be carried by every home- trade passenger ship of 100 tons or upwards. Engineers: Every foreign-going steamship of 100 nominal horse power or upwards must have two certificated engineers — the first possessing a first-class engineer's certificate, and the second possessing a second-class engineer's certificate, or a certificate of the higher grade. Every other foreign-going steamship, and every sea-going home-trade passenger steamship, is required to carry as the first or only engineer an engineer having a second-class certificate, or a certificate of the higher grade. Vessels in the home trade (i.e. United Kingdom and continent of Europe between the Elbe and Brest) are not required to carry certificated masters or officers unless they are passenger ships of 100 tons or upwards; and vessels in the foreign trade of less than 100 tons are not required to carry any mate.

*In 1898 a slight attempt was made to encourage shipowners *to carry apprentices. The Merchant Shipping Act of that year, which dealt with light dues, provided that " on proof to the satisfaction of the Board of Trade that a British ship has during any financial year carried, in accord- ance with the scale and regulations to be made by the Board of Trade, with the concurrence of the Treasury, boys between the ages of 15 and 19, there shall be paid to the owner of the ship, out of moneys to be provided by parliament, an allowance not exceeding one-fifth of the light dues paid during that year in respect of that ship. Provided that no such payment shall be made in respect of, anybody unless he has enrolled himself in the Royal Naval Reserve, and entered into an obligation to present himself for service when called upon in accordance with rules to be issued by the Admiralty." This enactment was to continue until 190; and does not seem to have been renewed. Some more efficient means will have to*

be devised if apprenticeship to the see service is to be revived; at present it has practically ceased to exist, except in the case of boys who intend to become officers.

Appren- ticeship.

Some only of the provisions of the acts apply to ships belonging to the general lighthouse authorities and pleasure yachts. But, with these exceptions, the whole of British Part II. (Masters and Seamen) applies, unless the ships not contract or subject-matter requires a different applica- registered tion, to all sea-going ships registered in the United ’” £j? e Kingdom. Where a ship is a British ship, but not registered in the United Kingdom, the provisions of Part II. apply as follows:

The provisions relating to the shipping and discharge of seamen in the United Kingdom and to volunteering into the navy apply in every case. The provisions relating to lists of the crew and to the property of deceased seamen and apprentices apply where the crew are discharged or the final port of destination of the ship is in the United Kingdom. All the provisions apply where the ship is em- ployed in trading or going between any port in the United Kingdom and any port not situate in the British possession or country in which the ship is registered. The provisions relating to the rights of seamen in respect of wages, to the shipping and discharge of seamen in ports abroad, to leaving seamen abroad, and the relief of seamen in distress in ports abroad, to the provisions, health, and accommoda- tion of seamen, to the power of seamen to make complaints, to the protection of seamen from imposition, and to discipline, apply in every case except where the ship is within the jurisdiction of the government of the British possession in which the ship is registered.

Fishermen. — The regulations respecting fishermen are con- tained chiefly in the Sea Fisheries Acts 1868 and 1883, and in the Merchant Shipping Act 1894, part iv. The Sea Fisheries Act of 1868 constituted a registry of fishing-boats, and that of 1883 gave powers of enforcing the provisions of the acts to sea fishery officers. The Merchant Shipping (Fishing-Boats) Act 1883 was passed in consequence of the occurrence of some cases of barbarous treatment of boys by the skippers of North Sea trawlers. It is now incorporated in the act of 1894.

This act provides, inter alia, that indentures of apprenticeship are to be in a certain form and entered into before a superintendent of a mercantile marine office, that no boy under thirteen is to be

employed in sea-fishery, that agreements with seamen on a fishing-boat are to contain the same particulars as those with merchant seamen, that running agreements may be made in the case of short voyages, that reports of the names of the crew are to be sent to a superintendent of a mercantile marine office, and that accounts of wages and certificates of discharge are to be given to seamen. No fishing-boat is to go to sea without a duly certified skipper. Provision is also made for special reports of cases of death, injury, ill-treatment or punishment of any of the crew, and for inquiry into the cause of such death, &c. Disputes between skippers or owners and seamen are to be determined at request of any of the parties concerned by a superintendent. Fishermen are exempt from Trinity House dues. There are numerous police provisions con- tained in various acts of parliament dealing with the breach of fishery regulations. These provisions act as an indirect protection to honest fishermen in their employment. The rights of British fishermen in foreign waters and foreign fishermen in British waters are in many cases regulated by treaty, generally confirmed in the United Kingdom by act of parliament. A royal fund for widows and orphans of fishermen has been formed, the nucleus of the fund being part of the profits of 'the Fisheries Exhibition held in London in 1883. Special provisions as to fishermen in Scotland are contained in s. 389 of the act of 1894 an d s. 83 of the act of 1906.

India and Colonies. — In India and in most British colonies there are laws affecting merchant seamen. In some cases such legislation is identical with the imperial act, but in most there are differences of more or less importance, and the colonial statutes should be consulted.

United States. — The law of the United States is in general accordance with that of England. The law relating to seamen in the navy will be found in the articles for the government of the navy (Revised Statutes, s. 1624). Legislation in the interests of merchant seamen dates from 1790. A list of the crew must be delivered to a collector of customs. The shipping articles are the same as those in use in the United Kingdom. For vessels in the coasting trade they are, with certain exceptions, to be in writing or in print. They must in the case of foreign-bound ships be signed before a shipping com- missioner appointed by the circuit court or a collector of customs, or (if entered into abroad) a consular officer, where practicable, and must be acknowledged by his signature in a prescribed form. One- third of a seaman's wages earned up to that time is due at every port where the ship unlades and delivers her cargo before the voyage is ended. They must be fully paid in gold or its equivalent within twenty days

of the discharge of the cargo. Advance notes can be made only in favour of the seaman himself or his wife or mother. There is a summary remedy for wages before a district court, a justice of the peace, or a commissioner of a district court. A shipping

commissioner may act as arbitrator by written consent of the parties. Seaworthiness is an implied condition of the hiring. There may be an examination of the ship on the complaint of the mate and a majority of the crew. The expenses of an unnecessary investigation are a charge upon the wages of those who complain. A seaman may not leave his ship without the consent of the master. For foreign-bound voyages a medicine-chest and antiscorbutics must be carried, also 60 gallons of water, 100 lb of salted meat, and 100 lb of wholesome bread for every person on board, and for every seaman at least one suit of woollen clothing, and fuel for the fire of the seaman's room. An assessment of forty cents per month per seaman is levied on every vessel arriving from a foreign port and on every registered coasting vessel in aid of the fund for the relief of sick and disabled seamen. In the navy a deduction of twenty cents per month from each man's pay is made for the same purpose. The offences and punishments are similar to those in the United Kingdom. There is also the additional offence of wearing a sheath knife on ship- board. As in England, consuls are required to provide for the passage home of destitute seamen (see Revised Statutes, §§ 4554 – 4591). A seamen's fund was constituted by the act of the 16th of July 1798, amended by subsequent legislation.

Continental European Countries. — The commercial codes contain provisions of a more or less detailed character. For France see §§ 250-272; Italy, §§ 343-380; Netherlands, §§ 394-452; Germany, Wendt, Maritime Legislation (1888). These enactments are in general accordance with British legislation. In Germany the law goes a little further than in the United Kingdom in enacting that copies of the part of the law affecting him must be handed to each seaman on his engagement at a seamen's office.

Authorities. — The works on merchant shippings, such as those of Abbott, Boyd, Kay, Maclachlan, Maude and Pollock, Temperley, and on admiralty law and. practice, such as those of Roscoe and Williams and Bruce. Also E. S. Roscoe Modern Legislation for Seamen and for Safety at Sea (1885). (J. W.)

SEA-POWER. This term is used to indicate two distinct, though cognate, things. The affinity of these two and the

indiscriminate manner in which the term has been History applied to each have tended to obscure its real signifi- term. cance. The obscurity has been deepened by the

frequency with which the term has been confounded with the old phrase, " Sovereignty of the sea," and the still current expression, " Command of the sea " (vide Sea, Command of). A discussion — etymological, or even archaeological in character — of the term must be undertaken as an introduction to the explanation of its now generally accepted meaning. It is one of those compound words in which a Teutonic and a Latin (or Romance) element are combined, and which are easily formed and become widely current when the sea is concerned. Of such are " sea-coast," " sea-forces " (the " land- and sea- forces " used to be a common designation of what we now call the "Army and Navy"); "sea-service," "sea-serpent" and " sea-officer " (now superseded by " naval officer "). The term in one form is as old as the 15th century. Edward III., in com- memoration of the naval victory of Sluys, coined gold " nobles " which bore on one side his effigy " crowned, standing in a large ship, holding in one hand a sword and in the other a shield." An anonymous poet, who wrote in the reign of Henry VI., says of this coin : —

" For four things our noble showeth to me, King, ship and sword, and power of the sea."

Even in its present form the term is not of very recent date. Grote (Hist, of Greece, v. 67, published in 1849, but with preface dated 1848) speaks of " the conversion of Athens from a land-power into a sea-power." In a lecture published in 1883, but probably delivered earlier, the late Sir J. R. Seeley says that " commerce was swept out of the Mediterranean by the besom of the Turkish sea-power " (Expansion of England, p. 89). The term also occurred in the 9th edition of this Encyclopaedia, vol. xviii. p. 574, in the article " Persia," where we are told that Themistocles was " the founder of the Attic sea-power." The sense in which the term is used differs in these extracts. In the first it means what we generally call a " naval power " — that is to say, a state having a considerable navy in contra- distinction to a " military power," a state with a considerable army but only a relatively small navy. In this sense there are many old uses of the phrase. In the last two extracts it means all the elements of the naval strength of the state referred to; and this is the meaning that is now generally, and is likely to be

exclusively, attached to the term owing to the brilliant way in which it has been elucidated by Captain A. T. Mahan of the United States Navy.

The double use of the term is common in German, though in that language both parts of the compound now in use are Teutonic. One instance out of many may be cited from the historian Adolf Holm (Griechische Geschichte, Berlin, 1889). He says (ii. p. 37) that Athens, being in possession of a good naval port, could become " eine bedeutende Seemacht," i.e. an important naval power. He also says (ii. p. 91) that Gelon of Syracuse, besides a large army (Heer), had " eine bedeutende Seemacht," meaning a considerable navy. The term, in the first of the two senses, is old in German, as appears from the following, extracted from Zedler's Grosses Universal Lexicon, vol. xxxvi. (Leipzig and Halle, 1 743); " Seemachten, Seepotenzen; Latin, summae potestates mari potentes." " Seepotenzen " is probably quite obsolete now. It is interesting as showing that German no more abhors Teuto-Latin or Teuto-Romance compounds than English. We may note, as a proof of the indeterminate meaning of the expression until his own epoch-marking works had appeared, that Mahan himself in his earliest book, Influence of Sea-power on History (1890), used it in both senses. He says (p. 35), " The Spanish Netherlands ceased to be a sea-power." He alludes (p. 42) to the development of a nation as a " sea-power," and (p. 43) to the inferiority of the Confederate States " as a sea-power." Also (p. 225) he remarks of the war of the Spanish Succession that " before it England was one of the sea-powers, after it she was the sea-power without any second." In all these passages, as appears from the use of the indefinite article, what is meant is a naval power, or a state in possession of a strong navy. The other meaning of the term forms the general subject of Mahan's writings. In his earlier works Mahan writes " sea power " as two words; but in a published letter of the 19th February 1897 he joins them with a hyphen, and defends this formation of the term and the sense in which he uses it. We may regard him as the virtual inventor of the term in its more diffused meaning, for — even if it had been employed by earlier writers in that sense — it is he beyond all question who has given it general currency. He has made it impossible for any one to treat of sea-power without frequent reference to his writings and conclusions.

There is something more than mere literary interest in the fact that the term in another language was used more than two thousand years ago. Before Mahan no historian — not Apprec i a . even one of those who specially devoted themselves to tion of the narration of naval occurrences — had evinced a sea'power more correct

*appreciation of the general principles of V*** naval warfare than Thucydides. He alludes several times to the importance of getting command of the sea. Great Britain would have been saved some disasters and been less often in peril had British writers — taken as guides by the public — possessed the same grasp of the true principles of defence as Thucydides exhibited. One passage in his history is worth quoting. Brief as it is, it shows that on the subject of sea-power he was a predecessor of Mahan. In a speech in favour of pro-secuting the war, which he puts in the mouth of Pericles, these words occur: 01 ph> yap ovx f^ovo-LV aWrjv avriXafieiv a/xaxtl, T)jxiv Si kort, 717 7roXX7/ koX kv VT]ffots Kal nar' f/Ttipov fiiya yap rb rrjs daXao-aris Kparos. The last part of this extract, though often translated " command of the sea," or " dominion of the sea," really has the wider meaning of sea-power, the " power of the sea " of the old English poet above quoted. This wider meaning should be attached to certain passages in Herodotus' (iii. 122 in two places; v. 83), which have been generally inter- preted " commanding the sea," or by the mere titular and honorific " having the dominion of the sea." One editor of Herodotus, Ch. F. Baehr, did, however, see exactly what was meant, for, with reference to the allusion to Polycrates, he says, classe maximum valuit. This is perhaps as exact a definition of sea-power as could be given in a sentence.*

*It is, however, impossible to give a definition which would be at the same time succinct and satisfactory. To say that " sea- power " means the sum total of the various elements Can onlybe that go to make up the naval strength of a state would explained be in reality to beg the question. Mahan lays down *&< < >»*■ the " principal conditions affecting the sea-power of caUy ' nations," but he does not attempt to give a concise definition of it. Yet no one who has studied his works will find it difficult*

to understand what it indicates. Our present task is, within the necessarily restricted limits of an article in an encyclopaedia,

to put readers in possession of the means of doing this. The

best, indeed — as Mahan has shown us — the only effective way of attaining this object is to treat the matter historically. What- ever date we may agree to assign to the formation of the term itself, the idea — as we have seen — is as old as history. It is not intended to

give a condensed history of sea-power, but rather an analysis of the idea and what it contains, illustrating this analysis with examples from history ancient and modern. It is important to know that it is not something which originated in the middle of the 17th century, and having seriously affected history in the 18th, ceased to have weight till Captain Mahan appeared to comment on it in the last decade of the 19th. With a few masterly touches Mahan, in his brief allusion to the second Punic war, has illustrated its importance in the struggle between Rome and Carthage. What has to be shown is that the principles which he has laid down in that case, and in cases much more modern, are true and have been true always and everywhere. Until this is perceived there is much history which cannot be understood, and yet it is essential to the welfare of Great Britain as a maritime power that she should understand it thoroughly. Her failure to understand it has more than once brought her, if not to the verge of destruction, at any rate within a short distance of serious disaster.

The high antiquity of decisive naval campaigns is among the most interesting features of international conflicts. Nothwith- Eariy standing the much greater frequency of land wars,

manifests- the course of history has been profoundly changed tions ot more often by contests on the water. That this has not sea-power. rece j vec j t jj e no tj ce jt deserved is true, and Mahan tells us why. " Historians generally, " he says, " have been unfamiliar with the conditions of the sea, having as to it neither special interest nor special knowledge; and the profound determining influence of maritime strength on great issues has consequently been overlooked. " Moralizing on that which might have been is admittedly a sterile process; but it is some- times necessary to point, if only by way of illustration, to a possible alternative. As in modern times the fate of India and the fate of North America were determined by sea-power, so also at a very remote epoch sea-power decided whether or not Hellenic colonization was to take root in, and Hellenic culture to dominate, central and northern Italy as it dominated southern Italy, where traces of it are extant to this day. A moment's consideration will enable us to see how different the history of the world would have been had a Hellenized city grown and prospered on the Seven Hills. Before the Tarquins were driven out of Rome a Phocaean fleet was encountered (537 B.C.) off Corsica by a combined force of Etruscans and Phoenicians, and was so handled that the Phocaeans abandoned the island and settled on the coast of Lucania (Mommsen, Hist. Rome, English trans, i. p. 153). The enterprise of their navigators had built up for the Phoenician cities and their great off-shoot Carthage, a sea-power which enabled them to gain the

practical sovereignty of the sea to the west of Sardinia and Sicily. The control of these waters was the object of prolonged and memorable struggles, for on it — ■ as the result showed — depended the empire of the world. From very remote times the consolidation and expansion, from within outwards, of great continental states have had serious conse- quences for mankind when they were accompanied by the acquisition of a coast-line and the absorption of a maritime population. We shall find that the process loses none of its importance in recent years. " The ancient empires, " says the historian of Greece, Ernst Curtius, " as long as no foreign elements had intruded into them, had an invincible horror of the water." When the condition, which Curtius notices in parentheses, arose the " horror " disappeared. There is something highly significant in the uniformity of the efforts of Assyria, Egypt, Babylon and Persia to get possession of the maritime resources of Phoenicia. Our own immediate posterity will perhaps have to reckon with the results of similar efforts in our own day. It is this which gives a living interest to even the very ancient history of sea-power, and makes the study of it of great practical importance to us now. We shall see, as we go on, how the phenomena connected with it reappear with striking regularity in successive periods. Looked

Persians.

at in this light the great conflicts of former ages are full of useful, indeed necessary, instruction.

In the first and greatest of the contests waged by the nations of the East against Europe — the Persian wars — sea-power was the governing factor. Until Persia had expanded to wars of the shores of the Levant the European Greeks had the Greeks little to fear from the ambition of the great king. The ™ conquest of Egypt by Cambyses had shown how formidable that ambition could be when supported by an efficient navy. With the aid of the naval forces of the Phoenician cities the Persian invasion of Greece was rendered comparatively easy. It was the naval contingents from Phoenicia which crushed the Ionian revolt. The expedition of Mardonius, and still more that of Datis and Artaphernes, had indicated the danger threatening Greece when the master of a great army was likewise the master of a great navy. Their defeat at Marathon was not likely to, and as a matter of fact did not, discourage the Persians from further attempts at aggression. As the advance of Cambyses into Egypt had been flanked by a fleet, so also was that of Xerxes into Greece. By the good fortune sometimes vouchsafed to a people, which, owing to its obstinate opposition to, or neglect of, a wise policy, scarcely*

deserves it, there appeared at Athens an influential citizen who understood all that was meant by the term sea-power. Themistocles saw more clearly than any of his contemporaries that, to enable Athens to play a leading part in the Hellenic world, she needed above all things a strong navy. " He had already in his eye the battle-field of the future." He felt sure that the Persians would come back, and come with such forces that resistance in the open field would be out of the question. One scene of action remained — the sea. Persuaded by him the Athenians increased their navy, so that of the 271 vessels comprising the Greek fleet at Artemisium, 147 had been provided by Athens, which also sent a large reinforcement after the first action. Though no one has ever surpassed Themistocles in the faculty of correctly estimating the importance of sea-power, it was understood by Xerxes as clearly as by him that the issue of the war depended upon naval operations. The arrangements made under the Persian monarch's direction, and his very personal movements, show that this was his view. He felt, and probably expressed the feeling, exactly as — in the war of American Independence — Washington did in the words, " What- ever efforts are made by the land armies, the navy must have the casting vote in the present contest." The decisive event was the naval action of Salamis. To have made certain of success, the Persians should have first obtained a command of the Aegean, as complete for all practical purposes as the French and English had of the sea generally in the war against Russia of 1854-56. The Persian sea-power was not equal to the task. The fleet of the great king was numerically stronger than that of the Greek allies; but it has been proved many times that naval efficiency does not depend on numerical superiority alone. The choice sections of the Persian fleet were the contingents of the Ionians and Phoenicians. The former were half-hearted or disaffected; while the latter were, at best, not superior in skill, experience, and valour to the Greek sailors. At Salamis Greece was saved not only from the ambition and vengeance of Xerxes, but also and for many centuries from oppression by an Oriental conqueror. Persia did not succeed against the Greeks, not because she had no sea-power, but because her sea-power, artificially built up, was inferior to that which was a natural element of the vitality of her foes. Ionia was lost and Greece in the end enslaved, be- cause the quarrels of Greeks with Greeks led to the ruin of their naval states.

The Peloponnesian was largely a naval war. The confidence of the Athenians in their sea-power had a great deal to do with its outbreak. The immediate occasion of the hostilities, which in time involved so many states, was the oppor- ˆesfan' tunity offered by the

conflict between Corinth and war , Corcyra of increasing the sea-power of Athens. Hither- to the Athenian naval predominance had been virtually confined to the Aegean Sea. The Corcyraean envoy, who pleaded for help at Athens, dwelt upon the advantage to be derived by the

Athenians from alliance with a naval state occupying an im- portant situation " with respect to the western regions towards which the views of the Athenians had for some time been directed" (Thirlwall, Hist. Greece, iii. 96). It was the "weapon of her sea-power," to adopt Mahan's phrase, that enabled Athens to maintain the great conflict in which she was engaged. Repeated invasions of her territory, the ravages of disease among her people and the rising disaffection of her allies had been more than made up for by her predominance on the water. The scale of the subsequent Syracusan expedition showed how vigorous Athens still was down to the interruption of the war by the peace of Nicias. The great expedition just mentioned overtaxed her strength. Its failure brought about the ruin of the state. It was held by contemporaries, and has been held in our own day, that the Athenian defeat at Syracuse was due to the omission of the government at home to keep the force in Sicily properly supplied and reinforced. This explanation of failure is given in all ages, and should always be suspected. The friends of unsuccessful generals and admirals always offer it, being sure of the support of the political opponents of the ad- ministration. After the despatch of the supporting expedition under Demosthenes and Eurymedon no further great reinforce- ment, as Nicias admitted, was possible. The weakness of Athens was in the character of the men who swayed the popular assem- blies and held high commands. A people which remembered the administration of a Pericles, and yet allowed a Cleon or an Alcibiades to direct its naval and military policy, courted defeat. Nicias, notwithstanding the possession of high qualities, lacked the supreme virtue of a commander — firm resolution. He dared not face the obloquy consequent on withdrawal from an enterprise on which the popular hopes had been fixed; and therefore he allowed a reverse to be converted into an overwhelming disaster. " The complete ruin of Athens had appeared, both to her enemies and to herself, impending and irreparable. But so astonishing, so rapid and so energetic had been her rally, that (a year after Syracuse) she was found again carrying on a terrible struggle " (Grote, Hist. Greece, v. p. 354). Nevertheless her sea-

power had indeed been ruined at Syracuse. Now she could wage war only " with impaired resources and on g, purely defensive system." Even before Arginusae, it was seen that "superiority of nautical skill had passed to the Peloponnesians and their allies " (ibid.

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The great, occasionally interrupted, and prolonged contest between Rome and Carthage was a sustained effort on the part Struggle °f one t0 S aul anc ^ °f the °th er to keep the control of between the western Mediterranean. So completely had that Rome and control been exercised by Carthage, that she had CarU "X e ' anticipated the Spanish commercial policy in America. The Romans were precluded by treaties from trading with the Carthaginian territories in Hispania, Africa and Sardinia. Rome, as Mommsen tells us, " was from the first a maritime city and, in the period of its vigour, never was so foolish or so untrue to its ancient traditions as wholly to neglect its war marine and to desire to be a mere continental power." It may be that it was lust of wealth rather than lust of dominion that first promoted a trial of strength with Carthage. The vision of universal empire could hardly as yet have formed itself in the imagination of a single Roman. The area of Phoenician maritime commerce was vast enough both to excite jealousy and to offer vulnerable points to the cupidity of rivals. It is probable that the modern estimate of the sea-power of Carthage is much exaggerated. It was great by comparison, and of course overwhelmingly great when there were none but insignificant competitors to challenge it. Mommsen holds that, in the 4th and 5th centuries after the foundation of Rome, " the two main competitors for the dominion of the Western waters " were Carthage and Syracuse. " Car- thage," he says, "had the preponderance, and Syracuse sank more and more into a second-rate naval power. The maritime importance of the Etruscans was wholly gone. . . . Rome itself was not exempt from the same fate; its own waters were likewise commanded by foreign fleets." The Romans were for a long time too much occupied at home to take much interest in Medi-

terranean matters. The position of the Carthaginians in the western basin of the Mediterranean was very like that of the Portuguese long afterwards in India. The latter kept within reach of the sea; " nor did their rule ever extend a day's march from their ships " (R. S. Whiteway, Rise of the Portuguese Power in India. Westminster, 1889, p. 12). " The Carthaginians in Spain," says Mommsen, " made no effort to acquire the interior from the warlike native nations; they were content with the possession of the mines and of stations for

traffic and for shell and other fisheries." Allowance being made for the numbers of the classes engaged in administration, commerce and supervision, it is nearly certain that Carthage could not furnish the crews required by both a great war-navy and a great mercantile marine. No one is surprised on finding that the land-forces of Carthage were composed largely of alien mercenaries. We have several examples from which we can infer a parallel, if not an identical, condition of her maritime resources. How, then, was the great Carthaginian carrying-trade provided for? The experience of more than one country will enable us to answer this question. The ocean trade of those off-shoots or dependencies of the United Kingdom, viz. the United States, Australasia and India, is largely or chiefly conducted by shipping of the "old country." So that of Carthage was largely conducted by old Phoenicians. These may have obtained a " Carthaginian Register," or the contemporary equivalent; but they could not all have been purely Carthaginian or Liby-Phoenician. This must have been the case even more with the war-navy. British India for a considerable time possessed a real, and indeed highly efficient navy; but it was officered entirely and manned almost entirely by men from the old country. Moreover, it was small. The wealth of India would have sufficed to furnish a larger material element; but, as the country could not supply the personnel, it would have been absurd to speak of the sea-power of India apart from that of England. As soon as the Romans chose to make the most of their natural resources the maritime predominance of Carthage was doomed. The artificial basis of the latter's sea-power would not enable it to hold out against serious and persistent assaults. Unless this is perceived, it is impossible to understand the story of the Punic Wars. Judged by every visible sign of strength, Carthage, the richer, the more enter- prising, ethnically the more predominant among her neighbours, and apparently the more nautical, seemed sure to win in the great struggle with Rome which, by the conditions of the case, was to be waged largely on the water. Yet those who had watched the struggles of the Punic city with the Sicilian Greeks, and especially that with Agathocles, must have seen reason to cherish doubts concerning her naval strength. It was an anticipa- tion of the case of Spain in the age of Philip II. As the great Elizabethan seamen discerned the defects of the Spanish naval establishment, so men at Rome discerned those of the Carthaginian. Dates in connexion with this are of great signifi- cance. A comprehensive measure, with the object of " rescuing their marine from its condition of impotence " was taken by the Romans in the year 267 B.C. Four quaestores classici — in modern naval English we may perhaps call them port-admirals — were nominated, and one

was stationed at each of four ports. The objects of the Roman Senate, so Mommsen tells us, were very obvious. They were "to recover their independence by sea, to cut off the maritime communications of Tarentum, to close the Adriatic against fleets coming from Epirus, and to emancipate themselves from Carthaginian supremacy." Four years after- wards the first Punic War began. It was, and had to be, largely a naval contest. The Romans waged it with varying fortune, but in the end triumphed by means of their sea-power. The victory of Catulus over the Carthaginian fleet off the Aegadian Islands decided the war and left to the Romans the possession of Sicily and the power of possessing themselves of Sardinia and Corsica. It would be an interesting and perhaps not ' barren investigation to inquire to what extent the decline of the mother states of Phoenicia, consequent on the campaigns of Alexander the Great, had helped to enfeeble the naval efficiency of the Carthaginian defences. One thing was certain. Carthage had

now met with a rival endowed with natural maritime resources greater than her own. That rival also contained citizens who understood the true importance of sea-power. " With a states-manlike sagacity from which succeeding generations might have drawn a lesson, the leading men of the Roman Commonwealth perceived that all their coast fortifications and coast garrisons would prove inadequate unless the war-marine of the state were again placed on a footing that should command respect " (Mommsen, i. 427). It is a gloomy reflection that the leading men of the United Kingdom could not see this in i860. A thorough comprehension of the events of the first Punic War enables us to solve what, until Mahan wrote, had been one of the standing enigmas of history, -viz. Hannibal's invasion of Italy by land instead of by sea in the second Punic War. Mahan's masterly examination of this question has set at rest all doubts as to the reason of Hannibal's action (Influence on Hist. pp. 13-21). The naval predominance in the western basin of the Mediter- ranean acquired by Rome had never been lost. Though modern historians, even those belonging to a maritime country, may have failed to perceive it, the Carthaginians knew well enough that the Romans were too strong for them on the sea. Though other forces co-operated to bring about the defeat of Carthage in the second Punic War, the Roman navy, as Mahan demonstrates, was the most important. As a navy, he tells us in words like those already quoted,

" acts on an element strange to most writers, as its members have been from time immemorial a strange race apart, without prophets of their own, neither themselves nor their calling understood, its immense determining influence on the history of that era, and consequently upon the history of the world, has been overlooked."

The attainment of all but universal dominion by Rome was now only a question of time. " The annihilation of the Cartha- ginian fleet had made the Romans masters of the of Roman sea " (Schmitz, Hist. Rome, p. 256). A lodgment had dominion already been gained in Illyricum, and countries farther furthered east were before long to be reduced to submission. power ˆ 8ˆ ance at tne ma P wu ˆ show that to effect this the command of the eastern basin of the Mediterranean, like that of the western, must be secured by the Romans. The old historic navies of the Greek and Phoenician states had declined. One considerable naval force there was which, though it could not have prevented, was strong enough to have delayed the Roman progress eastwards. This force belonged to Rhodes, which in the years immediately following the close of the second Punic War reached its highest point as a naval power (C. Torr, Rhodes in Ancient Times, p. 40). Far from trying to obstruct the advance of the Romans the Rhodian fleet helped it. Hannibal, in his exile, saw the necessity of being strong on the sea if the East was to be saved from the grasp of his hereditary foe; but the resources of Antiochus, even with the mighty co- operation of Hannibal, were insufficient. In a later and more often quoted struggle between East and West— that which was decided at Actium — sea-power was again seen to " have the casting vote." When the whole of the Mediterranean coasts became part of a single state the importance of the navy was naturally diminished; but in the struggles within the declining empire it rose again at times. The contest of the Vandal Genseric with Majorian and the African expedition of Belisarius- — not to mention others — were largely influenced by the naval opera- tions (Gibbon, Decline and Fall, chaps, xxxvi., xli.).

A decisive event, the Mahommedan conquest of northern Africa from Egypt westwards, is unintelligible until it is seen _ , . how great a part sea-power played in effecting it. westward Purely land expeditions, or expeditions but slightly of Mahom- supported from the sea, had ended in failure. The medan emperor at Constantinople still had at his disposal " qu a fleet capable of keeping open the communications with his African province. It took the Saracens half a century (a.d. 647-698) to win " their way along the coast of Africa as far as the Pillars of Hercules " (Hallam, Mid. Ages, chap, vi.) ; and, as Gibbon tells us, it was not till the Commander of the Faithful had prepared a

great expedition, this time by sea as

well as by land, that the Saracenic dominion was definitely established. It has been generally assumed that the Arabian conquerors who, within a few years of his death, spread the faith of Mahomet over vast regions, belonged to an essentially non-maritime race; and little or no stress has been laid on the extent to which they relied on naval support in prosecuting their conquests. In parts of Arabia, however, maritime enter- prise was far from non-existent; and when the Mahommedan empire had extended outwards from Mecca and Medina till it embraced the coasts of various seas, the consequences to the neighbouring states were as serious as the rule above mentioned would lead us to expect that they would be. " With the con- quest of Syria and Egypt a long stretch of sea-board had come into the Saracenic power; and the creation and maintenance of a navy for the protection of the maritime ports as well as for meeting the enemy became a matter of vital importance. Great attention was paid to the manning and equipment of the fleet " (Amir Ali, Syed, Short Hist. Saracens, p. 442). At first the fleet was manned by sailors drawn from the Phoenician towns, where nautical energy was not yet quite extinct; and later the crews were recruited from Syria, Egypt and the coasts of Asia Minor. Ships were built at most of the Syrian and Egyptian ports, and " also at Obolla and Bushire on the Persian Gulf," whilst the mercantile marine and maritime trade were fostered and encouraged. The sea-power thus created was largely artificial. It drooped — as in similar cases — when the special encourage- ment was withdrawn. " In the days of Arabian energy," says Hallam, " Constantinople was twice, in 668 and 716, attacked by great naval armaments." The same authority believes that the abandonment of such maritime enterprises by the Saracens may be attributed to the removal of the capital from Damascus to Bagdad. The removal indicated a lessened interest in the affairs of the Mediterranean Sea, which was now left by the administration far behind. " The Greeks in their turn determined to dispute the command of the sea," with the result that in the middle of the 10th century their empire was far more secure from its enemies than under the first successors of Heraclius." Not only was the fall of the empire, by a rational reliance on sea-power, postponed for centuries, but also much that had been lost was regained. " At the close of the 10th century the emperors of Constantinople possessed the best and greatest part " of southern Italy, part of Sicily, the whole of what is now called the Balkan Peninsula, Asia Minor, with some parts of Syria and Armenia (Hallam, chap, vi.; Gibbon, chap. li.).

Neglect of sea-power by those who can be reached by sea brings its

own punishment. Whether neglected or not, if it is an artificial creation it is nearly sure to disappoint those who wield it when it encounters a rival power Sea 'P° wer of natural growth. How was it possible for the crusades. Crusaders, in their various expeditions, to achieve even the transient success that occasionally crowned their efforts? How did the Christian kingdom of Jerusalem contrive to exist for more than three-quarters of a century ? Why did the Crusades more and more become maritime expeditions? The answer to these questions is to be found in the decline of the Mahommedan naval defences and the rising enterprise of the seafaring people of the West. Venetians, Pisans and Genoese transported crusading forces, kept open the communications of the places held by the Christians and hampered the operations of the infidels. Even the great Saladin failed to discern the important alteration of conditions. This is evident when we look at the efforts of the Christians to regain the lost kingdom. Saladin " forgot that the safety of Phoenicia lay in immunity from naval incursions, and that no victory on land could ensure him against an influx from beyond the sea " (Amir Ali, Syed, pp. 359-360). Not only were the Crusaders helped by the fleets of the maritime republics of Italy, they also received reinforce- ments by sea from western Europe and England, on the " arrival of Malik Ankiltar [Richard Cceur de Lion] with twenty ship- loads of fighting men and munitions of war."

Participation in the Crusades was not a solitary proof of the

importance of the naval states of Italy. That they had been able to act effectively in the Levant, may have been in some measure due to the weakening of the Mohammedans by S V\[p ?/ ,er the disintegration of the Seljukian power, the move- repubUcs. me nts of the Moguls and the confusion consequent on the rise of the Ottomans. However that may have been, the naval strength of those Italian states was great absolutely as well as relatively. Sismondi, speaking of Venice, Pisa and Genoa, towards the end of the nth century, says " these three cities had more vessels on the Mediterranean than the whole of Christendom besides " {Hal. Republics, English ed. p. 29). Dealing with a period two centuries later, he declares it " difficult to comprehend how two simple cities could put to sea such prodigious fleets as those of Pisa and Genoa." The difficulty disappears when we have Mahan's explanation. The maritime republics of Italy — like Athens and Rhodes in ancient,

Catalonia in medieval and England and the Netherlands in more modern times — were "peculiariy well fitted, by situation and resources, for the control of the sea by both war and commerce." As far as the western Mediterranean was con- cerned, Genoa and Pisa had given early proofs of their maritime energy, and fixed themselves in succession to the Saracens, in the Balearic Isles, Sardinia and Corsica. Sea-power was the Themistoclean instrument with which they made a small state into a greai one.

A fertile source of dispute between states is the acquisition of territory beyond sea. As others have done before and since, the maritime republics of Italy quarrelled over this. Sea- power seemed, like Saturn, to devour its own children. In 1284, in a great sea-fight off Meloria, the Pisans were defeated by the Genoese with heavy loss, which, as Sismondi states, " ruined the maritime power " of the former. From that time Genoa, transferring her activity to the Levant, became the rival of Venice. The fleets of the two cities in 1298 met near Cyprus in an encounter, said to be accidental, that began " a terrible war which for seven years stained the Mediterranean with blood and consumed immense wealth." In the next century the two republics, " irritated by commercial quarrels " — like the English and Dutch afterwards — were again at war in the Levant. Some- times one side, sometimes the other was victorious; but the contest was exhausting to both, and especially to Venice. Within a quarter of a century they were at war again. Hostilities lasted till the Genoese met with the crushing defeat of Chioggia. " From this time," says Hallam, " Genoa never commanded the ocean with such navies as before; her commerce gradually went into decay; and the 15th century, the most splendid in the annals of Venice, is till recent times the most ignominious in those of Genoa." Venice seemed now to have no naval rival, and had no fear that any one could forbid the ceremony in which the Doge, standing in the bows of the Bucentaur, cast a ring into the Adriatic with the words, " Desponsamus te, mare, in signum veri perpetuique dominii." The result of the combats at Chioggia, though fatal to it in the long run, did not at once destroy the naval importance of Genoa. A remarkable char- acteristic of sea-power is the delusive manner in which it appears to revive after a great defeat. The Persian navy occasionally made a brave show afterwards; but in reality it had received at Salamis a mortal wound. Athens seemed strong enough on the sea after the catastrophe of Syracuse; but, as already stated, her naval power had been given there a check from which it never completely recovered. The navy of Carthage had had similar experience; and, in later ages, the power of the Turks was broken at

Lepanto and that of Spain at Gravelines not- withstanding the deceptive appearances afterwards. Venice was soon confronted oh the sea by a new rival. The Turkish naval historian, Haji Khalifeh (Maritime wars of the Turks, Mitchell's trans, p. 12), tells us that, " After the taking of Constantinople, when they [the Ottomans] spread their conquests over land and sea, it became necessary to build ships and make armaments in order to subdue the fortresses and castles on the Rumelian and Anatolian shores, and in the islands of the Mediterranean." Mahommed II. established a great naval arsenal at Constanti-

nople. In 1470 the Turks, "for the first time, equipped a fleet, with which they drove that of the Venetians out of the Grecian seas " (Sismondi, p. 256). The Turkish wars of Venice lasted a long time. In that which ended in 1503 the decline of the Venetian naval power was obvious. " The Mussulmans had made progress in naval discipline; The Venetian fleet could no longer cope with theirs. " Henceforward it was as an allied contingent of other navies that that of Venice was regarded as important. Dyer (Hist. Europe, i. p. 85) quotes a striking passage from a letter of Aeneas Sylvius, afterwards Pope Pius II., in which the writer affirms that, " if the Venetians are defeated, Christendom will not control the sea any longer; for neither the Catalans nor the Genoese, without the Venetians, are equal to the Turks."

The last-named people, indeed, exemplified once more the rule that a military state expanding to the sea and absorbing older maritime populations becomes a serious menace to sea-oowet its neighbours. Even in the 15th century Mahommed and pro- II. had made an attack on Southern Italy; but his gresaof sea-power was not equal to the undertaking. Suley- tbe Turks. man the Magnificent directed the Ottoman forces towards the west. With admirable strategic insight he conquered Rhodes, and thus freed himself from the danger of a hostile force on his flank. " The centenary of the conquest of Constanti- nople was past, and the Turk had developed a great naval power besides annexing Egypt and Syria " (Seeley, British Policy, i. 143). The Turkish fleets, under such leaders as Khair- ad-din Barbarossa), Piale and Dragut, seemed to command the Mediterranean, including its western basin; but the repulse at Malta in 1565 was a serious check, and the defeat at Lepanto in 1571 virtually put an end to the prospect of Turkish maritime dominion. The predominance of Portugal in the Indian Ocean in the early part of the 16th century had seriously diminished the Ottoman resources. The wealth derived from the trade in that ocean, the Persian Gulf and the Red Sea had supplied the Mahommedans with the sinews of

war, and had enabled them to contend with success against the Christians in Europe. "The main artery had been cut when the Portuguese took up the challenge of the Mahommedan merchants of Calicut, and swept their ships from the ocean" (Whiteway, p. 2). The sea-power of Portugal wisely employed had exercised a great, though unperceived influence. Though enfeebled and diminishing, the Turkish navy was still able to act with some effect in the 17 th century. Nevertheless, the sea-power of the Turks ceased to count as a factor of importance in the relations between great states.

*In the meantime the state which had a leading share in winning the victory of Lepanto had been growing up in the West. Before the union of its crown with that of Castile and the Spanish formation of the Spanish monarchy, Aragon had been sea-power, expanding till it reached the sea. It was united with Catalonia, Catalonia in the 12th century, and it conquered * c ' Valencia in the 13th. Its long line of coast opened the way to an extensive and flourishing commerce; and an enterprising navy indemnified the nation for the scantiness of its territory at home by the important foreign conquests of Sardinia, Sicily, Naples and the Balearic Isles. Among the maritime states of the Mediterranean Catalonia had been conspicuous. She was to the Iberian Peninsula much what Phoenicia had been to Syria. The Catalan navy had disputed the empire of the Mediter- ranean with the fleets of Pisa and Genoa. The incorporation of Catalonia with Aragon added greatly to the strength of that kingdom. The Aragonese kings were wise enough to understand and liberal enough to foster the maritime interests of their new possessions (Prescott, Ferdinand and Isabella, In trod, sects. i.,ii.). Their French and Italian neighbours were to feel, before long, the effect of this policy; and, when the Spanish monarchy had been consolidated, it was felt not only by them, but by others also. The more Spanish dominion was extended in Italy the more were the naval resources at the command of Spain augmented. Genoa became " Spain's water-gate to Italy. . . . Henceforth the Spanish crown found in the Dorias its admirals;*

British tea-power. .

their squadron was permanently hired to the kings of Spain." Spanish supremacy at sea was established at the expense of France (G. W. Prothero, in M. Hume's Spain 1470-1788, p. 65). The acquisition of a vast domain in the New World had greatly developed

the maritime activity of Castile, and Spain was as formidable on the ocean as in the Mediterranean. After Portugal had been annexed the naval forces of that country were added to the Spanish, and the great port of Lisbon became available as a place of equipment and as an additional base of operations for oceanic campaigns. The fusion of Spain and Portugal, says Seeley, " produced a single State of unlimited maritime dominion. . . . Henceforth the whole New World belonged exclusively to Spain. " The story of the tremendous catastrophe — the defeat of the Armada — by which the decline of this dominion was heralded is well known. It is memorable, not only because of the harm it did to Spain, but also because it revealed the rise of another claimant to maritime pre-eminence — the English nation. The effects of the catastrophe were not at once visible. Spain still continued to look like the greatest power in the world; and, though the English seamen were seen to be something better than adventurous pirates — a character suggested by some of their contemporary exploits — few could have comprehended that they were engaged in building up what was to be a sea-power greater than any known to history.

They were carrying forward, not beginning, the building of this. " England," says Sir J. K. Laughton, " had always _ . believed in her naval power, had always claimed

manifests- the sovereignty of the Narrow Seas; and more than tioos of two hundred years before Elizabeth came to the throne, Edward III. had testified to his sense of its importance by ordering a gold coinage bearing a device showing the armed strength and sovereignty of England based on the sea " (Armada, Introd.). It is impossible to make intelligible the course of the many wars which the English waged with the French in the middle ages unless the true naval position of the former is rightly appreciated. Why were Crecy, Poitiers, Agincourt — not to mention other combats — fought, not on English, but on continental soil ? Why, during the so-called " Hundred Years' War," was England in reality the invader and not the invaded? We of the present generation are at last aware of the significance of naval defence, and know that, if properly utilized, it is the best security against invasion that a sea-surrounded state can enjoy. It is not, however, commonly remembered that the same condition of security existed and was properly valued in medieval times. The battle of Sluys in 1340 rendered invasion of England as impracticable as did that of La Hogue in 1692, that of Quiberon Bay in 1759 and that of Trafalgar in 1805; and it permitted, as did those battles, the transport of troops to the continent to support Great Britain's allies in wars which, had she not been strong at sea, would

have been waged on the soil of her country. Her early continental wars, therefore, are proofs of the long-established efficiency of her naval defences. Notwithstanding the greater attention now paid to naval affairs, it is doubtful if Great Britain even yet recognizes the extent to which her security depends upon a good fleet as fully as her ancestors did seven centuries ago. The narrative of pre-Elizabethan campaigns is interesting merely as a story; and, when told — as, for instance, D. Hannay has told it in the introductory chapters of his Short History of the Royal Navy — it will be found instructive and worthy of careful study at the present day. Each of the principal events in England's early naval campaigns may be taken as an illustration of the idea conveyed by the term " sea-power, " and of the accuracy with which its meaning was apprehended at the time. To take a very early case, we may cite the defeat of Eustace the Monk (see Dover: Battle of) by Hubert de Burgh in 1217. Reinforcements and supplies had been collected at Calais for conveyance to the army of Prince Louis of France and the rebel barons who had been defeated at Lincoln. The reinforcements tried to cross the Channel under the escort of a fleet commanded by Eustace. Hubert de Burgh, who had stoutly held Dover for King John, and was faithful to the young Henry III., heard of

the enemy's movements. " If these people land," said he, " England is lost; let us therefore boldly meet them." He reasoned in almost the same words as Raleigh about four centuries afterwards, and undoubtedly " had grasped the true principles of the defence of England. " He put to sea and defeated his opponent. The fleet on which Prince Louis and the rebellious barons had counted was destroyed; and with it their enterprise. " No more admirably planned, no more fruitful battle has been fought by Englishmen on water " (Hannay, p. 7) . As introductory to a long series of naval operations undertaken with a like object it has deserved detailed mention here.

The 1 6th century was marked by a decided advance in both the development and the application of sea-power. Previously its operation had been confined to the Mediterranean Extending or to coast waters outside it. Spanish or Basque sphere of seamen — by their proceedings in the English Channel — • se " m had proved the practicability of, rather than been power ' engaged in, ocean warfare. The English, who withstood them, were accustomed to seas so rough, to seasons so uncertain and to weather so boisterous, that the ocean had few terrors for them. All that was wanting was a sufficient inducement to seek distant fields of action and a development of the naval art that would permit them to be reached.

The discovery of the New World supplied the first; and consequently increased length of voyages and of absence from the coast led to the second. The world had been moving onwards in other things as well as in navigation. Intercommunication was becoming more and more frequent. What was done by one people was soon known to others. It is a mistake to suppose that, because the English had been behind-hand in the exploration of remote regions, they were wanting in maritime enterprise. The career of the Cabots would of itself suffice to render such a supposition doubtful. The English had two good reasons for postponing voyages to and settlement in far-off lands. They had their hands full nearer home; and they thoroughly, and as it were by instinct, understood the conditions on which permanent expansion must rest. They wanted to make sure of the line of communications first. To effect this a sea-going marine of both war and commerce, and, for further expansion, stations on the way were essential. The chart of the world furnishes evidence of the wisdom and the thoroughness of their procedure. Taught by the experience of the Spaniards and the Portuguese, when unimpeded by the political circumstances of the time, and provided with suitable equipment, the English displayed their energy in distant seas. It now became simply a question of the efficiency of sea-power. If efficiency was not a quality of the English sea-power, then their efforts were bound to fail; and, more than this, the position of their country, challenging as it did what was believed to be the greatest of maritime states, would have been altogether precarious. The principal expeditions now undertaken were distinguished by a characteristic peculiar to the people, and not to be found in connexion with the exploring or colonizing activity of most other great nations even down to our own time. They were really unofficial speculations in which, if the govern- ment took part at all, it was for the sake of the profit expected, and almost, if not exactly, like any private adventurer. The participation of the government, nevertheless, had an aspect which it is worth while to note. It conveyed a hint — and quite consciously — to all whom it might concern that the speculations were " under-written " by the whole sea-power of England. The forces of more than one state had been used to protect its maritime trade from the assaults of enemies in the Mediterranean or in the Narrow Seas. They had been used to ward off invasion and to keep open communications across not very extensive areas of water. In the 16th century they were first relied upon to support distant commerce, whether carried on in a peaceful fashion or under aggressive forms. This, naturally enough, led to collisions. The contention waxed hot, and was virtually decided when the Armada shaped course to the northward after the fight off Gravelines.

The expeditions against the Spanish Indies and, still more, those against Philip II. 's peninsular territory had helped to define

the limitations of sea-power. It became evident, and it was made still more evident in the next century, that for a great

country to be strong it must not rely upon a navy Umtta' along it must also have an adequate and properly sea-power, organized mobile army. Notwithstanding the number

of times that this lesson has been repeated Great Britain has been slow to learn it. It is doubtful if she has learned it even yet. English seamen in all ages seem to have mastered it fully; for they have always demanded — at any rate for upwards of three centuries — that expeditions against foreign territory oversea should be accompanied by a proper number of land- troops. On the other hand, the necessity of organizing the army of a maritime insular state and of training it with the object of rendering effective aid in operations of the kind in question, has rarely been perceived and acted upon by others. The result has been a long series of inglorious or disastrous affairs, like the West Indies voyage of 1595-1596, the Cadiz expedition of 1625 and that to the lie de Re of 1627. Additions might be made to the list. The failures of joint expeditions have often been explained by alleging differences or quarrels between the naval and the military commanders. This way of explaining them, however, is nothing but the inveterate critical method of the streets by which cause is taken for effect and effect for cause. The differences and quarrels arose, no doubt ; but they generally sprang out of the recriminations consequent on, not producing, the want of success. Another manifestation of the way in which sea-power works was first observed in the 17th century. It suggested the adoption of, and furnished the instrument for, carrying out a distinct maritime policy. What was practically Appear- a standing navy had come into existence. As regards auceot England this phenomenon was now of respectable standing a g e . Long voyages and cruises of several ships in naves. company had been frequent during the latter half of the 16th century and the early part of the 17th. Even the grandfathers of the men who sailed with Blake and Penn in 1652 could not have known a time when ships had never crossed the ocean, and squadrons kept together for months had never cruised. However imperfect it may have been, a system of provisioning ships and

supplying them with stores, and of preserving discip- line among their crews, had been developed, and had proved fairly satisfactory. The parliament and the Protector in turn found it necessary to keep a considerable number of ships in commission, and make them cruise and operate in company. It was not till well on in the reign of Queen Victoria that the man-of-war's man was finally differentiated from the merchant seaman; but, two centuries before, some of the distinctive marks of the former had already begun to be noticeable. There were seamen in the time of the Commonwealth who rarely, perhaps some who never, served afloat except in a man-of-war. Some of the interesting naval families which were settled at Ports- mouth and the eastern ports, and which — from father to son — helped to recruit the ranks of bluejackets till a date later than that of the launch of the first ironclad, could carry back their professional genealogy to at least the days of Charles II., when, in all probability, it did not first start. Though landsmen continued even after the Civil War to be given naval appoint- ments, and though a permanent corps, through the ranks of which every one must pass, had not been formally established, a body of real naval officers — men who could handle their ships, super- vise the working of the armament and exercise military command

— had been formed. A navy, accordingly, was now a and"rerrf- r weapon of undoubted keenness, capable of very effective terialex- use by any one who knew how to wield it. Having panstonin tasted the sweets of intercourse with the Indies, World!"" whether in the occupation of Portugal or of Spain,

both English and Dutch were desirous of getting a larger share of them. English maritime commerce had increased and needed naval protection. If England was to maintain the international position to which, as no one denied, she was entitled, that commerce must be permitted to expand. The minds of men in western Europe, moreover, were set upon obtaining for their country territories in the New World, the

amenities of which were now known. From lie reign of James I. the Dutch had shown great jealousy of English maritime enterprise. Where it was possible, as in the East Indian Archi- pelago, they had destroyed it. Their naval resources were great enough to let them hold English shipping at their mercy, unless a grand effort were made to protect it. The Dutch conducted the carrying trade of most of the world, and the monopoly of this they were resolved to keep, while the English were resolved to share in it. The exclusion of the English from every trade- route, except such as ran by their own coast or

crossed the Narrow Seas, seemed a by no means impossible contingency. There seemed also to be but one way of preventing it, viz. by war. The supposed unfriendliness of the Dutch, or at least of an important party amongst them, to the regicide government in England helped to force the conflict. The Navigation Act of 165 1 was passed and regarded as a covert declaration of hostilities. So the first Dutch war began. It established England's claim to compete for the position of a great maritime commercial power.

The rise of the sea-power of the Dutch, and the magnitude which it attained in a short time, and in the most adverse circumstances, have no parallel in history. The case of Athens was different, because the Athenian power Ses-pow had not so much been unconsciously developed out D utcn , of a great marit ime trade, as based on a military marine deliberately and persistently fostered during many years. Thirlwall believes that it was Solon who " laid the foundations of the Attic navy " (Hist. Greece, ii. p. 52), century before Salamis. The great achievement of Themistocles was to con- vince his fellow-citizens that their navy ought to be increased! Perhaps the nearest parallel with the power of the Dutch was presented by that of Rhodes, which rested largely on a carrying trade. The Rhodian undertakings, however, were by com- parison small and restricted in extent. Motley declares of the Seven United Provinces that they " commanded the ocean " (United Netherlands, ii. 132), and that it would be difficult to exaggerate the naval power of the young Commonwealth. Even in the days of Spain's greatness English seamen positively der dined to admit that she was stronger than England on the sea; and the story of the Armada justified their view. The first two Dutch wars were, therefore, contests between the two foremost naval states of the world for what was primarily a maritime object. The identity of the cause of the first and of the second war will be discerned by any one who compares what has been said about the circumstances leading to the former, with Monk's remark as to the latter. He said that the English wanted a larger share of the trade enjoyed by the Dutch. It was quite in accordance with the spirit of the age that the Dutch should try to prevent, by force, this want from being satisfied. Any- thing like free and open competition was repugnant to the general feeling. The highroad to both individual wealth and national prosperity was believed to lie in securing a monopoly. Merchants or manufacturers who called for the abolition of monopolies granted to particular courtiers and favourites had not the smallest intention, on gaining their object, of throwing open to the enterprise of all what had been monopolized. It was to be kept for the exclusive benefit of some privileged or chartered company. It was

the same in greater affairs. As Mahan says," To secure to one's own people a disproportionate share of the benefits of sea commerce every effort was made to exclude others, either by the peaceful legislative methods of monopoly or prohibitory regulations, or, when these failed, by direct violence." The apparent wealth of Spain was' believed to be due to the rigorous manner in which foreigners were ex- cluded from trading with the Spanish oversea territories. The skill and enterprise of the Dutch having enabled them to force themselves into this trade, they were determined to keep it to themselves. The Dutch East India Company was a powerful body, and largely dictated the maritime policy of the country. We have thus come to an interesting point in the historical consideration of sea-power. The Elizabethan conflict with Spain had practically settled the question whether or not the

Effect on

Mahan's survey.

*expanding nations were to be allowed to extend their activities to territories in the New World. The first two Dutch Wars were to settle the question whether or not the ocean trade of the world was to be open to any people qualified trade. *° en S a g e m it. We can see how largely these*

were maritime questions, how much depended on the solution found for them, and how plain it was that they must be settled by naval means.

Mahan's great survey of sea-power opens in 1660, midway between the first and second Dutch Wars. " The sailing-ship era, with its distinctive features, " he tells us, " had fairly begun. " The art of war by sea, in its more important details, had been settled by the first war. From the beginning of the second the general features of ship design, the classification of ships, the armament of ships, and the handling of fleets, were to remain without essential alteration until the date of Navarino. Even the tactical methods, except where improved on occasions by individual genius, altered little. The great thing was to bring the whole broadside force to bear on an enemy. Whether this was to be impartially distributed throughout the hostile line or concentrated on one part of it depended on the character of

particular admirals. It would have been strange if a period so long and so rich in incidents had afforded no materials for forming a judgment on the real signific- ance of sea-power. The text, so to speak, chosen by Mahan is that, notwithstanding the changes wrought in naval materiel since about 1850, we can find in the history of the past instructive illustrations of the general principles of maritime war. These illustrations will prove of value not only " in those wider opera- tions which embrace a whole theatre of war," but also, if rightly applied, " in the tactical use of the ships and Weapons " of our own day. By a remarkable coincidence the same doctrine was being preached at the same time and quite independently by Vice-Admiral Philip Colomb in his work on Naval Warfare. As a prelude to the second Dutch War we find a repetition of a process which had been adopted somewhat earlier. That was the permanent conquest of trans-oceanic territory. Until the 17th century had well begun, naval, or combined naval and military, operations against the distant possessions of an enemy had been practically restricted to raiding or plundering attacks on commercial centres. The Portuguese territory in South America having come under Spanish dominion in consequence of the annexation of Portugal to Spain, the Dutch — as the power of the latter country declined — attempted to reduce part of that territory into permanent possession. This improvement on the practice of Drake and others was soon seen to be a game at which more than one could play. An expedition sent by Crom- well to the West Indies seized the Spanish island of Jamaica, which has remained in the hands of its conquerors to this day. In 1664 an English force occupied the Dutch North American settlements on the Hudson. Though the dispossessed rulers were not quite in a position to throw stones at sinners, this was rather a raid than an operation recognized warfare, because it preceded the formal outbreak of hostilities. The conquered territory remained in English hands for more than a century, and thus testified to the efficacy of a sea-power which Europe had scarcely begun to recognize. Neither the second nor the third Dutch War can be counted amongst the occurrences to which Englishmen may look back with unalloyed satisfaction; but they, unquestionably, disclosed some interesting manifesta- tions of sea-power. Much indignation has been expressed concerning the corruption and inefficiency of the English govern- ment of the day, and its failure to take proper measures for keeping up the navy. as it should have been kept up. Some, perhaps a good deal, of this indignation was deserved; but it would have been nearly as well deserved by every other govern- ment of the day. Even in those homes of political virtue where the administrative machinery was worked by, or in the interest of speculating capitalists and privileged

companies, the accumu- lating evidence of late years has proved that everything was not considered to be, and as a matter of fact, was not, exactly as it ought to have been. Charles II. and his brother, the duke of

York, have been held up to obloquy because they thought that the coast of England could be defended against a naval enemy better by fortifications than by a good fleet and, as Pepys noted, were " not ashamed of it. " The truth is that neither the king nor the duke believed in the power of a navy to ward off attack from an island. This may have been due tc want cf intellectual capacity; but it would be going a long way to put it down to personal wickedness. They have had many imitators, some in our own day. The huge forts which stud the coast of the United Kingdom, and have been erected within living memory, are monuments, likely to last for many years, of the inability of people, whom no one could accuse of being vicious, to rate sea- power at its proper value. It is much more likely that it was owing to a reluctance to study questions of naval defence as industriously as they deserved, and to that moral timidity which so often tempts even men of proved physical courage to undertake the impossible task of making themselves absolutely safe against hostile efforts at every point.

Charles II. has also been charged with indifference to the interests of his country, or worse, because during a great naval war he adopted the plan of trying to weaken the enemy by destroying his commerce. The king " took a fatal

Misap- plication.

resolution of laying up his great ships and keeping only a few frigates on the cruise." It is expressly related that this was not Charles's own idea, but that it was urged upon him by advisers whose opinion probably seemed at the time as well worth listening to as that of others. Anyhow if the king erred, as he undoubtedly did, he erred in good company. Eighteen hundred years earlier the statesmen who conducted the great war against Carthage, and whose astuteness has been the theme of innumer- able panegyrics since, took the same " fatal resolution." In the midst of the great struggle they " did away with the fleet. At the most they encouraged privateering; and with that view placed the war-vessels of the state at the disposal of captains who were ready to undertake a corsair warfare on their own account " (Mommsen, 1894, ii. 191). In much later times this method has had many respectable defenders. Mahan's works are, in a sense, a formal warning to his fellow-citizens not to adopt it. In

France, within the last years of the 19th century, it found, and appears still to find, adherents enough to form a school. The reappearance of belief in demonstrated impossi- bilities is a recognized incident in human history; but it is usually confined to the emotional or the vulgar. It is serious and filled with menaces of disaster when it is held by men thought fit to administer the affairs of a nation or advise concern- ing its defence. The third Dutch War may not have settled directly the position of England in the maritime world; but it helped to place that country above all other maritime states — in the position, in fact, which Great Britain, the United Kingdom, the British Empire, whichever name may be given it, has retained up to the present. It also manifested in a very striking form the efficacy of sea-power. The United Provinces, though attacked by two of the greatest monarchies in the world, France and England, were not destroyed. Indeed, they preserved much of their political importance in the state system of Europe. The Republic " owed this astonishing result partly to the skill of one or two men, but mainly to its sea-power. " The effort, however, had undermined its strength and helped forward its decline.

The war, which was ended by the Peace of Ryswick in 1697, presents two features of exceptional interest: one was the havoc wrought on English commerce by the enemy; the other was Torrington's conduct at and after the engagement off Beachy Head. Mahan discusses the former with his usual lucidity. At no time has war against commerce been conducted on a larger scale and with greater results than during this period. England suffered " infinitely more than in any former war. " Many of her merchants were ruined; and it is affirmed that the English shipping was reduced to the necessity of sailing under the Swedish and Danish flags. The explanation is that Louis XIV. made great efforts to keep up powerful fleets. The English navy was so fully occupied in watching these that no ships could be spared to protect England's maritime trade. This is only

another way of saying that her commerce had increased so largely that the navy was not strong enough to look after it as well as oppose the enemy's main force. Notwithstanding her losses she was on the winning side in the conflict. Much misery and ruin had been caused, but not enough to affect the issue of the war.

Torrington's proceedings in July 1690 were at the time the subject of

*much angry discussion. The debate, still meriting the epithet angry, has been renewed within the last In being." * ew years. The matter has to be noticed here, because it involves the consideration of a question of naval strategy which must be understood by those who wish to know the real meaning of the term sea-power, and who ought to learn that it is not a thing to be idly risked or thrown away at the bidding of the ignorant and the irresponsible. Arthur Herbert, earl of Torrington — the later peerage is a viscountcy held by the Byng family — was in command of the allied English and Dutch fleet in the English Channel. " The disparity of force, " says Mahan, " was still in favour of France in 1690, but it was not so great as the year before. " We can measure the ability of the then English government for conducting a great war, when we know that, in its wisdom, it had still further weakened the fleet by dividing it. Vice-Admiral Killigrew had been sent to the Mediterranean with a squadron, and had neglected, and indeed refused when urged, to take the necessary steps to repair this error. The government having omitted, as governments sometimes do, to gain any trustworthy intelligence of the strength or movements of the enemy, Torrington suddenly found himself confronted by a considerably superior French fleet under Tour- ville, one of the greatest of French sea-officers. Since then the intentions of the French have been questioned; but it is beyond dispute that, in England at the time, Tourville's movements were believed to be preliminary to invasion. Whether Tourville deliberately meant his movement to cover an invasion or not, invasion would almost certainly have followed complete success on his part; otherwise, his victory would have been without any valuable result. Torrington saw that as long as he could keep his own fleet intact, he could, though much weaker than his opponent, prevent him from doing serious harm. Though personally not a believer in the imminence of invasion, the English admiral knew that " most men were in fear that the French would invade." His own view was " that whilst we had a fleet in being they would not dare to make an attempt." Of late years controversy has raged round this phrase, " a fleet in being," and the strategic principle which it expresses. Most seamen were at the time, have been since, and still are in agree- ment with Torrington. This might be supposed enough to settle the question. It has not been allowed, however, to remain one of purely naval strategy. It was made at the time a matter of party politics. This is why it is so necessary that in a notice of sea-power it should be discussed. Both as a strategist and as a tactician Torrington was immeasurably ahead of his contem- poraries. The only English admirals who can be placed above him are Hawke and Nelson. He paid the penalty of his pre- eminence: he could not make ignorant*

men and dull men see the meaning or the advantages of his proceedings. Mahan, who is specially qualified to do him full justice, does not devote much space in his work to a consideration of Torrington's case, evidently because he had not sufficient materials before him on which to form a judgment. The admiral's character had been taken away already by Macaulay, who did have ample evidence before him; William III., with all his fine qualities, did not possess a military genius quite equal to that of Napoleon; and Napoleon, in naval strategy, was often wrong. William III. understood that subject even less than the French emperor did; and his favourites were still less capable of understanding it. Consequently Torrington's action has been put down to jealousy of the Dutch. There have been people who accused Nelson of being jealous of the naval reputation of Caracciolo! The explanation of Torrington's conduct is this: He had a fleet so much weaker than Tourville's that he could not fight a general action with the latter without a practical certainty of a crushing defeat.

Such a result would have laid the kingdom open: a defeat of the allied fleet, says Mahan, " if sufficiently severe, might involve the fall of William's throne in England." Given certain move- ments of the French fleet, Torrington might have manoeuvred to slip past it to the westward and join his force with that under Killigrew, which wduld make him strong enough to hazard a battle. This proved impracticable. There was then one course left — to retire before the French, but not to keep far from them. He knew that, though not strong enough to engage their whole otherwise unemployed fleet with any hope of success, he would be quite strong enough to fight and most likely beat it, when a part of it was trying either to deal with our ships to the west- ward or to cover the disembarkation of an invading army. He, therefore, proposed to keep his " fleet in being " in order to fall on the enemy when the latter would have two affairs at the same time on his hands. Vice-Admiral Colomb rose to a greater height than was usual even with him in his criticism of this campaign. What Torrington did was merely to reproduce on the sea what has been noticed dozens of times on shore, viz. the menace of the flanking enemy. In land warfare this is held to give exceptional opportunities for the display of good generalship, but, to quote Mahan over again, a navy " acts on an element strange to most writers, its members have been from time immemorial a strange race apart, without prophets of their own, neither themselves nor their calling understood." Whilst Torrington has had the support of the seamen, his opponents have been landsmen. For the crime of being a good strategist he was brought before a court-martial, but acquitted.

His sovereign, who had been given the crowns of three kingdoms to defend our laws, showed his respect for them by flouting a legally constituted tribunal and disregarding its solemn finding. The admiral who had saved his country was dismissed from the service. Still, the principle of the " fleet in being " lies at the bottom of all sound strategy.

Admiral Colomb has pointed out a great change of plan in the later naval campaigns of the 17th century. Improvements in naval architecture, in the methods of preserving food, and in the arrangements for keeping the crews healthy, aa'af permitted fleets to be employed at a distance from operation. their home ports for long continuous periods. The Dutch, as allies of the Spaniards, kept a fleet in the Mediterranean for many months. The great de Ruyter was mortally wounded in one of the battles there fought. In the War of the Spanish Succession the Anglo-Dutch fleet found its principal scene of action eastward of Gibraltar. This, as it were, set the fashion for future wars. It became a kind of tacitly accepted rule that the operation of British sea-power was to be felt in the enemy's, rather than in British waters. The hostile coast was regarded strategically as the British frontier, and the sea was looked upon as territory which the enemy must be prevented from invading. Acceptance of this principle led in time to the so-called " block- ades " of Brest and Toulon. The name was misleading. As Nelson took care to explain, there was no desire to keep the enemy's fleet in; what was desired was to be near enough to attack it if it came out. The wisdom of the plan is undoubted. The hostile navy could be more easily watched and more easily followed if it put to sea. To carry out this plan a navy stronger in number of ships or in general efficiency than that of the enemy was necessary. With the exception of that of American Inde- pendence, which will, therefore, require special notice, England's subsequent great wars were conducted in accordance with the rule.*

In the early part of the 18th century there was a remarkable manifestation of sea-power in the Baltic. Peter the Great, having created an efficient army, drove the Swedes from the coast provinces south of the Gulf of Finland. R aS sia's Like the earlier monarchies of which we have spoken, sea-power. Russia, in the Baltic at least, now became a naval state. A large fleet was built, and, indeed, a considerable navy established. It was a purely artificial creation, and showed the merits and defects of its character. At first, and when under the eye of its creator, it was strong; when Peter was no more it

dwindled away and, when needed again, had to be created afresh. It enabled Peter the Great "to conquer the neighbouring portion of Finland, to secure his coast territories and to dominate the Baltic. In this he was assisted by the exhaustion of Sweden consequent on her endeavours to retain, what was no longer possible, the position of a quasi-great power which she had held since the days of Gustavus Adolphus. Sweden had been further weakened, especially as a naval state, by almost incessant wars with Denmark, which prevented all hope of Scandinavian pre- dominance in the Baltic, the control of which sea has in these days passed into the hands of another state possessing a quickly created navy — the modern German empire.

The War of the Spanish Succession left Great Britain a Mediter-ranean power, a position which, in spite of twice losing Minorca,

she still holds. In the War of the Austrian Succession, years' " F rance was forced to give up her conquests for want ■War. of a navy, and England saved her position by her

sea-power, though she had failed to use it to the best advantage " (Mahan, Influence on Hist. p. 280). This shows, as we shall find that a later war showed more plainly, that even the government of a thoroughly maritime country is not always sure of conducting its naval affairs wisely. The Seven Years' War included some brilliant displays of the efficacy of sea-power. It was this which put the British in possession of Canada, decided which European race was to rule in India, and led to a British occupation of Havana in one hemisphere and of Manila in the other. In the same war Great Britain learnt how, by a feeble use of sea-power, a valuable possession like Minorca may be lost. At the same time, the maritime trade and the general prosperity of the kingdom increased enormously. The result of the conflict made plain to all the paramount importance of having in the principal posts in the government men capable of understanding what war is and how it ought to be conducted.

This lesson, as the sequel demonstrated, had not been learned when Great Britain became involved in a war with the insurgent

colonies in North America. Mahan's comment is African str iking: " The magnificence of sea-power and its War% value had perhaps been more clearly shown by the

uncontrolled sway and consequent exaltation of one belligerent; but the lesson thus given, if more striking, is less vividly interesting than the spectacle of that sea-power meeting a foe worthy of its steel, and excited to exertion by a strife which endangered not only its most valuable colonies, but even its own shores " (Influence on Hist. p. 338). Great Britain was, in fact, drawing too largely on the prestige acquired during the Seven Years' War, and was governed by men who did not understand the first principles of naval warfare, and would not listen to those who did. They quite ignored the teaching of the then comparatively recent wars which has been alluded to already — that the enemy's coast should be looked upon as the frontier. A century and a half earlier the Dutchman Grotius had written — " Quae meta Britannia Litora sunt aliis."

Though ordinary prudence would have suggested ample prepara- tion, British ministers allowed their country to remain unpre- pared. Instead of concentrating their efforts on the main objective, they frittered away force in attempts to relieve two beleaguered garrisons under the pretext of yielding to popular pressure, which is the official term for acting on the advice of irresponsible and uninstructed busybodies. " Dfepuis le d6but de la crise," says Captain Chevalier, "les ministres delaGrande- Bretagne s'etaient montres inferieurs a leur tache." An impres- sive result of this was the repeated appearance of powerful and indeed numerically superior hostile fleets in the English Channel. The war — notwithstanding that land operations constituted an important part of it, and in the end settled the issue — was essentially oceanic. Captain Mahan says it was " purely maritime." It may be true that, whatever the belligerent result, the political result, as regards the status of the insurgent colonies, would have been the same. It is in the highest degree probable, indeed it closely approaches to certainty, that a proper use of the British sea-power would have prevented

independence from being conquered, as i were, at the point of the bayonet. There can be no surprise in store for the student acquainted with the vagaries of strategists who are influenced in war by political in preference to military requirements. Still, it is difficult to repress an emotion of astonishment on finding that a British government intentionally permitted de Grasse'i fleet and the French army in its convoy to cross the Atlantic unmolested, for fear of postponing for a time the revictualling of the garrison beleaguered at Gibraltar. Washington's opinion as to the importance of the naval factor has been quoted already; and Mahan does not put the case too strongly when he declares that the success of the Americans was due to " sea-power being in the hands of the French and its improper distribution

by the English authorities." England's navy, misdirected as it was, made a good fight of it, never allowed itself to be decisively beaten in a considerable battle, and won at least one great victory. At the point of contact with the enemy, however, it was not in general so conspicuously successful as it was in the Seven Years' War, or as it was to be in the great conflict with the French republic and empire. The truth is that its opponent, the French navy, was never so thoroughly a sea-going force as it was in the War of American Independence; and never so closely approached the British in sea experience as it did during that period. Great Britain met antagonists who were very nearly, but fortunately not quite, as familiar with the sea as she was; and she never found it so hard to beat them, or even to avoid being beaten by them. An Englishman would, naturally enough, start at the conclusion confronting him, if he were to speculate as to the result of more than one battle had the great Suffren's captains and crews been quite up to the level of those commanded by stout old Sir Edward Hughes. Suffren; it should be said, before going to the East Indies, had " thirty-eight years of almost uninterrupted sea-service " (Laughton, Studies in Naval Hist. p. 103). A glance at a chart of the world, with the scenes of the general actions of the war dotted on it, will show how notably oceanic the campaigns were. The hostile fleets met over and over again on the far side of the Atlantic and in distant Indian seas. The French navy had penetrated into the ocean as readily and as far as the British could do. Besides this, it should be remembered that it was not until the 12th of April 1782, when Rodney in one hemisphere and Suffren in the other showed them the way, that British officers were able to escape from the fetters imposed on them by the Fighting In- structions — a fact worth remembering in days in which it is sometimes proposed, by establishing schools of naval tactics on shore, to revive the pedantry which made a decisive success in battle nearly impossible.

*The mighty conflict which raged between Great Britain on one side and France and her allies on the other, with little inter- mission, for more than twenty years, presents a ~ n . different aspect from that of the war last mentioned, the Preach The victories which the British fleet was to gain were Revolution generally to be overwhelming; if not, they were looked *" d upon as almost defeats. Whether the fleet opposed mpre " to the British was or was not the more numerous, the result was generally the same — the enemy was beaten. That there was a discoverable reason for this is certain. A great deal has been made of the disorganization in the French navy consequent on the confusion of the Revolution. That there was disorganization is*

undoubted; that it did impair discipline and, consequently, general efficiency will not be disputed; but that it was con- siderable enough to account by itself for the French naval defeats is altogether inadmissible. Revolutionary disorder had invaded the land-forces to a greater degree than it had invaded the sea-forces. The supersession, flight or guillotining of army officers had been beyond measure more frequent than was the case with the naval officers. In spite of all this the French armies were on the whole — even in the early days of the Revolu- tion — extraordinarily successful. In 1702 " the most formidable invasion that ever threatened France," as Alison calls it, was repelled, though the invaders were the highly disciplined and veteran armies of Prussia and Austria. It was nearly two years

later that the French ' nd British fleets came into serious conflict. The first great battl ., " The Glorious First of June," though a tactical victory io Great Britain, was a strategical defeat. Villaret Joyeuse rr anceuvred so as to cover the arrival in France of a fleet of mercnant vessels carrying sorely needed supplies of food, and in this he was completely successful. His plan involved the probability, almost the necessity of fighting a general action which he was not at all sure of winning. He was beaten, it is true; but the French made so good a fight of it that their defeat was not nearly so disastrous as the later defeats of the Nile or Trafalgar, and — at the most — not more disastrous than that of Dominica. Yet no one even alleges that there was dis- order or disorganization in the French fleet at the date of any one of those affairs. Indeed, if the French navy was really dis- organized in 1794, it would have been better for France — judging from the events of 1798 and 1805 — if the disorganization had been allowed to continue. In point of organization the British navy was inferior, and in point of discipline not much superior to the French at the earliest date; at the later dates, and especially at the latest, owing to the all-pervading energy of Napoleon, the British was far behind its rival in organization, in " science," and in every branch of training that can be im- parted without going to sea. Great Britain had the immense advantage of counting among her officers some very able men. Nelson, of course, stands so high that he holds a place entirely by himself. The other British chiefs, good as they were, were not conspicuously superior to the Hawkes and Rodneys of an earlier day. Howe was a great commander, but he did little more than just appear on the scene in the Revolutionary War. Almost the same may be said of Hood, of whom Nelson wrote, " He is the greatest sea-

officer I ever knew " (Laughton, Nelson's Ldt. and Desp: p. 71). There must havcbeen something, there- fore, beyond the meritorious qualities of the principal British officers which helped the navy so consistently to victory. The many triumphs won could not have been due in every case to the individual superiority of the British admiral or captain to his opponent. There must have been bad as well as good among the hundreds on the lists; and we cannot suppose that Providence had so arranged it that in every action in which a importance British officer of inferior ability commanded, a still of sea more inferior French commander was opposed to him. expert- The explanation of the nearly unbroken success is, eace ' that the British was a thoroughly sea-going navy, and

became more and more so every month; while the French, since the close of the American War, had lost to a great extent its sea-going character and, because it had been shut up in its ports, became less and less sea-going as hostilities continued. The war had been for the British, in the words of Theodore Roosevelt, " a continuous course of victory won mainly by seamanship." The British navy, as regards sea experience, especially of the officers, was immensely superior to the French. This enabled the British government to carry into execution sound strategic plans, in accordance with which the coasts of France and its allied countries were regarded as the British frontier to be watched or patrolled by British fleets.

Before the long European war had been brought to a formal

ending we received some rude rebuffs from another opponent

of unsuspected vigour. In the quarrel with the

f°"5 United States, the so-called "War of 181 2," the American ' , , _, . . , . , , ', .*

War. great sea-power of the British in the end asserted its

influence, and the Americans suffered much more

severely, even absolutely, than their enemy. At the same time

the British might have learned, for the Americans did their

best to teach it, that over-confidence in numerical strength and

narrow professional self-satisfaction are nearly sure to lead to

reverses in war, and not unlikely to end in grave disasters. The British had now to meet the (lite of one of the finest communities of seamen ever known. Even in 1776 the Americans had a great maritime commerce, which, as Mahan says, " had come to be the wonder of the statesmen of the mother country." . In the six-and-thirty years which had elapsed since then this commerce bad further increased. There was no finer nursery of seamen than the then states of the American Union. Roosevelt says that " there was no better seaman in the world " than the American, who " had been bred in his work from infancy." A large proportion of the population " was engaged in sea-going pursuits of a nature strongly tending to develop a resolute and hardy character in the men that followed them " (Naval War of 1812, 3rd ed., pp. 29, 30) . Having little or no naval protection, the American seaman had to defend himself in many circum- stances, and was compelled to familiarize himself with the use of arms. The men who passed through this practical, and there- fore supremely excellent, training school were numerous. Very many had been trained in English men-of-war, and some in French ships. The state navy which they were called on to man was small; and therefore its personnel, though without any regular or avowed selection, was virtually and in the highest sense a picked body. The lesson of the War of 181 2 should be learned by Englishmen of the present day, when a long naval peace has generated a confidence in numerical superiority, ' in the mere possession of heavier materiel, and in the merits of a rigidly uniform system of training, such confidence, as experience has shown, being often the forerunner of misfortune. It is neither patriotic nor intelligent to minimize the American successes. Certainly they have been exaggerated by Americans and even by the British. To take the frigate actions alone, as being those which properly attracted most attention, the captures in action amounted to three on each side, the proportionate loss to the Americans, considering the smallness of their fleet, being immensely greater than to the British. We also see that no British frigate was taken after the first seven months of a war which lasted two and a half years. Attempts have been made to spread a belief that British reverses were due to nothing but the greater size and heavier guns of the enemy's ships. It is now established that the superiority in these details,, which the Americans

certainly enjoyed, was not great, and not of itself enough to account for their victories. Of course, if superiority in mere matiriel, beyond a certain well-understood amount, is possessed by one of two combatants, his antagonist can hardly escape defeat; but it was never alleged that size of ship or calibre of guns — greater within reasonable limits than the British had — necessarily led to the defeat of British ships by the French or Spaniards. In the words of Admiral Jurien de la Graviere: " The ships of the United States constantly fought with the chances in their favour." All this is indisputable. Nevertheless in any future war British sea-power, great as it may be, should not receive shocks like those that it unquestionably did suffer in 1812.

We have now come to the end of the days of the naval wars of old time. The subsequent period has been illustrated repeatedly by manifestations of sea-power, often of great interest and importance, though rarely understood or even discerned by the nations whom they more particularly concerned. The British sea-power, notwithstanding the first year of the War of 181 2, had come out of the great European conflict unshaken and indeed more pre-eminent than ever. The words used' half a century before by a writer in the great French EncyclopMie seemed more exact than when first written. " V Empire des mers," he says, is " le plus avantageux de tous les empires; les Phceniciens le possedoient autre fois et c'est aux Anglois que cette gloire appartient aujourd'hui sur toutes les puissances maritimes " (BncyclopZdie, 7th January 1765, art. " Thalas- sarchie "). Vast outlying territories had been acquired or were more firmly held, and the communications of all the oversea dominions of the British crown were secured against all possibility of serious menace for many years to come. Her sea-power was so ubiquitous and all-pervading that, like the atmosphere, Great Britain rarely thought of it and rarely remembered its necessity or its existence. It was not till a late date that the greater part of the nation — for there still are some exceptions- perceived that it was the medium apart from which the British empire could no more live than it could have grown up. Forty years after the fall of Napoleon she found herself again, at war with a great power. She had as her ally the owner of the greatest

navy in the world except her own. Her foe, as regards naval forces, came the next in order. Yet so overwhelming was the

strength of Great Britain and France on the sea that ˆJJˆƒ ” Russia never attempted to employ her navy against 1854-56. them. Not to mention other expeditions, considerable

enough in themselves, military operations on the largest scale were undertaken, carried on for many months, and brought to a successful termination on a scene so remote that it was two thousand miles from the country of one, and three thousand from that of the other partner in the alliance. " The stream of supplies and reinforcements, which in terms of modern war is called ' communications,' " was kept free from even the threat of molestation, not by visible measures, but by the undisputed efficacy of a real, though imperceptible sea- power. At the close of the Russian War there were, even in influential positions, men who, undismayed by the consequences of mimicking in free England the cast-iron methods of Frederick the Great, began to measure British requirements by standards borrowed from abroad and altogether inapplicable to British conditions. Because other countries wisely abstained from relying on that which they did not possess, or had only imperfectly and with elaborate art created, the mistress of the seas was led to proclaim her disbelief in the very force that had made and kept her dominion, and was urged to defend herself with fortifica- tions by advisers who, like Charles II. and the duke of York two centuries before, were " not ashamed of it." It was long before the peril into which this brought the empire was per- ceived, but at last, and in no small degree owing to the teachings of Mahan, the people themselves took the matter in hand and insisted that a great maritime empire should have adequate means of defending all that made its existence possible.

In forms differing in appearance, but identical in essentials, the efficacy of sea-power was proved again in the American Later Civil War. If ever there were hostilities in which,

manifests- to the unobservant or short-sighted, naval operations Uonsof might at first seem destined to count for little they sea-power. were tnese> 'j-jjg sequel, however, made it clear that they constituted one of the leading factors of the success of the victorious side. The belligerents, the Northern or Federal states and the Southern or Confederate states, had a common land frontier of great length. The capital of each section was within easy distance of this frontier, and the two were not far apart. In wealth, population and resources the Federals were enormously superior. They alone possessed a navy, though at first it was a small one. The one advantage on the Confederate side was the large proportion of military officers which belonged to it and their rare excellence as soldiers. In physique as well as in moral the army of one side differed little from that of the other; perhaps the Federal army was

slightly superior in the first, and the Confederate, as being recruited from a dominant white race, in the second. Outnumbered, less well equipped, and more scantily supplied, the Confederates nevertheless kept up the war, with many brilliant successes on land, for four years. Had they been able to maintain their trade with neutral states they could have carried on the war longer, and — not improb- ably — have succeeded in the end. The Federal navy, which was largely increased, took away all chance of this. It established effective blockades of the Confederate ports, and severed their communications with the outside world. Indispensable articles of equipment could not be obtained, and the armies, consequently, became less and less able to cope with their abundantly furnished antagonists. By dominating the rivers the Federals cut the Confederacy asunder; and, by the power they possessed of moving troops by sea at will, perplexed and harassed the defence, and facilitated the occupation of important points. Meanwhile the Confederates could make no reply on the water except by capturing merchant vessels, by which the contest was embittered, but the course of the war remained absolutely unaffected. The great numbers of men under arms on shore, the terrific slaughter in many battles of a war in which tactical ability, even in a moderate degree, was curiously uncommon on both sides, and the

varying fortunes of the belligerents, made the land campaigns far more interesting to the ordinary observer than the naval. It is not surprising, therefore, that peace had been re-established for several years before the American people could be made to see the great part taken by the navy in the restoration of the Union; and what the Americans had not seen was hidden from the sight of other nations.

In several momentous wars in Europe waged since France and Great Britain made peace with Russia sea-power manifested itself but little. In the Russo-Turkish War the naval r usso . superiority of the Turks in the Black Sea, where the Turkish Russians at the time had no fleet, governed the plans, War, if not the course, of the campaign. The water being 1877-78. denied to them, the Russians were compelled to execute their plan of invading Turkey by land. An advance to the Bosporus through the northern part of Asia Minor was impracticable without help from a navy on the right flank. Consequently the only route was a land one across the Danube and the Balkans. The advantages, though not fully utilized, which the enforce- ment of this line of advance put into the hands of the Turks, and the difficulties and losses which it caused the Russians, exhibited in a striking manner what sea-power can effect even when its operation is scarcely observable.

This was more conspicuous in a later series of hostilities. The civil war in Chile between Congressists and Balmacedists was specially interesting, because it threw into sharp relief the predominant influence, when a non-maritime C J£?. an enemy was to be attacked, of a navy followed up War Jgo ˆ by an adequate land-force. At the beginning of the dispute the Balmacedists, or President's party, had practically all the army, and the Congressists, or Opposition party, nearly all the Chilean navy. Unable to remain in the principal province of the republic, and expelled from the waters of Valparaiso by the Balmacedist garrisons of the forts — the only and doubtful service which those works rendered to their own side-ˆ-the Congressists went off with the ships to the northern provinces, where they counted many adherents. There they formed an army, and having money at command, and open sea communi- cations, they were able to import equipment from abroad, and eventually to transport their land-force, secured from molestation on the voyage by the sea-power at their disposal, to the neigh- bourhood of Valparaiso, where it was landed and triumphantly ended the campaign.

It will have been noticed that, in its main outlines, this story repeated that of many earlier struggles. It was itself repeated, as regards its general features, by the story of the war War between China and Japan in 1894-95. Every aspect between of the war, says Colomb, is interesting to Great Britain, China ani " as Japan is to China in a position similar to that]™f"'- which the British Islands occupy to the European continent " {Naval Warfare, 3rd ed. p. 436). It was additionally interesting because the sea-power of Japan was a novelty. Though a novelty, it was well known by British naval men to be superior in all essentials to that of China, a novelty itself. As is the rule when two belligerents are contending for something beyond a purely maritime object, the final decision was to be on land. Korea was the principal theatre of the land war; and, as far as access to it by sea was concerned, the chief bases of the two sides were about the same distance from it. It was possible for the Chinese to march there by land. The Japanese, coming from an island state, were obliged to cross the water. It will be seen at once that not only the success of the Japanese in the struggle, but also the possibility of its being carried on by them at all, depended on sea-power. The Japanese proved themselves decisively superior at sea. Their navy effectually cleared the way for one army which was landed in Korea, and for another which was landed in the Chinese province of Shan- tung. The Chinese land-forces were defeated. The navy of Japan being superior on the sea, was able to keep its sister service supplied or reinforced

as required. It was not, however, the navy, but the army, which finally frustrated the Chinese efforts at defence, and really terminated the war. What the navy did

was what, in accordance with the limitations of sea-power, may be expected of a navy. It made the transport of the army across the sea possible, and enabled it to do what of itself the army could not have done, viz. overcome the last resistance of the enemy.

The issue of the Spanish-American War, at least as regards the defeat of Spain, was a foregone conclusion. That Spain, Spanish- even without a serious insurrection on her hands, American was unequal to the task of meeting so powerful an Mft? antagonist as the United States must have been evident

even to Spaniards. However that may be, an early collapse of the Spanish defence was not anticipated, and however one-sided the war may have been seen to be, it furnished examples illustrating rules as old as naval warfare. Mahan says of it that, " while possessing, as every war does, characteristics of its own differentiating it from others, nevertheless in its broad analogies it falls into line with its predecessors, evidencing that unity of teaching which pervades the art from its beginnings unto this day " (Lessons of the War with Spain, p. 16). The Spaniards were defeated by the superiority of the American sea-power. " A million of the best soldiers," says Mahan, " would have been powerless in face of hostile control of the sea." That control was obtained and kept by the United States navy, thus per- mitting the unobstructed despatch of troops — and their subse- quent reinforcement and supply — to Spanish territory, which was finally conquered, not by the navy, but by the army on shore. That it was the navy which made this final conquest possible happened, in this case, to be made specially evident by the action of the United States government, which stopped a military expedition on the point of starting for Cuba until the sea was cleared of all Spanish naval force worth attention.

It is unnecessary here to . dwell on the results of sea-power in the war between Great Britain and the Boers, in which troops had to be transported by sea from England to South Africa, or in that between Russia and Japan, in which the culminating blow given by Japan was the defeat of the Russian fleet at the battle of Tsushima.

The events of the long period which we have been considering will have shown how sea-power operates, and what it effects. What it involves will have appeared from this narrative more clearly than would have been possible from any mere definition. Like many other things, sea-power is composed of several ele- ments. To reach the highest degree of efficacy it should be based upon a population naturally maritime, and on an ocean commerce naturally developed rather than artificially enticed to extend itself. Its outward and visible sign is a navy, strong in the discipline, skill and courage of a numerous personnel habituated to the sea, in the number and quality of its ships, in the excellence of its materiel, and in the efficiency, scale, security and geographical position of its arsenals and bases. History has demonstrated that sea-power thus conditioned can gain any purely maritime object, can protect the trade and the com- munications of a widely extended empire, and while so doing can ward off from its shores a formidable invader. There are, however, limitations to be noted. Left to itself its operation is confined to the water, or at any' rate to the inner edge of a narrow zone of coast. It prepares the way for the advance of an army, the work of which it is not intended and is unable to perform. Behind it, in the territory of which it guards the shores, there must be a land-force adjusted in organization, equipment and numbers to the circumstances of the country. The possession of a navy does not permit a sea-surrounded state to dispense with all fixed defences or fortification; but it does render it unnecessary and indeed absurd that they should be abundant or gigantic. The danger which always impends over the sea-power of any country is that, after being long unused, it may lose touch of the sea. The revolution in the constructive arts during the latter half of the 19th century, which has also been a period of but little-interrupted naval peace, and the universal adoption of mechanical appliances, both for ship- propulsion and for many minor services — mere materiel being thereby raised in the general estimation far above really more

important matters — make the danger mentioned more menacing in the present age than it has ever been before.

The classic works on Sea-power are those of Captain A. T. Mahan: Influence of Sea-power on History (1890); Influence of Sea-power on the French Revolution and Empire (1892); Nelson: the Embodiment of the Sea-power of Great Britain (1897), &c. See also the bibliography of the article Navy. (C. A. G. B.)

SEARCH, or Visit and Search, a term used in international law and apparently derived in some confused way from the French word

visite, which means search, combined with the English translation of the word visite. An attempt made by some writers to distinguish between visit and search only leads to misunderstanding. Search is the exact English equivalent of visite, and in the translation of the Declaration of London (Feb. 26, 1909) the translator has rightly rendered it as such (art. 63).

The right of search belongs to. belligerents alone. Its object is to verify the nationality of the vessel and if neutral to ascertain whether it carries contraband. The consequence of resistance to search is capture and trial in a Prize Court. " Forcible re- sistance to the legitimate exercise of the right of stoppage, search and capture," says art. 63 of the Declaratibn of London, 1909, " involves in all cases the condemnation of the vessel. The cargo is liable to the same treatment as the cargo of an enemy vessel. Goods belonging to the master or owner of the vessel are treated as enemy goods." At the Hague Conference of 1907 the question of the liability to search of mail-ships gave rise to much discussion based on incidents arising out of the South African and Russo-Japanese Wars. It was ultimately decided that postal correspondence of neutrals and even of belligerents, and whether official or private, found on board a neutral or even an enemy ship should be " inviolable," and that though the ship should be detained, this correspondence had to be forwarded to its destination by the captor " with the least possible delay." 1 – The only exception to this exemption is correspondence destined for or proceeding from a blockaded port. As regards the mail-ships themselves, apart from this inviolability of the correspondence, no exemption or privilege is extended beyond the injunction that they should not be searched, except when absolutely necessary, and then only " with as much consideration and expedition as possible," which might just as well be said of all ships stopped or searched on the high seas. (T. Ba.)

SEA-SERPENT. The belief in enormous serpents, both terrestrial and marine, dates from very early times. Pliny (H.N. viii. 14), following Livy (Epit. xviii.), tells us of a land- serpent 120 ft. long, which Regulus and his army besieged with balistae, as though it had been a city, and this story is repeated by several other writers (Florus ii. 2; Val. Max. i. 8; Gellius vi. 3). The most prolific in accounts of the sea-serpent, however, are the early Norse writers, to whom the " So-Orm " was a subject both for prose and verse. Olaus Magnus (Hist. gent, sept. xxi. 24) describes it as 200 ft. long and 20 ft. round, and states that it not only ate calves, sheep and swine, but also " disturbs ships, rising up like a mast, and sometimes snaps some of the men from the deck," illustrating his account with a vivid representation of

the animal in the very act. Pontoppi- dan, in his Natural History (Eng. trans., 1755, pp. 19S seq.), says that its existence was generally believed in by the sailors and fishermen of his time, and he recounts the means they adopted to escape it, as well as many details regarding its habits. The more circumstantial records of comparatively modern times may be conveniently grouped according to the causes which pre- sumably gave rise to the phenomena described. (1) A number of porpoises swimming one behind another may, by their character- istic mode of half emerging from and then re-entering the water during respiration, produce the appearance of a single animal showing a succession of snake-like undulations. The figure given by Pontoppidan was very likely suggested by such an appearance, and a sketch of an animal seen off Llandudno by

1 Convention relative to certain restrictions on the exercise of the right of capture in maritime war (art. 1).

several observers 1 looks as though it might have had a similar origin, notwithstanding that this hypothesis was rejected by them. (2) A flight of sea-fowl on one occasion recorded by Professor Aldis 2 produced the appearance of a snake swimming at the surface of the water. (3) A large mass of seaweed has on more than one occasion been cautiously approached and even harpooned under the impression that it was such a monster. 3 (4) A pair of basking sharks (Selache maxima) furnish an explana- tion of some of the recorded observations, as was first pointed out by Frank Buckland. These fish have a habit of swimming in pairs, one following the other with the dorsal fin and the upper lobe of the tail just appearing above the water, and, as each animal is fully 30 ft. long, the effect of a body of 60 or more ft. long moving through the water is readily produced. To this category belongs the famous serpent cast up on Stronsay, one of the Orkneys, of which an account was read to the Wernerian Society of Edinburgh; 4 some of its vertebrae were preserved in the Royal College of Surgeons of London, and identified as those of Selache maxima by both Home and Owen. 6 There is also evidence to show that .specimens of Carcharodon must have existed more than 100 ft. long. 6 (5) Ribbon-fish (Regalecus) , from their snake-like form and great length (sometimes as much as 20 ft.), have been suggested as the origin of so-called " sea- serpents," amongst others by Dr Andrew Wilson 7 ; but Dr Giinther, 8 from what is known regarding the habits of these fish, does not regard the theory as tenable. (6) A

gigantic squid (Architeuthis) was most likely the foundation of the old Norse accounts, 9 and also of those which in the early part of the 19th century came so frequently from the United States as to gain for the animal the sobriquet of "American sea-serpent." 10 These stories were so circumstantial, so consistent, and vouched for by persons of such eminence, that no doubt was possible (notwithstanding the cavilling of Mitchell) 11 as to the existence of a strange marine monster of very definite character in those regions. The description commonly given of it has been summed up by Gosse 12 somewhat thus: — (i.) general form that of a serpent; (ii.) length averaging 60 ft.; (iii.) head flattened, eye generally not mentioned, some distinctly stating that it was not seen; (iv.) neck 12 to 16 in, in diameter; (v.) appendages on the head, neck or back (accounts here variable) ; (vi.) colour dark, lighter below; (vii.) swims at the surface, head thrown forward and slightly elevated; (viii.) progression steady and uniform, body straight but capable of being bent; (ix.) water spouting from

it; (x.) in shape like a " nun buoy." The annexed figure (fig. 1) represents one which was seen from H.M.S." Daedalus." 13 To show the reason- ableness of this hy- pothesis, it may be added that gigantic Cephalopods are not unfrequeht on the shores of Newfoundland. 14 and are occasionally met with on the coasts

1 Mott, Nature, xxvii. pp. 293, 315, 338; also Land and Water (September 1872).

2 Nature, ibid. ; also Drew, in vol. xviii. p. 489 ; Bird, torn. cit. p. 519; Ingleby, torn, cit p. 541.

3 F. Smith, Times (February 1858); Herriman, quoted by Gosse, op. cit. postea, p. 338; Pringle, Nature, xviii. p. 519 (1878).

- *Mem. Wern. Soc. Edin. vol. i. pp. 418-444, pis. ix.-xi. (181 1).*

6 Ann. Mag. Nat. Hist. ser. 2, vol. ii. p. 461 (1848) ; for a criticism of these views, see Traill, Proc. Roy. Soc. Edin. vol. iii. p. 208 (1857).

- *Owen, Odontography, p. 30.*

7 Leisure Time Studies, p. 115 (London, 1879), containing a readable essay on the subject; Scotsman (6th September 1878); Nature, loc. cit.

8 Study of Fishes, p. 521 (Edinburgh, 1880).

- *See note 2; also Deinbolt, quoted in Zoologist, p. 1604 (1847).*

10 Bigelow, Amer. Journ. Sci. vol. ii. pp. 147-165 (1820); Warburton, ibid. vol. xii. p. 375 (1823); Zoologist, p. 1714 (1847).

11 Amer. Journ. Sci. vol. xv. p. 351 (1829).

12 Romance of Natural History, p. 345 (London, 1859).

" M'Quahae, Times (October 1848) ; III. Lond. News (October 1848). 14 A. E. Verrill, Trans. Connect. Acad. vol. v. part i. (1880), con- taining an account of all authenticated specimens of gigantic squids.

Fig. i-

-Sea-serpent, as seen from H.M.S. " Daedalus."

Fig. 2. — Sea-serpent, as observed by Hans Egede.

of Scandinavia, 15 Denmark and the British Isles, 16 and their extreme size seems to be above 60 ft., and, furthermore, that their mode of progression is by means of a jet of water forcibly expelled from the siphon, which would impart that equable motion to which several observers allude as being evidently not produced by any serpentine bending of the body. A very interesting account of a monster almost certainly originating in one of these squids is that of Hans Egede, 17 the well- known missionary to Greenland; the drawing by Bing, given in his work, is reproduced here (fig. 2), with a sketch of a squid in the act of rearing itself out from the water (fig. 3), an action which they have been observed in aquaria habitually to perform. Numerous otherac- counts seem to be explic- able by this hypothesis, 18 among them may be mentioned that of a huge " snake " seen by certain of the crew of the " Pauline " in the South Atlantic Oeean, which was said to be coiled twice round a large sperm whale, and then towered up many feet into the air and finally dragged the whale to the bottom. It is now well-known that the sperm whale kills and devours Architeuthis and other large oceanic Cephalopods, and no one who has read Bullen's vivid description, in The Cruise of the Cachalot, of the struggle between a cachalot and a giant squid, can doubt that it was a combat of this kind which was thus erroneously described. The immensely long arms of Architeuthis would not unnaturally be mistaken for a snake by sailors, and instead of being dragged to the bottom the whale doubtless sounded of its own accord as whales usually do (see Cuttle- fish) . (7) A sea-lion, or "Anson's seal"

{Morunga elephantina) , was suggested by Owen 19 as a pos- sible explanation of the serpent seen from H.M.S. ” Daedalus”; but as this was afterwards rejected by Captain M’Quahae, 20 who stated that it could not have been any animal of the seal kind, it seems better to refer the appearance to a squid. (8) A plesiosaurus, or some other of the huge marine reptiles usually believed to be extinct, might certainly have produced the

15 Steenstrup, Forhandl. Skand. Naturf., jde Mode, pp. 182-185 (Christiania, 1857).

18 Saville Kent, Prvc. Zool. Soc. Lond. p. 178 (1874) ; More, Zoologist, p. 4526 (1875); also Ann. Mag. Nat. Hist. ser. 4, vol. vi. p. 123.

17 Det gamle Gronlands nye Perlustration (Copenhagen, 1741 ; Eng. trans., A Description of Greenland, London, 1745, pp. 86-89); also Paul Egede, Efterretninger om Gronland, Copenhagen, n.d., pp.

45. 46-

18 L. de Ferry, quoted by Pontoppidan, op. cit. ; Davidson and Sandford, quoted in Zoologist, p. 2459 (1849) ; Senior, Graphic (19th April 1879); Barnett, Nature, vol. xx. p. 289 (1879); Penny, ///. Lond. News, vol. lxvii. p. 515 (20th November 1875).

” Ann. Mag. Nat. Hist. ser. 2, vol. ii. p. 461 (1848). 20 Times (21st November 1848).

Fig. 3. — Squid, rearing itself out of the water.

phenomena described, granting the possibility of one having survived to the present time. Newman ‘ and Gosse 2 have both supported this theory, the former citing as evidence in its favour the report of a creature with the body of an alligator, a long neck and four paddles having been seen by Captain Hope of H.M.S. ” Fly ” in the Gulf of California. 3 (9) No satisfactory explanation has yet been given of certain descriptions of the sea-serpent. Perhaps the most remarkable of these is Lieutenant Hayne’s 4 account of a creature seen from H.M. yacht “Osborne.” Two different aspects were recorded — the first being a ridge, 30 ft. in length, of triangular fins, each rising 5 to 6 ft. above the water, while the second view showed a large round

head 6 ft. in diameter, with huge flappers, which moved like those of a turtle.

A more recent record of the appearance of a mysterious sea- monster is that of Messrs Meade-Waldo and Nicoll, both fellows of the Zoological Society, in the Proceedings of that Society for 1906, p. 719. These two gentlemen on the 7th of December 1905 were on board the yacht " Valhalla " off the coast of Brazil when at 10-15 a.m. they saw, 100 yds. from the ship, a large fin projecting above the water to a height of 18 in. or 2 ft., and 6 ft. in length. Under the water to the rear of the fin was the shade of a considerable body. When Mr Meade- Waldo directed his field-glasses upon the object he saw a great head and neck rise out of the water in front of the fin. The neck appeared about the thickness of a man's body, and 7 to 8 ft. in length. The head was of the same thickness and had a very turtle-like appearance, eye and mouth being distinctly seen. The object was going very slowly and shortly disappeared from view. In this case as in others the objects seen were not sufficient to identify the nature of the animal. It is difficult to attribute such a head and neck to any known fish, and turtles have no dorsal fin. It would thus appear that, while, with very few exceptions, all the so-called " sea-serpents " can be explained by reference to some well-known animal or other natural object, there is still a residuum sufficient to prevent modern zoologists from denying the possibility that some such creature may after all exist.

Distinct in origin from the stories already touched on is the legend of the sea-serpent Or linnln among the Arabs (Mas'udi i. 266 seq.; Kazwini i. 132 seq.; Damiri i. 186 seq.), which is described in such a way as to leave no doubt that the waterspout is the pheno- menon on which the fable rests. The tinriin is the Hebrew tannin (E.V. " whale," " dragon "), which in Ps. cxlviii. 7 might in the context be appropriately rendered "waterspout."

In addition to the sources already cited, the reader may consult Blackwood's Magazine, vol. iii. (1818); Lee, Sea Monsters unmasked (International Fisheries Exhibition Handbook, London, 1883) ; Cogswell, Zoologist, pp. 1841,1911 (1847); and Hoyle, Proc. Roy. Phys. Soc. Edin. vol. ix. (W. E. Ho.; J. T. C.)

SEA-SICKNESS, the symptoms experienced by many persons when subjected to the pitching and rolling motion of a vessel at sea, of which depression, giddiness, nausea and vomiting are the most prominent. They generally show themselves soon after the vessel has begun to roll by the onset of giddiness and discomfort in the head,

together with a sense of nausea and sinking at the stomach, which soon develops into intense sickness and vomiting. At first the contents of the stomach only are ejected; but thereafter bilious matter, and occasionally even blood, are brought up by the violence of the retching. The vomiting is liable to exacerbations according to the amount of oscillation of the ship; but seasons of rest, sometimes admitting of sleep, occasionally intervene. With the sickness there is great physical prostration, as shown in the pallor of the skin, cold sweats and feeble pulse, accompanied with mental depression and wretchedness. In almost all instances the attack has a favourable termination, except in the case of persons weakened by other diseases.

The conditions concerned in the production of the malady are apparently of complex character. In the first place, the rolling or heaving of the vessel disturbs that feeling of the relation of the body to surrounding objects upon which the sense of security rests. The nervous system being thus subjected to a succession of shocks fails

1 Zoologist, p. 2395.

' Op. tit., p. 2356 (1849).

' Op. cit. p. 358.

- *Graphic (30th June 1877).*

to effect the necessary adjustments for equilibrium. Giddiness and with it nausea and vomiting follow, aided probably by the profound vaso-motor disturbance which produces such manifest depression of the circulation. The displacement of the abdominal viscera, especially the stomach, by the rolling of the vessel may possibly operate to some extent, but it can only be as an accessory cause. The same may be said of the influence of the changing impressions made upon the vision, since attacks of sea-sickness occur also in the dark, and in the case of blind persons. Other contributory causes may be mentioned, such as the feeling that sickness is certain to come, which may bring on the attack in some persons even before the vessel has begun to move; the sense of the body being in a yielding medium, the varied odours met with on board ship, and circumstances of a like nature tend also to precipitate or aggravate an attack.

No means has yet been discovered which can altogether prevent the occurrence of sea-sickness, npr is it likely any will be found, until the pitching movements of the vessel are done away with. Swinging

couches or chambers have not proved of any practical utility. No doubt there is less risk of sickness in a large and well- ballasted vessel than in a small one; but, even though the rolling may be considerably modified, the ascending and descending move- ments which so readily produce nausea continue. None of the medicinal agents proposed possess infallible properties: a remedy which suits one person will often -wholly fail with another. Nerve sedatives are among the most potent drugs which can be employed ; and doses of bromide of potassium, bromural or chloral, appear to act usefully in the case of many persons. On the other hand, 'some high authorities have recommended the employment of nerve stimulants, such as a small cupful of very strong coffee, to be taken about two hours before sailing, which will frequently prevent or mitigate the sickness. When the vessel is in motion, or even before starting, the recumbent position with the head low and the eyes closed should be assumed by those at all likely to suffer, and, should the weather admit, on deck rather than below — the body, especially the extremities, being well covered. Many persons, however, find comfort and relief from lying down in their berths with a hot bottle to the feet, by which means sleep may be obtained, and with it a temporary abatement of the giddiness and nausea. Should sickness supervene small quantities of some light food, such as thin arrowroot, gruel or soup, ought to be "wallowed if possible, to lessen the sense of exhaustion. The vomiting may be mitigated by saline effervescing drinks, ice, chloroform, hydrocyanic acid or opium. Alcohol, although occasionally useful in great prostration, generally tends rather to aggravate the sickness. Dr Chapman, in accordance with his view that the cause of the sickness is an undue afflux of blood to the spina! cord, introduced a spinal ice-bag; but, like every other plan of treatment, it has only occasional success. Such remedies as nitrite of amyl and cocaine do not seem to yield any better results.

SEASON (O. Fr. seson, seison, mod. saison, Lat. satio, sowing time, the spring, from serere, to sow; in Late Lat. the word is found with its present meaning, the spring being considered as particularly the season of the year), a period of time, in particular, that of the four periods into which the year is divided by the changing of the temperature, rainfall, and growth afid decay of vegetation due to the annual motion of the sun in declination. Divided strictly according to this motion the year falls into four nearly equal seasons, " spring " (i.e. the springing time, when vegetation rises or shoots), " summer " (O. Eng. sutner, cf. Dutch zomer, Ger. Somtner, probably connected with Skt. sama, year), " autumn " (Lat. autumnus, auctumnus, from augere, to increase, the period of ripening or fruiting) and " winter "

(common Teutonic, possibly a nasalized form of root seen in " wet "). (See further Climate, Meteorology.)

SEATON, SIR JOHN COLBORNE, ist Baron (1778-1863), British field marshal, was born at Lyndhurst, Hants, on the 16th of February 1778 and entered the 20th (Lancashire Fusiliers) in 1794, winning thereafter every step in his regimental promotion without purchase. He first saw service in the Helder expedition of 1799, and as a captain he took part in Sir Ralph Abercromby's expedition to Egypt in 1801. He distinguished himself at Maida, and soon afterwards was brought under the notice of Sir John Moore, who obtained a majority for him and made him his military secretary. In this capacity he served through the Corunna campaign, and Sir John Moore's dying request that he should be given a lieutenant-colonelcy was at once complied with. In the summer of 1809 Lieut. -Colonel Colborne was again in the Peninsula, and before taking command of the 66th regiment, he witnessed the defeat of the Spaniards at Ocafia. With the 66th he was present at Busaco and shared in the defence of the

lines of Torres Vedras, and next year, after temporarily com- manding a brigade with distinction at the battle of Albuera, he was gazetted to command the famous 52nd Light Infantry (Oxfordshire and Bucks L.I.)with which corps he is most closely identified. He led it and was very severely wounded at Ciudad Rodrigo (1812), and only rejoined in July 1814. Shortly after- wards he was placed in temporary charge of a brigade of the Light Division which he commanded in the Pyrenees engage- ments and the battles of Orthes and Toulouse. At the peace he was made colonel, aide-de-camp to the Prince Regent and K.C.B. In 1815 Colborne and the 52nd at Waterloo played a brilliant part in the repulse of the Old Guard at the close of the day. Promoted major-general in 1825, Colborne was soon after- wards made lieutenant-governor of Guernsey. In 1830 he served as lieutenant-governor of Upper Canada. In 1838 at the moment of his vacating the post on promotion to lieutenant-general, the rebellion broke out, and he was ordered to assume the func- tions of governor-general and commander-in-chief. He quickly repressed the revolt, and in 1839, returning home, he was raised to the peerage as Baron Seaton of Seaton in Devonshire. From 1843 to 1849 he was high commissioner of the Ionian islands. In 1854 he was promoted full general, and from 1855 to i860 he was commander-in-chief in

Ireland. He died at Torquay on the 17th of April 1863.

See the Life by G. C. Moore Smith (1906).

SEATTLE, the county-seat of King county, Washington, U.S.A., and the largest city in the state, situated on a neck of land between Elliott Bay (an eastern arm of Admiralty B ay, Puget Sound) and the fresh-water Lake Washington; about 865 m. by water N. of San Francisco, about 185 m. by rail N. of Portland, Oregon, and about 28 m. N. of Tacoma. Pop. (1870) 1107; (1880) 3533; (1890) 42,837; (1900) 80,671; (1910 U.S. census) 237,194. Of the population in 1900, 41,483 were of foreign parentage and 22,003 were foreign-born. The area of the city in 1910 was about 83-45 sq. m., of which 29-42 sq. m. were water surface, 23 sq. m. being salt water. Seattle is the terminus of the Northern Pacific, the Canadian Pacific (using the tracks of the Northern Pacific), the Great Northern, the Chicago, Milwaukee & Puget Sound (1909), the Oregon & Washington (1910; a joint extension to Puget Sound of the Southern Pacific and Union Pacific), the Chicago, Burlington & Quincy (using the tracks of the Northern Pacific), and the Columbia & Puget Sound railways. It is served by inter-urban electric lines to Tacoma and Everett; is the starting-point for steamers to Alaska and to Prince Rupert, British Columbia (Grand Trunk Pacific line), and for lines to Japan, China, Siberia, Hawaii, the Philippines, Australia, Mexico, South America and Pacific coast ports of the United States ; and is a port of call for coasting vessels. The city has the excellent salt-water harbour of Elliott Bay to the W.; and to the E. there is a fresh-water harbour, Lake Washington, connected with Puget Sound by the Lake Washington Canal, an artificial improvement of the natural waterway by Lake Union, a great V-shaped body of water in the north-central part of the city, and by Salmon Bay, a narrow channel setting in from Puget Sound on the N.W. Crossing the S.W. part of the city is Duwamish river, which empties into Elliott Bay. At Bremerton, Kitsap county, about 15 m. W. by S. of Seattle, is the Puget Sound Navy Yard, protected by Fort Ward, with one dry dock (1910) 836 ft. long and no ft. wide, another 627 ft. long, and two docks 650 ft. long.

The surface of the city is hilly, the greatest height being 500 ft. above sea-level. The higher hills, the better residential parts of the city, are reached by cable railways or by electric railways following winding routes. Many of the higher hills, especially in the business district, have been removed by hydraulic power and large parts regraded. Lake Washington, to the E., is 22 m. long, and 1 to 4 m. wide, with an area of 50 sq. m., a shore line of 80 m. and a maximum depth of

225 ft; its waters are deep and clear and never freeze. In the north-central part of the city is Green Lake, about 1 m. long and 5 m. wide. On Puget Sound and Lake Union and about these two lakes, both with well- wooded shores and both furnishing excellent boating and

canoeing, are the principal parks of the city. In 1910 the total park acreage under the park commissioners was 1058 acres. Im-mediately S. of Green Lake is Woodland Park (179 acres) with athletic fields and a zoological collection. On the southern shore of Union Bay (a circular, nearly landlocked arm of Lake Washing- ton) in the east-central part of the city is Washington Park (163 acres). Farther S. near Lake Washington are Madrona Park (9 acres), Frink Park (20 acres), which adjoins Leschi Park (4 acres), and Mount Baker Park (12 acres). Near Lake Union is Volunteer Park (48 acres) on Capitol Hill, containing a public observatory (460 ft. above sea-level) and a statue of W. H. Seward by Richard Brooks. Schmitz Park (30 acres) is woodland on the West Seattle peninsula, overlooking the Sound; and between Volunteer Park and Washington Park is Interlaken (46 acres). Kinnear Park (14 acres) is near the entrance to the harbour. Nearly all these parks command views of the Cascade and Olympic ranges. The city owns large areas which are to be improved as parks, including Ravenna Park, which has a noble native fir and cedar forest and sulphur springs. Private parks include the White City (on Lake Washington), Golden Gardens (50 acres) and, in West Seattle (annexed in 1907), Luna Park, an amusement place with a natatorium. North of the city on Lake Washington are the links of the Seattle Golf and Country Club. Practically a part of the city's park system and to be crossed by its boulevards are the campus of the uni- versity of Washington, and the fine grounds (605 acres given to the Federal government by the city) of Fort Lawton. On the campus of the university are a statue of Washington by Lorado Taft and a bust of J. J. Hill by Befi Frolick.

The principal public buildings are the county court house (on a commanding site), the county almshouse, the municipal build- ing, a federal building, the Y.M.C.A. building, a Labor Temple, a Carnegie library (1905), with several branches throughout the city and about 128,000 volumes in i9io,and the buildings of the university of Washington. In Georgetown, immediately S. of the main part of Seattle and nearly hemmed in by parts of the city, is the county hospital. The city has many churches, including Chinese, Japanese, Finnish, Scandinavian, German and Russian. Seattle is the see of a Roman Catholic bishop, and St James Cathedral is the finest church in the city. The First Presbyterian Church has a large auditorium.

Of the many educational institutions, the most important is the university of Washington (see Washington), which was established here by the legislature of 1 854-1 855. Among the others are: the Washington Preparatory School for Girls; the Holy Names Academy and Normal School (under the Sisters of the Holy Names of Jesus and Mary) ; the College of Our Lady of Lourdes ; Adelphia College; the Brothers' School; the Seattle College; three business colleges; the Seattle Art School, in connexion with which the Art Students' League of Seattle was formed in 1909; and a good public school system including six high schools in 1910, one of which has an excellent collection of the fauna and flora of the Pacific Coast. On Mercer Island in Lake Washington is the parental school of the municipal public school system. The city has a cosmopolitan press, including two Japanese dailies.

There are an associated charities organization and a " charities endorsement committee " (1903), which is under the auspices of three commercial associations. For children there are a receiving home (1896, under the Washington Children's Home Society) r the Seattle Children's Home (1884, under the Ladies' Relief Society of Washington); and a children's orthopaedic hospital (1907). The Seattle Federation of Women's Clubs supports a Girls' Home and Training School (1909). Under Roman Catholic control are a Deaconess Home, the Mount Carmel Home (under the Missionary Sisters of the Sacred Heart of Jesus), and the House of the Good Shepherd (under the Sisters of the Good Shepherd). The Ladies' Hebrew Benevolent Society, the Ladies' Montefiore Aid Society and the Hebrew Benevolent Association are Jewish charities. Other charities are the Seattle Seamen's Friend Society, the Florence Crittenton Home, the Lebanon Rescue Mission, the Japanese Women's Home, the Seattle Fruit and Flower Mission, and the Kenny Home for Old Ladies (Presbyterian). The principal hospitals are the Pacific (1899), the Seattle General (1894, under the Deaconess Home Association), the Providence (1877, under the Sisters of Charity), the Minor, the Wayside Emergency (1900), the Municipal and the County.

The situation of Seattle makes it important commercially and industrially. For its manufactories electric power is derived

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SEA-URCHIN

from Snoqualmie Falls (N.E. of Seattle) from Puyallup river (S.W.)

and from Cedar river.

The total value of the factory product in 1905 (excluding Ballard) was $25,406,574 (nearly one-fifth of that of the state), or 65-8 % more than in 1900. The increase was particularly marked in the value of flour, $4,593,566, or 253-9% more than in 1900. Other important manufactures in 1905 were: packed meats and slaughter house pro- ducts ($3,419,085); malt liquors ($2,121,631); foundry and machine shop products ($1,771,571) — there is a large manufactory of nuts and bolts; lumber and timber ($1,519,247) ; confectionery ($821,123); canned and preserved fish ($610,356) ; and ships and boats. In what was formerly Ballard, now the 13th ward, on Salmon Bay, there are large mills for the manufacture of red cedar shingles.

Seattle is the most important seaport of the state, being the commercial and industrial centre for the customs district of Puget Sound. In 1909 the net tonnage of vessels entering the harbour (local figures) was 2,467,351 tons. The foreign exports in 1908 (Harbour Master's Report) were valued at $18,413,735, the foreign imports at $23,805,727. Its exports and imports make up the greater part of the commerce of the district, which has Port Townsend as its port of entry, and the city is rivalled only by San Francisco among the cities of the Pacific coast in the amount of its water-borne traffic. The chief exports are wheat, flour, timber, hay, potatoes, live stock, fruit, fish (salmon), oats, coal (from the mines E. of Lake Washington), hops, cotton (from the Southern States), dairy products and general merchandise; and the imports include silk, nee, coffee, tea, sugar, spices, indigo and other Oriental products. Practically all the gold from Alaska and the Yukon territory is received here, and nearly 80 % of the Alaskan trade is done through Seattle. The foreign trade is with China, Japan, Siberia, Hawaii, the Philippines, Australia, Mexico, South America and Europe. The Chamber of Commerce has an excellent commercial museum.

The city was chartered in 1880, and under the charter of 1896 (as amended since) elections are biennial. By an amendment of 1908 the initiative and referendum were introduced; an initiative petition must be signed by 10 % of the voters at the preceding municipal election ; a petition for a referendum on any ordinance passed by the city council must be signed by 8 % of the voters at the preceding municipal election. The city council is com- posed of one councilman elected for a two-year term from each ward (in 1910 there were 14 wards), and two councilmen elected at large and serving for four years. The municipality owns the water- supply system with its

source at Cedar Lake and Cedar river, 28 m. S.E. , and an electric lighting plant (for which power is derived from the falls of the Cedar river) , but most of the lighting is supplied by private companies. The city has undertaken the regrading neces- sitated by the hilly site of Seattle. In 1909 the assessed valuation of the city was $185,317,470 and the city's debt was $8,570,380 (bonded) and $8,933,973 (net debt for local improvements).

The first permanent settlement here was made in 1852 by settlers who a year before had established New York, a village at Alki Point, on the W. side of Elliott Bay and in the present city limits. The name Seattle was given to the settle- ment in honour of a Dwamish chief of that name, who died in 1866 and who was friendly to the whites. In 1853 a town plat was filed, King county was erected, and Seattle became the county seat. In 1855 Seattle had a population of 300. In January 1856 in an attempt to exterminate the whites the neighbouring Indians unsuccessfully attacked Seattle, which was defended by the U.S. sloop-of-war " Decatur." The first railway reached Seattle in 1884. In 1885-1886, when there were anti-Chinese riots here led by the Knights of Labour, martial law was declared by the governor and the Chinese were defended by local vigilance committees. A destructive fire in 1889 and the financial depression of 1893 checked the city's growth, which, however, received a new impulse from the dis- covery of gold in Alaska and the Yukon territory in 1897, as Seattle became the outfitting place for prospectors and the port to which gold was shipped. The town of South Seattle was annexed in 1905; and the city of South-east Seattle, the town of Ravenna, the town of South Park, the city of Columbia, the city of Ballard, the city of West Seattle, and Dunlap, Rainier Beach and Atlantic City were .annexed in 1907. From the 1st of June to the 15th of October 1909 the Alaska- Yukon-Pacific Exposition was held in Seattle on grounds which now form part of the university campus, between Lake Union and Lake Wash- ington; of the twelve central Exposition buildings some were afterwards turned over to the university. The purpose of the

Exposition was to exploit Washington, the Yukon and the entire north-west on the Pacific slope.

SEA-URCHIN. These animals belong to the great group of Echinoderms (see Echinoderma) and to its class Echinoidea. Both the scientific and the English names denote their resem- blance to the urchin or hedgehog, the resemblance lying in the prickles with which the skin is covered. The skin itself is stiffened by a deposit of calcite (crystalline carbonate of lime) in the form of plates. If the prickles be

scraped away, these plates will be seen to form a hard shell or test, in which are two openings, for the mouth and the anus. According to the position of these openings the urchins are described as Regular or Irregular. In the Regular ur- chins, of which Echinus esculen- tus, the edible egg-urchin (fig. 1), and Dorocid- aris papillata, the piper (fig. 2), are familiar ex- amples, the test is spheroidal with the mouth at the lower pole and the anus at the upper. In the Irregular urchins, of which Spat- angus purpureus, the purple heart- urchin (fig. 3), is a common type,

Fig. 1. — A Regular Sea-urchin, Echinus esculentus. The test is still covered with spines, between which the suckers of the podia are seen in ten rows.

the test has been drawn out into an oval or heart shape, with the mouth shifted towards the front end and the anus towards the hinder end.

The greater part of the test of a Regular urchin is divided, as a globe by meridians of longitude, into ten areas, each composed of two columns of plates. In five of these areas the plates are pierced by pairs of pores (fig. 2, Ambulacrum), and in life there issues front each pair a tubular process with a sucking disk at its end (fig. 1). Within the test these processes or podia are connected with five tubes arising from a tubular ring round the mouth and running upwards to the apex, where each passes out as a single process through a special plate at the end of the area to which it belongs. Since this terminal process is sometimes surrounded by pigment, as are organs susceptible to light, it has been regarded as an eye and the plate through which it passes called an ocular (fig. 2). From the ring-canal round the mouth a single tube passes straight through the body-cavity to the apex, where it opens through a sieve-like plate — the madreporite (fig. 2). Thus all this system of tubes is placed in connexion with the outer sea-water, and is filled with it. Within the test the bottom of each podium is swollen into a little bag — ampulla — likewise full of water, and when the muscles with which it is provided pull the sides of the bag together, the water is squeezed into the podium and dilates it, so that it is stretched far out (see Echinoderma, fig. 12 D). The podium can then wave about and attach its sucker to any smooth object within reach. Each of these five areas, with the podia on each side of it extended and waving, looks like a garden avenue — Latin ambulacrum — and the areas are therefore called ambulacral areas, the plates composing them ambulacrals, and the whole system of water-vessels the ambu- lacral system. This system forms perhaps the most characteristic feature of

all living Echinoderms, but it reaches its highest develop- ment in the urchins. The five areas alternating with the ambulacral areas are called interambulacral (fig. 2, Interambulacrum) ; their plates are not pierced by pores but are generally ornamented by large tubercles bearing big prickles (spines or radioles), between and around which are smaller prickles (fig. 2). The madreporite is one of five plates that surround the anal opening and alternate in position with the oculars. Each of these plates is pierced by a pore, connected on the inside with one of the five generative glands, and giving passage to the eggs or milt when they are ripe; hence these plates are called genitals (fig. 2). The five genitals and five oculars together form the apical system of plates (see Echinoderma, fig. 3, A.B.). From the mouth to the anus the gut follows a coiled course, first going round_ the cavity of the test in one direction and then turning back on itself, while the two limbs of the loop thus formed are themselves thrown into festoons attached by strands to the wall of the test. The lower coil, next the mouth, is the stomach

in which food accumulates, while the upper coil is the intestine proper. In Echinus, but not in the Cidarids, a narrow tube branches from the gut at the beginning of the first coil, runs alongside the stomach, and re-enters the gut at the end of the coil ; this, which is called the siphon, permits a flow of water through the gut however full of food the stomach may be. Round the gullet is a jaw-apparatus, consisting essentially of five hard, pointed teeth, the ten jaw-pieces in which they are held, five struts between the pairs of jaws, and five cambered stays for the attachment of ligaments to keep the whole apparatus in position. The jaws are worked by muscles in such a way as to draw the teeth together or apart, inwards or out- wards. This apparatus is often called "Aristotle's lantern," though it is extremely doubtful whether Aristotle (Hist. Anim. iv. 5) was alluding to this structure. The whole of it is covered by the mem- brane lining the body-cavity, and from the space thus enclosed there

radiole.

*small spines J^rnbvdcuTunv *

Jhieramdufacrum.

MidrqjQrlte

ccular—

Fig. 2. — A Regular Sea-urchin, Dorocidaris papillata. The test seen from above, with most of the spines removed. Natural size.

pass to the exterior five pairs of hollow branched appendages, the external gills; the five notches through which the gills passed can be seen in the dried test of an Echinus from which the mouth- membrane has been removed, but not in the test of the piper-urchin or other Cidarid, because there the gills are not developed.

The prickles that cover the test are better studied in the piper- urchin (fig. 2), where some of them are very large and, from their resemblance to the drones of a bagpipe, have suggested the name of the animal. Each of these large spines or radioles is attached to a rounded tubercle by an enclosing ligament and outer coat of muscles, the base of the radiole being hollowed to fit on the tubercle. Thus the radiole can be moved in any direction. The attachment of the larger radioles is protected by a ring of smaller ones. These and the other small spines protect the sea-urchin, as its prickles protect a hedgehog; the larger ones may also help the animal to move or to fix itself firmly against the shock of waves. Some urchins, especially the purple egg-urchin, bore holes even in very hard rocks, and by stretching out their radioles they can hold themselves immovably in their holes; how they bore the holes is not known with certainty. Besides radioles, small pincer-like appendages called pedicellariae are attached to the test by similar ball-and-socket joints. Each consists of a long stalk bearing three blades which can meet at their points; on the inner surface of each blade is a cushion of sensitive

skin, and often a gland which secretes a poison. The pedicellariae were once supposed to be parasites, but they are really organs of the urchin of the same nature as the radioles; they are of four different forms, three of which undoubtedly serve for defence, while the shortest ones clean the test from impurities and sand-grains that fall between the radioles. Sea-urchins other than Cidarids also bear on the test minute sensory organs called sphaeridia, each consisting of a small hard knob, supported by a stalk which may be partly calcified but always contains many nerve- fibres. It is generally supposed that they are sensitive to vibrations in the water, and to any change from the normal position which the animal may assume or be forced into. Such a regular urchin as has here been described lives with the mouth downwards, preferring a hard floor, on which it creeps by its podia and its radioles, constantly scraping the algae and seaweeds from the rock with its teeth and so feeding itself. If it does not bore a

hole, or is not protected by long needle- like radioles, it may grasp bits of sea-weed or other objects with its pedicellariae and hide beneath them from the fish that seek it for food. The Irregular urchins (fig. 3) have been modified for another way of life. Some of them live in mud or ooze, through which they creep. The mouth

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Fig. 3. — An Irregular Sea-urchin, Spatangus purpureus.

has moved forward, has lost its jaws and often has a lip, pro- jecting so as to scoop up the mud. The prickles have become smaller, often almost silky, and are gener- ally directed wards so as oppose the the body, of the under still aid locomotion, but those of the upper surface, which are concentrated in five petal-shaped areas, act mainly as gills. These urchins often assume a heart shape, owing to the greater development and sinking in of the front petal. The sand-dollars and their allies, which live half-buried in sand without moving through it, retain a more or less circular outline, as well as the central position of the mouth, which has not lost its jaws; the anus, however, has moved to the side, while the podia of the upper surface are concentrated in petals and many of them modified into branched gills. The sand-dollars proper are very thin and flat, but the shield-urchins [Clypeaster, &c.) have the central region of the upper surface raised in a boss, which reaches above the sand, so that the animal can still breathe though the whole body is hidden. In many Irregular urchins the petals of the ambulacra are deeply sunk, and serve as a nursery for the young, which are covered by the spines of the parent.

Sea-urchins live only in the sea, from between tide-marks down to all but the greatest depths. The abyssal forms have very thin tests, which are often flexible. Urchins eat all kinds of animal and vegetable food, and are themselves attacked by fish, by star- fish, and even by other urchins. The ripe egg-bunches are a favourite article of diet with dwellers round the Mediterranean; in other respects sea-urchins are of small importance to man, being neither useful nor harmful. In olden times the larger radioles were recom- mended to be powdered and taken as a remedy for the stone.

For details of classification, see under Echinaidea, in the article

ECHINODERMA.

SEA-WOLF, also Sea-cat and Wolf-fish (Anarrhichas lupus), a

marine fish, the largest of the family Blenniidae or blennies. In spite of its large size, it has retained the bodily form and general external characteristics of the small blennies. Its body is long, subcylindrical in front, compressed in the caudal portion, smooth and slippery, the rudimentary scales being embedded and almost hidden in the skin. An even dorsal fin extends the whole length of the back, and a similar fin from the vent to the caudal fin, as in blennies. The pectorals are large and rounded, the pelvic fins entirely absent. Its dentition distinguishes the sea-wolf from all the other members of the family. Both jaws are armed in front with strong conical teeth, and on the sides with two series of large tubercular molars, a biserial band of similar molars occupying the middle of the palate. By these teeth the sea-wolf is able to crush the hard carapaces or shells of the crustaceans and molluscs on which it feeds; that it uses

Teeth of the lower and upper jaws of the Sea- wolf.

the teeth as a weapon of defence and deserves the character of ferocity generally attributed to it would appear to be rather

questionable. Sea- wolves are inhabit- ants of the northern seas of both hemi- spheres, one (A . lupus) being com- mon on the coasts of Scandinavia and North Britain, and two in the seas round Iceland and Green- land. Two others occur in the corre- sponding latitudes of the North Pacific. They attain to a length exceeding 6 ft., and in the north are esteemed as food, both fresh and preserved. The oil extracted from the liver is said to be in quality equal to the best cod-liver oil.

To the fishermen of the North Sea this fish is generally known as the cat-fish, and for some years past numbers of this species have been marketed. As it would be impossible to sell the fish in its natural state on account of its forbidding appearance, it is skinned and beheaded, and the flesh retailed under the name of rock-salmon.

SEAWRACK, the detached seaweeds thrown up, often in great quantities, by the sea and used for manure, also formerly for making kelp. It consists largely of species of Fucus — brown seaweeds with flat branched ribbon-like fronds, characterized in F. serratus by a saw-toothed margin and in F. vesiculosus, another common species, by bearing air-bladders. Also of Zostera marina, so-called sea-grass,

a marine flowering plant with bright green long narrow grass-like leaves.

SEBASTIAN, ST, a Christian martyr whose festival is celebrated on the 20th of January. According to St Ambrose (in Psalm 118, oct. 20) Sebastian was a native of Milan, went to Rome at the height of Diocletian's persecution, and there suffered martyr- dom. The Acta of St Sebastian, falsely attributed to the same St Ambrose, are far less sparing of details. They make him a citizen of Narbonne and captain of the first cohort under the emperors Diocletian and Maximian. Having secretly become a Christian, Sebastian was wont to encourage those of his brethren who in the hour of trial seemed wavering in their profession. This was conspicuously the case with the brothers Marcus and Marcellinus. He made many converts, several of whom suffered martyrdom. Diocletian, having been informed of this conduct, sent for him and earnestly remonstrated with him, but, finding him inflexible, ordered him to be bound to a stake and shot to death. After the archers had left him for dead, a devout woman, Irene, came by night to take his body away for burial, but, finding him still alive, carried him to her house, where his wounds were dressed. No sooner had he wholly recovered than he hastened to confront the emperor, reproaching him with his impiety; Diocletian ordered him to be instantly carried off and beaten to death with rods. The sentence was forthwith executed, his body being thrown into the cloaca, where, however, it was found by another pious matron, Lucina, whom Sebastian visited in a dream, directing her to bury him ad Catacombas juxta vestigia apostolorum. It was on this spot, on the Appian way, that was built the basilica of St Sebastian, which was a popular place of pilgrimage in the middle ages. The translation of his relics to Soissons in 826 made that town a new centre of his cult. St Sebastian is specially invoked against the plague. As a young and beautiful soldier, he is a favourite subject of sacred art, being most generally represented undraped, and severely though not mortally wounded with arrows.

See Acta Sanctorum, January, ii. 257-296; Bibliotheca hagio-graphica Latina (Brussels, 1899), n. 7543-7549; A. Bell, Lives and Legends of the Evangelists, Apostles and other early Saints (London, 1901), pp. 238-240. (H. De.)

SEBASTIAN, king of Portugal (Port. Sebastiao) (1554-1578), the posthumous son of Prince John of Portugal and of his wife

Joanna, daughter of the emperor Charles, was born in 1554, and became king in 1557, on the death of his grandfather John III. of

Portugal. During his minority (1557-1568), his grand- mother Queen Catherine and his great uncle the Cardinal Prince Henry acted jointly as regents. Sebastian's education was entrusted to a Jesuit, D. Luiz Congalves da Camara and to D. Aleixo de Menezes, a veteran who had served under Albuquerque. He grew up resolved to emulate the medieval knights who had reconquered Portugal from the Moors. He was a mystic and a fanatic, whose sole ambition was to lead a crusade against the Mahommedans in north-west Africa. He entrusted the govern- ment to the Jesuits; refused either to summon the Cortes or to marry, although the Portuguese crown would otherwise pass to a foreigner, and devoted himself wholly to hunting, martial exercises and the severest forms of asceticism. His first expedi- tion to Morocco, in 1574, was little more than a reconnaissance; in a second expedition Sebastian was killed and his army annihil- ated at Al Kasr al Kebir (4th of August 1578). Although his body was identified before burial at Al Kasr, reinterred at Ceuta, and thence (1582) removed by Philip II. of Spain to the Convento dos Jeronymos in Lisbon, many Portuguese refused to credit his death. " Sebastianism " became a religion. Its votaries believed that the rei encuberto, or " hidden king," was either absent on a pilgrimage, or, like King Arthur in Avalon, was awaiting the hour of his second advent in some enchanted island. Four pretenders to the throne successively impersonated Sebastian; the first two, known from their places of birth as the " King of Penamacor " and the " King of Ericeira," were of peasant origin; they were captured in 1584 and 1585 respectively. The third, Gabriel Espinosa, was a man of some education, whose adherents included members of the Austrian and Spanish courts and of the Society of Jesus in Portugal. He was executed in 1 594. The fourth was a Calabrian named Marco Tullio, who knew no Portuguese; he impersonated the "hidden king " at Venice in 1603 and gained many supporters, but was ultimately captured and executed. The Sebastianists had an important share in the Portuguese insurrection of 1640, and were again prominent during the Miguelite wars (1828-34). At an even later period Sir R. F. Burton stated that he had met with Sebastianists in remote parts of Brazil (Burton, Camoens, vol. i.p. 363, London, 1881), and the cult appears to have survived until the beginning of the 20th century, although it ceased to be a political force after 1834.

See Portugal, History; J. Barbosa Machado, Memorias para

governo del rey D. Sebastiao (4 vols., Lisbon, 1736-1741);

Miguel d'Antas, Les Faux Don Sebastien (Paris, 1866) ; Sao Mamede, Don Sebastien et Philippe II (Paris, 1884).

SEBASTIANI, HORACE FRANCOIS BASTIEN, Count (1772-1851) French marshal and diplomatist. Of Corsican birth, he was in his early years banished from his native island during the civil disturbances, and in 1789 he entered the French army. In 1793, as a French lieutenant, he took part in the war in his native island, after which he served in the Army of the Alps. He became chef de brigade in 1 799. Attached by birth and service to the future Emperor Napoleon, he took part in the Coup d'£lat of 18th Brumaire (9th November 1799). He was present at Marengo in 1800. Sebastiani next appears in his first diplo- matic post, in Turkey and Egypt (1802). Promoted general of brigade in 1803, he served in 1805 in the first of the great campaigns of the Empire. His conduct at Austerlitz (2nd December), where he was wounded, won him promotion to the rank of general of division. Sebastiani soon returned to Con- stantinople as French Ambassador. As ambassador he induced the Porte to declare war on Russia, as a soldier he directed with success the defence of Constantinople against the British squadron of Admiral (Sir) J. T. Duckworth. But the deposition of the Sultan Selim III. put an end to French diplomatic success in this quarter, and Sebastiani was recalled in April 1807 (see La Politique orientate de NapoUon: Sebastiani et Gardam, by E. Driault, Paris, 1905). He was at this time made Count of the Empire. As the commander of a corps he served in the Peninsular War, but his cavalry genius did not shine in the

laborious and painful operations against the careful English and the ubiquitous guerrilleros. In the more congenial grande guerre of Russia and Germany he was in his element, and at Smolensk, Borodino and Leipzig he did brilliant service. He accepted the Restoration government in 1814, but rejoined his old leader on his return from Elba. After Waterloo he retired into England for a time, but soon returned, and was placed on half-pay. From 1819 onwards he was a prominent member of the Chamber of Deputies. He held the posts of Minister of Marine, and, later, of Foreign Affairs. In this latter capacity he was the author of the historic saying " Order reigns at Warsaw." In 1832 he was a Minister of State without port- folio, next year ambassador at Naples, and from 1835 to 1840 was ambassador to Great Britain. On his retirement from this post he was made Marshal of France. He was a brilliant social figure in Paris. His last years were clouded by the death of his daughter at the hands of her husband, the due de Praslin. He died at Paris on the 21st of

July 1851.

His brother, Jean Andre Tiburce Sebastiani (1786-1871), entered the army in 1806, served in the Peninsula from 1809 to 181 1, and in the great campaigns of Russia, Germany, France and Belgium. He took part in the war of Greek independence under General Maison. In 1842, now lieutenant-general and peer of France, he was appointed to command the military division of Paris. But he proved incapable of dealing with the Revolution of 1848, and the remainder of his life was spent in retirement in Corsica.

SEBASTIANO DEL PIOMBO (1485-1547), Italian painter, was born at Venice in 1485. His family name was Luciani. He belongs to the Venetian school, exceptionally modified by the Florentine or Roman. At first a musician, chiefly a solo- player on the lute, he was in great request among the Venetian nobility. He soon showed a turn for painting, and became a pupil of Giovanni Bellini and afterwards of Giorgione. His first painting of note was done for the church of San Giovanni Crisostomo in Venice, and is so closely modelled on the style of Giorgione that in its author's time it often passed for the work of that master. It represents Chrysostom reading aloud at a desk, a grand Magdalene in front, and two other female and three male saints. Towards 151 2 Sebastiano was invited to Rome by the wealthy Sienese merchant Agostino Chigi, who occupied a villa by the Tiber, since named the Farnesina; he executed some frescoes here, other leading artists being employed at the same time. The Venetian mode of colour was then a startling novelty in Rome. " Michelangelo saw and approved the work of Luciani, became his personal friend, and entered into a peculiar arrangement with him. At this period the pictorial ability of Michelangelo was somewhat decried in Rome, the rival faculty of Raphael being invidiously exalted in comparison; in especial it was contended that Buonarroti fell short as a colourist. He therefore thought that he might try whether, by furnishing designs for pictures and leaving to Sebastiano the execution of them in colour, he could not maintain at its highest level his own general supremacy in the art. In this there seems to have been nothing particularly unfair, always assuming that the compact was not fraudulently concealed; and the facts are so openly stated by Michelangelo's friend Vasari (besides other writers) that there appears to have been little or no disguise in the matter. The pictures are there to speak for themselves; and connoisseurs have always acknowledged that the quality of Michelangelo's unmatched design is patent on the face of them. Some writers, however, jealous for Buonarroti's personal rectitude, have denied that his handiwork is to be traced in the pictures bearing the namcof Sebastiano.

Four leading pictures which Sebastiano painted in pursuance of his league with Buonarroti are the "Pietit" (earliest of the four), in the church of the Conventuali, Viterbo; the "Trans- figuration " and the " Flagellation," in the church of S. Pietro in Montorio, Rome; and, most celebrated of all, the " Raising of Lazarus," now in the National Gallery, London. This grand work — more remarkable for general strength of pictorial percep- tion than for qualities of detailed intellectual or emotional

expression — is more than 12 by 9 ft. in dimensions, with the principal figures of the natural size; it is inscribed " Sebastianus Venetus faciebat," and was transferred from wood to canvas in 1771. It was painted in 1517-1519 for Giulio de' Medici, then bishop of Narbonne, afterwards Pope Clement VII.; and it remained in Narbonne cathedral until purchased by the duke of Orleans early in the 18th century — coming to England with the Orleans gallery in 1792. It used to be generally admitted (yet it is now increasingly contested) that the design of Michel- angelo appears in the figure of Lazarus and of those who are busied about him (the British Museum contains two sketches of the Lazarus regarded as Michelangelo's handiwork); but whether he actually touched the panel, as has often been said, appears more than doubtful, as he left Rome about the time when the picture was commenced. Raphael's " Transfiguration " was painted for the same patron and the same destination. The two works were exhibited together, and some admirers did not scruple to give the preference to Sebastiano's. The " Flagellation of Christ," though ordinarily termed a fresco, is, according to Vasari, painted in oil upon the wall. This was a method first practised by Domenico Veneziano, and afterwards by other artists; but Sebastiano alone succeeded in preventing the blackening of the colours. The contour of the figure of Christ in this picture is supposed by many to have been supplied by Buonarroti's own hand. Sebastiano, always a tardy worker, was occupied about six years upon this work, along with its com- panion the " Transfiguration," and the allied figures of saints.

After the elevation of Giulio de' Medici to the pontificate, the office of the " piombo " or leaden seal — that is, the office of sealer of briefs of the apostolic chamber — became vacant; two painters competed for it, Sebastiano Luciani, hitherto a comparatively poor man, and Giovanni da Udine. Sebastiano, assuming the habit of a friar, secured the very lucrative appoint- ment — with the proviso that he should pay out of his emolu- ments 300 scudi per annum to Giovanni. If he had heretofore been slow in painting he became now supine in a marked degree. One of the few subject-pictures which he executed after taking office was " Christ carrying the Cross " for the*

patriarch of Aquileia, also a " Madonna with the body of Christ." The former painting is done on stone, a method invented by Sebastiano himself. He likewise painted at times on slate — as in the instance of " Christ on the Cross," now in the Berlin gallery, where the slate constitutes the background. In the same method, and also in the same gallery, is the " Dead Christ supported by Joseph of Arimathea, with a weeping Magdalene " — colossal half-length figures. Late in life Sebastiano had a serious dis- agreement with Michelangelo with reference to the Florentine's great -picture of the " Last Judgment." Sebastiano encouraged the pope to insist that this picture should be executed in oil. Michelangelo, determined from the first upon nothing but fresco, tartly replied to his holiness that oil was only fit for women and for sluggards like Friar Sebastian; and the coolness between the two painters lasted almost up to the friar's death. This event, consequent upon a violent fever acting rapidly upon a very sanguine temperament, took place in Rome in 1547. Sebastiano directed that his burial, in the church of S Maria del Popolo, should be conducted without ceremony of priests, friars or lights, and that the cost thus saved should go to the poor; in this he was obeyed.

Numerous pupils sought training from Sebastiano del Piombo; but, owing to his dilatory and self-indulgent habits, they learned little from him, with the exception of Tommaso Laureti. Sebastiano, conscious of his deficiency in the higher sphere of invention, made himself especially celebrated as a portrait painter: the likeness of Andrea Doria, in the Doria Palace, Rome, is one of the most re-nowned. In the National Gallery, London, are two fine specimens; one canvas represents the friar himself, along with Cardinal Ippolito de' Medici; the other, a portrait of a lady in the character of St Agatha, used to be identified with one of Sebastiano's prime works, the likeness of Julia Gonzaga (painted for her lover, the aforenamed cardinal), but this assumption is now discredited. There were also portraits of Marcantonio Colonna, Vittoria Colonna, Ferdinand marquis of Pescara, Popes Adrian VI., Clement VII. (Studj Gallery, Naples) and Paul III., Sanmicheli, Anton Francesco degli Albizzi

and Pietro Aretino. One likeness of the last-named sitter is in Arezzo and another in the Berlin gallery.

See his general histories of art ; and, with regard to his designs,

Bernhard Berenson, The Drawings of Florentine Painters (1904). The decision as to the authorship of various pictures which may or may not be attributable to Sebastiano del Piombo is necessarily a matter of contemporary connoisseurship, and it need only be noted that Mr Berenson is inclined to give increased importance to this master. (W. M. R.)

SEBENICO (Serbo-Croatian, Sibenik), an episcopal city, and the centre of an administrative district in Dalmatia, Austria; at the end of a branch railway from Knin. Pop. (1900) of city and commune, 24,751. Sebenico is built on a hill overlooking the river Kerka, which here forms a broad basin, connected by a winding channel with the Adriatic Sea, 3 m. S.W. The city is partly walled, and guarded on the seaward side by the 16th- century castle of St Anna and two dismantled forts. Venetian influence is everywhere manifest; the Lion of St Mark is carved over the main gateway and on many public buildings; and among the narrow and steep lanes of the city there are numerous examples of Venetian Gothic or early Renaissance architecture. Sebenico has been the seat of a Roman Catholic bishop since 1298. It has also an orthodox bishop. The Roman Catholics, who constitute the majority of citizens, possess a lofty and beautiful cruciform cathedral, built entirely of stone and metal. Probably no other church of equal size in Europe is similarly constructed. Even the waggon vaults over the nave, choir and transepts are of stone unprotected by lead or tiles. The older part of the cathedral, dating from 1430 to 1441, and includ- ing the fine north doorway, is Italian Gothic. Giorgio Orsini of Zara, who had studied architecture in Venice and been strongly influenced by the Italian Renascence, carried on the work of construction until his death in 1475. It was finished early in the 1 6th century; and thus the cathedral belongs to two distinct periods and represents two distinct styles.

Sebenico is lighted by electric light; the power being supplied by the celebrated falls of the Kerka, near Scardona, on the north. Sebenico is a steamship station, with an excellent harbour. Wine, oil, corn and honey are produced in the neighbour- hood; many of the inhabitants are fishermen and seamen. The Latin name of Sicum is adopted in public inscriptions; but the city cannot be identified with the Roman colony of Sicum, which was probably situated farther south. Sebenico first became prominent in the 12th century as a favourite residence of the Croatian kings. From 1358 to 141 2 it was ruled by Hungary; it subsequently formed part of the Venetian dominions. In 1647 it was unsuccessfully besieged by the Turks.

SEBORRHOEA, a medical term applied to describe an accumu- lation

on the skin of the normal sebaceous secretion mixed with dirt and forming, scales or a distinct incrustation. On the head, where it is commonly seen, it may interfere with the nutrition of the hair and cause partial baldness. A form of this disease occurs in young infants. The main treatment consists in thoroughly cleansing the parts. The crusts may be softened with oil and the affected skin regularly washed with soft soap and rectified spirit. The sebum frequently accumulates in the sebaceous ducts, giving rise to the minute black points often noticed on the face, back and chest in young adults, to which the term comedones is applied. A form of this disorder, of larger size and white appearance, is termed milium. These affections may to a large extent be prevented by strict attention to ablution and brisk friction of the skin, which will also often remove them when they begin to appear. The retained secretion may be squeezed out or evacuated by incision and the skin treated with some simple sulphur application.

SECCHI, ANGELO (1818-1878), Italian astronomer, was born on the 29th of June 1818 at Reggio in Lombardy, and entered the Society of Jesus at an early age. In 1849 he was appointed director of the observatory of the Collegio Romano, which was rebuilt in 1853; there he devoted himself with great perseverance to researches in physical astronomy and meteorology till his death at Rome on the 26th of February 1878.

The results of Secchi's observations are contained in a great number of papers and memoirs. From about 1864 he occupied himself almost exclusively with spectrum analysis, both of stars {Catalogo delle stelle di cui si e determinato lo spettro luminoso, Paris,

1867, 8vo; " Sugli spettri prismatici delle stelle fisse," two parts,

1868, in the Atli della Soc. Ital.) and of the sun (Le Soleil, Paris, 1870, 8vo; 2nd ed., 1877).

For a list of his publications see Poggendorff, Biographisch-Literarische; also see Monthly Notices R.A.S., No. 39, and Carlo Bricarelli, " Vita e opere di A. Secchi," Nuovi Line. Mem. (1888), vol. 4.

SECESSION, a term used in political science to signify the withdrawal of a state from a confederacy or composite state, of which it had previously been a part; and the resumption of all powers formerly delegated by it to the federal government, and of its status as an independent state. .To secede is a sovereign right; secession,

therefore, is based on the theory that the sovereignty of the individual states forming a confederacy or federal union has not been absorbed into a single new sovereignty. Secession is a right claimed or exercised by weaker states of a union whose rights are threatened by the stronger states, which seldom acknowledge such a principle. War generally follows the secession of a member of a union, and the seceding state, being weaker, is usually conquered and the union more firmly consolidated. The history of Europe furnishes several examples of secession or attempts to secede: in 1309 the Swiss cantons withdrew from the Empire and formed a confederacy from which, in 1843-1847, the Catholic cantons seceded and formed a new confederacy called the Sonderbund, which was crushed in the war that followed; in 1523 Sweden seceded from the Kalmarian Union formed in 1397 of Denmark, Sweden and Norway; and in 1814 Norway seceded and entered into a union with Sweden, from which, in the same year, it attempted to secede but was forcibly prevented; Norway, however, accomplished a peaceful secession from the Union in 1905 and resumed her independent status; in 1848-1849 Hungary attempted to withdraw from the union with Austria but the attempt was defeated; Prussia and other north German states withdrew in 1 866-1 868 from the German Confederation and formed a new one; a late instance of successful secession is that of Panama, which seceded in 1903 from the Republic of Colombia. But secession in theory and practice is best exhibited in the history of the United States. Most of the original states, and many of the later ones, at some period when rights were in jeopardy proclaimed that their sovereignty might be exercised in secession. The right to secede was based, the secessionists claimed, upon the fact that each state was sovereign, becoming so by successful revolution against England; there had been no political connexion between the colonies; the treaty of 1783 recognized them "as free, sovereign and independent states "; this sovereignty was recognized in the Articles of Confederation, and not surrendered, they asserted, under the Constitution; the Union of 1787 was really formed by a secession from the Union of 1776-1787. New states claimed all the rights of the old ones, having been admitted to equal standing. Assertions of the right and necessity of secession were frequent from the beginning; separatist conspiracies were rife in the West until 181 2; various leaders in New England made threats of secession in 1 790-1 796 and 1800-1815 — especially in 1803 on account of the purchase of Louisiana, in 181 1 on account of the proposed admission of Louisiana as a state, and during the troubles ending in the War of 1 81 2. Voluntary separation was frequently talked of before 181 5. Two early commentators on the Constitution,

St George Tucker in 1803 and William Rawle in 1825, declared that the sovereign states might secede at will. In 1832-1833 the " Union " party of South Carolina was composed of those who rejected nullification, holding to secession as the only remedy; and from 1830 to i860 certain radical abolitionists advocated a division of the Union. But as the North grew stronger and the South in comparison grew weaker, as slavery came to be more and more the dominant political issue, and as the South made demands concerning that " peculiar institution " to which the North was unwilling to accede, less was heard of secession in the North and more in the South. Between 1845

and i860 secession came to be generally accepted by the South as the only means of preserving her institutions from the inter- ference of the North. The first general movement toward secession was in 1850. In 1860-1861, when the federal govern- ment passed into the control of the stronger section, the Southern states, individually, seceded and then formed the Confederate states, and in the war that followed they were conquered and forced back into the Union. So, in the United States, secession along with state sovereignty is of the past. From the historical point of view it may be suggested that neither North nor South was correct in theory in 1861: the United States were not a nation; neither were the states sovereign; but from the embryo political communities of 1 776-1 787 , in which no proper sovereignty existed anywhere, two nationalities were slowly being evolved and two sovereignties were in the making; the North and the South each fulfilled most of the requirements for a nation and they were mutually unlike and hostile.

See Jefferson Davis, Rise and Fall of the Confederate Government (New York, 1881); A. H. Stephens, Constitutional View of the War between the States (Philadelphia, 1868-1870); J. L. M. Curry, Civil History of the Confederate States (Richmond, 1900); J. W. Du Bois, William L. Yancey (Birmingham, 1892); J. Hodgson, Cradle of the Confederacy (Mobile, 1876) ; B. J. Sage, Republic of Republics (Boston, 1876); W. Wilson, The State (Boston, 1900); A. L. Lowell, Govern- ment and Parties in Continental Europe (Boston, 1896); J. W. Burgess, Political Science and Comparative Constitutional Law (New York, 1895), and C. E. Merriam, American Political Theories (New York, 1902). See also State Rights, Nullification, and Confederate States. (W. L. F.)

SECKENDORF, FRIEDRICH HEINRICH, Count von (1673-1763),

German soldier, nephew of Veit Ludwig von Seckendorf (g.v.), was born at Konigsberg in Franconia. His father was an official of Saxe-Gotha. In 1693 he served in the allied army commanded by William III. of England, and in 1694 became a cornet in a Gotha cavalry regiment in Austrian pay. Leaving the cavalry he became an infantry officer in the service of Venice, and (1697) in that of the margrave of Anspach, who in 1698 transferred the regiment in which Seckendorf was serving to the imperial army. In 1699 he married and returned to Anspach as a court officer, but the outbreak of the War of the Spanish Succession called him into the field again as lieutenant- colonel of an Anspach regiment, which was taken into the Dutch service. He distinguished himself at Oudenarde (1708), and was severely wounded at the siege of Ryssel. Disappointed of promotion in Holland and Austria, he entered the Polish-Saxon army as a major-general, and fought as a volunteer at the siege of Tournai and the battle of Malplaquet. He continued to serve in Flanders to the end of the war, acted in a diplomatic capacity in the peace negotiations, and in 1713 suppressed an insurrection in Poland.. In 1715, as a lieutenant-general, he commanded the Saxon contingent at the siege of Stralsund, defended by Charles XII. of Sweden. In 171 7 Seckendorf once more entered the service of the emperor, with the rank of lieutenant field marshal, and he was present at the siege of Belgrade by Prince Eugene. In 1718 and 1719 he fought in Italy, and in the latter year he was made a count of the empire. In 1726, at the instance of Prince Eugene, he was made the Austrian representative at the court of Prussia. He remained at Berlin, with short intervals, up to 1735, and for the greater part of this time exercised a strong influence over Frederick William II. He was deeply involved in the family quarrels which embittered the lives of Frederick William, his queen and the crown prince (Frederick the Great), which culminated in the prince's condemnation to death by court martial, and is presented by Carlyle (Frederick the Great, vol. ii.) as a cold, passionless intriguer, taciturn, almost stolid, and absolutely unscrupulous in the furtherance of Austrian political aims. In 1726 Seckendorf was appointed general of cavalry of the army of the Holy Roman Empire, and served with such distinction as was to be gained in a war of positions in the Rhine campaigns of the War of the Polish Succession (1734-35). His dissensions with Prince Leopold of Anhalt- Dessau (g.v.) — the " old Dessauer " was Seckendorf's declared enemy at the Prussian court — made the conduct of operations impossible, and, after placing the Austrian and German armies

in favourable positions, Seckendorf departed to Hungary to report on

the state of the Austrian army there — -a task which brought him fresh enemies. In 1737 the emperor Charles VI., however, made Seckendorf commander-in-chief in Hungary, at the same time giving him the baton of field marshal. The new commander began well, but failed at the end, and his numerous enemies at Vienna brought about his recall, trial and imprisonment. He remained a prisoner till 1740, and was then reinstated by order of Maria Theresa, but being denied his arrears of pay he laid down all his Austrian and imperial offices and accepted from the emperor Charles VII., elector of Bavaria, the rank of field marshal in the Bavarian service. His last campaigns were those of 1 743 and 1 744 in the Austrian Succession War (q.v.), and, after the death of Charles VII. and the election of Maria Theresa's husband to the imperial dignity, he became reconciled with the Austrian court. From 1745 his life was spent more or less in retirement at Meuselwitz, near Altenburg. In 1757 the death of his wife, for whom, harsh and unamiable as he was, he had a deep and abiding affection, broke down his already failing health. He fell into the hands of a Prussian hussar party in December 1758, and was for five months held prisoner by Frederick the Great, who had little love for him either as his former court enemy or as his unsatisfactory ally in the first Silesian war. He died at Meuselwitz on the 23rd of November 1763.

See Wurzbach's Biogr. Lexikon, pt. 33, " Versuch einer Lebensr beschreibung des F. M. Seckendorf " (Leipzig, 1 792-1 794); Seelander, Graf Seckendorf und der Friede v. Passau (Gotha, 1883) ; Carlyle, Frederick the Great, vols. i.-v. passim; and memoir in Allgemeine deutsche Biographie.

SECKENDORF, VEIT LUDWIG VON (1626-1692), German statesman and scholar, was a member of a German noble family, which took its name from the village of Seckendorf between Nuremberg and Langenzenn. The family was divided into eleven distinct lines, but only three survive, widely distributed throughout' Prussia, Wurttemberg and Bavaria. 1 Veit Ludwig von Seckendorf, son of Joachim Ludwig von Seckendorf, was born at Herzogenaurach, near Erlangen, on the 20th of December 1626. In 1639 the reigning duke of Saxe-Coburg-Gotha, Ernest the Pious, made him his protege. Entering the university of Strassburg in 1642, he devoted himself to history and juris- prudence. The means for his higher education came from Swedish officers, former comrades of his father who had been actively engaged in the Thirty Years' War and who was executed at Salzwedel on the 3rd of February 1642 for his dealings with the Imperialists. After he finished his university course Duke Ernest gave him an appointment in his court at Gotha, where

he laid the foundation of his great collection of historical materials and mastered the principal modern languages. In 1652 he was appointed to important judicial positions and sent on weighty embassages. In 1656 he was made judge in the ducal court at Jena, and took the leading part in the numerous beneficent reforms of the duke. In 1664 he resigned office under Duke Ernest, who had just made him chancellor and with whom he continued on excellent terms, and entered the service of Duke Maurice of Zeitz (Altenburg), with the view of lightening his official duties. After the death of Maurice in 1681 he retired to his estate, Meuselwitz in Altenburg, resigning nearly all his public offices. Although living in retirement, he kept up a correspondence with the principal learned men of the day, He was especially interested in the endeavours of the pietist Philipp Jakob Spener to effect a practical reform of the German church, although he was hardly himself a pietist. In 1692 he

1 Besides Friedrich Heinrich, count von Seckendorf, separately noticed, other members of the family were Adolf Franz Karl (1742-1818), who was made a count by Frederick William III. of Prussia; Eduard Christoph Ludwig Karl v. Seckendorf-Gudent (1813-1875), a Wurttemberg official; Karl Sigmund (1744-1785), writer; Franz Karl Leopold v. Seckendorf- Aberdar (1 775-1 809), poet, literary man and soldier; the brothers; Christian Adolf (1767-1833) and Gustav Anton (" Patrik Peale ") ˆ(1775-1823),. both literary m&n of some note, and Arthur v. Seckendorf-Gudent (1845-1886), student of forestry.

was appointed chancellor of the new university of Halle, but he died a few weeks afterwards, on the 18th of December.

Seckendorf's principal works were the following: — Teutscher Furstenstaat (1656 and 1678), a handbook of German public law; Der Christenstaat (1685), partly an apology for Christianity and partly suggestions for the reformation of the church, founded on Pascal's Pensies and embodying the fundamental ideas of Spener; Commentarius kistoricus et apologeticus de Lutheranismo sive de Reformatione (3 vols., Leipzig, 1692), occasioned by the Jesuit Maimbourg's Histoire du Lutheranisme (Paris, 1680), his most important work, and still indispensable to the historian of the Reformation as a rich storehouse of authentic materials.

See Richard Pahner, Veil Ludwig von Seckendorff und seine Gedanken uber Erziehung und Unterricht (Leipzig, 1892), the best sketch of Seckendorf's life, based upon original sources. See also Theodor Kolde, " Seckendorf," in Herzog-Hauck's Realencyklopddie (1906).

SECKER, THOMAS (1693-1768), archbishop of Canterbury, was born at Sibthorpe, Nottinghamshire. He studied medicine in London, Paris and Leiden, receiving hisM.D. degree at Leiden in 1721. Having decided to take orders he graduated, by special letters from the chancellor, at Exeter College, Oxford, and was ordained in 1722. In 1724 he became rector of Houghton-le- Spring, Durham, resigning in 1727 on his appointment to the rectory of Ryton, Durham, and to a canonry of Durham. He became rector of St James's, Westminster, in 1733, and bishop of Bristol in 1735. About this time George II. commissioned him to arrange a reconciliation between the prince of Wales and himself, but the attempt was unsuccessful. In 1737 he was translated to Oxford, and he received the deanery of St Paul's in 1750. In 1758 he became archbishop of Canterbury. His advocacy of an American episcopate, in connexion with which he wrote the Answer to Dr Mayhew's Observations on the Charter and Conduct of the Society for the Propagation of the Gospel in Foreign Parts (London 1764), raised considerable opposition in England and America.

His principal work was Lectures on the Catechism of the Church of England (London, 1769).

SECOND (through Fr. from Lat. secundus, following, sequi, to follow), next after the first in order, time, rank, &c, more particularly the ordinal number corresponding to two. It is the only French ordinal in English; the older word was " other," Ger. ander, Goth, anthar, Skt. antara. The use of the word for the sixtieth part of a minute of time and of degree is from Med. Lat. secunda, abbreviation of minuta secunda, the second small division of the hour, minuta prima or minuta being the first division. Another particular meaning is for one who supports or assists another, especially the friend at a duel, who arranges for his principal the terms of the encounter and sees that all rules of the duel are carried out. In the British army an officer is said to be " seconded " ■ (with the accent on the second syllable) when he is employed on special service outside his regiment, his name being retained on the regimental list, but his place being filled by promotion of other officers. He may rejoin his regiment when his special employment is at an end.

SECOND SIGHT, a term denoting the opposite of its apparent significance, meaning in reality the seeing, in vision, of events before they occur. " Foresight " expresses the meaning of second sight, which perhaps was originally so called because normal vision was regarded as coming first, while supernormal vision is a secondary thing, confined to certain individuals.

Though we hear most of the " second sight " among the Celts of the Scottish Highlands (it is much less familiar to the Celts of Ireland), this species of involuntary prophetic vision, whether direct or symbolical, is peculiar to no people. Perhaps our earliest notice of symbolical second sight is found in the Odyssey, where Theoclymenus sees a shroud of mist about the bodies of the doomed Wooers, and drops of blood distilling from the walls of the hall of Odysseus. The Pythia at Delphi saw the Wood on the walls during the Persian War; and, in the Argo- nautica of Apollonius Rhodius, blood and fire appear to Circe in her chamber on the night before the arrival of the fratricidal Jason and Medea. Similar examples of symbolical visions occur in the Icelandic sagas, especially in Njala, before the burning of Njal and his family. In the Highlands, and in Wales, the

chief symbols beheld are the shroud, and the corpse candle or other spectral illumination. The Rev. Dr Stewart, of Nether Lochaber, informed the present writer that one of his parishioners, a woman, called him to his door, and pointed out to him a rock by the sea, which shone in a kind of phosphorescent brilliance. The doctor attributed the phenomenon to decaying sea-weed, but the woman said, " No, a corpse will be laid there to-morrow." This, in fact, occurred; a dead body was brought in a boat for burial, and was laid at the foot of the rock, where, as Dr Stewart found, there was no decaying vegetable matter.

Second sight flourished among the Lapps and the Red Indians, the Zulus and Maoris, to the surprise of travellers, who have recorded the puzzling facts. But in these cases the visions were usually " induced," not " spontaneous," and should be con- sidered as " clairvoyance " (q.v.). Ranulf Higdon's Polychronicon (14th century) describes Scottish second sight, adding that strangers " setten their feet upon the feet of the men of that londe for to see such syghtes as the men of that londe doon." This method of communicating the vision is still practised, with success, according to the late Dr Stewart. The present writer once had the opportunity to make an experiment, but to him the vision was not imparted. (For the method see Kirk's Secret Commonwealth of Elves, Fauns and Fairies, 1691,

1815, 1893.) It is, by some, believed that if a person tells what he has seen before the event occurs he will lose the faculty, and recently a second-sighted man, for this reason, did not warn his brother against taking part in a regatta, though he had foreseen the accident by which his brother was drowned. Where this opinion prevails it is, of course, impossible to prove that the vision ever occurred. There are many seers, as Lord Tarbat wrote to Robert Boyle, to whom the faculty is a trouble, " and they would be rid of it at any rate, if they could."

Perhaps the visions most frequently reported are those of funerals, which later occur in accordance with " the sight," of corpses, and of " arrivals " of persons, remote at the moment, who later do arrive, with some distinctive mark of dress or equipment which the seer could not normally expect, but observed in the vision. Good examples in their own experience have been given to the present writer by well-educated persons. Some of the anecdotes are too surprising to be published without the names of the seers. A fair example of second sight is the following from Balachulish. An aged man of the last generation was troubled by visions of armed men in uniform, drilling in a particular field near the sea. The uniform was not " England's cruel red," and he foresaw an invasion. " It must be of Americans," he decided, " for the soldiers do not look like foreigners." The Volunteer movement later came into being, and the men drilled on the ground where the seer had seen them. Another case was that of a man who happened to be sitting with a boy on the edge of a path in the quarry. Suddenly he caught the boy and leaped aside with him. He had seen a runaway trolly, with men in it, dash down the path; but there were no traces of them below. " The spirits of the living are powerful to-day," said the percipient in Gaelic, and next day the fatal accident occurred at the spot. These are examples of what is, at present, alleged in the matter of second sight.

" The sight " may, or may not, be preceded or accompanied by epileptic symptoms, but this appears now to be unusual. A learned minister lately made a few inquiries on this point in his parish, at the request of the present writer. His beadle had " the sight " in rich measure: " it was always preceded by a sense of discomfort and anxiety," but was not attended by convulsions. Out of seven or eight seers in the parish, only one was not perfectly healthy and temperate. A well-known seer, now dead, whom the writer consulted, was weak of body, the result of an accident, but seemed candid, and ready to confess that his visions were occasionally failures. He said that " the sight " first came on him in the village street when he was a boy. He saw a dead woman walk down the street and enter the

house that had been hers. He gave a few examples of his foresight of events, and one of his failure to discover the corpse of a man drowned in the loch.

The phenomena, as described, may be classed under " clair-voyance," " premonition," and " telepathy " (q.v.), with a residuum of symbolical visions. In these, " corpse candles " and spectral lights play a great part, but, in the region best known to the writer, the " lights " are visible to all, even to English tourists, and are not hallucinatory. The conduct of the lights is brilliantly eccentric, but, as they have not been studied by scientific specialists, their natural causes remain unascertained. It is plain that there is nothing peculiar to the Celts in second sight; but the Gaelic words for it and the prevailing opinion indicate telepathy, the action of " the spirits of the living " as the main agents. Yet, in cases of premonition, this explanation is difficult. Conceivably an engineer, in 1881, was thinking out a line of railway from Oban to Balachulish, at the moment when four or five witnesses were alarmed by the whizz and thunder of a passing train on what was then the road, but was later (1903) usurped by the railway track. (For this amazing anecdote the writer has the first-hand evidence of a highly educated percipient.) If the speculation of the engineer was " wired on," telepathically, to the witnesses, then telepathy may account for the premonition, which, in any case, is a good example of collective second sight. That second sight has died out, under the influence of education and newspapers, is an averment of popular superstition in the south.

The examples given, merely a selection from those known to the present writer, prove that the faculty is believed to be as common as in any previous age.

The literature of second sight is not insignificant. The Secret Commonwealth of the Rev. Mr Kirk (1691), edited by Sir Walter Scott in 1815 (a hundred copies), and by Andrew Lang in 1893, is in line with cases given in Trials for Witchcraft (cf. Dalyell's Darker Superstitions of Scotland, and Wodrow's Analecta). Aubrey has several cases in his Miscellanies, and the correspondence of Robert Boyle, Henry More, Glanvil and Pepys, shows an early attempt at scientific examination of the alleged faculty. The great treatise on Second Sight by Theophilus Insulanus (a Macleod) may be recommended; with Martin's Description of the Western Isles (1703-

1716), and the work of the Rev. Mr Fraser, Dean of the Isles (1707, 1820). Fraser was familiar with the contemporary scientific theories of hallucination, and justly remarked that " the sight " was not peculiar to the Highlanders; but that, in the south, people dared not confess their experiences, for fear of ridicule. (A. L.)

SECRET (Lat. secretum, hidden, concealed), that which is concealed from general knowledge. In special senses the word is applied to (a) a prayer in the Roman and other liturgies, said during mass by the priest in so low a voice that it does not reach the congregation, and (b) a covering or skull-cap made of steel fitting close to the head.

In law, the question of secrecy is an important one. Generally, English law does not require a solicitor or barrister to disclose secrets entrusted to them by a client, and the same probably holds good in the case of medical men. In the case of ministers of religion, it has never been definitely settled how far they can be compelled to disclose in evidence what has been confided in the secrecy of the confessional. But according to the 113th Canon, a priest of the Church of England would commit an ecclesiastical offence in revealing a secret disclosed to him in confession "except it be such as by the laws of this realm his own life may be called into question for concealing the same." As to what are called " trade secrets," it had been decided (Merry- weather v. Moore, 1892, 2 Ch. 518) that it is a breach of contract to reveal trade secrets acquired during service.

Official Secrets. — By the Official Secrets Act 1889 it was made a misdemeanour for an official to communicate any information or documents concerning the military or naval affairs of Her Majesty, to any person to whom it ought not to be communicated. If the information be communicated to a foreign state it is a felony. In Germany the betrayal of military secrets is punishable under an imperial law of 1893.

Secret Service. — In practically every civilized country, there is always a department of the government charged with the duty of espionage, either diplomatic or domestic. Its officials work in secret, and certain sums of money are placed at the disposal of the head of the department, and expended as he may think fit, without having to render any specific account of them. Various departments of governments have also their own departmental secret service, for the better guarding against frauds, such as in the United States, the Treasury Department and the Post Office.

The various European codes generally have dealt with breach of

secrecy, e.g. s. 300 of the German Penal Code imposes a fine up to 1500 marks and imprisonment up to three months on doctors, attorneys and other professional persons who reveal a secret entrusted to them in their professional capacity. For this offence also the French code, art. 378, imposes imprisonment of from one to six months and a fine of from 100 to 500 francs.

See Brouardel, Le Secret medical (Paris, 1 893); Hallays, Le Secret professionnel (Paris, 1890).

SECRETAN, CHARLES (1815-1895), Swiss philosopher, was born on the 19th of January 181 5, at Lausanne, where he died on the 21st of January 1895. Educated in his native town and later under Schelling at Munich, he became professor of philosophy at Lausanne (1838 to 1846), and at Neuchatel (1850 to 1866). In 1866 he returned to his old position at Lausanne. In 1837 he founded, and for a time edited, the Revue Suisse. His principal works were La Philosophie de la liberie (1848); La Raison et le Christianisme (1863); La Civilisation et les croyances (1887J; Mon Utopie (1892). The object of his writing was to build up a rational, philosophical religion, to reconcile the ultimate bases of Christianity with the principles of metaphysical philosophy.

For a detailed examination of his philosophy, see Pillon, La Philosophie de Charles Secretan.

SECRETARY-BIRD, a very singular African bird, first accurately made known, from an example living in the menagerie of the prince of Orange, in 1769 by A. Vosmaer. 1 in a treatise published simultaneously in Dutch and French, and afterwards included in his collected works issued, under the title of Regnum Animate, in 1804. He was told that at the Cape of Good Hope this bird was known as the " Sagittarius " or Archer, from its striding gait being thought to resemble that of a bowman advanc- ing to shoot, but that this name had been corrupted into that of " Secretarius." In August 1770 G. Edwards s,aw an example

Secretary-Bird.

(apparently alive, and the survivor of a pair which had been brought to England) in the possession of a Mr Raymond near Ilford in Essex; and, being unacquainted with Vosmaer's work, he figured and described it as "of a new genus" in the Philoso- phical Transactions for the following year (lxi. pp. 55, 56, pl.ii.). In 1776 P. Sonnerat (Voy. Nouv. GuinSe, p. 87, pi. 50) again described and figured, but

not at all correctly, the species, saying (but no doubt wrongly) that he found it in 177 1 in the Philippine Islands. A better representation was given by D'Aubenton in

1 Le Vaillant (Sec. Voy. Afrique, ii. p. 273) truly states that Kolben in 1719 (Caput Bonae Spei hodiernum, p. 182, French version, ii. p. 198) had mentioned this bird under its local name of " Snake- eater " (Slangenvreeter, Dutch translation, i. p. 214); but that author, who was a bad naturalist, thought it was a Pelican and atso confounded it with the Spoonbill, which is figured to illustrate his account of it.

the Planches mlumintes (721); in 1780 Buffon (Oiseaux, vii. P- 33°) published some additional information derived from Querhoent, saying also that it was to be seen in some English menageries; and the following year J. Latham (Synopsis, i. p. 20, pi. 2) described and figured it from three examples which he had seen alive in England. None of these authors, however, gave the bird a scientific name, and the first conferred upon it seems to have been that of Falco serpentarius, inscribed on a plate bearing date 1779, by John Frederick Miller (III. Nat. History, xxviii.), which plate appears also in Shaw's Cimelia Physica (No. 28) and is a misleading caricature. In 1786 Scopoli called it Otis secretarius — thus referring it to the Bustards, 1 and Cuvier in 1798 designated the genus to which it belonged, and of which it still remains the sole representative, Serpentarius. Succeeding systematists have, however, encumbered it with many other names, among which the generic terms Gypogeranus and Ophio- theres, and the specific epithets reptilivorus and cristatus, require mention here. 2 The Secretary-bird is of remarkable appearance, standing nearly 4 ft. in height, the great length of its legs giving it a resemblance to a Crane or a Heron; but unlike those birds its tibiae are feathered all the way down. From the back of the head and the nape hangs, loosely and in pairs, a series of black elongated feathers, capable of erection and dilation in periods of excitement. 3 The skin round the eyes is bare and of an orange colour. The head, neck and upper parts of the body and wing- coverts are bluish grey; but the carpal feathers, including the primaries, are black, as also are the feathers of the vent and tibiae — the last being in some examples tipped with white. The tail-quills are grey for the greater part of their length, then barred with black and tipped with white; but the two middle feathers are more than twice as long as those next to them, and drooping downwards present a very unique

appearance.

Its chief prey consists of insects and reptiles, and as a foe to snakes it is held in high esteem ; although it is undoubtedly also destructive to young game. It seems to possess a strange partiality for the destruction of snakes, and successfully attacks the most venomous species, striking them with its knobbed wings and kicking forwards at them with its feet, until they are rendered incapable of offence, when it swallows them. The nest is a huge structure, placed in a bush or tree, and in it two white eggs, spotted with rust-colour, are laid. The young remain in the nest for a long while, and even when four months old are unable to stand upright. They are very fre- quently brought up tame. The Secretary-bird is found, but not very abundantly and only in some localities, over the greater part of Africa, especially in the south, extending northwards on the west to the Gambia and in the interior to Khartum.

The systematic position of the genus Serpentarius has long been a matter of discussion, and is still one of much interest, though of late classifiers have been pretty well agreed 4n placing it in the order Accipitres. Most of them, however, have shown great want of perception by putting it in the family Falconidae. No anatomist can doubt its forming a peculiar family, Serpenlariidae, differing more from the Falconidae than do the Vulturidae; and the fact of A. Milne-Edwards having recognized in the Miocene of the Allier the fossil bone of a species of this genus, S. robustus (Ois. foss. France, ii. pp. 465-468, pi. 186, figs. 1-6), proves that it is an ancient form, one possibly carrying on a direct and not much modified descent from a generalized form, whence may have sprung not only the Falconidae but perhaps the progenitors of the Ardeidae and Ciconii- dae, as well as the puzzling Cariamidae (Seriema, q.v.). (A. N.)

SECRETARY OF STATE, in England, the designation of certain important members of the administration. The ancient English monarchs were always attended by a learned ecclesi- astic, known at first as their clerk, and afterwards as secretary, who conducted the royal correspondence; but it was not until the end of the reign of Queen Elizabeth that these functionaries were called secretaries of state. Upon the direction of public affairs passing from the privy council to the cabinet after 1688 the secretaries of state began to assume those high duties

1 Curiously enough, Boddaert in 1783 omitted to give it a scientific name.

*. * The scientific synonymy of the species is given at great length by Drs Finsch and Hartlaub (Vogel Ost-Afrikas, p. 93) and by R. B. Sharpe (Cat. B. Brit. Museum, i. p. 45).*

- *It is from the fancied resemblance of these feathers to the pens which a clerk is supposed to stick above his ear that the bird's name of Secretary is really derived.*

which now render their office one of the most influential of an administration.

Until the reign of Henry VIII. there was generally only one secretary of state, but at the end of his reign a second principal secretary was appointed. Owing to the increase of business con- sequent upon the union of Scotland, a third secretary, in 1708, was created, but a vacancy occurring in this office in 1746 the third secretaryship was dispensed with until 1768, when it was again in- stituted to take charge of the increasing colonial business. How- ever, in 1782 the office was again abolished, and the charge of the colonies transferred to the home secretary; but owing to the war with France in 1794 a third secretary was once more appointed to superintend the business of the war department, and seven years later the colonial business was attached to his department. In 1854 a fourth secretary of state for the exclusive charge of the war de- partment and in 1858 a fifth secretaryship for India were created. There are therefore now five principal secretaries of state, four of whom, with their political under-secretaries, occupy seats in the House of Commons. One of these secretaries of state is always a member of the House of Lords. The secretaries of state are the only authorized channels through which the royal pleasure is signified to any part of the body politic, and the counter-signature of one of them is necessary to give validity to the sign manual. The secretaries of state constitute but one office, and are coordinate in rank and equal in authority. Each is competent in general to execute any part of the duties of the secretary of state, the division of duties being a mere matter of arrangement. For the existing division of duties, see under separate headings, Colonial Office, Foreign Office, &c.

In the United States the " secretary of state " is a member of the executive, who deals with foreign affairs, and who, in the event of a vacancy in the office of president, is next in suc- cession after the vice-president. The title of " secretary " — " of the treasury," " of war," &c. — is used for some other members of the executive. In various states there is an executive officer called " secretary of state."

SECT, a body of persons holding distinctive or separate doctrines or opinions, especially in matters of religion; thus there are various sects among the Jews, the Mahommedans, and the Buddhists, &c. In the Christian Church it has usually a hostile or depreciatory sense and is applied, like " sectary," to all religious bodies outside the one to which the user of the term belongs.

The latter use has been influenced by the false etymology which makes the word mean " cut off " (Lat. secare, to cut). The derivation has been long a matter of dispute. The Latin secta was used in classical Latin first of a way, a trodden or beaten path; it seems to be derived from secare, to cut, cf. the phrase secare viam, to travel, take one's way, Gr. riiivav b&bv. From the phrase sectam sequi, to follow in the footsteps of any one, the word came to mean a party, following, faction. Another transferred sense is a manner or mode of life, so hanc sectam rationemque vitae . . . secuti sumus (Cic. Cael. 17, 40). It was also the regular word for a school of philosophy and so translates atpeau, lit. choice (alptiaSai, to choose), from which is derived " heresy " (q.v.). The Vulgate (N.T.) translates atptais sometimes by secta, sometimes by haeresis. In Med. Lat., besides these uses we find secta meaning a suit at law, a suit of clothes, and a following or suite. These meanings point to the derivation of secta adopted by Skeat (Etym. Diet., 1910) ; which connects the word with sequi, to follow. Whichever derivation is accepted a " sect " does not mean a part " cut off " from the church.

SECTION (Lat. sectio, cutting, secare, to cut), the act of cutting or a part cut off, thus used of any division of a subject, as the paragraph of a book, article, statute, &c, of a division of land, of a town, &c, or a separate class of a community or race; the term is more particularly applied to a thin slice of any substance prepared for examination by the microscope (see Microtomy) or to a diagram of any structure showing the internal plan as if exposed by the cutting off of an external surface; thus, in architecture, a section is a drawing of a building cut in half, so as to show the relative height of the floors, the depth of the foundation and its footings, the framing of the roof, if in timber or iron, or the construction of the vault or dome, if in masonry. The term is also applied to the details of the structure, such as the cornice and the various mouldings showing their profile.

SECULAR (Lat. saecularis, of or belonging to an age or genera- tion, saeculum), a word with two main branches of meaning

(1) lasting or occurring for a long indefinite period of time, and

(2) non-spiritual, having no concern with religious or spiritual matters. The first sense, which is directly taken from the classical

Latin, is chiefly found in scientific applications, of processes or phenomena which are continued through the ages and are not regularly recurrent or periodical, e.g. the secular cooling of the earth, secular change of the mean annual change of the temperature. The word is thus used widely of that which is lasting or permanent. In medieval and Late Latin, saecidaris was particularly used of that which belongs to this world, hence non-spiritual, lay. It is thus used, first to distinguish the " regular " or monastic clergy from those who were not bound by the rule (regula) of a religious order, the parish priests, the " seculars," who were living in the world, and secondly in the wide sense of anything which is distinct, opposed to or not connected with religion or ecclesiastical things, temporal as opposed to spiritual or ecclesiastical. Thus property transferred or alienated from spiritual to temporal hands is said to be "secularized"; "secularism" (q.v.) is the term applied in general to the separation of state politics or administration from religious or church matters; "secular education" is a system of training in which definite religious teaching is excluded.

SECULAR GAMES {Ludi Saccular es, originally Terentini). These were celebrated at Rome for three days and nights to mark the commencement of a new saeculum or generation. It is important to note that there was a saeculum civile, the length of which was definitely fixed at ioo years, and a saeculum naturale, which, under Greek and Etruscan influence, came to be accepted by the quindecimviri as no years. According to tradition, the secular games had their origin in certain sacrificial rites of the gens Valeria, which were performed at the Terentum, a volcanic cleft in the Campus Martius. According to the Roman antiquarians themselves, they were derived from the Etruscans, who, at the end of a mean period of ioo years (as representing the longest human life in a generation), presented to the chthonian deities an expiatory offering on behalf of the coming generation. The first definitely attested celebration of the games took place in 240 B.C., on which occasion a vow was made that they should be repeated every hundredth year (their name being also changed to Saccular es), a regulation which seems to have been immediately disregarded, for they were next held in 146 (not 149, although the authorities are not unanimous); in 49 the civil wars prevented any celebration. They would probably have fallen entirely

into oblivion, had not Augustus revived them in 17 B.C., for which occasion the Carmen Saccular e was composed by Horace. In explanation of the selection of this year it is supposed that the quindecimviri invented celebra- tions for the years 456, 346, 236, 126, the saeculum being taken as lasting no years.

In later times various modes of reckoning were adopted. The dates were: a.d. 47 (under Claudius), celebrating the 800th year of the foundation of the city; 88 (under Domitian), an interval of only 105 instead of no years; 147 (under Antoninus Pius), the 900th year of the city; 204 (under Septimius Severus), exactly two saectda (220 years) after the Augustan celebration; 248 (under Philip the Arabian), the 1000th year of the city; 262 (under Gallie- nus), probably a special ceremony in time of calamity; in 304 (which should have been 314) Maximian intended to hold a cele- bration, but does not appear to have done so. From this time nothing more is heard of the secular games, until they were rev ived in the year 1300 as the popish jubilees instituted by Boniface VIII. At the beginning of the harvest, heralds went round and sum- moned the people to the festival. The quindecimviri distributed to all free citizens on the Capitol and in the temp'e of Apollo on the Palatine various means of expiation — torches, sulphur and bitumen. Here and in the temple of Diana on the Aventine, wheat, barley, and beans were distributed, to serve as an offering of firstfruits. The festival then began, at which offerings were made to various deities. On the first night the emperor sacrificed three rams to the Parcae at an underground altar on the banks of the Tiber, while the people lighted torches and sang a special hymn. On the same or following nights a black hog and a black pig were sacrificed to Tellus, and dark victims to Dis (Pluto) and Proserpine. On the first day white bulls and a white cow were offered to Jupiter and Juno on the Capitol, after which scenic games were held in honour of Apollo. On the second day noble matrons sang supplicatory hymns to Juno on the Capitol; on the third, white oxen were sacrificed to Apollo and twenty-seven boys and maidens sang the " secular hymn " in Greek and Latin.

The above particulars are from Zosimus (ii. 5, and 6, which con- tain the Sibylline oracle), who, with Censorinus (De Die Natali, 17),

Valerius Maximus, ii. 4, and Horace {Carmen Saecidare) is the chief ancient authority on the subject;, see also Mommsen, Romiscke Chronologie (1858) ; C. L. Roth, " fiber die romischen Sacularspiele " in the Rheinisches Museum, viii. (1853); and Marquardt, Romische Staatsverwaitung, iii. (1885), p. 386. The inscription commemorating the ludi of 17 B.C. was discovered in 1890 and is

printed in the Ephemeris epigraphica, vol. viii. The best account of the whole subject is in H. Diels, Sibyllinische Blatter (1890), p. 109 foil.

SECULARISM, a term, applied specially (see Secular) to the system of social ethics associated with the name of G. J. Holyoake (q.v.). As the word implies, secularism is based solely on con- siderations of practical morality with a view to the physical, social and moral improvement of society. It neither affirms nor denies the theistic premises of religion, and is thus a particular variety of utilitarianism. Holyoake founded a society in London which subsequently under the leadership of Charles Bradlaugh advocated the disestablishment of the Church, the abolition of the Second Chamber and other political and economic reforms.

See Holyoake's Principles of Secularism (1885).

SECUND (Lat. secundus, following), a botanical term used of plants when similar parts are directed to one side only, as flowers on an axis.

SECUNDERABAD, one of the chief British military stations in India, situated in the state of Hyderabad or the Nizam's Dominions, 1830 ft. above sea-level, and 6 m. N.E. of Hyderabad city. Pop. (1901) 83,550. It is now the headquarters of the 9th division of the southern army. Secundefabad includes Bolaram, the former cantonment of the Hyderabad contingent (now merged in the Indian army), and also Trimulgherry, the artillery cantonment, covering a total area of 22 sq. m. These two places have an additional population of 12,888.

SECUNDUS, JOHANNES, whose real name was Johann Everts (1511-1536), Latin poet, was born at The Hague on the 10th of November 1511. He was descended from an ancient family in the Netherlands; his father, Nicholas Everts, or ■ Everard, seems to have been high in the favour of the emperor Charles V. On what account the son was called Secundus 1 is not known. His father intended him for the law; but though he took his degree at Bourges it does not appear that he devoted much time to legal pursuits. Poetry, painting and sculpture engaged his mind at a very early period. In 1533 he went to Spain, and soon afterwards became secretary to the cardinal- archbishop of Toledo, in a department of business which required no other qualification than that of writing Latin with elegance. During this period he composed his most famous work, the Basia, a series of amatory poems, of which the fifth, seventh, and ninth Carmina of Catullus seem to have given the hint. • In 1534 he

accompanied Charles V. to the siege of Tunis. After quitting the service of the archbishop, Secundus was employed as secretary by the bishop of Utrecht; and so much did he dis- tinguish himself by his compositions that he was called upon to fill the important post of private Latin secretary to the emperor, who was then in Italy. But, having arrived at St Amand; near Tournay, he died of fever on the 8th of October 1536.

SECUNDUS, PUBLIUS POMPONIUS, Roman general and tragic poet, lived during the reigns of Tiberius, Caligula and Claudius. He was on intimate terms with the elder Pliny, who wrote a biography of him (now lost). The chief authority for his life is Tacitus, according to whom Secundus was a man of refine- ment and brilliant intellect. His friendship with Sejanus and his brother made him politically suspect, and he only escaped death by remaining practically a prisoner in his own brother's house until the accession of Caligula. During his enforced retirement he composed tragedies, which were put on the stage during the reign of Claudius. In a.d. 50 he distinguished himself against the Chatti and obtained the honour of the triumphal insignia. Quintilian asserts that he was far superior to any writer of tragedies he had known, and Tacitus expresses a high opinion of his literary abilities. Secundus devoted much atten- tion to the niceties of grammar and style, on which he was recognized as an authority. Only a few lines of his work remain, some of which belong to the tragedy Aeneas.

See O. Ribbeck, Geschichte der romischen Dichtung, iii. (1892).

and Tragicorum Romanorum fragmenta (1897); Tacitus, Annals, v. 8, xi. 13, xii. 28; Quintilian, Inst. Or at. x. 1. 98; Pliny, Nat. Hist. xiv. 5; M. Schanz, GescUichte der rbmischen Literatur, ii. 2 (1900); Teuffel, Hist, of Roman Literature (Eng. trans., 1900), 284, 7.

SECURITY (Lat. securus, free from care, safe), in general, the condition of being secure. In law, a security is a document evidencing the right to money, goods or other property, e.g. stocks, shares, bills of exchange, mortgages, &c. A security is termed collateral when it is given merely as a guarantee for the repayment of money; personal, when it gives a right of action against a person for the recovery of money. A convertible security is one which can be readily converted into money (e.g. consols), as contrasted with land or buildings,

sometimes termed " dead " security. A person who holds himself responsible for the fulfilment of another's obligations or goes surety for him is called a security.

SEDAINE, MICHEL JEAN (1710-1797), French dramatist, was born at Paris on the 4th of July 17 19. His father, who was an architect, died when Sedaine was quite young, leaving no fortune, and the boy began life as a mason's labourer. He was at last taken as pupil by an architect whose kindness he eventu- ally repaid by the help he was able to give to his benefactor's grandson, the painter David. Meanwhile he had done his best to repair his deficiencies of education, and in 1750 he published a Recueil de pieces fugitives, which included fables, songs and pastorals. His especial talent was, however, for light opera. He produced Le Diable d, quatre (1756), the music being by several composers; Blaise le Savetier (1759), for the music of Danican Philidor; On ne s'avise jamais de tout (1761) and others with Pierre Alexandre de Monsigny; Aucassin et Nicolette (1780), Richard Cmur de Lion (1784), and Amphitryon (1788) with Andre Gretry. Sedaine's vaudevilles and operettas attracted the attention of Diderot, and two plays of his were accepted and performed at the Thedtre Francais. The first and longest, the Philosophe sans le savoir, was acted in 1765; the second, a lively one-act piece, La Gageure imprevue in 1768. These two at once took their place as stock pieces and are still ranked among the best French plays, each of its class. Except these two pieces little or nothing of his has kept the stage or the shelves, but Sedaine may be regarded as the literary ancestor of Scribe and Dumas. He had the practical knowledge of the theatre, which enabled him to carry out the ideas of Diderot and give him claims to be regarded as the real founder of the domestic drama in France. Sedaine, who became a member of the Academy (1786), and secretary for architecture of the fine arts division, died at Paris on the 17th of May 1797. He wrote two historical dramas, Raymond V. comte de Toulouse, and Maillard, ou Paris sauvi.

His CEuvres (1826) contain a notice of his life by Ducis.

SEDALIA, a city and the county-seat of Pettis county, Missouri, U.S.A., a little W. of the centre of the state. Pop. (1900) 15,231 ; (i725hegroes;972 foreign-born); (1910) 17,822. Sedalia is served by the Missouri Pacific and the Missouri, Kansas & Texas railway systems, and is a transportation centre with good facilities. The city has a high and pleasant site (about 990 ft. above sea- level) on a rolling prairie, and is laid out as an exact square. Among the public buildings much the handsomest are the court house, built of

Warrensburg blue sandstone (1884), and the Public Library (1900), given by Andrew Carnegie. Sedalia is the seat of the George R. Smith College (M. E., founded in 1894) for negroes. Liberty Park (60 acres), in the W. part of the city, is owned by the municipality. Broadway, the principal residence street, is 120 ft. wide, and is parked on either side. The State Board of Agriculture established fair grounds (now 210 acres) adjoining the city on the S.W. in 1900, and the annual state fair attracts many visitors. The water supply is derived from a Storage lake on Flat Creek, 3 m. from the city, settling basins being used to clarify the water. There are a city hospital and the May wood, a private hospital; and the Missouri, Kansas & Texas railway maintains here a hospital for all parts of its system. The surrounding country is a magnificent livestock and farming region, and in the immediate vicinity are valuable deposits of coal, of limestone, of shale suitable for sewer pipe and

of fire clays. The city has important horse and mule yards. The Missouri Pacific, three of whose operating divisions end at Sedalia and thus make the city its central division point, in 1904 established large shops (129 acres) in a suburb E. of the city. These shops and those of the Missouri, Kansas & Texas railway, of which Sedalia is the central division point on the N. end of its system, add greatly to the industrial importance of the city. The total value of the factory product in 1905 was $1,691,727, showing an increase of 31-8% since 1900.

Sedalia was established as a station on the Missouri Pacific railroad in 1857. In 1864 it was chartered as a town and was made the county-seat, succeeding Georgetown (then a flourishing town, which speedily fell into decay), the transfer of the offices taking place in 1865. Sedalia was a Union military post through- out the Civil War; on the 15th of October 1864 a detachment from Sterling Price's raiding column dislodged a small Union force that was occupying the town, but the Confederate occu- pation lasted only one day. Sedalia was chartered as a city in 1889. In 1896 a constitutional amendment to remove the state capital from Jefferson City to Sedalia was defeated by popular vote.

SEDAN, a town of northern France, capital of an arrondisse- ment in the department of Ardennes, on the right bank of the Meuse, 12 m. E.S.E. of Mezieres by rail. Pop. (1906) town 16,014; commune 19,599. Sedan is built on the right bank of the Meuse round a bend in the river forming a peninsula. On the left bank stands the suburb of Torcy, situated partly within the bend, partly beyond the canal which cuts across the neck of the peninsula. There is a statue of

Turenne (born at Sedan in 161 1), remains of a castle of the 15 th century and a Protestant temple dating from 1593. Sedan is the seat of a sub-prefect and has a municipal school of weaving. The manufacture of fine black cloth established in the middle of the 17th century by Cardinal Mazarin, held its place as the staple industry of the town till towards the end of the 19th century. A large variety of woollen fabrics are produced, and there are flour mills and factories for industrial machinery, boilers and heavy iron goods, chocolate, &c.

Sedan was in the 14th century a dependency of the abbey of Mouzon, the possession of which was disputed by the bishops of Liege and Reims. United to the crown of France by Charles V., it was ceded by Charles VI. to Guillaume de Braquemont, whose son sold it to his brother-in-law Evrard de la Marck. For two centuries this family continued masters of the place in spite of the bishops of Liege and the dukes of Burgundy and Lorraine; and Henri Robert adopted the title " prince of Sedan." In the 16th century the town was an asylum for many Protestant refugees, who laid the basis of its industrial prosperity, and it became the seat of a Protestant seminary. Robert I. de la Marck (d. 1489) was lord of Sedan when he acquired Bouillon. His grandson, Robert III., seigneur of Fleurange and Sedan (d. 1537), was marshal of France and left interesting memoirs. Robert IV. de la Marck (d. 1556), also marshal of France, erected Sedan on his own authority into an independent principality. By the marriage of his granddaughter Charlotte with Henry I. de la Tour d'Auvergne, the duchy of Bouillon and the principality of Sedan passed to the house of Turenne. When the new duke attempted to maintain his independence, Henry IV. captured Sedan in three days; and the second duke Fr6d6ric Maurice de la Tour d'Auvergne, eldest brother of the great marshal, who had several times revolted against Louis XIII., was, after his share in the conspiracy of Cinq-Mars, obliged to surrender his principality. Sedan thus became part of the royal domain in 1642. On the 1st of September 1870 the fortress was the centre of the most disastrous conflict of the Franco-German War (see below). The village of Bazeilles, 3 m. S.E. of Sedan, contains the great ossuary. The house, rendered famous by Neuville's paintings, " Les Dernieres Cartouches," now contains objects found on the battlefield. At Donchery, 3J m. to the west of Sedan, is the chateau of Bellevue, where Napoleon HI. surrendered his sword and where the terms of capitulation of Sedan were agreed upon.

Bailie of Sedan (September ist, 1870). — During the course of the 31st of August (see Franco-German War) the retreating French army (ist, 5th, 7th and 12th corps) under Marshal MacMahon assembled in and around Sedan, watched throughout the day by the German cavalry but not severely pushed by them. Sedan is a small old-fashioned fortress, lying in a depression between two ridges which converge in the plateau of Illy about 2 \ m. north-east of the town. The only part which its defences played, or might have played, in the ensuing battle lay in the strategic possibilities contained in the fine and roomy bridge-head of Torcy, covering an elbow bend of the Meuse whence the whole French army might have been hurled into the

SEDAN

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began to cross over the town itself. At nightfall on the 31st the leading German infantry were approaching. The Army of the Meuse on the right bank of the river, with the II. Bavarians moving towards Bazeilles to reinforce it, and the III. Army, consisting of the V. and XI. corps with the Wurttemberg division, was heading for Donchery to cut off the French from Mezieres, and only a weak cavalry screen closed the gap between them.

During the night of the 31st of August the Bavarians threw a pontoon bridge across the Meuse below Remilly, and soon after daybreak, in a fog which lay thickly over the whole country, they began their advance towards Bazeilles, held by Vassoigne's

division of the 12th corps

gap between the German III. and Meuse armies, had there been a Napoleon to conceive and to execute this plan. But MacMahon seems to have been too despondent to contemplate anything further than a battle for the honour of the army, and though communications with Mezieres, where Vinoy's corps (13th) was gathering, lay open throughout the day, he neither sent orders to it nor made any arrangements to meet the coming danger.

The troops received food and ammunition, the disorders consequent on the successive days' fighting in retreat were remedied, and the. men themselves got what they needed most of all, an almost unbroken day's rest. Locally their positions were strong, particularly

to the east, where the stream flowing through the Fond du Givonne, though fordable, presented a serious obstacle to the tactical handling of the German infantry. But as a whole it was far too cramped for the numbers crowded into it; it could be completely overlooked from the heights of Frfoois, where the king of Prussia's headquarters took their stand, and whence in the afternoon the German artillery fire

and fairly prepared for de- fence. The firing called all troops within reach of the sound to arms, and before

5 a.m. the Meuse Army was marching to the battle-field, the Guards on the northern road via Villers-Arnay, the Saxons and IVth corps to the south along the river.

Vassoigne's division con- tained a number of Marine battalions, and their stub- born resistance completely disconcerted the Bavarians. Deprived of all artillery co- operation owing to the fog, the latter spent themselves in fruitless and disconnected efforts in the gardens and streets of the village, and reinforcements were soon urgently needed. About

6 a.m. the fog lifted, and the German batteries at once took part in the struggle. One of the first shells wounded Marshal MacMahon. The next senior officer, General Ducrot, at once assumed command (7 a.m.). But it happened that General Wimpflen, who had only joined the army from Algiers on the night of the 30th, brought with him a secret commission to assume command in the event of the death or dis- ablement of MacMahon. Of this power he did not

at first avail himself, since he was a stranger both to the army and the country, whilst Ducrot possessed the confidence of the one and the knowledge of the other in the highest degree. But when about a.m. he learnt that Ducrot proposed to move the whole army under cover of rearguards to the west towards Mezieres, he produced his commission and countermanded the movement, being himself convinced that eastward towards Bazaine at Metz lay the road to salvation. Orders once issued on a battle-field are not easily recalled, and the result of this change of command was dire confusion. The French troops northward of Bazeilles, along the Fond du Givonne, were already commencing their withdrawal, when the leading troops of the Saxon XII. corps began to arrive about Daigny, and being only opposed by a weak rearguard, easily carried the ridge south of the Givonne-Sedan road, thus threatening the retreat of Vassoigne's division in and about Bazeilles, which then fell into the hands of the Bavarians between 10 and 11 a.m. At the same moment the Guard

corps had begun to form up between Daignv

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SEDAN-CHAIR

and Givonne, and there being no serious force of the enemy in front of them, the artillery was deploying along the western heights above the valley of Givonne, covered only by weak advanced guards of infantry, when suddenly a great column of French infantry, some 6000 strong, moving west in pursuance of Wimpffen's orders, came over the eastern border of the valley and charged down at full speed towards the guns. Then followed one of the most dramatic spectacles of the entire war. The whole of the corps artillery of the Guard turned upon these devoted men, and tore the column in half, shrouding it in dense clouds of dust and smoke from the bursting shells, above which could be seen the trunks and limbs of men flung upwards by their explosion. The head of the column, perhaps 2000 strong, nevertheless kept on its way, but under the combined fire of the Guard rifle battalion and the flanking fire from other guns its impetus died out and its debris disappeared by degrees under convenient cover. The German Guards were now free to stretch out their tight towards the Belgian frontier (where the scouts of the III. Army were already moving) and prepare with all deliberation for the attack on the Bois de la Garenne.

The III. Army had moved off as early as 2.30 a.m., and by 4 a.m. was already crossing the Meuse at Donchery, aided by several pontoon and trestle bridges thrown over during the night. Their right was covered from sight by the peninsula formed by a bend of the river, and the march of the several columns was unopposed till, clearing its northern extremity, they began to deploy to their right between St Menges and Floing. Here they encountered French outposts, which fell back on their main position on the ridge, to the south of the Floing-IUy road. Against this position the German artillery now pressed forward, and seeing their exposed position, General Gallifet brought for- ward his brigade of Chasseurs d'Afrique and delivered a most dashing charge. But being unsupported he was compelled to withdraw again behind the cover of the Cazal-Illy ridge.

It was now about n a.m., and, whether moved by the belated impulse of Ducrot's orders or attracted by the apparent weakness of the Prussians within sight, the French infantry now made a brilliant

counter-attack out of their position in their usual manner. But German reinforcements coming suddenly into view, and their Han having spent itself, they fell back again, holding only to Floing, whence it required nearly two hours more to expel them.

About noon Wimpffen rode up to General Douay and asked him whether he could hold on to his position. The latter, possibly elated by the success of his recent attack, replied in the affirma- tive, pointing out only the importance of maintaining the Calvaire d'llly to the north. De Wimpffen promised him support from the 1st corps on the right rear, part of which, hidden in the Bois de la Garenne, had as yet been little engaged, and then rode south to Balan, where he found the 12th corps fighting desperately. He then sent back to Douay for reinforcements, and the latter despatched all he could spare. These, marching south, crossed the troops of the 1st corps sent to Douay's assist- ance. The Prussian shells were already crashing into the woods from all sides, and countless stragglers and riderless horses caused most serious delay. To gain time, Margueritte's division was ordered to charge. Margueritte was killed as he rode forward to reconnoitre, and Gallifet took command. " For the next half-hour," says the Prussian official account, " the scene defies description. Gallifet and his squadrons covered themselves with glory, but he had not 2000 sabres at his disposal. Under the storm of shell and over the broken ground manoeuvring was impossible. But a series of isolated charges were delivered with results which convinced well-nigh every survivor that the day of cavalry, in sufficient' numbers and properly handled on the battle-field, was by no means spent." About an hour after the cavalry charges, between 3 and 4 p.m., the Germans at length gathered weight enough to attempt the assault of the French main position, and moved by a common instinct, lines of men almost 2 m. in extent, pressed on, gaining cover from the convex slope of the hill, till at length they were able to storm the stub- bornly-defended ridge. Meanwhile, Wimpffen had initiated a

fresh counter-stroke from the Fond du Givonne against Balan and Bazeilles. Carried out with magnificent courage, it swept the Bavarians out of both villages, and for a moment the road seemed open for escape, but Wimpffen did not know that the IV. Prussian corps stood waiting behind the gap.

Riding back to the town to seek the emperor and implore him to place himself at the head of all available reinforcements, he saw a white flag break out from the steeple of the church tower, but almost instantaneously disappear. He did indeed reach the emperor, but,

delayed by the appalling confusion, was too late. The flag had gone up again and he knew that further resistance was hopeless. The fighting did not cease at once. The troops he had directed to make the final effort, their eyes fixed on the enemy in front of them, never saw the flag; and until 6 p.m. a series of isolated attempts were made to break the iron circle with which the Germans had surrounded them. The emperor, who during the early hours of the day had fearlessly courted death, at length overcome by extreme physical pain and exhaustion, had ridden back to the town, and about 4 p.m., seeing no hope of success, had sent a parlementaire conveying his personal surrender to the king of Prussia, at the same time ordering the white flag to be hoisted. It was torn down by a Colonel Fauve, but was hoisted again half an hour later, when Prussian troops from Cazal were almost at the western gates of Sedan. It only remained for Wimpffen to make terms for the army, and after a long and gallant effort to avert the inevitable, he at length signed an unconditional surrender, with the sole alleviation (introduced as a tribute of respect for the gallantry shown by his men) that all officers were to retain their swords.

Thus passed into captivity 82,000 men, 558 guns and stores to an immense amount. The price to the victors for this result was in round numbers 9000. The French killed and wounded numbered about 17,000. It is indicative of the demoralization in the French army that this figure is 1000 less than the cost of the victory to the Germans at Worth, although on that occasion the French troops actually engaged numbered one half those available at Sedan. The duration of the fighting was the same in both cases. (F. N. M.)

SEDAN-CHAIR, a portable chair or covered vehicle, with side windows, and entrance through a hinged doorway at the front, the roof also opening to allow the occupant to stand. It is carried on poles by two " chairmen." Alike in Paris and in London the sedan-chair man was an institution — in the one

Sedan-Chair (after Hogarth).

city he was usually an Auvergnat, in the other an Irishman. The sedan-chair was a fashionable mode of transport in towns up to a century or so ago. It took its name from the town of Sedan, in France, where it was first used, and was introduced into England by Sir S. Duncombe in 1634. Although a typically 18th-century vehicle it was used in the 17th, and had been known much earlier. Indeed, the ancient sedia gestatoria of the popes is really a rudimentary form of sedan-chair. These vehicles were

often beautifully painted, even the greatest French pastoralists not disdaining to embellish their panels. It is still in use at the public baths at Ischl, in Austria, and also in the city of Bath, England, as a mode of transit in connexion with the medical baths. The sedan-chair can be taken into the bedroom, and the invalid conveyed without exposure to the outer air to and from the mineral-water bath. The poles are so arranged that the chair may be carried up and down stairs and still preserve its horizontal position.

SEDBERGH, a market town in the Skipton parliamentary division of the West Riding of Yorkshire, England, 28! m. S.S.E. of Penrith by a branch of the London & North- Western railway. Pop. (1901) 2430. It is pleasantly situated at the junction of several small streams forming the river Lune, in a deep valley surrounded by high-lying moors. The church of St Andrew is principally late Norman. The grammar school was founded by Dr Roger Lupton, provost of Eton College, in 1528, but as it was connected with a chantry it was suppressed by Henry VIII., to be refounded in 1551 by Edward VI.; it now takes rank among the important public schools.

SEDDON, RICHARD JOHN (1845-1906), New Zealand statesman, was born at Eccleston, Lancashire, England, in 1845, his father being a schoolmaster at Eccleston Hill school. He was brought up to the engineering trade, and when eighteen went to Australia and entered the railway workshops at Melbourne. He was caught by the " gold fever " and went to Bendigo, where he spent some time in the diggings; but in 1866 he joined an uncle on the west coast of New Zealand, starting work as a miner. In 1869 he married Miss Louisa Jane Spotswood, of Melbourne. In the same year he was elected to a seat on his local Road Board, and he was soon returned to the Westland Provincial Council for the Arahura district, becoming its first chairman of committees. In 1879 he was returned to the New Zealand parliament for Kumara, and sat for that constituency for twenty- six years, though its name was changed, to Westland. He was a member of the Ballance ministry (1891), holding the portfolios for public works, defence and mines; and on Ballance's death (1893) became premier, a position he retained till his sudden death on the 10th of June 1906. During these years Seddon held a unique place in the public life of New Zealand, and in its relations with the empire. He combined his premiership with various offices — as colonial treasurer, minister for education, postmaster-general, telegraph

commissioner, minister of marine, minister for land purchase, and minister for labour, — but his strenuous personality, and the confidence inspired by his deter- mination to make New Zealand a living force among the British dominions, were the dominating features in all his course of action. His large physique, his profound earnestness, his gift of popular oratory, his expansive kindliness and his power of dealing with men, made him supreme among his ov/n people. He became known in a wider sphere after his attending the colonial conference in London in 1897, and thenceforth he was regarded as one of the pillars of British imperialism. During the Boer War, and afterwards in the movement for preferential trade with the colonies, he was an enthusiastic supporter of Mr Chamberlain, though he was characteristically outspoken in opposition to the introduction of Chinese labour into South Africa. His rough and ready views were frequently open to criticism, but his vigorous patriotism and intensity of character give him a permanent place among those who have worked for the consolidation of the British dominions.

A Life, by J. Drummond, was published in 1907.

SEDDON, THOMAS (1821-1856), English landscape painter, was born in London on the 28th of August 1821. His father was a cabinetmaker, and the son for some time followed the same occupation; but in 1842 he was sent to Paris to study ornamental art. On his return he executed designs for furniture for his father. In 1849 he made sketching expeditions in Wales and France, and in 1852 began to exhibit in the Royal Academy, sending a figure-piece, Penelope, and afterwards landscapes, deriving their subjects from Brittany. In the end of 1853 he joined Holman Hunt at Cairo. He worked for a year in Egypt and Palestine, xxrv. 19

executing views which Ruskin pronounced to be " the first landscapes uniting perfect artistical skill with topographical accuracy; being directed, with stern self-restraint, to no other purpose than that of giving to persons who cannot travel trust- worthy knowledge of the scenes which ought to be most interesting to them." Seddon's Eastern subjects were exhibited in Berners Street, London, in 1855, and in Conduit Street in 1856. In October 1856 Seddon again visited Cairo, where he died on the 23rd of November. In 1857 his works were exhibited in the rooms of the Society of Arts, and his important and elaborately finished picture, " Jerusalem and the Valley of Jehoshaphat," was purchased by subscription and presented to the National Gallery. A memoir of Seddon, by his brother, was published in 1859.

SEDERUNT, ACT OF, in Scots law, an ordinance for regulating the forms of judicial procedure before the Court of Session, passed by the judges under authority of a power originally conferred by an act of the Scottish parliament, 1540, c. 93. A quorum of nine judges is required to pass an act of Sederunt.

SEDGLEY, an urban district of Staffordshire, England, between Dudley and Wolverhampton, in the parliamentary borough of Wolverhampton. Pop. (1901) 15,951. The district abounds in coal, lime and ironstone. Nails, rivets, chains, fire-irons, locks and safes are produced. The parish includes the large manufacturing districts of Upper and Lower Gornal, Coseley and Deepfields, the last having a station on the London & North- Western railway, 10 m. W.N.W. from Birmingham.

SEDGWICK, ADAM (1785-1873), English geologist, was born on the 22nd of March 1785 at Dent in Yorkshire, the second son of Richard Sedgwick, vicar of the parish. He was educated at the Grammar Schools of Dent and Sedbergh, and at Trinity College, Cambridge, where he graduated B.A. as fifth wrangler in 1808, and two years later was elected a Fellow of his college. For several years he was occupied as private tutor and afterwards as assistant mathematical tutor at Trinity College. In 18 18 he was admitted to priests' orders. He had at this time paid no serious attention to geology. As a lad he had collected fossils from the Mountain Limestone near Dent, and in 1813 he had visited the mines near Furness and Coniston. Nevertheless, when the Rev. John Hailstone retired in 181 8 from the post of Woodwardian professor of geology, Sedgwick applied for the vacancy, and was so strongly supported by his college as a man of talent that he was elected by a large majority. He now took up the study of geology with intense zeal, traversed large areas in the south of England, and, becoming acquainted with W. D. Conybeare, regarded him as his master in geology. It is astonishing with what rapidity he grasped the principles of stratigraphical geology and the relationships of rocks in the field. In papers read before the Cambridge Philosophical Society, 1820-1821, on the structure of parts of Devonshire and Cornwall, he made observations of exceptional interest and value. Of this society in 1819 he had been one of the founders with J. S. Henslow. Every year for a long period now brought its season of field-work. Sedgwick dealt with the geology of the Isle of Wight, and with the strata of the Yorkshire coast (in papers published in the Annals of Philosophy, 1822, 1826); and he examined the rocks of the north of Scotland with Murchison in 1827. He contributed an important essay On the Geological Relations and Internal Structure of the Magnesian Limestone to the

Geological Society of London (1828). As early as 1822 he had begun to make a detailed geological map of the older rocks of the Lake District; he continued these researches whereby the main structure of this mountain region was first unravelled, in succeeding years; and the principal results were brought before the Geological Society (1831-1836). Meanwhile he was elected president of the Geological Society in 1829-1830, and in 1831 he commenced field-work in North Wales. His chief attention was now concentrated on the older rocks of England and Wales. Murchison began the task of unravelling the structure of the older rocks on the Welsh borders in the same year. They had intended to start together, but the arrangements fell through, and thus they began their labours independently

and from opposite sides of the principality. Eventually Sedg- wick founded the Cambrian system for the oldest group of fossiliferous strata, and Murchison the Silurian system for the great group immediately below the Old Red Sandstone. Their systems were found to overlap — Sedgwick's Upper Cambrian and Murchison's Lower Silurian being practically equivalent. Hence arose a painful controversy that has only of late years been terminated by the adoption of Professor C. Lapworth's term Ordovician in place of the Upper Cambrian of Sedgwick and the Lower Silurian of Murchison.

Sedgwick was ever actively interested in the work of his university. His famous Discourse on the Studies of the University of Cambridge, delivered in 1832, was published in expanded form in 1833; it reached a fifth edition in 1850. The studies were reviewed under the headings of (1) The laws of nature, (2) Ancient literature and language, and (3) Ethics and metaphysics; and the volume had so grown that it ultimately consisted of 442 pages of preface, or preliminary dissertation on the history of creation, with arguments against the transmutation of species, and an essay on the evidences of Christianity; the discourse occupied 94 pages; and there was an appendix of notes, &c, that filled 228 pages.

In 1833 Sedgwick was president of the British Association at the first Cambridge meeting, and in 1834 he was appointed a canon of Norwich. In 1836 with Murchison he made a special study of the Culm-measures of Devonshire, which until that time had been grouped with the greywacke, and together they demonstrated that the main mass of the strata belonged to the age of the true Coal

Measures. Continuing their researches into the bordering strata they were able to show in 1839, from the determinations of William Lonsdale, that the fossils of the South Devon limestones and those of Ilfracombe and other parts of North Devon were of an intermediate type between those of the Silurian and Carboniferous systems. They therefore introduced the term Devonian for the great group of slates, grits and lime- stones, now known under that name in West Somerset, Devon and Cornwall. These results were published in the great memoir by Sedgwick and Murchison, " On the Physical Structure of Devon- shire " {Trans. Geol. Soc, 1839). Of later published works it will be sufficient to mention A Synopsis of the Classification of the British Palaeozoic Rocks (1855), which contained a systematic description of the fossils by F. McCoy. Also the preface by Sedgwick to A Catalogue of the collection of Cambrian and Silurian Fossils contained in the Geological Museum of the University of Cambridge, by J. W. Salter (1873).

The Wollaston Medal of the Geological Society was awarded to Sedgwick in 1851, and the Copley Medal of the Royal Society in 1863. He continued to lecture until 1872, when ill-health rendered necessary the appointment of a deputy (Professor J. Morris). He died at Cambridge on the 27th of January

1873-

In 1865 the senate of the university received from A. A. Van Sittart the sum of £500 " for the purpose of encouraging the study of geology among the resident members of the university, and in honour of the Rev. Adam Sedgwick." Thus was founded the Sedgwick prize to be given every third year for the best essay on some geological subject. The first Sedgwick prize was awarded in 1873. On the death of Sedgwick it was decided that his memorial should take the form of a new and larger museum. Hitherto the geological collections had been placed in the Woodwardian Museum in Cockerell's Building. Through the energy of Professor T. McK. Hughes (successor to Sedgwick) the new building termed the Sedg- wick Museum was completed and opened in 1903.

See the Life and Letters,by John Willis Clark and Thomas McKenny Hughes (1890).

SEDGWICK, JOHN (1813-1864), American general, was born at Cornwall, Connecticut, on the 13th of September 1813, and graduated at West Point in 1837. Amongst his classmates were Joseph Hooker, Braxton Bragg and J. A. Early. He saw active service

against the Seminoles in Florida, and took part as an artillery officer in the Mexican War, winning the brevets of captain and major for his conduct at Contreras-Churubusco and Chapultepec. In command first of a brigade and later of a division in the Army of the Potomac, he took part in the Seven

Days' and Maryland campaigns. At the battle of Antietam he was twice wounded, but remained on the field. Soon afterwards he was given command of the VI. corps, in which position he took an important part in the battle of Chancellorsville, capturing the famous lines of Fredericksburg and fighting the severe battle of Bank's Ford. The VI. corps bore a share in the battle of Gettysburg, having made a fine forced march to the field. Sedgwick had been offered the chief command of the army upon Hooker's resignation; but he declined, and retained his command of the VI. corps during the Virginian campaign of the autumn of 1863, being on several occasions placed by Meade in charge of a wing of the army. He was also given the command of the whole army in Meade's absence. At the action of Rappahannock station Sedgwick by a brilliant night attack destroyed two brigades of Early's division (November 7th). When Grant became commanding-general and the Army of the Potomac was reorganized in three corps, the VI. was one of these, and Sedgwick thus led his old corps, now greatly augmented, at the battle of the Wilderness. At the opening of the battle of Spottsylvania Court House, Sedgwick was killed (9th of May 1864) by a shot from a Confederate skirmisher. A monument to his memory, cast from the guns taken in action by the VI. corps, was erected at West Point in 1868.

SEDILIA (the plural of Lat. sedile, seat), in ecclesiastical architecture, the term given to the seats on the south side of the chancel near the altar for the use of the officiating priests. They are generally three in number, for the priest, deacon and sub-deacon. The custom of recessing them in the thickness of the wall began about the end of the 12th century; some early examples consist only of stone benches, and there is one instance of a single seat or arm-chair in stone at Lenham in Kent, thought by some to be a confessional. The niches or recesses in which they are sunk are often richly decorated with canopies and subdivided with moulded shafts, pinnacles and tabernacle work; the seats are sometimes at different levels, the eastern being always the highest, and sometimes an additional niche is pro- vided in which the piscina is placed.

SEDITION (Lat. se or sed, apart, and ire, to go, a going apart, dissension), in law, an attempt to disturb the tranquillity of the state.

In Roman law sedition was considered as majestas or treason. In English law it is a very elastic term, including offences ranging from libel to treason (q.v.). It is rarely used except in its adjectival form, e.g. seditious libel, seditious meeting or seditious conspiracy. " As to sedition itself," says Mr Justice Stephen, " I do not think that any such offence is known to English law " (Hist. Crim. Law, vol. ii. chap, xxiv.). 1 The principal enactments now in force dealing with seditious offences were all passed during the last twenty-five years of the reign of George III. They are the Unlawful Oaths Act 1797, prohibiting the administering or taking of unlawful oaths (see Oath) or the belonging to an unlawful confederacy; the Unlawful Drilling Act 1819-1820 prohibited unlawful drilling and military exer- cises; and the acts for the suppression of corresponding societies, the Unlawful Societies Act 1799 and the Seditious Meetings Act 181 7. No proceedings can be instituted under these last two acts without the authority of the law officers of the crown (Corresponding Societies, &c, Act, 1846). Under the head of statutes aimed at seditious offences may also be classed statutes of Richard II. (1378, 1388) against scandalum tnagnatum or slander of great men, such as peers, judges or great officers of state, whereby discord may arise within the realm, and a statute of Charles II. (1661) against tumultuous petitioning (see Peti- tion). There has been no prosecution for many years for seditious words as distinguished from seditious libel, but such words have been admitted as evidence in proceedings for seditious conspiracy (q.v.), as in the prosecution of O'Connell in 1844 and of C. S. Parnell and others in 1880 (see Reg. v. Parnell, Cox's Criminal Cases, vol. xiv. 508). By the Prison Act 1877, any prisoner under sentence for sedition or seditious libel is to be treated as a misdemeanant of the first division.

1 The word " sedition " occurs, however, in the Prison Act 1877, s. 40.

Scotland.—" All acts by which the minds of the people may be incited to defeat the government or control legislation by violent or unconstitutional means are seditious " (Macdonald, Criminal Law, 229). Sedition is punishable by fine or imprisonment or both (Punishment of Leasing-making, &c, 1825). A very large number of acts of the Scottish parliament dealt with sedition, beginning as early as 1 1 84 with the assize of William the Lion, c. 29. Leasing- making is to be distinguished from sedition, as it attacked only the sovereign

individually, not the government.

United States. — In the acts of Congress the word " sedition " appears to occur only in the army and navy articles. A soldier joining any sedition or who, being present at any sedition, does not use his utmost endeavour to suppress the same, is punishable with death or such other punishment as a court-martial shall direct (U.S. Rev. Stats. § 1342, arts. 22, 23). A sailor uttering seditious words is punishable at the discretion of a court-martial. In 1798 an act of Congress called the Sedition Act was passed, which expired by effluxion of time in 1801. Its constitutionality was violently assailed at the time and it "was beyond all question condemned by public sentiment " as " susceptible of being used for purposes of oppression and terrorism." (See Story on the constitution of the United States, §§ 1293-1294.) Several prosecutions under the act will be found in Wharton's State Trials. Sedition is also dealt with by the state laws mostly in a very liberal spirit. Thus the Louisiana Code, § 394, enacted that " there is no such offence known to our law as defamation of the government or either of its branches, either under the name of libel, slander, seditious writing or other appellation." By § in, to constitute the offence of sedition " there must be not only a design to dismember the state, or to subvert or change its constitution, but an attempt must be made to do it by force. It has been held that publications which tend to degrade and vilify the constitution, to promote insurrection and circulate discontent through its members, to asperse its justice and anywise impair the exercise of its functions are seditious and are visited with the peculiar rigour of the law (1805, Respub. v. Dennie, 4 Yeates (Penna), 267). The defendant was indicted " as a factitious and seditious person of a wicked mind and unquiet and turbulent disposition and conversation, seditiously, maliciously and wilfully intending as much as in him lay to bring into contempt and hatred the independence of the United States, the constitution of this commonwealth and of the United States, to excite popular discontent and dissatisfaction against the scheme of polity instituted and upon trial in the said United States and in the said commonwealth, to molest, disturb and destroy the peace and public tranquillity of the said United States … to condemn the principles of revolution and revile, depreciate and scandalize the characters of the revolutionary patriots and statesmen, to endanger, subvert and totally destroy the republican constitutions and free govern- ments of the United States … to involve (it) … in civil war, desolation and anarchy and to procure by art and force a radical change and alteration in the principles and forms of the said con- stitutions and

governments without the free will and concurrence of the people of the United States, and to fulfil, perfect and bring to effect his wicked, seditious and detestable intentions aforesaid he the said Joseph Dennie on the 23rd of April 1803 at the city of Philadelphia falsely, maliciously, factiously and seditiously did make, compose, write and publish the following libel, to wit, ‘ a democracy is scarcely tolerable at any period of national history. Its omens are always sinister and its powers are unpropitious ; it was weak and wicked at Athens, it was bad in Sparta and worse in Rome. … It was tried in England and rejected with the utmost loathing and abhorrence. It is on its trial here and its issue will be civil war, desolation and anarchy. . . . No honest man but proclaims its fraud, and no brave man but draws his sword against its force,’ &c, &c.” The defendant was found not guilty. .

Continent of Europe. — The continental codes as a rule are little more definite than English law in their treatment of sedition. In Germany a distinction is drawn between Auflauf, the remaining together of a mob after the authorities have thrice bid it disperse, and Aufruhr or Aufstand, an organized resistance to the authorities; but no definition is given of the terms. The Hungarian penal code defines Aufstand to be an armed assembly which has the intention of attacking a class of citizens, a nationality or a religious body. The French penal code recognizes a difference between sidition and riunion siditieuse. If carried out with sufficient numbers and sufficient force sedition becomes rebellion. Section 100 exempts from the penalties of sedition those who have merely been present at a seditious meeting without taking any active part therein, and have dispersed at the first warning of the military or civil authorities.

SEDLEY, SIR CHARLES (c. 1630-1701), English wit and dramatist, was born about 1639, and was the son of Sir John Sedley of Aylesford in Kent. He was educated at Wadham College, Oxford, but left without taking a degree. Sedley is famous as a patron of literature in the Restoration period, and was the ” Lisideius ” of Dryden’s Essay of Dramatic Poesy. His most famous song, ” Phyllis is my only joy,” is much more widely known now than the author’s name. His first comedy,

The Mulberry Garden (1668), hardly sustains Sedley ‘s contemporary reputation for wit in conversation. The best, but most licentious, of his comedies is Bellamira; or The Mistress (1687), an imitation of the Eunuchus of Terence, in which the heroine is supposed to represent the duchess of Cleveland, the mistress of Charles II. His two tragedies, Antony and Cleopatra (1667) and The

Tyrant King of Crete (1702), an adaptation of Henry Killigrew's Pallantus and Eudora, have little merit. He also produced The Grumbler (1702), an adaptation of Le Grondeur of Brueys and Palaprat. An indecent frolic in Bow Street, for which he was heavily fined, made Sedley notorious. He was member of parliament for New Romney in Kent, and took an active and useful part in politics. A speech of his on the civil list after the Revolution is cited by Macaulay as a proof that his reputation as a man of wit and ability was deserved. His bon mot at the expense of James II. is well known. The king had seduced his daughter and created her countess of Dorchester, whereupon Sedley remarked that he hated ingratitude, and, as the king had made his daughter a countess, he would endeavour to make the king's daughter a queen. He died on the 20th of August 1 701.

His only child, Catherine, countess of Dorchester (c. 1657- 17 1 7), was the mistress of James II. both before and after he came to the throne, and was created a countess in 1686, an ele- vation which aroused much indignation and compelled Catherine to reside for a time in Ireland. In 1696 she married Sir David Colyear, Bart. (d. 1730), who was created earl of Portmore in 1703, and she was thus the mother of Charles Colyear, 2nd earl of Portmore (1700-1785). She died at Bath on the 26th of October 17 17, when her life peerage became extinct. By James II. Lady Dorchester had a daughter Catherine (d. 1743), who married James Annesley, earl of Anglesey (d. 1702), and after his death married John Sheffield, duke of Buckingham. Through Catherine, her daughter by her first husband, she was the ancestress of the Barons Mulgrave.

See The Works of Sir Charles Sedley in Prose and Verse (1778), with a slight notice of the author.

SEDUCTION (from Lat. seducere, to lead astray), a term generally used in the special sense of wrongfully inducing a woman to consent to sexual intercourse. The action for seduc- tion of an unmarried woman in England stands in a somewhat anomalous position. The theory of English law is that the woman herself has suffered no wrong; the wrong has been suffered by the parent or person in loco parentis, who must sue for the damage arising from the loss of service caused by the seduction of the woman. Some evidence of service must be given, but very slight evidence will be sufficient, even making of tea, milking cows, minding children or any small household work. It is no bar if a daughter is out at work during the day time, provided she assists in the household when she comes home in the evening. The relationship of master and servant must,

however, exist, and the action must be brought by the person with whom the seduced girl was residing at the time, whether in the capacity of daughter and servant, ward and servant, or servant only. It is so seldom indeed that an action is brought against a seducer when the seduced girl is a servant only, that what Serjeant Manning wrote many years ago is still painfully true: " The quasi fiction of servitium amisit affords protection to the rich man whose daughter occasionally makes his tea, but leaves without redress the poor man whose child is sent unprotected to earn her bread amongst strangers " (note to Grinnell v. Wells, 1844, 7 M. & G. 1044). This capricious working of the action for seduction is somewhat obviated in Scots law, under which the seduced woman may sue on her own account, but only if deceit has been used, and most often there is a difficulty in showing that the deceit alone was the cause of the injury. Although the action is nominally for loss of service, still exemplary damages are given for the dishonour of the plaintiff's family beyond recompense for the mere loss of service. An action for seduction cannot be brought in the county court except by agreement of the parties. As to seduction of a married woman, the old action for criminal conversation was abolished

by the Divorce Act 1&57 which substituted for it a claim for damages against the co-respondent in a divorce suit; but if a married woman were living apart from her husband in her father's house, and giving her services to her father in the slightest degree, an action for seduction would lie. Seduction in England is not as a rule a criminal offence. But a conspiracy to seduce is indictable at common law. And the Criminal Law Amend- ment Act 1885 (which extends to the United Kingdom) makes it felony to seduce a girl under the the age of thirteen, and mis- demeanour to seduce a girl between thirteen and sixteen (§§ 4,5). The same act also deals severely with the cognate offences of procuration, abduction and unlawful detention with the intent to seduce a woman of any age. The Children Act 1908 gave a further protection to young people, enacting that if any person having the custody, charge or care of a girl under the age of sixteen causes or encourages the seduction of that girl he shall be guilty of a misdemeanour, and be liable to imprison- ment, with or without hard labour, for a term not exceeding two years.

United Stales. — In the United States state legislation has generally modified the common law. In some states the father brings the action

as the representative of the family whose purity has been in- vaded; in others the woman herself may bring the action. In many states there is a criminal as well as a civil remedy. The penal codes of New York, New Jersey, Louisiana and other states make it a crime to seduce under. promise of marriage an unmarried woman of good reputation. Subsequent intermarriage of the parties is in most cases a bar to criminal proceedings. The state legislation of the United States is in remarkable opposition to the rule of the canon law, by which the seduction of a woman by her betrothed was not punish- able on account of the inchoate right over her person given by the betrothal.

SEDULIUS, Coelius or Caelius (a praenomen of doubtful authenticity), a Christian poet of the first half of the 5th century, is termed a presbyter by Isidore of Seville and in the Gelasian decree. He must not be confused with Sedulius the Irish-Scot grammarian of the 9th century. His fame rests mainly upon a long poem, Carmen paschale, based on the four gospels. In style a bombastic imitator of Virgil, he shows, nevertheless, a certain freedom in the handling of the Biblical story, and the poem soon became a quarry for the minor poets. A hymn by Sedulius in honour of Christ, consisting of twenty-three quat- rains of iambic dimeters, has partly passed into the liturgy, the first seven quatrains forming the Christmas hymn A solis ortus cardine, and some later ones the Epiphany hymn, Hostis Herodes impie. A Veteris et novi Testamenti collatio in elegiac couplets has also come down, but we have uo grounds for ascrib- ing to him the Virgilian cento, De verbi incamatione.*

Sedulius's works were edited by F. Arevalo (Rome, 1794), re- printed in J. P. Migne's Patrol. Lat. vol. xix. ; and finally by J. Huemer (Vienna, 1885). See J. Huemer, De Sedulii poetae vita et scriptis commentatio (Vienna, 1878); M. Manitius, Geschichte der christiich-laleinischeh Poesie (Stuttgart, 1891); Teuffel-Schwabe, Hist, of Roman Lit. (Eng. trans.), 473; Herzog-Hauck, Realency- klopddte fitr protestantische Theologie, xviii. (Leipzig, 190b); Smith and Wace, Dictionary of Christian Biography (1887).

SEDUM, in botany, a genus of the natural order Crassulaceae, containing about 120 species, natives chiefly of the north temper- ate and frigid regions, and mostly perennial herbs with succulent leaves of varied form, but never compound. The white or yellow, rarely pink or blue, flowers are usually small and grouped in cymes. They have a calyx of fine sepals, as many petals, usually ten stamens and five distinct carpels, which have as many glands at their base and ripen into as many dry seed-pods. Several species are British, including some with tuberous roots and large leaves (Telephium) r and others

of smaller size, chiefly found on rocks, walls and dry banks; S. acre is stonecrop (see fig. 1), well known also in gardens, a variety of which, aureum, is in cultivation with golden-yellow tips to the leaves and shoots. Many others are cultivated for the beauty of their foliage or flowers, and many are remarkable for their vitality under adverse circumstances. They succeed on rockwork, old walls or as border plants; some, e.g. S. Lydium, a native of Asia Minor, are excellent for carpet bedding. 5. spectabUe, 1 to i| ft., with pink flowers in great cymose heads, is a fine plant for the borders,

and worthy also of pot-culture for greenhouse decoration. S. Sieboldi and its variegated form, from Japan, are often grown

Sedum acre (Stonecrop). (After Curtis.) Flora Lindinensis. 1, Diagram of flower; 2, flower enlarged.

in hanging pots or baskets in cottage windows. Sedums are very closely allied to Sempervivums (see Houseleek).

SEE (Lat. sedes, a seat), a seat or throne, particularly the throne of a bishop, the cathedra, the symbol of his office and dignity, the placing of which in a church makes it a cathedral (q.v.). The term is thus applied to the place where the bishop's cathedral is situated and from which he properly takes his title, and so is to be distinguished from diocese(q.v.), the territorial province over which his jurisdiction extends (see Bishop).

SEEBACH, MARIE (1830-1897), German actress, was born at Riga, in Russia, on the 24th of February 1830, being the daughter of an actor, Wilhelm Friedrich Seebach (1 798-1 863). After appearing first at Nuremberg as Julie in Kean, she played soubrette parts at Liibeck, Danzig and Cassel. In 1852 she achieved her first great success at the Thaliatheater in Hamburg as Gretchen in Goethe's Faust, and she remained there until 1854, when she appeared in Vienna. She then played in Munich, establishing her reputation as a tragic actress with the r61es of Jane Eyre and Adrienne Lecouvreur. From 1855 to 1866 she was engaged at the court theatre at Hanover, and there in 1859 she married the tenor Albert Niemann. In 1866 she followed her husband to Berlin, but separated from him after two years- In 1870-1871 she visited the United States, and gave in seventeen cities no less than 160 performances — mostly of Faust; and in 1886 she accepted a permanent engagement at the Schauspielhaus in Berlin. She retired from the stage in 1897, and died on the 3rd of August of that year. In 1895 she endowed a home for poor actors and actresses at Weimar, called the Marie Seebach

Stiftung.

See Gensichen, Aus Marie Seebachs Leben (Berlin, 1900).

SEED (from the root seen in Lat. serere, to sow), the fertilized ovule of plants. The seeds of the cryptogams or flowerless plants are not true seeds and are properly designated " spores " (see Fruit). For the sowing of seed see Sowing.

SEELEY, SIR JOHN ROBERT (1834-1895), English essayist and historian, was born in London in 1834. His father, R. B. Seeley, was a publisher, and author of several religious books and of The Life and Times of Edward I., which was highly esteemed by historians. From his father Seeley doubtless derived his taste for religious and historical subjects. He was educated at the City of London School and at Christ's College, Cambridge, where he was head of the classical tripos and senior chancellor's medallist, was elected fellow and became classical tutor of his college. For a time he was a master at his old school, and in 1863 was appointed professor of Latin at University College, London. His essay Ecce Homo, published anonymously in 1866, and afterwards owned by him, was widely read, and called forth

many replies, being held to be an attack on Christianity. Dealing only with Christ's humanity, it dwells on his work as the founder and king of a theocratic state, and points out the effect which this society, his church, has had upon the standard and active practice of morality among men. Some who comdemned the book seem to have forgotten that it was avowedly " a fragment," and that the author does not deny the truth of doctrines which he does not discuss. Its literary merit is unquestionable; it is written with vigour and dignity; its short and pointed sentences are never jerky, and there is a certain stateliness in the admirable order of their sequence. His later essay on Natural Religion, which, premising that supernaturalism is not essential to religion, maintains that the negations of science tend to purify rather than destroy Christianity, satisfied neither the Christian nor the scientist, and though well written excited far less interest than his earlier work. In 1869 he was appointed professor of modern history at Cambridge. His influence as a teacher was stimulating; he prepared his lectures carefully and they were largely attended. In historical work he is distinguished as a thinker rather

than a scholar. Avoiding research and disliking all attempts at a picturesque representation of the past, he valued history solely in its relation to politics, as the science of the state. He maintained that it should be studied scientifically and for a practical purpose, that its function was the solution of existing political questions. Hence he naturally devoted himself mainly to recent history, and specially to the relations between England and other states. His Life and Times of Stein, a valuable narrative of the anti-Napoleonic revolt, led by Prussia mainly at Stein's instigation, was written under German influence, and shows little of the style of his short essays. Its length, its colourlessness, and the space it devotes to subsidiary matters render it unattractive. Far otherwise is it with his Expansion of England (1883). Written in his best manner, this essay answers to his theory that history should be used for a practical purpose; it points out how and why Great Britain gained her colonies and India, the character of her empire, and the light in which it should be regarded. As an historical essay the book is a fine composition, and as a defence of the empire is unanswer- able and inspiring. It appeared at an opportune time, and did much to make Englishmen regard the colonies, not as mere appendages, but as an expansion of the British state as well as of British nationality, and to remind them of the value of Great Britain's empire in the East. Seeley was rewarded for this public service by being made K.C.M.G., on the recommendation of Lord Rosebery. His last book, The Growth of British Policy, written as an essay and intended to be an introduction to a full account of the expansion of Great Britain, was published posthumously. Seeley died on the 13th of January 1895. He married in 1869 Miss Mary Agnes Phillott, who survived him.

See G. W. Prothero, Memoir prefixed to Growth of British Policy (London, 1895). (W. Hu.)

SEES, a town of north-western France, in the department of Orne, on the river Orne 3 m. from its source and 13 m. N.N.E. of Alencon by rail. Pop. (1906) town, 2612; commune, 3982. The town is a bishop's see and has a Gothic cathedral remarkable for the boldness of its architecture. The church dates from the 13th and 14th centuries and occupies the site of three earlier churches. The west front, which is disfigured by the buttresses projecting beyond it, has two stately spires of open work 230 ft. high. The nave was built towards the end of the 13th century. The choir, built soon afterwards, is remarkable for the lightness of its construction. In the choir are four bas-reliefs of great beauty representing scenes in the life of the Virgin; and the altar is adorned with another depicting the removal of the relics of St Gervais and St Protais. The church has

constantly been the object of restoration and reconstruction. Other noteworthy buildings are the episcopal palace (1778), with a pretty chapel; the higher seminary, located in the old abbey of St Martin (sup- posed to be one of the fourteen or fifteen monasteries founded in the 6th century by St Evroult); and the sumptuous modern chapel of the Immaculate Conception, a resort of pilgrims.

The first bishop of Sees (Saium, Sagium) was St Lain, who lived about the 4th century. In the 9th century Sees was a fortified town and fell a prey to the Normans. At that period Sees consisted of two distinct parts, separated by the Orne — the bishop's burgh, and to the south, the new or count's burgh (Bourg le Comte). From 1356 the counts of Alencon were its possessors. It was captured and recaptured in the wars between Henry II. of England and his sons. In the Hundred Years' War it was one of the first towns of Normandy to fall into the hands of the English (1418). Pillaged by the Protestants during the Wars of Religion, Sees attached itself to the League in 1589, but voluntarily surrendered to Henry IV. in 1590.

SEETZEN, ULRICH JASPER (1767-1811), German explorer of Arabia and Palestine, was born, the son of a yeoman, in the little lordship of Jever in German Frisia on the 30th of January 1767. His father, who was a man of substance, sent him to the university of Gottingen, where he graduated in medicine. His chief interests, however, were in natural history and technology; he wrote papers on both these subjects which gained him some reputation, and had both in view in making a series of journeys through Holland and Germany. He also engaged in various small manufactures, and in 1802 obtained a government post in Jever. In 1801, however, the interest which he had long felt in geographical exploration culminated in a resolution to travel. In the summer of 1802 he started down the Danube with a companion Jacobsen, who broke down at Smyrna a year later. His journey was by Constantinople, where he stayed six months, thence through Asia Minor to Smyrna, then again through the heart of Asia Minor to Aleppo, where he remained from November 1803 to April 1805, and made himself sufficiently at home with Arabic speech and ways to travel as a native. Now began the part of his travels of which a full journal has been published (April 1805 to March 1809), a series of most instructive journeys in eastern and western Palestine and the wilderness of Sinai, and so on to Cairo and the Fayum. His chief exploit was a tour round the Dead Sea, which he made without a companion and in the disguise of a beggar. From Egypt he went by sea to Jidda and reached Mecca as a pilgrim in October 1809. In Arabia be made extensive journeys, ranging from Medina to Lahak

and returning to Mocha, from which place his last letters to Europe were written in November 1810. In September of the following year he left Mocha with the hope of reaching Muscat, and was found dead two days later, having, it is believed, been poisoned by the command of the imam of Sana.

For the parts of Seetzen's journeys not covered by the published journal (Reisen, ed. Kruse, 4 vols., Berlin, 1854), the only printed records are a series of letters and papers in Zach's Monatliche Corresponded and Hammer's Fundgruben. Many papers and collections were lost through his death or never reached Europe. The collections that were saved form the Oriental museum and the chief part of the Oriental MSS. of the ducal library in Gotha.

SEGANTINI, GIOVANNI (1858-1899), Italian painter, was born at Arco in the Trentino on the 15th of June 1858. His mother, who died in 1863, belonged to an old family of the mountain country. His father, who was a man of the people, went to Milan, whence he set forth with another son to seek his fortune, leaving Giovanni behind. At the age of seven the child ran away; he was found perishing of cold and hunger, and was ; obliged to earn his bread by keeping the flocks on the hills. He spent his long hours of solitude in drawing. Owing to his fame having reached the ears of a syndic, he was sent back to Milan; but, unable to endure domestic life, he soon escaped again, and led a wandering life till he met at Arco with his half-brother, who offered him the place of cashier in his provision shop. After more flights and more returns, Segantini remained at Milan to attend classes at the Brera, earning a living meanwhile by giving lessons and painting portraits. His first picture, " The Choir of Sant Antonio," was noticed for its powerful quality. After painting this, however, he shook himself free by degrees of academical teaching, as in his picture "The Ship." He subse- quently painted " The Falconer " and " The Dead Hero," and then settled in Brianza, near Como. There he gave himself up to the study of mountain life, and became in truth the painter of

the Alps. At this time he painted the " Ave Maria," which took a gold medal at the Amsterdam Exhibition (1883), " Mothers," " After a Storm in the Alps," " A Kiss," and " Moonlight Effect." Deeply impressed by Millet, the artist nevertheless quickly strove to reassert his individuality, as may be seen in " The Drinking-place," which

gained a gold medal in Paris (1889), "In the Sheep-fold, ""By the Spinning-wheel," and " Ploughing in the Engadine," for which he was awarded a gold medal at the Turin Exhibition (1892). Besides those works in which he studied simple effects of light and Alpine scenery, such as " Midday on the Alps " and " Winter at Savognino," he also painted sym- bolical subjects: "The Punishment of Luxury," and the " Unnatural Mothers " (in the Walker Art Gallery, Liverpool). Segantini died at Maloja in October 1899. An exhibition of his works was held in London, and afterwards at Brussels in 1899, and at Milan in 190×3.

Authorities. — H. Zimmern, Magazine of Art (London, 1897); W. Ritter, Gazelle des beaux-arts (Paris, 1898); Robert de la Sizeranne, Revue de I' art (Paris, 1899) ; and Revue des deux mondes (Paris, 1900).

SEGESTA (Gr. "E-yeora^an ancient city of Sicily, 8 m. W.S.W. of the modern Alcamo and about 15 m. E.S.E. of Eryx. It was a city of the Elymi, but, though the Elymi were regarded as barbari, Segesta, in its relations with its neighbours, was almost like a Greek city. Disputes with Selinus over questions of boundary seem to have been frequent from 580 B.C. onwards. In 454 B.C. we hear of dealings — possibly even an alliance — with Athens (the authority is a fragmentary inscription, see E. A. Freeman, History of Sicily, ii. 534), and in 426 an alliance was concluded by Laches. One of the ostensible objects of the Athenian expedition to Sicily in 415 was to aid Segesta against Selinus in a dispute, not only as to questions of boundary, but as to rights of marriage. After the Athenian debdcle, the Segestans turned to Carthage; but when Hannibal in 409 B.C. firmly established the Carthaginian power in western Sicily, Segesta sank to the position of a dependent ally, and was indeed besieged by Dionysius in 397, being at last relieved by Himilco. In 307 Agathocles marched on the city, massacred 10,000 men, sold the rest of the inhabitants into slavery and changed its name to Dicaeopolis; but it soon recovered its old name and returned to the Carthaginians. Early in the First Punic War, however, the inhabitants, having massacred the Carthaginian garrison and allied themselves with Rome, had to stand a severe siege from the Carthaginians. Segesta was treated with favour by the Romans, retaining its freedom and immunity from tithe; indeed it seems probable that the municipal constitution of Eryx was suppressed and its territory assigned to Segesta. It received Latin rights before Caesar's concession of them to the rest of Sicily.

The site is now absolutely deserted. The town lay upon the Monte Varvaro (1345 ft.) ; considerable remains of its external walls, of

houses and of a temple of Demeter are to be seen. The theatre is well preserved: its diameter is 205 ft. It is partly hewn in the rock, the rest (especially the back wall of the stage) being of very roughly hewn, long, thin blocks of hard limestone, approxi- mately rectangular, with smaller pieces filling up the interstices. To the W.N.W., 350 ft. below the theatre, is a temple, 200J ft. long and 86 J wide, including the steps: it is a hexastyle peripteros, and has 36 columns, 29 ft. in height, 6| ft. in lower diameter. The building was, however, not completed; the cella was never built, and the columns, not having been fluted, have a heavy appearance. It is, however, extremely well preserved. Its style places the date of its construction between 430 and 420, so that the interruption of the work must be due to the events of 416 or Of 409 B.C. The Thermae Segestanae were situated about 5 m. to the north on the road to Castellammare : the hot springs are still in use. (T. As.)

SEGESVAR (Ger. Schdssburg), a town of Hungary, in Transyl- vania, the capital of the county of Nagy-Kiikullo, 126 m. S.E. of Koloszvar by rail. Pop. (1900) 10,857. Amongst the principal buildings are a Gothic church of the 15th century, the town and county hall, a German gymnasium with a good collection of antiquities, and the municipal museum. In front of the county hall is a bronze statue of the Hungarian poet Alexander Petofi (1823-1849), erected in 1897. Segesvar has a good woollen and linen trade, as well as exports of wine and fruit.

Segesvar was founded by Saxon colonists at the end of the

12th century; its Latin name was Castrum Sex. Here, on the 31st of July 1849, the Hungarian army under Bern was defeated by the overwhelming numbers of the Russian General Liiders. Petofi is generally believed to have met his end in this battle.

SEGOVIA, a province of central Spain, formerly part of Old Castile, bounded on the N. and N.E. by the provinces of Burgos and Soria, S.E. by Guadalajara and Madrid, S.W. by Avila, and N.W. by Valladolid. Pop. (1900) 159,243; area, 2635 sq. m. The greater portion of the country consists of an arable tableland, some 2500 ft. above the sea, monotonous enough in appearance, and burnt to a dull brown during summer, but yet producing some of the finest corn in the Peninsula. Along the whole south- eastern boundary the Sierra de Guadarrama rises up suddenly, like a huge barrier, separating Old from New Castile and the basin of the Duero from that of the Tagus. The province is well watered by the streams which rise in the Guadarrama range and flow northwards to the Duero, and by careful

irrigation. The Eresma, Cega, Duraton and Riaza are the principal water- courses. Except the capital, Segovia, there is no town of more than 5000 inhabitants; but Sepulveda and other small towns contain monuments of some historical and ecclesiastical interest. At the foot of the Navacerrada pass lies the royal demesne and summer residence of La Granja (q.v.). After the completion (1883) of the railway from Medina del Campo to the city of Segovia, and its subsequent extensions to Madrid and Aranda de Duero, the towns adjoining these lines showed signs of increased prosperity and animation. There are manufactures on a small scale of coarse pottery, dyes, paper, alcohol, rosin, hats, pins and needles, flour, oil and beer. Such prosperity, however, as Segovia retains is dependent upon its agricultural produce — wheat, rye, barley, peas, hemp, flax, &c. — together with the rearing of sheep, cattle, mules and pigs. There are extensive forests in the sierras, which yield excellent granite, marble and limestone; but the difficulty of transport has prevented any systematic development of these resources.

SEGOVIA, the capital of the Spanish province of Segovia; on the railway from Madrid to Valladolid and Zamora. Pop. (1900) 14,547. Segovia is built upon a narrow ridge of rock which rises in the valley of the Eresma, where this river is joined by its turbulent tributary the Clamores. It is an episcopal see in the archbishopric of Valladolid. Founded originally as a Roman pleasure resort, it became in the middle ages a great religious centre and seat of the Castilian court; it was surrounded by Alphonso VI. with the walls and towers which still give to it, even in their dilapidation, the air of a military stronghold. The streets are steep, irregular and narrow, and are lined with quaint old-fashioned houses, built for the most part of granite from the neighbouring Sierra Guadarrama. The place ceems with records and monuments of the many vicissitudes of fortune and art through which it has passed, foremost among the latter being the ancient alcazar or citadel, the cathedral, the aqueduct of Trajan, and a notable array of churches and other ecclesiastical edifices.

The alcazar is perched upon the western tip of the long tongue of rock upon which the city is built. Of the original medieval fortress but little remains save the noble facade — the building having been wantonly fired in 1862 by the students of the artillery school then domiciled within its walls, and all but destroyed. The work is Gotho-Moorish, with an admixture of Renaissance in the decoration. The 16th-century cathedral (1521-1577), the work of Juan Gil de. Ontanon and his son Rodrigo, occupies the site of a former church of the nth century, of which the present cloisters, rebuilt in 1524,

formed part. It is a well-proportioned and delicate piece of Late Gothic — the latest of its kind in Spain — and con- tains some very fine stained glass. The most remarkable of the many other churches are those of La Vera Cruz (Knights Templar, Romanesque of the early 13th century), San Millan and San Juan (both Romanesque of second half of 13th century), El Parral (Gothic of early 16th century), and Corpus Christi, an ancient Jewish sanctu- ary and an interesting specimen of Moorish work. The towers and external cloistering, or corredores, of several of the later churches — especially those of San Estehan and San Martin — are fine. The great aqueduct, however, called El Puente del Diablo, usually ranks as the glory of Segovia, and is remarkable alike for its colossal proportions, its history, its picturesqueness, and the art with which

it is put together. Erected or rebuilt, according to fairly trust- worthy tradition, in the time of the emperor Trajan (c. a.d. 53-117), and several times barely escaping destruction, it is now in perfect working order, bringing the waters of the Rio Frio down from the Sierra Fuenfria, 10 m. S. The bridge portion striding across the valley into the city is 847 yds. long, and consists of a double tier of superimposed arches, built of rough-hewn granite blocks, laid without lime or cement. (For illustration, see Aqueduct.) Segovia lost its ancient prosperity when it was taken and sacked by the French in 1808. Since then, however, suburbs have sprung up on all sides, outside the walls. The woollen industry decayed, but its place was taken by dyeing, iron-founding, and manufactures of paper, flour, earthenware, and coarse porcelain. Segovia has a botanical garden, a museum and picture gallery, a savings bank, two public libraries, and two remarkable collections of archives. Public education is provided by an institute, a dozen primary schools, a school for teachers, and schools of art and handicrafts. The royal artillery school of Spain is also established here.

SEGRAVE, the name of an English baronial family. Stephen de Segrave, or Sedgrave (d. 1241), the son of a certain Gilbert de Segrave of Segrave in Leicestershire, became a knight and was made constable of the Tower of London in 1203. He obtained lands and held various positions under Henry III., and in 1232 he succeeded Hubert de Burgh as chief justiciar of England. As an active coadjutor of Peter des Roches, bishop of Winchester, Segrave incurred some share of the opprobrium which was lavished on the royal favourites,

and in 1234 he was deprived of his office. Soon, however, he was again occupying an influential position at Henry's court, and he retained this until his death on the 9th of November 1241. His son and heir, Gilbert de Segrave (d. 1254), who was also a judge, died in prison at Pons in France, whither he had gone to fight for Henry III.

Gilbert was the father of Nicholas de Segrave, 1st Baron Segrave (c. 1 238-1 295), who was one of the partisans of Simon de Montfort; he led the Londoners at the battle of Lewes, and was a member of Earl Simon's famous parliament of 1265. He was wounded at the battle of Evesham, and was afterwards among those who defied the royal authority in the isle of Ely. Soon, however, he obtained terms of peace, and went to the Holy Land with his future sovereign, Edward I. In 1283 he was summoned to parliament as a baron, and he served the king in various ways. He had six sons, three of whom, John (who succeeded him), Nicholas and Gilbert (bishop of London from 1313 until his death in December 1316), were men of note. Nicholas the younger (c. 1260-1322) was summoned to parliament in 1295, and was present at the battle of Falkirk and at the siege of Carlaverock Castle. In 1305 he was found worthy of death for deserting the English army in Scotland and for crossing over to France in order to fight a duel with Sir John de Cromwell; he was, however, pardoned, and again served Edward I. in Scotland. Under Edward II., Nicholas, who was one of Piers Gaveston's few friends, was made marshal of England, but lost this office definitely in 13 16. Later he associated himself with Thomas, earl of Lancaster. Through marriage he obtained the manor of Stowe in Northamptonshire, and he is generally called lord of Stowe.

John de Segrave, 2nd Baron Segrave (c. 1256-1325), was one of those who supported the earls of Norfolk and of Hereford in their refusal to serve Edward I. in Gascony in 1297. He took part in campaigns in Scotland, and like his brother Nicholas he signed the letter which was sent in 1301 by the barons at Lincoln to Pope Boniface VIII. repudiating the papal claim to the suzerainty of Scotland. Having been appointed warden of Scotland, Segrave was defeated at Roslin in February 1303; after the capture of Stirling he was again left in charge of this country and was responsible for the capture of Sir William Wallace, whom he conveyed to London. He was also warden of Scotland under Edward II., and was taken prisoner at Ban- nockburn, being quickly released, and dying whilst on active service in Aquitaine. His grandson and heir, another John (c. 1295-1353), married Margaret, daughter and heiress of Thomas of Broth erton, earl of Norfolk, a son of Edward I. Their daughter Elizabeth married John de Mowbray, and the barony of Segrave was

united with, and shared the fate of, that of Mowbray (q.v.).

Other celebrated members of the Segrave family are Sir Hugh Segrave (d. c. 1386), treasurer of England from 1381 until his death, and Stephen de Segrave (d. 1333), a noted pluralist, who was arch- bishop of Armagh from 1323 until his death on the 27th of October

1333-

SEGUIER, PIERRE (1588-1672), chancellor of France, was born in Paris on the 28th of May 1588, of a famous legal family originating in Quercy. His grandfather, Pierre Seguier (1504- 1 580) , was president & mortier in the parlement of Paris from 1 554 to 1576, and the chancellor's father, Jean Seguier, a seigneur d'Autry, was civil lieutenant of Paris at the time of his death in 1596. Pierre was brought up by his uncle, Antoine S6guier, president & mortier in the parlement, and became master of requests in 1620. From 1621 to 1624 he was intendant of Guienne, where he became closely allied with the due d'Epernon. In 1624 he succeeded to his uncle's charge in the parlement, which he filled for nine years. In this capacity he showed great independence with regard to the royal authority; but when in 1633 he became keeper of the seals under Richelieu, he proceeded to bully and humiliate the parlement in his turn. He became allied with the cardinal's family by the marriage of his daughter Marie with Richelieu's nephew, Cesar du Cambout, marquis de Coislin, 1 and in December 1635 he became chancellor of France. In 1637 Seguier was sent to examine the papers of the queen, Anne of Austria, at Val de Grace. According to Anquetil, the chancellor saved her by warning her of the projected inquisition. In 1639 Seguier was sent to punish the Normans for the insur- rection of the Nu-Pieds, the military chief of the expedition, Gassion, being placed under his orders. He put down pillage with a strong hand, and was sufficiently disinterested to refuse a gift of confiscated Norman lands. He was the submissive tool of Richelieu in the prosecutions of Cinq-Mars and Francois Auguste de Thou in 1642. His authority survived the changes following on the successive deaths of Richelieu and Louis XIII., and he was the faithful servant of Anne of Austria and of Mazarin. His resolute attitude towards the parlement of Paris made the chancellor one of the chief objects of the hatred of the Frondeurs. On the 25th of August 1648, Seguier was sent to the parlement to regulate its proceedings. On the way he was assailed by rioters on the Pont-Neuf, and sought refuge in the house of Louis Charles d' Albert, due de Luynes. In the course of the conces- sions made to the Fronde in 1650, Seguier was dismissed from his office of

keeper of the seals. He spent part of his retirement at Rosny, with his second daughter Charlotte and her husband, the duke of Sully. 2 He was recalled in April 1651, but six months later, on the king's attaining his majority, Seguier was again disgraced, and the seals were given to President Mathieu Mole, who held them with a short interval till his death in 1656, when they were returned to Seguier. Seguier lived for some time in extreme retirement in Paris, devoting himself to the affairs of the academy. When Paris was occupied by the princes in 1652, he was for a short time a member of their council, but he joined the king at Pontoise in August, and became president of the royal council. After Mazarin's death in 1661 Seguier retained but a shadow of his former authority. He showed a great violence in his conduct of the case against Fouquet (q.v.), voting for the death of the prisoner. In 1666 he was placed at the head of a commission called to simplify the police organi- zation, especially that of Paris; and the consequent ordinances of 1667 and 1670 for the better administration of justice were drawn up by him. He died at St Germain on the 28th of January 1672.

Seguier was a man of great learning, and throughout his life a patron of literature. In December 1642 he succeeded Richelieu as official " protector " of the Academy, which from that time until his death held its sessions in his house. His library was one of the most valuable of his time, only second, perhaps, to the royal col- lection. It contained no less than 4000 MSS. in various languages, the most important section of them being the Greek MSS. A catalogue was drawn up in Latin and in French (168 5-1686) by the

1 Mme de Coislin became a widow, and in 1644 married clan- destinely Guy de Laval, chevalier de Bois-dauphin, afterwards marquis of Laval. '

a She afterwards contracted a second marriage with Henri de Bourbon, duke of Verneuil, a grandson of Henry IV.

due de Coislin. The chancellor's great-grandson, Henri Charles du Cambout de Coislin, bishop of Metz, commissioned Bernard de Montfaucon, a learnedBenedictine of St Maur, to prepare a catalogue of the Greek MSS. with commentaries. This work was published in folio 1715, as Bibliotheca Coisliniana, olim Segueriana. . . . The greater part of the printed books were destroyed by fire, in

the abbey of St Germain-des-Pres, in 1794.

See F. Duchesne, Hist, des chanceliers de France (fol. 1680) ; for the affair of Val de Grace, Catalogue de documents historiques . . . relatifs au regne de Louis XIII (Paris, 1847); also R. Kerviler, Le Chancelier P. Siguier (Paris, 1874). Great part of his correspondence is preserved in the Bibliotheque Nationale, Paris.

SˆGUR, the name of a French family, the first member of which to attain distinction was Francois de Segur, better known as the seigneur de Sainte-Aulaye (d. c. 1605), who professed the reformed religion, and was closely associated with Henry IV., becoming in 1576 president of his council. Jean-Isaac, marquis de Segur (d. 1707), fought in most of the campaigns of the France of his time, and remained loyal throughout the troubles of the Fronde. His son, Henri Joseph, marquis de Segur(i66i-i737),was lieutenant-general of Champagne and Brie, governor of Foix. In his youth he was the hero of an episode of gallantry with Anne of Beauvilliers, abbess of La Joye, which led to the suggestion that she was none other than the Portuguese nun of the famous Letters. His son, Henri Francois, comte de Segur (1680-1751), was colonel at seventeen, when he succeeded to the command of the Segur regiment which his father had raised. In 1 718 he began a thirty years' tenure of the lieutenant- generalship of Champagne and Brie. He had married in that year Angelique de Froissy, a natural daughter of the regent, Philip of Orleans, but the death of his father-in-law a few years later prevented his reaping special advancement from his marriage, though Mme de Segur belonged to the inner circle of Louis XV. 's intimates. Segur served in Italy during the war of the Polish Succession under Marshal Villars, and became, in 1736, inspector- general of cavalry. In 1738 he was sent to Nancy as lieutenant- general under Marshal Belle-Isle, and to Bohemia in 1741 with the French troops allied with the Bavarians. But in September 1 741 he was compelled by the imperial troops to surrender at Linz. In 1744 he was again sent to Bavaria, and defeated the Austrians at Lichtenau on the 28th of January 1745. He served throughout the Flemish campaigns of 1746 and 1747, and was commandant of Metz at the time of his death (18th of June 1751). His son, Philippe Henri, marquis de Segur (1 724-1801), marshal of France, his grandson, Louis Philippe, comte de Segur (1753-1830), and Louis Philippe's son Philippe Paul, comte de Segur (1780-1873), are separately noticed.

Joseph Alexandre Pierre, vicomte de Segur (17 56-1805), second son of the marshal, quitted the army at the outbreak of the Revolution to devote himself to literature. He edited the Memoires of Besenval in

1795 from the MS. which, originally in his possession, had been surreptitiously placed with the printer during Segur's imprisonment under the Terror. These were printed in 1804-1805. Between 1790 and 1800 he produced a number of pieces at the Comedie Francaise and the Opera Comique. He published in 1802 a selection from his works entitled Comedies, chansons et proverbes, and in 1801 appeared Les Femmes, leurs mwurs … (3 vols.), which has often been reprinted, but is of doubtful authorship.

Octave-Henri Gabriel de Segur (1778-1818), elder son of Louis Philippe de S6gur, served in the later Napoleonic campaigns, and remained in the army under the Restoration. He threw himself into the Seine on the 15th of August 1818. The domestic unhappiness that led to his suicide is retailed by the comtesse de Boigne in her Memoires (vol. i., 1907). His elder son, Eugene, comte de Segur, succeeded his grandfather in the peerage in

1830. He married Sophie Rostopchine (1799-1894), daughter of Count Feodor Rostopchine, governor of Moscow. The countess of Segur wrote some famous books for children, the most familiar

of which are perhaps the Malheurs de Sophie and the Memoires d'un dne, and many tales in the Bibliotheque rose. Her letters to her daughter and son-in-law, the count and countess de Simard de Petray, were published in 1891, and those to her grandson in 1808.

Raymond Joseph Paul, comte de Segur d'Aguesseau (1803-1889), third son of Octave de Segur, took his mother's family name in addition to his own. He studied law at Aix and Paris. As procureur general of Amiens he gave in March 1830 a decision on the question of the electoral lists which pleased the liberal party, but late in the year, as substitute in the royal court of Paris, he ordered the suppression of certain liberal journals, and in other civil appointments was accused of re- actionary administration. He gave his adhesion to Prince Louis Napoleon, and became a member of the consultative commission in 1851, and of the senate in 1852. After the fall of the empire he retired into private life.

Louis Gaston Adrien de Segur (1820-1881), son of Eugene de Segur and Sophie Rostopchine, became a prelate of the papal court, and canon-bishop of Saint-Denis. He was a champion of the ultra-montane party and wrote a number of Catholic works, collected in ten volumes (Paris, 1876-1877). His life was written by his brother Anatole, who edited two collections of his letters in 1882 and 1899.

Anatole Henri Philippe de Segur (1823-1902), Gaston's brother, became councillor of state in 1872, serving until 1879. His works include the life of his grandfather Count Rostopchine (1872), Fables (1879), Un episode de la Terreur (1864), Paul Marie Charles Bernard (1875).

His son, Pierre Marie Maurice Henri, marquis de Segur (b. 1853), wrote a life (1895) of the marshal de S6gur, which was crowned by the French Academy. His book on Madame Geofirin, Le Royaume de la rue Saint-Honore (1897), also received a prize. His principal work is the three volumes devoted to Marshal Luxemburg — La Jeunesse du marechal de Luxembourg, 1628- 1668 (1900); Le Marechal de Luxembourg et le prince d'Orange, 1668-1678 (1902); Le Tapissier de Notre-Dame. Dernieres annees du marshal de Luxembourg, 1678-1695 (1904); Julie de Lespinasse (1905); English Transl., 1907; and Au couchant de la monarchie Louis XVI et Turgot, IJ74-1776 (Paris, 1910). He was elected to the French Academy in 1907.

There is much general information on the family of Segur in A. de Segur's Le Marechal de Segur, 1724-1801 (Paris, 1895), and in L. P. de Segur's Recueil defamille (1826).

SEGUR, LOUIS PHILIPPE, Comte de (i 753-1830), French diplomatist and historian, son of Philippe Henri, marquis de Segur, was born in Paris on the 10th of December 1753. He entered the army in 1 769, served in the American War of Indepen- dence in 1 78 1 as a colonel under Rochambeau. In 1784 he was sent as minister plenipotentiary to St Petersburg, where he was received into the intimacy of the empress Catherine II. and wrote some comedies for her theatre. At St Petersburg he concluded (11 January 1787) a commercial treaty which was exceedingly advantageous to France, and returned to Paris in 1789. He took up a sympathetic attitude towards the Revolution at its outset and in 1791 was sent on a mission to Berlin, where he was badly received. After fighting a duel he was forced to leave Berlin, and went into retirement until 1801 when, at Bonaparte's instance, he was nominated by the senate to the Corps ISgislatif. Subsequently he became a member of the council of state, grand master of the ceremonies, and senator, 1813. In 1814 Segur voted for the deposition of Napoleon and entered Louis XVIII. 's Chamber of Peers. Deprived of his offices and functions in 1815 for joining Napoleon during the Hundred Days, he was reinstated in 1819, supported the revolution of 1830, but died shortly afterwards in Paris on the 27th August 1830. By his wife, Antoinette d'Aguesseau, he had two sons, of whom Count Philippe Paul is

separately noticed. Among his writings may be mentioned Histoire des principaux evenements du regne de Frediric-Guillaume II (1800); PensSes politique (Paris, 1795); Histoire de France (n vols., 1824-1834); Histoire des juifs (1827); Memoires (3 vols., 1824); and Contes (1809). His CEuvres completes were published in 34 volumes in 1824 et seq.*

See due de Broglie, " Deux Frangais aux £tats-Unis " in Melanges publies par la Societe des Bibliophiles francais (2nd part, 1903); A. Cornereau, " La Mission du comte de Segur dans la xviii" division militaire," in the Memoires de la Societe bourguignonne de geographic et d'histoire (vol. 17, 1901). – -

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SEGUR, PHILIPPE HENRI, Marquis de (1724-1801), marshal of France, son of Henri Francois, comte de Segur, and his wife Angelique de Froissy, was appointed to the command of an infantry regiment at eighteen, and served under his father in Italy and Bohemia. He was wounded at Roucoux in Flanders in October 1746, and lost an arm at Lauffeld in 1747. In 1748 he succeeded his father as lieutenant-general of Champagne and Brie ; he also received in 1753 the governorship of the county of Foix. During the Seven Years' War he fought at Hastenbeck (1757), Crefeld (1758) and Minden (1759). In 1760 he was taken prisoner at Kloster-campen. The ability which he showed in the government of Franche-Comte in 1775 led in 1780 to his appointment as minister of war under Necker. He created in 1783 the permanent general staff, and made admirable regula- tions with regard to barracks and military hospitals; and though he was officially responsible for the reactionary decree requiring four quarterings of nobility as a condition for the appointment of officers, the scheme is said not to have originated with him and to have been adopted under protest. In 1783 he became a marshal of France. He resigned from the ministry of war in 1787. During the Terror he was imprisoned in La Force, and after his release was reduced to considerable straits until in 1800 he received a pension from Napoleon. He died in Paris on the 3rd of October of the next year.

See A. de Segur, Le Marechal de Segur, 1 724-1 801 (Paris, 1895).

SEGUR, PHILIPPE PAUL, Comte de (1780-1873), French general and historian, son of Louis Philippe, comte de Segur, was born in

Paris on the 4th of November 1780. He enlisted in the cavalry in 1800, and forthwith obtained a commission. He served with General Macdonald in the Grisons in 1800-1801, and published an account of the campaign in 1802. By the influence of Colonel Duroc (afterwards due de Frioul) he was attached to the personal staff of Napoleon. He served through most of the important campaigns of the first empire, and was frequently employed on diplomatic missions. During the cam- paign in Poland in 1807 he was taken prisoner by the Russians, but was exchanged at the peace of Tilsit. His brilliant conduct in the cavalry charge at Somo Sierra on the 30th of November 1808 (see Peninsular War) won him the grade of colonel, but his wounds compelled him to return to France. As general of brigade he took part in the Russian campaign of 181 2, and in the campaigns of 18 13 and 18 14 he repeatedly distinguished himself, notably at Hanau (October 1813), and in a brilliant affair at Reims (March 18 14). He remained in the army at the Restoration, but, having accepted a command from Napoleon during the Hundred Days, he was retired until 1818, and took no further active part in affairs until the revolution of 1830. During his retirement he wrote his Histoire de Napdion et de la grande armee pendant I'annee 1812 (Paris, 2 vols., 1824), which ran through numerous editions, and was translated into several languages. The unfavourable portrait of Napoleon given in this book provoked representations from General Gourgaud, and eventually a duel, in which Segur was wounded. On the estab- lishment of the July monarchy he received, in 1831, the grade of lieutenant-general and a peerage. In 1830 he was admitted to the French Academy, and he became grand cross of the Legion of Honour in 1847. After the revolution of 1848 he lived in retire- ment. He died in Paris on the 25th of February 1873. His works include: Histoire de Russie et de Pierre le Giand (1829); Histoire de Charles VIII. (2 vols., 1834-1842), in continuation of the history of France begun by his father; and the posthumous Histoire et tnemoires (8 vols., 1873).

See Un Aide-de-camp de Napoleon (1800-1812), tnemoires du general comte de Segur, new edition by his grandson Louis de Segur (3 vols., 1894-1895), of which an abridged English version was published in 1895.

SEGURA (anc. Tader), a river of south-eastern Spain about 1 50 m. long. It is formed by the confluence of three head-streams, one of which rises on the northern versant of La Sagra (7875 ft.), a mountain in Granada, while the other two spring from the Sierra de Segura, in Jaen. From the junction of these three streams below Yeste the river winds in an easterly and south-

easterly direction past the towns of Cieza and Archena to Murcia. Thence it trends N.E. and passing Orihuela falls into the Mediterranean 19 m. S.W. of Alicante. Its chief tributaries are the Mundo and Arroyo del Jua on the left, and the Caravaca, Quipar and Sangonera on the right. It is only navigable by small sailing-vessels, even in its estuary, but its waters are extensively utilized fcr irrigation.

SEGUSIO (mod. Susa, q.v.), an ancient town in north Liguria v the capital of the Cottii (see Cottii Regnum). Here the son of King Donnus, Cottius — who held the rank of imperial praefect over the fourteen tribes over which his father had ruled as king, so that in the inscription he calls himself " M. Iulius regis Donni f(ilius) Cottius praefectus civitatium quae subscriptae sunt " — erected a triumphal arch in honour of Augustus in 9-8 B.C., which is still standing. The style of the sculptures on the frieze is quite barbaric, with archaic elements, and is probably derived from Gaul. His tomb, situated near the city walls, mentioned by Ammianus Marcellinus, has long since disappeared. Claudius restored the royal titles to the family; but, after the death of its last member, Nero made the district into a province, and the town into a municipium. It was strongly fortified and garrisoned, and remains of its walls, including those of a double-arched gate, exist, while inscriptions testify to its importance, one of them mentioning baths erected by Gratian. Constantine captured the town, which offered some resistance to him, on his march against Maxentius.

See F. Genin, Susa Antica (Saluzzo, 1886); E. Ferrero, L'Arc d'Auguste a Suse (Turin, 1901); F. Studniczka, Jahrbuch des K. D, archdologischen Instituls, xviii. (1903), 1 sqq. (T. As.)

SEHESTED, HANNIBAL (1609-1666), Danish statesman, born at Arensborg Castle on Osel. After completing his educaˆ tion abroad, he returned to Denmark in 1632 and was attached to the court of Christian IV. Two or three years later he was sent to Wismar to negotiate a treaty with the Swedish chancellor, Axel Oxenstjerna, and, if possible, bring about a match between Christian's son Frederick and Gustavus Adolphus's daughter Christina. Though failing in both particulars, he retained the favour of the king, who had marked him out as one of his seven sons-in-law, by whose influence he hoped to increase the influence of the crown; and in 1636 he was betrothed to one of the daughters, the countess Christine, then in her tenth year, whom he married in 1642. In May 1640 Sehested became a member of the august Rigsraad. He imagined, with some reason, that the proper field for the exercise of

his talents was diplomacy, and he openly aspired to be minister of foreign affairs. Despite a success- ful embassy to Spain in 1640-1641 he did not obtain the coveted post, but was appointed viceroy of Norway (April 1642). He had now the opportunity of displaying an administrative and organizing ability, united with a zeal for reform, as remarkable as unexpected, which raises him high above his compeers. He made it his first object thoroughly to develop Norway's material resources, and reorganize her armaments and fiscal system; and he aimed at giving her a more independent position as regards Denmark. During Christian IV.'s second war with Sweden (1643-1645), Sehested, as viceroy of Norway, assisted his father-in-law materially. He invaded Sweden four times; successfully defended Norway from attack; and, though without any particular military talent, won an engagement at Nysaker in 1644. After the war he renewed his reforming efforts, and during the years 1646-1647 strove to withdraw his vice- royalty from the benumbing influence of the central administra- tion at Copenhagen, and succeeded with the help of Christian IV. in creating a separate defensive fleet for Norway and giving her partial control of her own finances. He was considerably assisted in his endeavours by the fact that Norway was regarded as the hereditary possession of the kings of Denmark. At the same time Sehested freely used his immense wealth and official position to accumulate for himself property and privileges of all sorts. His successes finally excited the envy and disapprobation of the Danish Rigsraad, especially of his rival Korfits Ulfeldt (q.v.), also one of the king's sons-in-law. The quarrel became acute when Sehested's semi-independent administration of the finances

of Norway infringed upon Ulfeldt's functions as lord treasurer of the whole realm; in November 1647 Ulfeldt carried his point, and a decree was issued that henceforth the Norwegian provincial governors should send their rents and taxes direct to Copenhagen. On the accession of Frederick III. (1648), Sehested strove hard to win his favour ; but an investigation into his accounts as viceroy, conducted by his enemies, brought to light such whole- sale embezzlement and peculation that he was summoned to appear before a herredag, or assembly of notables, in May 1 5 5 1 , and give an account of his whole administration. Unable to meet the charges brought against him, he compromised matters by resigning his viceroyalty and his senatorship, and surrendering all his private property in Norway to the crown. Throughout his trial Sehested had

shown consummate prudence. He surrendered voluntarily thrice as much as he had ever embezzled, and, calculating on the secret fondness of Frederick III. for a man of his monarchical tendencies, carefully abstained from the wild and treasonable projects of revenge which were the ruin of Korfits Ulfeldt. From 1651 to 1660 he lived abroad. At the end of 1655 he met the exiled Charles II. of England at Cologne, and lived a part of the following year with him in the Spanish Nether- lands. In the summer of 1657 he returned to Denmark, but Frederick III. refused to receive him, and he hastily quitted Copenhagen. During the crisis of the war of 1658 he was at the headquarters of Charles X. of Sweden. In seeking the help and protection of the worst enemy of his country, Sehested ap- proached the very verge of treason, but he never quite went beyond it. When, at last, it seemed probable that the war would not result in the annihilation of Denmark, Sehested strained every nerve to secure his own future by working in the interests of his native land while still residing in Sweden. In April 1660 he obtained permission from Frederick III. to come to Copenhagen, and was finally instructed by .him as pleni- potentiary to negotiate with the Swedes. The treaty of Copen- hagen, which saved the honour of Denmark and brought her repose, was very largely Sehested's work. He was one of the willing abettors of Frederick III. at the revolution of 1660, when he re-entered the Danish service as lord treasurer and councillor of state. Both at home and on his frequent foreign missions he displayed all his old ability. As a diplomatist he, in some respects, anticipated the views of Griffenfeldt, supporting the policy of friendship with Sweden and a French alliance. He died suddenly on the 23rd of September 1666 at Paris, where he was conducting important negotiations. His " political testa- ment " is perhaps the best testimony to his liberal and states- manlike views.

See Thyra Sehested, Hannibal Sehested (Copenhagen, 1886); Julius Albert Fridericia, Adelsvaeldens sidste Daee (Copenhagen, 1894). (R. N. B.)

SEHORE, a British station in Central India, within the state of Bhopal, with a station on the Bhopal-Ujjain section of the Indian Midland railway, 24 m. E. from Bhopal. Pop. (1901) 16,864. It is the headquarters of the political agent for Bhopal, and a British military cantonment. For many years it was also the headquarters of the Bhopal contingent, raised in 1818, which was in 1903 incorporated in the Indian army. It is an important centre of trade.

SEICHE (Fr. seche, fern, of sec, dry), in limnology, an irregular fluctuation of the water-level of lakes, first observed and so named

in Switzerland. (See Lake, and Geneva.)

SEIDL, ANTON (1850-1898), Hungarian operatic conductor, was born at Budapest on the 7th of May 1850. He entered the Leipzig Conservatorium in October 1870, and remained there until 1872, when he was summoned to Bayreuth as one of Wagner's copyists. There he assisted to make the first fair copy of Der Ring des Nibelungen. Thoroughly imbued with the Wagnerian spirit, it was natural that he should take a part in the first Bayreuth Festival in 1876. His chance as a conductor came when, on Wagner's recommendation, he was appointed to the Leipzig Stadt-Theater, where he remained until, in 1882, he went on tour with Angelo Neumann's Nibelungen Ring com- pany. To his conducting the critics attributed much of such

artistic success as attended the production of the Trilogy at Her Majesty's Theatre in London in June of that year. In 1883 Seidl went with Neumann to Bremen, but two years later was appointed successor to Leopold Damrosch as conductor of the German Opera in New York, and in the same year he married Fraul'ein Kraus, the distinguished singer. In America Seidl's orchestra became famous. In 1886 he was one of the conductors at Bayreuth, and in 1897 at Covent Garden, London, He died in New York on the 28th of March 1898.

See the memorial volume prepared by H. T. Finck, H. E. Krehbiel and others (New York, 1899).

SEIGNIORAGE, the due levied by the authority that possesses the right of coining on the metal that it manufactures into coin. The term " brassage " has been used to describe this due, when confined to the mere cost of the process; the wider term " seig- niorage " being employed when the charge is so raised as to become a profit to the imposer. The exercise of the right of seigniorage has been the instrument by which most of the debasements of currency have been carried out. Under feud- alism, especially in France, the chief nobles had this prerogative. In the modern state it is reserved for the sovereign authority. Most countries adopt a moderate seigniorage charge. Thus the fundamental currency law of France (1803) provides that " only the expense of coining " shall be charged. At present this due is 6 fr. 70 c. per kilo, of gold ˆj- fine, or 0-24%. The charge by the same law on silver was 3 fr. per kilo, or r-66%. The limita- tion on the coinage of silver in practically all countries has made the seigniorage on that metal very heavy. The policy of England in respect to gold has been peculiar. Since 1664 it has been

freed from any charge, though the delay in return amounts to a small due. In consequence of this gratuitous coinage, English gold has been regarded as equivalent to bullion, and exchange fluctua- tions have been reduced. The policy was severely criticized by Adam Smith, and it does in fact amount to a bounty on the coinage of gold. The amount is, however, too insignificant to deserve attention, especially as there are compensating gains. The employment of a seigniorage of about 1% on the " sovereign " was suggested by the proceedings of the Paris Monetary Conference of 1867, in order to bring about an assimila- tion of English and French money. By reducing the amount of gold in the sovereign to that in the proposed 25-franc piece an exact par would have been created, and, so it was hoped, the English currency and accounts need have undergone no change. The scheme was, however, rejected by a Royal Commission on the ground that an adjustment of obligations would be required.

The theory of the effects that a seigniorage produces have been discussed at length. The definitive results obtained may be briefly stated as follows: — (1) A seigniorage charge is the same as a debasement, but its evil effect may be avoided by limiting the amount of coin issued. (2) Seigniorage operates as a tax on the metal subject to it, and this tax tends ultimately to fall on the producers, or rather on the rent obtained through the pro- duction. A heavy seigniorage on gold would tend to lower the profits derived from the gold mines of the world, and might even compel the abandonment of the least productive ones.

See Money, Monetary Conferences, and Token Money.

(C F. B.)

SEIGNORY, or Seigniory (Fr. seigneur, lord; Lat. senior, elder), in English law, the lordship remaining to a grantor after the grant of an estate in fee-simple. There is no land in England without its lord: " Nulle terre sans seigneur " is the old feudal maxim. Where no other lord can be discovered the crown is lord as lord paramount. The principal incidents of a seignory were an oath of fealty; a " quit " or " chief " rent; a " relief " of one year's quit rent, and the right of escheat. In return for these privileges the lord was liable to forfeit his rights if he neglected to protect and defend the tenant or did anything injurious to the feudal relation. Every seignory now existing must have been created before the Statute of Quia Emplores (1290), which forbade the future creation of estates in fee-simple by subinfeudation. The only seignories of any importance at present are the lord- ships of manors. They are regarded as incorporeal

hereditaments,

and are either appendant or in gross. A seignory appendant passes with the grant of the manor; a seignory in gross — that is, a seignory which has been severed from the demesne lands of the manor to which it was originally appendant — must be specially conveyed by deed of grant.

Freehold land may be enfranchised by a conveyance of the seignory to the freehold tenant, but it does not extinguish the tenant's right of common (Baring v. Abingdon, 1892, 2 Ch. 374). By s. 3 (ii.) of the Settled Land Act 1882, the tenant for life of a manor is empowered to sell the seignory of any freehold land within the manor, and by s. 21 (v.) the purchase of the seignory of any part of settled land being freehold land, is an authorized application of capital money arising under the act.

SEINE (Lat. Sequana), one of the chief rivers of France, rising on the eastern slope of the plateau of Langres, about 5 m. N.W. of St Seine-l'Abbaye and 18 m. N.W. of Dijon. It keeps the same general direction (north-westwards) throughout its entire course, but has numerous windings: between its source and its mouth in the English Channel the direct distance is only 250 m., but that actually traversed by the river (through the departments of Cote-d'Or, Aube, Marne, Seine-et-Marne, Seine-et-Oise, Seine, Eure and Seine-Inferieure) is 482 m. Though shorter than the Loire and Rhone, and inferior in volume to the Loire, Rhone and Gironde, the Seine derives an exceptional importance from the regularity of its flow. This feature is due to the geological character of its basin, an area of 30,000 sq. m., entirely belonging to France (with the exception of a few communes in Belgium), and formed in three-fourths of its extent of permeable strata, which absorb the atmospheric precipitation to restore it gently to the river by perennial springs. At Paris the average volume of the river per second is 5300 cub. ft.; after it has received all its tributaries the volume is about 10,600 cub. ft. At Paris it falls as low as 1550 cub. ft., and in exceptional droughts the figure of 1200 is reached. During the flood of 1658 the volume between the quays at Paris is believed to have risen to 88,000 cub. ft. per second. The height of the river above the normal at Paris was probably on that occasion about 21 ft., whereas in the disastrous floods of January 1910 it was over 24 ft. Other notable floods are

recorded in 1740, 1799, 1802, 1876 and 1883.

Rising at a height of 1545 ft. above sea-level, at the base of the statue of a nymph erected on the spot by the city of Paris, the Seine is at first such an insignificant streamlet that it is often dry in summer as far as Chatillon (705 ft.) some 31 m. from its source. At Bar its waters feed the Haute-Seine Canal, though navigation thereon only begins at Troyes. It next passes Mery, and at Marcilly receives the Aube (right), at which point the canal terminates and the river itself is canalized ; here it is deflected from its hitherto north-north-westerly to a south-westerly direction by the heights of the Brie, the base of which it skirts past Nogent and Montereau. At the latter point it receives the Yonne, its most important left-hand tributary, and is deepened from 5 ft. 3 in. to 6 ft. 6 in. It then resumes its general north-westerly direction, receiving the Loing (left) at Moret; having passed Melun it is joined at Corbeil by the Essonne (left), and after its junction with the Marne (right), a tributary longer than itself by 31 m. at the confluence, reaches Paris. From this point to the sea its channel has been so deepened that vessels of 9 to 10 ft. draught can reach the capital. The river then winds through a pleasant champaign country past St Cloud, St Denis, Argenteuil, St Germain, Conflans (where it is joined from the right by the Oise, 56 ft. above the sea), Poissy, Mantes, Les Andelys, between which and the sea the river is remarkable for its detours, as also in the vicinity of Paris. At Poses the tide first begins to be perceptible. It next receives the Eure (left) , and passes Pont de l'Arche, Elbeuf and Rouen, where the sea navigation commences. The river is dyked below Rouen so as to admit vessels of 20 ft. draught, and large areas have thus been reclaimed for cultivation. At every tide there is a " bore " (barre or mascaret), ranging usually from 8 to 9 ft., and attaining its maximum from Quillebeuf to Caudebec. Below Quillebeuf (where the Risle is received from the left) the estuary begins, set with extensive sand- banks, between which flows a narrow navigable channel. Tancar- ville (right) is the starting-point of a canal to enable river boats for Havre to avoid the sea passage. The river enters the English Channel between Honfleur on the left and Havre on the right. The Marne brings to the Seine the waters of the Ornain, the Ourcq, and the Morin ; the Oise those of the Aisne ; the Yonne those of the Armancon. The low elevation of the bounding hills has rendered it comparatively easy to connect the Seine and its affluents with adjoining river basins by means of canals. The Oise and Somme are connected to the Picardy or Crozat Canal, which in turn is continued to the Scheldt by means of the St Quentin Canal and the

Oise, and to the Sambre by that of Oise and Sambre. Between the

Aisne and the Meuse is the Ardennes Canal, and the Aisne and the Marne are united by a canal which passes Reims. The Marne has similar communication with the Meuse and the Rhine, the Yonne with the Sa6ne (by the Burgundy Canal) and with the Loire by the Loing Canal dividing at Montargis into two branches — those of Orleans and Briare

SEINE, the department of northern France which has Paris as its chief town, formed in 1790 of part of the province of Ile- de-France. It is entirely surrounded by the department of Seine-et-Oise, from which it is separated at certain parts by the Seine, the Marne and the Bievre. The area of the department is only 185 sq. m., and of this surface about a sixth is occupied by Paris; the suburban towns also are close together and very populous. In actual population (3,848,618 in 1906) as well as in density (23-7 persons per acre) it holds the first place. Flowing from south-east to north-west through the department, the Seine forms three loops: on the right it receives above Paris ‘ the Marne, and below Paris the Rouillon, and on the left hand the Bievre within the precincts of the city. The left bank of the Seine is in general higher than the right, and consists of the Villejuif and Chatillon plateaus separated by the Bievre; the highest point (560 ft.) is above Chatillon and the lowest (105) at the exit of the Seine. Below Paris the river flows between the plain of Gennevilliers and Nanterre (commanded by Mont Valerien) on the left and the plain of St Denis on the right. On the right side, to the east of Paris, are the heights of Avron and Vincennes commanding the course of the Marne. Com- munication is further facilitated by canals.

Market gardening is the chief agricultural industry and by means of irrigation and manuring the soil is made to yield from ten to eleven crops per annum. Some districts are specially celebrated,- — Montreuil for its peaches, Fontenay-aux-Roses for its strawberries and roses, and other places for flowers and nurseries. The plain of Gennevilliers fertilized by the sewage water of Paris yields large quantities of vegetables. Milch-cows are reared in large numbers. The principal woods (Boulogne and Vincennes) belong to Paris. It is partly owing to the number of quarries in the district that Paris owes its origin: Chatillon and Montrouge in the south yielc! freestone, and Bagneux and Clamart in the south a’nd Montreuil and Rqmainville in the east possess the richest plaster quarries in France. Within the circuit of Paris are certain old quarries now forming the catacombs. Most of the industrial establishments in the department are situated in Paris or at St Denis (qq.v.). The department is traversed by all the railway lines which converge in Paris, and also contains the inner*

circuit railway (Chemin de Fer de Ceinture) and part of the outer circuit. There are 3 arrondissements (Paris, St Denis, and Sceaux), 41 cantons and 78 communes. The department forms the archiepiscopal diocese of Paris, falls within the jurisdiction of the Paris court of appeal and the academie (educational division) of Paris, and is divided between the II., III., IV., V. and VI carps d'armee : The chief places besides Paris are St Denis, Asnieres, Aubervilliers, Boulogne-sur-Seine, Clichy-sur-Seine, Courbevoie, Levallois-Perret, Neuilly-sur- Seine, Pantm, St Ouen, Colombes, Charenton, Ivry-sur-Seine, Montreuil-sous-Bois, Nanterre, Nogent-sur-Marne, Vincennes and Arcueil.

SEINE, or Sean (O. Fr. seigne, mod. seine, Lat. sagena, Gr. cayifirq, a draw-net), a type of fishing net, consisting of an ex- panse of netting weighted at the bottom and floated at the top edge by corks, cast from a boat or ship to enclose a space of water and then drawn into the vessel or to shore.

SEINE-ET-MARNE, a department of northern France, formed in 1790 of almost the entire district of Brie (half of which belonged to Champagne and half to Ile-de-France) and a portion of Gatinais (from Ile-de-France and Orleanais). Pop. (1906) 361,939. Area, 2289 sq. m. Seine-et-Marne is bounded N. by the department of Oise, N.E. by that of Aisne, E. by Marne and Aube, S.E. by Yonne, S. by Loiret and W. by Seine-et-Oise. The whole department belongs to the basin of the Seine, and is' drained partly by that river and partly by its tributaries the Yonne and the Loing from the left, and from the right the Voulzie, the Yeres and the Marne, with its affluents the Ourcq, the Petit Morin and the Grand Morin. With the exception of the Loing, flowing from south to north, all these streams cross the department from east to west, following the general slope of the surface, which is broken up into several plateaus from 300 to 500 ft. in height (highest point, in the north-east, 705 ft., lowest 105), and separated from each other by deep valleys. Most of

the plateaus belong to the Brie, a fertile well-wooded district of a clayey character. In the south lie the dry sandy district of the Fontainebleau sandstones and part of the region known as the Gatinais. The climate is rather more " continental " than that of Paris — the summers warmer, the winters colder; the annual rainfall does not exceed 16 in. There is a striking differ- ence in temperature

between the south of the department, where the famous white grape (ckasselas) of Fontainebleau ripens, and the country to the north of the Marne, — this river marking pretty exactly the northern limit of the vine.

The wheat and oats of Brie are especially esteemed; potatoes, sugar beet, mangel-wurzel and green forage are also important crops, and market gardening flourishes. Provins and other places are well-known for their roses. The cider and honey of the department are of good quality. Thousands of the well-known Brie cheeses are manufactured, and large numbers of calves, sheep and poultry are reared. The forests (covering a fifth of the surface) are planted with oak, . beech, chestnut, hornbeam, birch, wild cherry, linden, willow, poplar and conifers. Best known and most important is the forest of Fontainebleau. Large areas are devoted to game-preserves. Excellent freestone is quarried in the department, notably at Chateau-Landon in the valley of the Loing, mill-stones at La Fert6-sous-Jouarre; the Fontainebleau sandstone is used for pavements, and the white sand which is found along with it is in great request for the manufacture of glass. Along the Marne are numerous gypsum quarries; lime-kilns occur throughout the department; and peat is found in the valleys of the Ourcq and the Voulzie. Beds of common clay and porcelain clay supply the potteries of Fontainebleau and Montereau. Other industrial establishments are numerous large flour-mills, notably those of Meaux, the chocolate works of Noisiel, sugar factories, alcohol distilleries, paper-mills (the Jouarre paper-mill manufactures bank-notes, &c, both for France and for foreign markets), saw-mills, printing works (Coulommiers, &c.) and tanneries. Much of the motive-power used is supplied by the streams. Paris is the chief outlet for the industrial and agricultural products of the department. Coal and raw material for the manufactures are the chief imports. The Seine, the Yonne, the Marne, and the Grand Mprin are navigable, and, with the canals of the Loing and the Ourcq and those of Chalifert, Cornillon and Chelles, which cut off the windings of the Marne, form a total waterway of over 200 m. Seine-et-Marne has 5 arrondissements (Melun, Coulommiers, Fontainebleau, Meaux, Provins), 29 cantons and 533 communes. It forms the diocese of Meaux (archiepiscopal province of Paris), and part of the region of the V army corps and of the acadimie (educational circum- scription) of Paris. Its court of appeal is at Paris. Melun, the capital, Meaux, Fontainebleau, Coulommiers, Provins, Nemours and Montereau (qg-v.), are the more important towns in the department. Among other interesting places are Lagny (pop. 5302), with an abbey- church of the 13th century; Brie-Comte

Robert, with a church of the early 13th century; Ferrieres, with a fine chateau built in i860 by Baron Alphonse Rothschild; Moret-sur-Loing, which preserves fortifications dating from the 15th century including two remarkable gateways; St Loup-de-Naud, with a church of the first half of the I2th century; Jouarre, where there is a church of the 15th century, built over a crypt containing workmanship of the Merovingian period; and Vaux-le-Vicomte with the famous chateau built by Fouquet, minister of Louis XIV.

SEINE-ET-OISE, a department of northern France, formed in 1700 of part of the old province of tle-de-France, and traversed from south-east to north-west by the Seine, which is joined by the Oise. Pop. (1906) 749,753. Area, 2184 sq. m. It is bounded by the departments of Seine-et-Marne on the E., Loiret on the S., Eure-et-Loir on the W., Eure on the N.W. and Oise on the N. It encloses the department of Seine. The Epte on the north-west is almost the only natural boundary on the depart- ment. The streams (all belonging to the basin of the Seine) are: on the right the Yeres, the Marne, the Oise and the Epte, and on the left the Essonne (joined by the Juine, which passes Etampes), the Orge, the Bievre and the Mauldre. Seine-et-Oise belongs in part of the tableland of Beauce in the south and to that of Brie in the east. In the centre are the high wooded hills which make the charm of Versailles, Marly and St Germain. But it -is in the north-west, in the Vexin, that the culminating point (690 ft.) is reached, while the lowest point, where the Seine leaves the department, is little more than 40 ft. above the sea. The mean temperature is 51 F.

Seine-et-Oise is a flourishing agricultural and horticultural de-partment. Wheat, oats, potatoes and sugar-beet are important crops. Versailles, Rambouillet, Argenteuil are among the numerous market-gardening and horticultural centres, and wine is grown at Argenteuil and in other localities on the right bank of the Seine. Milch-cows and draught-oxen are the chief livestock, and poultry

farming is prosperous, the town of Houdan giving its name to a well-known breed of fowls. Forests occupy about 190,000 acres, the largest being that of Rambouillet (about 32,000 acres). Oak, hornbeam, birch and chestnut are the commonest trees. Building, paving and mill stones, gypsum, cement, &c, are produced by the department which is very rich in quarries. There are mineral springs at Enghien and Forges-les-Bains. The most important industrial establishments are the national porcelain factory at Sevres; the government powder-mills of Sevran and Bouchet; paper-mills, especially those of Essonnes and its vicinity, which are among the

most important in Europe; textile works, flour-mills, foundries and engineering, metallurgical or railway works at Evry-Petit-Bourg, Villeneuve-St Georges (pop. 9508) and elsewhere; agricultural implement factories at Dourdan and elsewhere ; sugar-refineries and distilleries; crystal works (Meudon), laundries, large printing establishments, close to Paris; factories for chemical products, candles, hosiery, perfumery, shoes and buttons; zinc-works, saw-mills. Seine-et-Oise exports chiefly the products of its farms and quarries. Its imports include coal, raw material for its industries, wine, kaolin and wood.

The railways of all the great companies of France (except the Southern) traverse the department, but most of the lines belong to those of the Western and Northern systems. The Seine and the Oise, and the canals of Ourcq and Chelles provide about 120 m. of waterway. Seine-et-Oise is divided into six arrondissements (Versailles, Corbeil, Etampes, Mantes, Pontoise, Rambouillet) with 37 cantons and 691 communes. It forms the diocese of Versailles and part of the educational circumscription (academie) of Paris and of the regions of the II., III., IV. and V. army corps, the troops in its territory being under the command of the military government of Paris. Its court of appeal is also at Paris.

The most notable towns in the department are Versailles, the capital, Corbeil, Sevres, Etampes, Mantes, Pontoise, Rambouillet, Argenteuil, Poissy, St Cloud, St Cyr, St Germain-en-Laye, Meudon, Montmorency, Rueil and Marly-le-Roi (see separate articles). Other places of interest are Montfort-l'Amaury, which has a Renaissance church with fine stained glass, a gateway of the 16th century and a ruined chateau once the seat of the powerful family of Montfort; Montlhery, which preserves the keep (13th century) and other ruins of a celebrated fortress which commanded the road from Paris to Orleans; Roche-Guyon, seat of the family of that name, which has two chateaus, one a feudal stronghold, the other also medieval but altered in the 18th century; Vigny, with a Gothic chateau of the 15th century; Ecouen, where there is a chateau of the 16th century once the property of the Cond6 family, now a school for daughters of members of the Legion of Honour; Dampierre, which has a chateau of the 17th century once the property of Charles, Cardinal of Lorraine; Maisons-Laffitte (pop. 8117), with a chateau of the same period once belonging to the family of Longueil. The chateau of Malmaison (18th century) is famous as the residence of the Empress Josephine.

Of the churches of the department, which are very numerous mention

may be made of those of Jouy-le Moutier (nth and 12th centuries) ; Beaumont-sur-Oise (13th century) ; Taverny (12th and 13th centuries) ; Longpont (remains of an abbey-church dating from the 1 ith to the 13th centuries). Near Cernay-la-Ville are interesting remains of a Cistercian abbey and near Levy-St-Nom those of the abbey of Notre- Dame de la Roche, including a church (13th century) with stalls which are among the oldest in France and the tombs of the LeVis-Mirepoix family.

SEINE-INFˆRIEURE, a department of the north of France, formed in 1790 of four districts (Norman Vexin, Bray, Caux and Roumois) belonging to the province of Normandy Pop. (1906) 863,879. Area 2448 sq. m Seine-Inferieure is bounded N.W. and N. by the English Channel for a distance of 80 m., N.E by Somme, from which it is separated by the Bresle, E. by Oise, S. by Eure and the estuary of the Seine, which separates it from Calvados. It is divided almost equally between the basin of the Seine in the south and the basins of certain coast streams in the north. The Seine receives from the right hand before it reaches the department the Epte and the Andelle from the Bray district, and then the Darn6tal, the Cailly, the Austreberthe, the Bolbec and the Lezarde. The main coast streams are the Bresle (which forms the ports of Eu and Treport), the Yeres, the Arques or Dieppe stream (formed by the junction of the Varennes, the Bethune and the Eaulne), the Scie, the Saane, the Durdent. The Pays de Caux, the most extensive natural division, is a system of plateaus separated by small valleys, terminating along the Seine in high bluffs and towards the sea in steep chalk cliffs 300 to 400 ft. high, which are continually being eaten away and transformed into beds of shingle. The Bray district in the south-east is a broad valley of denudation formed by the sea as it retired, and traversed by valleys covered with excellent

pasture. The highest point (about 800 ft.) is on the eastern border of the department. In the comparatively regular outline of the coast there are a few breaks, as at Le Treport, Dieppe, St Valery-en-Caux, Fecamp and Havre,- the Cap de la Heve, which commands this last port, and Cape Antifer, 12 or 13 m. farther north. Le Treport, Dieppe, Veules, St Valery, Veulettes, Fecamp, Yport, Etretat and Ste Adresse (to mention only the more important) are fashionable watering-places. Forges-les- Eaux (in the east of the department) has cold chalybeate springs of some note. The winter is not quite so cold

nor the summer so hot as in Paris, but the average temperature of the year is higher. The rainfall at Rouen is 28 in. per annum, increasing towards Dieppe.

In general the department is fertile and well cultivated. Along the Seine fine meadow-land has been reclaimed by dyking; and sandy and barren districts have been planted with trees, mostly with oaks and beeches, and they often attain magnificent dimensions, especially in the forest of Arques and along the railway from Rouen to Dieppe; Pinus sylvestris is the principal component of the f ore"st of Rouvray opposite Rouen. The forest of Eu covers 36 sq. m. in the north-east. Of the arable crops wheat and oats are the principal, rye, flax, colza, sugar beet and potatoes being also of importance. Milch cows are kept in great numbers especially in the Bray district, and Gournay butter and Gournay and NeufchStel cheese are in repute. The farms of the Caux plateau are each surrounded by an earthen dyke, on which are planted forest trees, generally beech and oak. Within the shelter thus provided apple and pear trees grow, which produce the cider generally drunk by the inhabitants. With the exception of a little peat and a number of quarries, Seine-Inferieure has no mineral source of wealth; but manufacturing and especially the textile industry is well developed. Rouen is the chief centre of the cotton trade, which comprises spinning and the weaving of rouenneries, indiennes (cotton prints), cretonnes and other cotton goods. Elbeuf is the centre of woollen manufacture. Flax-spinning, the dyeing and printing of fabrics and other accessory industries also employ many hands. Engineering works, foundries and iron ship-building yards are found at Havre and Rouen. Wooden ships are also built at Havre, Rouen, Dieppe and Fecamp. Other establishments of importance are the national tobacco-factories at Dieppe and Havre, sugar-refineries, distilleries, glass-works, potteries, paper works, soap- works, chemical works, flour-mills, oil-factories, leather works, &c. The fisheries are the great resource for the inhabitants of the sea- board. Fecamp, which plays a very important part at the Newfound- land fisheries, sends large quantities of cod, herrings, mackerel, &c, into the market; Dieppe supplies Paris with fresh fish; St Valery sends boats as far as Iceland. The principal ports for foreign trade are Havre, Rouen and Dieppe.

The chief imports of the department are cotton, wool, cereals, hides, coffee, timber and dye-woods, indigo and other tropical pro- ducts, coal, petroleum, &c. The exports include industrial and dairy products. Seine-Inferieure is served principally by the Western railway, but the Northern railway also has several lines there. The Seine and other rivers provide 85 m. of navigable waterway. The

canal of Tancarville from Quillebeuf to Havre is about 15 m. long, that from Eu to Treport about 2 m. The department is divided into five arrondissements (Rouen, Dieppe, Havre, Neufch&tel and Yvetot) 55 cantons and 760 communes. It forms the diocese of the archbishopric of Rouen and part of the region of the III. army corps and of the academie (educational division) of Caen. Its court of appeal is at Rouen, the capital.

Rouen, Havre and Dieppe and in a lesser degree, Elbeuf, Fecamp, Harfleur, Lillebonne, Yvetot, Eu, Le Treport, Aumale, fitretat, Bolbec, Barentin and Caudebec-en-Caux (see separate articles) are noteworthy towns for commercial, architectural or other reasons. The following places are also of architectural interest. St Martin-de Boscherville, where there are remains of an important abbey including a fine church in the Romanesque style of the early 12th century and a Gothic chapter-house of the latter half of the 12th century; Valmont, which has fine ruins (16th century) of the choir of a Cistercian abbey-church ; Varengeville, well known for the manor (16th century) of Jacques Ango (see Dieppe) ; Graville-Ste Honorine, with a Romanesque church and other remains of an ancient abbey ; Montivilliers, which has a fine abbey-church of the nth, 12th and 16th centuries; and Arques, Boos, Martainville, Mesnieres and Tancarville which have old chSteaus of various periods.

SEISIN (from M. Eng. saysen, seysen, in the legal sense of to put in possession of, or to take possession of, hence, to grasp, to seize; the O. Fr. seisir, saisir, is from Low Lat. sacire, generally referred to the same source as Goth, satjan, 0. Eng. seltan, to put in place, set), the possession of such an estate in land as was anciently thought worthy to be held by a free man (Williams, On Seisin, p. 2). Seisin is of two kinds, in law and in deed. Seisin in law is where lands descend and the heir has not actually entered upon them; by entry he converts his seisin in law into

seisin in deed. Seisin is now confined to possession of the freehold, though at one time it appears to have been used for simple possession without regard to the estate of the possessor. 1 Its importance is considerably less than it was at one time, owing to the old form of conveyance by feoffment with livery of seisin having been superseded by a deed of grant (see Feoff- ment), and the old rule of descent from the person last seised having been abolished in favour of descent from the purchaser. At one time the right of the wife to dower and of the husband to an estate by curtesy depended upon the doctrine of seisin. The Dower Act (1833-1834), however, rendered the fact of the seisin of the husband of no importance, and the Married

Women's Property Act 1882 practically abolished the old law of curtesy.

Primer seisin was a feudal burden at one time incident to the king's tenants in capite, whether by knight service or in socage. It was the right of the crown to receive of the heir, after the death of a tenant in capite, one year's profits of lands in possession and half a year's profits of lands in reversion. The right was abandoned by the act abolishing feudal tenures (12 Car. II. c. 24, 1660).

In Scots law the corresponding term is " sasine." Like seisin in England, sasine has become of little legal importance owing to modern legislation. By an act of 1845 actual sasine on the lands was made unnecessary. By an act of 1858 the instrument of sasine was superseded by the recording of the conveyance with a warrant of registration thereon.

SEISMOMETER (from Gr.

Popularly it is supposed that earthquake recorders are instruments so sensitive to slight vibrations that great care is necessary in selecting a site for their installation. Although this sup- position is correct for a certain class of apparatus, as for «"> < >•

example that which will record rapid elastic vibrations pro- sc °pe. duced by the movement of a train a mile distant, it is far from being so for the ordinary apparatus employed by the seismologist. What he usually aims at is either to record the more or less rapid movements of £he ground which we can feel, or the slow but large disturbances which do not appeal to our unaided senses. Generally speaking, the instruments used for these purposes are not disturbed by the vibra- tions resulting from ordinary traffic. In almost every household something may be found which will respond to a gentle shaking of the ground. Sometimes it is a loosely-fitting shutter or window- frame, a hanging drawer-handle, or a lamp-shade which will rattle; the timbers in a roof may creak, or a group of wine-glasses with their rims in contact may chatter. Any of these sounds may call attention to movements which otherwise would pass unnoticed. Specially arranged contrivances which tell us that the ground has b&en shaken are called seismoscopes or earthquake indicators. A small column, as for example a lead pencil standing on end, or a row of pins propped up against suitable supports, or other bodies which are easily over- turned, may be used as seismoscopes. Experience, however, has

1 Up to the middle of the 15th century " seisin " was applied to

chattels equally with freeholds, the word " possessed " being rarely used. In course of time the words acquired their modern meaning. See F. W. Maitland, " Seisin of Chattels," Law Quarterly Review, vol. 1. p. 324 and " The Mystery of Seisin," Law Q. R. ii. 481. Pollock and Maitland, Hist. Eng. Law, vol. ii. 29 seq. ; Fry, L. J., in Cochrane v. Moore (1890), 25 Q.B.D. 57.

Fig. i.

shown that contrivances of this order are wanting in sensibility, and often remain standing during movements that are distinctly perceptible. A more satisfactory arrangement is one where the body to be overturned is placed upon a platform which exaggerates the movements of the ground. For example, the platform h (see rig. i) may be on the top of a small rod r, fixed at its lower end by

plaster of Paris in a watch- glass w, and carrying a disk or sphere of lead at /. When the stand on which w rests is shaken, a multi- plied representation of this movement takes place at h, and any small body resting on that point, as for example a small screw s standing on its head, may be caused to topple over. If the loaded rod is elastic its lower end may be fixed in a stand, and the spherically curved base w is no longer required. In this case the motion at h is that of elastic switch- ing. Apparatus of this kind may be employed for several purposes beyond merely indicating that an earthquake has taken place. For example, if the falling body j is attached by a thread to the pendulum, of a timepiece, it may be used to stop it and indicate the approximate time at which the tremor occurred. In its most sensitive form r is a steel wire, the upper end of which passes freely through a small hole in a metal plate. By the movement of the wire or the movement of the plate, especially if the latter projects from the top of a second and similar piece of apparatus, an electrical contact can be established by means of which an electromagnet may ring a bell, stop a clock, or set free machinery connected with a cylinder or other surface upon which an earthquake machine may record the movement of the ground.

The next class of instruments to be considered are seismometers or earthquake measurers, and seismographs or instruments which give diagrams of earthquake motion. Although a seismo- graph may be designed that will not only respond to fairly rapid elastic vibrations,

but will also record very slow and slight undulatory movements of the ground, experience has shown that the most satisfactory results are obtained when special instruments are employed for special purposes. First we will consider the types of apparatus which are used to record the rapid back-and-forth movements of earthquakes which can be distinctly felt and at times are even destructive. The essential feature in these seismographs is a fairly heavy mass of metal, so suspended that although its supports are moved, some point in the mass remains practically at rest. For small earthquakes, in which the movement is rapid, the bob of a very long and heavy pendulum will practically comply with these conditions. If a style projecting

from this pendulum rests upon say the smoked surface of a glass plate fixed to the ground, the vibratory motion of the ground will be recorded on the glass plate as a set of superimposed vibra- tions. To obtain an open diagram of these movements the plate must be moved, say by clockwork.

Experience, however, has shown that even when the movements of the ground are alarming the actual range of motion is so small that a satisfactory record can be ob- tained only by some mechanical (or optical) method of multiplica- tion. This is usually accomplished as shown in fig. 2. b is the bob of a pendulum, with its style s passing through a slot in the short arm of a light lever, sop, pivoted at o, and with its outer end resting upon a revolving cylinder covered with smoked paper. As shown in the figure, it is evident that the motion of o in the line sop would not be recorded, and to obtain a complete record of horizontal movements it is necessary to have two levers at right angles to each other. A complete arrangement of this kind is shown in the plan of fig. 2. Here the style s of the pendulum rests in slots in the short arms of two writing levers pivoted at o and o'. Motion of the ground in the direction os actuates only the lever so'p', motion in the direction o's actuates only sop, whilst motion in inter-

Seltmo- meter. Seismo- graph.

Fig. 2.

Fig. 3.

mediate directions actuates both. The length of the short arms of the levers is usually J or t" s of the long arms.

This type of apparatus has been replaced in Japan by what are called

*duplex pendulum seismographs. The change was _ . made because it frequently happened that in consequence ??**

of the movement of the ground agreeing with the period lams"' of the pendulum, the latter no longer acted as a steady point, but was caused to swing, and the record became little better than that given by a seismoscope. Very long pendulums (30 to 40 ft.) are less subject to this disadvantage, but on the other hand their installation is a matter of some difficulty. A duplex pendulum (fig. 3) consists of an ordinary pendulum diagrammatically repre- sented by ab, connected by a universal joint to an inverted pendulum dc. The latter, which is a rod pointed at its lower end and loaded at c, would be unstable if it were not connected with b. Now imagine this system to be suddenly displaced so that a moves to a' and d moves to d'. In the new position b would tend to follow the direction of its point of support, whilst c would tend to fall in the opposite direction, and the bob of one pendulum would exercise a restraint upon the motion of the other. If, as in practice, the moment of b is made slightly greater than that of c, the system will come slowly to a vertical position beneath a'd'. In this way, by coupling together an ordinary pendulum about 3 ft. in length with an inverted pendulum 2 ft. 6 in. long, it is easy to obtain the equivalent of a slowly-moving very long pendulum which is too sluggish to follow the back-and-forth movements of its supports.

To complete an instrument of this description (see fig. 4) a point in the steady mass b is used as the fulcrum for the short arm of a light-writing index. This has a ball joint at s, a universal joint at o and a writing point at p, resting upon a piece of smoked glass. Attention was first directed to the possibility of rendering ordinary pendulums more truly astatic by Professor Thomas Gray, who suggested methods by which this might be accomplished. The method shown in fig. 4 is that devised by Professor J. A. Ewing. Records obtained from instruments of this description give informa- tion respecting the range and principal direction of motion, and show us that in a given earthquake the ground may move in many azimuths.

For obtaining an open diagram of an earthquake the best type of apparatus consists of a pair of horizontal pendulums writing their movements upon a moving surface. A simple form of . . . horizontal pendulum as shown in fig. 5, consists of a rod, """zontai op, free to swing like a gate round a vertical or nearly f e ° U " vertical axis, 00', and loaded at some point b. In practice " ' the weight b is pivoted on the rod whilst its outer end, bp, which writes on a smoked surface, is made extremely light. When the frame of this arrange- ment is rapidly displaced through a small horizontal range to the*

right and left of the direction in which the rod points, the weight b by its inertia tends to remain at rest, and the motion of the frame, which is that of the earth, is magnified in the ration op to bp. This apparatus, of which there are many types, was first intro- duced into seismometry by Professor Ewing.

To obtain a complete record of hori- zontal motion, two of these pendulums are placed at right angles; and by crank- ing one of the writing levers, o'p', as shown in the plan of fig. 5, two rect- angular components of the earth's move- ments are written side by side. Since the movements of the ground are frequently accompanied by a slight tilting, which would cause b or b' to swing or wander away from its normal position, a sufficient stability is given to the weights by inclining the axis of the instrument slightly forwards. Although by com- pounding corresponding portions of the diagrams given by instruments of this type, it is possible to determine the range and direction of the movement of which they are the resolved parts, their chief value is that they enable us to measure with ease the extent of any vibration, half of which is called its amplitude, and the time taken to make any complete back-and-forth movement, or its period. Now if a be the amplitude expressed in millimetres, and t the period expressed in seconds, then the maximum velocity of an earth particle as it vibrates to and fro equals 2ira/t, whilst the maximum acceleration equals ˆa/t 2 . The former quantity determines the distance to which a body, as for example the capping

Fig. 4.

SEISMOMETER

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of a pillar, may be projected, whilst the latter measures the effort exerted by an earthquake to overturn or shatter various bodies. If after a heavy earthquake we find bodies that have been projected or overturned, then by observing the distance of projection, and the height through which they have fallen, or their dimensions, we can

Fig. 5.

by means of simple formulae calculate quantities closely agreeing with those obtained from the seismogram. For example, if a body, say a coping-stone, has been thrown horizontally through a distance a, and fallen from a height b, the maximum horizontal velocity with which it was projected equals V (ga 2 /2b); or if the height of the

centre of gravity of a column like a gravestone above the base on which it rests is y, and x is the horizontal distance of this centre from the edge over which it has turned, then the acceleration or suddenness of motion which caused its overthrow is measured, as pointed out by C. D. West, with fair accuracy by gx/y.

To measure vertical motion, which with the greater number of earthquakes is not appreciable, a fairly steady mass to which a , multiplying light-writing index can be attached is ob-

*° rar * tained from a weight carried on a lever held by any selsmo- £ orm Q £ spr j n g ; n a horizontal position. Such an arrange- grapa. m ent, for which seismologists are indebted to Professor T. Gray, is shown in fig. 6, in which B is the mass used as the steady point. This, when supported as shown, can be arranged to have*

an extremely slow period of vertical motion, and in this respect be equivalent to a weight attached to a very long spring, an alternative which is, however, impracti- cable. The value of these records, as is the case with other forms' of seismographs, is impaired by pronounced tiltings of the ground.

We next turn to types of instruments employed to record earthquakes which have radiated from their origins, where they may have been violent, to such distances that their move- ■ ments are no longer perceptible. In these instruments the same principles are followed as in the construction of horizontal pendulums, the chief difference being that the so-called steady mass is lustra- arranged to have a much longer period than that required meats to w hen recording perceptible earthquakes. Instruments record dls- j ar g e i y employed for this purpose in Italy are ordinary t ant earth- p en ˆ u i um seismographs as in fig. 2. One at Catania quakes. cons j s ts of a weight of 300 kilos suspended by a wire 25 metres in length, the movements of which by means of writing indexes are multiplied 12-5 times. With pendulums of shorter length, say 2 metres, it is necessary to have a multiplication 80 to 100 fold by a double system of very light levers, in order to render the extremely slight tilting of their support perceptible. This arrangement, as devised by Professor G. Vicentini of Padua, will yield excellent diagrams of the gentle undulations of earthquakes

Fig. 6.

which have originated at great distances, but for local disturbances, even if the bob of the pendulum acts as a steady point, the highly

multiplied displacements are usually too great to be recorded.

In Japan, Germany, Austria, England and Russia horizontal pendulums of the von Rebeur-Paschwitz type are employed, which by means of levelling screws are usually adjusted to have a natural period or double swing of from 15 to 30 seconds. These pen- dulums are usually small. The swinging arm or boom is from 4 to 8 in. long hori- zontally, and carries at its extremity a weight of a few ounces. A simple form, which is sometimes referred to as a conical pen- dulum, may be con- structed with a large sewing needle carrying a galvanometer mirror, suspended by means of a silk or quartz fibre as shown in fig. 7. To avoid the possi- bility of displacements due to magnetic in- fluences, the needle may be replaced by a brass or glass rod. The adjustment of the instrument is effected turning which the axis vertical.

Fig. 7.

b y.

means of screws in the bed-plate, by o'o" may be brought into a position nearly As this position is approached the period of swing becomes greater and greater, and sensibility to slight tilting at right angles to the plane of o'o"m is increased. The movements of the apparatus, which when complete should consist of two similar pendulums in planes at right angles to each other, are recorded by means of a beam of light, which, after reflection from the mirror or mirrors, passes through a cylindrical lens and is focussed upon a moving surface of photographic paper. The more distant this is from the pendulum the greater is the magnification of the angular movements of the mirror. With a period of 18 seconds, and the record-receiving paper at a distance of about 15 ft., a deflection of 1 millimetre of the light spot may indicate a tilting of tJj part of a second of arc, or 1 in. in 326 miles. Although this high degree of sensibility, and even a sensibility still higher, may be required in connexion with investi- gations respecting changes in the vertical, it is not necessary in ordinary seismometry. A very sensitive modified von Rebeur instrument was employed by O. Hecker in his measurement of the variation in the vertical and of tidal earth tremors.

A type of instrument which has sufficient sensibility to record the various phases of unfelt earthquake motion, and which, at the suggestion of a committee of the British Association, has been adopted at many observatories throughout the world, is shown in fig.

8, With an adj ustment to give a 1 5-second period, a deflection

Fig. 8.

of 1 mm. at the outer end of the boom corresponds to a tilting of the bed-plate of o'-5, or I in. in 6-4 m. The record is obtained by the light from a small lamp reflected downwards by a mirror so as to pass through a slit in a small plate attached to the outer end of the boom. The short streak of light thus obtained moves with

the movement of the boom over a second slit perpendicular to the first and made in the !id of a box containing clockwork driving a band of bromide paper. With this arrangement of crossed slits a spot of light impinges on the photographic surface and, when the boom is steady, gives a sharp fine line. The passage of the long hand of a watch across the end of the slit every hour cuts off the light, and gives hour marks enabling the observer to learn the time at which a disturbance has taken place. The chief function of the instrument is to measure slow displacements due to distant earth- quakes. For local earthquakes it will move relatively to the pivoted balance weight like an ordinary bracket seismograph, and for very rapid motion it gives seismoscopic indications of slight tremors due to the switching of the outer end of the boom, which is necessarily somewhat flexible. If we wish to obtain mechanical registration from a horizontal pendulum of the above type, we may minimize the effect of the friction of the writing index — say a glass fibre touching the smoked surface of moderately smooth paper — by using a considerable weight and placing it near to the outer end of the boom. In the Isle of Wight there is a pair of pendulums ar- ranged as in fig. 5. The stand is 3 ft. in height. Weights of 10 lb each are carried at a distance of 10 in. from the pivots of booms which have a total length of 34 in. With these, or even with booms half the above length, actuating indices arranged as shown in fig. 2, but multiplying the motion six or seven times, good results may be obtained. At Rocca di Papa near Rome there is a pair of horizontal pendulums with booms 8 ft. 9 in. in length, 17 ft. in vertical height, which carry near their outer ends weights exceeding half a hundred- weight. Although such apparatus is far too cumbersome to be used by ordinary observers, it yields valuable results.

An apparatus of great value in measuring slight changes in the

vertical which have a bearing upon seismometrical observation is the Darwin bifilar pendulum. This consists of a mirror about half an inch in diameter, which, when it is suspended as shown in fig. 9, rotates by tilting at right angles to the paper. By this rotation a beam of light re- flected from the surface suffers displacement. It is possible to adjust the apparatus so that a tilt of ixsVij sec. of arc, or a change of slope of 1 in. in 1000 miles, can be detected. (See Sir G. H. Darwin, Scientific Papers, vol. i. (1907).)

The principle of the Vicentini instrument described above has been adopted by G. Agamennone, director of the observatory at Rocca di Papa, near Rome, and also by E. Wiechert of Gottingen. In the Agamennone seismometrograph the pendulum is cheese-shaped, and weighs 500 kilos in one form and 2000 kilos, or over two tons, in the largest. This cylinder, which is suspended from a stand rigidly attached to the earth, has a vertical hole in its centre extending from its upper surface to its centre of gravity, and to the bottom of this well a light rod is fixed. The motion .il the frame is communicated to this rod by an extension of the frtime which makes contact with it just above its point of attach- ment to the well. The motion is first magnified by the lever, and, on its communication to a complex lever system above the station- ary mass, is still further magnified before registration, which is effected by a pen supplied with ink writing on whit? paper. Mechanism is provided whereby the speed of the paper is doubled on receipt of a shock, an electric bell ringing at the same time to summon an attendant. In the Wiechert astatic pendulum seismometer the stationary mass is also cheese-shaped, but it is supported by a conical extension from its base, which balances it on the floor of its case. There is also an extension from the upper surface of the pendulum, in contact with a system of levers and rods attached to the case ; an air-dampi:ig cylinder is fitted to annul the free vibrations of the pendulum. The motion of the rod consequent to a motion of the case is modified by the projecting axle of the stationary mass, and after much magnification is recorded on a sheet of smoked paper. This instrument was made with a pendulum weight of 1 1 00 kilos or over a ton ; and with a modified construction the weight was increased to 17,000 kilos or nearly 19 tons, porta- bility being obtained by replacing the solid pendulum of the smaller instrument by a shell which can be filled with barytes, a heavy mineral readily obtainable in most places. This instrument, which has a magnification of 2200, detects the slightest tremors, and is consequently most useful in recording earthquakes of distant origin ; its high sensitiveness and complications, however, militate against its common use. Wiechert has also constructed a seismometer on the

same principle, but in which the stationary mass is smaller, being adjustable between 80 and 200 kilos (180 and 440 lb).

The Strassbuig or Bosch seismograph differs from those just described in resembling the Milne instrument, i.e. it is a horizontal and not a vertical pendulum. The steady mass, however, is much larger, being 100 kilos (or 220 lb) ; the magnification is from 80 to 100; and the registration is effected on a roll of smoked paper. An air-damping apparatus is attached in order to annul the natural oscillations 01 the pendulum. Two of these instruments are set up, one in the N.-S. direction and the other in the E.-W. so as to record the two horizontal components. A more popular Strassburg instrument has a stationary mass of 25 kilos. The Galitzin seismograph, devised by Prince

Galitzin, is of the same type, but it essentially differs from the Milne instrument in having its pendulum dead-beat; this is brought about by an electromagnetic device. Magnification and registration of the motion is effected in the following way. Attached to the pen- dulum is a coil of fine wire which moves in the field of a pair of magnets. The currents induced in the coil are led to -a dead-beat D'Arsonval galvanometer having the same natural period of vibra- tion as the pendulum. It is found that the motion of the galvano- meter mirror faithfully records, except in a few special cases, the motion of the pendulum; the actual record is made on sensitized paper. Two instruments are set up, and the two components are recorded on one strip.

Authorities. — For older forms see R. Mallet's Report of the British Association (1858). For modern forms see J. Milne, Seismology (London, 1898) ; Transactions of the Seismological Society of Japan, vols, i.-xvi. ; Seismological Journal, vols. i.v. (Yokohama, 1880 1895); Bollettino delta Societa Sismologica Italiana, vols. i.-v. (Rome, J 895) ; J. A. Ewing, Memoir on Earthquake Measurement (Tokyo, 1883); Reports of the British Association (1887-1902); E. von Rebeur-Paschwitz, Das Horizontalpendel (Halle, 1892); A. Sieberg, Handbuch der Erdbebenkunde (Braunschweig, 1904).

SEISTAN, or Sistan (Sejistan), the ancient Sacastane (" land of the Sacae ") and the Nimruz or " Meridies " of the Vendidad, a district of Persia and Afghanistan, situated generally between 30 o' and 31 35′ N., and between 61° o'and (including Rudbar) 62 40′ E. Its extreme length is about 100 and its breadth varies from 70 to over 100 m., but the exact limits are vague, and the modern signification of the name practically comprehends the peninsula formed by the

lower Helmund and its embouchure on the one side and the Hamun (lake) on the other. Its area is 7006 sq. m. ; 2847 sq. m. are Persian territory, while 4159 sq. m. belong to Afghanistan. When British arbitration was brought to bear upon the disputed claims of Persia over this country in 1872, it was found necessary to suppose two territories — one compact and concentrated, which was called " Seistan Proper," the other detached and irregular, called " Outer Seistan."

1. Seistan Proper is bounded on the north by the Naizar, or reed-bed which fringes the Hamun; west by the Hamun itself, of which the hill called Kuh-i-Khwajah marks the central point; south by a line shutting in Sikuha and all villages and lands watered by the main Seistan canal; and east by the old bed of the Helmund, from 1 m. above the dam at Kohak to the mouth. Kal'ab.-i-nau and Rindan are among the more northerly inhabited villages. The Kuh-i-Khwajah is a sufficient indication of the western side. Burj-i-'Alam Khan should be included within the southern boundary as well as Sikuha. Khwaj ah Ahmad and Jahanabad, villages on the left bank, or west of the true bed of the Helmund, denote the eastern line. The whole area is estimated at 947 sq. m. The fixed population may be roughly stated at 35,000 — some 20,000 Seistanis and 15,000 settlers — the greater part of whom are Parsiwans, or rather, perhaps, a Persian- speaking people. To the above numbers may be added 10,000 Baluch nomads. Taking the aggregate at 45,000, we find nearly 48 persons to the square mile. These figures are eight times in excess of the proportional result found for the whole of Persia. It should be explained that the designation Seistan Proper is not arbitrarily given. The territory comprehended in it is spoken of as Seistan by the dwellers on the right bank of the Helmund, in contradistinction to their own lands. At the same time it could only be but a fractional part — as indeed the whole country under consideration could only be — of the Seistan of Persian history.

Seistan Proper is an extensive tract of sand and clay alluvium, generally flat, but irregular in detail. It has heaps, but no hills; bushes, but no trees, unless indeed three or four tamarisks of aspiring height deserve the name; many old ruins and vestiges of civilization, but few monuments or relics of antiquity. It is well watered by rivers and canals, and its soil is of proved fertility. Wheat or barley is perhaps the staple cultivation; but pease, beans, oil-seeds and cotton are also grown. Among fruits, grapes and mulberries are rare, but melons and water- melons, especially the latter, are abundant. Grazing and fodder are not wanting, and besides the reeds peculiar to Seistan there are two grasses which merit notice — that called

bannu, with which the bed of the Hamun abounds on the south and the taller and less salt kirta on the higher ground.

2. Outer Seistan, the country on the right bank of the Hel- mund, and east of its embouchure in the Hamun, extends more than ioo m. in length, or from a point between the Charboli and Khuspas rivers north to Rudbar south. In breadth the district of Chakhansur, measuring from the old bed of the Helmund, inclusive of Nad Ah, to Kadah, may be estimated at some 30 m. It produces wheat and barley, melons, and perhaps a few vege- tables and oil seeds. Beyond the Chakhansur limits, southward or up to the Helmund, there is probably no cultivation save that obtained on the river bank, and ordinarily illustrated by patches of wheat and barley with melon beds. On the opposite side of the river, in addition to the cultivated portions of the bank, there is a large tract extending from south of Kuhak, or the Seistan dam (band), to the gravelly soil below the mountain ranges which separate Seistan from Baluchistan and Narmashir. The distance from north to south of this plain may be computed at 40 m., and from east to west at 80 or 90 m. Lands north of the Naizar not belonging to the Afghan district of Lash Juwain may also be included in Outer Seistan; but it is unnecessary to make any distinction of the kind for the tract marked Hamun on the west, where it merges into the Persian frontier. The in- habitants are Seistanis or Parsiwans, Baluch nomads and Afghans. Between the Kuhak band and Rudbar they are mainly Baluch. Most of the less nomad tribesmen are Sanjurani and Toki, the sardars jealously claiming the former appellation.

The most remarkable geographical feature of Seistan generally, in the modern acceptation of the term, is the Hamun, which stretches far and wide on the north, west and south, but is for a great part of the year dry or a mere swamp. It is a curious feature in the physical conformation of northern and western Afghanistan that none of the rivers flow to the sea, but that the Helmund and all the other rivers of western Afghanistan empty themselves into these lagoons, which spread over thousands of square miles. A noteworthy feature of the Seistan lagoon is that in times of excessive flood it overspreads a vast area of country, both to the north and south, shutting off the capital of Seistan (Nusretabad) from surrounding districts, and spreading through a channel southwards, known as Shelag, to another great depression, called the Gaud-i-Zirreh. This great salt swamp is about

1000 ft. lower in elevation and is situated so close to the Helmund as to leave but a few miles of broken ridge between. By that ridge all communication with Seistan must pass in time of flood. Seistan becomes a promontory connected with the desert south of the Helmund by that isthmus alone. In the early spring the existence of a lake could only be certified by pools or hollows of water formed at the mouths of the principal feeders, such as the Khash Rud on the north-east, the Farah Rud on the north-west, and the Helmund, where its old bed terminates at no great distance from the Khash Rud. Belle w describes the aspect of that portion of Seistan limited to the actual basin of the Helmund as indicating the former existence of a lake which covered with its waters a considerable area. On the north this tract has been raised to a higher level than the remainder by the deposit at the mouths of rivers of the solid matter brought down. It is still, however, from 200 to 500 ft. below the level of the desert cliffs that bound it, and at some former period formed the shores of the lake ; and it is from 50 or 60 to 200 ft. above the level of the beds of the rivers now flowing into the existing Hamun.

The water-supply of Seistan is about as uncertain as that of Sind, though the general inclination to one bank, the left, is more marked in the Helmund than in the Indus. Therefore the boundary lines given must be received with slight reservation. It is easy tc see that a good year of inundation extends the borders of the so-called lake to within the Naizar; and there are well-defined beds of dry canals intersecting the country, which prove the existence formerly of an extensive water-system no longer prevailing. The main canal of Seistan, confounded by some writers with the parent river, bears the waters of the Helmund westward into the heart of the country. They are diverted by means of a large band or dam, known indiffer- ently as the " Amir's," the ' Seistan "' or the " Kuhak " band, It is constructed of horizontally laid tamarisk branches, earth and per- pendicular stakes, and protected from damage bv a fort on the left and a tower on the right bank of the river. Although this diversion of the stream may be an artificial development of a natural channel, and undoubtedly dates from a period long prior to recent Persian occupation, it appears' that the later arrangements have been more maturely and better organized than those carried on by the pre- decessors of the amir of Kaian. The towns of Deshtak, Chelling, Burj-i-'Alam Khan, Bahramabad, Kimmak and others of less note are actually on the banks of this main canal. Moreover, it is the indirect means of supplying water to almost every town and village in Seistan Proper, feeding as it does a network of minor canals, by which a system of profuse irrigation is put in force. The yearly rainfall is only

2 to 3 in. The Seistan depression receives the drainage of a tract of country over 125,000 sq. m. in area.

Provisions in Seistan are as a rule sufficient, though sheep and oxen are somewhat poor. Bread is cheap and good, being procurable to natives at less than a halfpenny the pound. Vegetables are scarce, and rice is chiefly obtained from Herat. The inundated lands abound with water-fowl. Partridges and sand-grouse are occasionally seen. River fish are plentiful enough, but confined to one species, the barbel.

The population is about 205,000, but the country, even with the lazy methods of the present day, furnishes a very large amount of grain and food-supplies in excess of local require- ments, and it could, of course, be made to furnish very much more. Under improved government Seistan could with but little trouble be made into a second Egypt.

The inhabitants of Seistan are mainly composed of Kaianis, descendants of the ancient rulers of the land; Sarbandis and Shahrakis, tribes supposed to have consisted originally of immi- grants from western Persia; and Baluchis of the Nharui and Sanjurani (Toki) clans. Bellew separates the "Seistanis"; but it is a question whether this term is not in a large measure applied to fixed inhabitants of the country, whatever their descent and nationality. The dense reed-beds (Naizar) skirting the Hamun, often several miles in width and composed of reeds io ft. or more in height, look impenetrable, but narrow winding lanes exist in them, known only to the Sayads (Arab, for " hunter "), a strange aboriginal race of Seistan, who live by netting fish and water-fowl. These people live all the year round at the water's edge, in huts made of reeds, and change their abodes as the waters advance or recede. They have a language of their own, and are an unsociable people, suspicious of strangers, ever ready to decamp if they think a tax-collector is near.

History. — The ancient Drangiana (Zaraya, Darafika, " lake land ") received the name of " land of the Sacae " after this country was permanently occupied by the " Scythians " or Sacae, who overran Iran in 128 B.C. It was included in the Sassanian empire, and then in the empire of the caliphs. About a.d. 860, when it had undergone many changes of government under lieutenants of the Bagdad caliphs, or bold adventurers acting on their own account, Yakub b. Laith al-Saffar made it the seat of his power. In 901 it fell under the power of the Samanids, and a century later into that of the Ghaznevids. An invasion of Jagatais and the irruption of Timur are

salient points in the history of Seistan prior to the Sefavid conquest (1508). Up to 1722 Seistan remained more or less a Persian dependency. At the time of the Afghan invasion of Mir Mahmud (1722), Malik Mahommed Kaiani was the resident ruler in Seistan, and by league with the invader or other intrigue he secured for himself that particular principality and a great part of Khorasan also. He was slain by Nadir Kuli Khan, the general of Shah Tahmasp, who afterwards, as Nadir Shah, became possessor of Seistan as part of his Persian dominions. Shortly after the death of Nadir (17 51) Seistan passed, together with other provinces, into the hands of Ahmad Shah Abdali, the first sovereign in a united Afghanistan. On the death of Ahmad Shah in 1773 the country became a recognized bone of contention, not so much between Persians and Afghans as between Herat and Kandahar; but eventually the internal dissensions of Afghanistan gave Persia the desired opportunity; and by a steady course of intrigue and encroachment she managed to get within her grasp the better lands on the left bank of the lower Helmund and some- thing on the right bank besides. When the British arbitrator appeared on the scene in the beginning of 1872, though compelled to admit the shah's possession of what has been called " Seistan Proper," he could in fairness insist on the evacuation of NadAli, Kala Fath, and all places occupied on the right bank by Persian troops; and furthermore he left to the Afghans both sides of the river Helmund from the dam of Kuhak to its elbow west of Rudbar. A part of the work of General Sir Frederic J. Goldsmid, K.C.S.I., who conducted the first Seistan demarcation commission in 1872, was left undone and completed only in 1903-1905 by Col Sir Henry McMahon, K.C.I.E.

See Eastern Persia, vol. i. ; Bellew's " Record of Seistan Mission," Journal of R. Geog Society, vol. xliii. (1873); Col Sir H. McMahon's paper in Geographical Journal (September to October, 1906) ; also I-Persia. (F. J. G ; A. H.-S,)

SEJANUS, LUCIUS AELIUS, favourite and minister of the Emperor Tiberius. He was the son of Seius Strabo, prefect of the praetorians, and was adopted into the Aelian gens. After his father's departure from Rome to take up the governorship of Egypt, Sejanus was made prefect in his stead. He gained the confidence of Tiberius, and, supported by the praetorians, whom he concentrated in a camp on the Viminal Hill, became virtually ruler of Rome. But he aimed still

higher, and determined to put all the members of the royal house out of his way. Having removed Drusus (the son of Tiberius) by poison, he persuaded the emperor to retire to the island of Capreae. The death of Drusus was followed some years later by those of Agrippina (the wife of Germanicus) and her sons Drusus and Nero. Tiberius at last saw through his designs, and caused Sejanus to be put to death (a.d. 31).

Tacitus, Annals, iv. 1, 2, 3, 8, 39-59. 74. v. 6-9; Suetonius, Tiberius, 62; Dio Cassius lvii. Iviii. ; Juvenal x. 65-86; J. Jiilg, Vita Aelii Sejani (1882), with notes giving full references to authorities; J. C. Tarver, Tiberius the Tyrant (London, 1902), chap. xvii.

SEKOKDI, a port on the Gold Coast in 4° 57′ N., i° 42′ W., and 167 m. by rail S. by W. of Kumasi. Pop. (1908) about 5000, of whom some 200 were whites. Sekondi is one of the old trading stations on the Guinea coast, and Fort Orange was built here by the Dutch about 1640, the English later on building another fort near by. In 1694 the Dutch fort was plundered by the Ahanta, who in 1698 burnt the English fort. It was not rebuilt, and it was not until 1872 that the place became definitely British. The town was of comparatively little importance until it was chosen as the sea terminus of the railway serving the gold-mining districts and Ashanti. The railway reached the Tarkwa gold- fields in 1901 and the Obuassi mines in 1902. From that date Sekondi became the chief port of the Gold Coast colony, gold, rubber and timber being the principal exports. In 1908 the total trade of the port was £2,121,420. There is no sheltered harbour, but at the landing place are piers provided with cranes. Landing is effected in lighters, ships anchoring in the roadstead half a mile from the shore. The public buildings include Fort Orange, a church, court-house, government offices and hospital. The mean temperature is about 79 F. ; the rainfall about 40 in. a year. The climate is unhealthy for Europeans, but by the reclamation of the neighbouring lagoons its sanitary condition has been im- proved. Sekondi is governed by a municipality, created in 1905. It is in telegraphic communication withEuropebysubmarinecable, and is served by British, German and Belgian lines of steamers.

SELACHIANS, or Elasmobranchii, a subclass of fishes, including the various kinds of Sharks and Rays.

Structural Features. — The general shape is somewhat spindle- like in the Sharks, while in the Rays — in correlation with the ground-feeding habits — the body has become greatly depressed. Departures from the normal are seen in the Hammerheads (Sphyrna), where the

sides of the head are so produced as to give a hammer shape, and in the Saw-fishes (Pristis), where the head is prolonged forwards as a greatly elongated flattened rostrum. In regard to the fins, the tail is heterocercal in the adults of living forms, except in Chlamydoselachus, where the protocercal condition persists; the pectoral fins are greatly enlarged in the Rays, in which movement is effected mainly by the passage backwards of waves of flexure along the pectoral fins; the pelvic fins in the last-named fishes have their hinder portions modified in the male to form special copulatory organs, the myxipterygia or " claspers."

The mouth opening is a ventrally placed crescentic slit except in Chlamydoselachus, where it is nearly terminal. The olfactory organs, lying in front of the mouth, are widely open to the exterior, and in some cases are connected with the mouth by oronasal grooves. The spiracular opening frequently retains in the adult an opening to the exterior behind or below the eye. In the Rays it is used mainly for inspiration. The post-spiracular clefts open freely to the exterior, each guarded by a flap-like extension of its anterior margin which serves as a valve to allow water to pass only in one direction, viz. outwards. In the Holocephali the anterior flap, that arising from the hyoid arch, is greatly enlarged so as to form an operculum covering over all the clefts lying posterior to it.

The postspiracular clefts are usually five in number, but six in Chlamydoselachus and Notidanus griseus, and seven in N. cinereus. The gill lamellae are strap-like and attached by their edges to the gill septa. Fully developed lamellae are present on the anterior wall of the hyobranchial clefts and vestigial lamellae on the anterior wall of the spiracle where they form the " pseudobranch."

In the Basking Shark Cetorhinus the pharyngeal openings of the gill clefts are guarded by series of long slender rods — the greatly elongated representatives of the small conical " gill rakers " found in this position in other fishes. These structures form a sieve- like arrangement for preventing the minute creatures (plankton) upon which this shark feeds from passing out through the gill clefts.

There appears to be no representative of the lung or swimbladder, and there are no pyloric caeca. The intestine is provided with a spiral valve in its interior which varies in character in different forms (1). A glandular caecum — the rectal caecum — opens into the dorsal side of the rectum. In regard to the coelomic spaces the Selachians exhibit the interesting feature that the pericardiac cavity is in the adult in communication with the general splanchnocoele by an open

channel sometimes forked at its posterior end. This communication apparently arises secondarily and is not due to a per- sistence of the embryonic communication (2). In the case of Torpedo and in the ordinary Rays certain portions of the muscular system are converted into electrical organs. In the Skates and Rays the electrical disturbance is relatively small — imperceptible by human beings — but in Torpedo it is very considerable. No doubt the electric organs subserve a defensive function.

The kidney of the adult is a mesonephros. The pronephros is never functional, though it appears in a vestigial form in the embryo. The mesonephros shows a division into a broader posterior portion which alone is renal in function, and a slender anterior portion which in the male subserves a genital function. The female genital duct is a typical Miillerian duct having at its anterior end a wide coelomic funnel and lined by glandular epithelium whose secretion forms adventitious coats round the egg during its downward passage. The spermatozoa find their way to the cloaca by way of the mesone- phnc duct, the hinder portion of which is dilated to form a vesicula seminalis. The urino-genital sinus — formed by the fusion of the mesonephric ducts at their hinder ends — projects forward as a pair of pockets (the so-called sperm sacs).

The skeleton of the Selachian shows remarkably archaic features, inasmuch as the internal skeleton is entirely cartilaginous, the bony or placoid skeleton retaining its primitive superficial position and not showing in any part a tendency to sink or spread inwards for the reinforcement of the cartilaginous skeleton. The vertebral column is of the chordacentrous type, although in some of the more archaic of known fossil forms (Pleuropterygii, Ichthyotomi, Acan- thodei, Hybodus) the chondrified secondary sheath of the notochord apparently retained in the adult the unsegmented condition. The same holds for the Holocephali and for the hinder part of the vertebral column of the existing Chlamydoselachus. The centra are usually, if not_ always, strengthened in the adult by the deposition of lime salts in the intercellular matrix: such calcified cartilage must be carefully distinguished from true bone. The arrangement of the calcified tracts shows differences which are of taxonomic importance.

In the cyclospondylous type (fig. 1, A) the calcified tract has the form of a double cone — of the wall of a dice-box — and in the transverse section appears as a simple circle {Pa laeo – spinax, Acanthias, Scymnus). In the tectospondylous (fig. I, _ B) type, ad- ditional calcified tracts are developed outside and concen- tric with

the original double cone (Bato-

ldei) .while in the 'as- From ziUel , s BaMtbuch der Palsmiologie, by permission

*terospondylous (fig. of Herren R. Oldenbourg, Publishers, Munich. ji . ' * v P e *, e . a "" Fig. 1. — Diagrammatic transverse sections ditional calcifica- to ill ust rate the Cyclospondylous (A), the tion takes the form Tectospondylous (B) and the Asterospondylous of longitudinally © type of vertebra .*

arranged plates d< d > t d » t Calcified tracts, h.a, Haemal arch,

radiating outwards exm p r ; mary s heath. n.a, Neural arch,

from the original

double cone, so as to produce a star-like appearance in cross section {Scyllium, Lamna). Eventually in the adult the calcification may extend from the special tracts above mentioned throughout the whole centrum. In certain cases (Carchariidae, &c.) the transverse section of the centrum is modified by its surface becoming indented by the ingrowth of cartilage tracts (calcified or not) situated external to the primary sheath, thus producing an appearance something like a Maltese cross.

The arch elements of the vertebral column have lost in variable degrees the numerical correspondence with the centra which they possibly once possessed. The same applies to the relations of the

centra with the fundamental body metamerism, as shown by the neuro-muscular segments; e.g. there are frequently in the caudal region in sharks (3) two centra to each neuro-muscular segment, while in part of the trunk in Notidanidae one centrum corresponds to two neuro-muscular segments.

The chondrocranium retains through life its primitive character. The ethmoidal region is prolonged forwards into a" rostrum — which may be of enormous size (Pristis), or may be of insignificant dimen- sions as in most sharks.

The jaw apparatus is also remarkably archaic: the functional jaws

being the palatopterygoquadrate cartilage and Meckel's cartilage respectively. The suspension from the skull is typically hyostylic, except in Notidanus where it is amphistylic, in the Holocephali where it is autostylic, and in Heterodontus where it approaches the autostylic condition.

The skeleton of the postmandibular visceral arches consists of a half hoop of cartilage on each side divided into a number of seg- ments: the two half hoops are connected ventrally by a median copula (basihyal, or basibranchial). The hyoid arch most usually shows a division into a dorsal (hyomandibular) and a ventral (cera- tohyal) element, and except in the Notidanidae the dorsal segment is of large size in correlation with its function in the suspension of the jaws. This enlargement of the hyomandibular is particularly marked in the case of the Rays (Raia) where it may become freed from the ventral segmented part of the arch which articulates directly with the skull. The branchial arches usually are segmented oh each side into four pieces (pharyngobranchial, epibranchial, ceratobranchial and hypobranchial) in addition to the median copula.

All these visceral arch skeletons bear on their outer surface a number of cartilaginous rays which radiate outwards and support the gill septa. Those attached to the hyoid arch (branchiostegal rays) show by their specially large size a foreshadowing of the development of the operculum of the higher group of fishes.

In addition to the elements already mentioned slender cartila- ginous rods of doubtful significance are found superficial to the jaw cartilage (labials) and to certain of the branchial arches (extra branchials).

The limb girdles of the Selachians are very simple — a hoop of cartilage incomplete dorsally in the case of the pectoral, a transverse bar of cartilage in the case of the pelvic girdle.

In the ancient Pleuracanthids the two halves of the pectoral girdle remained distinct in the adult, and each was segmented into three pieces, thus showing a remarkable correspondence with the visceral arches lying in front of them. (For the bearing of this on theories of the origin of limbs see Ichthyology : Anatomy.) In some existing sharks (e.g. Acanthias) a relic of this condition is found — the dorsal extremity of the girdle being segmented off from the rest.

The cartilaginous skeleton of the pectoral limb consists of numerous cartilaginous rays which typically are connected with the girdle

through the intermediary of three basal pieces known as propterygium, mesoplerygium and metapterygium. In the Rays, in correlation with the gigantic development of the pectoral fins, the propterygium and metapterygium become greatly enlarged in an anteroposterior direction — the former becoming attached to the side of the cranium or even meeting and fusing with its fellow in front (Trygon). In the pelvic limb the rays are — except a few in front — borne on the outer side of a single backwardly projecting basal piece (metaptery- gium). In the male this is continued backwards to form the skeleton of the clasper.

The limb skeleton shows remarkably interesting features in the ancient extinct sharks Cladoselache and Pleur acanthus.

The placoid or bony skeleton is seen in its most archaic form in Selachians in the form of superficially placed placoid scales. These may be uniform in size forming the characteristic shragreen of the various sharks, or scattered scales may be greatly enlarged as in the thornbacks, or finally the scales may have completely atrophied as in the electric ray (Torpedo).

Local placoid elements or aggregations of placoid elements may become specially enlarged to form defensive or offensive weapons. In the sawfish (Pristis) a row of greatly enlarged placoid spines along each side of the rostrum form the " teeth " of the saw, and a similar condition occurs in the sharks of the genus Pristiophorus. In the sting-rays the tail is armed with a large serrated spine taking the place of the dorsal fin and having behind it smaller spines, the front one of which increases in size and becomes functional if the previously functional spine is broken off.

The portion of skin involuted to line the buccal cavity carries with it its armature of placoid scales (Chlamydoselachus). Normally these undergo atrophy except near the margin of the cavity where they are greatly enlarged to form the teeth. These vary greatly, as might be expected, in accordance with the nature of the food — they may be sharp prehensile spines, or triangular cutting blades with serrated edges (e.g. carcharodon and other sharks) or flattened plates adapted to crushing Molluscan shells (e.g. various rays).

Vascular System. — The heart possesses a single atrium and a single ventricle. Opening into the atrium is a well-developed sinus venosus and leading from ventricle into ventral aorta is a well-developed rhythmically contractile conus arteriosus, containing a complex arrangement of pocket valves. These pocket valves are arranged in

longitudinal rows, each row representing the remains of a longi-

tudinal ridge in the conus of the embryo. The valves of each row tend to become differentiated in size, e.g. in Rhina the anterior valve in each row is considerably enlarged. Finally a condition may be reached in which all the valves of the row disappear except two as in Scyllium canicula. As regards the remaining parts of the blood-vascular system, probably the most characteristic feature is the tendency seen in various Selachians for the main venous trunks (cardinals and hepatic veins) to become dilated at their front ends into a special sinus which fills the cavity of the orbit. The kidneys are provided with a well-developed renal portal system.

Nervous System. — The brain of the Selachians shows a mixture of primitive and specialized characters. The hemisphere region is remarkable for the indistinctness of the two hemispheres. This has been looked on by some, e.g. Gegenbaur, as a primitive feature, the hemispheres having not yet been developed. To others, including the writer of this article, the balance of evidence seems in favour of the condition in Selachians being due to a secondary disappearance of the separation between the two hemispheres. In such com- paratively primitive forms as the Notidanidae the paired character of the hemisphere region is still clearly indicated. In the Raiidae on the other hand even the lateral ventricles have lost their paired character, while in Myliobatis the ventricle of the region has dis-appeared entirely, leaving a solid unpaired mass. Although the hemisphere region has in great part lost its paired character, this does not apply to the anterior outgrowths from the hemispheres, the olfactory lobes. In the Holocephali the olfactory lobes remain close to the hemisphere surface. In other Selachians, however, the olfactory organ, with the olfactory lobe attached to it, becomes carried away by differential growth to a lesser or greater distance from the hemisphere. The result is that the middle part of the ol-factory lobe becomes greatly drawn out (Olfactory tract or peduncle). The swelling at its anterior end is now spoken of as the olfactory lobe, while its hinder end, where it passes into the brain, is the olfactory tubercle.

In the region of the thalamencephalon there is a well-developed infundibular gland, and the pineal body is present in the form of a greatly elongated slender tube which passes upwards and forwards to end in contact with the cranial roof about the level of the anterior boundary of the hemisphere region. The pineal body ends in a small bulbous enlargement but shows no trace of eye structure. In the mesencephalon are a pair of well-developed optic lobes.

The cerebellum is highly developed — as in the case of other fishes which perform active and complex movements. The medulla oblongata shows a characteristic feature in Torpedo, where the nucleus of origin of the electric nerves forms a large swelling on the floor of the fourth ventricle on each side of the mesial plane. In connexion with the organs of special sense in the Selachians, there are various points of general interest. In various forms, e.g. Scyllium and Rata, the olfactory organ is connected with the mouth by means of an open gutter — the oronasal groove — in which we may probably see the homologue of the similar groove which appears in the embryo of the higher vertebrates and which, becoming covered in, gives rise to the communication between nose and buccal cavity via the internal nares. The otocyst or auditory organ, which arises in ontogeny as an involution of the ectoderm, is remarkable in the Selachians from the fact that it does not become completely enclosed, Throughout life the ductus endolymphaticus remains open to the exterior by a minute pore on the dorsal side of the head. In Rhina (4) this communication of otocyst with exterior is relatively wide, and through it grains of sand gain admission to the interior of the otocyst, where they take the place functionally of the small calcareous otoconia of other forms.

Cutaneous Sense Organs. — As in other fishes there is a rich development of sense buds scattered over the general surface of the head and body. Certain of these retain their superficial position through- out life, while others are carried inwards by involution of the ecto- derm so that they come to be sunk in pits. These pits may become prolonged into tubes with dilatations at their inner ends containing the sense buds (" Ampullae of Lorenzini " of the head region), or their external opening may be narrowed to a fine slit, or they may become completely shut off from the exterior (" Savi's vesicles " on ventral side in Torpedo). Another series of these cutaneous sense buds is arranged in rows on the head and trunk to form the character- istic organs of the lateral line. These are innervated by the lateralis system of nerves. These organs, like the sense buds already mentioned, become sunk beneath the surface, lying first in the floor of an open groove (Chimaera) and later, as this becomes covered in, in a canal which opens to the exterior at intervals by pores.

Ontogenetic Development.- — The Selachians possess large heavily yolked eggs and show corresponding modifications in their developmental processes. Segmentation is partial, resulting in the formation of a blastoderm. The process of gaˆtrulation is much less modified than in the Sauropsida (where similar conditions prevail as regards quantity of yolk), and can be readily compared with the method seen

in the larger types of holoblastic egg.

Fertilization is internal, the myxipterygia or claspers serving as intromittent organs. On its passage down the oviduct the egg normally becomes surrounded by a layer of albumen and by a tough external envelope of flattened quadrangular shape. The corners of the external capsule may be produced into points (Raia) or into long

tendril-like structures (Scyllium) which serve to anchor it to sea-weeds.

In a large number of Selachians the adoption of internal fertilization has been followed by the retention of the embryo within the oviduct (uterus) for a prolonged period. In such cases we find interesting adaptive arrangements for aiding the nutrition and respiration of the young individual. The highly vascular wall of the yolk sac may come into intimate relation with the uterine lining, so as to form a simple yolk sac placenta (Mustelus laevis, &c). In other forms the uterine "lining secretes a nutritive fluid or uterine milk which apparently is taken into the alimentary canal of the embryo through the spiracles (Myliobatis sp., Taeniura sp.). In certain Rays (Pteroplataea micrura) this secretory activity of the uterine lining is concentrated in long villous processes known as trophonemata, which pass through the wide spiracles of the young fish and pour their secretion directly into the cavity of its alimentary canal.

Classification

The following table gives a convenient classification (taken from Bridge (5)) of those Selachians at present known: — Order I. Pleuropterygii (Extinct: palaeozoic).

,, II. Acanthodii (Extinct: palaeozoic mainly).

„ III. Ichthyotomi (Extinct: palaeozoic mainly).

„ IV. Plagiostomi.

Suborder I. Squali (Selachii s.s.). Fam. I. Notidanidae (iVo/t'danKS = Hexanchus and Heptanchus).

„ 2. Chlamydoselachidae (Chlamydoselachus) .

„ 3. Heterodontidae (Heterodontus = Cestracion).

„ 4. Cochliodontidae (Extinct: palaeozoic).

„ 5. Psammodontidae (Extinct: palaeozoic).

„ 6. Petalodontidae (Extinct: mainly palaeozoic).

„ 7. Scylliidae {Scyllium, Pristiurus, Stegostoma).

„ 8. Carchariidae (Carcharias, Galeus, Galeocerdo, Mustelus).

„ 9. Sphyrnidae (Smyrna = Zygaena).

„ 10. Lamnidae {Lamna, Carcharodon,Alopecias,Mitsukurina).

„ 11. Cetorhinidae (Cetorhinus) .

„ 12. Rhinodontidae (Rhinodon).

„ 13. Spinacidae (Acanthias, Spinax, Scymnus, Laemargus, Echinorhinus).

„ 14. Rhinidae (Rhino).

„ 15. Pristiophoridae (Pristiophorus). Suborder II. Batoidei. Fam. 1. Pristidae (Pristis).

„ 2. Rhinobatidae (Rhinobatus).

„ 3. Raiidae (Raia).

„ 4. Tamiobatidae (Extinct: palaeozoic).

„ 5. Torpedinidae (Torpedo: Narcine).

„ 6. Trygonidae (Trygon, Pteroplataea, Taeniura).

„ 7. Myliobatidae (Myliobatis, Aetobatis, Ceratoptera). Order V. Holocephali. Fam. I. Ptychodontidae (Extinct: palaeozoic).

„ 2. Squaloraiidae (Extinct: mesozoic).

,, 3. Myriacanthidae (Extinct: mesozoic).

„ 4. Chimaeridae (Chimaera, Callorhynchus, Harriotta).

Existing Forms. — The Selachians known to survive to the present

day are confined to orders IV. and V., the former in- cluding the Sharks (Squali) and Rays (Batoidei), and the latter including the remarkable Chimaera and its allies. For the more interesting members of the Plagiostomi see Shark and Ray.

The general morphological features of the Plagiostomi are dealt with in the article Ichthyology. It remains now to refer shortly to one or two of the subdivisions which contain forms of special morphological interest from their in many respects primitive character. Such families are the Notidanidae, the Chlamydoselachidae and the Heterodontidae. The second of these is of very special interest: it contains the single living genus Chlamydoselachus, specimens of which have been obtained in considerable numbers from deep water off the coast of Japan, while isolated specimens have been taken off the coasts of Australia and Norway and near Madeira.

The general shape of Chlamydoselachus is elongated, almost eel- like (fig. 2). The mouth is nearly terminal, instead of being well back on the ventral surface as in other sharks. The teeth are very characteristic, flattened in shape, pointing backwards and over- lapping one another in longitudinal rows. Each tooth has three slender pointed cusps and closely resembles the teeth of various members of the extinct group Ichthyotomi. The small placoid elements which cover the general body surface are seen to become enlarged at the margin of the mouth, especially posteriorly, these enlarged placoid elements functioning as accessory teeth and in fact being practically teeth in an early stage of evolution. It is interesting to note also that the lining of the mouth still develops a covering of placoid elements. (In the typical gnathostome the placoid elements have of course disappeared from the mouth lining,

except in the case of the functional teeth.) There is no oronasal groove in the adult, and the spiracle is greatly reduced. The valvular flaps guarding the external openings of the gill (6) cletts are much larger than in other sharks, particularly the most anterior (hyoidean) which meets its fellow ventrally and is prolonged backwards for some distance as an in- cipient operculum. The tail is practically proto- cercal, although the median fin-fold is con- siderably more developed on its ventral side than dorsally. The lateral line

From Challenger Reports Zool.. published by H.M. Stationery Office. (After Giinther.)

Fig. 2.

organs on the sides of the body are situated at the bottom of an open groove ; only in the head region has this become covered in.

The Notidanidae, like Chlamydoselachus, show more than the ordinary number of gill clefts. Notidanus griseus (Hexanchus) has six, while N. cinereus (Heptanchus) has seven postspiracular gill-clefts. In both Notidanidae and Chlamydoselachidae the vertebral column shows very primitive features with either very slight calcifica- tion or none at all. ,

The Heterodontidae include the recent genus Heterodontus (= Ces-tracion), the Port Jackson shark or Bullhead shark, widely distri-buted through the Pacific. Numerous Mesozoic and possibly also Palaeozoic forms belong to this family. The small and nearly terminal mouth, the amphistylic skuH, and the egg cases with an external spiral lamina are characteristic features.

Palaeontological History (6). — It must be borne in mind that the sharply delimited groups into which animals appear to be divided are due to our imperfect knowledge, to the fact that our knowledge is limited to short isolated periods of geological time. Were our knowledge of palaeontology complete, it would be found that the various groups graded into one another by insensible gradations, so that it would be quite impossible to set definite limits to any one group. Already even in the extraordinarily imperfect condition of palaeontological knowledge this difficulty is making itself felt, and in the remains from the older deposits it becomes difficult to decide which of the recognized groups the various forms are most closely allied to-

Amongst the most ancient forms of fishes known at present are the remarkable Ostracodermi of the Upper Silurian and Devonian. The general form of these creatures gives the impression that they were ground-feeding fishes which had become highly specialized along much the same lines as the rays amongst existing Selachians. In the highly interesting Coelolepidae described by_Traquair (7) from the Upper Silurian and Devonian and comprising the genera Thelodus and Lanarkia a placoid skeleton is present, the individual elements being in the form of small hollow spines without any basal plate of bone. The main organ of propulsion seems to have been the heterocercal tail, while the broad anterior region passes out on each side into a flap-like portion which may represent a pectoral fin. On the under surface of Thelodus there occur trans- verse markings which probably are caused by the presence of a branchial apparatus of the ordinary Selachian type. In the Drepan- aspidae (Lower

Devonian) and Pteraspidae (Upper Silurian and Lower Devonian) the isolated placoid elements of the Coelolepidae have undergone fusion to a less or greater extent into large plates which ensheath the anterior body region, the posterior portion possessing rhombic scales. The Ostracoderms so far mentioned are grouped together under the name Heterostraci. The Osteostraci form another main division of the Ostracoderms, distinguished from the Heterostraci by the presence of true unmodified bone in their skeletal plates. The orbits are more dorsal in position and a dorsal fin is known to occur, while none has as yet been recognized in the Heterostraci. The most familiar members of the group are the Cephalaspidae of the Silurian and Devonian with their highly characteristic crescentic shield covering the dorsal side of the head region. From behind the posterior horns of this shield there project in some specimens paddle-like structures which may be pectoral fins, or possibly structures serially homologous with limbs and not represented in modern Selachians. ,

Among the less doubtful members of the Selachii among fossil forms first place must be given to the Pleuropterygii represented by the genus Cladoselache (8) from the Upper Devonian of Ohio. This was a shark-like creature with the mouth apparently terminal. The body was covered with shagreen placoid elements: there were a series (five or seven) of gill slits on each side and the skull was probably hyostylic. The notochord was apparently persistent. The chief interest of Cladoselache, however, lies in its paired fins which are held by upholders of the " lateral fold " theory to be remarkably primitive. The unpaired fins are obviously highly developed — the tail being almost homocercalwith a lateral keel on each side as in various- existing sharks, and it seems on the whole unlikely that the paired fins should be very primitive while the unpaired fins are so highly developed. Moreover, the facts of structure of the paired fins so far as at present known seem to fit in quite well with the view that they are modifications of the unisenal archi- pterygial type (see Ichthyology, fig. 2).

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The Ichthyoiomi, including the family Pleuracanthidae (Lower Carboniferous to Permian), are again of special interest as regards their paired fins which are obviously of the uniserial archipterygial type. The tail is protocercal and the mouth nearly terminal.

The Acanthodei are small fishes ranging from the Upper Silurian to Permian. They had strongly heterocercal tail, gill clefts ap- parently opening independently to the exterior, but they are specially characterized by the strong spines in front of each fin and by the calcified plates lying superficial to the cranium, jaw apparatus and pectoral girdles.

Authorities. — (i) T. J. Parker, Trans. Zool. Soc. xi. (1879); (2) Hochstetter, Morphol. Jahrb. xxix. (1900) ; (3) W. G. Ridewood, Journ. Linn. Soc. Zool. vol. xxvii. ; (4) C. Stewart, Journ. Linn. Soc. Zool. xxix. (1906) ; (5) T. W. Bridge, Cambridge Nat. History, " Fishes " (1904); (6) A. Smith Woodward, Vertebrate Palaeontology (1898), for references to special literature; (7) R. H. Traquair, Trans. Roy. Soc. Edin., xxxix. (1899); (8) Bashford Dean, Journ. Morph. ix. (1894), and Trans. New York Acad. Sci. xiii. (1894).

a. g. k.)

SELBORNE, ROUNDELL PALMER, ist Earl of (181 2- 1895), English lawyer and statesman, was born at Mixbury, in the county of Oxford, on the 27th of November 1812. His father was rector of the parish : his grandfather and great-grand- father were merchants in the City of London, where their descendants for a long while continued to be influential people; his mother belonged to the family of Roundell, which had been settled for four centuries in the West Riding of Yorkshire. He was educated at Rugby and at Winchester, and in 1830 went into residence in the university of Oxford as a scholar of Trinity College. Here he lived in intimacy with many friends, especially P. C. Claughton and Charles Wordsworth. In 1834 he took a first class in Liter ae Humaniores; he won the Eldon scholarship and was elected to a fellowship at Magdalen College; and after a year, spent chiefly in private tuition, partly in Lord Winchilsea's house and partly in the university, he removed to London (November 1835) and commenced reading for the bar.

He was called to the bar on the 7th of June 1837, the same day on which John Rolt (1804-1871), a man of very different antecedents, but afterwards a worthy rival of Palmer, was also called. Through his family connexions in the City of London, clients soon came to Palmer's chambers, and his business at the Chancery bar increased rapidly. Meanwhile his interests were not wholly confined to law: for some time (1840-1843) he wrote for The Times and the British Critic; he made a plunge into patristic learning, from which he soon recoiled; he was much interested in the controversies which distracted the Church on the subject of Tract 90; in the treatment of

the Episcopal Church in Canada by the Canadian government and the Colonial Office; in the establishment by the crown, in conjunction with the king of Prussia, of the Jerusalem bishopric; and in the contest for the professorship of poetry at Oxford on Keble's retirement.

In 1847, and again in 1853, Palmer was returned as member of Parliament for Plymouth, as a Peelite, and in the House of Commons he took an active and independent part. He advo- cated the admission of Jews to parliament; he. opposed Lord John Russell's measure to repel the so-called papal aggression; he opposed the admission of Dissenters into the university of Oxford; and he was hostile to the action of the government in the Crimean War. On the question of the reform of the university of Oxford, he sympathized with the reformers, but felt himself prohibited, by the oaths which he had taken, from assuming any active part. In 1855 he supported Gladstone in the efforts to bring about peace with Russia before the capture of Sebastopol; in 1856 he opposed the opening of museums on Sunday; in the following year he supported Cobden in his disapproval of the second opium war with China. At the general election on March 1857, Palmer, finding that the independent part he had taken, especially in reference to the Chinese question, had alienated from him many of his constituents in Plymouth, abandoned the prospect of re-election for that borough, and did not seek for election elsewhere. In 1848 he married Lady Laura Waldegrave, daughter of Earl Waldegrave. In 1849 he had become a Q.C.; and in 1851 he took his seat in the Rolls Court, where he soon obtained a leading practice, and was engaged in many of the most important cases in the Court of Chancery. In July 1861 he

accepted from Lord Palmerston the office of solicitor-general, a knighthood, and a safe seat for the borough of Richmond in Yorkshire, secured for him through the friendly action of Lord Zetland, and thus began the second spell of Palmer's membership of the House of Commons, which continued till his elevation to the woolsack and the peerage. In September 1863 he became attorney-general, and so continued till the government of whicli he was a member resigned in 1866.

The Civil War in America, and the questions which arose from the relations of Great Britain with both belligerents, rendered the duties of the law officers of the crown more than usually onerous, and Palmer was called upon to take part, as adviser of the ministry, in the courts, and in the House, in the questions which arose in respect of the " Trent " and the " Peterhoff," the cruisers " Alabama " and "

Florida " and the " Alexandra," a ship which was seized by the government, and other matters. In 1865 he took a large part in the passing of the act under which all the law courts were gathered together in the Strand. In 1866 he expressed himself favourable to the making of household suffrage the basis of representation, an expression of opinion which probably influenced the Reform Bill of the following year — in the discussions on which Palmer took a prominent part, and especially in opposition to the so-called " fancy franchises " originally proposed by its authors. In the same year he took part in supporting the measure for the abolition of compulsory Church rates.

In 1868 occurred an event of great importance in his career. In April of that year Gladstone proposed his resolutions with reference to the Irish Church on which the bill for its disestablish- ment was subsequently based. This measure was opposed to many of the dearest beliefs and feelings of Palmer, and he evidenced his disapproval by abstaining from voting on the resolutions. At the election of November 1868 Palmer was again returned for Richmond, and Gladstone offered him the office of lord chancellor or the office of a lord justice with a peerage; both offers were declined by Palmer, and he assumed a position of independent opposition to the measure relative to the Irish Church. On the 22nd of March 1869 he delivered a very powerful speech against the second reading of the bill, and during its later stages exercised a considerable influence in modifying the severity of its provisions. The position of Palmer at this time was very remarkable. The foremost advocate at the bar, he was known to have declined the highest prize in the profession rather than promote a measure of which he disapproved; a very prominent member of the House of Commons, whose action had been more than usually independent of party, he had separated himself from his political friends and maintained a position as the dignified and forcible opponent of disestablish- ment. Without office and without combination with the Conservative Opposition, he exercised great influence within and without the walls of St Stephen's. What made his position the more remarkable was that he was frequently consulted by the government which he had declined to join, and that on some occasions they invoked the assistance which his great influence in the House enabled him to afford to them.

In 1869 he sought to modify rather than to oppose the bill for the abolition of tests in the universities. In 1870 he gave a qualified support to Gladstone's first Irish Land Act, and in the same year he supported Forster's Education Act. In 1872 he undertook the defence of his friend Lord Chancellor Hatherley, when attacked for his

appointment of Sir Robert Collier to the judicial committee of the Privy Council, and, by a line of argu- ment more ingenious than convincing, secured a majority for the government.

The treaty of Washington was the means of casting a great duty upon Palmer. After the conclusion of the Civil War in America very large claims were preferred against Great Britain for alleged breaches of her duty as a neutral power; and after long negotiations, England and the United States agreed to arbitration. Palmer, who had been advising the British govern- ment during these negotiations, and who (4th August 1871) had defended the treaty in the House of Commons, was briefed

on behalf of Great Britain. In the end the Geneva tribunal made an award requiring the payment by Great Britain to the United States of a sum of about £3,000,000. To those who, in order to promote the cause of international arbitration, are desirous of acquiring a knowledge of the dangers and difficulties which beset this mode of settling disputes, the account which Palmer has left of his part in this arbitration may be commended.

In September 1872 Gladstone again offered him the great seal, which Lord Hatherley had resigned; in the same year he took up his residence in his newly erected house at Blackmoor, in the parish of Selborne, in the county of Hampshire, from which he took his new title as a peer. In the following year (1873) Lord Selborne carried through parliament the Judicature Act. The foundations of this measure were laid so long ago as February 1867, when Palmer had moved for a royal commission on the constitution of the courts, and had taken an active part in the work of that commission, of which the first report was made in 1869. The result of this act of 1873 was to effect a fundamental change in the judicature system. By the operation of the Judicature Act one supreme court with several divisions was constituted; each division could administer the whole law; the conflict of divergent systems of law was largely overcome by declaring that when they were at variance, the principles of equity should prevail over the doctrines of the common law. The details of this great change were embodied in a code of general rules prepared by a committee of judges, over which Lord Sel- borne for two years presided week by week, with unfaltering attention to the minutest detail. " If, " wrote Lord Selborne in his memoirs, speaking of the

Judicature Act of 1873, " I leave any monument behind me which will bear the test of time, it may be this." It is impossible to separate this fusion of law and equity, this union of all the higher courts into one supreme tribunal, from the construction of a single home for this great institution; and the opening of the Royal Courts in the Strand in the year 1882, when Queen Victoria personally presided in her one supreme court, and handed over the care of the building to Lord Selborne, as her chancellor and as the head of this great body, was impressive as an outward and visible sign of the silent revolution, which owed more to Lord Selborne than to any other individual. To the student of the natural history of juris- prudence the fusion of the two systems of law and equity may well recall a similar result brought about in Imperial Rome; to the student of British institutions, the supreme court, for once presided over in person by the sovereign, could not but recall the Aula Regia, where the Norman kings sat amid their coun- sellors before equity had arisen to correct law, and before the separation between the three great common law courts had begun. A small incident may illustrate the novelty of the assemblage of the one great court on that day. The queen, on the prayer of the attorney-general, ordered that the proceedings of the day should be recorded, an order which caused a momentary embar- rassment to the lord chancellor, as the court had no existing registrar, and no existing book in which the record should be made. On the occasion of the opening of the Royal Courts Lord Selborne received an earldom.

The year 1885 was marked in Lord Selborne's life by the death of his wife, and by his final separation from the party of which Gladstone was the acknowledged leader. That statesman had in the latter part of the year indicated his leaning towards the disestablishment of the Church of England, and towards Home Rule for Ireland. Both these leanings were opposed to the deepest convictions of Lord Selborne; and it was an inevitable result that when in January 1886 Gladstone resumed office as premier, Lord Selborne should not be again his chancellor: on the 30th of January in that year they parted for ever; and Lord Selborne felt that his public life, except so far as he might serve his country by voice or pen, was now over. But neither his courage nor his industry forsook him; and he found, in opposing the new views of his old colleague, ample scope for both voice and pen; and as a member of the House of Lords he continued almost to the last to take part in hearing and deciding appeals, and sometimes in the ordinary business of the House.

In addressing the electors of Midlothian in September 1885, Gladstone had suggested the severance of the Church of England

from the state as a subject on which the foundation of discussion had already been laid, and he averred the existence of " a current almost throughout the civilized world, slowly setting in the direc- tion of disestablishment." Such an utterance from such a man greatly excited the hopes' of Nonconformists, who had previously published a manifesto under the title of " The Case for Dis- establishment." This stirring of the question deeply moved Lord Selborne, who was strongly opposed alike to disestablish- ment and disendowment, and in the following year, 1886, he published a work entitled A Defence of the Church of England against Disestablishment, with an introductory letter addressed to Gladstone. In the introductory letter he criticized Gladstone's pronouncement on the subject, and especially examined the allegation of a general tendency towards disestablishment in the civilized world at large, and arrived at a negative conclusion. In the body of the book the learned author treated of the history of the English Church, its endowments and the case of the advocates of disestablishment. The work is throughout charac- terized by an abundant supply of learning and of information as to the history and the state of the Church of England at that time, and by great dialectical acuteness. It is a powerful defence as well as a valuable summary of the history of the established Church in England. In 1888 Lord Selborne published a second work on the Church question, entitled Ancient Facts and Fallacies concerning Churches and Tithes, in which he examined more critically than in his earlier book the developments of early ecclesiastical institutions, both on the continent of Europe and in Anglo-Saxon England, which resulted in the formation of the modern parochial system and its general endowment with tithes. A second edition of this work, embodying the result of its author's subsequent researches in the Vatican library and elsewhere, was published in the year 1892. A perusal of these books will show with how wide a range of investigation and with what care Lord Selborne prepared himself for the discussion of these ecclesiastical questions which deeply stirred him. But Lord Selborne did not carry on his opposition to Gladstone's proposals only in his library or by his pen; in the year 1886-1887 he travelled to many parts of the country, and addressed meetings in defence of the union between the Church and state and against Home Rule; and in September 1893, in his eighty-first year, he addressed a powerful speech to the House of Lords in opposition to the Home Rule Bill.

Lord Selborne's health had, with the exception of two collapses in 1883 and 1888, which appear to have been due to overwork, continued excellent till February 1895, when he was attacked by

influenza. He died on the 4th of May 1895 at his seat in Hampshire, full of years and of honours.

To the subject of university education Lord Selborne at different times in his life gave much time and attention. As a fellow of Magdalen College, he had been desirous of changes which he felt himself bound by his oath from advocating; and he had taken part in the discussions on the abolition of tests in the old universities. 1 He gave much time and attention to his duties as chairman of the second Oxford commission under the act of 1876; in 1878 he filled the office of lord rector of the university of St Andrews; and in the following year he presided over a commission on the subject of university education in London. Lord Selborne's literary labours included the publi- cation in 1862 of a selection of hymns, under the title of The Book of Praise, a work in which he was greatly assisted by Daniel Sedgwick (181 4- 187 9), a bookseller and publisher in the city of London. The work was characterized by the great pains taken to ascertain the true authorship of hymns which were either anonymous or attributed to those who had not composed them, and by a like effort to exclude all variations grafted on the 1 In 1867 he founded an association for the improvement of legal education, in the hope of bringing about the establishment or the restoration of " a general school of law in London on a scale worthy of the importance of the law and of the resources of the Inns of Court." This enterprise was not successful. The opposing forces were too strong to permit Lord Selborne to succeed.

original language, and to give the hymns " in the genuine un- corrupted text of the authors themselves." In the course of his labours as editor of this volume he was struck by the unity which was presented by Christian hymnody, " binding together by the force of a common attraction, more powerful than all causes of difference, times ancient and modern, nations of various race and language, Churchmen and Nonconformists, Churches re- formed and unreformed " (Preface). In the same field of literature Lord Selborne further laboured by the publication of another collection called The Book of Praise Hymnal ; a contri- bution to an edition of Bishop Ken's hymns; a paper on English Church Hymnody at a Church Congress; and the article in the Encyclopaedia Britannica on " Hymns " (q.v.), which was re- published as a separate volume in 1892.

During the last few years of his life Lord Selborne engaged in the composition, for the benefit of his children, of memorials of his own life and of the lives of many members of his family. These Memorials, Part I:, Family and Personal, in 2 vols., which were published in 1896, Memorialsˆ Part II., Personal and Political, also in 2 vols., were edited by his daughter, Lady Sophia Palmer, and published in 1898. In the years 1880-1881 Lord Selborne wrote to his son a series of letters on religious subjects, dealing in an elementary way with natural and revealed religion, the inspiration of the Bible and Biblical criticism. These were published in 1898, under the title of Letters to His Son on Religion, by Roundell, First Earl of Selborne.

In person Lord Selborne was of about the average height: his manners when among strangers were somewhat reserved; his style, both in speaking and writing, was fluent, tending to diffuseness; his oratory was marked by uniform good sense and lucidity, both of arrangement and language; and if he never reached the highest level of oratorical excellence, he never descended to what was commonplace or irrelevant. As a judge, whether in the Supreme Court or in the House of Lords, he displayed high qualities: he was patient, courteous, logical and learned, and his judgments contain many valuable expositions of the principles of law. The fusion of law and equity, the reorganization of the whole judicial system of England, and the association of all the supreme tribunals in one common home were works of no ordinary magnitude or importance, and give a character of unusual importance to his chancellorship. That Lord Selborne was a truly religious man it is impossible to doubt: his whole life was regulated and inspired by a sense of his duty towards God and his fellowmen, and a long life spent amid the temptations of legal and public life left not the faintest stain on his memory. He was a devout member of the Church of England, to which he looked up with unstinted affection and reverence; and he found in its service and formularies an adequate satisfaction for all his religious feelings. He belonged to the High Church school, which was influenced by the teaching of Newman and Pusey and the Oxford teachers of their day; but he by no means slavishly followed them. With the later High Church movement, usually described as Ritualism, he had less sympathy. His life was prosperous, for from his first prize at the university till his acquisition of an earldom, he went on a course of almost unbroken success. He had the double dignity of having refused the highest prize in his profession for conscience' sake, and of having accepted that dignity without loss of consistency; in his life he acquired a high reputation and the sincere

admiration of his fellowmen, as well as an abundant 'fortune and ample titular distinctions. His life was also happy, for he had pleasure in his work, he loved and was loved by his wife and children ; he had a strong constitution, and retained his bodily and mental powers to the last; his faith in the religion of his youth was un-shaken to the end; and he lived throughout his long life with the consciousness of rectitude. (E. F.)

SELBORNE, WILLIAM WALDEGRAVE PALMER, 2nd Earl of (1859-), son of the preceding, was educated at Winchester and University College, Oxford, where he took a first class in history. In 1883, being then Viscount Wolmer, he married Lady Beatrix Cecil, 3rd daughter of the 3rd maTquess of Salisbury. He served a political apprenticeship as assistant private secretary to the chancellor of- the exchequer (Mr Childers) from 1882 to 1885, when he was elected Liberal member of parliament for East Hampshire. Like his father, he became a Liberal Unionist when in 1886 Mr Gladstone proposed Home Rule for Ireland, and he retained his seat till 1892, when he was elected for West Edinburgh. From 1895 to 1900 he was under-secretary for the colonies, having Mr Chamberlain as his chief, and during the difficult period before the outbreak of the South African War he ranue rapidly to the front. In 1900 he entered the cabinet as

first lord of the admiralty, and held this office till 1905, when he succeeded Lord Milner as high commissioner for South Africa and governor of the Transvaal and Orange River colonies. He assumed office at Pretoria in May of that year. He had gone out with the intention of guiding the destinies of South Africa during a period when the ex-Boer republics would be in a transi- tional state between crown colony government and self-govern- ment, and letters patent were issued granting the Transvaal representative institutions. But the Liberal party came into office in England in the December following, before the new constitution had been actually established, and the decision was now taken to give both the Transvaal and Orange River colonies self-government without delay. Lord Selborne loyally accepted the changed situation, and it was due in considerable measure to his moderation, common sense, administrative gifts and appreciation of the Boers' standpoint, that the experiment proved successful. He ceased to be governor of the Orange River Colony on its assumption of self-government in June 1907, but retained his other posts until May 1910, retiring on the eve of the establishment of the Union of South Africa. No one had done more to effect that union. The despatch, dated January 7th, 1907, in which he reviewed the situation in its economic and political aspects, was a masterly and comprehensive statement of the

dangers inherent in the existing system and of the ad- vantages likely to attend union. The force of its appeal had a marked influence on the course of events, while the loyalty with which Lord Selborne co-operated with the Botha administration was an additional factor in reconciling the Dutch and British communities. He returned to England with his reputation as a statesman enhanced by the respect of all parties, and with a practical experience, second only to that of Lord Milner, of British imperialism in successful operation. This experience made him a valuable ally in the movement among the Unionist party at home for Tariff Reform and Colonial Preference, to which he could now give his whole-hearted support.

SELBORNE, a village in the Petersfield parliamentary division of Hampshire, England, 43 m. S.S.E. of Alton station on the London & South-Western railway. It is pleasantly situated in a thickly wooded valley, and is celebrated as the birthplace and scene of the work of Gilbert White the naturalist; his house is in the village, and his memorial and grave are in the ancient church. Fine views over the district of which he wrote are obtained from the hills (between 500 and 700 ft.) in the neighbour- hood.

SELBY, WILLIAM COURT GULLY, ist Viscount (1835- 1909), Speaker of the British House of Commons, was born on the 29th of August 1835, the son of Dr James Manby Gully of Malvern. His grandfather was Daniel Gully, a Jamaican coffee- planter. He was educated at Trinity College, Cambridge, where he was president of the Union. He was called to the bar in i860, went the northern circuit, and took silk in 1877. In 1880 and 1885 he unsuccessfully contested Whitehaven as a Liberal, but was elected for Carlisle in 1886, and continued to represent that constituency until his elevation to the peerage. In April 1895 he was elected Speaker by a majority of eleven votes over Sir Matthew White Ridley (cr. Viscount Ridley, 1900), the Unionist nominee. In 1905 he resigned and was raised to the peerage with the title of Viscount Selby, the name being that of his wife, Miss Elizabeth Selby (d. 1906), whom he married in 1865. He died on the 6th of November 1909, and was suc- ceeded by his son, James William Herschell Gully (b. 1867).

SELBY, a market town in the Barkston Ash parliamentary division of the West Riding of Yorkshire, England, 133 m. S. of York on the Great Northern and North-Eastern railways. Pop. of urban district (1901) 7786. It stands, in a level plain on the left bank of the river Ouse, by which communication is provided with the Humber. The church of St Mary and St German belonged to a Benedictine abbey founded under a grant from William the Conqijeror in 1069 and raised to the dignity of a mitred abbey by Pope Alexander II. The monastic buildings have practically disappeared, but the church was a splendid building of various dates from Norman to Decorated, the choir

and Lady chapel representing the later period. The nave passes from Norman to Early English in the course of its eight bays from east to west and also from the arcade through the triforium to the clerestory. About midnight of the ioth-2oth of October 1906, a fire broke out in the Latham chapel adjoining the north choir aisle, in which a new organ had recently been erected, and soon involved the whole building. Specially serious damage was done in the immediate neighbourhood of the chapel, the oak-groined roof and rich fittings of the choir were wholly destroyed, but the finely moulded arches and the magnificent tracery of the east window survived in great part. Much damage was done to the tower, and the nave roof

perished, for the fire reached practically every part of the building, though the stonework of the nave suffered comparatively little. Schemes for the collection of funds and the complete restoration of the church were immediately set on foot, the architect being Mr Oldrid Scott.

Selby is the centre of a rich agricultural district, and its industries include rope and twine making, flax-scutching, boat- building, iron-founding, tanning and brewing. Tradition in- dicates Selby as the birth-place of Henry I., and thus accounts for the high privileges conferred upon the abbey. The town had a considerable part in the operations of the Civil Wars, being held at the outset by the Parliamentarians, and captured by the Royalists in 1644, but soon retaken by Sir Thomas Fairfax.

SELDEN, JOHN (1584-1654), English jurist, legal antiquary and oriental scholar, was born on the 16th of December 1584 at Salvington, in the parish of West Tarring, Sussex. His father, also John Selden, held a small farm. It is said that his accom- plishments as a violin-player gained him his wife, whose social position was somewhat superior to his own. She was Margaret, the only child of Thomas Baker of Rustington, a village in the vicinity of West Tarring, and was more or less remotely descended from a knightly family of the same name in Kent. John Selden commenced his education at the free grammar-school at Chi- chester, whence in 1600 he proceeded to Hart Hall, Oxford. In 1603 he was admitted a member of Clifford's Inn, London, and in 1604 migrated to the Inner Temple, and in 161 2 he was called to the bar. His earliest patron was Sir Robert Cotton, the antiquary, by whom he seems to have been employed in copying and abridging certain of the parliamentary records then pre- served in the Tower. For some reason which has not been explained, Selden never went into court as an advocate, save on rare and exceptional occasions. But his practice in chambers as a conveyancer and consulting counsel is stated to have been large, and, if we may judge from the considerable fortune he accumulated, it must also have been lucrative.

It was, however, as a scholar and writer that Selden won his reputation both amongst his contemporaries and with posterity. His first work, an account of the civil administration of England before the Norman Conquest, is said to have been completed when he was only two- or three-and-twenty years of age. But if this was the Analecton Anglo-Britannicon, as is generally supposed, he withheld it from the world until 161 5. In 1610 appeared his England's Epinomis and Janus Anglorum; Fades Altera, which dealt with the

progress of English law down to Henry II.; and The Duello, or Single Combat, in which he traced the history of trial by battle in England from the Norman Conquest. In 1613 he supplied a series of notes, enriched by an immense number of quotations and references, to the first eighteen cantos of Drayton's Polyolbion. In 1614 he published Titles of Honour, which, in spite of some obvious defects and omissions, has remained to the present day the most com- prehensive and trustworthy work of its kind that we possess; and in 1616 his notes on Fortescue's De laudibus legum Angliae and Ralph de Hengham's Summae magna et parva. In 161 7 his De diis Syriis was issued, and immediately established his fame as an oriental scholar among the learned in all parts of Europe. It is remarkable for its brilliant use of the comparative method; in which it was far ahead of its age, and is still consulted by students of Semitic mythology. In 1618 his History of Tithes, although only published after it had been submitted to the cen-

sorship and duly licensed, nevertheless aroused the apprehension of the bishops and provoked the intervention of the king. The author was summoned before the privy council and compelled to retract his opinions, or at any rate what were held to be his opinions. Moreover, his work was suppressed and himself forbidden to reply to any of the controversialists who had come or might come forward to answer it.

This seems to have introduced Selden to the practical side of political affairs. The discontents which a few years later broke out into civil war were already forcing themselves on public attention, and it is pretty certain that, although he was not in parliament, he was the instigator and perhaps the draftsman of the memorable protestation on the rights and privileges of the House affirmed by the Commons on the 18th of December 1621. He was with several of the members committed to prison, at first in the Tower and subsequently under the charge of Sir Robert Ducie, sheriff of London. During his detention, which only lasted a short time, he occupied himself in preparing an edition of Eadmer's History from a manuscript lent to him by his host or jailor, which he published two years afterwards. In 1623 he was returned to the House of Commons for the borough of Lancaster, and sat with Coke, Noy and Pym on Sergeant Glanville's election committee. He was also nominated reader of Lyon's Inn, an office which he declined to undertake. For this the benchers of the Inner Temple, by whom he had been appointed, fined him £20 and disqualified him from being chosen one of their number. But he was relieved from this incapacity after a few years, and became a master of the bench. In the first parliament of Charles I. (1625), it appears from the " returns of members " printed in 1878 that, contrary to the

assertion of all his biographers, he had no seat. In Charles's second parliament (1626) he was elected for Great Bedwin in Wiltshire, and took a prominent part in the impeachment of George Villiers, duke of Buckingham. In the following year, in the " benevolence " case, he was counsel for Sir Edmund Hampden in the court of king's bench. In 1628 he was returned to the third parliament of Charles for Ludgershall in Wiltshire, and had a large and important share in drawing up and carrying the Petition of Right. In the session of 1629 he was one of the members mainly responsible for the tumultuous passage in the House of Commons of the resolution against the illegal levy of tonnage and poundage, and, along with Eliot, Holies, Long, Valentine, Strode, and the rest, he was sent once more to the Tower. There he remained for eight months, deprived for a part of the time of the use of books and writing materials. He was then removed, under less rigorous conditions, to the Marshal- sea, until not long afterwards owing to the good offices of Arch- bishop Laud he was liberated. Some years before he had been appointed steward to the earl of Kent, to whose seat, Wrest in Bedfordshire, he now retired. In 1628 at the suggestion of Sir Robert Cotton he had compiled, with the assistance of two learned coadjutors, Patrick Young and Richard James, a catalogue of the Arundel marbles. He employed his leisure at Wrest in writing De successionibus in bona defuncti secundum leges Ebraeorum and De successione in pontificalum Ebraeorum, published in 1631. About this period he seems to have inclined towards the court rather than the popular party, and even to have secured the personal favour of the king. To him in 1635 he dedicated his Mare clausum, and under the royal patronage it was put forth as a kind of state paper. It had been written sixteen or seventeen years before; but James I. had prohibited its publication for political reasons; hence it appeared a quarter of a century after Grotius's Mare liberum, to which it was intended to be a rejoinder, and the pretensions advanced in which on behalf of the Dutch fishermen to poach in the waters off the British coasts it was its purpose to explode. The fact that Selden was not retained in the great case of ship money in 1637 by John Hampden, the cousin of his former client, may be accepted as additional evidence that his zeal in the popular cause was not so warm and unsuspected as it had once been. During the progress of this momentous constitutional conflict, indeed, he seems to have been absorbed in his oriental

researches, publishing De jure naturali et gentium juxta disci- plinam

Ebraeorum in 1640. He was not elected to the Short Parliament of 1640; but to the Long Parliament, summoned in the autumn, he was returned without opposition for the university of Oxford. He opposed the resolution against episcopacy which led to the exclusion of the bishops from the House of Lords, and printed an answer to the arguments used by Sir Harbottle Grimston on that occasion. He joined in the protestation of the Commons for the maintenance of the Protestant religion according to the doctrines of the Church of England, the authority of the crown, and the liberty of the subject. He was equally opposed to the court on the question of the commissions of lieutenancy of array and to the parliament on the question of the militia ordinance. In 1643 he participated in the discussions of the assembly of divines at Westminster, and was appointed shortly afterwards keeper of the rolls and records in the Tower. In 1645 he was named one of the parliamentary commissioners of the admiralty, and was elected master of Trinity Hall in Cambridge — an office he declined to accept. In 1646 he subscribed the Solemn League and Covenant, and in 1647 was voted £5000 by the parliament as compensation for his sufferings in the evil days of the monarchy. He had not, however, relaxed his literary exertions during these years. He published in 1642 Privileges of the Baronage of England when they sit in Parliament and Discourse concerning the Rights and Privileges of the Subject; in 1644, Dissertatio de anno civili et calendario reipublicae Judaicae; in 1646 his treatise on marriage and divorce among the Jews entitled Uxor Ebraica; and in 1647 the earliest printed edition of the old English law-book Fleta. In 1650 Selden passed the first part of De synedriis et prefecturis juridicis veterum Ebraeorum through the press, the second and third parts being severally published in 1653 and 1655, and in 1652 he wrote a preface and collated some of the manuscripts for Sir Roger Twysden's Historiae Anglicae scriptores decern. His last publication was a vindication of himself from certain charges advanced against him and his Mare clausum in 1653 by Theodore Graswinckel, a Dutch jurist.

After the death of the earl of Kent in 1639 Selden lived permanently under the same roof with his widow. It is believed that he was married to her, although their marriage does not seem to have ever been publicly acknowledged. He died at Friary House in Whitefriars on the 30th of November 1654, and was buried in the Temple Church, London. In 1880 a brass tablet was erected to his memory by the benchers of the Inner Temple in the parish church of West Tarring.

Several of Selden's minor productions were printed for the first time

after his death, and a collective edition of his writings was published by Archdeacon Wilkins in 3 vols, folio in 1725, and again in 1726. His Table Talk, by which he is perhaps best known, did not appear until 1689. It was edited by his amanuensis, Richard Milward, who affirms that " the sense and notion is wholly Selden's," and that " most of the words " are his also. Its genuineness has sometimes been questioned, although on insufficient grounds.

See Wood's Alhenae Oxonienses, ed. Bliss (London,- 1817, 4 vols.); Aikin, Lives of John Selden and Archbishop Usher (London, 1812); Johnson, Memoirs of John Selden, &c. (London, 1835); Singer, Table Talk of John Selden (London, 1847); and Wilkins, Johannis Seldeni opera omnia, &c. (London, 1725).

SELENE, in Greek mythology, the divine personification of the moon, daughter of Hyperion and Theia, sister of Helios and Eos. By Zeus she was said to have been the mother of Pandia (the all-bright), who was worshipped with her father at the festival named after her Pandia. 1 She was also wooed by Pan in the form of a white ram, or she had selected a white ram from his flock as the price of her favours. The most famous of her amours was with Endymion (?.».). Selene was represented as a beautiful young woman with wings and a golden diadem, sometimes riding in a chariot drawn by two white, sometimes winged, horses (or cows, symbolizing the moon's crescent, or bulls), or herself mounted on a horse, a bull, a mule or a ram. At Elis there was a statue of Selene, her head surmounted by a crescent. Later, she was identified with Artemis, and as such

1 The connexion of Selene or Pandia with this festival is denied by Wilamowitz-MSllendorff (Aus Ky da then, p. 133).

called Phoebe, the sister of Phoebus Apollo. She was worshipped on the days of the new and the full moon. Another name for Selene was Mene, in reference to the monthly changes of the moon. The existence of a male moon-god (Men), whose cult probably came to Attica from Asia Minor, is attested by in- scriptions. The Roman goddess of the moon was Luna, who possessed sanctuaries on the Aventine and Palatine hills. In the former she was worshipped on the last day of March (the first month of the old Roman year); in the latter as Noctiluca (giving light by night), her sanctuary being illuminated on such occasions.

See W. H. Roscher, Uber Selene und Verwandtes (1890), with Nachtrdge (1895); Preller, Griechische Mythologie (4th ed., 1894), pp. 443-446; A. Legrand, s.v. " Luna " in Daremberg and Sagfio's

Dictionnaire des antiquites.

SELENGA-ORKHON, a river of Central Asia, which rises in two principal head-streams, the Selenga and the Orkhon, on the plateau of N.W. Mongolia, not far apart in 101 E. Both flow generally E.N.E. as far as their confluence near Kiakhta, on the frontier of Mongolia and Siberia, at the eastern extremity of the Sayan Mountains. Beyond Kiakhta the river flows generally N. nearly as far as 52° N., when it turns W. and enters Lake Baikal on the S.W., forming a delta. It is navigable from Kiakhta downwards, a distance of 210 m., its total length being 750 m. From the left it receives the Eghin-gol and the Jida, and from the right the Tala, Kharagoy, Chikoy, Khilok and Uda, streams each 150 to 300 m. in length. Near the upper Orkhon was the permanent camp of Karakorum, from the 8th century down to the end of the 13th the centre of the Mongol power, especially under the sway of Jenghiz Khan and his son Ogotai or Ogdai in the 12th and 13th centuries.

Several remarkable inscriptions were discovered here in the end of the 19th century, and were interpreted by Professor V. Thomsen of Copenhagen Inscriptions de I'Orkhon (Helsingfors, 1900).

SELENIUM [symbol Se, atomic weight 79-2 (O— 16)], a non-metallic chemical element, discovered in 181 7 by J. J. Berzelius, who called it selenium (Gr. o-eXijjT), the moon) on account of its close analogy with tellurium (Lat. tellus, the earth). It is occasionally found in the native condition, but more frequently in combination with metals in the form of selenides, the more important seleniferous minerals being euchairite, crookesite, clausthalite, naumannite and zorgite. It is also found as a constituent of various pyrites and galenas, and in some specimens of native sulphur. The element is usually obtained from the flue dust or chamber deposits of sulphuric-acid works in which a seleniferous pyrites is burned. In this process, the residues are boiled with a dilute sulphuric acid to which nitric acid and potassium chlorate are added in order to transform the element into selenic acid, H 2 Se04, which is then reduced to selenious acid, H 2 Se03, by boiling with hydrochloric acid, and finally to selenium by sulphur dioxide. L. F. Nilson (Ber., 1874, 7, p. 1719) digests the well-washed chamber mud with a moderately concentrated solution of potassium cyanide, whereby the element goes into solution in the form of potassium seleno- cyanide, KSe(CN), from which it is precipitated by hydrochloric acid. As alternative methods, F. Wohler (Ann., 1859, 109, P- 375) heats the well- washed chamber residues with potassium nitrate and carbonate in order to obtain an alkaline selenate, which is then boiled with

hydrochloric acid, yielding selenious acid, from which the element is obtained as above; whilst H. Rose (Pogg. Ann., 1828, 90, p. 471) by the action of chlorine obtains selenium tetrachloride, which is converted into selenious acid by water, and the acid so prepared is finally reduced to selenium by treatment with sodium sulphite (see also G. Magnus, Pogg. Ann., 1830, 96, p. 165; O. Pettersson, Ber., 1873, 6, p. 1477; H. Koch, German Patent 167457, 1903). It is obtained from zorgite by heating the mineral with aqua regia; the excess of acid is evaporated, and the resulting syrupy liquid diluted, filtered and decomposed by sulphur dioxide, when the selenium is precipitated (Biliandot, Ency. chimique, 1883, 5, p. 198).

The commercial element usually contains a certain amount of sulphur, and some tellurium, and various methods have been devised

for its purification. L. Oppenheim {Jour, prakt. Chem., 1857, 71, p. 279) fuses the commercial selenium with potassium cyanide in a stream of hydrogen, takes up the melt in water and passes air through the solution; the precipitated tellurium is filtered off, and the solution then supersaturated with hydrochloric acid, when selenium is gradually deposited. E. Divers, (Chem. News, 1885, 51, p. 199) dissolves the element in boiling concentrated sulphuric acid and reduces the resulting selenious acid with sulphur dioxide, filters off the precipitate and washes it with water and alcohol. The resulting product, however, still contains traces of sulphur. C. Hugot (Ann. chim. phys., 1900 (7), 21, p. 34) converts the element by dilute nitric acid into selenium dioxide which is then sublimed, and dissolved in water. Any sulphuric acid present is removed by baryta water, the precipitated barium sulphate filtered off, the solution acidified by hydrochloric acid and reduced by sulphur dioxide

Several allotropic forms of selenium have been described, but the work of A. P. Saunders (Jour, Phys. Chem., 1900, 4, p. 423) seems to establish that the element exists in three distinct forms, namely liquid selenium (which includes the vitreous, soluble and amorphous forms), crystalline red selenium (which includes, perhaps, two very closely allied forms), and crystalline, grey or metallic selenium. Liquid selenium becomes more and more viscous in character as its temperature falls from 220 C. to 6o° C; it is soft at about 6o°, but is hard and brittle between 30° and 40 . It shows a conchoidal fracture. The amorphous variety, which only differs from the vitreous form in

its state of aggregation, is obtained by reducing solutions of selenious acid with sulphur dioxide. It is slightly soluble in carbon bisulphide. The red crystalline variety is obtained by crystallization of selenium from carbon bisulphide, or by leaving the amorphous form in contact with the same solvent. The grey crystalline form is obtained by heating the other varieties, and is the most stable form from ordinary temperatures up to 2 1 7°. All varieties of selenium dissolve in concentrated sulphuric acid, forming a green solution (see also R. Marc, Ber., 1906, 39, p. 697; and W. Oechsner de Coninck, Comptes rendus, 1906, 143, p. 682). A colloidal selenium was obtained by C. Paal and C. Koch (Ber., 1905, 38, p. 526) by reducing selenious acid dissolved in an aqueous solution of sodium protalbate with hydrazine hydrate and hydrochloric acid, the precipitate obtained being then dis- solved in sodium carbonate. The specific gravity of selenium is 4-8; the specific heat varies from 0-0716 to 0-1147, depending upon the particular form. Selenium combines directly with hydrogen when heated in the gas, and with fluorine in the cold. It burns with a blue flame when heated in the air or in oxygen, at the same time giving a characteristic smell of rotten horse- radish, a reaction which serves for the recognition of the element. It combines directly with nitrogen, phosphorus, antimony and carbon, and with all the metals (except gold) to form selenides, of which those of the alkali and alkaline earth metals are soluble in water. Metallic selenium is a conductor of electricity, and its conductivity is increased by light; this property has been utilized in apparatus for transmitting photographs by telegraphy (see Telegraph).

Seleniuretted Hydrogen, H 2 Se, is obtained by the direct union of its constituent elements in the heat; by the decomposition of various selenides with mineral acids; by the decomposition of aluminium selenide, or phosphorus selenide with water; by the action of selenium on a concentrated solution of hydriodic acid; and by heating selenium with colophene (H. Moissan), or better with paraffin wax (H. Wuyts and A. Stewart, Bull. Soc. chim. Belg., 1909, 23, p. 9). It is a colourless gas which possesses a characteristic smell, more unpleasant than sulphuretted hydrogen. Its physiological effects are much more persistent and injurious than sulphuretted hydrogen, producing temporary paralysis of the olfactory nerves and inflammation of the mucous membrane. It may be liquefied, the liquid boiling at -41° to-42°C. and becoming solid at-68°C. (K. Olszewski). It is somewhat soluble in water and forms a hydrate. It is decomposed by heat, burns with a blue flame, and behaves as a reducing agent. It -precipitates many of the heavy metals as selenides when passed into solutions of their salts. Its

aqueous solution is unstable, gradually depositing red selenium on standing. Selenium fluoride, SeFV is obtained as a colourless liquid by the direct action of fluorine or selenium (P. Lebeau, Comptes rendus, 1907, 144, p. 1042). It boils at about 100° C, attacks glass readily, is decomposed by water, and dissolves iodine. Selenium dichloride, Se 2 Cl 2 , is obtained by the action of chlorine on selenium; by the action of phosphorus pentachloride on selenium or the dioxide; by the action of hydrochloric acid on seleno-sulphur trioxide (E. Divers, Chem. News, 1884, 49, p. 212): 2S-Se0 3 2HC1 = H 2 S04

S-Se0 3 S e p 2 (|-H 2 0)->Se 2 Cl 2 +S0 2 (0H)Cl; and by heating selenium and selenium tetrachloride to ioo° C. in a sealed tube. It is a yellowish-broWn oily liquid which commences to distil at 130 C. with partial decomposition into selenium and the tetrachloride. It is decomposed by Water with formation of selenium and selenious acid: 2Se 2 Cl 2 +3H 2 = H 2 Se03+3Se-f 4HC1. Selenium tetrachloride, SeCU, is obtained by passing excess of chlorine over selenium; by the action of phosphorus pentachloride on selenium dioxide: Se0 2 -t-PCl 6 = SeOCl 2 -HPpCl 3 ; 3SeOCl 2 -l-2POCl s = 3SeCl4+P,0,; and by the action of thionyl chloride on selenium oxychloride. It is a white solid which can be obtained crystalline by sublimation in a current of chlorine. It dissociates when heated, and is decomposed by water with production of selenious acid. It dissolves selenium. Similar bromides and iodides are known. Selenyl chloride, SeOCl 2 , is formed when selenium tetrachloride is heated with the dioxide to l5o°C. (R.Weber, Pogg. Ann., 1859, 184, p. 615), or when the dioxide is heated with common salt. 2SeOj-|-2NaCl = SeOCl 2 + Na 2 SeOa. It is a yellow-coloured liquid which solidifies at 0° C, and fumes on exposure to air. It combines with titanium and tin bichlorides and with antimony trichloride, and it is decomposed by water.

Selenium dioxide, Se0 2 , is prepared by burning selenium in oxygen, or by oxidizing selenium with nitric acid and heating the residue. It may also be prepared by the action of selenium on sulphur oxyfluoride (H. Moissan, Bull. Soc. chim., 1902 (3) 27, p. 251): 2S0 2 F 2 +Se+Si0 2 = SeOs-|-2S0 2 -f-SiF4. It crystallizes in needles or prisms and volatilizes when heated, giving a pale yellow vapour. It is very hygroscopic, and dissolves in water and alcohol. It reacts with the caustic alkalis to form selemtes, and combines directly with hydrocyanic acid. It is decomposed by hydriodic acid with liberation of selenium and iodine, and by ammonia with formation of selenium and nitrogen. Selenious acid, H 2 Se0 3 , is obtained in the crystalline form when a solution of selenium dioxide in water is

concentrated over sulphuric acid. It effloresces on exposure to air. Oxidizing agents readily convert it into selenic acid, whilst reducing agents transform it into selenium. It yields normal, acid and super-acid salts (e.g. KHSe0 3 H 2 Se0 3). It is decomposed by many acids with liberation of selenium. Selenic acid, H 2 Se04, was discovered by E. Mitscherlich (Pogg. Ann., 1827, 85, p. 623). Its salts, the selen ates, are obtained by the oxidation of the selenites, and the free acid may be obtained by the decomposition of the lead, or barium salt. It is also obtained in the electrolysis of solutions of selenious acid (C. Manuelli and G. Lazzarini, Gazz., 1909, 39, 1, p. 50). The acid crystallizes in hexagonal prisms and melts at 58 C. It dissolves in water and yields a hydrate of composition H 2 Se0 4 H 2 0. It is very, hygroscopic, dissolves sulphur readily and acts on organic compounds in a manner similar to sulphuric acid. It decomposes when strongly heated. The selenates are isomorphous with the chromates and sulphates. A compound of selenium and sulphur has been described as resulting from the action of sulphuretted hydrogen on selenious acid, but A. Gutbier (Zeit. anbrg. Chem., 1905, 43, p. 384) is of the opinion that in this reaction, at ordinary temperature, a simple reduction takes place, leading to the formationof a mixture of sulphur and selenium. Selenium sulphoxide, SeS0 3 , is formed as a yellowish crystalline mass when selenium is warmed with sulphur trioxide. It decomposes when heated above 35 C, and also in the presence of water. A compound of composition, SeSOj, has been obtained by the addition of selenium dioxide to sulphuric acid saturated with sulphur trioxide (R. Metznen, Ann. chim. phys., 1898, (7), 15, p. 203). It crystallizes in colourless needles. Selenosulphuric acid, H 2 SeS0 3r is only known in the form of its salts, which are usually obtained by the action of selenium on solutions of the metallic sulphites, a seleno trithionate being simultaneously produced. The salts are unstable and readily decompose when heated. Selenotrithionic acid, H 2 SeS 2 0«, is also obtained in the form of its potassium salt by the action of potassium hydrogen sulphite on a selenosulphate. It is readily decomposed by acids with liberation of sulphur dioxide and selenium.

Nitrogen selenide, N 2 Se 2 , is formed by the decomposition of selenium chloride with ammonia (A Verneuil, Bull. soc. chim., 1882, 38, p. 548). It crystallizes readily from benzene or acetic acid and ex- plodes when subjected to shock or when heated. It is also obtained when dry ammonia gas is passed into a dilute solution of selenyl chloride in benzene, the precipitate produced being digested with potassium cyanide to remove any selenium (V. Lenher and E. Wolesensky, Jour. Amer. Chem. Soc, 1907, 29, p. 215). It is a brick-

red powder which explodes when heated to 130° C. Selenium cyanide, Se(CN) 2 , is obtained by decomposing silver selenocyanide with cyanogen iodide, or by the action of silver cyanide on a solution of selenium bromide in carbon bisulphide. It crystallizes in tables and is very soluble in water. A more complex cyanide, Se 3 (CN) 2 , is obtained by passing a current of chlorine and air'into an aqueous solution of potassium selenocyanide (A. Verneuil, Ann. chim. phys., 1886 (6), 9, p. 289). It crystallizes in golden yellow needles and is decomposed by boiling water: 2Se 3 (CN) 2 -f-2H 2 = 4HCN+Se0 2 (5Se. When heated to 180 C. in vacuo it yields the simple cyanide Se(CN) 2 . Potassium selenocyanide, KSeCN, is obtained by the action of selenium on a concentrated aqueous solution of potassium cyanide, or by heating selenium with anhydrous potassium ferrocyanide (W. Crookes, Ann., 1851, 78, p. 177). It crystallizes in needles,

possesses an alkaline reaction, and is readily decomposed by acids with liberation of selenium. It forms numerous double salts.

Numerous determinations of the atomic weight of selenium have been made. The earlier results of J. J. Berzelius from an analysis of the chloride gave values from 79-2 to 79-35. Later determinations by V. Lenher {Jour. Amer. Chem. Sac, 1898, 20, p. 595), from the analysis of silver selenite and the reduction of the double selenium ammonium bromide, give values from 79-277 to 79-367; whilst J. Meyer (Ber., 1902, 35, p. 1591) by the electrolysis of silver selenite in the presence of potassium cyanide obtained the value 79-22.

SELEUCIA (Gr. 2e\ak«a), the name of several ancient Greek cities named after Seleucus I. Nicator, founder of the Seleucid dynasty. The following are the most important.

1. Seleucia on the Tigris, at the mouth of the great royal canal (Naharmalka, mod. Radhwaniya) from the Tigris to the Euphrates, about 50 m. N. of Babylon and 15 m. S. of Bagdad. It was founded by Seleucus Nicator (see Seleucid Dynasty), ruler of Babylonia from autumn 312. Seleucus, departing from the precedent of Alexander the Great, who, after his return from India, had settled in Babylon, preferred to build a new capital of a decidedly Greek character. The new city " was founded with the object of exhausting Babylon " (Plin. vi. 122; Strabo xvi. 738) ; a legend says that the Chaldaean

priests, when they were consulted about the right hour for the initiation of the city, tried to frustrate the design of the king by naming a wrong hour, but that by chance the work was begun in the moment predicted by the stars and the decree of fate accomplished (Appian, Syr. 58). Seleucia was peopled with Macedonians and Greeks; Syrians and Jews were admitted to the citizenship (Joseph. Ant. xviii. 9. 8). It obtained a free constitution. A great many other Greek cities were founded in Babylonia by Seleucus I. and Antiochus I., while Babylon and the other ancient cities (Sippara, Erech, Ur, Borsippa) decayed into mere villages. Here the Chaldaean priests continued to teach their astrological wisdom (we possess many astrological tablets in cuneiform writing from the time of the Seleucids and the earlier Arsacids); but Seleucia became the centre of the new hellenistic civilization (see Hellenism). A great many Greek authors were born here (e.g. the Stoic Diogenes of Babylonia, 2nd century), though the inhabitants of Seleucia in Babylonia generally are simply called Babylonians by the Greeks. In the time of Pliny the town was said to have 600,000 inhabitants (vi. 122). Seleucia suffered from the rebellion of the satrap Molon of Media, who was put down by Antiochus III. the Great in 220 (Polyb. v. 54). Antiochus IV. Epiphanes once more restored the Seleucid supremacy in the east; but after his death (163) the decay of the empire began and was accelerated by the intrigues of the Romans. In Babylonia the governor Timarchus rebelled and was acknowledged by the Roman senate. But he was defeated and killed by Demetrius I. (c. 158), who was hailed as deliverer (Soler, " saviour ") by the inhabitants (Appian, Syr. 45. 4 f . ; Trogus, Prol. 34; Diod. 31. 27a). Soon after, the great conquests of the Arsacid king Mithradates I. began; Babylonia became subject to the Parthians (c. 140). The Greek towns were very unwilling to submit to the foreign rule, and welcomed Antiochus VII. Sidetes, when in 130 he attempted to restore his empire; but his defeat by Phraates II. in 129 ended the Seleucid rule in the east. Seleucia and other towns were cruelly punished by Phraates and his prefect Himerus, who also devastated Babylon (Justin xlii. 1; Trog. Prol. 42; Diod. xxxv. 19. 21; cf. Posi- donius ap. Athen. xi. 466 b). Seleucia, however, maintained her self-government and her spirit of Greek independence (Plin. vi. 122; Tac. Ann. vi. 42; cf. Joseph. Ant. xviii. 9. 8 f.), and remained the greatest commercial town of the east. The Arsacids did not dare to bring their host of barbarian soldiers and retinue into Seleucia, but fixed their residence opposite to it on the left bank of the Tigris in Ctesiphon (Strabo xvi. 743; see Ctesiphon). In all the wars with the Romans Seleucia inclined to the western deliverers; from a.d. 37 to 43 it was in open rebellion against the Parthians (Tac. Ann. xi. 8 f.). Volo-

gaeses I. (a.d. 50-91) " founded the town Vologesocerta (near Ctesiphon) with the intention of draining the stormy Seleucia " (Plin. vi. 122). Trajan occupied Seleucia in 116. In the war of Marcus Aurelius and L. Verus against the Parthians, Seleucia

was taken by Avidius Cassius in 164, and then the Romans did what the Parthians had not dared to do: they burnt down the great Greek town with 300,000 inhabitants (Dio Cass. lxxi. 2; Zonar, xii. 2; Capitol. Vit. Veri, 8; Eutrop. 8. 10; Ammian. Marc, xxiii. 6. 24; xxiv. 5. 3). The great plague, which laid waste the Roman empire during the next years, is said to have sprung from the ruins of Seleucia. The destruction of Seleucia may be considered as the end of Hellenism in Babylonia. (See also Seleucid Dynasty and Hellenism.) (Ed. M.)

2. A city on the north frontier of Syria towards Cilicia about 4 m. N. of the mouth of the Orontes, near the shore at the foot of Mount Pieria (hence called Seleucia Pieria). This town also was founded by Seleucus I. It served as the port of Antioch (Acts xiii. 4), and with Apamea, Laodicea and Antioch formed the Syrian tetrapolis. Considerable remains are still visible: the chief are those of a cutting through the solid rock nearly 1 1 00 yds. long, which Polybius describes as the road from the city to the sea; the triple line of walls; amphitheatre, cemetery, citadel, temples. It was of great importance in the struggle between the Seleucids and the Ptolemies; captured by Ptolemy Euergetes in 246, it was recovered by Antiochus III. the Great in 219. It was recognized as independent by the Romans in 70, but little of its subsequent history is known. It had practically ceased to exist in the 5th century a.d. The district stretching inland was known as Seleucis.

3. Seleucia Tracheotis, sometimes called Trachea, a city of Cilicia on the Calycadnus (Geuk Su), also founded by Seleucus I. about 300 B.C., near the older Olbia. It had considerable commercial prosperity as the port of Isauria, and was even a rival of Tarsus. In 113 7 it was besieged by Leon, king of Cilician Armenia. On the 10th of June n 90 the emperor Frederick Barbarossa was drowned in trying to cross the Calycadnus. In the 13th century it was captured by the Seljuks. There are many ancient remains, and on the Acropolis the ruins of a castle; many rock-cut tombs with inscriptions have been found. On the site is the modern Selefke, the chief town of the Ichili sanjak.

Other towns bearing the name Seleucia were: — (4) Seleucia in Mesopotamia, the modern Birejik; (5) in the Persian Margiana,

founded as Alexandria by Alexander the Great and rebuilt as Seleucia by Antiochus I. (of Syria) ; (6) in Pisidia; (7) in Pamphylia; (8) on the Belus in Syria. The city of Tralles (q.v.) also bore the name for a short period.

SELEUCID DYNASTY, a line of kings who reigned in Nearer Asia from 312 to 65 B.C.

The founder Seleucus (surnamed for later generations Nicator) was a Macedonian, the son of Antiochus, one of Philip's generals. Seleucus, as a young man of about twenty- three, accompanied Alexander into Asia in 333, and won distinction in the Indian campaign of 326. When the Macedonian empire was divided in 323 (the "Partition of Babylon ") Seleucus was given the office of chiliarch (Gr. -)(l\u)i, a thousand), which attached him closely to the person of the regent Perdiccas. Seleucus himself had a hand in the murder of Perdiccas in 321. At the second partition, at Triparadisus (321), Seleucus was given the government of the Babylonian satrapy. In 316, when Antigonus had made himself master of the eastern provinces, Seleucus felt himself threatened and fled to Egypt. In the war which followed between Antigonus and the other Macedonian chiefs, Seleucus actively co-operated with Ptolemy and commanded Egyptian squadrons in the Aegean. The victory won by Ptolemy at Gaza in 3 1 2 opened the way for Seleucus to return to the east. His return to Babylon in that year was afterwards officially regarded as the beginning of the Seleucid empire. Master of Babylonia, Seleucus at once proceeded to wrest the neighbouring provinces of Persis, Susiana and Media from the nominees of Antigonus. A raid into Baby- lonia conducted in 311 by Demetrius, son of Antigonus, did not seriously check Seleucus's progress. Whilst Antigonus was occupied in the west, Seleucus during nine years (3 11-302) brought under his authority the whole eastern part of Alexander's empire as far as the Jaxartes and Indus. In 305, after the extinction of the old royal line of Macedonia, Seleucus, like the other four principal Macedonian chiefs, assumed the style of king.

His attempt, however, to restore Macedonian rule beyond the Indus, where the native Chandragupta had established himself, was not successful. Seleucus entered the Punjab, but felt himself obliged in 302 to conclude a peace with Chandragupta, by which he ceded large districts of Afghanistan in return for 500 elephants. The pressing

need for Seleucus once more to take the field against Antigonus was at any rate in large measure the cause of his abandonment of India. In 301 he joined Lysimachus in Asia Minor, and at Ipsus Antigonus fell before their combined power. A new partition of the empire followed, by which Seleucus added to his kingdom Syria, and perhaps some regions of Asia Minor. The possession of Syria gave him an opening to the Mediterranean, and he immediately founded here the new city of Antioch upon the Orontes as his chief seat of government. His previous capital had been the city of Seleucia which he had founded upon the Tigris (almost coinciding in site with Bagdad), and this continued to be the capital for the eastern satrapies. About 293 he installed his son Antiochus there as viceroy, the vast extent of the empire seeming to require a double government. The capture of Demetrius in 285 added to Seleucus's prestige. The unpopularity of Lysimachus after the murder of Agathocles gave Seleucus an opportunity for removing his last rival. His interven- tion in the west was solicited by Ptolemy, Ceraunus, who, on the accession to the Egyptian throne of his brother Ptolemy II. (285), had at first taken refuge with Lysimachus and then with Seleucus. War between Seleucus and Lysimachus broke out, and on the field of Coru-pedion in Lydia Lysimachus fell (281). Seleucus now saw the whole empire of Alexander, Egypt alone excepted, in his hands, and moved to take possession of Mace- donia and Thrace. He intended to leave Asia to Antiochus and content himself for the remainder of his days with the Macedonian kingdom in its old limits. He had, however, hardly crossed into the Chersonese when he was assassinated by Ptolemy Ceraunus near Lysimachia (281).

Antiochus I. Soter (324 or 323-262) was half a Persian, his mother Apame being one of those eastern princesses whom Alexander had given as wives to his generals in 324. On the assassination of his father (281), the task of holding together the empire was a formidable one, and a revolt in Syria broke out almost immediately. With his father's murderer, Ptolemy, Antiochus was soon compelled to make peace, abandoning apparently Macedonia and Thrace. In Asia Minor he was unable to reduce Bithynia or the Persian dynasties which ruled in Cappadocia. In 278 the Gauls broke into Asia Minor, and a victory which Antiochus won over these hordes is said to have been the origin of his title of Soter (Gr. for " saviour ") . At the end of 275 the question of Palestine, which had been open between the houses of Seleucus and Ptolemy since the partition of 301, led to hostilities (the " First Syrian War ")• It had been con- tinuously in Ptolemaic occupation, but the house of Seleucus maintained its claim. War did not materially change the out- lines of

the two kingdoms, though frontier cities like Damascus and the coast districts of Asia Minor might change hands. About 262 Antiochus tried to break the growing power of Pergamum by force of arms, but suffered defeat near Sardis and died soon afterwards (262). His eldest son Seleucus, who had ruled in the east as viceroy from 275 (?) till 268/7, was P u t to death in that year by his father on the charge of rebellion (Wace, J.H.S. xxv., 1005, p. 101 f.). He was succeeded (261) by his second son Antiochus II. Theos (286-246), whose mother was the Mace- donian princess Stratonice, daughter of Demetrius Poliorcetes. War with Egypt still went on along the coasts of Asia Minor (the " Second Syrian War "). Antiochus also made some attempt to get a footing" in Thrace. About 250 peace was concluded between Antiochus and Ptolemy II., Antiochus repudiating his wife Laodice and marrying Ptolemy's daughter Berenice, but by 246 Antiochus had left Berenice and her infant son in Antioch to live again with Laodice in Asia Minor. Laodice poisoned him and proclaimed her son Seleucus II. Caixinicus (reigned 246-2 27) king, whilst her partisans at Antioch made away with Berenice and her son. Berenice's brother, Ptolemy III., who had just succeeded to the Egyptian throne,

at once invaded the Seleucid realm and marched victoriously to the Tigris or beyond, receiving the submission of the eastern provinces, whilst his fleets swept the coasts of Asia Minor. In the interior of Asia Minor Seleucus maintained himself, and when Ptolemy returned to Egypt he recovered Northern Syria and the nearer provinces of Iran. In Asia Minor his younger brother Antiochus Hierax was put up against him by a party to which Laodice herself adhered. At Ancyra (about 235?) Seleucus sustained a crushing defeat and left the country beyond the Taurus to his brother and the other powers of the peninsula. Of these Pergamum now rose to greatness under Attalus I., and Antiochus Hierax perished as a fugitive in Thrace in 228/7. A year later Seleucus was killed by a fall from his horse. His elder son, Seleucus III. Soter (reigned 227-223), took up the task of reconquering Asia Minor from Attalus, but fell by a conspiracy in his own camp.

Antiochus III. the Great (242-187), Callinicus's younger son, a youth of about eighteen, now succeeded to a disorganized kingdom (223). Not only was Asia Minor detached, but the further eastern provinces had broken away, Bactria under the Greek Diodotus (q.v.), and Parthia under the nomad chieftain Arsaces. Soon after Antiochus's accession, Media and Persis revolted under their governors, the brothers Molon and Alex- ander. The young king was in the hands of the bad minister Hermeias, and was induced to make an attack on

Palestine instead of going in person to face the rebels. The attack on Palestine was a fiasco, and the generals sent against Molon and Alexander met with disaster. Only in Asia Minor, where the Seleucid cause was represented by the king's cousin, the able Achaeus, was its prestige restored and the Pergamene power driven back to its earlier limits. In 221 Antiochus at last went east, and the rebellion of Molon and Alexander collapsed. The submission of Lesser Media, which had asserted its independence under Artabazanes, followed. Antiochus rid himself of Hermeias by assassination and returned to Syria (220). Meanwhile Achaeus himself had revolted and assumed the title of king in Asia Minor. Since, however, his power was not well enough grounded to allow of his attacking Syria, Antiochus considered that he might leave Achaeus for the present and renew his attempt on Palestine. The campaigns of 219 and 218 carried the Seleucid arms almost to the confines of Egypt, but in 217 Ptolemy IV. confronted Antiochus at Raphia and inflicted a defeat upon him which nullified all Antiochus's successes and compelled him to withdraw north of the Lebanon. In 216 Antiochus went north to deal with Achaeus, and had by 214 driven him from the field into Sardis. Antiochus contrived to get possession of the person of Achaeus (see Polybius), but the citadel held out till 213 under Achaeus's widow and then surrendered. Having thus recovered the central part of Asia Minor — for the dynasties in Pergamum, Bithynia and Cappadocia the Seleucid government was obliged to tolerate — Antiochus turned to recover the outlying provinces of the north and east. Xerxes of Armenia was brought to acknowledge his supremacy in 212. In 209 Antiochus invaded Parthia, occupied the capital Hecatompylus and pushed forward into Hyrcania. The Parthian king was apparently granted peace on his submission. In 209 Antiochus was in Bactria, where the original rebel had been supplanted by another Greek Euthydemus (see further Bactria and articles on the separate rulers). The issue was again favourable to Antiochus. After sustaining a famous siege in his capital Bactra (Balkh), Euthydemus obtained an honour- able peace by which the hand of one of Antiochus's daughters was promised to his son Demetrius. Antiochus next, following in the steps of Alexander, crossed into the Kabul valley, received the homage of the Indian king Sophagasenus and returned west by way of Seistan and Kerman (206/5). From Seleucia on the Tigris he led a short expedition down the Persian Gulf against the Gerrhaeans of the Arabian coast (205/4). Antiochus seemed to have restored the Seleucid empire in the east, and the achieve- ment brought him the title of " the Great King." In 205/4 the infant Ptolemy V. Epiphanes succeeded to the Egyptian throne, and Antiochus concluded a secret pact with Philip of

Macedonia for the partition of the Ptolemaic possessions. Once more Antiochus attacked Palestine, and by 199 he seems to have had possession of it. It was, however, recovered for Ptolemy by the Aetolian Scopas. But the recovery was brief, for in 198 Scopas was defeated by Antiochus at the battle of the Panium, near the sources of the Jordan, a battle which marks the end of Ptolemaic rule in Palestine. In 197 Antiochus moved to Asia Minor to secure the coast towns which had acknowledged Ptolemy and the independent Greek cities. It was this enterprise which brought him into antagonism with Rome, since Smyrna and Lampsacus appealed to the republic of the west, and the tension became greater after Antiochus had in 196 established a footing in Thrace. The evacuation of Greece by the Romans gave Antiochus his opportunity, and he now had the fugitive Hannibal at his court to urge him on. In 192 Antiochus invaded Greece, having the Aetolians and other Greek states as his allies. In 191, however, he was routed at Thermopylae by the Romans under Manius Acilius Glabrio, and obliged to withdraw to Asia. But the Romans followed up their success by attacking Antiochus in Asia Minor, and the decisive victory of L. Cornelius Scipio at Magnesia ad Sipylum (190), following on the defeat of Hannibal at sea off Side, gave Asia Minor into their hands. By the peace of Apamea (188) the Seleucid king abandoned all the country north of the Taurus, which was distributed among the friends of Rome. As a consequence of this blow to the Seleucid power, the outlying provinces of the empire, recovered by Antiochus, reasserted their independence. Antiochus perished in a fresh expedition to the east in Luristan (187).

The Seleucid kingdom as Antiochus left it to his son, Seleucus IV. Philopator (reigned 187-176), consisted of Syria (now including Cilicia and Palestine), Mesopotamia, Babylonia and Nearer Iran (Media and Persis). Seleucus IV. was compelled by financial necessities, created in part by the heavy war-indemnity exacted by Rome, to pursue an unambitious policy, and was assassinated by his minister Heliodorus. The true heir, Demetrius, son of Seleucus, being now retained in Rome as a hostage, the kingdom was seized by the younger brother of Seleucus, Antiochus IV. Epiphanes (i.e. "the Manifest [god]"; parodied Epimanes, "the mad"), who reigned 176-164. In 170 Egypt, governed by regents for the boy Ptolemy Philo- metor, attempted to reconquer Palestine; Antiochus not only defeated this attempt but invaded and occupied Egypt. He failed to take Alexandria, where the people set up the younger brother of

Philometor, Ptolemy Eurgetes, as king, but he left Philometor as his ally installed at Memphis. When the two brothers combined, Antiochus again invaded Egypt (168), but was compelled to retire by the Roman envoy C. Popillius Laenas (consul 172), after the historic scene in which the Roman drew a circle in the sand about the king and demanded his answer before he stepped out of it. Antiochus exercised his contemporaries by the riddles of his half-brilliant, half-crazy personality. He had resided at Rome as a hostage, and afterwards for his pleasure at Athens, and had brought to his kingdom an admiration for republican institutions and an enthusiasm for Hellenic culture — or, at any rate, for its externals. There is evidence that the forms of Greek political life were more fully adopted under his sway by many of the Syrian cities. He spent lavishly on public buildings at home and in the older centres of Hellenism, like Athens. Gorgeous display and theatrical pomp were his delight. At the same time he scandalized the world by his riotous living and undignified familiarities. But he could persevere in an astute policy under the cover of an easy geniality and had no scruples. It is his contact with the Jews which has chiefly interested later ages, and he is doubtless the monarch described in the pseudo-prophetic chapters of Daniel (q.v.). Jerusalem, near the Egyptian frontier, was an important point, and in one of its internal revolutions Antiochus saw, perhaps not without reason, a defection to the Egyptian side. His chastisement of the city, including as it did the spoliation of the temple, served the additional purpose of relieving his financial necessities. It was a measure of a very different kind when, a year or two later (after 168), Antiochus tried to suppress the practices of Judaism by force, and it was

this which provoked the Maccabaean rebellion (see Maccabees) . In 166 Antiochus left Syria to attempt the reconquest of the further provinces. He seems to have been signally successful. Armenia returned to allegiance, the capital of Media was re- colonized as Epiphanea, and Antiochus was pursuing his plans in the east when he died at Tabae in Persis, after exhibiting some sort of mental derangement (winter 164/3).

He left a son of nine years, Antiochus V. Eupator (reigned 164-162), in whose name the kingdom was administered by a camarilla. Their government was feeble and corrupt. The attempt to check the Jewish rebellion ended in a weak com- promise. Their subservience to Rome so enraged the Greek cities of Syria that the Roman envoy Graeus Octavius (consul 165 B.C.) was assassinated in Laodicea (162). At this juncture Demetrius, the son of Seleucus IV., escaped from Rome and was received in Syria as the true king. Antiochus Eupator was

put to death. Demetrius I. Soter (reigned 162-150) was a strong and ambitious ruler. He crushed the rebellion of Timarchus in Media and reduced Judaea to new subjection. But he was" unpopular at Antioch, and fell before a coalition of the three kings of Egypt, Pergamum and Cappadocia. An impostor, who claimed to be a son of Antiochus Epiphanes, Alexander Balas (reigned 150-145), was installed as king by Ptolemy Philometor and given Ptolemy's daughter Cleopatra to wife, but Alexander proved to be dissolute and incapable, and when Demetrius, the son of Demetrius I., was brought back to Syria by Cretan con- dottieri, Ptolemy transferred his support and Cleopatra to the rightful heir. Alexander was defeated by Ptolemy at the battle of the Oenoparas near Antioch and murdered during his flight. Ptolemy himself died of the wound he had received in the battle.

Demetrius II. Nicator (first reign 145-140) was a mere boy, 1 and the misgovernment of his Cretan supporters led to the infant son of Alexander Balas, Antiochus VI. Dionysus, being set up against him (145) by Tryphon, a magnate of the kingdom. Demetrius was driven from Antioch and fixed his court in the neighbouring Seleucia. In 143 Tryphon murdered the young Antiochus and assumed the diadem himself. Three years later Demetrius set off to reconquer the eastern provinces from the Parthians, leaving Queen Cleopatra tr> maintain his cause in Syria. When Demetrius was taken prisoner by the Parthians, his younger brother Antiochus VII. Sidetes (164- 129) appeared in Syria, married Cleopatra and crushed Tryphon. Antiochus VII. was the last strong ruler of the dynasty (138-129). He took Jerusalem and once more brought the Jews, who had won their independence under the Hasmonaean family, to subjection (see Maccabees). He led a new expedition against the Parthians in J30, but, after signal successes, fell fighting in 129 (see also Persia, History). Demetrius (second reign 129-126), who had been allowed by the Parthians to escape, now returned to Syria, but was soon again driven from Antioch by a pretender, Alexander Zabinas, who had the support of the king of Egypt. Demetrius was murdered at the instigation of his wife Cleopatra in 126. The remaining history of the dynasty is a wretched story of the struggle of different claimants, while the different factors of the kingdom, the cities and barbarian races, more and more assert their independence. Both Demetrius II. and Antiochus VII. left children by Cleopatra, who form rival branches of the royal house. To the line of Demetrius belong his son Seleucus V. (126), assassinated by his mother Cleo- patra, Antiochus VIII. Grypus (141-96), who succeeded in 126 the younger brother of Seleucus V., the sons of Grypus, Seleucus VI. Epiphanes Nicator

(reigned 96-95), Antiochus XI. Epiphanes Philadelphus (reigned during 95), Philip I. (reigned 95-83), Demetrius III. Eukairos (reigned 95-88), and Antiochus XII. Dionysus Epiphanes (reigned 86?-8s?), and lastly Philip II., the son of Philip I., who appears momentarily on the stage in the last days of confusion. To the line of Antiochus VII. belong his son Antiochus IX. Cyzicenus (reigned 116-95), tne son of Cyzicenus, Antiochus X. Eusep.es (reigned 95-83?), and the son of Eusebes, Antiochus XIII. Asiaticus (reigned 69-65). In 83 Tigranes, the king of Armenia, invaded Syria, and by 69 his conquest had reached as far as Ptolemais, when he was obliged to evacuate Syria to defend his own kingdom from the Romans. When Pompey appeared in Syria in 64, Antiochus XIII. begged to be restored to his ancestral

1 Some of the indications of our documents would make him older, and these are followed by Niese (iii. p. 276, note 5). But in that case Demetrius I. must have already had a wife and son when he escaped from Rome, and it seems to me highly improbable that such a material factor in the situation would have been left out of account in Polybius's full narrative. After all, it is only a question of probabilities, and the difficulties of fitting a wife and child into the story seem to be very great, whether we conceive them left behind by Demetrius in Italy, or sent out of the country before him.

kingdom or what shred was left of it. Pompey refused and made Syria a Roman province. Antiochus Grypus had given his daughter in marriage to Mithradates (q.v.), a king of Commagene, and the subsequent kings of Commagene (see under Antiochus) claimed in consequence still to represent the Seleucid house after it had become extinct in the male line, and adopted Antiochus as the dynastic name. The kingdom was extinguished by Rome in 72. The son of the last king, Gaius Julius Antiochus Epiphanes Philopappus, was Roman consul for a.d. 100.

Authorities. — E. R. Bevan, House of Seleucus (1902), and the earlier literature of the subject there cited. In addition may be mentioned Dssa. Adalgisa Corvatta, Divisione amininistrativa del- V impero dei Seleucidi (1901) ; Haussoullier, Histoire de Milet el du Didymeion (1902) ; B. Niese, Gesch. d. griech. u. maked. Staaten, Teil 3 (1903); J. Beloch. Griechische Geschichte, vol. iii. ; G. Mac-donald, " Early Seleucid Portraits," Journ, of Hell. Stud, xxiii.

(1903), P- 92 '•; A. J. B. Wace, "Hellenistic Royal Portraits," Journ. of Hell. Stud. xxv. (1905), p. 86 f. For the chronology of the end of the reign of Antiochus Epiphanes and the Maccabaean revolt, see a paper by J. Wellhausen, " Uber den geschichtlichen Wert des 2ten Makkabaerbuchs," Nachrichten d. k. Gesellschaft d. Wissensch. zu Gottingen. Philol.-hist. Klasse, 1905, Heft 2; and Maccabees, History. (E. R. B.)

SELF (O.Eng. seolf, silf, &c, cf. Dutch zelf, Ger. selbe, selbst), as a pronoun, an element attached to a personal pronoun or pro- nominal adjective to give emphasis, or to indicate a reflexive use; as an adjective a word properly meaning same, identical, also very (seen in the expression " self-same "), hence single, plain, not mixed with another colour. It is also a florist's term for a flower which has uniformity of tint, without markings or other tints. As a noun " self " means one's own person; for the psychological use of the term see Psychology, &c, and for its ethical aspect Egoism.

SELIGMAN, EDWIN ROBERT ANDERSON (1861-), American economist, was born at New York on the 25th of April 1861. He was educated at Columbia University, and, after studying for three years in Germany and France, became prize lecturer at Columbia University in 1885, being made adjunct professor of political economy in 1888. He became McVickar professor of political economy in the same university in 1904. His principal works are Railway Tariffs (1887), The Shifting and Incidence of Taxation (1899; 3rd ed., 1910), Progressive Taxation in Theory and Practice (1894; 2nd ed. 1908), Economic Interpre- tation of History (1902; 2nd ed. 1907), and Principles of Eco- nomics (1907).

SELIM, the name of three sultans of Turkey.

Selim I. (1465-1521) succeeded in 1512 his father Bayezid II., whom he dethroned, and whose death, following immediately afterwards, gave rise to suspicions which Selim's character certainly justified. He signalized his accession by putting to death his brothers and nephews; and gave early proof of resolu- tion by boldly cutting down before their troops two officers who showed signs of insubordination. A bigoted Sunni, he resolved on putting down the Shi'ite heresy, which had gained many adherents in Turkey: the number of these was estimated as high as 40,000. Selim determined on war with Persia, where the heresy was the prevalent religion, and in order that the Shi'ites in Turkey should give no trouble during the war, " measures were taken," as the Turkish historian states, which may be explained as the reader desires, and which proved fully

efficacious. The campaign which followed was a triumph for Selim, whose firmness and courage overcame the pusillanimity and insubordination of the Janissaries. Syria and Egypt next fell before him; he became master of the holy cities of Islam; and, most important of all, he induced the last Caliph of the Abbasid dynasty formally to surrender the title of caliph (q.v.), as well as its outward emblems, viz. the holy standard, the sword and the mantle of the prophet. The dignity with which the Ottoman sultans have thereby become invested lends them that prestige throughout the Mussulman world which is of such importance to the present day, and which has thrown into oblivion the condition that the caliph ought to be an Arab of the tribe of Koreish. After his return from his Egyptian campaign, he was preparing an expedition against Rhodes when he was overtaken by sickness and died, on the 22nd of September 1521, in the ninth year of his reign, near the very spot where he had

attacked his father's troops, hot far from Adrianople. He was about fifty-five years of age. He was bigoted, bloodthirsty and relentless, though one Turkish historian praises his humanity for having forbidden the cutting up alive of condemned persons, or the roasting of them before a slow fire; and at one time he was with difficulty dissuaded from ordering the complete extirpa- tion of all the Christians in Turkey. His ambition was insatiable; he is said to have exclaimed when looking at a map that the whole world did not form a sovereignty vast enough for one monarch. His four months' victorious campaign against Persia was undertaken and successfully carried through contrary to the advice of his ministers, several of whom he executed for their opposition to his plans; and he achieved an enterprise which neither Jenghiz Khan nor Timur was able to carry out. It is said that he contemplated the conquest of India and that he was the first to conceive the idea of the Suez Canal.

Selim II. (1 5 24-1 5 74) was a son of Suleiman I . and his favourite Roxelana, and succeeded his father in 1566. He was the first sultan entirely devoid of military virtues and willing to abandon all power to his ministers, provided he were left free to pursue his orgies and debauches. Fortunately for the country, an able grand vizier, Mahommed Sokolli, was at the head of affairs, and two years after Selim's accession succeeded in concluding at Constantinople an honourable treaty with the emperor Maxi- milian II., whereby the emperor agreed to pay to Turkey an annual " present " of 30,000 ducats (Feb. 17, 1568). Against Russia he was less fortunate, and the first encounter between Turkey and her future northern rival gave presage of disaster to come. A plan had been elaborated at Constantinople for uniting the Volga and Don by a canal, and in the

summer of 1569 a large force of Janissaries and cavalry were sent to lay siege to Astrakhan and begin the canal works, while an Ottoman fleet besieged Azov. But a sortie of the garrison of Astrakhan drove back the besiegers; 15,000 Russians, under Knes Sere- bianov, attacked and scattered the workmen and the Tatar force sent for their protection; and, finally, the Ottoman fleet was destroyed by a storm. Early in 1570 the ambassadors of Ivan the Terrible concluded at Constantinople a treaty which restored friendly relations between the sultan and the tsar. Expeditions in the Hejaz and Yemen were more successful, and the conquest of Cyprus in 1571, which provided Selim with his favourite vintage, led to the calamitous naval defeat of Lepanto in the same year, the moral importance of which has often been under-estimated, and which at least freed the Mediter- ranean from the corsairs by whom it was infested. Turkey's shattered fleets were soon restored, and Sokolli was preparing for a fresh attack on Venice, when the sultan's death on the 1 2th of December 1574 cut short his plans. Little can be said of this degenerate son of Suleiman, who during the eight years of his reign never girded on the sword of Osman, and preferred the clashing of wine-goblets to the shock of arms, save that with the dissolute tastes of his mother he had not inherited her ferocity. Selim III. (1762-1808) was a son of Sultan Mustafa III. and succeeded his uncle Abd-ul-Hamid I. in 1789. The talents and energy with which he was endowed had endeared him to the people, and great hopes were founded on his accession. He had associated much with foreigners, and was thoroughly persuaded of the necessity of reforming his state. But Austria and Russia gave him no time for anything but defence, and it was not until the peace of Jassy (1792) that a breathing space was allowed him in Europe, while Bonaparte's invasion of Egypt and Syria soon called for Turkey's strongest efforts and for the time shattered the old-standing French alliance. Selim profited by the respite to abolish the military tenure of fiefs; he intro- duced salutary reforms into the administration, especially in the fiscal department, sought by well-considered plans to extend the spread of education, and engaged foreign officers as instructors, by whom a small corps of new troops called nizam-i-jedid were collected and drilled. So well were these troops organized that they were able to hold their own against rebellious Janissaries in the European provinces, where disaffected governors made no scruple of attempting to make use of them against the reforming

sultan. Emboldened by this success, Selim issued an order that in future picked men should be taken annually from the Janissaries to serve in their ranks. Hereupon the Janissaries and other enemies of progress rose at Adrianople, and in view of their number, exceeding 10,000, and the violence of their opposition, it was decided that the reforms must be given up for the present. Servia, Egypt and the principalities were successively the scene of hostilities in which Turkey gained no successes, and in 1807 a British fleet appeared at Constantinople, strange to say to insist on Turkey's yielding to Russia's demands besides dismissing the ambassador of Napoleon I. Selim was, however, thoroughly under the influence of this ambassador, Sebastiani, and the fleet was compelled to retire without effect- ing its purpose. But the anarchy, manifest or latent, existing throughout the provinces proved too great for Selim to cope with. The Janissaries rose once more in revolt, induced the Sheikh-ul-Islam to grant a fetva against the reforms, dethroned and imprisoned Selim (1807), and placed his nephew Mustafa on the throne. The pasha of Rustchuk, Mustafa Bairakdar, a strong partisan of the reforms, now collected an army of 40,000 men and marched on Constantinople with the purpose of reinstating Selim. But he came too late; the ill-fated reforming sultan had been strangled in the seraglio, and Bairakdar's only resource was to wreak his vengeance on Mustafa and to place on the throne Mahmud II., the sole surviving member of the house of Osman.

For authorities see Turkey : History.

SELINUS (SeXtvoOs), an ancient city on the S. coast of Sicily, 27 m. S.E. direct from Lilybaeum (the modern Marsala) and 7 m. S.E. of Castel Vetrano, which is 74 m. S.S.W. of Palermo by rail. It was founded, according to Thucydides, in 628 B.C. by colonists from Megara Hyblaea, and from the parent city of Megara (see Sicily: History). The name, which belonged both to the city and to the river on the W. of it, was derived from the wild celery l which grows there abundantly, and which appears on some of its coins (see Numismatics, Greek, § " Sicily "). We hear of boundary disputes with Segesta as early as 580 B.C. Selinus soon grew in importance, and extended its borders from the Mazarus to the Halycus. Its wealth is shown by the fact that several of its temples belong to the first half of the 6th century B.C. Its government was at first oligarchical, but about 510 B.C. a short-lived despotism was maintained by Peithagoras and, after him, Euryleon (Herod, v. 43, 46). In 480 B.C. Selinus took the Carthaginian side. After this it seems to have enjoyed prosperity: Thucydides (vi. 20) speaks of its wealth and of the

to, and an overwhelming force (the Siceliot cities delaying too much in coming to the rescue) under Hannibal took and destroyed the city in 409 B.C.; the walls were razed to the ground; 6000 inhabitants were killed, 5000 taken prisoners, and only 2600 escaped to Agrigentum (Acragas). 8 In 408 Hermocrates, return- ing from exile, occupied Selinus and rebuilt the walls; and it is to him that the fine fort on the neck of the acropolis must be attributed. Hence he attacked Motya and Panormus and the rest of Punic Sicily. He fell, however, in 407 in an attempt to enter Syracuse, and, as a result of the treaty of 405 B.C., Selinus became absolutely subject to Carthage, and remained so until its destruction at the close of the first Punic War, when its inhabitants were transferred to Lilybaeum. It was never afterwards rebuilt, and Strabo (vi. p. 272) mentions it as one of the extinct cities of Sicily.

The ancient city occupied a sand-hill running N. and S.; the S. portion, overlooking the sea, which was the acropolis, is surrounded by fine walls of masonry of rectangular blocks of stone, which show traces of the reconstruction of 408 B.C. It is traversed by two main streets, running N. and S. and E. and W., from which others diverged at right angles. There are, however, some traces of earlier buildings at a different orientation. Only the S.E. portion of the acropolis, which contains several temples, has been excavated: in the rest private houses seem to predominate. The deities to whom the temples were dedi- cated not being certainly known, they are as a rule indicated by letters. In all the large temples the cella is divided into two parts, the smaller and inner of which (the adytum) was intended for the cult image. The opisthodomus is sometimes omitted. All of them lie in a state of ruin, and, from the disposition of the drums of the columns, it is impossible to suppose that their fall was due to any other cause than an earthquake. Temple C is the earliest of those on the acropolis. It had six columns at each end (a double row in the front) and seventeen on each long side. From it came the three archaic metopes now in the museum at Palermo, which are of great importance in the history of the development of art, showing Greek sculpture in its infancy. Portions of the coloured terra-cotta slabs which decorated the cornice and other architectural members have also been dis- covered. Next to it on the N. lies temple D, both having been included in one temenos, with other buildings of less importance: to the E. of D is a large altar. B is a small temple of compara- tively late date; while A and O lie on the S. side of the main street from E. to W. in another peribolos.

Table

of Measurements of the Temples (in feet).

A.

B.

C.

O.

D.

E.

F.

G.

Length excluding

steps . . Breadth excluding

132

3iJ

*209**

183!

*222**

203

362

steps ....

53l

l8J

78i

*77**

8 3,

8oi

164J

Length of cella .

94i

*136**

129

I63I

(?)

226 (?)*

Breadth of cella

28}

*34**

32!

461

3«>i

69

Height of columns

with capitals .

23i (?)

28f

27!

33i

Diameter of columns

at bottom

*4**

6J

6

61

51

8! (ui)

Number of columns

in peristasis .

36

4

42

36(?)

34

38

T, • 36

46

Class ....

Penpteros-

Prostylos-

Peripteros-

Penpteros-

Penpteros-

Peripteros-

Pseudo-dipteros-

hexa stylos

tetrastylos

hexastylos

hexastylos

hexastylos

hexastylos

octostylos

Approximate date .

480 B.C.

After 240

B.C.

581 B.C.

480 B.C.

570-554 B.C.

Soon after 480 B.C.

570-554 B.C.

treasures in its temples, and the city had a treasury of its own at Olympia.

A dispute between Selinus and Segesta (probably the revival of a similar quarrel about 454, when an Athenian force appears to have taken part 2) was one of the causes of the Athenian expedition of 415 B.C. At its close the former seemed to have the latter at its mercy, but an appeal to Carthage was responded

1 The plant was formerly thought to be wild parsley. It is now generally agreed that it is celery.

2 Cf. Timaeus, fr. 99, with Diod. xi. 86 and I.G. xiv. p. 45, No. 268.

At the N. end of the acropolis are extensive remains of the fortifications of Hermocrates across the narrow neck connecting it with the

rest of the hill. In front of the wall lies a deep trench, into which several passages descend, as at the nearly contemporary fort of Euryelus above Syracuse (q.v.). Outside this again lies a projecting semicircular bastion, which commands the entrance from the exterior of the city on the E., a winding trench approached by a pair of double gateways, which are not vaulted but covered by the gradual projection of the upper courses. Capitals and triglyphs

3 The figures are those of Diodorus (xiii. 58), but seem strangely small.

from earlier buildings have been used in the construction of these fortifications : from their small size they may be mostly attributed to private houses. A way across the curving trench leads to an open space, where the Agora may have been situated : beyond it lay the town, the remains of which are scanty, though the line of the walls can be traced.

Outside the ancient city, on the W. of the river Selinus, lie the ruins of a temple of Demeter, with a propylon leading to the sacred enclosure: the temple itself has a cella with a narrow door and without columns. A large number of votive terra-cotta figures, vases and lamps were found in the course of the excavations. The earliest temple must have been erected soon after the foundation of the city, while the later building which superseded it dates from shortly after 600 B.C. The propylon, on the other hand, may date from after 409 B.C.

On the hill E. of Selinus, separated from it by a small fiat valley, lies a group of three huge temples. No other remains have been found round them, though it seems improbable that they stood quite alone and unprotected. It is likely that they were outside the town, but stood in a sacred enclosure. All of them have fallen, undoubtedly owing to an earthquake. The oldest of the three is F. A peculiarity of the construction of this temple is that all the intercolumniations were closed by stone screens. In it were found the lower parts of two metopes. Next in date comes the huge temple G, which, as an inscription proves, was dedicated to Apollo ; though it was never entirely completed (many of the columns still remain unfluted), it was in use. The columns vary somewhat in diameter (more than even the difference caused by fluting would warrant) and three different

types of capital are noticeable. The plan is a curious one: despite the comparative narrowness of the cella, it had two rows of ten columns in it, in line with the front angles of the inner shrine. The third temple, E, has been proved by the discovery of an inscription to have been dedicated to Hera. It is famous for its fine metopes now in the museum at Palermo, belonging to the beginning of the 5th century B.C.

See R. Koldewey and O. Puchstein, Die griechischen Tempel in Unleritalien und SicUien (Berlin, 1899), 77-131. (T. As.)

SELJtJKS, Seljuks, or Seljuqs, the name of several Turkish dynasties issued from" one family, which reigned over large! parts of Asia in the nth, 12th arid 13th centuries of the Christian era. The history of the Seljuks forms the first part of the history of the Turkish empire. Proceeding from the deserts of Turkes- tan, the Seljuks reached the Hellespont; but this barrier was crossed and a European power founded by the Ottomans (Os- manli). The Seljuks inherited the traditions and at the same time the power of the Arabian caliphate, of which, when they made their appearance, only the shadow remained in the person of the Abbasid caliph of Bagdad. It is their merit from a Mahommedan point of view to have re-established the power of orthodox Islam and delivered the Moslem world from the subversive influence of the ultra-Shiite tenets, which constituted a serious danger to the duration of Islam itself. Neither had civilization anything to fear from them, since they represented a strong neutral power, which made the intimate union of Persian and Arabian elements possible, almost at the expense of the national Turkish — literary monuments in that language being during the whole period of the Seljuk rule exceedingly rare.

The first Seljuk rulers were Toghrul Beg, Chakir Beg and Ibrahim Niyal, the son of Mikail, the son of Seljuk, the son of Tukak, or Tuqaq (also styled Timuryalik, " iron bow "). They belonged to the Turkish tribe of the Ghuzz (Oufoi of Const. Porphyr. and the Byzantine writers), which traced its. lineage to Oghuz, the famous eponymic hero not only of this but of all Turkish tribes. There arose, however, at some undefined epoch a strife on the part of this tribe and some others with the rest of the Turks, because, as the latter allege, Ghuzz, the son (or grand- son) of Yafeth (Japhet), the son of Nuh (Noah), had stolen the genuine rain-stone, which Turk, also a son of Yafeth, had inherited from his father. By this party, as appears from this tradition, the Ghuzz were not considered to be genuine Turks, but to be Turkmans (that is, according to a popular etymology, resembling Turks). But the native tradition of the Ghuzz

was unquestion- ably right, as they spoke a pure Turkish dialect. The fact, however, remains that there existed a certain animosity between the Ghuzz and their allies and the rest of the Turks, which in- creased as the former became converted to Islam (in the course of the 4th century of the Flight). The Ghuzz were settled at that time in Transoxiana, especially at Jand, a well-known city on the banks of the Jaxartes, not far from its mouth. Some of

them served in the armies of the Ghaznavids Sabuktagin (Sebuk- tegin) and Maljmud (997-1030) ; but the Seljuks, a royal family among them, had various relations with the reigning princes of Transoxiana and Khwarizm, which cannot be narrated here. 1 But, friends or foes, the Ghuzz became a serious danger to the adjoining Mahommedan provinces from their predatory habits and continual raids, and the more so as they were very numerous. It may suffice to mention that, under the leadership of Pigu Arslan Israil, they crossed the Oxus and spread over the eastern provinces of Persia, everywhere plundering and destroying. The imprisonment of this chieftain by Masud, the son and suc- cessor of Mafimud, was of no avail: it only furnished his nephews with a ready pretext to cross the Oxus likewise in arms against the Ghaznavids. We pass over their first conflicts and the unsuccessful agreements that were attempted, to mention the decisive battle near Merv (1040), in which Masud was totally defeated and driven back to Ghazni (Ghazna). Persia now lay open to the victors, who proclaimed themselves independent at Merv (which became from that time the official capital of the principal branch of the Seljuks), and acknowledged Toghrul Beg as chief of the whole family. After this victory the three princes Toghrul Beg, Chakir Beg and Ibrahim Niyal separated in different directions and conquered the Mahommedan provinces east of the Tigris; the last named, after conquering Hamadan and the province of Jebel (Irak i Ajami), penetrated as early as 1048, with fresh Ghuzz troops, into Armenia and reached Manzikert, Erzerum and Trebizond. This excited the jealousy of Toghrul Beg, who summoned him to give up Hamadan and the fortresses of Jebel; but Ibrahim refused, and the progress of the Seljukian arms was for some time checked by internal discord — an ever- recurring event in their history. Ibrahim was, however, compelled to submit.

At this time the power of Qaim, the Abbasid caliph of Bagdad (see Caliphate, section C, § 26), was reduced to a mere shadow, as the Shiite dynasty of the Buyids and afterwards his more formidable Fatimite rivals had left him almost wholly destitute of authority. The real ruler at Bagdad was a Turk named Basaslri, lieutenant of the last Buyid, Malik-ar-Rahlm. Nothing could, therefore, be more

acceptable to the caliph than the protection of the orthodox Toghrul Beg, whose name was read in the official prayer (khotba) as early as 1050. At the end of the same year (1055) the Seljuk entered the city and after a tumult seized the person of Malik-ar-Rahim. Basaslri had the good fortune to be out of his reach; after acknowledging the right of the Fatimites, he gathered fresh troops and incited Ibrahim Niyal to rebel again, and he succeeded so far that he re-entered Bagdad at the close of 1058. The next year, however, Toghrul Beg got rid of both his antagonists, Ibrahim being taken prisoner and strangled with the bowstring, while Basaslri fell in battle. Toghrul Beg now re-entered Bagdad, re-established the caliph, and was betrothed to his daughter, but died before the con- summation of the nuptials (September 1063). Alp Arslan, the son of Chakir Beg, succeeded his uncle and extended the rule of his family beyond the former frontiers. He made himself master, e.g. of the important city of Aleppo; and during his reign a Turkish amir, Atsiz, wrested Palestine and Syria from the hands of the Fatimites. He made successful expeditions against the Greeks, especially that of 1071, in which the Greek emperor Romanus Diogenes was taken prisoner and forced to ransom himself for a large sum (see Roman Empire, Later). The foundation of the Seljuk empire of Rum (q.v.) was the immediate result of this great victory. Alp Arslan afterwards undertook an expedition against Turkestan, and met with his death at the hands of a captured chief, Barzami Yussuf (Yussuf Kothnal), whom he had intended to shoot with his own hand.

Malik Shah, the son and successor of Alp Arslan, had to encounter his uncle Kavurd, founder of the Seljukian empire of Kerman (see below), who claimed to succeed Alp Arslan in accordance with the Turkish laws, and led his troops towards Hamadan. However, he lost the battle that ensued, and the

1 Comp. Sachau, " Zur Geschichte und Chronologie von Khw5-rizm," in Sitzungsberichte of the Vienna Acad., lxxiv. 304 seq.

bowstring put an end to his life (1073). Malik Shah regulated also the affairs of Asia Minor and Syria, conceding the latter province as an hereditary fief to his brother Tutush, who estab- lished himself at Damascus and killed Atsiz. He, however,, like his father Alp Arslan, was indebted for his greatest fame to wise and salutary measures of their vizier, Nizam ul-Mulk. This extraordinary man, associated by

tradition with Omar Khayyam (q.v.), the well-known mathematician and free-thinking poet, and with Hassan (ibn) Sabbah, afterwards the founder of the sect of the Assassins (q.v.), was a renowned author and statesman of the first rank, and immortalized his name by the foundation of several universities (the Nizamiyah at Bagdad), observatories, mosques, hospitals and other institutions of public utility. At his instigation the calendar was revised, and a new era, dating from the reign of Malik Shah and known as the Jelalian, was introduced. Not quite forty days before the death of his master this great man was murdered by the Assassins. He had fallen into disfavour because of his unwillingness to join in the intrigues of the princess Turkan Khatun, who wished to secure the succession to the throne for her infant son Mahmud at the expense of the elder sons of Malik Shah.

Constitution and Government of the Seljuk Empire. — It has been already observed that the Seljuks considered themselves the de- fenders of the orthodox faith and of the Abbasid caliphate, while they on their side represented the temporal power which received its titles and sanction from the successor of the Prophet. All the members of the Seljuk house had the same obligations in this respect, but they had not the same rights, as one of them occupied relatively to the others a place almost analogous to that of the great khan of the Mongols in later times. This position was inherited from father to son, though the old Turkish idea of the rights of the elder brother often caused rebellions and violent family disputes. After the death of Malik Shah the head of the family was not strong enough to enforce obedience, and consequently the central govern- ment broke up into several independent dynasties. Within the limits of these minor dynasties the same rules were observed, and the same may be said of the hereditary fiefs of Turkish amirs not belonging to the royal family, who bore ordinarily the title of atabeg or aiabek (properly " father bey "), e.g. the atabegs of Fars, of Azerbaijan, of Syria, &c. The title was first given to Nizam ul-Mulk and expressed the relation in which he stood to the prince, — as lala, " tutor." The affairs of state were managed by the divan under the presidency of the vizier ; but in the empire of Rum its authority was inferior to that of the pervdneh, whom we may name " lord chancellor." In Rum the feudal system was extended to Christian princes, who were acknowledged by the sultan on condition of paying tribute and serving in the armies. The court dignitaries and their titles were manifold; not less manifold were the royal prerogatives, in which the sultans followed the example set by their predecessors, the Buyids.

Notwithstanding the intrigues of Turkan Khatun, Malik Shah was

succeeded by his elder son Barkiyaroq (1092-1104), whose short reign was a series of rebellions and strange adventures such as one may imagine in the story of a youth who is by turns a powerful prince and a miserable fugitive. 1 Like his brother Mahommed (1104-1118), who successfully rebelled against him, his most dangerous enemies were the Isma'iliteSj who had suc- ceeded in taking the fortress of Alamut (north of Kazvin) and become a formidable political power by the organization of bands of fedais, who were always ready, even at the sacrifice of their own lives, to murder any one whom they were commanded to slay.

Mahommed had been successful by the aid of his brother Sinjar, who from the year 1097 held the province of Khorasan with the capital Merv. After the death of Mahommed, Sinjar became the real head of the family, though Irak acknowledged Mahmud, the son of Mahommed. Thus there originated a separate dynasty of Irak with its capital at Hamadan (Ecbatana) ; but Sinjar during his long reign often interfered in the affairs of the new dynasty, and every occupant of the throne had to acknowledge his supremacy. In n 17 he led an expedition against Ghazni and bestowed the throne upon Bahram Shah, who was also obliged to mention Sinjar's name first in the official prayer at the Ghaznavid capital — a prerogative that neither Alp Arslan nor Malik Shah had attained. In 1134 Bahram Shah failed in this obligation and brought on himself

1 See Defremery, Journ. asiatigue (1853), i. 425 seq., ii. 217 seq.

a fresh invasion by Sinjar in the midst of winter; a third one took place in 1132, caused by the doings of the Ghorids (Hosain Jihansuz, or " world-burner "). Other expeditions were under- taken by him against Khwarizm and Turkestan; the govern- ment of the former had been given by Barkiyaroq to Mahommed b. Anushtagln, who was succeeded in n 28 by his son Atsiz, and against him Sinjar marched in 1138. Though victorious in this war, Sinjar could not hinder Atsiz from afterwards joining the gurkhan (great khan) of the then rapidly rising empire of the Karakitai, at whose hands the Seljuk suffered a terrible defeat at Samarkand in 1141. By the invasion of these hordes several Turkish tribes, the Ghuzz and others, were driven beyond the Oxus, where they killed the Seljuk governor of Balkh, though they professed to be loyal to Sinjar. Sinjar resolved to punish this crime; but his troops deserted and he himself was taken prisoner by the Ghuzz, who kept him in strict confinement during two years (1153-1155), though treating him with all outward marks of respect. In the meantime they plundered and destroyed the

flourishing cities of Merv and Nishapux; and when Sinjar, after his escape from captivity, revisited the site of his capital he fell sick of sorrow and grief and died soon afterwards (n 57). His empire fell to the Karakitai and afterwards to the shah Khwarizm. The successors of Mahommed in Irak were:— Mahmud (d. 1131); Toghrul, son of Mahommed, proclaimed by Sinjar (d. 1134); Masud (d. 1152); Malik Shah and Mahom- med (d. 1159), sons of Mahmud; Suleiman Shah, their brother (d. 1161); Arslan, son of Toghrul (d. 1175); and Toghrul, son of Arslan, killed in 1194 by Inanej, son of his atabeg, Mahommed, who was in confederation with the Khwarizm shah of the epoch, Takash. This chief inherited his possessions; Toghrul was the last representative of the Seljuks of Irak.

The province of Kerman was one of the first conquests of the Seljuks, and became the hereditary fief of Kavurd, the son of Chakir Beg. Mention has been made of his war with Malik Shah and of his ensuing death (1073). Nevertheless his descend- ants were left in possession of their ancestor's dominions; and till 1 1 70 Kerman, to which belonged also the opposite coast of Oman, enjoyed a well-ordered government, except for a short interruption caused by the deposition of Iran Shah, who had embraced the tenets of the Isma'llites, and was put to death (1101) in accordance with a fatwa of the ulema. But after the death of Toghrul Shah (n 70) his three sons disputed with each other for the possession of the throne, and implored foreign assistance, till the country became utterly devastated and fell an easy prey to some bands of Ghuzz, who, under the leadership of Malik Dinar (1185), marched into Kerman after harassing Sinjar's dominions. Afterwards the shahs of Khwarizm took this province. 2

The Seljukian dynasty of Syria came to an end after three generations, and its later history is interwoven with that of the crusaders. The first prince was Tutush, mentioned above, who perished, after a reign of continuous fighting, in battle against Barkiyaroq near Rai (Rhagae) in 1095. Of his two sons, the elder, Ridwan, established himself at Aleppo (d. n 13); the younger, Duqaq, took possession of Damascus, and died in 1 103. The sons of the former, Alp Arslan and Sultan Shah, reigned a short time nominally, though the real power was exercised by Lulu till 1117.

After the great victory of Alp Arslan in which the Greek emperor was taken prisoner (1071), Asia Minor lay open to the inroads of the Turks. Hence it was easy for Suleiman, the son of Kutulmish, 3 the son of Arslan Pigu (Israil), to penetrate as far as the Hellespont, the more so as after the captivity of Romanus two rivals, Nicephorus

Bryennius in Asia and Nicephorus Botaneiates in Europe, disputed the throne with one another. The former appealed to Suleiman for assistance, and was by his aid brought to Constantinople and seated on the imperial throne. But the possession of Asia Minor was insecure to the Seljuks

2 An outline of the history of this branch of the Seljuks is given in Z.D.M.G. (1885), pp. 362-401.

3 This prince rebelled against Alp Arslan in 1064, and was found dead after a battle.

as long as the important city of Antioch belonged to the Greeks, so that we may date the real foundation of this Seljuk empire from the taking of that city by the treason of its commander Philaretus in 1084, who afterwards became a vassal of the Seljuks. The conquest involved Suleiman in war with the neighbouring Mahommedan princes, and he met his death soon afterwards (1086), near Shaizar, in a battle against Tutush. Owing to these, family discords the decision of Malik Shah was necessary to settle the affairs of Asia Minor and Syria; he kept the sons of Suleiman in captivity, and committed the war against the un- believing Greeks to his generals Bursuk (IIpocoux) an d Buzan (noufwos) . Barkiyaroq, however, on his accession (1092), allowed Kilij Arslan, the son of Suleiman, to return to the dominions of his father. Acknowledged by the Turkish amirs of Asia Minor, he took up his residence in Nicaea, and defeated the first bands of crusaders under Walter the Penniless and others (1096); but, on the arrival of Godfrey of Bouillon and his companions, he was prudent enough to leave his capital in order to attack them as they were besieging Nicaea. He suffered, however, two defeats in the vicinity, and Nicaea surrendered on the 23rd of June 1097. As the crusaders marched by way of Dorylaeum and Iconium towards Antioch, the Greeks subdued the Turkish amirs residing at Smyrna, Ephesus, Sardis, Phila- delphia, Laodicea, Lampes and Polybotus; 1 and Kilij Arslan, with his Turks, retired to the north-eastern parts of Asia Minor, to act with the Turkish amirs of Sivas (Sebaste), known under the name of the Danishmand.

The history of the dynasty of the Danishmand is still very obscure, notwithstanding the efforts of Mordtmann, Schlumberger, Kara- bagek, Sallet and others to fix some chronological details, and it is

almost impossible to harmonize the different statements of the Armenian, Syriac, Greek and Western chronicles with those of the Arabic, Persian and Turkish. The coins are few in number, very difficult to decipher, and often without date. The founder of the dynasty was a certain Tailu, who is said to have been a schoolmaster (danishmand), probably because he understood Arabic and Persian. His descendants, therefore, took the style of " Ibn Danishmand," often without their own name. They took possession of Sivas, Tokat, Niksar, Ablastan, Malatia, probably after the death of Suleiman, though they may have established themselves in one or more of these cities much earlier, perhaps in 1071, after the defeat of Romanus Diogenes. During the first crusade the reigning prince was Kumushtegin (Ahmed Ghazi), who defeated the Franks and took prisoner the prince of Antioch, Bohemund, afterwards ransomed. He died probably in 1106, and was succeeded by his son Mahommed (d. 1143), after whom reigned Jaghi Basan; but it is very probable that other members of the same dynasty reigned at the same time in the cities already named, and in some others, e.g. Kastamuni.

Afterwards there arose a natural rivalry between the Seljuks and the Danishmand, which ended with the extinction of the latter about 1175. Kilij Arslan took possession of Mosul in 1 107, and declared himself independent of the Seljuks of Irak; but in the same year he was drowned in the Khaboras through the treachery of his own amirs, and the dynasty seemed again destined to decay, as his sons were in the power of his enemies. The sultan Mahommed, however, set at liberty his eldest son Malik Shah, who reigned for some time, until he was treacherously murdered (it is not quite certain by whom), being succeeded by his brother Masud, who established himself at Konia (Iconium), from that time the residence of the Seljuks of Rum. During his reign- he died in 1155 — the Greek emperors undertook various expedi- tions in Asia Minor and Armenia; but the Seljuk was cunning enough to profess himself their ally and to direct them against his own enemies. Nevertheless the Seljukian dominion was petty and unimportant and did not rise to significance till his son and successor, Kilij Arslan II., had subdued the Danishmands and appropriated their possessions, though he thereby risked the wrath of the powerful atabeg of Syria, Nureddin, and after- wards that of Saladin. But as the sultan grew old his numerous sons, who held each the command of a city of the empire, embittered his old age by their mutirfl rivalry, and the eldest, Kutb ed-dln, tyrannized over his father in his own capital, exactly at the time that Frederick I. (Barbarossa) entered his

1 The Turkmans who dwelt in these western parts of Asia Minor,

which were never regained by the Seljuks, were called Utch (Outsiders).

dominions on his way to the Holy Sepulchre (1190), Konia itself was taken and the sultan forced to provide guides and provisions for the crusaders. Kilij Arslan lived two years longer, .finally under the protection of his youngest son, Kaikhosrau, who held the capital after him (till n 99) until his elder brother, Rukneddin Suleiman, after having vanquished his other brothers, ascended the throne and obliged Kaikhosrau to seek refuge at the Greek emperor's court. This valiant prince saved the empire from destruction and conquered Erzerum, which had been ruled during a considerable time by a separate dynasty, and was now given in fief to his brother, Mughlt ud-din Toghrul Shah. But, marching thence against the Georgians, Suleiman's troops suffered a terrible defeat. After this Suleiman set. out to subdue his brother Masud Shah, at Angora, who was finally taken prisoner and treacherously murdered. This crime is regarded by Oriental authors as the reason of the premature death of the sultan (in 1204); but it is more probable that he was murdered because he displeased the Mahommedan clergy, who accused him of atheism. His son, Kilij Arslan III., was soon deposed by Kaikhosrau (who returned), assisted by the Greek Maurozomes, whose daughter he had married in exile. He ascended the throne the same year in which the Latin empire was established in Constantinople, a circumstance highly favourable to the Turks, who were the natural allies of the Greeks (Theodore Lascaris) and the enemies of the crusaders and their allies, the Armenians. Kaikhosrau, therefore, took in 1 207 from the Italian Aldobrandini the important harbour of Attalia (Adalia); but his conquests in this direction were put an end to by his attack upon Lascaris, for in the battle that ensued he perished in single combat with his royal antagonist (1 2 1 1) . His son and successor, Kaikaus, made peace with Lascaris and extended his frontiers to the Black Sea by the conquest of Sinope (1214). On this occasion he was fortunate enough to take prisoner the Comnenian prince (Alexius) who ruled the independent empire of Trebizond, and he compelled him to purchase his liberty by acknowledging the supremacy of the Seljuks, by paying tribute, and by serving in the armies of the sultan. Elated by this great success and by his victories over the Armenians, Kaikaus was induced to attempt the capture of the important city of Aleppo, at this time governed by the descendants of Saladin; but the affair miscarried. Soon afterwards the sultan died (12 19) and was succeeded by his brother, Ala ud-din Kaikobad I., the most powerful and illustrious prince of this branch of the Seljuks, renowned not only for his

successful wars but also for his magnifi- cent structures at Konia, Alaja, Sivas and elsewhere, which belong to the best specimens of Saracenic architecture. The town of Alaja was the creation of this sultan, as previously there existed on that site only the fortress of Candelor, at that epoch in the possession of an Armenian chief, who was expelled by Kaikobad, and shared the fate of the Armenian and Frankish knights who possessed the fortresses along the coast of the Mediterranean as far as Selefke (Seleucia). Kaikobad extended his rule as far as this city, and desisted from further conquest only on condition that the Armenian princes would enter into the same kind of relation to the Seljuks as had been imposed on the Comnenians of Trebizond. But his greatest military fame was won by a war which, however glorious, was to prove fatal to the Seljuk empire in the future: in conjunction with his ally, the Ayyubite prince Ashraf, he defeated the Khwarizm shah Jalal ud-din near Erzingan (1230). This victory removed the only barrier that checked the progress of the Mongols. During this war Kaikobad put an end to the collateral dynasty of the Seljuks of Erzerum and annexed it's possessions. He also gained the city of Khelat with dependencies that in former times had belonged to the Shah-i-Armen, but shortly before had been taken by Jalal ud-din; this aggression was the cause of the war just mentioned. The acquisition of Khelat led, however, to a new war, as Kaikobad's ally, the Ayyubite prince, envied him this conquest. Sixteen Mahommedan princes, mostly Ayyubite, of Syria and Mesopo- tamia, under the leadership of Malik al-Kamil, prince of Egypt, marched with considerable forces into Asia Minor againsi him. Happily for Kaikobad, the princes mistrusted the power of the

Egyptian, and it proved a difficult task to penetrate through the mountainous, well-fortified accesses to the interior of Asia Minor, so that the advantage rested with Kaikobad, who took Kharput, and for some time even held Harran, Ar-Roha and Rakka (1232). The latter conquests were, however, soon lost, and Kaikobad himself died in 1 234 of poison administered to him by his son and successor, Ghiyass ed-din Kaikhosrau II. This unworthy son inherited from his father an empire embracing almost the whole of Asia Minor, with the exception of the countries governed by Vatatzes (Vataces) and the Christian princes of Trebizond and Lesser Armenia, who, however, were bound to pay tribute and to serve in the armies — an empire celebrated by contemporary reports for its wealth. 1 But the Turkish soldiers were of little use in a regular battle, and the sultan relied mainly on his

Christian troops, so much so that an insurrection of dervishes which occurred at this period could only be put down by their assistance. It was at this epoch also that there flourished at Konia the founder of the order of the Mevlevis or Mawlawis, Jelal ed-din Rumi (see Ruhi), and that the dervish fraternities spread throughout the whole country and became powerful bodies, often discontented with the liberal principles of the sultans, who granted privileges to the Christian merchants and held frequent intercourse with them. Notwithstanding all this, the strength and reputation of the empire were so great that the Mongols hesitated to invade it, although standing at its frontiers. But, as they crossed the border. Kaikhosrau marched against them, and suffered a formid- able defeat at Kuzadag (between Erzingan and Sivas), in 1243, which forced him to purchase peace by the promise of a heavy tribute. The independence of the Seljuks was now for ever lost. The Mongols retired for some years; but, Kaikhosrau II. dying in 1245, the joint government of his three sons gave occasion to fresh inroads, till one of them died and Hulagu divided the empire between the other two, Izz ed-din (Kaikaus II.) ruling the districts west of the Halys, and Rukneddin (Kilij Arslan IV.) the eastern provinces (1259). But Izz ed-din, intriguing with the Mameluke sultans of Egypt to expel his brother and gain his independence, was defeated by a Mongol army and obliged to flee to the imperial court. Here he was imprisoned, but afterwards released by the Tatars of the Crimea, who took him with them to Sarai, where he died. Rukneddin was only a nominal ruler, the real power being in the hands of his minister, Muln ed-din Suleiman, who in 1267 procured an order of the Mongol Khan Abaka for his execution. The minister raised his infant son, Ghiyass ed-din Kaikhosrau III., to the throne, and governed the country for ten years longer, till he was entangled in a conspiracy of several amirs, who proposed to expel the Mongols with the aid of the Mameluke sultan of Egypt, Bibars (Beibars or Beybars). The latter marched into Asia Minor and defeated the Mongols in the bloody battle of Ablastan, the modern Albistan (1277); but, when he advanced farther to Caesarea, Muln ed-din Suleiman retired, hesitating to join him at the very moment of action. Bibars, therefore, in his turn fell back, leaving Suleiman to the vengeance of the khan, who soon discovered his treason and ordered a barbarous execution. Kaikhosrau III. continued to reign in name till 1284, though the country was in reality governed by a Mongol viceroy. Masud, the son of Izz ed-din, who on the death of his father had fled from the Crimea to the Mongol khan and had received from him the government of Sivas, Erzingan and Erzerum during the lifetime of Kaikhosrau III., ascended the Seljuk throne on the death of Kaikhosrau. But his authority was scarcely respected in his own

residence, for several Turkish amirs assumed independ- ence and could only be .subdued by Mongol aid, when they retired to the mountains, to reappear as soon as the Mongols were gone. Masud fell, probably about 1295, a victim to the vengeance of one of the amirs, whose father he had ordered to be put to death. After him Kaikobad, son of his brother Faramarz, entered Konia as sultan in 1298, but his reign is so obscure that nothing can be said of it; some authors assert that he governed only

1 See the details in Vincent of Beauvais, Speculum Historiale, bk. xxx. chaps. 143, 144.

till 1300, others till 1315. With him ended the dynasty of the Seljuks; but the Turkish empire founded by them continued to exist under the rising dynasty of the Ottomans. (See Turkey.)

Bibliography. — The best, though insufficient, account of the Seljuks is still de Guignes, Histoire generate des Huns, bks. x.-xii., from whom Gibbon borrowed his dates. Among translations from original sources (of which the most trustworthy are yet unedited), com'p. Mirkhond's Geschichte der Seldschuken (ed. Vullers), Giessen, (1838); Tarikh-l-Guzideh, French translation by Defremery in the Journal asiatique, 1848, i. 417 sqq., ii. 259 sqq., 334 sqq. ; Seid Locmani ex libro Turcico qui Oghuzname inscribitur excerpta (ed. J. H. W. Lagus, Helsingfors, 1854) (on the Seljuks of Asia Minor exclusively, but of little value). Information respecting certain periods is given incidentally in the works of von Hammer and d'Ohsson (see biblio- graphy to Turkey: History), and in Stanley Lane Poole's Mahom- medan Dynasties (1894). (M. T. H.)

SELKIRK (or Selcraig), ALEXANDER (1676-1721), Scottish sailor, the prototype of " Robinson Crusoe," seventh son of John Selcraig, shoemaker and tanner of Largo, Fifeshire, was born in 1676. In his youth he displayed an unruly disposition, and, having been summoned on the 27th of August 1695 before the kirk-session for his indecent behaviour in church, " did not compear, being gone away to the seas." In May 1703 he joined Dampier in a privateering expedition to the South Seas, going with the " Cinque Ports " galley as sailing master. In September 1704 the " Cinque Ports" put in at Juan Fernandez Island, west of Valparaiso; here Selkirk had a dispute with his captain, Thomas Stradling, and at his own request wds put ashore with a few ordinary necessaries. Before the ship left he begged to. be readmitted, but this was refused, and Selkirk remained alone in Juan Fernandez four years and four months, till on the 31st of January 1709 he was found, and on the 12th of

February following taken off, by Captain Woodes Rogers, commander of the " Duke" privateer (with Dampier as pilot), who made him his mate and afterwards gave him command of one of his prizes, " The Increase " (March 29th). Selkirk returned to the Thames on the 14th of October 1711; he was back at Largo in 1712, in 1 71 7 we find him again at sea, and in 1721 he died as master's mate of H.M.S. " Weymouth " (December 12th).

See Woodes Rogers, Cruising Voyage round the World (1712), and Edward Cooke, Voyage in the South Sea and round the World (1712), the earliest descriptions of Selkirk's adventures; also Providence Displayed, or a Surprising Account of one Alexander Selkirk . . . written by his own Hand (reprinted in Harl. Miscell. for 1810, v. 429) ; and Funnell's Voyage round the World (1707). Steele made Selkirk's acquaintance, and gave a sketch of the adventurer and his story in the Englishman for the 3rd of December 1713. In 1719, shortly after a second edition of Rogers' Voyage had appeared (1718), Defoe published Robinson Crusoe. While this is clearly indebted in its main outlines to Selkirk's story, most of its incidents are, of course, fairly independent of the latter; thus the decidedly tropical de- scription of Crusoe's island and the whole narrative of the cannibals' visits, &c, agree rather with one of the West Indies than with Juan Fernandez.

The best modern biography is the Life and Adventures of Alexander Selkirk by John Howell (1829). In 1868 a tablet was put up on Juan Fernandez at a point on the hill road called " Selkirk's Look-out," where in a gap in the trap rock a magnificent view may be had of the whole island, and of the sea north and south, over which the exile must have often watched for an approaching sail. It bears the following inscription: — " In memory of Alexander Selkirk, mariner, a native of Largo in the county of Fife, Scotland, who was on this island in complete, solitude for four years and four months. He was landed from the ' Cinque Porte ' (sic) galley, 96 tons, 16 guns, 1704 a.d., and was taken off in the ' Duke ' privateer, 12th February 1709. He died lieutenant of the ' Weymouth ' 1723 A.D., aged forty-seven years. This tablet is erected near Selkirk's look-out by Commodore Powell and officers of H.M.S. ' Topaze,' 1868 A.D."

SELKIRK, THOMAS DOUGLAS, jth Earl or (1771-1820), was born at St Mary's Isle, Kirkcudbrightshire, on the 20th of June 1 77 1. He succeeded his father in 1799, his six elder brothers having predeceased him. At this time the Highlands of Scotland were being changed into grazing land and deer forests. Selkirk took deep interest in the evicted peasants, and tried to organize emigration to the

British colonies. In 1803-1804 he founded a large and prosperous settlement in Prince Edward Island, and at about the same time a smaller one at Baldoon in Upper Canada. He later turned his attention to the Canadian west, and gradually

acquired control of the Hudson's Bay Company. In May 1811 an immense tract was granted to him in the Red River valley, and he at once proceeded to send out settlers; but the hostility of the North-West Fur Company, with its headquarters at Montreal, eventually ruined the colony (see Red River Settle- ment), and the influence of his rivals led to the defeat of Selkirk in various legal proceedings. On the 8th of April 1820 he died broken-hearted at Pau. One of the most generous and dis- interested men in the history of colonization, he fell a victim to the predatory selfishness of his rivals.

Copies of his papers, most of which are unpublished, are in the Canadian Archives Department at Ottawa.

SELKIRK, a royal and police burgh and the county town of Selkirkshire, Scotland. Pop. (1901) 6292. It lies on Ettrick Water, about 3 m. above its confluence with the Tweed, 6j m. S. of Galashiels by the North British Railway Company's branch line, of which it is the terminus. It is picturesquely situated on a hill on the right bank of the river, close to which are the mills and factories. The public buildings include the county buildings, public hall, library and the town hall (with a spire no ft. high). There are statues of Sir Walter Scott in his sheriff's robes, and Mungo Park, the African explorer, who was educated at the grammar school. Woollen manufactures (tweeds, tartans, plaids and shawls) are the principal industry, but the town is also an important agricultural centre. With Galashiels and Hawick it belongs to the Hawick or Border group of parlia- mentary burghs. Immediately south of the town are the beautiful grounds of the Haining.

As its early name (Scheleschyrche) indicates, Selkirk originally consisted of a number of shiels (huts), in the forest beside which a church had been planted by the Culdees of Old Melrose. David I., while prince of Cumbria, founded in 11 13 the abbey, which was removed fifteen years afterwards to Kelso, and also erected a castle. Captured by Edward I., by whom it was en- larged and strengthened, the fortress was retaken by Wallace in 1297, and remained in the

hands of the Scots till the battle of Halidon Hill (1333), when it was delivered to the English. It was probably destroyed in 141 7 when Sir Robert Umfraville, governor of Berwick, set fire to the town, and nothing remains of it save some green mounds and the name Peel Hill. It is significant of the havoc wrought during the Border warfare that there is not in Selkirk, in spite of its antiquity, any building two hundred years old. Of the eighty burghers who marched to Flodden (1513) under William Brydone, the town clerk, only the leader survived, with a banner captured from the English; he was knighted by James V. This banner is locally supposed to be the one borne by the Weavers' Corporation in the annual ceremony of Riding the Common, but the claim cannot be verified. The charter granted by David I. and other muniments having perished, James V. renewed the charter in 1533, with the right to enclose 1000 acres of the common and leave to elect a provost. After the battle of Philiphaugh (1645), David Leslie, the Covenanters' general, had some prisoners confined in the tolbooth of Selkirk and afterwards massacred in the market-place. From an early period the souters (shoemakers) were a flourishing craft, and in the rebellions of 171 5 and 1746 were required to furnish the Jacobites with several thousand pairs of shoes. Though shoemaking is extinct, " the souters of Selkirk" is still a nickname for the inhabitants. Tradition of the ancient craft yet survives also in connexion with the enrolment of bur- gesses, when the burgess elect has to go through the ceremony of " licking the birse " {i.e. bristles). When the loving-cup reaches the candidate he dips in the wine a brush of bristles like that used by shoemakers and passes it through his lips.

SELKIRK MOUNTAINS, a range in the S.E. of British Columbia, Canada, extending N. for about 200 m. from the American frontier with a breadth of about 80 m. and bounded E., W. and N. by the Columbia river. Though often spoken of as part of the Rocky Mountain system, they are really distinct, and belong to an older geological epoch', consisting mainly of crystalline or highly metamorphosed rocks, granites, gneiss, schists; their outline too is rounder and less serrated than that of the Rockies.

On the S.E. is the Purcell range, with the main chain of the Rockies still farther E., and on the W. the Gold range, prolonged northward as the Cariboo Mountains. They do not rise much above 10,000 ft., the highest peaks being Sir Donald (named after Lord Strathcona), 10,645 ft.; Macdonald (named after Sir John Macdonald), 9440 ft.; and Mount Tupper (after Sir Charles Tupper), 9030 ft. The scenery is wild and magnificent; below the snow-line, especially on the western side, the slopes are densely wooded, and enormous glaciers

fill the upper valleys; of these the most celebrated is that of the Illecillewaet, near Glacier House, on the Canadian Pacific railway. The Selkirks are crossed by the railway at Rogers Pass, discovered in 1883. The engineering difficulties overcome are greater than at any other portion of the line, and the grades are in places very steep. A magnificent series of caverns, called the Nakimu Caves, occur in the Glacier Park Reserve not far from Glacier on the Canadian Pacific railway. These caves are formed by the Cougar Creek, and were first comprehensively surveyed in 1905-1906 (see the Canadian Surveyor-General's Report for that year).

SELKIRKSHIRE, a southern county of Scotland, bounded N. by the shires of Peebles and Midlothian, E. and S.E. by Roxburghshire, S. and S.W. by Dumfriesshire and W. by Peebles- shire. Its area is 170,762 acres or 266-8 sq. m. Almost the whole of the surface is hilly, the only low-lying ground occurring in the valleys of the larger streams. The highest hills are found in the extreme west and south-west. On the confines of Peebles- shire the chief heights are Dun Rig (2433 ft.), Black Law (2285), Broad Law (2723) and Lochcraig Head (2625); and on the Dumfriesshire borders, Bodesbeck Law (2173), Ca,pel Fell (2223), Wind Fell (2180) and Ettrick Pen (2269). In the north, close to the Midlothian boundary, is Windlestraw Law (2161). The principal rivers are the Ettrick (32 m.) and its left-hand affluent the Yarrow (14 m.), but for a few miles the Tweed traverses the north of the county. Gala Water (21 m.), though it joins the Tweed a little below Galashiels, belongs rather to Midlothian, since it rises in the Moorfoot Hills and for most of its course flows in that shire. St Mary's Loch and its adjunct, the Loch of the Lornes, in the uplands, are the chief lakes, and of numerous small lakes in the south-east the two lochs of Shaws, Clearburn, Akermoor and Essenside may be mentioned. The vales of the Tweed and Yarrow and Ettrickdale are the principal valleys.

Geology. — This county is entirely occupied by Silurian and Ordovician rocks which are very much folded and crumpled ; the axes of the folds run in a south-westerly, north-easterly direction. The Ordovician rocks, represented by the Glenkiln and Hartfell shales, appear in the crests of the anticlinal folds ; in the western part of the county they are frequently sandy in character. Above the black Ordovician shales come the Birkhill graptolitic shales followed by the Queensberry grits, a series of greywackes, grits, flags and shales, which pass upwards into the Hawick rocks, shales with brown-weathering greywackes. Some of the Queensberry grits and under-lying greywackes in the Ordovician are used as building stones. Igneous rocks are represented by the Tertiary basalt dikes of Bower-

hope Law and dikes of quartz-felsite near Windlestraw Law and Caddon Water; dikes of minette occur near Todrig. A great deal of boulder-clay covers the older rocks; the ice-borne material travelled from west to east, and many of the hills show steep and bare slopes towards the west, but have gentle slopes covered with glacial deposits on the eastern side.

Climate and Agriculture. — The rainfall for the year, based on observations at Bowhill, between the confluence of the Yarrow and Ettrick, at a height of 537 ft. above the sea, averages 33-65 in. The mean temperature for the year, calculated at Galashiels (416 ft. above the sea), is 46-3° F., for January 36-2° F., and for July 58-2° F. The climate is thus cold and wet on the whole, and as the soil is mostly thin, over a subsoil of clayey till, agriculture is carried on at a dis- advantage. About one-sixth of the surface is under cultivation, oats being almost the only grain crop and turnips the chief green crop. Live stock is pursued more profitably, the sheep walks carrying heavy stocks. Blackfaced are the principal breed on the higher ground, but on the lower pure Cheviots and a cross of Cheviot with Leicester are common. Cattle also are raised, and horses (mainly for agricultural operations) and pigs to only a moderate extent. There are comparatively few small holdings, farms between 100 and 300 acres being the most usual. More than one-third of the county (upwards of 60,000 acres) belongs to the duke of Buccleuch. The land between the Ettrick and the Tweed was formerly covered with forest to such an extent that the sheriffdom was described as Ettrick

Forest. The chief trees were oak, birch and hazel; and the wood being well stocked with the finest breed of red deer in the kingdom became the hunting-ground of the Stuarts. James V., however, to increase his revenues, let the domain for grazing, and it was soon converted into pasture for sheep, with the result that now only about 5000 acres in the shire are under wood.

Manufactures and Communications. — Woollen manufactures (tweeds, tartans, plaiding, yarn and hosiery) are the predominant industry at Galashiels and Selkirk. Tanning, dyeing, engineering, iron-founding and bootmaking also are carried on at Galashiels, and there are large vineries at Clovenfords.

The only railway communication is in the north, where there is a

branch line from Galashiels to Selkirk, besides part of the track of the Waverley route from Edinburgh- to the south and the line from Galashiels to Peebles. There are coaches from Selkirk to St Mary's Loch and periodically to Moffat.

Population and Administration. — In 1891 the population numbered 27,712, and in 1901 it was 23,356, or 88 to the sq. m., a decrease of 1 5 • 78 %, much the largest for the decade in Scotland. Fifty-seven persons spoke Gaelic and English, none Gaelic only. The chief towns are Galashiels (pop. 13,615) and Selkirk (6292). Selkirkshire combines with Peeblesshire to return a member to Parliament, and the county town and royal burgh of Selkirk and the municipal burgh of Galashiels united with Hawick (in Roxburghshire) to constitute the Border or Hawick group of parliamentary burghs. The shires of Selkirk, Roxburgh and Berwick form a sheriffdom, and a resident sheriff-substitute sits at Selkirk and Galashiels. There is a combination poorhouse at Galashiels. The county is under school board jurisdiction, and there are high schools at Selkirk and Galashiels, while some of the other schools in the shire earn grants for higher education. Part of the " residue" grant is spent in supporting short courses of instruction in dairying, and Selkirk town council subsidizes popular science classes in the burgh school.

History and Antiquities. — There are no Roman remains in Selkirkshire, the natives probably being held in check from the station at Newstead near the Eildons. The Standing Stone near Yarrow church bearing a Latin inscription is ascribed to the 5th or 6th century and is only a quasi-Roman relic. No so- called British camps have been found on the upper and middle waters of the Ettrick and Yarrow, and of the few situated in the lower valleys of these streams the most important is the large work on Rink Hill in the parish of Galashiels, the district containing various interesting prehistoric remains. At Torwood- lee, 2 m. north-west of Galashiels, are the ruins of the only example of a broch (round tower) in the Border counties. The diameter of the structure measures 75 ft., and that of the enclosed court 40 ft., giving a thickness for the wall of 175 ft. The broch stands in an enclosure of mounds and a ditch, the whole being protected by an outer entrenchment at a considerable distance, of which only a fragment survives. Locally the works are called Torwoodlee Rings, or Eye Castle. The barrier known as the Catrail, or Picts' Work, starts near Torwoodlee, whence it runs southwards to Rink Hill. There it sweeps round to the south- west as far as Yarrow church, from which it again takes a due south direction to the valley of the Rankle, where it passes into Roxburghshire. Some Arthurian romance touches the shire at points,

for the field of the battle of Coit Celidon (the Wood of Celidon) was probably in Ettrick Forest, and that of Guinnion in the vale of Gala. The history of the shire for six centuries following the retreat of the Romans is that of the whole of south- eastern Scotland. The country formed part, first, of the British kingdom of Strathclyde, then of the Saxon kingdom of North- umbria, and finally, about 1020, was annexed to Scotland. The first sheriff of whom there is record was Andrew de Synton, appointed by William the Lion (d. 1214). After Edward I. nad overrun Scotland substantial burgesses of Selkirk were among those who took the oath of allegiance to him at Berwick in 1296, but next year William Wallace sought the covert of the forest to organize resistance. To the north of Hangingshaw in the country between the Yarrow and Tweed he constructed an earthwork, still called Wallace's Trench, 1000 ft. long and deep enough to conceal a moss horse and his rider, and paved in part with flat whinstones laid on edge. At the higher end on the top of a hill it terminated in a large square enclosure. Here

he lay till his plans were completed and at last departed, his forces including a body of Selkirk archers, for a raid into the north of England. During the prolonged strife that followed the death of Robert Bruce (1329) the foresters were constantly fighting, and the county suffered more heavily at Flodden (1513) than any other district. The lawlessness of the Borderers was at length put down by James V. with a strong hand. He parcelled out the forest in districts, and to each appointed a keeper to enforce order and protect property. In 1529 the ringleaders, including William Cockburn of Henderland, Adam Scott of TushieLaw and the notorious Johnnie Armstrong, were arrested and promptly executed. This severity gradually had the desired effect, though after the union of the crowns in 1603 the freebooters and mosstroopers again threatened to be troublesome, until James VI. 's lieutenants ruthlessly stamped out disaffection. The Covenanters held many con- venticles in the uplands, and their general, David Leslie, routed the marquis of Montrose at Philiphaugh in 1645.

The manufacture of woollen goods was introduced into Selkirk and Galashiels and attained great success, thus adding largely to the prosperity of the neighbourhood. In another direction the beauty and romance of Yarrow and Ettrick have proved a most stimulating force in modern Scottish literature.

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Ettrick and Yarrow (Selkirk, 1894) ; W. S. Crockett, The Scott Country (Edinburgh, 1902) ; In Praise of Tweed (Selkirk, 1899); J. Russell, Reminiscences of Yarrow (2nd ed., Selkirk, 1894).

SELLA, QUINTINO (182 7-1884), Italian statesman and financier, was born at Mosso, near Biella, on the 7th of July 1827. After studying engineering at Turin, he was sent in 1843 to study mineralogy at the Parisian school of mines. In Paris he witnessed the revolution of 1848, and only returned to Turin in 1852, when he taught applied geometry at the technical institute. In 1853 be became professor of mathematics at the university, and in i860 professor of mineralogy in the school of applied engineering. In i860 he was elected deputy for Cossato. A year later he was selected to be secretary-general of public instruction, and in 1862 received from Rattazzi the portfolio of finance. The Rattazzi cabinet fell before Sella could efficaciously provide for the deficit of £17,500,000 with which he was confronted; but in 1864 he returned to the ministry of finance in the La Marmora cabinet, and dealt energeti- cally with the deficit of £8,000,000 then existing. Persuading the king to forgo £120,000 of his civil list, and his colleagues in the cabinet to relinquish part of their ministerial stipends, he effected savings amounting to £2,400,000, proposed new taxation to the extent of £1,600,000, and induced landowners to pay one year's instalment of the land tax in advance. A vote of the chamber compelled him to resign before his preparations for financial restoration were complete; but in 1869 he returned to the ministry of finance in a cabinet formed by himself, but of which he made over the premiership to Giovanni Lanza. By means of the grist tax (which he had proposed in 1865, but which the Menabrea cabinet had passed in 1868), and by other fiscal expedients necessitated by the almost desperate condition of the national exchequer, he succeeded, before his fall from power in 1873, in placing Italian finance upon a sound footing, in spite of fierce attacks and persistent misrepresentation. In 1870 his great political influence turned the scale against interference in favour of France against Prussia, and in favour of an immedi- ate occupation of Rome. From 1873 until his premature death on the 14th of March 1884, he acted as leader of the Right, and was more than once prevented by an ephemeral coalition of personal opponents from returning to power as head of a Moderate Conservative cabinet. After the failure of an attempt to form a cabinet in May 1881 he practically retired from public life, devoting himself to his studies and his linen factory.

His Discorsi parlamentari were published (5 vols., 1887-1890) by order of the Chamber of Deputies. An account of his life and his

scientific labours was given by A. Cossa in the Proceedings of the Accademia dei Lincei (1884-1885).

SELLAR, WILLIAM YOUNG (1825-1890), Scottish classical scholar, was born at Morvich, Sutherlandshire, on the 22nd of February 1825. Educated at the Edinburgh Academy and afterwards at Glasgow University, he entered Balliol College, Oxford, as a scholar. Graduating with a first-class in classics, he was elected fellow of Oriel, and, after holding assistant professorships at Durham, Glasgow and St Andrews, was ap- pointed professor of Greek at St Andrews (1857). In 1863 he was elected professor of humanity in Edinburgh University, and occupied that chair down to his death on the 12th of October 1890. Sellar was one of the most brilliant of modern classical scholars, and was remarkably successful in his endeavours to reproduce the spirit rather than the letter of Roman literature.

His chief works, The Roman Poets of the Republic (3rd ed., 1889) and The Roman Poets of the Augustan Age (Virgil, 3rd ed., 1897), and h irace and the Elegiac Poets (2nd ed., by W. P. Ker, 1899), with memoir by Andrew Lang, are standard authorities. Sellar contri- buted to the 9th edition of the Ency. Brit, a series of brilliant articles on the Roman poets, the substance of which has been retained in the present edition.

SELMA, a city and the county-seat of Dallas county, Alabama, U.S.A., altitude 126 ft., on the right bank of the Alabama river, a little S. of the centre of the state, and known as the Central City. Pop. (1900) 8713, of whom 4429 were negroes; (1910 U.S. census) 13,649. It is served by the Louisville & Nashville, the Southern and the Western of Alabama railways. It has a Carnegie library, two parks and two Y.M.C.A. buildings. In the city are the Selma Military Institute (1907), and the Alabama Baptist Colored University (opened in 1878), which is one of the largest schools in the South owned and controlled by negroes, and has industrial, domestic, normal, collegiate and (especially) theological courses. The Society of United Charities supports the Selma. Hospital (1889) for negroes and the Selma Infirmary (1890). The city has a large trade, principally in cotton (the chief crop of the surrounding country), and in lumber from the great pineries. There are cotton' compresses, cotton warehouses, &c; in 1905 the value of the factory pro- ducts

was $1,138,817. The water supply is obtained from artesian wells. The site was originally called Moore's Bluff, from one Thomas Moore, who owned a steamboat landing here about 1815. A town was established about 1817, and in 1820 was incorporated under its present name (from the Ossianic legend). Selma was first chartered as a city in 1852. During the Civil War it was the seat of Confederate arsenals, shipyards and military factories. On the 2nd of April 1865 it was captured by Federal troops under General James H. Wilson (b. 1837) and much of the city was destroyed by fire. Near Selma lived William Rufus King (1786-1853), a Democratic representative in Congress from North Carolina in 1811-1816, a member of the United States Senate from Alabama in 1819-1844 and 1846- 1853, minister to France in 1844-1846, and vice-president of the United States from the 4th of March 1853 until his death on the 1 8th of April; and Selma was the home of John Tyler Morgan (1824-1907), a brigadier-general in the Confederate army in 1863-1865 and a prominent Democratic member of the United States Senate in 1877-1907; and of Edmund Winston Pettus (1821-1907), also a brigadier-general in the Confederate Army and, in 1897-1907, a Democratic member of the United States Senate.

SELMECZBANYA, officially called Selmecz-es Belabanya (Ger. Schemnilz), the capital of the county of Hont, Hungary, 152 m. N. of Budapest by rail. Pop. (1900) 16,370, about two- thirds Slovaks. It is an old mining town, situated at an altitude of 1945 ft. in a deep ravine in the Hungarian Ore Mountains, and is built in ' terraces. Selmeczbanya is encircled by high mountains, notably the isolated peak of the Calvarienberg (2385 ft.) on the S.W., on which are situated a castle and a church, and the Paradiesberg (2400 ft.) on the N.W. It possesses a famous academy of mining and forestry, founded by Maria Theresa in 1760, to which are attached a remarkable collection of minerals, and a chemical laboratory. Among other buildings are a picturesque old castle dating from the 13th century, now in ruins with the exception of a few rooms used as a prison; the

new castle, used as a fire watch-tower; and the town hall. The mines, chiefly the property of the state and of the corporation, yield silver, gold, lead, copper and arsenic. The town contains also flourishing potteries, where well-known tobacco pipes are manufactured. About 7 m. to the S.W. of the town lie the baths of Vihnye, with springs of iron, lime and carbonic acid, and about the same distance to the W. are the baths of Szkleno with springs of sulphur and lime.

Selmeczbanya is an old town whose mines existed in the 8th century.

In the 12th century, together with the whole mining region of northern Hungary, it was colonized by German settlers, who later embraced the Reformation. Owing to the counter-reformation the German element was driven out during the 1 8th century, and its place taken by the actual Slovak population.

SELOUS, FREDERICK COURTNEY (1851-), British explorer and hunter, was born in London on the 31st of December 1851, and was educated at Rugby and in Germany. His love for natural history led to the resolve to study the ways of wild animals in their native haunts. Going to South Africa when he was nineteen he travelled from the Cape to Matabeleland, reached early in 1872, and was granted permission by Lobengula to shoot game anywhere in his dominions. From that date until 1890, with a few brief intervals spent in England, Selous hunted and explored over the then little-known regions north of the Transvaal and south of the Congo basin, shooting elephants, and collecting specimens of all kinds for museums and private collections. His travels added largely to the knowledge of the country now known as Rhodesia. He made valuable ethnological investigations, and throughout his wanderings — often among people who had never previously seen a white man — he maintained cordial relations with the Kaffir chiefs and tribes, winning their confid- ence and esteem, notably so in the case of Lobengula. In 1890 Selous entered the service of the British South Africa Company, acting as guide to the pioneer expedition to Mashonaland. Over 400 m. of road were constructed through a country of forest, mountain and swamp, and in two and a half months Selous took the column safely to its destination. He then went east to Manica, concluding arrangements there which brought the country under British control. Coming to England in December 1892 he was awarded the Founder's medal of the Royal Geographical Society "in recognition of his extensive explorations and surveys," of which he gave a summary in " Twenty Years in Zambesia" (Geo. Journ. vol. i., 1893). He returned to Africa to take part in the first Matabele War (1893), being wounded during the advance on Bulawayo. While back in England he married, but in March 1896 was again settled with his wife on an estate in Matabeleland when the native rebellion broke out. He took a prominent part in the fighting which followed, and published an account of the campaign entitled Sunshine and Storm in Rhodesia (1896). On the restoration of peace Selous settled in England. He continued, however, to make shooting and hunting expeditions — visiting Asia Minor, Newfoundland, the Canadian Rockies and other parts of the world. In none of his expeditions was his object the

making of a " big bag," but as a hunter-naturalist and slayer of great game he ranks with the most famous of the world's sportsmen.

Besides the works mentioned he published A Hunter's Wanderings in Africa (1881, 5th ed., 1907), Travel and Adventure in South-East Africa (1893), Sport and Travel, East and West (1900), Recent Hunting Trips in British North America (1907), African Nature Notes and Reminiscences (1908), a valuable addition to the knowledge of African fauna, and made numerous contributions to The Geographical Journal, the Field and other journals.

SELVE, ODET DE (c. 1 504-1 563), French diplomatist, was the son of Jean de Selve, first president at the parlements of Rouen and Bordeaux, vice-chancellor of Milan, and ambassador of the king of France. In 1540 Odet was appointed councillor at the parlement of Paris and in 1542 at the grand council. In 1546, after the signature of the treaty of Ardres, he was sent on an embassy to England, in 1550 to Venice, and afterwards to Rome, where he obtained the election of Pope Paul IV. in I5SS-

SELWYN, ALFRED RICHARD CECIL (1824-1902), British geologist, son of the Rev. Townshend Selwyn, Canon of Gloucester, was born at Kilmington in Somerset on the 28th of July 1824. Educated in Switzerland, he there became interested in geology, and in 1845 he joined the staff of the Geological Survey of Great Britain. He was actively engaged in the survey of North Wales and bordering portions of Shropshire, and a series of splendid geological maps resulted from his joint work with A. C. Ramsay and J. B. Jukes. In 1852 he was appointed director of the Geological Survey of Victoria, Australia, where he gave special attention to the gold-bearing rocks, until in 1869 the Colonial Legislature brought the Survey to an abrupt termination. At this date Sir W. E. Logan had just retired from the office of director of the Geological Survey of Canada, and Selwyn was appointed his successor. In this new sphere of activity he continued his geological work with marked success, devoting particular atten- tion to the Pre-Cambrian rocks of Quebec. He retired in 1894. Meanwhile in 1874 he had been elected F.R.S., in 1876 he was awarded the Murchison Medal of the Geological Society of London, and he was created C.M.G. in 1886 for his distinguished work as assistant to the Canadian Commissioners at the exhibi- tions in Philadelphia (1876), Paris (1878) and London (1886). He retired

to Vancouver in British Columbia, where he died on the 19th of October 1902.

See memoir with portrait in Geol. Mag. (Feb. 1899).

SELWYN, GEORGE AUGUSTUS (1719-1791), English wit, son of Colonel John Selwyn (d. 1751) of Matson, Gloucestershire, was born on the nth of August 1719. Educated at Eton and Oxford, he became member of parliament for the family borough of Ludgershall in 1747, and from 1754, three years after he inherited Matson, to 1780 he represented Gloucester. In parlia- ment he took no part in debate, but he managed to obtain two or three lucrative sinecures; in society he was very popular and won a great reputation as a wit. He is said to have been very fond of seeing corpses, criminals and executions, and Horace Walpole says he loved " nothing upon earth so well as a criminal, except the execution ~of him." He died in London on the 25th of January 1791. Like the eccentric duke of Queensberry Selwyn claimed to be the father of Maria Fagniani, who became the wife of Francis Charles Seymour, 3rd marquess of Hertford.

See J. H. Jesse, George Selwyn and his Contemporaries (1843-1844; newed., 1882) ; and S. P. Kerr, George Selwyn andthe Wits (1909).

SELWYN, GEORGE AUGUSTUS (1809-1878), English bishop, second son of William Selwyn (1775-1855), a distinguished legal writer, was born at Hampstead, London, on the 5th of April 1809. He was educated at Eton and at St John's College, Cambridge, where in 1829 he rowed in the first university boat-race. He took his degree (second in the classical tripos) in 1 83 1. He returned to Eton as private tutor, was ordained deacon in 1833, and devoted himself with characteristic energy to work in the parish of Windsor. In 1841 it was proposed that he should go out as first bishop to New Zealand, then just begin- ning to be colonized. Despite the advice of his friends he accepted the offer. He studied navigation and the Maori language on the voyage, and gave himself up to a life of continual strain and hardship. He spent days and sometimes nights in the saddle, swam broad rivers and provided himself with a sailing vessel. Unfortunately, just when he had gained the confidence of the natives, his ascendancy was rudely shaken by the first Maori war. Selwyn endeavoured to mediate, but incurred the hostility of both parties. He went to the battlefield to minister to the sick and wounded in both camps; but the Maoris were persuaded that he had gone out to fight against them, and years afterwards one of them pointed out a scar on his leg to an Anglican bishop which he declared had been inflicted by Selwyn's own hands. It was long before he

regained the confidence he had forfeited by his strict adherence to duty. In 1854 he returned to England for a short furlough; but he spent much of it in pleading the needs of his diocese. He returned to New Zealand with a band of able associates, including J. C. Patteson, and began to divide his large diocese into sees of more manageable proportions.

The colonists came to respect his uprightness, and the Maoris learned to regard him as their father. In 1868, while he was in England to attend the first pan-Anglican synod, the bishopric of Lichfield became vacant, and after some hesitation he accepted it. In his new sphere of work he displayed the same unselfish activity as before, and in the " Black Country " portion of his diocese he won the hearts of the working classes. He called his clergy and laity together for consultation in the diocesan con- ference, an innovation the value of which he had proved by his colonial experience. On his death, on the nth of April 1878, his great work for the church was celebrated by a remarkable memorial, Selwyn College, Cambridge, being erected by public subscription and incorporated in 1882.

See Lives by H. W. Tucker (2 vols., 1879) and G. H. Curteis (1889).

His son, John Richardson Selwyn (1844-1898), bishop of Melanesia, was born in New Zealand on the 20th of May 1844. He was educated at Eton and at Trinity College, Cambridge, and was ordained deacon in 1869. At first he laboured with energy and tact as vicar of Wolverhampton in his father's diocese of Lichfield; but the martyrdom of John Coleridge Patteson, bishop of Melanesia, led him to volunteer for service in the Australasian Archipelago. After three years' service, during which the bishopric remained vacant, he was nominated as Patteson's successor (1877). For twelve years he threw himself with intense energy into his arduous work, but his health broke down and he returned to England in 1890. There he found an appropriate sphere in the mastership of Selwyn College, where he remained until his death on the 12th of February 1898.

SEMANG, an aboriginal people of the Malay peninsula, found in northern Perak, Kedah, Kelantan, Trengganu and the northern districts of Pahang. They are a fairly pure branch of the woolly-haired Negrito race, which includes the natives of the Andaman islands, the Aetas of the Philippines and the dwarfs of Central Africa. The men average about 4 ft. 9 or 10 in., while the women are 35 in. shorter. Their colour is a very dark brown or black. The shape of the head is round, or intermediate between round and long. The forehead is low and rounded, and projects over the root of the nose,

which is short, depressed and pyramid-shaped. The eyes are wide open and round, showing no obliquity, the iris being of a very rich, deep brown. Lips vary from moderate to full, the mouth is rather large, the chin feebly developed, and the jaws are often slightly projecting. The hair is very dark-brown black, never blue-black as among Chinese and Malays. It grows in short, spiral tufts, curling closely all over the head. The arm-stretch is almost always greater than .their height. The feet are usually short and splayed, with a remarkable inward curve of the great toe, and are very prehensile. The Semangs live in caves or leaf-shelters formed between branches. A waistcloth for the men, made of tree bark hammered out with a wooden mallet from the bark of the terap, a species of wild bread-fruit tree, and a short petticoat of the same for the women, is the only dress worn; many go naked. Tattooing, or rather scarring, is practised, by drawing the finely serrated edge of a sugar-cane leaf across the skin and rubbing in charcoal powder. They have bamboo musical instruments, a kind of Jews' harp and a nose flute. On festive occasions there is song and dance, both sexes decorat- ing themselves with leaves. The Semangs bury their dead simply, food and drink being placed in the grave.

SEMAPHORE, a town of Adelaide county, South Australia, 95 m. by rail from the city of Adelaide. It is one of the chief watering-places of the state, with a pier 1800 ft. long. Pop. about 8000.

SEMAPHORE (Gr. afjua, sign, and opa, carrying, from kptiv, to bear), the name of an apparatus or mechanical device by which information or messages can be signalled to a distance. It consists of movable arms or blades of wood, worked by levers and affixed to a high post or pole. The most familiar semaphore is that used in railway signalling on the block system, where the blade if horizontal signifies danger, if dropped safety. Used with a code, the semaphore is still used in the navy for signalling

from ship to ship. Until the invention of the electric telegraph, the semaphore was used for transmitting messages over long distances.

SEMELE, in Greek mythology, daughter of Cadmus and Harmonia, and mother of Dionysus by Zeus. It is said that Hera, having assumed the form of Semele's nurse, persuaded her rival to ask Zeus to show himself to her in all his glory. The god, who had sworn to refuse

Semele nothing, unwillingly consented. He appeared seated in his chariot surrounded by thunder and lightning; Semele was consumed by the flames and gave birth prematurely to a child, which was saved from the fire by a miraculous growth of ivy which sprang up round the palace of Cadmus. Dionysus afterwards descended to the nether world, and brought up his mother, henceforth known as Thyone (the raging one), to Olympus. Zeus and Semele probably represent the fertilizing rain of spring, and the earth, afterwards scorched by the summer heat. Another tradition represents Actaeon as the lover of Semele, and his death as due to the jealousy of Artemis. A statue and grave were to be seen in Thebes.

See Apollodorus in. 4; Pausanias iii. 24. 3, ix. 2. 3; Ovid, Metam. iii. 260.

SEMENDRIA (Smederevo) , an important commercial town and capital of the Smederevo department, Servia, on the Danube, between Belgrade and the Iron Gates. Pop. (1900) 6912. It is believed to stand on the site of the Roman settlement Mons aureus, and there is a tradition that its famous vineyards — supplying Budapest and Vienna with some of the finest table grapes — were planted by the Roman emperor Probus (a.d. 276-282). In the 15th century, when the Servian prince George Brankovich became lord of Tokay, in Hungary, he planted vines from Semendria on his estates there; and from these came the famous white wine Tokay. At the eastern end of the town, close to the river, there is a picturesque triangular castle with twenty-four square towers, built by George Brankovich in 1430 on the model of the Constantinople walls. Semendria was the residence of that Servian ruler and the capital of Servia from 1430 to 1459. It is the seat of the district prefecture and a tribunal, and has a garrison of regular troops. Besides the special export of grapes and white wine, a great part of the Servian export of pigs, and almost all the export of cereals, pass through Semendria. In 1886 the town was connected with the Belgrade-Nish railway by a branch line.

SEMINARY (Lat. seminarium, from semen, seed), a term originally applied to a nursery-garden or place where seeds are sown to produce plants for transplanting. It was early used in its present sense of a place of education. Its most frequent use is for a training college for the Roman Catholic priesthood, and in a transferred sense for a priest who has been trained in a foreign seminary, also often termed a "seminarist." A German usage, adopted in America, applies the term seminar to a class for advanced study or research.

SEMINOLE (properly Simanoli, " renegade," " runaway," in allusion to their secession from the Creek confederacy), a tribe of North American Indians of Muskhogean stock. They originally formed part of the Creek'confederacy, but separated from it early in the 18th century, and occupied the greater part of Florida. In 1817-1818 their attacks on the Georgian and Alabama settlements resulted in the invasion of their territory by General Andrew Jackson, who defeated them and hanged two British traders, named Arbuthnot and Ambrister, who were alleged to be the instigators of the raids. The long Seminole War of 1835-42, the hardest-fought of all the Indian wars, was due to the tribe's refusal to cede their lands and remove to Arkansas in accordance with the treaty (see Osceola) of Payne's Landing (1832). At the close of this struggle, costing thousands of lives and millions of dollars, the Seminoles were removed to Arkansas. They were recognized as " the Seminole Nation," and as one of the " Five Civilized Tribes, " and granted autonomy upon the scale permitted the other four, the Cherokee, Chickasaw, Choctaw and Creek. They live now mainly in Oklahoma, and a few in Florida.

SEMIPALATINSK, a province of the Russian dominions in Central Asia; administratively it forms a part of the general- governorship of the Steppes, although its northern portions really belong to the Irtysh plains of West Siberia. It is bounded on the N. by Tobolsk and Tomsk, on the S.E. by China, on the S. by Semiryechensk, and on the W. by Akmolinsk. As regards configuration, it differs widely in its northern and southern parts. The snow-clad ranges (9000 to 10,000 ft.) of the Altai and Narym enter it in the S.E., stretching S. to Lake Zaisan. Another complex of mountains, Kalbin, rising 5000 and 6000 ft. above the sea, continues them towards the west. A broad valley intervenes, through which the Irtysh finds its way from the Zaisan terrace to the lowlands of Siberia. Many extensions of these mountains and subordinate ranges stretch towards the north. The still lower but wild Chinghiz-tau mountains diversify the south-western part of Semipalatinsk, sending out their rocky spurs into the steppe region. In the south, the Tarbagatai (Marmots') range (9000 to 10,000 ft.) separates Semipalatinsk from Semiryechensk and Dzungaria. Wide steppes fill up the spaces between the mountains: e.g. the Zaisan steppe (1200 to 1500 ft.), between the Tarbagatai and the Altai ranges; the plains of Lake Balkash, some 300 ft. lower, to the south of the Chinghiz- tau; and the plains of the Irtysh, which hardly rise 600 ft. above the sea. All kinds of crystalline rocks — granites, syenites, diorites and porphyries, as also slates of all descriptions — are met with in the mountainous tracts. There also occur rich gold-bearing sands, silver and lead mines, graphite, coal

and the less valuable precious stones. The geology of the region and even its topography are still but imperfectly known. Numerous boulders scattered over the mountains testify to a much wider extension of glaciers in former times. The chief river of the province, the Irtysh, which issues from Lake Zaisan, flows north and north-west and drains Semipalatinsk for more than 760 m. Between Bukhtarma and Ust-Kamenogorsk it cuts its way through the Altai by a wild gorge, with dangerous rapids, through which, however, boats are floated. Lake Zaisan, 80 m. long and 10 to 20 m. wide, has depth sufficient for sleamboat navigation; steamers traverse also for some 100 m. the lower course of the Black Irtysh, which flows from Kulja to Lake Zaisan. The Kurchum, the Narym and the Bukhtarma are the chief right- hand tributaries of the Irtysh, while the Char-urban, Chagan and many smaller streams join it from the left; none are navigable; neither are the Kokpekty and Bugaz, which enter Lake Zaisan on the west. Lake Balkash, which borders Semipalatinsk on the south-west, formerly received several tributaries from the Chinghiz-tau. Many smaller lakes (some of them merely tem- porary) occur on the Irtysh plain, and yield salt.

The climate is severe. The average yearly temperature reaches 43 in the south and 34° in the north; the winter is very cold, and frosts of —44° F. are not uncommon, while the thermometer rises to 122 in the shade in the summer. The yearly amount of rain and snow is trifling, although snow-storms are very common; strong winds prevail. Forests are plentiful in the hilly districts and on the Irtysh plain, the flora being Siberian in the north and more Central Asiatic towards lakes Balkash and Zaisan.

The area of the province is 183,145 sq. m., and in 1906 its population was estimated at 767,500. Only about 6% of the population is settled, the remainder, chiefly Kirghiz, being nomads. The province is divided into five districts, the chief towns of which are Semipalatinsk, Pavlodar, Kokpekty, Karkaralinsk and Ust-Kamenogorsk. The Russians are chiefly agriculturists, and have wealthy settlements on the right bank of the Irtysh, as well as a few patches in the south, at the foot of the mountains. The Kirghiz are almost exclusively live-stock breeders and keep large flocks of sheep, horses and cattle, as also camels. Hunting is a favourite and profitable occupation with the Cossacks and the Kirghiz. Bee-keeping is extensively followed, especially among the Cossacks. Fishing, which is carried on in lakes Zaisan and Balkash, as also in the Black Irtysh, is of considerable importance. Gold is mined, also silver, copper, salt and coal. There are two ironworks, but the only other industrial establishments of any size are a steam flour-mill and a distillery. A

considerable amount of trade is carried on within the province, in which twenty fairs are held every year.

SEMIPALATINSK, a town of Asiatic Russia, capital of the province of the same name, on the right bank of the Irtysh, and on the highway from Dzungaria to Omsk, 683 m. by river S.E. of the latter. Pop. (1881) 17,820, (1897) 26,353. It carries on a

considerable trade, especially with the Kirghiz, and has a flour- mill, distillery and tanneries. Steamers ply on the Irtysh down co Omsk and up to Lake Zaisan.

SEMlRAMIS (c. 800 B.C.), a famous Assyrian princess, round whose personality a mass of legend has accumulated. It was not until 1910 that the researches of Professor Lehmann-Haupt of Berlin restored her to her rightful place in Babylonian- Assyrian history. The legends derived by Diodorus Siculus, Justin and Others from Ctesias of Cnidus were completely disproved, and Semlramis had come to be treated as a purely legendary figure. The legends ran as follows: Semlramis was the daughter of the fish-goddess Atargatis (q.v.) of Ascalon in Syria, and was miracul- ously preserved by doves, who fed her until she was found and brought up by Simmas, the royal shepherd. Afterwards she married Onnes, one of the generals of Ninus, who was so struck by her bravery at the capture of Bactra that he married her, after Onnes had committed suicide. Ninus died, and Semlramis, succeeding to his power, traversed all parts of the empire, erecting great cities (especially Babylon) and stupendous monu- ments, or opening roads through savage mountains. She was unsuccessful only in an attack on India. At length, after a reign of forty-two years, she delivered up the kingdom to her son Ninyas, and disappeared, or, according to what seems to be the original form of the story, was turned into a dove and was thenceforth worshipped as a deity. The name of Semlramis came to be applied to various monuments in Western Asia, the origin of which was forgotten or unknown (see Strabo xvi. 1.2). Ultimately every stupendous work of antiquity by the Euphrates or in Iran seems to have been ascribed to her — even the Behistun inscriptions of Darius (Diod. Sic. ii. 3). Of this we already have evidence in Herodotus, who ascribes to her the banks that confined the Euphrates (i. 184) and knows her name as borne by a gate of Babylon (iii. 155). Various places in Media bore the name of Semlramis, but slightly changed, even in the middle ages,

and the old name of Van was Shamirama- gerd, Armenian tradition regarding her as its founder. These facts are partly to be explained by observing that, according to the legends, in her birth as well as in her disappearance from earth, Semlramis appears as a goddess, the daughter of the fish-goddess Atargatis, and herself connected with the doves of Ishtar or Astarte. The same association of the fish and dove is found at Hierapolis (Bambyce, Mabbog), the great temple at which, according to one legend, was founded by Semlramis (Lucian, De dea Syria, 14), where her statue was shown with a golden dove on her head (33, 39). The irresistible charmsof Semlramis, her sexual excesses (which, however, belong only to the legends: there is no historical groundwork), and other features of the legend, all bear out the view that she is primarily a form of Astarte, and so fittingly conceived as the great queen of Assyria .

Professor Lehmann-Haupt, by putting together the results of archaeological discoveries, has arrived at the following conclusions. Semlramis is the Greek form of Sammuramat. She was probably a Babylonian (for it was she who imposed the Babylonian cult of Nebo or Nabu upon the Assyrian religion). A column discovered in 1909 describes her as " a woman of the palace of Samsi-Adad, King of the World, King of Assyria, . . . King of the Four Quarters of the World." Ninus was her son. The dedication of this column shows that Semlramis occupied a position of unique influence, lasting probably for more than one reign. She waged war against the Indo-Germanic Medes and the Chaldaeans. The legends probably have a Median origin. A popular etymology, which connected the name with the Assyrian summat, " dove," seems to have first started the identification of the historical Semlramis with the goddess Ishtar and her doves.

See F. Lenormant, La Legende de Semlramis (1873); A. H. Sayce, " The Legend of Semlramis," in Hist. Rev. (January, 1888).

SEMIRYECHENSK, a province of Russian Turkestan, including the steppes south of Lake Balkash and parts of the Tian-shan Mountains around Lake Issyk-kul. It has an area of 147,300 sq. m., and is bounded by the province of Semipalatinsk on the

N., by China (Dzungaria, Kulja, Aksu and Kashgarii] on the E. and S., and by the Russian provinces of Ferghana, Syr-darya, and Akmolinsk on the W. It owes its name (Jity-su, Semi- ryechie, i.e. " Seven Rivers ") to the rivers which flow from the south-east into' Lake Balkash. The Dzungarian Ala-tau Mountains, which separate it from Kulja, extend south-west towards the river Hi, with an average

height of 6000 ft. above the sea, several isolated snow-clad peaks reaching 1 1 ,000 to 14,000 ft. In the south Semiryechensk embraces the intricate systems of the Ala-tau and the Tian-shan. Two ranges of the former, the Trans-Hi Ala-tau and the Kunghei Ala-tau, stretch along the north shore of Lake Issyk-kul, both ranging from 10,000 to 15,000 ft. and both partially snow-clad. South of the lake two ranges of the Tian-shan, separated by the valley of the Naryn, stretch in the same direction, lifting up their icy peaks to 16,000 and 18,000 ft.; while westwards from the lake the precipitous slopes of the Alexander chain, 9000 to 10,000 ft. high, with peaks rising 3000 to 4000 ft. higher, extend into the province of Syr-darya. Another mountain-complex of much lower elevation runs north-westwards from the Trans-Hi Ala-tau towards the southern extremity of Lake Balkash. In the north, where the province borders Semipalatinsk, it includes the western parts of the Tarbagatai range, the summits of which (10,000 ft.) do not reach the limit of perpetual snow. The remainder of the province consists of a fertile steppe in the north-east (Sergiopol), and vast uninhabitable sand-steppes on the south of Lake Balkash. Southwards from the last-named, however, at the foot of the mountains and at the entrance to the valleys, there are rich areas of fertile land, which are being rapidly colonized by Russian immigrants, who have also pene- trated into the Tian-shan, to the east of Lake Issyk-kul.

The climate is thoroughly continental. In the Balkash steppes the winter is very cold; the lake freezes every year, and the ther- mometer falls to 13° F. In the Ala-kul steppes the winds blow away the snow. The passage from winter to spring is very abrupt, and the prairies are rapidly clothed with vegetation, which, however, is soon scorched up by the sun. The average temperatures are: at Vyernyi (2405 ft. high), for the year 46-4° F., for January 17 , for July 74 ; at Przhevalsk (5450 ft.), for the year 36-5°, for January 23°, for July 63 ; still higher in the mountains, at Naryn (6900 ft.) the average temperatures are only, for the year 43-7°, for January 1 -4°, for J uly 64-4°. The yearly rainfall at these three places is 2 1 -o, i6-0, and n-8 in. respectively.

The most important river is the Hi, which enters the province from Kulja and drains it for 250 m. before it enters Lake Balkash. The Chu rises in the Tian-shan Mountains and flows north-westwards through Akmolinsk; and the Naryn flows south-westwards along a longitudinal valley of the Tian-shan, and enters Ferghana to join the Syr-darya. Lake Balkash, or Denghiz, Lake Ala-kul (which was connected with Balkash in the post-Pliocene period, but now stands some hundred feet higher, and is connected by a chain of smaller

lakes with Sissyk-kul), Lake Issyk-kul and the alpine lakes of Son-kul and Chatyr-kul are the principal sheets of water.

The population was estimated in 1906 as 1,080,700. Kirghiz form 76% of the population, Taranchis 5-7 %, Russians 14 % and Dzungans most of the remainder. The province is divided into six districts, the chief towns of which are Vyernyi (the capital), Jarkent, Kopal, Pishpek, Przhevalsk and Sergiopol. The chief occupation of the Russians, the Taranchis and the Dzungans, and partly also of the Kirghiz, is agriculture. The most important crops are wheat, barley, oats, millet, rice and potatoes. A variety of oil-bearing plants and green fodder, as also cotton, hemp, flax and poppies, are grown. Live-stock breeding is very extensively carried on by the Kirghiz, namely, horses, cattle, sheep, camels, goats and pigs. Orchards and fruit gardens are well developed ; the crown maintains two model gardens. Bee-keeping is widely spread. The factories consist of flour-mills, distilleries, tanneries and tobacco works; but a great many domestic trades, including carpet-weaving and the making of felt goods, saddlery and iron goods, are carried on, among both the settled inhabitants and the nomad Kirghiz. There is a trade with China, valued at less than half a million sterling annually. Previous to 1 899 this province formed part of the general- governorship of the Steppes.

SEMITIC LANGUAGES, the general designation of a group of Asiatic and African languages, some living and some dead, namely Assyrian, Hebrew, Phoenician, Aramaic, Arabic, Ethiopic, Mahri-Socotri. The name, which was introduced by Schlozer, is derived from the fact that most nations which speak or spoke these languages are descended, according to Genesis,

from Shem, son of Noah. 1 – But the classification of nations in Genesis x. is founded neither upon linguistic nor upon ethno-graphical principles: it is determined rather by geographical and political considerations. For this reason Elam and Lud are also included among the children of Shem; but neither the Elamites (in Susiana) nor the Lydians appear to have spoken a language connected with Hebrew. On the other hand, the Phoenicians (Canaanites), whose dialect closely resembled that of Israel, are not counted as children of Shem. Moreover, the compiler of the list in Genesis x. had no clear conceptions about the peoples of south

Arabia and Ethiopia. Nevertheless it would be undesirable to give up the universally received terms " Semites " and " Semitic."

The connexion of the Semitic languages with one another is somewhat close, in any case closer than that of the Indo- European languages. The more ancient Semitic con . tongues differ from one another scarcely more than do

acxion. the various Teutonic dialects. Hence even in the 17th century such learned Orientalists as Hottinger, Bochart, Castell and Ludolf had a tolerably clear notion of the relationship between the different Semitic languages with which they were acquainted; indeed the same may be said of some Jewish scholars who lived many centuries earlier, as, for instance, Jehuda ben Koreish. It is not difficult to point out a series of characteristic marks common to these languages, — the pre- dominance of triconsonantal roots, or of roots formed after the analogy of such, similarity in the formation of nominal and verbal stems, a great resemblance in the forms of the personal pronouns and in their use for the purpose of verbal inflection, the two principal tenses, the importance attached to the change of vowels in the interior of words, and lastly, considerable agreement with regard to order and the construction of sentences. Yet even so ancient a Semitic language as the Assyrian appears to lack some of these features, and in certain modern dialects, such as New Syriac, Mahri and more particularly Amharic, many of the characteristics of older Semitic speech have disappeared. And the resemblance in vocabulary generally diminishes in pro- portion to the modernness of the dialects. Still we can trace the connexion between the modern and the ancient dialects, and show, at least approximately, how the former were developed out of the latter. Where a development of this kind can be proved to have taken place, there a relationship must exist, however much the individual features may have been effaced. The question here is not of logical categories but of organic groups.

All these languages are descendants of a primitive Semitic language which has long been extinct. Of course this should not be taken literally as implying an absolute unity. If, in the strictest sense of the words, no two men ever speak the same language, it must apply with still greater force to any considerable mass of men not living in the' closest conjunction; and as such we must conceive the ancient Semites, so soon as they had severed themselves from other races. As long as the primitive Semitic people occupied no great extent of territory, many linguistic differences existent in their midst might still be recon- ciled. Other differences, however, might even then

have formed the germs of the subsequent dialectical distinction. Thus, if the gradual, or sudden, separation of individual sections of the people led to alienation on a large scale, their dialects must necessarily have developed decided lines of cleavage and become finally distinct languages. With all this, it is still possible that, even in that pre-historic era, peaceful or warlike intercourse may have exercised an influence tending to assimilate these languages once again. Within the limitations which we have intimated rather than discussed, the expression " proto-Semitic language " is thoroughly justifiable.

Many of its most important features may be reconstructed with at least tolerable certainty, but we must beware of attempt- ing too much in this respect. When the various cognate languages of a group diverge in essential points, it is by no

1 In Eichhorn's Repertorium, viii. 161 (1781). Universally accepted from Eichhorn's Einleitung in das Alte Testament, 2nd ed., i. 15 (Leipzig, 1787).

means always possible to determine which of them has retained the more primitive form. The history of the development of these tongues during the period anterior to the docu- ments which we possess is often extremely obscure in ˆ uˆ its details. Even when several Semitic languages agree language. in important points of grammar we cannot always be sure that in these particulars we have what is primitive, since in many cases analogous changes may have taken place independently. To one who should assert the complete re-construction of the primitive Semitic language to be possible, we might put the question, Would the man who is best acquainted with all the Romance languages be in a position to reconstruct their common mother, Latin, if the knowledge of it were lost ? And yet there are but few Semitic languages which we can know as accurately as the Romance languages are known. As far as the vocabulary is concerned, we may indeed maintain with certainty that a considerable number of words which have in various Semitic languages the form proper to each were a part of primitive Semitic speech. Nevertheless even then we are apt to be misled by independent but analogous formations and by words borrowed at a very remote period. 2 Each Semitic lan- guage or group of languages has, however, many words which we cannot point out in the others. Of such words a great number no doubt belonged to primitive Semitic speech, and either disappeared in some of these languages or else remained in use, but not so as to be recognizable by us. In the case of certain proto-Semitic words, we can even yet observe how they

gradually recede from the foreground. So, for instance, in Hebrew, Aramaic and Arabic, the common designation of the lion, laith, has disappeared, almost before our eyes, in order to make room for other expressions. Yet many isolated words and roots may in very early times have been borrowed by the Hebrew, the Aramaic, the Ethiopic, &c, perhaps from wholly different languages, of which no trace is left. To what extent the separate languages created new roots is an extremely obscure problem.

The question which of the known Semitic dialects most resembles the primitive Semitic language is less important than one might at first suppose, since the question is one not of absolute but only of relative priority. After scholars had given up the notion (which, however, was not the fruit of scientific research) that all Semitic languages, and indeed all the languages in the world, were descendants of Hebrew or of Aramaic, it was long the fashion to maintain that Arabic bore a close resemblance to the primitive Semitic language. 3 But, just as it is now re- cognized with ever-increasing clearness that Sanskrit is far from having retained in such a degree as was even lately supposed the characteristics of primitive Indo-European speech, so in the domain of the Semitic tongues we can assign to Arabic only a relative antiquity. It is true that in Arabic very many features are preserved more faithfully than in the cognate languages, — for instance, nearly all the original abundance of consonants, the short vowels in open syllables, particularly in the interior of words, and many grammatical distinctions which in the other languages are more or less obscured. On the other hand, Arabic has coined, simply from analogy, a great number of forms which, owing to their extreme simplicity, seem at the first glance to be primitive, but which nevertheless are only modifications of the primitive forms; whilst perhaps the other Semitic languages exhibit modifications of a different kind. In spite of its great wealth, Arabic is characterized by a certain monotony, which can scarcely have existed from the beginning. Both Hebrew and even Aramaic are in many respects more ancient than Arabic. This would no doubt be far more apparent if we knew Hebrew more completely and according to the original pro- nunciation of its vowels, and if we could discover how Aramaic was pronounced about the 13th century before our era. It must always be borne in mind that we are far more fully and accurately

2 The more alike two languages are the more difficult it usually is to detect, as borrowed elements, those words which have passed from one language into the other.

3 This theory is carried to its extreme limit in Olshausen's very

valuable Hebrew Grammar (Brunswick, 1861).

acquainted with Arabic than with the other Semitic languages of antiquity. The opinion sometimes maintained by certain over-zealous Assyriologists, that Assyrian is the " Sanskrit of the Semitic world," has not met with the approval even of the Assyriologists themselves, and is unworthy of a serious refutation.

A comparative grammar of the Semitic languages must of course be based upon Arabic, but must in every matter of detail take into consideration all the cognate languages, as far as they are known to us. In the reconstruction of the primitive Semitic tongue Hebrew might perhaps afford more assistance than Ethiopic; but Aramaic, Assyrian, and even the less known and the more modern dialects might furnish valuable materials.

The method by which these younger languages, especially the dialects of to-day, have received their present form, may be traced with tolerable comprehensiveness. Thus we gain valuable analogies for determining the genetic process in the older tongues. At the same time, a conscientious investigation forces upon us the conviction that there are many and important phenomena which we are powerless to explain; and this applies, in part, to cases where, at first, the solution appears perfectly simple. So, although we have seen that the main features of the correspond- ence between the Semitic languages have long been definitely established — years before Bopp scientifically demonstrated the connexion of the Indo-European tongues — still in our domain it is a task of extreme difficulty to create a comparative grammar which shall be minutely exact and yield permanent results. Only the most accomplished philologist could attempt the task, and it is very doubtful whether the time is yet ripe for such an attempt. 1 Much careful and minute investigation is still indis- pensable. One great obstacle lies in the fact, that, in most Semitic languages, the sounds are very inadequately transmitted. It would probably be easier to give a comparative presentment of Semitic syntax than of Semitic phonetics and the theory of Semitic forms.

*It is not a formidable undertaking to describe in general terms the character of the Semitic mind, as has been done, for example, by Lassen (Indische Altertumskunde, i. 414 c *5 rac ' er sq.) and by*

Renan in the introduction to his Histoire mlad des langues semitiques. 2 But still there is a danger

of assuming that the most important characteristics of particular Semitic peoples, especially of the Israelites and of the Arabs, are common to all Semites, and of ascribing to the influence of race certain striking features which are the result of the external conditions of life, and which, under similar circumstances, are also developed among non-Semitic races. And, though it is said, not without reason, that the Semites possess but little talent for political and military organization on a large scale, yet we have in the Phoenicians, especially the Carthaginians, in Hamilcar and in Hannibal, a proof that under altered conditions the Semites are not incapable of distinguishing themselves in these domains. It is a poor evasion to deny that the Phoenicians are genuine Semites, since even our scanty sources of information suffice to show that in the matter of religion, which among Semites is of such supreme importance, they bore a close resemblance to the ancient Hebrews and Aramaeans. In general descriptions of this kind it is easy to go too far. But to give in general terms a correct idea of the Semitic languages is a task of very much greater difficulty. Renan's brilliant and most interesting sketch is in many respects open to serious criticism. He cites, for example, as characteristic of the Semitic tongues, that they still retain the practice of expressing psycho-logical processes by means of distinct imagery. In saying this he is taking scarcely any language but Hebrew into account. But the feature to which he here alludes is owing to the particular ■ ' By this we do not wish to call in question the merits of the following works: William Wright, Lectures on the Comparative Grammar of the Semitic Languages (Cambridge, 1890, a posthumous work) ; 0. E. Lindberg, Vergleichende Grammatik d. semitischen Sprachen (pt. I, Goteborg, 1897); Heinr. Zimmern, Vergl. Gramm. d. semit. Sprachen (Berlin, 1898); C. Brockelmann, Semitische Sprachwissenschaft (Leipzig, 1906) and Grundriss der vergl. Gramm. d. semit. Sprachen, vol. i. (Berlin, 1908).

2 Cf. Th. Noldeke, Some Characteristics of the Semitic Races, in Sketches from Eastern History (London and Edinburgh, 1892), I ff.

stage of intellectual development that had been reached by the Israelites, is in part peculiar to the poetical style, and is to be found in like manner among wholly different races. That the Semitic languages are far from possessing the fixity which Renan attributes to them we shall see below. But, however this may be, certain grammatical peculiarities of the Semitic languages — above all, the

predominance of triliteral roots — are so marked that it is scarcely possible to doubt whether any language with which we are tolerably well acquainted is or is not Semitic. Only when a Semitic language has been strongly influenced not only in vocabulary but also in grammar by some non- Semitic speech, as is the case with Amharic, can such a doubt be for a moment entertained.

Many attempts have been made, sometimes in a very super- ficial fashion and sometimes by the use of scientific methods, to establish a relationship between the Semitic y? e / a <; ons languages and the Indo-European. It was very with other natural to suppose that the tongues of the two races famines of which, with the single exceptions of the Egyptians speec • and the Chinese, have formed and moulded human civilization, who have been near neighbours from the earliest times, and who, moreover, seem to bear a great physical resemblance to one another, can be nothing else than two descendants of the same parent speech. But all these endeavours have wholly failed. It is indeed probable that the languages, not only of the Semites and of the Indo-Europeans, but also those of other races, are derived from the same stock, but the separation must have taken place at so remote a period that the changes which these languages underwent in prehistoric times have completely effaced what features they possessed in common; if such features have some- times been preserved, they are no longer recognizable. It must be remembered that it is only in exceptionally favourable cir- cumstances that cognate languages are so preserved during long periods as to render it possible for scientific analysis to prove their relationship with one another. 3

On the other hand, the Semitic languages bear so striking a resemblance in some respects to certain languages of northern Africa that we are forced to assume the existence of a tolerably close relationship between the two groups. We allude to the family of languages known in modern times as the " Hamitic," and composed of the Egyptian, Berber, Beja (Bisharl, &c), and a number of tongues spoken in Abyssinia and the neighbouring countries (Agaw, Galla, Dankali, &c). It is remarkable that some of the most indispensable words in the Semitic vocabulary (as, for instance, " water," " mouth " and certain numerals) are found in Hamitic also, and that these words happen to be such as cannot well be derived from triliteral Semitic roots, and are more or less independent of the ordinary grammatical rules. We notice, too, important resemblances in grammar — for ex- ample, the formation of the feminine by means of a t prefixed or affixed, that of the causative by means of s, similarity in the suffixes and prefixes of the verbal tenses, and, generally,

similarity in the personal pronouns, &c. It must be admitted that there is also much disagreement — for instance, the widest divergence in the mass of the vocabulary; and this applies to the Semitic languages as compared not only with those Hamitic languages that are gradually becoming known to us at the present day, but with the Egyptian, of which we possess documents dating from the fourth and perhaps fifth millennium before the Christian era. The question is here involved in great difficulties. . Some isolated resemblances may, improbable as it appears, have been produced by the borrowing of words. Uncivilized races, as has been proved with certainty, sometimes borrow from others elements of speech in cases where we should deem such a thing impossible — for example, numerals and even personal suffixes. But the great resemblances in grammatical formation cannot be reasonably explained as due to borrowing on the part of the

3 The following is an instance of the manner in which we may be deceived by isolated cases. " Six " is in Hebrew skesh, almost exactly like the Sanskrit and modern Persian shash, the Latin sex, &c. But the Indo-European root is sweks, or perhaps even ksweks, whereas the Semitic root is shidth, so that the resemblance is a purely accidental one, produced by phonetic change.

Original seat of Semites.

Hamites, more especially as these points of agreement are also found in the language of the Berbers, who are scattered over an enormous territory, and whose speech must have acquired its character long before they came into contact with the Semites. We are even now "but imperfectly acquainted with the Hamitic languages; and the relation in which Egyptian stands to Berber on the one hand and to the south Hamitic languages on the other requires further elucidation. The attempt to write a com- parative grammar of the Semitic and Hamitic languages would be, to say the least, very premature. 1

The connexion between the Semitic languages and the Hamitic appears to indicate that the primitive seat of the Semites is to be sought in Africa; for it can scarcely be supposed that the Hamites, amongst whom there are gradual transitions from an almost purely European type to that of the Negroes, are the children of any other

land than " the dark continent." There seems, moreover, to be a considerable physical resemblance between the Hamites and the Semites, especi- ally in the case of the southern Arabs; we need mention only the slight development of the calf of the leg, and the sporadic appearance amongst Semites of woolly hair and prominent jaws. 2 But both Semites and Hamites have been mingled to a large extent with foreign races, which process must have diminished their mutual similarity. All this, however, is offered not as a definite theory, but as a modest hypothesis.

It was once the custom to maintain that the Semites came origin- ally from certain districts in Armenia. This supposition was founded on the book of Genesis, according to which several of the" Semitic nations are descended from Arphaxad, i.e. the eponym of the district of Arrapachitis, now called Albak, on the borders of Armenia and Kurdistan. It was also thought that this region was inhabited by the primitive race from which both the Semites and the Indo- Europeans derived their origin. But, as we saw above, this ancient relationship is a matter of some doubt; in any case, the separation does not date from a period so recent that the Semites can be sup- posed to have possessed any historical tradition concerning it. There cannot be a greater mistake than to imagine that nations have been able to preserve during long ages their recollection of the country whence their supposed ancestors are said to have emigrated. The fantastic notion once in vogue as to the permanence of historical memories among uncivilized races must be wholly abandoned. The period in which the Hebrews, the Arabs and the other Semitic nations together formed a single people is so distant that none of them can possibly have retained any tradition of it. The opinion that the Hebrews and the tribes most closely related to them were descendants of Arphaxad is apparently due to the legend that Noah's ark landed near this district. The notion has therefore a purely mythical origin. Moreover, in Genesis itself we find a totally different account of the matter, derived from another source, which represents all nations, and, therefore, the Semites among them, as having come from Babylon. Scarcely any man of science now believes in the northern origin of the Semites.

Some prominent scholars consider the birthplace of the Semitic race to have been in Arabia. There is much that appears to support this theory. History proves that from a very early period tribes from the deserts of Arabia settled on the cultivable lands which border them and adopted a purely agricultural mode of life. Various traces in the language seem to indicate that the Hebrews and the Aramaeans were originally nomads, and Arabia with its northern prolongation (the

Syrian desert) is the true home of nomadic peoples. The Arabs are also supposed to display the Semitic character in its purest form, and their language is, on the whole, nearer the original Semitic than are the languages of the cognate races. To this last circumstance we should, however, attach little importance. It is by no means always the case that a language is most faithfully preserved in the country where it originated. The Romance dialect spoken in the south of Sardinia is far more primitive than that spoken at Rome; and of all living Teutonic languages the most ancient is the Icelandic. Besides, we cannot unreservedly admit that the Arabs display the Semitic character in its purest form; it would be more correct to say that, under the influence of a country indescribably monotonous and of a life ever changing yet ever the same, the inhabitants of the Arabian deserts have developed most exclusively certain of the principal traits of the Semitic race. All

1 This of course applies yet more strongly to Benfey's work, Xjber das Verhaltnis der agyptischen Sprache zum semitischen Sprachstamm (Leipzig, 1844); but his book has the permanent merit of having for the first time examined the relationship in a scientific manner. The investigation of the relationship between Egyptian and Semitic has been greatly advanced by the distinguished Egyptologist Ad. Erman: cf. especially his treatise, " Die Flexion des agyptischen Verbums," in the Sitzungsberichte der Berliner Akademie der Wissenschaften (1900), xix., especially p. 34 sq. See also Hamitic Languages.

2 Cf. G. Gerland, Atlas der Elhnographie (Leipzig, 1876), p. 40 of the text.

these considerations are indecisive; but we willingly admit that the theory which regards Arabia as the primitive seat of all Semites is by no means untenable.

Finally, one of the most eminent of contemporary Orientalists, Ignazio Guidi, 3 has attempted to prove that the home of the Semites is on the lower Euphrates. He contends that the geographical, botanical and zoological conceptions which are expressed in the various Semitic languages by the same words, preserved from the time of the dispersion, correspond to the natural characteristics of no country but the above-mentioned. Great as are the ingenuity and the caution which he displays, it is difficult to accept his con- clusions. Several terms might be mentioned which are part of the common heritage of the northern and the southern Semites, but which can scarcely have been formed in the region of the Euphrates. Moreover,

the vocabulary of most Semitic languages is but very imperfectly known, and each dialect has lost many primitive words in the course of time. It is therefore very unsafe to draw conclusions from the fact that the various Semitic tongues have no one common designation for many important local conceptions, such as " moun- tain." The ordinary words for " man," " old man," "boy," " tent," " block," "to beat," &c, are quite different in the various Semitic languages, and yet all these are ideas for which the primitive Semites must have had names.

It is not very easy to settle what is the precise connexion between the various Semitic languages, considered individually. In this matter one may easily be led to hasty con- elusions by isolated peculiarities in vocabulary or nex] oas grammar. Each of the older Semitic languages between occasionally agrees in grammatical points with some tbe other to which in most respects it bears no very close / ˆJJLˆLs. resemblance, while dialects much more nearly related to it are found to exhibit different formations. Each Semitic tongue also possesses features peculiar to itself. For instance, the Hebrew-Phoenician group and the Arabic have a prefixed definite article (the etymological identity of which is, however, not very probable); the dialect nearest to Arabic, the Sabaean, expresses the article by means of a suffixed n; the Aramaic, which in general more closely resembles Hebrew than does the Arabic group, expresses it by means of a suffixed a; whereas the Assyrian in the north and the Ethiopic in the south have no article at all. Of the termination n for the definite article there is no certain trace in either Arabic or Hebrew; the Sabaean, the Ethiopic, and the Aramaic employ it to give emphasis to demonstrative pronouns; and the very same usage has been detected in a single Phoenician inscription. 4 In this case, therefore, Hebrew and Arabic have, independently of one another, lost something which the languages most nearly related to them have preserved. In like manner, the strengthening of the pronoun of the third person by means of I (or tu) is only found in Ethiopic, Sabaean and Phoenician and perhaps in some Arabic particles too. Aramaic alone has no certain trace of the reflexive conjugation formed with prefixed n; Hebrew alone has no certain trace of the causative with shafi In several of the Semitic languages we can see how the formation of the passive by means of internal vocal change (as kullima, " he was addressed," as distinguished from kallama, " he addressed ") gradually dropped out of use; in Ethiopic this process was already complete when the language first became literary; in Aramaic it was not wholly so and in most modern Arabic dialects the old passive forms have nearly or totally disappeared. In a few cases phonetic

resemblances have been the result of later growth. For example, the termina- tion of the plural masculine of nouns is in Hebrew Im, in Aramaic In, as in Arabic. But we know that Aramaic also originally had m, whereas the ancient Arabic forms have after the n an a, which appears to have been originally a long a {una, ina); in this latter position (that is, between two vowels) the change of m into n is very improbable. 6 These two similar terminations were therefore originally distinct. We must indeed be very cautious in drawing conclusions from points of agreement between the vocabularies of the various Semitic tongues. The

8 " Delia sede primitiva dei popoli semitici," in the Proceedings of the Accademia dei Lincei (1878-1879).

' Viz. the great inscription of Byblus, C.I.S., fasc. i. No. I.

6 Shalhebeth, " flame,' is borrowed from Aramaic.

6 Arabic seems to have transplanted the termination from the verb to the noun, or to have at least modified the substantival termination in accordance with the verbal.

Ethiopians and the Hebrews have the same word for many objects which the other Semites call by other names — for instance, "stone," "tree," "enemy," "enter," "go out"; and the same may be said of Hebrew as compared with Sabaean. But to build theories upon such facts would be unsafe, since the words cited are either found, though with some change of mean- ing, in at least one of the cognate languages, or actually occur, perhaps quite exceptionally and in archaic writings, with the same signification. The sedentary habits of the Ethiopians- and the Sabaeans may possibly have rendered it easier for them to retain in their vocabulary certain words which were used by the civilized Semites of the north, but which became obsolete amongst the Arabian nomads. To the same cause we may attribute the fact that in religion the Sabaeans seem to resemble the northern Semites more closely than do the tribes of central Arabia; but these considerations prove nothing in favour of a nearer linguistic affinity.

One thing at least is certain, that Arabic (with Sabaean, Mahri and Socotri) and Ethiopic stand in a comparatively close Northern relationship to one another, and compose a group by and themselves,

as contrasted with the other Semitic

Southern languages, Hebraeo-Phoenician, Aramaic and Assyrian. groups. Only in these southern dialects do we find, and that under forms substantially identical, the important innovation known as the " broken plurals," consisting in the employment of certain forms, denoting abstracts, for the expression of plurals. They agree, moreover, in employing a peculiar development of the verbal root, formed by inserting an d between the first and second radicals (qdtala, taqdtala), in using the vowel a before the third radical in all active perfects — for example, {h)aqtala, qattala, instead of the haqtil, qattil of the northern dialects — and in many other grammatical phenomena. This is not at all con- tradicted by the fact that certain aspirated dentals of Arabic {th, dh, z) are replaced in Ethiopic, as in Hebrew and Assyrian, by pure sibilants — that is, s (Hebrew and Assyrian sh), % s — whereas in Aramaic they are replaced by simple dentals (/, d, t), which seem to come closer to the Arabic sounds. Still, after the separation of the northern and the southern groups, we suppose, the Semitic languages possessed all these sounds, as the Arabic does, but afterwards simplified them, for the most part, in one direction or the other. Hence there resulted, as it were by chance, occasional similarities. Even in many modern Arabic dialects th, dh become t, d. 1 Ethiopic, moreover, has kept d, the most peculiar of Arabic sounds, distinct from s, whereas Aramaic has confounded it with the guttural 'ain, and Hebrew and Assyrian with s. It is therefore evident that all these languages once possessed the consonant in question as a distinct one. One sound, sin, appears only in Hebrew, in Phoenician, and in the older Aramaic. It must originally have been pronounced very like sh, since it is represented in writing by the same character; in later times it was changed into an ordinary 5. Assyrian does not distinguish it from sh. 2 The division of the Semitic languages into the northern group and the southern is therefore justified by facts. Even if we were to discover really important gram- matical phenomena in which one of the southern dialects agreed with the northern, or vice versa, and that in cases where such phenomena could not be regarded either as remnants of primitive Semitic usage or as instances of parallel but independent develop- ment, we ought to remember that the division of the two groups was not necessarily a sudden and instantaneous occurrence, that even after the separation intercourse may have been carried on between the various tribes who spoke kindred dialects and were therefore still able to understand one another, andthatintermediate dialects may once have existed, perhaps such as were in use

1 In words borrowed from the literary language, s, 2, habitually appear in place of th, dh.

2 It is not quite certain whether all the Semitic languages originally had the hardest of the gutturals gh and kh in exactly the same places that they occupy in Arabic. In the case of kh we may assume so; since not only Arabic here agrees with Ethiopic, but Assyrian, also, has a particular guttural in roots which in Arabic have kh. But it would appear that in Hebrew and Aramaic the distinction between gh and 'ayin, between kh and h was often different from what it is in Arabic.

amongst tribes who came into contact sometimes with the agri-cultural population of the north and sometimes with the nomads of the south (see below) . All this is purely hypothetical, whereas the division between the northern and the southern Semitic languages is a recognized fact. It is perfectly certain, moreover, that Hebraeo-Phoenician and Aramaic are closely related with each other, and form a group of their own, distinct even from Assyrian. In fact, Assyrian seems to be so completely sui generis that we should be well advised to separate it from all the cognate languages, as an independent scion of proto-Semitic. We should classify these languages consequently in the following order: (1) Assyrian; (2) the remaining Semitic languages, viz.: A. Hebraeo-Phoenician and Aramaic, B. the southern Semitic tongues.

Although we cannot deny that there may formerly have existed Semitic languages quite distinct from those with which we are acquainted, yet that such was actually the

*case cannot be proved. Nor is there any reason to (: ... ,.,, , *: . ,,,, . . , Semitic*

think that the domain of the Semitic languages ever languages.

extended very far beyond its present limits. Some

time ago many scholars believed that they were once spoken in

Asia Minor and even in Europe, but, except in the Phoenician

colonies, this notion rested upon no solid proof. It cannot be

argued with any great degree of plausibility that even the

Cilicians, who from a very early period held constant intercourse

with the Syrians and the Phoenicians, spoke a Semitic language.

Assyrian.

Long before there existed any other Semitic culture, there flourished on the Lower Euphrates a sister language which has been preserved to us in the cuneiform inscriptions. It is usually called the Assyrian, after the name of the country where the first and most important excavations were made; but the term " Babylonian " would be more correct, as Babylon was the birthplace of this language and of the civilization to which it belonged. Certain Babylonian inscriptions go back to the fourth millennium before our era; but the great mass of these cuneiform inscriptions date from between 1000 and 500 B.C.

Assyrian differs in many respects from all the cognate languages. The ancient perfect has wholly disappeared, or left but few traces, and the gutturals, with the exception of the hard kh, . . have been smoothed down to a degree which is only paralleled in modern Aramaic dialects. So at least it would appear from the writing, or rather from the manner in which Assyriologists transcribe it. The Babylonian form bel (occurring in Isa. xlvi. I ; Jer. 1. 2 and li. 44 — passages all belonging to the 6th century B.C., and in many other ancient monuments), the name of the god who was originally called ba'l, is a confirmation of this; but, on the other hand, the name of the country where Babylon was situated, viz. Shin'ar, and that of a Babylonian god, 'Anammelek (2 Kings xvii. 31), as well as those of the tribes Sho'a and Qo'a (Ezek. xxiii. 23) who inhabited the Assyrio-Babylonian territory, seem to militate against this theory, as they are spelt in the Old Testament with 'ain. So, too, is the biblico-Aramaic word (e'em, (a'am, " order," " decree," which is derived from the Assyrian; and we may also compare some Babylonian local names, e.g. 'Anat. H is found in the name of the town Hit, and in the name of a man, written in Aramaic characters but formed quite in the Babylonian manner, Hadadnadinakh. Thus the Babylonians may have pronounced some gutturals, though they did not write them, precisely as the Persian cuneiform in- scriptions omit many h's, which, no doubt, were audible. The Assyrian system of writing is so complicated, and, in spite of its vast apparatus, is so imperfect an instrument for the accurate representation of sounds, that we are hardly yet bound to regard the transcriptions of contemporary Assyriologists as being in all points of detail the final dictum of science. However this may be, the present writer does not feel able to speak at greater length upon Assyrian. Attention may, however, be called to the fact, that, as might have been expected from the important r&le played by the Babylonians and Assyrians in the

history of civilization and oi peoples, many words passed over from their language into Hebrew and, more especially, into Aramaic, some of which attained a still wider vogue. 3 (Compare the article Cuneiform.)

Hebrew. Hebrew and Phoenician are but dialects of one and the same language. It is only as the language of the people of Israel that Hebrew can be known with any precision. Since in the Old

3 So the Assyrian mashkenii was adopted into Hebrew and Aramaic as misken; from the Aramaic it was borrowed by Arabic and Ethiopic {misken), and from Arabic it found its way into the Romance languages {mesquinho, mezquirio, meschind, mesquin).

Ancient Hebrew.

Testament a few of the neighbouring peoples are represented as being descended from Eber, the eponym of the Hebrews, that is, are regarded as nearly related to the latter, it was natural to suppose that they likewise spoke Hebrew — a supposition which, at least in the case of the Moat>ites, has been fully confirmed by the discovery of the Mesha inscription •(date, soon after 900 B.C.)- The language of this inscription scarcely differs from that of the Old Testament; the only important distinction is the occurrence of a reflexive form (with t after the first radical), which appears also in Arabic and Assyrian. We may remark in passing that the style of this in- scription is quite that of the Old Testament, and enables us to maintain with certainty that a similar historical literature existed amongst the Moabites. But it must be remembered that ancient Semitic inscriptions exhibit, in a sense, nothing but the skeleton of the language, since they do not express the vowels at all, or do so only in certain cases; still less do they indicate other phonetic modifications, such as the doubling of consonants, &c. It is therefore very possible that to the ear the language of Moab seemed to differ considerably from that of the Judaeans.

The Mesha inscription is the only non-Israelite source from which any knowledge of ancient Hebrew can be obtained. Still several Hebrew words occur even in the Tellel-Amarna letters, dis- covered in Egypt, and written in the Babylonian language by princes of Palestine during the second millennium B.C. They clearly show that

the " Hebrew " language existed in Palestine even before the migration of the Israelites into Canaan. Some fragments in the Old Testament belong to the last centuries of the second millennium before our era — particularly the song of Deborah (Judges v.), a document which, in spite of its many obscurities in matters of detail, throws much light on the condition of the Israelites at the time when the Canaanites were still contending with them for the possession of the country. The first rise of an historical literature may very probably date from before the establishment of the monarchy. Various portions of the Old Testament belong to the time of the earlier kings; but it was under the later kings that a great part of extant Hebrew literature came into shape. To this age also belong the Gezer and the Siloam inscriptions and a daily increasing number of seals and gems bearing the names of Israelites. The Hebrew language is thus known to us from a very ancient period. But we are far from being acquainted with its real phonetic condition in the time of David or Isaiah. For, much as we owe to the labours of the later Jewish schools, which with infinite care fixed the pronunciation of the sacred text by adding vowels and other signs, it is evident that even at the best they could only represent the pronunciation of the language in its latest stage, not that of very early ages. Besides, their object was not to exhibit Hebrew simply as it was, but to show how it should be read in the solemn chant of the synagogue. Accordingly, the pronunciation of the older period may have differed considerably from that represented by the punctuation. Such differences are now and then indicated by the customary spelling of the ancient texts, 1 and sometimes the orthography is directly at variance with the punctuation. 2 In a few rare cases we may derive help from the somewhat older tradition contained in the representation of Hebrew words and proper names by Greek letters, especially in the ancient Alexandrine translation of the Bible (the so-called Septuagint). It is of particular importance to remark that this older tradition still retains an original a in many cases where the punctuation has the later i or e. We have examined this point somewhat in detail, in order to contradict the false but ever-recurring notion that the ordinary text of the Bible represents without any essential modification the pronunciation of ancient Hebrew, whereas in reality it expresses (in a very instructive and careful manner, it is true) only its latest development, and that for the purpose of solemn public recitation. A clear trace of dialectal differences within Israel is found in Judges xii. 6, which shows that the ancient Ephraimites pronounced samek instead of shin.

The destruction of the Judaean kingdom dealt a heavy blow to the

Hebrew language. But it is going too far to suppose that it was altogether banished from ordinary life at the time of the exile, and that Aramaic came into use among all the Jews. In the East even small communities, especially if they form a religious body, often cling persistently to their mother-tongue, though they may be surrounded by a population of alien speech; and such was probably the case with the Jews in Babylonia. See Hebrew Language. Even so late as the time of Ezra, Hebrew was in all probability the ordinary language of the new community. In Neh. xiii. 24 we find a complaint that the children of Jews by wives from Ashdod and other places spoke half in the " Jewish " language and half in the language of Ashdod, or whatever else may Tiave been the tongue of their mothers. No one

PronuB elation.

Period of exile In Babylon.

1 For example, we may conclude with tolerable certainty, from the presence and absence of the vowel-letters y and w, that in older times the accented e and were not pronounced long, and that, on the other hand, the diphthongs au and ai were used for the later 6 and e.

'The very first word of the Bible contains an Aleph (spiritus lenis), which is required by etymology and was once audible, but which the pronunciation represented by the point-system ignores.

can suppose that Nehemiah would have been particularly zealous that the children of Jews should speak an Aramaic dialect with correctness. He no doubt refers to Hebrew as it was then spoken — a stage in its development of which. Nehemiah's own work gives a very fair idea.

After the time of Alexander large bodies of the Jewish population were settled in Alexandria and other western cities, and were very rapidly Hellenized. Meanwhile the principal language Hebrew of Syria and the neighbouring countries, Aramaic, which . . .

had already become the language of the older Jewish . colonies in Egypt (see below), and the influence of which ? . may be perceived even in some pre-exilic writings, began to spread more and more among the Jews of Palestine. Hebrew gradually ceased to be the language of the people and became that of religion and the schools. The book of Daniel, written in 167 or 166 B.C., begins in Hebrew, then suddenly passes into Aramaic, and ends again in Hebrew.

Similarly the redactor of Ezra (or more correctly of the Chronicles, of which Ezra and Nehe- miah form the conclusion) borrows large portions from an Aramaic work, in most cases without translating them into Hebrew. No reason can be assigned for the use of Aramaic in Jewish works intended primarily for Jerusalem, unless it were already the dominant speech, whilst, on the other hand, it was very natural for a pious Jew to write in the ancient " holy " language even after it had ceased to be spoken. Esther, Ecclesiastes, and a few Psalms, which belong to the 3rd and 2nd centuries before our era, are indeed written in Hebrew, but are so strongly tinctured by the Aramaic influence as to prove that the writers usually spoke Aramaic. It is certain, of course, that there were still many Jews capable both of writing and speaking Hebrew. So the Book of Sirach, composed shortly after 200 B.C., was written in an almost absolutely pure Hebrew, as is proved by the portions of the original, amounting to about two- thirds of the whole, which have come to light in our day. But we are not likely to be far wrong in saying that in the Maccabean age Hebrew had died out among the Jews as a current popular language, and there is nothing to show that it survived longer among any of the neighbouring peoples.

But in the last period of the history of Jerusalem, and still more after the destruction of the city by Titus, the Jewish schools played so important a part that the life of the Hebrew language was in a manner prolonged. The lectures and discussions of the learned were carried on in that tongue. We have very extensive specimens of this more modern Hebrew in the Mishnah and other works, and scattered pieces throughout both Talmuds. But, just as the " classical ' Sanskrit, which has been spoken and written by the Brahmans during the last twenty-five centuries, differs considerably from the language which was once in use among the people, so this " language of the learned " diverges in many respects from the " holy language "; and this distinction is one of which the rabbis were perfectly conscious. The " language of the learned " borrows a great part of its vocabulary from Aramaic, 3 and this exercises a strong influence upon the grammatical forms. The grammar is perceptibly modified by the peculiar style of these writings, which for the most part treat of legal and ritual questions in a strangely laconic and pointed manner. But, large as is the proportion of foreign words and artificial as this language is, it contains a con- siderable number of purely Hebrew elements which by chance do not appear in the Old Testament. Although we may generally as- sume, in the case of a word occurring in the Mishnah but not found in the Old Testament, that it is borrowed from Aramaic, there are several words of this class which,

by their radical consonants, prove themselves to be genuine Hebrew. And' even some grammatical phenomena of this language are to be regarded as a genuine de- velopment of Hebrew, though they are unknown to earlier Hebrew speech.

*From the beginning of the middle ages down to our own times the Jews have produced an enormous mass of writings in Hebrew, sometimes closely following the language of the Bible, *f e< « e ./ sometimes that of the Mishnah, sometimes introducing .*

*in a perfectly inorganic manner a great quantity of * . Aramaic forms, and occasionally imitating the Arabic h** 6 ™ style. The study of these variations has but little interest e rew ' for the linguist, since they are nothing but a purely artificial imita- tion, dependent upon the greater or less skill of the individual. The language of the Mishnah stands in much closer connexion with real life, and has a definite raison d'etre; all later Hebrew is to be classed with medieval and modern Latin. The dream of some Zionists, that Hebrew — a would-be Hebrew, that is to say — will again become a living, popular language in Palestine, has still less prospect of realization than their vision of a restored Jewish empire in the Holy Land. Much Hebrew also was written in the middle ages by the hostile brethren of the Jews, the Samaritans; but for the student of language these productions have, at the most, the charm attaching to curiosities.*

3 It is a characteristic feature that "my father" and "my mother " are here expressed by purely Aramaic forms. Even the learned did not wish to call their " papas " and " mammas " by any other names than those to which they had been accustomed in infancy.

The ancient Hebrew language, especially in the matter of syntax, has an essentially primitive character. Parataxis of sentences prevails over hypotaxis to a greater extent than in any Character \ x literary Semitic language with which we are well of ancient aC q Uam ted. The favourite method is to link sentences e rew ' together by means of a simple "and." There is a great lack of particles to express with clearness the more subtle connexion of ideas. The use of the verbal tenses is in a great measure deter- mined by the imagination, which regards things unaccomplished as accomplished, and the past as still present. There are but few words or inflexions to indicate slight modifications of meaning, though in ancient times the language may

perhaps have distinguished certain moods of the verb somewhat more plainly than the present punctuation does. But in any case this language was far less suited for the definite expression of studied thought, and less suited still for the treatment of abstract subjects, than for poetry. We must remember, however, that as long as Hebrew was a living language it never had to be used for the expression of the abstract. Had it lived somewhat longer it might very possibly have learnt to adapt itself better to the formulating of systematic conceptions. The only book in the Old Testament which attempts to grapple with an abstract subject in plain prose — namely, Ecclesiastes — dates fro.m a time when Hebrew was dying out or was already dead. That the gifted author does not always succeed in giving clear expression to his ideas is partly due to the fact that the language had never been employed for any scientific purposes whatsoever. With regard to grammatical forms, Hebrew has lost much that is still preserved in Arabic; but the greater richness of Arabic is in part the result of later development.

The vocabulary of the Hebrew language is, as we have said, known but imperfectly. The Old Testament is no very large work; v . it contains, moreover, many repetitions, and a great

oca u- number of pieces which are of little use to the lexico- ary ‘ grapher. On the other hand, much may be derived

from certain poetical books, such as Job. 1 The numerous aira£ \ty6iitva are a sufficient proof that many more words existed than appear in the Old Testament, the writers of which never had occasion to use them. Were we in possession of the-whole Hebrew vocabulary in the time of Jeremiah, for example, we should be far better able to determine the relation in which Hebrew stands to the other Semitic languages, the Old Testament would be far more intelligible to us, and it would be very much easier to detect the numerous corrupt passages in our text.

Phoenician.

The Phoenician dialect closely resembles Hebrew, and is known to us from only one authentic source, namely, inscriptions, some of p . which date from about 600 B.C. or earlier; but the great

*oen • mass f them begin with the end of the 5th century before c *”” our era. These inscriptions 2 we owe to the Phoenicians of*

the mother-country and the neighbouring regions (Cyprus, Egypt and

Greece), as well as to the Phoenicians of Africa, especially Carthage. Inscriptions are, however, a very insufficient means for obtaining the knowledge of a language. The number of subjects treated in them is not large; many of the most important gram- matical forms and many of the words most used in ordinary life do not occur. Moreover, the " lapidary style " is often very hard to understand. The repetition of obscure phrases, in the same con- nexion, in several inscriptions does not help to make them more intelligible. Of what use is it to us that, for instance, thousands of Carthaginian inscriptions begin with the very same incomprehensible dedication to two divinities? The difficulty of interpretation is greatly increased by the fact that single words are very seldom separated from one another, and that vowel-letters are used ex- tremely sparingly. We therefore come but too often upon very ambiguous groups of letters. In spite of this, our knowledge of Phoenician has made considerable progress of late. Some assistance is also got from Greek and Latin writers, who cite not only many Phoenician proper names, but single Phoenician words: Plautus in particular inserts in the Poenulus whole passages in Punic, some of which are accompanied by a Latin translation. This source of in- formation must, however, be used with great caution. It was not the object of Plautus to exhibit the Punic language with precision, a task for which the Latin alphabet is but ill adapted, but only to make the populace laugh at the jargon of the hated Carthaginians. Moreover, he had to force the Punic words into Latin senarii; and finally the text, being unintelligible to copyists, is terribly corrupt. Much ingenuity has been wasted on the Punic of Plautus; but the passage yields valuable results to cautious investigation which does not try to explain too much. 3

In its grammar Phoenician closely resembles Hebrew. In both dialects the consonants are the same, often in contrast to Aramaic

1 The Siloam inscription affords us one new word, the original of Sirach som; others. In the Gezer inscription there seem to be some new words of dubious interpretation.

2 The scattered materials are being collected in the Corpus in- scriptionum Semiticarum of the Paris Academy.

3 See Gildemeister, in Ritschl's Plautus (vol. ii. fasc. v., Leipzig,

1884).

and other cognate languages. 4 As to vowels, Phoenician seems to diverge rather more from Hebrew. The connecting of clauses is

scarcely carried farther in the former language than in the latter. A slight attempt to define the tenses more sharply appears once at least in the joining of kan (fuit) with a perfect, to express complete accomplishment (or the pluperfect). 6 One important difference is that the use of waw conversive with the imperfect — so common in Hebrew and in the inscription of Mesha — is wanting in Phoenician. The vocabulary of the language is very like that of Hebrew, but words rare in Hebrew are often common in Phoenician. For instance, " to do " is in Phoenician not 'as a but pa'al (the Arabic fa'ala), which in Hebrew occurs only in poetry and elevated language. " Gold " is not (zahab as in most Semitic languages) , but barn's (Assyrian h-uras), which is used occasionally in Hebrew poetry. Traces of dialectical distinctions have been found in the great inscription of Byblus, the inhabitants of which seem to be distinguished from the rest of the Phoenicians in Josh. xiii. 5 (and 1 Kings v. 32? [A.V. v. 18]). It is probable that various differences between the language of the mother-country and that of the African colonies arose at an early date, but our materials do not enable us to come to any definite conclusion on this point. It is tolerably certain that the language of Carthage possessed many dull vowels which were strange to Greek and Latin, so that the manner in which they are reproduced in proper names by the Greeks and Romans shows great diversity. In the later African inscriptions there appear certain phonetic changes, especially in consequence of the softening of the gutturals — changes which show themselves yet more plainly in the so-called Neo-Punic inscriptions (beginning with the 1st, if not the 2nd, century before our era). In these the gutturals, which had lost their real sound, are frequently interchanged in writing; and other modifications may also be perceived. Unfortunately the Neo-Punic inscriptions are written in such a debased indistinct character that it is often im- possible to discover with certainty the real form of the words. This dialect was still spoken about 400, and perhaps long afterwards, in those districts of North Africa which had once belonged to Car- thage. It would seem that in the mother-country the Phoenician language withstood the encroachment of Greek on the one hand and of Aramaic on the other somewhat longer than Hebrew did.

A ramaic.

*Aramaic is nearly related to Hebraeo-Phoenician ; but there is nevertheless a sharp line of demarcation between the two groups. Of its original home nothing certain is known. In the Old Testament " Aram " appears at an early period as a designation of certain districts in Syria (" Aram of graphical Damascus," &c.) and in Mesopotamia (" Aram of the Two e * teot < > * Rivers "). The*

*language of the Aramaeans gradually Aramaic * spread far and wide, and occupied all Syria, both those regions which were before in the possession ot the Kheta, probably a non-Semitic people, and those which were most likely inhabited by Canaanite tribes; last of all, Palestine became Aramaized. Towards the east this language was spoken on the Euphrates, and throughout' the districts of the Tigris south and west of the Armenian and Kurdish mountains; the province in which the capitals of the Arsacids and the Sassanids wˆre situated was called " the country of the Aramaeans." In Babylonia and Assyria a large, or perhaps the larger, portion of the population were most probably Aramaeans, even at a very early date, whilst Assyrian was the language of the government.*

The oldest extant Aramaic documents consist of inscriptions on monuments and on seals, weights and gems. Latterly, a very remarkable inscription of a king of Hamath 6 belonging to the 8th century B.C. has been found in Central Syria, and a few years before excavations in the extreme north of Syria (Zcngirli and district ; Nerab) brought to light some not less remarkable inscrip- tions which go back to the same century. The language of all these inscriptions is Aramaic, though in certain places it agrees with Hebrew. It is especially surprising that in the case of the Arabic sounds th, dh, z, they have not t, d, t, — as Aramaic generally has, — but sh, z, s, as is the rule in Hebrew and Assyrian. It is extremely strange, however, that, in place of the Arabic d, 'ain does not appear, as elsewhere in Aramaic, nor yet 5 as in Hebrew and Assyrian, — and, in isolated cases, even in Aramaic, — but q. These phenomena may be observed on several smaller monuments. We have no entirely satisfactory explanation at our disposal: perhaps Assyrian influence has been at work. Individual monuments prove, however, that the phonetic system of general Aramaic was already in existence

4 At an early period the Phoenician pronunciation may have distinguished a greater number of original consonants than are distinguished in writing. It is at least remarkable that the Greeks render the name of the city of Sur (Hebrew Sor), which must origin- ally have been pronounced Thurr, with a t (Tupos), and the name of Sidon (where the radical £ runs through all the Semitic languages, with a a (XcSiiv). Distinctions of this kind, justified by etymology, have perhaps been obscured in Hebrew by the imperfection of the alphabet. In the case of sin and shin this can be positively proved.

5 Kan nadar, " had vowed," Idal. 5 (C.I.S. Phoen. No. 93).

6 The consonants of his name are ZKR ; the pronunciation, perhaps,

was Zakkur.

in the period of our inscriptions: it would seem, therefore, that we must assume a dialectical cleavage, perhaps originated by the influence of Hebrew or Canaanean. Particularly remarkable is the use of the waw consecutivum in the inscriptions of the king of Hamath hitherto only known from Hebrew. Traces of the divergent phonetic treatment are found in the Hellenistic era, and — here and there — even later. Still, at the most, these can scarcely be more than conscious archaisms, — a view which is particularly corroborated by the fact, that, in certain Aramaic documents of the Persian period, both forms are used interchangeably, e.g. arqa, " earth," and ar'd. The latter orthography doubtless represents the actual pronunciation of the writer. It is to be observed, however, that 21 for dl, held its ground with especial tenacity as a form of the relative pronoun and in other capacities. In the Persian period Aramaic was the official language of the provinces west of the Euphrates; and this explains the fact that coins which were struck by governors and vassal princes in Asia Minor, and of which the stamp was in some cases the work of skilled Greek artists, bear Aramaic inscriptions, whilst those of other coins are Greek. This, of course, does not prove that Aramaic was ever spoken in Asia Minor and as far north as Sinope and the Hellespont. In Egypt some Aramaic inscriptions have been found of the Persian period, one bearing the date of the fourth year of Xerxes (482 B.C.). We possessed, even before this, a few official documents and other written pieces in Aramaic, inscribed upon papyrus, and dating from this period, but unfortunately in a very dilapidated condition. Latterly, however, we have had a whole series of similar documents of the 5th century B.C., in a very good state of preservation, bearing upon the affairs of Jewish colonists in the far south of Egypt. In that country, where the native writing was so formidable to the learner, the Aramaic language and script may well have appeared peculiarly serviceable. Thus they were employed, and frequently, even by indigenous Egyptians. But we need not doubt that, in Egypt, Aramaic was also spoken by many who had migrated from Syria; and this must be assumed to have been the case with the Jewish colonists mentioned. The fact is now established that these Jews who had come to Egypt before the Persian period were military colonists, and were often referred to in documents as " Aramaeans." According to Deut. xvii. 16, the kings of Judah sold their subjects to the kings of Egypt, who at that time obtained numbers of warriors

from foreign countries, instead of employing their own unwarlike subjects. The Syrian kings also sent soldiers to Egypt, from whom the Jews learned Aramaic. That this was used not only as an official language, but also as a vernacular, is shown by the fact that fragments of ordinary speech are found in J udaeo- Aramaic papyri. That the Egyptian- Aramaic documents exhibit traces of Hebrew and Phoenician influence is a matter for no surprise. Probably the preference shown by the Persians for Aramaic originated under the Assyrian empire, in which a very large proportion of the population spoke Aramaic, and in which this language would naturally occupy a more important position than it did under the Persians. We therefore understand why it was taken for granted that a great Assyrian official could speak Aramaic (2 Kings xviii. 26; Isa. xxxvi. 11), and for the same reason the dignitaries of Judah appear to have learned the language (ibid.), namely, in order to communicate with the Assyrians. The short dominion of the Chaldaeans very probably strengthened this preponderance of Aramaic. A few ancient Aramaic inscriptions have been discovered far within the limits of Arabia, in the palm oasis of Teima (in the north of the Hijaz); the oldest and by far the most important of these was very likely made before the Persian period. We may presume that Aramaic was introduced into the district by a mercantile colony, which settled in this ancient seat of commerce, and in consequence of which Aramaic may have remained for some time the literary language of the neighbouring Arabs. The Aramaic portions of the Old Testament show us the form of the language which was in use among the Jews of Palestine. Isolated Blbll at passages in Ezra perhaps belong to the Persian period, but Aramaic nave certainly been remodelled by a later writer. 1 Yet in Ezra we find a few antique forms which do not occur in Daniel. The Aramaic pieces contained in the Bible have the great advantage of being furnished with vowels and other orthographical signs, though these were not inserted until long after the composition of the books, and are sometimes at variance with the text itself. But, since Aramaic was still a living language when the punctuation came into existence, and since the lapse of time was not so very great, the tradition ran less risk of corruption than in the case of Hebrew. Its general correctness is further attested by the innumerable points of resemblance between this language and Syriac, with which we are accurately acquainted. The Aramaic of the Bible still exhibits various antique features, found in the Egyptian papyri too, which afterwards disappeared, — for example, the formation of the passive by means of internal vowel-change, and the causative with ha instead of with a, — phenomena which have been falsely explained as Hebraisms. Biblical Aramaic agrees in all essential points with the

language used in the numerous inscriptions of Palmyra (beginning soon before the Christian era and extending to about the end of the 3rd century), and on the Nabataean coins and stone monuments

1 The decree which is said to have been sent by Ezra (vii. 12 sqq.) >s in its present form a comparatively late production.

(concluding about the year 100). Aramaic was the language of Palmyra, the aristocracy of which were to a great extent of Arabian extraction. In the northern portion of the Nabataean kingdom (not far from Damascus) there was probably a large Aramaic population, but farther south Arabic was spoken. At that time, however, Aramaic was highly esteemed as a cultivated language, for which reason the Arabs in question made use of it, as their own language was not reduced to writing, just as in those ages Greek inscriptions were set up in many districts where no one spoke Greek. That the Nabataeans were Arabs is sufficiently proved by the fact that, with the exception of a few Greek names, almost all the numerous names which occur in the Nabataean inscriptions are Arabic, in many cases with distinctly Arabic terminations. A further proof of this is that in the great inscriptions over the tombs of Hejr (not far from Teima) the native Arabic continually shows through the foreign disguise, — ■ for instance, in the use of Arabic words whenever the writer does not happen to remember the corresponding Aramaic terms, in the use of the Arabic ghair, " other than," and in several syntactic features. The great inscriptions cease with the overthrow of the Nabataean kingdom by Trajan (105) ; but the Arabian nomads in those countries, especially in the Sinaitic peninsula, often scratched their names on the rocks down to a later period, adding some benedictory formula in Aramaic. We know hundreds of these Sinaitic inscriptions. 2 In any case Aramaic then exercised an immense influence. This is also proved by the place which it occupies in the strange Pahlavi writing, various branches of which date from the time of the Parthian empire (see Pahlavi). Biblical Aramaic, as also the language of the Palmyrene and Nabataean inscriptions, may be described as an older form of Western Aramaic. The opinion that the Palestinian Jews brought their Aramaic dialect direct from Babylon — whence the incorrect name " Chaldee " — is altogether untenable.

*We may now trace somewhat farther the development of Western Aramaic in Palestine; but unhappily few of the sources from which we derive our information can be thoroughly trusted. In the synagogues it was necessary that the reading of the A f ama,c ”’ Bible should be followed by an oral ” targum ” or trans- T * r X ums ‘ lation into Aramaic, the language of the people. The e ‘ Targum was at a later period fixed in writing, but the officially sanctioned form of the Targum to the Pentateuch (the so-called Targum of Onkelos) and of that to the prophets (the so-called Jonathan) was not finally settled till the 4th or 5th century, and not in Palestine, but in Babylonia. The redactors of the Targum preserved on the whole the older Palestinian dialect; yet that of Babylon, which differed considerably from the former, exercised a vitiating influence. The text of the Targums was punctu- ated later in Babylonia, in the supra-linear system there prevalent. Although this task was performed carefully, the punctuation is hardly as trustworthy as that of the Aramaic pieces of the Bible, — much less the transcriptions in the known Tiberian system used in the European Targum manuscripts. The language of Onkelos and Jonathan differs but little from Biblical Aramaic. The language spoken some time afterwards by the Palestinian Jews, especially in Galilee, is exhibited in a series of rabbinical works, the so-called Jerusalem Targums (of which, however, those on the Hagiographa are in some cases of later date), a few Midrashic works, and the Jerusalem Talmud. Unfortunately all these books, of which the Midrashim and the Talmud contain much Hebrew as well as Aramaic, have not been handed down with care, and require to be used with great caution for linguistic purposes. Moreover, the influence of the older language and orthography has in part obscured the character- istics of these popular dialects; for example, various gutturals are still written, although they are no longer pronounced. The adapta- tion of the spelling to the real pronunciation is carried farthest in the Jerusalem Talmud, but not in a consistent manner. Besides, all these books are without vowel-points; but the frequent use of vowel-letters in the later Jewish works renders this defect less noticeable. Attempts have been made latterly to utilize the above- mentioned books as a means of reconstructing to some extent the dialect spoken by Jesus and the Apostles, and of retranslating the utterances of Jesus into their original Galilaean form. This, however, is a far too venturesome undertaking. How far these Jewish works actually exhibit the Galilean language can hardly be definitely determined; and to this must be added the inexactitude of the traditional text, and, finally, the by no means inconsiderable difference in time.*

*Not only the Jews, but also the Christians of Palestine retained their native dialect for some time as an ecclesiastical and literary language. We possess translations of the Gospels and „ . . fragments of other works in this dialect by the Palestinian „ . f,' Christians dating from about the 5th century, partly Kf * s ,ne accompanied by a scanty punctuation which was not a ec ' added till some time later. This dialect closely resembles that of the Palestinian Jews, as was to be expected from the fact that those who spoke it were of Jewish origin.*

2 Even to the Cosmas Indicopleustes (first half of the 6th century) the Sinaitic inscriptions, the latest of which were then no more than 200-300 years old, were described as memorials of the Israelite exodus under Moses. And similar views have been propounded down to a short while ago!

Finally, the Samaritans, among the inhabitants of Palestine, translated their only sacred book, the Pentateuch, into their own dialect. The critical study of this translation proves that ?.™. a, ? tan the language which lies at its base was very much the same as that of the neighbouring Jews. Perhaps, indeed, the Samaritans may have carried the softening of the gutturals a little farther than the Jews of Galilee. Their absurd attempt to embellish the language of the translation by arbitrarily introducing forms borrowed from the Hebrew original has given rise to the false notion that Samaritan is a mixture of Hebrew and Aramaic. The introduction of Hebrew and even of Arabic words and forms was practised in Samaria on a still larger scale by copyists who lived after Aramaic had become extinct. The later works written in the Samaritan dialect are, from a linguistic point of view, as worthless as the compositions of Samaritans in Hebrew ; the writers, who spoke Arabic, endeavoured to write in languages with which they were but half acquainted.

All these Western Aramaic dialects, including that of the oldest inscriptions, have this feature among others in common, that they form the third person singular masculine and the third person plural masculine and feminine in the imperfect by prefixing y, as do the other Semitic languages. And in these dialects the termination d (the so-called " status emphaticus ") still retained the meaning of a definite article down to a tolerably late period.

As early as the 7th century the conquests of the Moslems greatly circumscribed the domain of Aramaic and a few centuries later it was almost completely supplanted in the west by Arabic. For the Christians of those countries, who, like every one else, spoke Arabic, the Palestinian dialect was no longer of importance, and they adopted as their ecclesiastical language the dialect of the other Aramaean Christians, the Syriac (or Edessene). The only localities where a Western Aramaic dialect, much changed from the old language, still survives are a few villages in Anti-Libanus.

The popular Aramaic dialect of Babylonia from the 4th to the 6th century of our era is exhibited in the Babylonian Talmud, in which, however, as in the Jerusalem Talmud, there is a Babylon- cons tant mingling of Aramaic and Hebrew passages. To m" S w a s ° mewna t later period, and probably not to exactly

rf/tew ea " tne same district oi Babylonia, belong the writings of the dialects. Mandaeans (q.v.), a strange sect, half Christian and half heathen, who from a linguistic point of view possess- the peculiar advantage of having remained almost entirely free from the influence of Hebrew, which is so perceptible in the Aramaic writings of Jews as well as of Christians. The orthography of the Mandaeans comes nearer than that of the Talmud to the real pronunciation, and in it the softening of the gutturals is most clearly seen. In other respects there is a close resemblance between Mandaean and the language of the Babylonian Talmud. The forms of the imperfect which we have enumerated above take in these dialects n or /. In Babylonia, as in Syria, the language of the Arabic conquerors rapidly drove out that of the country. The latter has long been totally extinct, unless possibly a few surviving Mandaeans still speak among themselves a more modern form of their dialect.

At Edessa, in the west of Mesopotamia, the native dialect had already been used for some time as a literary language, and had been reduced to rule through the influence of the schools p! iac or (as is proved by the fixity of the grammar and orthography) Edessan even before Christianity acquired power in the country in Aramaic. ˆ 2n(j century . At an early period the Old and New Testaments were here translated, with the help of Jewish tradition. This version and its transformations became the Bible of Aramaean Christendom, and Edessa became its capital. Thus the Aramaean Christians of the neighbouring countries, even those who were subjects of the Persian empire, adopted the Edessan dialect as the language of the church, of literature, and of cultivated intercourse. Since the ancient name of the inhabitants, " Aramaeans," just like that of "EXX7JC4S, had

acquired in the minds of Jews and Christians the unpleasant signification of " heathens," it was generally avoided, and in its place the Greek terms " Syrians " and " Syriac " were used. But " Syriac " was also the name given by the Jews and Christians of Palestine to their own language, and both Greeks and Persians designated the Aramaeans of Babylonia as " Syrians." It is therefore, properly speaking, incorrect to employ the word " Syriac " as meaning the language of Edessa alone; but, since it was the most important of these dialects, it has the best claim to this generally received appellation. It has, as we have said, a shape very definitely fixed; and in it the above-mentioned forms of the imperfect take an n. As in the Babylonian dialects, the termination a has become so completely a part of the substantive to which it is added that it has wholly lost the meaning of the definite article, whereby the clearness of the language is perceptibly impaired. The influence exercised by Greek is very apparent in Syriac. From the 3rd to the 7th century an extensive literature was produced in this language, consisting chiefly, but not entirely, of ecclesiastical works. In the development of this literature the Syrians of the Persian empire took an eager part. In the eastern Roman empire Syriac was, after Greek, by far the most important language; and under the Persian kings it virtually occupied a more prominent position as an organ of culture than the Persian language itself. The conquests of the Arabs totally changed this state of things.

But meanwhile, even in Edessa, a considerable difference had arisen between the written language and the popular speech, in which the process of modification was still going on. About the year 700 it became a matter of absolute necessity to systematize the grammar of the language and to introduce some means of clearly expressing the vowels. The principal object aimed at was that the text of the Syriac Bible should be recited in a correct manner. But, as it happened, the eastern pronunciation differed in many respects from that of the west. The local dialects had to some extent exercised an influence over the pronunciation of the literary tongue; and, on the other hand, the political separation between Rome and Persia, and yet more the ecclesiastical schism — since the Syrians of the east were mostly Nestorians, those of the west Monophysites and Catholics — had produced divergencies between the traditions of the various schools. Starting, therefore, from a common source, two distinct systems of punctuation were formed, of which the western is the more convenient, but the eastern the more exact and generally the more in accordance with the ancient pronunciation; it has, for example, a in place of the western 0, and in many cases where the

western Syrians pronounce u. In later times the two systems have been intermingled in various ways.

Arabic everywhere put a speedy end to the predominance of Aramaic — a predominance which had lasted for much more than a thousand years — and soon began to drive Syriac out of use. At the beginning of the nth century the learned metropolitan of Nisibis, Elias bar Shinnaya, wrote his books intended for Christians either entirely in Arabic or in Arabic and Syriac arranged in parallel columns, that is, in the spoken and in the learned language. Thus, too, it became necessary to have Syriac-Arabic glossaries. Up to the present day Syriac has remained in use for literary and ecclesiasti- cal purposes, and may perhaps be even spoken in some monasteries and schools; but it has long been a dead language. When Syriac became extinct in Edessa and its neighbourhood is not known with certainty (see Syriac Language).

This language, called Syriac par excellence, is not the immediate source whence are derived the Aramaic dialects still surviving in the northern districts. In the mountains known as the Tur 'Abdin in Mesopotamia, in certain districts east and north of Mosul, in the neighbouring mountains of Kurdistan, and again beyond them on the western coast of the Lake of Urmia, Aramaic dialects are spoken by Christians and occasionally by Jews, and some of these dialects we know with tolerable precision. The dialect of Tur 'Abdin differs considerably from all the rest; the country beyond the Tigris is, however, divided, as regards language, amongst a multitude of local dialects. Among these, that of Urmia has become the most im- portant, since American missionaries have formed a new literary language out of it. Moreover, the Roman Propaganda has printed books in two of the Neo-Syriac dialects. All these dialects exhibit a complete transformation of the ancient type, to a degree incom- parably greater than is the case, for example, with Mandaean. In particular, the ancient verbal tenses have almost entirely disappeared, but have been successfully replaced by new forms derived from participles. There are also other praiseworthy innovations. The dialect of Tur ' Abdin has, for instance, again coined a definite article. By means of violent contractions and phonetic changes some of these dialects, particularly that of Urmia, have acquired a euphony scarcely known in any other of the Semitic languages, with their " stridentia anhelantiaque verba " (Jerome). These Aramaeans have all adopted a motley crowd of foreign words, from the Arabs, Kurds, Persians and Turks, on whose borders they live and of whose languages they can often speak at least one.

Aramaic is frequently described as a poor language. This is an opinion which we are unable to share. It is quite possible, even now, to extract a very large vocabulary from the more ancient Aramaic writings, and yet in this predominantly : 3 r f^" theological literature a part only of the words that existed f . in the_ language have been preserved.', It is true that ram Aramaic, having from the earliest times come into close contact with foreign languages, has borrowed many words from them, firstly from Assyrian, later from . Persian and Greek; but, if we leave out of consideration the fact that many Syrian authors are in the habit of using, as ornaments or for convenience (especially in translations), a great number of Greek words, some of which were unintelligible to their readers, we shall find that the proportion of really foreign words in older Aramaic books is smaller than the proportion of Romance words in German or Dutch. The influence of Greek upon the syntax and phraseology of Syriac is not so great as that which it has exercised, through the medium of Latin, upon the literary languages of modern Europe. The literal reproduction of Greek phraseology and Greek construction is contrary to the whole spirit of the language. With regard to sounds, the most characteristic feature of Aramaic (besides its peculiar treatment of the dentals) is that it is poorer in vowels than Hebrew, not to speak of Arabic, since nearly all short vowels in open syllables either wholly disappear or leave but a slight trace behind them (the so- called shewa). In this respect the punctuation of Biblical Aramaic agrees with Syriac, in which we are able to observe from very early times the number of vowels by examining the metrical pieces constructed according to the number of syllables, and with the Mandaean, which expresses every vowel by means of a vowel-letter.

When several distinct dialects so agree, the phenomenon in question must be of great antiquity. There are nevertheless traces which prove that the language once possessed more vowels, and the Aramaeans, for instance, with whom David fought may i have pronounced many vowels which afterwards disappeared. Another peculiarity of Aramaic is that it lends itself far more readily to the linking together of sentences than Hebrew and Arabic. It possesses many conjunctions and adverbs to express slight modifications of meaning.^ It is also very free as regards the order of words. That this quality, which renders it suitable for a clear and limpid prose style, is not the result of Greek influence may be seen by the Man- daean, on which Greek has left no mark. In its attempts to express everything clearly

Aramaic often becomes prolix, — for example, by using additional personal and demonstrative pronouns. The contrast between Aramaic as the language of prose and Hebrew as the language of poetry is one which naturally strikes us, but we must beware of carrying it too far. Even the Aramaeans were not wholly destitute of poetical talent. Although the religious poetry of the Syrians has but little charm for us, yet real poetry occurs in the few extant fragments of Gnostic hymns. Moreover, in the modern dialects popular songs have been discovered which, though very simple, are fresh and full of feeling. It is therefore by no means improbable that in ancient times Aramaic was used in poems which, being contrary to the theological tendency of Syrian civilization, were doomed to total oblivion.

A rabic.

The southern group of Semitic languages consists of Arabic, Ethiopic and Mahri-Socotri. Arabic, again, is subdivided into the Early dialects of the larger portion of Arabia and those of the

Arabic south (the Sabaean). At a very much earlier time than lascrlp- we were but lately justified in supposing, some of the tioas. northern Arabs reduced their language to writing. For

travellers have recently discovered at al Ula in the northern Hijaz inscriptions in a hitherto unknown character, de- rived from the Sabaean (see below), which appear to have been Thamudlc wr ‘ tten before our era. Since it is probable that Tlmj, (Lihyaai) tne name ˚f two kings mentioned in them, is IItoXijahuos, lascrip- we are directed to the Hellenistic period, and other cir- tloas. cumstances confirm this conjecture. These inscriptions

have been called ” Thamudic,” because they were found in the country of the Thamud; but this designation is scarcely a suitable one, because during the period when the power of the ThamQd was at its height, and when the buildings mentioned in the Koran were hewn in the rocks, the language of this country was Nabataean (see above). A more commendable proposal is to call the inscriptions Lihyanl, since the tribe of Lihyan is sometimes mentioned in them. Unfortunately the inscriptions hitherto dis- covered are all short and for the most part fragmentary, and con- sequently furnish but little material to the student of languages. But there can be no doubt that they are written in an Arabic dialect. The treatment of the dentals, among other things, is a sufficient proof of this.

In some districts of the northern Hijaz and the neighbouring portion

of Nejd, other brief inscriptions, for the most part cursorily scratched upon rocks, have been discovered. These have been — not very happily — named " Pro to- Arabic," while the title Thamudic has been proposed for them also. Their writing is a somewhat later form of the Lihyanl, and the dialect, as well, seems to be very similar to Lihyani. Unfortunately, the brevity of the inscriptions, which generally contain only proper names, together with the incertitude of the meaning of many, does not allow an accurate insight into their language.

To the first centuries of the Christian era belong the thousands of Arabic inscriptions, found in the wild, rocky districts south-east of Damascus, which are commonly termed Safaitic, after Safa, a locality in their neighbourhood. For the most part, these also are short fugitive pieces scratched on rough stones, though a few of them show more careful execution. Their writing is, again, a later stage of development of the Sabaean. The task of decipherment was at first rendered extremely difficult by the scanty number of exemplars and the lack of perfectly exact facsimiles. To this must be added the fact that the Safaites insert extraordinarily few vowel letters. But the zeal of several scholars and the ever increasing number of good copies have rapidly brought us farther towards the goal; and we now know the language of the Safa inscriptions much better than that of the Lihyanl and " Proto-Arabic," — to which it stands in a close relationship. Although the inscriptions yield us no information as to unknown events of importance, still they teach its much with regard to the life and occupation of Arabian tribes who seem to have been subsequently displaced by others. The great mass of proper names, alone, is enough to make them of value to the philologist.

The Arabs who inhabited the Nabataean kingdom wrote in Aramaic, but, as has been remarked above, their native language, Arabic, often shows through the foreign disguise. We are thus able to satisfy ourselves that these Arabs, who lived a little before and a little after Christ, spoke a dialect closely resembling the later classical Arabic. The nominative of the so-called " triptote " nouns has, nearly as in classical Arabic, the termination u or o; the genitive

has i (the accusative therefore probably ended in a), but without the addition of n. Generally speaking, those proper names which in classical Arabic are " diptotes " are here devoid of any inflexional termination. The u of the nominative appears also in Arabic proper names belonging to more northern districts, as, for example, Palmyra and Edessa, All these Arabs were probably of the same race. It is possible that the inscription of Nemara, south-east of Damascus,

Arabic, but in Nabataean letters, dating from a.d. 328, and the two oldest known specimens of distinctively Arabic writing — namely, the Arabic portion of the trilingual inscription of Zabad, south-east of Haleb (Aleppo), written in Syriac, Greek and Arabic, and dating from 512 or 513 A.D., and that of the bilingual inscription of Harran, south of Damascus, written in Greek and Arabic, of 568 — represent nothing but a somewhat more modern form of this dialect. In these inscriptions proper names take in the genitive the termination «, which shows that the meaning of such inflexions was no longer felt. The three inscriptions have not yet been satis-factorily interpreted in all their details.

During the whole period of the preponderance of Aramaic this language exercised a great influence upon the vocabulary of the Arabs. The more carefully we investigate the more clearly does it appear that numerous Arabic words, used for ideas or objects which presuppose a certain degree of civilization, are borrowed from the Aramaeans. Hence the civilizing influence of their northern neigh-bours must have been very strongly felt by the Arabs, and contri-buted in no small measure to prepare them for playing so important a part in the history of the world.

In the 6th century the inhabitants of the greater part of Arabia proper spoke everywhere essentially the same language, which, as being by far the most important of all Arabic dialects, is „, . , known simply as the Arabic language. Arabic poetry. ^' as ^ lca ' at that time cultivated throughout the whole of central' AraDtQ – and northern Arabia as far as the lower Euphrates and even beyond it, employed one language only. The extant Arabic poems belonging to the heathen period were not indeed written down till much later, and meanwhile underwent considerable alterations; but the absolute regularity of the metre and rhyme is a sufficient proof that on the whole these poems all obeyed the same laws of language. It is indeed highly probable that the rhapsodists and the grammarians have effaced many slight dialectical peculiarities; in a great number of passages, for example, the poems may have used, in accordance with the fashion of their respective tribes, some other case than that prescribed by the grammarians, and a thing of this kind may after-wards have been altered, unless it happened to occur in rhyme; but such alterations cannot have extended very far. A dialect that diverged in any great measure from the Arabic of the grammarians could not possibly have been made to fit into the metres. More- (over, the Arabic philologists recognize the existence of various small distinctions between the dialects of individual tribes and of their poets, and the traditions of the more ancient schools of Koran*

readers exhibit very many dialectical nuances. It might indeed be con- jectured that for the majority of the Arabs the language of poetry was an artificial one, — the speech of certain tribes having been adopted by all the rest as a dialectus poetica. And this might be possible in the case of wandering minstrels whose art gained them their livelihood, such as Nabigha and A'sha. But, when we find that the Bedouin goat-herds, for instance, in the mountainous district near Mecca composed poems in this very same language upon their insignificant feuds and personal quarrels, that in it the proud chiefs of the Taghlibites and the Bekrites addressed defiant verses to the king of Hira (on the Euphrates), that a Christian in- habitant of Hira, AdI b. Zaid, used this language in his serious poems, — when we reflect that, as far as the Arabic poetry of the heathen period extends, there is nowhere a trace of any important linguistic difference, it would surely be a paradox to assume that all these Arabs, who for the most part were quite illiterate and yet extremely jealous of the honour of their tribes, could have taken the trouble to clothe their ideas and feelings in a foreign, or even a perfectly artificial, language. The Arabic philologists also invariably regarded the language of the poets as being that of the Arabs in general. Even in the 3rd century after Mahomet the Bedouins of Arabia proper, with the exception of a few outlying districts, were considered as being in possession of this pure Arabic. The most learned grammarians were in the habit of appealing to any unedu- cated man who happened to have just arrived with his camels from the desert, though he did not know by heart twenty verses of the Koran, and had no conception of theoretical grammar, in order that he might decide whether in Arabic it were allowable or necessary to express oneself in this or that manner. It is evident that these profound scholars knew of only one classical language, which was still spoken by the Bedouins. The tribes which produced the principal poets of the earlier period belonged for the most part to portions of the Hijaz, to Najd and its neighbourhood, and to the region which stretches thence towards the Euphrates. A great part of the H'j az , on the other hand, plays a very unimportant part in this poetry, and the Arabs of the north-west, who were under the Roman dominion, have no share whatever in it. The dialects of these latter tribes probably diverged farther from the ordinary language. The fact that they were Christians does not explain this, since the Taghlibites and other tribes who produced eminent poets

Dialect of the Koralsh,

also professed Christianity. Moreover, poets from the interior were gladly welcomed at the court of the Ghassanian princes, who were Christian vassals of the emperor residing near Damascus; in this district, therefore, their language was at least understood. It may be added that most of the tribes which cultivated poetry appear to have been near neighbours at an epoch not very far removed from that in question, and afterwards to have been scattered in large bands over a much wider extent of country. And nearly all those who were not Christians paid respect to the sanctuary of Mecca. It is a total mistake, but one frequently made by Europeans, to designate the Arabic language as " the Koraishite dia- lect." This expression never occurs in any Arabic author. True, in a few rare cases we do read of the dialect of the Koraish, by which is meant the peculiar local tinge that distinguished the speech of Mecca; but to describe the Arabic language as " Koraishite " is as absurd as it would be to speak of English as the dialect of London or of Oxford. This unfortunate designation has been made the basis of a theory very often repeated in modern times — namely, that classical Arabic is nothing else but the dialect of Mecca, which the Koran first brought into fashion. So far from this being the case, it is certain that the speech of the towns in the fiijaz did not agree in every point with the language of the poets, and, as it happens, the Koran itself contains some remarkable deviations from the rules of the classical language. This would be still more evident if the punctuation, which was introduced at a somewhat later time, did not obscure many details. The traditions which represent the Koraish as speaking the purest of all Arabic dialects are partly the work of the imagination and partly compli- ments paid to the rulers descended from the Koraish, but are no doubt at variance with the ordinary opinion of the Arabs themselves in earlier days. In the Koran Mahomet has imitated the poets, though, generally speaking, with little success; the poets, on the other hand, never imitated him. Thus the Koran and its language exercised but very little influence upon the poetry of the following century and upon that of later times, whereas this poetry closely and slavishly copied the productions of the old heathen period. The fact that the poetical literature of the early Moslems has been preserved in a much more authentic form than the works of the heathen poets proves that our idea of the language of its pattern, the ancient poetry, is on the whole just.

The Koran and Islam raised Arabic to the position of one of the principal languages of the world. Under the leadership of the _. Koraish the Bedouins subjected half the world to both

anges their dominion and their faith. Thus Arabic acquired the additional character of a sacred language. But soon it became evident that not nearly all the Arabs spoke a language precisely identical with the classical Arabic of the poets. The north-western Arabs played a particularly important part during the period of the Omayyads. The ordinary speech of Mecca and Medina was, as we have seen, no longer quite so primitive as that of the desert. To this may be added that the military ex- peditions brought those Arabs who spoke the classical language into contact with tribes from out-of-the-way districts, such as 'Oman, Bahrain (Bahrein), and particularly the north of Yemen. The fact that numbers of foreigners, on passing over to Islam, became rapidly Arabized was also little calculated to preserve the unity of the language. Finally, the violent internal and external commotions which were produced by the great events, of that time, and stirred the whole nation, probably accelerated linguistic change. In any case, we know from good tradition that even in the 1st century of the Flight the distinction between correct and incorrect speech was in places quite perceptible. About the end of the 2nd century the system of Arabic grammar was constructed, and never underwent any essential modification in later times. The theory as to how one should express oneself was now definitely fixed. The majority of those Arabs who lived beyond the limits of Arabia already diverged far from this standard ; and in particular the final vowels which serve to indicate cases and moods were no longer pronounced. This change, by which Arabic lost one of its principal advantages, was no doubt hastened by the feet that even in the classical style such terminations were omitted whenever the word stood at the end of a sentence (in pause) ; and in the living language of the Arabs this dividing of sentences is very frequent. Hence people were already quite accustomed to forms without grammatical terminations. But in the language of certain Bedouin tribes remnants of those termina- tions have been preserved down to our time.

Through the industry of Arabic philologists we are able to make ourselves intimately acquainted with the system, and still more with Vocabu- tne vocaDmar y ˚f the language. Although they have not I always performed their task in a critical manner, we are

obliged to thank them sincerely. We should be all the more disposed to admire the richness of the ancient Arabic vocabu- lary when we remember how simple are the conditions of life amongst the Arabs, how painfully monotonous their country, and consequently how limited'the range of their ideas must be. Within this range, however, the slightest modification is expressed by a particular word. It must

be confessed that the Arabic lexicon has been greatly augmented by the habit of citing as words by themselves such rhetorical phrases as an individual poet has used to describe an object: for example, if one poet calls the lion the " tearer "

In

classical

Arabic.

and another calls him the " mangier," each of these terms is explained by the lexicographers as equivalent to " lion." One branch of literature in particular, namely, lampoons and satirical poems, which for the most part have perished, no doubt introduced into the lexicon many expressions coined in an arbitrary and sometime in a very strange manner. Moreover, Arabic philologists seem to have underrated the number of words which, though they occur now and then in poems, were never in general use except among particular tribes. But in spite of these qualifications it must be admitted that the vocabulary is surprisingly rich, and the Arabic dictionary will always remain the principal resource for the elucidation of obscure expressions in all the other Semitic tongues. This method, if pursued with the necessary caution, is a perfectly legitimate one.

Poems seldom enable us to form a clear idea of the language of ordinary life, and Arabic poetry happens to have been distinguished from the very beginning by a certain tendency to artificiality and mannerism. Still less does the Koran exhibit the language in its spoken form. This office is more performed by the prose of the ancient normative traditions (Hadith). And the genuine accounts of the deeds of the Prophet and of his companions, and especially the stories concerning the battles and adventures of the Bedouins in the heathen period and in the earlier days of Islam, are excellent models of a prose style, although in some cases their redaction dates from a later time.

Classical Arabic is rich not only in words but in grammatical forms. The wanton development of the broken plurals, and sometimes of the verbal nouns, must be regarded as an excess of wealth. The sparing use of the ancient terminations which mark

Oram' matkat

*the plural has somewhat obscured the distinction between *,_,- ^-j plurals, collectives, abstract nouns, and feminines in ru i es general.*

*In its manner of employing the verbal tenses **

genuine Arabic still exhibits traces of that poetical freedom which we see in Hebrew; this characteristic disappears in the later literary language. In connecting sentences Arabic can go much further than Hebrew, but the simple parataxis is by far the most usual construction. Arabic has, however, this great advantage, that it scarcely ever leaves us in doubt as to where the apodosis begins. The attempts to define the tenses more clearly by the addition of adverbs and auxiliary verbs lead to no very positive result (as is the case in other Semitic languages also), since they are not carried out in a systematic manner. The arrangement of words in a sentence is governed by very strict rules. As the subject and object, at least in ordinary cases, occupy fixed positions, and as the genitive is invariably placed after the noun that governs it, the use of case-endings loses much of its significance.

*This languge of the Bedouins had now, as we have seen, become that of religion, courts and polished society. In the streets of the towns the language already diverged considerably from , . . . this, but the upper classes took pains to speak " Arabic." ?~ ,°. The poets and the beaux esprits never ventured to employ e 0£ ff * any but the classical language, and the " Atticists," with * * y ' pedantic seriousness, convicted the most celebrated among the later poets (for instance, Motanabbi) of occasional deviations from the standard of correct speech. At the same time, however, classical Arabic was the language of business and of science, and at the present day still holds this position. There are, of course, many gradations between the pedantry of purists and the use of what is simply a vulgar dialect. SensiMe writers employ a kind of Koivq, which does not aim at being strictly correct and calls modern things by modern names, but which, nevertheless, avoids coarse vulgarisms, aiming principally at making itself intelligible to all educated men. The reader may pronounce or omit the ancient terminations as he chooses. This language lived on, in a sense, through the whole of the middle ages, owing chiefly to the fact that it was intended for educated persons in general and not only for the learned, whereas the poetical schools strove to preserve exactly the grammar and the lexicon of the long extinct language of the Bedouins. As might be expected, this koivt\, like the koivti of the Greeks, has a comparatively limited vocabulary, since its principle is to retain only those ex- pressions from the ancient language which were generally understood, and it does not borrow much new material from the vulgar dialects.*

It is entirely a mistake to suppose that Arabic is unsuited for the

treatment of abstract subjects. On the contrary, scarcely any language is so well adapted to be the organ of scholasticism in all its branches. Even the tongue of the ancient Bedouins had a strong preference for the use of abstract verbal nouns (in striking contrast to the Latin, for example); thus they oftener said " Needful is thy sitting " than " It is needful that thou shouldest sit." This tendency was very advantageous to philosophical phraseology. The strict rules as to the order of words, though very unfavourable to the development of a truly eloquent style, render it all the easier to express ideas in a rigidly scientific form.

In the meantime Arabic, like every other widely spread language, necessarily began to undergo modification and to split up into dialects. The Arabic scholars are mistaken in attributing this development to the influence of those foreign languages rf f?T with which Arabic came into contact. Such influences can dialect have Had but little to do with the matter; for were it a**". otherwise the language of the interior of Arabia must have remained unchanged, yet even in this region the inhabitants are very far from*

speaking as they did a thousand years back. A person who in Arabia or elsewhere should trust to his knowledge of classical Arabic only would resemble those travellers from the north who endeavour to make themselves understood by Italian waiters through the medium of a kind of Latin. The written language has, it is true, greatly retarded the development of the dialects. Every good Moslem repeats at least a few short suras several times a day in his prayers. Nor is this all : the sacred book meets him everywhere. Now the majority of Arabian Moslems understand something at least of the passages they recite or hear; so that the Koran was bound to exercise, on the language of the widest circles, an influence such as has been exercised by no other book in the world. The idiom of the church, of learning and of diplomacy was brought — partially at least — nearer to the average man, with the result that many of its words and locutions passed, with more or less correcti- tude, into the language of common life, or that its mode of expression was taken as a model, precisely as Latin, the language of the church, science and the state, exerted a powerful influence on the living Romance tongues, even before the Renaissance. Yet, in spite of this, the Arabic dialects have developed on their own lines and have diverged widely from each other. Our knowledge of them has made rapid progress in late years,

and we have now good grammars of several dialects. We are best acquainted with the present speech of Egypt, and we are well posted in the dialects of the Maghrib — the African coastal lands from Tripoli to Morocco. To the Maghrib group of dialects belonged that once spoken in Sicily, of which we know little in especial, together with the Spanish Arabic of former times, which is better known to us through several literary monuments and the Grammar and Lexicon of Pedro de Alcala (1505). The shibboleth of these Western dialects is that, in the imperfect, they pronounce the 1st person plural with the ending u (as the 2nd and 3rd), and give to the 1st person singular the prefix n (as in the plural form). Maltese, also, is of the Maghrib family. This Arabic dialect, the only one spoken exclusively by Christians, is of peculiar interest to the philologist, owing to the fact that for some 900 years it has been completely withdrawn from the action of literary Arabic. On the other hand, it has been exposed to the influence of Italian. Nevertheless, it has developed in a very similar manner to the dialects of the neighbouring African coast: still it possesses many features which are peculiar to itself. Of the dialects of Syria, inner and southern Arabia, and other oriental countries, we also know more than was the case a short while ago; but the gaps in our knowledge are still too great to allow us to classify them in fixed groups. For the most part the Bedouin language is somewhat strongly distinguished from that of the sedentary tribes; but we should hardly be justified in believing that the Bedouin dialects form a contrasting unity as against the other idioms.

There can be no doubt that the development of these dialects is in part the result of older dialectical variations which were already in existence in the time of the Prophet. The histories of dialects which differ completely from one another often pursue an ana- logous course. In general, the Arabic dialects still resemble one another more than we might expect when we take into considera- tion the immense extent of country over which they are spoken and the very considerable geographical obstacles that stand in the way of communication. But we must not suppose that people, for instance, from Mosul, Morocco, San'a, and the interior of Arabia would be able to understand one another without difficulty. It is a total error to regard the difference between the Arabic dialects and the ancient language as a trifling one, or to represent the de- velopment of these dialects as something wholly unlike the develop- ment of the Romance languages. No living Arabic dialect diverges from classical Arabic so much as French or Rouman from Latin; but, on the other hand, no Arabic dialect resembles the classical language so closely as the Lugodoric dialect, which is still spoken in Sardinia, resembles its

parent speech, and yet the lapse of time is very much greater in the case of the latter. Side by side with the poetry of the old literary language there arose, in quite early days, another school of poetry which availed itself of the younger, living dialects. So, even in the 12th century, dialectic poetry was flourish- ing in Spain; and down to the present day, in the most diverse quarters of the vast linguistic domain of Arabic, songs have been composed in the various dialects. But this poetry, probably with the sole exception of Maltese, stands in some connexion or other with the antique, and is subject, more or less, to the influence of the classical language. And this is still more the case in other depart- ments of literature. Marchen, .and other tales, written by the un- educated, merely show a dialectic colouring, frequently combined with a catachrestic use of the grammatical forms of classical Arabic, not the genuine aspect of the dialect itself. These features are particularly evident in works by Jews and Christians. Purely " vulgar " texts, of any magnitude, would be hard to discover. The isolated Maltese alone has succeeded in producing a new written language distinct from the classical tongue; and in this a .fair amount of material has already been printed in Latin characters. In recent years, however, earnest attempts have been made to elevate the Egyptian dialect to the rank of a literary language: whether these attempts will be crowned with permanent success is a question to be resolved by time. In any case, the ancient written

language, though with all kinds of modifications, will long continue to exist. The very fact that it does not express the vocalization with exactitude is an advantage; for thus the Arabs, from the Persian Gulf to the Atlantic, can recognize the same word, although they may pronounce it with different vowels.

Sabaean.

Long before Mahomet, a peculiar and highly developed form of civilization had flourished in the table-land to the south-west of Arabia. The more we become acquainted with the sabaeaa country of the ancient Sabaeans and with its colossal i ascr lo- edifices, and the better we are able to decipher its in- ti oas , scriptions, which are being discovered in ever-increasing numbers, the easier it is for us to account for the haze of mythical glory wherewith the Sabaeans were once invested. The Sabaean incriptions (which till lately were more often called by the less correct name of " Himyaritic ") begin long before our era and continue till the 6th century. The somewhat stiff character is always very distinct; and the habit of regularly dividing the- words from one another renders decipherment easier, which,

however, has not yet been performed in a very satisfactory manner, owing in part to the fact that the vast majority of the documents in question consist of religious votive tablets with peculiar sacerdotal expressions, or of architectural notices abounding in technical terms. These inscriptions fall into two classes, distinguished partly by grammatical peculiarities and partly by peculiarities of phraseology. One dialect, which forms the causative with ha, like Hebrew and others, and employs, like nearly all the Semitic languages, the termination h (hu) as the suffix of the third person singular, is the Sabaean properly speaking. The other, which expresses the causative by sa (corre- sponding to the Shaphel of the Aramaeans and others), and for the suffix uses i (like the Assyrian sh), is the Minaic. To this latter branch belong the numerous South Arabic inscriptions recently found in the north of the Hijaz, near Hejr, where the Minaeans must have had a commercial settlement. On the other hand, the very old inscriptions, emanating from a colony at Jeha in Abyssinia, are Sabaean. The difference between the two classes of inscriptions is no doubt ultimately based upon a real divergence of dialect. But the singular manner in which districts containing Sabaean inscriptions and those containing Minaic alternate with one another seems to point in part to a mere hieratic practice of clinging to ancient modes of expression. Indeed it is very probably due to conscious literary conservatism that the language of the inscriptions remains almost entirely unchanged through many centuries. A few inscriptions from districts rather more to the east exhibit certain linguistic peculiarities, which, however, may perhaps be explained by the supposition that the writers did not, as a rule, speak this dialect, and therefore were but imperfectly acquainted with it.

A great hindrance to the completion of our knowledge of the Sabaean language lies in the paucity of vowel-letters in the in- scriptions. The unvarying style of the inscriptions excludes further a great number of the commonest u^‘i

grammatical forms. Not a single occurrence of the first ?” a or second person has yet been detected, with the possible orms – exception of one proper name, in which ” our god ” apparently occurs. But the knowledge which we already possess amply suffices to prove that Sabaean is closely related to Arabic as we are acquainted with it. The former language possesses the same phonetic elements as the latter. It possesses the broken plural, a dual form resembling that used in Arabic, &c. It is especially important to notice that Sabaean expresses the idea of indefiniteness by means of an appended m, just as Arabic expresses it by means of an n, which in all prob- ability is a modification of the former sound. But we may

main- tain that, in the later centuries, the m had fallen away in the pro- nunciation, either completely or in the majority of cases. Both in this point and in some others Sabaean appears more primitive than Arabic, as might be expected from the earlier date of its monuments. The article is formed by appending an n. In its vocabulary also Sabaean bears a great resemblance to Arabic, although, on the other hand, it often approaches more nearly to the northern Semitic languages in this respect; and it possesses much that is peculiar to itself.

Soon after the Christian era Sabaean civilization began to decline, and completely perished in the wars with the Abyssinians, who several times occupied the country, and in the 6th century remained in possession of it for a considerable period. In that age the language of central Arabia was already penetrating into the Sabaean domain. It is further possible that many tribes which dwelt not far to the north of the civilized districts had always spoken dialects resembling central Arabic rather than Sabaean. About the year 600 "Arabic" was the language of all Yemen, with the exception perhaps of a few isolated districts, and this process of assimilation continued in later times. True, a few echoes of Sabaean have survived in certain grammatical forms and the vocabulary of present-day dialects in those districts; but these dialects are, on the whole, thoroughly " Arabic." Several centuries after Mahomet, learned Yemenites were acquainted with the characters of the inscriptions which abounded in their country; they were also able to decipher the proper names and a small number of SaDaean words the meaning of which was still known to them, but they could no longer understand

the inscriptions as a whole. Being zealous local patriots, they discovered in those inscriptions which they imagined themselves to be capable of deciphering many fabulous stories respecting the glory of the ancient Yemenites.

Mahrl and Socotri. Farther to the east, in the sea-coast districts of Shihr and Mahra, up to the borders of the barren desert of the interior, and also in the island of Socotra, dialects very unlike Arabic are still spoken. Allusions to this fact are found in Arabic writers of the loth century. Mahri, from which Shkhauri forms a distinct dialect, and Socotri are probably scions of dialects which were related to Sabaean and Minaean; but they have developed on

altogether independent lines, and we can scarcely hope that they will render us any great assistance in the interpretation of the inscriptions. They certainly show the southern Semitic type in a most pronounced manner. The strange form of the words is produced, inter alia, by all manner of vowel lengthenings and violent mutations of consonants (e.g. in Socotri 5 frequently becomes h, a phonetic change otherwise unknown in Semitic philology). Exact investigation will undoubtedly still dis- cover an old acquaintance in many a strange-seeming word. Here and there, however, in Mahrl we discover words which at the first glance we recognize as common in Hebrew or Aramaic, while Arabic knows them either not at all or only in derivative significations. Still, a very large part — perhaps the preponderating part — of the Mahri vocabulary is formed by words which have been borrowed from the Arabic at different periods. Many of them have subse- quently undergone drastic phonetic alterations, so that at first they might be taken for genuine Mahri. In Socotri, which has been more protected by its insular position, the borrowed Arabic words are rarer, but even here they are not lacking. These languages, how- ever, especially Socotri, still contain a number of words, with regard to which we may well doubt whether they are Semitic at all. The conjecture that Hamites also were once settled in those 'districts and have left traces of themselves in the language, appears to be favoured by the bodily characteristics of the inhabitants. 1

Ethiopic. In Abyssinia, too, and in the neighbouring countries we find languages which bear a certain resemblance to Arabic. The Geez, or Ethiopic 2 proper, the language of the ancient kingdom p'hf' °u- °^ Axum, was reduced to writing at an early date. At Ethiopia g rs(. s ar jaean letters were employed. But even the proper. monument of King Aeizanas (c. A.D. 350), as is now well established, bears, in addition to the Greek inscription, one in Ethiopian. This, however, is both in Sabaean and in Geez char- acters, i.e. in a systematic transformation of the Sabaean. Here the Geez is still unvocalized; and some few inscriptions besides, without vowel signs, have been discovered. But two great inscriptions of the same king of Axum — so it appears to be after the newest researches — already have the full vocalization which obtains in the Ethiopian Bible and the remaining literature: the language, too, is identically the same. The indication of the vowels gives Ethiopic an advantage over all other Semitic scripts. By whom it was introduced is un- known. Not long after the time of the inscriptions the Bible was translated into Geez from the Greek, in part by Jews; for Jews and Christians were at that time actively competing with one another, both in Arabia and in

Abyssinia; nor were the former unsuccessful in making proselytes. The missionaries who gave the Bible to the Abyssinians must, at least in some cases, have spoken Aramaic as their mother-tongue, for this alone can explain the fact that in the Ethiopic Bible certain religious conceptions are expressed by Aramaic words. During the following centuries various works were produced by the Abyssinians in this language; they were all, so far as we are able to judge, of a more or less theological character, almost invariably translations from the Greek. We cannot say with certainty when Geez ceased to be the language of the people,. but it was probably about a thousand years ago. From the time when the Abyssinian kingdom was reconstituted, towards the end of the 13th century, by the sc-called Solomonian dynasty (which was of southern origin), the language of the court and of the government was Am- haric ; but Geez remained the ecclesiastical and literary language, and Geez literature even showed a certain activity in numerous translations from those Arabic and Coptic works which were in use amongst the Christians of Egypt; besides these, original writings were composed by monks and priests, namely, lives of saints, hymns, &c. This literary condition lasted till modern times. The language, which had long become extinct, was by no means invariably written in a pure form: we may often observe, inter alia, a servile imitation of Arabic modes of expression. Even in manuscripts of more ancient works we find many linguistic corruptions, which have crept in partly through mere carelessness and ignorance, partly through the influence of the later dialects. On points of detail we

'What certain knowledge we possess of Mahri and Socotri is almost wholly based on the researches of Vienna scholars. We hope to receive from them still more light on these strange tongues.

2 This name is due to the fact that the Abyssinians, under the influence of false erudition, applied the name kiOioxla to their own kingdom.

are still sometimes left in doubt, as we possess no manuscripts be-longing to the older period.

Geez is more nearly related to Sabaean than to Arabic, though scarcely to such a degree as we might expect. The historical inter-course between the Sabaeans and the people of Axum _. does not, however, prove that those who spoke Geez were . Yff" simply a colony from Sabaea; the language may be ofGeez descended from an extinct cognate dialect of south Arabia, or may have arisen from a mingling of several such dialects. And this colonization in Africa

probably began much sooner than is usually supposed. In certain respects Geez represents a more modern stage of development than Arabic ; we may cite as instances the loss of some inflexional terminations and of the ancient passive, the change of the aspirated dentals into sibilants, &c. In the manuscripts, especially those of later date, many letters are con- founded, namely, h, fr, and kh, s and sh, $ and d; this, however, is no doubt due only to the influence of the modern dialects. To this same influence, and indirectly perhaps to that of the Hamitic languages, we may ascribe the very hard sound now given to certain letters, g, (, s, and d, in the reading of Geez. The last two are at present pronounced something like (s and ts (the German 2). A peculiar advantage possessed by Geez and by all Ethiopic languages is the sharp distinction between the imperfect and the subjunctive: in the former a vowel is inserted after the first radical, a formation which exists also in Mahri and Socotri, and — though in another signification— in Assyrian as well. Geez has no definite article, but is very rich in particles. In the ease with which it joins sentences together and in its freedom as to the order of words it resembles Aramaic. The vocabulary is but imperfectly known, as the theologi- cal literature, which is for the most part very arid, supplies us with comparatively few expressions that do not occur in the Bible, whereas the more modern works borrow their phraseology in part from the spoken dialects, particularly Amharic. With regard to the voca- bulary, Geez has much in common with the other Semitic tongues, but at the same time possesses many words peculiar to itself; of these a considerable proportion may be of Hamitic origin. However, the grammar shows, at most, some slight and dubious traces of Hamitic influence. Geez seems to have been originally the language of a tribe almost exempt from non-Semitic blood. But we must not suppose that all the inhabitants of the ancient kingdom of Axum were pure Semites. The immigration of the Semites from Arabia was, in all probability, a slow process, beginning at a very ancient period, and under such circumstances there is every reason to assume that they largely intermingled with the aborigines. This opinion seems to be confirmed by anthropological facts.

Tigre and Tigrina. Not only in what is properly the territory of Axum (namely, Tigre, north-eastern Abyssinia), but also in the countries bordering upon it to the north, including the islands of Dahlak, dialects are still spoken which are but more modern forms of the linguistic type clearly exhibited in Geez, viz. that spoken in Tigre proper and that of the neighbouring countries. In reality, the name of Tigre belongs to both, and it would be desirable to distinguish them from one another as Northern and Southern Tigre. But it is the

custom to call the northern dialect Tigre simply, whilst that spoken in Tigre itself bears the name of Tigrai or, with an Amharic termination, Tigrina. Tigre bears a somewhat closer resemblance to Geez than does Tigrina, although this latter is spoken in the very home of Geez, for Tigrina has during several centuries been verv strongly influenced by Amharic, which has not been the case with Tigre, which is spoken mostly by nomads. But Tigre, on the other hand, seems to have been greatly influenced by Hamitic dialects. In late years careful observations on both languages have been made by scholars in loco, and we already have a number of printed texts, comprising partly original works, partly translations of Biblical books and so forth. But in this domain our knowledge still stands in great need of being perfected.

Amharic. Although Tigre and Tigrina are not free from foreign influences, yet at the core they are purely Semitic. This is not fundamentally the case with Amharic, a language of which the domain extends from the left bank of the Takkaze into regions far to the south. Although by no means the only language spoken in these countries, it always tends to displace those foreign tongues which surround it and with which it is interspersed. We here refer especially to the Agaw dialects. Although Amharic has been driven back by the invasions of the Galla tribes, it has already compensated itself to some extent for this loss, as the Yedju and Wollo Gallas, who penetrated into eastern Abyssinia, have adopted it as their language. With the exception, of course, of Arabic, no Semitic tongue is spoken by so large a number of human beings as Amharic. _ The very fact that the Agaw languages are being gradually, and, as it were, before our own eyes, absorbed by Amharic makes it appear probable that this language must be spoken chiefly by people who are not of Semitic race. 3 This supposition is confirm ed by a study of the language

3 Only an advanced guard of the Agaw languages, the Bilin or dialect of the Bogos, is being similarly absorbed by the Tigre.

itself. Amharic has diverged from the ancient Semitic type to a far greater extent than any of the dialects which we have hitherto enumerated. Many of the old formations preserved in Geez are completely modified in Amharic. Of the feminine forms there remain but a few traces; and that is the case also with the ancient plural of

the noun. The strangest innovations occur in the personal pronouns. And certainly not more than half the vocabulary can without improbability be made to correspond with that of the other Semitic languages. In this, as also in the grammar, we must leave out of account all that is borrowed from Geez, which, as being the ecclesiastical tongue, exercises a great influence everywhere in Abyssinia. On the other hand, we must make allowance for the fact that in this language the very considerable phonetic modifications often produce a total change of form, so that many words which at first have a thoroughly foreign appearance prove on further examination to be but the regular development of words with which we are already acquainted. But the most striking deviations occur in the syntax. Things which we are accustomed to regard as usual or even universal in the Semitic languages, such as the placing of the verb before the subject, of the governing noun before the genitive, and of the attributive relative clause after its substantive, are here totally reversed. Words which are marked as genitives by the prefixing of the relative particle, and even whole relative clauses, are treated as one word, and are capable of having the objective suffix added to them. It is scarcely going too far to say that a person who has learnt no Semitic language would have less difficulty in mastering the Amharic construction than one to whom the Semitic syntax is familiar. What here appears contrary to Semitic analogy is sometimes the rule in Agaw. Hence it is probable that in this case tribes originally Hamitic retained their former modes of thought and expression after they had adopted a Semitic speech, and that they modified their new language accordingly. And it is not certain that the partial Semitization of the southern districts of Abyssinia (which had scarcely any connexion with the civilization of Axum during . its best period) was entirely or even principally due to influences from the north.

In spite of its dominant position, Amharic did not for several centuries show any signs of becoming a literary language. The oldest documents which we possess are a few songs of the 15th and 1 6th centuries, which were not, however, written down till a later time, and are very difficult to interpret. There are also a few Geez-Amharic glossaries, which may be tolerably old. Since the 17th century various attempts have been made, sometimes by European missionaries, to write in Amharic, and in modern times this language has to a considerable extent been employed for literary purposes; nor is this to be ascribed exclusively to foreign influence. A literary language, fixed in a sufficient measure, has thus been formed. Books belonging to a somewhat earlier period contain tolerably clear proofs

of dialectical differences. Scattered notices by travellers seem to indicate that in some districts the language diverges in a very much greater degree from the recognized type.

The Abyssinian chronicles have for centuries been written in Geez, largely intermingled with Amharic elements. This " language of the chronicles," in itself a dreary chaos, often enables us to dis- cover what were the older forms of Amharic words. A similar mixture of Geez and Amharic is exemplified in various other books, especially such as refer to the affairs of the government and of the court.

Hararl and Gurague.

The town of Harar, situated at some distance east of Shoa, forms a Semitic island; for its language is extremely similar to Amharic. In comparison with this, it exhibits sometimes later, sometimes older formations. A few centuries ago, Harari was perhaps a dialect only slightly divergent from Amharic. To-day, Amharians and the inhabitants of Harar can no longer understand each other, especially as the latter have drawn largely on the languages of the surrounding Hamites (Galla, Somal, and probably also Dan&kil), and on Arabic, which exercises a strong influence upon them as Moslems. We may fairly regard them as an old colony of Abyssinians. As the case is with Harari, so it is probably with the dialects of Gurague (south of Shoa). These dialects, which are markedly divergent from one another and have assumed a highly peculiar form, placed as they are in the midst of entirely alien idioms, yet give unmistakable signs of an origin either from Amharic or a dialect extremely close to Amharic. It is certainly a matter for desire that we should soon receive some really comprehensive and at the same time trustworthy account of Harari and the language of Gurague. We repeat that the immigra- tion of the Semites into these parts of Africa was probably no one single act, that it may have taken place at different times, that the immigrants perhaps belonged to different tribes and to different districts of Arabia, and that very heterogeneous peoples and languages appear to have been variously mingled together in these regions. (Th. N.)

SEMLER, JOHANN SALOMO (1725-1791), German church historian and biblical critic, was born at Saalfeld in Thuringia on the 18th of December 1725, the son of a clergyman in poor circumstances. He grew up amidst pietistic surroundings, which powerfully influenced him his life through, though he

never became a Pietist. In his seventeenth year he entered the

university of Halle, where he became the disciple, afterwards the assistant, and at last the literary executor of the orthodox rationalistic professor S. J. Baumgarten (1706-1757). In 1749 he accepted the position of editor, with the title of professor, of the Coburg official Gazette. But in 1751 he was invited to Altdorf as professor of philology and history, and in 1752 he became a professor of theology in Halle. After the death of Baumgarten (1757) Semler became the head of the theological faculty of his university, and the fierce opposition which his writings and lectures provoked only helped to increase his fame as a professor. His popularity continued undiminished for more than twenty years, until 1779. In that year -he came forward with a reply (Beantwortung der Fragmente eines Ungenannten) to the Woljenbiittel Fragments (see Reimarus) and to K. F. Bahrdt's confession of faith, a step which was interpreted by the extreme rationalists as a revocation of his own rationalistic position. Even the Prussian government, which favoured Bahrdt, made Semler painfully feel its displeasure at this new but really not inconsistent aspect of his position. But, though Semler was really not inconsistent with himself in attacking the views of Reimarus and Bahrdt, his popularity began from that year to decline, and towards the end of his life he felt the necessity of emphasizing the apologetic and conservative value of true historical inquiry. His defence of the notorious edict of July 9, 1788, issued by the Prussian minister for ecclesiastical affairs, •Johann Christoph von Wollner (1732-1800), the object of which was to enforce Lutheran orthodoxy, might with greater justice be cited as a sign of the decline of his powers and of an unfaithfulness to his principles. He died at Halle on the 14th of March 1791, worn out by his labours, and disappointed at the issue of his work.

The importance of Semler, sometimes called " the father of German rationalism," in 'the history of theology and the human mind is that of a critic of biblical and ecclesiastical documents and of the history of dogmas. He was not a philosophical thinker or theologian, though he insisted, with an energy and persistency before unknown, on certain distinctions of great importance when properly worked out and applied, e.g. the distinction between religion and theology, that between private personal beliefs and public historical creeds, and that between the local and temporal and the permanent elements of historical religion. His great work was that of the critic. He was the first to reject with sufficient proof the equal value of the Old and the New Testaments, the uniform authority of all parts of the Bible, the divine authority of the traditional canon of Scripture, the inspiration and supposed correctness of the text of the Old and New Testaments,

and, generally, the identification of revelation with Scripture. Though to some extent anticipated by the English deist Thomas Morgan, Semler was the first to take due note of and use for critical purposes the opposition between the Judaic and anti-Judaic parties of the early church. He led the way in the task of dis- covering the origin of the Gospels, the Epistles, the Acts of the Apostles, and the Apocalypse. He revived previous doubts as to the direct Pauline origin of the Epistle to the Hebrews, called in question Peter's authorship of the first epistle, and referred the second epistle to the end of the 2nd century. He wished to remove the Apocalypse altogether from the canon. In textual criticism Semler pursued further the principle of classifying MSS. in families, adopted by R. Simon and J. A. Bengel. In church history Semler did the work of a pioneer in many periods and in several depart- ments. Friedrich Tholuck pronounces him " the father of the history of doctrines," and F. C. Baur " the first to deal with that history from the true critical standpoint." At the same time, it is admitted by all that he was nowhere more than a pioneer.

Tholuck gives 171 as the number of Semler's works, of which only two reached a second edition, and none is now read for its own sake. Amongst the chief are: Commentatio de demoniacis (Halle, 1760, 4th ed. 1779), Vmstandliche Untersuchung der ddmonischen Leute (1762), Versuch einer biblischen Damonologie (1776), Selecta capita historiae ecclesiasticae (3 vols., Halle, 1767-1769), Abhandlung von freier Untersuchung des Kanon (Halle, 1771-1775), Apparatus ad liberalem N.T. inter pretationem (1767; ad V.T., 1773), Institutioad doctrinam Christ, liberaliter discendam (Halle, 1774), Uber histor- ische, gesellschaftliche, und moralische Religion der Christen (1786), and his autobiography, Semler's Lebensbeschreibung, von ihm selbst abgefasst (Halle, 1 781-1782).

For estimates of Semler's labours, see W. Gass, Gesch. der prot. Dogmatik (Berlin, 1854-1867); Isaak Dorner, Gesch. der prot. Theol. (Munich, 1867); the art. in Herzog's Realencyklopddie; Adolf Hilgenfeld, Einleitung in das Neue Test. (Leipzig, 1875) ; F. C. Baur, Epochen der kirchlichen Geschichtsschreibung (1852); and Albrecht Ritschl, Gesch. des Pietismus (Bonn, 1880-1884).

SEMLIN— SEMO SANCUS

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SEMLIN (Hungarian, Zimony; Servian, Zemun), a town of Croatia-Slavonia, in the county of Syrmia, situated beside the south bank of

the Danube, on a tongue of land between that river and the Save. Pop. (iooo) about 15,079; the majority being Serbs, the remainder Croats, Jews, Germans, Magyars and Gipsies. Semlin is the seat of an Orthodox archbishop; but most of the inhabitants are Roman Catholic. Apart from numerous churches, its chief buildings are the law-courts, prison, theatre, synagogue, a higher grade school or real-gymnasium, and two technical schools, one being for girls. Much of the town is modern, but its suburb Franzenthal near the Danube consists partly of mud huts thatched with reeds. Standing at the confluence of two navigable rivers, and on the main line from Buda-Pest to Constantinople and Salonica, Semlin is the principal customs and quarantine station for travellers between Austria- Hungary and the Balkan states. It communicates with Vienna and the Black Sea, by the Danube; with Sissek, by the Save; and with Belgrade by a steam-ferry and a bridge over the Save. There are a few factories, but far more important is the transit trade in grain, fruit, livestock and timber.

Various Roman remains have been discovered near Semlin. On the top of Zigeunerberg, a hill overlooking the Danube, are the ruins of the castle of Hunyadi Janos, who died here in 1456. Until 1881 the town belonged to the Military frontier (g.».).

SEMMELWEISS, IGNATZ PHILIPP (1818-1865), Hungarian physician, was born at Buda on the 1st of July 1818, and was educated at the universities of Pest and Vienna. At first he intended to study law, but soon abandoned it for medicine; and such was his promise that, even as an undergraduate, he attracted the attention of men like Joseph Skoda and Carl Rokitansky. He graduated M.D. at Vienna in 1844, and was then appointed assistant professor in the maternity depart- ment, under Johann Klein. In Klein's time the deaths in this department from what was then known as " puerperal fever " became portentous, the ratio being rarely under 5-03 and some- times exceeding 7-45%. Between October 1841 and May 1843, of 513Q parturient women 829 died; giving the terrible death-rate of 16%, not counting those of patients transferred to other wards. It was observed that this rate of mortality prevailed in the students' clinic; in the midwives' clinic it ruled much lower. Semmelweiss found no satisfactory explanations of this mortality in such causes as overcrowding, fear, mysterious atmospheric influences or even contaminated wards; yet that the cause lay in some local conditions he felt certain. The patients would die in rows, others escaping; and women de- livered before arrival, or prematurely, would escape. At last, he tells us, the death of a colleague from a dissection wound " un- veiled to my mind an

identity " with the fatal puerperal cases; and the beginning of a scientific pathology of septicaemia was made. The students often came to the lying-in wards from the dissecting-room, their hands cleansed with soap and water only. In May 1847 Semmelweiss prescribed ablutions with chlorinated lime water: in that month the mortality stood at 12-24%; before the end of the year it had fallen to 3-04, and in the second year to 1-27; thus even surpassing the results in the midwives' clinic. Skoda and other eminent physicians were convinced by these results {Zeilschrift d. k. k. Gesellschaft der Arzte in Wien, J. vi. B . i. p. 107) . Klein, however, apparently blinded by jealousy and vanity, supported by other reactionary teachers, and aided by the disasters which then befell the Hungarian nation, drove Semmelweiss from Vienna in 1849. Fortunately, in the following year Semmelweiss was appointed obstetric physician at Pest in the maternity department, then as terribly afflicted as Klein's clinic had been; and during his six years' tenure of office he suc- ceeded, by antiseptic methods, in reducing the mortality to 0-85%, Semmelweiss was slow and reluctant as an author, or no doubt his opinions would have obtained an earlier vogue; moreover, he was not only tender-hearted, but also irascible, impatient and tactless. Thus it cannot be said that the stupidity or malignity of his opponents was wholly to blame for the tragical issue of the conflict which brought this man of genius within the gates of an asylum on the 20th of July 1865. Strange

to say, he brought with him into this retreat a dissection wound of the right hand, and on the 17th of the following August he died, a victim of the very disease for the relief of which he had already sacrificed health and fortune.

His chief publication was Die Atiologie der Begriff und die Prophy-laxis des Kindbettfiebers (Vienna, 1 861). There are biographies by Hegar (Freiburg, 1882), Bruck (Vienna and Tischen, 1887), Duka (Hertford, 1882), Grosse (Vienna, 1898) and Schilrer von Waldheim (Vienna, 1905). For the relations in the order of discovery of Semmelweiss to Lister see Lister. (T. C. A.)

SEMMERIN6 PASS, the lowest of all the great passes across the Alps. The hospice, near the summit, was founded about 1 1 60, but the pass was certainly used at a much earlier date. Between 1848 and 1854 a railway line (the first in any sense to cross the Alps) was constructed, but passes 282 ft. below the summit of the pass (3225 ft.) by a tunnel about 1 m. long. The line runs from Wiener Neustadt (305 m. from Vienna) past Bruck to Graz (139 m. from Vienna), the capital of Styria, whence it is 227 m. by rail to Trieste.

SEMOIS (also spelt Semoy and Semoys), a river of less than 1 20 m. in length rising near Arlon in Belgium, and flowing into the Meuse near Montherme in France. It is Belgian for about 100 m. and French for the remainder, entering France a short distance west of the village of Bohan. It passes through the most pictur- esque scenery in Belgium and is remarkable for its sinuous course, its length of 120 m. representing only 47 in a straight line. Bouillon is the only town on its banks, and since it is not navigable it has escaped the contamination of manufacturing life; its valley remains an ideal specimen of sylvan scenery and medieval tranquillity.

SEMONVILLE, CHARLES LOUIS HUGUET, Marquis de (1759-1839), French diplomat, was born in Paris on the 9th of March 1759, the son of one of the, royal secretaries. Minister and envoy extraordinary of France at Genoa in 1790-1791, he was instructed by Dumouriez to go to Turin to detach Victor Amadeo III. of Sardinia from the Austrian alliance, but was not permitted to cross the Sardinian frontier. In 1793 he had started with H. B. Maret (afterwards due de Bassano) for Italy where they had missions to Florence and Naples respectively, when the two envoys were kidnapped by Austrian orders in the Valtelline. They remained in a Tirolese prison until December 1795, when there was an exchange of prisoners on the release of Madame Royale, daughter of Louis XVI., from the Temple. In 1799 Bonaparte, through whose influence his release had been obtained, sent him to the Hague to consolidate the alliance between France and the Batavian Republic. In this mission he was entirely successful, and he is credited with another diplomatic success in the inception of the Austrian marriage. He accepted the Restoration and sat on the commission which drew up the charter. Semonville, who enjoyed a great measure of Louis XVIII. "s confidence, took no part in the Hundred Days. A frank opponent of the extremist policy of Charles X., he tried to save him in 1830; in company with Antoine d'Argout he visited the Tuileries and persuaded the king to withdraw the ordinances and to summon the Council. He had been made a count of the Empire in 1808, and marquis in 1819. He died in Paris on the nth of August 1839.

SEMO SANCUS, an Italian divinity worshipped by the Sabines, Umbrians and Romans, also called Dius Fidius and (perhaps wrongly) identified with the Italian Hercules. His dual nature, as a god of light and good faith, is indicated by the names Dius Fidius. Sancus is obviously from sancire, meaning one who hallows the acts in which he takes part. Semo has been variously explained as: (1) one who presides over seed-time and harvest (serere, cf. the female Semonia); (2) a being apart from and superior to man (se-homo);

(3) a demi-god (semis). The priests called bidentales, whose existence is attested by inscriptions, were specially connected with his worship, since lightning which fell from heaven during the day was looked upon as sent by Dius Fidius, and a special class of birds (sanquales) was under his protection. As the god of oaths, he protected the sanctity of the marriage tie, the rights of hospitality, international treaties and alliances. In his sanctuary on the Quirinal, the foundation

of which was celebrated on the 5th of June, there were shown the distaff and spindle of Tanaquil, the wife of Tarquinius Priscus, and in the eyes of Roman matrons the embodiment of all wifely virtues. Dionysius of Halicarnassus (iv. 58) states that the treaty concluded between Tarquinius Superbus and the town of Gabii was deposited in the same temple of Sancus, whose name he translates by Zew ttiotios. He could only be invoked under the open sky, as partaking of the nature of a god of light and day; hence a round opening was made in the roof of his temple through which prayers might ascend to heaven. If he was invoked in a private house, those who called upon his name stood beneath the opening in the roof called compluvium. The bronze orbs mentioned by Livy (viii. 20. 8) as having been set up in his temple are also supposed to have some connexion with this, although they may be merely symbols of the eternal power of Rome, There was a second chapel of Semo Sancus on the island in the Tiber with an altar, the inscription on which led Christian writers (Justin Martyr, Tertullian, Eusebius) to con- fuse him with Simon Magus, and to infer that the latter was worshipped at Rome as a god. The cult of Semo Sancus never possessed very great importance at Rome; authorities differ as to whether it was of Sabine origin or not. The plural Semones was used of a class of supernatural beings, a kind of tutelary deities of the state.

See Preller, Romische Mythologie; article ” Dius Fidius,” by Wissowa, in Roscher’s Lexikon der Mythologie, and his Religion und Kullus der Rbmer (1902), who rejects the identity of Semo Sancus Dius Fidius with Hercules; W. W. Fowler, The Roman Festivals (1899); E. Jannettaz, Etude sur Semo Sancus Fidius (Paris, 1885), according to whom he was a Sabine fire god.

SEMPACH, a small town in the Swiss canton of Lucerne, built above the eastern shore of the lake of the same name, and about 1 1 m. by

road north of the Sempach railway station (9 m. N.W. of Lucerne) on the main line between Lucerne and Olten. In 1900 it had 2592 inhabitants, German-speaking and Romanists. It has retained some traces of its medieval appearance, especially the main gateway, beneath a watch tower, and reached by a bridge over the old moat. About half an hour distant to the north-east, on the hillside, is the site of the famous battle of Sempach (9th July 1386), in which the Swiss defeated the Austrians, whose leader, Duke Leopold, lost his life. The legend- ary deed of Arnold of Winkelried (q.v.) is associated with this victory. The spot is now marked by an ancient and picturesque Battle Chapel (restored in 1886) and by a modern monument to Winkelried. Some miles north of Sempach is the quaint village of Munster or Beromiinster (973 inhabitants in 1900), with a collegiate church founded in the 10th century and dating, in parts, from the nth and 12th centuries (fine 17th-century choir stalls and altar frontals), the chapter of secular canons now consisting of invalided priests of the canton of Lucerne: it was in Beromiinster that the first dated book was printed (1470) in Switzerland, by care of the canons, while thence came Gering who introduced printing into France.

See Th. von Liebenau. Die Schlacht bei Sempach (Lucerne, 1886).

(W. A. B. C.)

SEMPER, GOTTFRIED (1803-1879), German architect and writer on art, was born at Altona on the 29th of November 1803. His father intended him for the law, but his impulses towards an artistic career were irresistible. His early mastery of classical literature led him to the study of classic monuments in classic lands, while his equally conspicuous talent for mathematics gave him the laws of form and proportion in architectural design. At the university of Gottingen he fell under the influence of K. O. Mtiller. His architectural education was carried out successively in Hamburg, where later, upon his return from Greece, he built the Donner Museum, in Berlin, in Dresden, in Paris under Gau and in Munich under Gartner; afterwards he visited Italy and Greece. While in Greece he made observations which showed that in ancient architecture the use of polychrome was frequent. In the diffusion of this discovery he was much aided by Jacques Ignace Hittorff. In 1834 he was appointed professor of architecture in Dresden, and during fifteen years received many important commissions from the Saxon court.

He built the opera-house in Renaissance style, the new museum and picture gallery, and a Byzantine synagogue. In 1848 his turbulent

spirit led him to side with the revolution against his royal patron; he furnished the rebels with military plans, and was eventually driven into exile. Semper came to London at the time of the Great Exhibition of 185 1, and Prince Albert found him an able ally in carrying out his plans. He was appointed teacher of the principles of decoration; his lectures in manuscript are preserved in the art library, South Kensington. He was also em- ployed by the prince consort to prepare a design for the Kensing- ton Museum; and he made the drawings for the Wellington funeral car. In 1853 Semper left London for Zurich on his appointment as professor of architecture, and with a commission to build in that town the polytechnic school and the hospital. He also built the observatory and the railway station in that city. Here, too, he made plans for a large theatre in Rio Janeiro. In 1870 he was called to Vienna to assist in the great archi- tectural projects since carried out around the Ring. A year later, after an exile of over twenty years, he received a summons to Dresden, on the rebuilding of the first opera-house, which had been destroyed by fire in 1869; his second design was a modifica- tion of the first. The closing years of his life were passed in comparative tranquillity between Venice and Rome, and in the latter city he died on the, 15th of May 1879. In 1892 a bronze statue of Semper, by Johannes Schelling, was unveiled on the Briihlsche Terrasse in Dresden.

Semper's style was a growth from the classic orders through the Italian Cinque Cento. He forsook the base and rococo forms he found rooted in Germany, and, reverting to the best historic ex- amples, fashioned a purer Renaissance. He stands as a leader in the practice of polychrome, since widely diffused, and by his writings and example did much to reinstate the ancient union between archi- tecture, sculpture and painting. Among his numerous liteiary works are Tiber Polychromie u. ihren Ursprung (1851), Die An- wendung der Farben in der Architektur u. Plastik bei den Allen, Der Stil in den technischen u. tektonischen Kunsten (1860-1863). His Notes of Lectures on Practical Art in Metals and Hard Materials: its Technology, History and Style, were left in MS.

SEMPILL, the name of a Scottish family long seated, in Renfrewshire. An early member, Sir Thomas Sempill (d. 1488), was killed whilst fighting for James III. at the battle of Sauchie- burn, and his son John (d. 1513), who was made a lord of parlia- ment about 1489, fell at Flodden. John's grandson, Robert, 3rd Lord Sempill (c. 1505-1572), assisted the Scottish regent, Mary of Lorraine, in her struggle with the lords of the congregation, and was afterwards one of the partisans of Mary, queen of Scots; about 1566,

however, he deserted the queen, against whom he fought at Carberry Hill and at Langside. His grandson, Robert (d. 161 1), became the 4th Lord Sempill, and another grandson was Sir James Sempill of Beltrees (q.v.).

The title of Lord Sempill descended to Francis, the 8th lord (d. 1684), who was succeeded by his sister Anne (d. 1695), the wife of Francis Abercromby (d. 1703), who was created a peer for life as Lord Glassford. Their sons, Francis, John and Hugh, who took the surname of Sempill, succeeded in turn to the title. Hugh, 12th Lord Sempill (d. 1746), fought in Spain and in Flanders, and held a command in the English army at Culloden; in 1747 he was made colonel of the Black Watch. His title descended to Selkirk Sempill, the 15th lord (1788-1835), who was succeeded by his sister, Maria Janet (1790-1884). She was succeeded by a cousin, William Forbes (1836-1905)ˆ descendant of the 13th lord, who took the name of Forbes-Sempill; in 1905 his son, John Forbes-Sempill (b. 1863), became the 18th lord.

A certain Robert Sempill, who served James Edward, the Old Pretender, in France, and is described as a captain in Dillon's famous Irish regiment, was created Lord Sempill by this prince after 1723. This circumstance has given rise to a certain amount of confusion between the different holders of the title.

SEMPILL (or Semple), SIR JAMES, ROBERT AND FRANCIS,

three Scottish ballad-writers, known as the Sempills of Beltrees from their place in Renfrewshire.

Sir James Sempill (1 566-1626) was the son of John Sempill of Beltrees, and Mary Livingstone, one of the " four Marys," companions of Mary, queen of Scots. He was brought up with James VI. under George Buchanan, and later assisted the king

in the preparation of his Basilikon Dor on. Ambassador to England 1590-1600, he was made a knight bachelor, and in 1601 was sent to France. He died at Paisley in 1626. His wife was Egidia or Geillis Elphinstone of Blythswood. He wrote some theological works in prose, but is chiefly remembered for the poem " The Packman's Pater Noster," a vigorous attack upon the Church of Rome. An edition was published at Edin- burgh in 1669 entitled " A Pick-tooth for the

Pope, or the Packman's Pater Noster, translated out of Dutch by S. I. S., and newly augmented and enlarged by his son R. S." (reprinted by Paterson). Seven poems, chiefly of an amorous character, are printed in T. G. Stevenson's edition of The Sempill Ballates.

Robert Sempill [the younger] (1 59 5 ?i66s ?) , son of the above, was educated at the university of Glasgow, having matriculated in March 1613. During the Civil War he fought for the Stuarts, and seems to have suffered heavy pecuniary losses under the Commonwealth. He died between 1660 and 1669. He married Mary, daughter of Sir Thomas Lyon of Auldbar. His reputation is based on the ballad, " The Life and Death of Habbie Simpson, Piper of Kilbarchan," written c. 1640. It is an interesting picture of the times ; and it gave fresh vogue to the popular six hned stanza which was much used later by Ramsay, Fergusson and Burns (see particularly, Burns's " Poor Mailie's Elegy"). Two broadside copies were printed before 1 700, and it appeared in James Watson's Collection of Poems (1706-1710). Sempill is supposed to be the author also of an epitaph on " Sawney Briggs, nephew to Habbie Simpson," written in the same stanza. He wrote a continuation of his father's " Packman's Pater Noster."

Francis Sempill (i6i6?-i682) was a son of Robert Sempill the younger. No details of his education are known. His fidelity to the Stuarts involved him in money difficulties, to meet which he alienated portions of his estates to his son. Before 1677 he was appointed sheriff-depute of Renfrewshire. He died at Paisley in March 1682. Sempill wrote many occa- sional pieces, and his fame as a wit was widespread. Among his most important works is the " Banishment of Poverty," which contains some biographical details. " The Blythsome Wedding," long attributed to Francis Sempill, has been more recently asserted to be the work of Sir William Scott of Thirlestane. Sempill's claim to the authorship of the celebrated song " She raise and let me in," and of the ballad " Maggie Lauder," has been discussed at considerable length. It seems probable that he had some share in both.

See the works mentioned below in the article on the elder Robert Sempill, and The Poems of the Sempitts of Beltrees, ed. James Paterson (Edinburgh, 1849); A Literary History of Scotland, by J. H. Millar ˆ1903); and Notes and Queries, 9th series (xi., 1903, pp. 436-437).

SEMPILL, ROBERT [the elder] (c. 1530-1595), Scottish ballad-writer, was in all probability a cadet of illegitimate birth of the noble

house of Sempill or Semple. Very little is known of his life. He appears to have spent some time in Paris. He was probably a soldier, and must have held some office at the Scottish court, as his name appears in the lord treasurer's books in February 1 567-1 568, and his writings show him to have had an intimate knowledge of court affairs. He was a bitter opponent of Queen Mary and of the Catholic Church. Sempill was present at the siege of Leith (1559-1560), was fn Paris in 1572, but was driven away by the massacre of St Bartholomew. He was prob- ably present at the siege of Edinburgh Castle (1573), serving with the army of James Douglas, earl of Morton. He died in 1595. His chief works are: " The Ballat maid vpoun Margret Fleming callit the Flemyng bark"; "The defence of Crissell Sande- landis"; "The Claith Merchant or Ballat of Jonet Reid, ane Violet and Ane Quhyt," all three in the Bannatyne MS. They are characterized by extreme coarseness, and are probably among his earlier works. His chief political poems are " The Regentis Tragedie," a broadside of 1570; "The Sege of the Castel of Edinburgh " (1573), interesting from an historical point of view; " Ane Complaint vpon fortoun ..." (1581), and "The Legend of the Bischop of St Androis Lyfe callit Mr Patrik Adamsone "

(1583).

See Chronicle of Scottish Poetry (ed. James Sibbald, Edinburgh, 1802) ; and"Essayson the Poets of Renfrewshire.," by William Mother-

well, in The Harp of Renfrewshire (Paisley, 1819; reprinted 1872). Modern editions of Sempill are: " Sege of the Castel of Edinburgh," a facsimile reprint with introduction by David Constable (1813); The Sempill Ballates (T. G. Stevenson, Edinburgh, 1872) containing all the poems ; Satirical poems of the Reformation (ed. James Cran- stoun, Scottish Text Soc, 2 vols., 1889-1893), with a memoir of Sempill and a bibliography of his poems.

SEMUR-EN-AUXOIS, a town of eastern France, capital of an arrondissement in the department of C6te-d'Or, 45 m. W.N.W. of Dijon on the Paris-Lyon railway. Pop. (1906) 3278. Semur occupies one of the finest sites in France, on the extremity of a plateau dominating the river Armancon, which surrounds the town on three sides. The river forms this extremity into a peninsula which is occupied by the old town, once surrounded by ramparts, the remains of which are still to be seen. An isthmus, on which stands the castle, unites the older to the newer quarter, in which are situated an old gateway of the 15th century and the church of Notre-Dame. This

building, which belongs mainly to the 13 th century, is one of the purest examples of Gothic archi- tecture in Burgundy, though the narrowness of the nave, to some degree, spoils its proportions. The portal with its three arched openings projects from the facade, which is flanked by two square towers surmounted by balustrades. Of the artistic features of the interior one of the most noteworthy is the sculptured keystone of the vaulting of the apse, representing the crowning of the Virgin. The castle (13th and 14th centuries) consistsof 'a rectangular keep flanked by four towers. Portions of it are still in use. Among the numerous old houses in the town is one belonging to the time of Louis XIV. of which the last proprietor was Florent Claude du Chatelet, husband of the friend of Voltaire. It is now used as a hospital. Semur possesses a sub-prefecture, a tribunal of first instance and a communal college. It is an important market centre for the Auxois and Morvan, and has trade in horses, grain, sheep, fruit and vegetables. Cement, leather, oil, and chemical manures are among its industrial products.

Semur (Sinemurum) was a Gallic fortress in the dark ages and in feudal times a castle of the dukes of Burgundy. In the nth century it became capital of Auxois. Its communal charter dates from 1276. The incorporation of Burgundy with France was resisted by the town, which was taken and pillaged by the royal troops in 1478. During the wars of religion in the 16th century it served as refuge for the Leaguers, and though it submitted to Henry IV. at his acces- sion its fortifications were destroyed in 1602.

SENAC DE MEILHAN, GABRIEL (1736-1803), French writer, son of Jean Senac, physician to Louis XV., was born in Paris in 1736. He entered the civil service in 1762; two years later he bought the office of master of requests, and in 1766 further advanced his position by a rich marriage. He was successively intendant of La Rochelle, of Aix and of Valenciennes. In 1776 he became intendant-general for war, but was soon compelled to resign. He had hoped to be made minister of finance, and was disappointed by the nomination of Necker, of whom he became a bitter opponent. He was intimate with thecomtesse de Tesse, sister of the due de Choiseul, and in 1781 met Madame de Crequy, then sixty-seven years of age, and began a long friend- ship with her. His first book was the fictitious Memoires d' Anne de Gonzague, princesse palatine (1786), thought by many people at the time to be genuine. In the next year followed the Con- siderations sur les richesses et le luxe, combating the opinions of Necker; and in 1788 the more valuable Considerations sur V esprit et les mxurs, a book which abounds in sententious, but often excessively frank, sayings. Senac witnessed the beginnings of the

Revolution in Paris, but emigrated in 1790, making his way first to London, and then, in 1791, to Aix-la-Chapelle, where he met Pierre Alexandre de Tilly, who asserts in his Memoirs that Senac attributed the misfortunes of Louis XVI. to the refusal of his own services. In 1793, while his recollections of the Revolution were still fresh, he wrote a novel, L' Emigre (Ham- burg, 4 vols., 1797), which shows perspicacity and good judgment in its treatment of events. It was reprinted in 1904 in an abridged form by Casimir Stryienski and Frantz Funck-Brentano. At the invitation of Catherine II. Senac went in 1792 to Russia, where he hoped to become imperial historiographer, but his manners displeased Catherine, who contented herself with dis- missing him with a pension. From Russia he went to Hamburg,

and thence to Vienna, where he found a friend in the prince de Ligne. He died on the 16th of August 1803. Senac also wrote a moderate exposition of the causes that led to the revolu- tion, entitled Du gouvernement, des mmurs et des conditions en France avant la Revolution, avec les caracteres des principaux personnages du regne de Louis XVI; the last part was reprinted (1813) by the due de Levis with a notice of the author as Por- traits et caracteres. Senac collected his own QLuvres philosophiques et lilteraires (2 vols.) at Hamburg in 1795.

Sec his (Euvres choisies, edited by M. de Lescure in 1862; Lettres inedites de Madame de Crequi a Senac de Meilhan (1856), edited by Edouard Fournier; Louis Legrand, Senac de Meilhan et I'intendance du Hainaut et du Cambresis (1868); and the notice by Fernand Caussy prefixed to his edition (1905) of the Considerations sur Vespril et les mceurs.

SENANCOUR, ETIENNE PIVERT DE (1770-1846), French author, was born in Paris in November 1770. His father desired him to enter the seminary of Saint-Sulpice preparatory to be- coming a priest, but Senancour, to avoid a profession for which he had no vocation, went on a visit to Switzerland in 1789. At Fribourg he married in 1 790 a young Frenchwoman, Made- moiselle Daguet, but the marriage was not a happy one. His wife refused to accompany him to the Alpine solitude he desired, and they settled in Fribourg. His absence from France at the outbreak of the Revolution was interpreted as hostility to the new government, and his name was included in the list of emi-

grants. He visited France from time to time by stealth, but he only succeeded in saving the remnants of a considerable fortune. In 1799 he published in Paris his Reveries sur la nature primitive de I'homme, a book containing impassioned descriptive passages which mark him out as a precursor of the romantic movement. His parents and his wife died before the close of the century, and Senancour was in Paris in 1801 when he began Obermann, which was finished in Switzerland two years later, and printed (Paris, 2 vols.) in 1804. This singular book, which has never lost its popularity with a limited class of readers, was followed in the next year by a treatise De V amour, in which he attacked the accepted social conventions. Obermann, which is to a great extent inspired by Rousseau, was edited and praised successively by Sainte-Beuve and by George Sand, and had a considerable influence both in France and England. It is a series of letters supposed to be written by a solitary and melancholy person, whose headquarters are placed in a lonely valley of the Jura. The idiosyncrasy of the book in the large class of Wer- therian-Byronic literature consists in the fact that the hero, in- stead of feeling the vanity of things, recognizes his own inability to be and do what he wishes. Professor Brandes has pointed out that while Rene was appreciated by some of the ruling spirits of the century, Obermann was understood only by the highly gifted, sensitive temperaments, usually strangers to success. Senancour was tinged to some extent with the older philosophe form of free-thinking, and had no sympathy with the Catholic reaction. Having no resources but his pen, Senancour was driven to hack- work during the period which elapsed between his return to France (1803) and his death at St Cloud (10th of January 1846); but some of the charm of Obermann is to be found in the Libres Meditations d'un solitaire inconnu. Thiers and Villemain succes- sively obtained for Senancour from Louis Philippe pensions which enabled him to pass his last days in comfort. He wrote late in life a second novel in letters entitled Isabelle (1833). He composed his own epitaph; Eternite, sois mon asile.

Senancour is immortalized for English readers in the Obermann of Matthew Arnold. Obermann itself was translated into English, with biographical and critical introduction, by A. G. Waite (1903). See the preface by Sainte-Beuve to his edition (1833, 2 vols.) of Obermann, and two articles Portraits contemporains (vol. i.) ; Un Precurseur and Senancour (1867) by J. Levallois, who received much information from Senancour's daughter, Eulalie de Senancour, herself a journalist and novelist; and a biographical and critical study Senancour, by J. Merlant (1907).

SENARMONT, ALEXANDRE ANTOINE HUREAU DE (1760- 1810),

French artillery general, was born at Strassburg, and educated at the Metz school for engineer and artillery cadets. In 1785 he was commissioned in the artillery, in which he served as a regimental officer for fifteen years. In 1800 he won great

credit both by his exertions in bringing the artillery of the Army of Reserve over the Alps and by his handling of guns in the battle of Marengo. In 1806, as a general of brigade, and com- mander of the artillery of an army corps, he took part in the Jena and Eylau campaigns. But he is remembered chiefly in con- nexion with the " caseshot attack " which was the central feature of Napoleon's matured tactical, system, and which Senarmont put into execution for the first time at Friedland (q.v.). For this feat he was made a baron, and in 1808 he was promoted general of division by Napoleon on the field of battle in front of Madrid. He was killed at the siege of Cadiz on the 26th of October 18 10.

SENARMONT, HENRI HUREAU DE (1808-1862), French mineralogist and physician, was born at Broue, Eure et Loire, on the 6th of September 1808. He became engineer-in-chief of mines, and professor of mineralogy and director of studies at the Ecole des Mines at Paris. He was distinguished for his researches on polarization and on the artificial formation of minerals. He also wrote essays and prepared maps on the geology of Seine et Marne and Seine et Oise for the Geological Survey of France (1844). He died in Paris on the 30th of June 1862.

SENATE (Lat. senatus, from root sen-, as in senex, old; the root is the Sanskrit sana, cf. Gr. 'evos; the same element appears in senor, seigneur, seneschal) literally the assembly of old men, 1 originally the heads of the chief families, and hence, in general, the upper council in a governmental system. The Latin word corresponds with the Greek gerousia (

The Ancient Roman Senate. (A) History. — ■ The senate or council of elders formed the oldest and most permanent element in the Roman constitution. The authorities are unanimous in ascribing the origin of the senate to ,ˆ aarchy. Romulus, who chose out 100 of the best of his subjects to form his advising body. They are, however, far from unani- mous in their account of the subsequent history of the senate down to the foundation of the republic. The only facts on which they are all agreed are that in 509 B.C. it already con- tained 300 members, and that a distinction already existed within it between patres maiorum gentium and minorum gentium (Livy i. 35; Cic. De rep.n. 20. 35; Dionys. ii. 47). Moreover, with one exception

they agree in asserting that throughout the monarchical period the senate consisted entirely of patricians. There is undoubtedly some connexion between the increase in the numbers of the senate by the admission of new members and the distinction between two classes of patres. The most probable view seems to be that the rise in the number of the senators was due to the gradual incorporation of fresh elements into the patrician community, with a consequent increase of gentes; and that the new clans, out of which new members came into the senate, were the gentes minores. The exclusively patrician char acter of the senate at this period seems an inevitable inference from all that we know of the political position of the plebs at the

1 With the idea of age is conjoined that of superior wisdom and experience, worthy of respect and qualified to decide; cf. the Anglo-Saxon Witanagemot, the assembly of the wise men. Originally the members were the advisers of the king, and their spirit was generally aristocratic and conservative.

time, and the evidence of Zonaras to the contrary is universally discredited. The appointment of senators depended entirely upon the king. They were not appointed for life, but at the pleasure of the king who summoned them. It is possible that a king might change his advisers during his reign, and a new king could certainly abstain from summoning some of those con- vened by his predecessors. 1 The powers of the senate at this time were very indefinite. Tradition ascribed to it the control of the interregnum and a power of sanctioning acts of state (patrum auctoritas), to which it is difficult to give any significance for this early period. It seems also to have possessed a customary right of controlling foreign policy, for the ancient formula of the Fetiales refers to the sanction of the patres (Livy i. 3 2) . From the senate also must have been chosen the delegates appointed by the king either to be his executive representative when he was absent in the field (praefeclus urbi), or to assist him in jurisdiction {Ilviri perduellionis, quaestor es parricidii).

The abolition of monarchy, and the substitution of two annually elected consuls did not at first bring any important

change in the position of the senate. It was the con- Republic suiting body of the consuls, meeting only at their

pleasure, and owing its appointment to them, and remained a power distinctly secondary to the magistrates, as it had been formerly to the king. The magistrates at this time were chosen entirely from the patrician houses, and the senate long remained a stronghold of patrician prejudice. Tradition ascribes to the first consuls some change in the class from which senators were drawn, but various accounts of the change arc given (Livy ii. 1; Festus, p. 254; Dionys. v. 13; cf. Tac. Ann. xi. 25). Whatever the exact nature of the change, we may be certain that plebeians were not introduced into the senate at this time. Such a change is utterly improbable at the crisis of a patrician coup d'etat, such as the expulsion of the Tarquins certainly was; and there is no evidence for the existence of a plebeian senator before the year 401 B.C. The statement that some modification in the original principle of selection was made in this year is invariably introduced as an explanation of the title patres conscripti, which is held to imply a distinction of rank within the senate, as derived from the formula of summons "qui patres, qui conscripti (estis)." 2 But either this formula is not as early as 509 B.C. or the term conscripti does not refer only to plebeians. In one respect the substitution of consuls for kings tended to the subordination of the chief magistrates to the senate. The consuls held office only for one year, while the senate was a permanent body; in experience and prestige its individual members were often superior to the consuls of the year. It was therefore improbable that the magistrate would venture to disregard the advice of his consilium, especially as he himself would pass into the senate at the close of his year of office, according to a recognized custom which was gradually modifying the theoretical freedom of choice that the consuls possessed with regard to their consilium. It was probably in their capacity of ex-magistrates that plebeians first entered the senate; for the first plebeian senator mentioned by Livy, P. Licinius Calvus, was also the first plebeian consular tribune. This is hardly likely to be mere coincidence. Of the two standing powers which the senate inherited from the monarchy, the interregnum and the patrum auctoritas, the first had become even rarer of exercise than before; for if either consul existed to nominate a successor, interregnum could not be resorted to. The patrum auctoritas, on the other hand, developed into a definite right claimed by the senate to give or withhold its consent to any legislative or elective act of the comitia, which could not be valid without such. consent. The control, too, which it had long exercised over foreign policy must have increased the importance of the senate in a period of constant warfare with the nations of Italy. But in the early republic the senate remained primarily

1 For other views on this point see Dionys. ii. 12, who maintains that the senators were elected by the clans, and T. Mommsen, Staatsrecht, iii. 844, 854, who maintains an automatic composition of the early senate.

2 For another view, however, see Willems, Le Sinai, i. p. 37 seq.

an advising body, and had as yet assumed no definite executive powers.

In the last two centuries of the republic we find that a great change has taken place in the position of the senate. It is now a self - existent, automatically constituted body, independent of the magistrates, a recognized factor in the constitution and the wielder of extensive powers. Its self-existence could only be secured by a transference of the selection of the senate from the magistrate to some other authority, and was actually effected by entrusting the selection to the recently instituted college of censors. The censorship was instituted in 443 B.C., and some time before the year 311 it was placed in charge of the lectio senaius. Conditions of selection had also been imposed by 311, which made the constitution of the senate practically automatic. Ex-curule magistrates were now admitted as a matter of course, together with any other persons who had done conspicuous public service in the lower grades of the magistracy or the higher ranks of the army; and for some time before Sulla's dictatorship little power of choice can really have rested with the censors. L. Cornelius Sulla, while abolishing the censorship (immediately revived), also secured an entirely automatic composition for the senate by increasing the number of quaestors, and enacting that all ex-quaestors should pass at once into the senate. This en- actment provided for the maintenance even of the increased number of 600 senators, twenty quaestorians passing into the senate every year. The senate's powers had now extended far beyond its two ancient prerogatives of appointing an interrex, and ratifying decisions of the comitia. The first of these powers, as has been shown above, had fallen into practical disuse, and the second had for some reason become a mere form by the last century of the republic. It is improbable that the change was entirely the result of the lex Publilia of 287 B.C., which decreed that the senate should exercise its auctoritas before the voting instead of after, though this law may have formed part of a process very imperfectly known to us by which senatorial control of legislation in this form was gradually nullified. But the senate had acquired a far more effective control over the popular vote through the observance of certain unwritten rules regulating the relation between senate and magistrates. It was

generally understood that the magistrate should not question the people on any important matter without the senate's consent, nor refuse to do so at its request; that one magistrate should not employ his veto to quash the act of another except at the senate's bidding, nor refuse to do so when directed. Such was the situation which had developed out of the tendency noticed above for the magistrate to be advised by his council in all important matters. Again, the earlier control of foreign policy developed into a definite claim put forward by the senate and recognized by the constitution to conduct all negotiations with a foreign power and frame an alliance which should merely be offered to the people for ratification. For the organization of a new Roman province even this formal ratification was dispensed with, and a commission of senators alone aided the victorious general in the organization of his conquests. The senate also held an important power in its right to distribute spheres of rule among the various magistrates. It seems also to have had entire control over the external relations of the free cities which were scattered through- out the provinces, but formed no administrative parts of those provinces, holding their rights by charter for which they de- pended upon the senate. The control of finance was also entirely in the senate's hands. Three circumstances had combined to bring about this result. The censors, who were only occasional officials, were entrusted with the leasing of the public revenues; the senate not only directed the arrangements made by them, and received appeals against oppressive contracts, but also con- trolled any financial assignments that had to be made during the vacancy in the censorship. Again, the details of public ex- penditure had been in very early times entrusted to the quaestors, who, when the magistracies were multiplied, occupied an en- tirely subordinate position; this strengthened the position of the senate as the natural director of a young and inexperienced magistrate. Thirdly, the general control exercised by the senate

over provincial affairs implied its direction of the income derived from the provinces, which in the later republic formed the chief property of the state. It had also claimed a right, unchallenged till the time of Tiberius Gracchus, of granting occupation and decreeing alienation of public lands, or of accepting or rejecting gifts and bequests to the state. Every branch of state finance was therefore in its hands. In matters of criminal jurisdiction the senate claimed the right to set free by its decree in case of emergency the full powers of

coercitio contained in the imperium of a magistrate, but limited normally in capital cases by successive laws of appeal. The exercise of this right amounted to a declara- tion of martial law, and had the effect of giving the consul the same powers of summary jurisdiction which had resided in the dictatorship. It was only resorted to in cases of special urgency, such as the epidemic of poisoning in 331 B.C. (Livy viii. 18), the prevalence of Bacchanalian licence in the city in 186 B.C. {id. xxxix. 18) and the formidable preponderance of the re- volutionary tribune Tiberius Gracchus in 133 B.C. The action of the senate on this last occasion evoked a vigorous protest from the people, on the ground that the senate was not acting on behalf of the state against its enemies, but in the interest of one party in the state against the other; and a law of C. Gracchus subsequently forbade any such exercise of capital jurisdiction on the part of a magistrate, whether authorized by the senate or not. The senate continued, however, to make use of this decree, and the question of its right to do so was one of the chief points at issue in the final struggle between the senatorial and demo- cratic parties. The best known instance of this decretum ultimum in the last century of the republic is that of 63 B.C., when Cicero took summary action against the Catilinarians, and justified his action on the plea that this decree had authorized him to do so. The senate also exercised a police control in Rome in sudden emergencies. It dissolved by a decree passed in 64 B.C. a number of trade gilds which had become the centres of political disturb- ance, and framed decrees from time to time dealing with bribery and corruption. The chief feature of the democratic revolution at Rome which occupied the century following the tribunate of T. Gracchus was an uncompromising opposition to the tenure of these extensive powers by the senate. Sulla's enactments in 81 B.C., which aimed at restoring its ascendancy, show clearly how much power it had already lost; and his attempts to reinstate it were short-lived (see Rome: History II. " The Republic ")• The Gracchi and Caesar alike found themselves obliged to override senatorial prerogative in the interests of progressive legislation, and though the senate, owing to its strong hold over the magistracy, succeeded repeatedly in dealing death to its opponents, it never regained the popular confidence; and the practical extinction of the old senate in 49 B.C. was hardly lamented.

Caesar's revision of the senatorial list and his increase of the senate to 900 was a return to the old practice by which kings

and the early magistrates had chosen their own body Empire. °^ councillors. And though after this revision Sulla's

arrangement for the automatic replenishing of the senate was restored, yet the growing influence exercised by Caesar and his successors over elections secured their control over the personnel of the senate. Still, the senate was regarded in the early principate as the great representative of republican institutions, and Augustus took elaborate pains to divide his authority with the senate. In legislation, indeed, the senate was supreme under the principate. The legislative powers of the comitia became very gradually extinct; but long before they had disappeared senatus consulta had come to take the place of leges in ordinary matters, and with this prerogative of the senate the princeps never directly interfered. Jurisdiction remained largely in the hands of the republican courts, but such cases as did not come under their cognizance were divided between princeps and senate. The senate, moreover, was left at the head of the ordinary administration of Rome and Italy, together with those provinces which, not requiring any military force nor presenting special administrative difficulties, were left to the care of the Roman people. It also retained control of the public treasury (see

Aerarium), while Caesar administered his own treasury (fiscus). It gradually became the electing body for the annual magistracies; and, as entrance to it was still won chiefly through the magistracy, co-optation became practically the principle of admission. But the power the senate theoretically possessed of creating and deposing a princeps was, formally at least, the chief of its pre- rogatives at this time, though considerably limited in practice. It had, on the other hand, lost all its control of foreign administra- tion, which had once been the bulwark of its power; and though occasionally consulted by the princeps, it was entirely subordinate to him in this department. It was clearly to the advantage of the early Caesars to pay an apparent deference to the senate, and so give to their rule an appearance of constitutionalism. But even in this capacity the senate did not long survive the overthrow of republican government. Though occasionally roused into activity during the 2nd and 3rd centuries, it ceased after the period of the Julian emperors to have any real control of affairs. Vespasian had admitted Italians and provincials into the senate, with a view, no doubt, to increasing its value as a representative council of the empire; but this widening was counterbalanced by the-institution of an hereditary senatorial order by Augustus, who thus gave recognition to the practical exclusiveness which had grown up in the later republican period, while reserving to himself the right of recruiting the order.

B. Procedure. — Senatorial procedure remained comparatively unchanged throughout the republic and the first three centuries of the

empire. The right of summoning the senate belonged originally to the consuls, and later to the consuls, praetors, and tribunes of the plebs. In the Ciceronian period, when all these were entitled to summon the meeting, the right belonged to them in the above order of precedence. The magistrate who summoned the senate also presided and brought business before it. He first made statements to the house on important public affairs, and might then at his discretion ask the opinion of the house on points arising out of them, or invite other senators to speak without himself putting forward any definite proposition. In both of these cases he. was expected to follow a regular order of precedence in asking for votes or speeches, and the magistrates of the year were precluded from expressing their opinion. When the chief senators had expressed their opinion on the motion of the president, or made proposals of their own, in the former case the house divided on the motion, in the latter the president put to the house in succession the various proposals made. The only important modification of this procedure introduced by the principate was the extension of all the presiding magistrate's rights to the princeps, who, however, enjoyed also the right of giving his opinion as a private senator.

C. Insignia. — The senatorial insignia were not at first distinguished from those of ex-curule magistrates. But by degrees the broad stripe (latus clavus) on the tunic and the red shoe (calceus mulleus) became distinctive of the senator (hence laticlavius, a senator). Seats in the theatre were reserved for senators; and even the sons of senators adopted the latus clavus as early as the reign of Augustus, and probably at an earlier time. Certain disqualifications were attached to senators in republican times, chief of which was their exclusion from trade; and these were increased under the principate. Failure to observe these disqualifications, or any public disgrace or gross misconduct, was punished by removal froimthe senate by the censors, until that office fell into abeyance after the time of Sulla. The censorial right of removing unworthy members from the senate was revived by Augustus, and was exercised by subsequent emperors at a yearly revision of the list, which supplemented the formal lectiones senatus periodically held by the princeps in his capacity of censor. »i

It has been questioned whether the two traditional prerogatives of the senate, the control of the 1 interregnum and the patrum auctoritas, belonged in historical times to the senate as a body, or to its patrician members only, or, as some have maintained, to the whole body of patricians. For conflicting views on this subject, see P. Willems, Le Senat, vol. ii. p. I ; T. Mommsen, Staatsrecht, iii. 1037

et seq.; and Rom. Forschungen, i. 218-249; C. C. L. Lange, De patrum auct. comm. (Leipzig, 1876-1877); O. Clason, Kritische Erorterungen iiber den rom. Staat (Rostock, 1817), p. 41 et seq. In favour of the view that the words patres and patricii are used in this connexion as the equivalent of senators may be cited the parallel use of the term patrician magistrates as the equivalent of curule magistrates, a usage due to the fact that these magistracies were for more than a century reserved for patricians.

General Bibliography. — T. Mommsen, Staatsrecht, iii. 2 (3rd edition, Leipzig, 1887) ; P. Willems, Le Senat de la ripublique romaine (2nd ed., Louvain, 1883); J. Rubino, Untersuchungen (iii. "von dem Senate und dem Patriciate," Cassel, 1839) ; A. H. J. Greenidge. Roman Public Life, p. 261 et seq. (1901); G. W. Botsford, Roman Assemblies (1909); also art. Rome, History. (A. M. Cl,)

SENEBIER, JEAN (1742-1809), Swiss pastor and voluminous writer on vegetable physiology, was born at Geneva on the 6th of May 1 742. He is remembered on account of his contributions to our knowledge of the influence of light on vegetation. Though Marcello Malpighi and Stephen Hales had shown that a great part of the substance of plants must be obtained from the atmosphere, no progress was made until Charles Bonnet observed on leaves plunged in aerated water bubbles of gas, which Joseph Priestley recognized as oxygen. Jan Ingenhousz proved the simultaneous disappearance of carbonic acid; but it was Senebier who clearly showed that this activity was confined to the green parts, and to these only in sunlight, and first gave a connected view of the whole process of vegetable nutrition in strictly chemical terms. He died at Geneva on the 22nd of July 1809.

See Sachs, Geschichte d. Botanik, and Arbeiten, vol. ii.

SENECA, the name of two famous men (father and son), natives of Corduba (Cordova) in Spain, who attained eminence in Rome under the Early Empire.

Lucius Annaeus Seneca (c. 54 b.c.-a.d. 39), called Seneca " the elder " or " the rhetorician," belonged to a well-to-do equestrian family of Corduba. His praenomen is uncertain, but in any caseMarcus is an

arbitrary conjecture of Raphael of Volterra. During a lengthy stay on two occasions at Rome he attended the lectures of famous orators and rhetoricians, to prepare for an official career as an advocate. His ideal orator was Cicero, and he disapproved of the florid tendencies of the oratory of his time. During the civil wars (which kept him in Spain and thus prevented him from ever hearing Cicero speak) his sympathies, like those of his native place, were probably with Pompey, as were those of his son and his grandson (the poet Lucan). By his wife Helvia of Corduba he had three sons: L. Annaeus Novatus, adopted by his father's friend, the rhetorician Junius Gallio, and subsequently called L. Junius Gallio; L. Annaeus Seneca, the philosopher; Annaeus Mela, the father of the poet Lucan. As he died before his son was banished by Claudius (41 ; Seneca, ad Helviam, ii. 4), and the latest references in his writings are to the period immedi- ately after the death of Tiberius, he probably died about a.d. 39. At an advanced age, at the request of his sons, he prepared, it is said from memory, a collection of various school themes and their treatment by Greek and Roman orators. These he arranged in ten books of Controversiae (imaginary legal cases) in which 74 themes were discussed, the opinions of the rhetoricians upon each case being given from different points of view, then their division of the case into different single questions (divisio), and, finally, the devices for making black appear white and ex- tenuating injustice (colores). Each book was introduced by a preface, in which the characteristics of individual rhetoricians were discussed in a lively manner. The work is incomplete, but the gaps can be to a certain extent filled up with the aid of an epitome made in the 4th or 5th century for the use of schools. The romantic elements were utilized in the collection of anecdotes and tales called Gesta Romanorum (q.v.). For books i., ii., vii., ix., x. we possess both the original and the epitome; for the re- mainder we have to rely upon the epitome alone. Even with the aid of the latter, only seven of the prefaces are available. The Controversiae were supplemented by the Suasoriae (exercises in hortatory or deliberative oratory), in which the question is dis- cussed whether certain things should or should not be done. The whole forms the most important authority for the history of contemporary oratory. Seneca was also the author of a lost historical work, containing the history of Rome from the begin- ning of the civil wars almost down to his own death, after which it was published by his son. Of this we learn something from the younger Seneca's De vita patris (H. Peter, Historicorum Roma- norum fragmenta, 1883, pp. 292, 301), of which the beginning was discovered by B. G. Niebuhr. The father's claim, to the authorship of the rhetorical work, generally ascribed to the son during the middle

ages, was vindicated by Raphael of Volterra and Justus Lipsius.

Editions. — N. Faber (Paris, 1587); J. F. Gronovius (Leiden, 1649, Amsterdam, 1672) ; (critical) C. Bursian (Leipzig, 1857) ; A. Kiessling (Leipzig, 1872); H.J. Muller (Prague, 1887, with many unnecessary conjectures). See also article by O. Rossbach in Pauly-

Wissowa's Realencyklopddie, i. pt. 2 (1894) ; Teuffel-Schwabe, Hist, of Roman Literature (Eng. trans., 1900), 269; M. Schanz, Geschichte der romischen Litter atur, ii. 1 (1899); and the chapter on " The Declaimers," in G. A. Simcox, History of Latin Literature, i. (1883). On Seneca's style, see Max Sander, Der Sprachgebrauch des Rhetor A. S. (Waren, 1877-1880); A. Ahlheim, De Senecae rhetoris usu dicendi (Giessen, 1886) ; E. Norden, Die antike Kunstprosa (1898), p. 300; on his influence upon his son the philosopher, E. Rolland, De Vinfluence de Seneque le pere et des rheteurs sur Seneque le philosophe (1906). On the use of Seneca in the Gesta Romanorum, see L. Friedlander, Darstellungen aus der Sittengeschichte Roms (Eng. trans., iii. p. 16 and appendix in iv.).

Lucius Annaeus Seneca (c. 3 b.c.-a.d. 65), statesman and philosopher, was the second son of the rhetorician. His teachers were Attalus, a Stoic, and Sotion, a pupil of the Sextii. In his youth he was a vegetarian and a water-drinker, but his father checked his indulgence in asceticism. He devoted himself to rhetorical and philosophical studies and early won a reputation at the bar. Gaius criticised his style as mere mosaic (commissuras meras) or " sand without lime," yet being in reality jealous of his successes he would have put him to death had he not been assured that he was too consumptive to live long (Suet. Calig. 63 ; Dio Cassius lix. 19. 7). Under Claudius his political career (he had been quaestor) received a sudden check, for the influence of Messallina having effected the ruin of Julia, the sister of Gaius, Seneca, who was compromised by her downfall, was banished to Corsica, a.d. 41. There eight weary years of waiting were relieved by study and authorship, with occasional attempts to procure his return by such gross flattery of Claudius as is found in the work Ad Polybium de consolatione or the panegyric on Messallina which he afterwards suppressed. At length the tide turned; the next empress, Agrippina, had him recalled, appointed praetor, and entrusted with the education of her son Nero, then (48) eleven years old. Seneca became in fact Agrippina's con- fidential adviser; and his pupil's accession increased his power. He was consul in 57, and during the first bright years of the new reign, the quinquennium Neronis, he shared the administration of affairs with Burrus, the praetorian prefect. The govern- ment in the hands of

these men was wise and humane; their influence over Nero, while it lasted, was salutary, though some- times maintained by doubtful means (see Nero). We must, however, regard the general tendency of Seneca's measures; to judge him as a Stoic philosopher by the counsels o£ perfection laid down in his writings would be much the same thing as to apply the standard of New Testament morality to the career of a Wolsey or Mazarin. He is the type of the man of letters who rises into favour by talent and suppleness {comitas honesta), and is entitled as such to the rare credit of a beneficent rule. In course of time Nero got to dislike him more and more; the death of Burrus in 6 2 gave a shock to his position. In vain did he petition for permission to retire. Even when he had sought privacy on the plea of ill-health he could not avert his doom; on a charge of being concerned in Piso's conspiracy he was forced to commit suicide. His manly end might be held in some measure to redeem the weakness of his life but for the testimony it bears to his constant study of effect and ostentatious self- complacency. His second wife, Pompeia Paulina, of noble family, attempted to die with him. His enormous wealth was estimated at 300 millions of sesterces. He had 500 ivory tables inlaid with citron wood (Dio lxi, 10, lxii. 2) . Some of the Fathers, probably in admiration of his ethics, reckoned Seneca among the Christians; this assumption in its turn led to the forgery of a correspondence between St Paul and Seneca which was known to Jerome (cf. Augustin, Ep. 153: "Seneca . . . cujus etiam ad Paulum apostolum leguntur epistolae "). This has given rise to an interesting historical problem, most thoroughly dis- cussed in many works on the Church in the Roman Empire.

Seneca is at once the most eminent among the Latin writers of the Silver Age and in a special sense their representative, not least because he was the originator of a false style. The affected and sentimental manner which gradually grew up in the first century a.d. became ingrained in him, and appears equally in everything which he wrote, whether poetry or prose, as the most finished pro- duct of ingenuity concentrated upon declamatory exercises, sub- stance being sacrificed to form and thought to point. Every variety of rhetorical conceit in turn contributes to the dazzling effect, now

tinsel and ornament, now novelty and versatility of treatment, or affected simplicity and studied absence of plan. But the chief weapon is the epigram (sententia), summing up in terse incisive antithesis the

gist of a whole period. ” Seneca is a man of real genius,” writes Niebuhr, ” which is after all the main thing; not to be unjust to him, one must know the whole range of that litera- ture to which he belonged and realize how well he understood the art of making something even of what was most absurd.” His works were upon various subjects, (i) His Orations, probably the speeches which Nero delivered, are lost, as also a biography of his father, and (2) his earlier scientific works, such as the monographs describing India and Egypt and one upon earthquakes (Nat. Qu. vi. 4. 2). The seven extant books of Physical Investigations (Natu- rales Quaestiones ; trans. John Clarke, with introd. by Sir Archibald Geikie, 1910) treat in a popular manner of meteorology and astronomy; the work has little scientific merit, yet here and there Seneca, or his authority, has a shrewd guess, e.g. that there is a connexion between earthquakes and volcanoes, and that comets are bodies like the planets revolving in fixed orbits. (3) The Satire on the Death (and deification, literally ” pumpkinification “) of Claudius (ed. Biicheler, Berlin, 1882) is a specimen of the ” satira Msnippea ” or medley of prose and verse. The writer’s spite against the dead emperor before whom he had cringed servilely shows in a sorry fashion when he fastens on the wise and liberal measure of conferring the franchise upon Gaulish nobles as a theme for abuse. (4) The remaining prose works are of the nature of moral essays, bearing various titles — twelve so-called Dialogues, three books On Clemency dedicated to Nero, seven On Benefits, twenty books of Letters to Lucilius (ed. Hense, Leipzig, 1898; W. C. Summers published a selection in 1910). They are all alike in discussing practical questions and in addressing a single reader in a tone of familiar conversation, the objections he is supposed to make being occasionally cited and answered. Seneca had the wit to discover that conduct, which is after all ” three-fourths of life,” could furnish inexhaustible topics of abiding universal interest far superior to the imaginary themes set in the schools and abundantly analysed in his father’s Controversiae and Suasoriae, such as poisoning cases, or tyrannicide, or even historical persons like Hannibal and Sulla. The innovation took the public taste, — plain matters of urgent personal concern sometimes treated casuistically, sometimes in a liberal vein with serious divergence from the orthodox standards, but always with an earnestness which aimed directly at the reader’s edification, progress towards virtue and general moral improve- ment. The essays are in fact Stoic sermons; for the creed of the later Stoics had become less of a philosophical system and more of a religion, especially at Rome, where moral and theological doctrines alone attracted lively interest. The schooi is remarkable for its anticipation of modern ethical

conceptions, for the lofty morality of its exhortations to forgive injuries and overcome evil with good; the obligation to universal benevolence had been deduced from the cosmopolitan principle that all men are brethren. In Seneca, in addition to all this, there is a distinctively religious temperament, which finds expression in phrases curiously suggestive of the spiritual doctrines of Christianity. Yet the verbal coincidence is sometimes a mere accident, as when he uses sacer spiritus; and in the same writings he sometimes advocates what is wholly repulsive to Christian feeling, as the duty and privilege of suicide.

In the tragedies which bear Seneca's name (Hercules Furens, Thyestes, Phoenissae, Phaedra, Oedipus, Troad.es, Medea, Agamemno, Hercules Oetaeus) the defects of his prose style are exaggerated : as specimens of pompous rant they are probably unequalled; and the rhythm is unpleasant owing to the monotonous structure of the iambics and the neglect of synapheia in the anapaestic systems. The praetexta Octavia, also ascribed to him, contains plain allusions to Nero's end, and must therefore be the product of a later hand. The doubt as to his authorship of the tragedies is due to a blunder of Sidonius Apollinaris (ix. 229-231); against it must be set Quin- tilian's testimony (" ut Medea apud Senecam," ix. 2. 8). The judgment of Tacitus (Ann. xiii. 4, 13, 42 sq., xiv. 52-56, xv. 60 sq.) is more favourable than that of Dio, who may possibly derive his account from the slanders of some personal enemy like Suilius. At least eighteen prose works have been lost, among them De super- stitione, an attack upon the popular conceptions of the gods, and De matrimonio, which, to judge by the extant fragments, must have been interesting reading. Since Gellius (xii. 2. 3) cites a book xxii. of the Letters to Lucilius, some of these have been lost.

The best text of the prose works, that of Haase in Teubner's series (1852), was re-edited in 1872-1874 and 1898. More recently Gertz has revised the text of Libri de beneficiis et de dementia (Berlin, 1876), H. A. Koch that of the Dialogorum libri xii. (completed by Vahlcn, Jena, 1879), and Gertz the Dialogi (Copenhagen, 1886). There is no complete exegetical commentary, either English or German. Little has been done systematically since the notes of Lipsius and Gronovius. There is, however, Ruhkopf's ed. with Latin notes, 5 vols. (Leipzig, 1 797-181 1), and Lemaire's variorum ed. (Paris, 1827-1832, 8 vols., prose and verse). The text of the tragedies was edited by Peiper and Richter, 1867, 2nd ed. 1902, and by F. Leo (2 vols., Berlin, 1878-1879); verse trans, by F. J. Miller (Chicago and London, 1908). Nisard, Etudes de moeurs et de

critique sur les poeles de la decadence (4th ed., Paris, 1878), has

criticized them in detail. Of some 300 monographs enumerated in Engelmann may be mentioned, in addition to the above, G. Boissier, Les Tragedies de Seneque ont-ils Ste representees ? (Paris, 1861) ; A. Dorgens, Senec. disciplinae moralis cum Antoniniana comparatio (Leipzig, 1857); E. F. Gelpke, De Senec. vita et moribus (Bern, 1848) ; Holzherr, Der Philosoph Seneca (Rastadt, 1858). See also Sir S. Dill, Roman Society from Nero to Marcus Aurelius (1904).

(R. D. H.; X.)

SENECA, a tribe of North American Indians of Iroquoian stock. They call themselves Tshoti-nondawaga, " people of the mountain." The French called them Tsonnonlouan. Their former range was in western New York state between Seneca lake and the Genesee river. They were one of the Six Nations League of the Iroquois, and eventually became the most im- portant tribe of the league. They were foremost in all the Iroquoian wars, and were the official guardians of the western frontier of the league. On the defeat of the Erie and Neuter tribes they occupied the county west of Lake Erie and south along the Alleghany to Pennsylvania. They fought on the English side in the War of Independence. About 2700 are now on reservations in New York State, while a few are in Oklahoma and on Grand River reservation, Ontario.

For Seneca Cosmology see 21s/ Ann. Report Bureau Amer. Eihnol.

(1899-1900).

SENECA FALLS, a village of Seneca county, New York, U.S.A., in the township of Seneca Falls, on Seneca Outlet, pr river (which connects Lake Seneca and Lake Cayuga), about 42 m. W.S.W. of Syracuse. Pop. (1900) 6519, of whom 801 were foreign-born; (1905) 6733; (1910) 6588; of the town- ship, including the village (1910) 7407. The village is served by the New York Central & Hudson River, the Lehigh Valley and electric suburban railways, and by the Seneca & Cayuga Canal. In the village are the Mynderse (public) Library and the Johnson Home for Old Ladies (1868). Cayuga Lake Park, a pleasure resort, is 3 m. distant and is reached by electric railway; The village is the shipping point for a farming and dairying region. The river here falls 50 ft. and provides a good water power; among the manufactures are pumps and hydraulic machinery, woollen goods, wagons and farm implements. Seneca Falls was settled about 1790, and was first incorporated as a village

in 1831, its charter as revised in 1902 being similar in some respects to that of a city. In Seneca Falls on the 19th and 20th of July 1848 was held a Woman's Rights Convention, the first in the United States. 1

SENEFELDER, ALOIS (1771-1834), German inventor of lithography, was born at Munich on the 6th of November 1771, his father Peter being an actor at the Theatre Royal. Owing to the death of his father he was unable to continue his legal studies at the university of Ingolstadt, and tried to support himself as a performer and author, but without success. In order to accelerate the publication of one of his works, he frequently spent whole days in the printing office, and found the process of printing so simple that he conceived the idea of purchasing a small printing press, thus enabling himself to print and publish his own com- positions. Unable to pay for the engraving of his compositions, he attempted to engrave them himself. He made numerous experiments with little success; tools and skill were alike wanting. Copper-plates were expensive, and the want of a sufficient number entailed the tedious process of grinding and polishing afresh those he had used. About this period his atten- tion was accidentally directed to a fine piece of Kellheim stone which he had purchased for the purpose of grinding his ink. His first idea was to use it merely for practice in his exercises in writing backwards, the ease with which the stone could be ground and polished afresh being the chief inducement. While he was engaged one day in polishing a stone slab on which to continue his exercises, his mother entered the room and desired him to write

1 The- convention, under the leadership of Lucretia Mott and Elizabeth Cady Stanton, adopted a " Declaration of Sentiments " modelled after the American Declaration of Independence, and resolved " that it is the duty of the women of this country to secure to themselves their sacred right to the elective franchise," and " that the same amount of virtue, delicacy and refinement of be- haviour that is required of woman in the social state should also be required of man, and the same transgressions should be visited with equal severity on both man and woman."

her a bill for the washer-woman, who was waiting for the linen. Neither paper nor ink being at hand, the bill was written on the stone he had just polished. The ink used was composed of wax, soap and

lamp-black. Some time afterwards, when about to wipe the writing from the stone, the idea all at once struck him to try the effect of biting the stone with aqua fortis. Surrounding the stone with a border of wax, he covered its surface with a mixture of one part of aqua fortis and ten parts of water. The result of the experiment was that at the end of five minutes he found the writing elevated about the tenth part of a line (tˆtt in.). He then proceeded to apply the printing ink to the stone, using at first a common printer's ball, but soon found that a thin piece of board covered with fine cloth answered better, communicating the ink more equally. He was able to take satisfactory im- pressions, and, the method of printing being new, he hoped to obtain a patent for it, or even some assistance from the govern- ment. For years Senef elder continued his experiments, until the art not only became simplified, but reached a high degree of excellence in his hands. In later years the king of Bavaria settled a handsome pension on Senefelder. He died at Munich in 1834, having lived to see his invention brought to compara- tive perfection.

SENEGA, the dried root of the Polygala Senega, which is official in the British and United States pharmacopoeias. Senega contains an active principle, saponin. Senega is used chiefly as a stimulating expectorant in chronic bronchitis. It is occasion- ally used as a diuretic in renal dropsy. It is a cardiac depressant, and is contra-indicated in diseased conditions of the heart. It has a tendency to upset the digestion, and is therefore only used in combination with other drugs in what are termed ex- pectorant mixtures.

SENEGAL, a river of West Africa, entering the Atlantic about 16 N., some 10 m. below St Louis, after a course of fully 1000 m. It is formed by the junction of the Bafing or Black river and the Bakhoy or White river, and its chief affluent is the Faleme. North of the Senegal the Sahara reaches the coast, and for over 1000 miles no river enters the ocean.

The Bafing rises in the Futa Jallon highlands about 2400 ft. above sea-level, in io° 28′ N., io° 5′ W., its source being within 1 2 5 m. of Konakry on the Gulf of Guinea. It is joined in about 11° 10′ N. and 11° 45′ W. by the Tene, which rises in 13 W. and 10° 37′ N. and flows north-east. A little south of 12° N. the Bafing is a large stream 250 yds. wide, and is here separated from the sources of the Faleme by a line of hills 2600 ft. high, which send to the latter river four important streams rising in about 12° N. The Bafing follows a northward course for about 350 m., during which it descends by a series of rapids till it reaches a level of 360 ft. above the sea. The headstreams of the Bakhoy rise between 11° 30′ and 12° N. and 9°

20′ and 9 50′ W. on theN.E. versant of the hills which here form a narrow divide between the basin of the Senegal and that of the upper Niger. The Bakhoy, in its upper course much interrupted by rapids, flows N.E., but about 12° 15′ N. turns north-westward. Its principal affluent, the Baule (Red river), and its headstreams rise farther east on the northern slopes of the hills which above Bamako shut in the Niger. The eastern headwaters of the Senegal thus drain a large area adjacent to the upper Niger. The Baule flows north and in a series of loops reaches 14° 20′ N., where it turns westward and in about 13 30′ N. and io° W. joins the Bakhoy. After receiving the Baule, the Bakhoy, now a river of fine proportions, flows "W. by N. through rocky country in a narrow valley. In 11° 55′ W. and 13 48′ N. it unites with the Bafing. At the confluence the Bakhoy is 800 ft. wide, the Bafing at this point having a width of 360 ft.

After the junction of the Black and White rivers the united stream is known as the Senegal. The confluence is called Bafulabe, i.e. " meeting of the waters." Below Bafulabe the river flows N.W. through a valley bordered on either side by hills which throw out rocky spurs, over which the Senegal descends in a succession of falls, those of Guina (160 ft.) and of Felu (50 or 60 ft.) being the most important. It receives from the north several intermittent streams, the chief, usually carrying a fair amount of water, being the Khulu or Kolimbine, coming from the Kaarta plateau. From the south it \h joined by the Faleme, a considerable river which rises in hilly

country in about 11° 50′ N. and II 30′ W. The first rise in the lower Senegal is due to the rains in the source region of the Faleme, the flood water passing down that stream more quickly than down the Bafing owing to its shorter course. A short distance below the Felu Falls is the town of Kayes on the left bank of the river. Be- tween the falls and Bakel (85 m.) there are twenty-seven " narrows," of which several, such as that at Kayes, are difficult. Kayes is the limit of navigability from the sea. From that town a railway connects with the navigable waters of the upper Niger at Bamako (see Senegal: Country, I.).

Below Bakel the river passes through flatter country and presents a series of great reaches. It sends off numbers of divergent channels (called marigots) forming several islands, the largest being that of Morfil, no m. long. The river attains its most northerly point, 16° 30′ N., in about 15 10′ W. Thereafter it runs S.W. and finally due S. In the last 10 m. of its course it runs parallel to the sea, from which it is separated by a narrow line of dunes. On an island at the head of this 10 m. is St Louis, the capital of the colony of Senegal. At this point

the right branch of the river is only 500 ft. from the open Atlantic. A marigot, called the Ndiadier or Maringuins, leaves the river 40 m. above St Louis, pierces the dunes at flood time and reaches the sea, 50 m. N. of the mouth of the river. The Senegal indeed has what is styled an interior delta, but, with the exception of the marigot named, all the divergent branches rejoin the main stream before the sea is reached.

*The comparative scantiness of its sources, the steepness of its upper course and the rapid evaporation which takes place after the short rainy season would make the Senegal an insignificant stream for more than half the year ; but natural dams cross the channel at intervals and the water accumulates behind them in deep reaches, ■which thus act as reservoirs. In the rainy season the barriers are submerged in succession, the reaches are filled and the plains of the lower Senegal are changed into immense marshes. Lake Cayor on the right side of the lower Senegal and Lake Panieful (Guier) on the left constitute reserve basins, receiving the surplus waters of the river during flood and restoring them in the dry se*ason. In the upper part of the river the reservoirs are partially protected by curtains of verdure from the effects of the evaporation which makes itself so severely felt on the treeless seaboard. Owing to these natural " locks," the Senegal never discharges less than 1700 or 1800 cubic ft. per second. The lower Senegal forms the boundary between the Sahara and the western Sudan; the line of its in- undations is an ethnographic march between the nomadic Berber and the settled Negro.*

From July to October the level of the Senegal shows a series of fluctuations, with, however, a general increase till the end of August or beginning of September, when the maximum occurs. Boats drawing from I ft. to 2 ft. 6 in. can ascend to Kayes from the be- ginning of June to the middle of November; steamers drawing 4 ft. 3 in., from July to October inclusive; and ocean steamers, lightened so as to draw 11-13 ft., during August and September. From Mafu to the sea, a distance of 215 m., the Senegal- is navigable all the year round by vessels drawing not more than 10 ft.

The existence of the Senegal appears to have been known to the ancients. It is usually regarded as the Chretes or Chremetes of Hanno, and the Nachyris and Bambotus of the Greeks and Romans, but it is not possible definitely to identify it with any of the rivers on Ptolemy's map. Idrisi and other medieval Arabian geographers undoubtedly refer to it. The seamen of Dieppe are said to have discovered the river about 1360, and even to have built a fort which

became the nucleus of the town of St Louis, but this claim is unproved (see Guinea). The mouth of the Senegal, then called Senaga, was entered in 1445 by the Portuguese navigator Dinas Diaz (who thought it a western arm of the Nile), and in 1455 Cadamosto ascended the river for some distance. Leo Africanus rightly describes its lower course as " severing by its winding channel the barren and naked soil from the green and fruitful." It was not until 1637 that the explora- tions of the upper river began, Jannequin, Sieur de Rochfort, in that year ascending the river some 200 m. above St Louis. In 1697 Andre Briie reached the island of Morfil, while in 1698 he penetrated past the Felu Falls; At that period geographers regarded the Senegal as the termination of the Niger, a theory held until Mungo Park's demonstration of the eastward course of that stream. Park himself added much to the knowledge of the upper basin of the Senegal. It was not until 1818 that the source {i.e. of the Bafing) was located, by Gaspard Mollien.

See G. Mollien, Decouverte des sources du SSnegal et de la Gambie (Paris, ed. 1889), with introduction by L. Ravaisson-Mollien ; J. Ancelle, Les Explorations au Senegal et dans les contrees voisines (Paris, 1886); M.Olivier, Le Senegal (Paris, 1908); Captain Fromaget, " L'Hydrographie du fleuve Senegal," in B.S.G. Cornm. Bordeaux, xxxii. (1909).

SENEGAL, a country of West Africa belonging to France. As a geographical expression it is the land watered by the Senegal river; politically it has a much wider significance. The French possessions in this region are divided into (1) the colony of Senegal, and dependent native states; (2) the colony of Upper Senegal and Niger, with a dependent Military Territory; (3) the Territory of Mauretania. The first colony includes the most westerly coast region of Africa ; a large part of the second colony is the country enclosed in the great bend of the Niger; while the Military Territory is east of that river. The Territory of Maure- tania is part of the western Sahara, stretching indefinitely north from the Senegal river. It includes the oasis of Adrar Temur (see Adrar) and the coast regions between Cape Blanco and the Senegal river. In the present article the two colonies are dealt with in separate sections (I. and II. below), the story of French conquest and colonization throughout this vast region forming section III.

I. Senegal

Senegal is bounded N. by the Territory of Mauretania, W. by the Atlantic, S. by Portuguese Guinea and French Guinea, and E. by the Faleme, which separates it from Upper Senegal and Niger. Wedged into Senegal and surrounded by it save seawards is the British colony of the Gambia. Senegal colony proper consists of the towns of Dakar, St Louis, Goree and Rufisque. a narrow strip of territory on either side of the Dakar-St Louis* railway, and a few detached spots, and has an area of 438 sq. m. with a population (census of 1904) of 107,826. The rest of the country consists of native states under French protection, and includes, since 1909, the northern bank of the river Senegal below Bakel. In this larger sense, which is that employed in this article, Senegal covers about 74,000 sq. m., with an estimated population of 1,800,000. Among the protected states is Bondu (q.v.) lying immediately west of the lower Faleme.

Physical Features. — The coast follows a S.S.W. direction from the mouth of the Senegal to Cape Verde, the most western point of the African continent ; thence it bends south as far as Cape Roxo, where the Portuguese frontier begins. The only gulf on the coast is that which lies to the south of Cape Verde and contains the island of Goree (q.v.). The coast in the northern part is low, arid, desolate and dune-skirted, its monotony relieved only here and there by cliffs and plateaus. Further south it becomes marshy, and clothed with luxuriant vegetation. A little to the north of the Gambia the coast-line is much broken by the archipelago of islands formed by the Salum estuary, whilst south of the Gambia is the broad estuary of the Casamance. Between the Senegal and the Gambia and as far east as about 13 W., the country behind the seaboard is a slightly elevated and, for the most part, barren plain. Further east is a mountainous and fertile region with altitudes of over 4000 ft. The mountains sink abruptly towards the Niger valley, while southwards they join the Futa Jallon highlands. On the north they extend to the left bank of the Senegal and throw out spurs into the desert beyond. The Senegal {q.v.), its tributary the Faleme, and the upper course of the Gambia (q.v.) are the chief rivers which drain the country. The Salum, already mentioned, is a river-like estuary which penetrates fully 100 m. and is split into many channels. It is navigable from the sea for 60 m. The Casamance flows between the Gambia to the north and the Cacheo to the south, and has a drainage area of some 6000 sq. m. Rising in the Futa Jallon, the river has a course of about 212 m., and at Sedhiu, 105 m. from the sea, is ij m. broad. Forty miles lower down it is joined by a northern tributary, the Songrogu, and thence

to the ocean forms, with its numerous lateral channels, an estuary. The mouth of the river is fully 6 m. wide. Six to seven feet of water cover the bar at low tide, the river being navigable by shallow draught vessels for the greater part of its length.

Geology. — The low region of the seaboard has a very uniform character. It consists of sandstones or clay rocks and loose beds of reddish soil, containing marine shells. At certain points, such as Cape Verde and Cape Roxo (or Rouge), the red sandstones crop out, giving to the latter its name. Clay slates also occur, and at intervals these sedimentary strata are interrupted by basaltic amygdaloid and volcanic rocks. For instance, the island of Goree is basaltic. The base of the mountains is formed in certain places of clay slate, but more generally of granite, porphyry, syenite or trachyte. In those districts mica-schists and iron ores occur. Iron and gold are found in the mountains and the alluvial deposits. Many of the valleys are covered with fertile soils; but the rest of the country is rather arid and sterile.

Climate. — There are two seasons, the dry and the rainy or winter, the latter contemporaneous with the European summer. In the rainy season the wind blows from the sea, in the dry season the har-

mattan sweeps seaward from the Sahara. Along the seaboard the dry season is cool and agreeable ; in the interior it is temperate in the three months which correspond to the European winter, for the rest of the year the heat is excessive. The maximum readings (90 to ioo° F.), which are exceptional at St Louis, become almost the rule at Bakel on the upper Senegal. The mean temperature at St Louis is 68° to 70° F. The rainy season begins at Goree between the 27th of June and the 13th of July. During this period storms are frequent and the Senegal overflows and floods the lowlands, the heat and humidity rendering the country affected very unhealthy. Several districts formerly covered with forest, to which fact Cape Verde owed its name, are now treeless, a continual slow diminution in the rainfall being the result. 1 No part of the country is suited for per- manent occupation by Europeans. Yellow fever, malaria, &c, once prevalent in the towns, have been successfully combated by attention to sanitation.

Flora. — The principal tree is the baobab (Adansonia digitata), which sometimes at the height of 24 ft. has a diameter of 34 and a circumference of 104 ft. Acacias are numerous, one species, A. adansonia, being valuable for ship-timber. Among the palm-trees is the ronier, whose wood resists moisture and the attacks of insects; in some places, as in Cayor, it forms magnificent forests. The mampatas

grows sometimes 100 ft. high, its branches beginning at a height of about 25 ft. Landolphia and other rubber plants, and the oil-palm, grow luxuriantly in the Casamance district. The karite, or shea-butter tree, is common. Wild indigo is abundant, and the cotton plant is indigenous.

Fauna. — The lion of Senegal and the neighbouring countries differs from the Barbary lion; its colour is a deeper and brighter yellow, and its mane is neither so thick nor so long. Other beasts of prey are the leopard, the wild cat, the cheetah, the civet and the hyena. The wild boar is clumsier than the European variety. Antelopes and gazelles occur in large herds; the giraffe is found in the region of the upper Senegal; the elephant is rare; the hippopotamus is gradually disappearing. Crocodiles swarm in the upper Senegal. Monkeys and apes of different species (the chimpanzee, the colobus, the cyno-cephalus, &c), the squirrel, rat and mouse abound. The hedgehog, marmot, porcupine, hare, rabbit, &c, are also met with. Among the more noteworthy birds are the ostrich, which migrates to the Sahara ; the bustard, found in desert and uncultivated districts; the mara-bout, a kind of stork, with its beak black in the middle and red at the point, which frequents the moist meadowlands and the lagoons; the brown partridge, the rock partridge and the quail in the plains and on the mountain sides; and the guinea-fowl in the thickets and brush-wood. Along the coast are caught the sperm whale, the manatee and the cod-fish.

Inhabitants. — The inhabitants of Senegal are, mainly," Moors" and allied Berber races, and Negroids. The Moors, or rather Berbers (Trarzas, Braknas and Duaish), inhabit the right bank of the Senegal. Fula (Peuls) are found in various parts of the country. Negroids, however, form the bulk of the population. There are few, if any, tribes of unmixed Negro blood, though in most of them the Negro element largely predominates. The best known of these tribes are the Wolofs and Mandingos, the last-named a widespread group of allied peoples bearing many names such as Sarakoles and Bambaras. Mandingos inhabit the basins of the upper Niger and the upper Senegal, and the western slope of the mountains of Futa Jallon. Under the name of Wakore or Wangara they are also found in all the immense tract enclosed in the bend of the Niger. The Berbers, Fula and Mandingos are Moslems. The Wolofs and the Serers inhabit the seaboard from St Louis to the Gambia, and the left bank of the Senegal from its mouth to Dagana. The Balanta inhabit the left bank of the Casamance; they are allied to the Mandingos. The principal languages spoken are Wolof, Fula, Serer, Mandingo and Arabic. The river Senegal marks the line of separation between

Wolof and Arabic. Fula is the language of the Fula and Tukulors (Fula half-breeds); Mandingo comprises several dialects and is widely spoken. Polygamy is generally practised. Slave raiding has been stopped and domestic slavery is not" recognized by the French. (See Berbers, Fula, Wolof, Mandingo, &c.)

Towns. — The chief towns of Senegal are St Louis, pop. (1904) 28,469, Dakar (23,452), Goree (1500) (all separately noticed) and Rufisque. Rufisque (12,446; including suburbs, 19,177) is a seaport 14 m. E. of Dakar and is on the railway connecting that town with St Louis. It is the chief place in the colony for the export of ground-nuts. Portudal and Joal are small places on the coast south of Rufisque. (Midway between Cape Verde and Cape Blanco is the small port of Marsa or Portendic, a little south of Jeil [Old Portendic],

1 See A. Knox, " The Isohyets 'twixt Sahara and Western Sudan," in Geog. Journ. (June 1909).

which was formerly noted for the export of gum arabic, and on the shores of the bay formed by Cape Blanco is Port Etienne, a fishing station provided with jetties and guarded by a military post. These last-named ports are in the Territory of Mauretania, but are most conveniently mentioned here.) On the river Senegal are the towns of Richard-toll (Richard's garden), Dagana and Bakel, all three founded by the French government in 1821. Carabane, Zighinchor and Sedhiu are settlements on the Casamance river. St Louis, Dakar, Goree and Rufisque are communes, with a franchise exercised by natives and Europeans alike. The total white population of the four towns is about 5000.

Agriculture and Trade. — Senegal's chief commercial product is the ground-nut, which, since 1888, has yielded about 30,000 tons a year. Millet ˆthe staple food of the native population, maize and rice occupy about two-thirds of the cultivated land. Acacia gum is gathered by the Moors in the northern region; the kola nut is cultivated and rubber is collected in the district of Casamance, which projects between Portuguese Guinea and British Gambia. There are large herds of cattle and flocks of sheep and goats, besides numerous camels, asses and horses. Gold, iron, quicksilver and copper are found. The natives carry on weaving, pottery, brickmaking, and

manufacture trinkets. Cotton goods (chiefly from England) form the most im- portant articles of import, and after them come kola nuts (mainly from Sierra Leone) , rice, wines and spirits, tobacco, implements, sugar, coal and fancy goods; the exports are mostly ground-nuts; rubber (much of which comes from the Niger regions), gum and gold coming next in value. The imports and ˆexports of Senegal are not shown separately, the figures for Upper Senegal and Niger being included. The average annual value for the five years ending 1905 was £3,100,000. By 1910 the value had risen to nearly £4,000,000. France takes 75% of the exports; Belgium, the Netherlands and Denmark the bulk of the remainder In value ground-nuts form four-fifths of the exports.

Communications. — A railway, 163 m. long, goes from Dakar to St Louis, from which point the Senegal river is navigable by steamer from August to November, both inclusive, for about 500 m., the navigable reach terminating at Kayes, whence a railway runs to the Niger. Direct communication between Dakar and the Niger is afforded by a railway starting from Thies, a station on the way to St Louis, and ending at Kayes. The construction of this line began in 1907. Telegraph lines connect the colony with all other parts of French West Africa. Dakar is in direct cable communication with Brest, and another cable connects St Louis with Cadiz. Steamship communication between Europe and Dakar and Rufisque is main- tained by several French, British and German lines. Over 50% of the shipping is French, Great Britain coming second.

II. Upper Senegal and Niger This colony is bounded N. by the Saharan territories dependent on Algeria, W. by Senegal and the Territory of Mauretania, S. by the French colonies of Guinea and the Ivory Coast, the Northern Territories of the Gold Coast (British), Togoland (German) and Dahomey (French). The Military Territory dependent on the colony extends E. of the Niger to the Lake Chad territory of French Congo, being bounded S. by Nigeria (British). The colony and its dependent territory thus form the link connecting all the possessions of France in north, west and central Africa. Their area is estimated at 210,000 sq. m., with a population of some 3,000,000. Those tribes living north and east of the Niger are mainly of Berber (Tuareg) stock; the inhabitants of the Niger bend are chiefly Negroids, such as the Mandingo, with Fula in certain districts.

The colony, as a whole, consists of a great plateau of granite and sandstone, rarely more than 1600 ft. high, and in its N.W. part, the Kaarta, all but desert. Hydrographically the western portion belongs

to the basin of the Senegal, the central to that of the Niger. At Mopti, 200 m. S.W. of Timbuktu, the Niger receives the Mahel Balevel, which rises in about 95°N. and with its tributaries drains a very large area. In its lower courses its divergent channels, uniting with offshoots from the Niger, form in the flood season an immense lake. This region — apparently the Wangara country of Idrisi — is sometimes called Bambara, the name of the chief race inhabiting it. The lakes or widenings of the Niger itself occupy vast areas; Lake Debo, the Lake of Horo, the Lake of Dauna, Lake Faguibini are all to the south or west of Timbuktu, and are permanent. The greater part of the colony lies within the bend" of the Niger, but westward it includes both banks of the Senegal as far as the Faleme confluence. It also extends north of the Niger so as to include the fertile land on the borders of the Sahara. On the S.W. and S. the country is somewhat mountainous and the general trend of the land and xxiv. 21

the course of the rivers is south to north. East of the Niger the conditions are mostly Saharan, but there is a belt of fairly fertile country, bordering northern Nigeria and extending to Lake Chad. This region includes the state of Zinder (q.v.) and the oases of Air or Asben and Bilma (q.v.). The country west of the Niger contains patches of forest, but it consists mainly of open land well adapted to agriculture and stock-raising. The fauna includes the lion, elephant, hippopotamus, wild boar, panther and various kinds of antelope. The climate is tropical, but, apart from the districts inundated by the Niger floods, dry and not unhealthy.

The Protected States. — Of the native states included in the colony Bambuk lies between the Senegal and the Faleme and Bafing. It is traversed from N.W. to S.E. by the steep and wall-like range of the Tamba-Ura Mountains. The soil in a large part of the country is of remarkable fertility; rice, maize, millet melons, manioc, grapes, bananas and other fruits grow abundantly; the forests are rich in a variety of valuable trees; and extensive stretches are covered with abundant pasturage of the long guinea-grass. The inhabitants, a branch of the Mandingo race, own large herds of cattle and sheep. The reports which reached Europe during the 17th and 18th centuries of a country in Upper Senegal rich in gold referred to this district, where both alluvial and quartz deposits have been found, though the stories of " hills of gold " remain unverified. In all the protected states the native rulers retain a considerable degree of authority and native law is administered.

Towns. — The principal towns in the colony are, in Upper Senegal, Kayes, Bafulabe and Kita; in the Niger regions Sikaso, the centre of

the rubber trade; Bamako, 1 the seat of government; Kulikoro, Segu, Sansandig, Bambara, Jenne {q.v.) and Timbuktu (q.v.). Nioro is the capital of the Kaarta country; between it and Timbuktu are Gumbu and Sokolo ; Gao (q.v.), Zinder or Sinder] (not to be con- founded with the Zinder mentioned above), Sansanne Hausa, Niamey and Say are towns on the Niger below Timbuktu, Say (q.v.) being an entrepot for the trade of the east Nigerian regions. In the centre of the Niger bend is the important city of Wagadugu,the capital of Mossi, a negroid and pagan state dating from the 14th century. Satadugu is on the upper course of the Faleme. Sati and Leo are towns just north of the British Gold Coast hinterland.

Of these towns Kayes is situated on the Senegal at the point of which that river ceases to be navigable from the sea — a distance of 460 m. from St Louis. Bamako, chosen in 1904 as the capital of the colony, is on the upper Niger at the head of its navigable waters and is in railway communication with Kayes. Segu, where Mungo Park first reached the Niger, is regarded as the capital of Bambara rather than the town of Bambara, which is on a backwater of the Niger some 100 m. S. of Timbuktu. Before the French occupation the possessor of Segu was the ruler of the surrounding country ; and the town was the headquarters of the emirs Omar and Ahmadu (see below, History). Sansandig stands on the north bank of the Niger below Segu. It was visited by Mungo Park in 1796, and Lieut. E. Mage and Dr Quintin, French officers, witnessed the stand it made in 1865 against a siege by Ahmadu, sultan of Segu, from whom it had re- volted. Before its conquest by the Tuareg in the first half of the 19th century Sansandig was an important mart, owing to its position at the upper end of the stretch of the Niger navigable for large vessels all the year round. After its occupation by France in 1900 its commercial importance gradually returned. It possesses good anchorage and landing places.

Communications. — There is regular communication by rail and river between Dakar, the principal port of Senegal, and Timbuktu, the journey occupying ten to twelve days. A railway linking the Senegal and Niger rivers starts at Kayes on the Senegal, passes S.E. through Bafulabe and Kita, whence it goes E. to Bamako on the Niger, and follows the left bank of that river to Kulikoro, the terminus, from which point the Niger is navigable down stream all the year round for a distance of 900 m., while from Bamako the Niger is navigable up stream to Kurussa, a distance of 225 m., for the greater part of the year. The Senegal-Niger railway is 347 m. long, and occupied twenty-four years in construction, owing to bad management and periods of retrogressive policy in Paris. The total

cost was upwards of £3,500,000. Construction of the line was sanctioned in 1880; by 1882, when £700,000 had been spent, but 10 m. of rails had been laid. The 33rd mile was reached at a cost ˚f £7. 2 5 2 Per mile for actual construction. Notwithstanding this heavy expense the line was condemned as hopelessly defective. In 1888 it reached Bafulabe (82 m.) when work was suspended, not to be vigorously resumed until 1898. The entire line was opened for traffic in 1905. Steamers ply on the Niger between Kabara, the port of Timbuktu, and Kulikoro and Bamako. Good roads connect Mossi

1 For a monograph on Bamako see Quest, dipt, et col. (1007)5 pp. 561-576.

and other countries in the Niger bend with the river ports and the colonies on the Gulf of Guinea. There is a complete system of telegraphic communication with all the French colonies in West Africa. The principal line (over 2000 m. long) connects Dakar with Timbuktu and from Timbuktu goes east to Zinder. At Burrem on the Niger, 212 m. below Timbuktu, starts a line across the Sahara to Algeria.

Trade and Agriculture. — The chief exports are gum (which comes largely from the northern districts such as Kaarta), rubber, gold, kola nuts, leather and ostrich feathers. Part of the trade is still done by caravans across the Sahara to Morocco and Algeria, and a goodly proportion of the exports from the middle Niger are shipped from Konakry in French Guinea. Under the direction of French officials, cotton-growing on scientific methods was begun in the Niger basin in 1904. American and Egyptian varieties were introduced, the American varieties proving well adapted to the soil. Indigenous varieties of cotton are common and are cultivated by the natives for domestic use, weaving being a general industry. Gold is found in the basin of the Faleme and of the Tankisso. Rubber is abundant in the southern part of the Niger bend, the latex being extracted by the natives in large quantities. The people are great agriculturists, their chief crops being millet, maize, rice, cotton and indigo. Tobacco is cultivated by the river folk along the banks inundated by the floods. Wheat is grown in the neighbourhood of Timbuktu, the seed having been, in all probability, brought from Morocco at the time of the Moorish invasion (see Timbuktu). The oil of the karite or shea-butter tree, common in the southern and western regions, is largely

used. Cattle are plentiful; there are several good breeds of horses; donkeys are numerous and largely used as transport animals; wool-bearing sheep — distinct from the smooth-haired sheep of the coast regions — are bred in many districts, the natives using the wool largely in the manufacture of blankets and rugs. Ostriches are fairly numerous in the upper portion of the Niger bend and on the left bank of the Niger east of Timbuktu, and their feathers form a valuable article of trade. Most of the trade of this vast region is with France and through Senegal.

III. History and Administration The story of the French conquests throughout West Africa is inseparably connected with the history of Senegal. Trading stations were established elsewhere on the coast, but the line of penetration into the interior of the continent was, until the last few years of the 19th century, invariably by way of the river Senegal. Hence there is a peculiar interest in the record of the early settlements on this coast. The Portuguese had some establishments on the banks of the Senegal in the 15th century; they penetrated to Bambuk in search of gold, and were for some time masters of that country, but the inhabitants rose and drove them out. Remains of their buildings are still to be seen. The first French settlement was probably made in 1626 (see Senegal, river). Between 1664, when the French settlements were assigned to Colbert's West India Company, and 1758, when the colony was seized by the British, Senegal had passed under the administration of seven different companies, none of which attained any great success, though from 1697 to 1724 affairs were conducted by a really able governor, Andre Brue, who did not, however, spend the whole of his time in Africa; from 1703 to 1714 he directed the affairs of Senegal from Paris. Brue made many exploring expeditions and was on one occasion (1701) captured by the natives, who extorted a heavy ransom. Under his direction the auriferous regions of Bambuk, long since abandoned by the Portuguese, were revisited (17 16) and the first map of Senegal drawn (1724). In the meantime (1677) the French had captured from the Dutch Rufisque, Portudal, Joal and Goree and they were confirmed in possession of these places by the treaty of Nijmwegen (1678). In 1717 the French acquired Portendic, a roadstead half way between capes Verde and Blanco, and in 1724 Arguin, an island off the coast of the Sahara, which still belongs to the colony. Goree and the district of Cape Verde were captured by the British • under Commodore Keppel in 1758, but were surrendered to the French in 1763, and by the treaty of peace in 1783 the whole of the Senegal was also restored. The British again captured the colony in the wars of the First Empire (Goree 1800, St Louis 1809) and, though the

treaty of Paris authorized a complete restitution, the French authorities did not enter into possession till 181 7. At that time the authority of France did not extend beyond the island of Goree and the town of St Louis, whilst up to 1854 little was effected by the thirty-seven governors who followed each other in rapid succession. Of these governors

Captain (afterwards Admiral) Bouet-Willaumez had previously explored the Senegal river as far as M6dine and was anxious to increase French influence, but his stay in Senegal (1842-1844) was too brief to permit him to accomplish much.

The appointment of General Faidherbe as governor in 1854 proved the turning-point in the history of Senegal. In the meantime the iSfiger had been explored, Timbuktu visited by Europeans and the riches of the region were attracting attention. General Faidherbe sought to bring these newly opened-up lands under French sway, and dreamed of a French empire stretching across Africa from west to east. As far as concerned West Africa he did much to make that dream a reality. On' taking up the governorship he set about subduing the Moorish (Berber) tribes of the Trarzas, Braknas and Duaish, whose " kings," especially the king of the Trarzas, had subjected the French settlers and traders to grievous and arbitrary exactions; and he bound them by treaty to confine their authority to the north bank of the Senegal. In 1855 he annexed the country of Walo and, ascending the river beyond Kayes, erected the fort of Medine for the purpose of stemming the advancing tide of Moslem invasion, which under Omar al-Haji (Alegui) threatened the safety of thecolony. In 1857 Medine was brilliantly defended by the mulatto Paul Holle against Omar, who with his army of 20,000 men had to retire before the advance of General Faidherbe and turn his attention to the conquest of the native states within the bend of the Niger. The conquest of the Senegambian region by the French followed. The outbreak of the Franco-Prussian War in 1870 checked the French schemes of penetration for some five or six years, but the delay proved to be no disadvantage for Great Britain, France's only serious rival in West Africa at the time, remained inert.

The first French expedition into the heart of the Niger country was undertaken in 1863, when General Faidherbe sent Lieut. E. Mage 1 and Dr Quintin to explore the country east „ .

of the Senegal. The two travellers pushed as far as ofthe Segu on the Niger, then the capital of the almany upper Ahmadu, a son of Omar al-Haji. At Segu they were Nlger forcibly detained from February

1864 to March 1866. During this period they gathered much valuable information concerning the geography, ethnology and history of the middle Niger region. In 1878 the explorer Paul Soleillet (1842-1886) also penetrated to Segu. In 1879 Colonel Briere de ITsle (governer of Senegal, 1876-1881) appointed Captain Joseph S. Gallieni to investigate the route for a railway and to reopen communications with the almany Ahmadu; and at this time the post of Bafulabe was constructed. The armed conquest began in 1880, and for more than fifteen years was carried on by Borgnis-Desbordes, J. S. Gallieni, H. N. Frey, Louis Archinard, Col. Combes, Tite Pierre Eugene Bonnier and other officers. In 1 88 1 the Niger was reached; the fort of Kita was erected to the south-east of Medine to watch the region between the Senegal and the Joliba (upper Niger) ; the fort of Bamako on the Niger was built in 1883; a road was made, 400 m. of tele- graph line laid down and the work of railway construction begun. In 1887 Ahmadu, who had formerly been anxious to obtairr British protection, signed a treaty placing the whole of his country under French protection. 2 Besides Ahmadu the principal opponent of the French was a Malinke (Mandingo) chieftain named Samory, a man of humble origin, born about 1846, who first became prominent as a reformer of Islam, and

1 Lieut. E. Mage (1837-1869) of the French navy, an officer of brilliant promise, first visited Senegal in 1856 when, under Faidherbe's direction, he went on a mission to the Duaish Moors. The " Gorgone," which he commanded, was wrecked off Brest in December 1869 and Mage was drowned.

2 It was in this year (1887) that the governor of Senegal took possession of a small uninhabited group of islands, named the Alcatras, lying off the coast of French Guinea. This act had a tragic sequel. By agreement with the governor, a chieftain of the neighbouring mainland sent four of his warriors to the islands to guard the tricolour. These soldiers were, however, like the islands themselves, completely forgotten by the authorities, and, the Alcatras producing nothing but sand, the four men starved to death, after exhausting the supplies with which they had been originally provided.

had by 1880 made himself master of a large area in the upper Niger basin. In 1887, and again in 1889, he was induced to recognize a French protectorate, but peace did not long prevail either with him or

with Ahmadu. The struggle was resumed in 1890; Ahmadu lost Segu; Nioro the capital of Kaarta was occupied (1891); Jenne was taken in 1893. Samory proved a veritable thorn in the flesh to his opponents. Wily and elusive, he made and broke promises, tried negotiation, shifted his " empire " to the states of Kong, and after numberless encounters was finally defeated on the Cavalla to the north of Liberia, and taken prisoner in September 1898. He was deported to the Gabun, where he died in 1900. Timbuktu was occupied in December 1893, in defiance of orders from the civil authorities. Colonel Bonnier, who went to the relief of the advance party, after having effected that purpose, was slain by the Tuareg (15th of January 1894), whom he had pursued into the desert. In the meantime France had signed with Great Britain the convention of the 5th of August 1890, which reserved the country east of the Niger and south of the Sahara to Great Britain.

Determined to profit by the convention, the French govern- ment despatched Colonel P. L. Monteil to West Africa to visit the countries on the Anglo-French frontier. That officer, starting from St Louis in 1891, traversed the Niger bend from W. to E., visited Sokoto and Zinder and arrived at Kuka on Lake Chad, whence he made his way across the Sahara to the Mediterranean. In the following years French expeditions from Senegal penetrated south-east into the hinterland of the British colonies and pro- tectorates on the Guinea coast and descended the Niger (February 1897) as far as Bussa, the limit of navigation from the ocean. These actions brought them into contact with the British outposts in the Gold Coast, Lagos and Nigeria. A period of tension between the two countries was put an end to by a con- vention signed on the 14th of June 1898 whereby the territories in dispute were divided between the parties, Great Britain retaining Bussa, while France obtained Mossi and other territories in the Niger bend to which Great Britain had laid claim. In the same year it was determined to send an expedition to Lake Chad, which should co-operate with other expeditions from Algeria and the Congo. The Senegal expedition was entrusted to Captains Voulet and Chanoine, officers who had served many years in West Africa. Reports of the misconduct and cruelty of these officers reaching St Louis, Lieut.-Colonel Klobb of the Marines was sent to supersede them. Colonel Klobb overtook the expedition at a spot east of the Niger on the 14th of July 1899. Voulet, fearing arrest and punishment, ordered his men to fire on Klobb and his escort, and the colonel was killed. Thereupon Voulet, joined by Chanoine, declared his intention to set up an independent state, and with the majority of his troops marched away, leaving the junior officers, who remained

loyal to France, with a small remnant. Within a fortnight both Voulet and Chanoine had been killed by their own men, who returned to the French camp. Lieut. Pallier assumed command and led the force to Zinder, reached on the 29th of July. Here, in the November following, they were joined by F. Foureau and Commandant Lamy, who had crossed the Sahara from Algeria. The combined force marched to Lake Chad, and, having been joined by the Congo expedition, met and defeated the forces of Rabah (q.v.). Thus was accomplished in fact the linking up of the French possessions in Africa, an object of French ambition since 1880, and theoretically effected by the Anglo-French convention of 1890.

In 1904, in virtue of another convention between Great Britain and France, the Senegal colony obtained a port (Yarba- tenda) on the Gambia accessible to sea-going vessels, while the trans-Niger frontier was again modified in favour of France, that country thereby obtaining a fertile tract the whole way from the Niger to Lake Chad. During 1905-1906 the oases of Air and Bilma, in the central Sahara, were brought under French control, notwithstanding a claim by Turkey to Bilma as forming part of the Tripolitan hinterland.

At first the whole of the conquered or protected territories

were either administered from Senegal, or placed under military rule. ■ Subsequently the upper Senegal country and the states included in the bend of the Niger wera formed into a separate administration and were given the title ifJJLf " French Sudan. " As the result of further reorgan- divisions. ization (October 18, 1899) the colonies of French Guinea, Ivory Coast and Dahomey were given their geographical hinterlands, and in October 1902 the central portion was created a protectorate under the style of the Territories of Senegambia and of the Niger. A further change was made in 1904 (decree of the 1 8th of October) when this central portion was changed into " The Colony of Upper- Senegal and Niger." The new colony was placed under a lieutenant-governor.

Soon after the reorganization of the country in 1902, the effective area of French control was increased by M. Coppolani, secretary-general of French West Africa, who in February 1903 induced the emirs of certain Trarza and Brakna Moors inhabiting a fertile region on the northern bank of the lower Senegal to place their country under the direct supervision of French officials. In the following year these regions were formally constituted the Territory of Mauretania, being placed under the direct control of the governor-general of French West Africa represented on the spot by a civil commissioner.

In 1905 M. Coppolani, the commissioner, was murdered by a band of fanatics at an oasis in the Tagant plateau. During 1908-1909 a force under Colonel Gouraud, after considerable fighting — the natives receiving help from Morocco — made effective French influence in Adrar Temur.

For the history of the native states in this vast region, see Tim- buktu, Jenne, Mandingo, Guinea, &c. Consult also the article Nigeria.

*The general oversight of both colonies is in the hands of the governor-general of Fre*nch West Africa. Senegal proper has been the subject of special legislation, its government being modelled on that of a department in France. mea t. The lieutenant-governor, who controls the military as well as the civil administration, is assisted by a secretary-general and by a privy council {conseil prive) consisting of high officials and a minority of unofficial nominated members, but he is not bound to follow its advice. This council corresponds to the prefectural council of a department. There is also a council-general {conseil general) with powers analogous to those of the similar councils in France. The Senegal council, however, does not share the right, possessed by the councils of other French colonies, of voting the budget, which is fixed by the governor- general of French West Africa. The inhabitants of " communes with full powers " {i.e. St Louis, Dakar, Goree and Rufisque) alone have the right of electing the council -general. The same constituencies — in which no distinction of colour or race is made — elect (law of April 1879) to the French chambers one deputy, who is also a member of the superior council of the colonies, a consultative body sitting in Paris. The communes named have the same municipal rights as in France. There have been, in addition, since 1891, " mixed " and native communes with restricted powers of local government. The judicial system applied to Europeans resembles that of France, and the judicature is independent of the executive. Native laws and customs not repugnant to justice are respected. Education is given in village, commercial and technical schools, all maintained by the state. Arabic is taught in all Mahommedan districts.*

The colony of Upper Senegal and Niger has a more rudimentary constitution. Its administrative council contains three " not- ables," unofficial members nominated by the lieutenant-governor.

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SENEGAMBIA, a term used to denote the region between the rivers Senegal and Gambia on the west coast of Africa. The country south

of the Gambia as far as Sierra Leone was formerly also regarded as part of Senegambia. As a geographical expres- sion Senegambia fell into disuse towards the end of the 19th century. Part of the hinterland is included in the French colony of Upper Senegal and Niger (see Senegal, II.)

SENESCHAL (the O. Fr. form, mod. senichal, of the Low Lat. senescalcus, a word of Teutonic origin, meaning " old or senior servant," Goth, sini- old; cf. Lat. senex and scalks, servant; Du Cange's derivation from seneste, flock, herd, must be rejected), the title of an official equivalent to "steward." The seneschal began presumably by being the major-domo of the German barbarian princes who settled in the empire, and was therefore the predecessor of the mayors of the palace of the Merovingian kings. But the name seneschal became prominent in France under the third or Capetian dynasty. The seneschal, called in medieval Latin the dapifer (from daps, a feast, and ferre, to carry), was the chief of the five great officers of state of the French court between the nth and the 13th centuries, the others being the butler, the chamberlain, the constable and the chancellor. His functions were described by the term major regiae domus, and regni Franciae procurator — major-domo of the royal household, and agent of the kingdom of France. The English equivalent was the lord high steward, but the office never attained the same importance in England as in France. Under the earlier Capetian sovereigns the seneschal was the second person in the kingdom. He inherited the power and position of the mayor of the palace — had a general right of supervision over the king's service, was commander-in-chief .of the military forces (princeps militiae regis, or Francorum), was steward of the household and presided in the king's court in the absence of the king. Under weak rulers the seneschal would no doubt have played the same part as the mayors of the palace of the Carolingian line. It was the vast possibilities of the office which must be presumed to have tempted the counts of Anjou of the Plantagenet line to claim the hereditary dapifership of France, and to support their claim by forgeries. A count of Anjou who was also in effective possession of the office would soon have reduced his feudal lord to absolute insignificance. French historical scholars have shown that the pretension of the Anjevins was unfounded, and that the treatise concocted to support it — the Be majoralu et senescalia Franciae, attributed to Hugues de Cleres — is a medieval forgery. At the close of the nth century the seneschalship was in the hands of the family of Rochefort, and in the early part of the following century it passed from them to the famiiy ox Garlande. The power of the office was a perpetual temptation to the vassal, and

a cause of jealousy to the king. The Garlandes came to open conflict with the king, and were forcibly suppressed by Louis VI. in 11 27. After their fall the

seneschalship was conferred only on great feudatories who were the king's kinsmen — on Raoul of Vermandois till 11 52, and on Thibaut of Blois till 1191. From that time forward no seneschal was appointed except to act as steward at the coronation of the king. The name of the seneschal was added with those of the other great officers to the kings in charters, and when the office was not filled the words dapifero vacante were written instead. The great vassals had seneschals of their own, and when the great fiefs, Anjou, Touraine, Maine, Poitou, Saintonge, Guienne, were regained by the crown, the office was allowed to survive by the king. In the south of France, Perigord, Quercy, Toulouse, Agenais, Rouergue, Beaucaire and Carcassonne were royal senichaussees. In Languedoc the landlords' agent and judicial officer, known in the north of France as a bailli, was called senSchal. The office and title existed till the Revolution.

See Du Cange, Glossarium mediae et infimae Latinitatis (Paris, 1 840- 1850); A. Luchaire, Histoire des institutions monarchiques de la France sous les premiers CapHiens (Paris, 1883-1885); Manuel des institutions francaises (Paris, 1 892); Paul Viollet, Droit publique — Hist, des institutions politiques et administrates de la France (Paris,

1890-1898). '

SENI GALLIA, or Sinigaglia (anc. Sena Gallica), a city and episcopal see of the Marches, Italy, in the province of Ancona, on the coast of the Adriatic, 15 m. by rail N. of Ancona. Pop. (1901) 5556 (town), 23,195 (commune). It is situated at 14 ft. above sea-level, and, despite its ancient origin, presents a modern appearance, with wide streets. The Palazzo Comunale dates from the 17th century. The cathedral was erected after 1787. The castle, of Gothic origin, was restored by Baccio Pontelli, a famous military architect, in 1492. The church of S Maria delle Grazie outside the town is one of the only two churches which he is known to have executed (the other is at Orciano near Mondavio, about 15 m. to the west by road). The small port is formed by the lower reaches of the Misa, a stream which flows through the town between embankments constructed of Istrian marble. The inhabitants are chiefly occupied in fishing, and in the summer the town is greatly frequented by visitors for the good sea-bathing. Senigallia used to hold one of the largest fairs in Italy,

which dated originally from 1200, when Sergius, count of Senigallia, received from the count of Marseilles, to whose daughter he was affianced, certain relics of Mary Magdalene; this fair used to be visited by merchants from France, Switzerland, Austria, Germany and especially the Levant. Senigallia is the residence of the Mastai-Ferretti family; the house in which Pope Pius IX. was born is preserved, and contains a few memorials of him.

The ancient Sena Gallica was a city of Umbria. A colony was founded there by the Romans after their victory over the Senones, rather before 280 B.C. The place is also mentioned in connexion with Hasdrubal's defeat at the Metaurus (q.v.) in 207 B.C. It was destroyed by Pompey in 82 B.C., and is not often mentioned afterwards. No ancient remains and very few inscriptions exist. . The name Gallica distinguishes it from Saena (Siena) in Etruria. Ravaged by Alaric, fortified by the exarch Longinus, and again laid waste by the Lombards in the 8th century and by the Saracens in the 9th, Senigallia was at length brought so low by the Guelph and Ghibelline wars, and especially by the severities of Guido de Montefeltro, that it was chosen by Dante as the typical instance of a ruined city. In the 15th century it was captured and recaptured again and again by the Malatesta and their opponents. Sigismondo Malatesta of Rimini erected strong fortifications round the town in 1450-1455. The lordship of Senigallia was bestowed by Pius II. on his nephew Antonio Piccolomini, but the people of the town in 1464 placed themselves anew under Paul II., and Giacomo Piccolomini in 1472 failed in his attempt to seize the place. Sixtus IV. assigned the lordship to the Delia Rovere family, from whom it was transferred to Lorenzo de' Medici in 1516. After 1624 it formed part of the legation oi Urbino.

SENIOR, NASSAU WILLIAM (1790-1864), English economist, was born at Compton, Berks, on the 26th of September 1790,

the eldest son of the Rev. J. R. Senior, vicar of Durnford, Wilts. He was educated at Eton and Magdalen College, Oxford; at the university he was a private pupil of Richard Whately, afterwards archbishop of Dublin, with whom he remained connected by ties of lifelong friendship. He took the degree of B.A. in 1811, was called to the bar in 1819, and in 1836, during the chancellorship of Lord Cottenham, was appointed a master in chancery. On the foundation

of the professorship of political economy at Oxford in 1825 Senior was elected to rill the chair, which he occupied till 1830, and again from 1847 to 1852. In 1830 he was requested by Lord Melbourne to inquire into the state of combinations and strikes, to report on the state of the law and to suggest improvements in it. He was a member of the Poor Law Inquiry Commission of 1832, and of the Handloom Weavers Commission of 1837; the report of the latter, published in 184 1 , was drawn up by him, and he embodied in it the substance of the report he had prepared some years before on combinations and strikes. He was also one of the commissioners appointed in 186 1 to inquire into popular education in England. In the later years of his life, during his visits to foreign countries, he studied with much care the political and social phenomena they exhibited. Several volumes of his journals have been published, which contain much interesting matter on these topics, though the author probably rated too highly the value of this sort of social study. Senior was for many years a frequent contributor to the Edinburgh, Quarterly, London and North British Reviews, dealing in their pages with literary as well as with economic and political subjects. He died at Kensington on the 4th of June 1864.

His writings on economic theory consisted of an article in the Encyclopaedia Metropolitana, afterwards separately published as An Outline of the Science of Political Economy (1836), and his lectures de- livered at Oxford. Of the latter the following were printed: An Introductory Lecture (1827); Two Lectures on Population, with a correspondence between the author and Malthus (1831); Three Lectures on the Transmission of the Precious Metals from Country to Country, and the Mercantile Theory of Wealth (1828) ; Three Lectures on the Cost of obtaining Money and on some Effects of Private and Government Paper Money (1830); Three Lectures on Wages and on the Effects of Absenteeism, Machinery and War, with a Preface on the Causes and Remedies of the Present Disturbances (1830, 2nd ed. 1831); A Lecture on the Production of Wealth (1847); and Four Introductory Lectures on Political Economy (1852). Several of his lectures were translated into French by M. Arrivabene under the title of Principes Fondamsntaux d'Economie Politique (1835). Senior also wrote on administrative and social questions — A Letter to Lord Howick on a Legal Provision for the Irish Poor, Commutation of Tithes and a Provision for the Irish Roman Catholic Clergy (1831, 3rd ed., 1832, with a preface containing suggestions as to the measures to be adopted in the " present emergency ") ; Statement of the Pro- vision for the Poor and of the Condition of the Labouring Classes in a considerable portion

of America and Europe, being the Preface to the Foreign Communications in the Appendix to the Poor Law Report (■835); On National Property, and on the Prospects of the Present Administration and of their Successors (anon.; 1835); Letters on the Factory Act, as it affects the Cotton Manufacture (1837) ; Suggestions on Popular Education (1861); American Slavery (in part a reprint from the Edinburgh Review, 1862); An Address' on Education delivered to the Social Science Association (1863). His contributions to the reviews were collected in volumes entitled Essays on Fiction (1864); Biographical Sketches (1865, chiefly of noted lawyers); and Historical and Philosophical Essays (1865). In 1859 appeared his Journal kept in Turkey and Greece in the Autumn of 1857 and the Beginning of 1858; and the following were edited after his death by his daughter: Journals, Conversations and Essays relating to Ireland (1868); Journals kept in France and Italy from 1848 to 1852, with a Sketch of the Revolution of 1848 (1871) ; Conversations with Thiers, Guizot and other Distinguished Persons during the Second Empire (1878); Conversations with Distinguished Persons during the Second Empire, from i860 to 1863 (1880); Conversations and Journals in Egypt and Malta (1882); also in 1872 Correspondence and Conver- sations with Alexis de Tocqueville from 1834 to 1859.

Senior's literary criticisms do not seem to have ever won the favour of the public; they are, indeed, somewhat formal and academic in spirit. The author, while he had both good sense and right feeling, appears to have wanted the deeper insight: the geniality and the catholic tastes which are necessary to make a critic of a high order, especially in the field he chose — that, namely, of imaginative literature. His tracts on practical politics, though the theses they supported were sometimes questionable, were ably written and are still worth reading, but cannot be said to be of much permanent interest. But his name continues to hold an honourable, though secondary,

place in the history of political economy. Senior regards political economy as a purely deductive science, all the truths of which are inferences from four elementary propositions. It is, in his opinion, wrongly supposed by J. S. Mill and others to be a hypothetic science — founded, that is to say, on postulates not corresponding with social realities. The premises from which it sets out are, according to him, not assumptions but facts. It concerns itself, however, with wealth only, and can therefore give no practical counsel as to political action : it can only suggest considerations which the politician should keep in view as elements in the study of the questions with which he has to deal. The conception of economics as

altogether deductive is certainly erroneous, and puts the science from the outset on a false path. But deduction has a real, though limited, sphere within it. Hence, though the chief difficulties of the subject are not of a logical kind, yet accurate nomenclature, strict definition and rigorous reasoning are of great importance. To these Senior gave special attention, and, notwithstanding occasional pedantries, with very useful results. In several instances he improved the forms in which accepted doctrines were habitually stated. He also did excellent service by pointing out the arbitrary novelties and frequent in- consistencies of terminology which deface Ricardo's principal work — as, for example, his use of " value " in the sense of " cost of production," and of " high " and " low " wages in the sense of a certain proportion of the product as distinguished from an absolute amount, and his peculiar employment of the epithets " fixed " and " circulating " as applied to capital. He shows, too, that in numer- ous instances the premises assumed by Ricardo are false. Thus he cites the assertions that rent depends on the difference of fertility of the different portions of land in cultivation; that the labourer always receives precisely the necessaries, or what custom leads him to consider the necessaries, of life; that, as wealth and population advance, agricultural labour becomes less and less proportionately productive; and that therefore the share of the produce, taken by the landlord and the labourer must constantly increase, whilst that taken by the capitalist must constantly diminish ; and he denies the truth of all these propositions. Besides adopting some terms, such as that of " natural agents," from Say, Senior introduced the word " abstinence " — which, though obviously not free from objection, is for some purposes useful — to express the conduct of the capitalist which is remunerated by interest; but in defining " cost of produc- tion " as the sum of labour and abstinence necessary to production he does not seem to see that an amount of labour and, an amount of abstinence are disparate, and do not admit of reduction to a common quantitative standard. He added some important considerations to what had been said by Smith on the division of labour. He dis- tinguishes usefully between the rate of wages and the price of labour. But in seeking to determine the law of wages he falls into the error of assuming a determinate wage-fund, and states as an economic truth what is only an identical proposition in arithmetic. Whilst enter- taining such an exaggerated estimate of the services of Malthus that he extravagantly pronounces him " as a benefactor of mankind on a level with Adam Smith," he yet shows that he modified his opinions on population considerably in the course of his career, regards his statements of the doctrine with which his name is associated as vague and ambiguous, and asserts that, " in the absence of disturbing

causes, subsistence may be expected to increase in a greater ratio than population." It is urged by H. X. C. Perin, and must, we think, be admitted, that by his isolation of economics from morals, and his assumption of the desire of wealth as the sole motive-force in the economic domain, Senior, in common with most of the other followers of Smith, tended to set up egoism as the legitimate ruler and guide of practical life. It is no sufficient answer to this charge that he makes formal reserve in favour of higher ends. From the scientific side Cliffe Leslie has abundantly proved the unsubstantial nature of the abstraction implied in the phrase " desire of wealth," and the in- adequacy of such a principle for the explanation of economic pheno- mena. (J. K. I.)

SENLIS, a town of northern France, in the department of Oise, on the right side of the Nonette, a left-hand affluent of the Oise, 34 m. N.N.E. of Paris by the Northern railway on the branch line (Chantilly-Crepy) connecting the Paris-Creil and Paris-Soissons lines. Pop. (1906) 6074. Its antiquity, its historical monuments and its situation in a beautiful valley, in the midst of the three great forests of Hallatte, Chantilly and Ermenonville, render it interesting. Its Gallo-Roman walls, 23 ft. high and 13 ft. thick, are, with those of St Lizier (Ariege) and Bourges, the most perfect in France. They enclose an oval area 1024 ft. long from E. to W. and 794 ft. wide from N. to S. At each of the angles formed by the broken lines of which the circuit of 2756 ft. is composed stands or stood a tower; numbering originally twenty-eight, and now only sixteen, they are semicircular in plan, and up to the height of the wall are unpierced. The Roman city had only two gates; the present number is five. The site of the praetorium was afterwards occupied by a castle occasionally inhabited by the kings of

France from Clovis to Henry IV., and still represented by ruins dating from the nth, 1 3 th and 1 6th centuries. In the neighbour- hood of Senlis the foundations of a Roman amphitheatre have also been discovered. The old cathedral of Notre Dame (12th, 13th and 1 6th centuries) was begun in 1155 on a vast scale; but owing to the limited resources of the diocese progress was slow and the transept was finished only under Francis I. The total length is 312 ft. (outside measurement), but the nave (92 ft. high) is shorter than the choir. At the west front there are three doorways and two bell towers. The right-hand tower (256 ft. high) is very striking: it consists, above the

belfry stage, of a very slender octagonal drum with open-work turrets and a spire with eight dormer windows. The left-hand tower, altered in the 16th century, is crowned by a balustrade and a sharp roof. In the side portals, especially in the southern, the flamboyant Gothic is displayed in all its delicacy. Externally the choir is extremely simple. In the interior the sacristy pillars with capitals of the 10th century are noteworthy. The episcopal palace, now an archaeological museum, dates from the 13th century; the old collegiate church of St Frambourg was built in the 12th century in the style which became characteristic of the " saintes chapelles " of the 13th and 14th centuries; St Pierre (chiefly of the 15th and 16th centuries) serves as a market. The ecclesiastical college of St Vincent, occupying the old abbey of this name, has an interesting church probably of the 12th century. Its date has, however, been greatly disputed by archaeologists, who sometimes wrongly refer it to Queen Anne of Russia, foundress in the nth century of the abbey. The town hall (15th century) and several private houses are also of architectural interest.

Senlis has tribunals of first instance and of commerce and a sub-prefecture. The manufacture of bricks and tiles, cardboard, measures and other wares are among the industries. The town is an agricultural market.

Senlis can be traced back to the Gallo-Roman township of the Silvanectes, which afterwards became Augustomagus. Christianity was introduced by St Rieul probably about the close of the 3rd century. During the first two dynasties of France Senlis was a royal residence and generally formed part of the royal domain; it obtained a communal charter in 11 73. In the middle ages local manufactures, especially that of cloth, were active. The burgesses took part in the Jacquerie of the 14th century, then sided with the Burgundians and the English; whom, however, they afterwards expelled. The Leaguers were there beaten in 1589 by Henry I., duke of Longueville, and Francois de La Noue. The bishopric was suppressed at the Revolution, and this suppression was confirmed by the Concordat. Treaties between Louis XL and Francis II., duke of Brittany (1475), and between Charles VIII. and Maximilian of Austria (1493) were signed at Senlis.

SENNA (Arab, sand), a popular purgative, consisting of the leaves of two species of Cassia (natural order Leguminosae), viz. C. acutijolia and C. anguslifolia. These are small shrubs about 2 ft. high, with numerous lanceolate or narrowly lanceolate leaflets arranged pinnately <5n a main stalk with no terminal leaflet; the yellow

flowers are borne in long-stalked racemes in the leaf-axils, and are succeeded by broad flattish pods about 2 in. long. C. acutijolia is a native of many districts of Nubia, e.g. Dongola, Berber, Kordofan and Senaar, but is grown also in Timbuctoo and Sokoto. The leaflets are collected twice a year by the natives, the principal crop being gathered in September after the rainy season and a smaller quantity in April. The leaves are dried in the simplest manner by cutting down the shrubs and exposing them on the rocks to the burning sun until quite dry. The leaflets then readily fall off and are packed in large bags made of palm leaves, and holding about a quintal each. These packages are conveyed by camels to Assouan and Darao and thence to Cairo and Alexandria, or by ship by way of Massowah and Suakim. The leaflets form the Alexandrian senna of commerce. Formerly this variety of senna was much adulterated with the leaves of Solenostemma Argel, which, however, are readily distinguishable

by their minutely wrinkled surface. Of late years Alexandrian senna has been shipped of much better quality. Occasionally a few leaves of a similar species with broader obovate leaves, C. obovata, may be found mixed with it. C. angustifolia affords the Bombay, East Indian, Arabian or Mecca senna of commerce. This plant grows wild in the neighbourhood of Yemen and Hadramaut in the south of Arabia, in Somaliland, and in Sind and the Punjab in India. The leaves are chiefly shipped from Mocha, Aden, Jeddah and other Red Sea ports to Bombay and thence to Europe, the average imports into Bombay amount- ing to about 250 tons annually, of which one-half is re-exported. Bombay senna is very inferior in appearance to the Alexandrian, as it frequently contains many brown and decayed leaflets and is mixed with leaf-stalks, &c. C. angustifoha is also cultivated in the extreme south of India, and there affords larger leaves, which are known in commerce as Tinnevelly senna. This variety is carefully collected, and consists almost exclusively of leaves of a fine green colour, without any admixture of stalks. It is exported from Tuticorin. American senna is Cassia marilandica.

The British Pharmacopoeia recognizes both Senna Alexandrina and Senna Indica. The composition of the leaves is the same in either case. The chief ingredient is cathartic acid, a sulphur containing glucoside of complex formula. It occurs combined with calcium and magnesium to form soluble salts. That this is the active principle of senna is shown by the fact that the cathartate of ammonia, when given separately, acts in precisely the same manner as senna itself. Cathartic acid can easily be decomposed into glucose and cathartogenic acid. The leaves contain at least two other glucosides, sennapicrin and sennacrol, but as these are insoluble in water, they

are not contained in most of the preparations of senna. Senna also contains a little chrysophanic acid.

Of the numerous pharmacopoeial preparations three must be mentioned. The confectio sennae, an admirable laxative for children, contains senna, coriander fruit, figs, tamarind, cassia, pulp, prunes, extract of liquorice, sugar and water. When coated with chocolate it is known as Tamar Indien. The pulvis glycerhizae compositus contains two parts of senna in twelve- the other ingredients being unimportant. A third preparation, rarely employed nowadays, is the nauseous " black draught," once in high favour. It is known as the mistura sennae composita, and contains sulphate of magnesium, liquorice, cardamoms, aromatic spirit of ammonia and infusion of senna. All the preparations are made indifferently from either kind of leaflet.

When taken internally, senna stimulates the muscular coat of the bowel in its entire length, the colon being more particularly affected. As some congestion of the rectum is thereby produced, senna is contra-indicated whenever haemorrhoids are present. The secretions of the bowel are not markedly stimulated, and the flow of bile is only slightly accelerated. The drug has the advantage, for most cases, of not producing subsequent constipation. The chief purgative ingredients are the cathartates already described. Partial absorption occurs, so that the colour of the urine may be darkened, and as the drug is also excreted by the active mamma it may cause purgation in a baby to whose mother it has been given.

Senna should not be used alone, as its taste and the pain induced by its muscular stimulation are both objectionable. There are many ways of using it. A few of the leaflets may be put into a dish of prune's, when a convenient aperient for children is desired. It is especially valuable in cases of atony of the colon, and the com- pound liquorice powder is safe and useful in the treatment of the constipation of pregnancy.

SENNACHERIB (Ass. Sin-akhi-erba, "the Moon-god has increased the brethren "), the son and successor of Sargon, mounted the throne on the 12th of Ab 705 B.C. His first cam- paign was against Babylonia, where Merodach-baladan had reappeared. The Chaldaean usurper was compelled to fly, and Bel-ibni was appointed king of Babylon in his place. Then Sennacherib marched against the Kassi in the northern moun- tains of Elam and ravaged the kingdom of Ellip where Ecbatana afterwards stood. In 701 B.C. came a great campaign in the west, which had revolted from Assyrian rule. Sidon

and other Phoenician cities were captured, but Tyre held out, while its king Lulia (Elulaeus) fled to Cyprus. Ashdod, Ammon, Moab and Edom now submitted, but Hezekiah of Judah with the dependent Philistine princes of Ashkelon and Ekron defied the Assyrian

army, trusting to the fortifications of Jerusalem and Egyptian help. Hezekiah, however, was forced to restore the anti-Jewish Padi to the government of Ekron, from which he had been re- moved by the Jewish party, and, after the defeat of his Egyptian allies at Eltekeh, to see his country wasted with fire and sword, forty-six fortresses being taken and 200,150 persons carried into captivity. He then endeavoured to buy off the invaders by numerous presents — 30 talents of gold, 800 talents of silver, precious stones, couches and thrones inlaid with ivory, girls and eunuchs — but all in vain. Jerusalem was saved eventually by a plague, which decimated the Assyrian army and obliged Senna- cherib to return to Nineveh. The following year he was again in Babylonia, where he made his son Assur-nadin-sum king in place of Bel-ibni and drove Merodach-baladan out of the marshes in which he had taken refuge. A few years later he had a fleet of ships built near Birejik on the Euphrates by his Phoenician captives; these were manned by Ionians and transported from Opis overland to the Euphrates and so to the Persian Gulf. Then they sailed to the coast of Elam, and there destroyed the colony of Merodach-baladan's followers at Nagitu. In return for this unprovoked invasion of Elamite territory the Elamites descended upon Babylonia, carried away Assur-nadin- sum (694 b.c.) and made Nergal-yusezib king. Three years later a great battle was fought at Khalule on the Tigris between the Assyrians on the one side and the Elamites and Babylonians on the other. Both sides claimed the victory, but the advantage remained with Sennacherib, and in 689 B.C. he captured Babylon and razed it to the ground, a deed which excited the horror of all western Asia. Some time previously — the date is not known — he had overrun the mountain districts of Cilicia. On the 20th of Tebet 681 B.C. he was murdered by his two sons, who fled to Armenia after holding Nineveh for forty-two days. Sennacherib was vainglorious and a bad administrator; he built the palace of Kuyunjik at Nineveh, 1 500 ft. long by 700 ft. broad, as well as the great wall of the city, 8 m. in circumference.

See George Smith, History of Sennacherib (1878). (A. H. S.)

SENNAR, a country of north-east Africa, part of the Anglo- Egyptian Sudan. Its boundaries have varied considerably, but Sennar proper is the triangular-shaped territory between the White and Blue Niles north of 10° N. This region is called by the Arabs " The Island of Sennar " and by the negro inhabitants " Hui." The northern part, where the two Niles approach nearer one another, is also known as El Gezira, i.e. " the Island." Whilst Sennar has never been held to extend westward of the White Nile, the term has often been used to embrace " the Island of Meroe," i.e. the country between the Blue Nile and the Atbara, and the land between the Blue Nile and its most eastern tributary the Rahad, this latter district being known as the " Isle of Isles." South-east Sennar stretches to the Abys- sinian hills. By the Sudan administration this region has been divided into mudirias (provinces), one, including the central portion, retaining the name of Sennar. The present article deals with the country as a whole.

In general Sennar is a vast plain, lying for the most part much higher than the river-levels and about 2000 ft. above the sea, its western part, towards the White Nile, being largely wilderness. From the plain rise isolated granitic hills, attaining heights of 1000 to 2000 ft. above the general level. Jebel Segadi is red granite of the finest quality. The plain, sandy in its northern part, is in the south a deep bed of argillaceous marl, scattered over with great granite boulders and fragments of greenstone.

Sennar lies in the region of light rain, increasing in the S.E. districts to as much as 20 in. in the year. The rainy season is from July to September.ˆ The climate is generally unhealthy during that period and the months following. The miasmatic exhalations caused by the sun playing on stagnant waters after the floods give rise to the " Sennar fever," which drives even the natives from the plains to the southern uplands. The temperature, which rises at times to over 120° Fahr., is also very changeable, often sinking from ioo" during the day to under 60° at night.

The soil, mainly alluvial, is naturally very fertile, and wherever cultivated yields abundant crops, durra being the principal grain grown. Many kinds of vegetables, and cotton, wheat and barley are also grown. The forest vegetation, largely confined to the " Isle of Isles " and the southern uplands, includes the Adansonia (baobab), which in the Fazogli district attains gigantic proportions, the tamarind, of which bread is made, the deleb palm, several valuable

gum trees (whence the term Sennari often applied in Egypt to gum-arabic), some dyewoods, ebony, ironwood and many varieties of

acacia. In these forests are found the two-horned rhinoceros, the elephant, lion, panther, numerous apes and antelopes, while the crocodile and hippopotamus frequent the rivers. The chief domestic animals are the camel, horse, ass, ox, buffalo (used both as a beast of burden and for riding), sheep with a short silky fleece, the goat and the pig, which last here reaches its southernmost limit.

The country is occupied by a partly settled, partly nomad population of an extremely mixed negroid character. There is evidence of the existence of a once dominant fair race, of which the still surviving Sienetjo, a people of a yellow or fair complexion, are regarded as descendants. The great plain of Sennar is mainly occupied by Hassania Arabs in the north, by Abu-Rof (Rufaya) Hamites of Beja stock in the east as far as Fazogli, and elsewhere by the negroid Funj (q.v.) and the group of tribes collectively known as Shangalla (the Bertat, Legas, Sienetjo, Gumus, Kadalos, &c. ; see Shangalla). The chief towns are on the banks of the Blue Nile. They are: Wad Medani (q.v.), 148 m. above Khartum, one of the most thriving towns in the eastern Sudan; Sennar, 241 m above Khartum, the capital of the Funj empire and chief town of the mudiria of Sennar — of the ancient city little remains except a mosque with a high minaret ; and Roseires, 426 m. from Khartum and the limit of naviga- tion up stream from that city. Near the Abyssinian frontier are Fazogli (left bank) and Famaka (right bank) on a navigable stretch of the Blue Nile above the rapids at Roseires and close to the Tumat confluence and the, gold district of Beni Shangul. On the river Dinder is the town of Singa. A railway, built in 1909-1910, connects Khartum, Wad Medani and Sennar with Kordofan, the White Nile being bridged near Goz Abu Guma.

History. — Sennar, lying between Nubia and Abyssinia, was in ancient times under Egyptian or Ethiopian influence and its inhabitants appear to have embraced Christianity at an early period. The capital of Aloa, which appears to have been at one time a powerful Christian state, was at Soba on the Blue Nile. In the 7th or 8th centuries a.d. there was a considerable emigra- tion of Arabs into the country. Christianity very gradually died out (see Dongala, mudiria). The Funj who had meantime settled in Sennar became the dominant race by the 15th century. They adopted the Mahommedan religion and founded an empire which in the 17th and 18th centuries ruled over a large part of the eastern Sudan. This empire was finally overthrown by the Egyptians in 182 1. Since that period Sennar has had no history distinct from that of the rest of the Anglo-Egyptian Sudan (see Sudan, § Anglo-Egyptian, History). The chief ambition of the people under Anglo-Egyptian rule was to own cattle rather than

*to improve their houses, food or clothing (vide Egypt, No. 1, 1910, p. 7*9).*

The country was visited by few Europeans before the time of the Egyptian conquest. In 1699 a French surgeon, J. C. Poncet, passed through Sennar on his way from Egypt to Abyssinia, and an account of his experiences has been published (Lettres . . . des missions Urangeres, Paris, ed. of 1870, tome iii.) . He was followed by Janus de Noir, le sieur du Roule, who was sent by Louis XIV. to open diplomatic relations with Abyssinia, but was murdered (1703) in Sennar. The most noteworthy, however, of the earlier travellers was James Bruce, the explorer of the Blue Nile. He spent some time in Sennar in 1772, and in his Travels has left an interesting account of the kingdom in its decadence. Various Egyptian expeditions added considerably to the knowledge of the district, which between 1854 and 1864 was explored by the Belgian scientist E. Pruyssenaere. Later explorers included the Viennese Ernst Marno (1870) and the Dutchman J. M. Schuver, who in 1881-1882 visited the sources of the Tumat. To this list should be added the names of those who, like Sir Samuel Baker, explored the Blue Nile. Since the establishment of the Anglo- Egyptian condominium (1899) the country has been thoroughly surveyed.

Lists of the kings of Sennar, and of the tributary rulers of Halfaya, Shendi, and Fazokl are given in vol. i. pp. 437-438 of A. M. N. J. Stokvis' Manuel d'histoire (Leiden, 1888).

SENONES, in ancient geography, a Celtic people of Gallia Celtica, who in Caesar's time inhabited the district which now includes the departments of Seine-et-Marne, Loiret and Yonne. From 53-51 B.C. they were engaged in hostilities with Caesar, brought about by their expulsion of Cavarinus, whom he had appointed their king. In the last-named year a Senonian named Drappes threatened the Provincia, but was captured and starved

himself to death. From this time the Gallic Senones disappear from history. In later times they were included in Gallia Lugdunensis. Their chief towns were Agedincum (later Senones, whence Sens), Metiosedum (Melun; according to A. Holder, Meudon), and Vellaunodunum (site uncertain).

See Caesar, Bell. Gall. v. 54, vii. 75, viii. 30, 44; T. R. Holmes, Caesar's Conquest of Gaul (1899), pp. 482-483, 755-766, 819; A. Holder, Allceltischer Sprachschatz, ii. (1904).

More important historically was a branch of the above (called Xivdives, Senones, by Polybius), who about 400 b.c. made their way over the Alps and, having driven out the Umbrians, settled on the east coast of Italy from Ariminum to Ancona, in the so-called ager Gallicus, and founded the town of Sena Gallica (Sinlgaglia), which became their capital. In 391 they invaded Etruria and besieged Clusium. The Clusines appealed to Rome, whose intervention, accompanied by a violation of the law of nations, led to war, the defeat of the Romans at the Allia (18th of July 390) and the capture of Rome. For more than 100 years the Senones were engaged in hostilities with the Romans, until they were finally subdued (283) by P. Cornelius Dolabella and driven out of their territory. Nothing more is heard of them in Italy. It is probable that they formed part of the bands of Gauls who spread themselves over the countries by the Danube, Macedonia and Asia Minor. A Roman colony was established at Sena, called Sena Gallica to distinguish it from Sena Julia (Siena) in Etruria.

For ancient authorities see A. Holder as above; on the subjugation of the Senones by the Romans, Mommsen, Hist, of Rome (Eng. trans.), bk. ii. ch. vii.

SENS, a town of north-central France, capital of an arrondisse- ment in the department of Yonne, 71 m. S.E. of Paris on the Paris-Lyon-Mediterranee railway. Pop. (1906) 13,701. It is situated on the right bank of, and on an island in, the Yonne just below its confluence with the Vanne. The streets of the town are narrow, but it is surrounded by fine promenades. The cathedral of St Etienne, one of the earliest Gothic buildings in France, is additionally interesting because the architecture of its choir influenced through the architect, William of Sens, that of the choir of Canterbury cathedral. St Etienne was begun in 1 140 and only completed early in the 16th century. It belongs mainly to the 12th century, and it is characterized by solidity rather than by beauty of proportion or richness of ornamentation. The west front is pierced by three portals; that in the middle has good sculptures, representing the parable of the virgins and the story of St Stephen. The right-hand portal contains twenty-two remarkable statuettes of the prophets, which have suffered considerable injuries. Above this portal rises the stone tower, decorated with armorial bearings and with statues repre- senting the principal benefactors of the church. The bells in the

campanile by which the tower is surmounted enjoyed immense reputation in the middle ages; the two which still remain, La Savinienne and La Potentienne, weigh respectively 15 tons 7 cwt. and 13 tons 13 cwt. The left portal is adorned with two bas-reliefs, Liberality and Avarice, as well as with the story of John the Baptist. The portal on the north side of the cathedral is one of the finest examples of French 16th-century sculpture, that on the south side is surmounted by magnificent stained- glass windows. Other windows of the 12th to the 16th century are preserved, some of them representing the legend of St Thomas of Canterbury. Among the interior adornments are the tomb of the dauphin (son of Louis XV.) and his consort, Marie Josephe of Saxony, one of the works of William Coustou the younger, and bas-reliefs representing scenes from the life of Cardinal Duprat, chancellor of France and archbishop of Sens from 1525 to 1535. The mausoleum from which they came was destroyed at the Revolution. The treasury, one of the richest in antiquities in France, contains a fragment of the true cross presented by Charlemagne, and the vestments of St Thomas of Canterbury. It was in the cathedral of Sens that St Louis, in 1234, married Marguerite of Provence, and five years later deposited the crown of thorns. To the south of the cathedral are the official buildings, dating from the 13th century, but restored by Viollet-le-Duc. The old judgment-hall and the dungeons had remained intact;

in the former is a collection of fragments of sculpture from the cathedral ; on the first story is the synod hall, vaulted with stone and lighted by beautiful grisaille windows. A Renaissance structure connects the buildings with the archiepiscopal palace, which also dates from that period. The oldest of the other churches of Sens is St Savinian, the foundation of which dates from the 3rd century; the crypt and other portions of the church are of Romanesque architecture. The museum of Sens contains, among other antiquities, some precious MSS., notably a famous missal with ivory covers, and a collection of sculptured stones mainly derived from the old Roman fortifications, which were themselves constructed from the ruins of public monuments at the beginning of the barbarian invasions. The town has statues of Baron J. J. Thenard, the famous chemist, and of the sculptor Jean Cousin. Sens is the seat of a sub-prefect, and includes among its public institutions a tribunal of first instance, a tri- bunal of commerce, a chamber of commerce, a council of trade arbitrators and a lycee for boys. Among the industries are flour-milling, tanning and the manufacture of agricultural implements, boots and shoes, chemicals and cutlery; there is trade in wine, grain, wood, coal and wool, in which the port on the Yonne has some share.

Sens, when the capital of the Senones, one of the most powerful peoples of Gaul, bore the name of Agedincum. It was not finally subdued by the Romans till after the defeat of Vercingetorix. On the division of Gaul into seventeen provinces under the emperor Valens, Agedincum became the metropolis of the 4th Lugdunensis. Theatres, circuses, amphitheatres, triumphal arches and aqueducts were all built in the town by the Romans. It was the meeting-point of six great highways. The inhabita nts, converted to Christianity by the martyrs Savinian and Potentian, held out against the Alamanni and the Franks in 356, against the Saracens in 731 or 738, and finally against the Normans in 886 — the last having besieged the town for six months. At the beginning of the feudal period Sens was governed by counts, who had become hereditary towards the middle of the 10th century; and the contests of these counts with the arch- bishops or with their feudal superiors often led to much blood- shed and disaster, until, in 1055, the countship was united to the royal domain. Several councils were held at Sens, notably that of 1 140, at which St Bernard and Abelard met. The burgesses in the middle of the 12th century formed themselves into a commune which carried on war against the clergy. This was suppressed by Louis VIIL, and restored by Philip Augustus. In the ardour of its Catholicism Sens massacred the Protestants in 1562, and it was one of the first towns to join the League. Henry IV. did not effect his entrance till 1594, and he then deprived the town of its privileges. In 1622 Paris, hitherto suffragan to Sens, was made an archbishopric, and the bishoprics of Chartres, Orleans and Meaux were transferred to the new jurisdiction. In 1 791 the archbishopric was reduced to a bishopric of the department of Yonne. Suppressed in 1801, the see was restored in 18 17 with the rank of archbishopric. The town was occupied by the Allies in 1814 and by the Germans in 1870-1871.

SENSATIONALISM, in psychology, the theory that all know- ledge comes from sensation (see Psychology). Thus Aristippus the Cyrenaic held that there could be no knowledge save that which the senses give, but the Stoics, while finding the origin of knowledge in the senses, do not restrict it to this. Sensationalism in modern times is chiefly associated with Hobbes, Locke, Hume and the French philosophers of the Enlightenment, Voltaire, Condillac and others. In its extreme sense it has rarely been held, and is practically abandoned by modern pMlosophers on the plain ground that a sensation as such lasts only as long as the stimulus is applied. Any connexion of sensation is some- thing over and above sensation, and without this connexion there can be no knowledge (see Empiricism, Phenomenon, &c). The term has also come into colloquial use for the practice of appealing — e.g. in art, literature and especially in

journalism — solely to the emotions, disregarding proportion and fact.

SENTENCE (Lat. sententia, a way of thinking, opinion, judg- ment,- vote, sentire, to feel, think), a word of which the principal

meanings now are: (a) in grammar, a thought expressed in words in complete grammatical form and composed of subject and predicate, and (6) in law, a judicial decision. In law, the term signifies either (1) a judgment of a court of criminal juris- diction imposing a punishment such as a fine or imprisonment, or (2) a decree of certain competent courts, as ecclesiastical and admiralty courts. In sense (1) a sentence may be either definite or final, i.e. one giving finality to the case, or interlocutory, determining some point in the progress of the case (see, however, Judgment). The sentences inflicted by the courts of various countries vary according to the gravity of the offence (see Criminal Law; also Capital Punishment; and, for the " indeterminate " sentence, Recidivism). Concurrent sentences are those which run from the same date in respect of convictions on various indictments. A cumulative sentence is the sum total of consecutive sentences passed in respect of each distinct offence of which an accused person has been found guilty on several counts of an indictment. A sentence, in the case of trials before a court of assize, commences to run from the first day of the sitting of the court, but in that of courts of quarter sessions from the time the sentence is pronounced.

SENTINEL, or Sentry, a guard or watch, a soldier posted at a particular spot to challenge all comers, passing those who give a countersign, and refusing those who do not, and giving alarm in case of attack. The etymology has been the subject of much controversy. The original word seems to be Ital. sentinella, adapted as Fr. sentinelle (the modern French military term is factionnaire, and the Ger. Fachmann). For the Italian word the source has been suggested in sentire, to perceive, but there are philological objections to this, and more plausibility attaches to a connexion with sentina, the bilge-water in a ship, figuratively rabble, camp-followers. If an Italian origin, as agreed on by most authorities, be set aside, the French word suggests a more appropriate formation as the diminutive of sentier, path, Lat. semita, meaning properly the sentry's beat. The O. Fr. senteret (a form of sentier) would account for the English form "

sentry." SENTINUM, an ancient town of Umbria, Italy, lying to the S. of the modern town of Sassoferrato, in the low ground. The foundations of the city walls are preserved, and a road and remains of houses have been discovered, including several mosaic pavements (T. Buccolini in Notizie degli scavi, 1890, 346) and inscriptions of the latter half of the 3rd century a.d., including three important tabulae patronatus. In the neighbourhood the battle took place in which the Romans defeated the combined forces of the Samnites and Gauls in 295 B.C. It was taken and destroyed in 41 B.C. by the troops of Octavian, but continued to exist under the Empire. It was, however, only a municipium, never (as some wrongly suppose) a colonia. Sassoferrato gave its name to Giambattista Salvi, surnamed Sassoferrato (1605- 1685), a painter celebrated for his Madonnas.

SENUSSI [Santjsi] and SENUSSITES, the names respectively of a Moslem family (and especially its chief member) and of the fraternity or sect recognizing the authority of the Senussi. Considerable diversity of opinion has prevailed among writers and travellers claiming knowledge of the Senussia; it is possible, however, to distinguish the main facts in the lives of the Senussi sheiks and to indicate the range of their direct political influence. The extent of their spiritual influence, the ramifications of the fraternity and the aims of its chiefs cannot be gauged so accurately.

Seyyid or Sidi (i.e. Lord) Mahommed ben Ali ben Es Senussi el Khettabi el Hassani el Idrissi el Mehajiri, the founder of the order, commonly called the Sheik es Senussi, was born near Mostaganem, Algeria, and was called es Senussi after a much venerated saint whose tomb is near Tlemcen. The date of his birth is given variously as 1791, 1792, 1796 and 1803. He was a member of the Walad Sidi Abdalla tribe of Arabs and his descent is traced from Fatima, the daughter of Mahomet. As a young man he spent several years at Fez, where he studied theology. When about thirty years old he left Morocco and travelled in the Saharan regions of Algeria preaching a reform of the faith. From Algeria he went to Tunisia and Tripoli, gaining

many adherents, and thence to Cairo, where he was opposed by

the Ulema of El Azhar, who considered him unorthodox. Leaving

Egypt Senussi went to Mecca, where he joined Mahommed b.

Idris el Fassi, the head of the Khadirites, a fraternity of Moroccan

origin. On the death of el Fassi Senussi became head of one of the two branches into which the Khadirites divided, and in 1835 he founded his first monastery at Abu Kobeis near Mecca. While in Arabia Senussi visited the Wahhabites, and his connexion with that body caused him to be looked upon with suspicion by the Ulema of Mecca. It was at Mecca, however, that Senussi gained his most powerful supporter, Mahommed Sherif , a prince of Wadai, who became in 1838 sultan of his ·”““ff • 1 fiTi«- iii.i ” oa of the native state, the most powerful Manommedan kingdom on f er . in the Central Sudan. Finding the opposition to him at Mecca too powerful Senussi quitted that city in 1843 and settled in the Cyrenaica, where in the mountains near Derna he built the Zawia Baida or White Monastery. There he was in close touch with all the Maghribin, gaining many followers among the Tripolitans and Moroccans. He also maintained a close correspondence with the sultan of Wadai, who greatly favoured the spread of the Senussia in his state. The sultan of Turkey viewed with some disfavour the growth of Senussi's influence as likely to become detrimental to his own position as the Khalifa of Islam. Probably with the desire to be independent of pressure from the Turks, Senussi removed in 1855 to Jarabub (Jaghbub), a small oasis some 30 m. N.W. of Siwa. Here he died in 1859 or i860, leaving two sons, one Mahommed Sherif (named after the sultan of Wadai), born in 1844, and the other,

El Mahdi, born in 1845. To the second son was left the succession. It is related that as the younger son showed a spirit in all things superior to that of his brother the father decided to put them to the test. Before the whole zawia at Jarabub he bade both sons climb a tall palm tree and then adjured them by Allah and His Prophet to leap to the ground. The younger lad leapt at once and reached the ground unharmed; the elder boy refused to spring. To El Mahdi, " who feared not to commit himself to the will of God," passed the birthright of Mahommed Sherif. Mahommed appears to have accepted the situation without complaint. He held the chief administrative position in the fraternity under his brother until his death in 1895.

Senussi el Mahdi, only fourteen when his father died, was at first under the guidance of his father's friends Amran, Reefi and others. He enjoyed all his father's reputation

Senussi el Mahdi.

for holiness and wisdom, attributes consistent with all that is known of his life. Mahommed Sherif, the sultan of Wadai, had died in 1858, but his successors the Sultan Ali (who reigned until 1874) and the Sultan Yusef (reigned from 1874 to 1898) were equally devoted to the Senussia. Under the Senussi el Mahdi the zawias of the order extended from Fez to Damascus, to Constantinople and to India. In the Hejaz members of the order were numerous. In most of these countries the Senussites occupied a position in no respect more powerful than that of numbers of other Moslem fraternities. In the eastern Sahara and in the central Sudan the position was different. From the western borders of Egypt south to Darfur, Wadai and Bornu,- east to Bilma and Murzuk, and north to the coast lands of Tripoli, Senussi became the most powerful sheik, acquiring the authority of a territorial sovereign. The string of oases leading from Siwa to Wadai — Kufra, Borku, &c— were occupied and cultivated

by the Senussites, trade with Tripoli and Benghazi was encouraged, law and order were maintained among the savage Bedouin of the desert. But the eastern Sahara, though vast (covering approximately about 500,000 sq. m.), is among the most desolate and thinly populated parts of the world, and of more importance to the order was the dominating influence possessed by the sheik at the court of Wadai.

Although named El Mahdi by his father there is no evidence to show that the younger Senussi ever claimed to be the Mahdi, though so regarded by some of his followers. When, however, Mahommed Ahmed, the Dongalese, rose against the Egyptians in the eastern Sudan and proclaimed himself the Mahdi, Senussi was disquieted. He sent an emissary via Wadai to Mahommed

Ahmed, this delegate reaching tne Mahdi's camp in 1883 soon after the sack of El Obeid.

" The moral and industrial training of the Senussi " [delegate], writes Sir Reginald Wingate, " revolted from the slaughter and rapine he saw around him. The sincere conviction of the regenera- tion of the world by a mahdi whose earnest piety should influence others to lead wholesome and temperate lives, the dignity of honest labour and self-restraint, these were the sentiments which filled the mind of the emissary from Wadai."

The sheik Senussi, there is reason to believe, shared the lofty views which Wingate attributes to his agent. He decided to have nothing to do with the Sudanese Mahdi, though Mahommed Ahmed wrote twice asking him to become one of his four great khalifs. In his second letter, the text of which has been preserved, the Mahdi urged Senussi either to attack Egypt or to join him in the Sudan. To neither letter did Senussi reply, and he warned the people of Wadai, Bornu and neighbouring states against the new creed. In 1890 the Mahdists advancing from Darfur were stopped on the frontier of Wadai, the sultan Yusef being firm in his adherence to the Senussi teaching. As evidence of the influence of the sheik may be instanced the appeal made to him in 1888 by the sultan of Borku (orBorgo), a state to the north of Wadai, when invited by the chiefs of Darfur to rise against the khalifa Abdullah. Senussi advised Borku to abstain from Sudan affairs and only to fight against the Mahdists should they attack his

kingdom. The Darfurian revolt of 1888-1889 against the khalifa was nevertheless carried out in the name of the Senussi.

*The growing fame of the sheik Senussi el Mahdi drew upon him the unwelcome attention of the Turks. In many parts of Tripoli and in Benghazi the power of the sheik was greater than that of the Ottoman governors, and though Abdul Hamid II. looked favourably on an organization which might become actively anti-Christian, he did not desire that a new mahdi should arise to dispute his authority. In 1889 the sheik Senussi was visited at Jarabub by the pasha of Benghazi at the head of some troops. This event showed the sheik the possibility of danger and led him (in 1894) to leave Jarabub and fix his headquarters at Jof in the oases of Kufra, a place sufficiently remote to secure him from any chance of sudden attack. By this time a new danger to Senussia had arisen; the French were advancing from the Congo towards the western and southern borders of Wadai. In 1898 Senussi, in his character of peace- maker, wishing also to range together all the states menaced by the French advance, sought to reconcile Rabah Zobeir (q.v.) and the sultan of Bagirmi; neither of those chieftains belonged to the Senussi order and the sheik's appeal was unavailing. At the end of the previous year, at the request of Sultan Yusef, the sheik had sent an envoy to Wadai to be his permanent representative in that country. Yusef's successor Ibrahim, who ascended the throne of Wadai in 1898, showed signs of resenting the advice of the sheik, stirred perhaps by the over- throw of the khalifa Abdullah at Omdurman. Senussi retaliated, says Captain Julien in his history of Wadai, by prohibiting the people of Wadai from smoking tobacco or drinking merissa, the native beer, " which is to the Wadaiin what the skin is to the body." Sultan Ibrahim rejoined that his people would fight and die for merissa; rather than give it up they would renounce Senussiism. The sheik had the wisdom to give way, declaring that in response to his prayers Allah had deigned to make an exception in favour of the faithful Wadaiins. Ibrahim died in 1900 and his successors fell again under the influence of the sheik, who again changed his headquarters, leaving Kufra for Geru, in Dar Gorane, a western province of Wadai, where he was welcomed with- veneration. He built and strongly fortified a zawia on the top of a rocky hill, difficult of access. His object in taking up this position was, presumably, to prevent with the * ne advance of the French. But, as Julien points out, French. Senussi was too late; Rabah had been slain by the French (April 1900), and Bagirmi was occupied by them. Nevertheless the sheik made an effort to prevent the French obtaining possession of Kanem, a country north-east of Lake Chad and on its northern and eastern frontiers*

bordering

Saharan territory, which the Senussites considered their particular preserve. A zawia was built at Bir Allali, in Kanem, that site being chosen as it was an entrepot for the trade of Tripoli with all the Chad countries. Bir Allali was strongly garrisoned by the Senussites and war with the French followed. 1 After a severe engagement Bir Allali was captured by a French column under Commandant Tetard in January 1902. The sheik Senussi, much affected by the loss of Kanem, died shortly afterwards (May 30, 1902). He was succeeded by his nephew Ahmed-el- Sherif, who in view of the presence of the French on the borders of Dar Gorane removed to Kufra.

The new head of the Senussites maintained the friendly rela- tions of his predecessors with Wadai, and, following the example of his uncle, made advances to Ali Dinar, the sultan of Darfur, which were not reciprocated. To keep in touch with Darfur a zawia had been built on the caravan route from Kufra to that country. The adherents of the Senussi el Mahdi in the deserts bordering Egypt maintained for years that he was not dead, and in March 1906 a public declaration was made at Siwa that • " Sidi Mahommed-el-Mahdi had returned from his secret journey to Kufra." Commenting on this announcement Sir R. Wingate wrote: "It is well known that the body of the late sheik lies in a tent at Zawia-el-Taj in the identical shrine which was made for it at Geru when he died " (Egypt No. 1 (1907), p. 120).

It will be seen that the Senussites occupy desert fastnesses which could only be attacked by Europeans after overcoming great difficulties. By Henri Duveyrier and other writers of the last half of the 19th century they were regarded as likely to pro- claim a jihad or holy war against the Christians of North Africa. This view was founded upon the supposed tenets of the order and upon geographical and political considerations. The record of the first and second Senussi sheiks shows them, however, to have acted chiefly on the defensive. A study of all available data up to 1906 led M L. G. Binger, one of the greatest authorities, to the conclusion that the politics of the sect were subordinated to the material interests of their chief, and that the Senussi sheik was as unable as were other noted Moslem leaders (such as Abd el Kader in Algeria; Samory in the western Sudan and the Dongolese Mahdi in the Egyptian Sudan) to overcome the rivalries and divergence of interests of their own co-religionists. This view received confirmation in the events of 1906-1910 when the French came in conflict with the sultanate of Wadai. Although there was severe fighting the French found less

difficulty than had been expected in seizing the capital of Wadai, nor was there any general movement of the Senussites against them. The French also sent flying columns into Borku and Enndi. The comparative ease with which these operations were carried out seemed to demonstrate the weakness of the Senussites (see Wadai). Nevertheless, like any other Moslem fraternity, and perhaps more readily, the Senussites might be speedily transformed into a powerful fighting organization. Through the seaports of Tripoli and Benghazi, with the connivance (or in defiance) of the Turks, the importation of arms and ammunition into the eastern Sahara is a matter of little or no difficulty, and the Bedouin of that region could furnish a numerous and well-armed fighting force. A Senussi sheik would also recruit many followers in the central Sudan. At the same time the Senussi organization is not so widespread The power in the Sudan and the western Sahara as would appear of the from the exaggerated reports once current. The S " IUS " Senussi sheiks, with the doubtful exception of Darfur, are without followers in the Anglo-Egyptian Sudan. Bagirmi, Kanem and other states once dependent on Wadai did not embrace Senussiism. In the Hausa States and in the greater part of the western Sudan as far as Timbuktu the Moslems acknowledge the spiritual headship of the emir of Sokoto,

1 In the accounts of the fighting in French equatorial Africa at this period it is necessary to distinguish between the sheik Senussi el Mahdi and the sultan Mahommed el Senussi (b. c. 1850) of N'Dele\ a prince who had married the sister of Rabah Zobeir. Senussi ot N'Dele became an ally of the French. The state of N'Del6 lies S. of Wadai and is cut by 9 N., and 20 E. (See Karl Kumm in Geog. Jour., Aug. IQIO.l

whose influence is believed to be sufficiently strong to prevent the spread of Senussiism among his followers. The general attitude of the Mahommedans in the western Sudan towards the Senussi emissaries was described by European observers in 1907 as one of good-natured tolerance. They are occasionally allowed to preach, but apparently with little effect. In Bornu, which does not acknowledge the spiritual supremacy of Sokoto, the Senussi propaganda meets with less opposition, but the adherents of the order are not numerous. Here and there in the western Sahara are tribes professing Senussiism, but they are regarded as unimportant.

It should, however, be remembered that while other dervish fraternities are mystical and latitudinarian in theology, and Tenets. on 'y sporadically meddle in politics, the Senussites have exercised a continuous political influence and have sought to revive the faith and usages of the early days of Islam. The order is in a sense an outcome of the Wahhabite movement, but, as gathered from the writings of Mahommed el Hechaish, a Tunisian sheik, and other trustworthy sources, appears to be neither mystical nor puritan. There is less of secrecy about their rites than is usual in Moslem fraternities. The use of tobacco and coffee is forbidden, but the drinking of tea is encouraged, and the wearing of fine clothes is allowed. While they profess to belong to the Malikite rite (one of the four orthodox sects of Islam), the Senussites are charged by the Ulema of Cairo with many deviations from the true faith; chiefly they are accused of interpreting the Koran and Sunna without consulting one of the recognized glosses. Thus the Egyptian theologians regard the Senussites as inaugurating a new rite rather than forming a simple fraternity; in this, if not in puritanism, resembling the Wahhabites. Their great work in the eastern Sahara, apart from proselytism, has been colonization and the encouragement of trade. Wells have been dug and oases cultivated, rest houses built along caravan routes, merchants from Tripoli, Bornu, Wadai and Darfur welcomed. Such at least is the report of Mahommedan writers and of French and British political agents; very few Europeans have had opportunities of making personal observations. Gustav Nachtigal was in Wadai in 1873, Gerhard Rholfs traversed the Cyrenaica and visited Kufra in 1879; but in general the Senussi, supported by the Turks at Tripoli, have closed the regions under their control to Europeans. At the oasis of Siwa (Jupiter Ammon) , however, they are in contact with the Egyptian administration. Siwa was visited by Silva White in 1898 and by Freiherr von Griinau in 1899. The last-named reports that he found the representative of Sheik Senussi living in perfect agreement with the Egyptian authorities, the inhabitants of the oasis being divided into two sections, known respectively as the Mussulmans and the Senussites, a distinction which goes to show the special position occupied by the Senussites in Islam.

The missionary zeal of the Senussites is undoubted. Outside the regions adjacent to their headquarters they appear to be most strongly represented in Arabia. In the eastern Sahara and Wadai practically all the population are Senussites; the order in other countries draws its adherents from a higher social rank than the generality of Moslem secret societies. Its chief agents are personages of wealth and importance and highly educated in Oriental lore. They

are in general on good terms with the rulers of the countries in which they live, as instanced in 1902 by the conferment of the Legion of Honour on the head of the zawia at Hillil in Algeria. These agents make regular tours to the various zawias placed under their charge, and expound the Senussi doctrines at the Moslem universities. From all that has been said it is apparent that the Senussi sheik controls a very powerful organization, an organization probably unique in the Moslem world.

Bibliography. — L. Rinn, Marabouts et Khotian, a good historical account up to the year 1884; O. Depont and X. Coppolani, Les Confreries religieuses musulmanes (Algiers, 1897), an authoritative work; Si Mohammed el Hechaish, " Chez les Senoussia et les Toua- reg," in L'Expansion col. francaise for 1900 and the Revue de Paris for 1901. These are translations from the Arabic of an educated Mahommedan who visited the chief Senussite centres. An obituary

notice of Senussi el Mahdi by the same writer appeared in the Arab journal El Hadira of Tunis, Sept. 2, 1902; a condensation of this article appears in the Bull, du Com. de I'Afr. francaise for 1902 ; " Les Senoussia," an anonymous contribution to the April supple- ment of the same volume, is a judicious summary of events, a short bibliography being added; Capt. Julien, in " Le Dar Ouadai " published in the same Bulletin (vol. for 1904), traces the connexion between Wadai and the Senussi; L. G. Binger, in " Le Peril de l'lslam " in the 1906 volume of the Bulletin, discusses the position and prospects of the Senussite and other Islamic sects in North Africa. Von Grunau, in Verhandl. ges.f. Erdk. for 1899, gives an account of his visit to Siwa. Sir F. R. Wingate, in Mahdiism and the Egyptian Sudan (London, 1891), narrates the efforts made by the Mahdi Mahommed Ahmed to obtain the support of the Senussi; Sir W. Wallace, in his report to the Colonial Office on Northern Nigeria for 1906-1907, deals with Senussiism in that country. Consult also H. Duveyrier, La Confrerie musulmane de Sidi Mohammed ben Ali es Senoussi (Paris, 1884), a book containing much exaggera- tion, and A. Silva White, From Sphinx to Oracle (London, 1898), which, while repeating the extreme views of Duveyrier, contains useful information.

The present writer, in endeavouring to arrive at a just con- clusion on an obscure and much controverted subject, is indebted, in addition to the above, to the article by D. A. Cameron in the 10th ed. of this encyclopaedia, and to communications from Prof. D. B. Macdonald. (F. R. C.)

SEONI, a town and district of British India, in the Jubbulpore division of the Central Provinces. The town is 2043 ft. above sea-level, half-way on the Toad between Nagpur and Jubbulpore. Pop. (1901) 11,864. It was founded in 1774, and contains large public gardens, a fine market place and a handsome tank.

The District of Seoni forms part of the Satpura tableland, containing the headwaters of the Wainganga. It is largely covered with forest, and 40% of the inhabitants belong to aboriginal tribes. Area 3206 sq. m. The district is remarkable for the beauty of its scenery and the fertility of its valleys. The northern and western portions include the plateaus of Lakhnadon and Seoni; the eastern section consists of the watershed and elevated basin of the Wainganga; and in the south-west is a narrow strip of rocky land known as Dongartal. The plateaus of Seoni and Lakhnadon vary in height from 1800 to 2000 ft.; they are well cultivated and clear of jungle, and their temperature is always moderate and healthy. Geolcgically the north part of Seoni consists of trap hills and the south of crystalline rock. The soil of the plateaus is the rich black cotton soil formed by distintegrated trap, of which about two-thirds of the district are said to consist; but towards the south, where cliffs of gneiss and other primitive formations occur, the soil is silicious and contains a large proportion of clay. The chief river is the Wainganga, with its affluents the Hiri, Sagar, Theli, Bijna and Than war; other streams are the Timar and the Sher, tributaries of the Nerbudda. The annual rainfall averages 53 in. The population in 1901 was 327,709, showing a decrease of 12% in the decade due to the effects of famine. The principal crops are wheat, millets, rice, pulse, oil-seeds and cotton. Three lines of the Bengal-Nagpur system traverse the district.

There is also a town called Seoni, or Seoni-Malwa, in the Central Provinces, a railway station in Hoshangabad district. Pop. (1901) 7531.

See R. A. Sterndale, Seonee, or Camp Life on the Satpura Range (1877); Seoni District Gazetteer (Allahabad, 1907).

SEOUL (Han-yang), the capital of Korea (Chosen), situated in 37° 34′ N. and 127° 6′ E., at an altitude of 120 ft., 25 m. from Chemulpo, its seaport, and 4 from Mapu, its river-port. Pop. about 200,000. It lies in a basin among granite hills, nowhere exceeding 2627 ft., remarkable for their denudation and their abrupt black crags and pinnacles. A well-built, crenelated stone wall from 20 to 30 ft. high, about n m. in circuit, and pierced by 8 gateways with

double-roofed gate towers, surrounds it. The native houses are built of stone or mud, deeply eaved, and either tiled or thatched. Above these rise the towers of the Roman Catholic cathedral, the high curved roofs of the royal audience halls, the palace gateways, and the showy buildings of the Russian and French legations. The antiquities are the Bell Tower, with a huge bronze bell dated 1468, a marble pagoda elaborately carved, but not of Korean workmanship, seven centuries old, and a " Turtle-Stone " of about the same date.

Seoul has some wide streets of shops, hundreds of narrow alleys, and is very fairly clean. It has an electric tramway 4 m. long, and is the centre of the railway system of the country.

SEPIA (Gr. crrjiria, cuttlefish), a deep brown pigment obtained from the ink-sacs of various species of cuttlefish (q.v.). To obtain sepia, the ink-sac, immediately on the capture of the animal, is extracted from the body and speedily dried to prevent putrefaction. The contents are subsequently powdered, dissolved in caustic alkali, and precipitated from the solution by neutraliz- ing with acid. The precipitate after washing with water is ready to make up into any form required for use.

Sepia-bone or cuttle-bone consists of the internal " shell " or skeleton of Sepia officinalis and other allied species. It is an oblong convex structure from 4 to 10 in. in length and I to 3 in. in greatest width, consisting internally of a highly porous cellular mass of calcium carbonate with some animal matters covered by a hard thin glassy layer. It is used principally as a polishing material and for tooth powder, and also as a moulding material for fine castings in precious metals.

SEPOY, the usual English spelling of sipahi, the Persian and Urdu term for a soldier of any kind, cf. spahi. The word sipah, " army," from which sipahi, " soldier," is derived, corresponds to the Zend cpadha, Old Persian Qpada, and has also found a home in the Turkish, Kurdish and Pashto (Pushtu) languages (see Justi, Handbuch der Zendsprache, p. 303, 6), while its deriva- tive is used in all Indian vernaculars, including Tamil and Burmese, to denote a native soldier, in contradistinction to gora, " a fair-complexioned (European) soldier." A sepoy is at the present day strictly a private soldier in the native infantry of the Indian army.

SEPPINGS, SIR ROBERT (1767-1840), English naval architect, was born at Fakenham, Norfolk, in 1767, and in 1782 was apprenticed in Plymouth dockyard. In 1800, when he had risen to be master shipwright assistant in the yard, he invented a device which, as compared with the laborious process of lifting then in vogue, greatly reduced the time required for effecting repairs to the lower portions of ships in dry dock. His plan was to make the keel of the ship rest upon a series of supports placed on the floor of the docl» and each consisting of three parts — two being wedges arranged one on each side of the keel at right angles to it, with their thin ends together, while the third was a vertical wedge fitting in and supported by the lower pair. The result was that it became possible in a comparatively short time to remove these supporting structures by knocking out the side wedges, when the workmen gained free access to the whole of the keel, the vessel remaining suspended by the shores. For this invention Seppings received £1000 from the Admiralty, and in 1804 was promoted to be a master shipwright at Chatham. There, in spite of the repugnance to innovation displayed by the naval authorities of that period, he was able to introduce important improvements in the methods of ship-construction. In particular he increased the longitudinal strength of the vessels by a system of diagonal bracing, and modified the design of the bows and stern, so that they became stronger, not only offering better protection than the old forms to the crews against the enemy's fire, but also permitting a powerful armament to be fitted. Seppings, who received a knighthood in 1819, was ap- pointed surveyor of the navy in 1813, and held that office till his retirement in 1832. He died at Taunton on the 25th of September 1840.

SEPSIS (Gr.

Sapraemia (Gr. aairpos, rotten, al/xa, blood), or septic intoxi- cation, is the result of the absorption of a dose of the toxins produced by micro-organisms from some area of infection without the entrance of the micro-organisms themselves into the blood. This condition was for a long time confounded with septicaemia, but is distinguished from it in being a chemical intoxication. The blood in sapraemia if injected into an animal is incapable

of reproducing the disease as in septicaemia. Any condition in which there is a mass of decomposing tissue in the neighbour- hood of an unhealed wound may give rise to sapraemia. In surgical practice it may be met with in large, deep and badly- drained wounds where a quantity of putrifying material is pent up. When it arises in connexion with wounds accidentally received, it may be unavoidably

due to the dirty state of the skin or to foreign bodies entering the wound. Absorption of toxins is notably frequent in portions of decomposing placental tissue which may accidentally have remained behind in the uterus after childbirth, and may give rise to puerperal sapraemia. Sapraemia is acute or subacute directly according to the amount of toxin absorbed. By some writers it is divided as follows: (1) Hectic fever is a chronic blood poisoning with continual absorption of small doses of the toxins. This variety usually arises in long-continued suppuration of bones and joints, and in decomposition occurring in a pulmonary cavity. The marked symptom is a sharp rise of temperature in the evenings; the face becomes flushed and the pulse rapid. After profuse sweating the temperature drops. Diarrhoea and wasting are a usual accompaniment. (2) Septic traumatic fever is a slight form which may follow burns or compound fractures and which tends to subside in a few days. (3) In acute septic intoxication large amounts of the poison are absorbed. It generally starts with a severe rigor followed by a continuous high temperature, dry tongue, rapid pulse and severe headache, together with nausea and vomiting, and in the later stages diarrhoea. If the case be a severe one rapid prostration speedily comes on with low muttering delirium, the temperature may fall to subnormal, and a gradually deepening coma may end in death; other cases pass into a typically " typhoid state," death occurring from exhaustion at the end of about a week. (4) Amyloid (Gr. HfivKov, starch, eldos, form), or lardaceous disease, usually of the liver, spleen, kidneys or other organs, is one of the results of long-continued septic intoxication. A substance derived from the breaking down of pus and tissue cells is carried in the blood and deposited in the connective tissue of the coats of the smaller arteries, and the viscera become infiltrated with a material looking like lard. The liver and spleen, being the organs most usually affected, become immensely enlarged.

No form of septic infection yields so easily to treatment as sapraemia. The prompt removal of the cause of septic absorp- tion, the flushing out of the wound with weak antiseptic solutions, in order to mechanically remove any decomposing masses, and the establishment of proper drainage in deep wounds, is usually followed by a fall in temperature and an improvement in the general condition. A strong, preferably mercurial, purgative should be given to aid in the elimination of toxic material. For the same purpose the injection into the veins or into the cellular tissue of large quantities of normal saline solution is useful. Heart depression should be overcome by diffusible stimulants and hypodermic injections of

strychnine. When the wound has become " surgically clean " recovery is usually rapid.

Septicaemia is an acute infective disease differing from sapraemia in that the micro-organisms themselves are absorbed, entering the general circulation, and may on examination be found in greater or lesser number in the blood-stream itself. The organism or organisms grow and reproduce themselves in the blood or tissues. A number of different organisms have been isolated from the blood-stream in cases of septicaemia. The most frequently found is the Streptococcus pyogenes, which is present in 50% of the cases and is common in puerperal septicaemia and in ulcerative endocarditis. The Staphylococcus pyogenes aureus et albus is also a frequent cause, but sometimes septicaemia may be due to other pathogenic microbes such as the Pneumococcus, the Bacillus coli communis, Bacillus pyo-cyaneus. Bacillus oedematis maligni and the Gonococcus. The micro-organisms are conveyed by the blood-stream to different parts of the body, in which as in the original wound itself they both multiply and set up factories for the production of toxins. The disease commonly follows blows or wounds which have

not been treated on surgical lines. Much laceration of the tissues at the time of the injury offers increased liability to infection. Septicaemia is frequent in spreading gangrene, in diseases of the periosteum, and in fevers such as scarlatina, diphtheria or plague, and in the puerperal state. The period of incubation may be from a few hours to several days. The condition of the wound or site of injury shows marked changes. In severe cases following a prick received in conducting a post-mortem the finger in a few hours becomes greatly swollen and painful, the pain spreading up the lymphatic vessels to the nearest lymphatic glands, which may become enlarged, and sloughing or gangrene of the parts involved may take place. In milder cases the wound remains with reddened and oedematous margins in a more or less unhealthy state. In mild cases of septicaemia the local condition of the wound, high temperature and feeling of illness are the distinguishing features. The treatment of septicaemia may be preventive or active. The preventive side consists in the performance of operations with all due aseptic pre- cautions. Since the days when I. P. Semmelweiss (q.v.) of Vienna insisted on cleanliness in his maternity wards, the death-rate of puerperal septicaemia has been enormously reduced. In the British registrar-

general's returns for 1868 it was stated that in twenty-two years no less than 23,689 women in England and Wales had died of puerperal septic diseases. In the reports of the Rotunda Hospital, Dublin, the largest maternity hospital in the United Kingdom, we ascertain that of 30,023 women delivered during the ten years 1894- 1903 there was only a mortality of 21 due to sepsis, a ratio of 0-066%, while the registrar-general's returns for England and Ireland for the period have a ratio for sepsis of 0-216%. When dealing with a wound that is already septic, free incision and swabbing the surface with pure carbolic acid may have to be resorted to, and constitutional treatment must be under- taken at once. Should the infection be due to a Streptococcus, an antistreptococcic serum may be injected. There are, however, many strains of Streptococci, and a polyvalent serum may give good results. Menzer's antistreptococcic serum has been successful in puerperal septicaemia not of gonococcic origin. Many cases have also now been recorded in which the systemic infection is combated by means of an autogenous vaccine. The first case was described by Sir James Barr before the Liver- pool Medical Institute in May 1906. In urgent cases, where time will not allow of the manufacture of a vaccine, quinine in large doses, stimulants and liquid nourishment must be given, and the temperature controlled by tepid sponging.

Pyaemia (Gr. irvov, pus, dlfia, blood), which got its name from an erroneous idea that the pus passed into the blood, is now understood to mean an acute disease with the formation of metastatic abscesses. The first definite account of the disease was published by Boerhaave in 1720. Virchow in 1846 pointed out that it was not pus in the veins, but altered blood-clot. Jean D'Arcet showed the separate processes of poisoning by products of decomposition and the blocking of the veins with emboli. Any pyogenic organism may give rise to pyaemia, or it may follow any acute abscess. The cause of pyaemia may be said to be any condition favouring the formation of emboli. An occasional cause of pyaemia is infective endocarditis, while puerperal pyaemia may arise from infection of the genital tract. When the emboli lodge in the lung there is a breaking down of the tissue in front of the embolus, a haemorrhagic infarct being formed. The clinical symptoms of acute pyaemia generally start with a rigor repeated at periodic intervals; the skin becomes hot and the patient soon develops an earthy colour, the pulse becomes frequent and weak and the tongue dry. In about a week secondary abscesses appear, most frequently in the region of joints. There may be little or no pain to herald the formation of an abscess, but usually there is intense pain followed by suppuration. Unless early treatment is

undertaken the joint may be rapidly destroyed. In acute cases multiple abscesses in the kidney may give rise to pain and albuminuria, abscesses in the lungs to dyspnoea, while acute peritonitis may arise from rupture of a splenic abscess into the peritoneal cavity,

and sudden blindness be the result of the plugging of the arteria centralis retinae. The duration of a case of pyaemia depends on the severity of the infection. Death may occur from the formation of abscesses in vital organs such as the brain and heart, or from exhaustion from continued suppuration, or chronic forms may after months pass on to complete recovery. Unfortunately pyaemia cannot be recognized apart from other blood infections until abscesses begin to form. The local treat- ment is to endeavour to prevent the detachment of infected emboli and the infection of the general blood-stream thereby. An infected limb may be dealt with by amputation above the seat of the lesion, or it may be feasible to dissect out the infected veins. When abscesses have formed they must be dealt with by opening and washing out the cavities. Antistreptococcic serum may be tried, as in septicaemia; and if there be time to prepare a vaccine it offers the best prospects, more particularly in the subacute and chronic forms of pyaemia. The usual administration of nourishing diet and stimulants when required should be undertaken, and every effort made to keep up the patient's strength.

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SEPT, a clan, the term generally applied to the tribes or families of Ireland, used also sometimes as by Sir H. Maine {Early History 0} Institutions, 231) of the Indian joint undivided family, the " combined descendants of an ancestor long since dead." Wedgewood {Diet, of Eng. Etym.), quoted by Skeat, takes the word as a corruption of " sect " {q.v.), and cites from the State Papers of 1536 and 1537, where secte and septe are used respectively. If so, the word must have been influenced by Lat. saeptum, fence or enclosure {saepire, to enclose, saepes, hedge), a word which has been adopted as " septum " into scientific terminology for any partition or wall dividing two cavities — e.g. in anatomy, of the partition between the nostrils, septum naris, or that between the right and left ventricles of the heart, septum cordis.

SEPTEMBER (Lat. septem, seven), the seventh month of the old Roman year, in which it had thirty days assigned to it. In the Julian calendar, while retaining its former name and number of days, it became the ninth month. The Ludi Magni (Ludi Romani) in honour of Jupiter, Juno and Minerva began on the 4th of September. The principal ecclesiastical feasts falling within the month are: the Nativity of the Blessed Virgin on the 8th, the Exaltation of the Holy Cross on the 14th, St Matthew the apostle on the 21st, and St Michael the archangel on the 29th. September was called " harvest month " in Charle- magne's calendar, and it corresponds partly to the Fructidor and partly to the Vendemiaire of the first French republic. The Anglo-Saxons called the month Gerstmonath, barley month, that crop being then usually harvested. It is still called Herbst- monat, harvest month, in Switzerland.

SEPTUAGINT, THE (Gr. ol 0', Lat. LXX.), or the "Alex- andrian version of the Old Testament," so named from the legend of its composition by seventy (Lat. septuaginta) , or more exactly seventy-two, translators. In the Letter of Aristeas to Philocrates 1 this legend is recounted as follows: Demetrius of Phalerum, keeper of the Alexandrian library, proposed to King Ptolemy II. Philadelphus

(285-247 B.C.) to have a Greek translation of the Jewish law made for the library. The king consented and, after releasing 100,000 Jewish captives in his kingdom, sent an embassy with rich presents to the high priest Eleazar at Jerusalem asking him to send six ancient, worthy and learned men from each of the twelve tribes to translate the law for him at Alex- andria. Eleazar readily sent the seventy-two men with a precious

1 Edited by H. St J. Thackeray in H. B. Swete's Introd. to the Old Testament in Greek (1900), and by P. Wendland in the Teubner series (1900).

roll of the law. They were honourably received at the court of Alexandria and conducted to the island (Pharos), that they might work undisturbed and isolated. When they had come to an agreement upon a section Demetrius wrote down their version; the whole translation was finished in seventy-two days. The Jewish community of Alexandria was allowed to have a copy, and accepted the version officially; indeed a curse was laid upon the introduction of any changes in it.

There is no question that this Letter (which is condensed in Josephus, Ant. xii. 2) is spurious. 1 Aristeas, an official at Ptolemy's court, is represented as a heathen, but the real writer must have been a Jew and no heathen. Aristeas is represented as himself a member of the embassy to Eleazar; but the author of the Letter cannot have been a contemporary of the events he records, else he would have known that Demetrius fell out of favour at the very beginning of the reign of Philadelphus, on a charge of intriguing against his succession to the throne. 2 Nor could a genuine honest witness have fallen into the absurd mistake of making delegates from Jerusalem the authors of the Alexandrian version. There are also one or two passages (§§ 28, 182) where the author seems to forget that he is playing the role of Aristeas. The forgery, however, seems to be an early one. 3 " There is not a court-title, an institution, a law, a magistracy, an office, a technical term, a formula, a peculiar phrase in this letter which is not found on papyri or inscriptions and confirmed by them." 4 That in itself would not necessarily imply a very early date for the piece; but what is decisive is that the author limits canonicity to the law and knows of no other holy book already translated into Greek. Nor does he claim any inspiration for the translators. Further, what he

tells about Judaea and Jerusalem is throughout applicable to the period when the Ptolemies bore sway there and gives not the slightest suggestion of the immense changes that followed the conquest of Palestine by the Seleucids. It is probable that the Jewish philosopher Aristobulus, who lived under Ptolemy VI. Philometor (180-145 B.C.), derived his account of the origin of the LXX. from this Letter, with which it corresponds. 5 There seems good ground for believing that the letter contains some elements derived from actual tradition as to the origin of the LXX. Ptolemy Philadelphus was a king of eclectic literary tastes, and the welcome he gave to a Buddhist mission from India might well have been extended to Jews from Palestine. The letter lays great stress on the point that the LXX. is the official and authoritative Bible of the Hellenistic Jews, having not only been formally accepted by the synagogue at Alexandria, but authorized by the authorities at Jerusalem. This, and the fact that the_ style of the version is not that of a book intended for literary use, points to the conclusion that the translation was made to satisfy the religious needs of the Jews in Alexandria, and possibly also in the hope of gaining proselytes. In view of the Jewish prejudice against writing Scripture in any but the old holy form (the Targum, for instance, was for centuries handed down orally), it is quite possible that some impulse to the Alexandrian version came from without. Philadelphus may have encouraged it both to satisfy his own curiosity and to promote the use of Greek among the large Jewish population of the city. That the work is purely Jewish in character is

1 Its claims were demolished by Humphry Hody, Regius Pro- fessor of Greek at Oxford, in 1684.

2 Hermippus Callimachius, ap. Diog. Laert. v. 78. Irenaeus indeed, evidently following some other account, fixes the translation in the time of Ptolemy I.

3 P. Wendland, however, puts it after the Maccabean age (say 96 B.C.) and before the Roman invasion of Palestine (63 B.C.).

‘ G. Lumbroso, Recherches sur I’econ. pol. de I’ltgypte sous les Lagides (Turin, 1870), p. xiii.

6 Clem. Alex. Strom, i. p. 342, ed. Sylb.; Eusebius, Praep. Ev. ix. 6, p. 410 seq. ; cf . Valckenaer, Diatribe de Aristobulo (Leiden, 1806), reprinted in Gaisford’s edition of the Praep. Ev. One must not over- lx>k the possibility that Aristobulus’s Interpretation of the Holy Laws may itself be the pseudonymous work of some otherwise unknown Jewish author. It and the Letter of A risteas seem to be of

the same date, if not even by the same hand. And Philo (Vila Mosis, ii. § 7, ii. 141) describes an annual festival held at Pharos in honour of the origin of the Greek Bible.

only what was inevitable in any case. The translators were necessarily Jews, though Egyptian and not Palestinian Jews, and were necessarily and entirely guided by the living tradition which had its focus in the synagogal lessons. 6 And hence it is easily understood that the version was ignored by the Greeks, who must have found it barbarous and largely unintelligible, but obtained speedy acceptance with the Jews, first in private use and at length also in the synagogue service.

The next direct evidence which we have as to the origin of the LXX. is the prologue to Ecclesiasticus, from which it appears that about 130 B.C. not only the law but "the prophets and the other books " were extant in Greek. 7 With this it agrees that the text of Ecclesiasticus and the other ancient relics of Jewish- Greek literature, preserved in the extracts made by Alexander Polyhistor (Eusebius, Praep. Ev. ix.), all show acquaintance with the LXX. 8 The experiment on the Pentateuch (of which alone Aristeas speaks) had evidently been extended to other rolls as they arrived from Jerusalem. These later translations were not made simply to meet the needs of the synagogue, but express a literary movement among the Hellenistic Jews, stimulated by the favourable reception given to the Greek Pentateuch, which enabled the translators to count on finding an interested public. If a translation was well received by reading circles among the Jews, it gradually acquired public acknowledgment and was finally used also in the synagogue, so far as lessons from other books than the Pentateuch were used at all. But originally the translations were mere private enterprises, as appears from the prologue to Ecclesiasticus and the colophon to Esther. It appears also that it was long before the whole Septuagint was finished and treated as a complete work. We may grant that the Pentateuch (and perhaps part of Joshua) was translated in the 3rd century B.C. The other books followed, generally speaking, in the order in which they occur in the Hebrew Canon. Isaiah perhaps dates from c. 1 80, Jeremiah, Ezekiel and the Twelve Prophets, as also 1 Kings (=1 Samuel), c. 150. Most of the "Writings," together with Judges and 2-4 Kings, were probably translated in the 1st century B.C., while Ecclesiastes and Daniel (the latter incorporated from Theodotion) date only from the 2nd century of the Christian era.

As the work of translation went on so gradually, and new books were always added to the collection, the compass of the Greek Bible came

to be somewhat indefinite. The law always maintained its pre-eminence as the basis of the canon; but the prophetic collection changed its aspect by having various Hagiographa incorporated with it according to an arbitrary arrangement by subjects. The distinction made in Palestine between Hagiographa and Apocrypha was never properly established among the Hellenists. In some books the translators took the liberty of making considerable additions to the original, e.g. those to Daniel, and these additions became a part of the Septuagint. Nevertheless, learned Hellenists were quite well aware of the limits of the canon and respected them. Philo can be shown to have known the Apocrypha, but he never cites them, much less allegorizes them or uses them in proof of his tenets. And in some measure the widening of the Old Testament canon in the Septuagint must be laid to the account of Christians.

The vocabulary and accidence of the Greek of the Septuagint are substantially those of the Koivq SidXwos or Hellenistic Greek spoken throughout the empire of Alexander. The language of the Pentateuch attains the higher level shown by the papyri of the early Ptolemaic age, that of the prophets reflects the less literary style of the papyri of c. 130-100 B.C. In the latest parts of the translation Mr St John Thackeray notes two opposing influences, (a) the growing reverence for the letter of Scripture, tending to a pedantic literalism, (b) the influence of the Atticistic school, strongest in free writings like 4 Maccabees but leaving, its mark also on 4 Kings. But if in some respects the Septuagint is the great monument of the kowt\, in

6 It is quite likely that they worked on rolls newly brought from Jerusalem. There was no desire to found an Alexandrian canon or type of text.

7 This does not necessarily niean that the whole of the section of the Hebrew Old Testament known as " The Writings " was trans- lated by that date.

8 Philo seems to have known the Greek version of most of the Old Testament except Esther. Ecclesiastes. Canticles and Daniel

others, especially in syntax, it is strongly tinged with Hebraisms, and there are many passages where it is difficult, if not impossible, to extract any rational meaning. In some cases a book bears the marks

of two hands: thus Jeremiah i.-xxviii. was not translated by the worker that undertook ch. xxix.-li. (the former is indifferent, the latter unintelligible Greek), and in Ezekiel one hand is responsible for ch. i.-xxvii., xl.-xlviii., and another for ch. xxviii.-xxxix. (except xxxvi. 24-38). So 1 Kings stands apart from 2-4 Kings. Isaiah is more akin to classical Greek ; like the Pentateuch and 1 Maccabees it is good koivt). The two chief MSS. of Judges vary so much as to point to different recensions. In some books, especially Jeremiah xxv.-li., the order of the Septuagint is totally different from that of the Massoretic Hebrew text (cf. also Proverbs xxiv.Xxix.). In other cases, notably in Job, the original LXX. text was much shorter than that of the Massoretes; in Esther and Daniel there are numerous additions. The Septuagint does not keep the triple Hebrew division of Law, Prophets and Hagiographa or Writings, but instead of this order of canonization principle it groups its books according to subject matter, Law, History, Poetry, Prophecy, a divergence which had much importance for the history of the Old Testament canon in the Christian church. The early Christians generally accepted the LXX. canon, which through the old Latin, despite Jerome's Vulgate adoption of the Hebrew canon, passed into the West, and into the Latin Bibles, where the Apocrypha (except 1 Esdras) are still in cluded. The German and English churches followed Jerome in giving a less honoured place to the impugned books.

The Septuagint came into general use with the Grecian Jews even in the synagogue. Philo and Josephus use it, and so do the New Testament writers. But at an early date small correc- tions seem to have been introduced, especially by such Palestinians as had occasion to use the LXX., in consequence partly of divergent interpretation, partly of differences of text or of pronunciation (particularly of proper names). The Old Testament passages cited by authors of the first century of the Christian era, especially those in the Apocalypse, show many such variations from the Septuagint, and, curiously enough, these often correspond with the later versions (particularly with Theodotion), so that the latter seem to rest on a fixed tradition. Corrections in the pronunciation of proper names so as to come closer to the Massoretic pronunciation are especially frequent in Josephus. Finally a reaction against the use of the Septuagint set in among the Jews after the destruction of the temple — a movement which was connected with the strict definition of the canon and the fixing of an authoritative text by the rabbins of Palestine. But long usage had made it im- possible for the Jews to do without a Greek Bible, and to meet this want a new version was prepared corresponding accurately with the canon and text of the

Pharisees. This was the version of Aquila, which took the place of the Septuagint in the synagogues, and long continued in use there. On this, together with the versions of Theodotion and Symmachus, Origen's Hexapla, and the recensions of Hesychius and Lucian, see Bible

(Old Testament, "Texts and Versions").

The LXX. is of great importance in more than one respect. " It was the first step towards that fusion of the Hebraic with the Hellenic strain , which has issued in the mind and heart of modern Christendom. Like the opening of tne Suez Canal it let the waters of the East mingle with those of the West, bearing with them many a freight of precious merchandise." Again, it is probably the oldest translation of con- siderable extent that ever was written, and at any rate it is the starting-point for the history of Jewish interpretation and the Jewish view of Scripture. And from this its importance as a. document of exegetical tradition, especially in lexical matters, may be easily understood. It was in great part composed before the close of the canon — nay, before some of the Hagiographa were written— and in it alone are preserved a number of important ancient Jewish books that were not admitted into the canon. As the book which created or at least codified the dialect of Biblical Greek, it is the key to the New Testament and all the literature connected with it. To many its chief value lies in the fact that it is the only independent witness for the text of the Old Testament which we have to compare with the Massoretic text. It may seem that the critical value of the LXX. is greatlv impaired, if not entirely cancelled, by the corrupt state of the text. If we have not the version itself in authentic form we cannot reconstruct with certainty the Hebrew text from which it was made, and so cannot get at various readings which can be confi- dently confronted with the Massoretic text; and it may be a long time before we possess a satisfactory edition of the genuine Septua- gint. The difficulties in getting behind the confusion of versions and recensions to produce such a result are indeed formidable. The materials at our disposal are of the usual threefold kind, Manuscripts, Versions and Patristic Quotations. The earliest MSS. are about a score of fragments on papyrus, a few of which go back to the 3rd

century a.d. The chief uncial MSS. are, as for the New Testament k, A, B, C and others. Of these A and B are largely complete, but though both of Egyptian origin vary considerably. A (with which the quotations in the New Testament generally agree) may represent the edition of Hesychius ; B, which is often, especially in the Psalms, in

accord with the Bohairi'c version, resembles the text used by Origen in the Hexapla. Of versions the Bohairic (Lower Egypt), the Sahidic (Upper Egypt), the various Syriac translations (unfortun- ately we have no Old Syriac for the Old Testament), and the Latin (Old Latin and Vulgate, especially the former) are the most im- portant. The evidence of the Fathers is valuable as helping to dis- tinguish local types of text. The testimony of the earliest patristic quotations seems to be in favour of A rather than B. The immediate aim of textual criticism is a recovery of the three main editions, those of Origen, Lucian and Hesychius, and then of the pre-Origenian LXX. text, which lies behind them all. When this has been accomplished there still remains the problem of the relation of the LXX. to the Hebrew. There is no doubt that the Hebrew text from which the LXX. translators worked was often divergent from that represented by the Massoretic. For the Pentateuch we have additional material in the Samaritan version, but here the variants are least. In view of the palpable mistakes made by the Septuagint translators and their often inadequate knowledge of Hebrew, we must not hastily assume that in cases of difference the Greek is to be preferred. The book of Ecclesiasticus (the Hebrew of which has recently been discovered) furnishes a useful lesson here. Yet there is no doubt that much (e.g. in 1 Samuel) may be learned from the Septuagint ; all one can say is that each case must be treated on its own merits.

Editions. — The Septuagint was first printed in the Complutensian Polyglot (1514-1517), but before it was published in 1521 Aldus published another edition in 1519. The Textus Receptus issued by Pope Sixtus V. (Rome, 1587) was based mainly on Cod. Vaticanus (B) with some collection of the Venice MS. (V). This edition was the basis of the great work of R. Holmes and J. Parsons (Oxford, 1798-1827), who furnished the Sixtine text with an apparatus (not always accurate) drawn from 20 uncials and nearly 280 minuscule MSS., in addition to versions. In 1 707-1 720 Grabe had published an edition based on Cod. Alexandrinus (A). C. Tischendorf's text (1850; 7th ed., 1887) was a revision of that of Holmes and Parsons with an apparatus drawn from the chief uncials. H. B. Swete's edition in 3 vols. (1887-1894; revised 1895-1899) gives the text of B, and, where this fails, that of A or n, with variant readings from the chief uncials. The larger Cambridge edition, begun in 1906 by A. E. Brooke and N. McLean, follows the same plan with the text, but its apparatus includes all the uncials, the best and most representative minuscules, and the chief versions and patristic quotations.

Literature. — H. B. Swete, Introduction to the Old Testament in Greek (1900); E. Nestle, Septuagintastudien (1886-1907); F. G.

Kcnyon, Our Bible -and the Ancient MSS., pp. 48-92 (1898); A. Rahlfs, Septuaginta-Studien (1904, Kings; 1907, Psalms); E. Hatch and H. A. Redpath, A Concordance to the Septuagint (Oxford, 1897-1906); H. St J. Thackeray, A Grammar of the Old Testament in Greek, vol. i. (Cambridge, 1909), containing a useful Septuagint bibliography ; F. C. Conybeare and St G. Stock, Selections from the Septuagint (Boston and London, 1905) ; the articles in the various Bible-dictionaries, and other works mentioned in the course of this article. (A. J. G.)

SEPULCHRE, CANONS REGULAR OF THE HOLY, an order said to have been founded in 1 1 14 (or, according to other accounts, during the rule of Godfrey of Bouillon in Jerusalem) on the rule of St Augustine. Pope Celestine III., in 1 143, confirms the Church and Canons of the Holy Sepulchre in all their possessions, and enumerates several churches both in the Holy Land and in Italy belonging to the Canons. According to Jacques de Vitry, the canons served the churches on Mount Sion and Mount Olivet in addition to that of the Holy Sepulchre. The canons survived in Europe till the French Revolution. In Italy they seem to have been suppressed by Innocent VIII. in 1489, and their property given to the Knights of St John. The canons are now extinct, but canonesses of the Holy Sepulchre are still to be found in various countries of Western Europe.

SEPULCHRE, EASTER, in church architecture an arched recess, generally in the north wall of the chancel, in which from Good Friday to Easter day were deposited the crucifix and sacred elements in commemoration of Christ's entombment and resurrection. It was generally only a wooden erection, which was placed in a recess or on a tomb. There are throughout England many fine examples in stone, some of which belong to the Decorated period, such as at Navenby and Heckington (1370) in Lincolnshire, Sibthorpe and Hawton (1370) in Notting- hamshire, Patrington in Yorkshire, Bampton in Oxfordshire, Holcombe Burnell in Devonshire, and Long Itchington and other churches in Warwickshire.

SEPULCHRE, THE HOLY, the tomb in which, after His crucifixion, the body of Jesus Christ was laid. Although the facts of the crucifixion and of the interment of the body of Christ in the tomb of Joseph of Arimathea are related in the New Testament with

considerable detail, sufficient indications are not supplied to locate the actual position of the tomb with reference to the city of Jerusalem. It would appear that Golgotha, the place of crucifixion, was outside the city, near a public thoroughfare leading to one of the gates, and visible from some distance. There is, however, no reason for supposing that it was a hill, and the expression " Mount Golgotha " was not used until some centuries later. Adjoining the place Golgotha was a garden, in which was a new rock-cut tomb, the property of Joseph of Arimathea. Rock-cut tombs were common in the vicinity of Jerusalem, as, in consequence of the geological

Plan of Jerusalem

to illustrate the question of the site of the Holy Sepulchre

Tombo

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formation, the faces of the hills are frequently broken by low cliffs with terraces between. The comparatively level terraces were used for cultivation while the tombs were excavated in the rock faces. Many instances of tombs so situated can be seen on the hillsides near Jerusalem, and it is not unreasonable to suppose that the tomb of Joseph was of a similar character. As it was outside the city, the question of trie validity of the traditional site, upon which the church of the Holy Sepulchre now stands, necessarily depends, to a great extent, upon whether this place was within or without the walls at the date of the crucifixion. At that time, it is clear, judging from the care- ful description written by Josephus a few years later, that Jerusalem was defended by two walls, as the third wall was not begun by King Herod Agrippa until a.d. 41. Of these, the first, or old wall, ran from the palace of Herod the Great, which was situated at the N.W. corner of the city, and, following an easterly direction, crossed the Tyiopoeon Valley and terminated at the west wall of the Temple enclosure. On the other hand, going south from Herod's palace, it encircled the city on the west

and south, and then turning at Siloam it followed the direction of the Kidron Valley and ended at the east wall of the Temple enclosure.

The second wall, which was built at some period between the return of the Jews from Babylon and the reign of Herod the Great, was on the north, and in front of the old wall. According to Josephus, it started " from the Gate Genath in the first wall, and, enclosing only

the northern quarter of the city, went up to the fortress of Antonia." The site of the Antonia, which was situated on the rising ground north of the Temple, is known with tolerable certainty, but the position of the Gate Genath has not been, fixed, and, as no certain traces of the second wall have hitherto been found, the line it followed is purely a matter of conjecture. Various theories on the subject are maintained by different authorities. Some of these are indicated on the plan. One suggestion is that the second wall started from a point in the first wall near the palace of Herod, and that some remains of an old wall, situated at the point A, formed part of it. The wall is then supposed to have been carried in a direction slightly west of north, up to the line of the existing city wall, to have followed this line to the Damascus gate, and then turned south- east to the Antonia. If this theory were correct, it is clear that the traditional site of the Holy Sepulchre would be impossible, as it would be some way within the city wall. The arguments against the proposal are, that, according to the account of the siege of Jerusalem given by Josephus, it is improbable that the second wall started from a point so near to Herod's palace, that the line of the present city wall is more likely to be that of the third wall, and that Josephus states that the second wall went " up to " and not " down to " the fortress of Antonia. Another theory is that the Gate Genath was at a point marked B on plan, and that some ancient masonry which lies east of the so-called Pool of Hezekiah, and over which the houses on the west side of Christian Street are built, represents a portion of the second wall. The wall is then supposed to have been carried north to the point C, and either to have turned east to D,and again north to F, and from this to the Antonia; or to have continued north to E, and thence east to the Antonia. The first supposition ex- cludes the site of the Holy Sepulchre, while the second includes it within the wall. A third theory is that the Gate Genath was at the point G, and that the second wall ran north to F, and thence to the Antonia. This proposal places the site of the Holy Sepulchre outside the wall, but it makes the part of the city protected by the latter smaller than is probable. Speaking generally, it may be stated that there is no certain evidence as to the line followed by the second wall, and it is impossible to say whether the traditional site lies inside or outside this wall. From the description in the Gospels of the burial of Jesus, it is not clear whether the tomb of Joseph was intended to be the final resting-place, or whether the body was only placed in it temporarily because the feast of the Passover was at hand and the disciples intended to remove it to some other place after the Passover. But whatever may have been proposed, the Resur- rection of Jesus Christ on the first day of the week, leaving the tomb empty, turned the attention of the

disciples from the sepulchre to the living presence of their Master. After He had risen from the dead, the place of His burial does not appear to have had any attraction for His followers, and there is nothing in the writings of the first three centuries to lead us to suppose that the actual rock-cut tomb was regarded with any special feelings of veneration. Whether even a recollection of the site was preserved traditionally is doubtful. There have been many who consider that the early Christians could not have forgotten the exact locality of so important a place; on the contrary, others maintain that to the followers of Jesus Christ it was the fact of the Resurrection that was important and not the empty tomb; and that knowledge of the latter was lost during the vicissitudes from which Jerusalem suffered in the years succeeding the crucifixion. About forty years after the crucifixion, the great revolt of the Jewish people against the Romans took place, and ended with the siege and capture of Jerusalem by Titus. Prior to the siege, the Christians, following the orders of their Master-

had retired to the city of Pella, east of Jordan, and the date of their return to Jerusalem is uncertain. Whether any of the disciples returned after the triumph of the Romans and recognized the tomb of Christ is matter of conjecture.

Among the temples built by Hadrian about a.d. 135 was one dedicated to Aphrodite or Venus; it was erected at that place where the church of the Holy Sepulchre now stands, but it is impossible to say whether it was purposely so placed because it was the site of the tomb of the Lord, or whether the selection of this position was accidental. The extent of the walls of Aelia Capitolina is not known with any accuracy, but it is probable that the northern wall followed the same line as the present north wall of Jerusalem, and therefore that the site of the temple of Aphrodite was then within the walls. Although it is doubtful whether the Christians returned to Jerusalem immediately after the destruction of the city by Titus, they were certainly there when Hadrian built Aelia Capitolina; according to Epiphanius, they had a small place of worship on Sion at the place where Jesus Christ ate the Last Supper. Eusebius also states that the Christians worshipped at the Mount of Olives where Jesus instructed His disciples, but no writer up to the time of Constantine speaks of the tomb, or of worship being performed there.

Constantine the Great became emperor of Rome in a.d. 306, and was converted to Christianity six years afterwards. Embrac- ing his new religion with enthusiasm he attributed his victories to the power of the Divine Cross, which was placed on the ensigns of the army. After the great council of the Church had been held at Nicaea in a.d. 325, the emperor decided to find the sites of the crucifixion and resurrection at Jerusalem, and to build a church at this place. Full descriptions of the discovery of the Holy Sepulchre and of the churches that were built are given by Eusebius in his Life of Constantine, but it is difficult to say from his account if the main object of Constantine was to find the sepulchre of the Lord or the cross upon which He suffered. Eusebius does not mention the cross directly and lays more stress on the recovery of the sepulchre; whereas later writers imply that the great wish of the emperor and of his mother Helena, who visited Jerusalem for the purpose, was to find the Holy Cross. The task of searching for the tomb and the cross was entrusted to Bishop Macarius. Whether the bishop was guided in his selection of the site by tradition or not is difficult to say, but he decided that the desired place was under Hadrian's temple of Aphrodite. By imperial order the temple was removed, and a rock-cut Jewish tomb, which lay below, was identified as the sepulchre of the Lord. In another cavity in the rock, 280 ft. to the east, three crosses were discovered, which were assumed to be the crosses upon which Jesus Christ and the two thieves were crucified, the cross of Jesus being identified by its power of healing the sick. Immedi- ately on the receipt of the intelligence of this remarkable dis- covery, the emperor wrote to Macarius, ordering the erection of magnificent buildings on the site. Two churches were built, one over the tomb, and the second, which was larger and grander, over the place where the crosses had been found. Between the two churches was a small hill, which was identified as Mount Golgotha. The ground surrounding the two churches was levelled and surrounded with porticoes or colonnades. The description of the buildings as detailed by Eusebius is rather obscure, but fortunately there still exists, in the church of Santa Pudenziana at Rome, a mosaic, supposed to have been originally executed in the 4th or 5th century, which shows the buildings clearly. The church of the Anastasis or Holy Sepulchre is herein delineated as a round church with a domed roof; the church of the Martyrion or Holy Cross, as a polygonal building, also with a domed roof; while between the two churches is Mount Golgotha, with the cross erected upon it. In another ancient mosaic, which still exists in a church of Madeba, east of the Jordan, a map of Palestine is represented which contains a rough plan of the walls and gates of Jerusalem. In this plan, also, it is possible to recognize the churches

built by Constantine. The Bordeaux pilgrim who visited Jerusalem about a.d. 333, when the church of the Holy Sepulchre was in course of construction, describes

the place, which was evidently the same as that on which the existing church of the Holy Sepulchre stands. There can, there- fore, be no reasonable doubt that the present site is that which was fixed upon by Bishop Macarius in the time of Constantine. The churches were completed about a.d. 336, and were doubtless visited by numbers of pilgrims. Among these a lady from the west of Europe, who is supposed to have been St Sylvia of Aquitania and who came to Jerusalem about a.d. 385, fortunately kept a diary of her travels, and she identifies very distinctly the great church of the Cross, the church of the Holy Sepulchre, and Mount Calvary between them. In a.d. 614 Jerusalem was captured by the Persians under Chosroes II., who did considerable damage to the churches, but they were repaired by Modestus after the defeat of the Persians by the emperor Heraclius. The caliph Omar, who captured the city in 636, behaved with leniency to the Christians, and left them in undisputed possession of the church of the Holy Sepulchre. In 1010 the third Fatimite caliph Hakim practically destroyed it. It is remarkable that from the beginning of the 8th century, while the church of the Holy Sepulchre is always mentioned in the accounts written by visitors to Jerusalem, the church of the Cross seems to have ceased to exist, although the place where the crosses were found was shown to pilgrims, and a church was built on Mount Calvary. After the capture of Jerusalem by the Crusaders in a.d. 1099, the church of the Holy Sepulchre was repaired and enlarged by the addition of a nave and chancel, and other churches were erected, so that the Holy Sepulchre became the centre of a group of ecclesiastical buildings and has so remained up to the present time.

The Authenticity of the Traditional Site. — From early times doubts have arisen as to whether the tomb discovered by Bishop Macarius was the veritable sepulchre. As early as 754, when the pilgrim Wildebald visited Jerusalem, he remarked, in describing the Holy Places, that " Calvary was formerly outside the city, but that the Empress arranged that place so that it should be within the city Jerusalem." Saewulf in 1 102, Wilbrand of Oldenburg in 121 1, Jacques de Vitry in 1226, and Burchard of Mount Sion in 1283, had evidently some doubts about the site, and explained the difficulty by suggesting that Hadrian had enclosed it within the walls but that it was outside before he rebuilt the city. Jacques le Saige in 1518, Gretzer in 1598, and F. Quaresmius in 1639, also alluded to the difficulty felt by some in believing in the traditional site. Monconys

in 1647 stated that Calvary was formerly outside Jerusalem, but that it was now in the centre of the city, which was smaller than at the time of the crucifixion. In 1738 Jonas Korte of Altona visited Jerusalem and published a book on. his travels, in which he expressed the view that the Calvary shown to visitors could not be the true Calvary because it was in the middle of the town. He placed the true site to the west of Jerusalem, near the Birket Mamilla which lies § m. west of the Jaffa gate. This view was supported by J. F. Plessing in 1789. Dr E. Clarke in 181 2 came to the conclusion that Calvary was outside the Sion gate, while Dr E. Robinson, who published his Biblical Researches in Palestine in 1841, expressed himself satisfied that the traditional site could not be the true one, but did not venture to suggest an alternative. In 1842 Otto Thenius asserted that the cruci- fixion must have taken place on the north of Jerusalem on the rising ground outside the Damascus gate above the quarry known as Jeremiah's Grotto. Thenius considered that the Holy Sepulchre was on the west side of the hill, and his views were adopted by a number of later writers, including Canon Tristram, Dr Selah Merrill, Fisher Howe and General C. G. Gordon. Colonel C. R. Conder, R.E., who carried out the survey of Palestine under the Palestine Exploration Fund, also adopted the same hill as the probable scene of the crucifixion, but considered that the tomb of Christ was an ancient rock-cut tomb, about 200 yds. west of Jeremiah's Grotto. Since General Gordon gave his opinion in favour of the site, it has been adopted by many, and the tomb in the face of the hill is sometimes called " Gordon's Tomb of Christ " or " The Garden Tomb." A careful examination of the question, however, leads to the conclusion

that the sites are not probable either for Calvary or the tomb. The hill in question, though not far outside the present north wall of the city, is at too great a distance from the probable line of the second wall, which was the outside line of fortification at the time of the crucifixion. The quarry, known as Jeremiah's Grotto, is likely to be of later date than the third wall, which was built some years after the crucifixion, and the tomb identified as that of Christ has with good reason been attributed to the Christian rather than to the Jewish period. On the whole, therefore, the balance of argument is against the identification proposed by Thenius.

An entirely different theory regarding the site of the tomb of Christ

was proposed by James Fergusson, the architect, who, in 1847, in his Essay on the Ancient Topography of Jerusalem, made the startling proposal that the Dome of the Rock, generally believed to have been erected by Abdalmalik (Abd el Melek) in a.d. 691, was the church built by the emperor Constantine over the Holy Sepulchre. He further elaborated his views in the interesting work entitled The Temples of the Jews and other buildings in the Haram area at Jerusalem (1878). Fergusson's proposal, which found a considerable number of supporters, was based on architectural evidence, and he maintained that the building must have been designed in the time of Constantine and could not have been constructed by the Mahommedans at the end of the 7th century. Fergusson's views were strongly supported by F. W. linger in Die Bauten Constantins des Grossen am Heiligen Grab zu Jerusalem, published at Gottingen in 1863, but the objections to them on historical and topographi- cal grounds are so considerable that they can hardly now be maintained. The theory involves placing the Temple of the Jews at the S. W. part of the Haram enclosure, and the explora- tions made by General Sir C. Warren showed conclusively that if the Temple had been in this position, it would have stood over the deepest part of the Tyropoeon Valley ˆ and the foundations must have been of a most unnecessarily gigantic character. Sir C. Warren, in The Temple and the Tomb, 1880, replied seriatim to Fergusson's proposals. The historical evidence also is entirely against the latter, and the discovery of the Madeba mosaic, which, as has been already explained, shows the church of the Holy Sepulchre in the same position as at present, is another proof that the latter was not placed by Constantine on Mount Moriah.

The final conclusion that may be arrived at with regard to the authenticity of the traditional site of the Holy Sepulchre is as follows. It may be taken as certain that the present site is that which was adopted by Macarius as the correct one early in the 4th century, but there is not sufficient evidence to prove that this tomb was the one in which the body of Christ was laid, or that remembrance of the latter had been preserved during the three centuries that had elapsed between the time of the crucifixion and the conversion of Constantine. No other sug- gested site, however, has more claim to be the true one than that over which the church of the Holy Sepulchre now stands.

Literature. — By far the most important of the many works which have been published on the subject is Golgotha and the Holy Sepulchre, by Sir C. W. Wilson (Palestine Exploration Fund, London, 1906). Sir C. Wilson was employed upon the Ordnance Survey of

Jerusalem in 1864-1865, and made careful plans of the church of the Holy Sepulchre; he had an extensive knowledge of the question, and his work forms a valuable index to the topographical and historical considerations which are involved. Among ancient writers, see Eusebius, The Life of Constantine, The Praise of Constantine, Theo- phania; Rufinus (a.d. 345-410), Ecclesiastical History; Sulpicius Severus (a.d. 363-420), Sacred History; Sozomen (a.d. 375-450), Ecclesiastical History; Socrates {circa a.d. 379), Ecclesiastical History. The Publications of the Palestine Pilgrims' Text Society contain a collection of translations of the records of pilgrims, who visited the Holy Places after the erection of Constantine's churches; among these are included (the dates are approximate) : The Bordeaux Pilgrim, A.D. 333; St Sylvia, a.d. 385; Eucherius, a.d. 440; Theo- dosius, A.D. 530; Antoninus Martyr, a.d. 530; Arculfus, A.D. 630; Willibald, a.d. 754; Bernard the Wise, A.D. 870; Saewulf, A.D. 1 102; Burchard of Mount Sion, a.d. 1283; Ludolph von Suchem, A.D. 1350; Felix Fabri, a.d. 1483. Among the writers of the 16th, 17th and 18th centuries, see J. Gretzer, Omnia opera (Ingoldstadt, 1 598) ; F. Quaresmius, Historica, theologica et moralis Terrae Sanctae

elucidatio (Antwerp, 1639) ; T. Fuller, A Pisgah Sight of Palestine (London, 1650); B. de Monconys, Journal des voyages (Paris, 1665); A. Bynoeus, De morte Jesu Christi (Amsterdam, 1698) ; J. Korte, Reise nach dem weiland Gelobten Lande (2nd ed., Altona, 1743) ; J. F. Plessing, Uber Golgotha und Christi Grab (Halle, 1789). Of the numerous writers of the 19th century some of the more important are: E. D. Clarke, Travels in the Holy Land (Cambridge, 1823); F. R. de Chateaubriand, Itiniraire de Paris & Jerusalem (Paris, 1837) ; E. Robinson, Biblical Researches in Palestine (London, 1 841 and 1856); O. Thenius, " Golgatha et Sanctum Sepulchrum " in Zeitschrift fur die historische Theologie (1842); J. Fergusson, The Ancient Topography of Jerusalem (London, 1847), The Holy Sepul- chre and the Temple (1865), The Temples of the Jews (1878); G. Williams, The Holy City (2nd ed., London, 1849); Hayter Lewis, The Holy Places of Jerusalem (London, 1888) ; J. T. Barclay, The City of the Great King (1857); F. Bovet, Voyage en Terre Sainte (Paris, 1862) ; F. W. Unger, Die Bauten Constantins des Grossen am. Heiligen Grabe zu Jerusalem (Gottingen, 1863); General Sir C. Warren, G.C.M.G., The Recovery of Jerusalem (London, 1871), The Temple and the Tomb (1880) ; Colonel C. R. Conder, R.E., Handbpok to the Bible (London, 1887) ;. General C. G. Gordon, C.B., Reflections in Palestine (London, 1 884); C. Clermont Ganneau, Archaeological Researches in Palestine (London,

1899); C. Mommert, Golgatha und das Heilige Grab zu Jerusalem (Leipzig, 1900). See also articles in The Quarterly Statement of the Palestine Exploration Fund; Hasting's Dictionary of the Bible; Smith's Dictionary of the Bible; Recueil d'archSologie orientate; Zeitschrift des Deutschen Paldstina-Vereins. A large scale plan of the church of the Holy Sepulchre forms part of the Survey of Jerusalem, published by the Ordnance Survey, Southampton. (C. M. W.)

SEQUANI, in ancient geography, a Celtic people who occupied the upper basin of the Arar (Saone), their territory corresponding to Franche-Comte and part of Burgundy. Before the arrival of Caesar in Gaul, the .Sequani had taken the part of the Arverni against their rivals the Aedui and hired the Germans under Ariovistus to cross the Rhine and help them (71 B.C.). But although his assistance enabled them to defeat the Aedui, the Sequani were worse off than before, for Ariovistus deprived them of a third of their territory and threatened to take another third. The Sequani then appealed to Caesar, who drove back the Germans (58), but at the same time obliged the Sequani to surrender all that they had gained from the Aedui. This so exasperated the Sequani that they joined in the revolt of Vercingetorix (52) and shared in the defeat at Alesia. Under Augustus, the district known as Sequania formed part of Belgica. After the death of Vitellius, the inhabitants refused to join the Gallic revolt against Rome instigated by Julius Civilis and Julius Sabinus, and drove back Sabinus, who had invaded their territory. A triumphal arch at Vesontio (Besancon), which in return for this service was made a colony, possibly commemorates this victory. Diocletian added Helvetia, and part of Germania Superior to Sequania, which was now called Provincia maxima Sequanorum, Vesontio receiving the title of Metropolis ciyitas Vesontiensium. Fifty years later Gaul was overrun by the barbarians, and Vesontio sacked (355). Under Julian it recovered some of its importance as a fortified town, and was able to withstand the attacks of the Vandals. Later, when Rome was no longer able to afford protection to the inhabitants of Gaul, the Sequani became merged in the newly formed kingdom of Burgundy.

See T. R. Holmes, Caesar's Conquest of Gaul (1899), p. 483; A. Holder, Altceltischer Sprachschatz, ii. (1904) ; Mommsen, Hist, of Rome (Eng. trans.), bk. v. ch. vii. ; Dunod de Charnage, Hist, des Sequanois (1735); J. D. Schopflin, Alsatia illustrata, i. (1751; French trans, by L. W. Ravene-z, 1849).

SEQUEIRA, DOMINGO ANTONIO DE (1768-ˆ37), Portuguese painter, was born at Lisbon in 1768, and studied art first at the

academy of Lisbon, and subsequently under A. Cavallucci in Rome. By the age of thirteen lie had evinced such marked talent that F. de Setubal employed him as assistant in his work for the Joao Ferreiras Palace. Sequeira sojourned in Rome from 1 788 to 1 794, when he was made honorary member of the Academy of St Luke. After another two years' travel and study in Italy, he returned to his native country preceded by so great a reputa- tion that important commissions for churches and palaces were immediately entrusted to him — scriptural subjects, large historical compositions and cabinet pictures. In 1802 he was appointed first court painter, in which capacity he executed many works

for the prince regent, for Donna Maria Teresa, and for the members of the court. He designed the valuable silver service which was presented by the Portuguese nation to Wellington, and a monument that was erected in 1820 in the Rocio square at Lisbon. In 1823 he visited Paris, where he is known to have tried his skill in lithography and etching. The last years of his life he spent in Rome, devoting himself chiefly to devotional subjects and to his duties as head of the Portuguese Academy. He died in Rome in 1837. His best-known pictures are the " Last Moments of the Poet Camoens," " Flight into Egypt," " Ugolino," the " St Bruno " at the Lisbon Academy, and the " Descent from the Cross. " Numerous paintings by Sequeira are in the royal palace at Mafra, the convent of Laveinas, the new palace of Ajuda, and in the principal palaces and churches of Lisbon.

SEQUESTER, VIBIUS (4th or 5th century, a.d.), the supposed author of an alphabetical list of geographical names occurring in the Roman poets, with special reference to Virgil, Ovid and Lucan. Several of the names given cannot be traced; unless this is the result of carelessness or ignorance, the compiler must have had access to sources no longer extant.

Editions by C. Bursian (Zurich, 1867), and in A. Riese, Geographi Latini minores (1878); see also Teuffel, Hist, of Roman Literature (Eng. trans., 1900), 445, 1.

SEQUESTRATION, the act of removing, separating or seizing anything from the possession of its owner, particularly in law, of the taking possession of property under process of law for the benefit of creditors or the state. The Latin sequestrare, to set aside or

surrender, a late use, is derived from sequester, a depositary or trustee, one in whose hands a thing in dispute was placed till the dispute was settled; this was a term of Roman jurisprudence (cf. Digest L. 16,115). By derivation it must be connected with sequi, to follow; possibly the development in meaning may be follower, attendant, intermediary, hence trustee. In English " sequestered " means merely secluded, withdrawn. In law, the term " sequestration " has many applications; thus it is applied to the act of a belligerent power which seizes the debts due from its own subject to the enemy power; to a writ directed to persons, " sequestrators," to enter on the property of the defendant and seize the goods (see Execution); to the action of taking profits of a benefice to satisfy the creditors of the incumbent. As the goods of the Church cannot be touched by a lay hand, the writ is issued to the bishop, and he issues the sequestration order to the churchwardens who collect the profits and satisfy the demand. Similarly when a benefice is vacant the churchwardens take out sequestration under the seal of the Ordinary and manage the profits for the next incumbent. In the Scots law of bankruptcy the term " sequestration " is used of the taking of the bankrupt's estate by order of the court for the benefit of the creditors (see Bankruptcy, § Scottish Bank- ruptcy Legislation).

SEQUIN (the French form of Ital. zecchino, zecchino d'oro), the name of a Venetian gold coin, first minted about 1280, and in use until the fall of the Venetian Republic. It was worth about nine shillings. It bore on the obverse a figure of St Mark blessing the banner of the republic, held by a kneeling doge, and on the reverse a figure of Christ. Milan and Genoa also issued ˆold sequins. The word in Italian was formed from zecca, Span, zeca, a mint, an adaptation of Arabic sikka, a die for coins. In the sense of " newly-coined," the Hindi or Persian sikka, anglicised sicca, was specifically used of a rupee, containing more silver than the East India Company's rupee, coined in 1793 by the Bengal government. The " sicca-rupee " ceased to be circulated after 1836. The term " sequin " is now used for small discs made of thin pieces of metal, tinfoil, celluloid or other composite material, highly glazed and brightly coloured, and applied as trimming for ladies' dresses.

SEQUOIA, a genus of conifers, allied to Taxodium and Crypto- meria, forming one of several surviving links between the firs and the cypresses. The two species are evergreen trees of large size, indigenous to the west coast of North America. Both bear their round or ovoid male catkins at the ends of the slender

terminal branchlets; the ovoid cones, either terminal or on short

lateral twigs, have thick woody scales dilated at the extremity, with a broad disk depressed in the centre and usually furnished with a short spine; at the base of the scales are from three to seven ovules, which become reversed or partially so by compression, ripening into small angular seed with a narrow wing-like expansion.

The redwood of the Californian woodsmen, S. sempervirens, on which the genus was originally founded by Stephan Endlicher, abounds on the Pacific coast from the southern borders of Oregon southward to about 12 m. south of Punta Gorda, Monterey county, California, forming a narrow mountain forest belt, rarely extending more than 20 or 30 m. from the coast or beyond the influence of ocean fogs, or more than 3000 ft. above sea-level (see C. S. Sargent, Silva of North America, vol. x.). It grows to a gigantic size, from 200 to 300 ft. or more in height, with a diameter of from 12 to 15, or rarely 20 to 28 ft. at the much-

Sequoia sempervirens — o, Branch with green cones and male cat-kins ; b, Section 01 cone ; c, Scale of cone. All slightly reduced.

buttressed base. Professor Sargent refers to it as the tallest American tree, which probably occasionally reaches 400 ft. or more in height. In old age the huge columnar trunk rises to a great height bare of boughs, while on the upper part the branches are short and irregular. The bark is red, like that of the Scots fir, deeply furrowed, with the ridges often much curved and twisted. When young the tree is one of the most graceful of. the conifers: the stem rises straight and tapering, with somewhat irregular whorls of drooping branches, the lower ones sweeping the ground — giving an elegant conical outline. The twigs are densely clothed with flat spreading linear leaves of a fine glossy green above and glaucous beneath; in the old trees they become shorter and more rigid and partly lose their distichous habit. The cones, from £ to 1 in. long, are at first of a bluish-green colour, but when mature change to a reddish brown; the scales are very small at the base, dilating into a broad thick head, with a short curved spine below the deep transverse depression. From the great size of the trunk and the even grain of the red cedar-like wood it is a valuable tree to the farmer and carpenter: it splits readily and evenly, and planes

and polishes well; cut radially, the medullary plates give the wood a

fine satiny lustre; it is strong and durable, but not so elastic as many of the western pines and firs. Professor Sargent describes it as the most valuable timber tree of the forests of Pacific North America. In England the tree grows well in warm situations, but suffers much in severe winters — its graceful form rendering it ornamental in the park or garden, where it sometimes grows 30 or 40 ft. in height; its success as a timber tree would be doubtful. In the eastern parts of the United States it does not flourish. It was discovered by Archibald Menzies in 1 795 and was first described as Taxodium sempervirens, under which name it was known until distinguished by Stephan Endlicher as a new genus in 1847.

The only other member of the genus is the giant tree of the Sierra Nevada, S. gigantea, the largest of known conifers; it is confined to the western portion of the great Californian range for a length of about 260 m., at an altitude of from 5000 to 8400 ft. above the sea, and forms extensive forests, or, in the northern part of the area, isolated groves, such as the Calaveras Grove, the Mariposa Grove, and others. The leaves of this species are awl-shaped, short and rigid, with pointed apex; closely adpressed, they completely cover the branchlets. The male catkins are small, solitary, and are borne at the ends of the twigs; the cones are from 1ˆ to 3 in. long, ovoid, with scales thicker at the base than those of the redwood, and bearing below the depression a slender prickle. The young tree is more formal and rigid in growth than S. sempervirens, but when old the outline of the head becomes cylindrical, with short branches sparsely clad with foliage sprays. The bark, of nearly the same tint as that of the redwood, is extremely thick and is channelled towards the base with vertical furrows; at the root the ridges often stand out in buttress-like projections. The average height is about 275 ft. with a diameter near the ground of 20 ft.; but specimens from 300 to 320 ft. tall, with trunks 25-35 ft. thick, are not rare.

The famous group known as the Mammoth Grove of Calaveras in California, containing above ninety large trees, stands in 38 N., about 4370 ft. above the sea, between the San Antonio and Stanislaus rivers. It was discovered by a hunter named Dowd in pursuit of a bear in r852, but had been visited before by John Bid will, who crossed the Sierra in r84i. Some trees in the Mariposa Grove rival these in size: one measures 101 ft. round the root, and a cut stump is 31 ft. in diameter. Gigantic as these trees are and imposing from their vast columnar trunks, they have little beauty, owing to the scanty foliage of the short rounded boughs; some of the trees stand very close together; they are said to be about four hundred in number. The age of the trees has been greatly

overestimated. A few years ago a full-sized tree was felled in Fresno county, California, and contiguous transverse sections have been set up, one in the Museum of Natural History at New York, the other (upper one) in the British Museum of Natural History at South Kensington; the annual rings of the latter section have been carefully counted and found to indicate an age of 1335 years.

The growth of the " mammoth tree " is fast when young, but old trees increase with extreme slowness. The timber is not of great value, but the heartwood is dense and of deeper colour than that of 5. sempervirens, varying from brownish red to very deep brown ; oiled and varnished, it has been used in cabinet work. S. gigantea was brought to England by Lobb in 1853, and received from Dr Lindley the name of Wellingtonia, by which it is still popularly known, though its affinity to the redwood is too marked to admit of generic distinction. In America it is sometimes called Washingtonia. In the Atlantic States it does not succeed ; and, though nearly hardy in Great Britain, it is planted only as an ornament of the lawn or paddock.

In early geological times the sequoias occupied a far more im- portant place in the vegetation of the earth. They occur in the Lower Chalk formations, and in Tertiary times were widely diffused ; the genus is represented in the Eocene flora of Great Britain, and in the succeeding Miocene period was widely distributed in Europe and western Asia. It is presumed that in the Glacial epoch the genus was exterminated except in the areas in western North America where it still persists.

SERAING, a town of Belgium in the province of Liege, adjoin- ing the city of that name. Pop. (1904) 39,843. It lies on the

right bank of the Meuse above Liege, with which it is connected by rail and tramway. Seraing owes all its prosperity and importance to the firm founded by John Cockerill, an Englishman, in 181 7, with the co-operation of King William I. of the Nether- lands, who provided half the capital. The Cockerill family has long disappeared, and the enterprise is now known as " the John Cockerill Company," It is one of the largest factories of engines and machinery — apart from war material — on the continent. Its headquarters occupy the old summer palace of the prince-bishops of Liege. In 1890 it established a branch at Hoboken on the Scheldt for the purpose of undertaking ship- building. The company employs 14,000 hands.

SERAJEVO (pronounced Serajevo, " the city of palaces "; Turkish,

Bosna Serai; Ger. Sarajewo; Ital. Seraglio), the capital of Bosnia, situated on the Miljacka, a small right-hand tributary of the Bosna and on the railway from Bosna-Brod, 167 m. N., to Ragusa. Pop. (1895) 37,713, chiefly Serbo- Croatians, with small colonies of gipsies and Jews. The city, frequently called the " Damascus of the North," spreads over a narrow valley, closed on the east by a semicircle of rugged hills. Though still half oriental, and wholly beautiful, with its Turkish bazaar, its hundred mosques, wooden houses and cypress groves, it was largely rebuilt, after 1878, in western fashion. The river was also canalized, a telephone service introduced, and extensive drainage works- carried out. Serajevo is the seat of the provincial government, of a Roman Catholic bishop, an Orthodox metropolitan, the highest Moslem ecclesi- astical authority or Reis-el-ulema, and the supreme court. It is the centre of Bosnian education, containing the celebrated orphanage founded in 1869 by Miss Irby and Miss Mackenzie (afterwards Lady Sebright); the Scheriat-Sckule, which derives its name from the Turkish code or scheri, and is maintained by the state for Moslem law-students; a gymnasium, a technical institute and a teachers' training-college. The ' Begova Djamia (Dzamia), or mosque of Husref Bey, is only surpassed, among European mosques, by those of Adrianople and Constantinople. It was founded, in 1465, by Husref or Usref, pasha of Bosnia. The castle and barracks, occupied by an Austrian garrison, stand on a cliff commanding a fine view of the city. Other noteworthy buildings are the konak or governor's residence, the Roman Catholic and Orthodox cathedrals, the hospital, the townhall and the museum, with fine antiquarian and natural history collections. In the Sinan Tekke or Dervish monastery the ceremonies of the howling and dancing Dervishes may be witnessed. Turkish baths and cafes are numerous. The bazaar, or carsija, is a labyrinth of dark lanes, lined with booths, where embroideries, rugs, embossed fire-arms, filagree-work in gold and silver, and other native wares are displayed. There are also large potteries, silk-mills, a brewery and a tobacco factory. At the mineral baths of Ilidze near the city, where many Roman remains have been found, a hydropathic establishment was opened in 1899. The whole neighbourhood is rich in prehistoric remains.

Founded, in 1262, by the Hungarian General Cotroman, under the name of Bosnavar or Vrhbosna, Serajevo was enlarged by Husref Bey two centuries later, and takes its name from the palace (Turkish, serai), which he founded. During the wars between Turkey and Austria, its ownership was often contested; and it fell before King Matthias I. of Hungary in 1480, and before Prince Eugene of Savoy

in 1697. Destructive fires laid it waste in 1480, 1644, 1656, 1687 and 1789. It was chosen as the seat of Turkish government in 1850, instead of Travnik. In 1878 it was seized by the Austrians, under Baron Philippovic.

SERAMPUR, a town of British India, in the Hugli district of Bengal, on the right bank of the river Hugli, opposite Barrack- pore, on the East Indian railway, 12 m. from Howrah. Pop. (1901) 44,45r. A Danish factory was established here about the middle of the 17th century, and called by them Frederiks- nagar. With the rest of the Danish possessions in India, it was acquired by purchase by the English in 1845. Serampur was the home of the Baptist mission founded by Carey. The mission press has been transferred to Calcutta, but a training college is

still maintained by the mission. There is a jute mill, and paper is manufactured.

SERAO, MATILDA (1856-), Italian novelist, was born at Patras in Greece. Her father was an Italian, a political emigrant, and her mother a Greek. She began by becoming a schoolmistress at Naples, and afterwards she described those years of laborious poverty in the preface to a book of short stories called Leggende Napolitane(iSSi). But attention was first attracted to her name by her Novelle, published in a paper of Rocco de Zerbi's, and later by her first novel, Fantasia (1883), which definitely estab- lished her as a writer full of feeling and analytical subtlety. She spent the years between 1880 and r886 in Rome, where she published her next five volumes of short stories and novels, all dealing with ordinary Italian, and especially Roman, life, and distinguished by great accuracy of observation and depth of insight: Cuore Inferno (1881), Fior di Passione (1883), La Conquista di Roma (T885), La Virtu di Checchina (1884), and Piccolo Anime (1883). With her husband, Epoardo Scarfoglio, she founded 77 Corriere di Roma, the first Italian attempt to model a daily journal on the lines of the Parisian press. The paper was short-lived, and when it was given up Matilda Serao established herself in Naples, where she edited II Corriere de Napoli, and in 1891 founded II Mattino, which became the most important and most widely read daily paper of southern Italy. But the stress of a journalistic career in no way limited her literary activity; between 1890 and 1902 she produced Paese di Cuccagna,

Ventre di Napoli, Addio Amore, AW Erta Sentinella, Castigo, La Ballerina, Suor Giovanna delta Croce, Paese di Gesu, novels in which the character of the people is rendered with minute sensitive power and sympathetic breadth of spirit. Most of these have been translated into English.

Matilda Serao's place as a contemporary Italian novelist is one apart: she is a naturalist, but her naturalism should be understood in a much wider sense than that which is generally given to it. She is a naturalist because her books reflect life with the utmost simplicity of means, sometimes with an utter neglect of means, and at the same time she is an idealist through her high sense of the beauty and nobility which humanity can attain, and to which her writings continually aspire. All her work is truly and pro- foundly Italian; it is the literature of a great mass of individuals, rather than of one peculiarly accentuated individual; the joy and pain of a whole class rather than the perplexities of a unique case or type pulsates through her pages. Matilda Serao's defects are always defects of style; her want of sufficient choice of detail often clogs the movement of her narrative and mars the artistic effect of her always animated pages. Like Fogazzaro's, her speech is too often the popular speech of her particular province, in description as well as in dialogue.

SERAPHIM, the imaginary supernatural guardians of the threshold of Yahweh's sanctuary, only mentioned in Isa. vi. (Isaiah's vision). Their form is not described, but they have not only six wings (verse 2), but hands (verse 6) and feet (verse 2). They are of colossal height, for they overtop Him who is seated on the high throne; and with a voice that shakes the thresholds they proclaim the Trisagion, like the four " living creatures " (cf. Cherubim) in Rev. iv. 6-8. Probably in the lost Hebrew text of Enoch xx. 7 " seraphim " stood where the Ethiopic and the Greek give "the serpents" or "the dragons"; Paradise, serpents and cherubim are here made subject to Gabriel. In late Jewish writings, more recognized than " Enoch," they are classed among the celestials with the cherubim and the 'ophannim (" wheels," cf. Ezek. i.). Now as to their origin and significance. They may originally have had a serpent form, for it is difficult not to regard " seraphim " as originally (as in Num. xxi. 8) = " serpents "; cf. also the flying serpents of Israelitish folklore in Isa. xiv. 29. If so, Isaiah has transformed and ennobled these supernatural guardians of sacred things and persons. The " Nehushtan " broken in pieces under Hezekiah (2 Kings xviii. 4) may have given an impulse to the prophet's imagination. Was it not a greater thing to ennoble them than to destroy their artistic representation ? There is no precise Babylonian or Egyptian

equivalent, though attempts have been made to produce points of contact with Babylonian or Egyptian beliefs.

See further Enc. Bib. " Seraphim," and cf. Duhm's Jesaia, ed. 2 (1902), on Isa. vi. (T. K. C.)

SERAPION, or Saeapion {fior. c. 350), bishop of Thmuis in the Nile Delta and a prominent supporter of Athanasius in the struggle against Arianism (sometimes called, for his learning, Scholasticus), is best known in connexion with a prayer-book or sacramentary intended for the use of bishops. This document, contained in a collection of Egyptian documents in an nth- century MS. at the Laura on Mount Athos, was published by A. Dmitrijewskij in 1894, but attracted little attention until independently discovered and published by G. Wobbermin in 1899. It is a celebrant's book, containing thirty prayers belong- ing to the mass ˆ9-30, 1-6), baptism (7-11, 15, 16), ordination (i2-r4), benediction of oil, bread and water (17), and burial (18), omitting the fixed structural formulae of the rites, the parts of the other ministers, and almost all rubrication, except what is implied in the titles of the prayers. The name of Serapion is prefixed to the anaphora of the mass (1) and to the group 15-18: but whether this indicates authorship is doubtful; for whereas the whole collection is bound together by certain marks of vocabulary, style and thought, 15-18 have characteristics of their own not shared by the anaphora, while no part of the collec- tion shows special affinities with the current works of Serapion. 1 But his name is at least a symbol of probable date and proven- ance: the theology, which is orthodox so far as it goes, but " conservative," and perhaps glancing at Arianism, shows no sign that the Macedonian question has arisen; the doxologies, of a type abandoned by the orthodox, and by c. 370 treated by Didymus of Alexandria as heretical; the apparent presupposition that the population is mainly pagan (1, 20); the exclusive appro- priation of the mass to Sunday (19; cp. Ath. ap. c. Ar. n), whereas the liturgical observance of Saturday prevailed in Egypt by c. 380; the terms in which monasticism is referred to — together point to c. 350: the occurrence of official interpreters (25) points to a bilingual Church, i.e. Syria or Egypt; and certain theological phrases {hytwqTos, kiri&rnxia, |»<5vt] KafloXi/oj eKiikri&ia.) characteristic of the old Egyptian creed, and the liturgical characteristics, indicate Egypt; while the petition for rains (23), without reference to the Nile-rising, points to the Delta as distinguished from Upper Egypt. The book is important, therefore, as the earliest liturgical collection on so large a scale, and as belonging to Egypt, where evidence for 4th -century ritual is scanty as compared with Syria.

The rites form a link between those of the Egyptian Church Order (a 3rd- or early 4th-century development of the Hip- polytean Canons, which are perhaps Egyptian of c. 260) and later Egyptian rites — marking the stage of development reached in Egypt by c. 350, while exhibiting characteristics of their own. I. The Mass has the Egyptian notes — a prayer before the lections, elsewhere unknown in the East; an exceptionally weighty body of intercessions after the catechumens' dismissal, followed by a penitential act, probably identical with the ££0ˆ0X67770-1$ of Can. Hippol. 2, which disappeared in later rites; a setting of the Sanctus found in several Egyptian ana- phoras; the close connexion of the commemorations of the offerers and of the dead; and the form of the conclusion of the anaphora. The structure of the communion — with a prayer before and prayers of thanksgiving and blessing after — shows that Egypt had already developed the common type, otherwise first evidenced in Syria, c. 375 {Ap. Const, viii. 13). Among the special characteristics of Serapion are the simplicity of the Sanctus, and of the Institution, which lacks the dramatic addi- tions already found in Ap. Const.; the interpolation of a passage containing a quotation from Didache 9 between the institutions of the bread and of the chalice; the form of the avanvqcris; and the invocation of the Word, not of the Holy Ghost, to effect consecration. That the Lord's Prayer before communion is not referred to may be only because it is a fixed formula belonging to the structure of the rite. II. The Order of Baptism has a form for the consecration of the water, and a preliminary prayer for the candidates, perhaps alluding to their exorcism; a prayer

1 These are: a vigorous and acute refutation of the Manichaearis, and some letters. A book on the titles of the Psalms has not survived.

for steadfastness following the renunciation and the confession of faith; the form of anointing with oil; appropriate prayers preceding and following the act of baptism; and the prayer of confirmation with imposition of the hand, chrism and crossing. All this corresponds to and fills up the outline of the Church Order and allusions in 4th-century writers, and is in line with later Egyptian rites. III. [Forms of Ordination are provided only for deacons, presbyters and bishops, the orders of divine institution (12). . They are concise, but of the normal type. That for deacons (12) commemorates St Stephen, invokes the Holy Ghost, and prays for the

gifts qualifying for the diaconate. That for presbyters (13) recalls the Mosaic LXX, invokes the Holy Ghost, and asks for the gifts qualifying for administration, teaching, and the ministry of reconciliation. That for bishops (14) appeals to the mission of our Lord, the election of the apostles, and the apostolic succession, and asks for the " Divine Spirit " conferred on prophets and patriarchs, that the subject may " feed the flock " " unblamably and without offence continue in " his office. The minor orders, interpreters, readers and subdeacons (25) are evidently, as elsewhere in the middle of the 4th century, appointed without sacramental ordination.

IV. The use of exorcised or blessed oil, water and bread is fully illustrated by the lives of the fathers of the desert (cp. the Gnostic use, Clem. Al. Excerpta 82). Serapion has a form of benediction of oil and water (5) offered in the mass (like Can. Hippol. and Ch. Ord. for oil), probably for the use of individual offerers. A longer form for all three matters (17) perhaps has in view the general needs of the Church in the visitation of the sick. The occurrence in both prayers of " the Name " and the commemora- tion of the Passion, Resurrection, &c, corresponds with early allusions, in Origen and elsewhere, to the usual form of exorcism.

V. For burial of the dead Serapion gives a prayer for the departed and the survivors (18). But the funeral procession is alluded to (eKKoiuˆofjivov) , and in the mass ® the particular commemora- tion of departed persons is provided for. Hence we have the elements of the 4th-century funeral, as we know it in Egypt and elsewhere: a preliminary office (of readings and psalms) to which the prayer belongs, the procession (with psalmody) to the cemetery, the burial and the mass pro domitione.

Authorities. — Dmitrijewskij in Trudy (Journal of the Eccl. Acad, of Kiev, 1894), No. 2; separately (Kiev, 1894); reviewed by A. Favlov, Xpdxi/ta BufaM-iea, i. 207-213; cp. Byzant. Zeitschr. iv. I (1895), p. 193; G. Wobbermin in Harnack-Gebhardt, Texle «. Untersuch., new series, ii. 3 b (1899); P. Drews, " Uber Wobbermins Altchristliche liturgische Stucke aus d. Kirche Agyptens " in Zeitschr. f. Kirchen-Geschichte, xx. 4 (Oct. 1899, Jan. 1900); F. E. Brightman, " The Sacramentary of Serapion of Thmuis " in Journal of Theological Studies, i. and ii. (Oct. 1899, Jan. 1900); J. Words- worth, Bishop Sarapion's Prayer-Book (London, 1899); P. Batiffol in Bulletin de lit. eccles. p. 69 sqq. (Toulouse, 1899). (F. E. Br.)

SERAPIS, the famous Graeco-Egyptian god. The statue of Serapis in

the Serapeum of Alexandria was of purely Greek type and workmanship — a Hades or Pluto enthroned with a basket or corn measure on his head, a sceptre in his hand, Cerberus at his feet, and (apparently) a serpent. According to Plutarch, Ptolemy Soter stole it from Sinope, having been bidden by the unknown god in a dream to bring him to Alexandria. On its arrival the statue was pronounced to be Serapis by two experts in religious matters: the one the Eumolpid Timotheus, the other the Egyptian Manetho. This story may not be true (some con- tend that Sinope as the provenance of the statue originated in the hill of Sinopeion, i.e. place of Apis (?), a name given to the site of the Serapeum at Memphis), but there is little doubt that Ptolemy Soter fixed the iconic type to serve for the god of the new capital of Egypt, where it was soon associated with Isis and Harpocrates in a triad. His policy was evidently to find a deity that should win the reverence alike of Greeks and Egyptians. The Greeks of that day would have had little respect for a grotesque Egyptian figure, while the Egyptians were more willing to accept divinity in any shape. A Greek statue was therefore chosen as the idol, and it.was proclaimed as the anthro- pomorphic equivalent of a much revered and highly popular Egyptian beast-divinity, the dead Apis, assimilated to Osiris. The Greek figure probably had little effect on the native ideas,

but it is likely that it served as a useful link between the two religions. The god of Alexandria soon won an important place in the Greek world. The anthropomorphic Isis and Horus were easily rendered in Greek style, and Anubis was prepared for by Cerberus. The worship of Serapis along with Isis, Horus and Anubis spread far and wide, reached Rome, and ultimately became one of the leading cults of the west. The destruction in a.d. 385 of the Serapeum of Alexandria, and of the famous idol within it, after the decree of Theodosius, marked the death- agony of paganism throughout the empire.

It is assumed above that the name Serapis (so written in later Greek and in Latin, in earlier Greek Sarapis) is derived from the Egyptian Userhapi — as it were Osiris-Apis — the name of the bull Apis, dead and, like all the blessed dead, assimilated to Osiris, king of the underworld. There is no doubt that Serapis was before long identified with Userhapi; the identification appears clearly in a bilingual inscription of the time of Ptolemy Philo- pator (221-205 B.C.), and frequently later. It has, however, been contended by an eminent authority (Wilcken, Archiv jitr Papy- rusforschung, iii. 249) that the parallel occurrence of the names Sarapis and Osorapis (Userhapi) points to an independent origin for the former. But doublets, e.g.

Petisis-Petesis, are common in Graecisms of Egyptian names. The more accurate form is then generally the later, found in documents written by Greeks in familiar intercourse with Egyptians, the less accurate is traditional from an older date in the mouths of pure Greeks and Hellenists, and is used in literary writings. Thus Sarapis would be the literary and official form of the name; it might be traditional, dating perhaps from the reign of Amasis or from the Persian period. We know that in Herodotus's day, and long before, the discovery of the new Apis was the occasion of universal rejoicing, and his death of universal mourning. The ancient Serapeum (Puserhapi) and the name Userhap would be almost as familiar to early Greek wanderers in Egypt as the Apieum and Apis itself.

But why was a Plutonic Serapis selected rather than another god to furnish the Egyptian element to the chief divinity of Alexandria? According to one account in Tacitus, Sarapis was the god of the village of Rhacotis before it suddenly expanded into a great capital; but it is not very probable that temples were erected to the dead Apis except at his Memphite tomb. Alexander had courted Ammon. But Ammon had little hold on the affections of the Egyptian people. He was the god of Ethiopia and the Thebais which were antagonistic to the pro- gressive north. On the other hand, Osiris with Isis and Horus was everywhere honoured and popular, and while the artificer Ptah, the god of the great native capital of Egypt, made no appeal to the imagination, the Apis bull, an incarnation of Ptah, threw Ptah himself altogether into the shade in the popular estimation. The combination of Osiris and the Apis bull which was found in the dead Apis was thus a most politic choice in naming the new divinity, whose figure represented a god of the underworld wearing an emblem of fruitfulness.

The earliest mention of Sarapis is in the authentic death scene of Alexander, from the royal diaries (Arrian, Anabasis, vii. 26). Here Sarapis has a temple at Babylon and is of such importance that he alone is named as being consulted on behalf of the dying king. It would considerably alter our conception of the dead Apis if we were to find that a travelling shrine of his divinity accompanied Alexander on his expedition or was set up for him in Babylon. On the other hand, the principal god of Babylon was Zeus Belus (Bel Marduk), and it is difficult to see why he should have been called Sarapis on this occasion. Evidence has, however, been found to prove that Ea, entitled Sarapsi, " king of the deep (sea)," who was also great in learning, and magic, had a temple in the city (Lehmann in Beitrdge zur alten Geschichte, iv. 396). It seems unwarranted to make this §arapsi= Sarapis travel to Sinope and thence to Alexandria as the

type of the Egyptian god; but whether or no the Egyptian appellation Sarapis was applied to express the Babylonian Sarapsi, the part it played in the last days of Alexander may have determined the choice by which the Egyptian Osiris-Apis supplied the name and some leading characteristics to the god of Alexandria.

See Isis; A. Bouche-Leclercq, Histoire des Lagides, i. (1903), ch. iv. ; J. G. Milne, History of Egypt under Roman Rule (1898) , p. 140; G. Lafaye, Histoire du culte des divinites d'Alexandrie hors de I'Ugypte (Paris, 1884). (F. Ll. G.)

SERENA, or La Serena, a city of Chile, capital of the province of Coquimbo, on the S. bank of the Coquimbo river about 5 m. from the sea. Pop. (1895) 15,712; (1902, estimate) 19,536. As the see of a bishop and the most important town politically of the semi-arid region, it contains a number of important public edifices, including a cathedral (1844-1860; 216 ft. long, 66 ft. wide) built of a light porous stone, an episcopal residence, several convents, a large hospital, an orphans' asylum, a beggars' asylum and a lazaretto. It is the seat of a court of appeal for Atacama and Coquimbo, and has an excellent lyceum and other schools, including a school of mines. It has a good water supply, well-paved streets, gas illumination, tramway service and several small industries, including brewing and the making of fruit conserves. The annual rainfall is only i-6 in. and its mean annual temperature is 59-2°. Its railway connexions include a line to Coquimbo (9 m.), its port, one to the Tamaya copper mines, and a narrow-gauge line up the valley of the Elqui to Guanta, through a region celebrated for its fruit. It is also in direct railway communication with the national capital.

Serena was founded by Juan Bohon in 1544, on the opposite side of the river, and was named after Pedro Valdivia's birth- place in Estremadura, Spain. It was destroyed by the Indians soon after, and was rebuilt on its present site in 1549 by Francisco de Aguirre.

SERENADE (from Ital. serenala, Lat. serenus, bright; the Italian term being applied, partly by confusion with serus, late, and partly through the use of Serena — cf. Gr. atkf)vr) — as an epithet for the moon, to a form of courting music played at night in the open air; whence also the synonym Notturno), in music; a term classically applied to a light kind of symphony, more rarely a piece of chamber

music, in a light sonata style with several extra movements, and in a few cases (as in the two serenades of Beethoven) not containing any fully developed examples of first-movement form. The divertimento is a similar composition, more often for chamber music, and frequently on a scale altogether too small for the sonata style to show itself, though some examples by Mozart {e.g. those for strings and two horns) are very large. The cassation is a smaller composition, beginning (like Beethoven's serenade op. 8) with a march. The classics of the serenade forms are among the works of Mozart and Haydn. Mozart's larger and later serenades, from the " Haffner " serenade onwards, are among his most delightful and voluminous lighter instrumental works. His two serenades for eight wind instruments are more serious, and that in C minor (which he afterwards arranged as a string quintet) is a majestic work in four normal movements, which Mozart probably called a serenade only because he did not find the term octet then in common use.

The typical scheme of a large serenade or divertimento differs from that of a symphony only in having six movements instead of four, the additions being another slow movement and minuet or scherzo. Beethoven's septet and Schubert's octet are on this plan, and are just as much serenades as Mozart's " Haffner " serenade, which is (not counting introductions) in eight movements with a kind of violin concerto in the middle. The six-movement scheme (though without the serenade style) was adopted by Beethoven in one of the profoundest and most serious works in all music, the string quartet in B flat, Op. 130.

Brahms's first essays in symphonic form took the shape of two orchestral serenades, of which the first was originally sketched for a large group of solo instruments. If it had finally taken that form Brahms would have called it a divertimento.

Other applications of the term in music are merely literary. Even its use, from the 17th century onwards, for a kind of operetta was clearly no more than a natural allusion to the notion of serenades as addressed at night by minstrels to ladies and by clients to patrons. (D. F. T.)

SERENUS, SAMMONICUS, Roman savant, author of a didactic medical poem, De medicina praecepta (probably incomplete). The work (n 15 hexameters) contains a number of popular remedies, borrowed from Pliny and Dioscorides, and various magic formulae, amongst others the famous Abracadabra (q.v.), as a cure for fever and ague. It concludes with a description of the famous antidote of

Mithradates VI. of Pontus. It was much used in the middle ages, but is of little value except for the ancient history of popular medicine. The syntax and metre are remarkably correct. It is uncertain whether the author was the famous physician and polymath, who was put to death in a.d. 212 at a banquet to which he had been invited by Caracalla, or his son, the tutor of the younger Gordian. The father, who was one of the most learned men of his age, wrote upon a variety of subjects, and possessed a library of 60,000 volumes, bequeathed to his son and handed on by the latter to Gordian.

The editio princeps (ed. Sulpitius Verulanus, before 1484) is very rare; later ed. by J. G. Ackermann (Leipzig, 1786) and E. Bahrens, Poetae Latini minores, iii. ; see also A. Baur, Quaestiones Sammoniceae (Giessen, 1886) ; M. Schanz, Geschichte der romischen Literatur, iii. (1896); Teuffel, Hist, of Roman Literature (Eng. trans., 1900), 374, 4, and 383.

SERENUS "of Antissa," Greek geometer, probably not' of Antissa but of Antinoeiaor Antinoupolis, a city in Egypt founded by Hadrian, lived, as may be safely inferred from the character and contents of his writings, long after the golden age of Greek geometry, most probably in the 4th century, between Pappus and Theon of Alexandria. Two treatises of his have survived, viz. On the Section of the Cylinder and On the Section of the Cone, the Greek text of which was first edited by Edmund Halley along with his Apollonius (Oxford, 17 10), and has now appeared in a definitive critical edition by J. L. Heiberg (Sereni Antis- sensis opuscula, Leipzig, 1896). A Latin translation by Com- mandinus appeared at Bologna in 1566, and a German transla- tion by E. Nizze in 1860-1861 (Stralsund). Besides these works Serenus wrote commentaries on Apollonius, and in certain MSS. of Theon of Smyrna there appears a proposition "of Serenus the philosopher, from the Lemmas " to the effect that, if a number of rectilineal angles be subtended, at a point on a diameter of a circle which is not the centre, by equal arcs of that circle, the angle nearer to the centre is always less than the angle more remote (Heiberg, preface, p. xviii.).

The book On the Section of the Cylinder had for its primary object the correction of an error on the part of many geometers of the time who supposed that the transverse sections of a cylinder were different from the elliptic sections of a cone. When this has been done, Serenus, in a series of theorems ending with Prop. 19 (ed. Heiberg), shows in Prop. 20 that " it is possible to exhibit a cone and a cylinder cutting one another in one and the same ellipse." He then solves problems such as — " given a cone (cylinder) and an ellipse

on it, to find the cylinder (cone) which is cut in the same ellipse as the cone (cylinder) " (Props. 21, 22); "given a cone (cylinder) to find a cylinder (cone), and to cut both by one and the same plane so that the sections thus formed shall be similar ellipses " (Props. 23, 24). In Props. 27, 28 he deals with subcontrary and other similar sections of a scalene cylinder or cone. He then gives the theorems: " All the straight lines drawn from the same point to touch a cylindrical (or conical) surface, on both sides, have their points of contact on the sides of a single parallelogram (or triangle) (Props. 29, 32). Prop. 31 states indirectly the property of a harmonic pencil.

The treatise On the Section of the Cone, though Serenus claims origin- ality for it, is unimportant. It deals with the areas of triangular sections of right or scalene cones by planes through the vertex, finding e.g. the maximum triangular section of a right cone and the maximum triangle through the axis of a scalene cone, and solving, in some easy cases, the problem of finding triangular sections of given area. (T. L. H.)

SERERS, a Negroid people, living in Senegambia. They are of the same stock as the Wolof, and in some parts form com- munities with them. Elsewhere they have mixed with the Mandingo, to which race belong most of their ruling families. The country of the pure Serers lies between the Gambia and Salum rivers to the south of Cape Verde. In this domain of nearly 5000 sq. m. the tribe has two main divisions, the None Serers and the Sine Serers. The Serers are an extraordinarily tall race, even excelling in height their kinsfolk, the Wolof. Men of 6 ft. 6 in., with muscular development in proportion, are by no means rare. They are less black than the Wolof and

have features more purely negroid with coarser lips and heavier jaws. Many Serers are nominally Mahommedans, but nature-worship is still prevalent. Their two chief gods are Takhar, god of justice, and Tiurakh, god of wealth, who are worshipped at the foot of trees. Snakes, too, have their cult, and formerly living animals were sacrificed to them. A belief in transmigra- tion, as shown by their funeral customs, is general among the Serers. They are an honest and industrious people, but are very heavy drinkers.

SˆRES, Serros or Siros, chief town of a sanjak in the vilayet of Salonica, European Turkey, on Lake Takhino, a navigable expansion

of the river Karasu or Struma (ancient Strymon), 43 m. by rail N.E. of Salonica. Pop. (1905) about 30,000, of whom about half are Bulgarians (one-third of them being Mussulmans), nearly one-fourth Greeks, about one-seventh Turks and the remainder Jews. Seres is built in a district so fertile as to bear among the Turks the name of Altin Ovassi, or Golden Plain, and so thickly studded with villages as to appear, when seen from the outliers of Rhodope on the north, like a great city with extensive gardens. It is the seat of a Greek archbishop and patriarch. It consists of the old town, Varosh, situated at the foot and on the slope of the hill crowned by the old castle, and of the new town built in the European fashion on the plain, and forming the commercial centre. The principal buildings are the Greek archiepiscopal palace, the Greek cathedral, restored since the great fire of 1879, by which it was robbed of its magnificent mosaics and woodwork, the Greek gymnasium and hospital (the former built of marble), the richly endowed Eski Jami mosque, and the ruins of the once no less flourishing Ahmed Pasha or Hagia Sophia mosque, whose revenues were formerly derived from the Crimea. On a hill above the town are the ruins of a fortress described in a Greek inscription as a " tower built by Helen in the mountainous region. " Seres is the headquarters of the Turkish wool trade, and has also manufactures of cloth and carpets. There is a large trade in rice and cereals, and the other exports include tobacco and hides.

Seres is the ancient Seris, Sirae or Sirrhae, mentioned by Herodotus in connexion with Xerxes's retreat, and by Livy as the place where Aemilius Paulus received a deputation from Perseus. In the 14th 1 century, when Stephen Dushan of Servia assumed the title emperor of Servia, he chose Sirrhae as his capital; and it remained in the hands of the Servians till its capture by Sultan Murad II. (1421-1451).

SERFDOM (from Fr. serf, Lat. servus, a servant or slave). The notion of serfdom is distinct from those of freedom and of slavery. The serf is not his own master: to perform services for other persons is the essence of his status, but he is not given over to his lord to be owned as a thing or an amimal — there are legal limits to the lord's power. Serfdom is very often con- ceived as a perpetual adherence to the soil of an estate owned by a lord, but this praedial character is not a necessary feature of the condition. Hereditary serfdom may sometimes assume the shape of a personal relation between servant and master. Such being the general features of serfdom, it is sure to appear in very different ages and countries. It will be formed naturally, for instance, in cases when one barbarous community conquers another, but it is not able to destroy entirely the latter or to

treat its members as mere chattels. This mitigated form of appropriation of human beings by their conquerors may be brought about as well by the paucity or comparative weakness of the victors as by the difficulty for them to draw income from pure slaves. In a state of backward agriculture and natural economy it will sometimes be more profitable for the conquerors as well as for the conquered to leave the dependent population in their own households and on their own plots, at the same time taxing them heavily in the way of tribute and services. Such an arrangement clearly obtained in several of the agricultural states on ancient Greece. The Penestae of Thessaly appear as a remnant of a distinct tribe settled on the confines of Macedonia and at the same time as a class of tributary peasants serving Thessalian aristocrats. The Mnoitae, Klarotae and Apha-

miotae of Crete were more or less in the same position. Their chief occupation was the cultivation of the shares (/cXSpot) of the Dorian aristocracy, but they lived in households of their own and were considered as subjects rather of the Cretan com- monwealths than of private men. The relation between both classes is well illustrated by a fragment of the Cretan poet Hybrias, who thus glories in his shield and sword: " I till the land with them, I press the wine from the grapes. On account of them I am called the lord of the Mnoa." Even in the case of the Helots of Sparta, although their condition was very hard and they were made to perform services to any Spartiate who might require them to do so, features of a similar tributary condition are apparent. The chief work of the Helots was to provide a certain quantity of corn, wine and oil for the lords of the shares on which they were settled (roughly 82 medimni of barley a year per share) ; personal services to other Spartiates were exceptional. Pollux in his account of the Helots places them distinctly in an intermediate position between free men and slaves. The fact that in these instances governments had a good deal to say in the regulation of the status of such serfs is well worth noting: it explains to a great extent the legal limitations of the power of the lords. Even downright slaves belonging to the state or to some great temple corporation were treated better and carefully distinguished from private slaves by the Greeks.

We shall not be astonished to find, therefore, in the Hellenistic states of Asia a population of peasants who seem to have been in a condition of hereditary subjection and adherent to the glebe on the great estates of the Seleucid kings (see Rostowtzew in Lehmann's Beitrage zur alien Geschichte, ii.). It is not un- likely that the customs of these Xaoi fiaaiXiKoi went back to the epoch of the Persian monarchy. In any case these peasants (yeotyyyot) were

certainly not slaves, while, on the other hand, their condition was closely bound up with the cultivation of the estates where they lived. The regulation by the state of the duties and customary status of peasants on government domains turns out to be one of the roots of serfdom in the Roman world, which in this respect as in many others follows on the lines laid down by Hellenistic culture. It is important for our purpose to notice that the condition of coloni was developed as a result of historic necessity by the working of economic and social agencies in the first centuries of the Roman empire and was made the subject of regular legislation in the 4th and 5th centuries. In the enactments of Justinian, summing up the whole course of development (C.J. xi., 48, 23), two classes of coloni are distinguished — the adscripticii, representing a more complete state of serfdom, and the free coloni, with property of their own. But the whole class, apart from minor variations, was characterized by the idea that the peasants in question were serfs of the soil (servi terrae) on which they were settled, though protected by the laws in their personal and even in their praedial status. Thus the ascription to the soil, although originally a consequence of ascription to the tributes (adscriptio censibus), became the mark of the legal status of serfdom. The emperors actually tried in their legislation to prevent the landowners from evicting their coloni and from raising their rents. In this way fixity of tenure and service was aimed at and to a certain degree enforced by the state.

With the break-up of the Roman empire the legal protection in regard to serfs could not be kept up in the same way as before. The weak governments which took the place of imperial authority were not able to maintain the strict discipline and the stress of judicial power which would have been necessary to guarantee the tenure and status of the serfs. And yet serfdom became the prevailing condition for the lower orders during the middle ages. Custom and economic requirements produced checks on the sway of the masters which proved effectual even when legal protection was insufficient. The direction .of events towards the formation of serfdom is already clearly noticeable in Celtic communities. In Wales and Ireland the greater part of the rural working classes was reduced not to a state of slavery, but to serfdom. The male slave (W. cceth) does not play an

important part in Celtic economic arrangements: there is not much

room for his activity as a completely dependent tool of the master. The female slave (cumal) was evidently much more prominent in the household. Prices are reckoned out in numbers of such slaves and there must have been a constant call for them both as concubines and as household servants. As for male workmen they are chiefly tasogs in Wales, that is half-free bondmen with a certain though base standing in law. Even these, however, could not be said to form the social basis for the existence of an upper free class. The latter was numerous, not wealthy as a rule, and had to undertake directly a great part of the common work; as may be seen from the extent of the free and servile tenures on the estates carved out for English conquerors in Wales and Ireland. Anyhow, the tasog class of half - free peasants stands by the side of the smaller tribesmen as subjected to heavier burdens in the way of taxation and services in kind. In Wales they are distributed into gavells and gwelys, like the free tribesmen themselves and thus connected with the land, but there is nothing to show that this connexion was deemed a servitude of the glebe. The tie with the lord is after all a personal one.

The Germanic tribes moved on similar lines. Slavery was not a natural institution with them, although it did occur. In the eyes of a Roman observer, however, even downright slavery was turned into serfdom by the force of circumstances. As Tacitus tells us, the ancient Germans made use of their slaves in a different way from the Romans. These slaves had their separate households, while the masters exacted tribute from them in the shape of corn, cattle or clothes, and the serfs had to obey to the extent of rendering such tribute (Tacitus, Germania, 21). This means, of course, that it was in the interest of the master to levy tribute and not to organize slave labour. After the conquest of the provinces by the Germanic invaders the Roman stock of coloni naturally combined with German tributary peasants to form medieval serfdom. A half-free group is marked off in the early laws under the designation of liti, lazzi, aldiones. But in process of time this group was merged with freedmen, settled slaves {servi casati) and small freedmen into the numerous class of serfs {servi, rustici, villani) which appears under different names in all western European countries. The customary regulations of the duties of an important group of this class in regard to their lords are clearly expressed in the Bavarian law (7th century): serfs settled on the estates of the church have to work, as a rule, three days in the week for their masters and are subject to divers rents and payments in kind. The regula- tions in question, although entered in a legal text, are not a legislative enactment but the result of a slow process of adjust- ment of claims between the ecclesiastical landowners and

masters on one side and their rural dependents on the other. There can be no doubt that they were largely representative of the Conditions prevailing on Bavarian estates belonging not only to the church but also to the duke and to lay lords. The old English Rectituditties singularum personarum (nth century) present other variations of the same customary arrangements. The rustic class appears in them to be differentiated into several sub- divisions — the geneats performing riding duties and occasional services, the geburs burdened with week work and the cotsets holding cottages and performing light work in the shape of one day in the week and services to match (see Vixlenage). Of these various groups that of the geburs corresponds more closely to the continental serfs {coloni, Horige, unfreie Hintersassen) .

The dualism characteristic of medieval serfdom, its formation out of debased freedom and rising servitude, may be traced all through the history of the middle ages. French jurists of the 13th century, e.g., lay stress on a fundamental difference in law between the complete serf whose very body belongs to his lord (cf. the German Leibeigenschaft) and the villein or roturier, who is only bound to perform certain duties and ought not to be further oppressed by the landowners on whose soil he is settled (Beaumanoir, Coutume de Beauvaisis). But the same texts which draw the line between the two classes make it clear that there were no other guaranteesto the maintenance of the rights of the

superior rustics than the moral sense and the self-interest of their masters. Should the lords infringe the well-established rights of their subjects, the latter had no court to appeal to and only God could inflict punishment on the oppressors. It must be added, however, that even in the darkest times of feudal sway, economic forces provided some protection for the peasants who had lost the means of appealing to legal remedies. A certain balance had to be struck in most cases between the greed and selfishness of the class of landowners and the necessary requirements and human aspirations of the subjects. Feudal masters could not afford to act with the ruthless cruelty of slaveholders relying on government and civilization to back their claims to a complete sway over their human chattels. Lords who did not wish to see their estates deserted had to submit to the rule of custom in respect of exactions. And the screen of rural custom proved sufficient to allow of the growth of some property in the hands of the toiling class, a result which in itself rendered possible further emancipation.

A very instructive example of the formation of serfdom is presented

by the history of Russia. Personal slavery in the sense in which it existed in the West was practised in ancient Russia {kholopi) and arose chiefly from conquest, but also from voluntary subjection in cases of great hardship and from the redemption of fines and debts (cf. the O. Eng. wite-theow) . But the number of personal serfs was not large and they were princip- ally to be met in the households of great people. The great mass of the peasantry was originally free. Even when in the course of time landownership was appropriated by the crown, the ecclesiastical corporations and the nobles, the tillers of the land retained their personal freedom and were considered to be farmers holding their plots under contracts. They were free to leave their farms provided they were able to effect a settlement in regard to all outstanding rent arrears and debts. Members of the household who were not directly responsible for the farms could look out for their livelihood as they pleased. The custom of the country gradually took the shape of a simultaneous resettlement of all conditions of rural occupation about St George's day (November 24), that is after the gathering of the harvest and the practical winding up of rural work. Such was the legal state of affairs up to the end of the 16th century. A great change supervened, however, through the slow working of economic and political causes. The peasants settled under the sway of nobles and churches could very seldom produce a clean bill in regard to their money relations with the landlords. They generally had to account for arrears and got into debt from the very start by taking over stock with the farm. The longer they remained on the same plot, the more entangled became the ties of their economic dependence. .Thus, as in the case of many Roman coloni, thoroughly free settlers gradually lapsed into a state of perpetual subjection from which they could not emanci- pate themselves by legal means. On the other hand, the growth of the Muscovite state with its fiscal and governmental require- ments involved a watchful repartition of burdens among the population and led ultimately to a system of collective liability in which the farms were considered chiefly as the sources of taxable income. The government was directly interested in maintaining their efficiency and in preventing migrations and desertions which led to a weakening of the taxpaying communities. A third aspect of the question must also not be desregarded, namely, the keen competition between landowners trying to attract settlers to their estates at the expense of their needy or less powerful neighbours. The first legislative measures of the Moscow rulers directed towards the establishment of a servile class similar to the Roman coloni fall into the first years of the 1 7th century (a.d. 1601, 1606) and consist in enactments against landowners depriving their neighbours of the tillers of their estates.

But matters were clearly ripe for a wider application of the view that the peasant ought to stick to the soil, and the restoration of the Muscovite empire under the Romanovs brought with it the consolidation of all rural arrangements around this principle. Peter the Great regularized and com- pleted this evolution by effecting a comprehensive cadastre and

census of the rural population. The ultimate result was, however, not only the fixity of peasant tenures, but the subjection of the entire peasant population as a separate class (Krepostrie) to the personal sway of the landowners. The state insisted to a certain extent on the public character of this subjection and drew distinctions between personal slavery and serfdom. In the midst of the peasants themselves there lived a consciousness of their special claims as to tenant right, claims which sometimes assumed the shape of the quaint saying, " The land is ours, though we are yours." But, in fact, serfdom naturally took the form of an ugly ownership of live chattels on the part of a privileged class, and all sorts of excesses, of cruelty, ruthless exploitation and wanton caprice, followed as a matter of course. Emancipation was brought about in the 19th century by economic causes as well as by humanitarian considerations. The fabric of a state built up on the basis of serfdom proved inadequate to meet the tasks of modern times. Private enterprise and the free application of capital and labour were hindered in every way by the bondage of the peasant class. Even such a necessary measure as that of moving cultivators to the rich soil of the south was thwarted by the adherence of the northern peasantry to the glebe. On the humanitarian and liberal ideas making for emancipation we need not dwell, as they are self-evident. After several half-hearted attempts directed in the course of Nicholas I.'s reign to face the question while safeguarding at the same time the rights and privileges of the old aristocracy, the moral collapse of the ancien regime during the Crimean war brought about the Emancipation Act of the 19th of February 1861, by which some 15 millions of serfs were freed from bondage. The most characteristic feature of this act was that the peasants, as distinct from household servants, received not only personal freedom but allotments in land in certain proportions to their former holdings. The state indemnified the former landowners, and the peasants had to redeem the loan by yearly payments extending over a number of years.

If we turn back from this course of development to the history of serfdom and emancipation in the West striking contrasts appear. As we have already noticed, medieval serfdom in the West was the result of a process of customary feudal growth hardly inter- fered with by central governments. The loosening of bondage is also, to a great extent, prepared by the working of local economic agencies. Villeins and serfs in France rise gradually in the social scale, redeem many of the onerous services of feudalism and practically acquire tenant-right on most of the plots occupied by them. Tocqueville has pointed out that already before the revolution of 1789 the greater part of the territory of France was in the hands of small peasant owners, and modern researches have confirmed Tocqueville's estimate. Thus feudal overlordship in France had resolved itself into a superficial dominion undermined in all directions by economic realities. The fact that there still existed all kinds of survivals of harsh forms of dependence, e.g. the bondage of the serfs in the Jura Mountains, only rendered the contrast between legal conditions and social realities more pointed. The night of the 4th of August 1789 put an end to this contrast at one stroke and the further history of rural population came to depend entirely on the play of free competition and free contract.

The evolution of serfdom in Germany was effected by the working of somewhat more complicated causes. The regulating influence of government made itself felt to a greater extent, especially in the east. The colonization of the eastern provinces and the struggle against the Slavs necessitated a stronger con- centration of aristocratic power, and the reception of Roman law during the 15th and 16th centuries hardened the forms of subjection originated by customary conditions. It may be said in a general way that Germany occupied in this respect, as in many others, an intermediate position between the west of Europe and Russia. Emancipation followed also a middle course. It was brought about chiefly by governmental measures, although the ground was to a great extent prepared by social evolution. The reforms of Stein and Hardenberg in Prussia, of the French and of their clients in South Germany, opened the way for a

gradual redemption of the peasantry. Personal serfdom {Leibei-genschaft) was abolished first, hereditary subjection (Erbunter-thdnigkeit) followed next. Emancipation in this case was not con-nected with a recognition of the full tenant-right of the peasants; they had to part with a good deal of their land. To the last the landowners were not disturbed in their economic predominance, and succeeded very well in working their estates by the help of agricultural labourers and farmers. In the west the small peasant

proprietorship had a better chance, but it arose in the course of economic competition rather than through any general recognition of tenant-right. On the whole serfdom appears as a characteristic corollary of feudalism. It grew up as a consequence of customary subjection and natural husbandry; it melted away with the coming in of an industrial and commercial age.

Authorities. — Wallon, Histoire de Vesclavage dans I'antiquite; Pauly-Wissowa, Realencyklopadie des klassischen Altertums, s.v. " Coloni "; Fustel de Coulanges, Recherches sur quelques problhmes d' histoire; Institutions politiques de la France {L'alleu et le domaine rural); F. Seebohm, English Village Community (1883); P. Vino-gradoff, The Growth of the Manor (1905); G. Waitz, Deutsche Verfas- sungsgeschichte (1844, fF.); P. Viollet, Histoire du droit francais (3rd ed., 1905) ; Engelmann, Geschichte der Leibeigenschaft in Russ- land; Kluchevsky, Lectures on the History of Russia (in Russian), ii. (1 906) ; G. Hansen, Die A ufhebung der Leibeigenschaft in Schleswig und Holstein (1861) ; G. F. Knapp, Die Bauernbefreiungin Preussen (1887) ; Handworterbuch der Staatswissenschaften, ed. by Conrad and Lexis, s.vv. " Bauernbefreiung," " Unfreiheit," " Grundherrschaft." (P.Vi.)

SERGEL, JOHAN TOBIAS (1 740-1814), Swedish sculptor, was born on the 8th of September 1740 in Stockholm. After studying for some time in Paris he went to Rome, where he remained for twelve years and sculptured a number of groups in marble, including, besides subjects from classical mythology, a colossal representation of " History," in which are depicted the achievements of Gustavus Adolphus before the Chancellor Oxenstierna. It was in Rome also that he modelled the statue of Gustavus III., subsequently cast in bronze and purchased by the city of Stockholm in 1796. Sergei returned to Stockholm in 1779 an d continued to produce his works there. Among them are a tomb for Gustavus Vasa, a monument to Descartes, and a large relief in the church of St Clarens in Stockholm, representing the Resurrection. He died in his native city on the 26th of February 18 14.

SERGINSK, UPPER and LOWER, two towns of East Russia, in the government of Perm, 53 and 44 m. W.S.W. of Ekaterin- burg respectively. They are noted for their iron-works. Upper Serginsk, which had a population of 8000 in 1897, yields annually over 8000 tons of pig-iron and 12,000 tons of steel. Lower Serginsk, with 14,000 inhabitants, yields about 7250 tons of pig- iron and 14,500 tons of steel. The latter town is well built and has a monument to Alexander II. Mineral waters (sulphurous) are found close by.

SERGIPE (originally Sergipe d'el-Rey), a small Atlantic state of Brazil, bounded N. by Alagoas, E. by the Atlantic, and S. and W. by Bahia. Area, 15,093 sq. m. Pop. (1900) 356,264, three-fourths half-castes and negroes. The Sao Francisco forms its northern boundary, and the drainage of the northern part of the state is northward and eastward to that river. The southern half of the state, however, slopes eastward and is drained directly into the Atlantic through a number of small rivers, the largest of which are the Irapiranga (whose source is in the state of Bahia and which is called Vasa Barris at its mouth), the Real, and the Cotinguiba. These streams are navigable for short distances, but are obstructed by sand-bars at their mouths, that of Cotinguiba being especially dangerous. The surface of the state resembles in part that of Bahia, with a zone of forested lands near the coast, and back of this a higher zone of rough open country, called agrestes. There is a sandy belt along the coast, and the western frontier is slightly mountainous. The intermediate lands are highly fertile, especially in the forested region, where the rainfall is abundant. Further inland the year is divided into wet and dry seasons with occasional prolonged droughts. These districts are pastoral, and the lower fertile lands are cultivated for sugar, cotton, maize, tobacco, I rice, beans, and mandioca — sugar being the principal product.

Rubber and some other natural products are exported. There is only one railway in the state, which runs from Aracaju north- ward to Capella, with a branch running westward to Simao Dias. The only manufacturing industries of importance are cotton mills, sugar factories and distilleries, one of the largest sugar usines in Brazil being located at Riachuelo near Larangeiras. There are no good ports on the coast because of the bars at the mouths of the rivers.

The capital of the state is Aracaju (pop. 1890, 16,336; 1906 estimate, 25,000), on the lower course, or estuary, of the Cotin-guiba river, near the coast. The bar at the entrance to this river is exceptionally dangerous, and the port is frequented only by coasting vessels of light draught. The town stands on a sandy plain, and there are sand dunes within the city limits. The public buildings are a large plain church with unfinished twin towers, the government palace, the legislative halls, a normal school and public hospital. The other principal towns are Estancia (pop. 1890, 14,555) on the Rio Real in the southern part of the state, with manufactures of cotton textiles,

cigars and cigarettes, and soap, and an active trade; Laranjeiras (11,350), in a highly productive sugar district N. of the capital; Capella (11,034); Simao Dias (10,984); Lagarto (10,473); Sao Christovao, formerly Sergipe d'el-Rey (8793), the old capital, near the mouth of the Irapiranga, and Maroim (7851).

SERGIUS, ST, generally associated with St Bacchus, one of the most celebrated martyrs of Christian antiquity. His festival is on the 7th of October, and the centre of his cult was Resafa, or Rosafa, in Syria, in the province of Augusta Euphratesia. This town, which since the middle of the 6th century was also called Sergiopolis, acquired importance as a place of pilgrimage, and became a bishop's see (Le Quien, Oriens Christ, ii. 951). The cult of the saint spread rapidly. In 353 we find a church of St Sergius at Eitha, in Batanaea (Waddington, Inscriptions de Syrie, n. 2124) — the most ancient example of a dedication of this kind. In the 6th century St Sergius was honoured in the West (Gregory of Tours, De gloria martyrum, 96). According to their Acta (which, however, have little authority), SS. Sergius and Bacchus were soldiers. In art they are most generally represented in military costume.

See Acta sanctorum (October), iii. 833-883; Analecta Bollandiana, xiv. 373-395- (H. De.)

SERGIUS, the name of four popes.

Sergius I., pope from 687 to 701, came of an Antiochene family which had settled at Palermo. He was elected after a fierce struggle between two other candidates, Paschal and Theodore. In the second year of his pontificate he baptized King Ceadwalla of Wessex at Rome. For rejecting certain canons of the Trullan (Quinisext) council of 692, Justinian II. com- manded his arrest and transportation to Constantinople, but the militia of Ravenna and the Pentapolis forced the imperial protospatharius to abandon the attempt to carry out his orders. Sergius was followed by John VI. as pope.

Sergius II., pope from 844 to 847, a Roman of noble birth, elected by the clergy and people to succeed Gregory IV., was forthwith consecrated without waiting for the sanction of the emperor Lothair, who accordingly sent his son Louis with an army to punish the breach of faith. A pacific arrangement was ultimately made, and Louis was crowned king of Lombardy by Sergius. He was a man of weak health, suffering much from gout, and abandoned the direction of affairs to unworthy persons, whose administration provoked many complaints. In this pontificate Rome was ravaged, and the churches

of St Peter and St Paul robbed, by Saracens (August 846) . Sergius was succeeded by Leo IV.

.Sergius III., elected pope by one of the factions in Rome in 898, simultaneously with John IX., was expelled from the ■city by his adversaries. Circumstances becoming more favour- able, he reappeared in 904, seized the two claimants, Leo V. and Christopher, who were disputing the succession of Benedict IV., and had them strangled. His adherents rallied round the vestiarius Theophylact, a powerful Roman functionary, and his wife Theodora. Sergius is reputed to have been the lover of

Theodora's daughter Marozia, by whom he is said to have had a son, who became pope as John XI. This is the beginning of the so-called " pornocracy." Unlike John IX. and his successors, Sergius was very hostile to the memory of Pope Formosus, and refused to recognize any of the ordinations celebrated by him, thus causing grave disorders. He also affected to consider as anti-popes, not only John IX., but also his successors down to and including Christopher. He restored the Lateran basilica, which had fallen down in 897. He died on the 14th of April 911, and was succeeded by Anastasius III.

Sergius IV., pope from 1009 to 1012, originally bore the name of Bucca porca (Os porci). He was a mere tool in the hands of the feudal nobility of the city; he was succeeded by Benedict VIII.

SERGIYEVO, a town of Russia, in the government of Moscow, 44 m. by rail N.N.E. of Moscow. It has grown up round the monastery or lavra of Troitsko-Sergiyevskaya. It is situated in a beautiful country, the buildings extending partly over the hill occupied by the monastery and partly over the valley below. Including the suburbs it had, in 1884, 31,400 inhabitants, and 3i,4T3 in 1900. Sergiyevo has long been renowned for its manu- facture of holy pictures (painted and carved) , spoons, and other articles carved in wood, especially toys, which are sold to pilgrims who resort to the place to the number of 100,000 annually.

The Troitsk or Trinity monastery is the most sacred spot in middle Russia, the Great Russians regarding it with more veneration than even the cathedrals and relics of the Kremlin at Moscow. It occupies a picturesque site on the top of a hill, protected on two sides by deep ravines and steep slopes. The walls, 25 to 50 ft. in height, are fortified by nine towers, one of which is a prison for both civil and ecclesiastical offenders. Thirteen churches, including the Troitskiy (Trinity) and Uspen- skiy cathedrals, a bell-tower, a theological

academy, various buildings for monks and pilgrims, and a hospital stand within the precincts, which are two-thirds of a mile in circuit. A small wooden church, erected by the monk Sergius, and afterwards burned (1391) by the Tatars, stood on the site now occupied by the cathedral of the Trinity, which was built in 1422, and contains the relics of Sergius, as well as ecclesiastic treasures of priceless value and a holy picture which has frequently been brought into requisition in Russian campaigns. The Uspensky cathedral was erected in 1585; close beside it are the graves of Tsar Boris Godunov (died in 1605) and his family. In the southern part of the monastery is the church of Sergius, beneath which are spacious rooms where 200,000 dinners are distributed gratis every year to the pilgrims. The bell-tower, 320 ft. high, has a bell weighing 64 tons. Several monasteries of less importance exist in the neighbourhood. In 1340 two brothers erected a church on the spot. The elder took monastic orders under the name of Sergius, and became famous among the peasants around. His monastery acquired great fame and became the wealthiest in middle Russia. Ivan the Terrible in 1561 made it the centre of the ecclesiastical province of Moscow. During the Polish invasion at the beginning of the 17th century it organized the national resistance. In 1608-1609 it withstood a sixteen months' siege by the Poles; at a later date the monks took a lively part in the organization of the army which crushed the outbreak of the peasants. In 1685 Peter the Great took refuge here from the revolted strellzi, or Muscovite military guards. The theological seminary, founded in 1744 and transformed in 1814 into an academy, reckoned Plat on and Philarete among its pupils.

SERIEMA, or Cariama, a South-American bird, sufficiently well described and figured in G. de L. Marcgrav's work (Hist, rer. nat. Brasiliae, p. 203), posthumously published by De Laet in 1648, to be recognized by succeeding ornithologists, ' among whom M. J. Brisson in 1760 acknowledged it as forming a distinct genus Cariama, while Linnaeus regarded it as a second species of Palamedea (see Screamer), under the name of P. cristata, English by J. Latham in 1785 (Synopsis, v. 20) the " Crested Screamer," — an appellation since transferred to a wholly different bird. Nothing more seems to have been known of it in Europe till 1803, when Azara published at Madrid his

observations on the birds of Paraguay (Apuntamientos, No. 340),

wherein he gave an account of it under the name of " Saria," which it bore among the Guaranis, — that of " Cariama " being applied to it by the Portuguese settlers, and both expressive of its ordinary cry. 1 It was not, however, until 1809 that this very remarkable form came to be autoptically described scientifically. This was done by the elder Geoff roy St-Hilaire {Ann. du musium, xiii. pp. 362-370, pi. 26), who had seen a specimen in the Lisbon museum; and, though knowing it had already been received into scientific nomenclature, he called it anew Microdactylias marcgravii. In 181 1 J. K. W. Illiger, without having seen an example, renamed the genus Dicholophus — a term which has since been frequently applied to it — placing it in the curious congeries of forms having little affinity which he called Alectorides. In the course of his travels in Brazil (1815-1817), Prince Max of Wied met with this bird, and in 1823 there appeared from his pen N. Act. Acad. L.-C. nat. curiosorum, xi. pt. 2, pp. 341-350, tab. xlv.) a very good contribution to its history, embellished by a faithful life-sized figure of its head. The same year Tem- minck figured it in the Planches colonies (No. 237). It is not easy to say when any example of the bird first came under the eyes of British ornithologists; but in the Zoological Proceedings for

Seriema.

1836 (pp. 29-32) W. Martin described the visceral and osteological anatomy of one which had been received alive the preceding year. The Seriema, owing to its long legs and neck, stands some two feet or more in height, and in menageries bears itself with a stately deportment. Its bright red beak, the bare bluish skin surrounding its large grey eyes, and the tufts of elongated feathers springing vertically from its lores, give it a pleasing and animated expression ; but its plumage generally is of an inconspicuous ochreous grey above and dull white beneath, — the feathers of the upper parts, which on the neck and throat are long and loose, being barred by fine zigzag markings of dark brown, while those of the lower parts are more or less striped. The wing-quills are brownish black, banded with mottled white, and those of the tail, except the middle pair, which are wholly greyish brown, are banded with mottled white at the base and the tip, but dark brown for the rest of their length. The legs are red. The Seriema inhabits the campos or elevated open parts of Brazil, from the neighbourhood of Pernambuco to the Rio de la Plata, extending inland as far as Matto Grosso (long. 6o°), and occurring also, though sparsely, in Paraguay. It lives in the high grass, running away in a stooping posture to avoid discovery on being approached, and taking flight only at the utmost need. Yet it builds' its nest in thick bushes or trees at about a man's height from the ground, therein laying two

eggs, which Professor Burmeister likens to those of the Land-Rail in colour. 2 The young are hatched

1 Yet Forbes states (Ibis, 1881, p. 358) that Seriema comes from Siri, " a diminutive of Indian extraction," and Etna, the Portuguese name for the Rhea (see Emeu), the whole thus meaning " Little Rhea."

2 This distinguished author twice cites the figure given by Thiene- mann (Fortpflanzungsgesch. gesammt. Vogel, pi. lxxii. fig. 14) as

fully covered with grey down, relieved by brown, and remain for some time in the nest. The food of the adult is almost exclusively animal, — insects, especially large ants, snails, lizards and snakes, but it also eats certain large red berries.

Until i860 the Seriema was believed to be without any near relative in the living world of birds; 3 but in the Zoological Pro- ceedings for that year (pp. 334-336) G. Hartlaub described an allied species discovered by H. C. C. Burmeister in the territory of the Argentine Republic. 4 This bird, which has since been regarded as entitled to generic division under the name of Chunga burmeisteri (P.Z.S., 1870, p. 466, pi. xxxvi.), and seems to be known in its native country as the " Chunnia," differs from the Seriema by fre- quenting forest or at least bushy districts. It is also darker in colour, has less of the frontal crest, shorter legs, a longer tail, and the mark- ings beneath take the form of bars rather than stripes, while the bill, eyes and legs are all black. In other respects the difference between the two birds seems to be immaterial.

There are few birds which have more exercised the taxonomer than this, and the reason seems to be plain. The Seriema must be regarded as the not greatly modified heir of some very old type, such as one may fairly imagine to have lived before many of the existing groups of birds had become differentiated, and it is probable that the extinct birds known as Stereornithes, and in particular the fossil Phororhachos from the Miocene of Patagonia, were closely allied to its ancestors. It is now placed in the family Cariamidae of Gruiform birds (see Bird). (A. N.)

SERIES (a Latin word from serere, to join), a succession or sequence. In mathematics, the term is applied to a succession of arithmetical or algebraic quantities (see below) ; in geology it is synonymous with formation, and denotes a stage in the classifica- tion of strata, being superior to group (and consequently to bed, and zone or horizon)

and inferior to system; in chemistry, the term is used particularly in the form homologous series, given to hydrocarbons of similar constitution and their derivatives which differ in empirical composition by a multiple of CH 2 , and in the form isologous series, applied to hydrocarbons and their deriva- tives which differ in empirical composition by a multiple of H 2 ; it is also used in the form isomorphous series to denote elements related isomorphously. The word is also employed in zoological and botanical classification.

In mathematics a set of quantities, real or complex, arranged in order so that each quantity is definitely and uniquely deter- mined by its position, is said to form a series. Usually a series proceeds in one direction and the successive terms are denoted by «i, Uz, . . . u n , ... ; we may, however, have a series pro- ceeding in both directions, a back-and-forwards series, in which case the terms are denoted by

. . . U-m, . . . M_2, W_i, Wo, Ui, U 2 , . . . tl,, . . . ;

or its general term may depend on two integers positive or nega- tive, and its general term may be denoted by u m , „; such a series is called a double series, and so on. The number of terms may be limited or unlimited, aiid we have two theories, (1) of finite series and (2) of infinite series. The first concerns itself mainly with the summation of a finite number of terms of the series; the notions of convergence and divergence present themselves in the theory of infinite series.

Finite Series. 1. When we are given a series, it is supposed that we are given the law by which the general term is formed. The first few terms of a series afford no clue to the general term; the series of which the first four terms are 1, 2, 4, 8, may be the series of whioh the general term is 2"; it may equally well be the series of which the general term is i(n 3 +$n+6); in fact we can construct an infinite number of series of which the leading terms shall be any assigned quantities. The only case in which the series may be completely determined from its leading terms is that of a " recurring series." A recurring series is a series in which the consecutive terms, after the earlier ones, are connected by a linear relation ; thus if we have a relation of the form

the series is said to be a recurring series with a scale of relation

though taken from a genuine specimen ; but little that can be called Ralline in character is observable therein. The same is to be said of an egg laid in captivity at Paris; but a specimen in Mr Walter's

possession undeniably shows it (cf. Proc. Zool. Society, 1881, p. 2).'

3 A supposed fossil Cariama from the caves of Brazil, mentioned by Bonaparte (C.R. xliii. p. 779) and others, has since been shown by " Reinhardt (Ibis, 1882, pp. 321-332) to rest upon the misinterpretation of certain bones, which the latter considers to have been those of a Rhea.

4 Near Tucuman and Catamarca (Burmeister, Reise durch die La Plata Staaten, ii. p. 508).

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do + a.\x + OiX 2 + . . . \'a p x*. It is clear that we can regard the series UQ--U\X--utf?\ . . .as the expansion in powers of x of an expression of the form

(b hx . . . +b p ixv l)l{oo+aix+ . . . +a P x"), and by splitting this expression into partial fractions we can obtain the general term of the series. If we know that a series is a recurring series and know the number of terms in its scale of relation, we can determine this scale if we are given a sufficient number of terms of the series and obtain its general term. It follows that the general term of a recurring series is of the form X(n)a", where 0(n) is a rational integral algebraic function of n, and o is independent of n. The series whose general term is of the form Ka"+4>(»), where {n) is a rational integral algebraic function of degree r, is a recurring series whose scale of relation is (1— ax) (1 — x) rn , but the general term of this series may be obtained by another method. Suppose we have a series Mo, u \, ih,... From this we can form a series v< >, »i, ˆ2, ... where !/n = «n+i—«»; from Vo, Vi, i>2, . . . we similarly form another series and so on ; we write v n =Au n , and we suppose E to be an operation such that Eun=K n+ i (the notation is that of the calculus of finite differences); the operations E and 1 +A are equivalent and hence the operations E n and (i+A)" are equivalent, so that we obtain Wn = w + «Awo +

' — A 2 « + • • • This is true whatever the form of w„. When

tt» is of the form Ka n +(n), where <#>(n) is of degree r, AˆMo, Aˆtto, . . . form a geometrical progression, of which the common difference is a — I , or vanish if the term Ko™ is absent. In either case we readily obtain the expression for tin.

2. The general problem of finite series is to find the sum of n terms of a series of which the law of formation is given. By finding the sum to n terms is meant finding some simple function of n, or a sum of a finite number of simple functions, the number being independent of n, which shall be equal to this sum. Such an ex- pression cannot always be found even in the case of the simplest series. The sum of n terms of the arithmetic progression a, 0+6, a+26, ... is na + \n(n — i)b; the sum of n terms of the geometric progression a, ab, ab 1 , ...is 0(1 — 6")/(i— 6) ; yet we can find no simple expression to represent the sum of n terms of the harmonic progression

3. The only type of series that can be summed to n terms with complete generality is a recurring series. If we let Sn = Mo+ˆi*+ . . . +u n -\x n ~ 1 , where «o, ... is a recurring series with a given scale of relation, for simplicity take it to be 1+px+qx 2 , we shall have

S„(l +pX+qX 2) =Ho + (ui+pUo)x + (j>Un-l+qUn-.2)X n +qiln-lX' i+1 .

If x had a value that made l--px+qx 2 vanish, this method would fail, but we could find the sum in this case by finding the general term of the series. For particular cases of recurring series we may proceed somewhat differently. If the nth term is u n x" we have from the equivalence of the operations E and I +A,

UlX--UiX*-- .

+UnX n =

XUi-

ˆUn+l . X 2 A«1— X" +2 Attn+l

+ "

+

(I-*) 2 X 3 A 2 Ul — 3C" +3 A 2 Mn+l (I-X) 3

in general, and for the case of x = unity we have

. . . .n.n — 1 n.n — l.n — 2 A , «l+«2 + • • • +Kn=»ttH — ˆ— AwH j-5-r A 2 Mi + . . .,

which will give the sum of the series very readily when «„ is a

polynomial in n or a polynomial f a term of the form Ka".

4. Other types of series, when they can be summed to n terms at all, are summed by some special artifice. Summing the series to 3 or 4 terms may suggest the form of the sum to n terms which can then be established by induction. Or it may be possible to express u„in the form Wn+i—w n , in which case the su m to n terms is %i- Wi. Th us, if Un = a(a+b)(a+2b) . . . (a+n — ib)/c(c+b)(c+2b) . . . (c +« — ife), the relation (c+nb) ua+i = {a+nb)u n can be thrown into the form {c+nb)u n+ i — (c+n — ib)u„ = (a—c+b)un, whence the sum can be found. Again, if M n = tan nx tan (n--l)x, th e summation can be effected by writing «„ in the form cot x (tan n-- \x — tan nx) — I . Or a series may be recognized as a coefficient in a product. Thus, if /(x) = «o+Mi#+«2X 2 + . . ., «o+«i+..-+Mn is the coefficient of x" in f{x)l(i —x) ; in this way the sum of the first n coefficients in the expansion of (1 — x)~ k may be found. The sum of one series may be deduced from that of another by differentiation or integration. For further information the reader may consult G. Chrystal's Algebra (vol. ii.).

5. The sum of an infinite series may be deduced from the sum to n terms, when this is known, by increasing n indefinitely and finding the limit, if any, to which it tends, but a series may often be summed to infinity when it cannot be summed to n terms; the

TIT ir 2

sum of the infinite series T2+r2+rj+. . is g, the sum to n terms

cannot be found.

For methods and transformations by means of which the sum to

n terms of a series may be found approximately when it cannot be found exactly, the reader may consult G. Boole's Treatise on the Calculus of Finite Differences.

Infinite Series. 6. Let Mi, %, « 3 , . . . «„, be a series of numbers real or complex, and let S» denote Mi+«2+. . . +«„. We thus form a sequence of numbers Si,S 2 , . . . S». This sequence may tend to a definite finite limit S as n increases indefinitely. In this case the series Ui +« 2 + . . . +«» is said to be convergent, and to converge to a sum S. If by taking n sufficiently large |S„| can be made to exceed any assignable quantity, however large, the series is said to be divergent. If the sequence Si, S 2 , . . . tends to finite but different limits according to the form of n the series is said to oscillate, and is

also classed under the head of divergent series. The sum of n terms of the geometric series i+x+x' i + . . .is (1 — x")/(i — x). If x is less than unity S„ clearly tends to the limit 1/(1— x), and the series is con- vergent and its sum is 1/(1 — x). If x is greater than unity S„ clearly can be made greater than any assignable quantity by taking n large enough, and the\eries is divergent. The series 1— 1 + 1 — 1 + . .., where S„ is unity or zero, according as n is odd or even, is an example of an oscillating series. The condition of convergency may also be presented under the following form. Let p R n denote §„+,,— S„: let c be any arbitrarily assigned positive quantity as small as we please; if we can find a number m such that for m = ox>n, UR n | <« for all values 1, 2,... of p, then the series converges. The least value of the number m corresponding to a given value of e, if it can be found, may be regarded as a measure of rapidity of the con- vergency of the series ; it may happen that when u n involves a variable x, m increases indefinitely as x approaches some value; in this case the convergence of the series is said to be infinitely slow for this value of x.

7. An infinite series may contain both positive and negative terms. The terms may be positive and negative alternately or they may occur in groups which without altering the order of the terms of the series may each be collected into a single term; thus all series may be regarded as belonging to one of two types, «i+M2+«3 + . . .in which the terms are all positive, or U\— Uz--Uz — . . .in which the terms are alternately positive and negative.

8. It is clear that if a series is convergent u n must tend to the limit zero as n is increased indefinitely. This condition though necessary is by no means sufficient. If all the terms of a convergent series are positive a series obtained by writing its terms in any other order is convergent and converges to the same sum. For if S a denotes the sum of n terms of the first series and 2„ denotes the sum of n terms of the new series, then, when n is any large number, we can choose numbers p and q such that S g > 2„ > S;, ; so that 2„ tends to the common limit of S p and S s , which is the sum of the original series. If «i, u 2 , u s ,... are all positive, and if after some fixed term, say the p' h , u n continually decreases and tends to the limit zero, the series «i— W2+M3— «4+ ... is convergent. For |S M .2„ — S ? j lies between |w P -n— u p+ A and \u p+ i — u p+ 2„\ so that, when n is increased indefinitely, |S p+2n | remains finite; also ISyˆn+i— S JH .2n| tends to zero, so that the series converges. If «„ tends to a limit a, distinct from zero, then the series v\— v 2 --Vz— . . ., where »„=«„— a, converges and the series «i— M2+M3. . . oscillates. As examples we may take the series 1— J + i — i+ ... and 2— f + | —

1+ ...; the first of these converges, the second oscillates.

9. The series Ui+u 3 Us . . . , u 2 +Ui+u 6 + . . . may each of them diverge, though the series «i — « 2 +«3— •• .converges. A series such that the series formed by taking all its terms positively is convergent is said to be absolutely convergent; when this is not the case the series ie said to be semi-convergent or conditionally con- vergent. A series of complex numbers in which «„ = ^>„ +ig„, where /> n and g„are real (i being V — 1), is said to be convergent when the series £1+^2 £3. . . , 2i+32+2s+--- ar e separately convergent, and if they converge to P and Q respectively the sum of the series is P+t'Q. Such a series is said to be absolutely convergent when the series of moduli of u n , i.e., 2(£„ 2 +g„ 2)i, is convergent; this is sufficient but not necessary for the separate convergence of the p and q series.

There is an important distinction between absolutely convergent and conditionally convergent series. In an absolutely convergent series the sum is the same whatever the order of the terms; this is not the case with a conditionally convergent series. The two series I-I+W +---, and i+W + ^+W+..., in which the terms are the same but in different orders, are convergent but not absolutely convergent. If we denote the sum of the first by S and the sum of the second by 2 it can be shown that 2 = |S. G. F. B. Riemann and P. G. L. Dirichlet have shown that the terms of a semi- convergent series may be so arranged as to make the series converge to any assigned value or even to diverge.

10. Tests for convergency of series of positive terms are obtained by comparing the series with some series whose convergency or divergency is readily established. If the series of positive terms M1+W2+W3+. • •, fli+?>2+!>3 + . . • are such that u n /v n is always finite, then they are convergent or divergent together; if Un +i/unv n+ ilv n and 2d„ is divergent, then 2m„ is divergent. By comparison with the ordinary geometric progression we obtain the

following tests. If *V«n approaches a limit I as n is indefinitely increased, Xu„ will converge if I is less than unity and will diverge if / is greater than unity (Cauchy's test) ; if M n i/«» approaches a limit / as n is indefinitely increased, S« n will converge if I is less than unity and diverge if I is greater than unity (D'Alembert's test). Nothing is settled when the limit / is unity, except in the case when /

remains greater than unity as it approaches unity. The series then diverges. It may be remarked that if «„:/«» approaches a limit and n -4un approaches a limit, the two limits are the same. The choice of the more useful test to apply to a particular series depends on its form.

In the case in which w„ + i/m„ approaches unity remaining constantly less than unity, J. L. Raabe and J. M. C. Duhamel have given the following further criterion. Write ujun + i = l + a n , where a„ is positive and approaches zero as n is indefinitely increased. If na„ approaches a limit /, the series converges for/ > i and diverges for / < 1 . For l = i nothing is settled except for the case where / remains constantlyjess than unity as it approaches it; in this case the series diverges. /

If /(».) is positive and decreases as n increases, the series Xf(n) is convergent or divergent with the series 2a n /(o”) where a is any number >2 (Cauchy's condensation test). By means of this theorem we can show that the series whose general terms are

l _i 1 1

*» a ‘ n(lra) a ‘ nln(l 2 n)«’ »l»l 2 n(l 3 re) < *' ' ' " where In denotes log n, Vn denotes log-log n, I'm denotes log log log n, and so on, are convergent if a > 1 and divergent if a = or < I.*

By comparison with these series, a sequence of criteria, known as the logarithm criteria, has been established by De Morgan and J. L. Bertrand. A. De Morgan's form is as follows: writing #„ = i/#(»), put p = x‘(x)!(x), £i = (po-i)l,/>2 = fe-l)l 2 *,£3 = (>2~l)l3»:,. . . where l r x denotes log log log. . .x. If the limit, when x is infinite, of the first of the functions p , pi, p\,.,., whose limit is not unity, is greater than unity the series is convergent, if less than unity it is divergent.*

In Bertrand's form we take the series of functions

1— /In, 1— /Vn, 1 ,-;

/!'».■

If the limit, when n is infinite, of the first of these functions, whose limit is not unity, is greater than unity the series is convergent, if less than unity it is divergent. Other forms of these criteria may be found in Chrystal's Algebra, vol. ii.

Though,, sufficient to test such series as occur in ordinary mathematics, it is possible to construct series for which they entirely fail. It follows that in a convergent series not oniy must we have Lt u n = but also Lt nu n = o, Lt n\nu n = 0, &c. Abel has, however, shown that no function (n) can exist such that the series 2k„ is convergent or divergent as Lt (n)u„ is or is not zero.

11. Two or more absolutely convergent series may be added together, thus («i +« 2 + ...) + (»i +v 2 + ...) = (ui+Vi) + (ui +v 2) + . . . , that is, the resulting series is absolutely convergent and has for its sum the sum of the sums of the two series. Similarly two or more absolutely convergent series may be multiplied together thus {ui+u 2 +u 3 + ■ . .) {V1+V2+V3+ . . .) =UiV l + (mv2+u i vi) + {uiv, +

, 1ty>2 + U3Vl) + ...,

and the resulting series is absolutely convergent and its sum is the product of the sums of the two series. This was shown by Cauchy, who also showed that the series Xw„, where H'„ = ttii; n +w 2 »„_-i + . . . +u n vi, is not necessarily convergent when both series are semi- convergent. A striking' instance is furnished by the series 1 — ^- +

V3 V4^"

which is convergent, while its

(75+$)

V2

square l ~^+

may be shown to be divergent. F. K. L. Mertens

*2_*

VV3

has shown that a sufficient condition is that one of the two series should be absolutely convergent, and Abel has shown that if ~Lw n converges at all, it converges to the product of S«„ and Xv n . But more properly the multiplication of two series gives rise to a double series of which the general term is u m v n .

12. Before considering a double series we may consider the case of a series extending backwards and forwards to infinity

. ._.«_„ + . . . + U-2 + U-1 + 1I0 + UI + UV + . . . «„. . .

Such a series may be absolutely convergent and the sum is then independent of the order of the terms and is equal to the sums of the two series u„ + Ui + u 2 + . . . and M-1 + W-2 + . . ., but, if not absolutely convergent, the expression has no definite meaning until it is explained in what manner the terms are intended to be grouped together; for instance, the expression may be used to denote the foregoing sum of two series, or to denote the series u + (wi + tt-i) + («2 + U-2J + . . . , and the sum may have different values, or there may be no sum, accordingly. Thus, if the series be ...—§ — } + 0 + i. • ., with the former meaning the two series o + J + i + • •„• and — J — J — . . . are each divergent, and there is no sum; but with the latter meaning the series is 0 + 0 + 0 + ■ . . which has a sum o. So, if the series be taken to denote the limit of (ua + Ui + . . . + «„) + (m_i + m_ + . . . + u-m), where n and m are each of them ultimately

infinite, there may be a sum depending on the ratio n : m, which sum acquires a determinate value only when this ratio is given. In the case of the series given above, if this ratio is k, the sum of the series is log k.

13. In a singly infinite series we have a general term «„, where n is an integer positive in the case of an ordinary series, and positive or negative in the case of a back-and-forwards series. Similarly for a doubly infinite series we have a general term u m , n where m, n are integers which may be each of them positive, and the form of the series is then

#0,0, Wo,l, Uq,z, . . . Wl,o, Ml,!, Ml, 2, . . .

or they may be each of them positive or negative. The latter is the more general supposition, and includes the former, since Um,„ may = 0, for m or n each or either of them negative. To attach a definite meaning to the notion of a sum, we may regard m, n as the rectangular coordinates of a point in a plane ; if m and n are each positive we attend only to the positive quadrant of the plane, but otherwise to the whole plane. We may imagine a boundary depending on a parameter T, which for T infinite is at every point thereof at an infinite distance from the boundary ; for instance, the boundary may be the circle * 2 + y 2 = T, or the four sides of a rectangle, x = ˆaT, y = ±| 8T. Suppose the form is given and the value of T, and let the sum S m

, n be understood to denote the sum of the terms u m , n within the boundary, then, if as T increases without limit, S m , n continually approaches a determinate limit (dependent, it may be, on the form of the boundary) for such form of boundary the series is said to be convergent, and the sum of the doubly infinite series is the limit of S m> „. The condition of convergency may be otherwise stated ; it must be possible to take T so large that the sum R m ,„ for all terms u mtn which correspond to points outside the boundary shall be as small as we please.

14. It is easy to see that, if each of the terms u m , n is positive and the series is convergent for any particular form of boundary, it will be convergent for any other form of boundary, and the sum will be the same in each case. Suppose that in the first case the boundary is the curve fi(x, y) =T. Draw any other boundary fc(x, y) =T . Wholly within this we can draw a curve fi(x, y)=Ti of the first family, and wholly outside it we can draw a second curve of the first family, fi(x, y) = T 2 . The sum of all the points within f 2 {x, y) =T' lies between the sum of all the points within fi(x, y) =Ti and the sum of all the points within fi{x, y)=T 2 . It therefore tends to the common limit to which these two last sums tend. The sum is therefore independent of the form of the boundary. Such a series is said to be absolutely convergent, and similarly a doubly infinite series of positive and negative terms is absolutely convergent when the series formed by taking all its terms positively is convergent.

15. It is readily seen that when the series is not absolutely convergent the sum will depend on the form of the boundary. Consider the case in which m and n are always positive, and the boundary is the rectangle formed by x=m, y = n, and the axes. Let the sum within this rectangle be S m ,„. This may have a limit when we first make n infinite and then m ; it may have a limit when we first make m infinite and then n, but the limits are not necessarily the same; or there may be no limit in either of these cases but a limit depending on the ratio of m to «,that is to say, on the shape of the rectangle.

When the product of two series is arranged as a doubly infinite series, summing for the rectangular boundary x = aT, y =j8T we obtain the product of the sums of the series. When we arrange the double series in the form Mi!>i + (miz;2+m 2 i»i) + . . . we are summing over the triangle bounded by the axes and the straight line x+y = T, and the results are not necessarily the same if the terms are not all posi- tive. For full particulars concerning multiple series the reader may consult E. Goursat, Cows d'analyse, vol. i. ; G. Chrystal, Algebra, vol. ii. ; or T. J. I'A. Bromwich, The Theory of

Infinite Series.

16. In the^ series so far considered the terms are actual numbers, or, at least, if the terms are functions of a variable, we have con- sidered the convergency only when that variable has an assigned value. In the case, however, of a series mi(z)+m 2 (z) + . . . , where Ui(z), w 2 (z),._. . are single-valued continuous functions of the general complex variable 2, if the series converges for any value of z, in general it converges for all values of z, whose representative points lie within a certain area called the " domain of convergence " and within this area defines a function which we may call S(z). It might be supposed that S(z) was necessarily a continuous function of z, but this is not the case. G. G. Stokes (1847) and P. L. Seidel (1848) independently discovered that in the neighbourhood of a point of discontinuity the convergence is infinitely slow and thence arises the notion of uniform and non-uniform convergence.

17. If for any value of z the series Ki(z)+« 2 (z) + . . .converges it is possible to find an integer n such that |S(z)— S»(s)|<«, |S(z) — Sn +i(z) I <«,... , where e is any arbitrarily assigned positive quantity, however small. For a given j the least value of n will vary through- out any region from point to point of that region. It may, however, be possible to find an integer v which is a superior limit to all the values of n in that region, and we thus have, throughout this region, I S(z) — Sv(z)]_< e,] S (z) — S>- + i(z) |< «. . .where z is any point in the region and v is a finite integer depending only on e and not on z.

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The series is then said to converge uniformly throughout this region.

If, as z approaches the value Zi, n increases as |z-zi[diminishes and becomes indefinitely great as |z-Zi| becomes indefinitely small the series is said to be non-uniformly convergent at the point Zi.

A function represented by a series is continuous throughout any region in which the series is uniformly convergent; there cannot be discontinuity with uniform convergence; on the other hand there may be continuity and non-uniform convergence. If Mi(z)+« 2 (z) + ... is uniformly convergent we shall ha.vefS(z)dz=fui(z)dz--fui(z)dz + ... along any path in the region of uniform convergence; and we shall

also have jjS(z) =^«i(z) +3^2^) + ... if the series ^«i(z) +^Ma(z)

+ . . . is uniformly convergent.

Uniform convergence is essentially different from absolute convergence; neither implies the other (see Function).

18. A series of the form r . . ., in which ao, Qi, ch, ■ ■ ■ are independent of z, is called a power series.

In the case of a power series there is a quantity R such that the series converges if] z | < R, and diverges if | z | > R. A circle de- scribed with the origin as centre and radius R is called the circle of convergence. A power series may or may not converge on the circle of convergence. The circle of convergence may be of*

z 3 infinite radius as in the case of the series for sin z, viz. z r+

3 '

rf— . . . In this case the series converges over the whole of the

z plane. Or its radius may be zero as in the case of the series I +1! z +2 ! z 2 + . . ., which converges nowhere except at the origin. The radius R may be found usually, but not always, from the consideration that a series converges absolutely if |tt„+iM»|i.

A power series converges absolutely and uniformly at every point within its circle of convergence; it may be differentiated or integrated term by term; the function represented by a power -series is continuous within its circle of convergence and, if the series is convergent on the circle of convergence, the continuity extends on to the circle of convergence. Two power series cannot be equal throughout any region in which both are convergent without being identical.

19. Series of the type ao+ai cos z+ch cos 2z-- . . .

+61 sin z+62 sin 2Z+ . . ., where the coefficients , ai, a?, . . . bi, 62, . . . are independent of z, are called Fourier's series. They are of the greatest interest and importance both from the point of view of analysis and also because of their applications to physical problems. For the consideration of these series and the expansion of arbitrary functions in series of this type see Function and Fourier's Series. For the general problem of the development of functions in infinite series of various types see Function.

20. The modern theory of convergence dates from the publication in

1 82 1 of Cauchy's Analyse algebrique. The great mathematicians of the 1 8th century used infinite series freely with very little regard to their convergence or divergence and with, occasionally, very extraordinary results. Series which are ultimately divergent may be used to calculate values of functions in special cases and to represent what are called " asymptotic expansions " of functions (see Function).

Infinite Products.

21. The product of an infinite number of factors formed in succession according to any given law is called an infinite product. The infinite product II„ = (i + %)(l + w 2) . . . (i + w„) is said to be convergent when Ltn_ K n„ tends to a definite finite limit other than zero. If Lt n„ is zero or infinite or tending to different finite values accord- ing to the form of n the product is said to be divergent.

The condition for convergency may also be stated in the following form. (1) The value of n n remains finite and different from zero however great n may become, and (2) Lt n„and Ltn n + r must be equal, when n is increased indefinitely, and r is any positive integer. Since in particular Lt n„ = Lt Iln + i, we must have Lt Un + \ = o. Hence after some fixed term wi, «2, . . . or their moduli in the case of complex quantities, must diminish continually down to zero. Since we may remove any finite number of terms in which \ur\ > 1 without affecting the convergence of the whole product, we may regard as the general type of a convergent product (i + «i)(i + « 2) . . . (i + «n) . . . where |«i|, \ui\, . . . \u n \, . . . are all less than unity and decrease continually to zero.

A convergent infinite product is said to be absolutely convergent where the order of its factors is immaterial. Where this is not the case it is said to be semi-convergent.

22. The necessary and sufficient condition that the product (i + «i)(i M2) ... should converge absolutely is that the series |«i|-t-|«2| . . . should be convergent. If «i, u%, . ■ ■ are all of the same sign, then, if the series M1 + M2 + ... is divergent, the product is infinite if Ui,u 2 , . . . are all positive and zero if they are all negative.

If Mi-(-«2 + ... is a semi-convergent series the product converges, but not absolutely, or diverges to the value zero, according as the -eries tti a +«s 2 + ... is convergent or divergent. These results may

be deduced by considering, instead of n„, log n„ which is the series

log (i+ttO+log (i-r-« 2)-l- . . . (see G. Chrystal's Algebra, vol. ii., or E. T. Whittaker's Modern Analysis, chap, ii.) ; they may also be proved by means of elementary theorems on inequalities (see E. W. Hobson's Plane Trigonometry, chap. xvii.).

23. If Mi, « 2 , . . . are functions of a variable z, a convergent infinite product (1 f«i) (1 +M2) . . . defines a function of z. For such products there is a theory of uniform convergence analogous to that of infinite series. Is is not in general possible to represent a function as an infinite product; the question has been dealt with by Weierstrass (see his Abhandlungen aus der Functionlehre or A. R. Forsyth's Theory of Functions). One of the simplest cases of a function ex pressed as an infinite product is that of sin z/z, which is the value of the absolutely convergent infinite product.

(*-i)(i ■£?)■■■ Otˆs)—

24. K. T. W. Weierstrass has shown that a semi-convergent or divergent infinite product may be made absolutely convergent by the association with each factor of a suitable exponential factor called

sometimes a " convergency factor." The product (i+- Z) (1+—)

g z_

y +ˆ r) ••• is divergent ; the product (1 +-) e " (1 + j-) e *" . . .

is absolutely convergent. The product for sin z/z is semi-convergent when written in the form

(-;)(‘+£) 0-£)0+£)-.

but absolutely convergent when written in the form

. 0-;)« 5 K)«"()«"()«"-

From this last form it can be shown that if

♦«-(‘-) Kt) ■■•(-£) K) (■+£) ... (■+£).

then the limit of <£(z) as m and n are both made infinite in any given ratio is

/m\ – sin z \»/ z

Another example of an absolutely convergent infinite product, whose convergency depends on the presence of an exponential

/ z \ £ + jii factor, is the product zTL (1 — ^ J eo^‘os’ where fi denotes 2mai +

2re&)2, wi and & > 2 being any two quantities having a complex ratio, and the product is taken over all positive and negative integer and zero values of m and n, except simultaneous zeros. This product is the expression in factors of Weierstrass’s elliptic function a\z).

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SERINGAPATAM, or Srirangapatana, a town of India, formerly capital of the state of Mysore, situated on an island of the same name in the Cauvery river. Pop. (1901) 8584. The town is chiefly noted for its fortress, which figured prominently in Indian history at the close of the 18th century. This formid- able stronghold of Tippoo Sultan twice sustained a siege from the British, and was finally stormed in 1799. After its capture the island was ceded to the British, but restored to Mysore in 1881. The island of Seringapatam is about 3 m. in length from east to west and 1 in breadth, and yields valuable crops of rice and sugar-cane. The fort occupies the western side, immediately overhanging the river. Seringapatam is said to have been founded in 1454 by a descendant of one of the local officers appointed by Ramanuja, the Vishnuite apostle, who named it the city of Sri Ranga or Vishnu. At the eastern or lower end of the island is the Lai Bagh or ” red garden,” containing the mausoleum built by Tippoo Sultan for his father Hyder Ali, in which Tippoo himself also lies.

SERJEANT, or Sergeant (from Lat. serviens, servire, to serve, through O. Fr. sergant, serjant, mod. Fr. sergent), the title (1) of a non-commissioned officer in the army and of a sub- ordinate officer of police; (2) of certain officials of the royal household (see Serjeants-at-arms, below). (3) The name was also given formerly to the highest rank of barristers in England and Ireland (see Serjeant-at-L aw). In the middle ages serviens had a variety of applications all connoting the sense of service, from the serviens de pane et mensa, the domestic servant of a monastery, to the servientes de armis, the serjeants-at-arms (Fr. sergeans d'armes) of monarchs, the servientes (sergeans) who were the apparitors of the French king, and vassals who held by a special service (serjeanty, q.v.). The Serjeants (Jratres servientes) formed also an important division of the great military orders (see Saint John of Jerusalem, Knights of the Order of, and Templars). Du Cange (Glossarium, s.v. "Serviens") gives many other instances.

1. Military Title. — In its early military uses the word implied a subordinate, and it is not clear how it came to be used for a minor commander. The " Serjeants " of ordinary medieval armies were the heavy-armed (generally mercenary) cavalry or men-at-arms. In the 15th century it became usual to sub- divide troops of all sorts into groups of dissimilar combatants, graded amongst themselves according to military or social importance. Thus a " lance," or group, might consist of a heavy-armed lancer (man-at-arms), a mounted and a foot archer and an armed valet, and the " Serjeant " would be its most important member. But the general evolution of armies led to their being classed by arms and grouped in more homogeneous regiments. Under such an organization the title of the group- leader lost its cavalry significance and became specifically the designation of an infantry rank. From the cavalry it disappeared altogether, the titles " corporal of horse," " marechal des logis," &c, taking its place. In 16th and 17th century armies the title serjeant is found amongst the highest ranks of an army. With a partial return to the old meaning it signifies, in all its forms, an expert professional soldier, the serjeant of a company, the serjeant-major of a regiment and the serjeant-major-general of the army (these last the originals of the modern ranks, major and major-general) being charged with all duties pertaining to the arraying, camping and drill of their units.

In modern armies the word serjeant is used of a non-com- missioned

officer ranking between corporal and serjeant-major. A " lance-serjeant " is a corporal holding the appointment and performing the duties, but not having the rank of serjeant. The serjeant-major in the British service is a " warrant-officer," although in the cavalry and artillery the ranks of " troop," " squadron " or " battery serjeant-major " are non-commissioned and correspond to the " colour-serjeant " of infantry. This last officer is the senior non-commissioned officer of a company, and has, besides his duties in the colour-party, the pay and accounting work of his unit. The former " corporal of horse " and " corporal-major " still survive in the British Household Cavalry. In Germany, Austria and Russia the regimental serjeant-majors of infantry and cavalry are styled Feldwebel and W achtmeister respectively, while in France the titles are adjudant and marichal des logis or marichal des logis chef.

2. Serjeants-at-Arms. — In the British royal household there are eight serjeants-at-arms, whose duties are ceremonial; they have to be in attendance only at drawing-rooms, levees, state balls and state concerts. There are also two other serjeants-at- arms to whom special duties are assigned, the one attending the Speaker of the House of Commons and the other the lord chancellor in the House of Lords, carrying their maces and executing their orders. The Speaker's serjeant-at-arms is the disciplinary officer of the House of Commons, whose duty it is to expel members at the order of the Speaker and to arrest and keep in custody those persons condemned to this punishment by the authority of the House. The serjeants-at-arms have no special uniform. At court they wear any naval, military or civil uniform to which they may be entitled, or the court dress of those holding legal appointments, but not entitled to wear

robes, i.e. a suit of black cloth, with knee-breeches, lace bands and ruffles, a black silk cocked hat with rosette and steel loop and a sword. A silver collar of office is worn on special occasions. This costume, with the chain, is that worn by the serjeants-at- arms in the House of Lords and the House of Commons always. SERJEANT-AT-LAW, the name (see above) given to what was formerly an order of the highest rank of barristers at the English or Irish bar. The word is a corruption of serviens ad legem, as distinguished from apprenticius ad legem, or utter barrister, who probably originally obtained his knowledge of law by serving a kind of apprenticeship to a serjeant. When the order of Serjeants was instituted is unknown, but it certainly dates from a very remote period. The authority of serjeant counters or countors (i.e. pleaders, those who frame counts in pleading) is treated in the Mirror of Justices, and they are named in 3 Edw. I. c. 29. They may possibly have been the representa- tives of

the conteurs mentioned in the great customary of Normandy. The position of the serjeant had become assured when Chaucer wrote. One of the characters in the Canterbury Tales is

" A serjeant of the law, wary and wise, That often had y-been at the parvis." J

Serjeants (except king's Serjeants) were created by writ of summons under the great seal, and wore a special and distinctive dress, the chief feature of which was the coif, a white lawn or silk skull-cap, afterwards represented by a round piece of black silk at the top of the wig. They enjoyed a social precedence after knights bachelors and before companions of the Bath and other orders. In this they differed from king's counsel, who had simply professional as distinguished from social rank. Socially the serjeant had precedence, professionally the king's counsel, unless indeed, as was often the case, a patent of pre- cedence was granted to the former. The Serjeants at the Irish bar had precedence next after the law officers of the crown. Till past the middle of the 19th century a limited number of the Serjeants were called " king's (queen's) Serjeants." They were appointed by patent and summoned to parliament. Until 1814 the two senior king's Serjeants had precedence of even the attorney-general and solicitor-general. It was the custom for Serjeants on their appointment to give gold rings with mottoes to their colleagues. Down to 1845 the order enjoyed a very valuable monopoly of practice. The Serjeants had the right of exclusive audience as leading counsel in the Court of Common Pleas. In 1834 a royal mandate of William IV. attempted to abolish this privilege, but in 1840 the judicial committee of the privy council declared the mandate informal and invalid. The monopoly was finally abolished in 1845 by Act of Parliament. For at least 600 years the judges of the superior courts of common law were always Serjeants, but by the Judicature Act 1873 no person appointed a judge of the High Court of Justice or the Court of Appeal was required to take or have taken the degree of serjeant-at-law. The Serjeants had their own inn of court known as Serjeants' Inn, which was formerly in two divisions, one in Fleet Street and one in Chancery Lane. In 1758 the members of the former joined the latter. In 1877 the society was dissolved, the inn sold to one of the members and the proceeds divided among the existing Serjeants. The order is now extinct.

See Serviens ad Legem, by Mr Serjeant Manning ; and The Order of the Coif, by Mr Serjeant Pulling.

SERJEANTY. Tenure by serjeanty was a form of land- holding under

the feudal system, intermediate between tenure by knight-service (q.v.) and tenure in socage. It originated in the assignation of an estate in land on condition of the per- formance of a certain duty, which can hardly be described more exactly than as not being that of knight-service. Its essence, according to Pollock and Maitland, might be described as " servantship," the discharge of duties in the household of king or noble; but it ranged from service in the king's host, dis- tinguished only by equipment from that of the knight, to petty

1 The parvis was the porch of old St Paul's, where each serjeant had his particular pillar at which he held interviews with his clients.

renders scarcely distinguishable from those of the rent-paying tenant or socager. Serjeanties, as Miss Bateson has expressed it, " were neither always military nor always agricultural, but might approach very closely the service of knights or the service of farmers. . . . The serjeanty of holding the king's head when he made a rough passage across the Channel, of pulling a rope when his vessel landed, of counting his chessmen on Christmas day,cof bringing fuel to his castle, of doing his carpentry, of finding his potherbs, of forging his irons for his ploughs, of tending his garden, of nursing the hounds gored and injured in the hunt, of serving as veterinary to his sick falcons, such and many others might be the ceremonial or menial services due from a given serjeanty." The many varieties of serjeanty were afterwards increased by lawyers classing for convenience under this head such duties as those of escort service to the abbess of Barking, or of military service on the Welsh border by the men of Archenfield.

Serjeants (servienles) are already entered as a distinct class in Domesday Book (1086), though not in all cases differentiated from the barons, who -held by knight-service. Sometimes, as in the case of three Hampshire serjeanties — those of acting as king's marshal, of finding an archer for his service, and of keeping the gaol in Winchester Castle — the tenure can be definitely traced as far back as Domesday. It is probable, however, that many supposed tenures by serjeanty were not really such, although so described in returns, in inquests after death, and other records. The simplest legal test of the tenure was that Serjeants, though liable to the feudal exactions of wardship, &c, were not liable to scutage; they made in place of this

exaction special composition with the crown.

The germ of the later distinction between " grand " and "petty" serjeanty is found in the Great Charter (1215), the king there renouncing the right of prerogative wardship in the case of those who held of him by the render of small articles. The legal doctrine that serjeanties were (a) inalienable, (b) impartible, led to the " arrentation," under Henry III., of serjeanties the lands of which had been partly alienated, and which were converted into socage tenures, or, in some cases, tenures by knight-service. Gradually the gulf widened, and " petty " serjeanties, consisting of renders, 1 together with serjeanties held of mesne lords, sank into socage, while "grand" serjeanties, the holders of which performed their service in person, became alone liable to the burden of wardship and marriage. In Littleton's Tenures this distinction appears as well defined, but the development was one of legal theory.

When the military tenure of knight-service was abolished at the Restoration (by 12 Charles II., cap. 24), that of grand serjeanty was retained, doubtless on account of its honorary character, it being then limited in practice to the performance of certain duties at coronations, the discharge of which as a right has always been coveted, and the earliest record of which is that of Queen Eleanor's coronation in 1236. The most conspicuous are those of champion, appurtenant to the Dymokes' manor of Scrivelsby, and of supporting the king's right arm, appurtenant to that of Worksop. The latter duty was performed at the corona- tion of King Edward VII. (1902).

The meaning of Serjeant as a household officer is still preserved in the king's serjeants-at-arms, serjeant-surgeons and serjeant-trumpeter. The horse and foot Serjeants (servientes) of the king's host in the 1 2th century, who ranked after the knights and were more lightly armed, were unconnected with tenure.

The best summary of tenure by serjeanty is in Pollock and Mait-land's History of English Law, McKechnie's Magna Carta (1905) should also be consulted ; and for Domesday the Victoria History of Hampshire, vol. i. The best list of serjeanties is in the Red Book nf the Exchequer (" Rolls " series), but the Testa de Nevill (Record Commission) contains the most valuable records concerning them. Blount's Tenures is useful, but its modern editions very uncritical. Wollaston's Coronation Claims is the best authority on its subject.

(J. H. R.) SERMON (Lat. sermo, a discourse), an oration delivered from a pulpit with fullness and rhetorical effect. Pascal, than whom

1 Usually a bow, sword, dagger or other small thing belonging to war.

no greater authority can be desired, defines a sermon as a re- ligious address, in which the word of God is stated and explained, and in which an audience is excited to the practice of virtue. This may be so extended as to include a discourse in favour of pure morality, though, even in that case, the morals are founded on Christian doctrine, and even the sermon which the fox preaches in La Fontaine's Fables is a parody of a Christian discourse. The Latin sermons of St Augustine, of which 384 are extant, have been taken as their models by all sensible subsequent divines, for it was he who rejected the formal arrangement of the divisions of his theme, and insisted that simplicity and familiarity of style were not incompatible with dignity and religion. His object was not to dazzle by a conformity with the artificial rules of oratory, but to move the soul of the listener by a direct appeal to his conscience. His adage was Qui sophistice loquitur odibilis est, and his influence has been exercised ever since in warning the Christian orator against artificiality and in urging upon him the necessity of awakening the heart. Nevertheless, on many occasions, fashion has led the preachers of a particular epoch to develop rules for the composition of sermons, the value of which is more than doubtful. Cardinal Siffrein, who is known as the Abbe Maury (1 746-181 7), resumed all the known artifices of sermon-style in a volume which has a permanent historical value, the well-known Essai sur VUoquence de la chaire (1810); he was himself rather a fiery politician than a persuasive divine. Maury describes all the divisions of which a good sermon should consist — an exordium, a proposition, a section, a confirmation in two or more points, a peroration; and he holds that a sermon on morals should have but two points, while one on the Passion must have three. These are effects of pedantry, and seem rather to be founded on a cold-blooded analysis of celebrated sermons than on any instinctive sense of the duty of the preacher. We may wish to see in a good sermon, what Bossuet recommended, not the result of slow and tedious study, but the flush of a celestial fervour. Voltaire makes an interesting observation on the technical difference between an English and a French sermon in the 1 8th century; the former, he says, is a solid and somewhat dry dissertation which the preacher reads to the congregation without a gesture and without any inflection of his voice; the latter is a long declamation, scrupulously divided into three points, and recited by heart with enthusiasm.

Among the earliest examples of pulpit oratory which have been

preserved in English literature, the discourses of Wycliffe and his disciples may be passed by, to arrive at the English sermons of John Fisher (1469?-! 535), which have a distinct literary value. But Hugh Latimer (i485?-i555) is the first great English preacher, and the wit and power of his sermons (1549) give them prominence in our literature. One of the expository discourses of John Knox (1505-1572), we are told, was of more power to awaken his hearers than a blast from " five 'hundred trumpets." When we come to Elizabethan times, we possess a few examples of the sermons of the " judicious " Hooker (1554- 1600) ; Henry Smith (1550-1591) was styled " the prime preacher of the nation "; and Lancelot Andrewes (1 555-1626), whose sermons were posthumously printed at the command of James I. in 1628, dazzled his contemporaries by the brilliancy of his euphemism; Andrewes was called " the star of preachers." At a slightly later date John Donne (1573-1621) and Joseph Hall (1 574-1656) divided the suffrages of the pious. In the middle of the 17th century the sermon became one of the most highly-cultivated forms of intellectual entertainment in Great Britain, and when the theatres were closed at the Common- wealth it grew to be the only public form of eloquence. It is impossible to name all the eminent preachers of this time, but a few must be mentioned. John Hales (1 584-1656); Edmund Calamy (1600-1666); the Cambridge Platonist, Benjamin Whichcote (1609-1685); Richard Baxter (1615-1691); the puritan John Owen (1616-1683); the philosophical Ralph Cudworth (1617-1688); Archbishop Leighton (1611-1684) — • each of these holds an eminent position in the records of pulpit eloquence, but all were outshone by the gorgeous oratory and art of Jeremy Taylor (1613-1667), who is the most illustrious

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writer of sermons whom the British race has produced. His matchless collection of discourses delivered at Golden Grove, The Eniautos, was published in 1653-1655. The fault of the 1 7th-century sermon was a tendency, less prominent in Jeremy Taylor than in any other writer, to dazzle the audience by a display of false learning and by a violence in imagery; the great merit of its literary form was the fullness of its vocabulary and the richness and melody of style which adorned it at its best. Some of the most remarkable divines of this great period, however, are scarcely to be mentioned as successful

writers of sermons. At the Restoration, pulpit oratory in England became drier, less picturesque and more sententious. The great names at this period were those of Isaac Barrow (1630-1677); Robert South (1634-17 1 6), celebrated for his wit in the pulpit ; John Tillotson (i63o-i694),the copyright of whose sermons fetched the enormous sum of 2500 guineas after his death, and of whom it was said that he Was " not only the best preacher of the age, but seemed to have brought preaching to perfection "; and Edward Stilling- fleet (1635-1699), styled, for his appearance in the pulpit, " the beauty of holiness." These preachers of the Restoration were controversialists, keen, moderate and unenthusiastic. These qualities were accentuated in the 18th century, when for a while religious oratory ceased to have any literary value. The sermons of Benjamin Hoadly (1676-1761) have a place in history, and those of Joseph Butler (1692-1752), the Rolls Sermons of 1726, have great philosophical importance. Thomas Boston's (1676- 1732) memory has been revived by the praise of Stevenson, but his zeal was far exceeded by that of John Wesley (1703- 1791), who preached 40,000 sermons, and by that of George Whitefield (17 14-1770).

Of all countries, however, France is the one which has shown most brightly in the .cultivation of the sermon. In the 14th century Gerson (1363-1429) seems to have been the earliest divine who composed and preached in French, but his example was not followed by any man of equal genius. It was the popular movement of the Reformation, which made the sermon a piece of literature, on the lips of Jean Calvin (1509-1564), Pierre Viret (1511-1571) and Theodore de Beze (1519-1605). With these stern Protestant discourses may be contrasted the beautiful, but somewhat euphuistical sermons of St Francois de Sales (1605- 1622), full of mystical imagery. Father Claude de Lingendes (1 591-1660) has been looked upon as the father of the classic French sermon, although his own condones were invariably written in Latin, but his methods were adopted in French, by the school of Bourdaloue and Bossuet. In the great body of noble religious eloquence delivered from French pulpits during the 17th century, the first place is certainly held by the sermons of J. B. Bossuet (1627-1704), who remains perhaps the greatest preacher whom the world has ever seen. His six Oraisons Funebres, the latest of which was delivered in 1687, form the most majestic existing type of this species of literature. Around that of Bossuet were collected other noble names: Louis Bour- daloue (1632-1704), whom his contemporaries preferred to Bossuet himself; Esprit Flechier (1632-1710), the politest preacher who ever occupied a Parisian pulpit; and Jules Mascaron

(1634-1703), in whom all forms of eloquence were united. A generation later appeared Baptiste Massillon (1663- 1742), who was to Bossuet as Racine to Corneille; and Jacques Saurin (1677-1730), whose evangelical sermons were delivered at the Hague. These are the great classic preachers whose discourses continue to be read, and to form an inherent part of the body of French literature. There was some revival of the art of the sermon at Versailles a century later, where the Abbe Maury, whose critical work has been mentioned above, preached with vivid eloquence between 1770 and 1785; the Pere Elisee (1726- 1783), whom Diderot and Mme Roland greatly admired, held a similar place, at the same time, in Paris. Since the end of the 1 8th century, although a great number of volumes of sermons have been and continue to be published, and although the pulpit holds its own in Protestant and Catholic countries alike, for purposes of exhortation and encouragement, it cannot be said that the sermon has in any way extended its influence as a form

of pure literature. It has, in general, been greatly shortened, and the ordinary sermon of to-day is no longer an elaborate piece of carefully balanced and ornamental literary architecture, but a very simple and brief homily, not occupying the listener for more than some ten minutes in the course of an elaborate service. In Germany, the great preachers of the middle ages were Franciscans, such as Brother Bertold of Regensburg (1220-1272), or Dominicans, such as Johann Tauler (1 290-1361), who preached in Latin. The great period of vernacular preaching lasted from the beginning of the 16th to the end of the 1 7th century. Martin Luther was the most ancient type of early Reformation preacher, and he was succeeded by the mystic Johann Arndt (1 555-1621); the Catholic church produced in Vienna the eccentric and almost burlesque oratory of Abraham a Santa Clara (1 642-1 709). The last of the great German preachers of this school was P. J. Spener, the founder of the Pietists (1635-1705).

Among the best authorities on the history of the sermon are Abbe Maury: Essai sur V eloquence de la chaire (2 vols., Paris, 1810) ; Rothe, Geschichie der Predigt (Bremen, 1881). (E. G.)

SEROUX D'AGINCOURT, JEAN BAPTISTE LOUIS GEORGE

(1730-1814), French archaeologist and historian, was born at Beauvais on the 5th of April 1 730. He belonged to a good family, and in his youth served as an officer in a regiment of cavalry. Finding it necessary to quit the army in order to take charge of his younger brothers who had been left orphans, he was appointed a

farmer-general by Louis XV. In 1777 he visited England, Germany and Holland; and in the following year he travelled through Italy," with the view of exploring thoroughly the remains of ancient art. He afterwards settled at Rome, and devoted himself to preparing the results of his researches for publication. He died on the 24th of September 1814, leaving the work, which was being issued in parts, unfinished"; but it was carried on by M. Gence, and published complete under the title L'Histoire de Part par les monuments, depuis sa decadence au quairieme siecle jusqu'd son renouvellement au seizieme (6 vols. fol. with 325 plates, Paris, 1823). An English translation by Owen Jones was published in 1847. In the year of his death Seroux d'Agin- court published in Paris a Recueil de fragments de sculpture antique, en terre cuite (1 vol. 4to).

SEROW, or Sarau, the Himalayan name of a goat-like antelope of the size of a donkey, nearly allied to the goral (q.v.) of the same region, but considerably larger, and with small face-glands. The Himalayan animal is a local race of the Sumatran Nemo- rhaedus sumatrensis; and the name serow is now extended to embrace all the species belonging to the same genus, the range of which extends from the Himalaya to Burma, the Malay Peninsula and Sumatra in one direction, and to Tibet, China, Japan and Formosa in another. Serows inhabit scrub-clad mountains, at no great elevation. (R. L.)*

SERPA PINTO, ALEXANDRE ALBERTO DE LA ROCHA (1846-1900), Portuguese explorer in Africa, was born at the castle of Polchras, on the Douro, on the 10th of April 1846. Entering the army in 1864, he served in Mozambique, and in 1869 took part in an expedition against tribes in revolt on the lower Zambezi. In 1877 he and Captains Capello and Ivens of the Portuguese navy were sent on an expedition to south central Africa. The explorers left Benguella in November 1877 for the interior, but Serpa Pinto soon parted from his colleagues, who went north, while Serpa Pinto continued east. . He crossed the Kwando in June 1878, and in August reached Lialui, the Barotse capital on the Zambezi, where he received help from the Rev. F. Coillard which enabled him to continue his journey down the river to the Victoria Falls, whence he turned south, arriving at Pretoria on the 12th of February 1879. He was the fourth explorer to traverse Africa from west to east, and was the first to lay down with approximate accuracy the route between Bihe and Lialui. Among other rewards the Royal Geographical Society of London awarded him (1881) the Founder's medal. The account of his travels appeared in English under the title How I crossed Africa (2 vols., London, 1881). In 1884 he at- tempted, with less success, the exploration of the regions between Mozambique and Lake Nyasa. Appointed

governor of

Mozambique in 1889, he organized an expedition with the object of securing for Portugal the Shir6 highlands and neighbouring regions, but the Vigorous action of the British agents (John Buchanan and H. H. Johnston) frustrated this design (see Africa, § 5). Shortly afterwards Serpa Pinto returned to Lisbon and was promoted to the rank of colonel. He died on the 28th of December iqoo.

SERPENT (Lat. serpens, creeping, from serpere; cf. " reptile " from repere, Gr. eprreiv), a synonym for reptile or snake (see Reptile, and Snakes), now generally used only of dangerous varieties, or metaphorically. See also Serpent -Worship below.

In music the serpent (Fr. serpent, Ger. Serpent, Schlangenrohr, Ital. serpentone) is an obsolete bass wind instrument derived from the old wooden cornets (Zinken), and the progenitor of the bass-horn, Russian bassoon and ophicleide. The serpent is composed of two pieces of wood, hollowed out and cut to the desired shape. They are so joined together by gluing as to form a conical tube of wide calibre with a diameter varying irom a little over half an inch at the crook to nearly 4 in. at the wider end. The tube is covered with leather to ensure solidity. The upper extremity ends with a bent brass tube or crook, to which the cup- shaped mouthpiece is attached; the lower end does not expand to form a bell, a peculiarity the serpent shared with the cornets. The tube is pierced laterally with six holes, the first three of which are covered with the fingers of the right hand and the others with those of the left. When all the holes are thus closed the instrument will produce the following sounds, of which the first is the fundamental and the rest the harmonic

series founded thereon: gl

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Each of the holes on being successively opened gives the same series of harmonics on a new fundamental, thus producing a chromatic compass of three octaves by means of six holes only. The holes are curiously disposed along the tube for convenience in reaching them with the fingers; in consequence they are of very small diameter, and this affects the intonation and timbre of the instrument adversely. With the application of keys to the serpent, which made it possible to

place the holes approximately in the correct theoretical position, whereby the diameter of the holes was also made pro- portional to that of the tube, this defect was remedied and the timbre improved.

The serpent was, according to Abb6 Leboeuf, 1 the outcome of experiments made on the cornon, the bass cornet or Zinke, by Edm6 Guillaume, canon of Auxerre, in 1590. The invention at once proved a success, and the new bass became a valuable addition to church concerted music, more especially in France, in spite of the serpent's harsh, un- pleasant tone. Mersenne (1636) describesand figures the serpent of his day in detail, but it was evidently unknown to Praetoriiis (1618). During the 18th century the construction of the instrument underwent many improvements, the tendency being to make the unwieldy windings more compact. At the beginning of the 19th century the open holes had been discarded, and as many as fourteen or seventeen keys disposed conveniently along the tube. Gerber, in his Lexikon (1790), states that in 1 780 a musician of Lille, named Regibo, making further experiments on the serpent, produced a bass horn, giving it the shape of the bassoon for greater portability; and Frichot, a French refugee in London, introduced a variant of brass which rapidly won favour under the name of "bass horn " or " basson russe " in English military bands. On being introduced on the continent of Europe, this instrument was received into general use and gave a fresh impetus to experiments with basses for military bands, which resulted first in the ophicleide (q.v.) and ultimately in the valuable invention of the piston or valve.

Further information as to the technique and construction of the serpent may be gained from Joseph Frohlich's excellent treatise

on all the instruments of the orchestra in his day (Bonn, 181 1), where clear and accurate practical drawings of the instruments are

given.

(K. S.)

1 See MSmoire concernant Vhistoire ecclesiastique el civile $ Auxerre (Paris, 1848), ii. 189.

SERPENTARIUS, or Ophiuchus, in astronomy, a constella- tion of the northern hemisphere, anciently named Aesculapius, and mentioned by Eudoxus (4th century B.C.) and Aratus (3rd century B.C.). According to the Greek fables it variously represents: Carnabon (or Charnabon), kiiigof the Getae, killing one of the

dragons of Triptolemus, or Heracles killing the serpent at the river Sangarius (or Sagaris), or the physician Asclepius (Aesculapius), to denote his skill in curing snake bites. Ptolemy catalogued 29 stars, Tycho Brahe 15, and Hevelius 40. " New " stars were observed in 1604 and 1848.

SERPENTINE, in geometry, a cubic curve described by Sir Isaac Newton, and given by the cartesian equation $y(a? + x^*) = abx$. The origin is a point of inflection, the axis of x is an asymptote, and the curve lies between the parallel lines $2y = \pm b$.

SERPENTINE, a mineral which, in a massive and impure form, occurs on a large scale as a rock, and being commonly of variegated colour, is often cut and polished, like marble, for use as a decorative stone. It is generally held that the name was suggested by the fancied resemblance of the dark mottled green stone to the skin of a serpent, but it may possibly refer to some reputed virtue of the stone as a cure for snake-bite. Serpentine was probably, at least in part, the XWos o^irijs of Dioscorides and the ophites of Pliny; and this name appears in a latinized form as the serpentaria of G. Agricola, writing in ! the 1 6th century, and as the lapis serpentinus and marmor serpentinum of other early writers. Italian sculptors have sometimes termed it ranochia in allusion to its resemblance to the skin of a frog.

Although popularly called a " marble," serpentine is essentially different from any kind of limestone, in that it is a magnesium silicate, associated however, with more or less ferrous silicate. Analyses show that the mineral contains ELMgaSi^Og, and if the water be regarded as constitutional the formula may be written Mg2(Si0 4) 2 H3(MgOH). Serpentine occurs massive, fibrous, lamellar or granular, but never crystallized. Fine pseudomorphs having the form of olivine, but the composition of serpentine, are known from Snarum in Buskerud, Norway, the crystals revealing their character by containing an occasional kernel of the original mineral. The alteration of rocks rich in olivine has: given rise to much of the serpentine occurring as rock-masses (see Peri- dotite) . Studied microscopically, the change is seen to proceed from the surface and from the irregular cracks of the olivine, producing fibres of serpentine. The iron of the olivine passes more or less completely into the ferric state, giving rise to grains of magnetite, which form a black dust, and may ultimately yield scales of haematite or limonite. Considerable increase of volume generally accompanies serpentinization, and thus are produced fissures which afford passage for the agents of alteration, resulting in the formation of an irregular mesh-like structure, formed of strings of serpentine

enclosing kernels of olivine in the meshes, and this olivine may itself ultimately become serpentinized. Serpentine may also be formed by the alteration of other non- aluminous ferro-magnesian silicates such as enstatite, augite or hornblende, and in such cases it may show microscopically, a characteristic structure related to the cleavage of the. original mineral, notably lozenge-shaped in the case of hornblende. Many interesting pseudomorphs of serpentine were described by Professor J. D. Dana from the Tilly Foster iron-mine, near Brewster, New York, U.S.A., including some remarkable speci- mens with cubic cleavage.

The purest kind of serpentine, known as " noble serpentine," is generally of pale greenish or yellow colour, slightly translucent, and breaking with a rather bright conchoidal fracture. It occurs chiefly in granular limestone, and is often accompanied by forsterite, olivine or chondrodite. The hardness of serpentine is between 3 and 4, while the specific gravity varies from 2-5 to 2'6s- A green serpentine of the exceptional hardness of 6,

formerly regarded as jade, is known as bowenite, having been named by J. D. Dana after G. T. Bowen. The original bowenite came from Smithfield, Rhode Island, U.S.A., and a similar mineral was described by General C. A. McMahon as occurring in Afghanistan, where it is carved for ornamental purposes in the belief that it is jade (q.v.). Many common carvings regarded as jade are really serpentine, and therefore soft. Serpen- tine of columnar or coarsely fibrous form is termed picrolite, a name proposed by J. F. L. Hausmann from the Greek wiicpos (bitter) in allusion to the presence of magnesia. The finely fibrous serpentine is called chrysotile from the lustrous yellowish colour which it usually presents (xpixros, gold; rtXos, fibre) and this variety is extensively worked, especially in Canada, for use as asbestos (q.v.). In order to avoid confusion between the words chrysotile and chrysolite, it has been proposed by Dr J. W. Evans that the fibrous serpentine should be distinguished as karystiolite — a modification of the ancient name, taken from its occurrence near Karystos in Euboea. Foliated serpentine is usually termed marmolite — a name given by G. T. Nuttall, from napixaipu (to glisten) in reference to its lustre. A thin lamellar or flaky serpentine supposed to occur in the Antigorio valley north of Domodossola in Piedmont is called antigorite, having been named in 1840 by M. E. Schweizer, after whom a somewhat similar mineral is

termed schweizerite. Antigorite has been studied by Professor T. G. Bonney and Miss C. Raisin (Quart. Journ. Geol. Soc, bri., 1905, p. 690; lxiv., 1908, p. 152). An apple-green translucent serpentine passes under the name of williamsite, having been so called by C. U. Shepard in honour of its discoverer L. White Williams, of West Chester, Pennsyl- vania, where this variety occurs.

" Common serpentine " is the impure massive kind which occurs in rock-masses and is extensively worked as " serpentine- marble." It is sometimes veined with steatite, or magnesite, and may contain scattered crystals of diallage, bronzite or bastite (an altered rhombic pyroxene) , which by schillerization may present a metallic lustre. In England the chief localities of serpentine are in Cornwall, especially in the Lizard district, where it is quarried and carved into mantelpieces, columns, vases and other ornaments. Much of it presents a rich red or brown colour, often mottled and sometimes veined. Professor Bonney has shown that it has been largely derived from olivine. Green serpentine occurs near Holyhead in Anglesey. A beautiful serpentine, generally mottled red and green, with veins of steatite, is found at Portsoy in Banffshire, Scotland, and was used for pillars in the great hall at Versailles. Serpentine con- taining chromite is found in the Shetland Islands.

The rock called " ophicalcite " consists of an intimate associa- tion of serpentine with limestone, often forming an ornamental stone which is beautifully clouded and zoned with various shades of green. It generally results from the metamorphism of an impure dolomitic limestone, the impurities having crystallized as new minerals which become altered to serpentine. Pseudo- morphs of serpentine occur after forsterite. The best known serpentinous marble of the British Isles occurs in Connemara in Galway, Ireland, and passes in trade under the name of " Irish green." Ophicalcites are developed also in various parts of Scotland, and the green pebbles found in Iona belong to this type of rock. The famous eozoonal marble of Canada is also of similar character.

In Saxony common serpentine is largely worked at Zoblitz near Marienberg and Waldheim. The rock of Zoblitz, mentioned by G. Agricola in the 16th century, is usually of dull green or brown colour, and frequently contains dark red Bohemian garnet or pyrope (q.v.). It was used in the mausoleum of Prince Albert at Frogmore, Windsor, and in Abraham Lincoln's monu- ment at Springfield, Illinois, U.S.A. Italy is rich in serpentine, the best-known being the verde di Praio, which has been quarried for centuries at Monteferrato near Prato in Tuscany, and has been largely used in

ecclesiastical architecture in Florence, Prato and Pistoja. Much serpentine is found near Genoa and Levanto. The verde di Pegli comes from Pegli not far from Genoa, while the verde di Genova is a brecciated serpentinous

limestone from Pietra Lavezzara. Serpentine occurs also at many localities in the Apennines, in Elba and in Corsica. The term ophiolite has been vaguely used to include not only serpen- tines but many other rocks associated with the Italian serpen- tines. Verde antico is a brecciated serpentine with fragments of limestone, originally brought by the Romans from Atrax in Thessaly, and called lapis atracius. It is sometimes known as vert antique, or, following the old French, verd antique. The term serpentine is often improperly applied to the ancient green porphyry of Laconia in the Peloponnesus (porfido serpentino verde). True serpentine occurs at numerous localities in the Alps and in France, an elegant variety being quarried at Epinal in the Vosges, whilst a fine ophicalcite is worked at St Veran and Maurins, dep. Hautes-Alpes. The Ronda Mountains in Spain also yield serpentine.*

In North America serpentine is so widely distributed that only a few localities can be specified. It is found in St Lawrence county, Essex county and Warren county, New York, and also on Staten Island; at Montville and Hoboken in New Jersey; at Newport, Rhode Island; at Newbury and Newburyport, Massachusetts; Texas, Lancaster county, and West Chester, Chester county, Pennsylvania; at many localities in Vermont, and in California, Connecticut, Georgia, Maine, Maryland, Michigan, New Mexico, North Carolina and Washington.

For American serpentine see Stones for Building and Decoration, by George P. Merrill (New York, 1903) ; and for serpentine asbestos see the same author's Non-metallic Minerals (New York, 1904).

(F. W. R.)*

SERPENT-WORSHIP. From all parts of the world there is a very considerable body of evidence for the prominence of the serpent in religion, mythology and folk-lore. Snake- t Pnval . worship still prevails largely in India, and a writer eaceia in 1896 remarks that the previous census showed in varying the North- West Provinces over 25,000 Naga (serpent) h>rms – worshippers, 123,000 votaries of the snake-god Guga, and, in the Punjab, some 35,000 special votaries of the snake godlings. 1 The evidence from modern India can be supplemented by the medieval and ancient Indian sources, and, in particular, by the representations of the adoration of snake-

deities on the Buddhist topes of Sanchi and Amravati. 2 There we find, not indeed living serpents, but deities with serpent-symbolism, indicating a composition of various strata of religious belief, analogous to the evidence for serpent-symbolism from Babylonia, Crete, Greece or Peru; for the higher religions have almost invariably retained in their ritual and belief, sometimes with only slight modification, cruder conceptions which can still be studied in less elevated form among the lower races of India, Africa or America. The result is instructive when we turn to the numerous serpent myths and legends from the Old World and the New, to the stray notices in old writers, or to the fragmentary scraps of popular superstition everywhere. Modern scientific research has vividly illustrated the stereotyped nature of the human mind; there is a general similarity in the effect of similar phenomena upon people at a similar stage of mental growth; there is an almost inherent or unconscious belief which has been transmitted through the countless ages of man's history. At the same time, apart from the gradual evolution of religious and other conceptions there are the more incidental and artificial influences which have shaped them. Hence, our evidence for serpent-cults everywhere represents varying stages in the historical development of a few related fundamental ideas which are psychologically explicable; and it is impossible to deal with the subject geographically or historically. It is most useful, perhaps, to survey some of the general features of belief as an introduction to the more complex inquiries which involve a consideration of other subjects over a larger field.

1 See W. Crooke, The Popular Religion and Folk-lore of Northern India (London, 1896), ii. 122.

2 See the elaborately illustrated work of James Fergusson, Tree and Serpent Worship, or Illustrations of Mythology and Art in India (2nd ed., London, 1873); also M. Winternitz, der Sarpabali, ein altindischer Schlangen-cult," in Mitteil. d. anthrop. Gesell. of Vienna, xviii. (1888), pp. 25-52, 250-264. Both give abundant information on the various features of serpent-cults.

Haunting buildings and famous ruins, gliding around pools, walls and trees, mysteriously disappearing below ground, the serpent and all its kind invariably arrested attention through its uncanny distinctiveness from bird or beast. Its gliding motion suggested the

winding river. Biting its tail it symbolized the earth surrounded by the world-river. Its patient watchfulness, the fascination it exerted over its victims, the easy domestication of some species, and the deadliness of others have always impressed primitive minds. Its swift and deadly dart was likened to the lightning; equally marvellous seemed its fatal power. It is little wonder that men who could tame and handle the reptiles gained esteem and influence. Sometimes the long life of the serpent and its habit of changing the skin suggested ideas of immortality and resurrection, and it is noteworthy that one Indian snake-festival occurs after or at the sloughing, when the sacred being is thus supposed to become purified. 1

A very common belief associates serpents or dragons and other monsters with the guardianship of treasure or wealth; comp., e.g., 2. Ser- tne golden apples of the Hesperides, and the Egyptian

peats' gods Kneph and Osiris, and the Indian Krishna and

wealth and Indra. Serpents adorned with necklaces of jewels w om ' or with crowns were familiar in old superstition, and the serpent with a ruby in its mouth was a favourite love- token. Many stories tell of the grateful reptile which brought valuable gifts to a benefactor. According to a common Indian belief a wealthy man who dies without an heir returns to guard his wealth in the form of a serpent, and Italian superstition supposed that to find a serpent's skin brought good luck (Leland). 2 No singular preference for jewels on the part of serpents will explain the belief, and creatures like the jackdaw which have this weakness do not enjoy this prominence in folk-lore. A rationalistic explanation might be found in the connexion between the chthonic serpent and subterranean sources of wealth. 3 Moreover, the serpent is often associated with metallurgy, and to serpent deities have been ascribed the working of metals, gem-cutting and indeed culture in general. The Aztec Quetzal- coatl taught metallurgy and agriculture, gave abundance of maize, also wisdom and freedom from disease. The Babylonian Ea, who sometimes has serpent attributes, introduced — like the American serpent Votan — knowledge and culture. The half-serpent Cadmus brought knowledge of mines, agriculture, and the " Cadmean " letters, while Cecrops inculcated laws and ways of life and was the first to establish monogamy. Although the reptile is not particularly intelligent, it has become famed for shrewdness and wisdom, whether in the Garden of Eden (Gen. iii. 1; 2 Cor. xi. 3) or generally (cf. Matt. x. 16). The Ophites {q.v.) actually identified the serpent with Sophia (" Wisdom ") ; the old sage Garga, one of the fathers of Indian astronomy, owed his learning to the serpent-god Sesha Naga; and the Phoenician

ytpoiv ‘0iti)v wrote the seven tablets of fate which were guarded by Harmonia. 4 Not only is the serpent connected with oracles, the beneficent agathodaemon of Phoenicia also symbolized immortality. In Babylonian myth a serpent, apparently in a well or pool, deprived Gilgamesh of the plant which rejuvenated old age, and if it was the rightful guardian of the wonderful gift, one is reminded of the Hebrew story, now reshaped in Gen. iii., where the supernatural serpent is clearly acquainted with the properties of the tree of life. 6

1 Fergusson, p. 259. Perhaps the sloughing more than any other feature stimulated primitive speculation ; cf . Wintermtz, p. 28.

2 See Crooke, ii. 1 and 33 sqq.; C. G. Leland, Etruscan Roman Remains, p. 283; Wintermtz 37 seq.; A. W. Buckland, Anthropological Studies (1891), pp. 104-139 (on serpents in connexion with metallurgy and precious stones).

3 Excavators know how the popular mind associates their labours with search for hidden treasure, and no doubt the wealth of dead civilizations often stimulated the imagination of subsequent generations. A gruesome Indian story (Crooke, ii. 136) shows how old treasure-chambers could actually harbour enormous and deadly snakes.

- *Nonnus (Dion. xli. 340 sqq.), cited by W. W. G. Baudissin, Stud. 2. Relig.-Gesch. (Leipzig, 1876), i. 274 seq. (pp. 255-292, Semitic serpent-cult). See, for Garga, C. F. Oldham, The Sun and the Serpent (London, 1905), p. 54; and, for the serpent’s wisdom, F. L. Schwartz, Ursprung der Mythologie (i860), pp. 55 seq.; T. Maehly, Die Schlange im Mythus u. Cultus d. class. Volker (1867), pp. 9 seq., II, 23 seq.*

5 See H. Gressmann, Archiv f. Religionswissenschaft, x. 357 sqq. A Babylonian cylinder represents two figures (divine?) on either side of a fruit-tree, and behind one of them a serpent coils upwards.

*Serpents were supposed to know of a root which brought back their dead to life, and an old Greek story told how certain mortals took the hint. 6 In one form or another the healing powers of the serpent are very familiar in 3 ‘ **t legend and custom. Siegfried bathed in the blood of healing. the dragon he slew and thus became invulnerable ; the blind emperor Theodosius recovered his sight when a grateful serpent laid a precious stone upon his eyes; Cadmus and his wife were turned into serpents to cure human ills. ” In 1899 a court in Larnaca, Cyprus, awarded £80: (Turkish) as damages for the loss of*

a snake's horn which had been lent to cure a certain disease " (Murison, p. 117, n. 9). Not to multiply examples, it must suffice to refer to the old popular idea that medical skill could be gained by eating some part of a serpent: the idea that its valuable qualities would thus be assimilated belongs to one of the fundamental dogmas of primitive mankind (cf. Porphyry, De abst. ii. 48). Now, serpents were tended in the sanctuaries of the Greek Aesculapius (Asklepios), the famous god of healing. Among his symbols was a serpent coiled round a staff, and physicians were for long wont to place this at the head of their prescriptions. He is also represented leaning on a staff while a huge serpent rears itself up behind him, or (on a coin from Gythium) a serpent seems to come to him from a well. At Athens, Asklepios Amynos had a sanctuary with altar and well, and among the votive offerings have been discovered models of snakes. 7 The god-hero came from Epidaurus to the shrine at Sicyon in the form of a serpent, and the serpent sent from Epidaurus to stay a plague at Rome remained there, and a temple was erected to Aesculapius. The sanctuary of the deified healer at Cos marked the site where another serpent brought from Epidaurus dived into the earth (Pausanias, ii. 10, 3, iii. 23, 4). Hygieia, goddess of health, passed for his daughter, and is commonly identified with the woman in Greek art who feeds a serpent out of a saucer. Moreover, the temple of the earth-goddess Bona Dea on the slopes of the Aventine was a kind of herbarium, and snakes were kept there as a symbol of the medicalart. Even in Upper Egypt a few decades ago, there was a tomb of the Mahommedan sheikh Heridi, who — it is alleged — was transformed into a serpent; in cases of sickness a spotless virgin entered the cave and the serpent-occupant might permit itself to be taken in procession to the patient. The place was the scene of animal sacrifices and a yearly visit of women, and apparently preserved the traces of an old serpent-cult. 8

*Several practices conform to the idea that " a hair of the dog that bit you " is a sure remedy, and that the serpent was best fitted to overcome other serpents. 9 At Emesa 4 As in Syria, watered by the Orontes, an image, the lower remedy part of which was a scorpion, cured the sting of against scorpions and freed the city from snakes. 10 Constanti- JS"**" nople was similarly protected by the serpent-trophy of Delphi which Constantine removed thither; an emperor was said to have performed an enchantment over the monument well known in Greek history. 11 In modern India a walking-stick from a species of cane in the neighbourhood of a certain serpent- shrine protects against snake-bite. 12 At Fernando Po, when there The interpretation is uncertain, but the motive has parallels (see Goblet d'Alviella, Migration of Symbols, London, 1894, pp. 129, 133, 167*

seq.). R. G. Murison, " The Serpent in the O.T. r ' (Amer. Journ. of Sent. Lang. xxi. 128), cites an American-Indian belief in a tree of healing, or rather of knowledge, inhabited by a serpent.

6 J. G. Frazer, Adonis, Attis and Osiris (2nd ed., London, 1907), p. 153; also his notes on Pausanias, vol. iii. p. 65 seq.

7 Similar votive offerings are known in India (Oldham, 87), and, though their true significance is uncertain, in ancient Arabia, Palestine and Elam (see H. Vincent, Canaan d'apres V exploration recente, Paris, 1907, pp. 174 sqq.).

8 A. H. Sayce, " Serpent Worship in Ancient and Modern Egypt," Contemporary Review (Oct. 1893), p. 523; cf. also Fergusson, 34.

9 See, for analogies, Frazer, Golden Bough (2nd ed.), ii. 426 seq.

10 Even clothes washed in the waters of Emesa similarly protected the wearers. See Guy Le Strange, Palestine under the Moslems, 353 sqq., and for other miscellaneous evidence, 396, 405, 495.

11 Ruy Gonzalez de Clarijo, Hakluyt Society (1859), p. 35.

12 Journal of the Bombay Branch of the Royal Asiatic Society, ix. p. 180.

and lakes.

was an epidemic among children, they were brought to touch a serpent's skin which hung on a pole. The same ideas underlie the story of the Brazen Serpent which cured the Israelites of the bites of the serpents in the Wilderness (Num. xxi. 6-9; 1 Cor. x. 9). The object, however, was no temporary device; centuries later, 250 years after the founding of the temple of Jerusalem, the Brazen Serpent was regarded as unorthodox by the reforming king Hezekiah, and the historian who relates its overthrow ascribes its origin to the founder of Israelite national religion (2 Kings xviii. 4). The story in fact may have arisen to explain the object of cult; in any case it illustrates a general belief.

According to primitive thought, rivers, lakes, springs and wells are commonly inhabited by spirits which readily assume human or

animal form. Here the serpent and its kind are 5. in wells frequently encountered. 1 In India the serpent-godlings are very often associated with water, and, even at the digging of a well,worship is paid to the"world serpent," and the Salagrama (spiral ammonite), sacred to Vishnu, is solemnly wedded to the TulasJ or basil plant, representative of the garden which the pool will fertilize. 2 It is often supposed that the Naga (serpent) chiefs rule countries in or under the water, and in Kashmir a submarine serpent-king became a convert and built churches. Especially common are the popular stories connecting serpents with submarine palaces and treasures (Crooke i. 45, cf. § 2 above) ; and one submarine realm in the Ganges was reputed to possess " the water of strength." In Palestine and Syria, where demoniacal beings are frequently associated with water, local opinion is sometimes uncertain whether the water is under the care of a jinn or of a patron-saint. Several springs are named after the serpent, and the sacred fountain of Ephca at Palmyra, whose guardian in the early Christian era was appointed by the god Yarhibol, is still tenanted by a female serpent-demon which can impede its flow. 3 Jeru- salem had the stone Zoheleth (possibly " serpent ") by the well En-Rogel (1 Kings i. 9) and also its Dragon Well (Neh. ii. 13); in modern times the curative Virgin's Spring or St Mary's Well has its dragon which, when awake, swallows the inter- mittent flow of the water. 4 Serpents of the water are often healers (cf. § 3). A serpent in a lagoon near Gimbo-Amburi in Africa could cure madness; another, which haunted an Algerian well, embodied the soul of a Mahommedan saint and could cure sore eyes. This feature is especially intelligible when the waters have medicinal qualities. Among the southern Arabs the hot well of Msa'ide was virtually a sanctuary, and the serpent-demon was honoured by annual festivals in the sacred month Rajab. As recently as 188 2, when the grand Llama of Tashilumpo was not relieved by the hot springs of Barchutsan, religious services were held to propitiate the serpent-deities (Oldham, 203). Finally, although in the sanctuary of Aesculapius healing came directly or indirectly as the patients dreamed, it appears from the burlesque of Aristophanes (Plutus, 653 sqq.) that they first bathed in the sacred spring.

The serpent of the water is also the serpent of the great sea upon which the earth rested. 6 Sometimes the reptile lives in submarine infernal regions (with his wife, Crooke i. 43), and as the demon of the underworld it is sometimes the earth-shaker. 6 The Greek demon or snake Poseidon, god of sea and springs, was an earth- quake god. To the great half-serpent monster Typhbn were ascribed numerous springs ; he -was also the cause of earthquakes, and when he buried

himself in the earth he formed the bed of the Syrian

1 See Frazer's notes on Pausanias (1898), vol. v. pp. 44 seq.

2 Crooke i. 42 seq., 49; see also Oldham, 51, 114; Winternitz, 259. The ammonite, here an instrument in a nature " marriage," has elsewhere given rise to legends of the destruction of serpents, viz. by St Hilda at Whitby in Yorkshire, and perhaps also by St Patrick in Ireland (see E. B. Tylor; Primitive Culture, 1903, i. 372).

3 W. R. Smith, Religion of the Semites, 2nd ed., pp. 168 seq., with references. Cf . G. F. Abbot, Macedonian Folk-lore, 261 : " the drakos held back the water "; see further § n below.

4 C. R. Conder, Tent-work in Palestine (1878), i. 313 seq., who notes the " moving " of the water in John v. 3, 4 (see R.V. marg.).

6 Cf. Amos ix. 3 and the Babylonian Tiamat, a serpent of the sea; see Baudissin in Hauck's Realency. f. Theol. v. p. 5 (1898); T. K. Cheyne, Ency. Bib., art. " Serpent."

6 See Fergusson, 57; J. G. Frazer, Adonis, 165; and R. Lasch, Arch. f. Relig. v. 236 sqq., 369 sqq.

Orontes. This river, which was otherwise called Drakon, Typhon or Ophites, is known at the present day as the " river of the rebel " {Nahr El-'Asi; Baudissin ii. 163). The waterspout, some- times taken for a long-tailed dragon, is a huge sea-serpent, aa f7 en m according to the Wanika of East Africa (Tylor i. 292 seq.). ˆ, / „.° c a"/ In ancient Persia the rainbow was the celestial serpent, coan % x . and among some African tribes it is the subterranean fe/ISi wealth-conferring serpent, stretching its head to the clouds, and spilling the rain in its greedy thirst. 7 An early Indian name of the Milky Way is " the path of the serpent " (Crooke i. 25), and a great dragon or serpent is often the cause of eclipses, so that in India, on the occasion of an eclipse, its attention can be attracted by bathing in a sacred stream, or by a ritual which in- cludes the worship of the image of the snake-god (i. 22 seq.). 8 Again the serpent is often associated with the lightning (Winternitz, 33). 9 Hencej as the reptile's range seems to be boundless, one is prepared for the serpentine deity of the Samoan and Tonga natives which connects heaven and earth (Tylor ii. 309 seq.), and for the part the serpent plays in the traditions of a universal deluge. 10

The fok-lore of the Old and New World contains many examples of supernatural conception, an idea which is to be supplemented by the actual living belief (e.g. in Palestine) that supernatural beings can be fathers. 11 a ‘ B< j erpeB In Annam where water spirits may take the form of parentage. serpents or of human beings, two deified heroes were said to have been serpents born of a childless woman, who drank from a bowl of water into which a star had fallen. 12 Leland (132) cites the medieval belief that the household snake (see § 9), if not propitiated, can prevent conception, and in Bombay barrenness is sometimes attributed to a serpent which has been killed by the man or his wife in a former state of their existence. Hence the demon is laid to rest by burning the serpent-image with due funereal rites. 13 In the sanctuary of Aesculapius at Epidaurus women were visited in their dreams by a serpent — the reputed father of the child that was born, and elsewhere Sicyon who had such a progenitor was regarded as the son of the divine healer. 14 Similar also was the origin of Augustus in a temple of Apollo, the god who had his tame serpents in the grove on Epirus. Further, as the serpent-" father " of Alexander the Great came with a healing-root to cure his general Pompey (Cicero, De div. ii. 66), so in an Indian story the son of a king of serpents and of a virgin (or, in a variant form, a widow) was succoured in warfare by his sire (Fergusson, 266), In India the serpent origin of kings and rulers is famous. The same idea meets us in China, Greece .. (e.g. Aegeus, and Drakon or Cecrops the first king of Athens), the Arabian dynasty of Edessa, the dynasty of Abyssinia, &c; it is proper, therefore, to notice the serpent-symbol of royalty on the signets of the Rajahs of Chota Nagpur, the fire-spitting serpent which adorned the head of Egyptian Pharaohs, and the dragons which entwine King Arthur as he stands at the tomb of

7 Crooke ii. 144; Tylor i. 294; A. B. Ellis, The Ewe-Speaking Peoples of the Slave Coast of West Africa (1890), pp. 47 seq.

8 See also R. Lasch, op. cit. Hi. 97 sqq.

9 D. G. Brinton, Myths of the New World (1896), 135; A. S. Palmer, Nineteenth Century (Oct. 1909), pp. 694 sqq.

10 For the latter, see J. T. Medina, Les Aborigines de Chile (1882), 28 sqq.; D. G. Brinton, op. cit., 176 sqq.; Frazer, Pausanias, v. 44 seq.; J. F. Maclennan, Studies in Anc. Hist., 2nd series, 203 seq. The Babylonian story of Ea (see § 2) and the deluge finds an Indian parallel in the fish (or, otherwise a manifestation of Vishnu the many-headed serpent) which warned Manu. Among the Austrian

gipsies the serpent is supposed to be able to swallow up prolonged rains, and it may be conjectured that the stories associating the commencement or conclusion of great floods with chasms (e.g. Lucian, De dea Syria, § 12 seq.) are connected with the beliefs associating wells or springs with serpents and other occupants.

11 See E. S. Hartland, Primitive Paternity (1909) ; Frazer, Adonis (Index, s.v. Conception), and Totemism and Exogamy (1910; Index, s.vv. " Conception," " Snake ").

12 E. S. Hartland, The Legend of Perseus (1894-1896), i. 121. In many places streams or springs are credited with the power of removing barrenness which, in primitive thought, is often ascribed to supernatural malevolence. See Hartland, op. cit., i. 71 sqq., 133, 167 sqq.

13 Journal of the Bombay Royal As. Soc. ix, 188; for sacrifices and snake-deities to obtain offspring, see Crooke i. 226 ; Winternitz, 258. In the Arabian Nights Solomon prescribes the flesh of two serpents for the childless wives of the king of Egypt and his vizier.

14 Frazer, Adonis, 72 (with other examples). The Inca hero Yupanqui had as father a divine being with serpent and lipn attributes who revealed himself in a well (Hartland ii. 14 seqO-

the emperor Maximilian at Innsbruck, 1 Sometimes the serpent stands at the head of the human race as the mother of ail. 2 This, following an old and still well supported interpretation of the name Eve (hawwah), was apparently also the belief of one branch of the Hebrews. 3

There are many instances of tribes or clans named after the serpent. These are not necessarily examples of nicknames, since

a relationship between the two often shows itself in ^/ ?e/a " custom or belief. This feature sometimes applies, clans. also, to cases where the clan does not bear the serpent

name. In accordance with universal ideas of the reality of the " name," there are tribes who will refrain from mentioning the serpent. 4 Also there are clans like the American Apaches and Navahos who will neither kill nor eat rattlesnakes for purely " superstitious "

reasons. Where the reptile is venerated or feared it is usually inviolable, and among the Brass- men of the Niger the dangerous and destructive cobra was especi- ally protected by an article in the diplomatic treaty of 1856 for the Bight of Biafra (Maclennan, 524). The North American Indians fear lest their venerated rattlesnake should incite its kinsfolk to avenge any injury done to it, and when the Seminole Indians begged an English traveller to rid them of one of these troublesome intruders, they scratched him — -as a matter of form — • in order to appease the spirit of the dead snake. 6 The snake-tribes of the Punjab clothe and bury a dead serpent, and elsewhere in India when one is killed in the village a copper coin is placed in its mouth and the body ceremonially burned to avert evil. 6 These snake-tribes claim to be free from snake-bite, as also the ancient Psylli of Africa and the Ophiogenes (" serpent born ") of Cyprus who were supposed to be able to cure others. This power (cf. above § 3 seq.) was claimed likewise by the Marsians of ancient Italy, and is still possessed by the snake-clan of Senegambia. 7 In Kashmir the serpent-tribes became famous for medical skill in general, and they attributed this to the health-giving serpent (Fergusson, 260). Moreover, the Psylli would test the legitimacy of their new-born by exposing them to serpents which would not harm those of pure birth, and a similar ordeal among the Ophiogenes of Asia Minor showed whether a man was really of their kin. 8 This peculiar " kinship " between serpent-clans and serpents may be further illustrated from Senegambia, where a python is supposed to visit every child of the python-clan within eight days of birth, apparently as a sign of recognition. Also at Fernando Po there was an annual cere- mony where children born within the year were made to touch the skin, of a serpent suspended from a tree in the public square. 9 We have next to notice the very general belief that the house- hold snake was an agreeable guest, if not a guardian spirit. In Sweden, even in the 16th century, such snakes were virtually household gods and to hurt them was a deadly sin. Among the old Prussians they were invited to share an annual sacrificial

1 Fergusson, 65; Crooke ii. 124; Oldham, 37, 85 sqq., 200 sqq. ; Maclennan, p. 526 seq.

2 JMurison, p. 130 n. 43; Maclennan, 527.

3 Possibly the Kenite and allied families; cf. the conjecture associating Moses and the Levites with a serpent-clan (E. Meyer and B. Luther, Die Israelite., 116, 426 sqq.). It is curious that Ther- muthis, the traditional name of the princess who adopted Moses (Josephus, Ant. ii. 9. 5), is also the name of a serpent-deity (Aelian,*

De anim. x. 31 ; see Wiedemann on Herod, ii. 74 seq.).

4 Examples in Frazer, Golden Bough, i. 456 sqq. ; N. W. Thomas, Encyc. of Rel. and Ethics, i. 526, col. 1.

6 Frazer, citing W. Bartram, Travels through N. and S. Carolina (London, 1792), 258 sqq.

6 See Fergusson, 259; Winternitz, 257; Crooke ii. 151 seq.

7 The 'Omar ibn 'Isa of the Hadhramaut had the same gift (so Makrizi); cf. also Lane's account of the " Saadeeyeh " sect who charm away serpents from houses (Modern Egyptians).

8 Strabo xiii. 1, 14. Serpents which would only attack those who were not natives were to be found on the banks of-the Euphrates and also at Tiryns (Mir. Ausc. 149 seq. ; Pliny viii. 59. 84). In Sicily also, where Pliny (xxxvii. 10. 54) records some mystery about harmless scorpions, old John Maundeville in his travels (chap, v.) found a belief in snakes which were harmful only to illegitimate children.

9 Frazer, Golden Bough, ii. 370 seq. ; Totemism and Exog. i. 20. See also Crooke ii. 124, 142, 151 seq. (descent from a serpent involves immunity from its bite, and a serpent is supposed to identify the rightful heirs of a kingdom).

meal, and their refusal was a bad sign. 10 Mahomet, it is said,

declared that the house-dwelling snakes were a kind of jinn,

and the heathen Arabs invariably regarded them as

alike malevolent or benevolent demoniacal beings. 11 «„_ ^"„«. a ,, t, , , , • . uons won*

Among the Romans every place had its genius families.

equally in the form of a serpent — cf. the doubt of Aeneas (Verg. Aen. v. 84 sqq.) — and household snakes were lodged and fed in vast numbers. They were the guardian- spirits of men and families, and stories are told of the way in which human life depended upon the safety of the reptile. 12 As a chthonic animal the serpent has often been regarded as an embodiment of the soul of the dead. Grimm's story of king Gunthram tells how, while he slept, his soul in serpent-form visited a mountain full of gold (Paulus Diac. iii. 34), and

Porphyry relates that a snake crawled from beneath the bed of Plotihus at the moment of the philosopher's death (cf. the Indian story, Oldham, 79). In Bali near Java, where the Naga-cult flourishes, a serpent is carried at the funeral ceremonies of the Kshatriya caste and burned with the corpse. Among many African tribes the house-haunting serpents are the dead, who are therefore treated with respect and often fed with milk. 13 But it does not appear that every venerated serpent was an incarnation or that every incarnation was reverenced or even tolerated. Among the Nayars of Malabar, the family-serpent is capable of almost ■ unlimited powers for good or evil; it is part of the household property, but does not seem to be connected with ancestral cults. 14

In Greece, however, " the dead man became a chthonic daemon, potent for good or evil; his natural symbol as such, often figured on tombs, was the snake." 15 " The men l0% As of old time," as Plutarch observed, "associated the heroes and snake most of all beasts with heroes," and in Photius ■ toca/ the term " speckled hero " thus finds an explanation. sua ans ' At the battle of Salamis the serpent which appeared among the ships was taken to be the hero Cychreus. 16 These heroes might become objects of cult and local divinities of healing; people would pass their tombs in awe, or resort thither for divination or for taking oaths. 17 In Egypt not only are there serpents of the houses, but each quarter in Cairo had a serpent-guardian (Lane). This is said also of the villages and districts of Armenia, and Buddhist legends affirm it for India. 18 The Sati (Suttee) wife immolated to accompany her deceased husband often became the guardian of the village, and on the Sati shrine a snake may be represented in the act of rising out of the masonry. 19 Athene (" the Athenian one ") was primarily the guardian spirit of Athens, and at the Erechtheum her sacred serpent (apparently known to the 3rd century a.d.), was fed monthly with honey- cakes; when, during the Persian War, it left the food untouched it was taken as a sign that the protectors had forsaken the city. 20 At Lebadeia in the shrine of Trophonios (to whom serpents were sacred) offerings of honey cakes were made to an oracular serpent. At Delphi a virgin superintended a similar oracle; and in the sacred grove of Apollo at Epirus a nude virgin-attendant brought

10 See also B. Deane, Serpent Worship, 245 seq., Fergusson, 23; J. Grimm, Teutonic Mythology (1888), iv. 1490 sqq.; Tylor ii. 240.

11 T. Noldeke (on serpent-beliefs in Arabia) , Zeit. f. Volkerpsychol. i. 412 sqq. (i860).

12 So, in the stories of Tiberius and D. Laelius; Frazer, Adonis, 74 n. 2 (with references) ; cf. Fergusson, 19.

13 Frazer, Adonis, 73 seq. ; for India, see Winternitz, 258.

14 F. Fawcett, Madras Bulletin, iii. 279 (1901).

16 Companion to Greek Studies, ed. L. Whibley (1905), p. 502 and fig. 97. The libations of milk which the Greeks poured upon graves were possibly for these embodiments of the dead.

16 Pausanias, i. 36, 1 ; see Rohde, Psyche, 2nd ed., i. 196.

17 See especially, on the Greek hero as a snake, Miss Jane E. Harrison, Journ. of Hell. Studies, xix. (1889), 204 sqq.; Proleg. to Study of Greek Religion (1903), 326 sqq.

18 Abeghian, Armen. Volksglaube, 74 sqq.; Crooke ii. 127.

19 Crooke i. 187 seq. To these local examples may be added the lord (or lady) of life, a serpent-deity of the Assyrian city Der (Winckler and Zimmern, Keilinschrift. u. d. alte Test. 505 : for other evidence, see Index, s.v. " Schlange ").

20 Herod, viii. 41. The serpent was probably regarded as the em* bodiment of the king Erechtheus; see Frazer, Adonis, 75; A. Frickenhaus, A then. Mitt, xxxiii. (1908), 171-176.

II. Human

sacrifice.

offerings, and it was a sign of a plentiful year if they were accepted. So also at Lanuvium, south of Rome, in a grove near the temple of the Argive Hera, sacred maidens descended blindfolded once a year with a barley-cake, and if the serpent took it, it indicated that they were pure and that the husbandmen would be fortunate. On a Greek vase-painting the snake is the vehicle of the wrath of Athene, even as Chryse, another local " maiden," had a snake-guardian of a shrine which she sent against Philoctetes. 1 Similarly Orestes in serpent-form would slay Clytaemnestra (Aeschylus, Choephori): the serpent is thus the avenging spirit of the deceased, the embodiment of

Vengeance (cf. Acts xxviii. 4).' To these characteristics of serpents and serpent-godlings we must add the control of the weather. This was ascribed to the naga demi-gods and rajahs of India and to the " king of snakes " among North American Indians. 3 It is significant that in India the widely-distributed Naga- pancami-festival occurs in the rainy season. We have seen how closely the serpent is associated with water generally (§ 5 seq.), and since we meet with the belief that sources will dry up when the serpent-occupant is killed (Bechuanas, Zulus), or that they will resent impurities thrown into their springs by causing storms (tribes of the Hindu-Kush) , it is not surprising to find elaborate precautions for the propitiation of such powerful beings. Now, there are popular stories of springs and waters which could only be used in return for regular human sacrifices. 4 In a story from the isle of Lesbos the dragon must receive a human victim twice a day. Curiously enough, an old authority tells us that the people of Lesbos were directed to throw a virgin into the sea to Poseidon, and the hero who vainly tried to save her reappeared years later with a wonderful cup of gold (Hartland, iii. 43 seq., 79, see Athenaeus xi. 15). In the Chinese annals of Khotan in Cashgar, when a certain stream dried up, a female dragon declared that her husband had died; one of the royal grandees sacrificed himself to meet the want, the water flowed once more, and the " husband " of the being became the guardian of the kingdom's prosperity. 6 A careful study of all the related traditions suggests that they preserve an unmistakable recollection of human sacrifice to serpents and other spirits of the water, and that the familiar story of the hero who vanquishes the demon and rescues the victim (usually a female, and especially a virgin) testifies to the suppression of the rite.

An extremely rich dynasty in the Upper Niger was supposed to owe its wealth to a serpent in a well which received yearly a maiden attired as a bride ; the cessation of the practice brought drought and sickness (Hartland iii. 57 seq.). In Mexico the half-serpent Ahuizotl dragged into its pool hapless passers-by; however, their souls were supposed to go to the terrestrial paradise — see on this idea, Rohde, ii. 374, n. 2 —and the relatives became rich through the unhappy accident (Hartland, 86 seq.). But in India human sacrifice was actually made in the expectation of gaining hidden treasure, and doubtless we have a survival of this when snake-charmers, for a drop of blood from the finger of a first-born, will track the snakes which are guardians of treasure (Crooke ii. 135, 170 seq.). Indian traditions tell how reformers have persuaded the people in the past to stop their human sacrifices to serpent-spirits (Fergusson, 64, Oldham, 101), and a survival may be recognized in parts of the

N.W. Provinces when, at the Gurui serpent-festival, women make vicarious offerings by throwing to Nag Deota, the river demon, dolls which the village lads beat with long switches (Crooke ii. 139). It is unnecessary to refer more fully to the evidence for former human sacrifice or to the popular stories and grim superstitions which indicate its persistence ; the grisly custom of our ancestors has been attested by comparatively recent observation in Mexico. Peru, Fiji and W. Africa. 8

1 Sophoc, Phil. 1327; Harrison, Prol. 301 seq., 306 seq.

- *Compare the snake attributes of the Erinyes; see Harrison, 217 sqq., 233 sqq.*

'Fergusson, 48 seq.. 82, 257 seq.; Crooke, ii. 129; Oldham, 49-51, 121, 123, 129, 200; cf. Winternitz, 44 seq., 259 seq.

4 Hartland iii. 2", 4, 10 seq., 14, 28, 30, 74, 87-94; Frazer, Pans. v. 45; Lectures on the Early Htstory of the Kingship (1905), 183 seq., 192.

6 Hartland iii. 73 seq., cf. also J. G. R. Forlong, Faiths of Man (1906), iii. 268.

• See Deane, Serpent Worship, 245 seq. (Livonia) ; and for more modern evidence, Maclennan, 216, 219; Oldham, 40, 50, 100 seq.; and A. B. Ellis (§ 12 below). Folk-lore adds to the survivals some of the customs for producing rain, e.g. bathing and drenching willing or unwilling victims, dipping hoiy images in water, and otherwise disturbing springs and fountains (Frazer, Golden Bough, i. 95 sqq.,

A conspicuous feature in serpent-cults is the prominence of females. In India, in Behar, during August there is a colourless festival in which women, " wives of the snake," go 12. The round begging on behalf of the Brahmans and the famous villages (Crooke ii. 138). Among the Nayars of Dahomey Malabar at the ceremonies of the Pambantullel, the household serpent-deities show their benevolence by inspiring with oracles certain women who must be of perfect purity. 7 In Travancore a serpent-god is the property of a family, the priests of a temple; the eldest female carries the image at the festal processions and must lead a celibate life (Oldham, 153 seq.). Far more noteworthy is the cult of the Python Dafih-gbi of Whydah, which after taking root in Dahomey, became the most remarkable example of a thoroughly organic serpent-cult. 8 The python-deity is god of wisdom and earthly bliss and the bene- factor of man (cf. §

2): he opened the eyes of the first human pair who were born blind. He is specially invoked on behalf of the king (the nominal head of the priesthood) and the crops, and a very close connexion was supposed to exist between the god's agency and all agricultural life. Initiated priests, after remaining silent in his temple for seven days, receive a new name and thus become ordained. They possess a knowledge of poisons and antidotes and thereby acquire considerable income (cf. §§ 3, 8). Children who touch or are touched by one of the many temple- snakes are sequestered for a year and learn the songs and dances of the cult. Women who are touched become " possessed " by the god. In addition to his ministrant priestesses, the god has numerous " wives," who form a complete organization. Neither of these classes may marry, and the latter are specially sought at the season when the crops begin to sprout. 9 These "wives" take part in licentious rites with the priests and male worshippers, and the python is the reputed father of the offspring (cf. § 7). Every snake of its kind receives the profound venera- tion of the native of Whydah, who salutes it as master, father, mother and benefactor. Such snakes must be treated with every respect, and if they are even accidentally killed, the offending native might be burned alive (cf. § 8). In 1890 a semblance of the penalty was still maintained: the offender being allowed to escape from a burning hut through a crowd of snake- worshippers armed with clubs; if discreet in his bribes, and lucky, he might reach running water and could purify himself there. On the day of public procession — the last took place in 1857 or 1858 — naked priests and " wives" escorted the company with songs and dances; death was the penalty of those caught peering from their houses, and, apart from this, the natives feared loathsome diseases should they gaze upon the sacred scene. It is said that Europeans who violated the prohibition have been poisoned. Occasional human sacrifice in honour of the god is attested (cf. § n).

While Dahomey furnishes this elaborate example of the modern worship of a god in the embodiment of a serpent, else- where we find either less organic types, or the persist- 13, various ence and survival of cults whose original form can only develop- be reconstructed by inference. In the gloomy rites me!at s of of the Diasia, the Olympian Zeus, as Zeus Meilichios cu " s • god of wealth, has been imposed upon a chthonic snake-deity who is propitiated by holocausts of pigs and by a ritual of purga- tion (Harrison, Prol. 12-28). In the Thesmophoria, a sowing festival of immemorial antiquity performed by women, cakes and pigs were thrown to serpents kept in caves and sacred to the corn- goddess Demeter, who, like the Bona Dea, was representative

108, in seq., 209 sqq.). Here also are the superstitions which associate rivers or pools with the safety of human life (e.g Frazer iii. 318 seq.; Hartland ii. 20, 22 sqq.; G. L. Gomme, Ethnology in Folklore [1892], 71 sqq., 77 seq.).

7 F. Fawcett, Madras Gov. Museum, Bull. iii. 277. (For the stress laid upon the personal purity of the females, cf. p. 282). For other evidence for the prominence of females, see Fergusson, 82, 257 seq.

8 A. B. Ellis (above, § 6, n. 7), 47 sqq., 140 sqq., cf. Frazer, Adonis, 57 sqq. The cult taken by slaves to America is the Vodu (Vaudoo or Vaudoux) worship of Haiti (Ellis, 29 seq.).

- *On their marriage to the god these devotees are marked with hia image (said to be imprinted by the god himself) ; cf . the story that Atia, the mother of Augustus, when touched by the serpent in the temple of Apollo, was marked with a stain like a painted serpent.*

of the fertility of nature. Myth explained it as a celebration of the capture of Korehy Plouton. 1 The Maenads (" mad ones") or Bacchae, the women attendants of Dionysus, with their snake-accompaniments, are only one of the various snake-features associated with the cult of a deity who was also a god of healing. The symbol of the Bacchic orgies was a consecrated serpent, and the snakes kept in the sacred cistae of the cult of Dionysus find a parallel among the sect of the Ophites where, at the sacramental rites, bread was offered to the living serpent and afterwards distributed among the worshippers. 2 Other develop- ments may be illustrated from the cult of Aesculapius, who seems to have been merely a deified ancestor, like the Egyptian Imhotep (below) or the interesting Indian healer Sokha Baba (Crooke i. 147, ii. 122). Introduced into Athens about 421 B.C., Aesculapius inherited the older local cult of the serpent " pro- tector " Amynos (Harrison, 346 seq.). In Laodicea he apparently replaced an older deity with serpent attributes. 3 In Egypt, he superseded the sage Imhotep at Memphis, and at the temple sacred to Aesculapius and Hygieia at Ptolemais the money-box has been found with the upper part in the form of a great snake. 4 Finally among the Phoenicians he was identified with Eshmun, an earlier god of healing, who in turn was already closely asso- ciated with Dionysus and with Caelestis-Astarte. 6

For the retention of older cults under a new name, Mahommedanism supplies several examples, as when a forest-serpent

of India receives a Mahommedan name (Oldham 128). , i'u" > Hb ˆ Ut sornet i mes there is a contest between the new serpents. cu lt an d the old. Thus Apollo has to fight the oracle

serpent of Gaia, and it has been observed that where Apollo prevailed in Greek religion the serpent became a monster to be slain. 6 At Thebes — the Thebans were Serpentigenae — Apollo took the place of Cadmus, who, after killing the dragon which guarded a well and freeing the district, had ended by being turned into a serpent. This looks like the assumption of indigenous traits by a foreigner — cf. Aesculapius (§ 13) — much in the same way as Hercules has contests with serpents and dragons, becomes the patron of medicinal springs, and by marrying the serpent Echidna was the ancestor of the snake- worshipping Scythians. 7 "But an ethnological tradition appears when Phorbas killed the serpent Ophiusa, freed Rhodes of snakes and obtained supremacy, or when Cychreus slew the dragon of Salamis and took the kingdom. 8 A story told by Herodotus (i. 78) admirably shows how the serpent as a child of earth was

1 Harrison, 109 seq., 120 sqq., and art. Thesmophoria. The rites included the " pursuit," possibly derived from the intentional opportunity of escape allowed the victim. Plouton, also associated with Proserpine, the great mother-goddess, was patron of the chasms with mephitic vapours in the valley of the Maeander (see Frazer, Adonis, 170 sqq.).

2 A Greek vase shows snake-bodied nymphs at the grape-harvest (Harrison 259 seq.), and in Egypt the harvest goddess Rannut had snake-form (F. Petrie, Relig. of Ancient Egypt, 1906, p. 26). The serpent-god revered by Taxilus (king of Taxila), which was seen by Alexander the Great on his way to India, was identified by Greek writers with Dionysus or Bacchus. For the serpent in the cult of Sabazius, see Harrison, Prol. 418, 535. A kind of sacramental communion with a snake is found among a Punjab snake-tribe (Frazer, Golden Bough, ii. 441 seq. ; Punjab Notes and Queries, ii. 91).

• For this and other Phrygian evidence, see W. M. Ramsay, Cities and Bishoprics of Phrygia, i. 52, 94, 104.

4 Ag. Zeit. xl. 140 seq. Aehan (be anitn. xvi. 36) mentions a huge serpent at the temple dedicated to Aesculapius. Serapis (Osiris- Apis)

who came to acquire the attributes of Aesculapius and of Pluto, god of the dead, sometimes had serpent-form, and even in the reign of Constantine popular belief connected the rise of the Nile with his agency (Frazer, Adonis, 398).

‘ See on this branch of the subject, W. W. G. Baudissin, Zeit. d. morgenl. Gesell. lix. (1905), 459-522, and Orient. Stud. Theodor Nbldeke (ed. Bezold, -IQ06), ii. 729 sqq.

• Harrison, Journ. Hell. Stud. xix. 223, cf . Proleg. 392 ; and E. Rohde, Psyche, i. 133 seq.

‘ Herod, iv. 9 ; for Hercules and healing waters, see Frazer, Adonis, 174 seq.; cf. above, § 5. Here arises the question of the tendency to attribute to outside aid the introduction of culture (cf. § 2), and even of law (F. Pollock, ed. of Maine’s Ancient Law, 1907, p. 19).

• Cf. the similar view of serpent-conflicts in Persian tradition (Fergusson, 44 seq.), and the story of the colonization of Cambodia, where the new-comer marries the dragon-king’s daughter (ib. 53).

a type of indigenous peoples, and there was a tendency to represent the earlier conquered races as monsters and demons, though not necessarily unskilled (e.g. the Cretan Kouretes), or to depict the conquest of barbarians as the overthrow of serpents or serpent-like beings. 9 This obviously complicates the investigation of serpent-ewto. Moreover, the serpent or dragon may have an opponent like the eagle (see Goblet d’Alviella, 17), or a cosmical antagonist — the lightning, thunder or rain-god. Indra, the rain-god, slew with a thunderbolt Ahi or Vitra, who kept back the waters (Oldham, 32 sqq.); the thunder-god of the Iroquois killed the subterranean serpent which fed on human flesh (Hartland iii. 151). 10 Or the victor is the sun: the Egyptian sun-god Re had his fire-spitting serpent to oppose his enemies, of which one was the cloud and storm serpent Apophis, while in Greek myth the sanctuary of Helios (the sun) sheltered the young Orpheus from the snake.

It is impossible to trace a safe path through the complicated aetiological myths, the fragments of reshaped legend and tradition, or the adjustment of rival theologies. It remains to observe the overthrow or supersession of the ‘rhrT- serpent in Christian lands. At Axum in Abyssinia, ttanity. where worship was divided between the serpent and the Mosaic Law, it is said that the great dragon was burst asunder by the prayers of Christian saints (c. a.d. 340; Fergusson, 35). At the Phrygian Hierapolis the serpent Echidna was

expelled by the Apostles Philip and John. 11 France had its traditions of the destruction of serpents by the early missionaries (Deane, 283 seq.), and the memory possibly survived at Luchon in the Pyrenees, where the clergy and people celebrated the eve of St John by burning live serpents. 12 Christian saints have also stepped into the shoes of earlier serpent-slayers, while, in the stories of " St George and the Dragon " type, the victory of the pious over the enemy of mankind has often been treated as a literal conflict with dragons, thus introducing a new and confusing element into the subject. This purely secondary aspect of the serpent as the devil cannot be noticed here. 13 At Rouen the celebration of St Romain seems to preserve a recollection of human sacrifice to a serpent-demon which was primarily sup- pressed by a pagan hero, and at Metz, where St Clement is celebrated as the conqueror of a dragon, its image (formerly kept in the cathedral) was taken round the streets at the annual festival and received offerings of food. 14 Most remarkable of all, at Cocullo in the Abruzzi mountains on the border of the old territory of the Marsi snake-men (see § 8), the serpent-deity has a lineal descendant in the shape of St Domenico of Foligno (a.d. 950-1031). The shrine is famous for its cures, and when the saint has his serpent-festival on the first Thursday in May, Serpari or serpent-men carry coils of live reptiles in procession before his image, which in turn is hung with serpents of all sizes. The rites, we may suppose, have become modified and more orthodox, but none the less they are a valuable testimony to the persistence of the cult among people who still claim power over serpents and immunity from their bite, and who live hard by the home of the ancient tribe which ascribed its origin to the son of Circe. 15 One may recall the old cult of Sabazios where

9 Cf. the serpent-pillars fbund in the old Roman provinces of Europe (Frazer, Pausanias, ii. 49, v. 478 seq.). For the Kouretes, the fish and serpent-like peoples struck down by Zeus or Apollo, see Harrison, Annual of Brit. School at Athens, xv. 308 sqq.

10 In popular Macedonian lore the lightning or thunder is the enemy of the serpent-dragon (G. F. Abbott, Macedonian Folklore, 261 ; cf. also Schwartz, 150 sqq., W. R. Smith, 175, n. I ; Winternitz, 45).

11 W. M. Ramsay, op. cit. i. 86 seq. ; cf. Gutschmid, Rhein. Mus. (1864), pp. 398 sqq.

12 Fergusson, p. 29, n. 2 (see, however, Frazer, Golden Bough, iii. 323 seq.). For analogous traditions, see Fergusson, 32.

13 See Antichrist; Devil; Dragon.

14 See further Frazer, Kingship, 184-192; Schwartz, 73 seq.; Hocker, Deutscher Volksglaube (Gottingen, 1853), p. 231. Similarly, food is offered to the snake of dough in the Punjab festival already mentioned (note 2 above).

16 The festival is described (as seen in 1906) by Marian C. Harrison, Folklore, xviii. (1907), 187 sqq. A combination of a cult of the house-snake with that of the (Christian) saint of the master of the house is said to prevail in modern Greece (J. C. Lawson, Modern Greek Religion, 1910, p. 260).

men waved great red snakes over their heads as they marched in procession. One may even recall the cult of Dahomey. More- over, we find at Madagascar the procession of the god of fertility and healing, the patron of serpents who are the ministers of his vengeance (Frazer, Paus. v. 66 seq.). In a Bengal festival the men march entwined with serpents, while the chief man has a rock-boa or python round his neck and is carried or rides on a buffalo (Fergusson, 259). Again, among the Moquis of America, where the snake-clan claim descent from a woman who gave birth to snakes, the reptiles are freely handled at the " snake dances " wˆiich are performed partly to secure the fertility of the soil. 1

These last examples are important because they illustrate the

immense difficulty of determining the true significance of any

isolated piece of evidence. It cannot be assumed that

1 h m 'r i so ' ate d features which find a parallel in more completely P 'ailv known cults presuppose such cults ; yet it may be in-

m es " ferred that they point to earlier, more perfect structures, to rites which perhaps linger only as a memory, and to conceptions and beliefs which have been elevated or modified by other religions. Hence also the impossibility of treating the present subject schematic- ally. Apart from the more obvious characteristics of the serpent likely to impress all observant minds (§ 1), its essentially chthonic character shows itself markedly when it is associated with the treasures and healing herbs of the earth, the produce of the scil, the

source of springs — and thence of all water — and the dust unto which all men return. 2 Although much evidence connects the serpent with the dead, especially as a guardian-spirit over the living, any discussion of this aspect of the subject is bound up with the varying beliefs regarding ancestors and death. Among the Arunta of Central Australia, the ghosts of the dead haunt certain localities, and, entering the bodies of passing women, are constantly rein- carnated; the Black-snake clan of the Warramunga tribe embodies the spirits which the original ancestor had deposited by a certain creek. 3 On the other hand, the " rattlesnake " men of the Moqui are merely transformations and expect to return at death to their original reptile form' (Maclennan, 357). It is another stage when only the more conspicuous mortals assume serpent guise, and the deification of heroes involves yet another course of ideas. Here it is evident that some of the attributes of prominent serpent-gods will be purely secondary. Moreover, it is a human weakness to mani- pulate one's ancestry, and the common claim to be descended from the local godling is not to be confused with the Arunta type of reincarnation. 4

Again, in the part taken by women in serpent-lore other problems of primitive society and religion intermingle. For example, when one considers how often milk is used in the tending and propitiation of venerated snakes, it is noteworthy that in Roman cult the truly rustic deities are offered milk (Fowler), and it is no less singular that many of the old goddesses of Greece have serpent attributes

(Harrison). 6 Now anthropological research has vividly shown that woman, naturally fitted (as it seemed) to understand the mysteries of increase, was assigned a prominent part in rites for the furtherance of growth and fertility. And the same thread of ideas seems to recur in the " wives " of the python Danh-gbi (§ 12), the Shakti cere- monies in India for the increase of the divine energy of nature

(Fergusson, 258 seq.), and, to a certain extent, in the providing of

1 J. G. Bourke, Snake-Dance of the Moquis (1884), p. 180 seq.; see Frazer, Totem, and Exog. iii. 229 sqq.

2 Here one will note the prevalence of the ideas of " mother earth," and also the association in higher religions of chthonic powers with the serpent, so, e.g. the winds (viz. Boreas in Greece, cf. Harrison, Prol. 68, 181), subterranean gods (for Assyria, cf. Zeit.f.Assyr. [1894] p. 116, and for the Finns, Fergusson, p. 250 seq.). For the serpent (sometimes with anthropomorphic hints) in the Tabellae devotionis, see R. Wiinsch, Sethianische Verfluchungstafeln (Leipzig,

1898), 100 sqq., and for a Carthaginian triad of the under world (cf. the threefold Hecate) including h-w-t (cf. hawwah, Eve, " serpent "), see G. A. Cooke, N. Semit. Inscr. (1903), p. 135.

3 Spencer and Gillen, N. Tribes of Central Australia, 162, 330 seq. (Frazer, Adonis, p. 80); A. Lang, Origins of Religion (1890), p. 124.

4 There appears to be a fundamental inclination towards ideas of rebirth and reincarnation (see F. B. Jevons, Introd. to Study of Comp. Religion, 1908, pp. 50 sqq., 59 sqq.); it would seem to be wrapped up in the feeling of the essential " one-ness " of the group (including its deity), and involves the belief that such corporate bodies never die (cf. even the Roman conception of the family, Maine, op. cit. 197 sqq.).

6 W. W. Fowier, Roman Festivals, 103-105; Harrison, Journ. Hell. Stud. xix. 221. For the use of milk, cf. Frazer, Adonis, 74 (with the suggestion that it is because milk is the food of babes), Crooke ii. 130, and F. Fawcett, Madras Gov. Bull. (1900), iii. I, 58 (a South-Indian festival on the fifth of Sravana, when the serpent- deity is bathed in milk).

deities or demons of serpent-type with consorts. 6 There is every-where a danger of misunderstanding isolated evidence, of wrongly classifying different motives, and of overlooking necessary links in the chain of argument. There is an obvious development from the serpent qua reptile to the deity or the devil, and that the original theriomorphic form is not at once forgotten can be seen in Zeus Meilichios, Aesculapius Amynos, in the Cretan snake-goddesses, or in the Buddhist topes illustrated by Fergusson. But naturally there are other developments to be noticed when originally distinct attributes are combined, when, for example, Greek goddesses take the forms of birds as well as of snakes (Harrison, 322), or when the Aztec snake-deity Huitzilcpochtli, like the Votan of the Mayas, has feathers (Maclennan, 384).'

Thus it will be perceived that the subject of this article involves at every turn problems of the history of thought (cf . the similar difficulties in the discussion of Tree-worship). There is ample material for purely comparative purposes and for an estimate both of the general fundamental ideas and of the artificially-developed secondary speculations; but for any scientific research it is necessary to observe the social, religious and historical conditions of the provenance and period of the evidence, and for this the material is often insufficient. The references in this article furnish fuller

information and are usually made to works suitable for pur- suing the subject more thoroughly. One may also consult the English and foreign journals devoted to folklore, comparative religion or anthropology (especially the volumes of Folklore, Index, s.v. " Snakes "), and the articles in this Encyclopaedia on the various departments of primitive religion, In general, works which endea- vour to reduce the evidence for this fascinating subject to clear- cut systems are more useful for the data they provide than for their conclusions, and it is not unnecessary to warn readers against the unscientific studies of " ophiolatry " and especially against " that portentous nonsense called the ' arkite symbolism ' ' (see E. B. Tylor's remarks, Primitive Culture, 4th ed., ii. 239).

(S. A. C.) SERPUKHOV, a town of Russia, in the government of Moscow, 62 m. by rail S. of the city of Moscow. The population in 1884 was 22,420, and 24,456 in 1897. Built on high cliffs on both banks of the river Nara, 3 m. above its confluence with the Oka, Serpukhov is an important manufacturing and commercial town. Its manufactories produce cotton and woollen stuffs, paper, leather, chemicals and candles. Petty trades are much developed in the neighbourhood — textile fabrics, furniture, and earthenware and porcelain. The manufactured goods of Serpukhov are sent — • mostly by rail — to the fairs of Nizhriiy-Novgorod and the Ukraine, while large amounts of grain, hemp and timber, brought from the east down the Oka, are discharged at Serpukhov and sent on to Moscow and St Petersburg. The cathedral (1380) was rebuilt in the 18th century; the old fortress has almost entirely disappeared.

Serpukhov is one of the oldest towns of the principality of Moscow; in 1328 it was a nearly independent principality under the protectorate of Moscow. Its fortress protected Moscow on the south and was often attacked by the Tatars; the Mongol prince Toktamish plundered it in 1382, and the Lithuanians in 1410. In 1556 the town was strongly fortified, so that fifteen years later it was able to resist the Mongols. Its commercial importance dates from the 18th century.

SERRANO Y DOMINGUEZ, FRANCISCO, Duke de la Torre and Count of San Antonio (1810-1885), Spanish marshal and statesman, was born in the island of Leon at Cadiz on the 17th of December 1 8 1 o. His father was a general officer and a Liberal. Serrano began his studies at Vergara in the Basque provinces, became a cadet in 1822, cornet in 1833 in the lancers of Sagunto, passed into the carabineers in 1829, and when the Carlist agitation began in 1833 he exchanged into the cuirassiers. He formed part of the escort which accompanied Don Carlos, the first pretender and brother of Ferdinand VII., to the

frontier of Portugal. As

6 Here the transition from mother-right to paternity should probably be taken into consideration. For the view that the serpent as a genius or daemon may be replaced by the human (and female) victim, who thus becomes in time the guardian (cf. § 10), see J. C. Lawson, op. cit. pp. 271 sqq.

7 One may note the Indian local saint Guga, who punishes by snake-bite and can cure his worshippers (similarly the Egyptian Mert-seger, the serpent-patroness of the Theban necropolis and the serpent, the saviour-god of the Phrygian Hierapolis) ; he is repre- sented on horseback descending to the infernal regions; over hira two snakes meet, one being coiled round the long staff which he holds in his hands (Crooke i. 212 seq.). But how many different factors may not have influenced the representation!

aide-de-camp of Espoz y Mina, then under the orders of Generals Cordoba and Espartero, in the armies of Queen Isabella, Serrano took such an active part in the Carlist War from 1834 to 1839 Chat he rose from the rank of captain to that of brigadier-general. His services obtained for him the Cross of San Fernando and many medals. In 1839 he was elected a member of Cortes for the first time by Malaga, and in 1840 he was made a general of division and commander of the district of Valencia, which he relinquished to take his seat in congress. From that day Serrano became one of the chief military politicians of Spain. In 1841 he helped Espartero to overthrow the regency of Queen Christina; in 1843 at Barcelona he made a pronunciamiento against Espar- tero; he became minister of war in the Lopez cabinet, which convoked the Cortes that declared Queen Isabella of age at fifteen, served in the same capacity in an Olozaga cabinet, sulked as long as the Moderados were in office, was made a senator in 1845, captain-general of Granada in 1848, and from 1846 to 1853 lived quite apart from politics on his Andalusian estates or travelling abroad. He assisted Marshal O'Donnell in the military movemerts of 1854 and 1856, and was his staunch follower for twelve years. O'Donnell made him marshal in 1856 and captain-general of Cuba from 1859 to 1862; and Serrano not only governed that island with success, and did good service in the war in Santo Domingo, but he was the first viceroy who advocated political and financial reforms in the colony. On his return to Spain he was made

duke de la Torre, grandee of the first class, and minister of foreign affairs by O'Donnell. Serrano gallantly exposed his life to help O'Donnell quell the formid- able insurrection of the 22nd of June 1866 at Madrid, and was rewarded with the Golden Fleece. At the death of O'Donnell, he became the chief of the Union Liberal, and as president of the senate he assisted Rios Rosas to draw up a petition to Queen Isabella against her Moderado ministers, for which both were exiled. Nothing daunted, Serrano began to conspire with the duke of Montpensier, Prim and Sagasta; and on the 7th of July 1868 Gonzalez Bravo had Serrano and other generals arrested and taken to the Canary Isles. There Serrano remained until Admiral Topete sent a steamer to bring him to Cadiz on the 18th of September of the same year. On landing he signed the mani- festo of the revolution with Prim, Topete, Sagasta, Martos and others, and accepted the command of the revolutionary army, with which he routed the troops of Queen Isabella under the orders of the marquis of Novaliches at the bridge of Alcolea. The queen fled to France, and Serrano, having entered Madrid, formed a Provisional Government, convoked the Cortes Con- stituyentes in February 1869, and was appointed successively president of the executive and regent. He acted very impartially as a ruler, respecting the liberty of action of the Cortes and cabinets, and bowing to their selection of Amadeus of Savoy, though he would have preferred Montpensier. As soon as Amadeus reached Madrid, after the death of Prim, Serrano consented to form a coalition cabinet, but it kept together only a few months. Serrano resigned, and took the command of the Italian king's army against the Carlists in North Spain. He tried to form one more cabinet under King Amadeus, but again resigned when that monarch declined to give his ministers dictatorial powers and sent, for Ruiz Zorilla, whose mistakes led to the abdication of Amadeus on the nth of February 1873. Serrano would have nothing to do with the federal republic, and even conspired with other generals and politicians to over- throw it on the 23rd of April 1873; but having failed, he had to go to France until General Pavia, on the eve of his coup d'etat of the 3rd of January 1874, sent for him to take the head of affairs. Serrano assumed once more the title of president of the execu- tive; tried first a coalition cabinet, in which JMfertos and Sagasta soon quarrelled, then formed a cabinet presided over by Sagasta, which, however, proved unable to cope with the military and political agitation that brought about the restoration of the Bourbons by another pronunciamiento at the end of December 1874. During the eleven months he remained in office Serrano devoted his attention chiefly to the reorganization of finance, the renewal of relations with American and European powers, and

the suppression of revolt. After the Restoration, Serrano spent some time in France, returned to Madrid in 1876, attended palace receptions, took his seat as a marshal in the senate, coquetted a little with Sagasta in 1881, and finally gave his open support to the formation of a dynastic Left with a democratic programme defended by his own nephew, General Lopez Dominguez. He died in Madrid on the 26th of November 1885, twenty-four hours after Alphonso XII. (A. E. H.)

SERRES, OLIVIA (17 7 2-1 834), an English impostor, who claimed the title of Princess Olive of Cumberland, was born at Warwick on the 3rd of April 1772. She was the daughter of Robert Wilmot, a house-painter in that town, who subsequently moved to London. In 1791 she married her drawing-master, John Thomas Serres (1759-1825), marine painter to George III., but in 1804 separated from him. She then devoted herself to painting and literature, producing a novel, some poems and a memoir of her uncle, the Rev. Dr Wilmot, in which she endeavoured to prove that he was the author of the Letters of Junius. In 1817, in a petition to George III., she put forward a claim to be the natural daughter of Henry Frederick, duke of Cumberland, the king's brother, and in 1820, after the death of George III., claimed to be the duke's legitimate daughter. In a memorial to George IV. she assumed the title of Princess Olive of Cumberland, placed the royal arms on her carriage and dressed her servants in the royal liveries. Her story represented that her mother was the issue of a secret marriage between Dr Wilmot and the princess Poniatowski, sister of Stanislaus, king of Poland, and that she had married the duke of Cumberland in 1767 at the London house of a nobleman. She herself, ten days after her birth, was, she alleged, taken from her mother, and substituted for the still-born child of Robert Wilmot. Mrs Serres's claim was supported by documents, and she bore sufficient resemblance to her alleged father to be able to impose on the numerous class of persons to whom any item of so-called secret history is attractive. In 1823 Sir Robert Peel, then Home Secretary, speaking in parliament, declared her claims unfounded, and her husband, who had never given her pretensions any support, expressly denied his belief in them in his will. Mrs Serres died on the 21st of November 1834, leaving two daughters. The eldest, who married Antony Ryves, a portrait painter, upheld her mother's claims and styled herself Princess Lavinia of Cumberland. In 1866 she took her case into court, producing all the documents on which her mother had relied, but the jury, without waiting to hear the conclusion of the reply for the crown, unanimously declared the signatures to be forgeries. Mrs

Serres's pretensions were probably the result of an absurd vanity. Between 1807 and 181 5 she had managed to make the acquaintance of some members of the Royal family, and from this time onwards seems to have been obsessed with the idea of raising herelf, at all costs, to their social level. The tale once invented, she brooded so continuously over it that she probably ended by believing it herself.

See W. J. Thorns, Hannah Light foot, and Dr Wilmot' s Polish Princess (London, 1867); Princess of Cumberland's Statement to the English Nation; Annual Register (1866), Case of Ryves v. the Attorney- General.

SERTORIUS, QUINTUS, Roman statesman and general, was a native of Nursia in Sabine territory. After acquiring some reputation in Rome as a jurist and orator, he entered upon a military career. He served under Marius in 102 b.c. at the great battle of Aquae Sextiae (mod. Aix) in which the Teutones were decisively defeated. In 97 he was serving in Spain. In 91 he was quaestor in Cisalpine Gaul, and on his return to Rome he would have been elected to the tribuneship but for the decided opposition of Sulla. He now declared for Marius and the democratic party, though of Marius himself as a man he had the worst opinion. He must have been a consenting party to the hideous massacres of Marius and Cinna in 87, though he 9eems to have done what he could to mitigate their horrors. On Sulla's return from the East in 83, Sertorius went to Spain, where he represented the Marian or democratic party, but without receiving any definite commission or appointment. Having been

obliged to withdraw to Africa in consequence of the advance of the forces of Sulla over the Pyrenees, he carried on a campaign in Mauretania, in which he defeated one of Sulla's generals and captured Tingis (Tangier) . This success recommended him to the people of Spain, more particularly to the Lusitanian tribes in the west, whom Roman generals and governors of Sulla's party had plundered and oppressed. Brave and kindly, and gifted with a rough telling eloquence, Sertorius was just the man to impress them favourably, and the native militia, which he organized, spoke of him as the " new Hannibal." Many Roman refugees and deserters joined him, and with these and his Spanish volunteers he completely defeated one of Sulla's generals and drove Q. Caecilius Metellus

Pius, who had been specially sent against him from Rome, out of Lusitania, or Further Spain as the Romans called it. Sertorius owed much of his success to his statesmanlike ability. His object was to build up a stable government in the country with the consent and co-operation of the people, whom he 'wished to civilize after the Roman model. He established a senate of 300 members, drawn from Roman emigrants, with probably a sprinkling of the best Spaniards, and surrounded himself with a Spanish bodyguard. For the children of the chief native families he provided a school at Osca (Huesca), where they received a Roman education and even adopted the dress of Roman youths. Strict and severe as he was with his soldiers, he was particularly considerate to the people generally, and made their burdens as light as possible. It seems clear that he had a peculiar gift for evoking the en- thusiasm of rude tribes, and we can well understand how the famous white fawn, a present from one of the natives, which was his constant companion and was supposed to communicate to him the advice of the goddess Diana, promoted his popularity. For six years he may be said to have really ruled Spain. In 77 he was joined by M. Perperna (or Perpenna) Vento from Rome, with a following of Roman nobles, and in the same year the great Pompey {q.v.) was sent to conquer him. Sertorius proved himself more than a match for his adversaries, utterly defeating their united forces on one occasion near Saguntum. Pompey wrote to Rome for reinforcements, without which, he said, he and Metellus would be driven out of Spain. Sertorius was in league with the pirates in the Mediterranean, was negotiating with the formidable Mithradates, and was in communication with the insurgent slaves in Italy. But owing to jealousies among the Roman officers who served under him and the Spaniards of higher rank he could not maintain his position, and his influence over the native tribes slipped away from him, though he won victories to the last. In 72 he was assassinated at a banquet, Perperna, it seems, being the chief instigator of the deed.

See Plutarch's lives of Sertorius and Pompey; Appian, Bell. civ. and Hispanica; the fragments of Sallust; Dio Cassius xxxvi. 25, 27, 28, xliv. 47; Veil. Pat. ii. 25, 29, 30, 90.

SERURIER, JEAUME MATHIEU PHILIBERT, Comte (1742- 181 9), French soldier, was born at Laon of middle-class parent- age. After being lieutenant of the Laon militia, he entered the royal army, and served in the campaigns in Hanover (1759), Portugal (1762) and Corsica (1771). At the beginning of the Revolution he had attained the rank of major, and in its course he became colonel, brigadier-general and finally general of division. He fought under Kellermann and B. L. J. Scherer in the army of the Alps in 1795, and under

Bonaparte in Italy at Vico, Mondovi, Castiglione and Mantua. Besides his military qualities, he showed great administrative talent in governing Venice (1797) and Lucca (1798). He helped Bonaparte in the coup d'ilat of 18 Brumaire, and had a brilliant career under the empire, when he was made senator, count, marshal, and governor of the palace of the Invalides. In 1814, however, he voted for the downfall of Napoleon, and under the Restoration was made a peer of France. He was dismissed from all his posts for having joined Napoleon during the Hundred Days, and died in retire- ment. A statue has been raised to his memory at Laon.

See L. Tuetey, Un Gtm&ral ie I'armie d'ltalie, Serurier (Paris,

1899).

SERVAL (Felis serval), an African wildcat, ranging from Algeria to the Cape. It is of medium size, with long limbs, short tail, and tawny fur spotted with black; the head and body may measure 40 in. and the tail 16 in. Messrs Nicolls and Eglington, joint authors of The Sportsman in South Africa, state that the serval is fairly common in South Central Africa, frequent- ing the thick bush near rivers, and preying on the smaller ante- lopes, guinea-fowls and francolins. The mantles made from its skin are reserved for chiefs and dignitaries of native tribes. Serval kittens can be tamed with little trouble, but are difficult to rear.

SERVAN, JOSEPH MICHEL ANTOINE (1737-1807), French publicist, was born at Romans (Dauphine) on the 3rd of Novem- ber 1737. After studying law he was appointed avocat-gSntral at the parlement of Grenoble at the age of twenty-seven. In his Discours sur la justice criminelle (1766) he made an eloquent protest against legal abuses and the severity of the criminal code. In 1767 he gained great repute by his defence of a Protestant woman who, as a result of the revocation of the Edict of Nantes, had been abandoned by her Catholic husband. In 1772, how- ever, on the parlement refusing to accede to his request that a present made by a grand seigneur to a singer should be annulled on the ground of immorality, he resigned, and went into retire- ment. He excused himself on the score of ill-health from sitting in the States General of 1789, to which he had been elected deputy, and refused to take his seat in the Corps Ugislalif under the Empire. Among his writings may be mentioned inflexions sur les Confessions de J.-J. Rousseau (1783) and Essai sur la formation des assemblies nationales, provinciates, el municipales (1789). His CEuvres choisies and CEuvres inidites have been published by De Portets. His brother Joseph Servan de Gerbey (1

741-1808) was war minister in the Girondist ministry of 1792.

See " Lettres inedites de Servan," in Souvenirs etmimoires (vol. iv., Paris, 1900).

SERVAN (or Servando known as Servandoni), JEAN NICOLAS (1695-1766), French decorator, architect and scene- painter, was born on the 2nd of May 1695. He was the son of a carriage-builder at Lyons. From 1724 to 1742 he was director of decorations at the Paris Opera, at that time situated in a wing of the Palais-Royal. His activity was considerable, whether as a painter or as an inventor of scenic contrivances for f 6tes at the marriage of royal personages. He also designed the decorations for altars, and the facade for the church of Saint Sulpice in Paris. He died in Paris on the 19th of January 1766. His writings include Description abrigie de I'Sglise Saint Pierre de Rome (Paris, 1738), and La Relation de la representation de la forU enchantie sur le thidtre des Tuileries, le 31 mars 1754.

SERVETUS, MICHAEL [Miguel Serveto] (1511-1553), physician and polemic, was born in 151 1 1 at Tudela in Navarre, his father being Hernando Villanueva, a notary of good family in Aragon. His surname is given by himself as "Serveto" in his early works, " per Michaelem Serueto, alias Reues." Later he Latinized it " Servetus "; when writing French (1553) he signs " Michel Seruetus." 2 It is probable that he was of the same family as the Spanish ecclesiastic Marco Antonio Serveto de Reves (d. 1598), born at Villanueva de Sigena in the diocese of Huesca (Latassa, Bibl. nueva, 1798, i. 609). At this place is the traditional mansion of the family, and in the parish church the family altar with the family arms (Christian Life, 29th Sept. 1888). Servetus at Geneva makes Villanueva his birthplace, assigning it to the adjoining diocese of Lerida. His later adopted surname, Villanovanus or de Villeneufve, was no mere pseudonym since he followed his father's example. Of his education we only know that his father sent him to study law at Toulouse, where he first became acquainted with the Bible (1528). Frorn t i525 he had found a patron in Juan de Quintana (d. 1 534), a Franciscan

1 This date rests on his own testimony (both at Vienna and Geneva) and that of Calvin. An isolated passage of the Geneva testimony may be cited in favour of 1509.

1 The form Servet first appears in a letter of Oecolampadius to the senate of Basel (1531) and is never used by himself. Mosheim's " Servede " is an imaginary form.

promoted in 1530 to be confessor to Charles V. In the train of Quintana he witnessed at Bologna the double coronation of Charles in February 1530, visited Augsburg, and perhaps saw Luther at Coburg. The spectacle of the adoration of the pope at Bologna impressed him strongly in an anti-papal direction. He left Quintana, visited Lyons and Geneva, repaired to Oecolam- padius at Basel, and pushed on to Bucer and Capito at Strass- burg. Considerable attention was attracted by his first publica- tion, De Trinitatis erroribus (1531, printed by John Setzer at Hagenau). It is crude, but original and earnest, and shows a wide range of reading very remarkable in so young a man. Melanchthon writes " Servetum multum lego." Quintana, who describes him as di grandissimo ingegno, and gran sophista, thought the matter was Serveto's, but the execution too good to be his (H. Lammer, Monumenta Vaticana, 1861, 109). The essay was followed in 1532 by a revised presentation of his views in dialogue form. We next find him at Lyons (1535) editing scientific works for the Trechsel firm, adopting the " Villano- vanus" surname, which he constantly used till the year of his death. At Lyons he found a new patron in Dr Symphorien Champier (Campegius) (1472-1539), whose profession he resolved to follow. Resorting (1536) to Paris, he studied medicine under Johann Gunther, Jacques Dubois and Jean Fernel. It was in 1536, when Calvin was on a hurried and final visit to France, that in Paris he first met Servetus, and as he himself says, proposed to set him right on theological points. 1 Servetus succeeded Vesalius as assistant to Gunther, who extols his general culture, and notes his skill in dissection, and ranks him vix tdli secundus in knowledge of Galen. He graduated in arts, and claims to have graduated in medicine (of this there is no record at Paris), published six lectures on " syrups " (the most popular of his works), lectured on geometry and " astrology " (from a medical point of view) and defended by counsel a suit brought against him (March 1538) by the medical faculty on the ground of his astro- logical lectures. In June 1538 he writes from Louvain (enrolled there as a university student on the 14th of December 1537 as Michael Villanova) to his father (then resident at San Gil), explains his removal from Paris, early in September, in conse- quence of the death (8th August) of his master (el seilor mi maestro), says he is studying theology and Hebrew, and proposes to return to Paris when peace is proclaimed. After this he practised medicine for a short time at Avignon, and for a longer period at Charlieu (where he contemplated marriage, but was

deterred by a physical impediment). In September 1540 he entered himself for further study in the medical school at Mont- pellier, possibly gaining there a medical degree.

Among attendants on his Paris lectures was Pierre Paulmier, since 1328 archbishop of Vienne. Paulmier now invited Servetus to Vienne as his confidential physician. He thus acted for twelve years (1541-1553), making money by his practice, and also by renewed editorial work for the Lyons publishers — work in which he constantly displayed his passion for original discovery in all departments. Outwardly he was a conforming Catholic; privately he pursued his theological speculations. It is probable that in 1541 he had been rebaptized (he maintained the duty of adult baptism at the age of thirty). Late in 1545, or very early in 1 546, he opened a fatal correspondence with Calvin, forwarding the manuscript of a much-enlarged revision of his theological tracts and expressing a wish to visit Geneva. Calvin replied (13th February 1546) in a letter now lost; in which, he says, he expressed himself " plus durement que ma coustume ne porte." On the same day he wrote to Guillaume Farel, " si venerit, mode valeat mea autoritas, vivum exire nunquam patiar," and to Pierre Viret in the same terms. Evidently Servetus had warning that if he went to Geneva it was at his peril. Writing to Abel Pouppin (in or about 1547) he complains that Calvin would not return his manuscript, and adds, " mihi ob earn rem moriendum esse certo scio." The volume of theo- logical tracts, again recast, was declined by two Basel publishers, Jean Frellon (at Calvin's instance) and MarrinuSj but an edition

1 Beza incorrectly makes Servetus the challenger, and the date

1534-

of 1000 copies was secretly printed at Vienna by Balthasar Arnollet. Ready by the 3rd of January 1553, the bulk of the impression was privately consigned to Lyons and Frankfort for the Easter market. On 26th February, a letter, enclosing a sheet of the printed book, and revealing the secret of its authorship, was written from Geneva by Guillaume H. C. de Trye, formerly (chevin of Lyons, to his cousin Antoine Arneys in that city. The letter bears no sign of dictation by Calvin (who must, how- ever, have furnished the enclosed sheet) , and de Trye's part may be explained by an old grudge of his against the Lyons book- sellers. For a subsequent letter Calvin furnished (reluctantly, according to de Trye) samples of Servetus's handwriting, expressly to secure his conviction. The inquisitor-general at Lyons, Matthieu Ory (the " Doribus " of Rabelais) took up

the case on 1 2th March; Servetus was interrogated on 16th March, arrested on 4th April, and examined on the two following days. His defence was that, in correspondence with Calvin, he had assumed the character of Servetus for purposes of discussion. At 4 a.m. on 7th April he escaped from his prison, evidently by connivance. He took the road for Spain, but turned back in fear of arrest. How he spent the next four months is not known. His own account is that he never left France; Calvin believed he was wandering in the North of Italy; the absurd suggestion that he lay hid as a conspirator in Geneva was first started by J. Spon (Hist, de Geneve, 1680). On Saturday the 12th of August he rode into Louyset, a village on the French side of Geneva. Next morning, having sold his horse, he walked into Geneva, put up at " the Rose," and asked for a boat to take him towards Zurich on his way to Naples. Finding he could not get the boat till next day (Monday) he attended afternoon service (he would probably have, got into trouble if he had not done so), was recognized at church par quelquesfreres, and immediately arrested. The process against him (Nicholas de la Fontaine being in the first instance the nominal prosecutor) lasted from 14th August to 26th October, when sentence " estre brusle tout vyfz " was passed, and carried out next day at Champel (Oct. 27th, 1553). Calvin would have had him beheaded. Meanwhile the civil tribunal at Vienne had ordered (17th June) that he be fined and burned alive; the sentence of the ecclesiastical tribunal at Vienne was delayed till 23rd December. Jacques Charmier, a priest in Servetus's confidence, was condemned to three years' imprisonment in Vienne. The only likeness of Servetus is a small copperplate by C. Sichem, 1607 (often reproduced); the original is not known and the authenticity is uncertain. In 1876 a statue of Servetus was erected by Don Pedro Gonsalez de Velasco in front of his Instituto Antropologico at Madrid; in 1903 an expiatory block was erected at Champel; in 1907′ a statue was erected in Paris (Place de la Mairie du XIV e Arrondissement) ; another is at Aramnese; another was prepared (1910) for erection at Vienne.

The religious views of Servetus, marked by strong individuality, are not easily described in terms of current systems. His denial of the tripersonality of the Godhead and the eternity of the Son, along with his anabaptism, made his system abhorrent to Catholics and Protestants alike, in spite of his intense Biblicism, his passionate devotion to the person of Christ, and his Christocentric scheme of the universe. His earliest theological writings, in which he approximates to the views of F. Socinus, are better known than his riper work. He has been classed with Arians, but he endorses in his own

way the homoousian formula, and denounces Arius as " Christi gloriae incapacissimus." He has had many critics, some apologists (e.g. Postel and Lincurius), few followers. The fifteen condemnatory clauses, prefacing the sentence at Geneva, set forth in detail that he was guilty of heresies, blasphemously expressed, against the foundation of the Christian religion. An instance of his injurious language was found in his use of the term " trinitaires " to denote " ceux qui croyent en la TriniteV' No law, current in Geneva, has ever been adduced as enacting the capital sentence. Claude Rigot, the procureur-g6neYal, put it to Servetus that his legal education must have warned him of the provisions of the code of Justinian to this effect ; but in 1535 all the old laws on the subject of religion had been set aside at Geneva ; the only civil penalty recognized by the edicts of 1543 being banishment. The Swiss churches, while agreeing to condemn Servetus, say nothing of capital punishment in their letters of advice. The extinct law seems to have been revived for the occasion. A valuable controversy followed on the question of executing heretics, in which Beza (for), Mino Celsi (against),

and several caustic anonymous writers (especially Castellio) took part.

The following is a list of his writings:—

1. De Trinitatis erroribus libri septem (Hagenau, 1531).

2. Dialogorum de Trinitaie libri duo (Hagenau, 1532); two reprints of 1 and 2, to pass for originals; No. 1 in Dutch version (1620), by Regnier Telle.

3. Claudii Ptolomaei Alexandrini geographicae enarrationis libri octo\ ex Bilibaldi Pirckheymeri translatione, sed ad Graeca et prisca exemplaria a Michaele Villanovano jam primum recogniti. Adjecta insuper ab eodem scholia, &c. Lyons, Melchior and Gaspar Trechsel (1535; 2nd ed., Lyons, Hugo a Porta (1541), i.e. 1542 fol.; printed by Caspar Trechsel at Vienne) ; on this work Tollin founds his high estimate of Servetus as a comparative geographer; the passage incriminated on his trial as attacking the verity of Moses is from Lorenz Friese; the accounts of the language and character of modern nations show original observation.

4. In Leonardum Fuchsium apologia. Autore Michaele Villano- vano

(1536, reproduced by photography, 1909).

5. Syruporum universa ratio, &c. (Paris, 1537); four subsequent editions; latest, Venice, 1548 (six lectures on digestion; syrups treated in fifth lecture).

6. Michaelis Villanovani in quendam medicum apologetica disceptatio pro astrologia (Paris, 1538; reprinted, Berlin, 1880); the medicus is Jean Tagault, who interrupted Servetus's lectures on astronomy, including meteorology.

7. Biblta Sacra ex Santis Pagnini tralatione . . . recognita et scholiis illustrata, &c. (Lyons, Hugo a Porta, 1542, fol.), remarkable for its theory of prophecy, explained in the preface and illustrated in the notes.

8. D'Artigny says Servetusyif les argumens to a Spanish version of the Summa of Aquinas; this, and divers traitis de grammaire from Latin into Spanish have not been identified.

9. Chrislianismi restitutio (1553; perfect copies in Vienna and Paris) ; a copy in Edinburgh University Library is complete except that the missing first sixteen pages are replaced by a transcript from the original draft, containing matter not in the print (this supplementary manuscript was reproduced by photography, 1909); a transcript of other portions of the draft is in the Bibl. Nat., Paris; partly reprinted (London, 1723), (copies in London and Paris) ; reprinted (page for page) from the Vienna copy (Nuremberg, Kau, 1790); German version, by B. Spiess (Wiesbaden, 1892-1895); the last section Apologia to Melanchthon, is given in the original Latin. The book is not strictly anonymous; the initials M.S.V. are given at the end; the name Seruetus on p. 199. The often-cited description of the pulmonary circulation (which occurs in the 1546 draft) begins p. 169; it has escaped even Sigmond that Servetus had an idea of the composition of water and of air; the hint for his re- searches was the dual form of the Hebrew words for blood, water, &c. Two treatises, Desiderius {ante 1542) and De tribus impos- toribus (1598) Jhave been wrongly ascribed to Servetus. Most of his few remaining letters are printed by Mosheim; his letter from Louvain was despatched in duplicate (to evade capture), but both were seized; one is in the Record Office (U. 140), the other in the British Museum (Cotton MSS., Galba B. x.).

Authorities. — The literature relating to Servetus is very large; a bibliography is in A. v. d. Linde, Michael Servet (i89i);_ the following

are among the important pieces. Calvin's Defensio orthodoxae fidei (1554) (in French, Declaration pour maintenir, &c, 1 554)i ' s the source of prevalent misconcep- tions as to Servetus's opinions, and atti- tude on his trial. De la Roche's Historical Account in Mem. of Lit. (1711-1712) (in French, Biblioth. Ang. Amsterdam, 1717) was followed by An Impartial History, &c, 1724 (said to be by Sir Benjamin or Nathaniel Hodges). ' Allwoerden's Historia, &c. (1728) (materials furnished by Mos- heim) is superseded by Mosheim's Anderweitiger Versuch (1748, with appendix, Neue Nachrichten, &c, 1750), reproducing the records of the Vienne examination (since lost) first printed by D'Artigny, Nouveaux Mbmoires dhist., &c, vol. ii. (1749). Chaufepii's valuable article, Nouv. Diet, historique, iv. (1756), fol. (in English, by Rev. James Yair, 1771) makes no use of Mosheim's later researches. Trechsel's Die Prot. Anlitriniiaires vor F. Socin, bk. i. (1839), uses all available material up to date. The investiga- tions of H. Tollin, M.D. (forty separate articles in various journals,

1874 to 1885) have thrown much light, mixed with some conjecture. The records of the Geneva trial, first published by De la Roche, reproduced in Rilliet's Relation &c, (184.4), an d elsewhere, are best given in vol. viii. (1870) of the Corpus reformatorum edition of Calvin's works; Roget's Hist, du peuple de Geneve, vol. iv. (1877), has a good account of both trials. The passage on the pulmonary circulation, first noticed by W. Wotton, Reflections upon Anc. and Mod. Learning (1694), has given rise to a literature of its own; see, especially, Tollin's Die Entdeckung des Blutkreislaufs, &c. (1876); Huxley, in Fortnightly Rev. (February 1878); Tollin's Kritische Bemerkungen uber Harvey und seine Vorgdnger (1882). Other physiological speculations of Servetus are noted by G. Sigmond, Unnoticed Theories of Servetus (1826). The best study of Servetus as a theologian is Tollin's Lehrsystem M. Servets (3 vols., 1876-1878); Piinyer's De M. Serveti doctrina (1876), is useful. From a Unitarian – point of view, Servetus is treated by R. Wright, Apology (1807); W. H. Drummond, D.D. (1848); R. Wallace, Antitrin. Biog. (1850); J. S. Porter, Servetus and Calvin (1854). E. Saisset, Rev. des deux Mondes (1848), treats Servetus as a pantheist; he is followed by Menendez Pelayo, Los Heterodoxos espanoles (1880, vol. ii.), and by R. Willis, M.D., Servetus and Calvin (1877, an unsatisfactory book; cf. A. Gordon, Theol. Rev., April and July 1878). Of Servetus's personal character the best vindication is Tollin's Characterbild M. Servets (1876, in French, with additions by Dardier, Portrait Carac- tere, 1879). His story has been dramatized by Max Ring, Die Genfer (1850), by Jose Echegaray, La Muerte en los Labios (1880), by

Albert Hamann, Servet (1881), and by Prof. Shields, The Reformer of Geneva (1897). Recent pamphlets by Spanish and French writers are numerous; some of the illustrations in Dr W. Osier's Michael Servetus (1909), are useful. (A. Go.)*

SERVIA 1 [Srbiya], an inland kingdom of south-eastern Europe, situated in the north of the Balkan Peninsula. The frontier, as defined by the Berlin Treaty of 1878, is, roughly speaking, indicated by rivers in the north, and by mountains in the south. In the north, between Verciorova and

*Railway**

Boundaries of Departments •"—

Capitals of Departments „...„ — •

E,ncrvV«]ker «c

Belgrade, the Danube divides Servia from Hungary for 157 m.; and between Belgrade and the border village of Racha the Save divides it from Croatia-Slavonia for 80 m. In the north- west the Drina flows for 102 m. between Bosnia and Servia; 1 The English-speaking races alone write this word with a v instead of a b, Servia for Serbia; a practice resented by the Serbs, as suggesting the derivation of their name from the Latin Servus. " a slave."

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in the north-east the Danube, for 50 m., and the Timok for 23 m., constitute respectively the Rumanian and Bulgarian boundaries. Various mountain ranges mark the frontiers of Bosnia, on the west, Turkey on the south-west and south, and Bulgaria on the south and south-east. According to the survey carried out by the Servian general staff in 1884 the area of the country is 18,782 sq. m.

Mountains. — The mountain groups which rise confusedly over almost the whole surface of the land, fall into two main blocks, one on either side of the river Morava. On the east of this river, three vast ranges, the Transylvanian Alps, the Balkans and Rhodope, encroach upon Servian soil; while on the west there is a chaos of mountain masses, outliers of the Bosnian and Albanian highlands.

Rivers. — The chief navigable river of Servia is the Danube, which

enters the country at Belgrade ana pierces the Transylvanian Alps by way of the Kazan (i.e. " Cauldron ") Pass, near the famous Iron Gates (see Rumania). The Timok, which formed the Bulgarian frontier as long ago as the 9th century, springs in the western Balkans, or Stara Planina, and issues into the Danube, near Negotin, after a course of 70 m. Sooner or later, indeed, all the Servian rivers reach the Danube. The Save, which is also navigable, meets it at Belgrade, after being joined, at Racha, by the Drina, a Bosnian river, which rises on the Montenegrin border, 155 m. S. by W. Near Obrenovats the Kolubara also enters the Save, after traversing 45 m. from its source in the Sokoiska Gora. Apart from frontier rivers, the most important stream is the Morava, which, rising on the western slopes of the Kara Dagh, a little beyond the Servian frontier, enters the country with a north-easterly course near the extreme S.E., and then turns N.N.W. and flows almost in a straight line through the heart of the kingdom to the Danube. Its total length is about 150 m. In the upper part of its course it is known as the Bulgarian Morava, and only after receiving the Servian Morava on the left is it known as the Morava simply or as the Great Morava. The Servian Morava is joined on the south by the Ibar, which comes from the Albanian Alps; the combined length of these rivers being about 130 m. The only other important tributary of the Great Morava is the Nishava, which it receives on the right, at Nish. This stream flows 68 m. W. by N. from its source among the foothills of the Stara Planina. The valleys of all these rivers, especially those of the Bulgarian and the Great Morava, and of the Nishava, contain considerable areas of level or low-lying country well suited for the growth of corn, and the low grounds along the Save and the Danube from the Drina to the Morava are also well adapted for agriculture, except the tract of fenland called the Machva, in the extreme north-west.

Geology. — The geological structure of Servia is varied. In the south and west the sedimentary rocks most largely developed are of ancient, pre-Carboniferous date, interrupted by considerable patches of granite, serpentine and other crystalline rocks. Beyond this belt there appear in the north-west Mesozoic limestones, such as occupy so extensive an area in the north-west of the Balkan Peninsula generally, and the valleys opening in that quarter to the Drina have the same desolate aspect as belongs to these rocks in the rest of that region. In the extreme north-east the crystalline schists of the Carpathians extend to the south side of the Danube, and stretch parallel to the Morava in a band along its right bank. Elsewhere east of the Morava the prevailing rocks belong to the Cretaceous series, which enters Servia from Bulgaria. The Shumadia is mainly occupied

by rocks of Tertiary age, with intervening patches of older strata; and the Rudnik Mountains are traversed by metal- liferous veins of syenite.

Minerals. — Gold, silver, iron and lead were worked by the Romans, whose operations can still be traced in the Kostolats mine, near Pozharevats, and elsewhere. Even more ancient is the Avala mercury mine, near Belgrade. The heaps of debris which cover so many acres near Belgrade, on the Kopaonik foothills and in the Toplitsa valley bear witness to the importance of this industry in the past. During the later middle ages the Servian mines brought in a large revenue to the merchant princes of Ragusa. They pros- pered greatly during the 14th century, but Turkish rule put a stop to this industry after 1459; and the revival only began in 1835, under the patronage of Prince Milosh. The richest coal and lignite seams occur among the north-eastern mountains, generally near the Danube or Timok, and along the Morava. They are worked by the state, by Belgian companies and by private enterprise, the output in 1907 being valued at £121,000. Lead is principally raised in the Podrinye, especially at Krupan; and at Kuchayna, in the Pozhare- vats department, where zinc and small quantities of gold and silver are obtained. Antimony is mined at Zayechar. Copper and iron are worked by Belgians at Maydanpek, the chief mining centre east of the Morava. Nickel, mercury, manganese, graphite, marble, sulphur and oil shales are found in various regions, but the mineral resources of the country, as a whole, remain almost undeveloped.

. The numerous mineral springs are even more neglected than the mines. Waters rich in iodine and sulphur occur in the Machva. About 1878 an unsuccessful attempt was made to convert

Arandyelovats into a popular health-resort. The baths near Nish and Vranya are comparatively prosperous, while the beautiful surroundings attract visitors even from abroad.

Climate.— The climate of Servia is on the whole mild, though subject to the extremes characteristic of inland Eastern countries. In summer the temperature may rise as high as 106° F., while in winter it often sinks to 13° or even 20 below zero. The high-lying valleys in the south are colder than the rest of the country, not only on account of their greater elevation but also because of their being exposed to cold winds from the north and north-east.

Fauna. — The wild life of the Servian highlands is unusually varied. A few bears and wild boars and lynxes find shelter in the remoter

forests, with many badgers, wolves, foxes, wildcats, martens and weasels. Otters are common along the rivers; chamois may very rarely be seen on the least accessible peaks; roe-deer, red-deer, squirrels and rabbits people the lower woodlands; arid hares abound in the open. The beaver is extinct. Among land birds may be enumerated several varieties of eagle, vulture, falcon, owl, crow, jay,_ magpie, stork, quail, thrush, dove, &c. Pheasants are easily acclimatized; grouse and woodcock are indigenous on the uplands of the north ; partridges, in all districts. Game laws were instituted in 1898. Innumerable aquatic birds haunt the banks of the Save, Danube and Drina, and the lower reaches of the Timok and Morava ; among them being pelicans, cranes, grey and white herons, and many other kinds of waders, besides wild geese, ducks, rail and snipe. Edible frogs, tree-frogs, lizards, snakes, tortoises and scorpions are found in all parts. The principal fisheries are in the Danube and Save.

_ Forests. — About one tenth of the land is covered by forests, which give place, at an altitude of 5000 ft., to lichens and mosses. Little care was bestowed on forestry in the 19th century, apart from government supervision of the national and communal domains, a task usually delegated to the local mayor. Much of the finest timber was felled in the wars of 1876-1878 and of 1885, and the rights of grazing and wood-cutting also caused widespread de- struction. The total forest area (official estimate, 1909) is about 3,800,000 acres, of which 1,625,000 belong to the communes and i ; 375>ooo to the state. Oaks and beeches predominate in the north; pines, often of gigantic size, among the fantastic /white or grey rocks of the wild south-western ridges.

Agriculture. — Servian methods of farming remain in many respects primitive. Real progress was, however, achieved in the period 1890-1910, chiefly owing to improvements in agri- cultural education. Indian corn is the principal crop, for corn- cake forms the staple diet of the peasantry, while the grain is also used for feeding pigs, the heads for feeding cattle and the stubble for manure. The normal yield exceeds 5,000,000 bushels yearly, wheat coming next with a little less than 4,000,000. Flax, hemp and tobacco are also grown; hemp especially near Leskovats. The cultivation of sugar-beet, introduced in 1900, became an important industry, but the attempt to introduce cotton failed. The native tobacco planta- tions meet all the local demand, except for a small quantity of Turkish tobacco imported for the manufacture of special blends The best Servian wines are those of Negotin and Semendria. Before the appearance of Phylloxera in 1882 wine was exported to France and*

Switzerland, but in 188 2-1 895 thousands of acres of vines were destroyed. Phylloxera was checked by the importation of American vines and the establishment of schools of viticulture. The creation of state vine-nurseries, stocked with American plants, was authorized by a law of 1908. Orchards are very extensive, and all the fruits of central Europe will thrive in Servia. The chief care is bestowed on plums, from which is distilled a mild spirit known as raki or rakiya. The favourite kind of raki is shlivovitsa (the sliwowitz of Austria), (extracted solely from plums. There is a considerable trade in dried plums and plum marmalade. Bees are very generally kept, the honey being consumed in the country, the wax ex<- ported. Mulberries are grown on many farms for silkworms; sericulture is encouraged and taught by the state, arid over 100,000 lb of cocoons are annually exported. Relatively to its population, Servia possesses a greater number of sheep (3,160,000 in 1905) and pigs (908,000 in 1905) than any country in Europe. Large herds of swine fatten, in summer and autumn, on the beech- mast and acorns of the forests, returning in winter to the low- lands. The Servian pig is pure white or black, but other breeds, notably the Berkshire and Yorkshire, are kept. Despite Ameri- can competition and Austro-Hungarian tariffs the export of swine remains the principal branch of Servian commerce; Cheeses are made from the milk of both sheep and goats; but

cattle are mostly bred for export or draught purposes. The cumbrous wooden carts which afford the sole means of transport in many districts are generally drawn by oxen, although buffaloes may be seen in the south. The native horses, though strong, are, like the cattle, of small size.

Land Tenure. — More than four-fifths of the Servians are peasant farmers; and the great majority of these cultivate the land be- longing to their own families. Holdings are generally small, not exceeding an average of 20 acres for each household. They cannot be sold or mortgaged entire ; the law forbids the alienation for debt of a peasant's cottage, his garden or courtyard, his plough, his last six yutara l of land and the cattle necessary for working his farm. Besides the small farms there is the zadruga, a form of community which appears to date from prehistoric times, and mainly survives along the Bosnian frontier, though tending to disappear everywhere and to be replaced by rural co-operation. Under the zadruga system, each homestead or cluster of cottages is occupied by a group of

families connected by blood and dwelling together on strictly communistic principles. The association is ruled by a house-father (domanyin or staryeshina) and a house-mother (domanyitsa) , who assign to the members their respective tasks. The staryeshina may be the patriarch of the community, but is often chosen by the rest of the members on account of his prudence and ability; nor is his wife necessarily the domanyitsa. In addition to the farm work, the members often practise various trades, the proceeds of which are paid into the common treasury. The community sometimes includes a priest, whose fees for baptism, &c, augment the common fund. The buildings belonging to the homesteads are enclosed within an immense palisade, inside which a large expanse of fields is mostly planted with plum, damson, and other fruit-trees, sur- rounding the houses of the occupiers. In the midst of these is the house of the staryeshina, which contains the common kitchen, eating hall, and family hall of the entire homestead. Here all the members assemble in the evening for conversation and amusement, the women spinning, while the children play. The houses are mostly very small wooden structures, serving for little else but sleeping places. But that of the staryeshina is often of brick, and is invariably of better construction than the rest. The houses are often raised on piles, above the level of the floods which occur so frequently near the Save and Drina. Zadrugas were very prosperous, as they had always a sufficient number of hands at command, and their members combined to obtain implements and cattle. But with the establishment of order and security, the zadrugas began rapidly to disappear, a further cause of their dissolution being the fact that members could legally acquire private property (osobina). A new stimulus was given to agriculture by the encouragement which King Alexander personally extended to the establishment of rural co-operative associations on the Raiffeisen principles. The object of these associations is principally to facilitate the acquisition of improved implements and better breeds of cattle. No fewer than 100 of such credit societies were founded between 1894 and 1899. The total number of agricultural co-operative societies exceeded 500 in 1910; each has its tribunal (Conseil des Prud' hommes) , which arbitrates in disputes; and all together, with the state-aided Co- operative Caisse, which lends money to the smaller societies, form a single great organization known as the General Union.

Small holdings were in themselves a hindrance to Servian agri- cultural progress, inasmuch as small farmers cannot afford the cost of scientific farming; hence the great success of co-operation. As a rule, also, the lots of ground belonging to one household or family do

not lie together, but are dispersed in different, very often distant, parts of the village land. To meet this difficulty, a farmer with more crops than he can reap unaided will summon his neighbours to his assistance, supplying them with food, but no money, and binding himself to repay the service in kind. This form of voluntary co-operation is called moba. Another serious drawback to the economic position is that Seryia has no seaboard, and that it is far from the nearest export harbours (e.g. Galatz, Salonica, Fiume). In such a situation the country is at the mercy of hostile tariffs.

Manufactures and Commerce. — The scarcity of labour prevents the growth of any great manufacturing industries. There is no native artisan class; for except in very rare cases, the people value their independence too highly to work in factories, or even to enter domestic service. A large proportion of the artisans throughout Servia are Austro-Hungarians or gipsies. The chief manufacturing industries are those for which the country supplies raw material, notably meat-packing, flourTmilling, brewing, tanning, and the weaving or spinning of hemp, flax and wool. There are also iron-foundries, potteries, and sugar, tobacco and celluloid factories. A law of 1898 authorizes the government to grant concessions on very favourable terms to foreign capitalists willing to promote mining and manufactures in Servia; but in 1910 the number of large industrial establish- 1 One yutro is the area which two oxen can plough in a day. ,

ments in the kingdom did not exceed 60, nor the number of hands employed 5000. There are a few domestic industries, such as the manufacture of sandals (opanke), and of the hand- woven carpets and rugs made at Pirot, which are popular throughout the Balkan Peninsula.

Commerce. — The following table shows the value of Servian imports and exports for five years : —

Year.

Imports.

Exports.

1904

1905 1906 1907 1908

£2,437,000

2,224,000 1,773,000 2,823,000 3,025,000

£2,486,000

2,879,000 2,864,000 3,259,000 3,019,000

Cotton and woollen fabrics, leather, salt, sugar, iron and machinery are the principal imports, and come chiefly from Austria-Hungary, Germany and Great Britain. Large quantities of prunes, grain, meat, raw hides, eggs and copper are exported, chiefly to Austria-Hungary, Germany and Turkey.

Finance. — Up to 1878 the principal revenues were derived from the customs, excise and a sort of poll-tax. The government required the town and village communities to pay into the state treasury £1, 4s. per head of the able-bodied citizens living in the community, and the municipal board made repartition of the total amount due to the government from its citizens according to their estimated wealth or earnings. That system yielded without the slightest difficulty about £750,000 annually. But the Berlin Treaty (1878) stipulated that Servia should construct part of the international railway to Constantinople and to Salonica, and should pay the Turkish landowners an indemnity for the estates which had been taken from them and divided among their Servian tenants. This and the necessity of indemnifying the people from whom, during the wars with Turkey (1876-1878), requisitions had been taken and money borrowed, forced the government to enter the European financial markets. Up to that time (1881) Servia had practically no public foreign debt, although it owed Russia about £240,000 lent privately for war preparations, and to its own people about £320,000 taken by a forced loan for war purposes. The first public loans were made in 1 88 1 by French banks at 71 1 for 5% bonds, and the ex- penditure had to be immediately increased to £1,240,000. The introduction of new taxes and the reorganization of the financial administration of the country could not keep pace with the increase of public expenditure, chiefly because the skupshtina was for some time reluctant to replace the old system of direct taxation by a more modern system. When in 1884 the new law of taxation was adopted, the situation became so serious that in 1895 a new scheme was adopted by which the government gave to the bondholders additional securities, the bondholders at the same time accepting the new 4% unified bonds in exchange for their old 5 % bonds. The following table gives an analysis of the national debt on the 1st of January 1909:—

Russian debt of 1876 (5%) . . . £150,000 Lottery loan of 1 88 1 (2%) . 989,000

Loan of the Uprava Fondova (5%) . 291,000

Primary loan of 1888 367,000

Unified loan of 1895 (4%)" . . . 13,516,000 Railway loan of 1899 (5%) . 192,000

Monopoly loan of 1902 (5%) . . 2,300,000 Loan of 1906 (45%) 3,767,000

Total £21,572,000

The chief sources of revenue are customs duties, the state monopolies of salt, sugar, tobacco, matches and petroleum; national property, e.g. forests, railways, postal service ; direct taxes, of which the most important are the poll-tax and the land taxes (graduated according to the quality of the land): The heaviest charges are for the service of the national debt and for the army ; each of these items exceeded £1,000,000 in 1909. ' The estimated revenue and expenditure for five years are shown below: —

Year.

Revenue.

Expenditure.

1905 1906 1907 1908 1909

£3,522,000

3.595.000 3,618,000 3,832,000 4,145,000

£3,505,000

3,566,000 3,615,000 3,830,000 4,132,000 .

Banks and Money. — The National Bank of Servia, founded in Belgrade in 1883, has a nominal capital of £800,000 (£260,000 paid). The Mortgage Bank (Uprava Fondova), founded in 1862, is a state institution which lends money for agricultural operations, &c. The Export Bank, founded in 1901, is a private bank under state super- vision, with branches in Budapest, Vienna, Berlin, &c. Its chief object is the furtherance of Servian foreign commerce.

In 1875 Servia adopted the decimal system for money, weights and measures, which came into actual use in 1883. The monetary unit is the dinar (franc) of 100 paras (centimes). In circulation there are gold pieces of 10 and 20 dinars; silver of 50 paras, and 1, 2 and 5 dinars; nickel of 5, 10 and 20 paras; and bronze of 2 paras. Twenty-five dinars equal £1 sterling.

Chief Towns. — The chief towns of Servia are Belgrade, the capital, with 69,097 inhabitants in 1900; Nish (24,451); Kraguyevats (14,160); Pozharevats (12,957); Leskovats (13,000); Shabats (12,072); Vranya (11,921); Pirot (10,421); Krushevats (10,000); Uzhitse (7000); Valyevo (6800); Semendria (6912); Chupriya (6000); and Kralyevo (3600).

Communications. — Until the middle of the 19th century, travellers through the Balkan Peninsula had a choice between two main routes, which started as a single highway from Belgrade, and up the Morava valley to Nish. Here two roads diverge; one branching off south-eastwards to Pirot, Sofia and Constantinople; the other proceeding southwards to Vranya, Uskiib and Salonica. The railway which connects western and central Europe with Constantinople and Salonica takes the same course. That section of it which traverses Servia was begun in 1881 and finished in 1888. Branch lines give access to Kraguyevats, Zayechar, Semendria and other important towns, and there are several smaller railways in the valleys of the Save, the Danube, the Servian Morava and their tributaries. Apart from country lanes and footpaths, there are three classes of highways, controlled, respectively, by the nation, department and commune. Construction and repairs are, in theory, carried out by compulsory labour; but this right is seldom enforced. Even in the Shumadia, where materials are plentiful, the roads rapidly give way under heavy traffic, or after bad weather; in the Machva, Podrinye and remoter districts, they are often impassable. The Constantinople and Salonica roads remain the best in Servia. Besides the frontier streams on the north and west, the only river of any importance for navigation is the Morava, which is navigable by steamers of light draught as high as Chupriya, about 60 m. from its mouth.

The postal system dates from 1820, when an organized system of couriers was established, for state correspondence only. From 1843 in 1868 the Servian government undertook the carriage of letters in

Servia itself, while the Austro-Hungarian consulate in Belgrade forwarded correspondence to and from central and western Europe. In 1868 the whole business of posting was taken over by the state; post offices are also maintained by many communes, and a few are itinerant. Servia joined the International Telegraphic Union in 1866, the Postal Union in 1874. The first telegraph line was con- structed as early as 1855; telegrams between Constantinople, Sofia, Budapest and Vienna pass over lines constructed by the Servian government (under conventions with Austria-Hungary and Turkey) in 1899 and 1906. The telephone service, inaugurated in 1900, is a state monopoly (both for construction and operation).

Population. — With a continuous excess of births over deaths, and of male over female children, the population of Servia rose from 2,161,961 in 1890 to 2,493,770 in 1900, and to about 2,750,000 in 1910. More than four-fifths of this number belong to the Serbo-Croatian branch of the Slavonic race; while the remainder is composed of about 160,000 Rumans, 47,000 gipsies, 8000 Austro-Hungarians and Germans, and 5000 Jews. Many Servian emigrants returned, after 1878, to the territories which the Treaty of Berlin restored to their country. These territories had been occupied, under Turkish rule, by Albanians, west of the Morava, and by Bulgarians, along the Nishava; but, after 1878, the Albanians withdrew, and the Bulgarians were absorbed. The Rumans reside principally in the north-east, near the borders of their native land, and are peasant farmers, like the Serbs. The gipsies occasionally settle down, forming separate camps or villages, but in most cases they prefer a wandering life. They are often admirable artisans and. musicians, almost every town possessing a gipsy band. The Germans and Austro- Hungarians control a large share of the commerce of the country; the Jews, as elsewhere in the Balkans, are retail traders. Anti- Semitism is not prevalent in Servia, owing to the smallness of the Jewish communities. The stature and features of the Serbs vary in different regions; but the northern peasantry are generally fairer and shorter than the mountaineers of the south, Those of the Shumadia are blue-eyed or grey-eyed. In many parts the prevailing types have been modified by intermarriage with Bulgars, Albanians and Vlachs; so that, along the Timok, for instance, it is impossible to make physiognomy a test of nationality. Even language does not afford a sure criterion, so nearly akin are many spoken dialects of Servian and Bulgarian.

National Characteristics. — Servia is a land without aristocracy or middle class. Instead, it possesses an army of placemen and

officials; but these being mainly recruited from the peasantry, do not disturb the prevailing social equality. In 1900 there was neither pauper nor workhouse in the country. The people, less thrifty and industrious than the Bulgars, less martial than the Montenegrins, less versatile and intellectual than the Rumans, value comfort far more highly than progress. A moderate amount of work enables them to live well enough, and to pass their evenings at the village wine-shop; although, being a sober race, they meet there rather to discuss politics than to drink. Of politics they never tire; and still greater is their devotion to music, poetry and dancing. Perhaps their most characteristic dance is the kolo, sometimes performed by as many as 100 men and women, in a single serpentine line. Their national instru- ment, the gush (gusla), is a single-stringed fiddle, often roughly fashioned of wood and ox-hide, the bow being strung with horse- hair. All classes delight in hearing or intoning the endless romances which celebrate the feats of their national heroes; for every true Serb lives as much in the past as in the present, and medieval wars still constantly furnish themes of new legends and ballads. It is largely this enthusiasm for the past which keeps alive the desire for a reunion of the whole race, in another Servian Empire, like that overthrown by the Turks in 1389. The fasts of the Orthodox Church are strictly kept; while the festivals, which are hardly less numerous, are celebrated even by the Servian Moslems. As in Bulgaria and Rumania, the slava, or patron saint's day, is set aside for rejoicing. A Servian crowd at a festival presents a medley of brilliant and picturesque costumes, scarlet being the favourite colour. Men wear a long smock of homespun linen, beneath red or blue waistcoats with trousers of white frieze. The women's dress consists of a similar smock, a " zouave " jacket of embroidered velvet and two brightly coloured aprons tied over a white skirt, one in front and one behind. The head-dress is a small red cap, tambourine- shaped, and strings of coins are coiled in the hair, or worn as necklaces and bracelets. In this manner a farmer's wife will often decorate herself with her entire dowry. During the cold months, both sexes wrap themselves in thick woollen coats or sheepskins, with the fleece inwards; both are also shod with corded sandals, called opanke. The Rumanian women retain their native costume, and are further distinguished by the wooden cradles, slung over the shoulders, in which they carry their infants ; the Servian mothers prefer a canvas bag. Women weave most of the garments and linen for their families, besides sharing in every kind of manual labour. Turkish ideas prevail about their social position; but so highly valued are their services, that parents are often unwilling to see their daughters marry; and wives are in many cases older than their husbands. The relationship called pobratimstvo

is only less common than in Montenegro (q.v.); equally binding is kumstvo, or sponsorship, e.g. the relation subsisting between the " best man " and the bridegroom at a wedding, or between godparents and god- children. Persons connected by kumstvo, pobratimstvo, or cousinship, however distant, may not marry. At a funeral, the coffin is left open until the last moment — a custom found every- where in the Balkans, and said to have been introduced by the Turks, who found that coffins were a convenient hiding-place for arms. The same practice is, however, common in Spain and Portugal. Few countries are richer than Servia in myth and folklore. The peasants believe in charms and. omens, in vam- pires, were-wolves, ghosts, the evil eye and vile or white-robed spirits of the earth, air, stream and mountain, with hoofs like a goat and henna-dyed nails and hair. Even at the beginning of the 20th century, education had done little to dispel such superstitions.

Constitution and Government.- — In 1903, after the murder of King Alexander Obrenovich, and the accession of Peter Kara- georgevich, the constitution of 1889 was revived. By this instrument the government of Servia is an independent constitu- tional monarchy, hereditary in the male fine, and in the order of primogeniture. The executive power is vested in the king, advised by a cabinet of eight members, who are collectively and individually responsible to the nation, and represent the

ministers of foreign affairs, war, the interior, finance, public works, commerce, religion and education, and justice. The king and the national assembly, or Narodna Skupshtina, of 130 1 members, together form the legislature. A general election must be held every fourth year. Each member receives 15 dinars for every day of actual attendance, and travels free on the rail- ways. There is also a state council which deals with various legal and financial matters. Of its 16 members, half are chosen by the king, and half by the Skupshtina. Apart from soldiers of the active army, all male citizens of full age may vote, if they pay 15 dinars in direct taxes; while, apart from priests, com- munal mayors and state servants, all citizens of 30 years, paying 60 dinars, are eligible to the Skupshtina. The Velika Skupshtina or Grand Skupshtina is only convoked to discuss the most serious national questions, such as changes in the succession, the con- stitution or the territories of the kingdom. Its vote is regarded as a referendum, and its members are twice as numerous as those of the

Narodna Skupshtina. For purposes of local government Servia is divided into 17 departments {okrug, pi. okruzhi)j each under a prefect (nachalnik), who is assisted by a staff of civil servants, dealing with finance, public works, sanitation, religion, education, police, commerce and agriculture. He also commands the departmental constabulary or pandurs. Every department is divided into districts (srez), administered by the sub-prefect (sreski nachalnik); and the districts are sub-divided into com- munes or municipalities, each having its salaried mayor (kmet or knez), who presides over a council elected on a basis of popula- tion. Within the smaller spheres of their jurisdiction, the sub-prefect and mayor have the same duties to fulfil as their superior, the prefect. The mayor is, further, responsible for the maintenance of the communal granary, forests and other property. He presents to the councillors (odbornik, pi. odbornitsi) a yearly statement of accounts and estimates, which they may reject or amend. All taxes levied by the state are paid by the communal council, which assesses the property owned by each family under its authority, collects the amount due and has the right to retain one-fourth, or more, for local requirements. The central government cannot veto the election of a communal mayor or councillor.

Justice. — The highest judicial authority in Servia is the Court of Cassation, created in 1855 and reorganized in 1865. The court of appeal (1840) has two sections, one competent for Belgrade and the seven northern departments, the other for the rest of the kingdom. There are also departmental tribunals of first instance in every de- partment, and a commercial court of first instance in Belgrade. Communal courts exist in every commune or municipality, and certain judicial powers are delegated to the police, under laws dated 1850-1904. Trial by jury, which existed among the Serbs at least as early as the 13th century and fell into desuetude under Turkish rule, was revived in 1871.

Defence. — The medieval citadels of Belgrade, Nish, Pirot and Semendria have no military value, but some strategic points on the Bulgarian frontier were entrenched between 1889 and 1899, while the modern forts of Nish, Pirot and Zayechar were strengthened and re-armed at the beginning of the 20th century. The defensive force of the country, as reorganized in 1901, consists of the national army (narodna voyska) and the landsturm. In the national army, which is organized in 5 divisions, with headquarters at Nish, Belgrade, Valyevo, Kraguyevats and Zayechar, every able-bodied citizen must serve (for two years in the artillery and cavalry or eighteen months in other branches) between his 21st and his 45th year. He must also

belong to the landsturm at the ages of 17-21 and 45-50. Exemption from service is granted in a few exceptional cases. The national army consists of three bans or classes ; the first is the field army, the units of the second exist in peace as cadres only, the third is unorganized. On a peace footing the strength of the army is 35,600 men; in war it might reach 225,000, including landsturm. The infantry were armed in 1910 with the Mauser rifle (model 99); the field artillery with quick-firing guns on the Schneider-Canet system.

Religion. — The Servian Church is an autocephalous branch of the Orthodox Eastern communion. It is subject, as a whole, to the ministry of education ; for internal administration its governing body is a synod of five prelates, presided over by the archbishop of Belgrade, who is also the metropolitan of Servia. Belgrade is the only archiepiscopal see; the four dioceses are Nish, Shabats, Chachak and the Timok (episcopal see at Zayechar). The synod is the highest ecclesiastical tribunal; there are also two ecclesiastical

1 One member is chosen to represent every 4500 electors.

courts of appeal and diocesan courts of first instance in- every bishop- ric; the canon law is an important part of the law of the land. In 1910 there were 54 monasteries, but only 1 10 monks, all belonging to the order of St Basil. Studenitsa, near Kralyevo, and Manasia and Ravanitsa, near Chupriya, are the most interesting monasteries. Much political influence is wielded by the priests, who played a prominent part in the struggles for national independence. They marry and work, and sometimes even bear arms like their parishioners, from whom a large part of their income is derived, in the shape of offerings and fees. The remainder comes principally from church lands; only the highest dignitaries being paid by the state. No able-bodied man may become a priest or monk unless he has served in the army. Liberty of conscience is unrestricted. Liberty of worship is accorded to Roman Catholics, Jews, Mahommedans and certain Protestant communities. The Mahommedans (about 3000 Turks and 11,000 gipsies) are the largest religious body apart from the national Church.

Education. — In 1910, 17 % of the population could read and write. Primary education in the state schools is free and compulsory; the reading of Church Slavonic, nature-study and agriculture (for boys) , domestic science (for girls) , certain handicrafts, singing and gym- nastics are among the subjects taught. There are higher schools (mostly Real-Gymnasien) in many of the larger towns, besides (1910) one theological seminary, 4 training schools for teachers, 4

technical schools, a military academy, and 5 secondary schools for girls. The communes and municipalities pay the entire cost of primary educa- tion, except the salaries of teachers, which, with the cost of higher education, are paid by the state. In February 1905 the Great School (Velika Shkola) in Belgrade was reorganized as the University of Servia, with faculties of theology, philosophy, law, medicine and engineering. Other important institutions of a semi-educational character are the Royal Servian Academy (1836), which controls the national museum and national library in Belgrade, and publishes periodicals, &c. ; the ethnographical museum (1891), the natural history museum (1904), the national theatre (1890), the State Archives (1866, reorganized 1901), and the state printing office (1831), all in Belgrade.

See Servia by the Servians, ed. A Stead (London, 1909); J. Mallat, La Serbie contemporaine (Paris, 1902); E. Lazard and J. Hogge, La Serbie de nos jours (Paris, 1901). For topography — the Servian and Austrian General Staff Maps; P. Coquelle, La Royaume de Serbie (Paris, 1894); and A. de Gubernatis, La Serbie et les Serbes (Florence, 1897). For geology and minerals:— J. Cvijic (Tsviyich), Grundlinien der Geographie und Geologie, &c. (Belgrade, 1908); J. M. Zhuyovich (Zujovic), Geologiya Srhiye . (with map, Belgrade, 1893); D. J. Antula, Revue genSrale des gisements metalli- feres en Serbie (with map, Paris, 1900); Th. Mirkovich (Mirkovic), Les Eaux minerales en Serbie (Paris, 1892). For commerce : — Annual British Consular Reports; Statistical Reports of the Servian Ministry of Commerce. For agriculture: — L. R. Yovanovich (Jovanovic), V Agriculture en Serbie (Paris, 1900). For religion: — Bishop N. Ruzhichich (Ruzici6), Istoriya Srpske Tsrkve (Belgrade,. 1 893-1 895); and, by the same author, Das kirchlich-religiose Leben bei den Seroen (Gottingen, 1896). (X.)

History

The Serbs (Srbi, as they call themselves) are a Slavonic nation, ethnically and by language the same as the Croats (Hrvati, Horvati, Croati). The Croats, however, are Roman Catholics and use the Latin alphabet, while the Serbs belong to the Ortho- dox Church and use the Cyrillic alphabet, augmented by special signs for the special sounds of the Serb language. (See Slavs.)

The earliest mention of the Serbs is to be found in Ptolemy (2ip/3oi) and in Pliny (Sirbi). Nothing is known of their earlier history except that they lived as an agricultural people in Galicia, near the sources of the rivers Wissla and Dniester. In the beginning of the 6th century

they descended to the shores of the Black Sea. Thence they began to move on in a westerly direction along the left shore of the Danube, crossed that river and occupied the north-western corner of the Balkan Peninsula. According to the emperor Constantine Porphyrogehitus, the emperor Heraclius (610-640) invited the Serbs to come over to settle down in the devastated north-western provinces of the Byzantine empire and to defend them against the incursions of the Avars. According fo newer investigations, Heraclius only made peace with them, confirming them in the possession of the provinces which they already had occupied, and obtaining from them at the same time the recognition of his suzerainty. Their known history as a Balkan nation begins towards the middle of the 7th century.

The Zhupaniyas. — In their new settlements the Serbs did not form at once a united political organization. The clans (plemena, sing, plerrie), more or less related to each other, occupied a certain

territory, which as a geographical and political unit was called Zhupa or Zhupaniya (county), the political and military chief of which was called Zhupan. The country was divided into many such Zhupaniyas, which were originally independent of each other. The history of the Serbs during the first five centuries after their arrival in their present country was a struggle between the attempts at union and centralization of the Zhupaniyas into one state under one government, and the resistance to such union and centralization, a struggle between the centripetal and the centrifugal political forces. The more powerful Zhupan was tempted to subjugate and absorb the neighbouring less powerful Zhupaniyas. If successful, he would take the title of Veliki Zhupan (Grand Zhupan). But such unions were followed again and again by decentralization and disruption. It is not to be wondered at that this struggle gave occasion for wars between the Zhupaniyas, for civil wars within the Zhupaniyas, for popular risings, court revolutions, dethronements, political assassinations and such like. The earlier history of the Serbs on the Balkan territory is especially turbulent and bloody. One of the minor causes of that turbulence is to be found in the struggle between the ancient Slavonic order of inheritance, according to which a Zhupan ought to be succeeded by the oldest member of the family and not necessarily by his own son, and the natural desire of every ruler that his own son should inherit the throne.

This internal political process was complicated by the struggle between the Greek Church and Greek emperors on the one side, and the Roman Catholic Church and the Roman Catholic Powers (Venice and Hungary) on the Other side, for the possession of exclusive ecclesiastical and political influence in the provinces occupied by the Serbs. The danger increased when the Bul- garians came, towards the end of the 7th century, and formed a powerful kingdom on the easterti and south-eastern frontiers of the Serbs. Practically from the 8th to the 1 2th century the bulk of the Serbs was under either Bulgarian or Greek suzerainty, while the Serbo-Croat provinces of Dalmatia acknowledged either Venetian or Hungarian supremacy.

The Visheslav Dynasty. — The first Serb princes who worked with more or less success at the union of several Zhupaniyas into one state, belonged to what might be called " the Visheslav dynasty." Zhupan Visheslav lived in the beginning of the 9th century, and seems to have been the descendant of that leader of the Serbs who signed the settlement treaty with the emperor Heraclius towards the middle of the 7th century. His ancestral Zhupaniya comprised Tara, Piva, Lim (the neck of land between the Montenegro and Servia of our days). Visheslav's son Radoslav, his grandson Prissegoy, and his great-grandson Vlastimir, continued his work. Vlastimir successfully defended the western provinces of Servia against the Bulgarian attacks, although the eastern provinces (Branichevo, Morava, Timok, Vardar, Podrimlye) were occupied by the Bulgars. The Bulgarian danger, and probably the energetic and successful operations of the Greek emperor Basil the Macedonian (867-886), determined the Servian Zhupans to acknowledge again the suzerainty of the Greek emperors. One of the important consequences of this new vassalship to the Byzantine empire was that the entire Servian people embraced Christianity, between 871 and 875. In all important transactions the Servians were led by the Grand Zhupan Mutimir Visheslavich (d. 891). During the reign of his heirs almost all the Servian provinces were conquered by the Bulgarian Tsar Simeon (924). In 931 Chaslav, one of the princes of the Visheslav dynasty, liberated the largest part of the Servian territory from Bulgarian domination, but to maintain that liberty he had to acknowledge the Byzantine emperors as his suzerains. The Princes of Zeita and the First Serb Kingdom. — Towards the end of the 9th century the political centre of the Serbs was transferred to Zetta (Zeta or Zenta: see Montenegro) and the Primorye (Sea-Coast). The prince (sometimes called king) of Zetta, Yovan Vladimir, tried to stop the triumphal march of the Bulgarian Tsar Samuel through the Serb provinces, but in 989 was defeated, made prisoner and sent to Samuel's capital, Prespa. The

historical fact that Vladimir married Kossara, the daughter of Samuel, and was sent back to Zetta as reigning prince under

the Bulgarian suzerainty, forms the subject of the first Serb novel, Vladimir and Kossara, as early as the 13th century. Vladimir, who seems to have been a noble-minded and generous mart, was murdered by Samuel's heir, Tsar Vladislav (1015). By the Christians of both churches in Albania he is to this day venerated as a saint. But after the death of Samuel the Bulgarian power rapidly lost the Serb provinces, which, to get rid of the Bulgarians, again acknowledged the Greek overlordship. About 1042, however, Prince Voislav of Travuniya (Trebinje), cousin of the assassinated Vladimir of Zetta, started a successful insurrection against the Greeks, and united under his own rule Travuniya, Zahumlye and Zetta. His son Michael Voislavich annexed the important Zhupaniya of Rashka (Rascia or Rassia), and in 1077 proclaimed himself a king {rex), receiving the crown from Pope Gregory VII. His son Bodin continued the work of his father, and enlarged the first Serb kingdom by annexing territories which up to that time were under direct Greek rule. A body of Crusaders under Count Raymond of Toulouse passed through Bodin's kingdom about 1101. After Bodin's death the civil wars between his sons and relatives materially weakened the first Serb kingdom. Bosnia reclaimed her own independence; so did Rashka, whose Grand Zhupans came forward as leaders of the Serb national policy, which aimed at freedom from Greek suzerainty and the union of all the Serb Zhupaniyas into one kingdom under one king. The task was difficult enough, as the Byzantine empire, then under the reign of the energetic Manuel Comnenus, regained much of its lost power and influence. About the middle of the 12th eentury all the Serb Zhupaniyas were acknowledging the suzerainty of the Byzantine emperors.

The Nemanyich Dynasty and the Serb Empire.-ˆ-A change for the better began when Stephen Nemanya became the Grand Zhupan of Rashka (1169). He succeeded in uniting all the Serb countries under his rule, and although he never took the title of king, he was the real founder of the Serb kingdom and of the royal dynasty of Nemanyich, which reigned over the Serb people for nearly 200 years. The youngest son of Stephen Nemanya, Prince Rastko, secretly left his father's royal court, went to a convent in Mount Athos, made himself a monk, and afterwards, under the name of Sava, became the first archbishop of Servia. As such he established eight bishoprics and encouraged schools and learning. He is regarded as the great patron and protector of education among the Serbs, as a saint, and as one of the greatest statesmen in the national history. After Stephen

Nemanya and Sava the most distinguished members of the Nemanyich dynasty were Urosh I. (1242-1276), his son Milutin (1282-1321) and Stephen Dushan 1 (1331-1355). Urosh married Helen, a French princess of the house de Courtenay, and through her he kept friendly relations with the French court of Charles of Anjbu in Naples. He endeavoured to negotiate an alliance between Serbs and French for the overthrow and partition of the Byzan- tine empire. His son Milutin continued that policy for some time, and increased his territory by taking several fortified places from the Greeks; but later he joined the Greeks under the emperor Andronicus against the Turks. Milutin's grandson, Stephen Dushan, was a great soldier and statesman. Seeing the danger which menaced the disorganized Byzantine empire from the Turks, he thought the best plan to prevent the Turkish invasion of the Balkan Peninsula would be to replace that empire by a Serbc- Greek empire. He took from the Greeks Albania and Macedonia excepting Salonica, Kastoria and Iannina. Towards the end of 1345 he proclaimed himself " emperor of the Serbs and the Greeks," and was as such solemnly crowned at Uskub on Easter Day 1346. At the same time he raised the archbishop of Ipek, the primate of Servia, to the dignity of patriarch. Three years later he convoked the Sabor (parliament) at Uskub to begin a codificaˆ tion of the laws and legal usages. The result was the publication, in 1349, of the Zakonik Tsara Dushana (Tsar Dushan's Book of Laws), a code of great historical interest which proves that Servia was not much behind the foremost European states in

1 Dushan is a term of endearment, derived from dusha, "the soul," and not, as formerly believed by Western philologists, from dushiti, " to strangle."

civilization. In 1355 Dushan began a new campaign against the Greeks, the object of which was to unite Greeks, Serbs and Bulgars into one empire, and by their united forces prevent the Turkish power taking root on European ground. To attain that object he was making preparations for a siege of Constanti- nople, but in the midst of these preparations, or, as some historians assert, on the march towards Constantinople, he died suddenly at the village of Deabolis on the 20th of December 1355. His only son Urosh, a young man of nineteen, seemed physically and mentally incapable of holding together an empire composed of such different races and upheaving with such divergent interests. Some of the powerful viceroys of

Dushan's provinces speedily made themselves independent. The most prominent amongst them was Vukashin, who proclaimed himself king of Macedonia. He wished to continue Dushan's policy and to expel the Turks from Europe, but in the battle of Taenarus, on the 26th of September 137 1, his army was destroyed by the Turks, and he was slain. This was the first great blow which shook the fragile structure of the Serb empire to its foundation. Two months later (December 137 1) Tsar Urosh died, and with his death ended the rule of the Nemanyich dynasty.

The Turkish Invasion: Kossovo. — After a few years of in- decision and anarchy the Sabor met at Ipek in 1374 and elected Knez (count) Lazar Hrebelyanovich, a kinsman of Urosh, as ruler of the Serbs. Lazar accepted the position and its responsi- bilities, but never would assume the title of tsar, although the people commonly called him " Tsar Lazar. " He tried to stop the further disruption of the Serb empire and worked to organize a Christian league against the Turks. When this was reported to the Turks, they at once decided to prevent the formation of such a league by attacking its prospective members one by one. This was the real cause of the Turkish attacks on Bulgaria and Servia in 1389, which resulted in the complete subjugation of Bulgaria and in the defeat of the Serb army in the battle of Kossovo (1 5th of June 1389). No historic event has made such a deep impression on the mind of the Serbs as the battle of Kossovo — probably because the flower of the Serb aristocracy fell in that battle, and because both the tsar of the Serbs, Lazar, and the sultan of the Turks, Murad I., lost their lives. The sultan was killed by the Serb knight or voyvode Milosh Obilich (otherwise Kobilovich). There exists a cycle of national songs — sung to this day by the Serb bards (guslari) — concerning the battle of Kossovo, the treachery of Vuk Brankovich and the glorious heroism of Milosh Obilich.

The Despolale. — After the battle of Kossovo Servia existed for some seventy years (1389-1459) as a country tributary to the sultans but governing itself under its own rules, who assumed the Greek title of " despot." The first despot after Kossovo was Tsar Lazar's eldest son " Stephen the Tall," who was an intimate friend of Sigismund IV., king of Hungary and emperor of the Germans. Being childless, Stephen on his death- bed in 1427 appointed his nephew, George Brankovich, to be his successor. As despot, George worked to establish an alliance between Servia, Bosnia and Hungary. But before such an alliance could practically be arranged, Murad II. attacked Servia in 1437 and forced George to seek refuge in Hungary, where he continued to work for a Serbo-Hungarian alliance against the Turks. Having at his disposal a large fortune he succeeded in organizing a Serbo-

Hungarian expedition against the Turks in 1444. This expedition, under the joint command of the Despot George and of Hunyadi Janos, defeated the Turks in a great battle at Kunovitsa. The sultan was forced to conclude peace, re- storing to George all the countries previously taken from him. For the remainder of his life George was rather estranged from his former allies the Hungarians. At the age of ninety he was wounded in a duel by a Hungarian nobleman, Michael Szilagyi, and died of his wound on the 24th of December 1457. His youngest son Lazar succeeded him, but only for a few months. Lazar's widow Helena Palaeologina gave Servia to the pope, hoping thereby to secure the assistance of Roman Catholic Europe against the Turks. But no one in Europe moved a finger to help Servia, and Sultan Mahommed II. occupied the country

in 1459, making it a pashalik under the direct government of the Porte.

For fully 345 years Servia remained a Turkish pashalik, enduring all the miseries which that lawless regime implied (see Turkey, History). But the more or less successful invasions of the Turkish empire in Europe by the Austrian armies in the course of the 18th century — invasions in which thousands of Serbs always participated as volunteers — prepared the way for a new state of things.

The Struggle for Servian Independence. — The disorganization and anarchy in the Turkish empire at the beginning of the 19th century gave the Serbs their opportunity, and the people rose en masse against its oppressors (January 1804). A national assembly met in February 1804 in the village of Orashats, and elected George Petrovich — more generally known under the name of " Tsrni Gyorgye " or " Karageorge " (q.v.) — both mean- ing " Black George " — as commander-in-chief of all the nation's armed forces and the leader of the nation (Vozhd naroda). Under his command the Serbs quickly succeeded in breaking the power of the Dahias, as the four chieftains of the Janissaries of Belgrade were called, who, having rebelled against the sultan, took posses- sion of Servia, became its political and military masters, and exploited the country as their own private property. The Serbs cleared their country altogether of the Turks, and began to organize it as a modern European state. In 1807 the sultan offered to grant the Serbs self-government, and to acknowledge Karageorge as the chief of the nation with the title of prince. On the advice of the Russians, who were just going to war with Turkey, the Serbs refused that offer, preferring to fight against the Turks as Russian allies. The principal scene of the Russo- Turkish war being transferred to the Lower Danube, only a few unimportant

actions took place on Servian territory. From 1804 till the autumn of 1813 the Serbs governed themselves as an independent nation. But when in 181 2 Russia, attacked by Napoleon, had in great haste to conclude at Bucharest a treaty of peace with Turkey, and omitted to make sufficient provision for the security of her allies the Serbsj the Turkish army invaded and reconquered Servia, occupying all its fortresses. Karageorge, with most of the leading men, left the country (September 1813) and found a refuge first in Austria and then in Russia. Of those who remained in Servia the natural leader, by his own position, talents and influence, was Milosh Obrenovich, voyvode of Rudnik. He surrendered to the Turks and was appointed by them the ruler of central Servia. Not quite two years later Milosh began the second insurrection of the Serbs against the Turks (on Palm Sunday 1815, near the little wooden church of Takovo). He was successful not only in the field but in his diplomacy, and by 181 7 Servia had regained autonomy under the suzerainty of the sultan. That autonomy was placed on an international basis by the treaty of Adrianople, concluded between Turkey and Russia in 1829. In compliance with that treaty the sultan by the Hatti-Sherif of 1830 formally granted full autonomy to the Serbs, retaining at the same time Turkish garrisons in the Servian fortresses.

Servia an Autonomous State: 1830-1879. — Milosh, declared hereditary prince of Servia, worked hard for the internal organization and for the economic and educational progress of his country. But his attempts to make Servia independent of Russian pro- tection brought him into conflict with Russia, and his autocratic methods of government united against him all who wished for a constitution. The result was that Prince Milosh was forced to abdicate and leave the country in 1839. Three days before his abdication he was induced to sign a constitution (that of 1838) imposed on Servia by the Porte, at the instance of Russia, with the object of undermining his position. This constitution delegated part of the prince's authority to a council of 70 members appointed for life. Prince Milosh's elder son, Prince Milan (Obrenovich II.), died in a few months, and the younger son Michael (Obreno- vich III.) ascended the throne. But the politicians who forced Milosh to abdicate did not feel safe with Milosh's second son as the reigning prince of Servia. They started a military revolt, drove Michael also into exile (1842), and elected Alexander

Karageorgevich, the younger son of Karageorge, as prince of Servia.

His reign (1842-1858) was quiet and prosperous, and the country made remarkable progress in culture and wealth. But he feared to summon the national assembly, was personally weak and vacillating, and in foreign politics was Turcophil and Austrophil rather than Russophil. Not only Russia but Servia also was dissatisfied with such a policy, and when Alex- ander Karageorgevich, forced by public opinion, at last dared convoke a national assembly, that assembly's first resolution was that Prince Alexander should be dethroned and replaced by the old Prince Milosh Obrenovich I. This change of the reigning dynasty was effected without the slightest disorder or loss of life. Milosh returned to power at the beginning of 1859, but died in i860. His son Michael then ascended the throne for the second time. He was a man of refinement who had learned much during his long exile (1842-1859). His political programme was that the law should be respected as the supreme will in the country, that Servia's political autonomy should be jealously guarded, and every encroachment on the part of the suzerain power should be resented and rebuffed. He introduced many important reforms in administration, and replaced the old constitution, granted to Servia by the Porte in 1830, by a new constitution which he him- self gave to the country. When in 1862 the Turkish garrison in the citadel of Belgrade bombarded the town, he demanded the evacuation of all the Servian fortresses and forts by the Turks. Only a few of the less important forts were delivered to the Serbs at that time; but in 1863 Prince Michael sent his wife, the beautiful and accomplished Princess Julia (nee Countess Hunyadi), to plead the cause of Servia in London, and she succeeded in interesting prominent English politicians (Cobden, Bright, Gladstone) in the fate of the Balkan countries. Prince Michael organized the national army, armed it and drilled it, and entered into understandings with Greece, Montenegro, Bosnia and Herzegovina, Bulgaria and Albania, for an eventful general rising against the Turks. In the beginning of 1867 he addressed to the Porte a formal demand that the Turkish garrisons should be withdrawn from Belgrade and other Serb fortresses. To prevent a general conflagration in the Balkan Peninsula, the powers advised the sultan to comply with the demand, and when the British government strongly supported that advice the sultan yielded and delivered all the fortresses on Servian territory to the keeping of the prince of Servia (March 1867). Prince Michael's great popularity in consequence of his diplomatic successes alarmed the friends of the exiled Kara- georgevich dynasty, more especially when rumours began to circulate that the prince contemplated divorcing his childless wife Julia and remarrying. A conspiracy was formed, and Prince Michael was assassinated on the 10th of June 1868. The con-

spirators failed to overthrow the government, and the army proclaimed Milan, the son of Prince Michael's first cousin Milosh Obrenovich (son of Yephrem, brother to Milosh the founder of the dynasty), as prince of Servia. The choice was unanimously approved by the Velika Skupshtina, which had been immediately convoked. As Milan Obrenovich IV. was a boy of only thirteen, a regency, presided over by Jovan Ristich or Ristitch (q.v.), was appointed to manage the government until the boy prince attained his full age, which took placeini872. In 1869 the regency had substituted a new constitution for that of 1838. Prince Milan followed the policy of his dynasty, and, encouraged by the Russian Panslavists, declared war on Turkey (June 1876). His army, commanded by the Russian General Chernyayev, was defeated by Abdul-Kerim Pasha, whose advance was stopped by the intervention of Tsar Alexander II. But the situation created by Prince Milan's action in the Balkans forced the hand of the tsar, and Russia declared war on Turkey (1877).

The Treaty of Berlin. — Prince Milan was educated in the political school favourable to Russia, and unhesitatingly followed the Russian lead up to the conclusion of the preliminary treaty of peace between Russia and Turkey at San Stefano. By that treaty Russia, desiring to create a great Bulgaria, took within its limits districts inhabited by Servians, and considered by the Servian politicians and patriots as the natural and legitimate

inheritance of their nation. This act of Russia created great dissatisfaction in Servia, and became the starting-point for a new departure in Servian politics. At the Berlin Congress the Servian plenipotentiary, Jovan Ristich, in vain appealed to the Russian representatives to assist Servia to obtain better terms. The Russians themselves advised him to appeal to Austria and to try to obtain her support. The utter neglect of the Servian interests by Russia at San Stefano, and her evident inability at the Berlin Congress to do anything for Servia, determined Prince Milan to change the traditional policy of his country, and instead of continuing to seek support from Russia, he tried to come to an understanding with Austria-Hungary concerning the conditions under which that power would give its support to Servian interests. This- new departure was considered- by the Russians — especially by those of the Panslavist party — almost as an apostasy, and it was decided to oppose Prince Milan and his supporters, the Servian Progressives. The treaty of Berlin (13th of July 1878) disappointed Servian patriots, although the complete independence of the country was established by it (art. 34). This was proclaimed at Belgrade by Prince (after- wards King) Milan on the 22nd of August.

The Progressive Rigime. — The political history of Servia from 1879 to the abdication of King Milan on 3rd March 1889 was an uninterrupted struggle between King Milan and the Progressives on one side, and Russia with her adherents, the Servian Radicals, on the other. King Milan and his government were badly handicapped by several unfortunate circumstances. To fulfil the engagements accepted in Berlin and the conditions under which independence had been granted to Servia, railways had to be constructed within a certain time, and the government had also to pay to the Turkish landlords in the newly acquired districts an equitable indemnity for their estates, which were divided among the peasants. These objects could not be attained with- out borrowing a considerable amount of money in the European markets. To pay regularly the interest on the loans the govern- ment of King Milan had to undertake the unpopular task of reforming the entire financial system of the country and of increasing the taxation. The expenditure increased more rapidly than the revenue. Deficits appeared, which had to be covered temporarily by new loans, and which forced the govern- ment to establish monopolies on salt, tobacco, matches, mineral oils, &c. Every such step increased the unpopularity of the government and strengthened the opposition. An attempt on the life of King Milan was made in 1882, and an insurrection in the south-eastern districts was started in 1883. But the majority of the people, and especially the regular army, remained loyal, and the revolt was quickly suppressed.

War with Bulgaria. — The union of Bulgaria and Eastern Rumelia inspired King Milan and his government with the notion that either that union must be prevented, or that Servia should obtain some territorial compensation, so that the balance of power in the Balkan Peninsula might be maintained. This view, which did not find support anywhere outside Servia, led to war between Servia. and Bulgaria (see Servo-Bulgarian War) ; the Servians were defeated at Slivnitza and had to abandon Pirot, whilst the farther advance of the Bulgarian army on Nish was stopped by the intervention of Austria-Hungary. An honourable peace was concluded between the two contending powers in March 1886. Then came the unhappy events con- nected with Milan's divorce from Queen Natalie. That domestic-misfortune was cleverly exploited by King Milan's enemies in the country and abroad, and did him more harm than all his political mistakes. He tried to retrieve his position in the country, and succeeded in a great measure, by granting a very liberal constitution (January 1889, or Dec. 1888 O.S.) at a time when all agitation for a new constitution had been given up. Then, to the great astonishment

of the Servians and of his Russian enemies, King Milan voluntarily abdicated, placing the government of the country in the hands of a regency during the minority of his only son Alexander, whom he proclaimed king of Servia on the 6th of March 1889. King Alexander: The Regency. — The leading man of the

regency was Jovan Ristich, who had already been regent during the minority of King Milan (1868-1871). Although he had been since 1868 the leader of the Liberal party, he showed himself, as regent, extremely Conservative. The new constitution was the embodiment of Radical principles, and the numerically strongest party in the country was Radical. The national assembly was composed, therefore, almost exclusively of Radicals, and the government was Radical likewise. From the very beginning the Conservative regency and the Radical government distrusted each other. The government was not strong enough to resist the clamour of their numerous partisans for participation in the spoils of party warfare. Political passions, which had been stirred up by the long struggle against King Milan's Progressive regime, could not be allayed so quickly; and as the anarchical element of the Radical party obtained the ascendancy over the more cultured and more moderate members, all sorts of political excesses were committed. The old system of borrowing money to cover the yearly deficits were continued, and the expenditure went on increasing from year to year. The administration lost all authority, the police were paralysed and brigandage became rife. The Radical government thought to strengthen their position by letting the national assembly vote a law prohibiting the return of the king's father to Servia, and forcibly expelling the king's mother, Queen Natalie. But such laws and such acts only embittered political passions and greatly encouraged the adherents of Prince Peter Karageorgevich, who, having married the eldest daughter of Prince Nicholas of Montenegro and living at Cettigne, was supposed to enjoy the support of Russia. The political situation became still more confused when on the death of the third regent, General Kosta Protich, the government tried to force the regency to accept in his stead M Pashich, the leader of the Radical party. The regents thereupon dismissed the Radical cabinet and called the Liberals to the government (August 1892). The Liberal cabinet dissolved the Radical national assembly, and at the general elections used very great pressure to secure a Liberal majority. In this they did not succeed, and the situation became hopelessly entangled

by the fact that the national assembly was Radical, the government Liberal, and the regency practically in all its tendencies Conservative. The legislative machinery as well as the administra- tion of the country was thus completely paralysed. Then the young king Alexander suddenly proclaimed himself of age (although at that time only in his seventeenth year), dismissed the regents and the Liberal cabinet, and formed his first cabinet from among the moderate Radicals (13th April 1893).

The King's Administration. — The moderate Radicals quickly showed themselves unable to do any serious work. They were fettered by the dissatisfaction of the Left wing of their own party. To satisfy the extreme Radicals they had to impeach the members of the last cabinet. This increased the bitterness of the Liberals, who, though not so numerous as the Radicals, included in their ranks more men of wealth and culture. Political passions were again in full blaze. The anti-dynastic party raised its head again, and in many Radical publications the expulsion of the reigning dynasty and its replacement by the Karageorgevich were advocated. At the same time reports were reaching King Alexander that Russia was discussing with the leaders of the extreme Radicals the conditions under which a Russian grand-duke was to be proclaimed king of Servia.

The ex-King Milan's Return.— In such circumstances King Alexander thought best to invite his father the ex-King Milan (who was living in Paris) to his side, and to use his great know- ledge of men and his political experience. In the beginning of January 1894 King Milan arrived in Belgrade. The Radical cabinet resigned and was replaced by a cabinet composed of politicians standing outside the political parties. In June the Radical constitution of 1889 was suspended, and in its place the constitution of 1869 was re-established.

The nation was evidently tired of the violent agitations of recent years. This feeling gave rise to Conservative, even somewhat reactionary, legislation. The duration of the legisla- ture was extended from three to five years; the liberty of the

press was curtailed by the enactment that proprietors of political papers must pay to the government a deposit of 5000 dinars (£200), and that the editors must have completed their studies at a university; the laws on lese-majesU were made more severe. After the advent to power of Dr Vladan Georgevich (October 1897) persistent and successful efforts were made to improve the country's financial and economic condition. The violent party strife which from 1880 to 1895 had absorbed the best energies of the country and paralysed

every serious and pro- ductive work, ceased almost completely, and the nation as a whole turned to improve its agriculture and commerce. The sustained improvement in the political and commercial situation was not influenced materially by the temporary excitement in consequence of the attempt on the life of King Milan (6th July 1899), and of the state trial of several prominent Radicals accused of having conspired for the overthrow of the dynasty. One remarkable feature in the foreign policy of Servia in the last years of the 19th century was that after King Milan was appointed commander-in-chief of the Servian regular army (1898), Russia and Montenegro practically, although not formally, broke off their diplomatic relations with Servia, while at the same time the relations of that country with Austria-Hungary became more friendly than under the Radical regime.

King Alexander's Marriage. — All this was suddenly changed when in July 1900 King Alexander married Mme Draga Mashin, once lady-in-waiting to his mother Queen Natalie. He threw himself into the arms of Russia, forbade his father Milan to reside in Servia, and followed Russian guidance in all questions of foreign policy. To strengthen his position in the country he promulgated a new constitution in April 1901, establishing for the first time in the history of Servia a parliament with two houses (skupshtina and senate). But the unpopularity of the king's marriage was not lessened. Constitutional liberties and especially the free press were mercilessly used to attack both the king and the queen, who neither wished nor were able to conceal their dissatisfaction. A' general feeling that King Alexander contemplated changing the situation by one of his bold and clever coups d'itat increased the political unrest. Matters went from bad to worse when persistent rumours were set in motion that Queen Draga had succeeded in persuading King Alexander to proclaim one of her two brothers heir-apparent to the throne. In 1002 a widespread military conspiracy was rumoured to exist, while Austria and Russia repeatedly gave proofs that they were indifferent to the fate of Alexander, and so encouraged the malcontents. King Alexander felt that he could eventually fortify his position either by a great foreign policy or by his divorce from the childless Queen Draga. He seems to have been working for joint action with Bulgaria for the liberation of Macedonia from Turkish rule. Some of his intimate friends asserted that he contemplated divorcing the queen, and that he was only waiting for her departure for an Austrian watering-place, which departure was fixed for the 15th of June 1903. In the first hours of the nth of June the conspirators surrounded the palace with troops, forced an entrance

and assassinated both King Alexander and Queen Draga in a most cruel and savage manner. (C. Mi.)

King Peter Karageorgevich. — The regicides proclaimed Prince Peter Karageorgevich king of Servia; and a provisional cabinet was formed, with Colonel Mashin, brother-in-law of the murdered Queen Draga and organizer of the conspiracy, as minister of public works. The skupshtina and senate assembled, restored the constitution of 1889 instead of the reactionary constitution promulgated by King Alexander on the 19th of April 1901, and ratified the election of Prince Peter, who entered Belgrade as king on the 24th of June 1903. Born in 1844, he was the son of Alexander Karageorgevich and grandson of Karageorge; in 1883 he had married Princess Zorka, daughter of Prince (after- wards king) Nicholas of Montenegro. His authority was at first merely nominal; the highest administrative offices were occupied by the regicides, who received the unanimous thanks of the skupshtina for the assassination of King Alexander and Queen Draga. Russia, Austria-Hungary and Montenegro were

the only Powers which congratulated King Peter on his accession, and in December 1903 all the Powers temporarily withdrew their representatives from Belgrade, as a protest against the attitude of the Servian government towards the regicides. But at the coronation of King Peter, in September 1004, all the European powers except Great Britain were officially represented, some concessions, more apparent than real, having been made in the matter of the regicides, who were very unpopular among the peasants and in the army. Further protests were made by many of the powers when the illusory nature of these concessions became known, and it was not until May 1906 that diplomatic relations with Servia were resumed by Great Britain. In the same year a convention was concluded by Servia and Bulgaria as a preliminary to a customs union between the two states. This convention, which tended to neutralize the dependence of Servia upon Austria-Hungary by facilitating the export of Servian goods through the Bulgarian ports on the Black Sea, brought about a war of tariffs between Servia and the Dual Monarchy.

The Bosnian Crisis. — In 1908 the annexation of Bosnia and Herzegovina by Austria-Hungary and the revolution in Turkey brought about an acute crisis. Many Serbs still hoped for the realization of the so-called " Great Servian Idea," i.e. the union in a single empire of Servia, Bosnia and Herzegovina, Montenegro and Old Servia (Stara Srbiya) or the sanjak of Novibazar with north-western Macedonia — all countries in which the population consists

largely, and in some cases almost exclusively, of Orthodox Serbs. The whole nation clamoured for war with Austria- Hungary, and was supported in this attitude by Montenegro, despite a temporary rupture of diplomatic relations between Belgrade and Cettigne, due to the alleged complicity of the Servian crown prince in a plot for the assassination of Prince Nicholas. As, however, the armaments and finances of Servia were unequal to a conflict with Austria-Hungary, while Great Britain, Russia, France and Italy counselled peace, the skupsh- tina, meeting in secret session on the nth of October 1908, determined to avoid open hostilities, and sent M Milanovich, the minister for foreign affairs, to press the claims of Servia upon the powers. The tariff war with Austria-Hungary was at the same time renewed. Servia demanded compensation in various forms for the annexation of Bosnia and Herzegovina; what the government hoped to obtain was the cession to Servia of a strip of territory between Herzegovina and Novibazar, which would check the advance of Austria-Hungary "towards Salonica, make Servia and Montenegro conterminous, pave the way for a union between them, and give Servian commerce an outlet to the Adriatic. Neither the Dual Monarchy nor the Young Turks would consider the cession of any territory, and in January 1909 the outcry for war was renewed in Servia. But the threatening attitude of Austria-Hungary, with the moderat- ing influence of M Pashich, who became the real, though not the nominal, head of a new ministry in February 1909, induced Servia to accept the advice of the Russian government by abandoning all claim to territorial " compensation," and leaving the Balkan question for solution by the Powers. The Servian government denned its attitude in a circular note to the Powers (9th of March), and finally accepted the terms of a conciliatory declaration suggested by the British government (31st of March). By this declaration Servia abandoned all its demands as against Austria-Hungary, while the Austro-Hungarian foreign minister made simultaneously a public declaration that the Dual Monarchy harboured no unfriendly designs against Servia.

On the 27th of March 1909 the crown prince George (b. 1887), who had been the most outspoken leader of the anti-Austrian party in 1908, was induced to resign his right of succession to the throne. It was alleged that his violence had caused the death of one of his own male servants, and that he was partially insane. On the 27th of March 1909 his brother Alexander (b. Dec. 17, 1888) took the oath as heir-apparent.

The books by Stead, Mallat and Hogge, mentioned above, contain important historical matter. See also the bibliography to the article

Balkan Peninsula, with L. von Ranke, Geschichte Serbiens bis

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Language

The Servian language belongs to the family of Slavonic languages (see Slavs). According to the Servian philologist Danichich (Dioba Slov. yezika, Belgrade, 1874), the Servians were the first Slavonic branch which separated from the original Slavonic stem, while the Russians and the Bulgarians only separated from it at a considerably later date. The Russian and Bulgarian languages. undoubtedly stand nearer to Old Slavonic than the Servian. According to another theory (T. Schmidt, Vocalismus ii. 179) two separate branches developed from the Old Slavonic stem, one identical with the western Slavs, and the other with the south-eastern group; and from the Slavonic of the south-east the first languages to separate were the Russian and the South Slavonic. From the latter developed Bulgarian, on one side, and Servian-Slovene on the other, while from the last-named branch Servian or Serbo-Croatian and Slovene developed on two separate twigs. There can be no doubt that in the south-eastern group of the Slavonic languages Serbo- Croatian and Slovene form a special closely-connected group, in which the Servian and the Croat languages are almost identical.

Both the Servians and the Croats arrived in the first half of the 7th century (or more precisely about a.d. 635) in the north- western corner of the Balkan Peninsula. There they met the partly RomanizedTllyrians, and in course of time absorbed them. ' There can be little doubt that this absorption softened and enriched the Serbo-Croatian dialects, a process to which climatic conditions and intercourse with Italy also contributed, until Serbo-Croatian became one of the richest and most melodious of Slavonic languages.

Servian is spoken in the following countries, forming geo- graphically (although not politically) a connected whole: southern Hungary, the kingdom of Servia, Old Servia (the Turkish vilayet of Kossovo), western Macedonia, the sanjak of Novi-Bazar, Bosnia, Herzegovina, Croatia-Slavonia, Dalmatia and Montenegro. It ranks with Bulgarian as one of the two principal Slav languages of the Balkan Peninsula; the Mace- donian dialects are intermediate between these two. Between eight and nine millions of people speak Serbo-Croatian in the countries just enumerated.

Considering the extent of territory in which the language is spoken, it is not surprising that it should have several dialects. Practically, however, there are only three principal dialects, which are differ- entiated by the manner in which the Old Slavonic double vocal ye (the so-called yach) is pronounced. The Old Slavonic words lyepo, byelo, are pronounced by the Servians of Herzegovina, Bosnia, Monte- negro, Dalmatia, Croatia and south-western Servia as leeyepo, beeyelo; by the Servians of Syrmia the same vowel is pronounced sometimes as e (lepo, belo), sometimes as ee (videeti, leteeti) ; by the Servians of the Morava valley and its accessory Ressava valley, always only as e {lepo, belo, videti, leteti). Vuk Stefanovich Karajich called the first dialect the " South- Western or Herzegovinian dia- lect," the second the " Syrmian," the third the " Ressava " dialect. Professor Belich of Belgrade University has tried to give in the Servian Dialectological Compendium (Belgrade, 1905) a new division of the Servian dialects into five groups, viz. Prizren-Timok, Kossovo- Ressava, Shumadiya-Srem (Syrmia), Zetta-Bosnia, Adriatic coast. Of all the Servian dialects the most correct, richest and softest is the Herzegovinian or Zetta-Bosnian dialect. Karajich and his followers tried to make it the literary language of the Servians. All the national songs which he transcribed from the recitations of the bards were written and published by him in that dialect, into which the Bible has also been translated. But, as in the second half of the 19th century the kingdom of Servia, speaking the Ressava or Shumadiya- Syrmian dialect, became the centre of Servian literary activity, the last-mentioned dialect tended to become the literary language.

*Servian and Croatian are only two dialects of the same Slavonic language. Servian is sometimes called shtokavsM because the Servian word for " what " is shto, whereas *hc Croats say cha for shto, and*

therefore their language is called chakavski. The more important differences between the two languages were pointed out by Danichich (Glasnik, ix., 1857). They are as follows: (a) while the Servians pronounce the Old Slavonic yach as ye or e or ee, the Croats pronounce it always as ee (Servian beeyelo or belo, Croatian beelo) ; (b) the Servians have the sound gye (softened d or g), the Croats are without it, but have instead ya or ye (Servian gospogya, Croatian gospoya) ; (c) the Servians let the vowel i transform the preceding consonant into a soft consonant, whereas the Croats pronounce the consonant unaffected by the softening influence of i (Servian bratya, Croatian bralia) ; (d) the Servians change the letter / at the end of a word into whereas the Croats always pronounce it as /. These differences are so insignificant that it was very natural that the Croats after having tried to convert the chakavski dialect into a separate literary language were compelled to abandon that attempt and to adopt the shtokavski. To facilitate this reform, to overcome the ecclesiastical prejudices of the Roman Catholic Croats against the Eastern Orthodox Servians, and vice versa, certain Croatian patriots, led by Ljudevit Gaj, pro- posed that all the Slavonic peoples in the north-western part of the Balkan Peninsula should call themselves Illyri and their language Illyrian (see Croatia-Slavonia: Language and Literature and History). The appellation " Serbo-Croatian "for the literary language of both nations now finds more favour. The great dictionary com- piled and published by the South Slavonic Academy of Agram is called The Lexicon of the Servian or Croatian Language. Although the Croats write and print in Latin characters, while the Servians write and print in Cyrillic, and although many a Servian cannot read Croatian books, and vice versa, the literary language of both nations is one and the same. (C. Mi.)

Literature

1 . Formation of a Servian – Slavonic Language. — Servian literature begins with the biblical and liturgical books, written in " Old Slavonic," or " Church Slavonic," into which " the Slavonic apostles " Cyril and Methodius (see Slavs) had trans- lated the Bible and other church books about the middle of the 9th century. Cyril and Methodius used the Greek alphabet somewhat modified and adapted to the necessities of the Slavonic language. That alphabet is called " Cyrillic " (in Servian Kyrilitsa), and is — simplified and modernized — practically the alphabet used by the Servians, Bulgarians and Russians of our times. The Cyrillic aphabet replaced an older Servian, or probably Old Slavonic, alphabet called "Glagolitic" (see Slavs: Alphabets) . A few Servian books are still printed in Glagolitic,

and some in Latin letters; but by far the greatest number are written and printed in Cyrillic.

The Old Slavonic church books had naturally to be copied from time to time, and the Servian, Bulgarian and Russian copyists were unable to resist the influences of their respective living languages. Thus comparatively soon there appeared church books no longer written in pure Old Slavonic (of which the so-called " Asseman's Gospel" in the Vatican is the best type), but in Old Slavonic modified by Servian, Bulgarian, Russian influences, or in the languages which could be called Servian-Slavonic, Bulgarian-Slavonic, Russian-Slavonic. The best extant specimen of the Servian-Slavonic is " Miroslav's Gospel," written in the second half of the 12th century for the Servian prince Miroslav; a facsimile edition was published in 1897 in Belgrade. Servian-Slavonic was the literary language of the Servians from the 12th century to the end of the 15th, i.e. during the first period of their literary history.

2. Servian-Slavonic Literature. — The only noteworthy literary productions of this first period of Servian literature were zhivoti (biographies) and letopisi (chronicles). The best writers of the time were Archbishop Sava (St Sava), his brother King Stephen (Stefan) Prvovenchani (i.e. the "first-crowned"), the monks Domentiyan and Theodosius, Archbishop Danilo, Gregorius Tsamblak, Stephen Lazarevich, prince of Servia, and Constantine the Philosopher. The most important literary work of St Sava (d. 1237) was The Life of St Simeon, in which he described the life of his father, Stephen Nemanya, the first sovereign of the united Servian provinces, who towards the end of his life became a monk and took the name of Simeon. Domentiyan wrote a life of St Sava in the involved and bombastic Byzantine style of the middle of the 13th century. The best literary creations of the period are undoubtedly The Lives of the Servian Kings and Archbishops by Archbishop Danilo (d. 1338), and Constantine the Philosopher's Life of Despot Stephen Lazarevich, written in 1432.

The chronicles (letopisi) are without any literary value, although as historical material they are useful. They number about thirty. The oldest of them was written between 1371 and 1390. The best are Letopis of Ypek, which ends with the year 139 1 ; Letopis of Koporin, written by Deacon Damyan in 1453; Letopis of Carlovitz, 1503; and the chronicle of the monastery of Tronosha, 1526.

To this period of Servian literature belongs the first attempt by an unknown author to write a romance. The story of the love and

sufferings of the Servian prince Vladimir, who lived in the nth century, and his wife, the Bulgarian princess Kossara, written probably in the 13th century, was very popular among the Servians of the 14th and 15th centuries. Other cpmparatively widely-read books of the period were the Life of Alexander the Great, The Story of the Siege of Troy, Stefanite and Ikhnylat (an Indian story) and The Journey of a Soul from this World to that Other, all of which were translations from the Greek.

A characteristic example of the literary and also, as it appears, of the official language of the Servians in the middle ages is the Codex of Tsar Dushan (Zakonik Tsara Dushana), which was promulgated at the Servian parliament (Sabor) in Skoplye (Usktib) in 1349 and 1 354. Very interesting material for the study of the Servian literary language during the 12th, 13th and 14th centuries is to be found in several collections of old charters and letters of that period (F. Miklosich's Monumenta Serbica, Putsich's Srpski Spotnenitsi u Dubrovachkoy Arkhivi, and the publications of the Royal Servian Academy in Belgrade and the South Slavonic Academy of Science in Agram). The oldest document written in the vernacular Servian is considered to be a charter by which Kulin, the ban of Bosnia, grants certain commercial privileges to the Ragusan merchants in

1 189.

The oldest printed book in Servian-Slavonic issued in 1483 from the printing-press of Andreas de Theresanis de Asula in Venice. A few years later the Servian nobleman Bozhidar Vukovich bought a printing-press in Venice and established it at Obod in Montenegro, from which issued in 1493 the first church book (the Octoich) printed on Servian territory. There is a copy of this book in the British Museum. Vicentius, the son of Bozhidar Vukovich, carried on the enterprise of his father, and their printing-press continued to work up to 1566, issuing several church books in the Servian-Slavonic language. During the first half of the 16th century the Servians had printing-presses in Belgrade, Skadar (Scutari) on the river Boyana, Gorazhde, Mileshevo and elsewhere. But in the second half of that century all printing absolutely ceased in the Servian countries under the direct rule of the Turks, and was not resumed until the middle of the 18th century. Books for the use of the churches had to be imported from Russia, printed in the Russian-Slavonic language.

3. Dalmatian Literature — While among the Servians belonging to the Eastern Church all literary work had practically stopped from the

middle of the 16th century to the middle of the 18th, the Roman Catholic Servians of Dalmatia, and more especially those of the semi-independent republic of Ragusa, became more active. . Being for centuries politically, ecclesiastically and commercially connected with Venice, Rome and Italy in general, they came under the influence of Italian civilization, and during the 15th, 1 6th and 17th centuries were the most cultured branch of the Servian nation. The awakening of literary ambition among these Servians of the Adriatic coast was originally due to the influence of immigrant Greek scholars who came to Ragusa after the fall of Constantinople in 1453.

Between 1450 and 1530 there had already been founded in Spalato a small literary society, in which the Servian poets Marulich, Papalich, Martinich and others read their poetical compositions, mostly lyrical and religious songs. About the same time (1457-1501) there ap- peared in Ragusa the poet Menchetich, who wrote nearly four hundred love-songs and elegies, taking Ovid as his model, and George Drzhich (1460-1510), author of many erotic poems and of a drama. Two of the finest works of this early period of the Servian literature of Ragusa are the poem Dervishiyada, written by the Ragusan noble- man Stepan Guchetich (1495-1525), rich in humour and satire, and the poem Yegyupka (" The Gipsy Woman "), written by Andreas Chubranovich (1500-1550), a goldsmith by profession and a very original and clever lyrical poet. Another remarkable Ragusan poet was Hectorovich (1486-1572), who wrote the poem Ribanye (" The Fishing and Talking with Fishermen "), and anticipated a new movement in Servian literature by publishing three national songs as he heard them from the popular bards (guslars). But the true glory of Ragusan literature was established by its three poets, Ivan Gundulich (1558-1638), Gyon Palmotich (1606-1657) and Ignacius Gyorgyich (1675-1737). Of these the greatest was Gundulich (q.v.). Palmotich is remarkable as a dramatic poet. The subjects of most of his dramas were taken from Latin and Italian poets (Atalanta after Ovid, Lavinia after Virgil, Armida after Tasso) ; but at least in two dramas, Pavlimir and Tsaptislava, he displayed some origin- ality, taking his themes from Servian national history. All the works of Palmotich have been published by the South Slavonic Academy (Stari Pisti, vols, xii., xiii., xiv. xix.). Gyorgyich's best work is

considered to be his translation of the Psalms into Servian verse

(Saltiyer Slovinski). He also wrote The Sighs of the Repenting Magdalen and the unfinished tragedy Judith.

After Gyorgyich the Servian literature of Ragusa and Dalmatia during the 18th century has no great name to show, except that of the mathematician, Ruggiero Boshkovich (see Boscovich). His two brothers and his sister Anitsa Boshkovich were known in their time as poets. But on the whole Servian literature on the Adriatic coast showed little originality in the 18th century; its writers were content to produce good translations of Latin, Italian and French works.

Mention must be made, however, of an author whose work con- nects the literature of the Adriatic Servians of the 18th century with the regenerative efforts of the Danubian Servians in the second decade of the 19th century. The literature of the Adriatic Servians was, with very few exceptions, Servian only in language, but Italian in form and spirit. About the middle of the 18th century a learned Dalmatian monk, Andrea Kachich Mioshich by name, emancipated himself from the yoke of pseudo-classicism and slavery to Western models. As a papal delegate he had to visit all the Roman Catholic communities in Dalmatia, Herzegovina and Bosnia, and had numer- ous opportunities of hearing the bards recite songs on old national heroes. In 1756 he published a book entitled Razgovor Ugodni Naroda Slovinskoga (" The Popular Talk of the Slavonic People "), in which in 261 songs he described— in the manner and in the spirit of the national bards — the more important historic or legendary events and heroes of the " Slavonic people." Under this denomina- tion he comprised Servians, Croats, Slovenes and Bulgarians, antici- pating the modern appellations of the Yugo-Sloveni (Southern Slavs). His book immediately became the most popular that ever appeared among the Servians, and was again and again reprinted, under the less ponderous title Pesmaritsa, " The Book of Songs." Some sixty years after its appearance it inspired Vuk Stefanovich Karajich with the vision of his true mission. But Kachich Mioshich found no immediate followers among the Servian literati of the second half of the 18th century.

4. The Revival of Servian Literature: Obradovich and Karajich. — As long as the countries inhabited by the Orthodox Servians were under the deadening immediate rule of the Turks, they produced no serious literature. But when the Austrian wars of the 17th century began to roll back the Turkish power, and Hungary recovered its freedom, the Servians living in that country rapidly acquired some culture, and their literature began to revive. During the 18th century, however, they did not write in the living language of the Servian people. After

the disappearance of the Servian printing-presses in the 16th century, all liturgical books were brought from Russia and printed in the Russian-Slavonic language; while the teachers in the Servian schools were Russians. Russian-Slavonic thus became the literary language of the Orthodox Servians.

The more important works of the time were the History of Montenegro, by the Montenegrin bishop Basil Petrovitch (Moscow, 1754); the Short Introduction into the History of the Origin of the Slaveno-Servian Nation, by Paul Yulinats (Venice, 1765); and above all the History of the Slavonic Nations, more especially of the Bulgarians, Croats and Servians, by Archimandrite Yovan Raich (Vienna, 1794). During extensive travels in Russia and the Balkan countries Raich had collected a rich historical material and was able to write, for the first time in the annals of Servian literature, a work which has every claim to be considered as a real history. The Servians call him " the father of Servian history."

But Russian-Slavonic was not readily understood by the Servian reading public. It was not much better when through the influence of the living language it began to approach nearer to Servian than to Russian, and was called " Slavonic-Servian " (Slaveno-Serbski). The Servians had some authors in the 18th century, but it could hardly have been said that they had readers. All this suddenly changed when Dositey (Dositheus) Obradovich (1739-1811) appeared on the scene. In boyhood he had entered the monastery of Hoppovo in south Hungary and had become a monk. But as very soon he found that the monastery could not satisfy his aspirations, he left it and started to travel, acquiring a knowledge of classical and modern languages and literatures. An ardent Servian patriot, he proclaimed the principle that books ought to be written for the people and therefore in the language which the people understood and spoke. His first book, The Life and the Adventures of Demeter Obradovich — o monk named Dositey (Leipzig, 1783), was written in the language spoken in Servian towns. It immediately made a great impression, • which was enhanced by the continuation of his autobiography {Home Letters) and especially by his Fables of Aesop and of other Writers (Leipzig, 1789). These books created a reading public among the Servians and mark the beginning of a really modern period of Servian literature. Obradovich, or rather " Dositey " as Servians call him, was so highly appreciated as an author, savant and patriot that in 1807 Karageorge invited him to Servia and ap- pointed him a senator and minister of public education, in which

capacity he established in Belgrade the first Servian college (Velika

Shkola). Dositey was an admirer of England and English literature. While staying in London in 1783 he was much encouraged by the patronage and friendship of Dr William Fordyce, while his pupil, Paul Solarich, another distinguished author, was befriended by the Hon. Frederick North, afterwards 5th earl of Guildford, state secretary for public instruction in the Ionian Islands.

Only a few of his contemporaries followed the example which Dositey set in writing in the vernacular (although even he introduced from time to time purely Slavonic words and forms). It was believed that the vernacular could not be raised to the dignity of a literary language, and that literature and science needed words and ex- pressions which were entirely lacking in the common language. But Vuk Stefanovich Karajich, a self-taught writer, proved the fallacy of that assumption. By his publication of the national songs and poems, which he carefully collected, he opened the eyes of Servian authors to the wealth and beauty of their own language, as spoken by the mass of the people and used by the national bards. Besides collecting national songs and poems, folk-lore, proverbs, &c, he wrote a grammar of the Servian language (Vienna, 1814) and the first Servian lexicon, with explanations in German and Latin (Vienna, 1818). His thorough knowledge of the Servian language led him to reform the Cyrillic alphabet, in which several letters were redundant and certain sounds of the spoken language were unrepre- sented. His efforts to make Servian writers adopt his reformed alphabet, and accept the language of the common people as a literary language, met with fierce opposition, especially on the part of the clergy and friends of the artificial Slaveno-Servian literary language. It was only after i860 that his principles won a complete victory in all directions. (See Karajich.)

. 5. Modern Servian Literature. — The activity of Karajich brought new life to the Servian literature of the 19th century. The poets abandoned classical models and ceased to write in hexameters; they preferred to derive their inspiration from popular poetry, of which Karajich collected for them hundreds of examples. Writers in different departments of literature vied with each other to write in pure and correct Servian. And, although it could not be justly said that the Servians of the 19th century produced a really great work from the literary point of view, they certainly made progress and produced some remarks- able poetry.

Their three greatest poets are Sima Milutinovich Sarayliya (179 1 -1 847), Peter Petrovich Nyegosh (1813-1851), prince-bishop of Montenegro, and " Zmay " Yovan Yovanovich (1833-1904).

Sarayliya's most important work is Serbiyanka (Leipzig, 1826), in which he describes the rising of the Servians against the Turks in 1804 and 1815. His imagination is lively, his descriptions graphic, but the impetuosity of his genius cannot find adequate words to express itself, and then he creates new words of which the meaning is not always clear. For this reason he never was really popular among the Servians. Nyegosh composed his first important poem, Lucha Microcosma or " The Light of the Microcosm " (Belgrade, 1847), under the influence of Paradise Lost. In the Lucha he describes how the spirit of man wished to solve the problem of human destiny. He was led by a protecting angel to the beginning of time when Satan, supported by an angel called Adam, was in full rebellion against God. But the co-rebel Adam repented and God then created the Earth and sent Adam to expiate his sin by living amidst diffi- culties and sufferings on that planet. In Gorski Viyenals, " The Mountain Wreath " (Vienna, 1847), Nyegosh describes the liberation of Montenegro from the Turks towards the end of the 17th century in the form of a drama. There is, however, hardly anything dramatic' in the poem, but the characters deliver magnificent descriptions of Montenegro and Montenegrins, and the play is full of noble senti- ments and great thoughts. The Servians consider Gorski Viyenats the finest poetical work in their literature. It has been translated into all the principal European languages except English. Dr Yovan Yovanovich, called by his admiring countrymen Zmay (the Dragon) on account of the high flight of his poetry and his ardent patriotism, began his poetical career by producing melodious translations of some of the best poems of other nations (the Hungarian Arany's Toldi Jdnos, Petofi's Jdnos Vitez, Lermontov's Demon, Tennyson's "Enoch Arden," Bodenstedt's Mizra-Shaffy, Goethe's Iphigenie, &c). His own lyrical and satirical poems are without a rival in Servian literature. In his later years he gave much of his time and talent to the interests of children, editing papers for boys and dedi- cating hundreds of his finest songs to children. There are several editions of his collected poems; one of the best is that of the Servian Literary Association (Belgrade, 1896),

Among the other prominent Servian poets of the 19th century may be mentioned Dr Milosh Svetich (1799-1869), Branko Radiche- vich (1824-1853), Gyura Yakshich (1832-1878), Yovan Subotich (1817-1886), Dr Laza Kostich (b. 1841), Aberdar (1842-1893), Voislav Ilich (1862-1894), Prince Nicholas of Montenegro (b. 1841).

The Servians have as yet no great novelist, but they have several very successful writers of short stories. Among these the first place

belongs to Dr Laza Lazarevich. After him the most popular authors of short stories are : Stefan Sremats, whose mild satire and sparkling humour earned for him the name of the " Servian Dickens " ; Yanko Veselinovich, author of some delightful sketches from the life of Servian peasants; Sima Matavuly, whose stories give a true picture of the Servians of Dalmatia and of Montenegro. Delightful stories of old times and of the Adriatic coast were written by Stefan Mitrov Lyubisha (1824-1878).

In dramatic literature the Servians are comparatively rich. The poet Dr Laza Kostich made excellent translations from Shakespeare (King Lear, Romeo and Juliet, King Richard III.), and gave the Servian stage two of its best tragedies: Maxim Tsrno- yevich and Petar Segedinats; also the comedy Gordana. Matiya Ban's Meyrimah is considered the best tragedy in the Serbo-Croatian language. The patriotic drama Balkanska Tsaritsa, by Prince Nicholas of Montenegro, has been often played and enthusiastically received by the public, but the critics deny to it much dramatic value. Milosh Tsvetich has given fine and lasting contributions to the Servian stage in his drama Stefan Nemanya and tragedy Todor of Stalach. Among the writers of comedy the first place must be assigned to Kosta Trifkovich (d. 1875) ; Milovan Glishich (d. 1908) was also very popular; and Branislav Nushich was the most suc- cessful of Servian dramatists early in the 20th century.

In modern scientific literature the principal Servian names are those of the electrician Nicholas Tesla, the botanist Dr Josif Panchich, and the geologists Dr Yovan Zhuyevich and Dr Yovan Tsviyich (Cvijic). In philology a very high place is occupied by Gyuro Damchich, once professor of philology at the high school in Belgrade and secretary to the South Slavonic Academy at Agram, where he was for years the principal editor of the great lexicon of the Servian or Croatian language. He had a very distinguished pupil in Stoyan Novakovich, who wrote numerous studies on philological subjects, and whose Servian grammar is still the standard book in all Servian schools. In historical literature we find besides Yovan Raich, mentioned earlier, Panta Sretykovich, with his History of the Servian Nation; Stoyan Boshkovich (d. 1908), with his Servia under Tsar Dushan ; Stoyan Novakovich, with his numerous essays on subjects from the medieval history of Servia, his History of Servian Literature, his Resurrection of the Servian National State and Rising against the Dahis (the two

last-named books appeared in Belgrade in 1904) ; Lyubomir Kovachevich and Lyuba Yovanovich, who together wrote a standard work on the history of the Servian nation; Chedo Mijatovich, with his monographs on Gyuragy Brankovich and the conquest of Constantinople by the Turks.

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SERVICE TREE, Pyrus domestica, a native of the Mediter- ranean region, not infrequently planted in southern Europe for its fruit. It has been regarded as a native of England on the evidence of a single specimen, which has probably been planted, now existing in the forest of Wyre. Though not much cultivated its fruit is esteemed by some persons, and therefore two or three trees may very well be provided with a place in the orchard, or in a sheltered corner of the lawn. The tree is seldom productive till it has arrived at a goodly size and age. The fruit has a peculiar acid flavour, and, like the medlar, is fit for use only when thoroughly mellowed by being kept till it has become bletted. There is a pear-shaped variety, pyriformis, and also an apple- shaped variety, maliformis, both of which may be propagated by layers, and still better by grafting on seedling plants of their own kind. The fruit is sometimes brought to market in winter. The service is nearly allied to the mountain ash, Pyrus Aucu- paria, which it resembles in having regularly primate leaves. P. torminalis is the wild service, a small tree occurring locally in woods and hedges from Lancashire southwards; the fruit is sold in country markets. These, with other species, including P. Aria, white beam, so- called from the leaves which are white and flocculent beneath, form the subgenus Sorbus, which -was regarded by Linnaeus as a distinct genus.

SERVIEN, ABEL, mar Qtris de Sable and de Boisdaothtn, comte de la RoCfiE-SERViEN (1593-1659), French diplomat, was born at Grenoble, the son of Antoine Servien, procurator- general of the estates of Dauphine. He succeeded his father in that office in 1616, and in the following year attended the assembly of notables at Rouen. In 16 18 he was named councillor of state and in 1624 was called to Paris, where he found favour with Richelieu. He displayed administrative ability and great loyalty to the central government as intendant in Guienne in 1627, and in 1628 negotiated the boundary delimitation with Spain. Appointed president of the parlement of Bordeaux in 1630, he soon resigned to accept an embassy to Italy, where he was one of the signatories of the treaty of Cherasco and of the treaties with the duke of Savoy (1 631-163 2). In 1634 he was admitted to the French Academy. Two years later he retired from public life as the result of court intrigue. Servien lived at Angers or on his estates at Sable until the death of Louis XIII., when Mazarin entrusted him with the conduct, conjointly with the comte d'Avaux, of French diplomatic affairs in Germany. After five years' negotiations, and a bitter quarrel with the comte d'Avaux, which ended in the latter's recall, Servien signed the two treaties of the 24th of October 1648 which were part of the general peace of Westphalia. He received the title of minister of state on his return to France in April 1649, remained loyal to Mazarin during the Fronde, and was made superintendent of finances in 1653. He was an adviser to Mazarin in the negotia- tions which terminated in the treaty of the Pyrenees (1659). He amassed a considerable fortune, and was unpopular, even in court circles. He died at the chateau of Meudon on the 17th of February 1659.

Servien left an important and voluminous correspondence. See R. Kerviler, A. Servien, etude sur savie politique et litteraire, (Mamers,

1879).

SERVITES, or "Servants of Mary," an order under the Rule of St Augustine, founded in 1233. In this year seven merchants of Florence, recently canonized as " the seven holy Founders," gave up their wealth and position, and with the bishop's sanction established themselves as a religious community on Monte Senario near Florence. They lived an austere life of penance and prayer, and being joined by others, they were in 1 240 formed into an order following the Augustinian rule supple- mented by constitutions borrowed from the Dominicans. Soon they were able to establish houses in various parts of Italy, where within twenty-five years four provinces were formed; they also at an early date founded many houses in France,

Germany and Spain, but they never came to England before the Reformation. The most illustrious member of the order and its chief propagator and organizer was St Filippo Benizi, the fifth general, who died in 1285. The order received papal approbation in 1255; in 1424 it was recognized as a Mendicant order, and in 1567 it was ranked with the four great orders of Mendicant friars. The Servites undertook missions in Tartary, India and Japan. As in the other orders there were various mitigations and relaxations of the rule, producing a variety of reforms, the chief being that of the eremiti- cal Servites. There are at the present day 64 Servites houses, mostly in Italy; there are two or three in England and in America. There are Servite nuns and also tertiaries, founded by St Juliana Falconieri, 1305, who are widespread and devote them- selves chiefly to primary education. They have several convents in England. The habit of the Servites is black.

The chief work on the Servites is the Monumenta by Morini and Soulier, 1897, &c. See Helyot, Histoire des ordres religieux (1715), iii. cc. 39-41 ; Max Heimbucher Orden u. Kongregationen (1907), ii. § 73; Wetzer u. Welte, Kirchenlexicon (2nd ed.); Herzog-Hauck Realencyhlopddie (3rd ed.). The most interesting part of Servite his- tory is told by P. Soulier, Vie de S. Philippe Benizi (1886). (E. C. B.)

SERVITUDE (Lat. servitus, from servire, to serve), a right over the property of another. In Roman law, servitudes were classi- fied into (1) personal, i.e. those given to a particular person, and (2) praedial, i.e. those enjoyed over something else (praedium serviens) by being owner or tenant of a piece of land or a house (praedium dominans). Personal servitudes were subdivided into (a) usus, the right of using property; (b) usufrucltts the

right of using and enjoying the fruits of property ; and © and (d) operas servorum sive animalium. Praedial servitudes were either (a) rustic, such a.s jus eundi, the right of walking or riding along the footpath of another; aquae ductus, the right of passage for water; pascendi, the right of pasture, &c ; or (b) urban. Urban servitudes were of various kinds, as oneris ferendi, the right of using the wall of another to support a man's own wall; pro- jiciendi, the right of building a structure, such as a balcony or verandah, so as to project over another's land; stillicidii, fumi immittendi and several others. Servitudes were created by a disposition inter vivos, or by contract;

by testamentary dis- position; by the conveyance of land or by prescription They might be extinguished by destruction of either, the res serviens or the res dominans; by release of the right, or by the vesting of the ownership of the res serviens and res dominans in the same • person.

In English law there may be certain limited rights over the land of another, corresponding somewhat to servitudes, and termed ease- ments {q.v.). In Scots law the term is still in use (see Easement).

SERVIUS HONORATUS, MAURUS (or Marius), Roman grammarian and commentator on Virgil, flourished at the end of the 4th. century a.d. He is one of the interlocutors in the Saturnalia of Macrobius, and allusions in that work and a letter from Symmachus to Servius show that he was a pagan. He was one of the most favourable examples of the Roman " grammatici " and the most learned man of his time. He is chiefly known for his commentary on Virgil, which has come down to us in two distinct forms. The first is a comparatively short commentary, definitely attributed to Servius in the superscription in the MSS. and by other evidence. A second class of MSS. (all going back to the 10th or nth century) presents a much expanded com- mentary, in which the first is embedded; but these MSS. differ very much in the amount and character of the additions they make to the original, and none of them bears the name of Servius. The added matter is undoubtedly ancient, dating from a time but little removed from that of Servius, and is founded to a large extent on historical and antiquarian literature which is now lost. The writer is anonymous and probably a Christian. A third class of MSS., written for the most part in Italy and of late date, repeats the text of the first class, with numerous interpolated scholia of quite recent origin and little or no value. The real Servian commentary practically gives the only complete extant edition of a classic author written before the destruction of the empire. It is constructed very much on the principle of a modern edition, and is partly founded on the extensive Virgilian literature of preceding times, much of which is known only from the fragments and facts preserved in the commentary. The notices of Virgil's text, though seldom or never authoritative in face of the existing MSS., which go back to, or even beyond, the times of Servius, yet supply valuable information concerning the ancient recensions and textual criticism of Virgil. In the gram- matical interpretation of his author's language, Servius does not rise above the stiff and overwrought subtleties" of his time; while his etymologies, as is natural, violate every law of sound and sense. As a literary critic the shortcomings of Servius, judged by a modern standard, are great, but he shines in comparison with his

contemporaries. In particular, he deserves credit for setting his face against the prevalent allegorical methods of exposition. But the abiding value of his work lies in his preservation of facts in Roman history, religibn, antiquities and language, which but for him might have perished. Not a little of the laborious erudition of Varro and other ancient scholars has survived in his pages. Besides the Virgilian commentary, other works of Servius are extant: a collection of notes on the grammar (Ars) of Aelius Donatus; a treatise on metrical endings (De finalibus) ; and a tract on the different metres (De centum melris).

Editions of the Virgilian commentary by G. Fabricius (1551); P. Daniel, who first published the enlarged commentary (1600); and G. Thilo and H. Hagen (1878-1902). The Essai sur Servius by E. Thomas (1880) is an elaborate and valuable examination of all matters connected with Servius; many points are treated also by O. Ribbeck in his Prolegomena to Virgil ; see also a review of Thilo's edition by H. Nettleship in Journal of Philology, x. (1882). The smaller works of Servius are printed in H. Keil's Grammatici Lalini, iv.

SERVIUS TULLIUS, sixth legendary king of Rome (578- 534 B.C.). According to one account he was the son of the household genius (Lar) and a slave named Ocrisia, of the house- hold of Tarquinius Priscus. He married a daughter of Tar- quinius and succeeded to the throne by the contrivance of his mother-in-law, Tanaquil, who was skilled in divination and foresaw his, greatness. Another legend, alluded to in a speech by the emperor Claudius (fragments of which were discovered on a bronze tablet dug up at Lyons in 1524), represented him as an Etruscan soldier of fortune named Mastarna, who attached himself to Caeles Vibenna (Caelius Vivenna), the founder of an Etruscan city on the Caelian Hill (see also Tacitus, Annals, iv. 65). An important event of his reign was the conclusion of an alliance with the Latins, whereby Rome and the cities of Latium became members of one great league, whose common sanctuary was the temple of Diana on the Aventine. His reign of forty-four years was brought to a close by a conspiracy headed by his son-in-law, Tarquinius Superbus.

The legend of Servius presents certain similarities to that of the founder of Rome. His miraculous birth, commemorated by Servius himself in the festival established by him in honour of the Lares, recalls that of Romulus. Again, as Romulus was the author of the patrician groundwork of the constitution, so Servius was regarded as the originator of a new classification of the people, which laid the

foundation of the gradual political enfranchisement of the plebeians (for the constitutional altera- tions with which his name is associated, see Rome: Ancient History; for the Servian Wall see Rome: Archaeology). His supposed Latin descent is contradicted by the Etruscan tradition alluded to above (on which see V. Gardthausen, Mastarna oder Servius Tullius, 1882), and his insertion among the kings of Rome is due to the need of providing an initiator of subsequent republican institutions. The treaty with the Latins is mentioned by Dionysius of Halicarnassus alone, who had not seen it himself; indeed, it is doubtful whether it was then in existence, and in any case, considering the changes which the language had undergone, it would have been unintelligible. It is also sus- picious that no list of the members of the league is given, contrary to the usual custom. ,

For a critical examination of the story see Schwegler, Romische Geschichte, bks. xvi., xvii. ; Sir G. Cprnewall Lewis, Credibility of early Roman History, ch. xi. ; W. Ihne, History of Rome, i. ; E. Pais, Storia di Roma, i. (1898); and Ancient Legends of Roman History (Eng. trans., 1906), where he comes to the conclusion that "instead of being the sixth rex- of Rome, he was originally the rex servus, the priest of the cult of Diana Aricina transferred to the Aventine, the priest of the protecting goddess of fugitive slaves "; C. Pascal, Fatti e legende di Ronia antica (Florence, 1903) ; also O.. Gilbert, Geschichte und Topographie der Stadt Rom im Altertum (1883-1885), and L B. Carter, The Religion of Numa (1906), on the reorganization of Servius. . .

SERVO-BULGARIAN WAR (1885). The Berlin Congress of 1878, by its revision of the treaty of San Stefano, created two states in the Balkan Peninsula— the principality 1 of Bulgaria owning a nominal suzerainty to Turkey, and the autonomous province of eastern Rumelia, presided over by a Turkish governor-general, ; and apparently intended to remain in close relations with the porte. This settlement came to an end when the movement in favour of a united Bulgaria culminated (September 1885) in a revolution in the Rumelian capital. Prince Alexander of Bulgaria, recognizing that the movement was irresistible and that, Unless directed by authority, it might degenerate into anarchy and civil war, placed himself at its head, and, proceeding to Philippopolis, formally accepted the government of the united Bulgarian states. As it was assumed that the sultan would reassert his claim by force of arms, the Bulgaro-Rumelian forces were concentrated as rapidly as possible near the Turkish frontier. Prince Alexander, however, had taken the step of acknowledging the sultan's suzerainty; and Turkey was not inclined

to begin a war which would probably cause a revolt in Macedonia and might end by rendering Russian influence paramount in Bulgaria. But, while a conference of ambassadors was vainly discussing the situation at Constanti- nople, the Gordian knot was cut by the announcement that

Servia, seeking compensation for the aggrandizement of Bul- garia, had constituted herself the champion of the treaty of Berlin.

King Milan had issued orders for the Servian army mobiliza- tion on the very day of Prince Alexander's proclamation at Philippopolis, and large forces were concentrated (October ist-i2th) on the Bulgarian frontier. On the 19th the prince ordered troops to the quarter thus threatened, but it seems certain that, whilst in eastern Rumelia every preparation had been made for war, Prince Alexander had so little expectation of, and wish for, a war with Servia, that few measures were taken to supply the needs of a field army on that side, though fortifications were begun at several places, notably at Sofia and Slivnitza, towards the end of October.

Unlike the Servian army, which contained few permanent units and consisted mainly of militiamen, the standing army of Bulgaria, trained and commanded by Russian officers since 1877-1878, was organized on the German system of filling up relatively strong cadres to war strength and forming additional units. When fully mobilized the field army numbered about 55,000 men. The Rumelian forces (militia) consisted in all of about 35,000 men. Besides these forces was the " Bandit brigade " of Captain Panitza, an irregular force some 3000 strong, composed of Macedonians, Turks, Jews and other miscellaneous volunteers. This force did good service as a flying right wing of the main army. In the Bulgarian army the whole of the staff and superior officers, as well as about half the regimental captains, were Russians. When the mobilization of the Bulgarian and Rumelian forces was decreed by the prince, the whole of the Russian officers were at once withdrawn, and the heavy task of creating a staff and selecting young officers for all the superior commands had to be undertaken in front of the enemy. Moreover, when on the 14th of November Milan finally declared war, the Bulgarian forces were mostly far away beyond the Balkans on the Turkish frontier. The Servian main army (under King Milan), and the army of the Timok promptly crossed the frontier and soon came in contact with small

forces of the enemy. On the Timok little or nothing of importance took place throughout the war, as the forces opposing the army of the Timok near Vidin effectually neutralized that force. In front of Dragoman and Trn the Bulgarians fell back, engaging in stubborn rearguard combats at every favourable place. The Servian " Army of the Nishava " advanced but slowly and with hesitation, while the most strenuous exertions were made by Prince Alexander and his newly-formed staff to collect their far-distant troops in the Slivnitza position. Every commander was given the simple order to march on Slivnitza. The civilian population was warned to be ready with supplies to meet the troops by the roadside, and under these peculiar conditions, and extraordinary difficulties of country and weather, the Bulgarians marched on the decisive point at the highest possible speed of man and horse. Some remarkable marches are recorded: the 8th infantry, 4500 strong, covered 59 m. in thirty-two hours, leaving only sixty-two men behind; the 3rd and part of another Rumelian battalion reached Sofia so exhausted that they were sent to the front on horseback, two men to each horse; the troops that were sent up by rail were packed in open trucks, sixty men to a truck. The furious energy displayed had its reward on the field of battle. Before the last shot of the battle of Slivnitza was fired, nearly half of the entire forces of Bulgaria and Rumelia were in the lines, and 14,000 men more faced the army of the Timok at Widdin. With the main army — a striking display of what could be accomplished by patriotism and vigour — were fifty-six pieces of artillery, most of which had been dragged over the Balkan passes in mid-winter.

The position of Slivnitza, barring the high road between Nish and Sofia, had been extensively fortified, but when the Servians opened their attack on the 17th of November, there were but few troops available to occupy the works. On the right of the Bulgarian line was the Meka Krud height, occupied by some battalions under Captain Benderev; here fighting went on through the short winter day, which ended with a gallant, and

for the time successful, counter-attack by six Bulgarian bat- talions led by Benderev. The prince, not yet ready for the offensive, withdrew these troops to their original position. In the centre, near the high road, a hot and, at one moment of the day, almost successful attack of the Servians ended with their complete repulse. The latter had had 17,000 men against the Bulgarians' 11,000; yet they had, owing mainly to faults in the superior leading, been unsuccessful. Next day their chances of victory would be even less, for the defenders were hourly reinforced from Sofia, and on the 18th were actually somewhat superior in numbers. On this day the

Servians made a very heavy attack on the Bulgarian left wing, which was eventually repulsed, though not without great difficulty, by the newly arrived troops from Sofia. Later a half-hearted attack was made on the centre, and from his position on Meka Krud Ben- derev again attacked the Servian " Danube " division. On this day a Servian division pushed the Bulgarians out of Breznik, but made no farther advance either on Sofia or on the left flank of the Bulgarians at Slivnitza, in spite of orders to do so. On the 19th alarm and consternation at Sofia, caused by the presence of hostile forces at Breznik, were so great that Alexander left the command in the hands of his chief of staff, Major Guchev, and hurried back to the capital in order to organize the defence. The Servian leader was, however, as inactive on the 19th as on the 18th, and when he at last moved forward towards Slivnitza it was only with a portion of his force; this was driven back, by a detachment from the left wing of the Bulgarian position, to Rakita. Meanwhile, the active Benderev had reopened his attack on the Danube division. Twice he was repulsed, but finally at about 3 p.m. his battalions carried the heights held by the Servians. A little before this the Bulgarian centre likewise moved forward, and, though a final attack of the Servians on the gap caused by the absence of the Bulgarian troops detached towards Breznik came near to success, the prince returned to the battlefield to find his troops everywhere victorious and driving the enemy before them. Two days later, reorganized and reinforced, the Bulgarians took the offensive and carried the Dragoman pass.

On the 25th Prince Alexander received at Tzaribrod pro- posals for an armistice from King Milan; these were not ac- cepted, and the Bulgarian army, crossing the frontier, advanced in several columns upon Pirot, where the army of the Nishava took up a defensive position in the town and on the surrounding heights. A two-days' engagement followed (26th and 27th of November). On the 26th the Bulgarians were, successful, but a heavy counter attack on the following day almost snatched the victory out of their hands, and it was only after a severe contest lasting eleven hours that the Servians finally gave way. The Bulgarians were not permitted to reap the fruits of their success. As they were preparing to pursue the defeated and now greatly demoralized enemy on the 28th, the Austrian minister at Belgrade arrived at headquarters and hostilities ceased. The intervention of Austria saved the Servian army, which was greatly demoralized, and was now threatened by the united Bulgarian force of nearly 55,000 men. On the same day the army of the Timok was repulsed with heavy loss in an attack on Vidin.

Servia escaped almost unpunished from her war of aggression. The

young Bulgarian army, with its improvised staff and newly-appointed field officers, displayed admirable marching power and fighting qualities, and the Rumelian militiamen proved themselves to be good soldiers. The Servians had, however, fought with great bravery also, and the victory must be ascribed in the main to the personal influence, the strenuous exertions and the sound military judgment of Prince Alexander; and the brief but decisive campaign set the seal to.Bulgarian unity.

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SESAME, the most important plant of the genus Sesamum (nat. ord. Pedalineae), is that which is used throughout India and other tropical countries for the sake of the oil expressed from its seeds. 5. indicum is a herb 2 to 4 ft. high, with the lower leaves on long stalks, broad, coarsely toothed or lobed. The upper leaves are lanceolate, and bear in their axils curved, tubular, two-lipped flowers, each about J in. long, and pinkish or yellowish in colour. The four stamens are of unequal length,

with a trace of •a fifth stamen, and the two- celled ovary ripens into a two-valved pod with numerous seeds. The ‘ plant has been cultivated in the tropics from time immemo- I rial, and is sup- posed on philo- logical grounds ‘to have been disseminated from the islands

of the Indian Archipelago, but at present it is not known with certainty in a wild state. The plant varies in the colour of the flower, and especially in that of the seeds,

From Bentley t and Tnmen, Medicinal Plants, by permission of w . • r 1.

from

J. & A. Churchill.

Sesame {Sesamum indicum).

1 , Corolla cut open with stamens.

2, Flower after removal of corolla.

3, Ovary cut lengthwise.

4, Fruit.

5, Seed cut lengthwise. 3 and 5 enlarged.

range light yellow or whitish to black. Sesame oil, otherwise known as gin- gelly or til (not to be confounded with that derived from Guizotia oleifera, known under the same vernacular name), is very largely used for the same purposes as olive oil, and, although less widely known by name, is commercially a much more important oil. The oil is included in the Indian and Colonial Addendum (1900) to the British Pharmacopeia. The seeds and leaves also are used by the natives as demulcents and for other medicinal purposes. The soot obtained in burning the oil is said to constitute one of the ingredients in India or Chinese ink. The plant might be cultivated with advantage in almost all the tropical and semi-tropical colonies of Britain, but will not succeed in any part of Europe.

A detailed account of its history and the cultivation of the plant in India is given by Sir G. Watt, Dictionary of Economic Products of India (1893).

SESOSTRIS, the name of a legendary king of Egypt. Accord- ing to Herodotus, Diodorus Siculus (who calls him Sesoosis) and Strabo, he conquered the whole world, even Scythia and Ethiopia, divided Egypt into administrative districts or nomes, was a great law-giver, and introduced a system of caste and the worship of Serapis. He has been considered a compound of Seti I. and Rameses II., belonging to the

XlXth Dynasty. In Manetho,

however, he occupied the place of the second Senwosri (formerly read Usertesen) of the XHth Dynasty, and his name is now usually viewed as a corruption of Senwosri. So far as is known no Egyptian king penetrated a day's journey beyond the Euphrates or into Asia Minor, or touched the continent of Europe. The kings of the XVIIIth and XlXth dynasties were the greatest conquerors that Egypt ever produced, and their records are clear on this point. Senwosri III. raided south Palestine and Ethiopia, and at Semna beyond the second cataract set up a stela of conquest that in its expressions recalls the stelae of Sesostris in Herodotus: Sesostris may, therefore, be the highly magnified portrait of this Pharaoh. Khian, the powerful but obscure Hyksos king of Egypt, whose prenomen might be pronounced Sweserenre, is perhaps a possible proto- type, for objects inscribed with his name have been found from Bagdad to Cnossus. Sesostris is evidently a mythical figure calculated to satisfy the pride of the Egyptians in their ancient achievements, after they had come into contact with the great conquerors of Assyria and Persia. When we recollect that the Ethiopian Tearchus (Tirhaka) of the 7th century B.C., who was hopelessly worsted by the Assyrians and scarcely ventured outside the Nile valley, was credited by Megasthenes (4th century) and Strabo with having extended his conquests as far as India and the pillars of Hercules, it is not surprising if the dim figures of antiquity were magnified to a less degree. In the case of Tearchus, the miscellaneous levies which he employed himself and those which composed the Egyptian and Assyrian armies opposed to him, and the lands that Egypt and Ethiopia traded with, must all have been counted, partly through mis- understanding, partly through wilful perversion, to his empire. Herodotus ii. 102-m; Diod. Sic. i. 53-59; Strabo xv. p. 687; see also article Egypt; and Kurt Sethe, " Sesostris," 1900, in his Unters. z. Gesch. u. Altertumskunde Agyptens, tome ii. (F. Ll. G.)

SESSA AURUNCA, a town and episcopal see of Campania, Italy, in the province of Caserta, on the S.W. slope of the extinct volcano of Rocca Monfina, 27 m. by rail W.N.W. of Caserta and 205 m. E. of Formia by the branch railway to Sparanise, 666 ft. above sea-level. Pop. 5945 (town), 22,077 (commune). It is situated on the site of the ancient Suessa Aurunca, on a small affluent of the Liri. The hill on which Sessa lies is a mass of volcanic tufa. The town contains many ancient remains, notably the ruins of an ancient bridge in brickwork of twenty-one arches, of substructures in opus reticulatum under the church of S. Benedetto, of a building in opus quadratum, supposed to have been a public portico, under the monastery of S.

Giovanni, and of an amphitheatre. The Romanesque cathedral is a basilica with a vaulted portico and a nave and two aisles begun in 1 103, a mosaic pavement in the Cosmatesque style, a good ambo resting on columns and decorated with mosaics showing traces of Moorish influence, a Paschal candelabrum, and an organ gallerj of similar style. The portal has curious sculptures with srenes from the life of SS. Peter and Paul. In the principal streets are memorial stones with inscriptions in honour of Charles V., surmounted by an old crucifix with a mosaic cross. The hills of Sessa are celebrated for their wine.

The ancient chief town of the Aurunci, Aurunca or Ausona, is believed to have lain over 2000 ft. above the level of the sea, on the narrow south-western edge of the extinct crater of Rocca Monfina. Here some remains of Cyclopean masonry exist; but the area enclosed, about 100 yds. by 50, is too small for anything but a detached fort. It dates, doubtless, from a time prior to Roman supremacy. In 337 B.C. the town was abandoned, under the pressure of the Sidicini, in favour of the site of the modern Sessa. The new town kept the old name until 313, when a Latin colony under the name Suessa Aurunca was founded here. It was among the towns that had the right of coinage, and it manufactured carts, baskets, &c. Cicero speaks of it as a place of some import- ance. The triumviri settled some of their veterans here, whence it appears as Colonia Julia Felix Classica Suessa. From inscrip- tions it appears that Matidia the younger, sister-in-law of Hadrian, had property in the district. It was not on a highroad, but on a branch between the Via Appia at Minturnae and the Via Latina

at Teanum; the pavement of the road between the latter place and Suessa is in places well preserved, especially near Teano, and so is that of a road ascending from Suessa northward towards the crater mentioned.

See A. Avena, Monumenti dell' Italia Meridionals (Naples, 1902), i. 181 sqq. (T. As.)

SESSION (through Fr. from Lat. sessio, sedere, to sit), the act of sitting or the state of being seated, more generally the sitting together or assembly of a body, judicial, legislative, &c, for the transaction of its business, and also the time during which the body sits until its

adjournment or dispersion. A session of parliament is reckoned from its assembling till prorogation; usually there is one session in each year. In particular the term is applied to the sittings of various judicial courts, especially criminal, such as the sessions of the Central Criminal Court in London. The sittings of the justices of the peace or magistrates in the United Kingdom are " sessions of the peace " for the transaction of the judicial business committed to them by statute or by their commission. These are either " petty sessions," courts of summary jurisdiction held by two or more justices of the peace or by a stipendiary or metropolitan police magistrate under statute for the trial of such cases as are not of sufficient import- ance to be tried before quarter-sessions, or for a preliminary inquiry into indictable offences (see Justice of the Peace and Summary Jurisdiction). The " special sessions " of the justices are held for licensing purposes, styled " Brewster sessions," or for carrying out the provisions of the Highway Acts, &c. The only sessions which are " general sessions " of the peace are now " quarter-sessions " (q.v.). The supreme court of Scotland is termed the " Court of Session " (see Scot- land), and the name is given in the Presbyterian church to the lowest ecclesiastical court, composed of the elders of the church presided over by the minister. In the Established Church of Scotland this is usually styled the " Kirk-session."

SESTETT, the name given to the second division of a sonnet, which must consist of an octave, of eight lines, succeeded by a sestett, of six lines. In the usual course the rhymes are arranged abc \ abc, but this is not necessary. Early Italian sonnets, and in particular those of Dante, often close with the rhyme-arrangement abc | cba; but in languages where the sonority of syllables is not so great as it is in Italian, it is danger- ous to leave a period of five lines between one rhyme and another. In the quatorzain, there is properly speaking no sestett, but a quatrain followed by a couplet, as in the case of Shakespeare's so-called " Sonnets." Another form of sestett has only two rhymes, ab | ab | ab; as is the case in Gray's famous sonnet " On the Death of Richard West." The sestett should mark the turn of emotion in the sonnet; as a rule it may be said, that the octave having been more or less objective, in the sestett reflection should make its appearance, with a tendency to the subjective manner. For example, in Matthew Arnold's in- genious " The Better Part," the rough inquirer, who has had his own way in the octave, is replied to as soon as the sestett com- mences:- —

" So answerest thou ? But why not rather say:

‘ Hath Man no second life ? Pitch this one high. More strictly, then, the inward judge obey !

Was Christ a man like us? Ah I let us try If we, then, too, can be such men as he I ‘ ”

Wordsworth and Milton are both remarkable for the dignity with which they conduct the downward wave of the sestett in their sonnet. The French sonneteers of the 16th century, with Ronsard at their head, preferred the softer sound of the arrange- ment aab I ccb |. The German poets have usually wavered between the English and the Italian forms.

SESTINA, one of the most elaborate forms of verse employed by the medieval poets of Provence and Italy, and retained in occasional use by the modern poets of Western Europe. The scheme on which the sestina is built was the invention of the great troubadour, Arnaut Daniel (d. n 99), who wrote many sestinas in the lingua di si. Dante, a little later, wrote sestinas in Italian, and of these the most famous is that beginning ” Al poco giorno ed al gran cerchio d’ ombra.” In the De vulgari

Eloquio, Dante admits that he copied the structure of his sestinas from Arnaut Daniel; ” et nos eum secuti sumus,” he says, after praising the work of the Provencal poet. The sestina, in its pure medieval form, is independent of rhyme; it consists of six stanzas of six lines each of blank verse. This recurrence of the number six gives its name to the poem. The final words of the first stanza appear in inverted order in all the others, the order as laid down by the Provencals being as follows: — abcdef, faebdc, cfdabe, ecbfad, deacfb, bdfeca. To these six stanzas followed a tornada, or envoi, of three lines, in which all the six key- words were repeated in the following order: — b-e, d-c, f-a. It has been supposed that there was some symbolic mystery involved in the rigid elaboration of this form, from which no slightest divergence was permitted, but if so this cryptic meaning has been lost. Petrarch cultivated a slightly modified sestina, but after the middle ages the form fell into disuse, until it was revived and adapted to the French language by the poets of the Pleiade, in particular by Pontus de Thyard. In the 19th century, the sestina or sextine was assiduously cultivated by the Comte de Gramont, who, between 1830 and 1848, wrote a large number of examples, included in his Chant du passi (1854). He followed the example of. Petrarch rather than of the Provencal trouba- dours, by introducing two rhymes instead of the rigorous blank verse. A sestina by Gramont, beginning: —

" L'etang qui s'eclaircit au milieu des feuillages, La mare avec ses joncs rubanant au soleil, Ses flotilles de fleurs, ses insectes volages Me charfnent. Longuement au creux de leurs rivages J'erre, et les yeux remplis d'un mirage vermeil, J'ecoute l'eau qui rive en son tiede sommeil,"

has been recommended to all who wish to " triumph over the innumerable and terrible difficulties " of the sestina, as a perfect model of the form in its " precise and classic purity." The earliest sestina in English was published in 1877 by Mr Gosse; this was composed according to the archaic form of Arnaut Daniel. Since that time it has been frequently employed by English and American writers, particularly by Swinburne, who has composed some beautiful sestinas on the rhymed French pattern; of these, that beginning " I saw my soul, at rest upon a day " is perhaps the finest example of this poem existing in English. Mr Swin- burne is, moreover, like Petrarch, the author of an astonishing tour deforce, " The Complaint of Lisa," which is a double sestina of twelve verses of twelve lines each. The sestina was cultivated in Germany in the 17th century, particularly by Opitz and by Weckherlin. In the 19th century an attempt was made, not without success, to compose German sestinas in dialogue, while the double sestina itself is not unknown in German literature.

SESTRI LEVANTE (anc. Segesta Tiguliorum) , a seaport of Liguria, Italy, in the province of Genoa, from which it is 285 m. distant by rail, $3 ft. above sea-level. Pop. (1901) 3034 (town); 1 2,038 (commune) . It is both a summer and a winter resort, with fine views. Part of the town is situated on a promontory (230 ft.) between two bays. The ancient town was the port of exportation of the slate of the district, for we hear of a place called Tigulia or Tegulata on the coast-road; but we know practically nothing of the political condition of the district in Roman times.

SESTRI PONENTE, a town of Liguria, Italy, in the province of Genoa, 4 m. W. of that town on the coast. Pop. (1901) 17,225. It has important shipbuilding yards and iron-works, with factories for macaroni, matches and tobacco, tanneries a.nd saw-mills, and, in the vicinity, alasbaster quarries. A mile and a half west is Pegli, also a favourite seaside resort, with beautiful walks and fine villas, among which the Villa Pallavicina, with rare trees and fantastic buildings, fountains and grottoes, is noticeable.

SETH (n# according to Dillmann, "setting" or "slip"; Septuagint, Philo and New Testament, X-qd, but 1 Chron. i. 1 2ifc in A ;

Josephus, 2?)0ps, Vulg. Seth), in Gen. iv. 25, 26 (J) and v. 3-8 (P), the son of Adam. At the age of 105 he begat EnoS; he lived in all 912 years. Seth was born after the murder of Abel, and in iv. 25 a popular etymology is given of his name — Adam's wife called his name Seth, " For God," saith she, " hath

appointed, shdth, me another seed instead of Abel." It is further said that after Enos was born, men began to worship Yahweh. Apparently Gen. iv. 25, 26 had no original connexion with J.'s story of the creation, which speaks of Yahweh freely from the outset. As Enos is a Hebrew word for man, it is probably derived from a tradition in which Enos was the first man. An examin- ation of the Sethite genealogy, w. 12-27, Kenan, Mahalalel, Jared, Enoch, Methuselah, Lantech, shows that it is a slightly different version of the Cainite genealogy, iv. 17-18, Cain (Heb. Kayin), Enoch, Irad, Mehujael, Metkusael, Lantech. Seth is named in the opening genealogy of Chronicles, 1 Chron. i. 1, and in Luke's genealogy of Christ, Luke iii. 38. The Hebrew text of Ecclesiasticus xlix. 16 has " And Shem and Seth and Enosh were visited," — probably with divine favour; the Greek version runs, " Shem and Seth were glorified among men."

In Num. xxiv. 17, the Authorized Version has " the children of Sheth " in a list of nations; the Hebrew is the same as Seth in Genesis. The passage may perhaps indicate that Seth was originally the name of a tribe. The " Seth " of Numbers is sometimes identified with the Bedouin, who appear as Sutu in Assyrian and Babylonian inscriptions. But the Revised Version takes the word sheth as a common noun, " tumult," and others interpret it as "pride"; cf. Gray's Numbers, p. 371.

If the ten patriarchs of Gen. v. (see Noah) correspond to the ten primitive kings of Babylon, Seth, as second, will correspond with the Adapa of the Babylonian inscriptions, the Alaparos or Adaparos of Berosus. The two have been compared in that Adapa was demiurge and Logos; and Seth figures as the Messiah in later Jewish tradition. 1 We may also note the resemblance between the names Sheth, Set, the Egyptian god of war, and the Hittite deity Suteh. The latter has been supposed to be a Hyksos or Semitic deity and to have some connexion with Sheth; but Cheyne and Miiller reject this view. 2 Seth is also identified with Moab or the land of Moab. 3

A mass of Christian and Jewish tradition has gathered round the name of Seth. Philo, De posteriori Caini, § 3, explains the name as meaning roriff/ioj," watering " or " irrigation," connecting it with the Hebrew root Sh Th H. Josephus, Ant. I. ii. 3, tells us that Seth was a virtuous man, and that his descendants lived in perfect harmony and happiness. They discovered astronomy, and inscribed their discoveries on two pillars, one of which, says Josephus, survived in his time. In the Book of Jubilees (1st century a.d.) the name of Seth's wife is given as Azura. In the Ascension of Isaiah (1st century a.d.) Seth is seen in heaven. In the Book of Adam and Eve (a.d 500-900) Seth is described as perfectly beautiful, like Adam, only more beautiful. Seth was the last child born to Adam; he grew in stature and strength, and began to fast and pray strenuously. A Gnostic sect took the name Sethians. (W. H. Be.)

SETIA (mod. Sezze, 52 m. by rail S.E. of Rome), an ancient town of Latium (adjectum), Italy, on the south-west edge of the Volscian mountains, overlookingthe Pomptine Marshes, 1047 ft. above sea-level, and over 900 ft. above the plain. It was an ancient Volscian town, a member of the Latin league of 499 B.C., which became a Latin colonyin 382 B.C., and, owing to the strength of its position as a frontier fortress, is frequently mentioned in the military history of Rome up to the time of Sulla, by whom it was captured in 82 B.C. Under the empire it was well known for its wine, which Augustus preferred even to Falernian. Con- siderable remains of the city walls exist, built of large blocks of limestone in the polygonal style. This style may also be seen in several terrace walls belonging to a later date, as is indicated by the careful jointing and bossing of the blocks of which they are composed. Such intentional archaism is by no means uncommon in the neighbourhood of Rome. The modern town, occupying the ancient site, is an episcopal see, with a much- restored 13th-century Gothic cathedral. Pop. (1901) 6944 (town) , 10,827 (commune). At the foot of the hill on which the town stands are considerable remains of Roman villas. (T. As.)

1 A. Jeremias, Das A. T. im Lichte des alien Orients, p. 118.

2 Encycl. Biblica, "Seth," " Egypt."

3 E. Meyer, Die Israeliten und thre Nachbarstdmme, p. 219.

SET-OFF, in law, a statutory defence to the whole or to a portion of a plaintiff's claim. It had no existence under the English common law, being created by 2 Geo. II. c. 22 for the relief of insolvent debtors. Such a defence could be pleaded only in respect of mutual

debts of a definite character, and did not apply to cases in which damages were claimed, nor to equitable claims or demands. By the rules of the Supreme Court (O. XIX. r. 3) a defendant in an action may set off or set up any right or claim by way of counterclaim against the claims of a plaintiff, and such set-off or counterclaim has the same effect as a state- ment of claim in a cross-action. (See Pleading.)

In architecture, the term set-off is given to the horizontal line shown where a wall is reduced in thickness, and consequently the part of the thicker portion appears projecting before the thinner. In plinths this is generally simply chamfered. In other parts of work the set-off is generally concealed by a pro- jecting string. Where, as in parapets, the upper part projects before the lower, the break is generally hid by a corbel table. The portions of buttress caps which recede one behind another are also called sets-off.

SETON (Family). The Scottish family of Seton, Seyton or Seatoun, claims descent from a Dougall Seton who lived in the reign of Alexander I. Sir Richard Maitland of Lethington counted seven generations between this personage and Sir Christopher Seton (d. 1306), the first of the house who emerges in history with any distinctness, but these links are not all supported by documentary evidence. The name was derived from the Anglo-Norman family of Say, the Anglo-Norman immigrant being supposed to have given the name of Sey-toun to the lands granted to him in East Lothian. The family honours include the earldoms of Wintoun (cr. 1600) and Dun- fermline; of Eglinton through marriage with the Montgomeries; and through alliance with a Gordon heiress a Seton became the ancestor of the earls and marquesses of Huntly and dukes of Gordon. The Setons were connected by marriage with the royal family of Scotland, and also with the Dunbars, Lindsays, Hays and Alaitlands.

Sir Christopher Seton, son and heir of John de Seton, a Cumberland gentleman, and his wife Erminia Lascelles, was born probably in 1278, since his age is given in March 1299 as twenty-one, in an inquisition into the lands of his deceased father. He did homage for these in October of that year, and was in the service of Edward I. at Lochmaben in 1304. In 1305 he came into possession of lands which had been granted by Sir John Seton to Robert Bruce and his wife Christian, who was perhaps a Seton. He had married about 1301 Christian Bruce, sister of King Robert, who was possibly his second cousin. He was present at his brother-in-law's coronation at Scone in 1306, and saved his life at the battle of Methven later in the same year. According to Dugdale he shut himself up in Loch- doon Castle

in Ayrshire, and on the surrender of that castle was hanged as a traitor at Dumfries by order of Edward I. He left no heirs. His widow was in March 1307 in receipt of three pence a day from Edward I. for her support at the monastery of Sixhill in Lincolnshire. She was afterwards placed in the custody of Sir Thomas de Gray. His Cumberland estates, with the exception of his mother's dower, were given to Robert de Clifford. Another Seton, John de Seton, described as having no lands or chattels, was hanged for helping in the defence of Tibbers Castle, and for aiding in the murder of John Comyn, with other prisoners of war, at Newcastle in August 1306.

Sir Alexander Seton (d. c. 1360) was probably the brother of Sir Christopher. He received considerable grants of land from King Robert Bruce, and was one of the signatories of the letter addressed by the Scottish nobles to the pope to assert the in- dependence of Scotland. He was twice sent on embassies to England, and in 1333 he defended the town of Berwick against the English. He agreed with the English to surrender the town on a certain date unless he received relief before that time, giving his eldest surviving son Thomas as a hostage.' On the refusal of the Scots to surrender at the expiry of the term Thomas Seton was hanged in sight of the garrison. This incident is

related by Fordun and Boece, but with inconsistencies that have rendered it suspect. An elder son, Alexander, had perished in 1332 in opposing the landing of Edward Baliol; according to some authorities the third son, William, was hanged with his brother, but he is generally said to have been drowned during the siege; his daughter Margaret married Alan de Wintoun. The tragic death of young Thomas Seton was the subject of a ballad of " Seton's Sons," printed in Sheldon's Minstrelsy of the Scottish Border; of a tragedy, The Siege of Berwick (1794, printed 1882) by Edward Jerningham, and of another by James Miller (1824).

Sir William Seton of Seton (fl. 1371-1303) is said to have been ennobled with the title of Lord Seton, and his heirs laid claim that the barony of Seton was the oldest in Scotland. By his wife Catherine Sinclair he had eight children. John suc- ceeded him; Alexander married Elizabeth, daughter and heiress of Sir Adam de Gordon, by whom he became the ancestor of the Gordons of Huntly.

Sir John of Seton (d. c. 1441) was taken prisoner at Homildon Hill in 1402. He was hostage in England for the earl of Douglas in 1405, and again in 1423 for James I. He married Lady Janet Dunbar, daughter of the 10th earl of March. His son Sir William was killed at Verneuil, fighting on the French side, leaving as heir George (d. 1478), 1st Lord Seton, who was created a lord of parliament in 1448 as Lord Seton. By his first marriage with Margaret, daughter of John Stewart, earl of Buchan, he had a son John, who died during his father's lifetime. He was suc- ceeded by his grandson George, 2nd Lord Seton (d. 1508), who was a scholar of St Andrews and Paris, and in common report a necromancer. He was captured by the Flemings, and on his release fitted out and maintained a ship for the purpose of harassing Flemish travellers. His son George, 3rd Lord Seton, was killed at Flodden in 15 13. He redeemed estates which his father had sacrificed to support his enterprises against the Flemings. By his marriage with Janet, daughter of Patrick Dunbar, 1st earl of Bothwell, he left a son George, 4th Lord Seton (d. 1549), who allowed Cardinal Beaton to escape from custody in 1543, and received considerable grants of land in the sequel. The castle and church of Seton were burnt by Hertford In revenge for the part he had taken against the English in 1544.

George, 5th Lord Seton (i530?is8s), was a firm friend of Mary, queen of Scots. He was present at her marriage with the dauphin in 1557, and three years later he was again in France because of his adherence to the old religion. When Mary re turned to Scotland he became privy councillor and master of the household, but four years later he again found it advisable to retire to France. Mary and Darnley spent their honeymoon at Seton Palace, and Mary found a retreat there after the murder of Rizzio and again after the murder of Darnley. She spent the night before Carberry Hill under Seton's roof, and he was waiting for her on her escape from Lochleven in May 1568. He took her to his castle at Niddrie, Linlithgowshire, and thence to Hamilton. A week later he was taken prisoner at Langside. He was set free after the assassination of the regent Moray, and made his way to Flanders, where he was said to have made his living as a wagoner. He was, in fact, entrusted by Mary's supporters with a mission to the duke of Alva, and sought in vain to secure for service in Scotland two regiments of Scots then in Spanish pay. He returned home in 1571, being ap- parently reconciled with the government, but he retained his Catholicism and his friendship for Mary, who wrote to Elizabeth in 1 581 desiring a passport for Lord Seton that he might alleviate her solitude. In 1581 he was one of Morton's judges, and in 1583 he was sent as ambassador to France, where he sought interference on Queen Mary's behalf. He died soon after his return on the 8th of January 1585. The 5th Lord Seton figures in Sir Walter Scott's Abbot. He was succeeded by his second and eldest surviving son, Robert, who became 6th Lord Seton and 1st earl of Wintoun. His third son, Sir John Seton of Barns, was a gentleman of the bedchamber to Philip II. of Spain. He was recalled to Scotland by James VI., and served as lord of session from 1587 to 1594.

Mary Seton, one of the " Four Maries" attendant on the queen, is supposed to have been the 5th Lord Seton's half-sister, being the daughter of the 4th lord by his second wife, a French- woman named Mary Pieris, maid of honour to Mary of Guise. She had been educated with Queen Mary in France, being about a year older than her mistress, with whom she returned to Scotland in 1561. She helped Mary to escape from Lochleven by assuming her clothes. Later on she joined her at Carlisle, and remained with her in her various prisons until 1583, when prison life had undermined her health and spirits. She retired to the abbey of St Pierre at Reims, and she was still living there, an old lady of seventy-four, in poverty in 1614.

Robert Seton (d. 1603) succeeded his father as 6th lord in 1585, and was created earl of Wintoun in 1600. He married, about 1582,

Margaret, eldest daughter of Hugh Montgomerie, 3rd earl of Eglinton. His sons Robert and George were succes- sively earls of Wintoun; the third, Alexander, became, in right of his mother, 6th earl of Eglinton; the fourth, Thomas, was the ancestor of the Setons of Oliveston.

George, 4th earl of Wintoun (1640-1704), succeeded his grandfather, George Seton, 3rd earl, in 1650. He saw some service in the French army, and fought against the Covenanters at Pentland and at Bothwell Bridge. By his second marriage, with Christian Hepburn, he had a son George, who quarrelled with his father and is said to have been working as a journeyman blacksmith abroad when he succeeded to the title in 1704. In 1715 the 5th earl joined Kenmure with 300 men at Moffat, but it was against his advice that the Jacobite army invaded England. He was lying in the Tower under sentence of death when he succeeded in making his escape, and proceeding to the continent, he became well known in Rome, where he was grand master of the Roman lodge of freemasons. He died there in 1749. With him the earldom became extinct, but it was revived in 1840 in favour of the earls of Eglinton.

Some of the cadet branches of the family remain to be noticed. The Setons of Parbroath in Fife, represented by American de- scendants, are descended from Sir George Seton (fl. 1 580-1 595). The Setons of Touch, near Stirling, descended from Alexander Seton, 1st earl of Huntly. They were hereditary armour-bearers and squires of the body to the king, dignities which passed, in the female line, to the Seton-Stewarts in 1786. From the Setons of Touch were descended the Setons of Culbeg or Abercorn. The Setons of Preston (Linlithgow) and Ekolsund (Sweden) have been connected with the Swedish army since the 18th century when George Seton, a merchant, settled in Stockholm. The Setons of Melarum descended from William Seton, brother of the 1st earl of Huntly. The Pitmedden branch was an offshoot from Meldrum; the baronetcy was created (1686) for the judge Sir Alexander Seton, Lord Pitmedden (c. 1639- 1719). The Setons of Mounie again were a branch of the Pit- medden family; one of their house, Lieut.-Colonel Alexander Seton, 74th Highlanders, was in charge of the troops on the ill-fated " Birkenhead " in 1852. The Setons of Cariston, descended from John, second son of the 6th Lord Seton, obtained the barony of Cariston in 1553. Other branches are Seton-Gordon of Embo, with a baronetcy created in 1631, and Seton of Garleton, with a baronetcy created in 1664. The viscounty of Kingston was created for Alex- ander Seton (d. 1691), third son of the 3rd earl of Wintoun, and became extinct on the attainder of James, 3rd viscount, in 1715. See Huntly, Earls and Marquesses of.

Authorities. — Sir Richard Maitland, History of the House of Seton, continued by A. Seton, 1st Viscount Kingston (mod. ed., Glasgow 1829, and Edinburgh 1830); G. Seton, The History of the House of Seton (2 vols., 1896) ; Sir R. Douglas, Scots Peerage, new ed. by Sir J. B. Paul; Calendar of Documents relating to Scotland in the " Rolls " series; and G. E. C(okayne), Complete Peerage.

SETTEE, a long upholstered seat, usually high-backed and with arms at each end. Its ancestors were the settle and the chair — it has alternately resembled the one and the other. It is broadly distinguished from the many varieties of sofa by being intended for sitting rather than reclining — its seat is of the same height as that of a chair; its arms and much of its detail are chair-like. It dates from about the middle of the 1 7th century, but examples of that early period are exceedingly rare. There is a famous one at Knole, made about midway between the restoration of Charles II. and the revolution of 1688. By that timo the settee had acquired the splendid upholstery and convoluted woodwork which adorned the end of the Stuart period. Early in the 18th century the conjoined double or triple chair form*

became fashionable. The form was artless, and the absence of upholstery, save on the seat, produced a somewhat angular effect. This type of settee was in essence two chairs with one set of arms. Chippendale made many such pieces, some oi them of great beauty. As the taste for carved furniture wuned these sturdy settees were replaced by lighter ones, often graceful enough in outline — Hepplewhite and Sheraton were distinguished practitioners — but partaking more and more of the " stuffed-over " character. The desire for comfort and ease gradually drove out the original idea that the settee was intended only for sitting bolt upright. Its modern varieties are many, but in all of them the frame, once so lavishly ornamented, is almost concealed by upholstery.

SETTEMBRINI, LUIGI (1813-1877), Italian man of letters and politician, was born in Naples. At the age of twenty-two he was appointed professor of eloquence at Catanzaro, and married Raffaela Luigia Faucitano (1835). While still a young man he had been affected by the wave of liberalism then spreading all over Italy, and soon after his marriage he began to conspire mildly against the Bourbon government. Betrayed by a priest, he was arrested in 1839

and imprisoned at Naples; although liberated three years later he lost his professorship and had to maintain himself by private lessons. Nevertheless he continued to conspire, and in 1847 he published anonymously a " Protest of the People of the Two Sicilies," a scathing indictment of the Bourbon government. On the advice of friends he went to Malta on a British warship, but although, when King Ferdinand II. granted a constitution (16th of February 1848), he returned to Naples and was given an appointment at the ministry of educa- tion, he soon resigned on account of the prevailing chaos, and retired to a farm at Posilipo. When reaction set in, once more Settembrini was arrested as a suspect (June 1849) and imprisoned. After a monstrously unfair trial, he and two other " politicals " were condemned to death, and nineteen others to varying terms of imprisonment (February 1851). The death sentences were, however, commuted to imprisonment for life, and Settembrini was sent to the dungeons of San Stefano. There he remained for eight years. His friends, including Antonio Panizzi, then in England, made various unsuccessful attempts to liberate him, and at last he was deported with sixty-five other political prisoners. The exiles received an enthusiastic welcome in London, but Settembrini after a short stay in England joined his family at Florence in i860. On the formation of the Italian kingdom he was appointed professor of Italian literature at the university of Naples, and devoted the rest of his life to literary pursuits. In 1875 he was nominated senator. He died in 1877. His chief work is his Lezioni di letteratura italiana, of which the dominant note is the conviction that Italian literature " is as the very soul of the nation, seeking, in opposition to medieval mysticism, reality, freedom, independence of reason, truth and beauty " (P. Villari).

See L. Settembrini, Ricordanze, 2 vols., edited by F. de Sanctis (Naples, 1 879-1 880); Epistolario di Luigi Settembrini, edited by F. Fiorentino; P. Villari, Saggi critici (Florence, 1884); Countess Martinengo Cesaresco, Italian Characters (London, 1901).

SETTLE, ELKANAH (1648-17 24), English poet and play- wright, was born at Dunstable on the 1st of January 1648. He entered Trinity College, Oxford, in 1666, but left the university without taking a degree. His first tragedy, Cambyses, King of Persia, was produced at Lincoln's Inn Fields in 1667. The success of this play led the earl of Rochester to encourage the new writer as a rival to Dryden. Through his influence Settle's Empress of Morocco (1671) was twice acted at Whitehall, and proved a signal success on the stage. It is said by Dennis to have been " the first play that was ever sold in England for two shillings, and the first play that was ever

printed with cuts." These illustrations represent scenes in the theatre, and make the book very valuable. The play was printed with a preface to the earl of Norwich, in which Settle described with scorn the effusive dedications of other dramatic poets. Dryden Was obviously aimed at, and he co-operated with Crowne and Shad well in an abusive pamphlet entitled "Notes and Observations

on the Empress of Morocco " (1674), to which Settle replier 1 in " Some Notes and Observations on the Empress of Morocco revised " (1674). In the second part of Absalom and Achilophel, in a passage certainly by Dryden's hand, he figures as " Doeg." Neglected by the court party he took an active share in the anti-popish agitation. When this subsided he turned round to expose Titus Oates, and with the Revolution he veered towards the Whig party. But he had lost the confidence of both sides, and " recanting Settle " accordingly abandoned politics for the appointment (1691) of city poet. In his old age he kept a booth at Bartholomew Fair, where he is said to have played the part of the dragon in a green leather suit devised by himself. He became a poor brother of the Charterhouse, where he died on the 12th of February 1724.

Settle's numerous works include, beside numerous political pamphlets and occasional poems, Ibrahim, the Illustrious Bassa (1676), a tragedy taken from Madeleine de Scudery's romance; The Female Prelate ; being the History of the Life and Death of Pope Joan (1680), a tragedy; The Ambitious Slave: or A Generous Revenge (1694); The World in the Moon (1697), an opera, of which the first scene was formed by a moon fourteen feet across ; and The Virgin Prophetess, or The Fate of Troy (1701), an opera.

SETTLE, a market town in the Skipton parliamentary division of the West Riding of Yorkshire, England, 41ˆ m. N.W. from Leeds by the Midland railway. Pop. (1901) 2302. It lies in the upper part of the Ribble valley, amid the wild scenery of the limestone hills of the Pennine system. The district includes several caves, such as Victoria Cave, close to the town, where bones of animals, and stone, bone and other implements and ornaments have been discovered. Other points of interest are Malham Cove and tarn, the ravine of Gordale Scar, the cliffs of Attermyre, Giggleswick Scar and Castleberg (the last imme- diately above Settle itself), the Clapham and Weathercote caves, the chasm of Helln Pot and the waterfall of Stainforth Foss. In the town are cotton factories and a tannery. To the west of the town is the grammar school of Giggleswick, one of the principal public

schools in the north of England, founded in 151 2.

SETTLE, a wooden bench, usually with arms and a high back, long enough to accommodate three or four sitters. It is most commonly movable, but occasionally fixed as in the " boxes " of those old coffee-houses of which a few examples still remain in London, and perhaps elsewhere. It shares with the chest and the chair the distinction of great antiquity. Its high back was a protection from the draughts of medieval buildings — a protection which was sometimes increased by the addition of winged ends or a wooden canopy. It was most frequently placed near the fire in the common sitting-room. Constructed of oak, or other hard wood, it was extremely heavy, solid and durable. Few English examples of earlier date than the middle of the 1 6th century have come down to us; survivals from the Jacobean period are more numerous. Settles of the more expensive type were often elaborately carved or incised; others were divided into plain panels. A well-preserved specimen, with its richly polished oak, darkened by time and beeswax, is a handsome piece of furniture often still to be found in its original environment — the farm-house kitchen or the manorial hall. Its vogue did not long outlast the first half of the 18th century, to which period most of the existing specimens belong.

SETTLEMENT, in law, a mutual arrangement between living persons for regulating the enjoyment of property, and the instrument by which such enjoyment is regulated. Settle- ments may be either for valuable consideration or not: the latter are usually called voluntary, and are in law to some extent in the same position as revocable gifts; the former are really contracts, and in general their validity depends upon the law of contract. They may accordingly contain any provisions not contrary to law or public policy. 1

The elements of the modern settlement are to be found in Roman law. The vulgaris, papillaris or exemplaris substituliti (consisting in the appointment of successive heirs in case of the

1 In this English law allows greater freedom than French. By § 791 of the Code Napoleon, in a contract of marriage the succession tc a living person cannot be renounced.

death, incapacity or refusal of the heir first nominated) may- have suggested the modern mode of giving enjoyment of property in succession. Such a substitutio could, however, only have been made by will, while the settlement of English law is, in the general acceptation of the term, exclusively an instrument inter vivos. The dos or donatio propter nuptias corresponds to a considerable extent with the marriage settlement, the instrument itself being represented by the dotale instrumentum or pacta dotalia. In the earliest period of Roman law no provision for the wife was required, for she passed under manus of her husband, and became in law his daughter, entitled as such to a share of his property at his death. In course of time the plebeian form of marriage by usus, according to which the wife did not become subject to manus, gradually superseded the older form, and it became necessary to make a provision for the wife by contract. Such provision from the wife's side was made by the dos, the property contributed by the wife or some one on her behalf towards the expenses of the new household. Dos might be given before or after marriage, or might be increased after marriage. It was a duty enforced by legislation to provide dos where the father possessed a sufficient fortune. Dos was of three kinds: profectitia, contributed by the father or other ascendant on the male side; adventitia, by the wife herself or any person other than those who contributed dos profectitia; receptitia, by any person who contributed dos adventitia, subject to the stipulation that the property was to be returned to the person advancing it on dissolution of the marriage. The position of the husband gradually changed for the worse. From being owner, subject to an obligation to return the dos if the wife predeceased him, he became a trustee of the corpus of the property for the wife's family, retaining only the enjoyment of the income as long as the marriage continued. The contribution by the husband was called donatio propter nuptias. 1 The most striking point of difference between the Roman and the English law is that under the former the children took no interest in the contributions made by the parents. Other modes of settling property in Roman law were the life interest or usus, the fideicommissum, and the prohibition of alienation of a legatum.

The oldest form of settlement in England was perhaps the gift in frankmarriage to the donees in frankmarriage, and the heirs between them two begotten (Littleton, § 17). This was simply a form of gift in special tail, which became up to the reign of Queen Elizabeth the most usual kind of settlement. The time at which the modern form of settlement of real estate came into use seems to be doubtful. There does not appear to be any trace of a limitation of an estate to an

unborn child prior to 1556. In an instrument of that year such a limitation was effected by means of a feoffment to uses. The plan of grant- ing the freehold to trustees to preserve contingent remainders 2 is said to have been invented by Lord Keeper Sir O. Bridgeman in the 17th century, the object being to preserve the estate from forfeiture for treason during the Commonwealth. 3 The settlement of chattels is no doubt of considerably later origin, and the principles were adopted by courts of equity from the corresponding law as to real estate.

Settlement in English law is, so far as regards real property, used for two inconsistent purposes — to " make an eldest son," as it is called, and to avoid the results of the right of succession to real property of the eldest son by making provision for the younger children. The first result is generally obtained by a strict settlement, the latter by a marriage settlement, which is for valuable consideration if ante-nuptial, voluntary if post- nuptial. But these two kinds of settlement are not mutually exclusive: a marriage settlement may often take the form of a strict settlement and be in substance a resettlement of the family estate. (See Conveyancing.)

In Scotland a disposition and settlement is a mode of providing for the devolution of property after death, and so corresponds

l See Hunter, Roman Law, p. 150; Maine, Early History of Institutions, Lect. xi.

- *The appointment of such trustees was rendered unnecessary by acts of 1845 and 1877.*
- *See Joshua Williams, Papers of the Juridical Society, i. 45.*

rather to the English will than to the English settlement. The English marriage settlement is represented in Scotland by the contract of marriage, which may be ante- or post-nuptial.

In the United States settlements other than marriage settle- ments are practically unknown. Marriage settlements are not in common use, owing to the fact that most states long ago adopted the principles of the English Married Women's Property Acts.

The word " settlement " is also used to denote such residence of a person in a parish, or other circumstances pertaining thereto, as would entitle him to obtain poor relief (see Poor Law). On the English Stock Exchange it is a term for the series of operations by which bargains are concluded, or carried over (see Account and

Stock Exchange). The word is also applied generally to the ter- mination of a disputed matter by the adoption of terms.

SETTLEMENT, ACT OF, the name given to the act of parlia- ment passed in June 1701, which, since that date, has regulated the succession to the throne of Great Britain and Ireland. Towards the end of 1700 the need for the act was obvious, if the country was to be saved from civil war. William III. was ill and childless; his sister-in-law, the prospective queen, Anne, had just lost her only surviving child, William, duke of Glou- cester; and abroad the supporters of the exiled king, James II., were numerous and active. In these circumstances the Act of Settlement was passed, enacting that, in default of issue to either William or Anne, the crown of England, France 4 and Ireland was to pass to " the most excellent princess Sophia, electress and duchess dowager of Hanover," a grand-daughter of James I., and "the heirs of her body being Protestants." The act is thus responsible for the accession of the house of Hanover to the British throne. In addition to settling the crown the act contained some important constitutional provisions, of which the following are still in force. (1) That whosoever shall hereafter come to the possession of this crown shall join in com- munion with the Church of England as by law established. (2) That in case the crown and imperial dignity of this realm shall hereafter come to any person not being a native of this kingdom of England, this nation be not obliged to engage in any war for the defence of any dominions or territories which do not belong to the Crown of England, without the consent of parliament. (3) That after the said limitation shall take effect as aforesaid, judges' commissions be made quamdiu se bene gesserint and their salaries ascertained and established; but upon the address of both houses of parliament it may be lawful to remove them. This clause established the independence of the judicial bench. (4) That no pardon under the great seal of England be pleadable to an impeachment by the Commons in parliament. The act as originally passed contained four other clauses. One of these provided that all matters relating to the government shall be transacted in the Privy Council, and that all resolutions " shall be signed by such of the Privy Council as shall advise and consent to the same "; and another declared that all office-holders and pensioners under the Crown shall be incapable of sitting in the House of Commons. The first of these clauses was repealed, and the second seriously modified in 1706. Another clause was framed to prevent the sovereign from leaving England, Scotland or Ireland without the consent of parliament; this was repealed just after the accession of George I. Finally a clause said that " no person born out of the kingdoms of

England, Scotland or Ireland, or the dominions thereunto belonging (although he be naturalized or made a denizen) except such as are born of English parents, shall be capable to be of the Privy Council, or a member of either House of Parliament, or enjoy any office or place of trust, either civil or military, or to have any grant of lands, tenements or heredita- ments from the Crown to himself, or to any other or others in trust for him." By the Naturalization Act of 1870 this clause is virtually repealed with regard to all persons who obtain a certificate of naturalization. This and some of the other clauses amount practically to censures on the policy of William III.

The importance of the Act of Settlement appears from the fact that, in all the regency acts, it is mentioned as one of the

4 The title of king of France was retained by the British sovereigns until 1801. Scotland accepted the Act of Settlement by Art. II. of the Act of UniOh.

acts to the repeal of which the regent may not assent. To maintain or affirm the right of any person to the crown, contrary to the provisions of the act, is high treason by an act of 1707.

See T. P. Taswell-Langmead's English Const. Hist. (1905); H. Hallam, Constitutional History, vol. iii. (1855) ; and L. von Ranke, Englische Geschichte (1859-1868).

SETUBAL (formerly called in English St Ubes and in French St Yves) , a seaport of Portugal, in the district of Lisbon (formerly included in the province of Estremadura), 18 m. S.E. of Lisbon by the Barreiro-Pinhal Novo-Setubal railway. Pop. (1900) 22,074. Setubal is built on the north shore of a deep estuary, formed by the rivers Sado, Marateca and Sao Martinho, which discharge their waters into the Bay of Setubal 3 m. below the city. Setubal is overtopped on the west by the treeless red heights of the Serra da Arrabida. There are five forts for the defence of the harbour; the castle of St Philip, built by Philip III. of Spain (1578-1621), commands the city. Setubal is the third seaport and fourth largest city of Portugal. It exports large quantities of fine salt, oranges and muscatel grapes; it has many sardine-curing and boat-building establishments, and manufactures of fish-manure and lace. Its port is officially included in that of Lisbon. Under John II. (1481-1495) Setubal was a favourite royal

residence, and one of the churches dates from this period; but most of the ancient buildings were de- stroyed by the great earthquake of 1755. There are some fine public buildings, statues and fountains of later date, including a statue of the poet M. M. de B. du Bocage (1766-1806), who was a native of Setubal. In the sandhills of a low-lying promon- tory in the bay opposite Setubal are the so-called ruins of " Troia," uncovered in part by heavy rains in 1814 and excavated in 1850 by an antiquarian society. These ruins of " Troia," among which have been brought to view a beautiful Roman house and some 1600 Roman coins, are those of Cetobriga, which flourished a.d. 300-400. In the neighbourhood, on a mountain 1600 ft. high, is the monastery of Arrabida.

SEUME, JOHANN GOTTFRIED (1 763-1810), German author, was born at Poserna, near Weissenfels, on the 29th of January 1763. He was educated, first at Borna, then at the Nikolai school and university of Leipzig. The study of Shaftesbury and Bolingbroke weakened his interest in theology, and, breaking off his studies, he set out for Paris. On the way he was seized by Hessian recruiting officers and sold to England, whereupon he was drafted to Canada. After his return in 1783 he deserted at Bremen, but was captured and brought to Emden; a second attempt at flight also failed. In 1787, however, a citizen of Emden became surety for him to the amount of 80 talers, and he was allowed to visit his home. He did not return, but paid off his debt in Emden with the remuneration he received for trans lating an English novel. He taught languages for a time in Leipzig, and became tutor to a Graf Igelstrom, whom, in 1792, he accompanied to Warsaw. Here he became secretary to General von Igelstrom, and, as a Russian officer, experienced the terrors of the Polish insurrection. In 1796 he was again in Leipzig and, resigning his Russian commission, entered the employment of the publisher Goschen. In December 1801 he set out on his famous nine months' walk to Sicily, described in his Spaziergang nach Syrakus (1803). Some years later he visited Russia, Finland and Sweden, a journey which is described in Mein Sommer im Jahr 1805 (1807). His health now began to fail, and he died on the 13th of June 1810, at Teplitz. His reputation rests on the two books just mentioned, to which may be added his autobiography, Mein Leben (1813, continued by C. A. H. Clodius). These works reflect Seume's sterling character and sturdy patriotism; his style is clear and straightforward; his descriptions realistic and vivid. As a dramatist (Miltiades, 1808), and as a lyric poet (Gedichte, 1801), he had but little success.

Seume's Gesammelte Schriften were first edited by J. P. Zimmer-

mann (1823-1826) ; his Samtliche Werke (1826-1827) passed through seven editions. The most recent edition is J. G. Seume's Prosaische undpoetische Werke (10 vols., 1879). SeeO. Planer and C. Reissmann, J. G. Seume. Geschichte seines Lebens und seiner Schriften (1898).

SEVASTOPOL, or Sebastopol, an important naval station of Russia on the Black Sea, on the S.W. coast of the Crimea,

in 44 37′ N. and 33 31′ E., 956 m. from Moscow, with which it is connected by rail via Kharkov. Pop. (1882) 26,150; (1897) 50,710. The estuary, which is one of the best roadsteads in Europe and could accommodate the combined fleets of Europe, is a deep and thoroughly sheltered indentation among chalky cliffs, running east and west for nearly 4 m., with a width of three- quarters of a mile, narrowing to 930 yds. at the entrance. It has a depth of 6 to 10 fathoms, with a good bottom, and large ships can anchor at a cable's length from the shore. The main inlet has also four smaller indentations — Quarantine Bay at its entrance, Yuzhnaya (Southern) Bay, which penetrates more than 1 m. to the south, with a depth of 4 to 9 fathoms, Dockyard Bay and Artillery Bay. A small river, the Chornaya, enters the head of the inlet. The main part of the town, with an elevation of 30 to 190 ft., stands on the southern shore of the chief inlet, between Yuzhnaya and Artillery Bays. A few buildings on the other shore of the chief bay constitute the " northern side." Before the Crimean War of 1853-56 Sevastopol was a well-built city, beautified by gardens, and had 43,000 inhabitants; but at'the end of the siege it had not more than fourteen buildings which had not been badly injured. After the war many privileges were granted by the government in order to attract population and trade; but both increased slowly, and at the end of seven years the population numbered only 5750.

The present town is well built and is becoming a favourite watering-place on account of its sea-bathing and numerous sanatoria. It has a zoological marine station (1897), a museum commemorative of the siege (1895), a cathedral of Classical design and another finished in 1888, monuments of Admirals Nakhimov (1898) and Kornilov (1895) and of General Todleben, and two navigation schools. In 1890 Sevastopol was made a third-class fortress, and the commercial port has been transferred to Theodosia.

The peninsula between the Bay of Sevastopol and the Black Sea was known in the 7th century as the Heracleotic Chersonese. In the 5th century B.C. a Greek colony was founded here and remained

independent for three centuries, when it became part of the kingdom of the Bosporus, and subsequently tributary to Rome. Under the Byzantine empire Chersonesus was an administrative centre for its possessions in Taurida. Vladimir, prince of Kiev, conquered Chersonesus (Korsun) before being baptized there, and restored it to the Greeks on marrying (088) the princess Anna. Subsequently the Slavs were cut off from relations with Taurida by the Mongols, and only made occasional raids, such as that of the Lithuanian prince Olgierd. In the 16th century a new influx of colonists, the Tatars, occupied Chersonesus and founded a settlement named Akhtyar. This village, after the Russian conquest in 1783, was selected for the chief naval station of the empire in the Black Sea and received its present name (" the August City "). In 1826 strong fortifications were begun. In 1854 the allied English, French and Turkish forces laid siege to the southern portion of the town, and on the 17th of October began a heavy bombardment. Sevastopol sustained a memorable eleven months' siege, and on the 8th of September 1855 was evacuated by the Russians. The fortifica- tions were blown up by the allies, and by the Paris treaty the Russians were bound not to restore them (see Crimean War). In November 1870, during the Franco-German War, the Russian government decided again to make Sevastopol a naval arsenal.

SEVEN CHAMPIONS OF CHRISTENDOM, the name given iu medieval tales to the seven national saints — of England, Scotland, Ireland, Wales, France, Spain and Italy — i.e. Saints George, Andrew/ Patrick, David, Denis, James and Anthony. The classical version of their achievements is that of Richard Johnson (I S73 _C – I 659), Famous Historie of the Seaven Champions of Christendom (3 parts, 1596, 1608, i6ro: many editions). The oldest known copy is dated 1597; there is also a poetical version by Sir George Buc (published 1623).

SEVEN DAYS' BATTLE, a name given to a series of combats in the neighbourhood of Richmond, Virginia, during the American Civil War, June 26-July 2, 1862. The Federal Army of the Potomac, advancing from the sea and the river Pamunkey

over the Chickahominy on Richmond, had come to a standstill after the battle of Seven Pines (or Fair Oaks), and General Robert Lee, who succeeded Joseph Johnston in command of the Confederates,

initiated the series of counter attacks upon it which constitute the " Seven Days."

McClellan had at his disposal 32 brigades and 67 batteries organized in five corps each of two or three divisions. His cavalry consisted of 10 regiments and 22 companies. Lee's army consisted of 40 brigades and 59 batteries organized in eleven divisions and an independent brigade: four divisions were grouped under Jackson and

June 25 in order to draw McClellan's attention to his left wing, and though on June 26 Jackson had failed to appear, General A. P. Hill at 3 p.m. crossed the Chickahominy and attacked the enemy's right wing at Beaver Dam Creek assisted by D. H. Hill, while Longstreet crossed at Mechanicsville. General Lee and President Davis were present and witnessed the loss of 2000 men in a frontal attack which continued till 9 p.m. Meanwhile General Jackson, with Stuart's cavalry corps, " marched by the fight without giving attention, and went into camp at Hundley's Corner half a mile in rear of the enemy's position."

three under Magruder. The

reserve artillery consisted of

23 batteries and Stuart's

cavalry corps of 3000 sabres.

McClellan lingered north of

Richmond, despite President

Lincoln's constant demand

that he should " strike a

blow " with the force he had

organized and taken to the

Yorktown peninsula in April,

until General Lee had con- centrated 73,000 infantry in

his front; then the Federal

commander, fearing to await

the issue of a decisive battle,

ended his campaign of in- vasion in the endeavour to

“save his army”; and he

so far succeeded that on July

3 he had established himself

on the north bank of the

James in a position to which

reinforcements and supplies

could be brought from the

north by water without fear

of molestation by the enemy.

But he lost 1 5,000 men in

the course of his seven days’

retreat, and 20% of the re- mainder became ineffective

from disease contracted in the swamps of the Chicka- hominy, while enormous quantities of valuable stores at White House on the Pamunkey had been burnt to avoid seizure by the enemy. McClellandescribedthisflight to the James as a change of base, but his resolve to abandon the attitude of an invader was formed when General Lee in the middle of June had caused Stuart’s cavalry to reconnoitre the flanks andrearof McClellan’s army, and had summoned Jackson’s corps from the

Shenandoah Valley (q.v.). The news soon reached McClellan, who thereupon prepared to evacuate White House on June 25 and moved his trains southward to the James covered by his army. Jackson had preceded his troops in order personally to confer with Lee, and had then appointed the morning of June 26 for his appearance north of the Chickahominy to lead the march and attack McClellan’s right wing under General Fitzjohn Porter. Jackson was to be supported by the divisions of A. P. Hill, Longstreet and D . H . Hill. Lee ‘s other divisions under Magruder, Huger and Holmes were to defend the lines which covered Rich- mond from the east, and so prevent

McClellan effecting a counter- stroke. Huger had demonstrated on the Williamsburg Road on

The Federal detachment retreated during the night to a stronger position in rear at Gaines's Mill near Cold Harbor, and on June 27 the Confederates again attacked Porter's corps. Lee's six divisions formed an echelon. D. H. Hill moving towards the enemy's right was followed by Jackson's corps (three divisions), while A. P. Hill engaged the enemy in front and Longstreet in reserve moved along the left bank of the Chicka- hominy. The resistance of the Federals was stubborn; at 5 p.m. General Lee required Longstreet to attack the enemy's left, and at this moment he procured the assistance of some part of Jackson's corps which had become separated from the remainder. About sunset the Federals under Porter (three.

divisions) yielded to the pressure of the attack at all points, and withdrew in the night across the Chickahominy, leaving 5000 prisoners in the hands of General Lee. The Confederates lost 7000 men on June 27.

Lee's right wing had in the meantime demonstrated against the main body of the Federals about Fair Oaks, on the south bank of the river. On June 28 complete inactivity supervened among the Confederates north of the Chickahominy save that Stuart's cavalry and Ewell's division were advanced as far as the railway to reconnoitre, but on this day McClellan was making good his retreat southwards to the James with little interference, for Magruder was instructed to " hold his lines at all hazards," and accordingly acted on the defensive except that Jones's division opposed a Federal division under W. F. Smith near Fair Oaks. On June 29 General Lee became aware of the situa- tion and then issued orders for his six divisions to cross the Chickahominy in pursuit. Jackson's corps and D. H. Hill's division were to follow the enemy, while Longstreet and A. P. Hill were to move their divisions via New Bridge to the Darby- town or James River Road to cut off McClellan from the James. Stuart was to operate at his discretion north of the Chickahominy, and it seems that he was attracted by the enemy's abandoned depot at White House more than by McClellan's retreating army. On this day Magruder with two divisions attacked superior forces about Fair Oaks and was repulsed, and again attacked at Savage Station with like results. General Lee, however, rebuked Magruder for slackness

in pursuit. Holmes's division was moving in front of Longstreet on the James River Road, but two Federal divisions were holding the route at Willis Church and at Jordan's Ford. On June 30 Jackson got into action with Whiting's division at White Oak Swamp, while Longstreet encountered the Federals at Frazier's Farm (or Glendale). Longstreet was supported by A. P. Hill and together they lost 3200 men; it was hoped that Jackson's corps would come up during the engage- ment and attack the enemy's rear, and Huger's division assail his right, but Federal artillery stopped Huger, and of Jackson's three divisions only one came into action. Magruder and Holmes were engaged to their own advantage at Turkey Bridge. Long- street and Hill were thus opposed to five Federal divisions, while General McClellan was pushing his wagons forward to Malvern Hill, on which strong position the Army of the Potomac was concentrated at nightfall. On July 1 Jackson's corps and D. H. Hill's division had been drawn again into the main operation and followed the Federal line of retreat to Malvern Hill with Huger and Magruder on their right. The divisions of Longstreet and A. P. Hill were in support.

General Lee had thus on the seventh day concentrated his army of ten divisions in the enemy's front; but Jackson's dispositions were unfortunate and General Lee's plan of attack was thus upset ; and while seeking a route to turn the enemy's right the Confederate commander was apprised that a battle had been improvised by the divisions in advance. In the result these troops were repulsed with a loss of 6000 men, a circumstance hardly to be wondered at, since McClellan had entrenched eight divisions on the strongest position in the country, and was aided by his siege artillery and also by a flanking fire from his gun- boats on the river near Haxall's Landing. General Lee's offensive operations now ended, though Stuart's cavalry rejoined the main army at night and followed the enemy on July 2 to Evelington Heights, while Lee rested his army. Stuart discovered a position which commanded the Federal camp, and maintained his cavalry and horse artillery in this position until the afternoon of July 3, when, his ammunition being expended, he was compelled to retire before a Federal force of infantry and a battery. Long- street and Jackson had been despatched to his support, but the former did not arrive before nightfall and the latter failed to appear until the next day (July 4) . Stuart afterwards moved farther down the James, and shelled McClellan's supply vessels in the river until recalled by General Lee, who on July 8 withdrew his army towards Richmond.

The operations resulted in re-establishing the confidence of the Confederates in their army which Johnston's retreat from

Yorktown had shaken, in adding prestige to President Davis and his government, and in rectifying the popular view of General Lee as a commander which had been based upon his failure to recover West Virginia in the autumn of 186 1. In the north a feeling of despondency overtook Congress at the " lame and impotent conclusion " of a campaign of invasion which was expected to terminate the war by the defeat of the Confederate army, the capture of Richmond and the immediate overthrow of the Confederacy. (G. W. R.)

SEVENOAKS, a market town in the Sevenoaks parliamentary division of Kent, England, 22 m. S.E. by S. of London by the South-Eastern and Chatham railway. Pop. of urban district (1901) 8106. It is beautifully situated on high ground among the wooded undulations of the North Downs, above the valley of the river Darent. The town consists principally of two streets which converge at the south end, near which is the church of St Nicholas, of the 13th, 14th and 15th centuries. It contains monuments of the Amherst family and a tablet to William Lambarde (d. 1601), which was removed from the old parish church of Greenwich when that was demolished. Lambarde was author of the Perambulation of Kent, and founded the College of the Poor of Queen Elizabeth at Greenwich. The grammar school founded in 1418 by Sir William Sevenoke was recon- stituted as a first-grade modern school in 1877. There is also a school founded by Lady Margaret Boswell, wife of Sir William Boswell, ambassador to Charles I. at The Hague, and alms- houses founded by Sir William Sevenoke in connexion with his school. Close to Sevenoaks is Knole Park, one of the finest old residences in England, which in the time of King John was possessed by the earl of Pembroke, and after passing to various owners was bought by Archbishop Bourchier (d. i486), who rebuilt the house. He left the property to the see of Canter- bury, and about the time of the dissolution it was given up by Cranmer to Henry VIII. By Elizabeth it was conferred first on the earl of Leicester and then on Thomas Sackville, afterwards earl of Dorset. By this earl it was in great part rebuilt and fitted up in regard to decoration much as it now exists. The gateway in the outer court and the Perpendicular chapel are from Archbishop Bourchier's time. The great hall, with elaborately carved music-gallery, is mainly the work of the first earl.

SEVEN SLEEPERS OF EPHESUS, THE, according to the most common form of an old legend of Syrian origin, first re- ferred to in Western literature by Gregory of Tours (De glor. mart. c. 95), seven Christian youths of Ephesus, who, in the Decian persecution (a.d. 250), hid themselves in a cave. Their hiding-place was discovered

and its entrance blocked, The martyrs fell asleep in a mutual embrace. Nearly 200 years later a herdsman of Ephesus rediscovered the cave on Mount Coelian, and, letting in the light, awoke the inmates, who sent one of their number (Jamblicus) to buy food. The lad was astonished to find the cross displayed over the city gates, and, on entering, to hear the name of Christ openly pronounced. By tendering coin of the time of Decius at a baker's shop he roused suspicion, and was taken before the authorities as a dishonest finder of hidden treasure. He confirmed his story by leading his accusers to the cavern where his six companions were found, youthful and beaming with a holy radiance. The emperor Theodosius II., hearing what had happened, hastened to the spot in time to hear from their lips that God had wrought this wonder to confirm his faith in the resurrection of the dead. This message delivered, they again fell asleep.

Gregory says he had the legend from the interpretation of " a certain Syrian "; in point of fact the story is common in Syriac sources. It forms the subject of a homily of Jacob of Sarug (ob. a.d. 521), which is given in the Acta sanctorum. Another Syriac ver- sion is printed in Land's Anecdota, iii. 87 seq.; see also Barhebraeus, Chron. eccles. i. 142 seq., and compare Assemani, Bib. Or. i. 335 seq. Some forms of the legend give eight sleepers — e.g. an ancient MS. of the 6th century now in the British Museum (Cat. Syr. MSS. p. 1090). There are considerable variations as to their names. The legend rapidly attained a wide diffusion throughout Christendom ; its currency in the East is testified by its acceptance by Mahomet (sur. xviii.), who calls them Asfiab al-Kahf, " the men of the cave."

According to BirunI (Chronology, tr. by Sachau, p. 285) certain un- decayed corpses of monks were shown in a cave as the sleepers of Ephesus in the 9th century. The seven sleepers are a favourite subject in early medieval art. The story is well told in Gibbon's Decline and Fall of the Roman Empire, ch. xxxiii.

SEVEN WEEKS' WAR, the name given to the war of 1866 between Prussia on the one side, and Austria, Bavaria, Hanover, Saxony and allied German states on the other. Concurrently with this war another was fought in Venetia between the Italians and the Austrian army of the South, for which see Italian Wars (1848-1870).

In 1830 Prussia, realizing from the breakdown of her mobiliza- tion for the war then impending with Austria that success was impossible, submitted to the Austrian demands, but her states- men saw from the first that the " surrender of Olmiitz," as it was termed, rendered eventual war with Austria " a military necessity." Preparation was begun in earnest after the accession of King William I., who selected Bismarck as his chancellor, Moltke as his chief of staff and Roon as his minister of war, and gave them a free hand to create the political situation and prepare the military machinery necessary to exploit it. Within six years the mobilization arrangements were recast, the war against Denmark in 1864 proving an opportune test of the new system. The number of field battalions' was nearly doubled, two-thirds of the artillery received breech-loading rifled guns, the infantry had for some years had the breech-loading " needle- gun," and steps were initiated to train an adequate number of staff officers to a uniform appreciation of strategical problems, based on Moltke's personal interpretation of Clausewitz's Vom Kriege. There was, however, a fundamental disagreement in the tactical ideas of the senior and those of the junior officers. The former, bred in the tradition of the Napoleonic battle, looked for the decision only from the employment of " masses "; the latter, trained with the breech-loader and without war experi- ence, expected to decide battles by infantry fire only. Both overlooked the changes brought by the introduction of the long- range rifle (muzzle- and breech-loading alike) , which had rendered impossible the "case shot preparation " which had formed the basis of Napoleon's tactical system. The men were trained for three years in the infantry and four years in the cavalry and artillery, but the war was not popular and many went unwillingly.

In contemporary military opinion, the Austrians were greatly superior in all arms to their adversary. Their rifle, 1 though a muzzle-loader, was in every other respect superior to the Prussian needle-gun, and their M.L. rifled guns with shrapnel shell were considered more than sufficient to make good the slight advantage then conceded to the breech-loader. The cavalry was far better trained in individual and real horsemanship and manoeuvre, and was expected to sweep the field in the splendid cavalry terrain of Moravia. All three arms trained their men for seven years, and almost all officers and non-commissioned officers had con- siderable war experience. But the Prussians having studied their allies in the war of 1864 knew the weakness of the Austrian staff and the untrustworthiness of the contingents of some of the Austrian nationalities, and felt fairly confident that against equal numbers

they could hold their own.

The occasion for war was engineered entirely by Bismarck; and it is doubtful how far Moltke was in Bismarck's confidence, though as a far-seeing general he took advantage of every opening which the latter's diplomacy secured for him. The original scheme for the strategic deployment worked out by Moltke as part of the routine of his office contemplated a defence of the kingdom against not only the whole standing army of Austria, but against 35,000 Saxons, 95,000 unorganized Bavarians and other South Germans, and 60,000 Hanoverians, Hessians, &c, and to meet these he had two corps (VII. and VIII.) on the Rhine, the Guard and remaining six in Brandenburg and Prussia proper. Bismarck diverted three Austrian corps by an alliance with Italy, and by consenting to the neutralization of the

1 The Lorenz rifle carried a -57 bullet and was sighted to 1000 yds. ; the needle-gun with a much lighter bullet was sighted to 400 only.

Federal fortresses set at liberty von Beyer's division for field service in the west. Moltke thereupon brought the VIII. corps and half the VII. to the east and thus made himself numeri- cally equal to his enemy, but elsewhere left barely 45,000 men to oppose 150,000. The magnitude of the risk was sufficiently shown at Lahgensalza. The direction of the Prussian railways, not laid out primarily for strategic purposes, conditioned the first deployment of the whole army, with the result that at first the Prussians were distributed in three main groups or armies on a front of about 250 m. As there had been no money available to purchase supplies beforehand, each of these groups had to be scattered over a wide area for subsistence, and thus news as to the enemy's points of concentration necessarily- preceded any determination of the plan of campaign.

Of the lines of concentration open to the Austrians, the direction of the roads and railways favoured that of Olmiitz so markedly that Moltke felt reasonably certain that it would be chosen, and the receipt of the complete ordre de bataille of the Austrian army of the north secured by the Prussian secret service on the nth of June set all doubts at rest.

According to this, the Austrian troops already in Bohemia, 1st corps, Count Clam-Gallas, 30,000 strong, were to receive the Saxons if the latter were forced to evacuate their own country, and to act as an advanced guard or containing wing to the main body under Feldzeugmeister von Benedek (2nd, 3rd, 4th, 8th, 10th corps) which was to concentrate at Olmiitz, whence the Prussian staff on

insufficient evidence concluded the Austrians intended to attack Silesia, with Breslau as their objective. On this date (June nth) the Prussians stood in the following order; The army of the Elbe, General HerWarth von Bittenfeld, three divisions only, about Torgau; the I. army, Prince Frederick Charles (II., III., IV. corps), about Gorlitz; the II. army under the crown prince (I., V., VI.) near Breslau; the Guard and a reserve corps of Landwehr at Berlin. As the army of the Elbe was numerically inferior to Clam-Gallas and the Saxons, the reserve corps was at once despatched to reinforce it, and the Guard was sent to the crown prince. Further, in deference to political (probably dynastic) pressure, the crown prince was ordered eastwards to defend the line of the Neisse, thus increasing the already excessive length of the Prussian front. Had the Austrians attacked on both flanks forthwith, the Prussian central (I.) army could have reached neither wing in time to avert defeat, and the political consequences of the Austrian victory might have been held to justify the risks involved, for even if unsuccess- ful the Austrians and Saxons could always retreat into Bavaria and there form a backbone of solid troops for the 95,000 South Germans.

Advance of the Elbe: and I. Armies. — This was one of the gravest crises in Moltke's career. To overcome it he at length obtained authority (June 15th) to order the army of the Elbe into Saxony, and on the 18th the Prussians entered Dresden, the Saxons retiring along the Elbe into Bohemia; and on the same day the news that the Austrian main body was marching from Olmiitz towards Prague arrived at headquarters. Moltke took three days to solve the new problem, then, on the 22nd, he ordered the I. and II. armies to cross the Austrian frontier and unite near Gitschin, a point conveniently situated about the converg- ence of the roads crossing the Bohemian mountains. As during this operation the II. army would be the most exposed, the I., to which the army of the Elbe had now been attached, was to push on its advance to the utmost. Apparently with this purpose in view, Prince Frederick Charles was instructed to break up his army corps into their constituent divisions, and move each division as a separate column on its own road, the reserve of cavalry and artillery following in rear of the centre. The con- sequences were the reverse of those anticipated. On the after- noon of the 26th the advance guards of the I. army and army of the Elbe came in contact with the Austrians at Huhnerwasser and Podol and drove the latter back after a sharp engagement, but, having no cavalry, could neither observe their subsequent proceedings nor estimate their strength. The prince, seeing the opportunity for a battle, immediately issued orders for an

enveloping attack on Munchengratz by his whole army, but, owing to distances and the number of units now requiring direction, it was late in the following day before all were in readiness for action. The Austrians then slipped away, and the whole of the next day was spent in getting the divisions back to their proper lines of advance. Clam-Gallas then retired deliberately to Gitschin and took up a new position. The Prussians followed on the 29th, but, owing to the iie of the roads, they had to march in two long columns, separated by almost a day's march, and when the advanced guard of the left column, late in the afternoon, gained touch with the enemy, the latter were in a position to crush them by weight of numbers, had they not suddenly been ordered to continue the retreat on Miletin.

Battles of the II. Army : Trautenau and Nachod. — Meanwhile the situation of the II. army had become critical. On its right wing the I. corps (General v. Bonin) had received orders on the 27th to seize the passages over the Aupa at Trautenau. This was accomplished without much difficulty, but the main body was still in the denies in rear, when about 3 p.m. the leading troops were attacked by an overwhelming Austrian force and

at Soor and Koniginhof (Guard corps) on the 28th and 29th, and at Schweinschadel (Steinmetz) on the 29th, the Prussians in every encounter proving themselves, unit for unit, a match for their adversaries. It is customary to ascribe their successes to the power of the breech-loader, but there were actions in which it played no part, cavalry versus cavalry encounters, and isolated duels between batteries which gave the Prussian gunners a confidence they had not felt when first crossing the frontier.

Junction of the Prussian Armies. — By the morning of the 30th it was clear that the junction between the two armies could be completed, whenever desired, by a forward march of a few miles. But Moltke, wishing to preserve full freedom for manoeuvre for each army, determined to preserve the interval between them, and began his dispositions to manoeuvre the Austrians out of the position he had selected as the best for them to take up, on the left or farther bank of the Elbe.

This is so characteristic of von Moltke's methods and of the tactical preconceptions of the time that it deserves more detailed notice.

Neither army had covered its front by a cavalry screen, both preferring to retain the mounted troops for battlefield purposes. Hence, though they were only a few miles apart, each was ignorant.

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driven back in confulfion; the confusion spread and became a panic, and the I. corps was out of action for the next forty- eight hours. Almost at the same hour, a few miles to the south- eastward, the advanced guard of the V. corps (Steinmetz) began to emerge from the long defile leading from Glatz to Nachod, and the Prussians had hardly gained room to form for action beyond its exit before they too were attacked. Steinmetz was a different man from Bonin, and easily held his own against the disconnected efforts of his adversary, ultimately driving the latter before him with a loss of upwards of 5000 men. Still the situation remained critical next day, for the I. corps having retreated, the Guard corps (next on its left) was endangered, and Steinmetz on his line of advance towards Skalitz (action of Skalitz, June 28th) could only count on the gradual support of the VI. corps. Benedek’s resolution was, however, already on the wane. From the first his supply arrangements had been defective, and the requisitions made by his leading troops left nothing for the rest to eat. While trying to feed his army he omitted

to fight it, and, with the chance of overwhelming the Prussians by one great effort of marching, he delayed the necessary orders till too late, and the Prussian II. army made good its concentration on the upper Elbe with insignificant fighting

of the other's position. Moltke, knowing well the danger for a great army of being forced into a battle with an unfordable river behind it, and with his naturally strong bent towards the defensive in tactics, concluded that Benedek would elect to hold the left bank of the Elbe, between the fortified towns of Josephstadt and Koniggratz, with his right thrown back and covered by the lower courses of the Aupa and the Mettau. Frontal attack on such a position being out of the question, he decided, after weighing well the weaknesses of the Austrian flanks, to direct his principal efforts against the left (i.e. southern), although that entailed the uncovering of the communication of the II. army and a flank march of almost the whole of the I. and II. armies across the front of the Austrians in position. As an eminent French critic (General Bonnal) says, this was but to repeat Frederick the Great's manoeuvre at Kolin (q.v.), and, the Austrians being where they actually were and not where Moltke decided they ought to be, the result might have been equally disastrous. Nevertheless the necessary movements were initiated by orders at noon on the 2nd of July, and one phrase in these saved the situation. According to these orders, the Elbe army was directed to Chlumetz on the way to Pardubitz, the I. army diagonally to the south-east across the front of the Austrian position. Two corps of the II. army were to make a demonstration against Josephstadt on the 3rd of July, and the other two were to move in a general direction south-west to keep touch with the I. Prince Frederick Charles was warned to guard the left flank of his marching troops and authorized to attack any forces of the enemy he might encounter in that direction, if not too strong for him. On receipt of these orders (about 3-30 p.m. July 2nd) the

prince immediately despatched officers' patrols towards the Elbe, and about 6 p.m. these, having crossed the Bistritz, discovered the enemy in considerable force, at least three corps, behind the line of low hills which here border that stream. The remainder of the Austrian main body, the whole of which was in fact still on the right bank of the Elbe, was hidden from view behind high ground farther to the eastward.

The 2nd of July. — The three Austrian corps were exactly the target Prince Frederick Charles desired. He promised him- self with the I. and the Elbe armies an easy victory if he attacked them. Orders in this sense were issued about 7 p.m. They instructed every corps under his command to be in readiness for action towards the Bistritz at 3 a.m. on the 3rd, and in a concluding paragraph announced that the crown prince had been requested to co-operate from the north. A copy of the orders and an explanatory letter were in fact despatched to the II. army, another copy also went direct to the king. Both appear to have been delayed in transmission, for the former only reached the crown prince's quarters at 2 a.m. He was then asleep and had given orders that he was not to be awakened. His chief of the staff, Blumenthal, was absent at the royal headquarters, and since the bearer of the order had not been warned of the importance of the despatch he carried, no one roused the prince. At 3 a.m. Blumenthal returned and read the letter, and without troubling to disturb his chief he dealt with the matter himself in what is certainly one of the most remarkable documents ever issued in a grave crisis by a responsible staff officer. Briefly he informed Prince Frederick Charles that the orders for the II. army based on the instructions received from the royal headquarters, having been already issued, the co- operation of the I. corps alone might be looked for.

Meanwhile the duplicates had reached Moltke, and he, knowing well the temperament of the " Red Prince " and the impossibility of arresting the intended movement, obtained the royal sanction to a letter addressed to the crown prince, in which the latter was ordered to co-operate with his whole command. This vital despatch was sent off in duplicate at midnight and reached von Blumenthal at 4 a.m. In face of this no evasion was possible. Army orders were issued at 5 a.m., but still the urgency of the situation was so little understood that had they been verbally adhered to the force of the II. army could hardly have been brought to bear before 5 p.m., by which time the defeat of the I. army might well have been an accomplished fact. Fortunately, however, the initiative of the Prussian subordinates was sufficient to meet the strain.

Battle of Koniggrttlz (Sadowa). — Thick mist and driving rain delayed the I. and Elbe armies, but by 5 a.m. the troops had reached their allotted positions. The 7th division now moved forward, taking as point df direction the wood of Maslowed (or Swiep Wald), and supported on the right by the 8th division which was to seize the bridge of Sadowa. The leading troops of the former easily rushed the Austrian outposts covtring-theˆ wood, but the reserves of the Austrian outposts counter- attacked. The firing drew other troops

towards the critical point, and very shortly the wood of Maslowed became the scene of one of the most obstinate conflicts in military history. In about two hours the 1 2 Prussian battalions and 3 batteries found themselves assailed by upwards of 40 Austrian battalions and 100 guns, and against such swarms of enemies each man felt that retreat from the wood across the open meant annihilation. The Prussians determined to hold on at all costs. The 8th divi- sion, belonging to the same corps, could not see their comrades sacrificed before their eyes, and pushed on through Sadowa to relieve the pressure on the right of the 7th division. Mean- while fresh Austrian batteries appeared against the front of the 8th division, and fresh Prussians in turn had to be engaged to save the 8th. Fortunately the Prussians here derived an un- expected advantage from the shape of the ground, and indeed from the weather. The heavy rain, which had delayed the commencement of the action, had swollen the Bistritz so as to check their advance and thus postpone the decision, whilst the mist and driving rain hid the approaching troops from the

Austrian gunners, whose shells burst almost harmlessly on the sodden ground. Then when once across the stream it was discovered that unlike the normal slopes in the district the hillside in front of them showed a slight convexity under cover of which they were able to re-form in regular order. The ad- vantage of the breech-loader now began to assert itself, for the Austrian skirmishers who covered the front of the guns could only load when standing up, while the Prussians lay down or fired from cover. The defenders were therefore steadily driven up the hill, and then cleared the front to give the guns room to act. But the Austrian gunners were intent on the Prussian batteries farther back, which as the light improved had come into action. The Prussian infantry crept nearer and nearer, till at under 300 yds. range and from cover they were able to open fire on the Austrian gunners under conditions which rendered the case fire of the latter practically useless; but here was the opportunity a great cavalry leader on the Austrian side might have seized to restore the battle, for the ground, the shortness of the distance, and the smoke and excite- ment of the cannonade were all in favour of the charge. §uch a charge as prelude to the advance of a great infantry bayonet attack must have swept the exhausted Prussians down the hill like sheep, but the opportunity passed, and the gunners find- ing their position untenable, Umbered up, not without severe losses, and retired to a second position in rear. This with- drawal took place about 2 p.m., and the crisis on the Prussian side may be said to have lasted from about 1 1 a.m. By this time every infantry soldier and

gun within call had been thrown into the fight, and the Austrians might well have thrown odds of three to one upon the Prussian centre and have broken it asunder.

Arrival of the II. Army. — But suddenly the whole aspect of affairs was changed. The 2nd and 4th Austrian corps found themselves all at once threatened in flank and rear by heavy masses of Prussian infantry, the leading brigades of the crown prince's army, and they began to withdraw towards the centre of their position in ordered brigade masses, apparently so intent on keeping their men in hand that they seem never to have noticed the approach of the Prussian reserve artillery of the Guard which (under Prince Kraft zu Hohenlohe-Ingelfingen) was straining forward over heavy soil and through standing corn towards their point of direction, a clump of trees close to the tower of the church of Chlum. Not even deigning to notice the retreating columns, apparently too without escort, the batteries pressed forward till they reached the summit of the ridge trending eastward from Chlum towards the Elbe, whence the whole interior of the Austrian position was disclosed to them, and then they opened fire upon the Austrian reserves which lay below them in solid masses of army corps. Occurring about 2.30, and almost simultaneously with the withdrawal of the Austrian ,guns on their left already alluded to, this may be said to have decided the battle, for although the Saxons still stood firm against the attacks of the Elbe army, and the reserves, both cavalry and infantry, attempted a series of counterstrokes, the advantage of position and moral was all on the side of the Prussians. The slopes of the position towards the Austrians now took on the usual concave section, and from the crest of the ridge every movement could be seen for miles. The Austrian cavalry, on weak and emaciated horses, could not gallop at speed up the heavy slopes (-5V), and the artillery of both Prussian wings practically broke every attempt of the infantry to form for attack.

Close of the Battle. — Still the Austrians made good their retreat. Their artillery driven back off the ridges formed a long line from Stosser to Plotist facing the enemy, and under cover of its fire the infantry at length succeeded in withdrawing, for the Prussian reserve cavalry arrived late on the ground, and the local disconnected efforts of the divisional cavalry were checked by the still intact Austrian squadrons. Whereas at 2.30 absolute destruction seemed the only possible fate of the defeated army, by 6 p.m., thanks to the devoted heroism of the artillerv and the initiative of a few iunior commanders of cavalry,

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it had escaped from the enclosing horns of the Prussian attack. | In spite of heavy losses the Austrians were perhaps better in hanc? and more capable of resuming the battle next morning than the victors, for they were experienced in war, and accustomed to defeat, and retired in good order in three organized columns within easy supporting distance of each other. On the other hand, the Prussians were new to the battlefield, and the reaction after the elation of victory was intense; moreover, if what happened at Huhnerwasser affords a guide, the staff would have required some days to disentangle the units which had fought and to assign them fresh objectives.

Final Operations. — The convergence of the Prussian armies on the battlefield ended in the greatest confusion. The Elbe army had crossed the front of the I. army, and the II. army was mixed up with both. The reserve cavalry reached the front too late in the day to pursue. Thus the Austrians gained 24 hours, and the direction of

their retreat was not established with any degree of certainty for several days. Moreover the little fortresses of Josepbstadt and Koniggratz both refused to capitulate, and the whole Prussian armies were thus compelled to move down the Elbe to Pardubitz before they could receive any definite new direction. Meanwhile Benedek had in fact assigned only one corps with the reserve cavalry to oppose a Prussian advance towards Vienna, and the remaining seven retired to Olmiitz, where they were on the flank of a Prussian advance on Vienna, and had all the resources of Hungary behind them to enable them to recuperate. They were also still in railway communication with the capital. On purely military grounds the Prussians should have marched at once towards the Austrian field army, i.e. to Olmiitz. But for political reasons Vienna was the more important objective, and therefore the I. and Elbe armies were directed towards the capital, whilst the II. army only moved in the direction of the Austrian main body. Political motives had, however, in the mean-time exercised a similar influence on the Austrian strategy. The emperor had already consented to cede Venetia to Italy, had re-called two corps from the south (see Italian Wars, 1848-1870) to

the capital, and had appointed the archduke Albert to command the whole army. The Army of the North, which had reached Olmutz on the loth of July, now received orders to move by road and rail towards Vienna, and this operation brought them right across the front of the II. Prussian army. The cavalry established contact on the 15th in the neighbourhood of Tobitschau and Rochetinitz (action of Tobitschau, July 15th), and the Austrians finding their intention discovered, and their men too demoralized by fear of the breech-loader to risk a fresh battle, withdrew their troops and endeavoured to carry out their concentration by a wide circuit down the valley of the Waag and through Pressburg. Meanwhile the Prussian main army was pursuing its advance under very adverse circumstances. Their railway communication ended abruptly at the Austrian frontier; the roads were few and bad, the country sparsely cultivated and inhospitable, and the troops suffered severely. One third of the cavalry broke down on a march of 97 m. in five days, and the infantry, after marching 112 m. in ten days, had to have a two days' halt accorded them on the 17th. They were then in the district about Briinn and Iglau, and on the 18th the royal headquarters reached Nikolsburg. News had now been received of the arrival of Austrian reinforcements by rail at the capital both from Hungary and Italy, and of the preparation of a strong line of provisional defences along the Florisdbrf position directly in front of Vienna. Orders were therefore issued during the 18th for the whole army to con- centrate during the following days in the position held by the Austrians around Wagram in 1809, and these orders were in pro- cess of execution when on the 21st an armistice was agreed upon to commence at noon on the 22nd. The last fight was that of Blumenau near Pressburg on the 22nd; this was broken off at the stated time.

Langensalza. — In western Germany the Prussian forces, depleted to the utmost to furnish troops for the Bohemian campaign, were opposed to the armies of Hanover and Bavaria and the 8th Federal corps (the last consisting of Hessians, Wurttembergers, Badensers and Nassauers with an Austrian division drawn from the neutralized Federal fortresses), which were far superior in number. These minor enemies were, however, unready and their troops were mostly of indifferent quality. Hanover and Hesse-Cassel, which were nearest to Prussia and therefore immediately dangerous, were dealt with promptly and without waiting for the decision in the main theatre of war. The 13th Prussian division (v. Goeben) was at Minden,

Manteuffel's troops from the Elbe duchies at Altona, v. Beyer's division (Federal fortress garrisons) at Wetzlar. On the 15th and 16th of June Beyer moved on Cassel, while the two other Prussian generals converged on Hanover. Both places were in Prussian hands before the 20th. The Hessianj retired upon Hanau to join the 8th Federal corps; only the Hanoverians remained in the north, and they too, threatened by Beyer's advance, marched from their point of concentration at Gottingen southward for the Main. With proper support from Bavaria the Hanoverians could perhaps have escaped intact ; but the Bavarians considered that their allies (about 20,000) were strong enough by themselves to destroy whichever of the converging Prussian columns tried to bar their way, and actually the Hanoverian general v. Arentschild won a notable success over the improvised Prussian and Coburg division of General v. Flies, which advanced from Gotha and barred the southward march of the Hanoverians at Langensalza. The battle of Langensalza (June 27th) showed that the risks Moltke deliberately accepted when he transferred so many of tho western troops to the Bohemian frontier were by no means imaginary, for v. Flies, outnumbered by two to one, sustained a sharp reverse before the other columns closed in. But the strategical object of General Vogel v. Falckenstein, the Prussian commander-in-chief in the west, was achieved next day. By the morn- ing of the 29th Manteuffel and Goeben lay north, v. Flies's column (backed by a fresh brigade) south of Langensalza, and Beyer approached from Eisenach. Whatever had been the prospects of the Hanoverian army five days previously, it was now surrounded by twice its numbers, and on the 29th of June the capitulation of Langensalza closed its long and honourable career.

The Main Campaign.— The Prussian army, now called the " Army of the Main," of three divisions (one being unusually strong), had next to deal with the 7th (Bavarians) and 8th (other South Germans) Federal corps in the valley of the Main. These were nominally over 100,000 strong and were commanded by Prince Charles of Bavaria. The ordre de bataille of the 8th corps is interesting. It was commanded by Prince Alexander of Hesse; the 1st division (3 infantry brigades, I cavalry brigade, 6 batteries) came from Wiirttemberg; the 2nd division (2 infantry and 1 cavalry brigades, 5 batteries) from Baden, the least anti-Prussian of all these states; the 3rd division (2 infantry and I cavalry brigades, I rifle battalion, 4 batteries) from Hesse- Darmstadt; the 4th division consisted of an Austrian brigade of 7 battalions (three of which were Italians), a Nassau brigade, and two batteries and some hussars of Hesse-Cassel. The remainder of the Hesse-Cassel troops, which had retired southward before Beyer's

advance on Cassel, went to the Rhine valley about Mainz. The centre of the rayon of the 8th corps was Darmstadt, and the Bavarian lirie extended from Coburg to Gemiinden. It appears that Prince Charles wished to march via Jena and Gera into Prussia, as Napoleon had done sixty years before, but the scheme was negatived by the Austrian government, which exercised the supreme command of the

allies. The Bavarians did, however, advance, and made for the ■ Eisenach-Gotha region, where the Prussian-Hanoverian struggle was in progress. Meanwhile the 8th Federal corps advanced also, but actuated probably by political motives it took the general direction of Cassel, and between the two German corps a wide gap opened, of which Vogel v. Falckenstein was not slow to take advantage. On the day of Koniggratz the Prussians moved into position to attack the Bavarians, and on the 4th of July v. Goeben won the victory of Wiesenthal (near Dermbach). The 7th corps thereupon drew back to the Franconian Saale, the 8th to Frankfurt, and on the 7th of July the Prussian army was massed about Fulda between them. Vogel v. Falckenstein moved forward again on the 8th, and on the 10th the Bavarians were again defeated in a series of actions around Kissingen, Waldaschach and Hammelburg. Meanwhile Prince Alexander's motley corps began its advance from Frankfurt up the Main valley to join the Bavarians, who had now retired on Schweinfurt. The army of the Main, however, had little difficulty in defeating the 8th corps at Laufach on the 13th and Aschaffenburg on the 14th of July. The Prussians occupied Frankfurt (16th). Vogel v. Falckenstein was now called to Bohemia, and v. Manteuffel was placed in command of the army of the Main for the final advance. The 7th and 8th corps now at last effected their junction about Wiirzburg, whither the army of the Main marched from Frankfurt to meet them. The Federals advanced in their turn, the Bavarians on the right, the 8th on the left, and the opponents met in the valley of the Tauber. More partial actions, at Hundheim (23rd), Tauber Bischofsheim (24th),Gerchsheim (25th), Helmstadt (25th) and Rossbrunn (26th) ended in the retreat of the Germans to Wiirzburg and beyond ; the armistice (Aug. 2nd) then put an end to operations. A Prussian reserve corps under the grand duke of Mecklenburg-Schwerin, formed at Leipzig, had mean- while overrun eastern Bavaria up to Nuremberg.

This campaign presents the sharpest contrast to that of Bohemia. Small armies moving freely within a large theatre of war, the occupa- tion of hostile territory as a primary object of operations, the absence of a decision-compelling spirit on either side, the hostile political "view" over-riding the hostile "feeling" — all these

conditions remind the student of those of 17th and 1 8th century warfare. But the improved organization, better communications and supplies, superior moral, and once again the breech-loader versus a standing target, which caused the Prussian successes, at least give us an opportunity of comparing the old and the new systems under similar conditions, and even thus the principle of the " armed nation" achieved the decision in a period of time which, for the old armies, was wholly insufficient.

The various treaties of Prague, Berlin and Vienna which followed the armistice secured the annexation by Prussia of Hanover, the Elbe duchies, the electorate of Hesse, Nassau and Frankfurt, the dis-solution of the existing confederation and the creation of a new North German Confederation under the hegemony of Prussia, and the payment of war indemnities to Prussia (the Austrian share being £6,000,000). Venetia was ceded by Austria to Napoleon III. and by him to King Victor Emmanuel.

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SEVEN WISE MASTERS, THE, a cycle of stories of Oriental origin. A Rotnan emperor causes his son to be educated away from the court in the seven liberal arts by seven wise masters. On his return to court his stepmother the empress seeks to seduce him. To avert some danger presaged by the stars he is bound over to a week's silence. During this time the empress accuses him to her husband, and seeks to bring about his death by seven stories which she relates to the emperor; but her narrative is each time confuted by tales of the craft of women related by the sages. Finally the prince's lips are unsealed, the truth exposed, and the wicked empress is executed.

The cycle of stories, which appears in many European languages, is of Eastern origin. An analogous collection occurs in Sanskrit, but the Indian original is unknown. Travelling from the east by way of Arabic, Persian, Syriac and Greek, it was known as the book of Sindibad, and was translated frpm Greek into Latin in the 12th century by Jean, de Hauteseille (Joannes de Alta Silva), a monk of the abbey of Haute-Seille near Toul, with the title of Dolopathos (ed. H. Oesterley, Strass- burg, 1873). This was translated into French about 1210 by a trouvere named Herbers as Li Romans di Dolopathos; another French version, Li Romans des sept sages, was based on a different Latin original. The German, English, French and Spanish chap-books of the cycle are generally based on a Latin original differing from these. Three metrical romances probably based on the French, and dating from the 14th century, exist in English. The most important of these is The Sevyn Sages by John Rolland of Dalkeith edited for the Bannatyne Club (Edinburgh, 1837).

The Latin romance was frequently printed in the 1 5th century, and Wynkyn de W^rde printed an English version about 1515. See G. Paris, Deux Redactions du roman des sept sages de Rome (Paris, 1876, Soc. des. anc, textes fr.) ; Biichner, Historia septem sapientium . . . (Erlangen, 1889) ; K. Campbell, A Study of the Romance of the Seven Sages with special reference to the middle English versions (Baltimore, 1898) ; D. Comparetti, Researches respecting the Book of Sindibdd (Folk-Lore Soc, 1882).

SEVEN WISE MEN OF GREECE, THE, a collective name for certain sages who flourished c. 620-550 B.C. The generally accepted list is Bias, Chilon, Cleobulus, Periander, Pittacus, Solon, Thales (see separate articles), although ancient authorities differ as to names and number. They obtained great influence in their respective cities as legislators and advisers, and a re- putation throughout the Greek world. Their rules of life were embodied in poems and short sayings in common use.

See O. Bernhardt, Die sieben Wei'sen Griechenlands (1864) ; F. Bohren, De septem sapientibus (1867) ; " Septem sapientium carmina et apophthegmata," with short biographies in F. Mullach, Fragmenta philosophorum Graecorum, i. (i860); H. Wulf in Dis- sertations philologicae Halenses, xiii. (1896).

SEVEN WONDERS OF THE WORLD, the name conferred on a select group of ancient works of art which had obtained pre-eminence among the sight-seers of the Alexandrian era. The earliest extant list, doubtless compiled from the numerous guide books then current in the Greek world,, is that of the epigrammatist Antipater of Sidon (2nd century B.C.). A second and slightly divergent list from the hand of a Byzantine rhetori- cian has been incorporated in the works of Philo of Byzantium. The monuments are as follows: (1) the pyramids of Egypt, (2) the gardens of Semiramis at Babylon, (3) the statue of Zeus at Olympia (see Pheidias) , (4) the temple of Artemis at Ephesus, (5) the Mausoleum at Halicarnassus (see Mausoleum), (6) the Colossus at Rhodes, (7) the Pharos (lighthouse) of Alexandria, or the Walls of Babylon. See " Philo " De septem mundi miraculis (ed. Hercher, Paris, 1858).

SEVEN YEARS' WAR (1756-1763), the name given to the European war which arose from the formation of a coalition between Austria, France, Russia, Sweden and Saxony against Prussia, with the object of destroying, or at least crippling, the power of Frederick the Great. Prussia was joined by England, and between England and France, as usual, a. maritime and colonial war broke out at the first pretext;

this war laid the foundations of the British empire, for ere the seven campaigns had been fought in Europe, the French dominion in Canada and the French influence in India, in spite of Dupleix, Lally and

Montcalm, had been entirely overthrown by the victories of Clive, Amherst and Wolfe. Great as was the effect of these victories on the history of the world, however, it is at least questionable whether the steadfast resistance of Prussia, almost single-handed as she was — the resistance which laid the solid, if then unseen, foundations of modern Germany — is not as important a pheno- menon, and from the technical military standpoint Rossbach and Leuthen, Zorndorf and Kunersdorf possess an interest which it would be possible perhaps to claim for Plassy and for Quebec, but not for border conflicts in Canada and India. It is not only battles, the distinct and tangible military events, that make up the story of Frederick's defence. There are countless marches and manoeuvres, devoid of interest as regards their details; but, as indications of the equilibrium of forces in 18th-century war- fare, indispensable to a study of military history as a whole.

Learning of the existence and intentions of the coalition, Frederick determined to strike first, and to that end, during the months preceding the outbreak of hostilities, he concentrated his 150,000 men as follows: — n, 000 men in Pomerania to watch the Swedes, 26,000 on the Russian frontier, 37,000 men under Field Marshal Schwerin in Silesia, and a main body of 70,000 in three columns ready to advance into Saxony at a moment's notice, the king being in chief command. On the 29th of August 1756 the Saxon frontier was crossed. Dresden was occupied on the 10th of September, the Saxon army, about 14,000 strong, falling back before the invaders to the entrenched camp of Pirna, an almost inaccessible plateau parallel to the Elbe and close to the Bohemian frontier. The secret of the Prussian intentions had been so well kept that the Austrians were still widely disseminated in Bohemia and Moravia. 32,000 men under Field Marshal Browne were at Kolin, and 22,000 under Piccolomini at Olmutz, when on the 31st of August the news of the invasion arrived, and such was their unreadiness that Browne could not advance till the 6th of September, Picco- lomini until the 9th. Meanwhile the Prussians, leaving detach- ments to' watch the exits from Pirna, moved up the Elbe and took post at Aussig to cover the investment of the Saxons. Learning of Browne's approach on the 28th of September, the king, assuming the command of the covering force, advanced yet farther up the Elbe to meet him, and the two armies met at Lobositz (opposite Leitmeritz) on the morning of the 1

st of October. The battle began in a thick fog, rendering dispositions very difficult, and victory fell to the Prussians, principally owing to the tenacity displayed by their infantry in a series of disconnected local engagements. The nature of the ground rendered pursuit impossible, and the losses on both sides were approximately equal — viz. 3000 men — but the result sealed the fate of the Saxons, who after a few half-hearted attempts to escape from their entrenchments, surrendered on the 14th of October, and were taken over bodily into the Prussian service! Prussian administrators were appointed to govern the captured country and the troops took up winter quarters.

Campaign of 1757. — The Coalition had undertaken to pro- vide 500,060 men against Prussia, but at the beginning of the year only 132,000 Austrians stood ready for action

in northern Bohemia. Against these the king was Battle ot

, , ° Prague.

organizing some 250,000, 45,000 of whom were paid

for by British subsidies and disposed to cover Hanover from a

French attack. After leaving detachments to guard his other

frontiers, Frederick was able to take the field with nearly 1 56,000

men, but these also were scattered to guard a frontier some 200

m. in length — the left wing in Silesia under Schwerin and the

duke of Brunswick-Bevern, the centre and right under the

king. In April the operations began. Schwerin and Bevern

crossed the mountains into Bohemia and united at Jung

Bunzlau, the Austrians falling back before them and surrendering

their magazines. The king marched from Pirna and Prince

Maurice of Dessau from Zwickau on Prague, at which point the

various Austrian commands were ordered to concentrate.

On the morning of the 5th the whole army, except a column

under Field Marshal Daun, was united here under Prince

Charles of Lorraine, and the king, realizing the impossibility of

storming the heights before him, left a corps under Keith and a few detachments to watch Prague and the fords across the river, and marched during the night upstream and, crossing above the Austrian right, formed his army (about 64,000) for attack at right angles to the Austrian front. The ground had not been reconnoitred, and in the morning mist many mistakes in the deployment had been made, but as Daun was known to be but 20 m. away and the Austrian army was changing its front to meet the unexpected attack, the king threw caution to the winds and sending Zieten with his cavalry by a wide detour to cover his left, he ordered the whole to advance. One of the most savage battles in history was the result. Almost immediately the Prussian infantry became entangled in a series of morasses, the battalion guns had to be left behind and the troops had to correct their alignment under the round shot fired by the Austrians, who had completed their change of front in time and now stood ready to sweep the open glacis before them. Before the storm of bullets and the grape and canister of the heavy and battalion guns the Prussian first line faltered and fell in thousands. Their attempts to prepare the way for the bayonet assault broke down. Schwerin was killed. But the second line carried the survivors on, and in the nick of time Zieten's cavalry drove the Austrian horsemen off the field and broke in on the flank and rear of their infantry. This turned the scale, and the Austrians retreated into Prague in hopeless confusion, leaving some 10,000 men (14-8%) on the ground, and 4275 prisoners, out of about 66,000, in their enemy's hands. The Prussians lost 11,740 men killed and wounded and 1 560 prisoners, and in all 20-8% of their strength. The actual fighting seems only to have lasted about two hours, though firing did not cease

Kolin.

till late at night; 16,000 Austrians managed in the confusion to evade capture and join Daun, who made no movement either on this or succeeding days to come to the assistance of his comrades, but began a leisurely retreat towards Vienna.

The Prussians immediately began the siege of the town, and after a month's delay Daun, now at the head of some 60,000 men, moved forward to the relief of the city. Learning of his approach, the king, taking with him all the men who could be spared from the investment and uniting all avail- able detachments, moved to meet him with only 34,000 men, and on the 18th of June he found Daun strongly entrenched. He immediately endeavoured to march past him and attack him on the right flank as at Prague, but the Austrian light troops harassed his columns so severely during the movement that without orders they wheeled up to drive them off and, being thus thrown into disarray, they took three divergent objectives. Their disunited attacks all fell upon superior numbers, and after a most obstinate struggle they were badly beaten with a loss in killed and wounded of 6710 (18-6%) and 5380 prisoners with 22 colours and 45 guns. The fighting lasted 5j hours. The Austrian loss was only 8000 out of 53,500, or 1 5; 2 %, of whom.only 1 500 were taken prisoners.

This disaster entailed raising the siege of Prague, and the Prussians fell back on Leitmeritz. The Austrians, reinforced by the 48,000 troops in Prague, followed them 100,000 strong, and, falling on Prince August Wilhelm of Prussia, who was retreating eccentrically (for commissariat reasons) on Zittau, inflicted a severe check upon him. The king was com- pelled to abandon Bohemia, falling back on Bautzen. Having re-formed his men and calling in Keith's 27,000 men from Pima,

he again advanced, but found the enemy so strongly posted at Burkersdorf (south of Bischofswerda) that he relinquished his purpose and retreated on Bernstadt.

*Meanwhile his enemies had been gathering around him. France had despatched 100,000 men under d'Estrees against Hanover, where Cumberland with 54,000 stood to fT/!"** meet him, and another 24,000 men were marching west. through Franconia to unite with the " Army of the*

Holy Roman Empire " under the prince of Saxe- Hildburghausen. Fortunately this latter army was not as formidable as its title, and totalled only some 60,000 most un- disciplined and heterogeneous combatants. In the north 100,000 Russians under Apraxin were

slowly advancing into East Prussia, where Lehwald with 30,000 was preparing to confront them, and 16,000 Swedes had landed in Pomerania. On the 26th of June Cumberland had been beaten at Hastenbeck by d'Estrees, and the French overran Han- over and Brunswick. The king, leaving Bevern with only 13,600 men in Silesia to watch the Austrians, began to march across Ger- many to succour Cumber- land. Arrived at Leipzig on the 3rd of September, he heard of Lehwald's defeat at Gross-Jagerndorf

on the 30th of August

and immediately afterwards

of Cumberland's convention

of Kloster Seven, which

gave up Hanover to the

French. Fearing that the

French army now set free

in Hanover might unite with

the Army of the Empire

under Hildburghausen

and with 150,000 men march

direct on Berlin, Frederick,

taking with him 23,000

men, marched to join" Prince

Ferdinand in the district

about Halberstadt, hoping to strike his blow before the enemy's

junction could be completed. Mobility, therefore, was the

first consideration, and arrangements for supply having been

made in advance along his road, his troops covered 170 m.

in 12 days (September 1-13). But Hildburghausen, not

having been joined by d'Estrees, refused to fight and fell

back into the wooded districts of Thuringia and Franconia. Bad news now reached Frederick from Silesia; leaving Ferdinand to observe Hildburghausen, he marched with all haste to Eckersberg to support Bevern. Arrived here, he found more bad news from Berlin, which had been entered by a body of Austrian raiders under Hadik and plundered. Prince Maurice and Seydlitz were sent by forced marches to its aid, and before them Hadik retired at once (October 18th). Finding the Austrians for the moment quiescent and hearing that Hildburg- hausen was again advancing, the king now concentrated all avail- able men on Leipzig and marched to support Prince Ferdinand. Hildburghausen took up a position about Meucheln on the 2nd of November, and on the 5th moved off to repeat Frederick's manoeuvre of Prague against its inventor. The battle of Rossbach (q.v.) followed. In this Seydlitz and the Prussian _ . . cavalry won imperishable renown. Aided only by the fire of 18 guns and of 7 battalions of infantry, only two of which fired more than five rounds, the Prussian squadrons swept down upon the marching columns of the Allies and in about 40 minutes the whole 64,000 were in full flight. Never was a victory more timely, for the Prussian army was almost worn out and more bad news was even then on the way.

Bevern in Silesia, who had been beaten at Moys near Gorlitz (September 7th) and in the battle of Breslau on the 22nd of October, had been compelled to retire behind the Oder, leaving the fortresses of Schweidnitz and Breslau to their fate, and both had capitulated within a few days. Leaving a small reinforcement for Ferdinand, the king now moved by forced marches to Liegnitz. The distance, about 170 m. through difficult country, was covered again in 12 days, but the numbers were small, only 13,000, which shews how tremendous had been

LEUTHEN

*deployment Z*f positions*

Austrians ,

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the drain upon the men of the previous six weeks' exertions. On the night of the 4th of December, having joined the beaten forces of Bevern at Parschwitz, making in all 43. 000 men ° very unequal*

fighting value, he decided to attack the 72,000 Austrians who lay across the Breslau road, their centre marked by the village of Leuthen (g.v.)- His position appeared so

Leathern.

desperate that he sent for all his generals, laid the facts before them, announced his decision to attack and offered to accept any man's resignation without prejudice to his character should he deem the risk too hazardous. Needless to say, not one accepted the offer.

Covered by the low rolling hillocks of the district, the army now moved off to its right across the Austrian front, the advance led by Zieten and half the cavalry, the rear covered by Driessen with the remaining half — some 40 weak squadrons. The infantry having gained a position sufficiently on the Austrian flank, now wheeled into line and attacked in echelon of battalions from the right. The battle soon became desperate, and the Austrian cavalry on their right wing under Luchesi, unaware of Driessen's presence as a flank guard, issued out of their lines, wheeled to their left and swept down upon the refused flank of the Prussian infantry; but they never reached them, for Driessen, seizing his opportunity, set his squadrons in motion and attacked. The Austrians, completely surprised, were ridden down and driven back on to the front of their own infantry, and the pressure of the fugitives threw the rear of their left wing into confusion and in a short time the ruin of their army was completed. When the news of Driessen's charge was brought to the king his astonishment was expressed in the single phrase, " What, that old fool Driessen?" The fighting, however, had been desperate, and though the Austrians out of their 72,000 lost 37% including 20,000 prisoners, with 116 guns and 51 colours, the Prussians lost 6200 (14%) making with the other battles of the year a total of nearly 75,000 men, and not including losses in minor skirmishes and on the march.

Campaign of 1758. — The raid upon Berlin had accomplished nothing, and the advance of the Russian main body had died out for want of resolution to seize the opportunities offered by Frederick the Great's absence. The Czarina, annoyed by his slowness, recalled Apraxin and appointed Fermor in his place. Utilizing the winter snows, he collected some 3 1 ,000 men and crossed the frontiers of

East Prussia (January 10th, 1758) and attempted to annex the province, driving out all the Prussian officials who refused to swear fealty to Elizabeth. This took time, and when the period of thaw supervened the Russians were immobilized and could not advance until approaching summer had dried the roads again. For the moment, therefore, no danger threatened Frederick from this quarter, and Rossbach had effectually tamed the French. The Swedes, too, showed little energy, the " roadless " period affecting them equally with the Russians.

Frederick therefore resolved to seize the opportunity renew his invasion of Austria. As a beginning he recap- tured Schweidnitz in April with 5000 prisoners. The Austrian field army under Daun lay about Koniggratz, covering all the passes out of Silesia; but covered by the newly formed " Free Corps " (his answer to the semi-savage Croats, Pandours and Tolpatches of the Austrians), Frederick marched right across their front on Olmiitz, whilst a special corps (30,000) under Prince Henry threatened their left from Saxony and the Elbe. He had with him about 40,000 men. But Olmiitz lay 90 m. from the Prussian frontier, and the Austrian light troops swarmed in the intervening dis- trict. Ultimately a great Prussian convoy was destroyed in the action of Domstadl, and the siege of Olmiitz had to be raised (July 1st); but instead of marching back the way he had come Frederick led his troops through Bohemia practically in the rear of Daun's army, and on the 14th of July entered Daun's empty entrenchments at Koniggratz. Fermor's Russians were now again in the field and had reached Posen, burning and plundering horribly. By skilful manoeuvring the king deceived the Austrians till the roads to Silesia by Skalitz and Nachod were open and then by a rapid march passed over into Silesia, reaching Grussau (near Landshut) on the 8th of August. Leaving Keith with half his force to hold this district, be then marched to Frankfurt-on- the-Oder, taking with him only some 15,000 men, to strengthen the wing already engaged against the Russians. Frankfurt

was reached on the 20th of August. Fermor was then besieging Ciistrin with 52,000 men, and hearing of the king's approach he raised the siege and placed himself behind a formidable obstacle facing north, near Zorndorf, from which direction the king was approaching. Seeing that the same obstacle that prevented him from attacking the Russians prevented them equally from attack- ing him, the king marched right round Ferrnor's eastern flank — the Russians gradually forming a fresh front to meet him — so that when the Prussian attack began on the morning of the 25th of August they stood in three irregular squares, divided from each other by marshy

hollows, and thus unable to render one another support. The king made his first effort against the square on the right — Seydlitz with his squadrons covering the „ . . movement. But the Russian troops fought with far more spirit than the Austrians had ever shown, and things were going very badly with the Prussians when Seydlitz, who in the meanwhile had succeeded in making paths across the Zabern-grund on which the Russian right rested, flung himself upon

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the great square, and rode over and destroyed the whole mass in a prolonged melee in which quarter was neither given nor asked. Relieved by this well-timed charge, the king now re-formed the infantry already engaged, and concen- trated all his efforts on the south-west angle of the great centre square. Again the Russians more than held their own, issuing forth from their squares and capturing many field- pieces. Some of the Prussian infantry was actually broken and in full flight when Seydlitz, with his ranks re-forjned and his horses rested, returned and again threw himself upon the square exactly as on the previous occasion and with the same result — the square, as a formation, was broken, but groups still stood back to back and the most savage butchery ensued. The combatants could not be separated and only darkness put a stop to the slaughter. Of 36,000 Prussians 12,500 were killed or wounded, 1000 prisoners or missing (37-5%), and of 42,000 Russians about 21,000 had fallen (50%).

In the night the survivors gradually rallied, and morning found the Russians in a fresh position a couple of miles to the northward, but Frederick's troops were too weary to renew the attack. Gradually the Russians withdrew towards Landsberg and Konigsberg, and the king, leaving Dohna to follow them up, marched with the remainder of his forces on the 2nd of September for Saxony, covering 22 m. a day. They arrived only in the nick of time, for Daun had united with portions of the Empire Army and was threatening to crush

Prince Henry under the weight of more than two-fold numbers. The prince had been driven into an entrenched position above Gahmig near Dresden and Daun was about to attack, but the mere name of Frederick was enough, and learning of his arrival Daun fell back to Stolpen on the 12th of September.

The Prussian army now lay around Grossenhain, Prince Henry's force covering Dresden and the Elbe bridges. The Empire Army was at Pirna, Daun at Stolpen, and 1]%],'. m tnese positions they remained until the 26th of

September, the Prussians getting the rest they so urgently needed. On that date, however, the state of truce was broken and the king moved towards Bischofswerda, where Daun's subordinate Loudon was posted. The latter retired, opening the road to Bautzen. The king arrived at Bautzen on the 7th of October and had to wait until the 10th for provisions from Dresden. He then moved forward to Hochkirch, where he found Daun strongly entrenched across his path at Kittlitz with 00,000 men, the Prussians having only 37,000. The king determined to attack the Austrian right. So confident had the Prussians become in the belief that Daun would never take the offensive himself that the most elementary precautions of safety were forgotten and only Zieten kept his horses saddled. During the night of the 13th the Austrians, leaving their watch- fires burning and moving silently through the woods, which covered much of the ground, formed up almost all round the Prussian camp. At 5 a.m. the attack was delivered from all quarters simultaneously and a most desperate struggle ensued. Nothing but the superb discipline of the Prussians saved the situation. Zieten with his squadrons managed to keep a way of escape open, and after a most obstinate conflict the wreck of the army succeeded in withdrawing, leaving 101 guns and 9450 men on the ground or in their enemies' hands (25-5%). The Austrians, in spite of the advantage of a well-conceived surprise, lost 7590 men and were too shaken for pursuit. They fell back to their old camp, where they remained for a week, thus giving Frederick time to bring up reinforcements from Dresden (6000 men) and, starting on the 23rd, he marched right round the Austrian right and raised the siege of Neisse, the prime object with which he had set out. Daun, learning that the king had gone past him into Silesia, now laid siege to Dresden. On the 15th of November he heard that Frederick was marching to its relief through Lusatia and incontinently gave way,

retiring on Pirna. The king was in Dresden again on the 20th.

Campaign of 1759. — The drain on Frederick's resources had been prodigious. On the battlefields of the previous three years he had lost at least 75,000 men, not counting the waste of life in his marches and skirmishes; but he still managed to keep 1 50,000 men in the field, though for want of the old two years' training in loading, firing and manoeuvring the average efficiency had much diminished. In cavalry, too, he was relatively weaker, as there was no time to train the remounts. His enemies felt their losses far less and were beginning to understand his tactics; fortunately they remained incapable of combined action.

After minor operations on the frontiers the Russians took the field. Fermor had been superseded by Soltikov, and Dohna with his 18,000 men proved quite inadequate to arrest the Russians' progress. He was superseded by Wedell, who, on the 23rd of July, with 26,000 men boldly attacked the 70,000 Russians whilst on the march near Ziillichau. He was defeated with a loss of 6000 and fell back to Crossen bridge, 5 m. below Crossen, which Soltikov occupied next day, thence he moved down the river towards Frankfurt, keeping on the eastern bank. Daun had detached Loudon and Hadik with -3 5,000 men to join him, and it became vital to Frederick to prevent the combination. Leaving Prince Henry at Schmottseifen to watch Daun, he marched with all available forces and joined Wedell on the 6th of August at Miillrose near Frankfurt, after vainly searching for the Hadik-Loudon force. Here he was joined on the 10th by Finck with 10,000 men, bringing his whole force up to 50,000 against the Russian and Austrian 90,000, who lay entrenched in the sandhills about Kunersdorf. On the nth he crossed his whole force over the

Kuners dort.

Oder at Reitwein and on the 12th marched forward, intending to envelop the Russians on both flanks; but his columns lost their way in the woods and their attacks were delivered succes- sively. In spite of their usual disciplined gallantry, the Prussians were completely beaten, even Seydlitz and his squadrons failed to achieve the impossible, and the night closed down on the greatest calamity Frederick had ever experienced. Of 43,000 men 20,720 (48-2%) were left on the ground and 178 guns and 28 colours fell into the hands of the enemy; and the allied Austro- Russian force only lost 15,700. The battle had only lasted six hours. In the depression following this terrible day he wrote to Schmettau, commanding at Dresden, telling him to expect no help, and on the 4th of September

Dresden fell.

As usual Frederick was saved by the sluggishness of his enemies, who attempted no pursuit, and being reinforced the day after the battle by 23,000 men, and having ordered up Kleist (who had been watching the Swedes), he was again at the head of an army. Week after week went by, during which he countered all attempts of Daun and Soltikov to combine, and ultimately the Russians, having consumed all the food and forage in the districts they occupied, were compelled to fall back on their own frontiers. Then, uniting with Prince Henry, the king turned to fall upon Daun; but his contempt for his adversary proved his own undoing. Contrary to all his own teaching, he sent a detachment of 12,000 men under Finck to work round the Austrians' flank by Dippoldiswald to Maxen, but the latter, learning of the movement and calling up a wing of the Empire Army to their assistance, fell upon Finck with 42,000 men and compelled him to surrender after two days' hard fighting. The combination having failed, the two armies stood facing one another till far into the winter. But for Prince Ferdinand's glorious victory at Minden on the 1st of August, the year would have been one catalogue of disaster to the Prussian arms, and these operations must now be mentioned.

In the early part of 1758 Prince Ferdinand with 30,000 men had advanced from Liineburg and was joined by Prince Henry with 8600 from Halberstadt. The approach of the latter threatened the right wing of the French army under Clermont, which was posted along the Aller, and the whole line gave way and retreated without making any serious stand behind the Rhine. Prince Ferdinand followed and defeated them on the 23rd of June at Crefeld. Clermont was relieved by Contades and at the same time Soubise, who had at last reorganized his com- mand, shattered by the disaster of Rossbach, moved forward through Hesse and compelled Prince Ferdinand to withdraw from his very advanced position. No engagement followed; Soubise fell back upon Frankfurt and Prince Ferdinand held a line through Minister, Paderborn and Cassel during the winter.

Fortunately events in Canada and the glory of his victories had made Frederick's cause thoroughly popular in Great Britain, and at last it became possible to detach a considerable force of British troops to Prince Ferdinand's assistance, whose conduct turned the scale in the critical moment of the campaign. During the winter the French had organized their forces in two columns — based on Frankfurt and Wesel respectively. Broglie was now in command of the former; Contades still led the latter.

In April Prince Ferdinand advanced to drive the French out of Hesse and Frankfurt, and actually reached Bergen, a village some 10 m. to the north, but here he ■■■

was defeated by Broglie (13th April) and forced to retreat the way he had come, the French following along their whole front and by sheer weight of numbers manoeuvring him successively out of each position he assumed. On the 10th of July Broglie surprised Minden, thus securing a bridge over the Weser and free access into Hanover, and light troops overran the south of the electorate. On the 16th Contades with the left column joined Broglie and the French now had some 60,000 men against the 4 5 ,000 Ferdinand could muster. The latter's position was extremely difficult, for the French had only to continue in possession of the bridges at Minden to ruin the whole country by their exactions, and the position they held was too well protected on the flanks and too strong in front for direct attack.

Nevertheless Prince Ferdinand drew up before it and met the French plundering raids by a threat on their communication with Cassel, and as a further inducement to tempt Contades to attack him, he detached a column under Wangenheim, which entrenched itself across the only outlet by which the right of the French army could debouch from behind the marshes which lie in the angle between the Weser and the Bastau, a small tributary joining the former below Minden. The bait took, and during the early hours of the ist of August the French army moved out to attack Wangenheim. But Ferdinand's troops had been lying in instant readiness for action, and as soon as the outposts gave the alarm they were in motion in eight columns, i.e. practically deployed for action to meet the French as they emerged from their positions. Unfortunately the outpost reports were delayed by about two hours, owing to the heavy gale and storm that was prevailing, and the French had made far greater progress with their deploy- ment than Ferdinand had reckoned on. An almost front-to- front engagement ensued. Things were going badly with the Prussians when, through a mistake in the delivery of an order, the British brigade (12th, 20th, 23rd, 25th, 37th, 51st), followed by some Hanoverian battalions, began to advance straight upon the masses of French cavalry who stood protected by the cross-fire of several batteries. Once launched, neither fire nor shock could check their progress; halting for a moment to pour volleys into the charging squadrons hastily thrown against them, they swiftly

resumed their advance. French infantry too were hurled against them, but were swept away by fire and bayonet, and presently they had pierced right through the French line of battle. Now came the moment when cavalry should have been at hand to complete the victory, and this cavalry, the Blues, the ist and 3rd Dragoons, Scots Greys and 10th Dragoons under Lord George (afterwards Viscount) Sack- ville (q.v.) stood ready, waiting only the order to advance. This Sackville refused to give, though called on three times by the prince; no satisfactory explanation of his conduct has ever been discovered, but he was tried by a general court-martial and cashiered. Nevertheless, so brilliant had been the conduct of all the troops engaged, especially of the infantry brigade that the victory was won even in spite of this failure of the cavalry, and before evening the French were retreating as a demoralized mass towards Cassel, leaving some 10,000 men, 17 colours and 45 guns in the hands of the victors, who on their side out of 43,000 had lost 2600 killed and wounded. Of the six British regiments that went into action 4434 strong, 1330 (30%) had fallen, but their feat is not to be measured only by the losses victoriously borne — these were not unusual in the period — but by the astounding discipline they maintained throughout the advance, resuming their march after beating off cavalry charges with the cool precision of a review in peace-time. Ferdinand followed up his victory by a pursuit which was vigorous for three days and had all but reached the Rhine when his movement was stayed by the necessity of detaching 12,000 men to the king to make good the losses of Kunersdorf.

Campaign of 17 60. —The. year opened gloomily for Frederick. His embarrassment both for men and money was extreme, and his enemies had at last agreed on a combined plan against him. They purposed to advance in three columns concentrically upon him: Daun with 100,000 men in Saxony, Loudon with 50,000 from Silesia, Soltikov's Russians from East Prussia; and, against whichever column the king turned, the others were to continue towards Berlin. Only in Hanover were the conditions more favourable, for Ferdinand had 70,000 (20,000 British) against the 125,000 of the French.

Early in April the king stood with 40,000 men, west of the Elbe near Meissen facing Daun, Prince Henry with 34,000 in Silesia from Crossen to Landeshut, 15,000 under Forcade and Jung-Stutterheim in Pomerania facing the Swedes and Russians. Towards the end of May Loudon moved to besiege Glatz, and Fouque, who commanded at Landeshut, marched with 13,000 to cover Breslau. Loudon at once seized Landeshut, and Fouque, returning in response to urgent orders from the king, was attacked by Loudon with 31,000 men and

almost destroyed. Meanwhile,

Prince Henry had moved to Landsberg against the Russians, but failed to seize his opportunities and thus Silesia lay open to the Austrians. Frederick decided to march with his main body against Loudon and attack him if unsupported, but, if his movement induced Daun to move to Loudon's support, then to double back and besiege Dresden. For this purpose a siege train was held in readiness at Magdeburg. He marched rapidly on Bautzen, then hearing that Daun was approaching to support Loudon he returned and besieged Dresden (July 12th). The town was bombarded, there being no time for regular siege approaches, but it held out, and by the 28th of July Daun's army returning had almost surrounded Frederick. The siege had to be raised, and during the night of the 29th of July the Prussians slipped away to Meissen. On the same day Frederick learnt that Glatz, the key to Southern Silesia, had fallen into the hands of the Austrians, but as a set-off the news shortly afterwards arrived of Prince Ferdinand's brilliant victory at Warburg, in which the British cavalry led by the marquis of Granby amply wiped out the disgrace incurred by Sackville. On the ist of August Frederick began his march into Silesia, summoning Prince Henry from Landsberg to join him, which he did by a splendid march of some 90 m. in three days. The king's march was almost as remarkable, for the roads were very bad and the Austrians had freely obstructed them, nevertheless in five days he reached Bautzen, having marched more than 100 m. from his starting- point, and crossed five considerable rivers on his way. Thence he continued more easily to Bunzlau. Daun was in front of him and Lacy with clouds of light troops on his right, the Russians under Czernicheff 'With Loudon not far away to his left front, 114,000 men in all to his 30,000, but he held to his decision to reach Schweidnitz. With this purpose in view he moved south- east on Jauer, marching 25 m. oh the 9th of August, but the enemy was still in front of him and hovering on his flanks. On the 10th he tried the Liegnitz road with the same result, and his position became desperate as his food was almost exhausted. He had already covered 15 m. that day, but at n p.m. he called on his men for a night march and formed up again on his old position next morning, the nth of August. He appeared to be completely surrounded, and things looked so desperate that Mitchell, the British ambassador, burnt his papers and cipher key. At sunset on the 12th, however, Frederick again broke camp and by a night march evaded the enemy's scouts and reached Liegnitz at noon on the 13th, the Austrians appearing a couple of hours later. The troops rested during the 13th and 14th, but at nightfall, leaving their watch- fires burning, marched off by

the Glogau road, and the only way of escape still open. The Austrians, however, had planned a night attack, and Loudon's columns were moving to close this last loophole of escape. Fortunately for the Prussians they ai rived just a few minutes too late, and in the combat that ensued 15,000 Prussians inflicted a loss of 10,000 men and 82 guns upon their assailants, afterwards resuming their march undisturbed.

But the danger was not yet over. Czernicheff was known to be in the immediate vicinity; so as to get him out of the way, Frederick gave to a peasant a despatch addressed to Prince Henry containing the words: " Austrians totally defeated to-day, now for the Russians. Do what we agreed upon." The peasant was to take care to be captured by the Russians and only give up the paper to save his life. The plan worked as he had anticipated, the paper duly reached Czernicheff's hands and he immediately evacuated the dangerous neighbourhood. Elated with his success the king now abandoned his retreat on Glogau and determined to press, on at all hazards to Breslau, which in spite of many anxious moments he reached on the i7t,h of August.

The Russians now abandoned the campaign in the open field and besieged Colberg on the Baltic coast. Frederick in Silesia manoeuvred for some weeks between Breslau, Schweidnitz and Glatz, but was suddenly recalled by the news of the capture of Berlin on the 9th of October by Cossacks and portions of the Empire Army and Austrians from Saxony. On the nth of October the king was in full march, but the news of his approach was enough and the enemy dispersed, the

Liegnitz.

Torgau.

Austrians and Empire Army making for Torgau. Daun, relieved of Frederick's pressure, now also moved to Torgau, leaving Loudon in Silesia, and had concentrated over 64,000 men at and around Torgau before Frederick had collected an attack- ing force of 45,000. The position held by the Austrians was an entrenched camp fronting in all directions, but it was too cramped for their numbers and difficult to leave for a counter-stroke. Frederick determined to attack it both front and rear, and leaving Zieten to act against the former, he marched off at 6-30 of the 3rd of November to attack it

as soon as Zieten should have thoroughly attracted the enemy's attention. But for once Zieten failed; he allowed himself to be drawn off by the Austrian light troops, and Frederick, in ignorance of the real state of affairs, launched his grenadiers against a thoroughly intact enemy, strongly entrenched, with, it is said, 400 guns in position to sweep the approaches. The grenadiers were simply swept away by grape and case — only 600 out of 6000 remained, and Prussian batteries hurrying up to their support were destroyed before they had time to load. The attack was, however, renewed

by fresh brigades as they came to hand, and the Prussian artillery did something to diminish the intensity of the Austrian case fire. The action began at 2 p.m. At 4.30, as the sun was setting, the king's last reserve of horse and foot at last succeeded in breaking the Austrian line and in the darkness there ensued a confused slaughter as at Zorndorf. The result was still in the balance when at length Zieten reached the field and attacked at ones. For an hour or so the struggle still raged, but the Austrians were by now completely spent and withdrew gradually into tie fortress and then across the river. Out of 44,000 the Prussians had lost 13,120 men (30%), out of 65,000 the Austrians only 11,260 (17-3%), but of these over 7000 were prisoners. Both sides, however, were completely paralysed by the struggle, and the year ended without further effort on either side.

On the western theatre of war Prince Ferdinand after the victory of Warburg had pressed the French back to the Rhine and besieged Wesel, but was compelled to raise the siege after suffering the defeat of Kloster-Kamp (16th Oct.) and to withdraw to Lippstadt and Warburg.

Campaign of 1761. — Torgau proved to be Frederick's last great battle. All parties were now so completely exhausted that they no longer were able to face the risks of a decision on the field. In the west Prince Ferdinand was first in the. field, and in February and March he drove the French southward as far as Fulda, but an attempt to capture Marburg failed and the gradual pressure of French numerical superiority, together

with the reduction of the British contingent on the death of George II., compelled him to retreat gradually until by the beginning of October both Brunswick and Wolfenbiittel fell into their hands. In the east the king had barely 100,000 men against 300,000 Austrians and Russians. Leaving Prince Henry to observe Daun in Saxony he marched to join von der Goltz, who with 23,000 stood about Schweidnitz. The Russians (50,000) under Buturlin were

approaching from Posen, and Loudon with 72,000 men starting from Glatz manoeuvred to join them. After two months' skirmishing and marching the Allies effected their junction between Liegnitz and Jauer, having completely severed Frederick's communications with Prussia. But Frederick depended for his food and immediate supplies on Southern Silesia, and not caring to risk a battle with odds of three to one against him he withdrew into the entrenched camp of Bunzelwitz, where the Allies did not dare to attack him. Ultimately, as usual, the Russian commissariat broke down, and in September Buturlin withdrew the way he had come. Relieved of this antagonist, Frederick manoeuvred to draw Loudon out of his positions and compel him to fight in the open, but Loudon refused the challenge and after an attempt to surprise Schweidnitz, which failed, withdrew into winter quarters. Prince Henry in Saxony held his own against Daun.

England now threatened to withdraw her subsidies, and as the Prussian armies had dwindled to 60,000 men the end seemed very near. But a turn of fortune was already at hand. On the 5th of January 1762 the tsarina died, and her successor, Peter III., at once offered peace. On the 16th of March an armistice was agreed to, and shortly afterwards the treaty of St Petersburg was signed, by which Pomerania was given back to Prussia and a contingent of 18,000 men placed at Frederick's disposal. The withdrawal of the Russians led in turn to the withdrawal of the Swedes, and thus only France and Austria remained— the former bled white by the strain of her colonial disasters, the latter too weary to make further great exertions. Though the war dragged on for some months, and Prince Henry, assisted by Seydlitz, won the victory of Freiberg over the Empire Army (29th Oct. 1762), no great battle was attempted, and although a revolution at St Petersburg deprived Frederick of Russian assistance, in the autumn Ferdinand drove the French back over the Rhine, and thereupon an armistice was agreed upon by all. Final terms of peace were adjusted on status quo ante basis at Hubertusburg on the 15th of February 1763. Prussia had maintained all her possessions and made good her claim to rank for all time with the Great Powers. (F. N. M.)

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Naval Operations The naval operations of the Seven Years' War began nearly a year before the declaration of hostilities. In June 1755 a British squadron under Boscawen was sent into the Straits of Belle Isle to intercept French ships carrying soldiers and stores to Quebec, in retaliation for aggressions on British possessions in North America. On the &th of June Boscawen seized two French line-of-battle ships fitted as transports, the " Alcide " and the " Lys." A general seizure of French merchant ships followed, and thousands of French sailors were in prison in England by the early days of 1756. The government of Louis XV. did not reply by a declaration of war, but prepared to retaliate by a threat of invasion, which created something like a panic in Great Britain. The government, then in the weak hands of the duke of Newcastle, accumulated warships in the Channel.,

and on the 3rd of February 1756 issued a proclamation which instructed the inhabitants of the southern counties of England to drive their cattle inland in case of a French landing, and thereby much aggravated the prevailing fear. But the invasion scheme was so far only a cover for an attack on Minorca, then held by Great Britain.

A squadron of twelve sail of the line was prepared at Toulon under La Galissoniere, a veteran admiral who had entered the navy in the reign of Louis XIV. It escorted transports carrying 1 5,000 troops under the due de Richelieu. The danger to Minorca, where the garrison had been allowed to fall below its due strength, was well known to the British ministers. On the nth of March they appointed Admiral John Byng to command a squadron which was to carry reinforcements. He did not, however, leave St Helens till the 6th of April. Byng had with him ten sail of the line, and carried 3000 soldiers for the garrison. The ships were indifferently manned, and the admiralty refused to strengthen him by drafts from the ships it

proposed to retain in the Channel. In order to find room for the soldiers, the marines of the squadron were left behind. There was therefore a danger that, if an encounter with the French fleet took place after the reinforcements were landed, the British squadron would be short-handed. Byng reached Gibraltar on the 2nd of May. The French invasion of Minorca had been carried out on the 19th of April. The governor of Gibraltar, General Fowke, refused to part with any of his soldiers to reinforce Minorca. On the 8th of May Byng sailed, and on the 19th he was in communication by signal with General Blakeney, governor of the fortress. Before the soldiers could be landed the French fleet came in sight. Byng had been joined by three ships of the line at Gibraltar, and had therefore thirteen ships to twelve. One of the French vessels, the " Foudroyant" (84), was a finer warship than any in the British line, but in effective power Byng "was at least equal to his opponent, and if his ships were poorly manned La Galissoniere was in worse case. The British admiral rejected one of his small line-of-battle ships in order to engage in the then orthodox manner — van to van, centre to centre, and rear to rear, ship against ship. By the manoeuvres of the afternoon of the 19th and morning of the 20th he gained the weather-gage, and then bore down on the enemy at an angle, the van of the English steering for the van of the French. The sixth ship in his line, the " Intrepid" (74), having lost her foretopmast, became unmanageable and threw the vessels behind her out of order. Thus the six in front were exposed to the fire of all the French, who ran past them and went off. Byng could have prevented them by bearing down, but refused to alter the formation of his fleet. Being now much disturbed by the crippled state of the ships in his van, he made no effort either to land the soldiers he had on board or to renew the action; and after holding a council of war on the 24th of May, which confirmed his own desire to retreat, he sailed for Gibraltar (see Byng, John, for his trial and execution). The loss of Minorca, which was the consequence of this retreat, gave the French a great advantage in the Mediterranean. During the rest of the year no very vigorous measures were taken on either side, though the British government reinforced its squadrons both in the Mediterranean and on the coast of America.

In 1757 the naval war began to be pushed with a vigour hitherto unprecedented. The elder Pitt became the effective head of the government, and was able to set about ruining the French power at sea. Owing to the long neglect of the French navy, it was so inferior in strength to the British that nothing short of the worst mismanagement on Pitt's part could have deprived Great Britain of

victory. Some of the minister's measures were not indeed wise. He sent out, during the last months of 1757 and the whole of 1758, a series of combined expeditions against the French coast, which were costly and for the most part unsuccessful. They terminated in September 1758 with a disaster to the troops engaged in St Cas Bay. Yet these assaults on the French coast did much to revive the spirit of the nation, by removing the fear of invasion. Meanwhile a sound aggressive policy was followed in distant seas during 1758.

In the East Indies the squadron which had been engaged during 1757 in co-operating with Clive in the conquest of Bengal was strengthened. Under the command of Sir George Pocock it was employed against the French squadron of M. d'Ache, who brought a body of troops from Europe under General Lally-Tollendal to attack the possessions of the East India Company on the Coro- mandel coast. The two actions fought at sea on the 29th of April and the 1st of August in the Bay of Bengal were not victories for Sir George Pocock, but neither were they defeats. The French admiral was so uncertain of his power to overcome his opponent that he sailed for the islands of the Indian Ocean so soon as Lally and the authorities at Pondicherry would allow him to go. In America the strong squadron of Boscawen rendered possible the capture of Louisburg, on the 26th of July, and cleared the way for the conquest of Canada in the following year. During 1759 the French government, trusting that the multiplicity of the calls upon its fleet would compel Great Britain to scatter its naval forces, laid plans for a great invasion (for the details of this plan and its results, see Quiberon, Battle of). But the British navy proved numerous enough not only to baffle invasion at home but to effect large conquests of French posses- sions abroad. In North America the co-operation of the navy rendered possible the capture of Quebec by Wolfe. In the West Indies, though an attack on Martinique was repulsed, Guadaloupe was taken in January. In the East Indies the squadron of M. d'Ache reappeared in the Bay of Bengal in September. He fought another undecided action with Sir George Pocock on the 8th, and gave some small help to the French army. But the bad state of his squadron forced him to retreat soon, and the resources of the French being now exhausted in those seas, he did not reappear. The British navy was left in complete command of the Bay of Bengal and the coast of Malabar. On shore, Lally, cut off from reinforcements, was crushed, and Pondicherry fell.

During 1760 and 1761 the French fleet made no attempt to keep the sea. The British navy went" on with the work of conquering French possessions. During 1760 it co-operated on the Lakes and on the St Lawrence in the final conquest of Canada. Between April and June

of 1761 it covered the capture of the island of Belle-Ile on the French coast, which both strengthened its means for maintaining blockade and gave the British government a valuable pledge to be used for extorting concessions when the time for making peace came. The com- plete ruin of French merchant shipping and the collapse of the navy left the maritime population free to seek a livelihood in the privateers. Commerce-destroying was carried on by them with considerable success. The number of British merchant ships taken has been put as high as one-tenth of the whole. But this percentage was the price paid for the enormous advantage gained by the ruin of the French as commercial rivals. The mer- chant shipping of Great Britain increased largely in the course of the war, and from it dates her commercial predominance.

By the close of 1761 the helplessness of France at sea had been demonstrated, but the maritime war was revived for a few months by the intervention of Spain. A close alliance, known as " the family compact," was made between the royal houses of that country and France in the course of 1761. The secret was divulged, and Pitt would have made war on Spain at once. He was overruled and retired. So soon, however, as the treasure ships from America had reached Spain, at the close of 1761, the Spanish government declared war. Its navy was incapable of offering a serious resistance to the British, nor did it even attempt to operate at sea. The British government was left unopposed to carry out the plans which Pitt had prepared against Spain. The only aggressive movement undertaken by the Spanish government was an attack on Portugal, which was the close ally of Great Britain and gave her most useful help by allowing her the free use of Portuguese ports. As the king of Portugal refused to join the French and Spanish alliance, his country was invaded by a Spanish army. Great Britain supported her ally. A regiment of cavalry and seven battalions of foot were landed. They gained several small actions against the invaders, and had

the most active share in the operations which forced them to retire. But the most effective blows delivered against Spain were directed at her colonies. The British troops, left free by the recent success, against the French in America, were employed in an attack on Havana. A powerful fleet left England on the 5th of March, bringing troops which were joined by others in the West Indies; Sir George Pocock, who had returned from the East Indies, was in command.

Under his direction the fleet reached its destination without loss, and Havana was assailed. The citadel known as the Moro Castle made a stout defence, and some of the ships suffered severely in a bombardment. But the worst losses of the besiegers were due to the climate of Cuba, aided by bad sanitary arrangements. Of the 10,000 troops landed, three-fourths are said to have suffered from fever or dysentery, and the majority of the sick died. Yet the Moro was taken on the 30th of September, and Havana, which could have made a longer resistance, surrendered on the 10th of October. Martinique, the last important possession of France in the New World except her half of San Domingo, had fallen in February. In the East Indies, where the surrender of Pondicherry had left other forces free, a combined expedition triumphed easily in October over the natives of Manila, under the direction of the archbishop, who acted as governor. The preliminaries of the peace of Paris were signed on the 3rd of November 1762.

See Beatson, Naval and Military Memoirs of Great Britain (London, 1 804) ; Captain Mahan, Influence of Sea Power upon History ; Lacour Gayet, La Marine militaire de la France sous le regne de Louis XV (Paris, 1902). (D. H.)

SEVERIANA, VIA, an ancient highroad of Italy, running S.E. from Ostia to Terracina, a distance of 73 m. along the coast, and taking its name, no doubt, from the restoration of an already existing road by Septimius Severus, who was a great benefactor of Ostia. It ran along the shore at first, just behind the line of villas which fronted upon the sea, and are now half a mile inland, or even upon its edge (for an inscription records its being damaged by the waves). Farther S.E. it seems to have kept rather more distant from the shore, and it probably kept within the lagoons below the Circean promontory. As is natural in a sandy district where building materials are rare, remains of it are scanty.

See R. Lanciani in Monumenti dei Lincei, xiii. (1903), 185; xvi. (1906), 241; T. Ashby in Melanges de I'&cole francaise de Rome (1905), 157 sqq. (T. As.) ,

SEVERINUS, pope in 640, successor of Honorius. He occupied the papal chair only three months after his consecration, having had to wait a year and a half for its ratification by the emperor. During this long vacancy the exarch of Ravenna, supported by the military body of Rome (exercitus Romanus), occupied the Lateranand seized the treasure of the Church.

SEVERN, JOSEPH (1793-1879), English portrait and subject painter, was born at Hoxton on the 7th of December 1793, his father, a musician, coming of an old Gloucestershire family. During his earlier years he practised portraiture as a miniaturist; and, having studied in the schools of the Royal Academy, in 18 18 he gained the gold medal for his " Una and the Red Cross Knight in the Cave of Despair." In 1819 he exhibited at the Academy his " Hermia and Helena." He was an intimate friend of Keats the poet, whom he accompanied to Italy in 1820 and nursed till his death in 182 1. His picture of " The Death of Alcibiades " then obtained for him an Academy travelling studentship, and he returned to Rome, where he lived till 1841, marrying in 1828 the daughter of Lord Montgomerie, a ward of Lady Westmoreland, one of his chief patrons, and mingling in the congenial art circles of the city. In 1861, after living in England for nineteen years, mainly for the education of his children, he was appointed British consul at Rome, a post which he held till 1872, and during a great part of the time he also acted as Italian consul. His most remarkable work is the " Spectre Ship" from the Ancient Mariner. He painted ", Cordelia watching by the Bed of Lear," the " Roman Beggar," " Ariel," " The Fountain," and " Rienzi," executed a large altar-piece for the church of St Paul at Rome, and produced many portraits, including one of Baron Bunsen and several of Keats. He died at Rome on the 3rd of August 1879. He had six children, of

whom Walter, Arthur and Ann (wife of Sir Charles Newton) were well-known artists.

See the Life and Letters, by William Sharp (1892).

SEVERN, a river of Wales and England. It rises on the N.E. side of Plinlimmon, on the S.W. border of Montgomeryshire, and flows with a nearly semicircular course of about 210 m. to the Bristol Channel; the direct distance from its source to its mouth is about 80 m. Its Welsh name is Hafren, and its Roman name was Sabrina. Through Montgomeryshire its course is at first in a S.E. direction, and for the first 15 m. it flows over a rough precipitous bed. At Llanidloes it bends towards the N.E., passing Newtown and Welshpool; this part of the valley bearing the name of the Vale of Powis. It receives the Vyrnwy near Melverley, and forms a mile of the Welsh border, and then turning in an E.S.E. direction enters Shropshire, and waters the broad rich plain of Shrewsbury, after which it bends southward past Ironbridge and Bridgnorth to Bewdley in Worcestershire. In Shropshire it receives a number of tributaries, the chief of which is the Tern. Continuing its southerly course through Worcester- shire it

passes Stourport, where it receives the Stour(left), and Worcester, shortly after which it receives the Teme (right). It enters Gloucestershire close to Tewkesbury, where it receives the Upper Avon (left), after which, bending in a S.W. direction, it passes the city of Gloucester, below which it becomes estuarine and tidal. A high bore or tidal wave, for which the Severn is notorious, may reverse the flow as high up as Tewkesbury Lock (135 m. above Gloucester), and has sometimes caused great destruction. The estuary merges into the Bristol Channel at the point where it receives on the left the Lower or Bristol Avon, and on the right the Wye.

The source lies at an elevation of about 2000 ft. ; the fall from Llanidloes is about 550 ft., from Newtown 365 ft. and from Shrewsbury, 90 m. above Gloucester, 180 ft. The scenery of the upper valley is wild and picturesque, and that of the lower river is at some points very beautiful. The course between the height of the Wrekin and Wenlock Edge (despite the manufacturing towns on the banks at this point), the valley above Bewdley, where the Forest of Wyre borders the left bank, and the fine position of Worcester, with its cathedral rising above the river, may be noticed. The distance from Gloucester to Avonmouth is 44 m., but the upper part of the estuary is tortuous, and, owing to the bores and shifting shoals, difficult of navigation; On this account the Gloucester and Berkeley Ship Canal, 16J m, in length, was constructed, admitting vessels of 350 tons to Gloucester from the docks at Sharpness on the estuary. The navigation extends up to Arley, above Bewdley, 47 m. from Gloucester, but is principally used up to Stourport (43 m.), from which the Staffordshire and Worcestershire canal gives access to the Wolverhampton industrial district and the Trent and Mersey navigation. The Berkeley canal and the Worcester and Birmingham canal are maintained by the Sharpness New Docks and Gloucester and Birmingham navigation company. There is connexion with the Thames by the Stroudwater canal from Framilode on the estuary, joining the Thames and Severn canal near Stroud. The Wye is in part navigable; the Bristol Avon gives access to the great port of Bristol, and the Upper Avon is in part navigable. The Severn is a good salmon river, and is famous for its lampreys, while many of the tributaries afford fine trout- fishing, such as the Teme and the Vyrnwy. The drainage area of the Severn is 6850 sq. m., including the Wye and the Bristol Avon, or 4350 sq.m. without these rivers.

Severn Tunnel. — The first bridge above the mouth of the Severn is that near Sharpness, which carries the Great Western and Midland joint railway between Berkeley Road and Lydbrook Junction. But the Severn tunnel, carrying the Great Western railway under the estuary

14 m. below the bridge, forms the direct route between the south of England and South Wales. Before the tunnel was made there was a steam ferry at a point known as " New Passage," where a ferry had existed from early times. The steam ferry was opened in connexion with the Bristol and South Wales Union railway in 1863, and was subsequently taken over by the Great Western company. Parliamentary powers to construct the tunnel were obtained by this company in 1872, and work began in the following year. The originator of the scheme and chief engineer was Mr Charles Richardson, and Sir John Hawkshaw was consulting engineer. The principal

difficulty encountered in the construction was the tendency to flooding, owing both to the river breaking into the works, and, more especially, to the underground springs encountered, one of which when tapped completely flooded the works at a rate of 6000 gallons per minute, and delayed the work for more than a year. In 1879, after this disaster, the contract for the whole work was let to Mr T. A. Walker. The total length of the tunnel is 4 m. 624 yds., of which 2\ m. are beneath the river. On the east side the cutting leading to the tunnel has a gradient of I in 100, which is continued in the tunnel itself until the deepest part is reached beneath the river-channel known as " the Shoots," which has a depth of about 60 ft. at low tide and 100 at high tide (ordinary spring). Beneath this the rails run level for 12 chains, after which the ascent of the tunnel and cutting on the west side is on a gradient of I in 90. At Sudbrook on the west side there is a pumping and ventilating station. The tunnel was completed in 1886; the time for passenger trains between Bristol and Cardiff was immediately reduced by nearly one half, and the value of the new route was especially apparent in connexion with the mineral traffic between the South Wales coal-field and London and the ports of the south of England.

SEVERUS, 1 LUCIUS SEPTIMIUS (a.d. 146-211), Roman emperor, was born in 146 at Leptis Magna on the coast of Africa. Punic was still the language of this district, and Severus was the first emperor who had learned Latin as a foreign tongue. The origin of his family is obscure. Spartianus, his biographer in the Hisloria Augusta, doubtless exaggerates his literary culture and his love of learning; but the taste for jurisprudence which he exhibited as emperor was probably instilled into him at an early age. The removal of Severus from Leptis to Rome is attributed by his biographer to the desire for

higher education, but was also no doubt due in some degree to ambition. From the emperor Marcus Aurelius he early obtained, by intercession of a consular ancle, the distinction of the broad purple stripe. At twenty- six, that is, almost at the earliest age allowed by law, Severus attained the quaestorship and a seat in the senate, and proceeded as quaestor militaris to the senatorial province of Baetica, in the Peninsula. While Severus was absent in Africa in consequence of "the death of his father, the province of Baetica, disordered by Moorish invasions and internal commotion, was taken over by the emperor, who gave the senate Sardinia in exchange. On this Severus became military quaestor of Sardinia. His next office, in 174 or 175, was that of legate to the proconsul of Africa, and soon after he was tribune of the plebs. This magistracy, though far different from what it had been in the days of the republic, was still one of dignity, and brought promotion to a higher grade in the senate. In 178 or 179 Severus became praetor by competition for the suffrages of the senators. Then, probably in the same year, he went to Hispania Citerior as legatus juridicus; after that he commanded a legion in Syria. After the death of Marcus Aurelius he was unemployed for several years, and, according to his biographer, studied at Athens. He became consul about 189. In this time also falls the marriage with his second wife, afterwards famous as Julia Domna, whose acquaintance he had no doubt made when an officer in Syria. Severus was governor in succession of Gallia Lugdunensis, Sicily and Pannonia Superior; but the dates at which he held these appointments cannot be determined. He was in command of three legions at Carnuntum, the capital of the province last named, when news reached him that Commodus had been murdered by his favourite concubine and his most trusted servants.

Up to this moment Severus had not raised himself above the usual official level. He had seen no warfare beyond the petty border frays of frontier provinces. But the storm that now tried all official spirits found his alone powerful enough to brave it. Three imperial dynasties had been ended by assassination. The Flavian line had enjoyed much shorter duration and less prestige than the other two, and the circumstances of its fall had been peculiar in that it was probably planned in the interest of the senate, and the senate reaped the immediate fruits. But the crises which arose on the deaths of Nero and of Commodus were alike. In both cases it was left to the army to determine by a struggle which of the divisional commanders should succeed to the command-in-chief, that is, to the imperial throne. In

1 For Marcus Aurelius Alexander Severus, Roman emperor from 322

to 235, see Alexander Severus.

each case the contest began with an impulsion given to the commanders by the legionaries themselves. The soldiers of the great commands competed for the honour and advantages to be won by placing their general on the throne. The officer who refused to lead would have suffered the punishment of treason.

There is a widespread impression that the Praetorian guards at all times held the Roman empire in their hands, but its errone- ousness is demonstrated by the events of the year 193. For the first time in the course of imperial history the Praetorians pre- sumed to nominate as emperor a man who had no legions at his back. This was Pertinax, who has been well styled the Galba of his time— upright and honourable to severity, and zealous for good government, but blindly optimistic about the possibilities of reform in a feeble and corrupt age. After a three months' rule he was destroyed by the power that lifted him up. According to the well-known story, true rather in its outline than in its details, the Praetorians sold the throne to Didius Julianus. But at the end of two months both the Praetorians and their nominee were swept away by the real disposers of Roman rule, the provincial legions. Four groups of legions at the time were strong enough to aspire to determine the destiny of the empire — those quartered in Britain, in Germany, in Pannonia and in Syria. Three of the groups took the decisive step, and Severus in Pannonia, Pescennius Niger in Syria, Clodius Albinus in Britain, received from their troops the title of Augustus. Severus outdid his rivals in promptness and decision. He secured the aid of the legions in Germany and of those in Illyria. These, with the forces in Pannonia, made a combination sufficiently formidable to overawe Albinus for the moment. He probably deemed that his best chance lay in the exhaustion of his competitors by an internecine struggle. At all events he received with submission an offer made by Severus, who confirmed Albinus in his power and bestowed upon him the title of Caesar, making him the nominal heir-apparent to the throne.

Before the action of Severus was known in Rome, the senate and people had shown signs of turning to Pescennius Niger, that he might deliver them from the poor puppet Didius Julianus and avenge on the Praetorians the murder of Pertinax. Having secured the co-operation or neutrality of all the forces in the western part of the empire, Severus hastened to Rome. To win the sympathy of the capital he posed as the avenger and successor of Pertinax, whose name he even added to his own, and used to the end of his reign. The feeble defences of Julianus were broken down and the Praetorians disarmed

and disbanded with- out a blow. A new body of household troops was enrolled and organized on different principles from the old. In face of the senate, as Dio tells us, Severus acted for the moment like " one of the good emperors in the olden days." After a magnificent entry into the city he joined the senate in execrating the memory of Commodus, and in punishing the murderers of Pertinax, whom he honoured with splendid funeral rites. He also en- couraged the senate to pass a decree directing that any emperor or subordinate of an emperor who should put a senator to death should be treated as a public enemy. But he refrained from asking the senate to sanction his accession.

The rest of Severus' reign is in the main occupied with wars. The power wielded by Pescennius Niger, who called himself emperor, and was supposed to control one half of the Roman world, proved to be more imposing than substantial. The magnificent promises of Oriental princes were falsified as usual. Niger himself, as described by Dio, was the very type of medio- crity, conspicuous for no faculties, good or bad. This character had no doubt commended him to Commodus as suited for the important command in Syria, which might have proved a source of danger in abler hands. The contest between Severus and Niger was practically decided after two or three engagements, fought by Severus' officers. The last battle, which took place at Issus, ended in the defeat and death of Niger (194). After, this the emperor spent two years in successful attacks upon the peoples bordering on Syria, particularly in Adiabeue and Osrhocne. Byzantium, the first of Niger's possessions to be attacked, was the last to fall, after a glorious defence.

Late in 196 Severus turned westward, to reckon with Albinus. He was better born and better educated than Severus, but in capacity far inferior. As Severus was nearing Italy he received the news that Albinus had been declared emperor by his soldiers. The first counter-stroke of Severus was to affiliate himself and his elder son to the Antonines by a spurious and posthumous adoption. The prestige of the old name, even when gained in this illegitimate way, was evidently worth much. Bassianus, the elder son of Severus, thereafter known as Aurelius Antoninus, was named Caesar in place of Albinus, and was thus marked out as successor to his father. Without interrupting the march of his forces, Severus contrived to make an excursion to Rome. Here he availed himself with much subtlety of the

sympathy many senators were known to have felt for Niger. Though he was so far faithful to the decree passed by his own advice that he put no senator to death, yet he banished and impoverished many whose presence or influence seemed dangerous or inconvenient to his prospects. Of the sufferers probably few had seen or communi- cated with Niger.

The collision between the forces of Severus and Albinus was the most violent that had taken place between Roman troops since the contest at Philippi. The decisive engagement was fought in February of the year 197 on the plain between the Rhone and the Saone, to the north of Lyons, and resulted in a complete victory for Severus.

Thus, released from all need for disguise, he " poured forth on the civil population all the wrath which he had been storing up for a long time " (Dio). He frightened the senate by calling himself the son of Marcus and brother of Commodus, whom he had before insulted. He read a speech in which he declared that the severity and cruelty of Sulla, Marius and Augustus had proved to be safer policy than the clemency of Pompey and Julius Caesar, which had wrought their ruin. He ended with an apology for Commodus and bitter reproaches against the senate for their sympathy with his assassins. Over sixty senators were arrested on a charge of having adhered to Albinus, and half were put to death. In most instances the charge was a pretence to enable the emperor to crush the forward and dangerous spirits in the senate. The murderers of Commodus were punished; Com- modus himself was deified; and on the monuments from this time onward Severus figures as the brother of that reproduction of all the vice and cruelty of Nero with the refinement left out.

The next years (197-202) were devoted by Severus to one of the dominant ideas of the empire from its earliest days — war against the Parthians. The results to which Trajan and Verus had aspired were now fully attained, and Mesopotamia was definitely established as a Roman province. Part of the time was spent in the exploration of Egypt, in respect of which Dio takes opportunity to say that Severus was not the man to leave anything human or divine uninvestigated. The emperor returned to a well-earned triumph, commemorated to this day by the arch in Rome which bears his name. During the six years which followed (202-208) Severus resided at Rome and gave his attention to the organization of the empire. Severus had confided much of the administration of the empire to Plautianus, the commander of the reorganized Praetorians, who is described by the ancient historians as a second Sejanus. In 203 Plautianus fell, owing, it is said, to an intrigue set on foot by

Caracalla, who had shortly before married the daughter of his victim.

Severus spent the last three years of his life (208-211) in Britain, amid constant and not very successful warfare, which he is said to have provoked partly to strengthen the discipline and powers of the legions, partly to wean his sons from their evil courses by hard military service. He died at York on the 4th of February 211. There are traditions that his death was in some way hastened by Caracalla. This prince had been, since about 197, nominally joint emperor with his father, so that no ceremony was needed for his recognition as monarch.

The natural gifts of Severus were of no unusual order. He had a clear head, promptitude, resolution, tenacity and great organizing power, but no touch of genius. That he was cruel cannot be ques- tioned, but his cruelty was of the calculating kind, and always

directed to some end. He threw the head of Niger over the ramparts of Byzantium, but merely as the best means of procuring a surrender of the stubbornly defended fortress. The head of Albinus he ex- hibited at Rome, but only as a warning to the capital to tamper no more with pretenders. The children of Niger were held as hostages and kindly treated so long as they might possibly afford a useful basis for negotiation with their father; when he was defeated they were killed, lest from among them should arise a claimant for the imperial power. Stern and barbarous punishment was always meted out by Severus to the conquered foe, but terror was deemed the best guarantee for peace. He felt no scruples of conscience or honour if he thought his interest at stake, but he was not wont to take an excited or exaggerated view of what his interest required. He used or de- stroyed men and institutions alike with cool judgment and a single eye to the secure establishment of his dynasty. The few traces of aimless savagery which we find in the ancient narratives are probably the result of fear working on the imagination of the time.

As a soldier Severus was brave, but he can hardly be called a general, in spite of his successful campaigns. He was rather the organizer of victory than the author of it. The operations against Niger were carried out entirely by his officers. Dio even declares that the final battle with Albinus was the first at which Severus had ever been present. When a war was going on he was constantly travelling over the scene of it, planning it and instilling into the army his own pertinacious spirit, but the fighting was usually left to others. His treatment of the army is the most characteristic feature of his reign.

He broke with the decent conventions of the Augustan constitution, ignored the senate, and based his rule upon force. The only title he ever laid to the throne was the pronunctamiento of the legjions, whose adherence to his cause he commemorated even on the coinage of the realm. The legions voted him the adopted son of Marcus Aurelius; the legions associated with him Caracalla in the government of the empire. Severus strove earnestly to wed the army as a whole to the support of his dynasty. He increased enormously the material gains and the honorary distinctions of the service, so that he was charged with corrupting the troops. Yet it cannot be denied that, all things considered, he left the army of the empire more efficient than he found it. He increased the strength of it by three legions, and turned the Praetorians, heretofore a flabby body without military experience or instinct, into a chosen corps of veterans. Their ranks were filled by promotion from all the legions on service, whereas previously there had been special enlistment from Italy and one or two of the neighbouring provinces. It was hoped that these picked men would form a force on which an emperor could rely in an emergency. But to meet the possibility of a legionary revolt in the provinces, one of the fundamental principles of the Augustan empire was abrogated: Italy became a province, and a legion was quartered at Alba Fucens under the direct command of the emperor. Further to obviate the risk of revolution, the great commands in the provinces were broken up, so that, excepting on the turbulent eastern frontier, it was not possible for a commander to dispose of troops numerous enough to render him dangerous to the government.

But, while the policy of Severus was primarily a family policy, he was by no means careless of the security and welfare of the empire. Only in one instance, the destruction of Byzantium, did he weaken its defences for his own ends — an error for which his successors paid dearly, when the Goths came to dominate the Euxine. The trouble- some Danubian regions received the special attention of the emperor, but all over the realm the status and privileges of communities and districts were recast in the way that seemed likely to conduce to their prosperity. The administration acquired more and more of a military character, in Italy as well as in the provinces. Retired military officers now filled many of the posts formerly reserved for civilians of equestrian rank. The praefect of the Praetorians re- ceived large civil and judicial powers, so that the investment of Papinian with the office was less unnatural than it seems at first sight. The alliance between Severus and the jurisconsults had im- portant consequences. While he gave them new

importance in the body politic, and co-operated with them in the work of legal reform, they did him material service by working an absolutist view of the government into the texture of Roman law. Of the legal changes of the reign, important as they were, we can only mention a few details. The emperor himself was a devoted and upright? judge, but he struck a great blow at the purity of the law by transferring the exercise of imperial jurisdiction from the forum to the palace. He sharpened in many respects the law of treason, put an end to the time-honoured quaestiones perpetuae, altered largely that important section of the law which defined the rights of the fiscus, and developed further the social policy which Augustus had embodied in the lex Julia de adultenis and the lex Papia Poppaea.

Severus boldly adopted as an official designation the autocratic title of dominus, which the better of his predecessors had renounced. During his reign the senate was powerless; he took all initiative into his hands. He broke down the distinction between the servants of the senate and the servants of the emperor. All nominations to office or function passed under his scrutiny. The estimation of the old consular and other republican titles was diminished. The growth of capacity in the senate was checked by cutting off the tallest of the poppy-heads early in the reign. The senate became a mere

registration office for the imperial determinations, and its members, as has been well said, a choir for drawling conventional hymns of praise in honour of the monarch. Even the nominal restoration of the senate's power at the time of Alexander Severus, and the acces- sion of so-called " senatorial emperors " later on, did not efface the work of Septimius Severus, which was resumed and carried to its fulfilment by Diocletian.

No period in the history of Latin literature is so barren as the reign of Severus. Many later periods — the age of Stilicho, for example — shine brilliantly by comparison. The only great Latin writers are the Christians Tertullian and Cyprian. The Greek literature of the period is richer, but not owing to any patronage of the emperor, except perhaps in the case of Dio Cassius, who, though no admirer of Severus, attributes to encouragement received from him the execution of the great historical work which has come down to our time. The numerous restorations of ancient buildings and the many new con^ structions carried out by Severus show that he was not

insensible to the artistic glories of the past ; and he is known to have paid much attention to works of art in foreign countries where his duties took him. But he was in no sense a patron or connoisseur of art. As to religion, if we may trust DJo, one of the most superstitious of historians, Severus was one of the most superstitious of monarchs. But apart from that it is difficult to say what was his influence on the religious currents of the time. He probably did a good deal to strengthen and extend the official cult of the imperial family, which had been greatly developed during the prosperous times of the Antonines. But what he thought of Christianity, Judaism or the Oriental mysticism to which his wife Julia Domna gave such an impulse in the succeeding reign, it is impossible to say. We may best conclude that his religious sympathies were wide, since tradition has not painted him as the partisan of any one form of worship.

Authorities. — Severus himself wrote an autobiography which was regarded as candid and trustworthy on the whole. The events of the reign were recorded by several contemporaries. The first place among these must be given to Dio Cassius, who stands to the empire in much the same relation as Livy to the republic. He became a senator in the year when Marcus Aurelius died (180) and retained that dignity for more than fifty years. He was well ac- quainted with Severus, and was near enough the centre of affairs to know the real nature of events, without being great enough to have personal motives for warping the record. Though this portion of Dio's history no longer exists in its original form, we have copious extracts from it, made by Xiphilinus, an ecclesiastic of the I ith century. The faults which have impaired the credit of Dio's great work in its earlier portions — his lack of the critical faculty, his inexact knowledge of the earlier Roman institutions, his passion for signs from heaven — could do little injury to the narrative of an eye- witness ; and he gives the impression of unusual freedom from passion, prejudice and insincerity. His Greek, too, stands in agreeable contrast to the debased Latin of the Scriptores historiae Auguslae. The Greek writer Herodian was also a contemporary of Severus, but the mere fact that we know nothing of his life is in itself enough to show that his opportunities were not so great as those of Dio. The reputation of Herodian, who was used as the main authority for the times of Severus by Tillemont and Gibbon, has not been proof against the criticism of later scholars. His faults are those of rhetoric and exaggeration. His narrative is probably in many places not independent of Dio. The Augustan historians, unsatisfactory compilers, form a principal source for the history of the reign. The numerous inscriptions belonging to the age of Septimius Severus

enable us to control at many points and largely to supplement the literary records of his reign, particularly as regards the details of his administration. The juridical works of Justinian's epoch embody much that throws light on the government of Severus.

The principal modern works relating to this emperor, after Tillemont and Gibbon, are— J. J. Schulte, De imperatore L. Septimio Severo (Miinster, 1867); Hofner, Untersuchungen zur Geschichte des Kaisers L. Septimius Severus (Giessen, 1875) ; Untersuchungen zur romischen Kaiser geschichte, ed. by M. Budinger; H. Schiller, Geschichte der romischen Kaiserzeit (Gotha, 1880-1883) ; De Ceuleneer, Essai sur la vie et le regne de Septime Severe (Brussels, 1880); ReVille, La Religion & Rome sous les Severes (Paris, 1886); Fuchs, Geschichte des Kaisers L. Septimius Severus (1884). On Julia Domna, see M. G. Williams, in American Journal of Archaeology, vi. (1902), PP- 259-306. (J. S. R.)

SEVERUS, SULPICIUS (c. 363-c. 425), Christian writer, was a native of Aquitania. He was imbued with the culture of his time and of his country, which was then the only true home of Latin letters and learning. Almost all that we know of Severus' life comes from a few allusions in his own writings, and some passages in the letters of his friend Paulinus, bishop of Nola. In his early days he was famous as a pleader, and his knowledge of Roman law is reflected in parts of his writings. He married a wealthy lady belonging to a consular family, who died young, leaving him no children. At this time Severus came under the powerful influence of St Martin, bishop

of Tours, by whom he was led to devote his wealth to the Christian poor, and his own powers to a life of good works and meditation. To use the words of his friend Paulinus, he broke with his father, followed Christ, and set the teachings of the " fishermen " far above all his " Tullian learning." He rose to no higher rank in the church than that of presbyter. He is said to have been led away in his old age by Pelagianism, but to have repented and inflicted long-enduring penance on himself. His time was passed chiefly in the neighbourhood of Toulouse, and such literary efforts as he permitted to himself were made in the interests of Christianity. In many respects no two men could be more unlike than Severus, the scholar and orator, well versed in the ways of the world, and Martin, the rough Pannonian bishop, ignorant, suspicious of culture, champion of the monastic life, seer and worker of miracles. Yet the spirit of the rugged saint subdued that of the polished scholar, and the works of Severus are only important because they reflect the ideas, influence and aspirations of Martin, the foremost ecclesiastic of Gaul.

The chief work of Severus is the Chronica (c. 403), a summary of sacred history from the beginning of the world to his own times, with the omission of the events recorded in the Gospels and the Acts, " lest the form of his brief work should detract from the honour due to those events." The book was a text-book, and was used as such in the schools of Europe for about a century and a half after the editio princeps was published by Flacius Illyricus in 1556. Severus nowhere clearly points to the class Of readers for whom his book is designed. He disclaims the intention of making his work a substitute for the actual narrative contained in the Bible. " Worldly historians " had been used by him, he says, to make clear the dates and the connexion of events and for supplementing the sacred sources, and with the intent at once to instruct the unlearned and to " con- vince " the learned. Probably the " unlearned " are the mass of Christians and the learned are the cultivated Christians and pagans alike, to whom the rude language of the sacred texts, whether in Greek or Latin, would be distasteful. The literary structure of the narrative shows that Severus had in his mind principally readers on the same level of culture with himself. He was anxious to show that sacred history might be presented in a form which lovers of Sallust and Tacitus could appreciate and enjoy. The style is lucid and almost classical. Though phrases and even sentences from many classical authors are inwoven here and there, the narrative flows easily, with no trace of the jolts and jerks which offend us in almost every line of an imitator of the classics like Sidonius. It is free from useless digres- sions. In order that his work might fairly stand beside that of the old Latin writers, Severus ignored the allegorical methods of inter- preting sacred history to which the heretics and the orthodox of his age were wedded.

As an authority for times antecedent to his own, Severus is of little moment. At only a few points does he enable. us to correct or supplement other records. Bernays has shown that he based his narrative of the destruction of Jerusalem by Titus on the account given by Tacitus in his " Histories," a portion of which has been lost. We are enabled thus to contrast Tacitus with Josephus, who warped his narrative to do honour to Titus. In his allusions to the Gentile rulers with whom the Jews came into contact from the time of the Maccabees onwards, Severus discloses some points which are not without importance. But the real interest of his work lies, first, in the incidental glimpses it affords all through of the history of his own time ; next and more particularly, in the information he has pre- served concerning the struggle over the Priscillianist heresy, which disorganized and degraded the churches of Spain and Gaul, and

particularly affected Aquitaine. The sympathies here betrayed by Severus are wholly those of St Martin. The bishop had withstood Maximus, who ruled for some years a large part of the western portion of the empire, though he never conquered Italy. He had reproached him with attacking and overthrowing his predecessors on the throne, and for his dealings with the church. Severus loses ho opportunity for laying stress on the crimes and follies of rulers, and on their cruelty, though he once declares that, cruel as rulers could be, priests could be crueller still. This last statement has reference to the bishops who had left Maximus no peace till he had stained his hands with the blood of Priscillian and his followers. Martin, too, had denounced the worldliness and greed of the Gaulish bishops and clergy. Accordingly we find that Severus, in narrating the division of Canaan among the tribes, calls the special attention of ecclesiastics to the fact that no portion of the land was assigned to the tribe of Levi, lest they should be hindered in their service of God. " Our clergy seem, he says, " not merely forgetful of the lesson but ignorant of it, such a passion for possessions has in our days fastened like a pestilence on their souls." We here catch a glimpse of the circumstances which were winning over good men to monasticism in the West, though the evidence of an enthusiastic votary of the solitary life, such as Severus was, is probably not free from exaggeration. Severus also fully sympathized with the action of St Martin touching Priscillianism. This mysterious Western

offshoot of Gnosticism had no single feature about it which could soften the hostility of a character such as Martin's, but he resisted the introduction of secular punishment for evil doctrine, and withdrew from communion with those bishops in Gaul, a large majority, who invoked the aid of Maximus against their erring brethren. In this connexion it is interesting to note the account given by Severus of the synod held at Rimini in 359, where the question arose whether the bishops attending the assembly might lawfully receive money from the imperial treasury to recoup their travelling and other ex- penses. Severus evidently approves the action of the British and Gaulish bishops, who deemed it unbecoming that they should lie under pecuniary obligation to the emperor. His ideal of the church required that it should stand clear and above the state.

After the Chronica the chief work of Severus is his Life of Martin, a contribution to popular Christian literature which did much to

establish the great reputation which that wonder-working saint maintained throughout the middle ages. The book is not properly a biography, but a catalogue of miracles, told in all the simplicity of absolute belief. The power to work miraculous signs is assumed to be in direct proportion to holiness, and is by Severus valued merely as an evidence of holiness, which he is persuaded can only be attained through a life of isolation from the world. , In the first of his Dialogues (fair models of Cicero) , Severus puts into the mouth of an interlocutor (Posthumianus) a pleasing description of the life of coenobites and solitaries in the deserts bordering on Egypt. The main evidence of the virtue attained by them lies in the voluntary subjection to them of the savage beasts among which they lived. But Severus was no indiscriminating adherent of monasticism. The same dialogue shows him to be alive to its dangers and defects. The second dialogue is a large appendix to the Life of Martin, and really supplies more in- formation of his life as bishop and of his views than the work which bears the title Vita S. Martini. The two dialogues occasionally make interesting references to personages of the epoch. In Dial. I, cc. 6, 7, we have a vivid picture of the controversies which raged at Alexandria over the works of Origen. The judgment of Severus himself is no doubt that which he puts in the mouth of his inter- locutor Posthumianus : " I am astonished that one and the same man could have so far differed from himself that in the approved portion of his works he has no equal since the apostles, while in that portion for which he is justly blamed it is proved that no man has committed more unseemly errors." Three Epistles on the death of Martin (ad Eusebium, ad Aurelium diaconum, ad Bassulam) complete the list of Severus' genuine works. Other letters (to his sister), on the love of God and the renunciation of the world, have not survived.

Authorities. — The text of the Chronica rests on a single nth century MS., one of the Palatine collection now in the Vatican; of the other works MSS. are abundant, the best being one of the 6th century at Verona. Some spurious letters bear the name of Severus; also in a MS. at Madrid is a work falsely professing to be an epitome of the Chronica of Severus, and going down to 511. The chief editions of the complete works of Severus are those by De Prato (Verona, 1741) and by Halm (forming vol. i. of the Corpus scrip- lorum ecclesiasticorum Latinorum, Vienna, 1866). There is a most admirable monograph on the Chronica by J. Bernays (Berlin, 1861). See also Goelzer, Grammaticae in Sulp. Severum observationes (1884) (thesis).

SEVERY (probably connected with the English word " sever "), in

architecture, any main compartment or division of a building. The word has been supposed to be a corruption of Ciborium, as Gervase of Canterbury uses the word in this sense; but he probably alludes to the vaulted form of the upper part of the web of each severy.

SEVIER, JOHN (1745-1815), American frontiersman, first governor of Tennessee, was born in Rockingham county, Virginia, on the 23rd of September 1745, of Huguenot ancestry, the family name being Xavier. He settled on the Watauga on the western slope of the AHeghanies in 1772, and served as a captain in Lord Dunmore's War in 1774. Early in 1776 the Watauga settlements were annexed to North Carolina, and Sevier, who from the beginning had been a member of the Watauga govern- ment, now represented the district in the provincial congress, which met at Halifax in November-December 1776 and adopted the first state constitution, and in 1777 he was a member of the state House of Commons. He took part in the campaign of 1 780 against the British, especially distinguishing himself in the battle of King's Mountain, where he led the right wing. In December 1780 he defeated the Cherokees at Boyd's Creek (in the present Sevier county, Tennessee), laying waste their country during the following spring. Later in the same year (1781), under General Francis Marion, he fought the British in the Carolinas and Georgia. In 1784, when North Carolina first ceded its western lands to the Federal government, he took part in the revolt of the western settlements; he was

president of the first convention which met in Jonesboro on the 23rd of August, and opposed the erection of a new state, but when the state of Frankland (afterwards Franklin, in honour of Benjamin Franklin) was organized in March 1785, he became its first and only governor (1785-1788), and as such led his riflemen against the Indians; in May 1788, after the end of his term, men in his command massacred several Indians from a friendly village, and thus provoked a war in which Sevier again showed his ability as an Indian fighter. He was arrested by the North Carolina authorities, partly as a leader of the independent government and partly for the Indian massacre, but escaped. About this time he attempted to make an alliance with Spain on behalf of the state of Franklin. In 1789 he was a member of the North Carolina Senate, and in 1 790-1 791 of the National House of Representatives. After the final cession of its western territory by North Carolina to the United States in 1790 he was appointed brigadier-general of militia for the eastern district of the " Territory South of the Ohio "; and conducted the Etowah campaign against the – Creeks and Cherokees in 1793. When Tennessee was admitted into the Union as a state, Sevier became its first governor

(1796-1801) and was governor again in 1803-1809. He was again a member of the National House of Representatives in 1811-1815, and then was commissioner to determine the boundary of Creek lands in Georgia. He died near Fort Decatur, Georgia, on the 24th of September 181 5.

See J. R. Gilmore, The Rear-Guard of the Revolution (New York, 1886), and John Sevier as a Commonwealth Builder (New York, 1887) ; errors in Gilmore's books are pointed out in Theodore Roosevelt's The Winning of the West (New York, 1 894-1 896).

SEVIGNfi, MARIE DE RABUTIN-CHANTAL, Marquise de (1626-1696), French letter-writer, was born at Paris on the 5th of February 1626. The family of Rabutin (if not so illustrious as Bussy, Madame de S6vigne's notorious cousin, affected to consider it) was one of great age and distinction in Burgundy. It was traceable in documents to the 12th century, and the castle which gave it name still existed, though in ruins, in Madame de Sevigne's time. The family had been gens d'Spge for the most part, though Francois de Rabutin, the author of valuable memoirs on the sixth decade of the 16th, century, belonged to it. Marie's father, Celse Benigne de Rabutin, Baron de Chantal, was the son of the celebrated " Sainte " Chantal, friend and disciple of St Francis of Sales; her mother was Marie de Coulange[s]. Celse de Rabutin, a great duellist, was killed during the English descent on the Isle of Rh6 in July 1627. His wife did not survive him many years, and Marie was left an orphan at the age of seven years and a few months. She then passed into the care of her grandparents on the mother's side; but they were both aged, and the survivor of them, Philippe de Coulanges (or Coulange), died in 1636, Marie being then ten years old. Her uncle Christophe de Coulanges, abbe de Livry, was chosen as her guardian. He was somewhat young for the guardianship of a girl, being only twenty-nine, but readers of his niece's letters know how well " Le Bien Bon " — for such is his name in Madame de Sevigne's little language — acquitted himself of the trust. He lived till within ten years of his ward's death, and long after his nominal functions were ended he was in all matters of business the good angel of the family, while for half a century his abbacy of Livry was the favourite residence both of his niece and her daughter. Coulanges was much more of a man of business than of a man of letters, but either choice or the fashion of the time induced him to make of his niece a learned lady. Jean Chapelain and Gilles M6nage are specially mentioned as her tutors, and Menage at least fell in love with her. Tallemant des Reaux gives more than one instance of the cool and good-humoured raillery with which she received his passion, and the earliest letters of hers that we

possess are addressed to Menage. Another literary friend of her youth was the poet Denis Sanguin de Saint-Pavin. Among her own sex she was intimate with all the coterie of the H6tel Rambouillet, and her special ally was Mademoiselle de la Vergne, afterwards Madame de la Fayette. In person she was extremely attractive, though the minute critics of the time

(which was the palmy day of portraits in words) objected to her divers deviations from strictly regular beauty, such as eyes of different colours and sizes, a "square-ended" nose and a somewhat heavy jaw. Her beautiful hair and complexion, however, were admitted even by these censors, as well as the extraordinary spirit and liveliness of her expression. Her long minority, under so careful a guardian as Coulanges, had also raised her fortune to the amount of 100,000 crowns-ˆa large sum for the time, and one which with her birth and beauty might have allowed her to expect a brilliant marriage. There had been some talk of her cousin Bussy, but fortunately for her this came to nothing. She married Henri, marquis de Sevigne, a Breton gentleman of good family, allied to the oldest houses of that province, but of no great estate. The marriage took place on August 4, 1644, and the pair went almost immediately to Sevigne's manor-house of Les Rochers, near Vitre, a place which Madame de Sevigne was in future years to immortalize. It was an unfortified chateau of no great size, but picturesque, with the peaked turrets common in French architecture, and surrounded by a park and grounds. The abundance of trees gave it the repute of being damp and somewhat gloomy. Fond, however, as Madame de Sevigne was of society, it may be sus- pected that the happiest days of her brief married life were spent there. For there at any rate her husband had less oppor- tunity than in Paris of neglecting her, and of wasting her money and his own. Very little good is said of Henri de Sevigne by any of his contemporaries. He was one of the innumerable lovers of Ninon de l'Enclos, and made himself even more con- spicuous with a certain Madame de Gondran, known in the nickname slang of the time as " La Belle Lolo." He was wildly extravagant. That his wife loved him and that he did not love her was generally admitted. At last his vices came home to him. He quarrelled with the Chevalier d'Albret about Madame de Gondran, fought with him and was mortally wounded on the 4th of February 1651; he died two days afterwards. There is no reasonable doubt that his wife regretted him a great deal more than he deserved. Though only six and twenty, and

more beautiful than ever, she never married again despite frequent offers, and no aspersion was ever thrown, save in one instance, on her fame. For the rest of her life she gave herself up to her children. These were two in number, and they divided their mother's affections by no means equally. The eldest was a daughter, Francoise Marguerite, who was born on the 10th of October 1646, whether at Les Rochers or in Paris is not certain. The second, a son, Charles, was born at Les Rochers in the spring of 1648. To him Madame de Sevigne was an indulgent, a generous (though not altogether just) and in a way an affection- ate mother. Her daughter, the future Madame de Grignan, she worshipped with an almost insane affection, which only its charming literary results and the delightful qualities which accompanied it in the worshipper, though not in the worshipped, save from being ludicrous if not revolting.

After her husband's death Madame de Sevignd passed the greater part of the year 16 51 in retirement at Les Rochers, but she returned to Paris in November of that year. For nearly ten years little of importance occurred in her life, which was passed at Paris in a house she occupied in the Place Royale (not as yet in the famous Hdtel Carnavalet), at Les Rochers, at Livry or at her own estate of Bourbilly in the M&connais. She had, however, in 1658, a quarrel with her cousin Bussy. Notwithstanding Bussy's various delinquencies the cousins had always been friends; and the most amusing and character- istic part of Madame de Sevigne's correspondence, before the date of her daughter's marriage, is addressed to him. She had a strong belief in family ties; she recognized in Bussy a kindred spirit, and she excused his faults as Rabutinades and Rabutinages. But a misunderstanding about money brought about a quarrel, which in its turn had a long sequel, and results not unimportant in literature. Bussy and his cousin had jointly come in for a considerable legacy, and he asked her for a loan. If this was not positively refused, there was a difficulty made about it, and Bussy was offended. A year later, at the escapade of Roissy

(see Bussy), according to his own account, he improvised (according to probability he had long before written it) the famous portrait of Madame de Sevigne which appears in his notorious Histoire amoureuse, and is a triumph of malice. Circulated at first in manuscript and afterwards in print, this caused Madame de Sevigne the deepest pain and indignation, and the quarrel between the cousins was not fully made up for years, though after Bussy's disgrace and imprisonment in 1666 the correspondence was renewed. What might have been, and to some extent was, a much

more serious matter occurred in 1 66 1 at the downfall of the Superintendent Fouquet. It was announced on indubitable authority that communications from her had been found in the coffer where Fouquet kept his love letters. She protested that the notes in question were ot friendship merely, and Bussy (one of the not very numerous good actions of his life) obtained from Le Tellier, who as minister had examined the letters, a corroboration of the protest. But these letters were never published, and there have always been those who held that Madame de Sevigne regarded Fouquet with at least a very warm kind of friendship. It is certain that her letters to Pomponne describing his trial are among her masterpieces of unaffected, vivid and sympathetic narration.

During these earlier years Madame de Sevign6 had a great affection for the establishment of Port Royal, which was not without its effect on her literary work. That work, however, dates in its bulk and really important part almost entirely from the last thirty years of her life. Her letters before the marriage of her daughter, though by themselves they would suffice to give her a very high rank among letter-writers, would not do more than fill one moderate-sized volume. Those after that marriage fill nearly ten large volumes in the latest and best edition. We do not hear very much of Mademoiselle de Sevigne's early youth. For a short time, at a rather uncertain date, she was placed at school with the nuns of Sainte-Marie at Nantes. But for the most part her mother brought her up herself, assisted by the Abbe de la Mousse, a faithful friend, and for a time one of her most constant companions. La Mousse was a great Cartesian, and he made Mademoiselle de S6vign6 also a devotee of the bold soldier of Touraine. But she was bent on more mundane triumphs than philosophy had to offer. Her beauty is all the more incontestable that she was by no means generally liked. Bussy, a critical and not too benevolent judge, called her " la plus jolie fille de France, " and it seems to be agreed that she resembled her mother, with the advantage of more regular features. She was introduced at court early, and as she danced well she figured frequently in the ballets which were the chief amusement of the court of Louis XIV. in its early days. If, however, she was more regularly beautiful than her mother she had little or nothing of her attraction, and like many other beauties who have entered society with similar expectations she did not immediately find a husband. Various projected alliances fell through for one reason or another, and it was not till the end of 1668 that her destiny was settled. On January 29 in the next year she married Francois d'Adhdmar, comte de Grignan, a Provencal, of one of the noblest families of France, and a man of amiable and

honourable character, but neither young, nor handsome, nor in reality rich. He had been twice married and his great estates were heavily encumbered. Neither did the large dowry (300,000 livres) which Madame de SevignS, somewhat unfairly to her son, bestowed upon her daughter, suffice to clear encumbrances, which were constantly increased in the sequel by the extravagance of Madame de Grignan as well as of her husband.

Charles de Sevign6 was by this time twenty years old. He never appears to have resented his mother's preference of his sister; but, though thoroughly amiable, he was not (at any rate in his youth) a model character. Nothing is known of his educa- tion, but just before his sister's marriage he volunteered for a rather harebrained expedition to Crete against the Turks, and served with credit. Then his mother bought him the commission of guidon (a kind of sub-cornet) in the Gendarmes Dauphin, in which regiment he served for some years. But though he always

fought well he was not an enthusiastic soldier, and was constantly and not often fortunately in love. He followed his father into the nets of Ninon de l'Enclos, and was Racine's rival with Mademoi- selle Champmesle. The way in which his mother was made con- fidante of these discreditable and not very successful loves is characteristic both of the time and of the country. In 1669 M. de Grignan, who had previously been lieutenant-governor of Languedoc, was transferred to Provence. The governor-in- chief was the young duke of Vend&me. But at this time he was a boy, and he never really took' up the government, so that Grignan for more than forty years was in effect viceroy of this important province. His wife rejoiced greatly in the part of vice-queen; but their peculiar situation threw on them the expenses without the emoluments of the office, so that the Grignan money affairs hold a larger place in Madame de Sevigne's letters than might perhaps be wished.

In 1671 Madame de Sevigne, with her son, paid a visit to Les Rochers, which is memorable in her history and in literature. The states of Brittany were convoked that year at Vitre. This town being in the immediate neighbourhood of Les Rochers, Madame de Sevigne's usually quiet life at her country-house was diversified by the necessity of entertaining the governor, the due de Chaulnes, of appearing at his receptions and so forth. All these matters are

recorded in her letters, together with much good-natured raillery on the country ladies of the neighbourhood and their ways. She remained at Les Rochers during the whole summer and autumn of 1671, and did not return to Paris till late in November. The country news is then succeeded by news of the court. At the end of the next year, 1672, one great wish of her heart was gratified by paying a visit to her daughter in her vice-royalty of Provence. Madame de Grignan does not seem to have been very anxious for this visit — perhaps because, as the letters show in many cases, the exacting affection of her mother was somewhat too strong for her own colder nature, perhaps because she feared such a witness of the ruinous extra- vagance which characterized the Grignan household. But her mother remained with her for nearly a year, and did not return to Paris till the end of 1673. During this time we have (as is usually the case during these Provencal visits and the visits of Madame de Grignan to Paris) some letters addressed to Madame de Sevigne, but comparatively few from her. A visit of the second class was the chief event of 1674. 1675 brought with it the death of Turenne (of which Madame de Sevign6 has given a noteworthy account, characteristic of her more ambitious but not perhaps her more successful manner), and also serious disturbances in Brittany. Notwithstanding these it was necessary for Madame de Sevigne to make her periodical visit to Les Rochers. She reached the house in safety, and the friendship of Chaulnes protected her both from violence and from the exactions which the miserable province underwent as a punishment for its resistance to excessive and unconstitutional taxation. No small part of her letters is occupied by these affairs. .

The year 1676 saw several things important in Madame de Sevigne's life. For the first time she was seriously ill — it would appear with rheumatic fever — and she did not thoroughly recover till she had visited Vichy. Her letters from this place are among her best, and picture life at a 17th-century watering-place with unsurpassed vividness. In this year, too, took place the trial and execution of Madame de Brinvilliers. This event figures in the letters, and the references to it are among those which have given occasion to unfavourable comments on Madame de Sevigne's character. In the next year, 1677, she moved into the Hotel Carnavalet, a house which still remains and is inseparably con- nected with her memory, and she had the pleasure of welcoming the whole Grignan family to it. They remained there a long time; indeed nearly two years seem to have been spent by Madame de Grignan partly in Paris and partly at Livry. The return to Provence took place in October 1678, and next year Madame de Sevigne had the grief of losing La Rochefoucauld,

the most eminent and one of the most intimate of her close personal friends and constant associates. In 1680 she again visited Brittany, but the close of that year saw her back in Paris

to receive another and even longer visit. from her daughter, who remained in Paris for four years. Before the end of the last year of this stay (in February 1684) Charles de Sevigne, after all his wandering loves, and after more than one talked-of alliance, was married to a young Breton lady, Jeanne Marguerite de Mauron, who had a considerable fortune. In the arrangements for this marriage Madame de Sevigne practically divided all her fortune between her children (Madame de Grignan of course receiving an unduly large share) , and reserved only part of the life interest. The greed of Madame de Grignan nearly broke her brother's marriage, but it was finally concluded, and proved happy in a somewhat singular fashion. Both Sevigne and his wife became deeply religious, and at first Madame de Sevign6 found their household (for she gave up Les Rochers to them) not at all lively. But by degrees she grew fond of her daughter-in- law. During this year she spent a considerable time in Brittany, first on business, afterwards on a visit to her son, and partly it would appear for motives of economy. But Madame de Grignan continued with only short absences to inhabit Paris, and the mother and daughter were practically in each other's company until 1688. The proportion of letters therefore that we have for the decade 1677-1687 is much smaller than that which represents the decade preceding it; indeed the earlier period contains the great bulk of the whole correspondence. In 1687 the Abbe de Coulanges, Madame de Sevigne's uncle and good angel, died, and in the following year the whole family were greatly excited by the first campaign of the young marquis de Grignan, Madame de Grignan's only son, who was sent splendidly equipped to the siege of Philippsbourg. In the same year Madame de Sevign6 was present at the Saint-Cyr performance of Esther, and some of her most amusing descriptions of court ceremonies and ex- periences date from this time. 1689 and 1690 were almost entirely spent by her at Les Rochers with her son; and on leaving him she went across France to Provence. There was some ex-citement during her Breton stay, owing to the rumour of an English descent, on which occasion the Breton militia was called out, and Charles de Sevigne appeared for the last time as a soldier; but it came to nothing. 1691 was passed at Grignan and other places in the south, but at the end of it Madame de Sevigne returned to Paris, bringing the Grignans with her; and her daughter stayed with her till 1694. The year 1693 saw the loss of two of her oldest friends — Bussy Rabutin, her faithless and troublesome but in his own way

affectionate cousin, and Madame de la Fayette, her life-long companion, and on the whole perhaps her best and wisest friend. Another friend almost as intimate, Madame de Lavardin, followed in 1694. Madame de Sevigne spent but a few months of this latter year alone, and followed her daughter to Provence. She never revisited Brittany after 1691. Two important marriages with their preparations occupied most of her thoughts during 1694-1695. The young marquis de Grignan married the daughter of Saint-Amant, an immensely rich financier; but his mother's pride, ill-nature and bad taste (she is said to have remarked in full court that it was necessary now and then to " manure the best lands, " referring to Saint-Amant's wealth and low birth, and the Grignan's nobility) made the marriage not very happy. His sister Pauline, who, in the impossibility of dowering her richly, had a narrow escape of the cloister, made a marriage of affection with the marquis de Simiane, and eventually became the sole representa- tive and continuator of the families of Grignan and Sevign6.

Madame de Sevigne survived these alliances but a very short time. During an illness of her daughter she herself was attacked by smallpox in April 1696, and she died on the 1 7th of that month at Grignan, and was buried there. Her idolized daughter was not present during her illness. But in her will Madame de Sevigne still showed her preference for this not too grateful child, and Charles de Sevigne accepted his mother's wishes in a letter showing the good-nature which he had never lacked. But the two families were, except as has been said for Madame de Simiane and her posterity, to be rapidly broken up. Charles de Sevigne and his wife had no children, and he himself, after occupying some public posts (he was king's lieutenant in Brittany

in 1697), went with his wife into religious retirement at Paris in 1703, and after a time sequestered himself still more in the seminary of Sainte-Magloire, where he died on March 26, 17 13. His widow survived him twenty years. Madame de Grignan had died on August 16, 1705, at a country-house near Marseilles, of the very disease which she had tried to escape by not visiting her dying mother. Her son, who had fought at Blenheim, had died of the same malady at Thionville the year before. Marie Blanche, her eldest daughter, was in a convent, and, as all the eomte de Grignan's brothers had either entered the church >r died unmarried, the family, already bankrupt in fortune, was extinguished in the male line by Grignan's own death in 1714, it a great age. Madame de Simiane, whose connexion with

the aistory of the letters is important, died in 1737.

The chief subjects of public interest and the principal family events of importance which are noticed in the letters of Madame de Sevigne have been indicated already. But, as will readily be understood, neither the whole nor even the chief interest of her correspondence is confined to such things. In the latest edition the letters extend to sixteen Or seventeen hundred, of which; how- ever, a considerable number (perhaps a third) are replies of other persons or letters addressed to her, or letters of her family and friends having more or less connexion with the subjects of her correspond- ence. As a rule her own letters, especially those to her daughter, are of great length. Writing as she did in a time when newspapers were not, or at least were scanty and jejune, gossip of all sorts ap- pears among her subjects, and some of her most famous letters are pure reportage (to use a modern French slang term), while others deal with strictly private matters. Thus one of her best-known pieces has for subject the famous suicide of the great cook Vatel owing to a misunderstanding as to the provision of fish for an entertainment given to the king by Conde at Chantilly. Another (one of the most characteristic of all) deals with the projected marriage of Lauzun and Mademoisellfc de Montpensier; another with the refusal of one of her own foctmer: to turn hay-maker when it was important to get the crop in at Les Rochers; another with the fire which burnt out her neighbour's house in Paris. At one moment she tells how a forward lady of honour was disconcerted in offering certain services at Mademoiselle's levee ; at another how ill a courtier's clothes became him. She enters, as has been said, at great length into the pecuniary difficulties of her daughter; she tells the most extra- ordinary stories of the fashion in which Charles de S6vign6 sowed his wild oats; she takes an almost ferocious interest and side in her daughter's quarrels with rival beauties or great officials in Provence. Almost all writers of literary letters since Madame de S&vigne's days, or rather since the publication of her correspondence, have imitated her more or less directly, more or less consciously, and it is therefore only by applying that historic estimate upon which all true criticism rests that her full value can be discerned. The charm of her work is, however, so irresistible that, read even without any historical knowledge and in the comparatively adulterated editions in which it is generally met with, that charm can hardly be missed. Madame de Sevign6 was a member of the strong and original group of writers — Retz, La Rochefoucauld, Corneille, Pascal, Saint-Evre- mond, Descartes and the rest — who escaped the influence of the later 17th century, while they profited by the reforms of the earlier. According

to the strictest standard of the Academy her phraseology is sometimes incorrect, and it occasionally shows traces of the quaint and affected style of the Precieuses; but these things only add to its savour and piquancy. In lively narration few writers have ex- celled her, and in the natural expression of domestic and maternal affection none. She had an all-observant eye for trifles and the keenest possible appreciation of the ludicrous, together with a hearty relish for all sorts of amusements, pageants and diversions, and a deep though not voluble or over-sensitive sense of the beauties of nature. But with all this she had an understanding as solid as her temper was gay. Unlike her daughter, she was not a professed blue-stocking or philosophess. But she had a strong affection for theology, in which she inclined (like the great majority of the religious and intelligent laity of her time in France) to the Tansenist side. Her favourite author in this class was Nicole. She has been reproached with her fondness for the romances of Mile de Scudˆry and the rest of her school. But probably many persons who make that reproach have themselves ne:ver read the works they despise, and are ignorant how much merit there is in them. In purely literary criticism Madame de SeVign6 was no mean expert. Her preference for Corneille over Racine has much more in it than the fact that the elder poet had been her favourite before the younger began to write; and her remarks on La Fontaine and some other authors are both judicious and independent. Nor is she wanting in original reflections of no ordinary merit. But to enjoy her work in its most enjoyable point — the combination of fluent and easy style with quaint archaisms and tricks of phrase — it must be read as she wrote it, and not in the trimmed and corrected version of Perrin and Madame de Simiane.

Great part of her purely literary merit lies in the extraordinary vividness of her presentation of character. But her r->yn has not

united quite such a unanimity of suffrage as her ability in writing. In her own time there were not wanting enemies who maintained that her letters were written for effect, and that her affection for her daughter was ostentatious and unreal. But no competent judge can admit this view On the other hand, her excessive affection for Madame de Grignan, her blindness to anything but her daughter's interest; her culpable tolerance of her son's youthful follies on the one hand and the uneven balance which she held in money matters between him and his sister on the other; the apparent levity with which she speaks of the sufferings of Madame de Brinvilliers, of galley slaves, of the peasantry, &c ; and the freedom of language

which she uses herself and tolerates from others, — have all been cast up against her. Here the historic estimate sufficiently disposes of some of the objections, a little common sense of others and a very little charity of the rest. If too much love felt by a mother towards a daughter be a fault, then Madame de SeVign6 was one of the most offending souls that ever lived; but it will hardly be held damning. The singular confidences which Madame de S6vign6 received from her son and transmitted to her daughter would even at the present day be less surprising in France than in England. They are only an instance, adjusted to the manners of the time, of the system of sacrificing everything to the maintenance of confidence between mother and son. Here too, as well as in reference to the immediately kindred charge of crudity of language, and to that want of sympathy with suffering, especially with the sufferings of the people, it is especially necessary to remember of what generation Madame de Sevigne was and what were her circumstances. That generation was the genera- tion which Madame de Rambouillet endeavoured with only partial success to polish and humanize, to which belong the almost in- credible yet trustworthy Historiettes of Tallemant, and in which Bussy Rabutin's Histoire amoureuse did not make him lose all caste as a gentleman and man-of honour. It is absurd to expect at such a time, and in private letters, the delicacy proper to quite different times and circumstances. It is not true that Madame de Sevigne 1 shows no sympathy with the oppression of the Bretons, though her incurable habit of humorous expression — of Rabutinage, as she says- makes her occasionally use light phrases about the matter. But it is in fact as unreasonable to expect modern political sentiments from her as it is to expect her to observe the canons of a 20th-century propriety. On the whole she may be as fairly and confidently ac- quitted of any moral fault, as she may be acquitted of all literary faults whatsoever. Her letters are wholly, what her son-in-law said well of her after her death, compagnons dSlicieux; and, far from faultless as Madame de Grignan was, none of her faults is more felt by the reader than her long visits to her mother, during which the letters ceased.

The bibliographic history of Madame de Sevigne's letters is of con- siderable interest in itself, and is moreover typical of much other con- temporary literary history. From Madame de Sevigne herself we know that her own letters w6re copied and handed about, sometimes under specified titles, as early as 1673. None of them, however, was published until her correspondence with Bussy Rabutin appeared in his Memoirs and Correspondence, partly in the year of her death, partly next year. The remainder were not printed in any form for

thirty years. Then between 1 725 and 1 728 appeared seven unauthor- ized editions, containing more or fewer additions from the copies which had been circulated privately. The bibliography of these must be sought in special works (see especially the Grands Itcrivatns edition, vol. xi.). They have interest, however, cjjiefly because they stirred up Madame de Simiane, the writer's only living representative, to give an authorized version. This appeared under the care of the Chevalier de Perrin in 6 vols. (Paris, 1734-1737). It contained only the letters to Madame de Grignan, and these were subjected to editing rather careful than conscientious, the results of which were never thoroughly removed until recently. In the first place, Madame de Simiane, who possessed her mother's replies, is said to have burnt the whole of these from religious motives; this phrase is ex. plained by Madame de Grignan's Cartesianism, which is supposed to have led her to expressions alarming to orthodoxy. In the second, scruples partly having to do with the susceptibilities of living persons, partly concerning Jansenist and other prejudices, made her insist on numerous omissions. Thirdly, and most unfortunately, the change of taste seems to have required still more numerous alterations of style and language, such as the substitution of " Ma Fille " for Madame de S&vign6's usual and charming " Ma Bonne," and many others. Perrin followed this edition up' in 1751 with a volume of supplementary letters not addressed to Madame de Grignan, and in 1754 published his last edition of the whole, which was long the standard (8 vols., Paris). During the last half of the_i8th century numerous editions of the whole or parts appeared with important additions, such as that of 1756, giving for the first time the letters to Pomponne on the Fouquet trial; that of 1773, giving letters to Moulceau; that of 1775, giving for the first time the Bussy letters separate from his memoirs, &c. An important collected edition of all these fragments, by the Abb6 de Vauxcelles, appeared in 1801 (Paris, An IX.) in 10 vols.; five years later Gouvelle (Paris, 1806, 8 vols.) introduced the improvement of chronological order; this was re- printed in 12 vols. (Paris, 1 8 19) with some more unpublished letters which had separately appeared meanwhile. In the same year appeared the first edition of M. de Monmerque. From that dafe

continual additions of unpublished letters were made, in great part by the same editor, and at last the whole was remodelled on manuscript copies (the originals unfortunately are available for but

few) in the edition called Des Grands Mcrivains, which M. de Monmerque began, but which owing to his death had to be finished by MM. Regnier, Paul Mesnard and Sommer (Paris, 1862-1868). This, which super- sedes all others (even a handsome edition published during its appearance by M. Silvestre de Sacy), consists of twelve volumes of text, notes, &c, two volumes of lexicon and an album of plates. It contains all the published letters to and from Madame de Sevigne, with the replies where they exist, with all those letters to and from Madame de Simiane (many of which had been added to the main body) that contain any interest. To it must be added two volumes (printed uniformly) of Lettres inSdites, published by M. Ch. Capmas in 1876 and containing numerous variants and additions from a MS. copy discovered in an old curiosity shop at Dijon. Of less elaborate and costly editions that in the collection Didot (6 vols., Parisˆ v.d.) is the best, though, in common with all others except the Grands iZcrivains edition, it contains an adulterated text.

Works on Madame de Sevigne are innumerable. Besides essays by nearly all the great French critics from Sainte-Beuve (Portraits defemmes) toM. Brunetiere (£tudes critiques) , the work of F. Combes, Madameˆde Sevigne, historien (1885), and G. Boissier's volume in the Grands Ecrivains Francais (1 88 1) , should be consulted. The biography by Paul Mesnard is nearly exhaustive, but the most elaborate biographical book is that of Walckenaer (3rd ed., Paris, 1856, 5 vols.), to which should be added the remarkable Histoire de Mme de Sevigne of Aubenas (Paris and St Petersburg, 1842). In English an excellent little book by Miss Thackeray (Lady Ritchie) (1881) may be recom- mended, and also Janet Aldis's Mme de Sevigne: The Queen of Letter-writers (1907) . Most of the editions have portraits. (G. Sa.)

SEVILLE, an inland province of southern Spain, one of the eight provinces into which Andalusia was divided in 1833; bounded on the N. by Badajoz, N.E. by Cordova, S. by Malaga and Cadiz and W. by Huelva. Pop. (1900) 555,256; area 5428 sq. m. The province is bisected by the navigable river Guadalquivir (#.».), which here receives the Genii and Guadaira on the left, and the Guadalimar on the right. West of the Guadalquivir the surface is broken by low mountain ranges forming part of the Sierra Morena; the eastern districts are comparatively flat and very fertile, except along the frontiers of Cadiz and Malaga, where rise the Sierras of Gibalbin and Algodonales; and there are extensive marshes near the Guadal- quivir estuary. Coal, copper, iron ore, silicate of alumina, marble and chalk are the chief mineral products; the province is famous for

its oranges, and also exports wheat, barley, oats, maize, olives, oil, wine and chick-peas. Iron-founding and the manufacture of gunpowder and ordnance are carried on by the state, and a great expansion of the other manufactures— leather, pottery, soap, flour, cork products, &c— took place after 1875 owing to the construction of railways between all the larger towns. Cattle-breeding is an important industry in the plains and marshes. Seville (q.v.) is the capital and chief river-port. Other towns described in separate articles are Ecija (pop. 1900, 24,372), Osuna (17,826), Carmona (17,215), Utrera (15,138), Moron de la Frontera (14ˆ90), Marchena (12,468), Lebrija (10,997).

SEVILLE (Span. Sevilla, Lat. Ispalis or Hispalis, Moorish IshbUiya), the capital of the Spanish province of Seville, and the chief city of Andalusia, on the left bank of the river Guadalquivir, 54 m. from the Atlantic Ocean, and 355 m. by rail S.S.W. of Madrid. Pop. (1900) 148,315. Seville is an archiepiscopal see, a port with many thriving industries, and in size the fourth city in the kingdom, ranking after Madrid, Barcelona and Valencia. Its history,, and its treasures of art and architecture render it one of the most interesting places in Europe. It is built in a level alluvial plain, as productive as a garden. Few parts of the city are more than 30 ft. above sea-level, and owing to the frequency of floods an elaborate system of defences against the Guadalquivir and its affluents the Guadaira, Tamarguillo and Tagarete, was undertaken in 1904. This entailed the construc- tion (spread over many years) of dykes, walls and surface drains, the raising of certain streets and railway embankments and the diversion of the lower Tagarete along a new channel leading into the Tamarguillo. The climate is pleasant at all seasons except in summer, when a shade temperature of n 6° Fahr. has been recorded. Water is provided by a British company, and a smaller quantity is obtained from Carmona, but the supply is inadequate.

On the right or western bank of the river is the suburb of the Triana, inhabited to a great extent by gipsies. Seville retains its Moorish appearance in the older quarters, although their narrow and tortuous alleys are lighted by electricity, and traversed, wherever they afford room, by electric tramways. In the more modern districts there are broad avenues and boulevards, the chief of which is the beautiful Paseo de los Delicias, along the river and below the city.

The animated and picturesque street-life of Seville has often been painted and described, or even, as in Mozart's Figaro and Don Giovanni, Rossini's Barbiere di Siviglia and Bizet's Carmen, set to music. The townsfolk, and the peasants who have come to town for bull-fights, fairs or carnival, have preserved many of the curious old customs which tend to die out in the other large cities of Spain; they continue to wear the vivid costumes which suit the sunny climate of Andalusia; and their own gaiety, wit and grace of manner are proverbial. Nowhere in Spain are the great Church festivals celebrated with so much splendour; Easter at Seville is especially famous, and at this season the city is usually crowded with foreigners. The stately reserve and formality of Madrid society are almost as unknown here as the feverish industrialism and political passion of Barcelona or Valencia; loyalty, good humour and light-hearted hedonism have always been characteristic of Seville.

Principal Buildings. — The cathedral, dedicated to Santa Maria de la Sede, is the largest church in the world, after St Peter's at Rome and the Mezquita at Cordova, being 414 ft. long, 271 ft. wide and 100 ft. high to the roof of the nave. The west front is approached by a high flight of steps, and the platform on which the cathedral stands is surrounded by a hundred shafts of columns from the mosque which formerly occupied the site. The work of building began in 1402 and was finished in 1519, so that the one style of Spanish Gothic is fairly preserved throughout the interior, however niuch the exterior is spoiled by later additions. Unfortunately the west front remained unfinished until 1827, when the central doorway was completed in a very inferior manner; but this has been renewed in a purer style. The fine relief above it representing the Assumption was added in 1885. At the east end are two Gothic doorways with good sculpture in the tympana ; and on the north side the Puerta del Perdon, as it is called, has some exquisite detail over the horse-shoe arch, and a pair of fine bronze doors. The gateway in the southern facade, designed by Casanova, dates from 1887. The interior forms a parallelogram containing a nave and four aisles with Surrounding chapels, a centre dome, 12 1 ft. high, and at the east end a royal sepulchral chapel, which was an addition of the 16th century. The thirty-two immense clustered columns, the marble floor (1787-1795) and the seventy-four windows filled with painted glass, mostly by Flemish artists of the 1 6th century, produce an unsurpassed effect of magnificence. The reredos is an enormous Gothic work containing forty-four panels of gilt and coloured wood carvings begun by the Fleming Dancart in 1479 and completed by Spanish artists in 1526; the silver statue of the Virgin is by Francisco Alfaro (1596). The archbishop's throne

and the choir-stalls (1475-1548) are fine pieces of carving, and amongst the notable metal-work are the railings (1519), by Sancho Nunoz, and the lectern by Bartolome Morel of the same period. The bronze candelabrum for tenebrae, 25 ft. in height, is a splendid work by B. More (1562). In the Sacristia Alta is a silver repousse reliquary presented by Alphonso the Wise in the 13th century; and in the Sacristia Mayor, which is a good plateresque addition made in 1535 from designs by Diego de Riafio (d. 1532), there is a magnificent collection of church plate and vestments, in- cluding the famous silver monstrance (1580-1587), 12 ft. high, by Juan de Arfe (Arphe). At the west end of the nave is the grave of Ferdinand, the son of Columbus, and at the east end in the royal chapel (1514-1566) lies the body of St Ferdinand of Castile (iaoo^- 1252), which is exposed three times in the year. This chapel also contains the tombs of Alphonso the Wise (1252-1284) and Pedro I. (1350-1369) and a curious life-size image of the Virgin, which was presented to St Ferdinand by St Louis of France in the 15th century. It is in carved wood with movable arms, seated on a silver throne and with hair of spun gold. The chief pictures in the cathedral are the " Guardian Angel," the " St Anthony," 1 and other works of Murillo; the " Holy Family " of Alfonso Miguel de Tobar (1678-1738); the " Nativity " and " La Generacion " of Luis de Vargas; Valdes Leal's "Marriage of the Virgin," and Guadelupe's "Descent from the Cross." In the Sacristia Alta are three fine paintings by Alexo Fernandez, and in the Sala Capitular are a " Conception " by Murillo and a " St Ferdi- nand " by Francisco Pacheco. The organs (1777 and 1827) are among the largest in the world. A curious and unique ritual is observed by the choir boys on the festivals of Corpus Christi and the Immaculate Conception — a solemn dance with castanets being performed by

1 This was stolen in 1874, sold in New York for £50, and returned by its purchaser, Mr Schaus.

ten of them before the altar; the custom is an old one but its origin is obscure. The Sagrario (1618-1662) on the north of the cathedral is a Baroque addition by Miguel de Zumarraga and Fernandez de Iglesias, which serves as the parish church.

At the north-east corner of the cathedral stands the Giralda, a bell tower of Moorish origin, 295 ft. in height. The lower part of the

tower, or about 185 ft., was built in the latter half of the 12th century by Yusuf I. ; the upper part and the belfry, which is surmounted by a vane formed of a bronze figure 14 ft. high representing Faith, were added (1 568) by Fernando Ruiz in the Renaissance style. The ascent is made by a series of inclined planes. The exterior is encrusted with delicate Moorish detail, and the tower is altogether the finest speci- men of its kind in Europe. At the base lies the Court of Oranges, of which only two sides now remain; the original Moorish fountain, however, is still preserved. But the chief relic of the Arab dominion in Seville is the Alcazar, a palace comparable in interest and beauty only with the Alhambra of Granada. It was begun in 1 181 during the best periods of the Almohades, and was surrounded by walls and towers, of which the Torre del Oro, a decagonal tower on the river side, is now the principal survival. The Torre del Oro (1220) has an 18th— century superstructure. Pedro I. made considerable alterations and additions in the Alcazar during the 14th century, and worse havoc was afterwards wrought by Charles V., Philip III. and Philip V. Restorations have been effected as far as possible, and the palace is now an extremely beautiful example of Moorish work. The facade, the hall of ambassadors and the Patio de las Mufiecas are the most striking portions, after which may be ranked the Patio de las Don- cellas and the chapel of Isabella. Among other Moorish remains in Seville may be mentioned the minaret of San Marcos, 75 ft. high. The Casa de Pilatos is Moorish and Renaissance of the 16th century, and in addition to its elegant courtyard surrounded by a marble colonnade, contains some fine decorative work. Somewhat similar in style are the 15th-century Casa de los Pinelos (Casa de Abades) and the 15th-century palace of the dukes of Alva (Palacio de las Duefias or de las Pinedas). The following are the most notable churches in Seville: Santa Maria la Blanca, an old Jewish syna- gogue; San Pedro, 14th-century Gothic; Santa Marina, with the oldest Christian sculptures in Seville; San Marcos, badly restored, but with a remarkable mudejar portal; San Clemente el Real with beautiful blue and white tile-work (azulejos) of 1588; the Gothic Parroquia of Santa Ana, in the Triana suburb; and Omnium Sanctorum, built by Pedro I., with a Moorish tower and Roman foundations. The church of La Caridad belongs to an almshouse founded in 1661 by the Sevillian Don Juan, Miguel de Mafiara. It possesses six masterpieces by Murillo, and two by Valdes Leal. The chapel of the convent of Santa Paula dates from 1475, and has a portal magnificently decorated with azulejos. Other churches, though generally deficient in architectural interest, are enriched by

Eaintings or sculptures of Pacheco, Montafles, Alonso Cano, Valdes eal, Roelas, Campana, Morales, Vargas and Zurbaran. The museum was formerly the church and convent of La Merced. It now contains priceless examples of the Seville school of painting, which flourished during the 16th and 17th centuries. Among the masters represented are Velazquez and Murillo (both natives of Seville), Zurbaran, Roelas, Herrera the Elder, Pacheco, Juan de Castillo, Alonso Cano, Cespedes, Bocanegra, Valdes Leal, Goya and Martin de Vos. The school founded in 1256 by Alfonso X. became a university in 1502; its present buildings were originally a Jesuit college built in 1567 from designs either by Herrera or by the Jesuit Bartolome de Bustamente, but devoted to their present use in 1767 on the ex-pulsion of the Jesuits. The university has faculties of Jaw, philosophy, natural science and medicine. The Casa del Ayuntamiento, in the Renaissance style, was begun in 1527 and has a fine staircase and hall and handsome carved doors. The Lonja, or exchange, was designed by Herrera in his severe classical style, and completed in 1598; the brown and red marble staircase which leads to the Archivo de Indias is the best part of the design. The archives contain 30,000 volumes relating to the voyages of Spanish discoverers, many of which are still unexamined. The archbishop's palace dates from 1697; the most notable features are the Churrigueresque doorway and staircase The palace of San Telmo was formerly the seat of a naval college founded by Ferdinand Columbus. An immense doorway is its principal architectural feature, but its picture gallery is interesting and important. Other noteworthy buildings are the Mudejar palaces of the duke of Osuna and the count of Penaflor; the house occupied by Murillo at the time of his death (1682) ; the civil hospital built in 1559 and enlarged in 1842; the foundling hospital (1558); the bull- ring, with room for 14,000 spectators; and fragments of the city walls, which formerly had a circumference of more than 10 m., with 12 gateways and 166 towers.

Commerce and Industries. — The port of Seville, in 37 10′ N. and 6° 10′ W. has always been one of the chief outlets of the wealth of Spain. It is the terminus of three railways to Madrid, and of other lines to Cadiz, Almorchon, Ciudad Real, Huelva, Badajoz and Lisbon. Three of these lines have branches down to the water-side of the quays. The quay on the left bank, 4500 ft. long, is provided with powerful cranes, and sheds for merchandise. Navigation up the Guadalquivir from its mouth to Seville (where the river is still tidal) is less dangerous for steamers than for sailing vessels, but is never-theless uncertain. The construction of a ship-canal 4 m. long from

the Punta de los Rernedios to the Punta del Verde — two points between which the windings of the river render navigation especially difficult — was first proposed in 1859, and was undertaken in 1907. Dredging operations were begun at the same time, so that on completion of the canal vessels drawing 25 ft. (instead of 16 ft.) could come up to Seville. The principal exports are Manzanilla, Amontillado and other wines, oranges and lemons, iron, copper and lead ores, mercury, olives, oil, cork and wool; the imports include coal, wood, iron, manufactured goods, hemp, flax and colonial produce. There are manufactures of machinery, tobacco, chocolate, soap, porcelain, beer, liqueurs, brandies, corks and silk. The royal artillery works and iron foundries are very important. The porcelain and earthen- ware factory in the Carthusian convent (Cartuja, 1 founded 1401) employs more than 2000 hands. Pottery has been the characteristic industry of the Triana from time immemorial; the patron saints of Seville, Justa and Rufina, are said by tradition to have been potters here. Equally important is the great tobacco and cigar factory, where 6000 women are employed.

History. — Seville appears originally to have been an Iberian town. Under the Romans the city was made the capital of Baetica in the second century B.C., and became a favourite resort for wealthy Romans. It was captured in 45 B.C. by Julius Caesar, who gave it the name of Colonia Julia Romula, and made it one of the conventus juridici. The emperors Hadrian, Trajan and Theodosius were born in the neighbourhood at Italica (now Santiponce) , where are the remains of a considerable amphitheatre. The chief existing monument of the Romans in Seville itself is the remains of an aqueduct, on four hundred and ten arches, by which water from Alcala de Guadaira was supplied to the town. At the beginning of the 5th century the Silingian Vandals made Seville the seat of their empire, until it passed in 531 under the Visigoths, who chose Toledo for their capital. After the defeat of Don Roderick at Guadalete in 712 the Moors took possession of the city after a siege of some months. Under the Moors Seville continued to nourish. Idrisi speaks in particular of its great export trade in the oil of Aljarafe. The district was in great part occupied by Syrian Arabs from Emesa, part of the troops that entered Spain with Balj in 741 at the time of the revolt of the Berbers. It was a scion of one of these Emesan families, Abu '1-Kasim Mahommed, cadi of Seville, who on the fall of the Spanish caliphate headed the revolt of his townsmen against their Berber masters (1023) and became the founder of the Abbadid dynasty, of which Seville was capital, and which lasted under his son Mo'tadid (1042-1069) and grand- son Mo'tamid (1069-1091) till

the city was taken by the Almoravides. The later years of the Almoravide rule were very oppressive to the Moslems of Spain; in 11 33 the people of Seville were prepared to welcome the victorious arms of Alphonso VII., and eleven years later Andalusia broke out in general rebellion. Almohade troops now passed over into Spain and took Seville in 1147. Under the Almohades Seville was the seat of government and enjoyed great prosperity; the great mosque (now destroyed) was commenced by Yusuf I. and completed by his son Almanzor. In the decline of the dynasty between 1228 and 1248 Seville underwent various revolutions, and ultimately acknowledged the Hafsite prince, but Ferdinand III. restored it to Christendom in 1248. Ferdinand brought temporary ruin on the city, for it is said that 400,000 of the inhabitants went into voluntary exile. But the position of Seville was too favourable for trade for it to fall into permanent decay, and by the 15th century it was again in a position to derive full benefit from the discovery of America. After the reign of Philip II. its prosperity gradually waned with that of the rest of the Peninsula; yet even in 1700 its silk factories gave employ- ment to thousands of workpeople; their numbers, however, by the end of the 18th century had fallen to four hundred. In 1800 an outbreak of yellow fever carried off 30,000 of the in- habitants, and in 1810 the city suffered severely from the French under Soult, who plundered to the extent of six- millions sterling. Politically Seville has always had the reputation of peculiar loyalty to the throne from the time when, on the death of Ferdinand III., it was the only city which remained faithful to his son Alphonso the Wise. It was consequently much

1 The interesting 15th-century tombs formerly in the Cartuja are now in the church of the university.

favoured by the monarchs, and frequently a seat of the court. For its loyalty during the revolt of the Comuneros it received from Charles V. the motto Ab Hercule et Caesare nobilitas; a se ipsa fidelitas. In 1729 the treaty between England, France and Spain was signed in the city; in 1808 the central junta was formed here and removed in 1810 to Cadiz; in 1823 the cortes brought the king with them from Madrid; and in 1848 Seville combined with Malaga and Granada against Espartero, who bombarded the city but fled on the return of Queen Maria Christina to Madrid.

See P.deMadrazo,Sero7/a;yCa

SEVRES, a town of northern France, in the department of Seine-et-Oise, on the left bank of the Seine, midway between Paris and Versailles, about 3 m. from the fortifications of the former. Pop. (1906) 7949. The town owes its celebrity to the porcelain manufactory established there in 1756 and taken over by the State three years later. In the museum connected with the works are preserved specimens of the different kinds of ware manufactured in all ages and countries and the whole series of models employed at Sevres from the beginning of the manu- facture, for an account of which see Ceramics. A technical school of ceramics is attached to the factory.

SEWALL, SAMUEL (1652-1730), American jurist, was born at Horton, near Bishopstoke, Hants, England, on the 28th of March 1652. He was taken to New England in 1661; graduated at Harvard in 1671; studied divinity; and was resident fellow of Harvard in 1673-1674 , and keeper of the college library in 1674. In 1683 he was deputy to the General Court for Westfield; from 1 68 1 to 1684 he managed the only licensed printing press in Boston; and as a member of the Board of Assistants in 1684- 1686 and in 1689-1690 he was ex efficio a judge of the Superior Court. He was a member of the Council in 1691-1725, and in 1692 he was made one of the special commissioners of oyer and terminer to try persons accused of witchcraft in Suffolk, Essex and Middlesex counties. This court condemned nineteen. Sewall in January 1697 stood in meeting while a bill was read in which he took " the blame and shame " of the " guilt contracted upon the opening of the late commission of oyer and terminer at Salem," and asked pardon. He was a judge of the Superior Court from 1692 to 1728, and in 1718-1728 was its chief justice; in 1715-1728 he was judge of probate for Suffolk county. He died in Boston on the 1st of January 1730. Sewall has been called the " last of the Puritans " and his character is attractively portrayed in Whittier's Prophecy of Samuel Sewall. He was a strict Calvinist and opposed the growing liberal control of Harvard College ; he contributed to the cause of Indian missions, built an Indian meeting-house (probably in Sandwich), was one of the commissioners of the Society for the Propagation of the Gospel in New England and Parts Adjacent, and for more than twenty years its secretary and treasurer.

He wrote: The Selling of Joseph, a Memorial (1700), the first anti-slavery tract printed in America; with Edward Rawson, anony-mously, The Revolution in New England Justified (1691 ; reprinted in Force's Tracts and in The Andros Tracts); Phaenomena quaedam apocalyptica ad aspectum novi orbis configurate (1697) and Taliiha

Cumi, or an Invitation to Women to look after their Inheritance in the Heavenly Mansions, both full of strange Biblical interpretation; and a journal begun in 1673, which, with his other papers, was bought by the Massachusetts Historical Society in 1869, and was published in vols, xiv.-xlviii. of its Collections.

See the sketch in J. L. Sibley, Biographical Sketches of Graduates of Harvard University, ii. (1881), 345-371; an article by C. H. C. Howard in vol. xxxvii. (Salem, 1901) of the Essex Institute Historical Collections; N. H. Chamberlain, Samuel Sewall and the World He Lived In (Boston, 1897); and G. E. Ellis, An Address on the Life and Character of Chief Justice Samuel Sewall (Boston, 1885).

His son, Joseph Sewall (1686-1769), became pastor of the Old South Church in 1713, and was a powerful preacher who sided with Whitefield. A descendant, Samuel Edward Sewall (1799-1888), a lawyer, was prominent in the anti-slavery move-

ment, first as a Garrisonian and afterwards as a member of the Liberty and Free-Soil parties; he was counsel for a number of fugitive slaves, and after the Civil War he worked for the improve- ment of the legal status of women.

See Nina M. Tiffany, Samuel E. Sewall: A Memoir (Boston 1898).

SEWANEE, a village of Franklin county, Tennessee, about 15 m. E. of Winchester, the county-seat, and (by rail) 95 m. S.S.E. of Nashville. Pop. about 1200. Sewanee is served by the Tracy City branch of the Nashville, Chattanooga & St Louis railway. It is on a spur of the Cumberland mountains about 2000 ft. above the sea and about 1000 ft. above the surrounding country. It is a resort for sufferers from malaria and pulmonary complaints. There are mineral springs, coal mines and sand- stone quarries here, all on the " domain," about 10,000 acres, of the University of the South, a Protestant Episcopal institution of higher learning, founded in 1857, largely through the efforts of Bishop Leonidas Polk, but not opened until 1868. The princi- pal buildings of the University, on a tract of 1000 acres, are all of Sewanee sandstone; they include Walsh Memorial (1890), with offices and college class-rooms; the Library (formerly Convocation Hall, 1886; remodelled 1901), with a tower copied from Magdalen College, Oxford; Thompson Hall (1883; en- larged i9oi),with science lecture-rooms and laboratories; Hoff- man Memorial (1898), a dormitory; All Saints' Chapel (1909), a copy of King's College Chapel, Cambridge; a Gymnasium (1901); Quintard

Memorial (1901), the home of the Sewanee Military Academy (until 1908 the Sewanee Grammar School), the preparatory department of the University; and St. Luke's Memorial (1878), the home of the Theological Department; and St Luke's Memorial Chapel (1907). The University is governed by a board of trustees consisting of the bishop, one clergyman and two laymen from each of 19 Protestant Episcopal dioceses in the Southern States.

SEWARD, ANNA (1747-1809), English writer, often called the " Swan of Lichfield," was the elder daughter of Thomas Seward (1708-1790), prebendary of Lichfield and of Salisbury, and author. Born at Eyam in Derbyshire, she passed nearly all her life in Lichfield, beginning at an early age to write poetry partly at the instigation of Dr. Erasmus Darwin. Her verses include elegies and sonnets, and she also wrote a poetical novel, Louisa, of which five editions were published. Miss Seward's writings, which include a large number of letters, are decidedly commonplace, and Horace Walpole said she had " no imagina- tion, no novelty."

Sir Walter Scott edited her Poetical Works in three volumes (Edinburgh, 1810); to these he prefixed a memoir of the authoress, adding extracts from her literary correspondence. He refused, however, to edit the bulk of her letters, and these were published in six volumes by A. Constable as Letters of Anna Seward 1784-1807 (Edinburgh, 181 1). Miss Seward also wrote Memoirs of the Life of Dr Darwin (1804). See E. V. Lucas, A Swan and her Friends (1907) ; and S. Martin, Anna Seward and Classic Lichfield (1909).

SEWARD, WILLIAM HENRY (1801-1872), American states- man, was born on the 16th of May 1801 in the village of Florida, Orange county, New York. He graduated from Union College in 1820, having taught school for a short time at Savannah, Georgia, to help pay his expenses; was admitted to the bar at Utica, N.Y., in 1822, and in the following year began the practice of law at Auburn, N.Y., which was his home for the rest of his life. He soon attained distinction in his profession, but drifted into politics, for which he had a greater liking, and early became associated with Thurlow Weed: He was at first an adherent of Daniel D. Tompkins in state, and a National Republican in national politics, after 1828 became allied with the Anti-Masonic party, attending the national conventions of 1830 and 1831, and as a member of the organization he served four years (1830- 1834) in the state Senate. By 1833 the Anti-Masonic movement had run its course, and Seward allied himself with the other opponents of the Jackson Democrats, becoming a Whig. In 1834 he received the Whig nomination for

governor, but was defeated by William L. Marcy. Four years later he was re- nominated, was elected, was re-elected in 1840, and served from January 1839 until January 1843. As governor, Seward favoured

a continuance of works of internal improvement at public expense, although this policy had already plunged the state into financial embarrassment. His administration was disturbed by the anti-rent agitation and by the M'Leod incident growing out of the Canadian rebellion of 1837. 1 During this period he attracted much attention by his liberal and humane policy, promoting prison reform, and proposing to admit Roman Catholic and foreign teachers into the public schools of the state. His refusal soon after his inauguration to honour the requisition of the governor of Virginia for three persons charged with assisting a slave to escape from Norfolk, provoked retaliatory measures by the Virginia legislature, in, which Mississippi and South Carolina soon joined. Laws were also passed during his term putting obstacles in the way of recovering fugitive slaves. Seward soon became recognized as the leader of the anti-slavery Whigs. He was one of the earliest political opponents of slavery, as distinguished from the radical Abolitionists, or the followers of William Lloyd Garrison, who eschewed politics and devoted themselves to a moral agitation.

On retiring from office Seward returned to the practice of law. His reputation was made in four great criminal cases — those of Abel F. Fitch and others, of Freeman, of Wyatt and of Van Zandt — the last-named bringing him especially the goodwill of opponents of slavery. Toward the end of his career at the bar, however, he changed from a general practitioner to a patent lawyer, and as such had a lucrative practice.

When the Whigs secured a momentary control of the state legislature in 1849 they sent Seward to the United States Senate. The antagonism between free labour an'd slave labour became the theme of many of his speeches. In his first set speech in the Senate, on the nth of March 1850, in opposing the pending compromise measures, he attracted the attention of the whole country by his assertion that " there is a higher law than the constitution " regulating " our authority over the domain " (i.e. the Territories). When the Democrats, however, declared such language incendiary he tried to

explain it away, and by so doing offended his friends without appeasing his opponents. In a speech at Rochester, New York, in 1858 he made the famous statement that there was " an irrepressible conflict between opposing and enduring forces, and it means that the United States must and will, sooner or later, become either entirely a slave-holding nation or entirely a free-labour nation." Although this idea had often been expressed by others, and by Seward himself in his speech of 1848, yet he was severely criticized, and four days later he sought to render this state- ment innocuous also.

In the election of 1852 Seward supported General Winfield Scott, but not his party platform, because it declared the Com- promise of 1850 a finality. He naturally opposed the Kansas- Nebraska Bill of 1854, which repealed the Missouri Compromise and established the principle of popular sovereignty in the Territories. Subsequently he actively supported in the Senate the free-state cause in Kansas. In 1854-1855, when it became evident that the Whig party in the North was moribund, Seward helped to lead its scattered remnants into the Republican fold. As the recognized leader of the new party, his nomination by the Republicans for the presidency in 1856 and in i860 was regarded as certain; but in each instance he was put aside for another. The heterogeneous elements of the new organization could not be made to unite on a man who for so many years had devoted his energies to purely Whig measures, and he was considered less " available " than Fremont in 1856 and than Lincoln in i860. After Lincoln was elected in i860 he chose Seward for his secretary

1 In 1837 the vessel " Caroline," which had been used by the Canadian insurgents, was seized by the Canadian authorities in American territory and was destroyed. In 1840 one Alexander M'Leod, a British subject then in New York, asserted that he had aided in the capture; he was promptly arrested and was held for trial on a charge of murder. The British minister demanded^ from the national government M'Leod 's release, but his case was in the New York courts, over which the national government has no jurisdiction. In the trial M'Leod proved an alibi, was acquitted (October 1841), and a serious international complication was thus averted.

of state. The new president was a man comparatively little known outside the state of Illinois, and many of his supporters, doubtful of his ability to deal with the difficult problems of 1861, looked to Seward as the most experienced man of the administra- tion and the one who should direct its policy. Seward himself, apparently sharing these views, although not out of vanity, at first possessed an unbounded confidence in his ability to influence the president and

his cabinet. He believed that the Union could be saved without a war, and that a policy of delay would prevent the secession of the border states, which in turn would gradually coax their more southern neighbours back into their proper relations with the Federal government. In informal conferences with commissioners from the seceded states he assured them that Fort Sumter should be speedily evacuated. Finding himself overruled by the war party in the cabinet, on the 1st of April 1 86 1, Seward suggested a war of all America against most of Europe, with himself as the director of the enterprise. The conduct of Spain toward Santo Domingo and of France toward Mexico, and the alleged attitude of England and Russia toward the seceded states were to be the grounds for precipitating this gigantic conflict; and agents were to be sent into Canada, Mexico and Central America to arouse a spirit of hostility to European intervention. Dangers from abroad would destroy the centrifugal forces at home, and the Union would be saved. When this proposal was quietly put aside by the president, and Seward perceived in Lincoln a chief executive in fact as well as in name, he dropped into his proper place, and as secretary of state rendered services of inestimable value to the nation. To prevent foreign states from giving official recognition to the Confederacy was the task of the hour, and in this he was successful. While he did not succeed in preventing the French occupation of Mexico or the escape of the Confederate cruiser " Alabama " from England, his diplomacy prepared the way for a future adjust ment satisfactory to the United States of the difficulties with these powers. While his treaty with Lord Lyons in 1862 for the suppression of the slave trade conceded to England the right of search to a limited extent in African and Cuban waters, he secured a similar concession for American war vessels from the British government, and by his course in the Trent Affair he virtually committed Great Britain to the American attitude with regard to this right.

On the 5th of April 1865 Seward was thrown from his carriage and severely injured. Nine days later, while lying ill at his home at Washington, he was attacked by one Lewis Powell, alias Payne, a fellow-conspirator of John Wilkes Booth, at the same time that Lincoln was assassinated. The secretary's son, Frederick W. Seward, and three other persons who came to his assistance, were also wounded by the assailant. Seward's wife, an invalid, received such a shock that she died within two months, and his only daughter, who witnessed the assault, never recovered from the effects of the scene and died within the year. Seward gradually regained his health, and remained in the cabinet of President Johnson until the expiration of

his term in 1869. In the struggle between the Executive and Congress over the method of reconstructing the Southern States, Seward sided with Johnson and thus shared some of the obloquy bestowed upon that unfortunate president. His greatest work in this period was the purchase of Alaska from Russia, in 1867. He also negotiated treaties for the purchase of the Danish West Indies, the Bay of Samana, and for American control of the isthmus of Panama; but these were not ratified by the Senate. After returning to private life, Seward spent two years and a half in travel and died at Auburn on the 10th of October 1872.

His son, Frederick William Seward, was born in Auburn, New York, on the 8th of July 1830, graduated at Union College in 1849 and was admitted to the bar at Rochester, N.Y., in 1851. From 185 1 to 1861 he was one of the editors and owners of the Albany Evening Journal, and during his father's term at the head of the State Department he was assistant secretary of state. He served in the New York Assembly in 1875, and from 1877 to 1881 was again assistant secretary of state. After 1881 he

devoted his time to the practice of his profession and to lecturing and writing.

The best biography of Seward is that by Frederic Bancroft, The Life of William H. Seward (2 vols., New York, 1900) ; see also, The Life and Works of William H. Seward (5 vols., new ed., Boston, 1883), edited by George E. Baker; William H. Seward: an Autobiography from i8<)l to 1834, with a Memoir of his Life and Selections from his Letters (3 vols., New York, 1891), by his son, Frederick W. Seward) William H. Seward's Travels around the World (New York, 1873), by his adopted daughter, Olive R. Seward ; Lincoln and Seward (New York, 1874), by Gideon Welles; and William Henry Seward (new ed., Boston, 1899), by T. K. Lothrop, in the " American Statesmen Series."

SEWELL, WILLIAM (1804-1874), English divine and author, was born at Newport, Isle of Wight, on the 23rd of January 1804, the son of a solicitor. He was educated at Winchester and Merton College, Oxford, was elected a fellow of Exeter College in 1827, and from 1831-1853 was a tutor there. From 1836- 1841 he was Whyte's Professor of Moral Philosophy. Sewell, who took holy orders

in 1830, was a friend of Pusey, Newman and Keble in the earlier days of the Tractarian movement, but subsequently considered that the Tractarians leaned too much towards Rome, and dissociated himself from them. When, however, in 1849, J- A. Froude published his Nemesis of Faith, Sewell denounced the wickedness of the book to his class, and, when one of his pupils confessed to the possession of a copy, seized it, tore it to pieces, and threw it in the fire. In 1843 he, with some friends, founded at Rathfarnham, near Dublin, St Columba's College, designed to be a sort of Irish Eton, and in 1847 helped to found Radley College. Sewell's intention was that each of these schools should be conducted on strict High Church principles. He was originally himself one of the managers of St Columba, and sub-warden of Radley, but his business management was not successful in either case, and his personal responsibility for the debts contracted by Radley caused the sequestration of his Oxford fellowship. In 1862 his financial difficulties compelled him to leave England for Germany, and he did not return till 1870. He died on the 14th of November

1874.

His publications include translations of the Agamemnon (1846), Georgics (1846 and 1854) and Odes and Epodes of Horace (1850); An Introduction to the Dialogues of Plato (1841); Christian Politics (1844); The Nation, the Church and the University of Oxford (1849); Christian Vestiges of Creation (1861).

His elder brother, Richard Clarke Sewell (1803-1864), practised successfully as a barrister in England, and then went to Australia, where he obtained a large criminal practice. In 1857 he was appointed reader in law to the University of Mel- bourne. He was the author of a large number of legal works.

A younger brother, Henry Sewell (1807-1879), who became a solicitor, acted in London as secretary and deputy-chairman •of the Canterbury Association for the Colonization of New Zealand, and eventually went out to the colony, and in 1854 was elected to the House of Representatives. In 1856 he became first premier of New Zealand. Subsequently he held the office of attorney-general (1861-1863) and minister of justice (1864- 1865 and 1869-1872). In 1876 he returned to England, where he died on the 14th of May 1879.

Another brother, James Edwards Sewell (1810-1903), warden of New College, Oxford, was educated at Winchester and New College.

In 1830 he became a fellow of his College, and practically passed the rest of his life there, being elected to the headship in i860. The first University Commission had just released the colleges from the fetters of their original statutes, and Sewell was called on to determine his attitude towards the strong reforming party in New College. Though himself instinc- tively conservative, he determined that it was his duty to give effect to the desire of the majority, with the result that New College led the way in the general reform movement, and from being one of the smallest became the second largest college in Oxford. Sewell was vice-chancellor of the university 1874- 1878. He died in his ninety-third year on the 29th of January 1903, having been warden for 43 years, and was interred in the College cloisters.

A sister, Elizabeth Missing Sewell (1815-1906), was the

author of Amy Herbert and many other High Church novels, and of several devotional books. An edition of her works was published in eleven volumes (1886).

SEWER, a large drain for carrying away by water excreta and other refuse, known therefore collectively as " sewage" (see Sewerage below); also, in a wider and older sense, the term for conduits such as are used for the draining of the fens, or of the water-courses, sea-defences, &c, over which the local authorities, known as commissioners of sewers, exercise jurisdic- tion. In English law a " sewer," as distinguished from a " drain," is that which carries away the sewage of more houses or other buildings than one. Many fanciful derivations of the word have been given, but there seems no doubt that the word is from O. Fr. seuwiere, Med. Lat. seweria, the sluice of a mill-pond, from the Late Lat. ex-aquaria, a means of conducting water out of anything; this is paralleled by Eng. " ewer," a water-jug, which undoubtedly comes from aquaria, through O. Fr. ewe, for water, mod. eau.

The old name " sewer," for a table attendant who placed and removed the dishes from the table, acted as waiter, &c, must be distinguished. In the household ordinances of Edward II. the word seems to appear in the form asseour, and in those of Edward IV. as assewer, an officer of the household who superintended the serving of a banquet. Asseour represents O. Fr. asseoirˆ to seat, set, Lat. assidere. The word was early connected with " sewe " or "sew," juice, broth, pottage, cognate with sucus, juice.

SEWERAGE, a general term for the process of systematically collecting and removing the fouled water-supply of a community. The

matter to be dealt with may conveniently be classified as made up of three parts: (1) excreta, consisting of urine and faeces; (2) slop-water, or the discharge from sinks, basins, baths, &c, and the waste water of industrial processes; (3) surface; water due to rainfall. Before the use of underground conduits became general, the second and third constituents were commonly allowed to sink into the neighbouring ground, or to find their way by surface channels to a watercourse or to the sea. The first .constituent was conserved in middens or pits, either together with the dust, ashes, kitchen waste and solid waste generally or separately, and was carried away from time' to time to be applied as manure to the land. In more modern times the pits in which excrement was collected took the form of covered tanks called cesspools, and with this modification the primitive system of conservancy, with occasional removal by carts, is still to be found in many towns. Even where the plan of removing excrement by sewers has been adopted, the kitchen waste, ashes and solid refuse is still treated by collecting it in pails or bins, whose contents are removed by carts either daily or at longer intervals, the refuse frequently being burned in destructors (q.v.). It therefore forms no part of the nearly liquid sewage which the other constituents unite to form.

The first constituent is from an agricultural point of view the most valuable, and from a hygienic point of view the most dangerous, element of sewage. Even healthy excreta decompose, if kept for a short time after they are produced, and give rise to noxious gases; but a more serious danger proceeds from the fact that in certain cases of sickness these products are charged with specific germs of disease. Speedy removal or destruction- of excremental sewage is therefore imperative. It may be re- moved in an unmixed state, either in pails or tanks or-.(with the aid of pneumatic pressure) by pipes; or it may be defaecated by mixture with dry earth or ashes; or, finally, it may be conveyed away in sewers by gravitation, after the- addition of a relatively large volume of water. This last mode of disposal is termed the water-carriage system of sewerage. It is the plan now usually adopted in towns which have a sufficient water supply, and it is probably the mode which best meets the needs • of any large community. The sewers which carry the diluted excreta serve also to take slop-water, and may or may not be used to remove the surface water due to rainfall. The water- carriage system has the disadvantage that much of the agri- cultural value of sewage is lost by its dilution, while the volume of foul matter to be disposed of is greatly increased.

I. Collection of Sewage. — House drains, that is to say,

Fig. 2. — Stanford's Joint.

those parts of the domestic system of drainage which extend from the soil-pipes and waste-pipes to the sewer, are generally made of glazed stoneware pipes having a diameter of 4 in., 6 in., or sometimes 9 or 12 in., according to the estimated amount of * waste to be removed. In

auwtnˆMfa ordinary domestic dwellings

there is rarely any occasion

to use pipes of a greater

diameter than 6 in., and

this only for the main drain,

the branches and single lines

of piping being 4 in. in dia- Fig. 1.— Stoneware. meter It is a good rule to

make the pipes and other fittings, such as channels and bends, as small in diameter as possible, having due regard to efficient capacity. Such a drain is more cleanly than one too large for its purpose, in that it is more thoroughly flushed when in use, the sewage running at a much faster speed through a full pipe than through one only partially full. For this reason a pipe having

too great a capacity for the

Mum&n.j|i HI work it has to do is liable to

(ZZZZZZZZ2& become corroded by sedi- ment deposited from slowly moving waste.

The pipes are made in 2 ft. lengths and are formed with a socket at one end into which the straight end of the next pipe fits loosely. This is wedged in position with a little gasket and the remaining space then carefully filled with neat Portland cement (fig. 1). Pipes are made also with a bituminous substance in the socket and around the spigot end, and by merely pushing the one into the other the joint is

made. The bitumen is curved to allow self adjustment to any slight settle ment, so that damage to the joint is avoided (fig. 2). A composite joint may be used having the bitumen lining reinforced with the ordinary Portland cement filling (fig. 3). This type is some- what more expensive than the ordinary jointing, but it makes a powerful and effective connexion. The method of connecting two lead pipes by a " wiped solder joint " is shown in fig. 4. Fig. 5

shows the method of connect- JXnwnjgg^gj|-Wurrtl£n ing a lead pipe into the socket

of a stoneware one, a brass sleeve piece or ferrule being used to give the necessary stiffness to the end of the lead pipe. This arrangement is frequently used, for example, at the base of a soil-pipe at its junction with the drain. In the next figure (fig. 6) the lead pipe has a brass socket attached to it to take the plain end of a stoneware pipe. This form of connexion is used between a water-closet and a lead trap. The joint shown in figs. 5 and 6 is similarly made when an iron pipe is substituted for a stoneware one, but instead of the Portland cement filling, molten lead is used and carefully caulked to form a water- tight joint.

In the water-carriage system of drainage each house has its own network of drain-pipes laid under the ground, into which are taken the waste-pipes which lead from the closets, urinals,

sinks, lavatory basins, and rain-water and other gulleys within and about the house. The many branches are gathered into one or more manholes, and connexion is finally made by means of a single pipe with the common public sewer. Gas from the sewer is prevented from entering the house drains by a disconnecting trap fixed in the manhole nearest the entrance to the sewer. The fundamental maxims of house sanitation are first, that there shall be complete disconnexion between the pipes within and without the house, and second, that the drainage shall be so constructed as to allow for the free admission of air in order to secure the thorough ventilation of all parts of the system

Fig. 3. — Composite Joint.

Fig. 4. — Lead-wiped Joint.

and avoid the possibility of the accumulation of gas in any of the waste- or drain-pipes. The drains must be planned to conduct the waste material from the premises as quickly as possible without

leakage or deposit by the way. The pipes should be laid in straight lines from point to point to true gradients of between 2 to 4 in. in 10 ft. Junctions with branch pipes and any bends necessary should be gathered, as far as practicable, in inspection chambers

*fitted with open channels W^-^JSP^llMSm&a^*

instead of closed pipes. This allows of easy in- spection and testing, and provides means of access for the drain-rods in cases of blockage. Some- times it is desired, for reasons of economy or otherwise, to avoid the use of a manhole at a change of direction in the drain. A branch pipe which may have a specially shaped junction for cleaning the pipes in both directions is taken up with a slope to the ground or floor level and there finished with an air-tight cover which may be removed to allow the introduction of drain-rods should the pipes become blocked. Junctions of one pipe with another should be made

Fig. 5. — Lead into Stoneware.

obliquely in the direction of the floor. Stoneware pipes should be laid upon a bed of concrete not less than 6 in. thick and benched up at the sides with concrete to prevent any movement. When such

soctazJ

Fig. 6. — Stoneware into Lead.

Fig. 7. — Iron Spigot and Socket Joint.

pipes pass under a building they should be entirely surrounded by a concrete casing at least 6 in. in thickness. No drain should lie under a building if it is possible to avoid it, for injury is very liable to occur through some slight settlement of the build- ing, and in a position such that the smells escaping from the damaged pipe would rise up through the floor into the building this would be an especially serious matter. The expense and annoyance of having the ^

*ground opened up for the ^^ta^^LfcBBfc9** 3 ‘ <, ' n repair of defects in the pipes beneath is another strong argument against drains being placed under a house. Where this is really neces- sary, however, pipes of cast- iron are recommended instead of the ordinary stoneware pipes, as being stronger; being made in lengths of 6 and 9 ft., they have a great advan- tage over the 2 ft. long stoneware tubes, for the joints of the latter are frequently a source of weakness. The joints, fewer in number, are made with molten lead (fig. 7), or flanged pipes are used and the joints packed with rubber*

and bolted (fig. 8).

The principle of disconnexion adopted between the indoor and outdoor pipes should be retained between the latter and the sewer, and the domestic system should be cut off from the public drain by means of a dis- connecting trap. This appli- ance is usually placed in a small chamber or manhole, easy of access for inspection, built close to the boundary of the premises, and as near as possible to the sewer into which the house drain discharges.

Fig. 9 shows a section and plan of such a manhole built in accord- ance with the London drainage by-laws. There are five inlets from branch drains discharging by specially-shaped glazed channels into the main channel in the centre. It will be seen that in case of blockage it would be a simple matter to clear any of the pipes with

Fig. 8. — Iron-flanged Joint.

and Bolted

the drain-rods. The cap to the clearing arm has a chain attached by which it can be removed in case of flooding. The channels are benched up at the sides with cement, and the manhole is rendered on the inside with a cement lining. A fresh air inlet is taken out near the top of the chamber and is fitted with a mica flap inlet valve. The cover is of cast-iron in a cast-iron frame shaped with grooves to afford a double seal, the grooves being filled with a composition of tallow and fine sand. Where there is a danger of a backflow from the sewer due to its becoming flooded, a hinged flap should be placed at the junction of drain and sewer to prevent sewage from entering the house drain. A ball trap designed for this purpose may be used in place of a flap, and is more satisfactory, for the latter is liable to become corroded and work stiffly. In the ball-trap appliance the flowing back of the sewage forces a copper ball to fit tightly against the drain outlet, the ball dropping out of the way of the flow directly the pressure is relaxed.

The water-carriage system of drainage is undoubtedly the most nearly perfect yet devised. At the same time it is a very Earth . costly system to install with its network of sewers, closets. pumping stations, and arrangements for depositing the sewage either in the sea or river, or upon the land or " sewage farm." In country districts

and small towns and villages, however, excreta are often collected in small vessels

into-uxpHrKj trap

SECTION.

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PLAN.

Fig. 9.— Manhole.

and removed in tank carts and deposited upon the land. The dry-earth system introduced by the Rev. Henry Moule (1801- 1880), and patented in i860, takes advantage of the oxidizing effect which a porous substance such as dry earth exerts by bringing any sewage with which it is mixed into intimate contact with the air contained in its pores. The system is of rather limited application from the fact that it leaves othe^HJpstituents of sewage to be dealt with by other means. But^Par as it goes it is excellent, and where there is no general system of water- carriage sewerage an earth-closet will in careful hands give perfect satisfaction. Numerous forms of earth-closet are sold in which a suitable quantity of earth is automatically thrown into the pan at each time of use (fig. 10), but a box filled with dry earth and a hand scoop will answer the purpose nearly as well. A plan much used in towns on the continent of Europe xxiv. 24

doot

Fig. 10. — Ash or Earth-Closet.

(Aram pipe –

is to collect excrement in air-tight vaults which are emptied at intervals into a tank cart by a suction pump. Another pneumatic system adopted on the continent has the cesspools at individual houses per- manently connected with a central reservoir by pipes through which the contents of the former are sucked by exhausting

air from the reservoir at the central station.

Newly laid drains should be carefully tested before the trenches are _ .. filled in to detect l egt ,’”” anydefectsinthe draJas – pipes or joints. These should be made good and the test again applied until the whole system is in perfect order. Cement joints should be allowed to set for at least forty- eight hours before the test

is made. There are several methods of testing. For the stone- ware drains laid under the ground the water test is generally adopted. After the lower end of the length of drain to be tested has been securely stopped (fig. 11) the drain is filled with water from its upper end until the desired pressure is obtained. To obtain the required head of water extra lengths of pipe are sometimes taken up temporarily at the upper end of the drain or, as an alternative, both ends of the pipe may be plugged and water introduced under pressure by a force pump through a small aperture provided in the plug. The exact pressure may then be ascertained by a water pressure gauge. An escape of water through some defective portion of the drain i& indicated by the subsidence of the level of the water in the upper part of the drain or by a diminution of the pressure shown by the gauge. Then the defect must be located and remedied and the drain re-tested until all weak points are eliminated. This process must be repeated in each section of the drainage system until the whole is found to be sound and tight. It is not necessary to test drains laid with ordinary socket joints made in cement with a greater pressure than is obtained with a 5 ft. or 6 ft. head of water. A foot head of water gives at its base a pressure of 433 lb per square inch, so that a head of 6 ft. would result in a pres sure of just over 2§ lb per square inch. Cast-iron drain-pipes with caulked lead joints will withstand a pressure of nearly 90 ft per square inch of internal surface, but in actual practice it is sufficient if they are tested with a pressure of 10 ft or say a head of 20 to 24 ft.

The atmospheric or air test is sometimes applied instead of the water test. The drain is plugged, as in the latter, and air is then pumped into the pipes until the desired pressure is registered by the gauge attached to the apparatus. This pressure should be maintained without appreciable diminution for a stipulated period before the drains are passed as sound.

The smoke test is generally used for testing vertical shafts such as soil-pipes and ventilators to which the water test cannot be conveniently applied owing to the excessive pressure produced at the lower portion of the pipe by the head of water. It is applied by

stopping the ends of the pipes and introducing smoke by a drain rocket or by a smoke-producing machine which forces volumes of thick smoke through an aperture in the stopper. The pipes and joints are then carefully inspected for any evidence of leakage.

The scent test is occasionally employed for testing soil and ventilating pipes, but the apparatus must be carefully handled to avoid the material being spilt in the building and thus misleading the operator. The test is made by introducing into the drain some substance possessing a powerful odour such as oil of peppermint, calcium carbide or other suitable material, and tracing any defect by means of the escaping odour. This is not so effective a method as the smoke test, as there is more difficulty in locating leakages. Gulleys, traps and other similar fittings should be tested by pouring in water and ob- serving whether siphonage or unsealing occurs. This of course will not happen if the appliances are of good design and properly ventilated. A section of a drain plug or stopper is shown in fig. 11. It has a band of india-rubber which expands when the screw is turned and presses tightly against the inside of the drain-pipe. In the centre of the plug is a capped aperture which allows for smoke

Drain Stopper.

testing and also allows the water gradually to escape after a test by water.

Existing drains which have become defective and require to be made good must be exposed, taken up and relaid with new pipes, unless advantage be taken of a method which, it is claimed, renders it possible to make them permanently watertight so as to withstand the water test under pressure, and at the same time to disinfect them and the surrounding subsoil. This end is accomplished with the aid of patent machines which on being passed through the drain-pipe first remove all obstructions and accumulations of foul matter and then thoroughly cleanse and disinfect it, saturating the outside con- crete and contaminated soil adjacent to any leak with strong dis- infectants. Subsequently, loaded with the best Portland cement, another machine is passed through the drain, and, by powerful evenly-distributed circular compression, forces the cement into every hole, crack or crevice in the pipes and joints. This work leaves the inner surface of the pipes perfectly clean and smooth. After the usual

time has been allowed for the cement to set the air test is applied, and the drain is claimed to be equal to, if not better than, a new drain, because the foundation is not dis- turbed by the process, and the risk of settlement, which is often the cause of leaky drains, is remote.

Every sanitary fitting should be trapped by a bend on the waste-pipe; this is generally made separately and fixed up near to the sink,
Traps. doset or basin, as the case may be. The traps of small wastes such as those of sinks and lavatories should be fitted with a brass screw cap to facilitate clearing when a stoppage occurs. Their object is to hold a quantity of water suffi- cient to prevent the access of foul air through the waste-pipe into the house. The depth of the water " seal " should not be less than 2 in., or it may become easily unsealed in hot weather through the evaporation of the water. Unsealing may be caused, too, by " siphonage," when a •iSSS BB number of fittings are attached to the same main

SE-TlSkˆ waste without the branches being properly ven-

tilated just below each trap. The discharge from one fitting in this case would create a partial vacuum in the other branches and probably suck the sealing water from one or more of the traps. To obviate such an occurrence an " anti-siphon- age " pipe is fixed having its upper end open to the air and provided with branches tapping such waste-pipe just below the trap. Then, with this contrivance, a discharge from any fitting, instead of causing air to be sucked in through the trap of another fitting, thereby breaking the seal and

p _ g-] allowing foul drain air to enter the house, merely

p;„ with Anti draws the necessary air through the anti-siphonage

ˆV n „, p;™T Pipe, leaving the other traps with their seals intact sipnonage ripe. (fig I2) There are many forms of traps for use

in different positions although the principle and purposes of all are identical. Two forms commonly used are known as the S and the P trap. The bell trap and the D trap are obsolete.

To collect the rain and waste water from areas, yards, laundry and other floors and similar positions an open trapped gulley is used. It is usually of stoneware and fitted with an open iron Qutteys. g rat i n g which admits the water (fig. 13). Many of these gulley s are made too shallow and speedily get choked if the water they receive is

charged with mud or sand. To obviate this difficulty

Tain water

Fig. 13. — Gulley.

Fig. 14. — Docking's Slipper Head.

the gulleys are made with a deep container and are often fitted with a perforated basket of galvanized iron which catches the solid matter and has a handle which allows for its easy removal when necessary. Gulleys with slipper or channel heads as shown in fig. 14 are required to be fitted in some districts to receive the waste from sinks. The warm waste water from scullery and pantry sinks contains much grease, and should discharge into a trapped gulley specially constructed to prevent the passage of the grease into the drain (fig. 15). It should be of ample size to contain sufficient cold water to solidify the fat which enters it. This forms in cakes on the top of the water end should be frequently broken up and removed.

Fig. 15.-

-Stoneware Grease Trap.

Water- closets.

Great attention has been directed to the design of sanitary fittings; with the object of making them as nearly self-cleansing as possible. In the fixing of closets the wood casings which used to be fixed around every water-closet are going steadily out of use, their place being taken by a hinged seat sup- ported on metal brackets — an arrangement which allows every part of the appliance to be readily cleaned with a cloth. In hospitals and similar institutions a form of closet is made fitted with lugs which are built into the wall; in this way support is obtained without any assistance from the floor, which is left quite clear for sweeping. Lavatory basins and sinks are also supported on cantilevers in the same way, and the wood enclosures which were formerly often fixed around these appliances are now generally omitted.

There are several distinct types of water-closets. Each type is made in many different patterns, both good and bad from a sanitary point of view, and, whatever the type decided upon, care is necessary in selecting to obtain one efficient and hygienic in shape and working. The principal kinds of closets now in use are the washdown, siphonic, valve, washout and hopper.

Washdown closets (fig. 16) are most commonly used. They are inexpensive to buy and to fix, and being made in one piece and simple in con- struction without any mechanical work ing parts are not liable to get out of order. When strongly made or pro- tected by brick or concrete work they will stand very rough usage. The objection is sometimes raised with regard to washdown closets that they are noisy in action. This must be allowed with many patterns, but some of the latest designs have been greatly improved in this respect, and when fitted with a silent flushing cistern are not open to this objection.

Siphonic closets (fig. 17) are a type of washdown in which the contents of the pan are removed by siphonic action, an after flush arrangement providing for the reseating of the trap. They are practically silent in action and with a flush of three gallons work very satisfactorily. Where the restrictions of the water company require the usual two gallon flush the ordinary washdown pan should be used.

Valve closets (fig. 18) are considered by many authorities on sanitation to be preferable to all other types. For domestic buildings,

■*Washdown.*

Fig. 17. — Siphonic Washdown.

Fig. 18. — Valve.

hotels, and where not subjected to the hardest wear, they are undoubtedly of great value. They should have a three gallon flush, and on this account they cannot be used in many districts owing to the water companies' regulations stipulating that a flush of not more than two gallons may be used.

The washout closet (fig. 19) is a type that never attained much popularity as it has been found by practical experience to be unsanitary and objec- tionable. The standing water is too shallow, and the receiving basin checks the force of the flush and the trap is therefore fre- quently imperfectly cleared.

Hopper closets are of two kinds — the long hopper and the short hopper. These are the forerunners of the washdown closet which the short hopper pan resembles, but instead of pan and trap being made in one piece the fitting consists of a fireclay or stoneware hopper, with straight sloping sides and central outlet jointed to a trap of lead or other material. The joint should be placed so as to be always kept

under water by

Fig. 19. — Washout.

the seal of the trap. The long hopper pan is a most objectionable type of closet which should be rigorously avoided as it easily becomes foul and is most insanitary. In most districts its use is prohibited. A water-waste preventer is a small tank fixed usually 4 or 5 ft. above a closet or urinal and connected therewith by a flushing pipe of i{ in. or greater internal diameter. This tank usually contains a siphon, and the flush is actuated by pulling a chain which admits water to the siphon; the contents are then discharged with some force down the flushing pipe into the pan of the closet, clearing out its contents and replacing the fouled water with clean. The flushing tank is automatically refilled with water by a valve fitted with a copper ball which rising on the surface of the incoming water shuts off the flow when the tank is full. Fig. 20 is a sectional drawing of one of the latest patterns and clearly shows its construction. The water-supply is shown near the top with the regulating ball valve attached. An overflow is provided and a pipe is led from this to an external outlet. The capacity of the ordinary domestic flushing cistern is two gallons, which is the maximum quantity allowed by most water companies. A three gallon flush is much better, however, and where this larger quantity is allowed should be adopted. Larger tanks for ranges of closets or urinals are often made to flush auto- matically when full, and for these the rate of water supply may be

supply

flow

Fig.

P'pz-

20. — Water- Waste Preventer for flushing W.C.'s.

fast or very slow as desired, for the siphons are so constructed that even a drop-by-drop supply will start a full flush.

The by-laws of the London County Council contain very full regulations respecting the construction and fitting up of water-

closets. These may be summarized as follows : — A water- Regula- closet or urinal must be furnished with an adequate wcˆ S flushing cistern distinct from any cistern used for drinking s ‘ water. The service pipe shall lead to the flushing cistern and not to any other part of the closet. The pipe connecting the cistern with the pan shall have a diameter of not less than ii in. in any part. The apparatus for the application of water to the ap- paratus must provide for the effectual flushing and cleansing of the pan, and the prompt and effectual removal therefrom, and from the trap connected therewith of all solid and liquid filth. The pan or basin shall be of non-absorbent material, of such shape, capacity and construction as to contain a sufficient quantity of water and to allow all filth to fall free of the sides directly into the water. No ” con- tainer” or similar fitting shall be fixed under the pan. There shall be fixed immediately beneath or in connexion with the pan an efficient siphon trap constructed to maintain a sufficient water seal between the pan and the drain or soil pipe. No D trap or other similar trap is to be connected with the apparatus. If more than one water-closet is connected with a soil-pipe the trap of each closet shall be ventilated into the open air at a point as high as the top of the soil-pipe, or into a soil-pipe above the highest closet. This ventilating (or anti-shiphonage) pipe shall be not less than 2 in. in diameter, and connected at a point not less than 3 and not more than 12 in. from’the highest part of the trap (fig. 12).

Baths may be made of many different materials; copper, cast- iron, zinc and porcelain are those most generally employed. Metal _ . baths have the great advantage of becoming hot with the

s ‘ water, while baths of porcelain, stoneware and marble, which are bad conductors of heat, impart to the user a sense of chilli- ness even though the water in the bath be hot. Copper baths are be it; they may be finished on the inside by tinning, enamelling or nickel plating. Iron baths, usually tapering in shape, are very popular and are usually finished in enamel, but sometimes tinned. Fig. 21 illustrates a good type of cast-iron bath with standing waste. A good feature of this bath lies in the fact that all parts are accessible and easily cleaned. Porcelain baths are cumbersome and take a long time to heat, but they are often used for public baths. The practice of enclosing the bath with a wood casing is fast dying out; it is insanitary in that it harbours dust and vermin. Baths are now usually elevated upon short legs, so that every part of them and of the adjacent floor and wall is accessible for cleaning.

Fig. 22 is a section of a good type of scullery sink, and shows the

waste and trap with brass clearing cap. The fitting is supported

upon galvanized iron cantilever brackets which are built into the wall.

Like closets, urinals have undergone much improvement in design and manufacture. The best types are of glazed ware, and have vertical curved backs and sides about 4 ft. high with a i/rioa/s flushing rim round the top and terminating in a base discharging into an open glazed channel waste, which, in the case of a range of urinals, collects the discharge from all and conveys it into

f floor

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Fig. 22. — Sink.

Fig. 21. — Bath, with Standing Waste, a trapped gulley at one end of the range. This is the type usually fixed in street conveniences and similar positions. Plate and iron urinals are often fixed, but there is more difficulty in keeping them clean on account of the sharp angle and the unsuitability of the material. Urinals are seldom fixed in private houses or offices, an ordinary washdown pedestal closet with hinged " tip-up" seat serving every purpose. Such seats are often fitted with balance weights to cause them to lift automatically when not in use as a closet. Unless kept very clean and well flushed with water, urinals are liable to become a nuisance.

In London among other towns the system of drainage is a " combined" one, that is, the storm water and the domestic sewage and waste is all collected in one sewer. For many reasons it is more satisfactory to have the two drains quite separate. In many districts this is done, but it entails the provision of a double system of drainage for each house, one drain being provided for rain-water, the other for sewage. Where combined drainage is installed an ex- cess of water poured into the sewers during a storm often results in back flow and the flooding of base- ments and cellars with sewage. Such an occur- rence might take place where there is a separate sewer for the storm water, but in this case the flooding would be with comparatively harmless rain-water instead of sewage and filth. Figs. 23 and 24 show two ground plans of the same house, a semi-detached suburban residence, one with combined drainage and the other with separate drains for storm water and sewage. In both figures the rain-

water drains are shown in a dotted line, and other drains in a full line.

In fig. 23, A is a 4 in. cast-iron rain-water down-pipe. B is a 4 in. ventilating-pipe taken up to a point above the building. C is a trapped gulley such as is shown in fig. 13. D is a gulley with channel head (fig. 14) into which are taken the discharges from the scullery sink on the ground floor, and from the bath and lavatory on the first floor. E is an untrapped manhole, with open channel bends and sealed cast-iron cover, from which any branch of the drains can easily be cleared by the use of drain-rods. F is a soil-pipe from a water-closet on the first floor, and is carried up above the roof to serve as a ventilator. G is a trapped gulley as fig. 13, taking the discharge from the rain-water pipe over it and serving also to drain the yard; H and J are similar gulleys. K is a manhole with trap for intercepting the foul gases from the sewer and preventing them from entering the house drains. The manhole is fitted with a sealed cast-iron cover and has an inlet at L with mica flap valve to admit fresh air to the drains ; in construction it is similar to the one shown in fig. 9, but has only two branches entering it instead of five. In fig. 24, A is a rain-water pipe discharging to the gulley B, which is un- trapped to allow of the ventilation of the branch C-B. C is a length of piping brought up to the surface of the ground and finished with a cap, which is removed when it is found necessary to clear away any obstruction. A special shaped junction here allows the rods to be pushed up either branch as required. D and E are trapped gulleys as already described. F is an untrapped gulley serving to ventilate the drain. G, H and J the same as for fig. 23. K is a pair of man- holes built side by side, one for storm water and the other for sewage. Both are fitted with intercepting traps, and the sewage chamber is ventilated by an air inlet at L as in fig. 23. The cover of the storm water manhole need not be sealed, and if necessary could be fitted with a grating and be used to drain the forecourt.

The London by-laws regulating drainage are very full and are strictly enforced. They include requirements regarding the size, _ , form, gradient and methods of construction and repair of

bv-law? drains, together with regulations affecting the design and ‘ fixing of traps, fittings and other apparatus connected with sanitary arrangements. Some of the headings of the different clauses of the

by-laws are subjoined: — water-closets; earth-closets; drainage of subsoil ; drainage of surface water ; rain-water pipes ; materials, &c, for drains; size of drains; drain to be laid on bed of concrete 6 in. thick; if under buildings to be encased with 6 in. of concrete; drain to be benched up with concrete to half its diameter; fall of drain; joints of drain; drain to be water-tight; thickness and weight of iron pipes; thickness of sockets and joints of stoneware pipes; drains under buildings; composition of concrete; every inlet to drain to be trapped ; drain beneath wall to be protected by arch, flagstone, or iron lintel; drain connected with sewer to be trapped and means of access to trap provided; no right-angled junctions to be formed either vertical or horizontal; at least two untrapped openings to be provided for ventilation, each fitted with a grating or cowl with apertures for passage of air equal in area to that

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'Load

Fig. 23. — " Combined " System. Tig. 24.—" Separate " System.

of the pipe to which it is fitted ; ventilating shafts to be at least 4 in. in diameter, and if possible all bends and angles to be avoided; ventilating shafts to be of the same material, construction and weight as soil-pipes; no unnecessary inlets to drains to be made within buildings; waste-pipes from sinks and lavatories to be of lead, iron or stoneware, trapped immediately beneath the fitting ; bell traps, dip traps and D traps are prohibited ; waste-pipes to discharge in the open air into a properly trapped gulley ; soil-pipes wherever practic- able to be situate outside the building and to be of drawn lead or heavy cast-iron; if fixed internally the pipes to be of lead with wiped joints; iron pipes to have socket joints not less than 2| in. in depth and to be made with molten lead or flanged joints securely bolted with some suitable insertion; the soil-pipe not to be con- nected with any rain-water or waste-pipe, and no trap to be placed between the soil-pipe and the drain ; the soil-pipe to be circular with an internal diameter of not less than 3 J in., and to be taken up above the building and its end left open as an outlet for foul air; methods of connecting a lead pipe with an iron one; connexion of stoneware and lead, connexion of iron and stoneware; ventilation of trap of water-closet with an anti-siphonage pipe of not less than 2 in. diameter and ventilated into the open air or into the soil-pipe at a point above the

highest fitting on the soil-pipe ; construction of slop sinks and urinals.

The by-laws respecting health and building in New York City are embodied in a large number of clauses. The more detailed health regulations are found in the Sanitary Code 1903. These are by-laws framed by the Board of Health under the authority of section 1172 of the New York Charter 1897. These must be taken in conjunction with the statute bearing on plumbing in New York City which was

made by the Department of Buildings, 1896, and to which there have been several small amendments. Section 141 of the Building Code also deals with sanitation and in the Tenement House Act 1901, 1902, 1903, chap. 4, sees. 91 to 100 inclusive, deals with sanitary matters. From a general point of view the requirements of the American by-laws as to materials and methods of construction vary in a very slight degree from those in force under the London authorities. It is in the regulations affecting the execution of the work that we findj a great difference, and these in New York are of a more stringent character than in any other capital. Thus no sanitary, plumbing or lighting work may be undertaken without first submitting for approval to the Department of Buildings complete and suitable drawings and particulars of the materials to be used. Such a notice is necessary even in the case of repairs and alterations to existing work. As a further guarantee of the work being satis- factory it is ordained that no such work shall be executed except under the superintendence of a registered plumber. Every master plumber in the city of New York or others working therein as such must obtain a certificate of competency from the Examination Board and be registered afresh every year during the month of March, as without such certificate or licence no work can be under- taken; any person violating such requirements shall upon con- viction be fined for each offence $250 or undergo three months' imprisonment or both, while in the case of any certificated plumber or his employes wilfully breaking, with his knowledge, any of the rules and regulations relating to drainage and plumbing, the certifi- cate of the master is to be forfeited in addition to the aforementioned fine.

II. Conveyance op Sewage. — For small sewers, circular pipes of glazed stoneware or of moulded cement are used, from 6 in. to 18 in. and even 20 in. in diameter. The pipes are made in short lengths, and are usually jointed severs by passing the end or spigot of one into the socket or faucet of the next. Into the space between the spigot and faucet a ring of gasket or tarred hemp should be forced, and the rest of the space filled up with cement. Other methods of jointing have

already been described and illustrated. The pipes are laid with the spigot ends pointing in the direction of the flow, with a uniform gradient, and, where practicable, in straight lines. In special positions, as under the bed of a stream, cast- iron pipes are used for the conveyance of sewage. Where the capacity of an 18-in. circular pipe would be insufficient, built sewers are used in place of stoneware pipes. These are sometimes circular or oval, but more commonly of an egg-shaped section, the invert or lower side of the sewer being a curve of shorter radius than the arch or upper side. The sewers. advantage of this form lies in the fact that great variations in the volume of flow must be expected, and the egg-section presents for the small or dry-weather flow a narrower channel than would be presented by a circular sewer of the same total capacity. Figs. 25 and 26 show two common forms

Figs. 25 and 26. — Forms of Sewer.

of egg-sections, with dimensions expressed in terms of the diameter of the arch. Fig. 26 is the more modern form, and has the advantage of a sharper invert. The ratio of width to height is 2 to 3.

Built sewers are most commonly made of bricks, moulded to suit the curved structure of which they are to form part. Separate invert blocks of glazed earthenware, terra-cotta or fire-clay are often used in combination with brickwork. The bricks are laid over a templet made to the section of the sewer, and are grouted with cement. The thickness of brickwork for sewers over 3 ft. in diameter should not be less than 9 in., but for smaller sewers laid in good ground at depths not exceeding 20 ft. from the surface a thickness of 4! in. will suffice if well backed up with concrete. The thickness of brickwork for a

Fig. 27. — Brick Sewer.

sewer of any size may be determined in feet by the formula dr/100, where d = depth of excavation in feet and r = external radius in feet.

An egg-shaped sewer, made with two thicknesses of brick, an invert block, and a concrete setting, is illustrated in fig. 27.

Concrete is largely used in the construction of sewers, either in combination with brickwork or alone. For this purpose the con- crete

consists of from 5 to 7 parts of sand and gravel or broken stone to 1 of Portland cement. It may be used as a cradle for or as a backing to a brick ring, or as the sole material of construc- tion by running it into position round a mould which is removed when the concrete is sufficiently set, the inner surface of the sewer being in this case coated with a thin layer of cement. A develop- ment in the construction of concrete sewers, whether laid in sectional pipes or constructed and moulded in situ, is the use of iron or steel bars and wires embedded in the material as a rein- forcement. Such conduits can be constructed of any size and designed to withstand high pressures. Fig. 28 is a section of a concrete sewer having a diameter of more than 9 ft. constructed with round rod reinforcement. With regard to the method for calculating the proportions, generally speaking the thickness of the concrete shell should in no place be less than one-twelfth

of the greatest in- 3VrhicK ternal diameter of

the tube, while the steel reinforcement should be designed to resist the whole of the tensile stress. S^"thicK Where the safe tensile stress in the steel is 8 tons per sq. in. P = the pres sure in pounds per sq. in., and r = the internal radius in inches; the weight of the re- inforcement per sq. ft = Pr/450, while its area at each side of the pipe per longitudinal foot, when /=safe tensile stress in the reinforcement in pounds, is i2Vr'f.

In determining the dimensions of sewers, the amount of sewage proper may be taken as equal to the water supply (generally about Dlmen- 3 ° g allons P er nea< i P er diem), and to this must be added sioas of (when the " combined " system is adopted) an allowance sewers. for the sur f ac e water due to rainfall. The latter, which is generally by far the larger constituent, is to be estimated from the maximum rate of rainfall for the district and from the area and character of the surface. In the sewerage of Berlin, for example, the maximum rainfall allowed for is J of an inch per hour, of which one- third is supposed to enter the sewers. In any estimate of the size of sewers based on rainfall account must of course be taken of the relief provided by storm-overflows, and also of the capacity of the sewers to become simply charged with water during the short time to which very heavy showers are invariably limited. Rainfall at the rate ot 5 or 6 in. per hour has been known to occur for a few minutes, but it is unnecessary to provide (even above storm-overflows) sewers capable ot discharging any such amount as this; the time taken by sewers of more moderate size to fill would of itself prevent the dis- charge from them from reaching a condition of steady flow; and. apart from this,

the risk oi damage by such an exceptional fall would not warrant so great an initial expenditure. Engineers differ widely in their estimates of the allowance to be made for the dischaige of surface water, and no rule can be laid down which would be of general application.

In order that sewers should be self-cleansing, the mean velocity of flow should be not less than 2§ ft. per second. The gradient

Fig. 28. — Reinforced Concrete Sewer. Section.

Inter- ception

sewers.

necessary to secure this is calculated on principles which are stated in the article Hydraulics (§.».). The velocity of flow, V, is

.... Velocity of

where i is the inclination, or ratio of vertical to horizontal discharge. distance; m is the " hydraulic mean depth," or the ratio of area of section of the stream to the wetted perimeter; and c is a coefficient depending on the dimensions and the roughness of the channel and the depth of the stream. A table of values of c will be found in § 98 of, the article referred to. This velocity multiplied by the area of the stream gives the rate of discharge. Tables to facilitate the determination of velocity and discharge in sewers of various dimensions, forms and gradients will be found in Latham's and other practical treatises.

Where the contour of the ground does not admit of a sufficient gradient from the gathering ground to the place of destination, the sewage must be pumped to a higher level at one or more points in its course. To minimize this necessity, and also for other reasons, it is frequently desirable not to gather sewage from the whole area into a single main, but to collect the sewage of higher portions of the town by a separate high- level or interception sewer.

It is undoubtedly necessary to construct overflows for storm water in connexion with combined systems of sewerage. No com- bined sewer of such size as will make it comparatively _. self-cleansing under normal conditions can hope to carry . " off the volume of water resulting from heavy rain. It over fi ows might be thought that the overflow resulting from a storm would consist of nearly pure rain-water, but this is not the case, as the pressure of storm water has the

effect of scouring out from the sewers a great deal of foul matter that is deposited when the flow is small. This being the case it is obviously bad policy to take the overflow into a stream, which would thereby suffer con- tamination. A better plan is to direct the discharge into a dry ditch or channel where the liquid may soak into the soil and the solid particles by contact with the air may quickly become oxidized. In agricultural districts it might be possible by arrangement with farmers to run the overflow over grass-land, as it has good manurial properties.

Occasionally when a sewer has to cross a stream or other ob- struction it is found impossible to bridge or carry the pipe across and preserve its proper gradient. In such cases it must be fa . . carried under the obstruction by means of an inverted s j D hons siphon. [The exact form that should be given to inverted siphons is disputed, but it is generally agreed that they are ex- pedients to be avoided wherever possible. The majority take roughly the form of the stream section, that is, they have two sloping pieces corresponding with the banks with a flat cross-piece under the bed of the stream. The pipes are invariably of iron and should be laid in duplicate, as they are liable to silt up in the flat length. For this reason it is usual in constructing a siphon to place permanent chains in the pipes, and these are periodically pulled backward and for- ward to stir up the silt. Brushes may also be attached to the chains and pulled through from end to end. At either end of the siphon pipes there are manholes into which the pipes are built. Penstock valves also should be provided at each end so that sewage can be shut out of one or both of the siphons as desired for clearing purposes.

Tumbling bays being prohibited, the usual method of leading a high- level sewer into a Tow-level sewer is by means of a ramp. This is constructed in connexion with a manhole into which the end of the high-level sewer is taken and finished usually with a flap valve. Some distance back along this sewer a wide-throated junction is put in the invert of the sewer, and from this junction a ramp-pipe is taken down to the invert of the low-level sewer, so that the sewage in the upper sewer instead of having a direct fall runs down the slope of the ramp. The ramp-pipe is usually con- structed of iron and is of smaller section than the high-level sewer because of the greater fall and pressure.'

In the low-lying parts of towns storage tanks are often constructed to receive the sewage of such districts. They are periodically emptied of their contents, which are pumped up into the main sewers through which the sewage travels to the outfall. This storing of sewage should

be avoided whenever possible. It is much better to provide for raising it as it is produced either by an installation of one or more automatic lifts, such as Adams's sewage lifts, or, where a large amount of material is to be dealt with, necessitating continual pumping, by a Shone ejector worked by compressed air.

Sewer gas is a term applied to the air, fouled by mixture with gases which are formed by the decomposition of sewage, and by the organic germs which it carries in suspension, that fills the_ sewer in the variable space above the liquid stream. It is universally recognized that sewer gas is a medium for the conveyance of disease, and in all well-designed systems of sewerage stringent precautions are taken to keep it out of houses. It is equally certain that the dangerous character of sewer gas is reduced, if not entirely removed, by free admixture with the oxygen of fresh air. Sewers should be liberally ventilated, not

Con- nexion between high- and low-level sewers.

Ventila- tion of sewers.

only for this reason, but to prevent the air within them from ever having its pressure raised (by sudden influx of water) so considerably as to force the " traps " which separate it from the atmosphere of dwellings. The plan of ventilation now most approved is the very simple one of making openings from the sewer to the surface of the street at short distances — generally shafts built of brick and cement — and covering these with metallic gratings. Under each grating it is usual to hang a box or tray to catch any stones or dirt that may fall through from the street, but the passage of air to and from the sewer is left as free as possible. The openings to the street are frequently made large enough to allow a man to go down to examine or clean the sewers, and are then called " manholes." Smaller openings, large enough to allow a lamp to be lowered for purposes of inspection, are called " lampholes," and are often built up of vertical lengths of drain-pipe, 6 in. or 9 in. in diameter, and finished at the surface with a cover similar to that used for a manhole but smaller. A length of 150 ft. Of pipe sewer is about the limit that can be sighted through. Lampholes are mostly used in the_construction of pipe and other small sewers.

To facilitate inspection and cleaning, sewers are, as far as possible, laid in straight lines of uniform gradient, with a manhole or lamphole _. .. at each change of direction or of slope and at each junction /" "re °^ mams with one another or with branches. The sewers o sewe . ma y a d van t a g eous iy De stepped here and there at man- holes. Sir R. Rawlinson pointed out that a difference of level between the entrance and exit pipes tends to prevent continuous flow of sewer gas towards the higher parts of the system, and makes the ventilation of each section more independent and thorough. When the gradient is slight, and the dry-weather flow very small, occasional flushing must be resorted to. Flap valves or sliding penstocks are introduced at manholes; by closing these for a short time sewage (or clean water introduced for the purpose) is dammed up behind the valve either in higher parts of the sewer or in a special flushing chamber, and is then allowed to advance with a rush. Many self-acting arrangements for flushing have been devised which act by allowing a continuous stream of comparatively small volume to accumulate in a tank that discharges itself suddenly when full. A valuable contrivance of this kind is Rogers Field's siphon flush tank. When the liquid in the tank accumulates so that it reaches the top of the annular siphon, and begins to flow over the lip, it carries with it enough air to produce a partial vacuum in the tube. The siphon. then bursts into action, and a rapid discharge takes place, which continues till the water-level sinks to the foot of the bell- shaped cover. Adams's " Monster Flusher " is constructed on similar principles and is of simple and strong design. Its flushing- power is claimed to be greater than that of the ordinary siphon. By the use of this appliance, which is automatic in action, shallow sewers can be effectively flushed. Fig. 29 is a section of a flushing chamber

fitted with this rmanholeaj sp ewing j> siphon. Such

flushing appar- atus may be operated by a water-su pply from an ordinary tap which may be regulated for a large or small flow. The cap- acity of flush tanks is a little difficult to deter- mine. As a rule 400 to 600 gallons sewers, the amount

Fig. 29. — Flushing Chamber for Shallow Sewers.

250 to 400 gallons are allowed, for 9-in. sewers

for 12-in., and 600 to 800 gallons for 15-in.

increasing by 200 gallons for each 3-in. additional diameter.

III. Disposal of Sewage. — The composition of domestic sewage is now fairly well known and is generally reduced for the purposes of coriiparison to a standard; that is to say, ordinary sewage is that due to a water-supply of about 30 gallons per head per diem. If the supply is less, and there is no leakage of subsoil water into the drainage system, the sewage will be stronger; conversely, if there is leakage, &c, the sewage will be more dilute, but obviously, the quantity of impurities will, for any given population, be the same in amount. The subjoined table shows the kind of sewage referred to: —

Average Domestic Sewage, in Grains per Gallon.

Total Solids in Solution.

Organic Carbon.

Organic

Nitrogen.

Am- monia.

Chlorine.

Suspended.

Mineral.

Organic.

Total Combined Nitrogen.

50-54

3-287

*1*543*

4-70

7-46

16-92

14-36

5-41

For all practical purposes we may say that average sewage

contains two tons of suspended matters in each million gallons, one-half of which is mineral matter. When, however, we come to a consideration of trade waste, the question becomes difficult in the extreme, because of the great variety of trades, and the ever varying quantities added to the sewage. Some of the prin- cipal trade wastes are from dye-works, print-works, bleach-works, chemical works, tanneries, breweries, paper-makers, woollen- works, silk-works, iron-works and many others. In some cases one only of these trade wastes finds its way to the sewers; in others, several of them may be found. In some instances, again, these trade wastes are of an alkaline nature, in others they are acid; the mixtures may be either, and of greatly varying character. Next comes the manner in which sewage is discharged at the works. The flow is variable throughout the entire 24 hours, but in the case of sewers discharging domestic sewage only, such sewage being of the standard strength, it will be a close approxi- mation to the facts to say that about two-thirds is discharged between the hours of 7 a.m. and 7 p.m., one-half during the eight hours of maximum flow, two-fifths during the six hours of maxi- mum flow, and about 7!% per hour during the two hours of maximum flow. These data will be sufficient for the design of the works intended for dealing with the sewage. Separate calculations must be made if there is trade refuse, or much leakage of subsoil water. In very large systems, again, the maxima are rather less because of the time occupied by the sewage in travelling to the outfall from the more remote parts of the district. In cases where one set of sewers is employed for both sewage and rainfall the sewage flow may be increased more than a hundredfold within a few minutes by heavy rain- storms. Of course the sewage disposal works can only deal with a small proportion of such flow, and the balance is discharged into some convenient water-course or other suitable place. Even when the separate system is employed, as in the case of the smaller towns, the flow may be in- creased ten to fifteen times by rain, because it is unusual to carry two sets of drains to the backs of the houses. In design- ing outfall works, therefore, all these circumstances must be carefully considered. Again, when the sewage is pumped, as is frequently the case, the size of the tanks must often be increased, because in the smaller installations the whole of the day's sewage is frequently pumped out in a few hours; this fact must also be remembered when designing filters.

Nearly every town upon the coast turns its sewage into the sea. That the sea has a purifying effect is obvious. The object to be attained is its dispersion in a large volume of sea-water. As it is lighter than salt

water it tends to rise after leaving the sewer; the outfall should, therefore, if practicable, terminate in deep water, so that the two liquids may become well mixed. The currents must be studied by means of floats, and in most cases the sewage must be discharged upon the ebb tide only, and then perhaps not throughout the entire period, the object being to prevent it from being carried towards the shore. That the purification is effected mainly by means of living organisms is well established, and it has been urged by competent authorities that this system is not wasteful, since the organic matter forms the food of the lower organisms, which in turn are devoured by fish. Thus the sea is richer, if the land is the poorer, by the adoption of this cleanly method of disposal. The next step is the partial purification of the sewage by means of a chemical process. When a town lies some distance up an estuary, as for example London, Glasgow, Rochester and many others, the dilution may be insufficient to prevent a nuisance, or the suspended matters may be deposited upon the foreshore to be uncovered at low water. The first stage of purification is then employed, namely, clarification in tanks. Practice varies with regard to tank capacity, but as a general rule it should be at least equal to Jialf a day's dry weather flow. This will enable the works manager to turn out a good effluent, even in wet weather, when the volume is much increased. With regard to the practical effect of any particular treatment, it is now recognized that the matters in solution are scarcely touched by any chemical process that can be employed, but the removal of the suspended matter is a great

gain, as has been proved in the case of London. Briefly, a good chemical process will do about one-half of the work of purification; and in many cases it is not necessary to go further. With regard to the kind of chemical to use, lime, either alone or in conjunction with aluminium sulphate or with ferrous sulphate, is most frequently employed. When the resulting sewage sludge has to be filter-pressed, lime is almost essential for the primary treat- ment of the sewage, in order to destroy the glutinous nature of the sludge. In the case of large towns like London, Manchester and Salford, the sludge is shipped in specially designed steamers, of 600 tons to 1000 tons burden, and discharged into the sea at a distance from the coast. The London outfall works have a fleet of six steamers, which convey the sludge out to Barrow Deep, a channel in the North Sea about 10 m. east of the Nore lightship. Each vessel has four oblong tanks having a

total capacity of 1000 tons of sludge, which can be discharged in seven minutes when the valves are fully opened. The sludge is discharged about 10 ft. under the water and being agitated by the action of the ship's screws is very completely diffused. The sand and earthy matters soon subside and the organic matter is rapidly consumed by the organic life in the sea- water. A care- ful microscopical examination and chemical analysis failed to detect more than the merest trace of the mineral portion of the sludge, either in dredgings from the bottom of the channels or on the surface of the sandbanks. The cost of the disposal works out at about 45 d. per ton of sludge.

In the case of towns situated on rivers above the range of tidal waters, the further purification is effected either on land, or by means of artificial filters, or a combination of the two. The question of land treatment is frequently considered from the standpoint of so many persons to the acre; but the best method is to ascertain how many gallons per day an acre of land will purify. As the quality of land varies greatly, the proper volume to be applied per acre can only be ascertained after a good deal of experience. The range lies between about 3000 gallons per acre per day in the case of poor land, to about 30,000 gallons in the same period in the case of the best. Let us assume an instance of the latter kind. The works have been designed on a basis of 1000 persons per acre, producing 30,000 gallons of sewage per day; the land being of a highly suitable character, and the sewage having been clarified, success is assured. But, conversely, through faulty construction of the sewers, the sewage amounts, say, to 60 gallons per head; the land, unable to deal with the liquid, quickly becomes water-logged and offensive, and the works are a failure. Precisely the same remarks apply to artificial filters, which are always designed upon' the basis of so many gallons per square yard of filtering material. Many failures of both land and filters have been due to the fact that the actual sewage flow was greatly in excess of the original estimates. We may say that clay soils lie at one end of the scale, and very porous sands or gravels at the other; obviously, therefore, each case must be considered on its merits. It should be re- membered that when such moderate quantities as 3000 gallons per acre per day are applied to land, there is no necessity to remove the suspended matter; broad irrigation being resorted to, the land readily assimilates the solids, and thus one source of expense may be eliminated.

The artificial filters are now generally called bacteria beds; although filters have been in constant use in some cases, as for instance at Wimbledon, for a great number of years. The first filters constructed

at these works were made in 1876, and were about 7000 sq. yds. in extent. With the growth of popula- tion additions have been made of at least five times that area. One of the original beds was used for crude sewage, but the mineral matter choked it completely, and experience pointed to the necessity of clarifying the sewage before filtration. Whether the treatment should be in open or in closed tanks, or whether chemicals should be added, has been much debated; but seeing that ordinary sewage contains one ton of suspended mineral matter in each million gallons, it is clear that if this is not removed before filtration, it will be retained in the filters and ultimately choke them, as happened at Wimbledon. The

common cesspool has been resuscitated and improved under the name of a septic tank. In this the disintegration of the suspended matter is brought about by anaerobic organisms, and the liquid in passing slowly through the tank absorbs most of the gases due to the breaking down of the organic matter. There is no oxidation at this stage. The liquid is – next passed through artificial filters, of which there are many types. What is known as a " contact " filter was constructed, probably for the first time on a large scale, at the London (Barking) works. The object sought to be attained was that of making each cubic yard of filtering material perform the same amount of work, and the least expensive way was apparently to close the- outlet, and charge the filter with liquid, allowing it to remain in contact for about two hours, and then drawing it off so that the bed could be thoroughly aerated. No doubt a better way would be to distribute the sewage in the form of a shower of liquid, and work the beds continuously, but this involves a good deal of expense for spreading appliances, and a fall is necessary in the works, which is not always obtainable. Probably the most complete installation of the kind last referred to is that at Salford. Iron pipes are led over the surface of the filters, and spraying nozzles are placed at short intervals, so that the sewage is applied in the form of a heavy shower. But whatever form the filters and appliances may assume, the final result is the same. If the beds are properly aerated, the aerobic organism establishes itself in prodigious numbers, and attacks the organic matter, breaking it down into harmless, soluble and gaseous products. It is, of course, assumed that the filters are adequate in area, and are properly managed. With regard to the materials to be employed in making sewage filters, it is now well established that the size of the particles has a more important bearing than their composition. At the same time, it may be remarked that materials with very rough surfaces, as for instance coke breeze, are more effective than those with smooth surfaces.

Doubtless the former classes afford, in the interstices, a lodging for the bacteria, and no doubt a given quantity of material with rough surfaces will harbour greater numbers than the same amount of smooth.

A reference must be made to the Manchester experiments. The experts' report suggested the provision of 60 acres of filters for dealing with the sewage of the city, which is said to average 30 million gallons per day in dry weather. But after inquiry into the merits of the proposal the officials of the Local Govern- ment Board recommended that the filters should be 02 acres in extent, and that the effluent should be finished on land. Storm water filters to take the excess after the sewage was diluted six times were also recommended, such filters being designed to pass 500 gallons per sq. yd. per diem. In this case clarified sewage was to be dealt with on filters 3 ft. 4 in. in depth, composed of clinkers broken to pass a sieve with meshes of i| in., but retained on one with meshes of \ in. It will be observed, therefore, that the bacterial treatment of sewage has scarcely as yet emerged from the experimental stage, but it will certainly be adopted in many cases where it is impracticable to obtain good land in sufficient quantity for the purification of the sewage. With regard to the disposal of sewage-sludge in inland towns, until it has been fairly established by a long trial that bacteria will dispose of this material, the reduction of its bulk by means of filter-presses will be found to be the most satisfactory method of dealing with it. The practical effect is the conversion of 5 tons of offensive mud into 1 ton of hard cake, which may be readily handled and carted. The cost is usually about 2s. 6d. per ton of cake, and a million gallons of average sewage produce about 8 tons.

The chief works of reference upon this subject are: — Colonel E. C. S. Moore, Sanitary Engineering ; L. Parkes and H. Kenwood, Hygiene and Public Health; A. J. Martin, The Sewage Problem; A. P. Poley, Law Affecting Sewers and Drains; J. J. Cosgrove, Principles and Practice of Plumbing, The Purification of Sewage; Colonel E. C. S. Moore, New Tables for the Complete Solution of Ganguillet and Kutter's Formula for the Flow of Liquid in Open Channels, Pipes, Sewers and Conduits; W. J. Dibden, The Purifica- tion of Sewage and Water; W. Spinks, House Drainage Manual; S. Rideal, Sewage and the Bacterial Purification of Sewage. Municipal Engineers' Specification. (J. Bt.)

SEWING 1 MACHINES. The sewing machine, as is the case with most mechanical inventions, is the result of the efforts of many persons, although it would appear that the most merit- orious of these worked in ignorance of the labours and successes of others in the same field. Many of the early attempts to sew by machinery went on the lines of imitating ordinary hand- sewing, and all such inventions proved failures. The method of hand-sewing is of necessity slow and intermittent, seeing that only a definite length of thread is used, which passes its full extent through the cloth at every stitch, thus causing the working arm, human or otherwise, to travel a great length for every stitch made, and demanding frequent renewals of thread.

The foundation of machine-sewing was laid by the invention of a double-pointed needle, with the eye in the centre, patented by Charles F. Weisenthal in 1755, with the object of avoiding the necessity for inverting the needle in sewing or embroidering. Many of the features of S the sewing machine are distinctly specified in a patent secured in England by Thomas Saint in 1790, in which he, inter alia, described a machine for stitching, quilting, or sewing. Saint's machine, which appears to have been intended principally for leather work, was fitted with an awl which, working vertically, pierced a hole for the thread. A spindle and projection laid the thread over this hole, and a descending forked needle pressed a loop of thread through it. The loop was caught on the under side by a reciprocating hook; a feed moved the work forward the extent of one stitch; and a second loop was formed by the same motions as the first. It, however, descended within the first, which was thrown off by the hook as it caught the second, and being thus secured and tightened up an ordinary tambour or chain stitch was formed. Had Saint hit on the idea of the eye-pointed needle his machine would have been a complete anticipation of the modern chain- stitch machine.

The inventor who first devised a real working machine was a poor tailor, Barthelemy Thimmonier, of St fitienne, who obtained letters patent in France in 1830. In Thimmonier's apparatus the needle was crocheted, and descending through the cloth it brought up with it a loop of thread which it carried through the previously made loop, and thus it formed a chain on the upper surface of the fabric. Though the machine was rather clumsy, made principally of wood, as many as eighty were being worked in Paris in i84r, making army clothing, when an ignorant and furious crowd wrecked the establishment and nearly murdered the unfortunate inventor. Thimmonier, how- ever, was not discouraged, for in 1845 he twice patented improvements on

it, and in 1848 he obtained both in England and the United Kingdom patents for further improvements. The machine was then made entirely of metal, and vastly improved on the first model. But the troubles of 1848 blasted the prospects of the resolute inventor. His patent rights for Great Britain were sold; a machine shown in the Great Exhibi- tion of 1851 attracted no attention, and he died in 1857 un- friended and unrewarded.

The most important ideas of an eye-pointed needle and a double thread or lock-stitch are strictly of American origin, and that combination was first conceived by Walter Hunt of New York about 1832-1834. Hunt reaped nothing of the enormous pecuniary reward which has been shared among the introducers of. the sewing machine, and it is therefore all the more necessary that his great merit as an inventor should be insisted on. He constructed a machine having a vibrating arm, at the extremity of which he fixed a curved needle with an eye near its point. By this needle a loop of thread was formed under the cloth to be sewn, and through that loop a thread carried in an oscillating shuttle was passed, thus making the lock-stitch of all ordinary two-thread machines. Hunt's invention was purchased by a blacksmith named Arrowsmith, and a good deal was done towards improving its mechanical details, but no patent was sought, nor was any serious attempt made to draw attention to the invention. After the success of machines

1 " Sew," for stitching with a needle, is a word common to Indo-European languages ; cf. Lat. suere, Gr. naaabav, zttrrbtai, Sansk. siv.

based on his two devices was fully established, Hunt in 1853 applied for a patent; but his claim was disallowed on the ground of abandonment. The most important feature in Hunt's invention — the eye-pointed needle — was first patented in the United Kingdom by Newton and Archbold in 1841, in connexion with glove-stitching.

Apparently unconscious of the invention of Walter Hunt, Elias Howe, a native of Spencer, Mass., directed his attention to machine-sewing about the year 1843. In 1844 he completed a rough model, and in 1846 he patented his sewing machine (fig. 1). Howe was thus the first to patent a lock-stitch machine, but his in- vention had the two essential features — the curved eye-pointed needle and the under-thread shuttle — which I were invented by Walter Hunt twelve years previously. Howe's invention was sold in England to William F. Thomas of Cheapside, London, a corset manufacturer, for £250. Thomas secured in December 1846 the English patent in his own

name, and engaged Howe on weekly wages to adapt the machine for his manu- facturing purposes. The career of the inventor in London was unsuccessful; and, having pawned his American patent rights in England, he returned in April 1849 in poverty to America. There in the meantime the sewing machine was beginning to excite public curiosity, and various persons were making machines which Howe found to trench on his patent rights. The most prominent of the manufacturers, if not of inventors, ultimately appeared in Isaac Merritt Singer (1811- 1875), who in 1851 secured a patent for his machine (fig. 2). Howe now became alert to vindicate his rights, and, after regaining possession of his pawned patent, he instituted suits against the infringers. An enormous amount of litigation ensued, in which Singer figured as a most obstinate defendant, but ultim- ately all makers became tributary to Elias Howe. It is calculated that Howe received in the form of royalties on ma- chines made up to the period of the expiry of his extended

Fig. 1. — Howe's original Machine.

Fig. 2.-

Singer's original Machine.

patent (September 1867 — he died in the next month) a sum of not less than two millions of dollars.

The practicability of machine-sewing being demonstrated, inventions of considerable originality and merit followed in quick succession. One of the most ingenious of all the inventors — who worked also without knowledge of previous efforts — was Mr Allan B. Wilson. In 1849 he devised the rotary hook and bobbin combination, forming the special feature of the Wheeler & Wilson machine. Wilson obtained a patent for his machine, which included the important and effective four-motion feed for moving the work after every stitch, in November 1850. In February 1851 William 0. Grover, a tailor, of Boston, patented

his double chain-stitch action, which formed the basis of the Grover & Baker machine. In 1856 James A. E. Gibbs (1829- 1902), a Virginia farmer, devised the chain-stitch machine, im- proved subsequently by J. Willcox and now known as the Willcox & Gibbs. These together — all American inventions — form the types of the

various machines now in common use. Thousands of patents have been issued in the United States and Europe, covering improvements in the sewing machine; but, although its efficiency and usefulness have been greatly increased by numerous accessories and attachments, the main principles of the various machines have not been affected thereby.

In machine sewing three varieties of stitch are made — (1) the simple chain or tambour stitch, (2) the double chain stitch and (3) the lock stitch. In the first variety the machine works with a single thread ; the other forms use two, an upper and an under thread.

The structure of the chain stitch is shown in fig. 3. The needle first descends through the cloth, then as it begins to ascend the

friction of the thread against the fabric is suf- ficient to form a small loop into which the point of a hook operating under the cloth plate enters, expanding and holding the Fig. 3. — Chain Stitch. loop while the needle rises

to its full height. The feed then moves the fabric forward one stitch length, the hook with its loop is also projected so that when next the needle descends its loop is formed within the previous loop. The hook then releases loop No. 1, seizes and expands loop No. 2, and in so doing draws up the previous loop into a stitch, chain-like on the under side but plain on the upper surface of the fabric. The seam so made is firm and elastic, but easily undone, for if at any point a thread is broken the whole of the sewing can be readily run out backwards by pulling the thread, just as in crochet work. To a certain extent this imperfection in the chain-stitch machine is overcome in the Wilcox & Gibbs machine, in which each loop, by means of a rotating hook,

is twisted half a revolution after it has passed through its predecessor. The somewhat complicated course of the threads in the double chain stitch of the Grover & Baker machine is shown in fig. 4. t- „ t-> ■ , r , . f.ˆ 1 The under thread was supplied

Fig. 4.— Double Chain Stitch. {rom an ordinary bobbin and

was threaded through a circular needle of peculiar form. The machine was wasteful of thread, and the sewing formed a knotted ridge on the under side of the fabric.

The lock stitch is that made by all ordinary two-thread sewing machines, and is a stitch peculiar to machine sewing. Its structure is,

as shown in fig. 5, very simple, and when by proper tension the threads interlock within the work it shows the same on both sides and is very secure. When, however.the tension on the upper thread is weak, the under thread runs along the surface as at b, held more or less tightly by the upper loops. It will be seen that to make the lock stitch the under thread has to be passed quite through the loop of the upper thread. That is done in two principal ways. By the first

plan a small metal shuttle, holding within it a bobbin of thread, is • carried backward and forward under the cloth plate, and at each forward movement passes through the Fig. 5. — Lock Stitch. ” upper thread loop formed by

each succeeding stroke of the needle. Such is the principle devised by Hunt, introduced by Howe, and improved by Singer and many others. The second prin- cipal method of forming the lock stitch consists in seizing the loop of the upper thread by a rotating hook, expanding the loop and passing it around a stationary bobbin within which is wound the under thread. The method is the invention of A. B. Wilson, and is known generally as the Wheeler & Wilson principle. The rotary hook seen at b, fig. 6, is so bevelled and, notched that it opens and expands the upper thread loop, causing it quite to enclose the bobbin of under thread, after which it throws it off and the so-formed lock stitch is pulled up and tightened either by an independent take-up motion as in later machines, or by the expansion of the next loop as in the older forms. The bobbin A, lenticular in form, and its case B, fig. 6, fit easily into a circular de- pression within the hook, against which they are held by the bobbin holder a, fig. 6.

Intermediate between the shuttle and the rotary-hook machines is the oscillating-shuttle machine introduced by the Singer Co. The shuttle is hook-formed, not unlike the Wilson hook, and it carries within it a capacious circular bobbin of thread h- fig. 7. This shuttle

is driven by an oscillating driver db within an annular raceway a a, and, instead of revolving completely like the Wilson hook, it oscil- lates only in an arc of 150°, so far as serves to catch and clear the upper thread. The oscillating-shuttle and rotary-hook machines work with great smoothness and rapidity.

Sewing machines are now made in hundreds of varieties for special kinds of work. Some, for example, are capable of performing the

Fig. 6. — Rotary Hook, Bobbin, and Bobbin Case (Wheeler & Wilson

Machine).

most complicated operations in ornamental stitching, a horizontal right and left motion, in addition to the ordinary vertical motions, being for this purpose often imparted to the needle bar; others will sew button-holes at the rate of 8 or 10 a minute; while others again will sew on the buttons, making the required number of stitches, stopping automatically with the needle at its highest point, and cutting the threads off close to the underside of the work. In some cases two or more needles are fitted, producing parallel rows of stitches; with a machine having 12 needles a single operation may make as many as 24,000 stitches a minute. Special forms of machine are designed to meet the requirements of the glove-sewer, the umbrella-maker, &c. In sewing carpets the great weight of the material makes feeding difficult, and therefore machines have been invented that move along the carpet, which itself remains stationary. The earlier forms were hand- worked ; the two lengths of carpet were stretched across the room, and the machine travelled along the seam, followed by the operator, who turned it by means of a hand- crank. One of these machines was capable of doing the work of eight or ten hand-sewers. With later forms, operated by electricity or

Fig. 7. — Singer Oscillating Shuttle.

other power and running along a track, the carpet is stretched and sewed so rapidly that one power machine does the work of eight or ten hand machines. The introduction of sewing machines has re-volutionized the boot and shoe industry, and books are stitched by machine, the Brehmer wire-sewing machine and Smyth thread-sewing machine being prominent representatives of this class.

SEX (Lat. sexus; possibly connected with secare, to cut), the character of being either male or female, which can be attributed to the vast majority of animals, but less correctly to the higher plants, where the so-called male and female organs, or flowers, are part of the sexless generation (see Reproduction: Plants). The primary distinction of sex resides in the essential organs of reproduction (q.v.). An organism that contains the germinal tissue or mass of tissue known as the testis, and producing the

sexual cells known as spermatozoa, is a male; an organism

containing the tissue which produces ova is known as a female; one producing both ova and spermatozoa is a true herma- phrodite; and one producing neither, if it belong to the sexual generation, is known as a neuter, although neuters are for the most part incomplete females. The primary sexual tissues and the gametes are described in the article Reproduction (A nimals).

Associated with the presence of the primary reproductive organs there may be a large number of other characters, and attempts have been made to classify these as secondary and tertiary sexual characters. It is impossible to define a series of logical categories in which any accessory character will find its inevitable place, but a convenient practical distinction first made by John Hunter may be drawn between characters directly auxiliary to the processes of reproduction and those which, although limited to one sex, are not immediately connected with reproductive processes. We may then make the division into (i) Primary Sexual Characters (A. Essential: power of producing respectively ova and spermatozoa. B. Auxiliary: possession of sexual ducts and reservoirs, intromittent and copulatory organs, organs associated with oviposition, gestation, parturition, and nutrition of the immature young in any stage) ; and (2) Secondary Sexual Characters (differences between the sexes in size, shape, appearance, ornamentation, armament, colour and coloration, voice, and instincts and habits not directly associated with the reproductive processes).

Those characters which are here grouped as primary are described in the article Reproduction. It is sufficient to repeat that in many animals only the essential primary characters are present. There is much diversity in the possession of secondary sexual characters, and in many cases these apparently are absent. Among mammals it is impossible to distinguish the sex without examination of the reproductive organs or observation of the sexual habits, in such cases as the domestic cat, the tiger and many other feline animals, hyaenas, bears, rabbits, hares, mice and a vast number of others. So also among birds there are many cases where the sexes are alike, as for instance, some humming- birds, parrots, owls, cranes, kingfishers, and many small birds such as robins and hedge-warblers. In reptiles and batrachians, in fish and a very large number of invertebrates there are no visible secondary sexual characters

C. Darwin, in the portion of the Descent of Man devoted to " Selection in relation to Sex," brought together what remains the most complete and valuable account of the existence and distri- bution amongst animals of secondary sexual characters, and it would be

impracticable here to give more than the most summary descrip- tion of the groups of facts involved. Among Crustacea the sexes frequently differ, but in most cases the differences concern auxiliary primary characters, such as the possession of intromittent and clasp- ing organs. Differences in size are frequent ; in the higher Decapods the males and in the lower Crustacea the females frequently being larger, the disparity being extreme in some of the parasitic Copepods and Isopods where the males are minute and attached to the females, whilst in the Cirripedes, as Darwin himself discovered, very minute complementary males may live as parasites in the mantle cavity of large hermaphrodite or female forms. Amongst Arachnids con- spicuous differences in colour and size occur, the males generally being smaller, more active and possessed of relatively longer ap- pendages, and more highly decorated. Amongst Insects, the differ- ences between the sexes may be very great, quite apart from those relating to intromittence, prehension of the female, oviposition, or the higher development of sense organs by which the males can more readily seek out the females. In many cases the males are winged, the females wingless and grub-like. In a few instances, the males are highly pugnacious and are furnished with special weapons for fighting with their rivals. Amongst the Homoptera and Orthoptera there are many instances where the males possess organs capable of producing loud sounds, and these are rudimentary or absent in the females, whilst in other cases, both sexes produce call-notes. Particularly amongst the Coleoptera, the males may differ very greatly from the females in the shape of the body and may be decorated with extra- ordinary growths of the head and thorax. The most notable sexual differences are in coloration, and whilst there are many instances where both sexes are inconspicuous, and a few where both are brilliant, there are still more where the males differ from the females by the display of more conspicuous patterns and of brighter colours. It may be said of Insects in general that it is the more common case for secondary sexual characters to exist in such a degree that the sexes may be distinguished at a glance.

Among Fishes, secondary sexual characters are common. Spines are developed on the head and pectoral fins of the males of some Rays, but it is probable that these may be auxiliary primary char- acters, useful in the prehension of the female. In the male salmon, a cartilaginous projection, developed during the breeding season, appears on the upper surface of the point of the lower jaw, whilst in old males the jaws become hook-like and the teeth are greatly in- creased in size. In the thornback, the adult male has the teeth sharp- pointed and backwardly-directed, while those of the female are flat

and pavement-like. In almost all fishes the males when adult are smaller than the females, and may be much smaller. Beards of stiff, hair-like structures, elongated processes of the fins, tubercles and many other structures that may be classed as ornaments, because their function is unknown, occur in males and are absent in females. Differences in pattern and colour are extremely frequent, become much more marked in the breeding season, and are of such a nature that the males are more conspicuous. Among Batrachia, differences between the sexes in size and general shape are not striking, but there are many instances of the males exhibiting crests, or special processes which may be classed as ornaments, and peculiar patterns and bright colours, during the breeding season.

Secondary sexual differences appear in the vast majority of birds. The shape seldom differs markedly, but differences in size are common, sometimes, as in birds of prey, the females, and sometimes, as in the allies of the domestic fowl, the males being larger. In a large number of instances the males are very pugnacious and are better armed, the bones and musculature being heavier, the beaks and claws stronger, while spurs or knobs on the wings and spurs on the legs may be present only in the males or be relatively small in the females. Special ornaments such as crests and wattles, combs, carbuncles, excrescences of the skin, and elongated or peculiarly shaped feathers are extremely frequent, and are developed or intensified in the breeding season, and in the vast majority of cases confined to the males. The voice almost invariably varies with the sex, is associated with the breeding period and is much more highly developed in the male, whilst structural developments such as modifications of the trachea, vocal sacs and resonators and differences in the larynx are frequently present and on the whole distinctive of the males. Differ- ences in colour and pattern are extremely well marked, and these are well known to be associated with the breeding period, which in many cases is preceded by a moult, after which the sexual plumage is assumed, or the colour of the naked parts intensified. In a few ex- ceptional cases such as some button-quails (Turnix), painted snipes (Rhynchaea), phalaropes (Phalaropus) , and cassowaries, the females exceed the males in size and brilliancy, and it is interesting to notice that in such cases the usual distinction of habit may be reversed, the females being pugnacious, aggressive, and courtiers of the males, whilst the latter are shy and may attend to the brood. Such ex- ceptions are so rare that they may be called abnormal, for the rule among birds is that where secondary sexual characters are displayed, ornamentation, voice, brilliant pattern and colour, pugnacity and amorousness are

distinctive of the male. Secondary sexual differ- ences of the same nature are abundant among mammals. The males are usually larger and have greater strength with corresponding bones and muscles, and courage and pugnacity. Special weapons of offence or defence are common and are usually limited to the males or more highly developed in them ; familiar instances are the horns of cattle, sheep and antelopes, the canine teeth, the mane of the lion. The antlers of the stags are certainly used in combats between the males, but in their more extreme development they may be classed as sexual ornaments. The males of many mammals emit powerful odours during the breeding season, whilst their voices, whether as a battle cry or a call to the female, are frequently more powerful. Crests, tufts and mantles, rudimentary in the female, conspicuous in the male, are extremely common. Differences in pattern and colour are rare except in monkeys, but when these exist they are usually found in the male.

The sexes, then, are distinguished by primary and secondary characters, these two categories being convenient rather than logical. The real dividing line is between the essential primary sexual character, the presence of a male or female gonad, and the various auxiliary and secondary differences which appear in every grade of elaboration. It is to be noted, moreover, that all the other sexual characters depend on the activity of the essential primary character. Immature males and females are closely alike; the auxiliary and secondary sexual characters almost invariably begin to appear only when the gonads become mature, and fade away when these are injured or destroyed by accident, disease, senescence or artificial interference, and finally, when the activity of the gonads waxes and wanes periodically, there is a corresponding periodicity in the display of the secondary char- acters. A number of observations and experiments support the conclusion that the gonads, in addition to their obvious function of producing the sexual cells, discharge secretions into the blood and tissues, and that these internal secretions or hormones,

are the physiological stimulus which awakens the development of the auxiliary and secondary sexual characters.

Auxiliary primary and secondary sexual characters are so many and various that general statements regarding them are difficult and

uncertain. In the broadest fashion, however, the following generalizations appear to be true. Secondary sexual characters begin to appear at puberty. Young or immature forms resemble the sex in which such characters are least marked, while the young and the undistinguished sex resemble ancestral forms. The sex that is distinguished is usually the male, and the characters are usually hypertrophies or specializations of characters that appear in the females and the young. (It is to be remembered that specialization may be the result of the suppression of characters as well as their acquisition, and there are a remarkable number of cases in which we may, at least tentatively, picture the bright sexual colour of males as due to the suppression of a pigment which masks them in the female.) Hermaphroditism is the condition in which gonads producing ova and gonads producing spermatozoa are contained in the same individual. Its distribution in the animal kingdom is irregular, and apparently independent of natural affinity, and the balance of opinion is in favour of regarding it not as a primitive condition, but as a secondary acquisition. C. Claus has pointed out that it is frequent among sessile animals, as for instance Sponges, Anemones, Corals, Polyzoa, bivalve Molluscs, and Tumcates, and sluggish animals such as many of the worms and snails, whilst it is extremely common amongst almost every kind of parasitic animal. The obvious suggestion is that if the condition be primitive, it has been preserved, and if not primitive, acquired, because in animals of such habit, the chances of sexual congress would be greater than if the sexes were separate. Against such an interpretation, however, it must be noticed that in most hermaphrodites the sexual maturity of the male and female gonads is not coincident, so that cross-fertilization commonly occurs. Self-fertilization is said to occur in the fish Serranus, and it certainly occurs in many parasitic Trematodes, in Tape- worms and a few Nematodes. The real meaning of the occurrence of the condition remains obscure. Both gonads are present in many Sponges, in the Ctenophora, in many Anemones and Corals, in degenerate Hydroids such as Hydra, in most Turbel- larians and Trematodes, in all the Tapeworms, in a few Nematodes, in many Chaetopods, in the Leeches, in a few Brachiopods and in many Polyzoa. It is absent in most Echinoderma and Arthropoda, but occurs in Cirripedes and some Isopods. It occurs in some bivalves, such as the common oyster, cockle and clam, and is present in the Euthyneurous Gastropods and in Pteropods. Amongst vertebrates it is rare. A number of observers have urged that the vertebrate embryo passes through a hermaphrodite condition. J. T. Cunningham and F. Nansen have stated that a testis is embedded in the ovary of the young hagfish (Myxine) and that this ripens before the ovary, but

later observers have disputed their interpretation of .the facts. In a few fish and some Batrachia, hermaphroditism has been demonstrated, but it is not certain, whether as a normal or aberrant occurrence, whilst in many of the Batrachian cases, the animals are known to be normally unisexual. The term hermaphroditism, however, has been applied frequently to cases of a different kind, in which there is no evidence of the essential sexual organs being affected, the appearances relating wholly to the auxiliary primary or the secondary sexual characters. It is most probable that such conditions differ entirely from true hermaphroditism. With regard to the auxiliary primary organs, and especially the genital ducts and external organs of sex, in a majority of cases as in vertebrates, the embryonic or youthful condition is undifferentiated, and so to say, contains the initial material which may be elaborated by specialization in one direction or the other, by the proliferation of certain portions and the suppression of others, into the structures characteristic of the male or of the female. Sometimes, growth takes place without normal differentiation, sometimes the specialization in one direction lags, with the result that a dubious appearance arises. Subsequent dissection or the approach of maturity, however,

make it plain that the dubiety was superficial and that the gonad of only one sex was present. Among mammals, including man, every normal male retains relics of the female side of the undifferentiated condition of the accessory sexual organs, whilst every normal female contains similar if less well-marked relics of the male condition. Apparent hermaphroditism depending on a dubious condition of the secondary sexual characters is equally widespread in possible occurrence. Amongst insects which have been much studied, such as the butterflies and moths, many curious conditions have been described; sometimes the pattern and colour of the upper and under sides, sometimes of different parts of the same wing, sometimes of different wings, present the characters of different sexes. Among birds and mammals, the secondary sexual characters of one sex, such as size, pattern or colour, weapons or habits, may appear in animals with the gonads of the other sex, in every degree of development, reaching to an apparently complete reversal. In many cases these abnormal occurrences are associated with arrest of the functional activity of the primary organs of sex, by disease, accident, or decay, and the failure of the necessary stimulus would certainly serve to explain cases where the apparent reversal is no more than the suppression of a specialization in one direction. The facts, however, go further; it appears as if the suppression of femaleness allows the development of a latent maleness.

Determination of Sex. — Answers to the question why a particular individual becomes a male or a female fall into two groups, in one of which it is supposed that external conditions determine the result, in the other that the sexual cells differ from the first. G. Canestrini suggested that the sex was determined by the number of spermatozoa which entered the ovum, but fuller knowledge of the details of fertilization (see Reproduction) has made it plain that only a single spermatozoon, normally conjugates with the ovum, whilst polyspermy, if it occur, results only in abnormalities which do not proceed to full development. Professor Thury in 1863 and C. Diising in 1883 urged that ova fertilized soon after ovulation gave rise to females, whilst those impregnated later produced males. Some evidence exists as to the effect of delay in fertilization; V. Hensen (1881) suggested that females were produced when both ova and spermatozoa were in the most active condition, and H. M. Vernon (1898) has shown that in hybridizing Echinoderms the fresher gamete appears to exert a greater influence, but it cannot be said that there is definite evidence as to the determination of sex on such lines. J. D. Hofacker in 1823 and M. T. Sadler in 1830 collected a large series of statistics from which they drew the conclusion that when the male parent is older, more males are produced, whilst many observers have attempted to draw conclusions from the comparative vigour of the parents. Popular belief and some observations with regard to the breeding of domestic animals have led to the inference that the sex of the offspring tends to be that of the least vigorous parent, and such a theory, as it would appear to imply the existence of a natural law for rectifying the proportions of the sexes, has gained more attention than the facts supporting it would justify, and several unbiassed observers have interpreted the events in the sense that the vigorous parent produces his or her own sex. It is to be noted that such theories of relative vigour do not necessarily imply that external conditions determine the sex, for they would apply equally were it the case that there was a power of selection amongst gametes of predetermined sex. A large number of investigators have been led to believe that conditions of nutrition are of importance, and this view is specially plausible in the case of vertebrates, if it be accepted that the embryos pass through a hermaphrodite condition. E. Yung found that when tadpoles were reared under normal conditions, the proportion of male to female was about as 43 to 57, but that when a flesh diet was provided the percentage of females was very greatly increased. It has been noted that when Aphides are under the favourable conditions of summer temperature and nutrition, they produce only females, but that the advent of autumn brings with it an equality in sex production. Mrs

Treat showed that starved

caterpillars turned into males; E. Maupas, in the case of Rotifers, and other observers in the cases of some Crustacea, have similarly pointed to a relation between abundant nutrition and the excessive production of females. In nearly every case, however, other observers have either obtained conflicting results, or placed another interpretation on similar results, whilst in none of the cases has the factor of selective mortality been sufficiently excluded. Even were it proved that a correlation existed between excessive diet and over-production of females, it might be that the incidence of mortality was differential. Many attempts have been made to derive information by examining the statistics of human births in times of plenty and of hardship, but the results are inconclusive. C. Darwin, reviewing the evidence, was disposed to believe that the proportions of the sexes varied, that the tendency to produce male and female offspring was inherited, and that by a process of natural selection it was adjusted to the needs of the species, but he was too cautious to lean to any particular view as to the nature of the determining factors. C. Diising (1883 and 1885) also believed in the existence of such a power of adaptation or adjustment, and attributed it to the action of a large number of external conditions. P. Geddes and J. A. Thomson (1889) similarly came to the conclusion that factors external to the sexual cells had a predominating importance, and these authors linked the determination of sex with their general theory of the nature of sex. They regarded sex as an expression of an alternating rhythm of anabolism and katabolism to be observed throughout the living world, and supposed that femaleness was specially associated, was in fact an outcrop of the anabolic or constructive processes of living matter, whilst maleness represented the katabolic, destructive or liberating processes. Their view ranges many diverse facts in apparent harmony, but has to encounter many facts that apparently contradict it. In a later work J. A. Thomson himself (1907) assigns less weight to his own theory, and quotes with approval T. H. Morgan's suggestion that the determination of sex may be brought about in different fashions in different cases.

Theories as to sex being predetermined in the sexual cells have been numerous, but it is only recently that any exact evidence appearing to point to such a conclusion has been adduced. When parthenogenesis (see Reproduction) was first being investigated, it

was found that eggs which gave rise to females were different from those which produced males, but when it was demonstrated that at least in many cases there was the further difference as to whether the eggs were fertilized or not, it was assumed that the presence or absence of fertilization determined the sex. Physicians have repeatedly propounded the theory that one ovary produces eggs capable of developing only into females, the other only those capable of becoming males, and the suggestion has been made that in the case of human beings ovulation takes place alternately from the ovaries. From this it would follow that were the sex resulting from one fertilization known, the sex of a subsequent fertilization could be predicted, or by choosing the date of fertilization, selected. These views, however, rest on no satisfactory evidence and remain uncorrected with any observations as to the structure of the eggs themselves. On the other hand, more exact workers, using modern cytological methods, have accumulated striking facts as to the existence of different kinds of sexual cells, the differences relating chiefly to the nuclear changes which occur in ovogenesis and spermato- genesis, and have been established with more certainty in the case of the spermatozoa. E. B. Wilson (1909) has given a full summary and discussion of various interpretations of these observations. In over a hundred species of insects, Myriapods and Arachnids, two kinds of spermatozoa are produced. The spermatozoa are formed in pairs, and the mother cell which gives rise to each pair exhibits, in the ordinary fashion of nuclear division, paired chromosomes, one member of each pair passing into each spermatozoon. The mother cell contains also an unpaired element, consisting in its simplest form of a single large chromosome, but sometimes represented by a group of peculiar chromosomes, which, for convenience, Wilson terms the "X" element, or " heterochromosome." The "X" element passes into one or other of the spermatozoa, from which it results that spermatozoa of two kinds are formed in equal numbers, the difference being the presence or absence of the "X" element. Eggs fertilized by spermatozoa containing the " X " element become females, those fertilized by spermatozoa without it become males. There is evidence that in some cases (e.g. bees) the spermatozoa devoid of the "X" element degenerate, with the result that any fertilized eggs must produce females.

E. B. Wilson's suggestion, advanced in the most cautious way, is

that the "X" element referred to in the last paragraph is the determinant, or at least the index, of sex, and further that the difference between the male and female organism is that the male comes

from an egg which, developing either parthenogenetically or after fertilization, contains only a single unit of the "X" element, while the female starts from an ovum which, whether developing after fertilization or parthenogenetically, contains the two "X" units. The ovum of a sexual egg in the process of maturation discards half its normal complement of the "X" element; if it be fertilized by a spermatozoon containing an " X " unit it gives rise to a female; if it be fertilized by one without this it becomes a male. A large number of different forms of nuclear change have been described in the maturation of normal and parthenogenetic eggs, and by the exercise of a little ingenuity it is easy to select from these various processes modes of nuclear division which if they actually occurred in the appropriate instances would adapt Wilson's hypothesis to cases in which parthenogenetic eggs give rise to males or to females. In some individual instances the process which the hypothesis would demand appears actually to occur.

Various workers on Mendelian lines (see Mendelism) have endeavoured to correlate the facts discussed by Wilson and their experimental inquiries into the inheritance of primary and secondary sexual characters, with the additional difficulty, absent from Wilson's hypothesis, that their theory requires them to suppose the unfertilized cells to be unisexual. W. E. Castle suggested that both males and females were Mendelian male-female hybrids with respectively male and female dominance, and that in the usual way disruption took place in the formation of the germ cells, with the result that male and female spermatozoa and male and female ova were produced. He assumed further that' there was a selection or repulsion in fertilization, so that ova and spermatozoa bearing the same sex never conjugated. C. Correns assumed the male to be sex-hybrid, the female to be homozygous or pure female, the male character being dominant. Ova were, therefore, unisexual, always female, while spermatozoa were either male or female, and when a female egg was fertilized by a female spermatozoon the result naturally was a female, but when it was fertilized by a male spermatozoon the result was a sex-hybrid appearing as a male because of the dominance of male characters. Correns's theory avoids the unlikely supposition of selective fertilization, but breaks down in those cases of parthenogenesis where the unfertilized egg produced by a female gives rise to a male. W. Bateson reverses the theory of Correns and supposes that the female is a hybrid with femaleness dominant, while the male is pure male. The female in fact contains a factor which makes her female whilst the male is a male because it is without this factor. This view, however, leaves unexplained the existence of two

kinds of spermatozoa and involves a series of elaborate hypotheses to reconcile it with cases of parthenogenesis. L. Doncaster has elaborated the extremely ingenious suggestion that the Mendelian pairs are not male and female, but male and absence of sex and female and absence of sex. The male is a pure male but produces two kinds of spermatozoa, those with the determinant for sex and those without it. The normal female is a sex-hybrid and produces male and female eggs in equal numbers, and it is assumed that there is a selective fertilization, female eggs being fertilized by male spermatozoa and giving rise to females, whilst male eggs are fertilized by spermatozoa without the sex factor and give rise to males. In cases of parthenogenesis, it is supposed that there are two kinds of females, the result of fertilization by different kinds of spermatozoa, and that those going through different kinds of maturation processes give rise without fertilization to males or to females. Doncaster has discovered many interesting details of the maturation processes in insects which agree with his suggestion. The Mendelian interpretations, however, are more ingenious than conclusive, but at least they combine with other work in supporting the probability that the determination of sex depends on the sexual cells and not on conditions influencing the developing embryo. Similarly they combine with other work in pointing to the conclusion that the male organism differs from the female by the absence of something present in the female. The Mendelian interpretations suggest that male and female sex determinants are different in kind ; Wilson's interpretation suggests that they differ only, so to say, in quantity. Both interpretations harmonize with the observed fact that cases in. which a female assumes male characters are much more frequent and much more definite than cases in which a male assumes femaleness.

Theory of Sexual Dimorphism. — Males and females may be alike, apart from their possession of male or female gonads, or may differ to almost any degree. It is plain, therefore, that although the presence and the maturity of the gonads may be, and probably are, the immediate stimulus to the appearance of the secondary differences, they cannot be the prime cause. Why, although equally potent sexually, do some males and females differ, others resemble one another? This is a question distinct from that of the primary determination of sex and the mechanism by which it is brought about. C. Darwin's theory of sexual selection remains the only comprehensive suggestion. Like his

theory of the Origin of Species, it is not a theory of the origin of variations. He starts from the observed fact that variations occur and are transmitted; he supposes that by natural selection individuals favoured by suitable variations are preserved, and that in such a fashion the divergence which leads to the origin of species has come about; he also supposes that by sexual selection, or preferential mating, the differences between male and female have been brought about. " Courage, pugnacity, perse- verance, strength and size of body, weapons of all kinds, musical organs, both vocal and instrumental, bright colours, stripes and marks, and ornamental appendages, have all been indirectly gained by the one sex or the other, through the influence of love and jealousy, through the appreciation of the beautiful in sound, colour or form, and through the exertion of a choice; and these powers of the mind manifestly depend on the development of the cerebral system " {Descent of Man, ii. p. 402). The characters to be accounted for are confined to one sex and are in close relation with the breeding season and breeding habits. In those cases where they differ from the females, the males are the most active in courtship, and the best armed, and are rendered the most attractive in various ways. They fight with their rivals for the possession of the female, or display their attractions before her, and either by conquest or by being preferred have an advantage over less favoured males. Darwin was in some doubt as to how far it could be shown that such favoured individuals had a chance of leaving more progeny, except in cases where males were polygamous or much more numerous than females, but he suggested that on the whole the more vigorous female would be the the first to breed and to choose the more attractive males, or be captured by the stronger males. A. R. Wallace was unable to accept the theory of sexual selection except in the most limited way, and in particular laid great stress on the want of evidence, to which Darwin himself has called attention, that females prefer more highly ornamented males. He thought that natural selection was sufficient to explain sexual differences such as the possession of weapons, scents and call-notes. With regard to colour and pattern, he regarded these as natural outcrops of specialized structure, better displayed in more vigorous animals, and therefore likely to increase under natural selection. The inconspicuous patterns and dull colours of females he believed to depend on natural selection, and to be associated with the greater need for females to be inconspicuous whilst engaged in their duties to their young. More recent writers have shown that in a large number of cases brilliant colours and patterns are in themselves really protective (see Colours of Animals), so that the facts left to be explained by the theory of sexual selection are still further restricted.

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SEXBY, EDWARD (d. 1658), English soldier, "leveller" and conspirator, was a private soldier in Cromwell's regiment of horse when first heard of about 1643. He opposed the proposal to disband the army in 1647; and as one of the " agitators " he resisted all attempts to come to an arrangement with Charles I.,

and advocated extreme democratic doctrines. He rose to the rank of colonel, but was deprived of his commission in 1651. When Cromwell assumed the title of lord protector, Sexby became one of his most violent opponents, and in 1655 tried to bring together the levellers and the royalists in a combination to overturn the government. Compelled to fly from England, he intrigued with the Spanish government with a view to restor- ing Charles II., as the only feasible plan for destroying Cromwell; and he was concerned in several plots to assassinate the pro- tector. About 1657 he wrote the celebrated apology for tyran- nicide entitled " Killing No Murder," under the pseudonym William Allen, which was printed in Holland and distributed in England. In July 1657 he was arrested in disguise

in England, whither he had come to attempt Cromwell's assassination, and he died in the Tower of London on the 13th of January 1658.

SEXPARTITE VAULT, in architecture, a name given to the single bay of a vault, which, in addition to the transverse and diagonal ribs, has been divided by a second transverse rib, forming six compartments. The principal examples are those in the Abbaye-aux-Hommes and Abbaye-aux-Dames at Caen (which were probably the earliest examples of a construction now looked upon as transitional), Notre Dame, Paris, and the cathedrals of Bourges, Laon, Noyon, Senlis and Sens; from the latter cathedral the sexpartite vault was brought by William of Sens to Canterbury, and it is afterwards found at Lincoln and in St Faith's Chapel, Westminster Abbey.

SEXTANT, an instrument for measuring angles on the celestial sphere. The name (indicating that the instrument is furnished with a graduated arc equal to a sixth part of a circle) is now only used to designate an instrument employing reflection to measure an angle; but originally it was introduced by Tycho Brahe, who constructed several sextants with two sights, one on a fixed, the other on a movable radius, which the observer pointed to the two objects of which the angular distance was to be measured.

The imperfections of the astrolabe and cross-staff for taking altitudes (see Navigation) were so evident that the idea of employing reflection to remove them occurred independently to several minds. R. Hooke contrived two reflecting instruments. The first, described in his Posthumous Works (p. 503), had only one mirror, which reflected the light from one object into a telescope which is pointed directly at the other. Hooke's second plan employed two single reflections, whereby an eye placed at the side of a quadrant could at the same time see the images formed in two telescopes, the axes of which were radii of the quadrant and which were pointed at the two objects to be measured. This plan is described in Hooke's Animadversions to the Machina Coelestis of Hevelius, published in 1674, while the first one seems to have been communicated to the Royal Society in 1666. Newton also studied this subject, but nothing was known about his ideas till 1742, when a description in his own handwriting of an instrument devised by him was found among Halley's papers and printed in the Philosophical Trans- actions (No. 465). It consists of a sector of brass, the arc of which, though only equal to one-eighth part of a circle, is divided into 90 . A telescope is fixed along a radius of the sector, the object-glass being close to the centre and having outside it a plane mirror inclined 45 to the axis of

the telescojfe, and inter- cepting half the light which would otherwise fall on the object glass. One object is seen through the telescope, while a movable radius, carrying a second mirror close to the first, is turned round the centre until the second object by double reflection is seen in the telescope to coincide with the first. But before Newton's plan was published the sextant in its present form had come into practical use. On May 13, 1731, John Hadley described an "octant," employing double reflection, and a fortnight later he exhibited the instrument. 1 On the 20th of May Halley stated to the Royal Society that Newton had invented an instrument founded

1 Hadley described two different constructions : in one the telescope was fixed along a radius as in Newton's form, in the other it was placed in the way afterwards universally adopted ; an octant of the first construction was made in the summer of 1730, according to a statement made to the Royal Society by Hadley's brother George on Feb. 7, 1734.

on the same principle, and had communicated an account of it to the society in 1699, but on search being made in the minutes it was only found that Newton had shown a new instrument " for observing the moon and stars for the longitude at sea, being the old instrument mended of some faults," but nothing was found in the minutes concerning the principle of the construc- tion. Halley had evidently only a dim recollection of Newton's plan, and at a meeting of the Royal Society on December 16, 1731, he declared himself satisfied that Hadley's idea was different from Newton's. The new instrument was tried in August 1732 on board the " Chatham " yacht by order of the Admiralty, and was found satisfactory, but otherwise it does not seem to have superseded the older instruments for at least twenty years. Hadley's instrument could only measure angles up to 90 ; but in 1757 Captain Campbell of the navy, one of the first to use it assiduously, proposed to enlarge it so as to measure angles up to 1 20 , in which form it is now generally employed.

Independently of Hadley and Newton the sextant was invented by Thomas Godfrey (1 704-1 749), a poor glazier in Philadelphia. In May 1732 James Logan wrote to Halley that Godfrey had about eighteen months previously showed him a common sea quadrant "to which he had fitted two pieces of looking-glass in such a manner as brought two stars at almost any distance to coincide." The letter gave

a full description of the instrument; the principle was the same as that of Hadley's first octant, which had the telescope along a radius. At the meeting of the Royal Society on January 31, 1734, t wo affidavits sworn before the mayor of Philadelphia were read, proving that Godfrey's quadrant was made about November 1730, that on November 28 it was brought by G. Stewart, mate, on board a sloop, the " Truman," John Cox, master, bound for Jamaica, and that in August 1731 it was used by the same persons on a voyage to Newfoundland. The statement that a brother of Godfrey, a captain in the West India trade, sold the quadrant at Jamaica to a Captain or Lieutenant Hadley of the British navy, who brought it to London to his brother, an instrument maker in the Strand, is devoid of foundation. 1

The figure shows the construction of the sextant. ABC is a light framework of brass in the shape of a sector of 6o°, the limb AB having

a graduated arc of silver (some-

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BCD. The limb AB is graduated so as to avoid the necessity of doubling the measured angle, a sp ace marked as a

1 See Professor Ri'gaud, Naut. Mag. vol. ii. No. 21. John Hadley was a country gentleman of independent means, and the fact that he was the first to bring the construction of reflecting telescopes to any perfection has made many authors believe that he was a professional instrument maker. His brother George, who assisted him, was a barrister.

degree on the limb being in reality only 30'. The vernier preferably of the extended type, i.e. a vernier whose divisions are twice the distance apart of those on the arc, should point to o° 0′ o" when the two mirrors are parallel, or in other words, when the direct and reflected images of a distant object coincide.

The sextant was formerly much used on land for determining latitudes in which case an artificial horizon (see below) is required, but it has now been largely superseded by the portable altazimuth cr theodolite, while at sea it continues to be indispensable.

The telescopes employed in sextants are of two kinds : the direct, for the more ordinary observations; and the inverting, for astro- nomical work, one of the eyepieces of which should be of high magnifying power, not less than 15 diameters. Each eyepiece has two pairs of wires, each pair perpendicular to the other, and dividing the field of view into nine divisions, of which the central is square. Contacts should be made as nearly as possible in the centre of this square. It is convenient if the telescope is fitted with an interrupted thread to screw into the collar of the up and down piece. Both mirrors are supplied with coloured shades of different degrees of shade, and may be used either singly or combined for sea observa- tions; they are subject to errors of refraction, due to non- parallelism of the sides of the glass. Coloured eyepieces of neutral glass of different intensities are fitted to slip on and off the conically ground surface of the eyepieces of the telescope; they are used for index error and for observations in the artificial horizon. Introducing no refraction error, they also ensure the suns being of the same brilliancy; a very important point. The up and down piece, when adj usted to equalize the suns, will bring the axis of the telescope nearly exactly in line with the edge of the silvered surface of the horizon glass, which is the best position for observing, and from this it must never be moved until the equal altitude or other observations are complete.

For observations on shore the sextant should be mounted on a stand.

In an improved form of stand, the bearing which carries the sextant is square, and the whole bearing revolving on a centre is controlled by a clamp and tangent screw. The counterpoise should exactly balance the sextant, and they may be fitted to allow for adjustment. A small spirit-level fixed on one of the arms of the sextant stand, and another level pivoting round the pillar on the index bar of the sextant carrying the microscope, working in a plane parallel to that of the instrument, and fixed by means of a set screw, are of use in placing the sextant exactly in the required position when observing faint stars. With the telescope pointing to the centre of the artificial horizon, the direct and reflected images of the sun at any convenient altitude are made to coincide. The levels are then adjusted and permanently fixed by their set screws. To observe a faint star, it is only necessary to set its- double altitude on the sextant, turn the instrument and the stand to bring the bubbles of their respective levels in the centre of their runs, and move the stand until the telescope points to the centre of the artificial horizon and in the direction of the star, when the direct and reflected images will be seen in the field. A small electric light fitted on the arm carrying the microscope, and worked by a dry battery, enables the sextant to be read at night.

The artificial horizon in common use consists of a glass trough containing mercury and protected from the wind by a glass roof. The glass in the roof should be of the best quality, and the faces of each pane of the trough accurately parallel. A new form of horizon consists of a shallow rectangular trough of metal gilt. After cleansing the surface by wetting it with a few drops of dilute sulphuric acid, a drop of mercury is rubbed on until the whole surface is bright, when a very small quantity of amalgamated mercury added will form an even horizontal surface. The dross is wiped off with a broad camel-hair brush. In this shallow trough waves are killed almost instantaneously.

The horizon is placed upon a stand, consisting of two iron plates, the upper resting on the lower, supported by three long large-headed screws, by means of which it can be levelled. If the stand is raised off the ground a foot or so, on a firm foundation, thus bringing the artificial horizon closer to the telescope, faint stars are more easily observed, and the movement of the sextant necessary to keep the star in the field, owing to its motion in the heavens, will be lessened. A lantern placed on the ground behind, or a little on one side of, the observer, and faintly showing on the artificial horizon, will sufficiently illuminate the wires of the telescope on a dark night.

Adjustments. — The planes of both the index glass and the horizon glass should be perpendicular to the plane of the instrument, and they should also be parallel to one another when the vernier is set to zero. The line of collimation of the telescope must be parallel to the plane of the sextant. This adjustment, though less liable to alter than either of the others, should be examined from time to time as follows: — With the sextant mounted on a stand, move the index so as to separate the direct and reflected images of a star by a distance nearly equal to the length of the parallel wires of the telescope, and turn the eyepiece until, the direct image of the star coinciding with one extremity of the wire, the reflected image coincides with the other extremity; the wires will then be parallel to the plane of the sextant. Select two bright stars and make a coin- cidence of the reflected and direct images on the middle of one wire, and then on the middle of the other. If the two readings agree, the

adjustment is correct; if not, the adjusting screws in the collar of the up and down piece must be moved' until the coincidence is exact.

" Centring error " is very important, but cannot be corrected. In an indifferent instrument it may be sufficient to vitiate the result of any observations on one side only of the zenith. It arises from the eccentricity of the centres of the index arm and of the arc, and varies with the angle measured, being generally greater as the angle in- creases; but the index arm becoming bent, or any part of the frame receiving a blow which alters its shape, the flexure of the instrument from varying temperature, and defective graduation, will all produce errors which it is generally impossible to disentangle, and they are all included in the one correction for centring. This correction is found by comparing the angle measured by the sextant (corrected for index error) with the true angle. The most accurate method, because it employs a large number of observations for the same or nearly the same angle, is by observations of pairs of circum-meridian stars in the artificial horizon at various altitudes. Double the difference between the resulting latitude by each star and the mean latitude will be the centring error for an angle equal to the double altitude of that star, that is, the angle actually measured by the sextant, index error being ascertained and applied before working out. Measurement of the angles between stars, compared with their calculated apparent distance, is another method. At Kew Observa- tory (National Physical Laboratory) the centring error is determined for certain

angles by fixed collimators. Including, as it does, errors from so many causes, the correction does not remain perfectly steady, and it should be ascertained from time to time. In a good sextant the error should not exceed one minute over the whole of the arc.

SEXTON (an early corruption of " sacristan," properly the keeper of sacred vessels and vestments, Med. Lat. sacristanus or sacrista), a minor officer of an ecclesiastical parish. In the early church the sexton was identical with the ostiarius, or door-keeper, whose duty it was to open and shut the church at certain hours, guard the church and all it contained, and prevent the heathen and excommunicated from entering. The duties of the modern sexton are practically those of the ancient sacristan. He has the custody of the church keys, is responsible for keeping the church clean, for the bell-ringing and lighting, and looks after the vest- ments and instrumenta of the church, but the duties may vary by custom in different parishes. Where his duties are confined to the care of the vestments and instrumenta the right of appoint- ment of a sexton lies in the churchwardens; if his duties are confined to the churchyard the right of appointment is in the incumbent, and where his duties extend to both the right of appointment is jointly in the churchwardens and the incumbent. By custom, however, he may be appointed by the parishioners. He usually has a freehold in his office, and in some parishes is entitled to certain customary fees.

SEXTUS EMPIRICUS (2nd~jand 3rd centuries a.d.), physician and philosopher, lived at Alexandria and at Athens. In his medical work he belonged to the " methodical " school (see Asclepiades), as a philosopher, he is the greatest of the later Greek Sceptics. His claim to eminence rests on the facts that he developed and formulated the doctrines of the older Sceptics, and that he handed down a full and, on the whole, an impartial account of the members of his school. His works are two, the Pyrrhonian Hypoiyposes and Against the Mathematici (ed. Fabricius, Paris, 1621, and Bekker, Berlin, 1842).

See Brochard, Les Sceptiques grecs (1887); Pappenheim, Lebens- verhaltnisse des Sextus Empiricus (Berlin, 1875); Jourdain, Sextus Empiricus (Paris, 1858) ; Patrick, Sextus Empiricus and the Greek Sceptics (1899, with trans, of Pyrrh. Hyp. i.) ; also Scepti- cism.

SEYCHELLES, an archipelago in the Indian Ocean, consisting of forty-five islands — besides a number of rocks or islets — situated between 3° 38′ and 5° 45′ S., and 52 55′ and 53 50′ E. Together with the Amirantes, Cosmoledo, Aldabra and other islands they form the British colony of Seychelles. The outlying islands lie south-west

of the Seychelles group and between that archipelago and Madagascar. In all ninety islands with a total area of over 156 sq. m. are under the Seychelles government. There are in addition 40,000 to 50,000 sq. m. of coral banks within the bounds of the colony.

The Seychelles lie, with two exceptions, towards the centre of a large submarine bank and are all within the 50 fathoms line. Mahe, the largest and most central island, is 934 m. N.N.W. of Mauritius, 970 m. E. by N. of Zanzibar and 600 m. N.E. of the northernmost point of Madagascar. The other chief islands form

two principal groups: (i.) Praslin, 26 m. N.N.E. of Mahe, and the adjacent smaller islands of La Digue, Felicite, East Silver, West Silver, Curieuse and Aride; (ii.) Silhouette, 14 m. W. by N. of Mahe, and North Island. The most easterly island is Frigate, the most southerly Platte; on the northern edge of the reef are Bird and Denis islands. The general aspect of the islands is one of great beauty and fertility, and in the opinion of General C. G. Gordon they formed the Garden of Eden.

Mahe is 17 m. long, and from 4 to 7 broad and of highly irregular shape, with an area of about 55 sq. m. There are small areas of lowlands, chiefly at the mouths of the river valleys, but most of the island is mountainous, and in general the hills rise abruptly from the sea. There are ten heights between 1000 and 2000 ft., and seven over 2000 ft. The highest point is Morne Seychellois, 2993 ft.; next comes Trois Freres, 2390 ft. Both these mountains are in the northern half of the island. The main ridge runs north and south along the line of the greatest diameter, and from the heights descend many torrents, the whole island being well watered. The principal harbour, Port Victoria, is on the north-east coast in 4° 37′ S., 55° 27′ E. It is approached by a deep channel through the coral reef which fringes the entire eastern side of the island. Of the small islands close to Mahg the chief are St Anne and Cerf, off the east, and Conception and Therese off the west coast.

Praslin Island is 8 m. long and from 1 to 3 m. broad, has an area of about 27 sq. m. and. its highest point is 1260 ft.; La Digue covers 4 sq. m. and its greatest height is 1 1 7 5 ft. : Silhouette is roughly circular in shape, covers 8 sq. m. and culminates in Mon Plaisir, 2473 ft. None of the other islands exceeds ij sq. m.

Geology. — Except Bird and Denis islands, which are of coralline limestone, the Seychelles are of granite, with in places fringing reefs

of coral based on granite foundations. The granite is of the same formation or closely related to that of Madagascar and throughout the islands is closely uniform in its composition, but exhibits dikes of finer grain. The rocks are deeply furrowed and cut into ridges, evidence of the long period over which they have been subjected to atmospheric influences. There is no sign of marine action over four-fifths of the islands, which nowhere exhibit any trace of volcanic action, recent or remote. The islands are regarded as a remnant of the continental land which in remote geological ages united South Africa and India. J. Stanley Gardiner supposes that when first cut off the Seychelles were the size of the present bank — about 12,000 sq. m. This cutting off was caused largely by subsidence, though partly by marine action. The subsequent dwindling of the 12,000 sq. m. to 156 divided into many small islands is attributed to marine action which had its chief force in the Eocene and Miocene periods. (Cf. " The Indian Ocean," Geo. Journ. vol. xxviii., 1906).

Climate. — The climate is healthy and equable, and for a tropical country the temperature is moderate. It varies on the coast from about 68° to 88° F., falling at night in the higher regions to 6o c or 55° F. The mean coast temperature slightly exceeds 79° F. The south-east monsoon blows from May to October, which is the dry season, and the west-north-west monsoon from December to March. During April and November the winds are variable. The average annual rainfall on the coast is ioo-8 in. ; it increases to about 120 in. at a height of 600 ft. and at heights exceeding 2000 ft. is about 150 in. The Seychelles lie outside the track of the hurricanes which occasionally devastate Reunion and Mauritius and are also immune from earthquakes. The public health is good, and fevers and plague are unknown.

Flora and Fauna. — Both flora and fauna include species and genera peculiar to the Seychelles. Of these the best known is the Lodoicea sechellarum, a palm tree indigenous only in Praslin Island — but since introduced into Curieuse — noted for its fruit, the so-called Maldive double coco-nut or coco de mer. The nut was long known only from sea-borne specimens cast up on the Maldive and other coasts, was thought to grow on a submarine palm, and, being esteemed a sovereign antidote to poisons (Lusiad, x. 136), commanded exorbitant prices in the East. This palm will grow to a height of 100 ft., and shows enormous fern-like leaves. Another tree found only in the islands is the capucin (Northea sechellarum), whose massive dead trunks are a striking feature in the landscape. This tree has almost completely fallen a victim to the ravages of a green beetle, probably introduced from Mauritius. The islands were

formerly densely wooded, but only patches of forest remain. The central mountain zone of Mahe was in 1909 acquired by the government for reafforestation purposes. This zone also included one of the last remaining portions of indigenous forest. The forests of the coast belt resembled those of the coral islands of the neighbouring parts of the Indian Ocean. Characteristic of this region are the mangrove and Pandanus, and, a little inland, the banyan (Ficus), Pisonia and Hemandia. The coco-nut, now a conspicuous feature of the coast

flora, is probably not indigenous. The forests of the granitic land, of which typical patches remain, had the characteristics of a tropical moist region, palms, shrubs, climbing and tree ferns growing luxuriantly, the trees on the mountain sides, such as the Pandanus sechellarum sending down roots over the rocks and boulders from 70 to 100 ft. Of timber trees the bois gayac has disappeared, but bois de fer (Stadtmannia sideroxylon) and bois de natte {Maba sechellarum) still flourish on Silhouette Island. Besides the cutting down for building purposes of the timber trees the jungle was largely cleared for the plantation of vanilla; while a multitude of other tropical plants have been introduced tending to the extermination of the indigenous flora. The most important of the trees introduced since 1900 are various kinds of rubber, including Para {Hevea Brasiliensis), which grows well. For other introduced plants see below, Industries. The indigenous fauna, so far as its limited range affords comparison, resembles that of Madagascar. It is deficient in mammals, of which the only varieties are the rat and bat. The dugong, which formerly frequented the waters of the islands, does so no longer. The reptiles include certain lizards and snakes; the crocodile, once common, has been exterminated. Land tortoises have also disappeared, 1 but one freshwater species (Slernothaerus sinuatus) is still found; and the adjacent seas contain many turtles. Three coecilians, three batra- chians (including a mountain-frequenting frog) and three fresh-water crustaceans are also indigenous, and about twenty-six species of land shells. The islands are the home of a large number of birds, including terns, gannets and white egrets, though most of the in- digenous species are extinct. The neighbouring seas abound in fish. Among the domestic animals introduced are the ass and pig.

Inhabitants. — Like Mauritius, Reunion and Rodriguez the

Seychelles were uninhabited when first visited by Europeans; though fragments of ruins found on Praslin and Frigate islands may indicate the presence of man in earlier centuries. The islands were colonized by Mauritian and Bourbon Creoles; the white element, still prevailingly French, has been strengthened by the settlement of several British families. The first planters introduced slaves from Mauritius, and the negro element has been increased by the introduction of freed slaves from East Africa. There has been also an immigration of Chinese and, in larger numbers, of Indians (mainly from the Malabar coast). An official report issued in 1910 stated that the greater part of the valuable town property had passed into the hands of Indians, and that Indians and Chinese had the bulk of the retail trade. Of the coloured population those born in the Seychelles of negro, or negro-Indian blood are known as " enfants des ties." They speak a rude Creole patois, based on French but with a large admixture of Indian, Bantu and English words. The Seychellois are of fine physique, and are excellent and fearless sailors.

At the census of 1881 the inhabitants numbered 14,081, in 1891 the figure was 16,603 an d in 1901 the population numbered 19,237, of whom 9805 were males and 9432 females. The popula- tion on December 31st, 1909, was officially estimated at 22,409, or 149-59 persons per sq. m. The pure white population is about 600. About two-thirds of the inhabitants are Roman Catholics.

Agriculture and Industries. — Apart from fisheries the wealth of the islands depends upon agriculture, and the industries connected there-with. These are fostered by the government, which in 1901 created an agricultural board and established a botanic station at Victoria. Spices (cloves, cinnamon, nutmegs) were the chief articles of trade in the 18th century, and these with cotton, coffee, tobacco, sugar, maize and rice were the main crops grown until about 1850. Bananas, yams, &c, were also largely cultivated, and there was considerable trade in coco-nut oil, timber, fish and fish oil and tortoise-shell, whaling being carried on, chiefly by Americans and French, in the neighbouring seas. Subsequently cocoa was cultivated extensively, and from about 1890 vanilla largely superseded the other crops; in 1899 the vanilla exported was valued at over £100,000 out of a total export of £140,000, and from 1896 to 1903 the crop represented more than half the total value of the exports. Owing to increased competition, and in some degree to careless harvesting, there was a great fall in prices after 1900, and the Seychellois, though still producing vanilla in large quantities, paid greater attention to the products of the coco- nut palm — copra,

soap, coco-nut oil and coco-nuts — to the develop- ment of the mangrove bark industry, the collection of guano, the cultivation of rubber trees, the preparation of banana flour, the growing of sugar canes, and the distillation of rum and essential oils. The tortoise-shell and calipee fisheries and the export of salt fish are important industries. Minor exports are cocoa, coco-de-mer and beche-de-mer. From the leaves of the coco-de-mer are made baskets and hats.

1 The gigantic land tortoise (Testudo elephantina) is found only in the Aldabra Islands.

The imports consist chiefly of cotton goods and hardware from Great Britain; rice, flour and cotton from India, sugar and rum from Mauritius, coffee from Aden, wines and spirits and clothing from France. The value of the imports and exports (exclusive of specie) for the six years 1901-1906 was: imports, £360,520; exports, £377,613. The increase of trade is indicated by the figures for 1907 (a record year) to 1909. In the three years the value of imports was £233,863, that of exports £355,306. Over 75% of the total trade is with Great Britain or British possessions. The medium of exchange is the Indian rupee (= i6d.), with the subsidiary coinage of Mauritius.

Towns and Communications. — The only town of any size is the capital, Port Victoria (or Mahe), picturesquely situated at the head of an excellent harbour. Many of the houses are built of massive coral, Porites gaimardi, hewn into square building blocks which at a distance glisten like white marble. The port is a coaling station of the British navy and is connected by telegraphic cables with Zanzibar and Mauritius. There is no inland telegraph system. All the islands are well provided with metalled roads. Regular monthly com- munication with Marseilles is maintained by the Messageries Mari- times, steamers. German and British lines serve the South African and Indian ports. The government employ steam vessels for pas- senger and mail services between the islands, and there are large numbers of sailing craft belonging to the islanders.

Government, Revenue, &"c. — Seychelles is a crown colony administered by a governor, assisted by nominated executive and legislative councils. Revenue is derived chiefly from customs, licences, court fees and the post office, while among the principal heads of expenditure figure telegraph and steamer subsidies and the education, medical, legal and police depart- ments. For the ten years 1899-1908 the average yearly revenue was £28,726; the average yearly expenditure £27,304. A public debt of £20,000, repayable in thirty annual instalments, was contracted in 1899. The law in force

is based on the Code Napoleon, considerably modified, however, by local ordinances. The simplification and codification of the laws was carried out during 1899-1904 (see the Colonial Office annual reports, especially that for 1903, § 37). Education is under the control, of a government board and, besides primary schools, there are institutions for higher education and a Carnegie Library. Grants are made to schools of all denominations. The Creole patois is unsuited to be a medium of instruction, and English is used as far as possible, though its acquisition by the peasantry is that of a foreign language. The same difficulty, to an almost equal degree, would apply to the use of French as a medium.

History. — The Seychelles are marked on Portuguese charts dated 1502. The first recorded visit to the islands was made in 1609 by an English ship; then for 133 years there is no docu- mentary evidence of any further visit. The second recorded visit, in 1 742, was made by Captain Lazare Picault, who, returning two years later, formally annexed the islands to France. Though then uninhabited there is a strong tradition, probably well founded, that the Seychelles had been from Arab times a rendez- vous of the pirates and corsairs who infested the high seas between South Africa and India. Picault, who acted as agent of the celebrated Mahe de la Bourdonnais, governor of the lie de France (Mauritius), named the principal island Mahe and the group lies de la Bourdonnais, a style changed in 1756, when the islands were renamed after Moreau de Sechelles, at that time contr61eur des finances under Louis XV. The first permanent settlement was made about 1768, when the town of Mahe was founded. Soon afterwards Pierre Poivre, intendant of lie de France, seeing the freedom of the Seychelles archipelago from hurricanes, caused spice plantations to be made there, with the object of wresting from the Dutch the monopoly they then enjoyed of the spice trade. The existence of these plantations was kept secret, and it was with that object that they were destroyed by fire by the French on the appearance in the harbour in 1778 of a vessel flying the British flag. The ship, however, proved to be a French slaver who had hoisted the Union Jack fearing to find the British in possession. Mahe proved very useful to French ships during the wars of the Revolution, and this led to its capture by the British in 1794, but no troops were left to garrison the place, and the administration went on as before. In 1806 the island capitulated to the captain of another British ship, but again no garrison was left, and it was not until after the capture of Mauritius in 1810 that the Seychelles were

occupied by the British, to whom they were ceded by the treaty of Paris in 1814. Throughout this period Mons. J. B. Queau de Quincy (1748-1827) administered the islands. This remark- able man, a Parisian by birth, became governor of the Seychelles in 1789 under the monarchy, continued to serve under the First Republic, and Napoleon I., — acknowledging the British authority when ships of that nationality entered the harbour, — and when the Seychelles were made a dependency of Mauritius was appointed by the British agent-civil. In all he governed the islands thirty-eight years, dying in 1827. His tomb is in Govern- ment House garden. Under de Quincy's administration the islands prospered; the cultivation of cotton and coffee was then begun, much of the land being deforested for this purpose — a deforestation practically completed when vanilla was introduced. In 1834 the abolition of slavery led to a decline in the prosperity of the islands, but as many of the slaves captured by British cruisers off the east coast of Africa were landed at Seychelles economic conditions were gradually ameliorated. There was also a slight immigration of coolies from India. From 1810 until 1872 the administration was dependent upon Mauritius; from that date onward greater powers were given to the local authorities, until in 1903 Seychelles was erected into a separate colony with its own governor. The over-dependence placed on one product caused waves of depression to alternate with waves of prosperity, and the depression following the fall in the price of vanilla was aggravated by periods of drought, " agricultural sloth and careless extravagance." 1 But during 1905-1910 successful efforts were made to broaden the economic resources of the colony. A natural field for the energies of the surplus population was also found in colonization work in British East Africa. The islands were chosen in 1897 as the place of deporta- tion of Prempeh, ex-king of Ashanti, and in 1901 Mwanga, ex-king of Uganda, and Kabarega, ex-king of Unyoro were also deported thither. Mwanga died at the Seychelles in May 1903.

Dependencies. — The outlying islands forming part of the colony of Seychelles consist of several widely scattered groups and have a total population of about 900. The Amirante archipelago is situated on a submarine bank west and south-west of the Seychelles, the nearest island being about 120 m. from Mah6. The archipelago consists of a number of coral islets and atolls comprising the African Islands (4), the St Joseph group (8), the Poivre Islands (9) and the Alphonso group (3). Farther south and within 170 m. of Mada- gascar is the Providence group (3) formed by the piling up of sand on a surface

reef of crescent shape. The Cosmoledo Islands, 12 in number, lie some 210 m. west of Providence Island, while 70 m. further west are the Aldabra Islands (q.v.). The chief island in the Cosmoledo group is 9 m. long by 6 broad. Coetivy (transferred from Mauritius to the Seychelles in 1908) lies about loom. S.S.E. of Platte. The majority of the outlying islands are extremely fertile, coco-nut trees and maize growing luxuriantly. Several of the islands contain valuable deposits of guano and phosphate of lime, and their waters are frequented by edible and shell turtle. Like the Amirantes all the other islands named are of coral formation.

See Unpublished Documents on the History of the Seychelles Islands Anterior to 1810, with a cartography and a bibliography compiled by A. A. Fauvel (Mahe, 1909); Ancient Maps of Seychelles Archipelago, a portfolio containing 28 maps (Mahe, 1909); J. Stanley Gardiner, " The Seychelles Archipelago " (with bibliographical notes), in Geo. Jnl. vol. 29 (1907) and " The Indian Ocean," Geo. Jnl. vol. 28 (1906). See also the annual reports on the Seychelles issued by the Colonial Office; those from 1901 onward contain valuable botanical reports. For the dependencies see R. Dupont, Report on a Visit of Investigation to St Pierre, Astove, Cosmoledo, Assumption and the Aldabra Group of the Seychelles Islands (Seychelles, 1907).

SEYDLITJS, FRIEDRICH WILHELM, Freiherr von (1721- 1773), Prussian soldier, one of the greatest cavalry generals of history, was born on the 3rd of February 1721 at Calcar in Cleve duchy, where his father, a major of Prussian cavalry, was stationed. After his father's death in 1728 he was brought up in straitened circumstances by his mother, but at the age of thirteen he went as a page to the court of the margrave of Schwedt, who had been his father's colonel. Here he acquired a superb mastery of horsemanship, and many stories are told of his feats, the best known of which was his riding between the sails of a wind-mill in full swing. In 1740 he was commissioned a cornet in the margrave's regiment of Prussian cuirassiers. Serving as a

1 Colonial Reports . . . Seychelles (1907).

subaltern in the first Silesian War, he was taken prisoner in May 1742 after so gallant a defence that King Frederick offered to exchange an Austrian captain for him. In 1743 the king made him a captain in the 4th Hussars, and he brought his squadron to a state of conspicuous efficiency. He served through the second war, and after Hohenfriedberg was promoted major at the age of twenty-four. At the

close of the war he had an opportunity of successfully handling 1 5 squadrons in front of the enemy, and this, with other displays of his capacity of leading cavalry in the searching tests of Frederick's " reviews," secured his promotion in 1752 to the rank of lieutenant-colonel and in 1753 to the command of the 8th cuirassiers. Under his hands this regiment soon became a pattern to the rest of the army. In 1755 he was made colonel. Next year the Seven Years' War, that was to make his name immortal, broke out. In 1757, regardless of the custom of keeping back the heavy cavalry in reserve, he took his regiment to join the advanced guard, at Prague he nearly lost his life in attempting to ride through a marshy pool, and at Kolin, at the head of a cavalry brigade, he distinguished himself in checking the Austrian pursuit by a brilliant charge. Two days later the king made him major-general and gave him the order pour le mtrite, which promotion he felt to be no more than his deserts, for to Zieten's congratulations he responded: " It was high time, Excellency, if they wanted more work out of me. I am already thirty-six." Four times in the dismal weeks that followed the disaster of Kolin, Seydlitz asserted his energy and spirit in cavalry encounters, and on the morning of Rossbach Frederick, superseding two senior generals, placed Seydlitz in command of the whole of his cavalry. The result of the battle was the complete rout and disorganization of the enemy, and in achieving that result only seven battalions of Frederick's army had fired a shot. The rest was the work of Seydlitz and his 38 squadrons. The same night the king gave him the order of the Black Eagle, and promoted him lieutenant-general. But he had received a wound in the melee, and for some months he was away from the army. He rejoined the king in 1758, and at the battle of Zorndorf Seydlitz's cavalry again saved the day and won the victory. At Hochkirch with 108 squadrons he covered the Prussian retreat, and in the great disaster of Kunersdorf he was severely wounded in a hopeless attempt to storm a hill held by the Russians. During his convalescence he married Countess Albertine Hacke. He rejoined the army in May 1760, but his health was so impaired that Frederick sent him home again. It was not until 1761 that he reappeared at the front. He now commanded a wing of Prince Henry's army, composed of troops of all arms, and many doubts were expressed as to his fitness for this command, as his service had hitherto been with the cavalry exclusively. But he answered his critics by his con- duct at the battle of Freyburg (October 29, 1762), in which, leading his infantry and his cavalry in turn, he decided the day. After the peace of Hubertusburg he was made inspector-general of the cavalry in Silesia, where eleven regiments were permanently stationed and whither Frederick sent all his most promising officers

to be trained by him. In 1767 he was made a general of cavalry. But his later years were clouded by domestic un- happiness. His wife was unfaithful to him, and his two daughters, each several times married, were both divorced, the eider once and the younger twice. His formerly close friendship with the king was brought to an end by some misunderstanding, and it was only in his last illness, and a few weeks before his death, that they met again. Seydlitz died of paralysis at Ohlau on the 27th of August 1773.

See Varnhagen von Ense, Das Leben des Generals von Seydlitz (Berlin, 1834); and Bismarck, Die kgl. preussische Reiterei unter Friedrich dem Grossen (Karlsruhe, 1837).

SEYMOUR, or St Maur, the name of an English family in which several titles of nobility have from time to time been created, and of which the duke of Somerset is the head. The family was settled in Monmouthshire in the 13th century. The original form of the name, which has been resumed by the dukes of Somerset since 1863, seems to have been St Maur, of which Camden says that Seymour was a later corruption. It appears

that about the year 1240 Gilbert Marshal, earl of Pembroke, assisted William St Maur to wrest a place called Woundy, near Caldecot in Monmouthshire, from the Welsh. Woundy and Penhow, at the latter of which he made his residence, were the property of Sir Richard St Maur at the end of the 13th century, but they passed away from the family through the marriage of Sir Richard's great-great-granddaughter, the only child of John St Maur. who died in 1359. John St Maur's younger brother Roger married Cecily, one of the daughters and co-heiresses of John Beauchamp of Hache, Baron Beauchamp de Somerset (d. 1361), who brought to her husband the greater part of her father's extensive estates in Somersetshire, Devonshire, Buckingham- shire and Suffolk. The eldest son of this marriage was Sir William St Maur, or Seymour (for the later form of the name appears to have come into use about this date), who was an attendant on the Black Prince, and who died in his mother's lifetime, leaving a son Roger, who inherited the estates and added to them by his marriage with Maud, daughter of Sir William Esturmi of Wolf Hall, Wiltshire. During the next three or four generations the wealth and importance of the Seymours in the western counties increased, until in the reigns of Henry VII. and Henry VIII. Sir John Seymour of

Wolf Hall became a personage of note in public affairs. He took an active part in suppressing the Cornish rebellion in 1497; and afterwards attended Henry at the Field of the Cloth of Gold, and on the occasion of the emperor Charles V.'s visit to England in 1522. The eldest of his ten children was Edward Seymour, 1st duke of Somerset (q.v.), the famous Protector in the reign of Edward VI.; his third son was Thomas Seymour, Baron Seymour of Sudeley (q.v.); and his eldest daughter Jane was third wife of King Henry VIII., and mother of Edward VI. The Protector was twice married; and, probably owing to the adultery of his first wife whom he repudiated about 1535, his titles and estates were entailed first on the issue of his second marriage with Anne, daughter of Sir Edward Stanhope. (See Somerset, Earls and Dukes or.)

fUo Protector's eldest surviving son by his first marriage, Sir Edward Seymour (d. 1593), knight, of Berry Pomeroy, Devon, was father of Sir Edward Seymour (d. 1613) who was created a baronet in 161 1; and the baronetcy then descended for six generations from father to son, all of whom were named Edward, until in 1750, on the failure of heirs of the Protector by his second marriage, Sir Edward Seymour, 6th baronet of Berry Pomeroy, succeeded to the dukedom of Somerset. The 3rd baronet, in whose time the family seat at Berry Pomeroy was plundered and burnt by the Roundheads, had a younger brother Henry (161 2-1686), who was a close personal attendant of Prince Charles during the Civil War, and bore the prince's last message to his father, Charles.L, before the latter's execution. Henry Seymour continued his service to Charles II. in exile, and at the Restoration he received several valuable offices from the king. In 1669 he bought the estate of Langley in Buckinghamshire, where he lived till his death in 1686. In 1681 his son Henry, at the age of seven years, was created a baronet.

Sir Edward Seymour, 4th baronet (1 633-1 708), speaker of the House of Commons, was elected member of parliament for Gloucester in 1661, and his influence at Court together with his natural abilities procured for him a position of weight in the House of Commons. He was appointed to the lucrative post of treasurer of the navy; and in 1667 he moved the impeachment of Lord Clarendon, which he carried to the House of Lords. In 1672 he was elected speaker, an office which he filled with distinction until 1679, when, having been unanimously re-elected to the Chair, the king refused to confirm the choice of the Commons. On the accession of JamesII., Seymour courageously opposed the arbitrary measures of the Crown; and at the revolution he adhered to the Prince of Orange. In 1691 he became a lord of the treasury, but losing his place three

years later he took an active part in the tory opposition to William's whig ministers; and in later years he was not less hostile to those of Queen Anne, but owing to the ascendancy of Marlborough he lost all influence for some time before his death, which took place; in 1708. Seymour was not less arrogant than his relative

" the Proud Duke " of Somerset; but he was described by Burnet as " the ablest man of his party, the first speaker of the House of Commons that was not bred to the law; a graceful man, bold and quick, and of high birth." Sir Edward Seymour was twice married. By his first wife he had two sons, Edward, 5th baronet, whose son Edward became the 8th duke of Somerset, and William, who became a lieutenant-general; by his second wife, a daughter of Alexander Popham of Littlecote, he had six sons, the eldest of whom, Popham, on succeeding to the estates of his mother's cousin, Edward, earl of Conway, assumed the name of Conway in addition to that of Seymour. Popham was killed in a duel with Colonel Kirk in 1669, and his estates devolved on his next brother, Francis, who likewise assumed the name of Conway, and having been created Baron Conway in 1703 was the father of Francis Seymour Conway (1719-1794), created marquess of Hertford in 1793, and of field-marshal Henry Seymour Conway (q.v.). (See Hertford, Earls and Marquesses of.) The eldest son of the Protector's second marriage, Edward Seymour (1537-1621), was relieved by act of parliament in the reign of Queen Mary from the attainder passed on his father in 1551, and was created Baron Beauchamp and earl of Hertford in 1559. In 1560 he secretly married Lady Catherine Grey, second daughter of Henry Grey, duke of Suffolk, and sister of Lady Jane Grey, claimant of the crown as great-granddaughter of Henry VII., on whose death Catherine stood next in succession to the throne after Queen Elizabeth under the will of Henry VIII. On this account both parties to the marriage incurred the displeasure of Queen Elizabeth; they were imprisoned in the Tower of London, and the fact of their marriage, together with the legitimacy of their two sons, was denied. The eldest of these sons was Edward Seymour (1561-1612), styled Lord Beauchamp notwithstanding the question as to his legitimacy, who in 1608 obtained a patent declaring that after his father's death he should become earl of Hertford. He, however, died before his father, leaving three sons, one of whom, William, became 2nd duke of Somerset; and another, Francis, was created Baron Seymour of Trowbridge in 1641. The latter had at first taken an active part in the opposition in the House of Commons to the government of Charles I., having been elected member for Wiltshire in 1620. He represented the same con- stituency in both the Short

and the Long Parliaments; and he refused to pay ship money in 1639. When, however, the popular party proceeded to more extreme measures, Francis Seymour refused his support, and was rewarded by being raised to the peerage; he voted in the House of Lords against the attainder of Strafford, and in 1642 he joined Charles at York and fought on the royalist side throughout the Great Rebellion. He died in 1664. His grandson Francis, 3rd baron, succeeded to the dukedom of Somerset in 1675; and on the death of his nephew Algernon, 7th duke of Somerset, in 1750, the male line of the Protector by his second marriage became extinct, and the dukedom reverted to the elder line, the 6th baronet of Berry Pomeroy becoming 8th duke of Somerset.

Henry Seymour (1729-1805), a son of the 8th duke of Somerset's brother Francis, was elected to the House of Commons in 1763; in 1778 he went to France, and fixing his residence at Prunay, near Versailles, he became the lover of Madame du Barry, many of whose letters to him are preserved in Paris. He was twice married, and in addition to children by both wives he left an illegitimate daughter, Henriette Felicite, who married Sir James Doughty-Tichborne, by whom she was the mother of Sir Roger Tichborne, impersonated in 1871 by the famous impostor Arthur Orton.

Lord Hugh Seymour (1759-1801), a younger son of Francis Seymour-Conway, marquess of Hertford, was a distinguished naval officer who saw much active service especially under Lord Howe, in whose famous action on the 1st of June 1794 he took a conspicuous part. His son Sir George Francis Seymour (1787-1870), admiral of the fleet, began his naval career by serving under Nelson; in 1818 he became Sergeant-at-arms in the House of Lords, a post which he retained till 1841, when he was promoted to the rank of rear-admiral and appointed a lord cf the admiralty; his eldest son, Francis George Hugh Seymour (18 12-1884), succeeded his cousin Richard Seymour- Conway as 5th marquess of Hertford in 1870. Lord Hugh Seymour's younger son, Sir Horace Beauchamp Seymour, was the father of Frederick Beauchamp Paget Seymour, Baron Alcester (q.v.).

A younger branch of the great house of Seymour is said to hava

settled in Ireland in the reign of Elizabeth, from which Sir Michael

Seymour (i 768-1 834) claimed descent. Sir Michael, like so many of his name, was an officer in the navy, in which he rendered much distinguished service in the last decade of the 18th century. He lost an arm in Howe's action on the 1st of June 1794; and between 1796 and 1810 as commander of the " Spitfire," and afterwards of the " Amethyst," he captured a great number of prizes from the French in the Channel. Seymour became a rear-admiral in 1832, and died two years later while in chief command on the South American station. His son, Sir Michael Seymour (1802-1887), entered the navy in 1813, and attained the rank of rear-admiral in 1854, in which year he served under Sir Charles Napier in the Baltic during the war with Russia. In 1856 he was in command of the China station, and conducted the operations arising out of the affair of the lorcha " Arrow "; he destroyed the Chinese fleet in June 1857, took Canton in December, and in 1858 he captured the forts on the Pei-ho, compelling the Chinese government to consent to the treaty of Tientsing. In 1864 he was promoted to the rank of admiral.

Authorities. — The Wiltshire Archaeological Magazine, vol. xv. ; William Camden, Britannia, English translation, edited by Richard Gough (4 vols., London, 1806); Arthur Collins, Peerage of England (8 vols., London, 1779) ; G. E. C, Complete Peerage, sub. " Somerset," "Seymour of Trowbridge," and "Hertford" (London, 1896); Burke's Peerage, sub. " Somerset," Dictionary of National Biography, sub. " Seymour," vol. li. (London, 1897).

SEYMOUR, HORATIO (1810-1886), American statesman, was born at Pompey, Onondaga county, New York, on the 31st of May 1 8 10. His ancestor, Richard Seymour, a Protestant Episcopal 'clergyman, was an early settler at Hartford, Connecti- cut, and his father, Henry Seymour, who removed from Connecti- cut to New York, was prominent in the Democratic party in the state, being a member of the " Albany Regency " and serving as state senator in 1816-1819 and in 1822, and as canal commissioner in 1810-1831. The son was brought up in Utica, studied in 1824-1825 at Geneva Academy (afterwards Hobart College), and then at a military school in Middletown, Conn., and was admitted to the bar in 1832. He was military secretary to Governor W. L. Marcy in 183 3-1 83 9, was a member of the New York Assembly in 1842, in 1844 and in 1845, being speaker in 1845; mayor of Utica in 1843, and in 1852 was elected governor of the state over Washington Hunt (1811-1867), the Whig candidate, who had defeated him in 1850. He vetoed in 1854 a bill prohibiting the sale of intoxicating liquors (which was declared unconstitutional almost immediately after its re- enactment in 1855), and in consequence he was defeated in 1854 for re-

election as governor by Myron Holley Clark (1806-1892), the Whig and temperance candidate. Seymour was a con- servative on national issues and supported the administrations of Pierce and Buchanan; he advocated compromise to avoid secession in 1860-1861; but when war broke out he supported the maintenance of the Union. In 1863-1865 he was again governor of New York state. His opposition to President Lincoln's policy was mainly in respect to emancipation, military arrests and conscription. The president tried to win him over early in 1863, but Seymour disapproved of the arrest of C. S. VaUandigham in May, and, although he responded immediately to the call for militia in June, he thought the Conscription Act un- necessary and unconstitutional and urged the president to postpone the draft until its legality could be tested. During the draft riots in July he proclaimed the city and county of New York in a state of insurrection, but in a speech to the rioters adopted a tone of conciliation — a political error which injured his career.. He was defeated as Democratic candidate for governor in 1864. In 1868 he was nominated presidential candidate by the National Democratic Convention, Francis P. Blair, Jr., being nominated for the vice-presidency; but Seymour and Blair carried only eight states (including New York, New Jersey and Oregon), and received only 80 electoral votes to 214 for Grant and Colfax. Seymour did not re-enter political life, refusing to be considered for the United States senatorship from New York in 1876. He died on the 12th of February 1886 in Utica, at the home of his sister, who was the wife of Roscoe Conkling.

The Public Record of Horatio Seymour (New York, 1868) includes his speeches and official papers between 1856 and 1868.

SEYMOUR, THOMAS DAY (1848-1907), American educa- tionist, was born in Hudson, Ohio, on the 1st of April 1848.

He graduated in 1870 at Western Reserve College, where his father, Nathan Perkins Seymour, was long professor of Greek and Latin. Here, after studying in Berlin and Leipzig, the son was professor of Greek in 1872-1880; and he became professor of Greek at Yale University in 1880, holding his position until his death in New Haven on the 31st of December 1907. He was from 1887 to 1901 chairman of the managing committee of the American School of Classical Studies at Athens, and was president of the Archaeological Institute of America from 1903. Except for his Selected Odes of Pindar (1882), his published work was practically confined to the study of the Homeric poems: An Introduction to the Language and Verse of Homer (1885); Homer's Iliad, i.-iv. (1887-1890); Homeric

Vocabulary (1889); Introduction and Vocabulary to School Odyssey (1897); and Life in the Homeric Age (1907). He edited, with Lewis R. Packard and John W. White, the " College Series of Greek Authors."

SEYMOUR, a city of Jackson county, Indiana, U.S.A., about 59 m. S. by E. of Indianapolis. Pop. (1890) 5337; (1900) 6445, (321 foreign-born) ; (1910) 6305. It is served by the Baltimore & Ohio, South- Western (which has repair shops here) , the Pittsburg, Cincinnati, Chicago & St Louis, and the Southern Indiana railways, and by the Indianapolis, Columbus & Southern and the Indianapolis & Louisville interurban electric lines. The city has a considerable trade in produce, and has various manufactures, including woollen-goods, furniture, carriages and automobiles. Seymour was settled in 1854, incorporated as a town in 1864, and chartered as a city in 1867.

SEYMOUR OF SUDELEY, THOMAS SEYMOUR, Baron (c. 1508-1549), lord high admiral of England, was fourth son of Sir John Seymour of Wolf Hall, Wiltshire, and younger brother of the Protector Edward Seymour, 1st duke of Somerset. His sister Jane Seymour became the third wife of Henry VIII. in 1 536, and another sister, Elizabeth, married Thomas Cromwell's son. Seymour's connexions thus ensured his promotion, and he quickly won the favour of the king, who gave him many grants of land and employed him in the royal household and on diplomatic missions abroad. From 1540 to 1542 he was at Vienna, and in 1 543 in the Netherlands, where he served with distinction in the war against France, holding for a short time the supreme com- mand of the English army. In 1544 he was rewarded with the post of master of the ordnance for life, becoming admiral of the fleet a few months later, in which capacity he was charged with guarding the Channel against French invasion. Henry VIII. left Seymour a legacy by his will, and is said to have directed that he should be raised to the peerage. In February 1547 he was accordingly created Baron Seymour of Sudeley and appointed lord high admiral. From this time forward he was mainly occupied in intrigue against his brother the Protector, of whose power he was jealous; and he aimed at procuring for himself the position of guardian of the young king, Edward VI. Several matrimonial projects entered into Seymour's schemes for gratifying his ambitions. No sooner was Henry VIII. dead than the lord high admiral tried to secure the princess (afterwards queen) Elizabeth in marriage; and when this project was frustrated he secretly married the late king's widow, Catherine Parr, whose hand he had vainly sought as early as 1543. He also took steps to ingratiate himself with Edward, and

proposed a marriage between the king and the Lady Jane Grey. He entered into relations with pirates on the western coasts, whom it was his duty as lord high admiral to suppress, with a view to securing their support; and when the Protector invaded Scotland in the summer of 1547 Seymour fomented opposition to his authority in his absence. On the death of his wife in September of the next year he made renewed attempts to marry the princess Elizabeth. Somerset strove ineffectually to save his brother from ruin, and in January 1549 Seymour was arrested and sent to the Tower; he was convicted of treason, and executed on the 20th of March 1549.

See Sir John Maclean, Life of Sir Thomas Seymour (London, 1869) ; Chronicle of Henry VIII., translated from the Spanish, with notes by M. A. S. Hume (London, 1889); Literary Remains of Edward VI., with notes and memoir by J. G. Nichols (2 vols., Londoa

1857); Mary A. E. Green, Letters of Royal and Illustrious Ladies of Great Britain to the Close of the Reign of Mary (3 vols., London, 1846). See also Somerset, Edward Seymour, 1st Duke of, and the authorities there cited.

SEYNE SUR MER, or La Seyne, an industrial suburb of Toulon, S.W. of that port, and connected with it by rail and steamer. Pop. (1901) 21,002. It owes its importance to the shipbuilding trade, the Societe des Forges et Chantiers de la Mediterranee having here one of the finest shipbuilding yards in Europe (it is a branch of the greater establishment at Marseilles), which gives employment to about 3000 workmen.

SFAX (Arabic Asfakis or Safdkus, the cucumbers), a city of Tunisia, second in importance only to the capital, 78 m. due S. of Susa, on the Gulf of Gabes (Syrtis Minor) opposite the Kerkenna Islands, in 34° 43′ N., io° 46′ E. Sfax occupies the site of the ancient Taphrura, of which few vestiges remain. The town consists of a European quarter, with streets regularly laid out and fine houses, and the Arab town, with its kasbah or citadel, and tower-flanked walls pierced by three gates. Many of the private houses, mosques and zawias are good specimens of native art of the 17 th and 18th centuries. North-east of the native town is a camp for the European garrison. Sfax was formerly the starting-point of a caravan route to Central Africa, but its inland trade now extends only to the phosphate region beyond Gafsa, reached by a railway which, after skirting the coast south-wards from Sfax to Mahares, runs inland past Gafsa. With Susa there is regular communication by steamer and motor car. Olive oil is manufactured, and the fisheries are important, notably those of sponges and of octopuses (exported to Greece) . The prosperity of the town is largely due to the export trade in phosphates, esparto grass, oil, almonds, pistachio nuts, sponges, wool, &c. There is in the Gulf of Gabes a rise and fall of 5 ft. at spring tides, which is rare in the Mediterranean. Formerly the only anchorage at Sfax was 2 m. from shore; but a harbour, completed in 1900 and entered by a channel ij

m. long and 2if ft. deep, now renders vessels independent of the tide. There are separate basins for fishing boats and a dock for torpedo-boat flotilla. Round the town for 5 or 6 m. to the north and west stretch orchards, gardens and country houses. Dates, almonds, grapes, figs, peaches, apricots, olives, and in rainy years melons and cucumbers grow there without irrigation. Two enormous cisterns, maintained by public charitable trusts, supply the town with water in dry seasons.

Sfax is on the site of a Roman settlement. Many of its Arab inhabitants claim descent from Mahomet. The Sicilians under Roger the Norman took it in the 12th century, and in the 16th the Spaniards occupied it for a brief period. The bombard- ment of the town in 1881 was one of the principal events of the French conquest of Tunisia; it was pillaged by the soldiers on the 16th of July, and the inhabitants had afterwards to pay a war indemnity of £250,000. The population, about 15,000 at the time of the French occupation, had increased to 50,000 m 1906.

SFORZA, the name of a famous Italian family. They were descended from a peasant condottiere, Giacomo or Muzio (some- times abbreviated into Giacomuzzo) Attendolo, who was born at Cotignola in the Romagna on the 10th of June 1369, gained command of a band of adventurers by whom he had been kid- napped, took the name of Sforza in the field, became constable of Naples under Joanna II., fought bravely against the Spaniards, served Pope Martin V., by whom he was created a Roman count, and was drowned on the 4th of January 1424 in the Pescara near Aquila while engaged in a military expedition. His natural son Francesco (1401-1466) succeeded in command of the condottieri, and showed military genius and political acumen. He served the- Visconti against the Venetians and then the Venetians against the Visconti; he attacked the pope, deprived him of the Romagna, and later defended him; he married in 1441 Bianca, the only daughter of Filippo Maria Visconti, duke of Milan, and received Pontremoli and Cremona as dowry and the promise of succession to the duchy of Milan. The short-lived Ambrosian republic, which was established by the Milanese on the death of Visconti (1447), was overthrown by Francesco,

who made his triumphal entry as duke of Milan on the 25th of March 1450. He suppressed a revolt at Piacenza, formed close alliances with Cosmo de' Medici and with Louis XI. of France, and exercised authority over Lombardy, several districts south of the Po and even Genoa. He rebuilt the fortress of Porta Giovio and constructed the Great Hospital and the canal of the Martesana, which connects

Milan with the Adda; and his court, filled with Italian scholars and Greek exiles, speedily became one of the most splendid in Italy. His daughter Ippolita was renowned for her Latin discourses.

Francesco left several sons, among whom were Galeazzo Maria, Lodovico, surnamed the Moor, and Ascagnio, who became a cardinal.

Galeazzo Maria, who succeeded to the duchy, was born in 1444, and was a lover of art, eloquent in speech, but dissolute and cruel. He was assassinated at the porch of the cathedral on the 26th of December 1476 by three young Milanese noblemen desirous of imitating Brutus and Cassius. His daughter Caterina is separately noticed. Gian Galeazzo (1469-1494), son of Galeazzo, succeeded to the duchy under the regency of his mother, Bona of Savoy, who was supplanted in her power (1481) by the boy's uncle, Lodovico the Moor. Gian Galeazzo married Isabella of Aragon, granddaughter of the king of Naples, and his sudden death was attributed by some to poison administered by the regent. His daughter, Bona Sforza (1493-1557), married King Sigismund of Poland in 1518. She displayed remarkable ability in government, built castles, schools and hospitals, but increased corruption and intrigue at the Polish court. She was accused of having killed her daughter- in-law, the wife of Sigismund Augustus. On the death of her husband she returned to Italy and was poisoned (1557) by her paramour Pappacoda.

Lodovico the Moor [Lodovico il Moro] (1451-1508), who is famed as patron of Leonardo da Vinci and other artists, had summoned Charles VIII. of France to his aid (1494) and received the ducal crown from the Milanese nobles on the 22nd of October in the same year, but finding his own position endangered by the French policy, he joined the league against Charles VIII., giving his niece Bianca in marriage to Maximilian I. and receiving in return imperial investiture of the duchy. Lodovico was driven from Milan by Louis XII. in 1499, and although reinstated for a short time by the Swiss he was eventually delivered over by them to the French (April 1500) and died a prisoner in the castle of Loches. Francesco, the son of Gian Galeazzo, was also taken to France by Louis XII., becameabbotof Marmoutiers, and died in 1511.

The two sons of Lodovico, Massimiliano and Francesco Maria, took refuge in Germany; the former, was restored to the duchy of Milan by the Swiss in 151 2, but after the over- whelming defeat of his allies at Marignano (151 5) he abandoned his rights to Francis I. for

a pension of 30,000 ducats, and died at Paris in 1530; the latter was put in possession of Milan after the defeat of the French at La Bicocca in 1522, subsequently entered the Italian League against the emperor Charles V., was unpopular on account of oppressive taxation, and his death (24th of October 1535) marked the extinction of the direct male line of the Sforza. The duchy went to Charles V.

The dukes of Sforza- Cesarini and the counts of Santa Fiora are descended from collateral branches of the Sforza family.

See J. Burckhardt, The Civilization of the Renaissance in Italy, trans, by S. G. C. Middlemore (London, 1898); J. A. Symonds, Age of the Despots (New York, 1888); W. P. Urquhart, Life and Times of Francesco Sforza (2 vols., Edinburgh, 1852) ; Mrs Julia Ady, Beatrice d'Este, duchess of Milan, 1475-1497 (London, 1905) ; F. Calvi, Bianca Maria Sforza-Visconti e gli ambasciatori di Lodovico il Moro (Milan, ; A. Segre, " Lodovico Sforza, duca di Milano," in R. Accad. d.

Sci. Alii, vol. 36 (Turin, 1901). There is a critical bibliography by Otto von Schleinitz in Zeitschrift fur Bucherfreunde, vol. v. (Bielefeld, 1901). (C. H. Ha.)

SFORZA, CATERINA (1463-1509), countess of Fori}, was an illegitimate daughter of Galeazzo Maria Sforza (see above). In 1473 she was betrothed to Girolamo Riario, a son of Pope Sixtus IV., who was thus able to regain possession of Imola, that city being made a fief of the Riario family. After a triumphal

entry into Imola in 1477 Caterina Sforza went to Rome with her husband, who, with the help of the pope, wrested the lordship of Forli from the Ordelaffi. Riario, by means of many crimes, for which his wife seems to have blamed him, succeeded in accumu- lating great wealth, and on the death of Sixtus in August 1484, he sent Caterina to Rome to occupy the castle of St Angelo, which she defended gallantly until, on the 25th of October, she surrendered it by his order to the Sacred College. They then returned to their fiefs of Imola and Forli, where they tried to win the favour of the people by erecting magnificent public buildings and churches and by abolishing taxes; but want of money obliged them to levy the taxes once more,

which caused dissatisfaction. Riario's enemies conspired against him with a view to making Franceschetto Cybo, nephew of Pope Innocent VIII., lord of Imola and Forli in his stead. Riario thereupon instituted a system of persecution, in which Caterina was impli- cated, against all whom he suspected of treachery. In 1488 he was murdered by three conspirators, his palace was sacked, and his wife and children were taken prisoners. The castle of Forli, however, held out in Caterina's interest, and every induce- ment and threat to make her order its surrender proved useless; having managed to escape from her captors she penetrated into the castle, whence she threatened to bombard the city, refusing to come to terms even when the besiegers threatened to murder her children. With the assistance of Lodovico il Moro she was able to defeat her enemies and to regain possession of all her dominions; she wreaked vengeance on those who had opposed her and re-established her power. Being now a widow she had several lovers, and by one of them, Giacomo Feo, whom she afterwards married, she had a son. Feo, who made himself hated for his cruelty and insolence, was murdered before the eyes of his wife in August 1495; Caterina had all the conspirators and their families, including the women and children, massacred. She established friendly relations with the new pope, Alexander VI., and with the Florentines, whose ambassador, Giovanni de' Medici, she secretly married in 1496. Giovanni died in 1498, but Caterina managed with the aid of Lodovico il Moro and of the Florentines to save her dominions from the attacks of the Venetians. Alexander VI., however, angered at her refusal to agree to a union between his daughter Lucrezia Borgia and her son Ottaviano, and coveting her territories as well as the rest of Romagna for his son Cesare, issued a bull on the 9th of March 1499, declaring that the house of Riario had forfeited the lordship of Imola and Forli and conferring those fiefs on Cesare Borgia. The latter began his campaign of conquest with Caterina Sforza's dominions and attacked her with his whole army, reinforced by 14,000 French troops and by Louis XII. Caterina placed her children in safety and took strenuous measures for defence. The castle of Imola was held by her henchman Dionigi Naldi of Brisighella, until resistance being no longer possible he sur- rendered (December 1499) with the honours of war. Caterina absolved the citizens of Forli from their oath, of fealty, and defended herself in the citadel. She repeatedly beat back the Borgia's onslaughts and refused all his offers of peace. Finally when the situation had become untenable and having in vain given orders for the magazine to be blown up, she surrendered, after a battle in which large numbers were killed on both sides, to Antoine Bissey, bailli of Dijon, entrusting herself to the honour of France (January 12, 1500). Thus her life was spared, but she was not saved

from the outrages of the treacherous Cesare; she was afterwards taken to Rome and held a prisoner for a year in the castle of St Angelo, whence she was liberated by the same bailli of Dijon to whom she had surrendered at Forli. She took refuge in Florence to escape from persecution from the Borgias, and the power of that sinister family having collapsed on the death of Alexander VI. in 1503, she attempted to regain possession of her dominions. In this she failed owing to the hostility of her brothers-in-law, Pierfrancesco and Lorenzo de' Medici, and as they wished to get her son Giovanni de' Medici (afterwards Giovanni dalle Bande Nere) into their hands, she took refuge with him in the convent of Annalena, where she died on the 20th of May 1509.

See Buriel, Vita di Caterina Sforza-Riario (Bologna, 1785); F. Oliva, Vita di C. Sforza, signora di Forli (Forli, 1821); Pietro Desiderio Pesolini Dall' Onda, Caterina Sforza (Rome, 1893); English translation by P. Sylvester (1 898) . This is the best and most complete work on the subject; E. M. de Vogue, Histoire et poesie (Paris, 1898) ; and Ernesto Masi, " C. Sforza," in the Nuova Antologia for May 1 and May 15, 1893.

SGAMBATI, GIOVANNI (1843-), Italian composer, was born in Rome on the 28th of May 1843, of an Italian father and an English mother. His early education took place at Trevi, in Umbria, and there he wrote some church music, and obtained experience as a singer and conductor. In i860 he settled in Rome, and definitely took up the work of winning acceptance for the best German music, which was at that time neglected in Italy. The influence and support of Liszt, who was in Rome from 1861, was naturally of the greatest advantage to him, and concerts were given in which Sgambati conducted as well as played the piano. His composition, of this period (1864-1865) included a quartet, two piano quintets, an octet, and an overture. He conducted Liszt's Dante symphony in 1866, and made the acquaintance of Wagner's music for the first time at Munich, whither he travelled in Liszt's company. His first album of songs appeared in 1870, and his first symphony was played at the Quirinal in 1881; this, as well as a piano concerto, was performed in the course of his first visit to England in 1882; and at his second visit, in 1891, his Sinfonia epilalamio was given at the Philharmonic. His most extensive work, a Requiem Mass, was performed in Rome 1901. His many piano- forte works have won permanent success; but his influence on Italian musical taste has been perhaps greater than the merits of his compositions, which, though often poetical and generally effective, are often slight in style.

SHABATS (also written Shabalz and Sabac), a town in Servia, capital of the Drina department, on the right bank of the river Save. Pop. (1900) 12,072. It has a medieval castle, built in 1470 by Sultan Mahommed II. , to facilitate the incursion of the Turks into Slavonia, which lies on the left bank of the river. It is the principal commercial town of north-western Servia, exporting cereals, prunes, cattle and pigs to Hungary. It is well known for the excellent white honey which comes from its neighbourhood. The district is rich in lime-trees. Shabats is the seat of a bishop, of the district prefecture, and of a tribunal. It has a college and a library, and a garrison occupies the old fort. The people of Shabats have the reputation of being the wittiest in Servia.

SHAD, the name given to certain migratory species of herrings (Clupea), which are distinguished from the herrings proper by the total absence of teeth in the jaws. Two species occur in Europe, much resembling each other — one commonly called allis shad (Clupea alosa or Alosa vulgaris), and the other known as twaite sha,d(Clupeafintaoi Alosa finta). Both, like the majority of herrings, are greenish on the back and silvery on the sides, but they are distinguished from the other European species Clupea by the presence of a large blackish blotch behind the gill-opening, which is succeeded by a series of several other similar spots along the middle of the side of the body. So closely allied are these two fishes that their distinctness can be proved only by an examination of the gill-apparatus, the allis shad having from sixty to eighty very fine and long gill-rakers along the concave edge of the first branchial arch, whilst the twaite shad possesses from twenty-one to twenty-seven stout and stiff gill-rakers only. In their habits and geographical distribution also the two shads are similar. They inhabit the coasts of temperate Europe, the twaite shad being more numerous in the Mediterranean. While they are in salt water they live singly or in very small companies, but during May (the twaite shad some weeks later) they congregate, and in great numbers ascend large rivers, such as the Severn (and formerly the Thames), the Seine, the Rhine, the Nile, &c, in order to deposit their spawn. A few weeks after they drop down the river, lean and exhausted, numbers floating dead on the surface, so that only a small proportion seem to regain the sea. At Elbeuf on the Seine above Rouen there was formerly a hatchery for the artificial

propagation of shad. The eggs are spawned in May and June, and are similar in the two species ; they are heavier than the fresh water in which they develop, but unlike the herring's eggs they are not adhesive. They remain free and separate at the bottom of the river, carried down by the current or up by the tide. In the Elbe the twaite shad spawns below Hamburg, the allis shad above Dresden. In November the fry have reached 3 to 5 in. in length, but very few specimens in their second year have been found in rivers. The majority seem to descend to the sea before their first winter, to return when mature. On rivers in which these fishes make their periodical appearance they have become the object of a regular fishery. They are much esteemed on the middle Rhine, where they are generally known as " Maifisch." The allis shad is caught at a size from 15 to 24 in., and is better flavoured than the twaite shad, which is generally smaller.

Other, but closely allied species, occur on the Atlantic coasts of North America, all surpassing the European species in importance as food-fishes and economic value, viz., the American shad (Clupea sapidissima) , the gaspereau or ale-wife (C. mattowocca or vernalis), and the menhaden (C, menhaden).

SHADDOCK (Citrus decumana), a tree allied to the orange and the lemon, presumably native to the Malay and Polynesian islands, but generally cultivated throughout the tropics. The leaves are like those of the orange, but downy on the under surface, as are also the young shoots. The flowers are large and white, and are succeeded by very large globose fruits like oranges, but paler in colour, and with a more pungent flavour. The name Shaddock is asserted to be that of a captain who introduced the tree to the West Indies. The fruit is also known under the name of grape-fruit, pommeloes, and " forbidden fruit." Varieties occur with yellow and reddish pulp; and there are also pear-shaped varieties.

SHADOOF (Arab, shdduf), an apparatus for drawing water, used in the East generally, and particularly on the Nile for the purpose of irrigation. It consists of an upright frame on which is suspended a long pole at a distance of about one-fifth of its length from one end; to the other end is attached a bucket or skin bag, while at the short end a weight is suspended serving as the counterpoise of a lever. The vessel containing the water is then swung round and emptied into the runnel, which conveys the water in the direction required.

SHADOW (O. Eng. Schadewe, sceadu; a form of "shade"; connected with Gr. ctkotos, darkness). When an opaque body is placed between

a screen and a luminous source, it casts a " shadow " on the screen. If the source be a point, such as the image formed by a lens of small focus or by a fine hole in a plate held close to a bright flame, the outline of the shadow is to be found by drawing straight lines from the luminous point so as to envelop the opaque body. These lines form a cone. The points of contact form a line on the opaque body separating the illuminated from the non-illuminated portion of its surface. Similarly, when these lines are produced to meet the screen, their points of intersection with it form a line which separates the illuminated from the non-illuminated parts of the screen. This line is called the boundary of the geometrical shadow, and its construction is based on the assumption that light travels in straight lines (in homogeneous media) and suffers no deviation on meeting an obstacle. But a deviation, termed diffraction, does occur, and consequently the complete theory of shadows involves considerations based on the nature of the rays them- selves; this aspect is treated in Diffraction of Light. An instance of the geometrical shadow is seen when a very small gas-jet is burning in a ground-glass shade near a wall. In this case the cone, above mentioned, is usually a right cone with its axis vertical. Thus the boundary of the geometric shadow is a portion of a circle on the roof, but a portion of an hyperbola on the vertical wall. If the roof be not horizontal, we may obtain in this way any form of conic section. Hints in projection may be obtained by observing the shadows of bodies of various forms cast in this way by rays which virtually diverge from one point: e.g. how to place a plane quadrilateral of given form so that its geometric shadow may be a square; how to place an

elliptic disk, with a small hole in it, so that the shadow may be circular with a bright spot at its centre, &c.

When there are more luminous points than one, we have only to draw separately the geometrical shadows due to each of the sources, and then superpose them. A new consideration now comes in. There will be, in general, portions of all the separate geometrical shadows which overlap one another in some particular regions of the screen. In such regions we still have full shadow; but around them there will be other regions, some illuminated by one of the sources alone, some by two, &c, until finally we come to the parts of the screen which are illuminated directly by all the sources. There will evidently be still a definite boundary of the parts wholly unilluminated, i.e. the true shadow or umbra, and also a definite boundary of the parts wholly illuminated. The region between these boundaries — i.e. the partially illumined portion — is called the penumbra.

Fig. 1 represents the shadow of a circular disk cast by four equal luminous points arranged as the corners of a square —

Fig. 1.

the disk being large enough to admit of a free overlapping of the separate shadows. The amount of want of illumination in each portion of the penumbra is roughly indicated by the shading. The separate shadows are circular, if the disk is parallel to the screen. If we suppose the number of sources to increase in- definitely, so as finally to give the appearance of a luminous surface as the source of light, it is obvious that the degrees of darkness at different portions of the penumbra will also increase indefinitely; i.e. there will be a gradual increase of brightness in the penumbra from total darkness at the edge next the geometrical shadow to full illumination at the outer edge.

Thus we see at once why the shadows cast by the sun or moon are in general so much less sharp than those cast by the electric arc. For, practically, at moderate distances the arc appears as a mere luminous point. But if we place a body at a distance of a foot or two only from the arc, the shadow cast will have as much of penumbra as if the sun had been the source. The breadth of the penumbra when the source and screen are nearly equidistant from the opaque body is equal to the diameter of the luminous source. The notions of the penumbra and umbra are important in considering eclipses (q.v.). When the eclipse is total, there is a real geometrical shadow — very small compared with the penumbra (for the apparent diameters of the sun and moon are nearly equal, but their distances are as 37b : 1); when the eclipse is annular, the shadow is all penumbra. In a lunar eclipse, on the other hand, the earth is the shadow-casting body, and the moon is the screen, and we observe things according to our first point of view.

Suppose, next, that the body which casts the shadow is a large one, such as a wall, with a hole in it. If we were to plug the hole, the whole screen would be in geometrical shadow. Hence the illumination of the screen by the light passing through

the Hole is precisely what would be cut off by a disk which fits the hole, and the complement of fig. i, in which the light and shade are

interchanged, would give therefore the effect of four equal sources of light shining on a wall through a circular hole. The umbra in the former case becomes the fully illuminated portion, and vice versa. The penumbra remains the penumbra, but it is now darkest where before it was brightest, and vice versa.

Thus we see how, when a small hole is cut in the window- shutter of a dark room, a picture of the sun, and bright clouds about it, is formed on the opposite wall. This picture is obviously inverted, and also perverted, for not only are objects depicted lower the higher they are, but also objects seen to the right are depicted to the left, &c. But it will be seen unperverted (though still inverted) if it be received on a sheet of ground glass and looked at from behind. The smaller the hole (so far at least as geometrical optics is concerned) the less confused will the picture be. As the hole is made larger the illuminated portions from different sources gradually overlap; and when the hole becomes a window we have no indications of such a picture except from a body (like the sun) much brighter than the other external objects. Here the picture has ceased to be one of the sun, it is now a picture of the window. But if the wall could be placed ioom. off, the picture would be one of the sun. To prevent this overlapping of images, and yet to admit a good deal of light, is one main object of the lens which usually forms part of the camera obscura (q.v.).

The formation of pictures of the sun in this way is well seen on a calm sunny day under trees, where the sunlight penetrating through small chinks forms elliptic spots on the ground. When detached clouds are drifting rapidly across the sun, we often see the shadows of the bars of the window on the walls or floor suddenly shifted by an inch or two, and for a moment very much more sharply defined. They are, in fact, shadows cast by a small portion of the sun's limb, from opposite sides alternately. Another beautiful illustration is easily obtained by cutting with a sharp knife a very small T aperture in a piece of note paper. Place this close to the eye, and an inch or so behind it place another piece of paper with a fine needle-hole in it. The light of the sky passing through the needle-hole forms a bright picture of the T on the retina. The eye perceives this picture, which gives the impression of the T much magnified, but turned upside down.

Another curious phenomenon may fitly be referred to in this connexion, viz. the phantoms which are seen when we look at two parallel sets of palisades or railings, one behind the other, or look through two parallel sides of a meat-safe formed of perforated zinc.

The appearance presented is that of a magnified set of bars or apertures which appear to move rapidly as we slowly walk past. Their origin is the fact that where the bars appear nearly to coincide the apparent gaps bear the greatest ratio to the dark spaces; i.e. these parts of the field are the most highly illuminated. The exact determination of the appearances in any given case is a mere problem of convergents to a continued fraction. But the fact that the apparent rapidity of motion of this phantom may exceed in any ratio that of the spectator is of importance — enabling us to see how velocities, apparently of impossible magnitude, may be accounted for by the mere running along of the condition of visibility among a group of objects no one of which is moving at an extravagant rate.

SHADWELL, THOMAS (c. 1642-1692), English playwright and miscellaneous writer, was born about 1642, at Santon Hall, Norfolk, according to his son's account. He was educated at Bury St Edmund's School, and at Caius College, Cambridge, where he was entered in 1656. He left the university without a degree, and joined the Middle Temple. In 1668 he produced a prose comedy, The Sullen Lovers, or the Impertinents, based on Les Fdcheux of Moliere, and written in avowed imitation of Ben Jonson. His best plays are Epsom Wells (1672), for which Sir Charles Sedley wrote a prologue, and the Squire of Alsatia (1688). Alsatia was the cant name for Whitefriars, then a kind of sanctuary for persons liable to arrest, and the play represents, in dialogue full of the argot of the place, the adventures of a young

heir who falls into the hand of the sharpers there. For fourteen years from the production of his first comedy to his memorable encounter with Dryden, Shadwell produced a play nearly every year. These productions display a genuine hatred of shams, and a rough but honest moral purpose. They are disfigured by indecencies, but present a vivid picture of contemporary manners. Shadwell is chiefly remembered as the unfortunate Mac Flecknoe of Dryden's satire, the " last great prophet of tauto- logy," and the literary son and heir of Richard Flecknoe: — " The rest to some faint meaning make pretence, But Shadwell never deviates into sense."

Dryden had furnished Shadwell with a prologue to his True Widow (1679), and in spite of momentary differences, the two had been apparently on friendly terms. But when Dryden joined the court party, and produced Absalom and Achitophel and The Medal, Shadwell became the champion of the true-blue Protestants, and made a scurrilous attack on the poet in The Medal of John Bayes: a Satire against Folly and Knavery (1682). Dryden immediately

retorted in Mac Flecknoe, or a Satire on the True Blue Protestant Poet, T.S. (1682), in which ShadwelPs personalities were returned with interest. A month later he contributed to Nahum Tate's continuation of Absalom and Achitophel satirical portraits of Elkanah Settle as Doeg and of Shadwell as Og. In 1687 Shadwell attempted to answer these attacks in a version of the tenth satire of Juvenal. At the Whig triumph in 1688 he superseded his enemy as poet laureate and historiographer royal. He died at Chelsea on the 19th of November 1692.

His son, Charles Shadwell, was the author of The Fair Quaker of Deal and other plays, collected and published in 1720.

A complete edition of Shadwell's works was published by his son Sir John Shadwell in 1720. His other dramatic works are — The Royal Shepherdess (1669), an adaptation of John Fountain's Rewards of Virtue; The Humorist (1671); The Miser (1672), adapted from Moliere; Psyche (1675); The Libertine (1676); The Virtuoso (1676); The history of Timon of Athens the Man-hater (1678), — on this Shakespearian adaptation see O. Beber, Shadwell's Bearbeitung des… Timon of Athens (Rostock, 1897); A True Widow (1679); The Woman Captain (1680), revived in 1744 as The Prodigal; The Lancashire Witches and Teague O'Divelly, the Irish Priest (1682); Bury Fair (1689) ; The Amorous Bigot, with the second part of Teague O'Divelly (1690); The Scowerers (1691); and The Volunteers, or Stockjobbers, published posthumously (1693).

SH&FI'I iMahommed ibn Idris ash-Shafi'i] (767-820), the founder of the Shafi'ite school of canon law, was born in a.h. 150 (a.d. 767) of a Koreishite (Quraishite) family at Gaza or Ascalon, and was brought up by his mother in poor circumstances at Mecca. There, and especially in intercourse with the desert tribe of Hudhail, he gained a knowledge of classical Arabic and old Arabian poetry for which he was afterwards famous. About 170 he went to Medina and studied canon law ifiqh) under Malik ibn Anas. After the death of Malik in 179 legend takes him to Yemen, where he is involved in an 'Alid conspiracy, carried prisoner to Bagdad, but pardoned by Hartin al-Rashld. He was certainly pursuing his studies, and he seems to have come to Bagdad in some such way as this and then to have studied under Hanifite teachers. He had not yet formulated his own system. After a journey to Egypt, however, we find him in Bagdad again, as a teacher, between 195 and 198. There he had great success and turned the tide against the Hanifite school. His method was to restore the sources of canon law which Abu Hanifa, had destroyed by inclining too much to speculative deduction. Instead, he laid equal

emphasis upon the four — Koran, tradition, analogy, and agreement. See further, under Mahommedan Law. In 198 he went to Egypt in the train of a new governor, and this time was received as the leading orthodox authority in law of his time. There he developed and somewhat changed the details of his system, and died in 204 (a.d. 820). He was buried to the south-east of what is now Cairo, and a great dome (erected c. A.d. 1240) is conspicuous over his tomb.

See F. Wustenfeld, Schafi'iten, 31 ff.; M. J. de Goeje in ZDMG. xlvii. 106 ff.; C. Brockelmann, Geschichte, i. 178 ff.; M'G. de Slane's transl. of Ibn Khallikan, ii. 569 ff., Fihrist, 209, Nawawi's Biogr, Diet. 56 ff. (D. B. MA.)

SHAFIROV, PETER PAVLOVICH, Baron (1670-1739), Russian statesman, one of the ablest coadjutors of Peter the Great, was of obscure, and in all probability of Jewish, extraction. He first made himself useful by his extraordinary knowledge of foreign languages. He was the chief translator in the Russian Foreign Office for many years, subsequently accompanying Peter on his travels. Made a baron and raised to the rank of vice-chancellor, he displayed diplomatic talents of the highest order. During the unlucky campaign of 171 1, he succeeded against all expectations in concluding the peace of the Pruth (see Turkey: History). Peter left him in the hands of the Turks as a hostage, and on the rupture of the peace he was imprisoned in the Seven Towers. Finally, however, with the aid of the British and Dutch ambassadors, he defeated the diplomacy of Charles XII. of Sweden and his agents, and confirmed the good relations between Russia and Turkey by the treaty of Adrianople (June 5th, 1 7 13). On the institution of the colleges or depart- ments of state in 1718, Shafirov was appointed vice-president of the department of Foreign Affairs, and a senator. In 1723, however, he was deprived of all his offices and sentenced to death. The capital sentence was commuted on the scaffold to banish- ment, first to Siberia and then to Novgorod. Peculations and disorderly conduct in the senate were the offences charged against Shafirov, and with some justice. On the death of Peter, Shafirov was released from prison and commissioned to write the life of his late master. He had previously (1717), in an historical tract on the war with Charles XII., in which Peter himself collaborated,' epitomized, in a high panegyric style, some of the greatest exploits of the tsar-regenerator. The successful rivalry of his supplanter, Andrei Osterman, prevented Shafirov from

holding any high office during the last fourteen years of his life.

See B. M. Solovev, History of Russia, vols, xiii.xvi. (Rus.) (Peters burg, 1895). (R. N. B.)

SHAFT (O. Eng., sceaft, from scafan, to shave; the word is common to Teutonic languages), any slender, smoothed rod or stick, and so first used of the body of an arrow or spear to which the head is attached; hence the word is applied to the handle of a tool, and to the pair of bars between which a horse is harnessed to a vehicle, and in machinery to connecting bars or rods conveying power from one part of a machine to another. It is also applied to an opening sunk in the ground for mining or other purposes (see Shaft-sinking). This use is probably due to the use of Ger. Schacht, a variant of schaft. In architecture the term " shaft " is applied to the body of a column between the capital and the base. In Romanesque work shafts are occasionally octagonal, and are sometimes ornamented with the zigzag or chevron, or fluted vertically or in spirals; the most beautiful examples of the latter being found in the cloisters of St John Latcran and at St Paul's outside the walls at Rome, where they are enriched with mosaics. Perhaps the earliest ornamented shafts are those of the Parthian Palace, now the mosque, at Diarbekr in Mesopotamia.

SHAFTESBURY, ANTHONY ASHLEY COOPER, ist Earl of (1621-1683), son of Sir John Cooper of Rockbourne in Hamp- shire, and of Anne, the only child of Sir Anthony Ashley, Bart., and was born at Wimborne St Giles, Dorset, on the 22nd of July 1621. His parents died before he was ten years of age, and he inherited extensive estates in Hampshire, Wiltshire, Dorsetshire and Somersetshire, much reduced, however, by litigation in Chancery. He lived for some time with Sir Daniel Norton, one of his trustees, at Southwick, and upon his death in 1635 with Mr Tooker, an uncle by marriage, at Salisbury. In 1637 he went as a gentleman-commoner to Exeter College, Oxford, where he remained about a year. No record of his studies is to be found, but he has left an amusing account of his part in the wilder doings of the university life of that day, in which, in spite of his small stature, he was recognized by his fellows as their leader. At the age of eighteen, on the 25th of February 1639, h e married Margaret, daughter of Lord Coventry, with whom he and his wife lived at Durham House in the Strand, and at Canonbury House in Islington. In Marcy 1640, though still a minor, he was elected for Tewkesbury, and sat in the parlia-

ment which met on the 13th of April, but appears to have taken no

active part in its proceedings. In 1640 Lord Coventry died, and Cooper then lived with his brother-in-law at Dorchester House in Covent Garden. For the Long Parliament, which met on the 3rd of November 1640, he was elected for Downton in Wiltshire, but the return was disputed, and he did not take his seat — his election not being declared valid until the last days of the Rump. He was present as a spectator at the setting up of the king's standard at Nottingham on the 25th of August 1642; and in 1643 he appeared openly on Charles's side in Dorsetshire, where he raised at his own expense a regiment of foot and a troop of horse, of both of which he took the command. He was also appointed governor of Weymouth, sheriff of Dorsetshire for the king and president of the king's council of war in the county. In the beginning of January 1644, however, for reasons which are variously reported by himself and Clarendon, he resigned his governorship and commissions and went over to the parlia- ment. He appeared on the 6th of March before the standing committee of the two Houses to explain his conduct, when he stated that he had come over because he saw danger to the Protestant religion in the king's service, and expressed his willingness to take the Covenant. In July 1644 he went to Dorsetshire on military service, and on the 3rd of August received a commission as field-marshal general. He assisted at the taking of Wareham, and shortly afterwards compounded for his estates by a fine of £500 from which, however, he was after- wards relieved by Cromwell. On the 25th of October he was made commander-in-chief in Dorsetshire, and in November he took by storm Abbotsbury, the house of Sir John Strangways — an affair in which he appears to have shown considerable personal gallantry. In December he relieved Taunton. His military service terminated at the time of the Self-denying Ordinance in 1645; he had associated himself with the Presby- terian faction, and naturally enough was not included in the New Model. For the next seven or eight years he lived in com- parative privacy. He was high sheriff of Wiltshire during 1647, and displayed much vigour in this office. Upon the execution of Charles, Cooper took the Engagement, and was a commissioner to administer it in Dorsetshire. On the 25th of April 1650, he married Lady Frances Cecil, sister of the earl of Essex, his first wife having died in the previous year leaving no family. In 1651 a son was born to him, who died in childhood, and on the 16th of January 1652, another son, named after himself, who was his heir. On the 17th of January he was named on the commission for law reform, of which Hale was the chief; and on the 17th of March 1653, he was pardoned of all delinquency and thus at last made capable of sitting in parliament. He sat for Wiltshire in the Barebones parliament, of which he was a leading member, and where

he supported Cromwell's views against the extreme section. He was at once appointed on the council of thirty. On the resignation of this parliament he became a member of the council of state named in the " Instru- ment." In the first parliament elected under this " Instrument " he sat for Wiltshire, having been elected also for Poole and Tewkesbury, and was one of the commissioners for the ejection of unworthy ministers. After the 28th of December 1654, he left the privy council, and henceforward is found with the Presbyterians and Republicans in opposition to Cromwell. His second wife had died during this year; in 1656 he married a third, who survived him, Margaret, daughter of Lord Spencer, niece of the earl of Southampton, and sister of the earl of Sunderland, who died at Newbury. By his three marriages he was thus connected with many of the leading politicians of Charles II. 's reign.

Cooper was again elected for Wiltshire for the parliament of 1656, but Cromwell refused to allow him, with many others of his opponents, to sit. He signed a letter of complaint, with sixty-five excluded members, to the speaker, as also a " Remon- strance " addressed to the people. In the parliament which met on the 20th of January 1658, he took his seat, and was active in opposition to the new constitution of the two Houses. He was also a leader of the opposition in Richard Cromwell's

parliament, especially on the matter of the limitation of the power of the protector, and against the House of Lords. He was throughout these debates celebrated for the " nervous and subtle oratory" which made him so formidable in after days.

Upon the replacing of the Rump by the army, after the breaking up of Richard's parliament, Cooper endeavoured unsuccessfully to take his seat on the ground of his former disputed election for Downton. He was, however, elected on the council of state, and was the only Presbyterian in it; he was at once accused by Scot, along with Whitelocke, of corresponding with Hyde. This he solemnly denied. After the rising in Cheshire Cooper was arrested in Dorsetshire on a charge of corresponding with its leader Booth, but on the matter being investigated by the council he was unanimously acquitted. In the disputes between Lambert at the head of the military party and the Rump in union with the council of state, he supported the latter, and upon the temporary supremacy of Lambert's party worked

indefatigably to restore the Rump. With Monk's commissioners he, with Haselrig, had a fruitless conference, but he assured Monk of his co-operation, and joined with eight others of the overthrown council of state in naming him commander-in-chief of the forces of England and Scotland. He was instrumental in securing the Tower for the parliament, and in obtaining the adhesion of Admiral Lawson and the fleet. Upon the restoration of the parliament on the 26th of December Cooper was one of the commissioners to command the army, and on the 2nd of January was made one of the new council of state. On the 7th of January he took his seat on his election for Downton in 1640, and was made colonel of Fleetwoods regiment of horse. He speedily secured the admission of the secluded members, having mean- while been in continual communication with Monk, was again one of the fresh council of state, consisting entirely of friends of the Restoration, and accepted from Monk a commission to be governor of the Isle of Wight and captain of a company of foot. He now steadily pursued the design of the Restoration, but with- out holding any private correspondence with the king , and only on terms similar to those proposed in 1648 to Charles I. at the Isle of Wight. In the Convention parliament he sat for Wiltshire. Monk cut short these deliberations and forced on the Restoration without condition. Cooper was one of the twelve commissioners who went to Charles at Breda to invite him to return. On his journey he was upset from his carriage, and the accident caused an internal abscess which was never cured.

Cooper was at once placed on the privy council, receiving also a formal pardon for former delinquencies. His first duty was to examine the Anabaptist prisoners in the Tower. In the prolonged discussions regarding the Bill of Indemnity he was instrumental in saving the life of Haselrig, and opposed the clause compelling all officers who had served under Cromwell to refund their salaries, he himself never having had any. He showed in- deed none of the avaricious temper so common among the politicians of the time. He was one of the commissioners for conducting the trials of the regicides, but was himself vehemently " fallen upon " by Prynne for having acted with Cromwell. He was named on the council of plantations and on that of trade. In the debate abolishing the court of wards he spoke, like most landed proprietors, in favour of laying the burden on the excise instead of on the land, and on the question of the restoration of the bishops carried in the interests of the court an adjourn- ment of the debate for three months. At the coronation in April 1661 Cooper had been made a peer, as Baron Ashley of Wimborne St Giles, in express recognition of his services at the

Restoration; and on the meeting of the new parliament in May he was appointed chancellor of the exchequer and under-treasurer, aided no doubt by his connexion with Southampton. He vehe- mently opposed the persecuting acts now passed — the Corpora- tion Act, the Uniformity Bill, against which he is said to have spoken three hundred times, and the Militia Act. He is stated also to have influenced the king in issuing his dispensing declara- tion of the 26th of December 1662, and he zealously supported a bill introduced for the purpose of confirming the declaration, rising thereby in favour and influence with Charles. He was

himself the author of a treatise on tolerance. He was now recog- nized as one of the chief opponents of Clarendon and the High Anglican policy. On the breaking out of the Dutch War in 1664 he was made treasurer of the prizes, being accountable to the king alone for all sums received or spent. He was also one of the grantees of the province of Carolina and took a leading part in its management; it was at his request that Locke in 1669 drew • up a constitution for the new colony. In September 1665 the king unexpectedly paid him a visit at Wimborne. He opposed unsuccessfully the appropriation proviso introduced into the supply bill as hindering the due administration of finance, and this opposition seems to have brought about a reconciliation with Clarendon. In 1668, however, he supported a bill to appoint commissioners to examine the accounts of the Dutch War, though in the previous year he had opposed it. In accordance with his former action on all questions of religious toleration he opposed the shameful Five Mile Act of 1665. In 1667 he supported the bill for prohibiting the importation of Irish cattle, on the ground that it would lead to a great fall of rents in England. Ashley was himself a large landowner, and, moreover, was opposed to Ormonde, who would have benefited by the importation. In all other questions of this kind he shows himself far in advance of the economic fallacies of the day. His action led to an altercation with Ossory, the son of Ormonde, in which Ossory used language for which he was compelled to apologize. On the death of Southampton, Ashley was placed on the commission of the treasury, Clifford and William Coventry being his principal colleagues. He appears to have taken no part in the attempt to impeach Clarendon on a general charge of treason.

The new administration was headed by Buckingham, in whose toleration and comprehension principles Ashley shared to the full. An able paper written by him to the king in support of these principles, on the ground especially of their advantage to trade, has been preserved. He excepts, however, from tolera- tion Roman Catholics

and Fifth Monarchy men. His attention to all trade questions was close and constant; he was a member of the council of trade and plantations appointed in 1670, and was its president from 1672 to 1676. The difficulty of the suc- cession also occupied him, and he co-operated thus early in the design of legitimizing Monmouth as a rival to James. In the intrigues which led to the infamous treaty to Dover he had no part. The treaty contained a clause by which Charles was bound to declare himself a Catholic, and with the knowledge of this Ashley, as a stanch Protestant, could not be trusted. In order to blind him and the other Protestant members of the Cabal a sham treaty was arranged in which this clause did not appear, and it was not until a considerable while afterwards that he found out that he had been duped. Under this misunder- standing he signed the sham Dover treaty on the 31st of December 1670. This treaty, however, was kept from public knowledge, and Ashley helped Charles to hoodwink parliament by signing a similar treaty on the 2nd of February 1672, which was laid before them as the only one in existence. His approval of the attempt of the Lords to alter a money bill led to the loss of the supply to Charles and to the consequent displeasure of the king. His support to the Lord Roos Act, ascribed generally to his desire to ingratiate himself with Charles, was no doubt due in part to the fact that his son had married Lord Roos's sister. So far from advising the " Stop of the Exchequer," he opposed this bad measure; the reasons which he left with the king for his opposition are extant. The responsibility rests with Clifford alone. In the other great measure of the Cabal ministry, Charles's Declaration of Indulgence, he concurred. He was now rewarded by being made earl of Shaftesbury and Baron Cooper of Pawlett by a patent dated the 23rd of April 1672. It is stated too that he was offered, but refused, the lord treasurership. On the 17th of November 1672, however, he became lord chancellor, Bridgman having been compelled to resign the seat. As chancellor he issued writs for the election of thirty-six new members to fill vacancies caused during the long recess; this, though grounded upon precedent, was open to suspicion as an attempt to fortify Charles, and was attacked by an angry House of Commons

which met on the 4th of February 1673. Th e wr i ts were cancelled, and the principle was established that the issuing of writs rested with the House itself. It was at the opening of parliament that Shaftesbury made his celebrated " delenda est Carthago" speech against Holland,

in which he urged the Second Dutch War, on the ground of the necessity of destroying so formidable a commercial rival to England, excused the Stop of the Exchequer which he had opposed, and vindicated the Declaration of Indulg- ence. On the 8th of March he announced to parliament that the declaration had been cancelled, though he did his best to induce Charles to remain firm. For affixing the great seal to this declaration he was threatened with impeachment by the Commons. The Test Act was now brought forward, and Shaftes- bury, who appears to have heard how he had been duped in 1670, supported it, with the object probably of thereby getting rid of Clifford. He now began to be regarded as the chief upholder of Protestantism in the ministry; he lost favour with Charles, and on Sunday, the 9th of September 1673, was dismissed from the chancellorship. Among the reasons for this dismissal is probably the fact that he opposed grants to the king's mistresses. He had been accused of vanity and ostentation in his office, but his reputation for ability and integrity as a judge was high even with his enemies.

Charles soon regretted the loss of Shaftesbury, and endeavoured, as did also Louis, to induce him to return, but in vain. He preferred now to become the great popular leader against all the measures of the court, and may be regarded as the intellectual chief of the opposition. At the meeting of parliament on the 8th of January 1674, he carried a motion for a proclamation banishing Catholics to a distance of 10 m. from London. During the whole session he organized and directed the opposition in their attacks on the king's ministers. On the 19th of May he was dismissed the privy council and ordered to leave London. He retired to Wimborne and urged upon his parliamentary followers the necessity of securing a new parliament. He was in the House of Lords, however, in 1675, when Danby brought forward his famous Non-resisting Test Bill, and headed the opposition which was carried on for seventeen days, distinguishing himself, says Burnet, more in this session than ever before. The bill was shelved, a prorogation having taken place in con- sequence of a quarrel between the two Houses, supposed to have been purposely got up by Shaftesbury, in which he supported the right of the Lords to hear appeal cases, even where the defendant was a member of the Lower House. Parliament was prorogued for fifteen months until the 15th of February 1677, and it was determined by the opposition to attack its existence on the ground that a prorogation for more than a year was illegal. In this matter the opposition were in the wrong, and by attacking the parliament discredited themselves. The result was that Shaftesbury,

Buckingham, Wharton and Salisbury were sent to the Tower. In June Shaftesbury applied for a writ of habeas corpus, but could get no release until the 26th of February 1678, after his letter and three petitions to the king. Being brought before the bar of the House of Lords he made submission as to his conduct in declaring parliament dissolved by the prorogation, and in violating the Lords' privileges by bringing a habeas corpus in the King's Bench.

The breaking out of the Popish Terror in 1678 marks the worst part of Shaftesbury's career. That so clear-headed a man could have credited the' lies of Oates and the other perjurers is beyond belief; and the manner in which he excited baseless alarms, and encouraged fanatic cruelty, for nothing but party advantage, is without excuse. On the 2nd»of November he opened the great attack by proposing an address declaring the necessity for the king's dismissing James from his council. Under his advice the opposition now made an alliance with Louis whereby the French king promised to help them to ruin Danby on condition that they would compel Charles, by stopping the supplies, to make peace with France, doing thus a grave injury to Protestant- ism abroad for the sake of a temporary party advantage at home. Upon the refusal in November of the Lords to concur in the address of the Commons requesting the removal of the queen from court,

he joined in a protest against the refusal, and was foremost in all the violent acts of the session. He urged on the bill by which Catholics were prohibited from sitting in either House of Parlia- ment, and was bitter in his expressions of disappointment when the Commons passed a proviso excepting James, against whom the bill was especially aimed, from its operation. A new parlia- ment met on the 6th of March 1679. Shaftesbury had meanwhile ineffectually warned the king that unless he followed his advice there would be no peace with the people. On the 25th of March he made a striking speech upon the state of the nation, especially upon the dangers to Protestantism and the misgovernment of Scotland and Ireland. He was suspected, too, of doing all in his power to bring about a revolt in Scotland. By the advice of Temple, Charles now tried the experiment of forming a new privy council in which the chief members of the opposition were included, and Shaftesbury was made president, with a salary of £4000, being also a member of the committee for foreign affairs. He did not, however, in any way change either his opinions or his action. He opposed the compelling of Protestant Nonconformists to take the oath required of Roman Catholics. That indeed, as Ranke says, which makes him memorable in English history is that he opposed the establishment of an Anglican

and Royalist organization with success. The question of the succession was now again prominent, and Shaftesbury, in opposition to Halifax, committed the error, which really brought about his fall, of putting forward Monmouth as his nominee, thus alienating a large number of his supporters; he encouraged, too, the belief that this was agreeable to the king. He pressed on the Exclusion Bill with all his power, and, when that and the inquiry into the payments for secret service and the trial of the five peers, for which too he had been eager, were brought to an end by a sudden prorogation, he is reported to have declared aloud that he would have the heads of those who were the king's advisers to this course. Before the prorogation, however, he saw the invaluable Act of Habeas Corpus, which he had carried through parliament, receive the royal assent. In pursuance of his patronage of Monmouth, Shaftesbury now secured for him the command of the army sent to suppress the insurrection in Scotland, which he is supposed to have fomented. In October 1679, the circumstances which led Charles to desire to conciliate the opposition having ceased, Shaftesbury was dismissed from his presidency and from the privy council; when applied to by Sunderland to return to office he made as conditions the divorce of the queen and the exclusion of James. With nine other peers he presented a petition to the king in November, praying for the meeting of parliament, of which Charles took no notice. In April, upon the king's declaration that he was resolved to send for James from Scotland, Shaftesbury advised the popular leaders at once to leave the council, and they followed his advice. In March we find him unscrupulously eager in the prosecution of the alleged Irish Catholic plot. Upon the king's illness in May he held frequent meetings of Monmouth's friends at his house to consider how best to act for the security of the Protestant religion. On the 26th of June, accompanied by fourteen others, he presented to the grand jury of Westminster an indictment of the duke of York as a Popish recusant. In the middle of September he was seriously ill. On the 15th of November the Exclusion Bill, having passed the Commons, was brought up to the Lords, and an historic debate took place, in which Halifax and Shaftesbury were the leaders on opposite sides. The bill was thrown out, and Shaftesbury signed the protest against its rejection. The next day he urged upon the House the divorce of the queen. On the 7th of December, to his lasting dishonour, he voted for the condemnation of Lord Stafford. On the 23rd he again spoke vehemently for exclusion, and his speech was immediately printed. All opposition was, however, checked by the dissolution on the 18th of January. A new parliament was called to meet at Oxford, to avoid the influences of the city of London, where Shaftesbury had taken the greatest pains to

make himself popular.. Shaftesbury, with fifteen other peers, petitioned the king that it might as usual be held in the capital. He prepared instructions to be handed by constituencies to theii

members upon election, in which exclusion, disbanding, the limitation of the prerogative in proroguing and dissolving parliament, and security against popery and arbitrary power were insisted on. At this parliament, which lasted but a few days, he again made a personal appeal to Charles, which was curtly rejected, to permit the legitimizing of Monmouth. The king's advisers now urged him to arrest Shaftesbury; he was seized on the 2nd of July 1681, and committed to the Tower, the judges refusing his petition to be tried or admitted to bail. This refusal was twice repeated in September and October, the court hoping to obtain evidence sufficient to ensure his ruin. In October he wrote offering to retire to Carolina if he were released. On the 24th of November he was indicted for high Treason at the Old Bailey, the chief ground being a paper of association for the defence of the Protestant religion, which, though among his papers, was not in his handwriting; but the grand jury ignored the bill. He was released on bail on the 1st of December. In 1682, however, Charles secured the appoint- ment of Tory sheriffs for London; and, as the juries were chosen by the sheriffs, Shaftesbury felt that he was no longer safe from the vengeance of the court. Failing health and the disappoint- ment of his political plans led him into violent courses. He appears to have entered into consultation of a treasonable kind with Monmouth and others; he himself had, he declared, ten thousand brisk boys in London ready to rise at his bidding. For some weeks he was concealed in the city and in Wapping; but, finding the schemes for a rising hang fire, he went to Harwich, disguised as a Presbyterian minister, and after a week's delay, during which he was in imminent risk of discovery, if indeed, as is probable, his escape was not winked at by the government, he sailed to Holland on the 28th of November 1682, and reached Amsterdam in the beginning of December. Here he was welcomed with the jest, referring to his famous speech against the Dutch, " nondum deleta Carthago." He was made a citizen of Amsterdam, but died there of gout in the stomach on the 21st of January 1683. His body was sent in February to Poole, in Dorset, and was buried at Wimborne St Giles.

Few politicians have been the mark of such abuse as Shaftesbury.

Dryden, while compelled to honour him as an upright judge, overwhelmed his memory with scathing, if venal, satire; and Dryden's satire has been accepted as truth by later historians. Macaulay in especial exerted all his art, though in contradiction of probability and fact, to deepen still further the shade which rests upon his reputation. Christie, on the other hand, in possession of later sources of information, and with more honest purpose, did much to rehabilitate him. Occasionally, however, he appears to hold a brief for the defence, and, though the picture is comparatively true, this Life (1871) should be read with caution. Finally, in his monograph (1886) in the series of " English Worthies," H. D. Traill professes to hold the scales equally. He makes an interesting addition to our concep- tion of Shaftesbury's place in English politics, by insisting on his position as the first great party leader in the modern sense, and as the founder of modern parliamentary oratory. In other respects his book is derived almost entirely from Christie. See also the present writer's article in the Diet. Nat. Biog. Much of Shaftesbury 's career, increasingly so as it came near its close, is incapable of defence ; but it has escaped most of his critics that his life up to the Restoration, apparently full of inconsistencies, was evidently guided by one leading principle, the determination to uphold the supremacy of parliament, a principle which, however obscured by self-interest, appears also to have underlain his whole political career. He was, too, ever the friend of religious freedom and of an enlightened policy in all trade questions. And, above all, it should not be forgotten, in justice to Shaftesbury's memory, that " during his long political career, in an age of general corruption, he was ever incorrupt, and never grasped either money or land." (O. A.)

SHAFTESBURY, ANTHONY" ASHLEY COOPER, 3 rd Earl of (1671-1713), was born at Exeter House in London on the 26th of February 1670/1. He was grandson of the first and son of the second earl. His mother was Lady Dorothy Manners, daughter of John, earl of Rutland. According to a curious story, told by the third earl himself, the marriage between his father and mother was negotiated by John Locke, who was a trusted friend of the first earl. The second Lord Shaftesbury appears to have been a poor creature, both physically and mentally. At the age of three his son was made over to the formal guardianship of his grandfather. Locke, who in his

capacity of medical attendant to the Ashley household had already assisted in bringing the boy into the world, though not his instructor, was entrusted with the superintendence of his education. This was conducted according to the principles enunciated in Locke's Thoughts concerning Education, and the method of teaching Latin and Greek

conversationally was pursued with such success by his instructress, Mrs Elizabeth Birch, that at the age of eleven, it is said, Ashley could read both languages with ease. In November 1683, some months after the death of the first earl, his father entered him at Winchester as a warden's boarder. Being shy and constantly taunted with the opinions and fate of his grandfather, he appears to have been rendered miserable by his schoolfellows, and to have left Winchester in 1686 for a course of foreign travel. He was brought thus into contact with those artistic and classical associations which exercised so marked an influence on his character and opinions. On his travels he did not, we are told by the fourth earl, " greatly seek the conversation of other English young gentlemen on their travels," but rather that of their tutors, with whom he could converse on congenial topics.

In 1689, the year after the Revolution, Lord Ashley returned to England, and for nearly five years he appears to have led a quiet and studious life. There can be no doubt that the greater part of his attention was directed to the perusal of classical authors, and to the attempt to realize the true spirit of classical antiquity. He had no intention, however, of becoming a recluse, or of permanently holding himself aloof from public life. Accord- ingly he became a candidate for the borough of Poole, and was returned the 2 1st of May 1695. He soon distinguished himself by a speech in support of the Bill for Regulating Trials in Cases of Treason, one provision of which was that a person indicated for treason or misprision of treason should be allowed the assistance of counsel. But, though a Whig, alike by descent, by education and by conviction, Ashley could by no means be depended on to give a party vote; he was always ready to support any proposi- tions, from whatever quarter they came, that appeared to him to promote the liberty of the subject and the independence of parliament. Unfortunately, his health was so treacherous that, on the dissolution of July 1698, he was obliged to retire from parliamentary life. He suffered much from asthma, a complaint which was aggravated by the London smoke.

Lord Ashley now retired into Holland, where he became acquainted with Le Clerc, Bayle, Benjamin Furly, the English Quaker merchant, at whose house Locke had resided during his stay at Rotterdam, and probably Limborch and the rest of the literary circle of which Locke had been a cherished and honoured member nine or ten years before. To Lord Ashley this society was probably far more congenial than his surroundings in England. Unrestrained conversation on the topics which most interested him — philosophy, politics, morals, religion — ■ *was at this time to be had in Holland with less danger and in*

greater abundance than in any other country in the world. To the period of this sojourn in Holland must probably be referred the surreptitious impression or publication of an imperfect edition of the Inquiry concerning Virtue, from a rough draught, sketched when he was only twenty years of age. This liberty was taken, during his absence, by Toland.

After an absence of over a twelvemonth, Ashley returned to England, and soon succeeded his father as earl of Shaftesbury. He took an active part, on the Whig side, in the general election of 1 700-1 701, and again, with more success, in that of the autumn of 1 701. It is said that William III. showed his appreciation of Shaftesbury's services on this latter occasion by offering him a secretaryship of state, which, however, his declining health compelled him to decline. Had the king's life continued, Shaftesbury's influence at court would probably have been considerable. After the first few weeks of Anne's reign, Shaftes- bury, who had been deprived of the vice-admiralty of Dorset, returned to his retired life, but his letters to Furly show that he retained a keen interest in politics. In August 1703 he again settled in Holland, in the air of which he seems, like Locke, to have had great faith. At Rotterdam he lived, he says in a letter to

his steward Wheelock, at the rate of less than £200 a year, and yet had much " to dispose of and spend beyond convenient living." He returned to England, much improved in health, in August 1704. But, though he had received immediate benefit from his stay abroad, symptoms of consumption were constantly alarming him, and he gradually became a confirmed invalid. His occupations were now almost exclusively literary, and from this time forward he was probably engaged in writing, completing or revising the treatises which were afterwards included in the Characteristics. He continued, however, to take a warm interest in politics, both home and foreign, and especially in the war against France, of which he was an enthusiastic supporter.

Shaftesbury w r as nearly forty before he married, and even then he appears to have taken this step at the urgent instigation of his friends, mainly to supply a successor to the title. The object of his choice (or rather of his second choice, for an earlier project of marriage had shortly before fallen through) was a Miss Jane Ewer, the daughter of a gentleman in Hertfordshire. The marriage took

place in the autumn of 1709, and on February 9, 1 7 10/ 1, was born at his house at Reigate, in Surrey, his only child and heir, the fourth earl, to whose manuscript accounts we are in great part indebted for the details of his father's life. The match appears to have been happy, though Shaftesbury had little sentiment on the subject of married life.

With the exception of a Preface to the Sermons of Dr Whichcote, one of the Cambridge Platonists or latitudinarians, published in 1698, Shaftesbury appears to have printed nothing himself till 1708. About this time the French prophets, Camisards (q.v.), as they were called, attracted much attention by their extravagances and follies. Various repressive remedies were proposed, but Shaftesbury maintained that fanaticism was best encountered by " raillery " and " good-humour." In support of this view he wrote a letter Concerning Enthusiasm to Lord Somers, dated September 1707, which was published anonymously in the following year, and provoked several replies. In May 1709 he returned to the subject, and printed another letter, entitled Sensus Communis, an Essay on the Freedom of Wit and Humour. In the same year he also published The Moralists, a Philosophical Rhapsody, and in the following year Soliloquy, or Advice to an Author. None of these pieces seems to have been printed either with his name or his initials. In 1711 appeared the Characteristics of Men, Manners, Opinions, Times, in three volumes, also without any name or initials on the title-page, and without even the name of a printer. These volumes contain in addition to the four treatises already mentioned, Miscellaneous Reflections, now first printed, and the Inquiry concerning Virtue or Merit, described as " formerly printed from an imperfect copy, now corrected and published intire," and as " printed first in the year 1699."

The declining state of Shaftesbury's health rendered it necessary for him to seek a warmer climate, and in July 1711 he set out for Italy. He settled at Naples in November, and lived there considerably over a year. His principal occupation at this time must have consisted in preparing for the press a second edition of the Characteristics, which appeared in 1713, soon after his death. The copy, carefully corrected in his own handwriting, is preserved in the British Museum. He was also engaged, during his stay at Naples, in writing the little treatise (afterwards included in the Characteristics) entitled A Notion of the Historical Draught or Tablature of the Judgment of Hercules, and the letter concerning Design. A little before his death he had also formed a scheme of writing a Discourse on the Arts of Painting, Sculpture, Etching, &c, but when he died he had made but little progress with it. " Medals, and pictures, and antiquities," he

writes to Furly, " are our chief entertainments here." His conversation was with men of art and science, " the virtuosi of this place."

The events preceding the peace of Utrecht, which he regarded as preparing the way for a base desertion of our allies, greatly troubled the last months of Shaftesbury's life. He did not, however, live to see the actual conclusion of the treaty (March 31, 1713/, as he died the month before, February 4, 1712/3.

He had not completed his forty-second year. His body was brought back by sea to England and buried at St Giles's, the family seat in Dorsetshire. His only son, Anthony Ashley, succeeded him as 4th earl, and his great-grandson was the famous philanthropist, the 7th earl.

Shaftesbury's amiability of character seems to have been one of his principal characteristics. Like Locke he had a peculiar pleasure in bringing forward young men. Among these may be especially mentioned Michael Ainsworth, a native of Wimborne St Giles, the young man who was the recipient of the Letters addressed to a student at the university, and was maintained by Shaftesbury at University College, Oxford. The interest which Shaftesbury took in his studies, and the desire that he should be specially fitted for the profession which he had selected, that of a clergyman of the Church of England, are marked features of the letters. Other proteges were Crell, a young Pole, the two young Furlys and Harry Wilkinson, a boy who was sent into Furly 's office at Rotterdam, and to whom several of the letters still extant in the Record Office are addressed.

In the popular mind, Shaftesbury is generally regarded as a writer hostile to religion. But, however short his orthodoxy might fall if tried by the standards of any particular church, his temperament was pre-eminently religious. This fact is shown in his letters. The belief in a God, all-wise, all-just and all-merciful, governing the world providentially for the best, pervades all his works, his correspondence and his life. Nor had he any wish to undermine established beliefs, except where he conceived that they conflicted with a truer religion and a purer morality.

To the public ordinances of the church he scrupulously con- formed. But, unfortunately, there were many things both in the teaching and the practice of the ecclesiastics of that day which were calculated to repel men of sober judgment and high principle. These evil tendencies in the popular presentation of Christianity undoubtedly begot in

Shaftesbury's mind a certain amount of repugnance and contempt to some of the doctrines of Christianity itself; and, cultivating, almost of set purpose, his sense of the ridiculous, he was too apt to assume towards such doctrines and their teachers a tone of raillery.

But, whatever might be Shaftesbury's speculative opinions or his mode of expressing them, all witnesses bear testimony to the elevation and purity of his life and aims. As an earnest student, and ardent lover of liberty, an enthusiast in the cause of virtue, and a man of unblemished life and untiring beneficence, Shaftesbury probably had no superior in his generation. His character and pursuits are the more remarkable, considering the rank of life in which he was born and the circumstances under which he was brought up. In many respects he reminds us of the imperial philosopher Marcus Aurelius, whose works he studied with avidity, and whose influence is stamped upon his own productions.

Most of Shaftesbury's writings have been already mentioned. In addition to these there have been published fourteen letters from Shaftesbury to Molesworth, edited by Toland in 1721; some letters to Benjamin Furly, his sons, and his clerk Harry Wilkinson, included in a volume entitled Original Letters of Locke, Sidney and Shaftesbury, which was published by Mr T. Fcrster in 1830, and again in an en-larged form in 1847; three letters, written respectively to Stringer, Lord Oxford and Lord Godolphin, which appeared, for the first time, in the General Dictionary; and lastly a letter to Le Clerc, in his re-collections of Locke, first published in Notes and Queries, Feb. 8, 1851. The Letters to a Young Man at the University (Michael Ains-worth), already mentioned, were first published in 1716. The Letter on Design was first published in the edition of the Characteristics issued in 1732. Besides the published writings, there are several memoranda, letters, rough drafts, &c., in the Shaftesbury papers in the Record Office.

Shaftesbury took great pains in the elaboration of his style, and he succeeded so far as to make his meaning transparent. The thought is always clear. But, on the other hand, he did not equally succeed in attaining elegance, an object at which he seems equally to have aimed. There is a curious affectation about his style — a falsetto note — which, notwithstanding all his efforts to please, is often irritat- ing to the reader. Its main characteristic is perhaps best hit off by Charles Lamb when he calls it " genteel." He poses too much as a fine gentleman, and is so anxious not to be taken for a pedant of the vulgar scholastic kind that he falls into the hardly more attractive

pedantry of the aesthete and virtuoso. But he is easily read and understood. Hence, probably, the wide popularity which his works enjoyed in the 18th century; and hence the agreeable feeling with which, notwithstanding all their false taste and their tiresome digressions, they impress the modern reader.

Shaftesbury's philosophical importance (see Ethics) is due mainly to his ethical speculations, in which his motive was primarily the refutaticn of Hobbes's egoistic doctrine. By the method of empirical psychology, he examined man first as a unit in himself and secondly in his wider relations to the larger units of society and the universe of mankind. His great principle was that of Harmony or Balance, and he based it on the general ground of good taste or feeling as opposed to the method of reason, (i) In the first place man as an individual is a complex of appetites, passions, affections, more or less perfectly controlled by the central reason. In the moral man these factors are duly balanced. " Whoever," he says, " is in the least versed in this moral kind of architecture will find the inward fabric so adjusted, . . . that the barely extending of a single passion too far or the continuance … of it too long, is able to bring irrecoverable ruin and misery " (Inquiry concerning Virtue or Merit, Bk. II. ii. i). (2) As a social being, man is part of a greater harmony, and, in order that he may contribute to the happiness of the whole, he must order his extra-regarding activities so that they shall not clash with his environs. Only when he has regulated his internal and his social relations by this ideal can he be regarded as ruly moral. The egoist and the altruist are both imperfect. In the ripe perfection of humanity, the two impulses will be perfectly ad- justed. Thus, by the criterion of harmony, Shaftesbury refutes Hobbes, and deduces the virtue of benevolence as indispensable to morality. So also he has drawn a close parallel between the moral and the aesthetic criteria. Just as there is a faculty which apprehends beauty in the sphere of art, so there is in the sphere of ethics a faculty which determines the value of actions. This faculty he described (for the first time in English thought) as the Moral Sense (see Hutcheson') or Conscience (cf. Butler). In its essence, it is primarily emotional and non-retlective; in process of development it becomes rationalized by education and use. The emotional and the rational elements in the " moral sense " Shaftesbury did not fully analyse (see Hume).

From this principle, it follows (1) that the distinction between right

and wrong is part of the constitution of human nature; (2) that morality stands apart from theology, and the moral qualities of actions are determined apart from the arbitrary will of God ; (3) that the ultimate test of an action is its tendency to promote the general harmony or welfare ; (4) that appetite and reason concur in the determination of action; and (5) that the moralist is not con- cerned to solve the problem of freewill and determinism. From these results we see that Shaftesbury, opposed to Hobbes and Locke, is in close agreement with Hutcheson (q.v.), and that he is ultimately a deeply religious thinker, inasmuch as he discards the moral sanction of public opinion, the terrors of future punishment, the authority of the civil authority, as the main incentives to goodness, and substi- tutes the voice of conscience and the love of God. These two alone move men to aim at perfect harmony for its own sake in the man and in the universe.

Shaftesbury's philosophical activity was confined to ethics, aesthetics and religion. For metaphysics, properly so called, and even psychology, except so far as it afforded a basis for ethics, he evidently had no taste. Logic he probably despised as merely an instrument of pedants — a judgment for which, in his day, and especially at the universities, there was only too much ground.

The main object of the Moralists is to propound a system of natural theology, and to vindicate, so far as natural religion is concerned, the ways of God to man. The articles of Shaftesbury's religious creed were few and simple, but these he entertained with a conviction amounting to enthusiasm. They may briefly be summed up as a belief in one God whose most characteristic attribute is universal benevolence, in the moral government of the universe, and in a future state of man making up for the imperfections and repairing the inequalities of the present life. Shaftesbury is emphatically an optimist, but there is a passage in the Moralists (pt. ii. sect. 4) which would lead us to suppose that he regarded matter as an indifferent principle, coexistent and coeternal with God, limiting His opera- tions, and the cause of the evil and imperfection which, notwithstand- ing the benevolence of the Creator, is still to be found in His work. If this view of his optimism be correct, Shaftesbury, as Mill says of Leibnitz, must be regarded as maintaining, not that this is the best of all imaginable but only of all possible worlds. This brief notice of Shaftesbury's scheme of natural religion would be conspicuously imperfect unless it were added that it is popularized in Pope's Essay on Man, several lines of which, especially of the first epistle, are simply statements from the Moralists done into verse. Whether, however, these were taken immediately by Pope from

Shaftesbury, or whether they came to him through the papers which Bolingbroke had prepared for his use, we have no means of determining.

The influence of Shaftesbury's writings was considerable both at home and abroad. His ethical system was reproduced, though in a more precise and philosophical form, by Hutcheson, and from him descended, with certain variations, to Hum; and Adam Smith. Nor was it without its effect even on the speculations of Butler. Of

the so-called deists Shaftesbury was probably the most important, as he was certainly the most plausible and the most respectable. No sooner had the Characteristics appeared than they were welcomed, in terms of warm commendation, by Le Clerc and Leibnitz. In 1745 Diderot adapted or reproduced the Inquiry concerning Virtue in what was afterwards known as his Essai sur le Merite et la Vertu. In 1769 a French translation of. the whole of Shaftesbury's works, including the Letters, was published at Geneva. Translations of separate treatises into German began to be made in 1738, and in 1776-1779 there appeared a complete German translation of the Characteristics. Hermann Hettner says that not only Leibnitz, Voltaire and Diderot, but Lessing, Mendelssohn, Wieland and Herder, drew the most stimulating nutriment from Shaftesbury. " His charms," he adds, " are ever fresh. A new-born Hellenism, or divine cultus of beauty presented itself before his inspired soul." Herder is especially eulogistic. In the Adrastea he pronounces the Moralists to be a composition in form well-nigh worthy of Grecian antiquity, and in its contents almost superior to it. The interest felt by German literary men in Shaftesbury was revived by the publication of two excellent monographs, one dealing with him mainly from the theo- logical side by Dr Gideon Spicker (Freiburg in Baden, 1872), the other dealing with him mainly from the philosophical side by Dr Gcorg von Gizycki (Leipzig, 1876). (T. F.; J. M. M.)

Authorities. — In Dr Thomas Fowler's monograph on Shaftesbury and Hutcheson in the series of " English philosophers " (1882) he was able largely to supplement the printed materials for the Life by extracts from the Shaftesbury papers in the Record Office. These include, besides many letters and memoranda, two Lives of him, com- posed by his son, the fourth earl, one of which is evidently the original, though it is by no means always closely followed, of the Life con- tributed by Dr Birch to the General Dictionary. For a description and criticism of Shaftesbury's philosophy reference may also be made to James Mackintosh's Progress of Ethical Philosophy, W. Whewell's History of Moral Philosophy in England, Jouffroy's

Introduction to Ethics (Channing's translation), Sir Leslie Stephen's English Thought in the Eighteenth Century, Martineau's Types of Ethical Theory, Windelband's History of Philosophy (Eng. trans., 1893); W. M. Hatch's unfinished edition with appendices of the Characteristics (1870); J. M. Robertson's edition of the Characteristics (1900); B. Rand's Life (1900). For his relation to the religious and theo- logical controversies of his day, see, in addition to some of the above works, J . Leland , View of the Principal Deistical Writers, V. Lechler, Geschichte des Englischen Deismus, J. Hunt, Religious Thought in England, C. J. Abbey and J. H. Overton, English Church in the Eighteenth Century and A. S. Farrar's Hampton Lectures; G. Zart, Einfluss der englischen Philosophen seit Bacon auf die deutsche Philosophie des i8ten Jahrhunderts (Berlin, 1881).

SHAFTESBURY, ANTHONY ASHLEY COOPER, 7™ Earl or (1801-1885), son of Cropley, 6th earl (a younger brother of the 5th earl; succeeded 181 1), and Anne, daughter of the 3rd duke of Marlborough, was born on the 28th of April 1801. He was educated at Harrow and Christ Church, Oxford, where he obtained a first class in classics in 1822, and graduated M.A. in 1832. In 1 84 1 he received from his university the degree of D.C.L. He entered parliament as member for the pocket borough of Woodstock in 1826; in 1830 he was returned for Dorchester; from 1831 till February 1846 he represented the county of Dorset; and he was member for Bath from 1847 till (having previously borne the courtesy title Lord Ashley) he succeeded his father as earl in 1 8 5 1 . Although giving a general support to the Conservatives, his parliamentary conduct was greatly modified by his intense interest in the improvement of the social condition of the working classes, his efforts in behalf of whom have made his name a household word. He opposed the Reform Bill of 1832, but was a supporter of Catholic emancipa- tion, and his objection to the continuance of resistance to the abolition of the Corn Laws led him to resign his seat for Dorset in 1846. In parliament bis name, more than any other, is associated with the new factory legislation. He was a lord of the admiralty under Sir Robert Peel (1834-1835), but on being invited to join Peel's administration in 1841 refused, having been unable to obtain Peel's support for the Ten Hours' Bill. Chiefly by his persistent efforts a Ten Hours' Bill was carried in 1847, but its operation was impeded by legal difficulties, which were only removed by successive Acts, instigated chiefly by him, until legislation reached a final stage in the Factory Act of 1874. The part which he took in the legislation beaiing on coal mines was equally prominent. His efforts in behalf of

the welfare of the working classes were guided by personal knowledge. Thus in 1846, after the resignation of his seat for Dorset, he explored the slums of the metropolis, and not only gave a new

impulse to the movement for the establishment of ragged schools, but was able to make it more widely beneficial. For forty years he was president of the Ragged School Union. He was also one of the principal founders of reformatory and refuge unions, young men's Christian associations and working men's institutes. He took an active interest in foreign missions, and was president of several of the most important philanthropic and religious societies of London. He died on the ist of October 1885. By his marriage (1830) to Lady Emily (d. 1872), daughter of the 5th earl Cowper, he left a large family, and was succeeded by his eldest son Anthony, who committed suicide in 1886, his son (b. 1869) becoming 9th earl.

See also Hodder's Life (1886).

SHAFTESBURY, a market town and municipal borough in the northern parliamentary division of Dorsetshire, England, 103 m. W.S.W. from London by the London & South-Western railway (Semley station). Pop. (1901) 2027. It lies high on a hill above a rich agricultural district. The church of St Peter is Perpendicular; those of Holy Trinity and St James are in the main modern reconstructions. The borough is under a mayor, 4 aldermen and 12 councillors. Area 157 acres.

Although there are traces of both British and Roman occupa- tion in the immediate neighbourhood, the site of Shaftesbury (Caer Palladur, Caer Septon, Seaftonia, Sceafstesbyrig, Shafton) was probably first occupied in Saxon times. Matthew Paris speaks of its foundation by the mythical king Rudhudibras, while Asser ascribes it to Alfred, who made his daughter Ethelgeofu the first abbess. It is probable that a small religious house had existed here before the time of Alfred, and that it and the town were destroyed by the Danes, being both rebuilt about 888. In 980 Dunstan brought St Edward's body here from Wareham for burial, and here Canute died in 1035. Shaftes- bury was a borough containing 104 houses in the king's demesne during the reign of Edward the Confessor; in 1086, 38 houses had been destroyed, but it was still the seat of a mint with three mint-masters. In the manor of the abbess of Shaftesbury were n

1 houses and 151 burgesses; here 42 houses had been totally destroyed since St Edward's reign. In 1280 the abbess obtained the royal manor at an annual fee-farm rent of £12 and remained the sole mistress of the borough until it passed at the dissolution of the monasteries to Sir Thomas Arundel, after whose execution it was granted about 1552 to William Herbert, earl of Pembroke. In 1252 the burgesses received their first charter from Henry III. This granted that in all eyres the justices itinerant should come to Shaftesbury and that the burgesses should not answer for aught without the town and might choose for themselves two coroners annually. The reeve of the borough is mentioned in 1313-1317. The office of mayor was created between the years 1350-1352, and an inquisition of 1392 records that the mayor held a court of pie-powder and governed the town in the absence of the steward. The seal of the commonalty is extant for 1350, and that of the mayoralty first occurs in 1428. By 147 1 a general asembly of burgesses had acquired power to take part in elections. There is no evidence that Elizabeth granted Shaftesbury a charter, as has been asserted, but she confiscated the common lands in 1585, the town only recovering them by purchase. This probably led to a charter of incorporation being obtained from James I. in 1604. A new charter was granted to the town in 1684, but without the surrender of the old charter confirmed by Charles II. in 1665. Shaftesbury returned two members to parliament from 1294 to 1832, when the representation was reduced to one, and it was lost in 1885. Leland speaks of Shaftesbury as a great market town, and it possessed a market in the time of Edward I. The Martinmas fair was granted in 1604. In the 17th century worsted, buttons and leather were manufactured, but these industries have disappeared.

See Charles Hubert Mayo, The Municipal Records of the Borough of Shaftesbury (Sherborne, 1889).

SHAFT-SINKING, an important operation in mining for reaching and working mineral deposits situated at a depth below the surface, whenever the topography does not admit of

driving adits or tunnels. Shafts are often sunk also in connexion with certain civil engineering works, e.g. at intervals along the line of a railway tunnel, for starting intermediate headings, thus securing more points of attack than if the entire work were carried on from the end headings only. Sundry modifications of shaft-sinking are adopted in excavating for deep foundations of heavy buildings, bridge piers and other engineering structures.

If in solid rock, carrying but little water, shaft-sinking is a comparatively simple operation. But when much water is encountered or the formation penetrated comprises unstable, watery strata, special forms of lining become necessary and the work is slow and expensive. Mine shafts are often very deep; notably in the Witwatersrand, South Africa; the Michigan copper district; at Bendigo, Australia; and in certain parts of Europe. Many vertical shafts exceed 4000 ft. in depth, and at least two — the Whiting shaft, of the Calumet and Hecla mine and shaft No. 3 of the Tamarack mine (both in Michigan)— are over 5000 ft. deep. The last named at the beginning of 1907 was about 5200 ft., and was then the deepest in the world. Several inclined shafts, in the same district, approximate 6000 ft. in length.

Shape of Shafts. — In Europe shafts are generally cylindrical, sometimes of elliptical cross-section, and are lined with masonry, concrete, cast iron or steel; in the United States and elsewhere throughout the mining regions of the world, rectangular cross-sections are the rule for sinking in rock, the shaft walls being supported by timbering, occasionally by steel lining. For sinking in loose, water-bearing soils, the cross-section is almost invariably cylindrical, as this form best resists pressure tending to cause crushing or caving of the shaft walls. The European practice of sinking cylindrical shafts even in rock is based mainly on four considerations: — (1) custom; (2) high cost of timber; (3) apart from questions of first cost, a cylindrical shaft, lined with masonry or iron, is strong and permanent, and its cost of maintenance low; (4) more shafts in difficult formations have been sunk in Europe than elsewhere. The cheaper timber-lined, rectangular shaft, however, is generally appropriate under normal conditions in rocky strata, in view of the temporary character of mining operations. Vertical shafts may be either rectangular or cylindrical; when inclined they are always rectangular.

The primary purpose of mine shafts is to act as hoisting- and travelling-ways; incidentally they serve for ventilation, for pumping and for transmitting power underground by steam, compressed air or other means. Rectangular shafts are usually divided longitudinally into compartments. One or more of these are for the cages or skips, which run in guides bolted to the shaft timbering (see Mining). Another is generally provided for a ladder- and pipe-way and] for ventilation. When much water is encountered a separate pump compartment is desirable. Cylindrical shafts may be similarly divided by subsidiary- timbering, though in many timbering is omitted and the hoisting cages arelguided by wire ropes stretched from top to

bottom.

Dimensions. — The cross-sectional area of shafts depends mainly on the size of the cages or skips — i.e. on the hoisting loads. Small rectangular shafts of one or two compartments measure inside of timbers, say 4 by 6 ft. up to 7 by 12 ft.; larger shafts of three compartments, from 5 by 12 ft. up to 8 or 10 ft. by 20 ft. For four- or five-compartment shafts, sometimes required for large scale work, as in the deep-level mines of the Witwatersrand, the inside dimensions range from 6 by 20 ft. to 6 or 8 by 30 ft., and for some of the Pennsylvania colliery shafts, up to 13 by 52 ft. Cylindrical shafts rarely have more than two hoisting compartments and are commonly from 10 to 16 ft., sometimes 20 or 21 ft. diameter, the segmental areas surrounding the hoisting-ways being utilized for ventilation, piping, &c.

Sinking in Rock. — If the rock be overlaid by loose soil carrying little water, excavation is begun by pick and shovel, and after the rock is reached it is continued by drilling and blasting (see Blasting). The sinking plant, usually temporary, comprises a small hoist and boiler, several buckets or sometimes a skip, one or more sinking pumps, according to the quantity of water,

occasionally a small ventilating fan, and a timber derrick or head-frame over the shaft mouth, with appliances for dumping the buckets, handling the rock and safe-guarding the men in the shaft against falling objects. In some circumstances a portion of the permanent mine plant is erected for sinking. The choice between hand and machine drilling depends chiefly on the kind of rock and the size and depth of shaft. For very hard rock or when rapid work is desired, machine drilling is advisable, a compressor and additional boiler capacity being then required. Remarkable speeds, however, have been made by hand-sinking in some of the deep vertical shafts on the Rand, the world's record being that of the Howard shaft, sunk by hand labour 203 ft. in one month. But such speeds are attainable only in dry, or nearly dry, ground, at a high cost per foot and by crowding as many men into the shaft as possible, both for drilling and loading away the blasted rock. The conditions being the same, inclined shafts closely approaching the vertical can be put down about as fast as vertical shafts; but for inclinations between say 75° and 30° to the horizontal, inclines are generally slower on account of

the greater inconvenience of carrying on the work, both of excavation and timbering. Very flat shafts, on the other hand, can be sunk at speeds little less than for driving tunnels, unless there is much water. The highest speed on record for a very flat incline (io°) is 267 ft. in one month.

As a rule, the speed attained in sinking depends less on the drilling time per round of holes than on the time required to handle and hoist out the rock; hence the speed generally diminishes with increase of depth. Furthermore, omitting shafts of small area, the cost per foot of depth does not increase greatly with the cross-sectional dimensions. For the same rock the rate of advance in wet formations is always much slower than in dry and the cost greater.

The work of sinking in rock is carried on as follows. A round of holes is drilled, usually from 3 to 4 ft. deep if by hand, or from 5 to 8 or 9 ft. if by machine drilling (see Blasting). A common mode of arranging machine drill holes is shown in plan and section in fig. 1. The holes are charged with dynamite and fired by fuze or electricity — in deep shafts preferably by electricity, as the men may have to be hoisted a long distance to reach a place of safety. After the smoke has cleared away (which may be hastened by sprays or by turning on the compressed air if machine drills are used), the work of hoisting out the broken rock is begun and drilling resumed as soon as possible. For shafts not over 6 or 8 ft. wide, machine drills are usually mounted on horizontal bars stretching across from wall to wall, or, in wider or cylindrical shafts, on tripods or special sinking-frames. In shafts of small area, or deep shafts which are timbered during sinking, the hoisting buckets must be guided to prevent them from striking against the sides. Small quantities of water are bailed into the buckets ; when the inflow is too great to be so disposed of, a sinking pump is employed (see Mining).

Shaft Timbering. — In sinking rectangular vertical shafts under normal conditions the excavation through the surface soil is commonly lined with cribbing, inside of which a concrete curb is sometimes built to dam out the surface water. After reaching rock the lining is generally composed of horizontal sets of 8 by 8 in. to 12 by 12 in. squared timber wedged against the walls, with smaller pieces, or planking, called " lagging," placed behind them, to prevent portions of the walls from falling away. In firm rock lagging may be omitted. Each set consists of (fig. 2) two long timbers (wall-

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Elevation FlG. 2.

plates) W, W, two shorter pieces (end plates) E,E, and usually one or more cross pieces (dividers or buntons) D,D, to form the compart-ments, strengthen the sets and support the cage guides, G,G. The sets are from 4 to 6 ft. apart, with vertical posts (studdles) S,S, between them. At intervals of say 80 to 120 ft., longer timbers

Fig. 3.

(" bearers ") are notched into the walls, under a set, to prevent displacement of the lining as a whole. A series of shaft sets, with their posts, are either built up from a bearing-set, or suspended from the latter by hanger-bolts. When the rock is firm, a considerable depth of shaft may be sunk and then timbered; generally, however, it is safer to put in a few sets at a time as sinking advances, the lowermost set being always far enough from the bottom to prevent it from being injured by the blasting. Inclined shafts in solid ground are often timbered as described above, though sometimes merely by setting longitudinal rows of posts, for supporting the roof and dividing the shaft into compartments.

Lining for Cylindrical Shafts in Rock. — Wooden linings are occasionally put in small shafts, or for temporary support, before the permanent lining is built, but a cylindrical shaft of any importance is lined with masonry or iron. Masonry linings are generally built in sections, as the sinking advances, each section being based on a walling-crib AB, CD, (fig. 3). Specially moulded tapered bricks are convenient, shaped to conform with the radius of the shaft. Concrete may be similarly moulded into large blocks, often weighing 1200 to 1600 lb each. The thickness of the walling depends on the depth of shaft and pressure antici- pated; it is usually from 13 in. to 2 ft., laid in cement mortar. Such linings, while not entirely water-tight, will shut out much of the water present in the surrounding rock.

Iron lining, or " tubbing," is employed when the inflow of water is rather large. It is usually composed of cast iron flanged rings, each cast in a single piece for shafts of small diameter, or in segments bolted together for large diameters. To permit the rings to adjust themselves to the pressure, the horizontal joints are rarely bolted ; they are packed with sheet-lead or thin strips of dry pine, any leaks appearing subsequently being stopped with wedges. Though preferably of cast iron, tubbing is occasionally built of steel plate rings, stiffened by angles or channels riveted to them. The irregular annular space between the tubbing and rock-walls is afterwards filled with concrete or cement grouting. The- lowermost tubbing ring is based upon a " wedging-crib." This is a heavy cast iron ring, composed of segments bolted together, and set on a projecting shelf of rock, carefully dressed down. The space behind the crib is driven full of wooden wedges, which expand on becoming water-soaked and thus make a tight joint at the bottom of the tubbing with the rock just above the mineral deposit. By this means most of the water may be permanently shut out of the shaft, and the cost of pumping materially reduced.

Kind-Chaudron System of Sinking. — This ingenious method, introduced in 1852, has thus far been confined to Europe. Up to 1904, 79 shafts had been sunk by its use, some of them to depths of 1000 ft. or more, without a single instance of failure. It is applicable only to firm rock and was devised to deal with cases where the quantity of water is too great to be pumped out while excavation is in pro- gress; that is, for inflows greater than 1000 or 1200 gallons per minute. In its after results the system is most successful when the water-bearing rocks rest on an impervious stratum, overlying the mineral deposit. The entire -excavation is carried on under water; then a lining of special design is lowered into place and the shaft unwatered. The shaft is sunk by boring on an immense scale, by apparatus resembling the rod and drop-drill (see Boring). Instead of ordinary drills, massive tools called " trepans " are employed, con- sisting of a heavy iron frame, in the lower edge of which are set a number of sepa- rate cutters (fig. 4). Shafts not exceeding 8 ft. diameter are bored in one operation; for larger diameters an advance bore usually made

Fig. 4.— Large and Small Trepans for shaft sink- ing, Haniel & Lueg, Dusseldorf, makers.

with a small trepan and after- wards enlarged to full size. The advance bore may be completed to the required depth of shaft before beginning enlargement, or the small and large trepans used alternately, the advance being kept 30 to 60 ft. ahead of the enlargement. An 8 ft. trepan weighs about 12 tons, those of 14 or 15 ft. 25 to 30 tons. The trepan is attached to a heavy rod, suspended from a walking-beam operated by an engine on the surface, as in ordinary boring. A derrick is erected over the

Fig. 5.

shaft, with a hoisting engine for raising and lowering the tools. Average rock is bored at a speed of about ij ft. per 24 hours. The advance bore is cleaned of debris at intervals by a bailer similar to that used for bore-holes. The enlarging trepan is so shaped that the bottom of the enlargement slopes to the centre, whereby the cuttings, assisted by the agitation of the water, run into the advance bore and are bailed out. Owing to the difficulty of this latter procedure the advance bore is sometimes omitted even for large shafts, the debris

being removed by a special dredger (Coll. Guard., Dec. 22, 1899, p. 1 1 81). For rather loose rock another somewhat similar system of drilling, the Pattberg, has been satisfactorily employed.

When the shaft has passed through the watery strata the lining is installed. This is composed of cast iron rings, like tubbing (cc, dd), bolted together at the shaft mouth and gradually lowered through the water (fig. 5). The first two rings, called the " moss-box" (aa, bb) are designed to telescope together and have a quantity of dry moss packed between their outer flanges. When the lowermost ring reaches the bottom, the weight of the lining com- presses the moss and forces it against the surrounding rock, making a tight joint. The lining is suspended from the surface by threaded rods, and to regulate and reduce its weight while it is being lowered the bottom is closed by a diaphragm Iff), from the centre of which rises an open pipe (g). This pipe is provided with cocks for admitting inside the lining from time to time enough water to overcome buoyancy. Finally, concrete is filled in behind the lining, the diaphragm removed and the completed shaft pumped out. In some formations the moss-box is omitted, the . concreting being relied on to make the lining

water-tight. I he cost of this method of sinking and lining (gener- ally £35 to £60 per foot), as well as the speed, compare favour- ably with results obtainable under the same conditions by other means ; in many cases it is the only practicable method.

Sinking in unstable, watery soils, which often cause serious engineering difficulties, is accomplished by: (i) spiling, vertical or inclined; (2) drop-shafts; (3) caisson and compressed air; (4) the freezing process.

Vertical spiling consists in driving one or more series of spiles around the sides of the excavation, supported by horizontal timber cribs. When the first spiles have been driven, and the enclosed soil removed, a second set follows inside, and so on. As a result of the successive reductions in cross-section of the shaft, vertical spiling is inapplicable to depths much greater than say 75 ft.

Inclined spiling is also limited to small depths. Cribs are put in every few feet and around them, driven ahead of the excavation, are

short, heavy planks, sharpened to a chisel edge. The spiles in- cline outward, being driven inside of one crib and outside of that next below (fig. 6). The shaft bottom also is_ usually sheathed with planking, braced against the lowest crib and advanced to new

positions as sinking progresses.

Drop – Shafts.— This important method has been used for depths of nearly 500 ft. A heavy timber, iron or masonry lining (usu- ally cylindrical) , is sunk through the soil, new sections being succes- sively added at the sur- face, while the excava- .,,,.. tion goes on inside. In

quite soft soil the lining or drop-shaft sinks with its own weight; when necessary', additional weights of pig-iron, rails, &c, are applied at the top. If, from excessive friction or other cause, the first lining refuses to sink farther, a second is lowered telescopically inside, followed by others if required. The drop-shaft, which must be strongly built to resist collapse, distortion or rupture, is based on a massive wooden or iron shoe, generally of triangular cross-section, which cuts into the soil as the weight of the structure increases and the excavation pro- ceeds. When built of masonry the great weight of the drop-shaft may become unmanageable in very soft soil, either sinking too fast or settling irregularly and spasmodically, accompanied by inrushes of sand or mud at the bottom. It is then suspended by iron rods, fastened to the shoe and threaded for passing through large nuts

supported by a framework on the surface. The rods are lengthened as required for lowering the lining. For deep shafts the lining must be of iron or steel, as wood is too weak and masonry too heavy. When the inflow of water can be met by a reasonable amount of pumping, the material is excavated by hand; otherwise, the water is allowed to stand at its natural level and the excavation carried on by dredging. This saves the cost of pumping during sinking, and the pressure of the unstable soil is largely counteracted by the weight of the coiumn of water within the shaft. After the lining has come to rest on the solid sub-stratum, the shaft is pumped out, inflow under- neath the shoe stopped as far as possible and sinking resumed by ordinary means. The dredging appliance commonly employed is the

sackborer." This consists of an iron or wooden rod, suspended vertically in the shaft, at the lower end of which on each side is attached a heavy hoop-like wing. The wings carry two large sacks of canvas and leather, opening in opposite directions. By rotating therod by machinery at the surface, the sacks are swept round horizontally like the cutting edges of an auger, and partly filling after \ \ rev °lutions are then raised and emptied. The leakage under the shoe may be stopped in several ways, e.g. by concreting the shaft bottom, then pumping out the water and sinking through the con-

crete by drilling and blasting; by unwatering the shaft and calking below the shoe; or by inserting a wedging crib. There are various modifications of the drop-shaft which cannot here be detailed. _ Sinking with caisson and compressed air is rarely adopted except in civil engineering operations, for deep foundations of bridge piers, &c. (see Caisson).

_ Freezing Process. — This useful process was introduced in Germany m 1883, by F. H. Poetsch. The soil in which the shaft is to be sunk is artificially frozen and then excavated like solid rock. A number of drive-pipes are put down (see Boring), usually 4 to 6 in. diameter and about 3 ft. apart, in a circle whose radius is, say, 3 ft. greater than that of the shaft, and reaching to bed-rock or other firm formation. Each pipe is plugged at the lower end and within it is placed an open pipe, l§ in. in diameter, extending nearly to the bottom. Or, pre- ferably, after the drive-pipes are down, a slightly smaller pipe, closed at its lower end, is inserted in each drive-pipe, the latter being after- wards pulled out. The inner 1 J in. open pipes are then put in place. At the surface, the outer and inner pipes are connected respectively to two horizontal distributing rings, which in turn are connected with a pump and ice-machine. A circulatory system is thus established. The freezing fluid, a nearly saturated solution of calcium or mag- nesium chloride (freezing point about- 29 °F.), is pumped through the ice-machine, where it is cooled to at least o°F., and goes thence to the freezing pipes. It passes down the inner pipes, up through the outer pipes, and returns to the ice-machine. The cold solution rising in the large pipes absorbs the heat from the surrounding watery soil, Whic u 1 , reezes concentrically round each pipe. As the process goes on the frozen masses finally join (in from 3 to 4 weeks), forming an unbroken wall. The enclosed soft soil may then be excavated by dredging; or the freezing may be continued (total time usually from 5 to 10 weeks according to the depth), until the solidification reaches the centre and to some distance beyond the circle of pipes, after which the ground is drilled and blasted. This process has been successfully employed to depths of over 700 ft., and is applicable not only to the most unstable soils but also to heavily water-bearing rocks. It is questionable whether it will prove to be practicable for great depths, largely because of the difficulty of maintaining verticality of the bore- holes for the freezing pipes. Even a slight angular divergence would leave breaks in the wall of frozen soil and cause danger. In a modi- fication of the Poetsch process, introduced by A. Gobert in 1891, the calcium chloride solution is replaced by anhydrous liquid ammonia, which on vaporizing in the freezing pipes produces a temperature of — 25 to

— 30 F. Sixty-four shafts had been sunk by the freezing process up to 1904.

Another method proposed for dealing with quicksand or similar watery ground is to inject through pipes a mixture of cement and water. The entire mass of soil would be solidified by the setting of the cement, and the shaft sunk by drilling and blasting, with no trouble from water.

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SHAGIA (Shaigia, ShaikIyeh), a tribe of Africans of Semitic origin living on both banks of the Nile from Korti to the Third Cataract, and in portions of the Bayuda Desert. The Shagla are partly a nomad, partly an agricultural people. They claim descent from one Shayig Ibn Hamaidan of the Beni Abbas, and declare that they came from Arabia at the time of the con- quest of Egypt in the 7th century. They must have dispossessed and largely intermarried with a people of Nuba origin. They appear (from a statement by James Bruce) to have been settled originally south of their present country and to have moved northward since 1772. Formerly subject to the Fun j kings of Sennar, they became independent on the decline of that state in the 18th century. They were overcome c. 181 1 at Dongola by the Mamelukes, but continued to dominate a considerable part of Nubia. To the Egyptians in 1820 they offered a stout resistance, but finally submitted and served in the Egyptian ranks during the suppression of the Ja'alin revolt (1822). For their services they obtained lands of these latter between Shendi and Khartum. At that time they were far more civilized than the neighbouring tribes. Freedom-loving, brave, enlightened and hospitable, they had schools in which all Moslem science was taught, and were rich in corn and cattle. Their fighting men, mounted on horses of the famous Dongola breed, were feared throughout the eastern Sudan. Their chiefs wore coats of mail and carried shields of hippopotamus or crocodile skin. Their arms were lance, sword or javelin. The Shagla are divided into twelve clans. Their country is the most fertile along the Nile between Egypt and Khartum. Many of their villages are well built; some of the houses are fortified. They speak Arabic and generally preserve the Semitic type, though they are obviously of very mixed blood. The typical Shagla has a sloping forehead, aquiline nose and receding chin. They have adopted the African custom of gashing the chests of their children. In the wars of 1884-85 General Gordon's first fight was to rescue a few Shagla besieged in a fort at Halfaya. In April 1884 Saleh Bey (Saleh Wad el Mek), head of the tribe, and 1400 men surrendered to the mahdi's forces. Numbers of Shagia continued in the service of General Gordon and this led to the outlawry of the tribe by the mahdi. When Khartum fell Saleh's sons were sought out

and executed by the dervishes. On the reconquest of the Sudan by the Anglo-Egyptian army (1896-98) it was found that the Shagla were reduced to a few hundred families.

See Anglo-Egyptian Sudan, edited by Count Gleichen (London, 1905) ; A. H. Keane, Ethnology of the Egyptian Sudan (London,

1884).

SHAGREEN, a species of untanned leather with a roughened, granular surface. The word is the English form; cf. Ger. Schagrin, of Fr. chagrin, Ital. zagrin, zigrino; these are usually referred to Turkish and Persian saghri, lit. the back of a horse, and so applied to leather made from this part. The skin of the wild ass was especially used. The method of preparing the skins to secure the rough, granular surface is as follows. The seeds of a plant, usually some species of Chinopodium, are embedded in the skin while soft, the surface is then shaved down and soaked in water, when the edges of the indentations swell up. The leather is then dyed, green being a favourite colour. Shagreen is now commonly made of the skins of sharks and rays; the placoid scales of the shark skin giving the necessary roughened surface. Shagreen is used as an ornamental leather for making pocket-books, small cases and the like, and for the handles of swords, daggers, &c.

The figurative use in French of " chagrin," for anxiety, xxiv. 25

annoyance, was adopted in English in the 17th century. This application of the word is due to the rasping surface of the leather.

SHAH, the title of the kings of Persia, the full title being padshah, i.e. " lord king," Pers. pati, lord, and shah, king (see Padishah, the Turkish form of the word). The word shah is a much shortened form of the O. Pers. khsayathiya, probably formed from khsayathi, might, power, khsi, to rule. The Sanskrit kshatram, dominion, is allied, cf. also " satrap." From the Pers. shah mat, the king is dead, is ultimately derived, through the Arab, pronunciation shag, " check-mate," then " check," " chess," " exchequer," &c.

SHAHABAD, a district of British India, in the Patna division of Bengal, with an area of 4373 sq. m. About three-fourths of the area to the north is an alluvial flat, planted with mangoes, bamboos and other trees; while the southern portion is occupied by the Kaimur hills, a branch of the great Vmdhyan range, and is a densely wooded tract. The chief rivers are the Ganges and the Sone, which unite in

the north-eastern corner of Shahabad. In the southern portion large game abounds. The annual rainfall averages 43 in. In 1901 the population was 1,962,696, showing a decrease of 4-7% in the decade. The chief crops are rice, millets, wheat, pulses, oilseeds, poppy and sugarcane. Shahabad is protected against drought by a system of canals from the Sone, some of which are navigable. The district is traversed by the East Indian railway near the Ganges, and by a branch from Mogul Serai to Gaya, which crosses the Sone at Dehri-on-Sone, where are the workshops of the canal. The administrative headquarters are at Arrah. Among other historic sites, it includes the hill-fort of Rohtas, the tomb of Shere Shah at Sasseram and the battlefield of Buxar.

See Shahabad District Gazetteer (Calcutta, 1906).

SHAH ALAM (1728-1806), Mogul emperor of Delhi, son of AlamgirlL, was born on the 15th of June 1728, and was originally known as the Shahzada Ali Gohar. Being proclaimed a rebel by his father, he fled to Shuja-ud-Dowlah, wazir of Oudh, and on the death of his father in 1759 assumed the name of Shah Alam. He joined Shuja-ud-Dowlah against the British, but after his defeat at the battle of Buxar, he sought British protec- tion. In 1765 he granted the diwani (superintendence of the revenue) of Bengal to Lord Clive for the East India Company in return for a payment of 26 lakhs a year. In 1771 he fell into the power of the Mahrattas, was installed emperor of Delhi, and lost the British subsidy. In 1788 the Rohilla chief Ghulam Kadir seized Delhi and put out Shah Alam's eyes. Sindhia restored him to the throne, and after the Mahratta war of 1803 he was again taken under British protection. He died on the 10th of November 1806.

See W. Francklin, History of the Reign of Shah Alam (Ca'.cutta,

1798).

SHAH JAHAN (fl. 1627-1658), Mogul emperor of Delhi, the fifth of the dynasty. After revolting against his father Jahangir, as the latter had revolted against Akbar, he succeeded to the throne on his father's death in 1627. It was during his reign that the Mogul power attained its greatest prosperity. The chief events of his reign were the destruction of the kingdom of Ahmadnagar (1636), the loss of Kandahar to the Persians (1653), and a second war against the Deccan princes (1655). In 1658 he fell ill, and was confined by his son Aurangzeb in the citadel of Agra until his death in 1666. The period of his reign was the golden age of Indian architecture. Shah

Jahan erected many splendid monuments, the most famous of which is the Taj Mahal at Agra, built as a tomb for his wife Mumtaz Mahal; while the Pearl Mosque at Agra and the palace and great mosque at Delhi also commemorate him. The celebrated " Peacock Throne," said to have been worth £6,000,000 also dates from his reign; and he was the founder of the modern city of Delhi, the native name of which is Shahjahanabad.

SHAHJAHANPUR, a city and district of British India, in the Bareilly division of the United Provinces. The city is on the left bank of the river Deoha or Garra, 507 ft. above the sea-level, with a station on the Oudh and Rohilkhand railway, 768 m. N.W. of Calcutta, asd a military cantonment. Pop,

(1901) 75,128. It was founded in 1647 during the reign of Shah Jahan, whose name it bears, by Nawab Bahadur Khan, a Pathan. His mosque is the only building of antiquarian interest. There is a manufacture of sugar, but no great trade.

The District of Shahjahanpur has an area of 1727 sq. m. It consists of a long and narrow tract running up from the Ganges towards the Himalayas, and is for the most part level and without any hills. The principal rivers are the Gumti, Khanaut, Garai and Ramganga. To the north-east the country resembles the tarai in the preponderance of waste and forest over cultivated land, in the sparseness of population and in general unhealthi- ness. Between the Gumti and the Khanaut the country varies from a rather wild and unhealthy northern region to a densely inhabited tract in the south, with a productive soil cultivated with sugar-cane and other remunerative crops. The section between the Deoha and Garai comprises much marshy land; but south of the Garai, and between it and the Ramganga, the soil is mostly of a sandy nature. From the Ramganga to the Ganges in the south is a continuous low country of marshy patches, alternating with a hard clayey soil that requires much irrigation in parts. Shahjahanpur contains a number of jhils or lakes, which afford irrigation for the spring crops. The climate is very similar to that of most parts of Oudh and Rohil- khand, but moister than that of the Doab. The annual rainfall averages about 37 in. In 1901 the population was 921,535. The principal crops are wheat,

rice, pulse, millets, sugar-cane and poppy. The district suffered very severely from the famine of 1877-1879. It is traversed by the Lucknow-Bareilly section of the Oudh and Rohilkhand railway, with a branch northwards from Shahjahanpur city. At Rosa is a large sugar refinery and rum distillery.

Shahjahanpur was ceded to the English by the nawab of Oudh in 1801. During the Mutiny of 1857 it became the scene of open rebellion. The Europeans were attacked when in church; three were shot down, but the remainder, aided by a hundred faithful sepoys, escaped. The force under Lord Clyde put a stop to the anarchy in April 1858, and shortly afterwards peace and authority were restored.

SHAHPUR, a town and district of British India, in Rawalpindi division of the Punjab. The town is near the left bank of the river Jhelum. Pop. (1901) 9386. The district of Shahpur has an area of 4840 sq. m. Its most important physical subdivisions are the Salt range in the north, the valleys of the Chenab and Jhelum, and the plains between those rivers and between the Jhelum and the Salt range. The characteristics of these two plains are widely different: the desert portion of the southern plain is termed the bar; the corresponding tract north of the Jhelum is known as the thai. The climate of the plains is hot and dry, but in the Salt range it is much cooler; the annual rainfall averages about 15 in. Tigers, leopards and wolves are found in the Salt range, while small game and antelope abound among the thick jungle of the bar. In 1901 the popula- tion was 524,259, showing an increase of 6% in the decade. The principal crops are wheat, millets, pulses and cotton. Irrigation is effected from government canals, and also from wells. The largest town and chief commercial centre is Bhera. The district is traversed by two branches of the North- Western railway.

Shahpur passed into the hands of the English along with the rest of the Punjab in 1849. During the Mutiny of 1857 the district remained tranquil, and though the villages of the bar gave cause for alarm no outbreak of sepoys occurred. Since annexation the limits and constitution of the district have undergone many changes.

SHAHRASTANI [Abu'LFath Mahommed ibn 'Abdalkarim ush-Shahrastani] (1076 or 1086-1153) Arabian theologian and jurist, was born at Shahrastan in Khorasan and studied at Jurjanlyah and Nishapur, devoting his attention chiefly to Ash'arite theology. He made the pilgrimage in n 16, on his way back stayed at Bagdad for three years, then returned to his native place. His chief work is the

Kitab ul Milal wan-Nihal, an account of religious sects and philosophical schools, published

by W. Cureton (2 vols., London, 1846) and translated into German by T. Haarbriicker (2 vols., Halle, 1850-1851). After a preface of five chapters dealing with the divisions of the human race, an enumeration of the sects of Islam, the objections of Satan against God and against Mahomet and the principles on which the sects may be classified, he deals with (1) the sects of Islam in detail, (2) the possessors of a written revelation (Jews and Christians) or something resembling it (the Magi), (3) the men who follow their own reason, i.e. the philosophers of Greece and their followers among the Moslems; the pre-Islamic Arabs, the Indians and the heathen. Among Shahrastani's other works still in manuscript only are a history of philosophers, a dogmatic text-book and a treatment of seven metaphysical questions.

A brief account of him is given on the authority of his pupil, the historian Sam 'am, in Ibn Khallikan, vol. ii., pp. 675 ff. (G. W. T.)

SHAHRUD, the capital of the Shahrud-Bostam province of Persia, situated about 258 m. E. of Teheran, on the highroad thence to Meshed, at an altitude of 4460 ft., in 36 25′ N., 54 59′ E. It has a population of about 10,000, post and telegraph offices, and a transit trade between western Khorasan and Astara- bad. Although capital of the province, it is not the residence of the governor, who prefers the more healthy Bostam, a small city with fine gardens and a mosque of the 14th century, lying 3 m. to the north-east.

SHAH SHUJA (i78o?i842), king of Afghanistan, was the son of Timur Shah, and grandson of Ahmad Shah, founder of the Durani dynasty. After conspiracies that caused the dethrone ment of two brothers, Taman Shah and Mahmud Shah, he became king in 1803. He was, however, in his turn driven out of Afghanistan in 1809 by Mahmud Shah, and found refuge and a pension in British territory. Distrusting the attitude of the Amir Dost Mahommed towards Russia, Lord Auckland in 1839 attempted to restore Shah Shuja to the throne against the wishes of the Afghan people. This policy led to the disastrous first Afghan War. After the retreat of the British troops from Kabul, Shah Shuja shut himself up in the Bala Hissar. He left this retreat on the 5th of April 1842, and was immediately killed by the adherents of Dost Mahommed and his son Akbar Khan.

SHAIRP, JOHN CAMPBELL (1819-1885), Scottish critic and man of letters, was born at Houstoun House, Linlithgowshire, on the 30th of

July 1819. He was the third son of Major Norman Shairp of Houstoun, and was educated at Edinburgh Academy and Glasgow University. He gained the Snell exhibition, and entered at Balliol College, Oxford, in 1840. In 1842 he gained the Newdigate prize for a poem on Charles XII., and took his degree in 1844. During these years the " Oxford movement " was at its height. Shairp was stirred by Newman's sermons, and he had a great admiration for the poetry of Keble, on whose character and work he wrote an enthusiastic essay; but he remained faithful to his Presbyterian upbringing. After leaving Oxford he took a mastership at Rugby under Tait. In 1857 he became assistant to the professor of humanity in the university of St Andrews, and in 1861 he was appointed to that chair. In 1864 he published Kilmahoe, a Highland Pastoral, and in 1868 he republished some articles under the name of Studies in Poetry and Philosophy. In 1868 he was presented to the principalship of the United College, St Andrews, and lectured from time to time on literary and ethical subjects. A course of the lectures was published in 1870 as Culture and Religion. In 1873 Principal Shairp helped to edit the life of his predecessor J. D. Forbes, and in 1874 he edited Dorothy Wordsworth's charming Recollections of a Tour in Scotland. In 1877 he was elected professor of poetry at Oxford in succession to Sir F. H. Doyle. Of his lectures from this chair the best were published in 1881 as Aspects of Poetry. In 1877 ne had published The Poetic Interpretation of Nature, in which he enters fully into the " old quarrel," as Plato called it, between science and poetry, and traces with great clearness the ideas of nature in all the chief Hebrew, classical and English poets. In 1879 he contributed a life of Robert Burns to the " English Men of Letters "series. He was re-elected to the chair of

poetry in 1882, and discharged his duties there and at St Andrews till the end of 1884. He died at Ormsary, Argyllshire, on the 18th of September 1885. In 1888 appeared Glen Desseray, and other Poems, edited by F. T. Palgrave. See W. A. Knight's Principal Shairp and his Friends (1888).

SHAKERS, an American celibate and communistic sect, officially called " The United Society of Believers in Christ's Second Appearing" or " The Millennial Church." 1 The early Quakers were sometimes called Shakers, and the name, or its variant, Shaking Quakers, was applied in the early 18th century to a Manchester

offshoot of the English Quakers, who, led by James and Ann Wardley, accepted the peculiar doctrines of the French Prophets, or Camisards, of Vivarais and Dauphin!. 2 The Wardleys were succeeded by the real founder of Shakerism, Ann Lee (1 736-1 784), the daughter of a Manchester blacksmith. Although a believer in celibacy, she had at her parents' urging married one Abraham Stanley (Standley, or Standerin); had borne him four children, who died in infancy; had joined the Wardleys in 1758; and had influenced their followers to preach more publicly the imminent second coming and to attack sin more boldly and unconventionally. She was frequently im- prisoned for breaking the Sabbath by dancing and shouting, and for blasphemy; had many "miraculous" escapes from death; and once, according to her story, being examined by four clergy- men of the Established Church, spoke to them for four hours in seventy-two tongues. While in prison in Manchester for fourteen days, she said she had a revelation that " a complete cross against the lusts of generation, added to a full and explicit confession, before witnesses, of all the sins committed under its influence, was the only possible remedy and means of salvation." After this, probably in 1770, she was chosen by the society as " Mother in spiritual things " and called herself " Ann, the Word." In 1774 a revelation bade her take a select band to America. Ac- companied by her husband, who soon afterward deserted her; her brother, William Lee (1740-1784); Nancy Lee, her niece; James Whittaker (1751-1787), who had been brought up by Mother Ann and was probably related to her; John Hocknell (1 723-1 799), who provided the funds for the trip; his son, Richard; and James Shepherd and Mary Partington, Mother Ann arrived on the 6th of August 1774 in New York City. Here they stayed for nearly two years. In 1776 Hocknell bought land at Niskayuna, in the township of Watervliet, near Albany, and the Shakers settled there. A spiritualistic revival in the neigh- bouring town of New Lebanon sent many penitents to Watervliet, who accepted Mother Ann's teachings and organized in 1787 (before any formal organization in Watervliet) the New Lebanon Society, the first Shaker Society, at New Lebanon (since 1861 called Mt. Lebanon), Columbia county, New York. The Society at Watervliet, organized immediately afterwards, and the New Lebanon Society formed a bishopric. The Watervliet members, as non-resistants and non-jurors, had got into trouble during the War of Independence; in 1780 the Board of Elders were im- prisoned, but all except Mother Ann were speedily set free, and she was released in 1781.

In 1 781-1783 the Mother with chosen elders visited her followers in

New York, Massachusetts and Connecticut. She died in Watervliet on the 8th of September 1784. James Whittaker was head of the Believers for three years. On his death he was succeeded by Joseph Meacham (1 742-1 796), who had been a Baptist minister in Enfield, Connecticut, and had, second only to Mother Ann, the spiritual gift of revelation. Under his rule and that of Lucy Wright (1760-1821), who shared the headship with him during his lifetime and then for twenty-five years ruled alone, the organization of the Shakers and, particularly, a rigid communism, began. By 1793 property had been made a " con-

1 Some of its leaders prefer the name "Alethians," as they con- sider themselves children of the truth; but they do not repudiate the commonly applied name Shakers.

2 The Wardleys' followers, when " wrestling in soul to be freed from the power of sin and a worldly life," writhed and trembled so that they won the name Shakers; their trances and visions, their jumping and dancing, were like those of many other sects, such as the Low Countries dancers of the 14th and 15th centuries, the French Convulsionnaires of 1720-1770, or the Welsh Methodist Jumpers.

secrated whole " in the different communities, but a " non-communal order " also had been established, in which sym- pathizers with the principles of the Believers lived in families. The Shakers never forbade marriage, but refused to recognize it as a Christian institution since the second coming in the person of Mother Ann, and considered it less perfect than the celibate state. Shaker communities in this period were established in 1790 at Hancock, West Pittsfield, Mass.; in 1791 at Harvard, Mass.; in 1792 at East Canterbury (or Shaker Village), New Hampshire; and in 1793 at Shirley, Mass.; at Enfield (or Shaker Station), Connecticut; at Tyringham, Mass., where the Society was afterwards abandoned, its members joining the communities in Hancock and Enfield; at Gloucester (since 1890, Sabbath-day Lake), Maine; and at Alfred, Maine, where, more than anywhere else among the Shakers, spiritualistic healing of the sick was practised. In Kentucky and Ohio Shakerism entered after the Kentucky revival of 1 800-1 801, 3 and in 1805-1807 Shaker societies were founded at South Union, Logan county, and Pleasant Hill, Mercer county, Kentucky. In 1811 a community settled at Busro on the Wabash in Indiana; but it was soon abandoned and its members went to Ohio and to Kentucky. In Ohio later communities were formed at Water- vliet, Hamilton county, and at Whitewater, Dayton county. In 1828 the communal property at Sodus Bay, New York, was sold and the community removed to Groveland, or

Sonyea; their land here was sold to the state and the few remaining members went to Watervliet. A short-lived community at Canaan, N.Y., was merged in the Mount Lebanon (New York) and Enfield (Connecticut) communities. The numerical strength of the sect decreased rapidly, probably from 4000 to 1000 in 1887-1908; and there has been little effort made to plant new communities. The Mt. Lebanon Society in 1894 established a colony at Narcoossee, Florida; the attempt of the Union Village Society in 1898 to plant a settlement at White Oak, Camden county, Georgia, was unsuccessful. In 1910 the Union Village Society went into the hands of a receiver.

The period of spiritual manifestations among the Believers lasted from 1837 to 1847; first, children told of visits to cities in the spirit realm and gave messages from Mother Ann; in 1838 the gift of tongues was manifested and sacred places were set aside in each community, with names like Holy Mount; but in 1847 the spirits, after warning, left the Believers. The theology of the denomination is based on the idea of the dualism of God : the creation of male and female " in our image " showing the bi-sexuality of the Creator; in Jesus, born of a woman, the son of a Jewish carpenter, were the male manifestation of Christ and the first Christian Church ; and in Mother Ann, daughter of an English blacksmith, were the female manifesta- tion of Christ and the second Christian Church — she was the Bride ready for the Bridegroom, and in her the promises of the Second Coming were fulfilled. Adam's sin was in sexual impurity; marriage is done away with in the body of the Believers in the Second Appear- ance, who must pattern after the Kingdom in which there is no marriage or giving in marriage. The four virtues are virgin purity ; Christian communism; confession of sin, without which none can become Believers; and separation from the world. 'The Shakers do not believe in the divinity or deity of Jesus, or in the resurrection of the body. Their insistence on the bi-sexuality of God and their reverence for Mother Ann have made them advocates of sex equality. Their spiritual directors are elders and " eldresses," and their temporal guides are deacons and deaconesses in equal numbers. The prescribed uniform costume with woman's neckerchief and cap, and the custom of men wearing their hair long on the neck and cut in a straight bang on the forehead, still persist; but the women wear different colours. The communism of the Believers was an economic success, and their cleanliness, honesty and frugality received the highest praise. They made leather in New York for several years, but in selling herbs and garden seeds, in making " apple-sauce " (at

3 A prominent part in this revival had been taken by Richard McNemar, a Presbyterian, who had broken with his Church because

of his Arminian tendencies and had established the quasi-independent Turtle Creek Church. McNemar was won by Shaker missionaries in 1805, and many of his parishioners joined him to form the Union Village Community on the site of the old Turtle Creek, 4 m. W. of Lebanon, Warren county, Ohio. McNemar was a favouriteof Lucy Wright, who gave him the spiritual name Eleazer Right, which he changed to Eleazer Wright; he wrote The Kentucky Revival (Cincinnati, 1807), probably the earliest defence of Shakerism, and a poem, entitled A Concise Answer to the General Inquiry Who or What are the Shakers (1808).

Shirley), in weaving linen (at Alfred), and in knitting underwear they did better work.

See John P. MacLean, A Bibliography of Shaker Literature, with an Introductory Study of the Writings and Publications Pertaining to Ohio Believers (Columbus, Ohio, 1905), and his Sketch of the Life and the Labors of Richard McNemar (Franklin, Ohio, 1905); Charles Edson Robinson, A Concise History of the United Society of Believers, called Shakers (East Canterbury, N.H., 1893); Anna White and Leila S. Taylor, Shakerism, Its Meaning and Message (Columbus, Ohio, 1905) ; Frederick W. E;vans, Shakers: Compendium of the Origin, History, Principles, Rules and Regulations, Governments and Doctrines ‘ of the United Society of Believers in Christ’s Second Appearing (Albany, 1858; and often elsewhere under other titles); M. Catherine Allen, A Century of Communism (Pittsfield, 1902) ; and the works of Nordhoff, Noyes, Hinds, &c, on American communism.

SHAKESPEARE, WILLIAM (1564-1616), English poet, player and playwright, was baptized in the parish church of Stratford- upon-Avon in Warwickshire on the 26th of April Blrt J’ I 5ˆ4- The exact date of his birth is not known. Two

parentage. 18th-century antiquaries, William Oldys and Joseph Greene, gave it as April 23, but without quoting authority for their statements, and the fact that April 23 was the day of Shakespeare’s death in 1616 suggests a possible source of error. In any case his birthday cannot have been later than April 23, since the inscription upon his monument is evidence that on April 23, 1616, he had already begun his fifty-third year. His father, John Shakespeare, was

a burgess of the recently constituted corporation of Stratford, and had already filled certain minor municipal offices. From 1561 to 1563 he had been one of the two chamberlains to whom the finance of the town was entrusted. By occupation he was a glover, but he also appears to have dealt from time to time in various kinds of agricultural produce, such as barley, timber and wool. Aubrey {Lives, 1680) spoke of him as a butcher, and it is quite possible that he bred and even killed the calves whose skins he manipulated. He is sometimes described in formal documents as a yeoman, and it is highly probable that he com- bined a certain amount of farming with the practice of his trade. He was living in Stratford as early as 1552, in which year he was fined for having a dunghill in Henley Street, but he does not appear to have been a native of the town, in whose records the name is not found before his time; and he may reasonably be identified with the John Shakespeare of Snitterfield, who administered the goods of his father, Richard Shakespeare, in 1561. Snitterfield is a village in the immediate neighbourhood of Stratford, and here Richard Shakespeare had been settled as a farmer since 1529. It is possible that John Shakespeare carried on the farm for some time after his father's death, and that by 1570 he had also acquired a small holding called Ingon in Hampton Lucy, the next village to Snitterfield. But both of these seem to have passed subsequently to his brother Henry, who was buried at Snitterfield in 1596. There was also at Snitterfield a Thomas Shakespeare and an Anthony Shakespeare, who afterwards moved to Hampton Corley; and these may have been of the same family. A John Shakespeare, who dwelt at Clifford Chambers, another village close to Stratford, is clearly distinct. Strenuous efforts have been made to trace Shake- speare's genealogy beyond Richard of Snitterfield, but so far without success. Certain drafts of heraldic exemplifications of the Shakespeare arms speak, in one case of John Shakespeare's grandfather, in another of his great-grandfather, as having been rewarded with lands and tenements in Warwickshire for service to Henry VII. No such grants, however, have been traced, and even in the 16th-century statements as to " antiquity and service " in heraldic preambles were looked upon with suspicion.

The name Shakespeare is extremely widespread, and is spelt in an astonishing variety of ways. That of John Shakespeare occurs 166 times in the Council Book of the Stratford corporation, and appears to take 16 different forms. The verdict, not altogether unanimous, of competent palaeographers is to the effect that Shakespeare himself, in the extant examples of his signature, always wrote " Shakspere." In the printed signa- tures to the dedications of his poems, on the

title-pages of nearly ail the contemporary editions of his plays that bear his name, and in many formal documents it appears as Shakespeare.

This may be in part due to the martial derivation which the poet's literary contemporaries were fond of assigning to his name, and which is acknowledged in the arms that he bore. The forms in use at Stratford, however, such as Shaxpeare, by far the commonest, suggest a short pronunciation of the first syllable, and thus tend to support Dr Henry Bradley's derivation from the Anglo-Saxon personal name, Seaxberht. It is interesting, and even amusing, to record that in 1487 Hugh Shakspere of Merton College, Oxford, changed his name to Sawndare, because his former name vile repulatum est. The earliest record of a Shake- speare that has yet been traced is in 1 248 at Clapton in Gloucester- shire, about seven miles from Stratford. The name also occur? during the 13th century in Kent, Essex and Surrey, and during the 14th in Cumberland, Yorkshire, Nottinghamshire, Essex, Warwickshire and as far away as Youghal in Ireland. There- after it is found in London and most of the English counties, particularly those of the midlands; and nowhere more freely than in Warwickshire. There were Shakespeares in Warwick and in Coventry, as well as around Stratford; and the clan appears to have been very numerous in a group of villages about twelve miles north of Stratford, which includes Baddesley Clinton, Wroxall, Rowington, Haseley, Hatton, Lapworth, Packwood, Balsall and Knowle. William was in common use as a personal name, and Williams from more than one other family have from time to time been confounded with the dramatist. Many Shakespeares are upon the register of the gild of St Anne at Knowle from about 1457 to about 1526. Amongst these were Isabella Shakespeare, prioress of the Bene- dictine convent of Wroxall, and Jane Shakespeare, a nun of the same convent. Shakespeares are also found as tenants on the manors belonging to the convent, and at the time of the Dissolu- tion in 1534 one Richard Shakespeare was its bailiff and collector of rents. Conjectural attempts have been made on the one hand to connect the ancestors of this Richard Shakespeare with a family of the same name who held land by military tenure at Baddesley Clinton in the 14th and 15th centuries, and on tnc other to identify him with the poet's grandfather, Richard Shakespeare of Snitterfield. But Shakespeares are to be traced at Wroxall nearly as far back as at Baddesley Clinton, and there is no reason to suppose that Richard the bailiff, who was certainly still a tenant of Wroxall in 1556, had also since 1529 been farming land ten miles off at Snitterfield.

With the breaking of this link, the hope of giving Shakespeare

anything more than a grandfather on the father's side must be laid aside for the present. On the mother's side he was connected with a family of some distinction. Part at least of Richard Shakespeare's land at Snitterfield was held from Robert Arden of Wilmcote in the adjoining parish of Aston Cantlow, a cadet of the Ardens of Parkhall, who counted amongst the leading gentry of Warwickshire. Robert Arden married his second wife, Agnes Hill, formerly Webbe, in 1548, and had then no less than eight daughters by his first wife. To the youngest of these, Mary Arden, he left in 1 556 a freehold in Aston Cantlow consisting of a farm of about fifty or sixty acres in extent, known as Asbies. At some date later than November 1556, and probably before the end of 1557, Mary Arden became the wife of John Shakespeare. In October 1556 John Shakespeare had bought two freehold houses, one in Greenhill Street, the other in Henley Street. The latter, known as the wool shop, was the easternmost of the two tenements now combined in the so-called Shakespeare's birthplace. The western tenement, the birthplace proper, was probably already in John Shakespeare's hands, as he seems to have been living in Henley Street in 1552. It has sometimes been thought to have been one of two houses which formed a later purchase in 1575, but there is no evidence that these were in Henley Street at all.

William Shakespeare was not the first child. A Joan was baptized in 1558 and a Margaret in 1562. The latter was buried in 1563 and the former must also have died young, although her burial is not recorded, as a second Joan was baptized in 1569. A Gilbert was baptized in 1566, an Anne in 1571, a Richard in 1574 and ac EdmuD(3 in 1580. Anne died in T -579; Edmund,

Youth.

who like his brother became an actor, in 1607; Richard in 1613. Tradition has it that one of Shakespeare's brothers used to visit London in the 17 th century as quite an old man. If so, this can only have been Gilbert.

During the years that followed his marriage, John Shakespeare became prominent in Stratford life. In 1565 he was chosen as an alderman, and in 1568 he held the chief municipal office, that of high bailiff. This carried with it the dignity of justice of the peace. John Shakespeare seems to have assumed arms, and thenceforward

was always entered in corporation documents as " Mr " Shakespeare, whereby he may be distinguished from another John Shakespeare, a " corviser " or shoemaker, who dwelt in Stratford about 1584-1592. In 1571 as an ex-bailiff he began another year of office as chief alderman.

One may think, therefore, of Shakespeare in his boyhood as the son of one of the leading citizens of a not unimportant provincial market-town, with a vigorous life of its own, which in spite of the dunghills was probably not much unlike the life of a similar town to-day, and with constant reminders of its past in the shape of the stately buildings formerly belonging to its college and its gild, both of which had been suppressed at the Reformation. Stratford stands on the Avon, in the midst of an agricultural country, throughout which in those days enclosed orchards and meadows alternated with open fields for tillage, and not far from the wilder and wooded district known as the Forest of Arden. The middle ages had left it an heritage in the shape of a free grammar-school, and here it is natural to suppose that William Shakespeare obtained a sound enough education, 1 with a working knowledge of " Mantuan" 2 and Ovid in the original, even though to such a thorough scholar as Ben Jonson it might seem no more than " small Latin and less Greek." In 1577, when Shakespeare was about thirteen, his father's fortunes began to take a turn for the worse. He became irregular in his contributions to town levies, and had to give a mortgage on his wife's property of Asbies as security for a loan from her brother-in-law, Edmund Lambert. Money was raised to pay this off, partly by the sale of a small interest in land at Snitterfield which had come to Mary Shakespeare from her sisters, partly perhaps by that of the Greenhill Street house and other property in Stratford outside Henley Street, none of which seems to have ever come into William Shake- speare's hands. Lambert, however, refused to surrender the mortgage on the plea of older debts, and an attempt to recover Asbies by litigation proved ineffectual. John Shakespeare's difficulties increased. An action for debt was sustained against him in the local court, but no personal property could be found on which to distrain. He had long ceased to attend the meetings of the corporation, and as a consequence he was removed in 1 586 from the list of aldermen. In this state of domestic affairs it is not likely that Shakespeare's school life was unduly prolonged. The chances are that he was apprenticed to some local trade. Aubrey says that he killed calves for his father, and " would do it in a high style, and make a speech."

Whatever his circumstances, they did not deter him at the early age of eighteen from the adventure of marriage. Rowe „ . recorded the

name of Shakespeare's wife as Hathaway,

and Joseph Greene succeeded in tracing her to a family of that name dwelling in Shottery, one of the hamlets of Stratford. Her monument gives her first name as Anne, and her age as sixty-seven in 1623. She must, therefore, have been about eight years older than Shakespeare. Various small trains of evidence point to her identification with the daughter Agnes mentioned in the will of a Richard Hathaway of Shottery, who died in 1 581, being then in possession of the farm-house now known as "Anne Hathaway's Cottage." Agnes was legally a distinct name from Anne, but there can be no doubt that ordinary custom treated them as identical. The principal record of the

1 It is worth noting that Walter Roche, who in 1558 became fellow of Corpus Christi College, Oxford, was master of the school in I 57° – i57 2 , so that its standard must have been good.

2 Baptista Mantuanus (1448-1516), whose Latin Eclogues Were translated by Turberville in 1567.

marriage is a bond dated on November 28, 1582, and executed by Fulk Sandells and John Richardson, two yeomen of Stratford who also figure in Richard Hathaway's will, as a security to the bishop for the issue of a licence for the marriage of William Shakespeare and " Anne Hathwey of Stratford," upon the consent of her friends, with one asking of the banns. There is no reason to suppose, as has been suggested, that the procedure adopted was due to dislike of the marriage dn the part of John Shakespeare, since, the bridegroom being a minor, it would not have been in accordance with the practice of the bishop's officials to issue the licence without evidence of the father's consent. The explanation probably lies in the fact that Anne was already with child, and in the near neighbourhood of Advent within which marriages were prohibited, so that the ordinary procedure by banns would have entailed a delay until after Christmas. A kindly sentiment has suggested that some form of civil marriage, or at least contract of espousals, had already taken place, so that a canonical marriage was really only required in order to enable Anne to secure the legacy left her by her father " at the day of her marriage." But such a theory is not rigidly required by the facts. It is singular that, upon the day before that on which the bond was executed, an entry was made in the bishop's register of the issue of a licence for a marriage between William Shakespeare and " Annam Whateley de Temple Grafton." Of this it can only be said that the bond, as an original document, is infinitely the better authority, and that a scribal error of "Whateley" for " Hathaway "- is quite a

possible solution. Temple Grafton may have been the nominal place of marriage indicated in the licence, which was not always the actual place of residence of either bride or bridegroom. There are no contemporary registers for Temple Grafton, and there is no entry of the marriage in those for Stratford-upon- Avon. There is a tradition that such a record was seen during the 19th century in the registers for Luddirigton, a chapelry within the parish, which are now destroyed. Shakespeare's first child, Susanna, was baptized on the 26th of May 1583, and was followed on the 2nd of February 1585 by twins, Hamnet and Judith.

In or after 1584 Shakespeare's career in Stratford seems to have come to a tempestuous close. An 18th-century story of a drinking-bout in a neighbouring village is of no obscure importance, except as indicating a local impression years, that a distinguished citizen had had a wildish youth. 1584 ~ But there is a tradition which comes from a double source and which there is no reason to reject in substance, to the effect that Shakespeare got into trouble through poaching on the estates of a considerable Warwickshire magnate, Sir Thomas Lucy, and found it necessary to leave Stratford in order to escape the results of his misdemeanour. It is added that he afterwards took his revenge on Lucy by satirizing him as the Justice Shallow, with the dozen white louses in his old coat, of The Merry Wives of Windsor. From this event until he emerges as an actor and rising playwright in 1592 his history is a blank, and it is impossible to say what experience may not have helped to fill it. Much might indeed be done in eight years of crowded Elizabethan life. Conjecture has not been idle, and has assigned him in turns during this or some other period to the occupations of a scrivener, an apothecary, a dyer, a printer, a soldier, and the like. The suggestion that he saw military service rests largely on a confusion with another William Shake- speare of Rowington. Aubrey had heard that " he had been in his younger years a sehoolmaster in the country." The mention in Henry IV. of certain obscure yeomen families, Visor of Woncote and Perkes of Stinchcombe Hill, near Dursley in Gloucestershire, has been thought to suggest a sojourn in that district, where indeed Shakespeares were to be found from an early date. Ultimately, of course, he drifted to London and the theatre, where, according to the stage tradition, he found employment in a menial capacity, perhaps even as a holder of horses at the doors, before he was admitted into a company as an actor and so found his way to his true vocation as a writer of plays. Malone thought that he might have left

Stratford with one of the travelling companies of players which from time to time visited the town. Later biographers have fixed upon Leicester's men, who were at Stratford in 1587, and have held that Shakespeare remained to the end in the same company, passing with it on Leicester's death in 1588 under the patronage of Ferdinando, Lord Strange and afterwards earl of Derby, and on Derby's death in 1594 under that of the lord chamberlain, Henry Carey, Lord Hunsdon. This theory perhaps hardly takes sufficient account of the shifting combinations and recombinations of actors, especially during the disastrous plague years of 1592 to 1594. The continuity of Strange's company with Leicester's is very disputable, and while the names of many members of Strange's company in and about 1593 are on record, Shakespeare's is not amongst them. It is at least possible, as will be seen later, that he had about this time relations with the earl of Pembroke's men, or with the earl of Sussex's men, or with both of these organizations.

*What is clear is that by the summer of 1592, when he was twenty-eight, he had begun to emerge as a playwright, and had evoked the jealousy of one at least of the group of pl *?' h . scholar poets who in recent years had claimed a oaf poet, monopoly of the stage. This was Robert Greene, who, in an invective on behalf of the play-makers against the play-actors which forms part of his Groats-worth of Wit, speaks of " an upstart Crow, beautified with our feathers, that with his Tygers heart wrapt in a Players hide, supposes he is as well able to bumbast out a blanke verse as the best of you : and being an absolute Johannes fac iotum, is in his owne conceit the onely Shake-scene in a countrie." The play upon Shake- speare's name and the parody of a line from Henry VI. make the reference unmistakable. 1 The London theatres were closed, first through riots and then through plague, from June 1592 to April 1594, with the exception of about a month at each Christmas during that period; and the companies were dissolved or driven to the provinces. Even if Shakespeare had been connected with Strange's men during their London seasons of 1592 and 1593, it does not seem that he travelled with them. Other activities may have been sufficient to occupy the interval. The most important of these was probably an attempt to win a reputation in the world of non-dramatic poetry. Venus and Adonis was published about April 1593, and Lucrece about May 1594. The poems were printed by Richard Field, in whom Shakespeare would have found an old Stratford acquaintance; and each has a dedication to Henry Wriothesley, earl of South- ampton, a brilliant and accomplished favourite of the court, still in his nonage. A possibly super-subtle*

criticism discerns an increased warmth in the tone of the later dedication, which is supposed to argue a marked growth of intimacy. The fact of this intimacy is vouched for by the story handed down from Sir William Davenant to Rowe (who published in 1709 the first regular biography of Shakespeare) that Southampton gave Shakespeare a thousand pounds " to enable him to go through with a purchase which he heard he had a mind to." The date of this generosity is not specified, and there is no known purchase by Shakespeare which can have cost anything like the sum named. The mention of Southampton leads naturally to the most • difficult problem which a biographer has to handle, that of the Sonnets. But this will be more conveniently taken up at a later point, and it is only necessary here to put on record the probability that the earliest of the sonnets belong to the period now under discussion. There is a surmise, which is not in itself other than plausible, and which has certainly been supported with a good deal of ingenious argument, that Shakespeare's enforced leisure enabled him to make of 1593 a Wanderjahr, and in particular that the traces of a visit to northern Italy may clearly be seen in the local colouring of Lucrece as compared with Venus and Adonis, and in that of the group of plays which may be dated in or about 1594 and 1595 as compared with those that preceded. It must, however, be borne in mind that, while Shakespeare may perfectly well, at this or at some earlier time, have voyaged

1 It is most improbable, however, that the apologetic reference in Chettle's Kind-hart's Dream (December 1592) refers to Shakespeare.

to Italy, and possibly Denmark and even Germany as well, there is no direct evidence to rely upon, and that inference from internal evidence is a dangerous guide when a writer of so assimila- tive a temperament as that of Shakespeare is concerned.

From the reopening of the theatres in the summer of 1594 onwards Shakespeare's status is in many ways clearer. He had certainly become a leading member of the Chamber- lain's company by the following winter, when his w " e °" name appears for the first and only time in the treasurer chamber- of the chamber's accounts as one of the recipients of Iain's payment for their performances at court; and there is '°"^ every reason to suppose that he continued to act with and write for the same associates to the close of his career. The history of the company may be briefly told. At the death of the lord chamberlain on the 22nd of July 1596, it passed under the protection of his successor, George, 2nd Lord Hunsdon, and once more became " the Lord Chamberlain's men " when he was appointed*

to that office on the 17th of March 1597. James I. on his accession took this company under his patronage as grooms of the chamber, and during the remainder of Shakespeare's connexion with the stage they were " the King's men." The records of performances at court show that they were by far the most favoured of the companies, their nearest rivals being the company known during the reign of Elizabeth as " the Admiral's," and afterwards as " Prince Henry's men." From the summer of 1594 to March 1603 they appear to have played almost continuously in London, as the only provincial performances by them which are upon record were during the autumn of 1597, when the London theatres were for a short time closed owing to the interference of some of the players in politics. They travelled again during 1603 when the plague was in London, and during at any rate portions of the summers or autumns of most years thereafter. In 1594 they were playing at Newington Butts, and probably also at the Rose on Bankside, and at the Cross Keys in the city. It is natural to suppose that in later years they used the Theatre in Shoreditch, since this was the property of James Burbage, the father of their principal actor, Richard Burbage. The Theatre was pulled down in 1598, and, after a short interval during which the company may have played at the Curtain, also in Shoreditch, Richard Burbage and his brother Cuthbert rehoused them in the Globe on Bankside, built in part out of the materials of the Theatre. Here the profits of the enterprise were divided between the members of the company as such and the owners of the building as " housekeepers," and shares in the " house " were held in joint tenancy by Shake- speare and some of his leading " fellows." About 1608 another playhouse became available for the company in the " private " or winter house of the Black Friars. This was also the property of the Burbages, but had previously been leased to a company of boy players. A somewhat similar arrangement as to profits was made.

Shakespeare is reported by Aubrey to have been a good actor, but Adam in A s You Like It, and the Ghost in Hamlet indicate the type of part which he played. As a dramatist, however, he was the mainstay of the company for at least some fifteen years, during which Ben Jonson, Dekker, Beaumont and Fletcher, and Tourneur also contributed to their repertory. On an average he must have written for them about two plays a year, although his rapidity of production seems to have been greatest during the opening years of the period. There was also no doubt a good deal of rewriting of his own earlier work, and also perhaps, at the beginning, of that of others. Occasionally he may have entered into collaboration, as, for example, at the end of his career, with Fletcher.

In a worldly sense he clearly flourished, and about 1596, if not earlier, he was able to resume relations as a moneyed man with Stratford-on-Avon. There is no evidence to show whether he had visited the town in the interval, or whether he had brought his wife and family to London. His son Hamnet died and was buried at Stratford in 1596. During the last ten years John Shakespeare's affairs had remained unprosperous. He incurred fresh debt, partly through becoming surety for

his brother Henry; and in 1592 his name was included in a list of recusants dwelling at or near Stratford-on-Avon,with a note by the commissioners that in his case the cause was believed to be the fear of process for debt. There is no reason to doubt this explanation, or to seek a religious motive in affairs. John Shakespeare's abstinence from church. William Shakespeare's purse must have made a considerable difference. The prosecutions for debt ceased, and in 1597 a fresh action was brought in Chancery for the recovery of Asbies from the Lamberts. Like the last, it seems to have been without result. Another step was taken to secure the dignity of the family by an application in the course of 1596 to the heralds for the confirmation of a coat of arms said to have been granted to John Shakespeare while he was bailiff of Stratford. The bearings were or on a bend sable a spear or steeled argent, the crest a falcon his wings displayed argent supporting a spear or steeled argent, and the motto Non sanz droict. The grant was duly made, and in 1 599 there was a further application for leave to impale the arms of Arden, in right of Shakespeare's mother. No use, however, of the Arden arms by the Shake- speares can be traced. In 1597 Shakespeare made an important purchase for £60 of the house and gardens of New Place in Chapel Street. This was one of the largest houses in Stratford, and its acquisition an obvious triumph for the ex-poacher. Presum- ably John Shakespeare ended his days in peace. A visitor to his shop remembered him as " a merry-cheekt old man " always ready to crack a jest with his son. He died in 1601, and his wife in 1608, and the Henley Street houses passed to Shakespeare. Aubrey records that he paid annual visits to Stratford, and there is evidence that he kept in touch with the life of the place. The correspondence of his neighbours, the Quineys, in 1 598 contains an application to him for a loan to Richard Quiney upon a visit to London, and a discussion of possible investments for him in the neighbourhood of Stratford. In 1602 he took, at a rent of 2S. 6d. a year, a copyhold cottage in

Chapel Lane, perhaps for the use of his gardener. In the same year he invested £320 in the purchase of an estate consisting of 107 acres in the open fields of Old Stratford, together with a farm-house, garden and orchard, 20 acres of pasture and common rights; and in 1605 he spent another £440 in the outstanding term of a lease of certain great tithes in Stratford parish, which brought in an income of about £60 a year.

Meanwhile London remained his headquarters. Here Malone thought that he had evidence, now lost, of his residence in South- wark as early as 1596, and as late as 1608. It is assocla- known that payments of subsidy were due from him tions. for 1597 and 1598 in the parish of St Helen's, Bishops-

gate, and that an arrear was ultimately collected in the liberty of the Clink. He had no doubt migrated from Bishopsgate when the Globe upon Bankside was opened by the Chamberlain's men. There is evidence that in 1604 he " lay," temporarily or permanently, in the house, of Christopher Mountjoy, a tire-maker of French extraction, at the corner of Silver Street and Monkwell Street in Cripplegate. A recently recovered note by Aubrey, if it really refers to Shakespeare (which is not quite certain), is of value as throwing light not only upon his abode, but upon his personality. Aubrey seems to have derived it from William Beeston the actor, and through him from John Lacy, an actor of the king's company. It is as follows: " The more to be admired q[uod] he was not a company-keeper, lived in Shoreditch, would not be debauched, & if invited to court, he was in paine." Against this testimony to the correctness of Shakespeare's morals are to be placed an anecdote of a green-room amour picked up by a Middle Temple student in 1602 and a Restoration scandal which made him the father by the hostess of the Crown Inn at Oxford, where he baited on his visits to Stratford, of Sir William Davenant, who was born in February 1606. His credit at court is implied by Ben Jonson's references to his flights " that so did take Eliza and our James," and by stories of the courtesies which passed between him and Elizabeth while he was playing a kingly part in her presence, of the origin of The Merry Wives of Windsor in

her desire to see Falstaff in love, and of an autograph letter written to honour him by King James. It was noticed with some surprise by Henry Chettle that his " honied muse " dropped no " sable tear " to celebrate the death of the queen. South- ampton's patronage may have introduced him to the brilliant circle that gathered round the earl of Essex, but there is no reason to suppose that he or his company were held personally responsible for the performance of

Richard II. at the command of some of the followers of Essex as a prelude to the disastrous rising ot February 1601. The editors of the First Folio speak also of favours received by the author in his lifetime from William Herbert, earl of Pembroke, and his brother Philip Herbert, earl of Montgomery.

He appears to have been on cordial terms with his fellows of the stage. One of them, Augustine Phillips, left him a small legacy in 1605, and in his own will he paid a Friends similar compliment to Richard Burbage, and to John Heminge and Henry Condell, who afterwards edited his plays. His relations with Ben Jonson, whom he is said by Rowe to have introduced to the world as a playwright, have been much canvassed. Jests are preserved which, even if apocryphal, indicate considerable intimacy between the two. This is not inconsistent with occasional passages of arms. The anonymous author of The Return from Parnassus (2nd part; 1602), for example, makes Kempe, the actor, allude to a " purge " which Shakespeare gave Jonson, in return for his attack on some of his rivals in The Poetaster. 1 It has been conjectured that this purge was the description of Ajax and his humours in Troilus and Cressida. Jonson, on the other hand, who was criticism incarnate, did not spare Shakespeare either in his prologues or in his private conversation. He told Drummond of Hawthornden that " Shakspeer wanted arte." But the verses which he con- tributed to the First Folio are generous enough to make all amends, and in his Discoveries (pub. 1641 ; written c. 1624 and later), while regretting Shakespeare's excessive facility and the fact that he often " fell into those things, could not escape laughter," he declares him to have been " honest and of an open and free nature," and says that, for his own part, " I lov'd the man and do honour his memory (on this side idolatry) as much as any." According to the memoranda-book (1661-1663) of the Rev. John Ward (who became vicar of Stratford in 1662), Jonson and Michael Drayton, himself a Warwickshire poet, had been drinking with Shakespeare when he caught the fever of which he died; and Thomas Fuller (1 608-1661), whose Worthies was published in 1662, gives an imaginative description of the wit combats, of which many took place between the two mighty contemporaries.

Of Shakespeare's literary reputation during his lifetime there is ample evidence. He is probably neither the " Willy " of Spenser's Tears of the Muses, nor the " Aetion " of Content- his Colin Clout's Come Home Again. But from the porary time of the publication of Venus and Adonis and reputa- Lucrece honorific allusions to his work both as poet and dramatist, and often to himself by name, come thick and fast from writers of every kind and degree. Perhaps

the most interesting of these from the biographical point of view are those contained in the Palladis Tamia, a kind of literary handbook published by Francis Meres in 1598; for Meres not only extols him as " the most excellent in both kinds [i.e. comedy and tragedy] for the stage," and one of " the most passionate among us to bewaile and bemoane the perplexities of Love," but also takes the trouble to give a list of twelve plays already written, which serves as a starting-point for all modern attempts at a chronological arrangement of his work. It is moreover from Meres that we first hear of " his sugred Sonnets among his private friends." Two of these sonnets were printed in 1599

1 Kempe (speaking to Burbage), " Few of the university pen plays well. They smell too much of that writer Ovid and that writer (sic) Metamorphosis, and talk too much of Proserpina and Jupiter. Why here's our fellow Shakespeare puts them all down; aye, and Ben Jonson too. O that Ben Jonson is a pestilent fellow. He brought up Horace giving the Poets a pill, but our fellow Shakespeare hath given him a purge that made him beray his credit."

Last years,

in a volume of miscellaneous verse called The Passionate Pilgrim. This was ascribed upon the title-page to Shakespeare, but pro- bably, so far as most of its contents were concerned, without justification. The bulk of Shakespeare's sonnets remained unpublished until 1609.

About 1610 Shakespeare seems to have left London, and entered upon the definite occupation of his house at New Place, Stratford. Here he lived the life of a retired gentleman, on friendly if satirical terms with the richest of his neighbours, the Combes, and interested in local affairs, such as a bill for the improvement of the highways in 161 1, or a proposed enclosure of the open fields at Welcombe in 1614, which might affect his income or his comfort. He had his garden with its mulberry-tree, and his farm in the immediate neighbourhood. His brothers Gilbert and Richard were still alive; the latter died in 1613. His sister Joan had married William Hart, a hatter, and in 1616 was dwelling in one of his houses in Henley Street. Of his daughters, the eldest, Susanna, had married in 1607 John Hall (d. 1635), a physician of some re- putation. They dwelt in Stratford, and had one child, Elizabeth, afterwards Lady Barnard

(1608-1670). The younger, Judith, married Thomas Quiney, a vintner, also of Stratford, two months before her father's death. At Stratford the last few of the plays may have been written, but it is reasonable to suppose that Shake- speare's connexion with the King's company ended when the Globe was burnt down during a performance of Henry VIII. on the 29th of June 1613. Certainly his retirement did not imply an absolute break with London life. In 1613 he devised an impresa, or emblem, to be painted by Richard Burbage, and worn in the tilt on Accession day by the earl of Rutland, who had been one of the old circle of Southampton and Essex. In the same year he purchased for £140 a freehold house in the Black- friars, near the Wardrobe. This was conveyed to trustees, apparently in order to bar the right which his widow would otherwise have had to dower. In 1615 this purchase involved Shakespeare in a lawsuit for the surrender of the title-deeds. Richard Davies, a Gloucestershire clergyman of the end of the 17th century, reports that the poet " died a papist," and the statement deserves more attention than it has received from biographers. There is indeed little to corroborate it; for an alleged " spiritual testament " of John Shakespeare is of suspected origin, and Davies's own words suggest a late conversion rather than an hereditary faith. On the other hand, there is little to refute it beyond an entry in the accounts of Stratford corporation for drink given in 1614 to " a preacher at the Newe Place."

Shakespeare made his will on the 25th of March 1616, appar- ently in some haste, as the executed deed is a draft with many erasures and interlineations. There were legacies to his daughter Judith Quiney and his sister Joan Hart, and remembrances to friends both in Warwickshire and in London; but the real estate was left to his sister Susanna Hall under a strict entail which points to a desire on the part of the testator to found a family. Shakespeare's wife, for whom other provision must have been made, is only mentioned in an inter- lineation, by which the " second best bed with the furniture " was bequeathed to her. Much nonsense has been written about this, but it seems quite natural. The best bed was an important chattel, which would go with the house. The estate was after all not a large one. Aubrey's estimate of its annual value as £200 or £300 a year sounds reasonable enough, and John Ward's state- ment that Shakespeare spent £1000 a year must surely be an exaggeration. The sum-total of his known investments amounts to £960. Mr Sidney Lee calculates that his theatrical income must have reached £600 a year; but it may be doubted whether this also is not a considerable overestimate. It must be remembered that the purchasing value of money in the 17th century is generally regarded as having been

about eight times its present value. Shakespeare's interest in the " houses " of the Globe and Blackfriars probably determined on his death.

A month after his will was signed, on the 23rd of April 1616, Shakespeare died, and as a tithe-owner was buried in the chancel of the parish church. Some doggerel upon the stone that covers

win.

Death.

the grave has been assigned by local tradition to his own pen. A more elaborate monument, with a bust by the sculptor Gerard Johnson, was in due course set up on the chancel wall. Anne Shakespeare followed her husband on the 6th of August 1623. The family was never founded. Shake- speare's grand-daughter, Elizabeth Hall, made two childless marriages, the first with Thomas Nash of Stratford, the second with John, afterwards Sir John, Barnard of Abington Manor, Northants. His daughter Judith Quiney had three sons, all of whom had died unmarried by 1639. There were, therefore, no direct descendants of Shakespeare in existence after Lady Barnard's death in 1670. Those of his sister, Joan Hart, could however still be traced in 1864. "On Lady Barnard's death the Henley Street houses passed to the Harts, in whose family they remained until 1806. They were then sold, and in 1846 were bought for the public. They are now held with Anne Hathaway's Cottage at Shottery as the Birthplace Trust. Lady Barnard had disposed of the Blackfriars house. The rest of the property was sold under the terms of her will, and New Place passed, first to the Cloptons who rebuilt it, and then to the Rev. Francis Gastrell, who pulled it down in 1 7 59. The site now forms a public recreation-ground, and hard by is a memorial building with a theatre in which performances of Shakespeare's plays are given annually in April. Both the Memorial and the Birthplace contain museums, in which books, documents and portraits of Shakespearian interest, together with relics of greater or less authenticity, are stored.

No letter or other writing in Shakespeare's hand can be proved to exist, with the exception of three signatures upon his will, one upon a deposition (May n, 161 2) in a lawsuit with which he was remotely concerned, and two upon deeds (March ro and 11, 1 61 3) in connexion with the purchase of his Blackfriars house. A copy of Florio's translation of Montaigne (1603) in the British Museum, a copy of the Aldine edition of Ovid's Metamorphoses (1502) in the Bodleian, and a copy of the 1612 edition of Sir Thomas North's

translation of Plutarch's Lives of the Noble Grecians and Romaines in the Greenock Library, have all been put forward with some plausibility as bearing his autograph name or initials, and, in the third case, a marginal note by him. A passage in the manuscript of the play of Sir Thomas More has been ascribed to him {vide infra), and, if the play is his, might be in his handwriting. Aubrey records that he was " a hand- some, well-shap't man," and the lameness attributed to him by some writers has its origin only in a too literal interpretation of certain references to spiritual disabilities in the Sonnets.

A collection of Mr William Shakespeare' s Comedies, Histories and Tragedies was printed at the press of William and Isaac Jaggard, and issued by a group of booksellers in 1623. This volume is known as the First Folio. It has dedications to the earls of Pembroke and Montgomery, and to " the great Variety of Readers," both of which are signed by two of Shakespeare's " fellows " at the Globe, John Heminge and Henry Condell, and commendatory verses by Ben Jonson, Hugh Holland, Leonard Digges and an unidentified I. M. The Droeshout engraving forms part of the title-page. The contents include, with the exception of Pericles, all of the thirty- seven plays now ordinarily printed in editions of Shakespeare's works. Of these eighteen were here published for the first time. The other eighteen had already appeared in one or more separate editions, known as the Quartos.

The following list gives the date of the First Quarto of each such play, and also that of any later Quarto which differs materially from the First.

The Quarto Editions.

Titus Andronicus (1594).

2 Henry VI. (1594).

3 Henry VI. (1595). Richard II. (1597, 1608). Richard III. (1597).

Romeo and Juliet (1597, 1599). Love's Labour's Lost (1598).

1 Henry IV. (1598).

2 Henry IV. (1600). Henry V. (1600).

A Midsummer Night's Dream

(1600).

The Merchant of Venice (1600). Much Ado About Nothing (1600). The Merry Wives of Windsor

(1602).

Hamlet (1603, 1604). King Lear (1608). Troilus and Cressida (1609). Othello (1622).

Entries in the Register of copyrights kept by the Company of Stationers indicate that editions of As You Like It and Anthony and Cleopatra were contemplated but not published in 1600 and 1608 respectively.

The Quartos differ very much in character. Some of them contain texts which are practically identical with those of the First Folio; others show variations so material as to suggest that some revision, either by rewriting or by shortening for stage purposes, took place. Amongst the latter are 2, 3 Henry VI., Richard III., Romeo and Juliet, The Merry Wives of Windsor, Hamlet and King Lear. Many scholars doubt whether the Quarto versions of 2, 3 Henry VI., which appeared under the titles of The First Part of the Contention betwixt the two famous Houses of York and Lancaster and The True Tragedy of Richard Duke of York, are Shakespeare's work at all. It seems clear that the Quartos of The Troublesome Reign of John King of England (1591) and The Taming of A Shrew (1594), although treated for copyright purposes as identical with the plays of King John and The Taming of the Shrew, which he founded upon them, are not his. The First Quartos of Romeo and Juliet, Henry V ., The Merry Wives of Windsor, and Hamlet seem to be mainly based, not upon written texts of the plays, but upon versions largely made up out of shorthand notes taken at the theatre by the agents of a piratical bookseller. A similar desire to exploit the commercial value of Shakespeare's reputation probably led to the appearance of his name or initials upon the title-pages of Locrine (1595), Sir John Oldcastle (1600), Thomas Lord Cromwell (1602), The London Prodigal (1605), The Puritan (1607), A Yorkshire Tragedy (1608), and Pericles (1609). It is not likely that, with the exception of the last three acts of Pericles, he wrote any part of these plays, some of which were not even produced by his company. They were not

included in the First Folio of 1623, nor in a reprint of it in 1632, known as the Second Folio; but all seven were appended to the second issue (1664) of the Third Folio (1663), and to the Fourth Folio of 1685. Shakespeare is named as joint author with John Fletcher on the title-page of The Two Noble Kinsmen (1634) , and with William Rowley on that of The Birth of Merlin (1662); there is no reason for rejecting the former ascription or for accepting the latter. Late entries in the Stationers' Register assign to him Cardenio (with Fletcher), Henry I. and Henry II. (both with Robert Davenport), King Stephen, Duke Humphrey, and Iphis and lanlhe; but none of these plays is now extant. Modern conjecture has attempted to trace his hand in other plays, of which Arden of Fever sham (1592), Edward III. (1596), Mucedorus (1598), and The Merry Devil of Edmonton (1608) are the most important; it is quite possible that he may have had a share in Edward III. A play on Sir Thomas More, which has been handed down in manu- script, contains a number of passages, interpolated in various handwritings, to meet requirements of the censor; and there are those who assign one of these (ii. 4, 1-172) to Shakespeare.

Unfortunately the First Folio does not give the dates at which the plays contained in it were written or produced; and the endeavour to supply this deficiency has been one of the Dates. ma j n preoccupations of more than a century of Shake- spearian scholarship, since the pioneer essay of Edmund Malone in his An Attempt to Ascertain the Order in which the Plays of Shakespeare were Written (1778). The investigation is not a mere piece of barren antiquarianism, for on it depends the possibility of appreciating the work of the world's greatest poet, not as if it were an articulated whole like a philosophical system, but in its true aspect as the reflex of a vital and constantly developing personality. A starting-point is afforded by the dates of the Quartos and the entries in the Stationers' Register which refer to them, and by the list of plays already in existence in 1 598 which is inserted by Francis Meres in his Palladis Tamia of that year, and which, while not necessarily exhaustive of Shakespeare's pre-1598 writing, includes The Two Gentlemen of

Verona, The Comedy of Errors, Love's Labour's Lost, A Mid- summer Night's Dream, The Merchant of Venice, Richard II.,

Richard III., Henry IV., King John, Titus Andronicus and

Romeo and Juliet, as well as a mysterious Love's Labour's Won,

which has been conjecturally identified with several plays, but most

plausibly with The Taming of the Shrew. There is a mass of supplementary evidence, drawn partly from definite notices in other writings or in diaries, letters, account-books, and similar records, partly from allusions to contemporary persons and events in the plays themselves, partly from parallels of thought and expression between each play and those near to it in point of time, and partly from considerations of style, includ- ing the so-called metrical tests, which depend upon an analysis of Shakespeare's varying feeling for rhythm at different stages of his career. The total result is certainly not a demonstration, but in the logical sense an hypothesis which serves to colligate the facts and is consistent with itself and with the known events of Shakespeare's external life.

The following table, which is an attempt to arrange the original dates of production of the plays without regard to possible revisions, may be taken as fairly representing the common results of recent scholarship. It is framed on the assumption that, as indeed John Ward tells us was the case, Shakespeare ordinarily wrote two plays a year; but it will be understood that neither the order in which the plays are given nor the distribution of them over the years lays claim to more than approximate accuracy.

Chronology of

1591-

(1, 2) The Contention of York and Lancaster (2, 3 Henry VI.).

1592.

(3) 1 Henry VI.

(The theatres were closed fpr riot and plague from June to the end of December.)

1593-

(4) Richard III.

(5) Edward III. (part only).

(6) The Comedy of Errors. (The theatres were closed for

plague from the beginning of February to the end of December.)

1594-

(7) Titus Andronicus.

(The theatres were closed for plague during February and March.)

(8) Taming of the Shrew.

(9) Love's Labour's Lost. (10) Romeo and Juliet.

1595-

(n) A Midsummer Night's Dream.

(12) TheTwo Gentlemen of Verona.

(13) King John.

1596.

(14) Richard II.

(iS) The Merchant of Venice.

1597-

(The theatres were closed for misdemeanour from the end of July to October.)

(16) I Henry IV.

1598.

(17) 2 Henry IV.

(18) Much Ado About Nothing.

1599-

(19) Henry V.

(20) Julius Caesar.

the Plays.

1600.

(21) The Merry Wives of Windsor.

(22) As You Like It.

1601.

(23) Hamlet.

(24) Twelfth Night.

1602.

(25) Troilus and Cressida.

(26) All's Well that Ends Well.

1603.

(The theatres were closed on Elizabeth's death in March, and remained closed for plague throughout the year.)

1604.

(27) Measure for Measure.

(28) Othello.

1605.

(29) Macbeth.

(30) King Lear.

1606.

(31) Anthony and Cleopatra.

(32) Coriolanus.

1607.

(33) Timon of Athens (un- finished).

1608.

(34) Pericles (part only).

1609.

(35) Cymbeline.

1610.

(36) The Winter's Tale.

1611.

(37) The Tempest.

1612.

1613.

(38) The Two Noble Kinsmen

(part only)..

(39) Henry VIII. (part only).

A more detailed account of the individual plays may now be attempted. The figures here prefixed correspond to those in the table above.

1, 2. The relation of The Contention of York and Lancaster to 2, 3 Henry VI. and the extent of Shakespeare's responsibility for either or both works have long been subjects of Composl , controversy. The extremes of critical opinion are to fan. be found in a theory which regards Shakespeare as the sole author of 2, 3 Henry VI. and The Contention as a shortened and piratical version of the original plays, and in a theory which regards The Contention as written in collaboration by Marlowe, Greene and possibly Peele, and 2, 3 Henry VI. as a revision of

The Contention written, also in collaboration, by Marlowe and Shakespeare. A comparison of the two texts leaves it hardly possible to doubt that the differences between them are to be explained by revision rather than by piracy; but the question of authorship is more difficult. Greene's parody, in the " Shake- scene " passage of his Groats-worth of Wit (1592), of a line which occurs both in The Contention and in 3 Henry VI., while it clearly suggests Shakespeare's connexion with the plays, is evidence neither for nor against the participation of other men, and no sufficient criterion exists for distinguishing between Shakespeare's earliest writing and that of possible collaborators on grounds of style. But there is nothing inconsistent between the reviser's work in 2, 3 Henry VI. and

on the one hand Richard III. or on the other the original matter of The Contention, which the reviser follows and elaborates scene by scene. It is difficult to assign to any one except Shakespeare the humour of the Jack Cade scenes, the whole substance of which is in The Contention as well as in Henry VI. Views which exclude Shakespeare alto- gether may be left out of account. Henry VI. is not in Meres's list of his plays, but its inclusion in the First Folio is an almost certain ground for assigning to him some share, if only as reviser, in the completed work.

3. A very similar problem is afforded by 1 Henry VI., and here also it is natural, in the absence of tangible evidence to the contrary, to hold by Shakespeare's substantial responsibility for the play as it stands. It is quite possible that it also may be a revised version, although in this case no earlier version exists; and if so the Talbot scenes (iv. 2-7) and perhaps also the Temple Gardens scene (ii. 4), which are distinguished by certain qualities of style from the rest of the play, may date from the period of revision. Thomas Nash refers to the representation of Talbot on the stage in his Pierce Penilesse, his Supplication to the Divell (1592), and it is probable that 1 Henry VI. is to be identified with the " Harey the yj." recorded in Henslowe's Diary to have been acted as a new play by Lord Strange's men, probably at the Rose, on the 3rd of March 1592. If so, it is a reasonable conjecture that the two parts of The Contention were originally written at some date before the beginning of Henslowe's record in the previous February, and were revised so as to fall into a series with 1 Henry VI. in the latter end of 1592.

4. The series as revised can only be intended to lead directly up to Richard III., and this relationship, together with its style as compared with that of the plays belonging to the autumn of 1594, suggest the short winter season of 159 2-1 593 as the most likely time for the production of Richard III. There is a difficulty in that it is not included in Henslowe's list of the plays acted by Lord Strange's men during that season. But it may quite well have been produced by the only other company which appeared at court during the Christmas festivities, Lord Pembroke's. The mere fact that Shakespeare wrote a play, or more than one play, for Lord Strange's men during 1592-1594 does not prove that he never wrote for any other company during the same period; and indeed there is plenty of room for guess-work as to the relations between Strange's and Pembroke's men. The latter are not known to have existed before 1592, and many difficulties would be solved by the assumption that they originated out of a division of Strange's, whose numbers, since their amalgamation with the Admiral's, may have been too much

inflated to enable them to undertake as a whole the summer tour of that year. If so, Pembroke's probably took over the Henry VI. series of plays, since The Contention, or at least the True Tragedy, was published as performed by them, and completed it with Richard III. on their return to London at Christmas. It will be necessary to return to this theory in connexion with the discussion of Titus Andronicus and The Taming of the Shrew. The principal historical source for Henry VI. was Edward Hall's The Union of the Noble and Illustre Families of Lancaster and York (1542), and for Richard III., as for all Shakespeare's later historical plays, the second edition (1587) of Raphael Holinshed's Chronicles of England, Scotland and Ireland (1577). An earlier play, The True Tragedy of Richard the Third (1594), seems to have contributed little if anything to Richard III.

5. Many scholars think that at any rate the greater part of the first two acts of Edward III., containing the story of Edward's wooing of the countess of Salisbury, are by Shakespeare; and, if so, it is to about the time of Richard III. that the style of his contribution seems to belong. The play was entered in the Stationers' Register on December 1, 1595. The Shakespearian scenes are based on the 46th Novel in William Paynter's Palace of Pleasure (1566). The line, " Lilies that fester smell far worse than weeds " (ii. 1. 451), is repeated verbatim in the 94th sonnet.

6. To the winter season of 159 2- 1593 may also be assigned with fair probability Shakespeare's first experimental comedy, The Comedy of Errors, and if his writing at one and the same time for Pembroke's and for another company is not regarded as beyond the bounds of conjecture, it becomes tempting to identify this with " the gelyous comodey " produced, probably by Strange's men, for Henslowe as a new play on January 5, 1593. The play contains a reference to the wars of succession in France which would fit any date from 1589 to 1594. The plot is taken from the Menaechmi, and to a smaller extent from the Amphitruo of Plautus. William Warner's translation of the Menaechmi was entered in the Stationers' Register on June 10, 1594. A performance of The Comedy of Errors by " a company of base and common fellows " (including Shakespeare?) is recorded in the Gesta Grayorum as taking place in Gray's Inn hall on December 28, 1594.

7. Titus Andronicus is another play in which many scholars have refused to see the hand of Shakespeare, but the double testimony of its inclusion in Meres's list and in the First Folio makes it unreasonable to deny him some part in it. This may, however, only have been the part of a reviser, working, like the reviser of The

Contention, upon the dialogue rather than the structure of a crude tragedy of the school of Kyd. In fact a stage tradition is reported by Edward Ravenscroft, a late 17th-century adapter of the play, to the effect that Shakespeare did no more than give a few " master-touches " to the work of a " private author." The play was entered in the Stationers' Register on February 6, 1594, and was published in the same year with a title-page setting out that it had been acted by the companies of Lords Derby {i.e. Strange, who had succeeded to his father's title on September 25, 1593), Pembroke and Sussex. It is natural to take this list as indicating the order in which the three companies named had to do with it, but it is probable that only Sussex's had played Shakespeare's version. Henslowe re- cords the production by this company of Titus and Andronicus as a new play on January 23, 1594, only a few days before the theatres were closed by plague. For the purposes of Hen- slowe's financial arrangements with the company a rewritten play may have been classed as new. Two years earlier hs had appended the same description to a play of Titlus and Vespacia, produced by Strange's men on April n, 1592. At first sight the title suggests a piece founded on the lives of the emperor Titus and Vespasian, but the identification of the play with an early version of Titus Andronicus is justified by the existence of a rough German adaptation, which follows the general outlines of Shake- speare's play, but in which one of the sons of Titus is named Vespasian instead of Lucius. The ultimate source of the plot is unknown. It cannot be traced in any of the Byzantine chroniclers. Strange's men seem to have been still playing Titus in January 1593, and it was probably not transferred to Pembroke's until the companies were driven from London by'the plague of that year. Pembroke's are known from a letter of Henslowe's to have been ruined by August, and it is to be suspected that Sussex's, who appeared in London for the first time at the Christmas of 1593, acquired their stock of plays and transferred these to the Chamber- lain's men, when the companies were again reconstituted in the summer of 1594. The revision of Titus and Vespasian into Titus Andronicus by Shakespeare may have been accomplished in the interval between these two transactions. The Chamber- lain's men were apparently playing Andronicus in June. The stock of Pembroke's men probably included, as well as Titus and Vespasian, both Henry VI. and Richard III., which also thus passed to the Chamberlain's company.

8. In the same way was probably also acquired an old play of The Taming of A Shrew. This, which can be traced back as far as 1589, was published as acted by Pembroke's men in 1594. In June of that year it was being acted by the Chamberlain's, but more probably in the revised version by Shakespeare, which bears the slightly altered title of The Taming of The Shrew. This is a much more free adaptation of its original than had been attempted in the case of Henry VI., and the Warwickshire allusions in the Induction are noteworthy. Some critics have doubted whether Shakespeare was the sole author of The Shrew, and others have assigned him a share in A Shrew, but neither theory has any very substantial foundation. The origins of the play, which is to be classed as a farce rather than a comedy, are to be found ultimately in widely distributed folk-tales, and more immediately in Ariosto's J Suppositi (1509) as translated in George Gascoigne's The Supposes (1566). It may have been Shakespeare's first task for the newly established Chamberlain's company of 1594 to furbish up the old farce. Thenceforward there is no reason to think that he ever wrote for any other company.

9. Love's Labour's Lost has often been regarded as the first of Shakespeare's plays, and has sometimes been placed as early as 1589. There is, however, no proof that Shakespeare was writing before 1592 or thereabouts. The characters of Love's Labour's Lost are evidently suggested by Henry of Navarre, his followers Biron and Longaville, and the Catholic League leader, the due de Maine. These personages would have been familiar at any time from 1585 onwards. The absence of the play from the lists in Henslowe's Diary does not leave it impossible that it should have preceded the formation of the Chamberlain's company, but certainly renders this less likely; and its lyric character perhaps justifies its being grouped with the series of plays that began in the autumn of 1 594. No entry of the play is found in the Stationers 'Register, and it is quite possible that the present First Quarto of 1 598 was not really the first edition. The title-page professes to give the play as it was " corrected and augmented " for the Christmas either of 1597 or of 1598. It was again revived for that of 1604. No literary source is known for its incidents.

10. Romeo and Juliet, which was published in 1597 as played by Lord Hunsdon's men, was probably produced somewhat before A Midsummer Night's Dream, as its incidents seem to have suggested the parody of the Pyramus and Thisbe interlude. An attempt to date it in 1591 is hardly justified by the Nurse's references to an earthquake eleven years before and the fact that there was a real earthquake in London in 1 580. The text seems to have been partly

revised before the issue of the Second Quarto in 1 599. There had been an earlier play on the subject, but the immediate source «used by Shakespeare was Arthur Brooke's narrative poem Romeus and Juliet (1562).

11. A Midsummer Night's Dream, with its masque-like scenes of fairydom and the epithalamium at its close, has all the air of having been written less for the public stage than for some courtly wedding; and the compliment paid by Oberon to the " fair vestal throned by the west " makes it probable that it was a wedding at which Elizabeth was present. Two fairly plausible occasions have been suggested. The wedding of Mary countess of Southampton with Sir Thomas Heneage on the 2nd of May 1594 would fit the May-day setting of the plot; but a widowed countess hardly answers to the " little western flower " of the allegory, and there are allusions to events later in 1 594 and in particular to the rainy weather of June and July, which indicate a somewhat later date. The wedding of William Stanley, earl of Derby, brother of the lord Strange for whose players Shakespeare had written, and Elizabeth Vere, daughter of the earl of Oxford, which took place at Greenwich on the 26th of January 1595, perhaps fits the conditions best. It has been fancied that Shakespeare was present when " certain stars shot madly from their spheres" in the Kenilworth fireworks of 1575, but if he had any such entertainment in mind it is more likely to have been the more recent one given to Elizabeth by the earl of Hertford at Elvetham in 1591. There appears to be no special

source for the play beyond Chaucer's Knight's Tale and the wide-spread fairy lore of western Europe.

12. No very definite evidence exists for the date of The Two Gentlemen of Verona, other than the mention of it in Palladis Tamia. It is evidently a more rudimentary essay in the genre of romantic comedy than The Merchant of Venice, with which it has other affinities in its Italian colouring and its use of the inter-relations of love and friendship as a theme; and it may therefore be roughly assigned to the neighbourhood of 1595. The plot is drawn from various examples of contemporary fiction, especially from the story of the shepherdess Filismena in Jorge de Montemayor's Diana (1559)- A play of Felix and Philiomena had already been given at court in 1585.

13. King John is another play for which 1595 seems a likely date, partly on account of its style, and partly from the impro- bability of a play on an independent subject drawn from English history being

interpolated in the middle either of the Yorkist or of the Lancastrian series. It would seem that Shakespeare had before him an old play of the Queen's men, called The Troublesome Reign of King John. This was published in 1591, and again, with " W. Sh." on the title-page, in 1611. For copy- right purposes King John appears to have been regarded as a revision of The Troublesome Reign, and in fact the succession of incidents in the two plays is much the same. Shakespeare's dialogue, however, owes little or nothing to that of his pre- decessor.

14. Richard II. can be dated with some accuracy by a com- parison of the two editions of Samuel Daniel's narrative poem on The Civil Wars Between the Two Houses of Lancaster and York, both of which bear the date of 1595 and were therefore issued between March 25, 1595 and March 24, 1596 of the modern reckoning. The second of these editions, but not the first, contains some close parallels to the play. From the first two quartos of Richard II., published in 1597 and 1598, the deposition scene was omitted, although it was clearly part of the original structure of the play, and its removal leaves an obvious mutila- tion in the text. There is some reason to suppose that this was due to a popular tendency to draw seditious parallels between Richard and Elizabeth; and it became one of the charges against the earl of Essex and his fellow-conspirators in the abortive tmeute of February 1601, that they had procured a performance of a play on Richard's fate in order to stimulate their followers. As the actors were the Lord Chamberlain's men, this play can hardly have been any other than Shakespeare's. The deposition scene was not printed until after Elizabeth's death, in the Third Quarto of 1608.

15. The Merchant of Venice, certainly earlier than July 22, 1598, on which date it was entered in the Stationers' Register, and possibly inspired by the machinations of the Jew poisoner Roderigo Lopez, (who was executed in June 1594, shows a con- siderable advance in comic and melodramatic power over any of the earlier plays, and is assigned by a majority of scholars to about 1 596. The various stories of which its plot is compounded are based upon common themes of folk-tales and Italian novelle. It is possible that Shakespeare may have had before him a play called The Jew, of which there are traces as early as 1579, and in which motives illustrating " the greedinesse of worldly chusers " and the " bloody mindes of usurers " appear to have been already combined. Something may also be owing to Marlowe's play of The Jew of Malta.

16. 17. The existence of Richard II. is assumed throughout in Henry

IV., which probably therefore followed it after no long interval. The first part was published in 1598, the second not until 1600, but both parts must have been in existence before the entry of the first part in the Stationers' Register on February 25th 1598, since Falstaff is named in this entry, and a slip in a speech-prefix of the second part, which was not entered in the Register until August 23rd 1600, betrays that it was written when the character still bore the name of Sir John Oldcastle. Richard James, in his dedication to The Legend of Sir John Oldcastle about 1625, and Rowe in 1709 both bear witness to the substitution of the one personage for the other, which Rowe

ascribes to the intervention of Elizabeth, and James to that of some descendants of Oldcastle, one of whom was probably Lord Cobham. There is an allusion to the incident and an acknowledgment of the wrong done to the famous Lollard martyr in the epilogue to 2 Henry I V. itself. Probably Shake- speare found Oldcastle, with very little else that was of service to him, in an old play called The Famous Victories of Henry the Fifth, which had been acted by Tarlton and the Queen's men at least as far back as 1588, and of which an edition was printed in 1598. Falstaff himself is a somewhat libellous presentment of the 15th century leader, 9tr John Fastolf, who had already figured in Henry VI.; but presumably Fastolf has no titled descendants alive in 1598.

18. An entry in the Stationers' Register during 1600 shows that Much Ado About Nothing was in existence, although its publication was then directed to be " stayed." It may plausibly be regarded as the earliest play not included in Meres's list. In 1613 it was revived before James I. under the alternative title of Benedick and Beatrice. Dogberry is said by Aubrey to have been taken from a constable at Grendon in Buckinghamshire. There is no very definite literary source for the play, although some of its incidents are to be found in Ariosto's Orlando Furioso and Bandello's novelle, and attempts have been made to establish relationships between it and two early German plays, Jacob Ayrer's Die Schbne Phoenicia and the Vincentius Ladiszlaus of Duke Henry Julius of Brunswick.

19. The completion of the Lancastrian series of histories by Henry V. can be safely placed in or about 1599, since there is an allusion in one of the choruses to the military operations in Ireland of the earl

of Essex,who crossed on March 2 7 and returned on September 28, 1599. The First Quarto, which was first " stayed " with Much Ado About Nothing and then published in 1600, is a piratical text, and does not include the choruses. A geniune and perhaps slightly revised version was first published in the First Folio.

20. That Julius Caesar also belongs to 1599 is shown, not only by its links with Henry V. but also by an allusion to it in John Weever's Mirror of Martyrs, a work written two years before its publication in 1601, and by a notice of a performance on September 21st, 1599 by Thomas Platter of Basel in an account of a visit to London. This was the first of Shakespeare's Roman plays, and, like those that followed, was based upon Plutarch's Lives as translated from the French of Jacques Amyot and pub- lished by Sir Thomas North in 1580. It was also Shakespeare's first tragedy since Romeo and Juliet.

21. It is reported by John Dennis, in the preface to The Comical Gallant (1702), that The Merry Wives of Windsor was written at the express desire of Elizabeth, who wished to see Falstaff in love, and was finished by Shakespeare in the space of a fortnight. A date at the end of 1599 or the beginning of 1600, shortly after the completion of the historical Falstaff plays, would be the most natural one for this enterprise, and with such a date the evidence of style agrees. The play was entered in the Stationers' Register on January 18th, 1602. The First Quarto of the same year appears to contain an earlier version of the text than that of the First Folio. Among the passages omitted in the revision was an allusion to the adventures of the duke of Wiirttemberg and count of Mompelgard, whose attempts to secure the Garter had brought him into notice. The Windsor setting makes it possible that The Merry Wives was produced at a Garter feast, and perhaps with the assistance of the children of Windsor Chapel in the fairy parts. The plot has its analogies to various incidents in Italian novelle and in English adaptations of these.

22. As You Like It was one of the plays " stayed " from publica- tion in 1600, and cannot therefore be later than that year. Some trifling bits of evidence suggest that it is not earlier than 1 599. The plot is based upon Thomas Lodge's romance of Rosalynde (1590), and this in part upon the pseudo-Chaucerian Tale of Gamelyn.

23. A play of Hamlet was performed, probably by the Chamber- lain's men, for Henslowe at Newington Butts on the 9th of June

1594. There are other references to it as a revenge-play, and it seems to have been in existence in some shape as early as 1589. It was doubtless on the basis of this that Shakespeare constructed his tragedy. Some features of the so-called Ur-Hamlet may perhaps be traceable in the German play of Der bestrafte Bruder- mord. There is an allusion in Hamlet to the rivalry between the ordinary stages and the private plays given by boy actors, which points to a date during the vogue of the children of the Chapel, whose performance began late in 1600, and another to an inhibition of plays on account of a " late innovation, " by which the Essex rising of February 1601 may be meant. The play was entered in the Stationers' Register on July 26, 1602. The First Quarto was printed in 1603 and the Second Quarto in 1604. These editions contain texts whose differences from each other and from that of the First Folio are so considerable as to suggest, even when allowance has been made for the fact that the First Quarto is probably a piratical venture, that the play underwent an exceptional amount of rewriting at Shake- speare's hands. The

title-page of the First Quarto indicates that the earliest version was acted in the universities of Oxford and Cambridge and elsewhere, as well as in London. The ultimate source of the plot is to be found in Scandinavian legends preserved in the Historia Danica of Saxo Grammaticus, and transmitted to Shakespeare or his predecessor through the Histoires tragiques (1 570) of Francois de Belleforest (see Hamlet) .

24. Twelfth Night may be fairly placed in i6oi-r6o2, since it quotes part of a song included in Robert Jones's First Book of Songs and Airs (1600), and is recorded by John Manningham to have been seen by him at a feast in the Middle Temple hall on February 2nd, 1602. The principal source of the plot was Bamabe Riche's " History of Apolonius and Silla " in his Fare- well to Military Profession (1581).

25. Few of the plays present so many difficulties as Troilus and Cressida, and it cannot be said that its literary history has as yet been thoroughly worked out. A play of the name, " as yt is acted by my Lord Chamberlens men " was entered in the Stationers' Register on February 7th, 1603, with a note that " sufficient authority " must be got by the publisher, James Roberts, before he printed it. This can hardly be any other than Shake- speare's play; but it must have been " stayed, " for the First Quarto did not appear until 1609, and on the 28th of January of that year a fresh entry had been made in the Register by another publisher. The text of the Quarto differs in certain respects from that of the Folio, but not to a greater extent than the use of different copies of the original manuscript might ex-plain. Two alternative title-pages are found in copies of the Quarto. On one, probably the earliest, is a statement that the play was printed " as it was acted by the Kings Maiesties seruants at the Globe "; from the other these words are omitted, and a preface is appended which hints that the " grand possessors" of the play had made difficulties about its publication, and describes it as " never staled with the stage." Attempts have been made, mainly on grounds of style, to find another hand than Shake- speare's in the closing scenes and in the prologue, and even to assign widely different dates to various parts of what is ascribed to Shakespeare. But the evidence does not really bear out these theories, and the style of the whole must be regarded as quite consistent with a date in 1601 or 1602. The more probable year is 1602, if, as seems not unlikely, the description of Ajax and his humours in the second scene of the first act is Shakespeare's " purge " to Jonson in reply to the Poetaster (1601), alluded to, as already mentioned, in the Return from Parnassus, a Cambridge play acted probably at the Christmas of r6o2-i6o3 (rather than, as is usually asserted, r6oi-i6o2). It is

tempting to conjecture that Troilus and Cressida may have been played, like Hamlet, by the Chamberlain's men at Cambridge, but may never have been taken to London, and in this sense " never staled with the stage." The only difficulty of a date in 1602 is that a parody of a play on Troilus and Cressida is introduced into Histrio-mastix (c. ˆ99), and that in this Troilus " shakes his furious speare." But Henslowe had produced another play on the subject, by Dekker and Chettle, in 1 599, and probably, therefore,

no allusion to Shakespeare is really intended. The material for Troilus and Cressida was taken by Shakespeare from Chaucer's Troilus and Criseyde, Caxton's Recuyell of the History es of Troye, and Chapman's Homer.

26. It is almost wholly on grounds of style that All's Well that Ends Well is placed by most critics in or about 1602, and, as in the case of Troilus and Cressida, it has been argued, though with little justification, that parts of the play are of considerably earlier date, and perhaps represent the Love's Labour's Won referred to by Meres. The story is derived from Boccaccio's Decameron through the medium of William Paynter's Palace of Pleasure (1566).

27. Measure for Measure is believed to have been played at court on the 26th of December 1604. The evidence for this is to be found, partly in an extract made for Malone from official records now lost, and partly in a forged document, which may, however, rest upon genuine information, placed amongst the account-books of the Office of the Revels. If this is correct the play was probably produced when the theatres were reopened after the plague in 1604. The plot is taken from a story already used by George Whetstone, both in his play of Promos and Cassandra (1578) and in his prose Heptameron of Civil Discourses (1582), and borrowed by him from Giraldi Cinthio's Hecatommithi (1566).

28. A performance at court of Othello on November 1, 1604, is noted in the same records as those quoted with regard to Measure for Measure, and the play may be reasonably assigned to the same year. An alleged performance at Harefield in 1602 certainly rests upon a forgery. The play was revived in 1610 and seen by Prince Louis of Wurttemberg at the Globe on April 30 of that year. It was entered in the Stationers' Register on October 6, 1621, and a First Quarto was

published in 1622. The text of this is less satisfactory than that of the First Folio, and omits a good many lines found therein and almost certainly belonging to the play as first written. It also contains some profane expressions which have been modified in the Folio, and thereby points to a date for the original production earlier than the Act to Restrain Abuses of Players passed in the spring of 1606. The plot, like that of Measure for Measure, comes from the Hecatommithi (1566) of Giraldi Cinthio.

29. Macbeth cannot, in view of its obvious allusions to James I., be of earlier date than 1603. The style and some trifling allusions point to about 1605 or 1606, and a hint for the theme may have been given by Matthew Gwynne's entertainment of the Tres Sibyllae, with which James was welcomed to Oxford on August 27, 1605. The play was revived in 1610 and Simon Forman saw it at the Globe on April 20. The only extant text, that of the First Folio, bears traces of shortening, and has been interpolated with additional rhymed dialogues for the witches by a second hand, probably that of Thomas Middleton. But the extent of Middleton's contribution has been exaggerated; it is probably confined to act iii. sc. 5, and a few lines in act. iv. sc. 1. A ballad of Macdobeth was entered in the Stationers' Register on August 27,1 596, but is not known. It is not likely that Shakespeare had consulted any Scottish history other than that included in Raphael Holinshed's Chronicle; he may have gathered witchlore from Reginald Scot's Discoverie of Witchcraft (1584) or King James's own Demonologie (1599).

30. The entry of King Lear in the Stationers' Register on November 26, 1607, records the performance of the play at court on December 26, 1606. This suggests 1605 or 1606 as the date of production, and this is confirmed by the publication in 1605 of the older play, The True Chronicle History of King Leir, which Shakespeare used as his source. Two Quartos of King Lear were published in 1608, and contain a text rather longer, but in other respects less accurate, than that of the First Folio. The material of the play consists of fragments of Celtic myth, which found their way into history through Geoffrey of Mon- mouth. It was accessible to Shakespeare in Holinshed and in Spenser's Faerie Queene, as well as in the old play.

31. It is not quite clear whether Antony and Cleopatra was the play of that name entered in the Stationers' Register on May 20, 1608, for no Quarto is extant, and a fresh entry was made in the Register before the issue of the First Folio. Apart from

this entry, there is little external evidence to fix the date of the play,

but it is in Shakespeare's later, although not his last manner, and may very well belong to 1606.

32. In the case of Coriolanus the external evidence available is even scantier, and all that can be said is that its closest affinities are to Antony and Cleopatra, which in all probability it directly followed or preceded in order of composition. Both plays, like Julius Caesar, are based upon the Lives of Plutarch, as Englished by Sir Thomas North.

33. There is no external evidence as to the date of Timon of Athens, but it may safely be grouped on the strength of its internal characteristics with the plays just named, and there is a clear gulf between it and those that follow. It may be placed provisionally in 1607. The critical problems which it presents have never been thoroughly worked out. The extraordinary incoherencies of its action and inequalities of its style have prevented modern scholars from accepting it as a finished pro- duction of Shakespeare, but there agreement ceases. It is some- times regarded as an incomplete draft for an intended play; sometimes as a Shakespearian fragment worked over by a second hand either for the stage or for printing in the First Folio ; sometimes, but not very plausibly, as an old play by an inferior writer which Shakespeare had partly remodelled. It does not seem to have had any relations to an extant academic play of Timon which remained in manuscript until 1842. The sources are to be found, partly in Plutarch's Life of Marcus Antonius, partly in Lucian's dialogue of Timon or Misanthropos, and partly in William Paynter's Palace of Pleasure (1566).

34. Similar difficulties, equally unsolved, cling about Pericles. It was entered in the Stationers' Register on May 20, 1608, and published in 1609 as " the late and much admired play " acted by the King's men at the Globe. The title-page bears Shake- speare's name, but the play was not included in the First Folio, and was only added to Shakespeare's collected works in the Third Folio, in company with others which, although they also had been printed under his name or initials in quarto form, are certainly not his. In 1608 was published a prose story, The Painful Adventures of Pericles Prince of Tyre. This claims to be the history of the play as it was presented by the King's players, and is described in a dedication by George Wilkins as " a poore infant of my braine. " The production of the play is therefore to be put in 1608 or a little earlier. It can hardly be doubted on internal evidence that Shakespeare is the author of the verse-scenes in the last three acts, with the exception of the doggerel choruses. It is probable, although it has been doubted, that he was also the author of the prose-scenes in those acts. To the first two acts he can

at most only have contributed a touch or two. It seems reasonable to suppose that the non- Shakespearian part of the play is by Wilkins, by whom other dramatic work was produced about 1607. The prose story quotes a line or two from Shakespeare's contribution, and it follows that this must have been made by 1608. The close resemblances of the style to that of Shakespeare's latest plays make it impossible to place it much earlier. But whether Shake- speare and Wilkins collaborated in the play, or Shakespeare partially rewrote Wilkins, or Wilkins completed Shakespeare, must be regarded as yet undetermined. Unless there was an earlier Shakespearian version now lost, Dryden's statement that "Shakespeare's own Muse her Pericles first bore " must be held to be an error. The story is an ancient one which exists in many versions. In all of these except the play, the name of the hero is Apollonius of Tyre. The play is directly based upon a version in Gower's Confessio Amantis, and the use of Gower as a " presenter " is thereby explained. But another version in Laur- ence Twine's Patterne of Painefull Adventures (c. 1576), of which a new edition appeared in 1607, may also have been consulted.

35. Cymbeline shows a further development than Pericles in the direction of Shakespeare's final style, and can hardly have come earlier. A description of it is in a note-book of Simon Forman, who died in September 161 1, and describes in the same book other plays seen by him in 1610 and 161 1. But these were not-necessarily new plays, and Cymbeline may perhaps be assigned

conjecturally to 1609. The mask-like dream in act v. sc. 4 must be an interpolation by another hand. This play also is based upon a wide-spread story, probably known to Shakespeare in Boccaccio's Decameron (day 2, novel 9), and possibly also in an English book of tales called Westward for Smelts. The historical part is, as usual, from Holinshed.

36. The Winter's Tale was seen by Forman on May 15, 1611, and as it clearly belongs to the latest group of plays it may well enough have been produced in the preceding year. A document amongst the Revels Accounts, which is forged, but may rest on some authentic basis, gives November 5, 161 1 as the date of a performance at court. The play is recorded to have been licensed by Sir George Buck, who began to license plays in 1607. The plot is from Robert Greene's

Pandosto, the Triumph of Time, or Dorastus and Fawnia (1588).

37. The wedding-mask in act iv. of The Tempest has suggested the possibility that it may have been composed to celebrate the marriage of the princess Elizabeth and Frederick V., the elector palatine, on February 14, r6i3. But Malone appears to have had evidence, now lost, that the play was performed at court as early as 161 1, and the forged document amongst the Revels Accounts gives the precise date of November 1, 1611. Sylvester Jourdan's A Discovery of the Bermudas, containing an account of the shipwreck of Sir George Somers in 1609, was pub- lished about October 1610, and this or some other contemporary narrative of Virginian colonization probably furnished the hint of the plot.

38. The tale of Shakespeare's independent dramas is now complete, but an analysis of the Two Noble Kinsmen leaves no reason to doubt the accuracy of its ascription on the title-page of the First Quarto of 1634 to Shakespeare and John Fletcher. This appears to have been a case of ordinary collaboration. There is sufficient resemblance between the styles of the two writers to render the division of the play between them a matter of some difficulty; but the parts that may probably be assigned to Shakespeare are acts i. sec. 1-4; ii. 1; iii. 1, 2; v. 1, 3, 4. Fletcher's morris-dance in act iii. sc. 5 is borrowed from that in Beaumont's Mask of the Inner Temple and Gray's Inn, given on February 20, 1613, and the play may perhaps be dated in 1613. It is based on Chaucer's Knight's Tale.

39. It may now be accepted as a settled result of scholarship that Henry VIII. is also the result of collaboration, and that one of the collaborators was Fletcher. There is no good reason to doubt that the other was Shakespeare, although attempts have been made to substitute Philip Massinger. The inclusion, how- ever, of the play in the First Folio must be regarded as conclusive against this theory. There is some ground for suspicion that the collaborators may have had an earlier work of Shakespeare before them, and thisfwould explain the reversion to the " history " type of play which Shakespeare had long abandoned. His share appears to consist of act i. sec. 1, 2; act ii. sec. 3, 4; act iii. sc. 2, 11. 1-203; act v. sc. 1. The play was probably produced in 1613, and originally bore the alternative title of All is True. It was being performed in the Globe on June 29, 1613, when the thatch caught fire and the theatre was burnt. The principal source was Holinshed, but Hall's Union of Lancaster and York, Foxe's Acts and Monuments of the Church, and perhaps Samuel Rowley's play of When You See Me, You Know Me (1605), appear also to have contributed.

Shakespeare's non-dramatic writings are not numerous. The narrative poem of Venus and Adonis was entered in the Stationers' Register on April 18, 1593, and thirteen editions, dating from 1593 to 1636, are known. The Rape of Lucrece was, entered in the Register on May 9, 1594, and the six extant editions range from 1594 to 1624. Each poem is prefaced by a dedicatory epistle from the author to Henry Wriothesley, earl of Southampton. The subjects, taken respect- ively from the Metamorphoses and the Fasti of Ovid, were frequent in Renaissance literature. It was once supposed that Shakespeare came from Stratford-on-Avon with Venus and Adonis in his pocket; but it is more likely that both poems owe their origin to the comparative leisure afforded to playwrights and actors

by the plague-period of 1592-1594. In 1599 the stationer William Jaggard published a volume of miscellaneous verse which he called The Passionate Pilgrim, and placed Shakespeare's name on the title-page. Only two of the pieces included herein are certainly Shakespeare's, and although others may quite possibly be his, the authority of the volume is destroyed by the fact that some of its contents are without doubt the work of Marlowe, Sir Walter Raleigh, Richard Barnfield and Bartholomew Griffin. In 1601 Shakespeare contributed The Phoenix and the Turtle, an elegy on an unknown pair of wedded lovers, to a volume called Love's Martyr, or Rosalin's Complaint, which was collected and mainly written by Robert Chester.

The interest of all these poems sinks into insignificance beside that of one remaining volume. The Sonnets were entered in the Register on May 20, 1609, by the stationer Thomas Thorpe, and published by him under the title Shake- £™^ ms speares Sonnets, never before Imprinted, in the same sonnets. year. In addition to a hundred and fifty-four sonnets, the volume contains the elegiac poem, probably dating from the Venus and Adonis period, of A Lover's Complaint. In 1640 the Sonnets, together with other poems from The Passionate Pilgrim and elsewhere, many of them not Shakespeare's, were republished by John Benson in Poems Written by Wil. Shake- speare, Gent. Here the sonnets are arranged in an altogether different order from that of 1609 and are declared by the publisher to " appeare of the same purity, the Authour himselfe then living avouched. " No Shakespearian controversy has received so much attention, especially during recent years, as that which concerns itself with the date, character, and literary history of the Sonnets. This is intelligible enough, since upon the issues raised depends the question whether these poems do or do not give a glimpse into the intimate depths of a personality which otherwise is at the most only*

imperfectly revealed through the plays. On the whole, the balance of authority is now in favour of regarding them as in a very considerable measure autobio- graphical. This view has undergone the fires of much destructive argument. The authenticity of the order in which the sonnets were printed in 1609 has been doubted; and their subject-matter has been variously explained as being of the nature of a philo- sophical allegory, of an effort of the dramatic imagination, or of a heartless exercise in the forms of the Petrarchan convention. This last theory has been recently and strenuously maintained, and may be regarded as the only one which now holds the field in opposition to the autobiographical interpretation. But it rests upon the false psychological assumption, which is disproved by the whole history of poetry and in particular of Petrarchan poetry, that the use of conventions is inconsistent with the expression of unfeigned emotions; and it is hardly to be set against the direct conviction which the sonnets carry to the most finely critical minds of the strength and sincerity of the spiritual experience out of which they were wrought. This conviction makes due allowance for the inevitable heightening of emotion itself in the act of poetic composition; and it certainly does not carry with it a belief that all the external events which underlie the emotional development are capable at this distance of time of inferential reconstruction. But it does accept the sonnets as an actual record of a part of Shakespeare's life during the years in which they were written, and as revealing at least the outlines of a drama which played itself out for once, not in his imagination but in his actual conduct in the world of men and women.

There is no advantage to be gained by rearranging the order of the 1609 volume, even if there were any basis other than that of individual whim on which to do so. Many of the sonnets are obviously linked to those which follow or precede them; and altogether a few may conceivably be misplaced, the order as a whole does not jar against the sense of emotional continuity, which is the only possible test that can be applied. The last two sonnets, however, are merely alternative versions of a Greek epigram, and the rest fall into two series, which are more probably parallel than successive. The shorter of these two series (exxvii.- clii.) appears to be the record of the poet's relations with a mistress, a dark woman with raven brows and mourning eyes.

In the earlier sonnets he undertakes the half-playful defence of black beauty against the blonde Elizabethan ideal; but the greater number are in a more serious vein, and are filled with a deep consciousness of the bitterness of lustful passion and of the slavery of the soul to the body. The woman is a wanton. She has broken her bed-vow for Shakespeare, who on his side is forsworn in loving her; and she is doubly forsworn in proving faithless to him with other men. His reason condemns her, but his heart has not the power to throw off her tyranny. Her particular offence is that she, " a woman coloured ill, " has cast her snares not only upon him, but upon his friend, " a man right fair," who is his "better angel," and that thus his loss is double, in love and friendship. The longer series (i.-cxxvi.) is written to a man, appears to extend over a considerable period of time, and covers a wide range of sentiment. The person addressed is younger than Shakespeare, and of higher rank. He is lovely, and the son of a lovely mother, and has hair like the auburn buds of marjoram. The series falls into a number of groups, which are rarely separated by any sharp lines of demarcation. Perhaps the first group (i.-xvii.) is the most distinct of all. These sonnets are a prolonged exhortation by Shakespeare to his friend to marry and beget children. The friend is now on the top of happy hours, and should make haste, before the rose of beauty dies, to secure himself in his descendants against devouring time. In the next group (xviii.xxv.) a much more personal note is struck, and the writer assumes the attitudes, at once of the poet whose genius is to be devoted to eternizing the beauty and the honour of his patron, and of the friend whose absorbing affection is always on the point of assuming an emotional colour indistinguishable from that of love. The con sciousness of advancing years and that of a fortune which bars the triumph of public honour alike find their consolation in this affection. A period of absence (xxvi.-xxxii.) follows, in which the thought of friendship comes to remedy the daily labour of travel and the sorrows of a life that is " in disgrace with fortune and men's eyes " and filled with melancholy broodings over the past. Then (xxxiii.-xlii.) comes an estrangement. The friend has committed a sensual fault, which is at the same time a sin against friendship. He has been wooed by a woman loved by the poet, who deeply resents the treachery, but in the end forgives it, and bids the friend take all his loves, since all are included in the love that has been freely given him. It is difficult to escape the suggestion that this episode of the conflict between love and friendship is the same as that which inspired some of the " dark woman " sonnets. Another journey (xliii.-lii.)isagain filled with thoughts of the friend, and its record is followed by a group of sonnets (liii.-lv.) in which the friend's beauty and the immortality which this will find in the poet's

verse are especially dwelt upon. Once more there is a parting (lvi.-lxi.) and the poet waits as patiently as may be his friend's return to him. Again (lxii.lxv.) he looks to his verse to give the friend im mortality. He is tired of the world, but his friend redeems it (lxvi.-lxviii.). Then rumours of some scandal against his friend (lxix.-lxx.) reach him, and he falls (lxxi.-lxxiv.) into gloomy thoughts of coming death. The friend, however, is still (Ixxv.lxxvii.) his argument; and he is perturbed (lxxviii. lxxxvi.) by the appearance of a rival poet, who claims to be taught by spirits to write " above a mortal pitch," and with " the proud full sail of his great verse" has already won the countenance of Shakespeare's patron. There is another estrangement (lxxxvii.- xc), and the poet, already crossed with the spite of fortune, is ready not only to acquiesce in the loss of friendship, but to find the fault in himself. The friend returns to him, but the relation is still clouded by doubts of his fidelity (xci.-xciii.) and by public rumours of his wantonness (xciv.-xcvi.). For a third time the poet is absent (xcvii.-xcix.) in summer and spring. Then comes an apparent interval, after which a love already three years old is renewed (c.-civ.) , with even richer praises (cv.cviii.). It is now the poet's turn to offer apologies (cix. cxii.) for offences against friendship and for some brand upon his name apparently due to the conditions of his profession. He is again absent (cxiii.) and again renews his protestations of the

imperishability of love (cxiv.-cxvi.) and of his own unworthiness (cxvii.-cxxi.), for which his only excuse is in the fact that the friend was once unkind. If the friend has suffered as Shakespeare suffered, he has " passed a hell of time." The series closes with a group (cxxii.-cxxv.) in which love is pitted against time; and an envoi, not in sonnet form, warns the " lovely boy " that in the end nature must render up her treasure.

Such an analysis can give no adequate idea of the qualities in these sonnets, whereby the appeal of universal poetry is built up on a basis of intimate self-revelation. The human document is so legible, and at the same time so incomplete, that it is easy to understand the strenuous efforts which have been made to throw further light upon it by tracing the identities of those other personalities, the man and the woman, through his relations to whom the poet was brought to so fiery an ordeal of soul, and even to the borders of self-abasement. It must be added that the search has, as a rule, been conducted with more ingenuity than judgment. It has generally started from the terms of a somewhat mysterious dedication prefixed by the publisher Thomas Thorpe to the volume of 1609. This runs as follows: — " To the onlie begetter of these insuing sonnets Mr W. H. all happinesse

and that eternitie promised by our ever-living poet wisheth the well-wishing adventurer in setting forth T. T." The natural interpretation of this is that the inspirer or " begetter " of the sonnets bore the initials W. H.; offiMr and contemporary history has accordingly been ran- w. li." sacked to find a W. H. whose age and circumstances might conceivably fit the conditions of the problem which the sonnets present. It is perhaps a want of historical perspective which has led to the centring of controversy around two names belonging to the highest ranks of the Elizabethan nobility, those of Henry Wriothesley, earl of Southampton, and William Herbert, earl of Pembroke. There is some evidence to connect Shakespeare with both of these. To Southampton he dedicated Venus and Adonis in 1593 and The Rape of Lucrece in 1594, and the story that he received a gift of no less than £1000 from the earl is recorded by Rowe. His acquaintance with Pembroke can only be inferred from the statement of Heminge and Condell in their preface to the First Folio of the plays, that Pembroke and his brother Montgomery had " prosequuted both them and their Authour living, with so much favour." The personal beauty of the rival claimants and of their mothers, their amours and the attempts of their families to persuade them to marry, their relations to poets and actors, and all other points in their biographies which do or do not fit in with the indications of the sonnets, have been canvassed with great spirit and some erudition, but with no very conclusive result. It is in Pembroke's favour that his initials were in fact W. H., whereas Southampton's can only be turned into W. H. by a process of metathesis; and his champions have certainly been more successful than South- ampton's in producing a dark woman, a certain Mary Fitton, who was a mistress of Pembroke's,, and was in consequence dismissed in disgrace from her post of maid of honour to Elizabeth. Unfortunately, the balance of evidence is in favour of her having been blonde, and not " black." Moreover, a careful investiga- tion of the sonnets, as regards their style and their relation to the plays, renders it almost impossible on chronological grounds that Pembroke can have been their subject. He was born on the 9th of April 1580, and was therefore much younger than South- ampton, who was born on the 6th of October 1573. The earliest sonnets postulate a marriageable youth, certainly not younger than eighteen, an age which Southampton reached in the autumn of 1591 and Pembroke in the spring of 1598. The writing of the sonnets may have extended over several years, but it is impossible to doubt that as a whole it is to the years 1593-1598 rather than to the years 1598-1603 that they belong. There is not, indeed, much external evidence available. Francis Meres in hisPalladis Tamia of 1598 mentions Shakespeare's " sugred sonnets

among his private friends," 1 but this allusion might come as well at

1 " The sweet witty soul of Ovid lives in mellifluous and honey-tongued Shakespeare, witness his Venus and Adonis, his Lucrece, his sugred sonnets among his private friends."

the beginning as at the end of the series; and the fact that two, not of the latest, sonnets are in The Passionate Pilgrim of 1590 is equally inconclusive.

The only reference to an external event in the sonnets them- selves, which might at first sight seem useful, is in the following lines (cvii.): —

" The mortal moon hath her eclipse endured, And the sad augurs mock their own presage; Incertainties now crown themselves assured, And peace proclaims olives of endless age."

This has been variously interpreted as referring to the death of Elizabeth and accession of James in 1603, to the relief caused by the death of Philip II. of Spain in 1598, and to the illness of Elizabeth and threatened Spanish invasion in 1596. Obviously the " mortal moon " is Elizabeth, but although "eclipse" may well mean " death," it is not quite so clear that " endure an eclipse " can mean " die."

Nor do the allusions to the rival poet help much. " The proud full sail of his great verse " would fit, on critical grounds, with Spenser, Marlowe, Chapman, and possibly Peele, Daniel or Drayton; and the "affable familiar ghost," from whom the rival is said to obtain assistance by night, might conceivably be an echo of a passage in one of Chapman's dedications. Daniel inscribed a poem to Southampton in 1663, but with this exception none of the poets named are known to have written either for Southampton or for Pembroke, or for any other W. H. or H. W., during any year which can possibly be covered by the sonnets. Two very minor poets, Barnabe Barnes and Gervase Markham, addressed sonnets to Southampton in 1593 and 1595 respectively, and Thomas Nash composed improper verses for his delectation.

But even if external guidance fails, the internal evidence for 1593-1598 as approximately the sonnet period in Shakespeare's life is very strong indeed. It has been worked out in detail by two

German scholars, Hermann Isaac (now Conrad) in the Shakespeare-Jahrbuch for 1884, and Gregor Sarrazin in William Shakespeares Lehrjahre (1897) and Aus Shakespeares Meister- werkstatt (1906). Isaac's work, in particular, has hardly received enough attention even from recent English scholars, probably because he makes the mistakes of taking the sonnets in Boden- stedt's order instead of Shakespeare's, and of beginning his whole chronology several years too early in order to gratify a fantastic identification of W. H. with the earl of Essex. This, however, does not affect the main force of an argument by which the affinities of the great bulk of the sonnets are shown, on the ground of stylistic similarities, parallelisms of expression, and parallel- isms of theme, to be far more close with the poems and with the range of plays from Love's Labour's Lost to Henry I V. than with any earlier or later section of Shakespeare's work. This dating has the further advantage of putting Shakespeare's sonnets in , the full tide of Elizabethan sonnet-production, which began with the publication of Sidney's Astrophel and Stella in 1591 and Daniel's Delia and Constable's Diana in 1592, rather than during years for which this particular kind of poetry had already ceased to be modish. It is to the three volumes named that the in-fluence upon Shakespeare of his predecessors can most clearly be traced; while he seems in his turn to have served as a model for Drayton, whose sonnets to Idea were published in a series of volumes in 1594, 1599, 1602, 1605 and 1619. It does not of course follow that because the sonnets belong to 1 593-1 598 W. H. is to be identified with Southampton. On general grounds he is likely, even if above Shakespeare's own rank, to have been somewhat nearer that rank than a great earl, some young gentleman, for example, of such a family as the Sidneys, or as the Walsinghams of Chislehurst.

It is possible that there is an allusion to Shakespeare's romance in a poem called " Willobie his Avisa," published in 1594 as from the pen of cme Henry Willoughby, apparently of West Knoyle in Wiltshire. In this Willoughby is introduced as taking counsel when in love with " his familiar friend W. S. who not long before had tryed the curtesy of the like passion, and was now newly recovered of the like infection." But there is nothing outside

the poem to connect Shakespeare with a family of Willoughbys or with the neighbourhood of West Knoyle. Various other identifications of W. H. have been suggested, which rarely rest upon anything except a similarity of initials. There is little plausibility in a theory broached by Mr Sidney Lee, that W. H. was not the friend of the sonnets at all, but a certain William Hall, who was himself a printer, and might, it is conjectured, have obtained the " copy " of the

sonnets for Thorpe. It is, of course, just possible that the " begetter " of the title-page might mean, not the " inspirer," but the " procurer for the press " of the sonnets ; but the interpretation is shipwrecked on the obvious identity of the person to whom Thorpe " wishes " eternity with the person to whom the poet " promised " that eternity. The external history of the Sonnets must still be regarded as an unsolved problem; the most that can be said is that their subject may just possibly be Southampton, and cannot possibly be Pembroke.

In order to obtain a glimmering of the man that was Shake- speare, it is necessary to consult all the records and to read the evidence of his life-work in the plays, alike in the light of the simple facts of his external career and in rhe a ˆ n that of the sudden vision of his passionate and dis- ar a s t. satisfied soul preserved in the sonnets. By exclusive attention to any one of these sources of information it is easy to build up a consistent and wholly false conception of a Shake- speare; of a Shakespeare struggling between his senses and his conscience in the artistic Bohemianism of the London taverns; of a sleek, bourgeois Shakespeare to whom his art was no more than a ready way to a position of respected and influential competence in his native town; of a great objective artist whose personal life was passed in detached contemplation of the puppets of his imagination. Any one of these pictures has the advantage of being more vivid, and the disadvantage of being less real, than the somewhat elusive and enigmatic Shakespeare who glances at us for a perplexing moment, now behind this, now behind that, of his diverse masks. It is necessary also to lay aside Shakespeareolatry, the spirit that could wish with Hallam that Shakespeare had never written the Sonnets, or can refuse to accept Titus Andronicus on the ground that " the play declares as plainly as play can speak, ' I am not Shakespeare's; my repulsive subject, my blood and horrors, are not, and never were his.' " The literary historian has no greater enemy than the sentimentalist. In Shakespeare we have to do with one who is neither beyond criticism as a man nor impeccable as an artist. He was for all time, no doubt; but also very much of an age, the age of the later Renaissance, with its instinct for impetuous life, and its vigorous rather than discriminating appetite for literature. When Ben Jonson said that Shakespeare lacked " art," and when Milton wrote of his " native wood-notes wild," they judged truly. The Shakespearian drama is magnificent and incoherent ; it belongs to the adolescence of literature, to a period before the instrument had been sharpened and polished, and made unerring in its touch upon the sources of laughter and of tears. Obviously nobody has such power over our laughter and our tears as Shakespeare. But it is the power of

temperament rather than of art; or rather it is the power of a capricious and unsystematic artist, with a perfect dramatic instinct for the exposition of the ideas, the characters, the situations, which for the moment command his interest, and a perfect disregard for the laws of dramatic psychology which require the patient pruning and subordination of all material that does not make for the main exposition. This want of finish, this imperfect fusing of the literary ore, is essentially characteristic of the Renaissance, as compared with ages in which the creative impulse is weaker and leaves room for a finer concentration of the means upon the end. There is nearly always unity of purpose in a Shakespearian play, but it often requires an intellectual effort to grasp it and does not result in a unity of effect. The issues are obscured by a careless generosity which would extend to art the boundless freedom of life itself. Hence the intrusive and jarring elements which stand in such curious incongruity with the utmost reaches of

which the dramatic spirit is capable; the conventional and melodramatic endings, the inconsistencies of action and even of character, the emotional confusions of tragicomedy, the complications of plot and subplot, the marring of the give-and-take of dialogue by superfluities of description and of argument, the jest and bombast lightly thrown in to suit the taste of the groundlings, all the flecks that to an instructed modern criticism are only too apparent upon the Shakespearian sun. It perhaps follows from this that the most fruitful way of approaching Shakespeare is by an analysis of his work rather as a process than as a completed whole. His outstanding positive quality is a vast comprehensiveness, a capacity for growth and assimila- tion, which leaves no aspect of life unexplored, and allows of no finality in the nature of his judgments upon life. It is the real and sufficient explanation and justification of the pains taken to determine the chronological order of his plays, that the secret of his genius lies in its power of development and that only by the study of its development can he be known. He was nearly thirty when, so far as we can tell, his career as a dramatist began; and already there lay behind him those six or seven unaccounted-for years since his marriage, passed no one knows where, and filled no one knows with what experience, but assuredly in that strenuous Elizabethan life with some experience kindling to his intellect and formative of his character. To the woodcraft and the familiarity with country sights and sounds which he brought with him from Stratford,

and which mingle so oddly in his plays with a purely imaginary and euphuistic natural history, and to the book-learning of a provincial grammar-school boy, and perhaps, if Aubrey is right, also of a provincial school- master, he had somehow added, as he continued to add through- out his life, that curious store of acquaintance with the details of the most diverse occupations which has so often perplexed and so often misled his commentators. It was the same faculty of acquisition that gave him his enormous vocabulary, so far exceeding in range and variety that of any other English writer.

His first group of plays is largely made up of adaptations and revisions of existing work, or at the best of essays in the conventions of stage-writing which had already achieved popularity. In the Yorkist trilogy he takes up the burden of the chronicle play, in The Comedy of Errors that of the classical school drama and of the page-humour of Lyly, in Titus Andronicus that of the crude revenge tragedy of Kyd, and in Richard III. that of the Nemesis motive and the exaltation of the Machiavellian superman which properly belong to Marlowe. But in Richard III. be begins to come to his own with the subtle study of the actor's temperament which betrays the working of a profound interest in the technique of his chosen profession. The style of the earliest plays is essentially rhetorical; the blank verse is stiff and little varied in rhythm; and the periods are built up of parallel and antithetic sentences, and punctuated with devices of iterations, plays upon words, and other methods of securing emphasis, that derive from the bad tradition of a popular stage, upon which the players are bound to rant and force the note in order to hold the attention of a dull-witted audience. During the plague-vacations of 1592 to 1594, Shakespeare tried his hand at the ornate descriptive poetry of Venus and Adonis and Lucrece; and the influence of this exercise, and possibly also of Italian travel, is apparent in the next group of plays, with their lyric notes, their tendency to warm southern colouring, their wealth of decorative imagery, and their elaborate and not rarely frigid conceits. Rhymed couplets make their appearance, side by side with blank verse, as a medium of dramatic dialogue. It is a period of experiment, in farce with The Taming of the Shrew, in satirical comedy with Love's Labour's Lost, in lyrical comedy with A- Midsummer Night's Dream, in lyrical tragedy with Romeo and Juliet, in lyrical history with Richard II., and finally in romantic tragicomedy with The Two Gentlemen of Verona and with the masterpiece of this singular genre, The Merchant of Venice. It is also the period of the sonnets, which have their echoes both in the phrasing and in the themes of the plays; in the black-browed Rosaline of Love's Labour's Lost, and in the

issue between friendship and love which is variously

set in The Two Gentlemen of Verona and in The Merchant of Venice. But in the latter play the sentiment is already one of retrospection; the tempest of spirit has given way to the tender melancholy of renunciation. The sonnets seem to bear witness, not only to the personal upheaval of passion, but also to some despondency at the spite of fate and the disgrace of the actor's calling. This mood too may have cleared away in the sunshine of growing popularity, of financial success, and of the possibly long-delayed return to Stratford. Certainly the series of plays written next after the travels of 1597 are light-hearted plays, less occupied with profound or vexatious searchings of spirit than with the delightful externalities of things. The histories from King John to Henry V. form a continuous study of the conditions of kingship, carrying on the political speculations begun in Richard II. and culminating in the brilliant picture of triumphant efficiency, the Henry of Agincourt. Meanwhile Shakespeare develops the astonishing faculty of humorous delineation of which he had given foretastes in Jack Cade, in Bottom the weaver, and in Juliet's nurse; sets the creation of Falstaff in front of his vivid pictures of contemporary England; and passes through the half-comedy, half melodrama, of Much Ado About Nothing to the joyous farce of The Merry Wives of Windsor, and to his two perfectly sunny comedies the sylvan comedy of As You Like It and the urban comedy of Twelfth Night.

Then there comes a change of mood, already heralded by Julius Caesar, which stands beside Henry V. as a reminder that efficiency has its seamy as well as its brilliant side. The tragedy of political idealism in Brutus is followed by the tragedy of in- tellectual idealism in Hamlet; and this in its turn by the three bitter and cynical pseudo-comedies, All's Well That Ends Well, in which the creator of Portia, Beatrice, Rosalind and Viola drags the honour of womanhood in the dust — Troilusand Cressida, in which the ideals of heroism and of romance are confounded in the portraits of a wanton and a poltroon — and Measure for Measure, in which the searchlight of irony is thrown upon the paths of Providence itself. Upon the causes of this new perturba- tion in the soul of Shakespeare it is perhaps idle to speculate. The evidence of his profound disillusion and discouragement of spirit is plain enough; and for some years the tide of his pessi- mistic thought advances, swelling through the pathetic tragedy of Othello to the cosmic tragedies of Macbeth and King Lear, with their Titan-like indictments not of man alone, but of the heavens by whom man was made. Meanwhile Shakespeare's style undergoes changes no less notable than those of

his subject- matter. The ease and lucidity characteristic of the histories and comedies of his middle period give way to a more troubled beauty, and the phrasing and rhythm often tend to become elliptic and obscure, as if the thoughts were hurrying faster than speech can give them utterance. The period closes with Antony and Cleopatra and Coriolanus, in which the ideals of the love of woman and the honour of man are once more stripped bare to display the skeletons of lust and egoism, and in the latter of which signs of exhaustion are already perceptible; and with Timon of Athens, in which the dramatist whips himself to an almost incoherent expression of a general loathing and detestation of humanity. Then the stretched cord suddenly snaps. Timon is apparently unfinished, and the next play, Pericles, is in an entirely different vein, and is apparently finished but not begun. At this point only in the whole course of Shakespeare's develop- ment there is a complete breach of continuity. One can only conjecture the occurrence of some spiritual crisis, an illness perhaps, or some process akin to what in the language of religion is called conversion, which left him a new man, with the fever of pessimism behind him, and at peace once more with Heaven and the world.

The final group of plays, the Shakespearian part of Pericles, Cymbeline, The Winter's Tale, The Tempest, all belong to the class of what may be called idyllic romances. They are happy dreams, in which all troubles and sorrows are ultimately resolved into fortunate endings, and which stand therefore as so many symbols of an optimistic faith in the beneficent dispositions of an ordering

Providence. In harmony with this change of temper the style has likewise undergone another change, and the tense structure and marmoreal phrasing of Antony and Cleopatra have given way to relaxed cadences and easy and unaccentuated rhythms. It is possible that these plays, Shakespeare's last plays, with the unimportant exceptions of his contributions to Fletcher's Henry VIII. and The Two Noble Kinsmen, were written in retirement at Stratford. At any rate the call of the country is sounding through them; and it is with no regret that in the last pages of The Tempest the weary magician drowns his book, and buries his staff certain fathoms deep in the earth.

(E. K. C.)

The Shakespeare-Bacon Theory.

In view of the continued promulgation of the sensational theory that the plays, and presumably the poems also, so long associated with the name of Shakespeare, were not written by the man whose biography is sketched above, but by somebody else who used this pseudonym — and especially that the writer was Lord Chancellor Francis Bacon, Viscount St Albans (1561-1626) — it appears desirable to deal here briefly with this question. No such idea seems to have occurred to anybody till the middle of the 19th century (see Bibliography below), but having once been started it has been elaborated in certain quarters by a variety of appeals, both to internal evidence as disclosed by the knowledge displayed in Shakespeare's works and by their vocabulary and style, and to external evidence as represented by the problems connected with the facts of Shakespeare's known life and of the publication of the plays. To what may be called ingenious inferences from data of this sort have even been added attempts to show that a secret confession exists which may be detected in a cipher or cryptogram in the printing of the plays. It must suffice here to say that the contentions of the Americans, Mr Donnelly and Mrs Gallup, on this score are not only opposed to the opinion of authoritative bibliographers, who deny the existence of any such cipher, but have carried their supporters to lengths which are obviously absurd and impossible. Lord Penzance, a great lawyer whose support of the Baconian theory may be found in his " judicial summing-up," published in 1902, expressly admits that "the attempts to establish a cipher totally failed; there was not indeed the semblance of a cipher." Sir Edwin Durning-Lawrence, in his Bacon is Shakespeare (1910), goes still farther in an attempt to prove the point by cryptographic evidence. According to him the classical " long word " cited in Love's Labour's Lost, " honorificabilitudinitatibus," is an anagram for " hi iudi F. Baconis nati tuiti orbi " (these plays F. Bacon's offspring preserved for the world) ; and he juggles very curiously with the numbers of the words and lines in the page of the First Folio containing this alleged anagram. He also cites the evidence of (more or less) contemporary illustra- tions to books, which he explains as cryptographic, in confirmation. These interpretations are in the highest degree speculative. But perhaps his argument is exposed in its full depth of incredibility when he counts up the letters in Ben Jonson's verses " To the Reader," describing the Droeshout portrait in the First Folio, and, finding them to be 287 (taking each " w " as two " v's "), concludes (by adding 287 to 1623, i.e. the date of the First Folio) that Bacon intended to reveal himself as the author in the year 19 10! This sort of argument makes

the plain man's head reel. On similar principles anything might prove anything. What may be considered the more reasonable way of approaching the question is shown in Mr G. Greenwood's Shakespeare Problem Restated (1908), in which the alleged difficulties of the Shakespearian authorship are competently presented without recourse to any such extravagances.

The plausibility of many of the arguments used by Mr Greenwood and those whom he follows depends a good deal upon the real obscurity which, for lack of positive evidence, shrouds the biography of Shakespeare and our knowledge of the precise facts as to the publi- cation of the works associated with his name ; and it has been assisted by the dogmatism of some modern biographers, or the differences of opinion between them, when they attempt to interpret the known facts of Shakespeare's life so as to account for his authorship. But it must be remembered that, if Shakespeare (or Shakspere) wrote Shakespeare's works, it is only possible to reconcile our view of his biography with our knowledge of the works by giving some interpre- tation to the known facts or accepting some explanation of what may have occurred in the obscure parts of his life which will be consistent with such an identification. That different hypotheses are favoured by different orthodox critics is therefore no real objection, nor that some may appear exceedingly speculative, for the very reason that positive evidence is irrecoverable and that speculation — consistent with what is possible — is the only resource. In so far as evidence is to be twisted and strained at all, it is right, in view of the long tradition and the prima facie presumptive evidence, to strain it in any possible direction which can reasonably make the Shakespearian authorship intelligible. As a matter of fact the evidence is strained alike by one side and the other ; but as between the two it has to be remembered that the onus lies, on the opponent of the Shakespearian authorship to show, first that there is no possible explanation which

would justify the tradition, and secondly that there is positive evidence which can upset it and which will saddle the authorship of Shakespeare's works on Bacon or some one else. The contempt indiscriminately thrown on supporters of the Baconian theory by orthodox critics is apt to be expressed in terms which are occasionally unwarranted. But even if we leave out of account the lunatics and fabricators who have been so prominently connected with it, the adventurous amateur — however eminent as a lawyer or however acute as a critic of everyday affairs — may easily be too ingenious in his endeavours to solve a literary problem in which judgment largely depends on a highly trained and subtle sense of

literary style and a special knowledge of the conditions of Elizabethan England and of the early drama. In such an exposition of what may be called the " anti-Shaksperian " case as Mr Greenwood's, many points appear to make for his conclusion which are really not more than doubtful interpretations of evidence; and though these interpretations may be derived from orthodox Shakespearians — orthodox, that is to say, so far at all events as their view of Shakespearian authorship is concerned — there have been a good many such interpreters whose zeal has outrun their knowledge. The fact remains that the most competent special students of Shakespeare, however they may differ as to details, and also the most authoritative special students of Bacon, are unanimous in upholding the traditional view. The Baconian theory simply stands as a curious illustration of the dangers which, even in the hands of fair judges of ordinary evidence, attend certain methods of literary investigation.

There is one simple reason for this: in order to establish even a prima facie case against the identification of the man Shakespeare (however the name be spelt) with the author of Shakespeare's works, the Baconian must clearly account for the positive contemporary evidence in its favour, and this cannot well be done; it is highly significant that it was not attempted or thought of for centuries. It is comparatively easy to point to certain difficulties, which are due to the gaps in our knowledge. As already explained, the orthodox biographer, armed with the results of accurate scholarship and prolonged historical research, attempts to reconstruct the life of the period so as to offer possible or probable explanations of these difficulties. But he does so backed by the unshaken tradition and the Eositive contemporary evidence that the Stratford boy and man, the ondon actor, the author of Venus and Adonis and Lucrece, and the dramatist (so far at least as criticism upholds the canon of the plays ascribed to Shakespeare), were one and the same.

It may be useful here to add to what has been written in the preceding article some of the positive contemporary allusions to Shakespeare which establish this presumption. The evidence of Francis Meres in Palladis Tamia (1598) has already been referred to. It is incredible that Ben Jonson, who knew both Shakespeare and Bacon intimately, who himself dubbed Shakespeare the " swan of Avon," and who survived Bacon for eleven years, could have died without revealing the alleged secret, at a time when there was no reason for concealing it. Much has been made of Jonson's varying references to Shakespeare, and of certain inconsistencies in his references to both Shakespeare and Bacon ; but these can be twisted in more than one

direction and their explanation is purely speculative. His positive allusions to Shakespeare are inexplicable except as the most authoritative evidence of his identification of the man and his works. Richard Barnfield (1598) speaks of Shakespeare as " honey-flowing," and says that his Venus and Lucrece have placed his name " in Fame's immortal book." John Weever (1599) speaks of " honey-tongued Shakespeare," admired for " rose-cheeked Adonis," and " Romeo, Richard, more whose names I know not." John Davies of Hereford (1610) calls him " our English Terence, Mr Will Shakespeare." Thomas Freeman (1614) writes " to Master W. Shakespeare: " — " Who loves chaste life, there's Lucrece for a teacher | Who list read lust there's Venus and Adonis | . . . | Besides in plays thy wit winds like Meander." Other contemporary allusions, all treating Shakespeare as a great poet and tragedian, are also on record.

Finally, it may be remarked that although many problems in connexion with Shakespeare's authorship can only be solved by the answer that he was a " genius," the Baconian view that " genius " by itself could not confer on Shakespeare, the supposed Stratford " rustic," the positive knowledge of law, &c, which is revealed in his works, depends on a theory of his upbringing, and career which strains the evidence quite as much as anything put forward by orthodox biographers, if not more. As shown in the preceding article, it is by no means improbable that the Stratford " rustic " was quite well educated, and that his rusticity is a gross exaggeration. We know very little about his early years, and, in so far as we are ignorant, it is legitimate to draw inferences in favour of what makes the re- mainder of his career and achievements intelligible. The Baconian theory entirely depends on straining every assumption in favour of Shakespeare's not having had any opportunity to acquire knowledge which in any case it would require " genius ", to absorb and utilize; and this method of argument is directly opposed to the legitimate procedure in approaching the undoubted difficulties. Isolated

Ehrases, such as Ben Jonson's dictum as to his small knowledge of atin and Greek, which may well be purely comparative, the contemptuous expression of a university scholar for one who had no academic training, can easily be made too much of. The extreme

inferences as to his illiteracy, drawn from his handwriting, depend on the most meagre data. The preface to the First Folio says that " what he thought he uttered with that easiness that we have scarce received from him a blot in his papers " ; whereas Ben Jonson, in his Discoveries, says, " I remember the players often mentioned it as an honour to Shakespeare that in his writing, whatsoever he penned, he never blotted a line. My answer had been, would he had blotted a thousand! — which they thought a malevolent speech." Reams have been written about these two sayings, but we do not know the real circumstances which prompted either, and the non-existence of any of the Shakespeare manuscripts leaves us open, unfortunately, to the wildest conjectures. That there were such manuscripts (unless Ben Jonson and the editors of the First Folio were liars) is certain; but there is nothing peculiar in their not having survived, though persons unacquainted with the history of the manuscripts of printed works of the period sometimes seem to think so.

We know so little of the composition of Shakespeare's works, and the stages they went through, or the influence of other persons on him, that, so far as technical knowledge is concerned (especially the legal knowledge, which has given so much colour to the Baconian theory), various speculations are possible concerning the means which a dramatic genius may have had to inform his mind or acquire his vocabulary. The theatrical and social milieu of those days was small and close ; the influence of culture was immediate and mainly oral. We have no positive knowledge indeed of any relations between Shakespeare and Bacon; but, after all, Bacon was a great contemporary, personally interested in the drama, and one would expect the contents of his mind and the same sort of literary expression that we find in his writings to be reflected in the mirror of the stage; the same phenomenon would be detected in the drama of to-day were any critic to take the trouble to inquire. Assuming the genius of Shakespeare, such a poet and playwright would naturally be full of just the sort of matter that'would represent the culture of the day and the interests of his patrons. In the purlieus of the Temple and in literary circles so closely connectetl with the lawyers and the court, it is just the dramatic " genius " who would be familiar with anything that could be turned to account, and whose works, especially plays, the vocabulary of which was open to embody countless sources, in the different stages of composition, rehearsal, production and revision, would show the imagination of a poet working upon ideas culled from the brains of others. Resemblances between phrases used by Shakespeare and by Bacon, therefore, carry one no farther than the fact that they were contemporaries. We cannot even say

which, if either, originated the echo. So far as vocabulary is concerned, in every age it is the writer whose record remains and who by degrees becomes its representative; the truth as to the extent to which the intellectual milieu contributed to the education of the writer, or his genius was assisted by association with others, is hard to recover in after years, and only possible in proportion to our knowledge of the period and of the individual factors in operation.

(H. Ch.)

The Portraits of Shakespeare

The mystery that surrounds much in the life and work of Shakespeare extends also to his portraiture. The fact that the only two likenesses of the poet that can be regarded as carrying the authority of his co-workers, his friends, and relations — yet neither of them a life-portrait — differ in certain essential points, has opened the door to controversy and encouraged the advance and acceptance of numerous wholly different types. The result has been a swarm of portraits which may be classed as follows: (1) the genuine portraits of persons not Shakespeare but not unlike the various conceptions of him; (2) memorial portraits often based on one or other of accepted originals, whether those originals are worthy of acceptance or not; (3) portraits of persons known or unknown, which have been fraudulently " faked " into a resemblance of Shakespeare; and (4) spurious fabrications especially manufactured for imposition upon the public, whether with or without mercenary motive. It is curious that some of the crudest and most easily demonstrable frauds have been among those which have from time to time been, and still are, most eagerly accepted and most ardently championed. There are few subjects which have so imposed upon the credulous, especially those whose intelligence might be supposed proof against the chicanery practised upon them. Thus, in the past, a president of the Royal Academy in England, and many of the leading artists and Shakespearian students of the time, were found to support the genuineness, as a contemporary portrait of the poet, of a picture which, in its faked Shakespeare state, a few months before was not even in existence. This, at least, proves the intense interest taken by the world in the personality of Shakespeare, and the almost passionate desire to know his features. It is

desirable, therefore, to describe those portraits which have chief claim to recollection by reason either of their inherent interest or of the notoriety which they have at some time enjoyed; it is to be remarked that such notoriety once achieved never entirely dies away,

if only because the art of the engraver, which has usually perpetuated them either as large plates, or as illustra- tions to reputable editions of the works, or to commentaries or biographies, sustains their undeserved credit as likenesses more or less authentic.

Exhaustive study of the subject, extended over a series of years, has brought the present writer to the conclusion— identical with that entertained by leading Shakespearian authorities — that two portraits only can be accepted without question as authentic likenesses: the bust (really a half-length statue) with its structural wall-monument in the choir of Holy Trinity Church, Stratford-on-Avon, and the copper-plate engraved by Martin Droeshout as frontispiece to the First Folio of Shake- speare's works (and used for three subsequent issues) published in 1623, although first printed in the previous year.

The Stratford bust and monument must have been erected on the N. wall of the chancel or choir within six years after Shake- speare's death in 16 16, as it is mentioned in the prefatory memorial lines by Leonard Digges in the First Folio. The design in its general aspect was one often adopted by the " tombe-makers " of the period, though not originated by them, and according to Dugdale was executed by a Fleming resident in London since 1567, Garratt Johnson (Gerard Janssen), a denizen, who was occasionally a collaborator with Nicholas Stone. The bust is believed to have been commissioned by the poet's son-in-law, Dr John Hall, and, like the Droeshout print, must have been seen by and likely enough had the approval of Mrs Shake- speare, who did not die until August 1623. It is thought to have been modelled from either a life or death mask, and inartistic as it is has the marks of facial individuality; that is to say, it is a portrait and not a generalization such as was common in funereal sculpture. According to the practice of the day, especially at the hands of Flemish sculptors of memorial figures, the bust was coloured; this is sufficient to account for the technical summariness of the modelling and of the forms. Thus the eyebrows are scarcely more than indicated by the chisel, and a solid surface represents the teeth of the open mouth; the brush was evoked to supply effect and detail. To the colour, as reapplied after the removal of the white paint with which Malone had the bust covered in 1793, must be attributed a good deal of the wooden appearance which is now a shock to many. The bust is of soft stone (not alabaster, as incorrectly stated by " the accurate Dugdale "), but a careful examination of the work reveals no sign of the alleged breakage and restora- tion or reparation to which some writers have attributed the apparently inordinate length of the upper lip. As a matter of fact the lip is not

long; it is less than seven-eighths of an inch: the appearance is to a great extent an optical illusion, the result partly of the smallness of the nose and, especially, of the thinness of the moustache that shows the flesh above and below. Some repair was made to the monument in 1649, and again in 1748, but there is no mention in the church records of any meddling with the bust itself. Owing, however, to the characteristic inaccuracy of the print by one of Hollars' assistants in the illustration of Dugdale's Antiquities of Warwickshire (p. 688), the first edition of which was published in 1656, certain writers have been misled into the belief that the whole monument and bust were not merely restored but replaced by those which we see to-day. As other prints in the volume depart grossly from the objects represented, and as Dugdale, like Vertue (whose punctilious accuracy has also been baselessly extolled by Walpole), was at times demonstrably loose in his descrip- tions and presentments, there is no reason to believe that the bust and the figures above it are other than those originally placed in position. Other engravers, following the Dugdale print, have further stultified the original, but as they (Vertue, Grignion, Foudrinier, and others) differ among themselves, little importance need be attached to the circumstance. A

warning should be uttered against many of the so-called " casts " of the busts. George Bullock took a cast in 1814 and Signor A. Michele another about forty years after, but those attributed to W. R. Kite, W. Scoular, and others, are really copies, departing from the original in important details as well as in general effect. It is from these that many persons derive incorrect impressions of the bust itself.

Mention should here be made of the " Kesselstadt Death Mask, " now at Darmstadt, as that has been claimed as the true death-mask of Shakespeare, and by it the authenticity of other portraits has been gauged. It is not in fact a death-mask at all, but a cast from one and probably not even a direct cast.

In three placeson the back of it is the inscription -AlT>m 1616:

and this is the sole actual link with Shakespeare. Among the many rapturous adherents of the theory was William Page, the American painter, who made many measurements of the mask and found that nearly half of them agreed with those of the Stratford bust; the greater number which do not he conveniently attributed to error in

the sculptor. The cast first came to light in 1849, having been searched for by Dr. Ludwig Becker, the owner of a miniature in oil or parchment representing a corpse crowned with a wreath, lying in bed, while on the background, next to a burning candle, is the date — Ao 1637. This little picture was by tradition asserted to be Shakespeare, although the likeness, the death-date, and the wreath all point unmistak- ably to the poet-laureate Ben Jonson. Dr Becker had purchased it at the death-sale at Mainz of Count Kesselstadt in 1847, in which also " a plaster of Paris cast " (with no suggestion of Shakespeare then attached to it) had appeared. This he found in a broker's rag-shop, assumed it to be the same, recognized in it a resemblance to the picture (which most persons cannot see) and so came to attribute to it the enormous historical value which it would, were his hypothesis correct, unquestionably possess. In searching for the link of evidence necessary to be established, through the Kesselstadt line to England and Shake- speare, a theory has been elaborated, but nothing has been proved or carried beyond the point of bare conjecture. The arguments against the authenticity of the cast are strong and cogent — the chief of which is the fact that the skull reproduced is funda- mentally of a different form and type from that shown in the Droeshout print — the forehead is receding instead of upright. Other important divergencies occur. The handsome, refined, and pleasing aspect of the mask accounts for much of the favour in which it has been held. It was believed in by Sir Richard Owen and was long on view in the British Museum, and was shown in the Stratford Centenary Exhibition in 1864.

The " Droeshout print " derives its importance from its having been executed at the order of Heminge and Condell to represent, as a frontispiece to the Plays, and put forth as his portrait, the man and friend to whose memory they paid the homage of their risky enterprise. The volume was to be his real monument, and the work was regarded by them as a memorial erected in a spirit of love, piety, and veneration. Mrs Shake- speare must have seen the print; Ben Jonson extolled it. His dedicatory verses, however, must be regarded in the light of conventional approval as commonly expressed in that age of the performances of portrait-engravers and habitually inscribed beneath them. It is obvious, therefore, that in the circumstances an authentic portrait must necessarily have been the basis of the engraving; and Sir George Scharf, judging from the contra- dictory lights and shadows in the head, concluded that the original must have been a limning — more or less an outline drawing — which the youthful engraver was required to put into chiaroscuro, achieving his task with but very partial success. That this is the case

is proved by the so-called ” unique proof ” discovered by HalHwell-Phillips, and now in America. Another copy of it, also an early proof but not in quite the same ” state, ” is in the Bodleian Library. No other example is known. In this plate the head is far more human. The nose is here longer than in the bust, but the bony structure corresponds. In the proof, moreover, there is a thin, wiry moustache, much widened in the print as used; and in several other details there are

important divergencies. In this engraving by Droeshout the head is far too large for the body, and the dress — the costume of well-to-do persons of the time — is absurdly out of perspective: an additional argument that the unpractised engraver had only a drawing of a head to work from, for while the head shows the individuality of portraiture the body is as clearly done de chic. The first proof is conclusive evidence against the con- tention that the ” Flower Portrait “at the Shakespeare Memorial Museum, Stratford-on-Avon — the gift of Mrs Charles Flower (1895) an(i boldly entitled the ” Droeshout original ” — is the original painting from which the engraving was made, and is therefore the actual life-portrait for which Shakespeare sat. This view was entertained by many connoisseurs of repute until it was pointed out that had that been the case the first proof, if it had been engraved from it, would have resembled it in all particulars, for the engraver would have merely copied the picture before him. Instead of that, we find that several details in the proof — the incorrect illumination, the small moustache, the shape of the eyebrow and of the deformed ear, &c. — have been corrected in the painting, in which further improvements are also imported. The conclusion is therefore irresistible. At the same time the picture may possibly be the earliest painted portrait in existence of the poet, for so far as we can judge of it in its present condition — (it was to some extent injured by fire at the Alexandra Palace) — it was probably executed in the earlier half of the 17th century. The inscription — Willn Shakespeare, 1609 — is suspect on account of being written in cursive script, the only known example at the date to which it professes to belong. If it were authentic it might be taken as showing us Shakespeare’s appearance seven years before his death, and fourteen years before the publica- tion of the Droeshout print. The former attribution of it to Cornelis Janssen’s brush has been abandoned — it is the work of a comparatively unskilful craftsman. The picture’s pedigree cannot definitely be traced far back, but that is of little import- ance, as plausible pedigrees have often been manufactured to bolster up the most obvious impostures. The most interesting of the copies or adaptations

of this portrait is perhaps that by William Blake now in the Manchester Corporation Art Gallery. One of the cleverest imitations, if such it be, of an old picture is the " Buttery " or " Ellis portrait, " acquired by an American collector in 1902. This small picture, on panel, is very poor judged as a work of art, but it has all the appearance of age. In this case the perspective of the dress has been corrected, and Shakespeare's shield is shown on the background. The head is that of a middle-aged man; the moustache, contrary to the usual type, is drooping. It is curious that the" Thurston miniature "done from the Droeshout print gives the moustache of the " proof. " Two other portraits of the same character of head and arrange- ment are the " Ely Palace portrait " and the " Felton portrait," both of which in their time have had, and still have, convinced believers. The " Ely Palace portrait "was discovered in 1845. in a broker's shop, and was bought by Thomas Turton, bishop of Ely, who died in 1864, when it was bought by Henry Graves and by him was presented to the Birthplace. An unsatisfactory statement of its history, similar to that of many other portraits, was put forth; the picture must be judged on its merits. It bears the inscription "M 39 + 1603," and it shows a moustache and a right eyebrow identical with those in the Droeshout "proof." It was therefore hailed by many competent judges as the original of the print; by others it was dismissed as a "make-up "; at the same time it is very far from being a proved fraud. Supposing both it and the " Flower portrait " to be genuine, this picture, which came to light long before the latter, antedates it by six years. Judged by the test of the Droeshout " proof" it must have preceded and not followed it. The " Felton portrait, " which made its first appearance in 1792, had the valiant championship of the astute and cynical Steevens, of Britton, Drake, and other authorities, as the original of the Droeshout print, while a few — those who believed in the " Chandos portrait " — denounced it as " a rank forgery. " On the back of the panel was boldly traced in a florid hand " Gul. Shakespear 1597 R.B." (by others read " R.N."). If

SHAKESPEARE

Plate I.

PORTRAITS OF SHAKESPEARE

Photo, Harold Baker, Birmingham.

THE STRATFORD BUST AND MONUMENT IX HOLY TRINITY CHURCH, STRAT- FORD-ON-AVON. Erected before 1623.

Photo, Emery Walker.

THE ENGRAVING BY MARTIN DROESHOUT. In the First Folio Edition. 1623.

Photo, Emery Walker.

THE CHANDOS PORTRAIT. In the National Portrait Gallery.

THE FLOWER PORTRAIT.

(The " Droeshout Original ").

In the Shakespeare Memorial Gallery.

Plate II.

SHAKESPEARE

PORTRAITS OF SHAKESPEARE

I. THE JANSSEN

2. THE FELTON.

3. THE ELY PALACE.

4. THE HUNT OR STRATFORD.

5. THE LUMLEY.

6. THE ASHBOURNE. 7. THE HAMPTON COURT. 8. THE SOEST.

**tyS"*

9. THE BILLIARD MINIATURE.

10. THE AURIOL MINIATURE.

fhok.W.A. Maitscll.

11. THE DUNFORD.

P!io!o,W.A. Mausdl.

12. THE STACE.

13. THE DEATH-MASK. 14. THE ROUBILIAC 15. THE

SCHEEMAKERS

STATUE. STATUE.

IE DAVENANT BUST. 24

SHAKESPEARE

789

R.B. is correct, it is contended the initials indicate Richard Burbage, Shakespeare's fellow-actor. Traces of the writing may still be detected. Boaden's copy, made in 1792, repeating the inscription on the back, has " Guil. Shakspeare 1587 R.N." The spelling of Shakespeare's name — which in succeeding ages has been governed by contemporary fashion — has a distinct bearing on the authenticity of the panel. At the first appearance of the " Felton portrait " in a London sale-room it was bought by Samuel Felton of Drayton, Shropshire, for five pounds, along with a pedigree which carried its refutation along with it. Nevertheless, it bears evidence of being an honest painting done from life, and is probably not a make-up in the sense that most of the others are. It fell into the hands of Richardson the printseller, who issued fraudulent engravings of it by Trotter and others (by which it is best known), causing the characteristic lines of the shoulders to be altered, so that it is set upon a body attired in the Droeshout costume, which does not appear in the picture; and then, arguing from this falsely-introduced costume, the publisher maintained that the work was the original of the Droeshout print and therefore a life-portrait of Shakespeare. Thus foisted on the public it enjoyed for years a great reputation, and no one seems to have recognized that with its down-turned moustache it agrees with the inaccurate print after the Droeshout engraving which was published as frontispiece to Ayscough's edition of Shakespeare in 1790, i.e. two years before the dis- covery of the Felton portrait! The "Napier portrait," as the excellent copy by John Boaden is known, has recently been presented to the Shakespeare Memorial. Josiah Boydell also made a copy of the picture for George Steevens in 1797. Quite a number of capital miniatures from it are in existence. With these should be mentioned a picture of a similar type discovered by Mr M. H. Spielmann in 1905. Finding a wretched copy of the Chandos portrait executed on a panel about three hundred years old, he had the century-old paint cleaned off in order to ascertain the method of the forger. On the disappearance of the Chandos likeness under the action of the spirit another por- trait of Shakespeare was found beneath, irretrievably damaged but obviously painted in the

17th century. At the time of the " fake " only portraits of the Chandos type were saleable, and this would account for the wanton destruction of an interesting work which was probably executed for a publisher — likely enough for Jacob Tonson — but not used. Early as it is in date it can make no claim to be a life-portrait.

The " Janssen " or " Somerset portrait " is in many respects the most interesting painted likeness of Shakespeare, and undoubtedly the finest of all the paintings in the series. It is certainly a genuine as well as a very beautiful picture of the

period, and bears the inscription — i6i q — but doubt has been

expressed whether the 6 of 46 has not been tampered with, and whether it was not originally an o and altered to fit Shake- speare's age. It was made known through Earlom's rare mezzotint of it, but the public knowledge of it has been mainly founded on Cooper's and Turner's beautiful but misleading mezzotint plates until a photograph of the original was published for the first time in 1909 (in The Connoisseur) by permission of the owner, the Lady Guendolen Ramsden, daughter of the duke of Somerset, the former owner of the picture. The resem- blance to the main forms of the death-mask is undoubted; but that is of little consequence as confirmation unless the mask itself is supported by something beyond vague conjectures. Charles Jennens, the wealthy and eccentric amateur editor of the poor edition of King Lear issued in 1770, was the first known owner, but vouchsafed no information of its source and shrank from the challenge to produce the picture. Of the beauty, excellence, and originality of this portrait there is no question; it is more than likely that Janssen was the author of it; but that it was intended to represent Shakespeare is still to be proved. A number of good copies of it exist, all but one (which enjoys a longer pedigree) made in the 18th century: the " Croker Janssen " now lost, unless it be that of Lord Darnley's; the '■' Staunton Janssen," the " Buckston Janssen," the " Marsden

Janssen, " and the copy in the possession of the duke of Anhalt. These are all above the average merit of such work.

The portrait which has made the most popular appeal is that called the " Chandos, " formerly known as the " d'Avenant, " the " Stowe, " and the " Ellesmere, " according as it passed from hand to hand; it is now in the National Portrait Gallery. Tradition, tainted at the 'outset, attributes the authorship of it to Richard Burbage, although it is impossible that the painter of the head in the Dulwich Gallery

could have produced a work so good in technique; and Burbage is alleged to have given it to his fellow-actor Joseph Taylor, who bequeathed it to Sir William d'Avenant, Shakespeare's godson. As a matter of fact, Taylor died intestate. Thenceforward, whether or not it be- longed to d'Avenant, its history is clear. At the great Stowe sale of the effects of the duke of Buckingham and Chandos (who had inherited it) the earl of Ellesmere bought it and then presented it to the nation. Many serious inquirers have refused to accept this romantic, swarthy, Italian-looking head here depicted as a likeness of Shakespeare of the Midlands, if only because in every important physiognomical particular, and in face-measurement, it is contradicted by the Stratford bust and the Droeshout print. It is to be noted, however, that judged by the earlier copies of it — which agree in the main points — some of the swarthiness complained of may be due to the restorer. Oldys, indifferent to tradition, attributed it to Janssen, an un- allowable ascription. This, except the " Lumley portrait," the " Burdett Coutts portrait," and the admitted fraud, the " Dunford portrait," is the only picture of Shakespeare executed before the end of the 18th century which represents the poet with earrings — the wearing of which, it should be noted, either simple gold circles or decorated with jewel-drops, was a fashion that extended over two centuries, in England mainly, if not entirely, affected by nobles and exquisites. Contrary to the general belief, the picture has not been subjected to very extensive repair. That it was not radically altered by the restorer is proved by the fine copy painted by Sir Godfrey Kneller, and by him presented to John Dryden. The poet acknowledged the gift in his celebrated Fourteenth Epistle, written after 1691 and published in 1694, and containing the passage beginning, "Shakespeare, thy gift, I place before my sight; With awe I ask his blessing ere I write." D'Avenant had died in 1668, and so could not, as tradition contends was the case, have been the donor. In Malone's time the picture was already in the possession of the earl Fitzwilliam. This at least proves the esteem in which the Chandos portrait was held so far back as the end of the 17th century, only three-quarters of a century after Shakespeare's death.

From among the innumerable copies and adaptations of the Chandos portrait a few emerge as having a certain importance of their own. That which Sir Joshua Reynolds is traditionally said to have made for the use of Roubiliac, then engaged in his statue of Shakespeare for David Garrick (now in the British Museum), and another alleged to have been done for Bishop Newton, are now lost. That by Ranelagh Barret was presented in 1779 to Trinity College Library,

Cambridge, by the Shake- spearian commentator Edward Capell. Dr Matthew Maty, principal librarian of the British Museum, presented his copy to the museum in 1760. There are also the smooth but rather original copy (with drapery added) belonging to the earl of Bath at Longleat; the Warwick Castle copy; the fair copy known as the Lord St Leonards portrait; the large copy in coloured crayons, formerly in the Jennens collection and now belonging to Lord Howe, by van der Gucht, which seems to be by the same hand as that which executed the pastel portrait of Chaucer in the Bodleian Library; the " Clopton miniature " attributed to John Michael Wright, which formed the basis of the drawing by Arlaud, by whose name the engravings of this modified type are usually known; the Shakespeare Hirst picture, based on Houbraken's engraving; the full-size chalk drawing by Ozias Humphry, R.A., at the Birthplace, which Malone guaranteed to be a perfect transcript, but which more resembles the late W. P. Frith, R.A., than Shakesper.re. Humphry also,

adhering to his modified type, executed three beautiful but inaccurate miniatures from the picture, one of which is in the Garrick Club, and the others in private hands.

The " Lumley portrait " is in type a curious blend of the faces in the Chandos portrait and the Droeshout print, with a dash of the " Auriol miniature " (see later). It represents a heavy-jowled man with pursed-up lips, and with something of the expression but little of the vitality of the Chandos. Although it is thought to be indicated though not actually mentioned in the Lumley sale catalogues of 1785 and 1807, it was only when it came into the possession of George Rippon, presumably about the year 1848, that it was brought to the notice of the world, and additional attention was secured by the owner's contention that it was the original of the Chandos. It is claimed that the picture originally belonged to the portrait collector John, Lord Lumley, of Lumley castle, Durham, who died in 1609, and descended to Richard, the 4th earl of Scarborough, and George Augustus, the 5th earl, at whose respective sales at the dates mentioned it was put up to auction. On the first occasion it was bought in, and on the second it was acquired by George Walters. It is to be observed, however, that it does not appear by name in the early inventory, and it is unconvincingly claimed that it was mistakenly entered as Chaucer, a portrait of whom is mentioned. When in the possession of George Rippon the picture was so superbly chromo-lithographed by

Vincent Brooks that copies of it, mounted on old panel or canvas, and varnished, have often changed hands as original paintings. It is clear that if the picture was indeed in possession of John, Lord Lumley, we have here a contemporary portrait of Shakespeare, and the fact that it is an amateur performance would in no way in-validate the claim. It is thinly painted and scarcely looks the age that is claimed for it; but it is an interesting work, which, in 1875, entered the collection of the late Baroness Burdett-Coutts.

To Frederigo Zuccaro are attributed three of the more important portraits now to be mentioned; upon him also have been foisted several of the more impudent fabrications herein named. The " Bath " or " Archer portrait "—it having been in the possession of the Bath Librarian, Archer, when attention was first drawn to it in 1859 — is worthy of Zuccaro's brush. It is Italian in feeling, with an inscription (" W. Shakespear ") in an Italian but apparently more modern hand. The type of head, too, is Italian, and it is curious that in certain respects it bears some resemblance not only to the Chandos, and to the Droeshout and Janssen portraits, but also to the "death-mask"; yet it differs in essentials from all. Certain writers have affirmed that Reynolds in one of his Discourses expressed his faith in the picture; but the alleged passage cannot be identified. This eloquent, refined, and well-bred head suggests an Italian noble, or, if an English poet, a man of the type of Edmund Spenser; a lady-love shoe-string, or " twist " (often used to tie on a jewel), threads the ear and a fine lace ruff frames the head. The whole picture is beautifully painted by a highly accomplished artist. If this portrait represents Shakespeare at about the age of 30, that is to say in 1594, the actor-dramatist had made astonishing progress in the world, and become well-to- do, and had adopted the attire of a dandy. But Zuccaro came to England in 1574, and as his biographers state " did not stay long, " and returned to Florence to complete the work at the Duomo there begun by Vasari. The conclusion appears to be definite. The picture was acquired for the Baroness Burdett- Coutts by W. H. Wills.

Stronger objection applies to the " Boston Zuccaro " or " Joy portrait, " now in Boston, U.S.A. A Mr Benjamin Joy, who emigrated from London to Boston, owned a picture with a doubt- ful pedigree — transparently a manufactured tradition. R. S. Greenough, the American sculptor, used it along with " other authentic portraits " to produce his bust. In parts it has been viciously restored, but it is in very fair condition and appears to be a good picture of the Flemish school. In the vague assertion that it was found in the Globe Tavern which was frequented by Shakespeare and his associates, no credence can be placed, if only because no such tavern is known to

have existed.

The " Cosway Zuccaro portrait " is now in America; but the reproduction of it exists in England in the miniature of it by Cosway's pupil, Charlotte Jones, as well as in the rare mezzotint by Hanna Greene. The picture is alleged to have disappeared from the possession of Richard Cosway; it was sold in his sale, however, and passed through the hands of Lionel Booth and of Augustin Daly. No one would imagine that it is intended for a portrait of the poet. It is far more like Shelley (some- what caricatured, especially as to the cat-like eyes and the Mephistophelian eyebrows) or Torquato Tasso. The attribution to Zuccaro is absurd, yet Cosway and Sir Charles Eastlake believed in it. The inscription on the back, " Guglielm : Shakespear," with its mixture of Italian and English, resembles in wording and spelling that adopted in the case of several admitted " fakes." No attempt at discovering the history of the picture was ever made, but there is no doubt that at the beginning of the 19th century it was widely credited; Wivell and others attributed it to Lucas Franchois. It is said to be well painted, but the copies show that it is ill drawn. The miniature by Charlotte Jones, a fashionable artist in her day, is pretty and weak, but well executed; it was painted in 1823.

Of the " Burdett-Coutts portrait " (the fourth interesting portrait of Shakespeare in the possession of Mr Burdett-Coutts) there, is no history whatever to record. No name has been suggested for the artist, but the hands and accessories of dress strongly resemble those in the portrait of Elizabeth Hardwick, countess of Shrewsbury, in the National Portrait Gallery. The ruff, painted with extreme care, reveals a pentimento. The picture is admirably executed, but the face is weak and is the least satisfactory part of it; especially feeble is the ear with the ring. Shakespeare's shield, crest, with red mantling, which appear co-temporary with the rest, and the figures "37 " beneath it, appear on the background, in the manner adopted in 17th- century portraits. From this picture the " Craven portrait " seems to have been " faked."

Equally striking is the " Ashbourne portrait," well known through G. F. Storm's engraving of it. It is sometimes called the " Kingston portrait " as the first known owner of it was the Rev. Clement U. Kingston, who issued the engraving in 1847. It is an important three-quarter length, representing a figure in black standing beside a table at the corner of which is a skull whereon the figure rests his right forearm. It is an acceptable likeness of Shakespeare, in the manner of Paul van Somer, apparently pure except in the ruff. The

inscription " ˆtatis svae. 47. A° 161 1," and the decoration of cross spears on a book held by the right hand, are also raised from the ground, so that it would be injudicious to decide that these are not of a later date yet at the same time ancient additions. It is the only picture — if we disregard the inadmissible " Hampton Court portrait " — in which Shakespeare is shown wearing a sword- belt and a thumb-ring, and holding a gauntleted glove. The type is that of a refined, fresh-coloured, fair-haired English gentleman. There is no record of the picture before Mr Kingston bought it from a London dealer.

More famous, but less reputable, is the " Stratford " or " Hunt portrait," amusingly exhibited in an iron safe in the Birthplace at Stratford, to which it was presented by W. O. Hunt, town clerk, in 1867. It had been in the Hunt family for many years and represented a black-bearded man. Simon Collins, the picture cleaner and restorer who had cleansed the Stratford bust of Malone's white paint and restored its colours, declaring that another picture was beneath it, was engaged to exercise himself upon it. He removed the top figure from the dilapidated canvas with spirit and found beneath it the painted version of the Stratford bust. At that time Mr Rabone's copy, now at Birmingham, was made; it is valuable as evidence. Then Collins, always a suspect in this matter, proceeded with the restoration, and by treatment of the hair made the portrait more than ever like the bust; and the owner, and not a few others, proclaimed the picture to be the original from which the bust was made. No judge of painting, however, accepts the picture as dating further back than the latter half of the 18th

century — -when it was probably executed, among a score of others, about the time of the bicentenary of Shakespeare's birth, an event which gave rise to much celebration. The ingenious but entirely unconvincing explanations offered to account for the state in which the picture was found need not be recounted here.

The " Duke of Leeds' portrait," now at Hornby castle, has been for many years in the family, but the circumstances of its provenance are unknown. It has been thought possible that this is the lost portrait of which John Evelyn speaks as having been in the collection of Lord Chancellor Clarendon, the companion picture to that of Chaucer; but no evidence has been adduced to support the conjecture. It represents

a handsome, fair man, with auburn beard, with an expression recalling the Janssen portrait; the nose, however, is quite different. He wears a standing " wired band," as in the Droe- shout print. It is a workmanlike piece of painting, but there is nothing in the picture to connect it with Shakespeare. The same may be said of the " Welcombe portrait," which was bought by Mark Philips of Welcombe and descended to Sir George Trevelyan. It is a fairly good picture, having some resemblance to the " Boston Zuccaro " with something of the Chandos. The figure, a half-length, wears a falling spiked collar edged with lace, and from the ear a love-lace, the traces of which only are left. Two other portraits at the Shakespeare Memorial should be named. The " Venice portrait," which was bought in Paris and is said to have come from Venice, bears an Italian unde- cipherable inscription on the back; it seems to have no obvious connexion with Shakespeare apart from its exaggeration of the general aspect of the Chandos portrait; it is a weak thing. The " Tonson portrait," inscribed on the frame " The Jacob Tonson Picture, 1735, "asmall oval, with the attributes of comedy and tragedy, is believed to have been executed for Tonson's 4th edition of Shakespeare, but not used.

The " Soest portrait " (often called Zoust or Zoest), formerly known as " the Douglas," the " Lister Kaye " or the " Clarges portrait," according to the owner of the moment, was for many years a public favourite, mainly through J. Simon's excellent mezzotint. The picture, a short half-length within an oval, is manifestly meant for Shakespeare, but the head as nearly resembles the head of Christ at Lille by Charles Delafosse (1636- 1 7 16) who also painted pictures in England. Gerard Soest was not born until 1637, and according to Granger the picture was painted in Charles II. 's reign. It is a pleasing but weak head, possibly based on the Chandos. The whereabouts of the picture is unknown, unless it is that in the possession of the earl of Craven. A number" of copies exist, two of which are at the Shakespeare Memorial. Simon's print was the first announce- ment of the existence of the picture, which at that time belonged to an obscure painter, F. Wright of Covent Garden.

The " Charlecote portrait," which was exhibited publicly at Stratford in 1896, represents a burly, bull-necked man, whose chief resemblance to Shakespeare lies in his baldness and hair, and in the wired band he wears. The former possession of the picture by the Rev. John Lucy has lent it a sort of reputation ; but that gentleman bought it as recently as 1853.

Similarly, the " Hampton Court portrait " derives such authority as it

possesses from the dignity of its owner and its habitat. William IV. bought it as a portrait of Shakespeare, but without evidence, it is suggested, from the de Lisles. This gorgeously attired officer in an elaborate tunic of green and gold, with red bombasted trunks, with fine worked sword and dagger pendent from the embroidered belt, and with a falling ruff and laces from his ear, bears some distant resemblance to the Chandos portrait. Above is inscribed, " ˆEtat. suae. 34." It appears to be the likeness of a blue-eyed soldier; but it has been suggested that the portrait represents Shakespeare in stage dress — a frequent explanation for the strange attire of quaintly alleged portraits of the poet. A copy of this picture was made by H. Duke about i860. Similarly unacceptable is the"H. Danby Seymour portrait" which has disappeared since it was lent to the National Portrait Exhibition of 1866. This is a fine three-quarter length in the Miervelt manner. The dignified

bald-headed man has a light beard, brown hair, and blue eyes, and wears white lace-edged falling collars and cuffs over a doublet gold-embroidered with points; and in the left hand holds a black hat. The " Lytton portrait," a royal gift made to Lord Lytton from Windsor Castle, is mainly interesting as having been copied by Miller in his original profile engraving of Shake- speare. The " Rendelsham " and " Crooks " portraits also belong to the category of capital paintings representing some one other than Shakespeare; and the same may be hazarded of the " Grafton " or " Winston " portrait, the " Sanders portrait," the " Gilliland portrait " (an old man's head impudently advanced), the striking " Thome Court portrait," the " Aston Cantlow portrait," the" Burn portrait," the " Gwennet portrait," the " Wilson portrait " and others of the class.

Miniature-painting has assumed a certain importance in relation to the subject. The " Welbeck Abbey " or " Harleian miniature," is that which Walpole caused to be engraved by Vertue for Pope's edition of Shakespeare (1723-1725), but which Oldys declared, in- correctly, to be a juvenile portrait of James I. According to Scharf, it belonged to Robert Harley, 1st earl of Oxford, but it is more likely that it was bought by his son Edward Harley in the father's lifetime. It already was in his collection in 1 7 19, but whence it came is not known. It has been denounced as a piece of arrant sycophancy that Pope consented to adopt this very beautiful but entirely unauthenti- cated portrait, which bears little resemblance to any other accepted likeness (more, however, to the Chandos than to the rest) simply in order to please the aristocratic patron of his literary circle. It measures 2 in. high ; Vertue's exquisite engraving, executed in 1 72 1 , enlarged it to 5J, and became the " authority " for numerous

copies, British and foreign. The " Somerville " or " Hilliard miniature," belonging to Lord and Lady Northcote, is claimed to have descended from Shakespeare's friend, Somerville of Edstone, grandfather of the poet William Somerville. It was first publicly spoken of in 181 8 when it was in the possession of Sir James Bland Burges. It is certainly by Hilliard, but although Sir Thomas Lawrence and many distinguished painters and others agreed that it was an original life- portrait of the poet, few will be disposed to give adherence to the theory, in view of its complete departure from other portraits. It represents a pale man with flaxen hair and beady eyes ; yet in it Burges found " a general resemblance to the best busts (sic) of Shakespeare," and an attempt was made to prove a relationship between the Ardens and the Somervilles — an untenable theory. The miniature has frequently been exhibited and has figured in important collections on its own merits. The well-known " Auriol miniature," now in America, is one of the least sympathetic and the least acceptable of the Shakespeare miniatures, excellent though it is in technique. It has the forehead and hair/'of the Chandos, but it is utterly devoid of the Shakespeare expression. In the background appears 1 , " J& 33." The costume is that worn by the highest in the land. It first appeared in its present character in 1826, but it had been known for a few years before, as being in the collection of " Dog " Jennings, and ultimately it came into the hands of the collector, Charles Auriol. Its early history is unknown. The other principal miniatures of interest, but lacking authority, are the " Waring miniature," the " Tomkinson miniature " (which, like the " Hilliard " and the " Auriol," was formerly in the Lumsden Propert collection), the doubtful " Isaac Oliver miniature " (alleged to have been in the Jaffe collection at Hamburg), the " Mackey " and " Glen " miniatures, and those presented to the Shakespeare Memorial by Lord Ronald Sutherland Gower, T. Kite, and Henry Graves. These are all contemporary or early works. Miniature copies of recognized portraits are numerous and many of them of high excellence, but they do not call for special enumeration. That, however, by Mary Anne Nichols, " an imitative cameo after Roubiliac," exhibited in the Royal Academy, 1848, claims notice. In this category are a number of enamels by accomplished artists, the chief of them Henry Bone, R.A., H. P. Bone, and W. Essex.

Several recorded painted portraits have disappeared, other than those already mentioned; these include the " Earl of Oxford portrait " and the " Challis portrait." The " Countess of Zetland's portrait," which had its adherents, was destroyed by fire.

Not a few of the existent representations of Shakespeare, un-

authoritative as they are, were honestly produced as memorial pictures. There is another class, the earnest attempts made to reconstitute the face and form of the poet, combining within" them the best and most characteristic features of the earliest portraits. The most successful, perhaps, is that by Ford Madox Brown, in the Manchester Corporation Art Gallery. Those by J. F. Rigaud, R.A., and Henry Howard, R.A., take a lower rank. It is to be regretted that Gainsborough did not execute the portrait for Garrick, for which he made serious preparations. The " Booker portrait," which gained wide publicity in Stratford, might be included here; it has dignity, but the pigment forbids us to allow the age claimed for it. The portraits by P. Kramer and Rumpf are among the best recently executed in Germany. The remarkable pen-and-ink drawings by Minanesi and Philip H. Newman deserve to be remembered.

The " faked " portraits have been at times as ardently accepted as those with some solid claim to consideration. The " Shakespeare Marriage picture," with its rhyming confirmatory " tag " intended as an inscription, was discovered in 1872. It is a genuine Dutch picture of man and wife weighing out money in the foreground — a frequent subject — while through the open door Shakespeare and, presumably, Ann Hathaway are seen going through the ceremony of handfasting. The inscription and the Shakespeare head (probably the whole group) are fakes. The " Rawson portrait," inscribed with the poet's name, is faked; it is really a beautiful little portrait of Lord Keeper Coventry by Janssen. The " Matthias Alexander portrait " shows a modern head on an old body. The " Belmount Hall portrait " with its pseudo-Garrick MS. inscription on the back, is in the present writer's opinion not the genuine thing which it claims to be. It represents the poet looking up from his literary work. In the early part of the 19th century two clever " restorers," Holder and Zincke, made a fairly lucrative trade of fabricating spurious portraits of Shakespeare (as well as of Oliver Cromwell and Nell Gwynn) and the clumsiness of most of them did not impede a ready sale. The way in which they imposed upon scholars as well as on the public is marvellous. Many of these impudent impostures won wide acceptance, sometimes by the help of the fine engravings which were made of them. Such are the " Stace " and' the " Dunford portraits " — so named after the unscrupulous dealers who put them forward and promulgated them. They have both disappeared, but of the latter a copy is still in existence known as the " Dr Clay portrait." The

former is based upon the portrait of Robert Carr, earl of Somerset. These are the two " Winstanley portraits," the " Bishop Newton," the " Cygnus Avoniae," the " Norwich " or " Boardman," the " Bellows "or" Talma "portraits — most of them, as well as others, traceable to one or other or both of the enterprising fakers already named. At least a dozen are reinforced, as corrobo- rative evidence, with verses supposed to issue from the pen of Ben Jonson. These are all to be attributed to one ready pseudo- Elizabethan writer whose identity is known. With these pic- tures, apparently, should be ranged the composition, now in America, purporting to represent Shakespeare and Ben Jonson playing chess.

The " fancy-portraits " are not less numerous. The 18th-century small full-length " Willett portrait " is at the Shakespeare Memorial. It is a charmingly touched-in little figure. There are many represen- tations of the poet in his study in the act of composition — they include those by Benjamin Wilson (Stratford Town Hall), John Boaden, John Faed, R.A., Sir George Harvey, R.S.A., C. Bestland, B. J. N. Geiger, and the painter of the Warwick Castle picture, &c. ; others have for subject Shakespeare reading, either to the Court or to his family, by John Wood, E. Ender, R. Westall, R.A., &c. ; or the infancy and childhood of Shakespeare, by George Romney (three pictures), T. Stothard, R.A., John Wood, James Sant, R.A.; Shakespeare before Sir Thomas Lucy, by Sir G. Harvey, R.S.A., Thomas Brooks, A. Chisholme, &c. These, and kindred subjects such as " Shake- speare's Courtship," have provided infinite material for the industry and ingenuity of Shakespeare-loving painters.

The engraved portraits on copper, steel, and wood are so numerous — amounting to many hundreds — that it is impossible to deal with them here; but one or two must be referred to, as they have genuine importance and interest. Vertue and Walpole speak of an engraved portrait by John Payne (fl. 1620, the pupil of Simon Pass and one of the first English engravers who achieved distinction) ; but no such print has even been found and its existence is doubted. Walpole probably confounded it with that by W. Marshall, a reversed and reduced version of the Droeshout, which was published as frontis- piece to the spurious edition of Shakespeare's poems (1640). It is good but hard. An admirable engraving, to all but expert eyes un- recognizable as a copy, was made from it in 1815, and another later. William Faithorne (d. 1691) is credited with the frontispiece to Quarles's edition of " The Rape of Lucrece, by William Shakespeare, gent." (1655). It was copied for Rodd by R. Sawyer and republished in 1819. It represents the tragic scene between Tarquin and Lucrece, and above is inset an oval medallion, being a rendering of the Droe-

shout portrait reversed. The earliest engravings from the Chandos portrait are of interest. The first by L. du Guernier (Arlaud type) and that by M. (father of G.) van der Gucht are introduced into a pleasing composition. The same elaborate design was adopted by L. van der Gucht. These, like Vertue's earlier prints, look to the left ; subsequent versions are reversed. Perhaps the most cele- brated, partly because it was the most important and technically the finestˆ up to that time, is the large engraving (to the right) by Houbraken, a Dutchman, done for Birch's " Heads of Illustrious Persons of Great Britain " published by T. and P. Knapton (1747- 1752). This free rendering of the Chandos portrait is the parent of the numerous engravings of " the Houbraken type." Since that date many plates of a high order, from all the principal portraits, have been issued, many of them extremely inaccurate.

Numerous portraits in stained glass have been inserted in the windows of public institutions. Typical of them are the German Chandos windows by Franz Mayer (Mayer & Co.) at Stationers' Hall, and in St Helens, Bishopsgate (Professor Blaim) ; and that of the Droeshout type in the great hall of the City of London school. Ford Madox Brown's design is one of the best ever executed.

We now come to the sculptured memorials. After Gerrard Johnson's bust no statuary portrait was executed until 1740, when the statue in Poets' Corner, Westminster Abbey, was set up by public subscription, mainly through the enthusiastic activity of the earl of Burlington, Dr Richard Mead, and the poet Pope. It was designed or " invented " by William Kent and modelled and carried out by Peter Scheemakers; what is, as Walpole said, " preposterous " about it — mainly the pedestal with its incongruous heads — may be credited to the former, and what is excellent to the latter. It is good sculpture, and is interesting as being the first sculptured portrait of the poet based upon the Chandos picture. Lord Pembroke possesses a replica of it. A free repetition, reversed and with many changes of detail, is erected in a niche on the exterior wall of the town-hall of Stratford-on-Avon. A copy of it in lead by Schee- makers' pupil, Sir Henry Cheere, used to stand in Drury Lane theatre. Wedgwood copied this work, omitting the absurdities of the pedestal, with much spirit in black basalt. The marble copy, much simplified, in Leicester Square, is by Fontana, a gift to London by Baron Albert Grant. Busts were executed by Scheemakers, founded on the same portrait. One is still at Stowe in the " Temple of British Worthies," and in Lord Cobham's possession is that presented by Pope to Lord Lyttelton. Some very fine engravings of the monument have been produced, the most important that in Boydell's Shakespeare (larger edition). By L. F. Roubiliac,

Cheere's protege, is the statue which in 1758 David Garrick commissioned him to carve and which he be- queathed to the British Museum. It is also based upon the Chandos portrait. The terra-cotta model for the statue is in the Victoria and Albert Museum; and a marble reproduction of it is in private hands. To Roubiliac also must be credited the celebrated " D'Avenant Bust " of blackened terra-cotta in the possession of the Garrick Club. This fine work of art derives its name from having been found bricked up in the old Duke's theatre in Portugal Row, Lincoln's Inn Fields, which 180 years before was d'Avenant's, but which after- wards passed through various vicissitudes. It was again adapted for theatrical purposes by Giffard, for whom this bust, together with one of Ben Jonson which was smashed at the moment of discovery, must have been modelled by the sculptor, who at the same time was engaged on Garrick's commission. The model for the British Museum statue is seen in the portrait of Roubiliac by Carpentiers, now in the National Portrait Gallery. Another portrait of Shake- speare is in Westminster Abbey — a medallion based on the Chandos picture, introduced into Webber's rather fantastic monument to David Garrick. An important alto-relievo representation of Shake- speare, by J. Banks, R.A., between the Geniuses of Painting and the Drama, is now in the garden of New Place, Stratford-on-Avon. It was executed for Boydell's Shakespeare Gallery in Pall Mall, and was presented to the British Institution which afterwards occupied the premises; on the dissolution of that body it was given to Stratford by Mr Holte Bracebridge. It is a fine thing, but the likeness adheres to no clearly specified type. It has been excellently engraved in line by James Stow, B. Smith, and others, and was reproduced on the admirable medai by Kiichler, presented by Boydell to every subscriber to his great illustrated edition of Shakespeare's works. It is remarkable that Banks's was the first British hand to model a portrait of the poet.

In more recent times numerous attempts have been made to re-constitute the figure of Shakespeare in sculpture. The most ambitious of these is the elaborate memorial group modelled and presented by Lord Ronald Sutherland Gower to Stratford and set up outside the Memorial Theatre in 1888. The large seated figureof Shakespeare is mounted on a great circular base around which are arranged the figures of Hamlet, Lady Macbeth, Prince Henry, and Falstaff. In 1864 J. E. Thomas modelled the colossal group of Shakespeare with attendant figures of Comedy and Tragedy that was erected in the grounds of the Crystal Palace, and in the same year Charles Bacon produced his colossal Centenary Bust, a reproduction of which forms the frontispiece to John H. Heraud's Shakspere: His Inner Life

(1865). The chief statues, single or in a group, in London still to be mentioned are the following: that by H. H. Armstead, R.A., in marble, on the southern podium of the Albert Memorial ; by Hamo Thornycroft, R.A. (1871), on the Poets' Fountain in Park Lane; by Messrs Daymond on the upper storey of the City of London School, on the Victoria Embankment ; and by F. E. Schenck, a seated figure, on the facade of the Hammersmith Public Library. The Droeshout portrait is the basis of the head in the bronze memorial by Professor Lanteri set into the wall on the conjectural site of the Globe Theatre (1909) and of the excellent bust by Mr C. J. Allen in the churchyard of St Mary the Virgin, Aldermanbury, in memory of Heminge and Condell (1896). A recumbent statue, with head of the Chandos type, was in preparation in 19 10 for erection in the south aisle of South wark Cathedral. Among statues erected in the provinces are those by Mr H. Pegram, A.R.A., in the building of Birmingham University (1908) and by M. Guillemin for Messrs Farmer and Brindley for the Nottingham University buildings.

Several statues of importance have been erected in other countries. The bronze by M. Paul Fournier in Paris (presented by an English resident) marks the junction of the Boulevard Haussmann and the Avenue de Messine (1888). The seated marble statue by Professor O. Lessing was set up in Weimar by the German Shakespeare Society ; the sculptor has also modelled a couple of busts of a very personal

and, it may be said, un-English type. A seated statue in stone roughly hewn with characteristic breadth by the Danish sculptor, Louis Hasselriis, has for some years been placed in the apartment of the Castle of Kronborg, in which, according to the Danish tradition, Shakespeare and his company acted for the king of Denmark. America possesses some well-known statues. That by J. Q. A. Ward is in Central Park, New York (1872). In 1886 William Ordway Partridge modelled and carved the seated marble figure for Lincoln Park, Chicago; and later, Frederick MacMonnies produced his very original statue for the Library of Congress, Washington, D.C. This is in some measure based on the Droeshout engraving. William R. O' Donovan also sculptured a portrait of Shakespeare in 1874. Great consideration is given by some to the bust made by William Page of New York in preparation for a picture of the poet he was about to paint. He founded it with pathetic faith and care and amazing punctiliousness on the so-called " Death Mask," which it little

resembles; as he was no sculptor the bust is no more successful than the picture. The bust by R. S. Greenough, already mentioned as based in part on the " Boston Zuccaro " portrait, must be included here, as well as the romantic, dreamy, marble bust by Augusto Possaglio of Florence (presented to the Garrick Club by Salvini in 1876); the imaginative work by Altini (Duke of Northumberland, Alnwick Castle) ; and the busts by F. M. Miller, E. G. Zimmermann, Albert Toft, J. E. Carew (Mr Muspratt, Liverpool) and P. J. Chardigny of Paris. The last named was a study made in 1850, for a proposed statue, 100 ft. high, which the sculptor hoped to be commissioned to produce. A multitude of small bronze and silver busts and statuettes have also been produced. Some attention has been accorded for several years past to the great pottery bust attributed to John Dwight's Fulham Pottery (c. 1675). The present writer, however, has ascertained that it is by Lipscombe, in the latter portion of the 19th century.

The wood carvings are numerous. The most interesting among them is the medallion traditionally believed to have been carved by Hogarth, and inset in the back of the " Shakespeare chair " presented by the artist to David Garrick (in the possession of Mr W. Burdett-Coutts). The statuettes alleged to be carved from the wood of Shakespeare's mulberry-tree are numerous; among the most attractive are the archaic carvings by Salsbee (1761). One statu- ette of a primitive order of art was sold in 1909 in London for a fantastic sum; it was absurdly claimed to be the original of Scheemakers' statue, but without the slightest attempt at proof or justification.

The .Medals and Coins of Shakespeare offer material for a separate numismatic study. Those of the Chandos type are by far the most numerous. The best of them are as follows: Jean Dassier (Swiss; in the " Series of Famous Men," c. 1730); J. J. Barre (French; in the " Series numismatica universalis," 1818); Westwood (Garrick Jubilee, 1769); J. G. Hancock — the young short-lived genius who engraved the die when only seven years old; J. Kirk (for the Hon. Order of Shakespeareians, 1777); W. Barnett (for the Stratford Commemoration, 1816); J. Moore (to celebrate the Birthplace, 1864); and L. C. Wyon (the gift of Mr C. Fox-Russell to Harrow School, 1870). The latest, and one of the most skilful, is the plaquette (no reverse) in the series of Beriihmter Manner " by Wilhelm Mayer and Franz Wilhelm of Stuttgart, the leading medal-partnership of Germany (1908). After the " Droeshout " engraving: Westwood (1821); T. A. Vaughton (1908-1909). After the "Stratford bust": W. F. Taylor (celebrating the Birthplace, 1842) ; and T. J. Minton; T. W. Ingram (for Shakespearean Club, Stratford,

1824); J. Moore, Birmingham ; and, head only, Antoine Desbceufs (French, exhibited in the Salon, 1822 — obverse only) ; B. Wyon (for the City of London School, Beaufoy Shakespearean prize, 1851); J. S. and A. B. Wyon (for the M'Gill University, Montreal, 1864); J onI1 Bell and L. C. Wyon (for the Tercentenary Anniversary, 1864); Allen and Moore (with incorrect birthdate, " 1574," 1864). From the " Janssen " type: Joseph Moore (a medal imitating a cast medal, 1908). There is an Italian medal, cast, of recent date; with the exception of this all the medals are struck.

The 18th-century tradesmen's Tokens, which passed current as money when the copper coinage was inadequate for the public needs, constitute another branch for collectors. About thirty- four of these, including variations, bear the head of Shakespeare. With one exception (a farthing, 1815, issued much later than the bulk of the tokens) all represented half-pence. They comprise the " local " and " not local." There are the " Warwickshire " series, the " London and Middlesex," and the " Stratford Promissory " series. Many are stamped round the edge with the names of the special places in which they are payable. In addition to these may be mentioned the 24 " imitation regal " tokens which bear Shakespeare's name, around (except in one or two cases) the effigy of the king. They belong to the last quarter of the 18th century.

Many of the more important kilns have produced portraits of Shakespeare in porcelain and pottery, in statuettes, busts, in " cameos " and in painted pieces. We have them in Chelsea; old Derby; Chelsea-Derby; old Staffordshire (salt-glaze), frequently reproducing, as often as not with fantastic archaism, Scheemakers' statue ; and on flat surfaces by transfer of printed designs — both

l8th-and 19th-century productions; also French-Dresden and Wedg-wood. In the last-named ware is the fine bust, half-life size, in black basalt, as well as several " cameos " in various sizes, in blue and white jasper, or yellow ground, and in black basalt. The busts were also produced in different sizes. Worcester produced the well-known " Benjamin Webster " service, with the portrait, Chandos type, en cama'icu, as well as the mug in " jet enamel," which was the fifth of the set of thirteen. Several of the portraits have also been pro- duced commercially in biscuit china. ' |

Gems with intaglio portraits of Shakespeare have been copiously produced since the middle of the 19th century, nearly all of them based upon earlier works by men who were masters of their still-living craft. The principal of these latter are as follows: Edward

Burch, A.R.A., exhibited in 1765; Nathaniel Marchant, R.A., exhibited 1773 (Garrick turning to a bust of Shakespeare); Thomas Pownall (c. 1750); William Barnett; J. Wicksted the Elder (Shakespeare and Garrick) ; W. B. Wray (a beautiful drawing for this is in the Print Room of the British Museum) ; and Yeo. In the same class may be reckoned the Cameos, variously sardonyx, chalcedony, and shell, some excellent examples of which have been executed, and the Ivories, both in the round and in relief. The Waxes form a class by themselves; in the latter portion of the 1 8th century a few small busts and reliefs were put forth, very good of their kind. These have been imitated within recent years and attempts made to pass them off as originals, but only the novice is deceived by them. Similarly the old Shakespeare brass pipe-stoppers have latterly been widely reproduced, and the familiar little brass bust is widely reproduced from the bronze original. So voracious is the public appetite for portraits of the poet that the old embroideries in hair and more recently in woven silk found a ready market; reliefs in silver, bronze, iron, and lead are eagerly snapped up, and postage stamps with Shakespeare's head have been issued with success. The acquisitiveness of the collector paralyses his powers of selection. The vast number of other objects for daily use bearing the portrait of Shakespeare call for no notice here. (M. H. S.)

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I. Principal Collective Editions

Plays

Date.

or Works.

Editors, Publishers, &c.

1623

P.

1st folio, J. Heminge and H. Condell (Jaggard & Blount) [reprinted

by J. Wright (1807, folio) and by L. Booth (1862-4, 3 vols

4to);

photo-lithographic facsimile by H. Staunton (1866, folio); re-

duced by J. 0. Halliwell-Phillipps, 1876, 8vo; reprod. Chatsworth copy, introd. by S. Lee, 1902, folio; Methuen, folio]. 2d folio (Cotes) [fasc. 1909 (Methuen) folio).

from

1910,

1632

P.

1663, 64

P.

3d folio (Chetwinde) [fasc. 1905 (Methuen) folio].

1685

P.

4th folio [fasc. 1904 (Methuen) folio].

1709

W.

1st 8vo, Rowe (Tonson), 7 vols., plates.

1 7 23-2 S

W.

A. Pope (Tonson), 7 vols. 4to.

1733

W.

L. Theobald (Tonson), 7 vols. 8vo, plates.

1743,44

P.

Sir T. Hanmer (Oxford), 6 vols. 4to, plates.

1747

P.

Bp. Warburton, 8 vols. 8vo.

176S

P.

Dr S. Johnson (Tonson), 8 vols. 8vo.

1767

P.

E. Capell (Tonson), 10 vols. sm. 8vo.

1773

P.

Johnson and G. Steevens, 10 vols. 8vo.

1773-75

P.

“Stage ed.” (Bell), 8 vols. 12 mo, plates.

1790

W.

E. Malone (Baldwin), first ” Variorum ed.” 10 vols. Sm. 8vo.

1793

P.

Johnson and Steevens's 4th ed., by I. Reed, r5 vols. Svo.

1795-96

w.

1st American ed,. S. Johnson (Philadelphia), 8 vols. 12 mo.

1 799-1801

w.

1st Continental ed. (Brunswick), 8 vols. 8vo; repr. of 1793 Basle, 1799-1802, 23 vols. 8vo.

ed. at

1802

P.

Boydell's illus. ed. (Bulmer), 9 vols, fol., plates, and 2 add

vols. A. Chalmers, 9 vols. 8vo, Fuseli's plates.

tional

1805

1807

Heath's engravings, 6 vols. imp. 4to.

1818

T. Bowdler's "Family ed.," complete, 10 vols. i8mo.

1821

w.

E. Malone, by J. Boswell, "Variorum ed.," 21 vols. 8vo.

182s

Rev. W. Harness, 8 vols. 8vo.

1826

S. W. Singer (Pickering), 10 vols. i8mo, woodcuts.

1829

1st French ed. (Baudry), 8vo.

1830

w.

L. Tieck (Leipzig), roy. 8vo.

1832-34

w.

J. Valpy, "Cabinet Pictorial ed.," 15 vols. sm. 8vo.

1838-43

w.

C. Knight, "Pictorial ed.," 8 vols. imp. 8vo.

1839-43

w.

B. Cornwall, 3 vols. imp. 8vo, woodcuts by Kenny Meadows.

1841-44

w.

J. P. Collier, 8 vols. 8vo.

1842-44

w

C. Knight, "Library ed.," 12 vols. 8vo, woodcuts.

1844

0. W. Peabody (Boston, U.S.), 7 vols. 8vo.

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w.

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794

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Date.

1856

1857

VV.

18ˆ7-60

W.

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1863-66

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VV

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vols. 8vo; Dingelstedt, W. Jordan and others, 1865-70, 9 vols. 8vo;F.Bodenstedt and others, 1867-71, 5th ed. 1800, 9 vols. 8vo;SchIegel-Tieck-Bernays, 1871-73, 12 vols. sm. 8vo; Schlegel-Gundolf, 1908, &c. French. — Letourneur, 1776-82, 20 vols. 8vo; Letourneur-Guizot, 1821, 13 vols. 8vo; B. Laroche, 1838-39, 2 vols. roy. 8vo; Francisque-Michel, 1839-40, 3 vols. roy. 8vo; F. Victor Hugo fils, 1859-66, 18 vols. 8vo; Guizot, 1860-62, 8 vols. 8vo; E. Montegut, 1868-73, 10 vols. i2mo; G. Duval, 1908-9, 8 vols. 8vo; J. H. Rosny, 1909, &c. Italian. — M. Leoni, 1814-15, 8 vols. 8vo; C. Rusconi, 1838, 8vo; C. Pasqualigo, 1870, &c; G. Carcano', 1875-82, 12 vols. 8vo. Spanish.— Marquis de Dos Hermanos, 1872-77, 3 vols. 8vo; J. Clark, 1870-74, 5 vols, (only 10 plays); G. Macpherson, 1885. Dutch.— B. Brunius, &c, 1778-82, 5 vols. 8vo; A. S. Kok, 1872-80, 7 vols. 8vo; L. A. J. Burgersdijk, 1886-88, 12 vols. 8vo. Danish. — Foersom and E. Lembcke, 1861-73, 18 vols. 8vo. Swedish.— C. A. Hagberg, 1847- 51, 12 vols. 8vo. Bohemian. —]. Cejka, F. Doucha, &c, 1856-73, 9 vols. 8vo. Hun- garian.— Dobrentei, 1824, 8vo; Lemouton, 1845, &c. Polish.— . Kefalinski and J. v. Placyd, 1839-47, 3 vols. 8vo; S. Kozmiana, 1866, &c; H. C. Selousa, 1875-77, 3 vols. Russian.— N. Ketschera, 1841-50, 5 vols. (18 plays); P.A.Kanshin, i893,i2vols. (com- plete works).

IV. Criticism, Illustration and Comment

A. — General Works.

T. Rymer, The Tragedies of the Last Age, 1678, 8vo, and A Short View of Tragedy,

1693, 8vo; C. Gildon, "Some Reflections on Mr Rymer" (in Miscellaneous Lectures,

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Proceedings of the Sheffield S. Club (1819-29), 1829, 8vo; Shakespeare Society (1841) various publications, 1841-53, 48 vols. 8vo; New Shakspere Society, Transactions and other publications, reprints of quartos, &c, 1874, &c, 8vo; Deutsche S. Gesellschaft (1S64), Jahrbuch, Weimar, 1865, &c, in progress. The S. Society of New York (1885) has published the Bankude S. (1888-92), 20 vols., and Bankside Restoration S (iqoj.&c.), underthe editorshipof J. A. Morgan, its first President, and has issued other publications. The S.

Societies of Philadelphia, Birmingham and Clifton may also be mentioned.

XII. Music

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SHALLOT, Allium ascalonicum, a hardy bulbous perennial, which has not been certainly found wild and is regarded by A. de Candolle as probably a modification of A . Cepa, dating from about the beginning of the Christian era (Origin of Culti- vated Planti, p. 71). It is extensively cultivated and is much used in cookery, besides which it is excellent when pickled. It is propagated by offsets, which are often planted in September or October, but the principal crop should not be got in earlier than February or the beginning of March. In planting, the tops of the bulbs should be kept a little above ground, and it is a commendable plan to draw away the soil surrounding the bulbs when they have got root-hold. They should not be planted on

ground recently manured. They come to maturity about July or August. There are two sorts — the common, and the Jersey or Russian, the latter being much larger and less pungent.

SHALMANESER [Ass. Sulmdnu-asarid, " the god Sulman (Solomon) is chief "], the name of three Assyrian princes.

Shalmaneser I., son of Hadad-nirari I., succeeded his father as king of Assyria about 1310 B.C. He carried on a series of campaigns against the Aramaeans in northern Mesopotamia, annexed a portion of Cilicia to the Assyrian empire, and estab- lished Assyrian colonies on the borders of Cappadocia. According to his annals, discovered at Assur, in his first year he conquered eight countries in the north-west and destroyed the fortress of Arinnu, the dust of which he brought to Assur. In his second year he defeated Sattuara, king of Malatia, and his Hittite allies, and conquered the whole country as far south as Carchemish. He built palaces at Assur and Nineveh, restored " the world- temple " at Assur, and founded the city of Calah.

Shalmaneser II, succeeded his father Assur-nazir-pal III. 858 B.C. His long reign was a constant series of campaigns against the eastern tribes, the Babylonians, the nations of Mesopotamia and Syria, as well as Cilicia and Ararat. His armies penetrated to Lake Van and Tarsus, the Hittites of Carchemish were compelled to pay tribute, and Hamath (Hamah) and Damascus were subdued. In 854 B.C. a league formed by Hamath, Arvad, Ammon, " Ahab of Israel " and other neigh- bouring princes, under the leadership of Damascus, fought an indecisive battle against him at Karkar (Qarqar), and other battles followed in 849 and 846 (see Jews § 10). In 842 Hazael was compelled to take refuge within the walls of his capital. The territory of Damascus was devastated, and Jehu of Samaria (whose ambassadors are represented on the Black Obelisk now in the British Museum) sent tribute along with the Phoenician cities. Babylonia had already been conquered as far as the marshes of the Chaldaeans in the south, and the Babylonian king put to death. In 836 Shalmaneser made an expedition against the Tibareni (Tabal) which was followed by one against Cappadocia, and in 832 came the campaign in Cilicia. In the following year the old king found it needful to hand over the command of his armies to the Tartan (commander-in-chief), and six years later Nineveh and other cities revolted against him under his rebel son Assur-danin-pal. Civil war continued for two years; but the rebellion was at last crushed by Samas- Rimmon or Samsi-Hadad, another son of Shalmaneser. Shal- maneser died soon afterwards in 823 B.C. He had built a palace at Calah, and the annals of his reign are engraved on an obelisk of

black marble which he erected there.

See V. Scheil in Records of the Past, new series, iv. 36-79.

Shalmaneser III. (or IV.) appears as governor of Zimirra in Phoenicia in the reign of Tiglath-pileser IV. (or III.) and is supposed by H. Winckler to have been the son of the latter king. At all events, on the death of Tiglath-pileser, he succeeded to the throne the 25th of Tebet 727 B.C., and changed his original name of Ulula to that of Shalmaneser. The revolt of Samaria took place during his reign (see Jews § 15), and while he was besieging the rebel city he died on the 12th of Tebet 722 B.C. and the crown was seized by Sargon.

For all these rulers see Babylonia and Assyria, Sections V. and VIII., and works quoted. (A. H. S.)

SHAMANISM, the name commonly given to the religion of the Ural-Altaic peoples. Properly speaking, however, there is nothing to distinguish Shamanism from the religions of other peoples in a similar stage of culture. On the other hand, the shaman or priest (Tungus saman, Altain Turk kama, cf. Russian hamlanie) performs duties which differ in some respects from those of the ordinary magician; one of his main functions is to protect individuals from hostile supernatural influence. He deals both with good and bad spirits; he also performs sacrifices and procures oracles. The drum (tungur) is an important instrument in his ceremonies; it may be assumed that in many cases the effect of the preliminary performances is to induce autohypnotic phenomena. The shaman's office is held to be hereditary and his chief assistants are ancestral spirits.

See Radloff, Aus Sibirien, ii. ; C. de Harlez, Religion nationale des Tatares orientaux; Hiekisch, " Die Tungusen," Mitt, der anthropo-logischen Gesellschaft, Wien, xviii. 165-182; Revue de I'hisloire des religions, xl. 321, xlvii. 51.

SHAMASH, or 3ama§, the common name of the sun-god in Babylonia and Assyria. The name signifies perhaps " servitor," and would thus point to a secondary position occupied at one time by this deity. Both in early and in late inscriptions Sha- mash is designated as the " offspring of Nannar," i.e. of the moon-god, and since, in an enumeration of the pantheon, Sin generally takes precedence of Shamash, it is in relationship, presumably, to the moon-god that the sun-god appears as the dependent power. Such a supposition would accord with the prominence acquired by the moon in the calendar

and in astro- logical calculations, as well as with the fact pointed out (see Sin) that the moon-cult belongs to the nomadic and therefore earlier, stage of civilization, whereas the sun-god rises to full importance only after the agricultural stage has been reached. The two chief centres of sun-worship in Babylonia were Sippara (Sippar), represented by the mounds at Abu Habba, and Larsa, represented by the modern Senkerah. At both places the chief sanctuary bore the name E-barra (or E-babbara) " the shining house " — a direct allusion to the brilliancy of the sun-god. Of the two temples, that at Sippara was the more famous, but temples to Shamash were erected in all large centres — as Babylon, Ur, Nippur and Nineveh.

The attribute most commonly associated with Shamash is justice. Just as the sun disperses darkness, so Shamash brings wrong and injustice to light. Khammurabi attributes to Shamash the inspiration that led him to gather the existing laws and legal procedures into a code, and in the design accompanying the code the king represents himself in an attitude of adoration before Shamash as the embodiment of the idea of justice. Several centuries before Khammurabi, Ur-Engur of the Ur dynasty (c. 2600 B.C.) declared that he rendered decisions " according to the just laws of Shamash." It was a logical consequence of this conception of the sun-god that he was regarded also as the one who released the sufferer from the grasp of the demons. The sick man, therefore, appeals to Shamash as the god who can be depended upon to help those who are suffering unjustly. This aspect of the sun-god is vividly brought out in the hymns addressed to him, which are, therefore, among the finest productions in the entire realm of Babylonian literature. • It is evident from the material at our disposal that the Shamash cults at Sippara and Larsa so overshadowed -local sun-deities elsewhere as to lead to an absorption of the minor deities by the predominating one. In the systematized pantheon these minor sun-gods become attendants that do his service. Such are Bunene, spoken of as his chariot driver, whose consort is Atgi- makh, Kettu ("justice") and Mesharu ("right"), who are introduced as servitors of Shamash. Other sun-deities, as Ninib (q.v.) and Nergal (q.v.), the patron deities of important centres, retained their independent existence as certain phases of the sun, Ninib becoming the sun-god of the morning and of the spring time, and Nergal the sun-god of the noon and of the summer solstice, while Shamash was viewed as the sun-god in general.

Together with Sin and Ishtar, Shamash forms a second triad

by the side of Anu, Bel and Ea. The three powers, Sin, Shamash . and Ishtar (q.v.), symbolized the three great forces of nature, the sun, the moon and the life-giving force of the earth. At times, instead of Ishtar, we find Adad (q.v.), the storm-god, associated with Sin and Shamash, and it may be that these two sets of triads represent the doctrines of two different schools of theological thought in Babylonia which were subsequently harmonized by the recognition of a group consisting of all four deities.

The consort of Shamash was known as A. She, however, is rarely mentioned in the inscriptions except in combination with Shamash. (M. Ja.)

SHAMBLES, a slaughter-house, a place where butchers kill animals for domestic food, an " abattoir." The word in the singular means properly a bench or stall on which butchers display their meat for sale in a market, and appears in O. Eng. fot-scamel, foot-stool. It represents the La. scamellum, diminu- tive of scamnum, step, bench; the root is seen in Gr. onifirrtiv,' to prop, cf. " sceptre." The distinct word " shamble," meaning to walk awkwardly, is to be traced to the 0. Du. schampelen, to stumble, an adaptation of 0. Fr. escamper, to decamp (Lat. ex, out of, and campus, field). The same French word has given the English " scamp," a worthless rascal, a rogue, vagabond.

SHAMMAI, a Jewish scribe of the time of King Herod, whom tradition almost invariably couples with Hillel (q.v.), with whom he stood in striking contrast, not merely in legal-religious decisions and discussions, but also in character and temperament. His motto (Aboth i. 15) reads: "Make thy study of the Thora a firmly established duty; say little and do much; and receive every man with friendly countenance." The last admonition is characteristic, as Shammai was choleric and brusque. The opposition between Shammai and Hillel was perpetuated by their respective schools, till, under Gamaliel II., the strife was decided at Jabneh in favour of the school of Hillel. (W. Ba.)

SHAMOKIN, a borough of Northumberland county, Pennsyl- vania, U.S.A., on Shamokin Creek, about 45 m. (73 m. by rail) N. by E. of Harrisburg. Pop. (1900) 18,202, of whom 2703 were foreign-born; (1010 U.S. census) 19,588. Shamokin is served by the Philadelphia & Reading, the Northern Central, and two interurban railways. There are two parks. The mining and shipping of anthracite coal and

the manufacture of silk goods and of hosiery and knit goods are the borough's principal industries, but it has, also, foundries and machine shops, and manufactories of powder, powder-kegs, shirts, overalls, hooks and eyes, brick, flour and dressed lumber. The total value of its factory product in 1905 was $1,443,915. The borough was named from Shamokin Creek; the name is probably a mutilation of a Delaware Indian word meaning " full of eels." The Indian village named Shamokin was on the site of the present Sunbury, Pa. Shamokin was formed in 1852 by the union of two villages, Groveville and Mary Ann. It was incorporated as a borough in 1864.

SHAMPOO, a word now principally used as a hair-dresser's term for washing the head and hair with soap and water or some special preparation. It is properly the Hindustani word (champna, to thrust, press; imperative champo) for the kneading and rubbing of the body, &c, which is one of the principal features of the various forms of hot bath a% practised in the East.

SHAMYL (c. 1797-1871), the leader of the tribes of the Cau- casus in the war against Russia. He was born about 1797 and, educated by the Mullah Djemaleddin, soon took a leading part in preaching a holy war against the Russians. He was both the spiritual and military leader of the tribes, who maintained the struggle for twenty-five years (1834-1859). This perpetual guerrilla was a severe strain upon the resources of the great power, and Shamyl's romantic fight for independence, making him a sort of ally of England and France at the time of the Crimean War (1853-55), earned him a European reputation. But the capacity of the tribes for resistance was already failing, and when at the close of the Crimean War Russia was able to employ large forces on the Caucasus, the defenders were gradually subdued, Shamyl himself being captured in 1859. The rest

of his life was spent in an easy captivity at Kaluga, St Petersburg and Kiev. He died at Mecca during a pilgrimage in 187 1. One of his sons took service in the Russian, the other in the Turkish army.

SHANGALLA, or Shankalla, a name loosely applied by Abyssinians to the non-Arab and non-Abyssinian tribes living west of Gojam in the Abyssinian-Sudan frontier lands. The principal tribes included are the Legas, Bertat, Gumus, Kadalos and Sienetjo. In some tribes Galla blood appears to pre- dominate; others are Negroids.

*SHANGHAI, a city in the Chinese province of*Kiang-su. The native city of Shanghai is situated in 31° 15′ N., 121 27′ E. and stands on the left or W. bank of the Hwang-p'u river, about 12 m. from the*

point where that river empties itself into the estuary of the Yangtsze-kiang. The walls which surround it are about 35 m. in circumference, and are pierced by seven gates. The streets and thoroughfares may be said to illustrate all the worse features of Chinese cities; while the want of any building of architectural or antiquarian interest robs the city of any redeeming traits. On the E. face of the city, between the walls and the river, stands the principal suburb, off which the native shipping lies anchored. Situated in the extreme E. portion of the province of Kiang-su, and possessing a good and commodious anchorage, as well as an easy access to the ocean, it forms the principal port of central China. From the W. wall of the city there stretches a rich alluvial plain extending over 45,000 sq. m., which is intersected by waterways and great chains of lakes and bears a population of 800 to the sq. m. The products of this fertile district, as well as the teas and silks of more distant regions, find their natural outlet at Shanghai. The looms of Suchow and the tea plantations of Ngan-hui, together with the rice of this" garden of China," for many years before treaty days, supplied the Shanghai junks with their richest freight. But though thus favourably situated as an emporium of trade, Shanghai did not attract the attention of foreign diplomatists until the outbreak of the War of 1841, when the inhabitants purchased protection from the attacks of Admiral Parker by the payment of a ransom of £145,000. In the Nanking treaty, which was signed in the following year, Shanghai was included among the four new ports which were thrown open to trade. In 1843 Captain (afterwards Sir) George Balfour was appointed British consul, and it was on his motion that the site of the present English settlement, which is bounded on the N. by the Suchow creek, on the S. by the Yang-king canal, and on the E. by the river, was chosen. The site, thus defined on its three sides (on the W. no boundary was marked out), is three-fifths of a mile in length, and was separated from the native city by a narrow strip of land which was subsequently selected as the site of the French settlement. Later again the Americans established themselves on the other side of the Suchow creek, on a piece of land fronting on the river, which there makes a sharp turn in an easterly direction.

A handsome bund runs along the river frontage of the three foreign settlements, and the public buildings, especially in the British settlement, are large and fine. The cathedral, which is built in the Gothic style,, is a notable example of Sir G. Gilbert Scott's skill, and the municipal offices, club-house and hospitals are all admirable in their way. The climate is somewhat trying. Shang- hai lies low, and, though the early winter is enjoyable, snow and ice being occasionally

seen, the summer months are excessively hot. Cholera occurs in the native city every summer, malarial fever exists and dysentery is apt to become chronic in spring and autumn on account of the sudden changes of temperature — a fall of 20° to 30 taking place in a few hours — and the moisture-laden atmosphere. Smallpox is endemic in the Chinese city during the autumn and winter, and enteric is common in the autumn. In the foreign settlements, owing to sanitary enactments, cholera is rare, and Europeans who adopt ordinary precautions " have nothing to fear from the climate of Shanghai " (China Sea Directory, vol. iii., ed. 1904).

At first merchants appeared disinclined to take advantage of the opportunities offered them at Shanghai. " At the end of the first year of its history as an open port Shanghai could count only 23 foreign residents and families, 1 consular flag, 11 merchants' houses, and 2 Protestant missionaries. Only

forty-four foreign vessels had arrived during the same period." 1 By degrees, however, the manifold advantages as a port of trade possessed by Shanghai attracted merchants of all nationalities; and from the banks of the Hwang-p'u arose handsome dwelling- houses, which have converted a reed-covered swamp into one of the finest cities in the East.

The number of foreigners, other than British, who took up their abode in the British settlement at Shanghai made it soon necessary to adopt some more catholic form of government than that supplied by a British consul who had control only over British subjects, and by common agreement a committee of residents, consisting of a chairman and six members, was elected by the renters of land for the purposes of general municipal administra- tion. It was expected when the council was formed that the three settlements — the British, French and Americans — would have been incorporated into one municipality, but international jealousy prevented the fulfilment of the scheme, and it was not until 1863 that the Americans threw in their lot with the British. In 1853 the prosperity of the settlements received a severe check in consequence of the capture of the native city by the T'ai-p'ing rebels, who held possession of the walls from September in that year to February 1855. This incident, though in many ways disastrous, was the cause of the establishment of the foreign customs service, which has proved of such inestimable

advantage to the Chinese government. The confusion into which the customs system was thrown by the occupation of the city by the rebels induced the Chinese authorities to request the consuls of Great Britain, France and the United States to nominate three officers to superintend the collection of the revenue. This arrangement was found to work so well that on the reoccupation of the city the native authorities proposed that it should be made permanent, and H. N. Lay, of the British consular service, was in consequence appointed inspector of the Shanghai customs. The results of Mr Lay's administration proved so successful that when arranging the terms of the treaty of 1858 the Chinese willingly assented to the application of the same system to all the treaty ports, and Mr Lay was thereupon appointed inspector-general of maritime customs. On the retirement of Mr Lay in 1862 Sir Robert Hart was appointed to the post.

From 1856 to 1864 the trade of Shanghai vastly increased, and its prosperity culminated between i860 and 1864, when the influx of Chinese into the foreign settlement in consequence of the advance E. of the T'ai-p'ing rebels added enormously to the value of land. Both in i860 and again in 1861 the rebels advanced to the walls of Shanghai, but were driven back by the British troops and volunteers, aided by the naval forces of England and France, ft was in this connexion that General Gordon assumed the command of the Chinese force, which under his direction gave a reality to the boastful title of " ever-victorious army " it had assumed under the two American adventurers Ward and Burgevine. To Shanghai the successful operations of Gordon brought temporarily disastrous consequences. With the disappearance of the T'ai-p'ings the refugees returned to their homes, leaving whole quarters deserted. The loss thus in- flicted on the municipality was very considerable, and was intensified by a commercial crisis in cotton and tea, in both of which there had been a great deal of over-speculation. But, though the abnormal prosperity was thus suddenly brought to an end, the genuine trade of the port has steadily advanced, subject of course to occasional fluctuations. For example, in 1880 the value of trade was £8,223,017, and in 1908 it was £40,400,000. The total burthen of foreign steamers which entered and cleared at Shanghai during 1884 was 3,145,242 tons, while in 1908 it was over 15,000,000 tons. The principal items of import are cotton yarns, metals, sugar, petroleum and coal; of export, silk, representing in value 34% of the total exports, cotton, tea, rice, hides and skins, wool, wheat and beans. Great Britain and the British colonies supply nearly 31 % of the imports, Japan I2|%, and the United States 12%; and of the exports Great Britain and the British colonies take 18%, the United States

12% and Japan_io%. Shanghai, moreover, is not only a port of trade, but is rapidly becoming a large manufacturing and industrial centre. In this category the first place must be given to cotton mills, which, though not very numerous, give promise of con- siderable development. The demand in China for cotton yarn, chiefly the produce of the Bombay mills, has been steadily on the increase. On the other hand, China produces raw cotton in indefinite quantity, and has hitherto been the main source of supply for the Japanese mills. _ Cloth weaving has been tried in two of the mills, but abandoned in favour of spinning. Next in importance is the

1 The Treaty Ports of China and Japan, by W. F. Mayers.

reeling of silk cocoons by machinery. This is gradually supplanting the wasteful method of native reeling, giving a much better finished and consequently more valuble article. Shanghai also contains three large establishments for docking, repairing and building ships. Among minor industries are match factories, rice and paper mills, ice, cigarette, piano, carriage and furniture factories, wood carving, &c.

The vastness of British interests in China and the large British population at Shanghai gave rise in 1865 to the establishment of a British supreme court for China and Japan, Sir Edmund Hornby, then judge of the British court at Constantinople, being the first judge appointed to the new office. Now, by virtue of extra-terri- torial clauses in the various treaties, all foreigners, subjects of any treaty power, are exempted from the jurisdiction of the Chinese authorities, and made justiciable only before their own officials, As there are now fourteen treaty powers represented at Shanghai, there are consequently fourteen distinct courts sitting side by side, each administering the law of its own nationality, fn addition, there is also a Chinese court, commonly called the Mixed Court, though it is no more mixed than any of the others in an international sense, except that a foreign assessor sits with the Chinese judge in cases where any of his own nationality are interested as plaintiffs. At first sight this arrangement seems somewhat complicated, but the principle is simple enough, viz. that a defendant must always be sued in the court of his own nationality f n criminal cases there is, of course, no difficulty. For the British, English law alone prevails, and they can only be tried and punished in the British court, and so on for every nationality, fn civil cases, where both parties are of the same nationality, there 5s also no difficulty, e.g. for British sub- jects the British court is the forum, for German subjects it is the German court. In cases involving cross actions with mutual accounts, say

between an Englishman and a German, if the German constitutes himself plaintiff he must sue his opponent before the British court, and vice versa. The greatest anomaly, however, in respect of the government of Shanghai is the local municipal control. This is exercised by the foreign community as a whole without regard to nationality, and is a share of the power which properly belonged to the Chinese local authorities, but which by convention or usage they have allowed to fall into foreign hands, ft is exercised only within the area termed the foreign settlements, which were originally nothing more than the " area set apart for the residence of foreign merchants." Of these " settlements " there were and are still, only three — the British, acquired in 1845, the French, acquired in 1849, and the American, acquired in 1862. At an early date, as a foreign town began to spring up, the necessity of having some authority to lay out and pave streets, to build drains, &c, for the common benefit, became evident, and as the Chinese authorities shirked the work and the expense, the foreigners resolved to tax themselves voluntarily, and appointed a committee of works to see the money properly laid out. In 1854 the consuls of Great Britain, France and the United States drew up a joint code of regulations applicable to both the then settlements, British and French, which being ratified by the respective governments became binding on their respective subjects. The two areas thus became an international settlement, and the subjects of all three nationalities — the only powers then interested — acquired the same privileges and became liable to the same burdens. The code thus settled was acquiesced in by the Chinese authorities and by other nationalities as they came in, and it conferred on the foreign community local self-government, prac- tically free from official control of any description, fn 1863 the area covered by the regulations was extended by the addition of the American settlement, which meanwhile had been obtained by that government from Jhe Chinese. But about the same time, 1862, the French decided to withdraw from the joint arrangement, and pro- mulgated a set of municipal regulations of their own applicable to the French area. These regulations differed from those appli- cable to the joint settlement, in that a general supervision over municipal affairs was vested in the French consul-general, his approval being made necessary to all votes, resolutions, &c, of the ratepayers before they could be enforced at law. Since the above date there have, consequently, been two municipalities at Shanghai, the French and the amalgamated British and American settlements, to which the original regulations continued to apply. The area of the latter now amounts to some 9 or 10 sq. m. The regula- tions have been altered and amended from time to time, and they have been accepted

expressly or impliedly by all the treaty powers which have since come into the field. The settlements have thus lost their original character of British or American, and become entirely cosmopolitan. The consuls of all the treaty powers rank equally, and claim to have an equal voice in municipal affairs with the British or American consuls.

The powers of self-government thus conferred on the foreign community consist in exclusive police control within the area, in draining, lighting, maintenance of streets and roads, making and enforcement of sanitary regulations, control of markets, dairies and so forth. To meet these expenses the foreign ratepayers are authorized to levy taxes on land and houses,' to levy wharfage dues on goods landed or shipped, and to charge licence fees. Taxes are payable by every one living within the settlements, Chinese included, though the latter have no voice in the local administration.

The executive is entrusted to a municipal council of nine, elected annually from among the general body of foreign ratepayers, irrespective of nationality. The legislative function is exercised by all ratepayers possessing a certain pecuniary qualification in public meeting assembled. Proxies for absentee landlords are allowed. One such public meeting must be held annually to pass the budget and fix the taxation for the year. No official sanction is required, and no veto is allowed for such money votes. Special meetings may be held at any time for special purposes. New legislation of a general kind requires to be approved by all the treaty powers in order to be binding on their several nationalities, but within certain limits the ratepayers can pass by-laws which do not require such sanction. The French municipality is worked on similar lines, except that every vote and every disbursement of money is subject to the approval of the French consul-general. The executive council consists of eight members, four of whom must be French and four may be foreign. The.French consul-general is chairman ex officio, so that the control in any case is French and practically official.

Both settlements were originally intended for the residence of foreign merchants only, but as the advantages of living under foreign protection became evident by reason of the security it gave from arbitrary taxation and arrest, Chinese began to flock in. This movement has continued, and is now particularly notice- able in the

cases of retired officials, many of whom have made Shanghai their home. The total native population in the settle- ments by the census of 1895 was 286,753, ana " the estimated popula- tion of the native city was 125,000, making a total for all Shanghai of 411,753. The census of the foreign population in 1905 showed 3713 British, 2157 Japanese, 1329 Portuguese, 991 Americans, 785 Germans and 568 Indians, out of a total of 11,497. The magni- tude of the foreign interests invested in Shanghai may be gathered from the following rough summary: Assessed value of land in settlements registered as foreign-owned £5,500,000; docks, wharves and other industrial public companies — market value of stock, £2,250,000; private property estimated £1,500,000 — total £9,250,000. This is exclusive of banks, shipping and insurance companies, and other institutions which draw profits from other places besides Shanghai.

SHANHAI-KWAN, a garrison town in the extreme east of the province of Chih-li, China. Pop. about 30,000. It is situated at the point where the range of hills carrying the Great Wall of China dips to the sea, leaving a kwan or pass of limited extent between China proper and Manchuria. It is thus an important military station, and the thoroughfare of trade between Man- churia and the great plain of China. The Imperial Northern railway from Tientsin and Taku, 174 m. from the former, runs through the pass, and skirts the shore of the Gulf of Liao-tung as far as the treaty port of Niu-chwang, where it connects with the railways leading from Port Arthur to the Siberian main line. The pass formed the southern limit of the Russian sphere of influence as defined in the convention between Great Britain and Russia of the 28th of April 1899.

SHANKARSETT, JAGANNATH (1800-1865), the recognized leader of the Hindu community of Bombay for more than forty years, was born in 1800 into a family of goldsmiths of the Daivadnya caste. Unlike his forefathers, he engaged in com- merce, and soon acquired what was in those days a large fortune, a great part of which he devoted to the good of the public. So high was his credit that Arabs, Afghans and other foreign merchants chose to place their treasures in his custody rather than with the banks. Foreseeing the need of better methods of education, he became one of the founders of the School Society and the Native School of Bombay, the first of its kind in Western India, which in 1824 developed into the Bombay Native In- stitution, and again in 1840 into the Board of Education which preceded theElphinstone Educational Institution founded in 1 8 5 6. When the Students' Literary and Scientific Society first opened their girls' schools, in spite of strong opposition of the Hindu community, he set the good example of providing another girls' school entirely at

his private cost. His zeal for progress was also shown in his starting the English School, the Sanskrit Seminary and the Sanskrit Library, all in Girgaum. To Jagannath Shankarsett and his public-spirited friends, Sir George Birdwood and Dr Bhau Daji, Bombay is also indebted for the reconstruc- tion which, beginning in 1857, gradually changed a close network of lanes and streets into a spacious and airy city, adorned with fine avenues and splendid buildings. He was the first Indian to be nominated to the legislative council of Bombay under the

Act of 1 86 1. While his influence was used by Sir John Malcolm to induce the Hindus to acquiesce in the suppression of suttee or widow-burning, his own community remember gratefully that to him they owe the cremation ground at Sonapur. He died at Bombay on the 31st of July 1865, regretted by all classes of society, who, about a year before his death, in a public meeting assembled at the Town Hall, voted a marble statue to perpetuate his memory.

SHANKLIN, a watering-place in the Isle of Wight, England, 85 m. S. of Ryde by rail. Pop. of urban district (1901) 4533. It is beautifully situated on the cliffs bordering the S.E. coast, and is sheltered W. by high-lying downs. The church of St John the Baptist is Perpendicular. , There are several modern churches and chapels, numerous villas, a pier and a lift connecting the town with the esplanade beneath the cliff. The picturesque winding chasm of Shanklin Chine breaches the cliffs S. of the town.

SHANNON, CHARLES HAZELWOOD (1865-), English artist, was born at Sleaford in Lincolnshire, the son of the Rev. Frederic Shannon, He attended the Lambeth school of art, and was subsequently considerably influenced by his friend Charles Ricketts and by the example of the great Venetians. In his early work he was addicted to a heavy low tone, which he abandoned subsequently for clearer and more transparent colour. He achieved great success with his portraits and his Giorgionesque figure compositions, which are marked by a classic sense of style, and with his etchings and lithographic designs. The Dublin Municipal Gallery owns his circular composition " The Bunch of Grapes " and " The Lady with the Green Fan " (portrait of Mrs Hacon). His " Study in Grey" is at the Munich Gallery, a " Portrait of Mr Staats Forbes " at Bremen, and a " Souvenir of Van Dyck " at Melbourne. One of his most remarkable pictures is " The Toilet of Venus " in the collection of Lord Northcliffe. Complete sets of his lithographs and etchings have been

acquired by the British Museum and the Berlin and Dresden print rooms. He was awarded a first-class gold medal at Munich in 189 s and a first-class silver medal in Paris in 1900.

SHANNON, JAMES JEBUSA (1862-), Anglo-American artist, was born at Auburn, New York, in 1862', and at the age of eight was taken by his parents to Canada. When he was sixteen, he went to England, where he studied at South Kensington, and after three years won the gold medal for figure painting. His portrait of the Hon. Horatia Stopford, one of the queen's maids of honour, attracted attention at the Royal Academy in 1881, and in 1887 his portrait of Henry Vigne in hunting costume was one of the successes of the exhibition, subsequently securing medals for the artist at Paris, Berlin and Vienna. He soon became one of the leading portrait painters in London. He was one of the first members of the New English Art Club, and in 1897 was elected an associate of the Royal Academy, and R.A. in 1909. His picture, " The Flower Girl," was bought in 1901 for the National Gallery of British Art.

SHANNON, the principal river of Ireland. It flows with a bow-shaped course from N. to S. and S.W., from the N.W. part of the island to its mouth in the Atlantic on the S.W. coast, with a length of about 240 m. and a drainage area of ,4544 sq. m. Rising in county Cavan in some small pools at the foot of Cuilcagh Mountain, the Shannon crosses county Leitrim, traversing the first of a series of large lakes, Lough Allen (9 m. in length). It then separates county Roscommon on the right (W.) bank from counties Leitrim, Longford, Westmeath and King's County on the left. In this part of its course it forms Loughs Boderg (7 m. long), Forbes (3 m.) and Ree (18 m.), and receives from W. the river Boyle and from E. the Inny, while in county Long- ford it is joined by the Royal Canal. It now separates county Galway on the right from King's County and county Tipperary ; receiving the Suck from W. and the Brosna from E., and forming Lough Derg (23 m.). Dividing county Clare from counties Tipperary and Limerick, the Shannon reaches the city of Limerick as a broad and noble river, and debouches upon an estuary 60 m. in length with a direction nearly E. and W. This divides county Clare on the right from counties Limerick and Kerry on the left.

A wide branch estuary, that of the Fergus, joins from N., and the rivers Mulkear, Maigne and Deel enter from S. From Lough Allen to Limerick, where the Shannon becomes tidal, its fall is 144 ft. With the assistance of short canals the river is navigable for light vessels to Lough Allen, and for small steamers to Athlone ; while Limerick is accessible for large vessels. The salmon- fishing is famous; trout are also taken in the loughs and tributary streams. Carrick-on-Shannon, Athlone, Killaloe, and Castle- connel are favourite stations for sportsmen. The scenery is generally pleasant, and on the loughs, with their deeply indented shores and numerous islands, often very beautiful. These islands are in several cases sites of early religious settlements, while of those on the river-banks the most noteworthy is that of the seven churches of Clonmacnoise.

SHANS, a collective name, probably from Chinese Shan-tse, Shan-yen {Shan= " mountain "), " highlanders," given by the Burmese to all the tribes of Thai stock subject to the former kingdom of Burma (see Shan States below). The Shans call themselves Tai or Punong; while the Chinese call them Pai or Pai-yi. Among them exist the purest types of the Thai race. They are found all over the province of Yunnan and in the border- land between China and Burma. Politically, where not under the direct control of Chinese magistrates, the tribes are organized under their own chiefs, who are recognized by the Chinese government and endowed with official rank and title. In Burmese such native chiefs are termed Sawbwa.

For the history of the Thai race see Thais. See also Laos. Miaotze, Lolos. Also A. R. Colquhoun, Amongst the Shans (1885); E. Aymonier, " Les Tchaines," in Revue de I'histoire des religions for

1891.

SHAN-SI, a northern province of China, bounded N. by Mongolia, E. by Chih-li, S. by Ho-nan, and W. by Shen-.si. Estimates of its area vary from 66,000 to 81,000 sq. m. and it has besides its capital, Tai-yuen Fu (pop. 230,000), eight prefectural cities. The population is returned as 12,200,000. It includes, in the northern districts, about 500,000 Mongols. The con- Iguration of Shan-si is noteworthy, forming, from its southern frontier as far north as Ning-wu Fu — an area of about 30,000 sq. m. — a plateau 2600 to 6000 ft. above the level of the sea, the whole of which is one vast coal-field. North and west the plateau is bounded by high mountain ranges trending south-west and north- east. Down the central line of the province from north to south lies a series of deep depressions, all of which are ancient lake basins. But though forming a series these lakes were not

formerly connected with each other, some being separated from those next adjoining by high ridges, and being drained by different rivers and in different directions. The Fen-ho, the largest river in Shan-si, with a general S.S.W. direction, and the Chin-ho, also a considerable stream, are both tributaries of the Yellow river.

Shan-si is one of the most remarkable coal and iron regions in the world, a veritable second Pennsylvania, and Baron von Richtho- fen gave it as his opinion that the world, at the present rate of consumption of coal, could be supplied for thousands

A vast coal-Held.

of years from Shan-si alone. In the south the neighbour- hood of Tsi-chow Fu abounds in both coal and iron, and has probably, partly through being within reach of the populous plain of Hwai-king Fu, of the Yellow river, of Tao-kow Chin and Sew-wu Hien (the shipping places for Tientsin and the Grand Canal) and of Ho-nan Fu, furnished more iron to the Chinese than any other region of a similar extent in the empire. The iron is of great purity and easily fusible, while clay and sand for crucibles, moulds, &c, and a superior anthracite coal, lie ready to hand. The coal is of two kinds, bituminous and anthracite, the line of demar- cation between the two being formed by the hills which are the continuation of the Ho-shan range, the fields of bituminous coal being west of these hills, and those of anthracite east. In the neighbourhood of P'ing-ting Chow the extent of the coal-field is incalculable; and speaking of the whole plateau, Baron von Richt- hofen says: " These extraordinary conditions, for which I know no parallel on the globe, will eventually give rise to some curious features in mining. It may be predicted that, if a railway should ever be built from the plain to this region, . . . branches of it will be constructed within the body of one or other of these beds of anthracite, which are among the thickest and most valuable known anywhere, and continue for miles underneath the hills west of the present coal-belt of P'ing-ting Chow. Such a tunnel would allow of putting the produce of the various coal-beds immediately on rail-

road carts destined for distant places." These mines are worked by the Peking Syndicate, who have gained a concession to develop them, and have a railway to connect their workings with the Lu- Han trunk line, which traverses the east of the province.

Salt is produced in the prefecture of P'ing-yang in the south of the province, both from a salt lake and from the alluvial soil in the

neighbourhood of the Fen-ho. Shan-si produces cereals, tobacco, cotton and sometimes rice, but in agricultural products the province is poor; the means of transport are rude and in- sufficient. The people of Shan-si are great traders, and nearly all the commerce of southern Mongolia is in their hands. A railway connecting the capital with Pekin was opened in 1908. The only wagon road leading into and through Shan-si is the great highway from Peking to Si-gan Fu, which enters Shan-si west of Ch&ng-ting Fu, and leaves the province at Tung-kwan at the great bend of the Hwang-ho. Transport is chiefly on the backs of camels, mules and asses. The province suffered from a terrible famine in 1878-1879, about which time Protestant missionaries began work in the capital. In the north, beyond the Great Wall, is the city of Kwei-hwa-Cheng (pop. about 200,000), formerly the residence of the grand Lama of Mongolia; it has many Lama monasteries.

Shan-si university, one of the best equipped in China, "owes its existence to the Boxer rising. Certain Protestant missionary bodies in the province refused to accept the compensation awarded them for damage to their property, and at their request the money was devoted to the foundation of a university, the missionaries being guaranteed for ten years the control of the western side of the education given therein.

See Richard's Comprehensive Geography of_ the Chinese Empire (Shanghai, 1908), § 1, ch. Hi. and the authorities there cited.

SHAN STATES, a collection of semi-independent states on the E. frontier of Upper Burma inhabited by the Shan or Thai race. The Shan States have a total area of 57,915 sq. m. and a total population (1901) of 1,137,444. There are six states under the supervision of the superintendent of the N. Shan States, and 37 under the superintendent and political officer of the S. Shan States. In addition, two states are under the commissioner of the Mandalay division, namely, Hkamti L&ng on the N. of Myitkyina district and Mong Mit which is temporarily admin- istered as a subdivision of the Ruby Mines district; and two states, Sinkaling Hkamti and Hsawng Hsup, near Manipur, are under the supervision of the commissioner of the Sagaing division. There are besides a number of Shan States beyond the border of Burma, which are tributary to China, though China exercises an authority which is little more than nominal. The British Shan States were tributary to Burma and came under British control at the time of the annexation of Upper Burma. They rank as British territory, not as native states. By section n of the. Burma Laws Act 1898, the civil, criminal and revenue administra- tion of

each state is vested in the chief, subject to the restriction specified in the sanad or order of appointment granted to him. Under the same section the law to be administered is the customary law of each state so far as it is in accordance with justice, and not opposed to the spirit of the law in British India.

Physical Features. — The shape of the Shan States is roughly that of a triangle, with its base on the plains of Burma and its apex on the Mekong river. The Shan plateau is properly only the country between the Salween and Irrawaddy rivers. On the W. it is abruptly marked by the long line of hills, which begin about Bhamo and run S. till they sink into the plains of Lower Burma. Op ˆhe E. it is no less sharply defined by the deep and narrow rife of the Salween. The average height of the plateau is between 2000 and 3000 ft., but it is seamed and ribbed by mountain ranges, which split up and run into one another. On the N. the Shan States are barred across by the E. and W. ranges which follow the line of the Namtu. The huge mass of Loi Ling, 9000 ft., projects S. from this, and from either side of it and to the S. extends the wide plain which extends down to M6ng Nai. The highest peaks are in the N. and the S. Loi Ling is the highest point W. of the Salween, and in Kokang and other parts of N. Hsenwi there are many peaks above 7000 ft. The majority of the intermediate parallel ranges have an average of between 4000 and 5000 ft. with peaks rising to over 6000. The country beyond the Salween is a mass of broken hills, ranging in the S. towards the Menam from 2000 to 3000 ft., while in the N. towards the Wa states they average from 5000 to 7000. Several peaks rise to 8000 ft. such as Loi Maw (8102). The climate varies

considerably. From December to March it is cool everywhere, and 10 of frost are experienced on the open downs. The hot season temperature is 8o° to 90 , rising to 100° in the Salween valley. The rains begin about the end of April, but are not continual till August, which is usually the wettest month. They last until the end of October or beginning of November. The annual rainfall varies from 60 in. in the broader valleys to 100 on the higher mountains.

Race and Language. — According to the census of 1901 there were 787,087 Shans (see above) in Burma. The Thai or Tai, as they call themselves, were first known to the Burmese as Tar6ks or Tarets. The original home of the Thai race was S.W. China, or rather that

was the region where they attained to a marked separate development as a people. It is probable that their first settlement in Burma proper was in the Shweli valley, and that from this centre they radiated at a comparatively recent date N., W. and S.E. through Upper Burma into Assam. It is supposed that the Thai race boasts of representatives across the whole breadth of Indo-China, from the Brahmaputra as far as the gulfs of Siam and Tongking; that it numbers among its members not only the Shans proper, the Laos and the Siamese, but also the Muongs of French Indo-China, the Hakas of S. China, and the Li, the inhabitants of the interior of the far Eastern island of Hainan in the China seas. But no exhaustive survey of the Thai has yet been accomplished. For the purposes of Burma they may be divided into the N.W., the N.E., the E. and the S. Shans. The Siamese and the Laos are the principal representatives of the S. division. Siamese are found in considerable numbers in the districts of Amherst, Tavoy and Mergui in the Tenasserim division. The total at the time of the census of 1901 was 31,800, while that of the Laos was 1047. The country of the E. Shans lies between the Rangoon-Mandalay railway and the Mekong, and is bounded roughly on the N. and S. by the 22nd and 20th parallels of latitude. It includes the S. Shan States, and comprises the country of the Lii and the Hkiin of the states of Kengtung and Kenghung. Linguistically the connexion between the Tatter two races and the Laos is very close, but apparently the racial affinity is not sufficiently near to justify the classification of the Hkiin and the Lii with the S. Thai. The N.W. Shan region is the area ex- tending from Bhamo to Assam between the 23rd and 28th parallels of latitude. It corresponds more or less with those portions of Katha, Myitkyina, Bhamo and Upper Chindwin districts which at one time or other during the palmy days of the Shan dominion acknowledged the suzerainty of the Sawbwa of Mogaung.' The N.E. Shans are the Chinese-Shans who are found where Upper Burma and the N. Shan states border on China.

The Thai language may be divided into two sub-groups, the N. and the S. The S. includes Siamese, Lao, Lii and Hktih; the N., the three forms of Shan, namely, N. Burmese-Shan, S.-Burmese Shan and Chinese-Shan with Hkamti and Ahom. The vernacular of the people who are directly known in Burma as Shan is S. Burmese- Shan. This language is isolating and polytonic. It possesses five tones, a mastery of which is a sine qu& non if the language is to he properly learnt. It is exhaustively described in the works of Dr Cushing. The Shans are a peaceful race, fond of trading. During the past decade the trade with Burma has increased very largely, and with the construction of the railway to Lashio a still further increase may be expected in the

N. states. The cultivation of wheat and potatoes in the S. states promise them wealth also when a railway furnishes them means of getting the produce out of the country. Since 1893 the peace of the Shan States has been practi- cally undisturbed.

See Ney Elias, Introductory Sketch of the History of the Shans in Upper Burmah and West Yun-nan (Calcutta, 1876); Cushing, Shan Dictionary (Introduction); Bock, Temples and Elephants; Sir A. Phayre, History of Burmah; A. R. Colquhoun, Across Chryse (London, 1883), and Amongst the Shans (1885); Diguet, Ittude de la langue Thai (Paris, 1896). (J. G. Sc.)

SHAN-TUNG (" East of the Mountains ") , a maritime province of China, bounded N. by the province of Chih-li and the Gulf of Chih-li, E. by the Yellow Sea, S. by Kiang-su and the Yellow Sea and W. by Chih-li. Area about 56,000 sq. m., population (estimated) 37,500,000. It is the most densely inhabited part of China, and is celebrated as the native province both of Con- fucius and Mencius. It is divided into ten prefectures, with as many prefectural cities, of which Chi-nan Fu (q.v.), the provincial capital, is the chief.

The physical features of the province are very plainly marked. The centre and eastern are occupied by mountain ranges running N.E. and S.W:, between which lie fertile valleys, while the north- western, southern and western portions form part of the great deltaic plain of the north of China. The mountainous region pro- jects seaward beyond the normal coast line forming a large peninsula, the shores of which are deeply indented and contain some good harbours, such as that of Kiao-chow. The most considerable range of mountains occupies the centre of the province, the highest peak being the T'ai-shan (5060 ft.), a mountain famous in Chinese history., for more than 4000 years, and to which hundreds of pilgrims

annually resort. The Lao-shan, east of Kiao-chow, fringes the south-eastern coast for about 18 m. With the exception of the Hwang-ho, which traverses the province in a north-easterly direction to the sea, there are no large rivers in Shan-tung. The most con- siderable are the Wei, which flows into the Gulf of Chih-li; the I-ho, which empties into a lake lying east of the Grand Canal; and the Ta-wen, which rises at the southern foot of the I-sham Mountains and terminates in the Grand Canal. The canal traverses the pro- vinces S. to N. east of the mountain region. There are several lakes, notably the Tu-shan Hu, which borders on the Grand Canal in the south-west. The fauna includes wild boars, wolves, foxes, badgers, partridges, quails and snipe. Cotton, silk, coal, grain, &c. are produced in the fertile tracts

in the neighbourhood of the lakes. Not being a loess region, the mountains are unproductive, and yield only brushwood and grass, while the plain to the north is so im- pregnated with salt that it is almost valueless, especially near the sea, for agricultural purposes. The valleys between the mountains and the plain to the south-west are, however, extremely rich and fertile.

The chief wealth of Shan-tung consists in its minerals, the principal of which is coal. Several coal-fields are worked ; the most considerable lies in the valley of the Lao-fu river in the centre of the province. Another large field lies on the plain a little to the south of I-chow Fu in the south. A third field is in the district of Wei Hien to the north; and a fourth in the neighbourhood of I-Hien in the south-west. Iron ore, ironstone, gold, galena, lead and copper are also found in considerable quantities in many districts.

Agricultural products are wheat, millet, Indian corn, pulse, arrowroot and many varieties of fruits and vegetables. Rice is grown in the extreme south of the province. Among trees, stunted pines, dwarf oaks, poplars, willows and the Cypress are fairly plentiful. The castor-oil plant, is common, and the wax tree grows plentifully in the neighbourhood of Lai-yang in the east, giving rise to a con- siderable trade in the wax produced by the wax insects. Unlike those of their kind in Sze Ch'uen, the wax insects of Shan-tung breed and become productive in the same districts. They are placed upon the trees in the spring, and at the close of the summer they void a peculiar substance which when melted forms wax. In the autumn they are taken off the trees, and are preserved within doors until the following spring. Sericulture is an important industry. The worms are fed in the west on mulberry leaves, in the east on those of the dwarf oak, the material made from the silk produced from the oak-fed. worms being known as pongee or Chifu silk. The worm itself, after the cocoon has been used, is eaten and is esteemed a delicacy.

Besides Chi-nan Fu, the provincial capital, other inland cities are Tsao-Chow Fu (pop. 150,000) on the Grand Canal (an industrial centre) and Wei-hsien (100,000), a commercial centre. The ports of Shan-tung include Chifu, Wei-hai-wei and Kiao-chow (Tsing-tao), all separately noticed.

As part of compensation for the murder of two. German missionaries in 1897 in this province — Protestant mission Work in Shan-tung dates from i860 — the Germans took possession on lease of the port of Kiao-chow, 300 m. N. of Shanghai, a 36 hours' run by steamer, with which were associated many railway and mining rights in the

district. In fulfilment of these rights a railway has been constructed connecting Kiao-chow with China,n- fu, the capital; there it connects with another railway crossing the province north to south and forming part of the Tientsin and Chin-kiang line. In consequence of this acquisition, of territory by Germany and the subsequent seizure of Port Arthur by Russia, Great Britain accepted the lease of Wei-hai-wei on the same terms. The convention confirming this arrangement was signed on the 1 st of July 1898. It was in Shang-tung that the Boxer movement was first turned against foreigners (see China § History).*

See M. Broomhall, The Chinese Empire (London, 1907), pp. 93- 100; L. Richard, Comprehensive Geography of the Chinese Empire (Shanghai, 1908), pp. 79-89, and authorities there cited.

SHAPIRA, M. W. (c. 1830-1884), Polish vendor of spurious antiquities, was of Jewish birth, but appears to have become a Christian early in life. He opened a shop for the sale of antiquities in Palestine, and after the discovery of the Moabite Stone in 1872 was successful in selling to the Prussian government for 20,000 thaler a number of alleged pieces of Moabite pottery. These were shown by Clermont-Ganneau and others (cf. Kautzsch and A. Socin, Achtheit der moabitischen Altertumer , 1876) to be forgeries produced by Shapira's client Selim al-Kari. Undeterred by this exposure, Shapira continued to do a con- siderable trade especially in Hebrew MSS. from Yemen, but

ultimately ruined himself by a fraud perpetrated upon the British Museum. In 1883 he offered, for the price, it is said, of £1,000,000, a number of leather strips containing speeches of Moses varying in many particulars from, though similar in matter to, those in Deuteronomy, and written in archaic Hebrew characters. He pretended that he had obtained them from a Bedouin who had discovered them in a Moabite cave. The fragments were submitted to C. D. Ginsburg, who published translations in The Times of Aug. 4, 17, 22, 1883. The French government, however, sent over Clermont-Ganneau to investigate, and, though the British Museum authorities declined to give him permission to make a complete study, he satisfied himself from a few strips which were publicly exhibited that the whole collec- tion must be a forgery (The Times, Aug. 1 5) . This view was con- firmed by Ginsburg's report to the Museum. Shapira,

who was never shown to have been the actual forger, committed suicide in Rotterdam on the nth of March 1884.

For the fragments see Guthe, Fragmenta einer Lederhandschrift (Leipzig, 1884); see also Clermont-Ganneau, Les Fraudes archeologiques (Paris, 1885), iii., iv.

SHAPUR (Pahlavi, Shahpuhre, " son of the king " ; Greek Sapores, commonly Sapor), the name of three Sassanian kings.

1. Shapur I. (a.d. 241-272), son of Ardashir I. The Persian legend which makes him the son of an Arsacid princess is not historical. Ardashir I. had towards the end of his reign renewed the war against Rome; Shapur conquered the Mesopotamian fortresses Nisibis and Carrhae and advanced into Syria; but he was driven back by C. Furius Timasitheus, 1 father-in-law of the young emperor, Gordianus III., and beaten at Resaena (243). Shortly afterwards Timesitheus died, and Gordianus (q.v.) was murdered by Philip the Arabian, who concluded an ignominious peace with the Persians (244). When the invasion of the Goths and the continuous elevation of new emperors after the death of Decius (251) brought the Roman empire to utter dissolution, Shapur resumed his attacks. He conquered Armenia, invaded Syria, and plundered Antioch. At last the emperor Valerianus marched against him, but suffered near Edessa the fate of Crassus (260). Shapur advanced into Asia Minor, but was beaten by Ballista; and now Odaenathus (Odainath), prince of Palmyra, rose in his rear, defeated the Persian army, reconquered Carrhae and Nisibis, captured the royal harem, and twice invested Ctesiphon (263-265). Shapur was unable to resume the offensive; he even lost Armenia again. But according to Persian and Arabic traditions, which appear to be trustworthy, he conquered the great fortress of Hatra in the Mesopotamian desert; and the great glory of his reign was that a Roman emperor was by him kept prisoner to the day of his death. In the valley of Istakhr (near Persepolis), under the tombs of the Achaemenids at Nakshi Rustam, Shapur is represented on horseback, in the royal armour, with the crown on his head; before him kneels Valerian, in Roman dress, asking for grace. The same scene is represented on the rocks near the ruins of the towns Darabjird and Shapur in Persis. Shapur left other reliefs and rock inscriptions; one, at Nakshi-Rajab near Persepolis, is accompanied by a Greek translation; here he calls himself " the Mazdayasnian (worshipper of Ahuramazda), the god Sapores, king of kings of the Aryans (Iranians) and non-Aryans, of divine descent, son of the Mazdayasnian, the god Artaxares, king of kings of the Aryans, grandson of the god-king Papak." Another long inˆ scription at

Hajjiabad (Istakhr) mentions the king's exploits in archery in the presence of his nobles.

From his titles we learn that Shapur I. claimed the sovereignty over the whole earth, although in reality his domain extended

1 Timesitheus is the generally accepted variant for the Misitheus (" God-Hater ") of Capitolinus; Zosimus, i. 16. 17, preferred Timesicles. In a paper read before a meeting of the British School of Archaeology at Rome on the 30th of January, 1908, Mr A. S. Yeames endeavoured to show that Timesitheus is the general commemorated by a bust in the Sala delle Colombe of the Capitoline Museum, and by the great sarcophagus in the Museo delle Terme, representing a battle between Romans and barbarians. On the forehead in each case is a non-Christian incised cross of unknown significance.

little farther than that of Ardashir I. Shapur built the great town Gundev-Shapur near the old Achaemenian capital Susa, and increased the fertility of this rich district by a barrage through the Karun river near Shushter, which was built by the Roman prisoners and is still called Band-i-Kaisar, " the mole of the Caesar." • Under his reign the prophet Mani, the founder of Manichaeism {q.v.) began his preaching in Persia, and the king himself seems to have favoured his ideas.

For the monuments and inscriptions cf. Sir R. Ker Porter, Travels; Flandin and Coste, Voyage en Perse; Stolze, Persepolis; Thomas, Journal R. Asiat. Soc, new series, iii., 1868; West in Grundriss der iranischen Philologie, ii. 76 f. ; Dittenberger, Orientis Graeci inscr. i., No. 434. A gem with the portrait of the king is in the museum of Gotha, cf. Pertsch, Zeitsch. d. deutschen morgenl. Ges. xxii. 280.

2. Shapur II. (310-379). When King Hormizd II. (302-310) died, the Persian magnates killed his eldest son, blinded the second, and imprisoned the third (Hormizd, who afterwards escaped to the Romans) ; the throne was reserved for the un- born child of one of the wives of Hormizd. This child, named Shapur, was therefore born king; the government was con- ducted by his mother and the magnates. But when Shapur came of age, he turned out to be one of the greatest monarchs of the dynasty. Under his reign the collection of the Avesta was completed, heresy and apostasy punished, and the Christians persecuted. This was the natural oriental reaction against the transformation of the Roman empire into a Christian empire by Constantine. In 337, just before the death of Constantine, Shapur

broke the peace concluded in 297 between Narses and Diocletian, which had been observed for forty years, and a war of twenty-six years (337-363) began. Shapur attempted with varying success to conquer the great fortresses of Roman Mesopotamia, Singara, Nisibis (which he invested three times in vain), Amida (Diarbekr). The emperor Constantius II. was always beaten in the field. Nevertheless Shapur made scarcely any progress; the military power of his kingdom was not sufficient for a lasting occupation of the conquered districts. At the same time he was attacked in the E. by nomad tribes, among whom the Chionites are named. After a prolonged struggle they were forced to conclude a peace, and their king, Grumbates, accompanied Shapur in the war against the Romans. Shapur now conquered Amida after a siege of seventy-three days (359), and took Singara and some other fortresses in the next year. In 363 the emperor Julian, at the head of a strong army, advanced to Ctesiphon, but was killed. His successor Jovian was defeated and made an ignominious peace, by which the districts on the Tigris and Nisibis were ceded to the Persians, and the Romans promised to interfere no more in Armenia. In the rock-sculptures near the town Shapur in Persis (Stolze, Persipolis, pi. 141) the great success is represented; under the hoofs of the king's horse lies the body of an enemy, probably Julian, and a suppliant Roman, the emperor Jovian, asks for peace.

Shapur now invaded Armenia, took king Arsaces III. (of the Arsacid race), the faithful ally of the Romans, prisoner by treachery and forced him to commit suicide. He then attempted to introduce Zoroastrian orthodoxy into Armenia, But the Armenian nobles resisted him successfully, secretly supported by the Romans, who sent King Pap, the son of Arsaces III, into Armenia. The war with Rome threatened to break out again; but Valens sacrificed Pap and caused his assassination in Tarsus, where he had taken refuge (374). Shapur had conducted great hosts of captives from the Roman territory into his dominions, most of whom were settled in Susiana. Here he rebuilt Susa, after having killed her rebellious inhabitants, and founded some other towns. He was successful in the east, and the great town Nishapur in Khorasan (E. Parthia) was founded by him.

3. Shapur III. (383-388), son of Shapur II., elevated to the throne by the magnates against his uncle, Ardashir II., and killed by them after a reign of five years. He concluded a treaty with Theodosius the Great. (Ed. M.)

SHARE (O. Eng. scearu, chiefly in compounds, e.g. land-scearu, a share of land, from sceran to cut; cf. " shear"), something cut off, a

portion, a definite part of anything distributed among a

number of persons. The word is particularly applied to the fixed and equal amounts into which the capital of a limited company is divided (see Stocks and Shares; Company; and Debentures). From the same O. Eng. verb sceran is derived " share " (O. Eng. scear), the cutting blade of a plough (q.v.).

SHARI, an important river of North-Central Africa, carrying the drainage of a large area into Lake Chad (q.v.). Its head- streams rise on the watersheds between the Lake Chad basin and those of the Nile and Congo. The principal headstream, known variously as the Wahme, Wa, Warn or Worn, rises, in about 6° 30′ N., 15° E., in mountainous country forming the divide between the Chad system and the basin of the Sanga affluent of the Congo.

The Warn flows east and then north and in about 7 20′ N., 1 8° 20′ E. is joined by the Fafa, a considerable stream rising east of the Wain. The upper course of the Warn is much obstructed by rapids, but from a little above the Fafa confluence it becomes navigable. Below the confluence the river, now known as the Bahr Sara, receives three tributaries from the west. In about 9 20′ N., 1 8° E., it is joined by the Bamingi, which is formed by the junction of the eastern headstreams of the Shari. The Bamingi, before the exploration of the Warn, was thought to be the true upper course oi the Shari. One of its branches, the Kukuru, rises in about 7 N., 21 15′ E. Some 90 m. from its source the Bamingi becomes navig- able, being 12 ft. deep and flowing with a gentle current. In 8° 42′ N. it receives on the west bank the Gribingi, a river rising in about 6° 20′ N. It is narrow and tortuous with rocky banks and often broken by rapids, but navigable at high water to 7° N. It flows in great part through a forest-clad country. A few mile? above its confluence with the Bahr Sara the Bamingi receives on the right hand another large river, the Bangoran, which rises in about 7 45′ N. and 22° E., in a range of hills which separates the countries of Dar Runga and Dar Banda, and, like the Bamingi, flows through open or bush-covered plains with isolated granite ridges.

Below the junction of the Bahr Sara and the Bamingi the Shari, as it is now called, becomes a large river, reaching, in places, a width of over 4 m. in the rains; while its valley, bordered by elevated tree-clad

banks, contains many temporary lakes and back-waters. Its waters abound with hippopotami and crocodiles, and the country on either side with game of all kinds. In 9 46′ N. it receives the Bakare or Awauk (Aouk) from the east, known in its upper course as the Aukadebbe. This, like the Bahr es Salamat, which enters the Shari in 10° 2′ N., traversesa wide extent of arid country in southern Wadai, and brings no large amount of "water to the Shari. In io° 12′ a divergent branch, the Ergig, leaves the main stream, only to rejoin it in li° 30'.

In 12 15′ N. and 15° E. the Shari receives on the west bank its largest tributary, the Logone, the upper branches of which rise far to the south between 6° and 7° N. The principal headstreams are the Pende and the Mambere. The Pende rises some 30 m. N. by E. of the source of the Warn. It flows northwards through a fertile valley and in 9° 35′ N. and 16° E. is joined by the Mambere, which rises in the hills of Adamawa and flows in a course roughly parallel to the Pende. Below the junction of the Pende and Mambere the Logone is a broad and deep river. Its system is connected with that of the Benue (see Niger) by the Tuburi Swamp, which sends northward a channel joining the Logone in about io° 30′ N. Below the Logone confluence the Shari, here a noble stream, soon splits up into various arms, forming an alluvial delta, flooded at high water, before entering Lake Chad. From the source of the Warn to the mouth of the river is a distance, following the windings of the stream, of fully 1400 m.

The existence of the Shari was made known by Oudney, Denham and Clapperton, the first Europeans to reach Lake Chad (1823). In 1852 Heinrich Barth spent some time-in the region of the lower Shari and Logone, and in 1872-1873 Gustav Nachtigal studied their hydrographical system and explored the Gribingi, which he called the Bahr el Ardhe. It was not, however, until the partition of the Chad basin between Great Britain, France and Germany (1885-1890) that the systematic exploration of the Shari and its affluents was undertaken. The most prominent explorers have been Frenchmen. In 1896 Emile Gentil reached the Bamingi and in a small steamer passed down the river to its mouth. The existence of the Bahr Sara had been made known by C. Maistre in 1892, and in 1894 F. J. Clozel discovered the Warn. In 1900 A. Bernard demonstrated the identity of these two streams. In 1907 an expedition under Captain E. Lenfant followed the Wam-Bahr Sara from its source to the confluence with the Bamingi and showed it to be the true upper course of the Shari. The same expedition also

discovered the Pende tributary of the Logone. Captain Lenfant had

previously demonstrated (1903) the connexion between the Benue and Logone. From the mouth of the Shari in Lake Chad there is a current towards the Bahr-el-Ghazal channel at the south-eastern end of that lake. This channel has been supposed to be a dried-up affluent of the lake (see Chad) . Investigations by the French scientists E. F. Gautier and R. Chudeau led Chudeau to the conclusion that the Shari did not end in Lake Chad, but, by way of the Bahr-el-Ghazal, passed between Tibesti and Ennedi and ended in some shat in the Libyan desert. That the Shari may have reached the Nile is an hypothesis not absolutely rejected. (See Missions au Sahara, tome ii. (Paris, 1909), and for theories as to the Niger-Nile connexion see Niger.)

From the spot where it is intersected by 10° 40′ N. to Lake Chad the Shari forms the boundary between the German colony of Cameroon and French Congo. The best route from the Congo to Lake Chad is via the Sanga affluent of the Congo to the station of Carnot, and thence across the watershed to the Pende.

See the works of Barth, Nachtigal and other travellers, especially Lenfant's La Decouverte des grandes sources du centre de I'Ajrique (Paris, 1909).

SHARK, a Selachian fish (see Selachians), belonging to the order Plagiostomi, suborder Squali.

Sharks are almost exclusively inhabitants of the sea, but some species enter the mouths of large rivers, and one species (Carcharias gangeticus) occurs frequently high up in the large rivers of India. C. nicaraguensis of the lake of Nicaragua and the Rio San Juan appears to have taken up its residence permanently in fresh water. Sharks are most numerous between the tropics, a few only reaching the Arctic circle; it is not known how far they advance S. in the Antarctic region. Altogether some hundred and fifty different species have been described.

With regard to their habits many are littoral species, the majority pelagic, and a few are known to belong to the deep-sea fauna, having hitherto been obtained down to a depth of nearly 1000 fathoms.

Littoral Sharks. — The littoral forms are of small size, and generally known under the name of " dog-fishes," " hounds," &c. Some pelagic sharks of larger size also live near the shore on certain parts of a coast, but they are attracted to it by the abundance of food, and are as frequently found in the open sea, which is their birthplace;

therefore we shall refer to them when we speak of the pelagic kinds.

The majority of the littoral species live on the bottom, some- times close inshore, and feed on small marine animals or on any animal substance, The following are deserving of special notice.

The tope (Galeus) is common on the coasts not only of England, Ireland and of S. Europe, but also of S. Africa, California, Tasmania and New Zealand. Its teeth are equal in both jaws, of rather small size, flat, triangular, with the point directed towards the one side, and with a notch and denticulations on the shorter side (fig. 1). It is of a uniform slaty-grey colour, and attains to a length of 6 ft. The female brings forth some thirty living young at one birth in May. It becomes trouble- some at times to fishermen by taking their bait and driving away other fish they desire to catch. The fins of G. zyopterus of the Californian coast are much esteemed for culi- nary purposes by the Chinese.

The hounds proper (Mustelus) possess a very different dentition the- teeth being small, obtuse, numerous, arranged in several rows like pavement (fig. 2). Five or six species are known from the shores of the various temperate and subtropical seas, one (M. vulgaris) being common on the coasts of Great Britain and the United States, on the Pacific as well as the Atlantic side. It is of a uniform grey colour or sparingly spotted with white, and attains to a length of 3 or

Fig. 1.— Teeth of Tope. u, Upper; I, lower.

Fig. 2. — Teeth of Mustelus.

4 ft. The young, about twelve in number, are brought forth alive in November. It is comparatively harmless and feeds on shells, crustaceans and decomposing animal substances.

The dogfishes proper (Scyllium, Chiloscyllium, &c.) are spread over nearly all the temperate and tropical seas. Their teeth are small, in several series, with a longer pointed cusp in the middle, and generally one or two smaller ones on each side (figs. 3 and 5). They are all oviparous, their oblong egg-shells being produced at each corner into a long thread by which the egg is fastened to

some fixed object. Some of the tropical species are ornamented with

a pretty pattern of colora- tion. The two British species,the lesser and the larger spotted dog- fish (Sc. canicula and Sc. catulus), belong to the most common fishes of the coast and are often con- founded with each other. But the former is finely dotted with brown above, the latter having the same parts covered with larger rounded brown spots, some of which are nearly as large as the eye. As regards size, the latter exceeds somewhat the other species, attaining to a length of 4 ft. Dog- fishes may become extremely troublesome by the large numbers in which they congregate at fishing stations; they are rarely used as food, except in the Mediterranean countries, in China and Japan, and in the Orkneys, where they are dried for home consumption. The black-mouthed dogfish {Pristiurus melano- stomus) is rarely caught on the British coasts, and is recognized

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Fig. 3.-

-Teeth of Scyllium canicula.

Fig. 4. — Chiloscyllium trispeculare.

by a series of small, flat spines with which each side of the upper edge of the caudal fin is armed.

The tiger-shark (Stegostoma tigrinum) is one of the commonest and handsomest sharks in the Indian Ocean. The ground colour is a brownish-yellow, ornamented with black or brown transverse bands or rounded spots. It is a littoral species, but adult specimens, which are from 10 to 15 ft. long, are met far from land. It is easily recognized by its enormously long bladelike tail, which is half as long as the whole fish. The teeth are small,

trilobed, in many series. The <&>i .f”””^^. fourth and fifth gill- openings*

\f &, 2m are c l° se together.*

The genus Crossorhinus, of which three species are known from the coasts of Australia and Japan, is remarkable as the only instance in this group of fishes in which the integu- ments give a ” celative ” rather than a ” protective ” resem- : blance to their surroundings. Skinny frond-like appendages N . , are developed near the angle of the mouth, or form a wreath round the side of the head, and the

irregular and varied coloration of the whole body closely assimilates that of a rock covered with short vegetable and coralline growth. The species of Crossorhinus grow to a length of 10 ft.

The so-called Port Jackson shark (Heterodontus = Cestracion) is likewise a littoral form. Besides the common species (H. philippi), three other closely allied kinds from the Indo-Pacific are known. This genus, which is the only existing type of a separate family, is one of special interest, as similar forms occur in Primary and Secondary strata. The jaws are armed with

Fig. 5. — Confluent Buccal Cavities of the same fish.

small obtuse teeth in front, which in young individuals are pointed, and provided with from three to five cusps. The lateral teeth are larger, pad-like, twice as broad as long and arranged in oblique series (fig. 7). The fossil forms far exceeded in size the living, which scarcely attain to a length of 5 ft. The shells of their eggs are found thrown ashore like those of our dogfishes. The shell is pyriform, with two broad lamellar ridges each wound edgewise five times round it (fig. 8).

The spiny or piked dogfish (Acanthias) inhabits the temperate seas of both the N. and S. hemispheres. For some part of the year it lives in deeper water than the sharks already noticed,

Fig. 6. — -Heterodontus galeatus.

but at uncertain irregular times it appears at the surface and close inshore in almost incredible numbers. Couch says that he has heard of 20,000 having been taken in a seine at one time; and in March 1858 the newspapers reported a prodigious shoal reaching W. to Uig, whence it extended from 20 to 30 m. seaward, and in an unbroken phalanx E. to Moray, Banff and Aberdeen. These fishes are distinguished by each of the two dorsal fins being armed in front by an acute spine. They do not possess an anal fin. Their teeth are rather small, placed in a single series, with the point so much turned aside that the inner margin of the tooth forms the cutting edge (fig. 9). The spiny

Fig. 7. — Upper Jaw of Port Jackson Shark (Heterodontus philippi).

dogfish are of a greyish colour, with some whitish spots in young specimens, and attain to a length of 2 or 3 ft. They are vivi- parous, the young being produced throughout the summer months.

Finally, we have to notice among the littoral sharks the " angel-fish " or " monk-fish " (Rhina squatina), which, by its broad flat head and expanded pectoral fins, approaches in general appearance the rays. It occurs in the temperate seas of the S. as well as the N. hemisphere, and is not uncommon on sandy parts of the coast of England and Ireland. It does not seem to exceed a length of 5 ft., and is too rare to do much injury to other fish. It is said to produce about twenty young at a birth.

Pelagic Sharks. — All these are of large size, and some are surpassed in bulk and length only by the larger kinds of cetaceans.

Fig. 8. — Egg-shell of same fish. I., External view; II., section; a and b, the two spiral ridges; c, cavity for the ovum.

Those armed with powerful cutting teeth are dangerous to man, whilst others, which -are provided with numerous but very small teeth, feed on small fishes only or marine invertebrates, and are of a timid disposition, which causes them to retire into the solitudes of the open sea. On this account we know very little of their life. All pelagic sharks have a wide geographical range, and nearly all seem to be viviparous.*

Of the more remarkable forms which we propose to notice here the genus most abun- dantly represented in species and individuals is Carcharias, now split up by many authors into several separate genera. Perhaps nine-tenths of the sharks of which we read in books of travel belong to this genus. Between

Fig. 9. — Teeth of Acanihias vulgaris.

Fig. 10. — Dentition of the Blue Shark {Carcharias glaucus). The single teeth are of the natural size.

thirty and forty species have been distinguished, all of which are found in tropical seas. They are the sharks which so readily

attach themselves to sailing vessels, following them for weeks. Others affect more the neighbourhood of land. One of the most common species is the blue shark {Carcharias glaucus), of which specimens (4 to 6 ft. long) are frequently caught on the S. coasts of England and Ireland. Other species of Carcharias attain a length of 30 ft. The

mouth of all is armed with a series of large flat triangular teeth, which have a sharp, smooth or serrated edge (fig. io) ;

Galeocerdo is likewise a large shark very dangerous to man, differing from the preceding chiefly by having the outer side of its teeth deeply notched. It has long been known to occur in the N. Atlantic, close to the Arctic Ocean (G. arcticus), but its existence in other parts has been ascertained within a recent period; in fact, it seems to be one of the most common and dangerous sharks of the Indo-Pacific, the British Museum having obtained speci- mens from Mauritius, Kurrachee, Madras and the W. coast of Australia.

Hammerheaded sharks {Sphyma= Zygaena) are sharks in which the anterior fiG. ii. — Upper and portion of the head is produced into a Lower Tooth of Lamna. lobe on each side, the extremity of which

is occupied by the eye. The relation of this unique configuration of the head to the economy of the fish is unknown. Otherwise these sharks resemble Carcharias, and are equally formidable, but seem to be more stationary in their habits. They occur in all tropical and subtropical seas, even in the Mediterranean, where S. Zygaena is by no means rare. In the Indian Ocean it is common, and Cantor states that specimens may be often seen ascending from the clear blue depths of the ocean like a great cloud.

The porbeagles {Lamna) differ from the preceding sharks in their dentition and are not dangerous to man; at least there is nO instance known of a person having been attacked by the species common on the British coast {L. cornubica). This is referred to in the works of older British authors as "Beaumaris shark." The short and stout form of its body contrasts strikingly with its much attenuated tail, which, however, is streng- thened by a keel on each side and terminates in a large and powerful caudal fin. The snout is pointed, and the jaws are armed with strong lanceo- late teeth, each of which bears a small cusp on each side of the base (see fig. n). The teeth are not adapted for cut- ting, like the flat triangular teeth of man-eating sharks, but rather for seizing and holding the prey, which con- sists chiefly of various kinds of fishes and cephalopods. In the upper jaw there are from thirteen to sixteen teeth on each side, the third being remarkable for its small size; in the lower jaw from twelve to fourteen. The gill-openings ire yecy wide. The porbeagle attains to a length of 10 or 12 ft., aiici is a pelagic fish, not rare in the N. Atlantic and Mediterranean, and frequently wandering to the British and more rarely to the American shores. This species is widely distributed over the N. of the Atlantic and Pacific Oceans. Other

closely allied species {L. spallanzanii, L. glauca) are known to occur in the S>. Atlantic, from the Mediterranean to the Cape of Good Hope.

To the genus Carcharodon particular interest is attached, because the single still existing species is the most formidable of all sharks, as were those which preceded it in Tertiary times. The existing species (C. rondeletii) occurs in almost all tropical and subtropical seas, but seems to be verging towards extinction. It is known to attain to a length of 40 ft. The tooth figured

Fig. 12.-

-Tooth of Carcharodon

rondeletii.

here of the natural size (fig. 12) is taken from a jaw much shrunk in drying, but still 20 in. wide in its transverse diameter, and taken from a specimen 36? ft. long. The extinct species must have been still more gigantic in bulk, probably reaching a length of 00 ft., as we may judge from teeth which are found in the crag or which were dredged up from the Pacific Ocean by the " Challenger " expedition, and which are 4 in. wide at the base and 5 in. long measured along their lateral margin. In some Tertiary strata these teeth are extremely abundant, so much so that — for instance, in Florida — the strata in which (hey occur are quarried to obtain the fossil remains for export co England, where they are converted into artificial manure.

The fox-shark or thresher (Alopecias vulpes), of which every year specimens are captured on the British coast, but which is common in the N. and S. hemispheres, is readily recognized

with the upper part of the back raised above the surface of the water, a habit which it has in common with the true sunfish (Orthagoriscus) , and from which it has derived its name.

A shark similar in many points to the basking shark, and an inhabitant of the Indo-Pacific Ocean, is Rhinodon typicus. So far as our present knowledge goes, it is the largest of all sharks, as it is known to-exceed a length of 53 ft., but it is stated to attain that of

70. The captures of only a few specimens are on record, at the Cape of Good Hope and near the Seychelles, where it is known as the " chagrin." The snout is extremely short, broad and flat, with the mouth and nostrils placed at its extremity; the gill-openings very wide, and the eye very small. The teeth are extremely small and numerous, conical in shape. No opportunity should be lost of obtaining exact information

Fig. 13. — Basking Shark.

by its extremely slender tail, the length of which exceeds that of the remainder of the body. Its teeth are small, flat, triangular and without serrature. It follows the shoals of herrings, pilchards and sprats in their migrations, destroying incredible numbers and frequently injuring the nets. When feeding it uses the long tail in splashing the surface of the water, whilst it swims in gradually decreasing circles round a shoal of fishes which are thus kept crowded together. Sometimes two threshers may be seen working together. Statements that it has been seen to attack whales and other large cetaceans rest upon erroneous observations; its dentition is much too weak to bite through their skin. The thresher attains to a length of 15 ft., the tail included.

The basking shark (Selache maxima), sometimes erroneously called " sunfish," is the largest fish of the N. Atlantic, growing

Fig. 14. — Greenland Shark (Laemargus borealis).

to a length of more than 30 ft. Though best known from the N. of the Atlantic or Pacific oceans, this species has also been recorded from the Australian seas. The mouth is of an extra- ordinary width, and, like the gill-cavity, capable of great expan- sion, so as to enable the fish to take at one gulp an enormous quantity of the small fish and other marine creatures on which it subsists. Also the gill-clefts are of great width, and the internal opening of each is guarded by a kind of strainer, formed by the enormously .elongated gill-rakers, which serves to prevent the food organisms from passing out through the clefts. The teeth are very small, numerous, arranged in several series, conical and probably without use in feeding. This shark is therefore quite harmless if not attacked. Off the W. coast of Ireland it was at one time hunted for the sake of the oil from the liver, one fish yielding from a ton to a ton and a half. Its capture is not unattended with danger, as one blow from the tail is sufficient to stave in the sides of a large boat. The basking ■hark is gregarious, and may be seen in calm weather lying

on this shark. The same applies to the allied Micristodus punctatus recorded from off the W. coast of America.

The Greenland shark (Laemargus borealis) belongs to the same family as the spiked dogfish, but grows to a much larger size, specimens 26 ft. long having been met with. The two dorsal fins are small and destitute of spines. The teeth (fig. 1 5) in the upper jaw are small, narrow, conical in shape; those of the lower flat, arranged in several series, one on the top of the other, so that only the uppermost forms the sharp dental edge of the jaw. The points of these lower teeth are so much turned aside that the inner margin only enters the dental edge. The Greenland shark is an inhabitant of the Arctic regions, sometimes straying to the latitudes of Great Britain and of Cape Cod in the W. Atlantic; it is one of the greatest enemies of the whale, which is often found with large pieces bitten out of the tail by this shark. Its voracity is so great that, as

Scoresby tells us, whilst engaged in feeding on the carcase of a whale it will allow itself to be stabbed with a lance or knife without being driven away.

The spinous shark (Echinorhinus spinosus) is readily recognized by the short bulky form of its body, its short tail, and the large round bony tubercles which are scattered all over its body, each of which is raised in the middle into a pointed conical spine. While most frequently recorded from the E. Atlantic, specimens have also been obtained from the coasts of N. America and of New Zealand. It always lives on the bottom, and probably descends to some depth. It does not seem to exceed a length of 10 ft.

Bathybial Sharks. — Sharks do not appear to have yet reached the greatest depths of the ocean; and so far as we know at present we have to fix the limit of their vertical distribution at 1000 fathoms. Those which we find to have reached or to pass

“ill.’ ‘”’ 1 * 7 ‘;-:’-i

Fig. 15. — Dentition of Greenland Shark.

the 100 fathoms line belong to generic types which, if they include

littoral species, are ground-sharks — as we generally find the bottom-feeders of our littoral fauna much more strongly represented in the deep sea than the surface swimmers. All belong to two families only, the Scylliidae and Spinacidae, the littoral members of which live for the greater part habitually on the bottom and probably frequently reach to the 100 fathoms

line. Distinctly bathy- bial species are two small dogfishes — ■ Spinax granulatus from 120 fathoms, and Scyllium canescens from 400 fathoms, both on the S.W. coast of S. America; also Cent- roscyllium granidatum from 340 fathoms in the S. Ocean, whose congener from the coast of Greenland probably descends to a similar depth. The shark which reaches the greatest depth recorded hitherto appears to be Scyllio- rhinus indicus obtained by the Valdivia ex- pedition from a depth of nearly 1000 fathoms in the W. Indian Ocean. It belongs to the genus Centrophorus, of which some ten species are known, all from deep water in the N. Atlantic, Mediter- ranean, the Molucca and Japanese seas. The Japanese species were discovered by the naturalists of the

Fig. 16. — Chlamydoselachus anguineus.

" Challenger " on the Hyalonema ground off. Inosima in 345 fathoms. Dr E. P. Wright found C. coelolepis at a still greater depth on the coast of Portugal. The fishermen of Setubal fish for these sharks in 400 or 500 fathoms, with a line of some 600 fathoms in length. " The sharks caught were, from 3 to 4 ft. long, and when they were hauled into the boat fell down into it like so many dead pigs "; in fact, on being rapidly withdrawn from the great pressure under which they lived they were killed, like other deep-sea fishes in similar circumstances. It is note- worthy that the organization of none of these deep-sea sharks has undergone such a modification as would lead us to infer that they are inhabitants of great depths.

One of the most, interesting types of the division of sharks is the small family of Notidanidae, which is externally distinguished by the presence of a single dorsal fin only, without spine and opposite to the anal, and by having six or seven wide branchial openings. They represent an ancient type, the presence of which in Jurassic formations is shown by teeth extremely similar to those of the living species. Their skeleton is notochordal. Only four species are known, of which one (Notidanus griseus) has now and then strayed N. to the English coast. Allied to

the Notidanidae are the Chlamydoselachidae or frilled sharks,

represented so far as is known by a single living species, C. anguineus Garman (fig. 16), which occurs frequently in deep water off the coast of Japan and as isolated specimens off the coasts of New South Wales, Madeira and Norway. A fossil species has been described from the Pliocene of N. Italy. It resembles a conger in shape, and differs from the Notidani proper by its elongated body, wide nearly terminal mouth, extremely wide gill-openings and peculiarly formed teeth. The teeth are similar in both jaws, each composed of three slender curved cusps separated by a pair of minute intermediate points, and with a broad base directed backwards.

A few words may be added with reference to the economic uses of this group of fishes. As mentioned above some of the smaller dog-fishes are eaten at certain seasons by the captors, and by the poorer classes of the population. An inferior kind of oil, chiefly used for the adulteration of cod-liver oil, is extracted on some of the N. fishing-stations from the liver of the spiked dogfishes, and occasionally of the larger sharks. Cabinet-makers make extensive use of shark's- skin under the name of " shagreen " for smoothing or polishing wood. This shagreen is obtained from species (such as our dog- fishes) whose skin is covered with small, pointed, closely-set, calcified papillae, whilst very rough skins, in which the papillae are large or blunt, are useless for this purpose. The dried fins of sharks (and of rays) form in India and China an important article of trade, the Chinese preparing gelatin from them, and using the better sort for culinary purposes. They are assorted in two kinds, viz. " white " and " black." The former consists exclusively of the dorsal fins, which are reputed to yield more gelatin than the other fins. The pectoral, ventral and anal fins constitute the " black " sort; the caudal are not used. (A. C. G. ; J. G. K.)

SHARON, a borough of Mercer county, Pennsylvania, U.S.A., on the Shenango river, about 70 m. by rail N.N. W. of Pittsburg. Pop. (1900) 8916, of whom 1805 were foreign-born and 113 were negroes; (1910 U.S. census) 15,270. Sharon is served by the Erie, the Lake Shore & Michigan Southern, and the Pennsylvania (Erie and Pittsburg division) railways. Sharon has an excellent public school system, and the F. H. Buhl Club (1903) is a social and educational institution, named in honour of its founder, an iron manufacturer of the borough. The borough has blast furnaces and rolling-mills; and iron and steel products, tin- plate and terne-plate are its principal manufactures. The total value of factory products in 1905 was $4,776,914, being 26-9% more than in 1900. Sharon and South Sharon (pop. by U.S. census in 1910, 10,190), which was separately incorporated as a borough in 1901, form what is virtually

a single industrial community. Sharon was first settled in 1795- but was only a small village when a movement for developing the coal-mines in the vicinity was begun in 1836. It was incorporated as a borough in 1841.

SHARP, GRANVILLE (1735-1813), English philanthropist, was the ninth of the fourteen children of Thomas Sharp (1693- 1758), a prolific theological writer and biographer of his father, John Sharp, archbishop of York. Granville, who was born at Durham in 1735, was educated at the grammar school there, and apprenticed to a London draper, but obtained employment in the government ordnance department in 1758. Sharp's tastes were scholarly; he managed to acquire knowledge of Greek and Hebrew, and before 1770 he had published more than one treatise on biblical criticism. His fame rests, however, on his untiring efforts for the abolition of slavery. In 1767 he had become involved in litigation with the owner of a slave called Jonathan Strong, in which it was decided that a slave remained in law the chattel of his master even on English soil. Sharp devoted himself to fighting this judgment both with his pen and in the courts of law; and finally it was laid down in the case of James Sommersett that .a slave becomes free the moment he sets foot on English territory. Sharp was an ardent sympathizer with the revolted American colonists, and at home advocated parliamentary reform and the legislative independence of Ireland, and agitated against the impressment of sailors for the navy. It was through his efforts that bishops for the United States of America were consecrated by the archbishop of Canter- bury in 1787. In the same year he was the means of founding a society for the abolition of slavery, and a settlement for

emancipated slaves at Sierra Leone. Granville Sharp was also one of the founders of the British and Foreign Bible Society, and of the Society for the Conversion of the Jews. One of his tracts, entitled Remarks on the Uses of the definitive article in the Greek text of the New Testament, published in 1798, propounded the rule known as " Granville Sharp's canon," which on account of its important bearing on Unitarian doctrine led to a celebrated controversy, in which many leading divines took part, including Christopher Wordsworth. This rule was to the effect that " when two personal nouns of the same case are connected by the copulate Kai, if the former has the definite article and the latter has not, they both belong to the same person. "

Sharp died on the 6th of July 1813, and a memorial of him was erected in Westminster Abbey.

See Prince Hoare, Memoirs of Granville Sharp (London, 1820), which contains observations by Bishop Burgess on Sharp's biblical criticisms; Sir James Stephen, Essays in Ecclesiastical Biography (London, i860); Thomas Clarkson, History of the Rise, Progress and Accomplishment of the Abolition of the African Slave Trade by the British Parliament (London, 1839).

SHARP, JAMES (1618-1670), Scottish divine, the son of William Sharp, sheriff-clerk of Banffshire, and Isabel Leslie or Lesley, daughter of Leslie of Kininvie, of the family of Halyburtons of Pitcur in Angus, was born in Banff Castle on the 4th of May 1618. In 1633 he went to King's College, Aberdeen, and graduated in 1637. He there studied divinity for one or two years, Aberdeen being at that time the home of Episcopal sentiment. On the outbreak of the Covenanting war he went to England (1639) and visited Oxford and perhaps Cambridge, becoming acquainted with the principal English divines. Upon his return he was chosen in 1643, through the influence of Lord Rothes, to be one of the " regents " of philosophy in St Leonard's College, St Andrews. In December 1647 he went through his ordinary trials for the ministerial office before the presbytery of St Andrews, and was appointed minister of Crail in Fifeshire, on the presentation of the earl of Crawford, in January 1648. In the great schism of Resolutioners and Protestors, he, with the large majority of educated men, took active part with the former. As early as March 1651 he was recognized as one of the leading men of the party, and was taken prisoner by Crom- well's forces. For eight months he was kept in the Tower of London, and liberated on parole. His first public employment was in 1656, when he went to London to endeavour to counteract with the Protector the influence of Archibald Johnston, Lord Warriston, who was acting for the Protestors. He displayed all his undoubted talents for small diplomacy, and considerable subtlety in argument, while on this service, and his mission was decidedly successful. He returned to Scotland in 1659, but upon Monk's march to London was again, in February 1660, sent by the Resolutioners to watch over their interests in London, where he arrived on the 13th of February. He was most favour- ably received by Monk, to whom it was of great importance to remain on good terms with the dominant party in Scotland. His letters to Douglas and others during this period, if they may be trusted, are useful towards following the intrigues of the time day by day. In the beginning of May he was despatched by Monk to the king at Breda. His letters on this occasion to Douglas show that he regarded himself equally as the emissary of

the Scottish kirk. It is to be noticed that he was also the bearer of a secret letter from Lauderdale to the king. There can be little doubt that while on this mission he was finally corrupted by Charles and Clarendon, not indeed so far as to make up his mind to betray the kirk, but at any rate to decide in no way to imperil his own chances by too firm an integrity. TJie first thing that aroused the jealousy of his brethren was his writing from Holland in commendation of Clarendon. This jealousy was increased on his return to London (May 26) by his plausible endeavours to stop all coming of Presbyterian com- missioners from Scotland and Ireland, though he professed to desire the presence of Douglas and Dickson, by his urgent advice that the Scots should not interfere in the restoration of Episcopacy in England, and by his endeavours to frustrate the proposed union of Resolutioners and Protestors. He informed

them that Presbyterianism was a lost cause in England, but as late as August n he intimated that, though there had been great danger for the Scottish kirk as well, this danger had been con- stantly and successfully warded off by his efforts. He returned to Scotland in this month, and busied himself in endeavouring to remove all suspicions of his loyalty to the kirk; but at the same time he successfully stopped all petitions from Scottish ministers to king, parliament or council. His letters to Drummond, a Presbyterian minister in London, and to Lauder- dale, without absolutely committing him, show clearly that he was certain that Episcopacy was about to be set up. How far he was actively a traitor in the matter had always been disputed until the question was set at rest by the discovery of his letter, dated May 21, from London, whither he went in April 1661, to Middleton, the high commissioner, whose chaplain he now was, showing that he was in confidential communication with Clarendon and the English bishops, that he was earnestly co-operating in the restoration of Episcopacy in Scotland, that he had before leaving Scotland held frequent conferences with Middleton on the subject (a fact which he had vehemently denied) and was aware that Middleton had all along intended it, and that he drew up the quibbling proclamation of June 10, the sole purpose of which was " the disposing of minds to acquiesce in the king's pleasure." The original of this letter (which is printed in the Lauderdale Papers and in the Scottish Review) is preserved in the Museum of the Society of Antiquaries, Edinburgh. It should be noticed that as late as the end of April, on the eve of starting on his mission to court with Rothes and Glencairne, he declared to Baillie that no change in the kirk was intended. The mask was at length dropped in August, when Episcopacy was restored, and Sharp was appointed archbishop of St Andrews. He and Leighton,

Fairfoul and Hamilton " were dubbed, first preaching deacons, then presbyters, and then consecrated bishops in one day, by Dr Sheldon and a few others." On April 8th the new prelates entered Scotland, and on the 20th of April 1662 Sharp preached his first sermon at St Andrews,

Sharp had carefully kept on good terms with Lauderdale, and when the Billeting Plot was concocted in September 1662 against the latter by Middleton, he managed to avoid acting against him; indeed it is probable that, after being appointed under an oath of secrecy to be one of the scrutineers of the billets, he, in violation of the oath, was the cause of Lauderdale receiving timely information of the decision against him; and yet he shortly went up to London to explain the whole affair in Middleton's interest. When Lauderdale's supremacy was established he readily co-operated in passing the National Synod Act in 1663, the first step in the intended subjection of the church to the crown. In 1664 he was again in London, returning in April, having secured the grant of a new church commission. So oppressive was his conduct and that of others of the bishops that it called forth a written protest from Gilbert Burnet. Sharp at once summoned him before the bishops and endeavoured to obtain a sentence of deprivation and excommunication against him, but was overruled by his brethren. On the death of Glencairne, the chancellor's greatest efforts were made to secure the vacant office for Sharp, and he was not inactive in his own interest; the place was not, however, filled up until 1667, and then by the appointment of Rothes. He was in strict alliance with Rothes, Hamilton and Dalyell, and the other leaders of oppression, and now placed himself in opposition to the influence of Lauderdale, attacking his friends, and especially the earl of Kincardine. In 1665 he was again in London, where, through his own folly and mendacity, he suffered a complete humiliation at the hands of Lauderdale, well described by the historian Burnet. The result of their system of violence and extortion was the rising of the Covenanters, during which, being in temporary charge during Rothes's absence, he showed, according to Bellenden, the utmost fear, equalled only by his cruelty to the prisoners after the rout of Pentland. When the convention of estates met in January 1667 Hamilton was substituted for him as president. He now

wrote letters of the most whining contrition to Lauderdale, who extended him a careless reconciliation. For a time he made himself

actively useful, and helped to restrain his brethren from writing to London to complain of the conciliation policy which for a while Lauderdale carried out. On July 10, 1668 an attempt was made upon his life by James Mitchell, who fired a pistol at him while driving through the streets of Edinburgh. The shot, however, missed Sharp, though his companion, the bishop of Orkney, was wounded by it, and Mitchell for the time escaped. In August Sharp went up to London, returning in December, and with his assistance Tweeddale's tolerant proposals for filling the vacant parishes with some of the " outed " ministers were carried out. In the debates on the Supremacy Act, by which Lauderdale destroyed the autonomy of the church, Sharp at first showed reluctance to put in motion the desired policy, but gave way upon the first pressure. When, however, Leighton, as archbishop of Glasgow, endeavoured to carry out a comprehensive scheme, Sharp actively opposed him, and expressed his joy at the failure of the attempt. From this time he was completely subservient to Lauderdale, who had now finally determined upon a career of oppression, and in 1674 he was again in London to support this policy. In this year also Mitchell, who had shot at him six years before, was arrested, and, upon Sharp's promise to obtain a pardon, privately made a full confession. When Mitchell later claimed this promise, Sharp denied that any such promise had been given. His falsehood was proved by the entry of the act in the records of the court. Mitchell was finally condemned, but a reprieve would have been granted had not Sharp himself insisted on his death. This was speedily avenged. On the 3rd of May 1679, as he was driving with his daughter Isabel to St Andrews, he was set upon by nine men, and, in spite of the appeals of his daughter, was cruelly murdered. The place of the murder, on Magus Muir, now covered with fir trees, is marked by a monument erected by Dean Stanley, with a Latin inscription recording the deed.

Unless otherwise mentioned, the proofs of the statements in this article will be found in vols. i. and ii. of the Lauderdale Papers (Camden Society) and in two articles in the Scottish Review, July 1884 and January 1885.

SHARP, JOHN (1645-1714), English divine, archbishop of York, was born at Bradford on the 16th of February 1645, and was educated at Christ's College, Cambridge. He was ordained deacon and priest on August 12th 1667, and until 1676 was chaplain and tutor in the family of Sir Heneage Finch at Kensington House. Meanwhile he became archdeacon of Berk- shire (1673), prebendary of Norwich, rector of St Giles's-in-the- Fields, and in 1681 dean of Norwich. In 1686, when chaplain to James II., he was suspended for

ten months on a charge of having made some reflections on the king, and in 1688 was cited for refusing to read the declaration of indulgence. Under William and Mary he succeeded Tillotson as dean of Canterbury in 1689, and (after declining a choice of sees vacated by non- jurors who were his personal friends) followed Thomas Lamplugh as archbishop of York in 1691. He made a thorough investiga- tion of the affairs of his see, and regulated the disordered chapter of Southwell. He preached at the coronation of Queen Anne and became her almoner and confidential adviser in matters of church and state. He welcomed the Armenian bishops who came to England in 17 13, and corresponded with the Prussian court on the possibility of the Anglican liturgy as a means of reconciliation between Lutherans and Calvinists. He died at Bath On the and of February 1714.

His works (chiefly sermons) were published in 7 volumes in 1754, and in 5 volumes at Oxford in 1829.

SHARP, RICHARD (1759-1835), known as " Conversation Sharp," was born in Newfoundland in r7sg, the son of a British officer in garrison there. He was for many years in business in London, and amassed a large fortune. He was the host of leading literary and political men at his houses in Park Lane and near Dorking. Johnson, Burke, Rogers, Hallam, Grattan, Sydney Smith, James Mill, Wordsworth and Coleridge were among his many friends. From 1806 to 1812 he was M.P. for Castle Rising, and subsequently he represented Portarlington

and Ikhester. He was the author of a volume of Letters and Essays in Prose and Verse (1834), which the Quarterly Review declared to be remarkable for " wisdom, wit, knowledge of the world and sound criticism." Sharp died at Dorchester on the 30th of March 1835.

SHARP, WILLIAM (1749-1824), English line-engraver, was born at London on the 29th of January 1 749. He was originally apprenticed to what is called a bright engraver, and practised as a writing engraver, but gradually became inspired by the higher branches of the engraver's art. Among' his earlier plates are some illustrations, after Stothard, for the Novelists' Magazine. He engraved the " Doctors Disputing on the Immaculateness of the Virgin " and the " Ecce Homo " of Guido Reni, the "St Cecilia " of Domenichino, the " Virgin and Child " of Dolci, and the portrait of John Hunter of Sir Joshua Reynolds. His style of en- graving is thoroughly masterly and original, excellent in its play of line and rendering of half-tints and of " colour." He died at Chiswick on the 25th of July 1824. In his

youth, owing to his hotly expressed adherence to the politics of Paine and Home Tooke, he was examined by the privy council on a charge of treasoii. Mesmer and Brothers found in Sharp a stanch believer; and for long he maintained Joanna Southcott at his own expense. As an engraver he achieved a European reputation, and at the time of his death he enjoyed the honour of being a member of the Imperial Academy of Vienna and of the Royal Academy of Munich.

SHARP, WILLIAM (1856-1905), Scottish poet and man of letters, was born at Paisley on the 12th of September 1856. His was a double personality, for during his lifetime he Was known solely by a series of poetical and critical works of great, but not of outstanding merit, while from 1894 onwards he pub- lished, with elaborate precautions of secrecy, under the name of " Fiona Macleod," a series of stories and sketches in poetical prose which made him perhaps the most conspicuous Scottish writer of the modern Gaelic renaissance. His early life' was spent chiefly in the W. highlands of Scotland, and after leaving Glasgow University he went to Australia in 1877 in search of health. After a cruise in the Pacific he settled for some time in London as clerk to a bank, became an intimate of the Rossettis, and began to contribute to the Pall Mall Gazette and' other journals. In 1885 he became art critic to the Glasgow Herald. He spent much time abroad, in France and Italy, and travelled extensively in America and Africa. In 1885 he married , his cousin, Elizabeth Amelia Sharp, who helped him in much of his literary work and collaborated with him in com- piling the Lyra Celtica (1896). His volumes of verse were The Human Inheritance (1882), Earth's Voices (1884), Romantic Ballads and Poems of Fantasy (1886), Sospiri di Roma (1891), Flower 0′ the Vine (1 894) , Sospiri d' Italia (1 906) . William Sharp was the general editor of the " Canterbury Poets " series. HewSs a discriminating anthologist, and his Sonnets of the Century (1886), to which he prefixed a useful treatise on the sonnet, ran through many editions. This was followed by American Sonnets (1889). He wrote biographies of Dante Gabriel Rossetti (r882'), ! of Shelley (1887), of Heinrich Heine (1888), of Robert Browning (1890), and edited the memoirs of Joseph Severn (1892). The most notable of his novels was Silence Farm (1899). Duriflg the later years of his life he was obliged for reasons of health to spend all his winters abroad, The secret of his authorship of the " Fiona Macleod " books was faithfully kept until his death, which took place at the Castello di Manlaee, Sicily, on the 12th of December 1905. As late as the 13th of May 1899 Fiona Macleod had written to the Athenaeum stating that she wrote only under that name and that it was her own. She began to publish her tales and

sketches of the primitive Celtic world in 1894 with Pharais: A Romance of the Isles. They found only a limited public, though an enthusiastic one. The earlier volumes include The Mountain Lovers (r895), The Sin-Eater (1895), The Washer of the Ford and other Legendary Moralities (1896), &c. In 1897 a collected edition of the shorter stories, with some new ones, was issued as Spiritual Tales, Barbaric Tales and Tragic Romances. Later volumes are The Dominion

of Dreams (1899); The Divine Adventure: Iona: and other Studies in Spiritual History (1900), and Winged Destiny (1904).

SHARPE, DANIEL (1806-1856), English geologist, was born in Marylebone, London, on the 6th of April 1806. His mother was a sister of Samuel Rogers, the poet. At the age of 16 he entered the counting-house of a Portuguese merchant in London. At the age of 25, after spending a year in Portugal, he joined his elder brother as a partner in a Portuguese mercantile business. As a geologist he first became known by his researches (1832-1840) on the geological structure of the neighbourhood of Lisbon. He studied the Silurian rocks of the Lake District and North Wales (1 842-1844), and afterwards investigated the structure of the Alps (1854-1855). He was elected F.R.S. in 1850. He published several essays on cleavage (1847-1852), and showed from the evidence of distortion of organic remains that the direction of the pressure producing contortions in the rocks was perpendicular to the planes of cleavage. Most of his papers were published in the Quarterly Journal of the Geological Society, but one " On the Arrangement of the Foliation and Cleavage of the Rocks of the North of Scotland," was printed in the Phil. Trans. 1852. He was author also of a Monograph on the Cephalopoda of the Chalk, published by the Palaeontographical Society (1853-1857). In 1856 he was elected president of the Geological Society, but he died in London, from the effects of an accident, on the 31st of May that year.

SHARPSBURG, a borough of Allegheny county, Pennsylvania, U.S.A., on the Allegheny river, opposite the N.E. part of Pitts- burg. Pop. (1900) 6842 (1280 foreign-born); (1910) 8153. Sharpsburg is served by the Pennsylvania and the Baltimore & Ohio railways. Coal is mined in the vicinity. Among the manu- factures are iron pipes, truck and bar iron, wire, stoves, paint and lubricating oil.

Sharpsburg was settled in 1826, was named in honour of James Sharp, the original proprietor, and was incorporated in 1841.

SHASI, a city in the province of Hu-peh, China, on the left bank of the river Yangtsze, about 85 m. below Ich'ang. Pop. about 80,000. It was opened to foreign trade under the Japanese treaty of 1895. The town lies below the summer level of the Yangtsze, from which it is protected by a strong embankment. Formerly Shasi was a great distributing centre, but the opening of Ich'ang to foreign trade diverted much of the traffic to the last-named port. It is the terminus of an extensive network of canals which run through the low country lying on the north bank of the Yangtsze as far down as Hankow. Native boats, as a rule, prefer the canal route to the turbulent waters of the Yangtsze, their cargoes being transhipped at Shasi across the embankment into river boats. Foreign residents are few, and the trade passing through the maritime customs is comparatively insignificant. The place is still, however, a large distributing centre for native trade, and is the seat of an extensive manu- facture of native cotton cloth. The British consulate was withdrawn in January 1899, British interests being placed under the care of the consul at Ich'ang.

SHAW, GEORGE BERNARD (1856-), British dramatist and publicist, was born in Dublin on the 26th of July 1856. His father, George Carr Shaw, was a retired civil servant, the younger son of Bernard Shaw, high sheriff of Kilkenny. His mother, Lucinda Elizabeth Gurly, was a good musician, who eventually became a teacher of singing in London. G. B. Shaw went to school in Dublin, and began to earn his living when he was fifteen. He was for five years a clerk in the office of an Irish land-agent, but came to London with his family in 1876, and in 1879 was, according to his own account in the preface to The Irrational Knot, in the offices of the Edison telephone company. He had begun to write novels, which did not immedi- ately find their market. The Irrational Knot, written in 1880, and Love among the Artists (written in 1881) first appeared as serials in Our Corner, a monthly edited by Mrs Annie Besant; Cashel Byron's Profession (reprinted in 1901 in the series of " Novels of his Nonage ") and An Unsocial Socialist first appeared in a Socialist magazine To-day, which no longer exists. Shaw joined the Fabian Society in 1884, a year after its formation,

and was active in socialistic propaganda, both as a street orator and as a pamphleteer. In 1889 he edited the Fabian Essays, to which he contributed " The Economic Basis of Socialism" and " The Transition to Social Democracy." He began journal- ism, through the influence

of William Archer, on the reviewing staff of the Pall Mall Gazette in 1885; he then became art and musical critic, writing from 1888 to 1890 for the Star, where his articles were signed " Corno di Bassetto," and then in 1890 to 1894 for the World. In 1895 to 1898 he was dramatic critic to the Saturday Review, his articles being collected in 1907 as Dramatic Opinions and Essays. He was an early champion of Richard Wagner and of Henrik Ibsen, and indicated his aesthetic point of view in the pamphlets, The Quintessence of Ibsenism (1 89 1) and The Perfect Wagnerite (1898). His first play, Widowers' Houses, two acts of which had been written in 1885 in collabora- tion with Mr William Archer, was produced Dy the Independent Theatre under the management of Mr J. T. Grein at the Royalty in 1892. This found few admirers outside Socialist circles, and was hooted by the ordinary playgoer. In 1893 he wrote The Philanderer, a topical comedy on Ibsenism and the " new woman," for the same theatre, but the piece proved technically unsuitable for Mr Grein's company. To replace it Mr Shaw wrote Mrs Warren's Profession, a powerful but disagreeable play, which was rejected by the censor and not presented until the 5th of January 1902, when it was privately given by the Stage Society at the New Lyric Theatre. When it was played in New York by Mr Arnold Daly's company in 1905 the actors were prosecuted. These three plays were classed by the author as " unpleasant plays " in the printed version. Arms and the Man was produced at the Avenue Theatre (21st of April 1894) by Miss Florence Farr, who was experimenting on the lines of the Independent Theatre, and by Mr Richard Mansfield at the Herald Square Theatre, New York (the 17th of Sept. 1894). The scene was laid in Bulgaria, the piece being a satire on romanticism, a destructive criticism on military " glory." Candida was written in 1894 for Mr Mansfield, who did not produce it until December 1903; but it was played in Aberdeen in July 1897 by the Independent Theatre Company. This defence of the poetic point of view against brute force and common sense was admirably constructed and it proved one of the most popular of his plays. The pieces which followed are: The Man of Destiny (written in 1895, played at Croydon in 1897 by Mr Murray Carson), a Napoleonic drama, which was revived at New York by Arnold Daly in 1904; You Never Can Tell (written in 1896, produced at the Strand Theatre in 1900), a farcical comedy; The Devil's Disciple (produced at New York by Richard Mansfield in 1897, and in London in 1899), the scene of which is laid in the War of American Independence, Caesar and Cleopatra (1898) and Captain Brassbound's Conversion (1898) — printed as Three Plays for Puritans (1900); The Admirable Bashville (Stage Society, Imperial Theatre, 1903), a dramatization of Cashel

Byron's Profession.

He had found no regular English audience when he published Plays Pleasant and Unpleasant (2 vols.) in 1898, and his pieces first became well known to the ordinary playgoer by the per- formances given at the Royal Court Theatre under the manage- ment of Messrs Vedrenne and H. Granville Barker. Man and Superman (published in 1903) was produced there on the 23rd of May 1905, in a necessarily abridged form, with Granville Barker in the part of John Tanner, the author of the " Revolu- tionists' Handbook and Pocket Companion," printed as an appendix to the play. Mr Shaw asserted that the piece originated in a suggestion from Mr A. B. Walkley that he should write a Don Juan play, which he proceeded to do in a characteristic topsy-turvy fashion. John Tanner (Juan Tenor) is a voluble exponent of Schopenhauer and Nietzsche, who finally falls a victim to the life force in Ann. Major Barbara (Court Theatre, Nov. 1905), a " discussion in three acts," placed the Salvation Army on the stage. The Vedrenne-Barker management also revived Candida (April 1904), You Never Can Tell (May 1905), Captain Brassbound's Conversion (March 1906) and John Bull's other Island (November 1904), a statement of the Irish land

question, which had been produced at the Camden Theatre in 1903, and later by the Stage Society. At the same theatre was produced (20th of November 1906) The Doctor's Dilemma, a satire on the medical profession, and How He lied to Her Husband (Feb. 1905), which had been previously played in New York. Later plays were: Getting Married (1908), The Showing-up of Blanco Posnet (1909) and Press-cuttings (1909). Among Mr Shaw's later writings on economics are: Socialism for Millionaires (1901), The Common Sense of Municipal Trading (1904), and Fabianism and the Fiscal Question (1904). Although an energetic member of the South St Pancras borough council, he failed to secure election to the London County Council when he stood as a candidate in 1904. Mr Shaw married in 1898 Miss Charlotte Frances Payne-Townshend.

There are essays on his work by H. L. Mencken (Boston and London, 1905), by E. E. Hale {Dramatists of To-Day, London, 1906), &c; " The Plays of Mr Bernard Shaw," in the Edinburgh Review (April 1905) ; " Mr Bernard Shaw's Counterfeit Presentment of Women," in the Fortnightly Review (March 1906) ; " Bernard Shaw as Critic," in

the Fortnightly Review (June 1907) ; and an apprecia- tion by Holbrook Jackson, Bernard Shaw (1907).

SHAW, HENRY WHEELER (1818-1885), American humorist, known by the pen-name of " Josh Billings," was born of Puritan stock at Lanesborough, Massachusetts, on the 21st of April 1818, the son of Henry Shaw (1788-1857), who was a representa- tive in Congress in 181 7-182 1. The son left Hamilton College to go West. In 1858 he settled in Poughkeepsie, N.Y., as a land – agent and auctioneer, and began writing newspaper articles, especially for the Poughkeepsie Daily Press. His " Essa on the Muel bi Josh Billings" (i860) in a New York paper was followed by many similar articles, chiefly in the New York Weekly and the New York Saturday Press, and by several popular volumes, among which are Josh Billings: His Sayings (1866), Josh Billings on Ice (1868), Everybody's Friend (1876), Josh Billings: His Works, Complete (1876), Trump Kards (1877), Old Probabilities (1879), Josh Billings' Spice-Box (1881), and Josh Billings' Farmers' Allminax, burlesquing the Old Farmers' Almanac, issued annually between 1870 and 1880, and collected into a volume in 1902 under the title Josh Billings' Old Farmers' Allminax. He died in Monterey, California, on the 14th of October 1885. His platform lectures, such as " Milk," " Hobby Horse," " The Pensive Cockroach," and " What I kno about Hotels," his mannerisms and apparently unstudied witticisms made him conspicuous.

See Life and Adventures of Josh Billings (New York, 1883), by Francis S. Smith.

SHAW, LEMUEL (1781-1861), American jurist, was born at Barnstable, Massachusetts, son of the minister of the West Parish there, on the 9th of January 1781. He graduated from Harvard College in 1800, and was admitted to the bar (of New Hampshire and of Massachusetts) in 1804. In 1805 he began to practise law in Boston. He was a prominent Federalist and was a member of the Massachusetts House of Representatives in 1811-1814, in 1820, and in 1829, and of the state Senate in 1821-1822, a delegate to the state constitutional convention of 1820-1821, and chief justice of the Supreme Court of the state from 1830 to i860. He died in Boston on the 30th of March 1861. As chief justice Shaw maintained the high standard of excellence set by Theophilus Parsons. He presided over the trial in 1850 of Professor John White Webster (1793-1850) for the murder of Dr George Parkman. His work in extending the equity, jurisdiction and powers of the court was especially notable. He was also largely instrumental in defeating an attempt (1843) to make a reduction of salary apply to judges already in office, and an

attempt (1853) to abolish the life term of judges. His opinion in Cary v.. Daniels (8 Metcalf) is the basis of the present law in Massachusetts as to the regulation of water power rights of riparian proprietors.

See the address by B. F. Thomas in Proceedings of the Massa-chusetts Historical Society, x. 50-79 (Boston, 1869) ; and the sketches by Samuel S. Shaw and P. Emory Aldrich in vol. iv. pp. 200-247, of Memorial Biographies of the New England Historic Genealogical Soci-ety (Boston, 1885).

SHAW, RICHARD NORMAN (1831-), British architect, was born in Edinburgh on the 7th of May 1831. At the age of

sixteen he went to London and became a pupil of William Burn. In Burn's office he formed that friendship with William Eden Nesfield which so profoundly influenced the careers of both, and was thoroughly grounded in the science of planning and in the classical vernacular of the period. He also attended the architectural schools of the Royal Academy, and devoted careful study both to ancient and to the best contemporary buildings. In 1854, having finished his term of apprenticeship with Burn, he gained the gold medal and travelling studentship of the Royal Academy, and until 1856 travelled on the continent, studying and drawing old work. On his return in 1856 he was requested by the Council of the Royal Academy to publish his drawings. This work, entitled Architectural Sketches from the Continent, was issued in 1858. In the meantime Nesfield was continuing his studies with Anthony Salvin; Mr Shaw also entered his office, and remained there until 1857, when he widened his experience by working for three years under George Edmund Street. In 1863, after sixteen years of severe training, he began to practise. For a short time he and Nesfield joined forces, but their lines soon diverged. Mr Shaw's first work of importance was Leyes Wood, in Surrey, a building of much originality, followed shortly afterwards by Cragside, for Lord Armstrong, which was begun in 1869. From that time until he retired from active practice his works followed one another in quick succession. In 1872 Mr Shaw was elected an Associate of the Royal Academy, and a full member in 1877; he joined the " retired " list towards the end of 1901.

Other characteristic examples of Shaw's work are Preen Manor, Shropshire; New Zealand Chambers, Leadenhall Street; Pierre- pont, Wispers, and Merrist Wood, in Surrey; Lowther Lodge, Kensington; Adcote, in Shropshire; his houses at Kensington, Chelsea, and at

Hampstead; Flete House, Devonshire; Greenham Lodge, Berkshire; Dawpool, in Cheshire; Bryanstone, in Dorset- shire; Chesters, Northumberland; New Scotland Yard, on the Thames Embankment; besides several fine works in Liverpool and the neighbourhood. He also built and restored several churches, the best known of which are St John's Church, Leeds; St Margaret's, Ilkley, and All Saints', Leek. His early buildings were most picturesque, and contrasted completely with the current work of the time. The use of " half timber " and hanging tiles, the projecting gables and massive chimneys, and the cunningly contrived bays and recessed fireplaces, together with the complete freedom from the con- ventions and trammels of " style," not only appealed to the artist, but gained at once a place in public estimation. Judged in the light of his later work, some of those early buildings appear almost too full of feature and design; they show, however, very clearly that Mr Shaw, in discarding " academic style," was not drifting rudder- less on a sea of fancy. His buildings, although entirely free from archaeological pedantry, were the outcome of much enthusiastic and intelligent study of old examples, and were based directly on old methods and traditions. As his powers developed, his buildings gained in dignity, and had an air of serenity and a quiet homely charm which were less conspicuous in his earlier works; the " half timber " was more sparingly used, and finally disappeared entirely. His work throughout is especially distinguished by treatment of scheme. There is nothing tentative or hesitating. His planning is invariably fine and full of ingenuity. Adcote (a beautiful drawing of which hangs in the Diploma Gallery at Burlington House) is perhaps the best example of the series of his country houses built between 1870 and 1880. The elements are few but perfectly pro- portioned and combined, and the scale throughout is consistent. The Great Hall is the keynote of the plan, and is properly but not unduly emphasized. The grouping of the rooms round the Hall is very ably managed — each room is in its right position, and has its proper aspect. New Zealand Chambers, in Leadenhall Street, another work of about the same period (1 870-1 880), is a valuable example of Mr Shaw's versatility. Here he employed a completely different method of expression from any of his preceding works, in all of which there is a trace of " Gothic " feeling. This is a facade only of two storeys, divided by piers of brickwork into three equal spaces, filled by shaped bays rich with modelled plaster; above, drawing the whole composition together, is a finely enriched plaster cove. An attic storey, roofed with three gables, completes the building, which is the antithesis of the accepted type of city offices ; it is yet perfectly adapted to modern uses. New Scotland Yard is undoubtedly Mr Shaw's finest and most complete work. The plain granite base is not

only subtly suggestive of the purposes of the building, but by dividing the height with a strongly marked line gives a greater apparent width to the structure; it. suggests also a division of departments. By its mass, too, it prevents the eye from dwelling on the necessary irregularity of the lower windows, which are not only different in character from those of the upper storeys, but more numerous and quite irregularly spaced. The projecting

angle turrets are most happily conceived, and besides giving emphasis to the corners, form the main point of interest in the composition of the riverfront. The chimneys are not allowed to cut the sky-line in all directions, but have been drawn together into massive blocks, and contribute much to the general air of dignity and strength for which this building is remarkable. Simple roofs of ample span complete a composition conspicuous for its breadth and unity.

Mr Shaw's influence on his generation can only be adequately gauged by a comparison of current work with that which was in vogue when he began his career. The works of Pugin, Scott, and others, and the architectural literature of the time, had turned the thoughts both of architects and the public towards a " revived Gothic." Before he entered the field, this teaching had hardened into a creed. Mr Shaw was not content to hold so limited a view, and with characteristic courage threw over these artificial barriers and struck out a line of his own. The rapidity with which he conceived and created new types, and as it were set a new fashion in building, compelled admiration for his genius, and swelled the ranks of his adherents. It is largely owing to him that there is now a distinct tendency to approach architecture as the art of Building rather than as the art of Designing, and the study of old work as one of methods and expressions which are for all time, rather than as a means of learning a language of forms proper only to their period.

SHAW-KENNEDY, SIR JAMES (1788-1865), British soldier arid military writer, was the son of Captain John Shaw, of Dalton, Kirkcudbrightshire. Joining the 43rd (Monmouthshire) Light Infantry in 1805, he first saw service in the Copenhagen Expedi- tion of 1807 as a lieutenant, and under Sir David Baird took part in the Corunna Campaign of 1808-9. I n tne retreat Shaw contracted a fever, from the effects of which he never fully recovered. The 43rd was again engaged in the Douro and Talavera Campaigns, and Shaw became

adjutant of his now famous regiment at the battle of Talavera. As Robert Craufurd's aide-de-camp he was on the staff of the Light Division at the Coa and the Agueda, and with another officer prepared and edited the " Standing Orders of the Light Division " (printed inHome's Precis of Modern Tactics, pp. 257-277), which serve as a model to this day. He was wounded at Almeida in 18 10, but rejoined Craufurd at the end of 181 1 and was with his chief at the siege of Ciudad Rodrigo in January 181 2. At the great assault of January 19th Shaw carried his general, mortally wounded, from the glacis, and at Badajoz, now once more with the 43rd, he displayed, at the lesser breach, a gallantry which furnished his brother officer William Napier with the theme of one of his most glorious descriptive passages (Peninsular War, bk. xvi. ch. v.). At the siege and the battle of Salamanca, in the retreat from Burgos, Shaw, still a subaltern, distinguished himself again and again, but he had to return to England at the end of the year, broken in health. Once more in active service in 181 5, as one of Charles Alten's staff officers, Captain Shaw, by his reconnoitring skill and tactical judgment was of the greatest assistance to Alten and to Wellington, who promoted him brevet-major in July, arid brevet lieut. colonel in 1819. During the occupation of France by the allied army Shaw was com mandant of Calais, and on his return to England was employed as a staff officer in the North. In this capacity he was called upon to deal with the Manchester riots of 1819, and his memor- andum on the methods to be adopted in dealing with civil disorders embodied principles which have been recognized to the present day. In 1820 he married, and in 1834, on succeed- ing, in right of his wife, to the estate of Kirkmichael, he took the name of Kennedy. Two years later Colonel Shaw-Kennedy was entrusted with the organization of the Royal Irish Con- stabulary, which he raised and trained according to his own ideas. He remained inspector-general of the R.I.C. for two years, after which for ten years he led a retired country life. In 1848, during the Chartist movements, he was suddenly called upon to command at Liverpool, and soon afterwards was offered successively a command in Ireland and the governorship of Mauritius. Ill-health compelled him to decline these, as also the Scottish command a little later, and for the rest of his life he was practically an invalid. He became full General in 1862 and was made K.C.I? . a year later. In 1859, at the time of the Orsini case, he published a remarkable essay on The Defence 9J Great Britain and Ireland, and in 1865 appeared his famous

Notes on Waterloo, appended to which is a Plan for the defence of Canada. He died the same year.

See the autobiographical notice in Notes on Waterloo, also the regimental history of the 43rd and Napier, passim.

SHAWL, a square or oblong article of dress worrˆ in various ways dependent from the shoulders. The term is of Persian origin (shdT), and the article itself is most characteristic of the natives of N.W. India and Central Asia; but in various forms, and under different names, the same piece of clothing is found in most parts of the world. The shawls made in Kashmir occupy a pre-eminent place among textile products; and it is to them and to their imitations from Western looms that specific import- ance attaches. The Kashmir shawl is characterized by the elaboration of its design, in which the "cone" pattern is a prominent feature, and by the glowing harmony, brilliance, depth, and enduring qualities of its colours. The basis of these excellences is found in the very fine, soft, short, flossy under-wool, called pashm or pashmina, found on the shawl-goat, a variety of Capra hircus inhabiting the elevated regions of Tibet. There are several varieties of pashm, but the finest is a strict monopoly of the maharaja of Kashmir. Inferior pashm and Kirman wool — a fine soft Persian sheep's wool — are used for shawl weaving at Amritsar and other places in the Punjab, where colonies of Kashmiri weavers are established. Of shawls, apart from shape and pattern, there are only two principal classes: (1) loom- woven shawls called tiliwalla, tilikar or kani kar— sometimes woven in one piece, but more often in small segments which are sewn together with such precision that the sewing is quite imperceptible; and (2) embroidered shawls— -amlikar— -in which over a ground of plain pashmina is worked by needle a minute and elaborate pattern.

SHAWM, Shalm (Fr. chalumeau, chalemelle, hautbois; Ger. Schalmei, Schalmey; Ital. Pijfar cenamelle; Lat. calamus; tibia; Gr. avXos), the medieval forerunner of the oboe, the treble members of the large family of reed instruments known in Germany as the Pommer (q.v.), Bombart or Schalmey family. Michael Praetorius, at the beginning of the 17th century, enumer- ates the members of this family (see Oboe); the two of highest pitch are Schalmeys, the first or little Schalmey ; being in, Bb (third line) or A, and the second, also called cantus or discant, in E or D below. The shawm or Schalmey had a compass of two octaves, the second diatonic octave being obtained by overblowing each of the notes of the first octave an octave higher; the chromatic semitones were produced by half stopping the holes and by cross-fingering. In some instance's the reed mouthpiece was half enclosed in a pirouette, a small case having a slit through which that part of the reed which is taken into the mouth of the player was alone exposed, the edges of the slit thus forming a

rest for his lips. : ‘

In the miniatures of the illuminated MSS. of all countries, more especially from the 14th century, and in early printed books, Schalmeys and Pommers are represented in every conceivable phase of social life in which music takes a part. (K. S.)

SHAWNEE or Shawano (said to mean ” southerner “), a tribe of North American Indians of Algonquian stock. They are said to have been first found in Wisconsin. Under the name Sacannahs towards the end of the 17th century they had their headquarters in South Carolina on the upper Savannah. Moving eastward they came in contact with the Iroquois, by whom they were driven S. again into Tennessee. Thence they crossed the mountains into South Carolina and again spread northward as far as New York state and southward to Florida. Subse- quently they recrossed the Alleghany mountains, once more came in contact with the Iroquois and were driven into Ohio. They joined in Pontiac’s conspiracy. They fought on the English side in the War of Independence and again in 1812 under Tecumseh. They are now on a reservation in Oklahoma.

SHAWNEE, a city of Pottawatomie county, Oklahoma, U.S.A., on the North Fork of the Canadian river, about 38 m. E.S.E. of Oklahoma city. Pop. (1907) 10,955, including 748 negroes and 20 Indians; (1910) 12,474, Shawnee is served by the Atchison, Topeka & Santa Fe, the Chicago, Rock Island & Pacific,, and the Missouri, Kansas & Texas railways and by interurhap electric

lines. The city has two large public parks and a Carnegie library, and is the seat of the Curtice Industrial School. Shawnee is situated in a fine agricultural region, is a shipping-point for alfalfa, cotton and potatoes, is an important market for mules, and has large railway repair shops, and cotton-gins and cotton compresses; among its manufactures are cotton-seed oil, cotton goods, lumber, bricks and flour. Shawnee was first settled in 1895 and was chartered as a city in 1896.

SHAYS, DANIEL (1747-1825), American soldier, the leader of Shays’s Insurrection in W. Massachusetts in 1 786-1 787 (see Massachusetts: History), was born in Hopkinton, Massa- chusetts, in 1747. In the War of Independence he served as second lieutenant in

a Massachusetts regiment from May to December 1775, became captain in the 5th Massachusetts regiment in January 1 77 7, and resigned his commission in October 1780. After the collapse of Shays's Insurrection he escaped to Vermont. He was pardoned in June 1788, and died at Sparta, New York, on the 29th of September 1825.

SHEARER, THOMAS, English 18th-century furniture designer and cabinet-maker. The solitary biographical fact we possess relating to this distinguished craftsman is that he was the author of most of the plates in The Cabinet Maker's London Book of Prices and Designs oj Cabinet Work, issued in 1788 " For the London Society of Cabinet Makers." The majority of these plates were republished separately as Designs for Household Furniture. They exhibit their author as a man with an eye at once for simplicity of design and delicacy of proportion. Indeed some of his pieces possess a dainty and slender elegance which has never been surpassed in the history of English furniture.

There can be little doubt that Shearer exercised considerable influence over Hepplewhite, with whom there is reason to suppose that he was closely associated, while Sheraton has recorded his admiration for work which has often been attributed to others. Shearer, in his turn, owes something to the brothers Adam, and something no doubt, to the stock designs of his predecessors. There is every reason to suppose that he worked at his craft with his own hands and that he was literally a cabinet-maker — so far as we know, he never made chairs. Much of the elegance of Shearer's work is due to his graceful and reticent employment of inlays of satinwood and other foreign woods. But he was as successful in form as in decoration, and no man ever used the curve to better purpose. In Shearer's time the sideboard was in process of evolution; previously it had been a table with drawers, the pedestals and knife-boxes being separate pieces. He would seem to have been first to combine them into the familiar and often beautiful form they took at the end of the 18th century. The combination may have been made before, but his plate is, in point of time, the first published document to show it.

Shearer, like many of his contemporaries, was much given to devising " harlequin " furniture. He was a designer of high merit and real originality, and occupies a distinguished place among the little band of men, often, like himself, ill-educated and obscure of origin, who raised the English cabinet-making of the second half of the 18th century to an illustrious place in artistic history.

SHEARS, an implement for cutting or clipping. The O. Eng. sceran, to clip, cut, represents one branch of a very large number of words in Indo-European languages which are to be referred to the root skar-, to cut, and of which may be mentioned Gr. Keiptiv, Lat. curtus, Eng. " short," " share," " sherd," " score." For cutting cloth " shears " take the form of a large, heavy pair of scissors with two crossed flat blades pivoted together, each with a looped handle for the insertion of the fingers; for clipping or " shearing " sheep the usual form is a single' piece of steel bent round, the ends being shaped into the cutting blades, and the bend or " bow " forming a spring which opens the blades when the pressure used in cutting is released. Another form of the same word, " sheers," is used of an apparatus for hoisting heavy weights, generally known as " sheer-legs." These consist of two or more aprights meeting at the top, where the hoisting tackle is placed, and set wide apart at the bottom. The masting of ships

was formerly carried out from another vessel, a dismasted hulk, hence called a " sheer-hulk," on which the " sheer-legs " were placed (see Crane). From this word must be distinguished " sheer," straight, precipitous, also absolute, downright; this is to be connected with Dan. skjaer, clear, bright, Ger. schier, free, clear; the root is also seen in O. Eng. scinan, to shine. The nautical phrase " to sheer off," to deviate from a course, is due to a similar Dutch use of scheren, to cut, shear, to cut off a course abruptly.

SHEARWATER, the name of a bird, first published in F. Willughby's Ornithologia (p. 252), as made known to him by Sir T. Browne, who sent a picture of it with an account that is given more fully in J., Ray's translation of that work (p. 334), stating that it is " a Sea-fowl, which fishermen observe to resort to their vessels in some numbers, swimming ■ swiftly to and fro, backward, forward and about them, and doth as it were radere aquam, shear the water, from whence perhaps it had its name." 2 Ray's mistaking young birds of this kind obtained in the Isle of Man for the young of the coulterneb, now usually called " Puffin," has already been mentioned under that heading; and not only has his name Puffinus anglorum hence become attached to this species, commonly described in English books as the Manx puffin or Manx shearwater, but the barbarous word Puffinus has come into use for all birds thereto allied, forming a well-marked group of the family Procellariidae (see Petrel), distinguished chiefly by their elongated bill, and numbering some twenty species, if not more — the discrimina- tion of which has taxed the ingenuity of ornithologists. Shear- waters are found in nearly all the seas and oceans of the world, 3 generally within no great distance from the

land, though rarely resorting thereto, except in the breeding season. But they also penetrate to waters which may be termed inland, as the Bosporus, where they are known to the French-speaking part of the population as Ames damntes, it being held by the Turks that they are animated by condemned human souls. Four species of Puffinus are recorded as visiting the coasts of the United Kingdom; but the Manx shearwater is the only one that at all commonly breeds in the British Islands. It is a very plain- looking bird, black above and white beneath, and about the size of a pigeon. Some other species are larger, and almost whole- coloured, being of a sooty or dark cinereous hue both above and below. All over the world shearwaters seem to have precisely the same habits, laying their single purely white egg in a hole under ground. The young are thickly clothed with long down, and are extremely fat. In this condition they are thought to be good eating, and enormous numbers are caught for this purpose in some localities, especially of a species, the P. brevicaudus of Gould, which frequents the islands off the coast of Australia, where it is commonly known as the " Mutton-bird." (A. N.)

SHEATHBILL, a bird so-called by T. Pennant in 1781 (Gen. Birds, ed. 2, p. 43) from the horny case 4 which ensheaths the basal part of its bill. It was first made known from having been met with on New-Year Island, off the coast of Staten Land, where Cook anchored on New Year's eve 1774. 6 A few days

1 Meaning, no doubt, skimming or "hovering," the latter the word used by Browne in his Account of Birds found in Norfolk (Mus. Brit. MS. Sloane, 1830, fol. 5. 22 and 31), written in or about 1662. Edwards {Gleanings, iii. 315) speaks of comparing his own drawing "with Brown's old draught of it, still preserved in the British Museum," and thus identifies the latter's " shearwater " with the " puffin of the Isle of Man."

2 Lyrie appears to be the most common local name for this bird in Orkney and Shetland; but Scraib and Scraber are also used in Scotland. These are from the Scandinavian Skraape or Skrofa, and considering Skeat's remarks (Etym. Dictionary) as to the alliance between the words shear and scrape it may be that Browne's hesitation as to the derivation of " shearwater had more ground than at first appears.

3 The chief exception would seem to be the Bay of Bengal and thence throughout the W. of the Malay Archipelago, where, though they may occur, they are certainly uncommon.

4 A strange fallacy arose that this case or sheath was movable. It is absolutely fixed.

5 Doubtless some of the earlier voyagers had encountered it, as Forster suggests {Descr. animalium, p. 330) and Lesson asserts

later he discovered the islands that now bear the name of South Georgia, and there the bird was again found — in both localities frequenting the rocky shores. On his third voyage, while seeking some land reported to have been found by Kerguelen, Cook in December 1776 reached the cluster of desolate islands now generally known by the name of the French explorer, and here, among many other kinds of birds, was a Sheathbill, which for a long while no one suspected to be otherwise than specifically identical with that of the western Antarctic Ocean; but, as will be seen, its distinctness has been subsequently admitted.

The Sheathbill, so soon as it was brought to the notice of naturalists, was recognized as belonging to a genus hitherto unknown, and J. R. Forster in 1788 {Enchiridion, p. 37) conferred upon it, from its snowy plumage, the name Chionis, which has most properly received general acceptance, though in the same year the compiler Gmelin termed the genus Vaginalis, as a rendering of Pennant's English name, and the species alba. It has thus become the Chionis alba of ornithology. It is about the size of and has much the aspect of a Pigeon ; ' its plumage is pure white, its bill somewhat yellow at the base, passing into pale pink towards the tip. Round the eyes the skin is bare, and beset with cream-coloured papillae, while the legs are bluish-grey. The second or eastern species, first discriminated by G. Hartlaub (Rev. zoologique, 1841, p. 5; 1842, p. 402, pi. 2J 2 as C. minor, is smaller in size, with plumage just as white, but having the bill and bare skin of the face black and the legs much darker. The form of the bill's " sheath " in the two species is also quite different, for in C. alba it is almost level throughout, while in C. minor it rises in front like the pommel of a saddle. The western and larger species gathers its food, consisting chiefly of sea-weeds and shell- fish, on rocks at low water; but it is also known to eat birds' eggs. As to the flavour of its flesh, some assert that it is wholly uneatable, and others that it is palatable. Though most abundant as a shore- bird, it is frequently met with far out at sea, and has once been shot in Ireland. It is not uncommon on the Falkland Isles, where it breeds. C.

minor of Kerguelen Land, Prince Edward Island, Marion Island and the Crozets, is smaller, with pinkish feet. The eggs of both species, though of peculiar appearance, bear an unmistakable likeness to those of oyster-catchers, while occasionally exhibiting a resemblance to those of the tropic-birds.

The systematic position of the sheathbills has been the subject of much hesitation, but they are now placed in a special family, Chionidae, amongst Charadriiform birds (see Birds), not far from the curious little group of " seed-snipes " of the genera Thinocorys and Attagis, which are peculiar to certain localities in S. America and its islands. (A. N.)

SHEBOYGAN, a city and the county seat of Sheboygan county, Wisconsin, U.S.A., on the W. shore of Lake Michigan at the mouth of the Sheboygan river, about 52 m. N. of Milwaukee. Pop. (1010 census) 26,398. The population is largely of German descent, and two German newspapers are published; many Greeks settled here after 1895. Sheboygan is served by the Chicago & North-Western railway, by interurban electric lines and by a steam-boat line (the Goodrich Transportation Co.). The city N. of the river and the southern half of the part S. of the river are built on a plateau 20-40 ft. above the lake level. Along the river is the factory district. The principal public buildings are a fine Federal building in which are housed the post office and the office of the internal revenue; a Carnegie library, the Sheboygan County Court House, an opera house, St Nicholas Hospital and a county insane asylum. Included in the public school system is a school for deaf children, partly supported by the state. The city has a good harbour and is an important distributing point for coal and salt. A rich agricultural region,

(Man. d'ornithologie, ii. 343) ; but for all practical purposes we certainly owe its discovery to the naturalists of Cook's second voyage. By some error, probably of transcription, New Zealand, instead of New- Year Island, appears in many works as the place of its discovery, while not a few writers have added thereto New Holland. Hitherto there is no real evidence of the occurrence of a Sheathbill in the waters of Australia or New Zealand.

1 In the Falkland Isles it is called the " Kelp-Pigeon," and by some of the earlier French navigators the " Pigeon blanc antarctique. The cognate species of Kerguelen Land is named by the sealers "Sore-eyed Pigeon," from its prominent fleshy orbits, as well as " Paddy-bird " — the last doubtless from its white plumage calling to mind

that of some of the smaller Egrets, so-called by the English in India and elsewhere.

8 Lesson (loc. cit.) cites a brief but correct indication of this species as observed by Lesquin (Lyc&e armoricain, x. 36) on Crozet Island, and, not suspecting it to be distinct, was at a loss to reconcile the discrepancies of the latter's description with that given of the other species by earlier authors.

devoted largely tOi dairying, extends to the N., S. and W., and large quantities of cheese are exported. Among the city's other manufactures are furniture, particularly chairs (for which the city is noted), toys, machinery, bee hives, gloves, knit goods, brick, carriages, wagons, excelsior, tanned leather, shoes, enamel ware, canned vegetables (especially peas), beer, flour, pianos and plumbing supplies. The total value of the factory product in 1905 was $10,086,648, 38-1% representing furniture; and 56-7% of the whole number of factory wage-earners were employed in the furniture factories. A trading post at the mouth of the Sheboygan river was established about 1820 and was maintained for about fourteen years; in 1834 a saw-mill was built at the first rapids of the river, about 2 m. from its mouth, and during the next three years many settlers came and a great city was platted on paper. Sheboygan was incorporated as a village in 1846, and was first chartered as a city in 1853. Several miles from Sheboygan Falls (pop. in 1905, 141 1), a village about 5 m. W. of Sheboygan and S.W. of Plymouth (pop. in 1905, 2764), the Spring Farms Association, a Fourierite community of ten families, farmed successfully thirty acres of land from 184s until 1848, when lack of interest in the experi- ment brought about a dissolution by mutual agreement.

SHECHEM (mod. Nablus), an ancient town of Palestine, S.E. of Samaria, which first appears in history as the place where Jacob and his family settled for a while (Gen. xxxiii. 18; cf. John iv. 12). It was occupied then by Hivites (Gen. xxxiv. 2), and a tragedy took place in connexion with the chieftain's violation of Jacob's daughter Dinah. It was set apart as a city of refuge (Jos. xx. 7) and was occupied by the Kohathite Levites in the tribe of Ephraim (xxi. 21). Here, between Ebal and Gerizim, Joshua made his last speech to the elders of the Israelites (Jos. xxiv. 1). The mother of Abimelech the son of Gideon was a Shechemite, and Shechem was the centre" of his short-lived kingdom (Jud. viii. 31, ix.). Here Rehoboam made the foolish speech which kindled the revolt of the N. kingdom (1 Kings xii. 1), after which it was for a time the headquarters of Jeroboam (1 Kings xii. 25).

Shechem was evidently a holy place in remote antiquity. The " oak " under which Jacob hid his teraphim (Gen. xxxv. 4) was doubtless a sacred tree, as there the images (which it was not seemly to bring on a pilgrimage to Beth-el) would be safe. The god of the Canaanite city was Baal-Berith: his temple was destroyed when Abimelech quelled the rising of his fickle subjects (Jud. ix. 4, 46) . A great standing stone under an oak-tree here was traditionally associated with Joshua's last speech (Jos. xxiv. 26). During the latter part of the Hebrew monarchy we hear nothing of Shechem, no doubt on account of the commanding importance of the neighbouring city of Samaria. It no doubt, owed its subsequent development to the destruction of Samaria and the rise in the district surrounding of the Samaritan nation founded on the colonists settled by Sargon and Assurbani-pal. To Josephus it was " the new city " by the inhabitants called Mabortha (B. J., IV. viii. 1), but the official name Neapolis or Flavia Neapolis, so called to commemorate its restoration by Vespasian (Titus Flavius Vespasianus), soon became universal, ;and is still preserved in the modern name Nablus — a signal exception to the general rule that the place-names of Palestine, whenever disturbed by foreign influence, usually revert in time to the old Semitic nomenclature.

There was a bishopric at Neapolis during the Byzantine period, and an attack made by the Samaritans on the bishop (Pentecost, a.d. 474) was punished by the emperor Zeno, who gave Gerizim to the Christians. It was captured by the crusaders under Tancred soon after the conquest of Jerusalem (1099); they held it till 1 184, when they lost it to Saladin. The principal mosque of the town is a church of the crusaders converted to Mahommedan worship. Towards the end of the 18th century it was the head- quarters of the turbulent sheikh Kasim el-Ahmad. In 1834 the soldiers of Ibrahim Pasha pillaged it.

Nablus is now the chief town of a subdivision of the province of Beirut. It lies in the valley between Ebal and Gerizim, on the main caravan route from Jerusalem northward. The situation

is famous for its beauty. There are about 24,000 inhabitants — all Moslems except about 1 50 Samaritans and perhaps 700 Christians. The inhabitants are notorious for fanaticism and lawlessness, and Europeans are usually greeted with vile epithets. There are missions,

both Protestant and Roman Catholic; and an important hospital under the auspices of the Church Missionary Society. There is a flourishing trade in soap, which is here manufactured, and a considerable commerce in wool and cotton with the regions E. of the Jordan.

In the neighbourhood of Nablus are shown: (1) a modern building which covers the traditional site of the tomb of Joseph, as accepted by Jews, Samaritans and Christians. The authority for the burial of Joseph at Shechem is the speech of Stephen (Acts vii. 16), though Josephus places the sepulchre at Hebron (Ant. II. viii. 2). Moslem tradition also regards Shechem as the burial-place of Joseph; but it appears as though the actual site, as shown, has not been always in one unvarying spot. (2) The well of Jacob, about a mile and a half from Nablus on the way to Jerusalem, which is an excavation of great depth. The tradition fixing this hallowed place seems to have been constant throughout the whole of the Christian centuries, and it is one of the very few " holy places " shown to travellers and pilgrims in Palestine, the authenticity of which deserves considera- tion. It is one of the small number of sites mentioned by the Bordeaux pilgrim (a.d. 333).

The site of the sacred oak has been sought at two places: one called El-'Amud, "the column" — where is "Joseph's tomb"; and the other at Balata (a name containing the consonants of the Semitic word for " oak "), near Jacob's well. (R. A. S. M.)

SHED. (1) A small hut, shelter or outhouse, especially one with a " shed roof " or " lean-to," a roof with only one set of rafters, falling from a higher to a lower wall, like an aisle roof. " Shed " is also the term applied to a large roofed shelter open at the sides for the storage of goods, rolling-stock, locomotives, &c, on a railway or dock-wharf. According to Skeat, the word is a Kentish form of " shade," " shadow," in O. Eng. scad, sceadu, cf. Ger. Schatten; the ultimate origin is the root ska-, to cover, seen in Gr. ana, shadow, curivi), tent, shelter, stage, whence Eng. "scene"; the Eng. "sky " comes from a closely allied root sku, also to cover, cf. Lat. obscurus. (2) To spill, to scatter, to cast off; originally the word seems to have meant to part, to divide, a use only surviving in " watershed." The O. Eng. verb was sceddan, in Mid. Eng. shasden, to divide, separate. " Shed " in the sense of to spill has, however, by some etymologists been taken to be. a separate word from that meaning to part; it would in that case appear to be connected with 0. Fris. schedda, to shake, the root of which is found in " shudder."

SHEDD, WILLIAM GREENOUGH THAYER (1820-1894), American Presbyterian, was born in Acton, Massachusetts, on the 21st of June 1820. In 1830 he graduated at the University of Vermont, and in 1843 at Andover Theological Seminary. After a short pastorate at Brandon, Vermont, he was successively professor of English literature in the University of Vermont (1845-18 5 2), professor of sacred rhetoric in Auburn Theological Seminary (1852-1854), professor of church history in Andover Theological Seminary (1854-1862), and, after- one year (1862- 1863) as associate pastor of the Brick Church of New York City, of sacred literature (1863-1874) and of systematic theology (i874-i8go) in Union Theological Seminary. He died in New York City on the 17th of November 1894.

Dr Shedd was a high Calyinist and was one of the greatest systematic theologians of the American Presbyterian church. His great work was Dogmatic Theology (3 vols., 1888-1894). ♦ He also wrote Lectures on the Philosophy of History (1856), in which he applied to history the doctrine of organic evolution; Discourses and Essays (1856); A Manual of Church History (2 vols., 1857), a translation of Guericke; A History of Christian Doctrine (2 vols., 1 863); Theologi- cal Essays (1877); Literary Essays (1878); Commentary on the Epistle to the Romans (1879); The Doctrine of Endless Punishment (1885); and he edited Coleridge's Complete Works (7 vols., New York, 1894).

SHEE, SIR MARTIN ARCHER (1770-1850), English portrait- painter and president of the Royal Academy, was born in Dublin on the 23rd of December 1770. He was sprung from an old Irish family, and his father, a merchant, regarded the profes 1 – sion of a painter as no fit occupation for a descendant of the Shees. Young Shee became, nevertheless, a student of art in the Dublin Society, and came early to London, where he was, in

1788, introduced by Burke to Reynolds, by whose advice he studied in the schools of the Royal Academy. In 1789 he exhibited 1 his first two pictures, the Head of an Old Man and Portrait of a Gentleman. During the next ten years he steadily increased in practice. He was chosen an associate of the Royal Academy in 1798, shortly after Flaxman, and in 1800 he was maide a Royal Academician. In the former year he had married, removed to Romney's house in Cavendish Square, and set Up as his successor. Shee continued to paint with great readiness of hand and fertility of invention, although his portraits were eclipsed by more than one of his contemporaries, and especially by Lawrence, Hoppner, Phillips,

Jackson and Raeburn. The earlier portraits of the artist are carefully finished, easy inaction, with good drawing and excellent discrimination of character. They show an undue tendency to redness in the flesh painting — a defect which is still more apparent in his later works, in which the handling is less " square," crisp and forcible. In addition to his portraits he executed various subjects and historical works, such as Lavinia, Belisarius, his diploma picture Prospero and Miranda, and the Daughter of Jephthah. In 1805 he published a poem consisting of Rhymes on Art, and it was succeeded by a second part in 1809. Byron spoke well-of it in his English Bards and Scotch Reviewers, and invoked a place for " Shee and genius " in the temple of fame. Shee published another small volume of verses in 1814, entitled The Commemoration of Sir Joshua Reynolds, and other Poems, but this effort did not greatly increase his fame. He now produced a tragedy called Alasco, of which the scene was laid in Poland. The play was accepted at Covent Garden, but Colman, the licenser, refused it his sanction, on the plea of its containing certain treasonable allusions, and Shee, in great wrath, resolved to make his appeal to the public. This violent threat he carried out in 1824, but Alasco is still on the list of unacted dramas. On the death of Lawrence in 1830, Shee was chosen president of the Royal Academy, and shortly afterwards he received the honour of knighthood. In the dispute regarding the use of rooms to be provided by government, and in his examination before the parliamentary committee of 1836, he ably defended the rights of the Academy. He continued to paint till 1845, and died on the 13th of August 1850.

SHEEP (from the Anglo-Saxon scedp, a word common in various forms to Teutonic languages; e.g. the German Schaf), a name originally bestowed in all probability on the familiar domesticated ruminant (Ovis aries), but now extended to include its immediate wild relatives. Although many of the domesticated breeds are hornless, sheep belong to the family of hollow-horned ruminants or Bovidae (q.v.). Practically they form a group im- possible of definition, as they pass imperceptibly into the goats. Both sexes usually possess horns, but those of the females are small. In the males the horns are generally angulated, and marked by fine transverse wrinkles; their colour being greenish or brownish. They are directed outwards, and curve in an open spiral, with the tips directed outwards. Although there may be a fringe of hair on the throat, the males have no beard on the chin; and they also lack the strong odour characteristic of goats. Usually the tail is short; and in all the wild species the coat takes the form of hair, and not wool. Like goats, sheep have narrow upper molar teeth, very different from

those of the oxen, and narrow hairy muzzles. Between the two middle toes, in most species, is lodged a deep glandular bag having the form of a retort with a small external orifice, which secretes an unctuous and odorous substance. This, tainting the herbage or stones over which the animal walks, affords the means by which, through the powerfully developed sense of smell, the neighbourhood of other individuals of the species is recognized. The crumen or suborbital face-gland, which is so largely developed and probably performs the same office in some antelopes and deer, is present, although in a comparatively rudimentary form, in most species, but is absent in others. Wild sheep attain their maximum development, both in respect of number and size, in Central Asia. They associate either in large flocks, or in family-parties; the old males generally keeping apart from the rest. Although essentially mountain animals, sheep generally frequent open,

undulating districts, rather than the precipitous; heights to which goats are partial. It may be added that the long tails of mpst tame breeds are, like wool, in all probability the results of domestication.

The Pamir plateau, on the confines of Turkestan, at an eleva- tion of 16,000 ft. above the sea-level, is the home of the magnifi- cent Ovis poli, named after the celebrated Venetian traveller Marco Polo, who met with it in the 13th century. It is remark- able for the great size of the horns of the old rams and the wide open sweep of their curve, so that the points stand boldly out on each side, far away from the animal's head, instead of curling round nearly in the same plane, as in most of the allied species; A variety inhabiting the Thian Shian is known as O. poli carelini. An even larger animal is the argali, O. ammon, typically from the Altai, but represented by one race in Ladak and Tibet (O. ammon hodgsoni), and by a second in Mongolia. Although its horns are less extended laterally than those of O. poli, they are grander and more massive. In their short summer coats the old rams of both species are nearly white. Ovis sairensis from the Sair mountains and. O. litlledalei from Kulja are allied species. In the Stanovoi mountains and neighbouring districts of E. Siberia and in Kamchatka occur two sheep which have been respectively named O., borealis and O. nivicola. They are, how- ever, so closely allied to the so-called bighorn sheep of N. America,

A Mouflon Ram (Ovis musimon).

that they can scarcely be regarded as more than local races of 0. canadensis, or 0. cervina, as some naturalists prefer to call the species. These bighorns are characterized by the absence of face-glands, and the comparatively smooth front surface of the horns of the old rams, whicB are thus very unlike the strongly wrinkled horns of the argali group. The typical bighorn is the khaki-coloured and white-rumped Rocky Mountain animal; but on the Stickin river there is a nearly black race, with the usual white areas (0. canadensis stonei), while this is replaced in Alaska by the nearly pure white 0. c. dalli; the grey sheep of the Yukon (O. c. fannini) being perhaps not a distinct form. Return- ing to Asia, we find in Ladak, Astor, Afghanistan and the Punjab ranges, a sheep whose local races are variously known as urin, urial and shapo, and whose technical name is 0. vignei. It is a smaller animal than the members of the argali group, and approximates to- the Armenian and the Sardinian wild sheep or mouflon (Ovis orientalis and O. musimon) (see Mouflon). We nave in Tibet the bharal or blue sheep, Ovis (Pseudois) bharal, and in N. Africa the udad or aoudad, 0. (Ammotragus) lervia, both of which have no face-glands and in this and their smooth horns approximate to goats (see Bharal and Aoudad).

The sheep was domesticated in Asia and Europe before the dawn of history, though unknown in this state in the New World until after the Spanish conquest. It has now been introduced by

man into almost all parts of the world where agricultural opera-tions are carried on, but flourishes especially in the temperate regions of both hemispheres. Whether this well-known and useful animal is derived from any one of the existing wild species, or from the crossing of several, or from some now extinct species, are matters of conjecture. The variations of external characters seen in the different breeds are very great. They are chiefly manifested in the form and number of the horns, which may be increased from the normal two to four or even eight, or may be altogether absent in the female alone or in both sexes; in the shape and length of the ears, which often hang pendent by the side of the head; in the peculiar elevation or arching of the nasal bones in some eastern races; in the length of the tail, and the development of great masses of fat at each side of its toot or in the tail itself; and in the colour and quality of the fleece.

On the W. coast of Africa two distinct breeds of hairy sheep are indigenous, the one characterized by its large size, long limbs and smooth coat, and the other by its inferior stature, lower build and heavily maned neck and throat. Both breeds, which have short tails

and small horns (present only in the rams), were regarded by the German naturalist Fitzinger as specifically distinct from the domesticated Ovis aries of Europe; and for the first type he proposed the name O. longipes and for the second O. jubata. Although such distinctions may be doubtful (the two African breeds are almost certainly descended from one ancestral form), the retention of such names may be convenient as a provisional measure.

The long-legged hairy sheep, which stands a good deal taller than a Southdown, ranges, with a certain amount of local varia- tion, from Lower Guinea to the Cape. In addition to its long limbs, it is characterized by its Roman nose, large (but not droop- ing) ears, and the presence of a dewlap on the throat and chest. The ewes are hornless, but in Africa the rams have very short, thick and somewhat goatlike horns. On the other hand, in the W. Indian breed, which has probably been introduced from Africa, both sexes are devoid of horns. The colour is variable. In th« majority of cases it appears to be pied, showing large blotches of black or brown on a white ground; the head being generally white with large black patches on the sides, most of the neck and the fore-part of the body black, and the hind-quarters white with large coloured blotches. On the other hand, these sheep may be uniformly yellowish white, reddish brown, greyish brown or even black. The uniformly reddish or chestnut-brown specimens approach most nearly to the wild mouflon or urial in colour, but the chestnut extends over the whole of the under- pays and flanks; domestication having probably led to the elimination of the white belly and dark flank band, which are doubtless protective characters. The feeble development of the horns is probably also a feature due to domestication.

In Angola occurs a breed of this sheep which has probably been crossed with the fat-tailed Malagasy breed; while in Guinea there is a breed with lappets, or wattles, on the throat, which is probably the result of a cross with the lop-eared sheep of the same district. The Guinea lop-eared breed, it may be mentioned, is believed to inherit its drooping ears and throat wattles from an infusion of the blood of the Roman-nosed hornless Theban goat (see Goat). Hairy long-legged sheep are also met with in Persia, but are not pure-bred, being apparently the result of a cross between the long-legged Guinea breed and the fat-tailed Persian sheep.

The maned hairy sheep (Ovis jubata), which appears to be confined to the W. coast of Africa, takes its name from a mane of langish hair on the throat and neck; the hair on the body being also longer than in the ordinary long-legged sheep. This breed is frequently black or

brown and white; but in a small sub-breed from the Cameroons the general colour is chestnut or foxy red, with the face, ears, buttocks, lower surface of tail and under-parts black. The mbst remarkable thing about this Cameroon sheep is, however, its extremely diminutive size, a full-grown ram standing only 19 in. at the withers.

In point of size this pigmy Cameroon breed comes very close to an exceedingly small sheep of which the limb-bones have been

SHEEP

Plate I.

LINCOLN LONGWOOL

RAM.

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WKNSLEYDALE RAM.

BICESTER RAM.

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OXFORD DOWN RAM.

SHROPSHIRE RAM.

BRITISH BREEDS OF SHEEP, from photographs by F. Babbage. The comparative sizes of the animals are indicated by

the scale of reproduction.

Plate II.

SHEEP

TTOLK RAM

KENT OR ROMNT.Y MARSH RAM.

RYELAND RAM.

DORSET HORN RAM.

CHEVIOT RAM.

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LONK RAM.

WELSH MOUNTAIN RAM.

BRITISH BREEDS OF SHEEP, from photographs by F. Babbage. The comparative sizes of the animals are indicated by

the scale of reproduction.

SHEEP

found in certain ancient deposits in the S. of England; and the

question arises whether the two breeds may not have been nearly-related. Although there are no means of ascertaining whether the extinct pigmy British sheep, was clothed with hair or with wool, it is practically certain that some of the early European sheep retained hair like that of their wild ancestor; and there is accordingly no prima facie reason why the breed in question should not have been hairy. On the other hand, since the so- called peat-sheep of the prehistoric Swiss lake-dwellers appears to be represented by the existing Graubunden (Grisons) breed, which is woolly and coloured something like a Southdown, it may be argued that the former was probably also woolly, and hence that the survival of a hairy breed in a neighbouring part of Europe would be unlikely. The latter part of the argument is not very convincing, and it is legitimate to surmise that in the small extinct sheep of the S. of England we may have a possible relative of the pigmy hairy sheep of W. Africa.

Fat-rumped sheep, Ovis steatopyga, are common to Africa and Asia, and are piebald with rudimentary horns, and a short hairy coat, being bred entirely for their milk and flesh. In fat-tailed sheep, on the other hand, which have much the same distribution, the coat is woolly and generally piebald. Four-horned sheep are common in Iceland and the Hebrides; the small half wild breed of Soa often showing this reduplication. There is another four horned breed, distinguished by its black (in place of brown) horns, whose home is probably S. Africa. In the unicorn sheep of Nepal or Tibet the two horns of the rams are completely welded together. In th e Himalayan and Indian hunia sheep, the rams of which are sped illy trained for fighting, and have highly convex foreheads, the tail is short at birth. Most remarkable of all is the so-called Wallachian sheep, or Zackelschaf (Ovis strepsiceros) , represented by several more or less distinct breeds in E. Europe, in which the long upright horns are spirally twisted like those of the mazkhor wild goat.

For the various breeds of wild sheep see R. Lydekker, Wild Oxen, Sheep and Goats (London, 1898), and later papers in the Proceedings of the Zoological Society of London. Also Rowland Ward, Records of Big Game (5th ed., London, 1906). (R. L.)*

Modern British Breeds of Sheep. — The sheep native to the British Isles may be classified as the lowland and the mountain breeds, and subdivided into longwools and shortwools — the latter including the Down breeds, sometimes termed black-faced. The longwool breeds are the Leicester, Border Leicester, Cotswold, Lincoln, Kent, Devon Longwool, South Devon, Wensleydale and Roscommon. The shortwool breeds are the Oxford Down, Southdown, Shropshire,

Hampshire Down, Suffolk, Ryeland, Dorset and Somerset Horn, Kerry Hill, Radnor and Clun Forest. The mountain breeds include the Cheviot, Scotch Black-face, Lonk, Rough Swaledale, Derbyshire Gritstone, Penistone, Limestone, Herdwick, Dartmoor, Exmoor and Welsh Mountain. These breeds are all English, except the Border Leicester, Cheviot and Scotch Black-face, which belong to Scotland; the Welsh Mountain, which belongs to Wales; and the Roscommon, which is Irish. The majority of the true mountain breeds are horned, the males only in the cases of Cheviot, Herdwick, Penistone and Welsh, though most Cheviot and many Herdwick rams are hornless. Of Derbyshire Gritstone neither sex has horns. In the other horned breeds, the Dorset and Somerset, Limestone, Exmoor, Old Norfolk, and Western or Old Wiltshire, both sexes have horns. The remaining breeds are hornless. The white-faced breeds include the Leicester, Border Leicester, Lincoln, Kentish, Cheviot, Ryeland, Devon Longwool, South Devon, Dorset and Somerset Horn, Limestone, Penistone, Exmoor and Roscommon.

The Leicester, though now not numerous, is of high interest. It was the breed which Robert Bakewell took in hand in the 18th century, and greatly improved by the exercise of his skill and judgment. Bakewell lived at Dishley Grange, Leicestershire, and in France the Leicester sheep are still called Dishleys. In past times Leicester blood Was extensively employed in the improvement or establishment of other longwool breeds of sheep. The Leicester, as seen now, has a white wedge-shaped face, the forehead covered with wool; thin mobile ears; neck full

towards the trunk, short and level with the bach; width over the shoulders and through the heart ; a full broad breast ; fine clean legs standing well apart; deep round barrel and great depth of carcass; firm flesh, springy pelt, and pink skin, covered with fine, curly, lustrous wool. The breed is maintained pure upon tht- rich pastures of Leicestershire, E. and N. Yorkshire, Cheshirt, Cumberland and Durham, but its chief value is for crossing, when it is found to promote maturity and to improve the fattening propensity.

The Border Leicester originated after the death in 1795 of Bakewell, when the Leicester breed, as it then existed, diverged into two branches. The one is represented by the breed still known in England as the Leicester. The other, bred on the Scottish Borders, with an early admixture of Cheviot blood, acquired the name of Border Leicester. The distinguishing characteristics of the latter" are: that it is an upstanding animal of gay appearance with light offal; and has a long though strong neck carrying a long, lean, clean head covered

with white, hard, but not wiry hair, free from wool, long highset ears and a black muzzle; back broad and muscular, belly well covered with wool; legs clean, and a fleece of long white wavy wool, arranged in characteristic locks or pirls.

The Blue-faced Wensleydales take their name from the York- shire dale of which Thirsk is the centre. They are longwool sheep, derived from the old Teeswater breed by crossing with Leicester rams. They have a tuft of wool on the forehead. The skin of the body is sometimes blue, whilst the wool has a bright lustre, is curled in small distinct pirls, and is of uniform staple. The rams are in much favour in Scotland and the N. of England for crossing with ewes of the various black-faced horned mountain breeds to produce mutton of superior quality and to use the cross-ewes to breed to a pure longwool or sometimes a Down ram. The Cotswold is an old-established breed of the Gloucestershire hills, extending thence into Oxfordshire. It was but slightly crossed for improvement by the Dishley Leicesters and has retained its characteristic type for generations. They are big, handsome sheep, with finely-arched necks and graceful carriage. With their broad, straight backs, curved ribs, 1 and capacious quarters, they carry a great weight of carcass upon strong, wide-standing legs. The fine white fleece of long wavy wool gives the Cotswold an attractive appearance, which is enhanced by its- topknot or forelock. The mutton of the Cotswolds isnot of high quality except at an early age, but the sheep are useful for crossing purposes to impart size, and because they are excep- tionally hardy.

The Lincolns are descended from the old native breed of Lincolnshire, improved by the use of Leicester blood. They are hardy and prolific, but do not quite equal the Cotswolds in size. They have larger, bolder heads than the Leicesters. Breeders of Lincoln rams like best a darkish face, with a few black spots on the ears; and white legs. The wool has a broad staple, and is denser and longer, and the fleece heavier, than in any other British breed. For this reason it has been the breed most in favour with breeders in all parts of the world for, mating with Merino ewes and their crosses. The progeny is a good general- purpose sheep, giving a large fleece of wool but only a medium quality of mutton. With a greater proportion of Lincoln blood in the mixed flocks of the world there is a growing tendency to produce finer mutton by using Down rams, but at the sacrifice of part of the yield of wool. In 1906 Henry Dudding;. of Riby Grove, Lincolnshire, obtained at auction the sum of 1430 guineas for a Lincoln ram bred by him, — the highest price paid for a sheep in the United Kingdom. In the same year Robert and William Wright, of Nocton Heath, Lincoln, sold their flock of 950 animals to Seflor

Manuel Cobo, Buerios Aires, fpr £30,000.

The Devon Longwool is a breed locally developed in the valleys of W. Somerset, N. and E. Devon, and parts of Cornwall It originated in a strong infusion of Leicester blood amongst the old Bampton stock of Devonshire.' The 1 Devon Longwool is not unlike the Lincoln, but is coarser. It is white-faced, with a lock of wool on the forehead.

The South Devon or South Dum are, like the cattle of that

name, a strictly local breed, which likewise exemplify the good results of crossing with the Leicesters. The South Devons have a fairly fine silky fleece of long staple, heavier than that of the Devon Longwool, which it also excels in size.

The Roscommon — the one breed of modern sheep native to \rel?.nd — is indebted for its good qualities largely to the use tf Leicester blood. It is a big-bodied, high-standing sheep, • arrying a long, wavy, silky fleece. It ranges mainly from the middle of Ireland westwards, but its numbers have declined considerably in competition with the Shropshire.

The Kent or Romney Marsh is native to the rich tract ot grazing land on the S. coast of Kent. They are hardy, white- faced sheep, with a close-coated longwool fleece. They were gradually, like the Cotswolds, improved from the original type of slow-maturity sheep by selection in preference to the use of rams of the Improved Leicester breed. With the exception of the Lincoln, no breed has received greater distinction in New Zealand, where it is in high repute for its hardiness and general usefulness. When difficulties relating to the quantity and quality of food arise the Romney is a better sheep to meet them than the Lincolns or other longwools.

The Oxford Down is a modern breed which owes its origin to crossing between Cotswolds and Hampshire Downs and South- downs. Although it has inherited the forelock from its longwool ancestors, it approximates more nearly to the shortwool type, and is accordingly classified as such. An Oxford Down ram has a bold masculine head; the poll well covered with wool and the forehead adorned by a topknot; ears self-coloured, upright, and of fair length; face of uniform dark brown colour; legs short, dark, and free from spots; back level and chest wide; and the fleece heavy and thick. The breed

is popular in Oxford and other midland counties. Its most notable success in recent years is on the Scottish and English borders, where, at the annual ram sales at Kelso, a greater number of rams is auctioned of this than of any other breed, to cross with flocks of Leicester- Cheviot ewes especially, but also with Border Leicesters and three-parts-bred ewes. It is supplanting the Border Leicester as a sire of mutton sheep; for, although its progeny is slower in reaching maturity, tegs can be fed to greater weights in spring —65 to 68 lb per carcass — without becoming too fat to be classed as finest quality.

The Southdown, from the short close pastures upon the chalky soils of the South Downs in Sussex, was formerly known as the Sussex Down. In past times it did for the improvement of the shortwool breeds of sheep very much the same kind of work that the Leicester performed in the case of the longwool breeds. A pure-bred Southdown sheep has a small head, with a light brown or brownish grey (often mouse-coloured) face, fine bone, and a symmetrical, well-fleshed body. The legs are short and neat, the animal being of small size compared with the other Down sheep. The fleece is of fine, close, short wool, and the mutton is excellent. " Underhill " flocks that have been kept for generations in East Anglia, on the Weald, and on flat meadow land in other parts of the country, have assumed a heavier type than the original " Upperdown " sheep. It was at one time thought not to be a rent-paying breed, but modern market requirements have brought it well within that category. The Shropshire is descended from the old native sheep of the Salopian hills, improved by the use of Southdown blood. Though heavier in fleece and a bulkier animal, the Shropshire resembles an enlarged Southdown. As distinguished from the latter, however, the Shropshire has a darker face, blackish brown as a rule, with very neat ears, whilst its head is more massive, and is better covered with wool on the top and at the sides. This breed has made rapid strides in recent years, and it has acquired favour in Ireland as well as abroad. It is an early-maturity breed, and no other Down produces a better back to handle for condition — the frame is so thickly covered with flesh and fat.

The Hampshire Down is another breed which owes much of its improved character to an infusion of Southdown blood. Early in the roth century the old Wiltshire white-faced horned sheep, with a scanty coat of hairy wool, and the Berkshire Knot,

roamed over the downs of their native counties. Only a remnant of the former under the name of the Western sheep survives in a pure

state, but their cross descendants are seen in the modern Hampshire Down, which originated by blending them with the Southdown. Early maturity and great size have been the objects aimed at and attained, this breed, more perhaps than any other, being identified with early maturity. One reason for this is the early date at whicfithe ewes take the ram. Whilst heavier than the Shropshire, the Hampshire Down sheep is less symmetrical. It has a black face and legs, a big head with Roman nose, darkish ears set well back, and a broad level back (especially over the shoulders) nicely filled in with lean meat.

The Dorset Down or West Country Down, " a middle type of Down sheep pre-eminently suited to Dorsetshire," is a local variety of the Hampshire Down breed, separated by the forma- tion of a Dorset Down sheep society in 1904, about eighty years after the type of the breed had been established.

The Suffolk is another Down, which took its origin about 1 790 in the crossing of improved Southdown rams with ewes of the old black-face Horned Norfolk, a breed still represented by a limited number of animals. The characteristics of the latter are retained in the black face and legs of the Suffolk, but the horns have been bred out. The fleece is moderately short, the wool being of close, fine, lustrous fibre, without any tendency to mat.. The limbs, woolled to the knees and hocks, are clean below. The breed is distinguished by having the smoothest and blackest face and legs of all the Down breeds and no wool on the head. Although it handles hard on the back when fat, no breed except the old Horned Norfolk equals it in producing a saddle cut of mutton with such an abundance of lean red meat in proportion to fat. It carried off the highest honours in the dressed carcass competition at Chicago in 1003, and the championship in the " block test " at Smithfield Club Show was won for the five years 1902-1906 by Suffolks or Suffolk cross lambs from big-framed Cheviot ewes. In 1907, the championship went to a Cheviot wether, but in the two pure, short-woolled classes all the ten awards were secured by Suffolks, and in the two cross-bred wether classes nine of the ten awards went to a Suffolk cross. The mutton of all the Down breeds is of superior quality, but that of the Suffolk is pre-eminently so.

The Cheviot takes its name from the range of hills stretching along the boundary between England and Scotland, on both sides of which the breed now extends, though larger types are produced in East Lothian and in Sutherlandshire. The Cheviot is a hardy sheep with straight wool, of moderate length and very close-set, whilst wiry white hair covers the face and legs. But to the Border Leicester ram the Cheviot ewe produces the Half-bred, which as a breeding ewe is

unsurpassed as a rent-paying, arable-, land sheep.

The Scotch Black-face breed is chiefly reared in Scotland, but it is of N. of England origin. Their greater hardiness, as com-, pared with the Cheviots, has brought them into favour upon the higher grounds of the N. of England and. of Scotland, where they thrive uqon heather hills and coarse and exposed grazing lands. The colour of face and legs is well-defined black and white, the black predominating. The spiral horns are low at the crown, with a clear space between the roots, and sweep in a wide curve, sloping slightly backwards, and clear of the cheek. The fashionˆ able fleece is down to the ground, hairy and strong, and of uniform quality throughout.

The Lonk has its home amongst the moorlands of N. Lancashire and the W. Riding of Yorkshire, and it is the largest of the mountain breeds of the N. of England and Scotland. It bears most resemblance to, the Scotch Black-face, but carries a finer, heavier fleece, and is larger in head. Its face and legs are mottled black and white, and its horns are strong. The tail is long and .rough. The Herdwick is the hardiest of all the breeds thriving upon the poor mountain land in Cumberland and Westmorland. The rams sometimes have small, curved, wide horns like those of the Cheviot ram. The colour of the fleece is white, with a few darkish spots here and there; the faces and legs are dark in the lambs, gradually becoming white or light grey in a few years.

The wool is strong and coarse, standing up round the shoulders and down the breast like a mane. The forehead has a topknot, and the tail is well covered.

The Limestone is a breed of which little is heard. It is almost restricted to the fells of Westmorland, and is probably nearly related to the Scotch Black-face. The breed does not thrive off its own geological formation, and the ewes seek the ram early in the season. The so-called ” Limestoneˆ ” of the Derbyshire hills are really Leicesters.

The Welsh Mountain .is a small, active, soft-woolled, white- faced breed of hardy character. The legs are often yellowish, and this colour may extend to the face. The mutton is of excellent quality. The ewes, although difficult to confine by ordinary fences, are in

high favour in lowland districts for- breeding fattening lambs to Down and other early maturity rams.

The Clun Forest is a local breed in W. Shropshire and the adjacent part of Wales. It is descended from the old Tan-faced sheep. It is now three parts Shropshire, having been much crossed with that breed, but its wool is rather coarser.

The Radnor is short-limbed and low-set with speckled face and legs. It is related to the Clun Forest and the Kerry Hill sheep. The draft ewes of all three breeds are in high demand for breeding to Down and longwool rams in the English midlands.

The Ryeland breed is so named from the Ryelands, a poor upland district in Herefordshire. It is a very old breed, against which the Shropshires have made substantial headway. Its superior qualities in wool and mutton production have been fully demonstrated, and a demand for rams is springing up in S. as well as in N. America. The Ryeland sheep are small, hornless, have white faces and legs, and remarkably fine short wool, with a topknot on the forehead.

The Dartmoor, a hardy local Devonshire breed, is a large horn- less, longwool, white-fleeced sheep, with a long mottled face. It has been attracting attention in recent years.

The Exmoor is a horned breed of Devonshire moorland, one of the few remaining remnants of direct descent from the old forest breeds of England. They have white legs and faces and black nostrils. The coiled horns lie more closely to the head than in the Dorset and Somerset Horn breed. The Exmoors have a close, fine fleece of short wool. They are very hardy, and yield mutton of choice flavour. >

The Dorset and Somerset Horn is an old west-country breed of sheep. The fleece is fine in quality, of close texture, and the wool is intermediate between long and short, whilst the head carries a forelock. Both sexes have horns, very much coiled in the ram. The muzzle, legs and hoofs are white; the nostrils pink. This is a hardy breed, in size somewhat exceeding the Southdown. The special characteristic of the breed is that the ewes take the ram at an unusually early period of the year, and cast ewes are in demand for breeding house lamb for Christmas. Two crops of lambs in a year are sometimes obtained from the ewes, although it does not pay to keep such rapid breeding up regularly.

The Merino is the most widely distributed sheep in the world.

From a photo in Professor Robert Wallace's Farm Live Slock of Great Britain (4th edition). Champion Merino Ram.

It has been the foundation stock of the flocks of all the great sheep countries. A few have existed in Britain for more than a

hundred years. They thrive well there, as they do everywhere, but they are wool-sheep which produce slowly a secondary quality of mutton— thin and blue in appearance. The Merino resemble the Dorset Horn breed. The rams possess large coiling horns — the ewes may or may not have them. The muzzle is flesh-coloured and the face covered with wool. The wool, densely set on a wrinkled skin, is white and generally fine, al- though it is classified into long, short, fine and strong. Merino cross with early-maturity longwool, Down, or other close-wooled rams, are good butchers' sheep, and most of the frozen mutton imported into the United Kingdom has had more or less of a merino origin. (W. Fr.; R. W.)

Lowland Sheep-breeding and Feeding. — A Shropshire flock of about two hundred breeding ewes is here taken as a typical example of the numerous systems of managing sheep on a mixed farm of grazing and arable land. The ewes lamb from early in January till the end of February. The lambs have the shelter of a lambing shed for a few days. When drafted to an adjoining field they run in front of their mothers and get a little crushed oats and linseed cake meal, the ewes receiving kail or roots and hay to develop milk. Swedes gradually give place to mangolds, rye and clover before the end of April, when shearing of the ewe flock begins, to be finished early in May. At this time unshorn lambs are dipped and dosed with one of Cooper's tablets of sulphur-arsenic dip material to destroy internal parasites. The operation is repeated in September. The lambs are weaned towards the end of June and the ewes run on the poorest pasture till August to lose surplus fat. In August the ewes are culled and the flock made up to its full numbers by selected' shearling ewes. All are assorted and mated to suitable rams. Most of the older ewes take the ram in September, but maiden ewes are kept back till October. During the rest of the year the ewes run on grass and receive hay when necessary, with a limited amount of dry artificial food daily, \ lb each, gradually rising as they grow heavy in lamb to 1 lb per day. Turnips before lambing, if given in liberal quantities, are an unsafe food. To increase the number of doubles, ewes are sometimes put on good fresh grass, rape or mustard a week before the tups go out — a ram to sixty ewes is a usual proportion, though with care a stud ram can be got to settle twice the number. With good management twenty ewes of any of the lowland breeds should produce and rear thirty

lambs, and the proportion can be increased by breeding from ewes with a prolific tendency. The period of gestation of a ewe is between 21 and 22 weeks, and the period of oestrum 24 hours. If not settled the ewe comes back to the ram in from 13 to 18 (usually 16) days. To indicate the time or times of tupping three colours of paint are used. The breast of the ram is rubbed daily for the first fortnight with blue, for a similar period with red, and finally with black.

Fattening tegs usually go on to soft turnips in the end of September or beginning of October, and later on to yellows, green-rounds and swedes and, in spring and early summer, mangolds. The roots are cut into fingers and supplemented by an allowance of concentrated food made up of a mixture of ground cakes and meal, | lb rising to about \ lb; and \ lb to I lb of hay per day. The dry substance consumed per 100 lb live weight in a ration of J lb cake and corn, 12 lb roots and I ft hay daily, would be i6| lb per week, and this gives an increase of nearly 2% live weight or I lb of live weight increase for 8j lb of dry food eaten. Sheep finishing at 135 lb live weight yield about 53 % of carcass or over 70 lb each.

Management of Mountain Breeds. — Ewes on natural pastures receive no hand feeding except a little hay when snow deeply covers the ground. The rams come in from the hills on the 1st of January and are sent to winter on turnips. Weak ewes, not safe to survive the hardships of spring, are brought in to better pasture during February and March. Ewe hogs wintered on grass in the low country from the 1st of November are brought home in April, and about the middle of April on the average mountain ewes begin to lamb. One lamb at weaning time for every ewe is rather over the normal amount of produce. Cheviot and cross-bred lambs are marked, and the males are castrated, towards the end of May. Nearly a month later black-face lambs are marked and the eild sheep are shorn — the shearing of milch ewes being delayed till the second week of July. Towards the end of July sheep are all dipped to protect them from maggot flies (which are generally worst during August) with materials containing arsenic and sulphur, like that of Cooper and Bigg. Fat wethers for the butcher are drafted from the hills in August and the two succeeding months. Lamb sales are most numerous in August, when lowland farmers secure their tegs to feed in winter. In this month breeding ewes recover condition and strength to withstand the winter storms. Ram auctions are on in September and draft ewe sales begin and continue through October. Early this month winter dipping is done at midday in dry weather. Early in November stock sheep having lost the distinguishing " buist " put on at clipping time with a large iron letter dipped in hot tar, have the distinctive paint or kiel mark

claimed by the farm to which they belong rubbed on the wool. The rams are turned Out to the hills between the 15th and the 24th of November.

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SHEEPSHANKS— SHEFFIELD

Lowland rams put to breed half-bred and cross lambs receive about i lb of grain daily to prevent their falling off too rapidly in condition, as they would do if exclusively supported on mountain fare.

Literature. — -D. Low, Breeds of the Domestic Animals of the British Isles (1842, illustrated, and 1845) ; R. Wallace, Farm Live Slock of Great Britain (1907) ; J. Coleman, Sheep of Great Britain (1907), and the Flock Books of the various breed societies. (R. W.)

SHEEPSHANKS, JOHN (1787-1863), British manufacturer and art collector, was born in Leeds, and became a partner in his father's business as a cloth manufacturer. His brother Richard. (1794-1855) was a distinguished astronomer and man of science, whose collection of instruments eventually passed to the Royal Astronomical Society. John Sheepshanks collected pictures, mainly by British artists, and in 1857 presented his magnificent collection to the nation. He retired from business in 1833 and died a bachelor in 1863.

SHEEPSHEAD, the name of one of the largest species of the genus Sargus, marine fishes known on the coasts of S. Europe as " sargo " or " saragu." These fishes possess two kinds of teeth: — one, broad and flat, like incisors, occupying in a single' series the front of the jaws; the other, semiglobular and molar- like, arranged in several series on the sides of the jaws. The genus belongs to the Acanthopterygian family Sparidae which includes the Sea-breams. The sheepshead, Sargus ovis, occurs in abundance on the Atlantic coasts of the United States, from Cape Cod to Florida, and is one of the most valued food-fishes of

L Sheepshead.

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North America. It is said to attain to a length of 30 in. and a weight of 15 lb. Its food consists of shellfish, which it detaches with its incisors from the base to which they are fixed, crushing them with its powerful molars. It may be distinguished from other allied species by seven or eight dark cross-bands traversing the body, by a recumbent

spine in front of the dorsal fin, by twelve spines and as many rays of the dorsal and ten rays of the anal fin, and by forty-six scales along the lateral line. The term " sheepshead " is also given in some parts of North America to a freshwater Sciaenoid, Corvina oscula, which is much less esteemed for the table.

SHEERNESS, a garrison town and naval seaport in the Faversham , parliamentary division of Kent, England, in the Isle of Sheppey, on the right bank of the Medway estuary at its junction with the Thames, 51 m. E. of London by the South- Eastern & Chatham railway. Pop. of urban district (1901) 18,179. Blue Town, the older part of the town, with the dock- yard, is defended by strong modern-built fortifications, especi- ally the forts of Garrison Point and Barton's Point, commanding the entrance of both the Thames and the Medway. The dockyard, chiefly used for naval repairs, covers about 60 acres, and consists of three basins and large docks, the depth of water in the basins ranging down to 26 ft. Within the yard there are extensive naval stores and barracks. Outside the dockyard are the residences of the admiral of the home fleet and other officers, and barracks. The harbour is spacious, sheltered, and deep

even at low water. Sheerness has some trade in corn and seed, and there is steamboat connexion with Port Victoria, on the opposite side of the Medway; with Southend, on the opposite side of the Thames; and with Chatham and London, and the town is in some favour as a seaside resort. A small fort was built at Sheerness by Charles II., which, on the 10th of July 1667, was taken by the Dutch fleet under De Ruyter.

SHEET, an expanse or surface, flat and thin, of various materials ; a rope attached to a sail. These two apparently widely separated meanings are to be explained by the generally received etymology. In O. Eng. there are three words, all from the root seen in "shoot," to dart, let fly, thrust forward; scete or scyte, a sheet of cloth, sceat, corner or fold of a garment, projecting angles, region {e.g. sees sceat, portion of the sea, gulf, bay), and sceata, foot of a sail, pes veli (Wright, Gloss.). The original meaning, according to Skeat, is " projection," or that which shoots out, then a corner, especially of a garment or of a cloth; after which it was extended to mean a whole cloth or " sheet." In Icelandic, the cognate word skaut has much the same meanings, including that of a rope attached to a sail. Other cognate forms in Teutonic languages are Ger. Schoss, lap, bosom, properly fold of a garment, Dutch schoot, Icel. skaut, &c. In current English usage, " sheet " is commonly applied to any flat, thin surface, such as a sheet of paper, a sheet of metal, or, in a

transferred appli- cation, to an expanse of water, ice, fire, &c. More specifically it is used of a rectangular piece of linen or cotton used as that part of the usual bed clothes which are next the sleeper's body. In nautical usage the term " sheet " is applied to a rope or chain attached to the lower corners of a sail for the purpose of extension or change of direction (see Rigging). The connexion in deriva tion with " shoot " is clearly seen in " sheet-anchor," earlier " shoot-anchor " — one that is kept in reserve, to be " shot " in case of emergency (see Anchor).

SHEFFIELD, JOHN BAKER HOLROYD, ist Eael of (1735- 1&21), English politician, came of a Yorkshire family, a branch of which had settled in Ireland. He inherited considerable wealth, and in 1769 bought Sheffield Place in Sussex from Lord de la Warr. Having served in the army he entered the House of Commons in 1780, and in that year was prominent against Lord George Gordon and the rioters. In 1783 he was created an Irish peer as Baron Sheffield of Roscommon, a barony of the United Kingdom (Sheffield of Sheffield, Yorks) being added in 1802. In 1816 he was created Viscount Pevensey and earl of Sheffield. He was a great authority on farming, and in 1803 he was made president of the Board of Agriculture; but he is chiefly remembered as the friend of Gibbon (q.v.), whose works he afterwards edited. His son and grandson succeeded as 2nd and 3rd earls, the latter (1832-1909) being a well-known patron of cricket, at whose death the earldom became extinct. The Irish barony, however, under a special remainder, passed to the 4th baron Stanley of Alderley, who thus became Baron Sheffield of Roscommon.

SHEFFIELD, a city, and municipal, county and parlia- mentary borough in the West Riding of Yorkshire, England, 1585 m. N.N.W. from London. Pop. (1901) 409,070. It is served by the Midland, Great Central and Great Northern railways, and has direct connexion with all the principal lines in the north of England. The principal stations are Victoria (Great Central) and Midland. Sheffield is situated on hilly ground in the extreme south of the county, and at the junction of several streams with the river Don, the principal of which are the Sheaf, the Porter, the Rivelin and the Loxley. The manufacturing quarter lies mainly in the Don valley, while the chief residential suburbs extend up the picturesque hills to the south. The centre of the city, with the majority of the public buildings, lies on the slope south of the Don, and here are several handsome thorough- fares. The older portions were somewhat irregular and over- crowded, but a great number of improvements were effected under an act of 1875, and have been steadily

continued. There is an extensive system of tramways, serving the outlying town- ships. The parish church of St Peter is a cruciform building, mainly Perpendicular. The original Norman building is supposed

to have been burned during the wars of Edward III. with the barons, and the most ancient existing part is the tower, dating from the 14th century. A restoration in 1880, when transepts and a W. front were added, improved the church by demolishing the galleries and other heavy internal fittings. There are a number of interesting mural monuments; and the Shrewsbury chapel contains a fine tomb of the 4th earl of Shrews- bury, who founded it in the 16th century. Of the principal public buildings, the town hall was opened by Queen Victoria in 1897. It is a fine building in the style of the Renaissance, surmounted by a lofty tower, which is crowned by an emblematic statue in bronze. The Cutlers' hall was built in 1 83 2 and enlarged in 1857 by the addition of a magnificent banqueting hall. The handsome corn exchange, in Tudor style, and the market hall were acquired from the duke of Norfolk by the corporation. Among several theatres, the Theatre Royal was originally erected in 1793. Others are the Alexandra, Lyceum and Alhambra. There are extensive barracks. Literary and social institutions include the Athenaeum (1847), with news-room and library; the literary and philosophical society (1822), the Sheffield club (1862), the Sheffield library, founded in 1777, and the free library (1856), with several branches. The public museum and the Mappin art gallery are situated in Weston Park ; and in Meersbrook Hall is the fine Ruskin museum, containing Ruskin's art, mineralogical, natural history, and botanical collections, and some original drawings and valuable books. These are in the custody of the corporation. Beyond St Peter's church relics of antiquity are few, but there, remains a part of the manor-house of Hallam, dating from the 16th century. In the S. of the city is Broom Hall, a fine ancient half-timbered building.

The educational establishments are important. University College, constituted by that title in 1897, was founded in 1879 as the Firth College by Mark Firth (1819-1880), an eminent steel-manufacturer. This institution was enlarged in 1892, and comprised, besides the college, a technical department (1886) occupying the buildings of the former grammar school, and equipped with metallurgical laboratories, steel works, iron foundry, a machine and fitting shop,

&c. ; and a medical school, together with a school of pharmacy. In 1903 the foundation was laid of a building, at Western Bank, to contain the departments of medicine, arts, pure science, commerce, &c. When the college became dissociated in 1904 from the Victoria University, Manchester, of which it had formed a constituent, the necessary financial and other preparations were taken in hand to enable the college to be incorporated as the Sheffield University, and it was opened as such by King Edward VII. Other educational institutions are the free writing school (171 5, rebuilt in 1827), the boys' charity school (founded 1706), the girls' charity school (1786), the Church of England educational institute, the Roman Catholic reformatory (1861), the Wesley College, associated with London University, Ranmoor College of the Methodist New Connexion, the mechanics' institute, arid the school of art.

Among numerous medical or benevolent institutions may be mentioned the general infirmary, opened in 1797; the public hospital, erected in 1858 in connexion with the Sheffield medical school established in 1792; the school and manufactory for the blind, 1879, and the South Yorkshire lunatic asylum, 1872. Among many charities founded by citizens the most noteworthy is the Shrewsbury hospital for twenty men and twenty women, originally founded by the 7th earl of Shrewsbury (d. 1616), but greatly enlarged by successive benefactions.

Among public monuments are the statue of Queen Victoria before the town hall; the statue to James Montgomery the poet (1771-1854), chiefly erected by the Sunday school teachers of Sheffield; the monument in Weston Park to Ebenezer Elliot (1781-1849), known as the Corn Law rhymer; the column to Godfrey Sykes the artist (1825-1866); the monument to those who died during an outbreak of cholera in 1833; and the monu- ment to the natives of Sheffield who fell in the Crimean War. Sir Francis Chantrey, the eminent sculptor, was born (1781) and

died (1842) near Norton in Derbyshire, in the neighbourhood of Sheffield, which was the scene of his earlier work.

Sheffield is well supplied with parks and public grounds. In the western suburbs is Weston Park, occupying the grounds of Weston Hall, purchased by the corporation in 1873. The Firth Park, of 36 acres, on the N.E. of the city, was presented by Mark Firth, and was opened in 1875 by King Edward VII. and Queen Alexandra when prince and princess of Wales. There are botanical gardens of 18 acres in the western suburbs. A park and other recreation grounds

have been presented by the duke of Norfolk as lord of the manor. To the N. W. , towards Penistone, is Wharncliffe, retaining much of the characteristics of an ancient forest, and overlooking the valley of the Don from bold rocky terraces and ridges. The Bramall Lane cricket ground in Sheffield is the scene of many of the Yorkshire county cricket matches.

The prosperity of Sheffield is chiefly dependent on the manu- facture of steel. The smelting of iron in the district is supposed to date from Roman times, and there is distinct proof carrying it back as far as the Norman Conquest. The town had become famed for its cutlery by the 14th century, as is shown by allusions in Chaucer. There was an important trade carried on in knives in the reign of Elizabeth, and the Cutlers' Company was incorporated in 1624. In early times cutlery was made of blister or bar steel; afterwards shear steel was introduced for the same purpose; but in 1740 Benjamin Huntsman of Handsworth introduced the manufacture of cast steel, and Sheffield retains its supremacy in steel manufacture, notwithstanding foreign competition, especially that of Germany and the United States, its trade in heavy steel having kept pace with that in the other branches. It was with the aid of Sheffield capital that Henry Bessemer founded his pioneer works to develop the manufacture of his invention, and a large quantity of Bessemer steel is still made in Sheffield. The heavy branch of the steel manufacture includes armour plates, rails, tyres, axles, large castings for engines, steel shot, and steel for rifles. The cutlery trade embraces almost every variety of instrument and tool — spring and table knives, razors, scissors, surgical instruments, mathematical instruments, edge tools, files, saws, scythes, sickles, spades, shovels, engineering tools, hammers, vices, &c. The manufacture of engines and machinery is also largely carried on, as weir as that of stoves and grates. The art of silver plating was introduced by Thomas Bolsover in 1742, and specimens of early Sheffield plate are highly prized. Among the other industries of the town are tanning, confectionery, cabinet- making, bicycle-making, iron and brass founding, silver refining, the manufacture of brushes, combs, optical instruments, horse-hair cloth, and railway fittings, and testing. The Cutlers' Company (1624) exercises, by acts of 1883-1888, jurisdiction in all matters relating to the registration of trade marks, over all goods com- posed in whole or in part of any metal, wrought or unwrought, as also over all persons carrying on business in Hallamshire and within 6'm. thereof. There are numerous collieries in the neighbourhood.

Sheffield is the seat of a suffragan bishop in the diocese of York. The town trust for the administration of property belonging to the town

dates from the 14th century, and in 1681 the number and manner of election of the " town trustees " was definitely settled by a decree of the Court of Chancery. Additional powers were conferred on the trustees by an act passed in 1874. The town first returned members to parliament in 1832. In 1885 the representation was increased from two to five members, the parliamentary divisions being Attercliffe, Brightside, Central, Ecclesall and Hallam. The county borough was created in 1888, and in 1893 the town became a city. The corporation consists of a lord mayor (the title was conferred on the chief magistrate in 1897), 16 aldermen, and 48 councillors. Area, 23,662 acres.

At the time of the Domesday Survey the four manors of Grimesthorpe, Hallam, Attercliffe and Sheffield (Escafeld) made up what is now the borough of Sheffield. Of these Hallam was the most important, being the place where Earl Waltheof, the Saxon lord of the manors, had his court. After the Conquest the earl was allowed to retain his possessions, and when he was executed for treason they passed to his widow Judith, niece of William the Conqueror, of whom Roger de Busli was holding Hallam with the three less important manors at the time of the Domesday Survey. From him the manors passed to the family of de Lovetot, but in the reign of Henry II., William de Lovetot, the 2nd lord, died without male issue, and his property passed to his daughter Maud, afterwards married to Gerard de Furnival. By the end of the 14th century Sheffield had become more im- portant than Hallam, partly no doubt on account of the castle which one of the Furnivals had built here. Thomas de Furnival, great-great-grandson of Gerard and Maud, in 1296 obtained a grant of a market every Tuesday and a fair every year on the

eve, day and morrow of Holy Trinity, and in the following year he gave the inhabitants a charter granting them the privileges of holding the town at a fee-farm rent of £3, 8s. ojd. yearly, of having a court baron held every three weeks, and of freedom from toll throughout the whole of Hallamshire. From the Furnivals the manor passed by marriage to John Talbot, after- wards earl of Shrewsbury, whose descendant the 6th earl was entrusted with the care of Mary Queen of Scots during her twelve years' imprisonment in Sheffield castle. In the reign of Edward VI. the property belonging to the town which had been amalgamated with other land left to the burgesses in trust for

certain charitable uses was forfeited to the crown under the act for the suppression of colleges and chantries, but on their petition it was restored in 1 554 by Queen Mary, who at the same time incor- porated the town under the government of twelve capital burgesses.

See Victoria County History, Yorkshire: Joseph Hunter, Hallam- shire. the history and topography of the parish of Sheffield (1869).

SHEFFIELD PLATE, the name applied to a variety of articles of domestic use or ornament, made of copper coated with silver by a special and now abandoned process. Many of them were actually manufactured in Birmingham, but as the secret of producing the material was discovered and brought to perfection in Sheffield, the name of that town was naturally connected with it, and thence transferred to articles constructed from it.

In 1742 a workman named Thomas Bolsover was mending the handle of a knife made of silver and copper, when, accident- ally overheating it, he caused the metals to fuse and flow, and found that as a consequence the silver adhered to the copper as a thin coating. Being an intelligent man, he perceived the commercial value of his chance discovery, and began the manu- facture of articles which, with all the appearance of silver, were both cheaper and stronger than those made of the pure metal. He apparently, however, confined himself to applying the silver direct to the surface of the copper after the latter had been given the shape destined to it, and was thus limited to the production of small articles such as snuff-boxes, knife handles, toilet articles, &c. It was reserved to Joseph Hancock to realize that by making the plate first and working it into the desired form afterwards he could almost indefinitely extend the possi- bilities of the material. The process in its final and highest development was as follows. The groundwork was a mixture of copper and brass, either metal alone having serious defects. This was cast into an oblong ingot, 1 to ij in. in thickness, 2% in. in breadth, and of a length regulated by the size of the plate desired. The surface of this was brought by planing, grinding and other means to the highest possible pitch of smooth- ness and evenness. A sheet of silver of a finer quality than standard, ranging in thickness from -fa in. to nearly 1 in. according to the quality aimed at, and of the same superficial extent as the copper bar, was levelled and polished in the same way and accurately fitted to it, neither surface at any time being soiled by contact with the workman's fingers. A sheet of copper, rather smaller than the other two and fa in. thick was laid upon the silver, and on the top of all was added a piece of iron, J in. thick, 1 in. wide, and a little shorter than the three others, to protect

them from the direct contact of the strong iron wire with which all were firmly bound together. The junction of the edges of the silver and copper-blend was treated with a flux of borax and the whole was submitted to the heat of a furnace until the silver was seen to be melting, when it was instantly removed, care being taken to avoid pressing upon the upper or lower surfaces, as the liquid silver in that case would have been squeezed out from between the two enclosing plates and the operation ruined. It was then left to cool, and after being thoroughly cleansed presented the appearance of a copper ingot with one silver side. This was passed again and again between gradually approximated rollers, with occasional annealing, until the desired thickness had been attained. The great extension of surface thus produced had the drawback of exaggerating any small defect in the union of the two metals, increasing it to a blister of an inch or more in diameter. It was, however, fortun- ately found easy to remedy this. The blister if unbroken was

heated, pricked, and then rubbed level with a burnisher; if, as sometimes happened, the silver had flaked away it was replaced by coatings of pure leaf silver rubbed in with a burnisher. The plate when passed as flawless was cut into the desired form and moulded as far as possible into shape, the edges where necessary being soldered. At first only one surface of the copper was plated with silver and thus its usefulness was necessarily restricted, but it was a simple matter to apply the silver to both sides and thenceforward whatever was made in solid metal could be reproduced in plate, and firm after firm went into the business, ever and anon introducing further improvements. The possi- bility of embossing the metal beyond a certain point without fracturing the coating of silver was got over by casting or stamping the raised ornament in silver, filling the hollows with a form of pewter and soldering the result to the appropriate part of the general design. Another difficulty, the concealment of the inner core of copper which was seen as a thin red line when a cut edge was exposed, was met about 1784 by George Cadman, who adopted the practice of soldering on an edging, generally orna- mented, of solid silver so as to cover the junction, and the presence of this is one of the trustworthy tests by which genuine Sheffield plate may be recognized. The labour of rolling the metal by hand was done away with about 1760, by the firm of Tudor, Leader & Sherburn, who first employed horse-power, and for more than half a century the trade both in Sheffield and Birmingham continued to flourish. In 1736 there were under 10,000 inhabitants in the former city; in 1760 when Horace Walpole passed through it, buying for two guineas a pair of candlesticks of the local plate,

which he thought " quite pretty," and pronouncing it to be " one of the foulest towns in England," there were two-and-twenty thousand who remitted eleven thousand pounds a week to London. It would be impossible, were it desirable, to enumerate all the varieties of the articles turned out, or to overpraise the beauty and elegance of most of them. The designs were identical with those in favour with the gold- and silver-smiths of the period, which was happily one when exceptionally good taste prevailed. The appreciation of light and well-proportioned curves and the skilful employment of well-contrived pierced work are conspicuous features.

The success was, however, doomed to be short lived and to come to an end as swiftly as it had grown up. In the year 1800 W. Cruikshank was already experimenting with a process of electro-plating, and in 1837 Mr Spencer in England, and in 1838 Professor M. H. Jacobi (1801-1874) in Russia, working inde- pendently, succeeded in contriving methods which could be made commercially profitable. Two years later Messrs Elkington in London and M. de Ruolz of Paris started in business oh those lines, and the slower and consequently more costly manufacture at Sheffield and Birmingham rapidly died out.

Of recent years old Sheffield plate after long neglect has come into fashion again, and genuine articles in good condition have greatly gone up in value, often exceeding in cost those of more modern date in sterling silver. Concurrently fraudulent imita- tion has regrettably increased. In some cases the whole object is a modern reproduction in electro-plate, but more often really old articles from which the original plating has been worn off in course of time have been replated, both equally being in the eyes of the connoisseur' unworthy of serious attention and comparatively valueless. The difference after a little experience is not difficult to detect, though inexpressible in words. The pressure to which the Sheffield plate was submitted produces a definite colour and texture which is absent from the surface produced by the deposit of silver in a liquid medium by electrical means, and the coat of silver is spread by the latter uniformly over the whole surface without a break, while in the former the junction between the embossed ornaments and the silver strips covering the cut edges may often be detected on careful examination.

See Sheffield Plate by Bertie Wyllie; H. N. Veitch, Sheffield Plate: its history, manufacture and art (London, 1908). (M. Be.)

SHEIKH, or Shaikh, an Arabic title of respect. Strictly it means a

venerable man, of more than fifty years of age. It is specially borne by heads of religious orders, chiefs of

tribes and headmen of villages. Every village, how- ever small, every separate quarter of a town, has a sheikh in whom is lodged the executive power of government — a power loosely defined, and of more or less extent according to the personal character and means of the individual who wields it. A village sheikh is a sort of head magistrate and chief of police. The Koran, the sole authentic authority in all matters, legal or civil, never accurately distinguished between the sheikh and the cadi (?.».), and its phrases, besides, are vague and capable of admitting different and even opposite interpretations. (For the Sheikh ul-Islam see Mufti.)

SHEIL, RICHARD LALOR (1791-1851), Irish politician and writer, was born at Drumdowney, Tipperary, on the 17th of August 1791. His father, Edward Sheil, had acquired consider- able wealth in Spain, and owned an estate in Tipperary. The son was taught French and Latin by the Abbe de Grimeau, a French refugee. He was then sent to a school in Kensington, London, presided over by another emigre, M. de Broglie. In October 1804 he was removed to Stonyhurst college, Lancashire, and in November 1807 entered Trinity College, Dublin, where he specially distinguished himself in the debates of the Historical Society. After taking his degree in 181 1 he entered Lincoln's Inn, and was admitted to the Irish bar in 1814. His play of Adelaide, or the Emigrants, was played at the Crow Street theatre, Dublin, on the 19th of February 1814, with complete success, and on the 23rd of May 1816 it was performed at Covent Garden. The Apostate, produced at the latter theatre on the 3rd of May 181 7, firmly established his reputation as a dramatist. His principal other plays are Bellamira (written in 1818), Evadne (1819), Huguenot, produced in 1822, and Montini (1820). In 1822 he began, along with W. H. Curran, to contribute to the New Monthly Magazine a series of graphic and racy papers entitled Sketches of the Irish Bar. These were edited by M. W. Savage in 1855 in two volumes, under the title of Sketches Legal and Political. Sheil was one of the principal founders of the Catholic Association in 1823 and drew up the petition for inquiry into the mode of administering the laws in Ireland, which was presented in that year to both Houses of Parliament. In 1825 Sheil accompanied O'Connell to London to protest against the suppression of the Catholic

Association. The protest was unsuccessful, but, although nominally dissolved, the association continued its propaganda after the defeat of the Catholic Relief Bill in 1825; and Sheil was one of O'ConnelPs leading supporters in the agitation persistently carried on till Catholic emancipation was granted in 1829. In the same year he was returned to Parlia- ment for Milborne Port, and in 183 1 for Louth. He took a prominent part in all the debates relating to Ireland, and although he was greater as a platform orator than as a debater, he gradually won the somewhat reluctant admiration of the House. In August 1839 he became vice-president of the board of trade in Lord Melbourne's ministry. After the accession of Lord John Russell to power in 1846 he was appointed master of the mint, and in 1850 he was appointed minister at the court of Tuscany. He died at Florence on the 23rd of May 1851.

See Memoirs of Richard Lalor Sheil, by W. Torrens M'Cullagh (2 vols., 1855). His Speeches were edited in 1845 by Thomas McNevin.

SHEKEL (from Heb. shdkal, to weigh), originally a Jewish unit of weight (£$ of a mina, and mfinr oi a talent) and afterwards a coin of the same weight. The Biblical references to shekels must refer to uncoined ingots. In the time of Josephus it seems that the light shekel weighed from 210 to 210-55 grains; the heavy shekel was twice that amount, which is practically identical with the Phoenician weight (224-4 grains). It corresponds to is. 4jd. and 2s. gd. respectively in English silver. Jewish shekels were first coined by Simon the Hasmonean, probably in 139-138 B.C. These bear inscriptions in the archaic Hebrew and various emblems, such as the cup or chalice, the lily branch with three flowers, the candlestick, the citron and palm branch and so forth. They never bear the portraits of rulers or figures of animals. A later series of shekels, belonging to the Roman period, are tetradrachms, " which came from the mints of

Caesarea and Antioch and were used as blanks on which to impress Jewish types.'" Hence in Matt. xvi. 24 the temple tax of half a shekel is called a didrachm (2 drams). In 2 Samuel xiv. 26 we read of " shekels after the King's weight." The royal norm was heavier than the common norm. The Hebrews divided the shekel into 20 parts, each of which was called a gerah. (See also Numismatics.)

See articles in Ency. Bibl. col. 4442, and Hastings' Diet, of the Bible, ii. 417 seq. ; F. W. Madden, Coins of the Jews (1881); T. Reinach, Jewish Coins (1903). (I. A.)

SHEKINAH, a Hebrew word meaning " that which dwells " or " the

dwelling." It is one of the expressions used in the Targums in place of " God."

In the Targums. — The word " Shekinah " is of constant occurrence in the Targums or Aramaic paraphrases of the Biblical lections that were read in the synagogue-service to the people. Great care was taken by the scribes in these renderings to mitigate the anthropomorphic expressions applied to God in the Scriptures, and by paraphrase, the use of abstract terms and indirect phraseology, to prevent such expressions from giving rise to erroneous views as to God's personal manifestation in the popular mind. Whenever, e.g. any indication of local limitation or action was implied or expressed, in the Hebrew text, of God the Targumists were careful to substitute some expres- sion involving the use of " Shekinah." In these connexions "Shekinah" thus becomes the equivalent of "God" or its synonyms. One or two examples will make the Targum-usage clear. Thus Ex. xxix. 45 (" and I will dwell among the children of Israel and will be their God ") is rendered in the Targum (Onkelos) : " And I will cause my Shekinah to dwell in the midst of the children of Israel, and I will be their God." All expressions implying God's local presence are similarly rendered: thus e.g. Habak. ii. 20 (" Jehovah is in His holy temple ") is rendered " Jehovah was pleased to cause His Shekinah to dwell," &c. " To see " God is similarly paraphrased. Thus Is. xxxiii. 17 (" thine eyes shall see the King in His beauty ") is rendered (Targum of Jonathan) : " Thine eyes shall see the Shekinah of the king of the worlds in His beauty." So too " hiding the face " when used of God is regularly paraphrased " remove His Shekinah " (Is. Ivii. 17, viii. 17, lix. 2; Jer. xxxiii. 5; cf. Is. i. 15, &c). Closely connected with the idea of the Shekinah, but distinct from it, is that of " the glory of the Lord." " Glory," indeed, in this connexion was conceived of as a property of the Shekinah (as, in fact, it is of God for whom " Shekinah " is the equivalent). For the divine " glory " as a property of the Shekinah, cf. e.g. Is. vi. 5 (" mine eyes have seen the King, the Lord of hosts "), which is rendered in the Targum: " mine eyes have seen the glory of the Shekinah of the King of the worlds the Lord of hosts."

In the New Testament. — In the New Testament both the term and the idea are referred to in various ways. The close associa- tion of the divine " glory " with the visible Shekinah has already been referred to. This Shekinah-glory is several times denoted in the New Testament by 56£a. The most notable passage is Rom. ix. 4 where St Paul, enumerating the list of Israel's privi- leges, says: " whose is the adoption, and the glory " (i.e. the Shekinah-glory, the visible presence of God among His people), &c. cf . Luke ii. 9. There is also

an obvious allusion to the Shekinah in the description of the theophanic cloud of the transfiguration- narrative (St. Matt. xvii. 5: "a bright cloud overshadowed them, and behold a voice out of the cloud, saying " &c. ; cf. St Mark ix. 7; St Luke ix. 34), the same verb being used as in the LXX. of Exod. xl. 34, 35, of the cloud which rested on the tabernacle when it was filled with " the glory of the Lord." There can be no doubt, too, that the word rendered " tabernacle" (o-Krjvii) with the corresponding verb " to tabernacle " (o-ktivovv) has been chosen for use in St John i. 14 and Rev. xii. 3, from its likeness both in sound and meaning to the term " Shekinah." The passage in Revelation runs: " Behold the tabernacle (aKqvri) of God is with men, and He will tabernacle (oia]v&!0-£C) with them." In St John i. 14 there is an allusion to the Word (=memra of the Targums), the Shekinah, and the Shekinah-glory,

all of which the writer declares became incarnate in Jesus. Cf. also Heb. i. 3 (" effulgence of the [Shekinah] glory ").

In Talmud and Midrash. — It is remarkable that the memra (= Logos or " Word ") of the Targums almost entirely disappears in the Midrashic literature and the Talmud, its place being taken by Shekinah. The Rabbis apparently dreaded the possibility of such terms becoming hypostasized into personal entities distinct from God. Against this they emphasized the Shekinah-ideal It is safe to say that wherever Shekinah is mentioned in Rabbinic literature it is God's direct action or activity that is thought of. Independent personality is never imputed to it. 1 It is probable that the use of the term was often in Rabbinic -writings polemical (against Jewish Christians or gnostic sects) .

See under " Shekinah " in Hastings' Diet, of (he Bible, and Diet, of Christ and the Gospels, and in the Jewish Encyclopedia; also Weber, Jiidische Theologie, 2nd ed., especially pp. 185-190. For the Targums in English, cf. Etheridge, The Targums on the Pentateuch (2 vols., 1862 and 1865); and Pauli, The Chaldee Paraphrase of the Prophet Isaiah (London, 1871). (G. H. Bo.)

SHELBY, ISAAC (1750-1826), American soldier and pioneer, was born at North Mountain, near Hagerstown, Maryland, on the nth of December 1750. With his father, Evan Shelby (17 20-1794), an emigrant from Wales, he removed to what is now Bristol, Tennessee,

in 1771, and in 1774 took a conspicuous part in the battle of Point Pleasant. 2 He was a surveyor in Kentucky for the Transylvania Company in 1775; became a captain of Virginia minute-men in 1776, and in 1777 became commissary with supervision over transportation of supplies from Staunton, Virginia, to the frontier. In 1779 he was elected to the Virginia House of Delegates, but, by the line established between Virginia and North Carolina at this time, he became a resident of North Carolina and he was appointed colonel of the Sullivan county militia, which in 1780 he commanded in guerilla fighting, and he led the left centre of the American force at King's Mountain (October 7). He served under General Francis Marion in 1781, and in 1782 was a member of the North Carolina House of Commons. He was active in the movement for the erection of the state of Kentucky, was a member of the Kentucky Constitutional Convention of 1792, and was governor of the new state in 1792-1796 and in 1812-1816; in 1813 he commanded twelve Kentucky regiments at the battle of the Thames, and for his services received the thanks of Congress and a gold medal. In 1818 he was a commissioner with Andrew Jackson to the Chick- asaws. He died on his estate in Lincoln county, Kentucky, on the 18th of July 1826.

SHELBYVILLE, a city and the county-seat of Shelby county, Indiana, U.S.A., about 27 m. S.E. of Indianapolis, on the Big Blue river. Pop. (1890) 5451; (1900) 7169, including 326 foreign-born; (1910) 9500. It is served by the Cleveland, Cincinnati, Chicago & St Louis and the Pittsburg, Cincinnati, Chicago & St Louis railways, and by an interurban electric line. It has a public library, a hospital and a children's home. The city is a trading centre for the surrounding farming region; among its manu- factures furniture is the most important. Shelbyville, named in honour of General Isaac Shelby of Kentucky, was platted in 1822, incorporated as a town in 1850, and chartered as a city in i860.

SHELD-DBAKE, or, as commonly spelt in its contracted form, Sheldrake, a word whose derivation 3 has been much

1 Maimonides, however, regarded the Shekinah, like the memra and " the glory," as a distinct entity.

8 Isaac Shelby's letter describing the battle is printed in Theodore Roosevelt's Winning of the West, i. 341-344.

3 Ray in 1674 {Engl. Words, p. 76) gave it from the local " sheld " (= particoloured), which, applied to animals, as a horse or a cat, still survives in East Anglia. This opinion is not only suitable but is

confirmed by the bird's Old Norsk name Skjbldungr, from Skjbldr, primarily a patch, and now commonly bestowed on a piebald horse, just as Skjalda (Cleasby's Icel. Diet., sub voce), from the same source, is a particoloured cow. But some scholars interpret Skjbldungr by the secondary meaning of Skjbldr, a shield, asserting that it refers to " the shield-like band across the breast " of the bird. If they be right the proper spelling of the English word would be " Shield- drake," as some indeed have it. A third suggested meaning, from the Old Norsk Skjol, shelter, is philologically to be rejected, but, if true, would refer to the bird's habit, described in the text, of breeding under cover.

discussed, one of the most conspicuous birds of the duck tribe, Anaiidae, called, however, in many parts of England the " Burrow-Duck" and in some districts by the almost obsolete name of " Bergander" (Du. Berg-eende, Ger. Bergente), a word used by Turner in 1544.

The sheldrake is the Anas tadorna of Linnaeus, and the Tadorna cornuta of modern ornithology, a bird somewhat larger and of more upright stature than an ordinary duck, having its bill, with a basal fleshy protuberance (whence the specific term cornuta) , pale red, the head and upper neck very dark glossy green, and beneath that a broad white collar, succeeded by a still broader belt of bright bay extending from the upper back across the upper breast. The outer scapulars, the primaries, a median abdominal stripe, which dilates at the vent, and a bar at the tip of the middle tail-quills are black; the inner secondaries and the lower tail-coverts are grey; and the speculum or wing-spot is a rich bronzed-green. The rest of the plumage is pure white, and the legs are flesh-coloured. There is little external difference between the sexes, the female being only somewhat smaller and less brightly coloured. The sheldrake frequents the sandy coasts of nearly the whole of Europe and North Africa, extending across Asia to India, China and Japan, generally keeping in pairs and sometimes penetrating to favourable inland localities. The nest is always made under cover, usually in a rabbit-hole among sandhills, and in the Frisian Islands the people supply this bird with artificial burrows, taking large toll of it in eggs and down.*

T. radjah of Australia, Papuasia and the Moluccas almost equals the true sheldrake in its brightly contrasted plumage, but the head is white in both sexes. Barbary, south-eastern Europe, and Central Asia are inhabited by an allied species of more inland range and very different coloration, the T. casarca or Casarca rutila of

ornithologists, the ruddy sheldrake of English authors — for it has several times strayed to the British Islands — and the " Brahminy Duck " of Anglo-Indians, who find it resort- ing in winter, whether by pairs or by thousands, to their inland waters. This species is of an almost uniform bay colour all over, except the quill-feathers of the wings and tail, and (in the male) a ring round the neck, which are black, while the wing-coverts are white and the speculum shines with green and purple; the bill and legs are dark-coloured. 6 A species closely resembling the last, but with a grey head, C. cana, inhabits South Africa. In Australia occurs another species of more sombre colours, the C. tadornoides; and New Zealand is the home of another species, C. variegata, still less distinguished by bright hues. In the last two the plumage of the sexes differs not incon- siderably.

Sheldrakes will, if attention be paid to their wants, breed freely in captivity, crossing if opportunity be given them with other species, and an incident therewith connected possesses an importance hardly to be overrated by the philosophical naturalist. In the Zoological Society's gardens in London in the spring of 1859 a male of T. cornuta mated with a female of C. cana, and, as will have been inferred from what has been before stated, these two species differ greatly in the colouring of their plumage. The young of their union, however, presented an appearance wholly unlike that of either parent, and an appearance which can hardly be said, as has been said {P.Z.S., 1859, p. 442), to be "a curious combination of the colours of the two." Both sexes of this hybrid have been admirably portrayed by J. Wolf; and, strange to say, when these figures are compared with' equally faithful portraits by the same master of the Australian and New Zealand species, C. tadornoides and C. variegata, it will at once be seen that the hybrids present an appearance almost midway

4 This is the Latinized form of the French Tadorne, first published by Belon (1555), a word on which Littr6 throws no light except to state that it has a southern variant Tardone.

6 Jerdon (B. India, iii. 793) tells of a Hindu belief that once upon a time two lovers were transformed into birds of this Species, and that they or their descendants are condemned to pass the night on the opposite banks of a river, whence they unceasingly call to one another: " Chakwa, shall I come?" "No, Chakwi." " Chakwi, shall I come?" "No, Chakwa." As to how, in these circum- stances, the race is perpetuated the legend is silent.

between the two species last named — species which certainly had nothing to do with their production. 1

The genera Tadorna and Casarca, as shown by the tracheal characters and coloration, are most nearly related to Chenalopex, containing the bird so well known as the Egyptian goose, C. aegyptiaca, and an allied species, C. jubata, from South America. For the same reason the genus Plectroptcus, composed of the spur-winged geese of Africa, and perhaps the Australian Anser- anas and the Indian and Ethiopian Sarcidiornis, also appear to belong to the same group, which should be reckoned rather to the Anatine than to the Anserine section of the Anatidae. (A. N.) SHELDON, CHARLES MONROE (1857-), American Congregational clergyman, was born in Wellsville, New York, on the 26th of February 1857. Graduating at Brown University in 1883 and at Andover Theological Seminary in 1886, he was pastor of a church at Waterbury, Vermont, in 1886-1888, and in 1889 became pastor of the Central Congregational Church of Topeka, Kansas. He is well known as the author of a number of widely read books of fiction, which at the same time inculcate an uncompromising obedience to the precepts of the Gospel in every- day life. Of these, In His Steps (1896), though not the earliest, is perhaps the best, and it is this one which first brought him into prominence.

SHELDON, GILBERT (1598-1677), archbishop of Canterbury, was born at Stanton in the parish of Ellastone, Staffordshire, and educated at Oxford. He was ordained in 1622 and was appointed chaplain to Thomas Lord Coventry (1578-1640). Four years later he was elected warden of All Souls' College, Oxford. During the years 1632-1639 he received the livings of Hackney (1633); Oddington, Oxfordshire; Ickford, Buckingham- shire (1636); and Newington, Oxfordshire; besides being a prebendary of Gloucester from 1632. In 1638 he was on a commission appointed to visit Merton College, Oxford. He was intimate with the Royalist leaders, participated in the negotia- tions for the Uxbridge treaty of 1644, and collected funds for Charles II. in exile. In 1648 he was ejected from All Souls' by order of parliament, and imprisoned for some months, but he regained the wardenship in 1659. In 1660 he became bishop of London and master of the Savoy, and the Savoy Conference was held at his lodgings. He was consecrated archbishop of Canter- bury in 1663. He was greatly interested in the welfare of Oxford University, of which he became chancellor in 1667, succeeding Clarendon (1609-1674). The Sheldonian theatre at Oxford was built and

endowed at his expense.

SHELL (O. Eng. scell, scyll, cf. Du. schel, shell, Goth, skalja, tile; the word means originally a thin flake, cf. Swed. skalja, to peel off; it is allied to " scale " and " skill," from a root meaning to cleave, divide, separate), the hard outside natural covering of anything, as of some fruits and seeds; more par- ticularly, the conch (q.v.) or integument which acts as a defence for the bodies of various animals (see Mollusca, Gastropoda, Malacostraca, &c), the test, crust or carapace; also the outer covering of an egg. The word is also used of many objects resembling the natural shell in use or shape, and especially of a hollow projectile filled with explosives (see Ammunition, § Shell, and Ordnance).

See also Shell-heaps, Shell-money.

SHELLEY, MARY WOLLSTONECRAFT (1797-1851), English writer, only daughter of William Godwin and his wife Mary Wollstonecraft, and second wife of the poet Percy Bysshe Shelley, was born in London on the 30th of August 1797. For the history of her girlhood and of her married life see Godwin, William, and Shelley, P.B. When she was in Switzerland with Shelley and Byron in 1816 a proposal was made that various members of the party should write a romance or tale dealing with the supernatural. The result of this project was that Mrs Shelley wrote Frankenstein, Byron the beginning of a narrative about a vampyre, and Dr Polidori, Byron's physician, a tale named The Vampyre, the authorship of which used frequently

1 It is further worthy of remark that the young of C. variegata when first hatched closely resemble those of C. rutila, and when the former assume their first plumage they resemble their father more than their mother (P.Z.S., 1866, p. 150).

in past years to be attributed to Byron himself. Frankenstein, published in 18 18, when Mrs Shelley was at the utmost twenty-one years old, is a very remarkable performance for so young and inexperienced a writer; its main idea is that of the formation and vitalization, by a deep student of the secrets of nature, of an adult man, who, entering the world thus under unnatural conditions, becomes the terror of his species, a half- involuntary criminal, and finally an outcast whose sole resource is self-immolation. This romance was followed by others: Valperga, or the Life and Adventures of Castruccio, Prince of Lucca (1823), an historical tale written with a good deal of spirit, and readable enough even now; The Last Man (1826), a fiction of the final agonies of human society

owing to the universal spread of a pestilence — this is written in a very stilted style, but possesses a particular interest because Adrian is a portrait of Shelley; The Fortunes of Perkin Warbeck (1830); Lodore (1835), also bearing partly upon Shelley's biography, and Falkner (1837). Besides these novels there was the Journal of a Six Weeks' Tour (the tour of 1814 mentioned below), which is published in conjunction with Shelley's prose- writings; and Rambles in Germany and Italy in 1840-1842-1843 (which shows an observant spirit, capable of making some true forecasts of the future), and various miscellaneous writings. After the death of Shelley, for whom she had a deep and even enthusiastic affection, marred at times by defects of temper, Mrs Shelley in the autumn of 1823 returned to London. At first the earnings of her pen were her only sustenance; but after a while Sir Timothy Shelley made her an allowance, which would have been withdrawn if she had persisted in a project of writing a full biography of her husband. In 1838 she edited Shelley's works, supplying the notes that throw such invaluable light on the subject. She succeeded, by strenuous exertions, in maintaining her son Percy at Harrow and Cambridge; and she shared in the improvement of his fortune when in 1840 his grandfather acknowledged his responsi- bilities and in 1844 he succeeded to the baronetcy. She died on the 2 1 st of February 1851.

SHELLEY, PERCY BYSSHE (1792-1822), English poet, was born on the 4th of August 1792 at Field Place, near Horsham, Sussex. He was the eldest child of Timothy Shelley (1 7 53-1 844) , M.P. for Shoreham, by his wife Elizabeth, daughter of Charles Pilfold, of Effingham, Surrey. His father was the son and heir of Sir Bysshe Shelley, Bart. (d. 1815), whose baronetcy (1806) was a reward from the Whig party for political services. Sir Bysshe's father Timothy had emigrated to America, and he himself had been born in Newark, New Jersey; but he came back to England, and did well for himself by marrying successively two heiresses, the first, the mother of Timothy, being Mary Catherine, daughter of the Rev. Theobald Michell of Horsham. He was a handsome man of enterprising and remarkable character, accumulated a vast fortune, built Castle Goring, and lived in sullen and penurious retirement in his closing years. None of his talent seems to have descended to his son Timothy, who, except for being of a rather oddly self- assertive character, was undistinguishable from the ordinary run of commonplace country squires. The mother of the poet is described as beautiful, "and a woman of good abilities, but not with any literary turn; she was an agreeable letter- writer. The branch of the Shelley family to which the poet Percy Bysshe belonged traces its pedigree to Henry Shelley,

of Worminghurst, Sussex, who died in 1623. These Worminghurst or Castle Goring Shelleys are of the same stock as the Michelgrove Shelleys, who trace up to Sir William Shelley, judge of the common pleas under Henry VII., thence to a member of parliament in 141 5, and to the reign of Edward I., or even to the epoch of the Norman Conquest. The Worminghurst branch was a family of credit, but not pf special distinction, until its fortunes culminated under the above-named Sir Bysshe.

In the character of Percy Bysshe Shelley three qualities became early manifest, and may be regarded as innate: im- pressionableness or extreme susceptibility to external and internal impulses of feeling; a lively imagination or erratic fancy, blurring a sound estimate of solid facts; and a resolute repudiation

of outer authority or the despotism of custom. These qualities were highly developed in his earliest manhood, were active in his boyhood, and no doubt made some show even on the borderland between childhood and infancy. At the age of six he was sent to a day school at Warnham, kept by the Rev. Mr Edwards; at ten to Sion House School, Brentford, of which the principal was Dr Greenlaw, while the pupils were mostly sons of local tradesmen; at twelve (or immediately before that age, on the 29th of July 1804) to Eton. The headmaster of Eton, up to nearly the close of Shelley's sojourn in the school, was Dr Goodall, a mild disciplinarian; it is therefore a mistake to suppose that Percy (unless during his very brief stay in the lower school) was frequently flagellated by the formidable Dr Keate, who only became headmaster after Goodall. Shelley was a shy, sensitive, mopish sort of boy from one point of view — from another a very unruly one, having his own notions of justice, independence and mental freedom; by nature gentle, kindly and retiring — under provocation dangerously violent. He resisted the odious fagging system, exerted himself little in the routine of school-learning, and was known both as " Mad Shelley " and as " Shelley the Atheist." Some writers try to show that an Eton boy would be termed atheist without exhibiting any propensity to atheism, but solely on the ground of his being mutinous. However, as Shelley was a declared atheist a good while before attaining his majority, a shrewd suspicion arises that, if Etonians dubbed him atheist, they had some relevant reason for doing so.

Shelley entered University College, Oxford, in April 1810, returned thence to Eton, and finally quitted the school at mid- summer, and commenced residence in Oxford in October. Here he met a young Durham man, Thomas Jefferson Hogg, who had preceded him in the university by a couple of months; the two youths at once struck up a warm and intimate friendship. Shelley had at this time a love for chemical experiment, as well as for poetry, philosophy, and classical study, and was in all his tastes and bearing an enthusiast. Hogg was not in the least an en- thusiast, rather a cynic, but he also was a steady and well-read classical student. In religious matters both were sceptics, or indeed decided anti-Christians; whether Hogg, as the senior and more informed disputant, pioneered Shelley into strict atheism, or whether Shelley, as the more impassioned and un- flinching speculator, outran the easy-going jeering Hogg, is a moot point ; we incline to the latter opinion. Certain it is that each egged on the other by perpetual disquisition on abstruse subjects, conducted partly for the sake of truth and partly for that of mental exercitation, without on either side any disposition to bow to authority or stop short of extreme conclusions. The upshot of this habit was that Shelley and Hogg, at the close of some five months of happy and uneventful academic life, got expelled from the university. Shelley — for he alone figures as the writer of the " little syllabus," although there can be no doubt that Hogg was his confidant and coadjutor- throughout — published anonymously a pamphlet or flysheet entitled The Necessity of Atheism, which he sent round to bishops and all sorts of people as an invitation or challenge to discussion. It amounted to saying that neither reason nor testimony is adequate to establish the existence of a deity, and that nothing short of a personal individual self-revelation of the deity would be sufficient. The college authorities heard of the pamphlet, identified Shelley as its author, and summoned him before them — " our master, and two or three of the fellows." , The pamphlet was produced, and Shelley was required to say whether he had written it or not. The youth declined to answer the question, and was expelled by a written sentence, ready drawn up. Hogg was next sum- moned, with a result practically the same. The precise details of this transaction have been much controverted; the best evidence is that which appears on the college records, showing that both Hogg and Shelley (Hogg is there named first) were expelled for " contumaciously refusing to answer questions," and for " repeatedly declining to disavow " the authorship. Thus they were dismissed as being mutineers against academic authority, in a case pregnant with the suspicion — not the proof —

of atheism; but how the authorities could know beforehand that the two undergraduates would be contumacious and stiff against disavowal, so as to give warrant for written sentences ready drawn up, is nowhere explained. Possibly the sentences were worded without ground assigned, and would only have been produced in terrorem had the young men proved more malleable. The date of this incident was the 25th of March 181 1. Shelley and Hogg came up to London, where Shelley was soon left alone, as his friend went to York to study conveyancing. Percy and his incensed father did not at once come to terms, and for a while he had no resource beyond pocket-money saved up by his sisters (four in number altogether) and sent round to him, sometimes by the hand of a singularly pretty school-fellow, Miss Harriet Westbrook, daughter of a retired and moderately rich hotel-keeper. Shelley, in early youth, had a somewhat " priggish " turn for moralizing and argumentation, and a decided mania for proselytizing; his school-girl sisters, and their little Methodist friend Miss Westbrook, aged between fifteen and sixteen, must all be enlightened and converted to anti- Christianity. He therefore cultivated the society of Harriet, calling at the house of her father, and being encouraged in his assiduity by her much older sister Eliza. Harriet not unnaturally fell in love with him; and he, though not it would seem at any time ardently in love with her, dallied along the flowery pathway which leads to sentiment and a definite courtship. This was not his first love-affair; for he had but a very few months before been courting his cousin Miss Harriet Grove, who, alarmed at his heterodoxies, finally broke off with him — to his no small grief and perturbation at the time. It is averred, and seemingly with truth, that Shelley never indulged in any sensual or dissipated amour; and, as he advances in life, it becomes apparent that, though capable of the passion of love, and unusually prone to regard with much effusion of sentiment women who interested his mind and heart, the mere attraction of a pretty face or an alluring figure left him unenthralled. After a while Percy was reconciled to his father, revisited his family in Sussex, and then stayed with a cousin in Wales. Hence he was recalled to London by Miss Harriet Westbrook, who wrote complaining of her father's resolve to send her, back to her school, in which she was now regarded with repulsion as having become too apt a pupil of the atheist Shelley. He replied counselling resistance. " She wrote to say " (these are the words of Shelley in a letter to Hogg, dating towards the end of July 181 1) " that resistance was useless, but that she would fly with me, and threw herself upon my protection." Shelley, therefore, returned to London, where he found Harriet agitated and wavering; finally they agreed to elope, travelled in haste to Edinburgh, and there, on

the 28th of August, were married with the rites of the Scottish Church. Shelley, it should be understood, had by this time openly broken, not only with the dogmas and conventions of Christian religion, but with many of the institutions of Christian polity, and in especial with such as enforce and regulate marriage; he held — with William Godwin and some other theorists- — that marriage ought to be simply a voluntary relation between a man and a woman, to be assumed at joint option and terminated at the after-option of either party. If, therefore, he had acted upon his personal conviction of the right, he would never have wedded Harriet, whether by Scotch, English or any other law; but he waived his own theory in favour of the consideration that in such an experiment the woman's stake, and the dis- advantages accruing to her, are out of all comparison with the man's. His conduct, therefore, was so far entirely honourable; and, if it derogated from a principle of his own (a principle which, however contrary to the morality of other people, was and always remained matter of genuine conviction on his individual part), this was only in deference to a higher and more imperious standard of right.

Harriet Shelley was not only beautiful; she was amiable, accommodating, adequately well educated and well bred. She liked reading, and her reading was not strictly frivolous. But she could not (as Shelley said at a later date) "feel poetry and understand philosophy." Her attractions were all on the surface;

there was (to use a common phrase) " nothing particular in her." For nearly three years Shelley and she led a shifting sort of life upon an income of £400 a year, one-half of which was allowed (after his first severe indignation at the mesalliance was past) by Mr Timothy Shelley, and the other half by Mr Westbrook. The couple left Edinburgh for York and the society of Hogg; broke with him upon a charge made by Harriet, and evidently fully believed by Shelley at the time, that, during a temporary absence of his upon business in Sussex, Hogg had tried to seduce her (this quarrel was entirely made up at the end of about a year) ; moved off to Keswick in Cumberland, where they received kind attentions from Southey, and some hospitality from the duke of Norfolk, who, as chief magnate in the Shoreham region of Sussex, was at pains to reconcile the father and his too unfilial heir; sailed thence to Dublin, where Shelley was eager, and in some degree prominent, in the good cause of Catholic

emancipa- tion, conjoined with repeal of the union; crossed to Wales, and lived at Nant-Gwillt, near Rhayader, then at Lynmouth in Devonshire, then at Tanyrallt in Carnarvonshire. All this was between September 181 1 and February 181 3. At Lynmouth an Irish servant of Shelley's was sentenced to six months' im- prisonment for distributing and posting up printed papers, bearing no printer's name, of an inflammatory or seditious tendency — being a Declaration of Rights composed by the youthful reformer, and some verses of his named The Devil's Walk. At Tanyrallt Shelley was (according to his own and Harriet's account, confirmed by the evidence of Miss Westbrook, the elder sister, who continued an inmate in most of their homes) attacked on the night of 26th February by an assassin who fired three pistol-shots. It was either a human assassin or (as Shelley once said) " the devil." The motive of the attack was undefined; the fact of its occurrence was generally disbelieved, both at the time and by subsequent inquirers. Shelley was full of wild unpractical notions; he dosed himself occasionally with laudanum as a palliative to spasmodic pains; he was given to strange assertions and romancing narratives (several of which might properly be specified here but for want of space), and was not incapable of conscious fibbing. His mind no doubt oscillated at times along the line which divides sanity from insane delusion. It is now, however, at last proved that he did not invent such a monstrous story to serve a purpose. The Century Magazine for October 1905 contained an article entitled " A Strange Adventure of Shelley's," by Margaret L. Croft, which shows that a shepherd close to Tanyrallt, named Robin Pant Evan, being irritated by some well-meant acts of Shelley in terminating the lives of dying or diseased sheep, did really combine with two other shepherds to scare the poet, and Evan was the person who played the part of " assassin." He himself avowed as much to members of a family. Greaves, who were living at Tanyrallt between 1847 and 1865. This was the break-up of the residence of the Shelley s at Tanyrallt; they revisited Ireland, and then settled for a while in London. Here, in June 1813, Harriet gave birth to her daughter Ianthe Eliza (she married a Mr Esdaile, and died in 1876). Here also Shelley brought out his first poem of any importance, Queen Mab; it was privately printed, as its exceed- ingly aggressive tone in matters of religion and morals would not allow of publication. In July the Shelleys took a house at Bracknell near Windsor Forest, where they had congenial neighbours, Mrs Boinville and her family.

The speculative sage whom Shelley especially reverenced was William Godwin, the author of Political Justice and of the romance

Caleb Williams; in 1796 he had married Mary Wollstone- craft, authoress of The Rights of Woman, who died shortly after giving birth, on the 30th of August 1797, to a daughter Mary. With Godwin Shelley had opened a volunteered corre- spondence late in 181 1, and he had known him personally since the winter which closed 1812. Godwin was then a bookseller, living with his second wife, who had been a Mrs Clairmont; there were four other inmates of the household, two of whom call for some mention here — Fanny Wollstonecraft, the daughter of the authoress and Mr Imlay, and Claire (Clara Mary Jane), the daughter of Mrs Clairmont. Fanny committed suicide in

October 1816, being, according to some accounts which remain unverified, hopelessly in love with Shelley; Claire was closely associated with all his subsequent career. It was towards May 1814 that Shelley first saw Mary Wollstonecraft Godwin as a grown-up girl (she was well on towards seventeen) ; he instantly fell in love with her, and she with him. Just before this, on the 24th of March, Shelley had remarried Harriet in London, apparently with a view to strengthening his position in his relations With his father as to the family property; but, on becoming enamoured of Mary, he seems to have rapidly made up his mind that Harriet should not stand in the way. She was at Bath while he was in London. They had, however, met again in London and come to some sort of understanding before the final crisis arrived — Harriet remonstrating and indignant, but incapable of effective resistance — Shelley sick of her companionship, and bent upon gratifying his own wishes, which as we have already seen were not at odds with his avowed principles of conduct. For some months past there had been bickerings and misunderstandings between him and Harriet, aggravated by the now detested presence of Miss Westbrook in the house; more than this cannot be said, and it seems dubious whether more will be hereafter known. Shelley, and not he alone, alleged grave misdoing on Harriet's part — perhaps mistakenly. The upshot came on the 28th of July, when Shelley aided Mary to elope from her father's house, Claire Clairmont deciding to accompany them. They crossed to Calais, and proceeded across France into Switzerland. Godwin and his wife were greatly incensed. Though he and Mary Wollstonecraft had entertained and avowed bold opinions regarding the marriage-bond, similar to Shelley's own, and had in their time acted upon these opinions, it is not clearly made out that Mary Godwin had ever been encouraged by paternal influence to think or do the like. Shelley and she chose to act upon their own likings and responsibility — he disregarding any claim which Harriet had upon him, and Mary

setting at nought her father's authority. Both were prepared to ignore the law of the land and the rules of society.

The three young people returned to London in September. In the following January 1815 Sir Bysshe Shelley died, and Percy, who had, lately been in great money-straits, became the im- mediate heir to the entailed property inherited by his father Sir Timothy. This entailed property seems to have been worth £6000 per annum, or little less. There was another very much larger property which Percy might shortly before have secured to himself, contingently upon his father's death, if he would have consented to put it upon the same footing of entail; but this he resolutely refused to do, on the professed ground of his being opposed upon principle to the system of entail; there- fore, on his grandfather's death the larger property passed wholly away from any interest which Percy might have had in it, in use or in expectancy. He now came to an understanding with his father as to the remaining entailed property; and, giving up certain future advantages, he received henceforth a regular income of £1000 a year. Out of this he assigned £200 a year to Harriet, who had given birth in November to a son, Charles Bysshe (he died in 1826). Shelley, and Mary as well, were on moderately good terms with Harriet, seeing her from time to time. His peculiar views as to the relations of the sexes appear markedly again in his having (so it is alleged) invited Harriet to return to his and Mary's house as a domicile; a curious arrangement which of course did not take effect. He had, undoubtedly, while previously abroad with Mary, invited Harriet to stay in their immediate neighbourhood. Shelley and Mary (who was naturally always called Mrs Shelley) now settled at Bishopgate, near Windsor Forest; here he produced his first excellent poem, Alastor, or the Spirit of Solitude, which was published soon after- wards with a few others. Thomas Love Peacock was one of his principal associates at Bishopgate.

In May 18 16 the pair left England for Switzerland, together with Miss Clairmont, and their own infant son William. They went straight to Secheron, near Geneva; Byron, whose separation from his wife had just then taken place, arrived there immediately afterwards. A great deal of controversy has arisen as to the

motives and incidents of this foreign sojourn. The clear fact is that Miss Clairmont, who had a fine voice and some inclination for the

stage, had seen Byron, as connected with the management of Drury Lane theatre, early in the year, and an amorous intrigue had begun between them in London. Prima facie it seems quite reasonable to suppose that she had explained the facts to Shelley or to Mary, or to both, and had induced them to convoy her to the society of Byron abroad; were this finally established as the fact, it would show no inconsistency of conduct, or breach of his own code of sexual morals, on Shelley's part. On the other hand, documentary evidence exists showing that Mary was totally ignorant of the amour shortly before they went abroad. Whether or not they knew of it while they and Claire were in daily intercourse with Byron, and housed close by him on the shore of the Lake of Geneva, may be left unargued. The three returned to London in September 1816, Byron remaining abroad; and in January 181 7 Miss Clairmont gave birth to his daughter named Allegra.

The return of the Shelleys was closely followed by two suicides — first that of Fanny Wollstonecraft (already referred to), and second that of Harriet Shelley, who on the 9th of November drowned herself in the Serpentine. The body was not found until the 10th of December. The latest stages of the lovely and ill-starred Harriet's career have never been very explicitly recorded. It seems that she formed a connexion with some' gentleman from whom circumstances or desertion separated her, that her habits became intemperate, and that she was treated with contumelious harshness by her sister during an illness of their father. She had always had a propensity (often laughed at in earlier and happier days) to the idea of suicide, and she now carried it out in act — possibly without anything which could be regarded as an extremely cogent predisposing motive, although the total weight of her distresses, accumulating within the past two years and a half, was beyond question heavy to bear. Shelley, then at Bath, hurried up to London when he heard of Harriet's death, giving manifest signs of the shock which so terrible a catastrophe had produced on him. Some self-reproach must no doubt have mingled with his affliction and dismay ; yet he does not appear to have considered himself gravely in the wrong at any stage in the transaction, and it is established that in the train of quite recent events which im- mediately led up to Harriet's suicide he had borne no part.

This was the time when Shelley began to see a great deal of Leigh Hunt, the poet and essayist, editor of the Examiner; they were close friends, and Hunt did something to uphold the reputation of Shelley as a pbet — which, we may here say once for all, scarcely obtained any public acceptance or solidity during his brief lifetime. The death

of Harriet having removed the only obstacle to a marriage with Mary Godwin, the wedding ensued on the 30th of December 1816, and the married couple settled down at Great Marlow in Buckinghamshire. Their tranquillity was shortly disturbed by a Chancery suit set in motion by Mr Westbrook, who asked for the custody of his two grand- children, on the ground that Shelley had deserted his wife and intended to bring up his offspring in his own atheistic and anti-social opinions. Lord Chancellor Eldon delivered judgment on the 27th of March 1817. He held that Shelley, having avowed condemnable principles of conduct, and having fashioned his own conduct to correspond, and being likely to inculcate the same principles upon his children, was unfit to have the charge of them. He appointed as their curator Dr Hume, an orthodox army- physician, who was Shelley's own nominee. The poet had to pay for the maintenance of the children a sum which stood eventually at £120 per annum; if it was at first (as generally stated) £200, that was no more than what he had previously allowed to Harriet. This is the last incident of marked importance in the perturbed career of Shelley; the rest relates to the history of his mind, the poems which he produced and published, and his changes of locality in travelling. The first ensuing poem was The Revolt of Islam, referred to near the close of this article.

In March 181 8, after an illness which he regarded (rightly or wrongly) as a dangerous pulmonary attack, Shelley, with his

wife, their two infants William and Clara, and Miss Clairmont and her baby Allegra, went off to Italy, where the short remainder of his life was passed. Allegra was soon sent on to Venice, to her father, who, ever since parting from Miss Clairmont in Switzer- land, showed a callous and unfeeling determination to see and know no more about her. In 1818 the Shelleys — always nearly with Miss Clairmont in their company— were in Milan, Leghorn, the Bagni di Lucca, Venice and its neighbourhood, Rome, and Naples; in 1819 in Rome, the vicinity of Leghorn, and Florence (both their infants were now dead, but a third was born late in 1 8 19, Percy Florence Shelly, who in 1844 inherited the baron- etcy); in 1820 in Pisa the Bagni di Pisa (or di San Giuliano), and Leghorn; in 1821 in Pisa and with Byron in Ravenna; in 1822 in Pisa and on the Bay of Spezia, between Lerici and Sari Terenzio. The incidents of this period are but few, and of no great importance apart from their bearing upon the poet's writings. In Leghorn he knew Mr and Mrs Gisborne, the latter a once intimate friend of Godwin; she taught Shelley Spanish, and he was eager to promote a project for a steamer to be built by her son by a former marriage, the engineer Henry Reveley; it would have been

the first steamer to navigate the Gulf of Lyons. In Pisa he formed a sentimental intimacy with the Contessina Emilia Viviani, a girl who was pining in a convent pending her father's choice of a husband for her; this impassioned but vague and fanciful attachment— which soon came to an end, as Emilia's character developed less favourably in the eyes of her Platonic adorer — produced the transcendental love-poem of Epipsychidion in 182 1. In Ravenna the scheme of the quarterly magazine the Liberal was concerted by Byron and Shelley, the latter being principally interested in it with a view to benefiting Leigh Hunt by such an association with Byron. In Pisa Byron and Shelley were very constantly together, having in their company at one time or another Shelley's cousin and schoolfellow Captain Thomas Medwin (1788-1869), Lieutenant Edward Elliker Williams (1793-1822) and his wife, to both of whom the poet was very warmly attached, and Captain Edward John Trelawny, the adventurous and romantic-natured seaman, who has left important and interesting reminiscences of this period. Byron admired very highly the generous, unworldly and enthu- siastic character of Shelley, and set some value on his writings; Shelley half -worshipped Byron as a poet, and was anxious, but in some conjunctures by no means able, to respect him as a man. In Pisa he knew also Prince Alexander Mavrocordato, one of the pioneers of Grecian insurrection and freedom; the glorious cause fired Shelley, and he wrote the drama of Hellas (1821).

The last residence of Shelley was the Casa Magni, a bare and exposed dwelling on the Gulf of Spezia. He and his wife, with the Williamses, went there at the end of April 1822 to spend the summer, which proved an arid and scorching one. Shelley and Williams, both of them insatiably fond of boating, had a small schooner named the " Don Juan " (or more properly the " Ariel "), built at Genoa after a design which Williams had procured from a naval friend, but the reverse of safe. They received her on the 12th of May, found her rapid and alert, and on the 1 st of July started in her to Leghorn, to meet Leigh Hunt, whose arrival in Italy had just been notified. After doing his best to set things going comfortably between Byron and Hunt, Shelley returned on board with Williams on the 8th of July. It was a day of dark, louring, stifling heat. Trelawny took leave of his two friends, and about half-past six in the evening found himself startled from a doze by a frightful turmoil of storm. The " Don Juan " had by this time made Via Reggio; she was not to be seen, though other vessels which had sailed about the same time were still discernible. Shelley, Williams, and their only companion, a sailor-boy, perished in the squall. The exact nature of the catastrophe was

from the first regarded as somewhat disputable. The condition of the " Don Juan " when recovered did not favour any assumption that she had capsized in a heavy sea — rather that she had been run down by some other vessel, a felucca or fishing-smack. In the absence of any counter- evidence this would be supposed to have occurred by accident; but a rumour, not strictly verified and certainly not refuted,

exists that an aged Italian seaman on his deathbed confessed that he had been one of the crew of the fatal felucca, and that the collision was intentional, as the men had plotted to steal a sum of money supposed to be on the " Don Juan," in charge of Lord Byron. In fact there was a moderate sum there, but Byron had neither embarked nor intended to embark. This may perhaps be the true account of the tragedy; at any rate Trelawny, the best possible authority on the subject, accepted it as true. He it was who laboriously tracked out the shore- washed corpses of Williams and Shelley, and who undertook the burning of them, after the ancient Greek fashion, on the shore near Via Reggio, on the 15th and 16th of August. The great poet's ashes were then collected, and buried in the new Protestant cemetery in Rome. He was, at the date of his untimely death, within a month of completing the thirtieth year of his age — a surprising example of rich poetic achievement for so young a man.

The character of Shelley can be considered according to two different standards of estimation. We can estimate the original motive forces in his character; or we can form an opinion of his actions, and thence put a certain construction upon his personal qualities. We will first try the latter method. It cannot be denied by his admirers and eulogists, and is abundantly clear to his censors, that his actions were in some considerable degree abnormal, dangerous to the settled basis of society, and marked by headstrong and undutiful presumption. But it is remarkable that, even among the censors of his conduct, many persons are none the less impressed by the beauty of his character; and this leads us back to our first point — the original motive forces in that. Here we find enthusiasm, fervour, courage (moral and physical), an unbounded readiness to act upon what he considered right principle, however inconvenient or disastrous the consequences to himself, sweetness and indulgence towards others, extreme generosity (he appears to have given Godwin, though sometimes bitterly opposed to him, between £4000

and £5000), and the prin- ciple of love for humankind in abundance and superabundance. He respected the truth, such as he conceived it to be, in spiritual or speculative matters, and respected no construction of the truth which came to him recommended by human authority. No man had more hatred or contempt of custom and prescription; no one had a more authentic or vivid sense of universal charity. The same radiant enthusiasm which appeared in his poetry as idealism stamped his speculation with the conception Of perfectibility and his character with loving emotion.

In person Shelley was attractive, winning and almost beautiful, but not to be called handsome. His height was nearly 5 ft. 11; he was slim, agile, and strong, with something of a stoop; his complexion brilliant, his hair abundant and wavy, dark brown but early beginning to grizzle; the eyes, deep blue in tint, have been termed " stag-eyes " — large, fixed and beaming. His voice was wanting in richness and suavity — high-pitched, and tending to the screechy; his general aspect, though extremely variable according as his mood of mind and his expression shifted, was on the whole uncommonly juvenile. The only portrait of Shelley, from which some idea of his looks used to be formed, is that painted by an amateur, Miss Curran, in 1819; Mrs Shelley, later, pronounced it to be " in many things very like." This is now in the National Portrait Gallery, together with a quasi- duplicate of it painted by Clint, chiefly from Miss Curran's likeness, and partly from a water colour (now lost) by Lieutenant Williams. In 1005 {Century Magazine) another portrait was brought forward: a pencil sketch taken in the last month of the poet's life by an American artist, William E. West, followed by an oil-painting founded on that sketch. The two works differ very considerably, and neither of them resembles Miss Curran's portrait, yet we incline to believe that the sketch was really taken from Shelley.

If we except Goethe (and leave out of count any living writers, whose ultimate value cannot at present be assessed), we must consider Shelley to be the supreme poet of the new era which, beginning with the French Revolution, remains continuous into our own day. Victor Hugo comes nearest to him in

poetic stature, and might for certain reasonr, be even preferred to him; Byron and Wordsworth also have their numerous champions — not to speak of Tennyson or Browning. The grounds, however, on which Shelley may be set highest of all are mainly three. He excels all his competitors in ideality, he excels them in music, and he excels them in importance. By importance we here mean the direct import of the work performed, its con- trolling power over the reader's

thought and feeling, the con- tagious fire of its white-hot intellectual passion, and the long reverberation of its appeal. Shelley is emphatically the poet of the future. In his own day an alien in the world of mind and invention, and in our day but partially a denizen of it, he appears destined to become, in the long vista of years, an informing presence in the innermost shrine of human thought. Shelley appeared at the time when the sublime frenzies of the French revolutionary movement had exhausted the elasticity of men's thought — at least in England — and had left them flaccid and stolid; but that movement prepared another in which revolution was to assume the milder guise of reform, conquering and to conquer. Shelley was its prophet. As an iconoclast and an idealist he took the only position in which a poet could advantageously work as a reformer. To outrage his contem- poraries was the condition of leading his successors to triumph and of personally triumphing in their victories. Shelley had the temper of an innovator and a martyr; and in an intellect wondrously poetical he united speculative keenness and humani- tarian zeal in a degree for which we might vainly seek his pre- cursor. We have already named ideality as one of his leading excellences. This Shelleian quality combines, as its constituents, sublimity, beauty and the abstract passion for good. It should be acknowledged that, while this great quality forms the chief and most admirable factor in Shelley's poetry, the defects which go along with it mar his work too often — producing at times vagueness, unreality and a pomp of glittering indistinctness, in which excess of sentiment welters amid excess of words. This blemish affects the long poems much more than the pure lyrics ; in the latter the rapture, the music and the emotion are in exquisite balance, and the work has often as much of delicate simplicity as of fragile and flower-like perfection.

Some of Shelley's principal writings have already been mentioned above; we must now give a brief account of others. Of his early work prior to Queen Mab — such romances as Zastrozzi and St Irvyne, such verse as the Poems by Victor and Cazire, and the Fragments of Margaret Nicholson — we ain only here say that they are intrinsically worthless. Alastor was succeeded (1817) by The Revolt of Islam, a poem of no common length in the Spenserian stanzaˆ preaching bloodless revolution; it was written in a sort of friendly competition with Keats. (who produced Endymion) and is amazingly fine in parts, but as a whole somewhat long-drawn and exhausting. This transcen- dental epic (for such it may be termed) was at first named Loon and Cythna, or the Revolution of the Golden City, and the lovers of the story were then brother and sister as well as lovers

— , an experiment upon British endurance which the publishers would not connive at. The year 181 8 produced Rosalind and Helen, a comparatively weak poem, begun in England and finished in Italy, and Julian and Maddalo, a very strong one, written in the neighbourhood of Venice — demonstrating in Shelley a singular power of seeing ordinary things with direct- ness, and at once figuring them as reality and transfiguring, them into poetry. In each of these two poems Shelley gives a quasi- portraiture of himself. The next year, 1819, was his culmination, producing as it did the grand tragedy of The Cenci and the sublime ideal drama Prometheus Unbound, composed partly on the ruins of the Baths of Caracalla in Rome. This last we have no hesitation in calling his masterpiece. It embodies, in forms of surpassing imagination and beauty, Shelley's deepest and most daring conceptions. Prometheus, the human mind and will, has invested with the powers proper to himself Jupiter, the god of heaven, who thereupon chains and torments Prometheus and oppresses mankind; in other words, the anthropomorphic god of religion is a creation of the human mind, and both the

mind of man and man himself are enslaved as long as this god exercises his delegated but now absolute power. Prometheus, who is from of old wedded to Asia, or Nature, protests against and anathematizes the usurper enthroned by himself. At last the anathema (although Prometheus has revoked it by an act of self-conquest) takes effect: Eternity, Demogorgon, dismisses Jupiter to unending nothingness. Prometheus is at once un- bound, the human mind is free; be is reunited to his spouse Nature, and the world of man passes from thraldom and its degradation into limitless progression, or (as the phrase goes) perfectibility, moral and material. This we regard as in brief the argument of Prometheus Unbound. It is closely analogous to the argument of the juvenile poem Queen Mob, but so raised in form and creative touch that, whereas to write Queen Mab was only to be an ambitious and ebullient tiro, to invent Pro- metheus Unbound was to be the poet of the future. The Witch of Atlas (1820) is the most perfect work among all Shelley's longer poems, though it is neither the deepest nor the most interesting. It may be rated as a pure exercise of roving imagina- tion — guided, however, by an intense sense of beauty, and by its author's exceeding fineness of nature. The poem has often been decried as practically unmeaning; we do not subscribe to this opinion. The " witch " of this subtle and magical inven- tion seems to

represent that faculty which we term " thefancy "; using this assumption as a clue, we find plenty of meaning in the poem, but necessarily it is fanciful or volatile meaning. The elegy on Keats, Adonais, followed in 1821; the Triumph of Life, a mystical and most impressive allegory, constructed upon lines marked out by Dante and by Petrarch, was occupying the poet up to the time of his death. The stately fragment which remains is probably a minor portion of the projected whole. The translations — chiefly from Homer, Euripides, Calderon and Goethe — date from 1819 to 1822, and testify to the poetic endowment of Shelley not less absolutely than his own original compositions; there are also prose translations from Plato.

Shelley, it will be seen, was not only a prolific but also a versatile poet. Works so various in faculty and in form as The Revolt of Islam, Julian and Maddalo, The Ccnci, Prometheus Unbound, Epipysychidion, and the grotesque effusions of which Peter Bell the Third is the prime example, added to the consummate array of lyrics, have seldom to be credited to a single writer — one, moreover, who died before he was thirty years of age. In prose Shelley could be as admirable as in poetry. His letters to Thomas Love Peacock and others, and his uncompleted Defence of Poetry, are the chief monuments of his mastery in prose; and certainly no more beautiful prose — -having much of the spirit and the aroma of poetry, yet without being distorted out of its proper essence — is to be found in the English language.

The chief original authorities for the life of Shelley (apart from his own writings, which contain a good deal of autobiography, if heed-fully sifted and collated) are — (1) the notices by Mrs Shelley inter-spersed in her edition of the Poems; (2) Hogg's amusing, discerning and authentic, although in some respects exaggerated, book; (3) Trelawny's Records; (4) the Life by Medwin; and (5) the articles written by Peacock. Some other writers, especially Leigh Hunt, might be mentioned, but they come less close to the facts. Among biographical books produced since Shellev's death, by authors who did not know him personally, the leading work is the Life by Professor Dowden (2 vols., 1886), which embodies important materials imparted by the Shelley family. The Real Shelley, by J. C. Jeaffreson (1885), is controversial in method and decidedly hostile in tendency, and tries a man of genius by tests far from well adapted (in our opinion) to bring out a right result ; it contains, however, an ample share of solid information and sharp disquisition. The memoir by W. M. Rossetti, prefixed to an edition of Shelley's Poems in two forms of publication (1870 and 1878), was an endeavour to formulate in brief space, out of the then confused and conflicting

records, an accurate account of Shelley — admiring, but not uncandidly one-sided. There is valuable material in Lady Shelley's Shelley Memorials, and in Dr Garnett's Relics of Shelley; and the memoir by J. Aldington Symonds, in the English Men of Letters series, is characteristic of the writer. The most complete edition of Shelley's poems is now the Oxford edition, edited by Thomas Hutchinson (Clarendon Press, T905), which includes several pieces not in any other edition, and uses the emendations, &c, published by Mr CD. Locock (1903) from examination of the MSS. in the Bodleian Library. Mr Buxton

Forman's earlier and excellent edition includes the writings in prose, as well as in verse. (W. M. R.)

SHELLEY'S CASE, RULE IN, an important decision in the law of real property. The litigation was brought about by the settlement made by Sir William Shelley (c. 1480-1549), a judge of the common pleas, of an estate which he had purchased on the dissolution of Sion Monastery. After prolonged argument the celebrated rule was laid down by Lord Chancellor Sir Thomas Bromley, who presided over an assembly of all the judges to hear the case in Easter term 1580-1581. The rule may be stated as follows: when an ancestor by any gift or conveyance takes an estate of freehold and in the same gift or conveyance an estate is limited, either mediately or immediately, to his heirs or the heirs of his body, in such a case the word " heirs " is a word of limitation and not of purchase; that is to say, the estate of the ancestor is not a life or other freehold estate with remainder to the heirs or heirs of the body, but an estate in fee or an estate tail according to circumstances. The rule is a highly technical one, and has led to much litigation and in many cases without a doubt to the defeat of a testator's intentions. It is said to have had its origin in the wish of the law to preserve to the lords their right of wardship, which would have been ousted by the heir taking as purchaser and not as successor. The rule is reported by Lord Coke in 1 Reports 93 b. (see also Van Grutten v. Foxwell, 1897, A.C. 658). In the United States the rule in Shelley's case was at one time in operation as a part of the common law, but it has been repealed by statute in most states.

SHELL-HEAPS, or Kitchen-midden (D&n.Kjdkken-modding), prehistoric refuse heaps or mounds found in all quarters of the. globe, which consist chiefly of the shells of edible molluscs mixed with fragments of animal bones, and implements of stone, bone and horn. They may sometimes, as in the Straits of Magellan, be seen in process of formation. Many having a prehistoric origin have been examined, notably on the eastern coast of Denmark. These were at

first thought to be raised beaches, but a cursory examination at once proved their artificial construction. Further investigation by archaeologists proved these shell-heaps to belong to a very ancient period, probably the early part of the Neolithic age, " when the art of polishing flint implements was known, but before it had reached its greatest development " (Lord Avebury, Prehistoric Times, 6th ed. p. 235). They contained the remains of quadrupeds, birds and fish, which served as the food of the prehistoric inhabitants. Among the bones were those of the wild bull or aurochs, beaver, seal and great auk, all now extinct or rare in this region. Moreover, a striking proof of the antiquity of these shell-heaps is that they contain full-sized shells of the common oyster, which cannot live at present in the brackish waters of the Baltic except near its entrance, the inference being that the shores where the oyster at that time flourished were open to the salt sea. Thus also the eatable cockle, mussel and periwinkle abounding in the kitchen-middens are of full ocean size, whereas those now living in the adjoining waters are dwarfed to a third of their natural size by the want of saltness. It thus appears that the connexion between the ocean and the Baltic has notably changed since the days of these rude stone-age peoples. The masses of debris were in some places ten to twenty feet thick and stretched a thousand feet. It does not appear that the men of the kitchen-middens had any knowledge of agriculture, no traces of grain of any sort being found. The only vegetable remains were burnt pieces of wood and some charred substance, possibly a sea-plant used in the production of salt. Flat stones' blackened with fire, forming hearths, were also found. That periods of scarcity must have been frequent in the absence of cereals is indicated by the , discovery of bones of the fox, wolf and other carnivora, which would hardly have been eaten from choice. The kitchen-middens of Denmark were not mere summer- quarters: the ancient fishermen appear to have stayed in the neighbourhood for two-thirds, if not the whole, of the year. This is suggested by an examination of the bones of the wild animals, from which it is often possible to tell the time of year when they were killed. Thus the remains of thewild swan {Cygnus musicus),

a winter visitor, leaving the Danish coast in March and returning in November, are found in abundance. Additional proof is afforded among the mammalian remains by two periodical phenomena, the shedding of the stag's antlers and the birth and growth of the young. The flint implements found include flakes, axes, awls, sling-stones or

net-weights, and rude lance- heads. A fragment of one polished axe was found at Havelse which had been worked up into a scraper Small pieces of coarse pottery are also met with. The Danish kitchen-midden men were not cannibals. In physique they seem to have resembled the Lapps, a race of small men with heavy over- hanging brows and round heads. The excavation of the Danish shell-heaps was followed by the investigation of others in other countries. At Omori (Japan), in the Aleutian Islands, in British Columbia, Oregon and California shell-mounds were explored, always with the result of proving that the present populations had been preceded by ruder tribes of great antiquity. On the Atlantic coast of Brazil shell-heaps, which must have taken thousands of years to accumulate, are now overgrown with dense forests.

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SHELL-MONEY, a medium of exchange common to many primitive races, consisting of sea shells or pieces of them worked into beads or artificially shaped. Shell-money has not been re- stricted to one quarter of the globe, but in some form or other appears to have been almost universal. It has been found in America, Asia, Africa and Australia. The shell used by the Indians of Alaska and California was the Dentalium pretiosum, a species of tusk-shell found along the north-west coast. It received its name from its tusk-like appearance, and was valued by length and not by the number of shells. The usual method of measuring was by the finger-joints, and the ligua, the highest denomination of their coinage, consisted of twenty-five shells strung together, which from end to end made a total measurement of a fathom (6 ft.) or thereabouts, equalling in English coinage about £50. Farther south on the shore of California the Indians used the Saxidomus gracilis or Tapis gracilis, while in the islands close to the littoral the LUornia obesa was in commonest use.

But the shell most used by primitive peoples has always been the Cypraea tnoneta, or money-cowry (see Cowry). It is most abundant

in the Indian Ocean, and is collected more particularly in the Maldive Islands, in Ceylon, along the Malabar coast, in Borneo and other 1 East Indian islands, and in various parts of the African coast from Ras Hafun. to Mozambique. It was formerly in familiar use in Bengal, where, though it required 3840 to make a rupee, the annual importation was valued at about £30,000. In western Africa it was, until past the middle of the 19th century, the usual tender, and before the abolition of the slave trade there were large shipments of cowry shells to some of the English ports for reshipment to the slave coast. As the value of the cowry was very much greater in West Africa than in the regions from which the supply was obtained, the trade was extremely lucrative, and in some cases the gains are said to have been 500%. The use of the cowry currency gradually spread inland in Africa, and about 1850 Heinrich Barth found it fairly recognized in Kano, Kuka, Gando, and even Timbuktu. Barth relates that in Muniyoma, one of the ancient divisions of Bornu, the king's revenue was estimated at 30,000,000 shells, every full-grown man being required to pay annually 1000 shells for himself, 1000 for every pack-ox, and 2000 for every slave in his possession. In the countries on the coast the shells were fastened together in strings of 40 or 100 each, so that fifty or twenty strings represented a dollar; but in the interior they were laboriously counted one by one,

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or, if the trader were expert, five by five. The districts mentioned above received their supply of kurdi, as they were called, from the west coast; but the regions to the north of Unyamwezi, where they were in use under the name of simbi, were dependent on Moslem traders from Zanzibar. The shells are still used in the remoter parts of Africa, but are yearly tending to give way to ordinary currency. The shell of the land-snail, Achatina monetaria, cut into circles with an open centre has been long used as coin in Benguella, Portuguese West Africa. In parts of Asia Cyproea annulus, the ring cowry, so-called from the bright orange-coloured ring on the back or upper side of the shell, was commonly used. Many specimens were found by Sir Henry Layard in his excavations at Nirrirud in 1845-1851.

In north Australia different shells were used, one tribe's shell being often absolutely valueless in the eyes of another tribe. In the islands north of New Guinea the shells are broken into flakes. Holes are bored through these flakes, which are then valued by length, as in the case of the American tusk- shell, the measuring, however, being done between the nipples of the breasts instead of by the finger-joints. Two shells are used by these Pacific islanders, one a cowry found on the

New Guinea coast, and the other the common pearl shell broken into flakes. As late as 1882 local trade in the Solomon Islands was carried on by means of a coinage of shell beads, small shells laboriously ground down to the required size by the women. No more than were actually needed were made, and as the process was difficult, the value of the coinage was satisfactorily maintained. The custom of breaking or flaking shells was common among some of the American Indian tribes, but the shells so manipulated were of the ponderous Pachyderma crassatelloides species, while in the South Pacific Islands the Oliva cameola was used . –

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SHELTON, THOMAS (fl.- 1612-1620), English translator of Don Quixote. In the dedication of The delightfull history of the wittie knight, Don Quishote (161 2) he explains to his patron, Lord Howard de Walden, afterwards 2nd Earl of Suffolk, that he had translated Don Quixote from Spanish into English some five or six years previously in the period of forty days for a " very dear friend " who was unable to understand the original. Shelton did not use the original edition of Cervantes, but one published in Brussels'in 1607. On the appearance of the Brussels imprint of the second part of Don Quixote in 1616, he translated that also into English, completing his task in 1620, and printing at the same time a revised edition of the first part. His perform- ance- has become a classic among English translations for its racy, spirited rendering of the original. Light was thrown on Thomas Shelton's personal history by the researches of Mr Alexander T. Wright in a paper published in October 1898. Among the kinsfolk of the earl of Suffolk were three persons bearing the name Thomas Shelton, and though all died before 1600 he was probably a member of the same family. It seems safe to identify him with the Thomas Shelton who wrote a sonnet prefixed to the Restitution of Decayed Intelligence (1605) of Richard Verstegan, who was most likely the friend referred to in Shelton's preface, for there is reason to believe that both of them were then employed in a matter of doubtful loyalty, the intrigues of the Roman Catholics in

England. He was acquainted with the " cries of the wild Irish," and seems to have been honestly employed in carrying letters to persons in England from Lord Deputy Fitzwilliam at Dublin Castle. But in 1599 he apparently acted as agent for Florence McCarthy to offer his service to the king of Spain, a commission for which his knowledge of Spanish especially 'fitted him. Soon afterwards an official ' precis of the facts was drawn up, in which Shelton was implicated

by name. A second version of this document in 1617 is actually signed by him, but all reference to his share in the matter is omitted. Lady Suffolk, the wife of his patron, received yearly £1000 in secret service money from the Spanish king, and Shelton may have been her accomplice. If the " many affairs " of his preface were official he would not wish to call atten- tion to his antecedents by owning friendship with Verstegan. ,

The 1612 edition is available in Mr Fitzmaurice Kelly's reprint for the Tudor Translations (1892); that of 1620 is reproduced in Macmillan's " Library of English Classics " with an introduction by Mr A. W. Pollard, who incorporates the suggestions made by Mr A. T. Wright in his Thomas Shelton, Translator.

SHEM (Hebrew for " name, renown, posterity "), in the Bible, the eldest of the three sons of Noah, whose superiority over Canaan is reflected in the tradition that Noah pronounced a curse upon the latter (Gen. ix. 20-27). In the genealogies (x. 21 sqq.), Shem numbers among his descendants Assyrian, Arabian, Aramaean and Hebrew populations, whence the ethnic Semitic (strictly speaking, Shemitic) has been coined as a con- venient term for these peoples. It is not altogether scientific, since the Lydians (Lud) and Elamites are included among Shem's " sons," apparently on account of their geographical position or because of their indebtedness to Assyrian culture. On the traditions of Shem, see E. Meyer, Israeliten u. Nach- barslamme (Halle, 1906), pp. 219 sqq.

SHEMAKHA, a town of Russian Transcaucasia, in the govern- ment of Baku, 70 m. W. of the town of Baku, and in 40° 38′ N. and 48 40′ E. It has some 20,000 inhabitants, consisting of Tatars (75%), Armenians and Russians. Shemakha was the capital of the khanate of Shirvan, and was known to the Roman geographer Ptolemy as

Kamachia. About the middle of the 16th century it was the seat of an English commercial factory, under the traveller Jenkinson, afterwards envoy extra- ordinary of the khan of Shirvan to Ivan the Terrible of Russia. In 1742 Shemakha was taken and destroyed by Nadir Shah of Persia, who, to punish the inhabitants for their creed (Sunnite Mahommedanism), built a new town under the same name about 16 m. to the W., at the foot of the main chain of the Caucasus. The new Shemakha was at different times a residence of the khan of Shirvan, but it was finally abandoned, and the old town rebuilt. The Russians first entered Shirvan in 1723, but soon retired. In 1795 they captured Shemakha as well as Baku; but the conquest was once more abandoned, and Shirvan was not finally annexed to Russia until 1805.

SHENANDOAH, a borough of Schuylkill county, Pennsyl- vania, U.S.A., about 40 m. N.N.W. of Reading. Pop. (1910, . census), 25,774. Among the foreign-born the Lithuanians and Poles predominate — in 1910 a Lithuanian and a Polish paper were published here. Shenandoah is served by the Pennsylvania, the Lehigh Valley and the Philadelphia & Reading railways. The borough has a public library. The United Greek Catholic Church (Ruthenian Rite) here is said to be the first of this sect in the United States; it was organized as St Michael's Parish in 1885, the first building was erected in 1886, and a new building was completed in 1909. Shenandoah is situated in the eastern part of the middle basin of the great anthracite coal region of Pennsylvania, and the mining and shipping of coal are its chief industries. A log house was built on the site of! the present Shenandoah as early as 1835, but there was no further development until 1862, when the first colliery was opened. The borough was incorporated in 1866.

SHENANDOAH VALLEY CAMPAIGNS. During the American Civil War the Shenandoah Valley was frequently the scene of military operations, and at two points in the war these opera- tions rose to the height of separate campaigns possessing great significance in the general development of the war. From a military point of view the Shenandoah Valley was valuable to the army which controlled it as a requisitioning area, for in this fertile region crops and cattle were plentiful. There were, moreover, numerous mills and factories. For the Confederates the Valley was also a recruiting area. A macadamized road from Lexington via Staunton and Winchester to Martinsburg gave them easy access to Maryland and enabled them to cover

Lynchburg from the north. By a system of railways which united at Gordonsville and Charlottesville troops from Richmond and Lynchburg were detrained within easy distance of five good passes over Blue Ridge, and as Strasburg in the valley lies almost due west of Washington it was believed in the North that a Confederate army thereabouts menaced a city the protection of which was a constant factor in the Federal plan of campaign. The Valley was 60 m. wide at Martinsburg and had been cleared of timber, so that the movements of troops were not restricted to the roads: the creeks and rivers were fordable at most places in summer by levelling the approaches: the terrain was specially suitable for mounted troops. The existence of the parallel obstacle between Strasburg and Newmarket, the two forks of the Shenandoah river enclosing the Massanutton range, afforded opportunities for strategic manoeuvres.

In the spring of 1862 the immense army organized by General McClellan advanced and threatened to sweep all before it. The Confederates, based on Richmond, were compelled to show a front westward to the Alleghanies, northward to the Potomac and eastwards to the Atlantic. The main armies were engaged on the Yorktown peninsula and the other operations were secondary. Yet in one instance a Confederate detachment that varied in strength between 5000 and 17,000 contrived to make some stir in the world and won renown for its commander. General Thomas J. Jackson with small means achieved great results, if we look at the importance which politics played in the affairs of the belligerents; and even in a military sense he was admirable for skilfully utilizing his experiences, so that his discomfitures of the winter of i86r, when Rosecrans and Lander and Kelley were opposed to him, taught him how to deal with such Federal leaders as Shields and Banks, Milroy and Fremont, fettered as they all were by the Lincoln administration. The Valley operations in 1862 began by a retrograde movement on the part of the Confederates, for Jackson on the 12th of March retired from Winchester, and Banks at the head of 20,000 men took possession. Banks pushed a strong detachment under General Shields on to Strasburg a week later, and Jackson then withdrew his small division (5000) to Mount Jackson, so yielding the Shenandoah Valley for 40 m. south of Winchester. He was now acting under instructions to employ the invaders in the Valley and prevent any large body being sent eastward to rein- force their main army; but he- was not to expose himself to the danger of defeat. He was to keep near the enemy, but not so near as to be compelled to fight Banks's superior forces. Such instructions, however, were difficult to carry out. When, on the 21st of March, Banks recalled Shields in accordance with orders from Washington, Jackson conceived that he was bound • to follow Shields, and, when Shields stood at bay at Kernstown on the 23rd of March with 7000 men, Jackson at the head Of 3500 attacked and was badly beaten.

For such excess of zeal two years later Sigel was removed from his command. But in 1862 apparently such audacity was true wisdom, for the proof thus afforded by Jackson of his inability to contend with Shields seems to have been regarded by the Federal authorities as an excuse for reversing their plans: Shields was reinforced by Williams's division, and with this force Banks undertook to drive Jackson from the Valley. A week after the battle of Kernstown, Banks moved to Strasburg with 16,000 men, and a month later (April 29) is found at Newmarket, after much skirmishing with Jackson's rear-guard which burnt the bridges in retiring. Meanwhile

Jackson had taken refuge in the passes of Blue Ridge, where he too was reinforced. Ewell's division joined him at Swift Run Gap, and at the beginning of May he decided to watch Banks with Ewell's division and to proceed himself with the remainder of his command to join Edward Johnson's division,then beset by General Milroy west of Staunton. Secretly moving by rail through Rockfish Gap, Jackson united with Johnson and in a few days located Milroy at the village of McDowell. After reconnaissance Jackson concentrated his forces on Setlington Hill and proposed to attack on the morrow (May 8th), but on this occasion the Federals (Milroy having just been joined by Schenck) took the initiative, and after a four

hours' battle Jackson was able to claim his first victory. The Confederates lost 500 out of 6000 men and the Federals 250 out

of 2 500 men. Jackson's pursuit of Milroy and Schenck campaign. was profitless, and he returned to his camp at McDowell

on the 14th of May. Meanwhile General Banks had been ordered by President Lincoln to fall back from New- market, to send Shields's division to reinforce General McDowell at Fredericksburg, to garrison Front Royal and to entrench

there was of brief duration, for McDowell was moving westward from Fredericksburg and Fremont eastward from Franklin under instructions from Washington to intercept him. On the 31st of May Fremont had reached Cedar Creek, McDowell was at Front Royal and Jackson had retired to Strasburg, where he was compelled to wait for a detachment to come in. This rejoined on the evening of the 1st of June. Ewell's division held Fremont back until Jackson was on his way to Newmarket.

the remainder of his command at Strasburg: and in this situation the enemy found him on the 2 2nd of May. Jackson's opportunity had come to destroy Banks's force completely. The Confederates numbered 16,000, the Federals only 6000 men. Jackson availed himself of the Luray Valley route to intercept Banks after capturing the post at Front Royal. He captured the post, but failed to intercept Banks, who escaped northwards by the turnpike road and covered his retreat across the Potomac by a rear-guard action at Winchester on the 25th of May. Jackson followed and reached Halltown a few days

later. But his stay

McDowell had sent Shields up the Valley by the Luray route. But Jackson gained Newmarket in safety and destroyed the bridge by which Shields could emerge from the Luray Valley to join Fremont, who was left to cope with Jackson single-handed. Jackson's rearguard destroyed the bridges and otherwise cross '■ impeded Fremont's advance, but a week later (June Keys and 7 th) Fremont at Harrisonburg located his enemy at Port Cross Keys and next day he attacked with 10,500 men. ' ˆe P uWfc • Shields was still at Luray. Jackson held Fremont with Ewell's division (8000) and with the remainder proceeded to the left bank

of the Shenandoah near Port Republic to await developments, for Shields had pushed forward a strong advanced guard under General Tyler, whose vanguard (two squadrons) crossed the river while Fremont was engaged with Ewell. Tyler's cavalry was driven back with heavy loss. Jackson retained possession of the bridge by which Tyler and Fremont could unite, and next day he crossed the river to attack Tyler's two brigades. The engage- ment of the 9th of June is called the battle of Port Republic. Jackson with 13,000 men attacked Tyler with 3000 men, and Tyler, after stoutly resisting in the vain hope that the main body under Shields would come up from Conrad's Store or that Fremont would cross the river and fall upon Jackson, retired with a loss of some 800 men, leaving as many Confederates hors de combat. Tyler's brave efforts were in vain, for Shields had once more received orders from Washington which appeared to him to justify leaving his detachment to its fate, and Fremont could not reach the river in time to save the bridge, which Ewell 's rear-guard burnt after Jackson had concentrated his forces against Tyler on the right bank. A few days later Jackson received orders to quit the Valley and join the main army before Richmond, and President Lincoln simultaneously discovered that he could not afford to keep the divisions of Fremont, Banks and McDowell engaged in operations against Jackson: so the Valley was at peace for a time.

In stricter connexion with the operations of the main armies in Virginia, the Confederates brought off two great coups in the Valley — Jackson's capture of Harper's Ferry and Martinsburg in the autumn of 1862 and Ewell's expulsion of Milroy from Martinsburg and Winchester in June 1863. The concentration of the Federal

forces in N. Virginia in May 1864 for the campaign which ultimately took Grant and Lee south of the James involved a fresh series of operations in the Valley. At first a Union containing force was placed there under Sigel; this general, however, took the offensive and unwisely accepted battle and was defeated at Newmarket. Next Hunter, who superseded Sigel in command in West Virginia and the Valley, was to co-operate with the Army of the Potomac by a movement on Staunton and thence to Gordonsville and Lynchburg, with the object of destroying the railways and canal north of the James river by which troops and supplies reached the Confederates from the West. Sigel meanwhile was to cover the Ohio railroad at Martinsburg. Hunter encountered Jones's division at Piedmont (Mount Crawford) on the 5th of June and caused General Lee to detach from his main army a division under Breckinridge to aid Jones. Grant then detached Sheridan to join Hunter at Char- lottesville, but Lee sent Hampton's cavalry by a shorter route to intercept Sheridan, and a battle at Trevillian Station com- pelled Sheridan to return and leave Hunter to his fate. The losses in this cavalry combat exceeded 1000, for the dense woods, the use of barricades and the armament of the mounted troops caused both sides to fight on foot until lack of ammuni- tion brought the action to an end. Sheridan during his three months' command of the Federal cavalry had steadfastly adhered to the principle of always fighting the enemy's cavalry, and, though now compelled to return to the Pamunkey, he con- trived to draw Hampton's force after him in that direction. Mean- while on the 13th of June General Early had moved from Cold Harbor to add his command to the Confederate forces in the Valley. Early succeeded in interposing between Hunter and Lynchburg, and within a week drove Hunter out of Virginia by the Kanawha river route. Early then moved down the Valley turnpike unmolested. Expelling Sigel from Martinsburg on the 4th of July and crossing the Potomac opposite Sharpsburg, he soon appeared before Washington, after defeating an im- provised force under" Lew Wallace on the Monocacy. Grant then detached Wright's corps (VI.) from Petersburg and called Emory's corps (XIX.) from the West to oppose Early, who after creating serious alarm retired, on the 13th of July, by Leesburg and Snicker's Gap into the Valley at Winchester. Hunter had meanwhile gained Harper's Ferry via the Baltimore and Ohio Railroad, and, when Early withdrew towards Strasburg, General Crook collected the forces of Hunter and Sigel to follow

the Confederates, but Early turned upon Crook and drove him back to the Potomac. Early then sent a detachment into Maryland to burn the town of Chambersburg. The alarm in the North for the safety of

Washington was only quieted by the appointment of General Sheridan to command in the Valley.

He arrived on the scene early in August. His mission was to drive Early up the Valley or, if the Confederates crossed into Maryland, to intercept their return, and in any case he was to destroy all supplies in the country which campa i gn , could not be consumed by his own army. Sheridan made Harper's Ferry his headquarters and concentrated at Halltown. Early retained his position about Bunker's Hill, destroyed the Ohio railroad, and held the main road up the Valley until Sheridan moved out in force on the 10th of August. Early then retreated up the Valley to Fisher's Hill (Strasburg), where he expected to be joined by Anderson's corps from Richmond. Sheridan had followed Early, but hearing of this reinforcement to the enemy, he decided to take up a de- fensive line at Halltown — the only point in the Valley which did not favour flanking operations — and await reinforcements. Sheridan's retrograde movement from Cedar Creek on the 17th of August was, however, regarded in the North as a sign of pusillanimity, and his removal from the Valley command was loudly called for. During the retreat Sheridan's cavalry en- countered Early's reinforcements, Anderson's corps and Fitz Lee's cavalry, about Winchester. Early had observed the Federal movements from the heights south of Strasburg, and now followed Sheridan down to Halltown. On the 21st of August he again attacked Sheridan at Summit Point south cf Charles- town. A few days later Early detached a force to raid Williams- port, and concentrated his main body behind the Opequan near Bunker's Hill, leaving outposts on the railway, a position which he held at the end of August. Sheridan meanwhile had moved out between the Shenandoah and the Opequan to seize all routes towards Washington, from Martinsburg on Early's left as far up as the Winchester-Berry ville turnpike by which his own reinforcements reached the Valley through Snicker's Gap. Sheridan also held the Smithfield crossing of the Opequan in Early's front. Each commander, however, hesitated to bring on a battle, Sheridan because the result of the Presidential election would be seriously affected by his defeat at this moment, and Early because with his inferior forces he was content to know that his position on Sheridan's flank effectively covered the Valley. But Sheridan was now at the head of the most formidable army that had ever invaded this region. It consisted of three small army corps under Wright (VI.), Emory (XIX.) and Crook (VIII.) and Torbert's cavalry (6000) in three divisions under Averell, Merritt and Wilson, the whole numbering 30,000 infantry, 6000 cavalry and 27 batteries. Early continued to hold Winchester with four divisions under Rodes,

Gordon, Breckinridge and Ramseur and two cavalry divisions under Fitz Lee and Lomax. He had soon been deprived of Anderson's corps which was sorely needed at Richmond, a fact which Sheridan discovered through his spies in Winchester, and indeed Sheridan had been waiting a fortnight for this movement by which Early's command was to be reduced. For a month the two armies had manoeuvred between Halltown and Strasburg, each commander hoping for such an increase to his own or decrease of his enemy's numbers as would justify attack. The Valley operations were aided indirectly by assaults and sorties about Petersburg. Grant aimed at preventing Lee sending reinforce- ments to Early until Sheridan's plans had been carried out. Meanwhile Early had been gathering up the harvests in the lower Valley, but on the 20th of August Sheridan was able to report " I have destroyed everything that was eatable south of Winchester, and they will have to haul supplies from well up to Staunton." Sheridan in September could put 23,000 infantry and 8000 cavalry into action, and at this moment he was visited by Grant, who encouraged his subordinate to seize an opportunity to attack the enemy.

The first encounter of Sheridan and Early took place on the

19th of September about 2 m. east of Winchester. Sheridan had crossed the Opequon and found the enemy in position

astride the Winchester-Berryville road. Early was out- chester. numbered and outfought,but he attributed his defeat to

the enemy's " immense superiority in cavalry," and in fact Sheridan depicts Merritt's division as charging with sabre or pistol in hand and literally riding down a hostile battery, taking 1200 prisoners and 5 guns. The Federal victory, however, cost Sheridan 4500 casualties and he had hoped for greater success, since Early had divided his forces. Sheridan's plan was to overwhelm Ramseur before he could be supported by Rodes and Gordon, but Early contrived to bring these divisions up and counter-attack while Sheridan was engaged with Ramseur. Early had confided his left to Fitz Lee's cavalry and taken Breckinridge to strengthen his right. But Merritt's horsemen rode through the Confederate cavalry, who fled, communicating their panic to the infantry of the left wing,

and the day was lost. Early retreated through hiii." ' Newtown and Strasburg, but at Fisher's Hill behind

Tumbling Run, where the Valley was entrenched on a front of 3 m. between the Shenandoah river and Little North Mountain, Early rallied his forces and again detailed his cavalry to protect his left from a turning movement. But Sheridan repeated his manoeuvre, and again on the 22nd of September Early was attacked and routed, General Crook's column having outflanked him by a detour on the western or Back road. Early now retreated to Mount Jackson, checked the pursuit at Rode's Hill, and, evading all Sheridan's efforts to bring him again to battle, reached Port Republic on the 25th of September. On learning of this disaster, and the distress of his troops, General Lee promised to send him boots, arms and ammunition, but under pressure of Grant's army, he could not spare any troops. Lee had estimated Sheridan's force at 12,000 effective infantry, and Early's report as to his being outnumbered by three or four to one was not credited. Yet Early had much to do to avoid destruction, for Sheridan had planned to cut off Early by moving his cavalry up the Luray Valley to Newmarket while the infantry held him at Fisher's Hill; but Torbert with the cavalry blundered. Sheridan made Harrisonburg his headquarters on the 25th of September, where he relieved Averell of his command for having failed to pursue after the battle of Fisher's Hill. In the first week of October Sheridan held a line, across the Valley from Port Republic along North river to the Back road, and his cavalry had advanced to Waynes- boro to destroy the railroad bridge there, to drive off cattle, and burn the mills and all forage and breadstuffs. Early had taken refuge in Blue Ridge at Rockfish Gap, where he awaited Rosser's cavalry and Kershaw's division (Longstreet's corps), for Lee had resolved upon again reinforcing the Valley command, and upon their arrival Early advanced to Mount Crawford and thence to Newmarket. The Federals retired before him, but his cavalry was soon to suffer another repulse,- for Rosser and Lomax having followed up Sheridan closely on the gth of October with five brigades, the Federal cavalry under Torbert turned upon this body when it reached Tom's Brook (Fisher's Hill) and routed it. Sheridan burnt the bridges behind him as he retired on Winchester, and apparently trusted that Early would trouble him no more and then he would rejoin Grant at Petersburg. But Early determined to go north again, though he had to rely upon Augusta county, south of Harrisonburg, for supplies, for Sheridan had wasted Rockingham and Shenan- doah counties in accordance with Grant's order. The Union commander-in-chief, contemplating a longer struggle between the main armies than he had at first

reckoned on, had deter- mined that the devastation of the Valley should be thorough and lasting in its effect.

Sheridan at Winchester was now free to detach troops to aid Grant, or remain quiescent covering the Ohio railroad, or move east of Blue Ridge. He had resisted the demand of the govern- ment, which Grant had endorsed, that Early should be driven through the Blue Ridge back on Richmond. Sheridan pointed out that guerrilla forces were always in his rear, that he would need

to reopen the Alexandria railroad as a line of supply, that he must detach forces to hold the Valley and protect the railroads, and that on nearing Richmond he might be attacked by a column sent out by Lee to aid Early. Yet in fact Sheridan carried out the government programme at the beginning of 1865, and therefore we may assume that his objections in October were not well-founded. Then he was expected to drive Early out of the Valley, but halted at Harrisonburg and, although in superior force, afterwards retired to Winchester, and his boast of having wasted the Valley seemed ill-timed, since Early was able to follow him down to Strasburg. There was evidently some factor in the case which is not disclosed by Sheridan in his Memoirs.

Early at Newmarket on the 9th of October said that he could depend on only 6000 muskets if he detached Kershaw, and he had discovered that all positions in the Valley could be turned, that the open country favoured the creek. shock tactics of the Federal cavalry, and so placed his own cavalry at a disadvantage, who, he declared, could not by dismounted action withstand attacks by superior numbers with the arme blanche. In these circumstances it would appear that Early showed great enterprise in following Sheridan down to Strasburg on the 13th of October " to thwart his purposes if he should contemplate moving across the Ridge or sending troops to Grant." But as his forward position at Fisher's Hill could not be long maintained for want of forage, he resolved to attack Sheridan, and on the night of the 18th of October he sent three divisions under Gordon to gain the enemy's rear, while Kershaw's division attacked his left and Wharton's division and the artillery engaged him in front. The attack was timed to commence at 5 a.m. on the 19th of October, when Rosser's cavalry was to engage Sheridan's cavalry and that of Lomax was to close the Luray Valley. This somewhat complicated disposition of forces was entirely successful, and Early counted his gains as 1300 prisoners and 18 guns after routing the Federal corps VIII. and XIX. and causing Wright's corps (VI.) to retire. Yet before nightfall Early's force was

in turn routed and he lost 23 guns. Early's report is that of a disheartened general. He complains that his troops took to plundering, that his regi- mental officers were incapable; and it is always the Federal cavalry that cause panic by threatening to charge; he has to confess that with a whole day before him he could neither com- plete his victory nor take up a position for defence, nor even retreat in good order with the spoils of battle. Sheridan had, it seems, actually put Wright's corps in march for Petersburg when news of Early's advance down the Valley reached him; then he recalled Wright and on the 14th of October was holding a defensive line along the north bank of Cedar Creek west of the Valley pike about Middleton. Early had reconnoitred and withdrawn as far as Fisher's Hill near Strasburg. Sheridan at this juncture was called to Washington to consult Halleck, the " chief of staff," on the 16th of October in reference to his future movements: for Halleck claimed to control Sheridan and often modified Grant's instructions to his subordinate. Before Sheridan could rejoin his army on the 19th of October Early had attacked and routed it, but Sheridan met the fugitives and rallied them with the cry: " We must face the other way." He found Getty's division and the cavalry acting as rear-guard, and resolved to attack as soon as his troops could be reorganized. Sheridan was, however, disturbed by reports of Longstreet's coming by the Front Royal road to cut him off at Winchester, and hesitated for some hours; but at 4 p.m. he attacked and drove back the Confederates and so recovered all the ground lost in the morning, and recaptured his abandoned guns and baggage.

After the battle of Cedar Creek, Early again retreated south to Newmarket and Sheridan was in no condition to pursue. The Federal government had agreed to Sheridan's proposal to fortify a defensive line at Kernstown and hold it with a detachment while Sheridan rejoined Grant with the main body. On the nth of November, Early again advanced to reconnoitre at Cedar Creek, but was driven back to Newmarket. At the beginning

of December the weather threatened to interfere with movement, and both sides began to send back troops to Petersburg. During the winter there were only cavalry raids and guerrilla warfare, and in February 1865 the infantry remaining on each side was less than a strong division. Sheridan seized the opportunity to advance with 10,000 cavalry. Early delayed this advance with his cavalry, while he

evacuated Staunton; he called up a brigade to defend Lynchburg and proceeded to Waynesboro to await developments. Sheridan feared to advance on Lynch- burg leaving Early on his flank and decided to attack Early at Waynesboro; and on the 2nd of March the Federal commander was rewarded by decisive victory, capturing 1600 Confederates and their baggage and artillery. Early himself escaped and Rosser's cavalry dispersed to their homes in the Valley, but with Early's third defeat all organized resistance in the Shenandoah Valley came to an end. Sheridan moved over Blue Ridge to Charlottesville and began his work of destruction south and east. Lynchburg was too strongly held to be captured, but from Amherst Court House the railway to Charlottesville and the canal to Richmond were destroyed, and thus Lee's army was deprived of these arteries of supply. On the 10th of March at Columbia, on the James river south of Charlottesville, Sheridan sent couriers to advise Grant of his success, and on the 19th of March he rejoined the main army in Eastern Virginia, receiving Grant's warm commendation for having " voluntarily deprived himself of independence." (G. W. R.)

SHENDI, a town in the Anglo-Egyptian Sudan in the mudiria (province) of Berber, on the right bank of the Nile in 18 1′ N., 33° 59′ E., and 104 m. N.N.W. of Khartum by rail. Shendi possesses small manufactories of leather, iron and cotton; ex- tensive railway workshops and a government experimental farm. It is the headquarters of the cavalry of the Egyptian army stationed in the Sudan. Shendi lies within the " Island of Meroe" " and is a town of great antiquity. Thirty miles north are the pyramids of Meroe. On the opposite (west) bank of the Nile is the village of Metemma, whence there is a caravan route across the Bayuda Desert to the Merawi (Merowe) by Jebel Barkal; this was the route followed by the desert column under Sir Herbert Stewart in 1884 in the Gordon relief expedition. In 1772 James Bruce stayed some time at Shendi — then governed by a woman- — on his way to Egypt after visiting the source of the Blue Nile. When the Egyptians invaded the Sudan in 1820 Shendi, then a place of considerable size, submitted to Ismail Pasha, son of Mehemet Ali, the pasha of Egypt. In 1822, how- ever, Ismail and his chief followers were treacherously burnt to death at Shendi by order of the mek (ruler) of the town, in revenge for the cruelties committed by the Egyptians. Later in the same year an Egyptian army from Kordofan razed the town to the ground, most of the inhabitants being massacred. From that period until the establishment of Anglo-Egyptian rule in 1898 Shendi was but a poor village. Its subsequent growth has been comparatively rapid. There is a considerable area of fertile land on either side of the Nile in the

neighbourhood.

SHENG-KING, Shen-king, or Liao-tung, a province of the Chinese empire, in southern Manchuria. It occupies an area of 50,00c sq. m. and contains a population of 4,000,000. Its capital is Mukden, or, as it is otherwise known, Sheng-king, " the Flourishing Capital." The province includes the Liao- tung peninsula, the most southern part of which, including Port Arthur, is leased to Japan.

ShSng-king is largely mountainous. A line drawn from King-chow Fu (41 ° 12′ N., 121 s 10′ E.) N.E. to Mukden, and then south by west through LSaoi-yang and Hai-cheng to Kai-ping and the sea, would define the level country. A large portion of the plain, being an alluvial deposit, is extremely fertile, but in the neighbourhood of the sea the saline exudation common in the north of China renders futile all attempts at cultivation. North and east of this district run numerous mountain ranges, for the most part in a north-and-south direction. The climate of Shgng-king is marked by extremes of heat and cold. In summer the temperature varies from 70 to 90 F., and in winter from 50 above to io° below zero. The mountain scenery is extremely picturesque, and the trees and shrubs are such as are common in England, the mountain ash being the only common English tree which is there conspicuous by its absence. The most important rivers are the Liao-ho and the Yalu. The former takes its

rise in Mongolia, and after running an easterly course for about 400 m., turns S.W., and empties into the Gulf of Liao-tung, in the neighbourhood of Ying-tsze, up to which town, 20 m. from the bar, the river is navigable for large junks. The Yalu rises in the mountains to the south of the plain, and empties into the Yellow Sea.

The chief cities, Mukden, Liao-yang, Niu-chwang, Port Arthur and Tairen (Dalny) are separately noticed. Niu-chwang is the chief port of the province. Sheng-king is well supplied with railways, Mukden being in direct railway connexion with Peking, Niu-chwang, Port Arthur and Tairen as well as with the Korean railways, and with Europe and Vladivostock by the trans-Siberian line. The Mukden-Peking railway follows the route of the imperial highway from Peking, which passes through the Great Wall at Shan-kai-kwan and along the shores of the Gulf of Chih-li, and after leaving Mukden divides into three branches — one going eastward to Korea, another going by Kirin and A-she-ho to San-sing, while a third diverges N. by W. to Fakumen, thence through Mongolia to Pe-tu-na, and then to Tsi-tsi-har, Mergen, and the Amur. Another road leads east from Niu-chwang to Fung-hwang-chung, now a station on. the Mukden-

Korea railway. The chief agricultural products are wheat, barley, millet, oats, maize, cotton, indigo and tobacco. Coal, iron and gold are also found in considerable quantities in various localities. (See also Manchuria and China.)

SHEN-SI, a northern province of China, bounded N. by the Great Wall, W. by the province of Kan-suh, S. by the province of Sze-ch'uen, and E. by Shan-si, from which it is separated by the Hwang-ho. Area about 75,000 sq. m.; pop. about 8,300,000. Si-gan Fu (q.v.), or Sian Fu, is the provincial capital; there are six other prefectural cities. Shen-si is divided into two parts by a barrier of mountains, consisting of the Fu-niu Shan and the Tsing- ling Shan, which attain elevations of over 11,000 ft., and run across the southern portion of the province from east to west. To the north of the mountains lie the basins of the Wei-ho and of several other tributaries to the Hwang-ho. The name Shenˆsi, " west of the pass," refers to the Tungkwan pass, near the confluence of the Wei and the Hwang-ho. The valley of the Wei, situated between high tableland (the Ordos plateau) on the north and rugged mountains to the south, forms the great channel of communication between Eastern China and Central Asia. Were it in the hands of an enemy the Chinese colonies in Central Asia would be completely severed from the mother country, hence the eagerness evinced by the government through- out all history to retain possession of the region. In this district are the sites of cities used as capitals of China in remote antiquity. Si-gan Fu, founded in the 3rd century B.C., was usually the capital until the time of the Kin dynasty (a.d. 1127), and it was chosen by the dowager empress as the temporary capital during the stress of the Boxer outbreak (1900-1901). It is noted also as containing the celebrated Nestorian tablet, erected a.d. 781, on which is engraved an edict according tolerance to the Nestorian missionaries. Modern Christian (Protestant) mission work in the city dates from 1876. The walls of Si-gan enclose a square space of 6 m. each way, and, unlike most Chinese cities, its fortifications are kept in perfect repair. During the Mahommedan rebellion it was closely invested for two years (1868-1870) by the rebels, who, however, failed to capture it. During a great famine which occurred in 1902 about 2,500,000 persons in the province died of starvation.

From Si-gan Fu radiate a number of roads going east, south and west. The east road is the great Tung-kwan road, which forms the principal means of communication between Peking and the north-eastern provinces of the empire, and Sze-ch'uen, Yun-nan and Tibet. To the south, one road crosses the mountains to Shang Chow, and on to the Tan river, an affluent of the Han-kiang, and is thus con-

nected with the trade of the Yangtsze-kiang ; and another leads to Han-.chung Fu and Sze-ch'uen. Leaving the west gate of the city two roads lead to Lan-chow Fu, from which town begins the great high road into Central Asia by way of Lian-chow Fu, Kan-chow Fu and Su-chow to Hami, where it forks into two branches which follow respectively the northern and southern foot of the Tian-shan range, and are known as the Tian-shan pei lu and the Tian-shan nan lu. It 'was along these roads that the fame of China first reached Europe, and it was by the Tian-shan nan lu that Marco Polo entered the empire. To defend this line of communication the Great Wall

was extended beyond Su-chow, and the Kia-yu gate, " the door of the empire," was built. During the reign of Hia-wuTi of the Han dynasty, Chinese colonies and high roads lined with fortified cities were established along this route, and though at times the government have lost possession of the line beyond the Great Wall, it has always succeeded in re-establishing its supremacy over it. Occupying a position, then, at the confluence of the roads which connect north-eastern China with its western and south-western portions, Si-gan Fu is a city of great commercial importance. It has few manufac- tures, but does' an extensive trade principally in the importation of silk from Cheh-kiang and Sze-ch'uen, tea from Hu-peh and Hu-nan, and sugar from Sze-ch'uen, and in the exportation of these and other articles (such as skins and furs) to Kan-suh, Russia and Central Asia.

Shen-si is purely an agricultural province. Its principal products are cotton, wheat and opium — the anti-opium decrees of 1906 had little effect on the province up to 1910 — and these it exchanges with the neighbouring provinces for coal, iron, salt, &c. Kao-liang, pulse, millet, maize, groundnut, barley, beans, .pease, lucerne, and rape seed are also grown. The Wei basin being a loess region is unfit for rice, but for the same reason it produces fine crops of the kinds mentioned at a minimum expenditure of labour. The Shen-si opium is much valued by smokers and ranked next to the Shan-si drug, which was second only to that produced in Kan-suh. Coal abounds in the northern part of the province, but owing to difficulty of transit it is not worked to any great extent. The winters are cold, but short, and though fruit trees abound and are most productive, no evergreen trees or shrubs are to be met with within the province. Shen-si is specially noted for the varnish tree. Wolves are numerous in the

mountains; the heron, ibis, wild goose and snipe in the valley of the Wei.

See M. Broomhall, The Chinese Empire (London, 1907), pp. 198-208; L. Richard, Comprehensive Geography of the Chinese Empire (Shanghai, 1908), pp. 39-46, and the authorities there cited.

SHENSTONE, WILLIAM (1714-1763), English poet, son of Thomas Shenstone and Anne, daughter of William Penn of Harborough Hall, Hagley, was born at the Leasowes, a property in the parish of Halesowen, now in Worcestershire, but then included in the county of Shropshire. At school he began a life- long friendship with Richard Jago, and at Pembroke College, Oxford, where he matriculated in 1732, he made another firm friend in Richard Graves, the author of The Spiritual Quixote. He took no degree, but, while still at Oxford, he published for private circulation Poems on various occasions, written for the entertainment of the author (1737). This edition, containing the first draft of " The Schoolmistress," Shenstone tried hard to suppress, but in 1742 he published anonymously a revised form of The Schoolmistress, a Poem in imitation of Spenser. . . . The original was Sarah Lloyd, teacher of the village school where Shenstone received his first education. Isaac DTsraeli pointed out that it should not be classed, as it was by Robert Dodsley, as a moral poem, but that it was intended as a burlesque, to which Shenstone appended in the first instance a " ludicrous index." In 1741 he published The Judgment of Hercules. He inherited the Leasowes estate, and retired there in 1745 to undertake what proved the chief work of his life, the beautifying of his property. He embarked on elaborate schemes of landscape gardening which gave the Leasowes a wide celebrity, but sadly impoverished the owner. Shenstone was not a contented recluse. He desired constant admiration of his gardens, and he never ceased to lament his lack of fame as a poet.

Shenstone's poems of nature were written in praise of her most artificial aspects, but the emotions they express were obviously genuine. His Schoolmistress was admired by Goldsmith, with whom Shenstone had much in common, and his "Elegies" written at various times and to some extent biographical in character won the praise of Robert Burns who, in the preface to Poems, chiefly in the Scottish Dialect (1786), called him " that celebrated poet whose divine elegies do honour to our language, our nation and our species." The best example of purely technical skill in his .works is perhaps his success in the manage- ment of the anapaestic trimeter in his "Pastoral Ballad in Four Parts " (written in 1743), but first printed in Dodsley 's Collection of Poems (vol. iv., 1755). Shenstone died

unmarried on the nth of February 1763.

His works were first ˆpublished by his friend Robert Dodsley (3 vols., 1764-1769). The second volume contains Dodsley's descrip- tion of the Leasowes. The last, consisting of correspondence with Graves, Jago and others, appeared after Dodsley's death. Other letters of Shenstone's are included in Select Letters (ed. Thomas Hill

1778). The letters of Lady Luxborough {nee Henrietta St John) to Shenstone were printed by T. Dodsley in 1775; much additional correspondence is preserved in the British Museum — letters to Lady Luxborough (Add. MS. 28958), Dodsley's letters to Shenstone (Add. MS. 28959), and correspondence between Shenstone and Bishop Percy from 1757 to 1763 — the last being of especial interest; To Shenstone was due the original suggestion of Percy's Reliques, a service which would alone entitle him to a place among the precursors of the romantic movement in English literature. See also Richard Graves, Recollections of some particulars in the Life of the Late William Shenstone (1788); H. Sydney Grazebrook, The Family of Shenstone the Poet (1890); Lennox Morison, " Shenstone," in the Gentleman's Magazine (vol. 289, 1900, pp. 196-205) ; A. Chalmers, English Poets (1810, vol. xiii.), with " Life " by Samuel Johnson; his Poetical Works (Edinburgh, 1854), with " Life " by G. Gilfillan; T. D'Israeli, " The Domestic Life of a Poet — Shenstone vindicated," in Curiosities of Literature; and " Burns and Shenstone," in Furth in Field (1894), by " Hugh Haliburton " (J. L. Robertson).

SHEPPARD, JOHN [Jack] (1702-1724), English criminal, was born at Stepney, near London, in December 1702. His father, who, like his grandfather and great-grandfather, was a carpenter, died the following year, and Jack Sheppard was brought up in the Bishopsgate workhouse. One of his father's old employers apprenticed him to the family trade, but young Sheppard fell into bad company at a neighbouring Drury Lane tavern. Here he met Elizabeth Lyon, known as " Edgeworth Bess," a woman of loose character with whom he lived, and to gratify whose tastes he committed many of his crimes. At the end of 1723 he was arrested as a runaway apprentice, and thence- forward, he says, " I fell to robbing almost every one that stood in my way," Joseph Blake, known as " Blueskin," being a frequent confederate. In the first six months of 1724 he twice escaped from gaol, and towards the end of that period he was responsible for an almost daily robbery in or near London. Eventually, however, his independent attitude provoked the bitter enmity of Jonathan Wild, who procured his capture at the end of July. Sheppard was tried at the Old Bailey and condemned to

death, but, largely thanks to " Edgeworth Bess," he managed to escape from the condemned cell, and was soon back in his old haunts. In September he was rearrested and imprisoned in the strongest part of Newgate, being actually chained to the floor of his cell, but by a combination of strength and skill he escaped through the chimney to the roof of the prison, whence he lowered himself into the adjoining house. After a ' few days' concealment he was rash enough to reappear in the Drury Lane quarter. He was captured, hopelessly drunk, in a Clare Market tavern and reimprisoned, his cell being now watched night and day. On the 16th of November 1724 he was hanged at Tyburn. He was then not quite twenty-two.

Sheppard has been made the unworthy hero of much romance, of which Harrison Ainsworth's novel, Jack Sheppard (1839), is the most notable instance. In truth he was merely a vulgar scoundrel, who did not hesitate to rob his only real friend.

See A Narrative of all the Robberies, Escapes, &c, of John Sheppard, attributed to Daniel Defoe (London, 1724); Newgate Calendar, ed. Knapp and Baldwin; Griffiths, Chronicles of Newgate; British Journal (August, October 1724) ; Weekly Journal (August, September, November 1724); Celebrated Trials.

SHEPPEY, an island off the Kentish coast of England, included in the north-eastern parliamentary division of Kent. It is the largest of the several low islands which are separated from the mainland by the ramifying creeks about the mouth of the river Med way. The strait isolating Sheppey is called the "jwale; it is about 3 m. broad at its eastern end, but narrows to some: 300 yds. at the west, where it is crossed on a bridge by a branch of the South-Eastern & Chatham railway, and by a road. There was formerly a ferry here, as there are at two other points. Sheppey is low-lying, with one small elevation slightly exceeding 200 ft. near the north coast, which presents slight cliffs towards the shallow sea. These are frequently encroached upon by the sea, while the flat shore on the south is protected by embankments. Sheppey is iof m. in extreme length from E. to W., while the greatest breadth is about 5 m. On the south, narrow branches of the Swale, formerly wider, divide the isles of Harty and Elmley from the main island, of which, however, they now practically form part. Sheppey is for the most part treeless but very fertile.

bearing much grain and fruit; its name, meaning the "island of sheep," is still appropriate, as great flocks are bred. On the west are the port of Queenborough and the naval station of Sheer- ness. From here the Sheppey light railway runs east through the island, serving Minster and Leysdown, which are in some favour as seaside resorts. The London clay, of which the island is composed, abounds in fossils.

SHEPSTONE, SIR THEOPHILUS (1817-1803), British South African statesman, was born at Westbury near Bristol, England, on the 8th of January 1817. When he was three years old his father, the Rev. William Shepstone, emigrated to Cape Colony. Young Shepstone was educated at the native mission stations at which his father worked, and the lad acquired great pro- ficiency in the Kaffir languages, a circumstance which determined his career. In the Kaffir War of 1835 he served as headquarters interpreter on the staff of the governor, Sir Benjamin D'Urban, and at the end of the campaign remained on the frontier as clerk to the agent for the native tribes. In 1838 he was one of the party sent from Cape Colony to occupy Port Natal on behalf of Great Britain. This force was recalled in 1839, when Shepstone was appointed British resident among the Fingo and other tribes in Kaffraria. Here he remained until the definite establishment of British rule in Natal and its organization as an administrative entity, when Shepstone was made (1845) agent for the native tribes. In 1848 he became captain-general of the native levies; in 1855 judicial assessor in native causes; and, in 1856, on the remodelling of the Natal government, secretary for native affairs and a member of the executive and legislative councils. This position he held until 1877. Thus for over thirty years he was the director of native policy in Natal. A man of strong will and pronounced views he gained a great influence over the natives, by whom he was called " father," and, in acknowledgment of his hunting exploits, " Somsteu." The main line of his policy was to maintain tribal customs as far as consistent with principles of humanity, and not to attempt to force civilization. The result of his policy is still traceable In the condition and status of the Natal natives. While he remained in charge there was but one serious revolt of the natives — that of Langalibalele in 1873 — against white control.

Shepstone's influence with the Zulus was made use of by the Natal government; in 1861 he visited Zululand and obtained from Panda a public recognition of Cetywayo as his successor. Twelve years later Shepstone attended the proclamation of Cetywayo as king, the Zulu chief promising Shepstone to live at peace with his neighbours. In 1874 and again in 1876 Shep- stone was in London on South African affairs, and to his absence from Natal Cetywayo's failure to keep his

promises is, in part, attributed. When in London in 1876 Shepstone was entrusted by the 4th earl of Carnarvon, then secretary of state for the colonies, with a special commission to confer with the Transvaal executive on the question of the federation of the South African states, and given power, should he deem it necessary, to annex the country, subject to the confirmation of the British government. Shepstone went to Pretoria in January 1877, and on the 12th of April issued a proclamation announcing the establish- ment of British authority over the Transvaal. Shepstone's force consisted of twenty-five mounted policemen only, but no overt opposition was made to the annexation; the republic at the time was in a condition bordering on anarchy. " Nothing but annexation," wrote Sir Theophilus to the Colonial Office, " will or dan save the state, and nothing else can save South Africa from the direst consequences. All the thinking and intelligent people know this, and will be thankful to be delivered from the thraldom of petty factions by which they are perpetually kept in a state of excitement and unrest because the govern- ment and everything connected with it is a thorough sham " (Martineau's Life of Sir Battle Frere, ch. 18). Shepstone's action has been condemned as premature. He had, however, reason to believe that if Great Britain remained inactive, Germany would be induced to undertake the protection of the Transvaal. 1

1 Frere to J. M. Maclean, 22nd of April 1881 (Life of Sir Battle Frere, vol. ii. p. 183).

Moreover, had the policy of self-government for the Boers which he outlined in his annexation proclamation been carried out, the revolt of 1880-81 might not have occurred. The annexation also, probably, saved the Transvaal from an attack by the Zulus under Cetywayo. Shepstone remained in Pretoria as administrator of the Transvaal until January 1879; his rule was marked, according to Sir Bartle Frere, who described him as " a singular type of an Africander Talleyrand," by an " apparent absence of all effort to devise or substitute a better system " than that which had characterized the previous regime. Shepstone had been summoned home to advise the Colonial Office on South African affairs and he reached England in May 1879; on his return to Natal he retired (1880) from the public service. In 1883, however, he was commissioned to replace Cetywayo as king in Zululand. He was active in church matters in Natal, and a friend of Bishop Colenso. He opposed the grant of self-government to Natal. He died at Pieter- maritzburg on the 23rd of June 1893. Shepstone married in 1833 Maria, daughter of Charles Palmer, commissary-general at Cape Town, and had six sons and three daughters. One of his sons was killed at Isandhlwana; of the

other sons H. C. Shepstone (b. 1840) was secretary for native affairs in Natal from 1884 to 1893; Theophilus was adviser to the Swazis (1887-1891); and A. J. Shepstone (b. 1852) served in various native expeditions, as assistant-commissioner in Zululand, in the South African War, 1899-1902, and became in 1909 secretary for native affairs (Natal) and secretary of the Natal native trust. A younger brother of Sir Theophilus, John Wesley Shepstone (b. 1827), filled between 1846 and 1896 various offices in Natal in connexion with the administration of native affairs.

SHEPTON MALLET, a market town in the eastern parlia- mentary division of Somersetshire, England, 22 m. S.W. of Bath, on the Somerset & Dorset and the Great Western railways. Pop. of urban district (1901), 5238. The old town extends in a narrow line along the river Sheppey, while the newer town has for its main street a viaduct across the river valley. The church of St Peter and St Paul is especially noteworthy. Con- sisting of a chancel, clerestoried nave, and aisles, it is Early English and Perpendicular in style, and contains a beautiful 13th-century oak roof of 350 panels, each with a different design; a isth-century pulpit of carved stone; and some interesting old monuments of the Strode, Mallet and Gournay families. The market cross, over 50 ft. high, and one of the finest in Somerset, was erected by Walter and Agnes Buckland in 1500. Shepton possesses a grammar school of the 1 7th century, and a science and art school. The once flourishing cloth and woollen trades have declined, but there are large breweries, roperies, potteries, and, in the neighbourhood, marble, granite, asphalt and lime works.

Shepton, before the conquest called Sepeton, was in the possession of the abbots of Glastonbury for four hundred years, and then passed to a Norman, Roger de Courcelle. Afterwards it came into the possession of the Norman barons Malet or Mallet, one of whom was fined for rebellion in the reign of King John. From the Mallets it went to the Gournays, but in 1536 it reverted to the crown, and it is now included in the duchy of Cornwall. The town received the grant of a market from Edward II. Monmouth and the rebel army passed through Shepton twice in 1685, and twelve of the rebels were hanged here by Judge Jeffreys.

SHERANI, or Shirani, a Pathan tribe on the Dera Ismail Khan border of the North-west Frontier Province of India. The Sherani Agency occupies an area of 1500 sq. m. and had a population in 1901 of 12,371. The Sheranis occupy the principal portion of the mountain known as the Takht-i-Suliman and the country thence eastward down to the border of Dera Ismail Khan district. They are bounded

on the north by the Gomal Pass, and beyond that by the Mahsud Waziris; on the south by the Ustaranas and Zmarais; and on the west by the Haripals, Kakars and Mandu Khels. Between the Sherani country and the British border lie several small mountain ridges, across which the three chief passes are the Zarakni or Sheikh Haidar.

the Draband and the Chandwan. The Sheranis are generally of middling stature, thin, but hardy and active. They have bold features, high cheek-bones, and their general appearance is wild and manly. Their dress consists of a coarse black blanket tied round the waist, and another thrown over the shoulders. Their chief occupation is agriculture, but they carry on an extensive trade in the autumn months in Dera Ismail Khan district. The Sherani tribe and country are divided into two well-defined branches called Bargha and Largha, or the High- lands and the Lowlands, the inhabitants being called respectively Barghawals and Larghawals. The Highlands are on the side of Zhob, the Lowlands on the side of the Derajat, the dividing line being generally the watershed and higher peaks of the Takht-i-Suliman range of mountains. The physical configura- tion of the country makes the separation so complete that the two tribal divisions act independently of each other. After the Zhob expedition of 1890 the question of boundaries between the Punjab and Baluchistan came up for settlement, and the government decided that Bargha should remain with Baluchistan and Largha with the Punjab. The Gomal river from Kundar- Domandi to Kajuri-Kach is the boundary between Baluchistan and Waziristan, as well as between the respective provinces. In 1901 these frontier districts were transferred from the Punjab to the North-west Frontier Province.

SHERATON, THOMAS (c. 1751-1806), next to Chippendale the most famous English furniture-designer and cabinet-maker, was born in humble circumstances at Stockton-on-Tees. His education was rudimentary, but he picked up drawing and geometry. He appears to have been apprenticed to a cabinet- maker, but he was ever a strange blend of mechanic, inventor, artist, mystic and religious controversialist. Indeed, it is as a writer on theological subjects that we first hear of him. Although his parents were church people he was a Baptist, and in 1782 he published at Stockton A Scriptural Illustration of the Doctrine of Regeneration, to which was added A Letter on the Subject of Baptism, describing himself on the title page as a " mechanic, one who never had the advantage of a collegiate or

academical education." Of his career as a maker and designer of furniture nothing is known until he is first heard of in London in 1790, when he was nearly forty. The date of his migration is uncertain, but it probably took place while he was still a young man. In London he did work which, although it has made him illustrious to posterity, never raised him above an almost sordid poverty. Biographical particulars are exceedingly scanty, and we do not know to what extent, if at all, he worked with his own hands, or whether he confined himself to evolving new designs, or modifying and adapting, and occasionally partly copying, those of others. Such evidence as there is points to artistic, rather than mechanical work, after he began to write, and we know that some part of his scanty income was derived from giving drawing lessons. Even the remarkable series of volumes of designs for furniture which he published during the last sixteen years of his life, and upon which his fame depends, were not a commercial success. He was a great artistic genius who lived in chronic poverty. The only trustworthy information we possess regarding his circumstances is found in the Memoirs of Adam Black, who when he first arrived in London lodged a week in his house, only two years before Sheraton's death. "Sheraton," he says, " lived in a poor street in London, his house half shop, half dwelling-house, and himself looked like a worn-out Methodist minister, with threadbare black coat. I took tea with them one afternoon. There was a cup and saucer for the host, and another for his wife, and a little porringer for their daughter. The wife's cup and saucer were given to me, and she had to put up with another little porringer. My host seemed a good man, with some talent. He had been a cabinet- maker, and was now author, publisher, and teacher of drawing, and, I believe, occasional preacher." Black shrewdly put his finger upon the causes of Sheraton's failure. " This many-sided worn-out encyclopaedist and preacher is an interesting character. . . . He is a man of talent and, I believe, of genuine piety. He understands the cabinet business — I believe was bred to it. He

is a scholar, writes well, and, in my opinion, draws masterly — is an author, bookseller, – stationer and teacher. . . I believe his abilities and resources are his ruin in this respect — by at- tempting to do everything he does nothing." There is, however, little indication that Sheraton chafed under the tyranny of " those twin jailors of the daring heart, low birth and iron fortune. " " I can assure the reader," he writes in one of his books, " though I am thus employed in racking my invention to design fine and pleasing cabinet-work, I can be well content to sit upon a wooden-bottom chair, provided I can but have common food and raiment wherewith to pass through life in peace."

His first book on furniture was published in 1791 with the title of The Cabinet-Maker and Upholsterer's Drawing Book. It was issued in parts by T. Bensley, of Bolt Court, Fleet Street; there was a second edition in 1793 and a third in 1802, each with improvements. In the first edition it was stated that copies could be obtained from the author at 41 Davies Street, Grosvenor Square; in the second, that he was living at 106 Wardour Street; the last address we have is 8 Broad Street, Golden Square. There was also an " Accompaniment " and an " Appendix." In this book, which contained in copper-plate engravings, Sheraton gives abundant evidence of the arrogance and conceit which marred all his publications. He dismisses Chippendale's designs in a patronizing way as " now wholly antiquated and laid aside, though possessed of great merit according to the times in which they were executed." His lack of practical common sense is suggested by the fact that more than half the book is taken up with a treatise on perspective, needless then and unreadable now. He falls foul of every volume on furniture which had been published before his time, and is abundantly satisfied of the merit of his own work. The designs in the book are exceedingly varied and unequal, ranging from pieces of perfect proportion and the most pleasing simplicity to efforts ruined by too abundant ornament. Some of the chair-backs are delightful in their grace and delicacy, but in them, as in other of his draw- ings, it is easy to trace the influence of Hepplewhite and Adam — it has even been suggested that he collaborated with the Adams. Sheraton, indeed, like his predecessors, made extensive use not so much perhaps of the works of other men as of the artistic ideas underlying them which were more or less common to the taste of the time. He was sometimes original, sometimes adaptive — what Alexandre Dumas pere called a " conqueror " — sometimes a copyist. His " conquest " of Hepplewhite was especially unmerciful, for he abused as well as pillaged him. But his slender forms and sweeping curves were his own inspiration, and his extensive use of satinwood differentiated his furniture from most of that which had preceded it.

It must be remembered that Sheraton's books, like those of the other great cabinet-makers of the second half of the 18th century, were intended not for the " general reader " but for the practical use of the trade, which, no doubt, copied their designs extensively, although it is reasonable to suppose that he himself obtained orders by the publication of his books and employed other cabinet-makers to manufacture the work. It seems certain, however, that he himself never possessed anything more than a small shop. Of his own actual manufacture only one piece is known with certainty — a glass-

fronted book-case, of somewhat frigid charm, stamped " T.S." on the inside of one of the drawers. It lacks the agreeable swan-necked pediment so closely associated with his style. The Drawing Book, of which a German translation appeared at Leipzig in 1794, was followed in 1802 and 1803 by The Cabinet Dictionary, containing an Explanation of all the Terms used in the Cabinet, Chair and Upholstery branches, containing a display of useful articles of furniture, illustrated with eighty-eight copperplate engravings. The text is in alphabetical form, and, in addition to a supplement with articles on drawing and painting, the book contained a list of " most of the master-cabinet-makers, upholsterers, and chair makers," 252 in number, then living in and around London. Sheraton told his readers that he had hitherto derived no profit from his publications on account of the cost of producing them.

Some of the designs in this volume show the earlier stages of the tendency to the tortured and the bizarre which disfigured so much of Sheraton's later work. This debased taste reached its culmination in The Cabinet Maker, Upholsterer and General Artists' Encyclopedia, the publication of which began in 1804. It was to consist of 125 numbers, but when the author died two years later only a few had been issued. The plates are in colour. The scope of this work was much wider than the title suggests. It dealt not only with furniture and decoration, but with history, geography, biography, astronomy, botany and other sciences. This fragmentary undertaking makes it clear that Sheraton ruined his style, once so graceful and so delicate, by an over-anxious following of the pseudo-classical taste which in France marked the period of the Consulate and the Empire. The harmonious marquetry, the dainty painting of flowers in wreaths and festoons, the lightness and finish were replaced by pieces of furniture which at the best were clumsy and at the worst were hideous. Some of the chairs especially which he designed in this last period are amazingly grotesque, their backs formed of fabulous animals, their " knees " and legs of the heads and claws of crowned beasts. Many charming little work-tables bear Sheraton's attribution, but even these graceful trifles in his later forms lose their delicacy and become squat and heavy. He designed many beautiful sideboards and bookcases, but he finished by drawing pieces that were ruined by insistence upon the characteristics, and often the worst characteristics, of the Empire manner. Sheraton's inventive ingenuity had led him to devise many of the ingenious pieces of combination or

“harlequin” furniture which the later 1 8th century loved. Thus a library table would conceal a step-ladder for reaching the top shelves of bookcases, a dressing table would be also a wash- stand and an escritoire — but this he admitted that he did not introduce — looking-glasses would enclose dressing-cases, writing- tables or work-tables. But his most astonishing fancy was an ottoman with ” heating urns ” beneath, ” that the seat may be kept in a proper temperature in cold weather.” How far he was responsible for the introduction of the hideous hall chair, made of mahogany, with the owner’s crest painted on the back, which was common for three-quarters of a century after he died, is not clear; but he describes and illustrates it.

That Sheraton can have been personally popular is incredible. His books make it evident that his character was tart, angular and self-assertive, and that he was little disposed to be generous towards the work of predecessors or rivals. Such an attitude towards the world would suffice to explain his lack of substantial success. He appears to have preached occasionally to the end, and even in his furniture books he sometimes falls into improving remarks of a religious character. As we have seen, his first publication was a religious work, and when in 1794 his friend Adam Callender, the landscape painter, wrote a pamphlet entitled Thoughts on the Peaceable and Spiritual Nature of Christ’s Kingdom, Sheraton contributed to it an exhortation upon Spiritual Subjection to Civil Government, which was reprinted separately with additions a year later. In 1805 he issued A Discourse on the Character of God as Love. He died on Oct. 22nd, 1806, at No. 8 Broad Street, Golden Square, aged about’ 55, from, it is said, over- work. An obituary notice of him appeared in the Gentleman’ s Magazine of the following month, which stated that he had been for many years ” a journeyman cabinet-maker, but since 1793 supported a wife and two children by authorship.” He was described as ” a well-disposed man, of an acute and enterprising disposition.” The writer added that he had ” left his family, it is feared, in distressed circumstances,” and that he had travelled to Ireland to obtain subscribers for the Encyclopedia, of which at the time of his death nearly 1000 copies had been sold. In 181 2 there appeared a folio volume, Designs for Household Furniture exhibiting a Variety of Elegant and Useful Patterns in the Cabinet, Chair and Upholstery Branches on eighty-four Plates. By the late T. Sheraton, Cabinet- maker. This was in the main, if not entirely, a collection of plates from the Cabinet Dictionary and the Encyclopedia.

Thomas Sheraton is unquestionably the most remarkable

man in the history of English furniture. His genius was less sane and

less balanced than that of Chippendale, but despite his excursions into the Chinese and Louis Quinze manners, Chippendale always produced an impression of English work. Sheraton's greater adaptability, his readiness to receive foreign impressions, his adaptations of Louis Seize ideas, the lightness of his forms and the grace of his conceptions had about them a touch of the exotic which was heightened by his lavish employ- ment of satin-wood and other beautifully grained woods sus- ceptible of a high polish. There are no more charming things outside French furniture than some of the creations of Sheraton in his great period. The severe and balanced forms, the delicate inlay, the occasional slight carving in low relief, the painted enrichments, the variety of the backs and legs of his chairs produce an impression of lightness and grace that has never been surpassed; whether he designed a little knife-case or the body of a long clock, harmony, proportion and a delicate fancy were ever present. It is true that he adapted and even copied extensively, but so did every one else, and it is impossible to be sure that a given conception is rightly attributed to the particular man whose name has become associated with it. Indeed " Sheraton," like " Chippendale," has come to indicate a style rather than a personal attribution. But the volume and the beauty of the designs in his books is such that, when every allowance has been made for adaptation, there remains a mass of beautiful work which cannot be denied to him. In later life his very adaptability was his undoing. The public, always ready to take its mobiliary fashions from France, de- manded Empire furniture, and Sheraton may have been, or have believed himself to be, compelled to give them what they wanted. His extravagant creations in that sphere — far worse than anything that was designed in France — had much to do with the development of a fashion of English Empire which finally ruined British furniture design. He rioted in sphinxes and lions and fabulous beasts, he evolved forms that were dull and cumbrous, and added to their heaviness by brass mounts at once massive and uninspired. After his death the eccentricity may have been less, but the "heaviness and dullness were greater, and with the disappearance of Sheraton the brief but splendid summer of English furniture ended in gloom. It had lasted little more than half a century, but it was a half-century which only France ever could, or did, rival. It is one of the strangest ironies in the history of art that the last and almost the greatest exponent of the English genius in the sphere of furniture was in the end mainly responsible for a decay from which there has as yet been no renaissance. (J. P.ˆB.)

SHERBET (the Turkish form of the Arabic sharbat, drink, shariba, he

drank, cf. " shrub," an English derivative), properly the name of an Oriental beverage, consisting of the juice of such fruits as the lemon, citron, &c., dropped upon a cake of sugar and partially frozen with snow or otherwise cooled. The word, and also the French form sorbet, are applied in Western usage to a water-ice not frozen as hard as the ordinary ice, and flavoured with fruit juice, spirit, &c. A cheap sweetened effervescing drink is also so styled.

SHERBORNE, a market town in the northern parliamentary division of Dorsetshire, England, 118 m. W.S.W. from London by the London & South -■ Western railway. Pop. of urban district (1901), 5760. It lies near the border of Somersetshire, on the southern slope of a hill overlooking the river Yeo, in a fertile, well-wooded district. The abbey church of St Mary the Virgin is a stately cruciform building with central tower, the nave and choir having aisles and clerestory. Some pre-Norman work appears in the western wall, the tower arches and south porch are Norman, and there are an Early English chapel and some Decorated windows. The church, however, was almost wholly reconstructed in the Perpendicular period, and is a fine example of that style, the interior gaining in beauty from the scheme of colour-decoration in the choir, while the magnificent stone-vaulted roof with fan tracery, extending throughout the church- eycentine the south transept, is unsuroassed. The parish church of Ah Hallows adjoined the abbey church Oil the

west, but was taken down after the Dissolution, when the abbey church was sold to the parish. Portions of the abbey buildings, including the Lady chapel of the church, now converted into a dwelling-house, are incoporated in those of Sherborne grammar school, founded (although a school existed previously) by Edward VI. in 1550, and now holding a high rank among English public schools. The almshouse known as the hospital of St John the Baptist and St John the Evangelist was founded in 1437 on the site of an earlier establishment, and retains a Perpendicular chapel, hall and other portions. The abbey conduit, of the middle of the 14th century, is conspicuous in the main street of the town. Of the old castle, the gatehouse and other parts are of Norman construction, but the mansion near it was built by Sir Walter Raleigh.

As there is no evidence of Roman or British settlement, it is probable that Sherborne (Scireburn, Shireburne) grew up after the Saxon

conquest of the country from the Corn-Welsh in the middle of the 7th century. It is first mentioned in 705 as the place where St Aldhelm fixed his bishop-stool for the new diocese of Western Wessex, being chosen probably for its central position. iEthelberht, king of Wessex, was buried here by the side of his brother yEthelbald in 866. For the next eighteen years its freedom from Danish attack made Sherborne the capital of Wessex. In 978 Bishop Wulfsey introduced the stricter form of Benedictine rule into his cathedral of Sherborne, and became the first abbot. The see, which was united with that of Ramsbury in 1058, was removed to Old Sarum in 1075. In 1086 the bishop of Sarum and the monks of Sherborne held the place, which seems to have been of fair size and an agricultural centre. On the separation of the offices of bishop and abbot in 1122, the abbot's fee was carved out of the bishop's manor, but did not include the town. Bishop Roger of Caen (1107-1139) built the castle, described by Henry of Huntingdon as scarcely inferior to that of Devizes, " than which there was none greater within the confines of England." Its strength made Stephen force Bishop Roger to surrender it in 1139, but during the civil war in his reign it passed into the hands of the empress Maud. It was later granted to the earls of Salisbury, who seem to have allowed it to fall into disrepair, for in 13 15 and in 13 19 the abbot of Sherborne was appointed to inquire into its condition. It was recovered by the bishop in 1355, and retained by the see until granted in 1599 to Elizabeth, who gave it to Sir Walter Raleigh. The abbey church was partly burnt in 1437, in a riot due to the monks' refusal to recognize the town's chapel of All Hallowes as the parish church, though they had restricted their use of the abbey church for parochial purposes. Signs of this fire are still visible on the walls, which are in part tinged red by the flames. The town, though frequently the centre for medieval assizes and inquisitions, never became a municipal or parliamentary borough, but was governed by two constables, elected in the manorial court. In 1540 Sir John Horsey, who had bought the manor and church at the Dissolution, sold the abbey to the vicar and parishioners. The Reformation made no break in the continuity of the school, which had probably existed in the abbey since the nth century. Edward VI. by his charter in 1550 made its governors one of the first purely lay educational corporations founded in England. The town suffered severely during the civil wars, the castle being besieged by the parlia- mentary forces in 1642 and 1645. The fairs now held on the 8th of May, the 26th of July and the first Monday after the 10th of October were granted to the bishop in 1227, 1240 and 1300. After the decline of the medieval trade in cloth, lace and buttons were the only articles manufactured here until the introduction of silk-weaving in 1740. In

June 1905, in commemoration of the 1200th anniversary of " the town, the bishopric and the school," an historical pageant, invented and arranged by Louis N. Parker (at one time music-master at the school) , was held in the grounds of Sherborne Castle, and set the model for a succession of pageants held subsequently in other historic English towns.

See William Beauchamp Wildman, A Short History of Sherborne from a.d. 70s (1902), and Life of S. Ealdhelm, first Bishop of Slier-borne (Sherborne, 1905).

SHERBROOKE, ROBERT LOWE, Viscount (1811-1892), British statesman, was born on the 4th of December 1811 at Bingham, Notts, where his father was the rector. He was educated at Winchester and University College, Oxford, where he took a first class in classics and a second in mathematics, besides taking a leading part in the Union debates. In 1835 he won a fellowship at Magdalen, but vacated it on marrying, in 1836, Miss Georgina Orred (d. 1884). He was for a few years a successful " coach " at Oxford, but in 1838 was bitterly disappointed at not being elected to the professorship of Greek at Glasgow. In 1841 Lowe moved to London, to read for the Bar ("called" 1842); but his eyesight showed signs of serious weakness, and, acting on medical advice, he determined to try his fortune in the colonies rather than in London. He went to Sydney, where he set to work in the law courts. In 1843 he was nominated by Sir George Gipps, the governor, to a seat in the New South Wales Legislative Council; owing to a difference with Gipps he resigned his seat, but was elected shortly after- wards for Sydney. Lowe soon made his mark in the political world by his clever speeches, particularly on finance and educa- tion; and besides obtaining a large legal practice, he was one of the principal writers for the Atlas newspaper. In 1850 he went back to England, in order to enter political life there. His previous university reputation and connexions, combined with his colonial experience, stood him in good stead. The Times was glad to employ his ready pen, and as one of its ablest leader-writers he made his influence widely felt. In 1852 he was returned to Parliament for Kidderminster in the Liberal interest. In the House of Commons his acute reasoning made a considerable impression, and under successive Liberal ministries (1853-1858) he obtained official experience as secretary of the Board of Control and vice-president of the Board of Trade. In 1859 he went to the Education Office as vice-president of the Council in Lord Palmerston's ministry; there he pursued a vigorous policy, insisting on the necessity of payment by results, and bringing in the revised code (1862), which embodied this principle and made an

examination in " the three R's " the test for grants of public money. He felt then, and still more after the Reform Act of 1866, that " we must educate our masters," ' and he rather scandalized his old university friends by the stress he laid on physical science as opposed to classical studies. Considerable opposition was aroused by the new regime at the Education Office, and in 1864 Lowe was driven to resign by an adverse vote in Parliament with reference to the way in which inspectors' reports were " edited." The result was unjust to Lowe, but a good deal of feeling had been aroused against Lingen's administration of the Education Office (see Lingen, Baron), and this was the outcome. Lord Palmerston's death in October 1865 was followed by the formation of the Russell- Gladstone ministry and the introduction of the Reform Bill of 1866. Lowe, a Liberal of the school of Canning and Peel, had already made known his objections to the advance of " democracy " — notably in his speech in 1865 on Sir E. Baines's Borough Franchise Bill — and he was not invited to join the new ministry. He retired into what Bright called the " Cave of Adullam," and opposed the bill in a series of brilliant speeches,' which raised his reputation as an orator to its highest point and effectually caused the downfall of the government. He remained, nevertheless, a Liberal; and after, the franchise question had been settled by what Lowe considered Disraeli's betrayal, and he had been elected the first member for London University, he accepted office again in the Gladstone Cabinet of 1868 as chancellor of the exchequer. Lowe Was a rather cut-and- dry economist, who prided himself that during his four years of office he took twelve millions off taxation; but later opinion has hardly accepted his removal of the shilling registration duty on corn (1869) as good statesmanship, and his failures are remembered rather than his successes. His proposed tax of a

1 This phrase is always ascribed to Lowe, and has become history in association with him. But what he really said in his address to the Edinburgh Philosophical Institution in 1867 was that it was neces- sary " to induce our future masters to learn their letters."

halfpenny a box on lucifer matches in 1871 (for which he sug- gested the epigram ex luce lucellum, "out of light a little profit") roused a storm of opposition, and had to be dropped. In 1873 he was transferred to the .Home Office, but in 1874 the govern- ment resigned. When the Liberals returned to power in 1880 he was raised

to the peerage as Viscount Sherbrooke, but from 1875 till his death at Warlingham, Surrey, on the 27th of July 1892, his health was constantly failing, and by degrees he figured less and less in public life.

Bobby Lowe, as he was popularly known, was one of the most remarkable personalities of his day, with his tall, striking figure, albino complexion and hair, and faculty for epigram and irony. During the 'seventies the following epitaph was suggested for him by one of the wits of his day: —

" Here lies poor old Robert Lowe;

Where he's gone to I don't know;

If to the realms of peace and love,

Farewell to happiness above ;

If, haply, to some lower level,

We can't congratulate the devil."

Lowe was delighted with this, and promptly translated it

into Latin, as follows: —

" Ccntinentur hac in fossa Humilis Roberti ossa; Si ad coelum evolabit, Pax in coelo non restabit ; Sin in inferis jacebit, Diabolum ejus poenitebit."

His literary talent, though mainly employed in journalism, was also shown in a little volume of verses, Poems of a Life (1884). He married a second time, in 1885, but left no children.

See Life and Letters by A. Patchett Martin (London, 1893).

(H. Ch.)

SHERBROOKE, a city and port of entry of Quebec, Canada, and capital of Sherbrooke county, 101 m. E. of Montreal, at the confluence of the rivers Magog and St Francis, and on the Grand Trunk, Canadian Pacific, Quebec Central and Boston & Maine railways. Pop. (1901) 11,765. It is the seat of a Roman Catholic bishopric and of the district courts, and contains manufactories of woollen and cotton goods and machinery, also saw and grist mills. It derives its name from Sir John Coape Sherbrooke (1 764-1830), who

from 1816 to 1818 was governor- general of Canada.

SHERE ALI KHAN (1825-1879), Amir of Afghanistan, was born in 1825, one of the younger sons of the amir Dost Mahommed, whom he succeeded in 1863. For some time after his succession Afghanistan was in a state of anarchy, and his rebellious half-brothers overran the country while he remained at Kandahar mourning the loss of a favourite son. At length, however, the capture of Kabul in 1866 roused him to action; but in spite of his own bravery he suffered general defeat until 1868, when he regained Kabul. Supported by the viceroys of India, Lord Lawrence and Lord Mayo, Shere Ali remained on good terms with the British government for some years; but after the rebellion of his son Yakub Khan, 1870-74, he leaned towards Russia, and welcomed a Russian agent at Kabul in 1878, and at the same time refused to receive a British mission. This led to long negotiations, and ultimately to war, when the British forced the Khyber Pass in November 1878, and defeated the amir's forces on every occasion. Shere Ali fled from his capital and, taking refuge in Turkestan, died at Mazar-i-Sharif on the 21st of February 1879.

SHERIDAN, the name of an Anglo-Irish family, made illus- trious by the dramatist Richard Brinsley (No. 4 below), but prominently connected with literature in more than one genera- tion before and after his.

1. Thomas Sheridan (1687-1738), grandfather of the drama- tist, was born at Cavan in 1687, and was educated at Trinity College, Dublin, taking his B.A. degree in 1711 and that of M.A. in 1714; he became B.D. in 1724 and D.D. in 1726. By a marriage with Elizabeth, heiress of Charles MacFadden, he restored to the Sheridan family Quilcagh House, which they had forfeited by their Jacobite sympathies. Thomas Sheridan is chiefly known as the favourite companion and confidant of

Swift during his later residence in Ireland. His correspondence with Swift and his whimsical treatise on the " Art of Punning" 1 make perfectly clear from whom his grandson derived his high spirits and delight in practical joking. The " Art of Punning " might have been written by the author of The Critic. Swift had a high opinion of his scholarship, and that it was not con- temptible is attested by a translation of the Satires of Persius, printed in Dublin in 1728. He also translated the Satires of Juvenal and the Philoctetes of Sophocles. When Swift came tv Dublin as dean of St Patrick's, Sheridan was established there as a schoolmaster of very high repute,

and the two men were soon close friends. Sheridan was his confidant in the affair of Drapier's Letters; and it was at Quilcagh House that Gulliver's Travels was prepared for the press. Through Swift's influence he obtained a living near Cork, but damaged his prospects of further preferment by a feat of unlucky absence of mind. Having to preach at Cork on the anniversary of Queen Anne's death he hurriedly chose a sermon with the text, " Sufficient unto the day is the evil thereof," and was at once struck off the list of chaplains to the lord-lieutenant and forbidden the castle. In spite of this mishap, for which the archdeacon of Cork made amends by the present of a lease worth £250 per annum, he " still remained," said the earl of Orrery (Remarks on the Life and Writings of Jonathan Swift, 1751), "a punster, a quibbler, a fiddler and a wit," the only person in whose genial presence Swift relaxed his habitual gloom. His latter days were not prosperous, probably owing to his having " a better knowledge of books than of men or of the value of money." He offended Swift by fulfilling an old promise to tell the dean if he ever saw signs of avarice in him, and the friends parted in anger. He died in poverty on the 10th of October 1738.

The original source of information about Dr Sheridan is his son's Life of Swift (vol. i. pp. 369-395), where his scholarship is dwelt upon as much as his improvident conviviality and simple kindliness of nature.

2. Thomas Sheridan (1719-1788), son of the above, was born- in Dublin in 17 19. His father sent him to an English school (Westminster) ; but he was forced by stress of circumstances to return to Dublin and complete his education at Trinity College, where he took his B.A. degree in 1739. Then he went on the stage, and at once made a local reputation. He even wrote a play, Captain O' Blunder, or the Brave Irishman, which became a stock piece, though it was never printed. There is a tradition that on his first appearance in London he was set up as a rival to Garrick, and Moore countenances the idea that Garrick remained jealous of him to the end. For this tradition there is little foundation. Sheridan's first appearance in London was at Covent Garden in March 1744, when, heralded in advance as the brilliant Irish comedian, he acted for three weeks in a succession of leading parts, Hamlet being the first. In October he appeared at Drury Lane, playing Horatio in Rowe's Fair Penitent, and subsequently as Pierre in Otway's Venice Preserved, and in Hamlet and other parts. On his return to Dublin he became manager of the Theatre Royal, and married Frances Chamber- laine. He was driven from Dublin as a result of his unpopular efforts to reform the theatre. A young man named Kelly had insulted the actresses, and when Sheridan interfered threatened

him. A riot followed, in consequence of which Kelly was imprisoned, but he was released on Sheridan's petition. This disturbance was followed in 1754 by another outbreak, when he refused to allow the actor, West Digges, to repeat a passage re- flecting on the government in James Miller's tragedy, Mahomet the Impostor. After two seasons in London he tried Dublin again, but two years more of unremunerative management induced him to leave for England in 1758. By this time he had conceived his scheme of British education, and it was to push this rather than his connexion with the stage that he crossed St George's Channel. He lectured at Oxford and Cambridge, and was incorporated M.A. in both universities. But the scheme did not make way, and we find him in 1760 acting under Garrick at Drury Lane. His merits as an actor may be judged from

1 Published in Nichols's Supplement to the works of Swift (1779).

the description of him in the Rosciad (1. 987) at this period. He is placed in the second rank, next to Garrick, but there is no hint of possible rivalry. Churchill describes him as an actor whose conceptions were superior to his powers of execution, whose action was always forcible but too mechanically calculated, and who in spite of all his defects rose to greatness in occasional scenes. Churchill never erred on the side of praising too much, and his description may be accepted as correct, supported as it is by the fact that the actor eked out his income by giving lessons in elocution. Sheridan solicited a pension for Samuel Johnson from Lord Bute through Wedderburn. The pension, £300 a year, was granted, and shortly afterwards Bute was so favourably impressed with a scheme submitted to him by Sheridan of his Pronouncing Dictionary that he bestowed a pension of £200 on him also. Some hasty remarks of Johnson's on the matter were repeated to Sheridan, who broke off his acquaintance with the doctor in consequence. Sheridan, how- ever, attracted attention chiefly by his enthusiastic advocacy, in public lectures and books, of his scheme of education, in which elocution was to play a principal part. In the case of his son, Richard Brinsley Sheridan, his instruction was certainly not wasted. Sheridan's indictment of the established system of education was that it did not fit the higher classes for their duties in life, that it was uniform for all and profitable for none; and he urged as a matter of vital national concern that special training should be given for the various professions. Oratory came in as part of the special training of men

intended for public affairs, but his main contention was one very familiar now — that more time should be given in schools to the study of the English language. He rode his hobby with great enthusiasm, published an elaborate and eloquent treatise on education, and lectured on the subject in London, Oxford, Cambridge, Edinburgh and other towns. In 1764 he went to live in France, partly for economy, partly for Mrs Sheridan's health, and partly to study the system of education. His wife died in 1766 and soon after- wards he returned to England. In 1769 he published a matured Plan of Education for the Young Nobility and Gentry with a letter to the king, in which he offered to devote the rest of his life to the execution of his theories on condition of receiving a pension equivalent to the sacrifice of his professional income. His offer was not accepted; but Sheridan, still enthusiastic, retired to Bath, and prepared his pronouncing General Dictionary of the English Language (2 vols., 1780). After his son's brilliant success he assisted in the management of Drury Lane, and occasionally acted. His Life of Swift, a very entertaining work in spite of its incompleteness as a biography, was written for the 1784 edition of Swift's works. He died at Margate on the 14th of August 1788.

3. Frances Sheridan (1 724-1 766), wife of the above and mother of the dramatist, was the daughter of Dr Philip Chamber- laine of Dublin. When only fifteen years of age she wrote a story, Eugenia and Adelaide, published after her death in two volumes. She took Sheridan's part in the so-called Kelly riots, writing some verses and a pamphlet in his defence. This led to her acquaintance, and finally in 1747 to her marriage, with the unpopular manager. It was by Richardson's advice that she wrote the Memoirs of Miss Sidney Bidulph. … It was issued anonymously in 1761 with a dedication to Richardson, and had great success, both in England and France. A second part (2 vols.) was published in 1767. Two of her plays were produced in 1763 at Drury Lane, The Discovery and The Dupe. We have it on the authority of Moore that, when The Rivals and The Duenna were running at Covent Garden, Garrick revived The Discovery at Drury Lane, as a counter-attraction, " to play the mother off against the son, taking on himself to act the principal part in it." But the statement, intrinsically absurd, is inaccurate. The Discovery was not an old play at the time, but one of Garrick's stock pieces, and Sir Anthony Branville was one of his favourite characters. It was first produced at Drury Lane in 1763. So far from being jealous of the elder Sheridan, Garrick seems to have been a most useful friend to the family, accepting his wife's play— which he declared to be

” one of the best comedies he ever read ” — and grving the husband several engagements. The Dupe was a failure and was only played once. Her last work was an Oriental tale, Nourjahad, written at Blois, where she died on the 26th of September 1766. Her third play, A Journey to Bath, was refused by Garrick, and R. B. Sheridan made some use of it in The Rivals.

4. Richard JBrinsley Butler Sheridan (1751-1816), third son of Thomas and Frances Sheridan, was born in Dublin on the 30th of October 1751. There is a story, discredited by Mr Fraser Rae, that Mrs Sheridan on placing her sons with their first school- master, Samuel Whyte, said that she had been the only instructor of her children hitherto, and that they would exercise the school- master in the quality of patience, ” for two such impenetrable dunces she had never met with.” One of the children thus humorously described was Richard Brinsley, then aged seven. At the age of eleven he was sent to Harrow school. Sheridan was extr6mely popular at school, winning somehow, Dr Parr con- fesses, ” the esteem and even admiration of all his schoolfellows “; and he acquired, according to the same authority, more learning than he is usually given credit for. He left Harrow at the age of seventeen, and was placed under the care of a tutor. He was also trained by his father daily in elocution, and put through a course of English reading. He had fencing and riding lessons at Angelo’s.

After leaving Harrow he kept up a correspondence with a school friend who had gone to Oxford. With this youth, N. B. Halhed, he concocted various literary plans, and between them they actually executed and published (1771) metrical transla- tions of Aristaenetus. In conjunction with Halhed he wrote a farce entitled Jupiter, which was refused by both Garrick and Foote and remained in MS., but is of interest as containing the same device of a rehearsal which was afterwards worked out with such brilliant effect in The Critic. Some of the dialogue is very much in Sheridan’s mature manner. Extracts given from papers written in the seven years between his leaving Harrow and the appearance of The Rivals — sketches of unfinished plays, poems, political letters and pamphlets — show that he was far from idle. The removal of the family to Bath in 1770-1771 led to. an acquaintance with the daughters of the composer Thomas Linley. The eldest daughter, Elizabeth Ann (b. 1754), a girl of sixteen, the prima donna of her father’s concerts, was exceed- ingly beautiful, 1 and had many suitors, among them Sheridan, N. B. Halhed and a certain Major Mathews. To protect her from this man’s persecutions, Sheridan, who seems to have acted at first only as a confidential friend, carried out the romantic plan of

escorting Miss Linley, in March 1772, to a nunnery in France. Sheridan returned and fought two duels with Mathews, which made a considerable sensation at the time. The pair had gone through the ceremony of marriage in the course of their flight, but Sheridan kept the marriage secret, and was sternly denied access to Miss Linley by her father, who did not consider him an eligible suitor. Sheridan was sent to Waltham Abbey, in Essex, to continue his studies, especially in mathematics. He was entered at the Middle Temple on the 6th of April 1773, and a week later he was openly married to Miss Linley.

His daring start in life after this happy marriage showed a .confidence in his genius which was justified by its success. Although he had no income, and no capital beyond a few thousand pounds brought by his wife, he took a house in Orchard Street, Portman Square, furnished it " in the most costly style," and proceeded to return on something like an equal footing the hospitalities of the fashionable world. His first comedy, The Rivals, was produced at Covent Garden on the 17th January 1775. It is said to have been not so favourably received on its first night, owing to its length and to the bad playing of the part of Sir Lucius O'Trigger. But the defects were remedied before the second performance, which was deferred to the 28 th of the month, and the piece at once took that place on the stage which it has never lost. His second piece, St Patrick's Day, or the Scheming Lieutenant, a lively farce, was written for the benefit

1 Her portrait, by Gainsborough, one of the best examples of the artist's work, hangs at Knole, Sevenoaks, Kent.

performance (2nd of May 1775) of Lawrence Clinch, who had succeeded as Sir Lucius. In November 177s, with the assistance of his father-in-law, he produced the comic opera of The Duenna, which was played 75 times at Covent Garden during that season. Sheridan now began to negotiate with Garrick for the purchase of his share of Drury Lane, and the bargain was completed in June 1776. The sum paid by Sheridan and his partners, Thomas Linley and Dr Ford, for the half-share was £35,coo; of this Sheridan contributed £10,000. The money was raised on mortgage, Sheridan contributing only £1300 in cash. 1 Two years afterwards Sheridan and his friends bought the other half of the property for £35,000.

From the first the direction of the theatre would seem to have been

mainly in the hands of Sheridan, who derived very material assistance from his wife. In February 1777 he produced his version of Vanbrugh's Relapse, under the title of A Trip to Scarborough. This is printed among Sheridan's works, but he has no more title to the authorship than Colley Cibber to that of Richard III. His chief task was to remove indecencies; he added very little to the dialogue. The School for Scandal was produced on the 8th of May 1777. Mrs Abington, who had played Miss Hoyden in the Trip, played Lady Teazle, who may be regarded as a Miss Hoyden developed by six months' experi- ence of marriage and town life. The lord chamberlain refused to license the play, and was only persuaded on grounds of personal friendship with Sheridan to alter his decision. There are tales of the haste with which the conclusion of The School for Scandal was written, of a stratagem by which the last act was got out of him by the anxious company, and of the fervent " Amen " written on the last page of the copy by the prompter, in response to the author's " Finished at last, thank God!" But, although the conception was thus hurriedly completed, we know from Sheridan's sister that the idea of a " scandalous college " had occurred to him five years before in connexion with his own experiences at Bath. His difficulty was to find a story sufficiently dramatic in its incidents to form a subject for the machinations of the character-slayers. He seems to have tried more than one plot, and in the end to have desperately forced two separate conceptions together. The dialogue is so brilliant throughout, and the auction scene and the screen scene so effective, that the construction of the comedy meets with little criticism. The School for Scandal, though it has not the unity of The Rivals, nor the same wealth of broadly humorous incident, is universally regarded as Sheridan's masterpiece. He might have settled the doubts and worries of authorship with Puff's reflection: " What is the use of a good plot except to bring in good things?"

Sheridan's farce, The Critic, was produced on the 29th of October 1779, The School for Scandal meantime continuing to draw larger houses than any other play every time it was put on the stage. In The Critic the laughable infirmities of all classes connected with the stage — authors, actors, patrons and audience — are touched cSff with the lightest of hands; the fun is directed, not at individuals, but at absurdities that grow out of the circumstances of the stage as naturally and inevitably as weeds in a garden. It seems that he had accumu- lated notes for another comedy to be called Affectation, but his only dramatic composition during the remaining thirty-six years of his life was Pizarro, produced in 1799— a tragedy in which he made liberal use of some of the arts ridiculed in the person of Mr

Puff. He also revised for the stage Benjamin Thompson's translation, The Stranger, of Kotzebue's Menschen- hass und Reue.

He entered parliament for Stafford in 1780, as the friend and ally of Charles James Fox. Apparently he owed his election for Stafford to substantial arguments. He is said to have paid the burgesses five guineas each for the honour of representing them, beside gifts in dinners and ale to the non- voting part of the community, for their interest and applause. His first speech in parliament was to defend himself against the charge of bribery,

1 For the elucidation of these transactions, see Brander Matthews's edition (1885) of Sheridan's Comedies (pp. 29-31).

and was well received. He spoke little for a time and chiefly on financial questions, but soon took a place among the best speakers in the House. Congress recognized his services in opposing the war in America by offering him a gift of £20,000 which, however, he refused. Under the wing of Fox he filled subordinate offices in the short-lived ministries of 1782 and 1783. He was under-secretary for foreign affairs in the Rockingham ministry, and a secretary of the treasury in the Coalition ministry. In debate he had the keenest of eyes for the weak places in an opponent's argument, and the happy art of putting them in an irresistibly ludicrous light without losing his good temper or his presence of mind. In those heated days of parliamentary strife he was almost the only man of mark that was never called out, and yet he had no match in the weapon of ridicule.

Sheridan found his great opportunity in the impeachment of Warren Hastings. His speeches in that proceeding were by the unanimous acknowledgment of his contemporaries among the greatest delivered in that generation of great orators. The first was on the 7th of February 1787, on the charges brought against Hastings with regard to the begums or princesses of Oude. Sheridan spoke for more than five hours, and the effect of his oratory was such that it was unanimously agreed to adjourn and postpone the final decision till the House should be in a calmer mood. Of this, and of his last great speech on the subject in 1794, only brief abstracts have been preserved; but with the second, the four days' speech delivered in his capacity of manager Of the trial, in Westminster Hall, on the occasion so brilliantly described by Macaulay, posterity has been more fortunate. Gurney's verbatim reports of the speeches on both sides at the trial were published at Sir G. Cornewall Lewis's instigation in 1859, and from them we are able to form an idea of Sheridan's power as an orator. There are passages here and there of

gaudy rhetoric, loose ornament and declamatory hyperbole; but the strong common sense, close argumentative force and masterly presentation of telling facts enable us to understand the impression produced by the speech at the time. From the time of the break-up of the Whig party on the secession of Burke he was more or less an " independent member," and his isolation was complete after the death of Fox. When Burke denounced the French Revolution, Sheridan joined with Fox in vindicating the principle of non-intervention. He maintained that the French people should be allowed to settle their constitution and manage their affairs in their own way. But when the republic was succeeded by the empire, and it became apparent that France under Napoleon would interfere with the affairs of its neighbours, he employed his eloquence in denouncing Napoleon and urging the prosecution of the war. One of his most celebrated speeches was delivered in support of strong measures against the mutineers at the Nore. He was one of the few members who actively opposed the union of the English and Irish parliaments. When the Whigs came into power in 1806 Sheridan was appointed treasurer of the navy, and became a member of the Privy Council; After Fox's death he succeeded his chief in the representation of Westminster, and aspired to succeed him as leader of the party, but this claim was not allowed, and thenceforward Sheridan fought for his own hand. When the prince became regent in 181 1 Sheridan's private influence with him helped to exclude the Whigs from power. Throughout his parliamentary career Sheridan was one of the iboon companions of the prince, and his champion in parliament in some dubious matters of payment of debts. But he always resented any imputation that he was the prince's confidential adviser or mouthpiece. A certain proud and sensitive independence was one of the most marked features in Sheridan's parliamentary career. After a coolness arose between him and his Whig allies he refused a place for his son from the government, lest there should be any suspicion in the public mind that his support had been bought.

His last years were harassed by debt and disappointment. He sat in parliament for Westminster in 1806-1807. At the general election of 1807 he stood again for Westminster and was defeated, but was returned as member for Ilchester, at

the expense apparently of the prince of Wales. In 181 2 he failed to secure a seat at Stafford. He could not raise money enough to buy

the seat. He had quarrelled with the Prince Regent, and seems to have had none but obscure friends to stand by him. As a member of parliament he had been safe against arrest for debt, but now that this protection was lost his creditors closed in upon him, and the history of his life from this time till his death in 1816 is one of the most painful passages in the biography of great men. It may be regarded as certain, however, that the description of the utter destitution and misery of the last weeks of his life given in the Croker Papers (i. pp. 288-312, ed. L. J. Jennings) is untrue. In any attempt to judge of Sheridan as he was apart from his works, it is necessary to make considerable deductions from the mass of floating anecdotes that have gathered round his name. It was not without reason that his grand-daughter Mrs Norton denounced the unfairness of judging of the real man from unauthenticated stories. The real Sheridan was not a pattern of decorous respectability, but we may fairly believe that he was very far from being the Sheridan of vulgar legend. Against the stories about his reckless management of his affairs we must set the broad facts that he had no source of income but Drury Lane theatre, that he bore from it for thirty years all the expenses of a fashionable life, and that the theatre was twice rebuilt during his proprietorship, the first time (1791) on account of its having been pronounced unsafe, and the second (1809) after a disastrous fire. Enough was lost in this way to account ten times over for all his debts. The records of his wild bets in the betting book of Brooks's Club date from the years after the loss, in 1792, of his first wife, to whom he was devotedly attached. He married again in 1795, his second wife being Esther Jane, daughter of Newton Ogle, dean of Winchester. The reminiscences of his son's tutor, Mr Smyth, show anxious and fidget ty family habits, curiously at variance with the accepted tradition of his imperturbable reck- lessness. He died on the 7th of July 1816, and was buried with great pomp in Westminster Abbey.

Sheridan's only son by his first marriage, Thomas Sheridan (1775-1817), was a poet of some merit. He became colonial treasurer at the Cape of Good Hope. His wife, Caroline Henrietta, nee Callander (1779-1851), wrote three novels, which had some success at the time. She received, after her husband's death, quarters at Hampton Court, and is described by Fanny Kemble as more beautiful than anybody ' but j her daughters. The eldest child, Helen Selina (1807-1867), married Commander Price Blackwood, afterwards Baron Dufferin. Her husband died in 1841, and in 1862 she consented to a ceremony of marriage with George Hay, Earl of Gifford, who died a month later. Her Songs, Poems and Verses

(1894) were published, with a memoir, by her son, the marquess of Dufferin. The second daughter, Caroline, became Mrs Norton (q.v.). The youngest, Jane Georgina, married Edward Adolphus Seymour, afterwards 1 2th duke of Somerset.

Bibliography. — Memoirs of the . . . Life of . . . R.B. Sheridan, with a Particular Account of his Family and Connexions (1817), by- John Watkins (" who deals," said Byron, " in the life and libel line"), was an altogether inadequate piece of work, and made many false statements. The Memoirs, &c.(i82$), compiled by Thomas Moore did not make full use of the papers submitted by the family. William Smyth (Memoir of Mr Sheridan, 1840), who had been a tutor in Sheridan's house, was responsible for many of the scandalous and sometimes baseless stories connected with Sheridan's name. Accounts of the dramatist's parents and of his grandfather are given by Alicia Lefanu in her Memoirs of the Life and Writings of Mrs Frances Sheridan, &c. (1824). There are numerous references to Sheridan in the Letters and Journals of Byron, and several anecdotes (see especi-ally vol. v. p. 411 seq., ed. Prothero, 1901). Popular works on the Sheridans are Mrs Oliphant's Sheridan (1883) in the " English Men of Letters " series; Mr Percy Fitzgerald's Lifes of the Sheridans (2 vols., 1886); and the Life of R. B. Sheridan (1890) by Lloyd C Sanders in the " Great Writers " series. An admirable sketch of Sheridan's political career is given in Wilkes, Sheridan, Fox : the Opposition under George the Third (1874), by Mr W. Fraser Rae, who reconstructed Sheridan's biography from the original sources and vindicated his reputation from the misstatements of earlier writers, in Sheridan :a Biography (2 vols., 1896), which has an introduction by the marquess of Dufferin and Ava, the great-grandson of the

dramatist. The Life of R. B. Sheridan by Walter Sichel (1909) is, however, the best account now available.

Among the numerous modern editions of Sheridan's plays, of which only The Rivals was published by the dramatist himself, may be mentioned: Sheridan's Plays now printed as he wrote them (1902), edited by W. Fraser Rae, who quotes at length the criticisms in the contemporary press; The Plays of R. B. Sheridan (1900), edited by Mr A. W. Pollard; and Sheridan's Comedies (Boston, U.S.A., 1885), with a valuable introduction by Mr Brander Matthews. For further details consult the extensive bibliography by Mr J. P. Anderson in the Life by Lloyd C Sanders.

SHERIDAN, PHILIP HENRY (1831-1888), American general, was

born at Albany, N.Y., on the 6th of March 1831. His early life was spent in a country district in Perry county, Ohio, and he proceeded to West Point in 1848, graduating in 1853. He was assigned to the infantry and served on the frontier and on the Pacific coast, gaining some experience of war in operations against the Indians. At the outbreak of the Civil War in 1861 he had just become first lieutenant, and soon afterwards he was promoted captain and entrusted with administrative duties in the western theatre of war. Early in 1862 he was commissioned colonel of the 2nd Michigan cavalry, with which he served in Halleck's army on the Tennessee. In June he was placed in command of a cavalry brigade, and a month later he won pro- motion to the rank of brigadier-general U.S.V. by his skilful conduct of the fight of Booneville on the 1st of July. He took part in General Buell's campaign against Bragg, and led the nth division of the Army of the Ohio at the hard-fought battle of Perry ville (October 8). Sheridan distinguished himself still more at the sanguinary battle of Murfreesboro (Stone river), and on the recommendation of Rosecrans was made major-general of volunteers, to date from the 31st of December 1862. His division took part in Rosecrans 's campaign of 1863 and a very distinguished part at Chickamauga and Chattanooga (q.v.). Sheridan's leading of his division at the latter battle attracted the notice of General Grant, and when the latter, as general in chief of the U.S. armies, was seeking an " active and energetic man, full of spirit and vigour and life " to command the cavalry of the Army of the Potomac, Sheridan was chosen on the sug- gestion of General Halleck. The extraordinary activity of the Union cavalry under his command justified the choice. Sheri- dan's corps took part in the battles of the Wilderness and Spott- sylvania Court House (see the article Wilderness), incidents of which led to a bitter quarrel between Sheridan and Meade and to Sheridan's being despatched by General Grant on a far- reaching cavalry raid towards Richmond. In the course of this was fought the battle of Yellow Tavern, where the Confederate general J. E. B. Stuart was killed. After rejoining the army Sheridan fought another well-contested action at Hawes' Shop and took and held Cold Harbor. After the battle at that place Sheridan undertook another raid, this time towards Charlottes- ville (June 7-28), in view of co-operation with the army of General David Hunter in the Valley. In the course of this was fought the action of Treyilian's Station (June n). A little later came General Sheridan's greatest opportunity for distinc- tion. He was appointed to command a new " Army of the Shenandoah " to oppose the forces of General Early, and con- ducted the brilliant and decisive campaign which crushed the Confederate army and finally put an end to the war in

Northern « Virginia (see American Civil War and Shenandoah Valley Campaigns). The victories of the Opequan, or Winchester (September 19), Fisher's Hill (September 22) and Cedar Creek (October 19), produced great elation in the North and correspond- ing depression in the Confederacy, and Sheridan was made successively brigadier-general U.S.A. for Fisher's Hill and major-general U.S.A. for Cedar Creek. " Sheridan's Ride " of 20 m. from Winchester to Cedar Creek to take command of the hard-pressed Union troops is a celebrated incident of the war. His capacity for accepting the gravest responsibilities was shown, not less than by his handling of an army in battle, by his ruthless devastation of the Valley — a severe measure felt to be necessary both by Sheridan himself and by Grant. From the Valley the cavalry rode through the enemy's country to join Grant before Petersburg, fighting the action of Waynesboro', destroying

communications and material of war, and finally reporting to the general-in-chief on the 25th of March 1865. A few days later the indefatigable Sheridan won the last great victory of the . war at Five Forks. The operations were conducted entirely by him and were brilliantly successful, leading to the retreat of Lee from the lines of Petersburg and the final catastrophe of Appo- mattox Court House. In the course of the battle of Five Forks Sheridan once more displayed his utter fearlessness of criticism by summarily dismissing from his command General G. K. Warren, an officer of the highest repute, whose corps was only temporarily under Sheridan's orders. The part played by the cavalry corps in the pursuit of Lee was most conspicuous, and Sheridan himself commanded the large forces of infantry and cavalry which cut off Lee's retreat and compelled the surrender of the famous Army of Northern Virginia (see American Civil War and Petersburg).

Soon after the close of the war Sheridan, who by these services Tiad gained his reputation as one of the greatest soldiers of the time, "was sent to exercise the military command in the south- west, where a corps of observation, on the Mexican frontier, watched the struggle between Maximilian and the Liberals (see Mexico: History). General Sheridan stated in his memoirs that material assistance was afforded to the Liberals out of the U.S. arsenals, and the moral effect of his presence on the frontier certainly influenced the course of the struggle to a very great extent. Later, in the Reconstruction period,

he commanded the Fifth Military District (Louisiana and Texas) at New Orleans, where his administration of the conquered states was most stormy, his differences with President Johnson culminating in his recall in September 1867. He was then placed in charge of the Department of the Missouri, which he commanded for sixteen years, and in 1869, on Grant's election to the presidency and Sherman's consequent promotion to the full rank of general, he was made lieutenant-general. In 1868-1869 he conducted a winter campaign against the Indians, which resulted in their defeat and surrender. During the Franco-German War of 1870 General Sheridan accompanied the great headquarters of the German armies as the guest of the king of Prussia. In 1873, at the time of the " Virginius " incident (see Cuba), when an invasion of Spain was projected, Sheridan was designated to command the United States field army. In 1875 he was sent to New Orleans to deal with grave civil disorder, a duty which he carried out with the same uncompromising severity that he had previously shown in 1867. In 1883 he succeeded Sherman in the chief command of the United States army, which he held until his death at Nonquitt, Mass., on the 5th of August 1888. A few months previously he had been raised to the full rank of general.

As a soldier, Sheridan combined brilliant courage and pains- taking skill. As a fighting general he was unsurpassed. Few of the leaders of either side could have stemmed the tide of defeat as he did at Stone river and turned a mere rally into a great victory as he did at Cedar Creek, by the pure force of personal magnetism. His restless energy was that of a Charles XII., to whom in this respect he has justly been compared, while, unlike the king of Sweden, he was as careful and vigilant as the most methodical strategist. He was a devout Roman Catholic, and in his private life he had the esteem and admiration of all who knew him well. General Sheridan was president of the Society of the Army of the Potomac and of the Society of the Army of the Cumberland, the latter for fourteen years. In 1875 he married Irene, daughter of General D. H. Rucker, U.S.A.

His Personal Memoirs (2 vols.) were published soon after his death.

SHERIFF, or Shire-Reeve (O. Eng. scir-gerefa or scirman, 1 Latin, vice-comes), often called "high sheriff," the English and Irish executive authority in a county, or other place, often called his " bailiwick." The office also exists in about twenty ancient cities and boroughs, among which may be named London, Norwich, York, Bristol, Oxford, Lincoln, Chester and Canterbury in England, and Dublin, Cork, Limerick and other places in Ireland. In most of these the office is of an honorary

1 The word occurs as early as the laws of Ine (c. 8), about 690.

nature. The office is at present an annual one, though this has not been always the case. Three names are put on the list by the chancellor of the exchequer and the judges of king's bench division on the morrow of St Martin (12th of November), and the first name is usually pricked by the king in council in the February or March following. City and borough sheriffs are usually appointed by the corporations on the 9th of November. London and Middlesex are specially provided for by the act of 1887, s. 33, and the sheriffs of the counties of Cornwall and Lancaster are separately appointed, the act not applying to them.

The shrievalty was at one time a far more important office than it is at present. " The whole history of English justice and police," says Maitland (Justice and Police, 69), " might be brought under this rubric, the decline and fall of the sheriff." That the sheriff sometimes abused his power is obvious from the grievances stated in the Inquest of Sheriffs of n 70. But he was necessary to protect the interests of the crown and the people against the powerful local baronage. Besides executing the king's writs, he called out the posse comitatus on any emergency needing an armed force. He had the ferm of the shire 2 (the rent he paid being called " sheriff-geld ") and presided in the county court and the hundred court. For more purely judicial purposes he held as the king's deputy the sheriff's tourn, 3 where his jurisdiction had not been ousted by franchise. He might be a peer or a judge, Bracton being an instance of the latter. The appointment seems to have been originally by popular election, a right confirmed by 28 Edw. I. c. 8, but ultimately vested in the crown unless where certain powerful landowners had contrived to make the office hereditary. The hereditary shrievalty of Westmorland was not abolished until 1850 by 13 & 14 Vict. c. 30. 4 The tendency of the hereditary office to become obsolete was no doubt helped by the creation of Viscount Beaumont as an hereditary peer under the new dignity of vice-comes in 1440. At one time cohtributions to the expense of the office were made by the magistrates and others of the county. " Sheriff-tooth " was a tenure on condition of supplying entertainment to the sheriff at the county court. Up to the 19th century " riding with the sheriff " was an incident of the assizes, the riders being some of the principal men of the shire who brought with them wine and victuals in order to assist the sheriff in showing hospitality to the judges.

At the present day the expensive duties of the sheriff depend on numerous statutes beginning with 2 Edw. III. c. 3 (1328). The most

important is the Sheriffs Act 1887, mainly a consolidat- ing act applying to England only. The person nominated is usually a magistrate for the county, but anyone is eligible provided that he have land in the county sufficient to answer the king. 5 Exempt are peers, clergy, officers in active service, practising barristers and solicitors and others. Poverty is also a ground of exemption. The sheriff appoints his undersheriff. The duties of the office at the present day are both administrative and judicial. Among the former the most important is attend- ance on the judges at assizes and election petitions. A certain amount of stately ceremony is required, and any lack of it is punishable by fine either by the judge of assize or by the High Court. Other administrative duties are execution of writs 6 and of the sentence of death, acting as returning officer at parliamentary elections, preparing the panel of jurors for assizes, the keeping prisoners in safe custody, he being liable for their escape, and the — now nominal — duty of summoning the posse comitatus. His judicial duties consist in himself or his deputy sitting to assess damages under the Lands Clauses Act 1845, and also in cases set down for trial where the defendant has made default in appearance and the issue resolves itself into one of damages. The expenses of the office are partly met by the

2 The ferm is abolished by the act of 1887, s. 19.

3 Abolished by s. 18 of the same act.

4 Repealed and re-enacted by the act of 1887, s. 31.

6 The counties of Cambridge and Huntingdon are combined for the purposes of the shrievalty. See the act of 1887, s. 32.

6 Where a question arises as to the ownership of goods seized in execution the sheriff may have to undergo the process known as sheriff's interpleader.

Treasury in accordance with the Treasury order of the 2nd of August 1898. The order lays down with somewhat grirn humour that the sheriff is not limited to the allowances, but may spend more if he likes. A sheriff cannot during his year of office act as a magistrate for the county of which he is sheriff.

See the works on the history of law by Stubbs, Pollock and Mait-

land and Holdsworth. Also W. S. McKechnie, Magna Carta (1905); Sir M. Hale, A Short Treatise touching Sheriff's Accompts (1683) ; Greenwood, Bouleuterion (1685) ; The Compleat Sheriff (1696) ; Impey (1786); Atkinson (1878); Churchill and Bruce (1882); and Mather (1903).

Scotland. — As far as is known the sheriff did not exist in Scotland before the beginning of the Norman period. In the feudal system he became as in England the centre of the local administration of justice, the representative of the crown in executive as well as judicial business, and was always a royal officer appointed by and directly responsible to the king. The earliest sheriffs on record belong to the reigns of Alexander I. and David I., and the office was common before the death of Alexander III. In many cases it had become hereditary, instances being those of De Sinton in Selkirk and Agnew in Galloway. The ordinance of Edward I. in 1305 rejected the hereditary character of the office, but an act of James II. shows that the office had again become hereditary.

One of the consequences was that sheriffs ignorant of law required deputes to discharge their judicial duties. In the course of succeeding reigns, down to that of James VI., the jurisdiction of the sheriffs came to be much limited by grants of baronies and regalities which gave the grantees the right to hold both civil and criminal courts of less or greater jurisdiction to the exclusion of the sheriff.

The civil jurisdiction of the sheriff was originally of very wide extent, and was deemed specially applicable to questions relating to the land within the shire, but after the institution of the court of session in 1532 it became restricted, and all causes relating to property in land, as well as those requiring the action called declarator for establishing ultimate right, and most of those requiring equitable remedies, were withdrawn from it. Nor did it possess any consistoriai jurisdiction. Practi- cally, therefore, the civil jurisdiction of the sheriff fell under the head of actions concluding for payment of money and actions to regulate the possession of land. The criminal jurisdiction of the sheriff was in like manner in its origin of almost universal extent. But this was first limited to cases where the offenders were caught in or shortly after the act, afterwards to cases in which the trial could be held within forty days, and subsequently further restricted as the business of the justiciary court became more organized. The punishment of death, having by long disuse come to be held beyond the power of the sheriff, and the statutory punishments of transportation or penal servitude never having been entrusted to him, his jurisdiction as regards crimes was usually said

to be limited to those punishable arbitrarily, that is, by imprisonment, fine or admonition.

As a consequence of the suppression of the Jacobite rising of 1745, after the 1st of March 1748 all heritable sheriffships were extinguished by 20 Geo. II. c. 43. The act declared that there should be but one sheriff-depute or stewart-depute in every shire or stewartry, who was to be an advocate of three years' standing, appointed by the crown. Since 1769 the sheriff-depute has held his office ad vitam aut culpam. Power was given to him by 20 Geo. II. c. 43 to appoint one or more sheriffs- substitute. In 1787 the sheriff - substitute was placed on the civil establishment and paid by the crown; in 1825 a qualification of three years' standing (now five years by the Sheriff Courts (Scotland) Act 1877) as an advocate or procurator before a sheriff court was required (6 Geo. IV. c. 23); in 1838 he was made removable by the sheriff-depute only with the consent of the lord president and lord justice clerk, and it was made com- pulsory that he should reside in the sheriffdom, the provision of 20 Geo. II. c. 43, which required the sheriff-depute so to reside for four months of each year, being repealed (1 & 2 Vict. c. 119). In 1877 the right of appointment of the substitutes was trans- ferred from the sheriff-depute to the crown by the act of 1877.

While the sheriff -depute has still power to hear cases in the first instance, and is required to hold a certain number of sittings in each place where the sheriff-substitute holds courts, and also once a year a small-debt court in every place where a circuit small debt court is appointed to be held, the ordinary course ■ of civil procedure is that the sheriff-substitute acts as judge of first instance, with an appeal under certain restrictions from his decision to the sheriff-depute, and from him to the court of session in all causes exceeding £25 in value. An appeal direct from the sheriff-substitute to the court of session is competent, but is not often resorted to. By the Interpretation Act 1889, s. 28, the word " sheriff " in any act relating to Scotland is to include a sheriff-substitute.

As regards criminal proceedings, summary trials are usually conducted by the sheriff -substitute; trials with a jury either by him or, in important cases, by the sheriff-depute. The sheriff- substitute also has charge of the preliminary investigation into crime, the evidence in which, called a precognition, is laid before him, and if necessary taken before him on oath at the instance of his procurator-fiscal, the local crown prose- cutor.

The duties of the sheriff-depute are now divided into ministerial or

administrative and judicial. The ministerial are the supervision of the accounts of the inferior officers of the sheriffdom; the superintendence of parliamentary elections ; the holding by himself or his substitutes of the courts for registration of electors ; the preparation of the list of persons liable to serve both on criminal and civil juries; the appointment of sheriff officers and supervision of the execution of judicial writs by them; and the striking of the " fiars." He has also to attend the judges of justiciary at the circuit courts for the county or counties over which his jurisdiction extends.

The judicial duties of the sheriff-depute are, as regards crimes, the trial of all causes remitted by the counsel of the crown for the trial by sheriff and jury, as well as summary trials if he chooses to take them. This now means most crimes for which a maximum of two years' imprisonment (in practice eighteen months is the longest sentence imposed) is deemed sufficient, and which afe not by statute reserved for the justiciary court. His civil jurisdiction is regulated by several statutes too technical for detail, but may be said generally to extend to all suits which conclude for payment of money, whatever may be the cause of action, with the exception of a few where the payment depends on status, all actions with reference to the possession of land or right in land, and actions relative to the right of succession to movable property. In bankruptcy he has a cumulative and alternative jurisdiction with the court of session, and in the service of heirs with the sheriff of chancery.

The courts which the sheriff holds are (1) the criminal court; (2) the ordinary civil court ; (3) the small-debt court for cases under £12 in value (6 Geo. IV. c. 48) ; (4) the debts recovery court for cases above £12 and under £50 in value (Debts Recovery [Scotland] Act 1867) ; and (5) the registration court. His judgment in the criminal court is subject to review by the court of justiciary, and in the ordinary civil court and the debts recovery court by the court of session. In the small-debt court it is final, except in certain cases where an appeal lies to the next circuit court of justiciary. The sheriff-substitute may competently exercise all the judicial jurisdiction of the sheriff, subject to appeal in civil cases other than small debt cases. As regards his administrative functions he assists the sheriff generally, and may act for him in the registration and fiars court, and he superintends the preliminary stage of criminal inquiries, consult- ing with the sheriff if necessary ; but the other administrative duties of the office are conducted by the sheriff-depute in person. The executive functions of the sheriff are performed by messengers-at- arms. The civil jurisdiction depends on numerous statutes known as the Sheriff Courts and Small Debts Acts.

The salaries of sheriffs- depute vary from £2000 to £500 a year, those of sheriffs-substitute from £1400 to £500.

There is a principal sheriff-clerk appointed by the crown fqr each county, who has depute clerks under him in the principal towns, and a procurator-fiscal for the conduct of criminal prosecutions for each county and district of a county, who is appointed by the sheriff with the sanction of the home secretary.

Besides the sheriffs of counties, there is a sheriff of chancery appointed by the crown, whose duties are confined to the service of heirs, with a salary of £500.

See the various works on sheriff court practice, such as those of J. D. Wilson (1883) and J. M. Lees (1889), and Green, Encyc. of Scots. Law, s.v. " Sheriff."

Ireland. — The sheriff has much the same duties as in England. His position is defined by numerous statutes, beginning with 53 Geo. III. c. 68 (1817). There is no consolidating act such as that of 1887 in England.

United States. — The office of sheriff is generally elective.

The sheriff has administrative and limited judicial authority. He sometimes serves for combined counties, as in England for Cambridge and Huntingdon. (J. W.)

SHERIFFMUIR, a battlefield situated on the verge of the extreme north-western flank of the Ochils, Perthshire, Scotland, watered by Wharry Burn, an affluent of the Allan. It lies within the bounds of the parish of Dunblane, 23 m. E. by N. of the town. It was the site of an indecisive battle (13th of November 1715) between the Jacobites, about 12,000 strong, under John Erskine, 6th or nth earl of Mar, and 4000 Royalists under Archibald Campbell, afterwards 3rd duke of Argyll. Both sides, each of which lost 500 men, claimed the victory, although in point of fact Mar deemed it prudent to retreat. The " battle stone " enclosed by a railing marks the scene of the encounter.

SHERIF PASHA (1818-1887), Egyptian statesman, was a Circassian who filled numerous administrative posts under Said and Ismail

pashas. He was of better education than most of his contemporaries, and had married a daughter of Colonel Seves the French non-commissioned officer who became Soliman Pasha under Mehemet Ali. As minister of foreign affairs he was useful to Ismail, who used Sherif's bluff bonhomie to veil many of his most insidious proposals. Of singularly lazy disposition, he yet possessed considerable tact — he was in fact an Egyptian Lord Melbourne, whose policy was to leave every- thing alone. His favourite argument against any reform was to appeal to the Pyramids as an immutable proof of the solidity of Egypt financially and politically. His fatal optimism rendered him largely responsible for the collapse of Egyptian credit which brought about the fall of Ismail. Upon the military insurrection of September 1881, Sherif was summoned by the khedive Tewfik to form a new ministry. The impossibility of reconciling the financial requirements of the national party with the demands of the British and French controllers of the public debt, compelled him to resign in the following February. After the suppression of the Arabi rebellion he was again installed in office (September 1882) by Tewfik, but in January 1884 he resigned rather than sanction the evacuation of the Sudan. As to the strength of the mahdist movement he had then no conception. When urged by Sir Evelyn Baring (Lord Cromer) early in 1883 to abandon some of the more distant parts of the Sudan, he replied with charac- teristic light-heartedness: " Nous en causerons plus tard; d'abord nous allons donner une bonne raclee a ce monsieur " {i.e. the mahdi). Hicks Pasha's expedition was at the time preparing to march on El Obeid. {Vide Egypt No. 1 (1907), p. 115). Sherif died at Gratz, on the 20th of April 1887.

SHERLOCK, THOMAS (1678-1761), English divine, the son of William Sherlock (?.!>.), was born at London in 1678. He was educated at Eton and at St Catharine's Hall, Cambridge, and in 1704 succeeded his father as master of the Temple, where he was very popular. In 17 14 he became master of his old college at Cambridge and vice-chancellor of the university, whose privileges he defended against Richard Bentley. In 1715 he was appointed dean of Chichester. He took a prominent part in the Bangorian controversy against Benjamin Hoadly, whom he succeeded as bishop of Bangor in 1728; he was afterwards translated to Salisbury in 1734, and to London in 1748. Sherlock was a capable administrator, and cultivated friendly relations with dissenters. In parliament he was of good service to his old schoolfellow Robert Walpole. He published against Anthony Collins's deistic Grounds of the Christian Religion a volume of sermons entitled The Use and Interest of Prophecy in the Several Ages of the World (1725); and in reply to Thomas

Woolston's Discourses on the Miracles he wrote a volume entitled The Tryal of the Witnesses of the Resurrection of Jesus (1729), which soon ran through fourteen editions. His Pastoral Letter (1750) on " the late earthquakes " had a circulation of many thousands, and four or five volumes of Sermons which he published in his later years (1754-1758) were also at one time highly esteemed. He died in July 1761.

A collected edition of his works, with a memoir, in 5 vols. 8vo, by J. S. Hughes, appeared in 1830.

SHERLOCK, WILLIAM (c. 1641-1707), English divine, was born at Southwark about i64r, and was educated at Eton and at Peterhouse College, Cambridge. In 1669 he became rector of St George's, Botolph Lane, London, and in 1681 he was appointed a prebendary of St Paul's. In 1674 he showed his controversial bent by an attack on the puritan John Owen, in The Knowledge of Jesus Christ and Union with Him. In 1684 he published The Case of Resistance of the Supreme Powers stated and resolved according to the Doctrine of the Holy Scriptures, an ably written treatise, in which he drew the distinction between active and passive obedience which was at that time generally accepted by the high church clergy; in the same year he was made master of the Temple. In 1686 he was reproved for his anti-papal preaching, and his pension stopped- After the Revolution he was suspended for refusing the oaths to William and Mary, but before his final deprivation he yielded, justifying his change of attitude in The Case of the Allegiance due to Sovereign Powers stated and resolved according to Scripture and Reason and the Principles of the Church of England (1691). During the period of his suspension he wrote a Practical Discourse concerning Death, which became very popular. In 1690 and 1693 ne pub- lished volumes on the doctrine of the Trinity which helped rather than injured the Socinian cause, and involved him in a warm controversy with Robert South and others. He became dean of St Paul's in 1691, and died at Hampstead in June 1707.

His sermons were collected in 2 vols. 8vo (4th ed., 1755).

SHERMAN, JOHN (1823-1900), American financier and statesman, a younger brother of General W. T. Sherman, was born at Lancaster, Ohio, on the roth of May r823. He began the study of law at Mansfield, Ohio, and was admitted to the bar in 1844. For ten years he practised his profession with success, and with only casual interest in politics. , His associa- tions and predilections were with the Whigs, and he was a delegate to the National Convention that

nominated General Zachary Taylor in r848. Upon the repeal of the Missouri Compromise by the Kansas-Nebraska Bill in 1854, he joined the great popular movement in Ohio against the policy represented by this bill, and was elected to Congress in the autumn of that year as an " Anti-Nebraska " man. In the summer of the next year he took an active part in the formal organization of the Republican party in the state, and at the opening of Congress in December began a long career of public service. As a member of the House (1855-1861), he quickly manifested the qualities which characterized his whole political life. Though a thorough and avowed partisan, he was within the party the counsellor of moderate rather than extreme measures, and thus gained on the whole a position of great influence. He was a member of the committee sent by the House in r8s6 to investigate the troubles in Kansas, and drafted the report of the majority. In 1859 he was the Republican candidate for Speaker of the House, but was obliged, after a contest that lasted two months, to withdraw, largely because of the recommendation he had inadvertently given to an anti-slavery book, The Impending Crisis of the South (1857), by Hinton Rowan Helper (1829-1909). He became, however, chairman of the Committee on Ways and Means, and was instrumental in the enactment of the Morrill 1 Tariff Act of i860. In March 1 861 he took his seat in the Senate, to which he had been elected to succeed Salmon P. Chase, when the latter became secretary of the treasury. As senator he sat continuously until he became secretary of the treasury in 1877. His interest and efficiency in financial legislation in the House led to his appointment on the Senate Committee of Finance, and after 1867 he was chairman of this influential committee. He thus became associated with the enactment of all the great fiscal laws through which the strain of war and of reconstruction was sustained. He gave earnest support to the Legal Tender Act, and the substitution of the national for the state banking system. When after the end of the war the question of financial readjustment came up, he vigorously opposed Secretary Hugh McCulloch's policy of retiring the legal tenders, and urged a different plan for effecting the resumption of specie payments. On the questions relating to political reconstruction and the

policy of President Johnson, he supported his party, though opposed to its Radical leaders. He warmly advocated the insertion in the Reconstruction Acts of a provision ensuring the early termination of military government; and he opposed the impeachment of President

Johnson, though he voted for convic- tion on the trial. During the administrations of President Grant his leadership in shaping financial policy became generally recognized. The Resumption Act of 1875, which provided for the return of specie payments four years later, was largely his work both in inception and in formulation, and his appointment to the head of the Treasury Department by President Hayes in 1877 enabled him to carry the policy embodied in the law to successful execution. His administration of the department, in circumstances of great difficulty arising out of the " greenback " agitation and the adverse political complexion of Congress, won him high distinction as a financier.

At the end of the Hayes administration he was again elected to the Senate from Ohio and held his seat until 1897. During this period he was largely concerned in the enactment of the Anti-Trust Law of 1890, and of the so-called Sherman Act of the same year, providing for the purchase of silver and the issuing of Treasury notes based upon it. This latter Act he approved only as a means of escaping the free coinage of silver, and he supported its repeal in 1893. In 1880 and 1888 he aspired actively to the Republican nomination for the presidency, but failed to obtain the requisite support in the Convention. During the last years of his senatorial career he was chairman of the Senate Committee on Foreign Affairs. Upon the accession of President McKinley in 1897, he resigned from the Senate and became secretary of state; but under the tension of the war with Spain the duties of the office became too exacting for his strength at his age, and in April 1898 he resigned and withdrew into private life. Infirmities multiplied upon rjim, until his death at Washington on the 22nd of October 1900.

A selection from the correspondence of John Sherman and his brother Gen. W. T. Sherman was published as The Sherman Letters in 1894. Sherman published Recollections of Forty Years in the House, Senate and Cabinet: an Autobiography (Chicago and New York, 1895). A volume of Selected Speeches was published in 1879. See Life, by T. E. Burton (1906). (W. A. D.)

SHERMAN, ROGER (1721-1793), American political leader, a signer of the Declaration of Independence, was born at Newton, Massachusetts, on the 19th of April 1721 (O.S.). He removed with his parents to Stoughton in 1723, attended the country school there, and at an early age learned the cobbler's trade in his father's shop. Removing to New Milford, Connecticut, in 1743, he worked as county surveyor, engaged in mercantile pursuits, studied law, and in 1754 was admitted to the bar. He represented New Milford in the

Connecticut Assembly in 1755-1756 and again in 1758-1761. From 1761 until his death New Haven was his home. He was once more a member of the Connecticut Assembly in 1764-1766, was one of the governor's assistants in 1766-1785, a judge of the Connecticut superior court in 1766-1789, treasurer of Yale College in 1765-1776, a delegate to the Continental Congress in 1774-1781 and again in 1 783-1 784, a member of the Connecticut Committee of Safety in 1777-1779 and in 1782, mayor of New Haven in 1784-1793, a delegate to the Federal Constitutional Convention of 1787 and to the Connecticut Ratification Convention of the same year, and a member of the Federal House of Representatives in 1789- 1791 and of the United States Senate in 1 791-1793. He was on the committee which drafted the Declaration of Independence, and also on that which drafted the Articles of Confederation. His greatest public service, however, was performed in the Federal Constitutional Convention. In the bitter conflict between the large state party and the small state party he and his colleagues, Oliver Ellsworth and William Samuel Johnson, acted as peacemakers. Their share in bringing about the final settlement, which provided for equal representation in one house and proportional representation in the other, was so important that the settlement itself has come to be called the " Connecticut Compromise." He helped to defeat the proposal to give Congress a veto on state legislation, showing that it was illogical to confer

such a power, since the constitution itself is the law of the land and no state act contravening it is legal. In the Federal Congress (1 789-1 793) he favoured the assumption of the state debts, the establishment of a national bank and the adoption of a protective tariff policy. Although strongly opposed to slavery, he refused to support the Parker resolution of 1789 providing for a duty of ten dollars per head on negroes brought from Africa, on the ground that it emphasized the property element in slavery. He died in New Haven on the 23rd of July 1793. Sherman was not a deep and original thinker like James Wilson, nor was he a brilliant leader like Alexander Hamilton; but owing to his conservative temperament, his sound judgment and his wide experience he was well qualified to lead the compromise cause in the convention of 1787.

Two of Sherman's grandsons, William M. Evarts and George F. Hoar, were prominent in the later history of the country.

Lewis H. Boutell's Life of Roger Sherman (Chicago, 1896), based on material collected by Senator Hoar, is a careful and accurate work.

SHERMAN, WILLIAM TECUMSEH (1820-1891), American general, was born on the 8th of February 1820, at Lancaster, Ohio. He was descended from Edmond Sherman, who emigrated from England to the Massachusetts Bay Colony in 1634. His father, Charles R. Sherman, a judge of the Supreme Court of Ohio, died suddenly in 1829, leaving his widow with a family of young children. William was adopted by the Hon. Thomas Ewing, a close friend of the father, sometime a senator of the United States and a member of the national cabinet. In 1836 he entered West Point, and on graduating near the head of his class he was appointed second lieutenant in the 3rd artillery regiment. His first field service was in Florida against the Seminole Indians. The usual changes of station and detached duty made him acquainted with the geography of all the Southern states, and Sherman improved the opportunity by making topographical studies which proved of no small value to him later. He also employed much of his time in the study of law. When the war with Mexico began in 1846 he asked for field duty, and was ordered to join an expedition going to California by sea. He was made adjutant-general to Colonel Mason, military governor, and as such was executive officer in the administration of local government till peace came in the autumn of 1848 and the province was ceded to the United States. In 1847 he served on the staff of the general commanding the division of the Pacific. In 1850 he married Ellen Boyle, daughter of Thomas Ewing, then secretary of the interior. Transferred in the same year to the commissariat department as a captain, he resigned three years later and went back to California to conduct at San Francisco a branch of an important St Louis banking-house. He continued successfully in the management of this business through a financial crisis incident to a wildly speculative time, until in the spring of 1857 the house, by his advice, withdrew from Californian affairs. Afterwards for a short time he was engaged in business at New York and in 1858 practised law at Leavenworth, Kansas. In 1859, the state of Louisiana proposing to establish a military college, Sherman was appointed its superintendent. On the 1st of January i860 the " State Seminary of Learning and Military Academy " was opened, and here Sherman remained until the spring of 1861, when it was evident that Louisiana would join the states seceding from the Union. He thereupon resigned the superintendency and returned to St Louis, parting with the governor of the state and his colleagues in the school with regret and mutual esteem. Though his brother John Sherman was a leader in the party which had elected Lincoln, William Sherman was very conserva- tive on the slavery question, and his distress at what he thought an unnecessary rupture between the states was extreme. Yet his devotion to the

national constitution was unbounded, and he offered his services as soon as volunteers for the three years' enlistments were called out. On the 14th of May 1861′ he was appointed colonel of the 13th U.S. Infantry, a new regiment, and was soon assigned to command a brigade in General McDowell's army in front of Washington. He served with it in the first battle of Bull Run, on the 21st of July. Promoted

brigadier-general of volunteers, Sherman was in August sent to Kentucky to serve under General Robert Anderson. In October he succeeded to the command of the department. On the 26th of October he reported that 200,000 men would be required for the Kentucky campaign. He was relieved of his post soon afterwards in consequence, but the event justified Sherman's view. He was soon re-employed in a minor position, and, at the head of a division of new troops, accompanied Grant's army to Pittsburg Landing. At the battle of Shiloh Sherman's gallant conduct gained him promotion to major-general. His appreciation of Grant, and his sympathy with the chagrin he suffered after this battle, cemented the friendship between the two. He took part in Halleck's advance on Corinth, Mississippi, and at the close of 1862 led the Mississippi column in the first Vicksburg campaign. He suffered defeat at Chickasaw Bayou, but the capture of Fort Hindman, near Arkansas Post, compensated to some extent for the Vicksburg failure. In Grant's final Vicksburg campaign Sherman commanded the XV. corps and the right of the investing line, and after the surrender he was sent to oppose General Johnston in the country about Jackson, Miss. In July he was made a brigadier-general in the regular army. When, after Rosecrans's defeat at Chicka- mauga, Grant was placed in supreme command in the west, Sherman succeeded to the command of the Army of the Tennessee, with which he took part in the great battle of Chattanooga (q.v.). He had already prepared for a further advance by making an expedition into the heart of Mississippi as far as Meridian, destroying railways and making impracticable, for a season, the transfer of military operations to that region; and on Grant becoming general-in-chief (March 1864) he was made commander of the military division of the Mississippi, including his Army of the Tennessee, now under McPherson, the Army of the Cumber- land, under Thomas, and the Army of the Ohio, under Schofield. Making detachments for garrisons and minor operations in a theatre of war over 500 m. wide, he assembled, near Chattanooga, his three armies, aggregating

100,000 men, and began (May 1864) the invasion of Georgia. After a brilliant and famous campaign of careful manoeuvre and heavy combats (see American Civil War), Sherman finally wrested Atlanta (q.v.) from the Confederates on the 1st of September. His able opponent Johnston had been removed from his command, and Hood, Johnston's successor, began early in October a vigorous movement designed to carry the war back into Tennessee. After a devious chase of a month Hood moved across Alabama to northern Mississippi. Sherman thereupon, leaving behind Thomas and Schofield to deal with Hood, made the celebrated " March to the Sea " from Atlanta to Savannah with 60,000 picked men. After a march of 300 m. Savannah was reached in December. Railways and material were destroyed, the country cleared of supplies, and the Confederate government severed from its western states. In January 1865 Sherman marched northwards again, once more abandoning his-base, towards Petersburg, where Grant and Lee were waging a war of giants. Every mile of his march northwards through the Carolinas diminished the supply region of the enemy, and desperate efforts were made to stop his advance. General Johnston was recalled to active service, and showed his usual skill, but his forces were inadequate. Sherman defeated him and reached Raleigh, the capital of North Carolina, on the 13th of April, having marched nearly 500 m. from Savannah. Lee's position in Virginia was now desperate. Hood had been utterly defeated by Thomas and Schofield, and Schofield (moved 2000 m. by land and sea) rejoined Sherman in North Carolina. With 90,000 men Sherman drove Johnston before him, and when Lee surrendered to Grant Johnston also gave up the struggle. There was much friction between Sherman and the war secretary, Stanton, before the terms were ratified, but with their signature the Civil War came to an end.

Sherman had the good fortune to learn the art of command by degrees. At Bull Run his brigade was wasted in isolated and disconnected regimental attacks, at Shiloh his division was completely surprised owing to want of precaution; but his

bravery and energy were beyond question, and these qualities carried him gradually to the front at the same time as he acquired skill and experience. When therefore he was entrusted with an independent command he was in every way fitted to do himself justice. At the head of a hundred thousand men he showed, besides the large grasp of strategy which planned the Carolinas march, besides the patient skill in manoeuvre which gained ground day by day towards Atlanta, the strength of will which sent his men to the hopeless assault of Kenesaw to teach them that he was not afraid to fight, and cleared Atlanta of its civil population in the face of a bitter popular outcry. Great as were his responsibilities they never strained him beyond his powers. He has every claim to be regarded as one of the greatest generals of modern history.

When Grant became full general in 1866 Sherman was promoted lieutenant-general, and in 1869, when Grant became president, he succeeded to the full rank. General Sherman retired, after being commanding general of the army for fifteen years, in 1884. He died at New York on the 14th of January 1 89 1. An equestrian statue, by Saint Gaudens, was unveiled at New York in 1903, and another at Washington in the same year.

Sherman's Memoirs were published in 1875 (New York). See also Rachel Sherman Thorndike, The Sherman Letters (New York, 1894) ; Home Letters of Gen. Sherman (1909), edited by M. A. De Wolfe Howe; S. M. Bowman and R. B. Irwin, Sherman and his Campaigns: a Military Biography (New York, 1865); W. Fletcher Johnson, Life of William Tecumseh Sherman (Philadelphia, 1891); Manning F. Force, General Sherman (Great Commanders series) (New York, 1 899).

SHERMAN, a city and the county-seat of Grayson county, Texas, U.S.A., 64 m. by rail N. by E. of Dallas and 9 m. S. of Denison. Pop. (1890) 7335: (1900) 10,243, of whom 2131 were negroes; (1910 census) 12,412. Sherman is served by the St Louis & San Francisco (Frisco System), which has car shops here, the St Louis & South-Western, the Gulf, Colorado & Santa Fe, the Missouri, Kansas & Texas, the Texas & Pacific, and the Houston & Texas Central railways, and by electric lines connect- ing with Denison and Dallas. In the city are Austin College (Presbyterian, 1850; removed from Austin to Sherman in 1876) for men, Carr-Burdette College (Christian, 1894) for girls, North Texas Female College- and Conservatory (Methodist Episcopal, 1877) and Saint Joseph's Academy (Roman Catholic) for girls. Sherman is situated on a ridge

720 ft. above sea-level between the Red river and the Trinity river, near a fertile part of the Red River Valley, in which the principal industries are the growing of cotton, Indian corn, wheat, oats, potatoes and alfalfa, and stock raising. The city contains cotton gins and compresses, and has various manufactures; in 1905 the value of factory products was $2,841,066 (94-4% more than in 1900). The municipality owns and operates the waterworks and the electric lighting plant. Sherman was settled in 1848 and was chartered as a city in 1895.

SHERRY, originally the name of wine coming from Xeres (Jerez de la Frontera), near Cadiz, Spain, and now the general name of the strong white wines, the lower grades excepted, which are made in the south of Spain (see Wine). The early form of the word in English was " sherris " (abbreviated from " sherris-wine " or " sherris-sack "), which was taken to be a plural, and " sherry " was formed as a singular by mistake.

'S HERTOGENBOSCH ('sBosch, or den Bosch, French Bois-le- Duc), the capital of the province of North Brabant, Holland, at the confluence of the rivers Dommel and Aa, which unite to form the Dieze, and a junction station 295 m. S.S.E. of Utrecht and 27I m. W.S.W. of Nijmwegen by rail. It is connected by steam tramway with Helmond (21 m. S.E.) and by the Zuid- Willem's canal with Maastricht (60 m. S. by E.). Pop. (1900) 32,343. 's Hertogenbosch is a well-built city and contains several churches. The Roman Catholic cathedral of St John, the Janskerk, with its interior in a state of preservation rare in Holland, is one of the finest architecturally in the country. Occupying the site of a much earlier building, of which there are remains, the present church with its fine choir was built in the middle of the 15th century. The 15th-century font, the pulpit (1570), the organ (1617), and the early Gothic Lady

chapel containing a much venerated 13th-century image of the Virgin, which was annually carried in procession through the town, are all noticeable. The choir-screen was sold to the South Kensington Museum in London for £900, this sum being devoted to the work of modern restoration. The town hall contains an interesting series of decorative panels by a modern artist, A. Derkinderen, describing the founding of the city. It also includes a museum of local antiquities. In the Provincial museum are interesting Roman, German and

Frankish anti- quities. The principal other buildings are the court house, government buildings (formerly a Jesuit monastery), episcopal palace, grammar school (once attended by Erasmus), a prison, hospitals, arsenal and barracks, 's Hertogenbosch is the market of the fertile Meiery district, and carries on a considerable trade, chiefly by water, with Dordrecht and Rotterdam, Nijm- wegen, Amhem, Maastricht and Liege. The chief industries include distilleries, breweries, glass works, cigar factories and the ancient linen and cutlery manufactures.

SHERWIN, JOHN KEYSE (1751-1790), English engraver and history-painter, was born in 1751 at East Dean in Sussex. His father was a wood-cutter employed in shaping bolts for ship- builders, and the son followed the same occupation till his seventeenth year, when, having shown an aptitude for art by copying some miniatures with exceptional accuracy, he was befriended by William Mitford, upon whose estate the elder Sherwin worked, and was sent to study in London, first under John Astley, and then for three years under Bartolozzi — for whom he is believed to have executed a large portion of the plate of Clytie, after Annibal Caracci, published as the work of his master. He was entered as a student of the Royal Academy, and gained a silver medal, and in 1772 a gold medal for his paint- ing of " Coriolanus taking Leave of his Family." From 1774 till 1780 he was an exhibitor of chalk drawings and of engravings in the Royal Academy. Establishing himself in St James's Street as a painter, designer and engraver, he speedily attained popularity and began to mix in fashionable society. His drawing of the " Finding of Moses," a work of but slight artistic merit, which introduced portraits of the princess royal of England and other leading ladies of the aristocracy, hit the public taste, and, as reproduced by his burin, sold largely. In 1785 he suc- ceeded Woollett as engraver to the king, and he also held the appointment of engraver to the prince of Wales. His pro- fessional income rose to about £12,000 a year; but he was constantly in pecuniary difficulties, for he was shiftless, indolent, and without method, open-handed and even prodigal in his benefactions — and prodigal, too, in less reputable directions, for he became a reckless gambler, and habits of intemperance grew upon him. He died in extreme penury on the 24th of September 1790 — according to Steevens, the editor of Shake- speare, at " The Hog in the Pound," an obscure alehouse in Swallow Street, or, as stated by his pupil J. T. Smith, in the house of Robert Wilkinson, a printseller in Cornhill.

It is as an engraver that Sherwin is most esteemed; and it may be noted that he was ambidexterous, working indifferently with either

hand upon his plates. His drawing is correct, his line ex- cellent and his textures are varied and intelligent in expression. Such of his plates as the " Holy Family " after Nicholas Poussin, " Christ Bearing the Cross " after Murillo, the portrait of the marquis of Buckingham after Gainsborough and that of Pitt occupy a high place among the productions of the English school of line-engravers. He also worked after Pine, Dance and Kauffman.

SHERWOOD, MARY MARTHA (1775-1851), English author, was born at Stanford, Worcestershire, on the 6th of May 1775, the daughter of the Rev. George Butt, D.D., then rector of Stanford. In 1803 she married her cousin, Captain Henry Sherwood, an officer in the British army, and subsequently accompanied him to India, where she devoted herself to charitable work and to writing. Her Indian story, Little Henry and his Bearer, was translated into many languages. Her best-known work, however, is The History of the Fairchild Family, written after her return to England, of which the first part appeared in 1818, and the second and third parts in 1842 and 1847 respec- tively. The sub-title of this tale is The Child's Manual, being a

series of stories calculated to show the importance and effects of a religious education. The book had a very large sale among the English middle-classes. Mrs Sherwood wrote nearly a hundred stories of a religious type and tracts, mainly for the young. She died on the 22nd of September 1851.

See The Life and Times of Mrs Sherwood. From the Diaries of Captain and Mrs Sherwood, edited by F. J. H. Darton (1910).

SHERWOOD FOREST, one of the ancient English forests, in Nottinghamshire. It extended from Nottingham northward to Worksop, being over 20 m. long and from 5 to 9 m. broad. The soil is sandy and poor, and although a considerable portion has been brought under cultivation, the district preserves many traces of its ancient character, especially as a great part of it is covered by the domains included under the modern name of the Dukeries (q.v.). Sherwood was a crown forest from the time of Henry II. and a favourite hunting-ground of several kings; the land was divided between various lords of the manor, and its disafforestation was carried out at various times. The forest is traditionally noted as the retreat of Robin Hood, whose cave is seen at Papplewick near Newstead.

SHETLAND, or Zetland, a group of islands constituting a county of

Scotland, and the most northerly British possession in Europe. It consists of an archipelago of islands and islets, over 100 in number, situated to the north-east of Orkney, between 59° 50′ and 60° 52′ N. and o° 55′ and 2° 14′ W., and bounded on the W. by the Atlantic and on the E. by the North Sea. The distance from Dennis Head in North Ronaldshay of the Orkneys to Sumburgh Head in Shetland is 50 m., but Fair Isle, which belongs to Shetland, lies midway between the groups. The islands occupy an area of 352,889 acres or 551-4 sq. m. Besides Mainland, the principal member of the group, the more important are Yell, Unst and Fetlar in the north, Whalsay and Bressay in the east, Trondra, East and West Burra, Papa Stour, Muckle Roe and Foula in the west, and Fair Isle in the south. The islands present an irregular surface, frequently rising into hills of considerable elevation (an extreme of 1475 ft. is found in the north-west of Mainland). Most of the inland scenery is bleak and dreary, consisting of treeless and barren tracts of peat and boulders. The coast scenery, especially on the west, is always picturesque and often grand, the cliffs, sheer precipices of brilliant colouring, reaching a height of over 1000 ft. at some places. The shores are so extensively indented with voes, or firths — the result partly of denudation and partly caused by glaciers — that no spot in Shetland is more than 3 m. from the sea. There are sheets of fresh water in the larger islands, the most important being Strom Loch (2 m. long), Girlsta (1ˆ m. long) and Spiggie (i|- m.) in Mainland, and Loch of Cliff (2 m.) in Unst, and numerous short streams. The principal capes are Sumburgh Head, the most southerly point of Mainland, a bold promontory 300 ft. high ; Fitful Head, on the south-west of the same island, a magnificent headland, 2 m. in length and nearly 1000 ft. high, where Noma, the prophetess of Sir Walter Scott's Pirate, was supposed to have her abode and which the Norsemen called the White Mountain, in allusion to the colour of the clay slate composing it; and the Noup and Herma Ness, two of the most northerly points in Unst.

' Geology. — The geological characters of this group of islands resemble those of the northern part of Scotland. Old Red Sandstone, red grits, sandstones and marls and conglomerate occur in a narrow belt on the east side of Mainland from Sumburgh Head to Rova Head, north of Lerwick; they also form the island of Bressay. In the western portion of Mainland, in Northmavine, there is a considerable tract of rocks of this age which are formed largely of intrusive diabase-porphyrite ; similar volcanic rocks occur in Papa Stour. These are penetrated by intrusions of granitic and felsitic character; one of these masses in Papa Stour is a handsome pink

felsite. Practically all the remaining area in these islands is occupied by metamorphic schists and gneisses which occur in great variety and with which are associated numerous dikes and masses of intrusive igneous rock. The southern part of Mainland, from Laxfirth Voe to Fitful Head a series of dark schists and slates, is found with subordinate limestones. The metamorphic rocks of the rest of Mainland are principally coarse gneisses, micaceous and chloritic schists, quartzites, &c. ; in these rocks at Tingwall and Wiesdale considerable beds of limestone occur, which may be followed across the island in a northerly direction to Yell Sound, and to Dales Voe in Delting.

Gabbro occurs in the peninsula of Fethland; diorite in North- ma vine between Rinas Voe and Mavis Grind ; and epidote-syenite in Dunrossness. Yell is formed of coarse gneiss and granitic rocks. In Unst the high ground on the west coast consists of gneiss, which is followed eastward by schists of various kinds, then by a belt of serpentine, 2 m, toa quarter of a mile in breadth, which crosses the island from S.W. to N.E. ; this is succeeded by a belt of gabbro, and finally the eastern border is again occupied by micaceous and chloritic schists. Similar rocks occur in Fetlar. Whalsay is built of coarse gneisses and schists. During the height of the glacial period the ice must have crossed the islands from E. to W., for many of the rocks belonging to the eastern side are found as boulders scattered over the western districts. Important formations of chromite are found at Hagdale and the Heog Hills; steatite occurs at Kleber Geo, and many interesting minerals have been recorded from these islands.

Climate and Fauna. — The average annual rainfall amounts to 46 in., and the mean temperature for the year is 45 ° 3 F., for March 39° F. and for August 54° F. The winter, which is very stormy, lasts from November to March ; spring begins in April, but it is the middle of June before warmth becomes general, and by the end of August summer is gone. The summer is almost nightless, print being legible at midnight, but in winter the days are only six hours long, though the nights are frequently illuminated with brilliant displays of the aurora borealis. The well-known Shetland breed of shaggy ponies are in steady demand for underground work in collieries. The native cattle, also diminutive in size, with small horns and short legs, furnish beef of remarkable tenderness and flavour; while the cows,

when well fed, yield a plentiful supply of rich milk. The native sheep possess many of the characteristics of goats. Ewes as well as rams generally have short horns, and the wool is long and very fine. White, black, speckled grey and a peculiar russet brown, called mooral, are the prevailing colours. It is customary to pluck the wool by hand rather than shear it, as this is believed to ensure a finer second crop. Black-faced and Cheviots are also found in some places. Large numbers of geese and poultry are kept. The lochs and tarns are well stocked with brown trout, and the voes and gios, or narrow inlets of the sea with steep rocks on both sides, abound with sea trout. Hares, for a long period extinct, were reintroduced about 1830, rabbits are very numerous, and the northern limit of the hedge- hog is drawn at Lerwick. Whales of various species are frequently captured in the bays and sounds; the grampus, dolphin and porpoise haunt the coasts, and seals occasionally bask on the more outlying islets. Besides the commoner kinds of fishes, sharks, the torsk, opah and sunfish occur. There is an immense variety of water-fowl, in- cluding the phalarope, fulmar petrel, kittiwake, Manx shearwater, black guillemot, whimbrel, puffin and white-tailed eagle.

Industries. — -There has been no agricultural advance corresponding to that which has taken place in Orkney, mainly owing to the poverty and insufficiency of the soil. Although there are some good arable farms in favoured districts, the vast majority of holdings are small crofts occupied mostly by peasants who combine fishing with farming. Crofting agriculture is conducted on primitive methods, spade tillage being almost universal, and seaweed the principal manure. The cottages are generally grouped in small hamlets called " touns." The size of the crofts varies greatly. There are several hundreds under 5 acres, but the average holding runs from 5 to 20 acres. At one time the land was held on the " runrig " system — that is, different tenants held alternate ridges— but now as a rule each holding is separate. About one-sixth of the total area is under cultivation, oats and barley being the chief grain, and potatoes (introduced in 1730) and turnips (1807) the chief green crops. Cabbage, said to have been introduced by a detachment of Cromwellian soldiers, is also raised, and among fruits black and red currants ripen in sheltered situations. In spite of somewhat adverse climatic conditions, live stock is reared with a fair amount of success.

The distinctive manufacture is knitted goods. The finest work is said to come from Unst, though each parish has its own speciality. The making of gloves was introduced about 1800, of shawls about 1840 and of veils about 1850. So delicate is the workmanship that

stockings have been knitted that could pass through a finger-ring. – Women do most of the farm work and spend their spare time in knitting. Fishing is the occupation of the men, and the real main-stay of the inhabitants. Formerly the fishery was in the hands of the Dutch, whose supremacy was destroyed, however, by the imposition of the salt tax in 1712. So complete was their control that they are estimated to have derived from it more than 200 millions sterling while it lasted. Then the fishery was neglected by the natives, who were content to use the " sixerns," or six-oared fishing boats, till the last quarter of the 19th century, when boats of modern type were introduced. Since 1890 the herring fishery has advanced rapidly, and the Shetland fishery district is the most important north of Aberdeen- shire. The haaf or deep-sea catch principally consists of cod, ling, torsk and saithe. Communication with the islands is maintained by steamers from Leith and Aberdeen to Lerwick, the capital (twice a week), and to Scalloway, the former capital, and other points (once a week).

Population. — In 1891 the population amounted to 28,711 and in 1001 it was 28,166 or 51 persons to the sq. m. The females numbered 15,753, or 127 to every 100 males, considerably the

largest proportion to any county in Scotland. In 1901 there were 55 persons speaking Gaelic and English, none who spoke Gaelic only, and 92 foreigners (almost all Scandinavians). Only twenty-seven islands of the group are inhabited, but in the case of some of them the population consists solely of a few lighthouse attendants, shepherds and keepers.

The Inhabited Isles. — The following is a list of the inhabited isles, proceeding from south to north; but it will be understood that they do not lie in a direct line, that several are practically on the same latitude, that the bulk are situated off the east and west coast of Mainland, and that two of them are distinctly outlying members of the group. The figures within brackets indicated the population in 1901. Fair Isle (147) lies 24 m. S.W. of Sumburgh Head, and is 3 m. long by about 2 m. broad. The name is derived from the Norse faar, a sheep (a derivation better seen in the Faroe Isles). It is a hilly island, with rocky cliffs; North Haven, on the east coast, being almost the only place where landing can be safely effected. From the survivors of a vessel of the Spanish Armada that went ashore in 1588 the natives are said to have acquired the art of knitting the coloured hosiery for which they are noted. The shipwrecked sailors taught the people how to prepare dyes from the plants and lichens, and many of the patterns still show signs of Moorish origin.

Mainland (19,676), the largest and principal island, measures 54 m. from N. to S., and 21 m. from E. to W., though the shores are indented to an extraordinary degree and the bulk of the island is much narrower than the extreme width would indicate. The parish of Walls, in the west, is said to contain more voes, whence its name (an erroneous rendering of the Norse waas), than all the rest of Shetland; while the neck of land at Mavis Grind (Norse, maev, narrow; eid, isthmus; grind, gate), forming the boundary between the parishes of Northmavine and Delting, is only 60 yds. wide and about 20 ft. above the sea, almost converting the north-western area of Mainland into an island. In the promontory of Eshaness may be seen some wonderful examples of sea sculpture. The Grind of the Navir (" Gate of the Giants ") is a staircase carved by the waves out of the porphyry cliffs. In the rock of Dore Holm is a natural archway, 70 ft. wide, through which the tide con- stantly surges, and to the south-east of it are the Drougs, stacks of quaint shapes, suggesting a ship in full sail, a ruin, a cowled monk and so forth. Besides Lerwick (q.v.) the county town, one of the most interesting places in the island is Scalloway (857), the ancient capital. According to Dr Jakob Jakob-sen, the name means the voe (waa) of the skollas, or booths, occupied by the men who came to attend the meeting of the ting, or open-air law court, which assembled in former days on an island in the Loch of Tingwall (hence its name), about 3 m. farther north. Scalloway stands at the head of a bay and has piers, quays, warehouses and cooperages in connexion with the fishing industry. The ruins of the castle built in 1600 by Patrick Stewart, earl of Orkney, stand at the east end of the bay and are in good preservation. An iron ring on one of the chimneys is said to be that on which he hung the victims of his oppression. On the opposite side of the bay is Gallow Hill, the old place of execution of witches and criminals. Off the south- eastern coast of Mainland, separated by a sound 1 m. broad and usually visited from Sandwick, lies the uninhabited island of Mousa (correctly spelled Moosa, the moory isle, from the Norse m6-r, moor), famous for the most perfect specimen of a Pictish broch, or tower of defence, in the British Isles. The broch, which stands on a rocky promontory at the south-west of the isle, now measures about 45 ft. in height, but as some of the top courses of masonry have fallen down it is supposed to have been 50 ft. high originally. It was entire in n 54, and was partially restored in 186 1. It has a diameter at the foot of 50 ft., and at the top of 38 ft. The interior court, open to the sky, is 30 ft. in diameter, the enclosing wall having a thickness, at the base, of 15 J ft. There are three separate beehive-shaped rooms on the ground floor, which were entered from the court, from which also there was an entrance to the

stair leading to the galleries, which were lighted by windows facing the court. Hevera

SHEVAPvOY HILLS

(25) lies off the west coast of Mainland, south of the two Burras. East Burra (203), about 4 m. long by 1 m. broad, is separated from Mainland by Clift Sound, a narrow arm of the sea, 8 m. long. West Burra (612), 6 m. long by 1 m. broad, with a very irregular coast-line, lies alongside of East Burra and contains a church. It is said to be the Burgh Westra of Sir Walter Scott's Pirate. Burra is a contraction of Borgar-oy, meaning "Broch island." Trondra (151), "Trend's island," Trond being an old Norse personal name, in the mouth of Scalloway Bay. Oxna (36) lies about 4 m. S.W. of Scalloway, and Papa (priest's isle, 16), to the E. of Oxna. Bressay (679) lies 1 m. E. of Lerwick, from which it is separated by the Sound of Bressay, in which Haakon V., king of Norway, anchored his galleys on the expedition that ended so disastrously for him at Largs (1263). The island is 6 m. long by 3 m. broad and has several notable natural features. Ward Hill (742 ft.) is the sailors' landmark for Lerwick harbour. Bard Head (264 ft.), the most southerly point, is a haunt of eagles, at the foot of which is an archway called the Giant's Leg. On the west side of the Bard is the Orkney Man's Cave — a great cavern with fine stalactites and a remarkable echo. Noss (7), to the E. of Bressay, from which it is separated by a channel 220 yds. wide. On the east coast the rocks form a headland (592 ft.) called the Noup of Noss (" the peak of the nose "), once the source from which falcons were obtained for the royal mews. Off the south-east shore lies the Holm (160 ft.), with which communication used to be maintained by means of the Cradle of Noss swing or ropes. Both Noss and Bressay are utilized in connexion with the rearing of Shetland ponies. Holm of Papal, "isle of the priest" (2), belonging to Bressay parish, and Linga, " heather isle " (8), to the parish of Tingwall, he S.E. of Hildasay. Foula, pronounced Foola (Norse, fugl-oy, " bird island ") (230), lies 27 m. W. of Scalloway, and 16 m. W. of the nearest point of Mainland. It measures 3ˆ m. long by 2J m. broad. The cliffs on the west coast attain in the Sneug (Norse, Snjoog, " hill top ") a height of 1272 ft. They are the home of myriads of sea-birds and one of the nesting-places of the bonxie, or great skua (Lestris cata- racles), which used to be fostered by the islanders to keep down the eagles, and the eggs of which are still strictly preserved. The natives are daring cragsmen. The only landing-place is the village of Ham, on the east coast. Vaila (21), in the mouth of the Bay of Walls, affords good pasturage. Linga (4) lies immediately to the north of Vaila. Papa Stour (272), properly spelt

Stoor, "the big [Norse stor] island of the priests," lies in the south-west of the great bay of St Magnus. It measures

2 m. in length by about 3 m. in breadth and has a coast-line of

20 m. Christie's Hole and Francie's Hole, two of the caves for which it is noted, are reputed to be among the finest in the United Kingdom. The sword dance described in the Pirate may still be seen occasionally. Four miles N.W. are the islets known as the Ve Skerries, where seals are sometimes found. Whalsay, " whale island " (975), measuring 5 m. from N.E. to S.W. by

2 1 m. wide, is an important fishing station. Muckle Roe, " great red island " (202), roughly circular in shape and about

3 m. in diameter, lies in the E. of St Magnus Bay. Gruay, " green isle " (10), Housay (68), Bruray (44), Bound (2) are members of the group of Out Skerries, about 4 m. N.E. of Whalsay. There is a lighthouse on Bound, and the rest are fishing stations. Yell (2483), separated from the north-east coast of Mainland by Yell Sound, is the second largest island of the group, having a length of 17 m., and an extreme width of 6 J m., though towards the middle the voes of Mid Yell and Whale Firth almost divide it into two. It contains several brocks and ruined chapels and is an important fishing station. Fetlar (347) lies off the east coast of Yell, from which it is divided by Colgrave Sound and the isle of Hascosay and is 5 m. long by t\ m. broad. It ranks with the most picturesque and most fertile members of the group and contains a breed of ponies, a cross between the native pony and the horse. Uyea, " the isle," from the Old Norse by (3), to the south of Unst, from which it is divided by the narrow sounds of Uyea and Skuda, yields a beautiful green serpentine. Unst (1940), to the N.E, of Yell and separated from it by Blue-

mull Sound, is 12 m. long and 6 m. wide. It has been called the "garden of Shetland," and offers inducements to sportsmen in its trout and game. The male inhabitants are mostly employed in the fisheries and the women are the most expert knitters of hosiery in the islands. Unst contains several places of historic interest. Near the south-eastern promontory stands Muness Castle, now in ruins, built in 1598 — according to an inscription on a tablet above the door — by Laurence Bruce, natural brother to Lord Robert Stewart, 1st earl of Orkney. Buness, near Balta Sound, was the house of Dr Laurence

Edmonston (1795- 1879), the naturalist. Near Balliasta are the remains of three stone circles. It is supposed the Ting, or old Assembly, met at this spot before it removed to Tingwall. Farther north, at the head of a small bay, lies Haroldswick, where Harold Haarfager is believed to have landed in 872, when he annexed the Orkney and Shetland Islands to Norway. Burra Firth, in the north of Unst, is flanked on both sides by magnificent cliffs, including the Noup of Unst, the hill of Saxavord (934 ft.), the Gord and Herma Ness. Muckle Flugga (3), about 1 m. N. of Unst, is the most northerly point of Shetland, and the site of a lighthouse.

Administration. — Shetland unites with Orkney to return a member to parliament. The island is divided into Mainland district (comprising the parishes of Northmavine, Delting, Nesting, Sandsting, Walls, Tingwall, Bressay, Lerwick and Dunrossness) and North Isles district (the parishes of Unst, Fetlar and Yell). It forms a sheriffdom with Orkney and Caithness, and there is a resident sheriff-substitute at Lerwick, the county town. There are parish poorhouses in Dunrossness and Unst, besides the Shetland combination poorhouse at Lerwick. The county is under school board jurisdiction and Lerwick has a secondary school, and a few of the other schools earn grants for higher education. The " residue " grant is expended on navigation and swimming classes.

History and Antiquities. — The word Shetland is supposed to be simply a modernized rendering of the Old Norse Hjaltland, of which the meaning is variously given as " high land," "Hjalti's land" — after Hjalti, a man whose name occurs in ancient Norse literature, but of whom little else is known — and " hilt land," in allusion to an imagined, though not too obvious, resemblance in the configuration of the archipelago to the hilt of a sword. Of the original Pictish inhabitants remains exist in the form of stone circles (three in Unst and two in Fetlar) and brocks (of which 75 examples survive). The islanders were converted to Christianity in the 6th and 7th centuries by Irish missionaries, in commemoration of whose zeal several isles bear the name of Papa or " priest." Four stones with Ogam inscriptions have been found at different places. About the end of the 8th century both the Shetlands and Orkneys suffered from the depredations of Norse vikings, or pirates, until Harold Haarfager annexed the islands to Norway in 875. Hence- forward the history of Shetland is scarcely separable from that of Orkney (q.v.). The people, more remote and less accessible to external influences, retained their Scandinavian character- istics longer than the Orcadians. The Norse language and customs survived in Foula till the end of the 18th century, and words and phrases of Norse origin still

colour their speech. George Low (1747-1795), the naturalist and historian of Orkney, who made a tour through Shetland in 1774, described a Runic monument which he saw in the churchyard of Crosskirk, in Northmavine parish (Mainland), and several fragments of Norse swords, shield bosses and brooches have been dug up from time to time.

See George Low, Tour through the Islands of Orkney and Shetland in 1774 (published in 1879) ; A. Edmondston, Zetland Islands (1809); Samuel Hibbert-Ware, Description of the Shetland Isles (1822); C. Rampini, Shetland and the Islanders (1884); C. Sinclair, Shetland and the Shetlanders (1840); R. S. Cowie, Shetland (1896); Dr Jakob Jakobsen, The Dialect and Place Names of Shetland (1897).

SHEVAROY HILLS, a detached range in southern India, in the Salem district of Madras, covering an area of 150 sq. m., with plateaus from 4000 to 5000 ft. above sea-level. They include the sanatorium of Yercaud, and several coffee plantations.

SHIBARGHAK, a town and khanate of Afghan Turkestan. The town lies some 60 m. W. of Balkh, and contains 12,000 inhabitants, Uzbegs and Parsiwans. It has a citadel, but is not otherwise fortified, and is surrounded by good gardens and excellent cultivation. The khanate is one of the " four domains," which were long in dispute between Bokhara and Kabul, but were allotted to the Afghans by the Anglo-Russian boundary agreement of 1873.

SHIBBOLETH, a Hebrew word, meaning an ear of corn or a stream or river, from shabal, to grow, increase, flow, used by Jephthah, probably in the second sense with reference to the river Jordan, as a test-word to distinguish the Ephraimites, who were unable to pronounce the sh, from the men of Gilead (see Judges xii. 6) at the passage of the Jordan. The word ciceri was similarly used at the time of the massacre of the French known as the Sicilian Vespers, for they betrayed their nationality by their inability to pronounce it. The term has also come generally to mean a watchword, catch-phrase or cry, to which the members of a party adhere after any significance or meaning which it may have imported has disappeared.

See Alphabet, i. 725, for a discussion of the sibilant difficulty involved in the test of Judges xii. 6.

SHIEL, LOCH, a lake near the Atlantic seaboard of Scotland, lying between the district of Moidart in Inverness-shire and the districts of Ardgour and Sunart in Argyllshire. The boundary line between the two counties is drawn lengthwise down the centre of the lake and is continued down the river Shiel to the sea. The loch is 175 m. long and varies in width from 200 yds. to 1 m., and is only 111 ft. above the sea. The maximum depth is 420 ft. with a mean depth of 81ˆ ft. The lake has an area of 4840 acres or 75 sq. m., and drains directly a basin of 725 sq. m., and with an outflow from Loch Dilate, or Doilake, of 85ˆ sq. m. Loch Dilate lies 15 m. E. of Loch Shiel, into which it flows by the Polloch. It is 15 m. long at its maximum, with a maximum depth of 55 ft., and covers an area pf 142 acres. For fully three-fourths of its length Loch Shiel has a south-westerly direction, but at Eilean Fhianain (Finnan's Island) it strikes towards the west. It receives the Finnan and other small streams and discharges by the Shiel to the salt-water Loch Moidart. On the north-west and south-east it is skirted by lofty hills (Sgor Choileam (3164), Sgor nau Coireachan (3133) and others of over 2000 ft.) ,but the land at the western extremity in Ardnamurchan is low-lying.

SHIELD, WILLIAM (1 748-1829), English musical composer, was born at Swalwell, near Newcastle, in 1748. His father began to teach him singing before he had completed his sixth year, but died three years later, leaving him in < charge of guardians, who made no provision whatever for continuing his musical education, for which he was thenceforward dependent entirely upon his own aptitude for learning, aided by a few lessons in thoroughbass which he received from Charles Avison. Notwith- standing the difficulties inseparable from this imperfect training, he obtained admission in 1772 to the orchestra at the Italian Opera in London, at first as a second violin, and afterwards as principal viola, and this engagement he retained for eighteen years. In the meantime he turned his serious attention to composition, and in 1778 produced his first English comic opera, The Flitch of Bacon, at the Little Theatre in the Haymarket, with so great success that he was immediately engaged as composer to Covent Garden Theatre, for which he continued to produce English operas and other dramatic pieces in quick succession until i797,when he resigned his office, and devoted himself to compositions of a different class, producing a great number of very beautiful glees, some instrumental chamber music, and other miscellaneous compositions. In 1817 he was made master of the royal music. He died in London on the 25th of January 1829, and was buried in the south cloister at Westminster Abbey.

Shield's most successful dramatic compositions were Rosina, The

Mysteries of the Castle, The Lock and Key and The Castle of Andalusia. As a composer of songs he was in no degree inferior to his great contemporary Charles Dibdin. Indeed The Arethusa, The Heaving of the Lead and The Post Captain are as little likely

to be forgotten as Dibdin's Tom Bowling or Saturday Night at Sea. His vein of melody was inexhaustible, thoroughly English in character and always conceived in the purest and most delicate taste, and hence it is that many of his airs are still sung at concerts, though the operas for which they were written have long been banished from the stage. His Introduction to Harmony (1794 and 1800) contains a great deal of valuable information; and he also published a useful treatise, The Rudiments of Thoroughbass.

SHIELD (0. Eng. scild, cf. Du. and Ger. S child, Dan. Skjold; the origin is doubtful, but may be referred to the root seen in " shell " or " scale "; another suggestion connects it with Icel. skjalla, to clash, rattle; it is not connected with the Indo-Ger. root skeu, seen in Gr. cncuros, kvtos Lat. cutis, skin, scutum, shield, O. Eng. hyd, hide, and in " sky "), a piece of defensive armour borne upon the left arm or carried in the left hand as a protection against missiles. Varying in shape and form, it was the principal piece of defensive armour from the Bronze and Iron Age to the introduction of fire-arms, and is still borne by savage warriors throughout the world (see Arms and Armour, and for the heraldic shield Heraldry).

In modern times the principle of the shield has been applied to guns of all calibres from n and 10 in. calibre downwards. Whereas the turret, barbette, cupola and other heavy-armoured structures are intended to be proof against the heaviest pro- jectiles, the shield is usually only designed to resist rifle and shrapnel bullets or very light shells. For the application of shields to field artillery, &c, see the articles Artillery and Ordnance.

SHIELDS, JAMES (1810-1879), American soldier, was born in Dungannon, county Tyrone, Ireland, in 1810. He emigrated to the United States in 1826, and in 1832 began to practice law in Kaskaskia, Illinois; He was prominent in Democratic politics, was a member of the Illinois House of Representatives in 1836-1838, was state auditor in 1841-1843, was judge of the supreme court of the state in 1843-1845, and was commissioner of the U.S. General Land Office in -1845-1847. In the Mexican War he served as a brigadier-general of volunteers under General Zachary Taylor on the Rio Grande, under General John E. Wool in Chihuahua, and under General Winfield Scott in the southern campaign; he was breveted

major-general for "gallantry at Cerro Gordo, where he was severely wounded, and he was again wounded at Chapultepec. In 1849-1855 he was a United States senator from Illinois; and in 1858-1859 was a senator from Minnesota. In i860 he removed to California. In August 1861, soon after the outbreak of the Civil War, he was commissioned brigadier-general of volunteers; in March 1862 he succeeded to the command of General Frederick W. Lander's division; he was in command on the Federal side at Winchester (23 March 1862) and at Port Republic (9 June); and in March 1863 he resigned his commission. He then settled in Carrollton, Mis- souri, and in 1875 was a member of the State House of Repre- sentatives; in 1879 he was United States senator from Missouri for six weeks to fill an unexpired term. He died at Ottumwa, Iowa, on the 1st of June 1879.

SHIFNAL, or Shiffnal, a market town in the Newport (N.) parliamentary division of Shropshire, England, 154 m. N.W. from London on the Wolverhampton-Shrewsbury line of the Great Western railway. Pop. (1901) 3321. The church of St Andrew is cruciform and full of fine details of late Norman, Early English artd Decorated work. Trade is mainly agricultural, and cattle-fairs are held. There are large iron-works. The name of the town was Idsall when in 1591 a fund was raised by royal favour in Shropshire and neighbouring counties in order to rebuild it after a serious fire.

Within 6 m. E. of Shifnal are Tong, Boscobel and the nunnery of White Ladies. Tong Castle shares with the castle of the same name in Kent the legend of the dealings of the Saxon Hengest with the British chieftain Vortigern. The medieval building was demolished late in the 18th century, and the present castle erected in mingled Gothic and Moorish styles. Tong church, of fine early Perpendicular work, contains a remarkable series of ornate tombs, mainly of the 15th and 16th centuries, to members I of the Vernon and Stanley families, former owners of the castle.

SHIGATSEˆ-SHriTES

8-57

The Golden Chapel on the south side is rich late Perpendicular, with a roof of fan-tracery, showing signs of the original decora- tion in colours. The mansion of Boscobel is famous as the house in which Charles II. was concealed in 1651 after an adventurous journey from Worcester, where his arms had failed before those of Cromwell. The secret chamber which hid him is preserved, but he also found refuge

in a tree of the forest which then sur- rounded Boscobel. A tree close to the house still bears the name of Charles's oak, but tradition goes no further than to assert that it grew from an acorn of the original tree. White Ladies was a Cistercian nunnery; and the slight remains are Norman. The pleasant wooded district was formerly part of Brewood Forest, which extended into Staffordshire.

SHIGATSE, one of the largest towns in Tibet, next in import- ance to Lhasa, the capital. The town, which is at the confluence of the Nyang chu with the Tsangpo, contains about 9000 in- habitants (exclusive of priests), and is about f m. long by a | m. broad. About 1 m. to the north-east is situated a monastery called Konkalifig, whilst to the south-west is the far-famed Tashilhunpo monastery, the residence of one of the great high priests of Tibet, co-equal with the Dalai-Lama of Lhasa. Be- tween the Tashilhunpo monastery and the city is the Thorn or open market, where all the business of the place is daily trans- acted. A wall about 1 m. in circumference surrounds the Tashilhunpo monastery, within which are numerous temples and houses, four of the larger temples being decorated with gilded spires. A great wealth of jewels and precious metal is said to enrich the numerous idols of Tashilhunpo. The monastery maintains 3300 priests. The city is protected by a fort which stands on a low hill to the north-west, and a garrison of 1000 Tibetan soldiers is quartered here. The municipal government is in the hands of two depen assisted by resident Jongpons. The soil around Shigatse is rich and productive, the elevation being between 11,000 and 12,000 ft. Shigatse lay to the west of the British route of advance on Lhasa in 1904, but it was visited by Captain Rawling on his way to open the market at Gartok.

SHIGNAN and ROSHAN, two small hill states E. of the Badakshan province of Afghanistan. They extend eastwards from the Panja, where it forms the eastern boundary of Badak- shan to the Pamirs. The native rulers of Roshan and Shignan claim descent from Alexander the Great, of whom legends are still current in the country about the upper Oxus. The two states were conquered by Abdur Rahman in 1882, but were assigned to Russia by the Durand agreement of 1893. Since that agreement Russia has retired from all districts previously occupied by her on the left bank of the Panja, or upper Oxus.

SHI'ITES (from Arab, shi'a, a party, and then a sect) , the name of one of the two great religious divisions of Islam. The Shiites hold that the imamate and caliphate belong to the house of Mahomet (Muhammad) alone, and so to 'AH, Mahomet's son-in- law, and his

successors. After the arbitration on the claims of 'All and Moawlya to the caliphate (a.d. 658), two great parties emerged from the strife of feeling caused in the East by the deposition of 'All. 1 Those who were known as the Kharijites, being mainly country Arabs, were democratic, and claimed that the office of caliph was elective, and that the caliph might be chosen from any Arab Moslem family. In strong opposition to these stood the party afterwards called the Shiites, who regarded 'All and his descendants as the only rightful caliphs. For them the caliphate was a God-given office, and not one to be given by human appointment. Belief in this was an ordinance of God, an article of the faith. He who did not accept it as such was an unbeliever. , Moreover, the party consisted largely of Persians who on their conversion to Islam brought with them many of the doctrines of their old faith, religious and political. Among these was the belief in the divinity of the sovereign and the duty of worshipping him. Gnostic elements, which may have come from the old religion of Babylonia, were also intro- duced. The idea of an absolute personal and hereditary monarchy was thus developed among the subjects of "AH. But in Islam 1 For these and following events see Caliphate.

there is no separation between politics and theology. The theological position of the Shiites was that the superhuman power of Mahomet descended to the members of his house ("All and his children), so that they could interpret the will of God and tell future events. The imam was infallible and a mahdi or guide for life. What the imam gained the Koran lost, and many of the Shiites held the Mu'tazilite or rationalistic opinion of the created nature of the sacred book.

The growth of the Shiites was fostered by the great discontent of the eastern half of the caliphate with Omayyad rule (see Caliphate, and Persia: History). Before long an active propaganda was started, and leaders (often adventurers) arose who formed parties and founded sects of their own in the ranks of the Shiites. One of the earliest of these was 'Abdallah ibn Saba (founder of the Saba'iyya), who in the caliphate of Othman had preached the return of Mahomet (founded on Koran xxviii. 84), had been concerned in the assassination of Othman, and had proclaimed the divinity of 'AH, but had been disowned and punished by him. On 'All's death he declared the thunder to be the voice, and the lightning the scourge of the translated caliph, and announced that his divine power had passed to his successors, the imams.

Another sect, the Kaisaniyya, followed Kaisan, a freedman of 'All, in believing in the superhuman knowledge of Mahommed ibn Hanafiyya, a son of 'All but not by Fatima. Religion for these was

obedience not to law but to a person. When the doctrine of a hidden imam arose, they differed from the Saba'iyya in expecting his return from his place of concealment on earth, not from heaven. Among them an adventurer Mokhtar (Mukh- tar) had a large following for a time. He taught the mutability both of the knowledge and of the will of God — a development of Mahomet's own teaching. He claimed to fight to avenge the death of Hosain (see Hasan and Hosain) and to serve Mahommed ibn Hanafiyya, who, however, disowned him. He was killed in 687. Some of the Shiite leaders, as Abu Moslim, when renounced by the members of the house of 'AH, transferred their allegiance to the house of 'Abbas (see Rawendis). The success of the Abbasids in supplanting the Omayyads was largely due to the help of the Shiites, and the early Abbasid caliphs, to the time of Motawakkil, were half-Shiites of a lax order. ShahrastanI (g.v.) in his Book on the Sects (Kitdb Milal wan-Nihal, ed. Cureton, pp. 109 ff.; Haarbriicker's translation, vol. i. pp. 164 ff.) divides the Shiites into five main divisions : the Kaisaniyya, the Zaidiyva, the Imamlyya, the Ghallyya and the Isma'iliyya. Of these the Ghallyya are represented by the followers of Ibn Saba (see above), and the Kaisaniyya have been already described. These parties as such have now ceased to exist, the others still remain: The Zaidites" or Zaidiyya are the followers of Zaid, a grandson of Hosain, and are the most moderate of the Shiites, for though holding that the imamate belongs only to the descend- ants of 'All by Fatima, and that any of these might be imam (even though two or three should be in existence at the same time), they allow that circumstances might justify the appoint- ment of another caliph for the time. Thus they acknowledge the imamate of Abu Bekr and Omar, though 'AH was more entitled to the office. One branch of the Zaidites held Tabaristan from 864 until overturned by the Samanids in 928; another branch, arising about 893 in Yemen, has remained there until the present day. The Isma'ilites or Isma'iliyya are the followers of Isma'il, the elder son of Ja'far us-Sadlq, the sixth imam (see table below). He was rejected as successor by his father for drinking wine, and his party might soon have disappeared if he had not served as imam for the adventurous sceptic 'Abdallah ibn Maimun (for his propaganda see Carmathians). Owing to the success of this man the Isma'ilites have given rise to the Carmathians (q.v.), the Fatimites (q.v.), the Assassins (q.v.) and the Druses (q.v.).

At the present time the Isma'iliyya still exist in small numbers, chiefly about Surat and Bombay. The Imamlyya believe that each imam has been definitely named by his predecessor. This party broke up into_ numerous divisions, and imams manifest or hidden secured

each his own following. The most important of these parties is that of the Twelve (the Ithria'ashariyya), who accept and follow the twelve descendants of 'AH numbered in the accompanying table.

I. "All (d. 661)

2. Hasan (d. 669) 3. Hosain (d. 680) Mahommed ibn ul-Hanafiyya

Zaid. 4. 'All called Zain ul-Abidln (d. c. 711)

5. Mahommed ul-Baqir (d. 736) (Abu Ja'far ul-Baqir).

6. Ja'far us-§adlq (d. 765)

Isma'il 7. Musa Kazim (d. c. 799).

8. 'All ul-Reza (Riza) (d. 818). 9. Mahommed ul-Jawad (d. 834).

10. 'AH ul-'Askari (d. 868). II. Hasan ul-'Askari (d. 874). 12. Mahommed ul-Mahdi.

The twelfth imam Mabommed is said to have vanished and to be in hiding, but will be restored by God to his people, when it pleases Him. The creed of this party was introduced into Persia in 1502, when the Safawids conquered the country, and still remains its official creed. The shah is thus only the temporary substitute for the hidden imam; and authoritative decisions in religious matters are pronounced by Mujtahids, i.e. theologians who can form their own opinions and require obedience to their decisions.

Other points in which Shiites differ from Sunnites depend on their legitimistic opinions, or are accommodations of the rites of Islam to the Persian nationality, or else are petty SA//te matters affecting ceremonial. The rejection of all the

Sunnite books of tradition goes with the repudiation of the caliphs under whose protection these were handed down. The Shiites, however, have their own collections of traditions. An allegorical and mystical interpretation reconciles the words of the Koran with the inordinate respect paid to 'AH; the Sunnite doctrine of the uncreated Koran is denied. To the Mahom- medan confession " There is no god but God and Mahomet is His ambassador " they add " and 'All is the

viceregent of God " (wait, properly " confidant "). There are some modifications in detail as to the four main religious duties of Islam — the pre- scriptions of ritual purity, in particular, being made the main duty of the faithful. The prayers are almost exactly the same, but to take part in public worship is not obligatory, as there is at present no legitimate imam whose authority can direct the prayer of the congregation. Pilgrimage to Mecca may be per- formed by a hired substitute, or its place can be taken by a visit to the tombs of Shiite saints, e.g. that of 'All at Nejef , of Hbsain at Kerbela, of Reza at Meshed, or of the " unstained Fatima " at Kum (Fatima-i-ma'asum, daughter of Musa, the 7th imam). The Shiites are much the most zealous of Moslems in the worship of saints (real or supposed descendants of 'All) and in pilgrimages to their graves, and they have a characteristic eagerness to be buried in those holy places. The Persians have an hereditary love for pomps and festivities, and so the Shiites have devised many religious feasts. Of these the great sacrificial feast ('id-i- Qurbdn; Turkish Qurbdn Bairdm) is also Sunnite;, the first ten days of the month Moharram are dedicated to the mourning for the death of Hosain at Kerbela (q.v.), which is celebrated by passion-plays (ta'ziya), while the universal joy of the Nauroz, or the New Year of the Old Persian calendar, receives a Mahom- medan sanction by the tradition that on this day the prophet conferred the caliphate on "All.

While they naturally reject the four Sunnite schools of juris- prudence, the Shiites also derive all law from the Koran, and their trained clergy (mollahs) are the only class that can give legitimate legal responses. The training of the mollah resembles that of the Sunnite 'dlitn. The course at the madrasa (medresse) embraces grammar, with some rhetoric and prosody, logic, dogmatic Koran exegesis, tradition and jurisprudence, and finally some arithmetic and algebra. The best madrasa is at

Kerbela. The scholar discharged from his studies becomes first a simple mollah, i.e. local judge and notary. A small place has one such judge, larger towns a college of judges under a head called the sheikh ul-Isldm. The place of the Sunnite muftis is filled by certain of the imam-juma, i.e. presidents of the chief mosques in the leading towns, who in respect of this function bear the title of imam mujtahid. This is a dignity con- ferred by the tacit consent of people and clergy, and is held at one time only by a very few distinguished men. In Persia, the cadi (kd%i) is an inferior judge who acts for the sheikh u '1-Islam in special cases, and a mufti is a solicitor acting under the judge to prepare cases for court.

Under the Safawids, when the clergy had great influence, they had at their head the sadru 's-sodur, who administered all pious foundations and was the highest judicial authority. But so great a power was found dangerous; 'Abbas the Great (1586- 1628) abstained from filling up a vacancy which occurred in it, and, though Shah SafI (1628-1641) restored the office, he placed it in commission. Nadir Shah abolished it in 'his attempt to get rid of the Shiite hierarchy (1736), and since then it has not been restored. Yet the imam-jum'a of Isfahan, the old Safawi capital, is tacitly regarded as representative of the invisible imam of the house of 'All, who is the true head of the church. Various vain attempts were made in the 19th century to sub- ordinate the authority of the clergy to the government. Outside the clergy the greatest influence in religious matters is that exercised by the dervishes (q.v.). As it was long necessary to profess orthodoxy for fear of the Arabs, it came to be an estab- lished Shiite doctrine that it is lawful to deny one's faith in case of danger. This " caution " (taqiyd) or " concealment " (ketmdn) has become a second nature with the Persians. Another mis- chievous thing is the permission of temporary marriages- marriages for a few hours on a money payment. This legitimized harlotry (mot a) is forbidden by the Sunna, but the Shiites allow it, and the mollahs adjust the contract and share the women's profits. There is still mental life and vigour among the Shiites, as appears among the sects, which, allowance being made for " taqlya," play no inconsiderable part. The Akhbarls (tracuV tionalists), who adopt a semi philosophical way of explaining away the plainest doctrines (such as the resurrection of the flesh) on the authority of false traditions of 'All, are not so much a sect as a school of theology within the same pale as the orthodox Shia or Mujtahids. A real dissenting sect, however, is the Sheikhis, of whose doctrines we have but imperfect and discrepant accounts. Representatives of the old extreme Shiites, who held 'All for a divine incarnation, are found all over Persia in the 'AlMlahi or 'Ali-Allahl sect (" 'AH deifiers "). Finally, in ,the 19th century arose the remarkable attempt at reform known as Babiism (q.v.).*

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SHIKAR, the Hindostani term for sport, in the sense of shoot- ing and

hunting. The word is in universal use by Anglo-Indians for the pursuit of large game, such as tiger-shooting and pig- sticking. The shikari is either the native expert, who marks the game for the sportsman, Or else the European sportsman himself.

SHIKARPUR, a town of British India, in the Sukkur district of Sind, Bombay. It is situated about 18 m. from the right bank of the Indus, with a station on the North-Western railway, 23 m. N.W. of Sukkur. Pop. (1901) 49,491. Shikarpur has always been an important place as commanding the trade route through the Bolan Pass, and its merchants have dealings with many towns in Central Asia. It has a large market and manufactures of carpets, cotton cloth and pottery. Shikarpur was formerly the headquarters of a district of the same name. In 1901 two sub- divisions of this district were detached to form the new district of Larkana, and the two other subdivisions were then constituted the district of Sukkur.

SHILDON, a market town in the Bishop Auckland parlia- mentary division of Durham, England, m. N.W. from Darling- ton by a branch of the North Eastern railway. Pop. of urban district of Shildon and East Thickley (1901) 11,759- At New Shildon or East Thickley are extensive railway engine and wagon works belonging to the railway company. A large coal traffic is handled here, as there are collieries and foundries in the vicinity.

SHILLETO, RICHARD (1809-1876), English classical scholar, was born at Ulleskelf in Yorkshire on the 25th of November 1809. He was educated at Repton and Shrewsbury schools, and Trinity College, Cambridge, and in 1867 was elected a fellow of Peter- house. His whole life was spent in Cambridge, where he died on the 24th of September 1876. Shilleto was one of the greatest Greek scholars that England has produced; in addition, he had an intimate acquaintance with the Latin and English languages and literature. He published little, being obliged to devote the best years of his life to private tuition. He was the most famous classical " coach " of his day, and almost all the best men passed through his hands. His edition of the De falsa legatione of Demosthenes will always remain a standard work, but his first two books of Thucydides (an instalment of a long-contemplated edition) hardly came up to expectation. His pamphlet Thucydides or Grote ? excited a considerable amount of feeling. While it un- doubtedly damaged

Grote's reputation as a scholar, it was felt that it showed a want of appreciation of the special greatness of the historian. Shilleto's powers as a translator from English into Greek (especially prose) and Latin were unrivalled; a selection of his versions was published in 1001.

See B. H. Kennedy in Cambridge Journal of Philology (1877).

SHILLING, an English silver coin of the value of twelve pence. The origin of the word is somewhat obscure. There was an Anglo- Saxon coin termed stilling, or scylling, worth about fivepence, which is said to be derived from a Teutonic root, skil, to divide, -{■ling on the analogy of farthing (q.v.). The silver shilling was first struck in 1504, in the reign of Henry VII. In Charles II. 's reign shillings were first issued with milled edges. In George IV. 's reign were issued the so-called " lion shillings," bearing the royal crest, a crowned lion on a crown, a design reverted to in the coinage of Edward VII. A shilling is token money merely, it is nominally in value the one-twentieth of a pound, but one troy pound of silver is coined into sixty-six shillings, the standard weight of each shilling being 87-27 grains.

SHILLONG, a town of British India, in the Khasi Hills district of Eastern Bengal and Assam. It is situated in 25 34′ N. and 91° 53′ E., on a plateau 4978 ft. above the sea, 63 m. by cart- road S. of Gauhati, on the Brahmaputra. Pop. (1901) 8384. Shillong practically dates from 1864, when the district head- quarters were transferred from Cherrapunji. It was chosen as the seat of government in 1874, when the province of Assam was constituted. Every one of the public buildings and houses that quickly grew up was levelled to the ground by the great earth- quake of the 12th of June 1897, but they have since been rebuilt. Cantonments are provided for a battalion of Gurkhas with two guns, and Shillong is the headquarters of the Assam brigade of the 8th division of the Northern army. There are a government high school and a training school for masters. The Welsh Presbyterian mission i; active in promoting education. Since 1905, when Dacca became the capital of the new province of Eastern Bengal and Assam, Shillong has declined in importance; but it is still the summer residence of the government and the headquarters of the district.

SHILLUH, or ShliJh (" vagabonds "), the name given by the Arabized Moors to the Berber peoples of southern Morocco. They occupy chiefly the province of Sus. The name is said to be a corruption of dshlilh (pi. ishldh), a camel-hair tent. They are of fine physique, strong and wiry, and true Berbers in features and fairness. They are

as a rule shorter than the Berbers of Algeria (see Berbers and Morocco).

SHILLUK, a Negro race of the upper Nile valley, occupying the lands west of the White Nile from the Sobat northward for about 360 m., and stretching westward to the territory of the Baggara tribes. They are the most numerous of the Negro tribes

of the Anglo-Egyptian Sudan, and form one great family with the Alur and Acholi (q.v.) and others in the south. Formerly extending as far north as Khartum and constituting a powerful Negro kingdom, they are now decadent. They are the only race on the upper Nile recognizing one chief as ruler of all the tribes, the chiefship passing invariably to the sister's child or some other relative on the female side. The Shilluk towns on the Nile bank are usually placed near to one another. They own large herds of cattle. In physique the Shilluks are typical Negroes and jet black. The men used to wear nothing, the women a calf-skin attached to their girdle, but with the establishment of Anglo-Egyptian control, c. 1900, they gradually adopted clothes. The poorer people smear themselves with ashes. They ornament the hair with grass and feathers in fantastic forms such as a halo, helmet, or even a broad-brimmed hat. When they saw Schweinfurth wearing a broad felt hat they thought him one of them, and were amazed when he took it off. They are skilful as hunters, and especially as fishermen, spearing fish while wading or from ambach rafts. Their arms are spears, shields and clubs. Their religion is a kind of ancestor and nature worship.

See G. A. Schweinfurth, Heart of Africa (1874); W. Junker, Travels in Africa, Eng. ed. (London, 1890-1892); The Anglo- Egyptian Sudan, edited by Count Gleichen (London, 1905).

SHILOH, BATTLE OF. This, the second great battle in the American Civil War, also called the battle of Pittsburg Landing, was fought on the 6th-7th of April 1862 between the Union forces under Grant and Buell and the Confederates under A. S. Johnston and Beauregard. In view of operations against Corinth, Missis- sippi, Grant's army had ascended the Tennessee to Pittsburg Landing and there disembarked, while the co-operating army under Buell moved across country from Nashville to join it. The Confederates concentrated above 40,000 men at Corinth and advanced on Pittsburg Landing with a view to beating Grant before Buell's arrival, but their concentration had left them only a narrow margin of time, and the advance was further delayed by the wretched condition of the roads. Beauregard advised Johnston to give up the enterprise, but on account of the bad effect a

retreat would have on his raw troops Johnston resolved to continue his advance. Grant meantime had disposed his divisions in camps around the Landing rather with a view to their comfort than in accordance with any tactical scheme. No entrenchments were made; Halleck, the Union commanding general in the West, was equally over-confident, and allowed Buell to march in leisurely fashion. Even so, more by chance than intentionally, Buell's leading division was opposite the Landing, awaiting only a ferry, on the evening before the battle; Grant, however, declined to allow it to cross, as he thought that there would be no fighting for some days. At 6 a.m. on the 6th of April, near Shiloh Church (2 m. from Pittsburg Landing), the Confederate army deployed in line of battle, and advancing direjctly on the Landing, surprised and broke up a brigade of the most advanced Union division (Prentiss's) which had been sent forward from camp to reconnoitre. The various Union divisions hurriedly prepared to defend themselves, but they were dispersed in several camps which were out of sight of one another, and thus the Confederate army lapped round the flanks of each local defence as it encountered it. The two advanced divisions were swiftly driven in on the others, who were given a little time to prepare themselves by the fact that in the woods the Confederate leaders were unable to control or manoeuvre their excited troops. But the rear Union divisions, though ready, were not connected, and each in turn was isolated and forced back, fighting hard, towards the Landing. The remnant of Prentiss's division was cut off and forced to surrender. Another division had its com- mander, W. H. L. Wallace, killed. But on the other side the disorder became greater and greater, many regiments were used up, and Johnston himself killed in vainly attacking on a point of Wallace's line called the Hornet's Nest. The day passed in confused and savage scuffles between the raw enthusiasts of either side, but by 5.30 p.m. Grant had formed a last (and now a connected) line of defence with Buell's leading division (Nelson's) and all of his own infantry that he could rally. This line was

hardly 600 yds. from the Landing, but it was in a naturally strong position, and Beauregard suspended the attack at sunset. There was a last fruitless assault, delivered by some of the Confederate brigades on the right that had not received Beau- regard's order against Nelson's intact troops, who were supported by the fire of the gunboats on the Tennessee. During the night Grant's detached division (Lew Wallace's) and Buell's army came up, totalling 25,000

fresh troops, and at 5 a.m. on the 7th Grant took the offensive. Beauregard thereupon decided to extricate his sorely-tried troops from the misadventure, and retired fighting on Corinth. About Shiloh Church, a strong rearguard under Bragg repulsed the attacks of Grant and Buell for six hours before withdrawing, and all that Grant and Buell achieved was the reoccupation of the abandoned camps. It was a Con- federate failure, but not a Union victory, and, each side being weakened by about 10,000 men, neither made any movements for the next three weeks.

SHILOH, a town of Ephraim, where the sanctuary of the ark was, under the priesthood of the house of Eli. According to 1 Sam. iii. 3, 15, this sanctuary was not a tabernacle but a temple, with doors. But the priestly narrator of Josh, xviii. 1 has it that the tabernacle was set up there by Joshua after the conquest. In Judges xxi. 19 seq. the yearly feast at Shiloh appears as of merely local character. The sanctuary at Shiloh seems to have been destroyed, probably by the Philistines after the battle of Ebenezer; cf. Jeremiah vii. 12 seq. The position described in Judges, loc. cit., gives certainty to the identification with the modern Seilun lying some 2 m. E.S.E. of Khan Labban (Lebonah), on the road from Bethel to Shechem. Here there is a ruined village, on an elevation protected by lofty hills on three sides, and open only towards the south, offering a strong position, which suggests that the place was a stronghold as well as a sanctuary. Fertile land surrounds the hill. The name Seilun corresponds to SiXoOi' in Josephus. LXX. has SrjXw, 2jj\«ju. The forms given in the Hebrew Bible (nˆp, iW) have dropped the final consonant, which reappears in the adjective "jiV-ir.

SHIMOGA, or Sheemoga, a town and district in the state of Mysore, southern India. The town is situated on the Tunga river, and is the terminus of a branch railway. Pop. (1001) 6240. The area of the district is 4025 sq. m. Its river system is twofold; in the east the Tunga, Bhadra and Varada unite to form the Tungabhadra, which ultimately falls into the Kistna and so into the Bay of Bengal, while in the west a few minor streams flow to the Sharavati, which near the north-western frontier bursts through the Western Ghats by the celebrated Falls of Gersoppa (g.v.).

The western half of the district is mountainous and covered with magnificent forest, and is known as the Malnad or hill country, some of the peaks being 4000 ft. above sea-level. The general elevation of Shimoga is about 2000 ft. ; and towards the east it opens out into the Maidan or plain country, which forms part of the general plateau of Mysore. The Malnad region is very picturesque, its scenery

abounding with every charm of tropical forests and moun- tain wilds; on the other hand, the features of the Maidan country are for the most part comparatively tame. The mineral products of the district include iron-ore and laterite. The soil is loose and sandy in the valleys of the Malnad, and in the north-east the black cotton soil prevails. Bison are common in the taluk of Saugor, where also wild elephants are occasionally seen; while tigers, leopards, bears, wild hog, sambhar and chitdl deer are numerous in the wooded tracts of the west. Shimoga presents much variety of climate. The south-west monsoon is felt in full force for about 25 m. from the Ghats, bringing an annual rainfall of more than 150 in., but the rainfall gradually diminishes to 31 in. at Shimoga station and to 25 in. or less at Chennagiri. The population in 1901 was 53 • .736- Rice is the staple crop; next in importance is sugar-cane; areca nuts are also extensively grown; and miscellaneous crops include vegetables, fruits and pepper. The chief manufactures are coarse cotton cloths, rough country blankets, iron implements, brass and copper wares, pottery and jaggery. The district is noted for its beautiful sandal-wood carving.

During the Mahommedan usurpation of Mysore from 1761 to 1799, unceasing warfare kept the whole country in constant turmoil. After the restoration of the Hindu dynasty Shimoga became the scene of disturbances caused by the mal-administration of the Deshast Brahmans, who had seized upon every office and made themselves obnoxious. These disturbances culminated in the

insurrection of 1830, which led to the diiect assumption of the administration by the British.

SHINGLE. (1) A Middle English corruption oischindle, from Lat. scindula or scandula, a wooden tile, from scandere, to cut — a kind of wooden tile, generally of oak, used in places where timber is plentiful, for covering roofs, spires, &c. In England they are generally plain, but on the continent of Europe the ends are sometimes rounded, pointed or cut into ornamental form. (2) W T ater-worn detritus, of larger and coarser form than gravel, chiefly used of the pebbly detritus of a sea -beach. This word is of Norwegian origin, from singl or singling, coarse gravel. It is apparently derived from singla, to make a ringing sound, a form of " to sing," with allusion to the peculiar noise made when walking over shingle. (3) The word " shingles," the common name of herpes zoster, a particular form of the inflammatory eruption of the skin known as herpes (q.v.), is the plural of an obsolete word for a girdle, sengle, taken through O. Fr. cengle from Lat. cingulum, cingere, to gird.

SHINWARI, a Durani Afghan tribe occupying the northern slopes of the Safed Kob below Jalalabad. One clan, the Ali Sher Khel, fall within the British sphere in the North- West Frontier Province of India. They live on the Loargai border of Peshawar district, and number some 3000 fighting men. The remaining three clans are Afghan subjects.

SHIO-GHI, the Japanese game of chess. Like Go-bang, the game of the middle classes, and Sugorochu (double-six), that of the common people, it was introduced from China many centuries ago and is still popular with the educated classes. It is played on a board divided into 81 squares, nine on a side, with 20 pieces on each side, arranged on the three, outer rows. The pieces, which are flat and punt-shaped with the smaller end towards the front, represent, by means of different inscriptions, the O, or Sho, King-General, with whose checkmate the game ends, his two chief aids, the Kin and Ghin, Gold and Silver Generals (two of each), Ka-Ma, horse or knight (two), Yari, spearman (two), one Hisha, or flying chariot (rook), one Kaku (bishop), and nine Hio or Fu, soldiers or pawns. All these pieces, like those in chess, possess different functions. The chief difference between chess and Shio-ghi is that in the Japanese game a piece does not cease to be a factor in the game when it is captured by the opponent, but may be returned by him to the board at any time as a reserve; and, secondly, all pieces, except the King and Gold General, are promoted to higher powers upon entering the last three rows of the enemy's territory. This possibility of utilizing captured forces against their former masters and the altering values of the different men render shio-ghi a very difficult and complicated game.

See Games Ancient and Oriental, by E. Falkener (London, 1892); the Field (Sept. 1904).

SHIP, the generic name (O. Eng. scip, Ger. Schiff, Gr. ctko.os, from the root skap, cf. " scoop ") for the invention by which man has contrived to convey himself and his goods upon water. The derivation of the word points. to the fundamental conception by which, when realized, a means of flotation was obtained superior to the raft, which we may consider the earliest and most elementary form of vessel. The trunk of a tree hollowed out, whether by fire, or by such primitive tools as are fashioned and used with singular patience and dexterity by savage races, represents the first effort to obtain flotation depending on some- thing other than the mere buoyancy of the material. The poets, with characteristic insight, have fastened upon these points. Homer's hero Ulysses is instructed to

make a raft with a raised platform upon it, and selects trees " withered of old, exceeding dry, that might float 'lightly for him " (Od. v. 240). Virgil, glorifying the dawn and early progress of the arts, tells us, " Rivers then first the hollowed alders felt " (Georg. i. 136, ii. 451). Alder is a heavy wood and not fit for rafts. But to make for the first time a dug-out canoe of alder, and so to secure its flotation, would be a triumph of primitive art, and thus the poet's expression represents a great step in the history of the inven- tion of the ship.

Primitive efforts in this direction may be classified in the

following order: (i) rafts — tloaung logs, or bundles of brush- wood or reeds or rushes tied together; (2; dug-outs — hollowed trees; (3) canoes of bark, or of skin stretched on framework or inflated skins (balsas) ; (4) canoes or boats of pieces of wood stitched or fastened together with sinews or thongs or fibres of vegetable growth; (5) vessels of planks, stitched or bolted together with inserted ribs and decks or half decks; (6) vessels of which the framework is first set up, and the planking of the hull nailed on to them subsequently. All these in their primitive forms have survived, in various parts of the world, with different modifications marking progress in civilization. Climatic in- fluences and racial peculiarities have imparted to them their specific characteristics, and, combined with the available choice of materials, have determined the particular type in use in each locality. Thus on the north-west coast of Australia is found the single log of buoyant wood, not hollowed out but pointed at the ends. Rafts of reeds are also found on the Australian coast. In New Guinea catamarans of three or more logs lashed together with rattan are the commonest vessel, and similar forms appear on the Madras coast and throughout the Asiatic islands. On the coast of Peru rafts made of a very buoyant wood are in use, some of them as much as 70 ft. long and 20 ft. broad; these are navigated with a sail, and, by an ingenious system of centre boards, let down either fore or aft between the lines of the timbers, can be made to tack. The sea-going raft is often fitted with a platform so as to protect the goods and persons carried from the wash of the sea. Upright timbers fixed upon the logs forming the raft support a kind of deck, which in turn is itself fenced in and covered over. 1 Thus the idea of a deck, and that

of side planking to raise the freight above the level of the water and to save it from getting wet, -are among the earliest typical expedients which have found their development in the progress of the art of shipbuilding.

I. History to the Invention or Steamships

Whether the observation of shells floating on the water, or of split reeds, or, as some have fancied, the nautilus, first sug- gested the idea of hollowing out the trunk of a tree, the practice ascends to a very remote antiquity in the history of man. Dug- out canoes of a single tree have been found associated with objects of the Stone Age among the ancient Swiss lake dwellings; nor are specimens of the same class wanting from the bogs of Ireland and the estuaries of England and Scotland, some obtained from the depth of 25 ft. below the surface of the soil. The hollowed trunk itself may have suggested the use of the bark as a means of flotation. But, whatever may have been the origin of the bark canoe, its construction is a step onwards in the art of ship- building. For the lightness and pliability of the material necessitated the invention of some internal framework, so as to keep the sides apart, and to give the stiffness required both for purposes of propulsion and the carrying of its freight. Similarly, in countries where suitable timber was not to befound, the use of skins or other water-tight material, such as felt or canvas, covered with pitch, giving flotation, demanded also a framework to keep them distended and to bear the weight they had to carry. In the framework we have the rudimentary ship, with longitudinal bottom timbers, and ribs, and cross-pieces, imparting the requisite stiffness to the covering material. Bark canoes are found in Australia, but the American continent is their true home. In northern regions skin or woven material made water- tight supplies the place of bark.

The next step in the construction of vessels was the building up of canoes or boats by fastening pieces of wood together in a suitable form. Some of these canoes, and probably the earliest in type, are tied or stitched together with thongs or cords. The Madras surf boats are perhaps the most familiar example of this type, which, however, is found in the Straits of Magellan and in Central Africa (on the Victoria Nyanza), in the Malay Archipelago and in many islands of the Pacific. Some of these canoes show a great advance in the art of construction, being

1 The raft of Ulysses described in Homer (Od. v.) must have been of this class.

built up of pieces fitted together with ridges on their inner sides, through which the fastenings are passed. 2 These canoes have the advantage of elasticity, which gives them ease in a seaway, and a comparative immunity where ordinary boats would not hold together. In these cases the body of the canoe is constructed first and built to the shape intended, the ribs being inserted aiterwards, and attached to the sides, and' having for their main function the uniting of the deck and cross-pieces with the body of the canoe. Vessels thus stitched together, and with an inserted framework, have from a very early time been constructed in the Eastern seas far exceeding in size anything that would be called a canoe, and in some cases attaining to 200 tons burthen.

From the stitched form the next step onwards is to fasten the materials out of which the hull is built up by pegs or treenails; and of this system early types appear among the Polynesian islands and in the Nile boats described by Herodotus (ii..o6), the prototype of the modern " nuggur." The raft of Ulysses described by Homer presents the same detail of construction. It is remarkable that some of the early types of boats belonging to the North Sea present an intermediate method, in which the planks are fastened together with pins or treenails, but are attached to the ribs by cords passing through holes in the ribs and corresponding holes bored through ledges cut on the inner side of each plank.

We thus arrive, in tracing primitive efforts in the art of ship construction, at a stage from which the transition to the practice of setting up the framework of ribs fastened to a timber keel laid lengthwise, and subsequently attaching the planking of the hull, was comparatively simple. The keel of the modern vessel may be said to have its prototype in the single log which was the parent of the dug-out. The side planking of the Vessel, which has an earlier parentage than the ribs, may be traced to the attempt to fence in the platforms upon the sea-going rafts, and to the planks fastened on to the sides of dug-out canoes so as to give them a raised gunwale. 3 The ribs of the modern vessel are the development of the framework originally inserted after the completion of the hull of the canoe or built-up boat, but with the difference that they are now prior in the order of fabrication. In a word, the skeleton of the hull is now first built up, and the skin, &c, adjusted to it; whereas in the earlier types of wooden vessels the outside hull was first constructed, and the ribs, &c, added afterwards. 4 It is noticeable that the invention of the outrigger and weather platform, the use of which is at the present time distributed from the Andaman Islands eastward throughout the whole of the South Pacific, has never made its way into the Western

seas. It is strange that Egyptian enterprise, which seems at a very early period to have penetrated eastward down the Red Sea and round the coasts of Arabia towards India, should not have brought it to the Nile, and that the Phoenicians, who, if the legend of their migration from the shores of the Persian Gulf to the coast of Canaan be accepted, would in all probability, in their maritime expeditions, have had opportunities of seeing it, did not introduce it to the Mediterranean. That they did not do so, if they saw it at all, would tend to prove that even in that remote antiquity both nations possessed the art of constructing vessels of a type superior to the outrigger canoes, both in speed and in carrying power.

*The earliest representations that we have as yet of Egyptian vessels carry us back, according to the best authorities, to a period little short of 30*00 years before Christ. Some of these are of considerable size, as is shown by the number of rowers, and by .the cargo consisting in many cases of cattle. The earliest of all presents us with the peculiar mast of two pieces, stepped apart but joined at the top. In some the masts are shown lowered*

2 See Captain Cook's account of the Friendly Islands, La Perouse on Easter Island, and Williams on the Fiji Islands.

3 Compare the planks upon the Egyptian war galleys, added so as to protect the rowers from the missiles of the enemy.

4 It is curious that these two methods should still survive, and be in use, in the construction of light racing 8-oared boats. Some of these are built ribs first, and skin laid on afterwards; others, skin laid on moulds and framework first, and ribs inserted in the shell when turned over.

and laid along a high spar-deck. The larger vessels show on one side as many as twenty-one or twenty-two and in one case twenty-six oars, besides four or five steering. They show considerable camber, the two ends rising in a curved line which in some instances ends in a point, and in others is curved back and over at the stern and terminates in an ornamentation, very frequently of the familiar lotus pattern. At the bow the stem is sometimes seen to rise perpendicularly, forming a kind of forecastle, sometimes to curve

backward and then forward again like a neck, which is often finished into a figure-head representing some bird or beast or Egyptian god. On the war galleys there is frequently shown a projecting bow with a metal head attached, but well above the water. This, though no doubt used as a ram, is not identical with the beak afleur d'eau, which we shall meet with in Phoenician and Greek galleys. It is more on a level with the proembolion of the latter.

The impression as regards the build created by the drawings of the larger galleys is that of a long and somewhat wall-sided vessel with the stem and stern highly raised. The tendencies of the vessel to " hog," or rise amidships, owing to the great weight fore and aft unsupported by the water, is corrected by a strong truss passing from stern to stern over crutches. The double mast of the earlier period seems in time to have given place to the single mast furnished with bars or rollers at the upper part, for the purpose apparently of raising or lowering the yard according to the amount of sail required. The sail in some of the galleys is shown with a bottom as well as a top yard. In the war galleys during action it is shown rolled up like a curtain with loops to the upper yard. The steering was effected by paddles, sometimes four or five in number, but generally one or two fastened either at the end of the stern or at the side, and above attached to an upright post in such a way as to allow the paddle to be worked by a tiller.

There are many remarkable details to be observed in the Egyptian vessels figured in Duemichen's Fleet of an Egyptian Queen, and in Lepsius's Denkmaler . The Egyptian ship, as represented from time to time in the period between 3000 and 1000 B.C., presents to us a ship proper as distinct from a large canoe or boat. It is the earliest ship of which we have cognizance. But there is a noticeable fact in connexion with Egypt which we gather from the tomb paintings to which we owe our knowledge of the Egyptian ship. It is evident from these records that there were at that same early period, inhabiting the littoral of the Mediterranean, nations who were possessed of sea-going vessels which visited the coasts of Egypt for plunder as well as for commerce, and that sea-fights were even then not uncommon. Occasionally the combination of these peoples for the purpose of attack assumed serious proportions, and we find the Pharaohs recording naval victories over combined Dardanians, Teucrians and Mysians, and, if we accept the explanations of Egypto- logists, over Pelasgians, Daunians, Oscans and Sicilians. The Greeks, as they became familiar with the sea, followed in the same track. The legend of Helen in Egypt, as well as the numerous references in the Odyssey, point not only to the attraction that Egypt had for the maritime

peoples, but also to long-established habits of navigation and the possession of an art of shipbuilding equal to the construction of sea-going craft capable of carrying a large number of men and a considerable cargo besides.

But the development of the ship and of the art of navigation clearly belongs to the Phoenicians. It is tantalizing to find that the earliest and almost the only evidence that we have of fhis development is to be gathered from Assyrian representations. The Assyrians were an inland people, and the navigation with which they were familiar was that of the two great rivers, Tigris and Euphrates. After the conquest of Phoenicia, they had knowledge of Phoenician naval enterprise, and accordingly we find the war galley of the Phoenicians represented on the walls of the palaces unearthed by Layard and his followers in Assyrian discovery. But the date does not carry us to an earlier period than 700 B.C. The vessel represented is a bireme war galley which is "aphract," that is to say, has the upper tier of

rowers unprotected and exposed to view. The apertures for the lower oars are of the same character as those which appear in Egyptian ships of a much earlier date, but without oars. The artist has shown the characteristic details, though some- what conventionally. The fish-like snout of the beak, the line of the parodus or outside gangway, the wickerwork cancelli, 1 the shields ranged in order along the side of the bulwark, and the- heads of a typical crew on deck (the irpuptvs looking out in front in the forecastle, an iirifiarris, two chiefs by the mast, and, aft, the /ceXeixrnfc and KvfiepvriTris) . The supporting timbers of the deck are just indicated. The' mast and yard and fore and back stays, with the double steering paddle, complete the picture.

But, although there can be little doubt that the Phoenicians, after the Egyptians, led the way in the development of the shipwright's art, yet the information that we can gather concern- ing them is so meagre that we must go to other sources for the description of the ancient ship. The Phoenicians at an early date constructed merchant vessels capable of carrying large cargoes, and of traversing the length and breadth of the Mediter- ranean, perhaps even of trading to the far Cassiterides and of circumnavigating Africa. They in all probability (if not the Egyptians) invented the bireme and trireme, solving the problem by which increased oar-power and consequently speed could be obtained without any great increase in the length of the vessel.

It is, however, to the Greeks that we must turn for any detailed account of these inventions. The Homeric vessels were aphract and

*not even decked throughout their entire length. They carried crews averaging from fifty to a hundred and twenty men, who, we are expressly told by Thucydides, all took part in the labour of rowing, except perhaps the chiefs. The galleys do not appear to have been armed as yet with, the beak, though later poets attribute thi§ feature to the Homeric vessel. But they had great poles used in fighting, and the term employed to describe these (vav/iaxa.) implies a knowledge of naval warfare. The general characteristics are indicated by the epithets in use throughout the Iliad and the Odyssey. The Homeric ship is sharp (6ori) and swift (co/ceia) ; it is hollow (koiX?j, y \avpri, IMeyaKrirrjs) , black, vermilion-cheeked GuiXT07rdp#os) , dark-prowed (Kvavowpccpos) , curved (Kopuvls, a/i$i*Xicr(ra), well-timbered (eiWeXjuos) , with many thwarts (jroKvˆvyof, iKaroˆvyos). The stems and sterns are high, upraised, and resemble the horns of oxen (opdoKpaipai) . They present in the history of the shipping of the Mediterranean a type parallel with that of the Vikings' vessels of the North Sea.*

On the vases, the earliest of which may date between 700 and 600 B.C., we find the bireme with the bows finished off into a beak shaped as the head of some sea monster, and an elevated forecastle with a bulwark evidently as a means of defence. The craft portrayed in some instances are evidently pirate vessels, and exhibit a striking contrast to the trader, the broad ship of burden {oprh evptia), which they are overhauling. The trireme, which was developed from the bireme and became the Greek ship of war (the long ship, vam y.a.Kph, navis longa, par excellence), dates, so far as Greek use is concerned, from about 700 B.C. according to Thucydides, having been first built at Corinth. The earliest sea-fight that the same author knew of he places at a somewhat later date — 664 B.C., more than ten centuries later than some of those portrayed in the Egyptian tomb paintings.

The trireme was the war ship of Athens during her prime, and, though succeeded and in a measure superseded by the larger rates, — quadrireme, quinquereme, and so on, up to vessels of sixteen banks of oars (inhabilis prope magnitudinis) , — yet, as containing in itself the principle of which the larger rates merely exhibited an expansion, a difference in degree and not in kind, has, ever since the revival of letters, concentrated upon itself the attention of the learned who were interested in such matters. The literature connected with the question of ancient ships, if collected, woiˆ.d fill a small library, and the greater part of it turns upon the construction of the trireme and the disposition of the rowers therein.

1 See Rawlinson, Ancient Monarchies, vol. ii. p. 176.

During the 19th century a fresh light was thrown upon the subject by the discovery (1834) at the Peiraeus of some records of the Athenian dockyard superintendents, belonging to several years between 3 73-3 24 B.C. These were published and admirably elucidated by Boeckh. Further researches were carried out by his pupil Dr Graser. Since the publication of Graser's notable work, De re navali velerum, the subject has been copiously treated by A. Cartauld, Breusing, C. Torr and others. The references to ancient writers, and the illustrations from vases, coins, &c, have been multiplied, and, though the vexed question of the seating of the rowers cannot be regarded as settled, yet, notwithstanding some objections raised, it seems probable that something like Graser's solution, with modifications, will eventu- ally hold the field, especially as practical experiment has shown the possibility of a set of men, seated very nearly according to his system, using their oars with effect, and without any inter- ference of one bank with another.

On one point it is necessary to insist, because upon it depends the right understanding of the problem. The ancients did not employ more than one man to an oar. The method employed on medieval galleys was alien to the ancient system. A. Jal, Admiral Fincati, Admiral Jurien de la Graviere and a host of other writers on the subject, some as recently as 1906, have been led to advocate erroneous, if ingenious, solutions of the problem, by neglect of, and in contradiction to, the testimony of ancient texts and representations, which overwhelmingly establish as an axiom of the ancient marine the principle of " one oar, one man."

The distinction between " aphract " and " cataphract " vessels must not be overlooked in a description of the ancient vessels. The words, meaning " unfenced" and " fenced," refer to the bulwarks which covered the upper tier of rowers from attack. In the aphract vessels these side plankings were absent and the upper tier of rowers was exposed to view from the side. Both classes of vessels had upper and lower decks, but the aphract class carried their decks on a lower level than the cataphract. The system of side planking with a view to the protection of the rowers dates from a very early period, as may

be seen in some of the Egyptian representations, but among the Greeks it does not seem to have been adopted till long after the Homeric period. The Thasians are credited with the introduction of the improvement.

In our account of the trireme, both as regards the disposition of the rowers and the construction of the vessel, we have mainly, though not entirely, followed Graser. Any such scheme must at the best be hypothetical, based upon inference from the ancient texts, or upon necessities of construction, and in every case plenty of room will be left for the critic, along with the Horatian invitation, " si quid novisti rectius istis, Candidus imperti."

*In the ancient vessels the object of arranging the oars in banks was to economize horizontal space, and to obtain an increase in the number of oars without having to lengthen the vessel. It has been reasonably inferred from a passage in Vitruvius * that the " inter- scalmium," or space horizontally measured from oar to oar, was 2 cubits. This is exactly borne out by the proportions of an Attic aphract trireme, as shown on a fragment of a bas-relief found in the Acropolis. The rowers in all classes of banked vessels sat in the same vertical plane, and seats ascending in a line obliquely towards the stern of the vessel. Thus in a trireme the thranite, or oarsman of the highest bank, was nearest the stern of the set of three to which he belonged. IMext behind him and somewhat below him sat his zygite, or oarsman of the second bank; and next below and behind the zygite sat the thalamite, or oarsman of the lowest bank. The vertical distance between these seats was probably 2 ft., the horizontal distance about I ft. The horizontal distance, it is; well to repeat, between each seat in the same bank was 3 ft. (the seat itself about 9 in. broad). Each man had a resting place for his feet, somewhat wide apart, fixed to the bench of the man on the row next below and in front of him. In rowing, the upper hand, as is shown in most of the representations which remain, was held with the palm turned inwards towards the body. This is accounted for by the angle at which the oar was worked. The lowest rank used the shortest oars, and the difference of the length of the oars on board was caused by the curvature of the ship's side. Thus, looked at from within, the rowers amidship seemed to be using the longest oars, but outside the vessel, as we are expressly told, all the oar-blades of the same bank took the water in the same longitudinal line. The lowest or thalamite oar- ports were 3 ft., the zygite 4j ft., the thranite 5§ ft. above the water. Each oar-port was protected by an ascoma or leather bag, which fitted over the oar, closing the aperture against the wash of the sea without impeding the action of the oar. The oar was attached by*

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1 In Vitruvius 1,2,4 the MSS. give Dipheciaca (or Difeciaca), which is an unknown word. Many of the editions read AII1HXAIKH, an emendation which commends itself as consonant with probability, though in itself conjectural. (We may suggest the reading AIIIHXIAKA, by which the scribe's error would be reduced to EC for X.)

thong (rpoirSs, rpoTroiriip) to a thowl (

The benches on which the rowers sat ran from the vessel's side to timbers, which, inclined at an angle of about 64° towards the ship's stern, reached from the lower to the upper deck. These timbers were, according to Graser, called the diaphragmata. In the trireme each diaphragma supported three, in the quinquereme five, in the octireme eight, and in the famous tesseraconteres forty seats of rowers, who all belonged to the same " complexus," though each to a different bank. In effect, when once the principle of construction had been established in the trireme, the increase to larger rates was effected, so far as the motive power was concerned, by lengthening the diaphragmata upwards, while the increase in the length of the vessel gave a greater number of rowers to each bank. The upper tiers of oarsmen ex- ceeded in number those below, as the contraction of the sides of the vessel left less available space towards the bows.

Of the length of the oars in the trireme we have an indication in the fact that the length of supernumerary oars (ireplvet?) rowed from the gangway above the thranites, and, therefore, probably slightly exceeding the thranitic oars in length, is given in the Attic tables as 14 ft. 3 in. The thranites were probably about 14 ft. The zygite, in proportion to the measurement, must have been 10J, the thalamite 7! ft. long. Comparing modern oars with these, we find that the longest oars used in the British navy are 18 ft. The university boat race has been rowed with oars 12 ft. 6 in. The proportion of the loom inboard was about one third, but the oars of the rowers amidship must have been somewhat longer inboard. The size of the loom inboard preserved the necessary equilibrium. The long oars, of the larger rates were weighted inboard with lead. Thus the topmost oars of the tesseraconteres, of which the length is given as 53 ft., were exactly balanced at the rowlock. (See Oar.)

Let us now consider the construction of the vessel itself. In the cataphract class the lower deck was I ft. above the water-line. Below this deck was the hold, which contained a certain amount of ballast,

and through an aperture in this deck the buckets for baling were worked, entailing a labour which was constant and severe on board an ancient sfiip at sea. The keel (rpSms) appears to have had considerable camber. Under it was a strong false keel (x«Xw/ia), very necessary for vessels that were constantly drawn up on the shore. Above the keel was the kelson, under which the ribs were fastened. These were so arranged as to give the necessary intervals for the oar-ports above. Above the kelson lay the upper false keel, into which the mast was stepped. The stem (or«pa) rose from the keel at an angle of about 70 to the water. Within was an apron (0AXkt)s), which was a strong piece of timber curved and fitting to_ the end of the keel and beginning of the stern-post and firmly bolted into both, thus giving solidity to the bows, which had to bear the beak and sustain the shock of ramming. The stem was carried upwards and curved generally backwards towards the forecastle and rising above it, and then curving forwards again terminated in an ornament which was called the acrostolion. The stern-post was carried up at a similar angle to the bow, and, rising high over the poop, was curved round into an ornament which was called " aplustre " (o0Xao top). But, inasmuch as the steering was effected by means of two rudders (7T7)6aXta), one on either side, there was no need to carry out the stern into a rudder post as with modern ships, and the stern was left, therefore, much more free, an advantage in respect of the manoeuv- ring of the ancient Greek man-of-war, the weapon being the beak or rostrum, and the power of turning quickly being of the highest importance.

Behind the " aplustre," and curving backwards, was the " chenis- cus " (xijxfoxos) , or goose-head, symbolizing the floating powers of the vessel. After the ribs had been set up and covered in on both sides with planking, the sides of the vessel were further strengthened by waling-pieces carried from stern to stem and meeting in front of the stern-post. These were further strengthened with additional balks of timber, the lower waling-pieces meeting about the water-level and prolonged into a sharp three-toothed spur, of which the middle tooth was the longest. This was covered with hard metal (generally bronze) and formed the beak. The whole structure of the beak pro- jected about 10 ft. beyond the stern-post. Above it, but projecting much less beyond the stern-post, was the " proembolion " (vpotp.06\iov), or second beak, in which the prolongation of the upper set of waling-pieces met. This was generally fashioned into the figure of a ram's head, also covered with metal; and sometimes again between this and the beak the second line of waling-pieces met in another metal boss called the irpoen0oKis. These bosses, when a vessel was rammed,

completed the work of destruction begun by the sharp beak at the water-level, giving a racking blow which caused it to heel over and so eased it off the beak, and releasing the latter before the weight of the sinking vessel could come upon it. At the point where the prolongation of the second and third waling-pieces began to converge inwards towards the stem on either side of the vessel stout catheads (f.iruTlScs) projected, which were of use, not only as supports for the anchors, but also as a means of inflicting damage on the upper part of an enemy's vessel, while protecting the side gangways of its own and the banks of oars that worked under them. The catheads were strengthened by strong balks of timber, which were firmly

bolted to them under either extremity and both within and without, and ran to the ship's side. Above the curvature of the upper waling-pieces into the vpoenPoXiov were the cheeks of the vessel, generally painted red, and in the upper part of these the eyes (600aXp.oi), answer- ing to our hawse holes, through which ran the cables for the anchors. On either side the trireme, at about the level of the thranitic benches, projected a gangway (napo&os) resting against the ribs of the vessel. This projection was of about 1 8 to 24 in., which gave a space, increased to about 3 ft. by the inward curve of the prolongation of the ribs to form supports for the deck, for a passage on either side of the vessel. This gangway was planked in along its outer side so as to afford protection to the seamen and marines, who could pass along its whole length without impeding the rowers. Here, in action, the sailors were posted as light-armed troops, and when needed could use the long supernumerary oars (irepivey) mentioned above. The ribs, prolonged upwards upon an inward'curve, supported on their upper ends the cross beams (oTpwrrtpes) which tied the two sides of the vessel together and carried the deck. In the cataphract class these took the place of the thwarts (fu-ya) which in the earlier vessels, at a lower level, yoked together the sides of the vessel, and formed also benches for the rowers to sit on, from which the latter had their name (fir/irai), having been the uppermost tier of oarsmen in the bireme; while those who sat behind and below them in the hold of the vessel were called BaXapxrai. or 8a\ap.aKts (from SaXajuos). In the trireme the additional upper tier was named from the elevated bench (Bpavos) on which they were placed (epavlrcu). On the deck were stationed the marines (l7ri/3dT

The dimensions of some dry docks discovered at Munychium and Zea, " ship-houses " as the ancients called them, afford some indications as to limitations of length and breadth in the Attic ships that used them. The measurements indicate for these houses about 1 50 ft. in length and 20 ft. in breadth. We may infer, therefore, that the ships housed in them did not exceed 150 by 20 ft. But there must necessarily have been some spare room in the dock houses, on either side and at both ends. Allowing 2 ft. on either side for passage room, and 10 ft. at either end, we should have room for a vessel of about 130 ft. in length including the beak, and of about 16 ft. beam. Adopting the 2 cubit " interscalmium," the rowing space in the trireme (31 by 3) for the upper tier would equal 93 ft. Allowing 12 ft. for bows and 15 for stern and 10 ft. for beak, we have 130 ft. as the aggregate length of the war vessel of three banks of oars. This of course is conjectural, but we submit that it is a reasonable conjecture from the evidence which we possess. There was indeed every reason for keeping the vessel as short as was compatible with the necessary requirements, and it is to be remembered that it was constantly being hauled up on shore for the night and launched again in the morning. As to the " interscalmium," it does not appear to exceed 3 ft. even in the largest boats now used in the royal navy. In the Chinese dragon boats, which are 73 ft. long and under 5 ft. beam, and have each 54 rowers or paddlers, it does not exceed 2 ft. 6 in An oarsman whose feet are nearly on a level with his seat, as in a modern racing eight, _ requires more room for the swing forward of the handle of his oar in the recovery, than a man whose feet rest on a level well below that of his seat. It is not likely that the ancient oarsman swung forward more than blue-jackets do now-a-days in a man-of-war's cutter. All the Attic triremes appear to have been built upon the same model, and their gear was interchangeable, "he Athenians had a peculiar system of girding the ships with long cables (6vofcip.aTa), each trireme having two or more, which, pass- ing through eyeholes in front of the stern-post, ran all round the vessel lengthwise immediately under the waling-pieces. They were fastened at the stern and tightened up with levers. These cables, by shrinking as soon as they were wet, tightened the whole fabric of

the vessel, and in action, in all probability, relieved the hull from part of the shock of ramming, the strain of which would be sustained by the waling-pieces convergent in the beaks. These rope-girdles are not to be confused with the process of undergirding or trapping, such as is narrated of the vessel in which St Paul was being carried to Italy. The trireme appears to have had two masts. In action the Greeks did not use sails, and everything that could be lowered was

stowed below. The mainmasts and larger sails were often left ashore if a conflict was expected.

The crew of the Attic trireme consisted of from 200 to 225 men in all. Of these 170 were rowers — 54 on the lower bank (thalamites), 54 on the middle bank (zygites), and 62 on the upper bank (thranites), — the upper oars being more numerous because of the contraction of the space available for the lower tiers near the bow and stern. Besides the rowers were about 10 marines (txuSarat) and 20 seamen. The officers were the trierarch and next to him, 'the helmsman (/cu/3tpv^T»)s), who was the navigating officer of tfi'e trireme. The rowers descended into_ the seven-foot space between the diaphragmata and took their places in regular order, beginning with the thalamites. The economy of space was such that, as Cicero remarks, there was not room for one man more.

The improvement made in the build of their vessels by the Corinthian and Syracusan shipwrights, by which the bows were so much strengthened that they were able to meet the Athenian attack stem on (Trpoofiokr)), caused a change of tactics, and gave an impetus to the building of larger vessels — quadriremes and quinqueremes — in which increased oar-power was available for the propulsion of the heavier weights.

In principle these vessels were only expansions of the trireme, so far as the disposition of the rowers was concerned, but the speed could not have increased in proportion to the weight, and hence arose the variety of contrivances which superseded the ramming tactics of the days of Phormio. In the century that succeeded the close of the Peloponnesian War the fashion of building big vessels became prevalent. We hear of various numbers of banks of oars up to sixteen (eKKai5eKr}pr)s) — the big vessel of Demetrius Poliorcetes. The famous tesseraconteres or forty-banked vessel of Ptolemy Philopator, if it ever existed except in the imagination of Callixenus, was in reality nothing more than a costly and ingenious toy, and never of any practical use. The story, however, of its construction indicates the per- fection to which the shipwright's art had been carried among the ancients.

The Romans, who developed their naval power during the First Punic War, though it is clear from the treaty with Carthage, 509 B.C., that they had had some maritime interests and adventur- ings before that great struggle began, were deficient in the art of naval construction. A Carthaginian quinquereme, which had drifted ashore, served them for a model, and with crews taught to row in a framework set up on

*dry land they manned a fleet which was launched in sixty days from the time that the trees were felled. Their first attempt was, as might have been expected, a failure. But they persevered, and the invention of the " corvus," by means of which boarding were opposed to ramming tactics, gave them under Duilius (260 B.c.)*victory at Mylae, and eventually the command of the sea. From that time onwards they continued to build ships of many banks, and seem to have maintained their predilection for fighting at close quarters. The larger vessels with their " turres," or castles, fore and aft, deserved Horace's description as " alta navium propugnacula." The " corvus " and the " dolphin " were ready in action to fall on the enemy's decks, and in Caesar's battle with the Veneti off the coast of Gaul the " fakes," great spars with curved steel heads like a sickle, mowed through the rigging and let down the sails on which alone the foe depended for movement.*

But the fashion of building big ships received a severe shock at the battle of Actium (31 B.C.), when the light Liburnian " biremes," eluding the heavy missiles of the larger vessels, swept away their banks of oars, leaving them crippled and unable to move, till one by one they were burnt down to the water's edge and sank. 1 After this experience the Romans adopted the Liburnians as their principal model, and though the building of vessels with many banks continued for some centuries, yet the Liburnian type was so far dominant that 1 Merivale, Hist, of Romans under the Empire, c. 28.

the name was used generically, just as the name of trireme had been used before, to signify a man-of-war, without reference to the size of vessel or the number of banks of oars.

Meanwhile, with the peace of the Mediterranean ensured, for piracy was kept in abeyance by the imperial power, and with increased commercial activity, the building of large merchant vessels naturally followed. These were propelled by sails and not by oars, which, however, continued to furnish the principal motive power for the ship of war until the necessity for increasing its carrying power began to make it too unwieldy for propulsion by rowing.

The great corn ships, which brought supplies from Egypt to the

capital, were, if we may take the vessel described by Lucian as a typical instance, 120 cubits long by 30 broad and 29 deep. The ship in which St Paul and his companions were wrecked carried 276 souls besides cargo. Even larger vessels than these were constructed by the Romans for the transport of marbles and great obelisks to Italy. These huge vessels carried three masts, with square sails, and on the main mast a topsail, which the corn ships from Alexandria alone were allowed to keep set when coming into the Italian port . All other merchant vessels were compelled to strike the supparum.

But while the construction of large vessels for commercial purposes was thus developed, the policy of keeping the war- vessel light and handy for manoeuvring purposes prevailed, and, though vessels of three, four or even five banks were still built, the great majority did not rise above two banks. In the war with the Vandals (a.d. 440-470) we hear of ships of a single bank, with decks above the rowers. These, we are told, were of the type which at a later date were called Dromons (Sponoivts) in allusion to their speedy qualities, a name which gradually superseded the Liburnian, as indicating a man-of-war. During the following centuries the Mediterranean was the scene of constant naval activity. The rise of the Mussulman power, which by a.d. 825 had mastered Crete and Sicily, made the maintenance of their fleet a matter of first importance to the emperors of the East, and as the Arab inroads became more threatening, and piracy more rife, so the necessity of improving their galleys as regards speed and armament became more and more pressing. It was during this period, and that very largely by the Arabs, that a great advance was made in the employment of what we should call artillery. The use of Greek fire and of other detonating and combustible mixtures, launched by siphons or in the form of bombs thrown by hand or machinery, led to various devices by way of protective armour, such as leather or felt casing, or woollen stuffs soaked in vinegar, and all such contrivances tended gradually to alter the character as well as the equipment of the war vessel.

During the same period the rise and growth of the Venetian republic mark the entrance on the scene of a new seafaring and shipbuilding power.

Meanwhile, the northern seas were breeding. a new terror. In the 5 th century the Roman fleet which guarded the narrow entrance into the British Channel had disappeared. The Frankish power gradually established itself in Gaul. But behind the Franks still fiercer races, born to the use of oar and sail, were gathering for the invasion of the

west and south. For a while it seemed as if the empire consolidated by Charle- magne would be able to withstand their inroads. Yet even in the year of his coronation (a.d. 800) the piratical Northmen had carried their ravages as far as Aquitaine. Charlemagne organized a naval force at Boulogne and at Ghent. But, though in alliance with the kings of Mercia and Wessex, he had not that control of the Channel which the possession of both shores had given to the Romans. The ships of the Vikings, propelled by oar and sail, were seagoing vessels of an extellent type. They were of various sizes, ranging from the skuta of about ,30 oars to ask or skeid with 64 oars and a crew of 240, and to the still larger dreki or dragon boats, and the famous snekkjur or serpents, said to be represented on the Bayeux tapestry. Of these vessels we have fortunately, though of the smaller class, a typical instance in the well-known Viking ship discovered in 1880 in a xtiv. 28

tomb-mound at Gokstad near Christiania, of which the dimensions are given as: length 78 ft., beam 16 ft. 7 in., depth 5 ft. 9 in., with high stem and stern; clinker-built of oak throughout, with 16 oars on either side. Of this type were the vessels large and small which had by the 9th century or even earlier found their way into the Mediterranean. Such were the fleets which continually infested the northern and western coasts of Gaul, carrying swarms of the fierce Northmen who eventually came to stay, and gave their name to the portion of Neustria which they had wrested from the Frankish king (912). If, as is probable, the Danes who invaded England used the same class of vessel, Alfred the Great must, according to the Saxon Chronicle, be credited with improvements in construction, which enabled him to defeat them at sea (897). He built, we are told, vessels twice as long as those of the Danes, swifter, steadier and higher, some of them for 60 oars, and after his own design, not following either the Danish or Frisian types.

While the northern seas were thus full of activity and conflict, there was little repose in the Mediterranean. The emperors of the West do not seem to have maintained their fleets or naval stations as they had been of old. Ravenna and Misenum were shorn of their ancient glories. But in the East things were different. There, as we have said, it was fully perceived that the maintenance of the empire depended upon sea power. The Tactica of the Emperor Leo (886-911), followed by Constantine Porphyrogenitus (911-959), give us full details as to the com- position of a Byzantine fleet and its units. Dromons of two sizes and of two banks of oars are described, and, besides these, smaller Dromons of great speed are referred to as " galleys or single-banked ships." In all these the rule was still " one

oar, one man," but the way was being prepared for improvements by which the medieval galley, still preserving a comparatively low freeboard, was enabled to equal or to surpass the many- banked vessel in speed, while it was gradually adapted to carry greater weight and more powerful means of offence.

The medieval man-of-war was essentially a one-banked vessel (ixovokpotov) , but the use of longer oars or sweeps took the place of the smaller paddling oars of the ancient vessel, and altered greatly the angle at which the oars reached the water. It was the increase in the length and weight of the oar, requiring for its efficiency greater power than that of one man, which led to the employment of more than one man to an oar. With the longer oar the necessity arose of placing the weight at a greater distance from the power applying the lever. This was gained by the invention of the apostis, which was practically a framework standing out on each side of the hull and running parallel to it; a strong external timber, in which the thowls, against which the oars were rowed, were set. By this means it became possible not only to arrange the oars horizontally, in sets of three or more of different lengths {alia zenzile), instead of in banks one above the other obliquely, but still further to make an innovation, unknown to the ancients, which, while greatly increasing the length and substance of the oar, and its leverage, applied the strength of three or four men (or even up to seven with, the larger galleys and galleasses) for the motive power of each blade. As time went on oars of from 30 to 50 ft. came into vogue, the inboard portion of which was about one-third of the length, and furnished with handles (manettes) attached to the loom, while the men for each oar were arranged in steps {alia scaloccio).

It must not be imagined that these developments took place all at once, or that any improvements in building, or in the method of propulsion, were generally adopted but by slow degrees. Moreover, as commerce increased and merchant vessels gained in size, the necessity of being able to defend themselves against piratical attacks became more and more cogent, a necessity which ultimately led the way to the supersession of the galley by the sailing vessel. Yet the galley for centuries, especially in the Mediterranean, maintained its place as the ship of war par excellence, even when mixed fleets of galleys and sailing vessels were not uncommon. In the Atlantic and northern seas it was less en Evidence, though even with the Spanish Armada some galleys and galleasses were included in the invading fleet.

SHIP

[BEFORE STEAMSHIPS

The period of the Crusades was one of great activity in ship-building, in which the Venetians and the Genoese were the leaders in the Mediterranean, but the enterprise of England under Richard Cceur de Lion (1189-1199) shows that in the northern seas great efforts were being made in the same direction, with the undoubted result that the English nation became more familiarized with the sea, and more eager for maritime adventure. Richard's fleet which sailed from Dartmouth consisted of no vessels, and its total in the Mediterranean after reinforcement amounted to 230 vessels. Among these were Busses, or Dromons of large size, with masts and sails, ships of burden and triremes. Nor were the Saracens without great vessels, if the story of Richard's destruction of a three-masted vessel, carrying rein- forcements to Acre, on board of which there were no less than 1500 men, be true. The attack of a swarm of galleys upon the great ship as she lay becalmed reads almost like the attack of a swarm of torpedo boats upon a disabled battleship to-day.

The whole period of the Crusades was, as regards naval matters, one of mixed fleets, in which the sailing vessels were mostly merchant vessels armed for fighting purposes. The effect of the Crusades upon the seafaring races of northern Europe was that the revelation of the East and its traffic quickened their desire for adventure in that and other directions. Hence rivalries between them and the Mediterranean sea powers, and consequent improvement in sea-going vessels and in seaman- ship. The steering side-paddle gradually disappears, and the rudder slung at the stern becomes the usual means of directing the vessel's course. The merchant vessels when prepared for war have fore-castles and stern-castles (compare the Roman turres) erected on them, of which the one survives in name, and the other in the quarter-deck of modern times. But a change was at hand which was destined to affect all classes, from the galley with its low freeboard to the alta propugnactda of the great sailing vessels.

The invention of gunpowder, and the consequent use of cannon on board ship, was the cause of many new departures in building and armaments. In the galleys we find guns mounted in the bows, and broadside on the upper deck, en barbette, firing over the bulwarks. Soon, however, the need of cover suggested portholes cut for the guns, just as in the ancient galleys they had been cut for the oars. The desire to carry many guns led to many alterations in build, such

as the tumble-home of the sides, and the desire for speed to many improvements in rig, as well as to an increase in the number of masts and consequently larger spread of sail. About 1370-1380 French, Venetians and Spaniards are using the new artillery in action, and the policy of maintaining a navy composed of sailing vessels built for the purposes of war, and not merely of armed merchant ships impressed for the emergency, soon began to take effect.

*In England Henry V. (1413) built large vessels for his fleet, *' great ships, cogs, carracks, ships, barges and ballingers," some of which were of nearly 1000 tons, but the generality from 420 to 520 tons. In the list of his fleet no galleys seem to be included. Meanwhile in the south the type of vessel called " caravel " was being developed, in which Portuguese and Spaniards dared the Atlantic and made their great discoveries. It was in a vessel of this kind that Columbus (1492) sought to reach the Indies by a western route. 1 She was but little over 230 tons when fully laden. Her forecastle overhung the stem by nearly 12 ft. Aft she had a half deck and a quarter deck. Her total length was 128 ft., her beam nearly 26 ft. She had three masts and a bowsprit. Her fore and main masts were square-rigged, but the mizzen had a lateen sail. The vessels in which Vasco da Gama first doubled the Cape of Good Hope (1497) were of the same type but larger. The ship of John Cabot (1497) in which he discovered Newfoundland must have been much smaller, as he had a crew of only eighteen men.*

Among the results of these world-famous voyages and dis- coveries was naturally a great increase in maritime adventure.

1 See Sir G. V. Holmes, Ancient and Modern Ships, i. 87, to which the writer is indebted for many of the details concerning modern vessels.

In England during the Tudor times a great advance in ship- building is observable. Henry VII. with his new ships, the " Regent " and the " Sovereign," and Henry VIII. with his " Henry Grace a. Dieu," or " Great Harry," both came abreast of their times, but it is worthy of notice that the French then, as well as at a later period, were providing the best models for naval architecture. These big ships were armed at first with " serpentines," and later with cannon and culverins. The re- presentations of them show several tiers of guns, four or even five masts, and enormous structures by way of forecastles and deck-houses aft. As regards merchant vessels, the Genoese and the Venetians during the 15th and 16th centuries carried out great improvements. The " carracks " of the 16th century

often reached as much as 1600 tons burden. There is a record of a Portuguese carrack captured by the English, of which the dimensions reached 165 ft. in length and 47 ft. in beam. She carried 32 pieces of brass ordnance and between 600 and 700 passengers. The Spanish Armada (1588) was composed of 132 vessels, of which the largest was about 1300 tons and 30 under 100 tons. Four galleys and four galleasses accompanied the fleet. The opposing fleet consisted of 197 vessels of which only 34 belonged to the royal navy. Of these the largest was the " Triumph " of about 1000 tons. The " Ark," the flagship of the English admiral, was of 800 tons, carrying 55 guns. Among the armed merchant vessels employed with the fleet was the " Buonaventure," the first English vessel that made a successful voyage to the Cape and India. The result to England of the defeat of the Spaniards was a great increase of mercantile activity. Merchants, instead of hiring Genoese or Venetian carracks, began to prefer building and owning home-built ships, and though the foreign merchant vessels appear to have been on a larger scale, yet, as sea-going craft, the English-built ships certainly held their own. We hear also during this period of many improvements in details, such as striking topmasts, the use of chain pumps, the introduction of studding, topgallant, sprit and top sails, also of the weighing of anchors by means of the capstan, and the use of long cables. In the men-of-war the lower tier of guns, which, as in the galleys, had been carried dangerously near the water-line, began to be raised. This improvement, however, does not seem to have been adopted in the English ships till after the Restoration. Meanwhile, in the Mediterranean the galley was still in vogue, being only partially superseded by the great galleasses, six of which are recorded to have taken part in the battle of Lepanto (1571), in which the Venetians and their allies employed no less than 208 galleys with single banks and long sweeping oars. The contrast between the conditions and the character of the vessels used in this battle and those engaged in the case of the Spanish Armada is interesting and instructive as typical of the different development of naval power in the inland and the open seas.

During the 1 7th century the expansion of trade and the increase of mercantile enterprise were incessant. The East India Company organized its fleet of armed vessels of about 600 tons, and fought its way through Portuguese obstruction to the Indian coast. The Dutch were also competing for the trade of the East and the West, and formed similar companies with this object in view. Conflicts owing to commercial rivalry and international jealousies were inevitable. Hence in the British navy the con- struction of large vessels such as

the " Prince Royal " and the " Sovereign of the Seas " (see Rigging), which may be con- sidered as among the earliest types of the modern wooden man- of-war. English oak afforded the best timber for shipbuilding, and skilful naval architects, such as Phineas Pett, succeeded in constructing the kind of sea-going war vessel which eventually gave England the superiority in its struggle with other naval powers in this and the following century. This, however, was by no means easily gained. The Dutch and the French were not slack in the building of merchant vessels and men-of-war. The capture of vessels from time to time on either side served to enlarge the area of improvement and to assist in the progress of the art of construction. The French navy especially, under the fostering care of Colbert, was greatly strengthened. During

the 18th century it was constantly found that the dimensions of French ships exceeded those of British ships of the same date, and that French vessels were superior in speed. This led from time to time to an increase of the measurements of the various classes of vessels in the British navy. These were now rated according to the number of guns which they were constructed to carry.

A 90 -gun ship of the line at the beginning of the 18th century averaged 164 ft. in length of gun deck, 47 ft. beam, and about 1570 tons, while the frigates now ran to 120 ft. with 34 ft. beam and from 600 to 700 tons. These dimensions, however, were not always maintained, and towards the middle of the century the Admiralty seem to have recognized the consequent inferiority of their ships. The famous and ill-fated " Royal George," launched in 1756, was the result of an effort to improve the line- of-battle ship of the period. She was 178 ft. in length, 52 ft. in beam, was of over 2000 tons, and carried 100 guns and a crew of 750 men. The " Victory," Nelson's flagship, was built nearly ten years later. Her dimensions were 186 ft., 52 ft., 2162 tons, and she carried 100 guns. During the same period frigates, which were cruisers carrying their armament on one deck, were built to carry 3 2 or 36 guns, but in this class also the French cruisers were superior in speed and of larger dimensions. The remainder of the 18th century and the beginning of the 19th witnessed a continuous rivalry in naval architecture, the French and Spanish models being constantly ahead of the British in dimensions

and armament. In the American war (1812) the same disparity as regards dimensions became apparent, and the English frigates, and sloops used as cruisers, were generally outclassed, and in some instances captured, by American vessels of their own rate. This as usual led to the construction of larger vessels with greater speed, and though, after the con- clusion of the long war, the activity of the royal dockyards slackened, yet the great three-deckers of the last period, before the adoption of steam power, had reached a length of over 200 ft., with more than 55 ft. beam, and over 3000 tons.

Meanwhile the mercantile navies of the world, but more especially of England, had largely increased. The East India- man, as the armed vessels of the East India Company were called, really performed the functions of merchant vessel, passenger ship, and man-of-war. But, where there was no monopoly, competition soon quickened the development of trading vessels. The Americans with their fast-sailing " clippers " again taught the English builders a lesson, showing that increased length in proportion to beam gave greater speed, while admitting of lighter rigging in proportion to tonnage, and of economy as regards the number of men required to work the ship. The English shipyards were for a long time unequal to the task of producing vessels capable of competing with those of their American rivals, and their trade suffered accordingly. But after the repeal of the Navigation Laws in 1850 things improved, and we find clippers from Aberdeen and from the Clyde beginning to hold their own on the lpng voyages to China and elsewhere.

At this epoch steam power appears in use on the scene, and the period of great wooden vessels closes with iron and steel taking their place in the construction of the hulls, while the sail gives way to the paddle and the screw.

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II. History since the Introduction of Steamships

Before steam was applied to the propulsion of. ships, the voyage from Great Britain to America lasted for some weeks; at the beginning of the 20th century the time had beem reduced to about six days, and in 1910 the fastest vessels could do it in four and a half days. Similarly, the voyage to Australia, which took about thirteen weeks, had been reduced to thirty days or less. The fastest of the sailing tea-clippers required about three months to bring the early teas from China to Great Britain; in 1910 they were brought to London by the ordinary P. & O. service in five weeks. Atlantic liners now run between England and America which maintain speeds of 25 and 26iknots over the whole course, as compared with about 12 knots before the introduction of steam. The accommodation in the modern passenger ships is palatial compared with that in the correspond- ing wooden sailing ships of the middle of the 19th century.

The changes from sail power to steam power for propulsion, and from wood to iron and steel for constructional purposes, proceeded together, though at first very slowly. The marine steam engine was at first a very imperfect motor, and the services upon which steamships could be used to advantage were, in consequence, much restricted. There was, moreover, a national prejudice against the substitution of iron for " the; Wooden Walls of Old England."

It is recorded that an iron boat, intended apparently for passenger service, Was built and launched on the river Foss, in Yorkshire, in 1777, and shortly afterwards iron was used for the shell plating of lighters for canal J?^" service. One of these, having its shell constructed / TOn . of plates five-sixteenths of an inch thick, was built near Birmingham in 1787. About the same time parts of wooden ships began to be replaced by iron, the first being beam knees. Early in the 19th century iron " diagonal riders " for providing the longitudinal strength were introduced by Sir Robert Seppings, and from this period down to the present day iron strengthenings for resisting both transverse and longitudinal strains have been generally used in wooden ships. The introduction of iron as a recognized material for ship construction is often given as dating from 1818, when the lighter " Vulcan " was built on the*

Monkland canal, near Glasgow.

Among the early objections were: (1) from its weight iron could not be expected to float, and was therefore unsuitable for the construction of a floating body; (2) when a ship constructed of this material grounded and was exposed to bumping on a shore, the bottom would be easily perforated; (3) the bottom could not be preserved from fouling by weeds and barnacles; and (4) the iron affected the compass, making it untrustworthy, if not useless. Gradually, however, the material made its way, and the objections to it proved to be for the most part untenable. Objection (1), although often repeated, was proved to involve a fallacy. With regard to objection (2) it was found that iron ships might ground and be subjected to a great deal of bumping and rough usage without being destroyed, and that, on the whole, they were better off in this respect than wooden ships. On more than one occasion when iron and wooden ships were stranded together by the same gale and in approximately the same circum- stances, the iron ships were got off, and, apart from local injury, were found to be little the worse for the grounding, while the wooden ships were either totally wrecked, or, if got off, were strained to such an extent as to be beyond repair. The power of resistance of iron ships to the strains produced by grounding received, in 1846-1847, a remarkable confirmation in connexion with the grounding of the " Great Britain," the first large screw steamer built of iron. This ship had been initiated by, and built under the supervision of, Mr I. K. Brunei, who had bestowed much attention upon the details of her construction. In 1846 she ran ashore in Dundrum Bay, in Ireland, and settled on two detached rocks; and although she remained aground for eleven months, including a whole winter, she was subsequently got off and repaired, and afterwards did good service. As regards (3), the fouling of the bottom, this evil, although not preventable.

can be lessened materially by frequent cleaning and repainting, provided, of course, that docks are available. The fourth objection, the effect of iron on the compass, was very serious. After experimenting with the " Rainbow " at Deptford and the " Ironsides " at Liverpool, Sir G. B. Airy in 1839 read a paper on the subject before the Royal Society, and the rules which he gave for the

correction of the error caused by the iron at once became the guide for future practice. Besides -the above, a further objection was raised which applied only to warships, namely, the nature of the damage which would be done to an iron ship by the enemy's shot: this also was found to be less serious, when proper appliances were supplied, than the damage done in the same circumstances to a wooden ship. Thus during the Chinese War in 1842 the " Nemesis," an iron vessel, was able to repair her damage from shot in twenty-four hours at the scene of the fight, while some wooden ships had to go to Bombay, the nearest port at which repairs could be carried out.

Steel, as a material for shipbuilding, was introduced under modern conditions of manufacture during the years 1870-1875. It is a homogeneous metal, stronger than iron, and of t ? iro .~ a more uniform and more trustworthy character. of steel. Its quality is to a considerable extent independent of the skill of those employed in its manufacture, whereas iron is produced by a laborious and unhealthy process, and is largely dependent for its quality on the skill of the workmen. Among the advantages which experience has proved iron and steel to possess over wood for the purposes of ship construction are: (1) the structure of the ship has less weight; (2) it has greater durability; (3) the requisite general and local strengths are much more easily obtained.

The importance of the first of these advantages can scarcely be overstated. The primary object of a particular ship is to carry cargo or passengers, or both, from place to place, at a given speed (in the case of a warship, the armament, ammunition, armour, &c, constitute the weight to be carried) ; and since at the maximum draught at which the vessel can properly and safely proceed on her passage the total weight of vessel, cargo, &c, complete, must be a definite quantity, namely, the weight of the water displaced by the ship, it follows that the less the weight required for the structure of the ship, the greater is that available for the cargo, &c.

As to durability, in wooden ships the chief source of deterioration is dry-rot, in iron or steel ships the wasting of the surfaces, especially of such portions of the outer surfaces of the bottom plating as are frequently left bare of paint and exposed to the sea, and of the inner surfaces of the bottom in machinery spaces, &c. If dry-rot can be prevented, the life of the wooden ship will be lengthened ; so also will the life of the iron or steel ship if the surfaces can be kept covered with paint, to prevent the corrosive action of air and water. With both wood and iron or steel ships, if the parts which have become deterior- ated can be removed and replaced, this is usually worth

doing when the deterioration is only local. At the end of the 1 8th century the preservation of wood was not so well understood as it is at the present day, and teak, one of the most durable of woods, was, in Great Britain at least, little known. The ships for the Royal Navy as then constructed were only expected to be available for service some fifteen or twenty years. The ships built for the East India Company made, on an average, four voyages, which occupied eight years. This at one time was considered the vessel's life, so far as the Company's service was concerned; but subsequently, if on examination at the expiration of that time they appeared worth repairing, this was done, and they were allowed to make two more voyages. It was unusual for one of these ships to make more than six voyages; after this they were sold or broken up.

In certain cases, however, ships lasted a considerable length of time; a number of vessels built in the 17th century continued in the service of the Royal Navy until the middle of the 1 8th century, though with a reduced number of guns, and specimens of the old wooden battleships which served in the fleet in the earlier part of the last century are still to be found in the naval and other ports as training vessels, hospital ships, &c. The best-known example is Nelson's "Victory" (fig. i.PlateXIII.). Laid down in 1759, she had been afloat 40 years before she took part in the battle of Trafalgar, and to-day flies the flag of the commander-in-chief at Portsmouth. Of small wooden merchant vessels there are instances of the attainment of very remarkable ages. Lloyd's Register for 1909-1910 shows one sailing vessel, the "Olivia " of 94 tons, as having been built as early as in 18 19, two vessels built in the 'twenties, and twelve built between 1830 and 1840. The collier brig " Brotherly Love," of South Shields, was over one hundred years old when she was broken up; and the schooner " Polly " built in 1805, was still sailing in 1902; as also was the brig " Hval&sken," built at Calmar in Sweden in 1801. The

dimensions of the last vessel are. length, 88 ft. 8 in.; breadth, 21 ft. 2 in.; depth of hold, 14 ft. 7 in.; and her gross tonnage, 211. The oldest vessel afloat in 19 10 was said to be the Danish sloop "Constance" — a small wooden sailing vessel built in 1723 and still employed in the coasting trade of Denmark. This vessel is 52 ft. 6 in. long, 14 ft. 8 in. beam, 6 ft. 8 in. depth in hold and of 35 tons gross.

In the cases of these very old wooden vessels it should be remembered that many portions of the original structures have been replaced by continual repairs. We have less experience concerning the life of iron and steel ships when taken care of , and in most

instances ships have been condemned and broken up only because they were obsolete ; but after twenty or even forty years' service, those parts which by accident or intention had remained properly covered and protected were found very little the worse for wear. Thus the inner surface of the outside plating of such vessels, coated with cement, have been found to be in as good condition as when the ships were first built. The hulls of many of the early iron vessels still afloat are known to be in excellent condition. The " Himalaya," an iron vessel of 3453 tons and 700 h.p., 6 guns, length 340 ft. 5 in., breadth 46 ft. 2 in., depth 24 ft., built by Mare of Blackwall in 1853 for the P. & O. Steam Packet Co., and purchased by the Admiralty, was actively employed, chiefly as a troop-ship, until 1896, when she was converted into a coal depot, it being found that her plating and framing were almost as good as new. Known as " C. 60," she seemed likely in 1910 to survive for many years in her new service. The " Warrior " — the first British iron battleship, built in 1861, was converted into a floating workshop forty years later at Portsmouth, where in 1910 she was known as " Vernon III." The hull and framing of the vessel were then practically as sound as when first put together. Experi- ence up to 1910 with vessels built of mild steel indicates that this is more liable to surface corrosion than iron, especially where exposed to the action of bilge water and coal ashes in boiler rooms. Some owners on this account require the plating for the tank tops under the boilers to be of iron in vessels otherwise built of mild steel, al- though the iron is inferior in strength and costs more than the mild steel.

That general and local strength are more easily obtained in an iron or steel ship than in a wooden one follows partly from the fact that the weight required for the structure is less in the former than in the latter, and also from the fact that iron and steel are more suitable materials for the purpose. They can be obtained in almost any desired shape, the parts can be readily united to one another with comparatively little loss of strength, and great local strength can be provided in very little space.

For some purposes, and in some markets, wood is still in favour. In scientific expeditions to the Polar regions, it is of the highest import- ance to avoid any disturbance of the compass, and this can be ensured by constructing the vessel of wood, with metal fastenings. The " Fram," built in 1892 for Nansen's Arctic expedition, was of wood, her outside planking, in three thicknesses, amounting in the aggregate to from 24 in. up to 28 in.; she was 117 ft. long, rigged as a three- masted schooner, and provided with auxiliary machinery working a screw propeller. The " America," fitted out for the Ziegler

expedi- tion to the North Pole, was an old Dundee whaler (the ‘ ‘ Esquimaux “), and was reported to be still a ” stout ” ship with timbers as sound as on the day they were put in thirty-six years before. She is 157 ft. long, 294 ft. beam, 19ˆ ft. deep, net tonnage 466; her engines have a nominal horse-power of 100, and she has a lifting screw. In 1901 the ” Discovery,” a wooden vessel, 172 ft. in length, was built at Dundee for Antarctic exploration, under Captain Robert Scott, R.N., 1 and a wooden vessel for similar service was constructed in Germany, and in 1910 the ” Terra Nova ” (Plate I., fig. 2) , a wooden Dundee whaler, 187 ft. long, barque-rigged and fitted with auxiliary steam power, which had already seen service in the Far South, carried to the Antarctic regions an expedition also led by Captain Scott. Some wooden sailing vessels are still built in the United States and employed in the coasting and other trades. One of these, the ” Wyoming,” the largest wooden sailing vessel ever built, was launched in December 1909 at Bath. She was a six-masted schooner 350 ft. long, 50 ft. wide and 30 ft. deep. Wood is also in favour for most of the large and palatial river steamers of the Western states of America.

Some progress had been made in the introduction of steam propulsion before the end of the 18th century, but steam the advance became more rapid in the 19th. In propulsion. the early steam vessels paddle-wheels only were used for propulsion.

In 1801-1802 the ” Charlotte Dundas,” one of the earliest steam vessels, was constructed by Symington in Scotland. She proved her capability for towing purposes on the Forth and Clyde canal. Fulton now made his experiments in France, and after visiting Scotland and witnessing the success of the ” Charlotte Dundas,” constructed the “Clermont” on the Hudson river in America in 1807. The engines for this vessel were obtained from Boulton& Watt,

1 A very complete account of this vessel was given by her designer, Mr W. E. Smith, C.B., in the Transactions of the Institution of Naval Architects (1905).

STEAMSHIPS]

SHIP

869

of England. She ran as a passenger boat between New York and Albany, and at the end of her second season proved too small tor the

crowd that thronged to take passage in her. In 1809 the " Phoenix " made the passage from Hoboken, in New Jersey, to Philadelphia, and was thus the first steamer to make a sea voyage. In 1812 Bell began running his steamer " Comet," with passengers, between Glasgow, Greenock and Helensburgh : she was 42 ft. long, 11 ft. broad, 5! ft. deep, and her engine had one cylinder 11 in. in diameter, with a 16-in. stroke. Owing to the success achieved by these and other vessels in America and Great Britain, steamers soon began to make their appearance on many of the principal rivers of the world. Early in 1814 there were five steamboats on the Thames, and the steamboat " Margery," built on the Clyde, was brought through the Forth and Clyde canal and round by the east coast to the Thames. In the same year a writer in the Gentleman's Magazine was able to say: " Most of the principal rivers in North America are navigated by steamboats; one of them passes 2000 m. on the great river Mississippi in twenty-one days, at the rate of 5 m. an hour against the descending current." In 1816 the first steam passenger- boat ran across the English Channel from Brighton to Havre, and a line of steamers was started to run between New York and New London. All of these vessels were built of wood; but in 1820 the first iron steamship, the " Aaron Manby," was constructed and employed in a direct service between London and Paris. In 1822 a return was made to the House of Commons showing the times occupied by steamers as compared with sailing vessels on some thirty coasting routes; the average speed given for steamers in the best of these was from eight to nine knots, while the average time taken varied from one-half to one-sixth (or even less) of the time taken by the sailing vessels.

Steam vessels were employed at a very early date upon the mail services, for besides being very much quicker than the sailing vessels, they were practically independent of the direction of the wind, and to a considerable extent of the weather; consequently the regularity of their Dassages contrasted very favourably with the irregular times kept by the sailing vessels. The mail service across the Irish Channel, between Holyhead and Dublin, was especially uncertain in the days of the sailing packets, frequently occupying three or four days, and occasionally as much as seven and nine days. All this was altered when in 1821 the steamers " Royal Sovereign " and " Meteor " were placed on the service. The advantages were so apparent that steam mail packets between Great Britain and the Continent, and on many other services, were soon established. The mail boats had been for many years owned by the crown, but in 1833 the carrying of the mails to and from the Isle of Man, and between England and Holland and Hamburg, was entrusted to private companies. Marked im-

provement in the services, and especially in the boats employed, resulted from the competition to secure the distinction and other advantages of carrying His Majesty's mails. An intermediate stage followed, extending over a comparatively short period, during which the crown still held many of the mail boats, while in a considerable number of cases the mail services were let to private companies. After this the British government abandoned altogether the policy of being the owners of the boats, and the mail services have since been competed for by private companies.

The " Savannah " was the first steamship to cross the Atlantic. She ran from Savannah to Liverpool in 1819 in twenty-five days, under steam, however, only for a portion of the time. She was built at New York as a sailing ship, but before launching was fitted with steam power, the paddle-wheels being arranged to be removed and placed on deck when not required. She was 130 ft. long, 26 ft. broad, 165 ft. deep and of about 380 tons. The success of the " Enterprise," of 470 tons, which made the voyage from London to Calcutta by the Cape of Good Hope in 1825 in 103 sailing days, is noteworthy. The distance is 11,450 nautical miles, and the vessel was under steam for 64 days and under sail for 39 days. The steamer afterwards (1829-1830; made the trip between Bombay and Suez in 54 days, in further- ance of a scheme to reach the former place from London by the Red Sea route. The year 1838 witnessed the successful transatlantic voyages of the steamers " Sirius " and " Great Western." The latter vessel, built under the advice of I. K. Brunei, the engineer of the Great Western Railway Company, was the first steamer actually constructed for the transatlantic service. She was built of wood, her dimensions being — length 212 ft., breadth 35! ft., depth 23! ft. and tonnage 1340 B.O.M.; and her total displacement on a draught of 16 ft. 8 in. was 2300 tons. Although not originally built for the service, the " Sirius " was subsequently placed on it at the recom- mendation of Mr M'Gregor Laird of Birkenhead. This vessel also was built of wood, and was 178 ft. long, 25ˆ ft. broad, i8j ft. deep and her tonnage was 703. Mr Laird's arguments in favour of placing the vessel on the transatlantic service throw light on the steaming capabilities of vessels of that day. He pointed to the steamers " Dundee " and " Perth " making 11 m. per hour, " in all weathers, winter and summer, fair and foul "; and to the other vessels making from 10 to 10J m. per hour. He based his estimate for the coal re- quired on the voyage on a speed of 10 m. per hour and a coal consump- tion of 30 tons per day, which gave 525 tons for the whole voyage. Finally, he allowed 800 tons, corresponding to the difference of the displacement at 15 ft. load draught and at 11 ft.

light draught, so that he had a margin of 275 tons for contingencies.

All the vessels just named were propelled by paddle-wheels. The screw propeller had been advocated as a means of propulsion by many inventors in England, France and America during the latter half of the 18th and the early part of the 19th century; a number of experiments had been made, but these had not been brought to a successful issue, as no pulsion. suitable steam engine was available for driving the propeller. Benjamin Franklin, in 1775, drew attention to the in- efficiency of side paddle wheels as a means of propulsion, and proposed as an alternative to set the steam engine to pump water in at the bow and force it out at the stern, the water passing along a trunk. In 1782 a boat 80 ft. long, fitted with this means of propulsion by James Rumsey, was driven at 4 m. an hour on the river Potomac, and a number of other vessels similarly fitted followed. In 1839 Dr Ruthven took out a patent for this method of propulsion in which the piston pump was replaced by a centrifugal pump; and in 1865 the " Nautilus," a vessel of this type, so impressed the British Admiralty of the day that an armoured gunboat — the " Waterwitch " — was provided with this system of propulsion. She was built of iron, 162 ft. long, 32 ft. broad, 13 ft. 9 in. deep, was double-ended and fitted with bow and stern rudders, but was otherwise similar to the armoured gunboat " Viper " built at the same time and fitted with a screw propeller. Many trials were carried out with the " Waterwitch " and " Viper," but the system adopted in the former was not repeated because of the great advances made in connexion with the screw propeller.

Many useful experiments appear to have been carried out by Colonel John Stevens in the United States in the early years of the 19th century, but, although some beautiful models of propellers made by him still remain, the pt ˆ p ˆˆ[system was not generally adopted until its com- mercial possibilities were more successfully demonstrated by Captain John Ericsson — formerly an officer in the Swedish army — and F. P. Smith of England. Smith took out his patent for the propulsion of ships by means of a screw fitted in a recess formed in the deadwood, in May 1836, and in July of the same year Ericsson, then practising as a civil engineer in London, took out his patent. Small vessels were built and fitted by both inventors and both were tested in the Thames. In 1838 Captain Robert F. Stockton, on behalf of the U.S. Navy, ordered two iron boats of Messrs Lairds of Birkenhead, to be supplied with steam engines and screw propellers of Ericsson's design. The first boat was named the " Robert F. Stockton," and arrived at New York under sail early in 1839, with her machinery on board. The machinery was fitted in her at

Bordentown, and under the name of " New Jersey " the boat afterwards served as a tow boat on the river Delaware. She was 70 ft. long, 10 ft. beam and 6 ft. 9 in. draught, and could steam about 10 m. an hour. Ericsson had the satisfaction of seeing his plans very largely adopted in the American Navy, but the mercantile marine adhered with great pertinacity to the paddle-wheel.

Fincham, writing in 1851, says that in England engineers were reluctant to admit the success of the screw propeller, and adds: " A striking instance of prevailing disinclination to the screw propeller was shown on the issue of a new edition of the Encyclopaedia Britannica, in which the article on steam, naviga- tion contained no notice whatever of the subject."

Smith, however, persevered, and with the assistance of some influential people of the day — notably Messrs Rennie & Co.— formed the Ship Propeller Company, and in 1838 built the " Archimedes," a vessel of 237 tons burthen, to illustrate the value of the plan. The length of the vessel was 106 ft. 8 in., breadth 21 ft. 10 in., depth in hold 13 ft., draught of water 9 ft. 6 in., h.p. 80 nominal, but only 66 could be developed. A speed of about 7I knots could usually be maintained, but on one run of 30 m. under very favourable circumstances a speed of 10-9 m. was reported. In 1840 she was placed at the disposal of the Admiralty for experiment, and the trials were favourably reported on. She afterwards passed into the hands of Brunei, who was so satisfied with the results of further trials that he modified the design of the " Great Britain " steamship then

in hand (1843), and fitted her with a screw propeller instead of paddle-wheels as originally intended. The success of this and other vessels was sufficient to largely influence public opinion in favour of the propeller, and the Admiralty took the important step of building the " Rattler," a vessel of 888 tons and 200 H.P., to test the system. She was practically a repeat of the " Alecto," as far as her hull and the power of her machinery were concerned, but she was propelled by a screw propeller, whereas the " Alecto " was propelled by paddle-wheels. These vessels were tested together at sea in March 1845, when the " Rattler " proved the faster vessel; but the great test took

place on Thursday, 3rd April following, when the two vessels were secured stern to stern, and it was found that with the engines of both ships working at full power the " Rattler " towed the " Alecto " astern at a speed of 2| knots. 1 In a few years the screw almost entirely superseded the paddle-wheel for war vessels, and in 1854, during the war with Russia, Great Britain possessed a screw steam fleet, including all classes of ships, built of wood.

The performances of the Great Western and other vessels had demonstrated that ships could traverse the oceans of the world by steam power alone, but great advance had to be made in the marine engine before the ordinary trade could be carried on by its means with economy. In the early marine engines only one cylinder was provided, and various w / "Ts'j' means were employed for transmitting the power to machinery, the paddle shaft; later came the oscillating cylinder engine and the diagonal engine, the latter being the type of paddle engine now most frequently adopted in Great Britain. With the introduction of the screw propeller the arrangements became much modified. At first the engines were run at com- paratively low speeds, as in paddle-boats, gearing being supplied to give the screw shaft the number of revolutions required, but direct-acting two-cylinder engines gradually replaced the geared engines. The compound engine was first adapted successfully to marine work by John Elder in 1854, and in time direct- acting vertical engines, with one high and one low pressure cylinder, became the common type for all ships. The boiler pressure, moreover, in 1854, had been raised to 42 lb per sq. in. The further change, accompanying still higher pressures of steam, from compound to triple-expansion engines was, like many other changes, foreseen and in some measure adopted by various workers at about the same time, but the first successful applica- tion of the principle was due to Dr A. C. Kirk. In 1874 he fitted a three-crank triple-expansion engine in the Propontis. The boiler used proved a failure, but in 1882 he fitted a similar set of engines in the Aberdeen, with a boiler pressure of 125 lb, and the result was entirely successful.

Continuous improvements have enabled engineers to produce machinery of less and less weight for the same power, and at the same time to reduce the spaces required for its accommoda- tion, the vibration due to the working of the engines, and the consumption of fuel per horse power. For engines of high power, quadruple expansion has sometimes been adopted, while scientific methods of balancing have been employed, improved qualities of steel and bronze have been introduced, the rate of revolution has been increased, and forced lubrication fitted. In the boilers higher steam

pressures have been used, superheating in some cases being resorted to; the rate of com- bustion has been accelerated by supplying air under pressure in the stokehold or in the furnaces, and in some cases by placing fans in the exhaust to draw the air and products of combustion more rapidly through the fires; the former being known as forced draught and the latter as induced draught. In the Navy, with the view of saving weight, water-tube boilers have been adopted, but boilers of this type have not yet been generally fitted in the mercantile marine. Steam pressures now in common use vary from 100 to 180 lb per sq. in. in cargo «ships; from 140 to 220 ft in passenger ships, including the large Atlantic liners; from 210 to 300 lb in large warships where water-tube boilers are used; while in destroyers and other classes of warships in

1 The original propeller used by the " Rattler " is now to be seen in the Victoria and Albert Museum.

which small tube water-tube boilers are used it varies from 180 to 250 ft) per sq. in.

A century ago the reciprocating steam engine was slowly making its way as a means of propulsion as an auxiliary to, or as a substitute for sail power — the steam being obtained by burning wood or coal. In 1815 nine small steam vessels, having an aggregate tonnage of 786 tons, were built and registered in the United Kingdom; in 1825 24 steam vessels were built, having an aggregate of 3003 tons; in 1835 86 vessels were built, having an aggregate of 10,924 tons. In 1910 the reciprocating steam engine, after reaching a very high degree of perfection and universal adoption, was being largely replaced by the turbine, coal was being replaced to a considerable extent by oil as a fuel for raising steam, and steam itself was being chal- lenged as a motive agent by the development of the internal combustion engine.

III. Statistics

For some years before 1870 the total tonnage of sailing ships built each year in the United Kingdom had been about equal to that of steam ships, but then a great change took place; n ecrea 541 sailing vessels, amounting to 123,910 tons, were . .„ added to the register of the United Kingdom, while 433 "tnnnaˆ steam ships, amounting to 364,860 tons, were added; the "

steam tonnage thus added being nearly three times that of sailing vessels. A uniform rate of increase of production of steam vessels

was on the whole maintained after 1870, but, as will be seen by referring to Table I. and fig. 3, considerable fluctuations have occurred, the falling off in steam tonnage being simultaneous with increases of sailing tonnage and vice versa down to 1895. The dotted lines on fig. 3 show approximately the average output for 50 years of sailing and steam tonnage separately and combined. Roughly speaking, it may be said that from i860 to 1895 the output of sailing tonnage fell from about 200,000 tons per annum to 100,000 tons; during the later 'nineties the falling off was more rapid, and between 1900 and 1910 the output varied between 15,000 and 30,000 tons.

The average tonnage of the sailing vessels built in the United Kingdom in i860 was 206 tons; this increased with a fair degree of regularity to 532 tons in 1890, 749 tons in 1891 Average and 963 tons in 1892, after which a rapid decrease took !z l 11 place, and by 1898 the average size had fallen to 75 tons; y= SS ejl there were fluctuations after this date, but the average never rose above 163 tons; and these vessels are practically restricted to the coasting trade and pleasure purposes.

Although the building of large sailing vessels of wood and steel has almost ceased in the United Kingdom, the sizes of the largest of such vessels built abroad have continued to increase. Under the influence of the shipbuilding bounties granted in France between 1895 and 1902 something like 150 sailing vessels of from 2000 to 3500 tons each were built, but few since. In Germany and in America a few large sailing vessels continue to be built.

Lloyd's Register for 1841 ^"ves a table of " the Steam Vessels belonging to England, Scotland and Ireland in the years 1814 to 1839," which shows that in 1839 there were 720 vessels rjrowth of a total tonnage of 79,240 tons owned in the United f s t eam Kingdom. Between 1839 and i860 considerable numbers tonaaiie of steam ships were built for various services, and the pro- ~'

duction from i860 is shown by fig. 3 and Table I. The tonnage added to the Register in i860 amounted to 93,590 tons, rising over . four years to 293,140 tons in 1865; after a gradual decline extending over three years to 100,000 tons it again rose till 1872, when nearly 500,000 tons were added. In 1876 it had fallen to about 200,000 tons; then came the great rise extending to 1883, when it reached a maximum of 885,495 tons. A rapid decrease followed, and in 1886 it had fallen practically to what it had been ten years before. In another three years the figure was again what it had been in 1883; and for a period of seventeen years, with much smaller fluctuations

than previously, great increases were maintained. In 1906 a maximum of 1,428,793 tons was reached, when another rapid fall occurred ■ — over two years — the minimum reached being 600,837 tons in 1908.

The fluctuations in output, shown by fig. 3, synchronize approximately with the improvements and depressions in trade.

The average tonnage of British steam vessels rose slowly from 80 tons in 1815 to 102 tons in 1830, and to 473 tons in i860, reaching a maximum of 1442 tons in 1882. During the next four Averase years it fell gradually to 896 tons, rising again to 1515 s / zeo * tons in 1890, and the average tonnage built since 1 890 has steam remained, with a certain amount of fluctuation, nearly ships. 1500 tons. These figures may be taken as roughly repre- senting the average tonnage of the ships produced throughout the world ; but as in these averages large numbers of comparatively small vessels are included, the vast increase in the numbers of large-sized vessels which have been built, especially during recent years, is not adequately represented. Of the vessels built in 1890 only I % exceeded 8000 tons in displacement, whereas the vessels of over 8000

Table I.— Showing the Number, Tonnage (Gross and Average), and Description of all Vessels {excluding Warships) built in and added to the Register of the United Kingdom during each year enumerated.

Year.

Mode

Wood and Composite.

Iron.

Steel.

Totals.

Average

Gross

Tonnage.

of Propulsion.

No.

Gross Tonnage. 1

No.

Gross Tonnage.

No.

Gross Tonnage.

1

No.

Gross Tonnage.

i860 j

Sail . . Steam .

786 49

I54.!3°

7,050

32 149

14,290. 86,540

818 198

168,420 93.590

206 473

1865 j

Sail . . Steam .

806 38

160,430 5.780

116

344

88,970 287,360

922

382

249,400 293,140

270 767

1870 |

Sail . . Steam .

478 51

72,970 7,290

63

382

50,940 357,570

541 433

123,910 364,860

229

843

1S75 j

Sail . . Steam .

373 66

46,060 8,740

193 291

206,110 281,390

566

357

252,170 290,130

446 813

1880 |

Sail . Steam .

273 20

18,159 1.779

39 362

40,015 447,389

4 26

1,671 36,493

316

408

59,845 485,661

189 1190

*1885 *

Sail . . Steam .

266

37

17,841 2,751

144 177

160,034 148,508

27 122

30,569 154,249

437 336

208,444 305.508

477 909

5890 -J

Sail . . Steam .

142 26

7.704 1.326

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no

5,9″ 40,144

59 432

96,374 817,010

207 568

109,989 858,480

532 1515

1891)

Sail . Steam .

156

25

8,541 1,212

3 167

1.544 31,381

93

388

178,593 730,051

252 580

188,678 762,644

749 1315

1892)

1893)

Sail . . Steam

151 19

8,372 1,026

6

86

5,121 18,937

128 365

260,874 660,847

285 470

274.367 680,810

963 1449

Sail . . Steam

154

27

7,980

I.55I

4 64

418 12,458

66 328

113,097 622,099

224 419

i2i,495

636,108

542 1 5 1 8

1S94)

Sail . Steam

155 26

7,570 1,183

3 65

207 12,400

67 389

83,167 751,668

225 480

90,944 765,251

404 1594

1895 j

Sail . Steam

150 35

7,529 1.579

9 66

782 9,879

32 379

4i,3i3

736,412

191

480

49,624

747,888

260 1558

*1896 *

Sail . Steam

161 17

7.5‘9 591

5 79

792 “,593

36

398

37,709 750,106

202 494

46,020 762,290

228 1543

1897)

Sail . Steam

183 33

8,317 1,581

■2

63

232 9,974

34 366

28,481 658,646

219

462

37,030 670,201

169 1451

*1898 *

Sail Steam

196 20

8,813 765

6 80

798 13,654

40 546

8,456 996,814

242 646

18,067 1,011,233

75 1565

1899 |

*1900 *

1901 |

Sail . Steam

165 29

7.342 1.497

2

64

182 12,184

60 534

U.757 i,i52,999

227 627

19,281 1,166,680

85 1861

Sail . Steam

•59

64

8,718 3.809

5 86

420 16,375

46 476

8,598 1,102,890

210 626

17,736 1,123,074

84 1794

Sail . Steam

146 83

7,826 5.479

2 14

174 2,474

54 469

22,118 1,115,227

202 566

30,118 1,123,180

149 1984

1902 |

Sail . Steam

142 71

7,479 4,098

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5',870

63 476

25,985 1,109,511

205 579

33,464 1,119,479

163 1933

1903 |

Sail . Steam

139

68

7,637 4,034

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537

60 538

15,077 943,333

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22,714 947,904

114

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Sail . Steam

161

52

8,626 2,961

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15,166 1,016 324

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23,792 1,020,112

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Sail . Steam

130

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7,962 1,840

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36 567

7125 1,204,293

166 614

15,087 1,206,280

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Sail . Steam

104

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330 79

42 660

8,810 1,422,472

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14,871 1,428,793

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Sail . Steam

121 196

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15,069

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8,228 1,182,566

166 825

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1908 }

Sail . Steam

108 142

4,931 9,056

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18,468 591,298

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Sail . Steam

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1 1 ,020 752,424

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14,382 756,304

121 1592

The above table is based upon information supplied to Lloyd's Registry by the Registrar-General of Shipping.

*1 As no actual returns are available for the gross tonnages for the years from i860 to 1879 inclusive (only net tonnages having been recorded), the gross for these years are only approximate, and are based on the relation «f »tok *r> -»et for the years 1883 an d 1900*

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tons built in 1900 made up 12 % of the whole tonnage. Jn 1890 there were no vessels built whose displacement exceeded 9000 tons; in 1900 such vessels constituted I if % of the whole, and about f % of the whole were over 16,000 tons. The year 1908 was notable for the number of large vessels launched; 10 British and 4 German

Fig. 3. — Gross tonnage of all sailing and steam merchant vessels built in and added to the register of the United Kingdom during each year from i860 to 1910. The dotted lines may be taken as representing the average production from year to year.

vessels were launched whose tonnage averaged about 15,000 tons each, their tons displacement being about 50 % greater. In 1910 there were afloat more than 80 vessels exceeding 12,000 tons, and having an average tonnage of more than 15,500 tons each (see Table XI. page 885). Six of these veseels were over 20,000 tons and had an average gross tonnage of 25,640 tons each. The tonnage of the largest vessels has almost continuously increased, and vessels with a tonnage of 45,000 tons are now being built, the fully loaded displacement of the vessels being more than 50,000 tons. Fig. 4 shows the tonnage of wood, composite, iron and steel vessels added

to the Register year by year since i860, and figures for a number of the years are given in Table I. The tonnage of wood and composite vessels added in i860

Denmark each with about 1 -8 %. The leading particulars as to the distribution of ownership of the merchant shipping throughout the world for 1873, 1890, 1900 and 1910 respectively are represented graphically in the block diagrams given in fig. 5, which have been constructed from particulars given in Table II. and similar tables for the other years named. The total tonnage owned in these years, excluding vessels under 100 tons and wood vessels on the Great Lakes of America, is represented by squares drawn to scale, in duplicate, and divided up amongst the countries owning shipping in proportion to their ownership. Parts of each holding are shaded in the squares on the right so as to show what portion is sailing tonnage and what steam tonnage, and in the squares on the left so as to show the distribution of the total as regards materials of construction in each country. The total tonnage owned is given for each year named, and the percentages owned by various countries are tabulated between the pairs of squares.

The tonnage of the shipping of the world has advanced at an increasing rate for many years; the character of this advance may be gathered from thedata given in fig. 5. In 1873 Great Britain and her colonies owned 43-25%, and in 1890 52-35%; but although the advance in the shipping of Great Britain and her colonies has continued approxi- mately at the same uniform rate, such has been the increasing rate of the advance of the world's shipping that the percentage owned by the British Empire fell to 49-1% in 1900 and to 45-36 in 1910. This increasing rate of advance of the tonnage of the world's shipping is shown by Table III. The remarkable rate at which the shipping of the United States and Germany has advanced will also be seen.

Table III. — Kale of Increase of the World's Shipping.

Tonnage built of

wood, Iron

was 161,180, increasing to 166,210 tons in 1865 and . , , then falling away at a fairly uniform rate until in 1880 anas.ee. q ˆ 19,938 ton's were reported, and since that date practically no increase in output of this class of tonnage has taken place. The tonnage of iron ships produced in i860 was about 63 % of that of

wood ships; while wood shipbuilding fell off, iron shipbuilding increased, and in 1870 the tonnage of iron ships was more than five times that of wood and composite ships. The out- put of iron ships increased until 1883, when a maximum of 856,990 tons was reached. Steel had now come into use, and iron shipbuild- ing fell away rapidly, amounting only to 50,579 tons in 1888; thi= figure fell to 10,679 tons in 1895, and since then very few vessels have been built of iron. Steel, which had been used in shipbuilding to a limited extent for special purposes for some eight years, came into use for the hulls of merchant ships in the later 'seventies. In 1880 the tonnage built— 38,164 tons— was 4J % of that of iron ships, by 1885 the ratio was 60 %, and in 1890 the tonnage of steel ships, 913,484 tons, was just 20 times that of iron ships. From that date the statistics of steel shipbuilding are practically those of steam vessels above given.

From Table II., which gives the distribution of ownership of existing merchant vessels and other vessels, excepting warships, it appears that the total tonnage of the world's shipping, excluding vessels under 100 tons and the wood vessels on the Great Lakes of America, is about 42 millions. Of this total, rather less than one-ninth is in sailing vessels, and the remainder in steam vessels. Taking the number of ships instead of their aggregate tonnage, the sailing vessels are 27 % of the whole. Out of the 42 million tons, Great Britain and her colonies own about 19 millions, or 45! % of the whole, 18 millions being steamers and I million sailing vessels.

The

world's shipping: tonnage and distri- bution of.

Year.

i873-

1890.

1900.

1910.

World's tonnage

(tons)

17,545,563

22,151,651

29,043,728

41,914,765

World's tonnage

!

taking 1873 as

100 ....

100

126

165

240

Average rate of

increase per

annum from 1 873

i-5 %

2-4 %

3-8 %

Proportion owned

by Britain .

43-25 %

52-35 %

49-1 %

45-36 %

Proportion owned

by United

States

H-27 %

8-23 %

9-47 %

12-06 %

Proportion owned

by Germany

5-88 %

7-o8 %

9-13 %

10-34 %

World's output of ships.

Fig. 4. — Gross tonnage of all wood, composite, iron and steel merchant vessels built in and added to the register of the United Kingdom during each year from i860 to 1910.

Next to Great Britain, the largest shipowning country in the world is the United States of America, with 5 million tons of shipping, 12% of the total. Then come in order Germany, with nearly 4ˆ millions, io£ % of the totalj Norway, with 4-8%; France, with

4-5%; Italy, with 3-2%: and Russia with 2-4 to 2

Japan, with 2-7%; Holland, Sweden 1%; and Austria-Hungary, Spain and

Table IV. gives the output, for the year 1909, of merchant and other vessels throughout the world, excluding warships, all ships of 'ess than 100 tons and the wood vessels of the Great Lakes of North America. The block diagrams in fig. 6 are constructed in the same way as the diagrams jn fig. 5, and are arranged to show the output of the principal ship- building countries of the world in 1900 and in 1909, the reference square for scale representing one-tenth the

amount of that of fig._ 5. The total output for the year 1900 was 2,343,854 tons, of which 1,509,837 tons, or 65 7 of the whole, was built in the United Kingdom; 303,339 tons or 13% was built by the United States of America; 9-4% by Germany and 5-4% by France. In 1909 the total output was 1,551,532 tons, of which 971,113 tons or 63-5% was built in the United Kingdom; 178,402 or 11-5% was built in the United States of America; Germany built 8-i%; France only 3%; the output of Holland and Belgium has risen from L„»_ 1-38% in 1900 to 4-34% in I9°9; and Japan appears with 2-98 % instead of about -6 % in 1900.

American Shipping. — Under the Registration Laws of the United States vessels may be (a) registered; {b) enrolled ; or © licensed. The proportion of vessels coming under these three headings as given by the United States Commissioner' of Navigation, 30th June 1909, is shown in Table V.

It will be seen that the Registered Tonnage _ includes only vessels engaged in the Foreign Trade and in Whale Fisheries, which amount in the total to 1633 vessels of 887,505 tons and include the smallest vessels crossing the St Lawrence equally with ocean liners. Two hundred and twenty-seven of the registered vessels are less than 100 tons, and only nine are over 10,000 tons, namely the " Minnesota,"" Manchuria," " Mongolia," "Siberia 'and on the Pacific, and the " St Louis " and " St Paul," New York " and " Philadelphia " on the Atlantic routes. The Enrolled Tonnage includes vessels engaged in the coasting trade and local fisheries which are over 20 tons; and the Licensed Tonnage vessels similarly engaged, but of a size not exceeding 20 tons. The whole of the tonnage included is officiallv described as tonnage

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F IG – 5- — Distribution of ownership of merchant shipping throughout the world. The tonnages are gross steam and net sailing as given in Table II. for 1910. The tonnages for 1 900 and 1 890 are prepared on the same basis, while those for 1873 are gross steam and gross sailing.

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Table V. — Showing the Tonnage of the United States Shipping. y>th June 1909.

[STATISTICS

Class.

Sailing.

Steam.

Canal.

Barge.

Total.

No.

Tons.

No.

Tons.

No.

Tons.

No.

Tons.

No.

Tons.

(a) Registered: —

Foreign trade .... Whale fisheries ....

445 25

225,376 5,682

490 8.

575,226 3,300

665

77,921

1,600 33

878,523 8,982

Total ....

(b) Enrolled:—

Coasting trade .... Cod and mackerel fisheries

470

231,058

498

578,526

665

77,921

1,633

887,505

3799

34i

1,391,965 33,232

6,327 91

4,099,087 7,979

745

80,951

2769

767,839

13,640

432

6,339,842 41,211

Total . . . ■ .

(c) Licensed : —

Coasting trade .... Cod and mackerel fisheries

4140

1,425,197

6,418

4,107,066

745

80,951

2769

767,839

14,072

6,381,053

4672 430

50,986 3,835

4,241

484

58,470 5,162

156

1-744

9,069 914

111,200 8,997

Total …. Grand Total ….

5102

54,821

4,725

63,632

156

1,744

9-983

120,197

9712

1,711,076

11,641

4,749,224

745

80,951

359o

847,504

25,688

7,388,755

documented in the United States, and the division is based on the trade on which the vessels are employed, and not as in the United Kingdom on the character of the vessels and their fitness to engage in trade to distant countries or on more local service.

By the United States Navigation Laws all trade between American ports no matter how far they are separated — such as New York to San Francisco, or from either of these ports to Honolulu or Manila — is declared to be coasting trade. None but United States vessels are allowed to engage in this trade, which in recent years has developed so rapidly as to employ the main part of the American Mercantile Marine; it demands large numbers of ocean-going vessels, and many vessels have been transferred from the Foreign Trade to meet the demand.

Lloyd's Register for 1909-1910 gives the following figures for United States shipping, excluding all vessels under 100 tons and all wooden vessels on the Great Lakes : —

On Sea Coasts . Northern Lakes . Philippines .

Number.

Tons.

2899

583 108

2,791,282

2,118,276

44,254

3590

4,953,812

Large numbers of American vessels are not included in the American Returns — such as yachts, boats and lighters employed within the

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Fig. 6. — Merchant shipping built in each of the countries of the world in 1900 and in 1909. The tonnages are gross, and are based

on the figures given in Lloyd's Register; see notes appended to Table IV.

STATISTICS]

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limits of any harbour; canal boats and barges without sails or motive power employed entirely within any State ; barges and boats on the rivers and lakes of the United States which do not carry passengers and do not trade to any foreign territory. None of these vessels are registered, enrolled or licensed. A census of shipping taken in 1889 revealed the fact that at that date the tonnage of these undocumented vessels amounted to just half the total shipping of the United States; since then their numbers have greatly decreased because of the improved means of transport by rail.

The distribution of the total documented shipping on the coasts of the United States in 1909 is shown by Table VI. The Atlantic

Table VI. — United States Shipping documented in igog.

Atlantic and Gulf Coasts. Porto Rico ....

Pacific

Hawaii

Northern Lakes . Western Rivers

Total . . .

No. of Ships.

Tons.

17.203

83

3.378

43

3,199

1,782

3,500,394 8,740

915.357

10,120

2,782,481

162,663

25,688

7.388,755

Coasts employ 67% of the number and 47% of the tonnage; the Great Lakes 12% of the number and nearly 38% of the tonnage. The total includes a great number of wooden sailing vessels as shown by Table VII., which also shows that the coasting trade employs over 1,000,000 tons of wooden steamships and over 3,000,000 tons of steel steamships (Enrolled and Licensed vessels), while the steel

Table VII. — Details of Ships documented in United States in zgog.

Steam.

Sailing.

Barges.

No.

Tons.

No.

Tons.

No.

Tons.

Registered — ■

Wood

Metal

Enrolled and Licensed —

Wood

Metal

349 149

9,43i

1,712

7i,474

507,052

1,084,690 3 ,086,008

448 22

9135

107

185, 728

45, 33°

1,281,064 198,954

644 21

2804 121

72,277 5,644

687 ,924 81,659

Total Documented Vessels Grand Total ....

11,641

4,749.224

9712

1,711.076

3590

847 ,504

. 25 ,688 Vessels. 7,388,755 Tons.

steamships in the Foreign Trade only reach a total of just over 500,000 tons (Registered Vessels).

Though the American Mercantile Marine has greatly varied in the rate of its growth (see Table VI 1 1.), very great increases have taken place from time to time, and after 1880 the average rate of increase was very considerable, the increase in thirty years amounting to 3,300,000 tons or over 80%. In the nine years 1900-1909 the increase was 2,220,000 tons, which is more than 40% of the total in

Table VIII. — Growth

of United States Shipping.

Total Tons.

Increase in

Ten Years.

Year.

Documented.

Tons.

Percentage.

1790

478,377

1800

972,492

+494,“5

+ 103-3

1810

1,424,783

+452,291

+46-5

1820

1,280,167

— 144,616

— IO-I

1830

1,191,776

-88,391

-6-9

1840

2,180,764

+988,988

- *+82-9*

1850

3,535,454

+ 1,354,690

+62-1

i860

5,353.868

+ 1,818,414

+51 +

1870

4,246,507

— 1,107,361

— 20-6

1880

4,068,034

-178,473

-4-2

1890

4,424,497

+356,463

+8-8

1900 1903

5,164,839 6,087,345

+ 740,342

+ 16-8

Increase in ‘

Three Years.

Tons.

Percentage.

+922,506

+ 17-9

1906

6,674,969

+587,624

+ 9-7

1909

7,388,755

+713,786

+ 10-7

1900. The increase of the general commerce of the United States in these periods was, however, so vast that, notwithstanding the great increases of tonnage, increasing proportions of the tonnage were absorbed by the home or coastwise trade, and the percentage of United States shipping^ carrying United States commerce to foreign ports was steadily reduced, as shown by Table IX.

From 1895 to 1908 very great progress was made in the output of ships in the United States; in 1901 a maximum of 483,489 tons was

reached; decreases occurred until 1905, when a minimum of 330,316 tons was reported, but a rapid recovery took place; and in 1908 the unprecedented American total of 614,216 tons was made. In 1909 the output fell off. Out of a total of 1247 vessels of 238,090 tons, built and documented during the year ending June 30, 1909,

Table IX. — Additions to and Employment of United States Shippinr.

Average Tonnage

Average percentage

Average percentage

Period.

of Ships built per

of Lnited States

of United States

Annum in the

Commerce carried in

tonnage trading in

United States.

United States Ships.

United States Ports.

I8I0

102,452

18IO-1820

89,797

1820-1830

89,372

902

88-2

I 830-I 840

118,960

83-9

68-7

I 840-I 850

185,309

7 8-i

66-6

1850-1860

366,603

71-2

65-4

1860-1870

299,690

38-1

50-4

1870-1880

253.800

26-2

29-0

1880-1890

220,197

15-2

21-0

1890-1900

235.698

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22-5

1901-1903

462,824

8-7

22-0

I 904- I 906

375.868

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22-3

1907

47L332

iO‘6

22-0

1908

614,216 l

9-8

22-0

1909

238,090 2

9-5

1

1 Maximum recorded. – Lowest for ten years.

61,000 tons consisted of barges and canal boats, nearly 30,000 tons consisted of sailing vessels, 798 vessels of 47,353 ‘tons are classed as river steamers, 17 steamers of 84,428 tons were built in the Great Lakes, and only 6 steam vessels of 16,427 tons were built for ocean trade, while no vessel was registered as built for the foreign trade.

Canadian Shipping. — A steamboat service between Montreal and Quebec was commenced in November 1809, two years before the ” Comet ” was set to work on the Clyde, and in 181 6 the steamer ” Frontenac ” commenced running on the Lakes and a number of other

vessels followed. During the middle of the 19th century Canada turned out large numbers of wooden ships, the output in 1874 being 487 ships of 183,010 tons. As wood shipbuilding dimin- ished the output fell off. In 1900 only 29 steam and sailing ships of over 100 tons were built, amounting in the aggregate to 7751 tons. Afterwards improvements took place, and in 1907 59 vessels of 38,288 tons were launched. Among the largest ships built in Canada are the passenger and freight vessel " Harmonic " of 5240 tons gross, and the " Midland Prince," a cargo vessel of 6636 tons gross — both built at Ontario. Smaller vessels are built to pass through the canals from the lakes to the sea, such as the " Haddington " of 1603 tons built at Toronto.

Japanese Shipping. — Recent years have seen a considerable de- velopment of shipbuilding in Japan. Several small vessels were built previous to 1898, but in that year the " Hitachi Maru," a steamer of 6000 tons, was built by the Mitsu 3ishi Works.

Lloyd's Register Reports show that in the five-year period 1895-1899 there were launched 61 ships with a tonnage of 45,661 ; in 1900-1904, 279 ships (tonnage 138,052); and in 1905-1909, 414 (tonnage 252,512).

The figures quoted by various authorities for the amount of ship- ping owned in Japan vary considerably, particularly as regards sailing vessels. Large numbers of wood sailing vessels are, however, passing away, their places are being taken by steel steamers of the highest class in great variety and increasing tonnage, and the finest and fastest vessels now on service in the Pacific Ocean are Japanese liners built in Japan. Lloyd's Register shows that in 1900 Japan possessed 503 steam vessels of 524,125 tons gross, while in 1908 she possessed 861 steam vessels of no less than 1,150,858 tons — an increase of 120% in eight years.

German Shipping. — For many years the mercantile marine of Germany has progressed at a very great rate, large numbers of vessels being built in Germany and in the United Kingdom for German owners. The average output in Germany per annum from 1895 to 1899 was 84 ships of a total tonnage of 139,000 tons; from 1900 to 1904, 114 ships of 204,600 tons; and from 1905 to 1909, 149 ships of 241,000 tons. The total net tonnage owned in 1870 was about 982,000 tons, and this was doubled by 1900, i.e. in thirty years. The total tonnage of Germany in 1900 was 2,905,782 tons, taking gross steam and net sailing tonnage; in 1910 the total on the same basis was 4,333,186 tons, an increase of nearly 50% in the ten

years.'

IV. Merchant Vessels

Sailing Ships. — Generally speaking, so far as the distribu- tion of sails is concerned, except as regards the abolition of studding-sails, the sailing ships of to-day differ little from those which existed in the middle of the 19th century, and in the case of many types at a much earlier period. The change from wood to iron and steel resulted, of course, in some changes

in rig, to suit the longer and larger vessels; and steel masts, with wire rope standing rigging and various labour-saving appliances, have been introduced. The larger ships also carry steam winches for various purposes, steam windlasses, and steam steering gear, but the general appearance of the vessels has changed very little.

Barges. — Rivers and canals abound with barges of various types, such as the Thames barge, the Tyne wherry or keel, and the Dutch galliot or pink. The Thames barge, which may be taken as a repre- sentative vessel of this class, has a length of from 70 to 80 ft., and a carrying capacity of from 100 to 120 tons on about 6 ft. draught. Like the Dutch galliot, she is provided with lee-boards, and is fore-and-aft rigged with sprit-sail and jigger.

In recent years the use of barges or lighters has been extended beyond river and canal service, and rapidly increasing numbers are now used, in addition, for sea transport. For example, on the east coast of England lighters of about 500 tons carrying capacity are used in the coal trade. The system has been carried much farther on the Great Lakes of North America, where cargo barges are in use of over 350 ft. in length, and approaching 5000 tons displace- ment when loaded. On the east coast of the United States barges, built sometimes of wood and sometimes of steel, are employed, carrying from 2000 to 4000 tons of coal, oil, grain, &c.

Smacks or Cutters. — This type of rig is still largely adopted in the merchant service for small vessels, usually called smacks, of a length, say, from 60 to 90 ft., and a displacement from 150 to 200 tons. They are single-masted, sharp-built vessels, provided with fore-

and-aft sails only, and fitted with a running bowsprit; they have no standing jib stay. Such vessels were at one time generally used for coasting passenger traffic. The term " cutter " is also applied to an open sailing boat carried on board ship.

Schooners, Brigs and Brigantines. — A schooner (fig. 7, Plate I.) is usually a two-masted vessel, with yards only on the foremast and fore-and-aft sails on the main. The foresail is not bent to the yard, but is set Hying. In some cases there are no yards at all and the schooner is then called a fore-and-aft schooner, a schooner with yards being sometimes called a square-rigged schooner. Before the days of steam, two- and three-masted schooners, known as " Fruiterers," were extensively employed in the fruit trade from the Western Islands, Italy, Malta and other orange-growing countries to London. In the 'fifties as many as three hundred were thus employed ; they kept their place till the 'eighties, and some even yet survive the introduction of steam as a motive power. They were beautifully modelled craft, and very fast under canvas. A brig is a two-masted vessel having yards, or square-rigged on both masts. A brigantine is a two-masted vessel having the foremast square-rigged, as in a brig, the main mast being rigged as in a schooner. Much of the coasting trade of the world is carried on by schooners, brigs and brigantines. These vessels were formerly employed in the Baltic : and to some extent in the West Indies and the Mediterranean. Schooners such as the above are usually from 80 to 100 ft. long, 20 to 25 ft. broad, 10 to 15 ft. deep, and have a gross tonnage of 130 to 200 tons. Brigs are generally larger, varying in tonnage from 200 to 350 tons; they are from 90 to 115 ft. long, from 24 to 30 ft. broad, and from 12 to 18 ft. in depth of hold. Brigantines usually occupy, as to size, a position intermediate between schooners and brigs.

Vessels somewhat larger than two-masted schooners and brigs, but of a similar form, are often rigged as three-masted schooners and as the so-called barquentines. The former is like a schooner with a third or mizzen mast added, this being rigged fore and aft, as is the main mast. The latter resembles a brigantine with a third mast added, which is also fore-and-aft rigged. The two rigs thus very nearly resemble each other: both types are square-rigged on the foremast, and fore-and-aft rigged on the main and mizzen; but while in the former the foresail is set flying, in the latter it is bent to the yard.

Largei vessels than these are sometimes fitted with four, five, six and even seven masts, as fore-and-aft schooners. A large number of vessels fitted in this manner are much in favour for the coasting trade of America. Fig. 8 (Plate I.) shows the " Helen W. Martin," a

five-masted wooden schooner, built in 1900 in the United States; she is 280 ft. 6 in. long, 44 ft. 9 in. broad and 21 ft. depth of hold, and her gross tonnage is 2265. Another vessel built at the same time, also of wood, and named the " Eleanor A. Percy," is 323 ft. 5 in. long, 50 ft. broad and 24 ft. 8 in. depth of hold, with a gross tonnage of 3402 ; she is rigged as a six-masted schooner. An interesting vessel of this class was the seven-masted schooner, " Thomas W. Lawson," built in 1902 by the Fore River Ship and Engine Co., Quincy, Massachusetts, of steel, 368 ft. long, 50 ft. beam, 34I ft. depth of hold, and on a draught of 26 ft. 6 in. of 10,000 tons displace- ment, thus being the largest vessel yet constructed for sailing only. She was recently wrecked on the Scilly Isles.

Barques and Ships. — Vessels intended to sail to all quarters of the globe are usually rigged as barques or ships; but as indicated above, these rigs are very far from embracing all those in use; many others are very common. A barque is a three-masted vessel, square- rigged on the two foremost masts (the fore and main masts) and fore-

and-aft rigged on the mizzen mast. A ship (a ship-rigged vessel) has three masts, each of which is square-rigged. These were the rigs employed in types of vessels now fast passing away, if indeed they must not be considered as already obsolete, in which great speed was the quality chiefly aimed at, and carrying power was of secondary importance. For instance, the " Phoenician," built in 1852, had a length of 150 ft. and a net tonnage of 478; the " Shannon," bui't in 1862, was 217 ft. long and her tonnage 1292. The former made the quickest run on record, up to 1852, from Sydney to London, ac- complishing the distance in 83 days; and the latter made a round voyage from Melbourne to London and back from thence to Sand- bridge Pier in 5 months and 27 days, handling two full cargoes in the time. The American ship " Witch of the Wave," built in 1852, and the British ship " Cairngorm," built in 1853, were engaged in the keen competition carried on between Great Britain and the United States for the rapid conveyance of early teas from China to London. The American builders had for some years been more successful than the British builders, and the "Cairngorm" was the first ship which equalled the American ships in speed, and it was, moreover, claimed for her that she delivered her cargo in better condition than the American ships. She was 215 ft. long, and her tonnage was 1250 old measurement, or 938 new measurement. The " Witch of the Wave " on her best voyage made the passage from Whampoa to Dungeness in 90 days, the best day's run being 338 knots in 24 hours, a very re- markable performance. Later, In 1856, the " Lord of the Isles " beat the two fastest American clippers then existing in a' race from China

to Great Britain, one of them only by a few minutes; her length was 183 ft., and her tonnage, new measurement, 630. It is noteworthy that the competition in bringing the early teas home from China, started between British and American ships, was carried on subsequently between British ships alone. In the memorable race of 1866 from Foo-Chow to London, five ships, the " Ariel," " Taeping," " Serica," "Fiery Cross" and " Taitsing " took part. The first three left Foo-Chow the same day — the " Ariel " first, followed 20 minutes later by the " Taeping " and " Serica " together. The vessels separated and lost one another till they reached the English Channel, when the " Ariel " and " Taeping " got abreast, and raced to the Downs, the former arriving some ten minutes before the latter, the " Serica " reaching the Downs a few hours later. These three occupied 99 days on the voyage; the " Fiery Cross " and " Taitsing " took two days longer, making the passage from Foo-Chow to the Downs in 101 days. The best day's run on the passage for all these ships differed but little, the " Fiery Cross " showing a slight superi- ority in this respect, having run 328 knots in the 24 hours. The time occupied in the above voyages was beaten in 1869 by the " Thermo- pylae " and "Sir Lancelot," both British ships and of composite build ; the times occupied by their passages were respectively 90 days from Foo-Chow to Dungeness for the former, and 88 days from Foo-Chow to Deal for the latter, each taking one day more to get into the docks. The dimensions of the " Thermopylae " were 212 ft. by 36 ft. by 21 ft. depth of hold, and of the " Sir Lancelot " 1975 ft. by 33i ft. by 21 ft. The best day's run of the " Sir Lancelot " was 354 knots in 24 hours. Shortly before the above voyage the " Thermopylae " made the passage from London to Melbourne in an unprecedentedly short time, namely, 62 days from Gravesend to Port Phillip harbour. With the opening of the Suez Canal and the general introduction of steam, the demand for exceptionally fast sailing vessels of these types has very considerably diminished, and, indeed, almost ceased to exist. The type of cargo sailing ship usually met with to-day is better illustrated by fig. 9 (Plate I.), which repre- sents the " Victoria Regina," built of iron in 1881 at Southampton: she is 270 ft. long and has a gross tonnage of 2006.

Ships with four and five masts were employed by several countries during the 19th century. Sometimes, in the case of four-masted ships, these were square-rigged on the fourth or mizzen mast, and sometimes fore-and-aft rigged; in the latter case they were called four-masted barques in Great Britain and shipentines in America. Five-masted ships are sometimes square-rigged on the fourth mast and fore-and-aft rigged on the fifth mast, and sometimes fore-and-aft

rigged on both of these masts. The Naval Chronicle, vol. vii. (1802), contains par- ticulars of the French privateer " L'Invention," which was captured by the British ship " Immortalite " ; she was rigged as a four-maated ship, carried 26 guns, and had a complement of 220 men. It is re- markable how little her rig differs irom that of modern vessels. A five-masted vessel is described in the same number of the Naval Chronicle which was square-rigged on the foremast and fore-and-aft rigged on the other four masts; she was apparently a forerunner of the American five-masted schooner of the present day. The shipen- tine clipper " Great Republic," built in 1853, is noteworthy as being the first ship fitted with double topsails, now so generally adopted. She was 305 ft. long and her tonnage was 3400; she could spread 40,500 square ft. of canvas, excluding stay-sails ; she had four decks and was built of wood, though her framing was diagonally braced with iron. The shipentine " Madeleine " built in France in 1896, is almost identical in rig to the " Great Republic " ; her length is 321 ft. and her gross tonnage 2892. A five-masted barque " France, " built in Glasgow in 1890, is 361 ft- long avid has a gross tonnage of 3942. As further examples of the large sailing ships built in recent years may be mentioned the " Astral " and " Potosi." . The " Astral " was built by Arthur Sewall & Co. at Bath, Maine, in 1900, tor the oil trade.

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Plate II.

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She is a full-rigged four-masted ship, 332 ft. long, 45i ft. beam, 26 ft. moulded depth, gross tonnage 3292, and intended to carry 1,500,000 gallons of oil in cases of 10 gallons each from the United States to Shanghai, returning with cargoes of sugar, hemp, &c. The masts and yards of this vessel, as well as the hull, are of steel. The five- masted German barque " Potosi," built in 1895, which is 366 ft. long, has a gross tonnage of 4027 and a dead-weight capacity of 6200 tons; she has a splendid record of quick passages, one reducing the record from Portland Bill to Iquique to 62 days. In 1902 the five-masted ship-rigged vessel " Preussen," of 5081 tons gross, was built in Germany (wrecked at Dover in November 1910), followed in 1906 by the five-masted barque " R. C. Rickmers " of 5548 tons gross, 441 ft. long over all, 53 ft. 8 in. beam, 30 ft. 5 in. depth of hold; her displacement when loaded is about 11,400 tons, of which 8000 tons are cargo. She carries 50,000 sq. ft. of canvas, and on her first voyage reached a speed of 15! knots for a short time under sail alone, maintaining 13 knots for long periods. Although fitted with auxiliary steam power the " R. C. Rickmers " usually trusts wholly to canvas on her ocean voyages, and may thus be considered the largest sailing vessel afloat in 1910.

As instances of the times occupied on the voyages of modern sailing ships the following may be given: 66 days from Iquique in Chile to the English Channel by the British ship " Maxwell," gross tonnage 1856; 29 days from Newcastle, New South Wales, to Valparaiso by the British four-masted ship " Wendur," 2046 gross tonnage; 30 days from the Lizard to Rio de Janeiro by the British ship " Salamanca," of gross tonnage 1233; and 78 days from Dover to Sydney for the same ship; 153 sailing days for a voyage round the world, made up of 50 days from Cardiff to Algoa Bay, 28 days from Algoa Bay to Lyttleum, and 74 days from Lyttleton to the Lizard, by the British ship " Talavera," gross tonnage 1796; 59 days from Cape Town to Iquique by the British ship " Edenballymore," of gross tonnage 1726;

88 days from San Francisco to Queenstown by the British four-masted barque " Falls of Garry," of gross tonnage 2102; and 69 days from Scilly to Calcutta by the " Coriolanus," gross tonnage 1074. Amongst the voyages recorded recently by German ships the following may be enumerated : 58 days from the English Channel to Valparaiso by the four-masted barque " Placilla," gross tonnage 2845; 71 days from the English Channel to Melbourne by the barque " Selene," gross tonnage 1319; and 69 days from the English Channel to Adelaide by the four-masted barque " Hebe," of gross tonnage 2722.

Although alterations in the rigs of ships have not caused much difference in their appearance over a very long period, a number of changes have been made, mostly for the purpose of saving labour. The mechanical reefing of topsails and top-gallant sails was introduced about 1858, but only remained in favour for a few years; double topsails, on the other hand, first used in the four-masted American shipentine clipper " Great Republic," have held their own, and double top-gallant sails have since been adopted. Until about 1875 almost all ships carried studding- sails, but since this date they have been gradually discontinued, and at present are usually only to be found in training vessels, and now and again in square-rigged yachts. As already stated, wire rope has been adopted for standing rigging, and deadeyes and lanyards have given place almost universally to rigging screws. Masts and the heavier yards have been made of iron for many years, and more recently of steel, and the lower masts and top masts have in a number of cases been made in one length ; when constructed in this manner the mast is termed a pole mast. This arrangement is very common in America, where the latest steel sailing ships are so fitted. Most large sailing ships carry a steam boiler or boilers, and engines are provided for all sorts of purposes, for which hand labour used to be commonly em- ployed. The result of this and other labour-saving arrangements has been to effect a very considerable reduction in the number of hands carried. As indicating the nature of the change which has taken place, it may be mentioned that whereas a 1000-ton ship of the East India Company in the middle of last century had a crew of 80 all told, a modern four-masted barque of 2500 tons has a total complement of S3 only.

As to the employment of sailing ships, there can at the present day be seen at most large shipping ports a number of sailing ships of various types and sizes. Some of the largest ships are employed in the jute trade of India, the grain trade of California, British Columbia, &c, the nickel ore trade from New Caledonia and the nitrate trade of

Chile. From Great Britain they usually take out coal, which, however low freights may be, may in nearly all cases be relied on.

Sailing ships are sometimes provided with auxiliary steam

propelling machinery of low power to save cost of tugs in getting in and out of harbour, to make headway when becalmed, and to increase the safety of the vessel. In the early days of steam, all sea-going vessels retained their rig, and the machinery fitted was only regarded as auxiliary. In sailing the " Savannah " — the first steam vessel to cross the ships with Atlantic — the paddle wheels were portable; they were auxiliary removed and packed up on board in case of bad weather f' wer – or when attempting a long voyage, but were replaced and used for getting into port after crossing the Atlantic. The screw propeller was found preferable in such cases, as it offered less obstruction than paddle wheels when the sails were set and the engines stationary; but the resistance offered by the screw when not in use led to various devices for either lifting it com- pletely out of the water, or for " feathering " the blades and fixing them fore and aft, so as to offer less obstruction in going through the water. Auxiliary power is of great advantage to vessels engaged in seal or whale fishing as it enables them to avoid ice floes, and to proceed through open channels in the ice as opportunity offers. In 1902, six such vessels — all barque rigged, and one fitted with a lifting propeller — hailed from Dundee, and a few others hailed from Norway, from Newfoundland and from New Bedford, U. S. A. Several navies have employed vessels fitted with auxiliary steam power for training purposes, such as the Chilean training ship " General Baquendo " built in 1899 of steel, sheathed with teak and coppered; she is 240 ft. long, 45! ft. broad, and of 2500 tons displacement on a mean draught of 18 ft. ; she has a large spread of canvas, and under steam alone is equal to a speed of 13 knots. In recent years the internal com- bustion motor has been adopted in some cases in place of the steam engine as a source of auxiliary power, especially in the smaller classes of sailing ships, and in many cases it has made the employment of such vessels remunerative once more. Should the heavy oil engines introduced in 1910 prove sufficiently simple and reliable for auxiliary power in the larger vessels, vessels so fitted might compete successfully with tramp steamers in certain trades.

Steamships. — Of merchant steamships, vessels of all sizes are to be met with, from a small launch to the stately Atlantic liner of over 30,000 tons gross and 25 to 26 knots speed, and the huge cargo ship of over 20,000 tons gross and 15 knots speed. They are employed on

every service for which sailing ships are used, and upon others for which sailing ships are not employed, and they monopolize nearly the whole of the passenger traffic of the world. The passenger vessel is provided with airy and spacious accommodation for her living freight above water, while the upper part of the cargo vessel is cut down as much as possible consistent with due provision for safe naviga- tion at sea. The passenger ship thus becomes a lofty vessel, especially amidships, while the cargo ship appears long and low lying. Apart from this broad difference, the various sizes of merchant steamships have in general no bold characteristic features like sailing ships; they possess different deck structures and certain differences in form, but, to the ordinary eye, a photograph of a vessel of, say, 1000 tons, apart from details of known size that may serve to fix the scale, may often be taken to represent a vessel of even ten or twenty times the size.

Types of Steamships. — A steam vessel may be little more than an open boat with the boiler and engines placed amidships if intended for river use, and may be of any shape necessary to suit local conditions and fulfil the services required. Vessels which proceed to sea must be decked over to prevent them from being " swamped " and built of a suitable form to make them otherwise seaworthy ; the height of the deck above water, or the freeboard, will be increased, and the sides carried up above the deck; these topsides meet at the extremity of the vessel, and as the size of the vessel increases or larger seas have to be encountered the topsides are covered in forward and aft to lurther improve the sea-keeping qualities of the vessel. If only a short portion is so covered in, the covering is often rounded off along its sides and is then termed a turtle back, or monkey forecastle, when fitted forward, and a turtle back, or hood, when fitted aft; if made larger and of sufficient height above the upper deck to be serviceable for accommodation forward it is called a top gallant forecastle, and aft a poop. It is frequently desirable to build up cabins or other accommo- dation across the middle of the ship beneath the bridge, forming

what is called a bridge house. Instead of fitting a turtle back or hood aft a break is sometimes made in the upper deck and the alter portion is raised a step higher than the midship portion, the after portion is

then called a raised quarter deck. If a poop be extended forward to join the bridge house it is called a long poop. In very many cases when a top gallant forecastle is fitted, the gap which occurs between this forecastle and the bridge house is partly shut in at the sides by the ship's topside plating; the space so formed is then called a well, and the ship a well-decked ship.

Vessels arranged as above described are illustrated by figs.' 10, 13, 14 on Plate II.; they include most of the vessels in the coasting trades of Europe, and many of the smaller and medium sized ocean-going cargo vessels. In larger vessels the forecastle, bridge and poop decks are frequently joined to form a light continuous

going vessels to or from warehouses, and are frequently fitted so that they can tow one or more dumb barges.

Many sea-going vessels are built to carry a particular cargo on one voyage and a general cargo on the return voyage. This usually results in their having certain features which adapt them for the special cargo, and do not interfere materially with their carrying a general cargo at remunerative' rates. Ordinary cargo ships, or " Ocean Tramps " as they are called, do. a very large portion of the world's cargo-carrying. They are mostly built of steel, and their usual speed is from 10 to 1 1 knots. In the early 'nineties weli-decked vessels formed a large proportion of the total number; but ten years later comparatively few of this type were being built, and these were principally intended for the coal trade, or were comparatively small vessels for coasting purposes. Partial awning-decked steamers, again,

n, — General arrangement of ore-carrying steamer " Vollrath Tham.

1. Hold.

2. Discharging trunk.

3. Electric crane.

4. Skip, or bucket.

5. Discharging doors.

6. Crew's space.

7. Officers' quarters.

8. Stores.

9. Engine and boiler room.

10. Coal bunker.

11. Loading hatch.

12. Slopes to discharging doors.

structure. The vessel is then termed a shade-decked vessel — if the ship's sides up to this level are not completely closed in. In still larger ships the sides are completely built in, the deck made stronger other decks or deck houses are fitted above it, and the ship is called an awning decked, spar decked, shelter decked or three decked vessel— according to the details of her construction. Above these strong steel decks light promenade decks, sun decks and boat decks are built according to the requirements of the accommodation for passengers, &c. .

Barges. — The simplest cargo steamer is the steam barge or lighter, often merely a long narrow box of wood or steel made small enough in section to pass through locks and canals, with the ends f I s "" fashioned more or less abruptly, and spaces allotted aft for j ships. the mac h; nery an d forward for the crew. For service on

rivers and estuaries they are made larger and wider as the circum-stances of draught and dock or wharf accommodation permit, the bottoms being generally flat in order that they may ground safely in tidal waters; thft" arp used for transferring cargoes of sea-

which were much in favour at the same period, gave place, a decade later, to other types; and vessels having a raised fore-deck went entirely out of fashion, the tendency being to revert to flush-deck vessels, having short poop, bridge house and forecastle.

Modern Developments. — The last few years have been remarkable for great development in special types of cargo vessels. While the vessels have frequently been specially designed to meet the requirements of the particular trades on which they are to be employed, certain general features apply to the lines of their develop-ment : — . ... . ,

1 In order to accommodate the maximum cargo possible in vessels of convenient size, the lines of the vessels have been filled out, giving block co-efficients which are frequently over 80 % and in some of the Great Lake freighters have reached 88 %. .

2 Such portions of the ship above the water as do not contri- bute usefully to carrying cargo, but would be measured for registered tonnage, are cut down to the smallest amount consistent with tne provision of sufficient reserve of buoyancy and stability.

3. To provide for a return journey without a cargo, in addition to the double bottom and peak tanks, large water ballast tanks are provided abreast of and above the cargo spaces, and arranged so that when ballasted down the metacentric height of the vessel is not excessive. Much of the ballast is carried in side or wing tanks extending to the upper or main deck, or in triangular tanks beneath the main deck, ballast discharge valves or pipes being arranged so that the tanks may be emptied by gravity when practicable.

4. The holds have been cleared of obstructions — such as pillars, hold beams and web frames — so that the stowage space for the cargo is unbroken, the necessary strength being given by a heavier system of framing of the ship and by the construction of the wing or side tank bulkheads.

5. To facilitate rapid handling of cargo, hatches have been increased in size and number, and special appliances fitted for rapidly loading and unloading the vessel — particularly, large numbers of derricks or cranes, with convenient steam or electric winches.

Several well-known types of cargo vessels have thus been pro- duced, such as the " Mancunia " built by Messrs W. Gray & Co. at West Hartlepool in 1898, with side-ballast tanks on McGlashan's patent; cantilever-framed vessels by Messrs Raylton Dixon & Co. on Harrowby and Dixon's patents; trunk-deck vessels by Messrs Rayner & Co., and turret-deck vessels by Messrs Doxford & Co. of Sunderland. Fig. 10 (Plate II.) is a photo of a turret-deck steamer. Her dimensions are: length 439 ft. 8 in., beam 51 ft. 7 in., gross tonnage 5995 and net tonnage 3794 tons. Many such vessels have been built ; they have the reputation of being good dead-weight carriers, and the shelf on each side of the central trunking can very conveniently be used for carrying timber and for other purposes. The " Echunga," built by Sir Raylton Dixon & Co. in 1907, is an example of a modern cantilever-framed flush-decked vessel, — she is 404 ft.

long over all, 56 ft. beam, 23 -6 ft. moulded depth. On a draught of 23 ft. 9 in. her displacement is about 12,000 tons and dead-weight capacity over 8000 tons, while as regards space she has a stowage capacity of more than 400,000 cub. ft. These results are obtained on the low net register tonnage of 2245 tons, the gross tonnage being 4590 tons. The vessel has continuous upper and main decks, and the underside of the wing tanks carried by the cantilever frames is at such a slope that coal will naturally stow close up on being dumped into the hold. The triangular wing tanks take 1350 tons of water ballast and the double bottoms and the fore- and after-peaks take 1850 tons.

The " Herman Frasch," a modern American cargo vessel of 3804 tons, gross, built in 1909 by the Fore River Shipbuilding Co., Quincy, Massachusetts, for the sulphur trade, is a single-decked vessel, with triangular side ballast tanks and fitted with a short forecastle which carries the windlass gear, a bridge-house well forward to accommodate captain and navigating officers, a poop for firemen and crew, and cabins above the poop for the engineer officers. Her dimensions are: length 345 ft., breadth 48 ft. 3 in., depth of hold 27 1 ft. At a draught of 23 ft. 6 in. her displacement is 8770 tons, of which 6125 tons may be dead-weight carried. Her engines are of 2100 I.H.P., are fitted right aft, and give her a speed of 10-5 knots.

An interesting cargo vessel of a different type is the " Vollrath Tham," recently completed by Messrs Hawthorn, Leslie & Co. for the Swedish ore trade. She is 387 ft. long, 56 ft. 6 in. beam, depth 309 ft., tonnage 5826 tons, gross, and dead-weight capacity 8000 tons. Instead of the usual open hold arrangement she has been divided into a series of hoppers and automatic discharging holds, and fitted with

10 electric discharging cranes. Trunks are provided in each hold, through which buckets or skips of two tons capacity can be lowered into position beneath discharging doors under the cargo hold. (Fig.

1 1 shows the general arrangement of this vessel.)

Great Lake Freighters. — The greatest development of cargo handling the world has yet seen is, however, to be found in North America, where the Great Lake freighters have been built to meet the rapidly growing trade in iron ore, coal and grain. Some of these vessels are 600 ft. or upwards in length, 60 ft. beam, and 32 ft. moulded depth, and on a draught of 20 ft. can carry 12,500 tons of coal or ore or 450,000 bushels of grain. The hatches of these vessels are 12 ft. apart, and are so wide that the holds are self-stowing. The holds are

quite unobstructed fore and aft, and built with flat bottoms and vertical sides, so that practically the whole of the ore can be removed by clam shell grabs. For loading, the vessels are brought alongside huge stacks of ore stored on long lofty piers called ore docks; these docks are provided with shoots from which the cargo is run into the ships by gravity, thus loading large vessels intwo hours. When unload- ing at the Cleveland end of the voyage the cranes and transporters fitted ashore can ht)ist out the cargo of 12,500 tons in ten hours, using grabs of 5 to 15 tons capacity. The propelling machinery is placed right aft and develops from 1800 to 2200 H.P., giving a speed of from 10 to 12 knots. They are well equipped with auxiliary machinery including steam steering gear, steam winches and hoists, pumps and electric light. The wheel-house and bridge are fitted at the after end of a short forecastle ; the officers are accommodated forward and the crew aft, both being provided with excellent quarters (see fig. 15, Plate II., and fig. 16).

Colliers. — In a number of cases vessels are built to carry special

cargoes; coal carrying vessels, colliers, are well-known examples of this class. One of the first colliers to be fitted with steam-engines was the sailing vessel " Q.E.D.," built at Wallsend in 1844, and fitted by Messrs R. & W. Hawthorn with auxiliary machinery of 20 N.H.P driving a screw propeller. She was constructed of iron, had an over-all length of 150 ft. with a breadth of 27J ft. In certain respects she was a remarkable vessel, for she was fitted with a double bottom, the space between the bottoms being divided into tanks and arranged for water ballast, a system which has since been re-invented and is now common in colliers and in most cargo ships. The advantage of the arrangement in colliers is especially great, as they usually carry a full cargo one way and return empty; in their light condition sufficient water ballast can be at once added to make them sea-worthy, and this at the end of the voyage can be pumped out at a small cost. It was not until about 1852 that steam alone began to be relied on for propelling colliers; in that year the iron screw collier, " John Bowes," was built by Messrs Palmer of Jarrow; she was 152 ft. long, 26 ft. 4 in. beam, had a dead-weight capacity of about 540 tons, was fitted with temporary tanks for water ballast; had machinery of 70 N.H.P. placed right aft; and she took her cargo to London in 48 hours. The saving in time and cost, as compared with the transport of coals to London by the sailing colliers then in vogue, was very great, and this led to the building of many other such vessels.

In 1880 the ordinary steam collier carried 600 or 700 tons of cargo; a steady increase in size has been in progress, and the popular collier of to-day carries about 3000 tons, while for long voyages vessels of from 8000 to 10,000 tons capacity are used. While improvements have been made in hull and machinery, so also have improvements been made to enable the colliers' cargoes to be handled more rapidly. Appliances have been adopted for emptying truckloads of coal into the vessels when loading, and many arrangements have been devised for discharging rapidly, but derricks and winches supplemented in some cases by Temperley transporters are still generally relied on. An interesting vessel in which special appliances have been fitted to reduce the amount of hand labour in discharging is the " Pallion," built by Messrs Doxford & Sons in 1909. She is of the following dimensions: length 269 ft., breadth 44J ft., depth 22 ft.; tonnage 2474 tons gross, 1307 tons net, and can carry 3100 tons on a draught of 17 ft. 10 in. She is a single screw ship fitted with three cylinder compound engines of 217 N.H.P. and 1200 I.H.P. fitted aft. Systems of conveyor-belts are fitted so that the cargo can be delivered direct into trucks ashore or into barges or other vessels alongside by steam power, and under trial conditions at Sunderland the rate of discharge was found to be 1000 tons per hour.

Oil Tank Steamers. — These form another class of vessels built for a particular cargo, and their construction and the character 'of the material carried are such that they cannot ordinarily be used for other purposes. In 1863 two sailing tank vessels were built on the Tyne. In 1872 Messrs Palmer built the " Vaderland," which appears to have been the first oil tank steamer. The oil carrying steamer ' ' Zoroaster ' ' was built in 1877 in Sweden and in 1910 was still on service. She was built of steel of length 184 ft., breadth 27 ft. ; draught 9 ft., and had a loading capacity of 250 tons. The oil tanks in the " Zoroaster " were separate from the hull, but after successful trials other vessels were built for Messrs Nobel Bros, in which the skin plating itself formed the tank. In 1886 Messrs Armstrong, Whitworth & Co. built the " Baku," and since that date large numbers of steamers have been built for this trade, the majority of them having been built by the Armstrong firm. Many of these steamers are of large dimensions while some are comparatively small. On the Caspian Sea, for instance, numerous small steamers are employed conveying oil from the Baku district to other ports, and to towns along the Volga; and in other places small steamers are used for the local distribution of oil brought across the ocean and stored in large depots. Such a small steamer is the " Chira," built by Smith's Dock Company in 1909; in size and appearance this vessel

resembles a steam trawler, she is 95 ft. long, 19 ft. 3 in. beam, depth moulded 7 ft. 9 in., 108 tons gross, 46 tons net tonnage. The fish hold is in this vessel replaced Dy a tank for carrying oil inbulk and a hold for case oil. Vessels of 6000 to l2,oco tons carrying capacity are now preferred by the large companies for trans- porting oil over very great distances on account of their relatively great economy. Fig. 12 shows the general arrangements of a typical modern oil tank steamer. As an example of a large oil vessel, the " Pinna," engaged in carrying petroleum from Russian ports to the East, may also be mentioned. She is 420 ft. long, 52 ft. broad, and 32 ft. deep, and can carry 9000 tons of oil in her fully-laden condition. The machinery is placed well aft, and the cargo space is divided up into twelve large tanks, extending to the height of the main deck, by seven transverse bulkheads and a longitudinal middle-line bulkhead. The spaces between the transverse bulkheads are called Nos. 1,2,3, 4, 5 and 6 holds respectively, and each hold has a port and a star- board tank. Each tank is provided with an expansion trunk, in order that the free surface of the oil may always be small, however much the bulk of the latter may expand or contract with changes of temperature.

Motor Tank Vessels. — Several oil tank vessels have been fitted with internal combustion engines instead of steam propelling machinery In 1903 the " Vandale " and " Sarmat," capable of carrying 750 tons of refined petroleum each, were built for Messrs Nobel Bros., and

fitted with Diesel motors of 360 H.P. More recently the " Emanuel Nobel " and " Karl Hagelin " have been built for the same firm; they are fitted with Diesel motors of 1200 H.P., are 380 ft. long,

combined, and is fitted with one deck, but has twc tiers of beams. B (fig. 14, Plate II.) is a vessel with a top-gallant forecastle, bridge-house and poop, and a single deck. C is an awning-decked vessel.

Hold. Fig. 12. — General Arrangement of a Modern Oil-Tank Steamer.

13, Donkey boiler.

14, Galley

I,

Crew space.

5.

Chain locker.

9.

Coffer dam.

2,

Cabins.

6,

Pump-room.

10,

Oil-tank.

3,

Engineers' cabins.

7.

Water-ballast tank.

ii>

Boiler-room.

4.

Store.

8,

Fore-hold.

12,

Engine-room

16, Cargo hatch.

17, Oil and cargo hatch. 15, Steering engine house. 18, Coal shoot.

ifi ft. beam, l6| ft. draught and carry 4600 tons of kerosene oil. The large motor-driven vessels are arranged somewhat similarly to the steam-driven oil-tank vessels, but with the machinery fitted in a comparatively shorter space, no boiler room being then required.

Table X. gives the dimensions, carrying capacity and other leading particulars of four cargo steamers of different types,

with two decks, but three tiers of beams. D is a shelter-decked vessel of the highest class fitted with three decks and four tiers of beams and having machinery of high power. E is an American lake steamer in which the draught was limited to 20 ft., similar in many respects to the smaller vessels shown in fig. 15 (Plate II.) and in fig. 16 below. Besides the principal dimensions and light and load displacements,

Table X. — Types of Cargo Carrying-Steamers.

When built

Type of Vessel

Length

Breadth

Depth (moulded)

Draught (without keel)

Weight of steel or iron in hull ....

,, wood, outfit, &c

„ propelling machinery .

Total light displacement

Load displacement

,, block coefficient

Ratio of light to load displacement

Dead-weight carried

Ratio of dead- weight carried to load displacement

Cargo capacity in cubic feet

Tonnage under deck

,, gross

,, net

Water-ballast capacity

A. Builtini88i

Well- decked.

263′ 6″ 35′ 8″ 20′ 6″ 19′ 3″

820 tons

166 ,,

184 „

1170 ,,

374° „ •72

•313

2570 tons

•687

115,000

H36

1816

1 167

357 tons

B. Built in 1894.

With Top-gallant

Forecastle,

Bridge House

and Poop.

300′ o” 40′ o”

23′ 6″ 19′ 2″

1620 tons 5530 „ •80

•293 3910 tons

■707

170,000

2150

2385

1500

500 tons

C. Built in 1897.

Awning-decked.

470′ o”

50′ o”

34′ 10″

27′ 5″

3676 tons

509 ..

615 „

4800 ,,

16,710 ,,

•81

•287

11,910 tons

•713

680,000

7038

7296

4770

3346 tons

D. Built in 1909.

Shelter-decked.

535 o” 63′ o” 38′ o” 28′ o”

*7650 tons *

2200 tons 9850 „ 18,350 „ •68

‘537

8500 tons

•463

8480

12,100

6780

E. Built in 1909.

American Lake Steamer.

580′ o”

58′ o”

32′ o”

19′ o”

4145 tons

300 „

350 „

4795 ,,

15.795 –

•886

•304

1 1 ,000 tons

•696

650,000

7100

7268

5484

9464 tons

and one .steamer carrying mails and passengers as well as a large cargo. A is a well-decked vessel (fig. 13, Plate II.), having a top-gallant forecastle with a long raised quarter-deck and bridge-house

the block ” coefficients ” corresponding to the load conditions are given in Table IV., in order to show the fullness of form commonly adopted in these vessels. The block coefficient is the ratio of the

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volume of the immersed portion of the ship to the volume of the parallelepiped, whose length, breadth and depth are the same as the length, breadth and mean draught (without keel) of the vessel itself; and it will be seen that in three cases out of the five given, the immersed volume, i.e. the displacement, is 80, or upwards of 80% of this circumscribing parallelepiped. The low speed, which is

^

!H

b a

B B

Fig. 16. — Plan of Great Lake Cargo Steamer.

A,

Cargo hold.

D

Boiler-room.

G, Crew's space.

B,

Hatches.

E,

Coal-bunker.

H, Water ballast.

c,

Engine-room.

F,

Officers' Quarters.

K, Pilot-house.

found economical for the " ocean tramp," admits of this fullness, and

provides that capability for large stowage accommodation for cargo which has brought it into existence, fn vessels whose speed is of great importance the block coefficient varies from -5 to -68, the lower limit being reached on the smaller vessels on cross-channel services, and the higher limit on very long vessels, such as Atlantic liners. In the moderately fast vessel D shown in table the block coefficient is ■68. The total weight of materia! in the hull, i.e. the iron or steel and woodwork, outfit, &c. and the propelling machinery, is called the vessel's light displacement. The load displacement is made up of the light displacement, together with the weight of the cargo, &c, or the dead-weight carried; this, it will be seen from Table X., varies from two to two and a half times the amount of the light displace-

their machinery of 500 I.H.P. is placed amidships and gives a speed of 12 knots; two saloons are arranged forward and two aft with access to a promenade deck from each, accommodation for 200 passengers with luggage being provided. A light wooden awning extends over all. These vessels are built of steel and divided into eight water-tight compartments; they were built and put together at Southampton, then taken to pieces, packed and shipped abroad, re-erected and completed at Calcutta.

The largest ferry-boats are to be found in America, and an interesting example is the " Hammonton " built in 1906 by the New York Shipbuilding Company. She is 168 ft. long overall, 38 ft. beam, 8 ft. 6 in. draught, 625 tons displacement. A feature of this vessel is that all details are arranged with the view to making the vessel practically fireproof, wood fittings being reduced to a minimum. The vessel is double-ended, carries over a thousand passengers and a large number of horses and vehicles on one deck. As in many American river vessels, the upper works extend to a considerable width beyond the body of the hull beneath to give large deck areas; the main deck being about 6 ft. above water and 55 ft. wide. Cart tracks are arranged along the midship portions of the deck with passenger saloons, &c, at the sides. A light shade deck extends forward and aft and carries a pilot house near each end. Water-tube boilers and three cylinder compound engines of 600 H.P. are fitted beneath the deck amidships and drive a propeller at each end of the boat. The " Oakland," " Berkeley " and " Newark " running at San Francisco are much larger than the " Hammonton," and have a seating capacity for 2000 people each, with a fine promenade deck above the upper deck. The first two are fitted with beam engines driving side paddle-wheels, while the third has a screw propeller at each end of the vessel driven by vertical triple expansion engines. Each of them burns oil fuel only.

River and Sound Steamers. — For service on rivers, harbours and estuaries where the traffic is considerable, paddle-wheel vessels oi limited speed are usually preferred, as possessing great manoeuvring power, and therefore the capability of being brought alongside the landing-places with rapidity and safety. The paddle-wheel steamer

Fig. 19. — Great Lake Passenger Steamer " City of Cleveland," longitudinal section.

ment, except in case D in which the machinery and the passenger accommodation absorb much weight. British vessels may not be loaded deeper than a certain mark, known for many years as the Plimsoll mark, which has to be placed on the sides of all merchant vessels. The mode of measuring tonnage is based on the Act of 1894, which embodies preceding legislation and subsequent Acts (see Tonnage).

The numerous varieties of passenger steamers may for convenience

be taken in the following order : — Ferry ; River and Sound ;

asseager Q ross channel; and Ocean Steamers; although it must

s earners. ˆ unc i ers t 00(j (-(ia (: ; n ma ny cases a hard and fast line

cannot be drawn between steamers for the several services.

Ferry Steamers. — Ferry steamers are found on many rivers and harbours in the United Kingdom ; they perform important services in transporting passengers and road traffic across sheltered waters where bridges are not available; and others are built in the United Kingdom for service in all parts of che world. The " Guanabacoa," a double-ended steel vessel built by Messrs Cammell, Laird & Co., for ferry service on Havana Bay, is 140 ft. long overall, breadth moulded 38 ft., depth moulded amidships 13 ft. 2J in. Well-decorated saloons 12 ft. high extend along the sides of the vessel, and between them are wood-paved tracks for 30 to 40 carts and horses. One thousand passengers can be carried, and a fine promenade deck for them extends over the saloons, &c. Above all a liˆht sun deck extends right fore and aft. Compound surface-condensing engines are fitted with a screw propeller at each end of the vessel, which drive her either way at from 10 to II knots. She made the passage to Havana under her own steam. A number of ferry-boats have been built by Messrs Thornycroft for service in India; they are 105 ft. long overall, of 20 ft. beam, 10 ft. moulded

depth and 5 ft. draught;

" City of Cleveland," midship section.

" La Marguerite," which formerly in the summer months made trips from London to the coast of Kent and to France, now conducts service between Liverpool and North Wales. She is 330 ft. long, has accommodation for a large number of passengers, and ob- tained 22 knots with 7500 I.H.P. on trial. Another well-known Thames steamer is the " Royal Sovereign," of length 300 ft., breadth 33 ft., depth moulded 10 ft. 6 in., draught 6 ft. 6 in., tonnage 891 tons gross, 190 tons net; carrying 2320 passengers at a speed of 21 knots.

Excursion steamers working round the coast are frequently of similar type to this vessel, but of less length and less extensive open promenade decks. A popular south coast pleasure steamer, built in 1909, is the paddie boat " Bournemouth Queen," shown in fig. 17 (Plate X.). She is 200 ft. long, 24 ft. breadth moulded and 48 ft. 6 in. outside guards, 8 ft. moulded depth, tonnage 353 tons gross, 139 tons net; she can carry 610 passengers on a No. 3 certificate and 704 on a No. 4 certificate. Her displacement at 5 ft. 2 in. load draught is 406 tons and her speed 15J knots. The " King Edward," a steamer which began to ply on the Clyde in 1901, is 250 ft. long, 30 ft. wide, 10 ft. 6 in. deep to the main deck, and 17 ft. 9 in. to the promenade deck. She was the first passenger steamer to be driven by Parsons steam turbine. Her speed is 20 knots. A second turbine steamer, the " Queen Alexandra," began to run on the Clyde in 1902; she is generally similar to the " King Edward," but larger and faster.

These vessels are popular because of their great speed and the absence of vibration. They have been followed by others such as the " Kingfisher " on the Thames and the " Atalanta " on the Clyde. The latter being 227 ft. long, 27 ft. beam, depth 10 ft. 6 in., draught 5 ft. 6 in., displacement 520 tons and gross tonnage 400; the machinery of 2500 H.P. gives a speed of 18 knots, and isof interest as it was utilized for very extensive shop experiments to obtain data for the construction of the turbines of the great Cunarders. Numerous steamers of this class are to be found on the rivers and coasts of the

Continent, but the finest are employed on the rivers and harbours of America, together with large numbers of a smaller class. Most of the light-draught river steamers of the United States are built of wood, but those employed elsewhere are usually built of steel. The " Hendrick Hudson " (fig. 18, Plate III.), built of steel in 1906, one of the most famous river boats of America, carries 5000 passengers, for whom five decks, which have a breadth of 82 ft. — the full width over the paddle-boxes — are set apart. She is 380 ft. long, 45 ft. breadth moulded, 13 ft. 5 in. moulded depth, draught 8 ft., freeboard amid- ships 6 ft. 3 in., tonnage gross 2847 tons. The old walking-beam arrangement of engines, for many years a distinctive feature of American river steamers, is in this vessel replaced by inclined, three-cylinder, compound, direct acting engines; her feathering paddle wheels are 24 ft. in diameter and 16 ft. 6 in. wide, and her speed is 22 knots.

Some of the boats of the Fall River Line are larger than the " Hendrick Hudson " ; the " Puritan " is 420 ft. long, of 7500 I. H.P. and 4650 tons gross; the " Priscilla," built in 1904, is very similar to the " Puritan," but is 440 ft. long and 2o| ft. depth moulded; her moulded breadth is 52J ft. and her decks extend to an extreme breadth of 93 ft. ; her tonnage is 5292 tons gross; the side wheels are 35 ft. in diameter and 14 ft. wide, driven by inclined engines of 8500 I.H.P., and running at about 24 revolutions per minute maintain a speed of about 15 knots on service. A still larger vessel of the same type is the " Commonwealth," which is 456 ft. overall; breadth of hull 55 ft. , breadth of decks outside guards 96 f t. , horse power 1 1 ,000. The " Puritan," " Priscilla " and " Commonwealth " run on night service only to Fall River through Long Island Sound, and the accommodation provided is very large; the " Priscilla," for instance, can sleep 1500 persons besides her crew of over 200. In these vessels the freeboard is carried to one deck higher than in the " Hendrick Hudson," to enable them to accomplish the exposed ocean portion of their passage with safety; and they form a link between the fast river steamer and the fast cross-channel steamer. Similar passenger vessels are employed on the Great Lakes, an example being the " City of Cleveland " (fig. 19), built in 1908, of the following dimensions: length overall 404 ft., breadth hull proper 54 ft., width over paddle-boxes 92 ft. 6 in., depth 22 ft.; tonnage 4568 tons gross, 2403 tons net. She is built of mild steel, divided into 10 principal water-tight compartments and fitted with a cellular double bottom, and has a water chamber of 100 tons capacity to check rolling in a sea way. The engines are compound, three-cylinder, inclined, connected directly to cranks on the paddle-wheel shaft, the diameters of the

cylinders being one of 54 in. and two of 82 in., and the stroke 8 ft. ; eight single-ended cylindrical boilers fitted with Howden forced draught supply steam at 160 lb, and on service the vessel can maintain 20 m. or 17-5 knots per hour without difficulty, developing about 6000 I. H.P. at 28 revolutions per minute.

Cross-Channel Steamers. — Cross-channel steamers are of a heavier type than those just considered and require higher freeboard and better sea-keeping qualities to be able to make passages across more exposed waters in all weathers. Over 200 such vessels are employed carrying mails, passengers, luggage, cattle and merchandise between Great Britain and Ireland, the Isle of Man, and continental ports. The mail service between Holyhead and Kingstown has for many years employed a number of splendid vessels of this class. The four paddle-steamers, " Ulster," " Munster," " Leinster " and " Connaught," built in i860, were 337 ft. long, 35 ft. broad and 19 ft. deep; their speed was 18 knots with 6000 I. H.P. A vessel of the same type, but larger, named the " Ireland," was added to the fleet in 1885. In 1896 and 1897 four new twin-screw steamers were built, and received the same names as the four vessels built in i860, which they have replaced. Their length is 360 ft., breadth 41 ft. 6 in., depth 29 \ ft., tonnage 2633 tons gross, 733 tons net, and displace- ment 2230 tons at 14 ft. 6 in. load draught. Their engines are of 9000 f.H.P. and sea-going speed 23 knots, over 24 knots having been

reached on trial. They have sleeping-berths for 238 first-class and 124 second-class passengers, and large dining and other public rooms for general accommodation.

In recent years large numbers of very fine vessels of the cross-channel type have been built for other services. In 1903 the " Queen," the first turbine vessel for the Dover-Calais service, was built by Messrs Denny of Dumbarton; she is 310 ft. long and obtained 2iJ knots. In 1905 the " Invicta " was built of the same dimensions and boiler power, and by means of improved turbines the speed was increased to 23 knots. In the same year the Midland Railway Company ordered three vessels each 330 ft. long, 42 ft. beam and 25 ft. 6 in. moulded depth ; and a fourth similar but a foot wider. Two of these vessels, the " Antrim " and " Donegal," were fitted with four-cylinder triple-expansion engines driving twin screws ; the chird and fourth, the " Londonderry " and " Manxman," were fitted with turbines of 6000 and 8000 H.P. respectively. All had cylindrical boilers of the same dimensions. The " Antrim " did better than the " Donegal " and obtained a speed of 21-86 knots with very re- markable economy; of the turbine vessels, the " Manxman " did

better than the " Londonderry," reaching 23-12 knots, and proving more economical than the " Antrim " at all speeds above 14 knots.

Other successful vessels of this class are the " St George " and three sister vessels, 350 ft. long, 2500 tons displacement, 11,000 H.P. and 22 J knots speed, built for the Great Western Railway Company for service from Fishguard to Rosslare; and the " Princesse Elisabeth," of 24 knots, employed on the Dover-Ostend service. But all these vessels were surpassed by the " Ben-my-Chree," built at Barrow

Boar Desk promenade Deck Shelter Deck ■

Upper Deck

Main Deck

Lower Deck ■

Orlop Deck

I oryer Orlop Deck

Fig. 29. — Section of " Mauretania."

for the Isle of Man Steam Packet Company. She is 375 ft. long, 46 ft. beam, 18 ft. 6 in. moulded depth, carries 2549 passengers on a No. 2 certificate, and displaces 3353 tons at 13 ft. 5 in. draught. On trial she attained 25J knots on the measured mile, and maintained 24J knots for over 6 hours; on service she averages 24 knots at sea and 23 knots between the Liverpool landing stage and Douglas pier. Numbers of cross-channel steamers are owned by continental companies, among which the " Prinses Juliana " (fig. 20, Plate III.) and her two sister vessels, belonging to the Zeeland Steamship Company of Holland, run on the night service between Queenboro' and Flushing. They are 350 ft. long, 42 ft. 6 in. beam, 16 ft. 4 in. depth, gross tonnage 2885 tons; they have four-cylinder triple-expansion engines of 10,000 H.P., and attained 225 knots on the mile, and 22 knots on a six hours' run ; they have excellent accommodation for 350 passengers.

For services on which relatively large cargoes and fewer passengers are carried smaller vessels of less speed are built, such as the " Rowan," built by Messrs D. & W. Henderson & Co. for the Laird Line service between Glasgow and Dublin. She is 292 ft. long, 38 ft. beam, 17 ft. 6 in. depth moulded, has sleeping accommodation for 200 passengers, triple-expansion engines, and a speed of 16 knots.

In America a number of vessels of the cross-channel type have recently been built. One of these, the " Governor Cobb," 290 ft. long, 54 ft. beam, 20 ft. 6 in. moulded depth, 14 ft. draught loaded, was the first merchant vessel in America to be driven by turbines. She was followed by the " Harvard " and " Yale "' of the same type, 407 ft. overall, 63 ft. extreme breadth, 16 ft. draught loaded; they carry 800 passengers and 600 tons freight on a night service between New York and Boston ; turbines of 10,000 H.P. give them a speed of 20 knots, making them at the time the fastest sea-going vessels on the American coast.

The " Prince Rupert," " Princess Charlotte," &c, recently built for service on the western coast of Canada, also belong to this section. The first-named (fig. 21, Plate III.) is 306 ft. long, 42 ft. beam, 24 ft. moulded depth. At 15 ft. draught her displacement is 3150 tons, of which 1 000 tons is cargo; she is of 3379 tons gross, 6000 I.H.P. andher speed i8J knots. The " Prince George " is similar to the " Prince Rupert " and obtained 19-2 knots on trial at 13 ft. 3 in. draught and 2622 tons displacement ; both vessels can carry 220 first-class and a

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Plate III.

•MJtMMMEMMB- :

Fig. 18. — American River Steamer Hendrick Hudson.

Fig. 21.— Canadian Coasting Steamer Prince Rupert,

Plate IV.

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Fig. 22. — Early Cunard Steamer Persia.

Fig. 23. — Inman Liner City of Rome.

Fig. 24. — Cunard Liner Campania.

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large number of second-class passengers. The ” Princess Charlotte ” is of 3600 tons and 20 knots speed.

Japan has built and engined two cross-channel steamers, which maintain a service between Japan and Korea. They are 335 ft. long, 43 ft. beam, gross tonnage 3200, displacement, at 17 ft. draught, 3880 tons. Parsons turbines of 8500 H.P., made in Japan, are fitted and give a speed of 21 knots.

Ocean Liners. — The article on Steamship Lines gives an account of the rise of the great shipping companies. The steamships of 12,000 tons and upwards, referred to on page 873, are shown in Table XI. : —

Table XI. — Vessels of 12,000 Tons and upwards afloat June igio.

Name.

Gross Tonnage

British. 1 Mauretania Lusitania Adriatic Baltic . Cedric . Celtic Caronia Carmania Oceanic Arabic Laurentic Megantic Minnewaska Saxonia Empress of Ireland Empress of Britain Ivernia

31,938 31,550 24,541 23,876 21,035 20,904 19,687 19,524

17,274 15,801 14,892 14,878

14,317 14,281 14,191 14,189 14,067

326,945

25 other vessels of 12,000-14,000 tons 317,358

42 vessels. Total 644,303

Dutch. Rotterdam Niew Amsterdam Noordam Rijndam Potsdam

24,149 16,967 12,531

12,527 12,522

5 ships. Total . 78,696

A merican.

Minnesota 2 . . 20,718

Manchuria . . 13,639

Mongolia . . . 13,639

3 ships. Total . 47,996

Name.

Gross Tonnage

German.

George Washington . . 25,570

Kaiserin Auguste Victoria 24,581

Amerika 22,622

Kronprinzessin Cecilie . 19,503

Kaiser Wilhelm II. . . 19,361

President Lincoln . . 18,168

President Grant . . . 18,072

Berlin 17,324

Prinz Friedrich Wilhelm 17,082

Cleveland 16,960

Deutschland 16,502

Cincinnati 16,339

Kronprinz Wilhelm . . 14,908

Kaiser Wilhelm der Grosse 14,349

8 other vessels of 12,000- 14,000 tons

261,341 103,435

22 ships. Total

364,776

Lapland Finland Kroonland Vaderland

Belgian.

17-540 12,185 12,185 12,018

4 ships. Total

53,928

La Provence

Espagne

French.

13,753 13,600

2 ships. Total

27,353

Japanese. Tenyo Maru 3 ... 13,454

Chiyo Maru 13,426

2 ships. Total

26,880

Summary.

Country.

Ships in No.

Gross Tonnage.

Average (Tons).

British

42

644,303

15,341

German .

22

364,776

16,581

Dutch . .

5

78,696

15-739

Belgian

4

53,928

13,482

American

3

47,996 ■

15,999

French

2

27,353

13,676

Japanese

2

26,880

13,440

Grand Total

80

1,243,932 .

15,549

Atlantic Liners. — The Atlantic liners running between Europe and the United States of America are the best known of all ocean liners ; they exhibit the highest attainment of excellence in merchant-ship building, and their great size and speed, and continuous rivalry, excite universal interest.

Particulars of the famous liners which have had a share in the development of the trans-Atlantic service from 1819 to 1900 are given in Table XII., some of which is taken from The Atlantic Ferry by A. J. Maginnis. The " Persia " (fig. 22, Plate IV.) was the first iron steamer to be placed on the Atlantic service by the Cunard Company (1856). She was followed two years later by the " Great Eastern," 688 ft. long, 82-8 ft. broad, 48-2 ft. depth and 32,160 tons displacement with a gross tonnage of 18,915 tons and 11,000 H.P., giving her a speed of 13 knots by paddle-wheels and screw. She was built from designs by I. K. Brunei, and remained the

1 “Titanic,” launched October 10, 43,500 tons.

! Sister vessel ” Dakota ” was lost on Japan coast March 1907.

3 A third vessel of same size was being completed

largest vessel afloat until the ” Cedric ” was built 45 years later. Fig. 23 is the ” City of Rome,” built in 1881 at Barrow for the Inman Line, one of the most graceful vessels placed on the Atlantic. The ” Campania ” (fig. 24) and her sister-ship the ” Lucania,” each 600 ft. long and built in 1893 for the Cunard Company by the Fairfield Shipbuilding Company, held the record for fast passages across the Atlantic for several years. With twin screws and triple-expansion engines they attained a speed of 23! knots on trial with 31,050 I.H.P. On her best runs the ” Lucania ” crossed the Atlantic, 2823 nautical miles, in 5 days 8 hours 38 minutes, the mean speed being 22 knots for the run, maintained with a consumption of coal amounting to 20J tons an hour.

In the ‘fifties the Collins Line took the record for speed to America, but, apart from that, the competition was chiefly between British companies until 1897, when the ” Kaiser Wilhelm der Grosse ” made a better record than the ” Campania ” or ” Lucania,” and for ten years from that date the fastest vessels were in German hands. The ” Deutschland ” (fig. 25, Plate V.), built at Stettin for the Hamburg-American Line, took the record in 1900, traversing the Atlantic from New York to the Eddystone in 5 days 17 hours 28 minutes, at a mean speed of 23-36 knots. The North German Lloyd Co. added three splendid vessels: the ” Kronprinz Wilhelm ” in 1901, the ” Kaiser Wilhelm II.” in 1902, and the ” Kronprinzessin Cecilie” in 1906, the machinery being respectively of 35,000,42,000 and 45,000 I.H.P. and forming the finest series of reciprocating engines ever built for ships. The ” Kaiser Wilhelm II.” raised the record on the home- ward run to 23-71 knots, and made practically the same speed as the ” Deutschland ” on the outward run, viz. 23-12 knots. The ” Kron- prinzessin Cecilie ” (fig. 26, Plate VI.) raised the outward record to 23-21 knots, and homeward her best passage was at 23-58 knots.

In 1903 the British government made an agreement with the Cunard Company under which two vessels of 24 to 25 knots speed across the Atlantic were to be built for mail and passenger service, and to be available for the use of the Admiralty in time of war. In accordance with this agreement the ” Mauretania ” (fig. 27, Plate VI.) was built by Swan, Hunter, Wigham Richardson & Co., and the ” Lusitania ”

by John Brown & Co., and both were supplied with Parsons turbines of 70,000 H.P. driving four screws. The latter vessel was the first on service in 1907, and at once regained for Great Britain the Atlantic record, the " Mauretania " following a little later and doing still better. Both vessels maintained very high speeds, and steadily improved their records, until the " Mauretania " averaged 26-06 knots and the " Lusitania " 25-85 knots on the passage. They are 790 ft. long overall, of 88 ft. beam, 57 ft. moulded depth, 42,000 tons displacement on a draught of 33i ft. and of 32,000 tons gross tonnage. They are thus 100 ft. longer, 5 ft. wider^ 6000 tons more displacement and of 70 % greater gross tonnage than the " Great Eastern." Figure 28 is a section of the " Mauretania," which shows clearly the great height of the decks.

The French liner " La Provence " was built in 1905, of 13,753 tons gross, and 22 knots speed. On her displacement of 19,160 tons she must carry about 3500 tons of coal for the! voyage, which leaves a margin of about 900 tons for passengers and cargo. The " France," launched September 10, is of 23,000 tons, 45,000 H.P. and 23! knots. _ A notable tendency in recent years is to build vessels of great size to run at more moderate speeds. The American liners " St Louis " and " St Paul " (fig. 29, Plate VII.), built in 1895, are of 11,630 tons gross and 21 knots; while the " Finland " and " Kroon- land," built in America in 1902, are of 12,185 tons and only 16 knots. The last-named vessels are now running under the Belgian flag (see Table XII.). The" Caronia " and " Carmania," built by the Cunard Company in 1905, furnished evidence of the advantage of the turbine for Atlantic liners, and also illustrate the gain due to a lower speed. Their dimensions are given in Table XII.; as compared with " La Provence " it will be seen that they are of 12,000 tons greater displacement, 2 knots less speed and 10,000 less H.P. Allowing for the voyage two-thirds the quantity of coal carried by " La Provence," these vessels thus have a margin of about 10,000 tons compared with the 900 tons of that vessel, so that a much larger quantity of cargo may be taken when required. The" Rotterdam," of 24, i70tons gross tonnage, can load to a displacement of 37,200 tons. Her speed is 17 knots; the reduction of engine- power gives space and weight for no less than 3585 passengers and nearly 13,000. tons of cargo after allowing for accommodation of crew and for coal, water and stores for the voyage. The second " Oceanic," of 17,274 tons (fig. 30, Plate V.), built in 1899 for the White Star Company, was the largest vessel then built and had 21-5 knots speed; she was followed by the " Celtic," " Cedric," " Baltic " and " Adriatic " for the same company, of 16 to 18 knots speed and size increasing up to nearly 25,000 tons

gross. These vessels each carry about 3000 passengers as well as a crew of 350 and upwards, and very large cargoes. The " Adriatic " (fig. 31, Plate VII.) is of 24,541 tons gross, 30% greater tonnage than the " Great Eastern." The " Titanic " and " Olympic," which in 1910 were in course of building by Harland & Wolff for the White Star Line, are not only much larger than the " Adriatic," but they are 90 ft. longer, of 13,000 tons greater tonnage and of 18,000 tons greater displacement than the " Mauretania " ; a combination of reciprocating and turbine machinery of 50,000 H.P. is provided for driving the vessels at a speed of 21 knots.

Table XII. — Showing Dimensions, &

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Famous At

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Name of Ship.

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Feet.

Tons.

Knts.

Lb.

Savannah ....

Colonel Stevens

1819

New York

Wood

130

26

16.5

1,850

320

6

Paddles

10

90

Royal William .

City of Dublin Co. .

1838

Liverpool

”

145

27

17-5

1,980

720

7-5

”

5

400 600

Sirius ....

Brit. & Amer. St. Nav. Co.

1838

Leith

”

178

25-5

18.25

1,995

703

8-5

”

IS

Great Western .

Great Western S. S. Co. .

1838

Bristol

212

35-3

23-25

2,300

1,340

8.5

”

IS

750

British Queen

Brit. & Amer. St. Nav. Co.

1839

London

ty

275

37-5

27.0

2,970

1,863

8

,,

15

700

Britannia ....

Cunard ....

1840

Greenock

,,

207

34-5

22.5

2,050

1,150

8.5

,,

12

740

Great Britain

Great Western

1843

Bristol

Iron

274

48.2

31-5

5,780

3,27o

11

Single Screw

25

1,500

America ….

Cunard ….

1848

Greenock

Wood

251

38

25-3

4,250

1,825

10.25

Paddles

13

1,400

Asia

Cunard ….

18,0

tf

268

45

24

3,620

2,227

12

”

IS

2,000

Arctic

Collins ….

1850

New York

282

45

31-5

6,200

2,860

12.5

”

17

2,000

Persia

Cunard ….

1856

Glasgow

Iron

360

45

29.9

7,130

3,300

12.5

”

20

3,600

Adriatic ....

Collins ....

1857

New York

Wood

3SS

50

35-0

7,564

3,670

135

”

25

4,000

Great Eastern .

Great Eastern S.S. Co.

1858

Millwall

Iron

680

82.8

48.2

32,160

18,915

13

S. Screw and Paddles

30

11,000

Scotia

Cunard ....

1862

Glasgow

)t

379

47-8

30-5

7,600

3,871

13S

Paddles

25

4,000

City of Paris

Inman ....

1866

,,

,,

346

40.4

26.2

6,411

2,651

135

Single Screw

30

2,600

Russia

Cunard ....

1867

,,

it

3b8

43

28.8

6,770

2,959

13-5

» > >

25

2,500

City of Brussels

Inman ....

1869

,,

tt

390

40.3

27.1

6, goo

3,o8l

14-5

>, >,

30

3,000

Oceanic ....

White Star

1871

Belfast

,,

420

41

31

7,240

3.707

14-75

» ,,

6S

3,000

City of Richmond

Inman ....

1874

Glasgow

,,

441

43-5

34

9,320

4,623

15

> > ‘,,

70

4,000

Britannic . .

White Star

1874

Belfast

,,

4SS

45- 2

33-7

9,600

5.00.0

16

r, „

75

5,100

City of Berlin

Inman ....

1875

Greenock

,,

4S8.5

44.2

35

10,100

• 5,491

16

i> ,,

75

5,200

Arizona ....

Guion ....

1879

Glasgow

,,

450.2

45-4

35- 7

9,900

5,147

16.25

,, ,,

90

6,300

Servia

Cunard ....

1881

,,

Steel

SIS

52 1

37-9

12,300

7,392

16.5

,, >,

90

12,000

City of Rome

Inman * . . . .

1881

Barrow

Iron

560.2

52 -3

37

13,500

8,144

17-5

> > ,,

90

11,500

Alaska

Guion

1881

Glasgow

fl

500

50

38

9,500

7,142

17-75

,, ,,

100

ZI.OOO

Notting-Hill

Notting-Hill S. S. Co.

1881

Steel

420

45-1

26.5

6,210

3,920

12

Twin Screw

100

2,800 8,500

Aurania ...”

Cunard . . . .

18S2

M

470

57-2

37-3

13,360

7,209

17

Single Screw

90

Oregon ....

Guion and Cunard

1883

Iron

SOI

54-2

40

12,500

7,375

19

» >,

no

13,000

America ....

National ....

1884

Steel

432

51-3

38.6

9,55o

5.S28

lS.75

,, ,,

95

8,300

Etruria ....

Cunard .

1S85

,,

SOI

57 3

38.2

13,300

8,120

19-5

,, ,,

no

14,500

Ailer .....

North German Lloyd

1 886

,,

,,

438

48

34-6

10,460

5,400

16-5

,,

150

8,200

City of Paris (second of

name) ....

Inman ....

1889

,,

M

527.6

63.2

39-2

17,650

10,670

21

Twin Screw

150

18,500

Teutonic ....

White Star

1889

Belfast

M

566

57-8

39-2

16,740

9,984

20

> > „

180

17,500

Fiirst Bismarck.

Hamburg-American

1890

Stettin

„

502.6

57-6

38

15,200

8,874

19-5

„ >,

160

■65

17,000

Campania ....

Cunard ....

1893

Glasgow

„

598

65

43

21,000

12,950

22

> > >,

30,000

St Louis ....

American ....

189s

Philadelphia

,,

S3S-7

63

42

16,000

11,630

21

>, „

200 178 226

20.500

Kaiser Wilhelm der Grosse

North German Lloyd

1897

Stettin

,,

625

66

43

23,760

14,350

23

> > > >

32,000

Kaiser Friedrich.

North German Lloyd

1898

Danzig

,,

584

64

41

20,100

1 2 ,000

21-5

,, >j

27,000

Oceanic (second of name) .

White Star

1899

Belfast

,,

685

68

44-5

26,100

17,274

21-5

>, ,,

192

29,000

Deutschland . (second of

36,000

name) ....

Hamburg-American .

1899

Stettin

,,

666

65.S

45-5

24,400

14,500

2325

>r if

225

Kronprinz Wilhelm .

North German Lloyd

1901

Beff'ast

”

637-3

66.3

39-3

22,300

14,908

23-47

>, >,

213

35,000

Celtic

White Star

1901

”

680.9

75-3

44.1

37,900

20,904

17.0

>• >,

210

13,000

Kaiser Wilhelm II

North German Lloyd

1902

Stettin

,,

684.3

723

40.2

26,000

19,361

23-71

>, »>

213

42,000

Finland ....

Red Star ....

1902

Philadelphia

,,

560.0

60.2

38.4

12,185

16-0

„ > >

170

10 000

White Star

1903

Belfast

680.9

75-3

44.1

38,000

21,03s

16.0

>, >,

210

13,000

Baltic . . . . _ .

White Star

1904

Jt

709.2

75-6

52.6

40,700

23,876

16.0

,, ,,

210

13,000

Kaiserin Auguste Victoria

Hamburg-American .

1905

Stettin

,,

677-5

77-3

50.2

43,000

24,581

17-5

M ,,

213

16,700

La Provence

Cie Ge”nerale Trans-

atlantique

1905

St Nazaire

,,

602.3

650

38.3

19,160

13,753

22.0

,, M

198

30,000

CarmaDia ....

Cunard ....

1 90S

Glasgow

»

650.4

72.2

40

31,000

19,524

20.0

Parsons Turbines 3 Screws

195

21,000

Caronia ....

Cunard ....

I9°S

Beffast

”

650.0

72.2

40.2

31,000

19,687

19.0

Twin Screw

210

21,000

Atnerika ....

Hamburg-American .

190S

”

669.0

74-3

47-8

42,000

22,622

17-5

,, n

210

15,800

Kronprinzessin Cecilie

North German Lloyd

1906

Stettin

,,

685.4

72.2

40.5

27,000

19,503

2358

,, ,,

213

45,000

Nieuw Amsterdam .

Holland Amerika

1906

Belfast

,,

600.3

68.9

35-6

31,000

16,967

16.0

„ ,,

215

10,000

Adriatic ....

White Star

1906

t>

709.2

75- S

52.6

40,800

24,541

18.0

,, ,,

210

16,000

Mauretania ...

Cunard ....

1907

Newcastle

762.2

88.0

57-1

42,000

31,938

26.06

) Parsons Turbines (

) 4 Screws I

195

70,000

Lusitania ....

Cunard ....

1907

Glasgow

Jt

762.2

87.8

56.6

42,000

31,550

25.85

195

70,000

Rotterdam ....

Holland Amerika

1908

Belfast

”

650.5

77-4

435

37,200

24,149

17.0

Twin Screw

215

15,000

Lapland ....

Red Star ....

1908

f ,

”

605.8

70.4

37.4

30,500

17,540

17-5

» > >

13,000

George Washington

North German Lloyd

1908

Stettin

”

69g.l

78.2

50.1

37,000

25,57°

19.0

» ,?

213

20,000

Minnewaska

Atlantic Transport Co.

1909

Belfast

”

600.3

654

39-6

26,530

14,317

16.0

“1 Combination of Par- t sons Turbines and

21 +

11,000

Titanic ....

White Star

1910

M

850.0

93-5

645

52,300

43,500

21.0

21S

50,000

Olympic ....

i

White Star

”

”

850.0

92 5 j 64-5

52,300

43,5oo

21.0

1 Reciprocating En- J gines, 3 Screws

215

50,000

The Hamburg-American Company followed a similar course to the White Star Line and added two large vessels of 17I knots speed — the " Amerika " of 22,622 tons gross, built by Messrs Harland & Wolff, and the " Kaiserin Auguste Victoria " (fig. 32, Plate VII.), of 24,581 tons gross, built at Stettin. The largest German vessel afloat in 1910 was the " George Washington," built in 1908 at Stettin for the North German Lloyd.

The Hamburg-American Company ordered in 1910 two vessels, not only much larger than the " George Washington," but exceed- ing even the " Olympic " in dimensions. They were said to be over 900 ft. long over all, 94 to 95 ft. beam, 20,000 tons gross greater tonnage than the " George Washington," 13,000 tons more than ' ' Mauretania ' ' and 2000 tons more than ' ' Titanic ' ' and ' ' Olympic ' ' ; turbines of 60,000 to 70,000 H.P. being provided to maintain a speed of 22 knots across the Atlantic. The Cunard Company ordered in Dec. 1910 a 50,000-ton turbine-driven ship from John Brown & Co., to steam at 23 knots on service.

The " Minnewaska " of the Atlantic Transport Company is typical of vessels on the Atlantic route carrying a large cargo together with a limited number of passengers of one class. Three hundred and twenty-six first-class passengers are carried and provided with ex- cellent accommodation. When fully loaded the displacement is over 26,000 tons and the speed 16 knots; the horse-power required being

only a sixth that of the fast Cunarders. To large numbers of pas- sengers the additional period on the voyage is no disadvantage, while the transport of a large cargo at the relatively high speed of 16 knots is a great advantage.

Canadian Liners. — With the increasing trade between Europe and Canada the direct Canadian liners increased in numbers and im- portance, and now bear favourable comparison with the great liners running between Europe and the United States. The " Victorian " and " Virginian " of the Allan line, built in 1904 and 1905 and plying between Liverpool and Montreal, were the first ocean liners to be fitted with Parsons turbines; they are 520 ft. long, 60 ft. 5 in. beam, 38 ft. moulded depth and 10,629 tons gross; and they can carry 1500 passengers and a large cargo at a speed of 17 knots. They were followed in 1906 by the " Empress of Britain " and " Empress of Ireland," built by the Fairfield Company for the Canadian Pacific Railway Company; they are 570 ft. long over all, 549 ft. between perpendiculars, 65 ft. 6 in. beam, 36 ft. 8 in. depth moulded, tonnage 14,189 gross tons, displacement 20,000 tons at 28 ft. draught; quadruple-expansion engines of 18,000 I. H.P. are fitted and a speed of over 20 knots was obtained on trial. Excellent accommoda- tion is provided for 1580 passengers; and a considerable quantity of meat can be carried in insulated holds provided with refrigerating arrangements, besides a large general cargo, a total of 6500 tons

SHIP

Plate V.

" WP " ' .-%B|I

Fig. 25. — Hamburg-American Liner Deulschland.

Fie. 30.— White Star Liner Oceanic.

24

Plate VI.

SHIP

Fig. 26. — North German Lloyd Liner Kronprinzessin Cecilie.

{Stuart, Southampton.)

Fig. 27.— Cunard Liner Mauretania, with Turbinia alongside.

MERCHANT VESSELS]

SHIP

ot cargo being carried in addition to the coals, water and stores required for the passage across the Atlantic.

In 1908 the " Laurentic " and " Megantic " were built by Messrs Harland & Wolff for the White Star Canadian Service ; they are 550 ft. long, 67 ft. 4 in. beam, 41 ft. 2 in. depth moulded and 14,890 tons gross; they can carry 1660 passengers and a very large cargo. The " Laurentic " is provided with reciprocating engines of 6500 I.H.P. in combination with Parsons turbines of 3500 H.P., while the " Megantic " is fitted with reciprocating engines only. On trial the " Laurentic " developed 12,000 H.P. with a speed of 17 J knots, and on service her coal consumption is 12 to 15% less than that of the " Megantic." A service from Bristol to Quebec and Montreal was opened in 1910 by the " Royal George " and the " Royal Edward," which ran for some time in a fast mail service from Marseilles to Alex- andria under the names of " Heliopolis " and " Cairo " respectively. They were built in 1908 and are 545 ft. long, breadth 60 ft., depth 38 ft., tonnage 11,150 tons gross, displacement 15,000 tons at 22 ft. Gin. draught. Parsons turbines of 18, 000 H.P. are fitted, driving three screws at 370 revolutions per minute and giving a maximum speed of 20″ knots, while 19-1 knots has been maintained by the " Royal Edward " from Bristol to Quebec. Accommodation is provided for over 1000 passengers. Still larger and faster vessels were being arranged for in 1910.

Emigrant Vessels. — Many vessels on the Atlantic Service are fitted up for carrying emigrants either with or without other passengers; they are always arranged to carry as much cargo as possible. Ships built for such services include the " Gerania," built by the Northumberland Shipbuilding Company in 1909 for Austrian owners. Her dimensions are: length 402 ft., beam 52 ft. 6 in., moulded depth 27 ft. I in., 4900 tons gross. She can carry 8000 tons dead-weight on 24 ft. draught at a speed of 11 knots, but her 'tween decks are arranged so that they cap. be used to carry cattle, troops or emigrants as required. The " Tortona," built in 1909 by Messrs Swan & Hunter for the Italian emigrant trade to Canada, is 464 ft. long over all, beam 54 ft., depth 29 ft., she is 7900 tons gross and can carry 8600 tons dead-weight as well as over 1000 emigrants. The 'Ancona," built in 1908 by Messrs Workman, Clark&Co. for the Italian emigrant trade to the United States, is 500 ft. long, 8188 tons gross, 7500 I.H.P. ; she can carry 2500 emigrants and a large cargo, and in addition 60 first-class passengers in spacious cabins on a promenade deck amid- ships. Some of the finest vessels carrying

emigrants are the ships of the " Cleveland " type belonging to the Hamburg- American Company. The " Cleveland " is 587 ft. long, 65 ft. breadth moulded, 46-7 ft. depth, 27,000 tons displacement on a draught of 32 ft. 8 in., 13,000 tons dead-weight capacity, about 17,000 tons gross and 10,000 tons net, with machinery of 9300 I.H.P. and 16 knots speed. She can carry 250 first-class, 392 second-class, 494 third-class and 2064 fourth- class or emigrant passengers, making with a crew of 360 a total of 3560 persons, and has cold storage spaces of 10,000 cub. ft. for provisions, and 30 000 cub. ft. for cargo.

Liners on other Routes. — Only a few typical vessels engaged on other routes can be mentioned here. The Royal Mail Company's " Avon " (fig. 33, Plate VIII.), trading to the West Indies and round South America to the Pacific coasts, is 520 ft. long, 62 ft. 4 in. beam, 31 ft. 9 in. depth moulded and 11,073 tons gross tonnage. The" Kenilworth Castle " (fig. 34, Plate VIII.), in 1910 one of the latest additions to the Union-Castle Line Fleet trading to South Africa, is 570 ft. long, 64 ft. 8 in. beam, 38 ft. 8 in. moulded depth, 12,975 tons gross tonnage, 12,500 I.H.P. and 175 knots speed. The " Osterley " (fig. 35, Plate VIII.) is typical of the splendid ships running via the Suez Canal to the Eastern ports, Australia and New Zealand; she was built in 1909 by the London & Glasgow Shipbuilding Company for the new fleet of the Orient Line. She is 535 ft. long, 63 ft. beam, 38 ft. depth to upper deck, 18,360 tons displacement at 28 ft. draught, 12,129 tons gross, and obtained 18-76 knots on trial with 13,790 I.H.P.; 1150 passengers can be carried as well as some 7000 tons of cargo. The " Maloja," which in 1910 was being built for the P. & O. Company, is a little larger than the " Osterley," being 550 ft. long, 62 \ ft. broad, 12,500 tons gross, of 15,000 I.H.P. and 19 knots speed.

Many vessels carrying very large cargoes and comparatively few passengers are engaged in the meat and fruit trades, and are fitted up with refrigerating machinery, insulated holds and cooling appliances so as to keep the fruit, vegetables or meat at the required temperature, and at the same time maintain a proper degree of humidity or of dryness of the atmosphere. The number and size of vessels engaged in these trades continue to increase, and the enormous volume of the trade may be indicated by the fact that thirteen million carcases of mutton would be required to fill the holds of the vessels fitted' for that particular trade. A typical vessel is the " Highland Laddie," built for the Argentine trade in 1909, 420 ft. long, 56 ft. beam, 37 ft. 6 in. moulded depth to shelter deck, 7500 tons gross, 4600 H.P. and speed 15I knots on trial. She can ca.-ry

over 500 passengers in well-fitted and comfortable apartments amidsh : ps, and has insulated cargo-holds of 343,000 cub. ft. capacity. To control the temperature of the chilled beef or frozen mutton in these holds she is fitted with powerful refrigerating machinery, and cooled brine is circulated through tubes lining the sides and ceilings of the holds, some 20 miles «f brine pipes being so used. The

" Ruahine," built in 1909 for the New Zealand trade, is similarly fitted; she is 480 ft. long, 60 ft. broad, 44 ft. depth moulded, speed on trial 15-9 knots. The " Port Royal " of the Elder Dempster Line has insulated holds capable of transporting 3,000,000 bananas, besides pineapples, oranges and other tropical and semi-tropical fruits. The fruit is kept at the desired temperature by means of large volumes of cold dry air circulated through the holds, and the air is cooled by contact with nests of pipes through which brine of a low temperature is circulated. The " Tortuguero," a vessel 390 ft. long, 48 ft. beam, 29 ft. 6 in. depth, 4200 tons gross, built for Messrs Elders & Fyffes, has a storage capacity of 25 times that of the " Port Royal."

Pacific Liners. — The " Empress " vessels of the Canadian Pacific Railway Company were the first liners built specially for the trans-pacific ocean service. The railway reached the Pacific seaboard in 1885, and in 1891 these vessels began running. They reached a maximum speed of 19-75 knots on trial, and in 1910 could still maintain 17 knots across the Pacific. In 1901 the " Korea " and " Siberia " were built for the service; they were in their day the largest American-built vessels, each being 552 ft. long, 63 ft beam and 41 ft. depth, of tonnage 11,276′ gross, and displacement 18,600 tons when loaded to 27 ft. draught. Quadruple-expansion engines of 18,000 I.H.P. gave them a speed of 20 knots on trial and 18 knots sea-going speed. Two hundred and twenty first-class passengers are carried in cabins and saloons above the upper deck, and pro- vision, is made for 60 third-class, and for 1200 Chinese steerage passengers. In 1904 these were joined by the American-built vessels the " Manchuria " and " Mongolia," of 2000 tons greater tonnage. They are 616 ft. long, 65 ft. beam, depth 31 ft. I in., 13,639 tons gross, 27,000 tons displacement and 20 knots maximum speed, and can each carry 1920 passengers and a large cargo. These were again outstripped in size by the " Minnesota " and " Dakota," which arrived shortly afterwards. They were 622 ft. long, of 20,718 tons gross, 33,000 tons displacement, 14 knots speed, and had capacity for 2850 passengers and 20,000 tons of cargo. The " Dakota " was lost off the coast of Japan in March 1907, but the " Minnesota " was

in 1910 still on service, and was the largest merchant vessel yet built in the United States. These American vessels carry on the transpacific service from San Francisco and Seattle, and replace the older vessels with which the American Pacific Mail Company carried on the service for many years. The American and British vessels were all outstripped by the Japanese, vessels " Tenyo Maru " and " Chiyo Maru " of the Toyo Kaisen Kaisha (Japanese Oriental S.S. Co.). They were built in Japan, of the following dimensions: length over all 575 ft., between perpendiculars 558 ft., breadth 63 ft., depth to shelter deck 46 ft. 6 in., to upper deck 38 ft. 6 in., gross tonnage 14,700 tons; displacement 21,500 tons at 31 ft. 8 in. draught. They are driven by three sets of Parsons turbines of a total H.P. of 17,000 at 270 revolutions per minute, and have attained 21-6 knots on trial and 20 knots on ocean service. Steam is supplied by 13 cylindrical boilers, working at 180 lb pressure and fired by oil fuel only. They have accommodation for 275 first-class, 54 second-class and 800 steerage passengers, and over 8000 tons of cargo. ˆ

Special Vessels. — Many vessels are built for special and exceptional purposes, and cannot be classed with either ordinary cargo or passenger vessels. Amongst these may be included dredgers, train-carrying ferry-boats, ice-breakers, surveying vessels, lightships, fishing vessels, coastguard and fishery cruisers, salvage and fire vessels, lifeboats and tugs. To Dredgers a special article is devoted (see Dredge).

Train Ferries. — In 1869 Mr Scott Russell described {Trans. Inst. Nav. Arch.) a train ferry-boat of special construction in use on the Lake of Constance, having a length of 220 ft., a breadth over the paddle-boxes of 60 ft., and a displacement of 1600 tons; the horse-power of her machinery was 200, divided between two paddle-wheels, each of which was driven by a pair of independent oscillating engines. The object of this steamer was to convey trains between Romanshorn, on the one side of the lake, and Friednchshafen, on the other ; she was built of iron, and was designed to have great strength combined with light draught.

In 1872 train ferry-boats were introduced into Denmark to carry trains between the mainland and the islands and, later, between Denmark and Sweden. The first was a single track iron paddle vessel, the " Lille Baelt," built by Richardson of Newcastle for the service from Fredericia to Strib (2 m.) ; her dimensions were : length 139 ft., breadth moulded 26 ft., extreme 44 ft. 6 in., draught 8 ft., tonnage 306, I. H.P. 280, and speed 8 knots. A similar boat, the " Fredericia," was afterwards built by Schichau of Elbing for the same

service; in 1883 this firm built two very similar but longer vessels for ferries of 2-2J m. across, which proved very successful; and others of various types followed for ferries of 16, 18J and 48 m. across. The Danish government in 1910 employed 22 vessels of a total of about 16,000 tons on eight ferries for railroad cars, as well as separate vessels for other traffic. These services have to be main- tained all the year round, and several of the vessels are specially strengthened for passage through ice ; in addition, four other vessels of 497 to 553 tons gross and 600 to 800 I.H.P. are employed wholly as ice-breakers. The latest of these vessels in 1910 was the " Christian IX." employed on the ferry across the Great Belt,

a distance of 16 m Fig. 36 shows the profile and deck plans of I ferry service between Sweden and Germany from Trelleborg to this vessel, for which with other particulars of the Danish ferries, Sassnitz, a distance of 65 m. For this service the " DrSttnine" we are indebted to International Marine Engineering. Particulars] Victoria'" (fig. 37, Plate IX.) was built by ˆssrsSwarˆHunte?,

MAIN DECK T ˆ

Fig. 36.— Profile and Deck Plans of Twin-Screw Ferry " Christian IX."

of the most important Danish train-carrying vessels are given in Table XIII.

The longest ferry, from Gjedser to Warnemunde, traverses a distance of 48 m. across the lower part of the Baltic Sea, and on this ferry the " Prinsesse Alexandrine " and " Prins Christian " are

Wigham Richardson & Co. Her dimensions are : length 370 ft. over all, 350 ft. between perpendiculars, breadth extreme 53 ft. 6 in., 3050 tons gross, displacement 4270 tons dead-weight capacity, 600 tons at a draught of 16 ft. 6 in., 5400 I.H.P. and speed i6f knots. Two rail tracks are provided, the trains are shipped at the stern and are

Table XIII.

Name of Ferry.

Christian IX. Prinsesse Alexandrine

Prins Christian Korsoer

Kjoebenhavn

Helsingborg

Marie .

Valdemar . Lille Baelt Ingeborg .

Type.

Twin screw, double track

Paddle wheel, double track

Twin screw, double track

Paddle wheel, double track

Paddle wheel, double track

Single forward and aft screw, single track

Two screws aft, one screw forward, single track

Single screw, single track, ice-breaker

Paddle wheel, single track

Paddle wheel, single track

Lengths.

Overall.

293 9

333′ 6″ 284′ 9″

252′ 6″

278′ o”

180′ o”

204′ 6″

144′ o”

140′ 6″ 168′ 9″

On L. W. L.

290

333′ 6″

281′ o”

250′ o”

272′ o”

177′ o”

199′ 3″

140′ o” 139′ o” 167′ o”

Breadth.

Moulded.

36′ o”

41′ 6″

34′ o”

34′ o”

32′ o”

3i‘6″

31′ 6″

26′ o” 26′ o”

Over Guards.

58′ o”

61′ 6″

57′ 9″

58′ o” 58′ o” 43′ o”

43′ o”

43′ o”

44′ 6″

44′ o”

Depth.

18′ 7″

18′ 9″ 22′ 6″

16′ O”

16′ 9″

14′ 6″

13′ O”

13′ O”

11′ 6′

12′ o”

Draught.

12′ 6″

12′ 6″ 14′ 5″

9′ 6″

10′ o”

10′ 3″

9'o"

9 'o" 8'o" 7'o"

Dis- place- ment. Tons.

Tonnage.

2600

2425 2065

1267

1455 720

950

550

399

440

Gross.

1504

1733-4 1824-0

971-0

1091-0

53O-0

500-0

361-0 306-0 343-0

Net.

598

676-6

686-o

436-0

425-0

187-0

250-0

129-0 125-0 136-0

Speed. Knots.

I3-0

13-8 13-75

12-25 12-5

10-0

IO-O IO-0

8-o

10-25

Revolu- tions per minute.

36 124

33

36

138

ii

25 50

134 34 37

employed. Two other vessels belonging to the Prussian govern- ment also work on this ferry, and the great success of the service led to the Swedish and German governments undertaking a direct

completely protected from the weather when on board, the bow of the ship being completed as usual for a sea-going vessel; ten full-sized

passenger or sleeping carriages can be taken, or eighteen

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Plate VII.

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Fis. 32.— Hamburg- American Liner Kaiserin Auguste Victoria™' • Sl ™" mmf " m –)

Plate VIII.

Fig. 33. — Royal Mail Steamer Avon.

Fig. 35. — Orient Liner Ostertey.

goods wagons. Ballast tanks are provided, and powerful centrifugal pumps fitted, so that the trim of the vessel can be adjusted as necessary while embarking and disembarking the trains; she is built specially strong so that she can be driven through ice during the winter months.

in 1883 the " Solano," a large train ferry 406 ft. long, was built by Messrs Harlan & Hollingsworth of Wilmington, Delaware, to run between Bernicia and Porto Casta in connexion with the Central Pacific railway. In 1899 the American railways employed nearly 200 ferries, with an aggregate capacity of over 2000 large wagons, and by 1909 the numbers and capacity had increased to about three times those amounts, on Lake Michigan alone nine such ferries being at •work.

Two other interesting examples of train ferries were built on the Tyne by Sir W. G. Armstrong, Whitworth & Co., Ltd., in 1895 and 1896, the former for service on the river Volga, and the latter for service on Lake Baikal in Siberia. The Volga has a rise and fall of no less than 45 ft. between spring and midsummer, and the ice upon it in winter is usually 2 ft., and sometimes 3 ft., thick; thus the problem presented considerable difficulties, which were increased by the fact that the locks of the Marinsky canal system, through which all vessels bound for the Volga must pass, are of such dimensions that it was impossible for vessels of sufficient size to be got through in one piece. It was decided to use two vessels to do the work, the first to act only as an ice-breaker, and the other to act only as a train-carrier. The ice-breaker was built in two pieces, the parting being at the longitudinal middle-line plane of the vessel. This was satisfactorily carried out by means of a double longitudinal middle- line bulkhead extending the whole length of the vessel. On arrival at the canal she

was divided into halves, and was joined up again after passing through the last of the locks. Her dimensions were: length 147 ft., breadth 37 ft. 6 in. and depth 16 ft. 6 in., and she was fitted with compound engines and twin screws. The ferry steamer itself (fig. 38, Plate IX.) was 252 ft. long, of 55 ft. 6 in. beam, and of 14 ft. 6 in. depth. Four lines of rails were laid upon her deck, sufficient space being provided for 24 trucks or carriages, which are shown in position in the figure. The difficulty presented by the great difference in the river level was got over by an arrange- ment of hydraulic hoists, placed at the bow, by which two trucks could be lifted at once to a height of 25 ft., and by hav- ing lines of rails at the landing-stages at two levels. The vessel was fitted with twin screws and compound engines, which gave her a speed of 9 knots. It was found necessary to divide her into four parts for the passage through the canal locks; the divisions were made at the longitudinal middle-line plane and athwartships at her middle. Each quarter, when apart, formed a water- tight hull, and reunion was effected while the parts were afloat.

The Lake Baikal Ferry was built for carrying trains across the lake in connexion with the Siberian railway. For more than half the vear the lake is frozen over to a considerable thickness, and in this case the vessel must of necessity be herself a powerful ice- breaker as well as a ferry steamer. Her dimensions are: length 290 ft., beam 57 ft., draught under ordinary conditions 18 ft. 6 in., and displacement 4200 tons. The hull is closely subdivided for additional safety in case of perforation. She has three sets of triple- expansion engines, working three independent screw propellers, two placed aft, as in ordinary twin-screw ships, and one placed at the forward extremity for the purpose of disturbing the water under the ice, thus assisting the heavy cast-steel stem and armoured bow to break up the solid field-ice which the vessel has to encounter. The complete structure was first erected on the Tyne, then taken to pieces and shipped to St Petersburg; from thence its numerous parts were carried to what was at that time the terminus of the Siberian railway, whence they were taken to their destination on sledges, and there the ship was re-erected and launched. The boilers constituted the heaviest individual pieces thus trans- ported, as the weight of each could not be reduced below 20 tons.

An interesting example of a modern river train ferry is the " Fabius," built by Messrs G. Rennie & Co., Greenwich, in 1909, for service in southern Nigeria, where the river is 2 m. across. She is a double-ended paddle-wheel vessel; length 160 ft., beam 33 ft. 6 in., depth 10 St., draught 5 ft. 6 in., speed 7 knots. She can carry six railway

carriages and freight and passengers up to a total of 200 tons.

Ice-Breakers. — Steamboats for breaking a passage through frozen waters date from an early period ; one is spoken of as early as 1851. The " Ermack " (fig. 39, Plate IX.), built in 1898, is one of the largest and most effective vessels of this type. Her dimensions are: length 320 ft., breadth 71 ft., depth to the upper deck 42 ft. 6 in., and displacement 8000 tons; her engines develop 8000 I.H.P., giving her a speed of 15 knots.

Her general outline is shown in fig. 40, from which it will be seen that her bow slopes upwards from below, so as to enable her to run up on to the ice and bring her weight to bear in breaking it. The " Ermack " made her maiden voyage in the winter of 1 898-1 899, when she steamed through the Baltic to Kronstadt. crushing the ice with comparative ease.

Surveying Vessels. — Special vessels are employed by various governments, and occasionally by institutions or individuals, to survey the oceans and ocean beds, and pursue scientific inquiries of a general nature regarding the sea. The British Admiralty employs the " Egena," " Fantome " and " Mutine," sloops of about 1000 tons displacement, modified and fitted up for the purpose, as well as two yachts purchased and suitably modified, and two vessels built especially for the purpose. The yachts are the " Waterwitch," 150 ft. long, 640 tons displacement and 10 knots speed, purchased in 1893; and the composite built vessel " Sealark," 180 ft. long. 1034 tons displacement and II knots speed, purchased in 1903: both are employed in Eastern waters. The vessels built for the purpose are the " Triton," 145 ft long, 415 tons displacement, 10 knots speed, built in 1882; and the " Research," 155 ft. long, 545 tons displacement, io| knots speed, built in 1888; both these vessels are propelled by paddle wheels, and both are of composite build. The " Dart," a steel yacht 130 ft. long, 500 tons displacement, l\ knots speed, purchased by the Admiralty in 1882, was in 1910 employed by the New South Wales government. The Canadian government has provided vessels such as the " Cartier," a twin- screw steel vessel, built in 1909, 164 ft. long, 29 ft. beam, 648 tons gross and \\ knots speed, for survey work on the coast of British Columbia. The Indian government had the steel single-screw vessel " Investigator " built by Messrs Vickers, Sons & Maxim for survey of Indian waters; she is 204 ft long, 33 ft. beam, 15 ft. 3 in. moulded depth, has a displacement of 1170 tons and a speed of 13! knots.

The United States government built a surveying vessel, the "

Pathfinder," in 1899. She is a steel single-screw vessel rigged as a brigantine, length over all 193 ft., on water-line 165 ft., beam 33 ft.

Fig. 40. — Section of " Ermack."

6 in., depth moulded 19 ft. 8 in., displacement 875 tons at 10 ft. draught, I.H.P. 1 170 and speed 13! knots. She has bunkers for 230 tons of coal, and is fitted up with very complete auxiliary machinery arrangements, electric lighting and ventilation, steam heating, and accommodation for a large staff. The outfit for hydrography and research is perhaps the most complete ever provided. The Carnegie Institution of Washington has fitted out the special non-magnetic vessel " Carnegie," 128 ft. long, 35 ft. beam, 12 ft. 7 in. draught, 568 tons displacement.

Lightships. — In many places round the coast the safe navigation of ships is assisted by vessels called lightships, moored in positions where lighthouses cannot well be built. Around the southern portion of Great Britain these vessels are maintained by the Trinity Corporation (see Lighthouse).

Fishing Vessels. — It is not many years since a few old paddle tugs were fitted up with fishing appliances. They proved very profit- able, and the experiment led to the building and fitting out of steam vessels specially designed for such employment. Screw steam trawlers (see Trawl) or other fishing-boats are among the vessels most frequently met with round the British coasts. In 1910 some 3000 such steam vessels of an average net tonnage of 50 tons were on the British register, as well as 23,000 sailing boats of an aggregate net register tonnage exceeding 200,000 tons. Fig. 41 (Plate X.) is the steam herring drifter " Three," and gives a general idea of the type, but there is considerable variety in the methods of fishing, and the fittings of the vessels vary accordingly.

Coastguard and Fishery Cruisers. — The lightships give warning of danger, and can also send signals ashore for the benefit of vessels in distress, but cannot themselves render help. The principal organiza- tions for giving assistance to vessels in distress and for saving life around the British coasts are : —

1 . The coastguard service maintained by the Admiralty.

2. The signal services, stations and agents maintained by Lloyd's.

3. The lifeboat services maintained by the Royal National Life- boat Institution.

The coastguard cruisers not only watch the coast but proceed to the fishery grounds to act as international marine police. They are controlled by an admiral, with headquarters at 66 Queen Victoria Street, London, who in 1910 had at his services the torpedo gunboats "Halcyon," " Leda," "Skipjack" and "Spanker"; the old composite gunboats "Ringdove" and "Thrush"; the vessels " Colleen," " Julia " and " Fanny," purchased and fitted up for the work; and the " Squirrel " and " Argus," two yacht-like vessels specially builtfor the service. The "Colleen," a wooden vessel built in 1869 and propelled by horizontal trunk engines of 250 I.H.P., is 145 ft. long and 415 tons displacement, and at one time the engines gave her a speed of 8 J knots; the "Argus" is a steel vessel built in 1904, 130 ft. long, 380 tons displacement, 23 ft. beam. 8 ft. 10 in. draught ; she has a light fore and aft rig, and vertical triple ex- pansion engines of 500 I.H.P. give her a speed of 12 knots. The Fishery Board of Scotland has provided itself with some small cruisers, such as the "Freya," built in 1904,0! length 138ft., beam 24 ft., moulded depth 12 ft., and gross tonnage 280 tons; and the " Norma," built in 1909, which is. 159 ft. long, 25 ft. beam, 14 ft. moulded depth, 457 tons gross tonnage and 950 I.H.P. In 1908 the Irish Fisheries Board procured the small cruiser " Helga," built by the Dublin Dockyard Co., 155 ft. long, 24 ft. 6 in. beam, 13 ft. 3 in. moulded depth; she obtained a speed of 14s knots on trial with a total deadweight of 140 tons carried.

Salvage and Fire Vessels. — Several private companies maintain special vessels which are available for assistance of vessels in distress, salvage, wreck-raising, &c. Many of these vessels are powerful tugs fitted with derricks and winches for hoisting out cargo and ships' fittings, and provided with powerful steam or electrically driven pumps and special hoses for pumping out flooded compartments of the vessels in distress. Some have been specially built and fitted up for salvage and wreck- raising; others have been built and fitted for salvage and fireboats.

A fire and salvage boat at Elswick is 45 ft. long, n ft. beam and 3 ft. draught; she is fitted with a Merryweather quick-steaming boiler, and engines arranged to drive the boat at 8J knots, or as an alternative to pump out vessels on either side, or to pump from the river for fire purposes and deliver up to 1500 gallons a minute. Many small

vessels of this character are provided for harbours, docks and shipbuilding works. One of the most powerful in England is that built for the Manchester Ship Canal. This boat is 90 ft. long, and is fitted with salvage pumps capable of clearing 5000 gallons a minute, as well as independent fire service pumps capable of delivering 4000 gallons per minute at a pressure of 150 lb per square inch. Fire and salvage boats of much greater capacity have been provided at San Francisco, New York and Chicago. Two fireboats of special design were built in 1908 for Chicago. They are 120 ft. long over all, 28 ft. beam, 15 ft. moulded depth, and 9j ft. draught. Power- ful turbine pumps are driven by two Curtis steam turbines on the same shafts, which also carry 275-volt 200-kilowatt electric motors for operating the propeller motors. The pumps can be worked so as to deliver 4500 gallons per minute at 300 lb per sq. in., 9000 gallons at 150 lb or larger volumes at lower pressures; the maximum speed of the turbines and pumps is 1700 revolutions per minute. Twin screws are fitted and each is driven by a motor arranged to develop 250 H.P. at 200 revolutions per minute. The boats are fitted with electric light, search-light, and steam steering gear. New York has ten powerful fireboats, several of which can throw over 10,000 gallons of water per minute. The " Beta " of the London Fire Brigade is 100 ft. long, 1 1 knots speed, and can deliver 4000 gallons per minute at a pressure of 140 lb per sq. in., engines and pumps being driven by vertical steam engines.

Lifeboats and Vessels. — The lifeboat services around the British shores are maintained almost entirely by the Royal National Life-boat Institution. In March 1910 there were 281 lifeboats in service, varying in length from 30 ft. to 56 ft. All are fitted with air-casing or watertight air-cases of sufficient capacity to keep them afloat if completely filled by the sea, and all are arranged so as automatically to relieve themselves of any sea breaking into the boat. The type of boat varies according to the service intended and the views of the men who use them — 182 are self-righting if capsized and 99 not self-righting. The conditions of service are such that the application of steam or other motive power to assist the crews presents many difficulties; these difficulties have, however, been successfully overcome by the institution and its advisers, and details of the power-driven boats are given in a paper read by Mr J. R. Barnett at the Institute of Naval Architects, March 1910. Four steam lifeboats have been tried and found very useful under the conditions in which they are employed, while three petrol-driven lifeboats, 40 to 43 ft. in length, 13 to 16 tons weight, 24 to 40 H.P. and about 7 knots speed, have been supplied as an experimental measure, and on their

voyages to their stations proved to be very seaworthy and reliable boats. The institution employs one steam- ship, the steel twin-screw tug " Helen Peel " of 230 tons displacement, which is stationed at Falmouth and used to tow lifeboats to sea and assist them in their work, and also to render aid to vessels in distress which have no chance of getting private tugs. The United States government has, however, taken the lead in this direction, in building and equipping a special vessel, the " Snohomish," for life-saving services on the North Pacific coast. This vessel is officially termed a revenue cruiser, and is 152 ft. long over all, 29 ft. beam, 17 ft. 6 in.

moulded depth, and displaces 795 tons at a draught of 12 ft. 45 in. ; a single screw driven by triple-expansion engines of 1370 I.H.P. gave a speed of 135 knots on trial. (See Lifeboat.)

Tugs or Tow-Boats. — On canals and rivers steam barges are often employed for towing, and small tugs are also built for this purpose, but on swift, large rivers the tugs are often of considerable power. The tug " Little John," built by Messrs Yarrow for service on the Trent canals, is 80 ft. long, 14 ft. 6 in. beam, draught with steam up 22 in., displacement about 40 tons. Twin screws are fitted working in tunnels, and this little vessel has towed five barges, weighing with their loads 247 tons, at a speed of 5! knots. A river tug recently built by Messrs Thornycroft & Co. for service on the swift waters of the Upper Yangtse, and named the " Shutung," is 150 ft. long, 15 ft. beam, with a depth of 6 ft. 6 in., fitted with compound surface-condensing engines of 550 I.H.P., driving twin screws working in tunnels (as the draught of the vessel is very limited) and giving a speed of about n knots. After trial at Southampton the tug was taken to pieces, the sections shipped to China, with sections of a barge of corresponding dimensions, and both, were put together and completed at Kiangnan. This was the first steamer to attempt regular passages in these troubled waters, and steamer and consort per-formed their first voyage with success. The American river tow-boat " Sprague " is 318 ft. long overall, 64 ft. 8 in. wide, depth amidships 7 ft., displacement 2200 tons, registered tonnage 1479. She is fitted with a stern wheel 40 ft. in diameter and 40 ft. in width, driven by two tandem compound engines of 12-ft. stroke, the cylinders being 28 in. and 63 in. in diameter; and at 95 revolutions per minute her horse-power is estimated at 1500 H.P. In 1907 she towed on one occasion 56 coal boats, each 180 ft. long and 26 ft. wide, loaded with over 67,000 tons of coal and covering a water area of nearly 7 acres. On the American rivers the superiority of the screw propeller is, however, now realized, and shallow-draught tow-boats with propellers working in tunnels have been adopted. Interesting tugs

have been built by Messrs Cox & Co. of Falmouth for work in the North-Eastern Railway Docks on the Tyne. Great power in small length was required, and engines of 1000 I.H.P. are installed in vessels 75 ft. long, 26 ft. beam, 12 ft. 6 in. deep, having a mean draught of 10 ft. ; twin screws set widely apart being provided to give manoeuv- ring power. Tugs in common use in harbour and coasting services are often 90 ft. to 120 ft. in length, 20 to 23 ft. beam, 10 to 12 ft. depth, 9 to 12 ft. draught, 400 to 600 I.H.P. and it to 12 knots speed; tugs fitted with independent acting paddle-wheels are popular for some services on account of their great handiness, but the great majority of new vessels are fitted with single or twin screws. For ocean service larger vessels are built. A steel tug built by the Bath Iron Works for the American coal trade is 165 ft. over all and 1045 tons displacement, with triple-expansion engines of 900 H.P. The " Cornell " is one of the largest American sea-going tugs; when towing she has developed 1390 I.H.P. at 97 revolutions, and when running light 1900 I.H.P. at 135 revolutions and a speed of 15 J knots. The " Hearty, built to go out under her own steam to work in the Hooghly, is 212 ft. long, 30 ft. beam, 12 ft. 6 in. draught, 1300 tons displacement, vertical compound engines of 2100 I.H.P. drive, twin screws, and the vessel can steam at 14J knots. Recent screw tugs of the " Rover " type, built for the British Admiralty, are 154 ft. long, 27 ft. 4J in. beam, 11 ft. draught, 615 tons displacement, 1400 I.H.P., giving 13J knots with twin screws. The latest paddle tugs of the " Grappler " type are 152 ft. long, 28 ft. beam moulded, 53 ft. 3 in. over guards, II ft. 4 in. draught and 690 tons displace- ment. Inclined compound engines are fitted with means to work the wheels independently or together as desired. 1250 I.H.P. gives a speed of 12 knots. In these tugs the towing hook is carried well forward to permit the tugs to manoeuvre freely, and good beam is given so that in case of a heavy side pull the tug will not capsize.

Each year from 20 to 30 tugs are built in the United Kingdom, and many of them are fitted with powerful pumps and heavy derricks and winches, so that they are of service in case of fire or salvage. The North-Eastern railway tugs referred to are able to pump 500 gallons a minute, i.e. about 140 tons an hour, while the " Lady Crundall," belonging to Dover, can pump 700 tons an hour.

Yachts. — Vessels built for pleasure purposes and for racing have for many years been known as Yachts. (See Yachting.)

In 1825 Mr Assheton Smith built a steam yacht, and although the building of such yachts was discouraged by the clubs, he con- tinued to build, and produced between 1825 and 1851 nine steam yachts of

various sizes; one built in 1844 had a screw propeller, the others were fitted with paddle wheels. In 1856 the ban on steam yachts was withdrawn by the clubs, and others began to build ; but as late as 1864 there were only 30 steam yachts afloat. In 1876, however, Lloyd's Register Committee issued Rules for the Building and Classification of_ Yachts, and from about that date great improvements were made in the design and construction of yachts of all classes, as well as in their propelling machinery, and steam yachts were built in much greater numbers.

As with trading vessels, the machinery at first fitted in yachts was only regarded as auxiliary; a well-known example of a successful auxiliary steam yacht is Lord Brassey's " Sunbeam " (fig. 42, Plate XL), built in 1874, of the following dimensions: length over all 170 ft., beam 27 ft. 6 in., depth of hold 13 ft. 9 in., displacement 576 tons, registered tonnage 334 tons gross, 227 tons net, and Thames

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Plate IX.

Fig. 38.— River Volga Train Ferry.

Fig. 37.— Sea-going Train Kerry Steamer Drullning Victoria.

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Fig. 39. — Ice-breaking Steamer Ermack.

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Plate X.

SHIP

WAR VESSELS]

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yacht measurement 532 tons; she is rigged as a three-masted schooner; her original sail area, 9200 sq. ft., has recently been reduced to 7950 sq. ft.; her hull is composite, the frames being of iron and the planking of teak; her engines are compound of 70 N.H.P. Very much larger yachts have been built in recent years, such as the " Lysistrata," 286 ft. long, 40 ft. beam, 13 ft. 9 in. depth of hold, 1943 tons gross tonnage and 2089 tons Thames Y.M., built in 1900; and the " Liberty," 268 ft. long, 35 ft. 6 in. beam, 17 ft. 9 in. depth of hold, 1607 tons gross tonnage and 1571 tons Thames Y.M., built in 1908. These two vessels and many others of similar types are American-owned. The yacht " Emerald," of 750 tons yacht measurement and 1400 H.P., built on the Clyde in 1902, crossed the Atlantic in May 1903, and was the first turbine steamer to be classed in any registry. The " Atalanta " (ex " Lorena "), of 1398 tons Y.M., built in 1903, fitted with turbines of 3800 H.P., was the finest turbine-driven private yacht afloat in 1910. The " Tarantula," built in 1902, of 122 tons Y.M. and fitted with turbines of 2200 H.P., is a high-speed vessel resembling a torpedo-boat destroyer. The " Winchester," built in 1909, is of a similar type; she is 165 ft. long, 15 ft. 6 in. beam, 188 tons Y.M., and has turbines of 2500 H.P., which give her a speed of 265 knots.

The royal yachts of European sovereigns are the largest yachts yet built. They include the imperial Russian yacht " Pole Star," of 3270 tons and 5600 I.H.P., built in 1888; the imperial German yacht " Hohenzollern " (fig. 43, Plate XL), of 3773 tons Y.M. and 9500 H.P., built in 1893; the Spanish royal yacht " Giralda," of 1664 tons Y.M., built in 1894; the imperial Russian yacht " Stand- art," of 4334 tons Y.M. and 11,000 H.P., built in 1895; and the British royal yachts, " Victoria and Albert," of 5005 tons Y.M. and 1 1,000 I.H.P., built in 1899, and the" Alexandra " (fig.44, PlateXL), of 2157 tons Y.M. and 4500 H.P., built in 1907.

Propulsion by Electricity. — In 1883 Messrs Siemens & Co. fitted up a launch, 40 ft. long and 6 ft. beam, with an electric motor driving a single propeller and operated by a battery of secondary cells, and at a displacement of 5 tons a speed of 7 knots was obtained. A launch 25 ft. long, provided with an electric motor capable of giving a speed of 7 knots, also was supplied to H.M. yacht " Victoria and Albert " in 1903. A number of other electric launches similarly fitted have been built chiefly for river service, the batteries being recharged from shore stations from time to time; but the method has not been extensively adopted, except fn submarines. In some cases the submarine's secondary battery has been used for propulsion on the surface as well as when submerged, being recharged from shore or

from a parent vessel as required; but in nearly all recent vessels they are used only for propulsion when submerged, the engines fitted for propulsion on the surface being arranged to drive dynamos for recharging the cells. In a number of small vessels and oil-tank steamers electric motors are fitted for driving the propeller and supplied with current from dynamos driven by steam turbines or internal combustion engines.

Propulsion by Naphtha Engines. — In 1888 several launches were built on the Thames in which petroleum spirit was used for fuel in place of coal, and also as an expanding agent for driving the propelling machinery in place of steam. A number of these boats were after- wards built in England and America, and known as zephyr or naphtha boats. Further particulars of these boats will be found in a paper read by Mr Yarrow before the Institute of Naval Architects in

1888.

Propulsion by Internal Combustion Engines. — Experiments have been made at various times with machinery in which the fuel is burnt or exploded in the engine itself without having recourse to the transfer of energy by means of an expanding and condensing agent such as steam or naphtha, and by these experiments the modern, internal combustion engine has been slowly evolved and adapted for marine propulsion. In 1680 an engine was patented in which gunpowder was exploded, and the engine was operated by the vacuum produced by the cooling of the gases; in 1794 an engine was patented in which the explosion of turpentine spirit drove the pistons forward, and about 1823 a gas-driven vessel was run on the river Thames. In the later years of the 19th century gas engines were highly developed for use in factories, &c, on shore, and petrol engines for driving motor cars, &c, and since the beginning of the present century similar engines adapted for marine propulsion have been greatly improved and produced in considerable numbers, especially in the United States, some of the vessels being as large as 800 tons gross.

Such vessels may be considered in three groups. (1) High-speed racing boats, pleasure boats of various sizes for service on rivers and in harbours, fireboats, patrol boats and launches for river work, yachts' tenders and sea-going yachts of light scantlings, in which highly volatile and readily exploded fuels such as gasolene, petrol and naphtha are used. (2) Vessels of low speed, in which the weight of the engine is not of great importance, such as barges for use on

rivers and canals, ferry-boats, small tug-boats, slow-speed cargo vessels and slow-speed oil-tank vessels, which have been fitted with engines using kerosene or paraffin, as well as oil fuels of greater specific gravity, and of higher flash-point and requiring a higher temperature for evaporation; in some cases these low-speed vessels have been fitted with engines using gas produced from anthracite coal, prepared charcoal and heavy oil. (3) Vessels in which auxiliary propelling machinery of low power is fitted; they

include a large number of fishing vessels, smaller numbers of coasting schooners, lifeboats and a few large vessels; in these both light and heavy oils and gas have been employed.

As examples of class (1) may be mentioned the racing boats " Ursula," built at Cowes in 1908, 49 ft. 6 in. long, 5 tons total weight, fitted with petrol engines of 800 H.P., driving twin screws at about 950 revolutions, and giving a speed of 38ˆ knots; and " Columbine," built on the so-called hydroplane principle in 1910, 26 ft. long, 65 H.P. and over 30 knots speed; the American yacht " Kalmia," 83 ft. long, 14 ft. 3 in. beam, 3 ft. 9 in. draught; and the yacht " Swiftsure," 70 ft. long, 11 ft. beam, 38 tons gross, 3 ft. draught, 160 H.P. and 16 knots speed, built at Cowes in 1909 and navigated under her own power to St Petersburg.

Examples of class (2) are the double-ended ferry-boat " Miss Vandenburg," employed on the St Lawrence, 100 ft. long, 20 ft. 9 in. beam, 9 ft. depth, 5 ft. draught, 150 tons displacement, fitted with two paraffin engines each of 75 H.P. ; the yacht " Bronzewing " (fig. 45, Plate X.), built at Sydney in 1908, no ft. long, fitted with three paraffin engines each of 105 H.P. ; the " Lochinvar," a West of Scotland passenger vessel of 12 knots speed, 145 ft. long, 200 tons gross, fitted with three paraffin engines each of 100 H.P. ; and the " Manatee " (fig. 46, Plate X.), 93 ft. long, 16 ft. beam, 5 ft. 6 in. draught, fitted with two paraffin motors of 75 H.P., giving her \o\ knots speed, built at Cowes in 1909 for service as a mail and passenger boat in Southern Nigeria, which was navigated to Forcados, a distance of 4000 m., under her own power and without escort.

Amongst examples of class (3) may be mentioned the three-masted topsail schooner " San Antonio " of Rotterdam, 165 ft. long, 27 ft. 3 in. beam, 9 ft. 2 in. depth and 410 tons gross, fitted with engines of 160 H.P., using crude heavy oil and driving a single screw; the " Modwena " of Glasgow, a barque-rigged sailing yacht of 400 tons, fitted with paraffin engines of 200 H.P., giving a speed of 9I knots,

the " Carnegie," already referred to under surveying vessels, which is fitted with gas engines of 150 H.P., driving twin screws; and the yacht " Lady Evelyn," of 366 tons Y.M., fitted in 1910 with heavy oil engines of 500 H.P.

The power of individual internal combustion engines completed up to 1910 was somewhat limited, and great difficulties had been encountered in the use of heavy oil fuels; but great advances and improvements had been made which were opening up the way for the more extensive adoption of motors of large power using heavy oil fuels. An ocean-going motor-driven cargo vessel of 9000 tons and 12 knots speed, was in 1910 being built in Germany for the Hamburg-American line, and fitted with heavy oil engines of 3000 H.P. driving twin screws, while engines of 10,000 H.P. were also being manufactured.

V. War Vessels

The adoption of iron and steel as the material for shipbuilding, and the development of the steam engine, have influenced warship construction in the same manner as they have influenced the construction of ships for the mercantile marine; but, in addition, the introduction of armour for the protection of ships, the great advances made in its manufacture, and, above all, the marvellous improvements in explosives and in the design and manufacture of guns and torpedoes, have changed the conditions of naval warfare, and called for corresponding changes in the design of warships. Those who are concerned in such questions may refer with advantage to an interesting comparison between the old " Victory " (fig. 1, Plate XIII.) and a modern battleship instituted by Sir Andrew Noble in his address to the Mechanical Science Section of the British Association in 1890. Sir Andrew Noble's remarks in this connexion are the more weighty, coming as they did from the director of the great arsenal of Sir W. G. Armstrong, Whitworth & Co., and from one whose scientific research has incalculably advanced our knowledge of artillery and explosives. Sir Andrew follows up this comparison by the following refer- ence to the condition of things just before the Crimean War: —

" The most improved battleships of the period just anterior to the Crimean War differed from the type I have just described mainly by the addition of steam power, and for the construction of these engines the country was indebted to the great pioneers of marine engineering, such as J. Penn & Sons, Maudslay. Sons & Field, Ravenhill, Miller & Co., Rennie Bros., &c, not forgetting Messrs

Humphreys & Tennant, whose reputation and achievements now are even more brilliant than in those earlier days. Taking the ‘ Duke of Wellington,’ completed in 1853, as the type of a first-rate just before the Crimean War, her length was 240 ft., her breadth 60 ft., her displacement 5830 tons, her indicated horse-power 1999, and her speed on the measured mile 9-89 knots. Her armament consisted of 131 guns, of which thirty-six 8-in. and .32-pdrs. were mounted on the lower deck, a similar number on the middle deck, thirty-eight 32-pdrs. on the main deck, and twenty short 32-pdrs. and one 68-pdr. pivot gun on the upper deck. Taking the ‘ Caesar ‘ and the ‘ Hogue ‘ as types of second- and third-rate line-of-battle

ships, the former, which had nearly the displacement of the ‘ Victory,’ had a length of 207 ft., a breadth of 56 ft., and a mean draught of 21. She had 1420 indicated horse-power, and her speed on the measured mile was 10-3 knots. Her armament consisted of twenty- eight 8-in. guns and sixty-two 32-pdrs., carried on her lower, main and upper decks. The ‘ Hogue ‘ had a length of 184 ft., a breadth of 48 ft. 4 in., a mean draught of 22 ft. 6 in. ; she had 797 indicated horse-power and a speed of 85 knots. Her armament consisted of two 68-pdrs. of 95 cwt., four 10-in. guns, twenty-six 8-in. guns, and twenty-eight 32-pdrs. of 50 cwt. — sixty guns in all.

” Vessels of lower rates (I refer to the screw steam frigates of the period just anterior to the Crimean War) were, both in construction and armament, so closely analogous to the line-of-battle ships that I will not fatigue you by describing them, and will only allude to one other class, that of the paddle-wheel steam frigate, of which I may take the ‘ Terrible ‘ as a type. This vessel had a length of 226 ft., a breadth of 43 ft., a displacement of about 3000 tons, and an indicated horse-power of 1950. Her armament consisted of seven 68-pdrs. of 95 cwt., four 10-in. guns, ten 8-in. guns and four light 32-pdrs.”

The warships which existed at the beginning of the latter half of the 19th century were, with the exception of special vessels, divided roughly into three classes — – ships of the line, frigates and gun-vessels. For many years the corre- sponding types of iron and steel vessels were known as battleships, cruisers and gunboats, but

recently we have seen the power of the cruiser increased to that of the battleship, and new types have been produced such as the torpedo boat, the torpedo boat destroyer and the scout, the latter developing into the fast cruiser of continually increas- ing size; while the submarine torpedo boat has become a recognized sea-going vessel, and is becoming comparable in size with the gun-vessel or the small cruiser. It is proposed to refer to these in the order named. (See also Navy.) Battleships. — The destruction of the Turkish fleet at Sinope (30th November 1853) by the Russian fleet, the latter alone being armed with shell guns, and the combined experience of the British and French fleets before Sevastopol when engaging Fort Constantine, de- monstrated conclusively that for ships of the line armour protection had be- come essential. The French govern- ment immediately began to build five armour-plated vessels, or batteries, as they were called, for service in the Black Sea; and eight similar vessels were begun shortly afterwards by the British government for the service. 1 The British vessels did not

arrive in time to take any part in the war; but three of the French batteries did, and were very favourably reported on by Admiral Bruat after an engagement with the Kinburn Forts on the 17 th of October 185s. With the exception of these three French batteries, the whole of the fleets employed in the operations were composed of unarmoured wooden ships, and a large number of them were sailing line-of-battle ships. As the result of the engagement with the Kinburn Forts, the French began to armourplate sea-going vessels, and the first step in this direction was taken by the celebrated French naval architectM. Dupuy de L6me, who razeed the " Napoleon," a wooden two-decker, and fitted her with a complete belt of 5-in. armour on a backing of 26 in. of wood. This work was completed in 1859, and the ship, renamed " La Gloire," became the first sea-going armour-clad. Two other vessels of the same design, the " Invincible " and " Normandie," were also laid down, and with the " Magenta," " Solferino " and the " Couronne,"

1 See letters of the earl of Rosse on this subject, Transactions of Inst, of Naval Architects for 1908.

a few years later, formed the first fleet of French armour- clads.

In June 1859 the armour-plated iron frigate " Warrior " was commenced by the British government. Others quickly followed, including the " Black Prince," which was a sister ship to the " Warrior," and four other vessels, the " Achilles," the sister ships " Minotaur " and " Agincourt," and the " Northumberland." The

distribution of the armour and other features of these vessels are shown in fig. 47. The " Warrior " and " Black Prince " were 380 ft. long and of 8830 tons displacement, had engines of 6000 I.H.P. and a speed of 145 knots; they were designed to carry thirty-six 68-pdr. 100-cwt. guns, but during construction the 7-in. 65-ton gun was introduced into H.M. Service, and the ships when completed for sea carried an armament of 28 of these 7-in. guns. They had a central citadel 213 ft. long, protected with 4j-in. iron armour extending from a few feet below the water-line to the height of the upper deck. Their outline was similar to the outline of the wooden frigates of the

WARRIOR & BLACK PRINCE.

400ft

Fig. 47. — " Warrior" and " Black Prince," " Achilles,'' " Minotaur " and Northumberland." E, Engine-room; B, boiler-room; C, coal bunkers; same shell-rooms.

" Agincourt," and M , magazines ; S,

day, and their rudder-heads and steering-gear were above water and unprotected against injury by shot and shell. In the four vessels which immediately followed, which were from 500 to 1500 tons more displacement, the overhanging bow, as will be seen from fig. 51, was given up, bows adapted for ramming were introduced, and some protection was afforded to the steering- gear by water-line belts of armour which extended the whole length of the vessel. In 1861 the British government began the construction of eleven armour-clads, six of which, including the " Hector " and " Valiant," sister ships of 6700 tons displace- ment and 3500 I.H.P., were iron vessels, and five, the " Cale- donia," " Royal Oak," " Ocean," " Prince Consort," and " Royal Alfred," were wooden vessels of rather over 4000 tons.

The reconstruction of the British fleet was taken in hand in earnest in 1863, when Mr (afterwards Sir) Edward J. Reed was placed at the head of the Construction Department at the Admiralty, with Messrs Barnaby, Barnes, Cross- R ee d. land, Morgan and Wright — the last-named (afterwards Sir James Wright) holding the position of engineer-in-chief — as

SHIP

Plate XX

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Fig. 42. — Sailing Yacht, with Auxiliary Steam Power, Sunbeam.

Fig. 43. — Imperial German Steam Yacht llohcnzollern.

(Photo, West.)

Fig. 44. — The Royal Steam Yacht Alexandra.

(Hopkins.)

Plate XII.

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WAR VESSELS]

his immediate assistants. Various types of vessels were devised, with arrangements of armour and dispositions of guns, to provide for the new conditions which had been introduced; and, in addition, great advance was made in the structural arrange- ments of ships, which up to this period had been considerably influenced by the old systems of construction in use in wooden ships. In investigating the qualities of ships, Sir Edward Reed had the good fortune to secure the co-operation and assistance of Mr William Froude, F.R.S., who had been the first to demon- strate accurately the theory upon which the behaviour of ships in a seaway depends. Mr Froude's experimental investigations on the forms of ships and kindred matters, begun in 1870 on behalf of the Admiralty and continued till his death in May 1879, had a most important bearing on the improvement of ships and on the science of naval construction generally. It is not too much to say that nearly the whole of the accurate information as to the best forms of ships and their resistance at various speeds, in the possession of naval architects to-day, is the direct result of Mr Froude's work, and that of his son, Mr R. E. Froude, F.R.S., who continued the work after his father's death.

Among the considerations which Reed had in view in the reconstruction of the navy may be enumerated the following: (1) Steadiness of ship as a gun platform, with ample stability

experience in the Crimean War; and in June i860 he embodied his ideas in a paper read before the United Service Institution. When the American Civil War broke out, Congress ordered a number of armoured vessels to be built, and one of the first to be completed was the turret vessel " Monitor " designed by Ericsson. She was 170 ft. in length, 41 J ft. beam, 1200 tons displacement, of low speed and low freeboard, the sides being protected by 3- to 5-in. armour, built up of i-in. plates on 27 in. of wood backing, and the single revolving turret which carried two 11-in. smooth-bore guns pro- tected by 8-in. armour built up of i-in. plates and placed amidships as shown in fig. 48. Her defeat of the " Merrimac " belongs to history. Several other similar low-freeboard turret vessels were built in America, and one of them, the " Miantonomoh," 250 ft. long, 55J ft. beam, 14 ft. draught, 3850 tons displacement, 1800 I.H.P., 12 knots speed, with twin screws and two turrets carrying four 10-in. B.L. guns, of only 2 to 3 ft. freeboard, succeeded in cross- ing the Atlantic, returning again in safety; but the " Monitor " her- self was caught in a gale

and foundered off Cape Hatteras in 1862.

The first turret ships in the British navy were the " Royal Sove- reign " and " Prince Albert." The former, a wooden ship, launched in 1857 as a 121-gun three-decked line-of-battle ship, of a tonnage of 3760 tons, was in 1864 cut down to 7 ft. above water and fitted with 5J-in. side-armour bedded on a 36-in. wood side, and with four turrets on Captain Cowper Coles' plan ; and the latter, an iron vessel, 240 ft. long, 48 ft. beam, launched in 1864, with 4j-in. side-armour with 18-in. backing fitted on i-in. skin plating, also carried four turrets, two fitted with pairs and two with single 12-ton guns; both were low-freeboard vessels and were reserved for coast defence. The

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Officers'!, Crews' Accommodation

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Two n"

Dahlgren Guns,

2 Thicknesses of/2 "each

in all conditions of lading to enable her to keep the sea in all weathers, and sufficient stability in a par- tially riddled condition to enable her to reach port in safety. (2) Protection by armour of the vitals of the ship, and of the heavy-gun positions, especially against shell fire. (3) The carrying of guns of power sufficient to penetrate the armour of any possible enemy . (4) Mounting the guns sufficiently high above the water-line to enable them to be fought in bad weather. (5) Simultaneous all-round fire, with con- centration of as many guns as possible on any given point of the compass. (6) Speed to overtake or get away from an enemy. (7) Manoeuvring power to maintain, as far as possible, any desired position

with regard to an enemy. (8) Large radius of action. (9) , : : . — » ,.-

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„ . . r 1 1 ,\ • ? m j 1 \ I as a sea-going turret ship. She was launched in May i860, her dimen-

Proper provision for the berthing of officers and crew. (10) , sions being . , ength 33Q ft _ breadth 57 ft 6 in . and draught 26 ft.;

Limitation of size and cost. ! her I.H.P. was 8000, giving her a speed of about 15 knots, and she

Objections were raised to the early armour-plated ships on the ! carried a large spread of canvas. She had a complete armour belt

Fig. 48. — Diagram of U.S.A. ” Monitor.” Monarch,” of 8300 tons displacement, was laid down in June 1866

score of their unhandiness, heavy rig, exposed position of guns, &c. To meet these, Reed designed a number of vessels. The ” Bellero-phon,” launched in 1865, was a vessel of 7550 tons displacement, 6500 I.H.P., 14 knots speed, and was 300 ft. long. Her armament consisted of ten 9-in. 14-ton and five 7-in. 6j-ton guns. Her water-line was wholly protected by 6-in. armour, and she was provided with a central battery 98 ft. long, protected with armour of the same thickness. She carried a considerable spread of canvas, and she was fitted with a balanced rudder. The ” Hercules,” com- pleted in 1868, was a much more important ship, her dimensions being: length 325 ft, breadth 59 ft., draught 265 ft., displacement 8680 tons. Her engines of 8500 I.H.P. gave her a speed of about 14J knots. She had two 9-in. guns, mounted one forwardand one aft on the main deck behind 6-in. armour, and eight 10-in. guns, mounted in a central battery on the main deck. Her water-line was protected by armour 9 in. thick amidships, reduced to 6 in. at her ends, and her battery was protected by 6-in. armour. The ” Sultan,” completed in 1871, was in many respects a similar ship but larger, having a displacement of 9300 tons, 2 ft. more beam and 1 ft. more draught; she attained a speed of upwards of 14 knots. Her main-deck battery carried the same guns as the main-deck battery of the ” Hercules,” but the 9-in. guns at the extremities of the vessel on this deck were dispensed with, and she carried, in addition, an upper-deck battery, placed over the after-end of the main-deck battery, in which four 9-in. guns were carried. Both batteries were protected with 6-in. armour; elsewhere the armour followed that of the ” Hercules.”

Turret Ships. — The system of mounting heavy guns in revolving

turrets was advocated in England by Captain Cowper Coles after

9 ft. 9 in. wide and 7 in. thick, reduced to 6 in. at the extremities. Above this armour belt amidships, for a length of 84 ft., she was provided with a citadel, also of 7-in. armour, which protected the bases of two revolving turrets, each protected with 10-in. armour and carrying two 12-in. guns. She also carried two 9-in. guns forward on the upper deck and one 7-in. gun aft on the main deck, all protected by armour.

The design of the " Monarch " did not satisfy Captain Coles, and he induced the Admiralty to build a turret ship of much lower free-board, in accordance with his views. This vessel was the " Captain," built at Birkenhead and launched in March 1869. By an unfortunate error her freeboard was even less than Captain Coles had contem-plated. She was fully rigged, with tripod masts and large sail- spread; this spread of canvas, with her low freeboard and deficient stability, resulted in her capsizing in the Bay of Biscay on 6th September 1870, amongst those drowned being her designer.

A number of low-freeboard turret vessels of the " Monitor " class, without masts and sails, were built for the British navy at this time, mostly for coast defence. Amongst these, the " Cerberus " for Australia and the " Abyssinia " and " Magdala " for India were completed in 1870. The " Abyssinia " had a displacement of 2900 tons and a speed of about gi knots; her dimensions were: length 225 ft., beam 42 ft., draught 14? ft., and her armament consisted of four 10-in. 18-ton guns. The other two vessels had the same armament, but were somewhat larger, being of 3340 tons displace- ment; and the thickness of their side-armour was 8 to 6 in., against 7 to 6 in. in the " Abyssinia." Several vessels of this type were also built for home service, including the single-turret vessels " Glatton of 4910 tons and " Hotspur " of 4010 tons, each carrying two

18-in. 25-ton guns, and the " Cyclops," " Gorgon," " Hecate " and " Hydra," each of 3560 tons and provided with two turrets carrying two 10-in. 18-ton guns. They were protected with armour from 8 to 12 in. thick, and their speed was from 10 to 12 knots.

The " Devastation," commenced in 1869, represented Reed's views of

what a sea-going turret ship should be. Low sides were adopted, but not in combination with rigging and sails. She was the first sea-going battleship in the British navy which depended wholly on steam power for propulsion. She was 285 ft. long, 62 ft. 3 in. broad, 27 ft. mean draught and 9330 tons displacement. Her sides, which, except right forward, rose only to a height of 4 ft. 6 in. above water, were protected with armour 12 in. thick. Her armament con- sisted of four 35-ton guns, mounted in pairs in two turrets, one at each end of a raised breastwork or redoubt which extended about 150 ft. along the middle of the upper deck. The guns were thus elevated to the height of some 14 ft. above the surface of the water. The turrets were protected by armour 12 in. and 14 in. thick, and the breastwork or redoubt by armour 10 in. and 12 in. thick. A forecastle extended forward from the fore-end of the breastwork at a height of 9 ft. 3 in. above the water-line; but in wake of this fore- castle the side armour dropped to a height of only 4 in. above the surface of the water, at which level there was an armoured deck. She was provided with twin-screw machinery of 7000 I.H.P., which gave her a speed of 14-2 knots, and she carried a large coal supply. After the loss of the " Captain," a special com- mittee, including many of the highest professional and scientific authorities in the United Kingdom, was appointed to examine into the design of such vessels. Of the " Devastation " they reported that " ships of this class have stability amply sufficient to make them safe against the rolling and heaving action of the sea "; they agreed, however, in recommending a plan which the con- structors of the Admiralty had pro- posed, with the view of increasing her range of stability and the accommoda- tion of the crew. This consisted in the addition of side superstructures, formed by continuing up the ship's side with light framing and plating as high as the level of the top of the breastwork, and carrying the breastwork deck over to the sides. The structures were con- tinued aft on each side some distance beyond the breastwork, providing two spacious wings, which added largely to the cabin accommodation. A good idea of her general appearance may be ob- tained irom ng. 49 (Plate XII.). The " Devastation " was followed by the " Thunderer " of the same dimensions, and the " Dreadnought " of 10,820 tons displacement, 8000 I.H.P. and 14 knots speed ; a vessel of higher free- board, plated with 14 in. of armour and carrying four 38-ton guns; she was the most powerful and best pro- tected vessel of her day.

Sir Edward Reed retired from the Admiralty a short time before the " Captain" foundered at sea. During his seven years' term of office some forty iron armour- clads of various sizes and types, besides iron

cruisers and numer- ous other vessels, had been added to the British navy, the adoption of armour for the protection of the vital parts of ships had become established, and especially had the importance of utilizing armour in such a manner as to exclude projectiles from the region of the water-line become recognized. The change from the widely- distributed armament of the first broadside armour-clads to the highly concentrated armament of the turrets, and from the high freeboard ship with sail-power to the low freeboard turret ship without sails, had also been effected; so that when Sir Edward Reed retired in 1870, the latest type of battleship was entirely different from that which existed when he took office; and although the construction of broadside ironclads had not been discontinued, " the wooden walls " had practically ceased to exist. Sir Edward Reed was succeeded by a Council of Construction composed of his immediate assistants, with Mr Barnaby (afterwards Sir Nathaniel Barnaby) as its president; but three years later this council was dissolved,

and Sir N. Barnaby was placed at the head of the Construction Department.

The sea-going qualities of the " Devastation " had successfully demonstrated that the battleship of the future might depend wholly on steam propulsion; and although many naval officers and others continued to hold the view ^' r that sea-going ironclads must of necessity be rigged Barnaby. ships, in the designs which immediately followed sail power was omitted. In the " Inflexible " (fig. 50, Plate XII.), and the sister ships " Ajax " and " Agamemnon," the offensive power was concentrated mainly in two pairs of heavy guns, as it was in the " Devastation " and other turret ships which preceded them; but in them the armour defence also was concentrated over a comparatively small space amidships, the unprotected ends being formed into what was called raft bodies by belts of cork, within which was placed a portion of the ship's coal, &c. Thus the buoyancy was secured by a citadel amidships which could not be penetrated, and by ends which might be

AJAX and AGAMEMNON (of 1876)

Plan of under water Protective Deck

Cofferdam

Coffer dam.

Coffer dam. Fig. 51

Coffer-dam

-Arrangement of ” Ajax ” and ” Agamemnon”'

riddled but (it was contended) not be destroyed. The arrange- ment shown in fig. 51 represents the ” Ajax ” and ” Agamem- non.” The ” Inflexible ” was similar but larger. Sir N. Barnaby described the design of the ” Inflexible ” in 1874 before the Institution of Naval Architects thus:

” Imagine a floating castle : 10 ft. long and 75 ft. wide, rising 10 ft. out of the water, and having above that again two round turrets planted diagonally at its opposite corners. Imagine this castle and its turrets to be heavily plated with armour, and that each turret has within it two guns of about 80 tons each — perhaps in the course of a few years guns of twice 80 tons each. Conceive these guns to be capable of firing, all four together, at an enemy ahead or on either beam, and in pairs towards every point of the compass.

” Attached to this rectangular armoured castle, but completely submerged, every part being 6 ft. to 7 ft. under water, there is a hull of the ordinary form, with a powerful ram bow, with twin screws and a submerged rudder and helm. This compound structure is the fighting part of the ship. Seaworthiness, speed and shapeliness would be wanting in such a structure if it had no additions to it; there is therefore an unarmoured structure lying above the sub- merged ship and connected with it, both before and abaft the armoured castle; and as this structure rises 20 ft. out of the wateT,

from stem to stern, without depriving the guns of that command of the horizon already described, and as it moreover renders a flying deck unnecessary, it gets over the objections which have been raised against the low freeboard and other features in the ‘ Devastation,’ ‘Thunderer’ and ‘ Fury.’ 1 These structures furnish also most luxurious accommodation for officers and seamen. The step in advance has therefore been from 14 in. of armour to 24 in., from 35-ton guns to 80-ton guns, from two guns ahead to four guns ahead, from a height of 10 ft. for working anchors to 20 ft., and this is done without an increase in cost, and with a reduction of nearly 3 ft. in draught of water, &c.”

The dimensions of the " Inflexible " were: length 320 ft., beam 75 ft., mean draught 26 ft. 4 in., and displacement 11,880 tons, and her speed was 14 knots. The dimensions of the "Ajax" and " Agamemnon," begun in 1876, were: length 280 ft., beam 66 ft., mean draught 24 ft. 9 in., and displacement 8660 tons. They carried four I2j-in. guns; their citadels were 104 ft. long, protected with 18-in. armour, their turrets being protected by 16-in. armour; and their speed was 12 knots. The " Edinburgh " and " Colossus," begun three years later, were of the same type, but were built of steel and were of 9480 tons displacement. Their citadels were longer, and their speed was 14J knots. Compound armour, adopted

general appearance is obtained from fig. 53 (Plate XII.), which repre- sents the " Camperdown." The " Victoria " 2 and the " Sans Pareil," built a few years later, were, with the " Benbow," the only ships of the British navy built to carry 110-ton guns, the former having them in pairs in a turret heavily armoured, and the latter singly in barbettes.

Among the last of the battleship designs undertaken by Sir N. Barnaby was that of the "Trafalgar" and "Nile," which was completed by Messrs. F. K. Barnes and H. Morgan after his retire- ment. These vessels, laid down in January and April 1886, were the largest ships then built for the British navy. They were 11,940 tons displacement, 345 ft. long, 73 ft. beam, and 28 ft. 10 in. mean draught; had engines of 12,000 I.H.P. and a speed of l6| knots. Their armour-protection consisted of a belt 230 ft. long and 20 in. thick, with bulkheads 18 in. and 14 in. thick. Above the belt was an armoured redoubt of iS-in. compound armour which enclosed the turret bases. The turrets themselves had 18-m. armour and between the turrets was an octagonal battery of 3 in. to 5 in. of steel containing the 4-7-in. Q.F. guns. The thickness of the pro- tective deck was 3 in. The disposition of armament originated in the " Collingwood " was adopted in these vessels, but the heavy guns were placed in turrets instead of in barbettes. The armament

6VJ..K.

Plan of Upper Vec/t

6~B1H.

B— B—E3-

6~B L R. 6"B,L R 6'Q.E

Plan of Protective Deck cU end

. _j'-» "'oltV •ˆ■Jji x eolefi* ■ie"Armou.r Plan of Dech. over Belt*

6 '■»

6′ Q.F

Plan of Protective ˆech. at end

K lS" Armour

Fig. 52. — The "Collingwood." A, communicating tubes; B, boiler-rooms; D, water-chambers; E, engine-room; M, magazines and shell-rooms; P, patent fuel packing; W, water-ballast tanks.

in these two ships for the first time, gave them a great advantage in defensive power.

The " Collingwood," begun in 1880, was the first of the battleships of a new type known as the " Admiral " class. In these vessels the main armament consisted of four heavy guns mounted in pairs on the middle line of the ship, in fixed heavily protected gun-positions called barbettes, one at each end of the ship; this main armament was supplemented by a secondary armament of lighter and more rapid-firing guns mounted on the broadsides between the barbettes. This arrangement of the armament, which is illustrated in fig. 52, continued, with small modification, to be adopted in the battleships of the British navy down to 1903.

The principal features of the " Collingwood " were : length 325 ft., beam 68 ft., mean draught 27 ft., displacement 9500 tons. She carried 18-in. armour on her sides, 16-in. on bulkheads, Iij-in. on barbettes and 12-in. conning towers. Her armament consisted of four 12-in. 45-ton guns, six 6-in. guns, and a number of smaller guns. Her speed was 165 knots, and she carried 900 tons of coal, with capacity for 1200. She was followed two years later by the

Rodney," " Howe," " Benbow," " Camperdown " and " Anson," which were of the same type, but larger. These six ships con- stitute what is known as the " Admiral " class. A good idea of their

1 The " Fury " was modified and renamed ' being launched.

Dreadnought " before

consisted of four 13-5-in. 67-ton B.L. guns, six 4-7-in. Q.F., eight 6-pdrs. Q.F., twelve 3-pdrs. Q.F., besides boat guns and six torpedo tubes. They carried 900 tons of coal at normal displacement, and had stowage for 1 100 tons.

Sir Nathaniel Barnaby retired from office in 1885. During his term of office there were built for the British navy upwards of twenty armoured battleships of various classes, in addition to a much larger number of cruisers of all sizes. The fight for supremacy between the gun and the armour plate had begun in earnest when Sir N. Barnaby took office, the increased weight of projectile and penetrative power obtained by the concentration of the armament into a few heavy guns being followed by the concentration of the armour into a short belt. The con- centration of guns and armour reached a limit in the " Inflexible " and her immediate successors; the later ships of Sir N. Barnaby's design carried a secondary battery of lighter guns in addition to the heavy main armament, and had much longer water-line belts. These changes, combined with the

5 The " Victoria " was accidentally rammed and sunk by the " Camperdown " during the Mediterranean manoeuvres of 1893.

introduction of compound armour and the adoption of steel instead of iron for the building material, both of which date from his time, allowed of greater armour protection and of other advantages, including increased speed, &c.

Sir Nathaniel Barnaby was succeeded in October 1885 by Mr W. H. White (afterwards Sir W. H. White, F.R.S.). The battleships then building were of four different types White. ' an d included two of the " Colossus " class, six of the " Admiral " class, two " Trafalgars," and the " Victoria " and " Sans Pareil." Their completion proceeded very slowly, and no new battleships were laid down till 1889, when the Naval Defence Act resulted in a reconsideration of the subject by the Board of Admiralty.

Before coming to a decision various designs were discussed, and the First Lord convened a meeting, not only of the members of the Board, but of a number of distinguished and experienced naval officers as well as the Director of Naval Ordnance and the Director of Naval

Construction. Subsequently the Board issued instructions for the preparation of detailed designs em- bodying the features which were agreed upon as being most desirable; and on these designs the seven barbette battleships

casemates of 5-in. armour; the armour belt was 12 in. thick, the protective decks 2 in., and the side armour between belt and main decks 3 in. thick. They were re-armed and improved in

1 902-1 903.

The " Renown " (fig. 55, Plate XII.), laid down in 1893, was 380 ft. long, 72 ft. beam, 25 ft. 6 in. mean draught, 12,000 I.H.P., and 18 knots speed, armed with four 10-in., ten 6-in., fourteen 12-pdr. and eight 3-pdr. guns, and five torpedo tubes. She was the first vessel in the British navy to be protected by Harveyized armour; the belt armour had a maximum thickness of 8 in., the barbettes were of 10-in. armour, the casemates 6 in., and the decks 2 in. to 3 in. thick. An innovation was made in the form of the protective deck, the sides being bent down to the level of the lower edge on the side armour, while the midship por- tion was kept flat at the level of the upper edge of the side armour. This method of construction was followed in all succeeding British battleships.

The "Majestic," laid down about the same time, was an un- sheathed first-class battleship, 390 ft. long, 75 ft. beam, 27 J ft. mean draught, 14,900 tons displacement, 12,000 I. H. P., and l7knots speed; her bunkers held 2000 tons of coal, of which 900 tons are included in the displacement named. Her armament consisted of four 12-in. wire-wound guns, which were more powerful than the heavier I3j-in. guns of the " Royal Sovereign," twelve 6-in. Q.F., eighteen 12-pdr., twelve 3-pdr. and smaller guns, and five torpedo tubes, four of them submerged. Her protective deck was 25 in. thick on the flat part

Fig. 54. — The " Royal Sovereign

of the " Royal Sovereign " class turret ship " Hood " were built.

The general arrangement of guns and armour in the vessels of the " Royal Sovereign " class is shown in fig. 54. They were 380 ft. in length, 75 ft. beam, 27^ ft. draught, 14,150 tons dis- placement, 13,000 I.H.P., and 17J knots speed. The coal bunkers can hold 1450 tons, of which 900 tons is included on the above displacement. For three-fifths of the length amidships the side is protected by an 18-in. belt of armour, a horizontal 3-in. protective deck being worked

across the ship at the middle or belt deck; between the belt deck and main deck 4-in. side armour is worked. Before and abaft the belt curved protective decks 2 J in. thick were worked, extending down to the ram forward and covering the steering gear aft. Four 132-in. B.L. 67-ton guns were fitted in pairs in pear-shaped barbettes forward and aft, protected by 17-in. armoured barbettes extending down to the belt deck; ten 6-in. Q.F. guns were fitted, four being on the main deck in 6-in. armoured casemates, which were adopted in these vessels for the first time; sixteen 6-pdr. and twelve 3-pdr. Q.F. guns were fitted, and seven torpedo tubes. The " Royal Sovereign " was laid down at Portsmouth in September 1889, floated in February 1891, and completed in May 1892. (The six upper- deck 6-in. guns were protected by 5-in. casemates added 1901 to i9°4-)

The " Hood " was similar in displacement, armament, armour, horse-power, speed and general dimensions, but was of less freeboard, the heavy guns being fitted in turrets revolving on armoured redoubts of reduced heights.

The " Centurion " and " Barfleur," laid down in 1890, were designed as sheathed second-class battleships for service in distant waters; they were 360 ft. in length, 70 ft. beam, 25 ft. 6 in. mean draught, 10, 500 tons displacement, 13,000 I. H. P., and i8jknots speed. They were armed with four 10-in. B.L. guns in circular barbettes of 9-in. armour, ten 47-in. and twenty-two small Q.F. guns, and five torpedo-tubes, four of the 47-in. guns being on the main deck in

amidships and 4 in.' thick on'the sloping sides; above the deck a broad belt of 9-in. Harveyized armour was fitted, rising to the main deck. Ine barbettes were protected by 14-in. armour, and all the 6-in. guns were protected by 6-in. case- mates. The " Majestic " was laid down at Ports- mouth on the 5th of February 1894, floated on the 31st of January 1895, and completed in December 1895.

Nine vessels of the same class were built, the last being the " Hannibal " (fig. 56, Plate XIV.), completed in April 1898. In two of the vessels, " Caesar" and " Illustrious," the bar- bettes were made circular, central revolving hoists being fitted and the guns arranged to load at any angle of training, a system which was adopted in the heavy gun mountings of all the later British battleships.

The " Formidable " and " London " classes, laid down from 1898 to 1 901, differ very slightly from each other, and for all practical pur-poses may be taken as identical, the main difference being in a re-arrangement of the armour protection to the bow in the later ships.

The former class consists of the thre" battleships " Formidable," " Irresistible " and " Implacable," and the latter of the five battle-ships " London," " Bulwark " (fig. 57, Plate XV-), " Venerable,' " Queen" and " Prince of Wales." These classes represent a development of the " Majestic " class, being 400 ft. long, 75 ft. beam, 26 ft. 9 in. draught, and 15,000 tons displacement, the belt being of the same general thickness and extent as in the " Majestic," but of Krupp steel, protection being given to the bow by 2-in. side-plating. In the " Formidable " the protective deck proper was formed as in the " Majestic," but thinner, being 2 in. to 3 in. thick,_ and a second protective deck, I in. thick, was formed at the main deck, giving a flat top to the citadel formed by the side belt and the bulkheads. In the " London " class the lower protective deck was thinner and the upper one thicker than in the "Formidable" class, the protection being extended forward by thinner material, tapering to 2 in. at the bow, and the forward transverse armour bulkhead being omitted. The 12-in. guns in both classes were

longer and heavier than in the ships of the " Majestic " class, and were in barbettes 12 in. thick; in addition, there were twelve 6-in. Q.F. guns — all in casemates — sixteen 12-pdrs. and four torpedo tubes. These eight battleships were each provided with 20 Belleville boilers, developed 15,000 H.P., and had a speed of 18 knots. They carried 900 tons of coal at their normal displacement,

Fig. 59. — Arrangement of Guns and Armour, H.M.S. " King Edward VII."

and had bunker space for 2200 tons; they were afterwards fitted to burn oil as well as coal in their boilers, the double bottom compartments having been adapted for the stowage of oil in bulk.

The line of development, as traced above, may be taken to begin with the " Collingwood " and to run through the " Admiral " class, the " Nile " and " Trafalgar," the " Royal Sovereign " class, the " Majestic " class, and the " Formidable " class to the " London " class, the most powerful type of warship constructed for the British navy up to the end of the 19th century. Branching off from this line, at a time when battleships became much heavier (the " Royal Sovereign " class

were of 2200 tons more displacement than the "Nile" and "Trafalgar"), a series of smaller, faster, and more lightly armed and armoured battleships than the series terminating with the " London " class was also built. These began with the " Barfieur " and "Centurion," which, though contemporary with the " Royal Sovereign " class, were of 1440 tons less displacement; they were followed by the " Renown," the " Canopus " and the " Duncan " class.

The six ships of the " Can- opus " class may be regarded as a development of the ' Renown." Begun in 1896, they were 12,95a tons in dis- placement, 390 ft. long, 74 ft. beam, and 26 ft. draught. They had a 6-in. Harveyized belt, 14 ft. two protective decks (anticipating the

boilers; they had 20 Bellevilles, developed 13,500 H.P., and had a speed of 18J knots. They carried 1000 tons of coal at normal load, and had bunkers for 2300 tons. The ships of the " Duncan " class were 'longer and larger than those of the " Canopus " class. They were begun in July 1899, were of 14,000 tons dis- placement, 405 ft. long, 75 ft. 6 in. beam, 26 ft. 6 in. draught. They

had a belt of Krupp steel, 7 in. thick amidships, tapering to 3 in. at bow, and two protective decks, as in the " Canopus " ; they had two barbettes, II in. thick, for four 12-in. guns, and carried twelve 6-in. Q.F. guns in 6-in. casemates on the main and upper decks; also a number of smaller guns and four submerged torpedo tubes. They were provided with 24 Belleville boilers, would de- velop 18,000 H.P., and attain a speed of 19 knots. Their normal coal supply was 900 tons, and they had bunker capacity for 2000 tons. Six of these ships were built, one of them, the " Montagu," being lost on Lundy Island in 1906. Vessels of similar type had been built abroad, but there was a tendency to provide in them a more powerful secondary armament. In 1901 France built the " Republique " with eighteen 6-5-in.

funs as her secondary armament; taly laid down the " Regina Elena," carrying twelve 8-in. guns as her secondary armament; and Germany the " Braunschweig," carrying four- teen 6-7-in. and twelve 3-4-in. guns as her secondary armament. In 1902 the United States followed with the " Georgia," carrying a secondary armament of eight 8-in. and twelve 6-in. guns, while two English vessels, the " Libertad " and " Independencia," laid down for Chile, carried no less than fourteen 7"5-in. guns as their secondary armament. 1 In 1902 the " King Edward VII." (fig. 58, Plate XIV.), the last battleship for which Sir

William White v/as responsible, was laid down, carrying four 12-in. guns, with a secondary armament of four 9-2-in. and ten 6-in. guns. She may be considered as an enlarged " Duncan," with the main-deck guns increased from eight to ten in number and enclosed in a battery having sides and ends pro- tected by 7-in. armour, with the backs of the casemates replaced by splinter bulkheads 1 to 2 in. in thickness, and with the four 6-in. guns in casemates on the upper deck replaced by four 45-calibre 9-2-in. guns, protected by enclosed revolving armour shields. The

Fig. 61. — Arrangement of Guns and Armour, H.M.S. " Lord Nelson."

broad and 195 ft. long; . " Formidable " in this respect); and two 12-in. barbettes, each carrying two wire-wound 12-in. guns, against the " Renown's " 10-in. They also carried twelve 6-in. guns in 5-in. casemates, ten 12-pdrs., a number of smaller and machine guns, and four submerged torpedo tubes. They were the first battleships of the British navy to be fitted with water-tube XXIV. 29

general arrangements of the guns and armour are shown in fig. 50. 2

1 These two vessels were afterwards purchased by the British government and became the " Swiftsure " and " Triumph " (fig. 69, Plate XVIIL).

2 The gun and armour diagrams and many particulars of modern vessels are taken by permission from Brassey's Naval Annual.

Sir

Philip

Watts.

The displacement of the " King Edward VII." was 16,350 tons, the length 425 ft., beam 78 ft., draught 26f ft.; the H.P. 18,000, while the designed speed was l8j knots. Eight vessels of this class were built, five being ordered in 1902 and three in 1903.

The principal changes to be noted in the development of the battleship type from 1885 to 1902 are: — (1) The successive improvements in armour by the introduction of the Harvey and Krupp processes, which enabled either a saving of weight to be effected for the same degree of protection, or a greater degree of protection to be provided for the same weight. (2) The belt armour was extended longitudinally and upward, shielding a greater portion of the hull and giving increased protection to the stability and to the secondary armament of the vessel. (3) Improvements in guns and explosives, by which more effective gun-fire was obtained with guns of smaller calibre and less weight than those previously in use. (4) The growth in importance of the secondary armament. (5) Improvements in machinery — the adoption of higher steam pressures, lighter and faster-running engines, and of water-tube boilers — which effected great savings in weight for a given power, and enabled increased speed to be obtained in successive ships. Sir William White held office for nearly seventeen years, and during that period a very large number of vessels of various classes were added to the British navy. He retired in February 1902, and was succeeded by Mr Philip Watts, F.R.S. (b. 1850), who was knighted

in 1905.

In 1903 the design of the vessel which afterwards became the "' Lord Nelson " was approved, her armament then including four 12-in. and twelve 9.2-in. guns, all of 50 calibre and all mounted in pairs in gun-houses above the upper deck. It was, however, decided to build the three additional King Edwards" above referred to, in order to complete the squadron of eight vessels of the same type. In the " Lord Nelson," as afterwards laid down in 1905, the con- dition that the vessels of this class should be capable of being docked in existing docks at Chatham and Devonport led to the reduction of the secondary armament to ten 9-2-in. guns, instead of twelve 9-2-in. guns. Only two vessels of the class were built, the " Lord Nelson " by Palmers Co. and the " Agamemnon " (fig. 60, Plate XIV.) by Beardmore & Co. They are 410 ft. long, 79i ft. beam, 27 ft. draught, 16,500 tons displacement, 17,500 I. H.P. and l8| knots speed. The general arrangements of the guns and armour are shown in fig. 61 ; the 12-in. guns are carried in pairs at each end of the ship in gun-houses upon barbettes protected by 12-in. armour, and the ten 9-2-in. guns are carried in gun-houses on the broadside, the midship gun-houses having single and the others pairs of guns instead of each having a pair of guns as originally contemplated. The gun-houses carry 8-in. and 7-in. armour, and the bases of the gun mountings are protected by a citadel of 8-in. armour rising to the upper deck and

unperforated for doors or ports. _ There are also twenty-four 12-pdr. anti-torpedo-boat guns carried upon super- structures and a hurricane deck. The water-line is protected by 12-in. armour amidships, tapering to 6 in. forward and 4 in. aft, associated with protective decks. (See Shipbuilding.)

Admiral Sir John Fisher (Baron Fisher of Kilverstone) became First Sea Lord of the Admiralty on the 20th of October 1904, and very shortly after he took office Lord Selborne, First Lord of the Admiralty, announced that the Board had appointed " a Special Committee on Designs to assist them and the Director of Naval Construction in the consideration of certain questions to be submitted to it by the Board in connexion with the features of the future designs of different types of fighting ships." The Committee began to sit in December 1904. Their "ao™ht" recommendations were approved in 1905 by the Board O-Pft and embodied in the designs of the " Dreadnought "

type of battleships, and the " Invincible " type of cruiser, as well as in new types of torpedo-boat destroyers.

The principal features of the " Dreadnought " design were as follows (Pari. Paper Cd. 3048 of 1906) : —

Armament. — •' Ten 12-in. guns and twenty-four 12-pdr. Q.F. anti-torpedo boat guns and five submerged torpedo tubes.

" In arranging for a uniform armament cf 12-in. guns it became at once appaient that a limitation to the number of guns that could be usefully carried was imposed by considerations of the blast effect of the guns on the crews of those guns adjacent to them. It is ob- viously uneconomical to place the guns in such relative positions that the blast of any single gun on any permissible training should very seriously hamper the use of one or more of the remaining guns.

" While it is recognized that broadside fire is held to be the most

important in a battleship, all-round fire is also considered of great importance, since it lies in the power of an enemy to force an op- ponent, who is anxious to engage, to fight an end-on action.

" In the arrangement of armament adopted, six of the guns are mounted in pairs on the centre line of the ship; the remaining four guns are mounted in pairs on the broadside. Thus eight 12-in. guns (80 % of the main armament) can be fired on either broadside, and four, or possibly six, 12-in. guns (or 60% of the main armament)

can be fired simultaneously ahead or astern.

"In view of the potentialities of modern torpedo craft, and considering especially the chances of torpedo attack towards the end of an action, it is considered necessary to separate the anti- torpedo-boat guns as widely as possible from one another, so that the whole of them shall not be disabled by one or two heavy shells. This consideration led the Committee to recommend a numerous and widely distributed armament of 12-pdr. Q.F. guns of a new design and greater power than those hitherto carried for use against torpedo craft."

Freeboard. — " In order to give the ship good sea-going qualities and to increase the command of the forward guns, a forecastle is provided giving the ship a freeboard forward of 28 ft. — a higher freeboard than has been given to any modern battleship."

Armour. — " The main armour belt has a maximum thickness of II in., tapering to 6 in. at the forward and 4 in. at the after extremity of the vessel; the redoubt armour varies in thickness from 1 1 in. to 8 in. : the turrets and fore conning tower are 1 1 in. thick, and the after conning tower is 8 in. thick; the protective deck varies from if in. to 2 f in. in thickness.

" Special attention has been given to safeguarding the ship from destruction by under-water explosion. All the main transverse bulkheads below the main deck (which will be 9 ft. above the water-line) are unpierced except for the purpose of leading pipes or wires conveying power. Lifts and other special arrangements are pro- vided to give access to the various compartments."

Speed. — •" Mobility of forces is a prime necessity in war. The greater the mobility the greater the chance of obtaining a strategic advantage. This mobility is represented by speed and fuel en-durance. Superior speed also gives the power of choosing the range. To gain this advantage the speed designed for the ' Dreadnought ' is 21 knots."

Type of Machinery. — " The question of the best type of propelling machinery to be fitted was also most thoroughly considered. While recognizing that the steam-turbine system of propulsion has at present some disadvantages, yet it was determined to adopt it because of the saving in weight and reduction in number of working parts, and reduced liability to breakdown; its smooth working, ease of manipulation, saving in coal consumption at high powers and

hence boiler-room space, and saving in engine-room complement ; and also because of the increased protection which is provided for with this system, due to the engines being lower in the ship; ad- vantages which more than counterbalance the disadvantages. There was no difficulty in arriving at a decision to adopt turbine propulsion from the point of view of =ea-going speed only. The point that chiefly occupied the Committee was the question of pro- viding sufficient stopping and turning power for purposes of quick and easy manoeuvring. Trials were carried out between the sister vessels ‘ Eden ‘ and ‘ Waveney ‘ and the ‘ Amethyst ‘ and ‘ Sapphire,’ one of each class fitted with reciprocating and the other with turbine engines ; experiments were also carried out at the Admiralty Experimental Works at Haslar, and it was considered that all requirements promise to be fully met by the adoption of suitable turbine machinery, and that the manoeuvring capabilities of the ship, when in company with a fleet or when working in narrow waters, will be quite satisfactory.

” Trie necessary stopping and astern power will be obtained by astern turbines on each of the four shafts. These astern turbines will be arranged in series, one high and one low pressure astern turbine on each side of the ship, and in this way the steam will be more economically used when going astern, and a proportionally greater astern power obtained than in the ‘ Eden ‘ and ‘ Amethyst.’

Radius of Action. — ” The ship has a total coal -bunker capacity of 2700 tons, and with this amount of coal she will be able to steam about 5800 sea miles at economical speed, and about 3500 sea miles at i8i knots after allowance has been made for bad weather and for a small amount of coal being left in the bunkers. Stowage for oii fuel has been arranged for, but oil fuel has not been taken intt. account in estimating the radius of action, which, of course, will 1»> greatly increased thereby.”

Accommodation. — ” Considerable attention has been devoted tc the arrangements for the accommodation of the officers and men. In view of the increasing length and greater power of modern ships the usual position of the admiral’s and captain’s quarters right aft is becoming more and more open to objection. Up to the present the principal officers have been berthed at the farthest possible distance from the fore bridge and conning tower, where their most important duties are performed. It has been decided that in this ship the admiral’s and captain’s quarters shall be placed on the main deck forward, near the conning tower; also_ that the officers’ quarters shall be placed forward, both on the main deck and on the upper

deck, in the fore part of the ship . Ample accommodation

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Plate XIII.

XXIV, 898.

Fig. 64. — H.M.S. Dreadnought.

Plate XIV.

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Fig. 56. — H.M.S. Hannibal (Majestic Class).

-H.M.S. King Edward VII.

Fig. 60. — H.M.S. Agamemnon (Lord Nelson Class).

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for the remainder of the crew is available on the main and lower decks aft.”

The tabulated particulars given in Pari. Paper Cd. 3048 for the designs approved are shown in Table XIV.

It is interesting to note that the distribution of armament finally adopted in the ” Dreadnought ” was nearly that of a design considered by Sir Nathaniel Barnaby at the Admiralty in 1874, which was a combination of the ” Devastation ” and ” Inflexible ” designs. The armament was an all-one-calibre big gun armament of 16-in. 80- ton guns carried in pairs in turrets above the upper deck, one pair being placed at each extremity on the middle line, and two pairs on the broadside en ichelon, having training on each broadside as well as ahead and astern, thus giving a fire of six guns ahead, six astern and eight on each broadside. The scheme was considered inadmissible on account of the great displacement involved, 16,000 tons. The arrange- ment of eight heavy guns then contemplated was actually adopted in the ” Invincible ” design, but it was not consi4ered that four pairs of 1 2-in. guns was a sufficiently heavy armament for the battleships of the ” Dreadnought ” class; a proposal to place a fifth pair of guns on the middle line between the broad- side guns and the aftermost pair of guns was finally adopted,

the turrets on the broadside being placed abreast of each other instead of en Echelon on account of the great increase of length and displacement involved.

The main features in which the " Dreadnought " differed from the " Lord Nelson " are: — (1) The all-one-calibre big gun armament in place of the mixed armament of 12-in. and 9- 2-in. guns. (2) The increase of 3 knots in speed. (3) The height of freeboard provided forward to enable the vessel to fight her bow guns at high speed in a sea way. (4) Great increase in manoeuvring power due to fitting twin rudders behind propellers.

The weight of the armament of the "Dreadnought" is the same as that of the " Lord Nelson "; it is 30% greater than that of the " King Edward VII.," the 1400 tons increase of dis- placement (about 8% of the displacement of the " Lord Nelson " and " King Edward VII.") being used in obtaining the increase of 3 knots of speed.

The general arrangements of guns and armour of the " Dread- nought " are shown in fig. 63, and on Plate XIII., fig. 64, a photograph of the vessel is given. She was built and tested as rapidly as possible, her keel was laid on the 2nd of October 1905, she was launched on the 10th of February 1906, King Edward VII. himself performing the christening ceremony and starting the vessel down the ways; and, she went to sea, for steam, gunnery and torpedo trials, on the 1st of October 1906, one year after the laying of the keel. The whole of the trials were com- pleted without hitch of any kind, the machinery realized the expectations as to power and smoothness of running, and a speed of 21-6 knots was obtained on the measured mile, with an expenditure of power well within the capacity of the boilers. She left England for a long experimental cruise on the 5th of December 1906.

Immediately after the trials of the " Dreadnought," three other vessels, the " Bellerophon," " Temeraire " and " Superb " of 18,600 tons were begun, the additional 700 tons in displace- ment being absorbed in additional armour protection and an improved anti-torpedo-boat armament consisting of sixteen 4-in. guns. In 1907 and 1908 the " St Vincent," " Collingwood " and " Vanguard " of 19,250 tons displacement were begun, in which further additions to the armour protection were made. These were followed by the " Neptune," " Hercules " and " Colossus," of about 20,000 tons displacement, laid down in 1909, the additional 800 tons lengthening the ships and enabling the 12-in. guns on the broadside to be placed en echelon and the second pair pf guns from aft to be

lifted high enough to fire over the aftermost pairs of guns; the whole of the main arma- ment being thus able to fire on either broadside and eight guns to fire astern. Each of these vessels was completed in two years from the date of laying the keel. See Table XV.

On the 29th of November 1909 the " Orion," the lead- ing vessel of what in 1910 was the most recent group of

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” Dreadnoughts,” was laid down at Portsmouth, 1 and the following vessels of the group (the ” Thunderer,” ” Monarch ” and ” Conqueror “) were ordered to be built in the private yards of the Thames Iron Works, Sir W. G. Armstrong & Co. on the Tyne, and Beardmore & Co. on the Clyde a few weeks

broadside. Their displacement had been reached by five steps from that of the ” King Edward VII.” and ” Lord Nelson,” — the first of 1400 tons, 85%; the next three each of about 700 tons, say 4%; and the last of 2500 tons, or i2§%. The first of these increases, though not without precedent in

Fig. 63. — Arrangement of Guns and Armour. H.M.S. " Dreadnought."

later. In these vessels there is a considerable increase in displacement, amounting to 2500 tons or 125% beyond that reached in the preceding group, their displacement being 22,500 tons on a length of S45 ft. between perpendiculars. The additional displacement has allowed the whole of the turrets to be placed on the middle line, the side armour to be raised to the upper deck, and heavier guns to be carried.

Great Britain thus had in 1910 fourteen " Dreadnoughts " built and building, not including the " Dreadnought " cruisers described later on under cruisers.

In the first seven vessels — "Dreadnought," " Bellerophon," " Temeraire," " Superb," " St Vincent," " Collingwood " and " Vanguard " — six 12-in. guns could fire directly ahead and six

the British navy, 2 elicited some hostile criticism. Its justifica- tion lay in the fact that all the world followed the lead. The 22,500 tons of the " Orion " was not acceptable in 1904, but. her design was practically that advocated by Lord Fisher when he took office as First Sea Lord in October 1904 after certain modi- fications had been made as the result of investigations at the Admiralty.

The general growth of the fleets of British and foreign powers is dealt with in the article Navy. Some details may be given here of foreign battleships.

United States. — In 1889 the " Texas," designed by the late Mr William John, was laid down. On a displacement of 6315 tons she carried an armament of two 12-in. and six 6-in. guns at a speed of 17 knots— the 12-in. guns being mounted in two turrets placed

Table XV. — Particulars of British Battleships

of Dreadnought Type.

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1 Estimated.

directly astern, and eight could fire on the broadsides. In the next three — ” Neptune,” ” Colossus ” and ” Hercules ” — six 12-in. guns could fire ahead, eight could fire astern, and the whole ten could fire on either broadside. In the last four — ” Orion,” ” Thunderer,” ” Monarch ” and ” Conqueror “—four guns could fire ahead, four astern and the whole ten on either 1 She was launched on the 20th of August 1910.

diagonally in a central citadel and protected by 12-in. armour. She was followed by the ” Maine,” which was sunk in Havana Harbour. In 1891 the ” Indiana,” ” Massachusetts ” and ” Oregon ” were laid down, of 10,288 tons displacement and 16 knots speed, protected by 18-in. belt armour and armed with four 13-in. and eight 8-in.

2 From the ” Trafalgar ” to the ” Royal Sovereign,” and from the ” Duncan ” to the “King Edward VII.,” increases in each case of 17 % were accepted.

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Fig. 57.— H.M.S. Bulwark.

Fig. 81. — Norwegian Norge.

Fig. 98. — Chilean Chacabuco.

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Plaie XVI.

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Fig. 66.— U.S.A. Illinois.

Fig. 70. — German Kaiser Frederick III.

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guns, the 13-in. guns being mounted in pairs in turrets on the upper deck, and the four 8-in. guns singly in turrets at the corners of the superstructure deck. They were followed by the " Iowa " of 11,346 tons, laid down in 1893; and in 1896 by the " Kearsarge " and " Kentucky," whose principal dimensions were: — length 368 ft., beam 72 ft., mean draught 23 ft. 6 in., displacement 11,525 tons, I.H.P. 10,500 and speed 16 knots as designed, 12,000 I.H.P. and l6f knots being reached on trial. They carried four 13-in. guns in turrets 15 in. thick, four 8-in. guns in turrets 9 in. thick, fourteen 5-in. Q.F. guns, twenty-seven smaller guns, and four torpedo tubes ; and at the above displacement they carried 410 tons of coal, but could stow 1 590 tons. They had a novelty in the shape of two double-storeyed turrets, one forward and one aft. In this arrange- ment a second turret is superposed or built on the first, the structure so formed turning as a whole; a pair of 8-in. guns is mounted in the upper turret, and a pair of 13-in. guns in the lower. A later example of American design is furnished by the five first-class battleships of the " Georgia " class (fig. 65), laid down in 1902, which have a displacement of 15,320 tons, length 435 ft., beam 76 ft. 10 in., and a mean draught of 24 ft.; they have a complete water-line belt of Krupp armour, from 11 in. to 8 in. thick, tapering to 4 in. at the bow; above this belt there is a belt of lighter armour, 6 in. thick and 245 ft. long, forming a battery for the 6-in. Q.F. guns, which extends to the upper deck; there are also four turrets — two large double-storeyed turrets, as in the " Ken-

r |ex» lev l*-»r. i»-q.f.

i — t=t

Fig. 65. — Gun and Armour Plan " Georgia " class (" Georgia," ‘

" Rhode Island " and "Virginia ").

tucky," placed one forward and one aft, and two smaller turrets, one placed on each side forward. The larger turrets carry each a pair of 12-in. guns and a pair of 8-in. guns, and are protected by a maximum thickness of 11 -in. armour, and the smaller carry each a pair of 8-in. guns and are protected by 6|-in. armour. In addition to the four 12-in. and eight 8-in. guns thus disposed, there are also twelve 6-in. guns on the main deck and some forty-two smaller guns.

Machinery of 19,000 I.H.P. was provided for aspeed of 19 knots,

and both were exceeded on the trials of the vessels. They carry 900 tons coal on the trial draught, and when fully loaded with 1900 tons of coal have a draught of 26 ft. This comparatively shallow draught is a distinctive feature of all the early United States battle- ships, but in later years a notable increase of draught was accepted. Between the " Kearsarge " and the " Georgia " were built in 1896-1898 the " Alabama," " Illinois " (fig. 66, Plate XVI.), and " Wisconsin," somewhat similar to the " Kearsarge," carrying four 13-in. guns and fourteen 6-in. guns, and in 1899-1901 the second " Maine,"the" Missouri "and " Ohio," which more nearly'resembled the " Georgia," as they carried 12-in. guns for their main armament.

The " Georgia " class was followed by two much larger vessels the "Connecticut" and "Louisiana," laid down in 1903; they were 450 ft. long, 76 ft. 10 in. beam, 17,600 tons displacement and 24 ft. 6 in. draught. when loaded with 900 tons coal, and 26 ft. 9 in. draught when loaded with full complement of ammunition and stores and 2200 tons coal; and they marked a great advance in fighting power. While retaining four 12-in. jpns for the main armament, they carried eight 8-in. and twelve 7-in. guns as a secondary arma- ment, and they were well protected, guns and armour being arranged as shown in fig. 67. Engines of 16,500 I.H.P. were provided for a speed of 18 knots, and both were considerably exceeded on trial. In these and later American vessels tall towers of open lattice-work, somewhat resembling the Eiffel Tower, were fitted instead of hollow steel masts for supporting signal and fire-control arrangements.

While the vessels of the " Connecticut " class were building in 1904, two other very similar but smaller vessels, the " Idaho "and" Missis- sippi," were also' laid down, of 13,000 tons with reduced armament and armour and less speed.

The first two American " Dreadnoughts," the " Michigan " and " South Carolina," were laid down in 1906; they are 450 ft. long, 80 ft. 3 in. beam, displacement 16,000 tons and draught 24 ft. 6 in. when carrying 900 tons of coal, increasing to 17,620 tons and 27 ft. draught when fully loaded. Engines of 16,500 I.H.P. are provided for 18-5 knots, and the armament consists of eight 12-in. guns mounted in four pairs, two pairs forward and two pairs aft, all on the middle line and arranged so that the guns of the second pair sweep over the turrets of the adjacent pair nearer the extremities of the vessel; an anti-torpedo boat armament of twenty-two 14-pdr. guns is provided, but no secondary armament. The sides and barbettes are protected by 8 in. to 12 in. of armour, the belt armour tapering to 4 in. at the bow and stern. In 1907 the " Delaware " and " North Dakota " were

laid down; the size of the vessels was increased to 20,000 tons in order to carry 12-in. and 14-in. guns behind armour from 12 in. to 8 in. in thickness and obtain a speed of 21 knots, and they are 510 ft. long, 85 ft. beam, 26 ft. 10 in. mean draught. Ten 5-in. guns are carried on the main deck behind 5-in. armour, two are carried on the main deck forward and two aft, in casemates. Curtis turbines are fitted in the" North Dakota " and reciprocating engines of the latest type

in the " Delaware"; the boilers pro- vided on each ship are for 25,000 I.H.P.; on trial the "Delaware" developed 28,578 I.H.P. and recorded a speed of 21-56 knots, while the " North Dakota " reached 31,826 H.P. and 22-25 knots.

I Parsons turbines were adopted for the four battleships next laid down. The first two, the " Florida " and " Utah," commenced in 1909, are very similar to the " Delaware," but of 21,825 tons displacement and 28 ft. 6 in. mean draught. The second pair, the " Arkansas " and " Wyoming," begun in 19 10, are of much greater displacement, viz., 26,000 tons; 8100 tons greater than the " Dreadnought " and 3500 tons greater than the " Orion." They are 554 ft. long, while a beam of 93 ft. and the same mean draught of 28 ft. 6 in. have been accepted. Turbines of 33,000 H.P. are provided for a speed of 20-5 knots, four propellers being fitted as in H.M.S. " Dreadnought." The coal to be carried on trial has been in- creased to 1650 tons, in place of the 1 000 tons in preceding vessels. Twelve 12-in. and twenty-one 5-in. guns are carried and vanadium steel armour of 8-in. to 11-in. thickness is fitted on sides and barbettes, associated with protective decks of increased thickness. Six pairs of 12-in. guns are carried, all on the middle line; the foremost pair is 34 ft. above the designed load-line, the second pair 40 ft., and the third pair 32 ft.; the aftermost guns are 25 ft. above water, the next forward 32 ft. and the third pair from stern again at a height of 25 ft. Twenty-one 5-in; anti-torpedo-boat guns are carried, and the complement of officers and men has reached the high total of 1 100. The main armament of the later vessels, " New York " and " Texas," is composed of ten 14-in. instead of twelve 12-in. guns, and the displacement is increased to 27,000 tons and the H.P. to 35,000.

Germany. — In 1885 Germany had one first-class battleship, the " Konig Wilhelm," of 9567 tons displacement, and four smaller vessels, the " Baden," " Bayern," "Sachsen" and " Wiirttemberg," of 7400 tons each. The " Kaiser " and " Deutschland," central- battery ships designed by Sir Edward Reed, and two turret ships, the " Preussen " and " F. der Grosse," followed shortly afterwards. The "

Kaiser " and " Deutschland " were 285 ft. in length, had a displacement of 7600 tons, 8000 I.H.P. and 14J knots speed; were armed with eight 22-ton guns and one 18-ton gun, and had side armour of a maximum thickness of 10 in. The vessels of the " Preussen " class were sea-going ships of the " Monarch " type, 308 ft. in length and of 6750 tons displacement and 14 knots speed, with belt armour of a maximum thickness of 9i in. and turret armour 8| in. thick.

In 1 89 1 an advance was made by laying down the " Brandenburg " class of 9901 tons, carrying six n-in. guns in three barbettes, one forward and one aft, and one on the middle line amidships. They were followed by the five first-class battleships of the " Kaiser " class, the last of which, the " Kaiser Friedrich III." (fig. 70, Plate XVI.), was finished in 1900. They are of 10,900 tons displacement, length 377 ft., beam 66 ft. 10 in., draught 25 ft. 9 in., 13,000 I.H.P. and 18 knots speed. They have belts of Krupp steel extending from the after

barbette to the stem, with a maximum thickness of 12 in., tapering to 6 in at the bow; there is no side armour above this belt. The main armament consists of four 9-4-in. guns, placed in pairs in barbettes, one forward and one aft, protected by 10-in. armour. On the main deck they have four 5-9-in. Q.F. guns in 6-in. armoured casemates, two on each side; and on the upper deck they have eight similar guns, protected in like manner, and six others in turrets- three each side; in all, eighteen 5-9-in. guns, besides twelve 3 – 5-'n- and smaller guns. There are five vessels of the ' Wittelsbach class, a development of the "Kaiser Friedrich III."; they are 700 tons more displacement, 15 ft. longer and ij ft. more beam, Dut are of shallower draught. They have engines of 15,000 H.P. and a speed of 19 knots, or a knot more than their predecessors. Their armament is the same, but the 9-4-in. guns are better protected. The main armour belt is somewhat longer, but in other respects the thicknesses and general disposition of the protection are similar to the " Kaiser Friedrich III." class.

In the next five vessels, the " Braunschweig class, laid down in 1901-1902, the 9-4-in. guns were replaced by 11-in. guns for the main armament; and the eighteen 5-9-in. guns were replaced by fourteen 6-7-in. guns for the secondary armament. The displacement was increased to 12,988 tons, the speed of 18 knots was maintained, and the armour protection practically as in the preceding

FlG. 67. — Arrangement of Guns and Armour of U.S. " Connecticut."

vessels. Five vessels of the new " Deutschland " class which followed in 1903-1905 were very similar to the " Braunschweig " class.

The " Nassau," the first of the German " Dreadnoughts " laid down in 1907, was 455 ft. in length and of 18,200 tons displace- ment, and carried an armament of twelve 11-in., twelve 5-9-in. and sixteen 3-4-in. guns, had an armour belt of Krupp steel II in. to 4 in. in thickness, I. H.P. 22,000 for 19 knots and speed on trial 20-7 knots. The " Posen " (fig. 71, Plate XVIL), " Rheinland " and " Westfalen " of the same type were also laid down in 1 907 and were built and completed for sea with extraordinary rapidity. The " Westfalen " attained 20-25 knots on trial with 26,792 H.P. The next three vessels, " Thuringen," " Helgoland " and " Ostfriesland," laid down in 1908, are provided with twelve 12-in. guns arranged as in H.M.S. " Neptune " ; they are of 22,150 tons displacement and 25,000 I. H.P. for 19-5 knots speed (probably at continuous sea speed; a measured-mile speed of about 2 knots more would doubtless be expected); they are protected by 12-in. Krupp steel armour; their dimensions are: length 489 ft., beam 98 ft., draught 27 ft. 6 in. The vessels laid down in 1910 were said to be still larger.

France. — For many years the French designers favoured the placing of the four heavy guns of their battleships in separate barbettes— -a 12-in. gun at each end and a io-8-in. gun on each side of the vessel amidships, intermediate positions being arranged for the smaller guns. Such vessels as the " Carnot," " Charles Martel," " Jaureguiberry," " Massena," " Bouvet " approximating to 12,000 tons displacement, and built in the 'nineties, were so arranged. These were followed by a series of vessels in which the 12-in. gun alone was accepted for the main armament, and two pairs were fitted, one forward and one aft as in British vessels; the " Gaulois," " Charlemagne," " St Louis " and " SufTren " were so arranged. The " Suffren," commenced in 1899 (displacement 12,728 tons, length 410 ft., beam 70 ft. and draught 27 ft. 6 in.), had a com- plete water-line belt of Harveyized steel armour of I if in. maximum

thickness, and above this, up to the main deck, similar armour, 5 in.

thick, extending from the after turret to the bow; she had also a short armoured battery on the main deck which enclosed the funnel uptakes. There were eight turrets on her upper deck — one forward and one aft, each carrying two 12-in. guns, and six arranged three on each broadside, each carrying a 6-4-in. gun. The armour of the larger turrets was of the same thickness as the armour belt, namely, 1 if in., and that of the smaller turrets 5 in. She mounted eight 3-9-in. guns on the superstructure, and also had twenty-two smaller guns and four torpedo tubes, of which two were submerged. She had triple screws, engines of 16,000 I. H.P. and a speed of 18 knots. The " Republique," laid down in 1901, and the " Patrie," laid down in 1902, were superior in speed and armament to any British battle-ships then building. They had a displacement of 14,865 tons, and were of 439 ft. length, 79 ft. 6 in. beam and 27 ft. 6 in. extreme draught. They had three screws, and a nominal I.H.P. of 17,500 for a speed of 18 knots; but on trial these were considerably ex- ceeded, the " Patrie " reporting 19,000 I.H.P. and 19-47 knots. They carried four 12-in. B.L. guns in pairs in turrets on the middle line, as in the British ships, twelve 6-4-in. Q.F. guns in pairs in turrets on the upper deck, six additional 6-4-in. Q.F. guns in casemates on the main deck, twenty-six 3-pdrs., three above- water and two sub- merged torpedo tubes. There was a complete water-line belt of a maximum thickness of 12 in., the bow was protected by 4-in. armour

and there was a partial 4-in. belt above the 12-in. belt. The pro-tective deck was 4 in. thick on the slopes, and the armour of the main turrets I2j in., the whole armour being of Harvey quality. Four later vessels of the class, "Justice," " D6mocratie," " Liberte " and " Verite," were given a still more powerful second- ary armament of 7-6-in. guns — six placed in well-protected turrets at a great height above water, and four in casemates be- tween decks. Six vessels, the "Condorcet," "Danton" (fig.72), " Diderot," " Mirabeau," " Ver-gniaud" and "Voltaire, "were laid down in 1907. All had Parsons turbines of 22,500 H.P. for a speed of 19-25 knots, and their main armament consisted of four 12-in. and twelve 9-4-in. guns, as shown in fig. 72. The later French ships " Courbet " and " Jean Bart " carry twelve 12- in. guns in six pairs, two for- ward and two aft on the middle line, one pair training over the other, and one pair on each side amidships as in " Dreadnought." They are of 23,000 tons displace- ment and 20 knots speed, and have an anti-torpedo boat armament of twenty-two 5-5-in. guns, all in casemates of 7-in. armour. ,

Japan. — Previous to the Russo-Japanese War Japan had provided herself with a number of excellent battleships built in Great Britain, such as the " Fuji " of 12,450 tons, laid down at the Thames Ironworks in 1894, the " Hatsuse," built at Elswick, the Asahi, built at Clydebank, and the " Shikishima," built at the Thames Ironworks, all of about 15,000 tons displacement and laid down in 1897-1898. The dimensions of these vessels were: length 400 ft., beam 75 ft. 6 in., mean draught 27 ft. The I.H.P. was 15,000 giving a speed of 18 knots. The armour-belt extended the full length oi the ship at the water-line, and had a maximum thickness of 9 in.; be- tween the top of this belt and the main deck, for a length of some 220 ft., was an upper belt 6 in. thick, which was continued by oblique bulkheads to the sides of the heavy-gun barbettes. I he barbettes themselves, which were two in number, one forward and one aft, had armour 14 in. thick, and the conning-tower also was 14 in. thick. The armament consisted of four 12-in. 49-ton b.L. guns, two mounted in each barbette and loading in any position of training; fourteen 6-in. Q.F. guns, all in 6-in. casemates, eight on the main deck and six on the upper deck; and twenty 12- pdrs., besides smaller guns and four submerged torpedo tubes The " Mikasa," laid down at Barrow in 1899, was a slight modification of the " Hatsuse " class design, being 200 tons heavier and 6 in. more in draught. The principal difference was that the eight 6-in. Q.F. guns on the main deck were increased to ten in number, and instead of being in separate casemates were in a 6-in. armoured central battery, with 2-m. divisional screen bulkheads. , , ...

The " Hatsuse " was destroyed in the war by a mine explosion, and the " Mikasa " was seriously damaged by mines. Alter the war she was accidentally sunk on the 10th of September 190-5; she was, however, refloated on the 8th of August 1906, re- paired and recommissioned. The Japanese fleet in 1910 contained

several vessels which were captured from Russia during the war, such as the " Iwami " of 13,515 tons (late " Orel "), the " Hizen " of 12,275 tons (late " Retvizan "), the " Segami " of 12,790 tons (late " Peresviet "), the " Suwo " of 12,997 tons (late " Pobyeda "), the " Tango " of 10,960 tons (late " Poltava "), and the" Ikv " of 9700 tons (late " ImperatorNicolail."). The" Suwo "

Fig. 72. — Arrangement of Guns and Armour of the French " Danton."

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and " Hizen " may be taken as typical examples of these captured vessels. The former is of the following dimensions: length 436 ft., beam 71 J ft., draught 27J ft., and displacement 12,670 tons; she has engines of I5, ; ooo H.P. and a nominal speed of i9i knots, carried an armament of four io-in. guns, mounted in pairs in turrets on the middle line forward and aft ; eleven 6-in. guns, distributed five on each broadside and one in the extreme bow of the vessel; twenty 3-in. guns and twenty-six smaller pieces; and six torpedo tubes. She is protected by a complete water-line belt of armour, 9 in. thick amidships, tapering to 4 in. at the ends, reinforced by a pro- tective deck 2 j in. thick. Above the belt, for a length of 185 ft. amidships, is a lighter belt of 5-in. Krupp armour, protecting the bases of the 6-in. guns, and terminated by transverse bulkheads. The io-in. gun turrets are 10 in. thick, and the 6-in. guns are pro- tected by casemates 5 in. thick. This vessel carries 30 Belleville boilers, and has storage for 2000 tons of coal. The " Hizen " (" Ret- vizan ") was built at Cramp's, U.S.A. She is of 12,700 tons dis- placement, 376 ft. long, 72j ft. beam, and 26 ft. draught. She has four 12-in. B.L. guns in pairs in turrets, twelve 6-in. Q.F. guns in 5-in. casemates, twenty 12-pdrs. and twenty-eight smaller guns, besides four submerged and two above-water torpedo tubes. She is pro- tected by a water-line belt extending from the after-turret to the stem, and tapering in thickness from 9 in. to 2 in. Above this is a complete belt of 6 in. maximum thick- ness, and the main armament is pro- tected by turrets 10 in. thick. She has 16,000 H.P. and a speed of 18 knots, and has stowage for 2000 tons of coal.

The " Kashima " (fig. 73, Plate XVII.) was laid down at Elswick in 1904 and the " Katori," at

Barrow in the same year; they were not delivered until the war was over. Also during the war Japan laid down two very much larger vessels, the " Aki " and " Satsuma." The " Aki " is the larger of the two, being 492 ft. long, 831 ft. beam, 27J ft. draught, and 19,800 tons displacement; she carries four 12-in., twelve io-in., eight 6-in. and twelve 12-pdr. guns and five torpedo tubes, and is protected by 9-in. to 5-in. armour. Curtis turbines of

24,000 H.P. are provided for a speed of 20 knots. It is note- worthy that this vessel was laid down on the 15th of March 1905, while the

" Lord Nelson " of 16,500 tons was not laid down until the 18th of May 1905 and the " Dreadnought " of 17,900 tons not until the 2nd of October 1905. The " Aki " also exceeds in dis- placement the " St Vincent, laid down in 1907-1908, and her

tonnage was not reached in Great Britain until 1 909 , when the" Neptune "was laid down. The " Aki " was followed by still larger vessels, the " Kawachi " and " Settsu," both of 20,800 tons. The " Ka- wachi " is thus 900 tons greater than the " Nep- tune," and she was laid down one day before that vessel. . The general arrangement of armour and guns of these large vessels is shown in fig. 74 ; they are protected by armour of 12 in. to 5 in. in thickness, and in addition to twelve 12-in. guns they carry ten 6-in., twelve 4-7 in. and four 12-pdrs.

Russia maintained in 1910 two fleets, one being in the Black Sea, pre- vented by treaty from passing through the Dardanelles, and the other, the main Russian Fleet, in the Baltic. In 1882 three remarkable vessels were laid down for the Black Sea Fleet, the " Catherine II.," " Tchesme " and " Sinope." They were barbette ships of 10,180 tons displacement, with a compound armour belt of a maximum thickness of 16 in., armed with six 12-in. B.L. guns mounted in pairs on the upper deck in a large pear-shaped barbette, and seven 6-in. guns on the main deck; and having a speed of 16 knots. Other vessels built for this fleet were the " Twelve Apostles " of 8709 tons, " George the Victorious," 11,032 tons, the " Three Prelates," 13,318 tons, the "Rostislav," of 8880 tons laid down in 1895 and the " Panteleimoh " of 12,582 tons laid down in 1897. The latest vessels built on the Black Sea are the " Ioann Zlatoust " and " Evstafi," of 12,840 tons and 16 knots, carrying four 12-in., four 8-in., twelve 6-in., fourteen 12-pdr. and six 3-pdr. guns; both were laid down in 1903.

Of the main Russian Fleet outside the Black Sea only a few battleships survived the Russo-Japanese War; these included the " Tzesarevich " of 13,000 tons, built in France in 1899, carrying four 12-in. guns in two barbettes, and twelve 6-in. guns in pairs in turrets; also the " Slava," laid down on the Neva in 1902, 370 ft. long, of

Fig. 74. — Arrangement of Guns and Armour of " Kawachi."

13,516 tons displacement, 16,000 I. H.P. and 18 knots speed, her hull protected by armour of 9 in. to 4 in. in thickness. The " Slava " carried four 12-in. guns in barbettes having io-in. armour, and twelve 6-in. guns in turrets having 6-in. armour.

In January 1903 Russia laid down the " Imperator Pavel I.," a larger and more powerful vessel than any then building by any other power, being of 17,400 tons displacement — almost that of the

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" Dreadnought," but laid down 2 J years earlier ; she carries four 12-in. and fourteen 8-in. guns as well as twelve 47-in. guns arranged as shown in fig. 75, from which it will be seen that an attempt was made to protect almost the whole of the vessel above water with armour varying from 85 in. to 3 in. in thickness. Engines of 17,600 I.H.P. are provided for 18 knots speed. A sister vessel, " Andrei Pervoz-

4-7'4-7'4-r 4-7"

Fig. 75. — Arrangement of Guns and Armour of " Imperator Pavel.

vanni," was also laid down in 1903, but neither vessel was com- pleted in time to take part in the war. In 1909 four vessels were laid down, which were again larger than any then building for any other power, viz. the " Sevastopol," " Petropavlovsk," " Gangut " and " Poltava," of 23,000 tons displacement, with Parsons turbines of 42,000 H.P. for 23 knots speed, 600 ft. long, 89 ft. beam, 27 ft. 3 in. draught, protected by 11-in. armour, armed with twelve 12-in. and sixteen 4-7-in. guns, the 12-in. guns being carried in four three- gun turrets placed a,t considerable distances apart on the middle line. Italy. — The Italian navy has always contained interesting vessels embodying the independent thought and skill of her own designers. The " Duilio," launched in 1876, and the " Dandolo," launched in 1878, were 340 ft. in length, 10,400 tons displacement, and carried four 100-ton M.L. rifled guns, mounted in two turrets and capable of penetrating 22-7 in. of iron at 1000 yds. They had a central citadel 107 ft. in length, pro- tected by 21 \ in. of steel armour, with 18-in. armour on the turrets. Their engines were of 7900 I.H.P., giving a speed of 15 knots. In the " Italia " and " Lepanto," launched in 1 880 and 1883 respectively, side armour was dispensed with, a curved 3-in. armour deck, with its sides 5J ft. below the water-line, being fitted from stem to stern, with armour glacis pro- tection to the funnel open- ings, &c, in this deck; they carried four 1 00- ton breech- loading guns mounted in two barbettes

arranged so as to permit all four guns to fire ahead, astern or on either broadside as in " Inflexible "; their displacement was 13,500 tons, their length 400 ft., and they had engines of 18,000 I.H.P. designed to give a speed of 18 knots. They were followed by three of the " Andrea Doria " class of 11,000 tons, launched in 1884 and 1885, armed with four 105-ton breech-loaders, and protected by an 18-in.

belt of compound armour; and by the " Re Umberto," " Sicilia " and " Sardegna " of 13,250 tons, launched 1888 to 1891, and armed with four 67-ton B.L. guns having a penetration of 27 in. of iron at 1000 yds. In 1897 Italy launched the second-class battleships " Ammiraglio di Saint Bon " and the " Emanuele Filiberto " of 9800 ions and 18 knots speed, carrying four 10-in., eight 6-in. and eight

4-7-in. guns and armoured with 10-in. to 4-in. armour. These were followed by the " Regina Margherita," laid down in 1898, and the " Benedetto Brin," laid down in 1899, two vessels of 13,426 tons displacement and 20 knots speed, of good freeboard, carrying an armament similar to that of the " Duncan " and in addition four 8-in. guns; the 12-in. guns are protected by 10-in. armour, the 6-in. guns and the

ship's sides by 6-in. armour with 3-in. side plating for- ward and aft. Four very notable vessels were next laid down — the " Regina Elena" (fig. 76, Plate XVII.) and "Vittorio Emanuele III." in 1901, and the " Napoli " and " Roma " in 1903, each on a displacement of 12,625 tons, carrying two 12-in. and twelve 8-in. guns in turrets, as well as a large number of small quick-firing guns; their machinery of 20,000 I.H.P. is provided for a speed of 22 knots; their hulls are cut down, giving reduced freeboard as compared with " Benedetto Brin," and the hulls and machinery are built as lightly as possible. For several years no new design was adopted, but in 1909 the "Dante Alighieri " was laid down, of 18,700 tons displace- ment, an increase of 50% She was reported to be 492 eighteen 4 7-in. and

over that of the preceding vessels.

ft. long, 79 ft. beam, carrying twelve 12-in., _ . .

sixteen 3-in. guns, turbines of 30,000 H.P. being provided for a speed of 23 knots, and side armour fitted 9 in. thick amidships tapering to ' 6 in. forward and 4! in. aft. Three later vessels, the " Conte di Cavour," " Giulio Cesare " and " Leonardo da Vinci," are of 22,000 tons, 35,000 H.P., 23 knots, and carry thirteen 12-inch

guns.

Austria. — Until quite recently Austria has made no attempt to maintain battleships of the first class. Three small battleships, the " Monarch," " Budapest " and " Wien," were laid down in 1893-1894, of 5550 tons displacement and 17ˆ knots speed, carry- ing four 9-4-in., six 6-in. and twelve 3-pdr. guns, with armour lo£ in. to 4 in. in thickness. In 1899 three larger vessels, the "Habsburg 7 '. (fig. 77- Plate XVII.), " Arpad " ' "" '

and " Baben-

Fig. 78. — Arrangement of Guns and Armour of Austrian " Erzherzog Franz Ferdinand."

berg," were begun, of 8340 tons displacement and 18 knots speed, carrying three 9-4-in., twelve 6-in. and several smaller Q.F. guns and well armoured. In 1901 it was decided to build the " Erzherzog Karl Friedrich " and " Ferdinand Max," of 10,600 tons and 19 knots, carrying four 9-4-in. and small Q.F. guns as in the " Monarch," but with the secondary armament increased to twelv

SHIP

Plate XVII.

IXATE XVIII.

SHIP

■■■'———■ — r-"e-~ˆ«-~««~-*

Fig. 79. — Brazilian Minas Geraes.

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ˆaˆBˆ

**s "U ■?> %. t,-«i ■ wg&gs* : ;*

Fig. 69.— II. M.S. Triumph.

Fig. 68— U.S.A. Michigan.

WAR VESSELS] SHIP

Table XVI. — Development of some of the Leading Features of Notable Armoured Battleships from i860 to

905

IOIO.

Vessel.

A%

Hull.

a

I.H.P.

Propulsive Machinery.

Armament

(including Machine

Guns).

Heavy

Guns — ‘

where

mounted.

Thickest Armour.

Cost (ex- cluding Guns).

^3

s

a

•a

**5*

4 .

a ”

►J.3 E

“o $

Engines.

Boilers,

Warrior .

i860

Iron

Ft.

380

Ft. In. 58 O

Ft. In.

26 7

Tons

8,830

Knots

*14*25*

6,000

X

Horizontal, trunk, jet- condensing 1 expansion 1 set of 2 cylinders;

*II2*X48′*

10 rectangular 22 lb pressure

28 — 7” 6i ton guns

Broadside

Inches 4i

£

356,693

Agincourt

1865

”

400

59 3

28 2

10,690

14-8

5,000

z

Horizontal, jet- condensing 1 expansion 1 set of 2 cylinders;

ioi’X54′

10 rectangular

17 — 12 ton M.L.R.

Broadside

*5**

496,069

Bellerophon .

1865

300

56 I

26

7.550

14-2

6,500

X

Horizontal , trunk, surface-condensing

z expansion

*1 set of 2 cylinders; io4*X48**

Rectangular 26 lb pressure

10 — 14 ton and 5 — 6i ton guns

Central battery

6

447,618

Monarch .

1868

”

330

S! 6

26

8,300

I50

7,850

I

Horizontal 1 expansion 1 set of 2 cylinders;

I2o'X54

Rectangular 31$ lb pressure

4 — 12" 25 ton, 2—9" 12 ton, 1 — 7 "63 ton and 20 small guns

Turrets

Turrets, 10 Sides, 7

478,971

Sultan .

1870

"

32S

61

26 I

9,300

I4-I

7,700

I

Horizontal, trunk, surf ace-condensing

1 expansion

1 set of 2 cylinders; n8"XS4'

Rectangular 30 lb pressure

8 — 18 ton and 4 — 12 ton guns

Central battery

9

485,155

Devastation .

lS7l

”

285

62 4

27

9,330

I 4 -2

7,000

2

Horizontal, trunk, su rf ace -condensing z expansion 2 sets of 2 cylinders;

*88*X39 r*

8 rectangular 30 ib pressure

4 — 12 35 ton and 10 smaller guns 2 torpedo tubes**

Turrets

Turrets, 14 Sides, 12

430,746

Inflexible .

1876

”

320

75

26 4

n,8So

14-0

8,000

2

Vertical

2 expansions 2 sets of 3 cylinders; 7o”-l-2@9o”X48″

8 single-ended, oval 4 double ,, ,, 60 lb pressure

*4 — – 1 6 * 80 ton and 8—4″ 22 cwt. guns 4 — 14* torpedo tubes*

Turrets

24

951,406

Benbow .

1SS5

Steel

330

63 6

28

10,600

16-9

11,500

2

Vertical

2 expansions

2 sets of 3 cylinders;

*52”+2@74*X45″*

12 oval

2 — 16" no ton, 10—6 and 13 smaller guns*

5 torpedo tubes

Barbettes

,z8

774,791

Royal Sove- reign

1S91

”

380

73

27 6

14,150

17-5.

13,000

2

Vertical

3 expansions

2 sets of 3 cylinders;

40 w +59”+88 fl X 5 i’

8 single-ended return tube 148 lb pressure

4—132″ 67 ton, 10 — 6″ and 38 smaller guns

7 torpedo tubes

Barbettes

18

839,136

Majestic .

1896

390

75

27 6

14,0.00

I7”5

12,000

2

Vertical

3 expansions

2 sets of 3 cylinders;

4o”+5o”-r-88”X43″

8 single-ended return tube boilers

4 — 12 46 ton, 12—6″ and 38 smaller guns 5 — i8”torpedo tubes*

Barbettes, hooded

Barbettes,

14

Sides, g Harvey ized

872,458

Formidable

1898

”

400

75

26 9

15,000

i8-o

15,000

2

Vertical 3 expansions 2 sets of 3 cylinders; 250 lb pressure 3ir+5ir +84”X5i”

20 Belleville, with

economizers 300 lb pressure

4 — 12* 46 ton, 12 — 6” and 32 smaller guns

4 — 18 “torpedo tubes

Barbettes, hooded

Barbettes,

12

Sides, 9 Krupp

1,022,745

Duncan .

1901

”

40S

75 6

26 6

14,000

19-0

18,000

-

Vertical

3 expansions

2 sets of 4 cylinders;

33£+54a ff +2@63”X*

48′

24 Belleville, with economizers

4—12’, i2 — 6″ and 26 smaller guns

4 torpedo tubes

Barbettes, hooded

Barbettes,

14

Sides, 7

1,023,147

Swiftsure.

1903

436

71

24 7

11,800

200

12,500

2

Vertical triple ex- pansion

2 sets of 4 cylinders; 29 w +47 , ‘+2@54 X*

39′

Yarrow large tube

4—10, 14—7*5*, 14 — 14 pr,, 2 — 12 pr., and 8 — 6 pr. and machine guns*

Barbettes

zo

849,474

King Edward VII.

1903

”

425

78

26 9

i6,35o

iS-5

1 8, 000

2

Vertical triple ex- pansion

2 sets of 4 cylinders; 38+6o”-f2@67”X*

48′

Babcock and Wil- cox and cylindrical

4 — 12”, 4—9-2, 10 — 6”, 14 — i2pr., 17 — 3 pr. and machine guns*

4 torpedo tubes

Barbettes

12

1,383,845

Lord Nelson

1906

410

79 6

27

16,500

iS-s

16,750

2

Vertical triple ex- pansion

2 sets of 4 cylinders; 33”+53+2@6o’X*

48′

15 Yarrow large tube

4 — 12”, 10 — 9-2’, and 24 — 1 2 pr. and 5 machine guns

5 torpedo tubes

Barbettes

12

1,540,889

Dreadnought

1906

-

49°

82

26 6

17,900

216

23,000

4

Parsons turbines

Babcock and Wil- cox

10 — 12, 24 — 12 pr.*

and 5 machine guns 5 torpedo tubes

Barbettes

XX

1,699,900

Imperator Pavel I. {Russian)

1907

”

429′ 9″

79 9

28 6

17,400

18-0

17,600

2

Vertical triple ex- pansion

Belleville

4 — 12”, 14 — 8, 12— 4-7”, and 14 smaller, light and machine guns*

5 torpedo tubes

Barbettes

12

i,x7o,ooo

Posen . (German)

1908

”

4SS

88 6

26 6

18,200

20’S

20,000

3

3 sets 4-cylinder vertical triple ex- pansion

Schultz-Thorny- croft

12 — n tf , 12— 5-9”, 2osmaUer, light and

machine guns 6 torpedo tubes

Barbettes

12

1 ,800,000

gO 6 SHIP [WAR VESSELS

Table XVI. (Continued). — Development of some of the Leading Features of Notable Armoured Battleships from i860 to ipio.

Vessel.

“3-5

•u C

0_l

Hull.

I.H.P.

Propulsive Machinery.

Armament

(including Machine

Guns).

Heavy

Guns — ■

where

mounted.

Thickest Armour.

Cost

(excluding Guns).

1

a

3

g

**o£*

Engines.

Boilers.

Erzherzog

Franz

Ferdinand (Austrian)

1908

Steel.

Ft. 45o' 0"

Ft. In.

80 6

Ft. In.

26 6

Tons.

14,226

Knots

20-5

'20,000

2 '

2 sets 4-cylinder vertical triple ex- pansion

Yarrow

4 — 12, 8— 9 "4*, 20 — 3*9*, 6'i2 pr. and 2 machine guns*

3 torpedo tubes

Barbettes

Inches

10

£

Minas Geraes (Brazilian)

1908

”

500

83

25

19,281

21-4

27,212

2

Vertical triple ex- pansion , —

*Babcdck and Wil- cox **

12 — I2 r , 22 — 4”7 W , and 8 — 3 pr. guns

”

12

1,821,400

Delaware (United States)

1909

Sio

85 3

27

20,000

21-5

28,578

2

Vertical ‘ triple ex- pansion

Babcock and Wil- cox

10—12, 14 — 5*, and 10 smaller, light and machine guns*

2 torpedo tubes

XI

Danton . (French)

1909

**’*

470

84

27

18,028

19-25

22,500

4

Parsons turbines

4 — 12, 12 — 9‘4*\ and 26 smaller, light and machine guns*

2 torpedo tubes

”

12

2 068,000

Kawachi . . (Japanese)

Bdg.

in

1910

■•

520

84

27

20,800

*20 *o*

26,500

4

Curtis turbines

Miyabara small tube

12 — 12, 10 — 6*, and 12 — 4- 7 “guns 5 torpedo tubes*

”

12

Alfonso XIII. (Spanish) •

”

”

435

78 9

25 6

15,460

19 ‘5

15,300

4

Parsons turbines

; Yarrow

8 — 12”, 20 — 4’,

2 — 3 pr-» 2, light,

~.and 2 machine

guns 3 torpedo tubes

10

Moreno (Argentine)

”

”

578

*95 9**

27 6

28 > 0OO

21

39,5oo

Curtis turbines

Babcock and Wil- cox

12 — 12, 12 — 6”, 16 — 4*, and 10 smaller guns*

*2 — 2 1 * torpˆ tubes*

”

12

2,200,000

7ˆ-in. guns all well protected, while the next step was to vessels of a type very similar to the ” King Edward VII.” class, but of greater gun-power and higjier speed, with somewhat thinner armour and smaller coal capacity. These vessels, ” Erzherzog Franz Ferdinand,” ” Radetsky ” and ” Zrinigi,” were being completed in 1910. Their arrangements of guns and armour are shown in fig. 78. Battle- ships of far greater fighting value were in 1910 laid down by Austria; of 20,000 tons displacement, 25,060 H.P., and 22 knots speed, mounting ten 12-in. guns, protected by Il-in. armour, and costing about 2j millions sterling each.

Brazil. — For several years by mutual arrangement no battleships were added to the South American navies, but: in 1906 Brazil ordered three vessels of 19,281 tons, 1380 tons heavier than the ” dread- nought, ” which was not then finished; the first two of these carry twelve 12-in. guns in place of the ten of the ” Dreadnought,” and can fire ten guns on either broadside, eight ahead and eight astern; they also carry fourteen 4‘7-in. guns behind 9-in. armour on the main deck, and eight behind thinner armour on the upper deck. The ship’s side, barbettes and gun mountings are pro- tected by 9-in. armour, the belt armour tapering to 4-in. forward and aft. The vessels are 500 ft. long, 83 ft. beam and 25 ft. draught ; engines of 23,500 I.H.P. being provided for 21 knots. The lead- ing vessel, the ” Minas Geraes ” (fig. 79, Plate XVIII.), was built at Elswick; she obtained about 2i| knots on trial, and passed through all her severe gun trials with great success. Fig. 80 shows the general arrangements of guns and armour. The second vessel, the ” Sao Paulo,” was built at Barrow, and was- also completed to the same design. The third vessel, the ” Rio de Janeiro,” which in 1910 was being built by the Elswick firm, has been redesigned to be 655 ft. in length over all, 92 ft. beam and 32,000 tons displacement on a draught of 26 ft. Her armament was to be twelve 14-in. guns, with a secondary armament of fourteen 6-5tt. guns, an anti-torpedo armament of fourteen 4-in. guns, as well as a number of smaller guns, and three submerged torpedo tubes. She was fitted with four screws and turbines of 45,000 H.P. to drive her at 22 \ knots. Her cost was reported to be almost £3,000,000, and in 19 10 she was by far the largest vessel on

the stocks.

Argentine Republic. — Early in 1910 the Argentine Republic ordered two vessels, the " Moreno " and " Rivadavia," of 28,000 tons, armed with twelve 12-in. guns, twelve 6-in. and sixteen 4-in. guns, to be built by the New York Shipbuilding Co. and the Fore River Shipbuilding Co. respectively. Their displacement is much greater than that of the largest battleships building at the time they were ordered, although they are 4000 tons smaller than the " Rio de Janeiro." They are 578 ft. long, 96 ft. beam, 27! ft. draught, and turbines of 40,000 H.P. are provided for a speed of 22J knots. The armament is arranged somewhat as in " Minas Geraes," but with the midship barbettes arranged so that the guns can fire on either broadside, giving a fire of twelve guns on either broadside, eight ahead and eight astern. The ship's side and the heavy guns are protected by 12-in. armour, and the 6-in. guns by

6-in. armour; 1600 tons of coal are carried on the load draught out of a possible 4000 tons, and there is also a large stowage for oil fuel.

Spain.— For some years battleship building was suspended in Spain, but, after considerable negotiation with British firms, designs were approved for three vessels of 15,130 tons and 19 j knots, to carry eight 12-in. and twenty 4-in. guns, with 10-in. armour on the barbettes, 9 in. on side tapering to 3 in. at bow and 4 in. at, stern, and fore and aft internal bulkheads i\ in. thick for protection against torpedoes. These vessels were named " Espana," laid down in 1909, " Alfonso XIII." and " Jaime I.," in 1910.

Smaller Battleships. — At various times several of the naval powers have laid down smaller battleships than those already referred to, such as the British " Conqueror " and " Hero," of 6200 tons, launched in 1882 and 1888 respectively; the armoured Coast Defence ships of France, of which the "Admiral Trehouart," launched in' 1893, of 6534 tons, 17 knots, carrying two 12-in. and eight 3'9-in. guns with good armourˆ protection, is a good example; the monitors of the United States named " Little Rock," &c, launched in 1900, of 3 2 35 tons and 12 knots, carrying two 12-in. and four 4-in. guns; and the principal battleships of the lesser European powers. A good example of the last is trie Norwegian armour-clad " Norge " (fig. 81, Plate XV.). This vessel and her sister the " Eidsvold," with their predecessors " Harald Haarfagre " and " Tordenskjold," were built at Elswick for the royal Norwegian navy, and completed in 1900. They had a displacement Of 3850 tons, length 290 ft., beam 50 ft. 6 in., draught 16 ft. 6 in., and with twin-

screw engines of 4500 horse-power attained 16 J knots speed. They were heavily armed with two 8-in. B.L. guns in armoured gun-houses, one at each end of the vessel ; six 6-in. Q.F. guns, four mounted in 5-in. nickel steel casemates, and two in the open, with strong shields; eight 12-pdrs. and six 3-pdrs. ; and two submerged torpedo tubes. The water-line was protected with 6-in. Krupp armour over a length of 170 ft., and bulkheads of the same thickness were provided at each end of the belt. These ships form a class of vessels • of small size which would prove formidable opponents to many larger armoured ships, and are especially useful for coast-defence purposes.

Table XVI. shows the development of the leading features of notable armoured battleships from the time of the " Warrior."

Cruisers. — The cruiser type was primarily intended to co- operate with armour-clad fleets, in the same manner as sailing frigates did with fleets of sailing line-of-battle ships, and the earliest cruisers were modelled directly upon the frigates which preceded them, the differences between the two being those incidental to the use of steam power and to the substitution of iron for wood as the building material. As steam propulsion grew in favour engines of greater power were provided, and the rig and sail-spread were reduced till at the present day they

SHIP

■V

4

f;

Plate XX.

SHIP

4 1

IB! I;

I.

?•

V =

have entirely disappeared. When the final adoption of iron led to the remodelling of the details of construction by Sir E. J. Reed, the new system of construction was applied to the cruisers of the day, but no attempt was made till much later to give these cruisers any protection, nor was the question of their armament given the importance which it afterwards came to have. Lord Armstrong was one of the first to recognize the import- ance of developing this class of vessel. He considered the essential features of a cruiser to be high speed, protection without the use of side armour, a powerful armament and minimum size and cost ; and his views were adopted by the Elswick firm in a large number of cruisers built for foreign Powers down to the intro- duction of high explosives, when side armour was advocated in place of, or in addition to, the armour deck. The cruisers built for the British navy prior to 1880 — of which the principal types were such vessels as the " Inconstant," of 5780 tons (1866) ; the "Active," of 3080 tons (1867); the "Raleigh," of 5200 tons (1871); and the faster despatch vessels "Iris" and "Mercury," of 3730 tons (1875) — had been almost entirely unprotected; and although the "Comus" : and " Leander "

T— I 1 — I I

Fig. 80. — Arrangements of Guns and Armour of " Minas Geraes.'

classes had been given a partial protective deck, the Elswick- built " Esmeralda " (1883) (fig. 82, Plate XXIII.) may be quoted as the first vessel in which the important features of a complete protective deck and good protection to. the guns we're combined with high speed and a powerful armament. On the other hand, the " Imperieuse " and " Warspite," completed in 1881, of much greater displacement than the " Esmeralda," were provided with a partial belt of 10-in. compound armour in combination with a protective deck. Thus the necessity for protecting cruisers led to the introduction of two types — 'the " protected " cruiser, of which the " Esmeralda " may be taken as the pioneer, and the " armoured " cruiser, of which the " Imperieuse " and " Warspite " are early representatives; but while in the British navy the " protected " cruiser type was repeated and

developed, the " armoured " type was dis- continued, and with the exception of the " Orlando " class, built shortly afterwards, the whole of the cruisers built for the British navy for another fifteen years were of the " protected " type. In France and Russia, however, the armoured cruiser continued in favour, the " Dupuy de L6me " of 1890, for the former, and

Rurik " of 1892, for the latter, being vessels of this

the type.

The reintroduction of side armour in British-built cruisers came about when the improvement of armour by the develop- ment of the Harvey and Krupp processes of manufacture

enabled more efficient protection to be provided with a much thinner belt than had previously b'6en possible. The Elswick cruiser " Esmeralda " (second), built for Chile in 1895, was one of the first in which the use of side armour was revived. She was followed by other vessels of the armoured type built by the same firm for the Chilean and Japanese navies. In 1898 the " Cressy " class (fig. 83, Plate XXI.) was begun for the British navy, and since this date all cruisers of 9000 tons and above for the British navy have been provided with side armour.

In the United States the adoption of armour belts of the new material for cruisers came somewhat earlier than it did in the British navy, the " Brooklyn" (fig. 84, Plate XXII.), built in 1895, being so protected; and the development of the type has been very marked in recent years, the tendency being to go to larger displacements, in order to provide greater protection and heavier armaments, with each new class of vessel. Indeed, the first-class armoured cruiser of 1910 might be very well described as a high-speed battleship. In the British navy, as might be expected, the demand

for vessels to meet the varied and diverse re- quirements that necessarily arise in a fleet of such magnitude has led to the production of a number of types, each ad- apted to its own special duties. They may be classified " as (1) unprotected cruisers; (2) pro- tected cruisers of first, second and third classes; and (3) armoured cruisers. Unpro- tected cruisers have neither side armour nor other ' protection ■ against loss of buoyancy from injury by shot a.nd shell. Protected cruiser slave no side or vertical armour, but they have horizontal armour decks > with" strong sloping sides in the vicinity of the water-line, upon which coal js carried in minutely divided

bunker compartments. Atmoured cruisers have side or vertical armour in addition to protective decks. Each of these classes includes a number of groups of Sister ships, but we ? shall confine ourselves to describing the main features , of a representative ship in a few of the most important groups.

The protected cruiser of medium displacement affords a convenient starting-point, as the latest vessels of this type in 1910 were of about the same displacement as the largest first- second- class cruisers of thirty years before, and a comparison of class representative ships of these classes illustrates the great cruisers. advances made in thirty years in ships of approximately the same size; while a further comparison of these second-class cruisers (as the vessels of medium displacement are styled) with the first-class protected cruisers and the armoured cruisers of the present day shows the growth in size and power of the largest units of the cruiser type during the same period. _ It should, however, be noted that while some second-class cruisers reached such a displacement (5600 tons) as to allow of this comparison being made, the great bulk of the vessels of this class were smaller. The " Mersey " is an early example of a vessel of this class which has seen – considerable service. . Begun in 1883, her principal dimensions are: length 300 ft., beam 46 ft., mean draught about 20 ft., and displacement 4050 tons. Protection to the vitals of the ship is provided for by means of a. protective deck a little above the level of the water-line, 2 to 3 in. in.

thickness, in combination with a system of coal-stowage in bunkers tlong the water-line. She carried two 8-in. and ten 6-in. B.L. guns and four torpedo tubes. Her horse-power was 6000 (forced draught) and speed 17-3 knots, and she carried 750 tons of coal at normal draught, with capacity for 900 tons. The " Astraea," begun in 1890, may be taken as representing the second-class cruisers of that date. She is built of steel, sheathed and coppered, is 320 ft. long, 49 ft. 6 in. beam, 21 ft. 6 in. mean draught and 4360 tons displace- ment, and carries two 6-in. Q.F. guns and eight 4-7-in. Q.F. guns, all on the upper deck and protected by shields, together with four torpedo tubes. She is protected by a steel deck 1 in. to 2 in. thick, and the engine cylinders, which project through this deck, are shielded by 5-in. sloping coamings. The coal bunkers in the neighbourhood of the

water-line are minutely subdivided, and the stowage is arranged so as to make full use of the coal protection. Her engines develop 9000 H.P. (under forced draught) and her speed is 19-5 knots. Her coal stowage is 1000 tons.

The " Hermes " (fig 85, Plate XX.) is one of the largest second- class cruisers added to the Royal Navy. She is 350 ft. long, 54 ft. beam, 20 ft. 6 in. mean draught and 5600 tons displacement. She presents a striking contrast compared with the " Inconstant," built in 1866, of almost the same displacement. The " Inconstant " was fully rigged, and sailed almost as fast as she steamed; while the " Hermes " has no sail, and steams 20 knots, or 6 knots faster than did the older vessel. The " Inconstant " was entirely un- protected, and carried her guns on the broadside, with very limited arcs of training; whilst the " Hermes " has all-round fire, the fire ahead and astern is a very large percentage of that on the broadside, and her guns all train through large arcs (120 and above) and are well protected by enveloping shields, and the ship herself is protected by a steel deck i£ to 3 in. thick, besides having coal protection. The " Inconstant's " main armament consisted of ten 9-in. and six 7-in. M.L. guns; the " Hermes'," of eleven 6-in. Q.F. guns, each firing probably ten rounds to one of the " Inconstant's " 9-in., and with a perforation of wrought iron of about one-third as much again. Tha " Hermes " is built of steel, sheathed with wood and coppered. She carries also eight 12-pdrs. and six 3-pdrs., and two submerged torpedo tubes. She has Belleville boilers, developing 10,000 H.P. and giving her a speed of 20 knots.

Somewhat similar to the " Hermes " in external appearance, the four vessels of the " Arrogant " class (fig. 86, Plate XX.) possess certain features of special interest which distinguish them from all other second-class cruisers, in which class they are usually included. They are of 150 tons greater displacement than the "Hermes," are 30 ft. shorter, but have 3 ft. 6 in. more beam and 6 in. more draught. They are built of steel and are unsheathed, have Belleville boilers, and engines giving 10,000 H.P. and a speed of 19 knots. They have an armament of four 6-in. Q.F. guns, three of which fire right ahead and one right astern; six 4-7-in. Q.F. guns, three on each broadside; eight 12-pdrs.; nine smaller guns; and two submerged torpedo tubes. All the guns are mounted on the upper deck in shields. The protective deck varies from 1 J in. to 3 in. in thickness. The bow is protected by a belt of 2-in. nickel steel extending to about 40 ft. back from the ram, the top of this belt being level with the main deck, and the bottom edge sloping downwards to strengthen the ram, and a cofferdam formed by two water-tight transverse bulkheads about 3

ft. apart, and extending from keel to main deck, separates the bow from the rest of the vessel. The "Arrogants " are fitted with tandem rudders, and the deadwood at the after end of the ship is cut away.

The " Gladiator," which was sunk in the Solent in 1908 after collision with the " St Paul," was one of the " Arrogant " class. The Canadian cruiser " Rainbow," one of the " Apollo " class, very similar to but smaller than the " Astraea " class, is of 3400 tons, 9000 I.H.P., 20 knots, and carries tw<5 6-in. Q.F., six 4-7-in. Q.F., eight 6-pdrs., and four torpedo tubes.

The protected cruisers of greater displacement, or first-class cruisers, as they were called, may be divided into four well-marked classes: " Blake " and " Blenheim " class, " Edgar " class (fig. 87, Plate XIX.)_, " Powerful " and " Terrible " class (fig. 88_, Plate XIX.) and the " Diadem " class. The " Blake " and " Blenheim," begun in 1 888, were amongst the earliest cruisers designed by Sir WilHam White at the Admiralty ; they are of 9000 tons displacement, irst-class ^^ f(. i orig) 6 g {t beam anc j 2 y It draught. They carry .misers. tWQ g. 2 -i n . B.L. guns, one firing directly ahead and the other directly astern, protected by open shields 6 in. thick; ten 6-in. Q.F. guns, of which four are on the main deck, protected by casemates of 6-in. compound armour, and six on the upper deck in shields ; sixteen 3-pdrs. ; two submerged and two above- water torpedo tubes. Their protection consists of a complete armour deck of steel 3 in. to 6 in. thick, with a dome or coaming over the tops of the cylinders 4 in. to 8 in. thick. Their machinery consists of four independent sets of vertical triple-expansion engines, two on each shaft, for which steam is provided from six double-ended cylindrical boilers, giving 20,000, H.P. under forced draught, and a speed of 21 knots; with open stokeholds their power is 13,000 H.P., which gives them a speed of 19J knots. They carry 1500 tons of coal. The " Edgar " class, begun in 1889, are vessels of 7350 tons displacement, 360 ft. long, 60 ft. beam and 23 ft. 9 in. mean draught. Their armaments consist of two 9-2-in. B.L. guns

and ten 6-in. Q.F., disposed and protected in the same way as the corresponding guns of the " Blake," with twenty-four smaller and machine guns, two submerged and two above-water torpedo tubes. The protective deck has a maximum thickness of 5 in., and the cylinders are protected by a raised coaming on this deck, with sloping sides 6 in. thick. They have six double-ended cylin- drical boilers and two sets of vertical triple-expansion engines, developing with forced draught 12,000 I. H.P. and giving a speed of 20 knots They carry 850 tons of coal at normal draught, with storage for

1250 tons. Nine vessels of this class have been built, four of them being sheathed with wood and coppered, the remaining five, including the " Edgar," being unsheathed. The " Powerful " and her sister the " Terrible " are the largest protected cruisers which have been built. They were begun in 1894. They are of steel, sheathed with wood and coppered, are of 14,200 tons dis- placement, 500 ft. length, 71 ft. beam and 27 ft. mean draught, armed with bow and stern 9-2-in. B.L. chasers, and twelve 6-in. Q.F. guns, of which eight are in 6-in. Harveyized casemates on the main deck and four in similar casemates on the upper deck. They have also eighteen 12-pdr. Q.F. guns, twelve 3-pdrs., nine machine guns and four submerged torpedo tubes. The 9-2-in. guns are protected by a shallow ring of 6-in. HaVveyized steel, surmounted by a 6-in. shield enveloping the gun and crew. The ship herself is protected by a complete deck at the water-line level of Harveyized steel plates 3 in. to 6 in. in thickness, and by a double line of coal bunkers above it. The machinery arrangements constitute the striking feature of these ships. They have no less than forty-eight Belleville boilers in eight boiler-rooms, with two sets of triple-expansion 4-cylinder engines, developing 25,000 H.P. with open stokeholds and giving the ships a speed of 22 knots. They carry as a normal supply 1500 tons of coal, and their bunkers will hold 3000 tons. Four 6-inch guns were added on the upper deck of these ships in

1902.

The " Diadem " class, launched in 1897 and 1898, were the last first-class protected cruisers added to the British navy. There are eight vessels of this class, but in the four last-built vessels, of which the " Spartiate " was one, some changes were made. The first vessel of the " Diadem " class was begun in 1895, is of 1 1,000 tons displace- ment, 435 ft. length, 69 ft. beam, 25 ft. 3 in. mean draught, and is built of steel, sheathed and coppered. Her principal armament consists entirely of 6-in. Q.F. guns, of which there are sixteen, twelve being protected by 5-in. casemates of Harveyized steel, and the others disposed, two on the forecastle as bow chasers, and two on the quarter-deck as stern chasers, all in separate shields. She also carries thirteen 12-pdrs., eleven smaller guns, including machine guns, and two submerged torpedo tubes. The protection consists of a steel deck, whose slopes are 4 in. thick and horizontal portions 2-| in. thick, upon which is stowed the 1000 tons of coal which the vessel ordinarily carries, the full coal capacity being 2000 tons. She is provided with 30 water-tube boilers of the Belleville type, and her machinery develops 16,500 H.P., giving her a speed of 20-5 knots. The Canadian cruiser " Niobe " is one of the. first four; in the

last four ships the casemates are 6 in. thick and the machinery is of greater power, viz. 18,000 I.H.P., giving a speed of a quarter of a knot higher.

*Third-class protected cruisers included vessels varying in displacement from 1500 to 3000 tons. With a reduction of displacement come reduction of initial cost and cost of upkeep, a smaller crew, a shorter time for building, and the many advantages Third- attendant upon reduced size and draught of water. It has * s*

been found possible to embody in a ship of about 2000 tons cru ‘ sers – displacement many of the most important requirements of a modern cruiser, and a large number of vessels of this class have been added to the fleet. Among these may be mentioned the ” Barham,” a typical small cruiser, which was built in 1889 of steel, of 1830 tons displacement; she is 280 ft. long between perpendiculars, 35 ft. broad and of 12 ft. 8 in. draught of water. As originally completed, this vessel had cylindrical boilers and a H.P. of 4700, giving a speed of 19 knots. In 1898 she and her sister, the ” Bellona,” were reboilered with water-tube boilers of the Thornycroft type, and with these a H.P. of 6000 is obtained, and the vessel reaches a speed of nearly 20 knots. The protection afforded is in the usual form of a protective deck, 1 in. thick on the flat, and sloping sharply downwards near the water- line, where the thickness is increased to 2 in. ; and above this deck the coal stowage is arranged in subdivided bunkers. She carries an armament of six 4-7-in. Q.F. guns in shields on the upper deck, four 3-pdrs., two machine guns and two above-water torpedo tubes. She carries 140 tons of coal in her normal condition, and her bunkers will take 250 tons. She has a light fore-and-aft rig. The ” Barham ” was followed by several vessels of the ” Tauranga ” class, built for service in Australian waters, and the “Pearl” class for service in other waters, all of 2575 tons displacement, 19 knots speed and carrying eight 4-7-in. and eight 3-pdr. Q.F. guns. In 1896-1898 nine smaller and faster cruisers were laid down, known as the ” Pioneer ” class, which might be taken to include the ” Pelorus ” class, the differences between them being small. Of the two classes eleven vessels have been built. The ” Pioneer ” is 305 ft. long, 36 ft. 9 in. broad, 13 ft. 6 in. mean draught and of 2200 tons displacement. She has water-tube boilers of the small-tube type,

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” Imperieuse,” being only 5600 tons displacement, 300 ft. long and 56 ft. beam, and 22 ft. 6 in. draught. They had a water-line belt of compound armour, 10 in. thick and nearly 200 ft. long; extending over the top of this, and sloping down forward and aft to the ends of the ship, was a deck 2 in. to 3 in. thick. Their arma- ment consisted of two 9-2 in. B.L. guns — one forward and one aft — instead of the four carried in the ” Imperieuse ” and ” Warspite,” but in other respects the same armament as the latter ships. They had engines of 8500 H.P. and a speed of over 18 knots. These vessels were all built from the designs of Sir N. Barnaby.

As already stated, between 1885 and 1898 no armoured cruisers were laid down for the British navy. The ” Cressy ” (fig. 83, Plate XXI.) class, commenced in 1898, consists of six vessels of 12,000 tons displacement, 440 ft. length, 69 ft. 6 in. beam, and 26 ft. 3 in. mean draught. They are built of steel, sheathed and coppered, have a belt of Harveyized steel 1 1 ft. 6 in. wide, 230 ft. long, and 6 in. thick, with bulkheads 5 in. thick and 2 in. protective plating on the sides from the forward bulkhead to the stem. They carry two 9-2-in. B.L. guns in barbettes and gun-houses 6-in. thick, mounted on the middle line forward and aft, twelve 6-in. Q.F. guns in 6-in.

casemates, and twenty-five 12-pdrs. and smaller guns, with two submerged torpedo tubes. Their H.P. is 2 1,000 with natural draught, steam being supplied by 30 Belleville boilers, and their speed is 21 knots. They carry 800 tons of coal at normal draught, with capacity for 1600 tons.

The four vessels of the " Drake " class (see fig 91, Plate XXIV.),

and engines of 7000 H.P., giving lier a speed of 20 knots. She carries 250 tons of coal at the above displacement, and has stowage for 550 tons. She has eight 4-in. Q.F. guns, eight 3-pdrs., and two above-water torpedo tubes, and a 2-in. protective deck.

This type of cruiser reached its final development in the four vessels of the " Diamond " class, of 3000 tons, laid down in 1902-1903, which were the last third-class cruisers designed by Sir William White. Three of the vessels, " Diamond," " Sapphire " and " Topaze," were fitted with reciprocating engines of 9800 I.H.P. for 22 knots, and in the fourth, the "Amethyst," Parsons turbines were fitted. All were 360 ft. long., 40 ft. beam, 14 ft. 6 in. draught, and carried twelve 4-in. and eight 3-pdr. Q.F. guns. On trial the " Topaze " reached a maximum speed of 22-25 knots, while the " Amethyst " obtained 23-63 knots, an advantage of 1-38 knots per hour for the turbine with practically the same coal consumption, and with a distinctly less rate of coal consumption at equal speeds for all speeds above 14 knots. The experiment was regarded as a great success for Parsons turbines, and materially influenced the question of their adoption in succeeding vessels at home and abroad.

In 1903 four vessels classed as scouts were laid down, viz., the " Pathfinder," " Patrol," "Sentinel " and " Skirmisher," of about 2900 tons displacement, and 25 knots speed; 370 ft. long, with engines of 17,000 I.H.P., and carrying ten 12-pdr. and eight 3-pdr. Q.F. guns as well as two torpedo tubes. Two others laid down in 1903 were named " Forward " and " Foresight," and carried fourteen 12-pdrs. and two 3-pdrs., and obtained the 25 knots with 15,000 I.H.P.Thelasttwoofthe scries — " Adventure " and "Attentive " (fig.89, Plate XIX.) — of 16,000 I.H.P. and 26 knots, were laid down at Els- wick in 1904; they were 374 ft. long, 38 ft. 3 in. beam, J 2 ft. 6 in. draught, 2670 tons displacement, 16,000 I.H.P., carried ten 12-pdrs. and eight 3-pdrs.

Four vessels, named " Boadicea," " Bel- lona," " Blanche " and " Blonde," were laid down in 1907-1909, of slightly larger dimen- sions, the " Blonde " being 385 ft. long, 41 ft. 6 in. beam, 13 ft. 6 in.

draught, 3360 tons displacement, 18,000 I.H.P., 25 knots, and armed with ten 4-in. Q.F. guns and two tor- pedo tubes.

In 1909 five vessels of FlG _ .—Arrangement of Guns and Armour of H.M.S

4800 tons displacement, B

22,000 I.H.P., 25 knots speed, carrying two 6-in. and ten 4-in. Q.F. guns, with two torpedo tubes, were laid down and known as second- ■ class protected cruisers of the ” Bristol ” class. They are 430 ft. long, 47 ft. beam, 15 ft. 3 in. draught and protected by a i-in. steel deck with 2-in. slopes. Fig. 90, Plate XIX., shows the ” Newcastle,” a vessel of this class built at Elswick. Four other vessels, the

Drake.’

” Dartmouth ” class, laid down six months later, were very similar, but slightly larger to give one knot more speed. The navy estimates for 1910-1911 provided for laying down five larger vessels of this tvpe. The Australian cruisers ” Melbourne ” and ” Sydney ” are of the ” Dartmouth ” class, while the new Canadian cruisers are of he later type. Between 1870 and 1881, several armoured cruisers were laid down in England and abroad, those in England being the Armoured •> shannon,” of 5390 tonsand I2| knots, laid down in 1873, cruisers. t j le ■< kelson " ant j " Northampton," of 7630 tonsand 13 knots, laid down in 1874, and the " Imperieuse " and " Warspite," laid down in 1 88 1. The two last-named ships were provided with masts and a good spread of sails, and were the last large vessels to be so fitted for the British navy. The sails were not found to be of much service and were removed. These vessels were of 8400 tons displacement, 315 ft. long, and were protected by a partial belt amidships of ib-in. compound armour over a length of about 140 ft., with a protective deck above it I J in. thick and transverse bulkheads at the ends of the belt 9 in. thick, the protective deck from these bulkheads to the ends of the ship being 3 in. thick. They had machinery of 10,000 H.P. and a speed of i6| knots. They carried four 9-2-in. B.L. guns in separate barbettes — one forward, one aft, and one on each beam — besides ten 6-in. guns, twenty-six smaller and machine guns, and six torpedo tubes. They were sheathed with wood and coppered, in order to be able to keep the sea for a long period without docking. The next vessels of the type were the " Orlando " class, begun in 1885. Seven of these were launched in 1886 and 1887. They were much smaller than the

laid down in 1899, were for several years the largest and fastest armoured cruisers afloat. They are of 14,100 tons displacement, are 500 ft. long, 71 ft. beam, and 26 ft. mean draught. They are unsheathed, are protected by a Krupp steel 6-in. belt extending from barbette to barbette, and from 6 ft. below water to the height of the main deck, completed at the after end by a 5-in. bulkhead, and carried forward to the bow by 2-in. plating extending right up to the upper deck. There are two protective decks, the lower, being 3 in. to 2 in. in thickness, and the main deck, which is I in. thick. Their armament consists of two 9-2-in. B.L. guns in barbettes and gun-houses 6 in. thick on the middle line forward and aft as shown in fig. 92, sixteen 6-in. Q.F. guns in 6-in. casemates, fourteen 12-pdrs., twelve smaller and machine guns and two submerged torpedo tubes. Their speed was 23 knots as designed, and all the vessels of the class have attained over 24 knots on service. They have engines of 30,000 H.P., the boilers being of the Belleville type. They carry 1250 tons of coal, with bunker capacity for 2500 tons.

A consideration of the above features will illustrate the difficulties of the classification of modern ships. The " Drake " is called an armoured cruiser, but she is superior to the battleships " Renown," " Barfleur," and " Canopus " in armour protection and in her secondary quick-firing armament, as well as in speed and coal endurance, and is somewhat inferior to them only in the number, weight, and protection of primary armament. If 10-in. guns had been given to this vessel in lieu of her 9-2-in., she would probably have been called a first-class battleship, and would have been a 23-knot battleship at that. Each successive increase of size has given the battleship more speed and the armoured cruiser heavier guns and armour, thus tending to merge the two types in one.

The next series of armoured cruisers was composed of ships of much less power produced in reply to the fast lightly armed cruisers being built abroad as commerce destroyers, and a considerable number of such vessels so built, although weak compared with the " Drake," were much less costly and at the same time endowed with

great sea-keeping power and were superior in all respects to the vessels which caused them to be built. The first set comprised ten vessels of the " Monmouth " class, laid down in 1900 and 1901. Fig. 93 (Plate XXI.) gives a view of the " Cornwall," which may be taken as typical of the class. They are of 9800 tons displacement, length 440 ft., beam 66 ft., mean draught 24 ft. 6 in. They are armoured with a belt of 6 in. of Krupp steel over the main part of the length, diminishing in thickness towards the extremities; they carry fourteen 6-in. Q.F. guns, of which ten are in 4-in. casemates, and the others mo'-nted in pairs in turrets and gun-houses 4 in. thick, forward and aft; they also carry ten I2-pdr., eleven small and machine guns and two submerged torpedo tubes. Their horse-power is 22,000, giving them a speed of 23 knots.

They were followed by six vessels of the " Devonshire " class, laid down in 1902, which were given greater gun power and better armour protection to meet the corresponding advances in foreign vessels. They were of 10,850 tons displacement, 21,000 I.H.P. and 23} knots speed; were armed with four 7-5-in. and six 6-in. Q.F. guns protected by 6-in. armour, and the armour belt was increased frTn 4 in. to 6 in. in thickness. These were the last armoured cruisers designed by Sir William White.

pairs in four barbette turrets placed as already stated in de- scribing the development of the " Dreadnought " design (see Table XIV. and fig. 96). Thus three pairs of guns can fire directly ahead, three directly astern, and the whole armament can fire on either broadside. In the " Invincible," built at Elswick, all the heavy guns are worked by electric power; in the other vessels they are worked by hydraulic power as usual in H.M. Navy. An anti-torpedo boat armament of sixteen 4-in. guns is provided. The 12-in. guns are protected by 8-in. armour, and a broad belt of side armour is fitted 7 in. thick amidships, and 4 in. forward and aft, associated with thick protective decks. All are fitted with Parsons turbines of 41,000 H.P. and obtained over 27 knots on trial without pressing the boilers. The high steaming power of these ships was shown by the "Indomitable," which conveyed King George V. and Queen Mary (then prince and princess of Wales) to Canada and back in 1908, and steamed, on her return journey across the Atlantic — from Belleisle to the

Fig. 96. — Arrangement of Guns and Armour of H.M.S. " Invincible."

The next armoured cruisers built for the British navy, the six vessels of the " Duke of Edinburgh " type, laid down in 1903- 1904, were of

much greater power, of 13,550 tons displacement, 23,500 I.H.P. and 23 knots speed, and have a main armament of six 9-2-in. guns, mounted singly in barbettes. The secondary armament consists of ten 6-in. Q.F. guris in the first two vessels of the class, but in the remaining four vessels the ten 6-in. guns are replaced by four 7 • 5-in. guns. They also carry from twenty- five to twenty-nine 3-pdrs. and machine guns and three torpedo tubes. The guns and ship's side are protected by 6-in. armour. In 1905 the " Minotaur " class (fig. 94, Plate XXI.) was laid down, consisting of three vessels of 14,600 tons displacement, 27,000 I.H.P. and 23 knots speed, carrying an armament of four 9-2-in. guns mounted in pairs in 7-in. barbettes forward and aft, and ten 7 -5-in. guns all on the upper deck in shallow barbettes of 6-in. armour, with 6 in. enclosed shields. The belt armour is 6 in. thick amidships, tapering to 4 in. forward and 3 in. aft. These vessels are 490 ft. long, 747 and 755 ft. beam, 25 to 26 ft. mean draught, and are the last large cruisers to be propelled by re- ciprocating engines, or to be armed with 9-2-in. guns. They carry 1000 tons of coal on the load draught, and can stow 2000 tons of coal besides 700 tons of oil fuel.

The next cruisers to be built were the " Invincibles," which might have been classed as battleships on account of their heavy armament and substantial armour protection; the former greatly exceeding in power the armament of any battleship before the " Lord Nelson," and the latter exceeding that provided in any armoured Their most striking feature, however, is their great speed, previously only reached by torpedo boats and torpedo boat destroyers, in which everything was sacrificed to obtain the highest possible speed. They were named " Invincible " (fig. 95, Plate XXL), " Indomitable " and " Inflexible," and were laid down in 1906 at the yards of the Elswick, Fairfield and Clyde- bank Companies respectively. Their dimensions were: — length 530 ft., breadth 78 ft. 6 in., draught 26 ft., displacement 17,250 tons. They were armed with eight 12-in. guns mounted in

Dread- nought cruisers.

cruisers.

Fastnet — at an average speed of 25-13 knots, a record speed at the time for a transatlantic voyage.

It is interesting to compare the " Indomitable's " performance on the voyage referred to above with that of the " Hero " — a screw line-of-battle ship of 91 guns and 600 nominal horse-power, when employed

on a similar errand. This ship was considered a crack ship of her class in i860, and in that year was selected to convey King Edward VII. (then prince of Wales) on a visit to Canada ; she made the passage from Plymouth to St John's in 13 days under steam and sail, and this was considered an exceedingly good performance for a line-of-battle ship in those days.

In 1909 the " Indefatigable " of 18,750 tons displacement was laid down at Devonport; she is very similar to the " Invincible/' with the same armament and certain minor improvements. She was followed in 1910 by the " Lion " at Devonport and " Princess Royal "at Barrow, each 660 ft. long, 88 ft. 6 in. beam, and of 26 l ,35p'tons displacement on a draught of 28 ft. Parsons turbines of 70,000 H.P. are provided to give a sea speed of 28 knots. Table XVII. contains further particulars of the British " In- vincibles," from which it may be seen that the Australian cruisers " Australia " and " New Zealand " are similar to the " Inde- fatigable."

With regard to cruisers of other navies than the British, it may be said that the vessels constructed at Elswick exercised considerable influence in their development as well as of those of the British navy. The "Esmeralda" (fig. 82, Plate XXIII.) of 1883, built for the Chilean government, but bought by Japan in 1895 and re-named " Idzumi," was of 2950 tons displacement, had 6000 H.P. and 18-3 knots speed, was protected by a complete i-in. steel deck, and carried the very heavy armament of two 10-in. B.L. guns, six 6-in. Q.F., two 6-pdrs., seven smaller guns and three torpedo tubes. The " Piemonte " (fig. 97, Plate XXIV), built for the Italian navy in 1888, had a displacement of only 2640 tons, but was of 13,000 H-P. and had a speed of nearly 22J knots. She was protected by a steel deck of 3 in. maximum thickness, and carried six 6-in. Q.F., six 4-7-in. Q.F., ten 6-pdrs., eleven smaller guns and three torpedo tubes, an armament which, as pointed out by Lord Armstrong, was capable of discharging in a given time twice the weight of shot and shell that could be fired by the largest war vessel then afloat. The " Buenos

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Fig. 91.— H. M.S. Drake.

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Fig. 105. — French Jules Michclct.

(A. Borgault, Toulon.)

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Aires,” built in 1895 for the Argentine Republic, is 396 ft. in length and of 4800 tons displacement, her machinery developing 13,300 H.P. with open stokeholds, and giving her a speed of 23-2 knots. She is protected by a complete deck ij in. to 3 in. thick, and carries a powerful armament of quick-firing guns, consisting of two 8-in., four 6-in., six 4-7-in., twenty-two smaller guns and five torpedo tubes. Her normal coal supply is 350 tons, and she can stow 1000 tons in her bunkers. Rather smaller than the ” Buenos Aires,” but of still later build (1901), is the Chilean cruiser ” Chacabuco ” (fig. 98, Plate XV.). She is a characteristic Elswick cruiser in design and general appearance, being heavily armed, fast and of moderate displacement. Her dimensions are: displacement 4500 tons, length 360 ft., breadth 46 ft. and draught 18 ft. She carries an armament of two 8-in. Q.F. guns, mounted on the middle line forward and aft, and protected by well-armoured gun-houses, ten 47-in. Q.F. guns in shields on the broadsides and nineteen smaller guns, including machine-guns. She is protected by a strong armoured deck 1 f in. thick on the flat to 4ˆ in. on the slopes, and by the 1000 tons of coal which forms her normal supply. Her engines develop nearly 16,000 H.P., and her speed is 23 knots.

In the matter of armoured cruisers also Elswick has taken a leading place — among the cruisers built by this firm being the ” Esmeralda ” (second), of 7000 tons, in 1895 for Chile; the ” O’Higgins,” of 8500 tons, in 1896 for the same state; the ” Asama ” and ” Tokiwa,” of 9700 tons, in 1897 for Japan; and the ” Idzumo ” and ” Iwate,” in 1899, also for Japan. The ” Idzumo ” (fig. 99, Plate XXIII.) is 9750 tons displacement, 400 ft. long, 68 ft. 6 in. beam, 24 ft. 3 in.

draught. She has 16,000 H.P. and a speed of 22 knots; is protected by a complete belt of Krupp steel 7 in. thick, tapering to 35 in. at the ends, a 2§-in. steel deck with a citadel above it 5 in. thick, and carries an armament of four 8-in. Q.F., fourteen 6-in. Q.F., twelve 12-pdrs., seven smaller guns and four torpedo tubes. The 8-in. guns are in pairs in 6-in. barbettes and hoods, while of the 6-in. guns ten are in 6-in. casemates and four in shields. She carries, with bunkers full, 1300 tons of coal.

United States. — In the United States ravy-the proportion of " protected " cruisers is smaller than in trie British navy, as the " armoured " type established itself at an earlier date. The " Philadelphia," begun in 1888, may be taken as an example of the U.S. protected cruiser. She is 4345 tons in displacement and 327 ft. long, has twin screws and a horse-power of 8800, giving her a speed of 196 knots. She is protected by a steel deck l\ in. to 4 in. thick, and carries twelve 6-in. B.L. guns (later converted to Q.F.), seven- teen smaller guns and five torpedo tubes.

The " Columbia " and " Minneapolis " are very fast armoured cruisers laid down in 1 89 1. On a displacement of 7350 tons they carry one 8-in., two 6-in., eight 4-in. and twelve 6-pdr. and a number of smaller guns. They are protected by heavy steel decks and thin side armour. The " Columbia " developed 18,500 I. H.P. and 22-8 knots on trial, while the " Minneapolis " reached 20,860 I. H.P. and 23 knots; these powers and speeds were at that date the highest recorded for such vessels. The " Columbia " crossed the Atlantic at 184 knots in 1895, but the type has not been repeated in America although followed for a little while by France. The " Brooklyn " (fig. 84, Plate XXII.), begun in 1893, is of the " armoured " type. She is of 9215 tons displacement and 400 ft. long, has twin screws and develops 16,000 horse-power with forced draught, giving a speed of 21 knots. She is protected by a steel belt for two-thirds of her length 8 ft. broad and 8 in. to 3 in. thick, and a complete steel deck 6 in. to 3 in. thick. She carries eight. 8-in. B.L. guns in pairs in 15-in. barbettes — disposed one forward, one aft and one on each beam- — twelve 5-in. Q.F. guns in 4-in. shields, twenty smaller guns and five torpedo tubes. Her normal coal stowage is 900 tons, and she can stow 1650 tons in her coal spaces.

In 1903-1904 there were launched six armoured cruisers of the " California " class, of 13,700 tons, and in 1904-1905 three of the " St Louis " class, of 9700 tons. The former are vessels 502 ft. in length, 70 ft. beam and 26 ft. 6 in. draught, have machinery developing 23,000 indicated hcrse-power, and a speed of 22 knots. The

latter are 424 ft. in length, 66 ft. beam and 23 ft. 6 in. draught, with engines of 2 1 ,000 indicated horse-power, and the sa me estimated

speed, namely, 22 knots. Both classes have fourteen 6-in. Q.F. guns, but the larger vessels have in addition four 8-in. guns in two 6|-in. turrets, besides a heavier battery of smaller Q.F. guns. The " California " class are completely belted with armour having a thickness of 6 in. over half the length amidships and 3ˆ in. to the ends, and a battery of 5-in. armour enclosing the 6-in. Q.F. guns, and extending to the upper deck. The " St Louis " class have only a water-line belt for about one-half the vessel's length, with a similar battery above it, the whole of the armour being 4 in. thick of Krupp quality. The "California" class comes between the English " Cressy " and " Drake " classes. The " St Louis " class is practi- cally the English " Monmouth," with about a knot less speed, bow- plating omitted and a 4-in. battery added.

In 1903 two larger armoured cruisers, the " Tennessee " and " Washington," were laid down. The speed of 22 knots was re- tained, but the armament consisted of four 10-in., sixteen 6-in., twenty-two 14-pdrs., twelve 3-pdrs., &c, with four 21-in. submerged torpedo tubes. The side armour was slightly reduced in thickness, but spread over a greater area, giving 5 in. uniformly on the belt and 3 in. forward and aft ; the citadel and casemates remain 5 in. thick, but the protection of the heavy guns is increased to 9 in.; in addition, the 14-pdr. battery on the upper deck is protected by 2-in. plating. The displacement is 14,500 tons. Two similar vessels, " North Carolina " and " Montana," were laid down in 1905, but up to 1910 the United States had not proposed to lay down any cruisers corresponding in power and speed to the " Invincible."

Germany. — Germany for many years built a number of small cruisers of moderate speed for service on distant stations, &c, and subsequently a series of very successful third-class and second-class cruisers of increasing power and speed. Seven vessels of the " Gaz- elle " class were launched in 1898-1900. The " Gazelle " was of 2558 tons, 6370 I. H.P. and 19! knots speed; the " Niobe," a sister vessel, was of the same displacement, and the five later vessels were of 2608 tons; several developed nearly 9000 I. H.P. and obtained 2lf to 22J knots speed. The " Undine," "Arcona " and " Frauen- lob," laid down in 1901, were of 2656 tons displacement; these were all sheathed with wood and coppered. Seven vessels of the " Hamburg " class were laid down in 1902-1904, of 3200 tons dis- placement, having the same protection as the preceding vessels and carrying the same armament at a higher speed, machinery of 10,000 I. H.P. being

provided for 22 knots. The highest speed reached was 22-6 knots by the " Liibeck," which was fitted with Parsons turbines of 13,500 H.P. and driven by eight screws on four shafts. Four vessels of the " Konigsberg " class, laid down in 1905, are of 3350 to 3500 tons displacement. They retain the same protection — a deck -8 in. to 2 in. in thickness and the same armament — ten 4-1 in., fourteen smaller guns and two submerged torpedo tubes; but their machinery has been varied to admit of trial of various types of turbines and reciprocating engines. The " Konigsberg," " Stutt gart " and " Nurnberg " are fitted with engines of 13,200 I.H.P. for 23-5 knots; while the " Stettin " is fitted with Parsons turbines of 15,500 H.P., and attained 24-0 knots on trial. The next two vessels, " Dresden " and " Emden," of 3592 tons, laid down in 1906, have the same protection as before, but twelve 4-i-in. guns are carried instead of ten, and a still higher speed is aimed at. The " Dresden " is fitted with Parsons turbines of 16,000 H.P., and the " Emden," with reciprocating engines of 15,000 I.H.P., to give a speed of 25 knots. Four later vessels are of 4230 to 4280 tons displacement, and are fitted with machinery of about 25,000 H.P. for a speed of 25 knots, as follows: the " Kolberg " with Schichau turbines, the " Mainz " with A.E.G. (modified Curtis) turbines, the " Coin " with Zoelly turbines and the " Augsburg " with Parsons turbines. Two vessels of the same type were in 1910 under construction, in which a further increase of speed was contemplated; the displacement is increased to 4800 tons and the H.P. to 30,006; one of these, the vessel to replace " Bussard," was to have Schulz turbines. Thus in these second-class cruisers Germany was carrying out the greatest series of experiments on turbines which had been attempted, no less than five different types of large power being tested in comparison with reciprocating engines.

Besides the foregoing very fast vessels, in 1897-1898 Germany built five larger second-class cruisers of the " Hertha " class. They

were lofty vessels, and carried a good armament of two 8-2-in., eight 5'9-in. and ten 3-4-in. guns, as well as other smaller guns and three submerged torpedo tubes; they were 344 ft. long, 56 ft. to 58 ft. beam, 21 to 22 ft. mean draught, 5575 to 5790 tons displacement; they had a protective deck 1-6 to 3-9 in. in thickness, and 3-9 in.

gun houses. Fig. 100 (Plate XXII.) shows the " Victoria Luise," the second vessel of the class.

The older German cruisers, " Fiirst Bismarck " and " Prinz Heinrich," laid down in 1896-1898, were armed with 9-4-in. and 5'9-in. guns, and had speeds of 19-20 knots. The " Prinz Adalbert " and " Friedrich Karl," laid down in igoi.and" Yorck "and" Roon," laid down in 1902-1903, were of 8850 to 9350 tons displacement and 21 knots speed, carrying four 8-2-in., ten 5'9-in., twelve 3-4-in. guns and four submerged torpedo tubes. The 8-2-in. guns were carried in enclosed 6-in. shields forward and aft ; and the other guns were mostly in a very short citadel amidships, protected by 4-in. armour; the water-line being completely protected by 4-in. to 3-in. armour. The latest vessels of this type, the " Gneisenau " and " Scharnhorst, " were laid down in 1905-1906 of 11,420 tons displacement and 22 j knots speed.

In 1907 Germany commenced a new series of large and powerful cruisers, the " Bliicher " (fig. 101, Plate XXII.), the first of the series, being of 15,550 tons displacement, an increase of more than 4000 tons beyond that of the preceding German vessels. She carries twelve 8-2-in., eight 5-9-in., sixteen smaller guns and four submerged torpedo tubes, and is protected by 7-in. armour. Engines of 32,000 I.H.P. were provided, and the maximum speed on trial exceeded 25 knots. In the second vessel, the " Von der Tann " (fig. 102, Plate XXII.), the main armament was increased to eight 11-in. guns; she is 560 ft. in length, 85 ft. beam, 27 ft. draught and 18,700 tons displacement; Parsons turbines of 45,000 H.P. were provided for

25 knots speed, and both power and speed were exceeded on trial. The third vessel, the " Moltke," is of 23,000 tons displacement, of

26 knots speed, and is armed with 12-inch in place of 11 -inch guns, and cost £2,200,000.

France.' — In France the line of development of the cruiser has been similar to that in Great Britain. In 1887 four third-class cruisers were built, of which the " Forbin " may be taken as a type; she was 312 ft. long, 30J ft. beam, 16 ft. draught, 1935 tons displacement, 5800 I.H.P. and 20 knots speed, protected by a Ij-in. deck and a belt of cellulose, and armed with four 55-in. and eight 3-pdr. guns and five torpedo tubes. These were followed by " Linois," " Galilee," ' Lavoisier," of about 2300 tons in 1893, and the " d'Estrees " and " Infernet " in 1897. The latter were 312 ft. long, 39 ft. beam, 17 ft. 9 in. draught and 2420 tons displacement, sheathed and coppered,

protected by a Ij-in. deck and armed with two 5-5-in., four 3-9-in. and eight 3-pdr. guns and three torpedo tubes; 8500 I.H.P. was provided for 21 knots speed.

The French second-class cruisers may be said to have commenced with the " Davout," of 3027 tons, 9000 I.H.P. and 20J knots, and the " Alger " and " Isly," of 4350 tons, 8000 I.H.P. and 19 knots, in 1887. They were followed by two of the " Friant " class in 1891, two of the " Pascal " class and three of the " Cassard " class in 1893, and the sheathed vessels, " Catinat " and " Protfit," in 1894 and 1895. These vessels were from 3700 to 4050 tons displacement, and 195 to 20 knots speed, protected by decks i\ in. to 3 in. in thickness, and armed with four to six 6-5-in. guns, four to ten 3-9-in. guns, as well as smaller guns and torpedo tubes. The last of this series, the " Protet," was laid down in 1895.

In 1894 France laid down a first-class protected cruiser, the " d'Entrecasteaux," of 8000 tons, carrying two 9-4-in., twelve 5'5-in., twelve 3-pdr. guns and six torpedo tubes, with a speed of 19I knots, and then by three very remarkable vessels lightly built and armed, but of very high speed, viz. the " Jurien de la Graviere," of 5600 tons and 23 knots, the " Guichen," of 8150 tons. and 23 knots and uie" Chateaurenault," of 7900 tons and 24 knots.

A new departure was made in 1890 in laying down the armoured cruiser " Dupuy de Lome," of 6300 tons, 14,000 I.H.P. and 20 knots speed, carrying two 7-6-in., six 6-4-in. and several smaller guns; a protective deck i| in. thick was fitted, and the whole side of the ship was armoured, the thickness at the water-line amidships being 47 in., tapering gradually towards the extremities. This type has, however, not been repeated.

The " Jeanne dArc," launched in 1899 at Toulon, is 11,100 tons displacement, 477 ft. in length, 63 ft. 8 in. beam and 24 ft. 8 in. mean draught, has engines of 33,000 indicated horse-power and a speed of 21-8 knots. She has a complete water-line armour belt of Harveyized steel, having a maximum thickness of 6 in., and the bow is also protected as far aft as the bow guns with 15 in. steel to the upper deck. Her armament consists of two 7-6-in. guns, fourteen 5'5-in. Q.F., twenty-two smaller guns and two submerged torpedo tubes. Of more recent date than the " Jeanne dArc," but smaller in size, is the " Montcalm " (fig. 103, Plate XXIIL), an armoured cruiser launched in 1900, of 9367 tons displacement, 453 ft. length, 63 ft. 8 in. beam and 24 ft. 6 in. draught. She carries an armament of two 7-6-in. guns in separate turrets of Harveyized steel 6 in. thick

forward and aft, eight 6-5-in. Q.F. guns in casemates on the broadsides, four 3-9-in. Q.F. guns in shields on the broadsides, twenty-two smaller guns and two submerged torpedo tubes. She is protected by a water-line belt 6j ft. deep, which extends from

the bow to within 30 ft. of the stern, whert 'is terminated by a transverse bulkhead 4 in. thick; amidship this belt is 6 in. thick at its upper edge, diminishing to 2 in. at its lower edge, where it meets the 2-in. protective deck, but the maximum thickness tapers to 3 in. at the forward and after ends. Above this main belt is a thinner one extending over the same length, but only 3f in. maximum thickness and of about 4 ft. depth. The " Montcalm " has 20 water-tube boilers of the Normand-Sigaudy type, and engines of 19,600 H.P., giving her a speed of 21 knots. She carries 1000 tons of coal and some oil fuel. Her engine-rooms are placed between the two sets of boiler-rooms, instead of abaft them, as is usual in British vessels, the peculiar appearance of many French vessels, with two pairs of funnels widely separated, being thus accounted for.

Three vessels of the " Montcalm " class were ordered, and then three smaller vessels of " Kleber " type, of 7578 tons only, and four larger vessels of improved " Montcalm " type. The latter were very similar to " Montcalm," with improved armour protection and of 500 tons greater displacement. They were followed by three larger vessels, the "Leon Gambetta " (fig. 104, Plate XXIIL), "Jules Ferry " and " Victor Hugo." These vessels are armoured cruisers of about 12,400 tons displacement, length 480 ft., beam 70 ft. 3 in., draught 26 ft. 3 in., with an indicated horse-power of 28,500 and speeds of 22J to 23 knots.

In 1904 the " Jules Michelet " (fig. 105, Plate XXIV), of 12,370 tons, was laid down, of 30,000 I.H.P. and 23 knots speed. The " Ernest Renan " followed in 1903, the I.H.P. being 36,000 for 23J knots.

The most powerful French cruisers built or building in 1910 were the " Edgar Quinet," laid down in 1905, and " Waldeck Rousseau," laid down in 1906, of 13,780 tons displacement, armed with four- teen 7-6-in. guns, eight being fitted in pairs in turrets and four in separate casemates, together with fourteen 6-pdr. and eight 3-pdr. guns and two submerged torpedo tubes; 36,000 I.H.P. is provided for a designed speed of 24 knots.

Japan. — Japan possesses a great variety of cruisers, many of which were built at Elswick, others were captured during the war with

Russia, and refitted or reconstructed; the latter including the " Aso " (ex-" Bayan "),the" Tsugaru " (ex-" Pallada"), the " Soya" (ex-" Varyag ") and " Sudzua " (ex-" Novik "). In addition, large and small cruisers were built in America, Germany and France, but the finest were built in Japan.

As examples of the Japanese cruisers laid down towards the end of the 19th century may be mentioned the second-class cruisers " Kasagi " and " Chitose," of 4800 and 4900 tons displacement, I5>5°0 I.H.P. and 22| knots speed, built in America and armed with two 8-in. and ten 4"7-in guns, and the third-class cruisers " Suma " and " Akashi," of 2657 tons displacement and 19ˆ knots speed, built in Japan and armed with two 6-in., six 4-7-in. and ten 3-pdr. Q.F. guns.

In 1902 Japan launched the protected cruisers ' Tsushima " and, " Niitaka," of 3365 tons displacement, 9400 I.H.P. and 20 knots speed, armed with six 6_-in. and fourteen smaller guns; in 1903 the " Otowa," of 3082 tons, 10,000 I.H P, and 21 knots carrying two 6-in , six 4'7-in.'and six smaller guns; and in 1907 the " Tone," of 4100 tons displacement, 15,000 I.H.P. and 23 knots speed, armed with two 6 in., ten 4-7 in. and three smaller guns and three torpedo tubes. All of these vessels are fitted with reciprocating machinery. The " Yahagi," " Chikuma ." and " Hirato," laid down later, have turbine machinery of 22,500 H.P. to give 26 knots speed, two 6-in. and ten 4-7-in. guns and two torpedo tubes. They are 440 ft. long, 52 ft. beam and 5000 tons displacement.

Of first-class protected cruisers Japan possessed in 1910 only two, the " Tsugaru " (ex-" Pallada ") and " Soya " (ex-" Varyag "). The " Tsugaru " was built at St Petersburg in 1899, is of 6630 tons, 11,600 I.H.P., 20 knots speed, armed with eight 6-in., twenty-two 12-pdr. and several smaller guns, and protected by an armour deck I J to 2\ in. in thickness. The " Soya " was built at Philadelphia in 1899, is of 6500 tons, 20,000 I.H.P., 23 knots speed, armed with twelve 6-in., twelve 12-pdr. and smaller guns, and protected by a if to 3-in. deck. The " Sudzua " (ex-" Novik ") is a lighter and faster vessel, of 3000 tons displacement, 25 knots speed, armed with two 6-in., four 4-7-in. and several smaller guns, and protected by a 1-2 to 2-in. deck.

Of armoured cruisers she possessed in 1910 a relatively large number. In 1897 Japan ordered the " Yakumo," of 9850 tons displacement, from Germany, and in 1899 the " Adzuma," of 9436 tons displacement, from France ; both vessels have a speed of 2 1

knots, and carry an armament of four 8-in. guns mounted in pairs in two turrets, and twelve 6-in. guns in 6-in. casemates, and are protected by a complete belt of Krupp steel 7 in. to si m – in thickness. They are somewhat similar to the " Iwate " and " Idzumo " (fig. 99, Plate XXIIL), built at Elswick, but with slightly less gun power and speed. The " Aso " (ex-" Bayan "), built in France in 1900, is 7700 tons displacement, 17,000 I.H.P., 21 knots, carrying two 8-in., eight 6-in. and a number of smaller guns, and protected by 8-in. armour.

In 1905 a very important advance was made. Early in .that year Japan laid down the " Ikoma " and " Tskuba," 440 ft. in length, T 3t750 tons displacement, 23,000 I.H.P. and of 21 knots speed.

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These were the first cruisers laid down to carry the guns of a first-class battleship. Their armament includes four 12-in. guns mounted in pairs in two barbettes, one forward and one aft, twelve 6-in. guns in casemates and twelve 4-7-in. guns, and they have a complete armour belt 7 to 5 in. in thickness and 7 in. of armour on the barbettes (fig. 106). They were followed by the 22-knot cruisers " Kurama," laid down in 1905, and the " Ibuki," laid down in 1906, which are 10 ft. longer, of about 900 tons greater displacement, and 4500 more I.H.P.

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Fig. 106. — Arrangement of Guns and Armour, Japanese

than in the " Tsukuba " type. The armament is also more powerful,

twelve 6-in. guns being replaced by eight 8-in. guns mounted in pairs in barbettes, while the 4-7-in. guns are increased to fourteen in number. The " Ibuki " is fitted with turbines of 27,000 H. P., the " Kurama " with reciprocating engines of 22,500 I.H.P. The disposition of guns and armour are as shown in fig. 106. In 1910 Japan ordered of Vickers Co. an armoured cruiser of 27,000 tons and 72,000 H.P.

Russia. — Before the Russo-Japanese War, Russia had pro- vided herself with a great variety of fast, well-armed cruisers of various sizes, including some very notable vessels. Of those which remained in 1910 may be mentioned' the protected cruiser " Zhemchug," of 3100 tons, 17,000 I.H.P., 24 knots, carry- ing eight 4-7-in. guns; the " Askold," built at Kiel in 1900, 6500 tons displacement, 20,000 I.H.P. and 23 knots speed, armed with twelve 6-in., twelve 12-pdr. and other smaller guns; the "Diana" and "Aurora," of 6630 tons and 20 knots; the " Bogatyr " and similar vessels launched 1901- 1903, of 6675 tons displacement, 20,000 I.H.P., 24 knots speed, armed with twelve 6-in., twelve 12-pdr. and several smaller guns, and having a protective deck ij to 2 in. in thickness. The armoured cruisers, " Rossia," of 12,200 tons and 20 knots, and " Gromoboi," of 13,220 tons, 15,500 I.H.P. and 20 knots speed, carry four 8-in., twenty-two 6-in. and other smaller guns, and are protected by 6-in. armour. Since the war several vessels of this type have been built, including three of a new " Bayan " class, 7900 tons displacement, 19,000 I.H.P., 22 knots, armed with two 8-in., eight 6-in., twenty 12-pdr. and other smaller guns, and protected by 6-in. armour; and the " Rurik," built at Barrow in 1906, 490 ft. in length, 15,190 tons displacement, 19,100 I.H.P. and 21J knots speed, armed with four 10-in. guns mounted in pairs in barbettes forward and aft, eight 8-in. and twenty 4-7-in. guns, and protected by a complete belt of armour 12 ft. deep, 6 in. thick amidships, tapering to 4 in. forward and 3 in. aft.

Italy. — Italy possesses several protected cruisers of the " Piemonte " type already described as well as a number of smaller vessels. She was in 19 10 building scouts of the " Quarto " type of about 3500 tons displacement and 27 knots, armed with 4-7-in. and 12-pdr. guns. The most notable Italian cruisers are, however, those of the " Garibaldi " class, which are heavily armed, well armoured and of moderate speed. They have been developed from the " Marco Polo " type, which comprises three vessels; the " Marco Polo," launched in 1892, of 4500 tons, 19 knots, armed with six 6-in., ten 4-7-in. and several smaller guns, and protected by a 4-in. armour belt as well as a steel deck; the " Vettor Pisani " and the " Carlo Alberto," which

are of 6400 tons, carry twelve 6-in., six 4-7-in., fourteen 6-pdr. and other smaller guns. The " Giuseppe Garibaldi," " Varese " and " Francesco Ferrucio," xxiv. 29 a

launched in 1899, are of 7400 tons displacement, 13,500 I.H.P., 20 knots speed; they are armed with one 10-in., two 8-in., fourteen 6-in. and a number of smaller guns, and are r~otected by armour disposed as shown in fig. 107; the belt, batcery and gun protection are all 6 in., the belt tapering to 4J in. in thickness at the bow and stern.

In 1905 Italy commenced a series of enlarged " Garibaldis " o' 9830 tons and 22J knots, carrying four 10-in. guns in barbettes

forward and aft with a secondary armament of eight 7j-in. guns in turrets on the upper deck amid- ships, the bases being en- closed in an armoured citadel as shown in fig. 108, which gives the general arrangement of guns and armour in the K Amain" and " Pisa."

Gunboats and Torpedo Craft. — Gunboats in- clude numerous small vessels which, even in times of general peace amongst the great mari- time nations, have im- portant duties allotted to them. For the pa- trolling of rivers and islands, protection of fisheries, &c, a battle- ship or a cruiser, from its size, would be un- suitable, and for the performance of these have been built. These may

Ibuki " and " Kurama.'

and other duties special vessels

types, and those included in the torpedo-craft division.

be conveniently grouped under three headings, as follows: — –

I. Sloops.

II. Gun-vessels and Gunboats.

III. Torpedo-boats, Torpedo Gunboats and Torpedo-boaˆ Destroyers.

The " Wild Swan " class, the first of which was launched in 1876 for the British navy, represents one of the earliest of the sloop type. She was a single-screw composite-buHt vessel of 1 130 tons dis- placement and 170 ft. length', with a speed under steam of I0j

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Fig. 107.-

-Arrangement of Guns and Armour, Italian " Giuseppe Garibaldi."

knots and an armament of two 6-in., six 5-in. B.L. guns, and four smaller guns. This proved a very useful class of ships, and siaoas in all sixteen of them were built. The " Beagle ' class, "

commenced in 1889, represented an advance on the " Wild Swan." They were built of steel, sheathedˆ with wood and coppered, and had twin-screws. Their displacement was 11 70 tons, and they were 195 ft. long, steamed at 13 knots, and carried eight 5-in. B.L. guns and eight machine-guns. They were followed, at an interval of five years, by the " Torch " and " Alert," which were of 960 tons

displacement, 180 ft. long, steamed at 13! knots and carried an arma- ment of six 4-in. Q.F. guns, four 3-pdrs. and two machine-guns. They were single-screw vessels, built of steel, sheathed and coppered. The " Condor " class, which comprises six vessels built between 1898 and 1901, are very slightly modified " Torches," having 20 tons more displacement and 6 in. more beam, with the same length,

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Fig. 108. — Arrangement of Guns and Armour, Italian " Amain " and " Pisa."

speed and armament. They are able, however, to maintain a higher continuous speed, being fitted with water-tube boilers. In 1901 to 1902 there were laid down four sloops of the " Fant&me " class, which are larger vessels than the " Condors," being 1075 tons dis- placement and 185 ft. long. They are twin-screw vessels, built of steel, sheathed and coppered. They have water-tube boilers, giving 1400 H.P., and a speed of 13ˆ knots. Their armament is similar to that of the " Condor." All the foregoing vessels are fitted as sailing vessels as well as steam. The " Beagle " is schooner-rigged, the others all barque-rigged.

Of the gun-vessel or gunboat type, one of the earliest built for the British navy is represented by the " Staunch," a twin-screw vessel designed by Mr G. W. Rendel, and built at Elswick Quaboats. ; n jgg^ The guiding principle in the design of this vessel was that she should simply be a floating gun-carriage, propelled by steam and provided with plenty of manoeuvring power. The 9-in. 12-ton gun which constituted her armament was arranged to sink into and be raised from a well by means of hydraulic power. She was only 180 tons in displacement and 75 ft. long, and had a speed of 6| knots. The " Medina " class, consisting of twelve gunboats built about 1876, were twin-screw vessels of 363 tons displacement and no ft. length, and had a speed of 8} knots. Their arma- ment was light, consisting only of three 64-pdrs. and three machine guns. They were fitted with bow rudders in addition to those at the stern, in order to increase their manoeuvring power. The " Paluma " and " Gayundah " were built at Elswick in 1884 for the Queensland government. They had a displacement of 360 tons and were 115 ft. in length, were schooner-rigged, but had twin-screws and a speed under steam of

10 knots. They carried one 8-in. B.L. gun forward, which was mounted behind a breastwork and had a considerable arc of training; one 6-in. gun,

which was mounted aft; and three machine-guns.

The " Protector " was a more important craft.

Built for the government of South Australia in

1884, she was 920 tons in displacement and 180

ft. long, had twin screws and a speed of 14 knots

snder steam. She carried one 8-in. B.L. gun

forward, mounted as in the " Paluma," five 6-in.

4-ton guns, and five Gatlings. The " Cock- chafer class (1881) and the " Thrush " class

(1889) are sea-going cruising vessels of a different

type, carrying much lighter guns than in the

" Staunch class. The former, of which four were

built, were composite-built, single-screw ships of 465 tons displacement and 125 ft. length, with a fore-and-aft rig and a speed under steam of 9I knots; the latter, of which there were nine, were schooner-rigged composite vessels of 805 tons displacement and 165 ft. length, with a single screw and a speed of 13ˆ knots. The armament of the " Cockchafers " consisted of two 64-pdrs. R.M.L. guns, two-20-pdrs. R.B.L. guns, and two machine-guns; that of the "Thrush" (fig. 109, Plate XXVI.) was of six 4-in. B.L. guns and four smaller guns (she was commanded by H.M. King George V. when he was on active service in the navy). The Bramble," launched in 1898, is a representative of what in 1910 was the most recent type of first-class gunboat. Her displacement is 710 tons, or 100 less than the " Thrush." She is 180 ft. long and has a speed of 13 J knots, is built of steel, sheathed and coppered, and carries two 4-in. Q.F. guns, four 12-pdrs. and ten machine-guns. She has •Vter-tube boilers, twin screws and machinery of 1300 I.H.P.

Four of these vessels have been built, named the "Bramble," "Britomart," "Dwarf" (fig. no, Plate XXVI.) and "Thistle." They were designed specially for service on rivers in hot climates; their draught is limited to 8 ft.; their sails are reduced to a very light fore-and-aft rig, and they are fitted with a complete shade deck of teak and felt. They were still on active service in 19 10, but no new vessels had been laid down since 1897.

A number of gun-vessels have been designed for special services, among which may be mentioned the " Mosquito " (fig in, Plate XX.) and "Herald," two stern- wheel steamers for the Zambezi built by Messrs Yarrow in 1890 They are of 80 tons displacement and 77 ft.

long, having a speed of iof knots and carrying an armament of four 3-pdrs. and eight machine-guns. They are built in sections, each of which forms a separate pontoon, so that the whole vessel can be readily taken to pieces for transport and easily put together in the water. These two gun-vessels were handed over to the Colonial authorities on the river Zambezi. Built for somewhat similar service, but of different design, are the four shallow-draught river gunboats of the " Sand- piper " class. They are steel twin-screw boats, built in 1897, also by Messrs Yarrow. They are 88 tons in displacement, 100 ft. long and 20 ft. broad, and carry an armament of two 6-pdrs. and four machine-guns. Their speed is 9 knots, and they draw only 2 ft. of water, their screws working in arched tunnels, the summits of which are above the water-level outside. These arches always remain full of water, and serve the double purpose of enabling sufficiently large screws to be fitted for the economical propulsion of the vessel without increasing the draught, and of protecting them from damage. The " Woodcock " and " Woodlark " are larger vessels of the same type, designed for service on the rapid and shallow rivers of China. They were built by Messrs Thornycroft in 1897, are 120 tons in displacement, 145 ft. long, 23 ft. beam and 2 ft. draught of water. They have twin screws, also carried in arched tunnels, and their speed is 15 knots. They carry the same armament as the " Sandpiper " class. In 1901 the " Tea!" and " Moorhen," designed for service in China, were also constructed in sections, but are considerably larger than either the " Mosquito " or the " Woodcock," being about 180 tons displacement. They are twin- screw vessels, the propellers being in tunnels, as in the " Woodcock," and their speed is over 13 knots. Their furnaces will burn wood. They carry two 6-pdrs. and four machine-guns. The latest vessel of this type in 1910 was the " Widgeon," of similar construction, built by Messrs Yarrow in 1904 and carrying the same armament. She is 160 ft. long, 24 ft. 6 in. beam, 2 ft. 5 in. draught, 19s tons displacement, 800 I.H.P. and 13 knots speed.

Fig. 112 (Plate XX.) and fig. 113 show a light-draught gunboat of the " Sultan " class, of which several have been built for service on the Nile. She has a displacement of 140 tons, a length of 143 ft., a beam of 24 ft. 6 in., a draught of only 2 ft. and a speed of 12 knots. Her armament consists of one 12-pdr., one howitzer, and four Maxims, and she is protected by a |-in. bullet-proof breastwork. The gunboats of other navies are generally similar to those described above. The Brazilian twin-screw gunboat " Tiradentes," built in 1892, of steel, sheathed with teak and coppered, was

If (I i k

ICJF-i ht-M-MJ

fr

sSsft

L

S3

6 ib' ' 20

Fig. 113.— Plan of Nile Gunboat " Sultan."

165 ft. long and 800 tons displacement, and attained a speed of 14-5 knots. She had an armament of four 47-in. guns, three 6-pdrs. and four machine-guns, and carried a considerable spread of canvas.

In torpedo gunboats and torpedo craft generally, possibly the last thirty years of the 19th century showed more development and greater diversity than in any other type of war vessel then exist- ing. The first small high-speed boat we have any record of is the

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Plate XXV.

Fig. 117. — Turbinia.

Fig. 120.— U.S.A. Bainbridge.

Fig. 121. — Japanese Niji.

Plate XXVI.

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9 r 5

" Miranda," built by Messrs Thornycroft in 1871. She was built of light steel, was 45 ft. in length, 6i ft. b(:am and i\ ft. draught,

*Tornedo anc * attained a speed of l6‘4 knots with a single screw, _J«” the engine running at 355 revolutions per minute and indi-*

eating 58 H.P. The results obtained with her attracted much attention, and in 1873 Thornycroft launched for the Norwegian government a somewhat larger boat, armed with a spar torpedo, which attained a speed of 15 knots. Owing to the introduction of machine-guns in warships as a defence against torpedo-boat attack, it was recognized that there was a very slight chance of a boat

Table XVIII. gives particulars of many of the most notable torpedo-boats built between 1871 and 1910.

The torpedo-boat- thus established was primarily a weapon of offence, the only two elements of a protective nature in its design being those of small size and high speed; but even these were also necessary for purposes of offence. The deadly nature of their attack, and the difficulty of meeting it in the ship attacked, led to the construction of special vessels intended, among other duties, to meet and destroy them. The French " Bombe " (1885) was one of the earliest of these; and the "Rattlesnake" and three sister

Table XVIII.-

—Particulars

of Torpedo-

boats.

Vessel's Name.

Country.

Where Built.

Principal ■Dimensions,

&c.

a

a

Speed.

Armament, &c.

a

3

a

m

S3

P

JS a

.2 a

as

Torpedo-boats —

Ft. In.

Ft. In.

Ft. In.

Tons.

Knots.

Miranda

Great Britain

Messrs Thornycroft, London.

1871

45

6 6

2 6

I

58

16.4

Nil. Experimental boat.

1st torpedo-boat

built.

Norway

Messrs Thornycroft, London.

1873

S7

7 6

3

I

iS-o

1 spar torpedo.

Lightning (after-

wards No.i T.B.)

Great Britain

Messrs Thornycroft, London.

1877

75

10 10

5

34

I

477

18.5

Single torpedo tube. –

No. 10T.B. . .

t(

Messrs Thornycroft, London.

1880

90 6

10 10

4

28

I

450

21.7

1 torpedo tube.

Swift (afterwards

No. 81 T.B.) .

Messrs J. S. White & Co., Cowes.

188s

150

17 6

5 11

125

X

1300

20. s

6 — 3 pdrs. , 3 tubes.

Falke. . . .

Austria .

Messrs Yarrow, London.

1886

135

13 9

S 8

9S

I

900

22.4

2 mach.-guns, 2 tubes.

1st class T.B.

China

Elbing.

1886

144 4

16 S

7 6

128

I

1400

24.2

4—1 pdrs., 2 tubes.

Forban .

France .

Messrs Normand.

189S

144 2 166

15 2

10

135

2

3200

31-2

2 — 1 pdrs., 2 tubes.

No. 109 T.B.

Great Britain

Messrs Thornycroft, London.

1902

17 4

8 5

194

I

2900

2S-0

3 — 3 pdrs., 3 tubes.

No. 11 T.B. . .

Messrs Yarrow, London.

1909″

17a

18

5 9

263

3

3750

26.0

2 — 12 pdrs., 3 tubes.

Goyaz

Brazil .

Messrs Yarrow, London.

1907

152 6

15 4

130

3

26.5

2 — 3 pdrs., 2 tubes.

Gabbiano

Italy .

Spezzia

1907

164

17 5

7

200

2

3000

26.0

3 — 3 pdrs., 3 tubes.

No. 29 T.B. . .

Great Britain

Messrs Denny, Dumbarton.

1ˆ08

180

18

5 9

278

3

4000

26.0

2 — 12 pdrs., 3 tubes.

approaching sufficiently near to a vessel to successfully attack her by means of a towing or a spar torpedo, and the Whitehead torpedo fired from a revolving tube on the deck was accordingly adopted as the armament of future torpedo-boats. This rendered it unnecessary for the torpedo-boat to approach nearer than say 400 yds., and also enabled the torpedo to be fired without stopping the boat, a point of

great importance. The first torpedo-boat for the British navy was built by Messrs Thornycroft four years later; she was called the " Lightning," was 75 ft. in length and 34 tons displacement, had engines giving nearly 500 H.P., and obtained a speed of 19 knots. She was armed with a single torpedo tube. The boats which followed varied somewhat as regards size and speed, but on the whole pursued the usual course of growing larger and more powerful with each new design. By 1885 the length had gone up to 150 ft., the displacement to 125 tons and the speed to 20 knots. This last was not the highest that had been obtained, some of the earlier and smaller boats having reached 21 § knots; but the boats of 1885 carried a heavier armament, consisting of six 3-pdrs. and three torpedo tubes, and were more serviceable and seaworthy craft. A very notable boat of this date was the " Swift," after- wards known as No. 8i, built by J. S. White of Cowes; she marked a great advance in seaworthiness and fighting power in combina- tion with high speed.

Messrs Yarrow built for the Austrian navy in 1886 the " Falke," 135 ft. in length and 95 tons displacement, which obtained a speed of 22-4 knots on trial, and a similar boat for the British navy of 105 tons displacement, armed with 5 torpedo tubes and three 3-pdr. guns, which attained a speed of 23 knots on trial. About the same time Messrs Thornycroft built the " Ariete " and " Royo " for the Spanish navy. These vessels had twin screws and water-tube boilers. The former attained a speed of 26 knots on the measured mile and 24-9 knots on a 2 hours' run, and the latter 25-5 knots on the measured mile and 24-6 knots on the 2 hours' run. In 1895 M. Normand built the torpedo-boat " Forban " for the French navy, which attained a speed of 31-2 knots on trial, and the boats of the Normand type which followed her attained equally remarkable speeds. The maximum speeds for the British torpedo-boats up to the end of the 19th century were from 23 to 23J knots. From 190 1 to 1904 larger and faster types of torpedo-boats were constructed. These boats were 160 ft. to 165 ft. in length, 17 ft. to 18 ft. beam, 8£ ft. draught, 180 to 200 tons displacement, 2900 I.H.P., attained a speed of 25 knots and were armed with 3 torpedo tubes. In 1906 to 1909 boats of a new and still faster type were built with turbine machinery and burning oil fuel instead of coal. These boats, 36 in number, vary from 166 to 185 ft. in length. 17! to 19 ft. beam, 5! to 6f ft. draught and 243 to 308 tons in displacement. They have engines of 3600 to 4000 H.P. giving speeds of 26 and 27 knots, and are armed with two 12-pdr. guns and three torpedo tubes. The first twelve ordered in 1905 were at first known as Coastal Torpedo-boat Destroyers, and given names such as the " Cricket," " Gadfly " and " Mayfly/' They

are now numbered throughout, i.e. from I to 36. The prefix O has been added to the numbers of such of the boats originally bearing these numbers as are still in existence, to distinguish them from the new type boats.

vessels, the first of the English torpedo gunboats, came closely after her. The " Rattlesnake ' was launched in 1886, was of 525 tons displacement, and had a speed of 19J knots. She carried a more powerful armament than the torpedo-boats, namely, one 4-in. gun, six 3-pdrs. and 4 torpedo tubes. She was followed in 1888 by the " Sharpshooter, with ten sister vessels, still larger and more heavily armed. They were 230 ft. long and 735 tons displacement, had engines developing 3500 H.P., giving a speed of 19 knots, and carried two 4-7-in. Q.F. guns, four 3-pdrs. and two torpedo tubes.

France built six vessels of the " Bombe " class, and the " Leger " (a slightly larger vessel), and in 1 89 1 to 1896 built five other torpedo gunboats of about 900 tons and 21 knots. The last was named La Hire," and was 241 ft. long, 27 ft. 6 in. beam, 12 ft. 9 in. draught,; 890 tons displacement; was armed with six 9-pdr. and six 3-pdr. Q.F guns and was provided with engines of 6400 I. H.P. for 23; knots. These vessels have no torpedo tubes. The torpedo cruiser' "Fleurus," laid down in 1891, was armed with four torpedo tubes as well as five 3-9-in. and six 3-pdr. guns. She was also protected by a ij-in. protective deck and fitted with a belt of cellulose 3 ft. thick in the vicinity of the water-line. Her dimensions were: length 230 ft., beam 29! ft., draught aft 15 ft., displacement 1300 tons, I. H.P. 4000, and speed 18 knots.

The " Niger " class of 1892, which included eleven vessels (fig. 114, Plate XX.), were repeats of the " Sharpshooters," except that they carried an additional torpedo tube and three machine-guns, with certain hull additions and more durable machinery, the displacement being increased by these causes to 810 tons, and the speed being reduced by a quarter of a knot. In 1893 a fourth series of this class of vessel was begun, known as the " Dryad " class, and considerably larger than the " Nigers," being 250 ft. long and of 1070 tons displacement. They are of 3500 I.H.P., have a speed of l8| knots, and carry an armament of two 4-7-in. Q.F. guns, four 6-pdTs., and three torpedo tubes. Five vessels of this class were; built, the difference between their general appearance and that of the preceding classes being illustrated by fig. 115 (Plate XX.), which shows the " Hazard," which in 1910 was employed on special service in connexion with the reception and trials of British sub- marines. In these thirty-one British vessels of the torpedo gunboat class the

elements of strength and seaworthiness are developed at the expense of speed, and they combine in themselves some of the functions of the torpedo-boat with many of the most important I features of the small cruiser. The successive increases of ‘ displace- ‘ I ment are very largely due to additions to the hull, giving greater 1 habitability and trustworthiness for continuous work at sea. It j will be noticed that the speed shows a continuous falling off; but : the ” Sharpshooter ” class and subsequent vessels have been refitted [with water-tube boilers in lieu of the locomotive boilers originally I fitted, and some of them are in addition re-engined, with the result that a speed of 21 knots was obtained; this, in the ordinary weather met with at sea, would probably enable them to overtake craft of lighter types possessed of considerably greater smooth-water speeds. These vessels have not been repeated, many of them have been sold, but all those remaining are actively employed on a variety i of subsidiary but important services.

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Torpedo-boat Destroyers were primarily, as their name implies, intended to meet and destroy torpedo-boats, their larger size, greater coal capacity, heavier armament, and higher speed enabling them to overtake such boats before they could complete their attack; but it soon became evident that these additional powers also enabled the destroyer to perform the duties of the torpedo-boat more efficiently than the boat herself, and with the advent of the destroyer the production of the smaller boat declined.

The pioneers of this type of vessel were the “Daring,” “Decoy,” ” Havock ” and ” Hornet,” the construction of which was entered upon in July 1892, the two first-named at Messrs Thornycroft’s and the other two at Messrs Yarrow’s. They were thus contemporary with the ” Dryads,” the last of the torpedo gunboats. The success of these four vessels was followed with great interest, and in the following year (1893) six others were begun. One of these, the ” Boxer,” built by Thornycroft, attained a speed of 29 2 knots. A much greater number of destroyers (32 in all), nearly the whole of which were of 27 knots speed, were laid down in 1894. The suc- ceeding year (1895) saw a great advance in size, power and speed, thirteen destroyers being laid down, for each of which the contract speed was 30 knots. Similar vessels were constructed by various firms in England for foreign

powers, and abroad by Messrs Schichau in Germany and M. Normand in France; the " Sokol " being con- structed by Messrs Yarrow for the Russian navy. Over sixty destroyers of the 30-knot type were built for the British navy be- tween 1895 and 1905, and in only three vessels with reciprocating engines — the " Albatross," the "Express," and the " Arab " — were speeds exceeding 30 knots contracted for. In 1896 an attempt was made to realize greater speeds, but it was found that the power and cost necessary for the addition of a few knots were dispro- portionate to the value of the results obtained, and the attempt was not followed by any general increase of speed above 30 to 31 knots in destroyers fitted with reciprocating engines. The general appearance of a typical destroyer of this period is shown by fig. 116 (Plate XXVI.), which represents the "Albatross" at full speed.

Particulars of destroyers will be found in Table XIX.

Experience with the marine steam turbine, the invention of the Hon. C. A. Parsons, dates only from the time of the " Turbinia " (fig. 117, Plate XXV.), which made her successful trials in 1898 after much investigation on the part of the inventor. The turbine machinery consisted of three separate turbines directly coupled to three screw shafts and working in series, one turbine being high

engines approaching 1200 and the power being estimated at about 12,000 H.P. At the time of their completion these were the fastest vessels of any type afloat, but both were unfortunately lost at sea, the " Viper " after a very short period of service being run upon the Renouquet Rock in the Channel Islands, and the "Cobra" being lost at sea on her first voyage after leaving the contractor's works.

The results attained by these vessels led the British Admiralty to make further experiments with this type of machinery. The " Velox," which had been launched in 1902, was purchased from the Parsons Company, and two experimental vessels were ordered from Messrs Hawthorn, Leslie & Co., both 220 ft. long, about 590 tons displacement" and with similar boilers. Both vessels were launched in 1903. One, the " Eden," was fitted with Parsons turbines, and reached 26 ■ I knots on trial ; the other, the " Waveney," with reciprocating engines, reached 25-6 knots on trial; the " Waveney " had twin screws; the " Eden " had six screws, two on each of three shafts, and at high speed showed a great saving in coal consumption.

Experience with the 30-knot boats led to a decision to order boats of stouter build and better sea-keeping qualities. In them the turtleback

forward was replaced by a lofty forecastle, and it was laid down that the trials should be run with the boats more heavily loaded and more closely approaching their ordinary loaded condition on service. These changes were embodied in the " River " class, in which a trial speed of 25J knots under the modified conditions was provided for.

In 1902-1904 thirty-four destroyers of the " River " class were ordered, of the following dimensions, &c. : length 220 to 230 ft., breadth 23ˆ to 24 ft., mean load draught 8 ft. 2 in. to 8 ft. 8 in., displacement 540 to 590 tons, I. H.P. 7000 to 7500, speed 25J knots. The 1904 Committee on Designs recommended two new types of destroyers called " ocean-going " and " coastal " respectively, and also one experimental vessel of the highest speed obtainable, all to be fitted with Parsons turbines, and to use oil only for fuel. The ocean-going destroyers include five of 33 knots and the special destroyer of 35 knots named the " Swift " (fig. 118), built by Messrs Laird & Co. She was the largest destroyer afloat in 1910. Fig. 119 (Plate XXVI.) gives a view of this vessel.

From 1906 to 1908 eight ocean-going destroyers of, 33 knots of the " Tribal " class were ordered, ranging from 970 to 1045 tons displace- ment and armed with two 4-in. guns and two 18-in. torpedo tubes. In 1908-1909 sixteen ocean-going destroyers of the " Beagle " class

Table XIX

— Particulars of Torpedo-boat Destroyers.

Vessel's Name.

Country.

Where Built.

Principal Dimensions, &c.

Ph

V

13

Speed.

Armament, &c.

a

1

.§•§ A

*J! **

Ft. In.

Ft. In.

Ft. In.

Tons.

Knots.

Daring . . .

Great Britain

Messrs Thornycroft, London.

1893

185

19

6 6

275

2

4,200

27.0

1 — 12 pdr., 3 — 6 pdrs., 3 tubes.

Swordnsh

,,

Armstrong, Whitworth, Elswick.

1895

200

19

6 6

33°

2

4.500

27-6

1 — 12 pdr., 5 — 6 pdrs., 2 tubes.

Sokcl ....

Russia .

Messrs Yarrow, London.

1895

100

18 6

7

240

2

4,400

29.7

1 — 12 pdr., 8 others, 2 tubes.

Corrientes

Argentina

Messrs Yarrow, London.

1896

190

19 6

7 4

280

2

4,000

27.4

1 — 14 pdr., 2 tubes.

Chamois

Great Britain

Messrs Palmer.

1896

215

20 9

7 3

360

2

6,200

30.0

1 — 12 pdr., 5—6 pdrs., 2 tubes.

Express

tt

Messrs Laird Bros.

1897

235

22

9

465

2

9.250

31-0

1 — 12 pdr., 5 — 6 pdrs., 2 tubes.

Gipsy ....

tt

Messrs Fairfield.

1897

227 6

22

9

380

2

6,300

30.0

1 — 12 pdr., 5 — 6 pdrs., 2 tubes. Nil. Experimental boat.

Turbinia

tt

Hon. C. A. Parsons.

1897

100

9

3

44 J

3

2,IOO

32-75

Albatross

Messrs Thornycroft, London.

1898

227 6

21 3

8 6

43°

2

7,500

31.5

1 — 12 pdr., 5 — 6 pdrs., 2 tubes.

Cobra . . . .

,,

Armstrong, Whitworth, Elswick.

1899

210

21

6 9

350

8

12,000

34-o

1 — 12 pdr., 5 — 6 pdrs., 2 Hotchkiss, 2 tubes.

Bailey ....

United States

Morris Heights.

1899

205

19

6

280

2

5,600

30.0

4 — 6 pdrs., 2 tubes.

Lawrence

,,

Weymouth, Mass.

1900

242 3

22″ 3

6 2

400

2

8,400

30.0

2 — 14 pdrs., 5 — 6 pdrs., 2 tubes.

Derwent

Great Britain

Messrs Hawthorn, Leslie.

1904

220

23 6

8 6

555

2

7,000

25-5

4 — 12 pdrs., 2 tubes.

Swift . . . .

tt

Messrs Cammell, Laird.

1907

345

34 2

12

1800

4

30,000

35-o

4 — 4”, 2 tubes.

Tartar ....

Messrs Thornycroft, London.

1907

270

26

9 1

870

3

14,50°

33 -o

3 — 12 pdrs., 2 tubes.

Para . . . .

Brazil

Messrs Yarrow, London.

1908

240

23 7

10

55°

2

8,000

27-5

2 — 4”, 4 — 3 pdrs., 2 tubes.

Zulu . . . .

Great Britain

Messrs Hawthorn, Leslie.

1909

280

27

8 10

1000

3

15,500

33-0

2 — 4”, 2 tubes.

Beagle ….

”

Messrs J. Brown.

1909

269 O

26 7

8 3

860

3

12,500

27-o

1 — 4”, 3 — 12 pdrs., 2 tubes.

S 167 . . . .

Germany

Elbing.

1909

. ,

607

12,000

30.0

2 — 24 pdrs., 2 machine, 3 tubes.

Smith .

United States

Philadelphia.

1909

289 O

26

8”o

700

3

IO.QOO

28.35

5 — 14 pdrs., 2 machine, 3 tubes.

Mameluck .

France .

Nantes.

1909

210 7

2i 9

jo 4

405

3

7.750

28.0

6—9 pdrs., 3 tubes.

San Luis

Argentina 1 Messrs Cammell, Laird.

1910

285 O

28

9

960

2

20,000

32.0

4 — 4”, 4 tubes.

pressure, one intermediate and one low pressure. Each screw shaft at first carried three propellers, the total number of propellers thus being nine ; the weight of main engines was approximately 3 tons 13 cwt., and the total weight of machinery and boiler, screws and shafting, tanks, &c, 22 tons. The boilers were of the water-tube type, with a working pressure of 225 lb per square inch.

The ” Turbinia ” was followed by the ” Cobra ” and ” Viper ” torpedo-boat destroyers. The machinery of these boats consisted of two sets, one on each side of the ship; each set comprised two turbines, had two expansions, and drove two shafts (making four shafts in all). The outer shaft on each side was driven by a high-pressure turbine, from which the steam passed to a low- pressure turbine on the inner shaft and thence to the condenser; on the inner shaft also was a small turbine, added for going astern, the Parsons steam turbine not being adapted for reversal. Steam was supplied by water-tube boilers of the express type. These vessels attained a speed of upwards of 34 knots, the revolutions of the

were ordered, of 27 knots speed, coal being used as the fuel instead of oil as in the preceding classes. In 1909-1910 twenty more ocean-going destroyers of the ” Acorn ” class, designed by Sir Philip Watts, were laid down; in these oil was again adopted for fuel and a speed of 29 knots obtained. These vessels are of 780 tons displacement, 240 ft. long, 23J ft. beam, 7f ft. draught, 13,500 turbine H.P., and carry two 4-in., four 12-pdr. guns and two 21-in. torpedo tubes. The ” Acorn,” ” Alarm ” and “Brisk ” are provided with Brown-Curtis turbines, all the others with Parsons turbines. The navy estimates for 1910 provided for laying down twenty-three destroyers. The three Australian destroyers of the ” Paramatta ” class were designed by Professor Biles, and are of 700 tons displacement and 28 knots speed.

While the idea of the torpedo-boat destroyer originated in Great [Britain, and the first boats of the type were built for the British I navy, foreign powers were not slow in availing themselves of the I results obtained, and large numbers of torpedo-boat destroyers have

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been added to the fleets of foreign navies, the boats built by Messrs Schichau of Germany and Normand of France having especially achieved success in the attainment of high speeds on trial. The " Bainbridge " class (fig. 120, Plate XXV.), built for the U.S. navy in 1901, are 245 ft. long, 23 ft. 7 in. wide, draw 6 ft. 6 in. of water, and have a displacement of 420 tons. Their sea-going speed is 29 knots, and their armament consists of two 18-in. torpedo tubes, two 3-pdr. Q.F. guns, and five 6-pdrs. The destroyers building in 1910 are of 742 tons with a speed of 29! knots.

German destroyers are numbered consecutively, the numbers being prefixed by letters indicating the yard where built. Thus, S for Schichau works, Elbing; G, Germania works, Kiel; V, Vulcan works, Stettin. Numbers below 90 are appropriated for torpedo-boats. Two destroyers only have names, viz. S. 97, which also bears the name " Sleipner," and is fitted to serve as the emperor s yacht; and one without a number named " Taku," late " Hai- jing," taken from China in 1900, but built at the Schichau works in 1898. (The British navy list also contains the name of a destroyer " Taku," built at the same works in 1898, and also taken from China in 1900.) The German torpedo-boat flotilla is divided up into sections, each section led by a division boat of much larger size than the others. These division boats increased in size, from 226 tons displacement, 1800 I.H.P. and 21 knots speed in 1887, to 374 tons, 5500 I.H.P. and 28 knots speed in 1898. Division boats are numbered D 1 to D 10, and of these two bear names, D 1 that of " Carmen,

armed with two 3‘9-in. and four 9-pdr. guns and four torpedo tubes; Russia was building vessels of about 1000 tons and of 35 knots speed.

Submarine Boats. — About 1880 much attention began to be paid by several of the naval powers to the development of the submarine boat, the United States and France in particular.

The history of the subject goes back at least 300 years, but the first undoubted success with a submarine vessel was achieved by David Bushnell in America in 1775. It was worked by one man, for whom it provided just sufficient room; its general appearance, according to Bushnell’s own description, bore some resemblance to two upper tortoise shells of equal size joined together, the entrance to the vessel being represented by the openings in the swellings of the shells at the animal’s head; the body of the vessel was constructed of wood. The

operations on board were entirely manual. By an oar in form of a screw with its spindle passing through the top the boat was sunk or raised, by another oar at the after end it was propelled; a rudder was used for guidance, and in some cases for propulsion ; valves admitted water when submergence was required, and

Fore peak. Crew space. Oil-fuel tank. W.T. compartment. Paint-room.

Fig. 118. — Torpedo-boat Destroyer " Swift.'

6, Chain locker. 10, Boiler-room.

7, Fresh-water tank. II, Engine-room.

8, Naval store. 12, Dynamo-room.

9, Magazine and shell- 13, Cabin.

room.

14.

Ward-room.

18,

15,

Magazine.

19,

16,

Spirit-room.

20,

17,

Store.

21,

4-in. Q.F. gun. 18-in. torpedo tubt Boat stowed. Ventilator.

and D 2 " Alice Roosevelt." Since 1898 torpedo-boat destroyers have

been built in place of division boats. The first 46, built be- tween 1898 and 1906, are of very similar type, the length gradually increasing from 207 to 216 ft., the displacement from 394 to 480 tons, engine-power from 5400 to 6500 I.H.P., speed from 26j to 28 knots, while the breadth remained at 23 ft., and the draught at 7! ft. G 137, built at Kiel in 1906, is 235 ft. long, 560 tons dis- placement, 1 1,000 I.H.P., and obtained 33-9 knots speed. The nominal speed of the 48 vessels which followed is 30 knots, but several have exceeded this speed on trial. Recent destroyers are about 620 tons displacement, 12,000 H.P., and speeds of 34 to 36 knots have been reported. They are armed with two 24-pdr. Q.F., two machine- guns and three torpedo tubesf while two of 950 tons and 18,000 H.P. were launched in 1910.

In 1902-1903 Japan built in her own yards three destroyers of 375 tons, 6000 I.H.P. and 29 knots, armed with two 12-pdr. and four 6-pdr. guns and two torpedo tubes. She had previously obtained a number of boats from Messrs Thornycroft & Yarrow. The " Niji " (fig. 121, Plate XXV.) was one of the " Ikadzuchi " class built by Messrs Yarrow; of 340 tons displacement, 6000 I.H.P. and 31 knots speed, armed with two 12-pdr. and four 6-pdr. guns and two torpedo tubes, and may be taken as typical of all of the foreign built Japanese destroyers. Between 1904 and 1908 Japan built 35 destroyers of 375 tons, 6000 I.H.P. and 29 knots, carrying six 12-pdr. guns and 2 torpedo tubes; and in 1910 was building two ocean-going destroyers, the " Umikaze " and " Yamakaze," of 1150 tons, 20,500 H.P. and 35 knots, armed with two 4-in. and five 12-pdr. guns and three 18-in. torpedo tubes.

The largest torpedo-boat destroyers building by France in 1910 were of 750 tons displacement, 14,000 H.P-, 31 knots speed and

hand pumps discharged this water when it was desired to come to the surface, and a detachable weight of 200 lb was also supplied for emergency use. The air in the boat was capable of supporting the operator for thirty minutes; and as soon as he brought the boat to the surface, two air pipes, for discharge of foul and supply of fresh air, opened automatically. A compass, a pressure- gauge, and a sounding-line and lead were among the fittings. Behind the vessel was a large magazine containing 150 lb of powder, and a time-control for exploding it. From the magazine was led a rope to a wood screw at the fore part of the crown of the boat, and this screw, being worked from within, could be driven into the object to be destroyed in such a manner as to keep the magazine required for the explosion in position after it had been detached from the boat. During the War

of Inde- pendence the boat was submerged beneath the British warship " Eagle," and the operator attempted to attach the wood screw to her bottom planking: in this he failed, apparently simply because he did not let go his detachable weight and so get enough upward pressure to drive the screw into the plank. The magazine was released and exploded an hour afterwards, but at some distance from its intended position.

The problem of submarine navigation received the practical attention of Fulton during the time that he was making his experiments upon steam propulsion, and even at an earlier

period. He constructed two submarine boats in France, and one in America. One of the former, the " Nautilus," was built with the direct encouragement of Napoleon in 1801. It was supplied with compressed air for respiration, and with it Fulton conducted a series of experiments under the direction of a com- mission of naval officers. He descended to a depth of 25 ft., and remained under water for fully four hours, placing below a vessel provided for the purpose a torpedo by which it was blown into fragments. As with his steam engine, so too with his submarine boats, the report of the commission charged with investigation was so unfavourable that Fulton was much discouraged, and though he afterwards continued his labours in this direction, the results achieved by him were practically lost. Fulton's boat, like Bushnell's, was propelled by manual power, two horizontal screws being employed for propulsion, and two vertical screws for descending and ascending: it was built of wood with iron ribs, and was sheathed with copper.

The substitution of mechanical for hand power came later, and one of the first mechanically driven boats was the " Plongeur," built in France in 1863 from the designs of Charles Brun. This boat had a length of 146 ft. and a diameter of 12 ft., and was propelled by an 80-horse-power compressed-air engine. During the American Civil War the Confederates built a number of iron cigar-shaped boats; some were propelled by steam engines and some by hand. Each was armed with a torpedo containing 50 to 70 lb of powder carried at the

end of a spar. These boats were known as ” Davids,” from their diminutive size as com- pared with the size of the ships attacked, and in 1864 one of the hand-worked boats, 50 ft. long, manned by a crew of nine men, successfully attacked the Federal ship ” Housatonic,” and sank her by means of a spar torpedo, but in so doing was herself sunk. It is claimed that the loss of the boat was due to faulty handling and not to inherent defect. Against the protest of her builder, she was immersed only to the hatch coaming; and the cover being left open, she was swamped and sunk by the wave thrown up by the explosion.

About the same time another hand-worked submarine, called the ” Intelligent Whale, ” 26 ft. in length and 9 ft. in diameter, attracted some attention in America. An officer with two other persons dived with her in water about 16 ft. deep; the officer, in diver’s dress, left the boat through a manhole in the bottom, placed a torpedo under a scow and blew the latter to pieces.

In 1875 Mr. J. P. Holland produced his first plan for a sub- marine vessel, and in r877 he constructed a small experimental boat, which embodied features now accepted as essentials in American design. His plan ensured that when, for the purpose of diving, water was admitted into compartments of limited size, the total weight of the boat and its contents should still be a little less than the total buoyancy. Immersion was maintained by the action of horizontal rudders, which gave a downward tendency so long as the boat had any forward motion, and there always remained enough surplus buoyancy to bring the boat to the surface on the stoppage of her propelling machinery. Any weight consumed on board was automatically compensated for by admission of water, so that the total weight remained fixed and constant; while the con- finement of the water to small compartments further secured a fixed centre of gravity. The securing of these qualities of fixed weight and fixed centre of gravity is essential, and the want of them has been the cause of failure in many other designs. With the necessarily slight longitudinal stability possessed by a submarine boat, any change of centre of gravity in the fore- and-aft direction has a no’ able effect on the angle of trim; and such a change may readily occur, for instance, from the surging of water in a large ballast-tank not completely full. An unintentional alteration of trim when the submarine boat is being propelled involves several possible dangers: in extreme cases the crew or some of the fittings may be thrown out of position, but in any case the path of the submarine is altered, and may tend either to too great immersion on the one hand, or “» breaking the surface of the water on the other. From the*

Holland's boat.

risk of these dangers it is claimed by Mr Holland that his design is free. The first of his boats now under discussion was steered down and up inclines by her horizontal rudders, and motive- power was obtained from a petroleum engine. The tests to which she was subjected showed that inefficiency of the engine, difficulty of vision and trouble with the compass tended to destroy the boat's usefulness.

In 1883 Mr Nordenfeldt, famous as an inventor in many directions, built a submarine boat at Stockholm. She had a length of 64 ft., a main diameter of 9 ft. and a displacement of 60 tons; she was propelled by a compound surface-condensing engine indicating 100 H.P., and on a measured-mile trial, not being submerged, attained a speed of 9 knots. Steam was supplied by an ordinary marine return-tube boiler, worked under forced draught, which could be fired as long as the boat was at the surface. Storage of steam was fiMˆ"" effected at the surface, and the steam thus stored was boat. used to drive the engine in the submerged condition. To store sufficient steam two large tank reservoirs or cisterns were connected with the boiler, and the contents of boiler and tanks (8 tons of water in all) were raised to a temperature corresponding to 150 lb pressure. In preparing for submergence the firing of the boiler was stopped, and the steam given off by the heated water in boiler and tanks sufficed to propel the boat for a period. The smoke was driven out through two channels, which passed round the hull and pointed astern. The material of the hull was mild steel, the frames being 3 in. by 3 in. by f in., and the plating I in. to f in. in thickness; the depth to which she could safely descend was about 50 ft. When ballasted ready for a submerged trip, this boat showed only a very small dome for observation above the level of the water, the reserve buoyancy represented by this dome being but 1 cwt. To overcome this reserve two propellers working on vertical shafts were fitted in sponsons, one on each side of the boat, nearly amidships. These propellers were driven by a 6-horse-power engine, and drew the boat under water to the desired depth; an automatic contrivance, set in motion by the water pressure outside the boat, closing the throttle-valve when the safety limit of depth was approached. On coming to rest, the reserve buoyancy brought the boat again to the surface. When propelled by the main engines in the submerged condition, the boat was kept horizontal by means of two bow rudders operated by a plumb weight. The crew consisted of three men only, this small number rendering un- necessary the employment of artificial means of maintaining a pure atmosphere. The scheme of attack was to approach the hostile ship running at the surface until the danger of discovery was

imminent, then to descend to the " awash " condition with only the dome above water, and finally to go below the surface and advance to striking distance entirely submerged, rising if necessary once or twice to allow the direction to be adjusted by observations made from the dome " awash." The weapon of offence employed was a Whitehead torpedo, carried outside on the bow and discharged mechanically. Several larger boats were subsequently built from Mr Nordenfeldt's designs; they all involved the same principles, but were in some details made more efficient both for attack and defence. ■

The three main points insisted upon by Nordenfeldt were: (1) that his method of storing energy gave him a reservoir which was not liable to get out of order, could readily be repaired if necessary, and required for its manipulation no knowledge beyond that possessed by an ordinary engineer ; (2) that for submergence he relied on mechanical means easily controlled, adding, as a criticism upon the alternative method of descending by steering downwards, " I need only point out the great risk of allowing an object 100 ft. long and of great weight to proceed in the downward direction even at a small angle, as the impetus gained would very easily carry it beyond a safe depth so quickly that they might not have time to check it "; (3) that the bow. rudders always secured a horizontal position when the boat was running submerged, which position he had found to be a sine qua non for a submarine boat.

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Plate XXVII.

Fig. 122.— Holland Submarine.

Fig. 123. — Holland Submarine.

Fig. 124. — Holland Submarine.

Fig. 125. — Holland Submarine.

Fig. 128. — French Submersible Vendcmiaire.

Plate XXVill.

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Fig. l;o. —British Submarine D I.

Fig. 131. — British Submarine Flotilla at Portsmouth.

In response to an invitation for proposals for submarines, made by the U.S. government in 1887, designs by Holland and Noraenfeldt were submitted After much consideration the proposals of the former designer were accepted, and formed the basis of the designs for the " Plunger," the " Holland " and the six vessels of the " Adder " class. From what has been already stated, the criticism of Admiral Hichborn (chief con- structor of the U.S. navy) will be understood when he char- acterizes Holland's method as a " steering-under " or " diving " device, and Nordenfeldt's as a "down-haul" or "sinking" design. The great majority of modern boats are worked by the Holland method. The " Plunger " was authorized in 1903; she has a length of 85 ft., diameter 11ˆ ft., light displacement 154 tons and load displacement 168 tons; she is of sufficient strength for a submergence of 75 ft., and when wholly submerged has a margin of buoyancy of j ton. In addition to her horizontal rudders for diving, she has two down-haul screws, fitted in opposition to Mr Holland's recommendations; she may there- fore be said to be a combination, for diving purposes, of both the Holland and the Nordenfeldt designs. The " Plunger's " main engines are used for propulsion when she is navigated at the surface of the water. As originally designed they were triple-expansion steam engines, driving triple screws, but have since been altered to gasolene internal-combustion engines driving a single screw. These engines are also used for

control in the vertical plane that she may be kept whilst moving within a few inches of any desired depth, and that she may be brought to the surface and submerged again in a very short time." A good idea of the general form of the " Holland " may be obtained from figs. 122, 123, 124 and 125 (Plate XXV1L), the last three of which represent this vessel when undergoing trials to test her driving qualities.

The design of the six submersibles of the " Adder " class is shown in fig. 126. They are of the following dimensions: length 63 ft. 4 in., diameter 11 ft. 9 in.; displacement for surface running 104 tons; submerged displacement 120 tons. The main features of this class are the same as for the " Plunger." The shell-plating is ˆB in. in

thickness, and the frames 3J in. by 3 in., with a spacing of 18 in. The main machinery is a four-cylinder single-acting balanced Otto gasolene engine, which at 360 revolutions will develop 160 H.P. and give the boat a speed of about 8 knots. For propulsion in the submerged condition an electric motor is used, working at 800 revolu- tions, and giving a speed of 7 knots, a single left-handed propeller being employed. The current for the motor is provided by storage batteries capable of supplying 70 H.P. for four hours; and these batteries are charged by the main engine. The requisite air supply is obtained when the vessel is at the surface, and is stored under a pressure of 2000 lb by a pump driven by gearing off the main engine or main motor. Air at a pressure of 50 ft> is used for the expulsion of torpedoes, and the same agent, at various degrees of pressure, works the trimming and ballast tanks and some parts of the machinery; while the exhaust air from the latter subserves the purpose of ventilation. The vessel is fitted with power and hand-steering gear, and there are automatic devices for securing a con-

Fig. 126.— Plan of the U.S. "Adder" (reproduced by permission of Admiral Hichborn). A, storage batteries; B, gas-engine; C, dynamo and motor; D, water-tight compartments; E, main ballast tanks; F, air-flasks; G, gasolene tank; H, expulsion tube.

charging electric accumulators, from which alone motive-power can be obtained when the boat is submerged. The current for charging the accumulators is obtained from a dynamo of 70 H.P., which can always be run in the awash condition to keep the accumulators fully charged. In the awash condition, when the boat is otherwise air- and water-tight, communication is kept up with the outer air by means of ducts and a smoke-pipe, the former bringing in air for combustion and respiration, and the latter carrying off deleterious products of all kinds. For submergence special fittings are used to close these ducts and pipes, and to stop the gasolene generator. The main engine is then no longer available, and for propulsion power is drawn from the accumulators, the dynamo thus becoming a motor which derives current from the accumulators and itself drives the screw-shaft. As was the case with Mr Holland's earlier boats, great attention is given to automatic control of weights, and water-ballast is admitted to compensate for any change, such as would be produced by the discharge of a torpedo. With her original machinery the " Plunger " was to have had a surface speed of 15 knots; her anticipated speed awash or submerged is now 8 knots. To assist in determining the boat's direction a camera lucida is ordinarily provided, but for correcting this Mr Holland prefers trusting to observations made during occasional rises to the surface; for this purpose the boat is

provided with a conning tower 4 ft. high, protected with 4-in. steel. The " Plunger " is armed with Whitehead torpedoes, and has two tubes for discharging them. After many trials it was at last decided to build a repeat of the " Adder " to take her place, and this second " Plunger " was completed in 1903. The " Holland " is a smaller boat, having a length of about 54 ft., and was purchased in 1900. The official report on this vessel is that " she has shown herself capable of such perfect

stant depth during submergence. Five Whitehead torpedoes, 45 cm. (about 18 in.) in diameter and 1 1 ft. 8 in. long, are provided, and there is one expulsion tube placed forward about 2 ft. below the light water-line.

The French submarine boat " Plongeur " has already been mentioned. A further advance in this direction was made in France in 1 88 1, when a small submarine was completed by M. Q OU bet Goubet at Paris. An inspection of this vessel led to an system- order for the mechanism of a number of boats from this engineer for the Russian government, and several sets were built and delivered early in 1883. The length of a boat constructed by M. Goubet in 1885 was 16 ft. 5 in. ; it had an oval section 5 ft. 9 in. in depth and 3 ft. 3 in. in breadth, and tapered to a point at each end. A longitudinal section of the boat is represented by fig. 127. The main portion of the hull was of bronze, cast in one piece, and at the centre of its length it was surmounted by a large dome having seven glazed openings. There was just sufficient room for an officer and a man seated back to back within it, their eyes in this position being level with the glass windows of the dome. All valves and other mechanism requiring regulation were brought within reach of these occupants, so that no movement on their part was required which might affect the trim; a reservoir of compressed air supplied the means of respiration, and an air-pump removed the vitiated atmo- sphere. The motive-power was furnished by accumulators, the electric energy stored therein driving a screw propeller by means of a motor. No Means of recharging these accumulators when ex- hausted was provided on board. Submersion was effected by ad- mitting water into tanks divided by transverse bulkheads at sufficient intervals to prevent the surging of the water in the fore and aft direction. A pump expelled this water again when desired, and a safety weight attached to the bottom of the boat was ready for detachment in the presence of danger. A pressure gauge indicated the depth of water reached, and the officer could regulate the opening of the inlet valves or the action of the pumps to maintain or vary this depth as desired. For controlling the boat in a horizontal direc tion a specially devised pendulum was employed, by means of

which a clutch was moved, and a constantly running shaft was thrown into gear with a pump as soon as the boat departed appreciably from the horizontal plane. The action of the pump was reversible,

and the clutch engaged it always in such a way that it drew water from a tank at the low end of the boat, and delivered it to a tank at the high end. Several other devices of great ingenuity were employed in the boat; notably a special form of universal joint introduced into the line of shafting. At the after end, close to the propeller, this universal joint was fitted in such a way that the screw could be set at an angle to the line of motion, and steering effected without the aid of a vertical rudder. A torpedo containing ioo ft> of dynamite or other explosive was carried outside the hull, and secured by a catch joint. This torpedo, on the submarine boat being manoeuvred into position, could be thrown off and allowed to rise and attach itself, by means of spikes, to some vulnerable part

Reservoir

Fig. 127. — Section of Goubet Submarine Torpedo-boat.

of the ship doomed to destruction. Retiring then to a safe distance, the submarine boat could explode the torpedo by the agency of an electric current.

Working in the light of his now considerable experience, M. Goubet built several other boats. These were of larger dimensions, having a length of 27 ft.; their material was also bronze, and they were cast in three pieces, the centre one having a thickness of 1 in., while the others were reduced to a little more than \ in. at the ends. Possessing to a large extent the same contrivances as their predecessor, these improved boats were fitted also with an automatic apparatus for regulating the depth of submersion. In this regulator a piston is moved along a cylinder by the rotation of a rod with a screw thread cut in it, and so increases or diminishes the amount of water in the cylinder. The movement of the piston is effected by a small motor, and the direction of action of the motor is regulated by a commutator placed in juxtaposition to a pressure gauge. When the depth of submersion is too small, current is supplied to move the

piston so as to admit more water; when the depth is too great, current is supplied in the opposite direction, and water is expelled. The speed attained by this boat was from 5 to 6 knots. Smaller boats of this type have been built for propulsion by manual power, but, however perfect the mechanism, the range of action of a submarine dependent on man-power for propulsion is very limited. Recent Goubet boats are being built,' with motive- power, which it is proposed to carry on board ship and lower from davits when required.

The " Gymnote " was constructed at Toulon in 1888. She is a steel vessel, with a length of 59 ft. and a displacement of 30 tons; being of an experimental character only, she has no weapon of attack. The maximum speed obtainable is 8 knots. The designs of the " Gustave Zede " and of the " Morse " were both based on those of the " Gymnote," the former having a length of 148 ft. and a displacement of 263 tons. In both of these the hull is of bronze; one great advantage of this metal being that, like the bronze of the Goubet boats, it is non-magnetic in character, and cannot therefore disturb the equilibrium of the compass. With their large dimensions they were intended to be formidable engines of war, and were furnished for attack with Whitehead torpedoes; of these latter they each carry three of 45 cm. (nearly 18 in.) diameter, discharging them by means of a torpedo tube. The " Morse " and the " Gustave Zede," like the " Gymnote," possess only electric means of propulsion, the power being derived from batteries of accumulators. No power is provided in the vessels by which the accumulators can be recharged, so that the radius of action of these boats is necessarily very limited. The " Narval," designed by M. Laubeuf, and the outcome of a general competition in 1897, has a length of 112 ft. and a total displacement of 200 tons. She was built at Cherbourg in 1898,

bination of manoeuvring

rudders ship

and is furnished with a triple-expansion steam engine, obtaining its steam from a water-tube boiler of special form and heated by petroleum. As in, the American submarines, this engine propels the boat when at the surface, and also drives a dynamo which recharges accumulators, the latter giving the reserve power for use in the submerged condition. A speed of II knots is obtained at the surface, and 8 knots when submerged. A new departure in the " Narval " is her double hull, the inner shell of which is of steel plate of sufficient thickness to resist any water-pressure to which the boat may be

subjected, and the outer shell, placed at varying distances from the inner, forms a protection to the inner against attack. An armoured dome surmounts the boat, cutting through the external shell and carrying a short and narrow telescopic funnel, which, as in the case of the American boats, must be withdrawn preparatory to diving. Control in the vertical direction is obtained, when diving, by the use of two pairs of horizontal rudders, placed symmetrically — one pair forward, the other aft. By the above arrangement it is claimed that the horizontal direction of the boat is ensured, the American course of inclining the axis of the boat when diving being considered open to such grave objections that it is desirable to avoid it.

The early American boats of the " Hol- land " type, and the French boats built in the last decade of the 19th century, were the earliest really practical submarine boats, in the sense that unlike the boats which preceded them they were instru- ments of war which could be used by ordinary trained crews with the average chances of success and failure which attend all warlike operations. They owe their practicability not to any discovery of the method of controlling the move- ments of a boat beneath the surface of the water, as has been sometimes supposed, since the ordinary method of steering by means of a rudder or a com- perfectly analogous to that used for .1 the horizontal plane was well known and had been applied to steering submarines in the vertical

f)lane before; \but principally to the perfection of the accumu- ator cell as a means of storing energy for propulsion without the expenditure of air or other weight contained in the boat, and to the introduction of the optical tube. This latter instru- ment is a telescope with the optical axis twice bent through a right angle by totally reflecting prisms or mirrors; and under diverse forms and various names, such as periscope, cleptoscope, hyphydroscope, omniscope, &c, it affords the only practical means by which objects on the surface of the water can be seen at a distance from the interior of a submerged vessel. The problem of providing means for seeing at a distance through the water still awaits solution, and when solved, if it ever should be, will enormously add to the power of submarine boats as weapons of war.

By far the greater number of submarine boats in existence in. 1910 were developments through a process of continuous experiment and improvement of the " Gymnote " and of the early Holland boats, although the process of evolution had been so rapid and extensive that the parentage of these modern boats is barely recognizable. There are, however, a considerable number of submarines built by

the Lake Submarine Boat Co. of Bridgeport, U.S.A., in the service of various naval powers. These boats are designed by Mr Simon Lake, who was also a pioneer in submarine boat construction, contemporary with Mr J. P. Holland in the United States of America. His earliest boat, the " Argonaut," was intended rather for running along the bottom in shallow water than for ordinary navigation; and for sending out divers rather than for discharging torpedoes. For this purpose it was fitted with wheels for running along the bottom and with an air-tight chamber having a hatch at the bottom which could be opened when the air pressure in the chamber was made equal to that of the water outside. These features are still retained in many of the modern Lake boats, though these boats are now constructed like all other submarines, primarily for the purpose of submarine navigation.

Other boats which should be mentioned as laying claims to distinctive features in matters of detail are those built by the Fiat San Giorgio Company of Spezia, designed by Colonel Laurenti, and those built by the Germania Werft of Kiel, which are under- stood to embody the patents of M. d'Equeviliey. The Russian government also possesses several boats generally regarded as of a distinctive type designed by M. Drzwiecki.

Perhaps the most outstanding distinction between different submarine boats is the amount of their submerged displacement which is devoted to carrying water ballast. This, of course, measures their reserve of buoyancy in the surface condition, which in different

examples of boats varies from as little as 5% to as much as 60% of their surface displacement. It is obvious that, the more water ballast carried, the less of some other weight of machinery or equip- ment can be carried on a given submerged displacement, and the whole problem resolves itself into making the compromise which will best meet the requirements of the service for which the boat is intended. This fact has sometimes been lost sight of in discussions on this subject, which have tended sometimes to proceed on the issumption of a radical difference in character between boats of high reserve of buoyancy and those of low reserve, even to the extent of giving them the different names of " submersible " and " submarine." Another

technical point in the design of submarines which has frequently been the subject of non-technical discussion is the desirability or otherwise of " bow-rudders " or " hydroplanes." •This question depends on the form of the boat, and the manner in which it is proposed to handle her. and is unsuitable for discussion except in relation to the ascertained tendencies of a particular form

length and 568 tons displacement on the surface and 797 tons submerged, and the " Admiral BourgojsJ"' 181 ft. in length and 555 tons surface displacement, were laid down. The H.P.s of these three submersibles are 1400, 1700 and 1500 respectively at the surface, giving a speed of 15 knots (submerged speed 10 knots).

After the completion of the last boat of the ' ' Adder ' ' class already referred to, a period of about three years elapsed before the acquisition for the United States navy of any additional submarine boats. The " Octopus," which underwent extended trials in 1907, was designed by the Electric Boat Company, the successors of the Holland Boat Company, and marked a great advance in all respects over the earlier boats. She is a twin-screw boat, having two torpedo tubes instead of one, as in the previous boats; she is of about 273 tons displacement submerged and 255 tons on the surface, and is credited with maximum trial speeds of 11 knots on the surface and 10 knots submerged. Three other boats, the " Cuttlefish," " Tarantula " and

Viper," generally similar to but somewhat smaller and less power-

under the vertical hydrodynamical forces which are set up by its j ful than the "Octopus," were also completed during 1907 and 1908

propulsion through the water.

Similar considerations apply to the questions whether a submarine boat should have a separate means of propulsion for surface-running distinct from that fitted for submerged propulsion, and if so, whether it should consist of steam or internal-combustion engines. On account of the very limited capacity of even the best modern electric accumulator, any submarine which is intended to have a considerable radius of action must necessarily have heat engines of some description for surface propulsion and for charging bat- teries.

As to the type of heat engine, France was the only country which in 19 10 had fitted steam engines in recently built submarines; and the general tendency was undoubtedly to use internal-combustion engines, of which those burning heavy oil are much less expensive in

working than those using gasolene.

The general tendency in 1910 was to increase the size of submarine boats. Improvements in the design, apart from increase in size, depend principally on the improvements which may be made in the internal combustion engines required for their surface propulsion, and in the improvement or possible elimination of the electric accumu lators and motors for submerged propulsion, the weight of which is exceedingly great for the power obtained when compared with that which is obtained from heat engines.

It is the practice of all countries to keep secret the really important details of their submarine boats, to an even greater extent than those of ordinary warships. Some particulars, however, of the newer sub-marinesof different countriesare given below, prin- cipally to illustrate the progress in size and power.

In France, in 1901, M. Romazzotti, already re- ferred to as the designer of the " Morse " and " Gustave Zede," produced two other boats, the " Francais " and " Algerien," similar to the " Morse." Four vessels, the " Sirene," " Triton," "Silure" and " Espadon,"of a modified" Narval" type, were built from M. Laubeuf's designs in 1901 ; two others of a similar type, the "Aigrette" and " Cigogne," but of 170 tons surface displace- ment, were built in 1904, and two other still larger boats, the" Circe "and "Calypso," in 1905. These two boats are (155 ft. long, 16 ft. beam, 10 ft. draught) of 350 tons displacement on the surface, 480 tons submerged. Two Diesel heavy oil engines are fitted to give nf knots speed on the surface and two electric motors for use when submerged. Four boats of the " Gnome " type, of 200 tons and 280 H.P. and 135 ft. in length, designed by M. Maugas, were commenced in 1899. In 1901 twenty small submarines of the " Naiade " type were com- menced to M. Romazzotti's design; they are 76 ft. in length and of 68 tons displacement, and have a surface speed of 8 knots and a speed of 4-5 knots when submerged. Their motive-power is electrical both for surface and submerged propulsion, except in the case of two boats which are provided with benzol motors for surface work. From 1905 to 1909, 34 boats of the " Pluvi6se " type of twin-screw submersibles designed by M. Laubeuf were laid down; they have a displacement on the surface of 392 tons, and have engines of 700 H.P. and a speed of 12 knots on the surface, and 440 H.P. and a speed of 7J knots when submerged. Eighteen boats of the class have triple-expansion engines, and each of the remainder has two Diesel heavy oil motors for surface propulsion, while all have electric motors for use when submerged. Some of the steam-driven boats have traversed 730 m. in 82 hours, while the "

Papin " with oil motors ran 1200 rn. from Rochefort to Oran in six days without calling at any intermediate port. In fig. 128 (Plate XXVII.) is shown the " Vendemiaire," one of the boats of this class. The twin- screw submarines of the " Emeraude " class, six in number, de- signed by M. Maugas and laid down in 1906, are of approximately the same displacement as the " Pluviose " class and of about the same speed; their motive-power consists of two Diesel heavy oil engines on surface and electric motors when submerged. A con- siderable advance in length and displacement was made in 1907, when the " Mariotte," 216 ft. in length, 522 tons displacement on the surface, and 615 tons submerged, the " Archimede," 199 ft. in

and the "Snapper," "Bonita," "Stingray" and "Tarpon," of the same size as the " Octopus," in 1909. The " Salmon," a boat similar to the " Octopus," but of 278 tons displacement on the surface, 360 tons submerged and carrying four torpedo tubes, was completed in 19 10, and is credited with trial speeds of 13 knots on the surface and 9! knots submerged. In July 1910 this boat made the ocean passage of about 700 to 800 m. from Quincy, Mass., to Kingston, Bermuda, in four days, and returned in about the same time, proving herself remarkably seaworthy for so comparatively small a boat in the rough weather encountered. Several similar boats were in 1910 under construction.

In 1900 Great Britain ordered five submarine boats from Messrs Vickers, Sons & Maxim, at Barrow, who, by arrangement with the Electric Boat Company of New York, were enabled to embody in their designs all the features of the Holland boats of the " Adder " class, which these first British submarines resembled in size and most other respects, the length being about 63 ft. and submerged displacement 120 tons. Subsequent British submarines of the A, B and C classes were designed by Messrs Vickers, Sons & Maxim under instructions from the Admiralty. The progress in size and power has been continuous, and the departure from the original " Holland " type more and more marked with each successive new design. Table XX. indicates the various steps. All the boats there mentioned, except A13, which has heavy oil engines, are fitted with

Table XX.

Name or

Class of

Boat.

Year of Completion.

Length.

Breadth.

Submerged Displacement.

Horse- Power of Engines.

Speed on Surface.

Ai

A2-A4 .

A5-A12 .

A13

Bi-Bii.

C1-C17.

C19-C38

1903

1904-1905

1905-1906

1 906-1 907

1905-1907

1 907-1 909

1908-1910

Feet.

100

99

99

99

135

135

135

*11*9**

12′ 8″ 12′ 8″ 12′ 8″ 13′ 6″ 13′ 6″ 13′ 6″

Tons.

206 205 205 205 314

3H

320

350 450 600 500 600 600 600

Knots.

io| Hi nf

I2| I2|

I2j

gasolene engines for surface propulsion. Di, which also has heavy oil engines, was completed in September 1909, and was the first of a new series of boats for the design of which Sir Philip Watts was personally responsible. She passed through her trials, and seven similar boats were in 1910 under construction. Fig. 129 (Plate XXVIII.) gives a view of C32, while fig. 130 shows Di under weigh on the surface, and fig. 131a flotilla in Portsmouth Harbour.

Russia purchased the Lake demonstration boat ” Protector ” in 1904. This boat is 65 ft. long, 115 tons displacement on the surface and 170 tons submerged. The surface speed is stated to be 9 knots and the submerged 6 knots. A larger boat, of 135 tons displace- ment — the ” Simon Lake ” — was also purchased, and four others of the same size built in 1904-1905. In 1907 another small ” Lake ” boat of no tons was obtained, and in 1908 and 1909 seven larger vessels, 125 ft. long, 14 ft. beam, 450 tons on surface, 500 tons submerged, 16 knots speed on surface with petrol engines, and 6| knots sub-

merged, with electric motors. Of the " Holland " type Russia has obtained a considerable number; fifteen of these are from 106 to 175 tons on the surface, and one is 184 ft. long, 12 ft. beam, II ft. deep and 360 tons on the surface. She has also obtained three boats of the " Germania " type, 131 ft. long, 197 tons on the surface, as well as a specimen of a small submarine of 17 tons hoisting weight driven by electric accumulators only, giving 8 knots on the surface and 6 knots submerged, and armed with one torpedo tube. The large boats of the " Lake " type are driven by engines of 1200 H.P., and are stated to carry an armament of two 3-pdr. and two machine guns in addition to their four torpedo tubes. Three of the Russian submarines under construction in 1910 were 500 tons displacement on the surface.

Germany did not build submarines until 1906, when Ul was launched at the Germania Works, Kiel. She is 139 ft. long, lift. 9 in. beam, 7 ft. 9 in. draught and 240 tons on the surface, being

slightly larger than the Russian boats built by the same firm. She is fitted with twin-screws driven by petroleum motors of 450 H.P., giving a speed of 11 knots on the surface, and electric motors of 200 H.P., giving a speed of 9 knots when submerged. Three 18-in. torpedoes are carried, one bow tube only being provided. In 1908-1909 three larger boats were built at Dantzig, and in 1909-1910 three of 600 tons displacement at the Germania works. The boats were reported to have made very long sea passages without escort.

Japan commenced building " Holland " boats in 1905. The first five were 87 ft. in length and 125 tons displacement. Two smaller boats of 86 tons were also built. In 1908 two boats of 320 tons were built at Barrow, and despatched by steamer to Japan; and three similar boats were in 1910 being built in Japan.

In 1894 Italy launched the " Delfino," a single-screw boat of 105 tons and 150 H.P. The type has not been repeated, but in 1905 a fresh start was made with three boats of the " Glauco " type, twin-screw boats of 150 tons on the surface, 175 tons submerged, H.P. on surface 600 to 700, speed 14 knots on surface and 8 knots submerged. In 1908 three similar but larger boats followed, the largest being the " Foca," 137 ft. 9 in. long, 14 ft. beam, displacement 175 tons, 900 H.P. and 15 knots speed in surface condition,

225 tons displacement, 200 H.P. and 9 knots when submerged, fitted with two 18-in.' torpedo tubes. In 1910 six similar but larger boats were laid down at Spezia.

The increased interest in naval matters in Austria is shown by the expenditure on submarines as well as on battleships. In 1907 two boats of the " Lake " type 100 ft. long, 250 tons submerged, were laid down at the government dockyard at Pola ; between that date and 1910 two boats of modified " Holland " type, 138 ft. long, 300 tons submerged and 12 knots surface speed, were built at Fiume, and two of the " Germania " type ordered from Kiel.

The Swedish government began by building a submarine boat, the " Hojen," which is understood to have resembled the early " Holland " designs. In 1910 the " Hvalen," a boat similar to the latest Italian submarines, was built for the Swedish government by the Fiat San Giorgio Company at Spezia, and acquired some notoriety by making the voyage from Spezia to Stockholm without escort, including a longest run of about 700 m. from Spezia to Cartagena.

The " Dykkeren," a submarine of the " Laurenti " type, but entirely electrically propelled both at the surface and submerged, was built by the Fiat San Giorgio Company at Spezia for the Danish government in 1909. She is credited with a maximum speed of 12 knots on the surface and 8 knots submerged, but, depending entirely on the energy stored in electric accumulators, her radius of action is necessarily restricted.

Fleet Auxiliaries. — Various types of auxiliaries are provided in the principal navies to perform services of a supplementary, though frequently important character. In many cases fighting vessels of the older classes have been converted and adapted as well as is

Cracticable for these services, but in other cases new vessels have een built or arrangements made with ovners of suitable merchant ships for the adaptation and use of those ships when required by the navies. Amongst such auxiliaries the following are found in the British navy. — Mine-laying vessels — second-class cruisers of the Apollo class modified for the purpose ; fleet-repair ships — the modified merchant-built vessels " Assistance " of 96.00 tons displacement and the "Cyclops" of 11,300 tons; distilling vessel — Aquarius " of 3660 tons, a modified merchant vessel, and a large number of tank vessels such as the " Provider" of 395 tons, specially built for distributing fresh water; depot and repair ships {or destroyers — the modified cruisers " Blake," " Blenheim," " Leander

" and " St George," and the modified merchant vessels " Hecla " and " Ty ne ' ' ; depot ships for submarines — the modified cruisers " Bonaventure," " Thames," &c, and the repair ship " Vulcan," as well as a new vessel the " Maidstone," of 3600 tons, laid down at Scott's Yard, Greenock, in 1910; oil tank vessels — the merchant built vessels " Petroleum," of 9900 tons and " Kharki " of 1430 tons, and a new vessel, the " Burma " of 3870 tons, laid down at the. Greenock Dockyard Co.'s Yard in 1910. The hospital ship " Maine " of 4540 tons- was fitted up for service of the United States in the Spanish-American War, and was presented to the British government in 1901 by the Atlantic Transport Co.

Besides the foregoing, arrangements are made for fitting up fast vessels such as the " Mauretania " and " Lusitania " with a number of 6-in. or other Q.F. guns for service as merchant cruisers in time of war, when they would be used as ocean-going scouts, or for the protection of trade routes. Corresponding arrangements are made by several – other countries, while in Russia and Japan special mercantile cruisers have been built under the title of Volunteer steamers. A full account of the Russian Volunteer Fleet is to be found in a paper read by Mr H. Rowell at the Institute of Naval Architects 1905, later vessels being described in Engineering,

nth March 1910, and an account of the Japanese Volunteer vessels will be found in International Marine Engineering, June

1909.

The writer is indebted to Mr J. H. Narbeth, M.V.O., for valuable assistance in preparing this article. (P. Wa.)

SHIPBUILDING. When ships were built of wood and propelled by sails their possible size and proportions were limited by the nature of the structural material, while the type of structure had been evolved by long experience and was incapable of any radical modification. Speed depended so much on circumstances inde- pendent of the design of the vessel, such as the state of the wind and sea, that it was impossible to include a definite speed over a voyage or measured distance as one of the essential requirements of a design; and the speed actually obtainable was low even under the most favourable conditions when judged by modern standards. Stability depended principally on the amount of ballast carried, and this was determined experimentally after the completion of the vessel. Under these conditions there was no room for any striking originality of design. One vessel followed so closely on the lines of another, that the

qualities of the new ship could be determined for all practical purposes by the performance of an almost identical vessel in the past. The theoretical science of shipbuilding, the object of which is to establish quantitative relations between the behaviour and performance of the ship and the variations in design causing them, was generally neglected.

With the introduction of iron, and later of steel, as a struc- tural material for the hulls of ships, and of heat engines for their propulsion, the possible variation of size, proportions and propelling power of ships was enormously increased. In order to make the fullest use of these new possibilities, and to adapt each ship, as closely as may be, to the special purpose for which it is intended, theoretic knowledge has become of paramount im- portance to the designer. He has been forced to investigate closely those branches of the abstract physical sciences that bear specially on ships and their behaviour, and these mathe- matical and experimental investigations constitute the study of Theoretical Shipbuilding. It embraces the consideration of problems and questions upon which the qualities of a ship depend and which determine the various features of the design, having regard to the particular services that the ship will be required to perform; i.e. the requirements that must be fulfilled in order that she may make her various passages economically and with safety in all conditions of wind and sea, the best form for the hull with regard to the resistance offered by the water and the engine power requisite in order to attain the speed desired, the nature of waves and their action upon the ship, and the structural arrangements necessary in order that she may be sufficiently strong to withstand the various stresses to which she will be subjected. The determination of the most suitable dimensions to fulfil certain conditions involves the consideration of a different set of circumstances for almost every service; and here the experience gained in vessels of similar type, together with the known effect of modifications made to fulfil new conditions of each particular design, can be used as a guide. The requirements of economical working, safety, &c, determine the length, breadth, depth and form. The length has a most important bearing on the economy of power with which the speed is obtained; and on the breadth, depth and height of side, or freeboard, depend to an important degree the stability and seaworthiness of the vessel.

While, however, the importance to the ship designer of mathe- matical theories based on first principles and experiment can hardly be overrated, it should be observed that the circumstances and conditions postulated are invariably much less complex than those

which surround actual ships. The applicability of the theories depends on the closeness with which the assumed circumstances are realized in practice. The ultimate guide in the design of new ships must, therefore, still remain practical experience. To this experience theory is a powerful assistance, but can by no means replace it.

Theoretical Shipbuilding

Stability.

When a ship floats at rest in still water, the forces acting upon her must be in equilibrium. These consist of the weight of the

THEORETICAL]

SHIPBUILDING

923

Equi- librium.

ship acting vertically downwards through its centre of gravity and the resultant pressure of the water on the immersed hull. If the ship be supposed removed and the cavity thus formed filled with water, then, since this volume of water is in equilibrium under the same system of fluid pres- sures, the resultant of these pressures must be equal and opposite to the weight of the water in the cavity and will therefore act vertically upwards through the centre of gravity of this portion of water. Defining the weight of water displaced by the ship as the displacement, and its centre of gravity as the centre of buoyancy, it is seen that the fundamental conditions for the equilibrium of a ship in still water are (a) that the weight of the ship must be equal to the displacement, and (&) that its centres of gravity and buoyancy must be in the same vertical line.

A floating ship is always subject to various external forces disturbing it from its position of equilibrium, and it is necessary to investigate the stability of such a position, i.e. to Stability determine whether the ship, after receiving a small Hbrium. disturbance, will tend to return to its former position, in which case its equilibrium is termed stable, or whether, on the other hand, it will tend to move still farther from the original position, when the equilibrium is termed unstable. The intermediate case, when the ship tends to remain in its new posi- tion, is a third state of equilibrium, which is termed neutral.

Of the modes of disturbance possible, it is evident that a bodily

movement of the ship in a horizontal direction or a rotation about a vertical axis will not affect the conditions of equilibrium; the equilibrium is also stable for vertical displacements of a ship. The remaining movements, viz. rotations about a horizontal axis, can be resolved into rotations in which the displacement is unaltered, and vertical displacements, the effect of the latter being considered separately. Of the various horizontal axes about which a ship can rotate two are of particular importance, viz. (1) an axis parallel to the longitudinal plane of symmetry, (2) an axis at right angles to this plane, both axes being so chosen that the displace- ment remains constant; the stability of a ship with reference to rotations about these axes is known as the transverse stability and the longitudinal stability- respectively. In the following account the consideration of stability is confined at first to these two cases; the general case of rotation about any horizontal axis whatever being dealt with later.

*Transverse ˆ et n ˆ' * re P resen t a transverse section of a ship, WL*

stability being its water line when upright, and WL' its water

line when inclined to a small angle as shown.

Assuming that the displacement is unaltered, if G be the position

of the ship's centre of gravity and B, B' the positions of its centre of

buoyancy in the upright and inclined positions respectively, the forces acting on the ship con- sist of its weight W vertically downwards through G and the re- sultant water pressure equal .to W acting verti- cally upwards through B'. These constitute a coupleofmomentWxGZ where Z is the foot of the perpendicular from G on to the vertical througn B' ; the direction of the couple as drawn in the figure is such as would cause the ship to return to its original

f>osition, i.e. the equi- ibrium is stable for the inclination shown. If M be the intersection of the vertical through B' with the original vertical, the moment of the restoring couple is equal to W XGM sin 9, and GM sin 9 is termed the righting lever.

If, by moving weights on board, G be moved to a different position on the original vertical through B, the original position of the ship will remain one of equilibrium, but the moment of stability at the angle of inclination 9 will vary with GM. If G be brought to the position G' above M the moment WXG'Z' will tend to turn the ship away from the original position. It follows that the condition that the original position of equilibrium shall be stable for the given in- clination is

that the centre of gravity shall be below the intersection

Fig. 2.

of the verticals through the upright and inclined centre of buoyancy ; and the moment of stability is proportional to the distance between these two points.

When the inclination 6 is made smaller the point M approaches a definite position, which, in the limit when 6 is indefinitely small, is termed the metacentre.

In ships of ordinary form it is found that for 10 to 15 degrees of inclination, the intersection of the verticals through the _ ;// . centres of buoyancy B and B' remains sensibly at the c ™aatlons metacentre M ; and therefore within these limits the '

moment of stability is approximately equal to WXGM sin 9.

Since, the angle on either side of the vertical within which a ship rolls in calm or moderate weather does not usually exceed the limit above stated, the stability and to a great extent the behaviour of a vessel in these circumstances are governed by the distance GM which is known as the metacentric height. The position of G can be calculated when the weights and positions of the component parts of the ship are known. This calculation is made for a new ship when the design is sufficiently advanced to enable these com- ponent weights and their positions to be de- termined with reason- able accuracy; in the initial stages of the design an approxima- tion to the vertical position of G is made by comparison with previous vessels.

The position of the centre of gravity of a ship is entirely inde- pendent of the form or

draught of water, except so far as they affect the amount and distribution of the component weights of the ship. The position of the metacentre, on the other hand, depends only on the geometrical properties of the immersed part of the ship ; and it is determined as follows i

Let WL, W'L' (fig. 2) be the traces of the upright and inclined water planes of a ship on the transverse plane; B, B' the corre- sponding position of the centre of buoyancy; '9 the. dngle of in- clination supposed indefinitely small in the limit, and S tfte intersection of WL and W'L' ; join BB'.

By supposition the displacement is unchanged, and the volumes WAL, W'AL' are equal ; on subtracting W'AL it is seen that the two wedges WSW, LSL' are also equal." If dx represent an element of length at right angles to the plane of'the figure, y x , y 2 , the half-breadths one on each side at any point in the original water line, so that WS = }>!,. SL=3>2, the areas WSW', -LSL' differ, from iyS.9, hy?.6 by indefinitely small amounts, neglecting which the volumes of WSW', LSL' are equal to fiyffdx and fiy&dx. Since these are equal We have

hfy 1 dx = ifyfdx or Jyidxxf = JyrffcX;

i.e. the moments of the two portions of the water plane about their line of intersection passing through S are equal. This line is also the axis of rotation, which therefore passes through the centre of gravity of the water plane. For vessels of the usual shape, having a middle line plane of symmetry and floating initially up- right, for small inclinations consecutive water planes intersect on the middle line.

Again if gj, g 2 are the centres of gravity of the wedges WSW', LSL', and v the volume of either wedge, the moment of transference of the wedges v Xgig2 is equal to the moment of transference of the whole immersed volume VXBB' where V is the volume of displace- ment.

But i»XgiS = moment of wedge WSW' about , S = $fyi t .0:dx, and »XSg 2 = moment of wedge LSL' about S = ifyj . 9 . dx. Adding, $f{y 1 >+yi>)e.dx = vXgigi = VXBB'. But BB' = BM.0 to the same order of accuracy, and §f(yi s +yt 3) ■ dx is the moment of inertia of the water plane about the axis of rotation; denoting 1 the latter by I, it follows that BM = I/V; i.e. the height of the metacentre above the centre of buoyancy is equal to the moment of inertia of the water plane about the axis of rotation divided by the volume of displace- ment. These quantities, and also the position of the centre of buoyancy can be obtained by the approximate methodsof quad- rature usual in ship calculations, and from them the position of the metacentre can be found.

If the ship is wholly immersed, or if the inertia of the water plane is negligible as in a submarine when, diving, BM =0, and the condi- tion for stability is that G should be below B ;_ the righting lever at. any angle of inclination is then equal to BG sin

During, the process of design the position of the centre of gravity

is determined by the disposition of hull material and fittings, machinery, coal and all other movable weights, the position of which is necessarily fixed by other considerations than those of stability; but the height of the metacentre above the centre of buoyancy varies approximately as the cube of the breadth, and any desired value of GM is readily obtained by a suitable modification in the beam.

The metacentric height in various typical classes of ships at " normal load " is as follows:—

Class of Ship.

Approximate GM in Ft.

First class battleship and cruiser .

3§to5

Second and third class cruiser and scout

2 to 3

Torpedo boat destroyer

l| t0 2§

First class torpedo boat

i to if

Steam p'iket Ijiial oi launch

8 to l§

River gunboat (shallow draught) .

8 to 20

Large mail and passenger steamer

•5 to 2

Cargo steamer .....

I to 2

Sailing ship ……

2 to 6

Tug

ii to 2|

The metacentric height adopted in steamships is governed principally by the following considerations: —

(a) It should be sufficiently large to provide such a position of G as will give ample stability at considerable angles of inclination and sufficient range.

(b) Where ample stability at large angles is obtained by other means, the stability at small angles, which is entirely due to the metacentric height, should be sufficient to prevent forces due to

n t a i ii ii ii ii i

SCill OF T0H5 OlSPLACtMINT,

Fig. 3. — Metacentric Diagram of a Battleship.

wind on upper works, movement of weights athwartships, turning, &c, causing large and uncomfortable angles of heel.

(c) It should be sufficient to allow one or more compartments to become opened to the sea, through accidental damage, without risk of capsizing.

(d) It should, if possible, be sufficiently large in the normal condition of the ship to permit the greatest possible freedom in the stowage of a miscellaneous cargo without producing instability.

(e) On the other hand an excessive value causes rapid and uncomfortable rolling among waves.

A ship having small initial stability is said to be " crank," while one possessed of a large or excessive amount is termed " stiff." The former type is generally found to be steadier and easier in rolling among waves ; and for this reason when other circumstances permit, the metacentric height is usually chosen as small as possible con-

sistent with safety and comfort.

The metacentric height is affected by an alteration in displace- ment or in position of the centre of gravity caused by loading or unloading cargo, fuel and stores. In consequence the stability has, to be investigated for a variety of conditions, particularly

that in which the metacentric height is a minimum. The change in the position of the centre of gravity can be readily determined from an account of the weights removed, added or shifted ; and the height of the metacentre is obtained by calculat- ing its position at a number of water lines, and drawing a curve of heights of metacentre above keel on a base of the draught of water. The results are conveniently embodied in the form of a metacentric diagram; the curves of height of metacentres and vertical positions

GM(LIGHT), 2' 99. GM(DEEP), i'-67.

Fig. 4. — Metacentric Diagram of a Merchant Vessel.

of centres of buoyancy being set up from a line intersecting the water lines at 45 °.

Figs. 3, 4 and 5 are the metacentric diagrams for a battleship, a vessel sharply curved at the bilge typical of a large number of merchant steamers, and a sailing ship of " Symondite " (or peg top) section; it will be observed that in the first and second the M'curve is slightly concave upwards, and in the third sharply convex.

The buoyancy curve in all cases is nearly a straight line whose inclination at a particular water plane to the horizontal is equal to tan-'A/i/V; where A is the water plane area, and h the depth of the centre of buoyancy below the surface. The position of the meta- centre at an intermediate water line is obtained from the diagram by drawing a horizontal line at the draught required, and squaring

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MEAN

TONS

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DRAFT

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IN TONS

I7“5’A > ’

!0 49

1077

16 O’/i

906

15’- 7”

8 55

631

Q’-Bˆ

5-74

295

Fig. 5. — Metacentric Diagram of a Sailing Ship of ” Symondite ”

section.

up from its intersection with the 45 ° line to meet the curve of meta-centres.

With these curves are associated (though usually drawn separately) two others known as the curves of Displacement and of Tons per inch and expressed by AA and BB respectively in the above figures: These have the mean draught of water as abscissa (vertical), and

Fig. 6.

the displacement in tons and the number of tons required to increase the mean draught by I in., respectively, as ordinates (horizontal). The ordinate o; the curve of displacement at any water line is clearly proportional to the area of the curve of tons per inch up to that water line.

The properties of the metacentric stability at small angles are used when determining the vertical position of the centre of gravity lacllaiaz °^ a sm P ^y an " inclining experiment "; this gives a expert-check on the calculations for this position made in the meat' initial stages of the design, and enables the stability of the completed ship in any condition to be ascertained with great accuracy.

The experiment is made in the following manner: — Let fig. 6 represent the transverse section of a ship ; let w, w be two weights on deck at the positions P, Q, chosen as far apart trans- versely as convenient ; and let G be the combined centre of gravity

of ship and weights. When the weight at P is moved across the deck to Q', the centre of gravity of the whole moves from G to some point G' so that GG' is parallel to PQ' (assumed horizontal) and equal to hw/W where h is the dis- tance moved through by P, and W is the total dis- placement. The ship in consequence heels to a small angle 9, the new vertical through G pass- ing through the meta- centre M ; also GM =

GG' cot e = hwiyj cot e,

the metacentric height being thereby determined and the position of G then found from the meta- centric diagram. In prac- tice 9 is observed by means of plumb bobs or a short period pen- dulum recording angles on a cylinder; ‘ the weight w at P, which is chosen so as to give a heel of from 3 to 5°, is divided into several portions moved separately to Q’. The weight at Q’ is replaced at P, the angle heeled through again observed; and the weight at Q similarly moved to P’ where P’Q=/t = PQ’, and the angle observed; GM is then taken as the mean of the various evaluations.

In the case of small transverse inclinations it has been assumed that the vertical through the upright and the inclined positions of the Lanre la- centre °f buoyancy intersect, or, which is the same thing, cliaatioas. tnat tne centre °f buoyancy remains in the same trans- verse plane when the vessel is inclined. This assumption is not generally correct for large transverse inclinations, but is nevertheless usually made in practice, being sufficiently accurate

for the purpose of esti- mating the righting moments and ranges of stability of different ships, calculated under the same conventional system; this is all that is necessary for practical purposes.

With this assump- tion, there will always be a point of inter- section (M’ in fig. 7) of the verticals through the upright and in- clined centres of buoy- ancy ; and the righting lever is as before 9 2 7,9W Sm , 9 ‘ ?” this case ‘ however, there is no simple formula for BM as there is for BM in the limiting case where 9 is infini- tesimal ; and other methods of calculation are necessary.

The development of this part of the subject was due originally to Atwood, who m the Philosophical Transactions of 1796 and 1798 advanced reasons for differing from the metacentric method which was published by Bouguer in his Traite du navire in 1746 Atwood’s treatment of stability (which was the foundation of the modes of calculation adopted in England until about twenty years ago) was as follows : —

Let WL, W’L’ (fig. 7) be respectively the water lines of a ship when

1 Such an instrument is described by Froude for recording the ” relative ” inclination of a ship amongst waves, Transactions of Institution of Naval Architects, 1873, p. 179. The pendulum should have sufficient weight and the arm carrying the pen may be about 4 ft. long. If the cylinder be fitted with a clock recording the time the natural period of the ship will also be obtained.

Fig. 7.

upright and inclined at an angle 9, S their point of intersection; B and B' the centres of buoyancy, gi and g 2 the centres of gravity of the equal wedges WSW', L'SL, and h, fa the feet of the perpendiculars from gi, gi on the inclined water line. Draw GZ, BR parallel to W'L', meeting the vertical thvough B' in Z and R.

The righting lever is GZ as before ; if V be the volume of displacement, and v that of either wedge, then

also

VXBR = vXhfa

GZ = BR-BGsinfl; whence the righting moment or

WXGZ=wjˆ?-BGsin0J.

This is termed Atwood's formula. Since BG, V and W are usually known, its application to the computation of stability at various angles and draughts involves only the determination of vXfafa. A convenient method of obtaining this moment was introduced by F. K. Barnes and published in Trans. Inst. N.A. (1861). The steps in this method were as follows: (a) assume a series of trial water lines at equal angular intervals radiating from S' the inter- section of the upright water line with the middle line plane; (b) calculate the volumes of the various immersed and emerged trial wedges by radial integration, using the formula

v=§(ˆdJrHx,

where r, are the polar co-ordinates of the ship's side, measured from S' as origin, and dx an element of length; (c) estimate the moment of transference of the same wedges parallel to the particular trial water line by the formula

v X fafa – J Pcos (0 –)dfr>dx,

adding together the moments for both sides of the ship ; and (d) add or subtract a parallel layer at the desired inclination to bring the result to the correct displacement. The true water line at any angle is obtained by dividing the difference of volume of the two wedges by the area of the water plane (equal to frdx, for both sides) and setting off the quotient as a distance above or below the assumed water line according as the emerged wedge is greater or less than the immersed

wedge. The effect of this " layer correction " on the moment of transference is then allowed.

The righting moment and the value of GZ are thus determined for the displacement under consideration at any required angle of heel.

A different method of obtaining the righting moments of ships at large angles of inclination has prevailed in France, the standard investigation on the subject being that of M. Reech first published in his memoir on the ' ' Construction of Metacentric Evolutes for a Vessel under different Condi- tions of Lading" (1864). The principle of his method is dependent on the following geo- metrical properties : —

Let B', B" (fig. 8) be the centres of buoy- ancy corresponding to two water lines W'L', W"L" inclined at angles 6, e + dd, to the original upright water line WL, d9 being small ; and let gi, g2 be the centres of gravity of the equal wedges W'TW", L'TL". The moment of either wedge about the line giga is zero, and the moments of W'L'A and of W"L"A about gig 2 are therefore equal; since these volumes are also equal, the per- pendicular distances of B' and B" from gig 2 are equal, or B'B" is parallel to gig2.

The projection on the plane of inclination of the locus of the centre of buoyancy for varying inclinations with constant displacement is termed the curve of buoyancy, a portion BB'B" of which is shown in the figure. On diminishing the angle d9 indefinitely so that B" approaches B' to coincidence, the line B'B" becomes, in the limit, the tangent to the curve BB'B", and gig 2 coincides with the water line W'L'; hence the tangent to the curve of buoyancy is parallel to the water line.

Again, if the normals to the curve at B', B" (which are the verticals corresponding to these positions of the centre of buoyancy) intersect at M', and those at B", B" (adjacent to B") at M", and so on, a curve may be passed through M', M, . . . , commencing at M, the meta- centre. This curve, which is the evolute of the curve of buoyancy, is known as the metacentric curve, and its properties were first

Fig. 8.

investigated by Bouguer in his Traite du Navire. The points M'M", ... on the curve are now termed pro-metacentres.

If p represent the length of the normal B'M' or the radius of curvature of the curve of buoyancy at an angle 8, then p.d8 = ds the length of an element of arc of the B curve. In the limit when dd is ds

indefinitely small,

dd

= p. Using Cartesian co-ordinates with B as

origin and By, Bz, as horizontal and vertical axes, we have —

dy ds

1 g= w cose=pcose, .

dz ds . . „

le = d0 sme=psme – ■

(1) (2)

whence

re – I p . cos 6.dd ; z =

-'0

ˆP-si

sin e.de,

and the righting lever GZ=y cos 0+(z — BG) sin 8.

The radius p is (as for the upright position) equal to the moment of inertia of the corresponding water-plane about a longitudinal axis through its centre of gravity divided by the volume of dis- placement; the integration may be directly performed in the case of bodies of simple geometrical form, while a convenient method of approximation such as Simpson's Rules is employed with vessels of the usual ship-shaped type. As an example in the case of a box, or a ship with upright sides in the neighbourhood of the water-line, if BG=a and BM =p , then p = po sec 3 8; whence

re y= \ p cos e.d9 = pd tan 6, Jo

z^\ p sin 8.d8 = ip tan 2 8, and

GZ = (p — o) sin + Jpo tan 2 8. sin 6;

which relations will also hold for a prismatic vessel of parabolic section. It is interesting to note that in these cases if the stability for infinitely small inclinations is neutral, i.e. if po = a, the vessel is stable for small finite inclinations, the righting lever varying approximately as the cube of the angle of heel.

The application of the preceding formulae to actual ships is troublesome and laborious on account of the necessity for finding by trial the positions of the inclined water-lines which cut off a constant volume of displacement. To avoid this difficulty the process was modified by Reech and Risbec in the following manner: — Multiply equations (1) and (2) by V.d8, V being the volume of displacement; we then have —

d(Vy) = I cos6.de, d{Vz) =1 sin e.de,

(3) (4)

where I is the moment of inertia of the inclined water-line about a longitudinal axis passing through its centre of gravity. These formulae have been obtained on the supposition that the volume V is constant while 8 is varying; but by regarding the above equa- tions as representing the moments of transference horizontally and vertically due to the wedges, it is evident that V may be allowed to vary in any manner provided that the moment of inertia I is taken about the longitudinal axis passing through the intersection of consecutive water-lines. In particular the water-lines may all be drawn through the point of intersection of the upright water-line with the middle line, and the moments of inertia are then equal to ifr 3 dx for both sides of the ship, r being the half-breadth along the inclined water-line; the increase in volume is the difference between the quantity fd8f\rHx for the two sides of the ship.

If V«, Vo be the volumes of displacement at angles a and respectively,

and substituting in (3) and (4) and integrating,

cos e,

V"J > [/?]'*

sin 8.

(5)

(6)

(7)

On eliminating Vain (5), (6) and (7), y and z can be found.

This is repeated at different draughts, and thus Vo, y and z are determined at a number of draughts at the same angle, enabling curves of y and z to be drawn at various constant angles with V for an abscissa ; from these, curves may be obtained for y and z with the angle a as abscissa for various constant displacements; GZ being equal to

y cos a + (z— a) sin a.

From the foregoing it is evident that the elements of transverse stability, including the co-ordinates of the centre of buoyancy, position

of pro-metacentre, values of righting lever and righting

depend on two variable quantities — the displacement anc

of heel. The righting lever GZ is in England selected

as the most useful criterion of the stability, and, after

being evaluated for the various conditions, is plotted

in a form of curves — (a) for various constant displacements on

an abscissa of angle of inclination, (6) for a number of constant

moment, the angle

Curve ot stability.

Fig. 9. — Cross Curves of Stability of a Battleship.

angles on an abscissa of displacement. These are known as curves of stability and cross curves of stability respectively; either of these can

be readily constructed when the other has been obtained; which process is utilized in the method now almost universally adopted for obtaining GZ at large angles of inclination, a full description being given in papers by Merrifield and Amsier in Trans. I.N.A. (1880 and 1884). The procedure is as follows:

1. The substitution of calculations at constant angle for those at constant volume. A number of water-lines at inclinations having a constant angular interval (generally 15°) are drawn passing through the intersection S' of the load water-line with the middle line on the body plan. Other water-lines are set off parallel to these at hxed distances above or below the original water-line passing through S'.

2. The volumes of displacement and the moments about an axis through S' perpendicular to the water-line are determined for each draught and inclination by means of the Amsler-Laffon integrator,

**aooo*

30 «•*

Angle or INCLINATION

Deep CondiT40n shewn

Normal

*Light**

*5**

Fig. 10. — Curves of Stability of a Battleship.

the pointer of this instrument being taken in turn round the immersed part of each section.

3. On dividing the moments by the corresponding volumes, the perpendicular distance of the centre of buoyancy from the vertical through S' is obtained, i.e. the value of GZ, assuming G and S' to coincide.

4. For each angle in turn " cross curves " of GZ are drawn on a base of displacement.

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5. From the cross curves, curves of stability on a base of angle of inclination can be constructed for any required displacement, allowance being made for the position of G by adding to, or subtracting from, each ordinate, the quantity GS' sin a according as G is below or above S'.

A typical set of cross curves of stability for a battleship of about 18,000 tons displacement is shown in fig. 9. It will be observed that the righting levers decrease with an increase of displacement ; and this is a general characteristic of the cross curves for ships of ordinary

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Fig. 11. — Curves of Stability of a Merchant Vessel.

form. The additional weights that constitute the difference between light and deep load (i.e. cargo, coal, stores and water) are generally placed low down, and thus the position of the centre of gravity is usually lower when loaded than when light, causing an increase of stability which frequently more than compensates for the loss of stability indicated by the cross curves.

The stability curves for the same vessel are reproduced in fig. 10. It is customary in warships to draw separate curves for three conditions: (a) normal load, i.e. fully equipped with bunkers about half full, and reserve feed tanks empty; (b) deep load with all bunkers and tanks full; (c) light with all coal, water (except in boilers), ammunition, provisions and consumable stores removed.

The curves for a cargo or passenger ship are generally drawn for the condition when light, when f ully.laden with passengers or with a

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Fig. 12.-— Curves of Stability of a Box-shaped Vessel, showing ~" the influence of beam and freeboard.

homogeneous cargo, and sometimes for an intermediate condition; typical curves are given in fig. 11.

Stability curves are pbtained on the assumptions —

1. That all openings in the upper deck, forecastle and poop (if any) are covered in and made watertight ; and the buoyancy of any

erections above these decks is generally neglected.

2. That the side of the ship is intact up to the upper deck, all side scuttles, ports or other openings being closed.

3. That all weights in the ship are absolutely fixed.

4. That no changes of trim occur during the inclination.

_ In some cases curves are drawn (a) with forecastle and poop intact, (b) with these thrown open to the sea, the latter condition being more commonly considered.

The slope of the stability curve for small angles, the maximum righting lever with the angle at which it occurs, and the range or the inclination at which the stability vanishes are of particular interest, inasmuch as the curve depends principally on these features; and the effect on them, particulars of variation of freeboard, breadth and position of centre of gravity, is considered below.

The stability curve AA (fig. 12) is drawn for a box-shaped vessel of draught 10 ft., freeboard 10 ft. and beam 30 ft. ; with C.G. in the water-plane. The curves EE, FF, GG are drawn for the same vessel, but with freeboard altered to I2|, 7 J and 5 ft. fj™f' °' respectively; it will be observed that freeboard has no " e6oarA influence on the stability at small angles, but has a marked effect on the range and maximum righting lever. An increase of freeboard is generally accompanied by a rise in the position of the centre of gravity ; this is not included in the curves, but would actually reduce*

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Anolc of Inclination Fig. 13.— Curves of Stability of ” Monarch ” and ” Captain.”

the stability to some extent. The effect of freeboard on the range and on the safety of ships is also illustrated by a comparison between the curves of stability (fig. 13) of the armoured turret ships ” Monarch ” and ” Captain,” the latter of which was lost at sea in 1870. These vessels were similar in construction and dimensions except that the freeboard of. the ” Monarch “was 14′ o” and that of the ” Captain ” 6′ 6”; the smaller freeboard of the “Captain” was associated with a slightly lower position of the centre of gravity and a greater metacentric height. The stability curve of the ” Captain ” in consequence rises rather more steeply than that of the ” Monarch ” up to about 14 when the deck edge is immersed ; the righting lever then rapidly declines, and vanishes at 54i°, in contrast to the ” Monarch’s,” where the maximum righting lever is doubled and range augmented 1.3 times by the additional freeboard. For the influence of the range in enabling a ship to withstand a suddenly applied force see ” Dynamical Stability.”*

Again, for the box-shaped vessel previously considered, if the breadth is modified successively from 30 ft. to 35, 25 and 20 ft., other features remaining unaltered, the curves of stability then obtained are represented by BB,CC and DD in fig. 12. Itis f” ect ot seen that

alteration in beam affects principally the stability beam – levers at moderate angles of inclination, while at 90 inclination the curves all intersect. Since at small angles GZ = GM.0 (in circular

Fig. 14.— Curves of Stability of a Steam Yacht showing effect of variation in height of centre of gravity.

measure) approximately, the initial slope of the curve is proportional to GM, and the tangent to this curve at the origin can be drawn by setting by the value of GM as an ordinate to an angle of one radian (57- 3) as abscissa, and joining the point to the origin. (See figs. 10 and 11.) The height of the metacentre above the centre of buoyancy will, caeteris paribus, vary with the cube of the breadth, and an increase of beam will result in a large increase of stability at moderate angles.

Finajly the effect of an alteration in the vertical position of the centre of gravity is illustrated by the three stability curves of a steam yacht in fig. 14, where the centre of gravity is _-. successively raised 1 ft. In the condition corresponding „„? . to the fourth and lowest curve, the GM is negative (— -2 ft.) ˆunion or and so also are the righting levers up to 15° when the curve crosses the axis ; from 15 to about 52 the GZ is positive, but above*

that value it again becomes negative. In this case the stability is unstable at the upright position, and the ship will roll to an angle of 15° on either side where the equilibrium is stable. This peculiarity is not uncommon in merchant steamers at light draught. Ample stability at large angles and good range is provided in such cases by high freeboard; but, apart from any considerations of safety, water ballast is used to lower the centre of gravity to a sufficient extent to avoid excessive tenderness.

The properties of the loci of centres of buoyancy and of pro- metacentres were fully investigated by Dupin in 1822, including also Q the surfaces into which these curves develop when admit-

metrical tm S inclinations about transverse and ” skew ” axes. It properties. nas been shown that the tangent to the curve of buoyancy at any point is parallel to the corresponding water-line; and

assuming that the ship is only free to turn in a plane perpen- dicular to the axis of inclination, the positions of equilibrium are found by drawing from the centre of gravity all possible normals to the buoyancy curve, or equally, all possible tangents to its evolute, the metacentric curve, since the condition to be satisfied is, that the centres of gravity and buoyancy shall lie in the same vertical. Again,

Fig. 15. — Metacentric, Buoyancy and Flotation Curves of " Serapis."

when the curve of statical stability crosses the axis, making an acute positive angle as at P in fig. 14, the values of GZ on either side of P are such as to tend to move the ship towards the position at P, and the equilibrium at P is stable. Similarly, when the curve crosses the axis " negatively," as at the origin and Q, the equi- librium is unstable. Since the angle of intersection cannot be either positive or negative twice in succession, on considering rotation in one direction only, it follows that positions of stable and unstable equilibrium occur alternately and the total number of positions of equilibrium is even.

The radius of curvature of the curve of buoyancy is equal to I/V, and is always positive. The curve, therefore, has no re-entrant parts or cusps, is continuous and has no sudden changes in direction; parallel tangents (or normals) can be drawn through two points only (corresponding to inclinations separated by 180), which property is shared by its evolute, the metacentric curve. On the other hand, the moment of inertia I varies continuously with the inclination, attaining maximum and minimum values alternately; and the metacentric curve, therefore, contains a series of cusps correspond- ing to the values of I when dI = o, which will generally occur at positions of symmetry (e.g. at 0° and 180), near the angles at which the deck edge is immersed or emerged, and at about 90 and 270 .

The curves of buoyancy and flotation and the metacentric curve for H.M. troopship " Serapis " are shown with reference to the section of the ship in fig. 15, and on an enlarged scale for greater

clearness in fig. 16. 1 It will be seen that the metacentric curve contains eight cusps, Mi, M 2 , . . . Mg. Assuming the ship to heeS to starboard, Mi corresponds to the upright position, M2 to the immersion of the starboard topsides and emersion of the port bilge; Mj corresponds to 90° of heel, M 4 to the complete immersion of the deck and the emersion of the starboard bilge. M 5 corresponds to the bottom-up position and similarly for Me, Mj and M 8 . There are also

6 nodes, of which P and Q are on the middle line. By means of those curves, the effect of a rise or fall in the position of the ship's centre of gravity can readily be traced. The positions of equilibrium correspond to the normals that can be drawn from G to the buoyancy curve, or equally to the tangents drawn to its evolute the metacentric curve. For stable equilibrium G lies below M, i.e. generally between B and M ; and for unstable equilibrium, similarly, B is between G and M . In the ship under consideration, Gi was the actual centre of gravity, and G1M1 corresponds to the upright position of stable equilibrium. As the vessel heels over, equilibrium (this time un- stable) is again reached at about 90 , and a third position (stable) is obtained when the vessel is bottom up, GiMe being then the meta- centric height. A fourth (unstable) position is obtained at about

270 , after which the original position G1M1 is reached, the vessel having turned completely round. For this position of Gi therefore, there are four positions of equilibrium, two of which are stable and two unstable; and this is also true for all positions of G between Mi and Ms-

If G lies at Gt between M5 and the point P, there are six positions of equilibrium, alternately stable and unstable. If G is below P as at Gs, there are two positions of equilibrium of which the upright only is stable. A self-righting life-boat exactly corresponds to this condition, the vessel being capable of resting only in the original upright position. If G is above Q, on the other hand, as at G3, there are again only two positions of equilibrium, the vessel being unstable when upright. If G is at G 2 there are again six positions of equilibrium ; the up- right position is unstable, but a stable position is reached at a certain angle on either side. This phase is often realised in merchant ships when light, as already stated (vide fig. 14). When G is exactly upon one of the branches of the metacentric curve, the equilibrium is neutral ; if it is at Mi the ship is stable for finite inclinations, and if at Q unstable ; similarly for M 5 (except that the neutral state is then reached at 180°) and for P.

In all the above cases it will be observed that the positions of 9table and unstable equilibrium are equal in number and occur alternately. There are two exceptions : —

1 . When the moment of inertia of the water plane changes abruptly so that the B curve receives a sudden change of curvature. This is possible with bodies of peculiar geometrical forms, and two positions of M then correspond to one position of the body ; if G lies between

them, the equilibrium is stable for inclinations in one direction and unstable for those in the opposite direction, and is then termed "mixed."

2. When the equilibrium is neutral, this condition may be re- garded as the coincidence of two or more positions of equilibrium alternately stable and unstable. The ship may then be either stable, unstable or neutral for finite inclinations; in exceptional cases she may be stable in one direction and unstable in the other, resembling to some extent the condition of " mixed equilibrium."

Another curve whose properties were originally investigated by Dupin is the curve of flotation F1F2F3 . . . (fig. 15). which is the envelope of all the possible water-lines for the ship when inclined transversely at constant displacement. Since, as previously shown, consecutive water-planes intersect on a line pass ing through their

'The curves of buoyancy and flotation and the metacentric curve for various forms, including that of H.M.S. " Serapis," were obtained by practical investigation by the writer in 187 1. The results showed that Dupin's investigations, which were apparently purely theoretical, had not fully disclosed certain features of the curves, such as the cusps, &c.

centre of gravity, or, as it is termed, the centre of flotation, the curve of flotation will be the locus of the projections of the centres of flotation on the plane of the figure, which curve touches each water-line.

From consideration of the slope of a ship's side around the peri- phery of a water-line, Dupin obtained the following expression for p', the radius of curvature of the curve of flotation, , fy 1 tan a. ds

p ~ area of water-plane' where ds is an element of the perimeter, a the inclination of the ship's side to the vertical, and y its distance from the longitudinal axis

-for both sides,

giving Leclert's first expression ; also, since p =

dV~

■p + V^p',

which is Leclert's second expression for p'.

The value of p' at the upright can be obtained from the metacentric diagram by the following simple construction. Let M and B be the metacentre and the centre of buoyancy for a water-line WL on the metacentric diagram (fig. 18) ; draw th- tangent to the B curve meeting WL at Q, and through Q draw QR to meet MB and parallel to the tangent to the M curve at M. Let BP = h, and area of water-line be A. Then

PQ-AcotS-fcjj-^;

also,

MR = BM-(BP + PR) = p-^ (tan 0 + tan tf). If D be the draught,

whence

. , (dp . do

tan 0 + tan <£ = —^ = – A-^,

MR = p + Vj£ = p'

Fig. 18.

through the centre of flotation. M. Emile Leclert, in a paper read at the Institution of Naval Architects, 1870, proved the equivalence of the above formula to the two following, which are known as Leclert's Theorem :

,dp.

dl

p ' = p + V 3V and ' , ' = 3V' where I and V are respectively the moment of inertia of the water- plane and the volume of displacement, and p is the radius of the curve of buoyancy or B'M'. Independent analytical proofs of the formulae were given in the paper referred to; and {Trans. I.N. A., 1894) a number of elegant geometrical theorems in connexion with stability, given by Sir A. G. Greenhill, include a demonstration of Leclert's Theorem as follows (in abbreviated form) :

Let B, B! (fig. 17) be the centres of buoyancy of a ship in two consecutive inclined positions, and F, Fi the corresponding centres of flotation. Draw normals BM, BiM, meeting at the pro- metacentre M, and FC, FiC, meeting at the centre of curva- ture C. Produce FB, F1B1 to meet at O; join OM, MC.

Then BM, CF and BjM, CFi are re- spectively parallel, and ultimately also BBi, FFi; hence the triangles MBBi, CFFi are similar and

BM BB! OB CF _ FF,~OF' so that 0, M and C are collinear. If the displacement V be now increased

Fig. 17. by dV, changing B to B', and M to M',

then since the added displacement dV may be supposed concentrated at F, B' will lie on OBF, and it may be shown similarly as before that M' lies on OC. Further, considering the transference of moments, BB' XV = BF XdV. Draw MED parallel to BF, then

CTT .dp p'—p , . ,.dp

••3v = -\r orp= ' > + v 2v'

XXIV. 30

dp

V-P ;

the curve of flota- tion being concave upwards if R is below M.

For moderate in- clinations from the upright, the buoy- ancy of the added layer due to a small additional submer- sion will act through the centre of curva- ture of the curve of flotation ; this

point may be regarded as that at which any additional weight will, on being placed on a ship, cause no difference to the values of the righting moment at moderate angles of inclina tion. The curve of flotation, therefore, and its evolute bear similar relations to the increase or decrease of the stability of a ship due to altera- tion of draught, as the curves of buoyancy and of pro-metaceritres do to the actual amount of , the stability. The curve of flotation resembles the curve of buoyancy in that not more than two tangents can be drawn to it in any given direction, but it differs in that its radius of curvature can become infinite or change sign. It contains a number of*

cusps determined by p'=-ry = 0. These occur in an

ordinary ship-shape body at positions: (1) at or near the angles at which the deck is immersed or emerged (four in number) ; and (2) at or near the angles 90 and 270 °. There are, therefore, six cusps in the curve of flotation of an ordinary ship; they are shown in figs. 15 and 16 by the points F 2 , F 3 , F 4 , F 6 , F 7 , F 8 .

The following relations between the curves of buoy- ancy and of pro- metacentres and the curve of statical stability are of interest, and enable the former curves to be constructed when the latter have been obtained. If GZ', GZ" (fig. 19) are the righting levers corresponding to inclinations 9, + dB, where dB vanishes in the limit; B', B", the centres of buoyancy, M' the pro- metacentre; produce GZ' to meet B"M' in U.

Then, neglecting squares of small quantities,

d(GZ')=Z'V = M'Z'.d0,

or vertical distance of M' above G = – ˆj- .

AlsoM'B' = M'B"; hence

Z"B"-Z'B' = MZ'-MZ" = Z"U = GZ'.d0, or

C7 d(B'Z')

i.e. the vertical distance (B'Z') of G over B is equal to fGZ.dB.

It follows that by differentiating the levers of statical stability and finding the slope at each ordinate the vertical distance of M' over G is obtained, and M' may be plotted by setting up this value from Z' above GZ' drawn at the correct inclination ; also that by integrating the curve of statical stability and finding its area up to any angle, the vertical separation of G and B' is obtained, and B' may be plotted by setting down this value increased by BG below Z'.

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The work done in inclining a ship slowly so as to maintain a constant displacement (and avoid communicating any unnecessary Dvnamical movement or disturbance to the water) is given by the stability.

expression j M.dS where M is the moment resisting the inclination. This hiay be written

W X f "GZ.dfl ;

and it has been shown above that this is equal to the weight multiplied by the vertical separation of the centres of gravity and buoyancy. This is otherwise evident since the work is the sum of that done against the forces acting on the ship, viz. the weight and the buoyancy; these are respectively equal to WXrise of G, and WXfall of B, giving the value W.(Z'B'-BG) as before.

The dynamical stability of a ship at any angle is defined as the work done in inclining the ship from the upright position; and its value is conveniently obtained by integrating the curve of statical stability as stated above. The dynamical stability can thus be calculated at various angles and a curve obtained, whose ordinates represent work done in foot-tons. The curve' of dynamical stability is drawn for a battleship (normal condition) in fig. 10, and is there shown in relation to the curve of statical stability; it will be seen that the dynamical stability increases continuously until the righting moment vanishes, when it becomes a maximum.

A formula for the dynamical stability of a ship at any angle was given by Canon Moseley in a paper read before the Royal Society in 1850. Experiments on models made under his direction at Ports-mouth Dockyard showed that the actual work in quickly inclining to a moderate angle agreed closely with that calculated in the case of a model of circular section; but considerable divergence was obtained with a model of triangular section owing to the motion of the water set up, and also, probably, to the variation in displacement during the roll.

The existence of large righting couples at moderate angles of heel is of greater importance in a sailing ship than in a steamship, Sailing-since in the former it determines the amount of sail that . . can be safely carried under known weather conditions and

thereby influences the speed, A sailing ship in motion is subjected to the wind-pressures on the sails and the upper works of the ship, and to the water-pressures on the hull. When the ship is in steady motion, these forces are equal and opposite; and, so far as the stability is concerned, it is sufficient to determine the trans- verse resultant of the wind-pressure on the sails, and its moment, the water-pressure on the hull affecting only the speed and leeway of the ship.

The pressure on the sails depends on their form and area, their position, and the apparent velocity of the wind, i.e. the velocity relative to the ship. The pressure of the wind on the hull is obtainable similarly to that on the sails, but is usually neglected as the heeling moment is small. Experiments have been made to determine the wind-pressure on plates by Dines, Langley, Eiffel, Stanton and others ; and the results of the experiments are briefly as follows —

The normal pressure R in pounds on a plate of area A square feet exposed to face normally a wind of velocity V feet per second is given by the formula R = KAV 2 , where K is a coefficient depending on the form and area of the plate. For a square or circular plate of about I sq. ft. in area K is about -0014, corresponding to a pressure of I lb per sq. ft. at about 16 knots. The coefficient increases slightly for larger dimensions of the plate. It has also been found that a departure from the square or circular form involving an increase in perimeter for the same area causes an increase in the mean pressure. An alteration from the plane to the concave, analogous to the " bellying " of sails, is accompanied by a slight, increase in the pressure per square foot of projected area; but for any large amount of concavity the increase is more than counterbalanced by the decrease in the projected area.

No simple law exists connecting the normal pressure on a plate exposed obliquely to the wind with the angle of incidence; it is found that the results for air exhibit a close agreement with those for water after allowing for the difference of density between the two fluids. At small angles of incidence up to about 20 , or even 40 (varying with the shape of the plate), the pressure varies directly as the angle ; beyond this limit it is slightly diminished, afterwards increasing or decreasing to a value which is almost constant for the remaining angles up to and including 90°. The centre of pressure for oblique impact lies between the leading edge and the centre of gravity of the area. In a plate 1 ft. square, it lies 03 ft. from the leading edge at 10° inclination and 0-4 ft. at 30° inclination, gradually approaching the centre of the plate as the angle of inclination is increased. A slight curving or concavity of the plate does not appear to have much influence on the normal component of the wind- pressure.

The wind-pressure on the sails of a ship cannot be calculated with any degree of precision because existing information is insufficient to take account of (a) the variety in area and shape of the sails used ; (6) the different positions in which the sails may be placed relative to the wind and to each other; and © the interference of adjacent sails with each other. On the other hand, conclusions based on these

experiments are of value both in assisting in an intelligent

appreciation of the effects of changes in the sail areas, sail positions, and in the form of rig, and in forming a comparison between the various qualities of speed, stability and general behaviour of vessels with which experience has been obtained.

The stability of a sailing vessel is usually estimated by assuming all plain sail to be placed in a fore and aft direction and to be subject to a normal pressure of I lb per sq. ft., corresponding to a wind of about 16 knots. The resultant pressure of the wind is supposed to act through the centre of gravity of the total sail area (termed the centre of effort). The resultant pressure of the water on the hull, which is equal and opposite to the wind-pressure, is assumed to pass through the centre of gravity of the area of the immersed middle line plane (termed the centre of lateral resistance). If h be the vertical distance between these points in feet, A the sail area in square feet, and a the angle of heel, the moment causing the heel is (on these assumptions)

r2 4 o toot – tons

and the righting moment is approximately WXGM sin a. Hence

Ah

™" " ~ 2240.W X GM" The reciprocal of this quantity or

2240 .WXGM M

is a measure of the capability of the ship to stand up under her canvas and is termed the power to carry sail. Its value varies with different sizes and classes of ships and boats. It is relatively small in small boats and small yachts owing to the practicability of reducing the angle of heel by movable ballast ; and a low value is also permissible in Targe yachts on account of their great range of stability. In boats and yachts it varies from 3 to 4 and in full-rigged sailing ships from 15 to 20.

The stabilityof sailing vessels at large angles of inclination varies considerably with the class of vessel. In racing yachts and other completely decked sailing boats whose ratios of beam to depth and draught are comparatively small, initial stability is obtained by lowering the centre of gravity with ballast fitted on the keel, and the range then extends to considerably over 90 ; on the other hand, a number of half -decked or open sailing boats immerse their gunwales when inclined to a moderate angle. With reference to this, Mr Dixon

Kemp in his Yacht Architecture remarks that the deck edge should not be immersed at an angle of heel less than 20 ; some small centre-board boats whose gunwales are awash at 12° or 15° cause anxiety. With full-rigged sailing ships this angle is commonly 20° to 25 .

The effect of a sudden gust of wind on a sailing ship is obtained by equating the work done on the ship by the gust to her dynamical stability; and the angle at which this equality holds will be the extreme angle of heel, assuming the ship to be originally upright and at rest. Since the dynamical stability is represented by the area of the statical stability curve it is convenient to represent this angle in relation to this latter curve. The effects of the resistance and inertia of the water and any change of displacement are neglected ; the wind-pressure is assumed constant during the roll, in accordance with the results of experiments on oblique plates (the maximum angle of roll being supposed less than 50) ; the modification of the pressure due to the motion of the sail is also neglected.

Let OPQ (fig. 20) be the curve of statical stability, the ordinates representing righting moments, and let the heeling couple due to the gust be represented by OS. If N be the extreme angle of heel, draw SPUR parallel to the base, cutting the curve at P, R; and PM, NQ perpendicular. The work done by the wind is the area OSUN and is equal to the dynamical stability of the ship or the area OPQN. Hence the areas OPS, PQU are equal, and the extreme angle of heel is deter- mined by this equality. If P and Q lie on the initial and approximately straight portion of the curve, the ex- treme angle of heel ON is about twice that of the steady angle OM corre- sponding to the strength of the gust. The area QUR represents the reserve dynamical stability when the wind is blowing with strength corresponding

sZ _-ˆ»

— %£— D*

A\ 1 !

*< m »' * ' *r*

Fig. 20.

to OS; the intercepts of the ordinates below SPUR doing work against the force of the wind, leaving the segments above SPR available for absorb- ing the kinetic energy possessed by the vessel at the position of steady heel PM. As the strength of the gust is increased the points

P and Q travel farther along the curve until P', Q' are reached, such that the area? P'Q'Q, OTP' are equal ; the vessel will then come momentarily to rest at Q' and will be in unstable equilibrium, any increase in the wind-pressure causing her to capsize. It follows that a ship sailing in a wind of sufficient strength to cause a moderate angle of heel equal to OM' will be on the point of capsizing if the wind should happen to drop and afterwards return suddenly with its

former force. A more dangerous,' triouˆh improbable, case in which a gust of wind strikes the ship just as she'has completed a roll to windward can similarly be investigated; it is found that the safe angle of steady heel under this condition is considerably less than that represented by OM'. It thus appears that it is of the greatest importance that sailing vessels' should possess large dynamical stability in order to provide against the "risk of capsizing due to fluctuations in the wind-pressure. Although the neglect of the wind and water resistances in the above investigation' materially modifies the quantitative results, the general conclusions point to the necessity for sufficient range and freeboard however large the righting levers may be at small inclinations.

The centres of effort and of lateral resistance have not the same longitudinal position, consequently a horizontal eouple is produced which turns the vessel either into the wind or away from it. In the former condition the vessel is said to be:" ardent," and in the latter to be " slack." In order that a vessel maybe quick in going about and yet not require too large a helm angle on a straight course, she should be slightly" ardent," i.e. the true centre 1 of ' effort should be slightly abaft the true centre of lateral resistanceˆ The assumed and true positions of these centres differ to some extent, and op making allowance for this it is found that in the majority of vessels possessing slight ardency the assumed C.E. lies slightly before instead of Abaft the assumed C.L.R.' In small sailing boats the points are usually very near together; but in a large number of sailing ships, including H.M. sloops, their distance apart isabout •05 L, and in yachts about ■62 L, where L is the length. ' It may be noted in this connexion that the area of sail spread and

1 ■ ■• ' """.■.■' A the size of the ship are often connected 'by the

coefficient rrrj known

*as the Driving Power. The value for small sailing boats: and for yachts is about 200, and for full-rigged sailing ships from. 80 to 100 (including plain sail only). . The method of estimating the: righting moment of a ship when . inclined from a, position of equilibrium through a small idit angle in the longitudinal plane is exactly analogous to that "tabttttv U8 ^ * n e case °^ sma l' transverse inclination, and s .... : similar propositions are true in both cases, viz*: —*

1. Consecutive water-lines intersect about an axis passing through the centre of flotation.

2. The height of the longitudinal metacentre M above the centre of buoyancy is equal to the moment of inertia about this axis divided by the volume of displacement of the ship.

3. The righting moment at any small angle of inclination 6 (circular measure) is equal to

W.GM.0.

In fig. 21 let WL be the water-line corresponding to the positions G and B, and conceive a longitudinal movement of a portion of

M

Fig. 21.

the weights in the ship causing G to move horizontally to G'. If G' be abaft G the ship will alter trim by the stem until B moves to B' vertically beneath G' and the water-line changes to W'L', intersecting WL at the centre of flotation F.

If L be the length of the ship between the draught marks, the change of trim (WW'+LL') isequaltoL.0, and the moment changing trim is W.GG' or W. CM.fr the change of trim in inches (other linear dimensions being in feet) is therefore

WXGG'4

WXGM

The change of trim due to any horizontal movement of weights is therefore equal to the moment of the shift of weight divided by the

quantity

WXGM 12XL

which is the moment required to change trim one inch. Since the longi- tudinal moment of inertia of the water-plane includes the cube of the length as a factor, the longitudinal BM is usually large compared

with BG, and the moment to change trim I in. in foot-tons is nearly equal to

WXBM _ WXI I

12 XL 12XLXV 420L'

which is approximately constant for moderate variations of draught.

If a weight of moderate amount w tons be placed at a distance of a

feet abaft the centre of flotation F, the bodily sinkage in inches is

frt, the moment changing trim by the stern is via foot-tons, and the

change of trim is therefore -jr? where T is the " tons per inch " and

M the moment to change trim i in If b be the distance of F abaft the middle of length, the draughts forward and aft are increased respec-*

dvel y b y /i- 'a l+2&

w Vt~m : ; "~2l-J

/l , a L — 2&\ . . ...

ˆlT+M'ˆir; mches -.

A ship provided "ˆith water-tight compartments is liable to have water admitted into any of thˆm on account bf damage -. '. .... received, or may require to carry water or other fluid, rn f y

and

when damaged.

bulk as ballast or cargo. The effect of this addiitiqn on the draught and the stability is therefore of interest. There are three cases : — '•■

1. When the water completely fills a compartment;

2. When the water partially fills a compartment up to the level of the water-line, remaining in free communication with the sea ; and

3. When a compartment is partially filled with water without any communication with the sea.

In the first case the water is regarded as a weight added to the ship ; the mean sinkage is obtained from the displacement curve, the change of trim from the " moment to change trim," and the angle of heel from the metacentric diagram, or (for large angles) the cross curves. In general, if the compartment filled is low in the ship, the stability is increased ; if high, it is diminished.

In the second case, assume in the first place the compartment to be amidships, so that no heel or change of trim occurs, and to be moderate in size, so that the sinkage is moderate in amount.

Let ABCD (fig. 22) be such a compartment bounded by water- tight bulkheads sufficiently high to prevent water reaching adjoining

Fig. 22.

compartments. Let the water-lines be WEFL, W'GHL', before and after bilging; let A, a be the area of the whole water-plane WEFL and of the portion EF within the compartment respectively, in square feet; and let v be the volume contained, in EBCF diminished by the volume of any solid cargo in the compartment; .The buoyancy is reduced by an amount v by bilging, and the amount added through sinking must be equal to the amount so lost. If x be the sinkage in feet, then

. . '• v = x(A— a),

so that the mean sinkage is equal to the buoyancy lost divided by the area of the intact water-plane. In the event of the com- partment being so situated as to cailse heel and change of trim, the. mean sinkage is first determined as above, and the effect pf heel and change of trim superposed.

, To obtain the heel produced, the position of the centre of flotation for the intact portion of the water-plane is found, and thence the vertical and horizontal positions of the new centre of buoyancy, ate deduced by taking account of the buoyancy lost through bilging, and then regained by the layer between the two water-planes. The moment of inertia of the intact water-plane is found about an axis

through the new centre of flotation and thence the height of the new metacentre M' determined. The heel 6 (assumed small) is found by equating the horizontal shift of B to sin 0X the vertical distance of M' above G, both being equal to the moment causing heel divided by the displacement. In a similar manner the change of trim is obtained. If the compartment bilged is large So that considerable changes in its area and that of the ship at the water-line result, the sinkage and alteration in stability are found by a tentative process, closer approximations to the final water-line being succes- sively made.

An investigation of the stability when bilged at or near the water-Kne is, of special importance in warships owing to their liability to damage by gunfire in action, with the consequent opening up' of a large number of compartments to the sea. Calculations are made of the sinkage and stability when the unarmoured or lightly armoured parts of the ship are completely riddled; 1 the stability should be sufficient to provide for this contingency.

The third case, where the ship is intact but has compartments partially filled with water 6r other liquid, is of frequent occurrence. Practical illustrations occur in connexion with the filling and

emptying of water-ballast and oil-fuel tanks, and particularly in the case of ships fitted to carry large quantities of oil in bulk.

Let fig. 23 represent the section of a vessel fitted with a tank PQRS partly full of water. Let WL, wl be the upright water-lines

Fig. 23.

of the vessel and tank, G the centre of gravity of the vessel and water combined, B the centre of buoyancy of the vessel, and 6 the centre of gravity of the water.

As the ship is inclined successively through angles 6 it 0j, . . . the centre of buoyancy B moves along the curve of buoyancy to Bi, Bi, . . . the normals at which are tangential to the metacentric curve Mi Mi, . . . those at small angles passing through themetacentre M. If the water in the tank could be kept from moving as the inclination proceeded, G would be fixed in the ship, and the righting levers

would be GZi, GZj, ... those at small angles being equal to GM sin 6. Actually, if the inclination be slowly performed, the water-level in the tank changes successively to wih, wj?,. ■ • maintaining a level surface at all times; its centre of gravity moves to 61, fa,. . . thereby causing a corresponding alteration in the combined centre of gravity G. Drawing br it bri, ... perpendicular to the verticals through 61, 61, . . . and calling w, W the weights of the water and of the water and ship combined, then at the angle 0i the line of action of the weight of the water w has moved through a distance bri and the righting moment of the ship is diminished by an amount w%brt. It is evident that the movement of the centre of gravity of the water in the tank is the same as would be the movement of the C.B. of a ship having the same form as the tank and water-lines correspond- ing to wl, tvJi, Wih, &c. The values of the levers bri, bri. . .can therefore be obtained by a process similar to that used for obtaining the righting levers of the ship; cross curves and thence ordinary stability curves being drawn for various heights of water and inclinations. If 81 be a small angle of inclination, the line of action of the weight !»im will be such as to pass through the meta- centre m corresponding to the water-line wl, and determined by the

formula bm =— where t is the moment of inertia of the water-plane wl

about a longitudinal axis through its centre of gravity and v the volume of water contained. The moving weight w at b may there- fore be replaced by an equal weight fixed at m, which is the virtual centre of gravity of the water ; and the centre of gravity G of ship and water is likewise raised to a virtual position G' where

If the tank contain a fluid of specific gravity p the virtual rise of the

centre of gravity is ?r. The loss of stability at small angles due to

the mobility of the water is thus independent of the quantity in the tank, but is proportional to the moment of inertia of its free surface. It is possible for a small quantity of water with an extensive free surface to render a ship unstable in the upright condition ; the angle to which this large loss of stability extends depends, however, on the quantity of water in the tank, for the extent of the sideways movement of the centre of gravity G of ship and water is minute if the tank be either nearly empty or nearly full, and the loss of stability at all angles above a small amount will then be inappreciable; the loss at moderate angles is usually a maximum when the tanks are about half full.

The assumption made above, viz. that the ship is inclined so gradually as to maintain a level water surface in the tank, is by no means in accordance with the actual circumstances during rolling; waves are then set up in the water, causing it to wash from side to side, so that the loss of stability may be either more or less than the

amount calculated. To avoid danger of capsizing in still water, large tanks in a ship are filled or emptied in succession as far as possible, so that not more than one or two are partly full at the same time. Water-tight longitudinal partitions are also fitted in wide tanks in order to reduce the moment of inertia of the free surface. On the other hand tanks, partly filled with water, have been fitted and found effective in certain ships in order to reduce the rolling oscillations among waves. (See § Rolling.)

Hitherto the stability of a ship has been considered only with reference to inclinations about either a longitudinal or transverse axis. These are the only cases which it is necessary to «-»*-. deal with in practice for the purpose of ascertaining the u, an y probable qualities as regards stability of a vessel by MrJciion comparing the elements of its stability in the design stage with those of existing ships whose qualities have been tested by experience. For the exact theoretical consideration of the stability of a ship or any floating body, however, it is necessary to take account of the true line of the action of the buoyancy and not merely of its projection on the plane of inclination. The development of this part of the subject has largely been due to M. Dupin in his Mtmoire de la stabiliti des corps flottants and to M. Guyou in his Thiorie du navire. If a ship is inclined in all possible positions, keeping the displacement constant, the locus 01 the centre of buoyancy is a closed surface which is known as the surface of buoyancy ; the curve of buoyancy for two-dimensional inclinations being the projection on the plane of rotation of the corresponding points on the surface of buoyancy. Similarly the envelope of all the water-planes is defined as the surface of flotation. The stability of a ship in all positions is known when (a) the forms and dimensions of the surface of buoyancy, and (6) the position of the centre of gravity relative to it, have been obtained; the former depends entirely on the geometrical form of the ship and on the constant volume of displacement assumed, and the latter has reference only to the arrangement and magni- tude of the component weights of the structure and lading. For an infinitesimal inclination the line joining the centres of buoyancy when upright and inclined is parallel to the water-plane, and the tangent plane to the surface of buoyancy is therefore parallel to the water- plane, i.e. it is horizontal, and the normal to the surface is vertical- If the initial*

position is one of equilibrium, the centre of gravity must lie on the normal. To determine the effect of a small disturbance from the position of equilibrium, it is necessary, as in the particular inclinations already considered, to find the line of action of the buoyancy for adjacent positions, i.e. to trace the normals to the surface of buoyancy. Consecutive normals to this surface will not, in general, intersect; but, from the properties of curvature of surfaces, there are two particular directions of inclination for which adjacent normals to the surface will intersect the original nor- mal, these directions being perpendicular to one another and parallel to the principal axes of the indi- catrix of the surface of buoy- ancy.

If fig. 24 be a plan of the water-plane, Ox 1 the axis of inclination passing through

the centre of flotation, Oy' and Oz perpendicular axes in and at right angles to the plane of notation, then, from a consideration of the wedges of immersion and emersion for a small inclination 8, the travel of the centre of buoyancy B becomes: —

Fig. 24.

and

ˆCfy.dx'.dy' (or BB X in fig. 24) parallel to 0/ ˆjffx'y'.dx'.dy' (or-BiBj) parallel to Ox'

iˆffy'.dx'.dy' (or B 2 B') parallel to Oz.

These may be written : —

y-I»'; ˆrr-P; andˆylx' respectively

where I,' is the moment of inertia of the water-plane about Ox', and P the product of inertia about Ox', Oy'. If the principal axes of inertia of the water-plane Ox, Oy make an angle £ with Ox', Oy 1 , and if, from B as origin, axes Bx, By, Bz are drawn parallel to Ox, Oy, Oz, then the co-ordinates of B' are as follows : — .

a

x= — BiB 2 cos — BBi sin 4> = y(P cos — \ x ' sin);

a

y= BBi cos — BiB 2 sin — y(I' cos ˆ+P sin •)>);*

Also

5= B 2 B' = |yI

Ix' = I cos 2 <£+I» sin 2 ; P = (lx – 1») sin cos ;*

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where I», I, are the principal moments of inertia of the water-plane. Hence

X — — rr'Iy'Sln ;

y= ylj-cos^;

2 = (Ucos+IySin 4 ^).

Eliminating 8 and , the locus of the centre of buoyaney for small inclinations of the ship becomes the elliptic paraboloid —

The equation to the indlcatrix referred to axes parallel to Bx, By is therefore

Uv

+£v=

constant ;

unaltered. The resultant couple can be readily found, but in this case it bears no simple relation to the indicatrix, as before ; it may be shown, however, that the plane of the couple is conjugate to the axis of inclination with respect to the confocal ellipse

• = constant.

V – \T°

In the case when GM =0, the ship being in neutral equilibrium for that direction of inclination, the resultant couple is parallel to the axis Ox', i.e. perpendicular to the plane of the indicatrix.

Numerical values of the metacentric height GM, the angle of

obliquity a or QOM (equal to tan~' r /_ g y) and the angle \f> are given

in the following table for a ship whose transverse GM is 4 ft., longitudinal GM 400 ft., and BG 10 ft. : —

•

0°

1°

5°

10°

20°

30°

40°

50°

6o°

70°

8o°

90

GM

4'

41

7'

16

50-4'

103'

168'

237

300

354

388

400′

a

0°

6o°

78-5

76-8°

68-5°

59°

49-3°

39-5°

29-7°

19-8°

99°

0°

-

90°

29-0°

6-5°

3-2°

1-5°

1-0°

o-7°

o-5°

o-3°

0-2°

o-i°

0°

and the indicatrix is therefore similar and similarly situated to the momental ellipse of the water-plane, and the surface of buoyancy is everywhere synclastic and concave to all points within it. The quantities I„/V and Ix/V are evidently equal to BM, and BM„ (referring to inclinations about Oy and Ox respectively); and the indicatrix and momental ellipse become

rni + mr x =constint –

The angle

y I tan iA = — f- cot*

hence the direction is conjugate to that of the axis of rotation with

*respect to the indicatrix. , This is illustrated in fig. 25, where • * the ellipse shown is the indicatrix; OP*' the axis of inclination, OQ the con- jugate radius, and ORMy' the per- pendicular on the tangent. Draw QN parallel to OM to meet OP. The tri- angle OMQ is similar to BB1B2; and they can be made equal by giving a suitable value to the constant in the indicatrix equation. In that case QN is the projection on the plane of*

the figure of the normal to the surface at B 1 , and the shortest

distance between the normals at B and B 1 is equal to ON = MQ = P0

BiBj = rr, since ON or the axis of inclination is perpendicular to

them both. Also, the length B'M of the normal at B' intercepted between B and the foot of the common perpendicular is equal to*

**g- since 6 is the angle between the normals at B and B' ; it follows

that B'M'=5B'=^',

an expression analogous to that obtained before for. the case of small inclinations in the direction of the principal axes of the water-plane. It is worthy of note that the radius of curvature p of the normal section of the surface of buoyancy through Oy' is, in general,

OM* less than BM; the latter being equal to -r— , and p being equal

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OR' to -rr ; p is also obtainable by Euler's equation —

1 cosy , sin'0

p = EM;" t "B3y

becoming equal to BM for inclinations about the principal axes.

Similarly the radius of curvature of the normal section through Q is,

in general, greater than BM.

If the centre of gravity G of the ship is coincident with B, the arm

\ x ' of the righting couple is OM or S-8; and there is also a couple of

P lever ON or y0 in a perpendicular vertical plane. The resultant

couple lies in a plane containing OQ, having a lever equal to

' cos V+V sin V-

OQory > J , I,"+P'or^^i7 In the general case when G is situated at a distance a above B, the righting lever becomes l-rr—ajd, and the perpendicular couple is

The greatest angle of obliquity (o) occurs in this case when is about 5f° and the plane of the couple is nearly coincident with the middle line plane for all angles of greater than about 30 . It follows that if a weight is moved obliquely across the ship the axis of rotation is approximately longitudinal, except when the line of movement is nearly fore and aft; and in the latter case a small deviation from a fore and aft direction produces a large change in the position of the axis of rotation.

The direction of the axis of rotation is above expressed with reference to the position of the inclining couple in relation to the indicatrix of the surface of buoyancy; as, however, the couple is assumed small, the direction of the axis and the amount of inclination may equally be obtained by resolving the couple in planes perpendicular to the principal axes and superposing the separate inclinations produced by its components.

It has been shown above that the positions of equilibrium are found by drawing all possible normals to the surface of the buoyancy, and the condition for stability for an inclination in any direction is that the centre of gravity shall lie below the corresponding metacentre. The height of the metacentre varies with the moment of inertia of the water-plane about the axis of inclination, and the maximum and minimum heights are associated with the maximum and minimum moments of inertia, which again correspond to inclinations about the least and_ greatest axes of inertia respectively. If the centre of gravity lies below the lowest position of the metacentre (the transverse metacentre in the case of a ship when upright) the equilibrium is stable for all inclinations, and the condition is referred to as one of absolute stability; if it lies above the highest metacentre, the condition is one of absolute instability; if it lies between the highest and lowest metacentres, the condition is one of relative stability, the ship being stable for inclinations about a certain set of axes, and unstable otherwise.

The foregoing remarks apply to a vessel whose axis of inclination is fixed so that the component couple perpendicular to the plane of inclination is resisted. If, on the other hand, the vessel is free to move in all directions the resultant couple does not in general tend to restore the original position of equilibrium, although the com- ponent in the plane of inclination complies with the conditions-above stated for absolute stability. If mi and tth be the greatest and least values of GM, the ratio of the component couples perpendicular to and in the plane of inclination, or tan a (fig. 25), is greatest when

tan

and then

tan a = rrr-

mi —ntt

If nh/mi be small, this

ratio is large, being equal to 4-95 in the numerical example above. In such cases the extent of the movement that can result from a small initial disturbance cannot be readily determined by a statical method, but the investigation of the work done in moving the vessel from one position to another appears to meet this difficulty.

This process is employed by M. Guyon in his Theorie du navire, the stability of a ship in any condition being treated throughout from the dynamical standpoint. He proved that : —

1. For changes of displacement, without change.in inclination, the potential energy of a system consisting of a floating body and the water surrounding is a minimum when the weight of the body is equal to its displacement.

2. For changes of direction, without change of displacement, the potential energy of the system is equal to the weight of the body, multiplied by the vertical resolute of BG ; when this distance is a minimum or a maximum the stability is respectively stable or unstable. A statical proof of this has been given in the two-dimensional case.

The potential energy is thus equal to the dynamical stability

increased by an arbitrary constant. If from any point B/ of the surface of buoyancy (fig. 26) a tangent plane be drawn, the perpendicular upon it, GN, is proportional to the potential energy, and the stability of the body is thus the same as that of the surface of buoyancy regarded as a solid capable of rolling on a hori- zontal plane. The locus of the foot of the perpendicular N is called the ” podaire ” (shown dotted in the figure); this surface resembles’ the surface of buoyancy in its general /shape, and touches it when GB is normal, i.e. at positions of equi- librium Bi, B 2 , B 3 , B 4 , ; it has the property that a radius GN drawn when the body is in the position has a length proportional to the

Fig. 26.

from G is always vertical corresponding to N, and potential energy.

If the ship or body be supposed to move under no external forces, and the effect of any change in the displacement be neglected, the kinetic energy of the system can be expressed by 2mu 2 /2g, and the total energy by (WXGN)-f-Jg. 2 tod 2 ; the latter is constant when there are no resistances, and steadily decreases if resistances are in operation. Neglecting resistance, when the body is momentarily at rest, W XGN becomes W./, where / is a linear quantity ; and through-

out the motion GN is less than I by yˆ 'Smv 2 .

The effect of re-

Fig. 27.

direction; also horizontal translations and rotations about a vertical axis which are not generally of an oscillatory character and will not materially affect the rolling. It is convenient when considering rolling to neglect the J'f influence of the other accompanying oscillations, whose effect in most cases is: slight in magnitude although complex in character. ,

The ship is in the first place conceived '.to, Be rolling in still water without any resistances operating to dirri'iri&h the motion. The equation of motion for moderate angles of inclination, within which the arm of the righting couple is approximately proportional to the angle of heel (i.e. GZ = to X0), is

sistance is gradually to decrease I or the maximum value of GN ; and it may be exhibited graphically by the following conception. Imagine a sphere of water, with centre at G, to be originally entirely within the podaire and then to be capable of expanding untirthe whole surface is submerged. It will first touch the podaire at the minimum normal, and will then form a small lake round it; similar lakes will form later at all other positions of absolute stability. Positions of absolute instability will be touched externally by the sphere, and if the water recede a little, will form small islands. At positions of relative stability the water will in general divide the surface into two parts meeting at an angle (fig. 27), and become one or the other of ■ the branches XX', YY' according as the size of the sphere is slightly in- creased or diminished. Let the radius GN to the podaire along the edge of the water be represented by / ; from the energy equation the radius for any other position of the body moving without external

forces is less than /, and the position lies within the lake so bounded. The diminution of / due to resistances has the effect of gradually drying the lake. If the body is originally placed near a position of absolute stability, the small lake on drying will leave the body in or very near that position. On the other hand, if the body is placed at rest near a position of absolute instability, the water in drying will necessarily cause the body to move farther and farther from that position. Finally, if moving near a position of relative stability, the body will move freely from side to side until the drying has proceeded so far that separate branches XX' or YY' are obtained ; when this occurs, the body will be fenced, as it were, on one side or the other, and will oscillate until a position of absolute stability is finally attained.

With regard to the surface of flotation it has been shown that in order that the displacement shall remain constant, consecutive water- lines must intersect on a line passing through the centre of gravity of the waterline or the centre of flotation. If the inclination take place from a given position in all possible directions, the lines of intersection with the original water-plane will all meet at the centre of flotation, which must, therefore, lie in the envelope of the water-planes, or the surface of flotation. The surface is therefore the locus of the centre of flotation for all possible inclinations. Since the curvature of the curve of flotation, which is the projection of the centre of flotation for inclinations about an axis perpendicular to the plane of projection, may change sign, the surface can also undergo similar changes in curvature and may be synclastic in certain parts and anti-clastic or saddle-shaped in others. ■

The relation between the surface of flotation and the stability of the ship is similar to that established in the two dimensional cases, i.e. the projection on the plane of inclination Of the curve corresponding to the inclination has a centre of curvature whose height is a measure of the increase or decrease oi stability caused by art alteration in displacement; the investigation, however, of the general ease and the extension of Leclert's theorem to oblique inclinations contain no features of special interest or importance.

Rolling of Ships.

The action of the waves upon a ship at sea is such as to produce

rolling or angular oscillations about a horizontal longitudinal

axis, pitching or angular oscillations about a horizontal transverse

axis, and heaving or translational oscillations in a vertical

(1)

where e is the radius of gyration of the ship about the axis of rotation, m the metacentric height, 8 the angle of inclination arid g the acceleration produced by gravity. From this the time deduced for a single oscillation, from port to starboard, or vice versa, is

“V— .

V m:e’

<2)

showing that the time of oscillation varies directly as the radius of gyration, and inversely as the square root of the metacentric height.

‘ The value of T is generally about 10 seconds in a large Atlantic liner, 7 to 8 seconds in a battleship, and 5 to 6 seconds in second-class cruisers and ships of similar type. In a large modern warship e is about one-third the breadth of the ship.

,For unresisted rolling of ships among waves the, theory gener- ally accepted is that ; due to, Froude (see Trans. Inst. Nav. Arch., 1861 and i $62)ˆ Before his work, ; many eminent _ mathe- maticians had attempted to arrive at a solution of this most difficult problem, but for the most part their attempts met with scanty success ; wave-motion and wave-structure were imperfectly understood, and the forces impressed on a ship by waves could not be even approximated to. Froude’s theory is] based on the pro- position that, when a ship is among waves, the impressed forces on her tend to place her normal to a wave sub-surface, which is as- sumed to be the surface passing through the ship’s centre of buoy- ancy, and which is regarded as the effective wave surface, as far as the rolling is concerned. As in water at rest the ship is in equilibrium when her masts are normal .to the surface of the water, so in waves she is in equilibriurii when her masts, are normal, instant by instant, to the effective surface of the wave that is passing v her. When she at any instant deviates from this position, the effort by *hich she endeavours to return to, the normal dependsipn the angle of deviation, in the same manner as the effort to assume An upright position, when forcibly inclined in still water, depends on the angle of inclination. ‘ Hence her stability {i.e. her effort to. become vertical) in still water measures her effort to become normal to the wave at any instant on a wave. Froude made the assumptions that the profile of the wave was a curve of sines, and

that the ship was rolling broadside on in a, regular series of similar waves, Of given dimensions and of given period of recurrence. He Was aware that the profile of the wave would be better represented by a trochoid, but in his first paper he gave several reasons why he preferred the curve of sines. He also assumed thatthe ship's rolling in Stillwater was isochronous, and that the period of the rolling was given

by 7=v

as obtained theoretically.

, a= uuioiuvu t »»v.ˆ.v.uvo…,. On these assumptions

the equation of motion is obtained by substituting, for the angle of inclination in still water, the instantaneous angle between the ship and the normal to the wave-slope, and thus becomes

(3)

dt~*

has to be expressed in terms of time, and is given by 0i = 0j sin ˆr,

where ©i is the maximum wave-slope, Ti is the half period of the wave, i.e. half the time the wave takes to travel a distance equal to its length, and t is the time dating from the mid-trough of the wave. Equation ("}) can therefore be written—

w=-fH- 01 – sm TTV' -. • • . (4)*

which is the general differential equation of the unresisted motion of a ship in regular waves of constant peribd. The solution of this equation is —

X' , y-. ., IT , , ©1 . -IT ,

8 = Ci . sinˆ+C2C0sˆ+-

T7

(5)

where Ci and C 2 are constants depending on the initial movement

and attitude of the ship.

The last term of this expression, – ■’ ‘ > • : ■

©i ..•”-, “.;■.. — — rp2 . sinsf 7 f , ‘ ■

I- T? .’

ROLLING OF SHIPS]

SHIPBUILDING

935

= Ci sin7K < + C2Cos7p < — -?p0

represents the forced oscillations imposed on the ship by the passage of the series of waves during the time t; and the first and second terms,

Ci . sin;p/ + C2 . cos 7p <,

are the same as the free oscillations of the ship in still water.

Equation (5) indicates, therefore, that the ship performs oscillations as in still water, but has superposed on these a series of oscillations, governed by the wave-slope and the relation existing between the period of the ship and that of the wave. The equation shows that there will be innumerable phases, and of these three are worthy of notice.

(a) In the case in which the ship’s period T is equal to the semi-period Ti of the wave, equation (5) becomes indeterminate. The correct solution to equation (4) is then —

(6)

It is seen that at each successive wave crest and hollow the range of the oscillation is increased, so that the ship under these conditions would inevitably capsize but for the effect of the resistances and the departure from synchronism at large angles of roll.

T (i) When ;rr = 0, in which, case the ship is assumed to be quick

in her movements, or the period of the wave is infinitely long as compared with that of the ship, the equation (5) becomes —

9 = 0! sin frt,

that is to say, the ship will behave very much as a thin flat board does on the surface of a wave, her marts being always perpendicular to the surface.

(c) If we choose the initial conditions in equation (5) so that the coefficients Ci and C 2 are zero, then the equation will become —

8 = 0. ™ sin rp-t.

1 TV

Since 0i, the slope of the wave, is equal to 0i sin W/, the ratio of

the ship's angle to the vertical to the angle that the normal to the wave-slope makes with the vertical, or 0/0i, I

I —

Ti 2

= constant.

That is to say, the ship forsakes her own period and takes up "forced" oscillations in the period of the wave. Under these conditions the ship's masts will lean towards the wave-crest if T is greater than Ti, and from the wave-crest if T is less than Ti.

Froude in his first paper further showed how the successive angles of a ship's rolling may be exhibited graphically, and he touched on the influence of resistance in reducing rolling. The following is the summary he gave in 1862 of the conclusions he had reached:

" (i.) All ships having the same ' periodic time,' or period of natural roll, when artificially put in motion in still water, will go through the same series of movements when subjected to the same series of waves, whether this stability in still water (one of the conditions which govern the periodic time) be due to breadth of beam, or to deeply stowed ballast, or to any such peculiarity of form as is in practical use.

" This statement would be almost rigorously true if the oscilla- tions were performed in a non-resisting medium, or if the surface- friction and keel-resistance, by which the medium operates to destroy motion, were of the same equivalent value for all the ships thus compared. It requires, however, to be modified in reference to the circumstance that of two ships having the same periodic time in still

water, the comparative forms may be such that the one shall experience such resistance in a higher proportionate degree than the other, and the necessary modification may be ex- pressed in terms of their relative behaviour when set in motion in still water. The vessel which is the more rapidly brought to rest by resistance in still water will in the greater degree resist the accu- mulations of angle imposed on her by consecutive wave-impulses, and will the more fall short of the maximum angle which both would alike attain if oscillating in a non-resisting medium.

" (ii.) The condition which develops the largest angles of rolling is equality in the periodic times of the ship and of the waves; and this is true alike for all ships, whether their scale of resistance, as above referred to, be large or small.

" (iii.) That ship will fare the best which, caeteris paribus, has the slowest periodic time.

" (a) The waves which have a periodic time as slow as hers will have a greater length from crest to crest than those of quicker period ; and, on the whole, long waves are relatively less steep than short ones. Now it is the steepness of the waves in a wave-series, not their height simply, which governs the rate at which angles of rolling will accumulate in a given ship when exposed to it.

" (6) Of two ships one of which has periodic time rather slower than the waves in a given ratio, the quicker ship will accumulate the larger angles.

" (c) It will require a heavier or a more continued gale to rear waves which have the lengthened period.

" (d) When the gale has continued so long that the largest waves have outgrown the period of the ship, she will not thereby have been released from the operation of waves having her own period, since the larger waves carry on their surface smaller waves of every inter- mediate period (this, at least, I believe to be the case).

" (e) When the gale has ceased and the sea is going down, the slower the period of the ship the sooner she will be released from waves of as slow a period.

" (iv.) There are two, and only two, methods of giving a slow period to a ship :

" (a) By increasing her ' moment of inertia,' as by removing her

weights as far as possible from her centre of gravity ; an arrangement which for the most part can only be accomplished to a limited extent. " (b) By diminishing her stability under canvas. This can always be accomplished in the construction of a ship, and generally in her stowage, to any degree consistent with her performance of her regular duties, by simply raising her weights. Were we to raise these so high as to render her incapable of standing up against the action of the wind on her sails, the steepest waves would pass under her with- out putting her in motion.'

" Thus the enormous weights carried by the armour-plated ships, extended laterally to the greatest possible distance from the centre of gravity, and raised high above it, serve in both respects to moderate, not to enhance, this tendency to roll ; and when it is said that with the weights thus placed, and once put in motion, a ship ' must roll deep (deep, though easy),' it should be remembered that those very relations of force and momentum, which show how difficult it must be to check her motion when once it has been impressed on her, show also that it must be equally difficult to impart that motion to her in the first instance. The difficulty of starting her has a priority in point of time over the difficulty of stopping her, and prevents it from being felt by limiting the motion which would have called it into play.

" (v.) The conditions which govern pitching may be noticed here, though they have not been discussed in the paper.

" Were it possible, by concentrating her weights or by extending her plane of flotation, to give to the ship a period indefinitely quick for both longitudinal and transverse oscillations, as compared with that of such waves as are large enough to put her, in motion, she would acquire no cumulative oscillation, but would float always conformably to the mean surface of the wave which passes under her.

" But this condition, which is so unapproachable in practice in reference to transverse oscillations that the attempt to approach it will but develop the evils pointed out in (iii.), is of necessity so closely approached in practice in reference to longitudinal oscilla- tions, that those evils can only be escaped by approaching it as closely as is possible. The plunging of a ship whose weights are extended far fore and aft is but an incipient development of those phases of oscillation which have their proper development in trans- verse motion only. The best that can be desired in reference to longitudinal motion is that the ship's period, for longitudinal oscilla- tion, shall be as quick as possible, and her position always as con-

formable as possible to the mean surface of the passing waves.

" I have insisted here, more prominently than in the body of the paper, on the circumstance that a total loss of stability, using that word in the ordinary sense of power of carrying sail, implies the possession of absolute stability, as regards rolling motion due to wave-impulse, because it has been pointed out to me that the attention of readers should be more strongly directed to it, not indeed as representing a practically available possibility, but as serving best to force the mind, by contact with an extreme conclusion immediately deducible from the theory, to appreciate its funda-mental principles. And the proposition thus certainly furnishes a crucial test of whether the principles have been appreciated or not, and it supplies also a ready means of testing the theory by a crucial experiment. I must, in addition, express my own confident belief that any one who will try the experiment fairly will find the pro- position so fully verified that he will feel obliged to admit that the theory which leads to so paradoxical yet true a conclusion deserves at least a careful study. But the more practically useful aspect of the theory is that which presents to view the varying phases of cumulative oscillation which a ship tends to undergo when exposed to various types of wave-series ; the phases depending on the relation which her natural period of rolling, when set in motion in still water, bears to the period of wave-recurrence, and on the maximum steep- ness of each individual wave of the series — phases, in fact, which she would actually undergo but for the effect of surface-friction and keel-resistance; the nature and value of which conditions, as well as the nature and necessity of experiments for their determination, have been pretty fully dealt with in the body of the paper.

" I will here only add a synoptical statement of the principal features of those phases, given in a rather more complete form than in that part of the paper which referred to them, though they are pretty fully exhibited by the diagrams.

" By a ' complete phase ' is meant that series of oscillations which the ship undergoes counting from the time when, for a moment, she is stationary and upright in a similar position, and is about to

recommence an identical repetition of the movements she has just completed.

" For the benefit of those who may glance at the appendix before they read the paper, I will mention that T is the number of seconds occupied by the ship in performing a single oscillation in still water, starboard to port, or vice versa. Ti is the number of seconds occupied by the wave in passing from hollow to crest, or crest to hollow. 61 is the number of degrees in slope of the steepest part of the wave ; and plq is the ratio T/Ti, with the numerator and denominator converted into the lowest whole numbers that will express the ratio, where, however, it must be noticed that for T/Ti = i, plq must be taken as the limit of such a form as ˆHˆjs- Then —

(i.) The ship will complete the phase in the time = 2gT.

" (ii.) In completing the phase the ship will pass through the vertical position 2 p times, or 2 9 times, according as p or q is the smaller number.

" (iii.) The ship will pass through the vertical position at the middle of the phase.

" (iv.) On either side of the middle of the phase there must occur, as equal maximum oscillation, the maximum in the phase, say 9,

*which will approximately (but never in excess) = ±6i — *—v*

q—p

" (v.) From these propositions it appears that if we compare two cases, in one of which the value of T/Ti is the reciprocal of its value in the other, the phase will in each case consist of the same number of oscillations similarly placed; but in that one in which the period of the wave is slower than the period of the ship, the angles of oscillation will be the larger in the ratio p/q or q/p, whichever is the greater. The following table expresses the results of the above propositions, as exhibited in the diagrams, based on the assumption that the period of the ship is in every case T = 5", and that the maximum slope of the wave 9i =9 degrees:

H

i

■*c*

SJ

Ph

(A

“a

■J3

Wave’s Period, or T..

“PI?

a ?

a »

& si

Approx. Outside Value ofj®, the Maximum Angle reached during Phase.

5,;

*5**

I

AYtWo

Infinite.

Infinite.

Infinite.

5”

6-25’

o-8

4

50”

8

45 deg.

b”

K

1-25

i

40″

8

36 „

5′

*10**

o-5

$

20″

2

18 „

5:

2 ; 5 ‘

2

£

10′

2

9 ..

5

9″

o-55

4

90″

10

20 ,,

5″

277″

i-8

I

50″

10

11 .,

The assumption made in equation (1) that Gz = m.6 is true if the sections of the ship in the vicinity of the water-line are concentric circular arcs; and is approximately true generally for small angles of inclination as long as m is not small. If m be small, the relation does not generally hold.

In a wall-sided ship,

GZ = sin B(m + ia tan 2 0), where the BM is denoted by a; whence the equation for rolling through small angles becomes —

3 = o,

where 9 5 and higher powers of 9 are neglected.

Sections of other forms lead to a similar equation, but with different coefficients of 9 3 ; the above equation is therefore typical of all others. This condition has been worked out fully by Professor Scribanti, 1 who obtained a solution in the following form :

where 8 is the maximum angle of roll. J is defined as the moment of inertia of the water-plane expressed in foot-ton units, i.e. is equal to W.a, where W is the displacement in tons. I is the mass moment of*

inertia of the ship about its axis of oscillation, and

P = — . Some numerical results for -t?, where T m is the period

8 2 +4- l

found by the usual ” metacentric ” formula and is 12°, are:

a

16 ft.

16 ft.

16 ft.

m

3 ft.

4 in.

1 in.

T„ T

1-04

i-3i

2-98

When the metacentric height is zero, the formula becomes —

*■.-‘■ˆVr 5 * 5*

\&

1 Trans. Inst. Naval Arch., 1904.

It has been assumed in the foregoing that the rolling in still water and among waves is unresisted; it remains to take into account the resistances which always operate during rolling. In still _ . . . water these cause a degradation of the amplitude until the roBlm ship finally comes to a position of rest ; and when a vessel is rolling among waves they cause a similar degradation of amplitude.

The earliest investigations of resisted rolling in still water were made

by Froude in England, and by Bertin, Dunil de Benazd, Risbec and Antoine in France. The method adopted was actually to roll the ship in still water and observe how the amplitude decreased roll by roll. Men were caused to run from side to side of the ship, their runs being so timed as to add to the angle of roll on each successive swing until the maximum angle obtainable was reached, when all movement on board was stopped, and the ship allowed to roll freely of herself until she came to rest. During this free movement a complete record of her angular motion was registered by means of a short-period pendulum and an electric timer, and from this a curve of " declining angles " was constructed, in which abscissae repre- sented number of rolls and ordinates extreme angles of roll to one side of the vertical. From this curve another curve was constructed, which was termed a " curve of extinction," in which the abscissae represented angles of roll and the ordinates the angle lost per swing. Figs. 28 and 29 give examples of these curves obtained from experi- ments with H.M.S. "Revenge." 2 Having obtained such curves, Froude proceeded to investigate the relation between the degradation of the amplitude and the resistances which cause it. He assumed that the resistance to rolling varied partly as the angular velocity, and partly as the square of the angular velocity, thus obtaining the following equation for the angular motion of the ship : We 8 cPO- , v d9 . v l&9\ i , „. ■

-T"^ +Kt H +Kl \fR) +W.».»-o.

If K2 is zero, a complete solution is —

where A and B are arbitrary, and the period Tr of resisted rolling is given by

7T T

tf=A. aW ^sm|

T-J m S KrV J T Ki'g lr \ e 2 4WV V 4WVM

4WV \T 4WVj» It appears, therefore, that the period is slightly_ increased and the amplitude progressively diminished by the resistance. In actual cases where K2 is necessarily included in the differential equation, the complete solution cannot be conveniently expressed analytically, but it can be determined in effect either by any method of approxi- mate quadrature or by a process of " graphic integration. The diminution of amplitude can also be approximately obtained by

*SO *£» SO*

Count of successive swings.

Fig. 28.— Curves of declining angles. C, light, and D, deep draught, no bilge keels ; E, light, and F, deep draught, with bilge keels.

assuming the motion to be simple harmonic with amplitude and by equating the work done by the resistances during the roll to the loss of dynamical stability — W. m. ©X decrement. The differential equation for the curve of extinction is thus obtained, and is —

-g-a.8 + 6.

02

where 0 = extreme angle (in degrees) reached at any particular oscillation, n the number of oscillations, and o and 6 are coefficients equal to

KlTT 2

and

Kˆ

2WmT auu 3 180 WmP

2 Given by Sir W. H. White, F.R.S., in a paper read before the Institution of Naval Architects in 1895.

respectively. Froude gave his reasons for expecting the resistance to vary partly as the first and partly as the second power of the angular velocity. The latter part he considered would be due to surface-friction and the head resistance of keels and dead wood, and the

“ˆ

c

B S

V

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I>,

k%

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f

A

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f

*e**

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1

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<3

Fig.

Angle of roll (0) from vertical.

29. — Curves of extinction. A, light, and B, deep draught, no bilge keels ; C, light, and D, deep draught, with bilge keels.

former to the resistance caused by the creation of a small wave at each roll, which, by travelling away from the ship, would cause dissipation of energy. Froude's views have been confirmed by the

accuracy with which "the expression — T—=a.8 + ft.9 2 may be

made to fit the curve of extinction of practically any ship by the

j udicious selection of the coefficients a and 6. M . Bertin has, however,

do preferred an expression equivalent to — jrz = b.0′ i , while other

French investigators have preferred an expression equivalent to

— T =a.0. an

On substituting the value of a in equation (7) it becomes —

-at

-A.**, (^-5 + *).

(8)

a simplified form of the equation for resisted rolling when the coefficient ft is neglected.

For the " Revenge " the following equations represent the curves of extinction given in fig. 29 :

For deep draught :

d®

without bilge keels — -7— = -O!23© + -oo250 2

with For light draught :

„ -^-065 6 + -OI7 6′ d0

without bilge keels— 7 = -015 + -OO280 2

with

d& 735 = -084 + -OI9 2

(0 in all cases being measured in degrees and not in circular measure). The large increase in the ft coefficient after bilge keels had been fitted has given rise to considerable discussion. Mr R. E. Froude had experimented with a deeply submerged plane oscillating in water, and he found that at a speed of I foot per second the resistance per square foot was I -61b. Using this figure to calculate the work per swing from an extreme angle of 6°, the head-resistance of the bilge keels is found to account for about one-fourth the energy lost in a single swing due to the increased value of the ft coefficient in the above formula. The energy abstracted in this particular case is thus about four times greater than the theoretical head-resistance of

the bilge keels. This discrepancy has been observed in many cases, and it appears that when bilge keelsare added to a ship they become effective, not merely as flat surfaces moving with the ship and experiencing direct resistances, but also by indirectly influencing the stream-line motions which would exist about the oscillating ship, if there were no bilge keels. Another cause of the difference is that the bilge keels during the early portion of the swing set into motion a large mass of water, only a small proportion of whose energy is returned to the ship towards the end of the roll. This condition is accentuated when the vessel is in motion ahead, and owing also to the increase of other resistances at high speeds, a more rapid extinction is then obtained. It appears from experiments made on H.M.S. " Revenge " and on a torpedo boat destroyer that the extinction at a given angle

of roll is given by a linear formula — d& = a+pV, where a and fi are coefficients independent of the speed V. 1

Froude attacked the problem of resisted rolling in an inverse manner, endeavouring to ascertain " what wave-series is required to keep the given ship at a given range of steady rolling with any assigned period, including the effect of resistance." Subsequently he treated the problem in a direct manner by the process of " graphic integration," an exact method of determining the motion of a ship, the elements of the ship's rolling in still water and the wave-series acting upon her being given. 2 Some interesting developments of the process were made by Sir William White in a paper read before the Inst. Nav. Arch, in 1881 on the " Rolling of Sailing Ships," in which the action of the wind on the sails and the variation of the virtual weight of the ship on the wave are included. The effect of wind-pressure in heeling a ship is very much greater when she is at the crest of a wave than when she is at the trough, because her virtual weight is less. This must be taken into account when dealing with sailing vessels; the reduction of virtual weight, and therefore of righting moment, at the crest of a wave being very considerable, although the heeling moments due to the wind suffer no such reduction.

The differential equation for rolling among waves including the effect of resistances varying as the first power of the angular velocity

1S — We 2

which becomes on substitution (K being expressed in terms of a) —

dte 2a de tt 2 _tt 2 a, . t .

2”r”T /Iti’TˆT 1 Sin T~*

“T dt

The general solution is-

-at

=Ae sm

where

Of V 1 ~S +/J) +Al@l sin (•ft _/Jl) •

*Al 2- y-‘Y?) + ,,» Ti 2 and Pl ~ tan *-(Ti s -T 2)*

(9)

and A and are arbitrary.

The first term represents a free oscillation of the ship, which in time dies out, leaving a forced oscillation in the period of the waves. From observations on rolling, however, it is found that, owing to the departure from exact uniformity in the waves encountered a ship seldom, if ever, completely forsakes her own natural period of rolls; for each slight alteration in the wave period Ti introduces afresh terms involving the free oscillations of the ship. In the synchronizing conditions where T = Ti, the forced oscillation is represented by ,*

the amplitude being limited entirely by the resistance; the phase

is – before that of the wave slope. The vessel is then upright

in mid-height, and inclined to its maximum angle on the crest and in the hollow of the wave. The maximum amplitude is given

by ˆ•0 1 =a.0. Since the right-hand term represents the decrement

of roll due to resistance, the left-hand side must represent the increment of roll due to the wave in this synchronizing steady motion. If this latter relation be assumed to hold when the resistance to motion is represented by the more general decremental equation, then the maximum amplitude is given by

|0i = o. 0+6. s .

In 1894 and 1895 M. Bertin, at the Institution of Naval Architects, extended this relation to cases in which Ti is not equal to T, obtaining at the same time not simply the angles of steady rolling for these cases, but the maximum angles passed through on the way to the steady condition; to these maximum angles he gave the name of " apogee " rolls.

In 1896, at the Institution of Naval Architects, Mr R. E. Froude investigated the probable maximum amplitude of roll under the influence of a non-synchronous and non-harmonic swell. He imagined three identical ships, A, B and C, the first rolling in still water, and the two others placed in the same swell assumed recurrent in period 2T1, but not necessarily harmonic. Assuming resistance to

vary as -r, then denoting the vessels by suffixes, the effective wave

slope by 0i, and constants by K, K' and K",

a " >eA J-K d0A J-K'f> n

"3F+ K W+ K0A -°'

dt

dP

; +K^+K'fe = K"'fl 1 ;

:+K§+K'fc.

:K

1 See papers on this subject read before the Institution of Naval Architects in 1900 by Professor Bryan and in 1905 and 1909 by Mr A. W. Johns. 2 See Trans. Inst. Naval Arch., 1875.

[ROLLING OF SHIPS

If at any instant

9A = e c 9 B and 3r = - 5 j-

d9s

~ dt

it follows that

d 2 e A (PBc <»b. df dt? d? '

whence the above three relations hold at the successive instants and consequently for all time. Hence the rolling of C differs from that of B in having the free oscillations of A in still water superposed upon it. If, therefore, it is possible to obtain any one motion in the swell, any other motion due to a different phase relation between ship and wave slope can be at once determined. A convenient motion in the swell to form a basis for obtaining other motions is the forced oscillation proper to the swell, i.e. the particular oscillation that is recurrent in the period of the swell. The amplitude of roll at any instant is therefore the sum of the amplitudes due to the forced oscillation and to an arbitrary free oscillation in still water. If the latter component be regarded as perfectly arbitrary there is no limit to the angle of roll obtained by postulating suitable initial conditions; to determine the practical limitation of rolling, however, it may reasonably be assumed that at or near the commencement of the motion there will be a brief period of no roll, and that the maximum angle of roll obtained will occur at no great interval of time after this period. At the instant when there is no roll, the forced and free oscillations are equal in magnitude and opposite in phase, and the period of maximum (termed the " criterion") ampli- tude Q c will occur as soon as the two components are in phase;

T the time interval between the two conditions is»T, where n— ˆ t — T '

It is assumed also that during the above interval — (i) the effect of the swell was sensibly the same as that of a simple harmonic wave, A being the amplitude of the forced oscillation (and of the initial free oscillation) ; (2) the extinction equation of the free oscillation

— t— = o9 + i6 2 can be replaced by the simple form — 7 = EG,

where E = a+bQ c approximately; this has been implied by the

absence of terms containing (-n) in the differential equation above.

The amplitude of the free oscillation during the maximum roll is, from equation (8) Ae – ”’ ; whence

9c=A(i+e-“«). Also, from equation (9), the forced oscillation is given by

©

‘= A \/(I -T? +) (f”TT E) !

From these equations ©i can be determined if T, Ti, a, 6 and ©care given ; conversely if 0c is known, ©i can be tentatively obtained.

The following table gives the criterion angle (0c) and the angle of steady roll (A) for the Revenge,” both without and with bilge keels, obtained on the above-mentioned assumptions :

Maximum Wave-Slope, 3 Degrees.

T

T

T

T

TT 1 ‘ 3 –

T,- IJ –

Ti- 11 ‘

jr-.-o.

n-3‘33-

» = 5-

» = IO.

» = oo.

_;

2 «j

otf

°«i

.2 u

°oj

.9. «

°i2

P

ft

si

*3**

2lL

P

“Revenge” (deep

deg.

deg.

deg.

deg.

deg.

deg.

deg.

deg.

draught), with no bilge keels

8-2,s

4-35

12-25

6-8

21-2

13-9

41-1

41-1

“Revenge” (deep draught), with

bilge keels

6-6

4-24

8-6

6-4

u-55

io-8

.14-85

14-85

Among the conclusions reached by Mr R. E. Froude in the case of a ship rolling in a uniform swell were :

*However non-uniform initially, the rolling ultimately falls into the uniform forced oscillation; it does so the sooner, caeteris paribus, the higher the resistance, and with the fewer ” cycles ” or alterations of amplitude of rolling, the more nearly syn- chronous the swell with the ship. The amplitude of the *« ultimate uniform rolling is an approximate mean of the alternate maxima and minima of the precedent non-uniform rolling. If the rolling starts from zero, the maximum ampli- tude falls short of twice the ultimate uniform amplitude, the more so the higher the resistance and the more synchronous the swell; and in a synchronous swell the maximum*

ampli- tude cannot exceed the ultimate uniform amplitude, unless it does so initially.

In two papers by Captain and Professor Kriloff of St Petersburg,

read before the I.N.A. in 1896 and 1898, the whole motion of the ship, including pitching and rolling, is dealt with; every variation which can reasonably be conceived is taken into account in these papers.

Of the various appliances adopted to reduce rolling, the most important and successful are bilge keels. Some reference has already been made to the influence they exert on the rolling of ships, as illustrated by H.M.S. " Revenge," in which there was one bilge keel on each side, 200 ft. in length and 3 ft. in depth, tapered at the extreme ends. The great value of bilge keels, in diminishing rolling was pointed out by Froude and demonstrated by him in 1872 by experiment with the " Perseus" and the " Greyhound," which were alike in every essential respect, except that the

Methods of reducing

former was not provided with bilge keels and the latter TO u in „

was. The general conclusion was that the rolling of the

" Greyhound," was only about one-half that of the " Perseus."

Bilge keels were usual in warships until, in the design of the " Royal Sovereign " class, it was decided not to fit them, owing to the large dimensions of the vessels and the difficulties in certain circumstances of docking them if provided with bilge keels. Ulti- mately one of the class, the " Repulse," had them fitted for purposes of comparison, and the effect on her rolling was so marked that it was resolved to fit them to all the ships of the class. Before fitting them on the " Revenge," a careful programme was drawn up of experiments to be made before and after the bilge keels were fitted ; and on carrying out this programme some valuable results were obtained. The experiments were made at Spithead in smooth water, the general effect of the bilge keels was to reduce the rolling to one-third of its former amount. When, instead of having no motion in the line ahead, the ship had a speed of 12 knots, an even greater reduction in the rolling was observed. Their effect on other qualities of ships is on the whole beneficial, and in general little, if any, reduction in speed has resulted from their use. The experience of Great Britain with regard to bilge keels has been repeated in America. Bilge keels were

omitted for the same reasons as they were in the " Royal Sovereign " class ; they were afterwards fitted in the U.S.S. " Oregon," experimental investigation being made both without and with them, and the general conclusion arrived at was that the rolling was diminished by two-thirds by the adoption of the bilge keels.

A method for reducing rolling of ships in a sea-way by the use of water-chambers was devised by the writer in 1874 in connexion with the design of the " Inflexible," which was expected to be a bad roller. It consists in fitting one or more tanks across the ship of such shape that when filled to a suitable height with water the motion of the water from side to side as the vessel rolls is such as to retard the rolling. Let fig. 30 represent a series of transverse sections of a ship fitted with a water-chamber, in various positions in rolling from port to starboard; and suppose the water to move so as to be most effective in quelling rolling. Let G represent the centre of gravity of the ship including the water in the chamber, g the centre of gravity of the water in the chamber, and B the centre of buoyancy of the ship ; and let the arrows over the sections indicate the direction in which the ship is rolling at the instant considered. In position No. 1 suppose the ship to have reached the extreme heel to port and to be on the point of commencing the return roll, then g should have reached the middle line on its way down towards the port side and the righting couple will be that due to the angle of heel, supposing the water to be a fixed weight amidships. In the position No. 2 the ship has performed part of the roll back towards the upright; the water will have moved farther down the incline, so that g will be some distance from the middle line on the port side as shown, and therefore G will also have moved out from the middle line on the port side; hence the righting couple will be less than what would correspond to the angle of heel if the water were a fixed weight amidships. In position No. 3 the ship has just reached the upright and will be moving with the maximum angular velocity; the water will have moved still farther down the incline, and g will be at a greater distance from the middle line on the port side, and therefore G will have moved farther out from the middle line, whereas B will have returned to the middle line; so that the weight of the ship and the upward pressure of the water will form a couple tending to retard the ship's rotation, although she is for the moment in the upright position. In the position No. 4 the ship is heeling over to starboard and the centre of gravity of the water is returning towards the middle line; but it and G are still on the

«■

«.

)

Fig. 30.

port side, and the righting couple is therefore greater than that corresponding to the angle of heel of the ship and a fixed centre of gravity amidships. In the position No. 5 the ship has momentarily

come to rest at the end of the starboard roll, the centre of gravity of the water should have again reached the middle line, and the righting couple should be neither increased nor diminished by the water-chamber, except in so far as it affects the displacement and the vertical position of the centre of gravity. The same process is repeated on the ship's roll back from starboard to port. Thus the water-chaYnber reduces the angle of roll of the ship chiefly by modify- ing the righting couple acting upon her throughout the rolling; it increases the righting couple which opposes the motion as the ship heels over, thereby reducing the amount of the heel, and on the return roll it lessens the righting couple and causes the ship to move more slowly than she otherwise would, so that she acquires less angular momentum on reaching the upright, and therefore tends to roll less deeply the other way.

Two water-chambers were originally contemplated in the old Inflexible, but the space occupied by one of these was required for other purposes, and only one, the smaller of the two, which was 51 ft. long (across the ship), and 14 ft. wide (fore and aft), was finally fitted. This was shown to reduce the rolling by about 25 %. Several ships have since been fitted with this device. 1

In addition to trials at sea to ascertain the diminution of roll by this means, still-water rolling experiments were carried out in the " Edinburgh " and compared with the results obtained with a model

water-chamber on a linear scale of 5ˆ7;' loaded so that its period and

stability corresponded to those of the ship. A close agreement was observed between the behaviour of the model and the ship; and this enabled the experiments to be carried out over a larger range of conditions than would have been practicable with the ship alone. The model was supported on knife edges and connected to a paddle partially immersed in the water of a tank; this was adjusted to represent to scale the natural extinction of roll in the ship without

to 15 10 $ o

Angle of Roll in degrees

Fig. 31.

the water-chamber. The length of the chamber (in the ship) was 16 ft. ; and widths of 43 ft., 51! ft. and 67 ft. were successively given to it. The displacement of the ship was about 7500 tons; the period 10 seconds; and the metacentric height 7-52 ft. On experi- menting with different depths of water, it was found that the maxi- mum extinctive effect at all angles of roll was obtained with the depth at which the period of motion of the water from side to side of the tank is equal to the period of the ship. The best depths were found to be 2-3 ft. and 3-35 ft. with breadths of 43 ft. and 51 5 ft. respectively, thus agreeing closely with the theoretical formula, » = ijgh, for the speed of a solitary wave across the water-chamber. . In these circum- stances the water rushed across the tank in a breaking wave or bore, and consumed energy in its passage and through its violent impact with the sides of the tank. With other depths, the motion of the water, at moderate angles, took the form of a slope gently alternating from side to side at small angles of roll ; and the effect was practically non-extinctive. With the critical depth the growth of the resistance to rolling commenced almost at zero angle; but, with other depths, the extinction was nearly nil, until a certain angle of roll was attained, whose amount increased with the departure from the critical depth. At the larger angles of roll, the disadvantage of the departure from the critical depth was not marked. The resistance of the chamber increased considerably with the breadth; the value of the 515-ft. chamber was roughly twice and that of the 67-ft. chamber three times that of the 43-ft. chamber.

In order to compare the effect of water-chambers with that of other methods of extinction, it is observed that the resistance due to the former increases slowly at large angles of roll. The effectiveness of bilge keels, on the other hand, increases rapidly as the angle of roll increases. It was found that, with i2°roll, the resistance of the water-

chamber was equivalent to that of 2 ft. of additional bilge keel; but at 17I the water-chamber was relatively about half as effective. With 3 of roll, however, the water-chamber was about 9 times as

‘ See paper on ” A Method of Reducing the Rolling of Ships at Sea ” in Trans. Inst. Nav. Archs. 1883.

effective as the additional bilge keel. Fig. 31 shows the comparative rates of extinction under the various conditions. 2

Water-chambers have been successfully employed to limit the rolling motions at sea in ships of the old ” Inflexible,” ” Edinburgh ” and ” Admiral ” classes, and in other warships and merchant vessels.

Sir John Thornycroft devised an arrangement for overcoming the rolling motion of a ship amongst waves, consisting of a weight carried from side to side so as always to oppose the heeling couple caused by the wave slope. The weight was automatically worked by apparatus controlled by two pendulums (or their equivalent) , one of which — a long period pendulum — remained vertical, and the other — a short-period pendulum — placed itself perpendicular to the effective wave slope. The gear was fitted on a yacht of about 230 tons displacement, the moving weight being 8 tons; and the net effect in this case was to reduce the rolling by about one-half. (See Trans. Inst. Nav. Archs. 1892.)

An interesting application of the gyroscope to the diminution of rolling was devised by Dr 0. Schlick, and fitted by him to the S.S. ” See-bar.” The principle of its action, the details of the gear, and a description of the trials are given in papers read before the Inst. Nav. Archs. in 1904 and 1907. Particulars of the ” See-bar ” were: length 116 ft., breadth 11-7 ft., draught 3-4 ft., displacement 56 tons, meta- centric height 1-64 ft., and period of double roll (gyroscope at rest) 4-14 seconds. The fly-wheel of the gyroscope was one metre in external diameter, weighed 1 100 ft, and it was run at 1600 revolutions per minute ; its axis was initially vertical, and the casing containing the wheel was capable of revolving about a horizontal athwartship axis, the centre of gravity of the apparatus lying slightly below this axis. A brake was fitted to control the longitudinal oscillations of the casing. When the wheel was revolving and the axis held by the brake, no effect was produced upon the motion of the ship ; but when the axis was allowed to oscillate freely in the middle-line plane the period of roll was lengthened to 6 seconds, but no other extinctive effect was obtained. By suitably damping the longitudinal oscillations of the gyroscope, however, by means of the

brake, a large extinctive effect upon the rolling was experienced ; and during the trials made, the apparatus stopped practically all rolling motion.

The equations for the pitching motions of a vessel are identical in form with those for rolling ; and the preceding remarks are, in general, equally applicable to pitching. In a large number of ships piirhinr the period for pitching is approximately one-half of that d ™

for rolling; but the angles attained are considerably less. heaving. Where control over the longitudinal positions of weights is possible, e.g. in small sailing vessels, weights are removed as far as possible from the ends in order to shorten the period, the safety of short ships and boats being secured when the deck is maintained as nearly as possible parallel to the wave slope (v. remarks by Froude ante).

The single period for heaving and dipping oscillations is equal to

t \l-^- lr when W is the displacement in tons, and T" the tons per inch

immersion. When proceeding across waves of apparent semi-

T1 2 period Ti, forced heaving oscillations of semi-amplitude a vp 2 _^ 2

are obtained, where T is the single period of dip, and 2a is the vertical distance between the statical positions of the ship on crest and in trough of Wave. These oscillations combine with the free dipping oscillations due to the circumstances of the initial motion, the resultant motion being of interest in connexion with the longi- tudinal bending moments in the ship caused by the waves. (See section Strength.)

Pitching or rolling is frequently the cause of dipping oscillations, and the motion is then termed uneasy; this action may be of im- portance in ships whose sides near the water-line have a considerable slope to the vertical, since any rolling motion is then accompanied by vertical oscillations of the centre of gravity. It may also be shown that forced dipping oscillations of considerable amplitude are ob- tained when the period of roll (or pitch) in such cases approximates to twice the dipping period; the complex nature of the resistances attending the motion of the ship has, however, prevented a complete investigation being made.

Interference also occurs between the rolling and pitching move- ments of a ship, when the centres of gravity of the wedges of im-

mersion and emersion for moderate angles of heel are separated by a considerable distance longitudinally ; and occasionally uneasy rolling of a peculiar character is caused thereby.

Resistance. The resistance of a ship in steady motion, or the force exerted by the surrounding water on the hull, opposing its progress, is equal and opposite to the thrust of the propellers. The ship is subjected to a system of balanced forces, each of which is in some degree affected by the others. It is convenient, however, first to confine attention to the resistance of the hull, assuming the

2 See paper entitled " The Use of Water-Chambers for Reducing the Rolling of Ships at Sea," Trans. Inst. Nav. Archs. 1885.

propeller to be removed, and the ship to be towed through undisturbed water. Under these conditions the power expended in towing the vessel is termed the effective horse power, and is considerably less than the indicated horse power exerted by the propelling engines at the same speed. The relation between the effective and indicated horse powers, and the effect of the propellers on the resistance of the ship will be discussed under Propulsion, below.

If a body of " fair " form, i.e. without abruptness or discontinuity in its surface, moves uniformly at a considerable depth below the surface of an incompressible and perfect fluid, it can be shown that no resistance is experienced, and the uniform motion will, caeteris paribus, continue indefinitely. The motion of the fluid is extremely small, except in the close vicinity of the body. A clearer conception of the interaction of fluid and body is obtained by impressing upon the whole system a velocity equal and opposite to that of the body, which then becomes motionless and is situated in a uniform stream of the fluid. The particles of fluid move in a series of lines termed " stream lines"; and the surface formed by all the stream lines passing through a small closed contour is termed a " stream tube." If a denote the area of a stream tube, assumed sufficiently small for the velocity v at a point within it to be sensibly uniform across a section, then, since no fluid is leaving or entering the tube,

o.i» = constant throughout its length. The motion of the fluid is also

subject to Bernoulli's energy quotation —

p D 2

— A -h = constant,

w 2g

p, w and h being respectively the fluid pressure, the density and the height above a fixed datum.

The remaining conditions affecting the flow and determining the forms of the stream lines are purely geometrical, and depend on the form of the body.

The motion in a perfect fluid flowing past bodies of a few simple mathematical forms has been investigated with success, but in the general case the forms of the stream lines can only be obtained by approximate methods. It is evident that the flow is in all cases reversible since the equations are unaltered when the sign of v is changed; on the other hand any resistance must always oppose the motion, and therefore, as stated above, there can be no resistance under these conditions.

The circumstances attending the motion of a ship on the surface of the sea (or that of a stream of water flowing past a stationary vessel) Com ' differ from those hitherto as-

poaeats of sumec j . anc j resistance is experi- resistaace. ence(j through various causes. Frictional resistance results from the rubbing of the water past the surface of the hull; eddy resistances are caused by local discon- tinuities, such as shaft brackets; and resistance due to wind is experienced on the hull and upper works. Moreover, the stream-line motion, as will be shown later, causes a diminution in the relative velocity of the water at the ends of the ship; from the energy equation above, it is evident that the pressure is increased, resulting in an elevation of the surface of the water at those places. A wave is thus formed at the bow and stern, requiring an expenditure of energy for its maintenance and entailing additional resistance.

Of these components of resistance, that due to eddy making is usually small; eddying is caused by blunt beginnings or endings, particularly the latter, in the water-lines and underwater fittings. Air resistance also is generally of small importance; in the " Grey- hound " (unrigged) it constituted 1-4% of the total resistance at 10 knots in calm weather, and in a large Atlantic liner at 25 knots it absorbs

about 4% of the total power. In the case of average ships, unrigged or with moderate top-hamper, the proportion of air resistance is probably less than the latter value. The effect of wind and rough weather on the speed of ships is also largely due to the action of the waves and other motion of the sea, the additional effect of which is indeterminate.

The difference between the total resistance and that due to skin friction is termed the residuary resistance ; from the foregoing remarks it appears that it consists principally of the resistance due to wave- making. Since the action of the waves is such as to distort the stream lines near the hull, and the form of the waves is in turn affected by the frictional wake, the frictional and wave-making resistances of a ship are to some extent mutually dependent. It is convenient, how- ever, to neglect the interaction of these constituents, and to assume that the whole resistance is obtained by simple summation of its component parts as calculated independently. Considerable justi- fication for this assumption is furnished by the close agreement between the results of experiments on models and on ships, where the proportion of frictional to total resistance is greatly different.

Since the action and the reaction of the water pressure on the hull of a ship are equal and opposite, forward momentum is generated in the water at such a rate that the increase of momentum wake

per second is equal to the total resistance. The water participating in the forward movement is termed the wake ; the portion of the wake in the vicinity of the propellers is found to have consider- able effect upon the propulsion of the ship. Experiments -flrere made by Mr Calvert (Trans. Inst. N.A. 1893) to determine the wake velocity with a model of length 285 ft. and displacement 2-9 tons. The extent of the wake was measured at various positions in the length, and its maximum velocity was observed to be 0-67 times the speed of the ship. Abreast the screw the mean velocity ratio over an area of the same breadth (366 ft.) as the ship and of depth equal to the draught (1-55 ft.) was 0-19, of which about 0-05 was ascribed to frictional resistance. In Rep. Brit. Assoc. 1874 is contained an investigation by Froude of the extent of the frictional wake and its velocity distribution based on the equality of the resistance to the momentum added per second. It may be here observed that for any ship propelled in the ordinary manner at uniform speed the momentum generated in the sternward race from the propeller is equal and opposite to that of the forward wake due to the hull. The motion of the water as a whole thus consists of a circulatory disturbance

advancing with the ship, and having no linear momentum.

The whole of the resistance at low speeds, and a considerable proportion of it at higher speeds, is due to surface friction, i.e. to the eddying belt surrounding the hull which is caused by the Frictlona . tangential frictional action between the water and the out- . side skin. It is nearly independent of the form of the vessel ; n ‘ st ‘ u ” :e • and is conveniently estimated from the results of experiments made by towing in a tank planks coated with various surfaces. The most important of such experiments were those made by Froude in the experimental tank at Chelston Cross, Torquay. The object was to obtain the laws of variation of resistance with the speed, the length, and the quality of the surface. A dynamometric apparatus by which the planks were towed was used to register the resistance; the planks were given a fine edge at each end to avoid eddy making, and were fully immersed in order that no waves should be formed. The results are given in the Reports of the British Association, 1872 and 1874. In the following extract n is the index of the speed at which the resistance varies, A the mean resistance per square foot of surface over the length stated, and B the resistance per square foot at the after end of the plank; both A and B refer to a velocity of 10 ft. per second in fresh water.

Length of Surface in Feet.

2 ft.

8 ft.

20 ft.

50 ft.

n.

A.

B.

n.

A.

B.

n.

A.

B.

n.

A.

B.

Tinfoil .

2-l6

•30

•295

1-99

•278

•263

1-90

•262

■244

1-83

•246

•232

Paraffin

1-95

•38

•370

1-94

•314

•260

1-93

•27I

•237

Varnish

2-00

•41

■39°

i-8S

•325

•264

i-«5

•278

■240

1-83

•250

•226

Fine sand .

2-0O

•81

•690

2-00

•583

•450

2-00

•480

•3«4

2-06

•405

•337

Calico .

1-93

•87

•725

1-92

■626

•504

1-89

•531

•447

i-8 7

•474

•423

Medium sand .

2-00

•90

•730

2-00

•625

•488

2-00

•534

■4 < >5

2-00

•488

•456

Coarse sand

2-O0

I-IO

•880

2-O0

•714

•520

2-00

•5«8

•490

These results are in accordance with the formula —

V”

R being the frictional resistance, S the area of surface, V the speed, w the density of the water, / a coefficient depending on the nature and length of the surface, and n the index of the speed; the values of / and n can be readily obtained from the above table. It is seen that the resistance varies as the density of the water, but is inde- pendent of its pressure; it diminishes as the length of the surface increases, on account of the frictional wake, which reduces the velocity of rubbing between the water and the surface towards the after end. The index n

is 1-83 for a varnished surface equivalent to the freshly painted hull of a ship. The results of Froude' s ex- periments are closely corroborated by similar experiments under- taken by the late Dr Tideman.

When applying the data to ships of length greater than 50 ft., the coefficient B, denoting the resistance 50 ft. from the bow, is assumed to remain unaltered at all greater distances astern. The velocity of rubbing is assumed equal to the speed of the ship, any slight variation due to stream-line action being neglected. The wetted surface S, when not directly calculated, can be estimated with sufficient accuracy by the formula —

S = i- 7 LD+ˆ

where V is the volume of displacement, L the length, and D the mean draught.

The resistance due to wave making, although inconsiderable at low speeds, is of importance at moderate and at high Ware speeds; it constitutes the greater portion ot the total regirtajIce . resistance in fast ships.

RESISTANCE]

SHIPBUILDING

94

By impressing, as above, a suitable velocity on the whole system sf ship and water, the problem is reduced to one of steady motion in a stream flowing past a stationary ship. The stream tubes, originally of uniform width, become broader on approaching the bow of the ship, and attain their greatest breadth close to the stem. Proceeding aft, the tubes contract, and near amidships they become smaller than they were originally; an enlargement in the tubes again takes place near the stern. The changes in size and velocity in the stream tubes lead to corresponding alterations of pressure in accordance with the energy equation, which alterations appear as elevations and depressions of the surface forming what is termed the statical wave system. If this were a permanent system, no resistance to the motion of the ship would be caused thereby. The surface disturbance, however, is subject to the dynamical laws underlying the propagation of waves; in consequence the wave formation differs from the " statical wave," the crest lagging astern of the " statical " wave crest, and the ship being followed by a train of waves whose lengths are

appropriate to the speed attained. The energy within the wave system travels backward relative to the ship at one-half its speed; the resistance experienced by the ship is due to the sternward drain of the wave energy which requires work to be done on the ship to replace that absorbed by the waves.

The form of the wave system is not susceptible of complete mathematical investigation; but the circumstances are approximately realized and the conditions considerably simplified when the actions of the bow and stern of the vessel are each replaced by the mathematical conception of a " pressure point." This consists of an infinitely large pressure applied over an indefinitely small region of the water surface; it is assumed to move forward in place of the ship through still water, or, equally, to be stationary in a uniform stream. The resulting wave system has been investigated by Lord Kelvin and others. It is found to consist of a local disturbance surrounding the pressure point and depending on the pressure distribution combined with a series of waves which are confined within two straight lines drawn backwards through the pressure

point and making angles of about 20° (tanˆJTˆ) with the line of

motion. The waves within this region extend indefinitely astern with crests crossing the line of motion perpendicularly. The crest lines are slightly curved, convex to the pressure point, and at the bounding lines form cusps whose tangents are inclined to the line of

flow at an angle of about 36° (tan -1 ~ˆ=) . The crest lines afterwards

curve forward towards the pressure point. The distance apart of the transverse wave crests is equal to the length / of wave appro- priate to the speed v, as expressed in the formula v' — gl/2ir. These results are of interest since they are in agreement in many respects with those of actual observation for ships and models. In fig. 32,

Fig. 32.

reproduced from a paper in the I.N.A. 1877, read by Froude, is shown the bow-wave system obtained from a model, which is also illustra- tive of that produced by ships of all types. It appears therefore that two types of waves accompany a ship — (1) diverging waves having sharply defined crests placed in echelon, the foremost wave alone extending to the ship ; (2) transverse waves limited in breadth by the diverging crests and reaching the sides of the vessel

through- out its length. These compare with the crest lines obtained in the above hydrodynamical investigation; the transverse and diverging waves correspond to the different portions of the crest lines which are separated by the cusps.

Since the bow diverging waves are not in contact with the ship except at the bow, the energy spent in their maintenance travels away from the ship and is lost. A diverging wave system of similar form but of smaller dimensions attends the passage of the stern; and the resistance due to the diverging systems of waves is therefore the sum of its components at the bow and stern, following a regular

although unknown law, increasing with the speed, and depending considerably on the shape of the bow and stern.

On the other hand the interference between the transverse bow and stern wave systems produces a stern wave in contact with the ship; the resistance due to the resultant transverse wave system depends therefore on the phase relation between the waves of the component systems. The effect of interference on the wave resistance was investigated by Froude (Trans. I.N.A. 1877) by means of experiments on a series of models having the same entrance and run, but in which the length of parallel middle body was varied. At constant speed curves of residuary resistance on a length base consisted of humps and hollows, whose spacing was constant and approximately equal to the wave length appropriate to the speed ; the amplitude of the fluctuation diminished as the length increased. For a given length the residuary resistance in general increased at a high power of the speed ; but it was also subject to a series of fluctuations whose magnitude and spacing increased with the speed. The results of these experiments were fully analysed in 1881 by Mr R. E. Froude, who showed that a reduction in the resistance occurred when the trough of the bow wave coincided with the crest of the component stern wave, the resultant wave system being of relatively small dimen- sions. Conversely, the resistance was abnormally increased when the crests of the bow and stern systems coincided. The fluctuation in the resistance thereby obtained was smaller when the length of middle body became greater, owing to the greater degradation of the bow wave system at the stern through viscosity and lateral spreading. For very considerable lengths of middle body, the height of the bow wave system at the stern was insufficient to produce interference or affect the resistance.

The speed in knots (V) of a wave is related to the length in feet (/) by the formula V 2 =l-8/. If L' be the distance apart of the com- ponent

bow and stern waves (which is generally rather greater than the length of the ship), relatively small resistance would be antici- pated when V 2 is approximately equal to 3-6 L' or any odd sub- multiple of 3-6 L'; on the other hand when V 2 was not greatly different from 1-8 L', or any submultiple of 1-8 L', abnormal wave resistance would be developed. This result is to a great extent con- firmed by experience with ships of all classes; for economical pro- pulsion at a speed V, the length L of a ship should be generally equal to or slightly less than V 2 , corresponding to the " favourable '

. V 2 value of about 1-2 of the ratio y, ; torpedo-boat destroyers and

similar vessels of extremely high speed constitute an exception, the

V 2 value of the ratio y being then frequently as great as 4, which ap-

V 2 proximately coincides with the highest "favourable" value of -7-7.

The foregoing description of the resistance experienced by ships through wave making makes it evident that the conditions under- lying wave resistance are too complex to enable its amount to be directly estimated as is possible in the case of Law of frictional resistance. Experiments also show that there is com ' no simple law connecting wave resistance with size, form paiison. or speed. The effect of size alone, i.e. the scale of the experiment, can, however, be eliminated by means of the " principle of similitude " enunciated by Newton, which is applicable with certain limitations to all dynamical systems. The extension of this principle forms the foundation of all methods employed practically for estimating the residuary resistance and horse power of ships. The principle states that in two geometrically and mechanically similar systems, whose linear dimensions vary as the squares of the velocities of the corresponding particles, and whose forces vary as their masses, the motions of the two systems will be similar. A proof of this theorem follows at once from the equations of motion for any particle. The law of comparison, which is the application (origin- ally made by Froude) of the principle of similitude to the resistance of ships, is enunciated as follows :

" If the linear dimensions of a ship be n times those of its model, and the resistances of the latter be Ri, R 2 , R 3 , ... at speeds Vi, V 2 , V3, . . . , then the_ resistances of the ship at the 'correspond- ing speeds ' Vi Vw, V 2 V», V3 Vw, . . . will be Ri» 3 , R 2 » 3 , R 3 » 3 , .

. . and therefore the effective horse powers at corresponding speeds are increased in the ratio n 2 : 1."

It is necessary to ensure that the conditions underlying the principle of similitude are satisfied by all the components of resistance, when the law of comparison is employed for the purpose of obtaining the ratio between the total resistances of two ships at corresponding speeds. Residuary resistance, consisting of that caused by wave making, eddies, and air resistance, is attributable to normal pressures on various surfaces caused by changes of velocity in the water or air. It appears from Bernoulli's energy equation that the pressures per unit area are proportional to the square of the velocity, i.e. at corre- sponding speeds, to the linear dimensions. The total pressures are therefore proportional to the cube of the linear dimensions, i.e. to the masses, thus complying with the primary condition regarding the force ratios. Frictional resistance, which varies with the length of surface and as the 1-83 power of the speed, does not satisfy this condition. In the application of the law of comparison to ships and

models where the linear ratio is considerable, the residuary resistance alone should be compared by that means, the frictional resistance being independently calculated for ship and model from the results of Froude's experiments. The law may, however, be extended with- out appreciable error to total resistance when the correspond- ing linear dimensions of the ships compared are not greatly different.

If it be assumed that the residuary resistance of a ship is capable of being expressed as the sum of a number of terms of the form W m V B , where W is the displacement, it appears from the law of comparison that 6OT + n = 6 for each term of the expression; and in the con- struction of approximate formulae of this type for residuary resist- ance, the indices m and n must satisfy this equation. The values of the indices are found to vary irregularly with the speed and type of ship; at uneconomical speeds n may be equal to or greater than 5, and at " favourable " speeds its value may be as low as 1-5, 4 being an approximate mean value for n at moderate speeds. A fact pointed out by Professor Biles in a paper read before the Institution

of Naval Architects in 1881 is interesting in this connexion. When the resistance of a ship varies as the 6th power of the speed, an increase in the displacement by a proportionate enlargement of dimension will not cause an increase in the resistance for the same speed; and if the resistance varied as a higher power of the speed than the 6th, the resistance would actually be reduced by increasing the displacement.

The accuracy of the law of comparison was verified by the " Grey-hound " resistance experiments carried out by Froude on behalf of the Admiralty (Trans. I.N.A., 1874).

The "Greyhound " was a twin-screw sloop 170 ft. long and of about 1 1 60 tons displacement; the trials were made over a range of speeds extending from 3 to 12J knots, and with varying draught and trim. She was towed from the end of a spar 48 ft. in length projecting over the side of the towing vessel, H.M.S. " Active "; this ensured that the wave system and wake of the " Active " were prevented from reach- ing the " Greyhound " and influencing her resistance. A dynamo- metric apparatus was placed in the bow of the " Greyhound, " and arranged so as to record the horizontal component of the tension in the tow rope ; by this means the ship's resistance was measured under various conditions and her effective horse-power obtained. A " log ship" or small board, ballasted to sink a few feet and remain normal to the direction of the pull, was attached to the end of a log line which was allowed to run freely out over the end of a spar during the trials. The slip of the " log ship " having been obtained during inde- pendent trials, the speed of the " Greyhound " was estimated from the log-line readings with fair accuracy. From these results curves of resistance on a base of speed were constructed for various conditions of draught and trim ; the frictional resistance was estimated from the experiments on planks, and curves of residuary resistance were obtained. A model of the " Greyhound," on a scale of ˆ full size, was also towed in'the experimental tank under conditions correspond- ing to those of the ship ; as with the ship, the total resistance was measured, that due to friction was calculated, and the residuary resistance of the model was obtained. It was found, by assuming a particular value for the unknown frictional coefficient of the " Greyhound," that a close agreement occurred between the residuary resistances of ship and model. This coefficient corresponded to that for a mixture of § calico and § varnish, which was probably equivalent to the condition of the ship's bottom during the trials.

Similar experiments were carried out by Mr Yarrow (Trans. I.N. A.,

1883) on a torpedo boat 100 ft. long; it was found that the residuary resistance of the boat was then about 3% in excess of that deduced by the law of comparison from experiments on a model.

As a result of the " Greyhound " trials, the accepted method of estimating the horse-power required for a new ship is by running a Model scale model under corresponding conditions in an ex-

expert- perimental tank fitted and equipped for the purpose. meats The law of comparison is applied to the residuary resistance,

or, if used for the total resistance, a " frictional correction " is made (see below). In 1871 Froude constructed a tank and suitable apparatus at Torquay on behalf of the British Admiralty. In 1885, six years after his death, the ground occupied by the Torquay tank was required for building purposes, and a new tank was constructed at Haslar, near Portsmouth, from the designs and under the super-vision of Mr R. E. Froude, such improvements being added as experience at Torquay had shown to be desirable. At both these tanks models of propellers as well as of ships were experimented upon, besides a variety of matters connected with the general subject.

Similar establishments have now been instituted by several foreign governments and by two private firms in Great Britain, Messrs Denny at Dumbarton and Messrs John Brown at Clydebank. The ex-perimental tank now under construction at Teddington should prove an important and useful addition to the number of such installations in this country. It is intended to be used for general research and to be available also for undertaking such private work as may be re-quired by shipbuilding firms. Its inception is due to a committee composed largely of members of the Institution of Naval Architects, and the cost of installation is being defrayed by Mr A. F. Yarrow. The tank will form a part of the National Physical Laboratory,

and its general control will be in the hands of officers of the laboratory.

The Admiralty experimental tank at Haslar is nearly 400 ft. long, 20 ft. wide and 9 ft. deep. The main experimental carriage spans the whole width of the tank, and carries a secondary railway on which the subsidiary carriages, which carry the experimental apparatus of different kinds, are adjusted in position. The main carriage runs on rails on the side walls, and can travel the whole length of the tank; it is driven at various speeds by a wire rope from a stationary engine of ample power. Ordinary speeds range from 100 to 800 ft. per minute,

while an extreme speed of 1200 ft. per minute can be obtained; the speeds are regulated by a highly sensitive governor. The models, generally from 10 to 14 ft. long, are made of hard paraffin wax, somewhat over 1 in. in thickness; they are cast in a mould, with an allowance of about J in. for finishing. The model is shaped accurately by being placed bottom up on the bed of a machine in which a pair of revolving cutters, one on each side of the model, cuts out on its surface a series of level lines, whose contours are precisely similar to those on the drawing of the ship whose model is under treatment. When all the level lines have been cut in, the model presents the appearance of a series of steps, the bottom angles of which correctly represent the true form the model should possess. The paraffin ridges between these level lines are trimmed off by the use of suitable tools and the outside surface made quite smooth with flexible steel scrapers. The model is ballasted to its required displacement and saddled with a frame, which carries the guiding attachment and also the towing-rod, and is then placed below the dynamometer. The towing-rod at its for- ward end is then in a position to impart horizontal forces by a hard steel surface to a knife-edge on the dynamometer lever within the model at about the level of the water surface. There are various delicate arrangements with knife-edge adjustments, which result in the horizontal forces being transmitted through a spiral spring, the extensions of which are multiplied by a lever and recorded by a pen on a paper-covered cylinder, distance and time being simul- taneously recorded. The speed and resistance corresponding to each experiment are deduced from these elements, a most necessary condition being that the speed shall be uniform throughout each experiment. By somewhat similar arrangements on a subsidiary carriage, the action of model screw propellers is tested either in undisturbed water or behind a model, the speed, rate of rotation, rotary resistance and thrust being measured.

An interesting account by Dr Glazebrook of some experimental tanks in various countries, together with particulars of some im- provements in their equipment, appears in Trans. I.N. A., 1909.

Of the very large number of experimental results that have now been obtained from the trials of ships' models in the tanks referred to above, comparatively few have been made public. .

In connexion with the Torquay and Haslar tanks some Exaerl- few of the reports by the elder Froude and Mr R. E. Froude have been published by order or permission of the Board of Admiralty, chiefly through the Institution of Naval Architects. Amongst these may be

mentioned the " Greyhound " experiments recorded in 1874; the " Merkara " results in 1876; experiments on the effect produced on the wave-making resistance of ships by varying the length of parallel middle body, in 1877; results obtained from models of three merchant liners in 1881; papers in 1888 and 1892 on the " constant " system of notation of results of model experiments, used at the Admiralty Experimental Works; and some results of a systematic series of model experiments by Mr R. E. Froude appeared in 1904. Some records of the experiments made at private and foreign experiment establishments have also appeared.

Some of the most important of these experiments are described in these notes ; it remains to show how they are applied in practice to obtain an estimate of the indicated horse-power required to drive a ship at any speed. If the resistance has been obtained from a model experiment, or inferred by the law of comparison from data obtained with a vessel of similar type, the effective horse-power is known; and by assuming a suitable value for the propulsive coefficient (vide Propulsion) the indicated horse-power is determined.

If model experiments or data for exactly similar ships are un-available, the method of estimating the power which is probably most commonly used is one involving a relation between I.H.P., displacement, and speed, which is expressed by the formula—

(Speed) 3 X (Displacement) 3 I.H.P.

mental results.

= C,

C being called the Admiralty coefficient. The value of C varies considerably at different speeds even for the same ship. For it to be constant, the I.H.P. must vary as the cube of the speed; if resistance varied as the square of the speed and I.H.P. as resistance and speed, the condition of constancy would be fulfilled. Actually, owing to variations in the index of the speed to which the resistance is proportional, in the length and form of the ship and ' in the machinery and propellers, this method of estimating I.H.P can only be used with great caution, care being taken that the values of C selected for comparison are taken from ships of fairly similar type, and of corresponding lengths and speeds. I Another means of obtaining approximate estimates of the power

RESISTANCE]

required for ships of ordinary types is from curves of resistance drawn on a base of simple functions of the speed, length and displacement, the curves being faired through the spots obtained from a large number of results of model experiments with different classes of ships. Curves of this character have been constructed by Mr D. W. Taylor and Mr A. W. Johns (Trans. I.N.A., 1907) ; the former series expresses the residuary resistance per ton of displacement in

V 2 W

terms of jj and t 3 ; the latter gives the residuary horse-power

1 V 2

divided by W 6 in terms of j and the prismatic coefficient

Volume of Displacement . .

Area of Immersed Midship Section X Length : tne fnctl ° nal resistance is calculated independently by Froude's or Tideman's tables..

To furnish data for estimating the I.H.P. of vessels covering a considerable range of type, a series of experiments on systematically varied forms of -hull were made by-Mr R. E. Fronde. The results" were published by him in the Trans. I.N. A., ˆ904; iand are given in figs. 40 to 51.

The forms of hull dealt with may be primarily divided into two

groups, A and B, differing in Beam and Draught ratio; j-. 6a "L

being equal to 2-59 and 3-48 for A and B respectively. Each group is further divided into 6 types, differing in block coefficients, and the table following gives particulars of the coefficients for the models tried:—

,

Stern snubbed,

forward body

as Type 1 .

Bow snubbed, after body as Type 3.

Type. ‘

1.

2.

3-

■ *4:*

5-

6.

Block coefficients 1

or 1

Volume of Displacement |

■*495*

•*505*

•*516*

•*522*

•*?29*

•*542*

Length X Breadth X Draught J

Largest section coefficient ~|

or _ 1

Area of immersed midship section f

Breadth X Draught J

•*951*

•*The hull characteristics for A are shown in figs.. 33 and 34, 1 and the mode of presenting these indicates the way in which the several*

types were formed, each being obtained from- the type I model by successively cutting back its stern and bow. This cutting back is termed snubbing. A curve of areas of transverse sections is given (fig. 35, Plate I.), as well as the sheer draught. The lines of group B can be derived from A, by altering beam and draught scales in the ratio of

57 and io^I re 9P ecti vely/ Each of, the^.12- forms which embodied

these lines was the generator of a series, differing only in length proportion. , /

The curve of areas is an important item in the hull characteristics. Experiment shows that the resistance of a hull, of given curve of areas, beam and water-line entrance, is practically unaltered how-ever the lines are varied (so long as they are kept ship-shape, and no unfair features are introduced). It follows, therefore, that although the data correspond to a given type of lines, yet (consistently with the preceding conditions) they are capable of application—oVer a wider field than at .first sight seems likely, covering variations of draught, form of profile and transverse sections,.- '

Regarding the foregoing statement of permissible variations of

lines, alteration in p raug ht rat '° has some effect. Comparison of

the two groups A and B gives the effect of the variation in the

Beam . .' . , ... -'''

Draught ratl ° tned ' and it is found that [caeteris paribus) in-

Beam , ' . .. creasing fo raught by 34% [i.e. from 2 59 to 3 48) increases the

E.H.P. by about 4%. A brief and approximate statement of the

results of some experiment>Avith models of varying ts eam . t ratio,

by Lieut.-Colonel G. Rota, R.I.N, (see Trans. I.N:A.., 1905), is that

u j 1 <■ Beam . " ■ ' ' ,,, . Beam

*beyond a value of BSifft^'5 an increase of 10% in p^^*

1 These lines differ from, those tried in the models which are given in Trans. J.N.A-, l.9°4 CsJ") Those now given have the same curve of

areas and beam, but ajfe modified in respect of draught, profile and shape of transverse -sections, these latter being filled out so as more closely to represent rhbdern forms. However, a model has been tried recently, embodying th£ modifications, and the results found to be practically identical with those obtained for the original lines.

causes about 1% to 2-5% increase in resistance (the lower value being appropriate to the higher speeds, and vice versa). This result accords with that deduced from the A and B groups.

By the aid of the law of comparison (and a correction for skin friction), the information, provided can- be used to obtain the E.H.P. for any size of ship of form included in the experiments (or covered by the possible extensions, vide supra). The I.H.P. follows by using a suitable propulsive coefficient. An example is given below as an illustration. In practical application it is important to notice that the lengths used in reckoning the proportions must be the total length of immersed form {i.e. of the curve of areas) and not the distance between perpendiculars arbitrarily placed.

The data are here given.Xfigs. 40-51, Plates IIL-VI.) in the form of curves of E.H.F.' for ships of 1000 tons displacement, plotted for a given speed on a base of immersed length. The range in abscissae shows the amount of variation in length proportion tried in the-experiments; and as regards speed range the group B is for gener-ally higher speeds than group A. The curves may be termed standard E.H.P. curves.

The block coefficients of the forms dealt with are lower than those of the greater proportion of merchant ships, and hence the data are not directly applicable to these. At higher speeds, however, the E.H.P. might be approximately estimated from 'these curves, by assuming a further degree of snubbing appropriate to the required block coefficient; but at speeds which correspond to those of ordinary merchant ships (which are the lower speeds given in the diagrarns) the effect of snubbing is variable, and depends really upon

the actual speed-length ratio (i.e. =\ of the ship we are dealing

with.

" In this connexion it may be noted that the diagrams not only afford a means of determining the I.H.P. of a given ship, but they may also be used in designing, and so enable the best form to be chosen, to fulfil the given conditions of displacement and speed, &c. For

example, suppose a ship of given displacement is, required to obtain a given speed, with a given maximum E.H.P. (or 'I.H.P. assuming an appropriate propulsive coefficient). First bring' the given particulars to the proper scale for 1 000 tons displacement (», the ratio of the

linear dimensions, is equal to -(D , spt) 3 and hence E.H.P. becomes

(rjfpr:) * and speed (cˆpr:) S times the given values)- A * e.h.p.

curve for the given speed is easily interpolated on the diagrams, and we can at once obtain-for the given E.H.P. (I) thie …length for each type,' (2) the type which gives the most suitable ■■length', (3) the economy resulting from any additional length, (4) the'type for a. given fixed length which gives the speed with least E.H.P., and (5) t)y inspec- tion at lower speeds,' how alternative forms compare at.thes£ speeds. The following points may commend themselves, from consideration of an instructive comparison shown in fig. 4, where for the B group, E.H.P. curves for types I, 3 and 6 are drawn together. In draw— ing conclusions, it must be clearly remembered that the E.H.P.'s, speeds and lengths are for a standard displacement, viz. 1O00 tons ; .and so in applications for different displacements, these quantities all undergo a numerical change, dependent upon the change in dis- placement. The first point is the effect of length on E.H.P. ; this is most marked at high speeds; and even at low speeds, for the shorter lengths the E.H.P. begins to increase rapidly with decrease in length. At these low speeds if, on the other hand, the length be increased beyond a certain point, no economy at all results, but the reverse. The reason for this is clear. At the low speed-length ratio we are considering, the wave-making resistance is practically nil, the resistance being almost entirely due to skin friction and eddy making, &c. It is obvious that by continually reducing the transverse dimensions of a ship of constant displacement, we increase the wetted skin (in the limit when the transverse scale is zero the surface is infinite) ; hence the resistance due to skin friction increases, and so therefore does the total resistance. This point would be more evident if the diagrams had been continued to a greater length and lower speed. A second point is the effect of alteration in block coefficient. At all speeds above 20 knots, snubbing within the limits shown is beneficial as regards performance. At lower speeds the effect de- pends oh the length. Since it is at these lower speeds the ordinary type' of merchant ship works, we may say that the effect of snubbing is doubtful for these, and depeiids upon the speed*length ratio. A better result might be obtained in such cases if the method of increas- ing the block coefficient were by i he insertion of parallel middle body and not by an extension of snubbing. (For fuller

*information on this point see Mr R. E. Froude's 1904 I.N.A. paper.)' A third point is the effect of change in speed. For a given length, the.rate of increase of EJf.P. with speed grows with the speed,but increases least for the more snubbed type. As an instance consider group B, types I and 6 at alength of 300 ft. (see fig. 36, Plate I.). The following table gives the increase in E.H.P. for the corresponding changes in speed, and the index of the speed, representing the. variation of E*H,P. with speed. The figures in columns (4) and (5) are the means obtained from the individual pairs of speeds ; at intermediate speeds these may have different'and constantly changing values: —*

■ < – ¥ *J*

*kl *. w hi*

Change of Speed.

Corresponding Change : in E.H.P.

Corresponding Index of Speed.

Types(l)and(6).

Type (1).

Type (6).

Type (1).

Type (6).

14-16 knots 22-23 „ 25-26 „

245 E.H.P. 760 „ 890 „

273 E.H.P. 650 „ 820 „

31

5‘3 4-0

3-o

4.9

4-1

The variation of the rate of growth of I.H.P. (or E.H.P.) with the speed is a result of the interference of the bow and stern wave systems, and is dependent upon the speed-length ratio {vide ” Wave Resistance, ” above). A good illustration is afforded by taking the case of a vessel such as a torpedo-boat destroyer, which is run over a con- siderable range of speed. Fig. 37, Plate 1 1 . shows, for such a vessel.three curves plotted to a base of speed, the ordinates being respectively —

*IHPIHP ^**

J-H-P-i A s ‘need’v fsneed^ 3 ‘ The second of these is of course a curve of resistance, and the rapid rise and fall of the rate of growth of resist- ance manifests itself in this resistance-curve by a very marked hump

I H P between 15 and 25 knots speed. The third curve, that of / eedS 3 ‘

is interesting as affording, by its slope at different points, a very good indication of this rate of growth. Up to about 13 knots this curve is not far frm being horizontal, indicating that till then the resistance is varying about as the square of the speed. The rate of growth increases from this point till it reaches a maximum of 15 knots, and , then falls, off till at about 20 knots the resistance once more varies as the square of the speed. From this point onward the resistance increases at a less rate than the square of the speed.

It has been previously noted that the skin friction part of, the E.H.P.

does not obey the law of comparison; this is on account of variation . of / with length, and the index of the speed being different from 2. The coefficient / varies much more rapidly at the smaller lengths, and hence for these the. skin friction correction is more important for a given change in length. For such lengths as are dealt -with in ships, e.g. 100 ft. and upwards, and such lengths as we should deal'with in applying the data that are now given, it has been found possible to express the correction for skin friction very accurately by the curves in fig. 38, Plate I J. These indicate the absolute correction that miist be applied to the E.H.P. dedyced for thcgiven displacement from the standard curves when interpreted by the law of comparison, and are drawn for a series of displacements on a base of speed; the correction for any odd displacement can be easily interpolated. An addition must be made for displacements under, and a deduction for displacements over, the standard 1000 tons. ■

The following example illustrates this point and the method of using the standard curves : — –

A vessel 32o'X35f'Xt3'X2i35 tons is being designed ; to construct an E.H.P. curve, for speeds 1 1-22 J knots. The proportions

(f)r hT rat ‘° an ˆ block coefficient) -of the design are most closely

approximated to by type 2, group A (350′ being the immersed length). First find the length I for a similar vessel of 1000 tons displace-

ˆ20

ment; /= ; ˆ y 1 -=248-5 ft., and then from fig. 41 read off

ordinateˆ representing E.H.P. for the given speeds of the 1000-ton standard ship. These figures are converted into those appropriate for the design, by the law of comparison. If v and e are the speed and E.H.P. for the 1000-ton ship, and V and E corresponding quantities

for the design, then – = (2-'i35) J = 1-135; and £ r = (2-I35) J =2-424-;

using these ratios we get a table thus : —

*In the results hitherto recorded the depth of water has been sup-posed sufficient to prevent the disturbance attending the motion of a vessel on the Surface from extending to the bottom ; in these circumstances the resistance is unaffected by a moderate sb *”°'« r*

change in the depth. Conditions, however, frequently water – arise in which vessels are run at high speeds in comparatively shallow water; and a marked alteration is then observed in the resistance and power corresponding to a particular speed. An investigation of the effect of shallow water on resistance is therefore of importance and interest; and a brief account of this part of the subject is here appended.

The change from deep to shallow water modifies the shape of the stream lines, many of which in deep water are approximately in planes normal to the surface of the hull; those in shoal water tend to lie more nearly in horizontal planes, owing to the reduced space under the bottom of the ship. In consequence, the velocity in the stream tubes in the vicinity of the ship is increased, and the changes of pressure and. the " statical " wave heights are exaggerated. This causes an increase in the f rictional resistance as the depth of water becomes less; but the effect on the residuary resistance is more complicated. ■ '

Firstly, the length .f ■ of the waves corresponding to a speed v is increased from that expressed by

■ '■ ■ v = & , 2w*

to be in accordance with the formula

a depth h. When the

v – f- tanh —r

JIT I . '

which applies to shallow- water waves for

depth h is' equal to — , the length of wave is infinite,? and the wave

becomes of the type investigated by Scott Russell in canals, and termed a "solitary wave " or a " wave of translation." When the

v % depth of water is less than — no permanent wave system of speed

v can exist. These changes In the wave length considerably affect the wave pattern and alter the speeds at which interference between the bow and stern systems has a favourable or unfavourable effect on the efficiency of propulsion.

In the second place the amount by which the speed of 'travel of the energy of the wave falls snort of the speed of the ship is -expressed by

sinh

I

*As converted by *

As read from

Law of Compari-

Correction to

the Standard

son for 2135-Tons

C0I.4 for Skin

C0I.4-C0I.5

Curves at a

Design.

' Friction : readfrom Figure.

= E.H.P.

Length = 248-5 Ft.

Corrected.

r. , , V, . E

Col. IX(W35=J0

Lot 2X(2-424=7>

Knots.

E.H.P.

Knots.

E.H.P.

E.H.P.

E.H.P.

10

150

n-35

364

16

348

12 ,

275-

■ *—13.62-*

667

29

. . 638 .

H '•

475

15-89

1151

42

1109

16

740

18-16

1794

55

1739

17

940

19-30

2278

61

„ 2217

18

1285

20-43

3115

67

, 3048

19

1825

21-56

4423

74

4349

20

2590

22-70

6278

6198

The curve shown in fig. 39, Plate II. results from plotting col. (6) to a base of speed given by col. (3) . Since the propulsive coefficient varies with the speed, it is preferable to take the E.H.P. from the curve and convert to I.H.P., using an appropriate coefficient, than to use a common coefficient by plotting a curve of I.H.P.

In deep water this difference of- speed. is.-; in shiallow water it

dirninishes, becoming zero at the critical depth producing & wave of translation. ... ... –

Thirdly, the local disturbance immediately surrounding the ship is increased in , shallow water, theoretical inyestigajripn showing that, at the critical depth above- referred to, it becomes indefinite or is only limited by its own viscosity and eddying~rESistance. ˆn still shallower Water, the antouflt'of 'disturbance is reduced as the depar ture from the critical depth becomes greater.

Finally, the increase of* the frictiorial resistance due to the higher velocity of rubbirfg is further modified by the large 'dimen- sions of the wave ' accompanying the ship; th£ particles of a wave in very shallow water are moving appreciably in the direction of travel, which might lead to a reduction in the frictional resistance.

From these considerations it appears impossible to obtain, a priori, the net effect of shallow water on the resistance, owing to the divergent character of the component effects producing the final result. This difficulty is confirmed by the inconsistency of the readings frequently obtained during experiments in shallow water, pointing to instability in the conditions then existing. A • number of experiments have been carried out in shallow water with both ships and models; the most important are those by Constructor Paulus (Schleswig- "Holstein District Club, 1904), Captain Rasmujssen, Mr Yarrow, Herr Popper and Major Rota, many of which are recorded in the I.N. A. Transactions. A summary of the conclusions drawn from them is appended : —

1. The minimum depth of water that has no appreciable influence on the resistance increases with the speed and, in some degree, with the dimensions of the ship.

2. At constant speed the resistance is, in general, greatest

at tˆe critical depth of water f — J . It is concluded, there-

fci-ej that the increase of resistance due to the enhanced dimensions of the wave then accompanying the ship is more thin sufficient to counteract the gain resulting from the ” diminished drain.ol energy from tie wave system astern.

3. At high speeds, when a considerable portion/ of the resistance is due tq wave-making, the total resistance diminishes at depths lower than the critical depth, and is frequently less in very shallow water than in deep water.

4. The “humps” in the curves of resistance on a base of

SHIPBUILDING

Plate L

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Group:;“AYB”

Types 1

-6

Body.

Fore

Body.

Type 1

- 2.

Types 1. Type 4.

2.2

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Types 3/-, 5,6

• 5

- 6

1

II 10

Fig. 35-— If length for 1,000-ton Ship be assumed 240 feet, then maximum ordinate of above curves represents- 279-9 square feet for Type i”

and for other lengths, the number of square feet varies inversely as the length.

2747

2

2690 ,,

3

2655

4

2621

5

855 ‘4

6

ZOO £4-0 280 S20

Immersed length in feet.

Fig. 36. —(“.roup B. Comparison of Types.

Type 1.

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Plate II.

SHIPBUILDING

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SCALt OF ^jPEED IN KNOTi

Fig. 37.

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Scale: of SPE.ED in Knots. Fig. 38. — Curves of Surface Friction Correction.

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Scale or Speed in Knots

Fig. 39.— Estimated Curve of E.H.P. for Vessel.. 320′ × 35!’ x 13′ × 2,135 Tons.

SHIPBUILDING

Plate HI.

*200 2*0 ”” 280*

Immersed length in feet.

Fig. 40.— Curves of E.H.P. for 1,000-ton Ship.

(‘■roup “A.”

Type 1. Block Coefficient -495.

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Immersed length in feet.

Fig. 42.— Curves of E.H.P. for 1,000-ton Ship. Group "A." Type 3. Block Coefficient -516.

Immersed length in feet.

Fig. ju.— Curves of E.H.P. for 1,000-ton Ship. Group "A." Type 2. Block Coefficient -505.

Immersed length in feet.

Fig. 43.— Curves of E.H.P. for 1,000-ton Ship.

Group "A."

Type 4. Block Coefficient -522.

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Plate IV.

SHIPBUILDING

2500 E.H.R

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1500

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zoo 24-0

Immersed length in feet.

Fig. 44. — Curves of E. II. P. for 1, 000-ton Ship. Group "A." Type 5. Block Coefficient -529.

E.M.P.

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200 24-0 280 320

Immersed length in feet.

Fig. 46. — Curves of E. H. P. for 1,000-ton Ship. Group "B." Type 1. Block Coefficient -495.

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EOO 24-0 260

Immersed length in feet.

Fig. 45. — Curves of E. H. P. for 1,000-lon Ship. Group “A.” Type 6. Block Coefficient -542.

Immersed length in feet.

Fig. 47. — Curves of E. H.P. for 1,000-ton Ship. Group “B.” Type 2. Block Coefficient -505.

SHIPBUILDING

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Immersed length in feet.

Fig. 50. — Curves of E. II. P. fur 1,000-ton Ship. Group ” B.” Type 5. Block Coefficient -529.

Immersed length in feet.

Fig. 51. — Curves of E. H.P. for 1,000-ton Ship. Group ” B.” Type 6. Block Coefficient -542.

M.iplin 74 fathoms

Sktlmorlic 40 ”

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Fig. 52.— Speed trials of H.M. Torpedo Boat Destroyer “Cossack.” At Maplin and Skelmorlie. Displacement 836 tons.

speed occur at lower speeds in shallow water, and are more pronounced; the resistance is occasionally reduced when the speed is increased.

5. The changes of resistance produced by shallowness are accom- panied by corresponding changes in the speed of revolution of the engines and in the trim of the vessel. These are illustrated by the curves in fig. 52, Plate VI., which are taken from a paper read before the I.N. A. by the writer in 1909, giving the results of some trials on H.M. torpedo-boat destroyer ” Cossack.”

The data obtained from the various shallow water experiments are capable of extension to ships of similar types by the applica- tion of the law of comparison at corresponding depths (pro- portional to the linear dimensions) and at corresponding speeds. The influence of shallow water on the speed ol a large number of ships can be thus obtained ; but the data at present available are insufficient to enable a general law, if any exists, to be determined.

A further modification in the conditions arises when a ship proceeds

along a channel of limited breadth and depth. Some interesting experiments were made in this connexion by Scott Russell on the resistance of barges towed in a narrow canal. He obtained (by measuring the pull in the tow rope) the resistance of a barge of about 6 tons displacement, for a mean depth of the canal of about 4j ft., as follows : .

Speed in miles per hour .

6-19

7-57

8 -5.2

9-04

Resistance in pounds .

250

500

400

280

At the critical speed (8-2 m. per hour) corresponding to the depth, the resistance was in this case reduced ; and at a higher speed a further reduction of resistance was observed. It is stated that the boat was then situated on a wave of translation extending to the sides of the canal, and which was capable of travelling unchanged for a considerable distance; the resistance of the boat was then almost entirely due to skin friction.

When the speed of a ship is not uniform, the resistance is altered

by an amount depending on the acceleration, the inertia of the ship

and the motion of the surrounding water. In the ideal

/lcee/era» conditions of a vessel wholly submerged in a perfect fluid,

”’ the force producing acceleration is the product of the

acceleration with the ” virtual mass,” which is the mass of the vessel increased by a proportion of the displacement; e.g. for a sphere, one

half the displacement added to the mass is equal to the virtual mass. The effect of acceleration on a ship under actual conditions is less simple; and the virtual mass, defined as the increase of re- sistance divided by the acceleration of the ship, varies considerably with the circumstances of the previous motion. . The mean value of the virtual mass of the " Greyhound," obtained by Froude from the resistance experiments, was about 20% in excess of the displace- ment. This value is probably approximately correct for all. ships of ordinary form, and is of use in estimating the time and distance required to make a moderate alteration in speed ; the conditions during the stopping, starting and reversing of ships are generally, however, such as to make this method inapplicable.

. . Propulsion.

The action of a marine propeller consists fundamentally of the sternward projection of a column of water termed the propeller race; the change of momentum per unit time of this water is equal to the thrust of the propeller, which during steady motion is balanced by the resistance of the ship.

Assuming in the first place that the passage of the ship does not affect and is uninfluenced by the working of the propeller, let V be the speed of the ship, -v., that of the propeller race relative to the ship, and m the mass of water added to the propeller race per second. The thrust T is then equal to m (»-V), and the rate at which useful work is done is TV or mV (v-V). Loss of energy is caused by (a) shock or disturbance at the propeller, (b) friction at the propeller surface, (c) rotational motions of the water in the race, and (d) the astern motion of the race. Of these (a), (b) and © are capable of variation and reduction by suitable pro- peller design; though unavoidable in practice, they may be dis- regarded for the purpose of obtaining the theoretical maximum efficiency of a perfect propeller. The remaining loss, due to the sternward race, is equal to §m(w-V) 2 ; whence the whole energy supplied to the propeller in unit time is expressed by ˆm(v'-V 2)

2V and the efficiency By ., . . The quantity iˆ-V is commonly termed

the slip, and — — the slip ratio ; the latter expression being denoted

by s, the theoretical maximum efficiency obtained on this basis

becomes ■ . It appears, therefore, that the maximum efficiency

should be obtained with minimum slip ; actually, however, with

screw propellers the losses here disregarded entirely modify this result, which is true only to the extent that very large slip is accompanied by

a low efficiency. The foregoing considerations show that, with a given thrust, the larger m the quantity of water acted upon (and the smaller, therefore, the slip), the higher is the efficiency generally obtained.

The type of propeller most nearly conforming to the fundamental assumption is the jet propeller in which water is drawn into the«hip through a pipe, accelerated by a pump, and discharged aft. The " Waterwitch " and a few other vessels have been propelled in this manner ; since, however, the quantity of water dealt with is limited for practical reasons, a considerable sternward velocity in the jet is required to produce the thrust, and the slip being necessarily large, only a very low efficiency is obtained. A secOndtype of propeller is the paddle, or stern-wheel which operates by means of floats mounted radially on a circular frame, and which project a race similar to that of the jet propeller. Certain practical difficulties inherent to this form of propulsion render it unsuitable or inefficient for general use, although it is of service in some ships of moderate speed which require large manoeuvring powers, e.g. tugs and pleasure steamers, or in vessels that have to run in very shallow water. The screw, which is the staple form of steamship propeller, has an action similar in effect to the propellers 1 already considered. Before proceeding to 1 discuss the action of screw propellers, it is desirable to define some of the' terms employed. The product of the revolutions and pitch is often called the speed of the propeller; it represents what the speed,wowld v be,in the absence of slip. Speed of advance, on the other hand, is applied to the forward movement of the propeller without reference to its rotation; and is equal to the speed of the ship or body. carrying. the propeller. The difference between the speed of the propeller and the speed of advance is termed the slip; and if the two former speeds be denoted by v and V respectively, the slip is v-V and the slip ratio

V-V '■■'-.-■■' :;■■■..:!.■■■. (or properly the apparent slip ratio) ... This notatiqacorresppncis

to that previously used, v-V being then defined- as the absolute velocity of the race; it is found with propellers of the usual type, that zero thrust is obtained when v = V, provided that the " con- ventional " pitch, which for large screws is approximately 1-02 times the pitch of the driving surface, is used in estimating v. The pitch divided by

the diameter is termed the pitch ratio. – ■ ‘

The theories formulated to explain the action of the screw pro- peller are divisible into two classes — (i.) those in which the action of the screw as a whole is considered with reference to the change of motion produced in the water which it encounters, the blade friction being, however, deduced from experiments on planes; and (ii.) those in which the action of each elementary portion of the blade surface is separately estimated from the known forces on planes moved through water with various speeds and at different angles of obliquity’; the force on any element being assumed uninfluenced by the surrounding elements, and being resolved axially and circumferentially, the thrust, turning, moment, and efficiency are given by summation^’ Professor Rankine in Trans. Inst. Nav. Archs., 1865, assumed that the pro- peller impressed change of. motion upon the water without change of pressure except such as is caused by the rotation of the race! In Sir George Greenhill’s investigation (Trans. Inst. Nav. Archs., 1888) it is assumed conversely that the thrust is obtained by change of pressure, the only changes of motion being the necessary circumferential velocity due to the rotation of the screw, arid a sufficrerit sternward momentum to equalize trie radial’ and axial’ pressures.- These two theories are both illustrative of class (i.) ; and this idea “viae further developed by Mr R. E. Froude in I889, who concluded that, the screw probably obtained its thrust by momentarily impressing -an increase of pressure on the water which eventually resulted in an increase of velocity about one-half of whichwas obtained’before and one-half abaft the screw. A lateral contraction of the race necessarily accompanies each process of acceleration. These general conclusions have been in some degree confirmed by experiments: carried qut by Mr D. W. Taylor,’ Proceedings of the (American) Society of Naval Architects, Sfc, 1906, and by Professor Flamm, who obtained photo- graphs of a screw race in a glass tank, air being drawn iri to show^he spiral path of the Wake. j

In Trans. Inst. Nav. Archs., 1878, Froude propounded a theqryiof the screw propeller illustrative of the second class above mentioned, the normal and tangential pressures on an elementary area being deduced from the results of his own previous experiments on obliquely moving planes. He was led to the following conclusions regarding maximum efficiency :— (1) The slip angle (obliquity of surface to’the direction of its motion) should have a particular value (proportional to the square root of the coefficient of friction) ;. and .Uljyhen this is so, the pitch angle should be 45 . The maximum efficiency obtained from this investigation was 77 %. This theoretical*

investigation, though of importance and interest; does not exactly represent the actual conditions, inasmuch as the deductions from a small jelerrient are applied to the whole blade, and, further, the considerable disturbance of the water when a blade reaches it, owing to the passage of the preceding blade, is ignored. .... ',

The most complete information respecting the properties of screw propellers has been obtained from model experiments, the – J _ ■ i_ < law of comparison which has been shown to hold for Jli

ship resistance being assumed to apply equally to screw , "l /J propellers. No f fictional correction is made in obtain- " ■ '*"•'• ing the values for large screws from the model ones; as st&ted by*

9+8

SHIPBUILDING

[PROPULSION

Mr R. E. Froude in 1908, it is probable that the effect of friction would be in the direction of giving higher efficiencies for large screws than for small. The results obtained with ships' propellers are in general accordance with those deduced from model propellers, although the difficulties inherent to carrying out experiments with full-sized screws have hitherto prevented as exact a comparison being made as was done with resistance in the trials of the " Greyhound " and her model. Results of model experiments have been given by Mr R. E. Froude, Mr D. W. Taylor, Sir John Thornycroft and others; of these a very complete series was made by Mr R. E. Froude, an account of which appears in Trans. Inst. Nav. Archs., 1908. Propellers of three and four blades, of pitch ratios varying from o-8 to 1-5, and with blades of various widths and forms were successively tried, the slip ratio varying from zero to about 0-45. In each case the screw advanced through undisturbed water; the diameter was uniformly 0-8 ft., the immersion to centre of shaft 0-64 ft., and the speed of advance 300 ft. per minute. Curves are given in the paper which express the results in a form convenient for application. Assuming as in Froude's theory that the normal pressure on a blade element varies with the area, the angle of incidence, and the square of the speed, the thrust T would be given by a formula such as

T = a R-Z > R where R is the number of revolutions per unit time.*

On rationalising the dimensions, and substituting for R in terms of the slip ratio s, the " conventional " pitch ratio p, the diameter D,

and the speed of advance V, this relation becomes:

From the experiments the coefficient a was determined, and the final empirical formula below was obtained —

or H = 003216 IWXB

p + 21 (i—oSs)

■Xs

P " (i-*) :*

where H is the thrust horse-power, R the revolutions in hundreds per minute, V is in knots, and D in feet. The " blade factor " B depends only on the type and number of blades; its value for various " disk area ratios," i.e. ratio of total blade area (assuming the blade to extend to the centre of shaft) to the area of a circle of diameter D is given in the following table : —

Disk area ratio .

•30

•40

■50

•60

•70

•80

B for 3 blades elliptical

•0978

•1050

•1085

■1112

•ii35

•1157

B for 3 blades, wide tip

•1045

•1126

•1166

•“95

■*1218*

■*1242*

B for 4 blades, elliptical

•1040

•1 159

•1227

•1268

‘•1294

•1318

The ratio of the ordinates of the wide tip blades to those of the elliptical blades varies as i+yr, where r is the radius from centre of

shaft. . • . •

Curves of propeller efficiency on a base of slip ratio are drawn in

fig- 53. these are correct for a 3-bladed elliptical screw of disk area

ratio 0-45 ; a uniform deduction from the efficiency obtained by the curves of -02 for a 3-bladed wide tip and -012 for a 4-bladed elliptical screw must be made. Efficiency correc- tions for different disk area ratios have also to be applied; for a disk ratio of 0-70 the deductions are -06, -035, -02 and •01 with pitch ratios of o-8, i-o, 1-2 and I -4 respectively ; for other disk ratios, the deduction is roughly proportional to (disk ratio-o-45), a slight increase in efficiency being obtained for low values of the disk ratio. A skew- was found to make no material

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Fig 53. — Curves of Screw Propeller Efficiency

later- action between ship and screw.

back of the blades to an angle of 15′ difference to the results, ,

Hitherto, the theoretical and experimental considerations of the screw have been made under the convention that the pro- peller is

advanced into undisturbed or ” open ” water, which conditions are very different from those existing behind the ship. The vessel is followed by a body of water in complex motion and the assumption usually made is that the ” wake,” as it is termed, can be con- sidered to have a uniform forward velocity V over the propeller disk.

If V be the speed of the ship, the velocity of the propeller relative to the water in which it works, i.e. the speed of advance of the pro- peller is V-V. The value of the wake velocity is given by the ratio

V

\t_-\ji =w, which is termed the wake value.

The propeller behaves generally the same as a screw advancing into ” open ” water at speed V— V instead of at speed V and the

real slip is v— (V — V) = v— , • The real slip is greater than the

apparent slip »-V, since in general w is a positive fraction ; and the real slip must be taken into account in the design of propeller dimensions.

On the other hand the influence of the screw extends sufficiently far forward to cause a diminution of pressure on the after part of the ship, thereby causing an increase in resistance. The thrust T, given by the screw working behind the ship, must be sufficient to balance the tow-rope resistance R and the resistance caused by the diminution in pressure. If this diminution of pressure be expressed as a fraction t of the thrust exerted by the screw then T(W) = R.

The power exerted by the propeller or the thrust horse-power is proportional to T X (V-V) ; the effective or tow rope horse-power is

RV

RXV, and the ratio of these two powers Tyv— VM = (1 — <)(i +"0 is

termed the hull efficiency.

*It is evident that the first factor (l--w) represents the power regained from the wake, which is itself due to the resistance of the ship. As the wake velocity is usually a maximum close to the stern, the increase of w obtained through placing the screw in a favourable position is generally accompanied by an increase in *; for this reason the hull*

efficiency does not differ greatly from unity with different positions of the screw. Model screw experi- ments with and without a ship are frequently made to determine the values of w, t, and the hull efficiency for new designs; a number of results for different ships, together with an account of some interesting experiments on the effect of varying the speed, position of screw, pitch ratio, direction of rotation, &c, are given in a paper read at the Institution of Naval Architects in 1910 by Mr W. J. Luke.

The total propelling efficiency or propulsive coefficient {p) is the ratio of the effective horse- power (RV) to the indicated horse-power, or in turbine-driven ships to the shaft horse-power as determined from the torque on the shaft. In addition to the factor " hull efficiency," it includes the losses due to engine friction, shaft friction, and the propeller. Its value is generally about 0-5, the efficiencies of the propeller and of the engine and shafting being about 65 and 80 % respectively. The engine losses are eliminated in the propulsive coefficient as measured in a ship with steam turbines; but the higher rate of revolutions there adopted causes a reduction in the propeller efficiency usually sufficient to keep the value of the pro- pulsive coefficient about the same as in ships with reciprocating engines.

The table on the following page gives approximate values of w, t, and p in some ships of various types.

The action of a screw propeller is believed to involve the accelera- tion of the water in the race before reaching the screw, which is necessarily accompanied by a diminution of pressure; Ca Y Uatlon, and it is quite conceivable that the pressure may be reduced below the amount which would preserve the natural flow of water to the screw. This would occur at small depths of immersion where the original pressure is low, and with relatively small blade- areas in relation to the thrust, when the acceleration is rapid; and it is in conjunction with these circumstances that so-called " cavita- tion " is generally experienced. It is accompanied by excessive slip, and a reduction in thrust; experiments on the torpedo-boat destroyer " Daring," made by Mr S. W. Barnaby in 1894, 1 showed that cavitation occurred when the thrust per square inch of pro- jected blade area exceeded a certain amount (n J lb). Further trials have shown that the conditions under which cavitation is produced depend upon the depth of immersion and other factors, the critical pressure causing cavitation varying to some extent with the type of ship and with the details of the propeller; the phenomenon, however, provides a lower limit to the area of the screw below which irregularity in

thrust may be expected, and the data for other screws (whether model or full-size) become inapplicable.

1 Trans. I.N.A. 1897 (vol. xxxix.).

Type of Ship.

Number of Screws.

Propulsive

Coefficient,

P-

Wake Value,

w.

Thrust Deduction,

Hull Efficiency.

Remarks.

Battleship (turbine driven)

Battleship (older types) First-ciass cruiser Second „ . . . Third „ ... Torpedo-boat destroyer Mail steamer (turbine))

Cargo vessel

Submarine (on surface) (diving) .

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2 2

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2 2

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•47 •53 •48 •48 •62

•46 •45

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■14 •IO •06

•05 •01

$ -30

(-22

•20 •21 •16 •20

•12 •16

•17 •10 •10 •08 •02

•17 ■20 •14

•17 •10 •12

I-OI

1-01

•95

•99

■95

•97

•97

1-08

•98

1-03

I -co

1-04

1-05

Inner screws Outer screws

Inner screws Outer screws

M M M is obtained which gives the bending moment at any sec- tion. Symbolically, if w, F, M represent the load, shearing force, and bending moment, and x the co-ordinate of length,

d¥

dU

The above figures refer to full speed and are affected by alteration of speed. 1 Higher values have been obtained for the propulsive coefficients of the most recent turbine-driven ships,

Strength.

The forces tending to strain a ship's structure include (1) the static forces arising from the distribution of the weight and buoyancy when afloat, and the weight and supporting forces when in dock or ashore; (2) the dynamic forces arising from the inertia of the ship and its lading under the accelerations experi- enced in the various motions to which the ship is liable, such as rolling and pitching in a sea way; and (3) local forces and water pressures incidental to (a) propulsion and steering, and (6) the operation of the various mechanical contrivances which it carries.

The straining actions of the forces, due to the distribution of the weight and buoyancy of the ship at rest and to the inertia of the ship in motion, constitute the only part of the problem of the strength of the structure which can be considered theoretically with any generality; the character of the internal reactions arising in the structure is so complex, that simplifying assumptions have always to be made in order to enable them to be calculated.

The results of theoretical calculations as to the general structural

strength of ships are therefore of value for comparative purposes and to some extent for the approximate estimation of stresses actually liable to occur in the structure. The comparison of the theoretical calculations with the results of experience forms an invaluable guide to the proper distribution of material. In making such a comparison the necessity of providing sufficient strength, on the one hand, and of keeping down the weight, on the other hand, has to be borne in mind; the latter point being especially important in a ship, since its economical performance is roughly dependent on the difference between the weight, of the structure and the total available displacement.

*The greatest straining actions, to which vessels of ordinary forms and proportions are subject, are due to inequalities in the longitudinal Loari- distribution of the weight and the buoyancy. Let WWW tudlaal (fyl- 54) represent the weight, and BBB:. .the buoyancy bending. Pˆ T f° ot run * a sn 'P plotted along the length AC ; over the lengths ha, be, de.fC the weight is in excess of the buoy- ancy ; while from a to b, c to d, e to/, it is in defect. A curve LLL, whose ordinates are equal to the differences between those of WWW and*

BBB, is termed a curve t /-\ of loads, and represents

the net load of the ship

regarded as a beam

subject to longitudinal

bending. Shearing forces

are produced whose

resultant at any trans- verse section is equal to

the total net load on

either side of the section ;

they are represented by

the " shearing force "

curve FFF . . . , whose

ordinate at any trans- verse section is pro- p IG -. portional to the

area

‘ “”” of the ” loads ” curve

LLL . . .up to that section. Similarly, on plotting the areas of the shearing force curve as ordinates, a ” bending moment ” curve

w = fc an dF = ˆ,

The conditions of equi- librium, viz. (a) that the total weight and buoyancy are equal, and (6) that the centre of gravity and the centre of buoyancy are in the same vertical transverse section, en- sure that the end ordinates of the shearing force and bending moment curves are zero.

These curves are usually constructed for three standard conditions of a ship, viz. (i.) in still water; (ii.) on a trochoidal wave of length equal to that of the ship and height ˆth of the length, with the crest amidships; and (iii.) on a similar wave with the trough amidships. The curve of weight is ob- tained by distributing each item of weight over the length of the ship occupied by it and sum- ming for the whole ship. Such a condition of the ship as regards stores, coal, cargo, &c, is select- ed, which will produce the greatest bending

moment in each case. The ordinates of the curve of buoyancy are calculated from-the areas of the immersed sections, the ship being balanced longitudinally on the wave in the second and third con- ditions. The shearing force and bending moment curves are then drawn by successive in- tegration of the curve of loads. Typical curves are shown in figs. 55 to 59 for a first-class cruiser on wave crest, a torpedo- boat destroyer on wave crest (bunkers empty) and in trough (bunkers full), and a cargo vessel on wave crest (hold and bunkers empty) and in trough (hold and bunkers full). From these curves it is seen that the maxi- mum bending moment

occurs near amidships; its effect in figs. 55, 56 and 58 is to cause the ends to fall relatively to the middle, such a moment being termed ” hogging “; the reverse or a ” sagging ” moment is illustrated in figs. 57 and 59. Curves of a similar character are obtained in the still- water condition, but the bending moments and shearing forces are then generally reduced in amount.

The maximum bending moment is frequently expressed as a ratio of the product of the ship’s length and the displacement; average values for various types of ships are tabulated below : — • . . .

Fig. 55. — Cruiser of 14,000 Tons on Wave Crest.

Fig. 56.-

-Torpedo Boat Destroyer on Wave Crest.

Class of Ship.

WXL Maximum B.M.

Whether Hogging (on Wave Crest)

or Sagging (in Wave Hollow).

Mail steamer ....

Cargo vessel

Battleship (modern) . . Battleship (older types) First-class cruiser Second-class cruiser

Torpedo-boat destroyer Torpedo boat ....

From 25 to 30 From 30 to 35

About 30

About 40

About 32

About 25

About 22 \ About 22 (From 17 to 25 \ About 23 (About 23

H H H H H S H H S H S

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SHIPBUILDING

[STRENGTH

The stresses at a transverse section due to bending are obtained from the usual formula "r = ?. where M is the bending moment, I

the moment of inertia of the section about the neutral axis, y the distance from the neutral axis of the point at which the stress is

required, and p the intensity of stress. In calculating I, a deduction from the area of plating in tension is made for rivet holes, and only the continuous longitudinal portions of the structure are assumed effective in resisting bending.

The stresses obtained ; by this method undergo considerable variation with class and size of ship. As regards the former, it is evident that the actual straining actions upon a ship necessarily vary with the type;- and the stresses allowable, as calculated on a uniform basis of applied forces, must vary accordingly. The variation due to Size is less obvious, but it is clear that the larger the ship, the less is the probability of encountering waves as long as herself ; and, moreover, the proportion of height to length of the largest waves is generally- less than that assumed. For these reasons greater calculated stresses are allowable in large ships than in small ships or in those of moderate size. The limiting stress frequently adopted for small ships is 6 tons per sq. in., which may be increased for portions in tension to 8 tons with high tensile steel ; on the other hand, the calculated stresses in the largest vessels frequently exceed 8 tons compressive and 10 tons tensile.

The above method is that now universally adopted for comparing the stresses in ships caused by longitudinal bending; although imperfect, it affords a reasonable basis of comparison between the longitudinal strengths of vessels, especially when, as is generally

on Torpedo-Boat Destroyers (see Trans. Inst. Nav. Archs., 1905). The principal dimensions of the " Wolf " are — length 210 ft., breadth 21 7 ft., draught 53 ft., and displacement 360 tons, with a coal capacity of 80 tons. Two sets of experiments were made— (i.) under a hogging moment when supported in dock on two cradles 10 ft. wide, spaced 26 ft. apart centre to centre, and equidistant from the ship's centre of gravity, bunkers empty; (ii.) under a sagging moment when supported by similar blocks 120 ft. apart, bunkers full. The distribution of weight and buoyancy had previously been determined for each case so that the pressures on the blocks and the bending moments caused thereby could be accurately obtained. When thus supported the water-level in the dock was gradually lowered; and for successive water-levels spaced 6 in. apart the extension or compression of the plating was measured at various points of the structure by Stromeyer's strain indicators; the vertical deflections at various points of the length were also recorded. The observations were repeated several times, and the following are the general results :

(a) In the sagging condition the neutral axis was actually situated 7 55 ft. above; the keel; the calculated distance was 7 8 ft. de ducting rivet holes in parts in tension and 77 ft. without such deduction. In the hogging condition the observed height was 7 -2 ft., those calculated as before being 7 5 ft. and 76 ft. All shell and deck plating, gunwale and keelson angles, and the side girders and angles were included in the calculation for the moment off inertia. The calculated and observed positions of the neutral axis are thus in fairly close agreement.

(b) The actual vertical distribution of strain over a transverse

Fig. 57. — Torpedo-Boat Destroyer in Wave Trough.

FiGi 58. — Cargo Vessel of 12,000 Tons on Wave Crest.

Fig. 59. — Cargo Vessel of l2,ooo Tons in Wave ; Trough.

the case, the comparison is made between two ships of similar type. The relation between stress and strain has therefore to be investigated, which involves the experimental determination of the modulus of elasticity of the structure.

The assumptions on which the theory of bending is based are :

(a) At any transverse section the material lying on the neutral surface," which passes through the C.G. of the effective sectional material, is neither extended nor compressed.

(b) The material is homogeneous; and the layers comprised between adjacent surfaces parallel to the neutral surface act inde- pendently. (This is probably more nearly the case in a ship than in a beam of solid section;)

(e) The material situated at a distance y from the neutral surface

is compressed (or extended) longitudinally by an amount – of its

original length ; where 1 /p is the curvature of the neutral surface if originally straight, or the alteration of curvature if originally curved.

E-y

(d) The stress is proportional to the strain and equal to — , E

being Young's modulus for the material. It follows that the resultant longitudinal force across a section is zero, and the moment of the

internal forces about the neutral axis (i.e. about the trace of the

EI neutral surface in the section) is — , which is equal and opposite

to the external bending moment M.

(e) Taking axes — Ox longitudinal, Oz vertical, since p is large,

- may be replaced ;by -5—,,, and

„d?z M _ (CM , ,

giving the deflection z at any point.

The validity of the theory as applied to a ship was tested and confirmed' in 1903 at Portsmouth Dockyard when experiments were made-on H:M.S. " Wolf " by Professor J. H. Biles for the Committee

section was approximately in accordance with the linear law assumed in the theory of bending.

(c) The modulus of elasticity E was obtained by equating the sum of the moments about the neutral axis of the stresses deduced from the observed strains to the bending moment. ' ; .

(d) The value of E was also deduced from the deflections by means of the formula ' /TM

Ez = I I 5 dx dx ;

and its value under a sagging moment is in agreement with that found by ©. Under a hogging moment the mean value obtained from the deflection is less than that from the strain, showing tha(the curvature obtained from the deflections is greater than that to which the structure is actually bent.

The table at the top of the following page shows the values obtained for E, the modulus of elasticity.

By observing the deflections of two vessels when loaded with ballast, the following values for E were obtained by T. C. Read and Q. Stanbury (Traps. Inst. Nav. Arch., 1894), and are given for purposes of comparison!:

Principal Dimensions of Vessel.

Load in Tons.

Deflection in Inches.

Value of E deduced.

347'X45'-6'X27'-2 , ' 30o'X4i'-6" , X2i'-2"

5000 1800

2 31

■62

11,000 9,000

After the experiments the " Wolf " was sent to sea in rough weather with the object of comparing the stresses then observed with those calculated under the standard conditions on trough or crest. The strains at various portions of the structure were again measured with Stromeyer's indicators, and the stresses deduced from

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appears, therefore, that in the majority of ships whose departure from longitudinal symmetry is slight, pitching has little effect on the amount of the maximum longitudinal bending moment; nevertheless it considerably increases the bending moments near the ends.

The effect of heaving is investi- gated by obtaining the positions' of equilibrium of the C.G. of the ship when on wave crest and in wave trough; intermediate positions of equilibrium are assumed to be Note. — The maximum stresses above are approximate, and are recorded in order that the given by y = a sin vt where Ti is the variation of E;with the stress in the material may be seen. Tons per square-inch units are Ti

Draught of Water.

Sagging.

Hogging.

Maximum

Compressive

Stress.

Maximum Tensile Stress;'

E by Strain Indicator.

E by Deflec- tion over the whole length.

Maximum

Compressive

Stress.

Maximum Tensile Stress.

E by Strain Indicator.

Eby Defiec-, tion over the whole length.

Feet.

6

5 4 3

2

I

Dry

i-7

29 4-1

5 2

6-o

6-5 6-7

2 3

37 5-4 6-6

77 8-4 8 6

12,100 12,100

II,4O0

11,400

IO,80O

10,700 10,200

II,800

12,000

II,4O0 II,5O0

11,100

10,600 10,300

1-0

27 4-2

5 3 61 6-6 6-8

9 2-6

40 50

5 8 64

6 6

16,000

, I5.!°0

13,000 12,700 12,700 11,800

II,8oo

IO,800

10,400

9,600 .

9,900

9,806

employed.

the values for E found from the dock experiments, stresses were as follows : —

The maximum

Condition.

Stress — Tons per Square Inch.

Maximum observed stresses when hogging ....

Maximum observed stresses when sagging ....

Calculated stress (sagging) when in a wave hollow of height 2 5 th length ....

Keel.

Deck.

2 9 C. 5‘4 T.

71 T.

20T. 25C.

5‘3 C.

C. = Compressive. T. = Tensile.

It appears from these experiments that (at least in ships of similar character to H.M.S. ” Wolf “) the stresses corresponding to any particular external conditions closely agree with those calculated from the usual theory of bending; on the other hand the waves encountered during the sea trials were such that the maximum stress then obtained was considerably less than that in the condition assumed for the standard calculations. Finally, the material of the ship was subjectedˆ in dock to a tensile stress of nearly 9 tons and a compressive stress of nearly 7 tons per sq. in. without distress.

While dealing with longitudinal bending, some of the refinements suggested for calculating stresses among waves may be cited, although the additional labour involved in their application has, prevented their introduction in general practice.

Since the distribution of pressure in the water of a wave system differs from that in still water, the buoyancy of a vessel or the resultant vertical thrust of the water is then not equal to the weight of the water displaced ; and the position of the ship when in equilibrium and the stresses upon it are changed in consequence. By assuming the pressure at any point of the water to be in accordance with the trochoidal theory of wave motion, and undisturbed by the intrusion of the ship, the equilibrium position can be obtained and the modified stresses evaluated. This process was first applied to ships by Mr W. E. Smith {Trans. I.N.A., 1883), who obtained the arithmetical sum of the sagging and hogging moments on vessels placed in the trough and on the crest of a wave, thereby eliminating the effect of the distribution of weight; and compared it with the sum of the moments as ordinarily obtained. The correction for the ships considered involved a reduction of the bending, moment to about I of the value calculated in the ordinary manner, and in a torpedo-boat destroyer a reduction of about 10% has been obtained. This reduction increases as the draught and fullness of the ships are increased, and the bending moment on a square-bilged ship deeply immersed is almost uninfluenced by wave motion, since the reduction in orbital motion at considerable depths below the surface ensures the bottom of a fairly deep ship being in comparatively undisturbed water.

In the foregoing the vessel is assumed to occupy at every instant a horizontal position on the wave with the correct displacement; a ship proceeding perpendicularly to the crests of a wave system will, however, undergo heaving arid pitching oscillations which lead to a further modification in the bending moment obtained (see paper by T. C. Read, Trans. T.N.A., 1890). Considering first the effect of pitching only, imagine the ship at her proper displacement (allowance being made for the altered buoyancy of the wave system as before), but momentarily out of her correct trim; the longitudinal restoring couple, due to the wedges of immersion and emersion, is balanced by the moment of the reversed mass-accelerations of the component parts. If the ship is longitudinally symmetrical about her midship section, one half of the moment of the restoring forces and one haif of the moment of the reversed mass-accelerations about amidships are due to the forward end, and one half to the after end. These moments are therefore equal and opposite for each half of the

ship and have no influence oa the midship bending moment. It

apparent semi-period of the wave. On taking into account the mass of the

ship, assumed originally stationary, the height of the C.G. above

its mean position becomes

aX

T, 2

rJ5-2_Jpj

SlnJjr-

T . Tt

!•

where T= it

SP

= period of dip in still water;

W is the displacement, and p the tons per foot immersion; the re-sistance to vertical motion being neglected. When T and Ti are nearly equal, allowance has to be made for; the. resistance by using a process of graphic integration. On applying the correction to two vessels, and comparing the bending moments in their positions of the wave, given by the formula,, with those in the equilibrium position, the effect on the maximum hogging moment was found small; but the sagging moment of a moderately fine vessel was increased by over 20 %, and that of a full vessel by about ip %., ;

Allowance has also been made for the effect of the superposed heaving, pitching and rolling oscillations undergone by a ship moving obliquely across the crests of a wave system (see papers by Captain Kriloff, Trans. I.N.A., I896 and 1898)- , , .-

*The maximum calculated stress on vessels inclined to considerable angles of heel has been found in some instances to be slightly greater than that for the upright condition ; and the stress oh the rnaterial towards the ends is then usually more nearly equal to that amidships**

In addition to the direct stresses on keel, bottom, anfl upperworks resulting from longitudinal bending, shearing stresses are experienced which in some cases are of appreciable magnitude. ,Tlie in-

tensity of shear stress in the side plating is equal to ˆj ; where F

is the shearing force over the transverse section, A2 the moment about the neutral axis of the sectional area above or below a horizontal line through the point considered, and t the thickness of side plating. This stress is usually greatest at or near a quarter of the length from either end and at the height of the neutral axis, since here F and A? respectively attain their maximum values. In some cases the thickness of plating and arrangement of riveting have to be specially considered in relation to these shearing stresses.

*The stresses due to transverse bending are not, in genera}, capable of definite determination; as, however, they are frequently severe when the ship is in dry dock, and may also attain consider- ˆ able magnitude during heavy rolling, a means of com- Iracsˆi paring the transverse strength of vessels is of sprne > Yendlas interest. A transverse bulkhead forms a region of almost ■_ *• infinite transverse stiffness, and it is therefore difficult in ships in- ternally subdivided by hurnerous bulkheads, to determine how JEar the stresses at intermediate sections are influenced by the neighbour- ing bulkheads. In many , vessels carrying cargo, however, in which trans- verse bulkheads are widely spaced, a section midway along a hold may be so' far removed from all bulkheads as to be uninfluenced by their local support; and the following method has been proposed for com- paring the transverse strengths of such ships :*

A frame and a strip of plating one frame space in width are regarded as a stiff inextensible bar subjected to the known external forces and to the- unknown tension, shearing force, and bending moment, at any fixed point.

Let OP (fig. 60) be a portion of the framing under consideration; O being the keel, and Ox, 0% horizontal and vertical axes.

On consideration of the forces on the arc OQ, which are in

Fig. 60.

equilibrium, the tension T, shearing force F, and bending moment M, at Q can be algebraically expressedin terms of its coordinates (x, y,), the water or other external pressures on OQ, and the values of T, F and M at O (To, F , M 0l).

Neglecting the effects of T and F on the element QR, it follows from the equations of bending that

M = El(f-g)

where and ‘ are the respective inclinations of the element QR to Ox before and after the strain caused by bending, and ds is the length of QR. Due to the effect of M on QR, the bar at the point P (xi, y{) is rotated through an angle d‘—d and moved through distances —

iyi-y) (d‘-d) and (*i-x) (ty) in directions parallel to Oz and Oy respectively. On integrating along OP the total movement of P due to the bending of all such elements as QR in OP is obtained ; when P is moved round the com plete section so as to return to O, where the total movement is zero, it follows, on subtraction and reduction, that

rU, (Mx., fMy,

I j ds=o; J -Y-ds = o;J — ds-°o;

the integrations being taken completely round the section. It is assumed in the foregoing that rigid connexions are made at dis-continuities, such as deck edges, in order to prevent any alteration in the angle due to strain.

M Mˆc Mv The values of -t, $_r$, -t— can be calculated at varying points and

expressed in terms of To, F , Mo; by using a method of approxi- mate quadrature, T , Fo, Mo are found by solving. the 3 equations obtained, and M is deduced giving the corresponding stress at any point. In applying this method to the determination of the stresses caused by rolling, the centrifugal forces on each element are included in the external forces when estimating M.

This method of estimating the transverse strength of ships is due to Dr Bruhn, who in Trans. I.N.A., 1901, 1904 and 1905, gives illustrations of its application.

In addition to the stresses due to longitudinal and transverse bending, which are distributed over the whole or a considerable part of the structure, local stresses are experienced including those caused by water-pressure ; forces on sails, masts and rigging ; reactions of moving parts of machinery; heavy blows from the sea on side, deck and upper works; anchor, cable and mooring gear, and blast from gun-fire. General methods are usually inapplicable to such cases; the support provided is determined by experience and by the particular requirements. The stresses in bottom plating due to water-pressure are of small amount where the curvature is appreciable, since the plating, by compression, directly resists any tendency towards change of curvature; in a deep flat-bottomed ship, on the other hand, resistance to water-pressure is chiefly due to the bending of the plating, the slight extension having little influence. The plating is supported at the transverse and longitudinal frames, and, to some extent, at the edges. The close spacing of transverse frames usually adopted in merchant ships reduces the stress to a small amount; but in large warships, whose frame spacing varies from 3 to 4 ft., it is probable that the flat plating near the keel amidships is subjected to considerable stress, although, as experience shows, not beyond the limits of safety. In fine ships special provision is frequently made to prevent the side plating near the bow from panting due to the great and rapid fluctuation of water- pressure when pitching.

*The material of the structure is arranged so that the distribution of stress over any localized section of material is maintained as uniform uniform- as P° ss i D ‘ e * n order that the ratio of maximum to mean Hy of ” stress may not be unduly large. For this reason abrupt stress. discontinuities and sudden changes of section are avoided, and ” compensation ” is introduced where large openings are cut in plating. The corners of hatchways in ships whose upper decks are subjected to considerable tension are frequently rounded, since failure of the material near the square corners of such hatch-ways has been known to take place, pointing to the existence of abnormal stress intensities, which are also, evident from theoretical considerations. Similarly, local stiffening required for the support of a heavy weight or for resisting the blast of gun-fire is reduced in sectional area at the ends, or continued for a length greater than absolutely necessary, to ensure an even distribution of stress.*

Among the stresses to which a ship is subjected are those caused by its mode of propulsion. The stresses due to the reactions of Vibration t ˆ ie mov ‘ n 8 parts of the machinery are, in general, of small amount, but owing to their periodic character vibrations are induced in the structure which are frequently of sufficient magnitude to cause

considerable inconvenience and even damage.

It is known that when a periodic force of frequency n is applied to a structure capable of vibrating naturally with frequency p, the amplitude of the forced vibrations assumed by the structure is

Local stresses.

If the period of the force synchronizes or nearly synchronizes with the natural period of the structure, the amplitude is considerable, but otherwise it is of relatively small amount. If, therefore, the natural period of vibration has been found for a ship, the causes of vibration at various speeds, can be readily traced, since marked vibration is usually attributable to a synchronizing source.

Vibration in a steamship is due to various causes, the principal of which are: —

1. The reciprocating parts of the engines, if unbalanced, cause vibrating forces and couples in a vertical plane and of two frequencies, one equal to, and the other twice, the speed of revolution, the latter being due to the secondary action introduced by the connecting rod. In twin-screw ships torsional oscillations in transverse planes may also result when the engines are working in opposite phase.

2. The rotating parts of the engines cause vertical and horizontal oscillations of frequency equal to the speed of revolution.

3. The variation in the crank effort tends to cause torsional oscillation of the same frequency, particularly in single or two-cylinder engines.

4. Vibrations, principally at the stern, may result from an un-balanced screw, these are similar to those caused by the rotating parts of the machinery.

5. A screw propeller which experiences uneven resistance during its revolution is the cause of vibrations, whose frequency is the product of the revolution and the number of blades. Such resist- ances occur when (1) the blades pass too close to the hull; (2) when the screw breaks the surface of the water; and (3) when the supply of water to the propeller is imperfect, due either to " cavitation " or to the screening effect of shaft and propeller supports.

The natural vibration of a ship's structure (irrespective of local

vibrations) is analogous to that of an unsupported rod of suitable dimensions, the principal difference being that the vibrations in the rod are undamped and those in the ship are damped rapidly ■ through the communication of the motion at the hull surface to the surrounding water. A thinjaniform rod vibrating laterally

has a minimum frequency (per minute) equal to 1210

inversely proportional to

V^-n^+K,*

where K is a coefficient depending on the resistance to vibration.

WD"

in this mode of vibration there are two nodes situated at a distance 224 L from either end. Vibrations of a higher order having three, four or more nodes are also possible, the fre quencies increasing approximately in the ratio 1 : 2-8 : 5-4, &c. The complex variation of the weight, inertia and modulus in a ship prevent a corresponding result being obtained by direct mathematical investigation; recourse is therefore made either to direct experi- ments on ships, or to a " dynamic model." The instrument used for measuring and recording vibrations consists of a weight suspended, and held laterally in position, by springs, so as to have a long period of oscillation; pens or pencils attached to the weight record the vibrations upon revolving cylinders fixed to the vessel and fitted with time records. The formula (of the same form as that for a rod)

where N is the frequency per minute, was used by Dr Schlick for the vibration of ships ; the value of c found by him for vertical vibrations varied from 1600 in very fine vessels to 1300 in those having moder- ately full lines. The nodes were found to be at about a third of the length from the stem and about a quarter of the length from the after perpendicular. The frequency with three nodes was slightly more than twice that of the primary vibrations. Horizontal and torsional vibrations were also observed; their minimum frequency is, however, generally considerably more than that of the vertical vibrations, and they are therefore generally of much smaller ampli- tude. (See papers in Trans. Inst. Nav. Archs. from 1884 to 1901, by Dr O. Schlick, and in 1895 by Mr A. Mallock.) The " dynamic model," suggested by Mr Mallock, forms a convenient means of approximately investigating the positions of the nodes and the frequencies of vibration of a ship. The formula given above suggests that by making a model of material

whose modulus E and density p

are known, and on a linear scale of — , then if N„ N m refer to ship

and model, _N»_L |JL Br>*

N m _ n\E m ” p.” This relation is unaffected if the lateral distribution of material is changed in the model, provided that I m and the weight of the model per foot run are unaltered at each point in the length ; the model is therefore made solid and of rectangular or other convenient section, so that

I m =i-I.andW m =ˆ,.ˆ.W,;

the weight being also similarly distributed in a longitudinal direction to that in the ship. The model is supported at points, whose positions are obtained by trial, giving the highest frequency for the mode of vibration considered; these points are the nodes corresponding to the free vibrations when the model is unsupported, and the influence of the supports is thus eliminated. On comparison with the results obtained in a ship, the reliability of such model experiments has

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2.33

12-32

Fig. 6i. The curve given is that described by the pivoting point. The first time round is shown in a drawn line, the second time round in a dotted line.

h. m. s.

A, Position of ship’s centre of gravity when helm is half over . 12 32 52

B, Position of ship’s centre of gravity after she had turned through

the first 180 ° 12 35 23-4

C, Position of ship’s centre of gravity Piter she had turned through

the second 180° 12 38 4

D, Position of ship's centre of gravity after she had turned through

the third 180° . . . 12 40 46

E, Position of ship's centre of gravity after she had turned through

the fourth 180 12 43 28

Speed on final circle, 7-14 knots.

Diameter of final circle, 1240 ft.

Tactical diameter, 1315 ft.

Time of turning through 180 , 2 min. 31 sec.

been verified in a few cases, the value adopted for E, being that for a riveted structure or about 10,000 tons per square inch. In some model experiments made in air and in water, the frequency in the latter case was found to be reduced, and owing to the rapid damping of the free vibrations and to a virtual increase in the mass-inertia caused by the concomitant motion of the surrounding water, which occurs in the ship and not in the model when vibrated in air, there must be a difference in the results. A second difference is due to the ratio of depth to length in a ship being sufficient to make the term for rotational inertia appreciable, which factor is neglected in the formulae for a' thin har and the dynamic model. The extent to which such results require modification cannot be determined until further experiments have been made. ••■"•■■

Finally it appears that vibration in a ship can generally be avoided only by removing its cause; the addition of further stiffening to the structure with the object of reducing vibration has not infre- quently had the opposite effect, the natural frequency being brought more nearly into synchronism with that of the disturbing force.

The adoption of the steam turbine obviates many of the causes pro- ducing vibration referred to above, leaving only those due to the forces resulting from inequalities in the working or position of the

propellers.

Steering. The information available on the steering and manoeuvring qualities of ships is largely due tq the. results of the methodic trials- made with H.M. ships. These include observations of the paths when turning under different angles of helm, at various speeds, with and without assistance from the propellers, and with variation in certain features of the hull. which influence the steering, $uch as the addition of bilge keels, change of draught or trim, and the omission of the after deadwood.

One of 'the first attempts at plotting the curve traversed by a ship under the action of her rudder, and the position of the ship at any instant with reference to that curve, was made by the writer in 1877 with H.M.S. " Thunderer " (see Appendix XIII. to Report of " Inflexible's " Committee). 1 The position of the ship was fixed at numerous intervals with reference to the line of advance by observing simultaneously (a) the direction of her head and (b) the angles of the base of a triangle, whose apex was a floating object within the approximate circle in which she turned, and whose base was the line between two observers at fixed points on the deck, one forward and the other aft; these angles in conjunction with the base fixing the distance of the middle line plane of the ship from the floating object. The data were observed for different speeds and with different angles of rudder, and with and without the turning effect of the screws.

Fig. 61 gives the plotted positions of the ship continued for two complete turns with 31 ° of hetmˆvhen going ahead initially at 10-5 knots. The straight line which becomes curved at the point A is the initial course of the ship. The short lines give the positions of the ship when turning at intervals of a minute; and the curve drawn touches the positions successively occupied by the middle line of the ship. It will be seen that the bow of the ship is- nearer the centre of the circle, or curve in which she turns, than the stern. The vessel may be regarded as going ahead and turning or pivoting about a point well forward in her middle line; this is termed the " pivoting point," the middle line being, at this point, a tangent to the curve concentric with and similar to that described by her centre of gravity. In the " Thunderer " the pivoting point was situated about 50 ft. abaft the stem.

Similar information for a more modern ship is given in fig. 62 for the Japanese battleship ".Yashima " when turning under 32 of helm with an initial speed of 17-5 knots. 2 AAA is the; locus.Qf the pivoting point 0,'and BBB that of the ship's centre of gravity. The*

bow of the ship is directed inwards with reference to the latter curve; the angle between the middle line plane and the tangent to the curve BBB is termed the " drift angle."

The distance between the pivoting point and the ship's centre of gravity is equal to p sin , where p is radius of curvature of BBB and is the drift angle. The value of (j> is about 23 ° in the " Yashima," and about Io° in the " Thunderer "; and the pivoting point O of the former ship is situated very near ithe fore end of the vessel. CCC is the path of the outer edge of the stern and represents the clear space required when turning. !

In both ships the path is spiral in form until about 16 points (180°) have been turned through, and it then becomes approximately a circle. The maximum distance that the ship's centre of gravity travels in her original direction after the helm is put over is termed the "advance," and the " tactical diameter " is the perpendicular distance between the original line of advance and the ship's position after turning through 16 points.

1 Similar experiments had been made by M. Risbec on the " Elorn " (Revue maritime el coloniale, 1876).

1 See " The Steering Qualities of the 'Yashima,' " Trans. Inst. Nav. Archs., 1898.

Nature of forces when turning.

For an approximate investigation of the forces in operation during the turning of. a ship, the, motion may be divided into three stages: (a) when the rudder is first put over and the pressures on the hull are those necessary to produce angular accelera- tion; (i) when the accelerative forces are combined with those caused by the resistance of the ship to rotation ; and (c) when finally turning uniformly in a circular path. The characters of the forces acting during the states (a) and © can be ascertained, and the type of motion under the complex conditions represented by (b) will consist of a gradual replacement of the motion at (a) by. that at ©.

Initially, on putting the helm over, the change in the stream line motioft at the stern produces a pressure upon the rudder normal to its plane. If the rudder is unbalanced, there is generally an additional pressure upon the after deadwood caused by the .widening of the stream lines approaching the rudder. The resultant of these pres- sures on rudder and deadwood is a force P at the stern which

may be resolved longitudinally and transversely into R and Q, where R tends to reduce the speed of the ship and Q to move the stern outwards (fig. 63). The proportion of the force P due to the deadwood is unknown, but it is small in recent warships in which the after deadwood is considerably cut away ; the portion due to the rudder pressure can be calculated from the re- sults of experiments on plates moving obliquely through water. If A is the area of the rudder in square feet, 6 the angle of helm and V the relative velocity in knots with which the water impinges on the rudder (assumed equal to the speed of the ship increased by the slip of the screw), t jj en p (; n tons) = j. AV 2 sin0, approximately ,

where the mean value of k for small inclinations is jfˆ for a square rudder and about jlxi Ior a rectangular rudder, of breadth twice its depth (k also varies with the angle of incidence,; when the latter is greater than about 35 °, the above formula becomes inapplicable). The convergence of the stream lines at the stern due to the angle of run, and the oblique and variable motion of the water caused by the screw propellers, modify the value of k,ˆas applied to the determina- tion of the rudder pressure ; but it is evident that with ships of fairly similar types the force causing initial turning varies with the shape of the rudder and approximately as its area, the angle of helm and the square of the speed. ■

The initial angular motion of the ship is due to the action of the component Q of the pressure on the rudder and deadwood, which is equivalent to a force Q at the centre of gravity tending to produce a lateral translation of the ship as a whole and a couple Q. BG tending to rotate the ship about the centre of gravity. Both the lateral and angular movements of the ship are accompanied by the motion of a mass of water, which may be regarded as virtually increasing the mass and moment of inertia of the ship. Denoting these quantities thus increased, by W and I respectively, the initial lateral acceleration of*

the ship is equal to H,, and its lateral speed at the end of a- short

■ interval of time At, during which Q and W may be supposed to have

remained constant, is M, . At. At the same instant and under similar

hypotheses the angular velocity about the centre of gravity is

*ˆ — — *f Hence a point O forward in the middle line of the ship*

Fig. 63.

T

, At.

taken so that GO.

Q-BG

.At = Q.AtorGO = ;

I

at the in-

T~'"~W"""" ~~~W.BG stant considered, at rest except for the motion of the ship ahead, which is due to the original speed of the ship before putting the rudder over, somewhat reduced by the action of the component R of the rudder pressure during the time At. The instantaneous centre of the motion of' the ship must therefore be somewhere in the perpendicular at O to the middle line of the ship, the point O thus corresponding to the " pivoting point " as previously defined for the steady motion of the ship in a circle.*

The actual position of O cannot be calculated, as it depends on the values of I and W, which are different from, and not expressible in terms of, the moment of inertia I' and mass W' of the ship itself; , but from the method by which it is determined it is clearly forward of the centre of gravity; and so far the investigation is confirmed by observation, which shows that the first effect of putting the rudder over is to cause the stern of the ship to swing towards the side to which the helm is moved to a much greater extent than the bow moves towards the opposite side.

If the time At be supposed to become infinitesimal, and the effect

SHIPBUILDING

Plate VII.

tTTTrtamd

100

= ± =

200

— I

Scale of Feet.

300 400 500

I I I

6 00

700

■ *I*

eoo

= ± =

Fig. 62.

A, A, A, Curve described by pivoting point.

B, B, B, Curve described by centre of gravity.

C, C, C, Curve described by outer edge of stern.

D, Position of ship's centre of gravity when helm commenced to move over.

E, Position of ship's centre of gravity when helm had reached 32".

F, Position of ship's centre of gravity when vessel had turned through 90 °. Time from D, 49§ sec.

G, Position of ship's centre of gravity when vessel had turned through 180 . Time from D, I min. 20 sec.

900

lOOO

STEERING]

of putting over the rudder be regarded as an impulse (measured by the finite product P. dt), delivered at the stern of the ship normal to the rudder, the resistance of the water to the rotation of the ship may be neglected, and the instantaneous centre of the turning motion (as distinguished from the motion ahead) is the point O on a straight line GB perpendicular to the direction of the impulse,

and such that GO. GB = ˆrr,an expression for the position of O of the

same form as obtained before.

I'

In this case tttv = £ 2 , where k is the radius of gyration of the ship

about a vertical axis through the centre of gravity, and the point O is obtained by the geometrical construction shown in fig. 64, given by Professor W. M. Rankine, where GL = k and is perpendicular to GB, and the angle BLO is a right angle.

The value of I is dependent on (1) the distribution of weight in the ship, being large when heavy weights are situated near bow and stern, (2) the length of the ship, p IG g .

and (3) the underwater form near

the ends, being relatively large in fine ended vessels with large areas of deadwood. W is also dependent on the shape of the ship under-water. :

The handiness of a ship or her readiness to respond to slight alterations in helm is mainly dependent on the relation between QXBG the moment of rudder pressure for a given angle, and I the virtual moment of inertia. If I is comparatively large, the vessel will turn slowly under helm until, gathering way, the rapidity of its angular motion becomes so large that reverse helm may be re- quired to limit the change of course to that desired. Unhandiness is usually experienced at low speeds (Q being then small) and also in shallow water when I is increased by the restriction in the flow of water from one side of the ship to the other. Improvement in the handiness in these circumstances has been obtained in certain ships with unbalanced rudders by filling in the after deadwood, the loss from

the increased inertia being more than compensated by the greater turning moment due to the pressure on the after dead- wood.

When the ship is turning steadily in a circle, if C (fig. 63) is the centre of rotation, and CO perpendicular to the middle line of ship, the motion is equivalent to a progression ahead with speed V (which is considerably less than the initial speed), combined with a rotation about the " pivoting point " O, which is generally situated slightly abaft the bow; the drift angle 4> is given by the relation

OG = OCtan<2>.

The time of turning through 180° is -y where r is the radius OG. The forces acting upon the ship are now — the pressure P on

rudder and deadwood (if any), the centrifugal force

WV cos

; the

thrust of the propellers, and the pressures on the hull. The last named consist of forces Pi outwards before O, and P 2 inwards abaft O; of these Pi is usually negligible in amount; P2 cannot be directly estimated, but since work is done against it by the trans- verse motion of the after part of the ship, a reduction of speed results whose amount is largely dependent on the obliquity of motion at the centre of gravity, that is on the drift angle . Under full helm the ratio of the steady speed when turning to the initial speed is often about 60 or 70%; but in some quickly turning ships it is less than 50 %. Of the remaining forces, the transverse com-

ponent — — of the centrifugal force is known since the final

diameter of turning 2r is approximately the same as the tactical diameter. To obtain P, it is to be observed that the water im- pinges on the rudder in a direction BF intermediate between BE (perpendicular to BC) due to the ship's motion and BD due to the form at the stern; if BF is assumed to bisect the angle DBE, the effective rudder angle is approximately 0-. The pressure on the rudder is therefore less than when helm is first put over and is further reduced on account of the diminution in the speed of the ship. ■

From experiments made with the object of measuring P when turning steadily, it is found that the pressure recorded was about one-fourth

of the value calculated on the assumption of the ship retaining her original speed and effective rudder angle ; when helm had just been put hard over, from one-half to one-third of the theoretical pressure was obtained. ‘ (See Bulletin de I’ Association Technique Maritime, 1897; American Institution of Naval Archs. and Mar. Eng., 1893.) The transverse forces calculated on this basis for a battleship of 15,000 tons displacement when turning steadily under full helm are approximately — centrifugal force 200 tons, pressure on rudder 40 tons, and Q 2 , the transverse component of P2, 240 tons passing through a point on the middle line about 40 ft. abaft the rentre of gravity.

The following equations applicable to the state of steady rotation

can be obtained from the above considerations, neglecting Pi and the small, couple due to R :

Q 2 XGM = GBXQ . . •’ • .’ (ii.) From (i.) it is seen that a small tactical diameter will be obtained when Q 2 is large compared with Q; from (ii.) it follows’that the point M (fig. 63) should then be near G. These conditions are realised in a ship whose resistance to leeway is considerable but concentrated about the middle of the length, such, for example, as a yacht having a deep web keel, or a boat with centre board and drop keel. In these instances “the vessel may be regarded as virtually anchored by its keel, and the pivoting point brought to a position in close proximity to the centre of gravity. Similarly tactical diameters of vessels of ordinary type are reduced by diminishing the resistance to lateral motion at the after end and by increasing it amidships or forward.

*During the turning trials made with H.M.S. ” Thunderer,” observations were made of the heel caused by the transverse forces brought into play when turning. On first putting the L,_ . . helm over a small inward heel caused by the pressure ■” * ˆ n of the rudder was observed; as the rotational speed of “* %’ the ship increased this inclination was succeeded by a steady put- ward heel, amounting to about l” at 7 knots speed. The latter is caused by the couple formed by the centrifugal force and the lateral resistance diminished by the (usually) small couple d’iie ‘to’ the rudder pressure. During some more recent trials carried out on the ” Yashima ” the angle of heel was 8| Q at full speed. Similar large inclinations are generally found with modern warships having small turning circles and high speeds and whose centres of gravity are also situated high up; at moderate speeds, however, the heel is of small amount. On putting the helm qnickly amidships when turn- ing, the opposing coupl© due to the*

rudder pressure is removed or reversed and the angle of heel momentarily increased; instances have occurred of ships with small stability and comparatively large ” rudder couples “capsizing through this cause. -.■..---

The rudders used in ships are of two types: — (1). Unbalanced, shown in figs. 65, 67, 68; and (2) balanced, shown in figs.- 66, 67 (at bow) and 69 to 74. An unbalanced rudder is in stable eqiii- _ .

librium when amidships and force has to be applied to the . ˆ£SL° tiller, in order to place it at any angle to the middled line. – ™ { ˆ rs ‘ It is supported at its forward edge by means of pintles working- in*

Fig. 65. — Cargo Vessel.

Fig. 66. — Atlantic Liner.

gudgeons on the sternpost; and owing to its simplicity of con- struction and to its prpperty of returning quickly tq ; the middle line when the tiller is released through any cause, this type is pre- ferred when the force required to put the rudder hard over is sufficiently moderate fo enable steering to be performed’ by hand or by an engine and gear of moderate size when steam steering is admissible.

With high speeds and large manoeuvring powers, the unbalanced type is generally unsuitable; and balanced rudders are adopted

Fig. 67— H.M S. ” Formidable.” H.M.S. ” Duncan ” similar.

*Fig. 68.— H.M.S. “King Edward VII.**

in order to reduce the force required and the work done to obtain large angles of helm. ■ A balanced rudder is unstable amidships, and, if left free, comes to rest at a moderate angle on either side of the middle line. Slightly less than one-third of the area is usually placed before the axis; in some ships in which a greater proportion has been put forward, difficulty has been experienced in bringing back the rudder to amidships. As shown in the figures, the method of support has varied in different ships; in many cases a steadying pintle has been placed at the heel or mid-depth, but in the latest warships the support has necessarily been taken entirely inboard.

In the merchant service, unbalanced rudders of the form shown in fig. 65 are generally fitted ; the rudder extends “up to, or above, the water-line, and is comparatively narrow longitudinally. Some- what greater efficiency when using small or moderate angles of helm is

obtained with rudders of this shape ; as, for a given pressure

on rudder, the turning moment on the rudder head, and the power required for working the rudder are also less. A type of balanced rudder devised by Professor Biles and adopted in some large Atlantic liners is shown in fig. 66.

Broader and shallower rudders are adopted in warships owing to the necessity of keeping the whole of the steering gear below the water-line for protection.

(fig. 74), which had, in addition to the usual rudder at the stern, a double-balanced rudder in the bow, which could be drawn up into recesses in the hull; the two rudders were about 3 ft. apart and when in use worked together.

The results of the turning trials of some of the Experimental principal classes of warships are given in the following results. table :

Area of

Ship or Class.

Displacement

in

Tons.

Length

in Feet.

Longitudinal

Plane

divided by

Area of

Rudder.

Speed in

Knots at

Commencement

of Turn.

Advance

in Yards.

Tactical

Diameter

in

Yards.

Tactical

Diameter

divided

by Length.

Dreadnought ....

17,900

490

37-5

19

490

440

2-7

Lord Nelson

16,500

410

40-5

17

400

370

2-7

King Edward VII.

16,350

425

44.8

l6i

45°

440

3-1

Formidable .

15,000

400

45-2

14I

440

500

3-7

Majestic

14,900

390

47-8

16

45o

500

3-9

Minotaur

14,600

490

48-4

19

480

600

37

Monmouth

9,800

440

44.4

23!

59°

790

5-4

Drake

14,100

500

46-8

*23**

700

810

4.9

Diadem

11,000

435

44-5

20j

650

920

6-3

Powerful

14,200

500

5°-3

22

800

1 120

6-7

Minerva

5,600

35o

48-3

18

540

770

6-6

Arrogant.

5.750

320

33-5

17

350

380

3-6

Helm angle about 35 in all cases.

The unbalanced type was mainly used in British battleships up to H.M.S. ” Formidable ” (1901) and ” Duncan ” (1903) (fig. 67). In

_ the ” King Edward VII.” class

(i9°5) (fig. 68) the rudder was balanced, about one-fourth of its area being placed before the axis; balanced rudders supported at about mid-depth were fitted in the ” Yashima ” (1897) and the Fig. 69.— H.M.S.” Lord Nelson.” ” Lord Nelson” class (1905) “Yashima” and H.M.Ss. “Swift- (fig. 69). In H.M.S. ” Dread- sure,” “Warrior “and “Minotaur” nought ” (1906) and recent similar. battleships, twin-balanced

rudders are fitted immediately behind the inner propellers (fig. 70), to obtain additional steering effect from the propeller race, and to enable the ship to be steered from rest in getting under way. Owing to the higher speeds of first- class cruisers, balanced rudders were used; those fitted in ” Diadem ”

In the last column the tactical diameter is expressed in terms of the length of the ship ; this ratio enables a rough comparison between the steering capacities of different ships to be expressed. The improvement in turning in modern warships has been due largely to the increase of rudder area in relation to the area of the immersed middle-line plane, which has been made possible by the adoption of balanced rudders. Considerable improvement has also been effected by cutting away the after deadwood ; this will be seen on comparing the performances of H.M.Ss. ” Monmouth ” and ” Diadem,” and ” Drake ” and ” Powerful “; the former ship of each pair has her after deadwood partially cut away and has a smaller tactical diameter. In

the " Yashima " the whole of the deadwood is removed and a very large rudder fitted ; her tactical diameter is twice her length.

The rudder area is relatively much less in merchant vessels, where the necessity for a small tactical diameter does not arise.

Experiments have been made to ascertain separate effects of angle of helm, time of putting helm over, and draught and trim of ship.

The effect of variation of helm angle is shown in table below :

Section at A.P. Fig. 70.— H.M.S. " Dreadnought." and " Powerful " classes (1897-1900) are shown in fig. 71, and for " Oessy," " Monmouth " and " Devonshire " classes (1901-1905)

in fig. 72. In " Warrior " and " Minotaur " classes (1907- 1908) the rudders are as shown in fig. 69. The older second- class cruisers had rudders and sterns of the type shown for H.M.S. " Powerful;' in fig. Vm tt H iu <; " Pˆw«.rf„i " 7 1 ' witn tne exception of the h'J i " r\- ˆ ..ˆm Arrogant " class (1898), in

H.M.S. ˆ Diadem similar. which two rudders were fitted

in conjunction with a considerable cut-up at the stern in order to obtain increased manoeuvring capacity (fig. 73). Recent second-class cruisers have rudders of the type shown in fig. 69.

*cu_*

Fig. 72.— H.M.S. " Devonshire." Fig. 73.— H.M.S.

H.M.Ss."Cressy" and" Monmouth" " Arrogant."

similar.

Auxiliary rudders have been fitted in H.M. ships in a few in- stances. An interesting example was that of H.M.S. " Polyphemus "

Tactical Diameter in

Yards at about 12 knots speed.

Ship.

Battleship.

First-

Class

Cruiser.

Second- Class Cruiser.

Torpedo-

Boat Destroyer.

10° helm 20° helm 35° helm

750 550 450

1400

1000

750

1600

1000

800

700 500 300

Fig. 74.— H.M.S. " Polyphemus."

In ships having unbalanced rudders and fitted with hand-steering gear considerable time is required to put the helm hard over at full speed; and consequently the tactical diameter and the advance are greater at high speeds than at low speeds. When steam-steering gear is provided the helm can usually be put hard over in from .10 to 20 seconds at any speed; and in modern warships the speed is found to have little influence on the path described when turning. In the case of torpedo-boat destroyers marked increases in the tactical diameter and in the advance occur at high speeds, the cause of which is not fully known. In such vessels of length 270 ft. and dis- placement 900 tons, the tactical diameter is about 550 yds. at 30 knots and 300 yds. at 15 knots.

A moderate variation in the mean draught has little effect on the course, but additional trim by the stern results in a greater space being required for turning.

By working one propeller ahead and the other astern the space required for turning may be shortened, but the time of turning is frequently increased. The character of the path described depends on the relation between the revolutions of the screws.

In a single-screw ship, with the propeller well immersed, the upper blades experience greater resistance to rotation than the lower blades, since the forward velocity of the frictional wake is greatest at the surface; hence a right-handed screw tends to turn the ship's head to starboard, and requires starboard helm. The reverse is occasionally experienced when the upper portion of the screw is incompletely immersed.

When a ship is going astern manoeuvring is performed with some uncertainty, as the rudder is near the pivoting point.

PROCESS OF DESIGN]

SHIPBUILDING

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Process of Design

When a shipbuilder is approached for the production of a new ship, he must be informed of the requirements of the case; the kind of trade or service in which the vessel will be engaged; her speed; if she is to be a steam vessel, the distance she must run on ordinary voyages without recoaling; the weight of cargo to be taken or the number of passengers to be carried, and the kind of accommodation required for them. Very frequently these requirements will include certain limits of size, draught, cost, or tonnage, which must not be exceeded. In addition it must be stated in what society, if any, she is to be classed, as this will determine the details of the scantlings to be employed. The shipbuilder will usually have, to guide him, the details of some successful ship or ships previously built to fulfil the same or similar conditions as in the vessel required, and he will probably know what measure of success or popularity the respective features of the vessel or vessels have earned on service. The dimensions can in this case be at once fixed to provide the necessary speed, strength, stability and seaworthiness, and the cost of the vessel determined. If the departures from some similar ship of known and approved qualities are small, the details of the new ship can be inferred directly from those of the similar ship, and modified drawings, specifications, &c, can be rapidly prepared and the building

proceeded with. On the other hand, the departures from previous vessels or the usual practice may be very great, in which case much will depend on the ship- builder's skill and judgment. Outline drawings must first be prepared to the dimensions which may be considered suit- able, and the calculations are made on this assumed design. These will include estimate of the weights of the hull, of the machinery, equipment, &c. ; and if it is not intended to class the vessel in some registration or classification society, questions of strength will have to be considered. If, however, the vessel is to be so classed, the determination of the structural strength may be omitted, as the scantlings required by the rules of such society are arranged to provide sufficient strength. If the calculations show that the dimensions assumed do not enable the required conditions to be fulfilled, the dimensions must be modified in the direction indicated by the calculations, and the calculations made over again. This process must be continued until a satisfactory result is obtained. As soon as the dimensions obtained for the vessel are found to be appropriate, more com- plete drawings are put in hand, and the final calculations pertain- ing to the displacement sheet, weights of hull and equipment, centre of gravity and trim, metacentric diagram and curves of stability and speed, are made. In the design of yachts the views of the owner, especially if he is a yachtsman of ex- perience, must necessarily play an important part.

While the present writer was designing the Royal Yacht " Alexandra " he was commanded on several occasions to wait on the late King Edward VII. to take his instructions. King Edward took a special interest in the design throughout and sketched in his own hand the shapes of the knee of head and the stern. All leading details were shown to him in model and settled by him personally. At an important stage the king consulted the prince of Wales (George V.), whose views as to the principal dimensions were afterwards adopted.

In the case of the construction of large passenger ships the design often originates with the owner's or steamship com- pany's staff, and in some instances naval architects are employed, completed drawings and specifications being handed over to the shipbuilder with the order for the vessel. In other cases shipbuilders work in close connexion with the steamship com- panies, and the business relations are of a very simple character, the company being content to send an order, with a note of the principal dimensions and type of ship required, leaving the determination of all details of the design in the hands of the builders. The general practice lies between these two extremes. In any case, complete design drawings and detailed specifications are necessary for the shipyard operations, and if not

supplied must be prepared by the shipyard staff. Sometimes outline drawings

of the vessel on a small scale — including an elevation or side view, one or two plans of the main deck and other parts, and a short description of the vessel— are first prepared, and are called an outline or sketch design; but usually the information which constitutes a design comprises a sheer, profile and plans of each deck on a £-in. scale, a midship section on a J-in. scale, and a complete specification.

The sheer drawing gives the outside form of the ship. It consists of an elevation showing her longitudinal contour; the positions of the decks; the water-line or line at which she will float, and certain other lines parallel to this and equally spaced below it, which are also called water-lines; a series of vertical lines equally spaced from stem to stern, called "square stations"; and certain other details: of a body plan showing the sectional form of the ship at the square stations, supposing her to be cut by transverse planes at these stations: and of a half-breadth plan showing the form of the ship at the several water-lines, supposing her to be cut by horizontal planes at the levels of these lines- The profile and plans give all the internal arrangements of the vessel, the holds or spaces set apart for cargo, the passenger accommodation, the positions of the engines and boilers, the accommodation provided for the crew, and other principal fittings In a warship there are no cargo holds or passenger accommoda- tion, but the distribution of the armament and magazines, the armour, and other arrangements for the protection of the vessel against injury in action are carefully shown, and the appropria- tion of every portion of the internal capacity of the vessel is clearly indicated. The midship section shows the structural arrangements of the vessel, and usually the scantlings of the most important parts. The specification is a statement of all the particulars of the vessel, including what is shown on the drawings as well as what cannot be shown on them; the quality of the materials to be used is described, and the scantlings of the same carefully recorded; and it is clearly stated how parts not manufactured by the shipbuilders are to be obtained.

When first formed the objects of register societies were simply the maintenance of a register in which was recorded for insurance purposes the main particulars of each vessel's hull, machinery, equipment, &c, together with the names of owner, master and builder, as well as a designation or class represented by a symbol, which was in- tended to give to underwriters an indication of the

strength, durability and general seaworthiness of the ship._ As a natural sequence it became necessary for the register societies to formu- late rules which would indicate to owners and builders the structural conditions that would entitle vessels to the highest class and the minimum rates of insurance. The register societies now provide the shipbuilder not only with a record of all the important features of the ships which are classed, and thus with much of the information which he requires for the design of his vessel, but they also fix the quality and strength of the material to be used, the scantlings of all the parts of the hull, the riveting of the attachments, the equipment of pumps, anchors, cables, &c, the dimensions and details of the principal parts of the machinery, and all the details of the boilers. Classification societies are thus technical bureaux of the highest value to the shipping community, whose rules are a reflex of the most advanced knowledge and whose methods encourage developments in structural design.

The principal registration and classification societies in 19 id, and the number of vessels (sailing and steam) classed, were as follows: —

Lloyd's Register of British and Foreign Ship- ping, having its headquarters in London

British Corporation for the Survey and Registry of Shipping, in Glasgow

Bureau Veritas International Register of Ship- ping, at Paris . . .

Germanischer Lloyd, at Berlin

Norske Veritas, at Christiania

Registro Nazionale Italiano, at Genoa .

Record of American and Foreign Shipping, at New York .....

Veritas Austro-Ungarico, at Trieste

Great Lakes Register . .

Of these societies, Lloyd's Register, as at present constituted, has existed since 1834; at that date it Superseded two rival institutions having a similar object. The name is traced back to Lloyd's Coffee-house, once situated in Lombard Street, in which underwriters met for business purposes, and from which in 1696 they issued their first publication. The first printed register was issued about 1726, a copy

dated 1764 being still extant. The office of surveyors is referred

Registra- tion tocietles.

0,302

vessels.

710

»»

4,626

2,672 1,560 1,263

ti

1. 139

1,041 609

it

95 8

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to in a register bookof the date 178-1, but there are evidences that in 1768 repairs were superintended by officers of the society. In 1799 surveyors were stationed at twenty-four ports in the United Kingdom. In 1822 the register for the first time recorded a steamship. In 1824 appeared the first " Instructions to Surveyors " as to the carrying out the rules for classification; and in 1834, on the establishment of the present, society, precise regulations were issued regarding the survey of steamers. An iron ship was built under survey and re- ceived a class in 1837, while the first rules for the construction of iron ships were issued in 1855. In 1851 a composite vessel was classed, but it was not until 1867 that rules for the construction of such vessels were issued. Steel was accepted in 1867, experimentally, steel being, then made, by the Bessemer process. Steel by the Siemens-Martin process was first used for two small steamers in 1877. Engineer surveyors Were first appointed in 1874. The society is voluntarily maintained by the shipping community. Its affairs are managed by a committee of sixty-one members— com- posed of merchants,

shipowners and underwriters — elected to represent the important shipping centres of the country, and there are branch committees at Liverpool and Glasgow. In technical matters affecting the rules for the construction of ships and machinery the committee has the advantage of the co-operation of a body of representatives of prominent shipbuilders, engineers, steelmakers and forgemasters, who are specially elected by the leading technical institutions of Great Britain. The society's rules for steel ships were entirely revised so recently as 1909. The society has a total staff, at home and abroad, of 310 surveyors, of whom 232 are its exclusive servants.

In the case of a new vessel intended for classification, the plans for its construction are in the first place submitted to and approved by the committee; the building proceeds under the supervision of the local surveyor, and when completed, a character is assigned to the vessel by the committee upon that surveyors report. The society issues annually to its subscribers a register book containing particulars of classification of vessels to which classes have been assigned, together with many other details. All merchant vessels in the world of 100 tons and upwards, excluding those trading on the Caspian Sea, and wooden vessels on the Great Lakes of North America, are included in the work. This register contains particulars of the age, build, tonnage, dimensions, ownership, &c, of some 30,000 vessels. The society also publishes yearly a register of yachts, containing full particulars of the yachts of the world and other interesting information, and a register of American yachts, which gives similar particulars of all American and Canadian yachts.

All 'the public proving establishments in the United Kingdom for the testing of anchors and chain cables are licensed by the Board of Trade to carry out these tests under the control of the Committee of Lloyd's Register. The assignment of freeboards of vessels, the survey of refrigerating machinery, electric light installation, &c., all come within the scope of the society's operations.

The Bureau Veritas was founded in Antwerp in 1828, one of its principal aims being to make known to underwriters the qualities and defects of ships frequenting Dutch and Belgian ports. In 1832 the headquarters were moved to Paris, and in due time its influence spread to all countries where shipowning or shipbuilding existed ; it is now represented in over 250 districts comprising about 1500 ports. In 1851 rules were drawn up for the construction of wood ships, and about 1867 for iron. Rules for steel came later, and also rules for the construction of machinery, and, as circumstances arose, provision was made for special types, such as oil-tank vessels, turret

vessels, dredgers, &c, as well as for the testing of materials. These rules have been revised from time to time and recently have been remodelled and extended, so as to apply to vessels up to about 900 ft. in length. Special rules have been issued for. vessels intended for navigation in inland waters, for yachts and for motor boats. A staff of surveyors formed part of the organization from the be- ginning; and in the earlier days the professional experience of the surveyors was the only guide as to what was necessary and sufficient. With the lapse of time, arid with increased variety of construction and complication of interests, something more than individual judgment and experience became necessary, and with the Bureau Veritas, as with Lloyd's and other similar societies, definite rules were introduced, and by their means a greater uniformity of practice was attempted and secured.

The British Corporation was founded in 1890, and obtained its charter under the Merchant Shipping Acts for the assignment of freeboards; its first rules were issued in 1893. Its inception was due to the enterprise and influence of a number of leading shipowners, shipbuilders and engineers throughout the country, and more particularly in Glasgow and the West of Scotland, the first aim of the founders being to provide an independent society, thoroughly capable of dealing with the complicated questions which were likely to arise under the Load. Line Act then coming into operation. The Liverpool Registry, which had once been independent, had been absorbed into Lloyd's Register some years before, and it was thought that the enormous shipbuilding interests of the country demanded the existence of a society whose friendly rivalry with the great society of Lloyd's Register would have a beneficial influence on the shipbuilding of the country. Owing to the comparative absence of small vessels the relatively small number of the vessels on the

register represents 2,331,000 tons. The society is controlled by a committee of forty members — shipowners, shipbuilders and under-writers — and,' in addition, there is a branch committee in Italy. There is a staff of 135 surveyors distributed over the principal home and foreign ports.

The Norske Veritas was established in 1 864 by the various marine insurance clubs of Norway. Previously each club had its own separate staff of surveyors, on whose report to their club depended the class of the vessel and the premium to be paid. As ships rose in value and reinsurance became the rule, something had to be done for mutual protection. By the establishment of the Norske Veritas one uniform system of classing and valuing was substituted for the older

methods. In the matter of rules this society kept pace with the changes of the mercantile marine; it provided, as the occasion required, for the introduction of iron arid steel in place of wood, and of steam in place of sails.

The Germanischer Lloyd was established in 1867, and reorganized as a joint-stock company in 1889. Its functions are carried out by officers at the central office in Berlin, assisted by a staff of 50 ship and engine surveyors in Germany and 120 at the principal foreign ports, the latter under control of agents, who are mostly consuls. " In all foreign parts in which the Germanischer Lloyd has no representative, the German consuls are required by order of their government to exercise the functions of an agent of the Germanischer Lloyd."

The Registro Nazionale Italiano was formed in: 1910 to take over the Registro Italiano, which was founded in 1861. The society has adopted the rules of the British Corporation Registry, has a staff of surveyors in Italy, and has an arrangement with the British Corporation which enables them to utilize the services of the surveyors to that society in British and foreign ports.

The Record of American and Foreign Shipping was established in 1867 by the American Shipmasters' Association (now called tht American Bureau of Shipping), and is the standard American authority. Its rules for the construction and classification of vessels, as published in 1889 and amended in 1900, received the approval of the U.S. Navy Department and of the several boards of American underwriters. It has agents and surveyors in many of the principal ports of the world.

The present rules and tables of most of the above societies apply to construction in steel. If iron is to be used in the construction of vessels, the material must be increased in thickness from 10% to 25 %, dependent upon the part for which it is to be used and the quality of the iron. In some cases separate tables for steel and iron accompany the rules, and in a few cases the societies provide rales for construction in wood. The.latest rules of Lloyd's Register provide only for steel ships, but vessels of wood and iron are still classed,

The highest class assigned, upon completion of a ship by the societies referred to, is as follows :—

Lloyd's

ifl 100A i t||L.M.C:

Bureau Veritas ....

4l#3/3L 1. 1.

British Corporation

B.8.M.B.S.

Norske Veritas . . . .

|{| 1A1 1 |j(M&K,V

Germanischer Lloyd

»i« ioo A 4&M.C.;

Record of Amer. Shipping

iff M M.C.

The star or cross in each case denotes special survey. In Lloyd's Register 100A refers to conformity of scantlings with the tables; the figure I, to the efficient state of the equipment, including anchors and cables; L.M.C. denotes Lloyd's Machinery Certificate. In the Bureau Veritas the large I expresses first division of classification (put of three) ; [the two rings around the J denote that the ship is divided into a sufficient nurnber of water-tight compartments to enable her to float in still water with any two of them in free coiririiunication with the sea. Very few ships in the register have the double ring,

but some have a single ring ˆ), denotingpower to float in still water

with any one compartment in free communication with the sea; 3/3 expresses completeness and efficiency of hull and machinery; the letter following 3/3 indicates the navigation for which the vessel is intended; the first I, that the wood' portions of the hull are entirely satisfactory ; while the second I has the same significance in respect to the equipment of masts, spars,' rigging, anchors, chains and boats. In the British Corporation Register, B.S. signifies con- forrnity with all requirements, these letters standing for British Standard; M.B.S. signifies that the machinery also conforms. In, the Norske Veritas 1A1 denotes compliance with rule requirements as regards the hull. M & K.V. signifies that the vessel. has a Norske Veritas certificate for

engines and boilers. The third figure 1 denotes the efficient state of the equipment. In the Germanischer Lloyd the

mark 100 A signifies that the ship which bears it is, including her

equipment, up to the requirements of the highest class of the society. The figure 4 signifies that the class is to be regularly renewed after special surveys held in periods of four years each. M.C. signifies

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that the machinery also conforms with the requirements of the rules and has obtained a separate certificate.

Certain steam vessels obtain a I 1 which encloses the lf| in front

of the class mark. This signifies that the arrangement of the water-tight bulkheads is such as theoretically to ensure the floatability of the ship when the sea has access to one or two of her compartments. The tests for steel material to be used in building the ships, as required by the same societies, may be tabulated as follows: —

appointed by the British government, and one of the questions considered was that of the load line. In'' the final report in 1874 the conclusion was arrived at that a settlement of ailpad line should., in the main, be guided by reserve buoyancy as a first consideration. The commissioners were, however, of opinion that an act-of parlia- ment, framed to enforce any scaleof freeboard would be mischievous, if not impossible, as would be any universal rule for the, safe, .loading of merchant ships. ,' ,*

In 1874-, in a paper read before the Institution of Naval Architects

Ultimate Tensile Strength.

Elongation in Length of 8 in.

Temperature Test.

British Corporation . . Registro Nazionale Italiano . .

Norske Veritas

Bureau Veritas

Record of American Shipping .

Germanischer Lloyd ....

Between 28 and 32 tons per sq. in.

»» '»*

m . >j Between 27 and 32 tons per

sq. in. Between 58,000 and 68,000 lb

per sq. in.

Between 26 and 31 tons per

sq. in.

Not less than 20% for plates | in. thick and upwards.

t» ,, »» ' »» ,, • l»

22 % for plates weighing 18 lb per sq. ft. and upwards.

20% for plates 10 mm. in thickness and upwards.

Sample heated to a low cherry red and cooled in water at 8o° F. and doubled oyer a radius of 1 § times the thick- ness of , the plate tested.

For plates less than § in. in thickness the first four societies in the above table allow an elongation of 16%; the Bureau Veritas allows an elongation varying between 20% and 10% for plates between ijths and ii\ths of an inch in thickness; the Record of American Shipping allows an elongation of 18% for plates weighing less than 1 8 lb per square foot ; the Germanischer Lloyd allows an elongation of 16% for plates between 10 mm. and 5 mm. in thickness and 14% for plates less than 5 mm. in thickness. For steel plates to be flanged cold Lloyd's Register and the British Corporation require a minimum tensile strength of 26 tons, and for sectional material such as angles, bulb angles and channels the tensile strength may be as high as 33 tons. For rivet steel the tensile strength must be between 25 and 30 tons per square inch, with a minimum elongation of 25 % on a gauge length of eight times the diameter at the bar. Hot and cold bending and forge tests for angle bars are also prescribed.

The regulation of certain matters connected with the design of merchant ships falls upon the Marine Department of the Board of Trade. The authority of the Board is the Merchant Board of Shipping Act of 1894, which consolidated previous Trade enactments. These matters include the measurement

toper- £ tonnage, an(j provision for the safety and comfort of v s on. passengers and crew. The former is discussed in a separate article (see Tonnage), but it may be mentioned here that the following countries have at various dates accepted the British rules for tonnage: United States, Denmark, Austria-Hungary, Germany, France, Italy, Spain, Sweden, Netherlands, Norway, Greece, Russia, Finland, Hayti, Belgium and Japan. The amount of deduction for propelling power varies in Spain, Sweden, Nether- lands, Greece, Russia and Belgium, but option is granted to owners to have the engine-room remeasured under the rules of allowance for engine-room relating to British ships. Special certificates are at present also issued, on application, to vessels trading to Italian ports, as the Italian authorities do not at present recognize certain sections of the Act of 1894 in regard to deductions from tonnage and exemp- tions from measurement. Special tonnage certificates are also issued for the Suez Canal, where the measurements of ships and deductions from tonnage vary from British rules, and are detailed at length by the Board of Trade in their Instructions to Surveyors.

With regard to safety and comfort the surveyors have to see, among other matters, that the crews are properly accommodated and the passengers not too crowded ; that the boats and life-saving appliances are sufficient; that the lights and signals are in order; that the freeboard is sufficient and ship otherwise seaworthy ; that grain cargoes are properly stowed ; and that coal cargoes are ade- quately ventilated. Any question of doubt as to the strength of passenger vessels has to be referred to the Board of Trade, and in future midship sections, with all particulars marked thereon, are to be submitted in the case of all new steamships building under survey for which passenger certificates are required. A passenger certificate is required whenever a steamer carries more than twelve passengers. In granting it the Board of Trade recognizes five different services, ranging from foreign-going steamers to excursion steamers in smooth water. The Board of Trade rules for scantlings are not published officially.

A Bill, introduced into parliament in 1869, dealing with the load

line question, contained a clause requiring the draught of water to be

recorded at which a vessel is floating when leaving port.

V, This Bill did not pass; but in the following year the fcˆfiS 6 ” Merchant Shipping Code Bill was brought in, containing boara – the same provision, and, in addition, requiring a stale showing the draught of water to be marked on stem and stern post of every British ship. This became law in 187 1. The same Act empowered the Board of Trade to record the draught of water of all sea-going ships on leaving port by surveyors duly authorized. In March 1873 a Royal Commission on ” Unseaworthy Ships ” was

by Mr B. Martell, who was then the chief surveyqr to Lloyd’s Register, tables of freeboard were suggested from data collected at all the principal ports in the United Kingdom. These tables were based on the principle of reserve buoyancy, and were intended to apply to the loading of the various types of sea-going, ships then to be dealt with. As an indication of the form of the vessel, it was suggested that. a tonnage coefficient of fineness should be used, in order that the tables proposed might be readily adapted to all sea-going ships, whether at that time at sea or in port, til 1875 a short Act was passed, to remain in force only until October of the following year, which embodied as its chief . feature the requirement of what was afterwards universally known as the ” Plimsollmark ” (after the late Mr S.Plimpoll, M.P;, the prime mover in securing legislation for the prevention ,pf over- loading in British ships). All British ships were to have the position of the deck shown on the side of the ship, and every foreign-going British ship was to have, a circular disk marked below fhe deck line, indicating the maximum draught to which it was intended to load. The Act in no way fixed the amount of freeboard ; this was left to the shipowner. The provisions of the 1875′ Act were con- firmed by a more comprehensive Act in 1876, which extended the compulsory marking of the deck line and disk to all British ships, except those under 80 tons engaged in fishing and the coasting trades, also excepting ˆ yachts or war vessels. Before this Act, was passed the Board of Trade took action, by appointing a committee to consider the possibility of framing rules for the regulation of freeboard. The committee was to be composed of representatives of the Board of Trade, Lloyd’s Register, and the Liverpool Under- writers’ Registry. This attempt to establish an authorized scale of freeboard failed. Meanwhile the subject was not lost sight of ; the collection of data was continued, investigations were carried outi and six years later (in, 1882) the committee of Lloyd’s Register issued freeboard tables, and undertook to assign freeboard, on the’ basis of the tables issued, on owners making application’ for the same. In the course of three years 944

vessels had freeboards thus assigned to them, and in the case of 775 of this number the owners voluntarily accepted the freeboards assigned. In December i 883 . the Load Line Committee was appointed by the Board of Trade ; and after two years' careful deliberation and investigation, 'involving much labour, the committee presented its report. This report was accom- panied by tables, which agreed closely with those previously issued by Lloyd's Register; and they were accepted by ; the committee of that society, in September 1885. Between 1885. and—June 1890 (the latter being the date the Load Line Act was passed) 2850 steam and sailing vessels had freeboards fixed by Lloyd's '.Register, and of these 2520 were taken from the tables. After the passing of the Act in 1890 appointments to assign freeboards were granted to Lloyd's Register, Bureau Veritas and the British Corporation.

In 1893 tne original 'tables were' modified with respect to some 'of the ports in the United States on the Atlantic, the sailing from or to which in the winter was to subject the ship' to a few' inches additional freeboard. In 1898 they were further modified (a) to exempt ships over S30 ft. in length from the additional freeboard just tijentibned, and to limit the; additional freeboard in smaller ships;' (b) tp give some concession to turret-deck steamers; and © 'in some other minor matters. ' ' .' ' ",""" ".."

I n 1 906 the Shipping Laws' were amended so that all foreign vfesfels loading at British ports required to be provided either , with a '.free- board assigned under the British tables, or under tables of a'.fbreijyl country which had been certified by the British Board of Trade as being equally effective with the British freeboard tables.

In the same year the British tables were revised throughout in the light of the experiences of previous years of practical administration,; by a committee whose members were drawn from, the Board of Trade and the three assigning bodies— Lloyd's, British Corporation, and the Bureau Veritas. Important modifications were

made in the freeboards for vessels with complete superstructures or a considerable extent of strong deck erections, and in those for large vessels, with the result that a considerable increase was given to the

carrying capacity of British shipping. This was followed by a conference in Hamburg between eight delegates nominated by the British government — being practically the former committee— and eight German delegates. The conference resulted in an adjustment of the German freeboard tables previously in force, and Germany has adopted freeboard tables and regulations which are recognized by the British government in an Order in Council dated 2 1 stNovember 1908. France and Holland have adopted the British tables, and the load line certificates issued by those countries are recognized in Orders in Council dated 22nd November 1909 and nth June 1910 respec- tively. Denmark, Sweden and Spain have also adopted the British tables, and as other maritime nations have the subject under con- sideration it is confidently expected that the load line regulations will become international. Under the provisions of the Merchant Shipping Act 1906 the British load line regulations now apply to all foreign ships while they are within any port in the United Kingdom.

Ships laden with grain have to comply with rules of the Board of Trade, which provide that for single-decked ships there shall either be provision for feeding the hold, or there shall not be Loading of more j-jˆn three-quarters of the hold occupied by grain in T? " bulk, the remaining one-fourth being occupied by grainor • other, suitable cargo in bags, bales or barrels, supportedon platforms laid on the grain in bulk. For ships with two decks, grain in bulk in the 'tween-decks is for the most part prohibited ; but certain grains are allowed, provided there are separate feeders for hold and 'tween-decks, or else sufficiently large feeders to the 'tween- decks, and the hatches and other openings there made available for feeding the holds. In ships with two decks longitudinal grain-tight shifting-boards must be fitted where grain is carried either in bags or bulk; these shifting- boards must extend from beam to deck and from beam to keelson, and in the case of bulk grain must also be fitted between the beams and carried up to the very top of the space. The regulations also impose a fine not exceeding five pounds for every hundred cubic feet of wood carried as deck cargo which arrives in a ship, British or foreign, in any port of the United Kingdom between the 31st October and 16th April, provided no unforeseen circumstances, as defined by the Act, intervene. By deck cargo in this section is meant any deals, battens or other wood goods of any description to a height exceeding 3 ft. above the deck.*

In 1890 a committee was appointed by the Board of Trade to deal with the spacing and strength of transverse water-tight bulk- heads and to make recommendations. The first matter submitted to this

committee related to subdivision which should enable a ship to float in moderate weather with any two compartments in free connexion with the sea. The committee, while recommending the above as a standard for sea-going ships of not less than 425 ft. in length, and for cross-channel steamers irrespective of length, suggested less stringent conditions for sea-going ships of shorter length. There was no suggestion of enforcing such subdivision by law; but as a reward for complying some concession was to be allowed, under the Life Saving Appliances Act of 1888, as to the boats or life rafts to be carried. On the presentation of the report the matter was, however, allowed to drop, and the rules of Lloyd's Register and the other classification societies are therefore the only rules with practical influence. The subdivision required by Lloyd's Register for all steamers comprises a bulkhead at each end of the machinery spaces, and a bulkhead at a reasonable distance from each end of the ship, making four in all. In addition for larger steamers other bulkheads have to be fitted, making the total as follows, namely : —

Length of Steamer. Bulkheads.

285 ft. to 335 ft . .5

335

., 405 ..

405

., 470 .»

470

,. 540 ».

540

„ 610 „

610

„ 680 „

6

7 8

9 10

The positions of these additional bulkheads, and the height to which they are to be carried, are clearly stated, and the rules are given for their scantlings. These scantlings are suitable for purposes of safety in the event of accident ; but it is understood that they have to be considerably increased when the bulkhead is also used to withstand frequently the pressure of oil or water ballast ; a deflection of the plating which would do no harm in an emergency once en- countered would certainly become serious if often repeated in the ordinary service of the ship. The foremost bulkhead of the ship receives the name of collision bulkhead, or sometimes fore-peak bulkhead; the aftermost, the after-peak bulkhead. In sailing ships the collision bulkhead alone requires to be fitted.

Practical

Practical shipbuilding requires a knowledge of the properties

of the materials used in the construction of ships, and of the

processes by which they are produced or prepared for use, so that

they may be suitably selected for the services for which they are

intended; also a knowledge of the methods, means and machinery by which, after delivery in the shipyard, the materials are brought to the requisite shape, erected in their proper relative positions, connected together, and completed so as to form a structure which shall fulfil the intentions of the design, whether large or small, merchant ship or warship. The varieties of ships are very great, and are constantly changing, and thus new problems continually present themselves to the shipbuilder. There is also an ever-increasing demand for rapid production, which necessi- tates a rigorous and constant search for simplification of methods of work, for labour-saving and time-saving machinery, for improved means of handling material in the shipyard, and for workshops and factories which will more completely prepare and finish their various products before despatch to the shipyard.

Whatever the size of the ship or the type to which she belongs, the general principles of construction remain very much the same in all cases. The following account applies to steel and iron shipbuilding. The exterior parts — the bottom, parts% sides and decks — supply the strength required for the structure as a whole. The bottom and sides are spoken of as the shell or outside plating, and are, with the decks, kept to the proper shape by means of frames running across the ship, like the rafters in a roof or the ribs in the body. These are

called transverse frames or ribs, and beams where they run under the decks. The parts of the frames at the bottom of the ship, where they are made deep and strong to support her when she is docked or grounded, are known as floors, while the spaces between these floors are spoken of as the bilges. The transverse frames and floors are held upright in their proper relative positions by other frames which run lengthwise in the ship; one at the middle line being called the centre keelson, and others fitted at the sides, keelsons, bilge keelsons and side stringers. All the fore-and-aft frames, taken together, are spoken of as the longitudinal framing. Where tanks for carrying water ballast are built into the bottom of the ship, the centre keelson is called the centre girder, and the keelsons or bilge keelsons the side girders. In large merchant vessels, and in all war vessels, except the smallest classes, an inner bottom is provided for increasing the security against injury by grounding, and against ramming and torpedo attack in war vessels, in addition to forming tanks for carrying water, either as ballast or for use in the ship. In such cases the centre keelson is called the vertical keel, and the keelsons and girders are called longitudinals. When the deep vertical transverse plates forming the floors only extend between the keelsons, girders or longitu- dinals, and are attached to them by angle bars, the floors are called intercostal floors, and the keelsons, girders and longi- tudinals are said to be continuous; on the other hand, when the keelsons, girders or longitudinals extend only between the frames and floors they are called intercostal keelsons, girders and longitudinals, and the frames, and floors are said to be continuous. In war vessels, except the smallest classes, much of the longitudinal framing is continuous; and the transverse framing, for the most part, is built up of angle bars upon the outer bottom and under the inner bottom, with short plates, called bracket plates, between them, attached to the longitudinals by short angle bars. Frames built up in this way are called bracket frames. In mercantile vessels the transverse frames both within and without the double bottom are usually continuous.

Besides the transverse and longitudinal framing, there are partitions used for dividing up the internal spaces of the ship, which are called bulkheads; they are partial, complete, water- tight or non-water-tight, as the circumstances ofthe case require. In warships the transverse bulkheads are so numerous, in order to restrict as much as possible the entrance of water from damage in action, that they go a long way towards providing the necessary transverse strength, and the transverse frames are consequently made of thinner materials and fitted at greater distances apart than they otherwise would be.

Transverse frames are from 36 to 48 in. apart in large warships, and from 24 to 33 and some- times 36 in. in large merchant ships. At the extreme ends of the ship the shell plating on the two sides is attached to forgings

01 castings, which are known as the stem at the fore end, and the stern-frame or sternpost at the after end. The stem of a warship is generally made very massive, and projects under the water so as to form the ram.

The longitudinal framing is carried right forward and aft when possible, and the ends of the several frames are connected to- gether across the ship by strong plates and angles, which are called knees or breasthooks, forward; and knees or crutches, aft. Additional supports, introduced to enable the vessel to withstand the heavy blows of the sea in bad weather, are called panting stringers, panting knees, and panting beams, panting being the term applied to the movements which occur in the side plating

The sections of the iron and steel bars in common use are shown in fig. 75, and are named as follows: —

A. Angle bar.

B. T (Tee) bar.

C. Channel bar.

D. Z (Zed) bar.

E. I bar.

F. Plain bulb bar.

G and h. Angle bulb. 1. T bulb bar.

J. Half-round moulding.'

K. Hollow moulding.

The vertical, or central, portion in the I, T and bulb sections is

spoken of as the web, and varies from about 3 in. to 9 in. in depth ; the horizontal parts are called flanges ; in an angle bar, both parts of the section are called flanges. The flanges vary in width from about 2 in. to 7 in. in the angle bar, and from 3 in. to 6 in. in the others. The thickness varies from about J in. to | in. These dimensions taken together are called the scantlings of such material. The thicknesses of the plates in common use generally lie between

Fig. 75.

if sufficient strength is not provided. Where the ends of the ship are very full, or bluff, the frames are sometimes inclined, or canted out of the transverse plane, so as to be more nearly at right angles to the plating; such are known as cant frames. At the stern a transverse frame, called a transom, is attached to the upper part of the sternpost to form a base for cant frames of the overhanging part of the stern which is known as the counter. To assist the beams and bulkheads in holding the decks in their proper positions, vertical pillars are introduced in large numbers; but to avoid the loss of space and inconvenience in handling cargo, ordinary pillars are often dispensed with, and special pillars and deep deck girders are fitted instead.

The steel generally used in shipbuilding is known as mild steel. It is very tough and ductile, and differs from the hard steel, out of Materials, which tools are made, in that it will not take a temper, i.e. if heated and plunged into oil or water, the sudden cooling has very little effect upon it, whereas with tool steels a great change takes place, the steel becoming very hard, and usually brittle. This quality of tempering depends chiefly on the amount of carbon in the steel, mild steel containing less than 25 . Steel of greater strength than mild steel is used occasionally in certain parts of warships. The extra strength is obtained generally by the addition of carbon, nickel or chromium, coupled with special treat ment. The quality of the plates and bars used is tested by cutting off strips about 2 in. wide, and bending them double by hammering, or in a press, until the bend is a semicircle whose diameter is three times the thickness of the strip. The strips are sometimes heated and plunged into water to cool them suddenly before bending, and they may be cut from either side or the end of the plate. Strips are taken occasionally and hammered into various other shapes while hot and while cold, so as to ascertain the general quality of the material. To ensure its tenacity, strips are taken and machined to give a parallel part about 2 in. in width, of at least 8 in. in length.. Two centre- punch marks are made 8 in. apart, and the strip is secured in a testing-machine constructed so that the

ends can be gripped by strong jaws which do not injure the parallel part. The jaws are then gradually pulled apart, the amount of the pull required to break the strip being registered, and also the extent to which the strip stretches in the length of 8 in. before breaking. The tensile strength varies between 26 and 32 tons per square inch, calculated on the original sectional area of the parallel part before breaking, and the elongation in the 8 in. is about 20. The standard strength and elongation required by the principal registration societies have already been given. The steel used for making rivets is similarly tested; and samples of the finished rivets are also taken, and hammered into various shapes, hot and cold, to ensure that the metal is soft and ductile and suitable for the work.

The stem, stern-frame, &c, are frequently made of forged iron; but if of steel, they are' cast to the form required. These castings are tested by being let fall on hard ground and then slung in chains and hammered all over, when faults of casting are generally dis- covered by variations in the sounds produced. By this hammering the general soundness of the casting is ensured. To test the quality of the steel in the casting, small pieces, which are cast on for the purpose, are removed and tested in the same manner as just de- scribed for the strips cut off from'the plates; they are required to give about the same tensile strength, but a little less ductility, say 10% instead of 20% elongation in 8 in.

i in. and 1 in. Thicker or thinner plates are obtainable, but are not often used for merchant ships. These plates are of varying sizes as required, the tendency being to use very large plates where possible, and widths of 5 ft. to 7 ft. are used in lengths of from 40 to 20 ft. Angle bars are used in ■lengths of from 20 to 80 ft. as required, or as may be limited by the means of transport between the steel works and the shipyard.

The various plates and bars are connected together by means of rivets of various forms. Specimens of the common kinds are shown in fig. 76. The heads and points have distinctive names, as follows: —

(a) Countersunk head, chipped flush.

(b) Ordinary countersunk head.

(c) Snap head.

(d) Snap head with conical or swelled neck.

(e) Pan head with conical or swelled neck.

(f) Pan head.

(g) Countersunk point.

(h) Rough hammered point. (1) Snap point, hand work, (j) Snap point, machine work.

The pan head rivet (e) with conical or swelled neck is the most commonly used, as it is convenient to handle and gives good sound work. The rough hammered point (h) is also very commonly used, is very effective and is readily worked. The pan head (f) and snap head ©, without cones under the heads, are only used for small

ffl © & & Q HI

r\y

■■ .. *n wm*m*

Fig. 76.

rivets; the heads (a), (b), (c), (d), are used where considered desirable for appearance' sake, but © and (d) are also adopted when the riveting is done by hydraulic machinery, in which case the snap point J is also used. The countersunk point (g) is used on the outside of the shell, and in other places where flush work is required. The snap point (1), for internal hand riveting, is usied where desired for appearance, instead of the rough hammered point. The rivets vary in diameter from about f in. to I J in., and the lengths are as required to go through the holes and give enough material properly to form the points. The diameter of the rivet is settled according to the thickness of the plates to be connected, being generally about j in. more than the thickness of the separate plates. The distance from centre to centre of the rivets is spoken of as the pitch, and is generally expressed in diameters. For connecting plates and bars in the framing, the pitch of the rivets runs gener- ally to 7 diameters; for securing edges which must be water-tight, the pitch is from 4j to 5 and, if tney are to be oil-tight, 3 to 3 j diameters. In butts and edges of shell-plating the pitch varies from 3§ to 4$ diameters.*

Fig. 77.

In some positions rivets like the above cannot be driven into place and properly hammered up; resort is then made to rivets which have screwed points, called tap rivets, shaped as shown in fig. 77. That shown at (b) is used where it is necessary to make the surface

flush, but not necessary to re- move the rivet for examination of plating; and when hove right up, the square head is chipped off and the surˆ face hammered smooth. In other positions pat- terns (a) or © are used as may . _ , , be mostsuitable.

The machines used in the shipyard have been m,uch improved of recent years. The one most used is the punching and shearing Machine machine, on one side of which plates of all thicknesses up toots to 2 ”’• “ˆy b e cut or sheared to any desired form, while

on the other side rivet holes may ‘be punched of any re- quired size. Special shears are provided with V-shaped cutters for shearing angle bars, but in some cases the cutters of ordinary shears may be replaced by V-shaped cutters for this purpose. When the plates and bars leave the shearing and punching machine their edges are rough and slightly distorted, to remove which it is necessary in many cases to plane them. This is usually done by special machines provided for the purpose. In the most modern types the cutters are duplicated and the machine arranged to cut both ways. When it is required to cut a square edge on the flange of an angle bar to facilitate caulking, a pneumatic chipping machine of recent introduction is frequently used, but this is more usually done in a planing machine. In shipbuilding a great deal of drilling must be done by hand, but, where it is possible, drilling machines are employed. The most modern forms can drill a number of holes at the same time. For countersunk work it 13 necessary to make the hole funnel-shaped, as will be seen from fig. 77. This shape is rapidly given to the holes already punched or drilled by means of a special drilling machine, which can be very easily and rapidly manipulated. The use of portable drills, to avoid hand labour, is_ rapidly increasing, and several types are in use, operated by electric motors, compressed air or flexible shafting. They are carried to any position required. The hole made by a drill is cylindrical, but that made in the process of punching is conical. On one side of the plate its diameter is

determined by the diameter of the punch, and on the other by the diameter of the die, Which must be greater than that of the punch. This taper tends to produce close and sound riveting, as the joint is closed both by the knocking down of the rivet and by the contraction of the rivet on cooling. On the other hand, the operation of punching injures the steel in the neighbourhood of the hole, and for work subjected to great stress this deteriorated material must be removed by countersinking or by drilling the hole to a larger size, or the quality of the material may be partially restored by annealing. The pro- cess of annealing consists in heating the steel to a good red, then allowing it to cool very slowly; during this process parts of the material which have been unduly distressed in working regain their strength by molecular rearrangements in the distressed parts. This process occurs to some extent when hot rivets are introduced into the holes and hammered up. The steel immediately adjacent to the rivet' is heated, and afterwards cools gradually as the heat becomes distributed into the body of the plate. In some experi ments carried put by the Admiralty in Pembroke Dockyard in 1905, it was found that the effect of punching holes close together, as for a butt-strap, was to diminish the tensile strength of the plates about 10%; that hot riveting restored about half of this; and that when holes were drilled and countersunk right through, also when holes were punched J in. and countersunk right through, so as to enlarge hole to i in. in diameter, there was no loss.

In addition to the machines mentioned above, many special appliances have recently been introduced into shipyards for the purpose of economically carrying out definite operations rendered possible by the use of mild steel. Ships built with a bar keel require the garboard strake plates on each side to be flanged on one edge, so as to fit against the bar keel. This flanging was formerly carried out by heating the plates and treating them hot, but now a very powerful machine, called a keel-plate bending machine, and usually worked by hydraulic power, is employed for' the purpose with the plate cold. Flanging plates cold has also become general for a variety of .purposes. In, a, bulkhead, stiffening is necessary, and for this purpose angle bars, were commonly used; the horizontal stiffeners are now frequently formed by flanging the lower edges of the plates. Instead if fitting an angle bar to connect two plates at right angles to one another, the edge or end of one may be flanged, and half the weight of the angle baE and the rivet work saved. For all such work somewhat lighter flanging machines than the keel-plate bending machine are used ; they are generally worked by hydraulic power, but there is no difficulty in driving them by any other means.

Another modern appliance is the scarfing machine, which is used chiefly in connexion with the lapped butts of shell and other plating. Before its introduction it was usual to bring the ends of the plates together and cover the joint with a short plate called a butt-strap, secured to both plates with a proper arrangement of rivets (see fig. 78). It is now more usual in merchant ships to work overlap butts, some half of the weight of the butt-strap and riveting and other work being saved thereby, although the appearance may not be quite so sightly. The difficulty with this system is that the passing plates on each side have their edges lapped over the ends of the lap butt, and in order that they may be brought close some machining is necessary ; this is called scarfing, i.e. slotting away the corner of the projecting butt so as to produce smooth surfaces for the side laps (see section at A B, fig. 78). The machine used for this operation is a slotting machine with two heads, so as to slot both edges of the plate at the same time ; it is provided with a table which can be adjusted to the necessary bevel, so that the slotting tools may reduce the thickness of the edges operated on in a gradual taper to a knife- edge. A more redent appliance for reducing weight is the joggling machine. As already, described, the usual method of working the shell-plating is by alternate inside and outside strakes of plating, the outside plates overlapping the inside plates, and the space be- tween them and the frames being filled in by slips or liners. These liners throughout the ship amount to a considerable weight, and the object of the joggling is to do away with the necessity for them. This is effected by shaping the outside plates as shown in section b. fig. 79. Sometimes the frames are joggled instead of the plates, as shown in section c, fig. 79; the inside plate lies. in the recessed portion of the frame formed by the joggling process, and the outside plate on the unrecessed portion, its edge lapping over the edge of the inside plate the usual width. The angle bar in this case must be heated, and the hydraulic press is placed so as to be readily accessible for the handling of the part to be heated. The system of joggling the frames has not been adopted to nearly so large an extent as that of joggling the plates.*

Frame-bevelling machines appear to be growing in favour. 'The machine is placed on rails, near to and across the mouth of the frame furnace, so that it can be readily placed in position for the frame bar to be drawn out of the furnace directly through it, and moved to one side when not required. In the machine a series of rollers, which can be inclined to suit the varying bevel required, operate on the bar. The inclination of the roller is varied as the bar passes along, a dial and pointer giving the angle of bevel at each instant. As the bar passes through, the workman, with his. eye on the

dial, manipulates the machine so as to give it the required bevel. It is afterwards completed on the slabs, the form being taken from the scrive-board in the usual way.

The shipyard should be supplied with modern machinery of the most approved type, in order to produce the best work at economical rates: rolls for straightening and bending plates, for fairing and bending beams and angle bars; shaping and slotting machines; lathes and milling machines; heavy planing machines. It should also have a blacksmith's shop, saw-mills, joiners' shops, &c, all fully equipped for completing, as far as possible, the work of the yard. The workshops and machines should be distributed so that, as far as possible, the material moves steadily along, as the various operations are performed upon it, to its place in the ship. Pneumatic tools are often preferred for light work, such as chipping, drilling, rimering and caulking; they are also occasionally used for riveting, but they are not yet much in favour for this class of work. Hydraulic power is particularly well adapted for heavy presses, such as for keel-plate flanging, for punching and shearing, and especially for punching manholes and lightening holes in plates, and for heavy riveting. It is also very successfully applied for pressing to shape a great variety of small fittings made of steel or iron. For such machines as rolls, ordinary shears and punches, winches, &c, separat? steam engines are still frequently fitted, but there is a very marked tendency to replace all these by electric motors. Electric power for driving all the machinery has been introduced into many ship- yards. It has many advantages: all the power required in the yard may be generated in one building in any position, containing the boilers, steam engines and electric generators, and the whole may be designed and worked so as to secure great economy. The current is supplied either to motors directly driving the heavier or outlying machines, or to motors driving a line of shafting where the machines are of a lighter character and are arranged in compact groups. Fixed machines can be placed where most convenient for the work, without any reference to the position of the boilers or other machinery, and a large number of machines can be very readily made portable for the lighter classes of work. The power may be transmitted with but little loss, whereas with steam-driven machines at a distance from the boilers, lines of steam piping must be intro- duced, and loss of power is entailed. The saving which the system of electric driving effects over that of .steam driving in the con- sumption of coal in a large shipyard is considerable, and is claimed by those who have adopted it to be sufficient to justify the large capital expenditure required to convert a shipyard from the latter system to the former.

As the plates, beams, angle bars, Z-bars, &c, are delivered, they must be stored in convenient racks, with marks showing for what

purpose they are intended, so that they can be readily identified and removed without loss of time. When required, they are taken from the racks, and the edges, butts and rivet holes carefully

*hoisting, except for plates under the bottom and counter, where a wire rope is used. **

At Newport News, in Virginia, the structures are differently

REVERSe FRAME

Enlarged Section through C D.

Enlarged Section through A B. shewing scarfed corner of Plate M.

Fig. 78.— Details of Shell-plating.

arranged, being on the cantilever travelling-crane principle. There are five such structures in the yard; three of them are wood, tb-

*5

Section shewing Ordinary Type of Plating

marked upon them before they are taken to the machines where the shearing, punching, drilling, shaping, &c, are carried out, after which they are taken to their proper position in the ship.

In many shipyards great attention has been given to the questions of the economical handling of the Cranes- material ,and very costly and novel appliances are to be found in these yards for the pur- pose. As an example mention may be made of the overhead cranes fitted at the Union Ironworks of San Francisco. A framework of wood is built up over the entire building berth, the structure being well braced in all directions for carrying two travelling girder cranes. There are four building berths fitted in this manner, and the latest has a length of 408 ft., a clear breadth of 80 It., and clear heightof 72 ft. A swing crane of 50 ft. spread at each end of the erection increases its

effective length to 500 ft. Each of the travelling girders carries a trolley, with motion transverse to the ship; five tons can be so lifted, and parts of the ship's struc- ture not exceeding this weight can be taken from the ground anywhere in the neighbourhood of the structure

and conveyed to any desired spot in the ship. The -Pˆ. _„ ,, ,, , , , . c , „ , ,·

driving power is electric. The longitudinal travel of FlG " 79-— Methods of working Shell-plating.

ˆJaˆHˆ™ }? i'2° ft ' Pf m p j nute : th e transverse travel of the trolley] last two of steel. The largest is 700 ft. long. One trestle structure, or " --------- • ■■ • •- gantry, serves two building berths, and runs longitudinally between

Section shewing |oggled Frames.

and speed of lift, each 90 ft. per minute. A manila rope is used for I

9 6 +

SHIPBUILDING

[COURSE OF CONSTRUCTION

the two. On the gantry is mounted a double cantilever crane, having an effective reach of 95 ft. on each side of the centre; this outreach is sufficient for a ship 70 ft. broad on each side of the trestle. The height of the cantilever above the ground is some 90 ft., the load that can be raised is 15 tons, and if necessary a bulkhead up to that weight can be lifted bodily into place. The speed of lift for this weight is too ft. per minute, and for lighter loads 700 ft. per minute. The speed of the trolley along the cantilever is 400 to 800 ft. per minute, and of the whole crane longitudinally is 400 to 700 ft. per minute. All movements are made by electric power. Similar gantries and arrangements are used in other American shipyards. The view shown in fig. 80 (Plate VIII.) represents one of these structures as fitted in Messrs Cramp's shipyard in Philadelphia.

At the yard of Messrs C. S. Swan & Hunter, on the Tyne, similar structures have been erected since 1894; besides carrying cranes, these have standards and stiffening girders, from whic,h ships under construction are shored for fairing. Roofs and sides are fitted to protect the ship, and the workmen engaged in building her, from the

weather. The side supports are three in number, and serve for two berths ; they are formed of steel lattice- work, with standards mostly 20 ft. apart. The clear height of roof is 83 ft., and clear breadth of berths 68 ft. and 73 ft. ; a roadway on the ground level is left free on each side of the berths inside the standards. Two revolving 3-ton electric cranes travel along paths suspended from each roof; their jibs have sufficient radius to lift material from the roadways and deposit it at the centre of the ships building. The longitudinal speed of these cranes is 300 ft. per minute; speed of lift, 100 ft. per minute. A third berth is served by a travelling cantilever crane on top of the adjoining roof. At Messrs Harland & Wolff's yard at Belfast another modification was introduced in 1897 (see fig. 81, Plate VIII.). In this case the structure takes the form of a travelling gantry or bridge over the building berth, the legs running on rails at the ground level. The gantry, which is driven by hydraulic power, has three traversing cranes and four 4-ton swing cranes. It was designed to facilitate the lifting of plates and portions of the structure into position, and also to support the hydraulic riveting machines and other appliances for the carrying out of the work. The success of the appliances, first used in the " Oceanic," has led to a further extension for other ships in hand.

Course of Construction

The first steps taken on the receipt at the shipyard of the design drawings and specifications, which have been generally described on page 957, have for their object the provision of detailed drawings of the structural arrangements, which will enable materials for the various parts to be ordered from the manufacturers, and of information for the guidance of the workmen in erecting the structure.

A wooden model of half of the exterior Surface of the ship, called the " half-block " model, is immediately prepared from the sheer drawing, generally to a scale of J in. to the foot for a large ship and a somewhat larger scale for a small one, and on its- surface are carefully drawn the main frames, the edges and butts of , the outer bottom or shell-plating, together with the positions of decks, longitudinals and other features which influence the detailed arrangement of the framing and shell- plating, the particulars of which are fixed by the specification and the midship and other sections. The work on this model is carried out concurrently with the laying off. of the ship, which will be described presently, so as to be complete by the time the latter is sufficiently far advanced to enable full-sized measure- ments of the breadth of the plates to be obtained.

The lengths of the plates are then measured from the model and the breadths from the mould loft floor, a small surplus on the net measure- ments being allowed to provide for inaccuracies; and the whole of the outer bottom plating ordered from the manufacturers. The whole of the framing is also ordered, the lengths of the various parts being measured from the model.

A similar block model is made to the shape of the inner bottom, if one is to be provided, or of the top of the ballast tanks, as the case may be; arid in a battle-ship a block model will be made of the protective deck if it should have much curvature or sloping sides. All details of plating, framing, beams, cartings, hatchways, &c, will be shown on these models, and the dimen- sions of all the parts will be carefully measured off and the material ordered of the manufacturers; the breadths of the plating being obtained as in the case of the outside bottom plating.

For flat or nearly flat surfaces such as flat keel plates, vertical keel, bulkheads, decks, engine and boiler bearers, &c, the

detailed arrangements of plating and frames are made on draw- ings, from which the dimensions are taken for ordering the material from the manufacturers; while the drawings them- selves constitute working drawings which are issued for general guidance in building the ship.

Drawings of details of important structural castings or forgings, such as the stem, sternpost and shaft brackets, are also among the earliest taken in hand, but the patterns to which these parts are made, when they are large and complicated castings as in a warship, cannot generally be completed without information obtained from the mould loft floor.

Laying off is the name given to the process of drawing the lines of a ship to full size in plan and elevation in order to determine the exact dimensions of the most important and funda- mental parts of the structure. The necessity for drawing Maying to full size arises from the extreme accuracy with which the dimensions of the various parts must correspond with one another in order that when assembled there may be no irregularity or unfairness in the surface of the ship; the methods of ordinary mechanical drawing to a small scale being inadequate for this purpose, on account of the analytically indeterminate nature of the curves which define the form of the ship. The process is carried out on a specially planed and blackened floor, most conveniently of rectangular shape, and of such a size as to take

in the full depth of the ship in its width. The building or room in which the floor is situated is called the " mould loft," and is an important adjunct to the shipyard drawing office.

The rationale of the methods of projection of points and lines and rabatment of planes used in laying off is subjected to a de- tailed examination in the article Geometry, part III., Descriptive, vol. xi., and therefore will not be referred to in this article, which is confined to a description of some of the detailed pr.oblems which occur in actual practice, the solutions being often approximations which are found sufficiently exact for practical purposes.

In different localities and in the construction of different types of vessel, the extent to which the process of laying off to full size is employed varies considerably. In some yards laying off on a large scale on paper is relied on almost entirely, and very little full-sized work on the floor is considered necessary. This chiefly applies to ships of stereotyped form, such as ordinary " tramp " steamers, the lines of which have very little curvature for the greater part of their length. In the American Lake shipyards for the cargo vessels employed on the Great Lakes templates are very carefully and ingeniously made for the framing, one set sufficing to mark off all the frames on the greater portion of the ship's length. In a similar way one template is made for each strake of plating and used to mark off the whole of the plates of that strake, a slip mould being used when they begin to depart from the parallel midship body.

The types of vessels in which the greatest complication of structure occurs and in which the highest degree of accuracy in building is necessary are passenger ships and war vessels ; the description of the process of laying off, which follows, while generally applicable to all types of vessels, refers more particularly to the practice followed in building war vessels at the British Government Dockyards and at the more important shipbuilding centres in the United Kingdom.

The nature of the Sheer Drawing, with a description of the prin- cipal lines shown on it, has been stated on p. 957. Specimen sheer drawings of different types of ships are shown on _. Plate IX. Fig. 83, Plate IX., is a sheer drawing of the drawinz Midland Railway steamer " Londonderry," designed by Professor J. H. Biles, LL.D., of length between perpendiculars 330 ft., breadth moulded 42 ft., depth 25 ft. 6 in., displace- ment 2200 tons, speed 21-7 knots. Fig. 82, Plate IX., is the sheer drawing of the battleship " Lord Nelson," whose dimen- sions and other particulars are set forth in the article on Ship, page 898. Her form over the midship portion below the

water- line and above the turn of the bilge is flattened so as to enable her to be docked in a dock existing at Chatham when she was built, and at the same time to secure the greatest possible beam of ship at the water-line; and the bottom of the ship out to the dotted line in the half-breadth plan is absolutely flat so as to enable her to be docked on two or more lines of blocks whose upper surfaces lie in one plane, thereby reducing the docking strains, a system adopted for the first time in the " Lord Nelson " and in all succeeding vessels of large size in the British Navy since this vessel. In Plate IX. figs. 85 and 87, the hairbreadth and body plans of the royal yacht " Alexandra " are given in association with the profile, fig. 84, in place of the usual outline sheer, which is omitted to save space. In each of these sheer drawings the names of the various lines have been added ; whereas in ordinary practice only the numbers of the stations in the sheer and half-breadth and of the sections in the body are given. In the sheer drawing, fig. 83, very little more is given in the three plans than the various sections and the traces of the planes, whose intersections with the surface of the ship they are ; in such a case the sheer drawing is generally spoken of as the lines, and is only used for giving the outside form of the ship,

other information required for laying the vessel off and making the necessary moulds being usually given on other drawings. The sheer drawing of the " Lord Nelson " contains the information usually given concerning the form of the ship and other features of the design required for laying the vessel off, ordering the material for her construction and afterwards erecting the same in position. In these drawings it has been necessary for the sake of clearness to reduce the number of square stations and water or level lines commonly shown in drawings of this character. The number of these lines is fixed in the preparation of the design by the necessity of accurately defining the surface of the ship so that the intentions of the designer as regards form, displacement, and what may be called the geometrical features of the ship may be realised. In a large warship there are usually 21 square stations shown, including the forward and after

perpendiculars, the distance between which defines the nominal length of the ship. The water-lines are 3 to 4 ft. apart. Intermediate square stations and water-lines are frequently intro- duced where the curvature of the surface of the ship is rapidly altering; as at the ends and below the bilge. It is usual, and obvi- ously sufficient in the sheer drawing as well as in the process of laying off, to show only one-half of the ship on one side of the longi- tudinal vertical plane of symmetry. Thus, in the half-breadth plan only the port side of the ship is drawn; and in the body plan, for greater clearness, the half ship is further divided, the part forward of the midship section, or square station at the middle of the length of the ship, being shown on the right of the middle line of that plan, and the part aft of the midship section on the left of the middle line.

Other Drawings. — The profile and plans and the midship section have also been described in this article. The profile and plans of H.M. yacht " Alexandra " are given on plates. Fig. 84, Plate X., is the profile which shows in sectional elevation all the decks, bulkheads, machinery, living spaces, store spaces, &c. ; figs. 86, 93, 94, 95 and 96, Plate X., give the plans of the promenade deck, upper deck, main deck, lower deck and hold respectively with important fittings shown upon them; figs. 88, 89, 90, 91 and 92, Plate X., give sections of the ship showing the inboard works at stations E, D, C, B and A on the profile respectively; and on fig. 97, Plate XII., is given the midship section with all the principal scantlings of the framing and plating. Fig. 98, Plate XIII., also gives the midship section of H.M. battleship " Lord Nelson."

Any two of the three plans of the sheer drawing may be taken to represent the " horizontal " and " vertical " planes of Descriptive Geometry, and are theoretically sufficient to define the shape of the vessel completely, but the three plans are practically necessary for the sake of clearness and are always used.

In the design sheer drawing the lines may represent the inter- sections of planes with the surface of the framing of the ship, or with an imaginary surface having a mean position between the irregu- larities of the surface of the ship caused by the system of plating adopted. The former system is the more usual in the drawings of steel-built merchant ships, necessitating an allowance on all measured dimensions used in calculating displacement, &c. ; the latter system is usual in warships, in which the surface represented by the sheer drawing of a ship plated with raised and sunken plates strakes as described on p. 962, would be an imaginary surface midway between the outsides of the raised and the sunken strakes. A sheer drawing on

this latter system is said to show displacement lines in contra-distinction to the former system which shows ” moulded ” or frame lines. In the case of vessels with a plank sheathing over the bottom the surface shown on the sheer drawing is the outside of the planking. As the primary object of the laying off of the ship is to ascertain the shape of the frames, the surface of the outside of the frames is always that which is laid off on the mould loft floor. If displacement lines are given in the sheer drawing a preliminary process of deriving from them the moulded lines is necessary before lay ing off on the floor. The process, to be strictly accurate, involves setting in the requisite distance along the normal to the surface shown in the sheer drawing. This is easily done at the midship section, where the normal to the sur- face lies in the plane of the section and coincides with the normal to the curve of the square station in the body plan, or at the practically vertical parts of the sides of the ship, where the normal to the surface lies in the water plane and coincides with the normal to the water- line in the half-breadth plan. In other positions, however, it would be necessary to rabat a plane containing the normal on one of the planes of reference, set in the required distance along the rabatted normal, find the projections of the point in the frame surface so obtained and of other similar points, and thus obtain the projections of curves on the frame surface, which by their intersections with ordinates and water-lines would give a new set of square stations and water-lines corresponding to the moulded surface of the ship. Such a process, though simple, is more laborious than is necessary in view of the degree of accuracy required, and in practice it is customary to set in normal to each square station a distance slightly greater than the thickness of the plank and plating, the increased distance required being roughly estimated from a consideration of the obliquity of the water-lines, without producing any sensible error.

The frame lines having been obtained, it is customary at some shipyards to ” fair” the body on paper on a larger scale than that

*of the sheer drawing, before laying off on the floor. This saves p. certain amount of labour in fairing the full-sized body on p the floor, the errors in the body as first copied on the floor, *r y” 1 € which it is the object of the fairing process to correct, being e ° y ‘ proportional to the increase in scale in first copying. The process is similar to the full-sized fairing which is described below.*

A straight line is drawn on the floor parallel to a fixed straight batten nailed to the floor a short distance from the wall of the building to represent the load water-line in the sheer and body plans

and in such a position that the whole depth of the ship can be drawn with regard to it within the limits on the floor and clear of the batten, the inner edge of which becomes the base-line of the sheer, half-breadth and body plans. The fore and after per- pendiculars of the sheer and half-breadth plans are drawn at right angles to this line and the fixed batten in convenient positions near the ends of the floor, the fore perpendicular on the right and the after perpendicular on the left as in the sheer drawing, and so as to allow the extreme outlines of the stem and stern to be drawn upon the floor together with not less than one-fifth of the length of the sheer and half-breadth plans at each end of the ship. A line perpendicular to the water-line and the fixed batten is drawn, usually near the middle of the floor, to represent the middle line of the body plan. The middle line of the half-breadth plan is usually taken as coinciding with the base-line, the inner edge of the fixed batten. The level or water lines shown on the sheer drawing are drawn in on the floor parallel to the load water-line so as to serve for both the sheer and body plans. Ordinates representing those

§iven in the sheer drawing, which correspond to the sections in the ody plan, are drawn in the sheer and half-breadth plans and others are added where desired, so also are additional water-lines between those shown on the sheer drawing and above the load water-line, so that in full-sized drawing on the floor the sections and stations may be sufficiently near for fairing the whole of the external form of the ship. If, as is usually the case, the ship is too long to be laid off in one length on the floor the midship portions of the sheer and half-breadth plans are drawn superposed over the forward and after parts, and are usually contracted longitudinally as will be described presently.

The distances from the middle line along each water-line in the body plan of the original sheer drawing, or of the enlarged body when the process of preliminary fairing has been adopted, to the intersection of the water-line with each section are measured to scale and tabulated. At the lower parts of the body, in the vicinity of and belowthe" bilge," where the water-lines cut the square stations very obliquely and the points of intersection become somewhat indeter- minate, diagonal lines as shown by ID, 2D in fig. 99 are drawn in the sheer drawing in such positions as to intersect as many as possible of the square stations approximately at right angles, and the corresponding diagonal lines are drawn on the floor. The distances from the middle line of the body plan in the sheer drawing along the diagonal lines to their intersections with the sections are measured and tabulated. It is usually desirable, especially in ships with a great

extent of practically flat bottom, to draw bow and buttock lines to include this portion of the surface, such as iB in the figure, as the diagonals approach more or less closely to bow and buttock lines and shorter measurements are required in transferring the lines; the heights of their intersections with the transverse sections above the base-line being measured and tabulated. The draught of water of the ship at the forward and after perpendiculars is given in the specification enabling the underside of keel in the sheer plan to be drawn in on the floor between the points where the rise of keel commences at the extremities. The flat part of the keel is generally uniform in width for the greater part of the length of the ship, and tapered at the extremities. The line representing its side must be drawn on the floor in the half-breadth plan. The height of keel-line above the base-line at each station in the sheer plan and the corresponding half siding of keel are the co-ordinates of the lower extremity of the corresponding transverse section in the body plan. The lower extremities of the -sections are at once fixed in the body plan by the intersections of their horizontal and vertical ordinates transferred from the half-breadth and sheer plans, For the upper endings of the transverse sections in the body plan a level line is generally drawn on the body of the sheer drawing just above the projection of the upper deck edge and the sections at the square stations produced to meet it. The intersections of this water-line with the sections are measured and tabulated.

The whole of this process of measurement and tabulation is frequently done in the drawing office, and the " loftsman " or person who conducts the laying off on the floor is not supplied with the sheer drawing, but only with these tables of " offsets," and similar tables for the lines in the sheer and half-breadth. The process, however, is the same in either case.

The tabulated measurements for the sections of the body plan are then set off full size by means of long_ measuring staffs on the lines on the floor, corresponding to those in the sheer drawing on which the measurements were taken, and thus give points whose co-ordinates are to those of the corresponding points in the drawing in the ratio of 48 :l, if the drawing from which they were taken was to a scale of J inch to the foot as is usually the case. A suitable wood batten is then bent or " penned " as nearly as possible through the

series of points on the several water, diagonal and buttock or bow lines corresponding to each square station, being held in position by nails, specially adapted for the purpose, lightly driven into the floor, the batten in each case being adjusted so as to lie in a fair curve. Usually the batten will not under these conditions pass through all the points found for the curve on account of irregularities introduced or magnified in the process of enlarging to full size, and it must be allowed to take up a mean position passing outside some of the points and inside others. All of the sections ia the body plan are drawn in with chalk in this way. The section where the greatest breadth of the ship occurs, usually at or near the middle of the length, must have the line parallel to and half the moulded breadth of the ship from the middle line for a tangent, and no section must project beyond this line.

The intersections of each section thus drawn, with the water and other lines, are the vertical projections on the body plan of points, the horizontal projections of which lie in the horizontal trace of the transverse plane at the corresponding square station or ordinate in the sheer and half-breadth plans, and are at the same perpendicular

intersection of the bow plane iB with square station 2, and U. is the projection in the sheer of the intersection of water-line 2WL with the same bow plane. The water-lines and diagonals in the half-breadth and the diagonals and bow and buttock lines in the sheer may thus be drawn as fair lines by the help of battens, and if the lines do not pass through all the points obtained by projection from the body plan, the sections in the latter are rubbed out and new ones obtained from the lines in the half-breadth. This process should be repeated until the curves in both plans are fair and the intersections correspond accurately with one another as the pro- jections of points in space.

No frame of the ship, however, is made to the curves of these water and diagonal lines, so that their true shapes are not required for any practical purpose except fairing the body. For the whole contracted length of the ship, except about three to four twentieths at me n, j f each end, space and labour are therefore saved and greater / a / r &,,,. accuracy is ensured by using the contracted method of fairing. In this method the ordinates of the half -breadth are set only from Jth to ˆ,th of their true distance apart, while the transverse

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CONTRACTED HALF-BREADTH PLAN

Fig. 99.

distances from the middle line of the half-breadth as the correspond-ing vertical projections are from the middle line of the body. For example, in fig. 99 pi and g t are the projections in the half-breadth of the same points of which p and q are projections in the body plan, and are found by making the ordinates of pi and gi measured from the middle line of the half-breadth plan at square station 2 equal to the perpendicular distances of p and q respectively from the middle line of the body plan. Thus points in the projections in the half-breadth of the water and diagonal lines can be found from the body plan already drawn, and in order that the surface of the ship may be fair, the series of points corresponding to any water or diagonal line must He on a fair curve. In the case of a diagonal line the distance from the middle line of the body to the intersections of the diagonal with the square stations may be measured along the diagonal, and set off on the corresponding square stations in the half -breadth. This gives the true or rabatted form of the intersection of the diagonal plane with the ship's surface, and this, equally with the projected diagonal, must be a fair curve if the surface is fair. The diagonals are also projected into the sheer plan by measuring the height above the base-line at which each diagonal in the body plan cuts each square station, and setting up this height from the base-line of the sheer plan at the corresponding square station. The projections of the bow and buttock lines in the sheer plan are obtained in a similar manner. Thus in fig. 99 V 2 is projection in the sheer plan of the

measurements are made to full size as before, thus making the curva-ture of the water and diagonal lines sharper throughout the region over which it would otherwise be somewhat flat and indefinite. As the curvature of the contracted level and diagonal lines depends upon the differences between the lengths of the ordinates of the curves and not upon their actual length, a further saving of space is effected by measuring the distances to be set up as ordinates in the'half-breadth not from the middle line of the body but from a point selected arbitrarily in each water or diagonal line, generally a few inches outside the midship section. By suitably varying the

distances outside the midship section of these arbitrarily chosen points in the different water and diagonal lines, it can be arranged that the curves in the half-breadth do not interfere with one another, an advantage from the point of view of clearness. With the above modifications the process of fairing by the contracted method is precisely similar to that when the ordinates are their full distance apart.

*In fig. 88 the diagonals iD and 2D are shown laid off by the con- tracted method, the spacing of the ordinates in the contracted half- breadth being |th of that representing the spacing in the diagram of the uncontracted sheer and half-breadth. In the con- tracted half- breadth the ordinates 4n, 5*1, &c, are equal to the distances Or, Os, &c, measured to sections 4, 5, &c, in the body, O being a point arbitrarily selected in the diagonal J D.*

The principle of contracted fairing is sometimes extended by the

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provision of a large drawing-board 4 or 5 ft. broad and long enough to take the whole length of the ship on a scale of .ˆth full size. The ordinates of the half-breadth and sheer being set off on the board to this scale, any line in which the difference between the greatest and least ordinates does not exceed the breadth of the board can be faired thereon by this contracted method. This allows considerable lengths of the midship parts of diagonals and water-lines, and such lines as decks at middle and side, and any other lines of very flat curvature, to be faired on the board, resulting in a great saving of time and labour, owing to the convenient height at which the board can be placed, and to greater accuracy, as the fairness of the lines can be better seen and judged.

At the forward and after ends of the ship the correct shapes of the water-lines are required in order to determine the shapes of the stem and stern-post, besides which the curvature of these lines is Falling

too great to p erm it of contraction of the abscissa scale. the ends, Tij ese parts are] therefore, faired by uncontracted water and other lines as already described, except that bow and buttock lines are used to less extent than in the flatter portions of the vessel.

Care must be taken that at the junction of parts of the ship faired

Upper Part.

aa, Fore edge of rabbet for sheathing.

bb. Fore edge of rabbet for shell arid protective

plating. cc t Webs for attachment of decks, breastholes.&c. d, Web for attachment of wood keel.

Fig. 100.

by separate processes there shall be a considerable overlap throughout which the water and other lines in the two parts are identical in order to ensure the continuity of the surface.

The detailed drawings of the stem and stern castings already referred to must ensure that these castings shall form a fair continua- tion of the outside surface of the plating or sheathing. They are perhaps most complicated in the case of sheathed armoured warships where the surfaces of " rabbets " or recesses for housing the bottom and armour plating and the wood sheathing must also conform to the lines of the ship laid off on the floor. A sketch of the stem casting for an armoured, sheathed ship with a ram bow is given in fig. 100, the sections being shown to a greater scale than the elevations for the sake of clearness, except the section at the water-line AA, which is drawn to illustrate the method of ending the water-lines, similar sections being drawn on the floor at the other water-lines. The fore edge of the stem is drawn in full size in the sheer plan on the floor in its correct position relatively to the fore perpendicular and water-lines by measurements taken from the sheer drawing, and the projections of the line of the inner angle of the rabbet for the shell

plating, called the " middle of rabbet," marked h in the figure, are drawn in the sheer and body plans as fair lines. It should be observed that in the figure h, the middle of rabbet and b, the fore edge of rabbet of plating are shown in side elevation as coincident lines on account of the smallness of the scale; they will not be generally coincident on a full-sized projection on the floor. The middle of rabbet line is best faired in an expansion drawing. In this method a

batten is bent to the curve of the -projection of the line in the sheer plan, and the position of the water-lines where sections of the stem have been shown on the drawing are marked on the batten, which is then allowed to spring straight along a straight line drawn in any convenient position on the floor, and the positions of the water- lines are transferred from the batten to the floor. The distances such as xh in the section at AA are measured from each section given in the drawing and set up in full size perpendicular to the straight line on the floor at the positions corresponding to the sections. A fair line through the ends of these perpendiculars will give the distance xh at any position in the length of the stem and enable the projections of the middle of rabbet-line to be drawn accurately in the body and half-breadth plans.

To end any water-line such as AA in the half-breadth plan a perpendicular to the middle line of the half-breadth is drawn from the intersection of the line AA, with the projection of the middle of rabbet-line in the sheer plan, and the distance xh, taken from the body plan, or direct from the expansion of the middle of rabbet- line, is set out from the middle line of the half-breadth ; the point h is the ending of the water-line AA required. The water- lines having been drawn and ended in this manner, additional ordinates coinciding with the transverse frames are drawn in the half-breadth plan and their projections obtained and faired in the body plan, in order to define more closely the somewhat twisted surface of the ship in the neighbourhood of the stem. Fairing these frame sections may involve correction and adjustment of the endings of the water-lines, which corrections are made subject to the condition that the projections and expansion of the middle of rabbet-line must remain fair curves. With the middle of rabbet thus fixed in proper relation to the faired surface of the fore end of the ship, the sections of the stem by the yjater- planes can be reconstructed in the half-breadth plan by the help of the drawing of the stem and of any additional information con- tained in the specification as to the nature of the fastenings of the plank and plating to the casting and the length of the hood ends. Where the general direction of the stem is considerably out of the "- vertical, sections of the frame surface by planes normal to the fore edge of the stem are obtained by the help of the closely spaced frame sections, and rabatted on the sheer plane ; and sections of the stem casting constructed on them as in the case of the water-lines. In this way as many points as are required are obtained in the various lines in the surface of the stem, viz. the after edge of the casting, and the various angles of the rabbets, and these lines are faired so far as they are continuous in the three plans. The shell and protective plating

and plank sheathing are also put on outside the various sections of the frame surface for a short distance in the neigh- bourhood of the stem, and the surface of the stem forward of the fore edge of the rabbet is faired in with the outside surface of the ship.

A plain batten mould is made to the outline of the stem in the sheer plan, and the projections of the lines of rabbets and of gulleting, position and shape of webs for connecting to decks and stringers and to the wood keel, lines of rabbets for con- necting to keel plates at the lower end and to the tuck plate at the upper end (if the casting is not continued right up to the forecastle deck), the position of the fore perpendicular and load water-line are marked upon it. Sections of the casting taken from the floor are painted on the mould, the centre lines of the sections indicating the position where they are taken, showing more particu- larly the changes in shape of the casting at such positions as the upper and lower edges of the protective plating and the upper edge of the plank sheathing. The stem mould thus gives complete information for the preparation of the pattern for the casting. The positions of the fore perpendicular and load water-line marked on the mould are transferred to the casting when made, and enable the stem to be erected in its correct position at the ship.

The after end of the ship is faired and the mould for the stern post and other castings prepared in a similar manner. The process of preparing the moulds for the stem and stern post is also generally similar to the above in the case of an unsheathed ship, but the castings are less complicated owing to the absence of the plank sheathing.

*The whole of the 21 square stations which constitute the original body plan having been faired as described above, it is usual to calculate the displacement and position of centre of buoyancy of the ship from the lines laid off on the floor J*f e r*

*to ensure that in the process of fairing no departure of ^" Wo * " any consequence has been made from the original design. For this purpose the steel plating and wood sheathing, if any there be, must be put on by a process the inverse of that described as taking off the plank. If any serious departure from the original design should be discovered as the result of this calculation, the lines must be corrected and again faired.*

Stem mould.

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Frame lines.

The transverse frame lines are the intersections with the frame surface of transverse vertical planes passing through the lines of intersection of the two exterior surfaces of the flanges of the frame angle bars, or of the web and flange of any other type of rolled section which may be used for the frame. The distance between two adjacent frame lines, called the " frame space," is given in the specification, and the positions of the frames relatively to the ordinates are shown in the sheer plan of the sheer drawing. The frame space in a warship is commonly 4 ft. within the limits of the double bottom and 3 ft. forward and aft. In a merchant ship the spacing is usually less. The positions of the planes of the frames are set off along the middle line of the half- breadth plan, the proper scale being used in the contracted half- breadth, and ordinates are drawn to represent their traces in the half-breadth and sheer plans. The projections of the frame lines in the body are obtained from the intersections of the ordinates with the water and diagonal lines in the half-breadth and the bow and buttock lines in the sheer plan in a manner already described in the case of the more widely spaced stations used in fairing the body. These frame lines in the body should require no further fairing if the work has been accurately done when using the original square stations, and they can be at once rased in on the floor.

As already stated, it is usual to dispose the transverse framing of a ship entirely in planes perpendicular to the trace of the load water-plane with the longitudinal plane of symmetry of the ship. This practice leads to a large and varying bevel being given to the frame bars at the ends of a vessel with a very bluff bow or stern, and it becomes a practical question whether it would not be better at such parts to dispose the frames in planes which are more nearly normal to the general surface of the ship and which need not be perpendicular to either of the three planes of reference. The disposal of frames in this way, more usually in planes perpendicular to the half-breadth planes only, when they

Cant frames.

Fig. ioi.

are called " cants," is in common use in wood shipbuilding, it being of great economical importance that the timber frames shall be of square or nearly square section, but it is also adopted in iron and steel ships of unusual form or having special features, such for instance as a lifting screw propeller.

To lay off a cant frame or " cant " : Let the traces of the cant be a'b', ab in fig. 101. Let LL be the projections of a level line in the three plans intersecting ab at b in the half-breadth. Then bi in the sheer is the vertical projection of b, and a curve through all such points as h is the projection in the sheer of the shape of the frame or, as it is called, of the moulding edge of the frame. 62 in the body, where a 2 £>2 is equal to the perpendicular distance of b from the middle line of the half-breadth, is a point in the projection in the body plan; and bi where ajbi is equal to ab is the position of the point, when the cant plane is hinged about a'b' until it is parallel with the body plane. Hence a curve drawn through all such points as b 3 is the true form of the moulding edge of the cant. To obtain the angle which the surface of the ship makes with the plane of the moulding edge, a plane parallel to that of the moulding edge and distant from it the width of the bevelling board must be laid off in a suitable position in the body plan. Let g'c', gc be the traces of such a plane where af, the normal distance between it and the plane whose traces are a'b', ab, is the breadth of the bevelling board. The vertical projections of c, viz. Ci and c 2 , in the sheer and body are found in the same way as those of b; but in order to obtain the rabatted curve of the bevelling edge in such a position relatively to the moulding edge that the perpendicular distance between the two curves measures the bevelling in the same way that the perpendicular

distance between two frame lines of the square body measures their bevelling, it is necessary to first project the bevelling edge on the plane of the moulding edge before rabatting the latter. The whole operation is effected by making

Spots on the cant can also be obtained from diagonals as follows: — In fig. 102 let DD be the projections of a diagonal

Fig. 102.

line in the three plans cutting the horizontal traces of the moulding and bevelling edges at d and e in the hatf-breadth. The pro- jections di, ei in the sheer and d\, a in the body of the intersections of the diagonal line with the planes of the moulding and bevelling edges are obtained in the same way as in the case of the level line, and the

method of obtaining the rabatted positions, when the plane of the moulding edge, with the bevelling edge projected upon it, is turned about a'b until it is parallel to the body plane, is also analogous; but in this case the corresponding points of the moulding and bevelling edges are in different level planes a\d\ eˆei. Points in the rabatted curves of the moulding and bevelling edges of the cant may also be obtained from the intersections with bow and buttock lines, as shown in fig. 103, where BB are the projections of the

Fig. 103.

bow or buttock line in the three plans. The method is analogous to that described above when using level lines and as shown by the figure, hi and ks being rabatted positions of points in the moulding

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and bevelling edges respectively; where ht h 3 is equal to ah and k t k 3 tofk.

In fig. 104 let AB, A'B' be the traces of the plane of the moulding edge of the frame in the sheer and half-breadth plans respectively. _ . When, as in the figure, neither trace is perpendicular to

uouoie t jj e j 3age jj ne ^ ^ e f rame j s gay t0 be a double canted

frame, or a double cant. Let iL, 2L, 3L be the projec- tions of level

lines in the three plans, P, Q, R in the sheer plan being their point of intersection with AB. The

canted frame.

Fig. 104A.

horizontal projections of these points are found as indicated in the figure where Q/ on the middle line of the half breadth is the horizontal projection of Q. The line Q'q' parallel to A'B' is the horizontal projection of the line of intersection of the double cant plane with the level plane 2L, and q, obtained by the construction shown, is the vertical projection of the point where this line of intersection cuts the surface of the ship, 3′ being the horizontal projection of the same point. The projections of other points in the intersection of the double cant plane with the surface of the ship are found in a similar manner by the help of other level lines; and the projections s' and s of the ending where the line of half siding of the flat keel cuts the double cant plane are found by the construction indicated. The projections of the moulding edge of the double cant frame spqr in the sheer plan and s'p'q'r' in the half-breadth are thus determined.

The true form of the moulding edge is laid off in the body plan by a double process of rabatment of the double cant plane, first about the trace AB to bring it perpendicular to the sheer plan, and then about a normal to the sheer plan through A to bring it parallel to the body plan, in the following manner. Set off P 2 , Q2, R 2 on the middle line of the body so that their distances from A2 are equal to AP, AQ, AR measured along the trace AB in the sheer plan. Draw AC in the sheer plan perpendicular to AB and measure the heights parallel to AB of the points p , q and r above AC. Draw level lines iL', 2L', 3L' in the body plan at distances above the base line equal to these heights, and from the centres P 2 , Q2, R 2 describe circles cutting iL', 2L', 3L' in p 2 , q it r 2 , &c, so that the radius (? 2 § 2 is equal to Q'q', &c. The curve £ 2 ? 2 r 2 is the true form of the moulding edge of the double cant laid off in the body plan.

The plane of the bevelling edge is parallel to that of the moulding edge and at a perpendicular distance from it suitable for use as the base of a bevelling triangle similar to that which is described for the ordinary frames. The width of the bevelling board is made equal to this perpendicular distance, corresponding to the frame space in the case of the ordinary frames, and the bevelling edge

must be laid off so that the normal distance between it and the moulding edge can be used for marking the bevelling in the same way as the normal distance between consecutive frames of the square body is used.

To obtain the traces of the plane of the bevelling edge, in fig. 104a let AB, AB' be the traces of the moulding edge plane; nm drawn perpendicular to AB and mm' perpendicular to the axis are the traces of a plane perpendicular to the plane of the moulding edge and to the vertical or sheer plane. If otM be drawn perpendicular to nm and equal to mm', »M is the intersection of the planes BAB' and nmm' rabatted on to the sheer plane, and mjH perpendicular to »M is the rabatted position of a line perpendicular to the plane of the moulding edge. Make HK equal to the chosen distance of the bevelling edge plane from the moulding edge plane; draw Kk parallel to M» cutting nm in k; through h draw D&E parallel to AB and through D, where DE meets the base line, draw DE' parallel to AB'; then DE, DE' are the traces of the plane of the bevelling edge arranged at the required perpendicular distance from the plane of the moulding edge.

In laying off the bevelling edge it is first projected on to the plane of the moulding edge, and the latter then rabatted into the body plane. To effect this operation the horizontal trace Am'i, of a plane perpendicular to the double cant plane and intersecting it in the vertical trace AB must be drawn, which is done by the construction shown in fig. 104a, where nm is, as before, perpendicular to AB through any point n in it other than A, and n'm'u drawn through n', the horizontal projection of n, is per- pendicular to AB'. The projections of the traces with the several level planes of the plane of the bevelling edge, such as Vw' and the projections of the bevelling edge Itwv in the sheer plan and t'l'w'v' in the half breadth are obtained in exactly the same way as in the case of the moulding edge. The projections such as Q'w'i, of the traces with the several level planes of the plane whose traces are AB and Am\, in fig. 104a are also drawn parallel to Am'i, through the horizontal projections of P, Q, R, &c. The vertical projection vii of the point v>\, in which Qiiu'i meets UV produced, is found and A2U2 set up on the middle line of the body equal to the perpendicular distance of wi from AC. A level line 2L in the body plan is drawn at a distance from the base line equal to the perpen dicular distance of w from AC and a point w 2 found in it such that the radius U 2 w 2 is equal to w\w' in the half- breadth. w>2 is then the rabatted position of the projection on the plane of the moulding edge of the point in the bevelling edge whose projections are w and w'. Points h, h and i» 2 corresponding to the projections I and /', / and t', v and »' are found in a similar

manner and a curve drawn through hhwiVi is the bevelling edge laid off in the body plan in the correct relation to the laid off position of the moulding edge for the bevellings to be taken.

Additional points in the rabatted shape of the double canted frame may be obtained by the use of diagonals when

Fig. 105.

desired. In fig. 105 AB, A'B' are the traces of the double canted plane; cd, c t di are the projections of a diagonal line in the body and

sheer and Ctdi its rabatment in the half-breadth plan. Draw ef, e'f, the traces of a bow plane and through d where it cuts the diagonal in the body draw the trace of a level plane WL. Find the intersection ph, p'g' of this plane with the double cant plane. Then g', g the intersection of ph, p'g' with the bow plane is a point common to these two planes and to the bow plane. Since this point is common to the level plane WL and to the bow plane ef, e'f, it lies in the diagonal plane cd. Hence gg' is a point in the diagonal and double cant planes. In a similar manner cic' is a point in the same two planes. Therefore Cig is the projection of the intersection of these planes, and m where Cig cuts Csd 3 is a point where the double cant plane meets the diagonal line. In rabatment of the double cant about AB, m moves in the line OTiWiM perpendicular to AB. If now m be projected on to Cidi, then M taken in «i«M so that ?»iM is equal to c'm' , will be a point in the moulding edge of the double-canted frame rabatted on to sheer plan. Similar points can be obtained for each diagonal. The plane of the bevelling edge is determined as previously described, and the bevelling edge laid off similarly to the moulding edge, except that provision must be made that it shall come in its right relation to the moulding edge for bevellings to be taken as in the previous case when laying off by level lines.

A method of determining and fairing the swell for the propeller shaft in a twin or multiple screw ship is shown in fig. 106. The projections of the centre line of shaft, which are given in the Swell for sneer an(j half-breadth plans of the sheer drawing, are shaft " d rawn '» these plans on the floor, and the projection in the body plan of the trace of centre line of shaft with the plane of each square

station is found as shown by the series of points on the straight line o b in the figure. The radius from the centre of shaft required for the shaft tube and fittings at the boss frame, or frame where the shaft passes outside the ship, is found from the machinery specification. This is in- creased by the thickness of the plank in the case of a wood-sheathed ship and of the plating, and by any allowance neces- sary for clearance and for the obliquity of the shaft line, and a frame is selected for the boss frame such that a circle drawn with that radius, viz. H in figure, from the trace of the centre line of shaft with the frame plane in question would just touch the frame line on the outside. The length and amount of projection beyond the ordinary frame lines of the shaft swell can be considerably reduced if the frames abaft the boss frame, viz. frame No. 14 in the figure are dished inwards as shown in the figure, thus allowing the required radius between the centre of shaft and the frame line to be obtained further forward than if the frames were not dished. A similar method is used for finding the frame where the distance required round the centre of shaft will not cause any bossing in the frame line. Special attention must be given to the radius required at the stuffing box bulkhead, where considerable space is required for the stuffing box and fittings, and at the after end of the double bottom, where the shaft — although well clear of the frame line — may not be sufficiently clear of the inner bottom line to permit a sufficient depth of double bottom to be maintained without bossing out the frame line as shown by the small diagram in the figure. The frame, No. 2 in the figure, where the swell is to end, having been selected, a normal nl to the frame line is drawn from n, the trace of the centre of shaft line with the plane of the frame, and parallel lines are drawn through the traces of the centre of shaft line with the other frame planes, representing projections of the intersections with the frame planes of a plane through the centre of shaft. This plane is projected on to a diagonal plane having its trace with the body plane parallel to the trace of the plane, and the diagonal plane carrying the projection with it is rabatted by the following process. A convenient line XY is selected perpendicular to the parallel traces in the body plan, and a corre- sponding line XY is drawn in any convenient position on the floor, having ordinates set up perpendicular to it, the frame-spacing apart. The distances from XY in the body are measured along all such lines as nl to the projections of the centre of shaft and to the un- bossed frame lines, and these distances are set up from XY in the plan at the corresponding frame ordinates giving the straight centre of shaft line, and GG the plan of the line of intersection of the plane through the centre of shaft with the frame surface. The radius required to house the shaft tube and fittings is set out from the centre

of shaft at the boss frame, as shown by h in plan, and a fair line, as a rule straight except for a short distance at the forward end, is drawn from the point so found to break in fair with the line GG at the frame station where the swell is to end. The distances at

the various ordinates, corresponding to that marked r at No. 8, are used as radii for describing the outer part of the section of the shaft swell at the corresponding square stations in the body plan, the trace of the shaft line being the centre at each frame from which the circular arc is described. The outer part of the section of the swell thus formed, e.g. cc at the boss frame in figure, is joined up to the general run of the frame line to which it belongs by arcs of circles c d struck with the same radius as the outer part. The radii for the hollowed-out frame lines abaft the boss frame are obtained in a similar manner. One or more diagonals cutting the swell may be drawn and rabatted in the half-breadth plan to test the fairness of the altered lines, but no further alteration should be required if the swell has been drawn in the manner described above.

The sectional shape of the boss frame casting is shown in the plan in fig. 106, and the outline of the palm which is secured to the floor plate of the boss frame is shown by the line k.k. in the body plan. This part of the casting is fashioned solely Mould for with the view of providing sufficient area for a suitable ??SL„ a ‘ ne number of fastenings to the floor plate. A drawing is ””

made of the casting, and for further guidance in preparing the pattern a plain batten mould is made to the outline dccdkk on the floor. The line dpd, the position of the centre of shaft and the outline of the circular web for connecting to the shaft tube are marked on the mould. The varying angles made by the webs con- necting the casting to the shell plating forward and aft of the boss frame, of which the outlines are deed and dpd, and of the circular web connecting it to the shaft tube, are obtained by the same

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SHAFT Win »T SECTIONS IN WUt OF OOUBLE BOTTOM

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CCNTflC LINE OF SHAFT

Fig. 106.

method as that used for obtaining the bevelling of the frame angles,

which will be described later. These bevellings are marked at the points of the several lines on the mould where they are taken.

The fore and aft position of the shaft struts, or " A " brackets, as they are sometimes called, is shown on the design drawings, and the scantlings of the hollow cylindrical boss which carries shaft

the shaft bearing and of the arms which connect the struts boss to the ship's structure are given in the specifica- tion. The detailed drawing appears in these pages, showing these particulars together with the shape of the palms worked on the inner end of the bracket arms to connect them to the ship's structure, and it is only necessary to obtain from the lines of the ship laid off on the floor the exact relation of the positions of the surfaces of the palms to one another and to the centre of the shaft.

Fur this purpose the traces of the line of centre of shaft with transverse planes at the forward and after ends of the boss are marked in the body plan, and a batten mould is made in each of these planes showing the centre of shaft, the direction of the two arms and the position where they are crossed by the frame line of the ship, or, if the lower arm connects to a web or palm on the stern post, as is frequently the case, in a ship with a rising keel line aft, the position of the edge of this palm and the direction of its surface. Each mould has marked on it, or indicated by a straight- edged batten forming part of the mould, a convenient water-line and vertical line drawn on the floor. When the moulds are held in vertical planes separated by the length of the shaft boss the corresponding straight lines on the two moulds are made to lie in the same plane, or are " looked out of winding," giving the relation between the

Plate XI.

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laaer bottom.

position of the palms and the direction of centre of shaft. Guided by these moulds and the detailed drawing, the pattern for casting the A brackets is made.

The projections of the plate and longitudinal sight edges are drawn in the body plan on the floor by measuring their distances from the middle line along each frame line in the half- S !f ht block model, on which they have been already arranged,

“thh d enlarging the measurements to full size and setting them the body o ˆ roun g ˆg corresponding square stations in the body. p an. rpj)e p ; n t s so f ou nd should lie on fair curves, if the sight

edges have been properly arranged on the model, except of course where discontinuities in the curves may occur, as where a plate sight edge crosses a longitudinal sight edge to avoid an acute intersection. The edges of the sunken strakes of plating are drawn parallel to and

distant the width of the lap from the sight edges, and as already stated, the breadths of the bottom plates are measured between the lines of plate edges so found and used in ordering the material from the manufacturers.

The surface of the inner bottom is defined relatively to the outer bottom by the depth of the vertical keel and longitudinal frames given in the specification. The outline of the vertical keel is also shown in the sheer drawing, and the general shape of the inner bottom by the midship section, which is often supplemented by a section through the engine-room where the double bottom is locally made deeper. The surface of the longi- tudinal is arranged so that its trace with the plane of each square station is approximately normal to the curve of the square station ; taken in conjunction with the method of drawing the sight edges so as to cut the frame lines as nearly as possible at right angles, this is approximately the same thing as generating the surface of the longitudinal by the normal to the ship's surface as it moves along the sight edge. The depths given in the specification are depths measured in the plane of the square stations, and, when the longitudinals are fitted on a raised strake of outer bottom plating, are greater by the thickness of that plating than the distance to be set in from the frame line to find the inside of the frame on the inner bottom. The latter is usually worked with the strakes of plating disposed " clinker " fashion, or is sometimes flush with edge strips fitted on the underside. Points in the sections of the inner bottom frame surface by the planes of the square stations are obtained by setting in the depth of the longitudinals, and the surface of the inner bottom is faired by diagonal and water lines in the same way as the outer frame surface. In the engine-room space where the depth of the double bottom is increased, and where there are usually plane surfaces to take the structure under the engine bed, and a cylindrical recess to provide clearance for the engine cranks, these special features must be faired separately, so also is any bossing of the inner bottom at the after end to allow clearance for the shaft tube and fittings.

The plate edges already arranged on the model of the inner bottom must be transferred to the floor and faired in the same way as those of the outer bottom; and the breadths of the plates measured from the floor must be used in ordering the material from the manufacturers.

Before and abaft the double bottom the transverse frames may consist of zed bars, split at their lower ends for the insertion of a floor plate. The longitudinals are reduced in depth, °? r , and are

intercostal between the frames until they coalesce surface ot w j t jj fl ats or f ore an(j a f t bulkheads, Or they are con- ames. tinued as deep zed bars slotted over the narrower trans- verse frames. The inner surface of the frames therefore does not require any process of general fairing; but the upper parts of the floor plates are drawn on the floor, and are faired locally throughout the lengths of the ship where they maintain a uniform character.

The freeboard forward and aft and amidships is generally given in the specification and can be measured from the sheer drawing. Guided by these dimensions and by the deck lines shown in the sheer drawing, the heights of the intersections of the beam at middle with the square stations are marked on the corresponding square stations of the contracted sheer plan and faired, and the intersections with the square stations are then pro- jected to the middle line of the body plan. The round up or camber of the midship beam of each deck is shown on the midship section drawing. The camber line is a circular arc, the round up being the versed sine of half the arc and the breadth of the ship at the level of the beam the chord. A mould is readily constructed to these data and is applied so that the chord is perpendicular to and its middle point coincident with the middle line of the body plan on the floor. When the centreof the arc coincides with a point projected from the beam at middle line the arc cuts the corresponding square station at a point in the projection of the beam-end line. The points in the beam-end or beam-at-side line so formed should lie on a fair curve, which is tested by projection into the contracted sheer plan, and the line is then rased in in the body plan.

The shape of the lower protective deck in a battleship is shown in the sheer drawing. Throughout that part of the length of the ship covered by the main armour belt, which rests on this deck, the deck edge usually lies in a water plane. The middle part of the deok also lies in a water plane, except where it is raised up over the engines,

Outside

double

bottom.

Deck lines.

and the sloping sides form cylindrical surfaces. The straight lines of the sides and middle part of the deck section are joined Dy arcs of

circles of uniform radius, and this part of the deck is necessarily fair from the nature of the method of constructing the sections ol its surface. At the ends of the ship the beam-at-middle and beam-at-side lines are copied from the sheer drawing and faired on the floor and the beam surface between these points may be faired by one or more bow and buttock lines.

The surface of the framing behind the main armour belt in a war-ship, arranged as shown by the m'dship section depicted, is parallel to the surface of the armour and distant from it the thick- ness of armour and wood backing plus the thickness of '/ D / n ?, plating behind armour, generally a double thickness of ?f f£j plating flush jointed. This distance, less the thickness of -,,,,,_ the shell plating already taken off in getting in the frame lines, is set in normal to the surface shown by the lines on the floor in wake of the armoured side by approximate methods similar to those used in taking off the plank and plating, and the pro- jections of the frame lines behind armour in the body plan are thus obtained and drawn in. The frames are usually single zed bars extending vertically from deck to deck and are completely defined by these lines without the necessity of drawing any inside surface lines.*

Projections of the intersection of the surface of the frames behind armour with the beam surface of the deck at the top of the frames and with the plate surface of the deck at their heels are drawn in the half-breadth plan, and expansion drawings of the frame surface are prepared in a manner somewhat similar to that which will be described later in dealing with the expansion of the surface of each separate armour plate, except that in the present case the whole length of the surface is expanded in two or three 3-in. scale drawings. The expanded positions of the frame lines, and of any longitudinal girders which may be fitted behind armour are shown on this drawing, also the approximate positions of the armour plate butts and edges and of the armour bolts. The butts and edges of the plating behind armour are arranged on this drawing and the dimen-sions of the plates measured therefrom in ordering them from the manufacturers.

Thin protective plating beyond the ends of the main armour belt usually projects from the ship's side and is secured without wood backing direct to the shell plating, which is worked in two thicknesses flush jointed in wake of the protective plating. In this case the frame surface of the ship already laid off is the frame surface behind armour, and the disposition of the butts and edges of the plating behind armour and of the armour itself is arranged on the half block

model ; but only the plating behind the armour is ordered to dimensions taken from the model.

It is important that the detailed information giving the shapes and dimensions of the armour plates should be in the hands of the manufacturers as early as possible on account of the time 7 . required for the manufacture of this material. As, more- ˆ?ˆj? over, modern armour plate steel is so hard that it is im- .

*possible to cut it with machine tools, the plates must be fwˆL delivered of the exact size required, and the information sent to the manufacturers must be of a high degree of accuracy. For this Reason the shapes and sizes of the armour plates are sometimes, obtained by the " mocking up " process, in which the surface of the armour is represented in three dimensions by making moulds of batten frames to the sections of the surface in the body' plan on the floor and erecting them in their correct lateral and fore and aft relative positions. The positions of the butts and edges of the plates being marked on the frames so erected, the moulds for each plate, as described below, can be made with great accuracy, and this process is practically necessary if there is any considerable twist in the surface of the ship where covered by the armour. **

In general, however, the armoured side is very little twisted and can be treated for practicable purposes as a developable surface, in which case the necessary information can be obtained by a process of laying off as described below, which, though obviously only approximate, is found by experience to be sufficiently accurate for practical purposes.

In fig. 107 the portion of the body plan shows sections of the armour surface by planes of the frames, which are generally 2 ft. apart behind the armour, and the half breadth shows projections of the upper and lower boundaries of the armour surface, and of the joint between the two strakes, which is arranged to lie in a level plane. The armour belt extends from the main deck above to the armour deck below. The upper edge of the armour, therefore, follows the beam-at-side line of the main deck; but is generally allowed to be about f in. below it, so as to make sure of getting in the armour, in spite of possible small inaccuracies in building the rest of the structure, which might result in restriction of the space between the two decks. The lower edge follows the armour deck edge, which is usually a level line throughout the length of the belt ; but is kept an inch or two above it to avoid making the armour plates with a sharp edge to fit the acute angle between the protective deck and the ship's

side ; the armour, how: ever, actually rests on the deck as shown by the midship section depicted. The butts of the armour are arranged " brick fashion," that is, the butts of one strake at the middle of a plate in the adjacent

strake, and each butt should be as close as possible to one of the vertical frames behind armour in order to allow the armour bolts to be sufficiently near the butt of the plate. At the same time it is convenient both for manufacturing purposes and for erecting the plates at the ship, to have the butt surfaces as nearly as possible normal to the surface of the plates. The butts are therefore arranged in vertical planes whose traces in the half-breadth plan lie in direction between the normals to the projections of the upper and lower edges of the plate. The lengths of the plates are made as great as possible taking into consideration the capacity of the manufacturer's rolls and of the appliances for handling them during erection at the ship.

To lay off any plate such as that of which the projections of the intersections of the planes of the butts with the surface of the armour are ab, cd in the body plan and aibi, dd\ in the half breadth, a straight line YY is drawn in the body plan so that its direction lies between the directions of the normals to ab and cd at the points where they cut YY, and a straight line XX is drawn in the half-breadth plan similarly lying between the normals to Oi ci, and bi d\ and approximately at the centre of the plate.

Battens are bent to the curves aYb, cYd, aiXci, biXdi and the points named are marked on the battens so as to give the lengths aY, iY, aiX, &c, measured round the curves. A pair of rectangular axes OX, OY are then drawn in any convenient position on the floor and the points ai, 62, Ci, d? found such that the co-ordinates of 02 are Yo, Xai, of 62, Y6 and X&i, of c 2 , Yc and Xei, of ck, Yd and Xˆi. The figure aJyˆCidi obtained by joining the points so found by straight lines is regarded as the expanded shape of the surface of the plate. A flexible batten mould is made to this figure and is used by the manufacturer to mark the four corners of the plate and thus to get its superficial size. A pair of moulds such as N are made, one to the top and the other to the bottom of the plate in the half-breadth

Fig. 107. .

plan, showing the curvature of the edge and the direction of the butts; and another pair such as M, one at each butt, showing the curvature of the edge of the butt plane and the sectional shape of the top and bottom of the plate. The butt moulds are made to the section of the surface of the plate by the plane of the frame, which is indistinguishable from the section by the very slightly inclined plane of the butt. Each of the butt moulds serves for the two plates which join at the butt, but each edge mould refers only to one plate. Female moulds, the backs of which are straight lines which lie in one plane, or, as it is technically expressed, are " out of wind- ing " when the moulds are in their proper position, are also made to fit on the butt and edge moulds as P, Q in the figure. By means of these moulds the manufacturer makes each separate plate to its correct curvature and twist, while the top and bottom " out-of- winding " moulds for two or more consecutive plates have a common straight line drawn on them as // in the figure, to fix the relative position of the plates when they are temporarily erected at the manufacturer's works to prove the correctness of their shape.

A drawing is also made showing superposed expansions of the back and front surfaces of the armour without any necessity for extreme accuracy, as these surfaces are fully defined by the moulds. The butts and edges of the plates with numbers identifying each plate with its moulds are shown on this drawing.

The specification gives particulars of the dimensions of the bolt to be used and lays down the general principle of their distribution, e.g. one bolt to so many square feet of armour. The bolts are approximately arranged in accordance with this specification on the expansion of the plating behind armour. For the purposes of the present drawing their positions must be definitely fixed sufficiently clear of the frames behind armour to allow space for putting on the nuts. With vertically arranged frames practically the fore and aft position only is of importance from this point of view. The pro- jections of the normals to the plate surface representing the centre lines of the bolts are drawn in the half-breadth plan, and shifted if necessary to give the required clearance of the frames. The positions of the centres on the back of the plates are then measured along the curved sections of this surface in the body and half-breadth plans from the nearest edge and butt, and these distances are indi- cated in figures on the drawing.

The positions of any holes for the fastenings of top and bottom edge

covering plates, or of any fittings to go on the outside surface of the armour are also shown by figured distances from the edges and butts of the plates on this drawing. All holes must be drilled and tapped in the plates by the manufacturer before the final hardening process which renders the material unworkable.

The drawing also shows the plate in each strake selected as the " shutter in " or last plate to be fitted in place. This plate is not finally completed by the manufacturer until all the rest are in place at the ship and moulds have been made to the space which remains to be filled up.

The moulds for screen bulkhead armour are prepared in a similar manner, but the process is usually simpler as the surface of this armour, when not actually plane, is cylindrical with a vertical generating line and therefore accurately developable.

For barbette armour nothing more than a drawing is usually necessary, the barbette being circular in mmniion plan, the surface cylindrical and the top

in a horizontal plane.

The information issued from the Mould Loft for the guidance of the workmen in the shipyard has been generally order of passed over in the foregoing work. description, which has been de- voted principally to the information pre- pared for the guidance of manufacturers of material, but it is not intended to imply that all the material is ordered before erection is begun. Much of the informa- tion for the erection of the frames and other parts of the structure, including the keel and transverse and longitudinal frames amidships, may be given before the ends of the ship are faired on the floor.

Keel battens are provided giving the spacing of the transverse frames through- out the length of the ship, the Keel. lines defining their positions on the battens being marked with the dis- tinguishing numbers by which the frames are identified on all the drawings, moulds and information subsequently issued.

The drawing showing the size of each plate and the position of each butt of the flat and vertical keel plating and angle bars, prepared in connection with the ordering of the material, is completed to show all details of the keel and its riveting in accordance with the specification, and serves as information for its erection. Section moulds are made in accordance with the frame lines in the body plan

for guidance in shaping the flat keel plates trans- versely, and on these the edges of the adjacent plates are also marked.

The practice, at one time quite common, of making batten moulds to each frame line on the Mould Loft floor for the guidance of the workmen employed bending the angle or zed bars, and Transverse shaping and assembling the parts of the frame, is now f rames . almost entirely superseded by the use of the " scrive- board." Such batten moulds, when issued, showed the outline of the frame, or of the part of the frame between two longi- tudinals, the shape of the floor plate or bracket plates, the position of the plate edges and other bevelling spots, and generally everything necessary for completing the frame ready to go into its place at the ship.

The scrive-board is an auxiliary mould loft floor constructed conveniently near the frame-bending slabs, and having copied on it, with certain modifications or additions adapting it to the Scrlve- practical needs of the shipyard work, the whole of the board. body plan as laid off on the Mould Loft floor. For con- venience in copying the lines it is sometimes made so that it can" be divided into portable parts and taken to the Mould Loft to have the lines copied on it, and then transported to its proper position and put together again. Otherwise it is a fixture in its proper

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Plate XIII.

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Fig. 98. -Midship Section of H.M.S. "Lord Nelson.

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position; but the process of copying the frame lines on it is one of measuring on battens the ordinates of their intersections with water and diagonal lines, and is the same in either case. All of the frame lines are shown on the scrive-board, and the complete section of the frame surface tor both sides of the ship is shown at each station. To avoid confusion of lines, either a separate board is used for the fore and after bodies, or they are drawn on the same board with their centre lines parallel and a few feet apart, and one of the two bodies inverted. All the lines already referred to as having been laid off in the body plan on the mould loft floor, including the lines of outer edges of all transverse frames, the inner edges of all in the double bottom, and the upper edges of all floor plates outside the double bottom, the projections of plate edges of inner and outer bottom, ana of longitudinal frames and main longitudinal bulkheads, projections of beam at side lines for all decks, and of the intersection of the beam surface of the protective deck by the plane of each frame, are copied on the scrive-board and rased in on its surface. The scrive-board thus gives complete information of the shape and dimensions of every part of each transverse frame. To completely define the frame the " bevelling " is required in addition, that is the angle between the two flanges of the angle bar on the edge of the frame connecting it to the outer or inner bottom plating. The bevelling is usually given at the plate sight edges; but any other convenient bevelling spots may be chosen and their positions marked on the frame lines. To obtain the bevelling at any spot a normal is drawn to the frame line in the body plan at the spot ; the distance from the frame line is measured along this normal to its intersection with the next frame line .towards the midship section, and this distance is set up as one of the sides containing the right angle in a right-angled triangle of which the frame space is the base. The angle

of this triangle opposite the base is the supplement of the bevelling of the frame at the spot considered. When the curvature of the bottom in the plane normal to the square station at the bevelling spot considered is sensible in the length of a frame space, the normal distance measured is that between the two frame lines on either side of that at which the bevelling is to be obtained, and the base of the triangle is made equal to twice the frame space. The bevellings for each frame are marked on a bevelling board, the angles between the straight lines marked on the side of the board and the straight edge of the board representing both the bevelling and its supplement. In the frame bars there is no doubt as to which of these two angles the workmen are to regard as the true bevelling, since the flanges of the frames are all turned towards the midship section, so as to make the true bevelling always greater than a right angle, or " standing " as it is usually expressed, in con- tradistinction to " under " bevelling, which is less than a right angle.

Special bevelling frames are used in marking the bevelling boards, by which the construction of the triangles is reduced to setting off the normal measurement between the frame lines and drawing the hypotenuse directly on the bevelling board. The flanges of the angle bars on the inside edge of the frame, or the " reverse " frame bars, usually point the same way (that is towards the midship section) as the flanges of the frame bars, throughout the double bottom, in order to facilitate the construction of the bracket frame. Where the breadth of the longitudinals is constant, therefore, the bevelling of these angles on the inner bottom is the supplement of that of the frame angles. But throughout the double bottom neither bevelling differs much from a right angle. When the longitudinals taper in breadth separate bevellings must be taken for the inner angles by a method similar to that already described for the frame angles. Outside the double bottom the reverse angle, or inner part of the split zed bar, is either unconnected to anything but the floor plate, or else connects to a horizontal flat, and does not require bevelling.

The bevellings of the short angle bars which connect the bracket or floor plates of the transverse frames to the longi- tudinals are also obtained by measuring in the body plan at the middle of the inter- section of the longitudinal surface with the plane of a frame station the normal dis- tance to its intersection with the plane of the next frame station, and setting it up as one side of a right-angled triangle of which the frame space is the base.

To check the spread of the transverse frames during their erection, half-breadth staffs and height of breadth staffs are issued from the

mould loft, or their lengths may be taken off the scrive-board. These give the co-ordinates of the •intersections of the longitudinal sight edges with the frame fines, referred to the middle line of the body plan and a level line through the underside of the keel at each station. The frames are brought to and held in their correct positions

as shown by these staffs by shoring them in the vicinity of the longitudinals.

Shoring ribbands are not universally employed, the longitudinals at some shipyards being relied upon to keep the transverse frames in their correct relative position while framing the ship. „. . When they are used, one is usually placed a few inches rn.^% below and parallel to each deck edge and longitudinal sight anas.

edge. For the ribbands under the deck edges, the beam at side line is projected into an uncontracted half-breadth plan, a flexible batten is bent to the line, and on it are marked the positions and directions of the ordinates representing the traces of the planes of the frames. The ribband batten is then used to mark the positions of the frames on the ribband itself, generally made of pitch pine about 6 in. square in section. The position where the upper edge of the ribband is to come is marked on the scrive-board and the marks transferred to the frame angles when they are bent. When the frames are erected at the ship they are brought into their correct positions as shown by the marks on the ribband, the upper edge of which is kept to the marks on the frames. The frames and ribband are temporarily secured together, until the plating is fitted, and the whole kept in its proper position by shores. The ribbands under the longitudinals lie for practical purposes in diagonal planes, which must be rabatted in order to get the positions and directions of the frames correctly marked on the ribband battens. The ribbands are marked, secured to the frames and shored, similarly to those under the deck edges.

A beam mould is prepared for each deck, the upper edge of the mould showing the round down or camber of the longest beam in relation to a level line marked on the mould. The mould neck is applied to the body plan on the mould loft floor or on fc eams the scrive-board in its correct position at each frame station and the ends of each beam are marked on it, the ends being short of the frame lines by an amount which varies with the nature of the frame, but sufficient in any case to clear the inside of the flange of the frame bar. Bevelling-boards are supplied showing the angle at each frame station between the upper edge of the beam and the frame line for guidance in forming the beam arm, which is usually two and a half times the

depth of the beam, and the form of which is shown by a separate mould. When placing the beams in position at the ship their height is given by the beam end lines shown on the scrive-board and transferred to the frames when bent to the lines on the scrive-board.

The beam mould for the armour deck shows the length of the sloping part and the shape of the knuckle, with only a short length of the middle horizontal part. On the horizontal arm of the mould vertical lines are drawn at a given distance from the middle line at each frame station.

It is essential that the shape of the longitudinal frames should be obtained with considerable accuracy, especially when half- breadths and heights measured to their sight edges are f °5 , largely relied upon for keeping the transverse frames to •

As already stated, the longitudinal surface does not much differ from a surface generated by the normal to the ship's surface as it travels along the curve of the longitudinal sight edge. The surface generated by the normal is developable provided the sight edge is a line of curvature, which is approxi- mately ensured by the method of drawing it, and it is found by experience that no error of practical importance is involved in developing the surface of the longitudinal by the following approximate method.

Fig. 1 08 shows part of the body plan in which the frame lines are numbered I to 7, the projection of the longitudinal sight edge is

Fig. 108.

shown by a b c d e f ' g, and the projections of the traces of the longitudinal surface with the planes of the frames are shown by the straight lines a\ aa 2 , bi bbi, ft ce 2 , &c.

The curves a t 61 C\ di e x /1 % x and a 2 62 c 2 d? e 2 / 2 g 2 both cut all the traces at right angles, so that they are involutes of their envelope. Their positions are chosen at convenient distances beyond the inside and outside of the group of frame lines, which defines the length of longitudinal which is to be developed in one operation.

Farallel straight lines Aid, A2G2, the distance between which is equal to the normal distance between the two involutes in the body plan, are drawn in any convenient position on the floor, and perpendicular ordinates, 1, 2, 3, 4, 5, 6, 7, drawn between them distant the frame space apart. The longitudinal is developed in this plan on the assumption that when its surface is unrolled the involutes ai bi gi and 02 b 2 g 2 will coincide with the straight lines A t Gi and A 2 Gj respectively. Taking gigj in the body, repre- sented by G1G2 in the plan, as the fixed end of the longitudinal from which the surface is to be unrolled, the lengths gi/i, giti, &c, are measured along the curve of the involute and set off along the lines 6, 5, 4, &c, in the plan giving the points Fs, Es, &c, which represent with sufficient approximation the true positions of points of the line ai £>! C\ d, ei /1 gi in space relatively to a straight line through gj perpendicular to the body plane. A batten is bent through the points Gi Fs E 3 Ds C 5 B 3 A 3 thus obtained, and the positions of the points marked on the batten, which is then allowed to spring straight along the line GiAl the points Fi Ei Di Ci Bi Ai being marked from the corre- sponding marks on the batten. The points F2 E2 D2 C2 B 2 A 2 are ob- tained from the other involute in a similar manner, and the straight lines F1F2, E1E2, &c, obtained by joining corresponding points are regarded as the expanded positions of the traces of the longitudinal surface with the planes of the frames. The distances G2G, F2F, E2E, &c, are then made equal to g 2 g, fif_, e 2 e, &c, in the body, and the curve G F E D C B A through the points so found is the expanded sight edge of the longitudinal. The distances GGo, FFo, EEo, &c, are then made equal to the depth of the longitudinal in the plane of the cor- responding frame stations, when Go Fo Eo Do Co Bo Ao will be the expanded shape of the inner edge of the longitudinal.

The method described above is sufficiently accurate to lay off a whole longitudinal in one length, if it is not abnormally twisted. A modification of this method, in which the involutes tii bi gi and

When the longitudinal is much twisted, as, for example, when the longitudinal surface at its end is to be made continuous with a deck flat, which is not normal to the surface of the ship, it is generally desirable to use the more laborious but reliable method of " mocking up."

In fig. 109 the curves numbered 1 to 6 are projections of frame lines in the body plan, a b c d e f is the projection of the sight edge

of the longitudinal breaking into the projection of the edge of a deck flat at a, and ai 61 C. di ex /1 is the projection of the inner edge of

the longitudinal. The edges of the longitudinal are faired so that the traces of the longi- tudinal with the planes of the frames shall turn uniformly from the horizontal position of the deck flat at aa-i to the position of the main part of the longi- tudinal normal to the frame lines at 6 and beyond, the depth of the longitudinal in the planes of the frames being kept constant.

LL is the trace of a level plane drawn conveniently near to the sight edge in such a position that it is entirely below all the traces Of the longitudinal with the planes of the frames throughout the length which is to be mocked up. Trapezoidal frames made of four straight battens nailed together at the corners, such as X Y E E in the figure, are made to show the relative position of the traces of the longi- tudinal surface and of the level plane, with the plane of each frame. The outer and inner ends of the trace of the longitudinal surface are marked on the upper batten of each frame as at e, ei, and a point Oi, fixing the lateral position of each batten frame relatively to a convenient straight line perpendicular to the planes of the ship's frames, is marked on the lower batten. A diagonal plane such as DD can be used instead of the level plane LL for convenience in allowing smaller and better-shaped batten frames to be used ; and the process is precisely the same.

The batten frames are then erected on their bases XY in planes perpendicular to the floor, parallel to one another and distant the frame space apart, with the points O in all the frames lying in one straight line perpendicular to the batten frames. The upper edges of the upper battens then define the true shape of the longitudinal surface in three dimensions, and a fair curve through the points

Fig. 109.

e, &c, marked on the battens represents the outer edge, and through points «i/ &c, the inner edge of the longitudinal.

Whether the shape of the longitudinal has been obtained by development on the floor or by the mocking-up process, batten moulds are made to the outline of each plate, the butts being arranged to come in the middle of a frame space allotted to them in the draw- ing, giving the shift of butts of bottom plating and longitudinals. Cross battens are fitted to mark the position of each transverse frame, and diagonal battens in each frame space to stiffen the mould, and to carry marks or figures indicating the shape and dimensions of the lightening hole, which occurs between each pair of frames in non- watertight longitudinals. These moulds are used by

the workmen for marking off the shape of the plates and the positions of the rivet holes in them, the size and spacing of the rivets being given by the specification. No moulds giving the twist of the longitudinal are required, as that is so small that the plane plate can be pressed down into shape on the ends of the parts of the transverse frames, which must be already in position when the longitudinal is erected at the ship.

The external sectional shape of the bilge keel in a sheathed ship consists of a single steel plate in the middle of the section covered over by wood trimmed to shape. The plate lies in a diagonal plane and is readily laid off by rabatting Bilge keel. the diagonal plane. This gives the true form of the intersection of the bilge keel plate with the surface of the frames, and the outer edge of the plate is obtained by setting out from the inner edge the specified width of the keel plate plus an allowance for the thickness of the shell-plating.

In an unsheathed ship the bilge keel is of triangular section, as shown in the body plan in fig. 99, and is formed by two steel plates riveted together at their outer edges and connected to the shell- plating by angle bars at their inner edges, the space between the plates being filled with wood. In this case the middle plane of the keel is a diagonal plane, as shown by 2D in the figure. The depth of the bilge keel at each frame plus the allowance for shell-plating is set out from the frame line along the diagonal, giving the vertex of the section of the keel at each frame station. A triangular mould is then made to the section of the bilge keel shown in the midship section drawing and is applied with its vertex coinciding with the points on the floor found as described above and with its centre line coinciding with the diagonal, and the traces of the sides of the keel are drawn by it at each frame station as ab, dc, in the figure.

The surface of each side of the keel is then developed in the same way as the surface of a longitudinal except that in this case, since all the traces are parallel, the involutes used in the case of the longitudinal become straight lines, and the development is strictly accurate. A mould to each plate of the bilge keel, similar to the mould for a longitudinal plate, is prepared from the expansion on the floor and issued for the guidance of the workmen. A triangular batten mould, made to show the angle between the diagonal plane, in which the centre of the bilge keel lies, and the horizontal, and having marked on it a point to be set at a given distance from the middle line plane of the ship at the height of the under side of the keel, is also issued to enable the position of the centre line of the bilge keel to be sighted-in on the bottom plating of the ship.

The remaining information issued for the erection of the ship is mostly in the form of drawings, which are largely descriptive rather than dimensioned, inasmuch as the frames and beams of ,

the ship being once erected all other principal parts have urawm S s – to conform to them in shape, even where a slight difference may occur between their shape as erected and as laid off on the mould loft floor.

All the drawings of the structure and of the fittings must be pushed on and issued to the shipyard in good time. Very much of the success achieved in actual building will depend upon the efficiency of the drawing office, and the rapidity with which the various detailed working plans can be supplied for guidance. These plans must be accurate and complete, and must be ready as soon as required. The drawing-office staff has the oversight of weights actually worked into the ship, a careful record of which should be kept. Each firm has its own system of work in these departments, but experience shows that the more thorough and systematic the work in the drawing office and its adjunct, the mould loft, the better the general result. Another important record is the cost of materials and labour. In all shipyards careful account is kept of workmen's time, whether employed on piece or by the day. Many different systems are in vogue; but whatever the system, the aim is to record the cost of the labour in each trade, and the detailed cost of various parts of the ship.

While the work connected with laying-off and obtaining materials, &c, is going on, the shipwrights, assisted by .

handy labourers, prepare the ground for the keel blocks, keel" g

lay the blocks at the proper height and inclination, and blocks. secure them against being floated away by the tide or being accidentally tripped while the ship is building. The blocks consist

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SHIPBUILDING

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Keel and frames.

of several pieces of tough rectangular timber, 4 to 6 ft. in length, and laid on each other to the height required. The top block is called the cap-piece, and is of oak or other hard wood. The blocks are spaced

about 4 ft. apart for ships of medium size, and somewhat less for ships of large size. They are usually placed upon a longi- tudinal bed of timber, which remains embedded in the ground for successive ships: the ground should be hard, or very well piled, otherwise the blocks may sink when weight becomes concentrated over them during building, and difficulty arises from the keel, or the propelling shafts, drooping from a straight line. The upper surface of the blocks must be at such a height from the ground that men, especially riveters, can do their work with facility under the bottom of the vessel, that the launch can be fitted, and that when launched the vessel may move down into the water without striking the ground. The last-named is a most important consideration; and thus it comes about that the first thing to be settled, before the blocks are laid, is how the vessel is to be launched. The tops of all the blocks are accurately adjusted to a plane surface sloping about f in. in a foot from bow to stern. The shipwrights at the same time prepare the uprights for the staging, and erect them around the building berth in suitable position with the first line of staging, which will be required at an early period in the ship's construction. The platers and angle-smiths begin to prepare the keel, framing, bulk- heads, &c, as soon as the material is delivered and the laying-off and mould-making are sufficiently advanced for the purpose. The actual building generally dates from the first work of this character.

The keels of small vessels usually consist of a stout flat bar placed vertically and attached to the garboard strakes by through rivets. Occasionally the keel consists of a vertical centre through-plate, with side bars at its lower edge. In large merchant ships, and in war vessels, the keel usually consists of a wide horizontal plate running along the centre line of the bottom, the sides being turned up as necessary to follow the shapeof the bottom (see figs. 1 18 and 1 19, Plate XIV.). The framing varies very considerably with the size and type of the ship, as already described. In small vessels a frame usually consists of an angle bar, called a frame bar, extending from gunwale to gunwale, to which is riveted a bar, also continuous from gunwale to gunwale, called a reverse bar, in such a way as to form a built-up Z-bar, and between these floor-plates are introduced across the bottom, to give the required strength when resting on the ground or on the blocks. Sometimes the frame consists of a Z-bar, in which case the reverse bar is not required in the vicinity of the floor-plate. Sometimes angle bulbs are used for frames, as in the case of oil steamers, where internal ceilings are not required. The process of constructing a complete frame of angle bars and plate is as follows: From the scrive-boards the shape of the section at the frame is

transferred to the bending blocks or slabs, the outline being drawn in with chalk; the necessary preparation is made, and the frame bar is drawn from the furnace, and while hot bent to its shape and given the required bevel. The reverse bar is prepared in the same way, except that the inner edge of the frame and floor must be worked to. The floor- plate has to be cut to shape. In large ships the frame bars, reverse bars and floor-plates will be in two, or even in three, pieces; in this case the butts are kept some distance from the middle line, and are shifted in alternate frames, so as not all to lie in the same fore-and- aft lines. The butts of both frame and reverse bars, as well as those of the floor-plate, are butt-strapped, to maintain as much as possible the strength of the structure. The frame bar, floor-plate and reverse frame bar all being set, they are placed together in their respective positions over the outline of the frame on the slabs or scrive-boards, the final adjustments made and rivet holes marked and punched, and the work secured together and riveted up.

When the keel is in place, and as far as possible riveted, the frames, bulkheads and beams, which have been made ready by the iron-workers, are brought to the building slip and got into position by the shipwrights. They are held in place and faired by means of shores and ribbands. The latter are made from straight- grained timber of considerable length, sawn out in long straight pieces of square transverse section. They hold the frames in position until the outside plating is riveted. Upon them are marked the lines at which they must be crossed by each frame, and they are bent round and attached to the frames in a fore-and-aft direction at certain heights, which are marked on the frames at the scrive- boards. Some four or more ribbands are used each side of the ship. As the work proceeds, the positions of the frames and ribbands are checked continuously, their positions being maintained by shores from the ground, or some structure prepared for the purpose. Except in small vessels, the beams are not attached to the frames before they are erected, but are hoisted into place as soon as possible afterwards.

The bulkheads are put together on some convenient flat surface, sometimes on the scrive-board or a similar platform constructed for the purpose. If of large size, they are transferred piece by piece and erected at their proper positions in the ship; but when- ever possible, they are rivited up and hoisted into position complete. The stem and sternpost are obtained from the forge or foundry and erected at an early stage of the work. The part of the stern abaft

the transom is sometimes framed separately on the ground before being erected in the ship. The centre keelson is generally worked

intercostally between the floors, but it has continuous parts, usually angle bars, above the floors. Each intercostal plate is secured by angle bars or flanged edges to the floors and to the flat keel plate. Sometimes it is continuous, especially in large ships and in war-ships. The frames are then cut by it, and the floor-plates are attached to it by short angle bars. After the centre keelsons, the side keelsons and side and deck stringers are fitted. The steel pillars are substituted for the shores supporting the deck beams, being riveted at their heads to the beams and at their heels to the keelson, inner bottom or tank top.

While the work is proceeding, the shipwrights make the stages, put up gangways and ladders for carrying on the work, fit extra blocks and shores, or remove and replace them as may be required. They line off all plate edges on the frames, the overlap being usually painted in with white paint, ready for the platers. They also erect the stem, sternpost, rudder and shaft brackets, or struts in twin- screw vessels.

In a ship fitted with an inner bottom the procedure is somewhat more complicated, as the transverse frames cannot be lifted into place as a whole. There are many varieties in the arrangements in such cases; one frequently adopted is shown in fig. 113, in which the inner bottom extends out to the turn of the bilge. This figure also shows the general construction of the vessel, including the framing at a bulkhead and elsewhere, the bulkhead itself with all its stiffening bars and attachments to the sides of the vessel, and the inner bottom. At the centre line, immediately over the flat keel plates, there is a vertical girder, the full depth of the double bottom, connected to the flat keel plate and to the centre plate of the inner bottom by continuous double-angle bars. This centre girder may or may not be water-tight, according to the desired tank arrange- ments. The transverse frames are in four parts: the two lower extending on either side from the centre girder to the margin plate of the double bottom, which is a continuous girder of special construction; and the two upper, from the margin plates to the top-sides. The lower parts consist of a floor-plate with angle bars at its edges for attaching it to the outer and inner bottoms, the centre girder and the margin plate. At the bulkheads these floor- plates are solid, and the angle bars are united and made water- tight; elsewhere they are lightened by holes, and the angle bars at their upper and lower edges and ends are separate pieces. The two upper parts of the transverse framing consist of a frame and a reverse bar, each having a deep and a shallow flange, and are riveted to one another along their deep flanges, with their shallow flanges standing the reverse way to one another. The shell-plating is attached to the shallow flange of the

frame bar. Between the centre girder and the margin plate on each side of the ship there are two intercostal girders, the plates of which are connected by short angle bars to the floors- and to the shell and inner bottom plating; and between the margin plates and the lower deck on each side there are three stringers, consisting of intercostal plates attached by short bars to the outer plating, and three continuous angle bars riveted to part of the intercostal plates which extend beyond the reverse bars.

In the course of erection, after the flat keel plate is laid upon the blocks, and the centre girder placed upon it, the two lower parts of the frames, which have been constructed alongside, are put into position, their outer ends being carried by ribbands shored from the ground. The intercostal girders and margin plates are then fitted. The lower edge of the margin plate is brought close to the outer edge of the frames, and is connected by a longitudinal angle bar to the shell-plating, while its upper edge is flanged for the purpose of being attached to the inner bottom plating. The ship at this stage gives the impression that a flat pontoon is being constructed.

When the margin plates are up and faired and, as far as desirable, riveted, the upper parts of the frames on each side are erected and the fairing proceeded with as before. The beams are now got into place, also the side and deck stringers. As will be seen, the margin plate cuts completely through the transverse frames, and special brackets are provided to maintain the transverse strength. The chief advantages derived from cutting the frames by the margin plate are the cheapness with which water-tight work is secured, and the rapidity with which this part of the work can be proceeded with.

As soon as the keelsons and stringers are riveted, and the ship by their means sufficiently stiffened, the outside or shell plating is commenced. The plating squad is supplied with a drawing „

showing the disposition of the butts in each line of plates; ‘

*light wooden moulds or templates are then made, giving ˆ ii„t the exact shape of the edges and butts, and the positions ** a of all the rivet holes in the frames. From these moulds the edges and butts and the holes are marked off, the holes are punched, and the edges and butts sheared and planed. The plates are then rolled to shape, furnacing being resorted to only when the curvature is too extreme to be obtained with the plate cold. The usual arrangement of the plating is that of inside and outside strakes alternately (see a, fig. 79). The inside strakes, which are worked first, are templated off the ship,*

and lie directly on the flanges of the frame bars. The outside or overlapping

plates are then worked, and are templated from the place they are intended to occupy on the ship. They are kept at the proper distance from the frames by liners or slips of the same thickness as the adjacent inside plates. Towards the ends of the ship the number of strakes of plating must be reduced, as the girth along the frames is much less than over the midship portions. Stealers are introduced for this purpose; they are single plates, which at one end receive the butts of two plates, and at the other the butt of only one. By them two strakes are merged into one.

The number of plates requiring to be furnaced is small in comparison with the whole number, but there are always some at the after end of the ship, especially in the neigh- bourhood of the boss (for the stern tube) and the counter, and a few at the forward end of most ships. As each plate is got ready, it is taken to the ship, hoisted into position, and temporarily secured by the platers by means of bolts and nuts. As the work of plating proceeds, and the weight of the ship increases, extra shores are put into place, and bilge blocks erected by theshipwrights.tokeepthestructure to its shape and prevent local and general " unfairness." The shell-plating in way of the intended bilge blocks is completed at as early a period as possible, and painted, so that when once the bilge blocks are in place they need not be disturbed until immediately before launching. While the platers are at work on the shell-plating, other squads of riveters are engaged on the deck-plating and internal work, such as the bunkers, engine and boiler bearers, the shaft tunnel, casings and, in the later stages, the hatches, houses on deck, &c, and as much as possible of the internal work is done before the shell shuts out the day- light. As the work is completed by the platers, it is ready for the riveters and caulkers; and these trades follow on without delay, except in some parts of the casings and decks in way of the machinery, which are left portable, and taken down after the launch, to allow the machinery to be put in place.

The platers usually work in squads, composed generally of three platers, a marker-boy and a number of helpers or labourers, the

number of whom depends on the size and weight of the plates, and the nature of the work to be done on them, and also on the facilities of the yard for hand- ling such material. On the work of a large vessel many of these squads would be employed. The riveters also work in squads, a squad consisting of two riveters, one holdcr-up and one heater-boy, with sometimes a catcher, i.e. a boy to pass on the heated rivets when the distance from the rivet-hearth is great. Pneumatic riveting has not made great progress in Great Britain. Hydraulic riveting to a limited extent is adopted, especially in the case of work that can be taken to the machine, such as frames, beams and other parts; but in shipbuilding the large proportion of the riveting is done by hand. In the Royal dockyards platers' work is done by shipwrights, and riveting is not considered a trade; though regarded as skilled labour. Shipwrights also lay the blocks, erect the ribbands, shore and fair the ship, but labourers con- struct the stages. Drillers' work consists in drilling by hand or by portable electric or pneumatic drills holes which it is not convenient or possible to punch or drill before erection ; they also rimer out and countersink punched and drilled holes when this is necessary. Portable electric or pneumatic drills are used when possible in some ship- yards, and three-cylinder hydraulic engine drills are employed for some purposes, such as in cutting armour bolt holes in thick plating behind armour. The caulkers follow closely upon the riveters, and generally work singly. A very important part of a caulker's duty is water-test- ing. In the large oil-tank steamers possibly 8000 tons of water are used for testing one ship alone, and about the same amount for a large war vessel. This water is pumped from the sea or river into the compartment to be tested. In the case of an oil vessel, each compart- ment is filled right up, and a pressure put on by means of a stand pipe, carried 'for a considerable height above the highest part of the tank; any leakage found must be made good by the caulker, and the tank retested until it is perfectly water-tight. The double bottoms of merchant ships, and the smaller compartments and double bottoms of war vessels, are filled up and tested by a head of water rising a few feet above the load water-line. It is not usual to fill all the larger compartments, such as boiler and engine rooms in war vessels, or the machinery compartments and cargo holds in merchant ships; but water at a high velocity is played on the bulkheads by hose, to test the water-tightness and the strength. An occasional test, however, is made by filling a typical large compartment with water to a height of some feet

in a smith's fire is required. It is usual to defer the painting of certain parts of the steel structure of a ship as long as possible, so

Fig. no. — Great Lake Cargo Steamer; midship portion, in perspective.

Fig. in. — British Cargo Steamer; midship portion, in perspective.

above the load water-line. Angle-smiths form beam knees where 1 that ordinary red rust may form and dislodge the black mill scale these are welded, and generally all angle-bar work where heating | which is answerable for a great deal of corrosion in steel ships, as

in certain circumstances it forms a galvanic couple with the steel plate. For warships the British Admiralty requires the removal of this scale from these parts by immersing the plates in a weak solution of hydrochloric acid. Red and white lead, oxide of iron and oxide of zinc form the bases of most of the paints used on steel ships.

Structural Arrangements.

The following are particulars of ships recently built at New

London (Conn., U.S.A.) on the longitudinal system: "The great

centre girder, which in all vessels prior to these has been in the form

of an I girder, is formed of a double II or box; that is, these vessels

Fig. 112. — Cunard Liner " Campania"; midship portion, in perspective,

have two vertical keels instead of one. The girder is of the same depth as the double bottom (6 ft.). On each side of this girder there are several other vertical longitudinal members, having the plating on the top, forming the tank top, and the shell-plating below, forming the bottom of the tank. This tank or double bottom is 6 ft. deep for the greater part of its length, and is increased at the extremities, where it merges into the fore-and-aft peaks at the collision bulk-heads. The whole of this space can be filled with water when desired, to sink the ship to a suitable draught when making a voyage without a cargo or with a very light one, at the same time allowing the ship to

keep afloat whenever the outer shell or skin has been pierced by rocks or by colliding with other vessels. This bottom girder or double bottom forms the ‘ backbone ‘ of the ship, from which the great frames spring or extend up to the weather deck, about 6o ft. above the keel. The frames are made of channel steel spaced 30 in. apart, but as they near the extreme ends they are spaced closer, and are xxiv. 31 a

composed of angle bars riveted together. At certain parts of the structure, where the heave of the sea will tend to strain the ship, the frames are double and made very strong. The outer surface of these frames is covered with a shell of steel plates averaging about 1 in. in thickness. These enormous plates are arranged to give a maximum of strength, and the riveting of them to the frames and to each other is receiving the utmost care.

” These ships have a continuous longitudinal bulkhead on the centre, extending from the inner bottom to the main deck. The side plating of the shell, with this longitudinal bulkhead, form three vertical members of the entire structure. The upper flanges of the girder are formed by the upper and main decks, which are laid with heavy steel plates. This great girder is designed to support a full cargo when suspended by long sea waves at either end. The side girders are kept in place by three inter- mediate decks between the tank and the main deck, making in all five complete decks, each covered with heavy steel plate. The beams supporting all these decks are of channel steel, and fitted to every frame by large bracket plates. One of the many notable features in the con- struction of these vessels is the distribution of the water ballast. Various conditions of trim and safety can be obtained. The double bottom is divided longitudinally into three water-tight divisions and transversely into about twelve, making in all thirty-six separate tanks. In addition to these there are the fore-and-after peak tanks, and side tanks between the main and ‘tween decks, about one quarter of the vessel’s length from either end. The latter tanks are really fitted for the purpose of controlling the ship’s stability and seaworthiness.

” The vessels are divided transversely into thirteen water-tight compartments, while the longitudinal bulk- head is water-tight in the machinery space, which makes in all fifteen water-tight compartments. The engine- rooms are completely independent of each other; so are the boiler-rooms ; but access is had from one to the other by water-tight doors. The coal can gravitate direct to the stokehold floor. The method of pillaring is somewhat novel. … Strong girders run under the transverse beams and are supported at wide

intervals by built stanchions. By this means the least possible trouble is experienced in stowing the cargo."

Fig. 1 10 shows the construction of a typical American Lake steamer, a diagram of which is given in the article Ship, fig. 16. She is 450 ft. over all, 50 ft. beam and 28 ft. 6 in. moulded depth; and when loaded to a draught of 18 ft. 3 in. can carry about 6000 tons weight of / imer f can cargo on a total displacement of about 9000 tons. Grea< z, a Ae For half the length or more the ship is of the S (eaa , er< same transverse section, the frames being made identical in form. The outside plating is about f in. thick generally, but it is thicker at the garboards, flat keel and sheer strake, and becomes thinner generally towards the ends of the vessel. The frames are 24 in. apart, and consist of four separate pieces — two across the bottom arid one up each side. These across the bottom consist of a I5ˆin. channel bar, with deep flanged brackets of 17 j lb plating connecting their inner ends to the centre keelson and their outer ends to the bilge and tank top. Extending up each side the frames consist of 6-in. channel bars of 17 lb per foot, worked 24 in. apart in the case of ordinary frames; and 15-in. channel bars of 33 lb per foot, worked 8 ft. apart, and called belt or special frames. The frames are all connected to the tank top and to the upper deck-plating by flanged bracket plates 175 lb per square foot; and the belt frames are stiffened by hold beams of I section, 12 in. deep and 35 lb per foot, attached to each by deep flanged brackets of 17J lb plating as indicated, and sup- ported in the middle by stanchions or pillars of similar section. The stanchions are attached to the tank top by double clips of 6-in. angle bar, and to the upper deck beams by direct riveting and by flanged brackets of 15 lb plating. Each belt frame is thus complete in itself, and very readily erected after the tank top is completed. The tank top is. of 20 lb plating amidships and under the loading hatches and 1 1\ lb elsewhere. The margin plate is a continuation of the tank top, is made of 17J lb plating, and flanged against the shell. The centre keelson is of about 22 J lb plating and about 5 J ft. deep; the side keelsons are of 17J lb and slightly less depth, so that with a small rise of floor on the outside, say 3 in. in the half-breadth of the ship, there is a small fall of the tank top towards the bilges, say 6 in. in the half-breadth, so as to drain the hold to the water-courses over the margin plates. The centre keelson extends from the inner to the outer bottom, being attached to the tank top and the flat keel by heavy double angle bars, and well stiffened by the flanged floor brackets, which are connected to it by heavy double angle bars. The side keelsons are connected to the tank top and the floors by fore-and-aft angle bars 3 in. by 3 in. of l\ lb per

foot, and stiffened by vertical 6-in. angle bars at every frame. At the lower edge the keelson plates are connected to fore-and-aft intercostal cha«uel bars

97 8

SHIPBUILDING

[COURSE OF CONSTRUCTION

*DCCK STSUIGC**

■”•”•■*ftr*

SECTION OF SHIP AT ORDINARY FRAME

Vertical Section through A B

V 1 SECTION OF SKIP AT TRANVERSE WATERTIGHT BULKHEAD

5HUI PLATING

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MAR.GW PLATE

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Horizontal Section through C D. w«gm brackft!;*

HORIZONTAL AN(,U 6ULB t-Tif r tNt a J

*SKOAL KCP *CATI£AL*

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Fig. 113. — Details of Framing and Bulkheads.

STRINGER BRACKET

IOW0 51DC STRINOES*

15 in. deep of 33 lb per foot, riveted to the sheel-plating, which, with the channel floors, give very great local support to the bottom. This system of framing extends practically throughout the length of the vessel ; thus the bottom is very strong, and v.ery large ballast tanks are formed, having a capacity of nearly 3000 tons. The upper deck is plated, and the stringers are made specially heavy, to compen- sate

for the strength lost by cutting wide hatchways.

Fig. 1 1 1 represents a modern British cargo steamer of ordinary construction, of about the same breadth and depth as the American British Lake steamer 3 us t described, and it will be interesting to cargo note the differences between the two vessels. These differ-

steatner. ences – 9° far as the outside form is concerned, are chiefly that the British cargo steamer has deck erections, top- sides and a main deck, whereas the Lake steamer has scarcely any deck erections and no topsides, while her hold extends from the top of the inner bottom to the upper deck; they are due to the fact that the latter ship is only required to traverse inland waters, where heavy weather is not met with, whereas the former is an ocean- going vessel, and must be prepared to meet all conditions of wind and sea. As to the differences in the details of construction, they are chiefly that in the American Lake steamer the bottom framing, which is of great depth, consists of deep channel-frame bars, above which the longitudinals are continuous, instead of the usual transverse framing in the British ship, extending between the outer bottom and tank top; and that the margin plate con- tinues the surface of the tank top out to the side, instead of being nearly vertical, as in the British ship. The system adopted in the American steamer conduces to security in case of grounding in the shallow waters through which she has to pass.

The general construction of a large passenger vessel is shown by fig. 112, which gives a perspective sectional view of the framing, &c. of the Cunard liner "Campania." The transverse frames and the girders or longitudinals extend in depth from the outer bottom plating to the inner bottom plating. The centre keelson, the second longitudinal from the middle line, and

Atlantic liner.

the margin plate on each side, are continuous, the transverse frames being fitted between them and attached to them by angle bars. The first and third longitudinals from the middle line are intercostal, being fitted in short pieces between the frames and attached to the

BAACKC

Fig. 114. — Breast-hook and Panting Stringers.

floor-plates by short angle bars. The floor-plates have large holes cut in them to lighten them, and to give access to the different spaces for inspection, painting, &c, and smaller holes for watercourses. From

the margin plate the transverse frames consist of stout channel

Fig. 115. — Stern Framing, Shaft Tunnel, &c, of Single-Screw Ship.

bars extending to the upper deck; each tier of beams is securely riveted to them, and their lower ends are connected to the margin plate by strong brackets. At intervals the channel-bar frames are replaced by deep built-up frames, the frequency of which depends on local requirements. Heavy side stringers of the same depth as the deep frames run fore arid aft, to stiffen the side between the bilges and the first plated deck. Where the deep frames are cut by these

Fig. 116. — Stern Framing of the " Campania."

stringers, the strength of the frames is continued by gusset plates, as shown.

Some further structural arrangements usually adopted in British ships are shown in figs. 113 to 115. Fig. 113, to which reference has already been made, shows in detail the construction of a bulkhead, with the framing in wake of it, and the same details at an ordinary frame; also the stringers, beams, pillars, &c. The bulkhead itself stops at the tank top, being secured to it by double angle bars, and the flpor immediately beneath it is made water-tight. It would involve very costly work to make the bulkhead water-tight if the side and bilge stringers were made continuous ; these have therefore been cut, and the continuity of the longitudinal strength is main- tained, as far as possible, by the large brackets shown in the plan. Besides bulb stiffeners, the bulkhead is provided with built-up vertical stiffeners at AB and a built-up horizontal stiffener at CD. Fig. 114 shows the arrangement for special strengthening at the extreme fore end of a vessel, between the collision bulkhead and the stem, and below the main deck, these consisting chiefly of panting stringers, panting beams and breast hook. Fig. 115 shows the general arrangement of stern framing of a single-screw ship, including the shaft tunnel. A water-tight door, which can be closed when necessary from above the level of the outside water, shuts off communication between the engine-room and tunnel; the form of the stern post and aperture frame casting is shown, with its attachment to the centre keelson and other details.

Figs. 116 and 117 show the arrangements of the stern and bow framing of the " Campania," which may be taken as those usually

adopted in large passenger steamers of this class. 1 In both the transverse framing becomes deeper and stronger as the extremities are approached, while the decks and side stringers are all continued to the extremities, finishing in strong breast-hooks, and additional stringers, breast-hooks and panting beams are introduced. It is worthy of note that the rudder and steering gear are in this vessel entirely under water, so that she may be used for war purposes without running the risk of disablement by the rudder or steering gear being struck by projectiles. Above the water the stern is finished off so as to have the appearance of being fitted with an ordinary rudder. This important departure from the usual practice was first introduced by Professor Biles in the " City of Paris," and the " Campania " and her sister the " Lucania " were in 1902 the only British ships so fitted.

Fig. 122 gjves in perspective the general structural arrangements of theJapanesecruiser"Idzumo,"andfigs. 118-121 (Plate XIV.) are from photographs of the vessel in course of construction. It will be seen that the departures from the structural arrange- inferences mentsof amerchantshipareveryconsiderable. Asalready „„]T!ˆ," pointed out, lighter scantlings are used in warships than """" ""

war and merchant

in ordinary merchant ships. This is effected by more "J"™ carefully devised and more costly arrangements of framing s ps% and plating, and by making the structural features necessary in a warship for protection, &c, serve also for local and general strength.*

Fig. 117. — Bow Framing of the " Campania."

In warships, frames are placed at greater distances apart, 4 ft. amidships and 3 ft. at the extremities being the usual spacing, as compared with some 2 ft. in a merchant ship. On the other hand, there are more continuous longitudinals in the framing of a warship, which extend in depth from the inner bottom to the shell-plating, and give

1 We are indebted to the late Dr Elgar, F.R.S., for these and other plans of the " Campania."

local support to the bottom as well as general strength to the vessel. There are in a warship so many structural features, such as water-tight bulkheads and flats or platforms, required for the necessary subdivision, armour decks, plating and framing behind armour, &c, which are made to contribute to the strength of the structure as a whole, that the strength of the shell-plating and the transverse framing can be proportionately reduced.

In a merchant ship there are many considerations which require the structure to be stronger and heavier than would be necessary

door or from a deck above water, or from both. Below the protective deck are the engine and boiler spaces, magazines, shell-rooms, submerged torpedo rooms, and steering-gear. A passage is provided on each side of the ship just below the protective deck, for the supply of ammunition to the secondary armament.

Fig- 118 shows the " Idzumo " partially in frame, looking forward from the after extremity : the frames below the armour deck over a considerable length of the ship are complete, and a number of the beams which carry the armour deck are in place. Fig. 119 shows the ram stem, which has just been placed in position. The collision bulkhead and the framing below the armour deck are for the most part in place. Fig. 120 gives the top of the armour deck, which is nearly completed, as seen from the fore end, with the forward citadel

Fig. 122. — Japanese Cruiser " Idzumo "; midship portion, in perspective, to withstand the wind and waves which she may encounter. The continual change of cargo and of disposition of cargo necessitates special local strength throughout. The custom, often pursued, of grounding vessels to discharge cargo, and their liability to touch the ground in the ports they frequent, make the provision of great strength in the floors and the shell-plating essential. Other considerations affect the decks, and call for local strength in them with corresponding increase of weight.

Most warships, except gunboat, torpedo and other small craft, have double bottoms, chiefly for protection against damage in action, but also against accidental grounding. The space between the bottoms is divided into a large number of compartments by making some of the frames and longitudinals water-tight. The inner bottom extends on each side to the turn of the bilge, and from that point is carried up vertically as a wing bulkhead, as shown in fig. 122, the wing spaces

thus formed being occasionally utilized for coal-bunkers. The framing, consisting of frame bars, reverse frame bars and frame plates or brackets, is usually carried up in a fair curve to the armour shelf, supposing the vessel to be an armour-clad, as in fig. 122. From the edge of the armour, which is generally about 5 ft. below the load water- line, a change in structure is made, and the framing behind the armour is set back from the outside of the ship suffi- ciently to admit of an internal skin of steel plating (often worked in two thicknesses), teak backing, upon which the armour is embedded, and the armour itself, to be carried with the surface of the armour flush with the shell-plating. The vertical frames behind armour are spaced 2 ft. apart, and the longitudinals are made intercostal, the whole hav- ing exceptional strength, to support the armour. Above the armour another change is made, the frames being brought again to the outside of the ship, and the topside plating directly attached to them becoming flush with the outside of the armour. There is generally a strong deck, called the protective deck, extending from stem to stern in the form of a turtle 'back, the lower edges being at the armour shelf on each side of the ship, and the top of the arch forming the first deck above water, as indicated in fig. 120. With a view to maintaining its defensive power where it has to be perforated for funnels and air shafts, armour gratings, or armour bars as they are called, are fitted in the open- ings. As much water-tight subdivision as possible is introduced throughout the ship, but for communication between the various compartments openings are provided in the bulkheads, having water- tight doors which can be closed either from a position close to the

Elevation, 'levation.

Fig. 123. — Steering Gear of Merchant Ship.

bulkhead in course of construction. Fig. 121 shows the after part of the vessel, which is not so far advanced as the forward portion shown in fig. 120. In fig. 121 the framing has been carried to a bulk- head near the after extremity, the rudder post is in place, and the bearing for the rudder head can be seen in the foreground. The construction of the armour deck is proceeding, and the after citadel bulkhead is also well advanced, though no backing is yet upon it, as in the case of the forward bulkhead, but the base of the redoubt which carries the after turret is erected.

The fittings in a ship cannot be fully described in the present article, but we shall conclude with some account of the auxiliary machinery. Two ordinary arrangements of steering-gear . ... fitted in merchant

steamers are shown in fig. 123. In the mac hlnerr first example a three-quarter circular grooved rim, keyed to the rudder head, carries the steering-chains, which are led forward one on each side of the hatches to the steam engine, placed in this case in the engine-room casing, and controlled by shafting from the bridge. The usual steering-wheel is fitted on the bridge, and actuates the controlling valve of the steam engine by means of the shafting. The second example is very similar to the first : a quadrant is keyed

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[Fig. 124. — Steering Gear of Warship.

on the rudder head, and worked by chains led over pulleys one on each side of the ship to the steam gear, which in this case is placed on the bridge, close to the wheel. In all such cases gear is also provided by which in an emergency the ship can be steered by hand, by steering-wheels placed close to the rudder head, as indicated in the figures.

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In a warship the arrangement is different, as it is necessary to keep the steering gear below the water-line for protection. The breadth available at the rudder head is as a rule not sufficient for a tiller or quadrant to be fitted. Fig. 124 illustrates an arrangement frequently adopted. A crosshead of sufficient size is keyed on to the rudder head, and is worked by connecting rods from a similar crosshead placed a little farther forward, where the breadth of the ship is sufficient to allow a tiller to be worked. The tiller is worked by a block or carriage, which is drawn across the ship on a guide, at the

same time sliding upon the tiller, which is machined for the purpose. The block-and-guide arrangement is known as Rapson's slide. The block is hauled to and fro across the ship by a chain which passes round a sprocket wheel upon a shaft, which is driven in either direction, as required, by the steering-engine. In fig. 125 the arrangement is shown which has been for a considerable period adopted in large merchant ships and has in recent years been adopted in ships of the British navy. It is known as screw steering gear. On the same central shaft there are right- and left- handed screws as indicated on the plan, by which blocks A and B are made to travel always in the opposite direction when the shaft is

Fig. 125. — Screw Steering Gear.

rotated. These actuate the crosshead on the rudder E by means of the rods C and D, one of which will communicate a thrust and the other a pull, and vice versa according to which way the shaft is made to rotate. The shaft may be actuated either by hand-gear or by steam by means of the clutch F. In many cases the steam steering-engine is placed in the engine-room, to avoid heating the after-compartments by the steam pipes, and for the sake of easier control by the engineers.

Amongst the auxiliary machinery usually fitted in passenger and other well-found vessels may be mentioned the windlass for working the cables and weighing the anchors ; a warping capstan forward in connexion with the windlass, and another aft with its own engine; steam winches for handling the cargo and baggage, and for hoisting coals on board ; and occasionally steam cranes, fitted either in addition to or in place of the winches. Then there are the electric light, pumping, ventilating and refrigerating installations. Hydraulic, power is employed in many cases, especially for cranes, but here the source of the power is necessarily a steam engine, which is usually placed in the main engine-room. Electric power sometimes replaces steam for operating some of the machines enumerated above; for instance, ventilating fans are now generally driven by electric motors in passenger and war ships. A large number of comparatively small fans are Used, each supplying air to a particular part of the ship.

In warships the amount of auxiliary machinery has been very greatly increased in recent years. On each side of the deck amidships there is generally a steam winch for raising and lower- ing the boats, one of the principal functions of the mast in the modern warship being to carry the derrick used for this purpose. Electric motors are fitted for working the after-capstans, ash hoists, sometimes the winches, and

the workshop machinery; also to traverse, elevate and work the guns, and bring the powder and projectiles up from the magazines to the guns. But for the heavier guns, the steering-gear, and certain other purposes, hydraulic power or steam is still preferred.

The writer is indebted to Mr H. G. Williams, Mr Lloyd Wool- lard and Mr A. W. A. Cluett for valuable assistance in preparing this article. (P. Wa.)

SHIPKA PASS, in Bulgaria, a pass in the Balkans, celebrated as the scene of fierce fighting in the Russo-Turkish War of 1877-78. The main road from Rumelia to Bulgaria, leading from Sistova by Tirnova and Eski Zagra to Adrianople, crosses the Balkans near the village of Shipka, and this passage was of necessity an important point in the Russian plan of operations. The road does not pass between high peaks, but crosses the main ridge at the highest point ; it is therefore not a pass in the ordinary sense of the word. Near the summit, running parallel, and close to the road is a series of three ridges, some 200 ft. high, and about 2 m. from north to south, which formed the position for a force holding the pass. It was originally held by a Turkish force of about 4000 men with 12 guns, prepared to resist the Russian advance. On the 17th of July they repelled a feeble attack from the north, and the following day faced round and drove back an attack by Gurko from the south. These attacks were to have been simultaneous, but Gurko, having met with unexpected resistance, was a day late. Though so far successful, the Turks evacuated their strong position, and it was occupied by the Russians on the 19th of July.

They were first attacked by Suleiman Pasha towards the end of August. Having concentrated with Reouf Pasha and driven Gurko across the Balkans at the end of July, he moved to the Shipka on the morning of the 2 1 st of August, and attacked. The Russian force there, including five battalions of Bulgarians, then numbered 5000, but that day a regiment from Selvi brought their numbers to 7500, and this force held the position against 30,000 Turks for three days, when heavy rein- forcements arrived. The fighting continued till the morning of the 26th, when Suleiman, his troops being exhausted, and having lost 10,000 men, entrenched him- self in the position he then occupied in a semi-circle round the southern end of the Russian position. Having called up more battalions from Yeni Zagra, after a four days' artillery bombardment, he attacked on the 17th of September, and was repelled with a loss of 3000 men.

There was no more fighting on the Shipka till the general advance of

the Russians after the fall of Plevna. Radetzky's command of about 60,000 men advanced from Gabrova on the 5th of January, in three columns. Radetzky, with the central column, moved by the main road and attacked the Turks, who still faced the position on the summit, while Skobelpv and Mirski, crossing by trails some 3 m. to the west and east of the Turkish position, attacked their reserves on the far side, about Shipka and Shenova, where Vessil Pasha (who had succeeded Suleiman in command) had formed an entrenched camp. These flank columns made their way over the mountains, deep in snow. Mirski attacked alone on the 8th of January, as Skobelev's advance had been delayed, but the following day both columns attacked, and after fierce fighting the Turks surrendered. The force on the summit had that day repulsed, with heavy loss, a frontal attack by Radetzky, but they were included in the surrender. Their numbers were 36,000, including 6000 sick and wounded, and 93 guns. The Russian losses were 5500.

Not only were the Turkish attacks on the Shipka unsuccessful, but they were made without object. At the end of July, when Suleiman forced Gurko back over the Balkans, the moral equili- brium and the plan of operations of the Russians had been upset by the second battle of Plevna, and the Shipka ceased to have any strategical importance for the time being. Had Suleiman at that time followed up Gurko and joined Mehemet Ali, or moving round acted with Osman against the Russian flank, the evacuation of the Shipka would have been compulsory. Suleiman, knowing nothing of strategy, preferred to act independently, and his action was supported by the still more ignorant ministers at Constantinople. The Shipka was merely a geographical point until the Russians were prepared to advance, but, fortunately for them, the Turks chose to waste an army in fighting for it throughout the critical period of the operations. As with Osman at Plevna, it was Constantinople that forbade Vessil

Pasha to withdraw his forces at the beginning of January, compelling him to wait to be swallowed up. The Turkish tactics were equally unsound. Suleiman divided his forces and used up his troops in costly frontal attacks on Mt. St Nicholas, the southern and strongest point of the position, whereas a well-supported flank attack would probably have met with success. The manner in which he sacrificed his men earned for him the name of the " Shipka butcher." (J. H. V. C.)

SHIPLEY, JONATHAN (1714-1788), bishop of St Asaph, was educated at Reading and Oxford. He was ordained about 1738, and acted as tutor in the household of the 3rd earl of Peter- borough. In 1 743 he became rector of Silchester and Sherborne St John, Hampshire, and prebendary of Winchester. He was appointed to a canonry of Christ Church, Oxford, in 1748, and in 1760 to the deanery of Winchester and the living of Chilbolton, Hampshire, which he held in addition to his earlier preferments. In 1769 he was consecrated successively bishop of Llandaff and of St Asaph. He was much concerned with politics, and joined the Whig party in strong opposition to the policy of George III. towards the American colonies. In 1779 he was the only bishop to advocate the abolition of all laws against Protestant dissenters. He died on the 6th of December 1788. His brother, William Shipley (1714-1803), originated the Society of Arts; and his son, William Davies Shipley (1745-1826), became dean of St Asaph.

SHIPLEY, an urban district in the Shipley parliamentary division of the West Riding of Yorkshire, England, on the south bank of the Aire, 3 m. N. by W. of Bradford, on branches of the Great Northern, Midland, and North Eastern railways. Pop. (1901) 25,573. The manufacture of worsted 's the principal industry, and there are large stone quarries in the neighbour- hood. The parish includes Saltaire, so named after Sir Titus Salt, who established large alpaca manufactories, opened in 1853.

SHIP-MONEY, a tax, the levy of which by Charles I. of England without the consent of parliament was one of the causes of the Great Rebellion. The Plantagenet kings of England had exercised the right of requiring the maritime towns and counties to furnish ships in time of war; and the liability was sometimes commuted for a money payment. Notwith- standing that several statutes of Edward I. and Edward III. had made it illegal for the crown to exact any taxes without the consent of parliament, the prerogative of levying ship-money in time of war had never fallen wholly into abeyance, and in 1619 James I. aroused no popular opposition by levying £40,000 of ship-money on London and £8550 on other seaport towns. The fleet of Charles I. during the first three years of his reign was, says S. R. Gardiner, " largely composed of vessels demanded from the port towns and maritime counties. The idea of universal ship- money to be levied in every county in England seemed to him to be merely a further extension of the old principle." Accordingly, on the nth of February 1628, Charles issued writs requiring £173,000 to be returned to the exchequer by the 1st of March for the provision of a fleet to secure the country against French invasion and for the

protection of commerce, and every county in England was assessed for payment. This was the first occasion when the demand for ship-money aroused serious opposition. Lord Northampton, lord-lieutenant of Warwick- shire, and the earl of Banbury in Berkshire, refused to assist in collecting the money; and Charles withdrew the writs.

It will be seen, then, that the statement of Hallam — that in 1634 William Noy, the attorney-general, unearthed in the Tower of London musty records of ship-money as a tax disused and forgotten for centuries — has no real foundation. It was, it is true, the suggestion of Noy that a further resort should be had to this expedient for raising money when, in 1634, Charles made a secret treaty with Philip IV. of Spain to assist him against the Dutch; and Noy set himself to investigate such ancient legal learning as was in existence in support of the demand. The king having obtained an opinion in favour of the legality of the writ from Lord Keeper Coventry and the earl of Manchester, the writ was issued in October 1634 and directed to the justices of London and other sea ports, requiring them to provide a certain number of ships of war of a prescribed tonnage and

equipment, or their equivalent in money, and empowering them to assess the inhabitants for payment of the tax according to their substance. The distinctive feature of the writ of 1634 was that it was issued, contrary to all precedent, in time of peace. Charles desired to conceal the true aim of his policy, which he knew would be detested by the country, and he accordingly alleged as a pretext for the impost the danger to commerce from pirates, and the general condition of unrest in Europe. The citizens of London immediately claimed exemption under their charter, while other towns demurred to the amount of their assessment; but no resistance on constitutional grounds appears to have been offered to the validity of the writ, and a sum of £104,000 was collected. On the 4th of August 1635 a second writ of ship-money was issued, directed on this occasion, as in the revoked writ of 1628, to the sheriffs and justices of inland as well as of maritime counties and towns, demanding the sum of £208,000, which was to be obtained by assessment on personal as well as real property, payment to be enforced by distress. This demand excited growing popular discontent, which now began to see in it a determination on the part of the king to dispense altogether with parliamentary government. Charles, therefore, obtained a written opinion, signed by ten out of twelve judges consulted, to the effect that in time of national danger, of which the crown was the sole judge, ship-money might legally be levied on all parts of the

country by writ under the great seal. The issue of a third writ of ship-money on the 9th of October 1636 made it evident that the ancient restrictions, which limited the levying of the impost to the maritime parts of the kingdom and to times of war or imminent national danger, had been finally swept away, and that the king intended to convert it into a permanent and general form of taxation without parliamentary sanction. The judges again, at Charles's request, gave an opinion favourable to the prerogative, which was read by Coventry in the Star Chamber and by the judges on assize. Payment was, however, refused by Lord Saye and by John Hampden (5.11.) , a wealthy Buckinghamshire landowner. The case against the latter (Rex v. Hampden, 3 State Trials, 825) was heard before all the judges in the Exchequer Chamber, Hampden being defended by Oliver St John (q.v.) and Robert Holborne, and lasted for six months. Seven of the twelve judges, headed by Finch, chief justice of the common pleas, gave judgment for the crown, and five for Hampden; though two of the latter — namely, Bramston, chief justice of the king's bench, and Davenport, chief baron of the exchequer — based their judgment on technical grounds which did not touch the constitutional question at issue. The judgment of the court practically abrogated the right of parliament to control supply; and the necessity for curbing the royal pre- rogative in regard to taxation, thus rendered arbitrary by legal decision, became one of the chief motives in the popular resistance to Charles I., which after the Hampden trial grew increasingly formidable. In 1639 Charles ventured again to issue a writ of ship-money, but for the comparatively small sum of £70,000. In 1641, by an Act of the Long Parliament (17 Car. I. c. 2), introduced by Selden, the illegality of ship-money was expressly declared, and the Hampden judgment annulled.

See John Rushworth, Historical Collections, vols, i., ii., iii. (7 vols., 1659-1701) ; Strafford's Letters and Despatches , edited by W. Knowler (2 vols., London, 1739); S. R. Gardiner, History of England from the Accession of James I. to the Outbreak of the Civil War, vols, iii., vi., vii., viii. (10 vols., London, 1883-1884); Henry Hallam, Con- stitutional History of England (3 vols., London, 1832, &c.) ; Oliver St John, Speech to the Lords, Jan. 7, 1640, concerning Ship-money (London, 1640). (R. J. M.)

SHIPPARD, SIR SIDNEY GODOLPHIN ALEXANDER (1838- 1902), British colonial administrator, was the eldest son of Captain William Shippard, 29th Regiment. He was educated at King's College school and Oxford. Taking his degree in 1863, he was called to the bar as a member of the Inner Temple in 1867. He then entered upon a long

career in South Africa. He was attorney-general of Griqualand West from 1873 until 1877, when he was made acting recorder of the High Court of Griqua- land. From 1880 to 1885 he sat as a judge of the Supreme Court of Cape Colony; and he was British commissioner on the Anglo-

German commission in 1884-1885 for settling the claims of British subjects at Angra Pequena and other parts of the south-west coast. Shippard, while at Oxford in 1878, had discussed with Cecil Rhodes the plan of the projected British advance in south central Africa. He saw in the German annexation of Damaraland and Namaqualand the first step in a design to secure for Germany territory stretching from ocean to ocean — a design which if executed would have been fatal to the British position in South Africa. Consequently when after the Warren expedition of 1885 he was chosen to organize the newly acquired British possessions in Bechuanaland he saw in his appointment an opportunity for forestalling the Germans, and also the Boer adventurers who likewise sought to be beforehand with Britain in the countries north of the Limpopo. From his first establishment in Bechuana- land he kept up a friendly correspondence with the Matabele king Lobengula with the object of attaching him to the British cause. At the end of 1887 he went to Graham's Town with the hope of inducing the high commissioner (Sir Hercules Robinson — afterwards Lord Rosmead) to sanction the conclusion of a treaty with Lobengula binding that ruler not to cede any part of his territory to any other power than England. " I used all my power of persuasion," Sir Sidney writes, " but failed to induce Lord Rosmead either to act on his own responsibility in the matter or to approach Her Majesty's government on the subject. As a last resource I telegraphed to Mr Rhodes, who was then busily engaged at Kimberley, to come down at once to Graham's Town and try the effect of his eloquence. He came, and by taking upon himself all pecuniary responsibility succeeded in ob- taining the requisite sanction " (see article " Bechuanaland," by Sir S. Shippard, in British Africa, London, 1899). The treaty was signed and British interests secured. Shippard was thenceforth freer to devote himself to the special interests of Bechuana- land, which he governed with conspicuous success. He held the chief official position there from 1885 to 1895, being adminis- trator, chief magistrate and president of the Land Commission for British Bechuanaland, and resident commissioner for the Bechuanaland Protectorate and the Kalahari.

He was created K.C.M.G. in 1887. In 1896 he played an unofficial part in the negotiations between Sir Hercules Robinson and the Johannes- burg reformers after the Jameson Raid. He then returned to England, where he died on the 29th of March 1902.

SHIPPING. To the floating log and paddle of the primeval fisherman must doubtless be attributed the first beginning of the

great industry of merchant shipping. The hollowing history °^ a ^°8 an d tne addition of a skin sail would before

long serve to convert the embryo craft into a vessel navigable in the smooth and narrow waters which lapped the shores of the Mediterranean and the far distant East. The coastal villages had need of worked stone knives, of beads and of skins for winter coverings, to be obtained by barter for their fish and salt. Passing from settlement to settlement dotted on the shore, the traders found in the local skiffs a convenient alterna- tive to the rough and tedious tracks along the winding or indented coast. In course of time they established themselves at the coastal settlements and built or purchased craft for their own use. As populations and their needs increased, th« traders, gaining confidence by experience, built larger vessels and extended the area of their barter, sailing in companies, for mutual safety and defence. Of the early days of this traffic, as developed in the East, we have but little information, but in the Eastern seas, apparently, the Chinese usually came no farther than the coast of Malabar. The Malays seem in all ages to have traded with India and probably with the coast of Africa. In the Indian Ocean the Arabians were the principal carriers. Greatest of all the ancient navigators nearer to the West were the Phoenicians, the hardy sons of Tyre and Sidon. To the remarkable maritime ascendancy of Tyre Ezekiel xxvii. bears eloquent testimony. King Solomon's undertaking for the building of the temple was largely founded on the support of Phoenician Hiram. Much later, but still some 2000 years ago, ships had become a common means of transport and were of no small size, since the centurion charged with the conveyance of St Paul to Rome

(Acts xxvii.) found at Myra an Alexandrian ship about to sail with wheat for Italy, which was able to take on board, besides the cargo, the whole of the company, making a total of 276 souls in all. Then, as now, ships were but links in a mighty chain of commerce on the land, a commerce for which the ports are the centres of collection and distribution. The products of India and Europe were conveyed from east and west in stages by inland or coastal routes with which

in their entirety India and Europe alike were unacquainted (Vincent). And, generally, in the ancient days ocean commerce ceased with the summer season, and sea-borne goods from the distant east to the remote west found their way from entrep6t to entrepdt. These entrepots were great trading centres, the advantageous situation of London, for example, having before the days of the Roman conquest marked it out as a convenient emporium for the northern trade.

The Phoenicians, especially, for centuries pushed their com- merce farther and farther afield, establishing factories and trading ports which in time grew into independent settlements. Cadiz, the ancient Gadir, was one of such, and from Gadir or more northern settlements the Phoenicians visited Britain, bartering merchandise for tin at Cornwall or the Scilly Isles. Amongst the various nations of the south, between whom the great shipping heritage of the Phoenicians was in course of time divided, the Rhodians rose to great importance. By these notable traders was drawn up a code of maritime laws, many of which were embodied in the Roman law, and eventually, at or about the time of Richard I., became a foundation for the Law of Oleron, which is in some part adopted at this day. Emerging from the constant struggles in the Mediterranean and Adriatic, the Venetians, Genoese and Pisans attained to great prosperity and renown, the reputation of the Genoese as shipbuilders creating from time to time a demand for their ships on the part of the nations struggling for maritime supremacy in the channel and the North Sea. The once familiar English word " argosy V dates from the appreciation of the vessels built at Arguze or Ragusa, a Dal- matian city on the Adriatic. The proximity of Italy to the Holy Land tended greatly to the prosperity of the Italian shipping.

In very early days the commerce of northern Europe was principally carried on by inland routes. With the increase and civilization of the populations, the cities on the navigable rivers and on the sea found the advantage of ocean commerce, and strove for supremacy in trade. In Britain many an ancient seaboard town, from Bristol to far north Inverness, largely owing to the enterprise of the Flemish and the German merchants, became important as a trading centre. The English merchants were not without ships, but the foreign traders were enterprising and wealthy, and in their emulation for the renowned English wool and for English hides were prepared to venture much.

In those days and for several centuries later the history of shipping was a history of arbitrary restraints, of claims for exclusive rights of

trading and navigation, and of pretexts of various kinds, resulting in captures and burnings, in embargoes and confiscations in port and in fierce reprisals. The merchant- man was a more or less armed vessel prepared alike for aggression or defence, a condition of affairs to which has probably to be attributed the occasional construction of vessels of a tonnage then remarkable. The ships of Spain and Portugal, of England and the Netherlands — of French shipping for a considerable period there was comparatively little — homeward bound from Indian ports and factories and from the New World's trading settlements from time to time were preyed on by one another. The Algerian and Barbary corsairs, with nothing to lose and everything to gain in merchandise and captives, were the dread of all who sailed the seas from Lisbon to Gibraltar — and indeed still farther north — and within the straits. The insurance of the voyagers against capture and the payment of head-money for their ransom was a well-established system of the times.

In England, the Cinque ports, in consideration of valuable privileges, were specially engaged to hold vessels at the service of the state, but on need arising the ports at large were called upon for ships and men. These demands at times became oppres- sive. Thus we read that in 13 7 r it was complained in parliament*

English progress.

that owing to the demands of the king the merchants were being ruined and their mariners driven into other trades. The size or measurement of ships was assessed on the basis of their capacity to carry tuns of wine, the first step in the present system of tonnage measurement. Ships sailed in fleets, one or more of their masters being appointed admirals, to be obeyed by all the company. In times of special maritime disturbance an armed fleet convoyed the merchantmen, much, no doubt, to the added cost of transport. The great source of England's wealth was her wool, of which the abundance and fineness gave rise to a wide demand. Staples or licensed entrep6ts or marts were set up for this and other produce at certain towns in England and overseas, English merchants associating themselves at such foreign staples. In like manner foreign trading societies located themselves under certain privileges and obligations at English marts, to the great increase of ship- ping, more especially of foreign bottoms. About the middle of the 15th century a

considerable use sprang up for shipping in the carriage of African slaves to Portugal, their captors being the Moors. In later years this melancholy trade found large employ- ment for the ships of Liverpool, Bristol and London, trading with the distant west. Pilgrimages, too, were bringing profit to the ships, a constant stream of the devout with their offerings journeying on the one hand to the shrine of St James of Com- postela and on the other to that of St Thomas of Canterbury. From times remote the fishing industry produced a hardy race of shipmen, the maritime nations being all more or less engaged in an enterprise rendered doubly lucrative by the want of flesh meat and the regulations of Holy Church. Thus in very early days the northern seas were thronged with rival fishing fleets, which, from about the middle of the 15th century, began to find their way to the banks of Newfoundland. At the close of the 1 6th century the whale was being pursued by rival fishermen on the Greenland coasts. Queen Elizabeth, for the maintenance of shipping and the increase of fishermen and mariners, forbade the eating of flesh on Wednesdays and Saturdays, an order from time to time subsequently revived. Sir Walter Raleigh, in his statement to King James, lamenting English commercial supine- ness as compared with the enterprise of the Dutch, declared that 20,000 vessels of all nations were engaged in fishing off the British coasts, of which vessels the Dutch owned 3000; and no doubt they formed a valuable mercantile and naval school.

The great discoveries of the renowned Spanish and Portuguese navigators in the reign of Henry VII. awoke in the maritime states a new spirit of commercial enterprise and emulation, in which Henry and his successors took an active part. A royal grant of navigation and discovery was given to the Cabots, then settled at Bristol, and " divers tall ships " of London, South- ampton and Bristol traded direct with the Mediterranean ports, though the English merchants generally employed foreign vessels for this trade. A " tall" ship was apparently a vessel carrying topmast with yards and square sails, an important development of the simpler pole-mast rig of earlier times. Henry VIII. and Ferdinand of Spain entered into a league, primarily aimed at France, under which it was agreed to police the seas in protection of their shipping, the English fleet to watch the sea to Gibraltar, and Spain to guard the Mediterranean. The Corporation of the Trinity House was now established, in great part for the deepen- ing of the Thames and to supply shipping with the ballast gained in the process, though the vessels actually London-owned were apparently few in number. Most English ships of burthen were then obtained by purchase at the South Baltic ports, where the great

Hanse town, Liibeck, was the centre of an enormous trade. The Hanse towns, indeed, practically carried on the trade of England. In the time of Elizabeth, England began to achieve commercial independence. Great building of ships took place, for which bounties were granted by the queen, and Eliza- beth set herself against the Hanseatic league. At the close of her reign the Steelyard was shut up, and the Dutch were compet- ing successfully with the Hanse towns, of which " most of their teeth were out and the rest but loose." In the early days of commerce the risks were too considerable to be borne by

individuals, who accordingly associated themselves as companies of merchant adventurers for the purposes of their particular trade, exclusive rights and privileges being granted to them by their own sovereign, and corresponding facilities on the part of the foreign states or cities traded with. In England certain of these societies, notably the company of Russian merchants, the Turkey merchants and, for long, the East India Company, occupied positions of influence and importance, the last-named company especially becoming possessed of much shipping, including large vessels, well armed, for prize-making or defence. The needs of trade and shipping were for long but little under- stood and often arbitrarily obstructed, but as a broad general principle it was recognized by the crown that the national trading interests required for their protection special privileges and concessions. Thus the patent granted by Elizabeth to the African adventurers in 1588 was expressed to be on the ground that " the adventuring of a new trade cannot be a matter of small charge and hazard to the adventurers in the beginning."

At the middle of the 16th century Antwerp was at the zenith of its great prosperity. It was described as the general store- house of the world, and it was stated that so many as 2500 vessels might be seen lying in the Scheldt at one time. These, however, were mainly foreign, Antwerp being a mart or emporium to which other nations traded. Towards the close of the century this great city's peaceful population was, in the name of Holy Church, crushed under the iron heel of Christian Spain. Its traders fled from cruelty and torture largely to Amsterdam, about this time the northern entrepot for Portugal's East India trade. The Hollanders, profiting by the decline of the Hanse towns, were now greatly devoting themselves to shipbuilding and to foreign trade. They, like the English, hampered in their navigation by hostile and unfriendly occupation of the ports of refuge and supply at the two great southern capes, were bent on discovering a north-east or north-west passage to the East. This enterprise and the desire for gems and precious metals, as to the

existence and abundance of which there were many false beliefs, added greatly to the knowledge of the distant seas and shores, on which many settlements were being established. To such settlements the attention of the French was now directed, with much encouragement to their shipping by the powerful Richelieu. The East Indian settlements and shipping of the Portuguese were being persistently harassed by the advancing Dutch, while the rich treasure ships of Spain were laid wait for and captured by English shipping, greatly to the Spanish loss. But the Dutch especially were prospering. Amsterdam, a vast trade centre supplied by Dutch shipping, had between 1571 and 1650 trebled itself in size. So far back as 1603 Sir Walter Raleigh, in his statement to King James, had complained that the vessels of the Dutch, by reason of their greater capacity and smaller crews and consequently lower freights, were cutting out the English ships or driving them into the Newcastle coal trade. By such enterprise the Hollanders gradually became the carriers for the English merchants. English bottoms were neglected and English seamen took service with the Dutch. Affairs for English shipping had about 1650 reached a crisis. There existed, moreover, great animosity between the English and the Hollanders.

In the defence of the national shipping the great Navigation Act was in 1651 placed upon the British statute-book. Under this far-reaching act the trade between England and her colonies and the British coasting trade was strictly ^^Act confined to English bottoms, English owned and iˆst. manned substantially by English seamen. The act contained further provisions in support of British shipping, the effect of which was greatly to prejudice foreign shipping in its competition for the British carrying trade. It is not impossible that some of the regulations of the act may have proceeded from the animosity already mentioned (Adam Smith). From the point of view of the Dutch, indeed, it was a " vile act and order," to be resisted at all costs. From the prolonged hostilities which ensued England finally emerged supreme at sea. For some time the French, under the powerful encouragement of Richelieu and

subsequently of Colbert, had been devoting themselves to colonial enterprises both across the Atlantic and in distant India, to the eventual important increase of French shipping, whilst on the other hand Spanish shipping was declining. As the result of the Navigation Act and its successful maintenance a great increase had taken place

in English tonnage, which in 1688 was said to be nearly double that of 1666. In the war with France this increase was greatly in favour of her privateers, which in two years are stated to have captured 3000 British ships as against but 67 which were taken from France, a result in part attribut- able to her employment of Dutch vessels. About this time Inverness, long devoted to shipbuilding, had obtained a high reputation for its ships.

In 1701 England's private shipping numbered 3281 vessels, of a total burthen of 261,222 tons and carrying 5660 guns, London leading with 560 ships of 84,882 tons, Bristol coming next with 165 of 17,338 tons, Liverpool being seventh on the list with 102 ships. Thirty years later London's ships ,8th had increased to 1417, ranging from 15 tons to a great

cen toy. · ^ ^^ tons, owned by the South Sea Company, but the majority measured less than 200 tons. In 1765 we read that the Dutch, Danish and Swedish ships were generally larger than the English vessels and that they had succeeded in ousting England as the carrier of Lisbon's Mediterranean trade. In 1 7 14 an act was passed, and at subsequent dates revived, offering public rewards for improved methods of ascertaining longitude at sea, and John Harrison (" that heaven taught artist") received in all £20,000 for the invention of a chronometer which was successful to a degree of accuracy beyond that for which the act provided. Towards the second half of the 18th century the foundations were laid of the present great shipping industry on the Great Lakes. Oak timber of large size was now becoming scarce in England, and in the interests of the navy restrictions were placed upon the East India Company as regards its use. British merchant shipping, too, had apparently outgrown the supply of seamen, for towards the close of the century it was permitted to British vessels to carry foreign seamen to the extent of three-fourths of the crew. The traffic in African negroes gave much employment to British shipping. The war with America led to the harrying of British commerce by American privateers cruising off the English coasts. War premiums were very high and the insurance obtainable was insufficient. Partly on this account and partly owing to the fact that about 1000 British vessels had been taken up for transport and other public services, whilst many more were sailed as privateers, the Thames was now full of foreign vessels loading British cargoes. During the absence from the West Indies of the British fleet under Admiral Byron, engaged in conveying homewards the West Indian merchantmen, two valuable British islands were captured by the French. The hostilities of the rival states were being fought out at sea, with peaceful commerce as their

objective. The seas swarmed with privateers, armed and equipped as sordid specu- lative enterprises, occasional rich prizes stimulating the greed of many citizens, not a few of them, no doubt, the owners of ships and merchandise which had in like manner fallen to the enemy. The French privateer " Bordelais," captured by the English in 1799, is reported to have taken in four years 164 prizes, of the net value of £1,000,000 sterling (Mahan). Between May 1756 and July 1757 a total of 772 French vessels was captured by the British, whilst 637 British ships were taken by the French. It was declared in the House of Lords in February 1778 that the value of the British captures of American vessels had amounted to £1,808,000, against which that of British shipping captured by America had been £1,800,000. Towards the close of the prolonged hostilities which concluded in 181 5 Liverpool and Glasgow were holding public meetings and urging upon the admiralty and the throne that they were being ruined by the want of protection to their shipping. In 1786 an act was passed (26 Geo. III. c. 86) for the encouragement of shipping, in which the personal liability of shipowners, till then unlimited, was in certain cases of their loss of cargo now limited to the value of the vessel and her freight, the first of progressive acts of the

like nature. Smuggling was for long the cause of serious loss to the national revenue, and an act was passed declaring forfeited any British sloops or cutters found within four leagues of the coast if provided with a bowsprit exceeding two-thirds of the vessel in length (27 Geo. III. c. 32).

In 1797 the English and Scottish private vessels numbered together 12,995 of 1,385,252 tons burthen. With respect to tonnage, in the days of wooden vessels the weight of cargo which a ship was capable of carrying was about equivalent to her own displacement or breaking-up weight. Nowadays, owing to steel construction and the adoption of a fuller cross-section in ship designing, the carrying capacity of a cargo steamer is reported to be about double, or even more than double, the ship's own weight; but types of steamers of course vary. The Board of Trade ton is 100 cub. ft., purely a measure of permanently covered-in space, and not to be confounded with the ship's capacity to carry dead-weight, of which capacity the registered tonnage is consequently not to be regarded as an index. For the purpose of a rough and ready calculation, however, the dead-weight carrying capacity of an average cargo steamer may. be taken to be about twice that of her net registered tonnage or a little more. The chief object of fixing and registering the gross and net tonnage is the establishment of a basis of assess- ment for tonnage dues and for liability for payment of damages caused by wrongful navigation or

otherwise. The present diversity in the designs of steamships is in no small degree due to a desire on the part of shipowners to possess vessels which with a minimum of registered tonnage shall provide a maximum of cargo space.

The close of the 18th century was marked, especially in America, by attention to the possibilities of steam navigation. A new era in shipping had dawned, and year by year and step by step, from river craft to short-voyage century. vessels, the new motive power gained ground. In 1833 the Canadian vessel " Royal William" steamed throughout from Quebec to London, making the voyage in seventeen days, and in 1838 the " Great Western " and the " Sirius " arrived on the same day at New York, having crossed the Atlantic in eighteen days and fifteen days respectively (Pollock). In 1840 was founded the celebrated Cunard Steamship Company, the nucleus of its fleet being four wooden paddle steamers, also equipped as sailing vessels. Each was about 206 ft. in length and of about 1145 tons burthen. At the beginning of the 19th century American shipowners had laid themselves out to obtain command of the Atlantic trade, from which the British Naviga- tion Act did not debar them. With this aim, ships of great sailing power and carrying capacity were constructed, being provided in addition with ingenious labour-saving devices which materially enhanced their economy in working. Successful in their attempts on the Atlantic trade, the Americans now set themselves to gain predominance in the trade with China, for which they provided vessels of unexampled speed. But British owners, put upon their mettle, eventually succeeded in designing a class of sailing ship superior to any yet constructed, while the advantages of steam navigation were now proving fatal to American sailing vessels in the Atlantic (Cornewall- Jones). The use of steam was becoming general, to the gradual displace- ment of sailing vessels, though the Australian trade for some considerable time continued to be carried on by sailing ships of wide renown. The opening of the Suez Canal and the provision of coaling stations on the long sea routes eventually, however, placed the bulk of the Australasian carrying trade in the hands of the steamship owners, the principal employment for large sailing vessels now being in the Pacific trade. Probably in great part on account of the cost and difficulty of fuel supplies, the Californian wheat trade, and the guano and the nitrate trades of the South Pacific, are thus still competed for by sailing vessels, some of them of remarkable capacity. For some years the possibilities of iron in shipbuilding had been slowly gaining recognition, to the eventual displacement in Great Britain, though not in the United States, of wooden hulls. Partly as the result of the war between the Northern

and Southern states and partly

owing to the superior advantages of iron hulls, not yet constructed in America, the United States now further lost place as ocean carriers. In 1908 the chief employment of her ocean shipping was on the Atlantic coast and in the Gulf of Mexico.

The steady increase in steam-propelled vessels resulted in the establishment of many coaling stations in distant parts, with much employment of shipping to supply them. Towards the middle of the 19th century British shipowners were greatly alarmed at proposals to repeal the navigation acts, and in spite of their petitions and remonstrances, and of demands that the bill, eventually introduced, should at least require reciprocity, in 1849 the proposed measure became an act, the coastal trade being in 1854 similarly thrown open, this latter measure being induced by the need for British ships and seamen for the purposes of the Crimean War (Lindsay). Probably in no small degree owing to the discovery of gold in California and Australia about this time, and to the further employment provided for shipping by the Crimean War and by the necessities of the Indian Mutiny, the direful forebodings of British owners as to the consequences of the repeal of the Navigation Act were not verified. In 1856 the Treaty of Paris and its appended Declaration pronounced, amongst other notable clauses affecting maritime warfare, the abolition of privateering. To this great treaty most of the maritime states in course of time gave their adhesion, the United States and Spain, however, not yet being signatories. The altered conditions as between warships and merchant vessels, and the disabilities imposed by neutrality laws have, however, in themselves done very much to render privateering as formerly conducted no longer possible. But the Declaration, notwith- standing, the employment of duly commissioned merchant vessels may still be resorted to by the state for the destruction of commerce and for other belligerent purposes.

In 1858, after great difficulty and outlay, Brunei's huge ship the " Great Eastern" was floated on the Thames. The vessel, having a length of 679 ft. and a burden of 18,337 tons gross and 13,344 tons net (Lloyd's Register) and being provided with six sail-carrying masts, was furnished both with a screw propeller and with paddles. Highly successful as an engineering enterprise, commercially she was

from the first a ruinous failure. Under the remarkable development of the Atlantic passenger traffic, however, the size of steamships steadily and continually increased.

In 1873, as the outcome of a prolonged public agitation con- ducted by Mr Samuel Plimsoll, member for Derby, a royal commission was appointed to inquire into his allegations that many lives were lost owing to the unseaworthiness of ships. In 1876, under pressure of public sympathy with the views of Mr Plimsoll, an amended Merchant Shipping Act was passed (39 & 40 Vic. c. 80), making it a penal offence to knowingly send a ship to sea unseaworthy, and requiring a loadline to be fixed on British vessels, the line to be indicated on ocean going vessels by what is now universally known as the Plimsoll mark.

The opening in 1869 of the Suez Canal created a revolution in the eastern shipping trade. Year by year steamships increased greatly in number and in burden. With improved conditions of steam navigation the supplementary use of sails was generally abandoned, masts being retained only for signalling purposes and as attachments for cargo hoists. New conditions in ship con- struction, the commercial demand for expedition and the manu- facture of new articles of commerce together resulted in an increased risk of fire on ships both at sea and in port, with great loss primarily to underwriters, more especially by the flooding of holds full of valuable cargo. To overcome this danger steam- ships are being increasingly equipped with an apparatus which on the outbreak of fire enables the holds to be filled with a fire- extinguishing gas. The invention and adoption of refrigerating machinery and insulated holds resulted in the development of a vast trade in frozen meat and perishable produce.

The triumph of Germany in the Franco-Prussian War awoke in the Fatherland a spirit of industrial enterprise which greatly increased the population of her manufacturing areas. The supplies required by the prosperous industrial populations and the national demand for raw materials for the manufactories,

together with the great export trade for which these were now laying themselves out, filled the German and other North Sea ports with shipping. Germany, able to consume whole shiploads of various foreign products, now imported these direct instead of in parcels through London and other ports. Unwilling that the profit of carrying her great and increasing trade should be reaped by foreign bottoms, Germany turned herself to shipowning and shipbuilding, and with

remarkable success. So great, indeed, was this success that important lines of German steamships rapidly grew up as competitors with British and other lines in foreign trades. Both in bringing home raw materials and in enabling German manufacturers to send their products to foreign consumers at low rates of freight, the German shipping was now greatly increasing the national prosperity. In return, the state neglected nothing which would promote the success of its industrial centres in their competition for foreign markets, or which would assist the development of the national shipping. Rates of carriage from inland centres to the shipping ports were, in the case of goods intended for shipment by German vessels, considerably reduced by the state railways; and whereas in Great Britain shipping subsidies or subventions are granted essentially if not solely for services to be rendered, in Germany the granting of subsidies has also in view the development of the national shipping. The notable growth in Germany's trade and shipping is in fact believed to be in no small degree attributable to a system of subsidies to shipping in conjunction with prefer- ential railway rates on German goods despatched for shipment under " through " bills of lading under the national flag.

In the Far East also, a new and important maritime com- petitor has sprung up, the industrial and commercial awakening of Japan having been attended by the creation of a Japanese merchant fleet and by much enterprise in the national ship- building. To the name of every Japanese merchant vessel is added the word " Maru," in ancient times a masculine " humility title," but in its present use having the approximate signification of " dearest" or " esteemed."

The following figures, supplied by Lloyd's Register, recording the number and tonnage of German and Japanese steamers and sailing vessels of 100 tons and upwards, illustrate severally the recent maritime progress of the two countries : —

Year.

Germany.

Japan.

No.

Sailing Vessels Net, Steamers Gross.

No.

Sailing Vessels Net, Steamers Gross.

1890 1900 1908 1908)

steamers [only)

1875 1710 2178

1806

Tons.

1,569,311 2,650,033

4,232,145 3,839,378

289 1066

865

Tons.

171,554

574,557

1,140,177

In consequence of an act passed by the French government to grant bounties on sailing vessels constructed and owned in France, the owners of such vessels found it to their profit, the bounty being assessed on distances sailed, to engage in long voyages, with the earning of freight as a secondary consideration. This procedure being found to operate prejudicially on the freight earnings of sailing vessels generally, and more especially in the Pacific trade, an international meeting of the owners of sailing vessels was held at Paris in 1903, with the result of the formation of the Sailing Ship Owners' International Union to maintain rates of freight, French owners identifying themselves with the measures decided on by the union in the common interest. Influenced, no doubt, by German example, certain French steamship companies about this time decided to grant preferential combined tariffs on goods sent from inland centres of production in France for shipment by their vessels, to the great dissatisfac- tion of the owners of foreign steamers loading for similar destina- tions at French ports.

Early in 1902 a shipping pool or " combine " was effected in the case

of certain important British steam lines engaged in the North Atlantic trade. The combine, involving vast capital

values, was engineered by a well-known New York business house largely interested in American railways. In England it was variously attributed to a resolve on the part of American traders to share in the transport of the national trade ; to a desire on the part of the lines concerned to effect economies by a consolidation of management, and to a scheme intended to benefit certain great American railways. The transaction gave rise to much comment in Great Britain, being by not a few regarded as con- templating the eventual transfer of the lines to American owner- ship. And indeed, though the steamers continued to be under the British flag, the extent to which they remain substantially under British ownership cannot be affirmed. It was stated in 1908 that on completion of its building programme the combined fleet would consist of 132 vessels of together, 1,159,704 tons.

The general adoption of steamships in place of sailing vessels was gradually followed by their separation into two classes, one devoted to a fixed service on regular lines of employment, the other to promiscuous trade. The former class are now known somewhat vaguely as " liners," ranging, however, from the first-class mail and passenger steamer on the one hand, to the regular cargo steamer on the other. To the second class belong the " seekers " or " tramps " which come and go wherever profitable employment offers, and which more especially lay themselves out to be chartered to carry full cargoes of coal, timber, wheat, nitrate, jute and such like. These vessels, some of which are of great capacity, are frequently in competition with the liners. This competition sometimes results in " cut rates " of freight, to the serious loss of the great shipowning firms and companies. With the establishment of regular lines, moreover, there grew up competition between rival lines, with similar results. A solution was found by the creation of working agreements between rival lines at agreed rates of freight, but the lines thus associated were still exposed to the attacks of " tramps " upon what the liner owners regarded as their privileged trade. Fierce conflicts from time to time ensued, with great disturbance of the freight market and with consequent loss or inconvenience to the merchants themselves. As the result, shipping " rings " or " conferences" were created in many trades, the owners of the liners undertaking to provide the traders

with a regular service accompanied by advantageous conditions, whilst the traders undertook to ship only by the conference steamers. In order to ensure this support, the shipowners instituted the system of deferred rebates, under which each merchant, at the end of a year or other fixed period, should be entitled to a discount or rebate on the amount of freight paid by him during such period, provided that he should have shipped no goods at all by steamers outside the conference, the discount only to be paid after a further fixed period of six or nine months, during which time also he should rigidly support the conference lines. In the event of failure to comply with the conditions, a merchant is exposed to forfeiture of the rebate, and in addition to measures in the nature of a boycott on the part of the con- ference lines. Notwithstanding, attempts are from time to time made by steamers outside the ring to gain admittance, with the consequence of occasional freight wars, and with the incidental result that goods are sometimes carried, for example, from America to a British colony at lower rates of freight than similar goods manufactured in England. Mainly on account of com- plaints made against the working of the South African ring, a British royal commission was in 1906 appointed to take evidence and report upon the subject generally.

With the growth of populations and the development of means of transport, both by land and sea, a great increase arose both in production andxonsumption, and competition became very keen for markets, both home and foreign. In this competition the cost of carriage is always an element of great importance, even though the freight payment may bear but an insignificant relation to the value of the goods carried. For in modern trade rivalries every penny saved in charges counts with the importer, and if goods of a similar kind can, by reason of lower transport charges, be obtained a fraction cheaper from one industrial centre than from another, the tendency is to give the preference to the centre or

country which can deliver most cheaply to the consumer. Trade follows cheapness, and, with the world's industrial development, the striving for cheapness took at the outset the form of economies in production. The day of small trade with large profits was passed, and producers of all kinds now aimed at a large output at diminished cost, and contended themselves with a smaller ratio of profits on a larger business. The utmost economy was studied with a view to successful competition, especially in over- seas markets; and in this struggle for the cheapening of supplies the cost of transport became an important element. The fact was recognized that the ship is but a link in the chain of con- nexion between producer and consumer, and

the system of " through " bills of lading was introduced, under which a particu- lar steamer line or railway service contracted for the through- carriage of goods in conjunction with other lines, with the object and effect of cheapening the transport as a whole. Individual shipowners, in order to obtain cargoes for their ships, were in turn driven to devise economies in transport, with the result that rates of freight were continually reduced. In modern ocean carriage size means cheapness, the transport of a given weight of cargo being cheaper in a single vessel than in two vessels each of half the size. For not only does this concentra- tion of carrying power effect economy of officers and crew, with their wages, provisions and accommodation space, but in ship- building also size makes for cheapness. Thus, if, for example, two steamers each carrying 2000 tons will cost together say £40,000, a single vessel of equal carrying capacity can be supplied for £35,000. Or, put another way, if for £40,000 two steamers can be built to carry between them 4000 tons, for the same sum a single vessel can, it is stated, be provided to carry 4700 tons. Consequently, the size of vessels is continually on the increase, and no sooner is a navigable channel at much cost made deep enough for the great vessels knocking at the door of the port, than still larger are constructed, and shipowners complain anew that the harbour depth provided is insufficient. The constant demand for greater depths resulted in the production of mammoth dredgers of which, also, the size and power are continually increasing. At the present time it is the navigable depth of ports and canals, and the need of adequate dry docks, rather than the obtaining of cargoes, which are the controlling factors in the size of great ocean vessels. But the heavy interest on the capital cost of these vessels and their working expenses call for the utmost despatch in their loading and discharge, and with the simultaneous arrival of several vessels of large tonnage, the question of prompt discharge is one of great and increasing difficulty. For many modern steamers will carry 10,000 tons of cargo, and some a great deal more; so that, with old-type railway trucks carrying ordinarily only about 8 tons, it not infrequently happens that the discharge of the ship, equipped though she be with remarkable facilities for landing her cargo and assisted by discharge into barges, is impeded owing to deficiency of shore clearance. If 8 tons be taken as the capacity of an ordinary railway truck and 30 trucks be allowed to a train, it will be obvious that a single modern cargo ship will require a vast procession of rolling stock to clear her cargo. A single cargo of 10,000 tons, for example, will require some 1250 railway trucks for its removal; or, allowing 6 yards' length to the truck, 7500 yards of rolling stock, without engines and vans. And, in fact, congestion of shipping owing to

delays is frequently the cause of bitter complaint in the case of certain ports. Trucks of much increased capacity are now being introduced, but for various reasons their adoption is very slow. In port polemics the argument is sometimes heard that the backwardness of this or that port will result in the trade being driven elsewhere: the ships, it is said, will remove it. But the ship is but the blind instrument of trade, to come and go where and as trade calls it. The ship will, however, sooner or later require a higher rate of freight for ports of slow despatch, and this increased expense in transport will undoubtedly operate in favour of rival ports. For the ports themselves are but stepping-stones to or from a market or industrial centre, and the market will always select the cheapest route for its trade.

N.B. — The figures of the official or Board of Trade returns, owing to their inclusion of vessels below ioo tons, differ more or less widely from the totals as appearing in Lloyd's Register.

(A) Wooden colonial vessels trading on the Great Lakes of North America are not included. (B) These figures only include sea- going vessels and iron and steel vessels trading on the Great Lakes. (C) These figures do not include sailing vessels registered in southern Russia.

The following table illustrates the growth and progress of British home shipping: —

Number and Tonnage of Steamers and Sailing Vessels registered in the United Kingdom, Isle of Man and Channel Islands on 31s/ of December of various Years. {Official Returns of the Board of Trade.)

With the increase of populations in the Old World and the development of new countries, the transport of emigrants and of travellers for business and for pleasure became a highly important and lucrative source of employment for steam ship- ping. It is now indeed becoming a common practice on the part of ocean steamship companies to employ a surplus or superseded vessel of their fleet solely in carrying holiday tourists to a succes- sion of foreign ports. In regular traffic the demand for increased speed and greater security and comfort on the part of ocean travellers resulted in the competitive evolution of passenger steamers of dimensions and

draught which create an increasing strain on port and dock authorities.

These remarks must not be concluded without mention of the important part played in the evolution of modern shipping by the system of marine insurance and by the rules of classification. For the cost of insurance is a heavy tax on the profits of the shipowners, and only by providing vessels of the best construction and maintaining their reputation can owners gain the advantage of low insurance rates. And not only so, but by the merchants also, to whom insurance premiums are a no less serious con- sideration ; vessels of the highest class and reputation are insisted on with a view to cheap cargo insurance, inferior ships being consequently placed at a serious disadvantage. On the other hand, the rules of construction and classification of the Society of Lloyd's Register (a body altogether distinct from the Corpora- tion of Lloyd's) are most exacting, and any failure to comply with the rules of the Register or " Book," which, moreover, are in a constant state of scientific evolution, may involve withdrawal of the vessel's class, a result which would be fatal to her cheap in- surance as well as to her employment in successful competition for freights. With its skilled surveyors at foreign, colonial and home ports, the great society offers every facility for the classing of the whole world's shipping, and foreign as well as British owners are fully alive to the importance of a strict com- pliance with the Book's re- quirements. Consequently, amongst the various factors making for improved con- struction and the greater safety of shipping, the beneficent influence of Lloyd's Register occupies a foremost place.

But the various factors or forces which make for the evolution of shipping may all be summed up

under the word " competition," which is the mainspring of the machinery both of insurance and classification. These factors operate, however, in different ways. Thus, while insurance and classification make most for ships' increased safety, the desire for profitable freights tends continu- ally to their greater size. But making also for increased size, and in addition for the many improvements and inventions which result in luxury and comfort at sea, the vast influence of the ocean passenger is conspicuous. For, no longer regarded as an encumbrance to be made room for on a cargo ship, the modern age of travel has rendered him a vast source of profit. The old position is reversed, and now fast-steaming hotels are built for ocean travellers, in which cargo occupies a secondary place, which only merchandise able to pay highly for the costly advan- tage

of a speedy voyage can afford to occupy. The growth of the passenger traffic and the demand of travellers for routes the most direct is, in turn, creating or developing ports which have small regard to cargo considerations, and involving the ports, both old and new, of the various maritime states in a keen and costly competition for the great passenger steamers. This competition is further enhanced by railway lines at rivalry for the conveyance of the ocean passenger and for the more valuable merchandise able to pay high rates for speed between ocean port

and inland city, and therefore shipped by the fastest vessels. Competition for freights and competition for passengers, these are the great and beneficent forces which are silently but irre- sistibly developing the ship, while insurance and classification are the potent handmaids of this competition.

Number and Tonnage of Steamers and Sailing Vessels (of 100 tons and upwards) belonging to various countries as recorded in the 1908 Edition of Lloyd's Register or Book.

Country.

United Kingdom .... United Kingdom and Colonies (A) United States (B) ....

Germany

Norway . . ...

France

Italy

Japan (Steamers only) .

Russia ©

Sweden

Spain

Holland

Denmark

Vessels.

9.542

n.563 3,48o

2,178

2,148 •

I,5i7

1,098

865

1,381

1.542

551

565

870

Tonnage. (Net for Sailing Vessels and Gross for Steamers.)

17,318,351

18.709.537

4,810,268

4,232.H5

1,982,878

1,883,894

1,285,225

1,140,177

974,517

904,155

701,278

876,620

733.790

Year.

Steamers.

Sailing Vessels.

Total.

Tonnage.

Tonnage.

Tonnage.

No.

No.

No.

Net.

Gross.

Net.

Gross.

Net.

Gross.

1830

298

30,339

18,876

2,171,253

19,174

2,201,592

1840

771

87,928

21,883

2,680,334

22,654

2,768,262

1850

1,187

168,474

24,797

3,396,659

25,984

3,565,133

i860

2,000

454.327

25,663

4,204,360

27,663

4,658,687

1870

3,178

1,112,934

23,189

4,577,855

26,367

5,690,789

1880

5,247

2,723,468

19,938

3,851,045

25,185

6,574,513

1890

7,410

5,042,517

8,095,370

14,181

2,936,021

3,055,136

21,591

7,978,538

11,150,506

1900

9,209

7,207,610

11,816,924

io,773

2,096,498

2,247,228

19,982

9,304,108

14,064,152 18,089,700

1907

11,394

10,023,700

16,513,800

9,648

1,461,490

i,575,9O0

21,042

11,485,190

(D. 0.)

SHIPTON, MOTHER, a witch and prophetess who is supposed to have lived in early Tudor times. There is no really trust- worthy evidence as to her ever having existed, but tradition has it that her maiden-name was Ursula Southill, Sowthiel or Southiel, and her parents were peasants, living near the Dropping Well, Knaresborough, Yorkshire. The date of her birth is uncertain, but it is placed about 1486-1488. Her mother, Agatha Southill, was a reputed witch, and Ursula from her infancy was regarded by the neighbours as " the Devil's child." The girl's appearance seems to have been such as to encourage superstitions. Richard Head in his Life and Death of Mother Shipton (1684) says, " the body was of

indifferent height, her head was long, with sharp fiery eyes, her nose of an incredible and unproportionate length, having many crooks and turnings; adorned with many strange pimples of divers colours, as red, blue and dirt, which like vapours of brimstone gave such a lustre to her affrighted spectators in the dead time of the night, that one of them confessed several times in my hearing that her nurse needed no other light to assist her in her duties " Allowing for the absurdity of this account, it certainly seems (if any reliance is to be placed on the so-called authorities) that the child was phenomenally plain and deformed. While still at school she became known as a prophetess. When about twenty-four she married a builder of York, Tobias Shipton.

Her most sensational prophecies had to do with Cardinal Wolsey, the duke of Suffolk, Lord Percy and other men prominent at the court of Henry VIII. There is a tradition that on one occasion the abbot of Beverley, anxious to investigate the case for himself, visited Mother Shipton's cottage disguised, and that no sooner had he knocked than the old woman called out " Come in, Mr Abbot, for you are not so much disguised but the fox may be seen through the sheep's skin." She is said to have died at Clifton, Yorkshire, in 1561, and was buried there or at Shipton. Her whole history rests on the flimsiest authority, but her alleged prophecies have had from the 17th century until quite recently an extraordinary hold on the popular imagination. In Stuart times all ranks of society believed in her, and referring to her supposed foretelling of the Great Fire, Pepys relates that when Prince Rupert heard, while sailing- up the Thames on the 20th of October 1666, of the outbreak of the fire " all he said was, ' now Shipton's prophecy was out.' " One of her prophecies was supposed to have menaced Yeovil, Somerset, with an earthquake and flood in 1879, and so con- vinced were the peasantry of the truth of her prognostications that hundreds moved from their cottages on the eve of the expected disaster, while spectators swarmed in from all quarters of the county to see the town's destruction. The suggestion that Mother Shipton had foretold the end of the world in 1881 was the cause of the most poignant alarm throughout rural England in that year, the people deserting their houses, and spending the night in prayer in the fields, churches and chapels. This latter alleged prophecy was one of a series of forgeries to which Charles Hindley, who reprinted in 1862 a garbled version of Richard Head's Life, confessed in 1873.

See Richard Head, Life and Death of Mother Shipton (London, 1684); Life, Death and the whole of the Wonderful Prophecies of Mother Shipton, the Northern Prophetess (Leeds, 1869); W. H. Harrison, Mother Shipton investigated (London, 1881); Journ. of Brit. Archaeo. Assoc, xix. 308. Mother Shipton's and Nixon's Prophecies, with an introduction by S. Baker (London, 1797).

SHIRAZ, the capital of the province of Fars in Persia, situated in a fertile plain, in 29 36′ N., 52 32′ E , at an elevation of 5100 ft., 156 m. byroad N.E. by E. from Bushire (112 m. direct). According to Eastern authorities Shiraz was founded in a.d. 693 by Mahommed b. Yusuf Thakefi, a brother of the famous Hajjaj. It is approached on the south from the Persian Gulf through lofty and difficult mountain passes (highest 7400 ft.) and on the north through chains of hills which separate the plain of Shiraz from that of Mervdasht, where the ruins of Persepolis are. It is surrounded by a low mud wall flanked by towers, and a dry ditch, and measures about 4 m. in circumference. There are six gates. The town is divided into eleven quarters (mahalleh), one of which is exclusively inhabited by Jews and called Mahalleh Yahudi. The population of Shiraz is estimated at 60,000, but in 1884 it was 53,607, of which 1970 were Jews. The houses of Shiraz are, in general, small, and the streets narrow. A great bazaar, built by Kerim Khan Zend, forms an exception to this ; it is about 500 yds. in length and has a vaulted roof 22 ft. high, and contains many spacious shops well supplied with goods and merchandise. There are many mosques, the most notable being the old Jama, a foundation of the Saffarid ruler Amr b. Leith in 894, now in a state of ruin; the new Jama, generally called Masjed i Nau; the New Mosque, built by Atabeg S'ad b. Zengi, c. 1200; and the Jama i Vakil, built by Kerim Khan Zend in 1766. Shiraz still possesses the title " Dar ul ilm," the " Seat of Know- ledge," and has many colleges (madresseh), the oldest being the Mansurieh built in 1478 by Seyed Sadr ed din Mahommed Dashteki; the Hashimiyeh and Nizamieh date from the middle of the 17th century, the college called M. i Agha Baba was begun by Kerim Khan Zend, c. 1760, but finished in 1823 by Agha Baba Khan Mazanderani. Of the twenty caravanserais, or more, which Shiraz has, the oldest is that called Car Chiragh Ali, built in 1678. There are several shrines of Imam-zadehs, the most venerated and rich being that of Seyed Amir Ahmed, commonly known as Shah Chiragh, a son of Musa Kazim, the seventh imam of the Shiites. It was built C. 1240 by Atabeg Abu Bekr. Two of Shah Chiragh's brothers and a nephew also

have their graves at Shiraz. Within the town and in close proximity to it are many pleasant gardens (bagh), among them the B. Jehan

Nema (Kerim Khan 1766), where C. J. Rich, British resident at Bagdad and explorer of Babylon and Kurdistan, died on the 5th of October 1821, and the adjoining B. i Nau (1810) ; B. i Takht i Kajar (built 1087 by Atabeg Karajeh under the Seljuk Malik Shah; restored 1794 by order of Agha Mahom- med Khan, the first Kajar ruler); B. i Dilgusha (restored 1785), &c. Close to the last-mentioned garden is the Sadiyeh, an enclosure with the tomb of the celebrated poet S'adi, and in a cemetery near the northern side of the town stands theHafiziyeh, with the tomb of the likewise celebrated poet Hafiz, a sarcophagus made of yellow Yezd marble with two of the poet's odes beauti- fully chiselled in relief in a number of elegant panels upon its lid. A fine view of the town and environs is obtained from the narrow pass (iang) , which leads into the Shiraz plain a mile or two north of the city, and " so overwhelmed with astonishment at the beauty of the panorama is the wayfarer expected to be, that even the pass takes its name of Tang i Allahu Akbar, the Pass of God is Most Great, from the expression that is supposed to leap to his lips as he gazes upon the entrancing spectacle " (Curzon).

. The most noted product of Shiraz is its wine made from the famous grapes of the Khullar vineyards, 30 m. N.W. of Shiraz, but only a very small quantity of it is exported, and religious scruples still prevent its manufacture on a large scale. The climate of Shiraz is agreeable and healthy in the winter, but unhealthy in the spring and summer. July is the hottest month with a mean temperature of 85 , February the coldest with 47 . The lowest temperature observed during a number of years was 21°, the highest 113°, showing a difference of 92 between extremes. The mean annual temperature is 65 . Earthquakes are of frequent occurrence; those in modern times which caused great loss of life and destruction of property happened in 1824 and 1853. Shiraz is the residence of a British consul (since 1903) and has post and telegraph offices. On a hill adjoining the Dilgusha garden stand the ruins of an old castle known as Kal'ah i Bender (a corruption of Fahn-dar), with two wells hewn in the rock to a depth of several hundred feet. (A. H.-S.)

SHIR&, a river of East Central Africa, the only tributary of the Zambezi navigable from the sea. The Shire (length about 370 m.) issues from the southernmost point of Lake Nyasa and almost immediately enters a shallow sheet of water called Malombe or (Pa-Malombe) , 18 m. broad and 12 or 13 m. long. A shifting bar of sand obstructs the end of Malombe nearest Nyasa, but does not prevent navigation. Below Malombe the bed of the Shire deepens. The river flows through a mountainous country, and in its descent to the Zambezi valley forms rapids and cataracts, rendering its middle

course for a distance of 60 m. unnavigable. The most southern and the finest of these cataracts is called the Murchison Cataract or Falls, after Sir Roderick Murchison, the geologist, who identified himself during the mid- Victorian epoch with geographical exploration in Africa. In passing the cataracts the Shire falls 1200 ft. From the station called Katunga, a short distance below the cataracts, shallow- draught steamers can navigate the river when in flood (January- March) to its junction with the Zambezi, and thence proceed to the Chinde mouth of the main stream. About 130 m. above its confluence with the Zambezi the Shire is joined from the east by a smaller stream, the Ruo river, whose headwaters rise in Mount Mlanje. At the junction of the Ruo and Shire is the town of Chiromo, and here is an extensive swampy region and game reserve known as the Elephant Marsh. The scenery of the lower Shire is very picturesque, the spurs of the plateau forming bold, rocky crags overhanging the water. The river is studded with small islands usually covered by thick grass. A little before the Zambezi is reached the country becomes flat. The Shire joins the main river in about 35° 25′ E., 17° 50′ S., at a point where the Zambezi is of great width and presents in the dry season many narrow winding channels, not more than 3 ft. deep, with intervening sandbanks.

The lower part of the Shire is in Portuguese territory; the

upper part is in the British Nyasaland Protectorate, to which it

is the natural highway. At the lowest point in British territory, on the west bank of the river, is Port Herald, whence a railway runs past Chiromo to Blantyre. Below Port Herald the Shire is navigable all the year round.

See Zambezi and British Central Africa.

SHIRE, one of the larger administrative divisions, in Great Britain, now generally synonymous with ” county ” (q.v.), but the word is still used of smaller districts, such as Richmondshire and Hallamshire in Yorkshire, Norhamshire and Hexhamshire in Northumberland. The Anglo-Saxon shire (0. Eng. scir) was an administrative division next above the hundred and was presided over by the ealdorman and the sheriff (the shire-reeve). The word .?«>, according to Skeat (Etym. Diet., ioio), meant originally office,

charge, administration; thus in a vocabulary of the 8th century (Wright-Wulcker, Anglo-Saxon and Old English Vocabu- laries, 1884, 40-32) is found procuratio, sciir. Skeat compares O. Eng. scirian, to distribute, appoint, Ger. Schirrmeister, steward. The usual derivation of the word connects it with " shear " and " share," and makes the original meaning to have been a part cut off.

SHIRLEY (or Sherley), SIR ANTHONY (1565-c. 1635), English traveller, was the second son of Sir Thomas Shirley (1 542-161 2), of Wiston, Sussex, who was a member of parlia- ment during the reigns of Elizabeth and James I. and who was heavily in debt when he died in October 1612. Shirley's im- prisonment in 1603 was an important event as in consequence thereof the House of Commons successfully asserted one of its privileges — freedom of its members from arrest. Educated at Oxford Anthony Shirley gained some military experience with the English troops in the Netherlands "and also during an expedi- tion to Normandy in 1591 under Robert Devereux, earl of Essex, who was related to his wife, Frances Vernon; about this time he was knighted by Henry of Navarre (Henry IV. of France), a proceeding which brought upon him the displeasure of his own sovereign and a short imprisonment. In 1596 he conducted a predatory expedition along the western coast of Africa and then across to Central America, but owing to a mutiny he returned to London with a single ship in 1597. In 1598 he led a few English volunteers to Italy to take part in a dispute over the possession of Ferrara; this, however, had been accommodated when he reached Venice, and he decided to journey to Persia with the twofold object of promoting trade between England and Persia and of stirring up the Persians against the Turks. He obtained money at Constantinople and at Aleppo, and was very well received by the shah, Abbas the Great, who made him a mirza, or prince, and granted certain trading and other rights to all Christian merchants. Then, as the shah's representative, he returned to Europe and visited Moscow, Prague, Rome and other cities, but the English government would not allow him to return to his own country. For some time he was in prison in Venice, and in 1605 he went to Prague and was sent by the emperor Rudolph II. on a mission to Morocco; afterwards he went to Lisbon and to Madrid, where he was welcomed very warmly. The king of Spain appointed him the admiral of a fleet which was to serve in the Levant, but the only result of his extensive preparations was an unsuccessful expedition against the island of Mitylene. After this he was deprived of his command. Shirley, who was a count of the Holy Roman Empire, died at Madrid some time after 1635.

Sir Anthony's elder brother, Sir Thomas Shirley (1564-c. 1620), was

knighted while serving in Ireland under Sir William Fitz- william in 1 589. In 1601 he was chosen a member of parliament, but his time was mainly passed in seeking to restore the shattered fortunes of his family by piratical expeditions. In January 1603 he was captured by the Turks and he was only released from his captivity at Constantinople in December 1605. One of his sons was Henry Shirley (d. 1627) the dramatist, who was murdered in London on the 31st of October 1627, and one of his grandsons was Thomas Shirley (1638-1678), the physician and writer.

Sir Anthony's younger brother, Sir Robert Shirley (c. 1581- 1628), went with his brother to Persia in 1598, remaining in that country when the latter returned to Europe in 1599. Having

married a Circassian lady he stayed in Persia until 1608 when the shah sent him on a diplomatic errand to James I. and to other European princes; after visiting Cracow, Prague, Florence, Rome and Madrid, he reached England in 161 1 and had an interview with the king. In 16 13 he went again to Persia, but in 161 5 he returned to Europe and resided for some years in Madrid. His third journey to Persia was undertaken in 1627, but soon after reaching that country he died at Kazvin on the 13th of July 1628.

Sir Anthony Shirley wrote: Sir Anthony Sherley: his Relation of his Travels into Persia (1613), the original manuscript of which is in the Bodleian Library at Oxford. There are in existence five or more accounts of Shirley's adventures in Persia, and the account of his expedition in 1596 is published in R. Hakluyt's Voyages and Dis-coveries (1809-1812). See also The Three Brothers; Travels and Adventures of Sir Anthony, Sir Robert and Sir Thomas Sherley in Persia, Russia, Turkey and Spain (London, 1825); E. P. Shirley, The Sherley Brothers (1848) , and the same writer's Stemmata Shirleiana (1841, again 1873).

SHIRLEY (or Sherley), JAMES (1596-1666), English dramatist, was born in London in September 1 596. He belonged to the great period of English dramatic literature, but, in Lamb's words, he " claims a place among the worthies of this period, not so much for any transcendent genius in himself, as that he was the last of a great race, all of whom spoke nearly the same language and had a set of moral feelings and notions in common." His career of play writing extended from 1625 to the suppression of stage plays by parliament in 1642. He was educated at Merchant Taylors' school, St John's College, Oxford, and Catherine Hall, Cambridge, where he took his B.A. degree in or before 161 8. His first poem, Echo, or the

Unfortunate Lovers (of which no copy is known, but which is probably the same as Narcissus of 1646), was published in 161 8. After proceeding to M. A. he was, Wood says, " a minister of God's word in or near St Albans." In consequence apparently of his conversion to the Roman Catholic faith he left his living, and was master of St Albans grammar school from 1623-1625. His first play, Love Tricks, seems to have been written while he was teaching at St Albans. He removed in 1 6 2 5 to London, where he lived in Gray's Inn, and for eighteen years from that time he was a prolific writer for the stage, producing more than thirty regular plays, tragedies and comedies, and showing no sign of exhaustion when a stop was put to his occupation by the Puritan edict of 1642. Shirley's sympathies were with the king in his disputes with parliament and he received marks of special favour from the queen. He made a bitter attack on Prynne, who had attacked the stage in Histriomastix; and, when in 1634 a special masque was presented at Whitehall by the gentlemen of the Inns of Court as a practical reply to Prynne, Shirley supplied the text — The Triumph of Peace. Between 1636 and 1640 Shirley went to Ireland, under the patronage apparently of the earl of Kildare. Three or four of his plays were produced by his friend John Ogilby in Dublin in the theatre in Werburgh Street, the first ever built in Ireland and at the time of Shirley's visit only one year old. On the outbreak of war he seems to have served with the earl of Newcastle, but when the king's fortunes began to decline he returned to London. He owed something to the kindness of Thomas Stanley, but supported himself chiefly by teaching, publishing some educational works under the Common- wealth. Besides these he published during the period of dramatic eclipse four small volumes of poems and plays, in 1646, 1653, 1655 and 1659. He " was a drudge " for Ogilby in his translations of the Iliad and the Odyssey, and survived into the reign of Charles II., but, though some of his comedies were revived, he did not again attempt to write for the stage. Wood says that he and his second wife died of fright and exposure after the great fire, and were buried at St Giles's-in-the- Fields on 'the 29th of October 1666.

Shirley was born to great dramatic wealth, and he handled it freely. He constructed his own plots out of the abundance of materials that had been accumulated during thirty years of unexampled dramatic activity. He did not strain after novelty of situation or character, but worked with confident ease and buoyant copiousness on the familiar lines, contriving situations

and exhibiting characters after types whose effectiveness on the stage had been proved by ample experience. He spoke the same language with the great dramatists, it is true, but this grand style is sometimes employed for the artificial elevation of commonplace thought. " Clear as day " becomes in this manner " day is not more conspicuous than this cunning"; while the proverb " Still waters run deep " is ennobled into —

"The shallow rivers glide away with noise — The deep are silent."

The violence and exaggeration of many of his contemporaries left him untouched. His scenes are ingeniously conceived, his characters boldly and clearly drawn; and he never falls beneath a high level of stage effect.

Shirley's tragedies are : The Maides Revenge (acted, 1626 ; printed, '639); The Traytor (licensed, 1631 ; printed, 1635), which Dyce reckoned as Shirley's best tragedy; Love's Crueltie (1631; printed, 1640); The Duke's Mistris (acted, 1636; printed, 1638); The Polititian (acted, 1639; printed, 1655); The Cardinal (acted, 1641 ; printed, 1652), a good example of Shirley's later style, and characterized by Edmund Gosse as perhaps the last great play produced by the giants of the Elizabethan age. His comedies are: Love Tricks, or the School of Complement (licensed, 1625; printed under the latter title, 1631) ; The Wedding (licensed, 1626; printed, 1629) ; The Brothers (acted, 1626; printed, 1652); The Wittie Faire One (acted, 1628; printed, 1633); The Gratefull Servant (licensed in 1629 as The Faithful Servant; printed, 1630); Changes: Or Love in a Maze (acted and printed, 1632); Hide Parke (acted, 1632; printed, 1637); The Ball (acted, 1632; printed, 1639); The Bird in a Cage (acted and printed, 1633), ironically dedicated to William Prynne; The Young Admirall (licensed, 1633; printed, 1637); The Gamester (played at court, 1634; printed, 1637), executed at the command of Charles I. who is said to have invented or proposed the plot; The Example (acted, 1634; printed, 1637); The Oppor- tunity (licensed, 1634; printed, 1640); The Coronation (licensed, 1635, as his, but printed, 1640, as by Fletcher) ; The Lady of Pleasure (licensed, 1635; printed, 1637); The Constant Maid, or Love will find out the Way, printed in 1640 under the former title with St Patrick for Ireland; The Royall Master (acted and printed, 1638), an excellent comedy of intrigue, with an epilogue addressed to Strafford ; The Doubtfull Heir (printed, 1652), licensed as Rosania, or Love's Victory in 1640; The Gentleman of Venice (licensed, 1639; printed, 1655); The Imposture (acted, 1640; printed, 1652); The Sisters (licensed, 1642; printed, 1653); The Humorous Courtier (perhaps

identical with The Duke, licensed, 1631), printed, 1640; The Court Secret (printed, 1653). Poems (1646), by James Shirley, contained " Narcissus," and a masque dealing with the Judgment of Paris, entitled The Triumph of Beautie. A Contention for Honour and Riches (1633) appeared in an altered and enlarged form in 1659 as Honoria and Mammon. In 1653 a selection of his pieces was published as Six New Playes. He wrote the magnificent entertainment presented by the members of the Inns of Court to the king and queen in 1633, entitled The Triumph of Peace, the scenery being devised by Inigo Jones and the music by W. Lawes and Simon Ives. In this kind of composition he had no rival but Ben Jonson. His Contention of Ajax and Ulysses (printed, 1659) closes with the well-known lyric, " The Glories of our Blood and State."

The standard edition of Shirley's works is The Dramatic Works and Poems of James Shirley, with Notes by William Gifford, and Additional Notes, and some Account of Shirley and his Writings, by Alexander Dyce (6 vols., 1833). A selection of his plays was edited (1888) for the " Mermaid " series, with an introduction bv Edmund Gosse.

SHIRLEY, WILLIAM (1694-1771), colonial governor of Massachusetts, was born at Preston in Sussex, England, on -the 2nd of December 1694. He studied law, entered the Middle Temple, emigrated to Massachusetts in 1731, was appointed " the King's only advocate-general in America " {i.e. of all New England except Connecticut) in 1734, and in 1741, while repre- senting Massachusetts in a boundary dispute with Rhode Island, was appointed governor. His efforts to secure a permanent fixed salary for himself (of £1000) were unsuccessful; and his attempt to prevent the further issue of paper money also involved him in a controversy with the General Court; but their relations were not unfriendly after 1743. The most important event of his administration was the conquest of Louisburg in 1 745. The expedition was undertaken on his suggestion and its success was largely due to his energy and enthusiasm; in September 1749 £183,650 (English) in coin was brought to Boston to cover the outlay of Massachusetts, and largely through Shirley's influence this was used for the redemption of outstanding paper money, thus re-establishing the finances of the province, a subject to

which Shirley had given much attention. Both in the colonies and in England, whither he returned in 1 749 on leave of absence, Shirley kept up an active agitation for the expulsion of the French from the whole of Canada. He went back to Massa- chusetts as governor in

1753; led an unsuccessful expedition against Fort Niagara in 1755, and after the death of General Edward Braddock (1755) until June 1756 was commander-in- chief of all the British forces in America. In September 1756 he was recalled to England and was succeeded as governor by Spencer Phips. He was governor of the Bahamas until 1770, then again returned to Massachusetts and died at Roxbury on the 24th of March 1771. He published a Journal of the Siege of Louisbourg (1745), and The Conduct of General William Shirley Briefly Stated (1758).

SHIRREFF, EMILY ANNE ELIZA (1814-1897), English pioneer in the higher education for women, was born on the 3rd of November 1814, the daughter of a rear-admiral. Both she and her sister Maria (Mrs William Grey) took a keen interest in bettering women's equipment for educational work, and, in 1858, she published Intellectual Education and its Influence on the Character and Happiness of Women. Before that the sisters had written in collaboration a novel, Passion and Principle (1841), marked with that serious sense of the deficiencies in women's education, to remedy which they did so much, and Thoughts on Self-Culture addressed to Women (1850). In 1869 Emily Shirreff was for a short time honorary mistress of Girton College, and she served for many years on the council of that institution and of the Girls' Public Day School Company. She took a leading part in establishing and developing the Maria Grey Training College for teachers and in the work of the Froebel Society, of which she was the president. She was a firm believer in Froebel's system and wrote a short memoir of him, and several books on kindergarten methods. She died in London on the 20th of March 1897.

SHIRT, an undergarment of linen, silk, cotton and flannel for the upper part of the body, usually only applied to such a garment when worn by men, though the term is becoming common as used of a plain form of blouse worn by women, the American " shirt-waist." The word is apparently Scandinavian in origin and is an adaptation of the Icel. skyrte, Dan. skiorte, properly a short garment, and is derived from the root skar — to cut off; it is cognate with Ger. Schurz, apron, and the same root is seen in " short," " shear " and " skirt "; the last word is now used of that part of a woman's garment which reaches from the waist to the feet, but properly means the lower part of the shirt, hence, edge, border of anything.

SHIRVAN, a small district of the great province of Khorasan in Persia, N.W. of Meshed and W. of Kuchan. It is under the jurisdiction of Kuchan and comprises the town of the same name and twelve villages with a population of 12,000. It produces cotton,

wheat and a little silk. Shirvan, the capital, is situated on the river Atrek, in 37 24′ N., 57° 56′ E. at an elevation of 3500 ft. Its inhabitants are of the Turkish Garai'i tribe and number about 7000. There are post and telegraph offices.

SHOA, the southern of the three principal provinces of the Abyssinian empire. Shoa from about the middle of the 10th century till nearly the close of the 13th century was the residence of the Abyssinian sovereigns, who had been driven out of Axum, their former capital. About 1528 Shoa was conquered by Mahommedan invaders and was for over a century afterwards a prey to Galla raiders. In 1682 it was reconquered by an Abyssinian chief, but remained independent of northern Abys- sinia until 1855 when the emperor Theodore reduced it to sub- mission. In 1889 Menelek II., king of Shoa, on the death of the emperor John, made himself master of the whole of Abyssinia. The capital, Adis Ababa (q.v.), is the seat of government for the whole empire (see Abyssinia).

SHOCK, or Collapse, in surgery, the enfeebled condition of body which comes on after a severe physical injury, such as a blow upon the head or a kick in the abdomen, or as the result of grievous mental disturbance, as on seeing a ghastly sight or

hearing sad news. It is the condition which the prize-fighter desires to inflict upon his adversary by giving what is called the " knock-out blow " upon the point of the jaw, over the heart or in the lower part of the chest.

In severe shock the individual falls " all of a heap," as the saying is, which is exactly expressed by the word " collapse " (collapsus, collabor, fall in ruins). The explanation of the con- dition is that the heart is suddenly deprived ■of its power to pump blood up to the brain which, like the face itself, is left anaemic and has no power to send out control to the muscles. The blood at once sinks into, and remains stagnant in, the large veins of the abdomen. And inasmuch as the condition of collapse is due to. anaemia of the brain, it is met with in those cases in which a sudden and serious loss of blood has been sustained, as in the " flooding " of child-bed, the giving way of an aneurism, or the opening of some large blood-vessel. It may also supervene on the rupture of a gastric ulcer, and is then the result of the injury to which the network of nerves in the interior of the

abdomen has been subjected by the sudden escape on to them of the contents of the stomach.

In severe shock the patient is pale, and bathed in clammy perspiration; his sensibility is blunted; his pulse is small and weak, sometimes, indeed, it is imperceptible, and even on laying the hand over the heart no cardiac impulse may be felt. The person is unable to make any exertion, but lies indifferent to external circumstances, and can be roused only with difficulty or not at all. He complains of a feeling of cold, and he may have a distinct shivering. These symptoms may continue for some hours. The first evidence of improvement is that he shifts his position, becomes restless and complains of the injury. Perhaps he vomits. The pulse becomes stronger, and he then passes from the state of shock into that of reaction. If the improvement continues, recovery takes place; but if it is only transient, he sinks back again into a drowsy condition, which may end in death, for it must be clearly understood that shock may end fatally. Sometimes there is no rallying, death following the injury immediately. In cases where there is no reaction, the patient gradually becomes weaker, and his pulse feebler, till death ensues. Shock is due to an impression conveyed to the medulla oblongata, by which the nerve-centres are so affected that a partial paralysis of the voluntary and involuntary muscular fibres in the body takes place, the patient being, perhaps, unable to lift his arm or move his leg. The respiratory functions are performed wearily, and the muscle of the heart contracts feebly. The walls of the blood-vessels lose their tonicity and the vessels dilate, the blood collecting in the large venous trunks, more especially of the abdomen. The vessels of the skin being emptied of blood, marked pallor ensues. The heart beats feebly because its nervous energy is loweied, and because it has not a sufficient quantity of blood upon which to act. An understanding of these facts gives the general indications for treatment, which comprise external stimulation over the heart by mustard poultices or turpentine stupes; elevation of the limbs — to cause the blood to gravitate towards the heart, and so to the brain; manual pressure on the abdominal cavity from below upwards — to encourage the flow of blood from the overloaded abdominal veins into the heart. In urgent cases an injection may be given into the veins of warm water in which table salt (60 grains to a pint) is dissolved. These different measures may be supple- mented by the administration of stimulants by the mouth, or, if the patient cannot swallow, by subcutaneous injection of brandy, ether or a solution of strychnine. In all probability many men have been left for dead upon the field of battle who were only in a state of extreme collapse; in the future many

such cases will be saved by the prompt injection of ether over the region of the heart.

In syncope from mental emotion the weakened heart cannot drive a sufficient quantity of blood to the brain; the patient feels dizzy and faint, and falls down insensible. The condition is transitory and the recumbent posture, assisted if need be by elevation of the limbs, causes the blood to gravitate to the heart, which is thereby stimulated to contract. A sufficient quantity

of blood is then driven to the brain, and the insensibility passes off. If the patient is in the sitting posture when he feels faint, the head should be! depressed between the knees, which will cause the blood to flow to the brain, and the faintness will pass off. Otherwise he should be laid flat on his back, his head being kept low. When a collapsed person is put to bed, no pillow should be allowed, and the foot of the bed should be raised above the level of the head. (E. O.)*

SHODDY, in origin probably a factory term and first applied to the waste thrown off or " shed " during the process of wool manufacture. It is now the name given to a special type of fabric made from remanufactured materials, i.e. materials which have already been spun into yarn and woven into cloth but have been torn up or " ground up " — as this operation is termed technically — into a fibrous mass, and _ respun and rewoven. The term " shoddy " is sometimes applied to all fabrics made of such remanufactured materials, of which there are many types, such as " mungos," " extracts," " flocks," &c, but strictly it should be confined to a cloth produced from fabrics originally made from English and the longer cross-bred wools. Mungo is produced from fabrics originally made from Botany and short fine wools; extract is the wool fibre obtained from goods origin- ally composed of wool and cotton from which the cotton has been " extracted " by sulphuric acid or some other agent; and flocks mostly come from milling, raising and cropping machines. There are some few other particular types of minor importance. , :

The operations of converting rags, tailors' clippings, &c, into these remanufactured materials are as follows: dusting, to render the subsequent operations as healthy and agreeable as possible; seaming i.e. taking out every little bit of sewing thread (unless the rags are for extracting) in order that a good " spin " may result; sorting into the various qualities and colours; oiling, to cause the fibres to glide upon one another, and thus separate so far as possible without breakage; and finally grinding, i.e. tearing up into a fibrous mass which may be readily spun into threads. The last-named operation is usually

spoken of as " grinding, " but really it is anything but grinding, being more of a teasing-out operation, the object being to preserve the length of the fibre so far as possible. The remanu- factured materials are necessarily very short in fibre, so that it is usually necessary to mix, i.e. " blend," some better material with them to carry the bulk through the machines into the yarn. With this object in view, sometimes good wool or noils (the short from combing), but more often cotton, is employed. The yarns thus spun are in the majority of cases woven into pieces as weft yarns, the warps usually being cotton; but there are some exceptions, a really good mungo blend being readily woven as warp.

Upon the whole the " cheap and nasty " idea usually associated with the term " shoddy," in reference to these remanufactured materials, is quite a mistake. Some most excellent cloths are produced, and when price is taken into consideration it must be conceded that the development of this industry has benefited the • working classes of Great Britain and other countries to a remarkable extent. Many are now well clothed, who, without the advent of the remanufactured materials, would have been clothed in rags.

SHOE (a word appearing in the Teutonic languages in various forms, as Ger. Schuh, Swed. and Dan. sho, sometimes supposed to come from an unknown root ska or sku, cover), a covering for the foot. The simplest foot-protector is the sandal, which consists of a sole attached to the foot, usually by leather thongs. The use of this can be traced back to a very early period; and the sandal of plaited grass, palm fronds, leather or other material still continues to be the most common foot-covering among oriental races. Where climate demanded greater protection for the foot, the primitive races shaped a rude shoe out of a single piece of untanned hide; this was laced with a thong, and so made a complete covering. Out of these two elements' — sole without upper and upper without sole — arose the perfected shoe arid boot, consisting of a combination of both. The boot

proper differs from the shoe in reaching up to the knee, as exem- plified by such forms as jack-boots, top-boots, Hessian boots and Wellington boots, but the term is in England now commonly applied to " half-boots " or " ankle-boots " which reach only above the ankle. A collection illustrating the numerous forms and varieties of

foot-covering, formed by Jules Jacquemart, is in the Cluny Museum in Paris.

Wooden Shoes. — The simplest foot-covering, largely used throughout Europe, is the wooden shoe (sabot) made from a single piece of wood roughly cut into shoe form. Analogous to this is the clog of the midland counties of England. Clogs, known also as pattens, are wooden soles to which shoe or boot uppers are attached. Sole and heel are made of one piece from a block of maple or ash 2 in. thick, and a little longer and broader than the desired size of shoe. The outer side of the sole and heel is fashioned with a long chisel- edged implement, called the dogger's knife or stock; a second implement, called the groover, makes a groove about one-eighth of an inch deep and wide round the side of the sole; and by means of a hollower the contour of the inner face of the sole is adapted to the shape of the foot. The uppers of heavy leather, machine sewed or riveted, are fitted closely to the groove around the sole, and a thin piece of leather-binding is nailed on all round the edges, the nails being placed very close, so as to give a firm durable fastening. These clogs are of great advantage to all who work in damp sloppy places, keeping the feet dry and comfortable in a manner impossible with either leather or india-rubber. They are consequently largely used on the continent of Europe by agricultural and forest labourers, and in England and the United States by dyers, bleachers, tanners, workers in sugar-factories, chemical works, provision packing ware- houses, &c. There is also a considerable demand for expensive clogs, with finely trimmed soles and fancy uppers, for use by clog- dancers on the stage. ♦

Manufacture of Leather Shoes. — There are two main divisions of work comprised in ordinary shoemaking. The minor division — the making of " turn shoes " — embraces all work in which there is only one thin flexible sole, which is sewed to the upper while outside in and turned over when completed. Slippers and ladies' thin house boots are examples of this class of work. In the other division the upper is united to an insole and at least one outsole, with a raised heel. In this are comprised all classes, shapes and qualities of goods, from shoes up to long-top or riding boots which reach to the knee, with all their variations of lacing, buttoning, elastic-web

side gussets, &c. The accompanying cuts (figs, i and 2) show the parts and trade names of a boot.

Shoemaking was formerly a pure handicraft ; but now machinery effects almost every operation in the art. On the factory system all

human feet are treated alike; in the handicraft, the shoemaker deals with the individual foot, and he should produce a boot which for fit, comfort, flexibility and strength cannot be approached by the product of machinery.

The shoemaker after measuring the feet, cuts out upper leather according to the size and pattern. These parts are fitted and stitched together by the " boot-closers," but little of this clos- ing is now done by hand. The sole " stuff " is next cut out and assembled, consisting of a pair of inner soles of soft leather, a pair of outer soles of firmer texture, a pair of welts or bands about I in. broad, of flexible leather, and lifts and top-pieces for the heels. These the " maker " mellows by steep- ing in water. He attaches the insoles to the bottom of a pair of wooden lasts, which are blocks the form and size of the boots to be made, fastens the leather down with lasting tacks, draws it out

Fig. 1. — Parts of a Boot. aa, The extension.

The front.

The side seam.

The back.

The strap.

The instep.

The vamp or front.

The quarter or counter, and, when it is dried,

The rand. with pincers till it takes the exact

The heel — the front is form of the last bottom. Then he

the breastj the bottom " rounds the soles," by paring down

k, I, m,

the face. The lifts of the heel. The shank or waist. The welt. The sole.

the edges close to the last, and forms round these edges a small channel or feather cut about one-eighth of an inch in the leather. Next he pierces the in- soles all round with a bent awl, which bites into, but not through, the leather, wid comes out at the channel or feather. The boots are then " lasted," by placing the uppers on the

lasts, drawing their edges tightly round the edge of the insoles, and fastening them in position with lasting tacks. Lasting is a crucial opera- tion, for, unless the upper is drawn smoothly and equally over

the last, leaving neither crease nor wrinkle, the form of the boot will be bad. The welt, having one edge pared or chamfered, is put in position round the sides, up to the heel or " seat," and the maker proceeds to " inseam," by passing his awl through the holes already made in the insole, catching with it the edge of the upper and the thin edge of the welt, and sewing all three together in one flat seam, with a waxed thread. He then pares off inequalities and " levels the bottoms," by filling up the depressed part in the centre with a piece of tarred felt; and, that done, the boots are ready for the outsoles. After the leather for them has been tho- roughly compressed by hammering on the " lap-stone," they are fastened through the insole with steel tacks, their sides are pared, and a narrow channel is cut round their edges; and through this channel they are stitched to the welt, about twelve stitches of strong waxed thread being made to the inch. The soles are now hammered into shape; the heel lifts are put on and attached with wooden pegs, then sewed I through the stitches of the insole; \ and the top-pieces, similar to the out- soles, are put on and nailed down to the lifts. The finishing operations embrace pinning up the edge of the heel, paring, rasping, scraping, smooth- ing, blacking and burnishing the edges of soles and heels, scraping, sand- papering and burnishing the soles, withdrawing the lasts, and cleaning out any pegs which may have pierced through the inner sole. Of course, there are numerous minor operations connected with forwarding and finish- ing in various materials, such

Fig. 2. — Section of Boot.

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The upper. The insole. The outsole. The welt. The stitching of

sole to the welt. The stitching of

upper to the welt.

the the

in various materials, such as punching lace-holes, inserting eyelets, applying heel and toe irons, hob-nailing, &c. To make a pair of common stout lacing boots occupies an expert workman from

fourteen to eighteen hours.

The principal difficulties to be overcome in applying machinery to shoemaking were encountered in the operation of fastening together the soles and uppers. The first success in this important operation was effected when means other than sewing were devised. In 1809 David Meade Randolph obtained a patent for fastening the soles and heels to the inner soles by means of little nails, brads, sprigs or tacks. The lasts he used were covered at the bottom with plates of metal, and the nails, when driven through the inner soles, were turned and clinched by coming against the metal plates. To fix the soles to the lasts during the operation the metal plates were each perforated with three holes, in which wooden plugs were inserted, and to these the insoles were nailed. This invention may be said to have laid the foundation of machine boot-making. In 1810 M. I. Brunei patented a range of machinery for fastening soles to uppers by means of metallic pins or nails, and the use of screws and staples was patented by Richard Woodman in the same year.

Apart from sewing by machine or hand, three principal methods of attaching soles to uppers have been used. The first is " pegging " with small wooden pins or pegs driven through outsole and insole, catching between them the edges of the upper. The points of the pegs which project through the insole are cut away and smoothed level with the leather either by hand or by a machine pegging rasp. The second is the system of " riveting or clinching " with iron or brass nails, the points of the nails being turned or clinched by coming in contact with the iron last used. The third method, screwing, hascome into extensive use since the standard screwing machine was introduced in America by the McKay Sewing-Machine Association, of Boston, Massachusetts, and in Europe by the Blake and Goodyear Company, of London. The standard screw machine, which is an American invention, though the idea was anticipated by a Frenchman named Blanchon in 1856, is provided with a reel of stout screw-threaded brass wire, which by the revolution of the reel is inserted into and screwed through outsole, upper edge and insole. Within the upper a head presses against the insole directly opposite the point of the screw, and the instant screw and head touch the wire is cut level with the outsole- The screw, making its own hole, fits tightly in the leather, and the two soles, being both compressed and screwed firmly together, make a perfectly water-tight and solid shoe. The surface of the insole is quite level and even, and as the work is really screwed, the screws are steady in their position, and they add materially to the durability of the soles. The principal disadvantage in the use of standard screwed soles is the great diffi- culty met with

in removing and levelling down the remains of an old sole when repairs are necessary.

The various forms of sewing-machine by which uppers are closed, and their important modifications for uniting soles and uppers, are .also principally of American origin. But the first suggestion of machine sewing was an English idea. The patent secured by Thomas Saint in the English Patent Office in 1790, while it fore- shadowed the most important features of the modern sewing- machine, indicated more particularly the devices now adopted in the sewing of leather. After the introduction of the sewing-machine for cloth work its adaptation to stitching leather both with plain

thread and with heated waxed thread was a comparatively simple task. The first important step in the more difficult problem of sewing together soles and uppers by a machine was taken in the United States by Lyman R. Blake in 1858. Blake's machine was ultimately perfected as the McKay sole-sewing machine — one of the most successful and lucrative inventions of modern times. Blake secured his first English patent in 1859, his invention being thus described: " This machine is a chain-stitch sewing-machine. The hooked needle works through a rest or supporting surface of the upper part of a long curved arm which projects upwards from the table .of the machine. This arm should have such a form as to be capable of entering a shoe so as to carry the rest into the toe part as well as any other part of the interior of it; it carries at its front end and directly under the rest a looper, which is supported within the end of the arm so as to be capable of rotating or partially rotating round the needle, while the said needle may extend into and through the eye of the looper, such eye being placed in the path of the needle. The thread is led from a bobbin by suitable guides along in the curved arm, thence through a tension spring applied to the arm, and thence upwards through the notch of the looper. The needle carrier extends upwards with a cylindrical block which can be turned round concentrically with it by means of a handle. The feed wheel by which the shoe is moved along the curved arm during the process of sewing is supported by a slider extending downwards from the block, and applied thereto so as to be capable of sliding up and down therein. The shoe is placed on the arm with the sole upwards. The feed wheel is made to rest on the sole." Blake's original machine was very imperfect and was incapable of sewing round the toe of a shoe; but a principal interest

in it coming into the hands of Gordon McKay (1821-1903), he in conjunction with Blake effected most important improvements in the mechanism, and they jointly in i860 procured United States patents which secured to them the monopoly of wholly machine-made boots and shoes for twenty-one years. On the outbreak of the Civil War in America a great demand arose for boots, and, there being simultaneously much labour withdrawn from the market, a profitable field was opened for the use of the machine, which was now capable of sewing a sole right round. Machines were leased out to manufacturers by the McKay Company at a royalty of from 3 to 3 cents on every pair of soles sewed, the machines themselves registering the work done. The income of the association from royalties in the United States alone increased from $38,746 in 1863 to $589,973 in 1873, and continued to rise till the main patents expired in 188 1, when there were in use in the United States about 1800 Blake-McKay machines sewing 50,000,000 pairs of boots and shoes yearly. The monopoly secured by the McKay Company barred for the time the progress of invention, but still many other sole-sewing machines were patented. Among the most important of these is the Goodyear welt machine — the first mechanism adapted for sewing soles on lasted boots and shoes. This machine originated in a patent obtained in 1862 in the United States by August Destory for a curved-needle machine for sewing outsoles to welts, but was not successful till taken in hand by Charles Goodyear, son of the well- known inventor in indiarubber fabrics. This device was first applied in a machine for sewing turn shoes. Later it was used in a machine which sewed with a chain-stitch from the channel of the insole through the welt and upper, and a little later still it was followed by the " rapid outsole lock-stitch machine," which united the outsole to the welt with lock-stitching. Improvements have been continually effected in the Goodyear system and numerous accessory mechanisms have been brought out, until there is now not a single operation necessary in shoemaking, however insignificant, for which machinery has not been devised. In consequence the range of machines employed in a modern shoe factory is very extensive, the various operations being highly specialized, and there being minute subdivision of labour. Through the fundamental principles were not in all cases of American origin, American inventors were foremost in developing such machinery, and America took the lead in employing it to the supersession of handwork in shoemaking. When English makers, in about the seventh or eighth decade of the 19th century, were forced by the pressure of economic necessity to do the same, they found that the suitable machinery was con- trolled by American makers, from whom therefore they had to hire it on the payment of royalties and

under stringent conditions which rendered it difficult for them to use machines of any other maker, even if available, on pain of the whole plant being stripped from their factories. The British United Shoe Machinery Company, the English branch of the United Shoe Machinery Company, of Boston, Mass., thus maintained a practical monopoly of the supply of shoemaking machinery in Great Britain. However, by the begin- ning of the 20th century English makers began to assert them- selves and to show that they could produce machines able to com- pete effectively with those from America. The loosening of the American monopoly thus begun was aided by the Patent Act of 1907, section 27 of which provided that a patent may be revoked if. the article is not manufactured " to an adequate extent " in Great Britain (most of the shoe machinery in question having been manu- factured in America), while- section 38 prohibits the insertion in a lease of conditions excluding the lessee from using articles or processes not supplied or owned by the lessor.

Rubber Shoes. — The manufacture of indiarubber galoshes, 1 shoes, fishing boots, &c, forms an important branch of the indiarubber industry, especially in America, where rubber overshoes, colloquially known as " rubbers," are extensively worn, and where fully 1000 different shapes and sizes are said to be produced. So far back as 1833 the Roxbury India Rubber Company was constituted to work the discovery that indiarubber dissolved in turpentine and mixed with lampblack formed a varnish which gave a hard waterproof surface when applied to leather, but the process failed because the varnish melted with heat and cracked with cold. This defect was remedied by Charles Goodyear (1800-1860), who found that when sulphur was combined with the rubber by the aid of heat the product (" vulcanized rubber ") was not only stronger but retained its elasticity through a wide range of temperature. His patent, taken out in 1844, was the foundation of various American rubber indus- tries including that of rubber boots and shoes. Guttapercha has also been used instead of leather for the outer soles of boots.

SHOK-BILL, a huge African bird from the White Nile, the Balaeniceps rex of ornithology, now regarded as a giant heron. It was first brought to Europe by M. Parkyns and described by J. Gould in the Zoological Proceedings (1851, pp. 1, 2, pi. xxxv.)

After J. Wolf in Trans. Zool. Soc.

Shoe-Bill or Whale-headed Heron.

as an abnormal pelican. This view was disputed by Reinbardt {op.

cit. i860, p. 377), and wholly dispelled by W. K. Parker in the Zoological Transactions (iv. pp. 269-351), though these two authors disagreed as to its affinities, the first placing it with the storks, the last assigning it to the herons. In singularity of aspect few birds surpass Balaeniceps, with its gaunt grey figure, some 5 ft. in height, its large head surmounted by a little curled tuft, the scowling expression of its eyes and its huge bill in form

1 The galosh or golosh was originally a wooden shoe or clog, but later came to mean an overshoe (cf. R. Holme, Armoury, 1688; " Galloshios are false shooes, or covers for shooes "). The word is adapted from the French galoche, from Low Lat. galopedium, a wooden shoe, Gr. KaKoirbbt-ov, shoemaker's last, from koKov, wood, and irovs, foot.

not unlike a whale's head — this last suggesting its generic name — but tipped with a formidable hook. The shape of the bill has also prompted the Arabs to call it, according to their idiom, the " father of a shoe. " It forms large flocks and frequents dense swamps. The flight is heron-like, and the birds settle on trees. The food consists of any small animals or carrion. The nest is a hole in dry ground, roughly limed with herbage, and from two to twelve chalky white eggs are laid. (A.N.)

SHOEBURYNESS, a promontory on the coast of Essex, England, the point at which the coast-line trends north-eastward from the estuary of the Thames. It gives name to a school of gunnery, where officers are instructed and experiments carried out. The railway station (39 m. E. from London, the terminus of the London, Tilbury and Southend railway) bears the same name, but the parish is South Shoebury; North, Shoebury is a parish situated nearer to Southend-on-Sea. The church of St Andrew retains some ornate Norman work, but is mainly a Perpendicular reconstruction. On the seaward side of the Ness there is a large ancient earthwork which is attributed to the Norsemen through a reference in the Saxon Chronicle (894) under the name Sceobrig. The parish is in the S.E. parliamentary division of the country. Pop. (1901) 4081.

SHOFAR, Schofar or Shofer, the ancient ram's horn trumpet of the Hebrews, sometimes also translated cornet in the English Bible. The shofar consisted of a natural horn turned up at the bell end, and,

having a short conical bore of very large calibre, it would be capable of producing at most the fundamental octave and twelfth. The shofar has continued in use in the Jewish synagogue until the present day, being blown with great solemnity once every year at the impressive service held on the Day of Atonement. The shofar was more generally used by the Israelites than the other horn Keren, and although figuring largely as a signal instrument in battle, and used for rousing the people against the foe, it can hardly be regarded as a military instrument, but rather as the token of God's presence in their midst, to give them the victory as in the case of Joshua and Gideon. It was the shofar that was used to call the people together on a solemn feast day (Ps. lxxxi. 3). (K. S.)

SHOGUN (Japanese for " generalissimo "), in Japan, originally merely the style of a general in command in the field, a title which only gradually came into existence at the beginning of the 8th century, the mikado himself having previously been regarded as the only authority. The rise of a military class and of shoguns (generals) was a development coincident with the division of supremacy between the Minamoto and Taira clans (see Japan: History). In 1192 the emperor Takahira made the Minamoto leader, Yoritomo, a Sei-i-tai-shogun (" barbarian-subjugating generalissimo ") or general-in-chief, and this office became stereotyped in the hands of successive great military leaders, till in 1603 Lyeyasu Tokugawa became shogun and established the Tokugawa dynasty in power. The shogunate from that time till 1867 exercised the de facto sovereignty in Japan, though in theory subordinate to the mikado. The revolution of 1867 swept away and abolished the shogunate and restored the mikado's supreme authority.

The term " Tycoon, "'which was commonly used by foreigners in the 19th century, is merely a synonym for shogun, being the English rendering of the Japanese taiko or taikun, " great lord. "

SHOLAPUR, a city and district of British India, in the Central division of Bombay. The city is 164 m. S.E. from Poona by rail. Municipal area, about 8 sq. m.; pop. (1901) 75,288. Since 1877 it has ceased to be a military cantonment. Its great fort, of Mahommedan construction, dates from the 14th to 17th centuries. The large bazaar is divided into seven sections, one of which is used on each day of the week. There are two municipal gardens, with fine tanks and temples. It is an import- ant centre of trade, with three cotton mills.

The District of Sholapur has an area'of 4541 sq. m. Except in

Karmala and Barsi subdivisions, in the north and east, where there is a good deal of hilly ground, the district is generally flat or undulating; but it is bare of vegetation, and presents every- where a bleak treeless appearance. The chief rivers are the

Bhima and its tributaries — the Man, the Nira and the Sina — all flowing towards the south-east. Lying in a tract of uncertain rainfall, Sholapur is peculiarly liable to seasons of scarcity; much, however, has been done by the opening of canals and tanks, such as the Ekruk and Ashti tanks, to secure a better water-supply, the Ekruk tank near Sholapur city is the second largest irrigation work in the Deccan. In 1901 the population was 720,977, showing a decrease of 4% in the decade. The principal crops are millet, pulse, oil seeds and cotton. There are manufactures of silk and cotton cloth, and blankets. The chief trading mart is Barsi. Pandharpur is a popular place of pilgrimage. The Great Indian Peninsula railway runs through the district, with a junction for the Southern Mahratta railway, and another junction for the Barsi light railway, recently extended to Pandharpur.

Sholapur passed from the Bahmani to the Bijapur kings and from them to the Mahrattas. In 1818, on the fall of the peshwa, it was ceded to the British, when it formed part of the Poona collectorate, but in 1838 it was made a separate district.

SHOOTING, as a British field sport, may be said to have existed for at least two hundred years, though it is only within the last half century that it has attained its present importance. In many parts of Great Britain the importance of the sporting rights of an estate now more than counterbalance its agricultural value, while enormous sums are annually devoted to the artificial production of game. Taking all contingent expenses into con- sideration, the average cost of every head of game killed may be taken as not less than three shillings. A hand-reared pheasant can scarcely be brought to the gun for less than seven to eight shillings; and these birds in particular — and partridges and wild duck to a lesser, but steadily increasing, extent — are reared in tens of thousands every year. So far, the grouse alone among recognized British game-birds has defied all attempts at artificial production, but it is probable that in course of time this will also yield to the modern taste for big bags.

The enormous head of game now preserved, and the corre- spondent development of the art of gunmaking, has to a great extent revolutionized the sport of shooting, the modern tendency being all in favour of " driving, " i. e. bringing the game to the sportsman,

instead of the sportsman to the game. While this has undoubtedly raised the standard of. marksmanship, it has equally deteriorated the exercise of such minor woodcraft as is required for small game shooting under present conditions.

In this article it is only possible to touch on the various forms of the sport of shooting most in vogue. First must be placed grouse-shooting, admittedly the finest form of sport with the gun obtainable in the British Islands. It S bootiajr. is customary to speak of this as though it were merely confined to Scotland, but grouse are found in every English county north of the Trent, as well as in Shropshire, Wales and Ireland, while in a good season as many are probably killed in Yorkshire alone as in any two Scotch counties put together. Practically all English grouse are killed by driving, the practice of which is fast extending to Scotland. On the undulating English and Lowland moors this has undoubtedly resulted in largely increasing the stock of grouse, but it is questionable whether it has been equally successful on the more rugged hills of the Highlands. Save in a few specially favoured localities, such as the Moy Hall moors in Inverness -shire, grouse-driving in Scotland has by no means produced the marvellous results achieved on the English moors, while far too many lessees oi Scottish shootings resort to the suicidal policy of only driving their birds when the latter have become too wild to lie to dogs.

In laying out a moor for driving care should be taken to avoid placing a row of butts against a sky line: where possible these should be placed in a depression of the ground, which not only serves to conceal them from the birds, but also ensures higher and more difficult shots. For these reasons, on very flat stretches of ground the butts are sometimes excavated after the manner of a rifle pit with a low parapet, but in the writer's experience these are not to be specially recommended. It is in all cases advisable to refrain from placing a line of butts on very stony or

rocky ground, owing to the possibility of an accident from glancing or deflected shot-pellets. Much of the success of a day's grouse-driving depends on the manner in which the drivers-are handled, and especially on the " flankers," whose business it is to turn in such birds as show a tendency to break away from the butts.

A few simple rules for the guidance of the shooter may be mentioned in connexion with grouse-driving. He should remain motionless in his butt, without attempting to conceal himself by crouching, until the moment arrives for him to throw up his gun, when he should refrain from dwelling on his bird, or reserving his fire until it is close upon him — the latter a very common error among beginners. An excellent method of determining the range at which to open fire is to mark some conspicuous object, a tuft of heather or a stone, about 40 yds. in front of one's butt, before the commencement of a drive. Above all the shooter should concentrate his attention only on birds coming at him, and not concern himself with those that have passed his butt: in nine cases out of ten by the time he has turned to fire they will be 60 or 70 yds. away, and the only result of his shot will be to wound, but not kill; apart from the cruelty of such a proceeding, it should be remembered that these " pricked " birds are a fruitful source of grouse disease. A good retriever is essential to enjoyment in grouse-driving, where only a limited time is available for picking up dead birds. The modern fashion is in favour of spaniels for this work, but a large wavy-coated retriever is usually preferable, as being less likely to tire or " potter." It is customary on some moors to burn the heather round the butts with a view to facilitating the recovery of dead birds, but this has also the disadvantage of rendering the butts more conspicuous to the grouse, which soon come to know the dangerous zone. In August grouse can be driven without much difficulty, but later in the season, and especially in a high wind, pack after pack will go straight back over the beaters' heads sooner than face the guns. Enormous bags of driven grouse are occasionally made on the Yorkshire and Durham moors; over 1300 brace have been killed in a single day at Broomhead near Sheffield, and there are several other well-known moors where, in a good season, 1000 brace are obtainable in a day's shooting. Grouse driving is believed to have been first practised in a very modified form on the English moors as early as 1805, but its usage did not become general until fifty or sixty years later.

Grouse-shooting over dogs, though lacking the excitement of grouse-driving, and not requiring the same high standard of skill in shooting, is none the less incomparably the higher form of sport. Owing to the almost universal wildness of all modern game-birds, its general practice is now almost entirely confined to the Highlands, where, especially on the western seaboard, grouse will lie to dogs practically throughout the season. Except on very ill-watered moors, where they suffer more than other breeds of dogs from thirst, large big-boned setters are preferable to pointers for grouse-shooting, as

the latter are more easily affected by cold and damp, and in the writer's experience are more easily fatigued. Care should of course be taken always to work one's dogs up wind when possible, and in hot, still weather to beat the higher ground thoroughly, with a view to killing down the old cocks and barren hens which resort there. In stormy weather grouse naturally seek the lower slopes of the moors.

Partridge-shooting over dogs is a most delightful form of sport, popularly supposed to be extinct nowadays, but there are happily many parts of England where it is still practised in shooting, suitable localities. None the less, modern agricultural conditions do not lend themselves to the use of dogs in partridge-shooting, and the most general custom is to drive the birds off the pastures and stubbles into the root crops where they can be walked up in line, a rather uninteresting method of shooting. Care should of course be taken always to walk across the drills; and where birds are wild, and time does not press, it will occasionally be found advantageous to work a field in a series of gradually diminishing circles. Much valuable time

is often wasted in partridge-shooting in the search for dead and wounded birds; this can be obviated to a large extent by observing the golden rule that as soon as a bird is down the line should halt, and the dogs, whose business it is to retrieve the game, be allowed to do so, unassisted — or more correctly unhampered. If the bird cannot be found within reasonable time, the line should proceed, leaving a keeper and a steady dog behind to search for it. Where game is plentiful it is always advisable to employ one man with a couple of retrievers for the sole purpose of remaining behind the line to retrieve lost or running birds. As with all game, the modern tendency is to drive partridges: a form of shooting that of all others exacts the highest test of skill, not only on the part of the shooter, but also of the keeper who organizes the proceedings. To these require- ments must be added a suitable tract of country for the purpose, and a large head of game; given all these essentials, partridge- driving is a delightful amusement; without them it is usually a fruitless and wearisome undertaking.

In driving, the birds should be gradually and quietly collected into one large root-field, and sent from this over the guns, who should, when possible, always be placed in a grass-field where dead or wounded birds are more easily retrieved. Another field of roots should be at a convenient distance behind the guns for the purpose of gathering the birds, which, unless the wind be specially unfavourable, can then be brought back over them in a return drive. Long drives are not advisable; the more partridges can be kept on the

wing, and the coveys broken up, the better. Where partridge-driving is carried on on a large scale, it is a good plan to supplement such hedge-rows as are convenient for the purpose by narrow belts of coniferous trees. These, if wired in to prevent disturbance by foxes, dogs, &c, not only provide admirable nesting-ground for winged-game, but afford better concealment for the guns, and cause the partridges to offer higher and more attractive shots. In shooting driven partridges, the sportsman should stand as far as practic- able away from the fence, and concentrate his attention on the bird which first tops it. A driven grouse or rocketing pheasant will fly straight towards the shooter without swerving when he raises his gun, but not so the partridge, which can twist in the air almost like a snipe; it is this peculiarity, coupled with their startling scream, that proves so disconcerting to the young sportsman. Especial care should always be taken that the guns stand in a perfectly straight line within sight of one another: neglect of this precaution has often led to serious accidents.

Frequent change of blood is beneficial on estates where a large head of partridges is preserved, and it is advisable to kill off superfluous cock-birds before the commencement of the breeding- season, though when partridges are reared artificially a better plan is to catch them alive, and use them as foster-mothers, a duty they perform admirably.

The pheasant, once one of the rarest British game-birds, has now, thanks to artificial production, become almost the com- monest, and to shoot it over dogs among the hedge- rows in October, as was formerly the practice, would saoot j ng " be a manifest absurdity. Under modern conditions it can only be dealt with satisfactorily' as a " rocketer," i.e. a bird flying high and fast towards the shooter. As such, the pheasant has no superior, provided only it fly high and fast enough, but otherwise it is a rather uninteresting sporting-bird which invariably elects to seek safety by running rather than flight. Like the modern pheasant itself, the rocketer is a more or less artificial creation, and considerable organization is necessary to produce it in perfection. It is only of late years that keepers have recognized that sportsmen place little value on the mere magnitude of a day's bag, as compared to the difficult or "pretty" shots .they may obtain. Much, therefore, depends on the management of covert-shooting, the handling of the beaters, the disposition of the " stops," and the pains taken to ensure high-flying pheasants, or the reverse. When the configuration of the coverts permits of it, pheasants should always be driven down-hill to the guns; on flat ground the latter should stand at such a distance from the covert-side as to permit

the birds to rise high, and get well on the wing. This is some- times attained by cutting away the undergrowth at the end of the covert where it is purposed to flush the birds, but this is also liable to make them break back over the beaters. Where pheasants exist in large quantities, " false coverts " of spruce or fir loppings should always be placed at the flushing-point; the birds should be collected as quietly as possible in these, and then sent forward over the guns in small quantities at a time.

Of other recognized British game-birds — as distinct from wildfowl— it is only necessary to dwell on the most beautiful of them all, blackgame. These, though far more widely diffused than the red grouse, are not nearly so numerous. This is possibly due to altered agricultu/al conditions, the laying to pasture of much of the arable land which formerly fringed the Lowland moors, and the consequent surface-drainage which is responsible for the destruction of many young birds; but the chief cause lies in the wholly inefficient close-time afforded, which should be extended by at least a month. Black-game- and grouse-shooting differ in no way in their methods, though the former are far more difficult birds to handle by driving, while really fascinating sport can be obtained by stalking the old cocks with a miniature rifle.

Ptarmigan are practically confined to the summits of the higher Scottish hills, which are usually reserved for deer-forests, and, therefore, offer no opportunity for sport with the shot-gun. In mild still weather they give but poor sport, running persistently in front of the dogs, or sitting until they can almost be knocked down with a stick, but on stormy days they rise wild, and afford splendid sport, especially in conjunction with the wild and romantic scenery in which they are found. They are of course invariably shot over dogs.

Capercally, once extinct in Great Britain, were reintroduced into Scotland about 1835, and now exist in tolerable numbers, chiefly in Perthshire. Being a forest-haunting bird, ca /* r " they are usually driven to the guns like pheasants, but apart from their rarity and size, they are not held in great favour as sporting birds, while owing

to the great damage they do to young coniferous trees, they are not encouraged to multiply on estates where there is a large acreage of growing plantations. Capercally are very courageous birds, and the writer has seen a winged cock attack and hold at bay a dog sent to retrieve it.

Snipe and woodcock, though properly wild-fowl, are usually regarded as belonging to the category of game-birds. Though both the full-snipe and the woodcock breed to a limited ape ‘ extent in the British Isles, they may more correctly be described as autumn and winter migrants to them. The varieties then to be shot are the full-snipe, the jack-snipe and the great or solitary snipe; but the latter is exceedingly rarely met with, and the jack-snipe is becoming scarcer every year. Neither of these latter varieties breeds in the United Kingdom. Snipe are exceedingly erratic in their movements, which are largely influenced by the weather; like the woodcock they are here to-day and gone to-morrow. They haunt moist, or marshy localities, and the finest snipe shooting in the British islands is to be found on the Irish bogs. In hard frosts they should be sought near running water. As a general rule a dog is not used to find snipe, but where this may be considered nfecessary, a well broken Irish water-spaniel is to be recommended. These are the most intelligent of dogs, can be trained to point and retrieve as well, and are capable of standing wet and cold with impunity. It is a generally accepted axiom that snipe should be walked up, down wind, since they offer an easier mark when rising against it’, but in the writer’s experience this is more than counterbalanced by the fact that snipe, which are particularly susceptible to noise, lie far better when approached up wind. To kill snipe well is the most difficult knack in shooting, and one to which few men, however good shots they may be at other forms of game, rarely attain.

Woodcock are rarer birds than snipe, and even more erratic in their movements. Large quantities of them usually arrive in England with the first November combination of an easterly

Roe-deer.

gale and a full moon, but they cannot be depended on to stay more than a few hours in the locality where they alight. In Ireland, however, they are far more constant in their habits, and it is here that the largest bags of °° coc ‘ woodcock are made in the United Kingdom. Though woodcock are properly forest, or covert-haunting birds, in many parts of Ireland and the Western Highlands of Scotland they frequent the open bogs and moors, where they are shot

over pointers or setters. Otherwise no particular rules can be laid down for their pursuit, beyond the fact that they are very conservative in their choice of a haunt, and that year after year cock may be found in the same spot. Woodcock are usually esteemed difficult birds to shoot, but more are missed from over-eagerness on the part of the shooter than from the difficulty of the shot they present. Still in thick covert they undoubtedly require a quick hand and eye acting in unison, to kill them neatly.

Of quadrupeds or ground-game, only three varieties, the roe-deer, the hare and the rabbit, are preserved for sport with the shot-gun in the United Kingdom. The first- named, though found in a few widely distant districts in England and Ireland, is chiefly associated with Scotland so far as shooting is concerned. It is essentially a forest-loving animal, and is usually killed by driving it up to a line of guns, when, if close enough, it will drop to an ordinary charge of No. 5 shot; but a heavy load of B.B. or No. 1 is a far preferable, and more merciful, gauge to use. Roe-deer are not easy animals to move in a direction in which they suspect danger, and the more quietly a drive is conducted, the greater the chance of success. A few men walking carelessly through a wood, i.e. as if beating were not their object, will drive roe, and especially the cunning old bucks, with far greater certainty than an array of shouting, stick-rapping beaters.

Far finer spcrt, however, in every sense of the expression, can be obtained by stalking roe-bucks during the summer months with a small-bore rifle, carrying a hollow-nosed, and not a solid bullet. The most suitable opportunity for this is at sunrise or sunset, when the roe will be found feeding in the more open spaces in the woods. The same animals will nearly always be found in the same locality, but they are exceedingly wary creatures, and the old bucks are quite as difficult to stalk as a red-deer stag.

•The hare no longer exists in the same quantities as formerly; indeed in many parts of Great Britain it is practically extinct, the result of the Ground Game Act of 1881. No special methods are employed for shooting hares, nor is any great skill requisite for doing so, but sportsmen should always bear in mind that unless hit in the head or heart hares are not easily killed dead, and should, therefore, refrain from firing long shots at them, especially when they do not offer a broadside shot.

It is to be presumed that the Ground Game Act was specially directed — and with reason — against rabbits more than hares, but the former show little or no evidence of being affected by it. Yet from

every point of view, except perhaps that of shooting, they are far less valuable, and more noxious, animals, which ravage alike the young plantations of the landlord and the crops of the tenant farmer. Where they are preserved in large numbers, the most usual method of shooting them is to ferret them out of the burrows as short a time as possible before the day fixed for shooting, and then fill in the mouths of the holes with well beaten soil, which should also be drenched with paraffin or tar to deter the rabbits from digging their way in again. If this be carefully done, and plenty of covert — coarse grass, bracken or gorse — be available, in fine dry weather the rabbits will lie out for two or three nights, but in the event of heavy rain or especially snow, nothing will prevent them going to ground again. Where natural covert is scarce, it can be supplemented by strewing brushwood and fir-loppings under which rabbits will readily shelter. In beating for rabbits, the beaters should not merely tap with their sticks, but should thrust them into the clumps of grass and underwood; otherwise many rabbits will be passed over. When rabbits are driven up

to a line of guns in covert, the latter — if no winged game is expected — should stand just inside the edge of the wood, with their backs to the beaters, and take the rabbits after they have passed. This not only induces the rabbits to face the open, but precludes the possibility of an accident to the beaters. Capital sport can be enjoyed in the summer evenings by stalking rabbits with a pea-rifle in a suitable locality, i.e. where no danger to human beings or live-stock can be caused by a stray or deflected bullet. A disused quarry or sand pit is an ideal place for such sport.

One branch of shooting remains to be touched on, namely, wild-fowling, which again must be classed under two totally distinct headings, shore or flight shooting, and shooting afloat with a swivel punt gun. In flight shooting, the sportsman stations himself at a point over which the birds will probably pass at sundown or daybreak in their passage from or to the sea, when going to or leaving their inland feeding places. Success in flight-shooting must, therefore, depend very largely on chance or luck, but given a fair proportion of the latter, it is a fine, wild sport. One essential requirement is a well-trained and thoroughly intelligent dog, and here again no better can

be selected than an Irish water-spaniel. No special rules of guidance can be laid down for shore-shooting; the districts are unhappily few and far between where even a moderate bag of edible wild-fowl can be made nowadays, and experience alone can give that knowledge of their habits which is essential to success. Wild stormy weather which drives the birds off the sea is best for shore-shooting.

Punt-gunning or wild-fowling afloat is a sport confined to an exceedingly small number of people, professional or amateur, and is as distinct from ordinary inland shooting as deer-stalking from pigeon-shooting. It may be briefly described as the art of shooting wild-fowl on the sea, or in estuaries of rivers, from a flat-bottomed punt carrying a heavy, fixed gun, weighing anything from 70-170 lb, the muzzle of which rests in a revolving crutch in the bow of the boat, and firing a charge of 1-2 lb of shot. A punt may be either single- or double-handed, i.e. to contain one or two people, and it is perhaps unnecessary to add the fowl are shot sitting, or just as they rise from the water. It is a sport that contains a considerable element of danger, and requires great powers of endurance and a strong constitution no less than good nerves, and it has been rightly termed a science in itself, only to be learnt by a patient apprenticeship under an experienced teacher.

The art of shooting cannot be learnt theoretically, and can only be acquired by experience and practice. The beginner should, however, from the first seek to avoid an ugly shooting. or cramped style, which, once developed, is very difficult to get rid of, and should bear in mind that, in firing at a moving object, his purpose should be not to place his charge of shot where such object is at the moment he pulls the trigger, but where it will be by the time the shot reaches it; in other words the game should run or fly into the circle of pellets. Nor should he seek to effect this by dwelling on his game with his gun at his shoulder — a practice not only clumsy but exceedingly dangerous — but by firing at an imaginary point in front of it. Practice alone can teach the knack of doing this properly; to some men it seems a natural gift, while others do not acquire it in a life-time. A sound digestion is the surest aid to successful shooting, for unless the nervous system be in perfect tune, brain, eye and hand cannot act in that spontaneous sympathy necessary to quick and pretty marksmanship.

None the less a good deal depends on the gun, as well as the man who uses it, and in choosing a fowling-piece it will be found an advantage, no less than an ultimate economy, for the young shooter to place himself in the hands of a London gunmaker of repute, and

pay a good price for a good article. A 12-bore is the generally accepted gauge for modern shot guns, and this should weigh from 6|-6f lb. Of late years it is gradually becom- ing customary to reduce the length of the barrels from 30 to 28 in., a most decided improvement, as without diminishing the killing-power of the gun it improves its balance, and so lessens

the probability of shooting under game, a very common fault among sportsmen. Excessive choking is to be deprecated; a pattern of 140 for the right and of 160 for the left barrel will be found amply sufficient, and a load of 40-42 grains of nitro- powder with 1 or i| oz. No. 5ˆ unchilled shot will meet. all ordinary requirements of the shooting field. A thoroughly good hammerless ejector gun can be obtained from a first-class London gunmaker for 35-45 guineas, and a pair for £75 to £100, but these prices are capable of considerable modification or the reverse. Single-trigger guns are the latest fashion, but no special advantage can be claimed for them.

The bibliography of shooting is very extensive, but the following works may be cited as standard ones on the subject: The " Bad- minton Library " Shooting — Hints to Young Shooters, by Sir Ralph Payne- Gall wey ; "The Fur and Feather" series of publications; The Gun and its Developments, by Greener; and for wild-fowling, Colonel Hawker's evergreen Instructions to Young Sportsmen; The Art of Wildfowling, by Abel Chapman; The Fowler in Ireland, by Sir Ralph Payne-Gallwey ; and The Wildfowler, by Folkard.

Big Game.

The pursuit of large game, whether for food or sport, has ever exercised the greatest fascination for mankind, and with the rapid opening up of vast continents hitherto unexplored, and the introduction of breech-loading rifles, it has assumed an importance within the last few decades that bids fair to render it a thing of the past before the end of the current century. The present generation has seen the bison, which formerly roamed the American prairies in countless millions, wiped off the face of creation; the veldt of Southern Africa, which teemed in equal proportions with big game of every description, has become a pastoral country, where a few of the commoner varieties of antelope are suffered to exist under much the same conditions as the semi-wild deer of the Scottish Highlands; and even the jungles of Hindustan, save where jealously preserved by native potentates, show signs of exhaustion as regards the larger fauna. True, wherever the white man holds sway, the danger of extinction has been recognized; close-times have been instituted ;

reserves set apart wherein the animals may breed unmolested, and the number of each species that may be killed, restricted; but it is doubtful whether these laws, wholesome and well-intentioned as they are, can do more than retard the ultimate destruction of big game outside such reserves as the Yellowstone Park in North America. Within the pale of this no rifle is ever fired, and the game has prospered correspondingly, but once let a single head of it wander outside the restricted area, and its doom is sealed. Moreover, there are still vast tracts in Africa, and to a limited extent in other parts of the. globe, where big game forms the staple meat supply of the aboriginal inhabitants, who, in addition, are no longer dependent on their primitive weapons of the chase, but are equipped with more or less efficient firearms. Great regions are however still to be found, of which sportsmen have as yet barely touched the fringe. The dense forests of Western Africa are practically unexplored, much less shot out, and Central and Eastern Asia, the Dutch East Indies, and Borneo and Sumatra, offer an almost virgin field for sport with big game. Save for the Barren Grounds of the Arctic regions and some parts of the extreme north-west — though Alaska now enjoys particularly stringent game laws — the North American continent is fast becoming denuded of big game ; but in Europe, within a week's journey of London, the mountains of the Caucasus and the forests at their feet are only known to a handful of intrepid explorers. It will thus be seen that although good trophies, whether of hide or horn, are yearly becoming scarcer, fair sport is yet obtainable in those parts of the world where big game is indigenous, though the days are long past when a sportsman could shoot at his own discretion over the whole of Africa or North America, or when the globe-trotter visiting India could count on big game shooting as forming part of his programme.

Indeed, in view of the increased, and increasing, facilities for world travel, and the prevalent fashion for sport, it is probable that in course of time big game shooting will be universally

conducted on modern European lines; i.e. wild animals will be carefully preserved by the state and private owners, and where the latter do not care to exercise the sporting rights they will be let to the highest bidder, and big game shooting will, as with Scottish deer-stalking, become exclusively a pastime of the wealthy or luxurious classes. Already large tracts in the wilder parts of the Eastern States

of America have been acquired by rich men, over which they jealously preserve the sporting; and with the opening up of railway communication in the south of Africa to the Zambezi, and in the north to Khartum, the dawn of another century may not improbably see shooting-boxes advertised " to let for the winter months," dotting the very countries where Oswell, or Baker, found a virgin field for their rifles within the last few decades. Distasteful as such a state of things may seem to the present generation of sportsmen, some- thing more or less approaching it will inevitably come to pass; and where climatic conditions or inaccessibility forbid its adop- tion, big game will become extinct at the hands of native races or white " professional " hunters. Carpe diem must undoubtedly be the motto of the big game shooter of the present day, who requires genuine wild sport under the highest possible conditions. Even at present it is essential that he should obtain the fullest information as to the existing game laws in the part of the world in which he proposes to hunt, the whole of North America and practically three-fourths of Africa being governed by stringent regulations respecting the preservation of big game. Every state in the North American Union, and in some cases every county in a state, has its own close-times and game laws, and the same is true of Canada. Moreover, heavy fees for licences to kill big game are now exacted in all parts of the world where game laws exist. In the United States the cost of this varies very much, the present highest charge being $50 for a " non-resident " sportsman, while in addition in some states he is not permitted to hunt unless accompanied with a qualified guide. Full information on these points can be obtained gratis on applica- tion to the Board of Agriculture at Washington, where every assistance is given with the greatest courtesy, and which further issues admirably compiled pamphlets dealing with the whole question of game-preservation. Infringement of the United States Game Laws entails exceedingly heavy penalties, amount- ing in the most extreme case to two years' imprisonment plus a fine of $5000.

In Canada the highest charge is $100 in Manitoba, while in Africa it varies from £50 in the Sudan and British and German East Africa to £100 in Bechuanaland. Moreover, it must be borne in mind that these fees only permit the killing of a limited number of specified animals. Still, excellent as these laws undoubtedly are, their value must remain enormously discounted as long as the sale of game and skins by aboriginal or professional hunters is permitted; it is they, and not the heavily taxed foreign sportsman, who are responsible for the threatened extinction of big game. .

So far as Asiatic sport is concerned, British India, save to those furnished with credentials to native potentates or high government officials, offers scant opportunity as regards big game to the itinerant sportsman, who must now wander farther afield into Central or North-Eastern Asia, Borneo, Java and the wilder parts of Assam or Burma; but the greater portion of the first-named locality is only open to persons duly authorized by the Russian government.

Although South America and Australia offer little attraction for sport with the rifle, big game of varying species is thus indigenous in every part of the world. 1 It is obviously impossible within our limits -to deal at any length with either its habits or the various methods of hunting it. Brief allusion will be made, however, to the chief varieties of it found in the various continents and the necessary equipment for their pursuit.

Europe contains big game in greater variety and quantity than is generally supposed. The last survivors of the aurochs or European bison still roam the forests of Lithuania and the

1 Except in New Zealand, where red-deer have, however, been introduced and afford magnificent sport.

Europe.

Caucasus: elk are found in Scandinavia, Russia and Eastern Prussia, and red-deer are common to the whole of the continent. Of the more Alpine kinds of big game, reindeer exist in Norway; chamois in the mountainous districts of Central and Southern Europe; wild sheep in Corsica and Sardinia; while a few of the European ibex still linger in the royal pre- serves of the Italian Alps. A variety of ibex is fairly plentiful in Spain, and wild goats are found in South-Eastern Europe. Of the carnivora, bears, wolves and lynxes, though not often met with, still exist in fair numbers in most of the mountainous countries of Europe, though the first-named animal is practically the only one affording opportunity for sport with the rifle. Gluttons or wolverines are found in Scandinavia and Russia, and so-called wild-boar are plentiful in the carefully preserved forests of Central Europe. The reason for this continued supply of big game is that the whole of the European continent has been for centuries under private, communal or state preservation. The Caucasus, which though geographically in Europe, can hardly with fairness be held to be so as regards sport, further contain such purely Asiatic varieties of big game as tigers, leopards and tahr, and but for the savage character of the country

and its inhabitants, and the obstacles thrown in the way of foreign travellers, would probably be far more visited by English sportsmen than is at present the case. In civilized Europe, Scandinavia, Spain and the Mediterranean islands probably offer the best field for the big game hunter of moderate means, though the last named localities still enjoy an unenviable reputation for brigandage.

Among useful works of reference dealing with big game shooting in Europe the following may be cited: Wild Spain, by Chapman, and Wild Norway by the same author ; Flood, Fell and Forest, by Sir Henry Pottinger; Savage Svanetia and Sport in the Crimea and Caucasus, by Phillips Woolley; Tyrol and the Tyrolese, by Baillie-Grohmann; the volumes of the " Badminton Library " dealing with the subject, and especially Short Stalks, by E. N. Buxton.

The physical geography of so vast a continent as Asia, no less than its varying climatic conditions, naturally produce many different species of big game, ranging from the Alpine to the purely tropical. When it is remembered that the continent includes the frozen tundras of the Arctic Circle, the steaming plains of Hindustan, the treeless wastes of the Pamirs and the dense jungles of Burma, together with the highest mountains in the world, it will be readily seen how varied must be its fauna. Among the carnivora, the tiger and the leopard or panther are found practically throughout Asia, save in the extreme north and north-west; while lions, though exceedingly rare, still exist in Guzerat and parts of Persia and Mesopotamia. The usual methods of tiger-shooting in British Asia are, when the game has been located, either to drive it to the sportsmen by means of natives acting as beaters, or else to force it into the open with a long line of elephants, which also serve to carry the shooters; the choice of methods must, of course, depend on local conditions. The second practice is not a form of sport within the reach of men of moderate means, who, indeed, except as the guests of some native potentate, are not likely to have the opportunity of indulging in tiger-shooting at all. In localities where neither of these methods is feasible, it is usual to tie up a live animal as a bait, and sit up over it during the night in a machan or platform lashed to the nearest tree; but this is usually an unsatisfactory and disappointing proceeding. In parts of Asia other than British possessions, tigers are found as far apart as the shores of the Caspian Sea and the island of Saghalien. Europeans recover with difficulty from the bite of a tiger, since blood-poisoning is the almost inevitable result owing to the septic condition of the animal's teeth and claws, and a supply of antiseptic lint and solution should always form part of the tiger-shooter's equipment. Panthers, though more plentiful than tigers, are less frequently bagged, as they are

exceedingly difficult animals to beat out of covert; they are usually killed by sitting up over a bait, or by smoking them out of the caves they frequently make their homes. A wounded panther has the reputation of being a more dangerous animal than a tiger. Other varieties of the felines are the cheetah, the clouded panther,

Asia.

the lynx, and most beautiful and rarest of all, the ounce or snow leopard only found above the snow line.

Of other Asiatic carnivora the bears are the most important from the sportsman's point of view. A great variety of them exists, ranging trom the great Kamchatkan bear to the small blue bear of Thibet, but the methods of their pursuit call for no special mention.

The Indian elephant is rather smaller than the African variety, and has other well-marked differences, the chief as regards shoot- ing being the fact that the cavity at the top of the trunk is not protected by the roots of the tusk as in the African elephant, thus enabling a frontal shot to reach the brain. This point, one at the side of the temple, and another at the back of the ear, are most usually selected for their aim by Indian sportsmen, who do not favour the shoulder shot so commonly employed in Africa. A charging elephant can often be turned by a well-planted, though not necessarily fatal, bullet, but a really determined animal, especially a female with a calf, will not cease its attack until either it or the hunter be killed. Though elephants will usually fly from the report of a rifle, the sound of a human voice will often make them charge.

Four varieties of rhinoceros, of which two are one-horned, and two double-horned, are found in Asia, ranging eastwards from Assam through Burma and Siam as far as Sumatra. The rhinoceros is almost invariably found in heavy grass swamps, and can consequently only be hunted by means of elephants, It is usually beaten out by means of a long line, but is occasion- ally tracked to its lair on a single elephant. In common with many animals of the deer and antelope tribes, the rhinoceros always deposits its droppings in the same place, a peculiarity which enables native shikaris to locate it with tolerable ease. Although a rhinoceros, even when wounded, will rarely charge home, it has a peculiarly terrifying effect on tame elephants, and

specially trustworthy ones are necessary for this sport. The Indian rhinoceros differs in many important details from the African variety.

Of bovines, Asia produces the buffalo, three species of the gaur — miscalled the Indian bison — and the yak, the latter a rather uninteresting beast of the chase only found on the open ground of the Tibetan plateau. Very different is the pursuit of the gaur in the dense forests of India and Burma, where it is usually stalked on foot; and to track a wounded bull through thick jungle affords one of the most exciting experiences of big game shooting. Such an animal will almost invariably turn at right angles to its trail, and watch for its pursuer, whom it will charge from a distance of perhaps a few yards, even feet. The wild buffalo, too, is an exceedingly plucky animal, and will on occasion even attack a European — whose smell appears distasteful to it — unmolested, a peculiarity it shares with the tame variety.

The numerous species of deer and antelope scattered over the continent of Asia are usually obtained by stalking, but the former being essentially forest-haunting animals, while the latter are usually found on open ground, the methods of approach- ing them naturally vary with local conditions. Of deer the best known are the sambar, the chital and the swamp deer, but the Hangul or Cashmere stag, the Altai wapiti and the Maral or Asiatic red-deer afford the finest trophies. Of Asiatic antelope the handsomest and commonest variety is probably the black- buck, found practically all over India as far east as Assam.

To many sportsmen the most fascinating form of Asiatic big game shooting is the pursuit of the many varieties of wild goats and sheep, common to the various mountain ranges and high- lying plateaus of the continent. While such sport lacks the risk of attack from the animal hunted, it exacts remarkable powers of endurance and perseverance on the part of the hunter, coupled in most cases with the dangers inseparable from Alpine climbing. There is scarcely a mountainous or elevated part of Asia which does not contain some variety of wild goat or sheep, of which the best known are the ibex and markhor of the Himalayas and Hindu Kush among the former, and the Ovis Poll and 0. Amman of Tibet among the latter. As a general rule all wild goats can only be obtained under conditions which exact the highest

mountaineering qualities on the part of the stalker, but with regard to the sheep of the vast tablelands of High Asia — " the roof of the

world " — a good deal of work has to be done on pony back, as the rarefied atmosphere of these great altitudes precludes much physical exertion. Exception, however, in this respect must be made of the burhel — Oris Nahura — which haunts the same inaccessible crags as the ibex or markhor. The sportsman who essays to bag an Ovis Poli, or O. Ammon, will probably have had ample opportunity of testing his climbing powers on the march from India to his shooting-ground.

Ibex-shooting begins with the melting of the snows on the lower slopes, and ends in June, when the flies and the flocks of native herdsmen, driven to the Alpine pastures, force the wild animals to seek ground absolutely inaccessible to man. " First come first served " is a recognized rule in Himalayan shooting, and once a sportsman has claimed a nullah, or mountain valley, by priority of possession, it is his alone as long as he chooses to retain it; consequently the " race for the nullahs " in early spring is not the least exciting part of Himalayan big game shooting. In addition to ibex, markhor and such animals, the season's bag should also include two varieties of bear, and, with extreme good fortune, an ounce or snow leopard.

Like the fox in Great Britain, the wild boar is never shot in any part of British Asia where it can be hunted on horseback.

Thanks to the improvements in modern firearms, and particu- larly to the adaptation of cordite ammunition to sporting rifles, the battery necessary for Asiatic big game shooting p has been considerably reduced, both in weight and meat. number of weapons required. It is not long since 8-, or even 4-bore rifles, weighing respectively 18 and 24 lb, or at least a -577 Express, were considered indispensable for the pursuit of the pachyderms and larger bovines, yet nowadays a •450 rifle of 11 lb weight, in conjunction with cordite powder, is held amply sufficient for the heaviest or most dangerous game, the penetration or expansion of the bullet being regulated by the extent of its covering of cupro-nickel or steel. For soft-skinned animals, deer and mountain game, a -256 or -303 magazine rifle is the most useful weapon, and it may be confidently said that the introduction of these and similar small-bore rifles has extended the killing zone in stalking by at least 100 yds. For forest or jungle shooting a 10- or 12-bore Paradox gun is an admirable weapon, capable of use as a rifle against large and dangerous animals, or as an ordinary shot gun for small game. A double- barrelled rifle is essential for dangerous game, the saving of time, short as it is, in merely shifting the finger from one trigger to another, being an enormous advantage as compared with the action

of ejecting and re-loading from a magazine. Finally it may be said that a sportsman would be completely equipped for big game shooting in Asia, or indeed any part of the world, with a battery consisting of a 450 cordite rifle, a 10 or 1 2-bore Paradox gun and a -256 or -303 magazine rifle.

As regards the rest of his outfit, if he propose to shoot in any part of British Asia, he can procure this on the spot, as well, and far cheaper, than in England.

Useful works dealing with big game shooting in Asia are: Baldwin, Large and Small Game of Bengal; Forsyth, Highlands of Central India; Sanderson, Thirteen Years among the Wild Beasts of India; Kinloch, Large Game Shooting in Thibet, Sfc; Maclntyre, Hindu Koh; Steindale, Natural History; Demidoff, Sport in Central Asia; Ronaldshay, Sport and Travel 'neath an Eastern Sky; A Shooting Trip to Kamchatka; and Fife-Cookson, Tiger- Shooting in the Doon and Ulwar.

The main feature of African big game is the antelopes, which exist in great variety; such widely different animals as the noble sable antelope and the tiny dik-dik being classed among Attica them. African gazelles and antelopes may be roughly divided into two classes, those found on plains or open ground, and those frequenting forest or bush, and the methods of hunting them naturally vary with the locality. Still, as a general rule, the antelopes of the plains are not only the finer animals, but afford more enjoyable sport in the stalk, combined with the advantage of a climate free from malaria. There is practically no part of Africa where antelopes do not exist in one variety or,

another, but probably British East Africa or Somaliland offer the best field for sportsmen. On open ground a good deal of hunting can be done on horseback — except in those districts where the tsetse fly exists — and antelopes are occasionally ridden down, but a very stout-hearted horse is required to overtake such animals as sable antelopes, eland or gemsbok. Caution should always be exercised in approaching the larger varieties of antelope when at bay, whether wounded or not, as some of them, notably the roan and sable, and the oryx, are inclined to be very savage, and will charge desperately home. It is said that even a lion is chary of attacking the oryx, owing

to its long rapier-like horns.

The African carnivora include the lion, leopard, cheetah, hyena and other smaller varieties, but it is only necessary to deal with the first named, which, where not exterminated or driven away by civilization, itnay be said to be common to the whole continent. As with all game, big or small, the conditions of lion-shooting vary with the locEuity; thus, on the open plains of Somaliland, lions can be spied from a distance and stalked on foot, or even ridden to bay on horseback, while in densely bushed districts, unless chanced on in open ground, the most usual method is to sit up at night over a bait or kill, inside a zareba of thorn bushes. This method, however, makes aiming with any degree of accuracy a matter of difficulty, but a German, Herr Schillings, has demonstrated the use of a flashlight in such circum- stances. Lions frequently lie up or shelter in detached patches of scrub, whence they may be driven by a " bobbery " pack of dogs, or as a last resource the bush may be set on fire, the sports-man having previously concealed himself down wind. Lions when emboldened by hunger will fearlessly attack human beings, especially at night, and, like tigers that have once developed a taste for human flesh, become positive scourges of their neigh- bourhood. Mr F. C. Selous, than whom there are few better authorities, considers the lion the most dangerous of all African big game, a distinction that other writers award to the buffalo.

Of the pachyderms the commonest is the rhinoceros (R.bicornis) , usually termed the black rhinoceros to distinguish it from the so-called " white " variety now almost extinct. Though the first-named is by no means so widely distributed as formerly, it is still plentiful in Equatorial Africa, and to a lesser extent in Somaliland. It bears rather a mixed character for ferocity, but most hunters agree that while it will charge with little or no provocation, it does so blindly, and rarely turns to renew the attack. This is probably due to its exceedingly poor sense of sight, but its sense of smell is correspondingly extraordinarily acute, while an additional cause that renders it a difficult beast to stalk is the presence of the " rhinoceros birds " which are its almost invariable companions, and which warn it of danger. Though so huge an animal, the rhinoceros is easily killed by a bullet in front of the base of the ear, or midway along the neck; the shoulder shot is only employed when the hunter has stepped aside to avoid a charge. The hippopotamus is still plentiful throughout most parts of uncivilized Africa. In narrow rivers where they can be shot from the bank, they are easily killed by a brain-shot, the best spot to aim at being the base of the ear. If the bullet be properly placed the animal will sink to the bottom of the

stream and rise to the surface within a few hours. Hippo- potami are nocturnal feeders, and can be occasionally shot at night when at a considerable distance from water; but owing to the difficulty of placing the bullet accurately, they are apt to escape wounded. Hippopotamus shooting does not rank high as a sport, but the meat, when young, is excellent, and the huge size of the animal enables a hunter to provide a large number of followers with food; this can be the only excuse for killing these comparatively harmless animals in any number.

Elephants still exist in considerable numbers in parts of Africa, but, unless more stringent methods of protection are afforded, their ultimate extermination at the hands of professional ivory- hunters, white or coloured, is inevitable. What can be done in the direction of preservation is shown in Cape Colony, where elephants, which have been rigidly protected for many years, now exist in considerable, and increasing, quantity. Elephants

have an extraordinarily keen sense of smell, which, coupled with their habit of roaming over vast expanses of country, forms their chief safeguard against the relentless persecution to which they are subject. They may be hunted either on foot or horseback; where feasible, the latter is the preferable method, as it not only enables the hunter to follow up his quarry with greater ease — and when startled, or wounded, elephants will travel enormous distances — but in open country gives him a better chance of escape from a charge. The heart, or broadside, shot is usually employed. Incredible as it may seem, these enormous creatures can be killed by a single pellet of hardened nickel, discharged from a -303 rifle. A weapon of heavier calibre is, however, t« be recommended, and a -450 rifle, or 10 or 8 bore Paradox gun, are most suitable; the closer the hunter can safely get to the animal the better. A charging elephant can usually, but not invariably, be turned by a shot in the chest ; to fire at the head is useless.

The buffalo (Bos caffer), formerly one of the commonest of African wild animals, has been practically exterminated in many parts by the plague of rinderpest, but is still plentiful in the malarious swamps between the mouths of the Limpopo and the Zambezi, and even more so in the Beira district of Portuguese East Africa. Like most wild animals, the buffalo is naturally disinclined to take the offensive, but when roused to action, it will pursue a hunter with relentless ferocity, and is held by many authorities to be the most dangerous of African big game. The greatest care should therefore be exercised in following up a wounded animal, or in approaching one that is

apparently dead, for as long as a spark of life lingers in it, it will endeavour to destroy its destroyer. A wounded buffalo will nearly always make for the nearest thicket, where it will await its pursuer, and in such circumstances, it should be left alone for an hour or two, when it will probably lie down, and be less active in attack owing to its wound having stiffened. A charging buffalo always carries its head at such an angle that a frontal shot is useless, unless the bullet penetrates through the nose into the throat or chest. ! A -500 or -450 rifle with a solid bullet, or an 8-bore Para- dox gun is the best weapon for buffalo-shooting. Other varieties of the African bovines are the smaller, Abyssinian, the Senegalian, and the dwarf, or Congo buffaloes.

The only other species of African big game calling for special mention is the giraffe, which is usually ridden down and killed by a raking shot at the root of the tail ; but except when required for food or specimens, the destruction of this inoffensive animal, which offers no trophy of the chase, is to be deprecated. Great numbers are annually destroyed by professional skin hunters, and their carcases left to rot. Bears, though little known, exist in North-West Africa, and the ubiquitous wild goat, or ibex, is also found in the north of the continent. A -450 cordite rifle, a -303 small bore, and a 10 or 8 bore. Paradox gun, is an ample battery for African big game shooting.

Useful books of reference for African shooting are: Selous, A Hunter's Wanderings in Africa; Travel and Adventure in S.E. Africa, by the same author; Baker, Wild Beasts and their Ways; Swayne, Seventeen Trips through Somaliland; Powell Cotton, Travel and Adventure in the Congo Free State, A Sporting Trip to Abyssinia; Melliss, Lion Hunting in Somaliland; Willoughby, East Africa and its Big Game; Neumann, Elephant Hunting in East Equatorial Africa; Hay, Western Barbary; Bryden, Kloof and Karroo; Millais, A Breath from the Veldt; Thomson, Through Masai- Land, and Theodore Roosevelt, African Game Trails (N.Y. 1910).

Big game in North America has been rapidly disappearing for several decades before the advance of civilization armed with breech-loading rifles. Among the carnivora, bears and pumas are the only species that need be taken into A^ertoH. account as far as shooting is concerned. Of the former three 1 varieties exist, the grizzly, rarely found east of the Reeky Mountains, the brown bear, and the black bear, common to practi-

1 The Polar bear may be claimed as a fourth species, as it is found

on the mainland of the ice-bound north, but it can hardly be included as far as big game shooting is concerned. American naturalists recognize many sub-varieties of both the grizzly and brown bear.

cally the whole of the continent, though now rarely killed in the Eastern states. The best country for bears is Alaska, where the grizzly grows to an enormous size, and the Kodiak Island bear is probably the largest variety of its genus in the world, except perhaps the Yezo bear of Japan. In Alaska, bears are frequently shot along the river-banks, to which they resort in autumn to feed on the salmon which then crowd the rivers. Otherwise no fixed rule can be laid down for American bear-shooting; the quarry may be hunted with dogs, which " tree " the black bear, or bring the grizzly, which is unable to climb, to bay; it may be killed over a bait; it may be spied and stalked, or, most common of all, it may be accidentally " jumped " and shot by the hunter. The neck or heart is the most vulnerable spot to aim for, but bears are very tenacious of life, and astonishingly active, despite their clumsy appearance. Their eyesight is bad, but their sense of smell and hearing very acute. The biggest of grizzlies will rarely charge unprovoked, unless it be a female with cubs, but when molested or wounded it will push its attack home with the greatest temerity, and caution should always be exercised in approaching a wounded animal, even when apparently dead.

Of North American Cervidae the finest is the wapiti, invariably miscalled elk, once as plentiful as the bison, but now extinct east of the Rockies, where, though still fairly abundant, it is found in sadly diminished numbers. It is especially common in Van- couver, but as is almost invariably the case with insular deer, the heads are small compared to those of the mainland. Wapiti- hunting is probably the finest sport in America, not only from the magnificent trophy these splendid deer afford, but also on account of the beautiful country they frequent in the United States; open rolling ranges of hills interspersed with patches of timber. Wapiti are almost invariably killed by stalking during the rutting-season, when the big bulls betray themselves by their defiant challenge. The largest deer in the world is the North American moose, which, except for a difference in size, is precisely the same animal as the elk of Northern and Eastern Europe. It is essentially a forest-haunting animal, which in the Eastern States and Canadais frequently killed by " calling " i.e. imitating the call of the cow , and so attracting the rutting bull to within shot of the

hunter. This is usually effected by means of a species of trumpet made of birch-bark, and in this art of "calling" both white men and Indians become exceedingly skilful. In Alaska, where the finest moose are found, they are usually stalked or " still-hunted " on foot, and to " still-hunt " these animals in dense timber successfully is a most delicate piece of wood craft. Unless struck in a vital part a wounded moose will travel enormous distances, but a single shot in the heart, or better still, the neck, is usually fatal. A wounded moose can be dangerous and should be approached with caution.

The North American caribou, which is practically the same animal as the European and Asiatic reindeer, may be divided into two varieties: the Barren Ground caribou, found in the north, and the Woodland caribou, found all over the forests of Canada, and in a few localities in the United States. The former is probably the only wild animal existing on the American continent in practically the same numbers as formerly, while the latter, thanks to careful preservation, is still abundant. The Barren Ground caribou of the northern regions of North America are frequently hunted by white men. They form the staple food of the natives of Arctic North America, and huge quantities of them are killed during the spring and autumn migration, especi- ally when swimming lakes or rivers. The woodland caribou is easily stalked in fairly open ground, and a bullet in the heart or neck will kill the largest bull. Caribou and reindeer are the only animals of the .Cervidae in which the females have horns as well as the males. The two most widely separated districts of Canada, Newfoundland and British Columbia, probably afford the best ground for woodland caribou. Other American deer are the mule, or black-tailed, and the Virginian, or white-tailed, both widely distributed throughout the continent, but the latter, which is essentially a denizen of thick forest, is much the most difficult beast to stalk. It is occasionally " hounded " or hunted with dogs, which drive it to runways where the hunter

has previously concealed himself. A smaller variety of the black-tail is found on the Pacific coast.

The prongbuck, invariably, but incorrectly, styled an antelope, is a sporting little animal only found on open plains. It was formerly exceedingly plentiful, but is now sadly diminished in numbers. It can only be obtained by fair stalking, and the shot has almost invariably to be taken at long range. It affords excellent sport when coursed with greyhounds. It is the only hollow horned ruminant which annually sheds its horns.

Now that the bison is extinct as far as shooting is concerned, the only bovine of North America is the musk ox of the Arctic Circle, but few sportsmen care to undergo the discomforts attendant on the pursuit of this animal, which moreover is an exceedingly uninteresting beast of sport and offers but a poor trophy. The same may be said of the Rocky Mountain goat, a curious animal, which zoologically is an antelope, and which, though its pursuit exacts great powers of endurance and moun- taineering ability, is so stupid, or self-confident a creature, that practically no science is required to stalk it. Very different is the chase of the magnificent big horn or wild sheep, now scarce in the United States, but fairly plentiful in the Kootenay district of British Columbia, and which, when killed by fair stalking, affords a trophy that may be considered the Blue Ribbon of American big game shooting. It is occasionally hunted with dogs, which hold it at bay until the hunter can get within range, or it may be killed by watching the so-called " licks," or beds of limestone clay, to which these animals are fond of resorting, and which they lick or gnaw, presumably as a form of corrective. Big horn, varying according to locality, are found as far north as the shores of the Bering Sea, and south to Northern Mexico. The only other wild animal of North America that needs mention is the puma or panther. This is invariably hunted with dogs, which " tree " it or hold it at bay until the arrival of the hunter, while a good pack of staunch hounds will kill it themselves. To seek it without the aid of dogs is useless, and it is therefore an uninteresting beast of sport. Certain American writers have claimed a rather spurious courage for the puma, but the general consensus of opinion is that it is a skulking, cowardly beast.

No special battery need be taken to America; a -303 rifle is sufficient for all the big game of the continent, but a -400 or -450 cordite rifle is probably preferable for dealing with the big Alaskan grizzlies.

Useful works of reference for American shooting are: Roosevelt, Hunting Trips of a Ranchman ; Van Dyke, The Still-Hunter ; Pike, The Barren Grounds of Northern Canada; Grohmann, Camps in the Rockies; Caton, The Antelope and Deer of America; American Big Game Hunting (edited by Roosevelt); Davis, Caribou Shooting in Newfoundland; Buxton, Short Stalks; Whitehead, Camp Fires of the Everglades; and the volumes of the "Badminton Library" dealing with the subject.

Although two or three sorts of unimportant deer are found in South America, as well as the puma and jaguar, it does not call for special mention in respect of big game America. shooting, an extraordinary fact in view of the enormous size of the continent. The best work of

reference is Kennedy, Sporting Sketches in South America.

Arctic big game shooting appeals to such a small class of sportsmen, and is so limited in its variety of game, that it need not be touched on here. Full information on the subject can be found in the works of Lamont, Nansen, and other Arctic explorers.

Some of the finest deer stalking in the world can be obtained in New Zealand, by those able to spare the time for so long a journey.

Big game shooting is not only an exceedingly expensive amusement, but one of which the cost has been continually increasing, and no expedition of any length outside Europe could be enjoyed under an expenditure of from Geae j 1 £3°o-£5°°; but in view of the enormous difference in tions. local conditions, no less than individual requirements, no hard and fast scale can be laid down. East Africa, and Somaliland are probably the most expensive localities in which*

Other areas.

to hunt, on account of the numbers of porters, and followers, with which a sportsman is obliged to encumber himself, while British India is relatively the cheapest. South of the Zambezi in Africa, it is usual to transport stores and equipment in an ox- wagon, and though the initial cost is heavy, great part of this can be recouped by selling the equipment at the end of the trip. No matter in what part of Africa it is purposed to hunt, it is advisable to bring everything, camp-equipment — Weissman tent, mosquito curtains, camp bedstead, table and chair — and all stores from England. These latter should be packed in strong boxes, each branded with the nature of its contents, to weigh when full 65 lb, the weight an African porter can conveniently carry. Beads and presents for natives should not be overlooked. In India, on the other hand, nearly everything can be procured cheaper and better there than in England, while as regards North America, as indeed everywhere, the expense of a shooting trip varies largely with locality; the outfit of wagons, horses and attend-ants requisite for Wyoming or Montana, being useless in British Columbia, or Alaska, where everything has to be " packed "on Indian porters. Of Central or Northern Asia it is difficult to speak with any degree of accuracy as regards expense; but on this important point, no matter in what part of the globe an expedition may be planned,

information should be sought from only the latest and most reliable authorities.

The hunter's personal equipment, rifle, clothing, saddlery, &c, should be the best procurable. Where a camp bed is not practicable, a sleeping-bag of three partitions and waterproof back should be taken. Clothing must of course be adapted to the climate, but flannel must always be worn next the skin, and a cholera belt is a necessity. It should be remembered that clothing should err on the side of warmth; a chill can be contracted in the tropics just as easily as in a temperate clime, and is far more dangerous in its effects. A small medicine-chest should form part of the equipment, and most medicines can now be obtained in easily portable tabloids. Warburg's fever tincture, and quinine, are essential in tropical or malarious districts. Cheap rubber-soled shoes, to be thrown away when worn out, are excellent for rock work, otherwise no footgear can equal a well-made English shooting boot. Good field-glasses are preferable to telescopes, on account of their hancfiness. Now that big game shooting has become the " fashion," and facilities for world travel are increasing every year, people are prone to enter on the sport with but vague ideas as to its dangers, hardships and responsibilities. Presumably no one not of sound constitution would undertake an expedition to, say, Central Africa, or Asia; but even granted this necessary qualification, he may be naturally unfitted by temperament to deal with the discomforts and draw- backs inseparable from big game shooting, even under the most favourable conditions. He may be able to plant shot after shot on the bull's-eye of a stationary iron target, yet this is a very different matter from finding the shoulder of an animal moving through surroundings which closely assimilate with its own colouring, or from placing his bullet in exactly the right spot to stop the charge of an infuriated wild-beast. In such a situation, if eye, hand, or nerve fail him, the odds are that the creature wiil kill him instead of his killing it, for, as has been truly said, dangerous wild animals when wounded, or provoked beyond endurance, will hunt a human being as a terrier does a rabbit. In dealing with coloured retainers, whether Asiatic or African, the hunter should above all remember that he is a white man, and exact implicit obedience and respect, by combining firmness with scrupulously fair treatment. Again, to instance a minor, but none the less important, essential, how many would-be big-game hunters are there who can trust themselves to find their direction by a compass, or steer a course at night by the aid of the best-known constellations? Yet this is merely one of a hundred other requirements necessary .to travel in a wild country.

(P. St.)

SHOP, a term originally for a booth or stall where goods were sold, and in most cases also made, now used chiefly in the sense of a room or set of rooms in a building where goods are displayed for sale and sold by retail, also the building containing the rooms. Another application of the word is to the building or rooms in which the making or repairing of articles is carried on, a carpenter's shop, a repairing-shop, at engineering works and the like. In America, in the smaller towns and rural districts the " shop " is usually styled a " store " (O.F. estor, Late Lat. slaurum, instaurare, to build, construct, in later use, to provide necessaries). While in- America in the larger cities the word " shop " is becoming applied to the retail places of sale, in English usage " store " has in recent years become the recognized form for the large retail places for universal supply.

SHORE, JANE (d. 1527), mistress of the English king Edward IV., is said to have been the daughter of Thomas Wainstead, a prosperous London mercer. She was well brought up, and married young to William Shore, a goldsmith. She attracted the notice of Edward IV., and soon after 1470, leaving her husband, she became the king's mistress. Edward called her the merriest of his concubines, and she exercised great influence; but, says More, " never abused it to any man's hurt, but to many a man's comfort and relief." After Edward's death she was mistress to Thomas Grey, marquess of Dorset, son of Elizabeth Woodville by her first husband. She also had relations with William Hastings, and may perhaps have been the intermediary between him and the Woodvilles. At all events she had political importance enough to incur the hostility of Richard of Gloucester, afterwards King Richard III., who accused her of having practised sorcery against him in collusion with the queen and Hastings. Richard had her put to public penance, but the people pitied her for her loveliness and womanly patience; her husband was dead, and now in poverty and disgrace she became a prisoner in London. There Thomas Lynom, the king's solicitor, was smitten with her, and wished to make her his wife, but was apparently dis- suaded. Jane Shore survived till 1527; in her last days she had to " beg a living of many that had begged if she had not been." More, who knew her in old age when she was " lean, withered and dried up," says that in youth she was " proper and fair, nothing in her body that you would have changed, but if you would have wished her somewhat higher." Her greatest charm was, however, her pleasant behaviour; for she was " merry in company, ready and quick of answer." She figured much in 16th-century literature, notably in the Mirrour for Magistrates, and in Thomas Heywood's Edward IV. The legend which

connected Jane Shore with Shoreditch is quite baseless; the place-name is very much older.

Bibliography. — Most of our information as to Jane Shore comes from Sir Thomas More's Life of Richard III., edited by J. R. Lumby (Cambridge, 1883), supplemented a little by Edward Hall (Chronicle, pp. 363-364). See also H. B. Wheatley's edition of Percy's Reliques, ii. 264 (1876-1877), and J. Gairdner's Life and Reign of Richard III (Cambridge, 1898). (C. L. K.)

SHORE, a word meaning (1) the margin or edge of land when bordering on a large piece of water, whether of an ocean or sea or lake, " bank " taking its place when applied to the borders on either side of a river; for the legal aspect of the " shore," i.e., the space bordering on tidal waters between high and low water mark, see Foreshore; (2) a prop of timber, used as a support, temporary or permanent, for a building when threatening to fall or during reconstruction (see Shoring), and more particularly a timber support placed against a ship's side when building on the stocks, or when ready for launching on the slips; the props which are the final supports knocked away at the mement of launching are called the " dog-shores," one of the very numerous uses of " dog " for mechanical devices of many kinds (see Ship- building). Both words are to be derived ultimately from the same source, viz., the root seen in " shear," to cut off; in sense (1) the word means a part cut or " shorn " off, an edge, and appears in M.Eng. as schore, from O. Eng. sceran, to cut, shear; in sense (2) it is of Scandinavian origin and is an adaptation of the Nor. skora, a piece of timber cut off to serve as a prop or support.

SHOREDITCH, an eastern metropolitan borough of London, England, bounded N.W. by Islington, N.E. by Hackney, E. by Bethnal Green and Stepney, S. by the City of London, and W. by Finsbury. Pop. (iqoi), 118,637. It is a poor and crowded district extending east and west of Kingsland Road, and has a large artisan population. Chain-making, cabinet work, and other industries are carried on. An old form of the name is Soersditch, and the origin is lost, though early tradition connects it with Jane Shore, mistress of Edward IV. The parliamentary borough of Shoreditch includes the Hoxton and Haggerston divisions, each returning one member. In Hoxton is the Shoreditch technical institute. The borough council consists of a mayor, 7 aldermen and 42 councillors. Area, 657 '6 acres.

SHOREHAM, a seaport in the Lewes parliamentary division of Sussex, England, near the mouth of the river Adur, 6 m. W. of Brighton on the London, Brighton & South Coast railway. Pop. of urban district of New Shoreham (1901), 3837. The town is sometimes known as New Shoreham, in distinction from the village of Old Shoreham, a mile up the river, which was the former port. The church of St Mary the Virgin lacks almost the entire nave, but the remainder shows fine work ranging from Norman to Early English. Of no less interest is the church of St Nicholas, Old Shoreham, a cruciform Norman structure retaining some remarkable early woodwork. There are public gardens containing a museum and theatre. The trade of the small port is chiefly in coal, corn and timber. Shipbuilding is also carried on. The important public boys' school of St Nicholas, Lancing, near Shoreham, is part of a wide scheme which within Sussex includes the middle-class school at Hurstpierpoint, that for sons of tradesmen, &c, at St Saviour's, Ardingly, and the girls' school of St Michael's, Bognor. The scheme was originated by the Rev. N. Woodward in 1849.

It seems probable that soon after the Conquest the increasing prosperity of New Shoreham (Soresham, Sorham, Schorham) resulted in the decay of Old Shoreham, and that the borough grew up within the former. Shoreham owed its early importance to the natural harbour formed by the river Adur. In the time of the Confessor it was held by Azor of the king, but in 1066 was among the lands granted to William de Braose. From here Charles II. escaped to Fecamp after the battle of Worcester, 1651. It became a port of great consequence in the 13th and 14th centuries, but in the 15th and following centuries was much reduced, doubtless owing to the encroachment of the sea. The port revived during the reign of George III., when acts were passed for securing and improving the harbour. Shoreham was called a borough in 1236. In 1308 there was a mayor, and the " mayor and bailiffs of Shoreham " are mentioned in a Close Roll of 1346, but no charter of incorporation is known. The town adopted the Local Government Act of 1858 in 1866. It returned two members to parliament from 1295 until it was disfranchised in 1885. In the reign of Edward I., William de Braose held at Shoreham by prescriptive right weekly markets on Wednesdays and Saturdays, and a two-days' fair at the Exaltation of the Holy Cross. In 1792 the market-day was Saturday and a fair was held on the 25th of July, but these are not now held. Ship- building has always been the chief industry, and was largely carried on in the 13th and 14th centuries.

SHORING (from " shore," a prop), an operation connected with building. It is often necessary before actual building is begun to support adjoining premises while the work of excavating for underground apartments is being carried out. The art of shoring comprises the temporary support of buildings, and may become necessary because of the failure or settlement of some portion of the structure or for the purpose of upholding the upper portion while alterations are being made in the lower. There are several different forms of shoring, each adapted to suit peculiar circumstances. Much of the shoring for ordinary cases is done with heavy, roughly sawn timbers strongly braced together, but for especially heavy work steel members may be introduced and prove of great value. There is the trouble in connexion with their use, however, that connexions between steel members are not made with the same facility as between pieces of timber.

The form of shore in most general use is that known as the raking shore. It consists of one or more timbers sloping from the face of the structure to be supported and bedded upon the ground. As the ground is usually of a more or less yielding nature, a stout timber plate termed a sole-piece, of sufficient area to withstand being driven into the soil, is placed to receive the base of the raking timber or timbers. A wall-plate, with the object of increasing the area of support, is fixed to the face of the wall by means of hooks driven into the wall. Where space is available an angle of 6o° is the best to adopt for the main shore, the auxiliary members ranging in their slope from 45 to 75°. In many cases, especially in towns, the angle of slope is governed by outside influences such as the width of the footway. Raking

Fig. 1.

shores are erected in " systems " of two or more members placed in the same vertical plane at right angles to the face of the wall. The different members rise fanwise from the sole-plate to support the wall at different points. The distance horizontally be- tween the systems depends on the condition of the building being propped up, and also upon the spacing of its window and other openings. The usual spacing is 10 ft. or 15 ft.- apart, but this distance has often to be varied according to the posi- tions of the openings in the wall. The application of the shores should be carefully made and support given only where there is a corresponding thrust inside, such as from a floor or roof, as without this the shore is liable to act more as a de- structive agent than a support- ing one, and cause the wall to cave in at that point, or placed against a parapet wall it might have the

effect of pushing it over. The members, therefore, should be so placed as to meet the wall at a point somewhat below the floor or roof, so that if their length were continued they would meet and support the end of the floor or roof inside. Perhaps the best idea of the positions and functions of the various component parts of a system of raking shores can be obtained from a description of the various members, coupled with some little study of the illustrations (fig. 1). The names of the different timbers are therefore set out here, and against each part is given a short description of its use and position.

Raking Shore, or Raker. — This is a piece of timber sloping up from the sole-plate to the wall-piece. For a detail drawing of the connexion between the raker and wall-plate see fig. 2. The top and longest shore is often formed in two pieces, in which form it can be more conveniently handled. The upper piece is termed the riding shore or rider, and the lower member which supports it is known as the back shore. At the junction of the rider and back shore a pair of folding wedges is introduced and driven in to give the head of the rider a firm bearing against the needle and wall-plate above. The sole-piece has already been mentioned as the timber base upon which the shores take their bed or bearing. It usually consists of a piece of 11 by 3 plank, but when the ground is soft or the load supported very great it should be bedded on a platform of timber to spread the weight over a large area. The sole should be placed sloping down towards the building at something less than a right angle (say 8o°) with the inside of the shore to enable the latter to be gradually levered to a firm bearing with the aid of a crowbar. Wedging should not be resorted to or the already shaky building may sustain further injury through the vibra- tion. When in position the foot of the shore is fixed by dog-irons to the sole- piece, and for additional security a cleat is spiked on the sole tight up to the shore to prevent any slipping.

Braces. — When more than one shore takes a bearing upon the sole-piece the feet of the several members are stiffened and braced, either by having rough boarding nailed right across them or by being bound together with a number of rounds of hoop-iron. For further strength also braces of i-in. boards, 6 to 9 in. wide, are taken across from the wall-plate to the topmost shore and spiked to each intervening member, binding the whole together. These braces should be fixed a little below the junctions of the heads of the shores with the wall-plate. The wall-opiate has already been re- ferred to. It is usually a deal 9 in. wide by 3 in. thick, secured tightly against the face of the wall with wrought-iron wall hooks, forming a good abutment for the shores and serving to spread the support

wallplate:

Fig. 2.

afforded by them. Holes are cut through this plate to receive the needles (or joggles as they are sometimes termed to distinguish them from the needles used in dead shoring, which are large horizontal

Fig. 3.

members usually of balk timber), which are pieces of wood about 1 ft. long and 4 in. square in section, cut with a shoulder to butt against the wall-plate. A portion of a brick or stone is removed from the wall and the end of the needle is passed through the rect- angular hole in the wall-plate and fitted into the recess in the wall.

The head of the nesdle projects about 4§ in. beyond the face of the wall-plate and forms an abutment for the head of the shore. The head of the shore is notched to fit the underside of the needle to prevent any movement sideways. If this is not done the shore is liable to be acted upon by the wind and be blown down. A small

block of wood, cut somewhat after the fashion of a wedge and termed a cleat, is fixed above the needle to keep the latter quite firm. Cleats are used also in other positions to keep timbers in position. Wedges are used to obtain a tight bearing for the rider shores and are used at their base. As little force as possible must be em- ployed in driving them as vibration is liable to injure the already weakened wall.

Horizontal shores, or flying shores as they are more often termed by the workman, may be employed for spans up to about 35 ft. They are used to support the party walls of the houses adjoining the pre- mises being rebuilt. They are erected during the pulling down operations and removed as the new building is raised and there is no further need for them. A system of flying shores consists of one or more horizontal timbers, sometimes known as dog shores, cut in tightly between the wall- plates fixed with hooks to the faces of the walls of the ad- joining buildings (fig. 3). These horizontal members are supported at each end by cleats and needles fixed in the wall-plate as described for raking shoring. The shores are supported in their length by inclined braces springing from needles fixed near the

Fig. 5.

lower ends of the wall-plates and serving to strut the shore at a point about a third of its length from the wall. Corresponding braces are carried from the upper surface of the shore and abut against needles at the upper ends of the plates. Straining pieces are secured to the upper and lower faces of the shore to serve as abutments for the ends of the braces. The best angle for these braces is one of 45 °, but a smaller inclination than this is frequently adopted. Wedges are inserted, usually at the end of the flyer so as to tighten this up between the wall-plates, and sometimes between the braces and the straining piece, and carefully driven to tighten up the whole and cause each timber to find a close bearing. If the adjoining premises are of considerable height and especially if it is proposed to undertake extensive excavations, the systems of flying shores may need to be somewhat complicated, each consisting of several horizontal members spaced from 10 to 13 ft. apart and well strutted one to another and to the wall-plate (fig. 4). In the application of this form of shoring, as in raking shores, the same rules

apply as regards placing the shores on the face of the wall in a proper position to obtain a solid abutment on a floor or roof on the other side. The members should be securely dogged and spiked together to form a homogeneous frame- work capable of resisting the attacks of a strong wind, which in an exposed position will sometimes destroy a poorly constructed framework.

Horizontal shores should be adopted wherever possible in preference to raking shores. Besides being more economical, they are more convenient and more effectual than rakers springing from the ground, especially if the height of the building is considerable and the span at the most not much over 30 ft. Apart from the economy effected, they present a direct resistance to the thrust and are well out of the way of any building operations that may be carried on below them, so that there is no risk of their being accidentally disturbed, whereas the feet of raking shores are generally in the way of the workmen, and if not disturbed by accidental blows from materials or carts will very likely be loosened and rendered useless by the digging and pumping which is going on around them.

Needle shoring is the next method of temporary support to come under consideration. It is known also as vertical shoring and dead shoring, and is the means usually adopted to support temporarily

VERTICAL SHORING

Fig. 6.

the upper portion of the walls of a building when it is found necessary to reconstruct the foundations or to make large openings in the

From a photograph by W. T. Green.

Fig. 7. — Shoring of the Presbytery, Exterior, Winchester Cathedral Restoration.

lower parts of the wall, as, for example, when putting a shop front in an existing building. – This form of shoring consists of horizontal members of balk timber termed needles (very different from the needles used in raking and flying shoring), which are passed through holes in the wall to be supported, at a sufficient height to allow of the insertion of any arch or lintels that may be necessary above the opening it is proposed to cut (figs. 5 and 6). The needles are supported at each end by an upright timber or dead shore, one on each side of the wall to each needle. These should not be allowed to rest upon any floor or vault but be carried down to a solid foundation and set upon and securely dogged to ;a timber sleeper running parallel to the wall. If it is not practicable to take the inner dead shore through intervening floors down to the solid ground in one piece, and it is necessary for its base to be set upon the floor or upon sleepers placed on the floor, the strutting must be continued in a direct line below it until a firm foundation is obtained. Between the needle and the head of the dead shores folding wedges are in- serted to force the horizontal supporting balk firmly up to the underside of the masonry. Connexions between the dead shores and the needles and sleepers are made with wrought iron dogs. The spacing of the systems of dead shoring depends to a large extent upon the material with which the wall is constructed; for brickwork they should be placed at intervals not greater than 6 ft. With this form of shoring especially it is often found necessary to adopt other methods auxiliary to the main shoring. These take the form of raking or flying shores from the face of the building. All the openings in the wall above should be well strutted between their reveals to prevent any alteration of shape taking place. Inside the building vertical shores or strutting must be carried up independently in a direct line between the floors with head and sole plates at floor level and ceiling. This

strutting must start from a firm foundation at the bottom of the building and be tightly wedged up so as to relieve the wall of any weight from the floors and roof. To obviate settlement as much as possible, work done in underpinning should be built slowly with Portland cement mortar mixed in strong proportions. Before the shoring is removed at least a week should elapse to allow the work to set hard and firm. Then the needles should be carefully loosened and -emoved and the holes from which they were withdrawn made good. The remainder of the props can then be " struck," leaving the raking or flying shores until the last. If possible this work should be spread over several days, an interval of a day or two being left between the removal of each portion of timbering to allow the work gradually to set on its new bearings.

Shoring should be the subject of careful calculations to ascertain the most suitable sizes of timbers and to determine the most appro- priate points of support. This is not always done, however, and much work of this character is carried out by rule of thumb methods. The usual result is that the timber used is of a much greater size than is really necessary, although as the material is not much injured and is available on removal for re-use this fact is not of

great consequence. Such methods perhaps work very well for ordinary buildings, but in special cases they may very well lead to shoring being constructed in too fragile a manner, with serious results. Some rules which experience has shown to work satisfactorily for ordinary work are given below, together with the ap- proximate scantlings of the timber required.

Rules and Sizes for Raking Shores. — Walls 15 ft. to 30 ft. high should have 2 shores to each system ; if 30 ft. to 40 ft. in height, 3 shores each system; if 40 ft. or more in height, 4 shores, with an additional shore for each 10 ft. in- crease. Shoring is rarely seen more than

5 shores high. The angle of the main shores is usually about 60 °, and none of the timbers should exceed an angle of 75°. Some of the lower shores will slope much less than this, at angles between 40° and 60°. The systems should not be placed at a greater distance apart than 15 ft. It is often found convenient to place them at the piers between window openings. As regards the sizes of the timbers used for walls 15 ft. to 20 ft. high, the shores may be 4 in. or 5 in. square in section; for walls 20 ft. to 30 ft. high, 6 in. by 6 in., or 9 in. by 4! in.; for walls 30 ft. to 35 ft. high, 12 in. by

6 in., or 8 in. by 8 in.; for walls 40 ft. to 50 ft. high, 9 in. by 9 in.; for walls above this height 12 in. by 9 in.

For Horizontal or Flying Shores. — For spans not exceeding 15 ft. the principal strut may be 6 in. by 4 in., with raking struts 4 in. by 4 in.; for spans exceed- ing 15 ft. but not exceeding 35 ft. the. size of the principal strut should be from 6 in. to 9 in. square, and the raking struts from 6 in. by 4 in. to 9 in. by 6 in.

Interesting examples of shoring on a large scale may frequently

From a photograph by W. T. Green.

Fig. 8. — Shoring of the Presbytery,' Interior, Winchester Cathedral Restoration.

be seen applied to large buildings in the course of repair or restora- tion. The rebuilding of the foundations of the retro-choir and lady chapel of Winchester cathedral which was carried out in the autumn

of 1906 necessitated the erection of a very elaborate and complicated arrangement of shoring to uphold the masonry while the work of underpinning the walls was being carried on. The foundations of the eastern portion of the cathedral were found to be dangerously insecure, being in fact laid upon a bed of 90ft marl only 10 ft. below the surface of the ground, in spite of the fact that at a depth of 16 ft. a hard solid stratum of gravel, at least 6 ft. thick, is arrived at. The medieval builders without doubt entertained suspicions as to the sustaining power of their proposed foundation, and so to ensure stability, as they thought, strengthened it by placing below the masonry horizontal layers of beech trees, filling up the interstices with hard chalk and flints. These contrivances were not sufficient to prevent the gradual sinking, through succeeding centuries, of the heavy mass of masonry. This not only affected the footings of the building, but caused fissures of an alarming nature in the vaulting nnd walls. Under the direction of Mr T. G. Jackson a carefully designed arrangement of shoring was applied, consisting of raking shores, flying shores and needling, for the purpose of the under pinning, with specially designed timbering to support the arches and vaulting while they were undergoing repair. The foundations were found to be much undermined by water, which filled the excavations made for the underpinning in such quantities

that it was necessary to employ a diver to deposit cement concrete in bag- fuls upon the gravel bed to which the new foundations are taken down. The illustration (fig. 7) will readily explain the external shoring above described, while fig. 8 shows the interior shoring of the presbytery.

Authorities. — The principal works of reference on this subject are: C. H. Stock, Shoring and Underpinning; T. Tredgold, Ele- mentary Principles of Carpentry; J. Blagrove, Shoring and its Application. (J. Bt.)

SHORNCLIFFE, a military station in Kent, England, on high ground immediately north of Sandgate and 3 m. W. of Folkestone. It was first established in 1803, when Sir John Moore here trained the troops which afterwards formed the Light Division in the Peninsular War. Its position was chosen as a strategic position on the flank of the French invader who was expected at the time to descend upon the English coast.

SHORT, FRANCIS JOB (1857-), English engraver, was born at Stourbridge, Worcestershire, on the 19th of June 1857. He was educated to be a civil engineer, and was engaged on various works in the Midlands until 1881, when he came to London as assistant to Mr Baldwin Latham in connexion with the Parliamentary Inquiry into the pollution of the river Thames. He was elected an associate member of the Institute of Civil Engineers in 1883. Having worked at the Stourbridge School of Art in his early years he joined the National Art Training School, South Kensington, in 1883. He also worked at the life class under Professor Fred Brown at the Westminster School of Art, and for a short time at the Schools of the Royal Institute of Painters in Water-colours. His real life-work now became that of an original and translator engraver. He was a keen student of the works of J. M. W. Turner; and his etchings and mezzotints from Turner's Liber Studiorum (188s seq.), wonder- ful examples of painstaking devotion and unrivalled skill, were among his earliest successes, showing the deepest sympathetic study of the originals combined with a full knowledge of the resources of engraving and unwearied patience. Short received the highest praise and constant advice and encouragement from Ruskin, and the co-operation of students of Turner such as Mr W. G. Rawlinson and the Rev. Stopford Brooke. After completing the series from the existing plates of Turner's Liber Short turned to the subjects which Turner and his assistants had left incomplete. Several fine plates resulted from this study, bearing the simple lettering " F. Short, Sculp., after J. M. W. Turner, R.A.," which told very little of the work expended

on their production even before the copper was touched. Short also reproduced in fine mezzotints several of the pictures of G. F. Watts, "Orpheus and Eurydice," "Diana and Endymion," " Love and Death," " Hope," and the portrait of Lord Tennyson, all remarkable as faithful and imaginative renderings. His own fine quality as a water-colour painter made him also a sym- pathetic engraver of the landscapes of David Cox and Peter de Wint. His subtle drawing of the receding lines of the low banks and shallows of river estuaries and flat shores is seen to perfection in many of his original etchings, mezzotints, and aquatints, notably " Low Tide and the Evening Star " and " The Solway at Mid-day." Other plates that may be mentioned are: —

" Gathering the Flock on Maxwell Bank," a soft -ground etching; " The Ferry over the Blyth," " Walberswick Pier," soft ground; " Dutch Greengrocery," " Noon on the Zuider Zee," " De venter," " Strolling Players at Lydd," " An April Day in Kent," and " Staithes," all etchings; " A Wintry Blast on the Stour- bridge Canal," " Peveril's Castle," and " Niagara Falls," dry points; " The Curfew," " A Span of old Battersea Bridge," and " Sunrise on Whitby Scaur," aquatints; " Ebbtide, Putney Bridge," " The Weary Moon was in the Wane," " Solway Fishers," " The Lifting Cloud," and " A Slant of Light in Polperro Har- bour," mezzotints. Short was elected A.R.A. in 1906 when the rank of associate-engraver was revived. As head of the Engrav- ing School at the Royal College of Art, South Kensington, he had great influence on younger engravers. Short was elected to the Royal Society of Painter-Etchers and Engravers in 1885, and took a prominent part in conducting its affairs. In 1910 he succeeded Sir Seymour Haden as president. He received, amongst other distinctions, the gold medal for engraving at the Paris International Exhibition, 1889, and another gold medal (Rap pel) 1900.

The Etched and Engraved Work of Frank Short, by Edward F. Strange (1908), describes 285 plates by the artist. (C. H.)*

SHORTHAND, a term applied to all systems of brief hand- writing which are intended to enable a person to write legibly at the rate of speech. Synonyms in common use are steno- graphy (from crevos, narrow or close), and tachygraphy (from Taxvs, swift), or occasionally brachygraphy (from fipaxvs, short).

Greek and Roman Tachygraphy. — The question of the existence among the ancient Greeks of a system of true tachygraphy, that is, of a shorthand capable of keeping pace with human speech, has not yet been solved. From surviving records we know that there were, both in

the 4th century B.C. and in the early centuries of the Christian era, as well as in the middle ages, systems in practice whereby words could be expressed in shortened form by signs or groups of signs occupying less space than the ordinary method of longhand writing. But such systems appear to have been systems of brachygraphy or stenography, that is, of shortened writing, which were not necessarily also systems of tachygraphy properly so called. If, however, as there is some reason to believe, the Roman system of tachygraphy, as exhibited in the Tironian notes (see below) was derived from a Greek system, it may fairly be inferred that the latter system was also a developed system of tachygraphy. But, be that as it may, no very early specimens of Greek shorthand have hitherto come to light; and the key to the decipherment of the steno- graphic inscriptions in the waxen book of the 3rd century in the British Museum (see below) still remains to be discovered. We are therefore in the dark whether we have in this MS. an example of true tachygraphic writing. Here it may be noticed that certain words of Diogenes Laertius have been taken to imply that Xenophon wrote shorthand notes (vTroarineuaaafievos) of the lectures of Socrates; yet a similar expression in another passage, which will not bear this meaning, renders it hardly possible that tachygraphy is referred to.

The surviving records of Greek shorthand are not very numerous, although they are scattered through a long period of time, beginning with the 4th century B.C. and extending to the 14th century. They have been arranged in three groups. At the head of the first group, which embraces all that has been found dating down to the 3rd century, is a remarkable inscription, unfortunately fragmentary, on a marble slab discovered'on the Acropolis of Athens in 1884, which is attributed to the 4th century B.C.; and it is on this discovery that the actual claim of tachygraphy to have been practised among the ancient Greeks chiefly rests. The inscription describes a system, or rather part of a system, whereby certain vowels and consonants can be expressed by strokes placed in various positions. But here, too, it has been urged that we have the explanation of a system of brachygraphy only, and not one of tachygraphy. To the first group also belong a few specimens of shorthand writing on papyri of the 2nd and 3rd centuries, and, above all, the most important MS. of Greek stenographic symbols hitherto discovered. This is the waxen book already referred to (Brit. Mus., Add. MS. 33,270), consisting of seven wooden tablets coated with wax on both sides, and two covers thus coated on the inner sides, which seems to have been the exercise- book of a shorthand scholar who has covered its pages with symbols, which in places are repeated again and again as if for

practice.

In these symbols we may have an actual system of tachygraphic shorthand, and not a mere syllabary; but unfortunately they have not yet been interpreted.

The second group of examples of Greek shorthand is confined to a few fragmentary papyri and waxen tablets ranging from the 4th to the 8th century, chiefly among the Rainer collection at Vienna, to which Professor Wessely has devoted much labour.

After this there is a long period unrepresented by any remains, until we come to the period of the third group, which stands quite apart from the preceding groups, being representative of the medieval Greek tachygraphy of the 10th century. First stands the Paris MS. of Hermogenes, with some tachygraphic writing of that period, of which Bernard de Montfaucon {Pal. Gr. , p. 35 1) gives some account, and accompanies his description with a table of forms which, as he tells us, he deciphered with incredible labour. Next, the Add. MS. 18231 in the British Museum contains some marginal notes in shorthand, of A.D. 972 (Wattenb., Script. Graec. specim., tab. 19). But the largest amount of material is found in the Vatican MS. 1809, a volume in which as many as forty-seven pages are covered with tachygraphic writing of the nth century. Cardinal Angelo Mai first published a specimen of it in his Scriptorum veterum nova collectio, vol. vi. (1832); and in his Novae patrum bibliothecae torn, secundus (1844) he gave a second, which, in the form of a marginal note, contained a fragment of the book of Enoch. But he did not quote the number of the MS., and it has only been identified in recent years. The tachygraphic portion of it has been made the subject of special study by Dr Gitlbauer for the Vienna Academy. It contains fragments of the works of St Maximus the Confessor, the confession of St Cyprian of Antioch, and works of the pseudo-Dionysius Areo- pagita. There are also certain MSS. written at Grottaferrata belonging to the group.

But here again this medieval shorthand is not a tachygraphic system in the true sense of the word, but a syllabic system having very little advantage over the ordinary system of contracted long- hand in respect to rapidity of writing, excepting that the scribecould pack more of the text into a given space. The medieval system therefore cannot be regarded as a development of any ancient system of Greek

tachygraphy, but rather as a stunted descendant or petrified fragment, as it has been called, of an earlier and better system. Other medieval varieties or phases of Greek shorthand have also been traced in the 14th and even in the 15th century.

Evidence of the employment of tachygraphy among the Romans is to be found in the writings of authors under the empire. It appears to have been taught in schools, and, among others, the emperor Titus is said to have been skilled in this manner of writing. According to Suetonius the first introduction of shorthand signs or notae was due to Ennius; but more generally Cicero's freedman M. Tullius Tiro is regarded as the author of these symbols, which commonly bear the title of Notae Tironianae. The Tironian notes belonged to a system which was actually tachygraphic; that is, each word was represented by a character, alphabetic in origin, but having an ideographic value. The notes, as we have them, have come down to us in a medieval dress, and are probably amplified from their shapes of early times with various diacritical additions which attached to them after the practice of the system had died out, and when the study of them had become an antiquarian pursuit, demanding a more exact formation of the symbols and their variants than was possible or necessary to a shorthand writer familiar with the system and writing at full speed. Such a system of shorthand, expressing words by comprehensive symbols or word-outlines, could be the only system possible for rapid reporting of human speech. But it seems that in instances where a symbol was not forthcoming to express an unusual word, such as a proper name, it was customary, at least in the written notes which have survived, to express it by a group of syllabic signs. A reporter, taking down a speech, could not have waited to express the unusual word or proper name by such a slow process; and no doubt in actual practice he would, in such an emergency, have invented on the spur of the moment some conventional sign which he would remember how to expand afterwards. But in the medieval inscriptions written in Tironian notes a syllabic system was made use of in such cases; and hence arose variations in different countries in the syllabic method of ex- pressing words; an Italian system, a French system and a Spanish system having already been identified. Such a syllabic system is comparable with the " African " and " Italian " varieties of the medieval Greek shorthand system noticed above.

There are no ancient documents written in Tironian notes. But the tradition of their employment survived, especially in the chanceries of the Merovingian and Carolingian dynasties of the Frankish empire; and a limited use of them was made by the officials who controlled the royal diplomas. In Merovingian docu- ments they

generally accompany the subscription of the referendary, the earliest instance being in a diploma of Chlothar II. A.D. 625. From the reign of Thierry III. they become fairly frequent. They give brief indications referring to the composition of the deed, the name of the person moving for it, that of the official revising it, &c. Such uses may be regarded as safeguards against forgery. A more extensive employment of the notes prevailed under the Carolingian monarchs. Official MSS. were written in these characters as, for example, the formulary of the chancery of Louis the Pious. They

appear in subscriptions, often attached to the ruches (see Diplomatic). Sometimes they accompany the monogrammatic invocation at the beginning of a deed; sometimes they themselves contain the invocation or a pious formula. Such notes continued to appear in royal deeds down to the end of the 9th century; and so inveterate had their employment become in certain positions in the charters, that the scribes, after having forgotten their meaning, went on adding mere imitative signs. In the 10th century they appear in ecclesiastical and even private deeds, but in the latter class of docu- ments their use was probably only suggested by vanity and pre- tension to learning on the part of the scribes. Even in the nth century a few notes lingered on, their meaning fast dying out.

In general literature Tironian notes were adopted in the 9th and 10th centuries by the revisers and annotators of texts. Of this period also are several MSS. of the Psalter written in these characters, which it has been suggested were drawn up for practice at a time when a fresh impulse had been given to the employment of shorthand in the service of literature. The existence also of volumes containing lexicons or collections of Tironian notes, of the same period, points to a temporary revival of interest in these symbols of Roman tachygraphy. But such revival was short-lived; early in the nth century it had expired.

Authorities. — J. Gomperz, Uber ein bisher unbekanntes griech. Schriftsystem (Vienna Academy, 1884) and Neue Bemerkungen (1895); M. Gitlbauer, Die drei Sysleme der griech. Tachygraphie (Vienna Academy, 1896); K. Wessely, Ein System altgriech. Tachygraphie (Vienna Academy, 1896) ; T. W. Allen, " Fourteenth Century Tachygraphy," Journ. Hellen. Studies, xii. (1890); F. W. G. Foat, " On Old Greek Tachygraphy," J.H.S., xx., giving a full bibliography (1901); Archiv fur Stenographic (new series, 1901); F. Ruess, Uber griech. Tachygraphie (1882); J. W. Zeibig, Geschichte una" Literatur der Geschwindschreibekunst (1878) ; V. Gardthausen, Griech. Paldographie (1879); P- Carpentier,

Alphabetum Tironianum (1747); U. F. Kopp, Palaeographia critica (1827); J. Tardif, Mem. sur les notes tironiennes (1854); O. Lehmann, Quaestiones de notis Tironis, &c. (1869); A. P. Kuhnelt, Uber die Geschwindschrift der Alien (1872); -F. Ruess, Uber die Tachygraphie der Romer (1879); W. Schmitz, Comment, notarum Tironiarum (1893) and many other works; Melanges J. Havet (1895); J. Havet, CEuvres (1896); E. Chatelain, Introduction a, la lecture des notes tironiennes (containing a full bibliography, 1900). (E. M. T.)

In the 10th century all practical acquaintance with the shorthand systems of Greece and Rome faded completely away, and not till the beginning of the 17th can the art be said to have revived. But even during that interval systems of writing seem to have been practised which for speed approxi- mated to modern shorthand. 1

Shorthand in English-speaking Countries. — England was the birthplace of modern shorthand. The first impulse to its cultiva- tion may possibly be traced to the Reformation. When the principles of that movement were being promulgated from the pulpit, a desire to preserve the discourses of the preacher naturally suggested the idea of accelerated writing. It is certainly striking that in the early systems so many brief arbitrary signs are provided to denote phrases common in the New Testament and Protestant theology. In the early systems of Dr Timothy Bright 2 and Peter Bales 3 almost every word is provided with an arbitrary sign. Dr Bright (c. 1551-1615) was a doctor of medicine who afterwards entered the church. His Characterie. An Arte of

1 For instances, see Zeibig's Geschichte u. Lit. der Geschwindschreibe- kunst (Dresden, 1878), pp. 67-79. For John of Tilbury's system (c. 1 1 75), see especially Shorthand, No. 5, and Hermes, viii. p. 303.

2 The Bodleian Library contains the only known copy of Bright's book. For a description of the system, see Phonetic Journal (1884), p. 86 ; Circulars of Information of the Bureau of Education (Wash- ington, 1884), No. 2, p. 8; and Notes and Queries, 2nd ser., vol. ii. p. 394. A is represented by a straight line, the other letters of the alphabet by a straight line with a hook, circle, or tick added at the beginning. Each alphabetic sign placed in various positions, and having some additional mark at the end, was used to indicate arbi- trarily chosen words beginning with a, b, c, d, &c. There were four slopes given to each letter and twelve ways of varying the base, so that forty-eight words could be written under each letter of the

alphabet if necessary. Thus the sign for b with different terminal marks and written in four different directions signified a number of words commencing with b; 537 such signs had to be learned by heart. By adding certain external marks these signs were applied to other words: thus by writing a dot in one of two positions with respect to a sign the latter was made to represent either a synonym or a word of opposite meaning. Under air are given as synonyms breath, exhalation, mist, reek, steam, vapour.

8 Bales's method was to group the words in dozens, each dozen headed by a Roman letter, with certain commas, periods, and other marks to be placed about each letter in their appropriate situations, so as to distinguish the words from each other.

SHORTHAND

1009

John Willis,

Shorte, Swifte and Secrete Writing by Character (1588), which set forth a system of writing by character or shorthand, was dedicated to Queen Elizabeth, who rewarded the author with a Yorkshire living, and granted to him the sole right for fifteen years of teaching and printing books " in or by Character not before this tyme commonlye knowne and vsed by anye other oure subjects " (Patent Roll, 30, Eliz. part 12). Peter Bales (iS47?-i6io) promised his pupils that " you may also learn to write as fast as a man speaketh, by the arte of Brachigraphie by him devised, writing but one letter for a word "; his : ' Arte of Brachigraphie " is contained in his Writing Schoolemaster (1590). Only with a gigantic memory and by unremitting labour could one acquire a practical knowledge of such methods.

The first shorthand system worthy of the name which, so far as is known, appeared in England is that of John Willis (d. c. 1627), whose Art of Stenographic (London, 14 editions ' from 1602 to 1647) is substantially based on the common alphabet ; but the clumsiness of his alphabetic signs, and the confused laborious contrivances by which he denotes prefixes and terminations, involving the continual lifting of the pen, would seem to render his method almost as slow as longhand. Of the numerous systems which intervened between J. Willis's and Isaac Pitman's phonography (1837) nearly all were based, like Willis's, on the alphabet, and may be called, a, b, c systems. But seven were, like phonography, strictly phonetic, viz. those by Tiffin (1750), Lyle (1762), Holds- worth and

Aldridge (1766), Roe (1802), Phineas Bailey (1819), Towndrow (1831) and De Stains (1839).

A few general remarks apply largely to all the a, b, c systems.

Each letter is designated by a straight line or curve (vertical,

horizontal, or sloping), sometimes with the addition

tlˆJL. of a hook or loop. C and q are rejected, k being

Sj'S l Gum 9 ˆ_ – -*, t*

substituted for hard c and q, s for soft c. Signs are provided for ch, sh, th. G and j are classed under one sign, because in some words g is pronounced as j, as in giant, gem. Similarly each of the pairs /, v and s, z has only one sign. A few authors make the signs for,;', v, z heavier than those for g,f, s. Some class p and b, t and d, each under one sign. The steno- graphic alphabet is therefore — a, b, d, e,f (y),g (J),h, i, k, I, m, n, 0, p, r, s (z), /, u, w, x, y, ch, sh, th. Letters which are not sounded may be omitted. Gh, ph may be counted as/ in such words as cough, Philip; but the th in thing is never distinguished from the th in them. Thus the a, b, c systems are largely phonetic with respect to consonant-sounds; it is rather with regard to the vowels that they disregard the phonetic principle. No attempt is made to provide adequately for the many vowel-sounds of the language. Thus the signs for like and lick, for rate and rat, &c, are the same. In the case of vowel-sounds denoted by two letters, that vowel is to be written which best represents the sound. Thus in meat the e is selected, but in great the a. In some a, b, c systems, including the best of them (Taylor's), a dot placed anywhere does duty for all the vowels. This practice is, of course, a fruitful source of error, for pauper, and paper, gas and goose, and hundreds of other pairs of words would according to this plan be written alike. In the early systems of Willis and his imitators the vowels are mostly written either by joined characters or by lifting the pen and writing the next consonant in a certain position with respect to the preceding one. Both these plans are bad; for lifting the pen involves expenditure of time, and vowels expressed by joined signs and not by marks external to the word cannot be omitted, as is often necessary in swift writing, without changing the general appearance of the word and forcing the eye and the hand to accustom themselves to two sets of outlines, vocalized and unvocalized. In the better a,b,c systems the alphabetic signs, besides combining to denote words, may also stand alone to designate certain short common

1 The first edition, published anonymously, is entitled The Art of Stenographic, teaching by plaine and certaine rules, to the capacitie of the meanest, and for the use of all professions, the way to Compendious writing. Wherevnto is annexed a very easie Direction for Stegano- graphie, or Secret Writing, printed at London in 1602 for Cuthbert Burbie. The only known copies are in the Bodleian and British Museum libraries.

words, prefixes and suffixes. Thus in Harding's edition of Taylor's system the sign for d, when written alone, denotes do, did, the prefixes de-, des-, and the terminations -dom, -end, -ened, -ed. This is a good practice if the words are well chosen and precautions taken to avoid ambiguities. Numbers of symbolical signs and rough word-pictures, and even wholly arbitrary marks, are employed to denote words and entire phrases. Symbolical or pictorial signs, if sufficiently suggestive and not very numerous, may be effective; but the use of " arbif raries " is objectionable because they are so difficult to remember. In many shorthand books the student is recommended to form additional ones for himself, and so of course make his writing illegible to others. The raison d'etre of such signs is not far to seek. The proper shorthand signs for many common words were so clumsy or ambiguous that this method was resorted to in order to provide them with clearer and easier outlines. For the purpose of verbatim reporting the student is recommended to omit as a rule all vowels, and decipher his writing with the aid of the context. But, when vowels are omitted, hundreds of pairs of words having the same consonant skeleton (such as minister and monastery, frontier and furniture, libel and label) are written exactly alike. This is one of the gravest defects of the a, b, c systems.

John Willis's system was largely imitated but hardly improved by Edmond Willis (1618), T. Shelton (1620), Witt (1630), Dix (1633), Mawd (1635), and Theophilus Metcalfe (1635). T. Shelton's system, republished a great many times down to 1687, was the one which Samuel Pepys used in writing his diary. 2 It was adapted to German, Dutch and Latin. 3 An advertise- ment of Shelton's work in the Mercurius Politicus of 3rd October 1650 is one of the earliest business advertisements known. The book of Psalms in metre (206 pages, 25X15 in.) was engraved according to Shelton's system by Thomas Cross. Metcalfe's Radio-Stenography, or Short-Writing, was republished again and again for about a hundred years. The 35th " edition " is dated 1693, and a 55th is known to exist. The inefficiency of the early systems seems to have brought the art into some contempt. Thus Thomas Heywood, a contemporary of Shake-speare, says in a prologue 4 that his play of Queen Elizabeth

" Did throng the seats, the boxes and the stage So much that some by stenography drew A plot, put it in print, scarce one word true."

Shakespeare critics would in this manner explain the badness of the text in the earliest editions of Hamlet, Romeo and Juliet, Taming of the Shrew, Merry Wives of Windsor, and Henry V. Perhaps a study of J. Willis's system and of E. Willis's (which, though not published till after Shakespeare's death, was practised long before) may shed light on corrupt readings of the text of these plays. 5 Rich's system (1646, 20th edition 1792) was reproduced with slight alterations by many other persons, including W. Addy, Stringer, and Dr Philip Doddridge (1799 and three times since). The New Testament and Psalms were engraved in Rich's characters (1659, 596 pages, 2ˆX15 in., 2 vols.), and Addy brought out the whole Bible engraved in shorthand 6 (London, 1687, 396 pp.). Locke, in his Treatise on Education, recommends Rich's system; but it is encumbered with more than 300 symbolical and arbitrary signs. In 1847 it was still used by Mr Plowman, a most accomplished Oxford reporter.

In 1672 William Mason, the best shorthand author of the 17th century, published his Pen pluck 'd from an Eagle's Wing. The alphabet was largely taken from Rich's. But Mason. in his Art's Advancement (1682) only six of Rich's letters are retained, and in his Plume Volante (1707) further

2 See a paper by J. E. Bailey, " On the Cipher of Pepys' Diary," in Papers of the Manchester Literary Club, vol. ii. (1876). Shelton (1601-1650) is not to be confounded with the translator of Don Quixote.

3 See Zeibig's Gesch. u. Lit. d. Geschwindschreibehunst, p. 195.

4 Pleasant Dialogues and Drammas (London, 1637), p. 249.

5 See M. Levy's Shakspere and Shorthand (London), and Phonetic Journal (1885), p. 34.

6 This curiosity is described in the Phonetic Journal (1885), pp. 158, 196. The Bodleian Library has a copy.

changes are made. Initial vowels are written by their alphabetic signs, final vowels by dots in certain positions (a, e at the beginning; i, y at the middle; o, u at the end), and medial vowels by lifting the pen and writing the next consonant in those same three positions with respect to the preceding one. Mason employed 423 symbols and arbitraries. He was the first to discover the value of a small circle for 5 in addition to its proper alphabetic sign. Mason's system was republished by Thomas Gurney in 1740, a circumstance which has perpetuated its use to the present day, for in 1737 Gurney was appointed shorthand writer to the Old Bailey, and early in the 19th century W. B. Gurney was appointed shorthand-writer to both Houses of Parliament. Gurney reduced Mason's arbitraries to about a hundred, inventing a few specially suitable for parliamentary reporting. The Gurneys were excellent writers of a cumbrous system. Thomas Gurney's Brachygraphy passed through at least eighteen editions.

In 1767 was published at Manchester a work by John Byrorii, sometime fellow of Trinity College, Cambridge, entitled The Byrom. Universal English Shorthand, distinguished for its precision, elegance, and systematic construction. Byrom had died in 1763. Having lost his fellowship by failing to take orders, he made a living by teaching shorthand in London and Manchester, and among his pupils were Horace Walpole, Lord Conway, Charles Wesley, Lord Chesterfield, the duke of Devonshire and Lord Camden. Shorthand, it is said, procured him admission to the Royal Society. He founded a stenographic club, to the proceedings of which his journal, 1 written in short- hand, is largely devoted. In the strangers' gallery of the House of Commons in 1728 Byrom dared to write shorthand from Sir R. Walpole and others. In 1731, when called upon to give evidence before a parliamentary committee, he took shorthand notes, and, complaints being made, he said that if those attacks on the liberties of shorthand men went on he " must have a petition from all counties where our disciples dwell, and Man- chester must lead the way." Thomas Molyneux popularized the system by publishing seven cheap editions between 1793 and 1825. Modifications of Byrom's system were issued by Palmer (1774), Nightingale (181 1), Adams (1814), Longmans (1816), Gawtress (1819), Kelly (1820), Jones (1832) and Roffe (1833). Byrom's method received the distinction of a special act of parliament for its protection (15 Geo. II. c. 23, for twenty-one years from 24th June 1742). To secure lineality in the writing and facility in consonantal joinings he provided two forms for b, h, j, w, x, sh, Ih, and three for /. A, e, i, 0, u, he represented by a dot in five posi tions with respect to a consonant. Practically it

is impossible to observe more than three (beginning, middle and end). With all its merits, the system lacks rapidity, the continual recurrence of the loop seriously retarding the pen.

In 1 786 was published An Essay intended to establish a Standard for a Universal System of Stenography, by Samuel Taylor (London). 2 This system did more than any of its " yor ' predecessors to establish the art in England and abroad. Equal to Byrom's in brevity, it is simpler in construc- tion. No letter has more than one sign, except w, which has two. Considering that five vowel places about a consonant were too many, Taylor went to the other extreme and expressed all the vowels alike by a dot placed in any position. He directs that vowels are not to be expressed except when they sound strong at the beginning and end of a word. Arbitraries he discarded altogether; but Harding, who re-edited his system in 1823, introduced a few. Each letter when standing alone represents two or three common short words, prefixes and suffixes. But the list was badly chosen: thus m represents my and many, both of them adjectives, and therefore liable to be confounded in many sentences. To denote in and on by the same sign is evidently absurd. Taylor's system was republished

1 Byrom's private journal and literary remains have been published by the Chetham Society of Manchester. See, too, a paper by J. E. Bailey in the Phonetic Journal (1875), pp. 109, 121.

1 Taylor, it was only lately discovered, died in 1811; see M. Levy in The Times (April 10, 1902), and Notes and Queries (May 24,

1902).

again and again. In Harding's edition (1823) the vowels are written on an improved plan, the dot in three positions repre- senting a, e, i, and a tick in two positions 0, u. Several other persons brought out Taylor's system, in particular G. Odell, whose book was re-edited or reprinted not less than sixty-four times, the later republications appearing at New York. The excellence of Taylor's method was recognized on the Continent : the system came into use in France, Italy, Holland, Sweden, Germany, Portugal, Rumania, Hungary, &c.

The Universal Stenography of William Mavor (1780) is a very neat system, and differs from Taylor's in the alphabet and in a more definite method of marking the vowels. A,e,i, u avor are indicated by commas, o, u, y, by dots, in three places with respect to a letter, namely beginning, middle and end. Other systems were introduced by

J. H. Lewis (181 2) and Moat (1833).

The vast mass of a, b, c systems are strikingly devoid of originality, and are mostly imitations of the few that have been mentioned. Nearly all may be briefly described as consisting of an alphabet, a list of common words, prefixes and suffixes, expressed by single letters, a list of arbitrary and symbolical signs, a . table showing the best way of joining any two letters, a few general rules for writing and. a specimen plate. 3

*Pitman's phonography, on account of its enormous diffusion in Great Britain and the colonies, and in America, its highly organized and original construction, and its many inherent advantages, merits a more extended notice Ptt m *n's than has been given to the systems already mentioned, maphy. In 1837 Mr (afterwards Sir) Isaac Pitman (q.v.) com- posed a short stenographic treatise of his own, which Samuel Bagster published under the title of Stenographic Sound-Hand. The price was fixed at fourpence, for the author had determined to place shorthand within the reach of everybody. In 1840 a second edition appeared in the form of a penny plate bearing the title Phonography, the principal feature of the system being that it was constructed on a purely phonetic basis. In December 1841 the first number of what is now known as Pitman's Journal appeared at Manchester in a lithographed form. It was then called the Phonographic Journal, and subsequently in turn the Phonotypic Journal, the Phonetic News and the Phonetic Journal. Pitman's system was warmly taken up in America, where it was republished in more or less altered forms, especially by the author's brother Benn Pitman, and by Messrs A. J. Graham, J. E. Munson, E. Longley, and Eliza B. Burns. A large number of periodicals lithographed in phonography are published in England and America. The Shorthand Magazine, monthly, was started in 1864. Of standard English books printed or lithographed in phonography may be mentioned, besides the Bible, New Testament, and Prayer Book, The Pilgrim's Progress, The Vicar of Wakefield, Pickwick Papers, Tom Brown's School-Days, Macaulay's Essays and Biographies, Gulliver's Travels, Blackie's Self-culture, Bacon's Essays, and a long list of tales and selections. Numerous societies have been formed in all English-speaking countries for the dissemination of phonography, the largest being the Phonetic Society. Phono- graphy has been adapted to several foreign languages, but not so successfully as Gabelsberger's German system. T. A. Reed's French Phonography (1882) was intended only for English phonographers who wish to report French speeches. Other adaptations to French were by A. J. Lawson and J. R. Bruce. A society for the adaptation of phonography to Italian was organized*

at Rome in 1883 by G. Francini, who published his results (Rome, 1883, 1886). Phonography was adapted to Spanish by Parody (Buenos Aires, 1864), to Welsh by R. H. Morgan (Wrexham, 1876), and to German by C. L. Driesslein (Chicago, 1884).

The main features of Pitman's system must now be described. The alphabet of consonant-sounds is — p, b; t, d; ch (as in chip), j; k, g (as in gay) ; /, v; th (as in thing), th (as in them); s, z; sh,

3 For early English systems, see especially some careful papers by Mr A. Paterson in Phonetic Journal (1886).

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zh (as in vision) ; m, n, ng (as in thing) ; I, r ; w, y, h. The sounds p, t, ch, k are represented respectively by the four straight strokes

\ I / ; and the corresponding voiced sounds b, d, j, g by exactly

the same signs respectively written heavy. F, th (as in thing), s,

sh are indicated by V_ [) J respectively; the same signs written heavy and tapering to the ends are used for v, dh, z, zh respec- tively. M, n, I, f are denoted by ·-l ˆrespectively, if is also represented by ˆ written upwards and in a more slanting direction than the sign for ch. The signs for sh and / may be written up or down when in combination, but standing alone sh is written downwards and I upwards. The signs for w, y, h are c'S'iSˆi

all written upwards. H has also / down. Ng, mp (or mb), rch (or rf), Ir, are represented by the signs for n, m, r, I respectively written heavy. Signs are provided for the Scotch guttural ch (as in loch), the Welsh 11, and the French nasal n. S is generally written by a small circle. The long-vowel sounds are thus classified — a (as in balm), e (as in bait), ee (as in feet), aw (as in law), o (as in coal), do (as in boot). The vowels a, e, ee are marked by a heavy dot placed respectively at the beginning, middle, and end of a consonant- sign ; aw, o, do by a heavy dash in the same three positions, and generally struck at right angles to the direction of the consonant. The short vowels are a (as in pat), e (as in pet), i (as in pit), 6 (as in pot), u (as in but), and do (as in put). The signs for these are the same as for the corresponding long vowels just enumerated, except that they are written light. Signs similarly placed are provided for the diphthongs oi (as in boil), da or de, di (as in Boan- erges, poet,

coincide), for the series yd, ye, yee, &c, and for the series wd, we, wee, &c. The signs for ei (as in bite) and ou (as in

cow) are A) and may be placed in any position with respect to a consonant. A straight line mav receive four hooks, one at each side of the beginning and end, but a curve only two, one at each end in the direction of the curve. Hooks applied to a straight line indicate the addition of r, I, n, and / or v respectively, thus

v \ pr, \ pi, \» pf or pv, and\ pn ; c — kf, = — kl, 3 kf, — 3 An ;

s* rf or rv, y" rn. Hooks applied to a curve denote the addition

of r, n respectively, thus v_ fr, Vo fn ; «-s ntr, s~z mn. Vowel- signs placed after (or, in the case of horizontal strokes, under) a consonant having the n or /, v hook are read between the consonant

and the n or / ; thus cough, Vd fun, but c-j- crow, N. pray.

A large hook at the commencement of a curve signifies the addi- tion of I, as Q_ fl. The hooks combine easily with the circle s,

thus \ sp \ spr (where the hook r is implied or included in the

circle), N spl, \ pns (the hook « being included), \« pfs, &c. The halving principle is one of the happiest devices in the whole history of shorthand. The halving of a light stroke — that is, writing it half length — implies the addition of t ; the halving of a heavy stroke that of d, the vowel placed after (or under) the halved stroke being

read between the consonant and the added t or d, thus C thaw,

r thought, I. Dee, |. deed, - pit, *~ cat, ˆ fat, y note, &c. By this means very brief signs are provided for hosts of syllables ending in t and d, and for a number of verbal forms ending in ed, thus ~-=-| ended. The halving of a heavy stroke may, if necessary, add t, and that of a light stroke d, thus ˆ beautified. By combining

the hook, the circle, and the halving principle, two or three to- gether, exceedingly brief signs are obtained for a number of con- sonantal series consisting of the combination of a consonant with

one or more of the sounds s, r, I, n, f, t, thus \sp, \spr, * sprt,

°*> sprts; \ pi, \ spl,X spit, I splnt, \splnts; K> fn, V» fns,

Ko fnt, v© fnts ; J frn, *b frnd, &c. As a vowel-mark cannot con-

*veniently be placed to a hook or circle, we are easily led to a way of distinguishing in outline between such words as ‘ cough and V_- coffee, > > pen and v^-. penny, *■? race and * } racy, &c. This distinction limits the number of possible readings of an un- vocalized outline. A large hook at the end of a stroke indicates the addition of -shon (as in fashion, action, &c). This hook easily*

combines with the circle s, as in actions, > > positions. The

circle s made large indicates ss or sz, as in\J pieces, (losses. The vowel between 5 and s (z) may be marked inside the circle, as in

*-^ exercise, /*0 subsistence. The circle s lengthened to a loop*

signifies st, as in ^s step, N> post, while a longer loop indicates str, as in /

boasts, ^p minsters. The loop written on the left

or lower side of a straight stroke implies the n hook and so signifies

nst, as in :-«, against, J danced. A curve (or a straight stroke with a final hook) written double length implies the addition of tr,

dr, or thr, as in \ father, f Utter, v ‘ kinder, . fender,

^ render. This practice is quite safe in the case of curves, but a straight stroke should not be lengthened in this way when there is danger of reading it as a double letter. The lineal consonant- signs may stand alone to represent certain short and common words as in many of the old, a, b, c systems, with this difference, that in the old systems each letter represents several words, but in phonography, in almost every case, only one. By writing the horizontal strokes in two positions with respect to the line (above and on) and the others in three positions (entirely above, resting on and passing through the line) the number is nearly trebled, and very brief signs are obtained for some seventy or eighty common short words (e.g. be, by, in, if, at, it, my, me, &c). A few very common monosyllables are represented by their vowel-marks, as

. the, remnant of (. ; S % remnant of N ^_ . ‘ on, remnant of ^, A certain number of longer words which occur frequently are con- tracted, generally by omitting the latter part, sometimes a middle

part of the word, as in \ (ksp) expect, h (djr) danger, c °~

(krk sh) characteristic, V. (nd f t) indefatigable. The connective

phrase of the is intimated by writing the words between which it occurs near to each other. The is often expressed by a short slanting stroke or tick joined to the preceding word and generally struck downwards, thus >- in the, ˆ_ for the.*

Three principles which remain to be noticed are of such importance and advantage that any one of them would go far to place phonography at the head of all other systems. These are the principles of positional writing, similar outlines and phraseography. (1) The first slanting stroke of a word can generally be written so as either to lie entirely above the line, or rest on the line, or run through the

line, thus .L-...I |

In the case of words composed wholly of horizontal strokes the last two positions (on and through the line) coincide, as — • x . These three positions are called first, second and third respectively. The first is specially connected with first-place vowels (a, a; aw, 6; i; oi), the second with second-place vowels (e, e; d, «), and the third with third-place vowels (ee, i; do, do; ou). In a fully vocalized style position is not employed, but in tne reporting style it is of the greatest use. Thus

the outline ™ written above the line Uˆ. must be read either time or Tom ; when written resting on the line U->, tome or tame ; when struck through the line .L. teem, team or tomb. By this method the number of possible readings of an unvocalized outline is greatly reduced. That word in each positional group which occurs the most frequently need not be vocalized, but the others should. In the case of dissyllables it is the accented vowel which decides the

position ; thus methought should be written first position ...X

*mithod second position '~. (2) Another way of distinguishing between words having the same consonants but different vowels to vary the ou*line. The possibility of variety of outline arises from the fact that many consonant sounds have duplicate or even triplicate signs, as we have seen. For instance, r has two lineal signs and a hook sign, and so each of the words carter, curator, creature and creator obtains a distinct outline. A few simple rules direct the student to a proper choice of outline, but some difference of practice obtains among phonographers in this respect. Lists of outlines for words having the same consonants are given in the instruction books;*

the Reporter's Assistant contains the outline of every word written with not more than three strokes, and the Phonographic Dictionary gives the vocalized outline of every word in the language. Aided by a true phonetic representation cf sounds, by occasional vocaliza- tion, variety of outline, and the context, the phonographic verbatim reporter should never misread a word. 1 (3) Lastly, phraseography. It has been found that in numberless cases two or more words may be written without lifting the pen. A judicious use of this practice

1 Phonography is so legible that the experiment of handing the shorthand notes to phonographic compositors has often been tried with complete success. A speech of Richard Cobden, on the Corn Laws, delivered at Bath on 17th September 1845, and occupying an hour and a quarter, was reported almost verbatim, and the notes, with a few vowels filled in, handed to the compositors of the Bath Journal, who set them up with the usual accuracy. A notice of the occurrence appeared the next day in the Bath Journal, and was immediately transferred to the columns of The Times and other newspapers. Mr Reed tried the same experiment with equal success, the notes being handed to the compositors in their original state (Phonetic Journal, 1884, p. 337).

promotes legibility, and the saving of time is very considerable. Words written thus should be closely connected in sense and awkward

joinings avoided. Such phrases are / am, V / have, „/ you are,

n— – you may, I, it would, I it would not, c^^ we are, c/v_ we have,

t/V^, we have not, -_ we have never been, L my dear

friends, — \ as far as possible, t-b. for the most part, and

many thousands of others. For the sake of obtaining a good phraseogram for a common phrase, it is often advisable to omit some part of the consonant outline. Thus the phrase you must

recollect that may very well be written - 1 (you must recollect

that). Lists of recommended phraseograms are given in the Phonographic Phrase Book, the Legal Phrase Book and the Railway

Phrase Book.

Specimens of Phonography. Corresponding Style.

■\^. \ ^ ^r ^\ -J . v(,. s y„

^ \ ^“vV -J ° -t, . • r “V**

‘ ^7 -fL ^ 1 . °V v -/■ ^ / -4” ^

Key. — If all the feelings of a patriot glow in our bosoms on a perusal of those eloquent speeches which are delivered in the senate, or in those public assemblies where the people are frequently convened to exercise the birthright of Britons — we owe it to shorthand. If new fervour be added to our devotion, and an additional stimulus be imparted to our exertions as Christians, by the eloquent appeals and encouraging statements made at the anniversaries of our various religious societies — we owe it to shorthand. If we have an opportunity in interesting judicial cases, of examining the evidence, and learning the proceedings with as much certainty, and nearly as much minuteness, as if we had been present on the occasion — we owe it to shorthand.

Reporting Style.

-v

~-“y o^^ w

*■< * "*

},.■- ^\ **

^1

< ^ ' y

-V

^ y\f> ““S-s

*r **

^ W*

‘ “-

1 1 % X>^>*

v-t

»■* ^ u s*

\j '

) «\j ^ v

>w xa^ (» ' j. -%^ 1^.

" } » ^ M-^ V ^ ' V

*• U, > 1, ' .L> . 1 } \^*

'. V

Key (the phraseograms being indicated by hyphens). — Characteristics of the Age. — The peculiar and distinguishing characteristics of the present-age are-in every respect remarkable. Unquestionably an extraordinary and universal-change has commenced in-the internal as-well-as-the external-world — in-the-mind-of-man as-well-as-in-the habits of society, the one indeed being-the necessary-consequence of the other. A rational consideration of the circumstances in-which-mankind are at-present placed must- show-us that influences of the most-important and wonderful character have-been and are operating in-such-a-manner-as-to bring-about if-not-a reformation, a thorough revolution in-the- organization of society. Never in-the-history-of-the-world have benevojent and philanthropic institutions for-the relief of domestic and public affliction; societies for-the promotion of manufacturing, commercial and agricultural interests; associations for-the instruc- tion of the masses, the advancement of literature and science, the

development of-true political-principles, for-the extension in-short of-every description of knowledge and-the-bringing-about of-every kind-of reform, — been-so numerous, so efficient and so indefatigable in-their operation as at-the-present-day.

An enumeration made in 1894 showed that 95% of British newspaper reporters used Pitman's system; but there are still numerous varieties preferred by individuals. Of the systems published since the invention of phonography history. the principal are A. M. Bell's Steno phonography (Edinburgh, 1852), Professor J. D. Everett's (London, 1877), PocknelPs Legible Shorthand (London,

1881), and J. M. Sloan's adaptation (the Sloan-Duployan) of the French system of Duploye (1882). More recent essays in English shorthand are almost 'entirely in the direction of script characters with con- nected vowels, as contrasted with the geometric forms and disjoined vowels of Pitman's phonography. The majority are founded on the French system of the brothers Duploye, but Cursive Shorthand (Cambridge, 1889), by Prof. H. L. Callendar, and Current Shorthand (Oxford, 1892), by Dr Henry Sweet, may be noted as original methods, the first having a phonetic, and the second both an orthographic and a phonetic, basis.

The distinctive features in recent shorthand history have been the widely-extended employment of the art, the increased atten- tion paid to instruction and the growth of stenographic societies. Throughout the civilized world the systems employed are those of the leading authors of the 19th century; earlier systems have now a numerically small number of practitioners. Shorthand has become an almost indispensable qualification for the amanu- ensis, and practical stenographic ability is a necessary equipment of Hhe typewriter operator. In professional and commercial offices, and more recently in the services, dictation to shorthand writers has become general. Shorthand has been included among examination subjects for the army, navy, civil service and medicine in the United Kingdom, and to a certain extent in other countries. Its inclusion in the Technical Instruction Act of 1889 was the first recognition of shorthand by the British parlia- ment, and it was subsequently comprised in the codes of ele- mentary day and evening continuation schools. It first became an examination subject for secondary schools in the Oxford Local Examination in 1888, but the Society of Arts has examined students of polytechnics, &c, in shorthand since 1876. Examina- tions in connexion with the phonographic system of Isaac Pitman date from 1845.

In 1887 the tercentenary of the origination of modern shorthand by Timothy Bright and the jubilee of Isaac Pitman's phono- graphy were celebrated by the holding of the first International Shorthand Congress in London. Subsequent congresses were held at Paris (1889), Munich (1890), when a statue of Gabels- berger was unveiled; Berlin (1891), Chicago (1893), Stockholm (1897), Paris (1900), &c. These gatherings have promoted the improved organization of stenographic practitioners in the respective countries. After the first congress, three national organizations were established in Great Britain by Pitman writers, which take the place of the Phonetic Society (established in 1843 and dissolved in 1895). In America the formation of national associations for reporters and

teachers followed the fifth congress.

As regards speed in shorthand writing, it may be mentioned that at the exhibition at Olympia (London) in 1908, the " World's Shorthand Championship " was awarded for 220 words a minute for five minutes. But it has been claimed that a rate of 250 words a minute has been accomplished. It may be pointed out, however, that such a rate cannot be wanted for any practical purpose, since the fastest public speaker never speaks anything like 250 words a minute, even though for a demonstration such a thing could be done. The average rate of public speaking is from 120 to 150 words a minute.

Foreign Shorthand Systems.

To complete the history of the subject, the following notes on systems introduced in various European countries may be useful.

German. — C. A. Ramsay's Tacheographia (Frankfort, 1679, and several times afterwards until 1743) was an adaptation of T. Shelton's English system. Mosengeil (1797) first practically introduced short-

hand writing into Germany in an adaptation of the Taylor-Bertin method. Reischl's (1808) is a modification of Mosengeil's. On Horstig's (1797) are based those of an anonymous writer (Nuremberg, 1798), Heim (1820), Thon (1825), an anonymous author (Tubingen, 1830), Nowack (1830), Ineichen (1831), an anonymous author (Munich, 1831) and Binder (1855). Mosengeil published a second system (1819) in which Horstig's alphabet is used. On the Mosengeil-Horstig system are based Berthold's (1819) and Stark's (1822). On Danzer's (1800), a close imitation of Taylor's, is based that of Ellison v. Nidlef (1820). Other systems are those of Leichtlen (1819); J. Brede (1827) ; Nowack (1834), a system in which the ellipse is employed as well as the circle; Billharz (1838) ; Cammerer (1848), a modification of Selwyn's phonography (1847); Schmitt (1850); Fischback (1857), a reproduction of Taylor's; and that of an anonymous author (1872), based on Horstig, Mosengeil and Heim. Nowack, in his later method of 1834, makes a new departure in avoiding right or obtuse angles, and in endeavouring to approximate to ordinary writing. This system Gabelsberger con- sidered to be the

best which had appeared down to that date. F. X. Gabelsberger's (1789-1849) Anleitung zur deutschen Redezeichen- kunst (Munich, 1834) is the most important of the German systems. The author, an official attached to the Bavarian ministry, commenced his system for private purposes, but was induced to perfect it on account of the summoning of a parliament for Bavaria in 1819. Submitted to public examination in 1829, it was pronounced satis- factory, the report stating that pupils taught on this system executed their trial specimens with the required speed, and read what they had written, and even what others had written, with ease and certainty. The method is based on modifications of geometrical forms, designed to suit the position of the hand in ordinary writing. The author considered that a system composed of simple geometrical strokes forming determinate angles with each other was unadapted to rapid writing. He does not recognize all the varieties of sound, and makes some distinctions which are merely orthographical. Soft sounds have small, light and round signs, while the hard sounds have large, heavy and straight signs. The signs too are derived from the current alphabet, so that one can find the former contained in the latter. Vowels standing between consonants are not literally inserted, but symbolically indicated by either position or shape of the surrounding consonants, without, however, leaving the straight writing line. On Gabelsberger's system is based that of W. Stolze (1840). Faulmann (Vienna, 1875) attempted in his Phonographie to combine the two methods. While Gabelsberger's system remained unchanged in principle, Stolze's split into two divisions, the old and the new. These contain many smaller factions, e.g. Velten's (1876) and Adler's (1877). Arends's (i860) is copied from the French system of Fayet. Roller's (1874) and Lehmann's (1875) are offshoots of Leopold Arends's (1817-1882). Many other methods have appeared and as rapidly been forgotten. The schools of Gabels- berger and Stolze can boast of a very extensive shorthand literature. Gabelsberger's system was adapted to English by A. Geiger (Dresden, i860 and 1873), who adhered too closely to the German original, and more successfully by H. Richter (London, 1886), and Stolze's by G. Michaelis (Berlin, 1863).

French. — The earliest French system worthy of notice is that of Coulon de Thevenot (1777), in which the vowels are disjoined from the consonants. Later may be divided info two classes, those derived from Taylor's English system, translated in 1791 by T. P. Bertin, and those invented in France. The latter are (a) Coulon de TheVenot's; Q>) systems founded on the principle of the inclination of the usual writing — the best known being those of Fayet (1832) and Senocq

(1842); and © systems derived from the method of Conen de Prepean (5 editions from 18 13 to 1833). Prevost, who till 1870 directed the stenographic service of the senate, produced the best modification of Taylor. Many authors have copied and spoilt this system of Prevost. The best known are Plantier (1844) and Tondeur (1849). On Conen's are based those of Aim6-Paris (1822), Cadres-Marmet (1828), Potel (1842), the Duploye brothers (1868), Guenin, &c. Among amateur writers the Duployan method is best known.

Spanish. — The father of Spanish stenography was Don Francisco de Paula Marti, whose system was first published in 1803. The alphabet is a combination of Taylor's and Coulon's. By decree of November 21, 1802, a public professorship of shorthand was founded in Madrid, Marti being the first professor. Founded on Marti's system are those of Serra y Ginesta (181 6) and Xamarillo (181 1). Many Spanish systems are merely imitations or reproductions of Marti's, and adaptations of Gabelsberger's, Stolze's and Pitman's systems. That of Garriga y Maril (1863) has attained some popu- larity in Spain.

Italian. — Italian translations and adaptations of Taylor's system succeeded one another in considerable numbers from Amanti (1809) to Bianchini (1871). Delpino's (1819) is the best. The Gabels-berger- Noe system (1863) has gained many followers.

Dutch. — J. Reijner's Dutch method (1673) was an adaptation of Shelton's, and Bussuijt's (1814) of Conen's system. Sommerhausen and Bossaert (1829) received prizes from the government for their productions. Cornelis Steger (1867) translated Taylor's work. Gabelsberger's system was transferred to Dutch by Rietstap (1869), and Stolze's by Reinbold (1881).

Adaptations of Gabelsberger's method have also come into use in other countries.

Indian. — Mirza Habib Hosain, at the Mahommedan Educational Conference of 1905 in India, introduced a system of Urdu and Hindi shorthand, called " Habib's Samia," for which he was awarded a gold medal. The Pitman system has also been adapted for some Indian languages.

Authorities. — J. W. Zeibig's Geschichte u. Literatur der Geschwind-schreibekunst (Dresden, 1878) contains a historical sketch of the use of shorthand in ancient and modern times (especially in Germany) , a full bibliography of shorthand literature in all languages, a number

of lithographed specimens, and a useful index. Circulars of Information of the Bureau of Education, No. 2, 1884 (Washington, 1885), by J. E. Rockwell, contains a very complete and accurate bibliography of English and American shorthand publications, a chronological list of 483 English and American shorthand authors, notices on shorthand in the United States, on the employment of stenographers in the American courts, on American shorthand societies and magazines, and a beautifully engraved sheet of 112 shorthand alphabets. Isaac Pitman's History of Shorthand (reprinted in the Phonetic Journal of 1884) reviews the principal English systems previous to phonography, and a few foreign ones. The author draws largely on J. H. Lewis's Historical Account of the Rise and Progress of Stenography (London, 1 816). Other histories of shorthand are by F. X. Gabelsberger (prefixed to his Anleitung zur deutschen Redezeichenkunst, Munich, 1834), A. Fosse (prefixed to his Cours theorique et pratique de stenographie, Paris, 1849), Scott de Martinville (Paris, 1849), M. Levy (London, 1862) and T. Anderson (London, 1882). Here too should be mentioned J. Heger's Bemer- kenswerthes iiber die Stenographie (Vienna, 1841), mainly historical; J. Anders's Entwurf einer allgemeinen Gesch. u. Lit. d. Stenographie (Coeslin, 1855) ; R. Fischer's Die Stenographie nach Geschichte, Wesen, u. Bedeutung (Leipzig, i860); Krieg's Katechismus der Stenographie (Leipzig, 1876) ; Dr Westby-Gibson's Early Shorthand Systems (London, 1882) ; T. Anderson's Shorthand Systems, with a number of specimens (London, 1884); T. A. Reed's Reporter's Guide (London, 1885), and Leaves from the Notebook of T. A. Reed (London, 1885). Mr C. Walford's Statistical Review of the Literature of Short- hand (London, 1885) contains valuable information on the circulation of shorthand books and on shorthand libraries. Among later publications dealing fully with the history and practice of shorthand are the Transactions of the London Congress in 1887, and similar publications in connexion with later congresses; Bibliography of Shorthand, by J. Westby-Gibson, LL.D. (London, 1887), treating of English, colonial and American authors; Shorthand Instruction and Practice, by J. E. Rockwell, of the United States Bureau of Education (Washington, 1893), dealing with shorthand work throughout the world; and Examen critique des stenographies francaises et itrangeres, by Dr Thierry-Mieg (Versailles, 1900).

SHORTHOUSE, JOSEPH HENRY (1834-1903), English novelist, was born in Great Charles Street, Birmingham, on the 9th of September 1834. He was the eldest son of Joseph Short- house, chemical manufacturer, and Mary Ann, daughter of John Hawker, of the same

town. He was educated at Grove House, Tottenham, where he proved a promising and industrious pupil, and upon leaving school entered his father's business, in which he was all his life actively engaged. He married, in 1857, Sarah, daughter of John Scott, of Birmingham. His literary interest was fostered by a local essay club, to which he contributed many papers. It was not until he was nearly fifty years old that Shorthouse made his public appearance as an author, and even then his remarkable [story, John Inglesant, had undergone vicissitudes. It was kept for over three years in MS., and the author eventually printed one hundred copies for private circula- tion. One of these found its way intofthe hands of Mrs Humphry Ward, who recommended it to Messrs Macmillan. Its first appearance was a quiet one; but Gladstone was at once struck by its quality, and made its reputation by his praise. It became the most discussed book of the day, and its author was suddenly famous. Besides John Inglesant (1881), Shorthouse published The Little Schoolmaster Mark (1883), Sir Percival (1886), The Countess Eve and A Teacher of the Violin (1888), and Blanche, Lady Falaise (1891); but none of these has been so popular as his first novel. He will always remain known to fame as " the author of John Inglesant." Shorthouse was originally a Quaker, but the appeal of the Anglican Church was insistent with him, and he was baptized into its body before the appearance of his story. Something of his own stress of religious transition appears in the character of his hero, who is pictured as living in the time of the Civil War, a pupil of the Jesuits, a philosopher and a Platonist, who is yet true to the National Church. The story,

which is deeply mystical and imaginative, has for its central idea the dangers of bigotry and superstition, and the necessity of intuitive religion to progress and culture. It is a work. full of opulent colour and crowded life, no less than of philosophy and spiritual beauty. Shorthouse's work was always marked by high earnestness of purpose, a luxuriant style and a genuinely spiritual quality. He lacked dramatic faculty and the work- manlike conduct of narrative, but he had almost every other quality of the born novelist. He died at Edgbaston on the 4th of March 1903.

See The Life, Letters and Literary Remains of J. Henry Shorthouse, edited by his wife (2 vols., 1905).

SHOSHONG, a town in the British protectorate of Bechuana- land,

formerly the chief settlement of the eastern Bamangwato. It is about 200 m. N.N.E. of Mafeking and 30 m. N. of Shoshong Road Station on the Cape Town-Bulawayo railway. The town is situated 3000 ft. above the sea in the valley of the Shoshong, an intermittent tributary of the Limpopo. The site was origin- ally chosen as the headquarters of the Bamangwato as being easily defensible against the Matabele. At the time of the declara- tion of a British protectorate in 1885 Shoshong had 20,000 to 30,000 inhabitants, including about twenty Europeans. Being the meeting place of trade routes from south and north it was of considerable importance to early explorers and traders in South-Central Africa, and a mission station of the London Missionary Society (preceded for many years by a station of the Hermannsburg Lutheran Missionary Society) was founded here in 1862. Owing, however, to the scarcity of water at Shoshong, Khama, the chief of the Bamangwato, and most of his followers removed about 1890 to Palapye — 5° m – N.E. of Shoshong — and later to Serowe to the north-west of Palapye. Like Shoshong, these places are built in valleys of tributaries of the Limpopo. Shoshong was not entirely deserted and has a population of about 800 (see Bechuanaland).

SHOTTS, a mining and manufacturing parish of Lanarkshire, Scotland. It comprises eight villages, parts of two others, and the town of Cleland (including Omoa) and is served by the North British and Caledonian railways. Pop. (i89r) 11,957; (1901) 15,562. The parish contains large ironworks, tile, fire-clay and brick-works, and quarries, and includes the Lanark district asylum and a fever hospital. The curious name of Omoa is supposed to have been given to his property by some soldier or sailor who had settled here after the wars in Honduras, of which Omoa is a seaport. Matthew Baillie (1761-1823), famous for his researches in morbid anatomy, and Janet Hamilton (1795- 1873), the poetess, were born in the parish of Shotts.

SHOULDER (in O.E. sculder, cognate with Ger. Schulter, Dutch schouder, Swed. skuldra, &c; the root is unknown), the name of that part of the body of man and animals where the upper arm or fore-leg articulates with the collar bone and shoulder-blade (see Joints).

SHOVEL, SIR CLOUDESLEY [or Clowdisley Shovell as he seems to have spelt the name himself] (c. 1650-1707), English admiral, was baptised at Cockthorpe in Norfolk on the 25th of November 1650, and went to sea under the care of his kinsman Sir Christopher Mynns. He set himself to study navigation, and, owing to his able seamanship and brave and open-hearted disposition, became a

general favourite and obtained quick promotion. In 1674 he served as lieutenant under Sir John Narborough in the Mediterranean, where he burned four men-of- war under the castles and walls of Tripoli, belonging to the pirates of that place. He was present as captain of the " Edgar " (70) at the first fight at Bantry Bay, and shortly afterwards was knighted. In 1690 he convoyed William III. across St George's Channel to Ireland; the same year he was made rear-admiral of the blue, and was present at the battle of Beachy Head on 10th July. In 1692 he was appointed rear-admiral of the red, and joined Admiral Russell, under whom he greatly distinguished himself at La Hogue, by being the first to break through the enemy's line. Not long after, when Admiral Russell was superseded, Shovel was put in joint command of the fleet with Admiral Killigrew and Sir Ralph Delaval. In 1702 he

brought home the spoils of the French and Spanish fleets from Vigo, after their capture by Sir George Rooke, and in 1704 he served under Sir George Rooke in the Mediterranean and co- operated in the taking of Gibraltar. In January 1704 he was named rear-admiral of England, and shortly afterwards com- mander-in-chief of the British fleets. He co-operated with the earl of Peterborough in the capture of Barcelona in 1705, and commanded the naval part of the unsuccessful attempt on Toulon in October 1707. When returning with the fleet to England his ship, the " Association," at eight o'clock at night on the 2 2nd of October, struck on the rocks near Stilly, and was seen by those on board the " St George " to go down in three or four minutes' time, not a soul being saved of 800 men that were on board. The body of Sir Cloudesley Shovel was cast ashore next day, and was buried in Westminster Abbey. It is said that he was alive when he reached the shore at Porthellick Cove, but was murdered by a woman for the sake of his rings.

See Life and Glorious Actions of Sir Cloudesley Shovel (1707); Burnet's Own Times; various discussions in Notes and Queries, 5th series, vols. x. and xi. ; and T. H. Cooke, Shipwreck of Sir Cloudesley Shovel (1883).

SHOVEL (O.E. scofl, from root of scufan, to shove, push, cf. Ger. Schaufel, also Schuppe, scoop), an implement or tool, consisting of a broad flat blade with edges or sides turned up fixed to a wooden handle terminating in a bow like a spade. It is used for lifting or removing such loose substances as coal, gravel and the like.

SHOVELER, formerly spelt Shovelar, and more anciently Shovelard, a word by which used to be meant the bird now almost invariably

called Spoonbill (q.v.), but in the latter half of the 16th century transferred to one hitherto generally, and in these days locally, known as the Spoon-billed Duck — the Anas clypeata of Linnaeus and Rhynchaspis or Spatula clypeala of modern writers. All these names refer to the shape of the bird's bill, which, combined with the remarkably long lamellae that beset both maxilla and mandible, has been thought sufficient to remove the species from the Linnaean genus Anas. Except for the extraordinary formation of this feature, which carries with it a clumsy look, the male Shoveler would pass for one of the most beautiful of this generally beautiful group of birds. As it is, for bright and variegated colouring, there are few of his kindred to whom he is inferior. His golden eye, his dark green head, surmounting a breast of pure white and succeeded by underparts and flanks of rich bay, are conspicuous; while his deep brown back, white scapulas, lesser wing-coverts (often miscalled shoulders) of a glaucous blue, and glossy green speculum bordered with white present a wonderful contrast of the richest tints, heightened again by his bright orange feet. On the other hand, the female, excepting the blue wing-coverts she has in common with her mate, is habited very like the ordinary Wild- Duck, A . boscas. The Shoveler is not an abundant species, and in Great Britain its distribution is local; but its numbers have remarkably increased since the passing of the Wild-Fowl Protec- tion Act in 1876, so that in certain districts it has regained its old position as an indigenous member of the Fauna. It has not ordinarily a very high northern range, but inhabits the greater part of Europe, Asia and America, passing southwards, like most of the Anatidae towards winter, constantly reaching India, Ceylon, Abyssinia, the Antilles and Central America, while it is known to have occurred at that season in Colombia, and, according to Gould, in Australia. Generally resembling in its habits the other freshwater ducks, the Shoveler has one peculi- arity that has been rarely, if ever, mentioned, and one that is perhaps correlated with the structure of its bill. It seems to be especially given to feeding on the surface of the water immedi- ately above the spot where diving ducks (Fuligulinae) are employing themselves beneath. On such occasions a pair of Shovelers may be watched, almost for the hour together, swim- ming in a circle, about a yard in diameter, their heads turned inwards towards its centre, their bills immersed vertically in the water, and engaged in sifting, by means of the long lamellae before mentioned, the floating matters that are disturbed by

their submerged allies and rise to the top. These gyrations are executed with the greatest ease, each Shoveler of the pair merely using the outer leg to impel it on its circular course.

Four other species of the genus Spatula, all possessing the characteristic light blue "shoulders," have been described: one, 5. platalea, from the southern parts of South America, having the head, neck and upper back of a pale reddish brown, freckled or closely spotted with dark brown, and a dull bay breast with in- terrupted bars; a second, S. capensis, from South Africa, much lighter in colour than the female of S. clypeata; a third and a fourth, S. rhynchotis and S. variegata, from Australia and New Zealand respectively — these last much darker in general coloration, and the males possessing a white crescentic mark between the bill and the eye, very like that which is found in the South-American Blue-winged Teal (Querquedula cyanoptera), but so much resembling each other that their specific distinctness has been disputed by good authority. (A. N.)

SHREVEPORT, a city and the capital of Caddo Parish, Louisiana, U.S.A., on the Red river, in the N.W. part of the state, near the Texas border. Pop. (1890) 11,979; iˆ 00) 16,013, of whom 8532 were negroes; (1910, census) 28,015. It is the second city of the state in population. It is served by the Vicksburg, Shreveport & Pacific, the Houston & Shreveport, the Kansas City Southern, the St Louis & South-Western, the Louisiana Railway & Navigation Company, the Texas & Pacific (main line and two branches), the Louisiana & Arkansas, the Kansas City Southern, and the Missouri, Kansas & Texas railways and by boats on the Red river. In the city are the State Charity Hospital (1872), the T. E. Schumpert Memorial Hospital (1910), the Genevieve Orphanage (1899) and the Shreveport Training School (1908). Owing to its situation and excellent transportation facilities the city has a large trade. The surrounding country is a rich agricultural region, mainly devoted to the production of cotton, for which Shreveport is the principal shipping point. Live-stock and cattle products are trade 'terns of importance. The situation of the city (about 170 m. east of Dallas, and some- what farther from Little Rock, Houston, and New Orleans) makes it a natural centre of wholesale trade of varied character, and the development since 1906 of the important Caddo oil and gas fields north of the city has added greatly to its industrial prominence. The city contains planing mills, cotton gins, compresses and cotton-seed oil mills, machine and railway shops, and ice and molasses factories. In 1905 its factory product was valued at $2,921,923 (87-8% more than in 1900). Shreve- port was settled

about 1835, incorporated as a town in 1839, and chartered as a city in 1871. It was named in honour of Henry Miller Shreve (1785-1854), a native of New Jersey, who in 181 5 ascended the Mississippi and the Ohio rivers to Louisville in the " Enterprise," the first steam vessel to make this trip, introduced improvements in the steamboat, and in 1826-1841 had charge of the improvement of western rivers, removing during this period the great Red river raft. After the capture of Baton Rouge, the state capital, and New Orleans by the Unionists in 1862, Shreveport was occupied by the Confederate officials of the state. In the spring of 1863 and again in that of 1864 it was the objective of combined naval and land expeditions made by the Union forces up the Red river under command of Admiral David D. Porter and General N. P. Banks, the Confederate commander in Louisiana being General Richard Taylor, with General E. Kirby Smith in charge of the entire trans-Mississippi . department. In 1863 Shreveport was not seriously threatened. In 1864 when the Federals were within two marches of the city they were worsted by Taylor at Mansfield (on the 8th of April) ; on the next day the Confederates in their turn met with a demoralizing repulse at Pleasant Hill.

SHREW, 1 a term applied to the species of the family Soricidae of the mammalian order insectivora (q.v.), but in the British Isles to the common and lesser shrews (Sorex araneus and 5. minimus).

The common shrew, or, properly, shrew-mouse, which in England is by far the commoner of the two, is a small animal

1 This word, whence comes the participial adjective " shrewd," astute, originally meant malicious, and, as applied to a woman, still means a vexatious scold. From their supposed venomous character it was applied to the Soricidae.

about the size of a mouse, which it somewhat resembles in the shape of its body, tail and feet. But here the resemblance ends, for, unlike the mouse, it possesses a long and slender muzzle, with prominent nostrils, which project far beyond the lower lip; the small eyes are almost concealed by the fur; the ears are wide, short and provided internally with a pair of deep folds, capable when laid forwards of closing the entrance; the tail, which is slightly shorter than the body, is quadrangular in section and clothed more or less densely with moderately long hairs, terminating in a short tuft, but in old individuals almost naked; the feet are five-toed, the toes terminating in slender, pointed claws. The dentition is very peculiar and characteristic: there are in all thirty-two teeth, tipped with deep

crimson; of which twelve belong to the lower jaw; of the remaining twenty ten occupy each side of the upper jaw, and of these the first three are incisors. The first incisor is large, with a long anterior canine-like cusp and a small posterior one; then follow two small single-cu sped teeth; which are succeeded by three similar progressively smaller teeth, the first being a canine and the other two premolars; the next, a premolar, is large and multi- cuspid, and this is followed by three molars, of which the third is small with a triangular crown. In the lower jaw there are anteriorly three teeth corresponding to the seven anterior teeth above, of which the first is almost horizontal in direction, with its upper surface marked by three notches, which receive the points of the three upper front teeth; then follow two small

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The Common Shrew {Sorex araneus).

teeth and three molars. The body is clothed with closely set fur, soft and dense, varying in colour from light reddish to dark brown above; the under surface of both body and tail being greyish; the basal four-fifths of all the hairs above and beneath are dark bluish grey. On each side of the body, about one-third of the distance between the elbow and the knee, is a gland covered by two rows of coarse inbent hairs, which secretes a fluid with an unpleasant cheesy odour, and which is protective, rendering the creature secure against the attacks of predaceous animals.

The lesser or pigmy shrew {S. minutus) is not so abundant in England and Scotland, but common in Ireland, where the other species is unknown. It appears at first sight to be a diminutive variant of that species, which it closely resembles in external form, but the third upper incisor is shorter, or not longer than the next following tooth, whereas in S. araneus it is longer, and the length of the forearm and foot is less in the former species than in the latter.

Both these shrews live in the neighbourhood of woods, making their nests under the roots of trees or in any slight depression, occasionally even in the midst of open fields, inhabiting the disused burrows of field-mice. Owing to their small size, dark colour, rapid movements and nocturnal habits, they easily escape observation. They seek their food, which consists of insects, grubs, worms and slugs, under dead leaves, fallen trees and in grassy places. They are pugnacious, and if two or more are confined together in a limited space they invariably fight fiercely, the fallen becoming the food of

the victorious. They are also exceedingly voracious, and soon die if deprived of food; and it is probably to insufficiency of food in the early dry autumnal season that the mortality among them at that time is due. The breeding-season extends from the end of April to the beginning of August, and five to seven, more rarely ten,

young may be found in the nests; they are naked, blind and toothless at birth, but soon run about snapping at everything within reach.

The' alpine shrew (S. alpinus), restricted to the alpine region of Central Europe, is slightly longer than the common shrew and differs in its longer tail, which exceeds the length of the head and body, in the colour of the fur, which is dark on both surfaces, and in the large size of the upper antepenultimate premolar.

The water-shrew {Neomysfodiens), the third species inhabiting England, differs from the common shrew in being larger with a shorter and broader muzzle, smaller eyes and larger feet adapted for swimming — the sides of the feet and toes being provided with comb-like fringes of stiff hairs. The tail is longer than the body, and has a fringe of moderately long regularly ranged hairs, which extend along the middle of the under surface from the end of the basal third to the extremity. The fur is long and dense, varying in colour in different individuals; the prevailing shades are dark, almost black, brown above, beneath more or less bright ashy tinged with yellowish; but occasionally we find individuals with the under surface dark-coloured. In the number and shape of the teeth the water-shrew differs from the common shrew: there is a premolar less on each side above; the bases of the teeth are more prolonged posteriorly; and their cusps are less stained brown, so that in old individuals they often appear white. This species is aquatic in habits, swimming and diving with agility. It frequents rivers and lakes, making burrows in the banks, from which when disturbed it escapes into the water. Its food consists of water insects and their larvae, small crustaceans and probably the fry of small fishes. It is generally distributed throughout England, is less common in Scotland and not recorded in Ireland.

The geographical range of the common shrew is wide, extending eastwards through Europe and Asia to Amurland. The lesser shrew extends through Europe and Asia to Sakhalin Island; and specimens of the water-shrew have been brought from different parts of Europe and Asia as far east as the Altai. In Siberia the common shrew is abundant in the snow-clad wastes about the Olenek river within the

arctic circle. Other species of red-toothed shrews are restricted chiefly to North America, where they are found in greater variety than in the Old World, though Neomys is not represented. Its place is taken by Sorex palustris east of the Rocky Mountains, and S. hydrodromus in Unalaska Island, which, like the water-shrew, have fringes of hair on the feet, but the unfringed tail and dentition of the common shrew. Of the American forms S. bendiri is the largest. Other red-toothed shrews belonging to the genus Blarina, distinguished from Sorex by the dentition and the shortness of the tail, are common in North America. All red-toothed shrews (except the aquatic forms) closely resemble one another .in habits, but the short-tailed North American shrew supplements its insectivorous fare by feeding on beech nuts. In destroying numbers of slugs, insects and larvae, shrews aid the farmer and merit protection. Although their odour renders them safe from rapacious animals, they are destroyed in numbers by owls. (G. E. D.)

SHREWSBURY, EARLS OF. The earldom of Shrewsbury, one of the most ancient in the English peerage, dates from the time of William the Conqueror. Roger de Montgomery (c. 1030- 1094), son of another Roger de Montgomery, known as " the Great," was a councillor of William, duke of Normandy, before his invasion of England, and was probably entrusted by William with the government of Normandy during the expedition of 1066. Roger came to England in the following year and received extensive grants of land in different parts of the kingdom. Obtaining thus a large territory in Sussex, including the city of Chichester and the castle of Arundel, he became earl of Arundel, or probably and more correctly earl of Sussex. In 107 1 the greater part of the county of Shropshire was granted to him, carrying with it the title of earl of Shropshire, though, from his principal residence at the castle of Shrewsbury, he' like his suc- cessors was generally styled earl of Shrewsbury. He probably exercised palatine authority. He was the founder of Shrewsbury

Abbey in 1083. His first wife was Mabel, daughter of the seigneur of Belesme and Alencon; hence his son Robert, who, after the death of another son, Hugh, succeeded to the earldoms of Shrewsbury and Arundel, was generally known as Robert de Belesme (q.v.), one of the most celebrated of the feudal nobles in the time of Henry I. Robert having been deprived of all his English estates and honours in 1102, the earldom of Shrewsbury was next conferred in 1442 on John, 5th baron Talbot, whose descendants have borne the title to the present day. (See Talbot; and Shrewsbury, ist Earl or, below.)

SHREWSBURY, CHARLES TALBOT, Duke of (1660-1718), only son by his second wife of Francis Talbot, nth earl of Shrewsbury, was born on the 24th of July 1660. His mother was a daughter of Robert Brudenell, 2nd earl of Cardigan, and the notorious mistress of the 2nd duke of Buckingham, by whom his father was killed in a duel in 1668. Charles was a godson of King Charles II., after whom he was named, and he was brought up as a Roman Catholic, but in 1679 under the influence of Tillotson he became a member of the Church of England. On his father's death in 1668 he succeeded to the earldom of Shrewsbury; he received an appointment in the household of Charles II., and served in the army under James II. But in 1687 he was in correspondence with the Prince of Orange, and he was one of the seven signatories of the letter of invitation to William in the following year. He contributed towards defraying the expenses of the projected invasion, and having crossed to Holland to join William, he landed with him in England in November 1688. Shrewsbury became a secretary of state in the first administra- tion of William and Mary, but he resigned office in 1690 when the tories gained the upper hand in parliament. While in opposition he brought forward the triennial bill, to which the king refused assent. In 1694 he again became secretary of state; but there is some evidence that as early as 1690, when he resigned, he had gone over to the Jacobites and was in correspondence with James at St Germains, though it has been stated on the other hand that these relations were entered upon with William's connivance for reasons of policy. However this may be, William appears to have had no suspicion of Shrewsbury's loyalty, for on the 30th of April 1694 the latter was created marquess of Alton and duke of s Shrewsbury, and he acted as one of the regents during the king's absence from England in the two following years. In 1696 definite accusations of treason were brought against him by Sir John Fenwick, which William himself communicated to Shrewsbury; and about this time the secretary of state took but a small part in public business, again professing his anxiety to resign. His plea of ill-health was a genuine one, and in 1 700 the king reluctantly consented to his retirement into private life.

For the next seven years Shrewsbury lived abroad, chiefly at Rome, whence in 1701 he wrote a celebrated letter to Lord Somers expressing his abhorrence of public life and declaring that if he had a son he " would sooner bind him to a cobbler than a courtier, and a hangman than a statesman." On the accession of Queen Anne the whig leaders made an ineffectual attempt to persuade Shrewsbury to return to office. When, however, at last he did return to England in 1707 he gradually became alienated from his old political associates,

and in 17 10 he accepted the post of lord chamberlain in the tory administra- tion to which the queen appointed him without the knowledge of Godolphin and Marlborough, while his wife was at the same time made a lady of the bedchamber. After a diplomatic mission to France for the purpose of negotiating preliminaries of peace, Shrewsbury became lord lieutenant of Ireland in 17 13; but he was in London in July 17 14 during the memorable crisis occasioned by the impending death of Queen Anne. On the 27 th of July, when the queen was dying, the earl of Oxford received his long-delayed dismissal from the office of lord treasurer. On the 30th Shrewsbury and other ministers assembled at Kensington Palace, and being admitted to the queen's bedchamber Bolingbroke recommended the appointment of Shrewsbury to the vacant treasurership; Anne at once placed the staff of that high office in the duke's hands. When

the queen died on the ist of August Shrewsbury was thus in a position of supreme power with reference to the momentous question of the succession to the crown. He threw his influence into the scale in favour of the elector of Hanover, and was powerfully influential in bringing about the peaceful accession of George I., and in defeating the design of the Jacobites to place the son of James II. on the throne. His disinclination for the highest political offices remained, however, as great as before; and having resigned the lord-treasurership and the lord-lieutenancy of Ireland, he was appointed lord chamberlain. This place he resigned in July 1715, and he died on the ist of February 17 18.

The duke of Shrewsbury was one of the greatest noblemen of the reign of Queen Anne. Strikingly handsome in person, his demeanour was dignified and his manners full of grace and courtesy. Swift described him as " the finest gentleman we have," and as " the favourite of the nation," while William III. spoke of him as " the king of hearts." Like most of his con- temporaries he endeavoured to keep himself in favour both with the exiled house of Stuart and with the reigning sovereign in England; but at the two critical junctures of 1688 and 1714 he acted decisively in favour of the Protestant succession. At other times he appeared weak and vacillating, and he never whole-heartedly supported either whigs or tories, though he co-operated with each in turn. His magnanimous disposition saved him from the vindictiveness of the party politician of the period; and the weak health from which he suffered through life probably combined with a congenital lack of ambition to prevent his grasping the power which his personality and talents might have placed in his hands.

In 1705 Shrewsbury married Adelaide, daughter of the Marquis Paleotti of Bologna. This lady, who is said to have had " a great many engaging qualities " besides many accomplishments, was the subject of much malicious gossip. She was the widow, or as some declared, the mistress of a Count Brachiano; and Lady Cowper reported that the lady's brother had forced Shrewsbury to marry her " after an intrigue together." After Shrewsbury's return to England the duchess became conspicuous in London society, where the caustic wit of Lady Mary Wortley- Montagu was exercised at her expense. On the accession of George I. the duchess of Shrewsbury became a lady of the bedchamber to the princess of Wales, a position which she retained till her death on the 29th of June 1726. Shrewsbury left no children, and at his death the dukedom became extinct, the earldom of Shrewsbury passing to his cousin Gilbert Talbot (see Talbot).

See Correspondence of Charles Talbot, Duke of Shrewsbury, with King William, the Leaders of the Whig Party, &c, edited by W. Coxe (London, 1821); Gilbert Bufnet, History of his own Time (6 vols., 2nd ed., Oxford, 1833) ; F. W. Wyon, History of Great Britain during the Reign of Anne (2 vols., London, 1876); Earl Stanhope, History of England comprising the Reign of Anne until the Peace of Utrecht (London, 1870), and History of England from the Peace of Utrecht, vol. i. (7 vols., London, 1836-1854); The Wentworth Papers, edited by J. J. Cartwright (London, 1883); W. E. H. Lecky, History of England in the Eighteenth Century, vol. i. (new edition, 7 vols., London, 1892); and G. E. C., Complete Peerage, vol. vii. (London, 1896). (R. J. M.)

SHREWSBURY, ELIZABETH TALBOT, Countess of (1518- 1608), better known by her nickname " Bess of Hardwick," was the daughter and co-heiress of John Hardwicke of Hardwicke in Derbyshire. At the age of fourteen she was married to a John Barlow, the owner of a large estate, who did not long survive the marriage, and as his estates had been settled on her and her heirs, she became a wealthy widow. She remained single till the 20th of August 1549, when she married Sir William Cavendish, who, to please her, sold his lands in the south of England and purchased the Chatsworth estates in Derbyshire. Six children were born of the marriage, three sons and three daughters. One of the sons was the founder of the ducal family of Devonshire, and another of the ducal family of Newcastle. Sir William Cavendish having died on the 25th of October 1557, her third husband was Sir William St Lo (or St Loe or St Lowe), captain of the guard to Queen Elizabeth and owner of an estate

at Tormarton in Gloucestershire. She insisted that his lands should be settled on her and her heirs, and when Sir William died without issue, she made good her claim to all his property to the detriment of his sister and cousins. Bess of Hardwick was now the wealthiest subject in England. Her income was calculated to amount to £60,000, which was relatively a far more important sum then than it is to-day. She still retained much of her good looks; her charms and her wealth outweighed her reputation for rapacity, and she was much sought in marriage. With the approval of Queen Elizabeth, who was not by habit a matchmaker, she was married in 1568 for the fourth time to George Talbot, 6th earl of Shrewsbury. Bess made her usual good bargain as to settlements, and also insisted on arranging marriages between two of her children by Sir William Cavendish and two of the earl's by a former marriage. In 1574 the countess took advantage of a visit of the countess of Lennox to marry her daughter Elizabeth to Charles Stuart, the younger son of the Lennoxes and brother of Lord Darnley, the second husband of the queen of Scots. She acted without the knowledge of her husband, who declined to accept any responsibility. As the Lennox family had a claim to the throne this match was con- sidered as a proof of the ambition of the countess of Shrewsbury, and she was sent to the Tower by the queen, but was soon released. The child of the marriage was Arabella Stuart, whom her grandmother treated at first with favour but later on with cruelty and neglect.

By this time the earl of Shrewsbury and his wife were on very bad terms with one another, and the former tried to obtain a divorce. The countess revenged herself by accusing him of a love intrigue with the queen of Scots, a charge which she was forced to letract before the council. In the meantime she had told some filthy scandal about Queen Elizabeth to Queen Mary, who made use of it in the extraordinary letter she wrote some time in 1584. In 1583 the countess of Shrewsbury went to live apart from her husband, with whom she was afterwards recon- ciled formally by the queen. After his death in 1590 she lived mostly at Hardwicke, where she built the noble mansion which still stands. She was indeed one of the greatest builders of her time at Hardwicke, Chatsworth and Oldcoates. It is said that she believed she would not die so long as she was building. Her death came on the 13th of February 1608 during a frost which put a stop to her building operations. She was buried in All Saints' Church, Derby, under a fine monument with a laudatory inscription which she took care to put up in her lifetime. Two portraits of her exist at Hardwicke, one taken in her youth, while the second, by Cornelius Janssen, engraved by Vertue, represents her as an old

woman. She had no children except by her second husband, and to them she left the vast estates she accumulated by her successive marriages.

See White Kennett, Memoirs of the Cavendish Family (London, 1708) ; and Mrs Murray Smith (Miss E. T. Bradley), Life of Arabella Stuart (London, 1889) ; Mrs Stepney Rawson, Bess of Hardwicke

(1910).

SHREWSBURY, JOHN TALBOT, ist Earl of (d. 1453), was second son of Richard, 5th baron Talbot, by Ankaret, heiress of the last Loid Strange of Blackmere. He was married before 1404 to Maud Neville, heiress of the barons Furnivall, and in her right summoned to parliament from 1409. In 142 1 by the death of his niece he acquired the baronies of Talbot and Strange. From 1404 to 1413 he served with his elder brother Gilbert in the Welsh war. Then for five years from February 1414 he was lieutenant of Ireland, where he held the honour of Wexford. Tie did some fighting, and had a sharp quarrel with the earl of Ormonde. Complaints were made against him both for harsh government in Ireland and for violence in Herefordshire. From 1420 to 1424 he served in France. In 1425 he was again for a short time lieutenant in Ireland. So far his career was that of a turbulent lord of the Marches, employed in posts where a rough hand was useful. In 1427 he went again to France, where he fought with distinction in Maine and at the siege of Orleans; but his exploits were those of a good fighter rather than of general, and it was his stubborn rashness that was chiefly to

blame for the English defeat at Patay in June 1429. After Patay Talbot was four years a prisoner. On his release he became one of the foremost of the English captains. In 1434 he recovered the county of Clermont, next year took part in the siege of St Denys, and in 1436 by reducing and harrying the revolted Pays de Caux saved Normandy. He was rewarded with the offices of captain of Rouen and marshal of France. During five years as a dashing fighter he was the mainstay of the English cause. His chief exploits were the defeat of the Burgundians before Crotoy in 1437 and the recovery of Harfleur in 1440. In 1442 during a visit to England he was created earl of Shrewsbury. In November he was back in France besieging Dieppe; but " fared so foul with his men that they would no longer

abide with him " and was forced to break the siege {Chronicles of London, p. 150). In March 1445 he was once more sent to Ireland, where he used his old methods, so that the Irish said " there came not from the time of Herod any one so wicked in evil deeds." In 1440 he served for a short time in Normandy. When in 1452 the Gascons appealed for English help, Shrewsbury was the natural leader of the expedition. He landed in Aquitaine on the 1 7th of October. Bordeaux and the surrounding district returned quickly to their old allegiance, and in the following summer Shrewsbury captured Fronsac. In July the French besieged Castillon. Shrewsbury hurried to its relief, and with foolhardy valour attacked the enemy in their entrenched camp without waiting for his artillery. The English and Gascon footmen charged in vain in face of the French cannon, until Shrewsbury and the flower of his troops had fallen. This happened in July 1453 and was the end of the English rule in Gascony. Shrewsbury's fighting qualities made him something of a popular hero, and in the doggerel of the day he was " Talbot our good dog," whose valour was brought to nought by the treason of Suffolk. But in truth though a brave soldier he was no general. He was twice married, his second wife being Margaret, eldest daughter of Richard Beauchamp, earl of Warwick. He was alleged to be eighty years old at his death; probably he was about sixty-five. Bibliography. — For Shrewsbury's French campaigns see especi- ally the Chronique of E. de Monstrelet, jehan de Waurin and Matthieu d'Escouchy (all these are published by the Soctite de VHistoire de France), and the Chronicles of London (ed. C. L. Kings- ford, London, 1905). Also H. Ribadieu, Conquete de Guyenne (1866); J. T. Gilbert, Viceroys of Ireland (1865); and J. H. Wylie's Henry the Fourth (1 884-1 898) for his early career. (C. L. K.)

SHREWSBURY, a municipal and parliamentary borough, market town and the county town of Shropshire, England. Pop. (1901), 28,395. It i s situated on both banks of the river Severn, but mainly on a peninsula formed by the river on the left bank. It is served by the London & North-Western and Great Western railways, being 163 m. N.W. from London. The companies use a joint station, and jointly work the line S. to Hereford. There is water communication eastward by the Shrewsbury canal, and by the Severn below the town. Eastward from the peninsula the English bridge crosses the river, westward the Welsh bridge; southward the Kingsland and Greyfriars bridges. The joint railway station is on the peninsula, and is reached from the south by a massive iron bridge. The streets, many retaining ancient names curiously corrupted, are hilly and irregular, but strikingly picturesque from their number of antique timber houses,

among which may be mentioned that in Butcher Row, formerly the town residence of the abbot of Lilleshall; the council-house overlooking the Severn, erected in 1620 for the presidents of the council of the Welsh marches; and the two adjacent mansions of Robert Ireland and Richard Owen, citizens c. 1590. Of the town ramparts built in the reign of Henry III. the principal remains are a portion to the south- west, used as a public walk, on which stands a square embattled tower. The castle built by Roger de Montgomery was dismantled in the reign of James II., and is modernized as a residence, but there remain the archway of the interior gateway, the walls of the inner court and two large round towers of the time of Edward I. The rich abbey of St Peter and St Paul was also founded by Roger, on the site of an earlier church. Of the abbey church (Holy Cross) the nave of massive Norman work remains,

especially impressive owing to the warm red stone of which it is built; there are further two Early English arches and the western tower. Of the monastic buildings little is left, save a remarkable roofed pulpit of ornate Decorated work. Among other churches St Mary's, founded in the 10th century, is a fine cruciform structure with a lofty tower and spire, displaying examples of various styles of architecture from early Norman to Perpendicular, the base of the tower, the nave and the doorways being Norman, the transept Early English and the aisles 15th century, while the interior is specially worthy of notice for its elaborate details, its early stained glass, including a Jesse window, and its ancient monuments. Some 50 ft. of the spire fell in 1894, severely injuring the church and necessitating extensive restoration. St Julian's was originally built before the Conquest, but rebuilt in 1748, except the tower, the older portion of which is Norman and the upper part of the 15th century. St Alkmond's also dated from the 10th century, but was rebuilt towards the close of the 18th century, with the exception of the tower and spire. It has a beautiful half-timbered rectory. St Giles's, originally the church of the leper hospital, dating from the time of Henry I., was altered at various periods. The hollow base of the old churchyard cross bears the name of the Pest Basin, because the citizens cast alms into it in the 16th century during the visitation of the plague, which, according to tradition, first appeared here. The old church of St Chad, supposed to have occupied the site of a palace of the princes of Powis, was destroyed by the fall of the tower in 1788, and of the ancient building the bishop's chancel alone remains. The new church of St Chad was built on another site in 1792. Shrewsbury is not fortunate in its ecclesiastical architecture of the late 18th century. There are slight remains of a Franciscan [house (Grey Friars)

founded in 1 291, of an Augustinian friary (1253) and of a Dominican house (1222). The old buildings completed in 1630 for the grammar school of Edward VI., founded in 1551, are now occupied by the county museum and free library, the school having been removed in 1882 to new buildings in the suburb of Kingsland S. of the river. It takes rank among the first public schools in England. The ground it occupies in Kingsland was formerly the scene of the Shrewsbury show, a pageant and festival held during the festival of Trinity. Among the principal secular buildings of the town are the fine market house in the Elizabethan style (completed according to an inscription over the northern arch in 1595), the shire hall and guildhall (rebuilt in 1837, and again, after a fire, in 1883), the general market and corn exchange (1869), and the drapers' hall, a timbered structure dating from the 16th century. The principal benevolent institu- tions are the county infirmary (1747), Millington's hospital (1734) and the eye, ear and throat hospital (1881). A monu- ment to Lord Clive, who was member for the borough 1761— 1764, was erected in the market-place in i860, and a Doric memorial pillar to General. Lord Hill in 1816 at the top of the Abbey Fore- gate. The town race-course occupies a portion of the " Soldiers' Piece," where Charles I. addressed his army in 1642. To the south-west of the town is a park of 23 acres, known as the Quarry, with beautiful avenues of lime-trees, descending to the river. Glass-staining, the spinning of flax and linen yarn, iron-founding, brewing, malting, the preparation of brawn and the manufacture of the well-known Shrewsbury cakes are now the principal industries. Shrewsbury is a suffragan bishopric in the diocese of Lichfield, and the seat of a Roman Catholic bishop. The parliamentary borough returns one member. The town is governed by a mayor, 10 aldermen and 30 councillors. Area, 3525 acres.

Shrewsbury (Pengwerne, Scrobsbyryg, Salopesberie), then known as Pengwerne or Pengwym, was the capital of the kings of Powis during the 5th and 6th centuries, but was taken in 779 by Offa king of Mercia, who changed its name to Shrewsbury (Scrobsbyryg).. Owing to its position on the Welsh borders it became one of the chief cities of the Saxon kings, and a mint was established here in the reign of King iEthelstan. After the Conquest the town was included in the earldom of Shrews- bury, and the Domesday Survey shows that the Saxon burgesses

paid the sarne danegeld as in the reign of Edward the Confessor. Until Wales was annexed to England in the 13th century, Shrewsbury was one of the chief border towns, and as such it was besieged by Owen Gwynedd- in 1067, but was relieved by William the Conqueror. In the reign of Henry I. it was garrisoned by Robert de Belesme, but surrendered to the king in 1 102. It was several times burnt by the Welsh and was taken and held by them from 1215 to 1221. During the Welsh war in the reign of Edward I., the king made the town his head- quarters, and in 1283 David, the last native prince of Wales, was tried and condemned to death by a parliament held here. In 1403 Henry Percy, son of the earl of Northumberland, was defeated and killed at Shrewsbury by Henry IV. At the begin- ning of the Civil War, Charles I. stayed in the town for some time, but it surrendered to parliament in 1645. The first .extant charter, dated iiqq, is a grant by Richard I. to the burgesses of the town at a fee farm of 40 marks, but Henry II. is known to have granted an earlier charter which was confirmed by King John in 1200. The same king granted two other charters, one in 1 200 giving the right of electing the reeves, and the other in 1 205 providing that their lands and tenements should be governed by the " laws of Breteuil, the laws of the Barony and the laws of the Englishry." Henry II. in 1227 granted a gild merchant with a house. Besides these charters there are numerous con- firmations before the incorporation charter of Elizabeth of 1586. Charles I. in 1638 altered the corporation to a mayor, 24 aldermen and 48 assistants. In 1684 the burgesses surrendered their charter to the king and received a new one in the following year which, however, did not change the form of government. From 1295 to 1885 Shrewsbury returned two members to parlia- ment, but then the number was reduced to one.

See H. Owen and J. C. Blakeway, A History of Shrewsbury (1825) ; Thomas Phillips, The History and Antiquities of Shrewsbury (1837); Victoria County History, Shropshire.

SHRIKE, a bird's name, so given by Turner (1544), but solely on the authority of Sir Francis Lovell, for Turner had seen the bird but twice in England, though in Germany often, and could not find anyone else who so called it. However, the word l was caught up by succeeding writers; and, though hardly used except in books — for butcher-bird is its vernacular synonym — it not only retains its first position in literary English, but has been largely extended so as to apply in general to all birds of the family Laniidae and others besides. The name Lanius, in this sense, originated with C. Gesner 2 (1555), who thought that the birds to which he gave it had not been mentioned by the ancients. C. J. Sundevall, however, considers that the M

alacocraneus of Aristotle was one of them, as indeed Turner had before suggested, though repelling the latter's supposition that Aristotle's Tyrannus was another, as well as P. Belon's reference of Collyrion.

The species designated shrike by Turner is the Lanius excubilor of Linnaeus and nearly all succeeding authors, nowadays 3 commonly known as the greater butcher-bird, ash-coloured or great grey shrike — a bird which visits the British Islands pretty regularly, though not numerously, in autumn or winter, occasion- ally prolonging its stay into the next summer; but it has never been ascertained to breed there, though often asserted to have done so. This is the more remarkable since it breeds more or less commonly on the continent from the north of France to within the Arctic Circle. Exceeding a song-thrush in linear measurements, it is a much less bulky bird, of a pearly grey above with a well-defined black band passing from the forehead to the ear-coverts; beneath it is nearly white, or — and this is

1 Few birds enjoy such a wealth of local names as the shrikes. M. Rolland {Faune,pop. de la France, ii. 146-151) enumerates up- wards of ninety applied to them in France and Savoy; but not one of these has any affinity to our word " shrike."

2 He does not seem, however, to have known that butcher-bird was an English name ; indeed it may not have been so at the time, but subsequently introduced.

3 According to Willughby, Rae and Charleton, it was in their day called in many parts of England " Wierangle " (Ger. Wiirgengel and Wurger, the strangler); but it is hard to see how a bird which few people in England could know by sight should have a popular name, though Chaucer had used it in his Assemblye of Foules.

particularly observable in Eastern examples — barred with dusky markings. The quill-feathers of the wings, and of the elongated tail, are variegated with black and white, mostly the former, though what there is of the latter shows very conspicuously, especially at the base of the remiges, where it forms either a single or a double patch. Much smaller than this is the red-backed shrike, L. collurio, the best-known species in Great Britain, where it is a summer visitor, and, though its distribution is rather local, it may be seen in many parts of England and occasionally reaches Scotland. The cock is a sightly bird with his grey head and neck, black cheek-band, chestnut back and pale rosy breast, while the hen is ordinarily of a dull brown, barred on the

lower plumage. A more highly coloured species is called the woodchat, L. auricu- lalus or rutUus, with a bright bay crown and nape, and the rest of its plumage black, grey and white. This is an accidental visitor to England, but breeds commonly throughout Europe. All these birds, with many others included in the genus Lanius, which there is no room here to specify, have, according to their respective power, the very remarkable habit (whence they have earned their opprobrious name) of catching insects, frogs, lizards or small birds and mammals, and of spitting them on a thorn or of fixing them in a forked branch, the more conveniently to tear them in pieces and eat them.

The shrikes belong to the Passerine family Laniidae, the limits of which are doubtful, but which is divided into five sub-families: Gymnorhininae, Malaconotinae, Pachycephalinae, Laminae and Prionopinae. The Laniinae or true shrikes occur in the Old and New Worlds, the other sub-families are limited to the Old World. The shrikes and their immediate allies are active and powerful birds, with stout bills often strongly hooked. Their diet is chiefly insects and small frogs, lizards, birds and mammals, but they also take seeds and fruits. The " greenlets " of North and South America are active and fearless birds, similar in general habits to the Laniidae and formerly regarded as forming a sub-family of that group, but now placed in a separate family the Vireonidae. (A. N.)

SHRIMP, a name applied in general to the smaller Crustacea of the order Macrura and in particular to an edible species found on the coasts of northern Europe (Crangon vulgaris). The shrimps and their allies are distinguished from the larger Macrura, such as the lobsters and crayfishes, by greater development of the paddle-like limbs of the abdomen or tail, which are used in swimming. The abdomen is usually sharply bent between the third and fourth segments and has a characteristically humped appearance when straightened out.

The common shrimp is found abundantly on the coasts of the British Islands, in shallow water wherever the bottom is sandy. It is 2 or 3 in. long, slightly flattened and with the rostrum or beak, in front of the carapace, very short. It is of a translucent greyish colour, speckled with brown and closely resembles the sand in which it lives. On many parts of the coast the shrimp fishery is of considerable importance. The instrument generally employed is a bag-shaped net attached to a semicircular hoop, provided with a long handle and pushed over the surface of the sand by a fisherman wading in the water at ebb-tide. When boiled, the body becomes of a brownish colour and on this account the species is sometimes termed the "

brown shrimp." The name of " pink shrimp " is given to Pandalus montagui or annulicornis, which turns red on boiling and which resembles in form the larger " prawns," having a long rostrum or beak, saw-edged above and below. The smaller species of Leander, especially L. squilla, are sold as " cup- shrimps " in some places.

The larger shrimp-like Crustacea are generally known as " prawns," the name being especially applied in Britain to the species Leander serratus, formerly called Palaemon serratus, which is highly esteemed for the table. In warmer seas many other kinds of prawns are caught for food. These are generally species of the genus Penaeus (like P. caramote of the Mediter- ranean) which are distinguished from all those already mentioned by having pincers on the first three, instead of only on the first two pairs of legs. The large river-prawns of the genus Palaemon

(closely allied to Leander) found in most tropical countries are also often used as food. In the West Indies P (daemon jamaicen- sis, and in the East Indies Pal. carcinus attain almost the dimensions of full-grown lobsters.

The name of shrimps is sometimes given to members of the order Schizopoda, which differ from most of the Macrura in having swimming branches or exopodites on the thoracic legs. In particular the Schizopods of the family Mysidae, which are abundant in the sea round our coasts, are often called " Opossum- shrimps " from the fact that the female is provided with a ventral pouch or " marsupium " in which the eggs and young are carried. (W. T. Ca.)

SHRINE (Lat. scrinium, a case or chest for books, hence a casket; from scribere, to write, Fr. ecrin, Ital. scrigno), the term given to the repository or chest to hold sacred relics. Sometimes shrines are merely small boxes, generally with raised tops like roofs; sometimes actual models of churches; some- times large constructions like that at St Albans, that of Edward the Confessor at Westminster, of Ste Genevieve at Paris, &c. Many are covered with jewels in the richest way, such as the example at St Taurin, at Evreux in Normandy, and that of San Carlo Borromeo, at Milan, of beaten silver; the largest series are those which were enriched with enamels. Sometimes the term is given to the chapel in which the shrine is deposited.

SHROPSHIRE (Salop), a western county of England on the Welsh border, bounded N. by Cheshire and a detached portion of Flint, E. by Staffordshire, S.E. by Worcestershire, S. by Herefordshire, S.W. by Radnorshire, W. by Montgomeryshire and N.W. by Denbighshire. The area is 1343 sq. m. The name of Salop, in common use, comes from an early name of the county town of Shrewsbuiy. Towards the west Shropshire partakes of the hilly scenery of Wales, from which several ranges are continued into it. South of the river Severn and partly in Montgomeryshire, the Breidden Hills rise abruptly in three peaks; and in the south-west there is a broad range of rough rounded hills known as Clun Forest, extending from Radnor- shire. South and west of the Severn there are four other princi- pal chains of hills extending from S.W. to N.E. — the Long Mynd (1674 ft.), west of Church Stretton; the Carodoc Hills, a little to the north, which are continued across the Severn and terminate in the isolated sugarloaf hill of the Wrekin (1335 ft.); Wenlock Edge, east of Church Stretton, a sharp ridge extending for 20 m., and at some points rising above 1000 ft.; and the Clee Hills near the south-eastern border (Brown Clee, 1805 ft.; Titter- stone Clee, 1749 ft.). The remainder of the county is for the most part pleasantly undulating and well cultivated. It lies almost entirely in the basin of the Severn, which enters from Montgomeryshire and flows eastward to Shrewsbury, after which it turns south-eastward to Ironbridge, and then continues in a more southerly direction past Bridgnorth, entering Wor- cester near Bewdley. The scenery on its banks is striking at some places, as near the finely situated town of Bridgnorth, but it is spoilt in one of the most beautiful stretches, that near Coalbrookdale, by the great factories in the neighbourhood. Its principal tributaries within Shropshire are: from the right the Rea, the Cound and the Borle; from the left the Vyrnwy, a well-known trout-stream forming part of the boundary with Montgomeryshire, the Perry, the Tern, which receives the Roden, and the Worf. The Dee and its tributary the Ceiriog touch the north-western boundary of the county with Denbigh- shire. In the south the Teme, which receives the Clun, the Onny and the Corve, flows near the borders of Herefordshire, which it occasionally touches and intersects. Salmon are taken in the Severn, and the Teme with its tributaries are frequented for trout and grayling fishing. There is a cluster of picturesque meres or small lakes in the north-west near the borders of Denbighshire, of which the largest is Ellesmere, and there are a number of others in various parts of the county.

Geology. — The Pre-Cambrian rocks of Shropshire include the granitoid and gneissic rocks of the Ercall and Primrose Hill

(Wrekin), the schists of Rushton, the lavas and ashes of the Wrekin, Caer Caradoc and Pontesford, and the purple slates, grits and conglomerates of the Longmynd. The Wrekin Quartzite, Comley

Sandstone and Shineton Shales are the local representatives of the Cambrian system. These are followed by the Ordovician formations which occupy three areas: the Breidden Hills, the Shelve district and the Caer Caradoc district, and include strata referable to the Arenig, Llandeilo and Bala series ; the rocks are fossilif erous shales, grits and volcanic ashes, with dolerite intrusions. The Silurian rocks which follow unconformably are represented in the Long Mountain and Clun Forest regions by sandstones and shales, and along Wenlock Edge by highly fossiliferous mudstones and lime- stones ; they include the Llandovery, Wenlock and Ludlow series, and the limestones are famed for their rich marine fauna. The Old Red Sandstone, a great series of red marls, sandstones and thin impure limestones (cornstones) , conformably succeeds the Silurian rocks, and occupies the south-eastern area (whence it extends into Herefordshire) ; it also makes extensive out-liers at Clun and Bettws-y-Crwyn ; the rocks have yielded fish and Crustacea. The highest beds are conglomeratic and are seen only round the Titter- stone Clee Hill. The Carboniferous Limestone and Millstone Grit of the Denbighshire coalfield enter the county near Oswestry ; they appear also at Lilleshall and Coalbrookdale on the western border of the Coalbrookdale coalfield, and underlie the little coalfield of the Titterstone Clee Hill. The Coal Measures with their coal-seams and bands of ironstone are present at Oswestry (extending south from Denbighshire) and form also the coalfields of Shrewsbury, Leebotwood, Coalbrookdale, Wyre Forest and the Clee Hills. In the last two districts basalt (dhustone) has been intruded into the Measures, and at Clee Hill is extensively quarried for roadstone and paving- cubes. The so-called Permian rocks (red sandstones and marls) are now grouped with the Coal Measures. The succeeding Triassic rocks — red sandstones, marls and conglomerates (Bunter and Keuper) — occupy the north-eastern part of the county, and are capped near Market Drayton by Rhaetic and Lias. Glacial deposits — boulder-clay, gravel and sand, often shell-bearing — overspread much of the Triassic plain in the north and east of the county ; they were laid down by ice-sheets which moved in from the Irish Sea and from the Aran and Arenig mountains in Merioneth. Some peat-bogs in the drift-covered regions appear to occupy the sites of lakes. Coal and ironstone, silver-lead and zinc from the Ordovician rocks of Shelve, with limestone, building-stone and roadstone, are the chief mineral products.

Industries. — More than four-fifths of the total area is under cultivation. The principal grain crops are barley and oats, the acreage under each of which is nearly double that under wheat. Some five-eighths of the total acreage cultivated is in permanent pasture, and there are besides considerable tracts of hill pasture. Turnips and swedes form the bulk of the green crops, as cattle are largely kept for the dairy. The cattle are chiefly Herefords and the sheep Shropshires. Cheshire cheese is made in the northern districts. A small acreage is under hops.

Apart from agriculture there are several important branches of industry. Coalbrookdale and the neighbourhood is the principal coal-mining centre, and was an early home of the ironfoundmg trade, under the famous family of Darby, and this industry is pro- secuted here and at Ironbridge, Shifnal and elsewhere. There are also considerable manufactures of machinery, tools and agricultural implements, as at Ludlow, Oswestry, Shrewsbury and Wellington. There are great encaustic tile and brick works in the Broseley district, where also is an old-established manufacture of tobacco-pipes; while at Coalport there are china works. Some woollen goods are made. In the Minsterley and Stiperstones district in the west, lead and barytes are obtained.

Communications. — The railways, for which Shrewsbury is the most important centre, belong mainly to the Great Western and London & North- Western companies. Of the first the main route to the north-west runs from Wolverhampton by Wellington, Shrewsbury and Gobowen to Chester, with a branch from Wellington to Crewe. Another line comes from Worcester and Bewdley, following the Severn valley by Bridgnorth and Ironbridge to Shrewsbury, with several branches through the Coalbrookdale and Wenlock districts. The two companies jointly work the line from Stafford by Newport, Wellington and Shrewsbury to Welshpool, and the Crewe-Hereford line by Whitchurch, Shrewsbury and Craven Arms. Frcm Craven Arms a branch of the North- Western system runs into South Wales and the short Bishops Castle railway serves that town. The Cam-brian line starts from Whitchurch and runs by Oswestry into Wales. The chief canals are the Shropshire Union, Shrewsbury and Elles-mere in the northern part of the county. The Severn is to some extent used for navigation up to Shrewsbury.

Population and Administration. — The area of the ancient county is 859,516 acres, with a population in 1891 of 236,339, and in 1901 of 239,324. The area of the administrative county is 861,802 acres. The county contains 14 hundreds. The municipal boroughs are —

Bishops Castle (pop. 1378), Bridgnorth (6052), Ludlow (4552), Oswestry (9579), Shrewsbury (28,395), Wenlock (15,866). The urban districts are Church Stretton (816), Dawley (7522), Ellesmere (1954), Newport (3241), Oaken- gates (10,906), a mining town, Wellington (6283), Wem (2149),

Whitchurch (5221). The more important towns not mentioned above are B roseley , Coalbrookdale, Madeley (this parish including Ironbridge and Coalport) andMuch Wenlock, which are embraced wholly or in part by the borough of Wenlock; Market Drayton (5167) and Shifnal (3321). Lesser towns are Clun (1915) which gives name to Clun Forest, and Cleobury Mortimer (1810) in the south. The county is in the Oxford circuit, and assizes are held at Shrewsbury. It has one court of quarter sessions, and is divided into 18 petty sessional divisions. The boroughs of Bridgnorth, Ludlow, Oswestry, Shrewsbury and Wenlock have separate commissions of the peace and courts of quarter sessions. There are 267 civil parishes. Shrewsbury is divided between the dioceses of Lichfield and Hereford, with a small part in the diocese of St Asaph, and contains 284 ecclesiastical parishes or districts, wholly or in part. There are four parlia- mentary divisions — Mid or Wellington, North or Newport, South or Ludlow, and West or Oswestry, each returning one member, while Shrewsbury returns one member.

History. — The district which is now Shropshire was annexed to the kingdom of Mercia by Ofia, who in 765 constructed Watt's Dike to defend his territory against the Welsh, and in 779, having pushed across the Severn, drove the king of Powys from Shrewsbury, then known as Pengwerne, and secured his conquests by a second defensive earthwork known as Offa's Dike, which, entering Shropshire at Knighton, traverses moor and mountain by Llanymynech and Oswestry, in many places forming the boundary line of the county, and finally leaves it at Bron y Garth and enters Denbighshire. In the 9th and 10th centuries the district was frequently overrun by the Danes, who in 874 destroyed the famous priory of Wenlock, said to have been founded by St Milburg, granddaughter of Penda of Mercia, and in 896 wintered at Quatford. In 912 lEthelflead, the lady of Mercia, erected a fortress at Bridgnorth against the Danish invaders, and in the next year at Chirbury. Mercia was mapped out into shires in the 10th century after its recovery from the Danes by Edward the Elder, and

Shropshire stands out as the sole Mercian shire which did not derive its name from its chief town. The first mention of it in the Saxon Chronicle occurs under 1006, when the king crossed the Thames and wintered there. In 1016 Edmund ˆEtheling plundered Shrews bury and the neighbourhood.

After the Conquest the principal estates in Shropshire were all bestowed on Norman proprietors, pre-eminent among whom is Roger de Montgomery, the 1st earl of Shrewsbury, whose son Robert de Belesme forfeited his possessions for rebelling against Henry I., when the latter bestowed the earldom on his queen for life. At this period a very large portion of Shropshire was covered by its vast forests, the largest of which, Worf Forest, at its origin extended at least 8 m. in length and 6 m. in width, and became a favourite hunting-ground of the English kings. The forest of Wrekin, or Mount Gilbert as it was then called, covered the whole of that hill and extended eastward as far as Sheriff Hales. Other forests were Stiperstones, the jurisdiction of which was from time immemorial annexed to the barony of Caus, Wyre, Shirlot, Clee, Long Forest and Brewood. The constant necessity of defending their territories against the Welsh prompted the Norman lords of Shropshire to such activity in castle-building that out of 186 castles in England no less than 32 are in this county. Of these the most famous are Ludlow, founded by Roger de Montgomery; Bishop's Castle, which belonged to the bishops of Hereford; Clun Castle, built by the Fitz- Alans; Cleobury Castle, built by Hugh de Mortimer; Caus Castle, once the barony of Peter Corbett, from whom it came to the Barons Strafford; Rowton Castle, also a seat of the Corbetts; Red Castle, a seat of the Audleys. Other castles were Bridgnorth, Corfham, Holgate, Pulverbatch, Quatford, Shrewsbury and Wem.

Among the Norman religious foundations were the Cluniac Priory at Wenlock, re-established on the Saxon foundation by Roger Montgomery in 1080; the Augustinian abbey of Haugh- mond founded by William Fitz- Alan; the Cistercian abbey of Buildwas, now a magnificent ruin, founded in 1135 by Roger,

bishop of Chester; Shrewsbury Abbey, founded in 1083 by Roger de Montgomery; the Augustinian abbey of Lilleshall, founded in the reign of Stephen; the Augustinian priory of Wombridge, founded before the reign of Henry I.; the Bene- dictine priory of Alberbury founded by Fulk Fitz-Warin in the 13th century; and Chirbury Priory founded in the 13th century.

The fifteen Shropshire hundreds mentioned in the Domesday Survey

were entirely rearranged in the reign of Henry I., and only Overs and Condover retained their original names. The Domesday hundred of Ruesset was replaced by Ford, and the hundred court transferred from Alberbury to Ford. Hodnet was the meeting-place of the Domesday hundred of Odenet, which was combined with Recordin, the largest of the Domesday hundreds, to form the modern hundred of Bradford, the latter also including part of the Domesday hundred of Pinholle in Staffordshire. The hundred of Baschurch had its meeting-place at Baschurch in the time of Edward the Confessor; in the reign of Henry I. it was represented mainly by the hundred of Pimhill, the meeting-place of which was at Pimhill. Oswestry represents the Domesday hundred of Mercete, the hundred court of which was transferred from Maesbury to Oswestry. Munslow hundred was formed in the reign of Henry I., but in the reign of Richard I. a large portion was taken out of it to form a new liberty for the priory of Wenlock, the limits of which correspond very nearly with the modern franchise of Wenlock. The Domesday hundred of Alnodestreu, abolished in the reign of Henry I., had its meeting-place at Membrefeld (Morville). The hundreds at the present day number fourteen.

Shropshire was administered by a sheriff, at least from the time of the Conquest, the first Norman sheriff being Warin the Bald, whose successor was Rainald, and in 1156 the office was held by William Fitz-Alan, whose account of the fee-farm of the county is entered in the pipe roll for that year. The shire court was held at Shrewsbury. A considerable portion of Shropshire was included in the Welsh marches, the court for the administration of which was held at Ludlow. In 1397 the castle of Oswestry with the hundred and eleven towns pertaining thereto, the castle of Isabel with the lordship pertaining thereto, and the castle of Dalaley, were annexed to the principality of Chester. By the statute of 1535 for the abolition of the marches, the lordships of Oswestry, Whittington, Masbroke and Knockin were formed into the hundred of Oswestry; the lordship of Ellesmere was joined to the hundred of Pimhill; arid the lordship of Down to the hundred of Chirbury. The boundaries of Shropshire have otherwise varied but slightly since the Domesday Survey. Richard's Castle, Ludford, and Ludlow, however, were then included in the Herefordshire hundred of Cutestornes, while several manors now in Hereford- shire were assessed under Shropshire. The Shropshire manors of Kings Nordley, Aveley, Claverley and Worfield were assessed in the Domesday hundred of Saisdon in Staffordshire; and Quatt, Romsley, Rudge and Shipley in the Warwickshire hundred of Stanlei. By statute 34 and 35 Henry VIII. the town and hundred of

Aberton, till then part of Merionethshire, were annexed to this county.

Shropshire in the 13th century was situated almost entirely in the dioceses of Hereford and of Coventry and Lichfield; and formed an archdeaconry called the archdeaconry of Salop. That portion of the archdeaconry in the Hereford diocese included the deaneries of Burford, Stottesdon, Ludlow, Pontes- bury, Clun and Wenlock; and that portion in the Coventry and Lichfield diocese the deaneries of Salop and Newport. In 1535 the Hereford portion included the additional deanery of Bridg- north; it now forms the archdeaconry of Ludlow, with the additional deaneries of Montgomery, Bishops Castle and Church Stretton. The archdeaconry of Salop, now entirely in the Hereford diocese, includes the deaneries of Condover, Edgmond, Ellesmere, Hodnet, Shifnal, Shrewsbury, Wem, Whitchurch and Wrockwardin. Part of Welsh Shropshire is included in the diocese of St Asaph, comprising the deanery of Oswestry in the archdeaconry of Montgomery, and two parishes in the deanery of Llangollen and the archdeaconry of Mexham.

The ezdr #>fltical history of Shropshire fe largely concerned «it& the constant incursions : arid depredations of the Welsh from across the border.- The Saxon Chronicle relates that in 1053 the Welshmen slew a great many of the English wardens at Westbury, and in that year Harold ordered that any Welshman found beyond Offa's Dike within the English pale should have his right hand cut off. Various statutory measures to keep the Welsh in check were enforced in the 14th and 15th centuries. In 1379 Welshmen were forbidden to purchase land in the county save on certain conditions, and this enactment was reinforced in 1400. In 1379 the men of Shropshire forwarded to parliament a complaint of the felonies committed by the men of Cheshire and of the Welsh marches, and declared the gaol of Shrewsbury Castle to be in such a ruinous condition that they had no place of imprisonment for the offenders when captured. In 1442 and again as late as 1535 acts were passed for the protection of Shropshire against the Welsh. But apart from the border warfare in which they were constantly engaged, the great Shropshire lords were actively concerned in the more national struggles. Shrewsbury Castle was garrisoned for the empress Maud by William Fitz-Alan in 1138, but was captured by Stephen in the same year. Holgate Castle was taken by King John from Thomas Mauduit, one of the rebellious*

barons. Ludlow and Shrewsbury were both held for a time by Simon de Montfort. At Acton Burnell in 1 283 was held the parliament which passed the famous Acton Burnell statute, and a parliament was summoned to meet at Shrewsbury in 1398. During the Percy rebellion Shrewsbury was in 1403 the scene of the battle of King's Croft, in which Hotspur was slain. On the outbreak of the Civil War of the 17th century the Shropshire gentry for the most part declared for the king, who visited Shrewsbury in 1642 and received valuable contributions in plate and money from the inhabitants. A mint and printing-press were set up at Shrewsbury, which became a refuge for the neighbouring royalist gentry. Wem, the first place to declare for the parlia- ment, was garrisoned in 1645 by Richard Baxter. Shrewsbury was forced to surrender in 1644, and the royalist strongholds of Ludlow and Bridgnorth were captured in 1646, the latter after a four weeks' siege, during which the governor burnt part of the town for defence against the parliamentary troops.

Shropshire is noted for the number and lustre of the great families connected with it. Earl Godwin, Sweyn, Harold, Queen Edith, Edward the Confessor and Edwin and Morcar are all mentioned in the Domesday Survey as having held land's in the county before the Conquest. The principal landholders at the time of the survey were the bishop of Chester, the bishop of Hereford, the church of St Remigius, Earl Roger, Osbern Fitz-Richard, Ralph de Mortimer, Roger de Laci, Hugh Lasne and Nicholas Medicus. Earl Roger had the whole profits of Condover hundred and also owned Alnodestreu hundred. The family of Fitz-Alan, ancestors of the royal family of Stuart, had supreme jurisdiction in Oswestry hundred, which was exempt from English law. Richard Fitz-Scrob, father of Osbern Fitz-Richard and founder of Richard's Castle, was lord of the hundred of Overs at the time of the Conquest. Gatacre was the seat of the Gatacres. The barony of Pulverbatch passed from the Pulverbatches, and was purchased in 1193 by John de Kilpeck for £100. The family of Cornwall were barons of Burford and of Harley for many centuries. The family of Lestrange owned large estates in Shropshire after the Conquest, and Fulk Lestrange claimed the right of holding pleas of the crown in Wrockworthyn in 1292. Among others claiming rights of jurisdiction in their Shropshire states in the same year were Edmund de Mortimer, the abbot of Cumbermere, the prior of Lanthony, the prior of Great Malvern, the bishop of Lichfield, Peter Corbett, Nicholas of Audley, the abbot of Lilleshall, John of Mortayn, Richard Fitz-Alan, the bishop of Hereford and the prior of Wenlock.

The earliest industries of Shropshire took their rise from its abundant

natural resources; the rivers supplying valuable fisheries; the vast forest areas abundance of timber; while the mineral pro- ducts of the county had been exploited from remote times. The

lead mines of Shelve and Stiperstones were worked by the Romans, and in 1220 Robert Corbett conferred on Shrewsbury Abbey a tithe of his lead from the mine at Shelve. In 1260 licence was granted to dig coal in the Clee Hills, and in 129 1 the abbot of Wigmore received the profits of a coal-mine at Caynham. Iron was dug in the Clee Hills and at Wombridge in the 16th century. Wenlock had a famous copper-mine in the reign of Richard II., and in the 16th centjry was noted for its limestone. The Domesday Survey mentions salt-works at Ditton Priors, Caynham and Donnington. As the forest areas were gradually cleared and brought under cultivation, the county became more exclusively agricultural. In 1343 Shropshire wool was rated at a higher value than that of almost any other English county, and in the 13th and 14th centuries Buildwas monastery exported wool to the' Italian markets. Shropshire has never been distinguished for any characteristic manufactures, but a prosperous clothing trade arose about Shrewsbury and Bridgnorth, and Oswestry was famous in the 16th century for its fine Welsh cottons.

Antiquities — The ecclesiastical ruins and buildings of Shropshire are numerous and beautiful. Among the numerous monastic buildings the finest remains are those of Shrewsbury Abbey, Lilleshall near Newport, White Ladies nunnery near Shifnal, Much Wenlock priory and Bromfield priory near Ludlow (see the towns iiamed). Besides these, Haughmond, 5 m. N.E. of Shrewsbury, an Augustinian foundation of the 12th century, has left extensive remains including a chapter-house, hall, monks' well and other domestic buildings. Of Buildwas Abbey, on the Severn above Coalbrookdale, a Cistercian foundation of 1 135, there are fine Norman and Early English remains of the church and chapter-house, together with the abbot's house and a series of passages below ground. Among the churches of the larger towns, those of Bridgnorth and Ludlow are conspicuous. Among village churches, those of Stottesdon and Stanton Lacy in the south of the county, show considerable traces of pre-Conquest construction. Of Norman date those of Wroxeter, in which frag- ments from Uriconium are incorporated, Claverley E. of Bridgnorth, Holdgate or Holgate in Corvedale and Clun, are good examples, but there is a remarkable number of Norman doors and fonts throughout the county. The church of Cleobury Mortimeris good Early English, and that of Tong near Shifnal fine Perpendicular with a splendid series of tombs, while the churchyard cross at Bitterley, near Titter-

stone Clee, is a beautiful specimen of the work of the same period. The solitary church of Battlefield, N. of Shrewsbury, marks the scene of the fight between Henry IV. and the Perries in 1403.

The remains of castles are generally slight, but the noble ruins at Ludlow are a noteworthy exception. The powerful fortress of Clun and the castle at Holdgate are Norman. Of the 13th century are those at Hopton near Clun and Acton Burnell, S.E. of Shrewsbury, where Edward I. held parliament in 1283. Middle Castle between Shrewsbury and Wem shows small ruins of the 14th century. At Moreton Corbet on the Roden, N.E. of Shrewsbury, there"is an old castellated mansion, but by far the finest example of this type in the county, and one of the best in England, is Stokesay Castle near Craven Arms. This beautiful relic dates from the 13th century, and is almost perfect, having a large hall and massive southern tower, and a remarkable half-timbered gatehouse. Shropshire is also rich in medieval domestic buildings, and in the streets of Ludlow and Shrewsbury are many beautiful examples of half-timbered architecture. Among old country mansions may be specially noted the half-timbered Pitchford Hall, near Shrewsbury and Benthall Hall, near Broseley, dating from 1535.

See Victoria County History, Shropshire; W. Pearson, Antiquities of Shropshire (London, 1807); R. W. Eyton, Antiquities of Shrop- shire (12 vols., London, 1853-1860); J. C. Anderson, Shropshire: Its Early History and Antiquities (London, 1864) ; C. H. Hartshorne, Salopia Antiqua (London, 1 841); Walcott, Introduction to Sources of Salopian Topography (Shrewsbury, 1879); La Touche, Handbook to the Geology of Shropshire (1886); Borderer, Hunting and Sporting Notes in Shropshire (London, 1 885-1 886); Hughes, Sheriffs of Shropshire, 183 1-1886 (Shrewsbury, 1886); Waiter, An Old Shropshire Oak (4 vols., London, 1886-1891); Fletcher, Religious Census of Shropshire in 1676 (London, 1891); Cranage, Architectural Account of the Churches of Shropshire (Wellington, 1894-1899); Timmins, Nooks and Corners of Shropshire (London, 1899); Shropshire Notes and Queries (1885, &c); Shropshire Archaeological and Natural History Society (1877, &c); Salopian Shreds and Patches

(1874-1891)-

SHROUD (0. Eng. scrud, garment; cf. Icel. skrudh, in the secondary sense of rigging, allied with " shred," 0. Eng. screade, a piece, strip), originally a word meaning garment, clothing or covering, but now particularly applied to the garment in which a dead body is wrapp2d preparatory to burial, a winding sheet. The shroud is usually a long

linen sheet wrapping the entire body. This was formerly dipped in melted wax (Lat. cera), whence the name "cerecloth," often wrongly written serecloth or searclolh and " cerements." In nautical usage the Icelandic meaning of skrudh, tackle, rigging of a ship, has been adopted in English; the " shrouds " of a ship are the set of

ropes which stretch from the heads of a ship's masts to the sides as supports (see Rigging).

SHROVE TUESDAY, the day before Ash Wednesday, the first day of Lent, so called as the day on which " shrift " or confession was made in preparation for the great fast. Skeat (Eiym. Diet.) derives the word " shrive," of which " shrove " is the past tense, ultimately from the Lat. scribere, to write, to draw up a law, and hence to prescribe (cf. Ger. schreiben) , through the Anglo-Saxon scrifan, to shrive, impose a penance, to judge. Shrove Tuesday is called the French Mardi gras, " Fat Tuesday," in allusion to the fat ox which is ceremoniously paraded through the streets. The Germans know it as Fasten-dienstag. It is celebrated in Catholic countries, as the last day of the carnival, with feasting and merrymaking, of which, in England, the eating of pancakes alone survives as a social custom, the day having been called at one time " Pancake Tuesday." The association of pancakes with the day was probably due to the necessity for using up all the eggs, grease, lard and dripping in stock preparatory to Lent, during which all these were forbidden.

SHRUB. (1) A bushy plant whose stem is woody and branches out thickly from the ground, not attaining sufficient height to be called a tree; this smallness of vertical growth is natural or is effected by cutting and lopping at an early stage or at stated seasons. The term is loose in application and the line between shrubs, trees and certain woody herbaceous plants is not easy to draw. The holly, the yew, the laurel, if allowed to grow from a single stem, become trees, other plants suph as rhododendron, syringa, the euonymous are properly shrubs. The word is the same as "scrub," low, stunted undergrowth, in O. Eng. scrob; the root, which is also seen in "shrimp" and " shrivel," means to contract. Many English place-names contain the word, the most familiar being Shrewsbury (Scrob- besbyrig) and Wormwood Scrubs. (2) The name of a drink or cordial, now rarely found except in country districts. It is made of currant juice boiled with water and sugar to which some spirit, usually rum, is added.

Another form of the drink is made of rum, orange and lemon juice, peel, sugar and water. The word is an adaptation of the Arabic sharb or sharab, beverage, % drink, shariba, he drank, and is thus directly related to " sher- bet " and " syrup " (q.v.).

SHUFFLE-BOARD, or Shovel-Board (originally "shove- board "), a game in which wood or metal disks are " shoved " by the hand or with an implement so that they shall come to a stop on or within certain lines or compartments marked on the " board " — a table or a floor. It was formerly very popular in England, especially with the aristocracy, under the names shove-groat, slide-groat and shovel-penny, being mentioned as early as the 15th century. It was a favourite pastime at the great country houses, some of the boards having been of ex- quisite workmanship. That at Chartley Hall in Staffordshire was over 30 ft. long and was made up of 260 pieces. Shuffle- board enjoys considerable vogue in the United States, the board being from 28 to 30 ft. long and from 18 to 20 in. wide, of pine, poplar or white wood, with a gutter 45 in. wide extending entirely round the board. The surface is slightly sanded and sometimes oiled. About 5 in. from each end of the board is drawn a line called the deuce line. Each side, whether composed of two or four persons, used four disks of polished brass or iron, generally about 2 in. in diameter and 5 in. thick. When two persons play they shove first from one end of the board and then from the other ; but when four play one of each side remains permanently at each end. The disks, four of which are marked A and four B, are shoved alternately by each side. A disk resting between the deuce line and. the end of the board is in and scores two. One protruding over the end sufficiently to be lifted by the finger is called a ship and counts three. A disk resting on the board but not crossing the line counts one. In scoring only the best of the eight disks counts, unless one side has two that are better than any of their opponents', in which case both count. The side first scoring 21 points wins.

A variety of shuffle-board is very popular as a deck game on

board steamers and yachts. It is played by pushing wooden disks by means of crutch-shaped cues, or shovels, into which the disks fit, so that they come to a stop within the lines of a large rectangle drawn with chalk on the deck and divided into squares numbered from 1 to 10 with an extra square nearest the player, numbered -10. The game is usually 2 1 points.

SHUKRIA, a large tribe of African nomads living in the " Island of Meroe," i.e. the country between the Atbara and the Blue Nile. The

family name of the principal, branch of this tribe is Abu Sin, and Gedaref, an important town in the centre of the Shukria country, was formerly called Suk Abu Sin.

SHUMLA (Bulgarian Shumen, Turkish Shumna), a fortified town of Bulgaria, 50 m. W. of Varna, on the railway from Trnovo to Shumla Road (a name given to a station on the Varna-Rustchuk railway by the English builders of the line). Pop. (1906) 22,290, about one-third being Moslems. The town is built within a cluster of hills, northern outliers of the eastern Balkans, which curve round it on the west and north in the shape of a horse-shoe. A rugged ravine intersects the ground longitudinally within the horse-shoe ridge. From Shumla roads radiate northwards to the Danubian fortresses of Rustchuk and Silistria and to the Dobrudja, southwards to the passes of the Balkans, and eastwards to Varna and Baltchik. Shumla has, therefore, been one of the most important military positions in the Balkan Peninsula. A broad street and rivulet divide the upper quarter, Gorni-Mahle, from the lower, Dolni-Mahle. In the upper quarter is the magnificent mausoleum of Jezairli Hassan Pasha, who in the 18th century enlarged the fortifications of Shumla. The principal mosque, with a cupola of very interest- ing architecture, forms the centre of the Moslem quarter. The town has an important trade in grain and wine, besides manu- factures of silk, red and yellow slippers, ready-made clothes, richly embroidered dresses for women, and copper and tin wares.

In 811 Shumla was burned by the emperor Nicephorus, and in 1087 it was besieged by Alexius I. In 1388 the sultan Murad I. forced it to surrender to the Turks. In the 18th century it was enlarged and fortified. Three times, in 1774, 1810 and 1828, it was unsuccessfully attacked by Russian armies. The Turks consequently gave it the name of Gazi (" Victorious "). In 1854 it was the headquarters of Omar Pasha and the point at which the Turkish army concentrated (see Crimean War). On the 22nd of June 1878 Shumla capitulated to the Russians.

SHUSHA, a town, formerly a fortress, of Russian Transcaucasia , in the government of Elisavetpol, in 39 46′ N. and 46° 25′ E., 170 m. S.E. of Tiflis, on an isolated rocky eminence, 3865 ft. above sea-level and accessible only from one side. Pop. about 2 5,000, consisting of Armenians and Tatars. Shusha was formerly the capital of the khanate of Kara-bagh. The town is locally renowned for its carpets, and the district for its excellent breed of Kara-bagh horses. Leather and silk are also made.

The fortress, constructed in 1789, successfully withstood a siege by Aga Mahommed of Persia in 179s, but was constrained to surrender two years afterwards. In 1805 Ibrahim Khan of Kara-bagh invoked the protection of Russia, but the annexation was not completed until 1822.

SHUSHTER, a district and town of the province of Arabistan (former Khuzistan) in Persia, S. of Dizful, and N. of Ahvaz. The district contains the town of the same name and 22 villages, and, including about 3700 nomad families of the Kunduzlu, Saad, Anafijeh and Al i Kethir tribes, has a population of about 40,000 and pays a yearly revenue of £6000. The district produces grain, opium, cotton, wool, limes (their juice, made into green extract, is exported in little earthenware jars), and manufactures gilims (woollen carpets without pile).

The town of Shushter, with a population of r 5,000, is situated at the point where the river Karun, after breaking through the Fedelek hills, bifurcates into the Gerger canal, flowing E., and the Shutait river flowing W. of it, in 32 3′ N. and 48 53′ E., and built on slightly elevated ground which rises gradually from the south-west to the citadel, Kalah Salasil, 1 standing in the

1 Considered to represent the Sele of Ammianus Marcellinus (xxiii. c. 6, 26), a city in Susiana, and of Ptolemy (Tab. v.).

north-eastern corner on a sandstone hill ending with a precipice about 80 ft. in height towards the river on the north. The ground covered by the citadel measures nearly 350 by 150 yds., and the town occupies a space of a square mile.

At the point of the divergence of the Gerger from the Karun, 600 yds. above the town, an artificial dike constructed of large blocks of hewn stone is thrown across the opening of the former. It was known as the Band i Kaisar (the Caesar's Dike), but after having been repaired by Mahommed Ali Mirza, a son of Fath Ali Shah, in the early part of the 19th century, it was called Band i Shahzadeh, or Prince's Dike. A little distance below this dike begins the artificial cutting in the sandstone rock and at half a mile from it is a second band, 60 yds. long, 65 ft. high, which completely blocks the progress of the stream. It has a roadway on the top, and, as it connected the town with the

village Bulaiti (now deserted) on the other side, was called Pul i Bulaiti, i.e. Bridge of Bulaiti. At a short distance above it some tunnels have been pierced in the rock below the canal level on either side of the Gerger. From the point where the principal river parts with the Gerger down to a point 500 yds. below the citadel the river bed was paved with great flags of stone, the pavement being called Shadurvan. At the end of the pavement stand the band and bridge ascribed to the Roman emperor Valerian. The band is called Band i Mizan, the bridge Pul i Kaisar. The bridge has been built and rebuilt several times and its forty-one arches differ in material, style and size. Its length is 560 yds., and its roadway is 7 yds. wide. Seventy yards of band and bridge were swept away in 1885. Between the bridge and the Gerger opening and cut into the rock on which the western part of the citadel stands is a tunnel leading to a canal formerly called Darian, now Minab, i.e. Mian-do-ab, " between two rivers," because it waters the district south of the town lying between Gerger and Shutait. With the break of the band in 1885 the level of the main river has fallen and the Minab canal is not properly filled, causing much damage to cultivation in the district.

Persian tradition has it that Ardashir (either Artaxerxes of the old Persian kings or Ardashir of the Sassanians) built the first dike across the river in order to raise the water of the river to the level of the Darian canal. The dike became destroyed and was renewed under the Sassanian Shapur I. by Roman workmen sent for by Valerian who had been captured by the Persian king in 260. That Valerian had a part in constructing these remark- able works does not rest upon any historical basis; we may, however, believe that the Sassanian Ardashir, or his son Shapur I, finding that the river, having its bed in friable soil, was daily getting lower and finally threatened to leave the town and the Mian-do-ab district dry by not filling the Darian canal, engaged Roman workmen. The Gerger canal was cut and the river diverted from west to east of the town. The old river then became emptied and its bed was raised and, to prevent further erosion and washing away of the soil and a consequent fall of the river, was paved with huge flags. Then the Band i Mizan and the great bridge were erected across the river and finally a dam was constructed across the Gerger canal, where is now the Pul i Bulaiti, so as to turn back the Karun into its original channel, but later, by means of sluices and tunnels, the flow of water was regulated in such a manner that two-sixths of the water flowed east and four-sixths west of the town. This gave rise to the later appellations Do-Dank and Chahar Dank, i.e.

two-sixths and four-sixths for the Gerger and Shutait re- spectively.

(A. H.-S.)

SHUTER, EDWARD (c. 1728-1776), English actor, was born in London of poor parents. He made his first appearance on the London stage in 1745 in Cibber's Schoolboy. He made a great reputation in old men's parts. He was the original Hardcastle in She Stoops to Conquer (1773), and Sir Anthony Absolute in The Rivals (1775).

SHUTTLE (O. Eng. shitel, &c; from the same word as " shoot "), a boat-shaped implement used in weaving to pass a thread of weft to and fro between two lines of warp. The origin of this implement is lost in the mists of a remote antiquity, and yet it was long preceded by the loom. Several wall paintings at Thebes depict looms that are apparently provided with a hooked rod for drawing weft through the warp, but with such a device either two weft threads would be simultaneously placed in one division of the warp, or the selvages would be imperfect. Since neither of these conditions obtain in the ancient Egyptian fabrics that have been recovered, it may be concluded that some other plan was also adopted. Netting needles have been found in Egyptian tombs, and as these would be more suitable for weaving than a hooked rod, it is conceivable they were so employed. Or a spinning spindle charged with weft might be conveyed through the k 'warp, as was customary, at a much later period, with Greek, Roman and other weavers. So long as a shuttle was thrown from hand to hand, the breadth of cloth which one weaver could produce was limited to his ability to reach from selvage to selvage of the piece. But from 1733, when John Kay invented the " fly shuttle," these implements have been made straight, and propelled mechanically, also, to secure light running, they have been mounted upon rollers which project slightly on the under side. Shuttles are now made in various forms and sizes from box, and other hard-grained, smooth woods, as well as from vulcanized fibre and metals. For silk weaving by hand, they are approximately 12 in. long by 1 in. square in section, and weigh about 3 oz.; those for calico weaving by power, are about i2§ in. long, ij in. wide, ij in. deep, and weigh about 9! oz.; they are also provided with conical steel tips which abut upon short coiled springs let into the shuttle. The construction, fixing and control of shuttle tongues that hold the weft, together with numerous devices for putting the thread under an elastic tension, have formed the subjects for many patents. The tongues intended to hold cops are split to form a spring whose strength suffices to fix the cop in position while the thread is drawn from the outer end through a porcelain eye in the shuttle front, the tension being regulated by deflection. The small shuttles employed to weave ribbons, and other narrow goods, are bowed in front, recessed to hold a spool of weft,

and have an eye fixed at the centre of the bow for the thread to pass through as it unrolls. These shuttles are formed into sets, which correspond with the number of fabrics to be manufactured simultaneously and may be placed on one level, or in tiers; in either event, all in one horizontal plane are moved to and fro together across different webs, by means of racks and pinions; for a rack is inserted lengthwise in each shuttle, and by engaging the racks with intermittently driven pinions, the shuttles receive their requisite movements.

For further information regarding weaving and looms, see Weav- ing and Weaving Machinery. (T. W. F.

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Lecturer on Geography in the University of Edinburgh. Secretary ot the Royal J c . . . . , . *,„-,} Scottish Geographical Society. Author of Handbook of Commercial Geography. 1 oiansncs \in pari). Editor of Longman’s Gazetteer of the World. L

George Gregory Smith, M.A. f Stirling, William Alexander,

” Author of The\ Earl of (in part).

Professor of English Literature, Queen’s University of Belfast.

Days of James IV. ; The Transition Period ; Specimens of Middle Scots ; &c.

INITIALS AND HEADINGS OF ARTICLES

IX

G. J. T.

G. Mo. G. Sa. G. W. T.

H.Br. H. CI.

Editor of Select Pleas of the Forests for the Selden i Soke.

George James Turner.

Barrister-at-Law, Lincoln's Inn. Society.

Gaetano Mosca.

Professor of Constitutional Law, University of Turin.

George Saintsbury, D.C.L., LL.D.

See the biographical article: Saintsbury, George E. B.

Rev. Griffithes Wheeler Thatcher, M.A., B.D. f

Warden of Camden College, Sydney, N.S.W. Formerly Tutor in Hebrew and Old i Slbawaihl. Testament History at Mansfield College, Oxford. L

Henry Bradley, M.A., Ph.D. f

Fellow of the British Academy. Joint-editor of the New English Dictionary i Slang. (Oxford). Author of The Story of the Goths; The Making of English; &c. I

Sir Hugh Charles Clifford, K.C.M.G.

Colonial Secretary, Ceylon. Fellow of the Royal Colonial Institute. Formerly Resident, Pahang. Colonial Secretary, Trinidad and Tobago, 1903-1907. Author of Studies in Brown Humanity; Further India, &c. Joint-author of A Dictionary of the Malay Language.

J Sicily: Geography and Statistics I- {in part).

Stael, Madame de.

Singapore; Straits Settlements.

H.

E.

S.*

H.

F.

G.

H.

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H.

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R.

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M

Wo

Author of Life of James Russell Lowell ; 1 Stowe, Mrs Beecher,

V

Horace Elisha Scudder (d. 1902).

Formerly Editor of the Atlantic Monthly. History of the United States ; &c.

Hans Friedrich Gadow, M.A., F.R.S., Ph.D.

Strickland Curator and Lecturer on Zoology in the University of Cambridge. Author of ” Amphibia and Reptiles ” in the Cambridge Natural History; &c.

H. Hamilton Fyfe. f

Special Correspondent of the Daily Mail ; Dramatic critic of The World. Author of J Stepniak, SergillS. A Modern Aspasia; The New Spirit in Egypt; &c. [

Snakes;

Song: Of Birds;

Sphenodon.

Socrates; Sophists; Speusippus.

H. 0. F.

H. R. T.

H.St. H. S. J.

H. W. C. D. LA.

J. A. Co.

J. A. E.

J. A. H. J. B.

Henry Jackson, M.A., Litt.D., LL.D., O.M.

Regius Professor of Greek in the University of Cambridge, and Fellow of Trinity College. Fellow of the British Academy. Author of Texts to illustrate the History of Greek Philosophy from Thales to Aristotle.

Hugh Munro Ross. . . J Signal: Army Signalling (in

Formerly Exhibitioner of Lincoln College, Oxford. Editor of The Times Engineering 1 part) and Railway Signalling Supplement. Author of British Railways. I n n

Harold Mellor Woodcock, D.Sc. [

Assistant to the Professor of Proto-Zoology, London University. Fellow of Uni- versity College, London. Author of ” Haemoflagellates ” in Sir £. Ray Lankester’s Treatise of Zoology, and of various scientific papers.

Henry Ogg Forbes, LL.D., F.R.G.S., F.G.S., F.Z.S.

Director of Museums to the Corporation of Liverpool. Reader in Ethnography in the University of Liverpool. Explorer of Mount Owen Stanley, New Guinea, Chatham Islands and Sokotra. Author of A Naturalist’s Wanderings in the Eastern Archipelago; Editor and part-author of Natural History of Sokotra and Abd-el- Kuri; &c.

Henry Richard Tedder, F.S.A.

Secretary and Librarian of the Athenaeum Club, London.

Henry Sturt, M.A.

Author of Idola Thealri; The Idea of a Free Church; Personal Idealism.

Henry Stuart Jones, M.A.

Formerly Fellow and Tutor of Trinity College, Oxford, and Director of the British School at Rome. Member of the German Imperial Archaeological Institute. Author of The Roman Empire ; &c.

Henry William Carless Davis, M.A.

Fellow and Tutor of Balliol College, Oxford. Fellow of All Souls' College, Oxford, 1895-1902. Author of England under the Normans and Angevins; Charlemagne.

Sporozoa.

Sokotra (in part).

Societies, Learned.

■\ Space Strabo.

and Time.

J Simeon of Durham; I Stephen, King of Er

Israel Abrahams, M.A.

Reader in Talmudic and Rabbinic Literature in the University of Cambridge. Formerly President, Jewish Historical Society of England. Author of A Short ' History of Jewish Literature; Jewish Life in the Middle Ages; Judaism; &c.

Simon Ben Yohai; Singer, Simeon; Smolenskin, Pen Steinschneider, '

Hon. Sir John Alexander Cockburn, K.C.M.G., M.D.

Knight of Grace of the Order of St John of Jerusalem. Premier and Chief Secretary, j o nu fk Austra' South Australia, 1889-1890: Minister of Education and Agriculture, 1893-1898 ; 1 wluun " Agent-General in London, 1898-1901. Author of Australian Federation; &c. |_

James Alfred Ewing, C.B., LL.D., F.R.S., M.Inst.CE. f Siemens, Si

Director of (British) Naval Education. Hon. Fellow of King's College,

Cambridge. J steam Eng Professor of Mechanism and Applied Mechanics in the University of Cambridge, | gt ren gt n f 1890-1903. Author of The Strength of Materials; &c. I 5 u

1890-1903. Author of The Strength of

John Allen Howe. f . .

Curator and Librarian of the Museum of Practical Geology, London. Author of i Silurian Geology of Building Stones. I jrnon;

James Bonar, M.A., LL.D. (" rd.

Master of the Royal Mint, Ottawa. Senior Examiner to the Civil Service Com- | gocia' mission, 1 895-1 907. Author of Malthus and his Work; Philosophy and Political'] Economy; &c. I i n part).

udhaile.

INITIALS AND HEADINGS OF ARTICLES

J. Bra. J. Bt.

J. C. Br.

J. D. B. J. F.-K.

Joseph Braun, SJ.

Author of Die Liturgische Gewandung ; &c.

{

Stole.

James Bartlett. . , f Staircase: Construction;

Lecturer on Construction, Architecture, Sanitation, Quantities, &c, at King s J gˆ ee j Construction" College, London. Member of Society of Architects. Member of Institute of Junior | gt '

Engineers. I

John Casper Branner, Ph.D., LL.D., F.G.S. C

Vice-President and Professor of Geology in Leland Stanford University, California.

Director of the Branner-Agassiz Expedition to Brazil, 1899. State Geologist of-j South America.

Arkansas, 1 887-1 893. Author of numerous works on the geology of Brazil , Arkansas |

and California. ˆ

James David Bourchier, M.A., F.R.G.S.

King’s College, Cambridge. Correspondent of The Times in South-Eastern Europe. Commander of the Orders of Prince Danilo of Montenegro and of the Saviour of Greece, and Officer of the Order of St Alexander of Bulgaria.

Silistria; Sofia; Stambolov, Stefan.

J.

G.

C. A.

J.

G.

M.

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H.

A. H.

J.

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P.

J.

H

R.

J

H1.B.

James Fitzmaurice-Kelly, Litt.D., F.R.Hist.S. f

Gilmour Professor of Spanish Language and Literature, Liverpool University. Spain: Language (in part), and Norman McColl Lecturer, Cambridge University. Fellow of the British Academy.-ˆ T Urralure (in bart) Member of the Royal Spanish Academy. Knight Commander of the Order of literature (.tn paw.

Alphonso XII. Author of A History of Spanish Literature; &c. ˆ

J Sinope.

John Gray McKendrick, M.D., LL.D., F.R.S., F.R.S. (Edin.). f Sleep;

Emeritus Professor of Physiology in the University of Glasgow. Professor of Physi- -< smell. ology, 1876-1906. Author of Life in Motion; Life of Helmholtz; &c. L

John George Clark Anderson, M.A.

Censor and Tutor of Christ Church, Oxford. Formerly Fellow of Lincoln College. Craven Fellow, Oxford, 1896. Conington Prizeman, 1893.

J Sibylline Oracles.

John Henry Arthur Hart, M.A.

Fellow, Theological Lecturer and Librarian, St John's College, Cambridge.

John Henry Poynting, D.Sc, F.R.S. r

Professor of Physics and Dean of the Faculty of Science in the University of | Birmingham. Formerly Fellow of Trinity College, Cambridge. Joint-author of 1 aouna. Text-Book of Physics. [_

John Horace Round, M.A., LL.D. f Stafford: Family;

Balliol College, Oxford. Author of Feudal England; Studies in Peerage and J Stanley : Family (in part).

Family History ; Peerage and Pedigree ; &c. [‘

John Holland Rose, M. A., Litt.D. r„. . _ . T .

Christ's College, Cambridge. Lecturer on Modern History to the Cambridge J Sieyes, Emmanuel JOSepJl, University Local Lectures Syndicate. Author of Life of Napoleon I. ; Napoleonic ■) Stein, Baron. Studies ; The Development of the European Nations ; The Life of Pitt ; &c.

J. H. van't H. Jacobus Hendricus van't Hoff, LL.D., D.Sc,

See the biographical article Van't Hoff, Jacobus Hendbicus.

i Stereoisomerism.

J. K. I. J. L. M.

J. L. N. J. M.

J. M. H. J.O.N. J. Pe. J. P. E.

J. S. F.

t Slavery (in part);

1 :

Soil: Soil and Disease.

Sovereignty; Spheres of Influence.

John Kells Ingram, LL.D.

See the biographical article: Ingram, John Kells. -j Smith, Adam (in part).

John Linton Myres, M.A., F.S.A. ,

Wykeham Professor of Ancient History in the University of Oxford, and Fellow of Magdalen College. Formerly Gladstone Professor of Greek and Lecturer in Ancient i Soli (Cyprus). Geography in the University of Liverpool, and Lecturer on Classical Archaeology in the University of Oxford.

J. Lane-Notter, M.A., M.D., F.R.S.Med. f

Colonel (retired), Royal Army Medical Corps. Formerly Professor of Military^ Hygiene, Army Medical School at Netley. Author of The Theory and Practice of Hygiene; &c.

Sir John Macdonell, C.B., M.A., LL.D.

Master of the Supreme Court, London. Formerly Counsel to the Board of Trade and the London Chamber of Commerce. Quain Professor of Comparative Law, and Dean of the Faculty of Law, University College, London. Editor of State” Trials; Civil Judicial Statistics; &c. Author of Survey of Political Economy; The Land Question ; &c.

John Malcolm Mitchell. | Solon;

Sometime Scholar of Queen’s College, Oxford. Lecturer in Classics, East London < Sphinx (in part) ; College (University of London). Joint-editor of Grote's History of Greece. 1 StrategUS.

Rev. James Okey Nash, M.A. r

Hertford College, Oxford. Headmaster of St John’s College, Johannesburg. J Sisterhoods. Formerly Missionary of the S.P.G. in Johannesburg. [

John Percival, M.A. f

St. John’s College, Cambridge. Professor of Agricultural Botany at University J Soil. College, Reading. Author of Text-Book of Agricultural Botany; &c. [_

Jean Paul Hippolyte Emmanuel Adhemar Esmein. [

Professor of Law in the University of Paris. Officer of the Legion of Honour. Member of the Institute of France. Author of Cours eiementaire d’histoire du droit francais; &c.

John Smith Flett, D.Sc, F.G.S.

Petrographer tc the Geological Survey of the United Kingdom. Formerly Lecturer on Petrology in Edinburgh University. Neill Medallist of the Royal Society of Edinburgh. Bigsby Medallist of the Geological Society of London.

States-General: France.

f Sill;

\ Slate: Geology;

\ Spherulites.

J. S. R.

J. T. Be.

J. V. B. J.W. J. W. G.

J. W. He.

K. G. J. K.L.

K. S.

L. C. L. D.*

L. J. S.

L. W. Ch. M. Ca. M. G.

M.Ja.

H.M.

M. N. T.

H. 0. B.

C

N.M.

O.A.

James Smith Reid, M.A., LL.M., Litt.D., LL.D.

Professor of Ancient History in the University of Cambridge and Fellow and Tutor . of Gonville and Caius College. Hon. Fellow, formerly Fellow and Lecturer, of Christ's College. Editor of Cicero's Academica; De Amicitia; &c.

John Thomas Bealby.

Joint-author of Stanford's Europe. Formerly Editor of the Scottish Geographical – Magazine. Translator of Sven Hedin's Through Asia, Central Asia and Tibet; &c.

Silius Italicus; Statius.

Siberia (in pari); Simbirsk (in part); Smolensk (in part); Stavropol (in part).

South Australia: Geology.

James Vernon Bartlet, M.A., D.D. j

Professor of Church History, Mansfield College, Oxford. Author of The Apostolic 1 Stephen, St. Age; &c. L

James Williams, M.A., D.C.L., LL.D. f

All Souls' Reader in Roman Law in the University of Oxford, and Fellow of Lincoln -I Statute. College. Barrister-at-Law of Lincoln's Inn. Author of Law of the Universities ; &c. [

John Walter Gregory, D.Sc, F.R.S. f

Professor of Geology in the University of Glasgow. Professor of Geology and Mineralogy in the University of Melbourne, 1900-1904. Author of The Dead Heart of Australia; &c.

James Wycliffe Headlam, M.A.

Staff Inspector of Secondary Schools under the Board of Education. Formerly Fellow of King's College, Cambridge, and Professor of Greek and Ancient History at Queen's College, London. Author of Bismarck and the Foundation of the German Empire; &c.

Kingsley Garland Jayne.

Sometime Scholar of Wadham College, Oxford. Author of Vasco da Gama and his Successors.

Rev. Kirsopp Lake, M.A.

Lincoln College, Oxford. Professor of Early Christian Literature and New Testa- J o n ,i OT1 u ormanll wnn ment Exegesis in the University of Leiden. Author of The Text of the New Testa- j oouen > nermann von. ment; The Historical Evidence for the Resurrection of Jesus Christ; &c. I

Kathleen Schlesinger. f cic*™™- Cmriinn. Cr.ir.ot.

Editor of the Portfolio of Musical Archaeology. Author of The

Instruments of the -i *’. m ‘ Boralno » »Pmei, Orchestra. { Stringed Instruments.

Rev. Lewis Campbell, D.C.L., LL.D.

See the biographical article: Campbell, Lewis.

Louis Duchesne.

See the biographical article: Duchesne, Louis M. O.

Matthew Arnold Prizeman, 1903. – :

SteRhan, Heinrich von.

J Spain: Geography and _ Statistics.

r

Sophocles.

J* Siricius; I Sixtus I.-III.

Sillimanite; Smaltite; Sodalite; Sphene; Stannite; Staurolite; Stephanite; Stibnite; Stilbite; Strontianite.

r

Smoke (in part).

Stevinus, Simon.

Sturdza (family).

O.M.

Leonard James Spencer, M.A.

Assistant in Department of Mineralogy, British Museum. Formerly Scholar of Sidney Sussex College, Cambridge, and Harkness Scholar. Editor of the Mineralo- gical Magazine.

Laurence Wensley Chubb.

Secretary of the Coal Smoke Abatement Society, and of the Commons and Foot- paths Preservation Society.

Moritz Cantor, Ph.D.

Honorary Professor of Mathematics in the University of Heidelberg. Hofrat of the German Empire. Author of Vorlesungen uber die Geschichte der Malhematik ; &c.

Moses Gaster, Ph.D.

Chief Rabbi of the Sephardic Communities of England. Ilchester Lecturer at Oxford on Slavonic and Byzantine Literature, 1886 and 1891. President of the – Folk-lore Society of England. Vice-President, Anglo-Jewish Association. Author of History of Rumanian Popular Literature ; &c.

Morris Jastrow, Ph.D. f

Professor of Semitic Languages, University of Pennsylvania. Author of Religion \ Sin (Moon-god), of the Babylonians and Assyrians; &c. l_

Max Arthur Macauliffe. f

Formerly Divisional Judge in the Punjab. Author of The Sikh Religion: its Gurus, J Sikh; Sacred Writings and Authors; &c. Editor of Life of Guru Nanak, in the Punjabi | Sikhism. language. I

Marcus Niebuhr Tod, M.A. f

Fellow and Tutor of Oriel College, Oxford. University Lecturer in Epigraphy. -< Sparta. Joint-author of Catalogue of the Sparta Museum. _

Maximilian Otto Bismarck Caspari, M.A. f

Reader in Ancient History at London University. Lecturer in Greek at Binning- -j Sicyon. ham University, 1905-1908. [

Norman McLean, M.A. f

Lecturer in Aramaic, Cambridge University. Fellow and Hebrew Lecturer, Christ's -j Stephen Bar Sudhaile. College, Cambridge. Joint-editor of the larger Cambridge Septuagint. [_

Osmund Airy, M.A., LL.D. r

H.M. Divisional Inspector of Schools and Inspector of Training Colleges, Board of J Sidney, Algernon; Education, London. Author of Louis XIV. and the English Restoration; Charles 1 SomerS, Lord. //. ; &c. Editor of the Lauderdale Papers ; &c. (.

David Orme Masson, M.A., D.Sc, F.R.S. f

Professor of Chemistry, Melbourne University. Author of papers on chemistry in -j Smoke (in part). the transactions of various learned societies. [_

INITIALS AND HEADINGS OF ARTICLES

0. T.

P. A. A.

P. A. K.

P. C. M.

Oldfield Thomas, F.R.S., F.Z.S.

Senior Assistant, Natural History Department of the British Museum. Catalogue of Marsupialia in the British Museum.

Author of i Skunk {in part).

Philip A. Ashworth, M.A., D. Juris. [.

New College, Oxford. Barrister-at-Law. Translator of H. R. von Gneist's History i Simson, Martin E. VOn.

of the English Constitution. I

Prince Peter Alexeivitch Kropotkin.

See the biographical article: Kropotkin, Prince P. A.

Siberia {in part); Simbirsk {in part); Smolensk {in part); Stavropol {in part).

P.

C.

Y.

S.

Vi.

R.

R.

A.

S.

M

R.

D.

H.

R

H.

C.

\ Strafford.

R. H. L. R. H. V.

R. I. P. R. J. M.

R.L.* R. Mu.

R. M. B. P. K.

Peter Chalmers Mitchell, M.A., F.R.S., F.Z.S. , D.Sc, LL.D.

Secretary of the Zoological Society of London. University Demonstrator in J Comparative Anatomy and Assistant to Linacre Professor at Oxford, 1888-3891. 1 Species. Author of Outlines of Biology ; &c. I

Philip Chesney Yorke, M.A.

Magdalen College, Oxford. Editor of Letters of Princess Elizabeth of England

Philip Schidrowitz, Ph.D., F.C.S. f

Member of the Council, Institute of Brewing; Member of the Committee of Society J gpjjjts. of Chemical Industry. Author of numerous articles on the Chemistry and! Technology of Brewing, Distilling, &c, L

Paul Vinogradoff, D.C.L., LL.D. •! Socage.

See the biographical article: Vinogradoff, Paul. \

Lord Rayleigh. f „.

See the biographical article: Rayleigh, 3RD Baron. \ ” Kv ‘

Robert Alexander Stewart Macalister, M.A., F.S.A. f

St John’s College, Cambridge. Director of Excavations for the Palestine Ex- -j Sodom and Gomorrah. ploration Fund. 1

Robert Drew Hicks, M.A. f ct j cs

Fellow, formerly Lecturer in Classics, Trinity College, Cambridge. \

Rev. Robert Henry Charles, M.A., D.D., D.Litt. f

Grinfield Lecturer, and Lecturer in Biblical Studies, Oxford, and Fellow of Merton |

College. Fellow of the British Academy. Formerly Professor of Biblical Greek, -j Solomon, The Psalms of. Trinity College, Dublin. Author of Critical History of the Doctrine of a Future Life; Book of Jubilees; &c. I

Robin Humphrey Legge. f

Principal Musical Critic for the Daily Telegraph. Author of Annals of the Norwich < Strauss, Richard. Festivals; &c. L

Robert Hamilton Vetch, C.B.

Colonel R.E. Employed on the defences of Bermuda, Bristol Channel, Plymouth Harbour and Malta, 1861-1876. Secretary of R.E. Institute, Chatham, 1877-1883. . Deputy Inspector-General of Fortifications, 1889-1894. Author of Gordon's Campaign in China ; Life of Lieutenant-General Sir Gerald Graham. Editor of the RE. Journal, 1 877-1 884.

Reginald Innes Pocock, F.Z.S.

Superintendent of the Zoological Gardens, London.

Strathnairn, Lord.

Spiders.

Ronald John McNeill, M.A.

Christ Church, Oxford. Barrister-at-Law. Gazette (London).

Formerly Editor of the St James's

Richard Lydekker, F.R.S., F.G.S., F.Z.S.

Member of the Staff of the Geological Survey of India, 1 874-1 882. Author of Catalogue of Fossil Mammals, Reptiles and Birds in the British Museum; The Deer of all Lands; The Game Animals of Africa; &c.

Sidney, Sir Henry;

Simnel, Lambert;

Smith, Sir Henry;

Somerset, Earls and Dukes of;

Stone, Archbishop.

Sifaka; Sirenia;

Skunk {in part);

Souslik; Squirrel;

Squirrel Monkey.

Stonehenge; Stone Monuments.

Robert Munro, M.A., M.D., LL.D., F.R.S. (Edin.).

Dalrymple Lecturer on Archaeology in the University of Glasgow for 1910. Rhind Lecturer on Archaeology, 1888. Secretary of the Society of Antiquaries of Scotland, 1888-1899. Founder of the Munro Lectureship on Anthropology and Prehistoric Archaeology in the University of Edinburgh. Author of The Lake-dwellings of Europe ; Prehistoric Scotland, and its place in European Civilization ; &c.

Richard Makdougall Brisbane Francis Kelly, D.S.O. f

Colonel R.A. Commanding R.G.A., Southern Defences, Portsmouth. Served J Sights, through the South African War, 1899-1902. Chief Instructor at the School of] Gunnery, 1904-1908. L

Sigismund

R. N. B.

K.OBERT NlSBET BAIN (d. IO09).

Assistant Librarian, British Museum, 1883-1909. Author of Scandinavia: The Political History of Denmark, Norway and Sweden, 15 13-1900; The First Romanovs, 1613-1725 ; Slavonic Europe: The Political History of Poland and Russia from 1469 to 1796; &c.

and III. of

I., II.

Poland; Skarga, Piotr; Skram, Peder; Skrzynecki, Jan Zygmunt; Sophia Aleksyeevna; Sprengtporten, Count Goran; Sprengtporten, Jakob; Stanislaus I. and II. of Poland; Stephen I. and V. of Hungary,' Stephen Bathory; Struensee, Johan F.; Sture {family).

INITIALS AND HEADINGS OF ARTICLES

Xlll

R. P. S.

R.Sn. R. S. C.

S. A. C.

S. BI. S. F. M.

St G. S. S.N.

T.As.

T. A. A. T. A. C.

T. Ba.

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R.

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V. w.

m. A. B. c.

W. A. G.

W. A. J. F.

R. Phene Spiers, F.S.A., F.R.I.B.A. f

Formerly Master of the Architectural School, Royal Academy, London. Past J Stair;

President of the Architectural Association. Associate and Fellow of King's College, 1 Stairease: Architecture;

London. Corresponding Member of the Institute of France. Editor of Fergusson's Spire.

History of Architecture. Author of Architecture: East and West; &c. ˆ

Examiner in Silk Throwing and Spinning for the City and Guilds of London Institute. L Silk: Trade and Commerce – Robert Seymour Conway, M.A., D.Litt. f

Professor of Latin and Indo-European Philology in the University of Manchester. J cj pu ij (irihA Formerly Professor of Latin in University College, Cardiff; and Fellow of Gonville 1 olcuu \frloej. and Caius College, Cambridge. Author of The Italic Dialects. I

Stanley Arthur Cook.

Lecturer in Hebrew and Syriac, and formerly Fellow, Gonville and Caius College, Simeon; Cambridge. Editor for the Palestine Exploration Fund. Author of Glossary of~\ Solomon. A ramaic Inscriptions ; The Laws of Moses and the Code of Hammurabi ; Critical Notes on Old Testament History; Religion of Ancient Palestine; &c.

Sigfus Blondal.

Librarian of the University of Copenhagen.

Sir Shirley Forster Murphy, F.R.C.S.

Medical Officer of Health for the County of London.

St George Stock, M.A.

Pembroke College, Oxford.

Lecturer in Greek in the University of Birmingham.

Simon Newcomb, D.Sc, LL.D.

See the biographical article : Newcomb, Simon.

\ SigurSsson, Jdn. | Slaughter-house. \ Simon Magus. | Solar System.

Thomas Ashby, M.A., D.Litt.

Director of the British School of Archaeology at Rome. Formerly Scholar of Christ Church, Oxford. Craven Fellow, 1897. Conington Prizeman, 1906. Member of 1 the Imperial German Archaeological Institute. Author of The Classical Topography of the Roman Campagna.

{

Thomas Andrew Archer, M.A.

Author of The Crusade of Richard I. ; &c.

Timothy Augustlne Coghlan, I.S.O. r

Agent-General for New South Wales. Government Statistician, New South Wales, 1 886-1 905. Honorary Fellow of the Royal Statistical Society. Author of Wealth -j and Progress of New South Wales; Statistical Account of Australia and New Zealand; &c. I

Sir Thomas Barclay.

Member of the Institute of International Law. Officer of the Legion of Honour. Author of Problems of International Practice and Diplomacy; &c. M.P. for Black- burn, 1910.

Theodore Freylinghuysen Collier, Ph.D.

Sicily: Geography and Statistics {in part), and History [$n part);

Siena {in pari);

Signia; Soluntum;

Sora; Spoleto;

Stabiae; Subiaco.

Silvester II.

South Australia: Geography

and Statistics.

Spy {in part); State.

Assistant Professor of History, Williams College, Williamstown, Mass. \ ” lxtus v ‘

Thomas Seccombe, M.A. r

Balliol College, Oxford. Lecturer in History, East London and Birkbeck Colleges, J Smollett; University of London. Stanhope Prizeman, Oxford, 1887. Assistant Editor of 1 Stephen Sir Leslie. Dictionary of National Biography, 1891-1901. Author of The Age of Johnson; &c. L

Walter Theodore Watts-Dunton. J

See the biographical article: Watts-Dunton, Walter Theodore. j_ Sonnet.

Thomas William Fox. f

Professor of Textiles in the University of Manchester. Author of Mechanics of-< Spinning. Weaving. (.

Thomas William Rhys Davids, M.A., LL.D., Ph.D.

Professor of Comparative Religion, Manchester University. President of the Pali Text Society. Fellow of the British Academy. Professor of Pali and Buddhist Literature, University College, London, 1 882-1904. Secretary and Librarian of” Royal Asiatic Society, 1 885-1902. Author of Buddhism; Sacred Books of the Buddhists; Early Buddhism; Buddhist India; Dialogues of the Buddha; &c.

The Hon. Lady Welby.

Formerly Maid of Honour to Queen Victoria. Sense ; What is Meaning?

Sigiri.

Author of Links and Clues ; Grains of J. Signifies.

Rev. William Augustus Brevoort Coolidge, M.A., F.R.G.S., Ph.D.

Fellow of Magdalen College, Oxford. Professor of English History, St David's College, Lampeter, 1880-1881. Author of Guide du Haul Dauphine; The Range of • the Todi; Guide to Grindelwald; Guide to Switzerland; The Alps in Nature and in History; &c. Editor of the Alpine Journal, 1880-1881 ; &c.

Walter Armstrong Graham.

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Siam.

Teacher of Singing at the Royal -j Song {in music).

W. A. P.

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S.

W. W. P.*

Sir;

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States-General;

Stole (in part).

Solution.

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William Cecil Dampier Whetham, M.A., F.R.S. f

Fellow and Tutor of Trinity College, Cambridge. Author of Theory of Solution ; 1 Recent Development of Physical Science ; The Family and the Nation ; &c. I

Sir William Edmund Garstin, G.C.M.G. f

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Rev. William Hunt, M.A., Litt.D.

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Beit Lecturer in Colonial History, Oxford University. Editor of Acts of the Privy 1 Lord.

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f Statistics;

I Stock Exchange.

Stubbs, William. \ Spaiks, Jared.

William Minto, M.A.

See the biographical article : Minto, William.

Sir William MacCormac, Bart.

See the biographical article: MacCormac, Sir William, Bart.

William McDougall, M.A.

Wilde Reader in Mental Philosophy in the University of Oxford, of St John's College, Cambridge.

William Matthew Flinders Petrie, F.R.S., D.C.L., Litt.D. See the biographical article: Petrie, W. M. Flinders.

William Michael Rossetti.

See the biographical article: Rossetti, Dante Gabriel.

Sir William Mitchell Ramsay, LL.D., D.C.L., D.Litt. See the biographical article: Ramsay, Sir W. Mitchell.

William Napier Shaw, M.A., LL.D., D.Sc, F.R.S.

Director of the Meteorological Office, London. Reader in Meteorology in the University of London. President of Permanent International Meteorological Committee. Member of Meteorological Council, 1897-1905. Hon. Fellow of Emmanuel College, Cambridge. Fellow of Emmanuel College, 1877-1906; Senior Tutor, 1890-1899. Joint author of Text Book of Practical Physics; &c.

William Warde Fowler, M.A.

Fellow of Lincoln College, Oxford. Sub-rector, 1881-1904. Gifford Lecturer, Edinburgh University, 1908. Author of The City-State of the Greeks and Romans; The Roman Festivals of the Republican Period ; &c.

Spenser, Edmund (in pari) ;. Steele, Sir Richard (in part); Sterne, Laurence (in part).

Simon, Sir John.

Formerly Fellow J Subliminal Self.

■! Sinai: The Peninsula.

Signorelli, Luca; Sodoma, II.

-1 Smyrna (in part).

Squall.

Silvanus.

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Sodium.

Speaker.

Stem.

Sierra Leone.

Soissons.

Spectacles.

Stettin.

Sign-board.

Solanaceae.

Speranski, Count.

Stickleback.

Sikh Wars.

Solicitor.

Sphere.

Stirling.

Silesia.

Solomon Islands.

Spitsbergen.

Stirlingshire.

Silicon.

Somersetshire.

Springfield.

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Silver.

Somme.

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Somnambulism.

Stafford.

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Sligo.

Southwark.

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Strophanthus.

Smallpox.

Sowing.

S tar-Chamber.

Strychnine.

Smithsonian Institution.

Spalato.

Staten Island.

Sturgeon.

Snail.

Spanish-American War.

State Rights.

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Steenkirk,

Styria.

ENCYCLOPEDIA BRITANNICA

ELEVENTH EDITION

VOLUME XXV

SHUVALOV (sometimes written Schouvaloff), PETER ANDREIVICH, Count (1827-1889), Russian diplomatist, was born in 1827 of an old Russian family which rose to distinction and imperial favour about the middle of the 18th century. Several of its members attained high rank in the army and the civil administration, and one of them may be regarded as the founder of the Moscow University and the St Petersburg Academy of the Fine Arts. As a youth Count Peter Andreivich showed no desire to emulate his distinguished ancestors. He studied just enough to qualify for the army, and for nearly twenty years he led the agreeable, commonplace life of a fashionable officer of the Guards. In 1864 Court influence secured for him the appointment of Governor-General of the Baltic Provinces, and in that position he gave evidence of so much natural ability and tact that in 1866, when the revolutionary fermentation in the younger section of the educated classes made it advisable to place at the head of the

political police a man of exceptional intelligence and energy, he was selected by the emperor for the post. In addition to his regular functions, he was entrusted by his Majesty with much work of a confidential, delicate nature, including a mission to London in 1873. The ostensible object of this mission was to arrange amicably certain diplomatic difficulties created by the advance of Russia in Central Asia, but he was instructed at the same time to prepare the way for the marriage of the grand duchess Marie Alexandrovna with the duke of Edinburgh, which took place in January of the following year. At that time the emperor Alexander II. was anxious to establish cordial relations with Great Britain, and he thought this object might best be attained by appointing as his diplo- matic representative at the British Court the man who had con- ducted successfully the recent matrimonial negotiations. Count Shuvalov was accordingly appointed ambassador to London; and he justified his selection by the extraordinary diplomatic ability he displayed during the Russo-Turkish War of 1877-78 and the subsequent negotiations, when the relations between Russia and Great Britain were strained almost to the point of rupture. After the publication of the treaty of San Stefano, which astonished Europe and seemed to render a conflict inevit- able, he concluded with Lord Salisbury a secret convention which enabled the two powers to meet in congress and find a pacific solution for all the questions at issue. In the delibera- tions and discussions of the congress he played a leading- part, and defended the interests of his country with a dexterity which excited the admiration of his colleagues; but when it became known that the San Stefano arrangements were profoundly modified by the treaty of Berlin, public opinion in Russia con- xxv. 1

demned him as too conciliatory, and reproached him with having needlessly given up many of the advantages secured by the war. For a time Alexander II. resisted the popular clamour, but in the autumn of 1879, when Prince Bismarck assumed an attitude of hostility towards Russia, Count Shuvalov, who had been long regarded as too amenable to Bismarckian influence, was recalled from his post as ambassador in London; and after living for nearly ten years in retirement, he died at St Petersburg in 1889. (D. M. W.)

SHUYA, a town in the government of Vladimir, 68 m. by rail N.E. of the town of Vladimir. It is one of the chief centres of the cotton and linen industries in middle Russia. It is built on the high left bank of the navigable Teza, a tributary of the Klyazma, with two suburbs on the right bank. Annalists men- tion princes of Shuya in 1403. Its first linen manufactures were established in 1755; but in 1800 its population did not exceed 1500. In 1882 it had 19,560 inhabitants,

and 18,968 in 1897. Tanneries, especially for the preparation of sheepskins — widely renowned throughout Russia — still maintain their importance, although this industry has migrated to a great extent to the country districts. The cathedral (1 799) is a large building, with five gilt cupolas. Nearly every village in the vicinity has a specialty of its own — bricks, pottery, wheels, toys, packing- boxes, looms and other weaving implements, house furniture, sieves, combs, boots, gloves, felt goods, candles, and so on. The manufacture of linen and cotton in the villages, as well as the preparation and manufacture of sheepskins and rough gloves, occupies about 40,000 peasants. The Shuya merchants carry on an active trade in these products all over Russia, and in corn, spirits, salt and other food stuffs, imported.

SHWEBO, a town and district in the Sagaing division of Upper Burma. The town is situated in the midst of a rice plain, 53 m. by rail N.E. from Mandalay: pop. (1901) 9626. It is of historic interest as the birthplace and [capital of Alompra, the founder of the last Burmese dynasty. After British annexation it became an important military cantonment; but only the wing of a European regiment is now stationed here. The area of the district is 5634 sq. m.; pop. (1901) 286,891, showing an increase of 24 % in the decade. It lies between the Katha, Upper and Lower Chindwin and Mandalay districts. The Irrawaddy forms the dividing line on the east. The physical features of the district vary considerably. The Minwun range runs down the whole eastern side, skirting the Irrawaddy. In the north it is a defined range, but at Sheinmaga, in the south, it sinks to an undulation. West of the Mu river, in the centre of the district, there is a gradual ascent to the hills which divide

Sagaing from the Upper Chindwin. Between these ranges and on both sides of the Mu is a plain, unbroken except for some isolated hills in the north and north-east and the low Sadaung-gyi range in the south-east. The greater part of this plain is a rice- growing tract, but on the sloping ground maize, millets, sesamum, cotton and peas are raised. A good deal of sugar is also produced from groves of the tart palm. The Mu river is navigable for three months in the year, from June to August, but in the dry season it can be forded almost anywhere. A good deal of salt is produced in a line which closely follows the railway. Coal has been worked at Letkokpin, near the Irrawaddy.

The Ye-u reserved forests are much more valuable than those to the

east on the Minwun and the Mudein. Extensive irrigation works existed in Shwebo district, but they fell into disrepair in King Thibaw's time. Chief of these was the Mahananda Lake. The old works have recently been in process of restoration, and in 1906 the main canal was formally opened. The rainfall follows the valleys of the Mu and the Irrawaddy, and leaves the rest of the district comparatively dry. It varies from an average of 29 to 49 in. The average temperature is 90° in the hot season, and falls to 60° or 61° in the cold season, the maximum and minimum readings being 104 and 56°.

SIALKOT, or Sealkote, a town and district of British India, in the Lahore division of the Punjab. The town, which has a station on the North- Western railway, is 72 m. N.E. of Lahore. Pop. (1901) 57,956. It is a military cantonment, being the headquarters of a brigade in the 2nd division of the northern army. There are remains of a fort dating from about the 10th century; but the mound on which they stand is traditionally supposed to mark the site of a much earlier stronghold, and some authorities identify it with the ancient Sakala or Sagal. Other ancient buildings are the shrine of Baba Nanak, the first Sikh Guru, that of the Mahommedan Imam Ali-ul-hakk and Raja Tej Singh's temple. The town has an extensive trade, and manufactures of sporting implements, boots, paper, cotton, cloth and shawl-edging. There are Scottish and American missions, a Scottish mission training institution and an arts college.

The District of Sialkot has an area of 1991 sq. m. It is an oblong tract of country occupying the submontane portion of the Rechna (Ravi-Chenab) Doab, fringed on either side by a line of fresh alluvial soil, above which rise the high banks that form the limits of the river-beds. The Degh, which rises in the Jammu hills, traverses the district parallel to the Ravi, and is likewise fringed by low alluvial soil. The north-eastern boundary is 20 m. distant from the outer line of the Himalayas; but about midway between the Ravi and the Chenab is a high dorsal tract, extending from beyond the border and stretching far into the district. Sialkot is above the average of the Punjab in fertility. The upper portion is very productive; but the southern portion, farther removed from the influence of the rains, shows a marked decrease of fertility. The district is also watered by numerous small torrents; and several swamps or jhils, scattered over the face of the country, are of considerable value as reservoirs of surplus water for purposes of irrigation. Sialkot is reputed to be healthy; it is free from excessive heat, judged by the common standard of the Punjab; and its average annual rainfall varies . from 35 in. near the hills to 22 in. in the parts farthest from them. The population in 1901 was 1,083,909, showing a decrease of 3 % as against an increase of 11% in the previous decade.

This is explained by the fact that Sialkot contributed over 100,000 persons to the Chenab colony (q.v.). The principal crops are wheat, barley, maize, millets and sugar-cane. The district is crossed by a branch of the North-Western railway from Wazirabad to Jammu.

The early history of Sialkot is closely interwoven with that of the rest of the Punjab. It was annexed by the British after the second Sikh war in 1849; since then its area has been consider- ably reduced, assuming its present proportions in 1867. During the Mutiny of 1857 the native troops plundered the treasury and destroyed all the records, when most of the European residents took refuge in the fort.

SIAM (known to its inhabitants as Muang Thai), an inde- pendent kingdom of the Indo-Chinese peninsula or Further India. It lies between 4° 20′ and 20 15′ N. and between 96 30′ and 106° E., and is bounded N. by the British Shan States and by the French Laos country, E. by the French Laos country and by Cambodia, S. by Cambodia and by the Gulf of Siam, and W. by the Tenasserim and Pegu divisions of Burma. A part of Siam which extends down the Malay Peninsula is bounded E. by the Gulf of Siam and by the South China Sea, S. by British Malaya and W. by the lower part of the Bay of Bengal. The total area is about 220,000 sq. m. (For map, see Indo-China.)

The country may be best considered geographically in four parts: the northern, including the drainage area of the four rivers which unite near Pak-Nam Po to form the Menam Chao Phaya; the eastern, including the drainage area of the Nam Mun river and its tributaries; the central, including the drainage area of the Meklong, the Menam Chao Phaya and the Bang Pakong rivers; and the southern, including that part of the country which is situated in the Malay Peninsula. Northern Siam is about 60,000 sq. m. in area. In general appearance it is a series of parallel ranges of hills, lying N. and S., merely gently sloping acclivities in the S., but rising into precipitous mountain masses in the N. Between these ranges flow the rivers Meping, Mewang, Meyom and Menam, turbulent shallow streams in their upper reaches, but slow-moving and deep where they near the points of junction. The longest of them is over 250 m. from its source to its mouth. The Meping and Mewang on the W., rising among the loftiest ranges, are rapid and navigable only for small boats, while the Meyom and Menam, the eastern pair, afford passage for large boats at all seasons and for deep draught river-steamers during the flood-time. The Menam is the largest, deepest and most sluggish of the four, and in many ways resembles its continuation, the Menam Chao- Phaya lower down. On the W. the river Salween and its tributary the Thoung Yin form the frontier between the Siam and Burma for some distance,

draining a part of northern Siam, while in the far north-east, for a few miles below Chieng Sen, the Mekong does the same. The districts watered by the lower reaches of the four rivers are fertile and are inhabited by a considerable population of Siamese. Farther north the country is peopled by Laos, scattered in villages along all the river banks, and by numerous communities of Shan, Karen, Kamoo and other tribes living in the uplands and on the hilltops.

Eastern Siam, some 70,000 sq. m. in area, is encircled by well-defined boundaries, the great river Mekong dividing it clearly from French Laos on the N. and E., the Pnom Dang Rek hill range from Cambodia on the S. and the Dom Pia Fai range from central Siam on the W. The right bank of the Mekong being closely flanked by an almost continuous hill range, the whole of this part of Siam is practically a huge basin, the bottom of which is a plain lying from 200 to 300 ft. above sea-level, and the sides hill ranges of between 1000 and 2000 ft. elevation. The plain is for the most part sandy and almost barren, subject to heavy floods in the rainy season, and to severe drought in the dry weather. The hills are clothed with a thin shadeless growth of stunted forest, which only here and there assumes the character- istics of ordinary jungle. The river Nam Mun, which is perhaps 200 m. long, has a large number of tributaries, chief of which is the Nam Si. The river flows eastward and falls into the Mekong at 1 5 20′ N. and 105 40′ E. A good way farther north two small rivers, the Nam Kum and the Nam Song Kram, also tributaries of the Mekong, drain a small part of eastern Siam. Nearly two million people, mixed Siamese, Lao and Cambodian, probably among the poorest peasantry in the world, support existence in this inhospitable region.

Central Siam, estimated at 50,000 sq. m. in area, is the heart of the kingdom, the home of the greater part of its population, and the source of nine-tenths of its wealth. In general appear- ance it is a great plain flanked by high mountains on its western border, inclining gently to the sea in the 3. and round the inner Gulf of Siam, and with a long strip of mountainous sea-board stretching out to the S.E. The mountain range on the W. is a

continuation of one of the ranges of northern Siam, which, extending still farther southward, ultimately forms the backbone of the Malay Peninsula. Its ridge is the boundary between central Siam and Burma. The highest peak hereabouts is Mogadok, 5000 ft., close to the border. On the E. the Dom Pia Fai throws up a point over 4000 ft., and the south-eastern range which divides the narrow, littoral, Chantabun and

Krat districts from Cambodia, has the Chemao, Saidao and Kmoch heights, between 3000 and 5000 ft. The Meklong river, which drains the western parts of central Siam, rises in the western border range, follows a course a little E. of S., and runs into the sea at the western corner of the inner gulf, some 200 m. distant from its source. It is a rapid, shallow stream, subject to sudden rises, and navigable for small boats only. The Bang Pakong river rises among the Wattana hills on the eastern ˆborder, between the Battambong province of Cambodia and Siam. It flows N., then W., then S., describing a semicircle through the fertile district of Pachim, and falls into the sea at the north-east corner of the inner gulf. The whole course of this river is about 100 m. long; its current is sluggish, but that of its chief tributary, the Nakhon Nayok river, is rapid. The Bang Pakong is navigable for steamers of small draught for about 30 m. The Menam Chao Phaya, the principal river of Siam, flows from the point where it is formed by the junction of the rivers of northern Siam almost due S. for 154 m., when it empties itself into the inner gulf about midway between the Meklong and Bang Pakong mouths. In the neighbourhood of Chainat, 40 m. below Paknam Poh, it throws off three branches, the Suphan river and the Menam Noi on the right, and the Lopburi river on the left bank. The latter two rejoin the parent stream at points considerably lower down, but the Suphan river remains distinct, and has an outlet of its own to the sea. At a point a little more than half-way down its course, the Menam Chao Phaya receives the waters of its only tributary, the Nam Sak, a good-sized stream which rises in the east of northern Siam a.nd waters the most easterly part (the Pechabun valley) of that section of the country. The whole course of the Menam Chao Phaya lies through a perfectly flat country. It is deep, fairly rapid, subject to a regular rise and flood every autumn, but not to sudden freshets, and is affected by the tide 50 m. inland. For 20 m. it is navigable for vessels of over 1000 tons, and were it not for the enormous sand bar which lies across the mouth, ships of almost any size could he at the port of Bangkok about that distance from the sea (see Bangkok). Vessels up to 300 tons and 12 ft. draught can ascend the river 50 m. and more, and beyond that point large river-boats and deep-draught launches can navigate for many miles. The river is always charged with a great quantity of silt which during flood season is deposited over the surrounding plain to the great enhancement of its fertility. There is prac- tically no forest growth in central Siam, except on the slopes of the hills which bound this section. The rest is open rice-land, alternating with great stretches of grass, reed jungle and bamboo scrub, much of which is under water for quite three months of the year.

Southern Siam, which has an area of about 20,000 sq. m., consists of that part of the Malay Peninsula which belongs to the Siamese kingdom. It extends from 10° N. southwards to 6° 35′ N. on the west coast of the peninsula, and to 6° 25′ N. on the east coast, between which points stretches the frontier of British Malaya. It is a strip of land narrow at the north end and widening out towards the south, consisting roughly of the continuation of the mountain range which bounds central Siam on the W., though the range appears in certain parts as no more than a chain of hillocks. The inhabitable part of the land consists of the lower slopes of the range with the valleys and small alluvial plains which lie between its spurs. The remainder is covered for the most part with dense forest containing several kinds of valuable timber. The coast both east and west is much indented, and is studded with islands. The rivers are small and shallow. The highest mountain is Kao Luang, an almost isolated projection over 5000 ft. high, round the base of which lie the most fertile lands of this section, and near which are

situated the towns of Bandon, Nakhon Sri Tammarat (Lakhon) and Patalung, as well as many villages.

Geology. 1 — Very little is known of the geology of Siam. It appears to be composed chiefly of Palaeozoic rocks, concealed, in the plains, by Quaternary, and possibly Tertiary, deposits. Near Luang Prabang, just beyond the border, in French territory, limestones with Productus and Schwagerina, like the Productus limestone of the Indian Salt Range, have been found; also red clays and grau- wacke with plants similar to those of the Raniganj beds ; and violet clays with Dicynodon, supposed to be the equivalents of the Panche series of India. All these beds strike from north-east to south-west and must enter the northern part of Siam. Farther south, at Vien- Tiane, the Mekong passes through a gorge cut in sandstone, arkose and schists with a similar strike ; while at Lakhon there are steeply inclined limestones which strike north-west.

Climate. — Although enervating, the climate of Siam, as is natural from the position of the country, is not one of extremes. The wet season — May to October — corresponds with the prevalence of the south-west monsoon in the Bay of Bengal. The full force of the monsoon is, however, broken by the western frontier hills; and while the rainfall at Mergui is over 180, and at Moulmein 240 in., that of Bangkok seldom exceeds 54, and Chiengmai records an average of about 42 in. Puket and Chantabun, being both on a lee shore, in this season experience rough weather and a heavy rainfall ; the latter, being farther from the equator, is the worse off in this respect. At this

period the temperature is generally moderate, 65 to 75 F. at night and 75 ° to 85° by day; but breaks in the rains occur which are hot and steamy. The cooi season begins with the commencement of the north-east monsoon in the China Sea in November. While Siam enjoys a dry climate with cool nights (the thermometer at night often falling to 40 — 50 F., and seldom being over 90 in the shade by day), the eastern coast of the Malay Penin- sula receives the full force of the north-easterly gales from the sea. This lasts into February, when the northerly current begins to lose strength, and the gradual heating of the land produces local sea breezes from the gulf along the coast-line. Inland, the thermometer rises during the day to over 100 F., but the extreme continental heats of India are not known. The comparative humidity of the atmosphere, however, makes the climate trying for Europeans.

Flora. — In its flora and fauna Siam combines the forms of Burma and the Shan States with those of Malaya, farther south, and of Cambodia to the south-east. The coast region is characterized by mangroves, Pandanus, rattans, and similar palms with long flexible stems, and the middle region by the great rice-fields, the coco-nut and areca palms, and the usual tropical plants of culture. In the temperate uplands of the interior, as about Luang Prabang, Hima- layan and Japanese species occur — oaks, pines, chestnuts, peach and great apple trees, raspberries, honeysuckle, vines, saxifrages, Cichoraceae, anemones and Violaceae; there are many valuable timber trees — teak, sappan, eagle-wood, wood-oil (Hopea), and other Dipterocarpaceae, Cedrelaceae, Pterocarpaceae, Xylia, iron- wood and other dye-woods and resinous trees, these last forming in many districts a large proportion of the more open forests, with an undergrowth of bamboo. The teak tree grows all over the hill districts north of latitude 15 , but seems to attain its best develop- ment on the west, and on the east does not appear to be found south of 17°. Most of the so-called Burma teak exported from Moulmein is floated down from Siamese territory. Among other valuable forest products are thingan wood (Hopea odorata), largely used for boat-building; damar oil, taken throughout Indo-China from the Dipterccarpus levis; agilla wood, sapan, rosewood, iron- wood, ebony, rattan. Among the chief productions of the plains are rice (the staple export of the country) ; pepper (chiefly from Chantabun) ; sirih, sago, sugar-cane, coco-nut and betel, Palmyra or sugar and attap palms; ‘many forms cf banana and other fruit, such as durian, orange-pommelo, guava, bread-fruit, mango, jack fruit, pine-apple, custard-apple and mangosteen.

Fauna. — Few countries are so well stocked with big game as is Siam. Chief of animals is the elephant, which roams wild in large numbers,

and is extensively caught and tamed by the people for transport. The tiger, leopard, fishing-cat, leopard-cat, and other species of wild-cat, as well as the honey-bear, large sloth-bear, and one- and two-horned rhinoceros, occur. Among the great wild cattle are the formidable gaur, or seladang, the banting, and the water-buffalo. The goat antelope is found, and several varieties of deer. Wild pig, several species of rats, and many bats — one of the commonest being the flying-fox, and many species of monkey — especially the gibbon — are also met with. Of snakes, 56 species are known, but only 12 are poisonous, and of these 4 are sea-snakes. The waters of Siam are particularly rich in fish. The crocodile is common in many of the rivers and estuaries of Siam, and there are many lizards. The country is rich in birds, a large number of which appear to be common to Burma and Cambodia.

1 See E. Joubert in F. Gamier, Voyage a" exploration en Indo- Chine (Paris, 1873), vol. ii.; Counillon, Documents pour servir & I'etude ghlogique des environs de Luang Prabang (Cochinchine) , Comptes rendus (1896), cxxiii. 1330-1333.

SIAM

Inhabitants. — A census of the rural population was taken for the first time in 1905. The first census of Bangkok and its suburbs was taken in 1909. Results show the total population of the country to be about 6,230,000. Of this total about 3,000,000 are Siamese, about 2,000,000 Laos, about 400,000 Chinese, 1 1 5,000 Malay, 80,000 Cambodian and the rest Burmese, Indian, Mohn, Karen, Annamite, Kache, Lawa and others. Of Europeans and Americans there are between 1300 and 1500, mostly resident in Bangkok. Englishmen number about 500; Germans, 190; Danes, 160; Americans, 150, and other nation- alities are represented in smaller numbers. The Siamese inhabit central Siam principally, but extend into the nearer districts of all the other sections. The Laos predominate in northern and eastern Siam, Malays mingle with the Siamese in southern Siam, and the Chinese are found scattered all over, but keeping mostly to the towns. Bangkok, the capital, with some 650,000 inhabitants, is about one-third Chinese, while in the suburbs are to be found settlements of Mohns, Burmese, Annamites and Cambodians, the descendants of captives taken in ancient wars. The Eurasian population of Siam is very small compared with that of other large cities of the East. Of the tribes which occupy the mountains of Siam some are the remnants of the very ancient inhabitants of the country, probably of the Mohn-Khmer family, who were supplanted by a later influx of more civilized Khmers from the south-east, the forerunners and part-ancestors of the Siamese, and

were still farther thrust into the remoter hills when the Lao-Tai descended from the north. Of these the principal are the Lawa, Lamet, Ka Hok, Ka Yuen and Kamoo, the last four collectively known to the Siamese as Ka. Other tribes, whose presence is probably owing to immigration at remote or recent periods, are the Karens of the western frontier range, the Lu, Yao, Yao Yin, Meo and Musur of northern Siam. The Karens of Siam number about 20,000, and are found as far. south as 13 N. They are mere offshoots from the main tribes which inhabit the Burma side of the boundary range, and are suDposed by some to be of Burmo-Tibetan origin. The Lu, Yao, Yao Yin, Meo and Musur have Yunnanese charac- teristics, are met with in the Shan States north of Siam and in Yun-nan, and are supposed to have found their way into northern Siam since the beginning of the 19th century. In the mountains behind Chantabun a small tribe called Chong is found, and in southern Siam the Sakei and Semang inhabit the higher ranges. These last three have Negrito characteristics, and probably represent a race far older even than the ancient Ka.

The typical Siamese is of medium height, well formed, with olive complexion, darker than the Chinese, but fairer than the Malays, eyes well shaped though slightly inclined to the oblique, nose broad and flat, lips prominent, the face wide across the cheek-bones and the chin short. A thin moustache is common, the beard, if present, is plucked out, and the hair of the head is black, coarse and cut short. The lips are usually deep red and the teeth stained black from the habit of betel-chewing. The children are pretty but soon lose their charm, and the race, generally speaking, is ugly from the European standpoint. The position of women is good. Polygamy is permitted, but is common only among the upper classes, and when it occurs the first wife is acknowledged head of the household. In disposition the Siamese are mild-mannered, patient, submissive to authority, kindly and hospitable to strangers. They are a light-hearted, apathetic people, little given to quarrelling or to the commission of violent crime. Though able and intelligent cultivators they do not take kindly to any form of labour other than agricultural, with the result that most of the industries and trades of the country are in the hands of Chinese.

The national costume of the Siamese is the panung, a piece of cloth about I yd. wide and 3 yds. long. The middle of it is passed round the body, which it covers from the waist to the knees, and is hitched in front so that the two ends hang down in equal length before; these being twisted together are passed back between the legs, drawn up and tucked into the waist at the middle of the back. The panung is common to both sexes, the women supplementing it with a scarf worn round the body under the arms. Among the better classes both sexes

wear also a jacket buttoned to the throat, stockings and shoes, and all the men, except servants, wear hats.

The staple food of the Siamese is rice and fish. Meat is eaten, but, as the slaughter of animals is against Buddhist tenets, is not often obtainable, with the exception of pork, killed by Chinese. The men smoke, but the women do not. Everybody chews betel. The principal pastimes are gambling, boat-racing, cock- and fish- fighting and kite-flying, and a kind of football.

Slavery, once common, has been gradually abolished by a series of laws, the last of which came into force in 1905. No such thing as caste exists, and low birth is no insuperable bar to the attainment of the highest dignities. There are no hereditary titles , those in use being conferred for life only and being attached to some particular office.

Towns. — There are very few towns with a population of over 10,000 inhabitants in Siam, the majority being merely scattered townships or clusters of villages, the capitals of the provinces (muang) being often no more than a few houses gathered round the market-place, the offices and the governor's residence. The more important places of northern Siam include Chieng Mai (q.v.), the capital ,of the north, Chieng Rai, near the northern frontier; Lampun, also known as Labong (originally Haribunchai), the first Lao settlement in Siam ; Lampang, Tern, Nan and Pre, each the seat of a Lao chief and of a Siamese commissioner; Utaradit, Pichai, Pichit, Pechabun and Raheng, the last of importance as a timber station, with Phitsnulok, Sukhotai, Swankalok, Kampeng Pet and Nakhon Sawan, former capitals of Khmer-Siamese king- doms, and at present the headquarters of provincial governments. In eastern Siam the only towns of importance are Korat and Ubon, capitals of divisions, and Nong Kai, an ancient place on the Mekong river. In central Siam, after Bangkok and Ayuthia, places of im- portance on the Menam Chao Phaya are Pak-Nam at the river mouth, the seat of a governor, terminus of a railway and site of modern fortifications; Paklat, the seat of a governor, a town of Mohns, descendants of refugees from Pegu ; Nontaburi, a few miles above Bangkok, the seat of a governor and possessing a large market; Pratoomtani, Angtong, Prom, Inburi, Chainat and Saraburi, all administrative centres ; and Lopburi, the last capital before Ayuthia and the residence of kings during the Ayuthia period, a city of ruins now gradually reawakening as a centre of railway traffic. To the west of the Menam Chao Phaya lie Suphanburi and Ratburi, ancient cities, now government headquarters; Pechaburi (the Piply of early travellers), the terminus of the western railway; and Phrapa- toom, with its huge pagoda on the site of the capital of Sri Wichaiya, a

kingdom of 2000 years ago, and now a place of military, agricultural and other schools. To the east, in the Bang Pakong river-basin and down the eastern shore of the gulf, are Pachim, a divisional headquarters; Petriou (q.v.) ; Bang Plasoi, a fishing centre, with Rayong, Chantabun (q.v.) and Krat, producing gems and pepper. In southern Siam the chief towns are Chumpon; Bandon, with a growing timber industry ; Nakhon Sri Tammarat (q.v.) ; Singora Xq-v.) ; Puket (q.v.) ; Patani.

Communications. — Central Siam is supplied with an exceptionally complete system of water communications; for not only has it the three rivers with their tributaries and much-divided courses, but all three are linked together by a series of canals which, running in parallel lines across the plain from E. to W., make the farthest corners of this section of the kingdom easily accessible from the capital. The level of the land is so low, the soil so soft, and stone suitable for metal so entirely absent, that the making and upkeep of roads would here be ruinously expensive. Former rulers have realized this and have therefore confined themselves to canal making. Some of the canals are very old, others are of comparatively recent construction. In the past they were often allowed to fall into dis- repair, but in 1903 a department of government was formed to control their upkeep, with the result that most of them were soon furnished with new locks, deepened, and made thoroughly service- able. The boat traffic on them is so great that the collection of a small toll more than suffices to pay for all maintenance expenses. In northern and southern Siam, where the conditions are different, roads are being slowly made, but natural difficulties are great, and travelling in those distant parts is still a matter of much discomfort.

In 1909 there were 640 miles of railway open. All but 65 miles was under state management. The main line from Bangkok to the north had reached Pang Tong Phung, some distance north of Utaradit and 10 m. south of Meh Puak, which was selected as the terminus for the time being, the continuation to Chieng Mai, the original objective, being postponed pending the construction of another and more important line. This latter was the continuation through southern Siam of the line already constructed from Bangkok south-west to Petchaburi (no m.), with funds borrowed, under a recent agreement, from the Federated (British) Malay States government, which work, following upon surveys made in 1907, was begun in 1909 under the direction of a newly constituted southern branch of the Royal Railways department. From Ban Paji on the main line a branch extends north-eastwards no m. to Korat. To the east of Bangkok the Bangkok-Petriew line (40 m.) was completed and open for traffic.

The postal service extends to all parts of the country and is fairly efficient. Siam joined the Postal Union in 1885. The inland tele- graph is also widely distributed, and foreign lines communicate with Saigon, the Straits Settlements and Moulmein. Agriculture. — The cultivation of paddi (unhusked rice) forms the

occupation of practically the whole population of Siam outside the capital. Primitive methods obtain, but the Siamese are efficient cultivators and secure good harvests nevertheless. The sowing and planting season is from June to August, and the reaping season from December to February. Forty or fifty varieties of paddi are grown, and Siam rice is of the best in the world. Irrigation is rudimentary, for no system exists for raising the water of the in- numerable canals on to the fields. Water-supply depends chiefly, therefore, on local rainfall. In 1905 the government started pre- liminary surveys for a system of irrigation. Tobacco, pepper, coco-nuts and maize are other agricultural products. Tobacco of good quality supplies local requirements but is not exported ; pepper, grown chiefly in Chantabun and southern Siam, annually yields about 900 tons for export. From coco-nuts about 10,000 tons of copra are made for export each year, and maize is used for local consumption only. Of horned cattle statistical returns show over two million head in the whole country.

Mining. — The minerals of Siam include gold, silver, rubies, sapphires, tin, copper, iron, zinc and coal. Tin-mining is a flourish- ing industry near Puket on the west coast of the Malay Peninsula, and since 1905 much prospecting and some mining has been done on the east coast. The export of tin in 1908 exceeded 5000 tons, valued at over £600,000. Rubies and sapphires are mined in the Chantabun district in the south-east. The Mining Department of Siam is a well-organized branch of the government, employing several highly-qualified English experts.

Timber. — The extraction of teak from the forests of northern Siam employs a large number of people. The industry is almost entirely in the hands of Europeans, British largely predominating. The number of teak logs brought out via the Salween and Menam Chao Phaya rivers average 160,000 annually, Siam being thus the largest teak-producing country of the world. A Forest Department, in which experienced officers recruited from the Indian Forest Service are employed, has for many years controlled the forests of Siam.

Technology. — The government has since 1903 given attention to

sericulture, and steps have been taken to improve Siamese silk with the aid of scientists borrowed from the Japanese Ministry of Agriculture. Surveying and the administration of the land have for a long time occupied the attention of the government. A Survey Department, inaugurated about 1887, has completed the general survey of the whole country, and has made a cadastral survey of a large part of the thickly inhabited and highly cultivated districts of central Siam. A Settlement Commission, organized in 1901, decided the ownership of lands, and, on completion, handed over its work to a Land Registration Department. Thus a very complete settlement of much of the richest agricultural land in the country has been effected. The education of the youth of Siam in the technology of the industries practised has not been neglected. Pupils are sent to the best foreign agricultural, forestry and mining schools, and, after going through the prescribed course, often with distinction, return to Siam to apply their knowledge with more or less success. Moreover, a college under the control of the Ministry of Lands and Agriculture, which was founded in 1909, provides locally courses of instruction in these subjects and also in irrigation engineer- ing, sericulture and surveying.

Commerce. — Rice-mills, saw-mills and a few distilleries of locally consumed liquor, one or two brick and tile factories, and here and there a shed in which coarse pottery is made, are all Siam has in the way of factories. All manufactured articles of daily use are imported, as is all ironware and machinery. The foreign commerce of Siam is very ancient. Her commerce with India, China and probably Japan dates from the beginning of the Christian era or earlier, while that with Europe began in the 16th century. Trade with her immediate neighbours is now insignificant, the total value of annual imports and exports being about £400,000; but sea- borne commerce is in a very flourishing condition. Bangkok, with an annual trade valued at £13,000,000, easily overtops all the rest of the country, the other ports together accounting for a total of imports and exports not exceeding £3,000,000. On both the east and west coasts of southern Siam trade is increasing rapidly, and is almost entirely with the Straits Settlements. The trade of the west coast is carried in British ships exclusively, that on the east coast by British and Siamese.

Art. — The Siamese are an artistic nation. Their architecture, drawing, goldsmith's work, carving, music and dancing are all highly developed in strict accordance with the traditions of Indo-Chinese art. Architecture, chiefly exercised in connexion with religious buildings, is clearly a decadent form of that practised by the ancient Khmers, whose architectural remains are among the finest in the world. The system of music is elaborate but is not written, vocalists and

instrumentalists performing entirely by ear. The interval corresponding to the octave being divided into seven equal parts, each about if semitone, it follows that Siamese music sounds strange in Western ears. Harmony is unknown, and orchestras, which include fiddles, flutes, drums and harmonicons, perform in unison. The goldsmith's work of Siam is justly celebrated. Repousse work in silver, which is still practised, dates from the most ancient times. Almost every province has its special patterns and processes, the most elaborate being those of Nakhon Sri Tammarat (Ligore), Chantabun and the Laos country. In the Ligore ware the hammered

ground-work is inlaid with a black composition of sulphides of baser metals which throws up the pattern with distinctness.

Government. — The government of Siam is an absolute monarchy. The heir to the throne is appointed by the king, and was formerly chosen from among all the members of his family, collateral as well as descendants. The choice was sometimes made early . in the reign when the heir held the title of " Chao Uparach " or " Wang' Na," miscalled " Second King " in English, and sometimes was left until the death of the king was imminent. The arrangement was fraught with danger to the public tran- quillity, and one of the reforms of the last sovereign was the abolition of the office of " Chao Uparach " and a decree that the throne should in future descend from the king to one of his sons born of a queen, which decree was immediately followed by the appointment of a crown prince. There is a council consisting of the ten ministers of state — for foreign affairs, war, interior, finance, household, justice, metropolitan government, public works, public instruction and for agriculture — together with the general adviser. There is also a legislative council, of which the above are ex officio members, consisting of forty-five persons appointed by the king. The council meets once a week for the transaction of the business of government. The king is an autocrat in practice as well as in theory, he has an absolute power of veto, and the initiative of measures rests largely with him. Most departments have the benefit of European advisers. The government offices are conducted much on European lines. The Christian Sunday is observed as a holiday and regular hours are prescribed for attendance. The numerous palace and other functions make some demand upon ministers' time, and, as the king transacts most of his affairs at night, high officials usually keep late office hours. The Ministry of Interior and certain technical departments are recruited from the civil service schools, but many appointments in government service go by patronage. For administrative purposes the country is divided into seventeen montons (or divisions) each in charge of a high commissioner, and an

‘eighteenth, including Bangkok and the surrounding suburban provinces, under the direct control of the minister for metropolitan government (see Bangkok). The high commissioners are responsible to the minister of interior, and the montons are furnished with a very complete staff for the various branches of the administration. The montons consist of groups of the old rural provinces (muang), the hereditary chiefs of which, except in the Lao country in the north and in the Malay States, have been replaced by governors trained in administrative work and subordinate to the high commissioner. Each muang is subdivided into ampurs under assistant commissioners, and these again are divided into village circles under headmen (kamnans), which circles comprise villages under the control of elders. The suburban provinces of the metropolitan monton are also divided as above. The policing of the seventeen montons is provided for by a gendarmerie of over 7000 men and officers (many of the latter Danes), a well-equipped and well-disciplined force. That of the sub- urban provinces is effected by branches of the Bangkok civil police.

Finance. — The revenue administration is controlled by the ministers of the interior, of metropolitan government and of finance, by means of well-organized departments and with expert European assistance. The total revenue of the country for 1908-1909 amounted to 58,000,000 ticals, or, at the prevailing rate of exchange, about £4,300,000, made up as follows : —

Farms and monopolies (spirits, gambling, &c.) . £783,000

Opium revenue 823,000

Lands, forests, mines, capitation. . . . 1,330,000

Customs and octroi 653,000

Posts, telegraphs and railways …. 331,000

Judicial and other fees 270,000

Sundries 110,000

Total £4,300,000

The unit of Siamese currency is the tieal, a silver coin about equal in weight and fineness to the Indian rupee. In 1902, owing to the serious depreciation of the value of silver, the Siamese mint was closed to free coinage, and an arrangement was made providing for the gradual enhancement of the value of the tical until a suitable value should be

attained at which it might be fixed. This measure was

successful, the value of the tical having thereby been increased from n jd. in 1902 to is. 5{|d. in 1909, to the improvement of the national credit and of the value of the revenues. A paper currency was established in 1902, and proved a financial success. In 1905 Siam contracted her first public loan, £1,000,000 being raised in London and Paris at 95ˆ and bearing 4.5 % interest. This sum was employed chiefly in railway construction, and in 1907 a second loan of £3,000,000 was issued in London, Paris and Berlin at 93! for the same purpose and for extension of irrigation works. A further sum of £4,000,000 was borrowed in 1909 from the government of the Federated (British) Malay States at par and bearing interest at 4 %, also for railway construction.

Weights and Measures. — In accordance with the custom formerly prevalent in all the kingdoms of Further India, the coinage of Siam furnishes the standard of weight. The tical (baht) is the unit of currency and also the unit of weight. Eighty ticals equal one chang and fifty chang equal one haph, equivalent to the Chinese picul, or 1332ft avoirdupois. For the weighing of gold, gems, opium, &c, the fuang, equal to J tical, and the salung, equal to i tical, are used. The unit of linear measure is the wah, which is subdivided into J wah or sauk, f wah or kup, and into fa wah or niew. Twenty wah equal one sen and 400 sen equal one yote. The length of the wah has been fixed at two metres. The unit of land measure is the rai, which is equal to 400 square wah, and is subdivided into four equal ngan. Measures of capacity are the tang or bucket, and the sat or basket. Twenty tanan, originally a half coco-nut shell, equal one tang, and twenty-five of the same measure equal one sat. The tang is used for measuring rice and the sat for paddi and other grain. One sat of paddi weighs 42 J ft avoirdupois.

Army and Navy. — By a law passed in 1903, the ancient system of recruiting the army and navy from the descendants of former prisoners of war was abolished in favour of compulsory service by all able-bodied men. The new arrangement, which is strictly terri- torial, was enforced in eight montons by the year 1909, resulting in a standing peace army of 20,000 of all ranks, in a marine service of about 10,000, and in the beginnings of first and second reserves. The navy, many of the officers of which are Danes and Norwegians, comprises a steel twin-screw cruiser of 2500 tons which serves as the royal yacht, four steel gunboats of between 500 and 700 tons all

armed with modern quick-firing guns, two torpedo-boat destroyers and three torpedo boats, with other craft for river and coast work.

Justice.— Since the institution of the Ministry of Justice in 1892 very great improvements have been effected in this branch of the administration. The • old tribunals where customary law was administered by ignorant satellites of the great, amid unspeakable corruption, have all been replaced by organized courts with qualified judges appointed from the Bangkok law school, and under the direct control of the ministry in all except the most outlying parts. The ministry is well organized, and with the assistance of European and Japanese officers of experience has drafted a large number of laws and regulations, most of which have been brought into force. Extra-territorial jurisdiction was for long secured by treaty for the subjects of all foreign powers, who could therefore only be sued in the courts maintained in Siam by their own governments, while European assessors were employed in cases where foreigners sued Siamese. An indication, however, foreshadowing the disappearance of extra-territorial rights, appeared in the treaty of 1907 between France and Siam, the former power therein surrendering all such rights where Asiatics are concerned so soon as the Siamese penal and procedure codes should have become law, and this was followed by a much greater innovation in 1909 when Great Britain closed her courts in Siam and surrendered her subjects under certain temporary conditions to the jurisdiction of the Siamese courts. When it is understood that there are over 30,000 Chinese, Annamese, Burmese and other Asiatic foreign subjects living in Siam, the importance to the country of this change will be to some extent realized.

Religion. — While the pure-blooded Malays of the Peninsula are Mahommedans, the Siamese and Lao profess a form of Buddhism which is tinged by Cingalese and Burmese influences, and, especially in the more remote country districts, by the spirit-worship which is characteristic of the imaginative and timid Ka and other hill peoples of Indo-China. In the capital a curious admixture of early Brah-minical influence is still noticeable, and no act of public importance takes place without the assistance of the divinations of the Brahmin priests. The Siamese, as southern Buddhists, pride themselves on their orthodoxy; and since Burma, like Ceylon, has lost its inde- pendence, the king is regarded in the light of the sole surviving defender of the faith. There is a close connexion between the laity and priesthood, as the Buddhist rule, which prescribes that every man should enter the priesthood for at least a few months, is almost universally observed, even young princes and noblemen who have been educated in Europe donning the yellow robe on their return to Siam. A certain amount of

scepticism prevails among the educated classes, and political motives may contribute to their apparent orthodoxy, but there is no open dissent from Buddhism, and those who discard its dogmas still, as a rule, venerate it as an ethical system. The accounts given by some writers as to the profligacy and immorality in the monasteries are grossly exaggerated. Many of the temples in the capital are under the direct supervision of the king, and in these a stricter rule of life is observed. Some of the

priests are learned in the Buddhist scriptures, and most of the Pali scholarship in Siam is to be found in monasteries, but there is no learning of a secular nature. There is little public worship in the Christian sense of the word. On the day set apart for worship (Wan Phra, or ” Day of the Lord “) the attendance at the temples is small and consists mostly of women. Religious or semi-religious ceremonies, however, play a great part in the life of the Siamese, and few weeks pass without some great function or procession. Among these the cremation ceremonies are especially conspicuous. The more exalted the personage the longer, as a rule, is the body kept before cremation. The cremations of great people, which often last several days, are the occasion of public festivities and are celebrated with processions, theatrical shows, illuminations and fireworks. The missionaries in Siam are entirely French Roman Catholics and American Protestants. They have done much to help on the general work of civilization, and the progress of education has been largely due to their efforts.

Education. — As in Burma, the Buddhist monasteries scattered throughout the country carry on almost the whole of the elementary education in the rural districts. A provincial training college was established in 1903 for the purpose of instructing priests and laymen in the work of teaching, and has turned out many qualified teachers whose subsequent work has proved satisfactory. By these means, and with regular government supervision and control, the monastic schools are being brought into line with the government educational organization. They now contain not far short of 100,000 pupils. In the metropolitan monton there are primary, secondary and special schools for boys and girls, affording instruction to some 10,000 pupils. There are also the medical school, the law school, the civil service school, the military schools and the agricultural college, which are entered by students who have passed through the secondary grade for the purpose of receiving professional instruction. Many of the special . schools use the English language for conveying instruction, and there are three special schools where the whole curriculum is conducted in English by English masters. Two scholarships of £300 a year each for

four years are annually com- peted for by the scholars of these schools, the winners of which proceed to Europe to study a subject of their own selection which shall fit them for the future service of their country. Most of the special schools also give scholarships to enable the best of their pupils to complete their studies abroad. The result of the wide- spread monastic school system is that almost all men can read and write a little, though the women are altogether illiterate.

History. Concerning the origin of the name ” Siam ” many theories have been advanced. The early European visitors to the country noticed that it was not officially referred to by any such name, and therefore apparently conceived that the term must have been applied from outside. Hence the first written accounts give Portuguese, Malay and other derivations, some of which have continued to find credence among quite recent writers. It is now known, however, that ” Siam ” or ” Sayam ” is one of the most ancient names of the country, and that at least a thousand years ago it was in common use, such titles as Swankalok-Sukhotai, Shahr-i-nao, Dwarapuri, Ayuthia, the last sometimes corrupted to ” Judea,” by which the kingdom has been known at various periods of its history, being no more than the names of the different capital cities whose rulers in turn brought the land under their sway. The Siamese (Thai) call their country Muang Thai, or ” the country of the Thai race,” but the ancient name Muang Sayam has lately been revived. The gradual evolution of the Siamese (Thai) from the fusion of Lao-Tai and Khmer races has been mentioned above. Their language, the most distinctively Lao-Tai” attribute which they have, plainly shows their very close relationship with the latter race and its present branches, the Shans (Tai Long) and the Ahom of Assam, while their appearance, customs, written character and religion bear strong evidence of their affinity with the Khmers. The southward movement of the Lao-Tai family from their original seats in south-west China is of very ancient date, the Lao states of Luang Prabang and Wieng Chan on the Mekong having been founded at least two thousand years ago. The first incursions of Lao-Tai among the Khmers of northern Siam were probably later, for the town of Lampun (Labong or Haribunchai), the first Lao capital in Siam, was founded about a.d. 575. The fusion of races may be said to have begun then, for it was during the succeeding centuries that the kings of Swankalok-Sukhotai gradually assumed Lao characteristics, and that the Siamese language, written character and other racial peculiarities were in course of formation. But the finishing

touches to the new race were supplied by the great expulsion of Lao-

Tai from south-west China by Kublai Khan in a.d. 1250, which profoundly affected the whole of Further India. There- after the north, the west and the south-west of Siam, comprising the kingdom of Swankalok-Sukhotai, and the states of Suphan and Nakhon Sri Tammarat (Ligore), with their sub-feudatories, were reduced by the Siamese (Thai) , who, during their southern progress, moved their capital from Sukhotai to Nakhon Sawan, thence to Kampeng Pet, and thence again to Suvarnabhumi near the present Kanburi. A Sukhotai inscription of about 1284 states that the dominions of King Rama Kamheng ex- tended across the country from the Mekong to Pechaburi, and thence down the Gulf of Siam to Ligore; and the Malay annals say that the Siamese had penetrated to the extremity of the peninsula before the first Malay colony from Menangkabu founded Singapore, i.e. about 1160. Meanwhile the ancient state of Lavo (Lopburi), with its capital at Sano (Sornau or Shahr-i-nao), at one time feudatory to Swankalok-Sukhotai, remained the last stronghold of the Khmer, although even here the race was much modified by Lao-Tai blood; but presently Sano also was attacked, and its fall completed the ascendancy of the Siamese (Thai) throughout the country. The city of Ayuthia which rose in a.d. 1350 upon the ruins of Sano was the capital of the first true Siamese king of all Siam. This king's sway extended to Moulmein, Tavoy, Tenasserim and the whole Malacca peninsula (where among the traders from the west Siam was known as Sornau, i.e. Shahr-i-nau, long after Sano had disappeared — Yule's Marco Polo, ii. 260), and was felt even in Java. This is corroborated by Javan records, which describe a " Cambodian " invasion about 1340; but Cambodia was itself invaded about this time by the Siamese, who took Angkor and held it for a time, carrying off 90,000 captives. The great southward expansion here recorded is confirmed by the Chinese annals of the period. The wars with Cambodia continued with varying success for some 400 years, but Cambodia gradually lost ground and was finally shorn of several provinces, her sovereign falling entirely under Siamese influence. This, how- ever, latterly became displeasing to the French, now in Cochin China, and Siam was ultimately obliged to recognize the pro- tectorate forced on Cambodia by that power. Vigorous attacks were also made during this period on the Lao states to the north- west and north-east, followed by vast deportation of the people, and Siamese supremacy was pretty firmly established in Chieng- mai and its dependencies by the end of the 18th century, and over the great eastern capitals, Luang Prabang and Vien-chang, about 1828. During the 15th and 16th centuries Siam was frequently invaded by the Burmese and Peguans, who, attracted probably by the great wealth of Ayuthia, besieged it more than once without success, the defenders being aided by Portuguese mercenaries,

till about 1555, when the city was taken and Siam reduced to dependence. From this condition, however, it was raised a few years later by the great conqueror and national hero Phra Naret, who after subduing Laos and Cambodia invaded Pegu, which was utterly overthrown in the next century by his successors. But after the civil wars of the 18th century the Burmese, having previously taken Chieng-mai, which appealed to Siam for help, entered Tenasserim and took Mergui and Tavoy in 1764, and then advancing simultaneously from the north and the west captured and destroyed Ayuthia after a two years' siege (1767).

The intercourse between France and Siam began about 1680 under Phra Narain, who, by the advice of his minister, the Cephalonian adventurer Constantine Phaulcon, sent an embassy to Louis XIV. When the return mission arrived, the eagerness of the ambassador for the king's conversion to Christianity, added to the intrigues of Phaulcon with the Jesuits with the supposed intention of establishing a French supremacy, led to the death of Phaulcon, the persecution of the Christians, and the cessation of all intercourse with France. An interesting episode was the active intercourse, chiefly commercial, between the Siamese and Japanese governments from 1502 to 1632. Many Japanese settled in Siam, where they were much employed.

They were dreaded as soldiers, and as individuals commanded a position resembling that of Europeans in most eastern countries. The jealousy of their increasing influence at last led to a massacre, and to the expulsion or absorption of the survivors. Japan was soon after this, in 1636, closed to foreigners; but trade was carried on at all events down to 1745 through Dutch and Chinese and occasional English traders. In 1752 an embassy came from Ceylon, desiring to renew the ancient friendship and to discuss religious matters. After the fall of Ayuthia a great general, Phaya Takh Sin, collected the remains of the army and restored the fortunes of the kingdom, establishing his capital at Bangkok; but, becoming insane, he was put to death, and was succeeded by another successful general, Phaya Chakkri, who founded the present dynasty. Under him Tenas- serim was invaded and Tavoy held for the last time by the Siamese in 1792, though in 1825, taking advantage of the Bur- mese difficulty with England, they bombarded some of the towns on that coast. The supremacy of China is indicated by occasional missions sent, as on the founding of a new dynasty, to Peking, to bring back a seal and a calendar. But the Siamese now repudiate this supremacy, and have sent neither mission nor tribute for sixty years, while no steps have been taken by the Chinese to enforce its recognition. The sovereign, Phra Para- mendr Maha Mongkut, was a very accomplished man, an en- lightened reformer

and devoted to science; his death, indeed, was caused by iatigue and exposure while observing an eclipse. Many of his predecessors, too, were men of different fibre from the ordinary Oriental sovereign, while his son Chulalong Korn, who succeeded him in 1868, showed himself an administrator of the highest capacity. He died on the 23rd of October 1910.

Of European nations the Portuguese first established inter- course with Siam. This was in 1511, after the conquest of Malacca by D ‘Albuquerque, and the intimacy lasted over a century, the tradition of their greatness having hardly yet died out. They were supplanted gradually in the 17th century by the Dutch, whose intercourse also lasted for a similar period; but they have left no traces of their presence, as the Portuguese always did in these countries to a greater extent than any other people. English traders were in Siam very early in the 17th century; there was a friendly interchange of letters between James I. and the king of Siam, who had some Englishmen in his service, and, when the ships visited ” Sia ” (which was ” as great a city as London “) or the queen of Patani, they were hospitably received and accorded privileges — the important items of export being, as now, tin, varnish, deer-skins and ” precious drugs.” Later on, the East India Company’s servants, jealous at the employment of Englishmen not in their service, attacked the Siamese, which led to a massacre of the English at Mergui in 1687, and the factory at Ayuthia was abandoned in 1688. A similar attack is said to have been made in 1719 by the governor of Madras. After this the trade was neglected. Pulo Penang, an island belonging to the Siamese dependency of Kedah, was granted on a permanent lease to the East India Company in 1786, and treaties were entered into by the sultan of Kedah with the company. In 1822 John Crawfurd was sent to Bangkok to negotiate a treaty with the suzerain power, but the mission was unsuccessful. In 1824, by treaty with the Dutch, British interests became paramount in the Malay Peninsula and in Siam, and, two years later, Captain Burney signed the first treaty of friendship and commerce between England and Siam. A similar treaty was effected with America in 1833. Subsequently trade with British possessions revived, and in time a more elaborate treaty with England became desirable. Sir J. Brooke opened negotiations in 1850 which came to nothing, but in 1855 Sir J. Bowring signed a new treaty whereby Siam agreed to the appointment of a British consul in Bangkok, and to the exercise by that official of full extra- territorial powers. Englishmen were permitted to own land in certain defined districts, customs and port dues and land revenues were fixed, and many new trade facilities were granted. This important arrangement was followed at intervals

by similar treaties with the other powers, the last two being those with

Japan in 1898 and Russia in 1899. A further convention afterwards provided for a second British consular district in northern Siam, while England and France have both appointed vice-consuls in different parts of the country. Thus foreigners in Siam, except Chinese who have no consul, could only be tried for criminal offences, or sued in civil cases, in their own consular courts. A large portion of the work of the foreign consuls, especially the British, was consequently judicial, and in 1901 the office of judge was created by the British government, a special judge with an assistant judge being appointed to this post. Meanwhile, trade steadily increased, especially with Great Britain and the British colonies of Hong Kong and Singapore.

The peaceful internal development of Siam seemed also likely to be favoured by the events that were taking place outside her frontiers. For centuries she had been distracted by wars with Cambodians, Peguans and Burmans, but the incorporation of Lower Cochin China, Annam and Tongking by the French, and the annexation of Lower and Upper Burma successively by the British, freed her from all further danger on the part of her old rivals. Unfortunately, she was not destined to escape trouble. The frontiers cf Siam, both to the east and the west, had always, been vague and ill-defined, as was natural in wild and unexplored regions inhabited by more or less barbarous tribes. The frontier between Siam and the new British possessions in Burma was settled amicably and without difficulty, but the boundary question on the east was a much more intricate one and was still outstanding. Disputes with frontier tribes led to complica- tions with France, who asserted that the Siamese were occupying territory that rightfully belonged to Annam, which was now under French protection. France, while assuring the British Government that she laid no claim to the province of Luang Prabang, which was situated on both banks of the upper Mekong, roughly between the 18th and 20th parallels, claimed that farther south the Mekong formed the true boundary between Siam and Annam, and demanded the evacuation of certain Siamese posts east of the river. The Siamese refused to yield, and early in 1893 encounters took place in the disputed area, in which a French officer was captured and French soldiers were killed. The French then despatched gunboats from Saigon to enforce their demands at Bangkok, and these made their way up to the capital in

spite of an attempt on the part of the Siamese naval forces to bar their way. In consequence of the resistance with which they had met, the French now greatly increased their demands, insisting on the Siamese giving up all territory east of the Mekong, including about half of Luang Prabang, on the payment of an indemnity and on the permanent with- drawal of all troops and police to a distance of 25 kilometres from the right bank of the Mekong. Ten days' blockade of the port caused the Siamese government to accede to these demands, and a treaty was made, the French sending troops to occupy Chantabun until its provisions should have been carried out.

In 1895 lengthy negotiations took place between France and England concerning their respective eastern and western frontiers in Farther India. These negotiations bore important fruit in the Anglo-French convention of 1896, the chief provision of which was the neutralization by the contracting parties of the central portion of Siam, consisting of the basin of the river Menam, with its rich and fertile land, which contains most of the population and the wealth of the country. Neither eastern nor southern Siam was included in this agreement, but nothing was said to impair or lessen in any way the full sovereign rights of the king of Siam over those parts of the country. Siam thus has its independence guaranteed by the two European powers who alone have interests in Indo-China, England on the west and France on the east, and has therefore a considerable political interest similar to that of Afghanistan, which forms a buffer state between the Russian and British possessions on the north of India. Encouraged by the assurance of the Anglo-French convention, Siam now turned her whole attention to internal reform, and to such good purpose that, in a few years, improved government and expansion of trade aroused a general interest

in her welfare, and gave her a stability which had before been lacking. With the growth of confidence negotiations with France were reopened, and, after long discussion, the treaty of 1893 was set aside and Chantabun evacuated in return for the cession of the provinces of Bassac, Melupre, and the remainder of Luang Prabang, all on the right bank of the Mekong, and of the maritime district of Krat. These results were embodied in a new treaty signed and ratified in 1904.

Meanwhile, in 1899, negotiations with the British government led to agreements defining the status of British subjects in Siam, and fixing the frontier between southern Siam and the British Malay States, while in 1900 the provisions of Sir J. Bowring's treaty of 1855, fixing the rates of land revenue, were abrogated in order to facilitate Siamese financial reform.

In 1907 a further convention was made with France, Siam returning to the French protectorate of Cambodia the province of Battambang conquered in 181 1, and in compensation receiving back from France the maritime province of Krat and the district of Dansai, which had been ceded in 1904. This convention also modified the extra-territorial rights enjoyed by France in Siam, and disclosed an inclination to recognize the material improve- ments of the preceding years. In 1907 also negotiations were opened with Great Britain, the objects of which were to modify the extra-territorial rights conceded to that power by the treaty of 1855, and to remove various restrictions regarding taxation and general administration, which, though diminished from time to time by agreement, still continued to hamper the government very much. These negotiations continued all through 1908 and resulted in a treaty, signed and ratified in 1909, by which Siam ceded to Great Britain her suzerain rights over trie dependencies of Kedah, Kelantan, Trengganu and Perlis, Malay states situated in southern Siam just north of British Malaya, containing in all about a million inhabitants and for the most part flourishing and wealthy, and obtained the practical abolition of British jurisdiction in Siam proper as well as relief from any obligations which, though probably very necessary when they were incurred, had long since become mere useless and vexatious obstacles to progress towards efficient government. This treaty, a costly one to Siam, is important as opening up a prospect of ultimate abandonment of extra- territorial rights by all the powers. Administrative reform and an advanced railway policy have made of Siam a market for the trade of Europe, which has become an object of keen competition. In 1908 the British empire retained the lead, but other nations, notably Germany, Denmark, Italy and Belgium, had recently acquired large interests in the commerce of the country. Japan also, after an interruption of more than two hundred years, had resumed active commercial relations with Siam.

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Language and Literature. Siamese belongs to the well-defined Tai group of the Siamese- Chinese family of languages. Its connexion with Chinese is clear though evidently distant, but its relationship with the other languages of the Tai group is very close. It is spoken throughout central Siam, in all parts of southern Siam except Patani Monton, in northern Siam along the river-banks as far up as Utaradit and Raheng, and in eastern Siam as far as the confines of the Korat Monton. In Patani the common language is still Malay, while in the upper parts of northern, and the outlying parts of eastern, Siam the prevailing language is Lao, though the many hill tribes which occupy the ranges of these parts have distinct languages of their own.

Originally Siamese was purely monosyllabic, that is, each true word consisted of a single vowel sound preceded by, or followed by, a consonant. Of such monosyllables there are less than two thousand, and therefore many syllables have to do duty for the expression of

more than one idea, confusion being avoided by the tone in which they are spoken, whence the term tonal," which is applied to all the languages of this family. The language now consists of about 15,000 words, of which compounds of two monosyllabic words and appropriations from foreign sources form a very large part. Bali, the ancient language of the kingdom of Magadha, in which the sacred writings of Buddhism were made, was largely instrumental in forming all the languages of Further India, including Siamese — a fact which accounts for the numerous connecting links between the M6n, Burmese and Siamese languages of the present time, though these are of quite separate origin. When intercourse with the West began, and more especially when Western methods of government and education were first adopted in Siam, the tendency to utilize European words was very marked, but recently there has been an effort to avoid this by the coining of Siamese or Bali compound words.

The current Siamese characters are derived from the more monumental Cambodian alphabet, which again owes its origin to the alphabet of the inscriptions, an offshoot of the character found on the stone monuments of southern India in the 6th and 8th centuries. The sacred books of Siam are still written in the Cambodian character.

The Siamese alphabet consists of 44 consonants, in each of which the vowel sound " aw " is inherent, and of 32 vowels all marked not by individual letters, but by signs written above, below, before or after the consonant in connexion with which they are to be pro- nounced. It may seem at first that so many as 44 consonants can scarcely be necessary, but the explanation is that several of them express each a slightly different intonation of what is practically the same consonant, the sound of " kh," for instance, Being repre- sented by six different letters and the sound of " t " by eight. More- over, other letters are present only for use in certain words imported from Bali or Sanskrit. The vowel signs have no sound by them- selves, but act upon the vowel sound " aw " inherent in the con- sonants, converting it into " a," " i," " o," " ee," " ow," &c._ Each of the signs has a name, and some of them produce modulations so closely resembling those made by another that at the present day they are scarcely to be distinguished apart. A hard-and-fast rule of pronunciation is that only vowel or diphthong sounds, or the letters " m," " n," " ng," " k," " t " and " p " are permissible at the end of words, and hence the final letter of all words ending in anything else is simply suppressed or is pronounced as though it were a letter naturally producing one or other of those sounds. Thus many of the words procured from foreign sources, not ex- cluding Bali and Sanskrit, are more or less mutilated in pronuncia- tion, though the entirely suppressed or altered letter is still retained in

writing.

Siamese is written from left to right. In manuscript there is usually no space between words, but punctuation is expressed by intervals isolating phrases and sentences.

The greatest difficulty with the Siamese language lies in the tonal system. Of the simple tones there are five — the even, the circumflex, the descending, the grave and the high — any one of which when applied to a word may give it a quite distinct meaning. Four of the simple tones are marked in the written character by signs placed over the consonant affected, and the absence of a mark implies that the one remaining tone is to be used. A complication B caused by the fact that the. consonants are grouped into three

classes, to each of which a special tone applies, and consequently the application of a tonal sign to a letter has a different effect, accord- ing to the class to which such letter belongs. Though many syllables have to do duty for the expression of more than one idea, the majority have only one or at most two meanings, but there are some which are used with quite a number of different inflections, each of which gives the word a new meaning. Thus, for example, the syllable khao may mean ” they,” ” badly,” ” rice,” ” white,” ” old,” or ” news,” simply according to the tone in which the word is spoken. Words are unchangeable and incapable of inflection. There is no article, and no distinction of gender, number or case. These, when it is necessary to denote them, are expressed by ex- planatory words after the respective nouns; only the dative and ablative are denoted by subsidiary words, which precede the nouns, the nominative being marked by its position before, the objective by its position after, the verb, and the genitive (and also the ad- jective) by its place after the noun it qualifies. Occasionally, how- ever, auxiliary nouns serve that purpose. Words like ” mother,” ” son,” ” water ” are often employed in forming compounds to express ideas for which the Siamese have no single words, e.g. Idk cdn, ” the son of hire,” a labourer; mi mil, ” the mother of the hand,” the thumb. The use of class words with numerals obtains in Siamese as it does in Chinese, Burmese, Anamese, Malay and many other Eastern languages. As in these, so in Siamese the personal pronouns are mostly represented by nouns expressive of the various shades of superior or lower rank according to Eastern etiquette. The verb is, like the noun, perfectly colourless — person, number, tense and mood being indicated by auxiliary words only when they cannot be inferred from the context. Such auxiliary words are yu, ” to be,” ” to dwell ” (present) ; dai, ” to have,” leas, ” end ” (past) ; ci, ” also ” (future) ; the first and third follow, the second and fourth precede, the

verb. H&i, ” to give ” (prefixed), often indicates the subjunctive. As there are compound nouns, so there are compound verbs; thus, e.g. pai, ” to go,” is joined to a transitive verb to convert it into an intransitive or neuter; and thtik, ” to touch,” and ibng, ” to be compelled,” serve to form a sort of passive voice. The number of adverbs, single and compound, is very large. The prepositions mostly consist of nouns.

The construction of the sentence in Siamese is straightforward and simple. The subject of the sentence precedes the verb and the object follows it. The possessive pronoun follows the object. The adverb usually follows the verb. In compound sentences the verbs are placed together as in English, not separated by the object as in German. When an action is expressed in the past the word which forms with the verb the past tense is divided from the verb itself by the object. Examples are: —

Rao (We) dekchai (boy) sam (three) kon (persons) cha (will) pai (go) chap (catch) pla (fish) samrap (for) hai (give) paw (father) kin (eat).

Me (Mother) tan (you) yu (live) ti (place) nai (where) , or ” Where is your mother ? ”

Me (Mother) pai (go) talat (bazaar) leao (finish), or ” (My) mother has gone to the bazaar.”

The difficulties of the Siamese language are increased by the fact that in addition to the ordinary language of the people there is a completely different set of words ordained for the use of royalty. This ” Palace language ” appears to have come into existence from a desire to avoid the employment in the presence of royalty of downright expressions of vulgarity or of words which might be capable of conveying an unpleasant or indelicate idea other than the meaning intended. In the effort to escape from the vulgar, words of Sanskrit origin have been freely adopted and many Cam- bodian words are also used. The language is so complete that the dog, pig, crow and other common or unclean animals are all ex- pressed by special words, while the actions of royalty, such as eating, sleeping, walking, speaking, bathing, dying, are spoken of in words quite distinct from those used to describe similar actions of ordinary people.

The prose literature of Siam consists largely of mythological and historical fables, almost all of which are of Indian origin, though many of them have come to Siam through Cambodia. Their number is larger than is usually supposed, many of them being known to few beyond

the writers who laboriously copy them and the professional ” raconteurs ” who draw upon them to replenish their stock-in-trade. The best known have all been made into stage-plays, and it is in this form that they usually come before the notice of the general public. Amongst them are Ramakien, taken from the great Hindu epic Ramayana; Wetyasunyin, the tale of a king who became an ascetic after contemplation of a withered tree; Worawongs, the story of a prince who loved a princess and was killed by the thrust of a magic spear which guarded her; Chalaivan, the tale of a princess beloved by a crocodile; Unarud, the life story of Anuruddha, a demigod, the grandson of Krishna; Phumhon, the tale of a princess beloved by an elephant; Prang long, a story of a princess who before birth was promised to a ” yak ” or giant in

return for a certain fruit which her mother desired to eat. Mahasot is an account of the wars of King Mahasot. Nok Khum is one of the theories of the genesis of mankind, the Nok Khum being the sacred goose or ” Hansa ” from whose eggs the first human beings were supposed to have been hatched. A consider- able proportion of the romances are founded upon episodes in the final life, or in one of the innumerable former existences, of the Buddha. The Pattama Sompothiyan is the standard Siamese life of the Buddha. Many of the stories have their scene laid in Himaphan, the Siamese fairyland, probably origin- ally the Himalaya.

A great many works on astrology and the casting of horoscopes, on the ways to secure victory in war, success in love, in business or in gambling, are known, as also works on other branches of magic, to which subject the Siamese have always been partial. On the practice of medicine, which is in close alliance with magic, there are several well-known works.

The Niti literature forms a class apart. The word Niti is from the Bali, and means ” old saying,” ” tradition,” ” good counsel.” The best known of such works are Rules for the Conduct of Kings, translated from the Bali, and The Maxims of Phra Ruang, the national hero-king, on whose wonderful sayings and doings the imagination of Siamese youth is fed.

In works on history the literature of Siam is unfortunately rather poor. There can be little doubt that, as in the case of all the other kingdoms

of Further India, complete and detailed chronicles were compiled from reign to reign by Order of her kings, but of the more ancient of these, the wars and disturbances which continued with such frequency down to quite recent times have left no trace. The A nnals of the North, the A nnals of Krung Kao (Ayuthia) and the Book of the Lives of the Four Kings (of the present dynasty) together form the only more or less connected history of the country from remote times down to the beginning of the present reign, and these, at least so far as the earlier parts are concerned, contain much that is inaccurate and a good deal which is altogether untrue. Foreign histories include a work on Pegu, a few tales of Cambodian kings and recently published class-books on European history compiled by the educational department.

The number of works on law is considerable. The Laksana Phra Thamasat, the Phra Tamra, Phra Tamnon, Phra Racha Kamnot and Inthapat are ancient works setting forth the laws of the country in their oldest form, adapted from the Dharmacastra and the Classification of the Law of Manu. These, and also many of the edicts passed by kings of the Ayuthia period which have been preserved, are now of value more as curiosities of literature and history than anything else, since, for all practical purposes, they have long been superseded by laws more in accordance with modern ideas. The laws of the sovereigns who have reigned at Bangkok form the most notable part of this branch of Siamese literature. They include a great number of revenue regulations, laws on civil matters such as mortgage, bankruptcy, rights of way, companies, &c, and laws governing the procedure of courts, all of which adhere to Western principles in the main. The latest addition is the Penal Code, a large and comprehensive work based upon the Indian, Japanese and French codes and issued in 1908.

Poetry is a very ancient art in Siam and has always been held in high honour, some of the best-known poets being, indeed, members of the royal family. There are several quite distinct forms of metre, of which those most commonly used are the Klong, the Kap and the Klon. The Klong is rhythmic, the play being on the inflection of the voice in speaking the words, which inflection is arranged according to fixed schemes; the rhyme, if it can so be called, being sought not in the similarity of syllables but of intonation. The Kap is rhythmical and also has rhyming syllables. The lines contain an equal number of syllables, and are arranged in stanzas of four lines each. The last syllable of the first line rhymes with the third syllable of the second line, the last of the second with the last of the third and also with the first of the fourth line, and the last syllable of the fourth line rhymes with the last of the second line of the next succeeding stanza. The

number of poems in one or other of these two metres is very great, and includes verses on almost every theme. In the Nirat poetry, a favourite form of verse, both are often used, a stanza in Klong serving as a sort of argument at the head of a set of verses in Kap. This Nirat poetry takes the form of narrative addressed by a traveller to his lady-love, of a journey in which every object and circumstance serves but to remind the wanderer of some virtue or beauty of his correspondent. In most of such works the journey is of course imaginary, but in some cases it is a true record of travelling or campaigning, and has been found to contain in- formation of value concerning the condition at certain times of out- lying parts of the kingdom. Of the little love songs in Klon metre, called Klon pet ton, there are many hundreds. These follow a prescribed form, and consist of eight lines divided into two stanzas

of four lines each, every line containing eight syllables. The last syllable of the first line rhymes with the third syllable of the second, and the final of the second line with the final of the third. The songs treat of all the aspects of love. A fourth poetical metre is Chan, which, however, is not so much used as the others.

The introduction of printing in the Siamese character has re-volutionized the literature of the country. Reading has become a general accomplishment, a demand for reading matter has arisen, and bookshops stocked with books have appeared to satisfy it. The historical works above referred to have been issued in many editions, and selections from the ancient fables and romances are continually being edited and reissued in narrative form or as plays. The educational department has done good work in compiling volumes of prose and verse which have found much favour with the public. All the laws, edicts and regulations at present in force are to be had in print at popular prices. Printing, in fact, has supplied a great incentive to the development of literature, the output has increased enormously, and will doubtless continue to do so for a long time to come. (W. A. G.)

SlBAWAIHI [Abu Bishr, or Abu-1 Hasan' Amr ibn'Uthman ibn Qanbar, known as Sibawaihi or Sibuya] {c. 753-793), Arabian grammarian, was by origin a Persian and a freedman. Of his early years nothing is known. At the age of thirty-two he went to Basra, where he was a pupil of the celebrated grammarian Khalil. Later he went to Bagdad, but soon left, owing to a dispute with the Kufan grammarian Kisa'i, and returned to Persia, where he died at the age of about forty. His great grammar of Arabic, known simply as The Book, is not only the earliest systematic presentation of Arabic grammar, but is recognized

among Arabs as the most perfect. It is not always clear, but is very full and valuable for its many illustrations from the Koran and the poets.

The Book was published by H. Derenbourg (2 vols., Paris, 1881-1889), and a German translation, with extracts from the commentary of SirafI (d. 978) and others, was published by G. Jahn (Berlin, 1895-1900). (G. W. T.)

SIBBALD, SIR ROBERT (1641-1722), Scottish physician and antiquary, was born in Edinburgh on the 15th of April 1641. Educated at Edinburgh, Leiden and Paris, he took his doctor's degree at Angers in 1662, and soon afterwards settled as a physician in Edinburgh. In 1667 with Sir Andrew Balfour he started the botanical garden in Edinburgh, and he took a leading part in establishing the Royal College of Physicians of Edinburgh, of which he was elected president in 1684. In 1685 he was appointed the first professor of medicine in the university. He was also appointed geographer-royal in 1682, and his numerous and miscellaneous writings deal effectively with historical and antiquarian as well as botanical and medical subjects. He died in August 1722.

Amongst Sibbald's historical and antiquarian works may be mentioned A History Ancient and Modern of the Sheriffdoms of Fife and Kinross (Edinburgh, 1710, and Cupar, 1803), An Account of the Scottish Atlas (folio, Edinburgh, 1683), Scotia Ulustrata (Edinburgh, 1684) and Description of the Isles of Orkney and Shetland (iolio, Edinburgh', 171 1 and 1845). The Remains of Sir Robert Sibbald, containing his autobiography, memoirs of the Royal College of Physicians, portion of his literary correspondence and account of his manuscripts, was published at Edinburgh in 1833.

SIBERIA. This name (Russ. Sibir) in the 16th century indicated the chief settlement of the Tatar khan Ku chum — Isker on the Irtysh. Subsequently the name was extended to include the whole of the Russian dominions in Asia. Geographically, Siberia is now limited by the Ural Mountains on the W., by the Arctic and North Pacific Oceans on the N. and E. respectively, and on the S. by a line running from the sources of the river Ural to the Tarbagatai range (thus separating the steppes of the Irtysh basin from those of the Aral and Balkash basins), thence along the Chinese frontier as far as the S.E. corner of Transbaikalia, and then along the rivers Argun, Amur and Usuri to the frontier of Korea. This wide area is naturally subdivided into West Siberia (basins of the Ob and the Irtysh) and East Siberia (the remainder of the region).

The inhabited districts are well laid down on the best maps; but the immense areas between and beyond them are mapped only along a few routes hundreds of miles apart. The inter- Q roerapn y mediate spaces are filled in according to information _ ^’

derived from various hunters. With regard to a great many rivers we know only the position of their mouths and their approximate lengths estimated by natives in terms of a day’s march. Even the

Name and extent.

hydrographical network is very imperfectly known, especially in the uninhabited hilly tracts. 1

Like other plateaus, the great plateau of the centre of Asia, stretching from the Himalayas to Bering Strait, 2 has on its surface a number of gentle eminences (angehaufte Gebirge of K. Ritter), which, although reaching great absolute altitudes, are relatively low. 3 These heights for the most part follow a north-easterly direc- tion in Siberia. On the margins of the plateau there are several gaps or indentations, which can best be likened to gigantic trenches, like railway cuttings, as with an insensible gradient they climb to a higher level. These trenches have for successive geological periods been the drainage valleys of immense lakes (probably also of glaciers) which formerly extended over the plateau or fiords of the seas which surrounded it. And it is along these trenches that the principal commercial routes have been made for reaching the higher levels of the plateau itself. In the plateau there are in reality two terraces — a higher and a lower, both very well defined in Transbaikalia and in Mongolia. The Yablonoi range and its south-western continuation the Kentei are border-ridges of the upper terrace. Both rise very gently above it, but have steep slopes towards the lower terrace, which is occupied by the Nerchinsk steppes in Transbaikalia and by the great desert of Gobi in Mongolia (2000 to 2500 ft. above the sea). They rise 5000 to 7000 ft. above the sea; the peak of Sokhondo in Transbaikalia (111° E.) reaches nearly 8050 ft. Several low chains of mountains have their base on the lower terrace and run from south-west to north-east; they are known as the Nerchinsk Moun- tains in Transbaikalia, and their continuations reach the northern parts of the Gobi. 4

The great plateau is fringed on the north-west by a series of lofty

border-ranges, which have their southern base on the plateau and their northern at a much lower level. They may be traced from the Tian-shan to the Arctic Circle, and have an east-north-easterly direction in lower latitudes and a north-easterly direction farther north. The Alai range of the Pamir, continued by the Kokshaltau range and the Khan-tengri group of the Tian-shan, and the Sailughem range of the Altai, which is continued in the unnamed border-range of West Sayan (between the Bei-kem and the Us), belong to this category. There are, however, among these border-ranges several breaches of continuity — broad depressions or trenches leading from Lake Balkash and Lake Zaisan to the upper parts of the plateau. On the other hand, there are on the western outskirts of the plateau a few mountain chains which take a direction at right angles to the above (that is, from north-west to south-east), and parallel to the great line of upheavals in south-west Asia. The Tarbagatai Moun- tains, on the borders of Siberia, as well as several chains in Turkestan, are instances. The border-ridges of the Alai Mountains, the Khan- tengri group, the Sailughem range and the West Sayan contain the highest peaks of their respective regions. Beyond 102 ° E. the configuration is complicated by the great lateral indentation of Lake Baikal. But around and north-east of this lake the same well- marked ranges fringe the plateau and turn their steep north-western slope towards the valleys of the Irkut, the Barguzin, the Muya and the Chara, while their southern base lies on the plateaus of the Selenga (nearly 4000 ft. high) and the Vitim. The peaks of the Sailughem range reach 9000 to 11,000 ft. above the sea, those of West Sayan about 10,000. In East Sayan is Munku-Sardyk, a peak 11,450 ft. high, together with many others from 8000 to 9000 ft. Farther east, on the southern shore of Lake Baikal, Khamar-daban rises to 6900 ft., and the bald dome-shaped summits of the Barguzin and southern Muya Mountains attain elevations of 6000 to 7000 ft. above sea-level. The orography of the Aldan region is little known ; but travellers who journey from the Aldan (tributary of the Lena) to the Amur or to the Sea of Okhotsk have to cross the same plateau and its border-range. The. former becomes narrower and barely attains an average altitude of 3200 ft.

A typical feature of the north-eastern border of the high plateau is a succession of broad longitudinal 6 valleys along its outer base,

‘The wide area between the middle Lena and the Amur, as well as the hilly tracts west of Lake Baikal, and the Yeniseisk mining region are in this condition.

2 The great plateau of North America, also turning its narrower point towards Bering Strait, naturally suggests the idea that there was a

period in the history of our planet when the continents turned their narrow extremities towards the northern pole, as now they turn them towards the southern.

3 See ” General Sketch of the Orography of Siberia ; ” with map and ” Sketch of the Orography of Minusinsk, &c,” by Prince P. A. Kropotkin, in Mem. Russ. Geogr. Sot., General Geography (vol. v.,

1875)-

4 The lower terrace is obviously continued in the Tarim basin of East Turkestan; but in the present state of our knowledge we cannot determine whether the further continuations of the border- ridge of the higher terrace (Yablonoi, Kentei) must be looked for in the Great Altai or in some other range situated farther south. There may be also a breach of continuity in some depression towards Barkul.

5 The word “longitudinal” is here used in an orographical, not a geological sense. These valleys are not synclinal foldings of rocks; they seem to be erosion- valleys.

Alpine region.

shut in on the outer side by rugged mountains having a very steep slope towards them. Formerly filled with alpine lakes, these valleys are now sheeted with flat alluvial soil and occupied by human settlements, and are drained by rivers which flow along them before they make their way to the north through narrow gorges pierced in the mountain-walls. This conformation is seen in the valley of the Us in West Sayan, in that of the upper Oka and Irkut in East Sayan, in the valley of the Barguzin, the upper Tsipa, the Muya and the Chara, at the foot of the Vitim plateau, as also, probably, in the Aldan. 6 The chains of mountains which border these valleys on the north-west contain the wildest parts of Siberia. They are named the Usinsk Mountains in West Sayan and the Tunka Alps in East Sayan; the latter, pierced by the Angara at Irkutsk, are in all probability continued north-east in the Baikal Mountains, which stretch from Irkutsk to Olkhon Island and the Svyatoi Nos peninsula of Lake Baikal, thus dividing the lake into two parts. 7

An alpine region, 100 to 150 m. in breadth, fringes the plateau on the N. W., outside of the ranges just mentioned. This constitutes what is called – in East Siberia the taiga: it consists of separate chains of mountains whose peaks rise 4800 to 6500 ft. above the sea, beyond the upper limits of forest vegetation; while the narrow valleys afford

difficult means of communication, their floors being thickly strewn with boulders, or else swampy. The whole is clothed with impenetrable forest. The orography of this alpine region is very imperfectly known; but the chains have a predominant direction from south-west to north-east. They are described under different names in Siberia — the Altai Mountains in West Siberia, the Kuznetskiy Ala-tau and the Us and Oya Mountains in West Sayan, the Nizhne-Udinsk taiga or gold-mine district, several chains pierced by the Oka river, the Kitoi Alps in East Sayan, the mountains of the upper Lena and Kirenga, the Olekminsk gold-mine district, and the unnamed mountains which project north-east between the Lena and the Aldan.

Outside of these alpine regions comes a broad belt of elevated plains, ranging between 1200 and 1700 ft. above the sea. These plains, which are entered by the great Siberian highway Elevated about Tomsk and extend south-west to the Altai Moun- D iai a s tains, are for the most part fertile, though sometimes dry, and are rapidly being covered with the villages of the Russian immigrants. About Kansk in East Siberia they penetrate in the form of a broad gulf south-eastwards as far as Irkutsk. Those oh the upper Lena, having a somewhat greater altitude and being situated in higher latitudes, are almost wholly unfitted for agriculture. The north-western border of these elevated plains cannot be deter- mined with exactitude. In the region between Viluisk (ontheVilui) and Yeniseisk a broad belt of alpine tracts, reaching their greatest elevation in the northern Yeniseisk taiga (between the Upper Tunguzka and the Podkamennaya Tunguzka) and continued to the south-west in lower upheavals, separates the elevated plains from the lowlands which extend towards the Arctic Ocean. In West Siberia these high plains seem to form a narrower belt towards Barnaul and Semipalatinsk, and are bordered by the Aral-Caspian depression.

Farther to the north-west, beyond these high plains, comes a broad belt of lowlands. This vast tract, which is only a few dozen feet above the sea, and most probably was covered by the sea during the Post-Pliocene period, stretches from the Aral-Caspian depression to the lowlands of the Tobol, Irtysh and Ob, and thence towards the lower parts of the Yenisei and the Lena. Only a few detached mountain ranges, like the Byrranga on the Taymyr peninsula, the Syverma Mountains, the Verkhoyansk and the Kharaulakh (E. of the Lena) ranges, diversify these monotonous lowlands, which are covered with a thick sheet of black earth in the south and assume the character of barren tundras in the north.

The south-eastern slope of the great plateau of Asia cannot properly be reckoned to Siberia, although parts of the province of Amur and

the Maritime Province are situated on it ; South- they have quite a different character, climate and vege- eastern tation, and ought properly to be reckoned to the Man- slope ot churian region. To the east of the Yablonoi border- range plateau lies the lower terrace of the high plateau, reaching 2000 p to 2500 ft. in Transbaikalia and extending farther south-west through the Gobi to East Turkestan. The south-eastern edge of this lower terrace is fringed by a massive border-range — the Khingan — which runs in a north-easterly direction from the Great Wall of China to the sources of the Nonni-ula.

A narrow alpine region (40 to 50 m.), consisting of a series of short secondary chains parallel to the border-range, fringes this latter on its eastern face. Two such folds maybe distinguished, correspond- ing on a smaller scale to the belt of alpine tracts which fringe the plateau on the north-west. The resemblance is further sustained by a broad belt of elevated plains, ranging from 1200 to 1700 ft., which

8 The upper Bukhtarma valley in the Sailughem range of the Altai system appears to belong to the same type.

‘The deep fissure occupied by Lake Baikal would thus appear to consist of two longitudinal valleys connected together by the passage between Olkhon and Svyatoi Nos.

Northern lowlands.

accompany the eastern edge of the plateau. The eastern Gobi, the occasionally fertile and occasionally sandy plains between the Nonni and the Sungari, and the rich plains of the Bureya and Silinji in the Amur province belong to this belt, 400 m. in breadth, the surface of which is diversified by the low hills of Ilkhuri-alin, Khulun and Turana. These high plains are bordered on the south-east by a picturesque chain — the Bureya Mountains, which are to be identified with the Little Khingan. It extends, with unaltered character, from Mukden and Kirin to Ulban Bay in the Sea of Okhotsk (close by the Shantar Islands), its peaks clothed from top to bottom with luxuriant forest vegetation, ascending 4500 to 6000 ft. A lowland belt about 200 m. broad runs in the same direction along the outer margin of the above chain. The lower Amur occupies the northern part of this broad valley. These lowlands, dotted ovef with numberless marshes and lakes, seem to have emerged from the sea at a quite recent geological

period; the rivers that meander across them are still excavating their valleys.

Volcanic formations, so far as is known, occur chiefly along the north-western border-range of the great plateau. Ejections of basaltic lava have been observed on the southern slope volcanoes. Q j t jjj s range, extending over wide areas on the plateau itself, over a stretch of more than 600 m. — namely, in East Sayan about Lake Kosso-gol and in the valley of the Tunka (river Irkut), in the vicinity of Selenginsk, and widely distributed on the Vitim plateau (rivers Vitim and Tsipa). Deposits of trap stretch for more than 1200 m. along the Tunguzka; they appear also in the Noril Mountains on the Yenisei, whence they extend towards the Arctic Ocean. Basaltic lavas are reported to have been found in the Aldan region. On the Pacific slope extinct volcanoes (mentioned in Chinese annals) have been reported in the Ilkhuri-alin mountains in northern Manchuria.

The mineral wealth of Siberia is considerable. Gold-dust is found in almost all the alpine regions fringing the great plateau. The „ . principal gold-mining regions in these tracts are the Minerals. cˆ ta ˆ t jj e U p per (or Nizhne-Udinsk) and the lower (or Yeniseisk) taigas, and the Olekma region. Gold is found on the high plateau in the basin of the upper Vitim, on the lower plateau in the Nerchinsk district, and on the upper tributaries of the Amur (especially the Oldoi) and the Zeya, in the north-east continuation of the Nerchinsk Mountains. It has been discovered also in the Bureya range, and in its north-east continuation in the Amgufi region. Auriferous sands, but not very rich, have been discovered in the feeders of Lake Hanka and the Suifong river, as also on the smaller islands of the Gulf of Peter the Great. Mining is the next most important industry after agriculture. In East Siberia gold is obtained almost exclusively from gravel-washings, quartz mining being confined to three localities, one near Vladivostok and two in Transbaikalia. In West Siberia, however, quartz-mining is steadily increasing in importance: whereas in 1900 the output of gold from this source was less than 10,000 oz., in 1904 it amounted to close upon 50,00c oz. On the other hand gravel-washing gives a declining yield in West Siberia, for while in 1900 the output from this source was approximately 172,000 oz., in 1904 it was only 81,000 oz. The districts of Mariinsk and Achinsk are the most successful quartz-mining localities. Altogether West Siberia yields annually 130,000 oz. of gold. The gold-bearing gravels of East Siberia, especially those of the Lena and the Amur, are relatively more prolific than those of West Siberia. The total yield annually amounts to some 700,000 oz., the largest quantity coming from the Olekminsk district in the province of Yakutsk, and this district is followed by the Amur region, the

Maritime province, and Nerchinsk and Trans- baikalia. Silver and lead ores exist in the Altai and the Nerchinsk Mountains, as well as copper, cinnabar and tin. Iron-ores are known at several places on the outskirts of the alpine tracts (as about Irkutsk), as well as in the Selenginsk region and in the Altai. The more important iron-works of the Urals are situated on the Siberian slope of the range. Coal occurs in many Jurassic fresh-water basins, namely, on the outskirts of the Altai, in south Yeniseisk, about Irkutsk, in the Nerchinsk district, at many places in the Maritime province, and on the island of Sakhalin. Beds of excellent graphite have been found in the Kitoi Alps (Mount Alibert) and in the Turukhansk district in Yenisei. Rock-salt occurs at several places on the Lena and in Transbaikalia, and salt-springs are numerous — those of Ust-kutsk on the Lena and of Usolie near Irkutsk being the most noteworthy. A large number of lakes, especially in Transbaikalia and in Tomsk, yield salt. Lastly, from the Altai region, as well as from the Nerchinsk Mountains, precious stones, such as jasper, malachite, beryl, dark quartz, and the like, are exported. The Ekaterinburg stone-polishing works in the Urals and those of Kolyvafi in the Altai are well known.

The orography sketched above explains the great development of the river-systems of Siberia and the uniformity of their course. _. The three principal rivers — the Ob, the Yenisei, and the

Hirers. Lena — take their rise on the high plateau or in the alpine regions fringing it, and, after descending from the plateau and piercing the alpine regions, flow for many hundreds of miles across the high plains and lowlands before they reach the Arctic Ocean. The three rivers of north-eastern Siberia — the Yana, Indigirka and Kolyma — have the same general character, their courses being, however, much shorter, as in these latitudes the plateau approaches

nearer to the Arctic Ocean. The Amur, the upper tributaries of which rise on the eastern border-range of the high plateau, is similar. The Shilka and the Argun, which form it, flow first towards the north-east along the windings of the lower terrace of the great plateau; from this the Amur descends, cutting through the Great Khingan and flowing down the terraces of the eastern versant towards the Pacific. A noteworthy feature of the principal Siberian rivers is that each is formed by the confluence of a pair of rivers. Examples are the Ob and the Irtysh, the Yenisei and the Angara (itself a double river formed by the Angara and the Lower Tunguzka), the Lena and the Vitim, the Argun and the Shilka, while the Amur in its turn receives a tributary as large as itself — the Sungari. Owing to this twinning and the general direction of their courses, the rivers of Siberia offer immense

advantages for inland navigation, not only from north to south but also from west to east. It is this circumstance that facilitated the rapid invasion of Siberia ˆ„ˆf„, by the Russian Cossacks and hunters; they followed the ”””””””””

communi- cation.

courses of the twin rivers in their advance towards the east, and discovered short portages which permitted them to transfer their boats from the system of the Ob to that of the Yenisei, and from the latter to that of the Lena, a tributary of which — the Aldan — brought them close to the Sea of Okhotsk. At the present day steamers ply from Tyumen, at the foot of the Urals, to Semipalatinsk on the border of the Kirghiz steppe and to Tomsk in the very heart of West Siberia. Uninterrupted water communication could readily be established from Tyumen to Yakutsk, Aldansk, and the gold- mines of the Vitim. Owing to the fact that the great plateau separates the Lena from the Amur, no easy water communication can be established between the latter and the other Siberian rivers. The tributaries of the Amur (the Shilka with its affluent the Ingoda) become navigable only on the lower terrace of the plateau. But the trench of the Uda, to the east of Lake Baikal, offers easy access for the Great Siberian railway up to and across the high plateau. Unfortunately all the rivers are frozen for many months every year. Even in lower latitudes (52 to 55° N.) they are ice-bound from the beginning of November to the beginning of May; 1 while in 65 ° N. they are open only for 90 to 120 days, and only for 100 days (the Yenisei) or even 70 days (the Lena) in 70 ° N. During the winter the smaller tributaries freeze to the bottom, and about 1st January Lake Baikal becomes covered with a solid crust of ice capable of bearing files of loaded sledges.

Numberless lakes occur in both East and West Siberia. There are wide areas on the plains of West Siberia and on the high plateau of East Siberia, which, virtually, are still passing through . . the Lacustrine period; but the total area now under Lane • water bears but a trifling proportion to the vast surface which the lakes covered even at a very recent period, when Neolithic man inhabited Siberia. All the valleys and depressions bear traces of immense post-Pliocene lakes. Even within historical times and during the 19th century the desiccation of the lakes has gone on at a very rapid rate. 2 The principal lake is Lake Baikal, more than 400 m. long, and 20 to 50 broad. Another great lake, Lake Kosso- gol, on the Mongolian frontier, is 120 m. long and 50 broad. Vast numbers of small lakes stud the Vitim and upper Selenga plateaus; the lower valley of the latter river contains the Goose Lake (Gusinoye). In the basin of the Amur are Lake Hanka

(1700 sq. m.), connected with the Usuri; Lakes Kada and Kidzi, by which the lower Amur once flowed to the Pacific ; and very many smaller ones on the left side of the lower Amur. Numerous lakes and extensive marshes diversify the low plains of West Siberia ; the Baraba steppe is dotted with lakes and ponds — Lake Chany (1400 sq. m.) and the innumer- able smaller lakes which surround it being but relatively insignificant remains of the former lacustrine basins; while at the confluence of the Irtysh and the Ob impassable marshes stretch over many thousands of square miles. Several alpine lakes, of which the picturesque Teletskoye may be specially mentioned, occupy the deeper parts of the valleys of the Altai.

The coast-line of Siberia is very extensive both on the Arctic Ocean and on the Pacific. The former ocean is ice-bound for at least ten months out of twelve; and, though Nordensk- jold and Captain Wiggins demonstrated (1874-1900) the Coasts possibility of navigation along its shores, it is exceedingly Mands doubtful whether it can ever become a commercial route of any importance. The coast-line has few indentations, the chief being the double gulf of the Ob and the Taz, separated from the Sea of Kara by an elongated peninsula (Samoyede), and from the bay of the Yenisei by another. The immense peninsula of Taymyr — a barren tundra intersected by the wild Byrranga Hills-projects in Cape Chelyuskin as far north as 77° 46′ N. The bay of the Yana, east of the delta of the Lena, is a wide indentation sheltered on the north by the islands of New Siberia. The bays of the Kolyma, the Chaun and Kolyuchin are of little importance. The New Siberia islands are occasionally visited by hunters, as is also the small group of the Bear Islands opposite the mouth of the Kolyma. Wrangel or Kellett Island is still quite unknown. Bering Strait, at

1 The Lena at Verkholensk is navigable for 170 days, at Yakutsk for 153 days: the Yenisei at Krasnoyarsk for 196 days.

s See Yadrintsev, in Izvestia of the Russian Geogr. Soc, (1886, No. 1, with maps).

the north-east extremity of Siberia, and Bering Sea between the land of the Chukchis and Alaska, with the Gulf of Anadyr, are often visited by seal-hunters, and the Commander Islands off Kamchatka are valuable stations for this pursuit. The Sea of Okhotsk, separated from the Pacific by the Kurile Archipelago and from the Sea of Japan by the

islands of Sakhalin and Yezo, is notorious as one of the worst seas of the world, owing to its dense fogs and its masses of floating ice. The Shantar Islands in the bay of the Uda possess geological interest. The double bay of Gizhiga and Penzhina, as well as that of Taui, would be useful as harbours were they not frozen seven or eight months in the year and persistently shrouded in dense fogs in summer. The northern part of the Sea of Japan, which washes the Usuri region, has, besides the smaller bays of Olga and Vladimir, the beautiful Gulf of Peter the Great, on which stands Vladivostok, the Russian naval station on the Pacific. Okhotsk and Ayan on the Sea of Okhotsk, Petropav- lovsk on the east shore of Kamchatka, Nikolayevsk, and Vladivo- stok on the Sea of Japan, and Dui on Sakhalin are the only ports of Siberia.

Climate. — The climate is extremely severe, even in the southern parts. This arises chiefly from the orographical structure; the vast plateau of Central Asia prevents the moderating influence of the sea from being felt. The extensive lowlands which stretch over more than one half of the area, as well as the elevated plains, lie open to the Arctic Ocean. Although attaining altitudes of 6000 to 10,000 ft., the mountain peaks of East Siberia do not reach the snow-line, which is found only en the Munku-Sardyk in East Sayan, above 10,000 ft. Patches of perpetual snow occur in East Siberia only on the mountains of the far north. On the Altai Mountains the snow-line runs at about 7000 ft. The air, after being chilled on the plateaus during the winter, drifts, owing to its greater density, down upon the lowlands; hence in the region of the lower Lena there obtains an exceedingly low temperature throughout the winter, and Verkhoyansk, in 67°N., is the pole of cold of the eastern hemi- sphere. The average temperature of winter (December to February) at Yakutsk is -40-2° F., at Verkhoyansk -53-1°. At the polar meteorological station of Sagastyr, in the delta of the Lena (73° 23′ N.), the following average temperatures have been observed: January -34-3° F. (February -43-6), July 40-8°, year 2-1°. The lowest average temperature of a day is -61 -6° F. Nevertheless owing to the dryness of the climate, the unclouded sun fully warms the earth during the long summer days in those high latitudes, and gives a short period of warm and even hot weather in the immediate neighbourhood of the pole of cold. Frosts of -13° to -18 F. are not uncommon at Krasnoyarsk, Irkutsk and Nerchinsk; even in the warmer southern regions of West Siberia and of the Amur the average winter temperature is 2-4° F. and -10-2° respectively; while at Yakutsk and Verkhoyansk the thermometer occasionally falls as low as -75 and -85 F. The minimum temperatures recorded at these two stations are -84 F. and -90° respectively; the minimum at Krasnoyarsk is -67 F., at Irkutsk -51 °, at Omsk -56 , and at Tobolsk 58 F. The soil freezes many

feet deep over immense areas even in southern Siberia. More dreaded than the frosts are the terrible burans or snowstorms, which occur in eariy spring and destroy thousands of horses and cattle that have been grazing on the steppes throughout the winter. Although very heavy falls of snow take place in the alpine tracts — especially about Lake Baikal — on the other side, in the steppe regions of the Altai and Transbaikalia and in the neighbourhood of Krasnoyarsk, the amount of snow is so small that travellers use wheeled vehicles, and cattle are able to find food in the steppe. Spring sets in with remarkable rapidity and charm at the end of April; but in the second half of May come the ” icy saints' days,” so blighting that it is impossible to cultivate the apple or pear. After this short period of frost and snow summer comes in its full beauty; the days are very hot, and, although they are always followed by cold nights, vegetation advances at an astonishing rate. Corn sown about Yakutsk in the end of May is ripe in the end of August. Still, at many places night frosts set in as early as the second half of July. They become quite common in August and September. Nevertheless September is much warmer than May, and October than April, even in the most continental parts of Siberia. The isotherms are exceedingly interesting. That of 32 F. crosses the middle parts of West Siberia and the southern parts of East Siberia. The summer isotherm of 68° F., which in Europe passes through Cracow and Kaluga, traverses Omsk, Krasnoyarsk and Irkutsk, whence it turns north to Yakutsk, and then south again to Vladivo- stok. Even the mouths of the Ob, Yenisei, Lena and Kolyma in 70 N. have in July an average temperature of 40 to 50°. Quite contrary is the course of the January isotherms. That of 14 F., which passes in Europe through Uleaborg in Finland only touches the southern part of West Siberia in the Altai Mountains. That of -4 F., which crosses Novaya Zemlya in Europe, passes through Tobolsk, Tomsk, Krasnoyarsk and Irkutsk, and touches 45 N. at Urga in Mongolia, turning north in the Amur region and reaching the Pacific at Nikolayevsk. The isotherm of 22° F., which touches the north point of Novaya Zemlya, passes in Siberia through Turuk hansk (at the confluence of the Lena and the Lower Tunguzka) and descends as low as 55° N. in Transbaikalia, whence it turns north to the Arctic Ocean.

Most rain falls in summer, especially in July and August. During the summer an average of 8 in. falls on a zone that stretches from Moscow and St Petersburg through Perm to Tobolsk and, after a dry belt as far as Tomsk, continues in a narrower strip as far as the S. end of Lake Baikal, then it broadens out so as to include the whole of the Amur basin, the total summer precipitation there being about 12 in. North of this zone the rainfall decreases towards the Arctic.

Flora. — The flora of Siberia presents very great local varieties, not only on account of the diversity of physical characteristics, but also in consequence of the intrusion of new species from the neighbouring regions, as widely different as the arctic littoral, the arid steppes of Central Asia, and the wet monsoon regions of the Pacific littoral. Siberia is situated for the most part in what Grisebach describes as the ” forest region of the Eastern continent.” 1 The northern limit of this region, must, however, be drawn nearer to the Arctic Ocean. A strip 60 to 200 m. wide is totally devoid of tree vegetation. The last trees which struggle for existence on the verge of the tundras are crippled dwarfs and almost without branches, and trees a hundred years old are only a few feet high and a few inches through and thickly encrusted with lichens. 2 The following species, none of which are found in European Russia, are characteristic of the tundras — arbutus (Arctostaphilus alpina), heaths or andomedas (Cassiope tetragona and C. hypnoides), Phyllodoce taxifolia, Loiseleuria pro- cumbejis, a species of Latifolium, a Polar azalea (Osmotkamnus fragrans) and a Polar willow (Salix ardica). In Yakutsk the tundra vegetation consists principally of mosses of the genera Polytrichum, Bryum and Hypnum. Some two hundred species of flowering plants struggle for a precarious existence in the tundra region, the frozen ground and the want of humus militating against them more than the want of warmth. 3 From this northern limit to the Aral-Caspian and Mongolian steppes stretches all over Siberia the forest region; the forests are, however, very unequally distributed, covering from 50 to 99% of the area in different districts. In the hill tracts and the marshy depression of the Ob they are unbroken, except by the bald summits of the loftier mountains (goltsy) ; they have the aspect of agreeable bosquets in the Baraba steppe, and they are thinly scattered through south-eastern Transbaikalia, where the dryness of the Gobi steppe makes its influence appreciably felt. Immense marshy plains covered with the dwarf birch take their place in the north as the tundras are approached. Over this immense area the trees are for the most part the same as we are familiar with in Europe. The larch becomes predominant chiefly in two new species (Larix sibirica and L. dahurica). The fir appears in the Siberian varieties Picea obovata and P. ayanensis. The silver fir (Abies sibirica, Pinus pectinata) and the stone-pine (P. Cembra) are quite common; they reach the higher summits, where the last-named is represented by a recumbent species (Cembra pumila). The birch in the loftier alpine tracts and plateaus becomes a shrub (Betula nana,

B. fruticosa), and in Transbaikalia assumes a new and very elegant aspect with a dark bark (B. da-urica). In the deeper valleys and on the

lowlands of West Siberia the larches, pines and silver firs, intermingled with birches and aspens, attain a great size, and the streams are fringed with thickets of poplar and willow. The alpine rose (Rhododendron dauricum) clusters in masses on the higher mountains; juniper, spiraea, sorbus, the pseudo-acacia (Caragana sibirica and

C. arborescens, C. jubata in some of the higher tracts), various Rosaceae — Potentilla fruticosa and Cotoneaster uniflora — the wild cherry (Prunus Padus), and many other shrubs occupy the spaces between the trees. Berry-yielding plants are found everywhere, even on the goltsy, at the upper limit of tree vegetation ; on the lower grounds they are an article of diet. The red whortleberry or cow- berry (Vaccinium Vitis idaea), the bog whortleberry (V. uliginosum, the bilberry (V. myrtillus) and the arctic bramble (Rubus arcticus) extend very far northward; raspberries and red and black currants form a luxuriant undergrowth in the forests, together with Ribes dikusha in East Siberia. The oak, elm, hazel, ash, apple, lime and maple disappear to the east of the Urals, but reappear in new varieties on the eastern slope of the border-ridge of the great plateau. 4 There we encounter the oak (Q. mongolica) , maple (Acerginala, Max.), ash (Fraxinus manchurica), elm (Ulmus montana), hazel (Corylus heterophylla) and several other European acquaintances. Farther east, in the Amur region, a great number of new species of European

1 According to A. Engler's Versuch einer Entwickelungsgeschichte der Pflanzenwelt (Leipzig, 1879-1882), we should have in Siberia (a) the arctic region; (b) the sub-arctic or coniferous region — north Siberian province; (c) the Central -Asian domain — Altai and Daurian mountainous regions; and (d) the east Chinese, intruding into the basin of the Amur.

2 See Middendorff 's observations on vegetable and animal life in the tundras, attractively told in vol. iv. of his Sibirische Reise.

3 Kjellmann, Vega Expeditionens Vetenskapliga Iahttagelser (Stockr holm, 1 872-1 887) reckons their number at 182; 124 species were found by Middendorff on the Taymyr peninsula, 219 along the borders of the forest region of Olenek, and 344 species within the forest region of the same; 470 species were collected by Maack in the Vilui region.

4 Nowhere, perhaps, is the change better seen than on crossing the Great Khingan.

trees, and even new genera, such as the cork-tree (Phellodendron amurense, walnut (Juglans manchurica) , acacia (Maackia amurensis) , the graceful climber Maximowiczia amurensis, the Japanese Trochostigma and many others — all unknown to Siberia proper — are met with.

On the high plateau the larch predominates over all other species of conifers or deciduous trees; the wide, open valleys are thickly planted with Betula nana and B. fruticosa in the north and with thick grasses (poor in species) in the southern and drier parts. The Siberian larch predominates also in the alpine tracts fringing the plateau on the north, intermingled with the fir, stone-pine, aspen and birch. In the drier parts the Scotch fir {Pinus sylvestris) makes its appearance. In the alpine tracts of the north the narrowness^ of the valleys and the steep stony slopes strewn with debris, on which only lichens and mosses are able to grow, make every plot of green grass (even if it be only of Carex) valuable. For days consecutively the horse of the explorer can get no other food than the dwarf birch. But even in these districts the botanist and the geographer can easily distinguish between the chern or thick forest of the Altai and the taiga of East Siberia. The lower plateau exhibits, of course, new characteristics. Its open spaces are lovely prairies, on which the Daurian flora flourishes in full beauty. In spring the traveller crosses a sea of grass above which the flowers of the paeony, aconite, Orobus, Carallia, Saussurea and the like wave 4 or 5 ft. high. As the Gobi desert is approached the forests disappear, the ground becomes covered chiefly with dry Gramineae, and Salsolaceae make their appearance. The high plains of the west slope of the plateau are also rich prairies diversified with woods. Nearly all the species of plants which grow on these prairies are common to Europe (paeonies, Hemerocallis, asters, pinks, gentians, violets, Cypripedium, Aquilegia, Delphinium, aconites, irises and so on) ; but here the plants attain a much greater size; a man standing erect is often hidden by the grasses. The flora of Minusinsk — the Italy of Siberia — is well known ; the prairies on the Ishim and of the Baraba steppe are adorned with the same rich vegetation, so graphically described by Middendorff and O. Finsch. Farther north we come to the urmans of West Siberia, dense thickets of trees often rising from a treacherous carpet of thickly interlaced grasses, which conceals deep marshes, where even the bear has learnt to tread circumspectly.

Fauna. — The fauna of Siberia is closely akin to that of central Europe; and the Ural Mountains, although the habitat of a few species

which warrant the naturalist in regarding the southern Urals as a separate region, are not so important a boundary zoologically as they are botanically. As in European Russia, so in Siberia, three principal zones — the arctic, the boreal and the middle — may be distinguished, and these may be subdivided into several sub-regions. The Amur region shares the characteristics of the north Chinese fauna. On the whole, we may say that the arctic and boreal faunas of Europe extend over Siberia, with a few additional species in the Ural and Baraba region — a number of new species also appearing in East Siberia, some spreading along the high plateau and others along the lower plateau from the steppes of the Gobi. The arctic fauna is very poor. According to Nordenskjold 1 it numbers only twenty-nine species of mammals, of which seven are marine and seventeen or eighteen may be safely considered as living beyond the forest limit. Of these, again, four are characteristic of the land of the Chukchis. The reindeer, arctic fox {Canis lagopus), hare, wolf, lemming (Myodes obensis), collar lemming {Cuniculus torquatus) and two species of voles (Arvicolae) are the most common on land. The avifauna is very rich in migratory water and marsh fowl (Grallatores and Natatores), which come to breed in the coast region; but only five land birds — the ptarmigan (Lagopus alpinus), snow-bunting, Iceland falcon, snow-owl and raven — are permanent inhabitants of the region. The boreal fauna is, of course, much more abundant; but here also the great bulk of the species, both mammals and birds, are common to Europe and Asia. The bear, badger, wolverine, pole- cat, ermine, common weasel, otter, wolf, fox, lynx, mole, hedgehog, common shrew, water-shrew and lesser shrew (Sorex vulgaris, S. fodiens and 5. pygmaeus), two bats (the long-eared and the boreal), three species of Vespertilio (V. daubentoni, V. nattereri and V. mysta- cinus), the flying and the common squirrel (Tamias striatus), the brown, common, field and harvest mouse (Mus decumanus, M. musculus, M. sylvaticus, M. agrarius and M. minutus), four voles (Arvicola amphibius, A. rufocanus, A. rutilus and A. schistocolor), the beaver, variable hare, wild boar, roebuck, stag, reindeer, elk and Phoca annelata of Lake Baikal— all these are common alike to Europe and to Siberia; while the bear, musk-deer (Moschus moschi- ferus), ermine, sable, pouched marmot or souslik (Spermophilus eversmani), Arvicola obscurus and Lagomys hyperboraeus, distributed over Siberia, may be considered as belonging to the arctic fauna. In addition to the above -we find in East Siberia Mustela alpina, Canis alpinus, the sable antelope (Aegocerus sibiricus), several species of mouse (Mus gregatus, M. oeconomus and M. saxatilus), two voles (Arvicola russatus and A. macrotus), Syphneus aspalax and the alpine Lagomys from the Central Asian plateaus; while the tiger makes incursions not only into the Amur region but

occasionally as far as Lake Baikal. On the lower terrace of the great plateau we find an

admixture of Mongolian species, such as Canis corsae, Felis manul, Spermophilus dauricus, the jerboa (Dipus jaculus), two hamsters (Cricetus songarus and C. furunculus), three new voles (Arvicolae), the Tolai hare, Ogotona hare (Lagomys ogotona), Aegocerus argali, Antilope gutturosa and Equus hemionus (jighitai). Of birds no less than 285 species have been observed in Siberia, but of these forty-five only are absent from Europe. In south-east Siberia there are forty-three new species belonging to the north Manchurian or Amur fauna ; and in south-east Transbaikalia, on the borders of the Gobi steppe, only 103 species were found by G. F. R. Radde, among which the most numerous are migratory birds and the birds of prey which pursue them. The rivers and lakes of Siberia abound in hsh; but little is known of their relations with the species of neighbouring regions. 2

The insect fauna is very similar to that of Russia; but a few genera, as the Tentyria, do not penetrate into the steppe region of West Siberia, while the tropical Colasposoma, Popilia and Languria are found only in south-eastern Transbaikalia, or are confined to the southern Amur. On the other hand, several American genera (Cephalaon, Ophryasles) extend into the north-eastern parts of Siberia. 3 As in all uncultivated countries, the forests and prairies of Siberia become almost uninhabitable in summer because of the mosquitoes. East Siberia suffers less from this plague than the marshy Baraba steppe ; but on the Amur and the Sungari large gnats are an intolerable plague. The dredgings of the ” Vega ” expedition in the Arctic Ocean disclosed an unexpected wealth of marine fauna, and those of L. Schrenck in the north of the Japanese Sea led to the discovery of no fewer than 256 species (Gasteropods, Brachiopods and Conchifers). Even in Lake Baikal Dybowski and Godlewski discovered no fewer than ninety-three species of Gammarides and twenty-five of Gasteropods. 4 The Sea of Okhotsk is very interesting, owing to its local species and the general composition of its fauna (70 species of Molluscs and 21 of Gasteropods). The land Molluscs, notwithstanding the unfavourable conditions of climate, number about seventy species — Siberia in this respect being not far behind north Europe. The increase of many animals in size (becoming twice as large as in Europe) ; the appearance of white varieties among both mammals and birds, and their great prevalence among domesticated animals (Yakut horses) ; the migrations of birds and mammals over immense regions, from the Central Asian steppes to the arctic coast, not only in the usual rotation of the seasons but also as a result of occasional climacteric conditions are not yet fully understood (e.g. the migration of thousands and

thousands of roe- buck from Manchuria across the Amur to the left bank of the river, or the migration of reindeer related by Baron F von Wrangel) ; the various coloration of many animals according to the composition of the forests they inhabit (the sable and the squirrel are well-known instances) ; the intermingling northern and southern faunas in the Amur region and the remarkable consequences of that intermixture in the struggle for existence ;— all these render the study of the Siberian fauna most interesting. Finally, the laws of distribution of animals over Siberia cannot be made out until the changes undergone by its surface during the Glacial and Lacustrine periods are well established and the Post-Tertiary fauna is better known. The remarkable finds of Quaternary mammals about Omsk and their importance for the history of the Equidae are merely a slight indication of what may be expected in this field.

Population. — In 1906 the estimated population was 6,740,600. In 1897 the distribution was as follows. Geographically, though not administratively, the steppe provinces of Akmolinsk and Semipalatinsk belong to Siberia. They are described under

Steppes.

1 In Vega Exped. Vetensk. lakttagelser., vol. ii.

Area in

Population

Density

Governments and Provinces.

in.

per

sq. m.

1897.

sq. m.

Tobolsk

535.739

1,444,470

2-7

Tomsk .

327-173

1,947,021

5-1

Irkutsk f Yeniseisk .

981,607

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0-6

(general- -! Irkutsk

280,429

515,132

1-8

government) (. Yakutsk

1,530,253

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0-2

f Transbaikalia

229,520

676,407

3-o

Far East j Amur .

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119,909

o-6

(viceroyalty) 1 Maritime .

712,585

209,516

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L Sakhalin

14,700

27,250

1-9

4.784.832

5,784.382

Av. 1-2

2 Czekanowski (Izveslia Sib. Geog. Soc, 1877) has described fifty species from the basin of the Amur ; he considers that these constitute only two-thirds of the species inhabiting that basin.

3 See L. Schrenck, Reisen und Forschungen im Amurlande (1858-

1891).

4 See Mem. de I'academie des sciences de St-Petersbourg, vol. xxii.

(1876).

Of the total in 1897, 81-4% were Russians, 8-3% Turko-Tatars, 5% Mongols and 0-6% " indigenous " races, i.e. Chukchis, Koryaks, _ Ghilyaks, Kamchadales and others. Only 8 % of the

Kuss aas. tota j are c l asse(j as urban. The great bulk of the population are Russians, whose number increased with great rapidity during the 19th century; although not exceeding 150,000 in 1709 and 500,000 a century later, they numbered nearly 6,500,000 in 1904.

Between 1870 and 1890 over half a million free immigrants entered Siberia from Russia, and of these 80 % settled in the govern- ment of Tobolsk; and between 1890 and 1905 it is estimated that something like a million and a half free immigrants entered the country. These people came for the most part from the northern parts of the black earth zone of middle Russia, and to a smaller extent from the Lithuanian governments and the Ural governments of Perm and Vyatka. The Russians, issuing from the middle Urals, have travelled as a broad stream through south Siberia, sending branches to the Altai, to the Hi river in Turkestan and to Minusinsk, as well as down the chief rivers which flow to the Arctic Ocean, the banks of which are studded with villages 15 to 20 m. apart. As Lake Baikal is approached the stream of Russian immigration becomes narrower, being confined mostly to the valley of the Angara, with a string of villages up the Irkut; but it widens out again in Transbaikalia, and sends branches up the Selenga and its tributaries. It follows the course of the Amur, again in a succession of villages some 20 m. apart, and can be traced up the Usuri to Lake Khangka and Vladivostok, with a string of villages on the plains between the Zeya and the Silinji. Small Russian settlements are planted on a few bays of the North Pacific and the Sea of Okhotsk, as well as on Sakhalin.

Colonization. — Siberia has been colonized in two different ways. On the one hand, the government sent parties (1) of Cossacks to settle on the frontiers, (2) of peasants who were bound to settle at appointed places and maintain communication along the routes, (3) of stryeltsy (i.e. Moscow imperial guards) to garrison forts, (4) of yamshiks — a special organization of Old Russia entrusted with the maintenance of horses for postal communication, and finally (5) of convicts. A good deal of the Amur region was peopled in this way. Serfs in the imperial mines were liberated and organized in Cossack regiments (the Transbaikal Cossacks) ; some of these were settled on the Amur, forming the Amur and Usuri Cossacks. Other parts of the river were colonized by peasants who emigrated with govern- ment aid, and were bound to settle in villages, along the Amur, at spots designated by officials. As a rule, this kind of colonization has not produced the results that were expected. On the other hand, free colonization has been more successful and has been undertaken on a much larger scale. Soon after the first appearance (1580) of the Cossacks of Yermak in Siberia thousands of hunters, attracted by the furs, immigrated from north Russia, explored the country, traced the first footpaths and erected the first houses in the wilder- ness. Later on serfdom, religious persecutions and conscription were the chief causes which led the peasants to make their escape to Siberia and build their villages in the

most inaccessible forests, on the prairies and even on Chinese territory. But the severe measures adopted by the government against such ” runaways ” were power- less to prevent their immigration into Siberia. While governmental colonization studded Siberia with forts, free colonization filled up the intermediate spaces. Since the emancipation of the serfs in 1861, it has been steadily increasing, the Russian peasants of a village often emigrating en bloc. 1

Siberia was for many years a penal colony. Exile to Siberia began in the first years of its discovery, and as early as 1658 we read of the Exiles Nonconformist priest Awakum' following in chains the ex-

ploring party of Pashkov on the Amur. Raskolniks or Non- conformists in the second half of the 17th century, rebel stryeltsy under Peter the Great, courtiers of rank during the reigns of the empresses, Polish confederates under Catherine II., the ” Decembrists ” under Nicholas I., nearly 50,000 Poles after the insurrection of 1863, and later on whole generations of socialists were sent to Siberia; while the number of common-law convicts and exiles transported thither increased steadily from the end of the 1 8th century. No exact statistics of Siberian exile were kept before 1823. But it is known that in the first years of the 19th century nearly 2000 persons were transported every year to Siberia. This figure reached an average of 18,250 in 1873-1877, and from about 1880 until the discontinuance of the system in 1900 an average of 20,000 persons were annually exiled to Siberia. After liberation the hard-labour convicts are settled in villages; but nearly all are in a wretched condition, and more than one-third have disappeared without being accounted for. Nearly 20,000 men (40,000 according to other estimates) are living in Siberia the life of brodyagi (runaways or outlaws), trying to make their way through the forests to their native provinces in Russia.

Asiatic Races. — The Ural-Altaians consist principally of Turko-Tatars, Mongols, Tunguses, Finnish tribes and Samoyedes. The Samoyedes, who are confined to the province of Tobolsk, Tomsk

1 See Yadrintsev, Siberia as a Colony (in Russian, 2nd ed., St Petersburg, 1892).

1 The autobiography of the protopope Awakum is one of the most popular books with Russian Nonconformists.

and Yeniseisk, do not exceed 12,000 in all. The Finns consist principally of Mordvinians (18,500), Ostiaks (20,000) and Voguls (5000). Survivals of Turkish blood, once much more numerous, are

scattered all over south Siberia as far as Lake Baikal. Their territories are being rapidly occupied by Russians, and their settle- ments are cut in two by the Russian stream — the Baraba Tatars and the Yakuts being to the north of it, and the others having been driven back to the hilly tracts of the Altai and Sayan Mountains. In all they number nearly a quarter of a million. The Turkish stock of the Yakuts in the basin of the Lena numbers 227,400. Most of these Turkish tribes live by pastoral pursuits and some by agriculture, and are a most laborious and honest population.

The Mongols (less than 300,000) extend into West Siberia from the high plateau — nearly 20,000 Kalmucks living in the eastern Altai. In East Siberia the Buriats occupy the Selenga and the Uda,

Earts of Nerchinsk, and the steppes between Irkutsk and the upper ena, as also the Baikal Mountains and the island of Orkhon; they support themselves chiefly by live-stock breeding, but some, especially in Irkutsk, are agriculturists. On the left of the Amur there are some 60,000 Chinese and Manchurians about the mouth of the Zeya, and 26,000 Koreans on the Pacific coast. The Tunguses (nearly 70,000) occupy as their hunting-grounds an immense region on the high plateau and its slopes to the Amur, but their limits are yearly becoming more and more circumscribed both by Russian gold-diggers and by Yakut settlers. In the Maritime Province, before the Boxer uprising of 1900, 26% of the population in the N. Usuri district and 36 % in the S. Usuri district were Koreans and Chinese, and in the Amur province there were nearly 15,000 Manchus and Koreans. Jews number 32,650 and some 5000 gipsies wander about Siberia.

At first the indigenous populations were pitilessly deprived of their hunting and grazing grounds and compelled to resort to agriculture — a modification exceedingly hard for them, not only on account of their poverty but also because they were compelled to settle in the less favourable regions. European civilization made them familiar with all its worst sides and with none of its best. Taxed with a tribute in furs from the earliest years of the Russian conquest, they often revolted in the 17th century, but were cruelly reduced to obedience. In 1824 the settled indigenes had to pay the very heavy rate of 11 roubles (about £1) per head, and the arrears, which soon became equal to the sums levied, were rigorously exacted. On the other hand the severe measures taken by the government prevented the growth of anything like legalized slavery on Siberian soil; but the people, ruined as they were both by the intrusion of agricultural colonists and by the exactions of government officials, fell into what was practically a kind of slavery to the merchants. Even the best-intentioned government

measures, such as the importation of corn, the prohibition of the sale of spirits, and so on, became new sources of oppression. The action of mission- aries, who cared only about nominal Christianizing, had no better effect.

Social Features. — In West Siberia there exist compact masses of Russians who have lost little of their primitive ethnographical features: but the case is otherwise on the outskirts. M. A. Castren characterized Obdorsk (mouth of the Ob) as a true Samoyedic town, although peopled with ” Russians.” The Cossacks of West Siberia have the features and customs and many of the manners of life of the Kalmucks and Kirghiz. Yakutsk is thoroughly Yakutic; marriages of Russians with Yakut wives are common, and in the middle of the 19th century the Yakut language was predominant among the Russian merchants and officials. At Irkutsk and in the valley of the Irkut the admixture of Tungus and Buriat blood is obvious, and still more in the Nerchinsk district and among the Transbaikal Cossacks settled on the Argun. They speak the Buriat language as often as Russian, and in a Buriat dress can hardly be distinguished from the Buriats. In different parts of Siberia, on the borders of the hilly tracts, intermarriage of Russians with Tatars was quite common. Of course it is now rapidly growing less, and the settlers who entered Siberia in the 19th century married Russian wives and remained thoroughly Russian. There are accordingly parts of Siberia, especially among the Raskolniks or Nonconformists, where the north Russian, the Great Russian and the Ukrainian (or southern) types have maintained themselves in their full purity, and only some differences in domestic architecture, in the disposition of their villages and in the language and character of the population remind the traveller that he is in Siberia. The special features of the language and partly also of the national character are due to the earliest settlers, who came mostly from northern Russia.

The natural rate of increase of population is very slow as a rule, and does not exceed 7 or 8 per 1000 annually. The great mortality, especially among the children, is one of the causes of this, the birth-rate being also lower than in Russia. The climate of Siberia, how- ever, cannot be called unhealthy, except in certain localities where goitre is common, as it is on the Lena, in several valleys of Nerchinsk and in the Altai Mountains. The rapid growth of the actual popula- tion is chiefly due to immigration.

Towns. — Only 8-1 % of the population live in towns (6-4% only in the governments of Tobolsk and Tomsk). There are seventeen towns with a population of 10,000 or more, namely, Tomsk (63,533

in 1900) and Irkutsk (49,106)— the capitals of West and East Siberia respectively; Blagovyeshchensk (37,368), Vladivostok (38,000). Tyumen (29,651) in West Siberia, head of Siberian navigation; Barnaul (29,850), capital of the Altai region; Krasnoyarsk (33,337) and Tobolsk (21,401), both mere administrative centres; Biysk (17,206), centre of the Altai trade; Khabarovsk (15,082), administrative centre of the Amur region; Chita (11,480), the capital of Transbaikalia; Nikolsk (22,000); Irbit (20,064); Kolyvan (11,703). the centre of the trade of southern Tomsk; Yeniseisk (11,539), the centre of the gold-mining region of the same name; Kurgan (IO ,579), a growing town in Tobolsk; and Minusinsk (10,255), m the southern part of the Yeniseisk province, trading with north-west Mongolia.

Education. — Education stands at a very low level. The chief town of every province is provided with* a classical gymnasium for boys and a gymnasium or progymnasium for girls; but the education there received is not of a high grade, and the desire of the local population for ” real schools ” is not satisfied. Primary education is in a very unsatisfactory state, and primary schools very scarce. The petitions for a university at Irkutsk, the money required for which has been freely offered to the government, have been refused, and the imperative demands of the local tradesmen for technical instruction have likewise met with little response. The Tomsk University remains incomplete, and has only 560 students. There are nevertheless eighteen scientific societies in Siberia, which issue publications of great value. Twelve natural history and ethnological museums have been established by the exiles — the Minusinsk museum being the best. There are also twenty public libraries.

Agriculture. — Agriculture is the chief occupation both of the settled Russians and of the native population. South Siberia has a very fertile soil and yields heavy crops, but immense tracts of the country are utterly unfit for tillage. Altogether it is estimated that not more than 500,000 sq. m. are suitable for cultivation. The aggregate is thus distributed— 192,000 sq. m. in West Siberia, 20,000 in Akmolinsk and Semipalatinsk, 100,000 in East Siberia, 85,000 in Transbaikalia, 40,000 in Amur, and 63,000 in Usuri. In the low- lands of West Siberia cultivation is carried on up to 61 ° N. 1 On the high plains fringing the alpine tracts on the north-west it can be carried on only in the south, farther north only in the valleys, reaching 62 ° N. in that of the Lena, and in the alpine tracts in only a few valleys, as that of the

Irkut. On the high plateau all attempts to grow cereals have failed, the wide trenches alone (Uda, Selenga, Jida) offering encouragement to the agriculturist. On the lower plateau, in Transbaikalia, grain is successfully raised in the Ner- chinsk region, with serious risks, however, from early frosts in the valleys. South-east Transbaikalia suffers from want of water, and the Buriats have to irrigate their fields. Although agriculture is carried on on the upper Amur, where land has been cleared from virgin forests, it really prospers only below Kumara and on the fertile plains of the Zeya and Silinji. In the depression between the Bureya range and the coast ranges it suffers greatly from the heavy July and August rains, and from inundations, while on the lower Amur the agriculturists barely maintain themselves by growing cereals in clearances on the slopes of the hills, so that the settlements on the lower Amur and Usuri continually require help from govern- ment to save them from famine. The chief grain-producing regions of Siberia an; — the Tobol and Ishim region, the Baraba, the region about Tomsk and the outskirts of the Altai. The Minusinsk district, one of the richest in Siberia (45,000 inhabitants, of whom 24,000 are nomadic), has more than 45,000 acres under crops. Mining, the second industry in point of importance, is dealt with above.

Land Tenure. — Out of the total area of over 3,000,000,000 acres of land in Siberia, close upon 96 % belong to the state, while the cabinet of the reigning emperor owns 114,700,000 acres (112,300,000 in the Altai and 2,400,000 in Nerchinsk) or nearly 4%. Private property is insignificant in extent — purchase of land being permitted only in the Amur region. (In West Siberia it was only temporarily per- mitted in 1860-1868.) Siberia thus offers an example of the nationali- zation of land unparalleled throughout the world. Any purchase of land within a zone 67 m. wide on each side of the trans-Siberian railway was absolutely prohibited in 1895, and the extent of crown lands sold to a single person or group of persons never exceeds 1080 acres unless an especially useful industrial enterprise is projected, and in that case the maximum is fixed at 2700 acres. The land is held by the Russian village communities in virtue of the right of occupation. Industrial surveys, having for their object the granting of land to the peasants to the extent of 40 acres per each male head, with 8 additional acres of wood and 8 acres as a reserve, were started many years ago, and after being stopped in 1887 were commenced again in 1898. At the present time the land allotments per male head vary greatly, even in the relatively populous region of southern Siberia. In the case of the peasants the allotments vary on an average from 32 to 102 acres (in some cases from 21-6 to 240 acres); the Transbaikal Cossacks have

about 111 acres per male head, and the indigenous population 108 to 154 acres.

1 The northern limits of agriculture are 60° N. on the Urals, 62° at Yakutsk, 61 ° at Aldansk, 54° 30′ at Udskoi, and 53° to 54° in the interior of Kamchatka (Middendorff, Sibirische Reise, vol. iv.).

The total cultivated area and the average area under crops every year have been estimated by A. Kauf mann as follows 2 : —

Province or Government.

Area

cultivated,

Acres.

Under Crops (Acres).

Total.

Average per House- hold.

Average per 100 Inhabit- ants.

Tobolsk Tomsk . Yeniseisk Irkutsk

Transbaikalia . Yakutsk Amur (Russians) South Usuri (peasants only)

5,670,000 8,647,000 1,830,000 1,800,000 1,415,000 81,000 143,000

151,000

3,270,000 5,259,000 977,000 910,000 872,000 43,000 143,000

151,000

13-2 15-7 13-0 13-2 9.4

o-8

19-4

24-0

243 310 267 265

159 16

275 :

375

19,737,000

11,625,000

Bee- keeping.

These figures are somewhat under-estimated, but the official figures are still lower, especially for Tomsk. Tillage is conducted on very primitive methods. After four to twelve years' cultivation the land is allowed to lie fallow for fen years or more. In the Baraba district it is the practice to sow four different grain crops in five to seven years and then to let the land rest ten to twenty-five years. The yield from the principal crops fluctuates greatly; indeed in a very good year it is almost three times that in a very bad one. The southern parts of Tobolsk, nearly all the government of Tomsk (exclusive of the Narym region), southern Yeniseisk and southern Irkutsk, have in an average year a surplus of grain varying from 35 to 40% of the total crop, but in bad years the crop falls short of the actual needs of the population. There is considerable move- ment of grain in Siberia itself, the populations of vast portions of the territory, especially of the mining regions, having to rely upon imported corn. The forest area under supervision is about 30,000,000 acres (in Tobolsk, Tomsk, Yeniseisk and Irkutsk), out of a total area of forest land of 63,000,000 acres.

As an independent pursuit, live-stock breeding is carried on by the Russians in eastern Transbaikalia, by the Yakuts in the province of Yakutsk, and by the Buriats in Irkutsk and Trans- baikalia, but elsewhere it is secondary to agriculture. tˆk. Both cattle-breeding and sheep-grazing are more profit- s able than dairying; but the Kirghiz herds are not well tended, being left to graze on the steppes all the year, where they perish from wild animals and the cold. The live stock includes some 180,000 camels.

Bee-keeping is widelycarriedon, especially inTomsk and the Altai. Honey is exported to Russia. The seeds of the stone-pine are collected for oil in West Siberia.

Hunting. — Hunting is a profitable occupation, the male population of whole villages in the hilly and woody tracts setting out in October for a month's hunting. The sable, however, which formerly con- stituted

the wealth of Siberia, is now exceedingly scarce. Squirrels, bears, foxes, arctic foxes, antelopes and especially deer in spring are the principal objects of the chase. The forests on the Amur yielded a rich return of furs during the first years of the Russian occupation, and the Amur sable, although much inferior to the Yakutsk and Transbaikalian, was iargely exported.

Fishing. — Fishing is a valuable source of income on the lower courses of the great rivers, especially the Ob. The fisheries on Lake Baikal supply cheap food (the omul) to the poorer classes of Irkutsk and Transbaikalia. The native populations of the Amur. — Golds and Gilyaks — support themselves chiefly by fishing, when the salmon enters the Amur and its tributaries in dense masses. Fish (e.g. the keta, salmon and sturgeon) are a staple article, of diet in the north.

Manufactures. — Though Siberia has within itself all the raw produce necessary for prosperous industries, it continues to import from Russia all the manufactured articles it uses. Owing to the distances over which they are carried and the bad organization of trade, all manufactured articles are exceedingly dear, especially in the east. The manufactories of Siberia employ less than 25,000 workmen, and of these some 46% are employed in West Siberia. Nearly one-third of the total value of the output represents wine- spirit, 23% tanneries, 18% tallow-melting and a considerable sum cigarette-making.

It is estimated that about one-half of the Russian agricultural population supplement their income by engaging in non-agricultural pursuits, but not more than 18 to 22% carry on domestic trades, the others finding occupation in the carrying trade— which is still important, even since the construction of the railway — in hunting (chiefly squirrel-hunting) and in work in the mines. Domestic and petty trades are therefore developed only round Tyumen, Tomsk and Irkutsk. The principal of these trades are the weaving of carpets — about Tyumen; the making of wire sieves; the painting of ikons or sacred images; the making of wooden vessels and of the necessaries for the carrying trade about Tomsk (sledges, wheels, &c); ;

2 Russian Encyclopaedic Dictionary, vol. lix. (1900).

the preparation of felt boots and sheepskins; and the manufacture of dairy utensils and machinery. Weaving is engaged in for domestic

purposes. But all these trades are sporadic, and are confined to limited areas, and often only to a few separate villages.

Commerce. — There are no figures from which even an approximate idea can be gained as to the value of the internal trade of Siberia, but it is certainly considerable. The great fair at Irbit retains its importance, and there are, besides, over 500 fairs in Tobolsk and over 100 in other parts of the region. The aggregate returns of all these are estimated at £2,643,000 annually. The trade with the natives continues to be mainly the sale of spirits.

In the external trade the exports to Russia consist chiefly of grain, cattle, sheep, butter and other animal products, furs, game, feathers and down. The production of butter for export began only in 1894, but grew with great rapidity. In 1902 some 1800 dairies were at work, the greater number in West Siberia, and 40,000 tons of butter were exported. The total trade between Russia and China amounts to about £5,500,000 annually, of which 87 % stands for imports into Russia and 13% for exports to China. Tea makes up nearly one-half of the imports, the other commodities being silks, cottons, hides and wool; while cottons and other manufactured wares constitute considerably oyer 50% of the exports. Part of this Commerce (textiles, sugar, tobacco, steel goods) is conveyed by sea to the Pacific ports. The principal centre for the remainder (textiles and petroleum), conveyed by land, is Kiakhta on the Mongolian frontier. Prior to the building of the trans-Siberian railway a fairly active trade was carried on between China and the Amur region; but since the opening of that railway (in 1902-1905) the Amur region has seriously and rapidly declined in all that concerns trade, industry, general prosperity and civilization. There is further an import trade amounting to between two and three-quarters and three millions sterling annually with Manchuria, to over one million sterling with the United States, and to a quarter to half a million sterling with Japan. As nearly as can be estimated, the total imports into Siberia amount approximately to £5,000,000, the amount having practically doubled between 1890 and 1902; the total exports average about £9,000,000. In the Far East the chief trade centres are Vladivostok and Nikolayevsk on the Amur, with Khabarovsk and Blagovyeshchensk, both on the same river. For some years a small trade was carried on by the British Captain Wiggins with the mouth of the river Yenisei through the Kara Sea, and after his death . in 1905 the Russians themselves endeavoured to carry farther the pioneer work which he had begun.

Communications. — Navigation on the Siberian rivers has developed both as regards the number of steamers plying and the number of

branch rivers traversed. In 1900, one hundred and thirty private and several crown steamers plied on the Ob-Irtysh river system as far as Semipalatinsk on the Irtysh, Biysk on the Ob, and Achinsk on the Chulym. The Ob- Yenisei canal is ready for use, but its actual usefulness is impaired by the scarcity of water in the smaller streams forming part of the system. On the Yenisei steamers ply from Minusinsk to Yeniseisk, and to Ghilghila at its mouth; on its tributary, the Angara, of which some rapids have been cleared, though the Padun rapids have still to be rounded by land; and on the Selenga. On the Lena and the Vitim there are steamers, and a small railway connects the Bodoibo river port with the Olekma gold-washings. In the Amur system, the Zeya, the Bureya and the Argun are navigated.

The main line of communication is the great Moscow road. It starts from Perm on the Kama, and, crossing the Urals, reaches Ekaterinburg — the centre of mining industry — and Tyumen on the Tura, whence steamers ply via Tobolsk to Tomsk. From Tyumen the road proceeds to Omsk, Tomsk, Krasnoyarsk and Irkutsk, sending off from Kolyvan a branch south to Barnaul in the Altai and to Turkestan. From Irkutsk it proceeds to Transbaikalia, Lake Baikal being crossed either by steamer or (when frozen) on sledges, in either case from Listvinichnoe to Misovaya. A route was laid out about 1868 round the south shore of Lake Baikal in order to maintain communication with Transbaikalia during the spring and autumn, and in 1905 the great Siberian railway was com- pleted round the same extremity of the lake. From Lake Baikal the road proceeds to Verkhne-udinsk, Chita and Stryetensk on the Shilka, whence steamers ply to the mouth of the Amur and up the Usuri and Sungacha to Lake Khangka. When the rivers are frozen communication is maintained by sledges on the Amur; but in spring and autumn the only continuous route down the Shilka and the Amur, to its mouth, is on horseback along a mountain path (very difficult across the Bureya range). On the lower Amur and on the Usuri the journey is also difficult even on horseback. When the water in the upper Amur is low, vessels are sometimes unable to reach the Shilka. Another route of importance before the conquest of the Amur is that which connects Yakutsk with Okhotsk or Ayan. Regular postal communication is maintained by the Russians between Kiakhta and Kalgan (close by Peking) across the desert of Gobi.

The first railway to reach Siberia was built in 1878, when a line was constructed between Perm, at which point travellers for Siberia „ .. used to strike off from the Kama eastwards, and Ekaterin-

Kavway*. ˆurg, on t jj e eas ˆ eTn s i ope f the Urals. In 1884 this line was continued as far as Tyumefi, the head of navigation on the

Siberian rivers. It was supposed at that time that this line would form part of the projected trans-Siberian railway; but it was finally decided, in 1885, to give a more southerly direction to the railway and to continue the Moscow-Samara line to Ufa, Zlatoust in the Urals, and Chelyabinsk on the west Siberian prairies, at the head of one of the tributaries of the Ob. Thence the line was continued across the prairies to Kurgan and Omsk, and from there it followed the great Siberian highway to Krasnoyarsk and Irkutsk, and on round Lake Baikal to Chita and Stryetensk on the Shilka. From that place it was intended to push it down the Amur to Khabarovsk, and finally to proceed up the Usuri to Vladivostok. The building of the railway was begun at several points at once in 1892; it had, indeed, been started a year before that in the Usuri section. For reasons indicated elsewhere (see Russia : Railways) it was found inadvisable to continue the railroad along the Shilka and the Amur to Khabarovsk, and arrangements were made in 1 896 with the Chinese government for the construction of a trans- Manchurian railway. This line connects Kaidalovo, 20 m. below Chita, with Vladivostok, and sends off a branch from Kharbin, on the Sungari, to Dalny and Port Arthur. Those parts of it which run through Russian territory (in Transbaikalia 230 m.; in the neighbourhood of Vladivostok 67 m.) were opened in 1902, and also the trans-Manchurian line (1000 m.), although not quite completed. A line was constructed from Vladivostok to the Amur before it became known that the idea of following the latter part of the route originally laid down would have to be abandoned. This line, which has been in working order since 1898, is 479 m. long, and proceeds first to Grafskaŷ, across the fertile and populous south Usuri region, then down the Usuri to Khabarovsk at the confluence of that river with the Amur. Returning westwards, Chelyabinsk has been connected with Ekaterinburg (153 m.) ; and a branch line has been built from the main Siberian line to Tomsk (54 m.). Altogether the entire railway system, including the cost of the Usuri line, the unfinished Amur line, the circum-Baikal line and the eastern Chinese railway, is put down at a total of £87,555,760, and the total distance, all branches included, is 5413 m., of which 1070 m. are in Chinese territory.

Histgry. — The shores of all the lakes which filled the depressions during the Lacustrine period abound in remains dating from the Neolithic Stone period; and numberless kurgans (tumuli), furnaces and so on bear witness to a much denser population than the present. During the great migrations in Asia from east to west many populations were probably driven to the northern borders of the great plateau and thence compelled to descend into Siberia; succeeding

waves of immigration forced them still farther towards the barren grounds of the north, where they melted away. According to Radlov, the earliest inhabitants of Siberia were the Yeniseians, who spoke a language different from the Ural-Altaic; some few traces of them (Yeniseians, Sayan-Ostiaks, and Kottes) exist among the Sayan Mountains. The Yeniseians were followed by the Ugro- Samoyedes, who also came originally from the high plateau and were compelled, probably during the great migration of the Huns in the 3rd century B.C., to cross the Altai and Sayan ranges and to enter Siberia. To them must be assigned the very numerous remains dating from the Bronze period which are scattered all over southern Siberia. Iron was unknown to them; but they excelled in bronze, silver and gold work. Their bronze ornaments and implements, often polished, evince considerable artistic taste ; and their irrigated fields covered wide areas in the fertile tracts. On the whole, their civilization stood much higher than that of their more recent suc- cessors. Eight centuries later the Turkish stocks of " Tukiu " (the Chinese spelling for "Turks"), Khagases and Uigurs — also com- pelled to migrate north-westwards from their former seats — subdued the Ugro-Samoyedes. These new invaders likewise left numerous traces of their sojourn,. and two different periods may be easily distinguished in their remains. They were acquainted with iron, and learned from their subjects the art of bronze-casting, which they used for decorative purposes only, and to which they gave a still higher artistic stamp. Their pottery is much more perfect and more artistic than that of the Bronze period, and their ornaments are accounted among the finest of the collections at the St Petersburg museum of the Hermitage. This Turkish empire of the Khagases must have lasted until the 13th century, when the Mongols, under Jenghiz Khan, subdued them and destroyed their civilization. A decided decline is shown by the graves which have been discovered, until the country reached the low level atwhich it was found by the Russians on their arrival towards the close of the 16th century. In the beginning of the 1 6th century Tatar fugitives from Turkestan subdued the loosely associated tribes inhabiting the lowlands to the east of the Urals. Agriculturists, tanners, merchants and mollahs (priests) were called from Turkestan, and small principalities sprang up on the Irtysh and the Ob. These were united by Khan Ediger, and conflicts with the Russians who were then colonizing the Urals brought him into collision with Moscow; his envoys came to Moscow in 1555 and consented to a yearly tribute of a thousand sables. As early as the nth centuiy the Novgorodians had occasionally pene- trated into Siberia; but the fall of the republic and the loss of it's north-eastern dependencies checked the advance of the Russians across the Urals. On the defeat of the adventurer Stenka

Razin (1667-1671) many who were unwilling to submit to the iron rule of Moscow made their way to the settlements of Stroganov in Perm,

and tradition has it that, in order to get rid of his guests, Stroganov suggested to their chief, Yermak, that he should cross the Urals into Siberia, promising to help him with supplies of food and arms. Yermak entered Siberia in 1580 with a band of 1636 men, following the Tagil and Tura rivers. Next year they were on the Tobol, and 500 men successfully laid siege to Isker, the residence of Khan Kuchum, in the neighbourhood of what is now Tobolsk. Kuchum fled to the steppes, abandoning his domains to Yermak, who, accord- ing to tradition, purchased by the present of Siberia to Ivan IV. his own restoration to favour. Yermak was drowned in the Irtysh in 1584 and the Cossacks abandoned Siberia. But new bands of hunters and adventurers poured every year into the country, and were supported by Moscow. To avoid conflicts with the denser populations of the south, they preferred to advance eastwards along higher latitudes; meanwhile Moscow erected forts and settled labourers around them to supply the garrisons with food. Within eighty years the Russians had reached the Amur and the Pacific. This rapid conquest is accounted for by the circumstance that neither Tatars nor Turks were able to offer any serious resistance. In 1607- 1610 the Tunguses fought strenuously for their independence, but were subdued about 1623. I n 1628 the Russians reached the Lena, founded the fort of Yakutsk in 1637, and two years later reached the Sea of Okhotsk at the mouth of the Ulya river. The Buriats offered some opposition, but between 1631 and 1641 the Cossacks erected several palisaded forts in their territory, and in 1648 the fort on the upper Uda beyond Lake Baikal. In 1643 Poyarkov's boats descended the Amur, returning to Yakutsk by the Sea of Okhotsk and the Aldan, and in 1 649-1 650 Khabarov occupied the banks of the Amur. The resistance of the Chinese, however, obliged the Cossacks to quit their forts, and by the treaty of Nerchinsk (1689) Russia abandoned her advance into the basin of the river. In 1852a Russian military expedition under Muraviev explored the Amur, and by 1857 a chain of Russian Cossacks and peasants were settled along the whole course of the river. The accomplished fact was recognized by China in 1857 an d i860 by a treaty. In the same year in which Khabarov explored the Amur (1648) the Cossack Dejnev, starting from the Kolyma, sailed round the north-eastern extremity of Asia through the strait which was rediscovered and described eighty years later by Bering (1728).

Cook in 1778, and after him La Perouse, settled definitively the broad features of the northern Pacific coast. Although the Arctic Ocean had been reached as early as the first half of the 17th century, the exploration of its coasts by a series of expeditions under Ovtsyn, Minin, Pronchishev, Lasinius and Laptev — whose labours constitute a brilliant page in the annals of geographical discovery — was begun only in the 18th century (l735~ I 739)-

The scientific exploration of Siberia, begun in the period 1733 to 1742 by Messerschmidt, Gmelin, and De Lisle de la Croyere, was followed up by Miiller, Fischer and Georgi. Pallas, with several Russian students, laid the first foundation of a thorough exploration of the topography, fauna, flora and inhabitants of the country. The journeys of Hansteen and Erman (1828-1830) were a most important step in the exploration of the territory. Humboldt, Ehrenberg and Gustav Rose also paid in the course of these years short visits to Siberia, and gave a new impulse to the accumulation of scientific knowledge; while Ritter elaborated in his Asien (1832- 1859) the foundations of a sound knowledge of the structure of Siberia. Middendorff's journey (1844-1845) to north-eastern Siberia — contemporaneous with Castren's journeys for the special study of the Ural-Altaian languages — directed attention to the far north and awakened interest in the Amur, the basin of which soon became the scene of the expeditions of Akhte and Schwarz (1852), and later on (1854-1857) of the Siberian expedition to which we owe so marked an advance in our knowledge of East Siberia. The Siberian branch of the Russian Geographical Society was founded at the same time at Irkutsk, and afterwards became a permanent centre for the ex- ploration of Siberia; while the opening of the Amur and Sakhalin attracted Maack, Schmidt, Glehn, Radde and Schrenck, whose works on the flora, fauna and inhabitants of Siberia have become widely known.

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SIBI, a town and district of Baluchistan. The town is now an important junction on the Sind-Peshin railway, where the Harnai line and the Quetta loop line meet, near the entrance of the Bolan pass, 88 m. S.E. of Quetta. Pop. (1901) 4551. The district, which was constituted in

1903, has an area of 4152 sq. m.; pop. (1901) 74,555. The greater part became British territory by the treaty of Gandamak in 1879; the rest is ad- ministered under a perpetual lease from the khan of Kalat. Political control is also exercised over the Marri-Bugti country, with an additional area of 7129 sq. m.: pop. (1901) 38,919. Besides the town of Sibi, the district contains the sanatorium of Ziarat, the summer residence of the government. See Sibi District Gazetteer (Bombay, 1907). SIBONGA, a town of the province of Cebu, island of Cebu, Philippine Islands, on the E. coast, 30 m. S.W. of Cebu, the capital. Pop. (1903) 25,848. Sibonga is an agricultural town with a port for coasting vessels, and is served by a railway. The principal products are Indian corn and tobacco. The climate is hot, but healthy. The language is Cebu-Visayan.

SIBPUR, a town of British India, in the Hugli district of Bengal, on the right bank of the river Hugli, opposite Calcutta. It is a suburb of Howrah. It contains jute-mills, a flour-mill, rope-works, brick-works and other industrial establishments; the royal botanical garden; and the engineering college with electrical and mining departments and a boarding-house. The college, of gothic architecture, was originally built for a missionary institution, as the Bishop's College, in 1824. It has recently been decided to remove it to Ranchi, in Chota Nagpur. SIBSAGAR, a town and district of British India, in eastern Bengal and Assam. The town is situated on the Dikhu river, about 9 m. from the left bank of the Brahmaputra, being pictur- esquely built round a magnificent tank, covering an area of 114 acres. Pop. (1901) 5712. In 1907 the transfer of the district headquarters to Jorhak (pop. 2899), on the Disai river, was sanctioned.

The District or Sibsagar has an area of 4996 sq. m. It consists of a level plain, much overgrown with grass and jungle, and intersected by numerous tributaries of the Brahmaputra. It is divided by the little river Disai into two tracts, which differ in soil and general appearance. The surface of the eastern portion is very flat, the general level being broken only by the long lines of embankments raised by the Ahom kings to serve both as roadways and as a protection against floods. The soil consists of a heavy loam of a whitish colour, which is well adapted for rice cultivation. West of the Disai, though the surface soil is of the same character, the general aspect is diversified

by the protrusion of the subsoil, which consists of a stiff clay

abounding in iron nodules, and is furrowed by frequent ravines and water-courses, which divide the cultivable fields into innumerable small sunken patches or kolas. The chief river is the Brahmaputra, which is navigable throughout the year by steamers. The tributaries of the Brahmaputra comprise the Dhaneswari, the Dihing, the Disang and the Dikhu, all flowing in a northerly direction from the Naga Hills. Included within the district is the island of Maguli, formed by the silt brought down by the Subansiri river from the Himalayas and deposited in the wide channel of the Brahmaputra. Coal, iron, petroleum and salt are found. The climate, like that of the rest of the Assam valley, is comparatively mild and temperate, and the annual rainfall averages about 94 in.

In 10,01 the population was 597,969, showing an increase of 24 % in the decade. Sibsagar is the chief centre of tea cultivation in the Brahmaputra valley, which was introduced by the Assam Company in 1852. It contains a large number of well-managed tea-gardens, which bring both men and money into the province. There are also several timber mills. The Assam-Bengal railway serves the southern part of the district, and a light railway connects this line with Kalikamukh on the Brahmaputra, itself an important highway of communication.

On the decline of the Ahom dynasty Sibsagar, with the rest of the Assam valley, fell into the hands of the Burmese. As a result of the first Burmese war (1824-1826) the valley was annexed to British India, and the country now forming Sibsagar district, together with the southern portion of Lakhimpur, was placed under the rule of Raja Purandhar Singh, on his agreeing to pay a tribute of £5000. Owing to the raja's misrule, Sibsagar was reduced to a state of great poverty, and, as he was unable to pay the tribute, the territories were resumed by the government of India, and in 1838 were placed under the direct management of a British officer.

See Sibsagar District Gazetteer (Allahabad, 1906).

SIBTHORP, JOHN (1758-1796), English botanist, was born at Oxford on the 28th of October 1758, and was the youngest son of Dr Humphrey Sibthorp (1713-1797), who from 1747 to 1784 was Sherardian professor of botany at Oxford. He graduated at Oxford in 1777, and then studied- medicine at Edinburgh and Montpellier. In 1784 he succeeded his father in the Sherardian chair. Leaving his professional duties to a deputy he left England for Gottingen and Vienna, in preparation for a botanical tour in Greece (1786). Returning to England at the end of the following year he took part in the foundation of the Linnaean Society in 1788, and set to work on a

flora of Oxfordshire, which was published in 1794 as Flora Oxoniensis. He made a second journey to Greece, but developed consumption on the way home and died at Bath on the 8th of February 1796. By his will he bequeathed his books on natural history and agriculture to Oxford university, where also he founded the Sibthorpian professorship of rural economy, attaching it to the chair of botany. He directed that the endowment should first be applied to the publication of his Flora Graeca and Florae Graecae Frodromus, for which, however, he had done little beyond collecting some three thousand species and providing the plates. The task of preparing the works was undertaken by Sir J. E. Smith, who issued the two volumes of the Prodromus in 1806 and 1813, and six volumes of the Flora Graeca between 1806 and 1828. The seventh appeared in 1830, after Smith's death, and the remaining three were produced by John Lindley between 1833 and 1840.

Another member of the family, Ralph Waldo Sibthorp (1792-1879), a grandson of Dr Humphrey Sibthorp, was a well-known English divine. He was educated at Oxford and took Anglican orders in 181 5. He became known as a prominent " evangelical " in London, but in 1841 was received into the Roman Church. Two years later he returned to the Anglican Church, though he was not readmitted to the ministry till 1857. Finally he re-entered the Roman communion in 1865, but on his death in 1879 he was, by his own request, buried according to the service of the English Church. His elder brother, Colonel

Charles de Laet Waldo Sibthorp (1783-1855), represented Lincoln in parliament from 1826 until his death, except for a short period in 1833-1834, and was notorious for the vigour with which he expressed his opinions and for his opposition to the Catholic Emancipation Bill and the Reform Bill. The eldest son of Colonel Sibthorp, Gervaise Tottenham' Waldo Sib- thorp (1815-1861), was also M.P. for Lincoln.

SIBYLLINE ORACLES, a collection of Apocalyptic writings, composed in imitation of the heathen Sibylline books (see Sibyls) by the Jews and, later, by the Christians in their efforts to win the heathen world to their faith. The fact that they copied the form in which the heathen revelations were conveyed (Greek hexameter verses) and the Homeric language is evidence of a degree of external Hellenization, which is an important fact in the history of post-exilic Judaism. Such was the activity of these Jewish and Christian missionaries that their imitations have swamped the originals. Even Virgil in his fourth Eclogue seems to have used Jewish rather than purely heathen oracles.

The extant fragments and conglomerations of the Sibylline oracles, heathen, Jewish and Christian, were collected, examined, translated and explained by C. Alexandre in a monumental edition full of exemplary learning and acumen. On the basis of his results, as they have been scrutinized by scholars like Schiirer and Geffcken, it is possible to disentangle some of the different strata with a certain degree of confidence.

1. Book III. contains Jewish oracles relative to the Golden Age established by Roman supremacy in the East about the middle of the 2nd century B.C. (especially 1 75-181: cf. 1 Mace, viii. 1-16). The evacuation of Egypt by Antiochus Epiphanes at the bidding of the Roman ambassadors suits the warning addressed to ” Greece ” (732-740) against overweening ambition and any attempt upon the Holy City, which is somewhat strangely enforced by the famous Greek oracle, ” Let Camarina be, ‘tis best unstirred.” Older than these are the Babylonian oracle (97-154) and the Persian (381-387). A later Jewish oracle (46-62) refers to the wars of the second Triumvirate of Rome, and the whole compilation seems to come from a Christian redactor.

2. Book IV. is a definite .attack upon the heathen Sibyl — the Jews and Christians did not attempt to pass off their ” forgeries ” as genuine — as the mouthpiece of Apollo by a Jew who speaks for the Great God and yet uses a Greek review (49- 114) of ancient history from the Assyrian empire. There are references to the legendary escape of Nero to Parthia (119-124) and the destruction of Jerusalem in a.d. 70 (130-136).

3. Book V. contains a more developed form of the myth of Nero redivivus in which a panegyric on him (137-141) has been brought up to date by some Jew or Christian, and eulogies of Hadrian and his successors (48-51) side by side with the legend of the miserable death of Titus in quittance of his destruction of Jerusalem (411-413) which probably represents the hope of the zealots who survived it.

4. The remaining books appear to be Christian (some heretical) and to belong to the 2nd and 3rd centuries.

Editions. — C. Alexandre (Paris, 1841, 2 vols.; 1869, 1 vol.); Rzach (Prague, 1891; text and appendix of sources); Geffcken (Leipzig, 1902; text with full apparatus of variants, sources and parallel passages) ; see also his Komposition und Entstehungszeit des Oracula Sibyllina (Leipzig, 1902). An annotated Eng. trans, was undertaken in 1910 by H. C. O. Lanchester. For references to modern literature see Schiirer, Geschichte des jildischen Volkes, iii. (4 th ed.), 555-592. (J. H. A.H.)

SIBYLS 1 (Sibyllae), the name given by the Greeks and Romans to certain women who prophesied under the inspiration of a deity. The inspiration manifested itself outwardly in distorted features, foaming mouth and frantic gestures. Homer does not refer to a Sibyl, nor does Herodotus. The first Greek writer, so far as we know, who does so is Heraclitus (c. 500 B.C.). As to the number and native countries of the Sibyls much diversity of opinion prevailed. Plato only speaks of one, but in course of time the number increased to ten according to Lactantius

1 The word is usually derived from Sw-/3o\Xa, the Doric form oit 0«>D (3ouXi} (= will of God).

(quoting from Varro) : the Babylonian or Persian, the Libyan, the Cimmerian, the Delphian, the Erythraean, the Samian, the Cumaean, the Hellespontine, the Phrygian and the Tiburtine. The Sibyl of whom we hear most is the Erythraean, generally identified with the Cumaean, whom Aeneas consulted before his descent to the lower world (Aeneid, vi. 10); it was she who sold to Tarquin the Proud the Sibylline books. She first offered him nine; when he refused them, she burned three and offered him the remaining six at the same price; when he again refused them, she burned three more and offered him the remaining three still at the same price. Tarquin then bought them (Dion. Halic. iv. 62). He entrusted them to the care of two patricians; after 367 B.C. ten custodians were appointed, five patricians and five plebeians; subsequently (probably in the time of Sulla) their number was increased to fifteen. These officials, at the command of the senate, consulted the Sibylline books in order to discover, not exact predictions of definite future events, but the religious observances necessary to avert extraordinary calamities (pestilence, earthquake) and to expiate prodigies in cases where the national deities were unable, or unwilling, to help. Only the interpretation of the oracle which was con- sidered suitable to the emergency was made known to the public, not the oracle itself. An important effect of these books was the grecizing of Roman religion by the introduction of foreign deities and rites (worshipped and practised in the Troad) and the amalgamation of national Italian deities with the correspond- ing Greek ones (fully discussed in J. Marquardt, Staatsver- waltung, iii., 1885, pp. 42, 350, 382). They were written in hexa- meter verse and in Greek; hence the college of curators was always assisted by two Greek interpreters. The books were kept in the temple of Jupiter on

the Capitol and shared the destruction of the temple by fire in 83. After the restoration of the temple the senate sent ambassadors in 76 to Erythrae to collect the oracles afresh and they brought back about 1000 verses; others were collected in Ilium, Samos, Sicily, Italy and Africa. In the year 12 B.C. Augustus sought out and burned a great many spurious oracles and subjected the Sibylline books to a critical revision; they were then placed by him in the temple of Apollo Patroiis on the Palatine, where we hear of them still existing in a.d. 363. They seem to have been burned by Stilicho shortly after 400. According to the researches of R. H. Klausen (Aeneas und die Penaten, 1839), the oldest collection of Sibylline oracles appears to have been made about the time of Solon and Cyrus at Gergis on Mount Ida in the Troad; it was attributed to the Hellespontine Sibyl and was preserved in the temple of Apollo at Gergis. Thence it passed to Erythrae, where it became famous. It was this very collection, it would appear, which found its way to Cumae and from Cumae to Rome.

Some genuine Sibylline verses are preserved in the Book of Marvels (Utpl Bavnaaluv) of Phlegon of Tralles (2nd century a.d.). See H. Diels, Sibyllinische Blatter (1890). On the subject generally see J. Marquardt as above; A, Bouchfi-Leclerq, La Divination dans VantiquM (1879-1882); E. Maass, De Sibyllarum indicibus (1879); C. Schultess, Die sibyllinischen Biicher in Rom (1895; with references to authorities in notes).

SICANI, in ancient geography, generally regarded (together with the Elymi) as the oldest inhabitants of Sicily. Sicania (the country of the Sicani) and the Siculi (q.v.) or Siceli are mentioned in Homer (Odyssey, xx. 383, xxiv. 307), the latter apparently being known to the Greeks as slave-dealers. There existed considerable difference of opinion among the ancients as to the origin of the Sicani. From the similarity of name, it would be natural to identify them with the Siculi, but ancient authorities expressly state that they were two distinct peoples (see Sicily: History, ad init.). At first the Sicani occupied nearly the whole of the island, but were gradually driven by the Siceli into the interior and the N. and N.W. They lived chiefly in small towns and supported themselves by agriculture. These towns were not subject to a single king, but each had its own ruler and constitution. The most important of the towns to which a Sicanian origin can be with certainty assigned and whose site can be determined, are: Hyccara (Muro di Carini),

taken and plundered by the Athenians during the Sicilian expedition (415 B.C.) ; Omphake, between Agrigentum (Girgenti) and Gela (Terranova) ; and Camicus (site unknown), the residence of the

mythical Sicanian king Cocalus, constructed for him by Daedalus (q.v.), to whom he had given shelter when pursued by Minos, king of Crete.

SICARD, ROCH-AMBROISE CUCURRON (1742-1822), French abbe and instructor of deaf-mutes, was born at Le Fousseret, Haute-Garonne, on the 20th of September 1742. Educated as a priest, he was made principal of a school of deaf-mutes at Bordeaux in 1786, and in 1789, on the death of the Abb6 de l'Epee (see £pee), succeeded him at Paris. His chief work was his Cows d 'instruction d'un sourd-muet de naissance (1800). See Deaf and Dumb. The Abb6 Sicard managed to escape any serious harm in the political troubles of 1792, and became a member of the Institute in 179S, but the value of his educational work was hardly recognized till shortly before his death at Paris ontheiothof May 1822.

SICILY (Ital. Sicilia), an island of the Mediterranean Sea belonging to the kingdom of Italy, and separated from the nearest point of the mainland of Italy only by the Straits of Messina, which at their narrowest part are about 2 m. in width. It is nearly bisected by the meridian of 14 E., and by far the greater part lies to the south of 38 N. Its southernmost point, however, in 36 38′ N. is 40′ to the north of Point Tarifa, the southernmost point of Spain and of the continent of Europe. In shape it is roughly triangular, 1 whence the ancient poetical name of Trinacria, referring to its three promontories of Pelorum (now Faro) in the north-east, Pachynum (now Passero) in the south-east, and Lilybaeum (now Boeo) in the west. Its area > exclusive of the adjacent small islands belonging to the comparti- mento, is, according to the calculations of the Military Geographi- cal Institute of Italy, 9860 sq. m.; while the area of the whole compartimento is 9936 sq. m.

The island occupies that part of the Mediterranean in which the shallowing of the waters divides that sea into two basins, and in which there are numerous indications of frequent changes in a recent geological period. The channel between Cape Bon in Tunis and the south-west of Sicily (a distance of 80 m.) is, on the whole, shallower than the Straits of Messina, being for the most part under 100 fathoms in depth, and exceeding 200 fathoms only for a very short interval, while the Straits of Messina, have almost every where a depth exceeding 150 fathoms. The geological structure in the neighbourhood of this strait shows that the island must originally have been formed by a rupture between it and the mainland, but that this rupture must have taken place at a period long antecedent to the advent of man, so that the name Rhegium cannot be based even on the tradition of any

such catastrophe. The mountain range that runs out towards the north-east of Sicily is composed of crystal- line rocks precisely similar to those forming the parallel range of Aspromonte in Calabria, but both of these are girt about by sedimentary strata belonging in part to an early Tertiary epoch. That a subsequent land connexion took place, however, by the elevation of the sea-bed there is abundant evidence to show; and the occurrence of the remains of African Quaternary mammals, such as Elephas meridionalis, E. antiquus, Hippo- potamus pentlandi, as well as of those of still living African forms, such as Elephas africanus and Hyaena crocuta, makes it probable that there was a direct post-Tertiary connexion also with the African continent.

The north coast is generally steep and cliff-bound, and abundantly provided with good harbours, of which that of Palermo is the finest. In the west and south, and in the south part of the east side, the hills are much lower and recede farther from the sea. The coast is for the most part flat, more regular in outline and less favourable to shipping, while in the east. 1 The name Tpivcuipla was no doubt suggested by the Qpwaichi of Homer (which need no*, however, be Sicily), and the geography was then fitted to the apparent meaning given to the name by the change. But of these three so-called promontories the last is not a true promontory, and it is more accurate to treat Sicily as having a fourth side on the west.

SICILY

where the sea-bottom sinks rapidly down towards the eastern

basin of the Mediterranean, steep rocky coasts prevail except

opposite the plain of Catania. In the northern half of this coast

the lava streams of Mount Etna stand out for a distance of about

20 m. in a line of bold cliffs and promontories. At various points

on the east, north and west coasts there are evidences of a rise

of the land having taken place within historical times, at Trapani

on the west coast even within the 19th century. As in the rest

of the Mediterranean, tides are scarcely observable; but at

several points on the west and south coasts a curious oscillation

in the level of the waters, known to the natives as the marrobbio (or marobia), is sometimes noticed, and is said to be always preceded by certain atmospheric signs. This consists in a sudden rise of the sea-level, occasionally to the height of 3 ft., sometimes occurring only once, sometimes repeated at intervals of a minute for two hours, or even, at Mazzara, where it is most frequently observed, for twenty-four hours together.

The surface of Sicily lies for the most part more than 500 ft above the level of the sea. Caltanissetta, which occupies the middle point in elevation as well as in respect of geographical situation, stands 1900 ft. above sea-level. Considerable mount- ains occur only in the north, where the lower slopes of all the heights form one continuous series of olive-yards and orangeries. Of the rest of the island the greater part forms a plateau varying in elevation and mostly covered with wheat-fields. The only plain of any great extent is that of Catania, watered by the Simeto, in the east; to the north of this plain the active volcano of Etna rises with an exceedingly gentle slope to the height of 10,868 ft. from a base 400 sq. m. in extent. This is the highest elevation of the island. The steep and narrow crystalline ridge which trends north-eastwards, and is known to geographers by the name of the Peloritan Mountains, does not reach 4000 ft. The Nebrodian Mountains, a limestone range connected with the Peloritan range and having an east and west trend, rise to a somewhat greater height, and farther west, about the middle of the north coast, the Madonie (the only one of the groups mentioned which has a native name) culminate at the height of nearly 6500 ft. From the western end of the Nebrodian Mountains a lower range (in some places under 1500 [ft. in height) winds on the whole south-eastwards in the direction of Cape Passaro. With the exception of the Simeto, the principal perennial streams— the Salso, the Platani and the Belice— enter the sea on the soutli coast.

Geology*— In general, the older beds occur along the northern coast, and progressively newer and newer beds are found towards the south Folding, however, has brought some of the older beds to the surface in the hills which lie to the north and north-east of sciacca. I he Monti Pelontani at the north-eastern extremity of the island consists of gneiss and crystalline schists; but with this ex- ception the whole of Sicily is formed of Mesozoic and later deposits the Tertiary beds covering by

far the greater part. Triassic rocks lorm a discontinuous band along the northern coast, and are especially well developed in the neighbourhood of Palermo. They rise again to the surface in the southern part of the island, in the hills which , lie to the north of Sciacca and Bivona. In both areas thev are accompanied by Jurassic, and occasionally by Cretaceous, beds- but of the latter there are only a few small patches. In the south- eastern part of the island there are also a few very small outcrops of Mesozoic beds. The Eocene and Oligocene form a broad belt along the northern coast, very much more continuous than the Mesozoic band and from this belt a branch extends southwards to bciacca Another patch of considerable size lies to the east of r-iazza-Armenna. Miocene and Pliocene deposits cover nearly the whole of the country south of a line drawn from Etna to Marsala- and there is also a considerable Miocene area in the north about

£1!ˆ f” 1 j£ amC u’ avas , ?- nd a , shes of a recent geological period IM? no L onIy th u e wh °leof Etna but also a large part of the Monti

vn it e ?°c ut – h – Sraa ” P atch es occur also at Pachino and in the hills north of Sciacca.

Climate .— The climate of Sicily resembles that of the other lands m the extreme south of Europe. As regards temperature, it has the warm and equable character which belongs to most of the Mediter- ranean region. At Palermo (where continuous observations have been made since 1791) the range of temperature between the mean of

the coldest and that of the hottest month is little greater than at Greenwich. The mean temperature of January (5if°F) is neariv ˆ’ˆVlˆf of o 0ctober « the south of England that of j” v (77 F.) about 13° warmer than the corresponding month at Green wich. In only seven of the thirty years, l8 7 i-l|oo, was the tier mometer observed to sink below the freezing-point; frost thus occurs in the island even on the low grounds, though never for more than a few hours. On the coast snow is seldom seen, buITt

Toln TnH ram – a11 ˆ C6pt ° n th f h u igher ™°untains does not reach 30 m., and as in other parts of the extreme south of Eurooek occurs chiefly ln the winter months, while the three months (Tune July and August) are almost quite dry. During these Months the whole rainfall does not exceed 2 in., except on the slorfes of the

s m umme a r ln T n h P th v n r h – eaSt — *¥”? m ° St of * he streamsTy up tn summer. The chief scourge is the sirocco, which is experienced in its most characteristic form on the north coast, as an oppressive narch

atˆ dry Wmd – ˆ° win u g Strongl y and steadil y fr° P n? thTIouth the atmosphere remaining through the whole period of its duration leaden-coloured and hazy in consequence of the presence of immense Quantities of reddish dust. It occurs most frequently fn ApT and then m May and September, but no month is entirety Lefrom “t Three days are the longest period for which it lasts. The same Tame is some tl rnes applied to a moist and not very hot, but vet oppressive south-east wmd wh.ch blows from time to time on the east coS’ Malaria occurs in some parts of the island.

Mora.— The flora of Sicily is remarkable for its wealth of species- but comparing Sicily with other islands that have been longˆa*: ated from the mainland, the number of endemic species is not Seat The orders most abundantly represented are the Comtositae CrZ)’ ferae Labiatae Caryophyllaceae and ScrophulartceaTˆheRofaclae

fpecfesVth U e n ros n p tly Th PreSented ‘ and “Tl* them are numerous species ot the rose. The general aspect of the vegetation of Sirilv

however has been greatly affected, as in other partfof the Medker’ ranean, by the introduction of plants within historicaHimes Be’ng more densely populated than any other large Mediterranean island and haying its population dependent chiefly on the products of the soil it is necessarily more extensively cultivated than any other of the larger islands referred to, and many of the objects 01 cultivation are not originally natives of the island. Not to mention the oliw which must have been introduced at a remote perio d, a”l he memblrs of the orange tribe, the agave and the prickly pear as welUsTher plants highly characteristic of Sicilian scenery^ nave blel introduced since the beginning of the Christian era. With respect to vSefati™ and cultivation three zones may be distinguished. P The ˆ firTtreaches to about 1600 ft above sea-level, the upper limit of the members of the orange tribe; the second ascends to about 3300 ft the Hmit of the growth of wheat, the vine and the hardier Evergreens d the th.rd, that of forests reaches from about 330 ft upwards But it is not merely height that determines the genera character al ˆ ege , ta V° n – - The cultivated trees of Sicily moltiy demands uch an amount of moisture as can be obtained only on thelnountˆn slopes, and it is worthy of notice that the structure of the rnolmtains is peculiarly favourable to the supply

of this want. The Hmestones of which they are mostly composed act like a sponge abSrbW the rain-water through their innumerable pores and fissures and thuf storing it up in the interior, afterwards to allow it to well forth in SF • at , va y iOU ? Ovations lower down. In this way the rrfetion which is absolutely indispensable for the members of the orangf tribe tr nn Vu e – d – y S – eaSO – n is great] y facilitated, and even thosf trees for which irrigation ls not so indispensable receive a more amnk supply of moisture during the rainy season. Hence it Is that while the. plain of Catania is almost treeless and trˆ-cultivation k comparat.vely imited in the west and south, where tte exWof knd under 1600 ft. is considerable, the whole of the north and north east Trrt f -° m * f he B u ay ,° f Castellammare round to Catania is anˆndle s

with oTvlˆ Tˆl 8 ‘ m Which ° ranges ‘ citrons and lemons alternate with olives, almonds, pomegranates, figs, carob trees, pistachfos

?7™?t n lU?L Vl ?% ? he ,! imit in height of e oHve P s about ?,n™ = ‘£« that ° f the Vlne about 35O0 ft. The lemon is really grown upon a bitter orange tree, grafted to bear the lemon. A conriae able silk production depends on the cultivation of the nVulberrvTn the neighbourhood of Messina and Catania. Among oth™ trees and shrubs may be mentioned the sumach, the date-pafm the plantani various bamboos, cycads and the dwarf-palm, the last of which !nT- S ‘.VT 6 Parts 0i – Sicil y more P rofus ely han anywhere else ve d et n hˆ e n d T fa < te f r ? gi ° n in the s °uth-west yields almolt the only vegetable product of importance. The A rundo Dcnax, the tallest of European grasses, is largely grown for vine-stakes.

A general account of the geology of the island will be found in L Baldacci, Descrizwne geologica dell’ isola di Sicilia (Rome, 1886), Zta T 3 ?;. |, °?’,. fuller an d later information reference should be made to the publications of the Reale Comitato Geologico d’ltalia.

Population.— The area and population of the several provinces are shown m the table on the next page. Thus between 1881 and 1 901 the population increased at the rate of 20-5% The average density is extremely high for a country which lives almost exclusively by agriculture, and is much higher than the average for Italy in general, 293 per sq. m. In 1905 the popula- tion was 3,568,124, the rate of increase being only 4-4% per annum; the low rate is due to emigration.

Province.

Area in sq. m.

Population

1881.

Population

1901.

No. of Communes.

Density

per sq. m.

1901.

Caltanissetta . Catania . Girgenti . Messina . Palermo . Syracuse . Trapani .

1263 1917 1172 1246 1948 1442 948

266,379

563,457 312,487 460,924

699,151 341,526 283,977

329,449 703,598 380,666 550,895 796,151 433,796 373,569

28 63 41 97 76 32 20

262 371 317 440

403 296

373

9936

*2 ,927,901

3,568,124

357

- In 1861, 2,392,414; in 1871, 2,584,099.

The chief towns in each of these provinces, with their communal populations in 1901, are as follow: Caltanissetta (43,023), Castrogiovanni (26,081), Piazza Armerina (24,119), Terranova (22,019), San Cataldo (18,090); Catania (146,504), Caltagirone (44,527), Acireale (35,203), Giarre (26,194), Paterno (22,857), Leonforte (21,236), Bronte (20,166), Vizzini (18,013), Agira (17,634), Nicosia (15,811),-Grammichele (15,017); Girgenti (24,872), Canicatti (24,687), Sciacca (24,645), Licata (22,993), Favara (20,403) ; Messina (147,106), Racalmuto (16,028), Palma (14,384), Barcellona (24,133), Milazzo (16,214), Mistretta (14,041); Palermo (305,716), Partinico (23,668), Monreale (23,556), Termini Imerese (20,633), Bagheria (18,329), Corleone (16,350), Cefalu (14,518); Syracuse (31,807), Modica (49,951), Ragusa (32,453), Vittoria (32,219), Comiso (25,837), Noto (22,284), Lentini (17,100), Avola (16,301), Scicli (16,220), Palazzolo Acreide (15,106); Trapani (61,448), Marsala (57,824), Alcamo (51,798), Monte S. Giuliano (29,824), Castelvetrano (24,510), Castellammare del Golfo (20,665), Mazzara del Vallo (20,044) , Salemi

(17,159)- . .

The archiepiscopal sees (the suffragan sees, if any, being placed after each in brackets) are Catania (Acireale), Messina (Lipari, Nicosia, Patti), Monreale (Caltanissetta, Girgenti), Palermo (Cefalu, Mazara, Trapani), Syracuse (Caltagirone, Noto, Piazza Armerina).

Agriculture. — Sicily, formerly called the granary of Italy, ex- ported grain until the end of the 18th century. Now, although the island still produces every year some 15 million bushels, the supply barely suffices for the consumption of a population of which bread is almost the exclusive diet. The falling-off in the exportation of cereals is not a consequence of any decadence in Sicilian agriculture, but rather of the increase of population, which nearly doubled within the 19th century. Two types of agriculture prevail in Sicily — the extensive and the intensive. The former covers mainly the interior of the island and half the southern coast, while the latter is generally adopted on the eastern and northern coasts. Large holdings of at least 500 hectares (a hectare equals about 25 acres) are indispensable to the profitable pursuit of extensive agriculture. These holdings are usually called feudi or latifondi. Their proprietors alternate the cultivation of wheat with that of barley and beans. During the years in which the soil is allowed to

lie fallow, the grass and weeds which spring up serve as pasture for cattle, but the poverty of the pasture is such that at least two hectares are required for the maintenance of every animal. This poverty is due to the lack of rain, which, though attaining an annual average of 29 in. at Palermo, reaches only 21 in. at Syracuse on the east coast, and about 19! in. at Caltanissetta, on the central high plateau. The system of extensive cultivation proper to the latifondi gives an annual average gross return of about 200 lire per hectare (£3. 4s- 5d- per acre).

Intensive agriculture in Sicily is limited to fruit trees and fruit- bearing plants, and is not combined with the culture of cereals and vegetables, as in central and parts of northern Italy. Originally the Sicilian system was perhaps due to climatic difficulties, but now it is recognized in most cases to be more rational than com- bined culture. Large extents of land along the coasts are therefore exclusively cultivated as vineyards, or as olive, orange, and lemon groves. Vineyards give an annual gross return of between £11 and £13 per acre, and orange and lemon groves between £32 and £48 per acre. The by-products of the citrus-essences, citrate of lime, &c. are also of some importance. Much damage is done by the olive fly. Vegetables are grown chiefly in the neighbourhood of large cities. Almonds are freely cultivated, and they seem to be the only trees susceptible also of cultivation upon the latifondi together with grain. A large export trade in almonds is carried on with north and central Europe. Hazel nuts are grown in woods at a level of more than 1200 ft. above the sea. These also are largely exported to central Europe for use in the manufacture of chocolate. The locust bean (used for forage), figs, and peaches are widely grown, while in certain special zones the pistachio and the manna-ash yield rich returns. On the more barren soil the sumach shrub, the leaves of which are used for tanning, and the prickly pear grow freely. The latter fruit constitutes, with bread, the staple food of the poorest part of the rural population for several months in the year. The cultivation of cotton, which spread during the American War of Secession, is now rare, since it has not been able to withstand the competition of more favoured countries. All these branches of

intensive cultivation yield a higher gross return than that of the extensive system. Along the coast landed property is as a rule broken up into small holdings, usually cultivated by their owners. There is possibility of great development of market-gardening.

Climatic conditions prevent cattle-raising in Sicily from being as prosperous an undertaking as in central Italy. The total number of bullocks in the island is calculated to be less than 200,000; and although the ratio of consumption of meat is low in proportion to the

population, some of the cattle for slaughter have to be imported. Sheep and goats, which subsist more easily on scanty pasturage, are relatively more numerous, the total number being calculated at 700,000. Yet the wool harvest is scarce, and the pro- . duction of butter a negligible quantity, though there

is abundance of the principal product of Sicilian pasture lands, cheese of various kinds, for which there is a lively local demand. The Sicilian race of horses would be good but that it is not prolific, and has degenerated in consequence of insufficient nourishment and overwork. A better breed of horses is being obtained by more care- ful selection, and by crossing with Arab and English stallions imported by the government. Donkeys and mules of various breeds are good, and would be better were they not so often weakened by heavy work before attaining full maturity.

Forests.— The absence of forests, which cover hardly 3% of the total area of the island, constitutes a serious obstacle to the pros- perity of Sicilian pastoral and agrarian undertakings. The few remaining forests are almost all grouped around Etna and upon the high zone of the Madonian Mountains, a range which rises 40 m. west of Palermo, running parallel to the northern coast almost as far as Messina, and of which many peaks reach nearly 6000 ft. above the sea. Here they are chiefly composed of oaks and chestnuts.

In that part of the island which is cultivated intensively some 100 million gallons of wine are annually produced. Had not the phylloxera devastated the vineyards during the last decade of the 19th century, the production would be considerably higher; 7,700,000 gallons of olive oil and 2500 million oranges and lemons are also produced, besides the other minor products above referred to. The zone of the latifondi, or extensive culture, yields, besides wheat, nearly 8,000,000 bushels of barley and beans every year.

Mining. — The most important Sicilian mineral is undoubtedly sulphur, which is mined principally in the provinces of Caltanissetta and Girgenti, and in minor quantities in those of Palermo and Catania. Up to 1896 the sulphur industry was in a state of crisis due to the competition of pyrites, to the subdivision of the mines, to antiquated methods, and to a series of other causes which oc- casioned violent oscillations in and a continual reduction of prices. The formation of the Anglo-Italian sulphur syndicate arrested the downward tendency of prices and increased the output of sulphur, so that the amount exported in 1899 was 424,018 tons, worth £1,738,475, whereas some years previously the value of sulphur exported had hardly been

£800,000. Ninetejen-twentieths of the sulphur consumed in the world was formerly drawn from Sicilian mines, while some 50,000 persons were employed in the extrac- tion, manufacture, transport and trade in the mineral. But the development of the United States sulphur industry at the beginning of the 20th century created considerable difficulties, including the practical loss of the United States market. In 1906, when the con- cession to the Anglo-Sicilian Sulphur Company was about to expire, the government decreed that it'should be formed into an obligatory syndicate for a term of twelve years for the control of all sulphur produced in Sicily, and exempted from taxation and legal dues, foreign companies established in Italy to exploit industries in which sulphur is a principal element. The Bank of Sicily was further obliged to make advances to the sulphur industry up to four-fifths of the value of the sulphur deposited in the warehouses. The ex- ports of sulphur in December 1906 were 17,534 tons, as compared with 40,713 tons in 1905; in the year 1904 the total production was 3,291,710 tons (value about £1,522,229) and the total exports 508,980 tons, as compared with 470,341 tons in 1905.

Another Sicilian mineral industry is that of common salt and rock-salt. The former is distilled from sea-water near Trapani, and the latter obtained in smaller quantities from mines. The two branches of the industry yielded in 1899 about 180,000 tons per annum, worth £80,000, while in 1906 about 200,000 tons were made at Trapani' alone. About half this quantity is exported, principally to Norway. Besides salt, the asphalt mining industry may be mentioned. Its centre is the province of Syracuse. The value of the annual output is about £40,000, and the exports in 1906 amounted to nearly 103,000 tons. Pumice stone is also exported from Lipari (11,010 tons in

1904).

Other Industries. — Deep-sea fisheries give employment to some twenty thousand Sicilians, who exercise their calling not only off the coasts of their island, but along the north African shore, from Morocco to Tripoli. In 1894 (the last year for which accurate statistics have been issued) 350 fishing smacks were.in active service, giving a catch of 2480 tons of fish. Approximately, the value of the annual catch may be reckoned at from £600,000 to £800,000. During 1904 the coial fisheries employed 98 vessels with 1138 men: the

profits were about £75,264, the expenses being £64,664. The sponge divers brought up sponges valued at £24,630. The estimated hauls of tunny fish were 5534 tons, valued at £110,324.

The majority of the scanty Sicilian industries are directly con- nected with various branches of agriculture. Such, for instance, is the preparation of the elements of citric acid, which is manu- factured at an establishment at Messina. Older and more flourishing is the Marsala industry. Marsala wine is a product of the western vineyards situated slightly above sea-level. In 1899, wine was exported to the value of more than £120,000, while in 1906, 24,080 pipes of the value of £361 ,200 were shipped. The quantity consumed in Italy is far greater than that exported abroad.

Another flourishing Sicilian industry carried on by a large number of small houses is that of preserving vegetables in tins. Artichokes and tomato sauce are the principal of these products, of which several dozen million tins are annually exported from Sicily to the Italian mainland, to Germany and to South America. Manu- factories of furniture, carriages, gloves, matches and leather exist in large number in the island. They are, as a rule, small in extent, and are managed by the owners with the help of five, ten or at most twenty workmen. There are several glass works at Palermo, a cotton dyeing works at Messina, and a large metal foundry at Palermo. Large shipbuilding yards and a yard for the construction of trams and railway carriages have been constructed in the latter city. There are dry docks both at Palermo and Messina.

Communications. — Before i860 there was no railway in Sicily. The total length of Sicilian railways is now 890 m., all single lines. Their construction was rendered very costly by the mountainous character of the island. They formed a separate system (the Rete Sicula) until in 1906, like the rest of the railways of Italy, they passed into the hands of the state, with the exception of the line round Mount Etna and the line from Palermo to Corleone. Messina is connected with the railway system of the mainland by ferry-boats from Villa S. Giovanni and Reggio, on which the through carriages are conveyed across the straits. From Messina lines run along the northern coast to Palermo, and along the east coast via Catania to Syracuse: the latter line is prolonged along the south of the island (sometimes approaching, sometimes leaving the coast) via Canicatti as far as Aragona Caldare, Girgenti and Porto Empedocle. From Catania another line runs westward through the centre of the island via S, Caterina Xirbi (with a branch to Canicatti) to Roccapalumba (with a branch to Aragona Caldare) and thence northwards to Termini, on the line between

Messina and Palermo. This is the direct route from Catania to Palermo. From Catania begins the line round Etna following its south, west and northern slopes, and ending at Giarre Riposto on the east coast railway. From Valsavoia (14 m. S. of Catania on the line to Syracuse) a branch line runs to Caltagirone. From Falermo a line runs southwards to Corleone and S. Carlo (whence there are diligences to Sciacca on the south coast) and another to Castelvetrano, Marsala and Trapani, going first almost as far as the south coast and then running first west and then north along the west coast. The only part of the coast of the island which has no railways is that portion of the south coast between Porto Empedocle and Castelvetrano (Sciacca lies about midway between these two points), where a road already exists, and a railway is projected, and the precipitous north coast between Palermo and Trapani. A steam tramway runs from Messina to the Faro at the north-east extremity of the island, and thence along the north coast to Barcelona, and another along the east coast from Messina to Giampilieri : while the island is fairly well provided with high roads, but is very backward in rural communications, there being only 244 yds. of road per sq. m., as compared with 1480 yds. in north Italy. The communications by sea, however, are at least as important as those by land, even for passengers. A steamer leaves Naples every night for Palermo, and vice versa, the journey (208 m.) being done in 11 hours, while the journey by rail (438 m.), including the crossing of the Straits of Messina takes 19 j hours; and the weekly steamer from Naples to Messina (216 m.) takes 12 hours, while the journey by rail and ferry boat (292 m.) takes 14 hours. Palermo, Messina and Catania are the most important harbours, the former being one of the two headquarters (the other, and the main one, is Genoa) of the Navigazione Generale Italiana, and a port of call for the steamers from Italy to New York. Emigrants to the number of 37,638 left Palermo direct for New York in 1906, and no less than 46,770 in 1905, while others embarked at Messina and Naples.

The movement of trade in these three ports may be shown by the following table : —

1900 1904 1906

Tonnage of shipping

„ goods landed

„ shipping

,, goods landed

shipping

Palermo. Messina. 1 Catania.

1,658,848

398,718 2,298,054

445,036

2,403,8s! 2

1,683,244

213,624

2,265,381

3I54I4

2,574,872

1,245,954 235.575

1. 593.678 309,514

1,542,520

L The high proportion of shipping entering Messina is due to its position in the Straits. 2 Steamships only.

Of the other harbours, Porto Empedocle and Licata share with Catania most of the sulphur export trade, and the other ports of note are Marsala, Trapani, Syracuse (which shares with the road- stead of Mazzarelli the asphalt export trade). The total importation of coal in 1906 amounted to 519,478 tons, practically all British.

In 1904, 75,779 Sicilians were registered as seamen, and no steamships with a gross tonnage of 145,702 were registered in Sicily.

Economic, Intellectual, and Moral Conditions. — As a general rule, trade and the increase of production have not kept pace with the development of the ways of communication. The poverty of the Sicilian population is accentuated by the unequal distribution of wealth among the different classes of society. A small but comparatively wealthy class — composed principally of the owners of latifondi — resides habitually in the large cities of the island, or even at Naples, Rome or Paris. Yet even if all the wealthy landowners resided on their estates, their number would not be sufficient to enable them tc play in local public life a part corre- sponding to that of the English gentry. On the other hand, the class which would elsewhere be called the middle class is in Sicily ex- tremely poor. The origin of most of the abuses which vitiate Sicilian political life, and of the frequent scandals in the representative local administrations, is to be found in the straitened condition of the Sicilian middle classes.

Emigration only attained serious proportions within the last decade of the 19th century. In 1897 the permanent emigration from the island was 15,994, ln 1 &9&i 21,320, and in 1899, 24,604. Since then it has much increased: in 1905 the emigrants numbered 106,000, and in 1906, 127,000 (3-5% of the population). Of these about three-fourths would be adults; but the population has in- creased so fast as more than to cover the deficiency — with the dis- advantage, however, that in three years 220,000 workers were replaced by 320,000 infants.

The moral and intellectual defects of Sicilian society are in part results of the economic difficulties, and in part the effect of bad customs introduced or maintained during the long period of Sicilian isolation from the rest of Europe. When, in i860, Sicily was incorporated in the Italian kingdom, hardly a tenth of the population could read and write. Upon the completion of Unity, elementary schools were founded everywhere ; but, though education was free, the indigence of the peasants in some regions prevented them from taking full advantage of the opportunities offered. Thus, even now, 60% of the Sicilian conscripts come up for military service unable either to read or to write. Secondary and superior education is more diffused. The pupils of the secondary schools in Sicily number 3-94 per 1000, the maximum being 6-6o in Liguria and the minimum 1-65 in Basilicata.

Brigandage of the classical type has almost disappeared from Italy. The true brigands haunt only the most remote and most inaccessible mountains. Public security is better in the east than in the west portion of the island. Criminal statistics, though slowly diminishing, are still high — murders, which are the most frequent crimes, having

been 27 per 100,000 inhabitants in 1897-1898 and 25-23 per 100,000 in 1903, as against 2-57 in Lombardy, 2-00 in the district of Venetia, 4-50 in Tuscany and 5-24 in Piedmont. Violent assaults with infliction of serious wounds are also frequent. This readiness to commit bloodshed is largely attributable to the senti- ment of the Mafia (a.v.). (G. G. C. ; G. Mo. ; T. As.)

History

The geographical position of Sicily led almost as a matter of necessity to its historical position, as the meeting-place of the nations, the battle-field of contending races and creeds. For this reason, too, Sicily was never in historic times (nor, it seems, in prehistoric times either) the land of a single nation: her history exists mainly in its relation to the history of other lands. Lying nearer to the mainland of Europe and nearer to Africa than any other of the great Mediterranean islands, Sicily is, next to Spain, the connecting-link between those two quarters of the world. It stands also as a breakwater between the eastern and western divisions of the Mediterranean Sea. In prehistoric times those two divisions were two vast lakes, and Sicily is a surviving fragment of the land which once united the two continents. That Sicily and Africa were once joined we know only from modern scientific research ; that Sicily and Italy were once joined is handed down in legend. Sicily then, compara- tively near to Africa, but much nearer to Europe, has been a European land, but one specially open to invasion and settlement from Africa. It has been a part of western Europe, but a part which has had specially close relations with eastern Europe. It has stood at various times in close connexion with Greece, Africa and Spain; but its closest connexion has been with Italy. Still the history of Sicily should never be looked on as simply part of the history of Italy. Lying thus between Europe

and Africa, Sicily has been the battle-field of Europe and Africa. That is to say, it has been.at two separate periods the battle-field of Aryan and Semitic man. In the later stage of the strife it has been the battle-field of Christendom and Islam. This history Sicily shares with Spain to the west of it and with Cyprus to the east. And with Spain the island has had several direct points of connexion. There was in all likelihood a near kindred between the earliest inhabitants of the two lands. In later times Sicily was ruled by Spanish kings, both alone and in union with other kingdoms. The connexion with Africa has

consisted simply in the settlement of conquerors from Africa at two periods, first Phoenician, then Saracen. On the other hand, Sicily has been more than once made the road to African conquest and settlement, both by Sicilian princes and by the Roman masters of Sicily. The connexion with Greece, the most memorable of all, has consisted in the settlement of many colonies from old Greece, which gave the island the most brilliant part of its history, and which made the greater part practically Greek. This Greek element was strengthened at a later time by the long connexion of Sicily with the Eastern, the Greek-speaking, division of the Roman empire. And the influence of Greece on Sicily has been repaid in more than one shape by Sicilian rulers who have at various times held influence and dominion in Greece and elsewhere beyond the Adriatic. The connexion between Sicily and Italy begins with the primitive kindred between some of the oldest elements in each. Then came the contemporary Greek colonization in both lands. Then came the tendency in the dominant powers in southern Italy to make their way into Sicily also. Thus the Roman occupation of Sicily ended the struggle between Greek and Phoenician. Thus the Norman occupation ended the struggle between Greek and Saracen. Of this last came the long connexion between Sicily and southern Italy under several dynasties. Lastly comes the late absorption of Sicily in the modern kingdom of Italy. The result of these various forms of Italian influence has been that all the other tongues of the island have died out before the advance of a peculiar dialect of Italian. In religion again both Islam and the Eastern form of Christianity have given way to its Italian form. Like the British Isles, Sicily came under a Norman dynasty; under Norman rule the intercourse between the two countries was extremely close, and the last time that Sicily was the seat of a separate power it was under British protection.

The Phoenician, whether from old Phoenicia or from Carthage, came from lands which were mere strips of sea-coast with a boundless continent behind them. The Greek of old Hellas came from a land of islands, peninsulas and inland seas. So did the Greek of Asia, though he had, like the Phoenician, a vast continent behind him. In Sicily they all found a strip of sea-coast with an inland region behind; but the strip of sea- coast was not like the broken coast of Greece and Greek Asia, and the inland region was not a boundless continent like Africa or Asia. In Sicily therefore the Greek became more continental, and the Phoenician became more insular. Neither people ever occupied the whole island, nor was either people ever able to spread its dominion over the earlier inhabitants very far inland. Sicily thus remained a world of its own, with interests and disputes of its own,

and divided among inhabitants of various nations. The history of the Greeks of Sicily is con- stantly connected with the history of old Hellas, but it runs a separate course of its own. The Phoenician element ran an opposite course, as the independent Phoenician settlements in Sicily sank into dependencies of Carthage. The entrance of the Romans put an end to all practical independence on the part of either nation. But Roman ascendancy did not affect Greeks and Phoenicians in the same way. Phoenician life gradually died out. But Roman ascendancy nowhere crushed out Greek life where it already existed, and in some ways it strengthened it. Though the Greeks never spread their dominion over the island, they made a peaceful conquest of it. This process was in no way hindered by the Roman dominion.

The question now comes, Who were the original inhabitants of Sicily? The island itself, StwXta, Sicilia, plainly takes

its name from the Sicels (ZuceXot, Siculi), a people whom we find occupying a great part of the island, chiefly east of the river Gela. They appear also in Italy (see Siculi), in the toe of the boot, and older history or tradition P'jˆff' spoke of them as having in earlier days held a large aatSm place in Latium and elsewhere in central Italy. They were believed to have crossed the strait into the island about 300 years before the beginning of the Greek settlements, that is to say in the nth century B.C. They found in the island a people called Sicans (cf. Odyssey, xxiv. 306), who claimed to be oiiTOxOovts {i.e. to have originated in the island itself), but whose name, we are told, might pass for a dialectic form of their own, did not the ancient writers expressly affirm them to be a wholly distinct people, akin to the Iberians. Sicans also appear with the Ligurians among the early inhabitants of Italy (Virg. Aen. vii. 795, viii. 328, xi. 317, and Servius's note). That the Sicels spoke a tongue closely akin to Latin is plain from several Sicel words which crept into Sicilian Greek, and from the Siceliot system of weights and measures — utterly unlike anything in old Greece. When the Greek settlements began, the Sicans, we are told, had hardly got beyond the life of villages on hill-tops (Dion. Hal. v. 6). Hyccara, on the north coast, is the one exception; it was probably a fishing settlement. The more advanced Sicels had their hill-forts also, but they had learned the advantages of the sea, and they already had settlements on the coast when the Greeks came. As we go on, we hear of both Sicel and Sican towns; 1 but we may suspect that any approach to true city life was owing to Greek influences. Neither people grew into any form of national unity. They were there- fore partly subdued, partly assimilated, without much effort.

The investigations of Professor Orsi, director of the museum at Syracuse, have thrown much light on the primitive peoples of south-eastern Sicily. Of palaeolithic man hardly any traces are to be found; but, though western Sicily has been com- paratively little explored, and the results hardly published at all, in several localities neolithic remains, attributable to the Sicani, have been discovered. The later Siculi do not appear to be a distinct race (cf. P. Orsi in Notizie degli scavi, 1898, 223), and probably both are branches of the Libyco-Iberian stock. Whereas other remains attributable to their villages or settle- ments are rare, their rock-hewn tombs are found by the thousand in the limestone cliffs of south-eastern Sicily. Those of the earliest period, the lower limit of which is put about 1500 B.C., are aeneolithic, metal being, however, rare and only found in the form of small ornaments; pottery with linear decoration is abundant. The second period (1500-1000 B.C.) shows a great increase in the use of bronze, and the introduction of gold and silver, and of imported Mycenaean vases. The chief cemeteries of this period have been found on Plemmyrium, the promontory south of Syracuse, at Cozzo Pantano, at Thapsus, at Pant.alica near Palazzolo, at Cassibile, south of Syracuse, and at Molinello near Augusta. The third period (1000-500 B.C.) in its first phase (1000-700) shows a continual increase of the introduction of objects of Greek origin; the pottery is at first imported geometric, and then vases of local imitation appear. Typical cemeteries are those of Monte Finocchito near Noto, of Noto itself, of Pantalica and of Leontini. In the second phase (700- 500 B.C.), sometimes called the fourth period, proto-Corinthian and Attic black figured vases are sometimes, though rarely, found, while local geometric pottery develops considerably. But the form of the tombs always remains the same, a small low chamber hewn in the rock, with a rectangular opening about 2 by 25 ft., out of which open other chambers, each with its separate doorway; and inhumation is adopted without excep- tion, whereas in a Greek necropolis a low percentage of cases of

1 Leontini, Megara, Naxos, Syracuse, Zancle are all recorded as sites where the Sicel gave way to the Greek (in regard to Syracuse [q.v.] this has recently been proved to be true), while many other towns remained Sicel longer, among them Abacaenum, Agyrium, Assorus, Centuripae, Cephaloedium, Engyum, Hadranum, Halaesa, Henna, Herbessus, Herbita, Hybla Galeatis, Inessa, Kafe Akte, Menaenum, Morgantina. The sites of several of these towns are doubtful.

cremation Is always present. Typical cemeteries of this period have been found at Licodia Eubea, Ragusa and Grammichele. After the failure of Ducetius to re-establish the Sicel nation- ality, Greek civilization triumphed over that of the Sicels entirely, and it has not yet been possible to trace the survivals of the latter. See Orsi in Romische Mitteilungen, 1898, 305 sqq., and Atti del Congresso Internazionale di Scienze Storiche (Rome, April 1903); also Archeologia (Rome, 1904, 167-191).

In the north-west corner of the island we find a small territory occupied by a people who seem to have made much greater advances towards civilized life. The Elymi were a people of uncertain origin, but they claimed a mixed descent, partly Trojan, partly Greek. Thucydides, however, unhesitatingly reckons them among barbarians. They had considerable towns, as Segesta and Eryx, and the history, as well as the remains, of Segesta, shows that Greek influences prevailed among them very early, while at Eryx Phoenician influence was stronger.

But, as we have already seen, the Greeks were not the first colonizing people who were drawn to the great island. As in Cyprus and in the islands of the Aegean, the Phoenicians were before them. And it is from this presence of the highest forms of Aryan and of Semitic man that the history of Sicily draws its highest interest. Of Phoenician occupation there are Early two > or ratner three, marked periods. We must always

Phoenician remember that Carthage — the new city — was one of Mettle- the latest of Phoenician foundations, and that the days meats. Q £ t k e Carthaginian dominion show us only the latest form of Phoenician fife. Phoenician settlement in Sicily began before Carthage became great, perhaps before Carthage came into being. A crowd of small settlements from the old Phoenicia, settlements for trade rather than for dominion, factories rather than colonies, grew up on promontories and small islands all round the coast (Thuc. vi. 2). These were unable to withstand the Greek settlers, and the Phoenicians of Sicily withdrew step by step to form three considerable towns in the north-west corner of the island near to the Elymi, on whose alliance they relied, and at the shortest distance by sea from Carthage — Motya, Solous or Soluntum, and Panormus (see Palermo).

Our earlier notices of Sicily, of Sicels and Sicans, in the Homeric poems and elsewhere, are vague and legendary. Both races appear as given to the buying and selling of slaves OraeA (qˆ xˆ 2gˆ j xxiv. 21). The intimate connexion be-

tfOJI< " tween old Hellas and Sicily begins with the foundation of the Sicilian Naxos by Chalcidians of Euboea under Theocles, which is assigned to 735 B.C. (Thuc. v. 3-5). The site, a low promontory on the east coast, immediately below the height of Tauromenium, marks an age which had advanced beyond the hill-fortress and which thoroughly valued the sea. The next year Corinth began her system of settlement in the west: Corcyra, the path to Sicily, and Syracuse on the Sicilian coast were planted as parts of one enterprise. From this time, for about 150 years, Greek settlement in the island, with some intervals, goes steadily on. Both Ionian and Dorian colonies were planted, both from the older Greek lands and from the older Sicilian settlements. The east coast, nearest to Greece and richest in good harbours, was occupied first. Here, between Naxos and Syracuse, arose the Ionian cities of Leontini and Catana (728 B.C.), and the Dorian Megara Hyblaea (726 B.C.). Settlement on the south-western coast began about 688 B.C. with the joint Cretan and Rhodian settlement of Gela, and went on in the foundation of Selinus (the most distant Greek city on this' side), of Camarina, and in 582 B.C. of the Geloan settlement of Acragas (Agrigentum, Girgenti), planted on a high hill, a little way from the sea, which became the second city of Hellenic Sicily. On the north coast the Ionian Himera (founded in 648 B.C.) was the only Greek city in Sicily itself, but the Cnidians founded Lipara in the Aeolian Islands. At the north-east corner, opposite to Italy, and commanding the strait, arose Zancle, a city of uncertain date (first quarter of the 7th century B.C.) and mixed origin, better known as Messana (Messene, Messina).

Thus nearly all the east coast of Sicily, a great part of the south coast, and a much smaller part of the north, passed into

the hands of Greek settlers — Siceliots (2twXt«roi), as dis- tinguished from the native Sicels. This was one of the greatest advances ever made by the Greek people. The Greek element began to be predominant in the island. Among the earlier inhabitants the Sicels were already becoming adopted Greeks. Many of them gradually sank into a not wholly unwilling subjec- tion as cultivators of the soil under Greek masters. But there were also independent Sicel towns in the interior, and there was a strong religious intercommunion between the two races. Sicel Henna (Enna, Castrogiovanni) is the special seat of the worship of Demeter and her daughter.

The Phoenicians, now shut up in one corner of the island, with Selinus on one side and Himera on the other founded right in their teeth, are bitter enemies; but the time of their renewed greatness under the headship of Carthage Prosperous has not yet come. The 7th century

B.C. and the perioA early part of the 6th were a time in which the Greek cities of Sicily had their full share in the general prosperity of the Greek colonies everywhere. For a while they outstripped the cities of old Greece. Their political constitutions were aristocratic; that is, the franchise was confined to the descend- ants of the original settlers, round whom an excluded body (Srjfios or plebs) was often growing up. The ancient kingship was perhaps kept on or renewed in some of the Siceliot and Italiot towns; but it is more certain that civil dissensions led very early to the rise of tyrants. The most famous if not the first 1 is Phalaris (q.v.) of Acragas (Agrigentum), whose exact date is uncertain, whose letters are now cast aside, and whose brazen bull has been called in question, but who clearly rose to power very soon after the foundation of Acragas. Under his rule the city at once sprang to the first place in Sicily, and he was the first Siceliot ruler who held dominion over two Greek cities, Acragas and Himera. This time of prosperity was also a time of intellectual progress. To say nothing of lawgivers like Charondas, the line of Siceliot poets began early, and the circumstances of the island, the adoption of many of its local traditions and beliefs — perhaps a certain intermingling of native blood — gave the intellectual life of Sicily a character in some things distinct from that of old Hellas. Stesichorus of Himera (c. 632-556 B.C.) holds a great place among the lyric poets of Greece, and some place in the political history of Sicily as the opponent of Phalaris. The architecture and sculpture of this age have also left some of their most remarkable monu- ments among the Greek cities of Sicily. The remains of the old temples of Selinus, with their archaic metopes, attributed to the 6th century B.C., show us the Doric style in its earlier state. In this period, too, begins the fine series of Sicilian coins (see Numismatics: Sicily).

This first period of Sicilian history lasts as long as Sicily remains untouched from any non-Hellenic quarter outside, and as long as the Greek cities in Sicily remain as a rule independent of one another. A change begins in the 6th century ,.™aii/es. and is accomplished early in the 5th. The Phoe- nician settlements in Sicily become dependent on Carthage, whose growing power begins to be dangerous to the Greeks of Sicily. Meanwhile the growth of tyrannies in the Greek cities was beginning to group several towns together under a single master, and thus to increase the greatness of particular cities at the expense of their freedom. Thus Thero of Acragas (488-472), who bears a good character there, acquired also, like Phalaris, the rule of Himera. One such power held dominion both in Italy and Sicily. Anaxilaus of Rhegium, by a long and strange tale of treachery, occupied Zancle and changed its name to Messana. But the greatest of the Siceliot powers,

that of the Deinomenid dynasty, began at Gela in 505, and was in 485 translated by Gelo (q.v.) to Syracuse. That city now became the centre of a greater dominion over both Greeks and Sicels than the island had ever before seen. But Gelo, like several later tyrants of Syracuse, takes his place — – and it is the redeeming point in the position of all of them — as

1 Panaetius of Leontini (608 B.C.) is said to have been the earliest tyrant in Sicily.

the champion of Hellas against the barbarian. The great double invasion of 480 B.C. was planned in concert by the barbarians of the East and the West (Diod. xi. 1; schol. on Pind., Pyth. i. 146; Grote v. 294). While the Persians threatened old Greece, Carthage threatened the Greeks of Sicily. There were Siceliots who played the part of the Medizers in Greece: Selinus was on the side of Carthage, and the coming of Hamilcar was immediately brought about by a tyrant of Himera driven out by Thero. But the united power of Gelo and Thero, whose daughter Damarete Gelo had married, crushed the invaders in the great battle of Himera, won, men said, on the same day as Salamis, and the victors of both were coupled as the joint deliverers of Hellas (Herod, vii. 165-167; Diod. xx. 20-25; Pind. Pyth. i. 147-156; Simonides, fr. 42; Polyaenus i. 27). But, while the victory of Salamis was followed by a long war with Persia, the peace which was now granted to Carthage stayed in force for seventy years. Gelo was followed by his brother Hiero (478-467), the special subject of the songs of Pindar. Acragas meanwhile flourished under Thero; but a war between him and Hiero led to slaughter and new settlement at Himera. These transplantings from city to city began under Gelo and went on under Hiero (q.v.). They made speakers in old Greece (Thuc. vi. 17) contrast the permanence of habitation there with the constant changes in Sicily.

None of these tyrannies was long-lived. The power of Thero fell to pieces under his son Thrasydaeus. When the power of Hiero passed in 467 B.C. to his brother Thrasybulus'the freedom of Syracuse was won by a combined movement of Greeks and Sicels, and the Greek cities gradually settled down as they had been before the tyrannies, only with a change to democracy in their constitutions. The mercenaries

who had received citizenship from the tyrants were settled at Messana. About fifty years of great prosperity followed. Art, science, poetry had all been encouraged by the tyrants. To these was added the special growth of freedom — the art of public speaking, in which the Sicilian Greeks became especially proficient, Corax being the founder of the rhetorical school of Sicily. Epicharmus (540-450), carried as a babe to Sicily, is a link between native Siceliots and the strangers invited by Hiero; as the founder of the local Sicilian comedy, he ranks among Siceliots. After him Sophron of Syracuse gave the Sicilian mimes a place among the forms of Greek poetry. But the intellect of free Sicily struck out higher paths. Empedocles of Acragas is best known from the legends of his miracles and of his death in the fires of Aetna; but he was not the less philosopher, poet and physician, besides his political career. Gorgias {q.v.) of Leontini had a still more direct influence on Greek culture, as father of the technical schools of rhetoric throughout Greece. Architecture too ad- vanced, and the Doric style gradually lost somewhat of its ancient massiveness. The temple at Syracuse, which is now the metro- politan church, belongs to the earlier days of this time. It is followed by the later temples at Selinus, among them the temple of Apollo, which is said to have been the greatest in Sicily, and by the wonderful series at Acragas (see Agrigentum) .

During this time of prosperity there was no dread of Carthaginian inroads. Diodorus's account of a war between Segesta and Lilybaeum is open to considerable suspicion. We have, on the other hand, Pausanias's evidence for the exist- ence in his day at Olympia of statues offered by Acragas out of spoil won from Motya, assigned to Calamis, an artist of this period (Freeman ii. 552), and the evidence of contemporary Condition inscriptions (1) for a Selinuntine victory over some un- of sicels knownenemy (possibly over Motya also), (2)for dealings aad between Athens and Segesta with reference to Halicyae,

a Sican town. The latter is important as being the first appearance of Athens in Sicily. As early as 480 (Freeman iii. 8) indeed Themistocles seems to have been looking westward. Far more important are our notices of the earlier inhabitants. For now comes the great Sicel movement under Ducetius, who, between force and persuasion, came nearer towards uniting his people into one body than had ever been done before. From his native hill-top of Menae, rising above the lake dedicated to

the Palici, the native deities whom Sicels and Greeks alike honoured, he brought down his people to the new city of Palicae in the plain. His power grew, and Acragas could withstand him only by the help of

Syracuse. Alternately victorious and defeated, spared by the Syracusans on whose mercy he cast himself as a suppliant (451), sent to be safe at Corinth, he came back to Sicily only to form greater plans than before. War between Acragas and Syracuse, which arose on account of his return, enabled him to carry out his schemes, and, with the help of another Sicel prince of Herbita, who bore the Greek name of Archonides, he founded Kale Akte on the northern coast. But his work was cut short by his death in 440; the hope of the Sicel people now lay in assimilation to their Hellenic neigh- bours. Ducetius's own foundation of Kale Akte lived on, and we presently hear of Sicel towns under kings and tyrants, all marking an approach to Greek life. Roughly speaking, while the Sicels of the plain country on the east coast became subject to Syracuse, most of those in other parts of the island remained independent. Of the Sicans we hear less; but Hyccara in the north-west was an independent Sican town on bad terms with Segesta. On the whole, setting aside the impassable barrier between Greek and Phoenician, other distinctions of race within the island were breaking down through the spread of the Hellenic element, but among the Greek cities themselves the distinction between the Dorian and the Ionian or Chalcidian settlements was still keenly felt.

Up to this time the Italiot and Siceliot Greeks have formed part of the general Greek world, while within that world they have formed a world of their own, and Sicily has again

formed a world of its own within that. Wars and 1 ‘ ,tel >

Terence ot conquests between Greeks and Greeks, especially on the A tneas ,

part of Syracuse, though not wanting, have been on the whole less constant than in old Greece. It is even possible to appeal to a local Sicilian patriotism (Thuc. vi. 64, 74). Presently this state of Sicilian isolation was broken in upon by the great Peloponnesian War. The Siceliot cities were drawn into alliance with one side or the other, till the main interest of Greek history gathers for a while round the Athenian attack on Syracuse. At the very beginning of the war the Lacedaemonians looked for help from the Dorian Siceliots. But the first active inter- vention came from the other side. Conquest in Sicily was a favourite dream at Athens (see Peloponnesian War). But it was only in 427 an opportunity for Athenian interference was found in a quarrel between Syracuse and Leontini and their allies. Leontini craved help from Athens on the ground of Ionian kindred. Her envoy was Gorgias; his peculiar style of rhetoric was now first heard in old Greece (Diod. xii. 53, 54), and his pleadings were successful. For

several years from this time (427-422) Athens plays a part, chiefly unsuccessful, in Sicilian affairs. But the particular events are of little import- ance, except as leading the way to the greater events that follow. The far more memorable interference of Athens in Sicilian affairs in the year 415 was partly in answer to the cry. of the exiles of Leontini, partly to a quite distinct appeal from the Elymian Segesta. That city, an ally of Athens, asked for Athenian help against its Greek neighbour Selinus. In a dispute, partly about boundaries, partly about the right of intermarriage between the Hellenic and the Hellenizing city, Segesta was hard pressed. She vainly asked for help at Acragas — some say at Syracuse (Diod. xii. 82) — and even at Carthage. The last appeal was to Athens.

The details of the great Athenian expedition (415-413) belong partly to the political history of Athens (q.v.), partly to that of Syracuse (q.v.). But its results make it a marked epoch in Sicilian history, and the Athenian plans, if ex p" d ^° oa successful, would have changed the whole face of the West. If the later stages of the struggle were remarkable for the vast number of Greek cities engaged on both sides, and for the strange inversion of relations among them on which Thucydides (vii. 57, 58) comments, the whole war was yet more remarkable for the large entrance of the barbarian element into the Athenian reckonings. The war was undertaken on behalf of Segesta;

the Steels gave Athens valuable help; the greater barbarian powers out of Sicily also came into play. Some help actually came from Etruria. But Carthage was more far-sighted. If Syracuse was an object of jealousy, Athens, succeeding to her dominion, creating a power too nearly alike to her own, would have provoked far greater jealousy. So Athens found no active support save at Naxos and Catana, though Acragas, if she would not help the invaders, at least gave no help to her own rival. But after the Spartan Gylippus came, almost all the other Greek cities of Sicily were on the side of Syracuse. The war is instruc- tive in many ways. It reminds us of the general conditions of Greek seamanship when we find that Corcyra was the meeting- place for the allied fleet, and that Syracuse was reached only by a coasting voyage along the shores of Greek Italy. We are struck also by the low military level of the Sicilian Greeks. The Syracusan heavy-armed are as far below those of Athens as those of Athens are below those of Sparta. The quasi-continental character of Sicily causes Syracuse, with its havens and its island, to be looked on, in comparison with Athens,

as a land power (JitrtLpSiTox, Thuc. vii. 21). That is to say, the Siceliot level represents the general Greek level as it stood before the wars in which Athens won and defended her dominion. The Greeks of Sicily had had no such military practice as the Greeks of old Greece; but an able commander could teach both Siceliot soldiers and Siceliot seamen to out-manceuvre Athenians. The main result of the expedition, as regards Sicily, was to bring the island more thoroughly into the thick of Greek affairs. Syracuse, threatened with destruction by Athens, was saved by the zeal of her metropolis Corinth in stirring up the Peloponnesian rivals of Athens to help her, and by the advice of Alcibiades after his withdrawal to Sparta. All chance of Athenian dominion in Sicily or elsewhere in the west came to an end. Syracuse repaid the debt by good service to the Peloponnesian cause, and from that time the mutual influence of Sicily and old Greece is far stronger than in earlier times.

But before the war in old Greece was over, seventy years after the great victory of Gelo (410), the Greeks of Sicily had to undergo barbarian invasion on a vaster scale than Phoenician ever. The disputes between Segesta and Selinus invasion called in these enemies also. Carthage, after a long under period of abstention from intervention in Sicilian affairs, and the observance of a wise neutrality during the war between Athens and Syracuse, stepped in as the ally of Segesta, the enemy of her old ally Selinus. Her leader was Hannibal, grandson and avenger of the Hamilcar who had died at Himera. In 409, at the head of a vast mercenary host, he sailed to Sicily, attacked Selinus (q.v.), and stormed the town after a murderous assault of nine days. Thence he went to Himera, with the object of avenging his grandfather. By this time the other Greek cities were stirred to help, while Sicels and Sicans joined Hannibal. At last Himera was stormed, and 3000 of its citizens were solemnly slaughtered on the spot where Hamilcar had died. Hannibal then returned to Carthage after an absence of three months only. The Phoenician possessions in Sicily now stretched across the island from Himera to Selinus. The next victim was Acragas, against which another expedition sailed in 406 under Hannibal and Himilco; the town was sacked and the walls destroyed.

Meanwhile the revolutions of Syracuse affected the history of Sicily and of the whole Greek world. Dionysius (q.v.) the tyrant began his reign of thirty-eight years in the first 1 y months of 405. Almost at the same moment, the new Carthaginian commander, Himilco, attacked Gela and Camarina. Dionysius, coming to the help of Gela, was defeated, and was charged (no doubt with good ground) with treachery. He now made the mass of the people of both towns find

shelter at Syracuse. But now a peace, no doubt arranged at Gela, was formally concluded (Freeman iii. 587). Carthage was confirmed in her possession of Selinus, Himera and Acragas, with some Sican districts which had opposed her. The people of Gela and Camarina were allowed to occupy their unwalled towns as tributaries of Carthage. Leontini, latterly a Syracusan fort, as

well as Messana and all the Sicels, were declared independent, while Dionysius was acknowledged as master of Syracuse (Diodorus xiii. ir4). No war was ever more grievous to freedom and civilization. More than half Sicily was now under barbarian dominion; several of its noblest cities had perished, and a tyrant was established in the greatest. The 5th century b. c, after its central years of freedom and prosperity, ended in far deeper darkness than it had begun. The minuter account of Dionysius belongs to Syracusan history; but his position, one unlike anything that had been before seen in Sicily or elsewhere in Hellas, forms an epoch in the history of Europe. His only bright side is his championship of Hellas against the Phoenician, and this is balanced by his settlements of barbarian mercenaries in several Greek cities. Towards the native races his policy varied according to momentary interests; but on the whole his reign tended to bring the Sicels more and more within the Greek pale. His dominion is Italian as well as Sicilian; his influence, as an ally of Sparta, is important in old Greece; while, as a hirer of mercenaries everywhere, he had wider relations than any earlier Greek with the nations of western Europe. He further opened new fields for Greek settlement on both sides of the Adriatic. In short, under him Sicily became for the first time the seat of a great European power, while Syracuse, as its head, became the greatest of European cities. His reign was unusually long for a Greek tyrant, and his career furnished a model for other rulers and invaders of Sicily. With him in truth begins that wider range of Greek warfare, policy and dominion which the Macedonian kingdoms carry on.

The reign of Dionysius (405-367) is divided into marked periods by four wars with Carthage, in 398-397, 392, 383-378 and 368. Before the first war his home power was all but overthrown; he was besieged in Syracuse itself u h war in 403; but he lived through the storm, and extended Carthage. his dominion over Naxos, Catana and Leontini. All three perished as Greek cities. Catana was the first Siceliot city to receive a settlement of Campanian mercenaries, while others settled in non-Hellenic Entella. Naxos was settled by Sicels; Leontini was again merged in Syracuse. Now begin the dealings of Dionysius with Italy, where the Rhegines, kinsmen of Naxos and Catana, planned a fruitless attack on him in common with Messana. He then sought a wife at Rhegium, but was refused with scorn, while Locri gladly gave him

Doris. The two cities afterwards fared accordingly. In the first war with Carthage the Greek cities under Carthaginian dominion or dependence helped him; so did Sicans and Sicels, which last had among them some stirring leaders; Elymian Segesta clave to Carthage. Dionysius took the Phoenician stronghold of Motye; but Himilco recovered it, destroyed Messana, founded the hill-town of Tauromenium above Naxos for Sicels who had joined him, defeated the fleet of Dionysiusoff Catana and besieged Syracuse. Between invasion and home discontent, the tyrant was all but lost; but the Spartan Pharacidas stood his friend; the Carthaginians again suffered from pestilence in the marshes of Lysimelia; and after a masterly combined attack by land and sea by Dionysius Himilco went away utterly defeated, taking with him his Carthaginian troops and forsaking his allies. Gela, Camarina, Himera, Selinus, Acragas itself, became subject allies of Dionysius. The Carthaginian dominion was cut down to what it had been before Hannibal's invasion. Dionysius then planted mercenaries at Leontini, conquered some Sicel towns, Henna among them, and made alliances with others. He restored Messana, peopling it with motley settlers, among whom were some of the old Messenians from Peloponnesus. But the Spartan masters of the old Messenian land grudged this possible beginning of a new Messenian power. Dionysius therefore moved his Messenians to a point on the north coast, where they founded Tyndaris. He clearly had a special eye to that region. He took the Sicel Cephaloedium (Cefalii), and even the old Phoenician border-fortress of Solous was betrayed to him. He beat back a Rhegine expedition; but his advance was checked by a failure to take the new Sicel settlement of Tauro- menium. His enemies of all races now declared themselves.

Many of the Sicels forsook him; Acragas declared herself independent; Carthage herself again took the field.

The Carthaginian war of 392-391 was not very memorable. Both sides failed in their chief enterprises, and the main interest of the story comes from the glimpses which we get of the Sicel states. Most of them joined the Carthaginian leader Mago; but he was successfully withstood at Agyrium by Agyris, the ally of Dionysius, who is described as a tyrant second in power to Dionysius himself. This way of speaking would imply that Agyrium had so far advanced in Greek ways as to run the usual course of a Greek commonwealth. The two tyrants drove Carthage to a peace by which she abandoned all her

Sicel allies to Dionysius. This time he took Tauromenium and settled it with his mercenaries. For new colonists of this kind the established communities of all races were making way. Former transportations had been movements of Greeks from one Greek site to another. Now all races are confounded.

Dionysius, now free from Phoenician warfare, gave his mind to enterprises which raised his power to its greatest height. In the years 390-387 he warred against the Italiot cities in alliance with their Lucanian enemies. Rhegium, Croton, the whole toe of the boot, were conquered. Their lands were given to Locri; their citizens were taken to Syracuse, sometimes as slaves, sometimes as citizens. The master of the barbarians fell below the lowest Hellenic level when he put the brave Rhegine general Phyton to a lingering death, and in other cases imitated the Carthaginian cruelty of crucifixion. Conqueror of southern Italy, he turned his thoughts yet further, and became the first ruler of Sicily to stretch forth his hands towards the eastern peninsula. In the Adriatic he helped Hellenic extension, desiring no doubt to secure the important trade route into central Europe. He planted directly and indirectly some settlements in Apulia, while Syracusan exiles founded the more famous Ancona. He helped the Parians in their settlements of Issa and Pharos; he took into his pay Illyrian warriors with Greek arms, and helped the Molossian Alcetas to win back part of his kingdom. He was even charged with plotting with his Epirot ally to plunder Delphi. This even Sparta would not endure; Dionysius had to content himself with sending a fleet along the west coast of Italy, to carry off the wealth of the great temple of Caere.

In old Greece men now said that the Greek folk was hemmed in between the barbarian Artaxerxes on the one side and Dionysius, master and planter of barbarians, on the other. These feelings found expression when Dionysius sent his embassy to the Olympic games of 384, and when Lysias bade Greece rise against both its oppressors. Dionysius vented his wrath on those who were nearest to him, banishing many, among them his brother Leptines and his earliest friend Philistus, and putting many to death. He was also once more stirred up to play the part of a Hellenic champion in yet another Punic war.

In this war (383-378) Dionysius seems for once to have had his head turned by a first success. His demand that Carthage should altogether withdraw from Sicily was met by a crushing defeat. Then came a treaty by which Carthage kept Selinus and part of the land of Acragas. The Halycus became the boundary. Dionysius had also to pay 1000 talents, which caused him to be spoken of as becoming tributary to

the bar- barians. In the last years of his reign we hear dimly of both Syracusan and Carthaginian operations in southern Italy. He also gave help to Sparta against Thebes, sending Gaulish' and Iberian mercenaries to take part in Greek warfare. His last war with Carthage, which began with an invasion of western Sicily, and which was going on at his death in 367 B.C., was ended by a peace by which the Halycus remained the boundary.

The tyranny of Dionysius fell, as usual, in the second genera- tion; but it was kept up for ten years after his death by the energy of Philistus, now minister of his son Dionysius Dionyaia tne Younger. It fell with the coming back of the o)ˆ exile Dion in 357. The tyranny had lasted so long

that it was less easy than at the overthrow of the elder tyrants to fall back on an earlier state of things. It had been a time of frightful changes throughout Sicily, full of breaking

up of old landmarks, of confusion of races, and of movements of inhabitants. But it also saw the foundation of new cities. Besides Tyndaris and Tauromenium, BC "f the foundation of Halaca marks another step in Sicel progress towards Hellenism, while the Carthaginians founded their strong town and fortress of Lilybaeum in place of Motya. Among these changes the most marked is the settle- ment of Campanian mercenaries in Greek and Sicel towns. Yet they too could be brought under Greek influences; they were distant kinsfolk of the Sicels, and the forerunners of Rome. They mark one stage of migration from Italy into Sicily.

The reign of Dionysius was less brilliant in the way of art and literature than that of Hiero. Yet Dionysius himself sought fame as a poet, and his success at Athens shows that his compositions did not deserve the full scorn of his enemies. The dithyrambic poet Philoxenus, by birth of Cythera, won his fame in Sicily, and other authors of lost poems are mentioned in various Siceliot cities. One of the greatest losses in all Greek history is that'of the writings of Philistus (436-356), the Syracusan who had seen the Athenian siege and who died in the warfare between Dion and the younger Dionysius. Through the time of both tyrants, he was, next to the actual rulers, the first man in Sicily; but of his record of his own times we have only what filters through- the recasting of Diodorus. But the most remark- able intellectual movement in Sicily at this time was the influence of the»

The time following the Dionysian tyranny was at Syracuse a time full

of the most stirring local and personal interest, under her two deliverers Dion and Timoleon. It is less easy timoleon to make out the exact effect on the rest of Sicily of the three years' career of Dion. Between the death of Dion in 354 and the coming of Timoleon in 344 we hear of a time of confusion in which Hellenic life seemed likely to die out. The cities, Greek and Sicel, were occupied by tyrants. The work of Timoleon {q.v.), whose headquarters were first at Tauromenium, then at Hadranum, was threefold — the immediate deliverance of Syracuse, the restoration of Sicily in general to freedom and Greek life, and the defence of the Greek cities against Carthage. The great victory of the Crimissus in 339 led to a peace with Carthage with the old frontier; but all Greek cities were to be free, and Carthage was to give no help to any tyrant. Timoleon drove out all the tyrants, and it specially marks the fusion of the two races that the people of the Sicel Agyrium were admitted to the citizenship of free Syracuse. From some towns he drove out the Campanians, and he largely invited Greek settlement, especially from the Italiot towns, which were hard pressed by the Bruttians. The Corinthian deliverer gave, not only Syracuse, but all Greek Sicily, a new lease of life, though a short one.

We have unluckily no intelligible account of Sicily during the twenty years after the death of Timoleon (337-317). His deliverance is said to have been followed by great immediate prosperity, but wars and dissensions very ˆ g> soon began again. The Carthaginians played off one city and party against another, and Agathocles, 1 following the same policy, became in 317, by treachery and massacre, undis- puted tyrant of Syracuse, and spread his dominion over many other cities. Acragas, strengthened by Syracusan exiles, now stands out again as the rival of Syracuse. The Carthaginian Hamilcar won many Greek cities to the Punic alliance. Agathocles, however, with Syracuse blockaded by a Carthaginian fleet, formed the bold idea of carrying the war into Africa.

For more than three years (310-307) each side carried on warfare in the land of the other. Carthage was hard pressed by Agathocles, while Syracuse was no less hard pressed by Hamilcar. The force with which Agathocles invaded Africa was far from being wholly Greek; but it was representatively European. Gauls, Samnites, Tyrrhenians, fought for him, while mercenary Greeks and Syracusan exiles fought for Carthage. He won many battles and towns; he quelled mutinies of his own 1 See Tillyard, Agathocles (1908).

troops; by inviting and murdering Ophelias, lord of Cyrene, he doubled his army and brought Carthage near to despair. Meanwhile Syracuse, all but lost, had driven back Hamilcar, and had taken him prisoner in an unsuccessful attack on Euryelus, and slain him when he came again with the help of the Syracusan exile Deinocrates. Meanwhile Acragas, deeming Agathocles and the barbarians alike weakened, proclaimed freedom for the Sicilian cities under her own headship. Many towns, both Greek and Sicel, joined the confederacy. It has now become impossible to distinguish the two races; Henna and Herbessus are now the fellows of Camarina and Leontini. But the hopes of Acragas perished when Agathocles came back from Africa, landed at Selinus, and marched to Syracuse, taking one town after another. A new scheme of Sicilian union was taken up by Deinocrates, which cut short his dominion. But he now relieved Syracuse from the Carthaginian blockade; his mer- cenaries gained a victory over Acragas; and he sailed again for Africa, where fortune had turned against his son Archagathus, as it now did against himself. He left his sons and his army to death, bondage or Carthaginian service, and came back to Sicily almost alone. Yet he could still gather a force which enabled him to seize Segesta, to slay or enslave the whole population, and to settle the city with new inhabitants. This change amounts to the extinction of one of the elements in the old population of Sicily. We hear no more of Elymi; indeed Segesta has been practically Greek long before this. Deinocrates and Agathocles came to a kind of partnership in 304, and a peace with Carthage, with the old boundary, secured Agathocles in the possession of Syracuse and eastern Sicily (301).

At some stage of his African campaigns Agathocles had taken the title of king. Earlier tyrants were well pleased to be spoken of as kings; but no earlier rulers of Sicily put either their heads or their names on the coin. Agathocles now put his name, first without, and then with, the kingly title, though never his own likeness — Hiero II. was the first to do this. This was in imitation of the Macedonian leaders who divided the dominion of Alexander. The relations between the eastern and western Greek worlds are drawing closer. Agathocles in his old age took a wife of the house of Ptolemy; he gave his daughter Lanassa to Pyrrhus, and established his power east of Hadria, as the first Sicilian ruler of Corcyra. Alike more daring and more cruel than any ruler before him, he made the island the seat of a greater power than any of them.

On the death of Agathocles tyrants sprang up in various

cities. Acragas, under its king Phintias, won back for the

Period moment somewhat of its old greatness. By a new after depopulation of Gela, he founded the youngest of Agatho- Siceliot cities, Phintias, by the mouth of the southern Himera. And Hellas was cut short by the seizure of Messana by the disbanded Campanian mercenaries of Agathocles (c. 282), who proclaimed themselves a new people in a new city by the name of Mamertines, children of Mamers or Mars. Messana became an Italian town — ” Mamertina civitas.” The Campanian occupation of Messana is the first of the chain of events which led to the Roman dominion in Sicily. As Pyrrhus ˆ et ˆ ome nas hardly been mentioned in Sicilian story. The Mamertine settlement, the war with Pyrrhus, bring us on quickly. Pyrrhus (q.v.) came as the champion of the western Greeks against all barbarians, whether Romans in Italy or Carthaginians in Sicily. His Sicilian war (278-276) 1 was a mere interlude between the two acts of his war with Rome. As son-in-law of Agathocles, he claimed to be specially king of Sicily, and he held the Sicilian conquest of Corcyra as the dowry of Lanassa. With such a deliverer, deliverance meant submission. Pyrrhus is said to have dreamed of kingdoms of Sicily and of Italy for his two sons, the grandsons of Agathocles, and he himself reigned for two years in Sicily as a king who came to be no less hated than the tyrants. Still as Hellenic champion in Sicily he has no peer.

The Greek king, on his way back to fight for Tarentum against Rome, had to cut his way through Carthaginians and Mamertines 1 For the ensuing years cf. Rome: History, II. “The Republic.”

in Roman alliance. His saying that he left Sicily as a wrestling- ground for Romans and Carthaginians was the very truth of the matter. Very soon came the first war between Rome and Carthage (the ” First Punic War “). It mattered much, now that Sicily was to have a barbarian master, whether that master should be the kindred barbarian of Europe or the bar- barian of Asia transplanted to the shore of Africa.

Sicily in truth never had a more hopeful champion than Hiero II. of Syracuse. The established rule of Carthage in western Sicily was now something that could well be „. .. endured alongside of the robber commonwealth at Messana. The dominion of the freebooters was spreading. Besides the whole north-eastern corner of the island, it reached inland to Agyrium and Centoripa. The Mamertines leagued with other Campanian freebooters who had forsaken the service of Rome to establish themselves at Rhegium. But a new Syracusan power was growing up to meet them. Hiero, claiming descent from Gelo, pressed the Mamertines hard. He all but drove them to the surrender of Messana; he even helped Rome to chastise her own rebels at Rhegium. The wrestling-ground was thus opened for the two barbarian commonwealths. Car- thaginian troops held the Messanian citadel against Hiero, while another party in Messana craved the help of the head of Italy. Rome, chastiser of the freebooters of Rhegium, saw Italian brethren in the freebooters of Messana.

The exploits of Hiero had already won him the kingly title (270) at Syracuse, and he was the representative of Hellenic life and independence throughout the island. Partly in this char- acter, partly as direct sovereign, he was virtual ruler of a large part of eastern Sicily. But he could not aspire to the dominion of earlier Syracusan rulers. The advance of Rome after the retreat of Pyrrhus kept the new king from all hope of their Italian position. And presently the new kingdom exchanged independence for safety. When Rome entered Sicily as the ally of the Mamertines, Hiero became the ally of Carthage. But in the second year of the war (263) he found it needful to change sides. His alliance with Rome marks a great epoch in the history of the Greek nation. The kingdom of Hiero was the first-fruits out of Italy of the system by which alliance with Rome grew into subjection to Rome. He was the first of Rome’s kingly vassals. His only burthen was to give help to the Roman side in war; within his kingdom he was free, and his dominions flourished as no part of Sicily had flourished since the days of Timoleon.

During the twenty-three years of the First Punic War (264- 241) the rest of the island suffered greatly. The war for Sicily was fought in and round Sicily, and the Sicilian cities were taken and retaken by the contending powers PmUs

(see Punic Wars). The highest calling of the Greek w ar .

had now, in the western lands, passed to the Roman. By the treaty which ended the war in 241 Carthage ceded to Rome all her possessions in Sicily. As that part of the island which kept a national Greek government became the first kingdom dependent on Rome, so the share of BC ” Carthage became the first Roman province. Messana alone remained an Italian ally of Rome on Sicilian soil.

We have no picture of Sicily in the first period of Roman rule. One hundred and seventy years later, several towns within the original province enjoyed various degrees of freedom, which they had doubtless kept from the beginning. Panormus, Segesta, with Centoripa, Halesa and Halikye, once Sicel but now Hellenized, kept the position of free cities (liberae et immunes, Cic. Verr. iii. 6). The rest paid tithe to the Roman people as landlord. The province was ruled by a praetor sent yearly from Rome. It formed, as it had even from the Carthaginian period, a closed customs district. Within the Roman province the new state of things called forth much discontent; but Hiero remained the faithful ally of Rome through a long life. On his death (216) and the accession of his grandson Hieronymus, his dynasty was swept away by the last revolution of Greek Syracuse. The result was revolt against Rome, the great sie

Sicily Roman.

Roman province. Two towns only, besides Messana, which had taken the Roman side, Tauromenium and Netos, were admitted to the full privileges of Roman alliance. Tauromenium indeed was more highly favoured than Messana. Rome had a right to demand ships of Messana, but not of Tauromenium. Some towns were destroyed; the people of Henna were massacred. Acragas, again held for Carthage, was for four years (214-210) the centre of an active campaign. The story of Acragas ended in plunder, slaughter and slavery; three years later, the story of Agrigentum began.

The reign of Hiero was the last time of independent Greek culture in

Sicily. His time marks the growth of a new form of local Sicilian genius. The spread of Hellenic culture among the Sicels had in return made a Greek home for many Sicel beliefs, traditions and customs. Bucolic poetry is the native growth of Sicily; in the hands of Theocritus it grew out of the germs supplied by Epicharmus and Sophron into a distinct and finished form of the art. The poet, himself of Syracuse, went to and fro between the courts of Hiero and Ptolemy Philadelphus; but his poetry is essentially Sicilian. So is that of his successors, both the Syracusan Moschus and Bion of Smyrna, who came to Sicily as to his natural school.

With the incorporation of the kingdom of Hiero into the Roman province independent Sicilian history comes to an end for many ages. In one part of the island the Roman people stepped into the position of Carthage, in another part into that of King Hiero. The allied cities kept their several terms of alliance; the free cities kept their freedom; elsewhere the land paid to the Roman people, accord- ing to the law of Hiero, the tithe which it had paid to Hiero. But, as the tithe was let out to publicani, oppression was easy. The praetor, after the occupation of Syracuse, dwelled there in the palace of Hiero, as in the capital of the island. But, as a survival of the earlier state of things, one of his two quaestors was quartered at Eryx, the other being in attendance on himself. Under the supreme dominion of Rome even the unprivileged cities kept their own laws, magistrates and assemblies, provision being made for suits between Romans and Sicilians and between Sicilians of different cities (Verr. ii. 16). In Latin the one name Siculi takes in all the inhabitants of the island; no distinction is drawn between Greek and Sicel, or even between Greek and Phoenician cities. It is assumed that all Siculi are Greeks (Verr. ii. 3, 29, 49, 52, 65; iii. 37, 40, 73)- Even is? Greek, St/ceXot is now sometimes used instead of ‘EiKeXubrtu All the persons spoken of by Cicero have Greek names save — a most speaking exception — Gaius Heius of Mamertina civitas. Inscriptions too from Sicel and Phoenician cities are commonly Greek, even when they commemorate men with Phoenician names, coupled perhaps with Greek surnames. The process of Hellenization which had been so long going on had at last made Sicily thoroughly Greek. Roman conquest itself, which everywhere carried a Greek element with it, would help this result. The corn of the fertile island was said even then to feed the Roman people. It was this character of Sicily which led to its one frightful piece of local history. The wars of Rome, and the systematic piracy and kidnapping that followed them, filled the Mediter- ranean lands with slaves of all nations. Sicily stood out before the rest as the first land to be tilled by slave-gangs, on the estates both of rich natives and of Roman settlers.

It became the granary of Rome and the free population naturally degenerated and died out. The slaves were most harshly treated, and even encouraged by their masters to rob. The land was full of disorder, and the praetors shrank from enforcing the law against offenders, many of whom, as Roman knights, might be their own judges. Of these causes came the two great slave- revolts of the second half of the 2nd centuiy B.C. The first lasted from 134 to 132, the time of Tiberius Gracchus and the fall of Numantia. Enna and Tauromenium were the headquarters of the revolt. The second (the centre of which was Triocala, the modern S. Anna, 9 m. N.E. of Sciacca) lasted from 102 to 99, the time of the Cimbrian invasion. At other times the power of Rome might have quelled the revolt more speedily.

Slave revolts.

The slave wars were not the only scourge that fell on Sicily. The pirates troubled the coast, and all other evils were out- done by the three years' government of Verres (73-70 Later B.C.). Besides the light which the great impeachment Roman throws on the state of the island, his administration rule la seems really to have dealt a lasting blow to its Skdfy. prosperity. The slave wars had not directly touched the great cities; Verres plundered and impoverished everywhere, re-moving anything of value, especially works of art, that took his fancy, and there is hardly a city that had not to complain of what it suffered at his hands. Another blow was the occupation of Messana by Sextus Pompeius in 43 B.C. He was master of Sicily for seven years, and during this period the corn supply of Rome was seriously affected, while Strabo (vi. 2, 4) attributed to this war the decayed state of several cities. To undo this mischief Augustus planted Roman colonies at Palermo, Syracuse, Tauromenium, Thermae, Tyndaris and Catana. The island thus received another Italian infusion; but, as elsewhere, Latin in no way displaced Greek; it was simply set up alongside of it for certain purposes. Roman tastes now came in; Roman buildings, especially amphitheatres, arose. The Mamertines were Roman citizens, and Netum, Centuripae and Segesta had become Latin, perhaps by a grant of Caesar himself, but in any case before the concession of Latin rights to the rest of Sicily; this was followed by M. Antonius's grant of full citizenship to the whole island. But Sicily never became thoroughly Roman; no roads were constructed, so that not a single Roman milestone has been found in the whole island. In the division of provinces between Augustus and the senate, Sicily fell to the latter. Under the empire it has practically no history: Few emperors visited Sicily; Hadrian was there, as everywhere, in a.d. 126, and ascended Etna, and Julian also (CD. 10). In its provincial state Sicily fell back

more than some other provinces. Ausonius could still reckon Catana and fourfold Syracuse (” quadruplices Syracusas “) among the noble cities; but Sicily is not, like Gaul, rich in relics of later Roman life, and it is now Egypt rather than Sicily that feeds Rome. The island has no internal history beyond a very characteristic fact, a third revolt of slaves and bandits, which was quelled with difficulty in the days of Gallienus. External history there could be none in the central island, with no frontier open to Germans or Persians. There was a single Frankish attack under Probus (276-282). In the division of Constantine, when the word ” province ” had lost its meaning, when Italy itself was mapped out into provinces, Sicily became one of these last. Along with Africa, Raetia and western Illyricum, it became part of the Italian praefecture; along with the islands of Sardinia and Corsica, it became part of the Italian diocese. It was now ruled by a corrector, afterwards by a consular under the authority of the vicar of the Roman city (Not. Imp. 14, 5).

Sicilian history began again when the wandering of the nations planted new powers, not on the frontier of the empire, but at its heart. The powers between which Sicily now passed to and fro were Teutonic powers. The mas < ers . earlier stages of Teutonic advance could not touch Sicily. Alaric thought of a Sicilian expedition, but a storm hindered him. Sicily was to be reached only by a Teutonic power which made its way through Gaul, Spain and Africa. The Vandal now dwelt at Carthage instead of the Canaanite. Gaiseric (429-477) subdued the great islands for which Roman and Phoenician had striven. Along with Sardinia, Corsica and the Balearic Isles, Sicily was again a possession of a naval power at Carthage. Gaiseric made a treaty with Odoacer almost like that which ended the First Punic War. He gave up (Victor Vitensis i. 4) the island on condition of a tribute, which was hardly paid by Theodoric. Sicily was now ruled by a Gothic count, and the Gotbs claimed to have treated the land with special tenderness (Procopius, Bell. Goth. iii. 16). The island, like the rest of Theodoric's dominions, was certainly well looked after by the great king and his minister; yet we hear darkly of disaffection to Gothic rule (Cass. Var. i. 3). Theodoric gave back Lilybaeum to the Vandal king Thrasamund as the dowry

of his sister Analafrida (Proc. Bell. Vand. i. 8). Yet Lilybaeum was a Gothic possession when Belisarius, conqueror of Africa, demanded it in vain as part of the Vandal possessions (Proc. Bell. Vand. ii. 5; Bell.

Goth. i. 3). In the Gothic war Sicily was the first land to be recovered for the empire, and that with the good will of its people (53 s). Panormus alone was stoutly defended by its Gothic garrison. In 550 Totila took some fortresses, but the great cities all withstood him, and the Goths were driven out the next year.

Sicily was thus won back to the Roman dominion. Belisarius Sicily was Pyrrhus and Marcellus in one. For 430 years under the some part of Sicily, for 282 years the whole of it, Eastern again remained a Roman province. To the Gothic p ‘ count again succeeded, under Justinian, a Roman praetor, in Greek crTpaTrryos. That was the official title; we often hear of a patrician of Sicily, but patrician {q.v.) was in strictness a personal rank. In the later mapping out of the empire into purely military divisions, the theme (de/xa) of Sicily took in both the island and the nearest peninsula of the mainland, the oldest Italy. The island itself was divided for financial purposes, almost as in the older times, into the two divisions of Syracuse and Lilybaeum. The revolutions of Italy hardly touched a land which looked steadily to the eastern Rome as its head. The Lombard and Frankish masters of the peninsula never fixed themselves in the island. When the Frank took the imperial crown of the west, Sicily still kept its allegiance to the Augustus who reigned at Constantinople, and was only torn away piecemeal from the empire by the next race of conquerors.

This connexion of Sicily with the eastern division of the empire no doubt largely helped to keep up Greek life in the Ectfesl- island. This was of course strengthened by union with astlcal a power which had already a Greek side, and where the relations Greek side soon became dominant. Still the connexion w y ‘ with Italy was close, especially the ecclesiastical

connexion. Some things tend to make Sicily look less Greek than it really was. The great source of our knowledge of Sicily in the century which followed the reconquest by Beli- sarius is the Letters of Pope Gregory the Great, and they naturally show the most Latin side of things. The merely official use of Latin was, it must be remembered, common to Sicily with Constantinople. Gregory’s Letters are largely occupied with the affairs of the great Sicilian estates held by the Roman church, as by the churches of Milan and Ravenna. But they deal with many other matters. Saint Paul’s visit to Syracuse naturally gave rise to many legends; but the Christian church undoubtedly took early root in Sicily. We hear of Manichaeans (CD. 163); Jews were plentiful, and Gregory causes compensation to be made for the unlawful destruction of synagogues. Many Christian catacombs and

Byzantine rock-cut villages, churches and tombs have been explored of recent years. See the compre- hensive work by the late J. Fiihrer and V. Schultze, ” Die altchristlichen Grabstatte Siziliens ” (Berlin, 1907, Jahrbuch des K.D. archaologischen Instiluts, ETganzungsheft vii.): and several articles by P. Orsi in the Notizie degli scavi, and in Byzantinische Zeitschrift (1898, 1; 1899, 613). Of paganism we find no trace, save that pagan slaves, doubtless not natives of the island, were held by Jews (CD. 127). Herein is a contrast between Sicily and Sardinia, where, according to a letter from Gregory to the empress Constantina, wife of the emperor Maurice (594-395), praying for a lightening of taxation in both islands, paganism still lingered (CD. 121). Sicily belonged to the Latin patriarchate; but we already (CD. 103) see glimmerings of the coming disputes between the Eastern and Western Churches. Things were changed when Leo the Isaurian confiscated the Sicilian and Calabrian estates of the Roman Church (Theoph. i. 631).

In the 9th, 10th and nth centuries the old drama of Sicily was acted again. The island is again disputed between Europe and Asia, transplanted to Africa between Greek and Semitic dwellers on her own soil. Panormus and Syracuse are again the headquarters of races and creeds, of creeds yet more than

477-829.

of races. The older religious differences were small compared with the strife for life and death between Christendom and Islam. Gregory and Mahomet were contemporaries, and, though Saracen occupation did not begin in B f r ˆ r Sicily till more than two centuries after Gregory’s inroads. death, Saracen inroads began much sooner. In 655 (Theoph. i. 532) part of Sicily was plundered, and its inhabitants carried to Damascus. Then came the strange episode of the visit of Constans II. (641-668), the first emperor, it would seem, who had set foot in Sicily since Julian. After a war with the Lombards, after twelve days’ plunder of Rome, he came on to Syracuse, where his oppressions led to his murder in 668. Sicily now saw for the first time the setting up of a tyrant in the later sense. Mezetius, commander of the Eastern army of Constans, revolted, but Sicily and Roman Italy kept their allegiance to the new emperor Constantine Pogonatus, who came in person to destroy him. Then came another Saracen inroad from Alexandria, in which Syracuse was sacked (Paul. Diac. v. 13). Towards the end of the 8th century, though Sicily itself was untouched, its patricians and their forces play a part in the affairs of southern Italy as enemies of the Frankish power. Charlemagne himself was believed (Theoph. i. 736) to have designs on Sicily; but, when it came to Saracen invasion,

the sympathies of both pope and Caesar lay with the invaded Christian land (Mon. Car. 323, 328).

In 813 a peace for ten years was made between the Saracens and the patrician Gregory. A few years after it expired Saraaen settlement in the island began. About this time Crete was seized by Spanish adventurers. But the first conquest. Saracen settlers in Sicily were the African neighbours of Sicily, and they were called to the work by a home treason. The story has been tricked out with many romantic details (Chron. Salem. 60, ap. Pertz, iii. 498; Theoph. Cont. ii. 272; George Cedrenus, ii. 97); but it seems plain that Euphemius or Euthymius of Syracuse, supported by his own citizens, revolted against Michael the Stammerer (820-829), and, when defeated by an imperial army, asked help of Ziyadet Allah, the Aghlabite prince of Kairawan, and offered to hold the island of him. The struggle of 138 years now began. Euphemius, a puppet emperor, was led about by his Saracen allies much as earlier puppet emperors had been led about by Alaric and Ataulf, till he was slain in one of the many sieges. The second Semitic conquest of Sicily began in 827 at Mazzara on the old border of Greek and Phoenician. The advance of the invaders was slow. In two years all that was done was to occupy Mazzara and Mineum — the old Menae of Ducetius — strange points certainly to begin with, and seemingly to destroy Agrigentum, well used to destruction. Attacks on Syracuse failed; so did attacks on Henna — Castrum Ennae, now changing into Castrum Johannis (perhaps Kaorpo- lavvrj), Castrogiovanni. The actual gain was small; but the invaders took seizin alike of the coast and of the island.

A far greater conquest followed when new invaders came from Spain and when Theodotus was killed in 830. The next year Panormus pased away for ever from Roman, for 230 years from Christian, rule. Syracuse was for fifty years, not only, as of old, the bulwark of Europe, but the bulwark of Christendom. By the conquest of Panormus the Saracens were firmly rooted in the island. It became the seat of the amir or lord of Sicily. We hear dimly of treasonable dealings with them on the part of the stralegos Alexius, son-in-law of the emperor Theophilus; but we see more clearly that Saracen advance was largely hindered by dissensions between the African and the Spanish settlers. In the end the Moslem conquests in Sicily became an Aghlabite principality owning at best a formal superiority in the princes of Kairawan. With the Saracen occupation begins a new division of the island, which becomes convenient in tracing the progress of Saracen conquest. This is into three valleys, known in later forms of language as Val di Mazzara or Mazza in the N.W., Val di Noto in the S.E. and Val Demone (a name of uncertain origin) in the N.E. (see Amari,

Musulmani in Sicilia, i. 465). The first Saracen settlement

of Val di Mazzara answers roughly to the old Carthaginian possessions. From Panormus the amir or lord of Sicily, Mahommed ibn Abdallah, sent forth his plunderers throughout Sicily and even into southern Italy. There, however, they made no lasting settlements.

The chief work of the next ten years was the conquest of the Val di Noto, but the first great advance was made elsewhere. In 843 the Saracens won the Mamertine city, Messana, and thus stood in the path between Italy and Sicily. Then the work of conquest, as described by the Arabic writers, went on, but slowly. At last, in 859, the very centre of the island, the strong- hold of Henna, was taken, and the main part of Val di Noto followed. But the divisions among the Moslems helped the Christians; they won back several towns, and beat off all attacks on Syracuse and Tauromenium. It is strange that the reign of Basil the Macedonian (867), a time of such renewed vigour in the empire, was the time of the greatest of all losses in Sicily. In Italy the imperial frontier largely advanced; in Sicily imperial fleets threatened Panormus. But in 875 the accession of Ibrahim ibn Ahmad in Africa changed the face of things. The amir in Sicily, Ja'far ibn Ahmad, received strict orders to act vigorously against the eastern towns. In 877 began the only successful Semitic siege of Syracuse. The next year the city passed for the first time under the yoke of strangers to the fellowship of Europe.

Thus in fifty-one years the imperial and Christian territory in Sicily was cut down to a few points on or near the eastern coast, to the Val Demone in short without Messana. But between Moslem dissension and Christian valour the struggle had still to be waged for eighty-seven years. Henna had been the chief centre of Christian resistance a generation earlier; its place was now taken by the small fort of Rametta not far from Messina. The Moslems of Sicily were busy in civil wars; Arabs fought against Berbers, both against the African overlord. In 900 Panormus had to be won by a son of Ibrahim from Moslem rebels provoked by his father's cruelty. But when Ibrahim' himself came into Sicily, renewed efforts against the Christians led to the first taking of Tauromenium (908), of Rametta and of other points. The civil war that followed his death, the endless revolutions of Agrigentum, where the weaker side did not scruple to call in Christian help, hindered any real Saracen occupation of eastern Sicily. The

emperors never gave up their claims to Sicily or their hopes of recovering it. Besides the struggle with the Christians in the island, there was often direct warfare between the empire and the Saracens; but such warfare was more active in Italy than in Sicily. In 956 a peace or truce was made by the emperor Constantine Porphyrogenitus. A few years later, Otho the Great, the restorer of the Western empire, looked to Sicily as a land to be won back for Christendom. It had not yet wholly passed away; but the day soon came. Strange to say, as Syracuse fell in the reign of Basil the Macedonian, the Saracen occupation was completed in the reign of Nikephoros Phokas (Nicephorus Phocas), the deliverer of Crete. In the year of his accession (963) Tauromenium was taken, and became for a hundred years a Mahommedan possession. Rametta was the last stronghold to fall (965).

Thus in 138 years the Arab did what the Canaanite had never done. The whole island was a Semitic, that is a Mahommedan, possession. Yet the complete Saracen possession of Sicily may seem a thing of a moment. Its first and longest period lasted only 73 years. In that time Mahommedan Sicily was threatened by a Western emperor; the Arabic writers claim Utata. the Saracen army by which Otho II. was beaten back quest by in 982 as a Sicilian army. A mightier enemy was Battera threatening in the East. Basil II. planned the recovery Empire. f gi c iiy j n g 00 d earnest. In 1027 he sent a great army; but his death stopped their progress before they reached the island. But the great conqueror had left behind him men trained in his school, and eleven years later the eagles of the new Rome again marched to Sicilian victories. The ravages of the Sicilian Saracens in the Greek islands were more frightful than ever, and George Maniaces, the first captain of his time,

was sent to win back the lost land. He too was helped by Saracei* dissensions. The amir Abul-afar became a Roman vassal, and', like Alaric of old, became magister militum in the /ft ,

Roman army. His brother and rival Abuhafa? brought help from Africa; and finally all joined against the Christians. Four years of Christian victory (1038-1042) followed. In the host of Maniaces were men of all races — Normans, who had already begun to show themselves in south Italy, and the Varangian guard, the best soldiers of the empire, among whom Harold Hardrada himself is said to have held a place. Town after town was delivered, first Messana, then Syracuse, then a crowd of others. The exact extent of the reconquest is uncertain; Byzantine writers claim the deliverance of the whole island; but it is certain that the Saracens never lost Panormus. But court influence spoiled everything: Maniaces was recalled; under his

successor Stephen, brother-in-law of the emperor Michael, the Saracens won back what they had lost. Messana alone held out, for how long a time is uncertain. But a con- queror came who had no empresses to thwart him. In 1060 began the thirty years' work of the first Roger.

Thus for 263 years the Christian people of some part or other of Sicily were in subjection to Moslem masters. But that subjection differed widely in different times and places. sktty The land was won bit by bit. One town was taken under by storm; another submitted on terms harsher or Saracen more favourable. The condition of the Christians ru/e- varied from that of personal slaves to that of communities left free on the payment of tribute. The great mass were in the intermediate state usual among the non-Mahommedan subjects of a Mahommedan power. The dhimml of Sicily were in essentially the same case as the r ayahs of the Turk. While the conquest was going on, the towns that remained unconquered gained in point of local freedom. They became allies rather than subjects of the distant emperor. So did the tributary districts, as long as the original terms were kept. But, as ever, the condition of the subject race grew worse. After the complete conquest of the island, while the mere slaves had turned Mahom- medans, there is nothing more heard of tributary districts. At the coming of the Normans the whole Christian population was in the state of rayahs. Still Christianity and the Greek tongue never died out; churches and monasteries received and held property; there still are saints and scholars. It would be rash to deny that traces of other dialects may not have lingered on; but Greek and Arabic were the two written tongues of Sicily when the Normans came. The Sicilian Saracens were hindered by their internal feuds from ever becoming a great power; but they stood high among Mahommedan nations. Their advance in civilization is shown by their position under the Normans, and above all by their admirable style of architecture (see Palermo). They had a literature which Norman kings studied and promoted. The Normans in short came into the inheritance of the two most civilized nations of the time, and allowed them to flourish side by side.

The most brilliant time for Sicily as a power in the world begins with the coming of the Normans. Never before or after was the island so united or so independent. Some of the old tyrants had ruled out of Sicily; none had

Norman conquest.

ruled over all Sicily. The Normans held all Sicily as the centre of a

dominion which stretched far beyond it. The conquest was the work of one man, Count Roger of the house of Hauteville (see Roger I.). The conquests of the Normans in Italy and Sicily form part of one enterprise; but they altogether differ in character. In Italy they overthrew the Byzantine dominion; their own rule was perhaps not worse, but they were not deliverers. In Sicily they were welcomed by the Christians as deliverers from infidel bondage.

As in the Saracen conquest of Sicily, as in the Byzantine recovery, so in the Norman conquest, the immediate occasion was given by a home traitor. Count Roger had already made a plundering attack, when Becumen of Catania, driven out by his brother, urged him to serious invasion. Messina was taken in ro6o, and became for a while the Norman capital. The

Christians everywhere welcomed the conqueror. But at Troina they presently changed their minds, and joined with the Saracens to besiege the count in their citadel. At Catania Becumen was set up again as Roger's vassal, and he did good service till he was killed. Roger soon began to fix his eye on the Saracen capital. Against that city he had Pisan help, as the inscription on the Pisan duotno witnesses (cf. Geoff. Mai. ii. 34). But Palermo was not taken until 1071, and then only by the help of Duke Robert, who kept the prize to himself. Still its capture was the turning-point in the struggle. Taormina (Tauromenium) was won in 1078. Syracuse, under its amir Benarvet, held out stoutly. He retook Catania by the help of a Saracen to whom Roger had trusted the city, and whom he himself punished. Catania was won back by the count's son Jordan. But progress was delayed by Jordan's rebellion and by the absence of Roger in his brother's wars. In 1085 Syracuse was won. Next year followed Girgenti and Castrogiovanni, whose chief became a Christian. Noto held out till 1090. Then the whole island was won, and Roger completed his conquest by a successful expedition to Malta.

Like the condition of the Greeks under the Saracens, so the condition of the Saracens under the Normans differed in different Saracens places according to the circumstances of each conquest. under The Mahommedan religion was everywhere tolerated, Norman i n many places much more. But it would seem that, ™' e " just as under the Moslem rule, conversions from

Christianity to Islam were forbidden. On the other hand, conversions from Islam to Christianity were not always en- couraged; Saracen troops were employed from the beginning, and Count Roger seems to have thought them more trustworthy when unconverted. At Palermo the capitulation secured to the Saracens the full enjoyment of their own laws; Girgenti was long mainly Saracen; in Val di Noto the Saracens kept towns and castles of their own. On the other hand, at Messina there were few or none, and we hear of both Saracen and Greek villeins, the latter doubtless abiding as they were in Saracen times. But men of both races were trusted and favoured accord- ing to their deserts. The ecclesiastical relations between Greeks and Latins are harder to trace. At the taking of Palermo the Greek bishop was restored; but his successors were Latins, and Latin prelates were placed in the bishoprics which Count Roger founded. Urban II. visited Sicily to promote the union of the church, and he granted to the count those special ecclesiastical powers held by the counts and kings of Sicily as hereditary legates of the Holy See which grew into the famous Sicilian monarchy (Geoff. Mai. iv. 29). But Greek worship went on; at Messina it lingered till the 15th century (Pirro, Sicilia sacra, i. 420, 431, 440), as it has been since brought back by the Albanian colonists. But the Greeks of Sicily have long been united Greeks, admitting the authority of the see of Rome.

In its results the Norman conquest of Sicily was a Latin

conquest far more thorough than that which had been made

by the Roman commonwealth. The Norman princes

Linguistic protected all the races, creeds and tongues of the

mSicUr island, Greek, Saracen and Jew. But new races came

to settle alongside of them, all of whom were Latin

as far as their official speech was concerned. The Normans

brought the French tongue with them; it remained the

court speech during the 12th century, and Sicily was thrown

open to all speakers of French, many of whom came from

England. There was constant intercourse between the two

great islands, both ruled by Norman kings, and many natives of

England filled high places in Sicily. But French was only a language of society, not of business or literature. The languages of inscriptions and documents are Greek, Arabic and Latin, in private writings sometimes Hebrew. The kings understood Greek and Arabic, and their deeds and works were commemorated in both tongues. Hence comes the fact, at first sight so strange, that Greek, Arabic and French have all given way to a dialect of Italian. But the cause is not far to seek. The Norman conquest opened Sicily to settlers from Italy, above all from the Norman possessions in Italy. Under the name of Lombards,

they became an important, in some parts a dominant, element. Thus at Messina, where we hear nothing of Saracens, we hear much of the disputes between Greeks and Lombards. The Lombards had hardly a distinct language to bring with them. At the time of the conquest, it was already found out that French had become a distinct speech from Latin; Italian hardly was such. The Lombard element, during the Norman reign, shows itself, not in whole documents or inscriptions, but in occasional words and forms, as in some of the mosaics at Monreale. And, if any element, Latin or akin to Latin, had lingered on through Byzantine and Saracen rule, it would of course be attracted to the new Latin element, and would help to strengthen it. It was this Lombard element that had the future before it. Greek and Arabic were antiquated, or at least isolated, in a land which Norman conquest had made part of western Europe and Latin Christendom. They could grow only within the island; they could gain no strength from outside. Even the French element was in some sort isolated, and later events made it more so. But the Lombard element was constantly strengthened by settlement from outside. In the older Latin conquest, the Latin carried Greek with him, and the Greek element absorbed the Latin. Latin now held in western Europe the place which Greek had held there. Thus, in the face of Italian, both Greek and Arabic died out. Step by step, Christian Sicily became Latin in speech and in worship. But this was not till the Norman reigns were over. Till the end of the 12th century Sicily was the one land where men of divers creeds and tongues could

live side by side.

Hence came both the short-lived brilliancy of Sicily and its later decay. In Sicily there were many nations all protected by the Sicilian king; but there was no Sicilian nation. Greek, Saracen, Norman, Lombard and Jew could not be fused into one people; it was the boast of Sicily that each kept his laws and tongue undisturbed. Such a state of things could live on only under an enlightened despotism; the discordant elements could not join to work out really free and national institutions. Sicily had parliaments, and some constitutional principles were well understood. But they were assemblies of barons, or at most of barons and citizens; they could only have repre- sented the Latin elements, Norman and Lombard, in the island. The elder races, Greek and Saracen, stand outside the relations between the Latin king and his Latin subjects. Still, as long as Greek and Saracen were protected and favoured, so long was Sicily the most brilliant of European kingdoms. But its greatness had no groundwork of national life; for lack of it the most brilliant of kingdoms presently sank below the level of other lands.

Four generations only span the time from the birth of Count Roger, about 1030, to the death of the emperor Frederick II. in 1250. Roger, great count of Sicily, was, at his death in 1101, succeeded by his young son Simon, and he in 1105 by the second Roger, the first king. He inherited all Sicily, save half Palermo — the other half had been given up — ■ and part of Calabria. The rest of Palermo was soon granted; the Semitic capital became the abiding head of Sicily. On the death of his cousin Duke William of Apulia, Roger gradually founded (1127-1140) a great Italian dominion. To the Apulian duchy he added (1136) the Norman principality of Capua, Naples (1138), the last dependency of the Eastern empire in Italy, and (1140) the Abruzzi, an undoubted land of the Western empire. He thus formed a dominion which has been divided, united and handed over from one prince to another oftener than any other state in Europe, but whose frontier has hardly changed at all. In 1130 Roger was crowned at Palermo, by authority of the antipope Anacletus, taking the strange title of ” king of Sicily and Italy.” This, on his reconciliation with Pope Innocent II., he exchanged for ” king of Sicily and of the duchy of Apulia and of the principality of Capua.” By virtue of the old relations between the popes and the Normans of Apulia, he held his kingdom in fief of the Holy See, a position which on the whole strengthened the royal power. But his power, like that of Dionysius and Agathqcles, was felt in more distant regions. His admiral George of Antioch, Greek by birth and creed, warre-_

against the Eastern empire, won Corfu (Korypho; the name of Korkyra is forgotten) for a season, and carried off the silk-workers from Thebes and Peloponnesus to Sicily. But Manuel Comnenus ruled in the East, and, if Roger threatened Constantinople, Manuel threatened Sicily. In Africa the work of Agathocles was more than renewed; Mahdia and other points were won and kept as long as Roger lived. These exploits won him the name of the ” terror of Greeks and Saracens.” To the Greeks, and still more to the Saracens, of his own island he was a protector and something more. His love for mathematical science, geography, &c, in which the Arabs excelled, is noteworthy.

Roger’s son William, surnamed the Bad, was crowned in his father’s lifetime in 1151. Roger died in n 54, and William’s ,,,,.., , sole reign lasted till 1 166. It was a time of domestic re-

Willlaml. ,...,.,, , , . . ,

and 11. belhons, chiefly against the king s unpopular ministers,

and it is further marked by the loss of Roger’s African conquests. After William the Bad came (1166-1189) his son William the Good. Unlike as were the two men in themselves, in their foreign policy they are hardly to be distinguished. The Bad William has a short quarrel with the pope; otherwise Bad and Good alike appear as zealous supporters of Alexander III. and as enemies of both empires. The Eastern warfare

of the Good is stained by the frightful sack of Thessalonica; it is marked also by the formation of an Eastern state under Sicilian supremacy (1186). Corfu, the possession of Agathocles and Roger, with DurazzO, Cephalonia and Zante, was granted by William to his admiral Margarito with the strange title of king of the Epeirots. He founded a dynasty, though not of kings, in Cephalonia and Zante. Corfu and Durazzo were to be more closely connected with the Sicilian crown.

The brightest days of Sicily ended with William the Good. His marriage with Joanna, daughter of Henry of Anjou and

England, was childless, and William tried to procure

the succession of his aunt Constance and her husband, King Henry VI. of Germany, son of the emperor Frederick I. But the prospect of German rule was unpopular, and on William's death the crown passed to Tancred, an illegitimate grandson of King Roger, who figures in English histories in the story of Richard III.'s crusade. In 1191 Henry, now emperor, asserted his claims; but, while Tancred lived, he did little, in Sicily nothing, to enforce them. On the death of Tancred (11 94) and the accession of his young son William III., the emperor came and conquered Sicily and the Italian possessions, with

an amount of cruelty which outdid any earlier war or /ft m revolution. First of four Western emperors who wore

the Sicilian crown, Henry died in 1197, leaving the kingdom to his young son Frederick, heir of the Norman kings through his mother.

The great days of the Norman conquest and the Norman reigns have been worthily recorded by contemporary historians. For few times have we richer materials. The oldest is Aim6 or Amato of Monte Cassino, who exists only in an Old-French translation. We have also for the Norman conquest the halting hexameters of William of Apulia, and for the German conquest the lively and partial verses of Peter of Eboli. 1 Of prose writers we have Geoffrey Malaterra, Alexander abbot of Telesia, Romuald archbishop of Salerno, Falco of Benevento, and above all Hugo Falcandus, one of the very foremost of medieval writers. Not one of these Latin writers was a native of the island, and we have no record from any native Greek. Occasional notices we of course have in the Byzantine writers, and Archbishop Eustathius's account of the taking of Thessalonica is more than occasional. And the close connexion between Sicily and England leads to many occasional references to Sicilian matters in English writers. The relations between

the various races of the islands are most instructive. The strong rule of Roger kept all in order. He called himself the defender of Christians; others, on account of his favour to the Saracens, spoke of him as a pagan. He certainly encouraged Saracen art and literature in every shape.

1 Petri Ansolini de Ebulo de rebus Siculis carmen (republished in the new edition of Muratori's Rerum Italicarum Scriptores, by E. Rota, torn, xxxi., Citta di Castello, 1904).

His court was full of eunuchs, of whom we hear still more under William the Bad. Under William the Good the Saracens, without any actual oppression, seem to be losing their position. Hitherto they had been one element in the land, keeping their own civilization alongside of others. By a general outbreak on the death of William the Good, the Saracens, especially those of Palermo, were driven to take shelter in the mountains, where they sank into a wild people, sometimes holding points of the island against all rulers, sometimes taking military service under them. The Jews too begin to sink into bondmen. Sicily is ceasing to be the land of many nations living side by side on equal terms.

The Germans who helped Henry to win the Sicilian crown did not become a new element in the island, but only a source of confusion during the minority of his son. Frederick — presently to be the renowned emperor Frederick II., ^, mi *?"!£ t " Fridericus stupor mundi et immutator mirabilis " — w _ was crowned at Palermo in n 98; but the child, deprived of both parents, was held to be under the protection of his lord Pope Innocent III. During his minority the land was torn in pieces by turbulent nobles, revolted Saracens, German captains seeking settlements, the maritime cities of Italy, and professed French deliverers. In 12 10 the emperor Otto IV., who had overrun the continental dominions, threatened the island. In 121 2, just when Frederick was reaching an age to be of use in his own kingdom, he was called away to dispute the crown of Germany and Rome with Otto. Eight years more of disorder followed; in 1220 the emperor-king came back. He brought the Saracens of the mountains back again to a life in plains and cities, and presently planted a colony of them > on the mainland at Nocera, when they became his most trusty soldiers. His necessary absences from Sicily led to revolts. He came back in 1233 from his crusade to suppress a revolt of the eastern cities, which seem to have been aiming at republican indepen- dence. A Saracen revolt in 1243 is said to have been followed by a removal of the whole remnant to Nocera. Some, however, certainly stayed or came back; but their day was over.

Under Frederick the Italian or Lombard element finally prevailed in Sicily. Of all his kingdoms Sicily was the best-beloved. He spoke all its tongues; he protected, as far as circumstances would allow, all its races. The heretic alone was persecuted; he was the domestic rebel Of the church; Saracen and Jew were entitled to the rights of foreigners. Yet Frederick, patron of Arabic learning, sus- pected even of Moslem belief, failed to check the decline of the Saracen element in Sicily. The Greek element had no such forces brought against it. It was still a chief tongue of the island, in which Frederick's laws were put forth as well as in Latin. But it was clearly a declining element. Greek and Saracen were both becoming survivals in an island which was but one of the many kingdoms of its king. The Italian element advanced at the cost of all others. Frederick chose it as the court speech of Sicily, and he made it the speech of a new-born literature. Sicily, strangely enough, became the cradle of Italian song.

Two emperors had now held the Sicilian crown. On Frederick's death in 1250 the crown passed to his son Conrad, not emperor indeed, but king of the Romans. He was nominally succeeded by his son Conradin. The real ruler under both was Frederick's natural son Manfred. In 1258, on a false rumour of the death of Conradin, Manfred was himself crowned king of Palermo. He had to found the kingdom afresh. Pope Innocent IV. had crossed into Sicily, to take advantage of the general discontent. The cities, whose growing liberties had been checked by Frederick's legislation, strove for practical, if not formal, independence, sometimes for dominion over their fellows. The 5th century B.C. seemed to have come back. Messina laid waste the lands of Taormina, because Taormina would not obey the bidding of Messina. Yet, among these and other elements of confusion, Manfred succeeded in setting up again the kingly power, first for his kinsmen and then for himself. His reign continued that of his father, so far as a mere king could continue the reign of such an emperor. The king of Sicily

was the first potentate of Italy, and came nearer than any prince since Louis II. to the union of Italy under Italian rule. He sought dominion too beyond the Adriatic: Corfu, Durazzo, and a strip of the Albanian coast became Sicilian possessions as the dowry of Manfred's Greek wife. But papal enmity was too much for him. His overlord claimed to dispose of his crown, and hawked it about among the princes of the West. Edmund of England bore the Sicilian title for a moment. More

came of the grant of Urban IV. (1264) to Charles, count of Anjou, and through his wife sovereign count of Provence. Charles, Aniou* ° crowned by the pope in 1266, marched to take posses- sion of his lord's grant. Manfred was defeated and slain at Benevento. The whole Sicilian kingdom became the spoil of a stranger who was no deliverer to any class of its people. The island sank yet lower. Naples, not Palermo, was the head of the new power; Sicily was again a province. But a province Sicily had no mind to be. In the continental lands Charles founded a dynasty; the island he lost after sixteen years. His rule was not merely the rule of a stranger king surrounded by stranger followers; the degradation of the island was aggravated by gross oppression, grosser than in the continental lands. The continental lands submitted, with a few slight efforts at resist- ance. The final result of the Angevin conquest of Sicily was its separation from the mainland.

Sicilian feeling was first shown in the support given to the luckless expedition of Conradin in 1268. Frightful executions in the island followed his fall. The rights of the Swabian house were now held to pass to Peter (Pedro), king of Aragon, husband of Manfred's daughter Constance. The connexion with Spain, which has so deeply affected the whole later history of Sicily, now begins. Charles held the Greek possessions of Manfred | and had designs both on Epeiros and on Constantinople. The emperor Michael Palaeologus and Peter of Aragon became allies against Charles; the famous John of Procida acted as an agent between them; the costs of Charles's eastern warfare caused great discontent, especially in an island where some might still look to the Greek emperor as a natural deliverer. Peter and Michael were doubtless watching the turn of things in Sicily; but the tale of a long-hidden conspiracy between them and the whole Sicilian people has been set aside by Amari. The actual outbreak of 1282, the famous Sicilian Vespers, was stirred up by the wrongs of the moment. A gross case of insult offered by a Frenchman to a Sicilian woman led to the massacre at Palermo, and the like scenes followed elsewhere. The strangers were cut off; Sicily was left to its own people. The towns and districts left without a ruler by no means designed to throw off the authority of the overlord; they sought the good will of Pope Martin. But papal interests were on the side of Charles; and he went forth with the blessing of the church to win back his lost kingdom.

Angevin oppression had brought together all Sicily in a common cause. There was at last a Sicilian nation, a nation for a while capable of great deeds. Sicily now stands out as a main centre of European politics. But the land has lost its character; it is becoming the plaything of powers, instead of the meeting-place of nations. The tale,

true or false, that Frenchmen and Provengals were known from the natives by being unable to frame the Italian sound of c shows how thoroughly the Lombard tongue had overcome the other tongues of the island. In Palermo, once city of threefold speech, a Greek, a Saracen, a Norman who spoke his own tongue must have died with the strangers.

Charles was now besieging Messina; Sicily seems to have put on some approach to the form of a federal commonwealth. Meanwhile Peter of Aragon was watching and pre- Aragoa. paring. He now declared himself. To all, except the citizens of the great cities, a king would be accept- able; Peter was chosen with little opposition in a parliament at Palermo, and a struggle of twenty-one years began, of which Charles and Peter saw only the first stage. In fact, after Peter had helped the Sicilians to relieve Messina, he was very little in Sicily; he had to defend his kingdom of Aragon, which Pope

Frederick.

Martin had granted to another French Charles. He was repre- sented by Queen Constance, and his great admiral Roger de Loria kept the war away from Sicily, waging it wholly in Italy, and making Charles, the son of King Charles, prisoner. In 1285 both the rival kings died. Charles had before his death been driven to make large legislative concessions to his subjects to stop the tendency shown, especially in Naples, to join the revolted Sicilians. By Peter's death Aragon and Sicily were separated; his eldest son Alphonso took Aragon, and his second son James took Sicily, which was to pass to the third j ames son Frederick, if James died childless. James was crowned, and held his reforming parliament also. With the popes no terms could be made. Charles, released in 1288 under a deceptive negotiation, was crowned king of Sicily by Honorius IV.; but he had much ado to defend his continental dominions against James and Roger. In 1291 James succeeded Alphonso in the kingdom of Aragon, and left Frederick not king, according to the entail, but only his lieutenant in Sicily.

Frederick was the real restorer of Sicilian independence. He had come to the island so young that he felt as a native. He defended the land stoutly, even against his brother. For James presently played Sicily false. In 1295 he was reconciled to the church and released from all French claims on Aragon, and he bound himself to restore Sicily to Charles. But the Sicilians, with Frederick at their head, dis- owned the agreement, and in 1296 Frederick was crowned king. He had to defend Sicily against his brother and Roger de Loria, who forsook the

cause, as did John of Procida. Hitherto the war had been waged on the mainland; now it was transferred to Sicily. King James besieged Syracuse as admiral of the Roman Church; Charles sent his son Robert in 1299 as his lieutenant in Sicily, where he gained some successes. But in the same year the one great land battle of the war, that of Falconaria, was won for Sicily. The war, chiefly marked by another great siege of Messina, went on till 1302, when both sides were thoroughly weakened and eager for peace. By a treaty, con- firmed by Pope Boniface VIII. the next year, Frederick was acknowledged as king of Trinacria for life. He was to marry the daughter of the king of Sicily, to whom the island kingdom was to revert at his death. The terms were never meant to be carried out. Frederick again took up the title of king of Sicily, and at his death in 1337 he was succeeded by his son Peter. There were thus two Sicilian kingdoms and two kings of Sicily. The king of the mainland is often spoken of for convenience as king of Naples, but that description was never borne as a formal title save in the 16th century by Philip, king of England and Naples, and in the 19th by Joseph Buona- parte and Joachim Murat. The strict distinction was between Sicily on this side the Pharos (of Messina) and Sicily beyond it.

Thus the great island of the Mediterranean again became an independent power. And, as far as legislation could make it, Sicily became one of the freest countries in Europe. By the laws of Frederick parliaments were to be regularly held, and without their consent the king could not make war, peace or alliance. The treaty of 1302 was not confirmed by parliament, and in 1337 parliament called Peter to the crown. But Sicily never rose to the greatness of its Greek or its Norman days, and its old character had passed away. Of Greeks and Saracens we now hear only as a degraded remnant, to be won over, if it may be, to the Western Church. The kingdom had no foreign possessions; yet faint survivals of the days of Agathocles and Roger lingered on. The isle of Gerba off the African coast was held for a short time, and traces of the connexion with Greece went on in various shapes. If the kings of Sicily on this side the Pharos kept Corfu down to 1386, those beyond the Pharos became in 13 n overlords of Athens, when that duchy was seized by Catalan adventurers, disbanded after the wars of Sicily. In 1530 the Sicilian island of Malta became the shelter of the Knights of Saint John driven by the Turk from Rhodes, and Sicily has received several colonies of Christian Albanians, who have replaced Greek and Arabic by yet another tongue. (See Naples, Kingdom of.) (E. A. F.; T. As.)

Peter.

SICKINGEN, FRANZ VON (1481-1523), German knight, one of the most notable figures of the first period of the Reformation, was born at Ebernburg near Worms. Having fought for the emperor Maximilian I. against Venice in 1508, he inherited large estates on the Rhine, and increased his wealth and reputation by numerous private feuds, in which he usually posed as the friend of the oppressed. In 15 13 he took up the quarrel of Balthasar Schlor, a citizen who had been driven out of Worms, and attacked this city with 7000 men. In spite of the imperial ban, he devas- tated its lands, intercepted its commerce, and only desisted when his demands were granted. He made war upon Antony, duke of Lorraine, and compelled Philip, landgrave of Hesse, to pay him 35,000 gulden. In 1518 he interfered in a civil conflict in Metz, ostensibly siding with the citizens against the governing oligarchy. He led an army of 20,000 men against the city, compelled the magistrates to give him 20,000 gold gulden and a month's pay for his troops. In 1518 Maximilian released him from the ban, and he took part in the war carried on by the Swabian League against Ulrich I., duke of Wurttemberg. In the contest for the imperial throne upon the death of Maximilian in 1519, Sickingen accepted bribes from Francis I., king of France, but when the election took place he led his troops to Frankfort, where their presence assisted to secure the - election of Charles V. For this service he was made imperial chamberlain and councillor, and in 15 21 he led an expedition into France, which ravaged Picardy, but was beaten back from Mezieres and forced to retreat. About 151 7 Sickingen became intimate with Ulrich von Hutten, and gave his support to Hutten's schemes. In 1 519 a threat from him freed John Reuchlin from his enemies, the Dominicans, and his castles became in Hutten's words a refuge for righteousness. Here many of the reformers found shelter, and a retreat was offered to Martin Luther. After the failure of the French expedition, Sickingen, aided by Hutten, formed, or revived, a large scheme to overthrow the spiritual princes and to elevate the order of knighthood. He hoped to secure this by the help of the towns and peasants, and to make a great position for himself. A large army was soon collected, many nobles from the upper Rhineland joined the standard, and at Landau, in August 1522, Sickingen was formally named commander. He declared war against his old enemy, Richard of Greiffenklau, archbishop of Trier, and marched against that city. Trier was loyal to the archbishop, and the landgrave of Hesse and Louis V., count palatine of the Rhine, hastened to his assistance. Sickingen, who had not obtained the help he wished for, was

compelled to fall back on his castle of Landstuhl, near Kaiserslautern, collecting much booty on the way. On the 22nd of October 1522 the council of regency placed him under the ban, to which he replied, in the spring of 1523, by plundering Kaiserslautern. The rulers of Trier, Hesse and the Palatinate decided to press the campaign against him, and having obtained help from the Swabian League, marched on Landstuhl. Sickingen refused to treat, and during the siege was seriously wounded. This attack is notable as one of the first occasions on which artillery was used, and by its aid breaches were soon made in an otherwise impregnable fortress. On the 6th of May 1523 he was forced to capitulate, and on the following day he died. He was buried at Landstuhl, and in 1889 a splendid monument was raised at Ebernburg to his memory and to that of Hutten.

His son Franz Conrad was made a baron of the empire {Reichs-freiherr) by Maximilian II., and a descendant was raised in 1773 to the rank of count (Reichsgraf). A branch of the family still exists in Austria and Silesia.

See H. Ulmann, Franz von Sickingen (Leipzig, 1872); F. P. Bremer, Sickingens Fehde gegen Trier (Strassburg, 1885); H. Prutz, ” Franz von Sickingen ” in Der neue Plutarch (Leipzig, 1880), and the ” Flersheimer Chronik ” in Hutten’s Deutsche Schriften, edited by O. Waltz und Szaraatolati (Strassburg, 1891).

SICKLES, DANIEL EDGAR (1825-), American soldier and diplomatist, was born in New York City on the 20th of October 1825. He learned the printer’s trade, studied in the university of the City of New York (now New York University) , was admitted to the bar in 1846, and was a member of the state Assembly in 1847. In 1853 he became corporation counsel of

New York City, but resigned soon afterward to become secretary of the U.S. legation in London, under James Buchanan. He returned to America in 1855, was a member of the state Senate in 1856-1857, and from 1857 to 1861 was a Democratic repre- sentative in Congress. In 1859 he was tried on a charge of murder, having shot Philip Barton Key, U.S. attorney for the District of Columbia, whom Sickles had discovered to have a liaison with his wife; but was acquitted after a dramatic trial lasting twenty days. At the outbreak of the Civil War Sickles was active in raising United States volunteers in New York, and was appointed colonel of a regiment. He became a brigadier-general of volunteers in September 1 86,1 , led a brigade of the Army of the Potomac with credit up to the battle of Antietam, and then succeeded to a divisional command. He took part with dis- tinction in

the battle of Fredericksburg, and in 1863 as a major- general commanded the III. army corps. His energy and ability were conspicuous in the disastrous battle of Chancellors- ville Iq.v.); and at Gettysburg (q.v.) the part played by the III. corps in the desperate fighting around the Peach Orchard was one of the most noteworthy incidents in the battle. Sickles himself lost a leg and his active military career came to an end. He was, however, employed to the end of the war, and in 1867 received the brevets of brigadier-general U.S.A. and major-general U.S.A. for his services at Fredericksburg and Gettysburg respectively. General Sickles was one of the few successful volunteer generals who served on either side. Soon after the close of the Civil War he was sent on a confidential mission to Colombia to secure its compliance with a treaty agreement (of 1846) permitting the United States to convey troops across the Isthmus of Panama. In 1 866- 1 86 7 he commanded the department of the Carolinas. In 1866 he was appointed colonel of the 42nd infantry (Veteran Reserve Corps), and in 1869 he was retired with the rank of major-general. He was minister to Spain from 1869 to 1873, and took part in the negotiations growing out of the ” Virginius Affair ” (see Santiago, Cuba). General Sickles was president of the New York State Board of Civil Service Commissioners in 1888-1889, was sheriff of New York in 1890, and was again a representative in Congress in 1893- 189 5.

SICULI, an ancient Sicilian tribe, which in historical times occupied the eastern half of the island to which they gave their name. It plays a large though rather shadowy part in the early traditions of pre-Roman Italy. There is abundant evidence that the Siculi once lived in Central Italy east and even north of Rome {e.g. Servius ad Aen. vii. 795; Dion. Hal. i. 9. 22;Thucy- dides vi. 2). Thence they were dislodged by the Umbro-Safine tribes, and finally crossed to Sicily. Archaeologists are not yet agreed as to the particular stratum of remains in Italy to which the name of the Siculi should be attached (see for instance B. Modestov, Introduction a Vhistoire romaine, Paris, 1907, pp. 135 sqq.). They were distinct from the Sicani {q.v.; Virg. Aen. viii. 328) who inhabited the western half of the island, and who according to Thucydides came from Spain, but whom Virgil seems to recognize in Italy. Both traditions may be true (cf. W. Ridgeway, Who were the Romans? London, 1908, p. 23). Of the language of the Siculi we know a very little from glosses preserved to us by ancient writers, most of which were collected by E. A. Freeman {Sicily, vol. i. App. note iv.), and from an inscription upon what is presumably an ornamental earthen- ware wine vessel, which has very much the shape of a tea-pot, preserved and transcribed by R. S. Conway in the Collection of the Grand Duke of Baden at Karlsruhe (Winnefeld, Grossherzogl.

vereinigte Sammlungen, 1887, 120), which has been discussed by R. Thurneysen (Kuhn's Zeitschrift, xxxv. 214). The inscription was found at Centuripa, and the alphabet is Greek of the 5th or 6th century B.C. We have not enough evidence to make a translation possible, despite Thurneysen's valiant effort, but the recurrence of the phrase hemiton esti durom in a varied order {durom hemiton esti) — presumably a drinking song or proverb, " half a cup is sorry cheer,"' though it is possible that the sign read as m may really denote some kind of 5 — makes the division of these three words quite certain, and renders it highly probable that we have to do with an Indo-European language. None of

the groups of sounds occurring in the rest of the inscription, nor any of the endings of words so far as they may be guessed, present any reason for doubting this hypothesis; and the glosses already mentioned can one and all be easily connected with Greek or Latin words (e.g. poirov, mutuum) ; in fact it would be difficult to rebut the contention that they should all be regarded as mere borrowings. (R. S. C.)

The towns of the Siculi, like those of the Sicani, formed no political union, but were under independent rulers. They played an important part in the history of the island after the arrival of the Greeks (see Sicily). Their agricultural pursuits and the volcanic nature of the island made them worshippers of the gods of the nether world, and they have enriched mythology with some distinctly national figures. The most important of these were the Palici, protectors of agriculture and sailors, who had a lake and temple in the neighbourhood of the river Symaethus, the chief seat of the Siceli; Adranus, father of the Palici, a god akin to Hephaestus, in whose temple a fire was always kept burning; Hybla (or Hyblaea), after whom three towns were named, whose sanctuary was at Hybla Gereatis. The connexion of Demeter and Kore with Henna (the rape of Proserpine) and of Arethusa with Syracuse is due to Greek influence. The chief Sicel towns were: Agyrium (San Filippo d' Argird); Centuripa (or Centuripae; Centorbi); Henna (Castrogiovanni, a corruption of Castrum Hennae through the Arabic Casr-janni) ; Hybla, three in number, (a) Hybla Major, called Geleatis or Gereatis, on the river Symaethus, probably the Hybla famous for its honey, although according to others this was (b) Hybla Minor, on the E. coast N. of Syracuse, afterwards the site of the Dorian colony of Megara, (c)

Hybla Heraea in the S. of the island.

For authorities see Sicily.

SICYON, or Secyon (the latter being the older form used by the natives), an ancient Greek city situated in northern Pelopon- nesus between Corinthia and Achaea. It was built on a low triangular plateau about 2 m. from the Corinthian Gulf, at the confluence of the Asopus and the Helisson, whose sunken beds protected it on E. and W. Between the city and its port lay a fertile plain with olive-groves and orchards. Sicyon's primitive name Aegialeia indicates that its original population was Ionian ; in the Iliad it appears as a dependency of Agamemnon, and its early connexion with Argos is further proved by the myth and surviving cult of Adrastus. After the Dorian invasion the com- munity was divided anew into the ordinary three Dorian tribes and an equally privileged tribe of Ionians, besides which a class of Kopvvij(j > 6poL or Ka.Twva.Ko4 > 6poi lived on the land as serfs. For some centuries Sicyon remained subject to Argos, whence its Dorian conquerors had come; as late as 500 B.C. it acknowledged a certain suzerainty. But its virtual independence was estab- lished in the 7th century, when a line of tyrants arose and initiated an anti-Dorian policy. This dynasty, known after its founder Orthagoras as the Orthagoridae, exercised a mild rule, and there- fore lasted longer than any other succession of Greek tyrants (about 665-565 B.C.). Chief of these rulers was the founder's grandson Cleisthenes — the uncle of the Athenian legislator of that name (see Cleisthenes, 2). Besides reforming the city's con- stitution to the advantage of the Ionians and replacing Dorian cults by the worship of Dionysus, Cleisthenes gained renown as the chief instigator and general of the First Sacred War (590) in the interests of the Delphians. From Herodotus' famous account of the wooing of Agariste it may be inferred that he held intercourse with many commercial centres of Greece and south Italy. About this time Sicyon developed the various industries for which it was noted in antiquity. As the abode of the sculptors Dipoenus and Scyllis it gained pre-eminence in wood- carving and bronze work such as is still to be seen in the archaic metal facings found at Olympia. Its pottery, which resembled the Corinthian ware, was exported with the latter as far as Etruria. In Sicyon also the art of painting was supposed to have been " invented." After the fall of the tyrants their institutions survived till the end of the 6th century, when the Dorian supre- macy was re-established, perhaps by the agency of Sparta, and the city was enrolled in the Peloponnesian League. Henceforth

its policy was usually determined either by Sparta or by its powerful neighbour Corinth. During the Persian wars Sicyon could place 3000

heavy-armed men in the field; its school of bronze sculptors still flourished, and produced in Canachus (?.».) a master of the late archaic style. In the 5th century it suffered like Corinth from the commercial rivalry of Athens in the western seas, and was repeatedly harassed by flying squadrons of Athenian ships. In the Peloponnesian war Sicyon followed the lead of Sparta and Corinth. When these two powers quarrelled after the peace of Nicias it remained loyal to the Spartans; but the latter thought it prudent to stiffen the oligarchic government against a nascent democratic movement. Again in the Corinthian war Sicyon sided with Sparta and became its base of operations against the allied troops round Corinth. In 369 it was captured and garrisoned by the Thebans in their successful attack on the Peloponnesian League. On this occasion a powerful citizen named Euphron effected a democratic revolution and established himself tyrant by popular support. His deposition by the Thebans and subsequent murder freed Sicyon for a season, but new tyrants arose with the help of Philip II. of Macedon. Never- theless during this period Sicyon reached its zenith as a centre of art: its school of painting gained fame under Eupompus and attracted the great masters Pamphilus and Apelles as students; its sculpture was raised to a level hardly surpassed in Greece by Lysippus and his pupils. After participating in the Lamian war and the campaigns of the Macedonian pretenders the city was captured (303) by Demetrius Poliorcetes, who trans- planted all the inhabitants to the Acropolis and renamed the site Demetrias. In the 3rd century it again passed from tyrant to tyrant, until in 251 it was finally liberated and enrolled in the Achaean League by Aratus (g.v.). The destruction of Corinth (146.) brought Sicyon an acquisition of territory and the presidency over the Isthmian games; yet in Cicero's time it had fallen deep into debt. Under the empire it was quite obscured by the re- stored cities of Corinth and Patrae; in Pausanias' age (a.d. 150) it was almost desolate. In Byzantine times it became a bishop's seat, and to judge by its later name" Hellas " it served as a refuge for the Greeks from the Slavonic immigrants of the 8th century.

The village of Vasiliko which now occupies the site is quite insignificant. On the plateau parts of the ancient fortifications are still visible, including the wall between town and Acropolis near the southern apex. A little north of this wall are remains of a theatre and stadium, traces of aqueducts and foundations of buildings. The theatre, which was excavated by the American School of Archaeology in 1886-1887, 1891 and 1898, was built in the slope towards the Acropolis, probably in the first half of the 4th century, and measured 400 ft. in diameter; the stage was rebuilt in Roman times. The side

entrances to the auditorium were covered in with vaults of Greek construction; a curious feature is a tunnel from below the stage into the middle of the auditorium.

Authorities. — Strabo, pp. 382, 389; Herodotus v. 67-68, vi. 92, ix. 28; Thucydides i. 108, in; iv. 70, 101; v. 52, 82; Xenophon, Hellenica, iv., vi., vii. ; Diodorus xviii. n, xx. 102; Pausanias ii. 5-1 1 ; W. M. Leake, Travels in the Morea (London, 1830), iii. PP- 351-381; E. Curtius, Peloponnesos (Gotha, 1851), ii. pp. 482-505; American Journal of Archaeology, v. (1889) pp. 267-303, viii. (1893) pp. 288-400, xx. (1905) pp. 263-276; L. Dyer in the Journal of Hellenic Studies (1906), pp. 76-83; for coins, B. V. Head, Historia numorum (Oxford, 1887), pp. 345-346; also Numis- matics, section Greek, § " Patrae, Sicyon." (M. O. B. C.)

SIDDONS, SARAH (1755-1831), English actress, the eldest of twelve children of Roger Kemble, was born in the " Shoulder of Mutton " public-house, Brecon, Wales, on the 5th of July 1755. Through the special care of her mother in sending her to the schools in the towns where the company played, Sarah Kemble received a remarkably good education, although she was accustomed to make her appearance on the stage while still a child. She became attached to William Siddons, an actor of the company; but this was discountenanced by her parents, who wished her to accept the offer of a squire. Siddons was dismissed from the company, and she was sent to a situation as lady's maid to Mrs Greathead at Guy's Cliff in Warwickshire. Here she recited Shakespeare, Milton and Rowe in the servants'

hall, and occasionally before aristocratic company, and here also she began to develop a capacity for sculpture which was sub- sequently developed (between 1789 and 1790), and of which she provided samples in busts of herself and of her son. The necessary consent to her union with Siddons was at last obtained, and the marriage took place at Trinity Church, Coventry, on the 26th of November 1773. It was while playing at Cheltenham in the following year that Mrs Siddons met with the earliest decided recognition of her powers as an actress, when by her representation of Belvidera in Otway's Venice Preserved she moved to tears a party of " people of quality " who had come to scoff. Her merits were made known by them to Garrick, who sent his deputy to Cheltenham to see her as Calista in Rowe's Fair Penitent, the result being that she was engaged to appear at Drury

Lane at a salary of £5 a week. Owing to inex- perience as well as other circumstances, her first appearances as Portia and in other parts were unfortunate, and when, after playing with success in Birmingham, she was about to return to town she received a note from the manager of Drury Lane stating that her services would not be required. Thus, in her own words, ” banished from Drury Lane as a worthless candidate for fame and fortune,” she again in the beginning of 1777 went on ” the circuit ” in the provinces. After a very successful engagement at Bath, beginning in 1778 and lasting five years, she again accepted an offer from Drury Lane, when her appearance as Isabella in Garrick’s version of Southerne’s Fatal Marriage, on the 10th of October 1782, was a triumph, only equalled in the history of the English stage by that of Garrick’s first night at Drury Lane in 1 741 and that of Edmund Kean’s in 1814. In her earlier years it was in scenes of a tender and melting character that she exercised the strongest sway over an audience; but in the performance of Lady Macbeth, in which she appeared on the 2nd of February 1785 for the first time in London, it was the grandeur of her exhibition of the more terrible passions as related to one awful purpose that held them spellbound. In Lady Macbeth she found the highest and best scope for her gifts. It fitted her as no other character did, and as perhaps it will never fit another actress. Her extraordinary and peculiar physical endowments — tall and striking figure, brilliant beauty, power- fully expressive eyes, and solemn dignity of demeanour — en- abled her to confer a weird majesty on the character which in- expressibly heightened the tragic awe surrounding her fate. After Lady Macbeth she played Desdemona, Rosalind and Ophelia, all with great success; but it was in Queen Catherine — which she first played on the occasion of her brother John Kemble’s spectacular revival of Henry VIII. in 1788 — that she discovered a part almost as well adapted to her peculiar powers as that of Lady Macbeth. As Volumnia in Kemble’s version of Coriolanus she also secured a triumph. In her early life she had attempted comedy, but her gifts in this respect were very limited. It was of course inevitable that comparisons should be made between her and her only peer, Rachel, who undoubtedly excelled her in intensity and the portrayal of fierce passion, but was a less finished artist and lacked Mrs Siddons’ dignity and pathos. Though Mrs Siddons’ minute and systematic study perhaps gave a certain amount of stiffness to her representations, it conferred on them a symmetry and proportion to which Rachel never attained. Mrs Siddons formally retired from the stage in 181 2, but occasionally appeared on special occasions even when advanced in years. Her last appearance was on the 9th of June 1819 as Lady Randolph in Home’s Douglas, for the benefit of Mr and Mrs Charles Kemble. Her most striking impersona- tions, besides the

roles already mentioned, were those of Zara in Congreve's Mourning Bride, Constance in King John, Mrs Haller in The Stranger, and Elvira in Pizarro. In private life Mrs Siddons enjoyed the friendship and respect of many of the most eminent" persons of her time. Horace Walpole at first refused to join the fashionable chorus of her praise, but he was ultimately won over. Dr Johnson wrote his name on the hem of her garment in the famous picture of the actress as the Tragic Muse by Reynolds (now in the Dulwich Gallery). " I would not lose," he said, " the honour this opportunity afforded to me for

my name going down to posterity on the hem of your garment." Mrs Siddons died in London on the 8th of June 1831, and was buried in Paddington churchyard.

On the 14th of June 1897 Sir Henry Irving unveiled at Pad- dington Green a marble statue of her by Chavalliaud, after the portrait by Reynolds. There is also a large statue by Chantrey in Westminster Abbey. Portraits by Lawrence and Gains- borough are in the National Gallery, and a portrait ascribed to Gainsborough is in the Garrick Club, London, which also possesses two pictures of the actress as Lady Macbeth by George Henry Harlow.

See Thomas Campbell, Life of Mrs Siddons (2 vols., 1834); Fitz- gerald, The Kembles (3 vols., 1871); Frances Ann Kemble, Records of a Girlhood (3 vols., 1878).

SIDE (mod. Eski Adalia), an ancient city on the Pamphylian coast about 12 m. E. of the mouth of the Eurymedon. Possessing a good harbour in the days of small craft, it was the most im- portant place in Pamphylia. Alexander visited and occupied it, • and there the Rhodian fleet defeated that of Antiochus the Great, and in the succeeding century the Cilician pirates established their chief seat. An inscription found on the site shows it to have had a considerable Jewish population in early Byzantine times. The great ruins, among the most notable in Asia Minor, have been re-occupied by some 200 families of Cretan Moslems. They cover a large promontory, fenced from the mainland by a ditch and wall which has been repaired in medieval times and is singularly perfect. Within this is a maze of structures out of which rises the colossal ruin of the theatre, built up on arches like a Roman amphitheatre for lack of a convenient hill-side to be hollowed out in the usual Greek fashion. The auditorium is little less perfect than that of Aspendus and very nearly as large; but the scena wall has collapsed over stage and proscenium in a cataract of loose blocks. The arches now afford shelter and stabling for the Cretans. Besides the theatres, three temples, an aqueduct and a nymphaeum are noticeable.

See C. Lanckorouski, Les Villes de la Pamphylie et de la Pisidie, i. (1890). – (D. G. H.)

SIDEBOARD, a high oblong table fitted with drawers, cup- boards or pedestals, and used for the exposition or storage of articles required in the dining-room. Originally it was what its name implies — a side-table, to which the modern dinner- wagon very closely approximates. Then two- or three-tiered sideboards were in use in the Tudor period, and were perhaps the ancestors, or collaterals, of the court-cupboard, which in skeleton they much resembled. Early in the 18th century they began to be replaced by side-tables properly so called. They were one of the many revolutions in furniture produced by the introduction of mahogany, and those who could not afford the new and costly wood used a cheap substitute stained to resemble it In the beginning these tables were entirely of wood and comparatively slight, but before long it became the fashion to use a marble slab instead of a wooden top, which necessitated a somewhat more robust construction; here again there was a field for imitation, and marble was sometimes replaced by scagliola. Many of the sideboard tables of this period were exceedingly handsome, with cabriole legs, claw or claw and bill feet, friezes of acanthus, much gadrooning and mask pendants. Many such tables came from Chippendale's workshops, but although that great genius beautified the type he found, he had no influence upon the evolution of the sideboard. That evolution was brought about by the growth of domestic needs. Save upon its surface, the side- board-table offered no accommodation; it usually lacked even a drawer. Even, however, in the period of Chippendale's zenith separate " bottle cisterns " and " lavatories " for the convenience of the butler in washing the silver as the meals proceeded were, sparsely no doubt, in use. By degrees it became customary to place a pedestal, which was really a cellarette or a plate- warmer, at each end of the sideboard-table. One of them would contain ice and accommodation for bottles, the other would be a cistern. Sometimes a single pedestal would be surmounted by a wooden vase lined with metal and filled with water, and fitted with a I tap. To whom is due the brilliant inspiration of attaching the

pedestals to the table and creating a single piece of furniture out of three components there is nothing to show with certainty. It is most probable that the credit is due to Shearer, who unques- tionably did much for the improvement of the sideboard; Hepplewhite and the

brothers Adam distinguished themselves in the same field. The pedestals, when incorporated as an integral part of the piece, became cupboards and the vases knife-boxes, and, with the drawers, which had been occasionally used much earlier, the sideboard, in what appears to be its final form, was completed. Pieces exist in which the ends have been cut away to receive the pedestals. If Shearer and Hepplewhite laid its foundations, it was brought to its full floraison by Sheraton. By the use of fine exotic woods, the deft employment of satin wood and other inlays, and by the addition of gracefully ornamented brass- work at the back, sometimes surmounted by candles to light up the silver, Sheraton produced effects of great elegance. But for sheer artistic excellence in the components of what presently became the sideboard, the Adams stand unrivalled, some of their inlay and brass mounts being almost equal to the first work of the great French school. By replacing the straight outline with a bombe front, Hepplewhite added still further to the grace of the late 18th-century sideboard. No art remains long at its apogee, and in less than a quarter of a century the sideboard lost its grace, and, influenced by the heavy feeling of the Empire manner, grew massive and dull. Since the end of the 1 8th century there has indeed been no advance, artistically speaking, in this piece of furniture.

SIDGWICK, HENRY (1838-1900), English philosopher, was born at Skipton in Yorkshire, where his father, the Rev. W. Sidgwick (d. 1841), was headmaster of the grammar-school, on the 31st of May 1838. He was educated at Rugby (where his cousin, subsequently his brother-in-law, E. W. Benson— after- wards archbishop) — was a master), and at Trinity, Cambridge, where his career was a brilliant one. In 1859 he was senior classic, 33rd wrangler, chancellor's medallist and Craven scholar. In the same year he was elected to a fellowship at Trinity, and soon afterwards appointed to a classical lectureship there. This post he held for ten years, but in 1869 exchanged his lectureship for one in moral philosophy, a subject to which he had been turn- ing his attention more and more. In the same year, finding that he could no longer declare himself a member of the Church of England, he resigned his fellowship. He retained his lectureship, and in 1881 was elected an honorary fellow. In 1874 he published his Method of Ethics (6th ed. 1901, containing emendations written just before his death), which first won him a reputation outside his university. In 1875 he was appointed praelector on moral and political philosophy at Trinity, in 1883 he was elected Knightbridge professor of moral philosophy, and in 1885, the religious test having been removed, his college once more elected him to a fellowship on the foundation. Besides his lecturing and literary

labours, Sidgwick took an active part in the business of the university, and in many forms of social and philanthropic work. He was a member of the General Board of Studies from its foundation in 1882 till 1899; he was also a member of the Council of the Senate of the Indian Civil Service Board and the Local Examinations and Lectures Syndicate, and chairman of the Special Board for Moral Science. He was one of the founders and first president of the Society for Psychical Research, and was a member of the Metaphysical Society. None of his work is more closely identified with his name than the part he took in pro- moting the higher education of women. He helped to start the higher local examinations for women, and the lectures held at Cambridge in preparation for these. It was at his suggestion and with his help that Miss Clough opened a house of residence for students; and when this had developed into Newnham College, and in 1880 the North Hall was added, Mr Sidgwick, who had in 1876 married Eleanor Mildred Balfour (sister of A. J. Balfour), went with his wife to live there for two years. After Miss Clough's death in 1892 Mrs Sidgwick became principal of the college, and she and her husband resided there for the rest of his life. During this whole period Sidgwick took the deepest interest in the welfare of the college. In politics he was a Liberal, and

became a Liberal Unionist in 1886. Early in 1900 he was forced by ill-health to resign his professorship, and he died on the 28th of August of the same year.

Though in many ways an excellent teacher he was primarily a student, and treated his pupils as fellow-learners. He was deeply interested in psychical phenomena, but his energies were primarily devoted to the study of religion and philosophy. Brought up in the Church of England, he gradually drifted from orthodox Christianity, and as early as 1862 he described himself as a theist. For the rest of his life, though he regarded Chris- tianity as " indispensable and irreplaceable—looking at it from a sociological point of view," he found himself unable to return to it as a religion. In political economy he was a Utilitarian on the lines of Mill and Bentham; his work was the careful investiga- tion of first principles and the investigation of ambiguities rather than constructive. In philosophy he devoted himself to ethics, and especially to the examination of the ultimate . intuitive principles of conduct and the problem of free will. He gave up the psychological hedonism of Mill, and adopted instead a position which may be described as ethical hedonism, according to which the criterion of goodness in any given action is that it produces the greatest possible amount of pleasure. This hedonism, however, is not confined to the self (egoistic), but involves a due regard to the pleasure of others, and

is, therefore, distinguished further as universalistic. Lastly, Sidg- wick returns to the principle that no man should act so as to destroy his own happiness, and leaves us with a somewhat unsatisfactory dualism.

His chief works are Principles of Political Economy (1883, 3rd ed. 1901); Scope and Method of Economic Science (1885); Outlines of the History of Ethics (1886, 5th ed. 1902), enlarged from his article Ethics in the Encyclopaedia Britannica; Elements of Politics (1891, 2nd ed. 1897), an attempt to supply an adequate treatise on the subject starting from the old lines of Bentham and Mill. The following were published posthumously: Philosophy; its Scope and Relations (1902) ; Lectures on the Ethics of T. H. Green, Mr Herbert Spencer and J. Martineau (1902); The Development of European Polity (1903) ; Miscellaneous Essays and Addresses (1904) ; Lectures on the Philosophy of Kant (1905).

His younger brother, Arthur Sidgwick, had a brilliant school and university career, being second classic at Cambridge in 1863 and becoming fellow of Trinity; but he devoted himself thence- forth mainly to work as a teacher. After being for many years a master at Rugby, he became in 1882 fellow and tutor of Corpus, Oxford; and from 1894 to 1906 was Reader in Greek in the uni- versity. He published a number of admirable classical school- books, including Greek Prose (1876) and Greek Verse (1882), and texts {Virgil, 1890; Aeschylus, 1880-1903), and was weU known as a consummate classical scholar, remarkable for literary taste and general culture. In the college life of Corpus he took the deepest interest and had the most stimulating influence; and he also played an active part in social and political move- ments from an advanced Liberal point of view.

A Memoir of Henry Sidgwick, written by his brother with the collaboration of his widow, was published in 1906.

SIDI-BEL-ABBES, chief town of an arrondissement in the department of Oran, Algeria, 48 m. by rail S. of Oran, 1552 ft above the sea, on the right bank of the Mekerra. Pop. (1906) ot the town, 24,494 (of whom three-fourths are French or Spaniards) ; of the commune, 29,088; of the arrondissement, which includes 17 communes, 98,309. The town, which occupies an important strategic position in the plain dominated by the escarpments of Mount Tessala, has barrack accommodation for 6000 troops, and is the headquarters of the i er regiment etranger, one of the two regiments known as the Foreign Legion. It is encircled by a crenellated and bastioned wall with a fosse, and has four gates, named after Oran, Daia, Mascara and Tlemcen respectively. Starting from the gates, two broad streets, shaded by

plane trees, traverse the town east to west and north to south, the latter dividing the civil from the military quarters. There are numerous fountains fed by the Mekerra. Sidi-bel-Abbes is also an important agricultural centre, wheat, tobacco and alfa being the chief articles of trade. There are numerous vineyards and olive-

groves in the vicinity. The town, founded by the French, derives its name from the kubba (tomb) of a marabout named Sidi-bel- Abbes, near which a redoubt was constructed by General Bedeau in 1843. The site of the town, formerly a swamp, has been thoroughly drained. The surrounding country is healthy, fertile and populous.

SIDMOUTH, HENRY ADDINGTON, ist Viscount (1757- 1844), English statesman, son of Dr Anthony Addingtori, was born on the 30th of May 1757. Educated at Winchester College and Brasenose College, Oxford, he graduated in 1778, and took the chancellor's prize for an English essay in 1779. Owing to his friendship with William Pitt he turned his attention to politics, and after his election as member of parliament for Devizes in 1784 gave a silent but steady support to the ministry of his friend. By close attention to his parliamentary duties, he obtained a wide knowledge of the rules and procedure of the House of Commons, and this fact together with his intimacy with Pitt, and his general popularity, secured his election as Speaker in June 1789. Like his predecessors, Addington con- tinued to be a partisan after his acceptance of this office, took part at times in debate when the house was in committee; and on one occasion his partiality allowed Pitt to disregard the authority of the chair. He enjoyed the confidence of George III., and in the royal interest tried to induce Pitt to withdraw his proposal for a further instalment of relief to Roman Catholics. Rather than give way on this question Pitt resigned office early in 1801, when both he and the king urged Addington to form a government. Addington consented, and after some delay caused by the king's illness, and by the reluctance of several of. Pitt's followers to serve under him, became first lord of the treasury and chancellor of the exchequer in March 1801. The new prime minister, who was specially acceptable to George, was loyally supported by Pitt; and his first important work, the conclusion of the treaty of Amiens in March 1802, made him popular in the country. Signs, however, were not wanting that the peace would soon be broken, and Pitt, dissatisfied with the ministry for ignoring the threatening attitude of Napoleon, and making no preparations for a renewal of the war, withdrew his

support. Addington then took steps to strengthen the forces of the crown, and suggested to Pitt that he should join the cabinet and that both should serve under a new prime minister. This offer was declined, and a similar fate befell Addington's subsequent proposal to serve under Pitt. When the struggle with France was renewed in May 1803, it became evident that as a war minister Addington was not a success; and when Pitt became openly hostile, the continued confidence of the king and of a majority in the House of Commons was not a sufficient counter- poise to the ministry's waning prestige. Although careful and industrious, Addington had no brilliant qualities, and his medi- ocrity afforded opportunity for attack by his enemies. Owing to his father's profession he was called in derision " the doctor," and George Canning, who wrote satirical verses at his expense, referred to him on one occasion as " happy Britain's guardian gander." Without waiting for defeat in the House he resigned office in April 1804, and became the leader of the party known as the " king's friends." Pitt, who now returned to office, was soon reconciled with his old friend; in January 1805 Addington was created Viscount Sidmouth, and became lord president of the council. He felt aggrieved, however, because his friends were not given a larger share of power, and when Pitt complained because some of them voted against the ministry, Sidmouth left the cabinet in July 1805. In February 1806 he became lord privy seal in the ministry of Fox and Grenville, but resigned early in 1807 when the government proposed to throw open commissions in the army and navy to Roman Catholics and Protestant dissenters; in 1812 he joined the cabinet of Spencer Perceval as lord president of the council, becoming home secretary when the ministry was reconstructed by the earl of Liverpool in the follow- ing June. The ten years during which he held this office coincided with much misery and unrest among the labouring classes, and the government policy, for which he was mainly responsible, was one of severe repression. In 181 7 the Habeas Corpus Act

was suspended, and Sidmouth issued a circular to the lords- lieutenant declaring that magistrates might apprehend and hold to bail persons accused on oath of seditious libels. For this step he was severely attacked in parliament, and was accused of fomenting rebellion by means of his spies. Although shaken by the acquittal of William Hone en a charge of libel the govern- ment was supported by parliament; and after the " Manchester massacre " in August 1819 the home secretary thanked the magistrates and soldiers for their share in quelling the riot. He was mainly responsible for the policy embodied in the " Six Acts " of 1819. In December 1821 Sidmouth resigned his office, but remained a member of the cabinet without official duties

until 1824, when he resigned owing to his disapproval of the recognition of the independence of Buenos Aires. Subsequently he took very little part in public affairs; but true to his earlier principles he spoke against Catholic emancipation in April 1829, and voted against the Reform Bill in 1832. He died at his residence in Richmond Park on the 15th of February 1844, and was buried at Mortlake. In 1781 he married Ursula Mary, daughter of Leonard Hammond of Cheam, Surrey, who died in 181 1, leaving a son, William Leonard, who succeeded his father as Viscount Sidmouth, and four daughters. In 1823 he married secondly Marianne, daughter of William Scott, Baron Stowell (d. 1836), and widow of Thomas Townsend of Honington, Warwickshire. Sidmouth suffers by comparison with the great men of his age, but he was honest and courageous in his opinions, loyal to his friends, and devoted to church and state.

The 2nd Viscount Sidmouth (1 794-1 864) was a clergyman of the Church of England; he was succeeded as 3rd Viscount by his son, William Wells Addington (b. 1824).

See Hon. G. Pellew, Life of Sidmouth (London, 1847); Lord John Russell, Life and Times of C. J. Fox (London, 1859-1866); Earl Stanhope, Life of Pitt (London, 1861-1862); Sir G. C. Lewis, Essays on the Administrations of Great Britain (London, 1864); Spencer Walpole, History of England (London, 1878-1886). (A. W. H.*)

SIDMOUTH, a market town and watering-place in the Honiton parliamentary division of Devonshire, England, on the river Sid and the English Channel, 167! m. W. by S. of London, by the London & South- Western railway. Pop. of urban district (1901) 4201. Lying in a hollow, the town is shut in by hills which ter- minate in the forelands of Salcombe and High Peak, two sheer cliffs of a deep red colour. The shore line curves away, beyond these, westward to the Start and eastward to Portland — both visible from Sidmouth beach. The restored church of St Nicholas, dating from the 13th century, though much altered in the 15th, contains a window given by Queen Victoria in 1866 in memory of her father, the duke of Kent, who lived at Woolbrook Glen, close by, and died there in 1820. An esplanade is built along the sea-wall, and the town possesses golf links and other recreation grounds. The bathing is good, the climate warm. Formerly of some importance, the harbour can no longer be entered by large vessels, and goods are transhipped into flat-bottomed lighters for conveyance ashore. Fishing is extensively carried on and cattle fairs are held. In the 13th century Sidmouth was a borough governed by a port-reeve. Tradition tells of an older town buried under the sea; and Roman coins and other remains have been washed up on the beach.

Traces of an ancient camp exist on High Peak.

SIDNEY (or Sydney), ALGERNON (1622-1683), English politician, second son of Robert, 2nd earl of Leicester, and of Dorothy Percy, daughter of Henry, 9th earl of Northumberland, was born at Penshurst, Kent, in 1622. As a boy he showed much talent, which was carefully trained under his father's eye In 1632 with his elder brother Philip he accompanied his father on his mission as ambassador extraordinary to Christian IV. of Denmark, whom he saw at Rendsburg. In May 1636 Sidney went with his father to Paris, where he became a general favourite, and from there to Rome- In October 1641 he was given a troop in his father's regiment in Ireland, of which his brother, known as Lord Lisle, was in command. In August 1643 the brothers returned to England. At Chester their horses were taken by the Royalists, whereupon they again put out to sea and landed at Liverpool. Here they were detained by the Parliamentary

commissioners, and by them sent up to London for safe custody. Whether this was intended by Sidney or no, it is certain that from this time he ardently attached himself to the Parliamentary cause. On the ioth of May 1644 he was made captain of horse in Manchester's army, under the Eastern Association. He was shortly afterwards made lieutenant-colonel, and charged at the head of his regiment at Marston Moor (and July), where he was wounded and rescued with difficulty. On the 2nd of April 1645 he was given the command of a cavalry regiment in Cromwell's division of Fairfax's army, was appointed governor of Chichester on ioth May, and in December was returned to parliament for Cardiff. In July 1646 he went to Ireland, where his brother was lord-lieutenant, and was made lieutenant-general of horse in that kingdom and governor of Dublin. Leaving London on 1st of February 1647, Sidney arrived at Cork on the 22nd. He was soon (8th April), however, recalled by a resolution of the House passed through the interest of Lord Inchiquin. On the 7th of May he received the thanks of the House of Commons. On the 13th of October 1648 he was made lieutenant of Dover castle, of which he had previously been appointed governor. He was at this time identified with the Independents as opposed to the Presbyterian party. He was nominated one of the com- missioners to try Charles I., but took no part in the trial, retiring to Penshurst until sentence was pronounced. That Sidney approved of the trial, though not of the sentence, there can, however, be little doubt, for in Copenhagen he publicly and vigorously

expressed his concurrence. On the 15th of May 1649 he was a member of the committee for settling the succession and for regulating the election of future parliaments. Sidney lost the governorship of Dover, however, in March 1651, in conse- quence, apparently, of a quarrel with his officers. He then went to the Hague, where he quarrelled with Lord Oxford at play, and a duel was only prevented by their friends. He returned to England in the autumn, and henceforward took an active share in parliamentary work. On the 25th of November Sidney was elected on the council of state and was evidently greatly con- sidered. In the usurpation of Cromwell, however, he utterly re- fused all concurrence, nor would he leave his place in parliament except by force when Cromwell dispersed it on the 20th of April 1653. He immediately retired to Penshurst, where he was con- cerned chiefly with family affairs. In 1654 he again went to the Hague, and there became closely acquainted with De Witt. On his return he kept entirely aloof from public affairs, and it is to this period that the Essay on Love is ascribed.

Upon the restoration of the Long Parliament, in May 1659, Sidney again took his seat, and was placed on the council of state. He showed himself in this office especially anxious that the military power should be duly subordinated to the civil. In June he was appointed one of three commissioners to mediate for a peace between Denmark, supported by Holland, and Sweden. He was probably intended to watch the conduct of his colleague, Admiral Montagu (afterwards 1st earl of Sandwich), who was in command of the Baltic squadron. Of his character we have an interesting notice from Whitelocke, who refused to accompany him on the ground of his ” overruling temper and height.” Upon the conclusion of the treaty he went to Stockholm as plenipotentiary ; and in both capacities he behaved with resolution and address. When the restoration of Charles II. took place Sidney left Sweden, on the 28th of June 1660, bringing with him from the king of Sweden a rich present in testimony of the estimation in which he was held. Sidney went first to Copenhagen, and then, being doubtful of his reception by the English court, settled at Hamburg. From there he wrote a celebrated letter vindicating his conduct, which will be found in the Somers Tracts. He shortly afterwards left Hamburg, and passed through Germany by way of Venice to Rome. His stay there, however, was embittered by misunderstandings with his father and consequent straits for money. Five shillings a day, he says, served him and two men very well for meat, drink and firing. He devoted himself to the study of books, birds and trees, and speaks of his natural delight in solitude being largely in- creased. In 1663 he left Italy, passed through Switzerland,

where he visited Ludlow, and came to Brussels in September, where his portrait was painted by van Egmondt; it is now at Penshurst. He had thoughts of joining the imperial service, and offered to transport from England a body of the old Common- wealth men; but this was refused by the English court. It is stated that the enmity against him was so great that now, as on other occasions, attempts were made to assassinate him. On the breaking out of the Dutch war, Sidney, who was at the Hague, urged an invasion of England, and shortly afterwards went to Paris, where he offered to raise a rebellion in England on receipt of 100,000 crowns. Unable, however, to come to terms with the French government, he once more went into retirement in 1666, — this time to the south of France. In August 1670 he was again in Paris, and Arlington proposed that he should receive a pension from Louis; Charles II. agreed, but insisted that Sidney should return to Languedoc. In illustration of his austere principles it is related that, Louis having taken a fancy to a horse belonging to him and insisting on possessing it, Sidney shot the animal, which, he said, ” was born a free creature, had served a free man, and should not be mastered by a king of slaves.” His father was now very ill, and after much difficulty Sidney obtained leave to come to England in the autumn of 1677. Lord Leicester died in November; and legal business connected with other portions of the succession detained Sidney from returning to France as he had intended. He soon became involved in political intrigue, joining, in general, the country party, and holding close com- munication with Barillon, the French ambassador. In the beginning of 1679 he stood for Guildford, and was warmly supported by William Penn, with whom he had long been in- timate, and to whom he is said (as is now thought, erroneously) to have afforded assistance in drawing up the constitution of Pennsylvania. He was defeated by court influence, and his petition to the House, complaining of an undue return, never came to a decision. His Letters to Henry Savile, written at this period, are of great interest. He was in Paris, apparently only for a short while, in November 1679. Into the prosecution of the Popish Plot Sidney threw himself warmly, and was among those who looked to Monmouth, rather than to Orange, to take the place of James in the succession, though he afterwards dis- claimed all interest in such a question. He now stood for Bramber (Sussex), again with Penn’s support, and a double return was made. He is reported on the ioth of August 1679 as being elected for Amersham (Buckingham) with Sir Roger Hill. When parliament met, however, in October 1680, his election was declared void. But now, under the idea that an alliance between Charles and Orange would be more hostile to English liberty than would the progress of the French arms, he acted with Barillon in influencing members of parliament in

this sense, and is twice mentioned as receiving the sum of 500 guineas from the ambassador. Of this there is no actual proof, and it is quite possible that Barillon entered sums in his accounts with Louis which he never paid away. In any case it is to be remembered that Sidney is not charged with receiving money for advocating opinions which he did not enthusiastically hold.

Upon the dissolution of the last of Charles's parliaments the king issued a justificatory declaration. This was at once answered by a paper entitled A Just and Modest Vindication, 6*c, the first sketch of which is imputed to Sidney. It was then, too, that his most celebrated production, the Discourses con- cerning Government, was concluded, in which he upholds the doctrine of the mutual compact and traverses the High Tory positions from end to end. In especial he vindicates the pro- priety of resistance to kingly oppression or misrule, upholds the existence of an hereditary nobility interested in their country's good as the firmest barrier against such oppression, and main- tains the authority- of parliaments. In each point the English constitution, which he ardently admires, is, he says, suffering: the prerogatives of the crown are disproportionately great; the peerage has been degraded by new creations; and parlia- ments are slighted.

For a long while Sidney kept himself aloof from the duke of Monmouth, to whom he was introduced by Lord Howard. After

the death of Shaftesbury, however, in November 1682, he entered into the conferences held between Monmouth, Russell, Essex, Hampden and others. That treasonable talk went on seems certain, but it is probable that matters went no further. The watchfulness of the court was, however, aroused, and on the discovery of the Rye House Plot, Sidney, who had always been regarded in a vague way as dangerous, was arrested while at dinner on the 26th of June 1683. His papers were carried off, and he was sent at once to the Tower on a charge of high treason. For a considerable while no evidence could be found on which to establish a charge. Jeffreys, however, was made lord chief-justice in September; a jury was packed; and, after consulta- tions between the judge and the crown lawyers, Sidney was brought to listen to the indictment on the 7th of November. The trial began on the 21st of November: Sidney was refused a copy of the indictment, in direct violation of law, and he was refused the assistance of counsel. Hearsay evidence and the testimony of the perjured informer Lord

Howard, whom Sidney had been instrumental in introducing to his friends, were first produced. This being insufficient, partial extracts from papers found in Sidney's study, and supposed only to be in his hand- writing, in which the lawfulness of resistance to oppression was upheld, were next relied on. He was indicted for " conspiring and compassing the death of the king." Sidney conducted his case throughout with great skill; he pointed especially to the fact that Lord Howard, whose character he easily tore to shreds, was the only witness against him as to treason, whereas the law required two, that the treason was not accurately defined, that no proof had been given that the papers produced were his, and that, even if that were proved, these papers were in no way connected with the charge. Against the determination to secure a conviction, however, his courage, eloquence, coolness and skill were of no avail, and the verdict of " guilty " was given. On the 25th of November Sidney presented a petition to the king, praying for an audience, which, however, under the influence of James and Jeffreys, Charles refused. On the 26th he was brought up for judgment, and again insisted on the illegality of his con- viction. Upon hearing his sentence he gave vent to his feelings in a few noble and beautiful words. Jeffreys having suggested that his mind was disordered, he held out his hand and bade the chief-justice feel how calm and steady his pulse was. By the advice of his friends he presented a second petition, offering, if released, to leave the kingdom at once and for ever. The supposed necessity, however, of checking the hopes of Mon- mouth's partisans caused the king to be inexorable. The last days of Sidney's life were spent in drawing up his Apology and in discourse with Independent ministers. He was beheaded on the morning of the 7th of December 1683. His remains were buried at Penshurst. (O. A.)

SIDNEY, SIR HENRY (1520-1586), lord deputy of Ireland, was the eldest son of Sir William Sidney, a prominent politician and courtier in the reigns of Henry VIII. and Edward VI., from both of whom he received extensive grants of land, in- cluding the manor of Penshurst in Kent, which became the principal residence of the family. Henry was brought up at court as the companion of Prince Edward, afterwards King Edward VI.; and he continued to enjoy the favour of the sovereign throughout the reigns of Edward and Mary. In 1556 he went to Ireland with the lord deputy, the earl of Sussex, who in the previous year had married his sister Frances Sidney; and from the first he had a large share in the administration of the country, especially in the military measures taken by his brother-in-law for bringing the native Irish chieftains into submission to the English Crown. In the course of the lord deputy's Ulster expedition in 1557 Sidney

devastated the island of Rathlin; and during the absence of Sussex in England in the following year Sidney was charged with the sole responsibility for the govern- ment of Ireland, which he conducted with marked ability and success. A second absence of the lord deputy from Ireland, occasioned by the accession of Queen Elizabeth, threw the chief control into Sidney's hands at the outbreak of trouble with Shane O'Neill, and he displayed great skill in temporizing with that

redoubtable chieftain till Sussex reluctantly returned to his duties in August 1559. About the same time Sidney resigned his office of vice-treasurer of Ireland on being appointed president of the Welsh Marches, and for the next few years he resided chiefly at Ludlow Castle, with frequent visits to the court in London. In 1565 Sidney was appointed lord deputy of Ireland in place of Sir Nicholas Arnold, who had succeeded the earl of Sussex in the previous year. He found the country in a more impoverished and more turbulent condition than when he left it, the chief disturbing factor being Shane O'Neill in Ulster. With difficulty he persuaded Elizabeth to sanction vigorous measures against O'Neill; and although the latter successfully avoided a decisive encounter, Sidney restored O'Neill's rival Calvagh O'Donnell to his rights, and established an English garrison at Derry which did something to maintain order. In 1567 Shane was murdered by the MacDonnells of Antrim (see O'Neill), and Sidney was then free to turn his attention to the south, where with vigour and determination he arranged the quarrel between the earls of Desmond and Ormonde, and laid his hand heavily on other dis- turbers of the peace; then, returning to Ulster, he compelled Turlough Luineach O'Neill, Shane's successor in the clan chief- tainship, to make submission, and placed garrisons at Belfast and Carrickfergus to overawe Tyrone and the Glynns. In the autumn of 1567 Sidney went to England, and was absent from Ireland for the next ten months. On his return he urged upon Cecil the necessity for measures to improve the economic con- dition of Ireland, to open up the country by the construction of roads and bridges, to replace the Ulster tribal institutions by a system of freehold land tenure, and to repress the ceaseless disorder prevalent in every part of the island. In pursuance of this policy Sidney dealt severely with the unruly Butlers in Munster. At Kilkenny large numbers of Sir Edmund Butler's followers were hanged, and three of Ormonde's brothers were attainted by an act of the Irish parliament in 1570. Enlightened steps were taken for the education of the people, and encourage- ment was given to Protestant refugees from the Netherlands to settle in Ireland.

Sidney left Ireland in 1 571, aggrieved by the slight appreciation of his statesmanship shown by the queen; but he returned thither in

September 1575 with increased powers and renewed tokens of royal approval, to find matters in a worse state than before, especially in Antrim, where the MacQuillins of the Route and Sorley Boy MacDonnell (q.v.) were the chief fomenters of disorder. Having to some extent pacified this northern territory, Sidney repaired to the south, where he was equally successful in making his authority respected. He left his mark on the administrative areas of the island by making shire divisions on the English model. At an earlier period he had already in the north combined the districts of the Ardes and Clandeboye to form the county of Carrickfergus, and had converted the country of the O'Farrells into the county of Longford; he now carried out a similar policy in Connaught, where the ancient Irish district of Thomond became the county Clare, and the counties of Galway, Mayo, Sligo and Roscommon were also delimited. He suppressed a rebellion headed by the earl of Clanricarde and his sons in 1576, and hunted Rory O'More to his death two years later. Meantime Sidney's methods of taxation had caused discontent among the gentry of the Pale, who carried their grievances to Queen Elizabeth. Greatly to Sidney's chagrin the queen censured his extravagance, and notwithstanding his distinguished services to the crown he was recalled in September 1578, and was coldly received by Elizabeth. He lived chiefly at Ludlow Castle for the remainder of his life, performing his duties as president of the Welsh Marches, and died there on the 5th of May 1586.

Sir Henry Sidney was the ablest statesman charged with the government of Ireland in the 16th century; and the meagre recognition which his unrewarded services received was a conspicuous example of the ingratitude of Elizabeth. Sidney married in 1551 Mary, eldest daughter of John Dudley, duke of Northumberland, by whom he had three sons and four daughters. His eldest son was Sir Philip Sidney (q.v.), and his second was

Robert Sidney, ist earl of Leicester (q.v.); his daughter Mary married Henry Herbert, 2nd earl of Pembroke, and by reason of her association with her brother Philip was one of the most celebrated women of her time (see Pembroke, Earls of).

See Calendar of State Papers relating to Ireland, Henry VIII.-Elizabeth; Calendar of the Carew MSS.; J. O'Donovan's edition of The Annals of Ireland by the Four Masters (7 vols., Dublin, 1851)-

Holinshed's Chronicles, vol. iii. (6 vols., London, 1807); Richard Bagwell, Ireland under the Tudors (3 vols., London, 1885) ; Calendar of Ancient Records of Dublin, edited by Sir J. T. Gilbert, vois. i. and ii. (Dublin, 1889); Sir J. T. Gilbert, History of the Viceroys of Ireland (Dublin, 1865); J. A. Froude, History of England (12 vols., London, 1856-1870). (R. J. M.)

SIDNEY, SIR PHILIP (1554-1586), English poet, statesman and soldier, eldest son of Sir Henry Sidney and his wife Mary Dudley, was born at Penshurst on the 30th of November 1554. His father, Sir Henry Sidney (1 529-1 586), was three times lord deputy of Ireland, and in 1560 became lord president of Wales. Philip Sidney's childhood was spent at Penshurst; and before he had completed his tenth year he was nominated by his father lay rector of Whitford, Flintshire. A deputy was appointed, and Philip enjoyed the revenue of the benefice for the rest of his life. On the 1 7th of October 1 564 he was entered at Shrewsbury school, not far from his father's official residence at Ludlow Castle, on the same day with his life-long friend and first biographer, Fulke Greville. An affectionate letter of advice from his father and mother, written about 1565, was preserved and printed in 1591 (A Very Godly Letter . . .). In 1568 Sidney was sent to Christ Church, Oxford, where he formed lasting friendships with Richard Hakluyt and William Camden. But his chief companion was Fulke Greville, who had gone to Broadgates Hall (Pembroke College). Sir Henry Sidney was already anxious to arrange an advantageous marriage for his son, who was at that time heir to his uncle, the earl of Leicester; and Sir William Cecil agreed to a betrothal with his daughter Anne. But in 1571 the match was broken off, and Anne Cecil married Edward Vere, 17th earl of Oxford. In that year Philip left Oxford, and, after some months spent chiefly at court, received the queen's leave in 1572 to travel abroad " for his attaining the knowledge of foreign languages."

He was attached to the suite of the earl of Lincoln, who was sent to Paris in that year to negotiate a marriage between Queen Elizabeth and the due d'Alencon. He was in the house of Sir Francis Walsingham in Paris during the massacre of Saint Bartholomew, and the events he witnessed no doubt intensified his always militant Protestantism. In charge of Dr Watson, dean, and afterwards bishop, of Winchester, he left Paris for Lorraine, and in March of the next year had arrived in Frankfort on the Main. He lodged there in the house of the learned printer Andrew Wechel, among whose guests was also Hubert Languet. Fulke Greville describes Philip Sidney when a schoolboy as characterized by " such staidness of mind, lovely and familiar gravity, which carried grace and reverence far above greater years." " Though

I lived with him, and knew him from a child," he says, " yet I never knew him other than a man." These qualities attracted to him the friendship of grave students of affairs, and in France he formed close connexions with the Huguenot leaders. Languet, who was an ardent supporter of the Protestant cause, conceived a great affection for the younger man, and travelled in his company to Vienna. In October Sidney left for Italy, having first of all entered into a compact with his friend to write every week. This arrangement was not strictly observed, but the extant letters, more numerous on Languet's side than on Sidney's, afford a considerable insight into Sidney's moral and political development. Languet's letters abound with sensible and affectionate advice on his studies and his affairs generally.

Sidney settled for some time in Venice, and in February 1574 he sat to Paolo Veronese for a portrait, destined for Languet. His friends seem to have feared that his zeal for Protestantism might be corrupted by his stay in Italy, and Languet exacted from him a promise that he would not go to Rome. In July he was seriously ill, and immediately on his recovery started for

Vienna. From there he accompanied Languet to Poland, where he is said to have been asked to become a candidate for the vacant crown. On his return to Vienna he fulfilled vague diplomatic duties at the imperial court, perfecting himself meanwhile, in company with Edward Wotton, in the art of horsemanship under John Pietro Pugliano, whose skill and wit he celebrates in the opening paragraph of the Defence of Poesie. He addressed a letter from Vienna on the state of affairs to Lord Burghley, in December 1574. In the spring of 1575 he followed the court to Prague, where he received a summons to return home, appar- ently because Sir Francis Walsingham, who was now secretary of state, feared that Sidney had leanings to Catholicism.

His sister, Mary Sidney, was now at court, and he had an influential patron in his uncle, the earl of Leicester. He accom- panied the queen on one of her royal progresses to Kenilworth, and afterwards to Chartley Castle, the seat of Walter Devereux, earl of Essex. There he met Penelope Devereux, the " Stella " of the sonnets, then a child of twelve. Essex went to Ireland in 1576 to fill his' office as earl marshal, and in September occurred his mysterious death. Philip Sidney was in Ireland with his father at the time. Essex on his deathbed had desired a match between. Sidney and his daughter Penelope. Sidney was often harassed with debt, and seems to have given no serious thought to the question for some time, but Edward Waterhouse, an agent of Sir Henry Sidney, writing in November 1576, mentions "the treaty

between Mr Philip and my Lady Penelope ” (Sidney Papers, i. p. 147). In the spring of 1577 Sidney was sent to con- gratulate Louis, the new elector Palatine, and Rudolf II., who had become emperor of Germany. He received also general in- structions to discuss with various princes the advancement of the Protestant cause. ‘ ‘

After meeting Don John of Austria at Lou vain, March 1577, he proceeded to Heidelberg and Prague. He persuaded the elector’s brother, John Casimir, to consider proposals for a league of Protestant princes, and also for a conference among the Protestant churches. At Prague he ventured on a harangue to the emperor, advocating a general league against Spain and Rome. This address naturally produced no effect, but does not seem to have been resented as much as might have been expected. On the return journey he visited William of Orange, who formed a high opinion of Sidney. In April 1577 Mary Sidney married Henry Herbert, 2nd earl of Pembroke, and in the summer Philip paid the first of many visits to her at her new home at Wilton. But later in the year he was at court defending his father’s interests, particularly against the earl of Ormonde, who was doing all he could to prejudice Elizabeth against the lord deputy.

Sidney drew up a detailed defence of his father’s Irish govern- ment, to be presented to the queen. A rough draft of four of the seven sections of this treatise is preserved in the British Museum (Cotton MS., Titus B, xii. pp. 557-559), and even in its frag- mentary condition it justifies the high estimate formed of it by Edward Waterhouse (Sidney Papers, p. 228). Sidney watched with interest the development of affairs in the Netherlands, but was fully occupied in defending his father’s interests at court. He came also in close contact with many men of letters. In 1578 he met Edmund Spenser, who in the next year dedicated to him his Shepherdes Calendar. With Sir Edward Dyer he was a member of the Areopagus, a society which sought to introduce classical metres into English verse, and many strange experi- ments were the result. In 1578 the earl of Leicester entertained EHzabeth at Wanstead, Essex, with a masque, The Lady of the May, written for the occasion by Philip Sidney. But though Sidney enjoyed a high measure of the queen’s favour, he was not permitted to gratify his desire for active employment. He was already more or less involved in the disgrace of his uncle Leicester, following on that nobleman’s marriage with Lettice, countess of Essex, when, in 1579, he had a quarrel on the tennis- court at Whitehall with the earl of Oxford. Sidney proposed a duel, which was forbidden by Elizabeth. There was more in the quarrel than appeared on the surface. Oxford was one of the chief supporters of the queen’s proposed marriage with Alencon,

now due d'Anjou, and Sidney, in giving the lie to Oxford, affronted the leader of the French party. In January 1580 he went further in his opposition to the match, addressing to Eliza- beth a long letter in which the arguments against the alliance were elaborately set forth. This letter (Sidney Papers, pp. 287- 292), in spite of some judicious compliments, was regarded, not unnaturally, by the queen as an intrusion. Sidney was compelled to retire from court, and some of his friends feared for his personal safety. A letter from Languet shows that he had written to Elizabeth at the instigation of " those whom he was bound to obey," probably Leicester and Walsingham.

Sidney retired to Wilton, or the neighbouring village of Ivychurch, where he joined his sister in writing a paraphrase of the Psalms. Here too he began his Arcadia, for his sister's amusement and pleasure. In October 1 580 he addressed a long letter of advice, not without affectionate and colloquial inter- ruptions, to his brother Robert, then about to start on his con- tinental tour. This letter (Sidney Papers, p. 283) was printed in Profitable Instructions for Travellers (1633). It seems that a promise was exacted from him not to repeat his indiscretions in the matter of the French marriage, and he returned to court. In view of the silence of contemporary authority, it is hardly possible to assign definite dates to the sonnets of Astrophel and Stella. Penelope Devereux was married against her will to Robert, Lord Rich, in 1581, probably very soon after the letter from Penelope's guardian, the earl of Huntingdon, desiring the queen's consent. The earlier sonnets are not indicative of over- whelming passion, and it is a reasonable assumption that Sidney's liking for Penelope only developed into passion when he found that she was passing beyond his grasp. Mr A. W. Pollard assigns the magnificent sequence beginning with No. 33 — " I- might! unhappy word — O me, I might, And then would not, or could not, see my blisse," —

to- the period following on Stella's reappearance at court as Lady Rich. It has been argued that the whole tenor of Philip's life and character was opposed to an overmastering passion, and that there is no ground for attaching biographical value to these sonnets, which were merely Petrarchan exercises. That Sidney was, like his contemporaries, a careful and imitative student of French and Italian sonnets is patent. He himself confesses in the first of the series that he " sought fit words to paint the blackest face of woe," by " oft turning others' leaves " before he obeyed the command of his muse to " look

in his heart and write." The account of his passion is, however, too circumstantial to be lightly regarded as fiction. Mr Pollard sees in the sonnets a description of a spiritual struggle between his sense of a high political mission and a disturbing passion calculated to lessen his efforts in a larger sphere. It seems certain, at any rate, that he was not solely preoccupied with scruples against his love for Stella because she was already married. He had probably been writing sonnets to Stella for a year or more before her marriage, and he seems to have continued to address her after his own marriage. Thomas Nash defined the general argument epigram- matically as " cruel chastity — the prologue Hope, the epilogue Despair." But after Stella's final refusal Sidney recovered his earlier serenity, and the sonnet placed by Mr Pollard at the end of the series — " Leave me, O Love, which readiest but to dust " — expresses the triumph of the spirit.

Meanwhile he prosecuted his duties as a courtier and as member for Kent in parliament. On the 15th and 16th of May 1581 he was one of the four challengers in a tournament arranged in honour of the visit of the duke of Anjou. In 1579 Stephen Gosson had dedicated to Sidney his School of Abuse, an attack on the stage, and incidentally on poetry. Sidney was probably moved by this treatise to write his own Apologie for Poetrie, dating from about 1581. In 1583 he was knighted in order that he might act as proxy for Prince John Casimir, who was to be installed as Knight of the Garter, and in the autumn of that year he married Frances, daughter of his friend and patron Sir Francis Walsingham, a girl of fourteen or fifteen years of age. In 1584 he met Giordano Bruno at the house of his friend Fulke Greville, and two of the philosopher's books are dedicated to him.

Sidney was employed about this time in the translation from the French of his friend Du Plessis Mornay's treatise on the Christian religion. He still desired active service and took an eager interest in the enterprises of Martin Frobisher, Richard Hakluyt and Walter Raleigh. In 1 584 he Was sent to France to condole with Henry III. on the death of his brother, the duke of Anjou, but the king was at Lyons, and unable to receive the embassy. Sidney's interest in the struggle of the Protestant princes against Spain never relaxed. He recommended that Elizabeth should attack Philip II. in Spain itself. So keen an interest did he take in this policy that he was at Plymouth about to sail with Francis Drake's fleet in its expedition against the Spanish coast (1585) when he was recalled by the queen's orders. He was, however, given a command in the Netherlands, where he was made governor of Flushing. Arrived at his post, he con- stantly urged resolute action on his commander, the earl of Leicester, but with small result. In July 1 586 he made a success- ful raid on Axel, near

Flushing, and in September he joined the force of Sir John Norris, who was operating against Zutphen. On the 22nd of the month he joined a small force sent out to intercept a convoy of provisions. During the fight that ensued he was struck in the thigh by a bullet. He succeeded in riding back to the camp. The often-told story that he refused a cup of water in favour of a dying soldier, with the words, ” Thy need is greater than mine,” is in keeping with his character. He owed his death to a quixotic impulse. Sir William Pelham happening to set out for the fight without greaves, Sidney also cast off his leg-armour, which would have defended him from the fatal wound. He died twenty-five days later at Arnheim, on the 17th of October 1586. The Dutch desired to have the honour of his funeral, but the body was taken to England, and, after some delay due to the demands of Sidney’s creditors, received a public funeral in St Paul’s Cathedral on the 16th of February 1587.

Sidney’s death was a personal grief to people of all classes. Some two hundred elegies were produced in his honour. Of all these tributes the most famous is Astrophel, A Pastoral Elegie, added to Edmund Spenser’s Colin Clout’s Come Home Again (1595). Spenser wrote the opening poem; other contributors are Sidney’s sister, the countess of Pembroke, Lodowick Bryskett and Matthew Roydon. In the bare enumeration of Sidney’s achievements there seems little to justify the passionate admira- tion he excited. So calm an observer as William of Orange desired Fulke Greville to give Elizabeth ” his knowledge and opinion of a fellow-servant of his, that (as he heard) lived unemployed under her. ... If he could judge, her Majesty had one of the ripest and greatest counsellors of estate in Sir Philip Sidney, that this day lived in Europe ” (Fulke Greville, Life of Sidney, ed. 1816, p. 21). His fame was due first of all to his strong, radiant and lovable character. Shelley placed him in Adonais among the ” inheritors of unfulfilled renown,” as ” sublimely mild, a spirit without spot.”

Sidney left a daughter Frances (b. 1584), who married Roger Manners, earl of Rutland. His widow, who, in spite of the strictures of some writers, was evidently sincerely attached to him, married in 1590 Robert Devereux, second earl of Essex, and, after his death in 1601, Richard de Burgh, earl of Clanricarde.

Sidney’s writings were not published during his lifetime. A Worke concerning the trewnesse of the Christian Religion, trans- lated from the French of Du Plessis Mornay, was completed and published by Arthur Golding in 1587.

The Countesse of Pembroke’s Arcadia written by Philippe Sidnei

(1590), in quarto, is the earliest edition of Sidney's famous romance. 1 A folio edition, issued in 1503, is stated to have been revised and rearranged by the countess of Pembroke, for whose delectation the romance was written. She was charged to destroy the work sheet by sheet as it was sent to her. The circumstances of its composition partly explain the difference between its intricate sentences, full of far-fetched conceits, repetition and antithesis, and the simple and dignified phrase of the Apologie for Poetrie. The style is a concession to the fashionable taste in

1 For a bibliography of this and subsequent editions see the fac- simile reprint (1891) of this quarto, edited by Dr Oskar Somraer.

literature which the countess may reasonably be supposed to have shared; but Sidney himself, although he was no friend to euphuism, was evidently indulging his own mood in this highly decorative prose. The main thread of the story relates how the princes Musidorus and Pyrocles, the latter disguised as a woman, Zelmane, woo the princesses Pamela and Philoclea, daughters of Basilius and Gynaecia, king and queen of Arcady. The shepherds and shepherdesses occupy a humble place in the story. Sidney used a pastoral setting for a romance of chivalry complicated by the elaborate intrigue of Spanish writers. Nor are these intrigues of a purely innocent and pastoral nature. Sidney described the passion of love under many aspects, and the guilty queen Gynaecia is a genuine tragic heroine. The loose frame- work of the romance admits of descriptions of tournaments, Elizabethan palaces and gardens and numerous fine speeches. It also contains some lyrics of much beauty. Charles I. recited and copied out shortly before his death Pamela's prayer, which is printed in the Eikon Basilike. Milton reproached him in the Eikonoklastes with having " borrowed to a Christian use prayers offered to a heathen god . . . and that in no serious book, but in the vain amatorious poem of Sir Philip Sidney's Arcadia." Professor Courthope {Hist, of English Poetry, i. 215) points out that the tragedy of Sidney's life, the divorce between his ideals of a nobly active life and the enforced idleness of a courtier's existence, is intimately connected with his position as a pioneer in fiction, in which the life represented is tacitly recognized as being contrary to the order of existence. Sidney's wide acquaint- ance with European literature is reflected in this book, but he was especially indebted to the Arcadia of Jacopo Sannazaro, and still more to George Montemayor's imitation of Sannazaro, the Diana

Enamorada. The artistic defects of the Arcadia in no way detracted from its popularity. Both Shakespeare and Spenser were evidently acquainted with it. John Day's He of Guls, and the plots of Beaumont and Fletcher's Cupid's Revenge, and of James Shirley's Arcadia, were derived from it. The book had more than one supplement. Gervase Markham, Sir William Alexander (earl of Stirling) and Richard Beling wrote con- tinuations.

The series of sonnets to Stella were printed in 1 591 as Sir P.S.: His Astrophel and Stella, by Thomas Newman, with an intro- ductory epistle by T. Nash, and some sonnets by other writers. In the same year Newman issued another edition with many changes in the text and without Nash's preface. His first edition was (probably later) reprinted by Matthew Lownes. In 1598 the sonnets were reprinted in the folio edition of Sidney's works, entitled from its most considerable item The Couniesse of Pembroke's Arcadia, edited by Lady Pembroke, with con- siderable additions. The songs are placed in their proper position among the sonnets, instead of being grouped at the end, and two of the most personal poems (possibly suppressed out of con- sideration for Lady Rich in the first instance), which afford the best key to the interpretation of the series, appear for the first time. Sidney's sonnets adhere more closely to French than to Italian models. The octave is generally fairly regular on two rhymes, but the sestet usually terminates with a couplet. The Apologie for Poetrie was one of the " additions " to the countess of Pembroke's Arcadia (1598), where it is entitled " The Defence of Poesie." It first appeared separately in 1594 (unique copy in the Rowfant Library, reprint 1904, Camb. Univ. Press). Sidney takes the word " poetry " in the wide sense of any imagina- tive woik, and deals with its various divisions. Apart from the subject matter, which is interesting enough, the book has a great value for the simple, direct and musical prose in which it is written. The Psalmes of David, the paraphrase in which he collaborated with his sister, remained in MS. until 1823, when it was edited by S. W. Singer. A translation of part of the Divine Sepmaine of G. Salluste du Bartas is lost. There are two pastorals by Sidney in Davison's Poetical Rhapsody (1602).

Letters and Memorials of State . . . (1746) is the title of an in- valuable collection of letters and documents relating to the Sidney family, transcribed from originals at Penshurst and elsewhere by Arthur Collins. Fulke Greville's Life of the Renowned Sir Philip Sidney is a panegyric dealing chiefly with his public policy. The

Correspondence of Sir Philip Sidney and Hubert Languet was trans- lated from the Latin and published with a memoir by Steuart A. Pears

(1845). The best biography of Sidney is A Memoir of Sir Philip Sidney by H. R. Fox Bourne (1862). A revised life by the same author is included in the ” Heroes of the Nations ” series (1891). Critical appreciation is available in J. A. Symonds’s Sir Philip Sidney (1886), in the ” English Men of Letters ” series; in J. J. A. Jusserand’s English Novel in the Time of Shakespeare (1890) ; and in modern editions of Sidney’s works, among which may be mentioned Mr A. W. Pollard’s edition (1888) of Astrophel and Stella, Professor Arber’s reprint (1868) of An Apologie for Poetrie, and Mr Sidney Lee’s Elizabethan Sonnets (1904) in the re-issue of Professor Arber’s English Garner, where the sources of Sidney’s sonnets are fully discussed. See also a collection of Sidneiana printed for the Roxburghe Club in 1837, a notice by Mrs Humphry Ward in Ward’s English Poets, L 341 seq., and a dissertation by Dr K. Brunhuber, Sir Philip Sidney’s Arcadia und ihre Nachldufer (Nurnberg, 1903). A com- plete text of Sidney’s prose and poetry, edited by Albert Feuillerat, is to be included in the Cambridge English Classics.

SIDNEY, a city and the county-seat of Shelby county, Ohio, U.S.A., on the Miami river, about 33 m. S. by W. of Lima. Pop. (1890) 4850; (1900) 5688, including 282 foreign-born and 108 negroes; (1910) 6607. Sidney is served by the Cleveland,/ Cincinnati, Chicago & St Louis, the Cincinnati, Hamilton & Dayton, and the Western Ohio (electric) railways. The city is situated on an elevated tableland, in an agricultural region. Sidney has a public library, and a monumental building, a memorial, erected in 1875, to the soldiers in the American Civil War, and now devoted to various public uses. The river here provides some water-power, and the city has various manu- factures. Sidney was laid out as the county-seat in 1819, was incorporated as a village in 1831 and first chartered as a city in 1897.

SIDON (Phoen. px, Hebrew p’x, Assyr. Sidunnu, Egypt. Diduna), formerly the principal city of Phoenicia, now a small town of about 15,000 inhabitants, situated on the Syrian coast between Beirut and Sur (Tyre). The name, which the Arabs now pronounce Saida, has been explained as meaning ” fish- town ” (cf. Hebr. to ” to hunt,” in Phoen. perhaps ” to fish “); more likely it is connected with the god Sid, who is known only as an element in proper names (see Cooke, North-Sem. Insert. p. 91); possibly both town and people were named after him. The ancient city extended some 800 yds. inland from the shore over ground which is now covered by fruit-gardens. From a series of inscriptions, all giving the same text, discovered at Bostan esh-Shekh, a little way to the N. of Saida, we learn that the ancient city was divided into three divisions at least, one of which was called ” Sidon by the sea,” and another ” Sidon on the plain ” (?) (see N.Sem.

Inscrr. App. i.). In front of the flat promontory to which the modern Sidon is confined there stretches northwards and southwards a rocky peninsula; at the northern extremity of this begins a series of small rocks enclosing the harbour, which is a very bad one. The port was formerly pro tected on the north by the Qal'at el-Bahr (" Sea Castle ";, a building of the 13th century, situated on an island still connected with the mainland by a bridge. On the S. side of the town lay the so-called Egyptian harbour, which was filled up in the 17th century in order to keep out the Turks. The wall by which Sidon is at present surrounded is pierced by two gates; at the southern angle, upon a heap of rubbish, stand the remains of the citadel. The streets are very narrow, and the buildings of any interest few; most prominent are some large caravanserais belonging to the period of Sidon's modern prosperity, and the large mosque, formerly a church of the knights of St John. The inhabitants support themselves mainly on the produce of their luxuriant gardens; but the increasing trade of Beirut has withdrawn the bulk of the commerce from Sidon. In earlier days Phoenicia produced excellent wine, that of Sidon being specially esteemed; it is mentioned in an Aramaic papyrus from Egypt (4th century B.C., N.S.I, p. 213). One of the chief in- dustries of Sidon used to be the manufacture of glass from the fine sand of the river Belus. To the S.E. of the town lies the Phoenician necropolis, which has been to a great extent investi- gated. The principal finds are sarcophagi, and next to these I sculptures and paintings. It was here that the superb Greek

sarcophagi, which are now in the Imperial Museum at Constanti- nople, were found, and the sarcophagi of the two Sidonian kings Eshmunazar (Louvre) and Tabnith (Imperial Museum, Con- stantinople) , both of them with important Phoenician inscriptions.

The ancient history of Sidon is discussed in the article Phoenicia. In a.d. 325 a bishop of Sidon attended the Council of Nicaea. In 637-638 the town was taken by the Arabs. During the Crusades it was alternately in the possession of the Franks and the Mahommedans, but finally fell into the hands of the latter in 129 1. As the residence of the Druse Amir Fakhr ud-Din, it rose to some prosperity about the beginning of the 1 7 th century, but towards the close of the 18th its commerce again passed away and has never returned. The biblical references to Sidon are Gen. x. 15 (the people), xlix. 13; Is. xxiii. 1-14; Ezek. xxvii. 8 ; Acts xxvii. 3. Sidon is nearly always mentioned along

with Tyre — Jer. xxvii. 3, xlvii. 4; Ezra iii. 7; Joel iii. 4; Mark iii. 8 and Luke vi. 17; Mark vii. 24, 31, and Matt. xv. 21; Matt. xi. 21 and Luke x. 13 f.; Acts xii. 20. In the Old Testa- ment, as frequently in Greek literature, ” Sidonians ” is used not in a local but in an ethnic sense, and means ” Phoenicians,” hence the name of Sidon was familiar to the Greeks earlier than that of Tyre, though the latter was the more important city (ed. Meyer, Encycl. Bibl. col. 4505).

See Robinson, Bibl. Res. ii. 478 ff . ; Prutz, Aus Phonicien (1876), 98 ff. ; Pietschmann, Gesch. d. Phohi’zier (1889), 53-58; Hamdy Bey and T. Reinach, Necropole royale a Sidon (1892-1896) ; A. Socin in Baedeker, Pal. u. Syrien. (G. A. C.*)

SIEBENGEBIRGE (” The Seven Hills “), a cluster of hills in Germany, on the Rhine, 6 m. above Bonn. They are of volcanic origin, and form the north-western spurs of the Westerwald. In no part of the Rhine valley is the scenery more attractive ; crag and forest, deep dells and gentle vine-clad slopes, ruined castles and extensive views over the broad Rhine and the plain beyond combine to render the Siebengebirge the most favourite tourist resort on the whole Rhine. The hills are as follows: the steep Drachenfels (1067 ft.), abutting on the Rhine and surmounted by the ruins of an old castle; immediately behind it, and connected by a narrow ridge, the Wolkenburg (ro76 ft.); lying apart, and to the N. of these, the Petersberg (1096 ft.), with a pilgrimage chapel of St Peter; then, to the S. of these three, a chain of four — viz. the Olberg (1522 ft.), the highest of the range; the Lowenburg (1506 ft.); the Lohrberg (1444 ft.), and, farthest away, the Nonnenstromberg (1107 ft.). At the foot of the Drachenfels, on the north side, lies the little town of Konigswinter, whence a mountain railway ascends to the summit, and a similar railway runs up the Petersberg. The ruins which crown almost every hill are those of strongholds of the archbishops of Cologne and mostly date from the 12th century.

See von Dechen, Geognostischer Fiihrer in das Siebengebirge (Bonn, 1861); von Sttlrtz, Fiihrer durch das Siebengebirge (Bonn, 1893); Laspeyres, Das Siebengebirge am Rhein (Bonn, 1901).

SIEBOLD, CARL THEODOR ERNST VON (1804-1885), German physiologist and zoologist, the son of a physician and a descendant of what Lorenz Oken called the ” Asclepiad family of Siebolds,” was born at Wurzburg on the 16th of February 1804. Educated in medicine and science chiefly at the university of Berlin, he became successively professor of zoology, physiology and comparative anatomy in Konigsberg, Erlangen, Freiburg, Breslau and Munich. In conjunction

with F. H. Stannius he published (1845-1848) a Manual of Comparative Anatomy, and along with R. A. Kolliker he founded in 1848 a journal which soon took a leading place in biological literature, Zeitschrift filr wissenschaflliche Zoologie. He was also a laborious and successful helminthologist and entomologist, in both capacities contributing many valuable papers to his journal, which he continued to edit until his death at Munich on the 7th of April 1885. In these ways, without being a man of marked genius, but rather an industrious and critical observer, he came to fill a peculiarly distinguished position in science, and was long reckoned, what his biographer justly calls him, the Nestor of German zoology.

See Ehlers, Zeitschr. f. wiss. Zool. (1885).

SIEBOLD, PHILIPP FRANZ VON (1796-1866), scientific explorer of Japan, elder brother of the physiologist, was born

at Wurzburg, Germany, on the 17th of February r7o6. He studied medicine and natural science at Wurzburg, and obtained his doctor's diploma in 1820. In 1822 he entered the service of the king of the Netherlands as medical officer to the East Indian Army. On his arrival at Batavia he was attached to a new mission to Japan, sent by the Dutch with a view to improve their trading relations with that country. Siebold was well equipped with scientific apparatus, and he remained in Japan for six years, with headquarters at the Dutch settlement on the little island of Deshima. His medical qualifications enabled him to find favour with the Japanese, and he gathered a vast amount of information concerning a country then very little known, especially concerning its natural history and ethnography. He had comparatively free access to the interior, and his reputation spreading far and wide brought him visitors from all parts of the country. His valuable stores of information were enriched by trained natives whom he sent to collect for him in the interior. In 1824 he published De historiae naturalis in Japonia statu and in 1832 his splendid Fauna Japonica. His knowledge of the language enabled him also in 1826 to issue from Batavia his Epitome linguae Japonicae. In Deshima he also laid the founda- tion of his Catalogus librorum Japonicorum and Isagoge in hibliothecam Japonicam, published after his return to Europe, as was his Bibliotheca Japonica, which, with the co-operation of J. Hoffmann, appeared at Leiden in 1833. During the visit which he was permitted to make to Yedo (Tokio), Siebold made the best of the rare opportunity; his zeal, indeed, outran his discretion, since, for obtaining a native map of the country, he was thrown into prison and compelled to quit Japan on the 1st of January 1830. On his return to Holland he was raised to the rank of major, and in 1842 to that of

colonel. After his arrival in Europe he began to give to the world the fruits of his researches and observations in Japan. His Nippon; Archiv zur Beschrei- bung von Japan und dessen Neben- und Schutz-Liindern was issued in five quarto volumes of text, with six folio volumes of atlas and engravings. He also issued many fragmentary papers on various aspects of Japan. In 1854 he published at Leiden Urkundliche Darstellung der Bestrebungen Niederlands und Russlands zur Eroffnung Japans. In 1859 Siebold undertook a second journey to Japan, and was invited by the emperor to his court. In 1861 he obtained permission from the Dutch government to enter the Japanese service as negotiator between Japan and the powers of Europe, and in the same year his eldest son was made interpreter to the English embassy at Yedo. Siebold was, however, soon obliged by various intrigues to retire from his post, and ultimately from Japan. Returning by Java to Europe in 1862, he set up his ethnographical collections, which were ultimately secured by the government of Bavaria and removed to Munich. He con tinued to publish papers on various Japanese subjects, and received honours from many of the learned societies of Europe. He died at Munich on the 18th of October 1866.

See biography by Moritz Wagner, in Allgemeine Zeitung, 13th to 1 6th of November 1866.

SIEDLCE (Russian Syedlets), a government of Russian Poland, between the Vistula and the Bug, having the governments of Warsaw on the W., Lomza on the N., Grodno and Volhynia on the E., Lublin on the S., and Radom on the S.W. Its area is 5533 sq. m. The surface is mostly flat, only a few hilly tracts appearing in the middle, around Biala, and in the east on the banks of the Bug. Extensive marshes occur in the north and in the south-east. Cretaceous, Jurassic and Tertiary strata cover the surface, and are overlain by widely spread Glacial deposits. The valley of the Vistula is mostly wide, with several terraces covered with sand-dunes or peat-bogs. Siedlce is drained by the Vistula, which borders it for 50 m. on the west; by the Bug, which is navigable from Opalin in Volhynia and flows for 170 m. on the east and north-east borders; by the Wieprz, a tributary of the Vistula, which is also navigable, and flows for 25 m. along the southern boundary; and by the Liwiec, a tributary of the Bug, which is navigable for some 30 m. below Wegrow. Of the total area only 5-2% is unproductive; 48-1% is under crops and 17-2 under meadows and pasture land. The estimated

population in 1906 was 907,700. The inhabitants consist of Little Russians (40%), Poles (43%), Jews (155%) and Germans (i|%). The government is divided into nine districts, the chief towns of which are the capital Siedlce, Biala, Konstantinow, Garwolin, Lukow, Radzyn, Sokolow, Wegrow, Wlodawa, The main occupation is agriculture, the principal crops being rye, wheat, oats, barley and potatoes. The area under forests amounts to 19-6% of the total. Live-stock breeding is second in importance to agriculture. Manufactures and trade are insignificant.

SIEDLCE, a town of Russia, capital of the government of the same name, 56 m. E.S.E. of the city of Warsaw, on the Brest- Litovsk railway. It is a Roman Catholic episcopal see. The Oginskis, to whom it belonged, have embellished it with a palace and gardens; but it is nothing more than a large village. Pop. 23,714 (1897), two-thirds Jews.

SIEGBURG, a town of Germany, in the Prussian Rhine Province, on the river Sieg, 16 m. by rail S.E. of Cologne by the railway to Giessen. Pop. (1905) 14,878. It has a royal shell factory, calico-printing mills, lignite mines, stone quarries and pottery and tobacco factories. The parish church, dating from the 13th century, possesses several richly decorated reliquaries of the 1 2th to 15th centuries. The buildings of the Benedictine abbey, founded in 1066, are now used as a prison. The town, which was founded in the nth century, attained the height of its prosperity in the isth and 16th centuries owing to its pottery wares. Siegburg pitchers (Siegburger Kriige) were widely famed. Their shape was often fantastic and they are now eagerly sought by collectors.

See R. Heinekamp, Siegburgs Vergangenheit und Gegenwart (Siegburg, 1897) ; and Renard, Die Kunsldenkmaler des Siegkreises (Diisseldorf, 1907).

SIEGE (0. Fr. sege, siege, mod. siige, seat, ultimately from sedere, to sit, cf. Class. Lat. obsidium, a siege), the ” sitting down ” of an army or military force before a fortified place for the purpose of taking it, either by direct military operations or by starving it into submission (see Fortification and Siegecraft). A special form of coin is known as a ” siege-piece.” These are coins that were struck during a siege of a town when the ordinary mints were closed or their issues were not available. Such coins were commonly of special shape to distinguish them from the normal coinage, and were naturally of rough workmanship. A common shape for the siege pieces which were issued during the Great Rebellion was the lozenge. A noteworthy example is

a shilling siege-piece struck at Newark in 1645 (see Token Money).

SIEGEN, a town of Germany, in the Prussian province of Westphalia, situated 63 m. E. of Cologne by rail, on the Sieg, a tributary entering the Rhine opposite Bonn. Pop. (1905) 25,201. The town contains two palaces of the former princes of Nassau-Siegen, a technical and a mining school. The sur- rounding district, to which it gives its name, abounds in iron- mines, and iron founding and smelting are the most important branches of industry in and near the town. Large tanneries and leather works, and factories for cloth, paper and machinery, are among the other industrial establishments.

Siegen was the capital of an early principality belonging to the house of Nassau; and from 1606 onwards it gave name to the junior branch of Nassau-Siegen. Napoleon incorporated Siegen in the grand-duchy of Berg in 1806; and in 181 5 the congress of Vienna assigned it to Prussia, under whose rule it has nearly quintupled its population. Rubens is said to have been born here

in 1577.

See Cuno, Geschichte der Stadt Siegen (Dillenburg, 1873).

SIEMENS, ERNST WERNER VON (1816-1892), German electrician, was born on the 13th of December 1816 at Lenthe in Hanover. After attending the gymnasium at Liibeck, he entered the Prussian army as a volunteer, and for three years was a pupil in the Military Academy at Berlin. In 1838 he received a commission as lieutenant in the artillery, and six years later he was appointed to the responsible post of superintendent of the artillery workshops. In 1848 he had the task of protecting the port of Kiel against the Danish fleet, and as commandant of

Friedrichsort built the fortifications for the defence of Eckern- forde harbour. In the same year he was entrusted with the laying of the first telegraph line in Germany, that between Berlin and Frankfort-on-Main, and with that work his military career came to an end. Thenceforward he devoted his energies to furthering the interests of the newly founded firm of Siemens and Halske, which under his guidance became one of the most important electrical undertakings in the world, with branches in different countries that gave it an international influence; in the London house he was associated with Sir William Siemens, one of his younger brothers. Although he had a decided pre- dilection for pure research, his scientific work was naturally determined to a large extent by the demands of his business,

and, as he said when he was admitted to the Berlin Academy of Sciences in 1874, the filling up of scientific voids presented itself to him as a technical necessity. Considering that his entrance into commercial life was almost synchronous with the introduc- tion of electric telegraphy into Germany, it is not surprising that many of his inventions and discoveries relate to telegraphic apparatus. In 1847, when he was a member of the committee appointed to consider the adoption of the electric telegraph by the government, he suggested the use of gutta-percha as a material for insulating metallic conductors. Then he in- vestigated the electrostatic charges of telegraph conductors and their laws, and established methods for testing underground and submarine cables and for locating faults in their insula- tion; further, he carried out observations and experiments on electrostatic induction and the retardation it produced in the speed of the current. He also devised apparatus for duplex and diplex telegraphy, and automatic recorders. In a somewhat less specialized sphere, he was an early advocate of the desirability of establishing some easily reproducible basis for the measurement of electrical resistance, and suggested that the unit should be taken as the resistance of a column of pure mercury one metre high and one square millimetre in cross-section, at a temperature of o° C. Another task to which he devoted much time was the construction of a selenium photometer, depending on the property possessed by that substance of changing its electrical resistance according to the intensity of the light falling upon it. He also claimed to have been, in 1866, the discoverer of the principle of self -excitation in dynamo-electric machines, in which the residual magnetism of the iron of the electro-magnets is utilized for excitation, without the aid of permanent steel magnets or of a separate exciting current. In another branch of science he wrote several papers on meteorological subjects, discussing among other things the causation of the winds and the forces which produce, maintain and retard the motions of the air. In 1886 he devoted half a million marks to the foundation of the Physikalisch- Technische Reichsanstalt at Charlottenburg, and in 1888 he was ennobled. He died at Berlin on the 6th of December 1892. His scientific memoirs and addresses were collected »and pub- lished in an English translation in 1892, and three years later a second volume appeared, containing his technical papers.

SIEMENS, SIR WILLIAM [Karl Wilhelm] (1823-1883), British inventor, engineer and natural philosopher, was born at Lenthe in Hanover on the 4th of April 1823. After being educated in the polytechnic school of Magdeburg and the uni- versity of Gottingen, he visited England at the age of nineteen, in the hope of introducing a process in

electroplating invented by himself and his brother Werner. The invention was adopted by Messrs Elkington, and Siemens returned to Germany to enter as a pupil the engineering works of Count Stolberg at Magdeburg. In 1844 he was again in England with another invention, the ” chronometric ” or differential governor for steam engines. Finding that British patent laws afforded the inventor a protection which was then wanting in Germany, he thenceforth made England his home; but it was not till 1859 that he formally became a naturalized British subject. After some years spent in active invention and experiment at mechanical works near Birmingham, he went into practice as an engineer in 1851. He laboured mainly in two distinct fields, the applications of heat and the applications of electricity, and was characterized

in a very rare degree by a combination of scientific comprehension with practical instinct. In both fields he played a part which would have been great in either alone; and, in addition to this, he produced from time to time miscellaneous inventions and scientific papers sufficient in themselves to have established a reputation. His position was recognized by his election in 1862 to the Royal Society, and later to the presidency of the Institu- tion of Mechanical Engineers, the Society of Telegraph Engineers, the Iron and Steel Institute, and the British Association; by honorary degrees from the universities of Oxford, Glasgow, Dublin and Wtirzburg; and by knighthood (in 1883). He died in London on the 19th of November 1883.

In the application of heat Siemens’s work began just after J. P. Joule’s experiments had placed the doctrine of the conservation of energy on a sure basis. Wnile Rankine, Clausius and Lord Kelvin were developing the dynamical theory of heat as a matter of physical and engineering theory, Siemens, in the light of the new ideas, made a bold attempt to improve the efficiency of the steam engine as a converter of heat into mechanical work. Taking up the regenerator — a device invented by Robert Stirling twenty years before, the im- portance of which had meanwhile been ignored — he applied it to the steam engine in the form of a regenerative condenser with some success in 1847, and in 1855 engines constructed on Siemens’s plan were worked at the Paris exhibition. Later he also attempted to apply the regenerator to internal combustion or gas engines. In 1856 he introduced the regenerative furnace, the idea of his brother Friedrich (1826- 1904), with whom he associated himself in directing its applications. In an

ordinary furnace a very large part of the heat of combustion is lost by being carried off in the hot gases which pass up the chimney. In the regenerative furnace the hot gases pass through a regenerator, or chamber stacked with loose bricks, which absorb the heat. When the bricks are well heated the hot gases are diverted so to pass through another similar chamber, while the air necessary for combustion, before it enters the furnace, is made to traverse the heated chamber, taking up as it goes the heat which has been stored in the bricks. After a suitable interval the air currents are again reversed. The process is repeated periodically, with the result that the products of combustion escape only after being cooled , the heat which they take from the furnace being in great part carried back in the heated air. But another invention was required before the regenerative furnace could be thoroughly successful. This was the use of gaseous fuel, produced by the crude distillation and incomplete combustion of coal in a distinct furnace or gas-pro- ducer. From this the gaseous fuel passes by a flue to the regenerative furnace, and it, as well as the entering air, is heated by the regenerative method, four brick-stacked chambers being used instead of two. The complete invention was applied at Chance's glass-works in Birmingham in 1861, and furnished the subject of Faraday's farewell lecture to the Royal Institution. It was soon applied to many industrial processes, but it found its greatest development a few years later at the hands of Siemens himself in the manufacture of steel. To produce steel directly from the ore, or by melting together wrought-iron scrap with cast-iron upon the open hearth, had been in his mind from the first, but it was not till 1867, after two years of experiment in " sample steel works " erected by himself for the purpose, that he achieved success. The product is a mild steel of exceptionally trustworthy quality, the use of which for boiler-plates has done much to make possible the high steam-pressures that are now common, and has consequently contributed, indirectly, to that improvement in the thermodynamic efficiency of heat engines which Siemens had so much at heart. Just before his death he was again at work upon the same subject, his plan being to use gaseous fuel from a Siemens producer in place of solid fuel beneath the boiler, and to apply the regenerative principle to boiler furnaces. His faith in gaseous fuel led him to anticipate that it would in time supersede solid coal for domestic and industrial purposes, cheap gas being supplied either from special works or direct from the pit; and among his last inventions was a house grate to burn gas along with coke, which he regarded as a possible cure for city smoke.

In electricity Siemens's name is closely associated with the growth of land and submarine telegraphs, the invention and development of the

dynamo, and the application of electricity to lighting and to locomotion. In i860, with his brother Werner, he invented the earliest form of what is now known as the Siemens armature; and in 1867 he communicated a paper to the Royal Society ” On the Con- version of Dynamical into Electrical Force without the aid of Per- manent Magnetism,” in which he announced the invention by Werner Siemens of the dynamo-electric machine, an invention which was also reached independently and almost simultaneously by Sir Charles Wheatstone and by S. A. Varley. The Siemens-Alteneck or multiple-coil armature followed in 1873. While engaged in con- structing a trans-Atlantic cable for the Direct United States Tele- graph Company, Siemens designed the very original and successful ship ” Faraday,” by which that and other cables were laid. One of the last of his works was the Portrush and Bushmills electric tram- way, in the north of Ireland, opened in 1883, where the water-power

of the river Bush drives a Siemens dynamo, from which the electric energy is conducted to another dynajno serving as a motor on the car. In the Siemens electric furnace the’ intensely hot atmosphere of the electric arc between carbon points ‘is ! ‘employed to melt re- fractory metals. Another of the uses to whiCh-he turned electricity was to employ light from arc lamps as a substitute for sunlight in hastening the growth and fructification of plants. Among his miscellaneous inventions were the differential governor already alluded to, and a highly scientific modification of it, described to the Royal Society in 1866; a water-meter which acts on the principle of counting the number of turns made by a small reaction turbine through which the supply of water flows; an electric thermometer and pyrometer, in which temperature is determined by its effect on the electrical conductivity of metals; an attraction meter for de- termining very slight variations in the intensity of a gravity; and the bathometer, by which he applied this idea to the problem of finding the depth of the sea without a sounding line. In a paper read before the Royal Society in 1882, ” On the Conservation of Solar Energy,” he suggested a bold but unsatisfactory theory of the sun’s heat, in which he sought to trace on a cosmic scale an action similar to that of the regenerative furnace. His fame, however, does not rest on his contributions to pure science, valuable as some of these were. His strength lay in his grasp of scientific principles, in his skill to perceive where and how they could be applied to practical affairs, in his zealous and instant pursuit of thought with action, and in the indomitable persistence with which he clung to any basis of effort that seemed to him theoretically sound.

Siemens’s writings consist for the most part of lectures and papers scattered through the scientific journals and the publications of the

Royal Society, the Institution of Civil Engineers, the Institution of Mechanical Engineers, the Iron and Steel Institute, the British Association, &c. A biography by Dr William Pole was published in 1888. (J.. A. E.)

SIENA, a city and archiepiscopal see of Tuscany, Italy, capital of the province of Siena, 59 m. by rail S. of Florence and 31 m. direct. Pop. (1901) 25,539 (town); 40,423 (commune). The area of the city within the walls is about 2\ sq. m., and the height above sea-level 1115 ft. The plan, spreading from the centre over three hills, closely resembles that of Perugia. The city possesses a university, founded in 1203 and limited to the faculties of law and medicine. Among the other public institu- tions the following are the more important: the town library, first opened to students in the 17th century; the Archivio, a record office, instituted in 1858, containing a valuable and splendidly arranged collection of documents; the Fine Arts Institution, founded in 1816; and the natural history museum of the Royal Academy of the Physiocritics, inaugurated in the same year. There are also many flourishing charities, including an excellent hospital and a school for the deaf and dumb. The chief industries are weaving and agriculture.

The public festivals of Siena known as the ” Palio delle Con- trade ” have a European celebrity. They are held in the public square, the curious and historic Piazza del Campo (now Piazza di Vittorio Emanuele) in shape resembling an ancient theatre, on the 2nd of July and the 16th of August of each year; they date from the middle ages and were instituted in commemoration of victories and in honour of the Virgin Mary (the old title of Siena, as shown by seals and medals, having been ” Sena vet us civitas Virginis”). In the 15th and 16th centuries the celebrations consisted of bull-fights. At the close of the 16th century these were replaced by races with mounted buffaloes, and since 1650 by (ridden) horses. Siena is divided into seventeen contrade (wards), each with a distinct appellation and a chapel and flag of its own; and every year ten of these contrade, chosen by lot, send each one horse to compete for the prize palio or banner. The aspect of Siena during these meetings is very characteristic, and the whole festivity bears a medieval stamp in harmony with the architecture and history of the town.

Among the noblest fruits of Sienese art are the public buildings adorning the city. The cathedral, one of the finest examples of Italian Gothic architecture, obviously influenced in plan by the abbey of S. Galgano (infra), built in black and white marble, was begun in the early years of the 13th century, but interrupted by the plague of 1248 and wars at home and abroad, and in 1317 its walls were extended to

the baptistery of San Giovanni; a further enlargement was begun in 1339 but never carried out, and a few ruined walls and arches alone remain to show the

magnificence of the uncompleted design, which would have produced one of the largest churches in the world.

The splendid west front, of tricuspidal form, enriched with a multitude of columns, statues and inlaid marbles, is said to have been begun by Giovanni Pisano, but really dates from after 1370; it was finished in 1380, and closely resembles that of Orvieto, which is earlier in date (begun in 1310). Both fagades have been recently restored, and the effect of them not altogether improved by modern mosaics. The fine Romanesque campanile belongs to the first half of the 14th century. Conspicuous among the art treasures of the interior is the well-known octagonal pulpit by Niccola Pisano, dating from 1 266-1 268. It rests on columns supported by lions, and is finely sculptured. Numerous statues and bas-reliefs by Renaissance artists adorn the various altars and chapels. The cathedral pave- ment is almost unique. It is inlaid with designs in colour and black and white, representing Biblical and legendary subjects, and is supposed to have been begun by Duccio della Buoninsegna. _ But the finest portions beneath the domes, with scenes from the history of Abraham, Moses and Elijah, are by Domenico Beccafumi and are executed with marvellous boldness and effect. The choir stalls also deserve mention: the older ones (remains of the original choir) are in tarsia work; the others, dating from the 16th century, are carved from Riccio's designs. The Piccolomini Library, adjoining the duomo, was founded by Cardinal Francesco Piccolomini (afterwards Pius III.) in honour of his uncle, Pius II. Here are Pinturicchio's famous frescoes of scenes from the life of the latter pontiff, and the collection of choir books (supported on sculptured desks) with splendid illuminations by Sienese and other artists. The church of San. Giovanni, the ancient baptistery, beneath the cathedral is ap- proached by an outer flight of marble steps built in 1451. It has a beautiful but incomplete fagade designed by Giovanni di Mino del Pellicciaio in 1382, and a marvellous font with bas-reliefs by Dona- tello, Ghiberti. Jacopo della Quercia and other 15th-century sculptors. The Opera del Duomo contains Duccio's famous Madonna, painted for the cathedral in 1 308-131 1, and other works of art.

Among the other churches are S. Maria di Provenzano, a vast baroque

building of some elegance, designed by Schifardini (1594); Sant' Agostino, rebuilt by Vanvitelli in 1755, containing a Cruci- fixion and Saints by Perugino, a Massacre of the Innocents by Matteo di Giovanni, the Coming of the Magi by Sodoma, and a St Anthony by Spagnoletto (?) ; the beautiful church of the Servites 05th century), which contains another Massacre of the Innocents by Matteo di Giovanni and other good examples of the Sienese school; San Francesco, designed by Agostino and Agnolo about 1326, and now restored, which once possessed many fine paintings by Duccio Buoninsegna, Lorenzetti, Sodoma and Beccafumi, some of which perished in the great fire of 1655 ; San Domenico, a fine 13th-century building with a single nave and transept, containing Sodoma's splendid fresco the Swoon of St Catherine, the Madonna of Guido da Siena, 1 28 1 , and a crucifix by Sano di Pietro. This church crowns the Fontebranda hill above the famous fountain of that name im- mortalized by Dante, and in a steep lane below stands the house of St_ Catherine, now converted into a church and oratory, and main- tained at the expense of the inhabitants of the Contrada dell' Oca. It contains some good pictures by Pacchia and other works of art, but is chiefly visited for its historic interest and as a striking memorial of the characteristic piety of the Sienese. The Accademia di Belle Arti contains a good collection of pictures of the Sienese school, illustrating its development.

The communal palace in the Piazza del Campo was begun in 1288 and finished in 1309. It is built of brick, is a fine specimen of Pointed Gothic, and was designed by Agostino and Agnolo. The light and elegant tower (Torre del Mangla) soaring from one side of the palace was begun in 1338 and finished after 1348, and the chapel standing at its foot, raised at the expense of the Opera del Duomo as a public thank-offering after the plague of 1348, begun in 1352 and com- pleted in 1376. This grand old palace has other attractions besides the beauty of its architecture, for its interior is lined with works of art. The atrium has a fresco by Bartolo di Fredi and the two ground-floor halls contain a Coronation of the Virgin by Sano di Pietro and a splendid Resurrection by Sodoma. In the Sala dei Nove or della Pace above are the noble allegorical frescoes of Ambrogio Lorenzetti representing the effects of just and unjust government; the Sala delle Balestre or del Mappamondo is painted by Simone di Martino (Memmi) and others, the Cappella della Signoria by Taddeo di Bartolo, and the Sala del Consiatorio by Beccafumi. Another hall, the Sala di Balia, has frescoes by Spinello Aretino (1408) with scenes from the life of Pope Alexander III., while yet another has been painted by local artists with episodes in recent Italian history. An interesting

exhibition of Sienese art, including many objects from neighbouring towns and villages, was held here in 1904. The former hall of the grand council, built in 1327, was converted into the chief theatre of Siena by Riccio in 1560, and, after being twice burnt, was rebuilt m I7 53 from Bibbiena'i designs. Another Sienese theatre that of the Rozzi, in Piazza Sfvi Pellegrino, designed by A. Doveri and erected in 1816, although modern, has an historic interest as the work of an academy dating nom the 16th century, called the Congrega de Rozzi, that played an important part in the history of the Italian coouc stage.

The city is adorned by many other noble edifices both public and private, among which the following palaces may be mentioned — Tolomei (1205); Buonsignori, formerly Tegliacci, an elegant 14th-century construction, restored in 1848; Grottanelli, formerly Pecci and anciently the residence of the captain of war, recently restored in its original style; Sansedoni; Marsilii; Piccolomini, now be- longing to the Government and containing the state archives ; ' Piccolomini delle Papesse, like the other Piccolomini mansion, designed by Bernardo Rossellino, and now the Banca d' Italia; the enormous block of the Monte de' Paschi, a bank of considerable wealth and antiquity, enlarged and partly rebuilt in the original style between 1877 and 1881, the old Dogana and Salimbeni palaces; the Palazzo Spannochi, a fine early Renaissance building by Giuliano da Maiano (now the post office) ; the Loggia di Mercanzia (15th century), now a club, imitating the Loggia dei Lanzi at Florence, with sculp- tures of the 15th century; the Loggia del Papa, erected by Pius II.; and other fine buildings. We may also mention the two celebrated fountains, Fonte Gaia and Fontebranda; the former, in the Piazza del Campo, by Jacopo della Quercia (1409-1419), but freely restored in 1868, the much-damaged original reliefs being now in the Opera del Duomo; the Fonte Nuova, near Porta Ovile, by Camaino di Crescentino also deserves notice (1298). Thanks to all these archi- tectural treasures, the narrow Sienese streets with their many wind- ings and steep ascents are full of picturesque charm, and, together with the collections of excellent paintings, foster the local pride of the inhabitants and preserve their taste and feeling for art. The medieval walls and gates are still in the main preserved. The ruined Cistercian abbey of S. Galgano, founded in 1201, with its fine church (1240- 1268) is interesting and imposing. It lies some 20 m. south-west of Siena.

History. — Siena was probably founded by the Etruscans (a few tombs of that period have been found outside Porta Camollia), and then, falling under the Roman rule, became a colony in the reign of Augustus, or a little earlier, and was distinguished by the name of Saena Julia. It has the same arms as Rome — the she-wolf and twins.

But its real importance dates from the middle ages. Few memorials of the Roman era 2 or of the first centuries of Christianity have been preserved (except the legend of St Ansanus), and none at all of the interval pre- ceding the Lombard period. We have documentary evidence that in the 7th century in the reign* of Rotaris (or Rotari), there was a bishop of Siena named Mauro. Attempts to trace earlier bishops as far back as the 5th century have yielded only vague and contradictory results. Under the Lombards the civil government was in the hands of a gaslaldo, under the Carolingians of a count, whose authority, by slow degrees and a course of events similar to what took place in other Italian communes, gave way to that of the bishop, whose power in turn gradually diminished and was superseded by that of the consuls and the commonwealth.

We have written evidence of the consular government of Siena from 1125 to 1212; the number of consuls varied from three to twelve. This government, formed of gentiluomini or nobles, did not remain unchanged throughout the whole period, but was gradually forced to accept the participation of the popolani or lower classes, whose efforts to rise to power were continuous and determined. Thus in n 37 they obtained a third part of the government by the reconstitution of the general council with 100 nobles and 50 popolani. In 1199 the institution of a foreign podesta (a form of government which became per- manent in 1 212) gave a severe blow to the consular magistracy, which was soon extinguished; and in 1233 the people again rose against the nobles in the hope of ousting them entirely from office.

The strife was largely economic, the people desiring to deprive the nobles of the immunity of taxation which they had enjoyed. The attempt was not completely successful; but the government was now equally divided between the two estates by the creation of a supreme magistracy of twenty-four citizens — twelve nobles and twelve popolani. During the rule of the nobles and the mixed rule of nobles and popolani the commune of Siena was enlarged by fortunate acquisitions of neighbouring lands and by the submission of feudal lords, such as the Scialenghi, Aldobrandeschi, Pannocchie'schi, Visconti di Campiglia, &c.

1 In these are especially interesting the painted covers of the books of the bicchiema and gabella, or revenue and tax offices.

2 There are, however, remains of baths some 2 J m. to the east; see P. Piccolomini in Bullettino Senese de storia patria, vi. (1899).

Before long the reciprocal need of fresh territory and frontier disputes, especially concerning Poggibonsi and Montepulciano, led to an outbreak of hostilities between Florence and Siena. Thereupon, to spite the rival republic, the Sienese took the Ghibelline side, and the German emperors, beginning with Frederick Barbarossa, rewarded their fidelity by the grant of various privileges.

During the 12th and 13th centuries there were continued disturbances, petty wars, and hasty reconciliations between Florence and Siena, until in 1 254-1 255 a more binding peace and alliance was concluded. But this treaty, in spite of its apparent stability, led in a few years to a fiercer struggle; for in 1258 the Florentines complained that Siena had infringed its terms by giv- ing refuge to the Ghibellines they had expelled, and on the refusal of the Sienese to yield to these just remonstrances both states made extensive preparations for war. Siena applied to Manfred, obtained from him a strong body of German horse, under the command of Count Giordano, and likewise sought the aid of its Ghibelline allies. Florence equipped a powerful citizen army, of which the original registers are still preserved in the volume entitled // Libro di Montaperti in the Florence archives. This army, led by the podesta. of Florence and twelve burgher captains, set forth gaily on its march towards the enemy's territories in the middle of April 1260, and during its first campaign, ending on the 1 8th of May, won an insignificant victory at Santa Petronilla, outside the walls of Siena. But in a second and more important campaign, in which the militia of the other Guelf towns of Tuscany took part, the Florentines were signally defeated at Montaperti on the 4th of September 1260. This defeat crushed the power of Florence for many years, reduced the city to desola- tion, and apparently annihilated the Florentine Guelfs. But the battle of Benevento (1266) and the establishment of the dynasty of Charles of Anjou on the Neapolitan throne put an end to the Ghibelline predominance in Tuscany. Ghibelline Siena soon felt the effects of the change in the defeat of its army at Colle di Valdelsa (1269) by the united forces of the Guelf exiles, Florentines and French, and the death in that battle of her powerful citizen Provenzano Salvani (mentioned by Dante), who had been the leading spirit of the government at the time of the victory of Montaperti. For some time Siena remained faithful to the Ghibelline cause; nevertheless Guelf and demo- cratic sentiments began to make head. The Ghibellines were on several occasions expelled from the city, and, even when a temporary reconciliation of the two parties allowed them to return, they failed to regain their former influence.

Meanwhile the popular party acquired increasing power in the state. Exasperated by the tyranny of the Salimbeni and other patrician

families allied to the Ghibellines, it decreed in 1277 the exclusion of all nobles from the supreme magistracy (consisting since 1270 of thirty-six instead of twenty- four members) , and insisted that this council should be formed solely of Guelf traders and men of the middle class. This constitution was confirmed in 1280 by the reduction of the supreme magistracy to fifteen members, all of the humbler classes, and was definitively sanctioned in 1285 (and 1287) by the institution of the magistracy of nine. This council of nine, composed only of burghers, carried on the government for about seventy years, and its rule was sagacious and peaceful. The territories of the state were enlarged; a friendly alliance was maintained with Florence; trade flourished; in 1321 the university was founded, or rather revived, by the introduction of Bolognese scholars; the principal buildings now adorning the town were begun; and the charitable institutions, which are the pride of modern Siena, increased and prospered. But meanwhile the exclusiveness of the single class of citizens from whose ranks the chief magistrates were drawn had converted the government into a close oligarchy and excited the hatred of every other class. Nobles, judges, notaries and populace rose in frequent revolt, while the nine defended their state (1 295-1309) by a strong body of citizen militia divided into terzieri (sections) and contrade (wards), and violently repressed these attempts. But in 1355 the arrival of Charles IV. in Siena gave fresh courage to the malcontents,

who, backed by the imperial authority, overthrew the government of the nine and substituted a magistracy of twelve drawn from the lowest class. These new rulers were to some extent under the influence of the nobles who had fomented the rebellion, but the latter were again soon excluded from all share in the govern- ment.

This was the beginning of a determined struggle for supre- macy, carried on for many years, between the different classes of citizens, locally termed ordini or monti — the lower classes striving to grasp the reins of government, the higher classes already in office striving to keep all power in their own hands, or to divide it in proportion to the relative strength of each monte. As this struggle is of too complex a nature to be described in detail, we must limit ourselves to a summary of its leading episodes.

The twelve who replaced the council of nine (as these had previously replaced the council of the nobles) consisted — both as individuals and as a party — of ignorant, incapable, turbulent men, who could neither rule the state with firmness nor confer prosperity on the republic. They speedily broke with the nobles, for whose manoeuvres

they had at first been useful tools, and then split into two factions, one siding with the Tolomei, the other, the more restless and violent, with the Salimbeni and the noveschi (partisans of the nine), who, having still some influence in the city, probably fomented these dissensions, and, as we shall see later on, skilfully availed themselves of every chance likely to restore them to power. In 1368 the adversaries of the twelve succeeded in driving them by force from the public palace, and substituting a government of thirteen — ten nobles and three noveschi.

This government lasted only twenty-two days, from the 2nd to the 24th September, and was easily overturned by the dominant faction of the dodicini (partisans of the twelve), aided by the Salimbeni and the populace, and favoured by the emperor Charles IV. The nobles were worsted, being driven from the city as well as from power; but the absolute rule of the twelve was brought to an end, and right of participation in the govern- ment was extended to another class of citizens. For, on the expulsion of the thirteen from the palace, a council of 124 plebeians created a new magistracy of twelve difensori (defenders), no longer drawn exclusively from the order of the twelve, but composed of five of the popolo minuto, or lowest populace (now first admitted to the government), four of the twelve, and three of the nine. But it was of short duration, for the dodicini were ill satisfied with their share, and in December of the same year (1368) joined with the popolo minuto in an attempt to expel the three noveschi from the palace. But the new popular order, which had already asserted its predominance in the council of the riformatori, now drove out the dodicini, and for five days (nth to 1 6th December) kept the government in its own hands. Then, however, moved by fear of the emperor, who had passed through Siena two months before on his way to Rome, and who was about to halt there on his return, it tried to conciliate its foes by creating a fresh council of 150 riformatori, who replaced the twelve defenders by a new supreme magistracy of fifteen, consisting of eight popolani, four dodicini, and three noveschi, entitled respectively ” people of the greater number,” ” people of the middle number,” and ” people of the less number. ” From this renewal dates the formation of the new order or monte dei riformatori, the title henceforth bestowed on all citizens, of both the less and the greater people, who had reformed the government and begun to participate in it in 1368. The turbulent action of the twelve and the Salimbeni, being dissatisfied with these changes, speedily rose against the new government. This time they were actively aided by Charles IV., who, having returned from Rome, sent his militia, commanded by the imperial vicar Malatesta da Rimini, to attack the public palace.

But the Sienese people, being called to arms by the council of fifteen, made a most determined resistance, routed the imperial troops, captured the standard, and confined the emperor in the Salimbeni palace. Thereupon Charles came to terms with the government, granted it an imperial patent, and left the city, consoled for his humiliation by the gift of a large sum of money.

SIENA

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In spite of its wide basis and great energy, the monte dei riformatori, the heart of the new government, could-not satisfac- torily cope with the attacks of adverse factions and treacherous allies. So, the better to repress them, it created in 1369 a chief of the police, with the title of esecutore, and a numerous associa- tion of popolani — the company or casata grande of the people — as bulwarks against the nobles, who had been recalled from banishment, and who, though fettered by strict regulations, were now eligible for offices of the state. But the appetite for power of the ” less people ” and the dregs of the populace was whetted rather than satisfied by the installation of the riformatori in the principal posts of authority. Among the wool-carders — men of the lowest class, dwelling in the precipitous lanes about the Porta Ovile — there was an association styling itself the “company of the worm.” During the famine of 1371 this company rose in revolt, sacked the houses of the rich, invaded the public palace, drove from the council of fifteen the four members of the twelve and the three of the nine, and replaced them by seven tatter- demalions. Then, having withdrawn to its own quarter, it was suddenly attacked by the infuriated citizens (noveschi and dodicini), who broke into houses and workshops and put numbers of the inhabitants to the sword without regard for age or sex. Thereupon the popular rulers avenged these misdeeds by many summary executions in the piazza. These disorders were only checked by fresh changes in the council of fifteen. It was now formed of twelve of the greater people and three noveschi, to the total exclusion of the dodicini, who, on account of their grow- ing turbulence, were likewise banished from the city.

Meanwhile the government had also to contend with difficulties outside the walls. The neighbouring lords attacked and ravaged the municipal territories; grave injuries were inflicted by the mercenary bands, especially by the Bretons and Gascons. The rival claims to the Neapolitan kingdom of Carlo di Durazzo and Louis of Anjou caused fresh disturbances in Tuscany. The Sienese government conceived hopes of gaining possession of the city of Arezzo, which was first occupied by Durazzo’s men, and then by Enguerrand de Coucy for Louis of Anjou; but while the Sienese were nourishing dreams of conquest the French general unexpectedly sold the city to the Florentines, whose negotiations had been conducted with marvellous ability and despatch (1384). The gathering exasperation of the Sienese, and notably of the middle class, against their rulers was brought to a climax by this cruel disappointment. Their discontent had been gradually swelled by various acts of home and foreign policy during the sixteen years’ rule of the riformatori, nor had the concessions granted to the partisans of the twelve and the latter ‘s

recall and renewed eligibility to office availed to conciliate them. At last the revolt broke out and gained the upper hand, in March 1385. The riformatori were ousted from power and expelled the city, and the trade of Siena suffered no little injury by the exile of so many artisan families. The fifteen were replaced by a new supreme magistracy of ten priors, chosen in the following proportions — four of the twelve, four of the nine, and two of the people proper, or people of the greater number, but to the exclusion of all who had shared in the government or sat in council under the riformatori. Thus began a new order or monte del popolo, composed of families of the same class as the riformatori, but having had no part in the government during the latter's rule. But, though now admitted to power through the burgher reaction, as a concession to democratic ideas, and to cause a split among the greater people, they enjoyed very limited privileges. 1

In 1387 fresh quarrels with Florence on the subject of Monte- pulciano led fo an open war, that was further aggravated by the interference in Tuscan affairs of the ambitious duke of Milan, Gian Galeazzo Visconti. With him the Sienese concluded an alliance in 1389 and ten years later accepted his suzerainty and resigned the liberties of their state. But in 1402 the death of

1 The following are the ordini or monti that held power in Siena for any considerable time — gentiluomini, from the origin of the re- public; nove, from about 1285; dodici, f rom 1 355 ; riformatori, from 1368; popolo, from 1385.

Gian Galeazzo lightened their yoke. In that year the first plot against the Viscontian rule, hatched by the twelve and the Salimbeni and fomented by the Florentines, was violently re- pressed, and caused the twelve to be again driven from office; but in the following year a special balia, created in consequence of that riot, annulled the ducal suzerainty and restored the liberties of Siena. During the interval the supreme magistracy had assumed a more popular form. By the partial readmission of the riformatori and exclusion of the twelve, the permanent balia was now composed of nine priors (three of the nine, three of the people, and three of iheriformatori) and of a captain of the people to be chosen from each of the three monti in turn. On nth April peace was made with the Florentines and Siena en- joyed several years of tranquil prosperity.

But the great Western schism then agitating the Christian world again brought disturbance to Siena. In consequence of the decisions of the council of Pisa, Florence and Siena had declared against Gregory XII. (1409); Ladislaus of Naples, therefore, as a supporter of the pope,

seized the opportunity to make incursions on Sienese territory, laying it waste and threatening the city. The Sienese maintained a vigorous resistance till the death of this monarch in 1414 freed them from his attacks. In 143 1 a fresh war with Florence broke out, caused by the latter's attempt upon Lucca, and continued in consequence of the Florentines' alliance with Venice and Pope Eugenius IV., and that of the Sienese with the duke of Milan and Sigismund, king of the Romans. This monarch halted at Siena on his way to Rome to be crowned, and received a most princely welcome. In 1433 the opposing leagues signed a treaty of peace, and, although it was disadvantageous to the Sienese and temptations to break it were frequently urged upon them, they faithfully adhered to its terms. During this period of comparative tranquillity Siena was honoured by the visit of Pope Eugenius IV. (1443) and by that of the emperor Frederick III., who came there to receive his bride, Eleanor of Portugal, from the hands of Bishop Aeneas Sylvius Piccolomini, his secretary and historian (1452). This meeting is recorded by the memorial column still to be seen outside the Camollia gate. In 1453 hostilities against Florence were again resumed, on account of the invasions and ravages of Sienese territory committed by Florentine troops in their conflicts with Alphonso of Naples, who since 1447 had made Tuscany his battle-ground. Peace was once more patched up with Florence in 1454. Siena was next at war for several years with Aldobrandino Orsini, count of Pitigliano, and with Jacopo Piccinini, and suffered many disasters from the treachery of its generals. About the same time the republic was exposed to still graver danger by the conspiracy of some of its leading citizens to seize the reins of power and place the city under the suzerainty of Alphonso, as it had once been under that of the duke of Milan. But the plot came to light; its chief ringleaders were beheaded, and many others sent into exile (1456); and the death of Alphonso at last ended all danger from that source. During those critical times the government of the state was strengthened by a new executive magistracy called the balia, which from 1455 began to act independently of the priors or consistory. Until then it had been merely a provisional committee annexed to the latter. But henceforward the balia had supreme jurisdiction in all affairs of the state, although always, down to the fall of the republic, nominally preserving the character of a magistracy extraordinary. The election of Aeneas Sylvius Piccolomini to the papal chair in 1458 caused the utmost joy to the Sienese; and in compliment to their illustrious fellow-citizen they granted the request of the nobles and readmitted them to a share in the government. But this concession, grudgingly made, only remained in force for a few years, and on the death of the pope (1464) was revoked altogether, save in the case of members of

the Piccolomini house, who were decreed to be popolani and were allowed to retain all their privileges. Meanwhile fresh discords were brewing among the plebeians at the head of affairs.

The conspiracy of the Pazzi in 1478 led to a war in which Florence and Milan were opposed to the pope and the king of Naples, and which was put an end to by the peace of 13th

March 1480. Thereupon Alphonso, duke of Calabria, who was fighting in Tuscany on the side of his father Ferdinand, came to an agreement with Siena and, in the same way as his grandfather Alphonso, tried to obtain the lordship of the city and the recall of the exiled rebels in 14 56. The noveschi (to whose order most of the rebels belonged) favoured his pretensions, but the riformatori were against him. Many of the people sided with the noveschi, rose in revolt on 22nd June 1480 and, aided by the duke's soldiery, reorganized the government to their own advant- age. Dividing the power between their two orders of the nine and the people, they excluded the riformatori and replaced them by a new and heterogeneous order styled the aggregati, composed of nobles, exiles of 1456 and citizens of other orders who had never before been in office. But this violent and perilous upset of the internal liberties of the republic did not last long. A decree issued by the Neapolitan king (1482) depriving the Sienese of certain territories in favour of Florence entirely alienated their affections from that monarch. Meanwhile the monte oi the nine, the chief promoters of the revolution of 1480, were exposed to the growing hatred and envy of their former allies, the monte del popolo, who, conscious of their superior strength and numbers, now sought to crush the noveschi and rise to power in their stead. This change cf affairs was accomplished by a series of riots between 7th June 1482 and 20th February 1483. The monte del popolo seized the lion's share of the government; the riformatori were recalled, the aggregati abolished and the noveschi condemned to perpetual banishment from the govern- ment and the city. But " in perpetuo " was an empty form of words in those turbulent Italian republics. The noveschi, being " fat burghers " with powerful connexions, abilities and tradi- tions, gained increased strength and influence in exile; and five years later, on 22nd July 1487, they returned triumphantly to Siena, dispersed the few adherents of the popolo who offered resistance, murdered the captain of the people, reorganized the state, and placed it under the protection of the Virgin Mary. And, their own predominance being assured by

their numerical strength and influence, they accorded equal shares of power to the other monti.

Among the returned exiles was Pandolfo Petrucci, chief of the noveschi and soon to be at the head of the government. During the domination of this man (who, like Lorenzo de' Medici, was surnamed " the M a g n ifi cen t ") Siena enjoyed many years of splendour and prosperity. We use the term " domination " rather than " signory " inasmuch as, strictly speaking, Petrucci was never lord of the state, and left its established form of govern- ment intact; but he exercised despotic authority in virtue of his strength of character and the continued increase of his personal power. He based his foreign policy on alliance with Florence and France, and directed the internal affairs of the state by means of the council {collegia) of the balia, which, although occasionally reorganized for the purpose of conciliating rival factions, was always subject to his will. He likewise added to his power by assuming the captainship of the city guard (1495) , and later by the purchase from the impoverished commune of several outlying castles (1507). Nor did he shrink from' deeds of bloodshed and revenge; the assassination of his father-in-law, Niccolo Borghesi (1500), is an indelible blot upon his name. He successfully withstood all opposition within the state, until he was at last worsted in his struggle with Cesare Borgia, who caused his ex- pulsion from Siena in 1502. But through the friendly mediation of the Florentines and the French king he was recalled from banishment on 29th March 1503. He maintained his power until his death at the age of sixty on 21st May 1512, and was interred with princely ceremonials at the public expense. The predominance of his family in Siena did not last long after his decease. Pandolfo had not the qualities required to found a dynasty such as that of the Medici. He lacked the lofty intellect of a Cosimo or a Lorenzo, and the atmosphere of liberty- loving Siena with its ever-changing factions was in no way suited to his purpose. His eldest son, Borghese Petrucci , was incapable, haughty and exceedingly corrupt; he only remained three years at the head of affairs and fled ignominiously in 1515. Through

the favour of Leo X., he was succeeded by his cousin Raffaello Petrucci, previously governor of St Angelo and afterwards a- cardinal.

This Petrucci was a bitter enemy to Pandolfo's children. He caused Borghese and a younger son named Fabio to be proclaimed as rebels, while a third son, Cardinal Alphonso, was strangled by order of Leo X. in 1518. He was a tyrannical ruler, and died suddenly in 1522. In the following year Clement VII. insisted on the recall of Fabio Petrucci; but two years later a fresh popular outbreak drove him from Siena for

ever. The city then placed itself under the protection of the emperor Charles V., created a magistracy of ” ten conservators of the liberties of the state” (December 1524), united the different monti in one named the ” monte of the reigning nobles,” and, rejoicing to be rid of the last of the Petrucci, dated their public books, ab instaurata libertate year I., II., and so on.

The so-called free government subject to the empire lasted for twenty-seven years; and the desired protection of Spain weighed more and more heavily until it became a tyranny. The imperial legates and the captains of the Spanish guard in Siena crushed both government and people by continual ex- tortions and by undue interference with the functions of the balia. Charles V. passed through Siena in 1535, and, as in all the other cities of enslaved Italy, was received with the greatest pomp; but he left neither peace nor liberty behind him. From 1527 to 1545 the city was torn by faction fights and violent revolts against the noveschi, and was the scene of frequent bloodshed, while the quarrelsomeness and bad government of the Sienese gave great dissatisfaction in Tuscany. The balia was recon- stituted several times by the imperial agents — in 1530 by Don Lopez di Soria and Alphonso Piccolomini, duke of Amalfi, in 1 540 by Granvella (or Granvelle) and in 1 548 by Don Diego di Mendoza; but government was carried on as badly as before, and there was increased hatred of the Spanish rule. When in 154.0 Don Diego announced the emperor’s purpose of erecting a fortress in Siena to keep the citizens in order, the general hatred found vent in indignant remonstrance. The historian Orlando Malavolti and other special envoys were sent to the emperor in 1550 with a petition signed by more than a thousand citizens praying him to spare them so terrible a danger; but their mission failed: they returned unheard. Meanwhile Don Diego had laid _ the foundation of the citadel and was carrying on the work with activity. Thereupon certain Sienese citizens in Rome, headed by Aeneas Piccolomini (a kinsman of Pius II.), entered into negotiations with the agents of the French king and, having with their help collected men and money, marched on Siena and forced their way in by the new gate (now Porta Romana) on 26th July 1552. The townspeople, encouraged and reinforced by this aid from without, at once rose in revolt, and, attacking the Spanish troops, disarmed them and drove them to take refuge in the citadel (28th July). And finally by an agreement with Cosimo de’ Medici, duke of Florence, the Spaniards were sent away on the 5th August 1552 and the Sienese took possession of their fortress.

The government was now reconstituted under the protection of the French agents; the balia was abolished, its very name having been rendered odious by the tyranny of Spain, and was replaced by a

similar magistracy styled capitani del popolo e reggimento. Siena exulted in her recovered freedom; but her sunshine was soon clouded. First, the emperor's wrath was stirred by the influence of France in the counsels of the republic; then Cosimo, who was no less jealous of the French, conceived the design of annexing Siena to his own dominions. The first hostilities of the imperial forces in Val di Chiana (1552-1553) did little damage; but when Cosimo took the field with an army commanded by the marquis of Marignano the ruin of Siena was at hand. On 26th January Marignano captured the forts of Porta Camollia (which the whole population of Siena, including the women, had helped to construct) and invested the city. On the 2nd of August of the same year, at Marciano in Val di Chiana, he won a complete victory over the Sienese and French troops under Piero Strozzi, the Florentine exile and

marshal of France. Meanwhile Siena was vigorously besieged, and its inhabitants, sacrificing everything for their beloved city, maintained a most heroic defence. A glorious record of their sufferings is to be found in the Diary of Sozzini, the Sienese historian, and in the Commentaries of Blaise de Monluc, the French representative in Siena. But in April 1555 the town was reduced to extremity and was forced to capitulate to the emperor and the duke. On 21st April the Spanish troops entered the gates; thereupon many patriots abandoned the city and, taking refuge at Montalcino, maintained there a shadowy form of republic until 1559.

Cosimo I. de' Medici being granted the investiture of the Sienese state by the patent of Philip II. of Spain, dated 3rd July 1557, took formal possession of the city on the 19th of the same month. A lieutenant-general was appointed as repre- sentative of his authority; the council of the balia was recon- stituted with twenty members chosen by the duke; the con- sistory and the general council were left in existence but deprived of their political autonomy. Thus Siena was annexed to the Florentine state under the same ruler and became an integral part of the grand-duchy of Tuscany. Nevertheless it retained a separate administration for more than two centuries, until the general reforms of the grand-duke Pietro Leopoldo, the French domination, and finally the restoration swept away all differences between the Sienese and Florentine systems of government. In 1859. Siena was the first Tuscan city that voted for annexation to Piedmont and the monarchy of Victor Emmanuel II., this decision (voted 26th June) being the initial step

towards the unity of Italy.

Literary History. — The literary history of Siena, while recording no gifts to the world equal to those bequeathed by Florence, and without the power and originality by which the latter became the centre of Italian culture, can nevertheless boast of some illustrious names. Of these a brief summary, beginning with the department of general literature and passing on to history and science, is sub- joined. Many of them are also dealt with in separate articles, to which the reader is referred.

As early as the 13th century the vulgar tongue was already well established at Siena, being used in public documents, commercial records and private correspondence. The poets flourishing at that period were Folcacchiero, Cecco Angiolieri — a humorist of a very high order — and Bindo Bonichi, who belonged also to the following century. The chief glory of the 14th century was St Catherine Benincasa. The year of her death (1380) was that of the birth of St Bernardino Albizzeschi (S Bernardino of Siena), a popular preacher whose sermons in the vulgar tongue are models of style and diction. To the 15th century belongs Aeneas Sylvius Piccolomini (Pius II.), humanist, historian and political writer. In the 16th century we find another Piccolomini (Alexander), bishop of Patras, author of a curious dialogue, Delia bella creanza delle donne; another bishop, ClaudioTolomei, diplomatist, poet and philologist, who revived the use of ancient Latin metres ; and Luca Contile, a writer of narratives, plays and poems. Prose fiction had two representatives in this century — Scipione Bargagli, a writer of some merit, and Pietro Fortini, whose productions were trivia! and indecent. In the 17th century we find Ludovico Sergardi (Quinto Settano), a Latinist and satirical writer of much talent and culture; but the most original and brilliant figure in Sienese literature is that of Girolamo Gigli (1660-1722), author of the Gazzettino, La Sorellina di Don Pilone, II Vocabolario cateriniano and the Diario ecclesiastico. As humorist, scholar and philologist, Gigli would take a high place in the literature of any land. His resolute opposition to all hypocrisy — whether religious or literary — exposed him to merciless persecution from the Jesuits and the Delia Cruscan Academy.

In the domain of history we have first the old Sienese chronicles, which down to the 14th century are so confused that it is almost impossible to disentangle truth from fiction or even to decide the personality of the various authors. Three 14th-century chronicles, attributed to Andrea Dei, AgnolodiTura, called II Grasso, and Neri diDonati, are published in Muratori (vol.xv.). To the 15th century

belongs the chronicle of Allegretto Allegretti, also in Muratori (vol. xxiii.) ; and during the same period flourished Sigismondo Tizio (a priest of Siena, though born at Castiglione Aretino), whose voluminous history written in Latin and never printed (now among the MSS. of the Chigˆi Library in Rome), though devoid of literary merit, contains much valuable material. The best Sienese historians belong to the 1 6th century . They are Orlando Malavolti (151 5-1 596) , a man of noble birth, the most trustworthy of all; Antonio Bellarmati; Alessandro Sozzini di Girolamo, the sympathetic author of the Diario dell' ultima guerra senese; and Giugurta Tommasi, of whose tedious history ten books, down to 1354, have been published, the rest being still in manuscript. Together with these historians we must mention

the learned scholars Celso Cittadini (d. 1627), Ulberto Benvoglienti (d. 1733), one of Muratori's correspondents, and Gio. Antonio Picci (d. 1768), author of histories o'f Pandolfo Petrucci and the bishopric of Siena. In the same category may be classed the librarian C. F. Carpellini (d. 1872), author of several monographs on the origin of Siena and the constitution of the republic, and Scipione Borghesi (d. 1877), who has left a precious store of historical, biographical and bibliographical studies and documents.

In theology and philosophy the most distinguished names are: Bernardino Ochino and Lelio and Fausto Soccini (16th century) ; in jurisprudence, three Soccini: Mariano senior, Bartolommeo and Marianojunior (15th and 16th centuries) ; and in political economy, Sallustio Bandini (1677-1760), author of the Discorso sulla Maremma. In physical science the names most worthy of mention are those of the botanist Pier Antonio Mattioli (1501-1572), of Pirro Maria Gabrielli (1643-1705), founder of the academy of the Physio- critics, and of the anatomist Paolo Mascagni (d. 1825).

Art. — Lanzi happily designates Sienese painting as " Lieta scuola fra lieto popolo " (" the blithe school of a blithe people"). The special characteristics of its masters are freshness of colour, vivacity of expression and distinct originality. The Sienese school of painting owes its origin to the influence of Byzantine art ; but it improved that art, impressed it with a special stamp and was for long inde- pendent of all other influences. Consequently Sienese art seemed almost stationary amid the general progress and development of the other Italian schools, and preserved its medieval character down to the end of the 15th century, when the influence of the Um- brian and— to a slighter degree— of the Florentine schools began to penetrate into Siena, followed a little later by that of the Lombard. In the 13th century we find Guido (da Siena), painter of the well- known

Madonna in the church of S Domenico in Siena. The 14th century gives us Ugolino, Duccio di Buoninsegna, Simone di Martino (or Memmi) , Lippo Memmi, Pietro and Ambrogio Lorenzetti, Andrea di Vanni (painter and statesman), Bartolo di Fredi and Taddeo di Bartolo. In the 15th century we have Domenico di Bartolo, Sano di Pietro, Giovanni di Paolo, Stefano di Giovanni (II Sassetta) and Matteo and Benvenuto di Giovanni Bartoli, who fell, however, behind their contemporaries elsewhere, and made indeed but little progress. The 1 6th century boasts the names of Bernardino Fungai, Guidoccio Cossarelli, Giacomo Pacchiarotto, Girolamo del Pacchia and especi- ally Baldassare Peruzzi (1481-1537), who while especially celebrated for his frescoes and studies in perspective and chiaroscuro was also an architect of considerable attainments (see Rome) ; Giovanni Antonio Bazzi, otherwise known as II Sodoma (1477-1549), who, born at Vercelli in Piedmont, and trained at Milan in the school of Leonardo da Vinci, came to Siena in 1504 and there produced some of his finest works, while his influence on the art of the place was con- siderable; Domenico Beccafumi, otherwise known as Micharino (1486-1550), noted for the Michelangelesque daring of his designs; and Francesco Vanni.

There may also be mentioned many sculptors and architects, such as Lorenzo Maitani, architect of Orvieto cathedral (end of 13th century) ; Camaino di Crescentino ; Tino di Camaino, sculptor of the monument to Henry VII. in the Campo Santo of Pisa; Agostino and Agnolo, who in 1330 carved the fine tomb of Bishop Guido Tarlati in the cathedral of Arezzo; Lando di Pietro (14th century), architect, entrusted by the Sienese commune with the proposed en- largement of the cathedral (1339), and perhaps author of the famous Gothic reliquary containing the head of S Galgano in the Chiesa del Santuccio, which, however, is more usually attributed to Ugolino di Vieri, author of the tabernacle in the cathedral at Orvieto; Giacopo (or Jacopo) della Querela, whose lovely fountain, the Fonte Gaia, in the Piazza del Campo has been recently restored ; Lorenzo di Pietro (II Vecchietta), a pupil of Della Quercia and an excellent artist in marble and bronze; Francesco d'Antonio, a skilful goldsmith of the 16th century; Francesco di Giorgio Martini (1439-1502), painter, sculptor, military engineer and writer on art; Giacomo Cozzarelli (15th century); and Lorenzo Mariano, surnamed II Marrina (16th century). Wood-carving also flourished here in the 15th and 16th centuries, and so also did the ceramic art, though few of its products are preserved. According to the well-known law, however, the Renaissance, made for the people of the plains, never fully took root in Siena, as in other parts of Tuscany, and the loss of its independ- ence and power in 1555 led to a suspension of

building activity, which to the taste of the present day is most fortunate, inasmuch as the baroque of the 17th and the false classicism of the 18th centdries have had hardly any effect here ; and few towns of Italy are so un- spoilt by restoration or the addition of incongruous modern buildings, or preserve so many characteristics and so much of the real spirit (manifested to-day in the grave and pleasing courtesy of the inhabi- tants) of the middle ages, which its narrow and picturesque streets seem to retain. Siena is indeed unsurpassed for its examples of 13th and 14th century Italian Gothic, whether in stone or in brick.

See VV. Heywood, Our Lady of August and the Palio (Siena, 1899) and other works ; R. H. Hobart Cust, The Pavement Masters of Siena (London, 1901) ; Langton Douglas, History of Siena (London, 1902); E. G. Gardner, The Story of Siena (London, 1902) ; St Catherine of Siena (London, 1908) ; W. Heywood and L. Olcott, Guide to Siena (Siena, 1603) ; A. Jahn Rusconi, Siena (Bergamo, 1904). (C. Pa. ; T. As.)

SIENETJO, one of the Shangalla tribes living in south-west Abyssinia near the Sudan frontier, who claim to be a remnant of the primitive population. They are apparently a Hamitic people, and their skin is of a yellowish tint. Their women never intermarry with the Negroes or Arabs. Sienet jo villages are usually built on hilltops. They are an industrious people, skilful jewellers, weavers and smiths.

SIENKIEWICZ, HENRYK (1846-), Polish novelist, was born in 1846 at Wola Okrzeska near Lukow, in the province of Siedlce, Russian Poland. He studied philosophy at Warsaw University. His first work, a humorous novel entitled A Prophet in his own Country, appeared in 1872. In 1876 Sienkiewicz visited America, and under the pseudonym of ” Litwos, ” con- tributed an account of his travels to the Gazeta Polska, a Warsaw newspaper. Thenceforward his talent as a writer of historical novels won rapid recognition, and his best-known romance, Quo Vadis? a study of Roman society under Nero, has been translated into more than thirty languages. Originally pub- lished in 1895, Quo Vadis? was first translated into English in 1S96, and dramatized versions of it have been produced in England, the United States, France and Germany. Remarkable powers of realistic description, and a strong religious feeling which at times borders upon mysticism, characterize the best work of Sienkiewicz. Hardly inferior to Quo

Vadis? in popu- larity, and superior in literary merit, is the trilogy of novels describing 17th-century society in Poland during the wars with the Cossacks, Turks and Swedes. This trilogy comprises Ogniem i mieczcm (" With Fire and Sword, " London, 1890, 1892 and 1895), Potop (" The Deluge, " Boston, Mass., 1891) and Pan Woxodjowski (" Pan Michael," London, 1893). Among other very successful novels and collections of tales which have been translated into English are Bez Dogmatu (" Without Dogma, " London, 1893; Toronto, i&gg),Janko muzykant: nowele (" Yanko the Musician and other Stories," Boston, Mass., 1893), Krzyzacy (" The Knight of the Cross, " numerous British and American versions), Hania (" Hania, " London, 1897) and Ta Trzecia (" The Third Woman, " New York, 1898). Sienkiewicz lived much in Cracow and Warsaw, and for a time edited the Warsaw newspaper Slowo; he also travelled in England, France, Italy, Spain, Greece, Africa and the East, and published a description of his journeys in Africa. In 1905 he received the Nobel prize for literature.

A German edition of his collected works was published at Graz (1906, &c), and his biography was written in Polish by P. Chmiel- owski (Lemberg, 1901) and J. Nowinski (Warsaw, 1901).

SIERADZ, a town of Russian Poland, in the government of Kalisz, situated on theWarta, no m. S.W. of the city of Warsaw. Pop. (1897) 7019. It is one of the oldest towns of Poland, founded prior to the introduction of Christianity, and was formerly known as Syra orSyraz. The annals mention it in n 39. Several seims, or diets, of Poland were held there during the 13th to 15th centuries, andit was a wealthy town until nearly destroyed by a fire in 1447. The old castle, which suffered much in the Swedish war of 1702-1711, was destroyed by the Germans in 1800. There are two churches, dating from the 12th and 14th centuries respectively.

SIERO, a town of northern Spain, in the province of Oviedo, on the river Nora, and on the Oviedo-Trifiesto railway. Pop. (1900) 22,503. Siero is in the centre of a fertile agricultural district, in which live-stock is extensively reared. There are coal mines in the neighbourhood, and the local industries include tanning and manufactures of soap, coarse linen and cloths.

SIERRA LEONE, a British colony and protectorate on the west coast of Africa. It is bounded W. by the Atlantic, N. and E. by French Guinea and S. by Liberia. The coast-line, following the indentations, is about 400 m. in length, extending from 9° 2′ N. to 6° 55′ N. It includes the peninsula of Sierra Leone — 23 m. long with an average breadth of 14 m. — Sherbro Island, Bance, Banana, Turtle, Plantain and other minor

islands, also Turner's Peninsula, a narrow strip of land southward of Sherbro Island, extending in a S.E. direction about 60 m. Except in the Sierra Leone peninsula, Sherbro Island and Turner's

Peninsula, the colony proper does not extend inland to a greater depth than half a mile. The protectorate, which adjoins the colony to the north and east, extends from 7 N. to io° N. and from io c 40′ W. to 13 W., and has an area of rather more than 30,000 sq. m., being about the size of Ireland. (For map, see French West Africa.) The population of the colony proper at the 1901 census was 76,655. The popula- tion of the protectorate is estimated at from 1,000,000 to

1,500,000.

Physical Features. — Sierra Leone is a well-watered, well-wooded and generally hilly country. The coast-line is deeply indented in its northern portion. Here the sea has greatly eroded the normal regular, harbourless line of the west coast of Africa, forming bold capes and numerous inlets or estuaries. The Sierra Leone peninsula is the most striking result of this marine action. North of it are the Sierra Leone and Scarcies estuaries; to the south is Yawry Bay. Then in 7° 30′ N. Sherbro Island is reached. This is succeeded by Turner's Peninsula (in reality an island). The seaward faces of these islands are perfectly regular and indicate the original continental coast-line. They have been detached from the mainland partly by a marine inlet, partly by the lagoon-like creeks formed by the rivers. In the Sierra Leone peninsula the hills come down to the sea, else- where a low coast plain extends inland 30 to 50 m. The plateau which forms the greater part of the protectorate has an altitude varying from 800 to 3000 ft. On the north-east border by the Niger sources are mountains exceeding 5000 ft. The most fertile parts of the protectorate are Sherbro and Mendiland in the south-west. In the north-west the district between the Great Scarcies and the Rokell rivers is flat and is named Bullom (low land). In the south-east bordering Liberia is a belt of densely forested hilly country extending 50 m. S. to N. and very sparsely inhabited.

The hydrography of the country is comparatively simple. Six large rivers — 300 to 500 m. long — rise in the Futa Jallon highlands in or beyond the northern frontier of the protectorate and in whole or in part traverse the country with a general S.W. course; the Great and Little Scarcies in the north, the Rokell and Jong in the centre and the Great Bum and Sulima in the south. These rivers are navi- gable for short distances, but in general rapids or cataracts mark their middle courses. The Great Scarcies, the Rio dos Carceres of the Portuguese,

rises not far from the sources of the Senegal. Between 9 go' and 9 15′ N. it forms the boundary between the protectorate and French Guinea ; below that point it is wholly in British territory. The Little Scarcies enters Sierra Leone near Yomaia, in the most northerly part of the protectorate. Known in its upper course as the Kabba, it flows through wild rocky country, its banks in places being 900 ft. high. After piercing the hills it runs parallel with the Great Scarcies. In their lower reaches the two rivers — both large streams — traverse a level plain, separated by no obstacles. The mouth of the Little Scarcies is 20 m. S. of that of the Great Scarcies. South of the estuary of the Scarcies the deep inlet known as the Sierra Leone river forms a perfectly safe and commodious harbour accessible to the largest vessels. At its entrance on the southern shore lies Freetown. Into the estuary flows, besides smaller streams, the Rokell, known in its upper course as the Seli. The broad estuary which separates Sherbro Island from the mainland, and is popularly called the Sherbro river, receives the Bagru from the N.W. and the Jong river, whose headstream, known as the Taia, Pampana and Sanden, flows for a considerable distance east of and parallel to the Rokell. The sources of the Taia, and those of the Great Bum, are near to those of the Niger, the watershed between the coast streams and the Niger basin here forming the frontier. The main upper branch of the Great Bum (or Sewa) river is called the Bague or Bagbe (white river). It flows east of and more directly south than the Taia. In its lower course the Bum passes through the Mendi country and enters the network of lagoons and creeks separated from the ocean by the long low tract of Turner's Peninsula. The main lagoon waterway goes by the name of the Bum-Kittam river, and to the north opens into the Sherbro estuary. Southward it widens out and forms Lake Kasse (20 m. long), before reaching the ocean just north of the estuary of the Sulima. The Wanje or upper Kittam joins this creek, and is also connected with Lake Mabessi, a sheet of water adjacent to Lake Kasse. The Sulima or Moa is a magnificent stream and flows through a very fertile country. One of its headstreams, the Meli, rises in French Guinea in 10 30′ W. 9° 17′ N. and flows for some distance parallel to the infant Niger, but in the opposite direction. It joins the Moa within Sierra Leone. The main upper stream of the Moa separates French Guinea and Liberia and enters British territory in 10° 40′ W. 8° 20′ N. Only the lower course is known as the Sulima. Between 7 40′ and 7 20′ are lacustrine reaches. Six miles S. of the mouth of the Sulima the Mano or Bewa river enters the sea. It rises in Liberia, and below 7° 30′ N. forms the frontier between that republic and the protectorate.

The Sierra Leone peninsula, the site of the oldest British settle- ment, lies between the estuary of the same name and Yawry Bay to the

south. It is traversed on its seaward face by hills attaining a height of 1700 ft. in the Sugar Loaf, and nearly as much in Mount Herton farther south. The hills consist of a kind of granite and of

beds of red sandstone, the disintegration of which has given a dark-coloured ferruginous soil of moderate fertility. Sugar Loaf is timbered to the top, and the peninsula is verdant with abundant vegetation.

Climate. —'Win coast lands are unhealthy and have earned for Sierra Leone the unenviable reputation of being " the white man's grave." The mean annual temperature is above 8o°, the rainfall, which varies a great deal, is from 150 to 180 or more inches per annum. In 1896 no fewer than 203 in. were recorded. In 1894 , a " dry " year, only 144 in. of rain fell. In no other part of West Africa is the rainfall so heavy. December, January, February and March are practically rainless; the rains, beginning in April or May, reach their maximum in July, August and September, and rapidly diminish in October and November. During the dry season, when the climate is very much like that of the West Indies, there occur terrible tornadoes and long periods of the harmattan — a north-east wind, dry and desiccating, and carrying with it from the Sahara clouds of fine dust, which sailors designate " smokes." The dangers of the climate are much less in the interior; 40 or 50 m. inland the country is tolerable for Europeans.

Flora.. — The characteristic tree of the coast districts is the oil- palm. Other palm trees found are the date, bamboo, palmyra, coco and dom. The coast-line, the creeks and the lower courses of the rivers are lined with mangroves. Large areas are covered with brushwood, among which are scattered baobab, shea-butter, bread fruit, corkwood and silk-cotton trees. The forests contain valuable timber trees such as African oak or teak (Oldfieldia Africana), rose- wood, ebony, tamarind, camwood, odum — whose wood resists the attacks of termites — and the tolmgah or brimstone tree. The frankincense tree (Daniellia thtirifera) reaches from 50 to 150 ft., the negro pepper (Xylopia Aethiopica) grows to about 60 ft., the fruit being used by the natives as pepper. There are also found the black pepper plant (Piper Clusii), a climbing plant abundant in the moun- tain districts; the grains of paradise or melegueta pepper plant (Amomum Melegueta) and other Amomums whose fruits are prized. Of the Apocynaceae the rubber plants are the most important. Both Landolphia florida and Landolphia owaricnsis are found. Of several fibre-yielding plants the

so-called aloes of the orders Amaryl- lidaceae and Liliaceae are common. The kola (Cola acuminata) and the bitter kola (Garcinia cola), the last having a fruit about the size of an apple, with a flavour like that of green coffee, are common. Of dye-yielding shrubs and plants camwood and indigo may be mentioned; of those whence gum is obtained the copal, acacia and African tragacanth (Slerculia tragacantha). Besides the oil-palm, oil is obtained from many trees and shrubs, such as the benni oil plant. Of fruit trees there are among others the blood-plum (Haematostaphis Barteri) with deep crimson fruit in grape-like clusters, and the Sierra Leone peach (Sarcocephalus esculentus). The coffee and cotton plants are indigenous ; of grasses there are various kinds of millet, including Paspalum exile, the so-called hungry rice or Sierra Leone millet. Ferns are abundant in the marshes. Bright coloured flowers are somewhat rare.

Fauna. — The wild animals include the elephant, still found in large numbers, the leopard, panther, chimpanzee, grey monkeys, antelope of various kinds, the buffalo, wild hog, bush goat, bush pig, sloth, civet and squirrel. The hippopotamus, manatee, crocodile and beaver are found in the rivers, and both land and fresh-water tortoises are common. Serpents, especially the boa-constrictor, are numerous. Chameleons, lizards and iguanas abound, as do frogs and toads. Wild birds are not very common ; among them are the hawk, parrot, owl, woodpecker, kingfisher, green pigeon, African magpie, the honey-sucker and canary. There are also wild duck, geese and other water fowl, hawk's bill, laggerheads and partridges. Mosquitoes, termites, bees, ants, centipedes, millipedes, locusts, grasshoppers, butterflies, dragonflies, sandflies and spiders are found in immen.se numbers. Turtle are common on the southern coast-line, sand and mangrove oysters are plentiful. Fish abound; among the common kinds are the bunga (a sort of herring), skate, grey mullet and tarpon. Sharks infest the estuaries.

Inhabitants. — Sierra Leone is inhabited by various negro tribes, the chief being the Timni, the Sulima, the Susu and the Mendi. From the Mendi district many curious steatite figures which had been buried have been recovered and are exhibited in the British Museum. They show considerable skill in carving. Of semi-negro races the Fula inhabit the region of the Scarries. Freetown is peopled by descendants of nearly every negro tribe, and a distinct type known as the Sierra Leoni has been evolved; their language is pidgin English. Since 1900 a considerable number of Syrians have settled in the country as traders. Most of the negroes are pagans and each tribe has its secret societies and fetishes. These are very powerful and are employed often for beneficent purposes, such as the regulation of agriculture and the

palm-oil industry. There are many Christian converts (chiefly Anglicans and Wesleyans) and Mahommedans. In the protectorate are some Mahommedan tribes, as for instance the

Susu. The majority of the Sierra Leonis are nominally Christian. The European population numbers about 500.

Towns. — Besides Freetown (q.v.) the capital (pop., 1901, 34,463), the most important towns for European trade are Bonthe, the port of Sherbro, Port Lokko, at the head of the navigable waters of a stream emptying itself into the Sierra Leone estuary, and Songo Town, 30 m. S.E. of Freetown, with which it is con- nected by railway. In the interior are many populous centres. The most noted is Falaba, about 190 m. N.E. of Freetown on the Fala river, a tributary of the Little Scarcies. It lies about 1600 ft. above the sea. Falaba was founded towards the end of the 18th century by the Sulima who revolted from the Mahommedan Fula, and its warlike inhabitants soon attained supremacy over the neighbouring villages and country. Like many of the native towns it is surrounded by a loopholed wall, with flank defences lor the gates. The town is the meeting-place of many trade routes, including some to the middle Niger. Kambia on the Great Scarcies is a place of some importance. It can be reached by boat from the sea. On the railway running S.E. from Freetown are Rotifunk, Mano, and Bo, towns which have increased greatly in importance since the building of the railway.

Agriculture and Trade. — Agriculture is in a backward condition, but is being developed. The wealth of the country consists, however, chiefly in its indigenous trees of economic value — the oil-palm, the kola-nut tree and various kinds of rubber plants, chiefly the Land-olphia owariensis. The crops cultivated are rice, of an excellent quality, cassava, maize and ginger. The cultivation of coffee and of native tobacco has been practically abandoned as unremunerative. The sugar cane is grown in small quantities. The ginger is grown mainly in the colony proper. Minor products are benni seeds, pepper and piassava. The oil-palm and kola-nut tree are especially abundant in the Sherbro district and its hinterland, the Mendi country. The palms, though never planted, are in practically unlimited numbers. The nuts are gathered twice a year. Formerly groundnuts were largely cultivated, but this industry has been superseded by exports from India. Its place has been taken to some extent by the extrac- tion of rubber.

The cotton plant grows freely throughout the protectorate and the cloth manufactured is of a superior kind. Exotic varieties of cotton do

not thrive. Experiments were made during 1903-1906 to intro- duce the cultivation of Egyptian and American varieties, but they did not succeed. Cattle are numerous but of a poor breed; horses do not thrive. The chief export is palm kernels, the amount of palm oil exported being comparatively slight. Next to palm products the most valuable articles exported are kola-nuts — which go largely to neighbouring French colonies — rubber and ginger. The imports are chiefly textiles, food and spirits. Nearly three-fourths of the imports come from Great Britian, which, however, takes no more than some 35% of the exports. About 10% of the exports go to other British West African colonies. Germany, which has but a small share of the import trade, takes about 45 % of the exports. The value of the trade increased in the ten years 1 896-1 905 from £943,000 to £1,265,000. In 1908 the imports were valued at £813,700, the ex- ports at £736,700.

The development of commerce with the rich regions north and east of the protectorate has been hindered by the diversion of trade to the French port of Konakry, which in 19 10 was placed in railway communication with the upper Niger. Moreover, the main trade road from Konakry to the middle Niger skirts the N.E. frontier of the protectorate for some distance. Sierra Leone is thus forced to look to its economic development within the bounds of the protectorate. Communications. — Internal communication is rendered difficult by the denseness of the ” bush ” or forest country. The rivers, however, afford a means of bringing country produce to the seaports. A railway, state owned and the first built in British West Africa, runs S.E. from Freetown through the fertile districts of Mendiland to the Liberian frontier. Begun in 1896, the line reached Bo (136 m.) in the oil-palm district in 1903, and was completed to Baiima, 15 m. from the Liberian frontier — total length 221 m. — in 1905. The gauge throughout is 2 ft. 6 in. The line cost about £4300 per mile, a total of nearly £1,000,000. Tramways and ” feeder roads ” have been built to connect various places with the railway; one such road goes from railhead to Kailahun in Liberia.

Telegraphic communication with Europe was established in 1886. Steamers run at regular intervals between Freetown and Liverpool, Hamburg, Havre and Marseilles. In the ten years 1899-1908 the. tonnage of shipping entered and cleared rose from 1,181,000 to

2,046,000.

Administration, Revenue, &c- — The country is administered as a crown colony, the governor being assisted by an executive and a

legislative council ; on the last-named a minority of nominated un- official members have seats. The law of the colony is the common law of England modified by local ordinances. There is a denomina- tional system of primary and higher education. The schools an

inspected by government and receive grants in aid. In 1907 there were 75 assisted elementary schools with nearly 8000 scholars. Furah Bay College is affiliated to Durham University. There is a Wesleyan Theological College; a government school (established 1906) at Bo for the sons of chiefs, and the Thomas Agricultural Academy at Mabang (founded in 1909 by a bequest of £60,000 from S. B. Thomas, a Sierra Leonian). Since 1901 the government has provided separate schools for Mahommedans. Revenue is largely derived from customs, especially from the duties levied on spirits. In the protectorate a house tax is imposed. In 1899-1908 revenue increased from £168,000 to £321,000, and the expenditure from £145,000 to £341,000. In 1906 there was a public debt of £1,279,000.

Freetown is the headquarters of the British army in West Africa, and a force of infantry, engineers and artillery is maintained there. The colony itself provides a battalion of the West African Frontier Force, a body responsible to the Colonial Office.

The protectorate is divided for administrative purposes into districts, each under a European commissioner. Throughout the protectorate native law is administered by native courts, subject to certain modifications. Native courts may not deal with murder, witchcraft, cannibalism or slavery. These cases are tried by the district commissioners or referred to the supreme court at Freetown. The tribal system of government is maintained, and the authority of the chiefs has been strengthened by the British. Domestic slavery is not interfered with.

History. — Sierra Leone (in the original Portuguese form Sierra Leona) was known to its native inhabitants as Romarong, or the Mountain, and received the current designation from the Portuguese discoverer Pedro deSintra (i462),eitheronaccount of the ” lion-like ” thunder on its hill-tops, or to a fancied resem- blance of the mountains to the form of a lion. Here, as elsewhere along the coast, the Portuguese had “factories”; and though none existed when the British took possession, some of the natives called themselves Portuguese and claimed descent

from colonists of that nation. An English fort was built on Bance Island in the Sierra Leone estuary towards the close of the 17th century, but was soon afterwards abandoned, though for a long period the estuary was the haunt of slavers and pirates. English traders were established on Bance and the Banana islands as long as the slave trade was legal. The existing colony has not, however, grown out of their establishments, but owes its birth to the philanthropists who sought to alleviate the lot of those negroes who were victims of the traffic in human beings. In 1786 Dr Henry Smeathman, who had lived for four years on the west coast, proposed a scheme for founding on the peninsula a colony for negroes discharged from the army and navy at the close of the American War of Independence, as well as for numbers of run- away slaves who had found an asylum in London. In 1787 the settlement was begun with 400 negroes and 60 Europeans, the whites being mostly women of abandoned character. In the year following, 1788. Nembana, a Timni chief, sold a strip of land to Captain John Taylor, R.N., for the use of the ” free community of settlers, their heirs and successors, lately arrived from England, and under the protection of the British government.” Owing mainly to the utter shiftlessness of the settlers and the great mortality among them, but partly to an attack by a body of natives, this first attempt proved a complete failure. In 1791 Alexander Falconbridge (formerly a surgeon on board slave ships) collected the surviving fugitives and laid out a new settle- ment (Granville’s Town) ; and the promoters of the enterprise — Granville Sharp, William Wilberforce, Sir Richard Carr Glyn, &c. — hitherto known as the St George’s Bay Company, obtained a charter of incorporation as the Sierra Leone Company, with Henry Thornton as chairman. In 1792 John Clarkson, a lieu- tenant in the British navy and brother to Thomas Clarkson the slave trade abolitionist, brought to the colony 1100 negroes from Nova Scotia. In 1794 the settlement, which had been again transferred to its original site and named Freetown, was plundered by the French. The governor at the time was Zachary Macaulay, father of Thomas Babington, Lord Macaulay. In 1807, when the inhabitants of the colony numbered 187 1, the company, which had encountered many difficulties, transferred its rights to the crown. The slave trade having in the same year been declared illegal by the British parliament, slaves captured by British vessels in the neighbouring seas were brought to Freetown, and thus the population of the colony grew. Its

development was hampered by the frequent changes in the governorship. Sydney Smith’s jest that Sierra Leone had always two governors, one just arrived in the colony, and the other just arrived in England, is but a slight exaggeration. In. twenty-two years (1

792-1814) there were seventeen changes in the governor- ship. After that date changes, although not quite so rapid, were still frequent. Several of the governors, like Zachary Macaulay, Colonel Dixon Denham, the explorer, and Sir Samuel Rowe, were men of distinction. Colonel Denham, after administering the colony for five weeks, died at Freetown of fever on the 9th of June 1828. Sir Charles M Carthy was, however, governor for ten years (1814-1824), an unprecedented period, during which he did much for the development of the country. Sir Charles fell in battle with the Ashanti on the 21st of January 1824. Whilst the governors found great difficulty in building up an industrious and agricultural community out of the medley of Africans brought to Sierra Leone, they had also to contend with the illicit slave trade which flourished in places close to the colony. To stop the traffic in Sherbro Island General Charles Turner concluded in 1825 a treaty with its rulers putting the island, Turner's Peninsula and other places under British pro- tection. (This treaty was not ratified by the crown, but was revived by another agreement made in 1882.)

At this time — 1826 — measures were taken to ensure that the liberated slaves should become self-supporting. Many colonists took to trade, and notwithstanding numerous collisions with neighbouring tribes the settlement attained a measure of prosperity. Among the leading agents in spreading civilization were the missionaries sent out from 1804 onwards by the Church Missionary Society. Despite the anxiety of the British govern- ment not to increase their responsibilities in West Africa, from time to time various small territories were purchased, and by 1884 all the land now forming the colony had been acquired. The Los Islands (q.v.) which were ceded by the natives to Great Britain in 1818 were transferred to France in 1904. In 1866 Freetown was made the capital of the new general government" set up for the British settlements on the West Coast of Africa (comprising Sierra Leone, Gambia, the Gold Coast and Lagos, each of which was to have a legislative council). In 1874 the Gold Coast and Lagos were detached from Sierra Leone, and the Gambia in 1888.

British influence was gradually extended over the hinterland, chiefly with the object of suppressing intertribal wars, which greatly hindered trade. In this work the British authorities enlisted the services of Dr Edward W. Th e . Blyden (a pure-blooded negro), who in 1872 visited incident Falaba and in 1873 Timbo, both semi-Mahommedan countries, being cordially received by the ruling chiefs. Falaba — ■ which had been visited in 1869 by Winwood Reade on his journey tothe Niger — came definitely underBritish protection, but Timbo, which is in Futa Jallon, was allowed to become French territory

through the supineness of the home government. The area for expansion on the north was in any case limited by the French Guinea settlements, and on the south the territory of Liberia 1 hemmed in the colony. In the east and north-east British officers also found themselves regarded as trespassers by the French. The necessity for fixing the frontier in this direction was emphasized by the Waima incident. Both French and British military expeditions had been sent against the Sofas — Moslem mercenaries who, under the chieftainship of Fulas or Mandingos like Samory, ravaged the hinterland both of Sierra Leone and French Guinea. On the 23rd of December 1893 a British force was encamped at Waima. At dawn it was attacked by a French force which mistook the British troops for Samory's Sofas (save the officers the soldiers of both parties were negroes). Before the mistake was discovered the British had lost in killed three officers — Captain E. A. W. Lendy, Lieut. R. E. Liston and Lieut. C. Wroughton — and seven men, besides eighteen wounded. The French also suffered heavily. Their leader Lieut. Maritz was brought into the British camp mortally wounded,

1 The Anglo-Liberian frontier, partly defined by treaty in 1885, was not delimitated until 1903 (see Liberia).

and was buried by the British. Steps were taken to prevent the occurrence of any further conflicts, and an agreement defining the frontier was signed in January 1895. This agreement finally shut out Sierra Leone from its natural hinterland. In 1896 the frontier was delimitated, and in the same year (26th of August 1896) a proclamation of a British protectorate was issued. To this extension of authority no opposition was offered at the time by any of the chiefs or tribes. Travelling commissioners were appointed to explore the hinterland, and frontier police were organized. The abolition of the slave trade followed; and with the introduction of the protectorate ordinance in 1897 a house tax of 5s. each was imposed, to come into operation in three districts on the 1st of January 1898. Chief Bai Bureh, in the Timni country, broke out into open war, necessitating a military punitive expedition. After strenuous fighting, in which the British casualties, including sick, reached 600, he was captured (14th of November 1898) and deported. Meantime (in April 189S) the Mendi tribes rose, and massacred several British and American missionaries, including four ladies, at Rotifunk and Taiama, some native officials (Sierra Leonis) in the Imperri district, and a large

number of police throughout the country. Speedy retribution followed, which effectually put down the revolt. Sir David P. Chalmers was appointed (July 1898) royal commissioner to inquire into the disturbances. He issued a report, July 1899, deprecating the imposition of the house tax, which was not, however, revoked. The disturbances would appear to have arisen not so much from dislike of the house tax per se as irritation at the arbitrary manner in which it was collected, and from a desire on the part of the paramount chiefs (who chafed at the suppression of slave trading and slave raiding, and who disseminated a powerful fetish “swear,” called “Poro,” to compel the people to join) to cast off British rule. After the suppression of the rising (January 1899) confidence in the British administration largely increased among the tribes, owing to the care taken to preserve the authority of the chiefs whilst safeguarding the elementary rights of the people. The building of the railway and the consequent development of trade and the introduction of European ideas tended largely to modify native habits. The power of fetishism seemed, however, unaffected.

See H. C. Lukach, A Bibliography of Sierra Ieone (Oxford 1911); Sir C. P. Lucas, Historical Geography of the British Colonies, vol. iii. (2nd ed., Oxford, 1900) ; T. J. Alldridge, The Sherbro and its Hinterland (London, 1901), and A Transformed Colony (London, 1910) — the last with valuable notes on secret societies and fetish; Winwood Reade, The African Sketch Book, vol. ii. (London, 1873); Colonel J. K. Trotter, The Niger Sources (London, 1898) ; Major J. J. Crook, History of Sierra Leone (Dublin, 1903) — a concise account of the colony to the end of the 19th century. For fuller details of the foundation and early history of the settlement consult Sierra Leone after a Hundred Years (London, 1894) by E. G. Ingham, bishop of the diocese, and The Rise of British West Africa (London, 1904) by Claude George. Bishop Ingham’s book contains long extracts from the diary of Governor Clarkson, which vividly portray the conditions of life in the infant colony. For the rising in 1898 see The Advance of our West African Empire (London, 1903) by C. B. Wallis. A Blue Book on the affairs of the colony is published yearly at Freetown and an Annual Report by the Colonial Office in London. ,Maps on the scale of 1 : 250,000 are published by the War Office.

SIERRA MORENA, THE, a range of mountains in southern . Spain. The Sierra Morena constitutes the largest section of the mountain system called the Cordillera Marianica (anc. Monies mariani), which also includes a number of minor Spanish ranges, together with the mountains of southern Portugal. The mean elevation of the range is about 2500 ft., but its breadth is certainly not less than 40 m. It

extends eastward as far as the steppe region of Albacete, and westward to the valley of the lower Guadiana. Its continuity is frequently interrupted, especially in the west; in the eastern and middle portions it is composed of numerous irregularly disposed ridges. Many of these bear distinctive names; thus the easternmost and loftiest is called the Sierra de Alcaraz (5900 ft.), while some of the component ridges in the extreme west are classed together as the Sierras de Aracena. The great breadth of the Sierra Morena long rendered it a formidable barrier between Andalusia and the

north; as such it has played an important part in the social, economic and military history of Spain. Its configuration and hydrography are also important from a geographical point of view, partly because it separates the plateau region of Castile and Estrcmadura from the Andalusian plain and the highlands of the Sierra Nevada system, partly because it forms the water- shed between two great rivers, the upper Guadiana on the north and the Guadalquivir on the south. Parts of the Sierra Morena are rich in minerals; the central region yields silver, mercury and lead, while the Sierras de Aracena contain the celebrated copper mines of Tharsis and Rio Tinto (q.v.).

SIERRA NEVADA (Span, for ” snowy range “), a mountain range, about 430 m. long, in the eastern part of California, containing Mt Whitney (14,502 ft.) ; the highest ooint in the United States, excluding Alaska. (See California.)

SIERRA NEVADA, THE, a mountain range of southern Spain, in the provinces of Granada and A*meria. The Sierra Nevada is a well-defined range, about 55 m. long and 25 m. broad, situated to the south of the Guadalquivir valley, and stretching from the upper valley of the river Genii or Jenil eastwards to the valley of the river Almerfa. It owes its name, meaning “the snowy range, ” to the fact that several of its peaks exceed 10,000 feet in height and are thus above the limit of perpetual snow. Its culminating point, the Cerro de Mulhacen or Mulahacen (11,421 ft.) reaches an altitude unequalled in Spain, while one of the neighbouring peaks, called the Picacho de Veleta (r 1,148 ft.), is only surpassed by Aneto (11,168 ft.), the loftiest summit of the Pyrenees. The Sierra Nevada is composed chiefly of soft micaceous schists, sinking precipitously down on the north, but sloping more gradually to the south and south-east. On both sides deep transverse valleys (barrancas) follow one another in close succession, in many cases with round, basin-shaped heads like the cirques of the Pyrenees (q.v.). In many of these cirques lie alpine lakes, and in one of them, the Corral de Veleta, there is even a small glacier, the most southerly in Europe. The transverse valleys open on the south into the

longitudinal valleys of the Alpujarras (q.v.). On the north, east and west there are various minor ranges, such as the Sierras of Parapanda, Harana, Gor, Baza, Lucena, Cazorla, Estancias, Filabres, &c, which are connected with the main range, and are sometimes collectively termed the Sierra Nevada system. The coast ranges, or Sierra Penibetica, are not included in this group. The Sierras de Segura form a connecting link between the Sierra Morena and the Nevada system.

SIEVE (O.E. sife, older sibi, cf. Dutch zeef, Ger. Sieb; from the subst. comes O.E. siflan, to sift), an instrument or apparatus for separating finer particles from coarser. The common sieve is a net of wires or other material stretched across a frame- work with raised edges; the material to be sifted is then shaken or pressed upon the net so that the finer particles pass through the mesh and the coarser remain. The word ” screen ” is usually applied to such instruments with large mesh for coarse work, and ” strainer ” for those used in the separation of liquids or semi-liquids from solid matter. In the separation of meal from bran ” bolting-clothes ” are used. There was an early form of divination known as coscinomancy (Gr. koctklvov, sieve, fxavrela, divination), where a sieve was hung or attached to a pair of shears, whence the name sometimes given to it of ” sieve and shears “; the turning or movement of the sieve at the naming of a person suspected of a crime or other act, coupled with the repetition of an incantation or other magic formula, decided the guilt or innocence of the person.

SIEYES, EMMANUEL-JOSEPH (1748-1836), French abbe and statesman, one of the chief theorists of the revolutionary and Napoleonic era, was born at Frejus in the south of France on the 3rd of May 1748. He was educated for the church at the Sorbonne; but while there he eagerly imbibed the teachings of Locke, Condillac, and other political thinkers, in preference to theology. Nevertheless he entered the church, and owing to his learning and subtlety advanced until he became vicar- general and chancellor of the diocese of Chartres. In 1788 the excitement caused by the proposed convocation of the States

General of France after the interval of more than a century and a half, and the invitation of Necker to writers to state their views as to the constitution of the Estates, enabled Sieves to publish his celebrated pamphlet, “What is the Third Estate?” He thus begins his answer, — ” Everything. What has it been hitherto in the political order? Nothing.

What does it desire? To be something.” For this mot he is said to have been indebted to Chamfort. In any case, the pamphlet had a great vogue, and its author, despite doubts felt as to his clerical vocation, was elected as the last (the twentieth) of the deputies of Paris to the States General. Despite his failure as a speaker, his influence became great; he strongly advised the constitution of the Estates in one chamber as the National Assembly, but he opposed the abolition of tithes and the confiscation of church lands. Elected to the special committee on the constitution, he opposed the right of ” absolute veto ” for the king, which Mirabeau unsuccessfully supported. For the most part, however, he veiled his opinions in the National Assembly, speaking very rarely and then generally with oracular brevity and ambiguity. He had a considerable influence on the framing of the depart- mental system, but after the spring of 1790 his influence was eclipsed by men of more determined character. Only once was he elected to the post of fortnightly president of the Constituent Assembly. Excluded from the Legislative Assembly by Robes- pierre’s self-denying ordinance, he reappeared in the third National Assembly, known as the Convention (September 1792- September 1795); but there his self-effacement was even more remarkable; it resulted partly from disgust, partly from timidity. He even abjured his faith at the time of the installation of the goddess of reason; and afterwards he characterized his conduct during the reign of terror in the ironical phrase, J’ai v&eu. He voted for the death of Louis XVI., but not in the contemptuous terms La mart sans phrases sometimes ascribed to him. He is known to have disapproved of many of the provisions of the constitutions of the years 1791 and 1793, but did little or nothing to improve them.

In 1795 he went on a diplomatic mission to the Hague, and was instrumental in drawing up a treaty between the French and Batavian republics. He dissented from the constitution of 1795 (that of the Directory) in some important particulars, but without effect, and thereupon refused to serve as a Director of the Republic. In May 1798 he went as the plenipotentiary of France to the court of Berlin in order to try to induce Prussia to make common cause with France against the Second Coalition. His conduct was skilful, but he failed in his main object. The prestige which encircled his name led to his being elected a Director of France in place of Rewbell in May 1799. Already he had begun to intrigue for the overthrow of the Directory, and is said to have thought of favouring the advent to power at Paris of persons so unlikely as the Archduke Charles and the duke of Brunswick. He now set himself to sap the base of the con- stitution of 1795. With that aim he caused the revived Jacobin Club to be closed, and made overtures

to General Joubert for a coup d'etat in the future. The death of Joubert at the battle of Novi, and the return of Bonaparte from Egypt marred his schemes; but ultimately he came to an understanding with the young general (see Napoleon I.). After the coup d'etat of Brumaire, Sieyes produced the perfect constitution which he had long been planning, only to have it completely remodelled by Bonaparte. Sieyes soon retired from the post of provisional consul, which he accepted after Brumaire; he now became one of the first senators, and rumour, probably rightly, connected this retirement with the acquisition of a fine estate at Crosne. After the bomb outrage at the close of 1800 (the affair of Nivose) Sieyes in the senate defended the arbitrary and illegal proceedings whereby Bonaparte rid himself of the leading Jacobins. During the empire he rarely emerged from his retirement, but at the time of the Bourbon restorations (1814 and 181 5) he left France. After the July revolution (1830) he returned; he died at Paris on the 20th of June 1836. The thin, wire-drawn features of Sieyes were the index of his mind, which was keen- sighted but narrow, dry and essentially limited. His lack

of character and wide sympathies was a misfortune for the National Assemblies which he might otherwise have guided with effect.

See A. Neton, Sieyes (1 748-1 836) d'apres documents inedits (Paris, 1900) ; also the chief histories on the French Revolution and the Napoleonic empire. (J. Hl. R.)

SIFAKA, apparently the name of certain large Malagasy lemurs nearly allied to the Indri (q.v.) but distinguished by their long tails, and hence referred to a genus apart — Propilhecus, of which three species, with several local races, are recognized. Sifakas are very variable in colouring, but always show a large amount of white. They associate in parties and are mainly arboreal, leaping from bough to bough with an agility that suggests flying through the air. When on the ground, to pass from one clump of trees to another, they do not run on all fours, but stand erectj

The Crowned Sifaka (Propithecus diadema coronatus) . Milne-Edwards and Grandidier.

From

and throwing their arms above their heads, progress by a series of short jumps, producing an effect which is described by travellers as exceedingly ludicrous. They are not nocturnal, but most active in the morning and evening, remaining seated or curled up among the

branches during the heat of the day. In disposition they are quiet and gentle, and do not show much intelligence; they are also less noisy than the true lemurs, only when alarmed or angered making a noise which has been compared to the clucking of a fowl. Like all their kindred they produce only one offspring at a birth (see Primates). (R. L.*)

SIGALON, XAVIER (1788-1837), French painter, born at Uzes (Gard) towards the close of 1788, was one of the few leaders of the romantic movement who cared for treatment of form rather than of colour. The son of a poor rural schoolmaster, he had a terrible struggle before he was able even to reach Paris and obtain admission to Guerin's studio. But the learning offered there did not respond to his special needs, and he tried to train himself by solitary study of the Italian masters in the gallery of the Louvre. The "Young Courtesan" (Louvre),

which he exhibited in 1822, at once attracted attention and was bought for the Luxembourg. The painter, however, regarded it as but an essay in practice and sought to measure himself with a mightier motive; this he did in his " Locusta " (Nimes), 1824, and again in " Athaliah's Massacre " (Nantes), 1827. Both these works showed incontestable power; but the "Vision of St Jerome " (Louvre), which appeared at the salon of 1831, together with the " Crucifixion " (Issengeaux), was by far the most individual of all his achievements, and that year he received the cross of the Legion of Honour. The terrors and force of his pencil were not, however, rendered attractive by any charm of colour; his paintings remained unpurchased, and Sigalon found himself forced to get a humble living at times by painting portraits, when Thiers, then minister of the interior, recalled him to Paris and entrusted him with the task of copying the Sistine fresco of the " Last Judgment " for a hall in the Palace of the Fine Arts. On the exhibition, in the Baths of Diocletian at Rome, of Sigalon's gigantic task, in which he had been aided by his pupil Numa Boucoiran, the artist was visited in state by Gregory XVI. But Sigalon was not destined long to enjoy his tardy honours and the comparative ease procured by a small government pension; returning to Rome to copy some pendants in the Sistine, he died there of cholera on the 9th of August 1837. SI-GAN FU (officially Sian Fu), the capital of the province of Shen-si, N.W. China, in 34 17′ N., 108° 38′ E. Shi Hwang-ti (246-210 B.C.), the first universal emperor, established his capital at Kwan-chung, the site of the modern Si-gan Fu. Under the succeeding

Han dynasty (206 b.c.-a.d. 25) this city was called Wei-nan and Nui-shi; under the eastern Han (a.d. 25-221) it was known as Yung Chow; under the T'ang (618-907) as Kwan- nui; under the Sung (960-1127) as Yung-hing; under the Yuan and Ming (1 260-1644) as Gan-si. During the Ts'in, Han and T'ang dynasties the city was usually the capital of the empire, and in size, population and wealth it is still one of the most important cities of China. It was to Si-gan Fu that the emperor and dowager empress retreated on the capture of Peking by the allied armies in August 1900; and it was once again constituted the capital of the empire until the following spring when the court returned to Peking, after the conclusion of peace. The city, which is a square, is prettily Situated on ground rising from the river Wei, and includes within its limits the two district cities of Ch'ang-gan and Hien-ning. Its walls are little inferior in height and massiveness to those of Peking, while its gates are handsomer and better defended than any at the capital. The population is said to be 1,000,000, of whom 50,000 are Mahommedans. Situated in the basin of the Wei river, along which runs the great road which connects northern China with Central Asia, at a point where the valley opens out on the plains of China, Si-gan Fu occupies a strategical position of great importance, and repeatedly in the annals of the empire has history been made around and within its walls. During the Mahommedan rebellion it was besieged by the rebels for two years (1868-70), but owing to the strength of the fortifications it defied the efforts of its assailants. It is admirably situated as a trade centre and serves as a depot for the silk from Cheh- kiang and Szech'uen, the tea from Hu-peh and Ho-nan, and the sugar from Szech'uen destined for the markets of Kan-suh, Turkestan, Kulja and Russia. Marco Polo, speaking of Kenjanf u, as the city was then also called, says that it was a place " of great trade and industry. They have great abundance of silk, from which they weave cloths of silk, and gold of divers kinds, and they also manufacture all sorts of equipments for an army. They have every necessary of man's life very cheap."

Several of the temples and public buildings are very fine, and many historical monuments are found within and about the walls. Of these the most notable is the Nestorian tablet, which was accidentally discovered in 1625 in the Ch'ang-gan suburb. The stone slab which bears the inscription is 75 ft. high by 3 wide.

The contents of this Nestorian inscription, which consists of 1780 characters, may be described as follows. (1) An abstract of Christian doctrine of a vague and figurative kind. (2) An account of the arrival

of the missionary Olopan (probably a Chinese form of Rabban =

Monk) from Tats'in in the year 635, bringing sacred books and images; of the translation of the said books; of the imperial approval of the doctrine and permission to teach it publicly. Then follows a decree of the emperor (T'ait-sung, a very famous prince), issued in 638, in favour of the new doctrine, and ordering a church to be built in the square of justice and peace (Ining fang) in the capital. The emperor's portrait was to be placed in this church. After this comes a description of Tats'in, and then some account of the fortunes of the church in China. Kaotsung (650-683, the devout patron also of the Buddhist traveller and doctor Hsiian Ts'ang), it is added, continued to favour the new faith. In the end of the century Buddhism got the upper hand, but under Yuen-tsung (7 1 3~755) the church recovered its prestige, and Kiho, a new missionary, arrived. Under Tih-tsung (780-783) the monument was erected, and this part of the inscription ends with a eulogy of I-sze, a statesman and benefactor of the church. (3) Then follows a recapitulation of the above in octosyllabic verse. The Chinese inscription, which concludes with the date of erection, viz. 781, is followed by a series of short inscriptions in Syriac and the Estrangelo character, containing the date of the erection, the name of the reigning Nestorian patriarch, Mar Hanan Ishua, that of Adam, bishop and pope of China, and those of the clerical staff of the capital. Then follow sixty-seven names of persons in Syriac characters, most of whom are characterized as priests, and sixty-one names of persons in Chinese, all priests but one.

The stone — one of a row of five memorial tablets — stood within the enclosure of a dilapidated temple. It appears at one time to have been embedded in a brick niche, and about 1891 a shed was placed over it, but in 1907 it stood in the open entirely unprotected. In that year Dr Frits v. Holm, a Danish traveller, had made an exact replica of the tablet, which in 1908 was deposited in the Metropolitan Museum of Art, New York. The tablet itself was in October 1907 removed by Chinese officials into the city proper, and placed in the Pei Lin or " forest of tablets," a museum in which are collected tablets of the Han, T'ang, Sung, Yuen and Ming dynasties, some of which bear historical legends, notably a set of stone tablets having the thirteen classics inscribed upon them, while others are symbolical or pictorial; among these last is a full-sized likeness of Confucius. Antiquities are constantly being discovered in the neighbourhood of the city, e.g. rich stores of coins and bronzes, bearing dates ranging from 200 B.C. onwards.

See Yule, Marco Polo (1903 ed.) ; A. Williamson, Journeys in North China (London, 1870), S. Wells Williams, The Middle Kingdom (London, 1883); Pere Havret, La Stele de Si-ngan Fou (Shanghai,

1895-1902); F. v. Holm, The Nestorian Monument (Chicago,

1909).

SIGEBERT (d. 575), king of the Franks, was one of the four sons of Clotaire I. At the death of Clotaire in 561 the Frankish kingdom was divided among his sons, Sigebert's share comprising the Rhine and Meuse lands and the suzerainty over the Germanic tribes beyond the Rhine as far as the Elbe, together with Auvergne and part of Provence. At the death of his brother Charibert in 567 Sigebert obtained the cities of Tours and Poitiers, and it was he who elevated to the see of Tours the celebrated Gregory, the historian of the Franks. Being a smoother man than his brothers (who had all taken mates of inferior rank), Sigebert married a royal princess, Brunhilda, daughter of Athanagild, the king of the Visigoths; the nuptials were celebrated with great pomp at Metz, the Italian poet Fortunatus composing the epithalamium. Shortly afterwards Sigebert's brother Chilperic I. married Brunhilda's sister, Gals- wintha; but the subsequent murder of this princess embroiled Austrasiaand Neustria, and civil war broke out in 573. Sigebert appealed to the Germans of the right bank of the Rhine, who attacked the environs of Paris and Chartres and committed frightful ravages. He was entirely victorious, and pursued Chilperic as far as Tournai. But just when the great nobles of Neustria were raising Sigebert on the shield in the villa at Vitry, near Arras, he was assassinated by two bravoes in the pay of Fredegond, Chilperic's new wife. At the beginning of his reign Sigebert had made war on the Avars, who had attacked his Germanic possessions, and he was for some time a prisoner in their hands.

See Gregory of Tours, Historia Francorum, book iv. ; Aug. Thierry, Recits des temps merovingiens (Brussels, 1840), and Aug Digot, Histoire du royaume d'Austrasie (Nancy, 1863). (C. Pf.)

SIGEBERT OF GEMBLOUX (c. 1030-1112), medieval chron- icler, became in early life a monk in the Benedictine abbey of Gembloux. Later he was a teacher at Metz, and about 1070 he returned to Gembloux, where, occupied in teaching and writing, he lived until his death on the 5th of October 1112. As an enemy of the papal pretensions he took part in the momentous contest between Pope Gregory VII. and the emperor Henry IV., his writings on this question being very serviceable to the imperial cause; and he also wrote against

Pope Paschal II. Sigebert's most important work is a Chronographia, or universal chronicle, according to Molinier the best work of its kind, although it contains many errors and but little original information. It covers the period between 381 and mi, and its author was evidently a man of much learning. The first of many editions was published in 1513 and the best is in Band vi. of the Monu- menta Germaniae historica. Scriptores, with valuable introduction by L. C. Bethmann. The chronicle was very popular during the later middle ages; it was used by many writers and found numerous continuators. Other works by Sigebert are a history of the early abbots of Gembloux to 1048 (Gesta abbatum Gem- blacensium) and a life of the Frankish king Sigebert III. {Vita Sigeberti III. regis Austrasiae). Sigebert was also a hagiographer. Among his writings in this connexion may be mentioned the Vita Deodcrici, Mettensis episcopi, which is published in Band iv. of the Monumenta, and the Vita Wicberti, in Band viii. of the same collection. Dietrich, bishop of Metz (d. 984) was the founder of the abbey of St Vincent in that city, and Wicbert or Guibert (d. 962) was the founder of the abbey of Gembloux.

See S. Hirseh, De vita et scriptis Sigiberti Gemblacensis (Berlin, 1841); A. Molinier, Les Sources de Vhistoire de France, tomes ii. and v. (1902-1904); and W. Wattenbach, Deutschlands Geschichts- quellen, Band ii. (Berlin, 1894).

SIGEL, FRANZ (1824-1902), German and American soldier, was born at Sinsheim, in Baden, on the 18th of November 1824. He graduated at the military school at Carlsruhe, and became an officer in the grand ducal service. He soon became known for revolutionary opinions, and in 1847, after killing an opponent in a duel, he resigned his commission. When the Baden insurrection broke out, Sigel was a leader on the revolutionary side in the brief campaign of 1848, and then took refuge in Switzerland. In the following year he returned to Baden and took a con- spicuous part in the more serious operations of the second outbreak under General Louis Mieroslawski (1814-1878.) Sigel subsequently lived in Switzerland, England and the United States, whither he emigrated in 1852, the usual life of a political exile, working in turn as journalist and schoolmaster, and both at New York and St Louis, whither he removed in 1858, he conducted military journals. When the American Civil War broke out in 1861, Sigel was active in raising and training Federal volunteer corps, and took a prominent part in the struggle for the possession of Missouri. He became in May a brigadier-general U.S.V,, and served with Nathaniel Lyon at Wilson's Creek and with J. C. Fremont in the advance on Spring- field in the autumn. In 1862 he took a conspicuous part in the desperately fought battle of Pea Ridge, which definitely secured

Missouri for the Federals. He was promoted to be major-general of volunteers, was ordered to Virginia, and was soon placed in command of the I. corps of Pope's " Army of Virginia." In this capacity he took part in the second Bull Run campaign, and his corps displayed the utmost gallantry in the unsuccessful attacks on Bald Hill. Up to the beginning of 1863, when bad health obliged him to take leave of absence, Sigel remained in command of his own (now called the XL) corps and the XII., the two forming a " Grand Division." In June 1863 he was in command of large forces in Pennsylvania, to make head against Lee's second invasion of Northern territory. In 1864 he was placed in command of the corps in the Shenandoah Valley, but was defeated by General John C. Breckinridge at Newmarket (15th of May), and was superseded. Subsequently he was in command of the Harper's Ferry garrison at the time of Early's raid upon Washington and made a brilliant defence of his post

(July 4-5, 1864). He resigned his commission in May 1865, and became editor of a German journal in Baltimore, Maryland. In 1867 he removed to New York City, and in 1869 was the unsuccessful Republican candidate for secretary of state of New York. He was appointed collector of internal revenue in May 187 1, and in the following October he was elected register of New York City by Republicans and " reform Democrats." From 1885 to 1889, having previously become a Democrat, he was pension agent for New York City, on the appointment of President Cleveland. General Sigel's last years were de- voted to the editorship of the New York Monthly, a German- American periodical. He died in New York City on the 21st of August 1902. A monument (by Karl Bitter) in his honour was unveiled in Riverside Drive, New York City, in October 1907.

SIGER DE BRABANT [Sighier, Sigieri, Sygeritjs], French philosopher of the 13th century. About the facts of his life there has been much difference of opinion. In 1266 he was attached to the Faculty of Arts in the University of Paris at the time when there was a great conflict between the four " nations." The papal legate decided in 1266 that Siger was the ringleader, and threatened him with death. During the succeeding ten years he wrote the six works which are ascribed to him and were published under his name by P. Mandonnet in 1899. The titles of these treatises are: De anima intellectiva (1270); Quaestiones logicales; Quaestiones naturales; De aeternitate mundi; Quaestio utrum haec sif vera: Homo est animal nullo homine existente; Impossibilia. In 1271 he was once more involved in a party struggle. The minority among the " nations " chose him as rector in opposition to the elected candidate, Aubri de Rheims. For three years the strife continued, and was probably based on the opposition between the

Averroists, Siger and Pierre Dubois, and the more orthodox schoolmen. The matter was settled by the Papal Legate, Simon de Brion, afterwards Pope Martin IV. Siger retired from Paris to Liege. In 1277 a general condemnation of Aristotelianism included a special clause directed against Boetius of Denmark and Siger of Brabant. Again Siger and Bernier de Nivelles were summoned to appear on a charge of heresy, especially in connexion with the Impossibilia, where the existence of God is discussed. It appears, however, that Siger and Boetius fled to Italy and, according to John Peckham, archbishop of Canterbury, perished miserably. The manner of Siger's death, which occurred at Orvieto, is not known. A Brabantine chronicle says that he was killed by an insane secretary {a clerico suo quasi dementi). Dante, in the Paradiso (x. 134-6), says that he found " death slow in coming," and some have concluded that this indicates death by suicide. A 13th-century sonnet by one Durante (xcii. 9-14) says that he was executed at Orvieto: a ghiado il fe' morire a gran dolore, Nella corte di Roma ad Orbivicto. The date of this may have been 1 283-1 284 when Martin IV. was in residence at Orvieto. In politics he held that good laws were better than good rulers, and criticised papal infallibility in temporal affairs. The importance of Siger in philosophy lies in his acceptance of Averroism in its entirety, which drew upon him the opposition of Albertus Magnus and Aquinas. In December 1270 Averroism was condemned by ecclesiastical authority, and during his whole life Siger was exposed to persecution both from the Church and from purely philosophic opponents. In view of this, it is curious that Dante should place him in Paradise at the side of Aquinas and Isidore of Seville. Probably Dante knew of him only from the chronicler as a persecuted philosopher.

See P. Mandonnet, Siger de Brabant et V Averroisme latin du XIII' siecle (Fribourg, 1899); G. Paris, " Siger de Brabant " in La Poesie du moyen Age (1895) ; and an article in the Revue de Paris (Sept. 1st, 1900).

SIGHTS, the name for mechanical appliances for directing the axis of the bore of a gun or other firearm on a point whose position relative to the target fired at is such that the projectile will strike the target.

Gun Sights. — Until the 19th century the only means for sighting cannon was by the " line of metal " — a line scored

along the top of the gun, which, owing to the greater thickness of metal at the breech than at- the muzzle, was not parallel to the axis. ” Some allowance had to be made for the inclination of the line of metal to the axis” (Lloyd and Hadcock, p. 32). The line of metal does not come under the definition of sights given above. In the year 1801 a proposal to use sights was sent to Lord Nelson for opinion, and elicited the following reply: ” As to the plan for pointing a gun, truer than we do at present, if the person comes, I shall, of course, look at it, or be happy, if necessary, to use it; but I hope we shall be able, as usual, to get so close to our enemies that our shot cannot miss the object ” (letter to Sir E. Berry, March 9, 1801). Three weeks later the fleet under Sir Hyde Parker and Nelson sailed through the Sound on its way to Copenhagen. In replying to the guns of Fort Elsinore no execution was done, as the long range made it impossible to lay the guns (Lloyd and Hadcock, P- 33)-

The necessity for sights follows directly on investigation of the forces acting on a projectile during flight. In a vacuum, the pro- jectile acted on by the force of projection begins to fall under the action of gravity immediately it leaves the bore, and under the combined action of these two forces the path of the projectile is 9. parabola. It passes over equal spaces in equal times, but falls with an accelerating velocity according to the formula h = Jg2 2 , where h is the height fallen through, g the force of gravity, and / the time of

g ■ J , From “£• J it: wi ” be seen that in three seconds the projectile would have fallen 144 ft. to G ; therefore to strike T the axis must be raised to a point 144 ft. vertically above G. This law holds good

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Fig. I — Elevation.

also in air for very low velocities, but, where the velocities are high, the retardation is great, the projectile takes longer to traverse each succeeding space, and consequently the time of flight for any range is longer; the axis must therefore be directed still higher above the point to be struck. The amount, however, still depends on the time of flight, as the retardation of the air to the falling velocity may be neglected in the case of flat trajectory guns. Owing to the conical shape of the early muzzle-loading guns, if one trunnion were higher than the other, the " line of metal " would no longer be in the same vertical plane as the axis; in consequence of this, if a gun with, say, one wheel higher than the other were layed by this line, the axis would point off the target to the side of the lower wheel. Further, the in- clination of the line of metal to the axis gave the gun a fixed angle of elevation varying from i° in light guns to 2 J" in the heavier natures. To overcome this a " dispart sight " (D) was introduced (fig. 2) to bring the line of sight (A'DG') parallel to the axis (AG).

Fig. 2. — Dispart and Tangent Sights.

AG is the axis of the bore, ab the dispart, A'DG' is parallel to AG D is the dispart sight, S the tangent sight, A'DS the clearance angle! At greater elevations than this the muzzle notch is used ; to align on the target at lesser angles the dispart sight is so used. Guns without dispart sights cannot be layed at elevations below the clearance angle.

The earliest form of a hind or breech sight was fixed, but in the early part of the 19th century Colonel Thomas Blomefield proposed a mov- able or tangent sight. It was not, however, till 1829 that a tangent sight (designed by Major-General William Millar) was introduced

Gradua- tion of tangent sights.

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—3

j into the navy; this was adopted by the army in 1846. In the case I ot most guns it was used in conjunction with the dispart sight above I referred to- The tangent sight (see fig. 3) was graduated in degrees only. I here were three patterns, one of brass and two of wood. As the tangent sight was placed in the line of metal, hence directly over the cascable, very little movement could be given to it so that a second

sight was required for long ranges. This was of wood ; the third sight, also of wood, was for guns without a dispart patch which consequently could not be layed at elevations below the dispart angle.

Referring to fig. 1 it will be seen that in order to strike T the axis must be directed to G' at a height above T equal to TG, while the line of sight or line joining the notch of the tangent sight and apex of the dispart or foresight must be directed on T. In fig. 4 the tangent sight has been raised from O to S, the line of sight is SMT, and the axis produced is AG'. D is the dispart, M the muzzle sight, OM is parallel to AG'. Now the height to which the tangent sight has been raised in order to direct the axis on G' is evidently proportional to the tangent of the angle OMS = AXS. This angle is called the angle of elevation; OM is constant and is Fig 3 called the sighting radius. If. the dispart sight were EarlyTangent being used, the sighting radius would be OD, but, as Sight at the range in fig. 4, the line of sight through D fouls the metal of the gun, the muzzle sight M is used. The formula for length of scale is, length = sighting radius X tangent of the angle of elevation. In practice, tangent sights were graduated graphic- ally from large scale drawings. It will be seen from fig. 4 that if the gun and target are on the same horizontal plane the axis can be equally well directed by inclining it to the horizontal through the requisite number of degrees. This is called " quadrant elevation, and the proper inclination was given by means of the gunner's quadrant," a quadrant and plumb bob, one leg being made long to rest in the bore, or by bringing lines scribed on the breech of the gun in line with a pointer on the carriage; these were called quarter sights."

Such were the sights in use with smooth-bore guns in the first half of the last century. Tangent sights were not much trusted at first. Captain Haultain, R.A., says in his description of test- ing sights (Occa- sio nal Papers, R.A. Institute, vol. i.): " Raise the sight, and if it keeps in line with a plumb bob, it can be as confi- dently relied upon as the line of metal, if the trunnions are horizontal. If the scale is only slightly out of the perpendicular, a few taps of the hammer will modify any trifling error."

The introduction of rifling necessitated an improvement in sights and an important modification in them. It was found that projectiles fired from a rifled gun deviated laterally from the line of fire owing to the axial spin of the projectile, and that if the sl S hts f ot spin were right-handed, as in the British service, the r,/ferf deviation was to the right. This deviation or derivation 8fms ' is usually called drift (for further details see Ballistics). The amount of drift for each nature of gun at different ranges was determined by actual firing. To overcome drift

the axis must be pointed to the left of the target, and the amount will increase with the range.

In fig- 5 (plan) at a range HT, if the axis were directed on T, drift would carry the shot to D, therefore the axis must be directed on a point D such that D'T = DT. HFT is the line of sight without any allowance for drift, causing the projectile to fall at D. Now if the notch of the tan-

gent sight be ˆ-ˆXi

carried to H' in order to lay or, T, the fore-sight, and with it the axis, will be moved to F', the line of fire H " will be HF'D', and the shot will strike T since D'T = DT. Left deflection has been put on ; this could be done by noting the amount of deflection for each range and applying it by means of a sliding leaf carrying the notch, and it is so done in howitzers; in most guns, however, it is found more convenient and sufficiently accurate to apply it automatically by inclining the socket through which the tangent scale rises to the left, so that as the scale rises, i.e., as the range increases,, the notch is carried more and more to the left, and an increasing

Fig. 4. — Theory of Tangent Sight.

H

Fig. 5.— Drift.

amount of left deflection given — the amount can easily be determined thus : —

The height of tangent scale for any degree of elevation is given with sufficient accuracy by the rough rule for circular measure

_ »XK wn ere a is the angle of elevation in minutes, h the height
3X1200 B .

of the tangent scale, and R the sighting radius; thus lor

1 ° < fc = 6 °X R = ~ Now supposing the sight is inclined l° to the left, which will move the notch from H to H' (see fig. 6); as before HH' = , but in this case R= =ˆ"- HH ' = 55 × 60′ the resultant angle of

deflection is HFH', and this can be determined by the same formula a = feXl ° X3 , but in this case fc-HH-gj^gg

. RX3600 , th t j f the si ht is ; nc ii ne d to the left l° it will

RX3600 ' B

give 1′ deflection for every degree of elevation. By the same

hLh

Fig. 7.

Fig. 6. — Correction for Drift.

formula it can be shown that 1′ deflection will alter the point of impact by I in. for every 100 yds. of range; thus the proper inclination to give a mean correction for drift can be determined. In the early R.B.L. guns this angle was 2° 16'. With rifled guns deflection was also found necessary to allow for effect of wind, difference of level of trunnions, movement of target, and for the purpose of altering the point of impact later- Notck ally. This was arranged for by a movable

leaf carrying the sighting V, worked by means of a mill-headed screw provided with a scale in degrees and fractions to the same radius as the elevation scale, and an arrow head for reading. Other improvements were : the gun was sighted on each side, tangent scales dropping into sockets in a sighting ring on the breech, thus enabling a long scale for all ranges to be used, and the foresights screwing into holes or dropping into sockets in the trunnions, thus obviating the fouling of the line of sight, and the damage to which a fixed muzzle sight was liable. The tangent sight was graduated in yards as well as degrees and had also a fuze scale. The degree scale was subdivided to 10′ and a slow-motion screw at the head enabled differences of one minute to be given; a clamping screw and lever were provided (see fig. 7).

Fore-sights varied in pattern. Some screwed in, others_ dropped into a socket and were secured by* a bayonet joint. Two main shapes were adopted for the apex — the acorn and the hogsback. Instruction in the use of sights was based on the principle of securing uniformity in laying; for this reason fine sighting was discountenanced and

laying by full sight enjoined. " The centre of the line joining the two highest points of the notch of the _ o t • t. 1- 11 tangent sight, the point of the fore- FlG. 8.— Laying by h ull sight and the target must

be in line ”

Sight. (Field Artillery Training, 1902) (see

fig. 8). Since the early days of rifled guns tangent sights have been improved in details, but the principles remain the same. Except for some minor differences the tangent sights were the same for all natures of guns, and for all services, but the develop- ment of the modern sight has followed different lines according to the nature and use of the gun, and must be treated under separate heads.

Sights for Mobile Artillery.

With the exception of the addition of a pin-hole to the tangent sight and cross wires to the fore-sight, and of minor improvements, and of the introduction of French’s crossbar sight and the reciprocating sight, of which later, no great advance was made until the introduction of Scott’s telescopic sight. This sight (see Plate, fig. 9) consists of a telescope mounted in a steel frame, provided with longitudinal trunnions fitting into V’s in the gun. These V’s are so arranged that the axis of the sight frame is always parallel to that of the gun. By means of a cross-level the frame can be so adjusted that the cross axis on which the tele- scope is mounted is always truly horizontal. Major L. K. Scott, R.E., thus described how he was led to think of the sight : “I had read in the Daily News an account of some experimental firing carried out by H.M.S. ‘ Hotspur ‘ against the turret of H.M.S. ‘ Glatton,’ At a

Field

artillery

sights.

range of 200 yds. on a perfectly calm day the ‘ Hotspur ‘ fired several rounds at the ‘ Glatton’s ‘ turret and missed it.” Major Scott attri- buted this to tilt in the sights due to want of level of mounting (R.A.I. Proceedings, vol. xiii.). Tilt of sights in field guns owing to the sinking of one wheel had long been recognized as a source of error, and allowed for by a rule-of -thumb correction, depending on the fact that the track of the wheels of British field artillery gun-carriages is 60”, so that, for every inch one wheel is lower than the other, the whole system is turned through one degree —

feXi200X3

:/tX6o = 6o’ or i°, as ft is 1 inch.

Referring to the calculations given above, this is equivalent to 1′ deflection for every degree of elevation, which amount had to be given towards the higher wheel. This complication is eliminated in Scott’s sight by simply levelling the cross axis of the telescope. Other advantages are those common to all telescopic sights. Personal error is to a great extent eliminated, power of vision extended, the sight is self-contained, there is no fore-sight, a fine pointer in the telescope being aligned on the target. It can be equally well used for direct or indirect, forward or back laying. A micrometer drum reads to 2’, while the vernier reads to single minutes so that very fine adjustments can be made.

Disadvantages of earlier patterns were, the telescope was inverting, the drum was not graduated in yards, and drift not allowed for. These defects were all overcome in later patterns and an important addition made, viz. means of measuring the angle of sight. In speaking of quadrant eˆevation a brief reference was made to the necessity for making an allowance for difference of level of gun and target. Figs. 10 to 13 explain this more fully, and show that for indirect laying the angle of sight must be

Target

Scott’s sight.

” “Angle of eleuniion\ ‘ Hori zontal lin e £~~~JS ?9 ei line of sight

Horizontal line

•

Figs. 10, 11, 12, 13.

added to the angle of elevation if the target is above the gun, and subtracted if vice versa. In Scott’s sight, mark iv., there is a longitudinal level pivoted at one end and provided with a degree scale up to 4 ; the level is moved by a spindle and micrometer screw reading to 2’. If now the telescope be directed on the target and this level be brought to the centre of its run, the angle of sight can be read — if afterwards any range ordered is put on the sight and the gun truly layed, this bubble will be found in the centre of its run — so that if thereafter the target becomes obscured the gun can be relayed by

elevating till the bubble is in the centre of its run, or at a com- pletely concealed target the angle of sight can, if the range and difference of level are known or can be measured from somewhere near the gun, be put on by means of the micrometer screw, and the gun subsequently layed by putting the range in yards or degrees on the sight drum and elevating or depressing till the bubble is central. The disadvantages that still remain are that the sight has to be re- moved every time the gun is fired, and the amount of deflection is limited and has to be put on the reverse way to that on a tangent scale. Scott's sight, though no longer used with quick-firing guns, is the precursor of all modern sights.

SIGHTS

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The introduction of trunnionless guns recoiling axially through a fixed cradle enabled sights to be attached to the non-recoil parts of the mounting, so that the necessity of removing a Modern delicate telescopic sight every round disappeared, and 1 Jl. telescope sights on the rocking-bar principle (see below)

s 'g s – were introduced for 4-7-in. Q.F. guns on field mountings; these sights admit of continuous laying, i.e. the eye need not be removed when the gun is fired. The increased importance of concealment for

one's own guns and the certainty of being called upon to engage concealed targets, brought indirect laying into great prominence (see also Artillery). This form of laying is of two kinds: (1) that in which the gun can be layed for direction over the sight on the target itself, or on some aiming point close by, but from indistinctness or other causes quadrant elevation is pre- Inainct ferred; and (2) that used when the target is completely lay ng. hidden and an artificial line of fire laid out and the guns layed for direction on pointers, or the line transferred to a distant aiming point. The old method of giving quadrant elevation by clinometer was obviously too slow. Scott's sight (see above) was the first attempt to obtain indirect laying for elevation by means of the sight itself, and in that sight the angle of sight was taken into account ; in modern guns this is effected by what is technically called the " independent line of sight " (see Ordnance: Field Equipments). It is obtained by different means in different countries, but the principle is the same. There must be two sets of elevating gears, one which brings the axis of the gun and the sights together on to the target, thus finding the angle of sight and also pointing the axis of the gun at the target, and a second by which, independent of the sight which remains fixed, the elevation due to the range can be given to the gun and read by means of a pointer and dial marked in yards for range. This latter is shown in the Krupp equipment (Plate, fig. 14), in which the sight is attached to the cradle, but does not move with it. The hand-wheel that screws the gun and cradle down at the same time screws the sight up, and vice versa. When the target is completely concealed it is necessary to lay the gun on an aiming point more or less out of the line of fire, or to lay on a " director " with a large amount of deflection, and to align aiming posts with the sights at zero to give the direction of the target, and afterwards perhaps to transfer the line of sight to some other distant object, all of which require a far greater scope of deflection than is afforded by the deflection leaf. In the South African war improvised detachable deflection scales of wood or iron placed over the fore-sight, called gun arcs, were used, but this device was clumsy, inaccurate and insufficient, as it only gave about 30° right or left deflection, and only a sight that admitted of all-round laying could really satisfy the requirements. " The goniometric sight in its simplest form is a circular graduated base plate on which a short telescope or sighted ruler is pivoted. Besides the main graduations there is usually a separate deflection scale " (Bethell). In this form, which is found in British field artillery, the goniometric or dial sight is used for picking up the line of fire. In the pillar sight used in the French 80- and 90-mm. Q.F. guns it is used for laying for direction.

The coUinmteur, or sight proper, has a lateral movement of 9 , and is actuated by the drum on the right turned by the mill- headed screw. The drum is divided into 100 graduations, each equal to 5-4'. The gonio plate below is divided into 4 quadrants, and each quadrant into 10 spaces of 9 each numbered in hundreds from o to 900. The stem is turned by pressing down on the mill- headed screw. The collimateur which is used in many sights is a rectangular box closed at one end by a darkened glass with a bright cross. Its use is graphically described in a French text-book thus: "The layer, keeping his eye about a foot from the collimateur and working the elevating wheel, makes the horizontal line dance about the landscape until it dances on to the target ; then working the traversing gear he does the same with the vertical line; then bringing his eye close, he brings the inter- section on to the target." In the Krupp arc sight (see Plate, fig. 14), the goniometric sight is placed on the top of the arc. In the French field Q.F. artillery the inter- mediate carriage (see description and dia- gram in article Ordnance: Field Equipments) carries the sight.

Fig. 15 shows the reciprocating sight for the 2-5-in. gun. The sight drops through a socket in a pivoted bracket which is provided with a level and a clamp ; the level is fixed at the correct art,"/" angle for drift ; if t he si S ht < as is especially liable to be

s'i 'hts* t ' le iase on stee P hillsides) is tilted away from the angle * ' it can be restored by moving the bracket till the bubble

of the spirit-level is central, and then clamping it.

With howitzers indirect laying is the rule, elevation being usually given by clinometer, direction by laying on banderols marking out the line of fire; then, when the direction has been established, an auxiliary mark, usually in rear, is selected and the line transferred to it. At night this mark is replaced by a lamp installed in rear

SPIRIT LEVEL

From Treatise on Service Ordnance.

Fig. 15.

and in line with the sights. The normal method of laying these is from the fore-sight over the tangent sight to a point in rear. Special sights were designed for this purpose by Colonel Sir E. H. French, called cross-bar sights, and were in the Siege year 1908 still in use with British 6-in. B.L. howitzers. art ™ e O- The principle of these sights (see fig. 16) is that the s «*' s – tangent sight has a steel horizontal bar

which can slide through the head of the tangent scale for deflection, and is graduated for 3 left and 1 ° right deflection. One end of the bar is slotted to take the sliding leaf; this end of the bar is graduated from 0° to 6°, and in conjunction with the fore-sight affords a lateral scope of 6° on either side of the normal for picking up an auxiliary mark. The fore-

Fig. 16.

sight has a fixed horizontal bar slotted and graduated similarly to the slotted portion o(the tangent sight. The leaves are reversible, and provided with a notch at one end and a point at the other, so that they can be used for either forward or reverse laying. The leaf of the fore-sight has a pinhole, and that of the tangent sight cross-wires for fine reverse laying. Fore-sights are made right and left; tangent sights are interchangeable, the graduations are cut on the horizontal edges above and below, so that the sight can be changed from right to left or vice versa by removing and reversing the bar. Howitzer sights are vertical and do not allow for drift; they are graduated in degrees only. Goniometric sights have recently been introduced into British siege artillery. The pattern is that of a true sight, that is to say, the base plate is capable of movement about two axes, one parallel to and the other at right anglesto the axis of the gun, and has cross spirit-levels and a graduated elevating drum and independent deflection scale, so that compensa- tion for level of wheels can be given and quadrant elevation.

In smooth-bore days the term mortar meant a piece of ordnance of a peculiar shape resting on a bed at a fixed angle of quadrant elevation of 45 . It was ranged by varying the charge, and layed for line by means of a line and plumb bob Laying aligned on a picket. The term mortar, though not used Mortars. in the British service, is still retained elsewhere to signify very short, large-calibre howitzers, mounted on a bed with a minimum angle of elevation of 45 , which with the full charge would give the maximum range. Range is reduced by increasing the angle of elevation (by clinometer) or by using reduced charges. In the 9-45-in. Skoda howitzer, which is really a mortar as defined above, direction is given by means of a pointer on the mounting and a graduated arc on' the bed. For a description of Goerz panoramic, " ghost " and other forms of sights, see Colonel H. A. Bethell, Modern Guns and Gunnery (Woolwich, 1907), and for sights used in the United States, Colonel O. M. Lissak, Ordnance and Gunnery (New York and London, 1907).

Sights for Coast Defence Artillery {Fixed Armaments).

In coast defence artillery, owing to the fact that the guns are on fixed mountings at a constant height (except for rise and fall of tide) above the horizontal plane on which their targets move, and that consequently the angle of sight and quadrant elevation for every range can be calculated, developments in sights, in a measure, gave way to improved means of giving quadrant elevation. Minor improvements in tangent sights certainly were made, notably an automatic clamp, but quadrant elevation was mainly used, and in the case of guns equipped with position-finders (see Range-finder) the guns could be layed for direction by means of a graduated arc on the emplacement and a pointer on the mounting. A straight-edge or vertical blade (see -fig. 17) was placed above the leaf of the tangent sight, and in some cases on the fore-sight as well, to facilitate laying for line. This enabled the gun to be layed from some little distance behind, so that the layer could be clear of recoil, and continuous laying was thus pos- sible. The arrangements for giving quadrant elevation con- sisted of an arc, called index plate (see fig. 18), on the gun, graduated in degrees read by a ” reader ” on the carriage. A yard scale of varnished paper, made out locally for quadrant eleva- tion with regard to height of site, was usually pasted over this. A correction for level of tide was in many cases necessary, and was

From Treatise on Service Ordnance.

Fig. 17.

entered in a table or mounted on a drum which gave several correc- tions that had to be applied to the range for various causes. One great drawback to this system was that elevation was given with reference to the plane of the racers upon which the mounting moved, and as this was not always truly horizontal grave errors were intro- duced. To overcome this Colonel H. S. Watkin, C.B., introduced a hydroclinometer fixed on the trunnion. It was provided with a yard scale calculated with reference to height – of site, and elevation was read by the intersection of the edge of the liquid with the graduation for the particular range. Special sights were introduced ! to overcome the difficulties of dis- 1 appearing guns, large guns firing through small ports, &c. Such were the Moncrieff reflecting sights, and the ” chase sights ” for the 10-in. gun in which the rear sight, equipped with a mirror, was placed on the chase, and the In the early days of B.L. guns very

Fig. 18. — Sketch of Index Plate and Reader.

Rocking- bar sight*

telescope.

fore-sight on the muzzle, &c

little change was made in the pattern of sights. Shield sights were in troduced for disappearing mountings to admit of continuous laying for liiie, and a disk engraved for yards of range duly corrected for height, and called an ” elevation indicator,” replaced the index plate and reader. As in mobile artillery, the introduction of trunnionless guns brought about a revolution in laying and sights. Smokeless powder also made rapid firing a possibility and a necessity. Con- tinuous laying and telescopic sights became possible. The reduction of friction by improved mechanical arrangements, and the introduction of electric firing, enabled the layer not only to train and elevate the gun himself, but also to fire it the moment it was truly ” on ” the target. The rocking-bar sight, which had been for some time in use in the navy, was introduced. In this sight both hind and fore sights are fixed on a rigid bar pivoted about the centre; the rear end is raised or depressed by a rack worked by a hand- wheel ; ranges are read from the periphery of a drum ; the fore-sight and leaf of the hind-sight are provided with small electric glow lamps for night firing. In addition to these open sights the bar also carries a sighting telescope. The advantages compared with a tangent sight are that only half the movement is required to raise the sight for any particular range; the ranges on the drum are easier to read, and if necessary can be set by another man, so that the layer need not take his eye from the The pattern of telescope used in coast defence is that designed by Dr Common. It is an erecting telescope with a field of view of io° and a magnification of 3 diameters, and admits plenty of light. The diamond-shaped pointer is always in focus ; focusing for individual eyesight is effected by turning the eye-piece, which is furnished with a scale for readjustment. A higher power glass has since been introduced for long ranges.

The improvements in gun mountings mentioned above led the way to the introduction of the automatic sight. The principle of combined sight and range-finder had long been known, .”””” and was embodied in the so-called ” Italian ” sight, but, sights. on accoun t { the s l ow ra te of fire imposed by black

powder, the rapidity of laying conferred by its use was of no great

advantage, and it was unsuited to the imperfect mechanical arrangements of the gun mountings of the time. When cordite replaced black powder, and the gun sights and all in front of the gun were no longer obscured by hanging clouds of smoke, it became a de- sideratum, and, as the automatic sight, it was reintroduced by Sir G. S. Clarke, when he, as superintendent of the Royal Carriage Factory, had brought gun mountings to such a pitch of perfection that it could be usefully employed.

An automatic sight is a sight connected in such a manner with the elevating gear of the gun, that when the sight is directed on the

water-line of a target at A any range the gun will

have the proper quadrant elevation for that range. Colonel H. S. Watkin, C.B., describes the theory of the sight thus (Pro- ceedings R.A.I. 1898). Conditions. — The gun Fig. 19. — Theory of the Automatic Sight, must be at a certain

known height above sea-level — the greater the height the greater the accuracy. The racer path must be level. Let FB (fig. 19) represent a gun at height BD above water-level DC, elevated to such an angle that a shot would strike the water at C. Draw EB parallel to DC. It is clear that under these conditions, if a tangent sight AF be raised to a height F representing the elevation due to the range BC, the object C will be on the line of sight. Then ABF = angle of elevation; EFB = quadrant angle; BCD = angle of sight; EBF = ABF— ABE; and sinceABE = BCD,italsoequalsABF-BCD. BCDcan always be cal- culated from the formula, angle of sight in minutes = ˆ ” [ˆ X] \ 46

R (in yards)

‘h — height of gun above sea-level; R = range). An automatic sight based on the Italian sight was tried in 1 878-1 879. In this

(see fig. 20) a rack I, fixed to the carriage, caused a pinion H on the gun to revolve. Fixed to the pinion were three cams, for high, low and mean tides. The tangent scale moved freely in a socket fixed to the gun ; its lower end rested on one of the cams, cut to a correct curve. It followed that when the gun was ele- vated or depressed, the rack caused the pinion to revolve, and the sight was thus raised or lowered to the proper height to fulfil the conditions given above ; but, as Colonel Watkin said, owing to want of level of platform and other causes it was not satisfactory.

With the introduction of quick-firing guns it was felt that the layer

should have the same control over his gun as a marksman had over his rifle, and this would be Proceedings R.A. Institute.

afforded by a satisfactory p IG 20 “Italian

automatic sight. The prin- ciple of the modern automatic sight is made clear in figs. 21 and 22, which show a combined rocking-bar and automatic sight.

The rocking-bar consists of a carrier a fixed to the cradle, a rocking-bar d pivoted to the carrier at e, a sight bar /carrying the sights and sighting telescope. The rocking-bar is moved by a rack g into which a pinion on a cross-spindle j gears ; the cross-spindle is moved by means of a worm-wheel into which a worm on the longitudinal

Sight.

Enlargement of A

From War Office Handbook.

Fig. 21.

spindle of the hand-wheel gears ; one end of the cross-spindle moves the range drum 2’. The worm and hand-wheel are thrown into and out of gear by means of the clutch t. When the hand-wheel is thrown out of gear the sights can only be moved by means of the elevating gear of the gun. The line of sight and the elevation of the gun henceforth are inseparable. The automatic sight consists of a bent lever roller cam m, also secured by the bolt e to the carrier ; the lower end of the lever carries the cam roller n, which is constrained to move in the cam p by means of the spring in the spring-box g; the rear end of the horizontal arm of the lever is formed into jaws v; the same action of the clutch t which releases the worm and hand-wheel forces a catch on a vertical stem u into the jaws of the lever, and fixes the rocking and sight bars rigidly to it. The movement of the sights can now only be effected by means of the elevating gear of the gun, acting by means of the move- ment of the vertical arm of the bent lever, and its movement is constrained to follow the cam, which is cut in such a way that for any given elevation of the gun the sight bar is depressed to the angle of sight for the range corre- sponding to the elevation; V is a lever for making allowance for state of tide, and c’ is the scale on which the rise and fall in feet above and below mean sea-level are marked. In later patterns, the sight is automatic pure and simple, the lever is rigidly attached to the rocking-bar, and the range scale and gear for raising the sights dispensed with, much as shown in fig. 23. In the larger

natures of

From War Office Handbook. Fig. 22.

Fig. 2.v

H Sight

gun there is a rocking-bar sight on one side and an automatic sight on the other. The automatic sight has, however, distinct limitations ; it depends for its accuracy on height of site, and at long ranges

even from a high site it cannot compare for accuracy with independent range-finding and careful laying or accur- ately applied quadrant elevation; it is also use- less when the water line of the target is obscured, as may often be the case from the splashes caused by bursting shell. Im- proved communications between range – finder and gun, range and training dials placed on the mountings where they can be read by the layers, and more accurate elevation indicators have made laying by quadrant elevation, and in certain cases giving direction by means of graduated arc and pointer, both accurate and rapid, so that once more this system of laying is coming into favour for long ranges.

Naval Sights. In the navy the conditions of an unstable platform rendered quadrant elevation of little use, and necessitated a special pattern of tangent sight to facilitate •firing the moment the roll of the ship brought the sights on the target. A diagram of the Foote-Arbuthnot, or H, or naval tangent sight, is given below (fig. 24).

The fore-sight was a small globe, and in the original patterns this was placed on a movable leaf on which deflection for speed of one's own ship was given, while deflection for speed of enemy's ship and wind were given on the tangent sight. The yard scales were on detachable strips, so that fresh strips could be inserted for variations in velocity. In subsequent patterns all the deflection was given on the tangent sight, which was provided with two scales, the upper one graduated in knots for speed of ship, and the lower one in degrees. Night sights were introduced by Captain McEvoy in 1884. They consist of an electric battery cable and lamp-holders and small glow lamps ; that for the hind-sight is coloured.

Turret Sights. — In turrets or barbettes two sets of sights are provided, one for each gun. They are geared so as to work simultaneously and alike. Toothed gearing connected with the gun mountings actuates a rack attached to the standards carrying the sights, so that any movement of the gun mounting is communicated to the sights. The sights themselves fit into sockets cut at the proper angle for drift, and are raised in their sockets the requisite amount for the range by means of a small hand-wheel; they are thus non-recoiling sights. The layer has under his control the hand-wheel for setting the range on the sights, another hand-wheel for elevating the gun and the sights on to the l^foeAnt/e target, and a third for traversing the turret. [graduated The introduction of trunnionless guns was followed by that of rocking-bar sights (described above). Sighting telescopes were also intro- Fig. 24. duced. _ In the navy one of the first essentials

is rapidity of fire; to attain this the duties of laying are subdivided ; one man laying for elevation, elevating and firing, a second laying for line and traversing, and a third putting on the elevation ordered or communicated by electric dial. To ensure the sights on each side reading together they are connected by rods. To facilitate the setting of the range the ranges are shown on a dial which can be read from the side of the mounting, from where also the sight can be set. (R. M. B. F. K.)

. Military Rifle Sights. With smooth-bore arms of short range, the soldier needed little more, in the way of sights, than the rough equivalent of the dis- part of cannon, viz. patches at the breech and muzzle with notch and blade (fig. 25). But some form of sight was almost invariably employed with rifled firearms, even of early date, and when about 178c— 1800 the rifle came into use as a military weapon, sights were introduced with it. The sights of the Baker, Brunswick, and other rifles did not differ in principle from the now common form of elevating back-sight (fig. 29), that is, the elevation was given on an upright adjustable back sight. But this refinement was long looked upon as a mere fad, both by the soldiers who used the smooth-bore (or converted rifle) musket, and by experienced short-range snap- shooters. In this connexion Major-General John Gibbon, U.S.A., records that in the American Civil War hunters and others who

served in the western regiments habitually knocked off the back-sights of the rifles that were issued to them, preferring to do without them. But, as rifles improved and came into general use for all troops, sights became indispensable, and to-day as much care is

Fig. 26.

Fig. 25.

taken over the sighting as over the ” proof ” of a military rifle. The modern rifle has invariably a back-sight and a fore-sight. The latter is, as a general rule, fixed and unalterable, its size, position on the barrel, &c, being practically ascertained, as accurately as possible, for the lowest elevation on the back-sight. Some fore- sights have, however, a lateral motion giving within narrow limits the deflection found to be necessary for the variation of each rifle from the average. The shape of the part seen through the notch or

Fig. 29.

aperture of the back-sight in aiming varies a good deal. Two of the commonest forms are shown in fig. 26, called the ” barleycorn,” and 27, called the ” bead.” The fore-sight of the Krag-Jorgensen rifle, used in the United States army until 1906, consisted of a blade with parallel sides. The shape of the part seen when aiming indicates whether the proper amount of the fore-sight is taken up into the line of vision from the back-sight to the target. A ” full ” sight is shown in fig. 8 above. The position of the fore-sight at or near

the end of the barrel renders it peculiarly liable to injury, and in some rifles therefore it is provided with guards or ears; these, however, have the disadvantage that more or less of the light that would otherwise light up the sight is intercepted by the guards. The fore-sight of the British service ” short ” Lee-Enfield (1903) has guards and also a lateral adjustment of the barleycorn. Back- sights are of many different patterns, almost any two being

unlike. Examples taken, except fig. 28, by permission from the Text Book of Small Arms (1909), are given in fig. 28 (German Mauser pattern), fig. 29 (” long ” hand-loader Lee-Enfield), fig. 30 (” short ” Lee-Enfield), fig. 31 (Dutch service rifle), and fig. 32 (Russian ” three-line ” rifle). Fine lateral adjustments are provided on the ” short ” Lee-Enfield, and on many other military sights of modern date. See for further details Rifle.

Authorities Consulted.— Owen, Modern Artillery; Lloyd and Hadcock, Artillery, its Progress and Present Position; Lissak, Ordnance and Gunnery; Colonel H. A. Bethell, Modern Guns and Gunnery; Proceedings and Occasional Papers, R.A. Institute, and War Office publications.

SlGIRI, the Lion's Rock, the ruin of a remarkable stronghold 7° 59′ N., and 8i° E., 14 m. N.E. of Dambulla, and about 17 m. nearly due W. of Pulasti-pura, the now ruined ancient capital of Ceylon. There a solitary pillar of granite rock rises to a great height out of the plain, and the top actually overhangs the sides. On the summit of this pencil of rock there are five or six acres of ground; and on them, in a.d. 477, Kasyapa the Parricide built his palace, and thought to find an inaccessible refuge from his enemies. His father Dhatu Sena, a country priest, had, after many years of foreign oppression, roused his countrymen, in 459, to rebellion, led them to victory, driven out the Tamil oppressors, and entered on his reign as a national hero. He was as successful in the arts of peace as he had been in those of war; and carried to completion, among other good works, an ambitious irrigation scheme — probably the greatest feat of engineering that had then been accomplished anywhere in the world. This was the celebrated Kala Wewa, or Black Reservoir, more than 50 m. in circumference, which gave wealth to the whole country for two days' journey north of the capital, Anuradha-pura, and provided that city also with a constant supply of water. Popular with the people, the king could not control his own family; and as the outcome of a palace intrigue in 477 his son Kasyapa had declared himself king, and taken his father prisoner. Threatened with death on his refusing to say where his treasure lay hid, the old king told them to take him to the tank. They took him there, and while bathing in the water he let some of it drop through his fingers, and said, " This is my treasure; this, and the love of my people." Then Kasyapa had his father built up alive into a wall. Meanwhile Kasyapa's brother had escaped to India and was plotting a counter revolution. It was then that the parricide prepared his defence. He utilized his father's engineers in the construction of a path or gallery winding up round the Sigiri rock. Most of it was made, by bursting the rock by means of wooden wedges, through the solid granite, and its outside parapet was supported by walls of brick resting on ledges far below. It is a marvellous piece of work. Abandoned since 495 — for Kasyapa was eventually slain during a battle fought in the plain beneath — it has, on the whole, well withstood the fury of tropical storms, and is now used again to gain access to the top. When rediscovered by Major Forbes in 1835 the portions of the gallery where it had been exposed

for so many centuries to the south-west monsoon, had been carried away. These gaps have lately been repaired, or made passable with the help of iron stanchions; the remains c.f the buildings at the top and at the foot of the mountain have been excavated; and the entrance to the gallery, between the outstretched paws of a gigantic lion, has been laid bare. The fresco paintings in the galleries are perhaps the most interesting of the extant remains. They are older than any others found in India, and have been carefully copied, and, as far as possible, preserved.

See Major Forbes, Eleven Years in Ceylon (London, 1841); H. C. P. Bell. Archaeological Reports (Colombo, 1892- 1906); Rhys Davids, ” Sigiri. the Lion Rock,” in Journal of the Royal Asiatic Society (1875), pp. 191-220; H. W. Cave, Ruined Cities of Ceylon (London, 1906). (T. W. R. D.)

SIGISMUND (1368-143 7), Roman emperor and king of Hungary and Bohemia, was a son of the emperor Charles IV. and Elizabeth, daughter of Bogislaus V., duke of Pomerania. He was born on the 15th of February 1368, and in 1374 was betrothed to Maria, the eldest daughter of Louis the Great, king of Poland and Hungary. Having become margrave of Brandenburg on his father’s death in 1378, he was educated at the Hungarian court

from his eleventh to his sixteenth year, becoming thoroughly magyarized and entirely devoted to his adopted country. His wife Maria, to whom he was married in 1385, was captured by the rebellious Horvathys in the following year, and only rescued by her young husband with the aid of the Venetians in June 1.387. Sigismund had been crowned king of Hungary on the 31st of March 1387, and having raised money by pledging Brandenburg to his cousin Jobst, margrave of Moravia, he was engaged for the next nine years in a ceaseless struggle for the possession of this unstable throne. The bulk of the nation headed by the great Garay family was with him; but in the southern provinces between the Save and the Drave, the Horvathys with the support of the Bosnian king Tvrtko, pro- claimed as their king Ladislaus, king of Naples, son of the murdered Hungarian king, Charles II. (see Hungary). Not until 1395 did the valiant Miklos Garay succeed in sup- pressing them. In 1396 Sigismund led the combined armies of Christendom against the Turks, who had taken advantage of the temporary helplessness of Hungary to extend their dominion to the banks of the Danube. This crusade, preached by Pope Boniface IX., was very popular in Hungary. The nobles flocked in thousands to the royal standard, and were reinforced by volunteers from nearly every part of Europe, the most important contingent being

that of the French led by John, duke of Nevers, son of Philip II., duke of Burgundy. It was with a host of about 90,000 men and a flotilla of 70 galleys that Sigismund set out. After capturing Widdin, he sat down before the fortress of Nico- polis, to retain which Sultan Bajazid raised the siege of Con- stantinople and at the head of 140,000 men completely overthrew the Christian forces in a battle fought between the 25th and 28th of September 1396. Deprived of his authority in Hungary, Sigismund then turned his attention to securing the succession in Germany and Bohemia, and was recognized by his childless step-brother Wenceslaus as vicar-general of the whole empire. He remained, however, powerless when in 1400 Wenceslaus was deposed and Rupert III., elector palatine of the Rhine, was elected German king in his stead. During these years he was also involved in domestic difficulties out of which sprang a second war with Ladislaus of Naples; and on his return to Hungary in 1401 he was once imprisoned and twice deposed. This struggle in its turn led to a war with Venice, as Ladislaus before departing to his own land had sold the Dalmatian cities to the Venetians for 100,000 ducats. In 1401 Sigismund assisted a rising against Wenceslaus, during the course of which the German and Bohemian king was made a prisoner, and Sigismund ruled Bohemia for nineteen months. In 1410 the German king Rupert died, when Sigismund, ignoring his step-brother's title, was chosen German king, or king of the Romans, first by three of the electors on the 20th of September 1410, and again after the death of his rival, Jobst of Moravia, on the 21st of July 141 1; but his coronation was deferred until the 8th of November 1414, when it took place at Aix-la-Chapelle.

During a visit to Italy the king had taken advantage of the difficulties of Pope John XXIII. to obtain a promise that a council should be called to Constance in 1414. He took a leading part in the deliberations of this assembly, and during the sittings made a journey into France, England and Burgundy in a vain attempt to secure the abdication of the three rival popes (see Constance, Council of). The complicity of Sigismund in the death of John Huss is a matter of controversy. He had granted him a safe-conduct and protested against his imprison- ment; and it was during his absence that the reformer was burned. An alliance with England against France, and an attempt to secure peace in Germany by a league of the towns, which failed owing to the hostility of the princes, were the main secular proceedings of these years. In 1419 the death of Wences- laus left Sigismund titular king of Bohemia, but he had to wait for seventeen years before the Czechs- would acknowledge him. But although the two dignities of king of the Romans and king of Bohemia added considerably to his importance,

and indeed made him the nominal head of Christendom, they conferred no increase of power and financially embarrassed him. It was only

as king of Hungary that he had succeeded in establishing his authority and in doing anything for the order and good govern- ment of the land. Entrusting the government of Bohemia to Sophia, the widow of Wenceslaus, he hastened into Hungary; but the Bohemians, who distrusted him as the betrayer of Huss, were soon in arms; and the flame was fanned when Sigismund declared his intention of prosecuting the war against heretics who were also communists. Three campaigns against the Hussites ended in disaster; the Turks were again attacking Hungary; and the king, unable to obtain support from the German princes, was powerless in Bohemia. His attempts at the diet of Nurem- berg in 1422 to raise a mercenary army were foiled by the re- sistance of the towns; and in 1424 the electors, among whom was Sigismund's former ally, Frederick I. of Hohenzollern, margrave of Brandenburg, sought to strengthen their own authority at the expense of the king. Although the scheme failed, the danger to Germany from the Hussites led to fresh proposals, the result of which was that Sigismund was virtually deprived of the leadership of the war and the headship of Germany. In 1 43 1 he went to Milan where on the 25th of November he re- ceived the Lombard crown; after which he remained for some time at Siena, negotiating for his coronation as emperor and for the recognition of the Council of Basel by Pope Eugenius IV. He was crowned emperor at Rome on the 31st of May 1433, an d after obtaining his demands from the pope returned to Bohemia, where he was recognized as king in 1436, though his power was little more than nominal. On the gth of December 1437 he died at Znaim, and was buried at Grosswardein. By his second wife, Barbara of Cilli, he left an only daughter, Elizabeth, who was married to Albert V., duke of Austria, afterwards the German king Albert II., whom he named as his successor. As he left no sons the house of Luxemburg became extinct on his death.

Sigismund was brave and handsome, courtly in his bearing, eloquent in his speech, but licentious in his manners. He was an accomplished knight and is said to have known seven languages. He was also one of the most far-seeing statesmen of his day, and steadily endeavoured to bring about the ex- pulsion of the Turks from Europe by uniting Christendom against them. As king of Hungary he approved himself a

born political reformer, and the military measures which he adopted in that country enabled the kingdom to hold its own against the Turks for nearly a hundred years. His sense of justice and honour was slight ; but as regards the death of Huss he had to choose between condoning the act and allowing the council to break up without result. He cannot be entirely blamed for the misfortunes of Germany during his reign, for he showed a willing- ness to attempt reform; but he was easily discouraged, and was hampered on all sides by poverty, which often compelled him to resort to the meanest expedients for raising money.

Bibliography. — The more important works to be consulted are Repertorium Germanicum; Regesten aus den pdpstlichen Archiven zur Geschichte des deutschen Reichs im XIV. und X V. Jahrhundert (Berlin, 1897); E. Windecke, Denkwiirdigkeiten zur Geschichte des Zeitalters Kaisers Sigmund (Berlin, 1893), and Das Leben Konigs Siegmund (Berlin, 1886); J. Aschbach, Geschichte Kaiser Sigmunds (Hamburg, 1838-1845); YV. Berger, Johannes Hus und Kbnig Sigmund (Augs- burg, 1871); G. Schonherr, The Inheritors of the House of Anjou (Buda-Pesth, 1895) ; and J. Acsady, History of the Hungarian Realm, vol. i. (Buda-Pesth, 1903). Of the German books Aschbach is the fullest, and Windecke the most critical. Schdnherr is the best Hungarian authority. Acsady is too indulgent to the vices of Sigismund. See also A. Main, The Emperor Sigismund (1903).

SIGISMUND I. (1467-1548), king of Poland, the fifth son of Casimir IV. and Elizabeth of Austria, was elected grand-duke of Lithuania on the 21st of October 1505 and king of Poland on the 8th of January 1506. Sigismund was the only one of the six sons of Casimir IV. gifted with extraordinary ability. He had served his apprenticeship in the art of government first as prince of Glogau and subsequently as governor of Silesia and margrave of Lusatia under his elder brother Wladislaus of Bohemia and Hungary. Silesia, already more than half Germanized, had for generations been the battle-ground between the Luxemburgers and the Piasts, and was split up into innumerable principalities which warred incessantly upon their neighbours and each other.

Into the midst of this region of banditti Sigismund came as a sort of grand justiciar, a sworn enemy of every sort of disorder. His little principality of Glogau soon became famous as a model state, and as governor of Silesia he suppressed the robber knights with an iron hand, protected the law-abiding classes, and revived commerce. In Poland also his thrift and businesslike qualities speedily remedied the abuses caused by the wastefulness of his predecessor Alexander. His first step was to recover control of the mint, and place it in the hands of capable middle-class merchants and bankers, like Caspar Beer, Jan

Thurzo, Jan Boner, the Betmans, exiles for conscience' sake from Alsace, who had sought refuge in Poland under Casimir IV., Justus Decyusz, subsequently the king's secretary and historian, and their fellows, all practical economists of high integrity who reformed the currency and opened out new ways for trade and commerce. The reorganization of the mint alone increased the royal revenue by 210,000 gulden a year and enabled Sigismund to pay the expenses of his earlier wars. In foreign affairs Sigismund was largely guided by the Laskis (Adam, Jan and Hieronymus), Jan Tarnowski and others, most of whom he selected himself. In his marriages also he was influenced by political considerations, though to both his consorts he was an affectionate husband. His first wife, whom the diet, anxious for the perpetuation of the dynasty, compelled him, already in his forty-fourth year (Feb. 1512), to marry, was Barbara Zapolya, whose family as repre- sented first by her father Stephen and subsequently by her brother John, dominated Hungarian politics in the last quarter of the 15th and the first quarter of the 16th century. Barbara brought him a dower of 100,000 gulden and the support of the Magyar magnates, but the match nearly brought about a breach with the emperor Maximilian, jealous already of the Jagiello in- fluence in Hungary. On Barbara's death three years later without male offspring, Sigismund (in April 1518) gave his hand to Bona Sforza, a kinswoman of the emperor and granddaughter of the king of Aragou, who came to him with a dowry of 200,000 ducats and the promise of an inheritance from her mother of half a million more which she never got. Bona's grace and beauty speedily fascinated Sigismund, and contemporary satirists ridi- culed him for playing the part of Jove to her Juno. She intro- duced Italian elegance and luxury into the austere court of Cracow and exercised no inconsiderable influence on affairs. But she used her great financial and economical talents almost entirely for her own benefit. She enriched herself at the expense of the state, corrupted society, degraded the clergy, and in her later years was universally detested for her mischievous meddling, inexhaustible greed, and unnatural treatment of her children.

The first twenty years of Sigismund's reign were marked by exceptional vigour. His principal difficulties were due to the aggressiveness of Muscovy and the disloyalty of Prussia. With the tsars Vasily III. and Ivan IV. Sigismund was never absolutely at peace. The interminable war was interrupted, indeed, by brief truces whenever Polish valour proved superior to Muscovite persistence, as for instance after the great victory of Orsza (Sept. 1514) and again in 1522 when Moscow was threatened by the Tatars. But the Tatars themselves were a standing menace to the republic. In the open field, indeed, they were

generally defeated (e.g. at Wisniowiec in 151 2 and at Kaniow in 1526), yet occasionally, as at Sokal when they wiped out a whole Polish army, they prevailed even in pitched battles. Generally, however, they confined themselves to raiding on a grand scale and, encouraged by the Porte or the Muscovite, systematically devastated whole provinces, penetrating even into the heart of Poland proper and disappearing with immense booty. It was this growing sense of border insecurity which led to the establish- ment of the Cossacks (see Poland: History).

The grand-masters of the Teutonic Order, always sure of support in Germany, were also a constant source of annoyance. Their constant aim was to shake off Polish suzerainty, and in 1520-21 their menacing attitude compelled Sigismund to take up arms against them. The long quarrel was finally adjusted in 1525 when the last grand-master, after a fruitless pilgrimage I through Europe for support, professed Lutheranism and as first

duke of Prussia did public homage to the Polish king in the market-place of Cracow. The secularization of Prussia was opposed by the more religious of Sigismund's counsellors, and the king certainly exposed himself to considerable odium in the Catholic world; but taking all the circumstances into considera- tion, it was perhaps the shortest way out of a situation bristling with difficulties.

Personally a devout Catholic and opposed in principle to the spread of sectarianism in Poland, Sigismund was nevertheless too wise and just to permit the persecution of non-Catholics; and in Lithuania, where a fanatical Catholic minority of magnates dominated the senate, he resolutely upheld the rights of his Orthodox subjects. Thus he rewarded the Orthodox upstart, Prince Constantine Ortrogski, for his victory at Orsza by making him palatine of Troki, despite determined opposition from the Catholics; severely punished all disturbers of the worship of the Greek schismatics; protected the Jews in the country places, and insisted that the municipalities of the towns should be composed of an equal number of Catholics and Orthodox Greeks. By his tact, equity, and Christian charity, Sigismund endeared himself even to those who differed most from him, as witness the readiness of the Lithuanians to elect his infant son grand-duke of Lithuania in 1522, and to crown him in 1529.

After his sixtieth year there was a visible decline in the energy and capacity of Sigismund. To the outward eye his gigantic strength and herculean build lent him the appearance of health and vigour, but forty years of unintermittent toil and anxiety had told upon him, and during the last two-and-twenty years of his reign, by which time all his old self-chosen counsellors had died off, he apathetically resigned himself to the course of events without making any sustained effort to stem the rising tide of Protestantism and democracy. He had no sympathy with the new men and the new ideas, and the malcontents in Poland often insulted the aged king with impunity. Thus, at his last diet, held at Piotrkow in 1547, Lupa Podlodowski, the champion of the szlachta, ocenly threatened him with rebellion. Sigismund died on the 1st of April 1548. By Bona he had five children — one son, Sigismund Augustus, who succeeded him, and four daughters, Isabella, who married John Zapolya, prince of Transylvania,. Sophia, who married the duke of Brunswick, Catherine, who as the wife of John III. of Sweden became the mother of the Polish Vasas, and Ann, who subsequently wedded King Stephen Bathory.

See August Sokolowski, History of Poland (Pol.), vol. ii. (Vienna, 1904) ; Zygmunt Celichowski, Materials for the history of the reign of Sigismund the Old (Pol.) (Posen, 1900); Adolf Pawinski, The youthful years of Sigismund the Old (Pol.) (Warsaw, 1893); Adam Darowski, Bona Sforza (1904). (R. N. B.)

SIGISMUND II. (1520-1572), king of Poland, the only son of Sigismund I., king of Poland, whom he succeeded in 1548, and Bona Sforza. At the very beginning of his reign he came into collision with the turbulent szlachta or gentry, who had already begun to oust the great families from power. The ostensible cause of their animosity to the king was his second marriage, secretly contracted before his accession, with the beautiful Lithuanian Calvinist, Barbara Radziwill, daughter of the famous Black Radziwill. But the Austrian court and Sigismund's own mother, Queen Bona, seem to have been behind the movement, and so violent was the agitation at Sigismund's first diet (31st of October 1548) that the deputies threatened to renounce their allegiance unless the king instantly repudiated Barbara. This he refused to do, and his moral courage united with no small political dexterity enabled him to win the day. By 1550, when he summoned his second diet, a reaction in his favour began, and the lingering petulance of the gentry was sternly rebuked by Kmita, the marshal of the diet, who openly accused them of attempting to diminish unduly the legislative prerogative' of the crown. The death of Barbara, five days after her coronation (7th of December 1550), under very distressing circumstances which led to an unproven suspicion that she

had been poisoned by Queen Bona,- compelled Sigismund to contract a third purely political union with the Austrian archduchess Catherine, the lister of Sigismund's first wife Elizabeth, who had died within a

twelvemonth of her marriage with him, while he was still only crown prince. The third bride was sickly and unsympathetic, and from her Sigismund soon lost all hope of progeny, to his despair, for being the last male of the Jagiellos in the direct line, the dynasty was threatened with extinction. He sought to remedy the evil by liaisons with two of the most beautiful of his countrywomen, Barbara Gizanka and Anna Zajanczkowska, the diet undertaking to legitimatize and acknowledge as his successor any heir male who might be born to him; but their complacency was in vain, for the king died childless. This matter of the king's marriage was of great political importance, the Protestants and the Catholics being equally interested in the issue. Had he not been so good a Catholic Sigismund might well have imitated the example of Henry VIII. by pleading that his detested third wife was the sister of his first and consequently the union was un- canonical. The Polish Protestants hoped that he would take this course and thus bring about a breach with Rome at the very crisis of the confessional struggle in Poland, while the Habsburgs, who coveted the Polish throne, raised every obstacle to the childless king's remarriage. Not till Queen Catherine's death on the 28th of February 1572 were Sigismund's hands free, but he followed her to the grave less than six months afterwards. Sigismund's reign was a period of internal turmoil and external expansion. He saw the invasion of Poland by the Reformation, and the democratic upheaval which placed all political power in the hands of the szlachta; he saw the collapse of the ancient order of the Knights of the Sword in the north (which led to the acquisition of Livonia by the republic) and the consolidation of the Turkish power in the south. Throughout this perilous transitional period Sigismund's was the hand which successfully steered the ship of state amidst all the whirlpools that constantly threatened to engulf it. A far less imposing figure than his father, the elegant and refined Sigismund II. was nevertheless an even greater statesman than the stern and majestic Sigismund I. Tenacity and patience, the characteristics of all the Jagiellos, he possessed in a high degree, and he added to them a supple dexterity and a diplomatic finesse which he may have inherited from his Italian mother. Certainly no other Polish king so thoroughly understood the nature of the ingredients of that witch's caldron, the Polish diet, as he did. Both the Austrian ambassadors and the papal legates testify to the care with which he controlled " this nation so difficult to lead." Every- thing went as he wished, they said, because he seemed to know everything beforehand.

He managed to get more money than his father could ever get, and at one of his diets won the hearts of the whole assembly by unexpectedly appearing before them in the simple grey coat of a Masovian squire. Like his father, a pro-Austrian by conviction, he contrived even in this respect to carry the Polish nation, always so distrustful of the Germans, entirely along with him, thereby avoiding all serious complica- tions with the ever dangerous Turk. Only a statesman of genius could have mediated for twenty years, as he did, between the church and the schismatics without alienating the sympathies of either. But the most striking memorial of his greatness was the union of Lublin, which finally made of Poland and Lithuania one body politic, and put an end to the jealousies and discords of centuries (see Poland, History). The merit of this crowning achievement belongs to Sigismund alone; but for him it would have been impossible. Sigismund II. died at his beloved Kny- szyne on the 6th of July 1572, in his fifty-second year.

See Ludwik Finkel, Characteristics of Sigismund Augustus (Pol.) (Lemberg, 1888); Letters to Nicholas Radziwill (Pol.) (Wilna, 1842); Geheime Brief e an Hozyus, Gesandten am Hofe des Kaisers Karl V. (Wadowice, 1850); Adam Darowski, Bona Sforza (Pol.) (Rome, 1904). (R. N. B.)

SIGISMUND HI. (1566-163 2), king of Poland and Sweden, son of John III., king of Sweden, and Catherine Jagiellonika, sister of Sigismund II., king of Poland, thus uniting in his person the royal lines of Vasa and Jagiello. Educated as a Catholic by his mother, he was on the death of Stephen Bathory elected king of Poland (August 19, 1587) chiefly through the efforts of the Polish chancellor, Jan Zamoyski, and of his own aunt, Anne, queen-dowager of Poland, who lent the chancellor 100,000 gulden

to raise troops in defence of her nephew's cause. On his election, Sigismund promised to maintain a fleet in the Baltic, to fortify the eastern frontier against the Tatars, and not to visit Sweden without the consent of the Polish diet. Sixteen days later were signed the articles of Kalmar regulating the future relations between Poland and Sweden, when in process of time. Sigismund should succeed his father as king of Sweden. The two kingdoms were to be perpetually allied, but each of them was to retain its own laws and customs. Sweden was also to enjoy her religion subject to such changes as a general council

might make. During Sigismund's absence from Sweden that realm was to be ruled by seven Swedes, six to be elected by the king and one by Duke Charles, his Protestant uncle. Sweden, moreover, was not to be administered from Poland. A week after subscribing these articles the young prince departed to take possession of the Polish throne. He was expressly commanded by his father to return to Sweden, if the Polish deputation awaiting him at Danzig should insist on the cession of Esthonia to Poland as a condition precedent to the act of homage. The Poles proved even more difficult to satisfy than was anticipated; but finally a com- promise was come to whereby the territorial settlement was postponed till after the death of John III. ; and Sigismund was duly crowned at Cracow on the 27th of December 1587.

Sigismund's position as king of Poland was extraordinarily difficult. As a foreigner he was from the first out of sympathy with the majority of his subjects. As a man of education and refinement, fond of music, the fine arts, and polite literature, he was unintelligible to the szlachta, who regarded all artists and poets as either mechanics or adventurers. His very virtues were strange and therefore offensive to them. His prudent reserve and imperturbable calmness were branded as stiffness and haughtiness. Even Zamoyski who had placed him on the throne complained that the king was possessed by a dumb devil. He lacked, moreover, the tact and bonhomie of the Jagiellos; but in fairness it should be added that the Jagiellos were natives of the soil, that they had practically made the monarchy, and that they could always play Lithuania off against Poland.

Sigismund's difficulties were also increased by his political views which he brought with him from Sweden cut and dried, and which were diametrically opposed to those of the omnipotent chancellor. Yet, impracticable as it may have been, Sigismund's system of foreign policy as compared with Zamoyski's was, at any rate, clear and definite. It aimed at a close alliance with the house of Austria, with the double object of drawing Sweden within its orbit and overawing the Porte by the conjunction of the two great Catholic powers of central Europe. A corollary to this system was the much needed reform of the Polish constitution, without which nothing beneficial was to be expected from any political combination. Thus Sigismund's views were those of a statesman who clearly recognizes present evils and would remedy them. But all his efforts foundered on the jealousy and suspicion of the magnates headed by the chancellor. The first three-and- twenty years of Sigismund's reign is the record of an almost constant struggle between Zamoyski and the king, in which the two opponents were so evenly matched that they did little more than counterpoise each other. At the diet of 1590 Zamoyski successfully

thwarted all the efforts of the Austrian party; whereupon the king, taking advantage of sudden vacancies among the chief offices of state, brought into power the Radzi- wills and other great Lithuanian dignitaries, thereby for a time considerably curtailing the authority of the chancellor. In 1592 Sigismund married the Austrian archduchess Anne, and the same year a reconciliation was patched up between the king and the chancellor to enable the former to secure possession of his Swedish throne vacant by the death of his father John III. He arrived at Stockholm on the 30th of September 1593 and was crowned at Upsala on the 19th of February IS94, but only after he had consented to the maintenance of the ” pure evangelical religion ” in Sweden. On the 14th of July 1594 he departed for Poland leaving Duke Charles and the senate to rule Sweden during his absence. Four years later (July 1598) Sigismund was forced to fight for his native crown by the usurpation of his

uncle, aided by the Protestant party in Sweden. He landed at Kalmar with 5000 men, mostly Hungarian mercenaries; the fortress opened its gates to him at once and the capital and the country people welcomed him. The Catholic world watched his progress with the most sanguine expectations. Sigismund’s success in Sweden was regarded as only the beginning of greater triumphs. But it was not to be. After fruitless negotiations with his uncle, Sigismund advanced with his army from Kalmar, but was defeated by the duke at Stangebro on the 25th of September. Three days later, by the compact of Linkoping, Sigismund agreed to submit all the points in dispute between himself and his uncle to a riksdag at Stockholm; but immediately afterwards took ship for Danzig, after secretly protesting to the two papal prothonotaries who accompanied him that the Linko- ping agreement had been extorted from him, and was therefore invalid. Sigismund never saw Sweden again, but he persistently refused to abandon his claims or recognise the new Swedish government; and this unfortunate obstinacy was to involve Poland in a whole series of unprofitable wars with Sweden.

In 1602 Sigismund wedded Constantia, the sister of his deceased first wife, an event which strengthened the hands of the Austrian party at court and still further depressed the chancellor. At the diet of 1605 Sigismund and his partisans endeavoured so far to reform the Polish constitution as to substitute a decision by a plurality of votes for unanimity in the diet. This most simple and salutary reform was, however, rendered nugatory by the opposition of Zamoyski, and his death the same year made matters still worse, as it left the opposition in the hands of men violent and incapable, like Nicholas Zebrzydowski, or sheer scoundrels, like Stanislaw Stadnicki. From

1606 indeed to 1610 Poland was in an anarchical condition. Insurrection and rebellion triumphed everywhere, and all that Sigismund could do was to minimize the mischief as much as possible by his moderation and courage. On foreign affairs these disorders had the most disastrous effect. The simultaneous collapse of Muscovy had given Poland an unexampled opportunity of rendering the tsardom for ever harmless. But the necessary supplies were' never forthcoming and the diet remained absolutely indifferent to the triumphs of Zolkiewski and the other great generals who performed Brobdingnagian feats with Lilliputian armies. At the outbreak of the Thirty Years' War Sigismund prudently leagued with the emperor to counterpoise the united efforts of the Turks and the Protestants. This policy was very beneficial to the Catholic cause, as it diverted the Turk from central to north- eastern Europe; yet, but for the self-sacrificing heroism of Zolkiewski at Cecora and of Chodkiewicz at Khotin, it might have been most ruinous to Poland. Sigismund died very suddenly in his 66th year, leaving two sons, Wladislaus and John Casimir, who succeeded him in rotation.

See Aleksander Rembowski, The Insurrection of Zebrzydowski (Pol.) (Cracow, 1893) ; Stanislaw Niemojewski, Memoires (Pol.) (Lemberg, 1899); Sveriges Historia, vol. iii. (Stockholm, 1881); Julian Ursyn Niemcewicz, History of the Reign of Sigismund III. (Pol.) (Breslau, 1836). (R. N. B.)

SIGMARINGEN, a town of Germany, chief town of the Prussian principality of Hohenzollern, on the right bank of the Danube, 55 m. S. of Tubingen, on the railway to Ulm. Pop. (1905) 4621. The castle of the Hohenzollerns crowns a high rock above the river, and contains a collection of pictures, an exceptionally interesting museum (textiles, enamels, metal- work, &c), an armoury and a library. On the opposite bank of the Danube there is a war monument to the Hohenzollern men who fell in 1866 and 1870-1871.

The division of Sigmaringen is composed of the two formerly sovereign principalities of Hohenzollern-Sigmaringen and Hohen-zollern-Hechingen (see Hohenzollern), and has an area of 440 sq. m. and a population (1905) of 68,282. The Sigmaringen part of the Hohenzollern lands was the larger of the two (297 sq. m.) and lay mainly to the south of Hechingen, though the district of Haigerloch on the Neckar also belonged to it. The name of Hohenzollern is used much more frequently than the official Sigmaringen to designate the combined principalities.

See Woerl, Fuhrer durch Sigmaringen (Wurzburg,i886).

SIGNAL

SIGNAL (a word common in slightly different forms to nearly all European languages, derived from Lat. signum, a mark, sign), a means of transmitting information, according to some pre- arranged system or code, in cases where a direct verbal or written statement is unnecessary, undesirable, or impracticable. The methods employed vary with the circumstances and the purposes in view, and the medium into which the transmitted idea is translated may consist of visible objects, sounds, motions, or indeed anything that is capable of affecting the senses, so long as an understanding has been previously effected with the recipient as to the meaning involved. Any two persons may thus arrange a system for the transmission of intelligence between them, and secret codes of this kind, depending on the inflections of the voice, the accent on syllables or words, the arrangement of sentences, &c, have been so elaborated as to serve for the production of phenomena such as are sometimes attributed to telepathy or thought transference. With the many private developments of such codes we are not here concerned, nor is it necessary to attempt an explanation of the systems of drum-taps, smoke-fires, &c, by which certain primitive peoples are supposed to be able to convey news over long distances with astonishing rapidity; the present article is confined to giving an account of the organized methods of signalling employed at sea, in military operations and on railways, these being matters of practical public importance.

Marine Signalling. — A system of marine signals comprises different methods of conveying orders or information to or from a ship in sight and within hearing, but at a distance too great to permit of hailing — in other words, beyond the reach of the voice, even when aided by the speaking-trumpet. The necessity of some plan of rapidly conveying orders or intelligence to a distance was early recognized. Polybius describes two methods, one proposed by Aeneas Tacticus more than three centuries before Christ, and one perfected by himself, which, as any word could be spelled by it, anticipated the underlying principle of later systems. The signal codes of the ancients are believed to have been elaborate. Generally some kind of flag was used. Shields were also displayed in a preconcerted manner, as at the battle of Marathon, and some have imagined that the reflected rays of the sun were flashed from them as with the modern heliograph. In the middle ages flags, banners and lanterns were used to distinguish particular squadrons, and as marks of rank, as they are at present, also to call officers to the admiral, and to report sighting the enemy and getting

into danger. The invention of cannon made an important addition to the means of signalling. In the instructions issued by Don Martin de Padilla in 1507 the use of guns, lights and fires is mentioned. The introduction of the square rig permitted a further addition, that of letting fall a sail a certain number of times. Before the middle of the 17th century only a few stated orders and reports could be made known by signalling. Flags were used by day, and lights, occasionally with guns, at night. The signification then, and for a long time after, depended upon the position in which the light or flag was displayed. Orders, indeed, were as often as possible com- municated by hailing or even by means of boats. As the size of ships increased the inconvenience of both plans became intolerable. Some attribute the first attempt at a regular code to Admiral Sir William Penn (1621-1670), but the credit of it is usually given to James II. when duke of York. Notwithstanding the attention paid to the subject by Paul Hoste and others, signals continued strangely imperfect till late in the 18th century. Towards 1780 Admiral Kempenfelt devised a plan of flag-signal- ling which was the parent of that now in use. Instead of in- dicating differences of meaning by varying the position of a solitary flag, he combined distinct flags in pairs. About the beginning of the 19th century Sir Home Popham improved a method of conveying messages by flags proposed by R. Hall Gower (1 767-1833), and greatly increased a ship's power of communicating with others. The number of night and fog signals that could be shown was still very restricted. In 1867 an innovation of prodigious importance was made by the adop- tion in the British navy of Vice- Admiral (then Captain) Philip

Colomb's flashing system, on which he had been at work since

1858.

In the British navy, which serves as a model to most others, visual signals are made with flags or pendants, the semaphore, flashing, and occasionally fireworks. Sound signals are made with fog-horns, steam-whistles, sirens and guns. The number of flags in use in the naval code, comprising what is termed a " set," are 58, and consist of 26 alphabetical flags, 10 numeral flags, 16 pendants and 6 special flags. Flag signals are divided into three classes, to each of which is allotted a separate book. One class consists of two alphabetical flags and refers to orders usual in the administration of a squadron, such as, for example, the flags LE, which might signify " Captain repair on board flagship." Another class consists of three alphabetical flags, which refer to a coded dictionary, wherein are words and short sentences likely to be required. The remaining refers to evolutionary orders for

manoeuvring, which have alpha- betical and numeral flags combined. The flags which constitute a signal are termed a ” hoist.” One or more hoists may be made at the same time. Although flag signalling is a slow method compared with others, a fair rate can be attained with practice. For example, a signal involving 162 separate hoists has been re- peated at sight by 13 ships in company in 76 minutes. Semaphore signals are made by the extension of a man’s arms through a vertical plane, the different symbols being distinguished by the relative positions of the arms, which are never less than 45° apart. To render the signals more conspicuous the signaller usually holds a small flag on a stick in each hand, but all ships are fitted with mechanical semaphores, which can be worked by one man, and are visible several miles. Flag signalling being comparatively slow and laborious, the ordinary message work in a squadron is generally signalled by semaphore. The convenience of this method is enormous, and by way of example it may be of interest to mention a record message of 350 words which was signalled to 21 ships simultaneously at the rate of 17 words per minute. Flags being limited in size, and only distinguishable by their colour, signals by this means are not altogether satisfactory at long distances, even when the wind is suitable. For signalling at long range the British navy employs a semaphore with arms from 9 to 12 ft. long mounted at the top of the mast and capable of being trained in any required direction, and worked from the deck. Its range depends upon the clearness of the atmo- sphere, but instances are on record where a message by this means has been read at 16 to 18 m.

Night signalling is carried out by means of ” flashing,” by which is meant the exposure and eclipse of a single light for short and long periods of time, representing the dots and dashes composing the required symbol. The dots and dashes can be made mechanically by an obscuring arrangement, or by electro- mechanical means where magnets do the work, or by simply switching on and off specially manufactured electric lamps. The ordinary rate of signalling by flashing is from 7 to 10 words per minute. In the British navy, as in the army, dots and dashes are short and long exposures of light; but with some nations the dots and dashes are short and long periods of darkness, the light punctuating the spaces between them. The British navy uses the European modification of the so-called Morse code used in telegraphy, but with special signs added suitable to their code. The introduction of the ” dot and dash ” system into the British navy was entirely due to the perseverance of Vice-Admiral Colomb, who, in spite of great opposition, and even after it had once been condemned on its first trial at sea, carried it through with the greatest success. The value of this innovation made in 1867 may be gauged by the fact that

now it is possible to handle a fleet with ease and safety in darkness and fog — a state of affairs which did not formerly exist. The simplicity of the dot and dash principle is its best feature. As the system only requires the exhibition of two elements it may be used in a variety of different manners with a minimum of material, namely, by waving the most conspicuous object at hand through short and long arcs, by exhibiting two different shapes, each representing one of the elements, or dipping a lantern in a bucket, and so on. Its

adoption has not only contributed very materially to the in- creased efficiency of the British navy, but it has been made optional for use with the mercantile marine. Curiously enough, flashing is not to any great extent used in the navies of other countries which rely more on some system of coloured lights at night. This system generally takes the form of four or five double-coloured lanterns, which are suspended from some part of the mast in a vertical line. Each lantern generally contains a red and a white lamp, either of which can be switched on. By a suitable keyboard on deck any combination of these coloured lanterns can be shown. The advantage of this system lies in the fact that each symbol is self-evident in its entirety, and does not require an expert signalman to read it, as is the case with flashing, which is a progressive performance.

For long distances at night the search-light, or some other high power electric arc light, is atilized on the flashing system. Dots and dashes are then made either by flashing the light directly on the object, or by waving the beam up and down for short and long periods of time. Sometimes when a convenient cloud is available the reflection of the beam has been read for nearly 40 m., with land intervening between the two ships. In a fog signals are made by the steam-whistle, fog-horn, siren or by guns. Except for the latter method the dot and dash system is employed in a similar manner to flashing a light. Guns are some- times used in a fog for signalling, the signification being deter- mined by certain timed intervals between the discharges. The larger British ships are supplied with telegraph instruments for connexion with the shore, and heliographs are provided for land operations. Marine galvanometers are also provided, and can be used to communicate through submarine cables. To the various methods of naval signalling must be added wireless telegraphy, which in its application to ships at sea bids fair to solve some problems hitherto impracticable. (See Telegraphy: Wireless.)

The international code of signals, for use between ships of all nations, is perhaps the best universal dictionary in exist- ence. By its means mariners can talk with great ease without knowing a word of one another's language. By means of a few flags any question can be asked and answered. The number of international flags and pendants used with the international code is 27, consisting of a complete alphabet and a special pendant characteristic of the code. At night flashing may be used. (C.A.G.B.; A.F.E.)

Army Signalling. — Communication by visual signals between portions of an army is a comparatively recent development of military service. Actual signals were of course made in all ages of warfare, either specially agreed upon beforehand, such as a rocket or beacon, or of more general application, such as the old-fashioned wooden telegraph and the combinations of lights, &c, used by savages on the N.W. frontier of India. But it was not until the middle years of the 19th century that military signalling proper, as a special duty of soldiers, became at all general. It was about the year 1865 that, owing to the initiative of Captain Philip Colomb, R.N., whose signal system had been adopted for his own service, the question of army signalling was seriously taken up by the British military authorities. A school of signal- ling was created at Chatham, and some time later all units of the line were directed to furnish men to be trained as signallers. At first a code book was used and the signals represented code words, but it was found better to revert to the telegraphic system of signalling by the Morse alphabet, amongst the unde- niable advantages of which was the fact that it was used both by the postal service and the telegraph units of Royal Engineers. Thenceforward, iA ever-increasing perfection, the work of signallers has been a feature of almost every campaign of the British army. To the original flags have been added the helio- graph (for long-distance work), the semaphore system of the Royal Navy (for very rapid signalling at short distances), and the lamps of various kinds for working by night. Full and detailed instructions for the proper performance of the work, which provide for almost every possible contingency, have been published and are enforced.

The apparatus employed for signalling in the British service consists of flags, large and small, heliograph and lamp for night work. The distances at which their signals can be read vary very considerably, the flags having but a limited ppara us# scope of usefulness, whilst the range of a heliograph is very great indeed. Whether it be 10 m. or 100 away, it has been found in practice that, given good sunlight, nothing but the presence of an intervening physical obstacle, such as a ridge or wood, prevents communication. For shorter distances

moonlight, and even artificial light, have on occasion been employed as the source of light. In northern Europe the use of the instrument is much restricted by climate, and, further, stretches of plain country, permitting of a line of vision between distant hills, are not often found. It is in the wilder parts of the earth, that is to say in colonial theatres of war, that the astonishing value of the helio- graph is displaced. In European warfare flag signalling is more usually emplo fed. The flags in use are blue and white, the former for w x with light, the latter for dark backgrounds.

B ˆ>’

1 1

V r

I I

I I

I +

I 1

I I

V\

Fig. 1.

There is further a distinction between the ” small ” flag, which is employed for semaphore messages and for rapid Morse over somewhat shorter distances, and the ” large ” flag, which is readable at a distance of 5 to 7 m., as against the maximum of 4 m. allowed to the small flag. With a clear atmosphere these distances may be exceeded. The respective sizes of these flags are as follows: — large flag 3’X3 r , pole 5′ 6″ long; small flag 2’X 2’, pole 3′ 6″ long. The lamps used for night signalling are of many kinds. Officially only the ” lime light ” and the ” Beg- bie ” lamps are recognized, but a considerable number of the old-fashioned oil lamps is still in use, especially in the auxiliary forces, and many experiments have been made with acetylene. The lime light is obtained by raising a lime pencil to a white heat by forcing a jet of oxygen through the flame of a spirit lamp. The strong light thus produced can be read under favourable conditions at a distance of 15 m.; but the equipment of gas-bag, pressure-bag, and other accessories make the whole instrument

rather cumbrous. The bull's-eye lamp differs but slightly from the ordinary lantern of civil life; it burns vegetable oil. The Begbie lamp, which burns kerosene, is rather more elaborate and gives a whiter light. It was in use for many years in India before the objections made by the authorities in England to certain features of the lamp were withdrawn. All these lamps when in use are set up on a tripod stand and signals in the Morse alphabet- are made by opening and closing a shutter in front of the light, and thereby showing long and short flashes.

The same principle is followed in the heliograph. This instru- ment, invented by Sir Henry C. Mance, receives on a mirror, and thence casts upon the distant station, the rays of the sun; the working of a small key controls the flashes by throwing the mirror slightly off its alignment and thus obscuring the light from the party reading signals. The fact that the heliograph requires sunlight, as mentioned above, militates against its employment in Great Britain, but where it is possible to use it it is by far the best means of signalling. Secrecy and rapidity are its chief advantages. An observer 6 m. distant would see none of its light if he were more than 50 yds. on one side of the exact align- ment, whereas a flag signal could be read from almost every

Fig. 2. — Heliograph (by permission of the Controller of H.M. Stationery Office).

hill within range. None of the physical exertion required for fast signalling with the flag is required to manipulate the instru- ment at a high rate of speed. The whole apparatus is packed in a light and portable form. An alternative method of using the heliograph is to keep the rays permanently on the distant point, a shutter of some kind being used in front of it to produce obscurations.

When in use the heliograph is fixed upon a tripod. A tangent screw (E) which moves the whole instrument (except the jointed arm L) turns the mirror in any direction. Metal U-shaped arms (C) carry the mirror (B), which is controlled by the vertical rod (J) and its clamping screw (K). The signalling mirror itself (usually having a surface of 5 in. diameter) is of glass, an un- silvered spot ® being left in the centre. This spot retains its position through all movements in any plane. The instrument is aligned by means of the sighting vane (P) fixed in the jointed arm L, and the rays of the sun are then brought on to the

distant station by turning the horizontal and vertical adjustments until the ” shadow spot ” cast by the unsilvered centre of the mirror appears on the vane. The heliograph is thus ready, and signals are made by the depression and release of the ” collar ” (I) which, with the pivoted arm (U, V) , acts as a telegraph key. When the sun makes an angle of more than 120 degrees with the mirror and the distant station, a ” duplex mirror ” is used in place of the sighting vane. The process of alignment is in this case a little more complicated. Various other means of making dots and dashes are referred to in the official work, ranging from the ” collapsible drum ” hung on a mast to the rough but effec- tive improvisation of a heliograph out of a shaving-glass. The employment of the beams of the search-light to make flashes on clouds is also a method of signalling which has been in practice very . effective.

The Morse code employed in army signalling is as follows :-

A B C D E F G H I

K

L

M — N — •

P

S ••• T —

U

V

w

X

Y

Q

R

Z

1 —

The semaphore code used in the army is shown below : —

ai } I (r n -a _l_

n B C B £

I 3 3 * S

hldl

A” *

If L MM

in

1YVV

“Annul”

/

h_k

“Humerafe “J or Cominy” LettenCcmnf

tk

Ready

J^

Fig. 3. — Semaphore (the thin upright strokes represent the seaman’s body, the thick strokes his arms).

UtTer'W"

In using this code the signaller invariably faces his reader, as unless this were enforced each letter might, be read as its opposite. In the above diagram the appearance of the signals to the reader is shown, thus the sender's right side only is used for the letter A.

In sending a message accuracy is ensured by various checks. The number of words in a message is the most valuable of these, as the receiving station's number must agree before the message is taken as correct. Each word or "group" sent by the Morse code must be " answered " before the sender passes on to another. All figures are checked by the " clock check " in which 1 is repre- sented by A, 2 by B and so on. All cipher " groups " are repeated back en bloc. There is an elaborate system of signals relating to the working of the line. The " message form " in use differs but slightly from the ordinary form of the Post Office telegraphs. Signal stations in the field are classed as (a) " fixed " and " mov- ing," the former connecting points of importance, or on a line of communications, the latter moving with the troops; (b) " ter- minal," "transmitting" and "central"; the first two require no definition, the last is intended to send and receive messages in many directions. The " transmitting station " receives and sends on messages, and consists in theory of two full " ter- minals," one to receive and one to send on. It is rarely possible in the field to work rapidly with less than five men at a trans- mitting and three at a terminal station. " Central " stations

are manned according to the number of stations with which they communicate.

Signalling is used on most campaigns to a large extent. In the Tirah expedition, 1897 and 1898, one signal station received and sent, between the 1st and 18th November, as many as 980 messages by heliograph, some of which were 200 to 300 words in length. It is often used as an auxiliary to the field telegraph, especially in mountainous countries, and when the wire is liable to be cut and stolen by hostile natives. In the Waziri expedition, 1 88 1, communication was maintained direct for a distance of 70 m. with a 5-in. heliograph. In the Boer War, 1899-1902, the system of heliographic signalling was employed very exten- sively by both sides.

In Germany the first army signalling regulations only appeared in 1902. The practice was, however, rapidly developed and towards the end of the 1905 campaign in South-West Africa, 9 signalling officers and 200 signallers were employed in that country. These usually worked in parties of 2 or 3, each party being protected by a few infantrymen or troopers. The apparatus used was heliograph by day and a very elaborate form of lamp by night, and work was carried on between posts separated by 60 and even 90 m. The signallers were employed both with the mobile forces and in a permanent net- work of communication in the occupied territory. In 1907-1908 fresh signalling regulations were issued to the home army, and each company, battery or squadron is now expected to find one station of three men, apart from the regimental and special instructors and staff. Some experiments were carried out at Metz to ascertain the mean distance at which signals made by a man lying down could be seen, this being found to be about 1000 yds. The new regulations allow of the use of flag and lamp signalling at 4 m. instead of as formerly at ij. Three flags are used, blue, white and yellow, and it is stated that the last is the most frequently useful of the three.

The enormous development of the field telegraph and telephone systems in the elaborate war of positions of 1904-1905 more or less crowded out, so to speak, visual signalling on both sides, and in any case the average illiterate Russian infantryman or the Cossack was not adaptable to signalling needs. Only about one-quarter of the signalling force (which consisted exclusively of engineer troops) in Kuropatkin's army was employed in optical work, the other three- quarters being assigned to telegraph, wireless and telephone station work. The Italians, who are no strangers to colonial warfare, have a well-developed visual signalling system.

See British Official Training Manuals: Signalling (1907).

Railway Signalling. — In railway phraseology the term " signal " is applied to a variety of hand motions and indications by lamps and other symbols, as well as to fixed signals; but only the last-named class — disks and semaphores, with lights, perman- ently fixed (on posts) at the side of the track — will be considered here. These may be divided into (1) interlocking signals, used at junctions and yards, and (2) block signals, for maintaining an interval of space between trains following one another. In both classes the function of a signal is to inform the engine-driver whether or not he may proceed beyond the signal, or on what conditions he may proceed, and it is essential to give him the information some seconds before it need be acted upon.

The semaphore signal, which is now widely used, consists of an arm or blade about 5 ft. long extending horizontally, at right angles to the line of the track, from the top of a post (wood or iron) 15 to 30 ft. high, and sometimes higher (fig. 4). This arm, turning on a spindle, is pulled down (" off ") to indicate that a train may pass it, the horizontal (or " on") position indicating " stop "; sometimes, as on the continent of Europe, use is made of the position of the arm in which it points diagonally upwards, and on one or two English lines the arm in the safety position hangs down perpendicularly, parallel to, but a few inches away from, the post. A lamp is fixed to the side of the post about on a level with the blade, and by the movement of the blade is made to show at night red for " stop " and green for go-ahead or " all clear." The earlier practice, white for " all clear," still prevails largely in America.

In the early days of railway signalling three positions of the semaphore arm were recognized: — (1) Horizontal, or at right angles to the post, denoting danger; (2) at a downward angle of 45 degrees, denoting caution; (3) hanging vertically downwards or parallel to the post, denoting all right. Corresponding to the position of the arm, three different lights were employed at night — red for danger, green for caution and white for all right. But now British railways make use of only two positions of the arm and two lights — the arm at right angles to the post and a red light, both signifying danger or

stop ; and the arm at about 60 degress (or vertical, as mentioned above) and a green light, both meaning all right or proceed. It is better to abolish the use of white lights for signalling purposes. The reason is obvious. There are many lights and lamps on the plat- forms, in signal-boxes and in the streets and houses adjacent to a rail- way; and if white lights were recognized as signals, a driver might mistake a light of this nature as a signal to proceed; in fact, accidents have been caused in this manner. A white light is not to be regarded as a danger signal, as is sometimes erroneously stated, but rather as no signal at all ; and as there is a well-known rule to the effect that " the absence of a signal at a place where a signal is ordinarily shown must be treated as a danger signal," it follows that a white light, when seen at a place where a red or green light ought to be visible, is to be treated as a danger signal, not because a white light per se means danger, but because in such a case it denotes the absence of the proper signal. Some companies have adopted a purple or small white light as a " danger " signal for shunting purposes in sidings and yards; but this practice is not to be com- mended, since red should be the universal danger signal.

Distant signals are used to make it unnecessary for an engine- driver to slacken his speed in case the stop (home) signal is obscured by fog or smoke, or is beyond a curve, or for any reason is not visible sufficiently far away. Encountering the distant signal at a point 400 to 800 yds. before reaching the home signal, he is informed by its position that he may expect to find the latter in the same position; if it is ” off ” he passes it, knowing that the home signal must be in the same position, but if it is at danger he proceeds cautiously, prepared to stop at the home signal, if necessary. The arm of a distant signal usually has a fish-tail end. In Great Britain its colour indications are generally the same as for the home signal, but occasionally it shows yellow, and on some lines it is distinguished at night by an angular band of light, shaped like a fish-tail, which appears by the side of the red or green light. In America its night colour-indication is made different from that of the home signal. Thus, where white is used to indicate all clear (in both home and distant) the distant arm, when horizontal, shows a green light; where green is the all- clear colour a horizontal distant shows either a yellow light or (on one road) a red and a green light side by side. Two lights for a single arm, giving their indication by position as well as colour, have been used to a limited extent for both home and distant signals. Dwarf signals (a in fig. 5) are used for very slow movements, such as those to or from a siding. Their blades are about 1 ft. long, and the posts about 4 ft. high; the lower arm on post c being for slow movements, is also frequently made shorter than the upper one. Where more than two full-sized arms are used on a post, the custom in America is to have the upper arm indicate for the track of the extreme right, and the others in the order in which the tracks lie; in Great Britain the opposite rule prevails, the upper arm indicating for the extreme left. But the signals controlling a large number of parallel or diverging tracks are preferably arranged side by side, often on a narrow overhead bridge or gantry spanning the tracks.

All the switches and locks are con- nected with the signal cabin by iron rods (channel-iron or gas-pipe) supported (usually near the ground and often covered by boxing) on small grooved wheels set at suitable distances apart. The foundations of these supports are of wood, cast iron or concrete. Concrete foundations are comparatively recent, but are cheap and durable. For signals (but not for points) wire connexions are uni- versal in England, and are usual in America, being cheaper than rods. In changing the direction of a line of rodding a bell-crank is used, but with a wire a piece of chain is inserted and run round a grooved pulley. Wire connexions are shown at a and b, fig. 4, the main or ” front ” wire being attached at a. By this the signalman

moves the arm down to the inclined or go- ahead position, to do which he has to lift the counter-

Q > G

4ff

An.

s)

J

Fig. 4. — Semaphore signal. R, Red glass; G, green glass.

7 +

SIGNAL

weight c. If the wire should break, the counter-weight would restore the arm to the horizontal (stop) position, and thus prevent the unauthorized passage of a train; and in case of failure of the rod I, the iron spectacle s would act as a safety counter-weight. The back-wire 6 is added to ensure quick movement of the arm, but is not common in England. Long lines of rigid connexions are “compensated” for expansion and contraction due to changes in temperature by the introduction of bell-cranks or rocker-arms. With wire connexions compen- sation is difficult, and many plans have been tried. The most satisfactory devices are those in which the connexion, in the cabin, between the wire and the lever is broken when the signal is in the horizontal position. The wire is kept taut by a weight or spring, and at each new movement the lever (if the wire has lengthened or shortened) grips it at a new place.

So early as 1846 it became a common practice in England to concentrate the levers for working the points and signals of a station in one or more cabins, and the necessity of interlocking soon became evident to prevent simul- taneous signals being given over conflicting routes, or for a route not yet prepared to receive the train. In large terminals concentration and interlocking are essential to rapid movements of trains and economical use of ground.

Fig. 5 shows a typical arrangement of interlocked signals, the principle being the same whether a yard has one set of points or

Inter- locking.

Fig. 5.-

-Interlocked signals (American practice, signals at right track and arms at right of post).

a hundred. The signals (at a, b, and c) are of the semaphore pattern. For the four signals and one pair of points there are, in the second storey of the cabin C, five levers. Each signal arm stands normally in the horizontal position, indicating stop. To permit a train to pass from A to B the signalman moves the arm of signal b to an inclined position (60 degrees to 75 degrees down- wards); and the interlocking of the levers prevents this move- ment unless it can safely be made. If a has been changed to permit a movement from S to B, or if the points x have beeen set for such a movement, or if either signal on post c has been lowered, the lever for b is immovable. In like manner, to incline the arm of signal a for a movement from S to B it is first necessary to have the points set for track S, and to have the levers of all the other signals in the normal (stop) position. A sixth lever, suitably interlocked, works a lock bar, which engages with the head rod of the points; it is connected to the lock through the ” detector bar,” d. This bar, lying alongside of and close to the rail, must move upwards when the points lock is being moved either to lock or to unlock; and being made of such a length that it is never entirely free of the wheels of any car or engine standing or moving over it, it is held down by the flanges, and the signalman is prevented from inadvertently changing the points when a train is passing. At r is a throw-off or derailing switch (” catch- points “). When x is set for the passage of trains on the main line, r, connected to the same lever, is open; so that if a car, left on the side track unattended, should be accidentally moved from its position, it could not run foul of the main track.

The function of the interlocking machine is to prevent the simultaneous display of conflicting signals, or the display of a signal over points that are not set accordingly. The most common forms of interlocking have the locking bars arranged in a horizontal plane; but for ease of description we may take one having them arranged vertically, the principle being the same. The diagram (fig. 6) shows a section with a side view of one lever. A machine consists of as many levers, placed side by side, as there are points and signals to be moved, though in some cases two pairs of points are moved simultaneously by a single lever, and two or more separate arms on the same post may be so

arranged that either one of them will be moved by the same lever, the position of the point connexions being made to govern the selection of

the arm to be moved. A switch rod would be connected to this lever at H; the lever K is for use where a signal is con- nected by two wires, as before described. The lever is held in each of its two positions by the catch rod V, which en- gages with notches in the segment B. When the signalman, preparatory to lowering a signal, grasps the lever at its upper end, he moves thisrodupwards, and in so doing actuates the interlocking, through the tappet N, attached at T. Lifting the tappet locks all levers which need to be locked to make it safe to move this one. In pulling over the lever the rocker

R is also pulled;

but the slot in it

is radial to the

centre on which B the lever turns,

so that during the

stroke N remains

motionless. On

the completion of the stroke and the dropping of V, N is raised still farther, and this unlocks such levers as should be unlocked after this lever is pulled (“cleared” or “reversed”). It will be seen that whenever the tappet N of any lever is locked in the

Fig. 6. — Signal Lever, with Mechanical Interlocking.

Fig. 7. — Interlocking Frame.

and

position shown in the figure, it is impossible to raise V, therefore impossible to move the lever.

The action of tappet N may be understood by reference to fig. 7. A tappet, say 3, slides vertically in a planed recess in the locking plate, being held in place by strips G and K. Transverse

Power Inter-

»tof

ToA

Fig. 8.-

grooves N, O, P, carry dogs, such as J. Two dogs maybe con- nected together by bars, R. The dogs are held in place by straps Y (fig. 6). Locking is effected by sliding the dogs horizon- tally; for example, dog J has been pushed into the notch in tappet i, holding it in the normal position. If tappet 2 were raised, its notch would come opposite dog J; and then the lifting of 1 would lock 2 by pushing J to the left. By means of horizontal rod R, the lifting of 1 also locks 4. If 4 were already up, it would be impossible to lift 1.

Switch and signal machines are sometimes worked by com- pressed air, or electric or hydraulic power. The use of power makes it possible to move points at a greater distance from the cabin than is permissible with manual locking. power. The most widely used apparatus is the electro- pneumatic, by which the points and signals are moved by compressed air at 70 ft) per sq. in., a cylinder with piston being fixed at each signal or switch. From a compressor near the cabin, air is conveyed in iron pipes buried in the ground. The valves admitting air to a cylinder are controlled by electro- magnets, the wires of which are laid from the cabin underground. Each switch or signal, on completing a movement, sends an electric impulse to the cabin, and the interlocking is controlled by this ” return.” In the machine the ” levers ” are very small and light, their essential i

Interlocking apparatus worked by compressed air at low pressure (15 ft) per sq. in.), and with no electrical features, is in use on some lines in America and has been introduced into England. In place of an electromagnet for admitting compressed air to the cylinders, a rubber diaphragm 8 in. in diameter is used. This is lifted by air at 7 lb pressure, this pressure being con- veyed from a cabin, distant 500 ft. or more, in one or two seconds. As in the electro-pneumatic machine, the lever of a switch cannot complete its stroke until the switch has actually moved home and conveyed a ” return indication ” to the cabin. Pneumatic apparatus of other designs is in use to a limited extent.

Pneumatic interlockings are costly to instal, and, depending on an unfailing source of power, have not been much used at iso- lated places, except on railways where an air-pipe is installed for block signals; but at large yards the pneumatic machines have been made a means of economy, because one

attendant can manage as many levers as can two or three in a manual power machine. Moreover, a single lever will work two or more switches, locks, &c, simultaneously, where desirable. The absence of outdoor connexions above ground is also an advantage. Since about 1900 electric power has come into use for working both points and signals. A motor, with gearing and cranks, is fixed to the sleepers at each pair of points, the power is conveyed from the cabin by underground wires, the locking is of common mechanical types, and, in general, the system is similar to pneumatic systems except in the source of power. By using accumulators, charged by dynamos run by gasoline engines, or by a travelling power-car, the cost of power is reduced to a very low figure, so that power-interlocking becomes economical at small as well as large stations.

The essence of block signalling is a simple regulation forbidding

a train to start from station A until the last preceding train has

passed station B ; thus a space interval is maintained

system. between each train, instead of the time-interval that

was relied upon in the early days of railways. As the

introduction of the telegraph was almost or quite contempor-

aneous with the advent of the railway, the possibility of a block system was early recognized; but its introduction was retarded by the great cost of employing attendants at every block station. But as traffic increased, the time-interval system proved in- adequate; and in the United Kingdom the block system is now practically universal, while in America it is in use on many thousand miles of line. In " permissive blocking " a second train is allowed to enter a block section before the first has cleared it, the engine-man being required so to control his speed that if the first train be unexpectedly stopped he can himself stop before coming into collision with it. It thus violates the essential condition of true block signalling.

The manual " block " system in use at the present day in no way differs from that devised by W. F. Cooke in 1842, except so far as the details and designs of the telegraphic instruments are con- cerned. Cooke used a single-needle instrument giving two indi- cations — the needle to the left signifying " line clear," to the right, "line blocked"; the instrument was also available for speaking purposes. The instruments employed in Great Britain consist of two dials — one for the up line and one for the down — and a bell. They may be divided into two main classes, those requiring one wire, and those requiring three wires for each double line of rails. The dials of the one- wire instruments give only two indications, namely, " line

/SOO ormore

ZPir

Z5£l

To C.

bQ

/fffO or mom

-Block signals. (English practice, trains run on left-hand track, signals at left of track, arms on left of post.)

clear " and " train on line " or "line blocked," the latter being the normal indication, even when there is no train in the section. The three-wire instrument has the advantage of giving three indications on the dial, namely, " line clear," " line closed " and " train on line," the normal indication being " line closed." The one-wire instru- ment differs from the three-wire in that the indicator is moved over to the different positions by a momentary current, and is then held there by induced magnetism, the wire being then free for any suc- ceeding signals. In the three-wire apparatus there is a separate wire, with an instrument at each end for the up line; the same for the down line; and a wire for the bell, which is common to both lines. When no current is flowing, the indicator is vertical, meaning " line blocked or closed." When a current is sent along one of the wires, the deflections to the right or left, according to the polarity of the current, mean " line clear " or " train on line " respectively. Some dial instruments are made with needles, some with small disks, some with miniature semaphores to give the necessary indications, but the effect is the same. The block instruments and bells should not, as a rule, be used for speaking purposes ; but on a few subsidiary railways, block working is effected by means of ordinary single- needle telegraphic instruments, or by telephone, the drawback to such an arrangement being that the signalman has no indication before him to remind him of the condition of the line.

Fig. 8 shows the signals at a typical English station, which may be called B. Notice having been received over the block telegraph that a train is coming from A (on the up track), the signalman in the cabin, b, lowers the home signal h; and (if the block section from B to C is clear of trains) he lowers the starting signal, s, also. The function of a distant signal d has already been described; it is mechanically impossible for it to be lowered unless h has previously been lowered. The relation of the signals to the " crossover road " xx is the same in principle as is shown in fig. 5. Dwarf or disk signals such as would be used for the siding T or the crossover xx are

omitted from the sketch. Where the sections are very short, the starting signal of one section is often placed on the same post as the distant signal of the next. Thus, supposing B and C to be very close to each other, B's starting signal would be on the same post as C's distant signal, the latter being below the former, and the two would be so interconnected by " slotting " apparatus that C could not lower his distant signal unless B's starting signal was " off," while B by the act of raising his starting arm would necessarily throw C's distant arm to " danger." In America many block stations have only the home signal, even at stations where there are points and sidings, and on double-track lines the block

telegraphing for both is done on a single Morse circuit. In the United Kingdom the practice is to have separate apparatus and separate wires for each track.

In the simple block system it is clearly possible for a signal- man, through carelessness, forgetfulness, or other cause, and in disregard of the indications of his telegraph instruments, ft/ocfc"" " so t0 l° wer his signals as to admit a second train into the block section before the first has left it, and that without the driver of either train being aware of the fact. To eliminate as far as possible the chance of such an occurrence, which is directly opposed to the essence of the block system and may obviously lead to a collision, the locking of the mechanical signals with the electrical block instruments was introduced in England by W. R. Sykes about 1876, the apparatus being so arranged that a signalman at one end of a section is physically unable to lower his signals to let a train enter that section until they have been released electrically from the cabin at the other end. The starting signal at a block section A cannot be lowered until the signalman at the next station B , by means of an electric circuit, unlocks the lever in connexion with it. In so doing he breaks the unlocking circuit at his own station, and this break is restored only on the arrival of the train for which the unlocking was performed, the wheels of the train acting through a lever or by a short rail circuit. Valuable improvements have been made in this machine by Patenall, Coleman and others, and these are in use in America, where the system is known as the " con- trolled manual." The passage of a train is also made to set a signal at "stop" automatically, by disconnecting the rod between the signal and its lever. The connexion cannot be restored by the signalman ; it must be done by an electro-magnet brought into action by the train as it passes the next block station.*

The block system is used on single as well as on double lines. In the United

Kingdom and in Australia the means for pre- venting collisions between trains running towards each other on single-track railways is the " staff system." The staff, suitably inscribed, is delivered to the engine-driver at station A, and constitutes his authority to occupy the main track between that station and station B. On reaching B he surrenders the staff, and receives another one which gives him the right to the road between B and C. If there are two or more trains to be moved, all except the last one receive tickets, which belong to that particular staff. The staff system requires no telegraph; but to obviate the incon- venience of sometimes finding the staff at the wrong end of the road, electric staff apparatus has been devised. Staffs (or tablets) in any desired number are kept at each of the two stations, and are locked in a cabinet automatically controlled, through electro-magnets, by apparatus in the cabinet at the other station ; and a staff (or tablet) being taken out at one station, a second one cannot be taken out at either station until this first one is re- turned to the magazine at one station or the other. Thus there is a complete block system. By simple " catching apparatus " on the engine, staffs or tablets may be delivered to trains moving at a good speed.

The signals so far described depend fqr their operation, either wholly or partially, on human agency, but there are others, commonly known as " automatic," which are worked signals. kv the trains themselves, without human intervention. Such signals, as a rule, are so arranged that normally they are constrained to stand at " safety," instead of in the "danger" position, which, like ordinary signals, they assume if left to themselves; but as a train enters a block section the constraint on the signals that guard it is removed and they return to the danger position, which they retain till the train has passed through. To effect this result an electrical track circuit or rail circuit is employed, in conjunction with some form of power to put the signalling devices to safety. Live-wire circuits were formerly employed, but are now generally abandoned. The current from a battery b (fig. 9) passes along the rails of one side oi trie track to tine signal s and returns along the other tails through a relay. If the current through this relay is stopped in

Staff system.

any way, whether by failure of the battery or by a short circuit caused by the presence of a train or vehicle with metal wheels connected by metal axles on any part of the block section, its electro-magnet is de-energized, and its armature drops, removing the constraint which kept the signals at safety and allowing them to move to danger. When the train has passed through the block

ˆr

Fig. 9. — Automatic electric block signal, with rail circuit.

section the current is restored and the signals are forced back to show safety. The current used for the track circuit must be of low tension, because of the imperfect insulation, and as a rule the ballast must not be allowed to touch the rails and must be free from iron or other conducting substance. At each rail joint a wire is used to secure electrical continuity, and at the ends of each block section there are insulating joints in the track. Block sections more than about 1 m. long are commonly divided into two or more circuits, connected together by relays; but usually they are made under 1 m. in length and often on intra-urban railways very much less, so that many more trains can be passed over the line in a given time than is possible with ordinary block signalling. At points the track circuit is run through a circuit breaker, so that the " opening " of the points sets the signal for the section. The circuit is also led through the rails of the siding so far as they foul the main track. An indicator at each switch gives visual or audible warning of an approaching train.

The signals themselves have been devised to work by clock- work, by electricity — obtained, not from the track circuit, but from a power station, or from non-freezing batteries at each post, or from accumulators charged by dynamos situated, say, every 10 m. along the line — and by pneumatic power, either com- pressed atmospheric air laid on from a main or carbonic acid gas

stored in a tank at the foot of the posts, each tank furnishing power for several thousand move- ments of the signal arm. A clock- work signal is shown in fig. 10. When an electro-magnet in the rail circuit drops its armature, the mechanism is released and causes the disk to turn and indicate stop. On the restoration of the current the disk makes another quarter

Fig. 10. — Signal moved by clockwork (Union).

Fig. 1 1 . — Enclosed disk signal (Hall).

turn and then shows only its edge to the approaching train, indicating " all clear."

The enclosed disk signal, commonly called a "banjo" (fig. 11), is a circular box about 4 ft. in diameter, with a glass-covered opening, behind which a red disk is shown to indicate stop. The disk, very light, made of cloth stretched over a wire, or of aluminium, is supported on a spindle, vjhicb. is delicately balanced on a pivot so that the closing of an electro-magnet lifts

the disk.

SIGNATURE

away from the window and thus indicates " all clear." On the withdrawal or failure of the current the disk falls by gravity to the " stop " position. A local battery is used, with a relay, the rail circuit not being strong enough to lift the disk. In the electro-pneumatic system a full-size semaphore is used. Com- pressed air, from pumps situated at intervals of 10 to 20 m., is conveyed along the line in an iron pipe, and is supplied to a cylinder at each signal, exactly as in pneumatic interlocking, before described. The rail circuit, when complete, maintains pressure in a cylinder, holding the signal " off." On the entrance of a train or the failure of the current, the air is liberated and the signal arm is carried by gravity to the " stop " position.

Automatic signals are sometimes made to stand normally (when no train is in the section) in the " stop " position. The local circuit is connected with the rail circuit so that it is closed only when a train is approaching within, say, 1 m. With the rail circuit, distant signals are controlled, without a line wire, by means of a polarized relay. Each signal, when cleared, changes the polarity of the rail circuit for the next section in its rear, and inis, by the polarized relay, closes the local circuit of the distant signal, without affecting the home signal for that section.

Automatic signals are used in America on a few single lines. The signal at A for the line AB is arranged as before described; and the signal at B, for movements in the opposite direction, is worked by means of a line wire from A, strung on poles. When a section is occupied, signals are set two sections away, so as to provide against the simultaneous entry of two trains.

One of the chief causes of anxiety and difficulty in the working of railway traffic is fog, which practically blots out the whole system P of visible signals, so that while the block telegraph re-

slxnalllnx. mams ; the means of communicating the necessary in- structions to the driver are no longer effective. Delay and confusion immediately arise; and in order to secure safety, speed has to be lessened, trains have to be reduced in number, and a system of " fog-signalling " introduced. In England, especially around London, elaborate arrangements have to be made. " Fog- signalling " consists in the employment of audible signals, or de- tonators, to convey to drivers the information ordinarily imparted by the visible or semaphore signals. As soon as possible after a fog comes on, a

man is stationed at the foot of each distant signal, and generally of each home signal also, who by means of detonators, red and green flags and a hand-lamp, conveys information to the driver of every train as to the position of the semaphore arm. A detonator is a small flat metal case about 2 in. in diameter and J in. deep, furnished with two leaden ears or clips which can be easily bent down to grip the head of the rail. The case contains some detonating composition, which readily explodes with a loud report when a wheel passes over it. As soon as a signal arm is raised to " danger," the fogman places upon one of the rails of the track to which the signal applies two detonators, or in the case of a new and improved class of detonator which contains two separate charges in one case, one detonator, and at the same time exhibits a red flag or light to the driver of an approaching train. The engine of a train passing over the detonators explodes them, the noise so made being sufficient to apprise the driver that the signal, though invisible to him, is at danger, and he then should act in the same way as if he had seen the signal. If, however, the signal arm should be lowered to the " all-right " position before a train reaches it, the fogman should immediately remove the detonators and exhibit a green flag or lamp, replacing the detonators as soon as the signal is again raised to danger. As a rule the fogmen are drawn from the ranks of the permanent-way men, who otherwise would be idle. But if, as sometimes happens, a fog continues for several days, great difficulty is experienced in obtaining sufficient men to carry on this important duty without undue prolongation of their hours of work. When this happens, signalmen, shunters, porters, yardsmen and even clerks may have to be called on to take a turn at " fogging." Some companies have adopted mechanical appliances, whereby a man can place a detonator upon a line of rails or remove it while standing at a distance away from the track, thus enabling him to attend to more than one line without danger to himself. The cost of detonators often amounts to a considerable sum; and an apparatus called an econo- mizer has been introduced, whereby the explosion of one detonator removes the second from the rails before the wheels reach it. As it is only necessary for one detonator to explode, the object of placing two on the rails being merely to guard against a miss-fire, consider- able saving can thus be effected. Many attempts have been made to design a mechanical apparatus for conveying to a driver the re- quisite information as to the state of the signals during a fog, and for enabling the fogmen to be dispensed with. Such inventions usually consist of two parts, namely (1) an inclined plane or block or trigger, placed on the permanent way alongside the track or between the rails, and working in connexion with the arm of the signal ; and (2) a

lever or rod connected with the steam-whistle, or an electric bell or indicator on the foot-plate, and depending from the under-side of the

engine in such a position as to come in contact with the apparatus on the ground, when the latter is raised above the level of the rails. Most of the proposed systems only give an indication when the signal is at danger, and are silent when the signal is off. This is contrary to good practice, which requires that a driver should receive a positive indication both when the signal is " off " as well as when it is " on." If this is not done, a driver may, if the signal is " off " and if the fog is thick, be unaware that he has passed the signal, and not know what part of the line he has reached. The absence of a signal at a place where a signal is usually exhibited should invariably be taken to mean danger. Fog signalling machines that depend on the explosion of detonators or cartridges have the drawback that they require recharging after a certain number of explosions, arying with the nature and size of the machine. Even when a satisfactory form of appliance has been discovered, the manner of using it is by no means simple. It is clearly no use placing such an apparatus im mediately alongside a stop signal, as the driver would receive the intimation too late for him to be able to stop at the required spot. To place devices of this description at or near every stop signal in a large station or busy junction would involve a multiplication of wires or rods which is undesirable. Every such apparatus should certainly be capable of giving an " all-right " signal as well as a " danger " signal. It requires very careful maintenance, and should be in regular daily use to ensure its efficiency.

The fundamental principles of railway signalling are simple,

but the development of the science has called for much study

and a large money outlay. On every railway of any

6 ., ui t 1 / 1 Develop-

consequence the problems of safety, economy and ment0 f

convenience are involved, one with another, and signalling.

cannot be perfectly solved. Even so fundamental a

duty as that of guarding the safety of life and limb is a relative

one when we have to consider whether a certain expenditure is

justifiable for a given safety device. Having good discipline

and foregoing the advantages of high speed, many a manager

has successfully deferred the introduction of signals; others,

having to meet severe competition, or, in Great Britain, under the pressure of the government, have been forced to adopt the most complete apparatus at great cost. In large city terminal stations, where additions to the space are out of the question, interlocking is necessary for economy of time and labour, as, indeed, it is in a less degree at smaller stations also; as a measure of safety, however, it is desirable at even the smallest, and the wise manager extends its use as fast as he is financially able. At crossings at grade level of one railway with another, and at drawbridges, interlocked signals with derailing switches obviate the necessity of stopping all the trains, as formerly was required by law everywhere in America, and saving a stop saves money. The block system was introduced primarily for safety, but where trains are frequent it becomes also an element of economy. Without it trains must usually be run at least five minutes apart (many managers deem seven or ten minutes the shortest safe interval for general use), but with it the interval may be reduced to three minutes, or less, according to the shortness of the block sections. With automatic signals trains are safely run at high speed only i| m. apart, and on urban lines the distance between them may be only a few hundred yards. (B. B. A.; H. M. R.)

SIGNATURE (through Fr. from Lat. signatura, signare, to sign, signum, mark, token, sign), a distinguishing sign or mark, especially the name, or something representing the name, of a

person used by him as affixed to a document or other writing to show that it has been written by him or made in accordance with his wishes or directions (see Autograph, Monogram, &c). In the early sense of something which "signifies," i.e. marks a condition, quality or meaning, the word was formerly also used widely, but now chiefly in technical applications. In old medical theory, plants and minerals were supposed to be marked by some natural sign or symbol which indicated the particular medicinal use to which they could be put; thus yellow flowers were to be used for jaundice, the " scorpion-grass," the old name of the forget-me-not, was efficacious for the bite of the scorpion; many superstitions were based on the human shape of the roots of the mandrake or mandragora; the bloodstone was taken to be a cure for hemorrhage; this theory was known as the " doctrine of signatures." (See T. J. Pettigrew, Superstitions, connected with Medicine or Surgery, 1844.) In printing or book-

Dinding the " signature " is a letter or figure placed at the bottom of the first page of a section of a book, as an assistance to the binder in folding and arranging the sections consecutively; hence it is used of a sheet ready folded. In music it is the term applied to the signs affixed at the beginning of the stave showing the key or tonality and the time or rhythm (see Musical Notation). '

SIGN-BOARD, strictly a board placed or hung before any building to designate its character. The French enseigne in- dicates its essential connexion with what is known in English as a flag (q.v.), and in France banners not infrequently took the place of sign-boards in the middle ages.

Sign-boards, however, are best known in the shape of painted or carved advertisements for shops, inns, &c, they are in fact one of various emblematic methods used from time immemorial for publicly calling attention to the place to which they refer. The ancient Egyptians and Greeks are known to have used signs, and many Roman examples are preserved, among them the widely-recognized bush to in- dicate a tavern, from which is derived the proverb " Good wine needs no bush." In some cases, such as the bush, or the three balls of pawnbrokers, certain signs became identified with certain trades, but apart from these the emblems employed by traders — evolving often into trade-marks — may in great part be grouped according to their various origins. Thus, at an early period the cross or other sign of a religious character was used to attract Christians, whereas the sign of the sun or the moon would serve the same purpose for pagans. Later, the adaptation of the coats of arms or badges of noble families became common ; these would be described by the people without consideration of the language of heraldry, and thus such signs as the Red Lion, the Green Dragon, &c, have become familiar. Another class of sign was that which exhibited merely persons employed in the various trades, or objects typical of them, but in large towns where many practised the same trade, and especially, as was often the case, where these congregated mainly in the same street, such signs did not provide sufficient distinction. Thus a variety of devices came into existence — sometimes the trader used a rebus on his own name (e.g. two cocks for the name of Cox) ; sometimes he adopted any figure of an animal or other object, or portrait of a well-known person, which he considered likely to attract attention. Finally we have the common associa- tion of two heterogeneous objects, which (apart from those representing a rebus) were in some cases merely a whimsical combination, but in others arose from a popular misconception of the sign itself (e.g. the combination of the " leg and star " may have originated in a representation of the insignia of the garter), or from corruption in popular speech (e.g. the com- bination " goat and compasses " is said by some to be a corrup- tion of " God encompasses "). Whereas the use of signs was generally optional, publicans were on a different footing from other traders in this respect. As early as the 14th century there was a law in England compelling them to exhibit signs, for in 1393 the prosecution of a publican for not doing so is recorded. In France edicts were directed to the same end in 1567 and 1577. Since the object of sign-boards was to attract the public, they were often of an elaborate character. Not only were the signs themselves large and sometimes of great artistic merit (especially in the 16th and 17th centuries, when they reached their greatest vogue) but the posts or metal supports protruding from the houses over the street, from which the signs were swung, were often elaborately worked, and many beautiful examples of wrought -iron supports survive both in England and on the Continent. The signs were a prominent feature of the streets of

London at this period. But here and in other large towns they became a danger and a nuisance in the narrow ways. Already in 1669 a royal order had been directed in France against the excessive size of sign-boards and their projection too far over the streets. In Paris in 1761 and in London about 1762-1773 laws were introduced which gradually compelled sign-boards to be removed or fixed flat against the wall. For the most part they only survived in connexion with inns, for which some of the greatest artists of the time painted sign-boards, usually

representing the name of the inn. With the gradual abolition of sign-boards the numbering of houses began to be introduced in the 18th century in London. It had been attempted in Paris as early as 151 2, and had become almost universal by the close of the 18th century, though not enforced until 1805. It appears to have been first introduced into London early in the 18th century. Pending this development, houses which carried on trade at night (e.g. coffee houses, &c.) had various specific arrange- ments of lights, and these still survive to some extent, as in the case of doctors' dispensaries and chemists' shops.

See Jacob Larwood and John Camden Hotten, History of Sign- boards (London, 1866).

SIGNIA (mod. Segni), an ancient town of Latium (adiectum), Italy, on a projecting lower summit of the Volscian mountains, above the Via Latina, some 35 m. S.E. of Rome. The modern railway station, 33 m. S.E. of Rome, lies 5 m. S.E. of Signia, 669 ft. above sea level. The modern town (2192 ft.) occupies the lower part of the ancient site. Pop. (1901) 6942. Its founda- tion as a Roman colony is ascribed to Tarquinius Superbus, and new colonists were sent there in 495 B.C. Its position was certainly of great importance: it commands a splendid view, and with Anagnia, which lies opposite to it, guarded the approach to the valley of the Trerus or Tolerus (Sacco) and so the road to the south. It remained faithful to Rome both in the Latin and in the Hannibalic wars, and served as a place of detention for the Carthaginian hostages during the latter. It seems to have re- mained a place of some importance. Like Cora it retained the right of coining in silver. The wonderfully hard, strong cement, made partly of broken pieces of pottery, which served as the lining for Roman water cisterns (opus signinum) owes its name to its invention here (Vitruvius, viii. 7, 14). Its wine, pears and charcoal were famous in Roman times. In 90 B.C. it became a municipium with a senatus and praetores. In the civil war it joined the democratic party, and it was from here that in 82 B.C. Marius marched to Sacriportus (probably marked by the medieval castle of Piombinara, near Segni station, commanding the junction of the Via Labicana and the Via Latina; see T. Ashby, Papers of the British School at Rome, London, 1902, i. 125 sqq.), where he was defeated with loss. After

this we hear no more of Signia until, in the middle ages, it became a papal fortress.

The city wall, constructed of polygonal blocks of the mountain limestone and i| m. in circumference, is still well preserved and has several gates; the largest, Porta Saracinesca, is roofed by the gradual inclination of the sides until they are close enough to allow of the placing of a lintel. The other gates, are mostly narrow posterns covered with flat monolithic lintels, and the careful jointing of the blocks of which some of them are composed may be noted. Their date need not be so early as is generally believed (cf. Norba) and they are certainly not pre-Roman. A portion of the wall in the modern town has been restored in opus quadratum. of tufa in Roman times. Above the modern town, on the highest point, is the church of S. Pietro, occupying the central cella of the ancient Capitolium of Signia (which had three cellae) . The walls consist of rectangular blocks of tufa, and the whole rests upon a platform of polygonal masses of limestone (see R. Delbriick, Das Capitolium von Signia, Rome, 1903). An open circular cistern in front of the church lined with rect- angular blocks of tufa may also be noted. (T. As.)

SIGNIFICS. The term " Signifies " may be defined as the science of meaning or the study of significance, provided sufficient recognition is given to its practical aspect as a method of mind, one which is involved in all forms of mental activity, including that of logic.

In Baldwin's Dictionary of Philosophy and Psychology (1901- 1905) the following definition is given: —

" I. Signifies implies a careful distinction between (a) sense or signification, (b) meaning or intention and © significance or ideal worth. It will be seen that the reference of the first is mainly verba! (or rather sensal), of the second volitional, and of the third moral (e.g. we speak of some event ' the significance of which cannot be overrated,' and it would be impossible in such a case to substitute the ' sense ' or the ' meaning ' of such event, without serious loss).

Signifies treats of the relation of the sign in the widest sense to each of these.

2. A proposed method of mental training aiming at the concentra- tion of intellectual activities on that which is implicitly assumed to constitute the primary and ultimate value of every form of study, i.e. what is at present

indifferently called its meaning or sense, its import or significance. . . . Signifies as a science would centralise and co-ordinate, interpret, inter-relate and concentrate the efforts to bring out meanings in every form, and in so doing to classify the various applications of the signifying property clearly and distinctly."

Since this dictionary was published, however, the subject has undergone further consideration and some development, which necessitate modifications in the definition given. It is clear that stress needs to be laid upon the application of the principles and method involved, not merely, though notably, to language, but to all other types of human function. There is need to insist on the rectification of mental attitude and increase of inter- pretative power which must follow on the adoption of the significal view-point and method, throughout all stages and forms of mental training, and in the demands and contingencies of life.

In so far as it deals with linguistic forms, Signifies includes " Semantics," a branch of study which was formally introduced and expounded in 1897 by Michel Breal, the distinguished French philologist, in his Essai de simantique. In 1900 this book was translated into English by Mrs Henry Cust, with a preface by Professor Postgate. M. Breal gives no more precise definition than the following: —

" Extraire de la linguistique ce qui en ressort comme aliment pour la reflexion et — je ne crains pas de l'ajouter — comme regie pour not re propre langage, puisque chacun de nous collabore pour sa part a revolution de la parole humaine, voila ce qui merite d'etre mis en lumiere, voila ce qui j'ai essaye de faire en ce volume."

In the Dictionary of Philosophy and Psychology Semantics is defined as " the doctrine of historical word-meanings; the systematic discussion of the history and development of changes in the meanings of words." It may thus be regarded as a reform and 'extension of the etymological method, which applies to contemporary as well as to traditional or historical derivation. As human interests grow in constantly specialized directions, the vocabulary thus enriched is unthinkingly borrowed and re- borrowed on many sides, at first in definite quotation, but soon in unconscious or deliberate adoption. Semantics may thus, for present purposes, be described as the application of Signifies within strictly philological limits; but it does not include the study and classification of the " Meaning " terms themselves, nor the attainment of a clear recognition of their radical import- ance as rendering, well or ill, the expressive value not only of sound and script but also of all fact or occurrence which demands and may arouse profitable attention.

The first duty of the Significian is, therefore, to deprecate the demand for mere linguistic reform, which is indispensable on its own proper ground, but cannot be considered as the satisfaction of a radical need such as that now suggested. To be content with mere reform of articulate expression would be fatal to the prospect of a significantly adequate language; one characterized by a development only to be compared to that of the life and mind of which it is or should be naturally the delicate, flexible, fitting, creative, as also controlling and ordering, Expression.

The classified use of the terms of expression-value suggests three main levels or classes of that value — those of Sense, Meaning and Significance.

(a) The first of these at the outset would naturally be associated with Sense in its most primitive reference; that is, with the organic response to environment, and with the essentially expressive element in all experience. We ostracize the senseless in speech, and also ask " in what sense " a word is used or a statement may be justified.

(b) But " Sense" is not in itself purposive; whereas that is the main character of the word " Meaning," which is properly reserved for the specific sense which it is intended to convey.

(c) As including sense and meaning but transcending them in range, and covering the far-reaching consequence, implication, ultimate result or outcome of some event or experience, the term " Significance " is usefully applied.

These are not, of course, the only significal terms in common use, though perhaps sense and significance are on the whole the most consistently employed. We have also signification, pur- port, import, bearing, reference, indication, application, implica- tion, denotation and connotation, the weight, the drift, the tenour, the lie, the trend, the range, the tendency, of given statements. We say that this fact suggests, that one portends, another carries, involves or entails certain consequences, or justifies given inferences. And finally we have the value of all forms of expression; that which makes worth while any assertion or proposition, concept, doctrine or theory; the definition of scientific fact,, the use of symbolic method, the construction of mathematical formulae, the playing of an actor's part, or even art itself, like literature in all its forms.

The distinctive instead of haphazard use, then, of these and like terms would soon, both as clearing and enriching it, tell for good on our thinking. If we considered that any one of them were senseless, unmeaning, insignificant, we should at once in ordinary usage and in education disavow and disallow it. As it is, accepted idiom may unconsciously either

illuminate or con- tradict experience. We speak, for instance, of going through trouble or trial; we never speak of going through well-being. That illuminates. But also we speak of the Inner or Internal as alternative to the spatial — reducing the spatial to the External. The very note of the value to the philosopher of the " Inner " as opposed to the " Outer " experience is that a certain example or analogue of enclosed space — a specified inside — is thus not measurable. That obscures. Such a usage, in fact, implies that, within enclosing limits, space sometimes ceases to exist. Com- ment is surely needless.

The most urgent reference and the most promising field for Signifies lie in the direction of education. The normal child, with his inborn exploring, significating and comparing tendencies is so far the natural Significian. At once to enrich and simplify language would for him be a fascinating endeavour. Even his crudeness would often be suggestive. It is for his elders to supply the lacking criticism out of the storehouse of racial experience, acquired knowledge and ordered economy of means; and to educate him also by showing the dangers and drawbacks of uncontrolled linguistic, as other, adventure. Now the evidence that this last has virtually been hitherto left undone and even reversed, is found on careful examination to be overwhelming. 1 Unhappily what we have so far called education has, anyhow for centuries past, ignored — indeed in most cases even balked — – the instinct to scrutinise and appraise the value of all that exists or happens within our ken, actual or possible, and fittingly to express this.

Concerning the linguistic bearing of Signifies, abundant evidence has been collected, often in quarters where it would least be expected —

1. Of general unconsciousness of confusion, defeat, anti- quation and inadequacy in language.

2. A. Of admission of the fact in given cases, but plea of helplessness to set things right. B. Of protest in such cases and suggestions for improvement.

3. Of direct or implied denial that the evil exists or is serious, and of prejudice against any attempt at concerted control and direction of the most developed group of languages.

4. Of the loss and danger of now unworthy or misfitting imagery and of symbolic assertion, observance or rite, once both worthy and fitting.

5. Of the entire lack, in education, of emphasis on the indis- pensable means of healthy mental development, i.e. the removal of linguistic hindrances and the full exploitation and expansion of available resources in language.

6. Of the central importance of acquiring a clear and orderly use of the terms of what we vaguely call ” Meaning “; and also of the active modes, by gesture, signal or otherwise, of conveying intention, desire, impression and rational or emotional thought.

1 It would be impossible of course in a short space to prove this contention. But the proof exists, and it is at the service of those who quite reasonably may deny its possible existence.

7. Finally and notably, of the wide-spread and all-pervading navoc at present wrought by the persistent neglect, in modern civilization, of the factor on which depends so much of our practi- cal and intellectual welfare and advance.

As the value of this evidence is emphatically cumulative, the few and brief examples necessarily torn from their context for which alone room could here be found would only be misleading. A selection, however, from the endless confusions and logical absurdities which are not only tolerated but taught without correction or warning to children may be given.

We speak of beginning and end as complementary, and then of ” both ends “; but never of both beginnings. We talk of truth when we mean accuracy: of the literal (” it is written “) when we mean the actual (” it is done “)• Some of us talk of the mystic and his mysticism, meaning by this, enlightenment, dawn heralding a day; others (more justly) mean by it the mystifying twilight, darkening into night. We talk of the un- knowable when what that is or whether it exists is precisely what we cannot know — the idea presupposes what it denies; we affirm or deny immortality, ignoring its correlative innatality; we talk of solid foundations for life, for mind, for thought, when we mean the starting-points, foci. We speak of an eternal sleep when the very raison d’etre of sleep is to end in awaking — it is not sleep unless it does; we appeal to a root as to an origin, and also figuratively give roots to the locomotive animal. We speak of natural ” law ” taking no count of the sub-attentive working in the civilized mind of the associations of the legal system (and the law court) with its decreed and enforced, but also revocable or modifiable enactments. Nature, again, is in- differently spoken of as the norm of all order and fitness, the desecration of which is reprobated as the worst form of vice and is even motherly in bountiful provision; but also as a monster of reckless cruelty and tyrannous

mockery. Again, we use the word " passion " for the highest activity of desire or craving, while we keep " passive " for its very negation.

These instances might be indefinitely multiplied. But it must of course be borne in mind that we are throughout dealing only with the idioms and habits of the English language. Each civilized language must obviously be dealt with on its own merits.

The very fact that the significating and interpretative function is the actual, though as yet little recognized and quite unstudied condition of mental advance and human achievement, accounts for such a function being taken for granted and left to take care of itself. This indeed, in pre-civilized ages (since it was then the very condition of safety and practically of survival) , it was well able to do. But the innumerable forms of pro- tection, precaution, artificial aid and special facilities which modern civilization implies and provides and to which it is always adding, have entirely and dangerously changed the situation. It has become imperative to realize the fact that through disuse we have partly lost the greatest as the most universal of human prerogatives. Hence arises the special difficulty of clearly showing at this stage that man has now of set purpose to recover and develop on a higher than the primitive plane the sovereign power of unerring and productive interpretation of a world which even to a living, much more to an intelligent, being, is essentially significant. These conditions apply not only to the linguistic but to all forms of human energy and expression, which before all else must be significant in the most active, as the highest, sense and degree. Man has from the outset been organizing his experience; and he is bound correspondingly to organize the expression of that experience in all phases of his purposive activity, but more especially in that of articulate speech and linguistic symbol. This at once introduces the volitional element ; one which has been strangely eliminated from the very, function which most of all needs and would repay it.

One point must here, however, be emphasised. In attempting to inaugurate any new departure from habitual thinking, history witnesses that the demand at its initial stage for unmistakably clear exposition must be not only unreasonable but futile. This bf course must be typically so in the case of an appeal for the vital

regeneration of all modes of Expression and especially of Language, by the practical recognition of an ignored but governing factor working at its very inception and source. In fact, for many centuries at least, the leading civilizations of the world have been content to perpetuate modes of speech once entirely fitting but now often grotesquely inappropriate, while also remaining content with casual changes often for the worse and always liable to inconsistency with context. This inevitably makes for the creation

of a false standard both of lucidity and style in linguistic expression.

Still, though we must be prepared to make an effort in assuming what is virtually a new mental attitude, the effort will assuredly be found fully worth making. For there is here from the very first a special compensation. If, to those whose education has followed the customary lines, nowhere is the initial difficulty of moving in a new direction greater than in the one termed Signifies, nowhere, correspondingly, is the harvest of advantage more immediate, greater, or of wider range and effort.

It ought surely to be evident that the hope of such a language; of a speech which shall worthily express human need and gain in its every possible development in the most efficient possible way, depends on the awakening and stimulation of a sense which it is our common and foremost interest to cultivate to the utmost on true and healthy lines. This may be described as the im- mediate and insistent sense of the pregnancy of things, of the actual bearings of experience, of the pressing and cardinal im- portance, as warning or guide, of that experience considered as indicative; a Sense realized as belonging to a world of what for us must always be the Sign of somewhat to be inferred, acted upon, used as a mine of pertinent and productive symbol, and as the normal incitant to profitable action. When this germinal or primal sense — as also the practical starting-point, of language — has become a reality for us, reforms and acquisitions really needed will naturally follow as the expression of such a recovered command of fitness, of boundless capacity and of perfect coherence in all modes of expression.

One objection, however, which before this will have suggested itself to the critical reader, is that if we are here really dealing with a function which must claim an importance of the very first rank and affect our whole view of life, practical and theoretical, the need could not have failed long ago to be recognised and acted upon. And indeed it is not easy in a few words to dispose of such an objection and to justify so venturesome an apparent paradox as that with which we are now concerned. But it may be pointed out that the special development of one faculty always entails at least the partial atrophy of another. In a case like this the principle typically applies. For the main human acquirement has been almost entirely one of logical power, subtle analysis, and co-ordination of artificial means. In modern civilization the application of these functions to an enormous growth of invention of every kind has contributed not a little to the loss of the swift and direct sense of point : the sensitiveness as it were of the compass-needle to the direction in which experi- ence was moving. Attention has been forcibly drawn elsewhere; and moreover, as already pointed out, the natural insight of children, which might have saved the situation, has been methodically silenced by a discipline called educative, but mainly

suppressive and distortive.

The biological history of Man has been, indeed, a long series of transmutations of form to subserve higher functions. In language he has so far failed to accomplish this. There has even in some directions been loss of advantage already gained. While his nature has been plastic and adaptive, language, the most centrally important of his acquirements, has remained relatively rigid, or what is just as calamitous, fortuitously elastic. There have been notable examples — the classical languages — of the converse process. In Greek and Latin, Man admirably con- trolled, enriched, varied, significated his expressions to serve his mental needs. But we forbear ourselves to follow and better this example. All human energies have come under orderly direction and control except the one in which in a true sense they all depend. This fatal omission, for which defective methods

of education are mainly responsible, has disastrously told upon the mental advance of the race. But after all, we have here a comparatively modern neglect and helplessness. Kant, for instance, complained bitterly of the defeating tendency of language in his day, as compared with the intelligent freedom of the vocabulary and idiom of the " classical " Greek, who was always creating expression, moulding it to his needs and finding an equally intelligent response to his efforts, in his listeners and readers — in short, in his public.

Students, who are prepared seriously to take up this urgent question of the application of Signifies in education and through- out all human spheres of interest, will soon better any instruction that could be given by the few who so far have tentatively striven to call attention to and bring to bear a practically ignored and unused method. But by the nature of the case they must be prepared to find that accepted language, at least in modern European forms, is far more needlessly defeating than they have supposed possible: that they themselves in fact are continually drawn back, or compelled so to write as to draw back their readers, into what is practically a hotbed of confusion, a prison of senseless formalism and therefore of barren controversy.

It can hardly be denied that this state of things is intolerable and demands effectual remedy. The study and systematic and practical adoption of the natural method of Signifies can alone lead to and supply this. Signifies is in fact the natural response to a general sense of need which daily becomes more undeniably evident. It founds no school of thought and advocates no

techni- cal specialism. Its immediate and most pressing application is, as already urged, to elementary, secondary and specialised education. In recent generations the healthy sense of discontent and the natural ideals of interpretation and expression have been discouraged instead of fostered by a training which has not only tolerated but perpetuated the existing chaos. Signs, however, are daily increasing that Signifies, as implying the practical recognition of, and emphasising the true line of advance in, a recovered and enhanced power to interpret experience and adequately to express and apply that power, is destined, in the right hands, to become a socially operative factor of the first importance.

Literature. — Lady Welby, "Sense, Meaning and Interpretation," in Mind (January and April 1896), Grains of Sense (1897), What is Meaning? (1903); Professor F. Tonnies, " Philosophical Termino- logy " (Welby Prize Essay), Mind (July and October 1899 and January 1900), also article in Jahrbuch, &c, and supplements to Philosophische Terminologie (December 1906) ; Professor G. F. Stout, Manual of Psychology (1898) ; Sir T. Clifford Allbutt's Address on " Words and Things " to the Students' Physical Society of Guy's Hospital (October 1906); Mr W. J. Greenstreet's " Recent Science " articles in the Westminster Gazette (November 15, 1906, and January 10, 1907). (V. W.)

SIGN-MANUAL, ROYAL, the autograph signature of the sovereign, by which he expresses his pleasure either by order, commission or warrant. A sign-manual warrant may be either an executive act, e.g. an appointment to an office, or an authority for affixing the Great Seal. It must be countersigned by a principal secretary of state or other responsible minister. A royal order under the sign-manual, as distinct from a sign-manual warrant, authorizes the expenditure of money, e.g. appropriations. There are certain offices to which appointment is made by com- mission under the great seal, e.g. the appointment of an officer in the army or that of a colonial governor. The sign-manual is also used to give power to make and ratify treaties. In certain cases the use of the sign-manual has been dispensed with, and a stamp affixed in lieu thereof, as in the case of George IV., whose bodily infirmity made the act of signing difficult and painful during the last weeks of his life. A special act was passed pro- viding that a stamp might be affixed in lieu of the sign-manual (n Geo. IV. c. 23), but the sovereign had to express his consent to each separate use of the stamp, the stamped document being attested by a confidential servant and several officers of state (Anson, Law and Custom of the Constitution, 1907, vol. ii. pt. i. p. 59).

SIGNORELLI, LUCA (c. 1442-c. 1524), Italian painter, was born in Cortona — his full name being Luca d'Egidio di Ventura;

he has also been called Luta da Cortona. The precise date of his birth is uncertain; but, as he is said to have died at the age of eighty-two, and as he was certainly alive during some part of 1524, the birth-date of 1442 must be nearly correct'. He belongs to the Tuscan school, associated with that of Umbria. His first impressions of art seem to be due to Perugia — the style of Bonfigli, Fiorenzo and Pinturicchio. Lazzaro Vasari, the great-grandfather of Giorgio Vasari, the historian of art, was brother to Luca's mother; he got Luca apprenticed to Piero de' Fran- ceschi. In 1472 the young man was painting at Arezzo, and in 1474 at Citta. di Castello. He presented to Lorenzo de' Medici a picture which is probably the one named the " School of Pan," discovered some years ago in Florence, and now belonging to the Berlin gallery; it is almost the same subject which he painted also on the wall of the Petrucci palace in Siena — the principal figures being Pan himself, Olympus, Echo, a man reclining on the ground and two listening shepherds. He executed, moreover, various sacred pictures, showing a study of Botticelli and Lippo Lippi. Pope Sixtus IV. commissioned Signorelli to paint some frescoes, now mostly very dim, in the shrine of Loreto — Angels, Doctors of the Church, Evangelists, Apostles, the Incredulity of Thomas and the Conversion of St Paul. He also executed a single fresco in the Sistine Chapel in Rome, the " Acts of Moses " ; another, " Moses and Zipporah," which has been usually ascribed to Signorelli, is now recognized as the work of Perugino. Luca may have stayed in Rome from 1478 to 1484. In the latter year he returned to his native Cortona, which remained from this time his ordinary home. From 1497 he began some professional excursions. In Siena, in the convent of Chiusuri, he painted eight frescoes, forming part of a vast series of the life of St Benedict; they are at present much injured. In the palace of Pandolfo Petrucci he worked upon various classic or mythological subjects, including the " School of Pan " already mentioned. From Siena he went to Orvieto, and here he produced the works which, beyond all others, stamp his greatness in art. These are the frescoes in the chapel of S. Brizio, in the cathedral, which already contained some pictures on the vaulting by Fra Angelico. The works of Signorelli represent the " Last Days of the Mundane Dispensation," with the " Pomp and the Fall of Antichrist," and the " Eternal Destiny of Man," and occupy three vast lunettes, each of them a single picture. In one of them, Anti- , christ, after his portents and impious glories, falls headlong from the sky, crashing down into an innumerable crowd of men and women. " Paradise," the " Elect and the Condemned," " Hell," the " Resurrection of the Dead," and the " Destruction of the Reprobate " follow in other compartments. To Angelica's ceiling Signorelli added a section showing figures blowing trumpets, &c; and in another ceiling he depicted the Madonna, Doctors of the Church, Patriarchs and Martyrs. There is also a great deal of subsidiary work connected with Dante, and with the poets and legends of antiquity. The daring and terrible

invention of the great compositions, with their powerful treat- ment of the nude and of the most arduous foreshortenings, and the general mastery over complex grouping and distribution, marked a development of art which had never previously been attained. It has been said that Michelangelo felt so strongly the might of Signorelli's delineations that he borrowed, in his own " Last Judgment," some of the figures or combinations which he found at Orvieto; this statement, however, has not been verified by precise instances. The contract for Luca's work is still on record. He undertook on 5th April 1499 to complete the ceiling for 200 ducats, and to paint the walls for 600, along with lodging, and in every month two measures of wine and two quarters of corn. Signorelli's first stay in Orvieto lasted not more than two years. In 1 502 he returned to Cortona, and painted a dead Christ, with the Marys and other figures. Two years later he was once more back in Orvieto, and completed the whole of his work in or about that time, i.e. some two years before 1506 — a date famous in the history of the advance of art, when Michel- angelo displayed his cartoon of Pisa.

After finishing off at Orvieto, Signorelli was much in Siena. In 1507 he executed a great altarpiece for S. Medardo at Arcevia

in Umbria — the " Madonna and Child," with the " Massacre of the Innocents " and other episodes. In 1508 Pope Julius II. determined to readorn the camere of the Vatican, and he sum- moned to Rome Signorelli, in company with Perugino, Pinturic- chio and Bazzi (Sodoma). They began operations, but were shortly all superseded to make way for Raphael, and their work was taken down. Luca now returned to Siena, living afterwards for the most part in Cortona. He continued constantly at work, but the performances of his closing years were not of special mark. In 1520 he went with one of his pictures to Arezzo. Here he saw Giorgio Vasari, aged eight, and encouraged his father to second the boy's bent for art. Vasari tells a pretty story how the wellnigh octogenarian master said to him " Impara, parentino " (" You must study, my little kinsman "), and clasped a jasper round his neck as a preservative against nose-bleeding, to which the child was subject. He was partially paralytic when he began a fresco of the " Baptism of Christ " in the chapel of Cardinal Passerini's palace near Cortona, which (or else a '" Coronation of the Virgin " at Foiano) is the last picture of his specified. Signorelli stood in great repute not only as a painter but also as a citizen. He entered the magistracy of Cortona as early as 1488, and in 1524 held a leading position among the magistrates of his native place. In or about the year 1524 he died there.

Signorelli from an early age paid great attention to anatomy, carrying on his studies in burial grounds. He surpassed all his con- temporaries in showing the structure and mechanism of the nude in immediate action; and he even went beyond nature in experi- ments of this kind, trying hypothetical attitudes and combinations. His drawings in the Louvre demonstrate this and bear a close analogy to the method of Michelangelo. He aimed at powerful truth rather than nobility of form; colour was comparatively neglected, and his chiaroscuro exhibits sharp oppositions of lights and shadows. He had a vast influence over the painters of his own and of succeeding times, but had no pupils or assistants of high mark; one of them was a nephew named Francesco He was a married man with a family ; one of his sons died, seemingly through some sudden casualty, and Luca depicted the corpse with sorrow- ful but steady self-possession. He is described as full of kindliness and amiability, sincere, courteous, easy with his art assistants, of fine manners, living and dressing well; indeed, according to Vasari, he always lived more like a nobleman than a painter. The Torri- giani Gallery in Florence contains a grand life-sized portrait by Signo- relli of a man in a red cap and vest ; this is said to be the likeness of the painter himself, and corresponds with Vasari's observation. In the National Gallery, London, are the " Circumcision of Jesus " and three other works.

See R. Vischer, Signorelli und die italienische Renaissance (1879); Burlington Fine Arts Club, Exhibition of Work of Signorelli, &c. (1893); M. Crutwell, Luca Signorelli (1899). (W. M. R.)

SIGONIUS, CAROLUS [Carlo Sigonio or Sigone] (c. 1524- 1584), Italian humanist, was born at Modena. Having studied Greek under the learned Franciscus Portus of Candia, he attended the philosophical schools of Bologna and Pavia, and in 1545 was elected professor of Greek in his native place in succession to Portus. In 1552 he was appointed to a professorship at Venice, which he exchanged for the chair of eloquence at Padua in 1560. To this period of his life belongs the famous quarrel with Rober- telli, due to the publication by Sigonius of a treatise De nominibus Romanorum, in which he corrected several errors in a work of Robertelli on the same subject. The quarrel was patched up by the intervention of Cardinal Seripando (who purposely stopped on his way to the Council of Trent), but broke out again in 1562, when the two rivals found themselves colleagues at Padua. Sigonius, who was of a peaceful disposition, thereupon accepted (in 1 563) a call to Bologna. He died in a country house purchased by him in the neighbourhood of Modena, in August 1 584. The last year of his life was embittered by another literary dispute. In 1583 there was published at Venice what purported to be Cicero's Consolatio, written as a distraction from his grief at the death of his daughter Tullia. Sigonius declared that, if not genuine, it was at least

worthy of Cicero; those who held the opposite view (Antonio Riccoboni, Justus Lipsius, and others) asserted that Sigonius himself had written it with the object of deceiving the learned world, a charge which he explicitly denied. The work is now universally regarded as a forgery, whoever may

have been the author of it. Sigonius's reputation chiefly rests upon his publications on Greek and Roman antiquities, which may even now be consulted with advantage: Fasti consular es (1550; new ed., Oxford, 1802), with commentary, from the regal period to Tiberius, the first work in which the history of Rome was set forth in chronological order, based upon some fragments of old bronze tablets dug up in 1547 on the site of the old Forum; an edition of Livy with the Scholia; De antiquo jure Romanorum, Italiae, provinciarum (1560) and De Romanae juris- prudential judiciis (1574); De republica Alheniensium (1564) and De Atheniensium et Lacedaemoniorum temporibus (1565), the first well-arranged account of the constitution, history, and chronology of Athens and Sparta, with which may be mentioned a similar work on the religious, political, and military system of the Jews (De republica Ebraeorum). His history of the kingdom of Italy (De regno Italiae, 1580) from the invasion of the Lombards (568) to the end of the 13th century forms a companion volume to the history of the western empire (De occidentali imperio, 1579) from Diocletian to its destruction. In order to obtain material for these works, Sigonius consulted all the archives and family chronicles of Italy, and the public and private libraries, and the autograph MS. of his De regno Italiae, containing all the preliminary studies and many docu- ments not used in print, was discovered in the Ambrosian library of Milan. At the request of Gregory XIII. he undertook to write the history of the Christian Church, but did not live to complete the work.

The most complete edition of his works is that by P. Argelati (Milan, 1732-1737), which contains his life by L. A. Muratori, the only trustworthy authority for the biographer; see also G. Tira- boschi, Storia delta letteratura italiana, vii. ; Ginguene, Histoire litteraire d'ltalie; J. P. Krebs, Carl Sigonius (1840), including some Latin letters of Sigonius and a complete list of his works in chrono- logical order; Franciosi, Delia vita e delle opere di Carlo Sigonio (Modena, 1872); Hessel, De regno Italiae libri XX. von Carlo Sigonio, eine quellenkritische Untersuchung (1900) ; and J. E. Sandys, History of Classical Scholarship, ii. (1908), p. 143.

SIGOURNEY, LYDIA HUNTLEY (1791-1865), American author, was born in Norwich, Connecticut, on the 1st of September 1791. She was educated in Norwich and Hartford. After conducting a private school for young ladies in Norwich, she conducted a similar school in Hartford from 1814 until 1819, when she was married to Charles Sigourney, a Hartford merchant. She contributed more than two thousand articles to many

(nearly 300) periodicals, and wrote more than fifty books. She died in Hartford, on the 10th of June 1865. Her books include Moral Pieces in Prose and Verse (181 5); Traits of the Aborigines of America (1822), a poem; A Sketch of Connecticut Forty Years Since (1824); Poems (1827); Letters to Young Ladies (1833), one of her best-known books; Sketches (1834); Poetry for Children (1834); Zinzendorf, and Other Poems (1835); Olive Buds (1836); Letters to Mothers (1838), republished in London; Pocahontas, and Other Poems (1841); Pleasant Memories of Pleasant Lands (1842), descriptive of her trip to Europe in 1840; Scenes in My Native Land (1844); Letters to My Pupils (1851); Olive Leaves (1851); The Faded Hope (1852), in memory of her only son, who died when he was nineteen years old; Past Meridian (1854); The Daily Counsellor (1858), poems; Gleanings (i860), selections from her verse; The Man of Uz, and Other Poems (1862); and Letters of Life (1866), giving an account of her career. She was one of the most popular writers of her day, both in America and in England, and was called " the American Hemans." Her writings were characterized by fluency, grace and quiet reflection on nature, domestic and religious life, and philanthropic questions; but they were too often sentimental, didactic and commonplace to have much literary value. Some of her blank verse and pictures of nature suggest Bryant. Among her most successful poems are " Niagara " and " Indian Names." Throughout her life she took an active interest in philanthropic and educational work.

SIGURD (Sigurdr) or Siegfried (M. H. G. Stfrit), the hero of the Nibelungenlied, and of a number of Scandinavian poems included in the older Edda, as well as of the prose Vblsunga Saga, which is based upon the latter. According to both the

German and Scandinavian authorities he was the son of a certain Sigmundr (Siegmund), a king in the Netherlands, or the " land of the Franks." The exploits of this Sigmundr and his elder sons Sinfiotli and Helgi form the subject of the earlier parts of Volsunga Saga, and Siegmund and Fitela {i.e. Sinfiotli) are also mentioned in the Anglo-Saxon poem Beowulf. According to the Scandinavian story Sigmundr was slain in battle before the birth of Sigurd, but the German story makes him survive his son. Sigurd acquired great fame and riches by slaying the dragon Fafnir, but the chief interest of the story centres round his connexion with the court of the Burgundian king Gunnar (Gunther). He married GuSrun (Kriemhild), the sister of that king, and won for him by a stratagem the hand of the Valkyrie Brynhildr, with whom he had himself previously exchanged vows

of love. A quarrel arose between Brynhildr and GuSrun, in the course of which the former learnt of the deception which had been practised upon her and this led eventually to the murder of Sigurd. According to the Scandinavian version he was slain by his brother-in-law Guttorm, according to the German version by the knight Hagen. Gunther's brothers were subsequently slain while visiting Atli (Etzel), who married Guorun after Sigurd's death. According to the German story they were killed at the instigation of Kriemhild in revenge for Siegfried. The Scandinavian version of the story attributes the deed to Atli's lust for gold.

The story of Sigurd has given rise to more discussion than any other subject connected with the Teutonic heroic age. Like Achilles he is represented as the perfect embodiment of the ideals of the race, and, as in the case of the Greek hero, it is customary to regard his personality and exploits as mythical. There is no question, however, that the Burgundian king who is said to have been his brother-in-law was an historical person who was slain by the Huns, at the time when the Burgundian kingdom was overthrown by the latter. Sigurd himself is not mentioned by any contemporary writer; but, apart from the dragon incident, there is nothing in the story which affords sufficient justification for regarding his personality as mythical. Opinions, however, vary widely as to the precise proportions of history and fiction which the story contains. The story of Siegfried in Richard Wagner's famous opera-cycle Der Ring der Nibelungen is mainly taken from the northern version; but many features, especially the characterization of Hagen, are borrowed from the German story, as is also the episode of Siegfried's murder in the forest.

See Nibelungenlied and also R. Heinzel, " Uber die Nibe- lungensage," in Sitzungsberichte der K. Akademie der Wissenschaften (Vienna, 1885); H. Lichtenberger, Le Poeme el la legende des Nibe- lungen (Paris, 1891); B.Symons, "Heldensage" inH. Paul's Grundriss der germ. Philologie, vol. iii. (Strassburg, 1900) ; and R. C. Boer, Untersuchungen uber den Ursprung und die Entwicklung der Nibe- lungensage (Halle, 1906). AlsoT. Abeling, Nibelungenlied (1907).

(F. G. M. B.)

SIGURSSSON, JON (1811-1879), Icelandic statesman and man of letters, was born in the west of Iceland in 181 1. He came of an old family, and received an excellent education. In 18.30 he was secretary to the bishop of Iceland, the learned Steingrimr Tonsson. In 1833 he went to the university of Copenhagen and devoted himself to the study of Icelandic history and literature. His name soon became prominent in the learned world, and it may safely be said that most of his historical works and his editions of Icelandic classics have never been surpassed for acute criticism and minute

painstaking. Of these we may mention Logsognmannatal og Lbgmanna a I standi ("Speakers of the Law and Law-men in Iceland"); his edition of Landndma and other sagas in Islendinga Sogur, i.-ii. (Copenhagen, 1843-1847) ; the large collection of Icelandic laws edited by him and Oddgeir Stephensen; and last, not least, the Diplomatarium Islandicum, which after his death was con- tinued by others. But although he was one of the greatest scholars Iceland has produced, he was still greater as a politician. The Danish rule had, during the centuries following the Reforma- tion, gradually brought Iceland to the verge of economic ruin; the ancient Parliament of the island, which had degenerated

to a mere shadow, had been abolished in 1800; all the revenue of Iceland went into the Danish treasury, and only very small sums were spent for the good of the island; but worst of all was the notorious monopoly which gave away the whole trade of Iceland to a single Danish trading company. This monopoly had been abolished in 1787, and the trade had been declared free to all Danish subjects, but practically the old arrangement was continued under disguised forms. Jon Sigurosson began a hard struggle against the Danish government to obtain a reform. In 1854 the trade of Iceland was declared free to all nations. In 1840 the Althing was re-established as an advisory, not as a legislative body. But when Denmark got a free constitution in 1848, which had no legal validity in Iceland, the island felt justified in demanding full home rule. To this the Danish government was vehemently opposed; it convoked an Icelandic National Assembly in 185 1, and brought before that body a bill granting Iceland small local liberties, but practically incorpor- ating Iceland in Denmark. This bill was indignantly rejected, and, instigated by Jon Sigurosson, another was demanded of far more liberal tendencies. The Danish governor-general then dissolved the assembly, but Jon SigurSsson and all the members with him protested to the king against these unlawful proceedings. The struggle continued with great bitterness on both sides, but gradually the Danish government was forced to grant many important reforms. High schools were established at Reykjavik, and efforts made to better the trade and farming of the country. In 1871 the Danish parliament (Riksdag) passed a law defining the political position of Iceland in the Danish monarchy, which, though never recognized as valid by the Icelanders, became dc facto the base of the political relations of Iceland and Denmark. At last, in 1874, when King Christian IX. visited Iceland at the festival commemorating the millenary of the colonization of Iceland from Norway, he gave to the country a Constitution, with full home rule in all internal matters. An immense victory was gained, entirely due to Jon SigurSsson, whose high personal qualities had rallied all the nation round him. He was a man of fine appearance, with an eloquence and diplomatic gifts such as no others of his countrymen possessed, and his unselfish love

of his country made itself felt in almost every branch of Icelandic life. Recognizing the value of an intellectual centre, he made Reykjavik not only the political, but the spiritual capital of Iceland by removing all the chief institutions of learning to that city; he was the soul of many literary and political societies, and the chief editor of the Ny Felagsrit, which has done more than any other Icelandic periodical to promote the cause of civilization and progressin Iceland. After Iceland had got home rule in 1874, the grateful people showered on Jon SigurSsson all the honours it could bestow. He lived the greater part of his life in Copen- hagen, and died there in 1879; but his body, together with that of his wife, Ingibjorg Einarsdottir, whom he had married in 1845, and who survived him only a few days, was taken to Reykjavik and given a public funeral. On his monument was placed the inscription: " The beloved son of Iceland, her honour, sword, and shield." (S. Bl.)

SIGWART, CHRISTOPH WILHELM VON (1789-1844), German philosopher, was born at Remmingsheim in Wiirttem- berg, and died in Stuttgart. He became professor of philosophy at Tubingen, and wrote numerous books on the history of philosophy: — Uber den Zusammenhang des Spinozismus mil der Cartesianischen Philosophie (1816); Handbuchzu Vorlesungen uber die Logik (1818, 3rd ed., 1835); Der Spinozismus (1839); and Geschichte der Philosophie (1844).

His son, Chkistoph von Sigwart (1830-1894), after a course of philosophy and theology, became professor at Blaubeuren (1859), and eventually at Tubingen, in 1865. His principal work, Logik, published in 1873, takes an important place among recent contributions to logical theory. In the preface to the first edition, Sigwart explains that he makes no attempt to appreciate the logical theories of his predecessors; his intention was to construct a theory of logic, complete in itself. It re- presents the results of a long and careful study not only of German but also of English logicians. In 1895 an English translation by

Miss H. Dendy was published in London. Chapter v. of the second volume is especially interesting to English thinkers as containing a profound examination of the Induction theories of Bacon, J. S. Mill and Hume. Among his other works are Spinozas neu entdeckter Traktat von Gott, dem Menschen und dessen Gliickscligkeit (1866); Kleine Schrijten (1881); Vorjragen der Ethik (1886). The Kleine Schrijten contains valuable criticisms on Paracelsus and Bruno.

SIGYNNAE (Ziyvvvcu, 'Siyivvoi), an obscure people of antiquity. They are variously located by ancient authors. According to Herodotus (v. 9), they dwelt beyond the Danube, and their frontiers extended almost as far as the Eneti on the Adriatic. Their horses (or rather, ponies) were small, with shaggy long hair, not strong enough to carry men, but very speedy when driven in harness. The people themselves wore a Medic costume, and, according to their own account, were a colony of the Medes. Strabo (xi. p. 520), who places them near the Caspian, also speaks of their ponies, and attributes to them Persian customs. In Apollonius Rhodius (iv. 320) they inhabit the shores of the Euxine, not far from the mouth of the Danube.

The statement as to their Medic origin, regarded as incompre- hensible by Herodotus, is doubtfully explained by Rawlinson as indicating that " the Sigynnae retained a better recollection than other European tribes of their migrations westward and Aryan origin " ; R. W. Macan (on Herod, v. 9) suggests that it may be due to a confusion with the Thracian Maedi (Maidoi). If the last para- graph in Herodotus be genuine, the Ligyes who lived above Massilia called traders Sigynnae, while among the Cyprians the word meant " spears." The similarity between Sigynnae and Zigeuner is obvious, and it has been supposed that they were the forefathers of the modern gipsies. According to J. L. Myres, the Sigynnae of Herodotus were " a people widely spread in the Danubic basin in the 5th century B.C.," probably identical with the Sequani, and connected with the iron-working culture of Hallstatt, which produced a narrow-bladed throwing spear, the sigynna spear (see notice of " Anthropological Essays " in Classical Review, November 1908).

SIKH, a member of the Sikh religion in India (see Sikhism). The word Sikh literally means " learner," " disciple," and was the name given by the first guru Nanak to his followers. The Sikhs are divided into two classes, Sahijdhari and Kesadhari. The former were so named from living at ease and the latter from wearing long hair. Both obey the general injunctions of the Sikh gurus, but the Sahijdhari Sikhs have not accepted the pahul or baptism of Guru Govind Singh, and do not wear the distin- guishing habiliments of the Kesadhari, who are the baptized Sikhs, also called Singhs or lions. Their distinguishing habili- ments are long hair wound round a small dagger and bearing a comb inserted in it, a steel bracelet and short drawers. Neither the Sahijdhari nor the Kesadhari Sikhs may smoke tobacco or drink wine. The prohibition of wine is, however, generally dis- regarded except by very orthodox Sikhs.

In the census of 1901, the number of Sikhs in the Punjab and North-Western Provinces was returned as 2,130,987, showing an increase of 13-9% in the decade; but these figures are not altogether reliable owing to the difficulty of distinguishing the Sahijdhari from the Kesadhari Sikhs and

both from the Hindus. A man is not born a Singh, but becomes so by baptism, the water of which is called amrit or nectar. It is possible that one brother may be a Hindu, while another is a true Sikh.

The Sikhs are principally drawn from the Arora, Jat and Ramgarhia tribes, but any one may become a Sikh by accepting the Sikh baptism. The Aroras are generally merchants or petty dealers. The Jats are agriculturists variously described as Scythian immigrants and as descendants of Rajputs who immi- grated to the Punjab from central India. They are of a tougher fibre than the Aroras; sturdy and self-reliant, slow to speak but quick to strike. The Ramgarhias are principally mechanics.

To the temperament of the Jat, the Arora and the Ramgarhia Sikh add the stimulus of a militant religion. The Sikh is a fighting man, and his best qualities are shown in the army, which is his natural profession. Hardy, brave and slow-witted, obedient to discipline, attached to his officers, he makes the finest soldier of the East. In victory he retains his steadiness, and in defeat he will die at his post rather than yield. In peace time he shows a decided fondness for money, and will go wherever

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Nanak . Angad . Amar Das Ram Das Arjan . .

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it is to be earned. There are some 30,000 Sikhs in the Indian army, and

the sect is cherished by the military authorities, who insist on all recruits taking the pahul or Sikh baptism. Many Sikhs are also to be found in the native regiments of east and central Africa and of Hyderabad in the Deccan, and they compose a great part of the police force in the treaty ports of China. (M.M.)

SIKHISM, a religion of India, whose followers (Sikhs) are principally found in the Punjab, United Provinces, Sind, Jammu and Kashmir. Sikhism was founded by Nanak, a Khatri by caste, who was born at Talwandi near Lahore in a.d. 1469, and after travelling and preaching throughout a great part of southern Asia died at Kartarpur in Jullundur in 1539. He was succeeded by nine gurus, great teachers or head priests, whose dates are as follows: —

A.D.

Har Govind. 1606-1645 Har Rai . 1645-1661 Har Krishan 1661-1664 Teg Bahadur 1664-1675 Govind Singh 167 5-1 708

Nanak, like Buddha, revolted against a religion overladen with ceremonial and social restrictions, and both rebelled against the tyranny of the priesthood. The tendency of each religion' was to quietism, but their separate doctrines were largely in- fluenced by the surroundings of their founders. Buddha lived in the centre of Hindu India and among the many gods of the Brahmans. These he rejected, he knew of nought else, and in his theological system there was found no place for divinity. Nanak was born in the province which then formed the borderland between Hinduism and Islam. He taught that there was one God; but that God was neither Allah nor Ram, but simply God; neither the special god of the Mahommedan, nor of the Hindu, but the God of the universe, of all mankind and of all religions. Starting from the unity of God, Nanak and his successors rejected the idols and incarnations of the Hindus, and on the ground of the equality of all men rejected also the system of caste. The doctrines of Sikhism as set forth in the Granth (q.v.) are that it prohibits idolatry, hypocrisy, class exclusiveness, the concremation of widows, the immurement of women, the use of wine and other intoxicants, tobacco-smoking, infanticide, slander and pilgrimages to the sacred rivers and tanks of the Hindus; and it inculcates loyalty, gratitude for all favours received, philanthropy, justice, impartiality, truth, honesty and all the moral and domestic virtues upheld by Christianity. Sikhism mainly differs from Christianity in that it inculcates the transmigration of the soul, and adopts a belief in predestination, which is universal in the East.

The Sikh religion did not reach this full development at once, nor was the first of the gurus even the first to feel dissatisfaction with the existing order

of things. Ideas of revolt and reform of decadent systems are always in the air, it otihe may be for centuries, until some one man bolder than Gurus. the rest stands out to give them free expression; and as John the Baptist preceded Jesus Christ, so Nanak was preceded by several reformers, whose writings are incorporated in the Granth itself. The chief of these reformers are Jaidev, Ramanand and Kabir. Jaidev is better known as the author of the Gita- gobind, which was translated by Sir Edwin Arnold, than as a religious reformer; but in the Adi Granth are found two hymns of his in the Prakrit language of the time, in which he represents God as distinct from nature, yet everywhere present. He taught at the. end of the 12th century a.d. that the practice of yog, sacrifices and austerities was as nothing in comparison with the repetition of God's name, and he inculcated the worship of God alone, in thought, word and deed. What was worthy of worship, he said, he had worshipped; what was worthy of trust he had trusted; and he had become blended with God, as water blends with water.

Jaidev was succeeded by numerous Hindu saints, who per- ceived that the superstitions of the age only led to spiritual blindness. Of these saints Ramanand was one of the most distinguished. He lived at the end of the 14th and beginning of

the 15th centuries, and during a visit to Benares he renounced some of the social and caste observances of the Hindus, called his disciples the liberated, and freed them from all restrictions in eating and social intercourse. Kabir denounced idolatry and the ritualistic practices of the Hindus. He was born a.d. 1398, and according to the legend was the son of a virgin widow, as the result of a prayer offered for her by Ramanand in ignorance of her status. Thus it will be seen that the doctrines of these early reformers contained the germs of the later Sikh religion.

Nanak seems to have been produced by the same cyclic wave of reformation as fourteen years later gave Martin Luther to Europe. He taught, " There is but one God, the Nanak. Creator, whose name is true, devoid of fear and enmity, immortal, unborn and self-existent, great and bounti- ful." He held that the wearing of religious garb, praying and practising penance to be seen of men, only produced hypocrisy, and that those who went on pilgrimages to sacred streams, though they might cleanse their bodies, only increased their mental impurity. He pointed out that God " before all temples prefers the upright heart and pure," and must be worshipped in spirit and in truth, and not with the idolatrous accessories of incense, sandal-wood and burnt-offerings. He abrogated caste

distinctions, and taught in opposition to ancient writings that every man had the eternal right of searching for divine know- ledge and worshipping his Creator. This doctrine of philosophic quietism was common to his successors, until in the time of the sixth guru, Har Govind, it was found necessary to support the separate existence of Sikhism by force of arms, and this led to the militant and political development of the tenth and most power- ful of the gurus, Govind Singh. The Sikhs of to-day, though they all derive primarily from Nanak, are only recognized as Singhs or real Sikhs when they accept the doctrines and practices of Guru Govind Singh.

Nanak's successor, Angad, was born in a.d 1 504 and died in 1 5 5 2. He also was a Khatri, and was chosen by Guru Nanak in preference to his own sons. The legend of his choice is that Nanak ˆ"j with his followers was going on a journey, when they saw the dead body of a man lying by the wayside. Nanak said, " Ye who trust in me eat of this food." All hesitated save Angad (or own body), who knelt and uncovered the dead, but, behold, the corpse' had disappeared, and a dish of sacred food was found in its place. The guru embraced his faith- ful follower, saying that he was as himself, and that his spirit should dwell within him. Thenceforward the Sikhs believe the spirit of Nanak to have been incarnate in each succeeding guru. Little is known of the ministry of Angad except that he committed to writing much of what he had heard about Guru Nanak as well as some devotional observations of his own, which were afterwards incorporated in the Granth.

Angad, like his predecessor, postponed the claims of his own sons to the guruship to those of Amar Das, who had been his faithful servant. Amar Das preached the doctrine Amar Das °ˆ forgiveness and endurance, upheld Guru Nanak's abrogation of caste distinctions, and his precepts were implicitly followed by his successors. He used to place all his Sikhs and visitors in rows and cause them to eat together, not separately, as is the practice of the Hindus. He said: "Let no one be proud of his caste, for this pride of caste resulteth in many sins. He is a Brahman who knoweth Brahma (God). Every one prateth of four castes. All are sprung from the seed of Brahm. The whole world is formed out of one clay, but the Potter hath fashioned it in various forms." It was a maxim of the Sikhs of his time: " If any one treat you ill, bear it. If you bear it three times God himself will fight for you and humble your enemies." Guru Amar Das also discountenanced the practice of suttee, saying: " They are not satis who burn them- selves with the dead. The true sati is she who dieth from the shock of separation from her husband. They also ought to be considered satis who abide in charity and contentment, who serve and, when rising, ever remember their lord." Amar Das was born in a.d. 1509 and died in 1574 after a ministry of twenty- two and a half years.

Guru Arjan.

The fourth guru, originally called Jetha, was attracted to the third guru by his reputation for sanctity. He became the servant of Amar Das, helped in the public kitchen, shampooed his master, drew water, brought firewood from the p am 0as> forest, and helped in the excavation of a well which Amar Das was constructing at Goindwal. Jetha was of such a mild temper that, even if any one spoke harshly to him, he would endure it and never retaliate. He became known as Ram Das, which means God's slave; and on account of his piety and devo- tion Amar Das gave him his daughter in marriage and made him his successor. Ram Das is amongst the most revered of gurus, but no particular innovation is ascribed to him. He founded, however, the golden temple of Amritsar in a.d. 1577, which has remained ever since the centre of the Sikh religious worship. From this time onward the office of guru became hereditary, but the practice of primogeniture was not followed, each guru selecting the relative who seemed most fitted to succeed him.

Ram Das himself, finding his eldest son Prithi Chand worldly and disobedient, and his second unfitted by his too retiring disposition for the duties of guru, appointed his third son, Arjan, to succeed him. When Prithi Chand represented that he ought to have received the turban bound on Guru Arjan's head in token of succession to his father, Arjan meekly handed it to him, without, however, bestowing on him the guruship. The Sikhs themselves soon revolted against the exactions of Prithi Chand, and prayed Arjan to assert himself else the seed of the True Name would perish. It was Guru Arjan who compiled the Granth or Sikh Bible, out of his own and his predecessors' compositions. On this account he was accused of deposing the deities of his country and substituting for them a new divinity, but he was acquitted by the tolerant Akbar. When Akbar, however, was succeeded by Jahangir the guru aided the latter's son Khusru to escape with a gift of money. On this account his property was confiscated to the state, and he was thrown into rigorous imprisonment and tortured to death. Arjan saw clearly that it was impossible to preserve his sect without force of arms, and one of his last injunctions to his son Har Govind was to sit fully armed on his throne and maintain an army to the best of his ability. This was the turning-point in the history of the Sikhs. Hitherto they had been merely an insignificant religious sect; now, stimulated by persecution, they became a militant and political power, inimical to the Mahommedan rulers of the country.

When Har Govind was installed as guru, Bhai Budha, the aged Sikh who performed the ceremony, presented him with a turban and a necklace, and charged him to wear and preserve them as the founder of his religion had done. Guru aov'tnd"" Har Govind promptly ordered that the articles should

be relegated to his treasury, the museum of the period. He said: " My necklace shall be my sword-belt, and my turban shall be adorned with a royal aigrette." He then sent for his bow, quiver, arrows, shield and sword, and arrayed himself in martial style, so that, as the Sikh chronicler states, his splendour shone like the sun.

The first four gurus led simple ascetic lives and were regardless of wordly affairs. Guru Arjan, who was in charge of the great Sikh temple at Amritsar, received copious offerings and became a man of wealth and influence, while the sixth guru became a military leader, and was frequently at warfare with the Mogul authorities. Several warriors and wrestlers, hearing of Guru Har Govind's fame, came to him for service. He enrolled as his body- guard fifty-two heroes who burned for the fray. This formed the nucleus of his future army. Five hundred youths then came to him for enlistment from the Manjha, Doab and Malwa districts. These men told him that they had no offering to make to him except their lives; for pay they only required instruction in his religion; and they professed themselves ready to die in his service. The guru gave them each a horse and five weapons of war, and gladly enlisted them in his army. In a short time, besides men who required regular pay, hordes gathered round the guru who were satisfied with two meals a day and a suit of clothes every six months. The fighting spirit of the people

was roused and satisfied by the spiritual and military leader. Har Govind was a hunter and eater of flesh, and encouraged his followers to eat meat as giving them strength and daring. It is largely to this practice that the Sikhs owe the superiority of their physique over their surrounding Hindu neighbours. The regal state that the guru adopted and the army that he maintained were duly reported to the emperor Jahangir.

In the Autobiography of Jahangir it is stated that the guru was imprisoned in the fortress of Gwalior, with a view to the realization of the fine imposed on his father Guru Arjan, but the Sikhs believe that the guru became a voluntary inmate of the fortress with the object of obtaining seclusion there to pray for the emperor who had been advised to that effect by his Hindu astrologers. After a time Jahangir died and was succeeded by Shah Jahan, with whom the guru was constantly at war. On three separate occasions after desperate fighting he defeated the royal troops sent against him. Many legends are told of his military prowess, for which there is no space in this summary. The guru before his death at Kiratpur, on the margin of the Sutlej, instructed his grandson and successor, Guru Har Rai, to retain two

thousand two hundred mounted soldiers ever with him as a precautionary measure.

Har Rai was charged with friendship for Dara Shikoh, the son

of Shah Jahan, and also with preaching a religion

£ a/ _ distinct from Islam. He was, therefore, summoned to

Delhi, but instead of going himself he sent his son

Ram Rai and shortly afterwards died. His ministry was mild but

won him general respect.

The eighth guru was the second son of Har Rai, but he died

when a child and too young to leave any mark on

Krishna, history. His elder brother Ram Rai was passed over

in his favour and also in favour of the next guru for

having altered a line of the Granth to please the emperor

Aurangzeb.

As the direct line of succession died out with Har Krishan, the guruship harked back at this point to Teg Bahadur, the second son of Har Govind and uncle of Har Rai. Teg Bahadur Bahadur. was P ut t0 death for refusal to embrace Islam by Aurangzeb in a.d. 1675. It is of him that the legend is told that during his imprisonment in Delhi he was accused by the emperor of looking towards the west in the direction of the imperial zenana. The guru replied, " Emperor Aurangzeb, I was on the top storey of my prison, but I was not looking at thy private apartments or at thy queen's. I was looking in the direction of the Europeans who are coming from beyond the seas to tear down thy purdahs and destroy thine empire." This prophecy became the battle-cry of the Sikhs in the assault on Delhi in 1857.

Teg Bahadur was succeeded by the tenth and most powerful guru, his son Govind Singh; and it was under him that what had sprung into existence as a quietist sect of a purely oovlnd religious nature, and had become a military society Singh. for self -protection, developed into a national movement which was to rule the whole of north-western India and to furnish to the British arms their stoutest and most worthy opponents. For some years after his father's execution Govind Singh, then known as Gobind Rai, lived in retirement, brooding over the wrongs of his people and

the persecutions of the fanatical Aurangzeb. He felt the necessity for a larger following and a stronger organization, and following the example of his Mahom- medan enemies used his religion as the basis of political power. Emerging from his retirement he preached the Khalsa, the " pure," and it is by this name his followers are now known. He, like his predecessors, openly attacked all distinctions of caste, and taught the equality of all men who would join him, and he instituted a ceremony of initiation with baptismal holy water by which all might enter the Sikh fraternity.

The higher castes murmured, and many of them left him, for he taught that the Brahmanical threads must be broken; but the lower orders rejoiced and flocked in numbers to his standard. These he inspired with military ardour in the hope of social freedom and of national independence. He gave them outward

signs of their faith in the five K's — which will subsequently be explained — he signified the military nature of their calling by the title of " singh " or " lion " and by the wearing of steel, and he strictly prohibited the use of tobacco. The following are the main points of his teaching: Sikhs must have one form of initiation, sprinkling of water by five of the faithful; they should worship the one invisible God and honour the memory of Guru Nanak and his successors; their watchword should be, " Sri wall guru ji ka khalsa, sri wah guru ji ki fatah " (Khalsa of God, victory to God!), but they should revere and bow to nought visible save the Granth Sahib, the book of their belief; they should occasionally bathe in the sacred tank of Amritsar; their locks should remain unshorn; and they should name themselves singhs or lions. Arms should dignify their person; they should ever practise their use'; and great would be the merit of those who fought in the van, who slew the enemies of their faith, and who despaired not although overpowered by superior numbers.

The religious creed of Guru Govind Singh was the same as that of Guru Nanak: the God, the guru and the Granth remained unchanged. But while Nanak had substituted holiness of life for vain ceremonial, Guru Govind Singh demanded in addition brave deeds and zealous devotion to the Sikh cause as proof of faith; and while he retained his predecessors' attitude towards the Hindu gods and worship he preached undying hatred to the persecutors of his religion.

During the spiritual reign of Guru Govind Singh the religious was partially eclipsed by the military spirit. The Mahommedans promptly responded to the challenge, for the danger was too serious to be neglected; the Sikh army was dispersed and two of Guru Govind Singh's sons were murdered at Sirhind by the governor of that fortress, and his mother died of grief at the cruel death of her grandchildren. The death of the emperor Aurangzeb

brought a temporary lull: the guru assisted Aurangzeb 's suc- cessor, Bahadur Shah, and was himself not long after assassinated at Nander in the Deccan. As all the guru's sons predeceased him, and as he was disappointed in his envoy Banda, he left no human successor, but vested the guruship in the Granth Sahib and his sect. No formal alteration has been made in the Sikh religion since Guru Govind Singh gave it his military organization, but certain modifications have taken place as the result of time and contact with Hinduism. After the guru's death the gradual rise of the Sikhs into the ruling power of northern India until they came in collision with the British arms belongs to the secular history of the Punjab (q.v.).

The chief ceremony initiated by Guru Govind Singh was the Khanda ka Pahul or baptism by the sword. This baptism may not be conferred until the candidate has reached an age of discrimination and capacity to remember obligations, cere- seven years being fixed as the earliest age, but it is monies. generally deferred until manhood. Five of the initiated must be present, all of whom should be learned in the faith. An Indian sweetmeat is stirred up in water with a two-edged sword and the novice repeats after the officiant the articles of his faith. Some of the water is sprinkled on him five times, and he drinks of it five times from the palms of his hands; he then pronounces the Sikh watchword given above and promises adherence to the new obligations he has contracted. He must from that date wear the five K's and add the word singh to his original name. The five K's are (1) the kcs or uncut hair of the whole body, (2) the kachh or short drawers ending above the knee, (3) the kara or iron bangle, (4) the khanda or small steel dagger,(s) the khanga or comb. The five K's and the other esoteric observ- ances of the Sikhs mostly had a utilitarian purpose. When fighting was a part of the Sikh's duty, long hair and iron rings concealed in it protected his head from sword cuts. The kachh or drawers fastened by a waist-band was more convenient and suitable for warriors than the insecurely tied dhoti of the Hindus or the tamba of the Mahommedans. So also the Sikh's physical strength was increased by the use of meat and avoidance of tobacco. Another Sikh ceremony is the kara parshad or com- munion made of butter, flour and sugar, and consecrated with certain ceremonies. The communicants sit round, and the. kara

par shad is then distributed equally to all the faithful present, no matter to what caste they belong. The object of this ceremony is to abolish caste distinctions.

There may be said to be three degrees of strictness in the observances of the Sikhs. There may first be mentioned the zealots such as the Akalis, who, though generally quite illiterate, aim at observing the injunctions of o'ttoˆday. Guru Govind Singh; secondly, the true Sikhs or Singhs who observe his ordinances, such as the prohibi- tions of cutting the hair and the use of tobacco; and, thirdly, those Sikhs who while professing devotion to the tenets of the gurus are almost indistinguishable from ordinary Hindus. These are largely Nanakpanti Sikhs, or followers only of Guru Nanak. The Nanakpanti Sikhs do not wear the hair long, nor use any of the outward signs of the Sikhs, though they reverence the Cranth Sahib and above all the memory of their guru. They are distinguished from the Hindus by no outward sign except a slight laxity in the matter of caste observances.

Sikhism attained its zenith under the military genius of Ranjit Singh. After the Biitish conquest of the Punjab the military spirit of the Sikhs remained for some time in abeyance. Then came the mutiny, and Sikhs once more were recruited in numbers and saved India for the British crown. Peace returned, and during the next twenty or twenty-five years Sikhism reached its lowest ebb; but since then the demand for Sikhs in the regiments of the Indian army and farther afield has largely revived the faith. The establishment of Singh Sabhas, of Sikh newspapers, and the spread of education have largely tended in the same direction, but the strict ethical code of Sikhism and the number of its obligatory divine services have caused many to fall away from the faith: nor does the austere Sikh ritual appeal to women, who generally prefer Hinduism with its picturesque material worship and the brightness of its innumerable festivals. At the present day the stronghold of Sikhism still remains the great Phulkian states of Patiala, Nabha and Jind and the surrounding districts of Ludhiana, Lahore, Amritsar, Jullundur and Gujranwala. In these states and districts are recruited the soldiers who form one of the main bulwarks of the British empire in India.

For authorities see Cunningham, History of the Sikhs; Sir Lepel Griffin, Maharaja Ranjit Singh ("Rulers of India" series, 1892); Falcon, Handbook on Sikhs; and specially M. Macauliffe, The Sikh Religion: Its Gurus, Sacred Writings and Authors (6 vols., 1909), and two lectures before the United Service Institution of India on " The Sikh Religion and its Advantages to the State " and " How the Sikhs became a Militant Race." (M. M.)

SIKH WARS, two Indian campaigns fought between the Sikhs and the British, which resulted in the conquest and annexation of the Punjab (see

Punjab).

First Sikh War (1843-46). — The first Sikh War was brought about by the insubordination of the Sikh army, which after the death of Ranjit Singh became uncontrollable and on the nth of December 1845 crossed the Sutlej, and virtually declared war upon the British. The British authorities had foreseen the outbreak, and had massed sufficient troops at Ferozepore, Ludhiana and Umballa to protect the frontier, but not to offer provocation. So complete were the preparations for advance that on the 12th, the day after the Sikhs crossed the Sutlej, Sir Hugh Gough, the commander-in-chief, marched 16 m. with the Umballa force to Rajpura; on the 13th the governor-general, Sir Henry Hardinge, declared war, and by the 18th the whole army had marched 150 m. to Moodkee, in order to protect Ferozepore from the Sikh attack.

Wearied with their long march, the British troops were enjoying a rest, when the news came in that the Sikhs were advancing to battle at four o'clock in the afternoon. The British had some 10,000 men, and the Sikhs are estimated by some authorities as low as 10,000 infantry with 2000 cavalry and 22 guns. The battle opened with an artillery duel, in which the British guns, though inferior in weight, soon silenced the enemy, the 3rd Light Dragoons delivered a brilliant charge, and the infantry drove the enemy from position after position with great slaughter and the loss of seventeen guns.

The victory was complete, but the fall of night prevented it from being followed up, and caused some of the native regiments to fire into each other in the confusion.

After the battle of Moodkee Sir Henry Hardinge volunteered to serve as second in command under Sir Hugh Gough, a step which caused some confusion in the ensuing battle. At 4 a.m. on the 21st of December the British advanced S hah. from Moodkee to attack the Sikh entrenched camp under the command of Lai Singh at Ferozeshah, orders having been sent to Sir John Littler, in command at Ferozepore, to join the main British force. At n a.m. the British were in front of the Sikh position, but Sir John Littler, though on his way, had not yet arrived. Sir Hugh Gough wished to attack while there was plenty of daylight; but Sir Henry Hardinge re- asserted his civil authority as governor-general, and forbade the attack until the junction with Littler was effected. The army then marched on to meet Littler and the battle did not begin until between 3.30 and 4 p.m. The engagement opened with an artillery duel, in which the British again failed to gain the mastery over the Sikhs. The infantry, therefore, advanced to the attack; but the Sikh muskets were as good as the British, and fighting behind entrenchments they were a most formidable foe. Sir John Littler's

attack was repulsed, the 62nd regiment losing heavily in officers and men, while the sepoys failed to support the European regiments. But the Moodkee force, undaunted, stormed and captured the entrenchment, though the different brigades and regiments lost position and became mixed up together in the darkness. The army then passed the night on the Sikh position, while the Sikhs prowled round keeping up an incessant fire. In the morning the British found that they had captured seventy-three pieces of cannon and were masters of the whole field; but at that moment a fresh Sikh army, under Tej Singh, came up to the assistance of the scattered forces of Lai Singh. The British were exhausted with their sleepless night, the native troops were shaken, and a determined attack by this fresh army might have won the day; but Tej Singh, after a half-hearted attack, which was repulsed, marched away, whether from cowardice, incapacity or treason, and left the British masters of the position.

After the battle of Ferozeshah the Sikhs retired behind the Sutlej, but early in January they again raided across the river near Ludhiana, and Sir Harry Smith was detached to protect that city. On the 21st of January he was approaching Ludhiana when he found the Sikhs under Runjoor Singh in an entrenched position flanking his line of march at Budhowal. Sir Harry Smith passed on without fighting a general action, but suffered considerable loss in men and baggage. After receiving reinforcements Sir Harry again advanced from Ludhiana and attacked the Sikhs at Aliwal on the 28th of January. An attack upon the Sikh left near the village of Aliwal gave Sir Flarry the key of the position, and a brilliant charge by the 16th Lancers, which broke a Sikh square, com- pleted their demoralization. The Sikhs fled in confusion, losing sixty-seven guns, and by this battle were expelled from the south side of the Sutlej.

Ever since Ferozeshah Sir Hugh Gough had been waiting to receive reinforcements, and on the 7th of February his siege train arrived, while on the following day Sir Harry Smith's force returned to camp. On the 10th of February Sir Hugh attacked the Sikhs, who occupied a strong entrenched position in a bend of the Sutlej. After two hours' cannonading, the infantry attack commenced at 9 A.M. The advance of the first brigade was not immediately successful, but the second brigade following on carried the entrenchments. The cavalry then charged down the Sikh lines from right to left and completed the victory. The Sikhs, with the river behind them, suffered terrible carnage, and are computed to have lost 10,000 men and 67 guns. The British losses throughout the campaign were considerably heavier than was usual in Indian warfare; but this was partly due to the fact that the Sikhs were the best natural fighters in India, and partly to the lack of energy of the Hindostani sepoys. After the battle of Sobraon

Aliwal.

the British advanced to Lahore, where the treaty of Lahore was signed on the nth of March.

Second Sikh War {1848-1840). — For two years after the battle of Sobraon the Punjab remained a British protectorate, with Sir Henry Lawrence as resident; but the Sikhs were unconvinced of their military inferiority, the Rani Jindan and her ministers were constantly intriguing to recover their power, and a further trial of strength was inevitable. The outbreak came at Multan, where on the 20th of April 1848 the troops of the Dewan Mulraj broke out and attacked two British officers, Mr Vans Agnew and Lieutenant Anderson, eventually murdering them. On hearing of the incident, Lieut. Herbert Edwardes, who was Sir Henry Lawrence's assistant in the Derajat, advanced upon Multan with a force of levies drawn from the Pathan tribes of the frontier; but he was not strong enough to do more than keep the enemy in check until Multan was invested by a Bombay column under General Whish. In the meantime Edwardes wished for an immediate British advance upon Multan; but Lord Gough, as he had now become, decided on a cold season campaign, on the ground that, if the Sikh government at Lahore joined in the rising, the British would require all their available strength to suppress it. Multan was invested on the 18th of August by General Whish in conjunction with the Sikh general Shere Singh; but during the course of the siege Shere Singh deserted and joined the rebels, thus turning the rising into a national war. The siege of Multan was temporarily abandoned, but was resumed in November, when Lord Gough's main advance had begun, and Mulraj surrendered on the 22nd of January. In the meantime Lord Gough had collected his army and stores, and on the 9th of November crossed the Sutlej.

On the 22nd of November there was a cavalry skirmish at Ramnagar, in which General Cureton and Colonel Havelock were killed. For a month after this Lord Gough remained inactive, waiting to be reinforced by General Whish from Multan; but at last he decided to advance without General Whish, and fought the battle of Chillianwalla on the 13th of January 1849. Lord Gough had intended to encamp for the night; but the Sikh guns opening fire revealed the fact that their army had advanced out of its intrenchments, and Lord Gough decided to seize the opportunity and attack at once. An hour's artillery duel showed that the Sikhs had the advantage both in position and guns, and the infantry advance commenced at three o'clock in the afternoon. The battle resulted in great loss to the

European regiments, the 24th losing all its officers in a few minutes, while the total loss in killed and wounded amounted to 2338; but when darkness fell the British were in possession of the whole of the Sikh line. Lord Gough subse- quently retired to the village of Chillianwalla, and the Sikhs returned and carried off their guns. After the battle Lord Gough received an ovation from his troops, but his losses were thought excessive by the public in England and the directors of the East India Company, and Sir Charles Napier was appointed to super- sede him. Before, however, the latter had time to reach India, the crowning victory of Gujrat had been fought and won.

After the fall of Multan General Whish marched to join Lord Gough, and the junction of the two armies was effected on the 1 8th of February. In the meantime the Sikhs had withdrawn from their strong intrenchments at Russool, owing to want of provisions, and marched to Gujrat, which Lord Gough considered a favourable position for attacking them. By a series of short marches he prepared the way for his " last and best battle." In this engagement, for the first time in either of the Sikh wars, the British had the superiority in artillery, in addition to a picked force of 24,000 men. The battle began on the morning of the 21st of February with two and a half hours' artillery fire, which was overwhelmingly in favour of the British. At 11.30 a.m. Lord Gough ordered a general advance covered by the artillery; and an hour and a half later the British were in possession of the town of Gujrat, of the Sikh camp, and of the enemy's artillery and baggage, and the cavalry were in full pursuit on both flanks. In this battle the British only lost 96 killed and 700 wounded, while the Sikh loss was enormous, in

addition to 67 guns. This decisive victory ended the war. On the 1 2th of March the Sikh leaders surrendered at discretion, and the Punjab was annexed to British India.

See Sir Charles Gough and A. D. Innes, The Sikhs and the Sikh Wars (1897) ; and R. S. Rait. Life and Campaigns of Viscount Cough

(1903)-

SIKKIM, called by Tibetans Dejong (" the rice country "), a protected state of India, situated in the eastern Himalaya, between 27 5′ and 28° 9′ N. and between 87 59′ and 88° 56′ E. It comprises an area of 2818 sq. m. of what may be briefly described as the catchment basin of the headwaters of the rivers Tista and Rangit. On the S. and S.E., branches of these rivers form the boundary between Sikkim and British India, while on the W., N. and N.E. Sikkim is separated from Nepal, Tibet and Bhutan by the range of lofty mountains which culminate in Kinchinjunga and form a kind of horse-shoe, whence dependent spurs project southwards, gradually

contracting and lessening in height until they reach the junction of the Rangit and the Tista. Thus the country is split up into a succession of deep valleys surmounted by open plateaus cut off from one another by high and steep ridges, and lies at a very considerable elevation, rising from 1000 ft. above sea-level at its southern extremity to 16,000 or 18,000 ft. on the north. The main trade-passes into Tibet, such as the Jelep (14,500), Chola (14,550), and Kangra-la (16,000), are not nearly so high as in the western Himalaya, while those into Nepal are less than 12,000 ft.

Physical Features. — Small though the country is, a wide variation of climate makes it peculiarly interesting. From a naturalist's point of view it can be divided into three zones. The lowest, stretch- ing from 1000 to 5000 ft. above sea- level, may be called the tropical zone; thence to 13,000 ft., the upper limit of tree vegetation, the temperate; and above, to the line of perpetual snow, the alpine. Down to about 1880 Sikkim was covered with dense forests, only interrupted where village clearances had bared the slopes for agri- culture, but at the present time this description does not apply below 6000 ft., the upper limit at which maize ripens; for here, owing to increase of population (particularly the immigration of Nepalese settlers) , almost every suitable spot has been cleared for cultivation. The exuberance of its flora may be imagined when it is considered that the total flowering plants comprise some 4000 species ; there are more than 200 different kinds of ferns, 400 orchids, 20 bamboos, 30 rhododendrons, 30 to 40 primulas, and many other genera are equally profuse; in fact Sikkim contains types of every flora from the tropics to the poles, and probably no other country of equal or larger extent can present such infinite variety. Butterflies abound and comprise about 600 species, while moths are estimated at 2000. Birds are profusely represented, numbering between 500 and 600 species. Among mammals, the most interesting are the snow leopard (Felis unica), the cat-bear {Aelurus fulgens) , the musk deer (Moschus moschiferus) and two species of goat antelope (Nemorhaedus bubalinus and Cemas goral). Copper and lime are the chief minerals found and worked in Sikkim, but they are of little commercial value at present.

Government and Population. — The population is essentially agri- cultural, each family living in a house on its own land : there are no towns or villages, and the only collection of houses, outside the Lachen and Lachung valleys, are the few that have sprung up round country market-places, such as Rhenock, Dikkeling and Gangtok; but in the above-mentioned valleys the inhabitants, who are Bhutanese in origin and herdsmen in occupation, have large clusters of well-built houses at various altitudes up the valleys, which they occupyˆ in rotation according to the season of the year.

The seat of government, or in other words the palace of the raja, was formerly situated at Rubdentze ; but when that place was taken and

destroyed by the Gurkhas, a new palace was built at Tumlong, close to the eastern and Tibetan boundary, while a subsidiary summer residence was erected on the other side of the Chola range at Chumbi, in the Am-mochu valley. At the present time the raja and his court remain in the more open country at Gangtok, where the British political officer and a small detachment of native troops are also stationed. 1

The first regular census of Sikkim, in 1901, returned the population at 59,014, showing an apparent increase of nearly twofold in the decade. Of the total, 65 % were Hindus and 35 % Buddhists. The Lepchas, supposed to be the original inhabitants, numbered only 8000, while no less than 23,000 were immigrants from Nepal.

The state religion is Buddhism as practised in Tibet, but is not confined to one particular sect ; while among the heterogeneous popu- lation of Sikkim all manner of religious cults can be found. Educa- tion is at a low ebb, though the monasteries are supposed to maintain schools, and missionary enterprise has established others.

The revenue of Sikkim has increased under British guidance from Rs. 20,000 a year to nearly Rs. 1,60,000, derived chiefly from a land and poll tax, excise, and sale of timber; the chief expenditure is on

the maintenance of the state, which practically means the raja's family, and on the improvement of communications. The country has a complete system of mountain roads, bridged and open to animal (but not cart) traffic. British trade with Central Tibet is carried over the Jelep route, on the south-eastern border of Sikkim.

History. — The earliest inhabitants of Sikkim were the Rong-pa (ravine folk), better known as Lepchas, probably a tribe of Indo- Chinese origin; but when or how they migrated to Sikkim is un- known. The reigning family, however, is Tibetan, and claims descent from one of the Gyalpos or princelings of eastern Chinese Tibet ; their ancestors in course of several generations found their way westwards to Lhasa and Sakya, and thence down the Am-mochu valley ; finally, about the year 1604, Penchoo Namyg6 was born at Gangtok, and in 1 64 1, with the aid of Lha-tsan Lama and two other priests of the Duk-pa or Red-hat sect of Tibet, overcame the Lepcha chiefs, who had been warring among themselves, established a firm government and introduced Buddhist Lamaism as a state religion. His son, Tensung Namyge, very largely extended his kingdom, but

much of it was lost in the succeeding reign of Chak-dor Namyge (1700-1717), who is credited with having designed the alphabet now in use among the Lepchas.

In the beginning of the 18th century Bhutan appropriated a large tract of country on the east. Between 1776 and 1792 Sikkim was constantly at war with the victorious Gurkhas, who were, however, driven out of part of their conquests by the Chinese in 1792; but it was not until 1 816 that the bulk of what is known to us as Sikkim was restored by the British, after the defeat of the Nepalese by General Ochterlony. In 1839 the site of Darjeeling was ceded by the raja of Sikkim. In 1849 the British resumed the whole of the plains (Tarai) and the outer hills, as punishment for repeated insults and injuries. In 1861 a Britisn force was required to impose a treaty defining good relations. The raja, however, refused to carry out his obligations and defiantly persisted in living in Tibet ; his administration was neglected, his subjects oppressed, and a force of Tibetan soldiers was allowed, and even encouraged, to seize the road and erect a fort within sight of Darjeeling. After months of useless re- monstrance, the government was forced in 1888 to send an expedi- tion, which drove the Tibetans back over the Jelep pass. A con- vention was then concluded with China in 1890, whereby the British protectorate over Sikkim was acknowledged and the boundary of the state defined ; to this was added a supplemental agreement relating to trade and domestic matters, which was signed in 1893. Since that time the government has been conducted by the maharaja assisted by a council of seven or eight of his leading subjects, and guided by a resident British officer. Crime, of which there is little, is punished under local laws administered by kazis or petty chiefs. Since 1904 political relations with Sikkim, which had formerly been conducted by the lieutenant-governor of Bengal, have been in the hands of the Viceroy.

Rajas of Sikkim (Dejong-Gyalpo) : Penchoo Namgye (1641- 1670), Tensung Namgye (1670-1700), Chak-dor Namgye (1700- 1717), Gyurme Namgye (1717-1734), Penchoo Namgye (1734- 1/80), Tenzing Namgy6 (1780-1790), Cho-phoe Namgye (1790- 1861), Sikhyong Namgye (ˆ861-1874), Tho-tub Namgye (1874), the maharaja, whose son has been educated at Oxford.

Authorities. — Sir J. W. Edgar, Report on a Visit to Sikkim and the Tibetan Frontier in 1873 (Calcutta, 1874); Macaulay, Report on a Mission to Sikkim and the Tibetan Frontier (Calcutta, 1885) ; The Gazetteer of Sikkim (Calcutta, 1894) ; Hooker, Himalayan Journals (London, 1854); L. A. Waddell, Lamaism (London, 1895); Among the Himalayas (London, 1898). (A. W. P.)

SILA, a mountainous forest district of Calabria, Italy, to the E. of Cosenza,

extending for some 37 m. N. to S. and 25 m. E. to W. The name goes back to the Greek period, and then pro- bably belonged to a larger extension of territory than at present. In ancient times these mountains supplied timber to the Greeks for shipbuilding, the forests have given way to pastures to some extent; but a part of them, which belongs to the state, is maintained. Geologically these mountains, which consist of granite, gneiss and mica schist, are the oldest portion of the Italian peninsula; their culminating point is the Botte Donato (6330 ft), and they are not free of snow until the late spring. They are very rarely explored by travellers.

SILANION, a Greek sculptor of the 4th century B.C. He was noted as a portrait-sculptor. Of two of his works, his heads of Plato and of Sappho, we possess what seem to be copies. Both are of simple ideal type, the latter of course not strictly a portrait, since Sappho lived before the age of portraits. The best copy of the Plato is in the Vatican.

SILAS (fl. a.d. 50), early Christian prophet and missionary, was the companion of St Paul on the second journey, when he took the place formerly held by Barnabas. The tour included S. Galatia, Troas, Philippi (where he was imprisoned), Thes- salonica and Beroea, where Silas was left with Timothy, though

he afterwards rejoined Paul at Corinth. He is in all probability the Silvanus l who is associated with Paul in the letters to the Thessalonians, mentioned again in 2 Cor. i. 19, and the bearer and amanuensis of 1 Peter (see v. 12). It is possible, indeed, that he has an even closer connexion with this letter, and some scholars (e.g. R. Scott in The Pauline Epistles, 1909) are inclined to give him a prominent place among the writers of the New Testament.. He was of Jewish birth and probably also a Roman citizen.

SILAY, a town of the province of Negros Occidental, island of Negros, Philippine Islands, on the N.W. coast, about 10 m. N. of Bacolod, the capital of the province. Pop. (1903, after the annexation of Guimbalon and a portion of Eustaquio Lopez) – 22,000. There are more than fifty barrios or villages in the town and the largest of these had, in 1903, 3834 inhabitants. The language is Visayan. There is a considerable coasting trade, sugar, brought by a tramway from neighbouring towns, is shipped from here, and the cultivation of sugar-cane is an important in- dustry; Indian corn, tobacco, hemp, cotton and cacao are also grown.

SILCHAR, a town of British India, in the Cachar district of Eastern Bengal and Assam, of which it is the headquarters. Pop. (1901) 9256. It is situated on the left bank of the river Barak, with a station on the Assam-Bengal railway, 271 m. N. of Chittagong. Silchar is the centre of an important tea industry, and the headquarters of the volunteer corps known

as the Surma Valley Light Horse.

SILCHESTER, a parish in the north of Hampshire, England, about 10 m. S. of Reading, containing the site of the Romano- British town Calleva Atrebatum. This site has been lately explored (1890-1909) and the whole plan of the ancient town within the walls recovered; unfortunately the excavators had to abandon their task before the suburbs, cemeteries and what- ever else may lie outside the walls have been examined. The results are published in Archacologia, the official organ of the London Society of Antiquaries (-see Britain: Roman). As the excavations proceeded, the areas excavated were covered in again, but the ruins of the town hall, which have been famous since the 12th century, still remain. The smaller and movable objects found in the excavations have been deposited by the duke of Wellington, owner of the site of Calleva, in the Reading museum.

SILENUS, a primitive Phrygian deity of woods and springs. As the reputed inventor of music he was confounded with Marsyas. He also possessed the gift of prophecy, but, like Proteus, would only impart information on compulsion; when surprised in a drunken sleep, he could be bound with chains of flowers, and forced to prophesy and sing (Virgil, Eel. vi., where he gives an account of the creation of the world; cf. Aelian, Var. hist. iii. 18). In Greek mythology he is the son of Hermes (or Pan) and a nymph. He is the constant companion of Dionysus, whom he was said to have instructed in the cultivation of the vine and the keeping of bees. He fought by his side in the war against the giants and was his companion in his travels and adventures. The story of Silenus was often the subject of Athenian satyric drama. Just as there were supposed to be several Pans and Fauns, so there were many Silenuses, whose father was called Papposilenus (" Daddy Silenus "), represented as completely covered with hair and more animal in appearance. The usual attributes of Silenus were the wine-skin (from which he is inseparable), a crown of ivy, the Bacchic thyrsus, the ass, and sometimes the panther. In art he generally appears as a little pot-bellied old man, with a snub nose and a bald head, riding on an ass and supported by satyrs; or he is depicted lying asleep on his wine-skin, which he sometimes bestrides. A more dignified type is the Vatican statue of Silenus carrying the infant Dionysus, and the marble group from the villa Borghese in the Louvre.

See Preller- Robert, Griechische Mythologie (1894), PP- 729-735; Talfourd Ely, " A Cyprian Terracotta," in the Archaeological Journal (1896); A. Baumeister, Denkmdler des klassischen Altertums, iii. (l? OON

1 For the abbreviation, cf. Lucas, Prisca (= Priscilla), Sopater (= Sosipater).

SILESIA

SILESIA, the name of a district in the east of Europe, the greater part of which is included in the German empire and is known as German Silesia. A smaller part, called Austrian Silesia, is included in the empire of Austria-Hungary.

German Silesia. ■ German Silesia is bounded by Brandenburg, Posen, Russian Poland, Galicia, Austrian Silesia, Moravia, Bohemia and the kingdom and province of Saxony. Besides the bulk of the old duchy of Silesia, it comprises the countship of Glatz, a fragment of the Neumark, and part of Upper Lusatia, taken from the kingdom of Saxony in 1815. The province, which has an area of 15,576 sq. m. and is the largest in Prussia, is divided into three governmental districts, those of Liegnitz and Breslau comprising lower Silesia, and of Oppeln taking in the greater part of moun- tainous Silesia.

Physiographically Silesia is roughly divided into a flat and a hilly portion by the so-called Silesian Langental, which begins on the south-east near the river Malapane, and extends across the province in a west-by-north direction to the Black Elster, following in part the valley of the Oder. The south-east part of the province, to the east of the Oder and south of the Malapane, consists of a hilly outpost of the Carpathians, the Tarnowitz plateau, with a mean elevation of about 1000 ft. To the west of the Oder the land rises gradually from the Langental towards the southern boundary of the province, which is formed by the central part of the Sudetic system, including the Glatz Mountains and the Riesengebirge (Schneekoppe, 5260 ft.). Among the loftier elevations in advance of this southern barrier the most conspicuous is the Zobten (2356 ft.). To the north and north-east of the Oder the province belongs almost entirely to the great North-German plain, though a hilly ridge, rarely attaining a height of 1000 ft., may be traced from east to west, asserting itself most definitely in the Katzengebirge. Nearly the whole of Silesia lies within the basin of the Oder, which flows through it from south-east to north-west, dividing the province into two approximately equal parts. The Vistula touches the province on the south-east, and receives a few small tributaries from it, while on the west the Spree and Black Elster belong to the system of the Elbe. The Iser rises among the mountains on the south. Among the chief feeders of the Oder are the Malapane, the Glatzer Neisse, the Katzbach and the Bartsch; the Bober and Queiss flow through Silesia, but join the Oder beyond the frontier. The only lake of any extent is the Schlawa See, 7 m. long, on the north frontier; and the only navigable canal, the Klodnitz canal, in the mining district of upper Silesia. There is a considerable difference in the

climate of Lower and Upper Silesia ; some of the villages in the Riesengebirge have the lowest mean temperature of any inhabited place in Prussia (below 40 F.).

Of the total area of the province 56% is occupied by arable land, 10-2% by pasture and meadow, and nearly 29% by forests. The soil along the foot of the mountains is generally good, and the district between Ratibor and Liegnitz, where 70 to 80% of the surface is under the plough, is reckoned one of the most fertile in Germany. The parts of lower Silesia adjoining Brandenburg, and also the district to the east of the Oder, are sandy and comparatively unproductive. The different cereals are all grown with success, wheat and rye sometimes in quantity enough for exportation. Flax is still a frequent crop in the hilly districts, and sugar-beets are raised over large areas. Tobacco, oil-seeds, chicory and hops may also be specified, while a little wine, of an inferior quality, is produced near Grunberg. Mulberry trees for silk-culture have been introduced and thrive fairly. Large estates are the rule in Silesia, where about a third of the land is in the hands of owners possessing at least 250 acres, while properties of 50,000 to 100,000 acres are common. The districts of Oppeln and Liegnitz are among the most richly wooded parts of Prussia. The merino sheep was introduced by Frederick the Great, and since then the Silesian breed has been greatly improved. The woods and mountains harbour large quantities of game, such as red deer, roedeer, wild boars and hares. The fishery includes salmon in the Oder, trout in the mountain streams, and carp in the small lakes or ponds with which the province is sprinkled.

The great wealth of Silesia, however, lies underground, in the shape of large stores of coal and other minerals, which have been worked ever since the 12th century. The coal measures of Upper Silesia, in the south-east part of the province, are among the most extensive in continental Europe, and there is another large field near Waldenburg in the south-west. The output in 1905 exceeded 34 million tons, valued at £12,500,000 sterling, and equal, to more than a quarter of the entire yield of Germany. The district of Oppeln also contains a great quantity of iron, the production in 1905 amounting to 862,000 tons. The deposits of zinc in the vicinity of Beuthen are perhaps the richest in the world, and produce two- thirds of the zinc ore of Germany (609,000 tons). The remaining mineral products include lead, from which a considerable quantity

of silver is extracted, copper, cobalt, arsenic, the rarer metal cadmium, alum, brown coal, marble, and a few of the commoner precious stones, jaspers, agates and amethysts. The province contains scarcely any salt or brine springs, but there are well-known mineral springs at Warmbrunn, Salzbrunn and several other places.

A busy manufacturing activity has long been united with the underground industries of Silesia, and the province in this respect is hardly excelled by any other part of Prussia. On the plateau of Tarnowitz the working and smelting of metals is the predominant industry, and in the neighbourhood of Beuthen, Konigshtitte and Gleiwitz there is an almost endless succession of iron-works, zinc- foundries, machine-shops and the like. At the foot of the Riesenge- birge, and along the southern mountain line generally, the textile industries prevail. Weaving has been practised in Silesia, on a large scale, since the 14th century; and Silesian linen still maintains its reputation, though the conditions of production have greatly changed. Cotton and woollen goods of all kinds are also made in large quantities, and among the other industrial products are beetroot sugar, spirits, chemicals, tobacco, starch, paper, pottery, and " Bohemian glass." Lace, somewhat resembling that of Brussels, is made by the women of the mountainous districts. The trade of Silesia is scarcely so extensive as might be expected from its im- portant industrial activity. On the east it is hampered by the stringent regulations of the Russian frontier, and the great waterway of the Oder, though in process of being regulated, is sometimes too low in summer for navigation. The extension of the railway system has, however, had its usual effect in fostering commerce, and the mineral and manufactured products of the province are freely exported.

At the census of 1905 the population of Silesia was 4,942,611, of whom 2,120,361 were Protestants, 2,765,394 Catholics and 46,845 Jews. The density is 317 per sq. m., but the average is of course very greatly exceeded in the industrial districts such as Beuthen. Three-fourths of the inhabitants and territory are; German, but to the east of the Oder the Poles, more than 1,000,000 in number, form the bulk of the population, while there are about 15,500 Czechs in the south part of the province and 25,000 Wends near Liegnitz. The Roman Catholics, most of whom are under the ecclesiastical sway of the prince bishop of Breslau, are predominant in Upper Silesia and Glatz; the Protestants prevail in Lower Silesia, to the west of the Oder, and in Lusatia. The nobility is very numerous in Silesia, chiefly in the Polish districts. The educational institutions of the province are headed by the university of Breslau. In 1900 the percentage of illiterate recruits, in spite of the large Polish-speaking contingent, was only 0-05. The capital and seat of the provincial diet is Breslau (q.v.), which is also by far the largest and most important town. The towns next in point of size are Gorlitz, Liegnitz, Konigshtitte. Beuthen, Schweidnitz, Neisse and Glogau. The province sends thirty-five members to the Reichstag and sixty-five to the Prussian chamber of deputies. The government divisions of Breslau and Oppeln together form the district of the 6th army corps with its headquarters at Breslau, while Liegnitz belongs to that of the 5th army corps, the headquarters of which are at Posen. Glogau, Glatz and Neisse

are fortresses.

History. — The beginnings of Silesian history do not reach back beyond the 10th century a.d., at which time the district was occupied by clans of Slavonic nationality, one of which derived its name from the mountain Zlenz (mod. Zobtenburg), near Breslau, and thus gave rise to the present appellation of the whole province. The etymology of place-names suggests that the original population was Celtic, but this conjecture cannot be verified in any historical records. About the year 1000 the Silesian clans were incorporated in the kingdom of Poland, whose rulers held their ground with difficulty against continuous attacks by the kings of Bohemia, but maintained themselves successfully against occasional raids from Germany. The decisive factor in the separation of Silesia from Poland was furnished by a partition of the Polish crown's territories in 1138. Silesia was henceforth constituted as a separate principality, and in 1201 its political severance from Poland became complete A yet more important result of the partition of 1138 was the transference of Silesia to the German nation. The independent dynasty which was then established was drawn under the influence of the German king, Frederick Barbarossa, and two princes who in 1163 divided the sovereignty among themselves as dukes of Upper and Lower Silesia inaugurated the policy

of inviting German colonists to their vacant domains. More extensive immigrations followed, in the course of which the whole of Silesia was covered with German settlements. The numerous townships which then sprang up acquired rights of self-govern- ment according to German law, Breslau being refounded about 1 250 as a German town, and a feudal organization was introduced among the landholding nobility. By the end of the 13th century Silesia had virtually become a German land.

This ethnical transformation was accompanied by a great rise in material prosperity. Large areas of forest or swamp were reclaimed for agriculturs; the great Silesian industries of mining and weaving were called into existence, and Breslau grew to be a leading centre of exchange for the wares of East and West . The growing resources of the Silesian duchies are exempli- fied by the strength of the army with which Henry II., duke of Lower Silesia, broke the force of the Mongol invasion at the battle of Liegnitz (1241), and by the glamour at the court of the Minnesinger, Henry IV. (1 266-1 290) . This prosperity, however, was checked by a growing tendency among the Silesian dynasties to make partitions of their territories at each new succession. Thus by the end of the 14th century the country had been split up into 18 principalities: Breslau, Brieg, Glogau, Jauer, Liegnitz, Munsterberg, 01s, Schweidnitz and Steinau in Lower Silesia; Beuthen, Falkenberg, Kosel, Neisse, Oppeln, Ratibor, Strehlitz, Teschen and Troppau in the upper district. The petty rulers of these sections wasted their strength with internecine quarrels and proved quite incompetent to check the lawlessness of their feudal vassals. Save under the vigorous rule of some dukes of Lower Silesia, such as Henry I. and Bolko I., and the above- named Henry II. and IV., who succeeded in reuniting most of the principalities under their sway, the country fell into a state of growing anarchy.

Unable to institute an effective national government, and unwilling to attach themselves again to Poland, the Silesian princes began about 1290 to seek the protection of the German dynasty then ruling in Bohemia. The intervention of these kings resulted in the establishment of their suzerainty over the whole of Silesia and the appropriation cf several of its petty states as crown domains. The earliest of these Bohemian overlords, King John and the emperor Charles IV., fully justified their intrusion by the vigorous way in which they restored order and regularized the administration; in particular, the cities at this time attained a high degree of material prosperity and political importance. Under later rulers the connexion with Bohemia brought the Silesians no benefit, but involved them in the destructive Hussite wars. At the outbreak of this conflict in 1420 they gave ready support to their king Sigismund against the Bohemian rebels, whom they regarded as dangerous to their German nationality, but by this act they exposed themselves to a series of invasions (1425-1435) by which the country was severely devastated. In consequence of these raids the German element of population in Upper Silesia permanently lost ground ; and a complete restitution of the Slavonic nationality seemed imminent on the appointment of the Hussite, George Podiebrad, to the Bohemian kingship in 1457. Though most of the Silesian dynasts seemed ready to acquiesce, the burghers of Breslau fiercely repudiated the new suzerain, and before he could enforce his claims to homage he was ousted by the Hungarian king,

Matthias Corvinus, who was readily recognized as overlord (1469). Matthias enforced his authority by the vigorous use of his mercenaries and by wholesale confiscations of the lands of turbu- lent nobles. By instituting a permanent diet of Silesian princes and estates to co-operate with his vicegerent, he took an important step towards the abolition of particularism and the establishment of an effective central government. In spite of these reforms the Silesians, who felt severely the financial exactions of Matthias, began to resent the control of the Bohemian crown. Profiting by the feebleness of Matthias' successor Vladislav, they extorted concessions which secured to them a practical autonomy. These privileges still remained to them at the outset of the religious Reformation, which the Silesians, in spite of their Catholic zeal during the Hussite wars, accepted readily and

carried out with singularly little opposition from within or without. But a drastic revolution in their government was imposed upon them by the German king, Ferdinand I., who had been prevented from interference during his early reign by his wars with the Turks, and who showed little disposition to check the Reformation in Silesia by forcible means, but subse- quently reasserted the control of the Bohemian crown by a series of important enactments. He abolished all privileges which were not secured by charter and imposed a more rigidly centralized scheme of government in which the activities of the provincial diet were restricted to some judicial and financial functions, and their freedom in matters of foreign policy was withdrawn altogether. Henceforth, too, annexations of territory were frequently carried out by the Bohemian crown on the extinction of Silesian dynasties, and the surviving princes showed an increasing reluctance to the exercise of their authority. Accordingly the Silesian estates never again chose to exercise initiative save on rare occasions, and from 1550 Silesia passed almost completely under foreign administration.

An uneventful period followed under the rule of the house of Habsburg, which united the kingship of Bohemia with the archduchy of Austria and the imperial crown. But this respite from trouble was ended by the outbreak of the Thirty Years' War (1618-48), which brought Silesia to the verge of ruin. Dis- quieted by some forcible attempts on Rudolph II. 's part to suppress Protestantism in certain parts of the country, and mistrusting a formal guarantee of religious liberty which was given to them in 1609, the Silesians joined hands with the Bohemian insurgents and renounced their allegiance to their Austrian ruler. Their defection, which was terminated by a capitulation in 1621, was not punished severely, but in spite of their attempt to maintain neutrality henceforth they were quite unable to secure peace. Silesia remained a principal objective of the various contending armies and was occupied almost continuously by a succession of ill-disciplined mercenary forces whose depredations and exactions, accentuated at times by religious fanaticism, reduced the country to a state

of helpless misery. Three-quarters of the population are estimated to have lost their lives, and commerce and industry were brought to a standstill. Recovery from these disasters was retarded by the permanent diversion of trade to new centres like Leipzig and St Petersburg, and by a state of unsettlement due to the govern- ment's disregard of its guarantees to its Protestant subjects. A greater measure of religious liberty was secured for the Silesians by the representatives of King Charles XII. of Sweden on their behalf, and effective measures were taken by the emperor Charles VI. to stimulate commercial intercourse between Silesia and Austria. Nevertheless in the earlier part of the 18th century the condition of the country still remained unsatisfactory.

An important epoch in the history of Silesia is marked by the year 1 740, when the dominion of Austria was exchanged for that of Prussia. Availing himself of a testamentary union made in 1 537 between the duke of Liegnitz and the elector of Brandenburg, and of an attempt by the elector Frederick William to call it into force in spite of its annulment by Ferdinand I. in 1546, Frederick II. of Prussia raised a claim to the former duchies of Liegnitz, Brieg, Jagerndorf and Wohlau. The empress Maria Theresa, who was at this time involved with other enemies, was unable to prevent the occupation of Lower Silesia by Frederick and in 1 741 ceded that province to him. In the following year Frederick renewed his attack and extorted from Austria the whole of Silesia except the districts of Troppau, Teschen and Jagerndorf, the present province of Austrian Silesia.

Though constrained by the general dangers of her position to make terms with Prussia, Maria Theresa long cherished the hope of recovering a possession which she, unlike her predecessors, valued highly and held by a far better title than did her opponent. A second war which Fiederick began in 1744 in anticipation of a counter-attack from her only served to strengthen his hold upon his recent conquest; but in the famous Seven Years' War (q.v.) of 1756-63 the Austrian empress, aided by France and Russia, almost effected her purpose. Silesia was repeatedly overrun by

Austrian and Russian troops, and Frederick's ultimate expulsion seemed only a question of time. Yet the Prussian king recovered his lost ground by gigantic efforts and eventually retained his Silesian territory undiminished.

The annexation by Frederick was followed by a complete reorganization in which the obsolete powers of the local dynasts were abolished and Silesia became a mere province of the highly centralized Prussian state. Owing to

the lack of a corporate Silesian consciousness and the feebleness of their local institutions, the people soon became reconciled to their change of rulers. Moreover Frederick, who had proved by his wars the importance which he attached to Silesia, was indefatigable in times of peace in his attempts to justify his usurpation. Making yearly visits to the country, and further keeping himself in touch with it by means of a special " minister of Silesia," he was enabled to effect numerous political reforms, chief of which were the strict enforce- ment of religious toleration and the restriction of oppressive seignorial rights. By liberal endowments and minute but judicious regulations he brought about a rapid development of Silesian industries; in particular he revived the mining and weaving operations which at present constitute the country's chief source of wealth.

After its incorporation with Prussia Silesia ceases to have an independent political history. During the Napoleonic wars it was partly occupied by French troops (1806-1813), and at the begin- ning of the War of Liberation it was the chief scene of operations between the French and the allied armies. In 1815 it was enlarged by a portion of Lusatia, which had become detached from Silesia as far back as the nth century and since then had been annexed to the kingdom of Saxony. During the rest of the 19th century its peace has been interrupted from time to time by riots of discontented weavers. But the general record of recent times has been one of industrial development and prosperity hardly inferior to that of any other part of Germany.

See C. Griinhagen, Geschichte Schlesiens (2 vols., Gotha, 1884- 1886), and Schlesien unter Friedrich dem Grossen (2 vols., Gotha, 1 890-1892) ; M. Morgenbesser, Geschichte von Schlesien (Berlin, 1892) ; Knotel, Geschichte Ober schlesiens (Kattowitz, 1906) ; H. Grotefend, Stammtafeln der schlesischen Fiirsten bis 1740 (Breslau, 1889); F. Rachfahl, Die Organisation der Gesamtstaatsverwaltung Schlesiens vor dem dreissigjdhrigen Kriege (Leipzig, 1894); H. Fechner, Geschichte des schlesischen Berg- und Hiittenwesens 1/41-1806 (Berlin, 1903) ; see also the Zeitschrift des Vereins fur Geschichte und Altertunt Schlesiens (Breslau, 1855 sqq.), and Oberschlesische Heimat, Zeit- schrift des ober schlesischen Geschichtsvereins (Oppeln, 1905 sqq.).

Austrian Silesia.

Austrian Silesia (Ger. Osterreichisch-Schlesien) is a duchy and crownland of Austria, bounded E. by Galicia, S. by Hungary and Moravia, W. and N. by Prussian Silesia. It has an area of 1987 sq. m. and is the smallest province of Austria. Silesia is divided by a projecting limb of Moravia into two small parts of territory, of which the western part is flanked by the Sudetic mountains, namely the Altvater Gebirge; while the eastern part is

flanked by the Carpathians, namely the Jablunka Gebirge with their highest peak the Lissa Hora (4346 ft.). A great pro- portion of the surface of Silesia is occupied by the offshoots of these ranges. The province is traversed by the Vistula, which rises in the Carpathians within eastern Silesia, and by the Oder, with its affluents the Oppa and the Olsa. Owing to its mountain- ous character, and its slopes towards the N. and N.E., Silesia has a somewhat severe climate for its latitude, the mean annual temperature being 50 F., while the annual rainfall varies from 20 to 30 in.

Of the total area 49-4% is arable land, 34-2% is covered by forests, 6-2% by pasturages, while meadows occupy 5-8% and gardens 1-3%. The soil cannot, as a rule, be termed rich, although some parts are fertile and produce cereals, vegetables, beetroot and fruit. In the mountainous region dairy-farming is carried on after the Alpine fashion and the breeding of sheep is improving. Large herds of geese and pigeons are reared, while hunting and fishing constitute also important resources. The mineral wealth of Silesia is great and consists in coal, iron-ore, marble and slate. It possesses several mineral springs, of which the best known are the alkaline springs at Karlsbrunn. Like its adjoining provinces, Silesia boasts of a great and varied industrial activity, chiefly represented by the metallurgic and textile industries in all their branches. The cloth

and woollen industries are concentrated at Bielitz, Jagerndorf and Engelsberg ; linen is manufactured at Freiwaldau Freudenthal and Bennisch ; cotton goods at Friedek. The iron industry is con- centrated at Trzinietz, near Teschen, and various industrial and agricultural machines are manufactured at Troppau, Jagerndorf, Ustron and Bielitz. The organs manufactured at Jagerndorf enjoy a good reputation. Other important branches of industry are chemicals at Hruschau and Petrowitz; sugar refineries, milling, brewing and liqueurs.

In 1900 the population numbered 680,422, which corresponds to 342 inhabitants per sq. m. The Germans formed 44-69% of the population, 33-21% were Poles and 22-05% Czechs and Slavs. According to religion, 84-73 were Roman Catholics, 14% Protestants and the remainder were Jews. The local diet is composed of 31 members, and Silesia sends 12 deputies to the Reichsrat at Vienna. For administrative purposes Silesia is divided into 9 districts and 3 towns with autonomous munici- palities: Troppau, the capital, Bielitz and Friedek. Other principal towns are: Teschen, Polnisch-Ostrau, Jagerndorf, Karwin, Freudenthal, Freiwaldau and Bennisch.

The actual duchy is only a very small part, which was left to Austria after the Seven Years' War, from its former province of the same name. It formed, with Moravia, a single province until 1849, when it was created a

separate duchy.

See F. Slama, Osterreichisch-Schlesien (Prague, 1887); and A. Peter, Das Herzogtum Schlesien (Vienna, 1884).

SILESIAN WARS, the name given to the contests between Austria and Prussia for the possession of Silesia. The first (1740- 1742) and second (1 744-1 745) wars formed a part of the great European struggle called the War of the Austrian Succession (q.v.), and the third war (1756-1762) similarly a part of the Seven Years' War {q.v.).

SILHOUETTE, ETIENNE DE (1709-1767), controller-general of France, was born at Limoges on the 5th of July 1709. He travelled extensively while still a young man and drew attention to himself by the publication of English translations, historical writings, and studies on the financial system of England. Suc- cessively councillor to the parlement of Metz, secretary to the duke of Orleans, member of the commission on delimitation of Franco-British interests in Acadia (1749), and royal commis- sioner in the Indies Company, he was named controller-general through the influence of the marquise de Pompadour on the 4th of March 1759. The court at first reposed a blind confidence in him, but soon perceived not only that he was not a financier but also that he was bent on attacking privilege by levj'ing a land-tax on the estates of the nobles and by reducing the pensions. A storm of opposition gathered and broke: a thousand cartoons and jokes were directed against the unfortunate minister who seemed to be resorting to one financial embarrassment in order to escape another; and in allusion to the sacrifices which he demanded of the nobles, even the conversion of their table plate into money, silhouette became the popular word for a figure reduced to simplest form. The word was eventually (1835) admitted to the dictionary by the French academy. Silhouette was forced out of the ministry on the 21st of November 1759 and withdrew to Brie-sur-Marne, where during the remainder of his life he sought refuge from scorn and sarcasm in religious devotion. He died on the 20th of January 1767.

Silhouette left, several translations from the English and the Spanish, accounts of travel, and dull historical and philosophical writings, a list of which is given in Querard, France litteraire, ix. 138. A Testament politique, published under his name in 1772, is apochry- phal. See J. P. Clement and A. Lemoine, M. de Silhouette (Paris,

1872).

SILICA, in chemistry, the name ordinarily given to amorphous silicon dioxide, Si0 2 . This chemical compound is widely and most abundantly distributed in nature, both in the free state and in combination with

metallic oxides. Free silica constitutes the greater part of sand and sandy rocks; when fairly pure it occurs in the large crystals which we know as quartz (q.v.), and which, when coloured, form the gem-stones amethyst, cairngorm, cats'eye and jasper. Tridymite (q.v.) is a rarer form, crystallo graphically different from quartz. Amorphous forms also occur: chalcedony (q.v.), and its coloured modifications agate, carnelian,

onyx and sard, together with opal (qq.v.) are examples. Amorph- ous silica can be obtained from a silicate (a compound of silica and a metallic oxide) by fusing the finely powdered mineral with sodium carbonate, decomposing the sodium silicate thus formed with hydrochloric acid, evaporating to dryness to convert the colloidal silicic acid into insoluble silica, and removing the soluble chlorides by washing with hot water. On drying, the .silica is obtained as a soft white amorphous powder, insoluble in water and in all acids except hydrofluoric; it dissolves in hot solutions of the caustic alkalis and to a less extent in alkali carbonates. It melts at a high temperature, and in the electric furnace it may be distilled, the vapours condensing to a bluish- white powder. By heating a solution of sodium silicate in a glass vessel the glass is attacked (an acid silicate being formed) and silica separates at ordinary temperatures in a hydrated amorphous form, at higher temperatures but below 180° as tridymite, and above 180° as quartz.

Silicates. — These compounds are to be regarded as salts of silicic acid, or combinations of silicon dioxide and metallic basic oxides; they are of great importance since they constitute the commonest rock-forming and many other minerals, and occur in every petro- graphical species. The parent acid, silicic acid, was obtained by T. Graham by dialysing a solution of hydrochloric acid to which sodium silicate had been added; a colloidal silicic acid being re- gained in the dialyser. This solution may be concentrated until it contains about 14% of silica by open boiling, and this solution on evaporation in a vacuum gives a transparent mass of metasilicic acid, H_2SiO_3. The solution is a tasteless liquid having a slight acid reaction; it gradually changes to a clear transparent jelly, which afterwards shrinks on drying. This coagulation is brought about very quickly by sodium carbonate, and may be retarded by hydro- chloric acid or by a solution of a caustic alkali. Several hydrated forms have been obtained, e.g. $2SiO_2 \cdot H_2O$, $3SiO_2 \cdot H_2O$, $4SiO_2 \cdot H_2O$, $8SiO_2 \cdot H_2O$; these are very unstable, the first two losing water on exˆ posure whilst the others absorb water. The natural silicates may be regarded as falling into 5 classes, viz. orthosilicates, derived from $Si(OH)_4$; metasilicates, from

SiO(OH) 2 ; disilicates, from Si 2 3 (OH) 2 ; trisilicates, from Si 3 6 (0H) 2 ; and basic silicates. These acids may be regarded as derived by the partial dehydration of the ortho-acid. Another classification is given in Metallurgy; a list of mineral silicates is given in Mineralogy, and for the synthetical production of these compounds see also Petrology.

SILICON [symbol Si, atomic weight 28-3 (0=i6)], a non- metallic chemical element. It is not found in the uncombined condition, but in combination with other elements it is, with perhaps the exception of oxygen, the most widely distributed and abundant of all the elements. It is found in the form of oxide (silica), either anhydrous or hydrated as quartz, flint, sand, chalcedony, tridymite, opal, &c, but occurs chiefly in the form of silicates of aluminium, magnesium, iron, and the alkali and alkaline earth metals, forming the chief constituent of various clays, soils and rocks. It has also been found as a constituent of various parts of plants and has been recognized in the stars. The element exists in two forms, one amorphous, the other crystalline. The older methods used for the preparation of the amorphous form, namely the decomposition of silicon halides or silicofluorides by the alkali metals, or of silica by magnesium, do not give good results, since the silicon obtained is always contaminated with various impurities, but a pure variety may be prepared according to E. Vigouroux (Ann. chim. phys., 1897, (7) 12, p. 1 53) by heating silica with magnesium in the presence of magnesia, or by heating silica with aluminium. The crystalline form may be prepared by heating potassium silicofluoride with sodium or aluminium (F. Wohler, Ann., 1856, 97, p. 266; 1857, 102, p. 382) ; by heating silica with magnesium in the presence of zinc (L. Gattermann, Ber., 1889, 22, p. 186); and by the reduc- tion of silica in the presence of carbon and iron (H. N. Warren, Chem. News, 1888, 57, p. 54; 1893, 67, p. 136). Another crystalline form, differing from the former by its solubility in hydrofluoric acid, was prepared by H. Moissan and F. Siemens (Comptes rendus, 1904, 138, p. 1299). A somewhat impure silicon (containing 90-98% of the element) is made by the Carborundum Company of Niagara Falls (United States Patents 745122 and 842273, 1908) by heating coke and sand in an electric furnace. The product is a crystalline solid of specific gravity 2-34, and melts at about 1430 C. See also German

Patent 108817 for the production of crystallized silicon from silica and carborundum.

Amorphous silicon is a brown coloured powder, the crystalline variety being grey, but it presents somewhat different appear- ances according to the method used for its preparation. The specific gravity of the amorphous form is 2-35 (Vigouroux), that of the crystalline variety varying, according to the method of preparation, from 2-004 to 2-493. The specific heat

varies with the temperature, from 0-136 at -39 C. to 0-2029 a t 2 3 2 ° C. Silicon distils readily at the temperature of the electric furnace. It is attacked rapidly by fluorine at ordinary temperature, and by chlorine when heated in a current of the gas. It undergoes a slight superficial oxidation when heated in oxygen. It combines directly with many metals on heating, whilst others merely dissolve it. When heated with sodium and potassium, appar- ently no action takes place, but if heated with lithium it forms a lithium silicide, Li 6 Si2 (H. Moissan, Comptes rendus, 1902, 134, p. 1083). It decomposes ammonia at a red heat, liberating hydrogen and yielding a compound containing silicon and nitro- gen. It reduces many non-metallic oxides. It is only soluble in a mixture of hydrofluoric and nitric acid, or in solutions of the caustic alkalis, in the latter case yielding hydrogen and a silicate: Si + 2KHO + H 2 = K !! SiOs + 2H 2 . On fusion with alkaline car- bonates and hydroxides it undergoes oxidation to silica which dissolves on the excess of alkali yielding an alkaline silicate.

Silicon hydride, SiH 4 , is obtained in an impure condition, as a spontaneously inflammable gas, by decomposing magnesium silicide with hydrochloric acid, or by the direct union of silicon and hydrogen in the electric arc. In the pure state it may be prepared by decom- posing ethyl silicoformate in the presence of sodium (C. Friedel and A. Ladenburg, Comptes rendus, 1867, 64, pp. 359, 1267) ; 4Si(OC 2 H 6) s = SiH4 + 3Si(OC 2 H 6)4. When pure, it is a colourless gas which is not spontaneously inflammable at ordinary temperature and pressure, but a slight increase of temperature or decrease of pressure sets up decomposition. It is almost insoluble in water. It burns when brought into contact with chlorine, forming silicon chloride and hydrochloric acid. It decomposes solutions of silver nitrate and copper sulphate. A second hydride of silicon, of composition Si 2 H 6 , was prepared by H. Moissan and S. Smiles {Comptes rendus, 1902, pp. 569, 1549) from the products obtained in the action of hydrochloric acid on magnesium silicide. These are passed through a vessel surrounded by a freezing mixture and on fractionating the product the hydride distils over as a colourless liquid which boils at 52° C. It is also obtained by the decomposition of lithium silicide with concentrated hydrochloric acid. Its vapour is spontaneously inflammable when exposed to air. It behaves as a reducing agent. For a possible hydride (Si 2 H 3)„ see J. Ogier, Ann. chim. phys., 1880, (5), 20, p. 5.

Only one oxide of silicon, namely the dioxide or silica, is known (see Silica).

Silicon fluoride, SiF 4 , is formed when silicon is brought into contact with fluorine (Moissan) ; or by decomposing a mixture of acid potas- sium fluoride and silica, or of calcium fluoride and silica with concen- trated

sulphuric acid. It is a colourless, strongly fuming gas which has a suffocating smell. It is decomposed with great violence when heated in contact with either sodium or potassium. It combines directly with ammonia to form the compound SiF 4 -2NH3, and is absorbed by dry boric acid and by many metallic oxides. Water decomposes it into silicofluoric acid and silicic acid: 3SiF 4 3H20=2H 2 SiF6 H 2 Si0 3 . With potassium hydroxide it yields potassium silicofluoride, whilst with sodium hydroxide, sodium fluoride is produced: 3SiF4 = 4KHO= Si0 2 + 2K 2 SiF 6 + 2H 2 0; SiF 4 + 4NaOH = Si0 2 +4NaF + 2H 2 0. It combines directly with acetone and with various amines. Silicon fluoroform, SiHF 3 , was obtained by O. Ruff and Curt Albert (Ber., 1905, 38, p. 53) by decomposing titanium fluoride with silicon chloroform in sealed vessels at 100-120° C. It is a colourless gas which may be condensed to a liquid boiling at -80-2° C. On solidification it melts at about — no" C. The gas is very unstable, decomposing slowly, even at ordinary temperatures, into hydrogen, silicon fluoride and silicon: 4SiHF 3 =2H 2 +3SiF 4 -|-Si. It burns with a pale-blue flame forming silicon fluoride, silicofluoric acid and silicic acid. It is decomposed readily by water, sodium hydroxide, alcohol and ether:

2SiHF 3 +4H 2 = H 4 Si0 4 +H 2 SiF 6 +2H 2 ; SiHF 3 +3NaOH+H 2 = H 4 Si0 4 +3NaF+H 2 ; 2SiHF 3 +4C 2 H 6 0H=Si(0C 2 H 6) 4 + H 2 SiF 6 +2H 2 ; SiHF 3 +3(C2H 6) 2 = SiH(OC 2 H 6)3+3C 2 H 5 F.

Silicofluoric acid, H 2 SiF 6 , is obtained as shown above, and also by the action of sulphuric acid on barium silicofluoride, or by absorbing silicon fluoride in aqueous hydrofluoric acid. The solution on evaporation deposits a hydrated form, H 2 SiF6-2H 2 0, which decom- poses when heated. The anhydrous acid is not known, since on

evaporating the aqueous solution it gradually decomposes into silicon fluoride and hydrofluoric acid.

Silicon chloride, SiCl 4 , was prepared by J. J. Berzelius (Jahresb., 1825, 4, p. 91) by the action of chlorine on silicon, and is also ob- tained when an intimate mixture of silica and carbon is heated in a stream of chlorine and the products of reaction fractionated. It is a very stable colourless liquid which boils at 58° C. Oxygen only attacks it at very high temperatures. When heated with the alkali and alkaline earth metals it yields silicon and the corresponding metallic chlorides. Water decomposes

«t into hydrochloric and silicic acids. It combines directly with ammonia gas to form SiCU-6NH 3 , and it also serves as the starting point for the prepara- tion of numerous organic derivatives of silicon. The hexachloride, Si 2 Cl6, is formed when silicon chloride vapour is passed over strongly heated silicon ; by the action of chlorine on the corresponding iodo-compound, or by heating the iodo-compound with mercuric chloride (C. Friedel, Comptes renins, 1871, 73, p. 49”). It is a colourless fuming liquid which boils at 146-148° C. It is decomposed by water, and also when heated between 350° and 1000 C, but it is stable both below and above these temperatures. The octochloride, Si 3 Cls, is formed to the extent of about J to I % in the action of chlorine on silicon (L. Gattermann, Ber., 1899, 32, p. 11 14). It is a colourless liquid which boils at 210 C. Water decomposes it with the forma- tion of silico-mesoxalic acid, HOOSi-Si(OH)2-SiOOH. Silicon chloro- form, SiHCl 3 , first prepared by H. Buff and F. Wohler (Ann., 1857, 104, p. 94), is formed by heating crystallized silicon in hydrochloric acid gas at a temperature below red heat, or by the action of hydro- chloric acid gas on copper silicide, the products being condensed by liquid air and afterwards fractionated (O. Ruff and Curt Albert, Ber., 1905, 38, p. 2222). It is a colourless liquid which boils at 33° C. It fumes in air and burns with a green flame. It is decomposed by cold water with the formation of silicoformic anhydride, H2Si 2 3 . It unites directly with ammonia gas yielding a compound of variable composition. It is decomposed by chlorine.

Similar bromo-compounds of composition SiBr 4 , Si 2 Br 6 and SiHBr3 are known. Silicon tetraiodide, Silt, is formed by passing iodine vapour mixed with carbon dioxide over strongly-heated silicon (C. Friedel, Comptes rendus, 1868, 67, p. 98) ; the iodo-compound con- denses in the colder portion of the apparatus and is purified by shaking with carbon bisulphide and with mercury. It crystallizes in octahedra which melt at 120-5° C. and boil at 290° C. Its vapour burns with a red flame. It is decomposed by alcohol and also by ether when heated to 100° C: SiI 4 +2C 2 H 6 OH =Si0 2 +2C 2 H s I + 2HI; SiI 4 -H(C 2 H 5) 2 0= =Si(OC 2 Hp 4 -4-4C 2 H 6 I. The hexaiodide, Si 2 I 6 , is obtained by heating the tetraiodide with finely divided silver to 300° C. It crystallizes in hexagonal prisms which exhibit double refraction. It is soluble in carbon bisulphide, and is decomposed by water and also by heat, in the latter case yielding the tetraiodide and the di-iodide, S12I4, an orange-coloured solid which is not soluble in carbon bisulphide. Silicon iodoform, SiHI 3 , is formed by the action of hydriodic acid on silicon, the product, which contains silicon tetraiodide, being separated by fractionation. It is also obtained by the action of hydriodic acid on silicon nitrogen hydride suspended in carbon bisulphide, or by the action of a benzene solution of hydri- odic acid on trianilino-silicon hydride (O. Ruff, Ber., 1907, 41, p.

3738). It is a colourless, strongly refracting liquid, which boils at about 220° C, slight decomposition setting in above 150° C. Water decomposes it with production of leucone. Numerous chloro-iodides and bromoiodides of silicon have been described.

Silicon nitrogen hydride, SiNH, is a white powder formed with silicon amide when ammonia gas (diluted with hydrogen) is brought into contact with the vapour of silicon chloroform at -10° C. Trianilino silicon hydride, SiH(NHC6H 6) 3 , is obtained by the action of aniline on a benzene solution of silicon chloroform. It crystallizes in needles which decompose at 114° C. Silicon amide, Si(NH 2)4, is obtained as a white amorphous unstable solid by the action of dry ammonia on silicon chloride at 50° C. (E. Vigouroux and C. Hugot, Comptes rendus, 1903, 136, p. 1670). It is readily decomposed by water: Si(NH 2) 4 +2H 2 = 4NH 3 +Si0 2 . Above o° C. it decom poses thus: Si(NH 2)4 = 2_HN 3 +Si(NH) 2 .

Silicon sulphide, SiS 2 , is formed by the direct union of silicon with sulphur; by the action of sulphuretted hydrogen on crystallized silicon at red heat (P. Sabatier, Comptes rendus, 1880, 90, p. 819); or by passing the vapour of carbon bisulphide over a heated mixture of silica and carbon. It crystallizes in needles which rapidly de- compose when exposed to moist air. By heating crystallized silicon with boron in the electric furnace H. Moissan and A. Stock (Comptes rendus, 1900, 131, p. 139) obtained two borides, SiB 3 and SiB 6 . They are both very stable crystalline solids. The former is com- pletely decomposed when fused with caustic potash and the latter by a prolonged boiling with nitric acid. For silicon carbide see carborundum. Numerous methods have been given for the prepara- tion of magnesium silicide, Mg 2 Si, in a more or less pure state, but the pure substance appears to have been obtained by P. Lebeau (Comptes rendus, 1908, 146, p. 282) in the following manner. Alloys of magnesium and silicon are prepared by heating fragments of mag- nesium with magnesium filings and potassium silico-fluoride. From the alloy containing 25% of silicon, the excess of magnesium is removed by a mixture of ethyl iodide and ether and a residue con- sisting of slate-blue octahedral crystals of magnesium silicide is left.

It decomposes water at ordinary temperature with evolution of hydrogen but without production of silicon hydride, whilst cold hydrochloric acid attacks it vigorously with evolution of hydrogen and spontaneously inflammable silicon hydride.

Organic Derivatives of Silicon.

The organic derivatives of silicon resemble the corresponding carbon compounds except in so far that the silicon atom is not capable of

combining with itself to form a complex chain in the same manner as the carbon atom, the limit at present being a chain ‘ of three silicon atoms. Many of the earlier-known silicon alkyl compounds were isolated by Friedel and Crafts and by Ladenburg, the method adopted consisting in the interaction of the zinc alkyl compounds with silicon halides or esters of silicic acids. SiCU-H 2Zn(C 2 H 6) 2 = 2ZnCl 2 +Si(C 2 H6)4- This method has been modified by F. S. Kipping (Jour. Chem. Soc, 1901, 79, p. 449) and F. Taurke (Ber., 1905, 38, p. 1663) by condensing silicon halides with alkyl chlorides in the presence of sodium: SiCl4+4R-Cl-|-8Na = SiR4+8NaCl;SiHCl 3 +3R-Cl+6Na=SiHR 3 +6NaCl;whilstKipping (Proc. Chem. Soc, 1904, 20, p. 15) has used silicon halides with the Grignard reagent :C 2 H 6 MgBr(+SiCl4)->C 2 H 6 SiCl 3 (-|-MgBrPh)-> Ph-C 2 HrSiCi 2 (+MgBrC 3 H 7)->Ph-C 2 H 5 -C ii H 7 -SiCl.

Silicon Telramelhyl, Si(CH 3) 4 (tetramethyl silicane), and silicon tetraethyl, Si(C 2 H 6) 4 , are both liquids. The latter reacts with chlorine to give silicon nonyl-chloride Si(C 2 H5) 3 -C 2 H 4 Cl, which condenses with potassium acetate to give the acetic ester of silicon nonyl alcohol from which the alcohol (a camphor-smelling liquid) may be obtained by hydrolysis. Triethyl silicol, (C 2 H6)sSi-OH, is a true alcohol, obtained by condensing zinc ethyl with silicic ester, the resulting substance of composition, (C 2 H 6) 3 -SiOC 2 H5, with. acetyl chloride yielding a chloro-compound (C 2 H5) 3 SiCl, which with aqueous ammonia yields the alcohol. Silicon tetraphenyl, Si(C 6 H 5) 4 , a solid melting at 231° C, is obtained by the action of chlorobenzene on silicon tetrachloride in the presence of sodium. Silico-oxalic acid, (SiO-OH) 2 , obtained by decomposing silicon hexachloride with ice- cold water, is an unstable solid which is readily decomposed by the inorganic bases, with evolution of hydrogen and production of a silicate. Silicomesoxalic acid, HO-OSiSi(OH)2-SiO-OH, formed by the action of moist air on silicon octochloride at 0° C, is very unstable, and hot water decomposes it with evolution of hydrogen and forma- tion of silicic acid (L. Gattermann, Ber., 1899, 32, p. 1 1 14). Silica benzoic acid, CsHs-SiO-OH, results from the action of dilute aqueous ammonia on phenyl silicon chloride (obtained from mercury diphenyl and silicon tetrachloride). It is a colourless solid which melts at 92° C. For silicon derivatives of the amines see Michaelis, Ber., 1896, 29, p. 710; on asymmetric silicon and the resolution of cK-benzyl-ethyl-propyl-silicol see F. S. Kipping, Jour. Chem. Soc, 1907, 91, pp. 209 et seq.*

The atomic weight of silicon has been determined usually by analysis of the halide compounds or by conversion of the halides into silica. The determination of W. Becker and G. Meyer (Zeit. anorg. Chem., 1905, 43, p. 251) gives the value 28-21, and the Inter- national Commission in 1910 has adopted the value 28-3.

SILISTRIA (Bulgarian Silistra), the chief town of a department in Bulgaria and the see of an archbishop, situated on a low-lying peninsula projecting into the Danube, 81 m. below Rustchuk and close to the frontier of the Rumanian Dobrudja. Pop. (1892) 11,718; (1900) 12,133; (1908) 12,055, of whom 6142 were Bulgarians and 4126 Turks. The town was formerly a fortress of great strength, occupying the N.E. corner of the famous quadrilateral (Rustchuk, Silistra, Shumla, Varna), but its fortifications were demolished in accordance with the Berlin Treaty (1878). In the town is a large subterranean cavern, the Houmbata, which served as a refuge for its inhabitants during frequent bombardments. The principal trade is in cereals; wine and wood are also exported. The town is surrounded by fine vineyards, some 30 kinds of grapes being cultivated, and tobacco is grown. Sericulture, formerly a flourishing industry, has declined owing to a disease of the silk-worms, but efforts have been made to revive it. Apiculture is extensively practised and there are large market-gardens in the neighbourhood, The soil of the department is fertile, but lacking in water; the inhabitants have excavated large receptacles in which rain-water is stored. A considerable area is still covered with forest, to which the region owes its name of Deli Orman (" the wild wood") ; there are extensive tracts of pasturage, but cattle-rearing declined in 1 880-1910. A large cattle-fair, lasting three days, is held in' May. The town possessed in 1910 one steam flour-mill and some cloth factories and tanneries.

Silistria was the Durostorum of the Romans (Bulgarian Drstr) ; the ancient name remains in the title of the archbishop, who is styled metropolitan of Dorostol, and whose diocese is now

united with that of Tcherven (Rustchuk). It was one of the most important towns of Moesia Inferior and was successively the headquarters of the legio I. (Italica) and the legio XI. (Claudia). It was defended by the Bulgarian tsar Simeon against the Magyars and Greeks in 893. In 967 it was captured by the Russian prince Sviatoslav, whom the Byzantine emperor Nicephorus Phocas had summoned to his assistance. In 971 Sviatoslav, after a three months' heroic defence, surrendered the town to the Byzantines, who had meanwhile become his enemies. In 1388 it was captured by the Turks under Ali Pasha, the grand vizier of the sultan Murad. A few years later it seems to have been in the possession of the Walachian prince Mircea, but after his defeat by Mahommed I. in 1416 it passed finally into the hands of the Turks. Silistria flourished under Ottoman rule; Hajji Khalifa describes it as the most important of all the

Danu- bian towns; a Greek metropolitan was installed here with five bishops under his control and a settlement of Ragusan merchants kept alive its commercial interests. In 1810 the town was surrendered to the Russians under Kamenskiy, who destroyed its fortifications before they withdrew, but they were rebuilt by foreign engineers, and in 1828-1829 were strong enough to offer a serious resistance to the Russians under Diebich, who captured the town with the loss of 3000 men. At that date the population including the garrison was 24,000, but in 1837 it was only about 4000. The town was held in pledge by the Russians for the pay- ment of a war indemnity (1829-1836). During the campaign of 1854 it was successfully defended by General Krach against the Russians under Paskievich; the circuit of its defences had been strengthened before this time by the outlying fortresses Medjid-tabia (built by English engineers) and Arab-tabia. It was again invested by the Russians in 1877, and on the con- clusion of peace was evacuated by the Turks. (J. D. B.)

SILIUS ITALICUS, in full Titus Catius Silius Italicus (a.d. 25 or 26-101), Latin epic poet. His birthplace is unknown. From his cognomen Italicus the conclusion has been drawn that he came from the town of Italica in Spain; but Latin usage would in that case have demanded the form Italicensis, and it is highly improbable that Martial would have failed to name him among the literary celebrities of Spain in the latter half of the 1st century. The conjecture that Silius derived from Italica, the capital of the Italian confederation during the Social War, is open to still stronger objection. Most likely some ancestor of the poet acquired the title " Italicus " from having been a member of one of the corporations of "Italici" who are often mentioned in inscriptions from Sicily and else- where. In early life Silius was a renowned forensic orator, later a safe and cautious politician, without ability or ambition enough to be legitimately obnoxious to the cruel rulers under whom he lived. But mediocrity was hardly an efficient protec- tion against the murderous whims of Nero, and Silius was generally believed to have secured at once his own safety and his promotion to the consulship by prostituting his oratorical powers in the judicial farces which often ushered in the doom of the emperor's victims. He was consul in the year of Nero's death (68), and is mentioned by Tacitus as having been one of two witnesses who were present at the conferences between Vitellius and Flavius Sabinus, the elder brother of Vespasian, when the legions from the East were marching rapidly on the capital. The life of Silius after his consulship is well depicted by the younger Pliny: — " He conducted himself wisely and courteously as the friend of the luxurious and cruel Vitellius; he won repute by his proconsulship of Asia, and obliterated by the praiseworthy use he made of his leisure the stain he had incurred through his active exertions in former days. In dignity and contentment, avoiding power and therefore hostility, he outlived the Flavian dynasty, keeping to a

private station after his governorship of Asia. " His poem contains only two passages relating to the Flavians; in both Domitian is eulogized as a warrior; in one he figures as a singer whose lyre is sweeter than that of Orpheus himself. Silius was a great student and patron of literature and art, and a passionate collector. Two great Romans of the past, Cicero and Virgil, were by him idealized

and veritably worshipped; and he was the happy possessor of their estates at Tusculum and Naples. The later life of Silius was passed on the Campanian shore, hard by the tomb of Virgil, at which he offered the homage of a devotee. He closely emu- lated the lives of his two great heroes: the one he followed in composing epic verse, the other in debating philosophic questions with his friends of like tastes. Among these was Epictetus, who judged him to be the most philosophic spirit among the Romans of his time, and Cornutus, the Stoic, rhetorician and grammarian, who appropriately dedicated to Silius a commentary upon Virgil. Though the verse of Silius is not wrapped in Stoic gloom like that of Lucan, yet Stoicism lends in many places a not ungraceful gravity to his poem. Silius was one of the numerous Romans of the early empire who had the courage of their opinions, and carried into perfect practice the theory of suicide adopted by their school. Stricken by an incurable tumour, he starved himself to death, keeping a cheerful countenance to the end.

Whether Silius committed to writing his philosophic dialogues or not, we cannot say. Chance has preserved to us his epic poem entitled Punica, in seventeen books, and comprising some fourteen thousand lines. In choosing the Second Punic War for his subject, Silius had, we know, many predecessors, as he doubtless had many followers. From the time of Naevius onwards every great military struggle in which the Romans had been engaged had found its poet over and over again. In justice to Silius and Lucan, it should be observed that the mythologic poet had a far easier task than the historic. In a well-known passage Petronius pointedly describes the difficulties of the historic theme. A poet, he said, who should take upon him the vast subject of the civil wars would break down beneath the burden unless he were " full of learning," since he would have not merely to record facts, which the historians did much better, but must possess an unshackled genius, to which full course must be given by the use of digressions, by bringing divine beings on to the stage, and by giving generally a mytho- logic tinge to the subject. The Latin laws of the historic epic were fixed by Ennius, and were still binding when Claudian wrote. They were never seriously infringed, except by Lucan, who substituted for the dei ex machina of his predecessors the vast, dim and imposing Stoic conception of destiny. By pro- tracted application, and being " full of learning," Silius had acquired excellent recipes for every ingredient that went to the making of the conventional historic epic. Though he is not

named by Quintilian, he is probably hinted at in the mention of a class of poets who, as the writer says, " write to show their learning." To seize the moments in the history, however un- important, which were capable of picturesque treatment; to pass over all events, however important, which could not readily be rendered into heroics; to stuff out the somewhat modern heroes to something like Homeric proportions; to subject all their movements to the passions and caprices of the Olympians; to ransack the poetry of the past for incidents and similes on which a slightly new face might be put; to foist in by well- worn artifices episodes, however strange to the subject, taken from the mythologic or historic glories of Rome and Greece, — all this Silius knew how to do. He did it all with the languid grace of the inveterate connoisseur, and with a simplicity foreign to his time, which sprang in part from cultivated taste and horror of the venturesome word, and in part from the subdued tone of a life which had come unscathed through the reigns of Caligula, Nero and Domitian. The more threadbare the theme, and the more worn the machinery, the greater the need of genius. Two of the most rigid requirements of the ancient epic were abundant similes and abundant single combats. But all the obvious resemblances between the actions of heroic man and external nature had long been worked out, while for the renova- tion of the single combat little could be done till the hero of the Homeric type was replaced by the medieval knight. Silius, however, had perfect poetic appreciation, with scarce a trace of poetic creativeness. No writer has ever been more correctly and more uniformly judged by contemporaries and by posterity alike. Only the shameless flatterer, Martial, ventured to call

his friend a poet as great as Virgil. But the younger Pliny gently says that he wrote poems with greater diligence than talent, and that, when, according to the fashion of the time, he recited them to his friends, " he sometimes found out what men really thought of them. " It is indeed strange that the poem lived on. Silius is never mentioned by ancient writers after Pliny except Sidonius, who, under different conditions and at a much lower level, was such another as he. Since the discovery of Silius by Poggio, no modern enthusiast has arisen to sing his praises. His poem has been rarely edited since the 18th century. Yet, by the purity of his taste and his Latin in an age when taste was fast becoming vicious and Latin corrupt, by his presentation to us of a type of a thousand vanished Latin epics, and by the historic aspects of his subject, Silius merits better treatment from scholars than he has received. The general reader he can hardly interest again. He is indeed of imitation all compact, and usually dilutes what he borrows; he may add a new beauty, but new strength he never gives.

Hardly a dozen lines anywhere are without an echo of Virgil, and there are frequent admixtures of Lucretius, Horace, Ovid, Lucan, Homer, Hesiod and many other poets still extant. If we could reconstitute the library of Silius we should probably find that scarcely an idea or a phrase in his entire work was wholly his own.

The raw material of the Punica was supplied in the main by the third decade of Livy, though Silius may have consulted other historians of the Hannibalic war. Such facts as are used are generally presented with their actual circumstances unchanged, and in their historic sequence. The spirit of the Punic times is but rarely misconceived — as when to secret voting is attributed the election of men like Flaminius and Varro, and distinguished Romans are depicted as contending in a gladiatorial exhibition. Silius clearly intended the poem to consist of twenty-four books, like -the Iliad and the Odyssey, but after the twelfth he hurries in visible weariness to the end, and concludes with seventeen. The general plan of the epic follows that of the Iliad and the Aeneid. Its theme is conceived as a duel between two mighty nations, with parallel dissensions among the gods. Scipio and Hannibal are the two great heroes who take the place of Achilles and Hector on the one hand and of Aeneas and Turnus on the other, while the minor figures are all painted with Virgilian or Homeric pigments. In the delineation of character our poet is neither very powerful nor very consistent. His imagination was too weak to realize the actors with distinctness and individuality. His Hannibal is evidently at the outset meant for an incarnation of cruelty and treachery, the embodiment of all that the vulgar Roman attached to the name " Punic. " But in the course of the poem the greatness of Hannibal is borne in upon the poet, and his feeling of it betrays itself in many touches. Thus he names Scipio "the great Hannibal of Ausonia"; he makes Juno assure the Carthaginian leader that if fortune had only permitted him to be born a Roman he would have been admitted to a place among the gods; and, when the ungenerous monster of the first book accords in the fifteenth a splendid burial to Marcellus, the poet cries, " You would fancy it was a Sidonian chief who had fallen. " Silius deserves little pity for the failure of his attempt to make Scipio an equipoise to Hannibal and the counterpart in personal prowess and prestige of Achilles. He becomes in the process almost as mythical a figure as the medieval Alexander. The best drawn of the minor characters are Fabius Cunctator, an evident copy of Lucan's Cato, and Paullus, the consul killed at Cannae, who fights, hates and dies like a genuine man.

Clearly it was a matter of religion with Silius to repeat and adapt all the striking episodes of Homer and Virgil. Hannibal must have a shield of marvellous workmanship like Achilles and Aeneas; because Aeneas descended into Hades and had a vision of the future history of Rome, so must Scipio have his revelation from heaven; Trebia, choked with bodies,

must rise in ire like Xanthus, and be put to flight by Vulcan; for Virgil's Camilla there must be an Asbyte, heroine of Saguntum; the beautiful speech of Euryalus when Nisus seeks to leave him is too good to

be thrown away — furbished up a little, it will serve as a parting address from Imilce to her husband Hannibal. The descriptions of the numerous battles are made up in the main, according to epic rule, of single combats — wearisome sometimes in Homer, wearisome oftener in Virgil, painfully wearisome in Silius. The different component parts of the poem are on the whole fairly well knit together, and the transitions are not often needlessly abrupt; yet occasionally incidents and episodes are introduced with all the irrelevancy of the modern novel. The interposition of the gods is, however, usually managed with dignity and appropriateness.

As to diction and detail, we miss, in general, power rather than taste. The metre runs on with correct smooth monotony, with something always of the Virgilian sweetness, though attenuated, but nothing of the Virgilian variety and strength. The dead level of literary execution is seldom broken by a rise into the region of genuine pathos and beauty, or by a descent into the ludicrous or the repellent. There are few absurdities, but the restraining force is trained perception and not a native sense of humour, which, ever present in Homer, not entirely absent in Virgil, and sometimes finding grim expression in Lucan, fails Silius entirely. The address of Anna, Dido's sister, to Juno compels a smile. Though deified on her sister's death, and for a good many centuries already an inhabitant of heaven, Anna meets Juno for the first time on the outbreak of the Second Punic War, and deprecates the anger of the queen of heaven for having deserted the Carthaginians and attached herself to the Roman cause. Hannibal's parting address to his child is also comical: he recognizes in the " heavy wailing " of the year-old babe " the seeds of rages like his own." But Silius might have been forgiven for a thousand more weaknesses than he has if in but a few things he had shown strength. The grandest scenes in the history before him fail to lift him up; his treatment, for example, of Hannibal's Alpine passage falls immensely below Lucan's vigorous delineation of Cato's far less stirring march across the African deserts.

But in the very weaknesses of Silius we may discern merit. He at least does not try to conceal defects of substance by contorted rhetorical conceits and feebly forcible exaggerations. In his ideal of what Latin expression should be he comes near to his contemporary Quintilian, and resolutely holds aloof from the tenor of his age. Perhaps his want of success with the men of his time was not wholly due to his faults. His self-control rarely fails him; it stands the test of the horrors of war, and of Venus working her will on Hannibal at Capua. Only a few passages here and there betray the true silver Latin extravagance. In the avoidance of rhetorical artifice and

epigrammatic antithesis Silius stands in marked contrast to Lucan, yet at times he can write with point. Regarded merely as a poet he may not deserve high praise; but, as he is a unique specimen and probably the best of a once numerous class, the preservation of his poem among the remains of Latin Literature is a fortunate accident.

The poem was discovered in a MS., possibly at Constance, by Poggio, in 1416 or 1417; from this now lost MS. all existing MSS., which belong entirely to the 15th century, are derived. A valuable MS. of the 8th or 9th century, found at Cologne by L. Carrion in the latter part of the 16th century, disappeared soon after its discovery. Two editiones principes appeared at Rome in 1471; the principal editions since have been those of Heinsius (1600), Drakenborch (1717), Ernesti (Leipzig, 1791) and L. Bauer (1890). The Punica is included in the second edition of the Corpus poetarum Latinorum. A useful variorum edition is that of Lemaire (Paris, 1823). Recent writing on Silius is generally in the form of separate articles or small pamphlets; but see H. E. Butler, Post- Augustan Poetry (1909), chap. x. (J, S. R.)

SILK, a fibrous substance produced by many insects, princi- pally in the form of a cocoon or covering within which the creatures are enclosed and protected during the period of their principal transformations. The webs and nests, &c, formed by spiders are also of silk. But the fibres used for manufacturing purposes are exclusively produced by the mulberry silk-moth of China, Bombyx mori, and a few other moths closely allied to that insect. Among the Chinese the name of the silkworm is ” si, ” Korean ” soi “; to the ancient Greeks it became known

as (Trip, the nation whence it came was to them S^pes, and the fibre itself ai\piKov, whence the Latin sericum, the French sole, the German Seide and the English silk.

History. — The silk industry originated in China; and according to native records it has existed there from a very remote period. The empress, known as the lady of Si-ling, wife of a famous emperor, Huang-ti (2640 B.C.), encouraged the cultivationof the mulberry tree, the rearing of the worms and the reeling of silk. This empress is said to have devoted herself personally to the care of silkworms, and she is by the Chinese credited with the invention of the loom. A voluminous ancient literature testifies not only to the antiquity but also to the importance of Chinese sericulture, and to the care and attention bestowed on it by royal and noble families. The

Chinese guarded the secrets of their valuable art with vigilant jealousy; and there is no doubt that many centuries passed before the culture spread beyond the country of its origin. Through Korea a knowledge of the silkworm and its produce reached Japan, but not before the early part of the 3rd century. One of the most ancient books of Japanese history, the Nihongi, states that towards a.d. 300 some Koreans were sent from Japan to China to engage competent people to teach the arts of weaving and preparing silk goods. They brought with them four Chinese girls, who instructed the court and the people in the art of plain and figured weaving; and to the honour of these pioneer silk weavers a temple was erected in the province of Settsu. Great efforts were made to encourage the industry, which from that period grew into one of national importance. At a period probably little later a knowledge of the working of silk travelled westward, and the cultivation of the silkworm was established in India. According to a tradition the eggs of the insect and the seed of the mulberry tree were carried to India by a Chinese princess concealed in the lining of her head dress. The fact that seri- culture was in India first estalished in the valley of the Brahma- putra and in the tract lying between that river and the Ganges renders it probable that it was introduced overland from the Chinese empire. From the Ganges valley the silkworm was slowly carried westward and spread in Khotan, Persia and the states of Central Asia.

Most critics recognize in the obscure word d'meseq or d'mesheq, Amos iii. 12, a name of silk corresponding to the Arabic dimaks, late Greek jxtraˆa , English damask, and also follow the ancients in understanding meshi, Ezek. xvi. 10, 13, of " silken gauze." But the first notice of the silkworm in Western literature occurs in Aristotle, Hist. anim. v. 19 (17), n (6), where he speaks of " a great worm which has horns and so differs from others. At its first metamorphosis it produces a caterpillar, then a bombylius and lastly a chrysalis — all these changes taking place within six months. From this animal women separate and reel off the cocoons and afterwards spin them. It is said that this was first spun in the island of Cos by Pamphile, daughter of Plates." Aristotle's vague knowledge of the worm may have been derived from information acquired by the Greeks with Alexander the Great; but long before this time raw silk must have begun to be imported at Cos, where it was woven into a gauzy tissue, the famous Coa veslis, which revealed rather than clothed the form.

Towards the beginning of the Christian era raw silk began to form an important and costly item among the prized products of the East which came to Rome. Allusions to silk and its source became common in classical literature; but, although these references show familiarity with the material, they are singularly vague and inaccurate as to its source; even Pliny knew nothing more about the silkworm than could be learned from Aristotle's description. The silken textures which at first found their way to Rome

were necessarily of enormous cost, and their use by men was deemed a piece of effeminate luxury. From an anecdote of Aurelian, who neither used silk himself nor would allow his wife to possess a single silken garment, we learn that silk was worth its weight in gold.

Notwithstanding its price and the restraints otherwise put on the use of silk the trade grew. Under Justinian a monopoly of the trade and manufacture was reserved to the emperor, and

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looms, worked by women, were set up within the imperial palace at Constantinople. Justinian also endeavoured, through the Christian prince of Abyssinia, to divert the trade from the Persian route along which silk was then brought into the east of Europe. In this he failed, but two Persian monks who had long resided in China, and there learned the whole art and mystery of silkworm rearing, arrived at Constantinople and imparted their knowledge to the emperor. By him they were induced to return to China and attempt to bring to Europe the material necessary for the cultivation of silk, which they effected by concealing the eggs of the silkworm in a hollow cane. From the precious contents of that bamboo tube, brought to Constantinople about the year 550, were produced all the races and varieties of silkworm which stocked and supplied the Western world for more than twelve hundred years.

Under the care of the Greeks the silkworm took kindly to its Western home and flourished, and the silken textures of Byzan- tium became famous. At a later period the conquering Saracens obtained a mastery over the trade, and by them it was spread both east and west — the textures becoming meantime impressed with the patterns and colours peculiar to that people. They established the trade in the thriving towns of Asia Minor, and they planted it as far west as Sicily, as Sicilian silks of the 12 th century with Saracenic patterns still testify. Ordericus Vitalis, who died in the first half of the 12th century, mentions that the bishop of St Evroul, in Normandy, brought with him from Apulia in southern Italy several large pieces of silk, out of the finest of which four copes were made for his cathedral chanters. The cultivation and manufacture spread northwards to Florence, Milan, Genoa and Venice — all towns which became famous for silken textures in medieval times. In 1480 silk weaving was begun under Louis XL at Tours, and in 1520 Francis I. brought from Milan silkworm eggs, which were reared in the Rhone valley. About the beginning of the 17 th century Olivier de Serres and Laffemas, somewhat against the will of Sully, obtained royal edicts favouring the growth of mulberry plantations and the cultivation of silk; but it cannot be said that these industries were firmly established till Colbert encouraged the planting of the mulberry by

premiums, and otherwise stimulated local efforts.

Into England silk manufacture was introduced during the reign of Henry VI. ; but the first serious impulse to manufactures of that class was due to the immigration in 1585 of a large body of skilled Flemish weavers who fled from the Low Countries in consequence of the struggle with Spain then devastating their land. Precisely one hundred years later religious troubles gave the most effective impetus to the silk-trade of England, when the revocation of the edict of Nantes sent simultaneously to Switzerland, Germany and England a vast body of the most skilled artisans of France, who planted in these countries silk- weaving colonies which are to this day the principal rivals of the French manufacturers. The bulk of the French Protestant weavers settled at Spitalfields, London — an incorporation of silk workers having been there formed in 1629. James I. used many efforts to encourage the planting of the mulberry and the rearing of silkworms both at home and in the colonies. Up to the year 1718 England depended on the thrown silks of Europe for manufacturing purposes. But in that year Lombe of Derby, disguised as a common workman, and obtaining entrance as such into one of the Italian throwing mills, made drawings of the machinery used for this process. On his return, subsidized by the government, he built and worked, on the banks of the Derwent, the first English throwing mill. In 1825 a public company was formed and incorporated under the name of the British, Irish and Colonial Silk Company, with a capital of £1,000,000, principally with the view of introducing sericulture into Ireland, but it was a complete failure, and the rearing of the silkworm cannot be said ever to have become a branch of British industry.

In 1522 Cortes appointed officials to introduce sericulture into New Spain (Mexico), and mulberry trees were then planted and eggs were brought from Spain. The Mexican adventure is

mentioned by Acosta, but all trace of the culture had died out before the end of the century. In 1609 James I. attempted to reinstate the silkworm on the American continent, but his first effort failed through shipwreck. An effort made in 1619 obtained greater success, and, the materials being present, the Virginian settlers were strongly urged to devote attention to the profitable industry of silk cultivation. Sericulture was enjoined under penalties by statute; it was encouraged by bounties and rewards; and its prosecution was stimulated by learned essays and rhapsodical rhymes, of which this is a sample: —

" Where Wormes and Food doe naturally abound A gallant Silken Trade must there be found. Virginia excels the World in both — Envie nor malice can gaine say this troth!"

In the prospectus of Law's great Compagnie des Indes Occidenlales the cultivation of silk occupies a place among the glowing attrac- tions which allured so many to disaster. Onward till the period of the War of Independence bounties and other rewards for the rearing of worms and silk filature continued to be offered; and just when the war broke out Benjamin Franklin and others were engaged in nursing a filature into healthy life at Philadelphia. With the resumption of peaceful enterprise, the stimulus of bounties was again applied — first by Connecticut in 1783; and such efforts have been continued sporadically down almost to the present day. Bounties were last offered by the state of California in 1865-1866, but the state law was soon repealed, and an attempt to obtain state encouragement again in 1872 was defeated. About 1838 a speculative mania for the cultivation of silk developed itself with remarkable severity in the United States. It was caused principally through the representations of Samuel Whitmarsh as to the capabilities of the South Sea Islands mulberry (Morus multicaulis) for feeding silkworms; and so intense was the excitement that plants and crops of all kinds were displaced to make room for plantations of M . multicaulis. In Pennsylvania as much as $300,000 changed hands for plants in one week, and frequently the young trees were sold two and three times over within a few days at ever-advancing prices. Plants of a single year's growth reached the ridiculous price of $1 each at the height of the fever, which, however, did not last long, for in 1839 the speculation collapsed; the famous M. multicaulis was found to be no golden tree, and the costly plantations were uprooted.

The most singular feature in connexion with the history of silk is the persistent efforts which have been made by monarchs and other potentates to stimulate sericulture within their dominions, efforts which continue to this day in British colonies, India and America. These endeavours to stimulate by artificial means have in scarcely any instance resulted in permanent success. In truth, raw silk can only be profitably brought to the market where there is abundant and very cheap labour — the fact that China, Japan, Bengal, Piedmont and the Levant are the principal producing localities making that plain.

The Silkworm.

The mulberry-feeding moth, Bombyx mori, which is the principal source of silk, belongs to the Bombycidae, a family of

Lepidoplera in which are em- braced some of the largest and most

handsome moths. B.mori is itself an inconspicuous moth (figs. 1 and 2), of an ashy white colour, with a body in the case of the male not | in. in length, the female being a little longer and stouter. Its wings are short and weak; the fore pair are falcate, and the hind pair do not reach to the end of the body. The larva (fig- 3) is hairless, of an ashy grey or cream colour, attains to a length of from 3 to 3ˆ in., and is slender in comparison with many of its allies. The second thoracic ring is humped, and there

Fig. 1. — Bombyx mori (male).

Fig. 2. — Bombyx mori (female).

is a spine-like horn or protuberance at the tail. The common silkworm produces as a rule only one generation during the year; but there are races in cultivation which are bivoltine, or two- generationed, and some are multivoltine. Its natural food is the leaves of mulberry trees. The silk glands or vessels consist of two long thick-walled sacs running along the sides of the body, which open by a common orifice — the spin- neret or seripositor — on the under lip of the larva. Fig. 4 represents the head (a) and feet (&, b) of the common silkworm, while c is a diagrammatic view ol the silk glands. As the larva approaches maturity these vessels become gorged with a clear viscous fluid, which, upon being exposed to the air immediately hardens to a solid mass. Advantage is taken of this peculiarity to prepare from fully developed larvae silkworm gut used for casting lines in rod-fishing, and for numerous other purposes where lightness, tenacity, flexibility and strength are essential. The larvae are killed and hardened by steeping some hours in strong acetic acid; the silk glands are then separated from the bodies, and the vis- cous fluid drawn out to the condition of a fine uniform line, which is stretched between

pins at the extremity ˆ T e „

of a board. The board FlG ” 3—Larva of Bombyx mart.

is then exposed to the sunlight till the lines dry and harden into the condition of gut. The preparation of gut is, however, merely an unimportant collateral manufacture. When the larva is fully mature, and ready to change into the pupa condition, it proceeds to spin its cocoon, in which operation it ejects from both glands simultaneously a continuous and reelable thread of 800 I

Fig. 4.

to 1200 yds. in length, moving its head round in regular order continuously for three days or thereabouts. The thread so ejected forms the silk of commerce, which as wound in the cocoon consists of filaments seriposited

from two separate glands (discovered by an Italian naturalist named Filippi) containing a glutinous or resinous secretion which serves a double purpose, viz. that of helping the thin viscous threads through their final outlets, and the adhesion of the two filaments when brought into contact with the atmosphere.

Under the microscope cocoon silk presents the appearance (fig. 5) of a somewhat flattened combination of two filaments placed side by side, being on an average -j-jVo P art °f an i nc h ‘ n thickness (see also Fibres, Plate I.). The cocoons are white or yellow in colour, oviform in shape, with often a constriction in the middle (fig. 6). According to race, &c, they vary considerably in size and weight, but on an average they measure from an inch to an inch and a half in length, and from half an inch to an inch in diameter. They form

hard, firm and compact shells with some straggling flossy filaments on the exterior, and the interior layers are so closely and densely agglutinated as to constitute a parchment-like mass which resists all attempts at unwinding. The whole cocoon with its enclosed pupa weighs from 15 grains for the smaller races to about 50 grains for

Fig. 5. — Microscopic appearance of Silk of Bombyx mori.

Fig. 6. — Cocoon of Bombyx mori.

the breeds which spin large cocoons. From two to three weeks after the completion of the cocoon the enclosed insect is ready to escape ; it moistens one end of its self-made prison, thereby enabling itself to push aside the fibres and make an opening by which the perfect moth comes forth. The sexes almost immediately couple; the female in from four to six days lays her eggs, numbering 500 and upwards; and, with that the life cycle of the moth being complete, both sexes soon die.

Sericulture.

The art of sericulture concerns itself with the rearing of silk- worms under artificial or domesticated conditions, their feeding, the formation of cocoons, the securing of these before they are injured and pierced by the moths, and the maturing of a sufficient number of moths to supply eggs for the cultivation of the follow- ing year. The first essential is a stock of mulberry trees adequate to feed the worms in their larval stage. The leaves preferred in Europe are those of the white-fruited mulberry, Morus alba,

but there are numerous other species which appear to be equally suitable. The soil in which the mulberry grows, and the age and condition of the trees, are important factors in the success of silkworm cultivation; and it has been too often proved that the mulberry will grow in situations where, from the nature of the leaf the trees put forth and from other circumstances, silkworms cannot be profitably reared. An elevated position with dry, friable, well-drained soil produces the best quality of leaves. Throughout the East the species of mulberry cultivated are numerous, but, as these trees have been grown for special purposes at least for three thousand years, they show the com- plex variations peculiar to most cultivated plants.

The eggs of the silkworm, called graine, are hatched out by artificial heat at the period when the mulberry leaves are ready for the feeding of the larvae. These eggs are very minute — about one hundred weighing a grain; and a vast number of hatched worms may at first be kept in a small space; but the rapid growth and voracious appetite of the caterpillars demand quickly increasing and ample space. Pieces of paper punctured with small holes are placed over the trays in which the hatching goes on; and the worms, immediately they burst their shell, creep through these openings to the light, and thereby scrape off any fragments of shell which, adhering to the skin, would kill them by constriction. The rearing-house in which the worms are fed (Fr. magnanerie) must be a spacious, well-lighted and well-ventilated apartment, in which scrupulous cleanliness and sweetness of air are essential, and in which the temperature may to a certain extent be under control. The worms are more hafdy than is commonly supposed, and endure variations of temperature from 62° to 78 F. without any injury; but higher temperature is very detrimental. The lower the temperature at which the worms are maintained the slower is their growth and develop- ment; but their health and vigour are increased, and the cocoon they spin is proportionately bigger. The worms increase in size with astonishing rapidity, and no less remarkable is their growing

voracity. Certain races moult or cast their skin three times during their larval existence, but for the most part the silkworm moults four times — about the sixth, tenth, fifteenth and twenty-third days after hatching. As these moulting periods approach, the worms lose their appetite and cease eating, and at each period of change they are left undisturbed and free from noise.

Laurent de l'Arbousset showed in 1905 that 1 oz. cf seed of 30 grammes producing 30,000 to 35,000 silkworms (30,000 may be depended upon to reach the cocoon stage) will give a harvest of 130 to 140 lb fresh cocoons and an ultimate yield of about 12 lb raw silk properly reeled. The amount of nourishment required for this rearing is as follows: — hatching to first

moult, about 9 lb of leaves of tender growth, equal to 40 to 45 lb ripe leaves; first to second moult, 24 lb, representing 100 lb ripe leaves; second to third moult, 80 lb, representing 240 lb ripe leaves; third to fourth moult, 236 lb, representing 472 lb ripe leaves; fourth moult to mounting, 1430 ft, representing 1 540 lb ripe leaves, totalling to about one ton of ripe leaves for a complete rearing. The growth of the worms during their larval stage is thus stated by Count Dandolo: —

Weight per 100.

Size in Lines.

Worms newly hatched After 1st moult . .

,, 2nd ,, ...

„ 3rd „ ....

,, 4th ,, ... Greatest weight and size

1 gr.

15 ..

94 ..

400 ,,

1628 „

9500 „

1

4

6

12

20

40

When the caterpillars are mature and ready to undergo their transformation into the pupa condition, they cease eating for some time and then begin to ascend the brushwood branches or echelletes provided for

them, in which they set about the spinning of their cocoons. Crowding of positions must now be guarded against, to prevent the spinning of double cocoons (doupions) by two worms spinning together and so interlacing their threads that they can only be reeled for a coarser and inferior thread. The insects complete their cocoons m. from three to four days, and in two or three days thereafter the cocoons are collected, and the pupa killed to prevent its further progress and the bursting of the shell by the fully developed moth. Such cocoons as are selected for the production of graine, on the other hand, are collected, freed from the external floss, and preserved at a temperature of from 66° to 72 F., and after a lapse of from eleven to fifteen days the moths begin to make their appearance. The coupling which immediately takes place demands careful atten- tion; the males are afterwards thrown away, and the impreg- nated females placed in a darkened apartment till they deposit their eggs.

Diseases. — That the silkworm is subject to many serious diseases is only to be expected of a creature which for upwards of 4000 years has been propagated under purely artificial conditions, and these most frequently of a very insanitary nature, and where, not the healthy life of the insect, but the amount of silk it could be made to yield, was the object of the cultivator. Among the most fatal and disastrous of these diseases with which the cultivator had long to grapple was " muscardine," a malady due to the development of a fungus, Botrytis bassiana, in the body of the caterpillar. The disease is peculiarly contagious and infectious, owing to the develop- ment of the fungus through the skin, whence spores are freed, which, coming in contact with healthy caterpillars, fasten on them and germinate inwards, giving off corpuscles within the body of the insect. Muscardine, however, has not been epidemic for many years. But about the year 1853 anxious attention began to be given in France to the ravages of a disease among silkworms, which from its alarming progress threatened to issue in national disaster. This disease, which at a later period became known as " pebrine " — a name given to it by de Quatrefages, one of its many investi- gators — had first been noticed in France at Cavaillon in the valley of the Durance near Avignon. Pebrine manifests itself by dark spots in the skin of the larvae; the eggs do not hatch out, or hatch imperfectly; the worms are weak, stunted and unequal in growth, languid in movement, fastidious in feeding; many perish before coming to maturity; if they spin a cocoon it is soft and loose, and moths when developed are feeble and inactive. When sufficient vitality remains to produce a second generation it shows in increased intensity the feebleness of the preceding. The disease is thus hereditary, but in addition it is virulently infectious and contagious.

From 1850 onwards French cultivators were compelled, in order to keep up their silk supply, to import graine from uninfected districts. The area of infection increased rapidly, and with that the demand for healthy graine correspondingly expanded, while the supply had to be drawn from increasingly remote and contracted regions. Partly supported by imported eggs, the production of silk in France was maintained, and in 1853 reached its maximum of 26,000,000 kilos of cocoons, valued at 117,000,000 francs. From that period, notwith- standing the importation at great cost of foreign graine, reaching in some years to 60,000 kilos, the production of silk fell off with startling rapidity: in 1856 it was not more than 7,500,000 kilos of cocoons; in 1861 and 1862 it fell as low as 5,800,000 kilos; and in 1865 it touched its lowest weight of about 4,000,000 kilos. In 1867 de Quatrefages estimated the loss suffered by France in the 13 years following 1853, from decreased production of silk and price paid to foreign cultivators for graine, to be not less than one milliard of francs. In the case of Italy, where the disease showed itself later but even more disastrously, affecting a much more extended industry, the loss in 10 years de Quatrefages stated at two milliards. A loss of £120,000,000 sterling within 13 years, falling on a limited area, and on one class within these two countries, constituted indeed a calamity on a national scale, calling for national effort to contend with its devastating action. The malady, moreover, spread east- ward with alarming rapidity, and, although it was found to be less disastrous and fatal in Oriental countries than in Europe, the sources of healthy graine became fewer and fewer, till only Japan was left as an uninfected source of European graine supply.

A scourge which so seriously menaced the very existence of the silkworm in the world necessarily attracted a great amount of attention. So early as 1849 Guerin Meneville observed in the blood of diseased silkworms certain vibratory corpuscles, but neither did he nor the Italian Filippi, who studied them later, connect them distinctly with the disease. The corpuscles were first accurately described by Cornalia, whence they are spoken of as the corpuscles of Cornalia. The French Academy charged de Quatrefages, Decaisne and Peligot with the study of the disease, and they issued two elaborate reports — Htudes sur les maladies actuettes des vers a sole (1859) and Nouvelles Recherches sur les maladies actuelles des vers & soie (i860) ; but the suggestions they were able to offer had not the effect of stopping the march of the disease. In 1865 Pasteur under- took a Government commission for the investigation of the malady. Attention had been previously directed to the corpuscles of Cornalia, and k had been found, not only that they occurred in the blood, but that they gorged the whole tissues of the insect, and their presence in the eggs themselves could be microscopically demonstrated. Pasteur established (1) that the corpuscles are the special character- istic of the disease, and that these

invariably manifest themselves, if not in earlier stages, then in the mature moths; (2) that the cor- puscles are parasites, and not only the sign but the cause of the disease; and (3) that the disease manifests itself by heredity, by contagion with diseased worms, and by the eating of leaves on which corpuscles are spread. In this connexion he established the very important practical conclusion that worms which contract the disease during their own life-cycle retain sufficient vitality to feed, develop and spin their cocoon, although the next generation is invariably infected and shows the disease in its most virulent and fatal form. But this fact enabled the cultivator to know with assurance whether the worms on which he bestowed his labour would yield him a harvest of silk. He had only to examine the bodies of the moths yielding his graine : if they were free from disease then a crop was sure ; if they were infected the education would assuredly fail. Pasteur brought out the fact that the malady had existed from remote periods and in many unsuspected localities. He found corpuscles in Japanese cocoons and in many specimens which had been preserved for lengthened periods in public collections. Thus he came to the con- clusion that the malady had been inherentˆ in many successive generations of the silkworm, and that the epidemic condition was only an exaggeration of a normal state brought about by the method of cultivation and production of graine pursued. The cure proposed by Pasteur was simply to take care that the stock whence graine was obtained should be healthy, and the offspring would then be healthy also. Small educations reared apart from the ordinary magnanerie, for the production of graine alone, were recommended. At intervals of five days after spinning their cocoons specimens were to be opened and the chrysalides examined microscopically for corpuscles. Should none have appeared till towards the period of transformation and escape of the moths, the eggs subsequently hatched out might be depended on to yield a fair crop of silk; should the moths prove perfectly free from corpuscles after depositing their eggs the next generation would certainly live well through the larval stage. For special treatment towards the regeneration of an infected race, the most robust worms were to be selected , and the moths issuing from the cocoons were to be coupled in numbered cells, where the female was to be confined till she deposited her eggs. The bodies of both male and female were to be examined for corpuscles, and the eggs of those found absolutely free from taint were preserved for similar " cellular " treatment in the following year. By this laborious and painstaking method it has been found possible to re-establish a healthy stock of valuable races from previously highly-infected breeds. The rearing of worms in small educations under special supervision has been found to be

a most effective means of combating pebrine. In the same way the rearing of worms for graine in the open air, and under as far as possible natural

conditions, has proved equally valuable towards the development of a hardy, vigorous and untainted stock. The open-air education was originally proposed by Chavannes of Laus- anne, and largely carried out in the canton of Vaud by Roland, who reared his worms on mulberry trees enclosed within " manchons " or cages of wire gauze and canvas. The insects appeared quickly to revert to natural conditions ; the moths brought out in open air were strongly marked, lively and active, and eggs left on the trees stood the severity of the winter well, and hatched out successfully in the following season. Roland's experience demonstrated that not cold but heat is the agent which saps the constitution of the silkworm and makes it a ready prey to disease.

Grasserie is another form of disease incidental to the silkworm. It often appears before or alter the first moult, but it is only after the fourth that it appears in a more developed form. The worm attacked presents the following symptoms: the skin is distended as if swollen, is rather thin and shiny, and the body of the worm seems to have increased, that is, it suffers from fatness, or is engraisse, hence its name. The disease is characterized by the decomposition of the blood ; in fact it is really a form of dropsy. The blood loses its transparency and becomes milky, its volume increases so that the skin cannot hold it, and it escapes through the pores. This disease is more accidental than contagious and rarely takes very dangerous proportions. If the attack comes on a short time before maturity, the worms are able to spin a cocoon of a feeble character, but worms with this disease never change into chrysalides, but always die in the cocoon before transformation can take place. The causes which produce it are not well known, but it is generally attributable to currents of cold and damp air, to the use of wet leaves in feeding, and to sudden changes of temperature.

Another cause of serious loss to the rearers is occasioned by Flacherie, a disease well known from the earliest times. Pasteur showed that the origin of the disease proceeded from microscopic organisms called ferments and vitrios. One has only to ferment a certain quantity of mulberry leaves, chop them up and squeeze them, and so obtain a liquid, to find in it millions of ferments and vitrios. It invariably happens during the most active period of feeding, three or four days after the fourth moult up to the rising, and generally appears after a meal of coarse leaves, obtained from mulberries pruned the same year and growing in damp soil. Flacherie is an intestinal disease of the cholera species and therefore contagious. The definite course is not occasioned so much from the ferments which exist in the leaves themselves, but from an arrest of the digestive process which allows the rapid multiplication of the former in the intestines. Good ventilation is indispensable to allow the worm to give out by transpiration the great quantity of water that it absorbs with the leaf. If this exhalation is stopped or lessened the digestion in its turn is also stopped, the leaf remains longer

than usual in the intestines, the microbes multiply, invading the whole-body, and this brings about the sudden death which surprises the rearers. The true remedies consist in the avoidance of the fermenta- tion of the leaves by careless gathering, transport or packing, in proper hygienic care in ventilation and in maintaining a proper degree of dryness in the atmosphere in rainy weather, and in the usa of quicklime placed in different parts of the nursery to facilitate the transpiration of the silk-worms.

Wild Silks. — The ravages of pebrine and other diseases had the effect of attracting prominent attention to the numerous othei insects, allies of the mulberry silkworm, which spin serviceable cocoons. It had been previously pointed out by Captain Hutton, who devoted great attention to the silk ques- tion as it affects the East Indies, that at least six species of Bombyx, differing from B. mori, but also mulberry-feed- ing, are more or less domesticated in India. These include B. textor, the boropooloo of Bengal, a large species having one generation Fig. 7. — Chinese Tussur Moth , yearly and producing a soft flossy Antheraea pernyi (male).- cocoon; the Chinese monthly

worm, B. sinensis, having several generations, aid making a small cocoon; and the Madrasi worm of Bengal (B. croesi), the Dassee or Desi worm of Bengal (B. fortunatus) and B. arracanensis, the Burmese worm — all of which yield several

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generations in the year and form reelable cocoons. Besides these there are many other mulberry-feeding Bombycidae in the East, principally belonging to the genera Theophila and Ocinara, the cocoons of which have not attracted cul- tivators. The moths yielding wild silks which have obtained most attention belong to the extensive and handsome

family Saturnidae. The most important of the species at the present time is the Chinese tussur or tasar worm, Antheraea pcrnyi (figs. 7, 8), an oak-feeding species, native of Mongolia, from which is derived the greater part of the so-called tussur silk nowimportedintoEurope. Closely allied to this is the Indian tussur moth (fig._ 9) Antheraea mylitla, found througliout the whole of India feeding on the bher tree, Zizyphus jujuba, and on many other plants. It yields a large compact cocoon (fig. 10) of a silvery grey colour, which Sir Thomas Wardle ol Leek, who devoted a great amount of attention to the wild-silk

Fig. 8. — Cocoon of Antheraea pernyi

Fig. 9. — Antheraea mylitla (female).

question, succeeded in reeling. Next in promising qualities the muga or moonga worm of Assam, Antheraea assama, a species to some extent domes- ticated in its native country. The yama-mai worm of Japan, Antheraea {Samia) yama-mai, an oak-feeder, is a race of considerable importance in Japan, where it was said to be jealously guarded against foreigners. Its eggs were first sent to Europe by Duchene du Bellecourt, French consul- general in Japan in 1861; but early in March following they hatched out, when no leaves, on which the larvae would feed were to be found. In April a single worm got oak-buds, on which it throve, and ultimately spun a cocoon whence a female moth issued, from which Guerin Meneville named and described the species. A further supply of eggs was secretly obtained by a Dutch physician Pompe van Meedervoort in 1863, and, as it was now known that the worm was an oak-feeder, and would thrive on the leaves of European oaks, great results were anticipated from the cultiva- tion of the yama-mai. These expectations, however, for various reasons, have been disappointed. The moths hatch out at a

Fl „ G ‘,, I0 ‘~ Coc ?° n of period when oak leaves are not ready Antheraea myhtta. for ˆ feedJng) and the ˆ . g ˆ

no means of a quality to compare with that of the common mulberry worm. The mezankoorie moth of the Assamese, Antheraea mezankooria, yields a valuable cocoon, as does also

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the Atlas moth, Attacus atlas, which has an omnivorous larva found throughout India, Ceylon, Burmah, China and Java. The Cynthia moth, Attacus cynthia, is domesticated as a source of silk in certain provinces of China, where it feeds on the Ailan- thus glandulosa. The eria or arrindi moth of Bengal and Assam, Attacus ricini, which feeds on the castor-oil plant, yields seven generations yearly, forming loose flossy orange-red and some- times white cocoons. The ailanthus silkworm of Europe is a hybrid between A. cynthia and A. ricini, first obtained by Guerin Meneville, and now spread through many silk-growing regions. These are only a few of the moths from which silks of various usefulness can be produced; but none of these presents qualities, saving perhaps cheapness alone, which can put them in competition with common silk.

Physical and Chemical Relations of Silk. Common cocoons enclosing chrysalides weigh each from 16 to 50 grains, or say from 300 to 600 of small breeds and from 270 to 300 of large breeds to the lb. About one-sixth of this weight is pure cocoon, and of that one-half is obtainable as

reeled silk, the remainder consisting of surface floss or blaze and of hard gummy husk. As the outer flossy threads and the inner vests are not reelable, it is difficult to estimate the total length of thread produced by the silkworm, but the portion reeled varies in length and thickness, according to the condition and robustness of the cocoon, in some breeds giving a result as low as 500 metres, and in others 900 to 1200 metres. Under favourable conditions it is estimated that n kilo- grammes of fresh cocoons give 1 kilogramme of raw silk for commerce, and about the same quantity ”’ for waste spinning purposes. Sir Thomas Wardle of Leek, in his handbook on silk published Fig. ii. — Microscopic appearance in 1887, showed by a series of Silk of chinese Tussur.

of measurements that the diameter of a single cocoon thread or bave varied from xrVirth to frVtrth part of an inch in diameter in the various species of Bombycides, whilst those of the Saturnides or wild species varied from ^^th to t ˆ th part of an inch. As this estimation presents some difficulties and diver- gences, the size of the thread is generally defined commercially by deniers or decigrammes, those of the Anthereas (wild silks) being said to range from 5 to 8 deniers or decigrammes, results confirmed by actual experience with the reeled thread. The silk of the various species of Antheraea and Attacus is also thicker and stronger at the centre of the reeled portion than towards its extremities; but the diameter is much greater than that of common silk, and the filaments under the microscope (fig. n) present the appearance of flat bands, the exudation from the two spinnerets being joined at their flat edges. On this account the fibres of tussur or tussore silk tend to split up into fine fibrillae under the various preparatory processes in manufacturing, and its riband structure is the cause of the glassy lustre peculiar to the woven and finished fibres.

Silk fibre (see Fibres) consists essentially of a centre or core of fibroin, with a covering of sericin or silk albumen, and a little waxy and colouring matter. Fibroin, which is analogous to horn, hair and like dermal products, constitutes about 75 to 82 % of the entire mass, and has a composition represented by the formula CutˆNsOe. It has the characteristic appearance of pure silk — a brilliant soft white body with a pearly lustre — insoluble in water, alcohol and ether, but it dissolves freely in concentrated alkaline solutions, mineral acids, strong acetic acid and in ammoniacal solution of oxide of copper. Sericin, which constitutes the gummy covering (Fr. gres) of the fibre, is a gelatinous body which dissolves readily in warm soapy solutions, and in hot water, in which on cooling it forms a jelly with even as little as 1 % of the substance. It is precipitated from hot solutions by alcohol, falling as a white powder. Its formula is CisHzsNsOs. According to P. Bolley, the glands of the silkworm contain semi-liquid fibroin alone, and it is on exposure to the air that

the surface is acted on by oxygen, transforming the external pellicle into the more soluble form of sericin. Silk is highly hygroscopic. If desiccated at 250 ° F. it will be found to lose from 10 to 15 % of moisture according to the condition of the silk. It is a most perfect non-conductor of electricity, and in its dry state the fibres frequently get so electrically excited as to seriously interfere with their working, so that it becomes necessary to moisten them with glycerin or soapy solutions. Silk is readily distinguished from wool and other animal fibres by the action of an alkaline solution of oxide of lead, which darkens wool, &c, owing to the sulphur they contain, but does not affect silk, which is free from that body. Again, silk dissolves freely in common nitric acid, which is not the case with wool. From vegetable fibres silk is readily distinguished by the bright yellow colour it takes from a solution of picric acid, which does not adhere to vegetable substances. The rod-like appearance of silk and its absence of markings under the microscope are also easily recognizable features of the fibre.

Silk Manufacture. Here we must distinguish between the reeled silk and the spun or waste silk manufactures. The former embraces a range of operations peculiar to silk, dealing as they do with continuous fibres of great length, whereas in the spun silk industry the raw materials are treated by methods analogous to those followed in the treatment of other fibres (see Weaving). It is only floss, injured and unreelable cocoons, the husks of reeled cocoons, and other waste from reeling, with certain wild silks, which are treated by the spun silk process, and the silk thereby produced loses much of the beauty, strength and brilliance which are characteristic of the manufactures from reeled silk.

Filature or Reeling. — When the cocoons have been gathered the chrysalides they contain are killed either by dry heat or by exposure to steam. All cocoons stained by the premature death of the chrysalides (chiques), pierced cocoons, and any from other causes rendered unreelable, are put aside for the spun-silk manufacture. Then the uninjured cocoons are by themselves sorted into classes hiving similar shades of colour, size and quality of fibre. This assortment is of great consequence for the success of the reeling operations, as uniformity of quality and evenness and regularity of fibre are the most valuable features in raw silk. The object of reeling is to bring together the filaments {have) from two or more (generally four or five, but sometimes up to twenty) cocoons, and to form them into one continuous, uniform, and regular strand, which constitutes the " raw silk " of commerce. To do this, the natural gum of the cocoons which holds the filaments together must be softened, the ends of the

filaments of the required number of cocoona must be caught, and means must be taken to unwind and lay these filaments together, so as to form a single uniform rounded strand of raw silk. As the reeling proceeds the reeler has to give the most careful attention to the thickness of the strand being pro- duced, and to introduce new cocoons in place of any from which the reelable silk has become exhausted. In this way a continuous uniform fibre or strand of raw silk of indefinite length is produced. The apparatus used for these purposes in some localities is of a very primitive kind, and the reeling being uneven and lumpy the silk is of inferior quality and low value. With comparatively simple appliances, on the other hand, a skilled reeler, with trained eye and delicate touch, can produce raw silk of remarkably smooth and even quality. According to the method commonly adopted in North Italy and France the cocoons are for a few minutes immersed in water a little under the boiling point, to which a small quantity of alkali has been added. A girl with a small hand brush of twigs keeps stirring them in the water till the silk softens, and the outer loose fibres (floss) get entangled with the twigs and come off till the end of the main filament (maitre brin) is found. These ends being secured, the cocoons are transferred to a basin or tray containing water heated to from 140 to 150 F., in which they float while the silk is being reeled off. If the water is too cold the gum does not soften enough and the cocoons rise out of the basin in reeling; if it is too hot the cocoons collapse and fall to the bottom. The ends of the requisite number of filaments being brought together, they are passed through an eyelet or guide, and similarly another equal set are passed through a corresponding guide. The two sets of filaments are then crossed or twisted around each other several turns as if to make one thread, after which they are separated and passed through separate guides to the reel round which they are separately wound. When a large number of cocoons are to be combined into one strand they may be reeled from the tray in four sets, which are first crossed in pairs, then combined into two, and those two then crossed and afterwards combined into a single strand. The object of crossing {croissage) is to round, smooth and condense the separate filaments of each set into one strand, and as the surface of the filaments is gummy and adhesive it is found on drying that they have agglutinated into a compact single fibre of raw silk. In the most approved modern filatures there is a separate cocoon boiler (cuiseuse), an oblong tank containing water boiled by steam heat. In these the cocoons are immersed in rectangular perforated boxes for about

three minutes, when they are transferred to the beating machine (batteuse), an earthenware trough having a perforated false bottom through which steam keeps the water at a temperature of from 140 to 160°. In this water the cocoons are kept stirring by small brushes rotated by mechanical means, and as the silk softens the brushes gradually rise out of the water,

bringing entangled with them the loose floss, and thereby revealing the main filament of each cocoon. The cocoons are next, in sufficient number, transferred to the reeler's tray (bacinella), where the water is heated to about 140 to 150°. From the tray the filaments are carried through a series of porcelain and glass eyelets, so arranged that the strand returns on itself, two portions of the same strand being crossed or intertwisted for rounding and consolidation, instead of the croissage of two separate strands as in the old method. The reel to which the raw silk is led consists of a light six-armed frame, enclosed within a wooden casing having a glass frame in front, the enclosure being heated with steam-pipes. To keep the strands from directly overlaying each other and so adhering, the last guide through which the silk passes has a reciprocating motion whereby the fibre is distributed within certain limits over the reel. Fig. 12 presents a sectional view of a reeling apparatus as used in Italy, and shows the passage of the thread from the basin to the reel, the threads being twisted around by the tavelette to give roundness to the thread, but though the principle remains much the same, great improvements have been made on this model.

Throwing. — Raw silk, being still too fine and delicate for ordinary use, next undergoes a series of operations called throwing, the object of which is to twist and double it into more substantial yarn. The first operation of the silk throwster is winding. He receives the raw silk in hanks as it is taken from the reel of the filature, and putting it on a light reel of a similar construction, called the swifts,

Fig. 12.

he winds it on bobbins with a rapid reciprocating motion, so as to lay the fibre in diagonal lines. These bobbins are then in general taken to the first spinning frame, and there the single strands receive their first twist, which rounds them, and prevents the compound fibre from splitting up and separating when, by the subsequent scouring operations, the gum is removed which presently binds them into one. Next follows the operation of cleaning, in which the silk is simply reeled from one bobbin to another, but on its way it passes through a slit which is sufficiently wide to pass the filament but stops the motion when a thick lump or nib is presented. In the doubling, which is the next process, two or more filaments are wound together side by side on the same reel, preparatory to their being twisted or thrown into one yarn. Bobbins to the number of strands which are to be twisted into one are mounted in a creel on the doubling frame, and the strands are passed over smooth rods of glass or metal through a reciprocating guide to the bobbin on which they are wound. Each separate strand passes through the eye of a faller, which, should the fibre break, falls down and instantly stops the machine, thus effectu- ally calling attention to the fact that a thread has failed. The spinning or throwing

which follows is done on a frame with upright spindles and flyers, the yarn as it is twisted being drawn forward through guides and wound on revolving bobbins with a reciprocating motion. From these bobbins the silk is reeled into hanks of definite length for the market. Numerous attempts have been made to simplify the silk-throwing by combining two or more operations on one machine, but not as yet with much success.

According to the qualities of raw silk used and the throwing operations undergone the principal classes of thrown silk are — (1) " singles," which consist of a single strand of twisted raw silk made up of the filaments of eight to ten cocoons; (2) tram or weft thread, consisting of two or three strands of raw silk not twisted before doubling and only lightly spun (this is soft, flossy and comparatively

weak) ; (3) organzine, the thread used for warps, made from two and rarely three twisted strands spun in the direction contrary to that in which they are separately twisted. Silks for sewing and em- broidery belong to a different class from those intended for weaving, and thread-makers throw their raw silks in a manner peculiar to themselves.

Numbering of Silk. — The metric system of weights and measures has been adopted so widely that it forms the most suitable basis for the titrage or counts of yarns. The permanent committee of the Paris International Congress of 1900, which was held for the purpose of unification of the numerotage of counts, unanimously decided — (a) With reference to cotton, silk and other textiles spun from fibres, that they should be based on a fixed weight and variable length, the unit being one metre to one gramme. Thus number 100 would be 100 metres per gramme calculated on the single strand. (6) With reference to raw and thrown silk, in order to enable the count to show the degrees of variation incidental to this class of material, it was decided for a basis of a fixed length and variable count weight. The length of skein adopted was 450 metres and the unit of length the half decigramme. Thus the count of silk is expressed by the number of half decigrammes which the length of 450 metres weighs. This obtains whether in the single, double or more threads joined together in the doubling.

This latter differs very little in actual practice from the previous method of determination by the number of deniers per 476 metres, the denier being calculated on the equivalent of 0-0531 gramme, the English equivalent showing 33J deniers per one dram avoirdupois.

As the old systems of counts have some technical conveniences they will no doubt be retained for some time. In some districts, especially in Yorkshire, the count is based on the number of yards per ounce, and in others the older method of drams avoirdupois per 1000 yard skein. The English cotton yarn and spun silk counts are reckoned upon the number of hanks of 840 yds. in lib of silk, cotton being reckoned upon the single thread and spun silk on the doubled or finished thread. Thus 2/40 8 cotton indicates single 40 s doubled to 20 hanks by 840 yds. to the lb., while 40/2 fold spun silk means a single 80 3 doubled to give 40 hanks of 840 yds. to the lb. All continental conditioning establishments now formulate their tests for counts on the agreement arrived at by the International Congress of 1900.

Conditioning. — Silk in the raw and thrown state absorbs a large amount of moisture, and may contain a percentage of water without being manifestly damp. As it is largely sold by weight it becomes necessary to ascertain its condition in respect of absorbed water, and for that purpose official conditioning houses are established in all the considerable centres of silk trade. In these the silk is tested or con- ditioned, and a certificate of weight issued in accordance with the results. The silk is for four hours exposed to a dry heat of 230° F., and immediately thereafter weighed. To the weight 11 % is added as the normal proportion of water held by the fibre.

Scouring. — Up to this point the silk fibre continues to be com- paratively lustreless, stiff and harsh, from the coating of albumin- ous matter (gum or gr'es) on its surface. As a preliminary to most subsequent processes the removal of the whole or some portion of this gum is necessary by boiling-off, scouring or decreusage. To boil off say 300 lb of thrown silk, about 60 lb of fine white soap is shred, and dissolved in about 200 gallons of pure water. This solution is maintained at a heat of 195 , and in it the hanks of raw silk are immersed, hung on a wooden rod, the hanks»being continually turned round so as to expose all portions equally to the solvent influence of the hot solution. After being dried, the hanks are packed in linen bags and boiled for three hours in a weaker soapy solution, then washed out in pure warm water and dried in a centrifugal hydro- extractor. According to the amount of gum to be boiled off the soap solutions are made strong or weak; but care has to be exercised not to overdo the scouring, whereby loss of strength, substance and lustre would result. For some, purposes — making of gauzes, crapes, flour-bolting cloth and for what is termed " souples " — the silk is not scoured, and for silks to be dyed certain dark colours half scouring is practised. The perfect scouring of silks removes from 20 to 27 % of their weight, according to the character of the silk and the amount of soap or oil used in the working. Scouring renders all common silks, whether white or yellow in the raw, a brilliant pearly white, with a delicate soft flossy texture, from the fact that the fibres which were agglutinated in

reeling, being now degummed, are separated from each other and show their individual tenuity in the yarn. Silks to be finished white are at this point bleached by exposure in a closed chamber to the fumes of sulphurous acid, and at the close of the pro cess the hanks are washed in pure cold water to remove all traces of the acid.

Silk Weighting. — Into the dyeing of silk it is not here necessary to enter, except in so far as concerns a nefarious practice, carried on in dye-houses, which has exercised a most detrimental influence on the silk trade. Silk, we have seen, loses about one-fourth of its weight in scouring. To obviate that loss it has long been the practice to dye some dark silks " in the gum," the dye combining in these cases with the gum or gelatinous coating, and such silks are known as " souples." Both in the gum and in the boiled-off state silk has the peculiar property of imbibing certain metallic salts largely and combining very firmly with them, the fibre remaining to external

appearance undiminished in strength and lustre, but much added to in size and weight. Silk in the gum, it is found, absorbs these sails more freely than boiled-off; so to use it for weighting there are these great inducements — a saving of the costly and tedious boiling-off, a saving of the 25 % weight which would have disappeared in boiling and a surface on which much greater sophistication can be practised than on scoured silk. In dyeing a silk black a certain amount of weight must be added; and the common practice in former times was to make up on the silk what was lost in the scouring. Up to 1857 the utmost the dyer could add was " Weight for weight," but an accidental discovery that year put dyers into the way of using tin salts in weighting with the result that they were enabled to add 40 oz. to scoured silk, 120 oz. to souples and as much as 150 oz. to spun silks. This excessive adulteration quickly worked its own cure by a de- creased consumption, and th£ weighting in practice in 1910 is con- fined to moderate and safer limits. The use of tin salts, especially stannic chloride, SnCU, enables dyers to weight all colours the same as black. In his " Report on English Silk Industry " to the Royal Commission on Technical Instruction (1885) Sir Thomas Wardle of Leek says: —

" Colours and white of all possible shades can very easily be im- parted to this compound of silk and tin, and this method is becoming extensively used in Lyons. Thus weighting, which was until recently thought to apply only to black silks, and from which coloured silks were comparatively free, is now cheapening and deteriorating the latter in pretty much the same ratio as the former. Thus the proto- and per-salts of iron, as well as the proto- and per-salts of tin, in- cluding also a large variety of tannin, sumac, divi-divi, chestnut, valonia, the acacias {Areca Catechu and Acacia Catechu from India), from which are obtained cutch and gambier, &c, are no longer used solely as mordants or tinctorial matters, but mainly to serve

the object of converting the silk into a greatly-expanded fibre, consisting of a conglomeration of more or less of these substances."

Sugar also is employed to weight silk. On this adulterant Sir Thomas Wardle remarks : —

" With a solution of sugar, silk can have its weight augmented from I oz. to 3 oz. per lb. I am not quite sure that this method of weighting was not first used by the throwsters, as sugar is known to have been used for adulterating and loading gum silk for a very long time, and then the idea was afterwards applied to silk after the dyeing operations. It is much resorted to for weighting coloured silks by dyers on the continent, and, though a very clumsy method, no substitute has been found so cheap and easy of application. Bichloride of tin, having chemical affinity for silk fibre, bids fair to extinguish the use of sugar, which, from its hygrometric qualities, has a tendency to ruin the silk to which it is applied, if great care be not taken to regulate the quantity. There is not the slightest use or excuse for the application of sugar, except to cheapen the silk by about 15 to 20%."

Wild Silk Dyeing. — Among the disadvantages under which the silks of the wild moths long laboured one of the most serious was the natural colour of the silks, and the extreme difficulty with which they took on dyes, specially the light and brilliant colours. For success in coping with this difficulty, as well as in dealing with the whole question of the cultivation and employment of wild silks, the unwearying patience and great skill of Sir Thomas Wardle of Leek deserve special mention here. The natural colour of tussur silk is a greyish fawn, and that shade it was found impossible to discharge by any of the ordinary bleaching agents, so as to obtain a basis for light and delicate dyes. Moreover, the chemical character of the tussur silk differs from that of the mulberry silk, and the fibre has much less affinity for tinctorial substances, which it takes up un- evenly, requiring a large amount of dye-stuffs. After protracted experimenting Sir Thomas Wardle was able in 1873 to show a series of tussurs well dyed in all the darker shades of colour, but the lighter and bright blues, pinks, scarlets, &c, he could not produce. Subse- quently Tessie du Motay found that the fawn colour of natural tussur could be discharged by solution of permanganate of potash, but the oxidizing action was so rapid and violent that it destroyed the fibre itself. Gentler means of oxidation have since been found for bleach- ing tussur to a fairly pale ground. The silk of the eria or castor-oil worm {Attacus ricini) presents the same difficulties in dyeing as the common tussur. A portion of the eria cocoons are white, while the others are of a lively brown colour, and for the dyeing of light colours the latter require to undergo a bleaching process. The silk takes up colour with difficulty from a strong vat, and is consequently costly to dye. Moonga silk

from ˆ4 ntheraea assama has generally a rather dark- brown colour, but that appears to be much influenced by the leaves on which the worm feeds, the cocoons obtained on the champaca tree (Michelia champaca) giving a fine white fibre much valued in Assam. The dark colours are very difficult to bleach, but the silk itself takes dye-colours much more freely and evenly than either tussur or eria silk. (F. W.)*

Trade and Commerce. About the beginning of the 19th century the chief silk-produc- ing regions of the world were the Levant (including Broussa, Syria and Persia), India, Italy and France, the two first named sending the low-priced silk, the other two the fine qualities.

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Between 1840 and 1850, after the opening of trade with China, large quantities of silk were sent from the northern port of Shanghai, and afterwards also from the southern port of Canton. The export became important just at the time when disease in Europe had lessened the production on the continent. This increased production of medium silk, and the growing demand for fine sorts, induced many of the cocoon-growers in the Levant to sell their cocoons to Europeans, who reeled them in Italian fashion under the name of " Patent Brutia," thus producing a very fine valuable silk. In 1857 commenced the exportation of Japan silk, which became so fierce a competitor with Bengal silk as gradually to displace it in favour; and the native silk reeled in Bengal has almost ceased to be made, only the best European filatures, produced under the supervision of skilled Europeans, now coming forward.

China and Japan, both of which contribute so largely to the supplies that appear in European and American statistics, only export their excess growth, silk-weaving being carried on and native silk worn to an enormous extent in both countries. The other Asiatic exporting countries also maintain native silk manufactures which absorb no inconsiderable proportion of their raw material. Since about 1880 the silk production of the world (including only exports from the East) has more than doubled, the variations owing to partial failures from some countries being more than compensated by increase from others. The supplies available for European and American consump- tion have been carefully tabulated by the Lyons Chamber of Commerce, as shown by the table.

While the tables indicate the fluctuations of supply they show generally that Asiatic countries, in addition to supplying the neces- sities for their home trade, export to Europe and America about three- nfths of the whole of the silk consumed in Western manufactures

Up to the year i860 the bulk of the silks from the East was shipped to London, but subsequently, owing to the importance of continental demands, a large portion of the supplies has been unshipped at Genoa and Marseilles (especially the finer reeled silks from Japan and Canton), which are sold in the Milan and Lyons markets. Those for American consumption are sent direct by the Pacific route via San Francisco. Table II. shows the official

annual returns of silk imports into Great Britain from 1880 to 1908.

Table II. — Imports of Silk into Great Britain.

Years.

1880 1884 1888 1892 1896 1900 1901 1902 1903 1904

1905 1906 1907 1908

Raw Silk.

3.673,949 4,522,702 3.065,771 1,503,283 1,697,668 1,413,320 1,332,480 1,252,848 1,109,930 1,337,579 1,160,265 1,036,258 1,195,366 1,110,481

Knubs or

Husks of Silk

and Waste.

55,002

67,239 83,466

46,392 62,923 60,720 48,162 55,782 66,782

71,450 72,055 66,348 66,299 64,669

Thrown Silk.

203,567

323.947 559,289

502,777 572,599 664,641 624,859 802,964 662,677 769,297 878,850 924,007 938,112 809,610

Silk (including

Lace, &c.) Manufacture.

13,329,935 10,984,073 10,466,537 11,412,263 16,923,176 14,767,610 13,708,645 14,320,541

I3.493.96l

13,585,462 13,010,766 13.069,588 12,862,834 11,907,661

The power loom, owing to the improvement in its mechanism, has gained a distinct precedence and materially increased its producing power. In the development of silk manufacture the hand loom has taken a very secondary position. In order to form a relative idea of the importance of the various countries engaged in silk manufacture, a tabulation of the number of looms employed in each country would prove an inadequate guide, owing to the variations from time to time of the fabrics woven, as also to the difficulty in obtaining trustworthy statistics of the number in active operation. The production and consumption of raw material shown in Table III. was prepared by Messrs Chabrieres, Morel & Co. of Lyons, Marseilles and Milan, and issued in 1905.

America takes a premier position in consumption of the raw material. The development and expansion of silk manufacture, owing to the importance and extent of the home market, coupled with high protective tariffs, has been enormous. In 1867 the im- port of raw material amounted to 491,983 lb. In 1905 a record was reached of 17,812,133 lb. During the decade of 1898 to 1908 the consumption has gone on steadily from about 10 million lb in the first five years to an average of 15 million lb in the second half of the decade. France comes a good second in importance with a

onsumption of 9 to 10 million lb annually. Lyons is the head- quarters of the trade, principally in the production of dress fabrics, plain and figured, and other light and heavier fabrics. St Etienne and St Chamond are important centres for the ribbon trade. There

Table III. — Production and Consumption of Raw Material.

Production.

Consumption.

Average of Seasons

Same Average of

1 903-1004, 1904-

Years 1 902-1903,

1905, 1 905-1906.

1904.

Europe — •

I,276,OO0

9,519,400

Italy

9,233,400

2,125,200

Switzerland ….

99,000

3,509,000

Spain

176,000

402,600

Hungary

360,800 323,400

I 1,707,200

Russia and Caucasus

893,200

2,796,200

Bulgaria, Servia and Roumania

343,200

37,400

Greece and Crete

138,600

44,000

Salonica and Adrianople .

. 574,200

66,000

Germany

Nil.

6,26l,20O

Great Britain ….

Nil.

i,559, 8 oo

America —

United States ….

Nil.

13,481,600

Asia —

1,207,800

66,000

Syria

1,100,000

242,000

Persia . . . (Exports)

556,600

(no estimates)

Turkestan … „

600,600

China …. ,,

8,960,600

,,

Canton, China . . ,,

4,661,800

Japan …. ,, India …. ,,

11,136,400

563,200

770,000

Tonquin and Annam. „

22,000

(no estimates)

Africa —

Egypt

Nil.

440,000

Nil.

154,000

Algeria, Tunis ….

Nil.

143.000

Various countries

Nil.

121,000

Total lb

42,226,800

43,445,000

N.B. — The difference in the totals is owing to the figures being based on the production in seasons, and that of consumption upon calendar years.

are also important manufactures of silk at Calais, Paris, Nimes, Tours, Avignon and Roubaix. Germany follows France with a consumption for the various fabrics of over six million fb annually. The principal seat of the trade in that country is at Crefeld, nearly one-half of the production of the empire being manu- factured there. Velvet is the special feature of the industry, about one-half of the looms being devoted to this textile, the remainder being devoted to union satins, pure broad silk goods and ribbons. Other principal centres of the silk trade in Rhenish Prussia are Viersen, Barmen, Elberfeld and Miihlheim. The

f>rovince of Saxony has also important manufactures of ace and glove fabrics. Third on the list of con- tinental producers is Switzerland", Zurich takes the lead with broad goods (failles, armures, satins, serges, &c), and Basel rivals St Etienne in the ribbon trade. Russia, by a prohibitive tariff on manufactured silks of other countries, has since 1890 developed and fostered a trade which consumes annually about 3 million lb of raw material for its home industry. This has also stimulated silk culture in the Caucasus, from which province it draws about one-third of its supplies. A special feature of its manufactures consists of gold and silver tissues and brocades for sacerdotal use. Moscow is one of the principal seats for the weaving of these fabrics. Italy, the early home of the silk trade in Europe, the land of the gorgeous velvets of Genoa and the damasks and brocades of medieval Sicily, Venice and Florence, now takes only a sixth place, the centre of greatest activity being at Como; but Genoa still makes velvets, and the brocades of Venice are not a thing of the past. Austria and England follow on the list of important silk manu- factures. The former has found its principal de- velopment in Vienna and the immediate neighbourhood. By special grants from the Hungarian government silk-reeling has been fostered and encouraged. In 1885 the production of raw silk was about 300,000 lb, while in 1905 it reached 750,000 lb, an annual production which is still maintained.

In the United Kingdom all the silk industries (those depending on spun silk alone excepted) have been declining since the French Treaty of i860 came

into operation. This cannot be gauged by the

decrease in imports of raw material from the fact before mentioned that formerly London was the centre of distribution for Eastern silk, which is now disembarked at other European ports for continental consumption. The shrinkage is the more noticeable in the throwing branch of the industry. Many of the mills formerly in operation in Derby, Nottingham, Congleton and Macclesfield have been closed owing to the importation of foreign thrown silks from Italy and France, where a lower rate of wages is paid to the operatives em- ployed in this branch. In like manner the manufacture of silk fabrics in the districts of Manchester, Middleton, Macclesfield, London (Spitalfields) and Nottingham (for silk lace) has decreased proportionately. Against this we must set off a decided increase in the manufacture of mixed goods, carried on principally in Scotland, Yorkshire and Lancashire.

The remarkable development of the comparatively new trade in spun silk goes far to compensate for the loss of the older trade of net silk, and has enabled the exports of silk manufactures from Great Britain to be at least maintained and to show some signs of ex- pansion. Silk spinning has chiefly developed in the Yorkshire, Lancashire, Cheshire and Staffordshire textiles centres. Its ex- pansion and importance may be seen from the fact that the imports of waste, knubs, &c, which in i860 was 1506 cwts., reached in 1905 a record of 72,055 cwts. But it is highly significant that while the exports of British silk manufactures have not decreased, the imports in the meantime have shown a marked expansion. Although the use of silk goods has unquestionably increased since the middle of the 19th century, the expansion of native productions has not kept pace with that growth. (R. Sn.)

The Spinning of " Silk Waste." The term silk waste includes all kinds of raw silk which may be unwindable, and therefore unsuited to the throwing process. Before the introduction of machinery applicable to the spinning of silk waste, the refuse from cocoon reeling, and also from silk winding, which is now used in producing spun silk fabrics, hosiery, &c, was nearly all destroyed as being useless, with the exception of that which could be hand-combed and spun by means of the distaff and spinning wheel, a method which is still practised by some of the peasantry in India and other Eastern countries.

The supply of waste silk is drawn from the following sources: (1) The silkworm, when commencing to spin, emits a dull, lustre- less and uneven thread with which it suspends itself to the twigs and leaves of the tree upon which it has been feeding, or to the straws provided for it by attendants in the worm-rearing establishments: this first thread is unreelable, and, moreover, is often mixed with straw, leaves and twigs. (2) The outside

layers of the true cocoon are too coarse and uneven for reeling;

Table IV. — Silk Goods exported from the United Kingdom.

Year.

Raw Silk.

Knubs, Husks,

Thrown and Spun Silk.

Silk Manufactures.

Foreign

Foreign

Silk Waste

British.

and

British.

and

and Noils.

Colonial.

Colonial.

lb.

cwts.

£

£

£

£

i860

3,153,993

1,506

826,107

426,866

1,587,303

224,366

1865

3,!37,292

1,212

767,058

306,701

1,404,381

166,936

1870

2,644,402

4,167

1,154,364

39,771

1,450,397

166,297

1875

2,551,417

i,779

880,923

87,924

1,734,519

328,426

1880

947.165

9,241

683,591

7,553

2,030,659

259,023

1884

377,349

6,538

612,951

50,559

2,i75,4 10

644,722

1888

167,086

7,438

388,828

63,192

2,664,244

727,673

1892

164,150

7,397

322,894

32,574

1,655,310

730,316

1896

142,034

5,053

265,142

74,140

1,423,174

725,123

1900

192,616

5,691

425,647

35,858

1,637,915

919,011

1901

244,566

5,370

294,3H

48,666

1,429,381

1,021,637

1902

152,463

6,160

237,718

95,862

1,393,314

1,071,633

1903

178,458

9,740

256,341

81,707

1,436,734

1,038,634

1904

186,174

9,148

218,881

43,938

1,604,554

1,241,242

1905

188,246

13,524

298,299

53,825

1,693,314

1,142,217

1906

92,124

3,243

323,873

57,143

1,858,634

1,094,657

1907

80,645

5,007

401,336

47,404

2,009,613

1,490,066

1908

42,898

6,57i

101,316

43,7H

1,244,546

1,427,974

and as the worm completes its task of spinning, the thread becomes finer and weaker, so both the extreme outside and inside layers are put aside as waste. (3) Pierced cocoons — i.e. those from which the moth of the silkworm has emerged — and damaged cocoons. (4) During the process of reeling from the cocoon the silk often breaks; and both in finding a true and

reelable thread, and in joining the ends, there is unavoidable waste. (5) Raw silk skeins are often re-reeled; and in this process part has to be discarded: this being known to the trade as gum-waste. The same term — gum-waste — is applied to " waste " made in the various processes of silk throwing; but manufacturers using threads known technically as organzines and trams call the surplus " manufacturer's waste." Finally we have the uncultivated varieties of silks known as " wild silks," the chief of which is tussur. The different qualities of " waste," of which there are many, vary in colour from a rich yellow to a creamy white; the chief producing countries being China, Japan, India, Italy, France and the countries in the Near East; and the best-known qualities are: steam wastes, from Canton; knubs, from China and from Italy and other Western countries; frisons, from various sources; wadding and blaze, Shanghai; china, Hangchow; and Nankin buttons; Indian and Szechuen wastes; punjum, the most lustrous of wastes; China curlies; Japan wastes, known by such terms as kikai, ostue, &c; French, Swiss, Italian, China, Piedmont, Milan, &c. There are yellow wastes from Italy, and many more far too numerous to mention.

A silk " throwster " receives his silk in skein form, the thread of which consists of a number of silk fibres wound together to make a certain diameter or size, the separate fibre having actually been spun by the worm, and this fibre may measure anything from 500 to 1000 yds. in length. The silk-waste spinner receives his silk in quite a different form: merely the raw material, packed in bales of various sizes and weights, the contents being a much-tangled mass of all lengths of fibre mixed with much foreign matter,

such as ends of straws, twigs, leaves, worms and chrysalis. It is the spinner's business to straighten out these fibres, with the aid of machinery, and then to so join them that they become a thread, which is known as spun silk.

There are two distinct kinds of spun silk — one called " schappe " and the other " spun silk " or " discharged spun silk." All silk produced by the worm is composed of two substances — fibroin, the true thread, and sericin, which is a hard, gummy coating of the " fibroin." Before the silk can be manipulated by machinery to any advantage, the gum coating must be removed, really dissolved and washed away — and according to the method used in achieving this operation the result is either a " schappe " or a " discharged yarn." The former, " schapping," is the French, Italian and Swiss method, from which the silk when finished is neither so bright nor so good in colour as the " discharged silk "; but it is very clean and level, and for some purposes absolutely essential, as, for instance, in velvet manufacture.

Schapping. — The method is as follows: If waste silk is piled in a heap in a damp, warm place, and kept moist and warm, the gum will in a few days' time begin to ferment and loosen, and can then be washed off, leaving the true thread soft and supple; but the smell caused by the fermentation is so offensive that it cannot be practised in or near towns. Therefore schappe spinners place their degumming plant in the hills, near or on a stream of pure water. The waste silk is put into large kilns and covered with hot water (temperature 170 F.). These are then hermetically closed, and left for a few hours for the gum to ferment and loosen. When thoroughly softened — the time occupied depending on the heat of the water and nature of the silk — the contents of the kiln are taken out and placed into vats of hot water, and allowed to soak there for some time. Thence the silk is taken to a washing machine, and the loosened gum thoroughly washed away. The silk is then partly dried in a hydro-extractor, and afterwards put in rooms heated by steam-pipes, where the drying is completed.

" Discharging " is the method generally used by the English, and results in a silk having brilliance and purity of colour. In this process the silk waste is put into strong, open-meshed cotton bags, made to hold (in accordance with the wish of individual spinners) from 1 lb to 5 ft in weight. When about 100 lb of silk has been bagged, the whole is placed in a large wooden tub and covered with boiling water in which 12 to 20 lb of white curd soap has previously been dissolved. In this the silk is boiled from one to two hours, than taken out and put through a hydro-extractor to remove the dirty gummy solution. Afterwards it is put into another tub of soapy liquor, and boiled from one to one and a half hours. It is then once more hydro-extracted, and finally taken to a stove and dried. " Discharged silk " must

be entirely free from gum when

finished, where " schappe " contains a percentage of gum — some- times as much as 20 %.

From this stage both classes of silk receive much the same treat- ment, differing widely in detail in different mills and districts.

Conditioning. — The " degummed silk," after it is dried, is allowed to absorb a certain amount of moisture, and thus it becomes soft and pliable to the touch, and properly conditioned for working by machinery.

Beating. — When the waste contains any large percentage of worm or chrysalis, it is taken to a " cocoon beater," a machine which has a large revolving disk on which the silk is put, and while revolving slowly is beaten by a leather whip or flail, which loosens the silk and knocks out the wormy matter. After the beating, the silk presents a more loose appearance, but is still tangled and mixed in length of fibre. The object of the spinner at this point is to straighten out the tangles and lumps, and to lay the fibres parallel : the first machine to assist in this process being known as an opening machine, and the second as a filling engine.

Opening and Filling. — The silk to be opened is placed on a latticed sheet or feeder, and thus slowly conveyed to a series of rollers or porcupines (rollers set with rows of proj ecting steel pins) , which hold the silk firmly while presenting it to the action of a large receiving drum, covered with a sheet of vulcanized rubber, set all over with fine steel teeth. As the drum revolves at a good speed, the silk is drawn by the steel teeth through the porcupines into tne drum in more or less straight and parallel fibres. When the teeth are full the machine is stopped, and the silk stripped off the drum, then presenting a sheet-like appearance technically known as a " lap." The lap is taken to the filling engine, which is similar in construction and appearance to the opener as far as the feeding arrangements are concerned, but the drum, in place of being entirely covered with fine steel teeth, is spaced at intervals of from 5 to 10 in. with rows of coarser straight teeth, each row set parallel with the axle of the machine. The silk drawn by the rows of teeth on the drum through the porcupine rollers (or porcupine sheets in some cases) covers the whole of the drum, hooked at certain intervals round the teeth; and when a sufficient weight is on the machine, it is stopped, and an attendant cuts, with a knife, the silk along the back of each row of teeth, thus leaving a fringe of silk hooked on the pins or teeth. This fringe of silk is placed by the attendant between two hinged boards, and whilst held firmly in these boards (called book-boards) is pulled off the machine, and is called a " strip "; the part which has been hooked round the teeth is called the " face," and the other portion the " tail." By these

means the silk has been opened, straightened and then cut into a certain length, the fibres now being fairly laid parallel and ready for the next operation, known as silk dressing.

Silk Dressing. — This is the process equivalent to combing in the wool industry. Its purpose is to sort out the different lengths of fibre, and to clear such fibres of their nibs and noils. There are two well-known principles of dressing: one known as " flat frame," giving good result with discharged silk, and the other known as ' circular frame " dressing, suitable for schappes.

The flat dressing frame is a box or frame holding a certain number of book-boards from the filling engine, which boards when full of silk are screwed tightly together in the frame. The frame is capable of being raised into contact with travelling combs, affixed to an endless belt placed round two metal rollers about 6 ft. apart. The attendant allows the silk to enter gradually into close contact with the combs, which comb through the silk in exactly the same manner as a lady combs her tresses. In a circular frame the silk is clamped between boards, and these are fixed on a large drum. This drum revolves slowly, and in its revolution conveys the fringes of silk past two quickly running smaller combing drums. These combing drums being covered with fine steel teeth penetrate their combs through the fringes of silk depending from the large drum, thus combing through the silk. In each machine the object is the same. First the filled silk is placed into a holding receptacle, clamped fast, and presented to combing teeth. These teeth retain a certain proportion of shorter fibre and rough places and tangled portions of silk, which are taken off the combs in a book-board or wrapped round a stick and again presented to the combs. This fibre again yields combings which will also be combed, and so on for five or six times until the combings are too short, and are taken from the machine and known as noils. The productions from these several combings are known as " drafts " and are of different lengths: the product of the filled silk first placed in the dressing frame being the longest fibre and of course the most valuable.

The flat frame is the most gentle in its usage of the silk, but is most costly in labour; whilst the circular frame, being more severe in its action, is not suitable for the thoroughly degummed silks, but on the other hand is best for silks containing much wormy matter, because the silk hanging down into the combing teeth is thoroughly cleansed of such foreign matter, which is deposited under the machine. This method also has the advantage of being cheaper in cost of labour. Recently a new machine has been invented giving the same results as circular frame : the silk depends from boxes into combs, and at the same time has the gentle action of the flat frame. The cost of the operations is as cheap as the circular frame, therefore the

machine combines the advantages of each of its predecessors.

Noils. — The noils resulting from the dressing operations are some- times combed, the comb used being similar to those used in the cotton trade. The resulting sliver is used by silk spinners who make a speciality of spinning short fibres, and the exhaust noils are bought by those who spin them up into " noil yarns " on the same principle as wool. The yarns are chiefly used by manufacturers of powder bags. The noils are also in great demand for mixing with wool to make fancy effects in wool cloths for the dress goods trade.

Drafts. — The drafts from the dressing frame are valued in accord- ance with their length of fibre, the longest being known as A or 1st drafts and so on : —

1st 2nd 3rd 4th 5th 6th

Drafts. Drafts. Drafts. Drafts. Drafts. Drafts.

or as quality A

B

C

D

Shorts.

Each draft may be worked into a quality of its own, and by such means the most level yarns are obtained. But occasionally one or more drafts are mixed together, when price is the determining factor.

Processes peculiar to Silk Spinning Industry. — The foregoing pro- cesses are all peculiar to the silk waste trade, no other fibre having to go through such processes, nor needing such machinery. In the first stages of the spun-silk industry, the silk was dressed before boiling the gum out ; the resulting drafts were cut into lengths of one or two inches. The silk was then boiled and afterwards beaten, scutched, carded, drawn, spun, folded, &c, in exactly the same way as fine cotton. Short fibre silks are still put through cards and treated like cotton; but the value of silk is in its lustre, elasticity and strength, which characteristics are obtained by keeping fibres as long

as possible. Therefore, when gill drawing machinery was invented, the cutting of silk into short fibres ceased, and long silks are now prepared for spinning on what is known as " long spinning process." Following the process of dressing, the drafts have to go through a series of machines known as preparing machines: the object being to piece up the lengths of fibre, and to prepare the silk for spinning.

Preparing or Drawing Machinery. — A faller or gill drawing machine consists of a long feeding sheet which conveys silk to a pair of rollers (back rollers). These rollers present the silk to a set of fallers (steel bars into which are fixed fine steel pins), which carry forward the silk to another pair of rollers, which draw the silk through the pins of the fallers and present it to the rollers in a continuous way, thus forming a ribbon of silk called a " sliver." The fallers are travelled forwards by means of screws, and when at the end of the screw are dropped automatically into the thread of a receiving screw fixed below, which carries the fallers back to their starting point to be risen by cams into the top pair of screws thus to repeat their journey.

Silk Spreader. — This is the first of the series of drawing machines. The drafts from the dressing frame are made into little parcels of a few ounces in weight, and given to the spreader, who opens out the silk and spreads it thinly and evenly on to the feeding sheet, placing a small portion of the silk only on the sheet. Another portion is opened out and placed tail end to the first portion; and these opera- tions are repeated until the requisite weight is spread. During this time the silk has been conveyed through the fallers and into a large receiving drum about 3 ft. in diameter, the silk being wrapped thinly and evenly all round the circumference of the drum. When the agreed-on weight is on the drum, the silk is drawn across the face of the drum parallel with its axle, and pulled off in form of a sheet, and is called a lap. This lap is thin, but presents the fibres of silk now joined and overlapped in a continuous form, the length measured by the circumference of the drum. This lap is sometimes re-spread to make it more even, and at other times taken to a drawing machine which delivers in a sliver form. This sliver is taken through a series of four other drawing machines called " four head drawing box." Eight or more slivers are put behind the first drawing head, con- veyed through the fallers and made into one sliver in front of the machine. This sliver is put up behind the second drawing; eight or more ends together run through the second head again into one sliver; and so on through the third and fourth heads of drawing. All these doublings of the sliver and re-drawing are for the purpose of getting each fibre to lie parallel and to make the sliver of an equal weight over every yard of its length. From the last head of drawing the sliver is taken to a machine known as a gill rover. This is a drawing machine fitted with fallers through which the sliver is drawn, but the end from the front roller is

wound on to a bobbin. The machine is fitted with 20 to 40 of these bobbins placed side by side, and its product is known as " slubbing roving," it being now a soft, thick thread of silk, measuring usually either 840 or 1260 yds. to 1 lb weight. Hitherto all the drawing has been by rollers and fallers, but in the next machine the drawing is done by rollers only.

Dandy Roving Frame. — This is a frame built with forty or more spindles. Two or three slubbing rovings are put up behind the machine opposite each spindle; each end is guided separately into back rollers and thence between smaller rollers, known as carrier rollers, to the front rollers. The back rollers revolve slowly, the front rollers quickly, thus drawing the rovings out into a thinner size or count. The product is wound on to the bobbin by means of flyer and spindle, and is known as dandied or fine roving, and is then ready for the spinning frame.

Spinning. — The spinning is done by exactly the same methods

as cotton or worsted, viz. either mules, ring frames, cap or flyer frames, the choice of machine being determined by the size or count of yarn intended to be produced.

Twisting and Doubling. — If a 2-fold or 3-fold yarn is needed, then two or more ends of the spun thread are wound together and after- wards conveyed to the twisting frame for the purpose of putting the needed twist in the yarn necessary for weaving or other require- ments. This process is exactly the same as in the cotton or worsted industry, ring or flyer frames being used as desired.

Weft Yarns. — These are taken straight from the spinning frame, wound on to a long paper tube and so delivered to the manufacturer ready to place in the loom shuttle.

Folded Yarns are hairy after being spun and folded, and in addition sometimes contain nibs and rough places. The fibre and nibs have to be cleaned off by means of a gassing machine so constructed that the end of silk (silk yarn) is frictioned to throw off the nibs, and at the same time is run very rapidly through a gas flame a sufficient number of times to burn off the hairy and fibrous matter without injuring the main thread. The yarn is now ready for reeling into skeins or for warping, both of which operations are common to all the textile yarns. It may be washed or dyed just as required, either in hank or in warp.

Growth of Industry and Uses of Spun Silk. — As will have been gathered, spun silk is pure silk just as much as that used by the throwster. The spinning industry has not decreased in England. The number of mills has

decreased, but machinery now runs so much more quickly than formerly that more yarn is being spun on fewer spindles. The American spinning industry shows little signs of expansion in spite of a protective tariff of some 35 %. The conti- nental spinners have largely increased, but are developing into huge syndicates, all working on the schappe principle. The three chief syndicates, one each in Italy, France and Switzerland, work very much together, practically ruling the prices for yarns and raw materials.

Spun silks are used largely for silk linings, hosieries, sewing threads, elastic webbing, lace, plush and many other purposes, such as mufflers, dress goods and blouse silks; also for mixing with other fibres in form of stripes in the weaving of various fabrics, or to be used in what are known as mixed goods, i.e. a warp of silk and weft of some other fibre or weft of silk and a warp of cotton or other fibre. The article known as tussur spun is prepared in exactly the same manner as other spun silks, but its chief use is to make an imitation of sealskin known commercially as silk seal. (A. Mel.)

SILL, EDWARD ROWLAND (1841-1887), American poet and educationist, was born at Windsor, Connecticut, on the 29th of April 1 84 1. He graduated at Yale in 1861, as class poet; engaged in business in California; entered the Harvard Divinity School in 1867, but soon left it for a position on the staff of the New York Evening Mail; and after teaching at Wadsworth and Cuyahoga Falls, Ohio (1868-1871), became principal of the Oak- land High School, California. He was professor of English literature at the university of California in 1874-1882. His health was failing, and he returned to Cuyahoga Falls in 1883. He devoted himself to literary work, abundant and largely anonymous, until his death in Cleveland, Ohio, on the 27th of February 1887. Much of his poetry was contributed to the Atlantic Monthly, the Century Magazine, and the Overland Monthly. Many of his graceful prose essays appeared in " The Contributors' Club," and others appeared in the main body of the Atlantic. Among his works are a translation of Rau's Mozart (1868); The Hermitage and Other Poems (1868); The Venus of Milo and Other Poems (1883), a farewell tribute to his California friends; Poems (1887); The Hermitage and Later Poems (1889); Hermione and Other Poems (1900); The Prose of Edward Rowland Sill (1900) ; Poems (1902). He was a modest and charming man, a graceful essayist, a sure critic. His contribu- tion to American poetry is small but of fine quality. His best poems, such as The Venus of Milo, The Fool's Prayer and Opportunity, gave him a high place among the minor poets of America, which might have been higher but for his early death. See A Memorial volume privately printed by his friends in 1887; and " Biographical Sketch " in The Poetical Works of Edward Rowland Sill (Boston, 1906), edited by William Belmont Parker with Mrs

Sill's assistance.

SILL (O.Eng. syl, Mid. E. sylle, selle; the word appears in Icel. syll, svill, Swed. syll, and Dan. syld, and in German, as Schwelle; Skeat refers to the Teutonic root swal-, swell, the word meaning the rise or swell formed by a beam at a threshold ; the Lat. solea, from which comes Fr. seuil, gives Eng. " sole," also sometimes used for " sill "), the horizontal base of a door or window-frame. I A technical distinction is made between the inner or wooden base

of the window-frame and the stone base on which it rests — the latter being called the sill of the window, and the former that of its frame. This term is not restricted to the bases of apertures;' the lower horizontal part of a framed partition is called its sill. The term is sometimes incorrectly written " cill." (See Masonry.)

SILL, in geology, an intrusive mass of igneous rock which consolidated beneath the surface and has a large horizontal extent in comparison with its thickness. In the north-eastern counties of England there is a great mass of this kind known as the Whin Sill. . The term " whin " is used in many parts of England and Scotland to designate hard, tough, dark coloured rocks often of igneous origin, and the Whin Sill is a mass of dolerite or, more strictly, quartz-diabase. Its most striking character is the great distance over which it can be traced. It starts not far north of Kirkby Stephen (Co. Durham) and follows a northerly course, describing a great curve with its convexity towards the west, till it ends on the sea-shore at Bamborough, not far south of Berwick-on-Tweed. The length of the outcrop is about 80 m., but in places it is covered with superficial deposits or may be actually discontinuous. Near Haltwhistle, however, it is visible for about 20 m., and as it lies among softer rocks (limestones and shales) , it weathers out on a bold craggy ridge or escarpment. When it crosses the streams the resistant character of the igneous rock is indicated by waterfalls or " forces," e.g. High Force in Teesdale. The thickness varies from 20 to 150 ft., but averages go ft. In some places the Whin Sill splits up into two or more smaller sills which may unite, or one of them may die out and disappear, and often small attendant sills, resembling the main mass in petrographical character, appear in association with it. It is difficult to estimate the area over which it extends, as it dips downwards from its outcrop and is no longer visible, but we may conjecture that it spreads over no less than 4000 sq. m. underground.

The rocks in which it lies belong to the Carboniferous Lime- stone series, and the Sill is probably one of the manifestations of the volcanic activity which occurred during the later part of the carboniferous period. Many similar sills, often of large size, though none so great as the Whin Sill, are found in the Scottish coalfields. There are few lavas or ash beds at or above the horizons on which these intrusive rocks lie, and hence it has been concluded that towards the close of that volcanic episode in British geological history the molten magmas which were impelled upwards towards the surface found a place of rest usually within the sedimentary rocks, and rarely flowed out as lavas on the sea- bottom (the intrusive succeeding the effusive phase of volcanic action). In the Carboniferous rocks the Whin Sill lies almost like an interstratified bed, following the same horizon for many miles and hardly varying more in thickness than the sedimentary bands which accompany it. This, however, is true only on a large scale, for where the junctions are well exposed the igneous rock frequently breaks across the layers of stratification, and sometimes it departs quite suddenly from one horizon and passes to another, where again for a time it continues its apparently regular course. Its intrusive character is also shown by the emission of small veins, never very persistent, cutting the sediments above or below it. In addition, it bakes and hardens the adjacent rocks, both below and above, and this proves that the superjacent beds had already been deposited and the molten diaoase forced its way along the bedding planes, as natural lines of weakness. The amount of contact alteration is not usually great, but the sandstones are hardened to quartzites, the shales become brittle and splintery, and in the impure limestones many new calc-silicates are produced.

The Whin Sill consists of a dark-green granular diabase, in which quartz or micropegmatite appears as the last product of crystallization. It is not usually vesicular and is not porphyritic, though exceptions may occasionally be noted. At both the upper and the under surface the diabase becomes much finer grained, and the finest intrusive veinlets which enter the surrounding rocks may even show remains of a glassy base. These phenomena are due to the rapid cooling where the magma was in contact with

the sediments. No ash beds accompany the Whin Sill, but there are certain dikes which occur near it and probably belong to the same set of injections. In many places the diabase is quarried as a road-mending stone.

The great Palisade trap of the Hudson river, which is an almost exact parallel to the Whin Sill, is an enormous sheet of igneous rock exposed among the Triassic beds of New Jersey and New York. It has an outcrop which is about 100 m. long; its thickness is said to be in places 800 ft., though usually not above 200 to 300 ft. Like the Whin Sill the rock is a

quartz-diabase occasionally passing into olivine-diabase, especially near its edges. The Palisade diabase is compact, non-vesicular and non-porphyritic as a rule. It follows the bedding planes of the sedimentary rocks into which it was injected, but breaks across them locally and produces a considerable amount of contact alteration. In New Jersey, however, there is also an extensive development of effusive rocks which are olivine-basalts, and by their slaggy surfaces, the attendant ash-beds and their strictly conformable mode of occurrence, show that they were true lavas poured out at the surface. There can be little doubt that they belong to the same period as the Palisade trap, and they are consequently later than the Whin Sill.

These great sheets of igneous rock intruded into cold and nearly horizontal strata must have solidified very gradually. Their edges are fine grained owing to their having been rapidly chilled, and the whole mass is usually divided by joints into vertical columns, which are narrower and more numerous at top and base and broader in the centre. Where exposed by denudation the rocks, owing to this system of jointing, tend to present a nearly vertical, mural escarpment which seems to consist of polygonal pillars. The name " Palisade trap " expresses this type of scenery, so characteristic of intrusive sills, and very fine examples of it may be seen on the banks of the Hudson river. In Britain it is no less clearly shown, as by the Sill at Stirling on which Wallace's Monument is placed; and by the well-known escarpment of Salisbury Crags which fronts the town of Edinburgh.

In the Tertiary volcanic district of the West of Scotland and North Ireland, including Skye, Mull and Antrim, innumerable sills occur. Perhaps the best known is the Sciur of Eigg, which forms a high ridge terminating in a vertical cliff or Sciur in the island of Eigg, one of the inner Hebrides. At one time it was supposed to be a lava-flow, but A. Harker has maintained that it is of intrusive origin. This Sill occupies only a small area as compared with those above described. Its length is about two and a half miles and its breadth about a quarter of a mile. On the east side it terminates in a great cliff from 300 to 400 ft. high, rising from a steep slope below. This cliff is beautifully columnar, and shows also a horizontal banding, simulat- ing bedding. The back of the intrusive sheet is a long ridge sloping downwards to the west. The rock of which the Sciur of Eigg consists is a velvety black pitchstone, containing large shining crystals of felspar; it is dull or cryptocrystalline in places, but its glassy char- acter is one of its most remarkable peculiarities.

In the Tertiary volcanic series of Scotland and Ireland intrusive sheets build up a great part of the geological succession. They are for the most part olivine-basalts and dolerites, and while some of them are nearly horizontal, others are inclined. Among the lavas of the basaltic plateaus there is great

abundance of sills, which are so numerous, so thin and so nearly concordant to the bedding of the effusive rocks that there is great difficulty in distinguishing them. As a rule, however, they are more perfectly columnar, more coarsely crystalline and less vesicular than the igneous rocks which consoli- dated at the surface. These sills are harder and more resistant than the tuffs and vesicular lavas, and on the hill slopes their presence is often indicated by small vertical steps, while on the cliff faces their columnar jointing is often very conspicuous.

On modern volcanoes intrusive sheets are seldom visible except where erosion has cut deep valleys into the mountains and exposed their interior structure. This is the case, for example, in Ireland, Teneriffe, Somma and Etna and in the volcanic islands of the West Indies. In their origin the deep-seated injections escape notice; many of them in fact belong to a period when superficial forms of volcanic action have ceased and the orifices of the craters have been obstructed by ashes or plugged by hard crystalline rock. But in the volcanoes of the Sandwich Islands the craters are filled at times with liquid basalt which suddenly escapes, without the appearance of any lava at the surface. The molten rock, in such a case, must have found a passage underground, following some bedding plane or fissure, and giving rise to a dike or sill among the older lavas or in the sediment- ary rocks beneath. Many of the great sills, however, may have been connected with no actual volcanoes, and may represent great supplies of igneous magma which rose from beneath but never actually reached the earth's surface.

The connexion between sills and dikes is very close ; both of them are of subterranean consolidation, but the dikes occupy vertical or highly inclined fissures, while the sills have a marked tendency to a horizontal position. Accordingly we find that sills are most common in stratified rocks, igneous or sedimentary. Very frequently sills give rise to dikes, and in other cases dikes spread out in a horizontal direction and become sills. It is often of considerable importance to

distinguish between sills and lavas, but this may be by no means easy. The Sciur of Eigg is a good example of the difficulty in iden- tifying intrusive masses. Lavas indicate that volcanic action was going on contemporaneously with the deposit of the beds among which they occur. Sills, on the other hand, show only that at some subsequent period there was liquid magma working its way to the surface. (J. S. F.)

SILLIMAN, BENJAMIN (1779-1864), American chemist and geologist,

was born on the 8th of August 1779 at Trumbull (then called North Stratford), Connecticut. Entering Yale College in 1792, he graduated in 1796, became tutor in 1799, and in 1802 was appointed professor of chemistry and mineralogy, a position which he retained till 1853, when by his own desire he retired as professor emeritus. Not only was he a popular and successful teacher of chemistry, mineralogy and geology in the college for half a century, but he also did much to improve and extend its educational resources, especially in regard to its mineralogical collections, the Trumbull Gallery of Pictures, the Medical Institution and the Sheffield Scientific School. Outside Yale he was well known as one of the few men who could hold the attention of a popular audience with a scientific lecture, and on account of his clear and interesting style, as well as of the un- wonted splendour of his illustrative experiments, his services were in great request not only in the northern and eastern states but also in those of the south. His original investigations were neither numerous nor important, and his name is best known to scientific men as the founder, and from 1818 to 1838 the sole editor, of the American Journal of Science and Arts — often called Silliman's Journal, — one of the foremost American scientific serials. In 1810 he published A Journal of Travels in England, Holland and Scotland, in which he described a visit to Europe undertaken in 1805 in preparation for the duties of his chair. He paid a second visit in 1851, of which he also issued an account, and among his other publications were Elements of Chemistry (1830), and editions of W. Henry's Chemistry with notes (1808), and of R. Bakewell's Geology (1827). He died at New Haven on the 24th of November 1864.

His son, Benjamin Silliman (1816-1885), chemist and mineralogist, was born at New Haven on the 4th of December 1816. After graduating at Yale in 1837 he became assistant to his father, and in 1847 was appointed professor in the school of applied chemistry, which was largely due to his efforts and formed the nucleus of the subsequent Sheffield Scientific School. In 1849 he was appointed professor of medical chemistry and toxicology in the Medical College at Louisville, Kentucky, but relinquished that office in 1854 to succeed his father in the chair of chemistry at Yale. The duties of this professorship, so far as they related to the Academic College, he gave up in 1870, but he retained his connexion with the Medical College till his death, which happened at New Haven on the 14th of January 1885. Much of his time, especially during the last twenty years of his life, was absorbed in making examinations of mines and preparing expert reports on technical processes of chemical manufacture; but he was also able to do a certain amount of original work, publishing papers on the chemistry of various minerals, on meteorites, on photo- graphy with the electric arc, the illuminating powers of gas, &c. A course of lectures given by him on agricultural chemistry in the winter of 184 5-1846 at New Orleans is

believed to have been the first of its kind in the United States. In 1846 he published First Principles of Chemistry and in 1858 First Principles of Physics or Natural Philosophy, both of which had a large circula- tion. In 1853 he edited a large quarto illustrated volume, The World of Science, Art and Industry, which was followed in 1854 by The Progress of Science and Mechanism. In 1874, when the 100th anniversary of Priestley's preparation of oxygen was celebrated as the " Centennial of Chemistry " at Northumberland, Pa., where Priestley died, he delivered an historical address on " American Contributions to Chemistry," which contains a full list, with their works, of American chemists up to that date. From 1838 to 1845 he was associated with his father in the editorship of the American Journal of Science, and from 1845 to the end of his life his name appeared on the title page as one of the editors in chief.

SILLIMANITE, a rock-forming mineral consisting of aluminium silicate, AˆSiOs. It has the same percentage chemical composi- tion as cyanite (q.v.) and andalusite {q.v.), but differs from these in crystalline form and physical characters. It crystallizes in the orthorhombic system and has the form of long, slender needles without terminal planes, which are often aggregated together to form fibrous and compact masses; hence the name fibrolite, which is often employed for this species. The name sillimanite is after Benjamin Silliman the elder. There is a perfect cleavage in one direction parallel to the length of the needles. The colour is greyish-white or brownish, and the lustre vitreous. The hardness is 65 and the specific gravity 3-23. Sillimanite is a characteristic mineral of gneisses and crystalline schists, and it is sometimes a product of contact-metamorphism. It has been observed at many localities; e.g. in Bohemia (the Faserkiesel of Lindacker, 1792), with corundum in the Carnatic (fibrolite of comte de Bournon, 1802), Chester in Connecticut (sillimanite of G. T. Bowen, 1824), Monroe in New York (" mon- rolite "), Bamle near Brevik in Norway (" bamlite "). Pre- historic implements made of compact sillimanite are found in western Europe, and have a certain resemblance to jade imple- ments. (L. J. S.)

SILLY, weakly foolish, stupid. This is the current sense of a word which has much changed its meaning. The O.E. scelig (usually gesdlig) meant prosperous, happy, and was formed from sal, time, season, hence happiness, cf. Icel. scela, bliss; Ger. selig, blessed, happy, &c, probably also allied to Lat. salvus, whole, safe. The development of meaning is happy, blessed, innocent or simple, thence helpless, weak, and so foolish. The old provincial and Scottish word for a caul (q.v.) was " silly- how," i.e. " lucky cap." The development of meaning of " simple," literally " onefold " (Lat. simplex), plain, artless, hence unlearned, foolish, is somewhat parallel. A special meaning of " simple," in the sense of medicinal herbs, is due to the supposition that each herb had its own particular or simple medicinal

value.

SILURES, a powerful and warlike tribe in ancient Britain, occupying approximately the counties of Monmouth, Brecon and Glamorgan. They made a fierce resistance to the Roman conquest about a.d. 48, but a legionary fortress (Isca Silurum, Ca?rleon) was planted in their midst and by a.d. 78 they were overcome. Their town Venta Silurum (Caerwent, 6 m. W. of Chepstow) became a Romanized town, not unlike Silchester, but smaller. Its massive Roman walls still survive, and recent excavations have revealed a town hall and market square, a temple, baths, amphitheatre, and many comfortable houses with mosaics, &c. An inscription shows that under the Roman Empire it was the chef-lieu of the Silures, whose ordo or county council provided for the local government of the district. (F. J. H.)

SILURIAN, in geology, a series of strata which is here under- stood to include those Palaeozoic rocks which lie above the Ordovician and below the Devonian or Old Red Sandstone, viz. the Llandoverian (Valentian of C. Lapworth), Wenlockian and Ludlovian groups of Great Britain with their foreign equiva- lents. A word of caution is necessary, however, for in the early history of British stratigraphy the exact delimitation of " Silurian" was the subject of a great controversy, and the term has been used with such varying significance in geological literature, that considerable confusion may arise unless the numerous inter- pretations of the title are understood. The name " Silurian " was first introduced by Sir R. I. Murchison in 1835 for a series of rocks on the border counties of England and Wales — a region formerly inhabited by the Silures. Murchison's Silurian em- braced not only the rock groups indicated above, but others below them that were much older, even such as are now classed as Cambrian. About the same time A. Sedgwick proposed the term Cambrian for a great succession of rocks which includes much of Murchison's Silurian system in its upper part; hence arose that controversy which left so lasting a mark on British geology. In 1850 A. d'Orbigny suggested the name " Murchi- sonian " for what is here retained as the Silurian system. As a solution of the difficulties of nomenclature, Professor C. Lapworth in 1879 proposed the term Ordovician systems (q.v.)

for those rocks which had been the Lower Silurian of Murchison and the Upper Cambrian of Sedgwick. An approximate cor- relation of the usages of the title " Silurian" is here given in tabulated form: —

R. I. Murchison.

A. Sedgwick.

C. Lapworth.

American.

A. de Lapparent.

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The Silurian rocks are almost wholly of marine origin and in- clude all the usual phases of sedimentation; shales and mudstones, marls and limestones, sandstones and grits are all represented in Great Britain and in most other countries where the Silurian is known. The majority of the rocks

were deposited in the com- paratively shallow waters of epicontinental seas, the graptolitic shales and sponge-bearing cherts being perhaps the representa- tive's of the deeper waters. Locally, glauconitic limestones and ironstones (Clinton beds) indicate special conditions; while the isolation and desiccation of certain marine areas (New York) towards the close of the period gave rise to beds of red sandstone, red marls, gypsum and rock salt. The hydraulic limestone (Water Lime) of New York was probably a brackish-water forma- tion. In Sweden and elsewhere some of the limestones and shales are distinctly bituminous.

Distribution. — In the preceding Ordovician period several well- marked marine provinces are indicated by the fossil contents of the rocks. At the beginning of Silurian time a general transgression of the sea — which had commenced at the close of the Ordovician — was in progress in the N. hemisphere (Europe and the Appalachian region). This culminated at the time when the Wenlock beds and their equivalents (Niagaran and Oesel beds) were forming at the bottom of a great periarctic sea or shallow ocean. It is thus found that the same general characters prevail in the Silurian of Britain, N. America, Scandinavia and the Baltic region, Russian Poland (Podolia, Kielce, Galicia), the Arctic regions, New Siberia (Kotelny), Olenk district, Waigatsch, N. Zembla, Tunguska, Greenland, Grinnell Land and China. The Bohemian region, comprising central Bohemia, Thuringia, Fichtelgebirge, Salzburg, Pyrenees, Languedoc, Catalonia, South Spain, Elba and Sardinia, alone retained some of its marked individuality. Later in the period a gradual withdrawal of the sea set in over the N. hemisphere, affecting the British area (except Devon), the left of the Rhine, Norway and the Baltic region, N. Russia, Siberia and the Ural region, Spitzbergen, Greenland and the W. states of N.- America. Thus the later Silurian conditions heralded those of the succeeding Devonian and Old Red Sandstone, and there is generally a gradual passage from one set of rocks to the other (Downtonian of Great Britain). The Silurian rocks may occur in close continuity with the upper Ordovician, as in S. Europe; or, as in the typical region, the Llandovery beds may rest unconformably upon older rocks; in N. America also there is a marked uncon- formity on this horizon. A large part of N. America was apparently land during part of Silurian time ; the lower members arc found in the E. alone, while the Cayaguan division is found to extend farther E. than the middle or Niagaran division, but not so far W. The falls of Niagara owe their existence to the presence of the hard Lockport and Guelph beds resting upon the softer Rochester shales. Most of the essential information as to the distribution of Silurian rocks will be found in a condensed form in the accompanying table and map; but attention may here be drawn to the upper Silurian (Ludlovian) limestone of Cornwallis Island, the mid-Silurian lime- stone of Grinnell Land and the lower Silurian limestone of New

Siberia. Limestones of lower and middle Silurian age are found also

in Timan, Tunguska and elsewhere in N. Russia. Rocks of this system in S. America have been only superficially studied ; they occur in the lower regions of the Amazon, where they bear some resemblance to the Medina and Clinton stages of N. America, and in Bolivia and Peru. Little is known of the Silurian rocks

recorded from N. Africa.

Silurian Life. — Our know- ledge of the life of this period is limited to the inhabitants of the seas and of the brackish waters of certain districts. The remains of marine organisms are abundant and varied. Grap- tolites flourished as in the pre- ceding period, but the forms characteristic of the Ordovician gave place early in the Silurian to the single-axis type {Mono- graptidae) which prevailed until the close of the period (Rast- rites, Monograptus, Retiolites and Cyrtograptus). As in the Ordovician rocks, the grapto- lites have been largely em- ployed as zonal indicators. Trilobites were important; the genera Calymene, Phacops and Encrinurus attained their maxi- mum development ; Proehis, Bronteus, Cyphaspis, Arethusina may be mentioned from among many other genera. The ostracods Leperditia and Bey- richia are very abundant locally. A feature of great interest is the first appearance of the remarkable Eurypterid crustacean Eurypterus, which occasionally reached the length of over a yard, and of the limulids, Neolimulus and Hemiaspis. The cephalopods were the predominant molluscs, especially Orthoceras and various abbrevi- ated or coiled orthoceras-like forms (Cyrtoceras, Phragmoceras, Trochoceras, Ascoceras); there was also a Nautilus, and an early form of goniatite has been recorded. Gasteropods include the genera Platyceras, Murchisonia and Bellerophon; the pteropod Tentaculites is very abundant in certain beds. The pelecypods were not very important (Cypricardinia, Cardiola interrupta, C. cornucopiae). Next to the cephalopods in importance were the brachiopods : in the lower Silurian pentamerus-like forms still continued (P. Knightii,

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Silurian Period

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P. oblongus), but the spire-bearing forms soon began to increase (Spirifer, Whitfieldia, Meristina, Airy pa). Other genera include Rhynckonella, Chonetes, Terebratula, Strophomena, Stricklandinia. The bryozoa, especially the bulky rock-building forms, were less in evidence than in the Ordovician. The echinoderms were well represented by the crinoids (Cyathocrinus, Crotalocrinus, Taxocrinus), some of which are found in a state of beautiful preservation at Dudley in England, Lockport (New York) (Waldron (Indiana) in N. America and also in Gothland in the Baltic. Cystids were abundant, but less so than in the Ordovician ; blastoids made their first appear- ance. Corals, mostly tabulate forms, flourished in great abundance in the clearer waters and frequently formed reefs (Favosites goth- landica, Halysites catenularia, Alveolites, Heliolites) ; tetracorallian forms include Stauria, Cyalhopkyllum, Cystiphyllum, Acervularia, Omphyma and the remarkable Goniophyllum. Sponges were repre- sented by Aslylospongia, Aulocopium, &c. The peculiar genera

SILVA

Approximate Correlation of Silurian Rocks.

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Receptaculitcs and Ischadites occur in the Silurian. Foraminifera and radiolaria also left their remains in the rocks. The most highly organized animals of the Silurian period were the fishes which had already made their appearance in the Ordovician rocks of Colorado and Russia. The Silurian fish include selachians (Onchus, Thyestis), and the occurrence of remains of the obscure backboned ostra- coderms (placoderms) is particularly worthy of notice (Pteraspis, Cephalaspis, Tremataspis, Cyathaspis, Thelodus, Lanarkia, Euker- aspis). Scorpions (Palaesphonus) have been found in Lanark, Gothland and New York. Plant remains are very fully repre- sented; land plants have been recorded from the Harz and Keller- wald (H. Potonie, 1901), and large silicified stems — up to 2 ft. in diameter — perhaps representing a gigantic seaweed (Nematophycus), have been found in Wales and in Canada. Pachytheca is a small spherical body often associated with Nematophycus. Girvanella is another obscure algal plant.

As a natural result of the open character of the great Silurian periarctic sea referred to above, there are many points of resemblance between the fauna of the several regions of the N. hemisphere; this has been specially noticed in the community not only of genera but of species between Britain, Sweden and the interior of N. America (Iowa, Wisconsin, Illinois). ■ *Goniophyllum pyramidale is common to Iowa and Gothland ; A try pa reticularis, Orthoceras annulatum and not a few others are common to Europe and N. America. An extremely interesting circumstance is the admixture of a periarctic and Bohemian fauna in the Australasian region.*

In a general sense the Silurian period was one of comparative quiescence as regards crustal disturbances, and a relative sinking of the land was followed by a relative elevation affecting wide areas in the N. hemisphere. Local oscillations, such as those taking part in the formation of the Salina beds, &c, were naturally taking place, but the folding of the Scandinavian mountains and in the N. highlands of Scotland continued throughout the period accompanied by a great amount of thrusting. Volcanic activity was quite subordinate in Silurian times; flows of diabase occurred at the commencement of the period in Bohemia, and evidence of minor basaltic flows and tuffs is found at Tortworth in Gloucestershire and at a few localities in N. America.

For further information, see articles on the Cambrian, Ordovician,

Llandovery, Wenlock, Ludlow Systems and Groups. (J. A. H.)

SILVA, ANTONIO JOSfc DA (1705-1739), Portuguese drama- tist, known as " the Jew," was born at Rio de Janeiro, but came to Portugal at the age of eight. His parents, Joao Mendes da Silva and Lourenca Coutinho, were descended from Portuguese Jews who had emigrated to Brazil to escape the Inquisition, but

in 1702 that tribunal began to persecute the Marranos in Rio, and in October 171 2 Lourenca Coutinho fell a victim. Her husband and children accompanied her to Portugal, where she figured among the " reconciled " in the auto-da-fe of the 9th of July 1 7 13, after undergoing the torment only. Her husband, having then acquired a fixed domicile in Lisbon, settled down to advocacy with success, and he was able to send Antonio to the university of Coimbra, where he matriculated in the faculty of law. In 1726 Antonio was suddenly imprisoned along with his mother on the 8th of August; on the 16th he suffered the first interrogation, and on the 23rd of September he was put to the torment, with the result that three weeks later he could not sign his name. He confessed to having followed the practices of the Mosaic law, and this saved his life. He went through the great auto-da-fe held on the 23rd of October in the presence of King John V. and his court, abjured his errors, and was set at liberty. His mother was only released from prison in October 1729, after she had undergone torture and figured as a penitent in another auto-da-fS. Meanwhile Antonio had gone back to Coimbra, and finishing his course in 1728-1729 he returned to Lisbon and became associated with his father as an advocate. He found an ignorant and corrupt society ruled by an immoral yet fanatical monarch, who wasted millions on unprofitable buildings though the country was almost without roads and the people had become the most backward in Europe. As his plays show, the spectacle struck Antonio's observation, but he had to criticize with caution. He produced his first play or opera in 1733, and the next year he married a cousin, D. Leonor Maria de Carvalho, whose parents had been burnt by the Inquisition, while she herself had gone through an auto-da-fe in Spain and been exiled on account of her religion. A daughter was born to them in 1734, but the years of their happiness and of Silva 's dramatic career were few, for on the 5th of October 1737 husband and wife were both imprisoned on the charge of " judaizing." A slave of theirs had denounced them to the Holy Office, and though the details of the accusation against them seem trivial and even contradictory, Antonio, was condemned to death. On the 18th . of October he was beheaded and his body burnt in an auto-da-fe 1 ;

that same day one of his popular operettas was given at a Lisbon theatre.

His dramatic works, which were produced at the Bairro Alto theatre between 1733 and 1738, include the following comedies, all played by marionettes: — D. Quixote (1733), Esopaida (1734), Os Encantos de Medea (1735), Amphitriao (May 1736), Labyrintho de Creta (November 1736), Guerras do Alecrim e Mangerona (carnival of 1737), As Variedades de Proteo (May 1737) and Precipicio de Faetonte (1738). Slight as these sketches are, they show considerable dramatic talent and an Aristophanic wit. The characters are well drawn and the dialogue full of comic strength, the scenes knit together and the plot skilfully worked out. Moreover Silva possessed a knowledge of stagecraft, and, if he had lived, he might have emanci- pated the drama in Portugal from its dependence on foreign writers; but the triple licence of the Palace, the Ordinary and the Inquisition, which a play required, crippled spontaneity and freedom. Even so, he showed some boldness in exposing types of the prevailing charla- tanism and follies, though his liberty of speech is far less than that of Gil Vicente (q.v.). His comedies give a truthful and interesting picture of 1 8 th century society, especially his best comedy, the Alecrim e Mangerona, in which he treats of the fidalgo pobre, a type fixed by Gil Vicente and Francisco Manoel de Mello (q.v.). His works bear the title " operas " because, though written mainly in prose, they contain songs which Silva introduced in imitation of the true operas which then held the fancy of the public. He was also a lyric poet of real merit, combining correctness of form with a pretty inspiration and real feeling. His plays were published in the first two volumes of a collection entitled Theatro comico portuguez, which went through at least five editions in the 18th century, while the Alecrim e Mange- rona appeared separately in some seven editions. This comedy and the D. Quixote have been reprinted in a critical edition with a life of Silva by Dr Mendes dos Remedios (Coimbra, 1905). Ferdinand Denis, in his Chefs-d'wuvre du theatre portugais (pp. 365-496, Paris, 1823), prints liberal extracts, with a French translation, from the Vida de D. Quixote, and F. Wolf likewise gives selections from Silva's various compositions. Silva is the subject also of several laudatory poems and dramas, one or two of which were composed by Brazilian compatriots.

See Dr Theophilo Braga, Historia do theatro portuguez; a baixa comedia e a opera (Oporto, 1871); F. Wolf, Dom Antonio Jos6 da Silva (Vienna, i860); Ernest David, Les Operas du juif Antonio Jos& da Silva, 1705-173Q (Paris, 1880); Oliveira Lima, Aspectos de litteratura colonial Brazileira (Leipzig, 1896); Jewish Encyclopedia, vol. xi. p. 341 ; G. A. Kohnt, " Bibliography of Works relating to Antonio Jose da Silva and Bibliography of Don Antonio's Compositions" in the Publ. Am. Jew. Hist. Soc. No. 4, p. 181; idem, " Martyrs of the Inquisition in South America," ib. p. 135; M. Grunwald, "Jose da Silva" in Monatsschrift (1880), xxix. p. 241. (E. Pr.)

SILVANUS (Lat. silva, wood), a deity or spirit of Italian woodland; not, however, of the wholly wild woodland, but of that which borders the clearings in a country not entirely re- claimed. Thus he is partly wild and partly civilized, and reflects the experience of the earliest settlers in Italy, whose descendants took him with them to the farthest limits of the empire, even to Britain, where we have many votive inscriptions to him, always as the friendly deity dwelling outside the new clearing, benevolent towards the settler in a strange land. This leading characteristic of Silvanus is shown clearly in Roman literature: Horace writes of the " horridi dumeta Silvani " (Odes, iii. 29) but he also calls him " tutor finium " (Epod. ii. 22) while for Virgil he is " arvorum pecorisque deus " (Aen. viii. 600). A writer on land measure- ment (Script, gromatici, i. 302) tells us that each holding had three Silvani — domcsticus (of the holding itself), agrestis (of the wilder pasture-land) and orientalis (of the boundaries). It is plain that in him the Italians had a very useful deity, and in all these capacities he became extremely popular, as the extraordinary number of his inscriptions shows. Unlike Mars, from whom he was probably in origin an offshoot (cf. the Mars Silvanus of Cato, De re rustica, 141; see Mars), he never made his way into the towns, but is almost the only Roman deity who from first to last retained the same perfectly intelligible rustic character. His double nature as deity of woodland and cultivated land is seen well in the artistic representations of him; he carries a young tree in one hand, a pruning-hook in the other.

See Wissowa, Gesammelte Abhandlungen (1904, p. 78 foil.).

(W. W. F.)*

S'LVER (symbol Ag, from the Latin argentum, atomic weight 107-88 (0=i6)), a metallic chemical element, known from the earliest times and of great importance as a " noble " metal for articles of value — coinage, ornamentation and jewelry.

Etymologically the word " silver " probably refers to the shining appearance or brightness of the metal. The Latin argentum is cognate with the Greek ixpyvpos, silver, which in turn is derived from apyos, shining. The Hebrew Keseph is connected with a root meaning " to be pale." The alchemists named it Luna or Diana, and denoted it by the crescent moon; the first name has survived in lunar caustic, silver nitrate. Silver is widely diffused throughout nature, occurring in minute amount in sea-water, and in the mineral kingdom as the free metal, as an amalgam with mercury and as alloys with gold, platinum, copper and other metals. Native silver is occasionally met with in metalliferous veins, where it has been formed by the alteration of silver-bearing minerals. It crystallizes in the cubic system, but the crystals are usually distorted and indistinctly developed: twisted

wire-like forms are much more common. The best crystallized specimens have been obtained from Kongsberg in Norway, large masses, weighing as much as 5 cwts., having been found. It is also found in other silver mines, especially those of Mexico, Peru and Chile; in the Lake Superior copper mining region it occurs in association with native copper. The element is a constituent of many mineral sulphides, some of which are of sufficiently frequent occurrence to rank as ores of silver. Of these the more important are noticed under Metallurgy; here we may notice the rarer minerals. Silver sulphide, Ag 2 S, occurs naturally as the orthorhombic acanthite, and the cubic argentite; the telluride, Ag 2 Te, named hessite, assumes cubic forms; other tellurides containing silver are petzite, (Ag,Au) 2 Te, and sylvanite, AuAgTej. In association with antimonious and arsenious sulphides, silver sulphide forms many important minerals, which sometimes present dimorphous forms, reflecting the dimorphism of silver sulphide; moreover, the corresponding arsenious and antimonious compounds are frequently isomorphous. This is illustrated by the hexagonal pyrargyrite 3Ag 2 S-Sb 2 S 3 , and proustite, 3Ag 2 S-As 2 S3, and the monoclinic pyrostilpnite, isomeric with pyrargyrite, and xantho- conite, isomeric with proustite. Other pairs of isomorphous argentiferous minerals are: the cubic polybasite, 9Ag 2 S-Sb 2 S3, and pearceite, 9Ag 2 S-As 2 S3j and the germanium minerals argyrodite, 4Ag 2 S-GeS 2 , and canfieldite, 4Ag 2 S-(Sn,Ge)S 2 .

Physical Properties. — In appearance silver presents a pure white colour with a perfect metallic lustre. It is the most malleable and ductile of all metals with the exception of gold: one gramme can be drawn out into a wire 180 metres long, and the leaf can be beaten out to a thickness of 0-00025 mm.; traces of arsenic, antimony, bismuth and lead, however, make it brittle. In hardness it is superior to gold, but inferior to copper. Its specific gravity, according to G. Rose, lies between 10-514 and 10-619 at 1 4°; an average value is 10-57. Its specific heat is 0-05701 (Regnault) or 0-0559 (Bunsen); its coefficient of linear expansion is 0-00001921. Its thermal conductivity is, according to Wiedemann and Franz, superior to that of other metals, being in the ratio of 100 : 74 as compared with copper and 100 : 54 with gold; it is the most perfect conductor of electricity, standing to copper in the ratio 100:75, and to gold 100:73. Silver melts at about iooo°C; recent determinations give 960-7° (Heycock and Neville) and 962 (Becquerel); at higher temperatures it volatilizes with the formation of a pale blue vapour (Stas). Its vapour density has been determined at 2000°, and corresponds to a monatomic molecule. When molten,- silver occludes the oxygen of the atmosphere, absorbing 20 times its own volume of the gas; the oxygen, however, is not permanently retained, for on cooling it is expelled with great violence; this phenomenon is known as the " spitting " of silver. It is prevented by preserving the molten metal from contact with air by covering the surface with non-

oxidizing agents, or by traces of copper, bismuth or zinc.

Chemical Properties. — Silver is not oxidized by oxygen, but resembles mercury in being oxidized by ozone. It has no action on water. It is readily soluble in dilute nitric acid, nitric oxide and silver nitrate being formed ; it also dissolves in hot, strong sulphuric acid, sulphur dioxide being evolved. Hydrochloric acid forms a surface film of silver chloride; hydriodic acid

readily dissolves it, while hydrofluoric acid is without action. Sulphuretted hydrogen is decomposed with the formation of a black coating of silver sulphide; this is the explanation of the black tarnish seen when silver is exposed to the fumes of coal gas, and other sulphuretted compounds, such as occur in eggs. The so-called ” oxidized ” silver is a copper-silver alloy coated superficially with a layer of the sulphides by immersion in sodium sulphide or otherwise. Silver combines with the free halogens on heating and also with sulphur.

Molecular silver is a grey powder obtained by leaving metallic zinc in contact with silver chloride which has been precipitated in the cold and washed till nearly free from acid. The powder is separated from the zinc, washed with hydrochloric acid, dried in the air, and then gently heated to 150 . It assumes a metallic lustre on burnishing or heating to redness. It receives application in synthetic organic chemistry by virtue of its power to remove the halogen atoms from alkyl haloids, and so effect the combination of the two alkyl residues.

Colloidal silver is the name given by Carey Lea to the precipitates obtained by adding reducing solutions, such as ferrous sulphate, tartrates, citrates, tannin, &c, or to silver solutions. They dissolve in water to form solutions, which do not penetrate parchment membranes, hence the name colloidal. Many other methods of preparing these substances are known. Bredig’s process consists in passing an electric arc between silver electrodes under water, when a brown solution is obtained.

Production. — The economic questions which attend the production of silver and the influence which gold and silver exercise on prices are treated in the articles Money and Bi- metallism; the reader is referred to the former article for the history of silver production and to the topographical headings for the production of specific countries. Since the middle of the 19th century the annual production has increased: the following table gives the average annual production in 1000 oz. over certain periods: —

1841-1850.

1851-1860.

1861-1865.

1866-1870.

1871-1875.

1 876-1 880.

1881-1885.

1 886-1 890.

1891-1895.

25,090

28,792

35.402

43.052

63,318

78,777

87,272

no,35 6

158.942

1900.

1901.

1902.

1903.

1904.

1905.

1906.

1907.

1908.

180,093

174.851

164,560

170,128

182,262

189,830

165,640

184,894

203,186

Over two-thirds of the world's supply is derived from Mexico and the United States. The Mexican mines first sent supplies to Europe in the 16th century, and during the period 1781-1800 yielded two- thirds of the world's production. Although the production has de- creased relatively, yet it has increased enormously absolutely; in 1900, it was 55,804,420 oz., being second to the United States; in 1905 it was 73,838,066 oz., establishing a record for any single country. The United States came into prominence in about i860, and the discovery of the famous Comstock lode in Nevada led to an enormous increase in the production. The production of this lode declined in 1876, but the total production of this country was in- creased by discoveries in Colorado (Leadville) and Nevada (Eureka) ; and in more recent years silver-producing areas in other states (Montana, Utah, Idaho) have been exploited. In i860 the pro- duction was 116,019 oz., which increased to 1,546,920 in 1861; in 1872 it was 22,254,002 oz. ; in 1888, 45,792,682; in 1890, 54,516,300 oz. ; in 1900, 57,647,000; and in 1905, 58,918,839 oz. S. America has furnished European supplies since the discovery of the Potosi mines of Peru in 1533; Bolivia and Chile are also notable producers. Of European producers, Germany, Spain and Austria are the most important; Greece, Italy, France, Turkey and Russia occupy secondary positions. The German mines were worked in the loth century; at the beginning of the 16th century the production was over 400,000 oz. annually; this dropped in the following century to about one-half; it then recovered, and in recent times has enor- mously increased,

attaining 12,535,238 oz. in 1905. The mines of Spain, neglected late in the 15th century on the advent of supplies from America, came into note in 1827; the output has since greatly increased, amounting to 3,774,989 oz. in 1905. Austria-Hungary was producing twice as much as Germany, and about one-half of the total European production, in the 16th century; the yield diminished in the ensuing century, to be subsequently increased. The output was about 1,800,000 oz. in 1905. The total European supply was about 17,000,000 oz. in 1900 and about 18,600,000 oz. in 1905. Of other countries we may notice Canada, which produced 4,468,225 oz. in 1900 and 5,974.875 oz – in 1905, and Japan, which produced about

670,000 oz. in 1880 and 3,215,000 oz. in 1905. Australia came into notice chiefly by reason of the discoveries at Broken Hill, New South Wales; these mines producing 36,608 oz. in 1885, 1,016,269 in 1886, and 7,727,877 oz. in 1890. The total Australasian production in 1900 was 14,063,244 oz. and 14,362,639 oz. in 1905.

Metallurgy. From the metallurgical point of view, silver ores may be classified as real silver ores and argentiferous ores. The former consist of silver minerals and gangue (vein matter, country-rock). The leading silver minerals are native silver; argentite or silver glance, Ag_2S, usually containing small amounts of lead, copper and tin; dyscrasite or antimonial silver, Ag_2Sb to $Ag_{13}Sb$, an isomorphous mixture of silver and antimony; proustite or light red silver ore, Ag_3AsS_3 ; pyrargyrite or dark red silver ore, Ag_3SbS_3 ; stephanite, Ag_5SbS_4 ; miargyrite, $AgSbS_2$; stromeyerite, CuAgS; polybasite, $9(Cu_2S,Ag_2S)'(Sb_2S_3,As_2S_3)$; cerargyrite or horn silver, AgCl; bromite or bromargyrite, AgBr; embolite, Ag(Cl,Br); iodite or iodargyrite, AgI. Metalli- ferous products containing silver arise in many operations; the chief products which may yield silver economically are copper and lead mattes, burnt argentiferous pyrites and certain drosses and scums. Argentiferous ores consist of silver-bearing base-metal minerals and gangue. Lead and copper ores, carrying silver in some form or other, are the leading representatives. The silver is extracted from the gangue with the base metal, usually by smelting, and the two are then separated by special processes (see Lead).

Milling, i.e. amalgamation and lixiviation, is cheaper than smelting, but the yield in silver is lower. Often it is more profitable to smelt real silver ores with argentiferous ores than to mill them, the greater cost being more than balanced by the

increased yield. Milling is practised mainly in isolated localities near the mine producing the ore. As any given region is opened up by rail- ways, cheapening transportation, milling is apt to give way to smelt- ing. Thus on the American continent, which produces the bulk of the world's silver,

milling is still prominent in S. America and Mexico, while in the United States it has to a considerable extent been replaced by smelting.

Amalgamation is based on the property of quicksilver to extract the silver from finely-pulverized ore and collect it in the form of an amalgam. When the rock has been separated from the amalgam by a washing operation, the quicksilver is recovered by distillation in an iron retort, and the remaining crude retort- silver melted into bars and shipped to a refinery, which removes the impurities, the leading one of which is copper. A silver ore is either free-milling or refractory, that is, the silver mineral is readily amalgamated or it is not. In free-milling ore the silver is present either in the native state, or as chloride or as simple sulphide. Complex silver minerals (sulph-arsenides and anti- monides) which are difficult to amalgamate must be made amenable to quicksilver, and the simplest way of doing this is to convert the silver into chloride. This is imperfectly accom- plished, in the wet way, by cupric and cuprous chloride solutions, but completely so, in the dry way, by roasting with salt (chlorid- izing roasting). According as a preliminary chloridizing roast has or has not been given, the process is classed as roast-amalga- mation or raw-amalgamation. The leading raw-amalgamation processes are the Patio and Washoe; then follow the Cazo, Fondon and Krohnke; of the roast-amalgamation processes, the European Barrel or Freiberg, the Reese River and the Franck-Tina are the most important.

The Patio process, sometimes named the American-heap-amalga- mation process, which is carried out principally in Mexico, aims at

amalgamating the silver in the open in a circular enclosure termed a torla, the floor of which is generally built of flagstones. In order to facilitate the decomposition of the silver-mineral, salt and magistral, i.e. cupriferous pyrites roasted to convert the copper into soluble sulphate, which is the active agent, are worked into the wet pulp spread out on the floor. The amalgamation proceeds very slowly, as the sole extraneous heat is that of the sun. According to Laur (" Metallurgie de l'argent au Mexico," Ann. des mines, series 6, vol. xx.), at Guanaxuato, Mexico, 92-79 % of the total silver recovered was extracted after 12 days, 97-55% after 25 days, 99-1 % after 28 days and 100% after 33 days. The loss of quicksilver in the process is large, owing to the formation of calomel which is not saved. The yield in silver is low unless the ores are exceptionally free-milling; the bullion produced is high-grade, as refractory silver minerals are hardly attacked. The process is suited to easy ores and a region where the climate

is warm and dry, and horse- or mule-power, labour and quicksilver are cheaper than fuel and water.

The Washoe process of pan-amalgamation, named from the Washoe district in the United States, is the leading raw-amalgamation process of the United States, where it was introduced in 1861 by A. B. Paul. It consists in wet-stamping coarsely crushed ore, settling the sands and slimes produced, and grinding and amalgamating them in steam-heated iron pans with or without the use of chemicals (salt and copper sulphate). The ores may contain a larger proportion of sulphides and complex silver minerals than with the Patio process and still give a satisfactory extraction. They are crushed to egg-size in a rock-breaker, and pulverized to pass a 40-mesh sieve in a Cali- fornia stamp-mill, which treats in 24 hovirs about 3 tons per stamp. A 10-stamp mill is fed by one rock-breaker, and discharges the liquid pulp into 10-15 wooden settling tanks, 9 by 5 by 8 ft., the settled contents of which are shovelled out and charged into the pans. The

Ean in general use is the combination pan. It has a flat cast-iron ottom, 5 feet in diameter, and wooden sides about 30 inches high, the lower parts of which are lined with cast-iron. In the centre is a hollow cone, through which passes the driving shaft, geared from below. This turns the grinding apparatus (driver with " muller "), which can be raised and lowered. The speed is 60-90 revolutions per minute. To the bottom and muller are attached grinding plates (shoes and dies), which are replaced when worn; and to the sides three wings to deflect the moving pulp towards the centre, and thus establish the necessary pulp current. The lower side of the bottom has also a steam-chest. A 10-stamp mill has 4-6 pans, which receive 2-ton charges. In working, the muller is raised % in., the pan charged with water and then with ore; the muller is then lowered, salt and blue vitriol added, and the charge ground for 3-4 hours. The pulp is heated with live steam to about 90° C, and kept at that temperature by exhaust steam in the bottom-chest. After grinding, the muller is raised and quicksilver added, and the silver up to 81-04 % then amalgamated in 4 hours.

In amalgamating without the use of chemicals, finely divided iron, worn from the shoes and dies in the stamp-mill and the pan, de- composes cerargyrite and argentite, and the liberated silver is taken up by the quicksilver; the process is hastened by adding salt. When salt and copper sulphate are added to the charge, they form sodium sulphate and cupric chloride, both of which are readily soluble in water. Cupric chloride acts upon argentite (Ag 2 S-f- CuCl 2 =2AgCl+CuS), proustite (4Ag 3 AsS 3 +4CuCl 2 =8AgCl-r- 2Ag 2 S+4CuS+2As2S3), pyrargyrite (2Ag 3 SbS s +3CuCl 2 =6AgCl-|- 3CuS+Sb 2 S 3), and is also reduced to cuprous chloride by metallic iron. This salt, insoluble in water but soluble in brine, also acts upon argentite (Ag 2 S+Cu 2 Cl 2 =2AgCl+CuS-|-Cu) and

pyrargyrite ($2Ag_3SbS_3 + Cu_2Cl_2 = 2AgCl + Ag_2S$-\|-$2Ag + 2CuS$-\|-$Sb_2S_3$), and would give with silver sulphide in the presence of quicksilver, the Patio- reaction; metallic silver, cupric sulphide, and mercurous chloride ($2Ag_2S + Cu_2Cl_2 + 2Hg = 4Ag$-l-$2CuS + Hg_2Cl_2$), but the iron decom- poses the quicksilver salt, setting free the quicksilver.

The amalgamation is rapid. Thus Austin found that at the Charleston mills, Arizona, 92-13% of the total silver recovered was extracted after 1 hour, 94-10% after 2 hours, 95-92% after 3 hours, and 100% after 4 hours. The loss in quicksilver is small, as there is no chemical loss inherent in the process; the yield is relatively high, but the bullion is liable to be low-grade, on account of copper being precipitated and amalgamated.

When the charge has been worked, the contents of the pan are discharged into a settler, in which the amalgam is separated from the sands. It has the same general construction as the pan. It is 8 ft. in diameter and 3 ft. deep. The bottom, slightly .conical, has a groove near the circumference to catch the amalgam, which is withdrawn through a discharge-spout into a bowl. In the sides at different levels are three discharge-holes for water and sand. The muller reaches to within 3 in. of the bottom and makes 12-15 revolutions per minute. In settling, the pulp is diluted by a small stream of water, and the thinned pulp drawn off, first through the top discharge- hole and then through the other two, the bottom one being about 8 in. above the amalgam. Settling takes about half the time required to work a charge in the pan, hence one settler serves two pans. _ The amalgam is dipped out from the bowl into a canvas bag (the strainer), to separate the excess of the quicksilver from the pasty amalgam, which is then retorted and melted. The cost of treating a ton of ore in the western part of the United States is from $3 to $7. At some

works treating ores containing sulphides which do not yield their silver to quicksilver, concentration apparatus (see Ore-Dressing) is inserted between the stamps and the settling tanks to remove the sulphides, which are worked by themselves ; at other works they are recovered from the sands after these have left the settlers. In order to do away with the handling of the wet pulp, and to obtain a higher extraction, M. P. Boss has modified the ordinary plant by making the pulp flowing from the stamps pass through a grinding pan, then through a series of amalgamating pans followed by a row of settlers.

A 20-stamp mill is served by 12 men in 24 hours. The Washoe process is independent of the climate, but it requires cheap power and an abundance of water.

In the Cazo, Caldron or Hot process the pulverized silver ore is boiled in a

copper-bottomed wooden vat, first with brine until the silver has been reduced by the copper, and then with quicksilver. The Fondon is an improvement on the Cazo. Bars of copper drawn over the bottom by mules or water-power (like the stone drags in the arrastra) grind off fine particles of copper, which hasten the reduction of the silver and diminish the formation of calomel. In the Krohnke process introduced by B. Krohnke into Copiapo, Chile, in i860, the silver mineral of the pulverized ore is decomposed in a revolving barrel by a hot solution of cuprous chloride in brine in the presence of zinc or lead and quicksilver (see B. Krohnke, Methode zur Entsilberung von Erzen, Stuttgart, 1900).

Chloridizing Roasting. — In a chloridizing roast chlorine produces its effect as nascent chlorine or gaseous hydrochloric acid. The leading reagents are salt (NaCl), sulphur trioxide (SO3, produced in the roasting), and steam (H 2 0). The decom- position of salt is expressed by 2NaCl+2S0 3 = Na 2 S04+S02+Cl2. In the presence of water-vapour the following reaction takes place: 2NaCl+S0 3 +H 2 = Na 2 S0 4 +2HCl. As some water-vapour is always present, hydrochloric acid will invariably be formed with the chlorine. The roasting is carried on in hand and mechanical reverberatory furnaces, and Occasionally in muffle-furnaces. A chloridation of over 90% silver is the rule.

The European Barrel or Freiberg process consists in roasting the ground ore with salt which converts the silver sulphide into chloride. The mass, along with certain proportions of water, scrap-iron and mercury, is then placed in barrels, which are made to rotate so that the several ingredients are thoroughly mixed. The salt solution dissolves a small proportion of chloride, which in this form is quickly reduced by the iron to the metallic state. This solution .and pre- cipitation is continuous, and the metal formed unites with the mercury to form a semi-fluid amalgam. The amalgam is pressed in linen bags to eliminate a quantity of relatively silver-free liquid mercury (which is utilized as such in subsequent operations), and the remaining solid amalgam is subjected to distillation from iron re- torts. This process was perfected at Freiberg, Saxony, but aban- doned there in 1856. In the United States it was used quite ex- tensively in Colorado and Nevada, but has now been given up. The main reasons for this are the length of time required to finish a charge, on account of the absence of any extraneous source of heat, and the great care with which operations have to be carried out in order to obtain satisfactory results.

The Reese River or pan-amalgamation process consists in dry- stamping crushed dried ore and dried salt (separately or together), charging them into a roasting furnace, and amalgamating the chlori- dized ore in an iron pan. The general arrangement and construction of a mill resemble those of the Washoe process. The apparatus for drying ore and salt varies greatly,

drying-floors, dry-kilns and con- tinuous mechanical reverberatory furnaces with stationary and re- volving hearths being used. The general construction of the pan is the same as in the Washoe process; the management, however, differs. The steam-chest is not used to such an extent, as the bottom would be prematurely corroded; less water is used, as the pulp would become too thin on account of the soluble salts (sodium chloride, sulphate, &c.) going into solution; and the roasted ore is not ground, as the hot brine readily dissolves the silver chloride from the porous ore, and thus brings it into intimate contact with iron and quicksilver. Chemical reagents are sometimes added — lime or sulphuric acid, to neutralize an excess of acid or alkali; copper sulphate, to form cuprous chloride with sodium chloride; and iron and zinc, to make the galvanic action more energetic and reduce the consumption of iron. The rest of the apparatus (settler, retort, crucible, furnace) is the same as with the Washoe process. The Reese River process costs from half as much again to twice as much as the Washoe process.

The Francke-Tina process, named from Francke, German consul at Bolivia, and Una, the wooden vat in which the process is carried out. was developed in Bolivia for the treatment of refractory ores rich in zinc blende and tetrahedrite (f ahl-ore) . The ore is given only a partial chloridizing roast, on account of the great loss in silver that would be caused by the formation of zinc chloride. The large amount of soluble sulphates of iron and copper formed in the roast is made to act upon salt charged in a copper-bottomed amalgamating pan ; the chlorides formed finish in the wet way the imperfect chloridation obtained in the furnace.

SILVER

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Lixiviation. — Ores suited for amalgamation can, as a rule, be successfully leached. In leaching, the silver ore is subjected to the action of solvents, which dissolve the silver; from the solution the silver is precipitated and converted into a marketable product.

The leading solvents are aqueous solutions of thiosulphates, un- systematically but generally termed hyposulphites. Sodium chloride, characteristic of the Augustin process in which the ores, after a chloridizing roast, were extracted with brine, and the silver pre- cipitated by copper, has almost wholly fallen into disuse; and potassium cyanide, which has become a very important solvent for finely divided gold, is rarely used in leaching silver ores. The use of sodium hyposulphite as solvent, and sodium sulphide as precipitant, was proposed in 1846 by Hauch and in 1850 by Percy, and put into practice in 1858 by Patera {Patera process); calcium hyposulphite

with calcium polysulphide was first used by Kiss in i860 (Kiss process, now obsolete) ; sodium hyposulphite with calcium poly- sulphide was adopted about 1880 by O. Hofmann (Hofmann process) ; finally, sodium hyposulphite with cuprous hyposulphite was first applied by Russell in 1884, who included in his process the acidula- tion of the first wash-water (to neutralize any harmful alkaline reaction), and the separation of lead with sodium carbonate from the silver solution previous to precipitating with sodium sulphide (see C. A. Stetefeldt, The Lixiviation of Silver Ores with Hyposulphite Solutions, &c, New York, 1888).

In all processes the silver ore is finely crushed, usually by rolls, as, because making few fines, they leave the ore in the best condition for leaching. As a. rule the ore is subjected to a preliminary chloridizing roast, though occasionally it may be leached raw. The vats in common use are circular wooden tanks, 16-20 ft. in diameter and 8-9 ft. deep if the leached ore is to be removed by sluicing, 5 ft. if by shovelling. They ha^e a false bottom, with cloth or gravel filters.

The basis of the following outline is the Patera process. The ore, supposed to have been salt-roasted, is charged loosely into the leaching vat and treated with water (to which sulphuric acid or copper sulphate may have been added), to remove soluble salts, which might later on be precipitated with the silver (base-metal chlorides), or overcharge the solution (sodium chloride and sulphate), or interfere with the solvent power (sodium sulphate). The vat is filled with water from above or below, in- and out-flow are then so regulated as to keep the ore covered with water. Any silver dissolved by the first wash-water is recovered by a. separate treatment. After the wash- water has been drained off, the ore is ready for the silver solvent. This is a solution containing up to 2 % of sodium hyposulphite, of which one part dissolves 0-485 part silver chloride, equivalent to 0-365 part metallic silver, to form double hyposulphites. Silver arsenate and antimoniate are also readily soluble, metallic silver slightly so, silver sulphide not at all. (In the Russell-process double salts: 4Na 2 S503-3Cu2S 2 03, and 8NaoSo0 3 -3Cu3S 2 3 the metallic silver and silver sulphide are readily soluble ; thus it supplements that of Patera.)

After the silver has been dissolved by percolation, the last of the solvent still in contact with the ore is replaced by a second wash- water. The silver solution, collected in a circular precipitating vat (10 ft. in diameter and 10 ft. deep), is treated with sodium sulphide (or calcium polysulphide), unless sodium carbonate was first added to throw down any lead, present in the ore as sulphate, that had gone into solution. Silver sulphide falls out as a black mud, with about 50 % silver, and the solvent will be regenerated.

If the sodium cuprous hyposulphite was used as a solvent in addition to the

simple sodium hyposulphite, cuprous sulphide will be precipitated with the silver sulphide, and the precipitate will be of lower grade. At some works the silver is precipitated with sodium sulphide, and the liquor, after having been separated from the silver sulphide, is treated with calcium polysulphide, that by the precipi- tation of calcium sulphate the accumulation of sodium sulphate may . be prevented. The precipitated silver (copper) sulphide is filtered, dried, and usually shipped to silver-lead works to be refined ; some- times it is converted into metallic silver at the works. The solution, freed from silver, is used again as solvent. Lixiviation has many advantages over amalgamation. It permits coarser crushing of the ore, the cost of plant is lower, the power required is nominal, the cost of chemicals is lower than that of quicksilver, less water is necessary, and the extraction is often higher, as silver arsenate and antimoniate are readily soluble, while they are not decomposed in amalgamation. On the other hand, silver and silver sulphide are readily amalga- mated ; and while they are not dissolved in the Patera process, they are in the Russell process.

Mention may be made of the Ziervogel process, introduced at Hettstadt in 1841 for the purpose of extracting silver from copper mattes. In principle it consists in oxidizing silver sulphide to the sulphate which is soluble in water, the silver being then precipitable by metallic copper. This process when carefully carried out, especi- ally as to the details of the roasting process whereby the silver sulphide is oxidized, yields 92 % of the silver originally present.

Electrolytic Methods. — Crude silver generally contains small amounts of copper, gold, bismuth, lead and other metals. To

eliminate these impurities, electrolytic methods have been devised; of these that of Moebius is the most important and will be described in detail.

Under his earlier patent of 1884, cast crude silver anode plates, about \ in. thick, and thin rolled silver cathodes, were suspended in a i%, slightly acid, solution of silver nitrate contained in tarred wooden tanks. The deposit from this solution even with low current- densities is pulverulent and non-coherent, and therefore during electrolysis wooden scrapers are automatically and intermittently passed over the surface of the cathode to detach the loose silver, which falls into cloth trays at the bottom of the tanks. These trays are removed at intervals, and the silver washed and cast into bars, which should contain over 99-9% of pure metal. The relatively electro-negative character of silver ensures that with moderate current densities no metal (other than precious metals) will be deposited with it ; hence, while the solution is pure a current-density of 30 amperes per sq. ft. of cathode may be used, but as copper accumulates in it, the current-

density must be diminished to (say) 15 to 20 amperes per sq. ft., and a little extra nitric acid must be added, in order to prevent the co-deposition of copper. A pressure of 1 -5 volt usually suffices when the space between the electrodes is 2 in. The tanks were arranged in groups of seven on the multiple system.

Of the metals present in the anode, practically all, except gold, pass into solution, but, under the right conditions, only silver should deposit. The whole of the gold is recovered as anode slime in cloth bags surrounding the anodes. Practical results with a large plant indicate an expenditure of 1-23 electrical horse-power hours per 100 oz. (Troy) of refined silver. In later installations, under the 1895 patent, the anodes are placed horizontally on a porous tray resting within the solution above an endless silver band revolving, also horizontally, over rollers placed near the ends of a long shallow tank. The revolving band forms the cathode, and at one end makes a rubbing contact with a travelling belt placed at an angle so that the crystals of silver detached thereby from the cathode are con- veyed by it from the solution anddeposited outside.

Alloy scrap containing chiefly copper with, say 5 or 6% of gold, and other metals, and up to 40 or 50% of silver, is often treated electrolytically. Obviously, with modifications, the Moebius process could be applied. Other systems have been devised. Borchers uses the alloy, granulated, in an anode chamber separated from the cathode cell by a porous partition through which the current, but not electrolyte, can pass freely. The anode residue is collected in the angular bottom of the tank, the electrolyte passes from the anode chamber to a series of tanks in which the more electro-negative constituents (silver, &c.) are chemically separated, and thence to the cathode chamber, where the copper is deposited electrolytically, thence it passes again to the anode chamber and so completes the cycle. In one form of the apparatus a rotating cathode is used. Dietzel has described (Zeitschrift fur Elektrochem., 1899, vol. vi. p. 81) the working of his, somewhat similar, process at Pforzheim, where about 130 ft of the alloy was being treated by it daily in 1899. The alloy is cast into anode plates about -J in. thick, and placed in the anode chamber beneath the cathode cell, and separated from it by linen cloth. In the upper compartment are two large revolving horizontal cathode cylinders. Acidified copper nitrate solution is run into this cell, copper is deposited, and the more or less spent solution then passes through the linen partition, and, taking up metal from the anodes by electrolytic solution, is run out of the trough through a series of _ vessels filled with copper by which the silver _ is precipitated by simple exchange; after acidification the resulting silver-free copper solution is returned to the cathode cell for the deposition of the copper, the solution being employed again and again until too impure for use.

Chemically Pure Silver. — Even the best " fine " silver of commerce contains a few thousandth-parts of copper or other base metal. To produce perfectly pure metal the usual method is to first prepare pure chloride and then to reduce the chloride to metal. This may be effected by mixing the dry chloride with one-fifth of its weight of pure quicklime or one-third of its weight of dry sodium carbonate, and fusing the mixture in a fire-clay crucible at a bright red heat. In either case we obtain a regulus of silver lying under a fused slag of chloride. The fused metal is best granulated by pouring it into a mass of cold water. A convenient wet method for small quantities is to boil the recently precipitated chloride (which must have been produced and washed in the cold) with caustic soda and just enough sugar to reduce the silver oxide (Ag 2 0) transitorily produced. The silver in this case is obtained as a yellowish grey heavy powder, which is easily washed by decantation; but it tends to retain unreduced chloride, which can be removed only by fusion with carbonate of soda.

Stas in his stoichiometric determinations employed the following process as yielding a metal which comes nearer ideal purity. Slightly cupriferous silver is made into dry nitrate and the latter fused tc

reduce any platinum nitrate that may be present to metal. The fused mass is dissolved in dilute ammonia and diluted to about fifty times the weight of the silver it contains. The filtered (blue) solution is now mixed with an excess of solution of ammonium sulphite, and allowed to stand. After twenty-four hours about one-half of the silver has separated out in crystals ; from the mother-liquor the rest comes down promptly on application of a water-bath heat. The rationale of the process is that the sulphite hardly acts upon the dis- solved oxide of silver, but it reduces some of the cupric oxide to cuprous oxide, which reduces its equivalent of silver oxide to silver and reforming cupric oxide which passes through the same cycle.

Alloys of Silver. — Silver readily alloys with many metals, and the admixture generally differs in physical properties from the pure metal. Thus arsenic, antimony, bismuth, tin or zinc render the metal brittle, so that it fractures under a die or rolling mill; copper, on. the other hand, increases its hardness, makes it tougher and more readily fusible. Consequently copper-silver alloys receive extensive application for coinage and jewelry. The composition of the alloy is stated in terms of its " fineness," the proportion of silver in iooo parts of alloy. Generally copper-silver alloys separate into two layers of different composition on fusion; an exception is the alloy Ag 3 Cu 2 , investigated by A. I. F. Levol, corresponding to a

fineness of 719, which remained perfectly homogeneous.

The extent to which the properties of silver are modified by addition of copper depends on the fineness of the alloy produced. The addition of even three parts of copper to one of silver does not quite obliterate the whiteness of the noble metal. According to Kamarsch, the relative abrasion suffered by silver coins of the degrees of fineness named is as follows : —

Fineness …. 312 750 900 993

Abrasion …. I 2-3 3-9 9-5

The same observer established the following relation between fine- ness p and specific gravity of alloys containing from 375 to 875 of silver per 1000: — sp. gr. =0-001647 />+8-833.

The fusing points of all copper-silver alloys lies below that of pure copper; that of British standard silver is lower than even that of pure silver

Compounds of Silver.

Silver forms one perfectly characterized oxide, Ag 2 0, from which is derived a series of stable salts, and probably several less perfectly known ones. Argentic or silver oxide, Ag20, is obtained as a dark brown precipitate by adding potash to a solution of a silver salt; on drying at 6o °-8o° it becomes almost black. It is also obtained by digesting freshly precipitated silver chloride with potash. It is sparingly soluble in water (one part in 3000) ; and the moist oxide frequently behaves as the hydroxide, AgOH, i.e. it converts alkyl haloids into alcohols. It begins to decompose into silver and oxygen at 250 . Silver peroxide, AgO, appears under certain conditions as minute octahedra when a solution of silver nitrate is electrolysed, or as an amorphous crust in the electrolysis of dilute sulphuric acid between silver electrodes. It readily decomposes into silver and oxygen. It dissolves in ammonia with the liberation of nitrogen and the formation of silver oxide, Ag 2 0; and in sulphuric acid forming a fairly stable dark green liquid which, on dilution, gives off oxygen and forms silver sulphate. It is doubtful whether the pure compound has been obtained. The compound obtained from silver nitrate always contains nitrogen; it appears to have the constant composition Ag 7 NOn, and has been named silver peroxynitrate. Similarly the sulphate yields 5Ag 2 2 , 2Ag 2 S0 7 , silver peroxysulphate, and the fluoride the peroxyfluorides' AguFsOis, Ag 7 FO s . The sesquioxide, Ag<03, is supposed to be formed when silver peroxide is treated with ammonia (Watson, Jour. Chem. Soc, 1906, 89, p 578).

Silver chloride, AgCl, constitutes the mineral cerargyrite or horn silver; mixed with clay it is the butter-milk ore of the German miners. Early

names for it are Lac argenti and Luna cornea, the first referring to its form when freshly precipitated, the latter to its ap- pearance after fusion. It is readily obtained as a white curdy precipitate by adding a solution of a chloride to a soluble silver salt It is almost insoluble in water, soluble in 50,000 parts of nitric acid, and more soluble in strong hydrochloric acid and solutions of alkaline chlorides. It readily dissolves in ammonia, the solution, on evapora- tion, yielding rhombic crystals of 2AgCl-3NH s ; it also dissolves in sodium thiosulphate and potassium cyanide solutions. On exposure to light it rapidly darkens, a behaviour utilized in photography (q.v.). Abney and Baker have shown that the pure dry chloride does not blacken when exposed in a vacuous tube to light, and that the blackening is due to absorption of oxygen accompanied by a loss of chlorine. Hydrogen peroxide is also formed. It melts at about 460 to a clear yellow liquid, which, on cooling, solidifies to a trans- lucent resinous mass. It is reduced to metallic silver by certain metals — zinc, iron, &c. — in the presence of water, by fusion with alkaline carbonates or cyanides, by heating in a current of hydrogen, or by digestion with strong potash solution, or with potassium carbonate and grape sugar. Silver bromide, AgBr, constitutes the

mineral bromargyrite or bromyrite, found in Mexico and Chile. It is obtained as a yellowish white precipitate by mixing solutions of a bromide and a silver salt. It is very slightly soluble in nitric acid, and less soluble in ammonia than the chloride. It melts at 427°, and darkens on exposure to air. The minerals embolite, mega- bromite and microbromite, occurring in Chile, are variable mixtures of the chloride and bromide. Silver iodide. Agl, occurs in nature as the mineral iodargyrite or iodyrite, forming hexagonal crystals, or yellowish green plates. It is obtained as a light yellow powder by dissolving the metal in hydriodic acid, or by precipitating a silver salt with a soluble iodide. It is very slightly soluble in acids and ammonia, and almost insoluble in alkaline chlorides; potassium iodide, however, dissolves it to form Agl-KI. Silver iodide is dimorphous; at ordinary temperatures the stable form is hexa- gonal; on heating to about 138 the colour changes from deep yellow to yellowish-white with the formation of cubic crystals. Silver fluoride, AgF, is obtained as quadratic octahedra, with one molecule of water, by dissolving the oxide or carbonate in hydrofluoric acid. It is deliquescent, and dissolves in half its weight of water to form a strongly alkaline liquid. It is not decomposed by sunlight. It melts at 435 and, on cooling, forms a yellow transparent mass. In addition to the salts described above there exist sub-salts. Silver nitrate, AgNOs, one of the most important silver salts, is obtained by dissolving the metal in moderately dilute nitric acid; on evaporation it separates in the anhydrous form as colourless triclinic plates. It dissolves in water, alcohol and ether. It stains the skin and hair black: an ethereal solution having been employed as a dye for the hair. Mixed with gum arabic it forms a marking ink for linen. It

fuses at 218°; and when cast in quill-like moulds, it constitutes the lunar caustic of medicine, principally used as a cauterizing agent.

Silver sulphide, Ag 2 S, constitutes the mineral argentite or silver glance, and may be obtained by heating silver with sulphur, or by precipitating a silver salt with sulphuretted hydrogen. Thus ob- tained it is a brownish solid, which readily fuses and resolidifies to a soft leaden-grey mass. It forms with silver nitrate the yellowish green solid, Ag 2 S-AgNC > 3, and with silver sulphate the orange-red powder, Ag 2 S-Ag 2 S04. Silver sulphate, Ag 2 SO <, is obtained as white crystals, sparingly soluble in water, by dissolving the metal in strong sulphuric acid, sulphur dioxide being evolved, or by adding strong sulphuric acid to a solution of the nitrate. It combines with ammonia to form the readily soluble 2NH 3 -Ag 2 S04. Silver selenide, Ag 2 Se, resembles the sulphide. It occurs in the minerals naumannite, PbSe-Ag 2 Se, and eukairite, Ag 2 Se-Cu 2 Se. The telluride, Ag 2 Te, occurs in nature as the mineral hessite.

Fulminating silver is an extremely explosive black powder, first obtained in 1788 by Berthelot, who acted with ammonia on silver oxide (prepared by adding lime water to a silver solution). When dry it explodes even on touching with a feather. It appears to be silver nitride AgaN, but it usually contains free silver and sometimes hydrogen. It is to be distinguished from silver fulminate (see Fulminic Acid). The nitride AgN 3 , silver azoimide (q.v.), is also highly explosive.

See j. Percy, Metallurgy of Silver and Gold (London, 1880), part i. ; T. Egleston, The Metallurgy of Silver, Gold and Mercury (New York, 1887-1890), part i. ; M. Eissler, The Metallurgy of Silver (London, 1891); H. F. Collins, The Metallurgy of Lead and Silver (London, 1900), part ii. ; H. O. Hofman, Hydrometallurgy of Silver (1907); C. Schnabel, Metallurgy, translated by H. Louis, 2nd ed. vol. i. (I905)-

Medicinal Use.

Two salts of silver are used in the British pharmacopoeia. (1) Argenti nitras (United States and British pharmacopoeia), lunar caustic, incompatible with alkalis, chlorides, acids, except nitric and acetic, potassium iodide and arsenical solutions. From the nitrate are made (a) argenti nitras indurata, toughened caustic, containing 19 parts of silver nitrate and one of potassium nitrate fused together into cylindrical rods; (b) Argenti nitras mitigatus, mitigated caustic, in which 1 part of silver nitrate and 2 parts of potassium nitrate are fused together into rods or cones. (2) Argenti oxidum, incompatible with chlorides, organic substances, phenol, creosote, &c, with which it forms explosive compounds.

Therapeutics. — Externally the nitrate has a caustic action, de- stroying the superficial tissues and separating the part acted on as a slough. Its action is limited. It may be" employed to destroy warts or small growths, to reduce exuberant granulations or it may be applied to bites. In granular lids and various forms of ophthalmia solutions of silver nitrate (2 grs. to I fl. oz.) are employed. A I % solution is also used as a prophylactic for ophthalmia neonatorum. The effects of the nitrate being both astringent and stimulating as well as bactericidal, solutions of it are used to paint indolent ulcers, and in chronic pharyngitis or laryngitis. Salts of silver are most useful as an injection in subacute and chronic gonorrhoea, either the nitrate (1 to 5% solution) being employed, or protargol, which is a proteid compound containing 8 % of silver nitrate, is used in I % solution; they also benefit in leucorrhoea. In pruritus of the

vulva and anus a weak solution of silver nitrate will relieve the itching, and strong solutions painted round the base of a boil at the beginning will abort its formation. Internally the nitrate has been used in the treatment of gastric ulcer, in ulcerative conditions of the intestine and in chronic dysentery. For the intestinal conditions it must either be given in a keratin-coated pill or injected high up into the rectum The oxide has been given in epilepsy and chorea. Nitrate of silver is eliminated from the system very slowly and the objection to its employment continuously as a drug is that it is deposited in the tissues causing argyria, chronic silver poisoning, of which the most prominent symptom is dark slate-blue colour of the lips, cheeks, gums and later of the skin.

Taken in large doses nitrate of silver is a powerful poison, causing violent abdominal pain, vomiting and diarrhoea with the develop- ment of gastro-enteritis. In some cases nervous symptoms and delirium supervene. The treatment consists in the use of solutions of common salt, followed by copious draughts of miik or white of egg and water or soap in water, in order to dilute the poison and protect the mucous membranes of the oesophagus and stomach from its action.

SILVERFISH, a small active insect, so-called from the silvery glitter of the scales covering the body. It is less than half an inch long and is found in damp corners or amongst books and papers in houses. Although accredited with destroying paper and linen, it probably feeds only on farinaceous or saccharine substances. Scientifically it is known as Lepisma saccharina and belongs to the sub-order Thysanura of the order Aptera.

SILVERIUS, pope from June 536 to March 537, successor of Pope Agapetus I., was a legitimate son of Pope Hormisdas, born before his father entered the priesthood. He was conse- crated on the 8th of June 536, having purchased his elevation from the Gothic king Theodotus. Six months afterwards (Dec. 9) he was one of those who admitted Belisarius into the city. He opposed the restoration of the patriarch Anthimus, whom Agapetus had deposed, and thus brought upon himself the hatred of Theodora, who desired to see Vigilius made pope. He was deposed accordingly by Belisarius in March 537 on a charge of treasonable correspondence with the Goths, and degfaded to the rank of monk. He went to Constantinople, and Justinian, who entertained his complaint, sent him back to Rome, but Vigilius was ultimately able to banish his rival to Pandataria, where the rest of his life was spent in obscurity. The date of his death is unknown.

SILVES, a city of S. Portugal, in the district of Faro (formerly the province of Algarve); on the right bank of the river Silves at the head of its estuary, and 30 m. W.N.W. of Faro. Pop. (1900) 9687. Silves is surrounded by Moorish walls and domin- ated by a Moorish castle. It has a fine Gothic church. It has manufactures of corks and soap; and exports corn, vegetables and fruits. Large numbers of pigs are bred, and fishing is carried on in the river and at sea. Alphonso III. (1210-1248) wrested Silves from the Moors. SILVESTER, the name of three popes.

Silvester I., bishop of Rome from January 314 to December 335, succeeded Melchiades and was followed by Marcus. The accounts of his papacy preserved in the Liber ponlificalis are little else than a record of the gifts said to have been conferred on the Roman church by Constantine the Great. He was represented at the council of Nice. The story of his having baptized Constantine is pure fiction, as almost contemporary evidence shows the emperor to have received this rite near Nicomedia at the hands of Eusebius, bishop of that city. Accord- ing to DSllinger, the entire legend, with all its details of the leprosy and the proposed bath of blood, cannot have been com- posed later than the close of the 5th century (cf. Duchesne, the Liber ponlificalis, i. 109). The so-called Donation of Constantine was long ago shown to be spurious, but the document is of very considerable antiquity and, in Dollinger's opinion, was forged in Rome between 752 and 777. It was certainly known to Pope Adrian in 778, and was inserted in the false decretals towards the middle of the next century.

Silvester II., pope from 999 till 1003, and previously famous, under his Christian name of Gerbert, first as a teacher and afterwards as archbishop successively of Reims and Ravenna, was an Aquitanian by birth, and was educated at the abbey of St Gerold in Aurillac. Here he seems to have had Gerald for his

abbot and Raymond for his instructor, both of whom were among the most trusted correspondents of his later life. From Aurillac, while yet a young man (adolescens) , he was taken to the Spanish march by " Borrell, duke of Hither Spain," prosecut- ing his studies. Borrell entrusted him to the care of a Bishop Hatto, under whose instruction Gerbert made great progress in mathematics. In this duke we may certainly recognize Borel, who, according to the Spanish chroniclers, was count of Barcelona from 967 to 993, while the bishop may probably be identified with Hatto, bishop of Vich or Ausona from about 960 to 971 or 972. In company with his two patrons Gerbert visited Rome, where the pope, hearing of his proficiency in music and astronomy, induced him to remain in Italy, and introduced him to the emperor Otto I. A papal diploma, still extant, shows that Count Borel and Bishop Octo or Otho of Ausona were at Rome in January 971, and, as all the other indications point. to a corresponding year, enables us to fix the chronology of Gerbert's later life.

When brought before the emperor, Gerbert admitted his skill in all branches of the quadrivium,but lamented his comparative ignorance of logic. Eager to supply this deficiency he followed Lothair's ambassador Germanus, archdeacon of Reims, to that city, for the sake of studying under so famous a dialectician in the episcopal schools which were rising into reputation under Archbishop Adalbero (969-989). So promising a scholar soon attracted the attention of Adalbero himself, and Gerbert was speedily invited to exchange his position of learner for that of teacher. At Reims, he seems to have studied and lectured for many years, having amongst his pupils Hugh Capet's son Robert, afterwards king of France, and Richer, to whose history we owe almost every detail of his master's early life. According to this writer Gerbert's fame began to spread over Gaul, Germany and Italy, till it roused the envy of Otric of Saxony, in whom we may recognize Octricus of Magdeburg, the favourite scholar of Otto I., and, in earlier days, the instructor of St Adalbert, the apostle of the Bohemians. Otric, suspecting that Gerbert erred in his classification of the sciences, sent one of his own pupils to Reims to take notes of his lectures, and, finding his suspicions correct, accused him of his error before Otto II. The emperor, to whom Gerbert was well known, appointed a time for the two philosophers to argue before him; and Richer has left a long account of this dialectical tournament at Ravenna, which lasted out a whole day and was only terminated at the imperial bidding. The date of this controversy seems to have been about Christmas 980, and it was probably followed by Otric's death, on the 1st of October 981.

It must have been about this time that Gerbert received the great abbey of Bobbio from the emperor. That it was Otto II., and not, as formerly supposed, Otto I., who gave him this benefice, seems evident from a diploma quoted by Mabillon (Annates, iv. 121). Richer, however, makes

no mention of this event; and it is only from allusions in Gerbert's letters that we learn how the new abbot's attempts to enforce his dues waked a spirit of discontent which at last drove him in November 983 to take refuge with his old patron Adalbero. It was to no purpose that he appealed to the emperor and empress for restitu- tion or redress; and it was perhaps the hope of extorting his reappointment to Bobbio, as a reward for his services to the imperial cause, that changed the studious scholar of Reims into the wily secretary of Adalbero. Otto II. died in December 983, leaving the empire to his infant heir Otto III. Lothair, king of the west Franks, claimed the guardianship, and attempted to make use of his position to serve his own purposes in Lorraine, which would in all probability have been lost to the empire but for the efforts of Adalbero and Gerbert. Gerbert's policy is to be identified with that of his metropolitan, and was strongly influenced by gratitude for the benefits that he had received from the first two Ottos.

According to M. Olleris's arrangement of the letters, Gerbert was at Mantua and Rome in 985. Then followed the death of Lothair (2nd of March 986) and of Louis V., the last Carolingian king, in May 987. Later on in the same year Adalbero crowned

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SILVESTER (POPES)

Hugh Capet (ist June) and his son Robert (25th December). Such was the power of Adalbero and Gerbert in those days that it was said their influence alone sufficed to make and unmake kings. The archbishop died on the 23rd of January 989, having, according to his secretary's account, designated Gerbert his successor. Notwithstanding this, the influence of the empress Theophana, mother of Otto III., secured the appointment for Arnulf , a bastard son of Lothair. The new prelate took the oath of fealty to Hugh Capet and persuaded Gerbert to remain with him. When Charles of Lorraine, Arnulf's uncle, and the son of Louis IV. D'Outremer, surprised Reims in the autumn of the same year, Gerbert fell into his hands and for a time continued to serve Arnulf, who had gone over to his uncle's side. He had, however, returned to his allegiance to the house of Capet before the fall of Laon placed both Arnulf and Charles at the mercy of the French king (March 991). Then followed the council of St Basle, near Reims, at which Arnulf confessed his treason and was degraded from his office (17th June 991). In return for his services Gerbert was elected to succeed the deposed bishop.

The episcopate of the new metropolitan was marked by a vigour and activity that were felt not merely in his own diocese, but as far as Tours, Orleans and Paris. Meanwhile the friends of Arnulf appealed to Rome, and

a papal legate was sent to investigate the question. As yet Hugh Capet maintained the cause of his nominee and forbade the prelates of his kingdom to be present at the council of Mouzon, near Sedan (June 2, 995). Notwithstanding this prohibition Gerbert appeared in his own behalf. Council seems to have followed council, but with uncertain results. At last Hugh Capet died in 996, and, shortly after, his son Robert married Bertha, the widow of Odo, count of Blois. The pope condemned this marriage as adulterous; and Abbo of Fleury, who visited Rome shortly after Gregory V.'s accession, is said to have procured the restoration of Arnulf at the-new pontiff's demand. We may surmise that Gerbert left France towards the end of 995, as he was present at Otto III.'s coronation at Rome on the 21st of May 996. Somewhat later he became Otto's instructor in arithmetic, and had been appointed archbishop of Ravenna before May 998. Early in the next year he was elected pope (April 999), and took the title of Silvester II. In this capacity Gerbert showed the same energy that had characterized his former life. He is generally credited with having fostered the splendid vision of a restored empire that now began to fill the imagination of the young emperor, who is said to have confirmed the papal claims to eight counties in the Ancona march. Writing in the name of the desolate church at Jerusalem he sounded the first trumpet-call of the crusades, though almost a century was to pass away before his note was repeated by Peter the Hermit and Urban II. 1

Nor did Silvester II. confine himself to plans on a large scale. He is also found confirming his old rival Arnulf in the see of Reims; summoning Adalbero or Azelmus of Laon to Rome to answer for his crimes; judging between the archbishop of Mainz and the bishop of Hikfesheim; besieging the revolted town of Cesena; flinging the count of Angouleme into prison for an offence against a bishop; confirming the privileges of Fulda abbey; granting charters to bishoprics far away on the Spanish mark; and, on the eastern borders of the empire, erecting Prague as the seat of an archbishopric for the Slavs. More remarkable than all his other acts is his letter to St Stephen, king of Hungary, to whom he sent a golden crown, and whose king- dom he accepted as a fief of the Holy See. It must, however, be remarked that the genuineness of this letter, in which Gerbert to some extent foreshadows the temporal claims of Hildebrand and Innocent III., has been hotly contested, and that the original document has long been lost. All Gerbert's dreams for the advancement of church and empire were cut short by the death of Otto III., on the 4th of February 1002; and this event was followed a year later by the death of the pope himself, which took place on the 1 2th of May 1003 . His body was buried in the church

1 This letter, even if spurious as now suspected, is found in the 1 1 1 h-centurv Leiden M S. . and is therefore anterior to the first crusade.

of St John Lateran, where his tomb and inscription are still to be seen.

A few words must be devoted to Silvester II. as regards his attitude to the Church of Rome and the learning of his age. He has left us two detailed accounts of the proceedings of the council of St Basle; and, despite his reticence, it is impossible to doubt that he was the moving spirit in Arnulf's deposition. On the whole it may be said that his position in this question as to the rights of the papal see over foreign metropolitans resembled that of his great predecessor Hincmar, to whose authority he constantly appeals. But he is rather the practised debater who will admit his opponent's principles for the moment when he sees his way to moulding them to his own purposes, than the philosophical statesman who has formulated a theory from whose terms he will not move. Roughly sketched, his argument is as follows. Rome is indeed to be honoured as the mother of the churches; nor would Gerbert oppose her judgments except in two cases — (1) where she enjoins something that is contrary to the decrees of a universal council, such as that of Nice, or (2) where, after having been once appealed to in a matter of ecclesiastical discipline and having refused to give a plain and speedy decision, she should, at a later date, attempt to call in question the provisions of the metropolitan synod called to remedy the effects of her negligence. The decisions of a Gregory or a Leo the Great, of a Gelasius or an Innocent, prelates of holy life and unequalled wisdom, are accepted by the universal church ; for, coming from such men, they cannot but be good. But who could recognize in the cruel and lustful popes of later days — in John XII. or Boniface VII., " monsters, as they were, of more than human iniquity " — anything else than " Anti- christ sitting in the temple of God and showing himself as God "? Gerbert proceeds to argue that the church councils admitted the right of metropolitan synods to depose unworthy bishops, but contends that, even if an appeal to Rome were necessary, that appeal had been made a year before without effect. This last clause prepares us to find him shifting his position still farther at the council of Causey, where he advances the proposition that John XV. was represented at St Basle by his legate Seguin, archbishop of Sens, and that, owing to this, the decrees of the latter council had received the papal sanction. Far firmer is the tone of his later letter to the same archbishop, where he contends from historical evidence that the papal judgment is not infallible, and encourages his brother prelate not to fear excommunication in a righteous cause, for it is not in the power even of the successor of Peter ' ' to separate an innocent priest from the love of Christ."

Besides being the most distinguished statesman, Gerbert was also the most accomplished scholar of his age. But in this aspect he is rather to be regarded as the diligent expositor of other men's views than as an original thinker. Except as regards philosophical and religious speculation, his writings show a range of interest and knowledge quite unparalleled in that

generation. His pupil Richer has left us a detailed account of his system of teaching at Reims. So far as the trivium is concerned, his text-books were Victorinus's translation of Porphyry's Isagoge, Aristotle's Categories, and Cicero's Topics with Manlius's Commentaries. From dialectics he urged his pupils to the study of rhetoric; but, recognizing the necessity of a large vocabulary, he accustomed them to read the Latin poets with care. Virgil, Statius, Terence, Juvenal, Horace, Persius and Lucan are specially named as entering into a course of training which was rendered more stimulating by a free use of open discussion. More remarkable still were his methods of teaching the quadrivium. To assist his lectures on astronomy he constructed elaborate globes of the terrestrial and celestial spheres, on which the course of the planets was marked; for facilitating arithmetical and perhaps geometrical processes he constructed an abacus with twenty-seven divisions and a thousand counters of horn. A younger contemporary speaks of his having made a wonderful clock or sun-dial at Magdeburg ; and we know from his letters that Gerbert was accustomed to ex- change his globes for MSS. of those classical authors that his own library did not contain. More extraordinary still was his knowledge of music — an accomplishment which seems to have been his earliest recommendation to Otto I. Probably he was beyond his age in this science, for we read of Garamnus, his first tutor at Reims, whom he attempted to ground in this subject: " Artis difficultate victus, a musica rejectus est." Gerbert's letters contain more than one allusion to organs which he seems to have constructed, and William of Malmesbury has preserved an account of a wonderful musical instrument still to be seen in his days at Reims, which, so far as the English chronicler's words can be made out, seems to refer to an organ worked by steam. The same historian tells us that Gerbert borrowed from the Arabs (Saraceni) the abacus with ciphers (see Numerals). Perhaps Gerbert's chief claim to the remembrance of posterity is to be found in the care and expense with which he gathered together MSS. of the classical writers. His love for literature was a passion. In the turmoil of his later life he looked back with regret to his student days; and " for all his troubles philosophy was his only cure." Everywhere — at Rome, at Treves, at Moutier-en-Der, at Gerona in Spain, at Barcelona — he had friends or agents to procure him copies of the great Latin writers for Bobbio or Reims. To the abbot of Tours he writes that he is " labouring assiduously to form a library," and " throughout Italy, Germany and Lorraine (Belgica)

is spending vast sums of money in the acquisition of MSS." It is noteworthy, however, that Gerbert never writes for a copy of one of the Christian fathers, his aim being, seemingly, to preserve the fragments of a

fast-perishing secular Latin literature. Despite his residence on the Spanish mark, he shows no token of a knowledge of Arabic, a fact which is perhaps sufficient to overthrow the statement of Adhemar as to his having studied at Cordova. There is hardly a trace to be found in his writings of any acquaintance with Greek.

So remarkable a character as that of Gerbert left its mark on the age, and fables soon began to cluster round his name. Towards the end of the nth century Cardinal Benno, the opponent of Hilde- brand, is said to have made him the first of a long line of magician popes. Ordericus Vitalis improves this legend by details of an inter- view with the devil, who prophesied Gerbert's threefold elevation in the famous line that Gerbert's contemporaries attributed to the pope himself :

Transit in R. Gerbertus in R. post papa vigens R. A few years later William of Malmesbury adds a love adventure at Cordova, a compact with the devil, the story of a speaking statue that foretold Gerbert's death at "Jerusalem— a prophecy fulfilled, somewhat as in the case of Henry IV. of England, by his dying in the Jerusalem church of Rome — and that imaginative story of the statue with the legend " Strike here," which, after having found its way into the Gesta Romanorum, has of late been revived in the Earthly Paradise.

Gerbert's extant works may be divided into five classes, (a) A collection of letters, some 230 in number. These are to be found for the most part in an nth-century MS. at Leiden. Other important MSS. are those of the Barberini Library at Rome (late 16th century), of Middlehill (17th century), and of St Peter's abbey, Salzburg. With the letters may be grouped the papal decrees of Gerbert when Silvester II. (b) The Acta concilii Remensis ad Sanctum Basolum, a detailed account of the proceedings and discourses at the great council of St Basle; a shorter account of his apologetic speeches at the councils of Mouzon and Causey; and drafts of the decrees of two or three other councils or imperial constitutions promulgated when he was archbishop of Ravenna or pope. The important works on the three above-mentioned councils are to be found in the 11th- century Leiden MS. just alluded to. (c) Gerbert's theological works comprise a Sermo de informatione episcoporum and a treatise en- titled De corpore et sanguine Domini, both of very doubtful authen- ticity, (d) Of his philosophical works we only have one, Libellus de ralionali et ratione uti, written at the request of Otto III. and pre- served in an 1 1 th-century MS. at Paris, (e) His mathematical works consist of a Regula de abaco computi, of which a 12th-century MS. is to be found at the Vatican ; and a Libellus de numerorum divisione (nth- and 12th-century MSS. at Rome, Montpellier and Paris), dedicated to his friend and correspondent Constantine of Fleury. A long treatise on geometry,

attributed to Gerbert, is of somewhat doubtful authenticity. To these may be added a very short dis- quisition on the same subject addressed to Adalbold, and a similar one, on one of his own spheres, addressed to Constantine, abbot of Micy. All the writings of Gerbert are collected in the edition of A. Olleris (Clermont, 1867). (T. A. A.)

Silvester III. When Boniface IX. was driven from Rome early in January 1044, John, bishop of Sabina, was elected in his stead and took the title of Silvester III. Within three months Boniface returned and expelled his rival. Nearly three years later (December 1046) the council of Sutri deprived him of his bishopric and priesthood. He was then sent to a monastery, where he seems to have died.

SILVESTRE, PAUL ARMAND (1837-1901), French poet and conleur, was born in Paris on the 18th of April 1837. He studied at the Ecole polytechnique with the intention of entering the army, but in 1870 he entered the department of finance. He had a successful official career, was decorated with the Legion of Honour in 1886, and in 1892 was made inspector of fine arts. Armand Silvestre made his entry into literature as a poet, and was reckoned among the Parnassians. His volumes of verse include: Rimes neuves et vieilles (1866), to which George Sand wrote a preface; Les Renaissances (1870); La Chanson des heures (1878); Le Chemin des eloiles (1885), &c. The poet was also a contributor to Gil Bias and other Parisian journals, distinguishing himself by the licence he permitted himself. To ‘ these ” absences ” from poetry, as Henri Chantavoine calls them, belong the seven volumes of La Vie pour rire (1881-1883), Conies pantagrueliques et galants (1884), Le Livre des joyeusetes (1884), Gauloiseries nouvelles (1888), &c. For the stage he wrote in many different manners: Sapho (1881), a drama; Henry VIII (1883), with Leonce Detroyat, music by Saint-Saens; and the Drames sacres (1893), religious pictures after 14th- and 15th- century Italian painters, with music by Gounod. An account of

his varied and somewhat incongruous production is hardly com- plete without mention of his art criticism. Le Nu au Salon (1888-1892), in five volumes, with numerous illustrations, was followed by other volumes of the same type. He died atToulouse on the 19th of February 1901.

SILVESTRE DE SACY, ANTOINE ISAAC, Baron (1758-1838), French orientalist, was born in Paris on the 21st of September 1758. His father was a Parisian notary named Silvestre, and the additional name of de Sacy was taken by the younger son after a fashion then common with the Paris bourgeoisie. From the age of seven years, when he lost his father, he was educated in the closest seclusion by his mother. In 1781 he was appointed councillor in the cour des monnaies, and was advanced in 1791 to be a

commissary-general in the same department. De Sacy had successively acquired all the Semitic languages, and as a civil servant he found time to make himself a great name as an orientalist. He began successfully to decipher the Pahlavi inscriptions of the Sassanian kings (1787-1791). 1 In 1792 hfe retired from the public service, and lived in close seclusion in a cottage near Paris till in 1795 he became professor of Arabic in the newly founded school of living Eastern languages. The interval was in part devoted to the study of the religion of the Druses, which was the subject of his last and unfinished work, the Expose de la religion des Druzes (2 vols., 1838). Since the death of Johann Jakob Reiske Arabic learning had been in a backward state. In the Grammaire arabe (2 vols., isted. 1810, 2nd ed. 1831) and the Chrestomathie arabe (3 vols., 1806), together with its supplement, the Anthologie grammatical (1829), De Sacy supplied admirable text-books, and earned the gratitude of later Arabic students. In 1806 he added the duties of Persian pro- fessor to his old chair, and from this time onwards his life was one of increasing honour and success, broken only by a brief period of retreat during the Hundred Days. He was perpetual secretary of the Academy of Inscriptions from 1832 onwards; in 1808 he had entered the corps legislatif; he was made a baron in 1 813; and in 1832, when quite an old man, be became a peer of France and was regular in the duties of the chamber. In 181 5 he became rector of the university of Paris, and after the second restoration he was active on the commission of public instruction. With Abel Remusat he was joint founder of the Societe asiatiqite, and was inspector of oriental types at the royal printing press. De Sacy died on the 21st of February 1838.

Among his other works are his edition of Hariri (1822, 2nd edition by Reinaud, 1847, 1855), with a selected Arabic commentary, and of the Alfiya (1833), and his Calila et Dimna (1816), — the Arabic version of that famous collection of Buddhist animal tales which has been in various forms one of the most popular books of the world. A version of Abd-Allatif, Relation arabe sur VEgypte, and essays on the history of the law of property in Egypt since the Arab conquest (1805-1818). To biblical criticism he contributed a memoir on the Samaritan Arabic of the Pentateuch (Mem. Acad, des Inscr. vol. xlix.), and editions of the Arabic and Syriac New Testaments lor the British and Foreign Bible Society. Of the brilliant teachers who went out from his lecture-room may be mentioned Professor Heinrich Leberecht Fleischer (1801-1888), who contributed elabor- ate notes and corrections to the Grammaire arabe [Kleinere Schriften, vol. i., 1885).

SILVESTRINES, or Sylvestrines, an order of monks under the Benedictine rule, founded 1231 by St Silvester Gozzolini. He was born at Osimo near Ancona and held a canonry there. About 1227 he resigned it to lead an austere eremitical life. Disciples came to him, and in 1231 he built a

monastery at Montefano. The rule was the Benedictine, but as regards poverty in external things, far stricter than the Benedictine. The order was approved in 1247 by Innocent IV., and at Silvester's death in 1 267 there were eleven Silvestrine monasteries. At a later date there were 56, mostly in Umbria, Tuscany and the March of Ancona. In 1907 there were nine Silvestrine houses, one in Rome, and about 60 choir monks. Since 1855 they 1 A communication to Eichhorn on the Paris MS. of the Syro-Hexaplar version of IV. Kings formed the basis of a paper in the latter's Repertorium, vol. vii. (1780). This was de Sacy's literary debut. It was followed by text and translation of the letters of the Samaritans to Jos. Scaliger (ibid. vol. xiii., 1783) and by a series of essays on Arabian and Persian history in the Recueil of the Academy of Inscriptions and in the Notices et extraits.

have had a house and a mission in Ceylon. The order has no history. The habit is blue.

See Helyot, Histoire des ordres religieux (1718), vi. c. 21; Max Heimbucher, Orden u. Kongregationen (1907), i. § 30; Wetzer u. Welte, Kirchenlexicon (ed. 2). (E. C. B.)

SIMANCAS, a town of Spain, in the province of Valladolid; 8 m. S.W. of Valladolid, on the road to Zamora and the right bank of the river Pisuerga. Pop. (1900) 1129. Simancas is a town of great antiquity, the Roman Septimanca, with a, citadel dating from the Moorish occupation in the 9th century, a fine bridge of seventeen arches, and many remains of old walls. In 934 it was the scene of a bloody battle between the Moors and Christians. The citadel is now the Archivo General del Reino, to which the national archives of Spain were removed by order of Philip II. in 1563. Their transference thither was first suggested to Charles V. by Cardinal Ximenes or Cisneros (d. 1 51 7). The extensive alterations were made by three celebrated 16th-century architects, Juan de Herrera, Alonso Berruguete and Juan Gomez de Mora; the arrangement of the papers was en- trusted to Diego de Ayala. They occupy forty-six rooms, and are arranged in upwards of 80,000 bundles (33,000,000 documents), including important private as well as state papers. The archives of the Indies were transferred in 1784 to the Lonja of Seville (q.v.). Permission to consult the documents at Simancas can be readily obtained.

SIMBIRSK, a government of E. Russia, on the right bank of the middle Volga, with the government of Kazan on the N., Samara on the E., Saratov

on the S., and Penza and Nizhniy- Novgorod on the W. It has an area of 18,095 S Q- m – and occupies the E. of the great central plateau of middle Russia. Its higher parts range from 750 to 1000 ft. above the sea, and form the Zhegulev range of hills, which compels the Volga to make its great bend at Samara. In the W. a broad depression, traversed by numerous rivers and streams, extends along the left bank of the Sura. The Volga flows for 300 m. along the E. boundary, separat- ing Simbirsk from Samara. The shallow Sviyaga rises in the Samarskaya Luka Hills and flows parallel to the Volga, at a distance of 2 to 20 m. but in the opposite direction. The Sura, also flowing N., drains the W. of Simbirsk; it is navigable for more than 270 m. A few lakes and marshes exist in the W. The climate is severe, and the extremes are great. At the city of Simbirsk the average temperature is 38-7°, but the thermometer sometimes reaches 115 F., and frosts of —47° F. are not un- common; the average rain and snowfall is only 17-6 in. In respect to the geology, all systems, beginning with the Carbon- iferous, are represented in the government. The exact age of the " Variegated Marls, " the subject of animated polemics among Russian geologists, remains problematic, but the inquiries of Professor Pavlov have definitely settled the geological age of the Jurassic formations. Triassic deposits appear in the N.; Carboniferous and Cretaceous predominate in the E. of the province, where they are covered in many places by Tertiary deposits; Chalk and Eocene deposits crop up chiefly in the W. and the Chalk in the S. Post-Pliocene deposits, containing bones of the mammoth and other • extinct mammals, overlie the older formations. Sulphur, asphalt, salt, ochre, and iron- ore are extracted, as well as various building stones.

The estimated pop. in 1906 was 1,783,000. Nearly all the inhabitants either belong to the Russian Orthodox Church or are Nonconformists, there being only 145,000 Mussulmans. The greater number (about two-thirds) are Great Russians, the remainder being Mordvinians (12%), Chuvashes (8%), and Tatars (8%), with about 1000 Jews. The Mordvinians are settled chiefly in the N.W., in Ardatov and Alatyr, and on the Volga in Sengilei; the Chuvashes make about one-third of the population of the districts of Buinsk and Kurmysh, contiguous to Kazan; the Tatars constitute -about 35% in Buinsk and 18% in Sengilei. The villages in Simbirsk are large, many of them having 3000 to 5000 inhabitants. The government is divided into eight districts, the chief towns of which are Simbirsk, Alatyr, Ardatov, Buinsk, Karsun, Kurmysh, Sengilei and Syzran.

School gardens and school farms have been widely introduced, while bee-keeping is taught in over 50 schools. Owing to the efforts of the zemstvos (local councils), sanitation is well looked after. Agri- culture is the principal occupation. Out of the total area the peasant village communities hold 40%, private owners 20%, the imperial domains 5%, and the towns and the crown 0‘6%. The area under forests amounts to 30% of the whole

and over 50% is under cultivation. The peasants are rapidly buying land in con- siderable quantities. Most of their allotments (more than 76 %) are cultivated, and besides what they own they rent over 500,000 acres from private owners. The principal crops are wheat, rye, oats, barley and potatoes. Good breeds ot horses are kept, and considerable numbers are exported. Fishing (sturgeon) is carried on in the Volga and the Sura, timber trade in the N. and shipbuilding on the Sura. Domestic trades give employment to over 15,000 persons; carts, sledges, wheels and all sorts of wooden wares are made in the villages, as also felt goods, boots, gloves, caps, handkerchiefs, ropes and fishing-nets, all extensively exported. The factories employ less than 20,000 persons. They comprise mainly cloth mills, flour-mills and distilleries, with tanneries, glass, oil and starch works. There are 82 fairs, the most important of which are held at Simbirsk, Syzran and Karsun. There is a considerable export trade in grain, 'mostly rye, and in flour.

The first Russian settlers made their appearance in the Simbirsk region in the 14th century, but did not go E. of the Sura. Not till two centuries later did they cross, that river and the district begin to be peopled by refugees from Moscow. The Zhegulev Mountains in the S. still continuing to be a place of refuge for the criminal and the persecuted, the town of Simbirsk was founded in 1648, with a string of small forts extending to the Sura. The region thus protected was soon settled, and, as the Russian villages advanced farther S., Syzran was founded, and a second line of small forts to the Sura was erected. The aboriginal Mordvinians rapidly lost their ethnographical individuality, especially since the middle of the 19th century. (P. A. K.; J. T. Be.)

SIMBIRSK, a town of Russia, capital of the government of the same name, 154 m. by the Volga S.S.W. from Kazan, between the Volga and the Sviyaga. Pop. (1897) 44,111. It is one of the best built provincial towns of Russia. It is an episcopal see of the Orthodox Greek Church. The central part of Simbirsk — the Crown {Vends), containing the cathedral and the best houses — is built on a hill 560 ft. above the Volga. Adjoining this is the commercial quarter, while farther down the slope, towards the Volga, are the storehouses and the poorest suburbs of the city; these last also occupy the W. slope towards the Sviyaga. There are three suburbs on the left bank of the Volga, communication with them being maintained in summer by steamers. A great fire having destroyed nearly all the town in 1864, it has been built again on a new plan, though still mostly of wood. The cathedral of St Nicholas dates from 17 12. The new cathedral of the Trinity was erected in 1824-1841 in com- memoration of the French invasion of 1812. The historian Karamzin (born in 1766 in the vicinity of Simbirsk) has a monument here, and a public library bearing his name contains about 1 5,000 volumes. The trade isjarisk, corn being the

principal item, while next come potash, wood, fruits, wooden wares and manufactured produce. Simbirsk fair has a turnover of £650,000 annually. The city was founded in 1648, and in 1670 endured a long siege by the rebel leader Stenka Razin.

SIMCOE, JOHN GRAVES (1752-1806), British soldier and first lieutenant-governor of Upper Canada, was born at Cotter- stock, Northumberland, England, on the 25th of February 1752. His father, John Simcoe, who was a captain in the Royal Navy, died in 1759, and his only brother was drowned in early youth. During Simcoe's childhood the family removed to Exeter. He was sent to Eton at the age of fourteen, and three years later entered Merton College, Oxford. After two years of college life, he became ensign in the 35th regiment, first seeing active service at Boston in 1775, and remaining in America during the greater part of the Revolutionary War. In 1776 he secured command of the Queen's Rangers with the rank of major. His military career in America ended with the surrender of Cornwallis at Yorktown (Oct. 19, 1781). He returned to England on parole, and for the next ten years divided his time between London and his family estate in Devon. In December

1782 he married Elizabeth Posthuma, only child of Colonel Thomas Gwillim of Old Court, Herefordshire. In 1790 he was elected member of parliament for St Mawes in Cornwall, and at the close of his first session was appointed lieutenant-governor of the new province of Upper Canada created under the Con- stitutional Act of 1 791. He reached Kingston, Upper Canada, on the 1st of July 1792. There the first council was assembled, the government of the new province proclaimed, and the oaths of office taken. Immediately afterwards preparations were made for the election of the first house of assembly, which opened at Newark near the mouth of the Niagara river, on the 17th of September 1792. Simcoe's ideas of colonial government were dominated by military and aristocratic conceptions quite unsuited to the pioneer conditions of Upper Canada. Thus, while his administration was characterized by the most dis- interested devotion to what he conceived to be for the best interests of the province, it was rendered ineffective by the impracticable character of his projects and the friction which developed between himself and Lord Dorchester, the governor- general. He left Canada in September 1 796, and was immediately afterwards sent on a mission to San Domingo, from which, however, he returned in a few months on account of ill-health. In October 1798 he was promoted to the rank of lieutenant- general, and appointed colonel of the 22nd foot. During 1800-1801 he was in command at

Plymouth. Desiring more active service, he was designated commander-in-chief for India to succeed Lord Lake, but before taking the appointment his health broke and he died at Exeter on the 26th of October 1806. See D. C. Scott, John Graves Simcoe (1905). SIMEON, in the Old Testament, the name of a tribe of Israel, named after the second son of Jacob by Leah (Gen. xxix. 33). According to Gen. xxxiv., the brothers Simeon and Levi massacred the males of Shechem to avenge the -violation of their sister Dinah (" judgment ") by. Shechem the son of Hamor. Jacob disavowed the act, and on his deathbed solemnly cursed their ferocity, condemning the two to be divided in Jacob and scattered in Israel (xlix. 5-7). Subsequently the priestly Levites are found distributed throughout Israel without portion or inheritance (Deut. xviii. 1, Josh. xiii. 14). The career of Simeon, on the other hand, raises numerous questions. Simeon is reckoned among the N. tribes in 2 Chron. xv. 9, xxxiv. 6, but is elsewhere assigned a district in S. Palestine, the cities of which are other- wise ascribed to Judah (cf. Josh. xix. 1-9 with xv. 26-32). 1 A gloss in 1 Chron. iv. 31 (which breaks the connexion) states that the latter was their seat in David's time, but there is no support for this in other records (see 1 Sam. xxvii., xxx.). In fact, Simeon is not mentioned in the " blessing of Moses " (Deut. xxxiii.," see S. R. Driver, Deut. p. 397 seq.), or in the stories of the "judges"; and notwithstanding references to it in the chronicler's history of the monarchy, it is not named in the earlier books of Samuel and Kings. But is Gen. xxxiv. to be taken literally? Shechem is the famous holy city, Hamor a well-known native family, Jacob talks of himself as being " few in number," and the deeds of Simeon and Levi are those of communities, not of individuals. What historical facts are thus represented, and how they are to be brought into line with the early history of Israel, are problems which have defied solution (see J. Skinner, Genesis, p. 421 seq.). It is conjectured that Dinah represents a clan or group (cf. Dan) which settled in Shechem and was exposed to danger (e.g. oppression or absorp- tion); the tribes Simeon and Levi intervened on its behalf, the ensuing massacre was avenged by the Canaanites, and the two were broken up. These events would belong to an early stage in the invasion of Palestine by the Israelites (i5th-i3th century B.C.), perhaps to a preliminary settlement by the " sons " of Leah (Reuben, Simeon, Levi and Judah), previous to the entrance of the " son " of Rachel, Joseph, the " father "

1 It is difficult to determine whether the writers included Simeon among the ten N. tribes (2 Sam. xix. 43, 1 Kings xi. 31, 35) which are contrasted with the one (Judah, I Kings xi. 32, 36, xii. 20), or two (plus Benjamin; ib. xii. 21-23) which remained faithful to the Davidic dynastj'.

of Ephraim and Manasseh. 2 The internal biblical evidence has forced all independent investigators to adopt some recon- struction, but the above theory is in many respects precarious. 3 It may explain the disappearance

of a secular tribe of Levi, but not the rise of the sacred Levites. Even in Judges ix. 28 Shechem is still held by the family of Hamor (cf. Gen. xxxiii. 19), and if Simeon was scattered and divided at any early date, its appearance in tradition many centuries later is inexplicable. On the other hand, the latter feature is significant for its vitality in post-exilic traditions. Gen. xxxiv. and the narratives upon which the above reconstruction depends are preserved by compilers of the 6th century and later, and the correlation of Simeon and Levi points to a time when the latter had at length become the recognized eponym of the well-known ecclesiastical body.

Gen. xxxiv. has been heavily revised and is in a post-exilic dress. The original story must have concerned Simeon and Levi alone (vv. 25 seq., 30, cf. xlix. 7), but it has been adapted to tribal history, to the spoliation of Shechem by all the " sons " of Jacob (xxxiv. 27-29) Both forms have lost their true sequel, and when Jacob and his sons journey S. they are protected from pursuit by a mysterious panic which seizes the district (Gen. xxxv. 5). As the narrative now stands, the conduct of Simeon and Levi is judged far less unfavourably than in Jacob's curse, and the editor evidently shared that aversion from foreign marriages (especially with the Samaritans of Shechem) which is characteristic of the post-exilic age (cf. Neh. xiii. 27-29). It is the attitude of the story of the zeal of Phinehas (Num. xxv. 1-15). and of the terrible extermination of Midian (ib. xxxi.), and it becomes more pronounced as early Judaism extolled the two brothers. 4 In these circumstances the original narrative can scarcely be re-covered, and one can only point to the traditions of the Levites (Q- v – § 3) ar >d the hints of fierce religious reforms which, in certain circles and at an intermediate stage in the literary growth of the bibli- cal sources, were condemned. In fact, the Levites are connected by the genealogical evidence with S. Palestine, the district which is associated with the scene of their divine selection, with the seat of the tribe Simeon, and with the life of Israel around Kadesh previous to Joshua's invasion. Herein lies the peculiar complexity of the problem. Underlying Gen. xxxiv. and other portions of Genesis may be recognized the tradition of a settlement of Jacob, which belongs to a cycle quite independent of the descent into Egypt and the Exodus (cf. E. Meyer, op. cit., and J. Skinner, Genesis, p. 418). But the story of the entrance of Jacob and his " sons " finds a parallel in the entrance of the tribes under Joshua and in the S. move of Judah and Simeon (see Genesis). With the conquest of Zephath (renamed Hormah, Judg. i. 17) by these tribes, compare not only Judah's settlement (Gen. xxxviii., cf. Skinner p. 450), but also that of Simeon (Gen. xlvi. 10), and the related tradition that Simeon married a Zephathite (Jubilees, xliv. 13). 1 Chron. iv. 39 sqq. men- tions a Simeonite occupation of Gedor, or rather Gerar, which would bring this tribe into the district of Kadesh (cf. Gen. xx.

1 seq., xxvi. 1), and adds a raid upon Mount Seir (Edom) ending in the over- throw of Amalek (1 Chron. iv. 39-43). 5 S. Palestine, associated with Abraham, Isaac and Jacob, and with the separation of the non- Israelite Ishmael and Esau (Edom), is the district whence Jacob de- parted to his Aramaean relatives (Gen. xxviii. sqq.). Hormah, too, is the scene of an Israelite victory in the story of the Exodus (Num. xxi. 1-3), and is connected with evidence suggesting that this victory at the very gate of the promised land belongs to a tradition of some movement from Kadesh into Judah (Wellhausen, G. F. Moore, H. P. Smith, and others; see Exodus, The). The other tradition, that the Israelites were defeated there by Amalekites and Canaanites, explains the detour by Edom and Moab (ib. xiv. 25, 40-45), and the appearance of the tribes E. of the Jordan to invade the land of their ancestors. Obviously these represent fundament- ally differing views, which cannot be woven into a single outline; and they cannot be isolated from more profound questions which really affect all ordinary conceptions of the structure of biblical history.

See S. A. Cook, Amer. Journ. of Theol. xiii. 370-388 (1909); Jews, §§ 5-8, 22; Levites; Palestine: History. (S. A. C.)

2 So in general, the favourite interpretation (Wellhausen, Stade, Guthe and many others) with some variation of detail, see especially Gunkel's commentary (Handkommentar, 1901, pp. 335 sqq.).

3 See the instructive study by E. Meyer, Die Israeliten und ihre Nachbarstamme (1906), pp. 409-428 (especially his criticisms, p. 421 seq.) ; cf. also I. Benzinger, Hebr. Archaologie (1907), pp. 345 sqq. (whose astral interpretation of the narrative, however, is quite inadequate).

4 See Judith ix. 2, Philo, De Migr. Abrahami, 39, and, for fuller details of the trend of Jewish opinion, R. H. Charles, Book of Jubilees, p. 179, id., " Test, of xii. Patriarchs," p. 22.

6 On these wars, see the criticisms of H. W. Hogg in his elaborate study of Simeon, Ency. Bib. col. 4524-34.

SIMEON (or Symeon) OF DURHAM (d. after 1129), English chronicler, embraced the monastic life before the year 1083 in the monastery of Jarrow; but only made his profession at a later date, after he had removed with the rest of his community to Durham. He was author of two historical works which are particularly valuable for northern affairs. He composed his Historia ecclesiae Dunelmensis, extending to the year 1096, at some

date between 1104 and 1108. The original manuscript is at Durham in the library of Bishop Cosin. It is divided into four books, which are subdivided into chapters; the order of the narrative is chronological. There are two continuations, both anonymous. The first carries the history from 1096 to the death of Ranulf Flambard (n 29); the second extends from 1133 to 1 144. A Cambridge MS. contains a third continuation covering the years 1141-1154. About 1129 Simeon undertook to write a Historia regum Anglorum et Dacorum. This begins at the point where the Ecclesiastical History of Bede ends. Up to 957 Simeon merely copies some old Durham annals, not otherwise preserved, which are of value for northern history; from that point to 1 1 19 he copies Florence of Worcester with certain interpolations. The section dealing with the years 1119-1129 is, however, an independent and practically contemporaneous narrative. Simeon writes, for his time, with ease and perspicuity; but his chief merit is that of a diligent collector and copyist.

Other writings have been attributed to his pen, but on no good authority. They are printed, along with his undoubted works, in the Scriptores decern of Roger Twysden (1652). The most complete modern edition is that of Thomas Arnold (" Rolls " series, 2 vols., 1882-1885). The value of the " Northumbrian Annals," which Simeon used for the Historia regum, has been discussed by J. H. Hinde in the preface to his Symeonis Dunelmensis opera, vol. i. pp. xiv. ff. (1868); by R. Pauli in Forschungen zur deutschen Geschichte, xii. pp. 137 sqq. (Gottingen, 1872); and by W. Stubbs in the intro- duction to Roger of HovebZen, vol. i. p. x. (" Rolls " series). Simeon's works have been translated by J. Stevenson in his Church Historians of England, vol. iii. part ii. (1855). (H. W. C. D.)

SIMEON, CHARLES (1759-1836), English evangelical divine, was born at Reading and educated at Eton and Cambridge. In 1782 he became fellow of King's College, Cambridge, and took orders, receiving the living of Holy Trinity, Cambridge, in the following year. He was at first so unpopular that the services were frequently interrupted, and he was often insulted in the streets. Having lived down this prejudice, he subsequently gained a very remarkable and lasting influence among the under- graduates of the university. He became a leader among evangelical churchmen, was one of the founders of the Church Missionary Society, and acted as adviser to the East India Company in the choice of chaplains for India. His chief work is a commentary upon the whole Bible, entitled Horae homileticae (London, 1819- 1820). He died on the 13th of November 1836. The " Simeon Trustees " were instituted by him for the purpose of acquiring church patronage in the interests of evangelical views.

See Memoirs of Charles Simeon, with a selection from his writings and correspondence, edited by the Rev. W. Carus (3rd ed., 1848); H. C. G.

Moule, Charles Simeon (London, 1892).

SIMEON, JOSEPH JER6ME, Comte (1749-1842), French jurist and politician, was born at Aix on the 30th of September 1749. His father, Joseph Sextius Simeon (17 17-1788), had been professor of law and royal secretary for the parlement of Provence. J. J. Simeon followed his father's profession, but he was outlawed for his share in the federalist movement in 1793, and only returned to France after the revolution of Thermidor. In the council of the Five Hundred, of which he was now a member, he took the conservative side. In 1799, for protesting against the invasion of the chamber by P. F. C. Augereau, he was im- prisoned until the 18th Brumaire (9th November). In the Tribunate he had an important share in the preparation of the Civil Code, being rewarded by a seat in the council of state. In 1807 he was one of the commissioners sent to organize the new kingdom of Westphalia, and was premier of King Jerome. He served the Restoration as councillor of state and in the chamber of peers. In 1820 he was under-secretary of state for justice, and in the next year minister of the interior until the fall of the Richelieu ministry. A baron of the Empire

and count at the second Restoration, he was admitted to the. Academy of Moral and Political Science in 1832, and in 1837 he became president of the Cour des Comptes. He died in Paris on the 19th of January 1842 in his 93rd year.

His son, Joseph Balthasar, Comte Simeon (1781-1846), entered the diplomatic service under the Empire. At the Restoration he was successively prefect of Var, Doubs and Pas de Calais. He was director-general of fine arts in 1828, and had a great reputation as a connoisseur and collector.

SIMEON STYLITES, ST (390-459), the first and most famous of the Pillar-hermits (Gr. crrOXos, pillar), was born in N. Syria. After having been expelled from a monastery for his excessive austerities, at thirty years of age he built a pillar six feet high on which he took up his abode. He made new pillars higher and higher, till after ten years he reached the height of sixty feet. On this pillar he lived for thirty years without ever descending. A railing ran round the capital of the pillar, and a ladder enabled his disciples to take him the necessaries of life. From his pillar he preached and exercised a great influence, converting numbers of heathen and taking part in ecclesiastical politics. The facts would seem incredible were they not vouched for by Theodoret, who knew him personally {Historia religiosa, c. 26). Moreover, Simeon had many imitators, well authenticated Pillar-hermits being met with till the 16th century.

The standard work on the subject is Les Stylites (1895), by H. Delehaye, the Bollandist; for a summary see the article " Saulen- heilige," in Herzog's

Realencyklopddie (ed. 3). On Simeon see Th. Noldeke's Sketches from Eastern History (1892), p. 210, and the Dictionary of Christian Biography. (E. C. B.)

SIMFEROPOL, a town of Russia, capital of the government of Taurida, in the S. of the Crimea, 78 m. by rail N.E. of Sevastopol and 800 from Moscow. Pop. (1897) 60,876. It occupies an admirable site on the N. slopes of the Chatyr-dagh Mountains, and is divided into two parts — the European, well built in stone, and the Tatar, with narrow and filthy streets peopled by some 7000 Tatars and by Jews. Although it has grown since the rail- way brought it into connexion with the rest of the empire, it still remains a mere administrative centre. It is the see of a bishop of the Orthodox Greek Church and the headquarters of the 7th Russian army corps. There are a museum and monuments to Dolgoruki, conqueror of the Crimea, and to the empress Catherine II. (1890). The town is famous for its fruit.

In the neighbourhood stood the small fortress of Napoli, erected by the ruler of Taurida some hundred years before the Christian era, and it existed until the end of the 3rd century. Afterwards the Tatar settlement of Ak-mechet, which in the 17th century was the residence of the chief military commander of the khan, had the name of Sultan-serai. In 1736 it was taken and burnt by the Russians, and in 1784, after the conquest of the Crimea by the Russians, it received its present name and became the capital of Taurida.

SIMLA, a town and district in British India, in the Delhi division of the Punjab. The town is the summer residence of the viceroy and staff of the supreme government, and also of the Punjab government. It is 58 m. by cart-road from the railway station of Kalka, which is n 16 m. from Calcutta. A metre-gauge railway, 68 m. long, was opened from Kalka to Simla in 1903. The population in 1901 was 13,960, but that was only the winter population, and the summer census of 1904 returned the number of 35,250. The sanatorium of Simla occupies a spur of the lower Himalaya, running E. and W. for about 6 m. The ridge culminates at the E. in the eminence of Jakko, in the vicinity of which bungalows are most numerous; the viceregal lodge stands on Observatory Hill. The E. of the station is known as Chota Simla and the W. as Boileauganj. The situation is one of great beauty; and the houses, built separately, lie at elevations between 6600 and 8000 ft. above sea-level. To the N., a beautiful wooded spur, branching from the main ridge, is known as Elysium. Three miles W. is the cantonment of Jutogh. The minor sanatoria of Kasauli, Sabathu, Dagshai and Solon he some distance to the S. The first European house at Simla was built in 1819, and the place was first visited by a governor-general in 1827. It has gradually

become the permanent headquarters of many of the official establishments. During the season Simla is the focus of Indian society; and viceregal and other balls, and entertainments of every description, are frequent. Simla is the headquarters of a volunteer rifle corps, and there are numerous libraries and institutes, of which the chief is the United Service Institution, with a subsidy from government. The two chief medical institutions are the Ripon and Walker hospitals. There are a theatre, concert room and numerous churches. Educational institutions include Bishop Cotton's school for boys, the Mayo industrial school for girls, several aided schools for European boys and girls, and two Anglo-vernacular schools for natives. The Lawrence military asylums are at Sanawar, near Kasauli.

The District of Simla has an area of 101 sq. m., and had a population in 1901 of 40,351. The mountains of Simla and the surrounding native states compose the S. outliers of the great central chain of the E. Himalaya. They descend in a gradual series from the main chain to the general level of the Punjab plain, forming a transverse S.W. spur between the great basins of the Ganges and the Indus. S. and E. of Simla the hills between the Sutlej and the Tons centre in the great peak of Chor, 11,982 ft. above sea-level. Throughout all the hills forests of deodar abound, while rhododendrons clothe the slopes up to the limit of perpetual snow. The principal rivers are the Sutlej, Pabar, Giri, Gambhar and Sarsa.

The acquisition of the patches of territory forming the district dates from various times subsequent to the close of the Gurkha War in 1816, which left the British in possession of the whole tract of hill-country from the Gogra to the Sutlej. Kumaon and Dehra Dun were annexed to the British dominions; but the rest, with the exception of a few localities retained as military posts and a portion sold to the raja of Patiala, was restored to the hill rajas, from whom it had been wrested by the Gurkhas. Garhwal state became attached to the North- Western Provinces; but the remaining principalities rank among the dependencies of the Punjab, and are known collectively as the Simla Hill States, under the superintendence of the deputy-commissioner of Simla, subordinate to the commissioner at Umballa. The chief of the Simla Hill States — which number 28 in all — are Jubbal, Bashahr, Keonthal, Baghal, Bilaspur and Hindur.

SIMLER, JOSIAS (1530-1576), author of the first book relating solely to the Alps, was the son of the former prior of the Cistercian convent of Kappel (Canton of Zurich), and was born at Kappel, where his father was the Protestant pastor and schoolmaster till his death in 1557. In 1544

Simler went to Zurich to continue his education under his godfather, the celebrated reformer, Heinrich Bullinger. After having completed his studies at Basel and Strasburg, he returned to Zurich, and acted as a pastor in the neighbouring villages. In 1552 he was made professor of New Testament exegesis at the Carolinum at Zurich, and in 1 560 became professor of theology. In 1 559 he had his first attack of gout, a complaint which finally killed him. In 1555 he published a new edition of Conrad Gesner's Epitome of his Bibliotheca universalis (a list of all authors who had written in Greek, Latin or Hebrew), in 1574 a new edition of the Biblio- theca itself, and in 1575 an annotated edition of the Antonine Itinerary. About 1551 he conceived the idea of making his native land better known by translating into Latin parts of the great Chronik of Johann Stumpf. With this view he collected materials, and in 1574 published a specimen of his intended work in the shape of a monograph on the Canton of the Valais. He published in the same volume a general description of the Alps, as the Introduction to his projected work on the several Swiss Cantons. In this treatise, entitled De Alpibus com- mentarius, he collected all that the classical authors had written on the Alps, adding a good deal of material collected from his friends and correspondents. This Commentarius is the first work exclusively devoted to the Alps, and sums up the knowledge of that region possessed in the 16th century. It was republished by the Elzevirs at Leiden in 1633, and again at Zurich in 1735, while an elaborate annotated edition (prepared by Mr Coolidge) , with French translation, notes and appendices, appeared at

Grenoble in 1904. Another fragment of his vast plan was the work entitled De Helvetiorum republica, which appeared at Zurich in 1576, just before his death. It was regarded as the chief authority on Swiss constitutional matters up to 1798.

See lives by G. von Wyss (Zurich, 1855), and in Mr Coolidge's book, pp. cxlvii.-clviii. (W. A. B. C.)

SIMMONS, EDWARD EMERSON (1852-), American artist, was born at Concord, Massachusetts, on the 27th of October 1852. He graduated from Harvard College in 1874, and was a pupil of Lefebvre and Boulanger. in Paris, where he took a gold medal. He was awarded the prize by the Municipal Art Society of New York for a mural decorative scheme, which he carried out for the criminal courts building, later decorating the Waldorf-Astoria hotel in New York, the Library of Congress, Washington, and the Capitol at Saint Paul, Minnesota. He was one of the original members of the Ten American Painters.

SIMMS, WILLIAM GILMORE (1806-1870), American poet, novelist and historian, was born at Charleston, S.C., on the 17th of April 1806 of Scoto-Irish descent. His mother died during his infancy, and his father

having failed in business and joined Coffee's Indian fighters, young Simms was brought up by his grandmother. He was clerk in a drug store for some years, and afterwards studied law, the bar of Charleston admitting him to practice in 1827, but he soon abandoned his profession for literature. At the age of eight he wrote verses, and in his 19th year he produced a Monody on Gen. Charles Colesworth Pinckney (Charleston, 1825). Two years later, in 1827, Lyrical and Other Poems and Early Lays appeared; and in 1828 he began journalism, editing and partly owning the City Gazette. The enterprise failed, and the editor devoted his attention entirely to letters, and in rapid succession published The Vision of Cortes, Cain, and other Poems (1829), The Tricolor, or Three Days of Blood in Paris (1830), and his strongest poem, Atalantis, a story of the sea (1832). Atalantis established his fame as an author, and Martin Faber, the Story of a Criminal, was warmly received. During the American) Civil War Simms espoused the side of the Secessionists in a weekly newspaper, and suffered damage at the hands of the Federal troops when they entered Charleston. He served in the state House of Representatives in 1 844- 1 846, and the university of Alabama conferred on him the degree of LL.D. He died at Charleston on the nth of June 1870.

In addition to the works mentioned above, Simms published the following poetry: — Southern Passages and Pictures, lyrical, senti- mental and descriptive poems (New York, 1839) ; Donna Florida, a tale (Charleston, 1843); Grouped Thoughts and Scattered Fancies, sonnets (Richmond, 1845); Areytos, or Songs of^ the South (1846); Lays of the Palmetto: a Tribute to the South Carolina Regiment in the War with Mexico (Charleston, 1848) ; The Eye and the Wing, poems, (New York, 1848); The City of the Silent (1850). To dramatic literature he contributed Norman Maurice, or the Man of the People (Richmond, 1851); and Michael Bonham, or the Fall of the Alamo (Richmond, 1852). His romances of the American Revolution — Thet Partisan (1835); Mellichampe (1836); Katherine Walton, or the Rebel of Dorchester (1851); and others — describe social life at Charleston, and the action covers the whole period, with portraits of the political and military leaders of the time. Of border tales the list includes Guy Rivers, a Tale of Georgia (1834); Richard Hurdis (1838); Border Beagles (1840); Beauchampe (1842); Helen Halsey (1845); The Golden Christmas (1852); and Charlemont (1856). The historical romances are The Yemassee (1835), dealing largely with Indian character and nature; Pelayo (1838); Count Julien (1845); The Damsel of Darien (1845); The Lily and the Totem; Vasconselos (1857), which he wrote under the assumed name of " Frank Cooper " ; and The Cassique of Kiawah (i860). Other novels are Carl Werner (1838); Confession of the Blind Heart (1842); The Wigwam and the Cabin, a collection of short tales (1845-1846); Castle Dismal (1845);

and Marie de Berniere (1853). Simms's other writings comprise a History of S. Carolina (Charleston, 1840); South Carolina in the Revolution (Charleston, 1853); A Geography Of South Carolina (1843); lives of Francis Marion (New York, 1844); Capt. John Smith (1846); The Chevalier Bayard (1848) and Nathanael Green (1849); The Ghost of my Husband (1866); and War Poetry of the South — an edited volume — (1867). Simms was also a frequent contributor to the magazines and literary papers, six of which he founded and conducted. In the discussion on slavery he upheld the views of the pro-slavery party. He edited the seven dramas doubt- fully ascribed to Shakespeare, with notes and an introduction to

each play. Simms' works in 10 vols, were published at New York in 1882; his Poems (2 vols., New York) in 1853.

See his biography (Boston, 1892), by Professor William P. Trent. A bibliographical List of the Separate Writings of W. G. Simms of South Carolina (New York, 1906) was compiled by O. Wegelin.

SIMNEL, LAMBERT (fl. 1477-1534). English impostor, was probably the son of a tradesman at Oxford. He was about ten years old in 1487, and was described as a handsome youth of intelligence and good manners. In i486, the year following the accession of Henry VII., rumours were disseminated by the adherents of the Yorkist dynasty that the two sons of Edward IV., who had been murdered in the Tower of London, were still alive. A young Oxford priest, Richard Symonds by name, conceived the project of putting forward the boy Simnel to impersonate one of these princes as a claimant for the crown, with the idea of thereby procuring for himself the archbishopric of Canterbury. He set about instructing the youth in the arts and graces appropriate to his pretended birth; but meanwhile a report having gained currency that the young earl of Warwick, son of Edward IV. 's brother George, duke of Clarence, had died in the Tower, Symonds decided that the impersonation of this latter prince would be a more easily credible deception. It is probable that Symonds acted throughout with the connivance of the Yorkist leaders, and especially of John de la Pole, earl of Lincoln, himself a nephew of Edward IV., who had been named heir to the crown by Richard III. The Yorkists had many adherents in Ireland, and thither Lambert Simnel was taken by Symonds early in 1487; and, gaining the support of the earl of Kildare, the archbishop of Dublin, the lord chancellor and a powerful following, who were, or pretended to be, con- vinced that the boy was the earl of Warwick

escaped from the Tower, Simnel was crowned as King Edward VI. in the cathedral in Dublin on the 24th of May 1487. Messages asking for help were sent to Margaiet, duchess of Burgundy, sister of Edward IV., to Sir Thomas Broughton and other Yorkist leaders.

On the 2nd of February 1487 Henry VII. held a council at Sheen to concert measures for dealing with the conspiracy. Elizabeth Woodville, widow of Edward IV., was imprisoned in the convent of Bermondsey; and the real earl of Warwick was taken from the Tower and shown in public in the streets of London. But although Lincoln is said to have conversed with Warwick on this occasion, he fled abroad immediately after the council at Sheen, where he was present. In Flanders, Lincoln joined Lord Lovell, who had headed an unsuccessful Yorkist rising in i486, and in May 1487 the two lords proceeded to Dublin, where they landed a few days before the coronation of Lambert Simnel. They were accompanied by 2000 German soldiers under Martin Schwartz, procured by Margaret of Burgundy to support the enterprise, Margaret having recognized Simnel as her nephew. This force, together with some ill-armed Irish levies commanded by Sir Thomas Fitzgerald, landed in Lancashire on the 4th of June. King Henry was at Coventry when the news of the landing reached him, and immediately marched to Nottingham, where his army was strengthened by the addition of 6000 men. The invaders met with little encouragement from the populace, who were not well disposed towards a monarch whom it was sought to impose upon them by the aid of Irish and German mercenaries. Making for the fortress of Newark, Lincoln and Sir Thomas Broughton, at the head of their motley forces, and accompanied by Simnel, attacked the royal army near the village of Stoke-on-Trent on the 16th of June 1487. After a fierce and stubborn struggle in which the Germans behaved with great valour, the Royalists were completely victorious, though they left 2000 men on the field; Lincoln, Schwartz and Fitzgerald with 4000 of their followers were killed, and Lovell and Broughton disappeared never to be heard of again. The priest Symonds, and Simnel were taken prisoners. The former was consigned to a dungeon for the rest of his life; but Henry VII., recognizing that the youthful pretender had been a tool in the hands of others and was in himself harmless, pardoned Lambert Simnel and took him into his own service in the menial capacity of scullion. He was later promoted to be royal falconer and is said to have afterwards become a

servant in the household of Sir Thomas Lovell. The date of Simnel's death is unknown, but he is known to have been still Lving in the year 1 534.

See Rolls of Parliament. VI. : Francis Bacon, History of Henry VII., with notes by J. R. Lumby (Cambridge, 1 881); Richard Bagwell, Ireland under the Tudors (3 vols., London, 1885-1890); James Gairdner, Henry VII. (London, 1889) and Letters and Papers illus- trative of the reigns of

Richard III. and Henry VII. (" Rolls " series, 2 vols., London, 1861-1863): The Political History of England, vol. v., by H. A. L. Fisher (London, 1906) ; and W. Busch, England under the Tudors (1895). For a contemporary account of Simnel's imposture, see Polydore Vergil, Anglicae historiae, to which all the later narratives are indebted. (R. J. M.)

SIMOCATTA, 1 THEOPHYLACT, Byzantine historian, a native of Egypt, flourished at Constantinople during the reign of Heraclius (510-640), under whom he held the office of imperial secretary. He is best known as the author of a history, in eight books, of the reign of the emperor Maurice (582-602), for which period he is the best and oldest authority. The work describes the wars with the Persians, the Avars and Slavs, and the emperor's tragic end. " His want of judgment renders him diffuse in trifles and concise in the most interesting facts " (Gibbon), but his general trustworthiness is admitted. The history contains an introduction in the form of a dialogue between History and Philosophy. Photius (cod. 65) while admit- ting a certain amount of gracefulness in the language, blames the author's excessive use of figurative and allegorical expressions and moral sentiments. While the vocabulary contains many strange and affected words, the grammar and syntax are on the whole correct (ed. pr. by J. Pontanus, 1609; best edition by C. de Boor, 1887, with a valuable Index Graecitatis).

Simocatta was also the author of Physical Problems^" k-xopiai. wucaf) in dialogue form, dealing with the nature of animals and especially of man (ed. J. Ideler in Physici et medici Graeci minores, i. 1841); and of a collection of 85 letters (moral, rustic, erotic), the supposed writers of which are either fictitious or well-known personages (Antisthenes to Pericles, Socrates to Plato, Socrates to Alcibiades). The best edition is by R. Hercher in Epistolographi Graeci (1873). The letters were translated into Latin (1509) by Copernicus (re- printed 1873 by F. Hipler in Spicilegium Copernicanum).

See C. Krumbacher, Geschichte der by zantinischen Liter atur (1897).

SIMON, ABRAHAM (1622-1692), English medallist and modeller, was born in Yorkshire in 1622. He was originally intended for the church, but turned his attention to art, and, after studying in Holland, proceeded to Sweden, where he was employed by Queen Christina, in whose train he travelled to Paris. He returned to England before the outbreak of the Civil War, and attained celebrity by his medals and portraits modelled in wax. During the Commonwealth he executed many medals of leading parliamentarians, and at the Restoration he was patronized by Charles II., from whom he received a hundred guineas for his portrait designed as a medal for the proposed order of the Royal Oak. Having incurred the

displeasure of the duke of York, he lost the favour of the court, and died in obscurity in 1692. Among the more interesting of his medals are those of the 2nd earl of Dunfermline, the 2nd earl of Lauderdale and the 1st earl of Loudon; that of the duke of Albemarle, and many other fine medals, were modelled by Abraham Simon and chased by his brother Thomas Simon (q.v.).

SIMON, SIR JOHN (1816-1904), English surgeon and sanitary reformer, was born in London on the 10th of October 1816. His father, Louis Michael Simon,was for many years a leading member of the London Stock Exchange. Both his grandfathers were French emigrants, who carried on business in London and Bath respectively. His father died at almost ninety-eight, and his mother at nearly ninety-five years of age. Simon was educated at a preparatory school in Pentonville, spent seven years at Dr Burney's school in Greenwich, and then ten months with a German Pfarrer in Rhenish Prussia. His father intended him for surgery, and he began the study of medicine on 1st October 1833, when he was a few days short of seventeen. He was an apprentice of Joseph Henry Green, the distinguished surgeon at St Thomas's, well known for his friendship for Samuel Taylor Coleridge, whose literary executor Green became. He became

1 Other forms of the name are Simocattos, Simocatos, Simocates.

a demonstrator of anatomy, and was assistant surgeon to King's College Hospital for several years; and in the autumn of 1847 he was appointed surgeon and lecturer on pathology at his old school, St Thomas's, where, with progressive changes, he con- tinued to remain an officer. His life was divided between two great pursuits — the career of a surgeon, and the mastery and solution of many of the great problems of sanitary science and reform. In the spring of 1844 he gained the first Astley Cooper prize by a physiological essay on the thymus gland, and the following year was elected a fellow of the Royal Society. In 1847 he gave his first lecture at St Thomas's Hospital, on the " Aims and Philosophic Method of Pathological Research," followed a little later by lectures on general pathology in relation to the principles of diagnosis, and the treatment of disease. These lectures were of great importance at the time, and of the utmost value in directing energy into new and profitable channels of work. Simon published many clinical surgical lectures of the greatest importance, and contributed a masterly article on " Inflammation " to Holmes's System of Surgery, which has become a classic of its kind. It was, however, on his appoint- ment in 1848 as medical officer of health to the City of London, and afterwards to the government, that Simon's great abilities found scope for congenial exercise. He stimulated and guided the development of sanitary

science, until it reached in England the highest degree of excellence, and gave an example to the civilized world. It is impossible to overestimate the value of Sir John Simon's work, or the importance of his influence in the furtherance of the public health and the prevention of disease, and in inculcating right methods of medical government. In 1878, after filling other offices in the Royal College of Surgeons, he became its president, and in 1887 was created K.C.B. It was largely due to his advocacy that the new St Thomas's Hospital was rebuilt on its present site after it was compelled to leave its old habitation near London Bridge. As a surgeon, Simon's work came second to his interest in sanitary science, but he claimed priority over Cock in the operation of perineal puncture of the urethra in cases of retention from stricture. He died on the 23rd of July 1904. (W. MacC).

SIMON, JULES FRANQOIS (1814-1896), French statesman and philosopher, was born at Lorient on the 27th of December 1814. His father was a linen-draper from Lorraine, who abjured Protestantism before his second marriage, of which Jules Simon was the son, with a Catholic Breton. The family name was Suisse, which Simon dropped in favour of his third prenomen. By dint of considerable sacrifice he was able to attend a seminary at Vannes, and was for a short time usher in a school before, in 1833, he became a student at the Ecole Normale in Paris. There he came in contact with Victor Cousin, who sent him to Caen and then to Versailles to teach philosophy. He helped Cousin, without receiving any recognition, in his translations from Plato, and in 1839 became his deputy in the chair of philosophy at the Sorbonne, with the meagre salary of 83 francs per month. He also lectured on the history of philosophy at the ficole Normale. At this period he edited the works of Malebranche (2 vols., 1842), of Descartes (1842), Bossuet (1842) and of Arnauld (1843), and in 1844-1845 appeared the two volumes of his Histoire de V ecole d' Alexandrie. He became a regular contributor to the Revue des deux mondes, and in 1847, with Amedee Jacques and fimile Saisset, founded the Liberie de penser, with the intention of throwing off the yoke of Cousin, but he retired when Jacques allowed the insertion of an article advocating the principles of collectivism, with which he was at no time in sympathy. In 1848 he represented the C6tes-du- Nord in the National Assembly, and next year entered the Council of State, but was retired on account of his republican opinions. His refusal to take the oath of allegiance to the govern- ment of Louis Napoleon after the coup d'Uat was followed by his dismissal from his professorship, and he devoted himself to philosophical and political writings of a popular order. Le Devoir (1853), which was tpanslated into modern Greek and Swedish, was followed by La Religion naturelle (1856, Eng. trans., 1887), La Liberie de conscience (1857), La Liberte politique

(1859), La Liberte civile (1859), L'Ouvriere (1861), L'Ecole (1864), Le Travail (1866), L'Ouvrier de huit ans (1867) and others. In 1863 he was returned to the Corps Legislatif for the 8th circonscription of the Seine, and supported " les Cinq " in their opposition to the government. He became minister of instruc- tion in the government of National Defence on the 5th of September 1870. After the capitulation of Paris in January 1871 he was sent down to Bordeaux to prevent the resistance of Gambetta to the peace. But at Bordeaux Gambetta, who had issued a proclamation excluding from the elections officials under the Empire, was all powerful. He affected to dispute Jules Simon's credentials, and issued orders for his arrest. Meanwhile Simon had found means of communication with Paris, and on the 6th of February was reinforced by Eugene Pelletan, E. Arago and Garnier-Pages. Gambetta resigned, and the ministry of the Interior, though nominally given to Arago to avoid the appearance of a personal issue, was really ia Simon's hands. Defeated in the department of the Seine, he sat for the Marne in the National Assembly, and resumed the portfolio of Education in the first cabinet of M.Thiers's presidency. He advocated free primary education yet sought to conciliate the clergy by all the means in his power; but no concessions removed the hostility of Mgr. Dupanloup, who presided over the commission appointed to consider his draft of an elementary education bill. The reforms he was actually able to carry out were concerned with secondary education. He encouraged the study of living languages, and limited the attention given to the making of Latin verse; he also encouraged independent methods at the ficole Normale, and set up a school at Rome where members of the French school of Athens should spend some time. He retained office until a week before the fall of Thiers in 1873. He was regarded by the monarchical right as one of the most dangerous obstacles in the way of a restoration, which he did as much as any man (except perhaps the comte de Chambord himself) to prevent, but by the extreme left he was distrusted for his moderate views, and Gambetta never forgave his victory at Bordeaux. In 1875 he became a member of the French Academy and a life senator, and in 1876, on the resigna- tion of M. Dufaure, was summoned to form a cabinet. He replaced anti-republican functionaries in the civil service by republicans, and held his own until the 3rd of May 1877, when he adopted a motion carried by a large majority in the Chamber inviting the cabinet to use all means for the repression of clerical agitation. His clerical enemies then induced Marshal MacMahon to take advantage of a vote on the press law carried in Jules Simon's absence from the Chamber to write him a letter regretting that he no longer preserved his influence in the Chamber, and thus practically demanding his resignation. His resignation in response to this act of the president, known as the " Seize Mai," which he might have resisted by an appeal to the Chamber, proved his ruin, and he never again held office. He justified his action by his fear of providing an opportunity for a coup d'itat

on the part of the marshal. The rejection (1880) of article 7 of Ferry's Education Act, by which the profession of teaching would have been forbidden to members of non-authorized congregations, was due to his intervention. He was in fact the chief of the left centre opposed to the radicalism of Jules Grevy and Gambetta. He was director of the Gaulois from 1879 to 1881 , and his influence in the country among moderate republicans was retained by his articles in the Matin from 1882 onwards, in the Journal des Dibats, which he joined in 1886, and in the Temps from 1890.

He left accounts of some of the events in which he had participated in Souvenirs du 4 septembre (1874), Le Gouvernement de M. Thiers (2 vols., 1878), in Memoires des autres (1889), Nouveaux memoires des autres (1891) and Les Derniers memoires des autres (1897), while his sketch of Victor Cousin (1887) was a further contribution to con- temporary history. For his personal history the Premiers memoires (1900) and Le Soir de ma journee (1902), edited by his son Gustave Simon, may be supplemented by Leon Seche's Figures bretonnes, Jules Simon, sa vie, son ceuvre (new ed., 1898), and G. Picot, Jules Simon: notice historique . . . (1897); also by many references to periodical literature and- collected essays in Hugo P. Thieme's Guide bibliographique de la lift, franc, de 1800 a 1906 (1907).

SIMON MAGUS ("Simon the Magician"; Gr. ixdyos, a wizard), a character who appears in the New Testament and also in the works of the Christian Fathers. In Acts viii. 5-24 he is portrayed as a famous sorcerer in Samaria who had been converted to Christianity by Philip. His personality has been the subject of considerable discussion. The conclusions to which the present writer has been led are mainly as follows: (1) that all we know of the original Simon Magus is contained in Acts; (2) that from very early times he has been confused with another Simon; (3) that the idea that Simon Magus is merely a distortion of St Paid is absurd.

As regards the story of Acts viii. 5-24, it will suffice to make a few remarks. First it is interesting to note that Simon Magus was . older than Christianity. The first missionary enterprise

of the nascent Church brought it into contact with a magician who had for a long time amazed the people of Samaria with his sorceries (v. 11). This person gave himself out to be " some great one," but the popular voice defined his claims by saying " this man is that power of God which is called Great." Such a voice of the people cannot be imagined in Judaea, but

Samaria was more open than Judaea to the influence of Greek ideas. Readers of Philo are familiar with the half-philosophical and half-mythological mode of thought by which the " powers of God " are substantialized into independent personalities. There were powers of all sorts, powers of help and salvation and also powers of punishment (Philo i. 431). It was through these powers that the incorporeal world of thought was framed, which served as the archetype of this world of appearance. The various powers are sometimes summed up under the two heads of /3

There is no reason for identifying the Simon Magus of Acts with the Simon, also a magician, who was a friend of Felix, and employed by him to tempt Drusilla away from her husband Azizus, the king of the Emesi. The name Simon was common, and so was the claim to magical powers. But the Simon of Josephus {Ant. xx. 7, § 2) is expressly declared to have been a Jew and a native of Cyprus.

The Apostolic Fathers say nothing about Simon Magus, but with Justin Martyr we get startling developments. In his First , .. Apology, written in a.d. 138 or 139, he tells us that one

us "' Simon, a Samaritan, from a village called Gitta or Gittae (see Ency. Bibl. iv. col. 4538), performed such miracles by magic acts in Rome during the reign of Claudius, that he was regarded as a god and honoured with a statue " in the river Tiber, between the two bridges, having an inscription in Latin as follows: Simoni Deo Sancto." " And almost all the Samaritans," he goes on to say, " and a few among the other nations, acknowledge and adore him as the first God. And one Helen, who went about with him at that time, who before had had her stand in a brothel, they say was the first thought that was brought into being by him " (Apol. i. 26. 1-3). Justin goes on to speak, as from personal knowledge, of the feats of magic performed by Menander, another Samaritan and a disciple of Simon's, who persuaded his followers that they would never die. After Menander Justin proceeds to speak of Marcion, who was still teaching at the time. The followers of Simon Magus, of Menander and of Marcion, he says, were all called Christians, but so also Epicureans and Stoics were alike called philosophers. He had himself composed a treatise against all the heresies that there had been, which he was willing to present to the imperial family (Apol. i. 26. 4-8). As Justin was himself a Samaritan it is natural that his fellow-countrymen should bulk largely in his eyes. Accordingly we find him reverting to Simon and Menander in a later passage of the same Apology, where he repeats that in the royal city of Rome, in the time of Claudius Caesar, Simon so astonished " the holy Senate " and the Roman people that he was worshipped as a god and honoured with a statue (Apol. i. 56), which Justin petitions to have taken down. In the Second Apology also there is a passage which seems mutilated or mis- placed, in which he

declares himself to have " despised the impious and misleading teaching of the Simonians in his own nation " (Apol. ii. 15. 1). In the Dialogue (349 c, ch. 120) he prides himself on the independence and love of truth which he had displayed in the Apology. " For," he says, " in writing to Caesar, I showed no regard even for any of my own nation, but said that they were deceived by trusting in a magician of their own race, Simon, whom

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they assert to be God, above all rule and authority and power " (cf. Eph. i. 21).

Such is the testimony of Justin; what is it worth? In 1574, during the pontificate of Gregory XIII., a stone was dug up in the island of the Tiber bearing the inscription — " Semoni Sango Deo Sacrum Sex. Pompeius " (see Semo Sancus). This discovery has led many to suspect that Justin Martyr has somehow been hoaxed. The stone is not the only one of its kind, and it is a serious charge to bring against Justin to suppose him guilty of so silly a confusion as this. But Justin Martyr was decidedly weak in history, and it is not unreasonable to suppose that he may have confused the Simon of Acts with a heretical leader of the same name who lived much nearer to his own time, especially as this other Simon also had a great reputation for magic. A full century must have elapsed between the conversion of Simon Magus to Christianity and the earliest date possible (which is the one that we have adopted) for the composition of Justin Martyr's First Apology. That work is assigned by Schmiedel and others to about A.D. 152. Justin Martyr could not have been mistaken as to the fact that the bulk of his countrymen were followers of a religious leader named Simon, whose disciple Menander he seems to speak of as an elder contemporary of his own. But having a mind void of historical per- spective he identified this Simon with Simon Magus.

When once this identification has been made by Justin, it was taken for granted by almost all subsequent writers. The tempta- tion to trace all heresy to one who had been condemned by Peter was too strong for the Fathers. 1 Dr George Salmon brought light into darkness by distinguishing between Simon of Gitta and the original Simon Magus. What has not perhaps been so clearly perceived is the consequence that all that is told about Helen refers to the later Simon.

With Hegesippus, who wrote during the episcopate of Eleutherus (a.d. 176-189), as with Justin, Simon heads the list of heretics, but there is no identification of him with Simon Magus; indeed, the context plainly excludes it (Eus. H.E. iv. 22).

During the same episcopate Irenaeus was appointed bishop of Lyons. In his work Against Heresies (i. 16) we hear for the first time of opposition on the part of Simon to the Apostles after irenaeus. his pretended conversion. His magic, we are told, pro- cured him the honour of a statue from the emperor Claudius. He was glorified by many as God, and he taught that it was he who appeared among the Jews as the Son, in Samaria as the Father and among other nations as the Holy Spirit. He was indeed the highest power, the Father, who is above all, but he consented to be called by whatever name men chose to give him. Irenaeus then goes on to tell how at Tyre Simon rescued Helen from prostitution, and took her about with him, saying that she was the first thought of his mind, the mother of all things,

by whom in the beginning he had conceived the idea of making angels and arch-angels. For that this Thought (ivvoia), recognizing her father's will, had leapt forth from him, and de- scended to lower regions, and generated the angelic powers by whom this world was made. But after she had done so she was detained by them through ill-will, since they did not wish to be thought the offspring of any other being. For, as for himself, they knew nothing at all about him. But his Thought had been detained by the angelic powers which had been sent forth from her, and had been subjected by them to every indignity, so that she might not return on high to her own father, insomuch that she was even enclosed in a human body, and for age after age transmigrated into different female forms, as though from one vessel into another. For she had been also in that Helen who was the cause of the Trojan War. But while she passed from body to body, and consequently suffered perpetual indignity, she had at the last been prostituted in a brothel ; she was " the lost sheep." Wherefore he himself had come to free her from her bonds, and to confer salvation upon men through knowledge of himself. For as the angels were mismanaging the world, owing to their individual lust for rule, he had come to set things straight, and had descended under a changed form, likening himself to the Principalities and Powers through whom he passed, so that among men he appeared as a man, though he was not a man, and was thought to have suffered in Judaea, though he had not suffered. But the prophets had delivered their prophecies under the inspiration of the world-creating angels : wherefore those who had their hope in him and in Helen minded them no more, and, as being free, did what they pleased; for men were saved according to his grace, but not according to just works. For works were not just by nature, but only by convention, in accordance with the enactments of the world-creating Angels, who by precepts of this kind sought to bring men into slavery. Wherefore he promised that the world should be dissolved, and that those who were his should be freed from the dominion of the world-creators. Irenaeus con- cludes his account by saying that this Antinomian teaching had its logical consequence in his followers, who lived licentious lives and practised every kind of magic. They also, he ad ds, worshipped

1 Clement of Alexandria (Strom, vii. § 107) alone seems to have an inkling that there was something wrong. He puts Simon after Marcion, and yet refers in the same breath to his acceptance of Peter's preaching.

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images of Simon under the form of Zeus, and of Helen under that of Athena. They were called Simoniani, and were the introducers of " knowledge falsely so called." In the next chapter Irenaeus speaks of Menanden who was also a Samaritan, as the successor of Simon, and as having, like him, attained to the highest pitch of magic. His doctrine is represented, as being the same as that of Simon, only that it was he this time who was the saviour of the world.

It is evident that the Samaritans were not to be outdone by the Jews, that Mount Gerizim was once more being set up against Jerusalem, and that a bold bid was being made by the hated Samaritans for a world-wide religion, which should embrace Pagans as well as Christians. But before such an amalgam of paganism and Christianity could be propounded, it is evident that Christianity must have been for some little time before the world, and that the system cannot possibly be traced back to Simon Magus. Is it not this early struggle between Jewish and Samaritan universalism, involving as it did a struggle of religion against magic, that is really symbolized under the wild traditions of the contest between Peter and Simon? 1

Tertullian is fond of alluding to Simon Magus. He says that he offered money for the Holy Spirit (De fuga, 12; De anima, 34), that Tertullian ˆ e was curse d by the Apostles and expelled from the faith (De idol. 9), that he consoled himself for the loss of the Spirit by the purchase of Helen of Tyre (De an. 34), that he was honoured at Rome with a statue bearing the inscription " Sancti Dei " (Apol. 13), that the Simonianae magiae discipline, had been condemned by Peter (De praescr. 33), and that in his own day (he died in a.d. 220) the followers of Simon professed to raise the souls of prophets from the dead (De anima, 57). In a list of heretics Marcion, Valentine and Apelles are followed by Hebion and Simon, whom we may take asˆtanding respectively for Jewish and Samaritan types of Christian heresy (De praescr. 10). But the important passage is the account of his doctrine in De anima, 34, which is evidently derived from the same source as that of Irenaeus. The pseudo-Tertullian in the short treatise Against all Heresies lets us know that the being whom the Most High God came down to seek was Wisdom. This is important as bearing upon the connexion between Simon and Valentinus. In the Clementine Homilies (ii. 25) it is said that Simon called Helen ao&a..

We now come to the important testimony of Hippolytus (c. A.D. 218-222). In his Refutatio omnium haeresium he gives the same account as Irenaeus with certain slight differences, which indicate a common source rather than direct borrowing. The word used for the Thought of the first Father, which

in Justin is iwoia., and which the translator of Irenaeus renders by conceptio and Tertullian by injectio, is in Hippolytus itrivoia.. We are told that Simon allegorized the wooden horse and " Helen with the lamp," 2 and applied them to himself and his inivota. Upon the story of " the lost sheep " Hippolytus comments as follows. " But the liar was enamoured of this wench, whose name was Helen, and had bought her and had her to wife, and it was out of respect for his disciples that he invented this fairy-tale" (Ref. 0. H. vi. 19). To this he adds a scathing indictment against the licentiousness of the Simonians. 3 Hippolytus speaks in language similar to that of Irenaeus about the variety of magic arts practised by the Simonians, and also of their having images of Simon and Helen under the forms of Zeus and Athena. But. here he has a significant addition. " But if any one, on seeing the images either of Simon or Helen, shall call them by > those names, he is cast out, as showing ignorance of the mysteries." From this it is evident that the Simonians did not allow that they worshipped their founders. Lipsius conjectured that the supposed worship of Simon and Helen was really that of Hercules-Melkart and Selene-Astarte. Baur before him made Simon =&?$, the Sun. In the Clementine Recognitions Helen is called Luna (ii. 8, 9), and in the Homilies she is mystically connected with the lunar month (Horn. ii. 23).

Hippolytus, like the rest, identified Simon of Gitta (Zip-uv 6 Yittt]v6s, vi. 7) with Simon Magus. Reduced to despair, he says, by the curse laid upon him by Peter, he embarked on the career that has been described, " Until he came to Rome also and fell foul of the Apostles. Peter withstood him on many occasions. At last he came (here some words are missing) and began to teach sitting under a plane tree. When he was on the point of being shown up, he said, in order to gain time, that if he were buried alive he would rise again on the third day. So he bade that a tomb should be dug by his disciples and that he should be buried in it. Now they did what they were ordered, but he remained there until now: for he was not the Christ."

Prefixed to this account of Simon, which, except in its dramatic close, so nearly tallies with that of Irenaeus, is a description of a book of which he was the author. It is quoted under the title of The Declaration (vi. 14, 18) or The Great Declaration (vi. 11). The

1 The account given by Irenaeus should be compared with what is said of Simon Magus in the Clementine Homilies, ii. 22, where the rivalry between Jews and Samaritans becomes evident (cf. Re- cognitions, i. 57).

2 On this see Epiph. xxi. 3.

, 3 Hippolytus says the free love doctrine was held by them in its frankest form.

longest extract from it is in vi. 18, but others occur here and there, and, where not explicitly quoted, it still underlies the statements of Hippolytus. It is written in a mystical and pretentious style, but the philosophy of it, if allowance be made for the allegorical method of the time, is by no means to be despised. As Hippolytus himself in more than one place (iv. 51, vi. 20) points out, it is an earlier form of the Valentinian doctrine, but there are things in it which remind us of the Stoic physics, and much use is made of the Aristotelian distinction between trkpyeia and Svva/iis.

Starting from the assertion of Moses that God is "a devouring fire " (Deut. iv. 24), Simon combined therewith the philosophy of Heraclitus which made fire the first principle of all things. This first principle he denominated a " power without end " (Svvafiis birkpavTos), and he declared it to dwell in the sons of men, beings born of flesh and blood. But fire was not the simple thing that the many imagined, and Simon distinguished between its hidden and its manifest qualities, maintaining, like Locke, that the former were the cause of the latter. Like the Stoics, he conceived of it as an intelligent being. From this ungenerated being sprang the generated world of which we know, whereof there were six roots, having each its inner and its outer side, and arranged in pairs (crufiryiai) as follows : vovs and eirivoca = ovpavos and yij ; tfjcovfj and ovop.a — rfkws and (TeXijnj ; ~Koy i

The whole book is a queer mixture of Hellenism and Hebraism, in which the same method of allegory is applied to Homer and Hesiod as to Moses. There is a physiological interpretation of the Garden of Eden. The five books of Moses are made to represent the five senses. There is a mystical passage on the unity of all things, sug- gestive of " the hymn the Brahman sings." Its language seems to throw light on the story about Helen. " This," he says, " is one power, divided between above and below, self-generating, self- increasing, self-seeking, self-finding, being its own mother, its own father, its own sister, its own spouse, its own daughter, its own son, mother, father, an abstract unity, being the root of all things " (Hipp. Ref. O. H. vi. 17). That a learned man like Hippolytus should refer a work which contains quotations from the Epistles and Gospels to Simon Magus, who was probably older than Jesus Christ, shows the extent to which men can be blinded by religious bigotry.

*Next in order comes Origen, who was ordained priest in a.d. 231 (Eus. H. E. vi. 23, 26). The most interesting point in his evidence relates to the decline of the Samaritan attempt to establish – a world religion. After speaking of Dositheus the Samari- ** '*

tan, who persuaded some of his countrymen that he was the Christ prophesied by Moses, he goes on to say: " Also Simon the Samaritan, a magician, wished to filch away some by his magic. And at _ the time indeed

he succeeded in his deception, but now I suppose it is not possible to find 30 Simonians altogether in the world; and perhaps 1 have put the number higher than it really is. _ But in Palestine there are very few, and in the rest of the world, in which he wished to spread his own glory, his name is nowhere mentioned. If it is, this is due to the Acts of the Apostles. It is the Christians who say what is said about him, and it has become plain as daylight (17 ivapyua ipaprvpTfatv) that Simon was nothing divine " (Origen, Cont. Cels. i. 57). Origen also mentions that some of the sect were called Heleniani (v. 62).

The treatise of the pseudo-Cyprian De Rebaptismate is assigned by some to about A.D. 260. The writer says that on the strength of the words of John, that " we were to be baptized with ps eu j . the Holy Ghost and with fire," the Simonians maintained cyorlan that the orthodox baptism was a mere form, and that they _

had the real baptism, for, as soon as their neophytes went down into the water, a fire appeared on it. The writer does not dispute the fact, but is at a loss what to make of it. Was it a bit of jugglery, or a natural phenomenon, or a piece of self-deception, or an effect of magic? In advocacy of this baptism, we are told, there was com- posed by the same heretics a book which was inscribed the Preaching of Paul.

Arnobius (early in the 3rd century) introduces us to a new phase of the Simon-legend. " They had seen," he says, " the car of Simon Magus blown away by the mouth of Peter and vanish at A taoB/la the name of Christ. They had seen, I say, him who " _ trusted in false gods and was betrayed by those gods in their fear, brought headlong down by his own weight, lie with broken legs, and afterwards be carr ied to Brund a and, exhausted by suffering and 4 E.g. iv. 51, v. 9, vi. 9, 11, 14, 17-

shame, fling himself down once more from the gable of a lofty roof." The immediate sequel shows that belief in this story was confined to Christians.

Eusebius (about a.d. 264-340) follows Justin Martyr and Irenaeus, but he adds the statement, which is not derived from them, that Eusebius P eter opposed Simon at Rome under the reign of Claudius. From Origen's statement one might have thought that the Simonians would have dwindled out altogether by the time of Eusebius. But they were still extant in his time, and there is no sect of whom he speaks in such unmeasured terms of vituperation. 1 Eusebius's account of Menander (iii. 26) is also based upon

Justin and Irenaeus.

St Cyril of Jerusalem (a.d. 346) in the sixth of his Catechetical Lectures prefaces his history of the Manichees by a brief account of CyrU. earlier heresies. Simon Magus, he says, was the father

of all heresy. After being cast out by the Apostles he came to Rome where, having joined to himself a profligate woman of the name of Helen, he gave out that it was he who appeared as the father on Mt. Sinai, and afterwards, not in the flesh, but in appearance (SoKiiaei) as Jesus Christ, and, finally, as the Holy Ghost, according to the promise of Christ. His success at Rome was so great that the emperor Claudius erected a statue to him with the inscription Simoni Deo Sancto. The triumph of Simon Magus was terminated on the arrival of Peter and Paul at Rome. Simon Magus had given out that he was going to be translated to heaven, and was actually careering through the air in a chariot drawn by demons when Peter and Paul knelt down and prayed, and their prayers brought him to earth a mangled corpse.

Such is the form assumed by the legend of Simon Magus about the middle of the 4th century. It is interesting to note in it the first introduction of Paul on the scene, at least by name. The reader who is not familiar with the eccentricities of the Tubingen school will doubtless be surprised to learn that the Paul who thus quietly slips in at the close of the drama was himself all along the disguised villain of the plot, the very Simon Magus whom he comes to assist Peter in destroying (see below).

Epiphanius (c. a.d. 367) is a writer who has nothing but his learning to recommend him. It seems that there were some Simonians Bpl- st ’” ln ex i stence m n ‘ s day, but he speaks of them as

phaaius. almost extinct. Gitta, he says, had sunk from a town into a village. He makes no mention of the Great De- claration, but as in several places he makes Simon speak in the first person, the inference is that he is quoting from it, though perhaps not verbatim. Take, for instance, the following passage: ” But in each heaven I changed my form,” says he, ” in accordance with the form of those who were in each heaven, that I might escape the notice of my angelic powers and come down to the Thought, who is none other than her who is also called Prounikos and Holy Ghost, through whom I created the angels, while the angels created the world and men ” (56 C, D). And again, ” And on her account,” he says, ” did I come down ; for this is that which is written in the Gospel ‘ the lost sheep ‘ ” (58 A). Epiphanius further charges Simon with having tried to wrest the words of St Paul about the armour of God (Eph. vi. 14-16) into agreement with his own identification of the ” ennoia ” with Athena. He tells us also that

he gave barbaric names to the " principalities and powers," and that he was the beginning of the Gnostics. The Law, according to him, was not of God, but of " the sinister power." 2

The same was the case with the prophets, and it was death to believe in the Old Testament. Epiphanius clearly has before him the same written source as Hippolytus, which we know to have been the Great Declaration. The story of Helen is thus definitely shown to belong to the second Simon, and not at all to the first. Dr Salmon pointed out that Simon was known as a writer to the author of the Clementine Recognitions (ii. 38), and towards the close of the 4th century we find St Jerome quoting from him as such. 3

Two points must by this time have become clear: (1) that our knowledge of the original Simon Magus is confined to what

we are told in the Acts, and (2) that from the earliest r? e times he has been confused with another Simon. The

theory? initial error of Justin was echoed by every subsequent

writer, with the one exception of Hegesippus, who had perhaps not read him. There were, of course, obvious reasons for the confusion. Both Simons were Samaritans, both were magicians, and the second Simon claimed for himself what was claimed for the earlier Simon by the people, namely, that he was the great power of God. But, if the end in view with the Fathers had been the attainment of truth, instead of the branding of heretics, they could not possibly have accepted the Great Declaration, which contains, as we have seen, the story of Helen, with its references to the Gospels, as the work of Simon

l See H.E. it. 1, 13, 14, iii. 26, iv. 11, 22.

2 58 D, xxi. 4, tt}$ Apwrcpas Svvaˆieus.

3 Comm. on Matt. xxiv. 5 — Ego sum sermo Dei, ego sum speciosus, ego paracletus, ego omnipotens, ego omnia Dei.

Magus. As regards the third point, the difficulty is to make clear to the ordinary mind why it should be treated at all. But as Schmiedel champions the Tubingen view in the Encyclopaedia Biblica, it cannot be overlooked.

Among the sources of the Simon-legend we have omitted the pseudo-Clementine literature and a number of Apocryphal Martyria, Passiones and Actus. It is necessary to treat them separately in connexion with the Tubingen view, which repre- sents Paul as the original Simon. That view is based on these works of fiction, of uncertain date and authorship, which

seem to have been worked over by several hands in the interest of diverse forms of belief. The romance of Clement of Rome exists at present in two forms, in Greek under the name of the Clementine Homilies and in a Latin translation by Rufinus, which is known as the Recognitions (see Clementine Litera- ture). It is contended that the common source of these docu- ments may be as early as the 1st century, and must have consisted in a polemic against Paul, emanating from the Jewish side of Christianity. Paul being thus identified with Simon, it was argued that Simon's visit to Rome had no other basis than Paul's presence there, and, further, that the tradition of Peter's residence in Rome rests on the assumed necessity of his resisting the arch-enemy of Judaism there as elsewhere. Thus the idea of Peter at Rome really originated with the Ebionites, but it was afterwards taken up by the Cathoiic Church, and then Paul was associated with Peter in opposition -to Simon, who had originally been himself.

Now it must be conceded at once that the Clementine Homilies are marked by hostility to Paul. Prefixed to them is a supposed letter from Peter to James, in which Peter is made to write as follows:—

" For some of the converts from the Gentiles have rejected the preaching through me in accordance with the law, having accepted a certain lawless and babbling doctrine of the enemy (tou ixBpov Mpimov). And this some people have attempted while I am still alive, by various interpretations to transform my words, unto the overthrow of the law; as though I also thought thus, but did not preach it openly: which be far from me! For to do so is to act against the law of God as spoken through Moses, the eternal duration of which is borne witness to by our Lord. Since He said thus — ' Heaven and earth shall pass away : one jot or one tittle shall not pass away from the law ' (cf. Matt. v. 18). Now this He said that all might be fulfilled. But they, professing somehow to know my mind, attempt to expound the words they heard from me more wisely than I who spoke them, telling those who are instructed by them that this is my meaning, which I never thought of. But if they venture on such falsehoods while I am still alive, how much more when I am gone will those who come after me dare to do so!"

It would be futile to maintain that that passage is not aimed at Paul. It does not identify Paul with Simon Magus, but it serves to reveal an animus which would render the identification easy. In the 17th Homily the identification is effected. SimoR is there made to maintain that he has a better knowledge of the mind of Jesus than the disciples, who had seen and conversed with Him in person. His reason for this strange assertion is that visions are superior to waking reality, as divine is superior to human (xvii. 5, 14). Peter has much to say in reply to this, but the passage which mainly concerns us is as follows: —

"But can any one be educated for teaching by vision ? And if you shall say, ' It is possible,' why did the Teacher remain and converse with waking men for a whole year? And how can we believe you even as to the fact that he appeared to you? And how can he have appeared to you seeing that your sentiments are opposed to his teaching? But if you were seen and taught by him for a single hour, and so became an apostle, then preach his words, expound his meaning, love his apostles, fight not with me who had converse with him. For it is against a solid rock, the foundation-stone of the Church, that you have opposed yourself in opposing me. If you were not an adversary, you would not be slandering me and reviling the preaching that is given through me, in order that, as I heard myself in person from the Lord, when I speak I may not be believed, as though forsooth it were I who was condemned and I who was reprobate. 4 Or, if you call me 'condemned' (KaTeyvuaii&vov, Gal. ii. 11), you are accusing God who revealed the Christ to me, and are inveighing against Him who called me blessed on the ground of the revelation. But if indeed you truly wish to work along with

4 Reading with Schmiedel dSoiayuov ovtos (from I Cor. ix. 27) in place of ebdoia/iovvTos.

the truth, learn first from us what we learnt from Him, and when you have become a disciple of truth, become our fellow -workman."

Here we have the advantage, rare in ecclesiastical history, of hearing the other side. The above is unmistakably the voice of those early Christians who hated Paul, or at all events an echo of that voice. But how late an echo it would be hazardous to decide. Schmiedel asks, " How should Paul ever come to be in the 2nd, or, as far as the pseudo-Clementine Homilies and Recognitions are concerned, even in the 3rd or 4th century, the object of so fanatical a hatred? It is a psychological im- possibility." Yet the love and hatred aroused by strong char- acters is not confined to their life-time. There is not the slightest reason why there should not have been people in the 3rd or 4th century who would have been glad to lampoon Paul. The introduction of Pauline features, however, into the representation of Simon Magus is merely incidental. The portrait as a whole is not in the least like Paul, and could not even have been intended for a caricature of him.

There are other features in the portrait which remind us strongly of Marcion. For the first thing which we learn from the Homilies about Simon's opinions is that he denied that God was just (ii. 14). By " God "

he meant the Creator. But he undertakes to prove from Scripture that there is a higher God, who really possesses the perfections which are falsely ascribed to the lower (iii. 10, 38). On these grounds Peter complains that, when he was setting out for the Gentiles to convert them from their worship of many gods upon earth, the Evil Power (ri naria) had sent Simon before him to make them believe that there were many gods in heaven. Peter throughout is repre- sented as defending the pavapx'i-a- of God against Simon's attacks on it (e.g. iii. 3, 9, 59).

If we knew more, we might detect other historical characters concealed under the mask of Simon. Just as whatever Plato approves is put into the mouth of Socrates, so whatever the author of the Homilies condemns is put into the mouth of Simon Magus. But while thus seeking for hidden meanings, are we not in danger of missing what lies on the surface, namely, that the Simon Magus of the Clementine romance is a portrait of Simon of Gitta, after he had been confused with the Simon of Acts? The mention of Helen in the Clementines stamps them as later than the Great Declaration, in which, to all appear- ance, her story originates. Indeed, the Clementine romance may most fitly be regarded as an answer to the Great Declaration, the answer of Jewish Gnosticism to the more Hellenized Gnosti- cism of Samaria. Let us look at the Homilies in this light, and see how far what they have to tell us about Simon accords with conclusions which we have already reached.

Simon, we are informed, was a Samaritan, and a native of Gitta, a village situated at a distance of 6 axolvoi (about 4 m.) from the „ ... city. The name of his father was Antonius, that of his Horn es. mother Rachel. He studied Greek literature in Alexandria, and, having in addition to this great power in magic, was so puffed up by his attainments that he wished to be considered a highest power, higher even than the God who created the world. 1 And some- times he " darkly hinted " that he himself was Christ, calling himself the Standing One. Which name he used to indicate that he would stand for ever, and had no cause in him for bodily decay. He did not believe that the God who created the world was the highest, nor that the dead would rise. He denied Jerusalem, and introduced Mount Gerizim in its stead. In place of the real Christ of the Christians he proclaimed himself; and the Law he allegorized in accordance with his own preconceptions. He did indeed preach righteousness and judgment to come: but this was merely a bait for the unwary.

So far we have had nothing that is inconsistent with Simon of Gitta, and little but what we are already familiar with in connexion either with him or his disciple Menander. But in what follows the identification of this Simon with the Simon of Acts has led the novelist to give play to his fancy. It may be well to premise that in the view of the writer of the Homilies, " All things

are double one against another." " As first night, then day, and first ignorance, then knowledge (-fvuji.s), and first sickness, then healing, so the things of error come first in life, and then the truth supervenes upon them, as the physician upon the sickness." (Horn. ii. 33). In this way every good thing has its evil forerunner.

According to the Homilies, the manner of his entering on his career of impiety was as follows. There was one John, a Hemero- 1 Supplying, with Schmiedel, ivairipa.

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baptist, who was the forerunner of our Lord Jesus in accordance with the law of parity ; 2 and as the Lord had twelve Apostles, bearing the number of the twelve solar months, so had he thirty leading men, making up the monthly tale of the moon. One of these thirty leading men was a woman called Helen. Now, as a woman is only half a man, in this way the number thirty was left incomplete, as it is in the moon's course. Of these thirty disciples of John the first and most renowned was Simon. But on the death of the master he was away in Egypt for the practice of magic, and one Dositheus, by spreading a false report of Simon's death, succeeded in installing himself as head of the sect. Simon on coming back thought it better to dissemble, and, pretending friendship for Dosi- theus, accepted the second place. Soon, however, he began to hint to the thirty that Dositheus was not as well acquainted as he might be with the doctrines of the school. Dositheus was so enraged at these suggestions, which were calculated to undermine his position as the Standing One, that he struck at Simon with his staff. But the staff went clean through the body of Simon as though it had been vapour. Whereat Dositheus was so amazed that he said to him, " Art thou the Standing One? And am I to worship thee? " When Simon said, " I am," Dositheus, knowing that he himself was not, fell down and worshipped him. Then he retired into the number of the twenty-nine leaders, and not long afterwards died.

The above is doubtless pure fiction. But Dositheus the Samaritan is a real person. He is mentioned by Hegesippus as the founder of a sect (Eus. H.E. iv. 22), and spoken of by the pseudo-Tertullian as a heretic from Judaism, not from Christianity, " who first dared to reject the prophets as not having spoken in the Holy Ghost." After this we return to the comparatively solid ground of Simon of Gitta. For the narrative goes on to say that Simon took Helen about with him, saying that she had come down into the world from the highest heavens, and was mistress, inasmuch as she was the all- mother being and wisdom. It was for her sake, he said, that the Greeks and Barbarians fought, deluding themselves with an image of truth, for the real being was then present with the First God. 3 By such specious allegories

and Grecian fables Simon deceived many, while at the same time he astounded them by his magic. A de- scription is given of how he made a familiar spirit for himself by conjuring the soul out of a boy and keeping his image in his bedroom, and many instances of his feats of magic are given.

The Samaritans were evidently strong in magic. In all the accounts given us of Simon of Gitta magic is a marked feature, as also in the case of his pupil Menander. We cannot, therefore, agree with Dr Salmon's remark that the only reason why Justin attributed magic to Simon of Gitta was because of his identifying him with Simon Magus. Rather Simon Magus and his sorceries would have been forgotten had not his reputation been reinforced in the popular mind by that of his successor.

Whether Simon of Gitta ever exhibited his skill in Rome we have no means of determining, but at all events the compound Simon, resulting from the fusion of him with his predecessor, is brought to Rome by popular legend, and represented as enjoying great influence with Nero. One of his feats at Rome is to have himself beheaded and to rise again on the third day. It was really a ram that was beheaded, but he contrived by his magic to make people think that it was himself. The Clementines leave room for this development. In the Epistle of Clement to James prefixed to the Homilies Peter is spoken of as the light of the West, and as having met with a violent death in Rome; and in Homilies i. 16, Peter invites Clement to share his travels and listen to the words of truth which he is about to preach from town to town, " even unto Rome itself."

It would be superfluous to criticize the Tubingen view under a form in which it has already been abandoned. We may, therefore, confine our attention to the latest exposition of it by Schmiedel in the Ency. Biblica. In the narrative of Acts Schmiedel finds much to surprise him. He thinks, for instance, that verse 10 of chapter viii. must be interpolated, and that in the process irpoo-tixov was borrowed from verse n. But there is no inconsistency between the two verses. Verse 10 merely states that the people gave heed to the magician, verse 11 adds why. All the complicated speculations about a redactor which follow are swept away by the simple assumption that the text is sound.

With Schmiedel's contention that there are passages in the Clementines which are aimed at Paul, we entirely agree. But this interesting discovery so dazzled the eyes of Baur and his followers that after it they saw Paul everywhere. In the Clemen- tines Simon by his magic imposes his own personal appearance upon Faustus, the father of Clement. This he does for his own ends, but Peter seeing his opportunity adroitly makes Faustus go to Antioch, and in the person of Simon make a public

2 kotA t6v rijs

3 As to the phantasmal nature of Helen see Plat. Rep. 586 c ; Sext. Emp. Adv. math. vii. 180; cf. Hdt. ii. 112-117. We have only the evidence of this passage for Simon having adopted the notion.

recantation of his aspersions on Peter, giving as a reason that he had been soundly scourged by angels during the preceding night. Now here, we are told, there is a malicious allusion to the " messenger of Satan to buffet me " of 2 Cor. xii. 6. We do not think that this conjecture will commend itself to the unpreju- diced, especially in view of the fact that scourging by angels is a well-known piece of supernatural machinery (cf. 2 Mace. iii. 26; Eus. H.E. v. 28, § 12; Tert. De idol. 15). Yet Schmiedel speaks of this as " a well ascertained case in which an utter- ance of Paul regarding himself is spitefully twisted to his dis- credit." There is more plausibility in connecting Simon's assumed knowledge of things above the heavens {Recog. ii. 65) with St Paul's claim to have been " caught up even to the third heaven " (2 Cor. xii. 2). But the passage is much more appropriate to Simon of Gitta. From the height in which he claimed to dwell even the third heaven would have seemed quite the lower regions. The question of meat offered to idols was a burning one, in every sense of the term, long after Paul's day. We need not, therefore, see a reference to the Apostle's laxity on this crucial point in the story (Horn. iv. 4, vii. 3) that Simon Magus had entertained the people of Antioch on a sacri- ficial ox, and so subjected them to the evil influence of demons. The non-necessity of martyrdom is mentioned as a feature of early Gnosticism. 1

The miracles which St Paul claims for himself in 2 Cor. xii. 12, Rom. xv. 19, must doubtless have led to his being regarded as a magician by those who did not accept him as divinely commissioned; but, as we have seen throughout, magic was the salient feature about the Samaritan Messiah, who is the real enemy aimed at in the Clementine literature. The opening of doors of their own accord no more connects Simon Magus with Paul than with Peter. We need not, therefore, see in Recog. ii. 9 a reference to Acts xvi. 26. As to the use of bad language, people in the 2nd century were glad to avail themselves of such missiles as iˆ€u6a7rocrToXot, which had been manufactured for them in the 1st (Horn. xvi. 21; 2 Cor. xi. 13). That the homo quidam inimicus of the Recognitions (i. 70) is intended for Paul is plain, but then, as Schmiedel points out in a note, he is not identified with Simon. " Even the style of Paul," Schmiedel assures us, " is plainly imitated in a mocking way." The reference is to the recantation in Horn. xx. 19,

which is like the rest of the treatise and quite unlike Paul, but Schmiedel's familiarity with Paul's writings enables him to collect phrases therefrom which occur also in the Homilies.

When the Tubingen School turn their attention to the Apocry- phal Acts and Martyrdoms, the image of Paul still obsesses their mental gaze. There is indeed one passage which may plausibly be adduced in favour of their contention. In the Martyrdom of the Holy Apostles Peter and Paul (ch. 45), Paul is made to put this question — " If then circumcision is a good thing, why did you, Simon, deliver up circumcised men and compel them to be condemned and put to death?" We must let the Tubingen School have this passage for what it is worth, only remarking that it was not on the ground of circumcision that Paul persecuted the Church, and that it is impossible to extract history out of these fictions. We certainly cannot subscribe to the conjecture of Lipsius that " the story of the seeming beheading of Simon has at its root malicious mis- representations of the beheading of Paul." The climax of absurdity seems to be reached when we are informed that the story of Simon offering money to the Apostles for the gift of the Holy Ghost arose out of Jewish-Christian scandal about Paul's " collection for the Saints " (1 Cor. xvi. 1). Yet Schmiedel follows Lipsius " in his latest treatment of the subject " in recognizing " a Samaritan 7677s named Simon as historical." But the part which he played in history is thus taken away from him. He was there, it seems, but he did not do what he is said to have done. Only the author of Acts, wishing to obviate the reproach against Paul of offering money to the Apostles, attributed the like conduct to Simon.

1 Pseudo-Tertullian says of Basilides, " Martyria negat esse facienda."

In conclusion, there are of course some grounds for the Tubin- gen view, but they are wholly inadequate to bear the structure that has been raised upon them. St Paul was a hard hitter, and Jewish Christians, who still clung to James and Peter as the only true pillars of the Church, are not likely to have cherished any love for his memory. This is enough to account for the hostility displayed against St Paul in the Clementines. But to push the equation of St Paul with Simon Magus further than we are forced to by the facts of the case is to lose sight of the real character of the Clementines as the counterblast of Jewish to Samaritan Gnosticism and to obscure the greatness of Simon of Gitta, who was really the father of all heresy, a character which has been erroneously attributed to Simon Magus.

Literature. — Harnack, Lehr. d. Dogmengesch., 2nd ed., 204-209, 264-270; Salmon in Diet. Chr. Biog. iv. 681 ; Hort, Notes Intro- ductory to the Study of the Clem. Recog. (1902) ; Bigg in Stud. Bib. (1890), 2, 157-193; Headlam in Hastings' Diet, of the BiUe; P. W. Schmiedel in

Encyc. Bibl. (St. G. S.)

SIMON, RICHARD (1638-1712), French biblical critic, was born at Dieppe on the 13th of May 1638. His early studies were carried on at the college of the Fathers of the Oratory in that city. He was soon, by the kindness of a friend, enabled to enter upon the study of theology at Paris, where he early dis- played a taste for Hebrew and other Oriental languages. At the end of his theological course he was sent, according to custom, to teach philosophy at Juilly, where there was one of the colleges of the Oratory. But he was soon recalled to Paris, and employed in the congenial labour of preparing a catalogue of the Oriental books in the library of the Oratory. His first publication was his Fides Ecclesiac orientalis, seu Gabrielis Metropolitae Philadelphiensis opuscula, cum interpretation Latina, cum notis (Paris, 1671), the object of which was to demonstrate that the belief of the Greek Church regarding the Eucharist was the same as that of the Church of Rome. Simon entered the priesthood in 1670, and the same year wrote a pamphlet in defence of the Jews of Metz, who had been accused of having murdered a Christian child. It was shortly before this time that there were sown the seeds of that enmity with the Port Royalists which filled Simon's after life with many bitter troubles. Antoine Arnauld (161 2-1694) had written a work on the Perpetuity of the Faith, the first volume of which treated of the Eucharist. The criticisms of Simon excited lasting indignation among Arnauld's friends and admirers. Another matter was the cause of inciting against him the ill-will of the monks of the Benedictine order. In support of a friend who was engaged in a lawsuit with the Benedictine monks of Fecamp, Simon composed a strongly-worded memorandum. The monks were greatly exasperated, and made loud complaints to the new general of the Oratory. The charge of Jesuitism was also brought against Simon, apparently on no other ground than that his friend's brother was an eminent member of that order. The commotion in ecclesiastical circles was great, and Simon's removal not only from Paris but from France was seriously considered. A mission to Rome was proposed to him, but he saw through the design, and, after a short delay dictated by prudential motives, declined the proposal. He was engaged at the time in superintending the printing of his Histoire critique du Vieux Testament. He had hoped, through the influence of Pere la Chaise, the king's confessor, and the due de Montausier, to be allowed to dedicate the work to Louis XIV., but, as the king was absent in Flanders at the time, the volume could not be published until he had accepted the dedication, though it had passed the censorship of the Sorbonne, and the chancellor of the Oratory had given his imprimatur. The printer of the book, in order to promote the sale, had caused the titles of the various chapters to be printed separately, and to be put in circulation. These, or possibly a copy of the work itself, had happened to come into the hands of the Port Royalists. It

seems that, with a view to injure the sale of the work, which it was well known in theological circles had been long in preparation by Simon, the Messieurs de Port Royal had undertaken a translation into French of the Prolegomena to Walton's Polyglott. To counteract this proceeding Simon announced his intention of publishing

an annotated edition of the Prolegomena, and actually added to the Critical History a translation of the last four chapters of that work, which had formed no part of his original plan. Simon's announcement prevented the appearance of the pro- jected translation, but his enemies were all the more irritated. They had now obtained the opportunity which they had long been seeking. The freedom with which Simon expressed himself on various topics, and especially those chapters in which he declared that Moses could not be the author of much in the writings attributed to him, especially aroused their opposition. The powerful influence of Bossuet, at that time tutor to the dauphin, was invoked; the chancellor Michael le Tellier lent his assistance; a decree of the council of state was obtained, and after a series of paltry intrigues the whole impression, consisting of 1300 copies, was seized by the police and destroyed, and the animosity of his colleagues in the Oratory rose to so great a height against Simon that he was declared to be no longer a member of their body. Full of bitterness and disgust, Simon retired in 1679 to the curacy of Bolleville, to which he had been lately appointed by the vicar-general of the abbey of Fecamp.

The work thus "confiscated in France it was proposed to republish in Holland. Simon, however, at first opposed this, in hopes of overcoming the opposition of Bossuet by making certain changes in the parts objected to. The negotiations with Bossuet lasted a considerable time, but finally failed, and the Critical History appeared, with Simon's name on the title page, in the year 1685, from the press of Reenier Leers in Rotterdam. An imperfect edition had previously been published at Amster- dam by Daniel Elzevir, based upon a MS. transcription of one of the copies of the original work which had escaped destruction and had been sent to England, and from which a Latin and an English translation were afterwards made. The edition of Leers was a reproduction of the work as first printed, with a new preface, notes, and those other writings which had appeared for and against the work up to that date.

The work consists of three books. The first deals with questions of Biblical criticism, properly so called, such as the text of the Hebrew Bible and the changes which it has undergone down to the present day, the authorship of

the Mosaic writings and of other books of the Bible, with an exposition of Simon's peculiar theory of the existence during the whole extent of Jewish history of recorders or annalists of the events of each period, whose writings were pre- served in the public archives, and the institution of which he assigns to Moses. The second book gives an account of the principal trans- lations, ancient and modern, of the Old Testament, and the third contains an examination of the principal commentators. He had, with the exception of the theory above mentioned, contributed nothing really new on the subject of Old Testament criticism, for previous critics as L. Cappel, Johannes Morinus (1591-1659) and others had established many points of importance, and the value of Simon's work consisted chiefly in bringing together and presenting at one view the results of Old Testament criticism. The work encountered strong opposition, and that not only from the Church of Rome. The Protestants felt their stronghold — an infallible Bible —assailed by the doubts which Simon raised against the integrity of the Hebrew text. J. le Clerc (" Clericus ") in his work Sentimens de quelques theologiens de Hollande, controverted the views of Simon, and was answered by the latter in a tone of considerable asperity in his Reponse aux Sentimens de quelques theologiens de Hollande, over the signature " Pierre Ambrun, " it being a marked peculiarity of Simon rarely to give his own name.

The remaining works of Simon may be briefly noticed. In 1689 appeared his Histoire critique du texte du Nouveau Testament, consisting of thirtj > three chapters, in which he discusses the origin and character of the various books, with a consideration of the objections brought against them by the Jews and others, the quotations from the Old Testament in the New, the inspiration of the New Testament (with a refutation of the opinions of Spinoza), the Greek dialect in which they are written (against C. Salmasius), the Greek MSS. known at the time, especially Codex D (Canta- brigiensis), &c. This was followed in 1690 by his Histoire critique des versions du Nouveau Testament, where he gives an account of the various translations, both ancient and modern, and discusses the manner in which many difficult passages of the New Testament have been rendered in the various versions. In 1693 was published

what in some respects is the most valuable of all his writings, viz.

Histoire critique des principaux commentateurs du Nouveau Testament

depuis le commencement du Christianisme jusques a notre temps.

This work exhibits immense reading, and the information it contains

is still valuable to the student. The last work of Simon that we need

mention is his Nouvelles Observations sur le texte et les versions du Nouveau Testament (Paris, 1695), which contains supplementary observations upon the subjects of the text and translations of the New Testament.

As a controversialist Simon displayed a bitterness which tended only to aggravate the unpleasantness of controversy. He was entirely a man of intellect, free from all tendency to senti- mentality, and with a strong vein of sarcasm and satire in his disposition. He died at Dieppe on the nth of April 1712 at the age of seventy-four.

The principal authorities for the life of Simon are the life or " eloge " by his grand-nephew De la Martiniere in vol. i. of the Letlres choisies (4 vols., Amsterdam, 1730); K. H. Graf's article in the first vol. of the Beitr. zu d. theol. Wissensch., &c. (Jena, 1851) ; E. W. E. Reuss's article, revised by E. Nestle, in Herzog-Hauck, Realencyklopddie (ed. 1906) ; Richard Simon et son Vieux Testament, by A. Barnus (Lausanne, 1869) ; H. Margival, Essai sur Richard Simon et ia critique biblique au XVII' Steele (1900). For the biblio- graphy, see, in addition to the various editions of Simon's works, the very complete and accurate account of A. Bernus, Notice biblio- graphique sur Richard Simon (Basel, 1882).

SIMON, THOMAS (c. 1623-1665), English medallist, was born, according to Vertue, in Yorkshire about 1623. He studied engraving under Nicholas Briot, and about 1635 received a post in connexion with the Mint. In 1645 he was appointed by the parliament joint chief engraver along with Edward Wade, and, having executed the great seal of the Commonwealth and dies for the coinage, he was promoted to be chief engraver to the mint and seals. He produced several fine portrait medals oi Cromwell, one of which is copied from a miniature by Cooper. After the Restoration he was appointed engraver of the king's seals. On the occasion of his contest with the brotheis Roettiers, who were employed by the mint in 1662, Simon produced his celebrated crown of Charles II., on the margin of which he engraved a petition to the king. This is usually considered his masterpiece. He is believed to have died of the plague in London in 1665.

A volume of The Medals, Coins, Great Seals and other Works of Thomas Simon, engraved and described by George Vertue, was published in 1753-

SIMON BEN YOHAI (2nd century a.d.), a Galilean Rabbi, one of the most eminent disciples of Aqiba (q.v.). His mastei was executed by Hadrian, and Simon's anti-Roman sentiments led to his own condemnation by Varus c. 161 a.d. (according to Graetz). He escaped this doom and dwelt for some years in a cavern. Emerging from concealment, Simon settled in Tiberias and in other Galilean cities. He acquired a reputation as a worker of

miracles, and on this ground was sent to Rome as an envoy, where (legend tells) he exorcised from the emperor's daughter a demon who had obligingly entered the lady to enable Simon to effect his miracle. This Rabbi bore a large part in the fixation of law, and his decisions are frequently quoted. To him were attributed the important legal homilies called Sifre and Mekhilta (see Midrash), and above all the Zohar, the Bible of the Kabbalah (q.v.). This latter ascription is altogether unfounded, the real author of this mystical commentary on the Pentateuch being Moses of Leon (q.v.).

The fullest account of Simon's teachings is to be found in W. Bacher's Agada der Tannaiten, ii. pp. 70-149. (I. A.)

SIMON OF ST QUENTIN (ft. 1247), Dominican mission- traveller and diplomatist. He accompanied, and wrote the history of, the Dominican embassy [under Friar Ascelin or Anselm, which Pope Innocent IV. sent in 1247 to the Mongols of Armenia and Persia. Simon's history, in its original form, is lost; but large sections of it have been preserved in Vincent of Beauvais's Speculum hisloriale, where nineteen chapters are expressly said to be ex libello fratris Simonis, or entitled frater Simon. The embassy of Ascelin and Simon, who were ac- companied by Andrew of Longjumeau, proceeded to the camp of Baiju or BachuiVoyaw (i.e. " General " Baiju, Noyan signify- ing a commander of 10,000) at Sitiens in Armenia, lying between the Aras river and Lake Gokcha, fifty-nine days' journey from Acre. The papal letters were translated into Persian, and thence into Mongol, and so presented to Baiju; but the Tatars were greatly irritated by the haughtiness of the Dominicans,

who implied that the pope was superior even to the Great Khan, and offered no presents, refused the customary reverences before Baiju, declined to go on to the imperial court, and made un- seasonable attempts to convert their hosts. The Frankish visitors were accordingly lodged and treated with contempt: for nine weeks (June and July 1247) all answer to their letters was refused. Thrice Baiju even ordered their death. At last, on the 25th of July 1247, they were dismissed with the Noyau's reply, dated the 20th of July. This reply complained of the high words of the Latin envoys, and commanded the pope to come in person and submit to the Master of all the Earth (the Mongol emperor). The mission thus ended in complete failure; but, except for Carpini's (q.v.), it was the earliest Catholic embassy which reached any Mongol court, and its information must have been valuable. It performed something at least of what should

have been (but apparently was- not) done by Lawrence (Lourenco) of Portugal, who was commissioned as papal envoy to the Mongols of the south-west at the same time that Carpini was accredited to those of the north (1245).

See Vincent of Beauvais, Speculum historiale, book xxxii. (some- times quoted as xxxi.), chaps. 26-29, 3 2 > 34» 4°-52. (cf. pp. 453 A- 454 B in the Venice edition of 1 591) ; besides these, several other chapters of the Spec. hist, probably contain material derived from Simon, e.g. bk. xxxi. (otherwise xxx.), chaps. 3, 4, 7, 8, 13, 32; and bk. xxx. (otherwise xxix.), chaps. 69, 71, 74-75, 78, 80. See also d'Ohsson, Histoire des Mongols, ii. 200-201, 221-233; iii. 79 (edition of 1852) ; Fontana, Monumenta Dominicana, p. 52 (Rome, 1675) ; Luke Wadding, Annates Minorum, iii. 116-118; E. Bretschneider, Mediaeval Researches from Eastern Asiatic Sources, vol. i., notes 455, 494 (London, 1888); M. A. P. dAvezac's Introduction to Carpini, pp. 404-405, 433-434, 464-465, of vol. iv. of the Paris Geog. Soc.'s Recueil de Voyages, &c. (Paris, 1839); W. W. Rockhill, Rubruck, pp. xxiv-xxv (London, Hakluyt Soc, 1900) ; C. R. Beazley, Dawn of Modern Geography, ii. 277, and Carpini and Rubruquis, 269-270.

(C. R. B.)

SIMONIDES (or Semonides) OF AMORGOS, Greek iambic poet, flourished in the middle of the 7th century B.C. He was a native of Samos, and derived his surname from having founded a colony in the neighbouring island of Amorgos. According to Suidas, besides two books of iambics, he wrote elegies, one of them a poem on the early history of the Samians. The elegy included in the fragments (85) of Simonides of Ceos is more probably by Simonides of Amorgos. We possess about thirty fragments of his iambic poems, written in clear and vigorous Ionic, with much force and no little harmony of versification. With Simonides, as with Archilochus, the iambic is still the vehicle of bitter satire, interchanging with melancholy, but in Simonides the satire is rather general than individual. His " Pedigree of Women " may have been suggested by the beast fable, as we find it in Hesiod and Archilochus', and as it recurs a century later in Phocylides; it is clear at least that Simonides knew the works of the former. Simonides derives the dirty woman from a hog, the cunning from a fox, the fussy from a dog, the apathetic from earth, the capricious from sea-water, the stubborn from an ass, the incontinent from a weasel, the proud from a high-bred mare, the Worst and ugliest from an ape, and the good woman from a bee. The remainder of the poem (96-118) is undoubtedly spurious. There is much beauty and feeling in Simonides's description of the good woman.

See Fragments in T. Bergk, Poetae lyrici Graeci; separate editions by F. T. Welcker (1835), and especially by P. Malusa (1900), with exhaustive introduction, bibliography and commentary.

SIMONIDES OF CEOS (c. 556-469 B.C.), Greek lyric poet, was born at Iulis in the island of Ceos. During his youth he taught poetry and music in his native island, and composed paeans for the festivals of Apollo. Finding little scope for his abilities at home, he went to live at Athens, at the court of Hipparchus, the patron of literature. After the murder of Hipparchus (514), Simonides withdrew to Thessaly, where he enjoyed the protection and patronage of the Scopadae and Aleuadae (two celebrated Thessalian families). An interesting story is told of the termination of his relations with the Scopadae. On a certain occasion he was reproached by Scopas for having allotted too much space to the Dioscuri in an ode celebrating the victory of his patron in a chariot-race. Scopas refused to

pay all the fee and told Simonides to apply to the Dioscuri for the remainder. The incident took place at a banquet. Shortly afterwards, Simonides was told that two young men wished to speak to him; after he had left the banqueting room, the roof fell in and crushed Scopas and his guests (Cicero, De oratore, ii. 86). There seems no doubt that some disaster overtook the Scopadae, which resulted in the extinction of the family. After the battle of Marathon Simonides returned to Athens, but soon left for Sicily at the invitation of Hiero, at whose court he spent the rest of his life.

His reputation as a man of learning is shown by the tradition that he introduced the distinction between the long and short vowels (e, ij, o, to), afterwards adopted in the Ionic alphabet which came into general use during the archonship of Eucleides (403). He was also the inventor of a system of mnemonics (Quintilian xi. 2, n). So unbounded was his popularity that he was a power even in the political world; we are told that he reconciled Thero and Hiero on the eve of a battle between their opposing armies. He was the intimate friend of Themistocles. and Pausanias the Spartan, and his poems on the war of libera- tion against Persia no doubt gave a powerful impulse to the national patriotism. For his poems he could command almost any price: later writers, from Aristophanes onwards, accuse him of avarice, probably not without some reason. To Hiero's queen, who asked him whether it was better to be born rich or a genius, he replied " Rich, for genius is ever found at the gates of the rich." Again, when someone asked him to write a lauda- tory poem for which he offered profuse thanks, but no money, Simonides replied that he kept two coffers, one for thanks, th other for money; that, when he opened them, he found the former empty and useless, and the latter full.*

Of his poetry we possess two or three short elegies (Fr. 85 seems from its

style and versification to belong to Simonides of Amorgos, or at least not to be the work of our poet), several epigrams and about ninety fragments of lyric poetry. The epigrams written in the usual dialect of elegy, Ionic with an epic colouring, were in- tended partly for public and partly for private monuments. There is strength and sublimity in the former, with a simplicity that is almost statuesque, and a complete mastery over the rhythm and forms of elegiac expression. Those on the heroes of Marathon and Thermopylae are the most celebrated. In the private epigrams there is more warmth of colour and feeling, but few of them rest on any better authority than that of the Palatine anthology. One interesting and undoubtedly genuine epigram of this class is upon Archedice, the daughter of Hippias the Peisistratid, who, " albeit her father and husband and brother and children were all princes, was not lifted up in soul to pride." The lyric fragments vary much in character and length : one is from a poem on Artemisium, cele- brating those who fell at Thermopylae, with which he gained the victory over Aeschylus; another is an ode in honour of Scopas (commented on in Plato, Protagoras, 339 b) ; the rest are from odes on victors in the games, hyporchemes, dirges, hymns to the gods and other varieties. The poem on Thermopylae is reverent and sublime, breathing an exalted patriotism and a lofty national pride ; the others are full of tender pathos and deep feeling, combined with a genial worldliness. For Simonides requires no standard of lofty unswerving rectitude. " It is hard," he says (Fr. 5), " to become a truly good man, perfect as a square in hands and feet and mind, fashioned without blame. Whosoever is bad, and not too wicked, knowing justice, the benefactor of cities, is a sound man. I for one will find no fault with him, for the race of fools is infinite. ... I praise and love all men who do no sin willingly ; but with necessity even the gods do not contend." Virtue, he tells us elsewhere in language that recalls Hesiod, is set on a high and difficult hill (Fr. 58) ; let us seek after pleasure, for " all things come to one dread Charybdis, both great virtues and wealth " (Fr. 38). Yet Simonides is far from being a hedonist ; his morality, no less than his art, is pervaded by that virtue for which Ceos was renowned — aatfrpoavvii or self-restraint. His most celebrated fragment is a dirge, in which Danae, adrift with the infant Perseus on the sea in a dark and stormy night, takes comfort from the peaceful slumber of her babe. Simonides here illustrates his own saying that ' poetry is vocal painting, as painting is silent poetry." Of the many English translations of this poem, one of the best is that by J. A. Symonds in Studies on the Greek Poets. Fragments in T. Bergk, Poetae lyrici Graeci; standard edition by F. G. Schneidewin (1835) and of the Danae alone by H. L. Ahrens (1853). Other authorities are given in the exhaustive treatise of E. Cesati, Simonide di Ceo (1882) ; see also W. Scbroter, De Simonidis Cei melici sermpne (1906).

SIMON'S TOWN, a town and station of the British navy in the Cape province, South Africa, in 34° 15′ S., 18 30′ E., on the

shores of Simon's Bay, an inlet on the west side of False Bay. It is 2 2§ m. S. of Cape Town by rail and 17 m. N. of Cape Point (the Cape of Good Hope). Apart from the naval station the town (pop. 1904, 6642) is an educational and residential centre, enjoying an excellent climate with a mean minimum temperature of 57 and a mean maximum of 70 F. Owing to the influence of the Mozambique current the temperature of the water in the bay is io° to 12 F. higher than that of Table Bay, hence Simon's Town and other places along the shores of False Bay are favourite bathing resorts. The naval establishment is the headquarters of the East India and Cape Squadron.

In 1900 the yard covered about 13 acres, exclusive of the victualling establishment and naval hospital, and was provided with a small camber, slipways for torpedo-boats and small vessels, together with various dockyard buildings, storehouses, coal stores, &c, but had no dry dock or deep-water wharf. Under the Naval Works Loan Act ot 1899 £2,500,000 was provided for the construction of ad- ditional docks east of the original naval yard. These works were begun in 1900 and completed in 1910. They consist of a tidal basin 28 acres in extent, with a depth of 30 ft. at low-water spring tides, enclosed by a breakwater on the eastern and northern sides and a similar projecting arm or pier on the west. The entrance to the basin faces north-westerly, and is 300 ft. in width. South of the basin is a large reclaimed area forming the site of the new dockyard. Opening from the basin is a dry dock, 750 ft. in length on blocks, with an entrance 95 ft. wide and having 30 ft. over the sill at low- water spring tides. The foundation stone of the dry dock was laid in November 1906 by the earl of Selborne, after whom it is named, and the dock was opened in November 1910 by the duke of Connaught.

The Selborne dock can be subdivided – by an intermediate caisson in such a manner as to form two docks, respectively 400 it. and 320 ft. in length, or 470 ft. and 250 ft. in length on blocks, as may be re- quired, or the full length of 750 ft. can be made available. The dockyard buildings include extensive shops for the chief engineer's and chief constructor's departments, the pumping-engine house, working sheds, &c, while ample space is reserved for additional docks and buildings. Berthing accommodation is provided in the basin alongside the wharf walls which surround it. The walls available for this purpose have a total length of 2585 ft. lineal, are

constructed of interlocked concrete block work, with an available depth of water of 30 ft. at low water, and are furnished with powerful shear-legs and cranes for the use of vessels alongside. Extensive sheds for the storage of coal are provided. The whole of the dockyard area (35 acres), including the enclosing breakwater and pier, was formed by reclamation from the sea ; and the total area of the new works, including the tidal basin, is 63 acres.

False Bay, which corresponds on the south to Table Bay on the north side of Table Mountain, is a spacious inlet which has an average depth of from 15 to 20 fathoms, and is completely sheltered on all sides except towards the south. Here a whole fleet of the largest vessels can ride at anchor. Defensive works protect the entrance to the bay.

Simon's Town dates from the close of the 17th century, the town and bay being named after Simon van der Stell, governor of the Cape in 1679-1699. It was at Simon's Town that the first British landing in Cape Colony was made by General Sir James Craig in 1795. About 1810 the bay was selected as the base for the South African squadron, Table Bay being abandoned for that purpose in consequence of its exposed position.

SIMONY, an offence, denned below, against the law of the church. The name is taken from Simon Magus (q.v.). In the canon law the word bears a more extended meaning than in English law. " Simony according to the canonists," says Ayliffe in his Parergon, " is defined to be a deliberate act or a premeditated will and desire of selling such things as are spiritual, or of anything annexed unto spirituals, by giving something of a temporal nature for the purchase thereof; or in other terms it is defined to be a commutation of a thing spiritual or annexed unto spirituals by giving something that is temporal." An example of the offence occurs as early as the 3rd century in the purchase of the bishopric of Carthage by a wealthy matron for her servant, if the note to Gibbon (vol. ii. p. 457) is to be believed. The offence was prohibited by many councils, both in the East and in the West, from the 4th century onwards. In the Corpus juris canonici the Decretum (pt. ii. cause i. quest. 3) and the Decretals (bk. v. tit. 3) deal with the subject. The offender, whether simoniacus (one who had bought his orders) or simoniace promotus (one who had bought his promotion),

was liable to deprivation of his benefice and deposition from orders if a secular priest, — to confinement in a stricter monastery if a regular. No distinction seems to have been drawn between the sale of an immediate and of a reversionary interest. The innocent simoniace promotus was, apart from dispensation, liable to the same penalties as though he were guilty. Certain matters were simoniacal by the canon law which would not be so regarded in English law, e.g. the sale of tithes, the taking of a fee for

confession, absolution, marriage or burial, the concealment of one in mortal sin or the reconcilement of an impenitent for the sake of gain, and the doing homage for spiritualities. So grave was the crime of simony considered that even infamous persons could accuse of it. English provincial and legatine constitutions continually assailed simony. Thus one of the heads in Lyndewode (bk. v.) is, " Ne quis ecclesiam nomine dotalitatis transferat vel pro praesentatione aliquid accipiat." In spite of all the provisions of the canon law it is well established that simony was deeply rooted in the medieval church. Dante places persons guilty of simony in the third bolgia of the eighth circle of the Inferno: —

" O Simon mago, O miseri seguaci,

Che le cose di Dio che di bontate Deono esser spose, voi rapaci Per oro e per argento adulterate." — Inf. xix. 1.

The popes themselves were notorious offenders. In the canto just cited Pope Nicholas III. is made by the poet the mouth- piece of the simoniacs. He is supposed to mistake the poet for Boniface VIII., whose simoniacal practices, as well as those of Clement V., are again alluded to in Par. xxx. 147. At a later period there was an open and continuous sale of spiritual offices by the Roman curia which contemporary writers attacked in the spirit of Dante. A pasquinade against Alexander VI. begins with the lines —

" Vendit Alexander claves, altaria, Christum. Emerat ille prius; vendere jure potest."

Machiavelli calls luxury, simony and cruelty the three dear friends and handmaids of the same pope. 1 The colloquy of Erasmus De sacerdotiis captandis bears witness to the same state of things. And, best proof of all, numerous decisions as to what is or is not simony are to be found in the reported decisions of the Roman rota. 2 That part of the papal revenue which consisted of first-fruits (primitiae or annates) and tenths (decimae) must have been theoretically simoniacal in its origin. In England this revenue was annexed to the crown by Henry VIII. and restored to the church by Queen Anne (see Queen Anne's Bounty).

For the purposes of English law simony is defined by Blackstone as the corrupt presentation of any person to an ecclesiastical benefice for money, gift or reward. The offence is one of purely ecclesiastical cognizance, and not punishable by the criminal law. The penalty is forfeiture by the offender of any advantage from the simoniacal transaction, of his patronage by the patron, of his benefice by the presentee; and now by the Benefices Act 1892, a person guilty of simony is guilty of an offence for which he may be proceeded against under the Clergy Discipline Act 1892.

An innocent clerk is under no dis- ability, as he might be by the canon law. Simony may be committed in three ways — in promotion to orders, in presentation to a benefice, and in resignation of a benefice. The common law (with which the canon law is incorporated, as far as it is not contrary to the common or statute law or the prerogative of the crown) has been considerably modified by statute. Where no statute applies to the case, the doctrines of the canon law may still be of authority. Both Edward VI. and Elizabeth promulgated advertisements against simony. The Act of 31 Eliz. c. 6 was intended to reach the corrupt patron as well as the corrupt clerk, the ecclesiastical censures apart from the statute not extending to the case of a patron. The first part of the act deals with the penalties for election or resignation of officers of churches, colleges, schools, hospitals, halls and societies for reward. The second part of the act provides that if any person or persons, bodies politic and corporate, for any sum of money, reward, gift, profit or benefit, directly or indirectly, or for or by reason of any promise, agreement, grant, bond, covenant or other assurances, of or for any sum of money, &c, directly or indirectly present or collate any person to any benefice with cure of souls, dignity, prebend or living ecclesiastical, or give or bestow the same for or in respect of

1 See Roscoe, Life of Leo X., vol. i. p. 463.

2 Compare the fine distinctions drawn by the casuists and attacked by Pascal in the twelfth of the Provincial Letters.

any such corrupt cause or consideration, every such presentation, collation, gift and bestowing, and every admission, institution, investiture and induction shall be void, frustrate and of none effect in law; and it shall be lawful for the queen to present, collate unto, or give and bestow every such benefice, dignity, prebend and living ecclesiastical for that one time or turn only; and all and every person or persons, bodies politic and corporate, that shall give or take any such sum of money, &c, directly or indirectly, or that shall take or make any such promise, &c, shall forfeit and lose the double value of one year's profit of every such benefice, &c, and the person so corruptly taking, procuring, seeking or accepting any such benefice, &c, shall be adjudged a disabled person in law to have or enjoy the same benefice, &c. Admission, institution, installation or induction of any person to a benefice, &c, for any sum of money, &c, renders the offender liable to the penalty already mentioned. But in this case the presentation reverts to the patron and not to the crown. The penalty for corrupt resigning or exchanging of a benefice with cure of souls is that the giver as well as the

taker shall lose double the value of the sum so given or taken, half the sum to go to the crown and half to a common informer. The penalty for taking money, &c'., to procure ordination or to give orders or licence to preach is a fine of £40; the party so corruptly ordained forfeits £10; acceptance of any benefice within seven years after such corrupt entering into the ministry makes such benefice merely void, and the patron may present as on a vacancy; the penalties are divided as in the last case. The act is cumulative only, and does not take away or restrain any punishment prescribed by ecclesiastical law. The Act of I Will. & M. sess. I, c. 16, guards the rights of an innocent successor in certain cases. It enacts that after the death of a person simoniacally presented the offence or contract of simony shall not be alleged or pleaded to the prejudice of any other patron innocent of simony, or of his clerk by him presented, unless the person simoniac or simoniacally presented was convicted of such offence at common law or in some ecclesiastical court in the lifetime of the person simoniac or simoniacally presented. The act also declares the validity of leases made by a simoniac or simoniacally- presented person, if bona fide and for valuable consideration to a lessee ignorant of the simony. By the Simony Act 1 71 3 if any person shall for money, reward, gift, profit or advantage, or for any promise, agreement, grant, bond, covenant, or other assurance for any money, &c, take, procure or accept the next avoidance of or pre- sentation to any benefice, dignity, prebend or living ecclesiastical, and shall be presented or collated thereupon, such presentation or collation and every admission, institution, investiture and induction upon the same shall be utterly void; and such agreement shall be deemed a simoniacal contract, and the queen may present for that one turn only; and the person so corruptly taking, &c, shall be adjudged disabled to have and enjoy the same benefice, &c, and shall be subject to any punishment limited by ecclesiastical law. The Ecclesiastical Commissioners Act 1840, § 42, provides that no spiritual person may sell or assign any patronage or presentation belonging to him by virtue of any dignity or spiritual office held by him; such sale or assignment is null and void. This selection has been construed to take away the old archbishop's " option, " i.e. the right to present to a benefice in a newly appointed bishop's patronage at the option of the archbishop. By canon 40 of the canons of 1603 an oath against simony was to be administered to every person admitted to any spiritual or ecclesiastical function, dignity or benefice. By the Clerical Subscription Act 1865 a de- claration was substituted for the oath, and a new canon incorporating the alteration was ratified by the crown in 1 866. By the canon law all resignation bonds were simoniacal, and in 1826 the House of Lords held that all resignation bonds, general or special, were illegal. Special bonds have since, however, been to a limited extent sanctioned by law. The Clerical Resignation Bonds Act 1828 makes a written promise to resign valid if made in favour of some particular

nominee or one of two nominees, subject to the conditions that, where there are two nominees, each of them must be either by blood or marriage an uncle, son, grandson, brother, nephew or grand-nephew of the patron, that the writing be deposited with the registrar of the diocese open to public inspection, and that the resignation be followed by presentation within six months of the person for whose benefit the bond is made. The Benefices Act 1898 substitutes and makes obligatory on every person about to be instituted to a benefice a simpler and more stringent form of declaration against simony. The declaration is to the effect that the clergyman has not received the presentation in consideration of any sum of money, reward, gift, profit or benefit directly or indirectly given or promised by him or any one for him to any one; that he has not made any promise of resignation other than that allowed by the Clerical Resignation Bonds Act 1828; that he has not for any money or benefit procured the avoidance of the benefice ; and that he has not been party to any agreement invalidated by sec. 3 sub-sec. 3 of the act which invalidates any agreement for the exercise of a right of patronage in favour or on the nomination of any particular person, and any agreement on the transfer of a right of patronage (a) for the retransfer of the right, or (b) for postponing payment of any part of the consideration for the transfer until a vacancy or for more than three months, or © for payment of interest until a vacancy or for more than three

months, or (d) for any payment in respect of the date at which a vacancy occurs, or (e) for the resignation of a benefice in favour of any person. Cases of simony have come before the courts in which clergy of the highest rank have been implicated. In 1695, in the case of Lucy v. The Bishop of St David's, the bishop was deprived for simony. The queen's bench refused a prohibition (1 Lord Raymond's Rep. 447). In 1841 the dean of York was deprived by the archbishop for simony, but in this case the queen's bench granted a prohibition on the ground of informality in the proceedings (In Re the Dean of York, 2 Q.B.R. 1). The general result of the law previous to the Benefices Act 1898, as gathered from the statutes and decisions, may be exhibited as follows: (1) it was not simony for a layman or spiritual person not purchasing for himself to purchase, while the church was full, as advowson or next presenta- tion, however immediate the prospect of a vacancy; (2) it was not simony for a spiritual person to purchase for himself a life or any greater estate in an advowson, and to present himself thereto; (3) it was not simony to exchange benefices under an agreement that nc payment was to be made for dilapidations on either side; (4) it was not simony to make certain assignments of patronage under the Church Building and New Parishes Acts (9 & 10 Vict. c. 88, 32 & 33 Vict. c. 94) ; (5) it was simony for any person to purchase the next presentation while the church was vacant; (6) it was simony for a spiritual person to purchase

for himself the next presentation, though the church be full; (7) it was simony for any person to purchase the next presentation, or in the case of purchase of an advowson the next presentation by the purchaser would be simoniacal if there was any arrangement for causing a vacancy to be made; (8) it was simony for the purchaser of an advowson while the church was vacant to present on the next presentation; (9) it was simony to exchange otherwise than simpliciter ■, no compensation in money might be made to the person receiving the less valuable benefice. The law on the subject of simony was long regarded as unsatisfactory by the authorities of the church. In 1879 a royal commission reported on the law and existing practice as to the sale, exchange and resignation of benefices. Many endeavours were made in parliament to give effect to the recommendations of the commission, but it was not until 1 898 that any important change was made in the law. The Benefices Act of that year absolutely invalidates any transfer of a right of patronage unless (a) it is registered in the diocesan registry, (b) unless more than twelve months have elapsed since the last in- stitution or admission to the benefice, and © unless " it transfers the whole interest of the transferor in the right " with certain re- servations; in other words, the act abolished the sale of next presentations, but it expressly reserved from its operation (a) a transmission on marriage, death or bankruptcy or otherwise by operation of law, or (b) a transfer on the appointment of a new trustee where no beneficial interest passes. It also substituted another form of declaration for that required under the Clerical Subscription Act 1865 (see above). It abolished the sale by auction of an advowson in gross, and empowered a bishop to refuse to in- stitute or admit a presentee to a benefice on a number of specified grounds: among others, on the ground of possible corrupt pre- sentation through a year not having elapsed since the last transfer of the right of patronage, and constituted a new court to hear appeals against a bishop's refusal to institute. This court consists of a judge of the Supreme Court, who shall decide all questions of law and of fact, and of the archbishop, who gives judgment.

In Scotland simony is an offence both by civil. and ecclesiastical law. The rules are generally those of the canon law. There are few decisions of Scottish courts on the subject. By the Act of 1584, c. 5, ministers, readers and others guilty of simony provided to benefices were to be deprived. An Act of Assembly of 1753 declares pactions simoniacal whereby a minister or probationer before presentation and as a means of obtaining it bargains not to raise a process of augmentation of stipend or demand reparation or enlarge- ment of his manse or glebe after induction.

SIMOOM, or Samum, the name usually given in Algeria, Syria and Arabia to dust and sand-laden desert winds of the sirocco type. See Sirocco and Khamsin.

SIMPLICIUS, pope from 468 to 483. During his pontificate the Western Empire was overthrown, and Italy passed into the hands of the barbarian king Odoacer. In the East, the usurpation of Basiliscus (475-476), who supported the mono- physites, gave rise to many ecclesiastical troubles, which were a source of grave anxiety to the pope. The emperor Zeno, who had procured the banishment of Basiliscus, endeavoured to compound with the monophysite party; and the bishop of Constantinople, who had previously fought on the pope's side for the council of Chalcedon, abandoned Simplicius and sub- scribed to the henoticon, the conciliatory document promulgated in 482 by the emperor. Simplicius died on the 2nd of March 483, but without settling the monophysite question.

SIMPLICIUS, a native of Cilicia, a disciple of Ammonius and of Damascius, was one of the last of the Neoplatonists. When,

in a.d. 529, the school of philosophy at Athens was disendowed and the teaching of philosophy forbidden, the scholars Damascius, Simplicius, Priscianus and four others resolved in 531 or 532 to seek the protection of Chosroes, king of Persia, but, though they received a hearty welcome, they found themselves unable to endure a continued residence amongst barbarians. Before two years had elapsed they returned to. Greece, Chosroes, in his treaty of peace concluded with Justinian in 533, expressly stipulating that the seven philosophers should be allowed " to return to their own homes, and to live henceforward in the enjoyment of liberty of conscience " (Agathias ii. 30, 31). After his return from Persia Simplicius wrote commentaries upon Aristotle's De coelo, Physica, De anima and Categoriae, which, with a commentary upon the Enchiridion of Epictetus, have survived. Simplicius is not an original thinker, but his remarks are thoughtful and intelligent and his learning is prodigious. To the student of Greek philosophy his commentaries are in valuable, as they contain many fragments of the older philo- sophers as well as of his immediate predecessors. (See Neo- platonism.)

See J. A. Fabricius, Bibliotheca Graeca, ix. 529 seq., who praises very highly Simplicius's commentary on the Enchiridion; Ch. A. Brandis's article in Smith's Diet, of Greek and Roman Biography; E. Zeller, D. Phil. d. Gr. III. ii. 851 seq., also Ch. A. Brandis, " tjber d. griech. Ausleger d..Aristot. Organons, " in Abh. Berl. Akad. (1833); C. G. Zumpt, " tjber d. Bestand d. phil. Schulen in Athen," ibid. (1842); Chaignet, Histoire de la psychologie des Grecs, v. 357; Zahlfleisch, Die Polemik des S.

SIMPLON PASS, a pass over the Alps. Not known early save as a purely local route, the Simplon Pass rose into importance when Napoleon caused the carriage road to be built across it between 1800 and 1807, though it suffered a new eclipse on the opening of the Mont Cenis (187 1) and St Gotthard railways (1882). The Simplon tunnel was opened in 1906. The pass proper starts from Brieg (Swiss canton of the Valais), which is in the upper Rhone valley and go§ m. by rail from Lausanne, past St Maurice and Sion. From Brieg it is about 14 m. up to the pass (6592 ft.), close to which is the hospice (first mentioned in 1235) in the charge of Austin Canons from the Great St Bernard. The road descends past the Swiss village of Simplon, and passes through the wonderful rock defile of Gondo before entering Italy at Iselle (28 m. from Brieg). Here the road joins the railway line through the tunnel, which is 12; m. in length, and 2313 ft. high, being thus both the longest and the lowest tunnel through the Alps. From Iselle it is about 1 1 m. by rail to Domo d'Ossola, whence the Toce or Tosa valley is followed to the Lago Maggiore (23 m.). The new line runs along the W. shore of the Lago Maggiore past Baveno, Stresa and Arona, and so on to Milan. (W. A. B. C.)

SIMPSON, SIR JAMES YOUNG (1811-1870), Scottish physician, was born at Bathgate, Linlithgow, Scotland, on the 7th of June 181 1. His father was a baker in that town, and James was the yeungest of a family of seven. At the age of fourteen he entered the university of Edinburgh as a student in the arts classes. Two years later he began his medical studies. At the age of nineteen he obtained the licence of the College of Surgeons, and two years afterwards took the degree of doctor of medicine. Dr John Thomson (1765-1846), who then occupied the chair of pathology in the university, impressed with Simpson's graduation thesis, " On Death from Inflammation," offered him his assistantship. The offer was accepted, and during the session 1S37-1838 he acted as interim lecturer on pathology during the illness of the professor. The following winter he delivered his first course of lectures on obstetric medicine in the extra-academical school. In February 1840 he was elected to the professorship of medicine and midwifery in the university. Towards the end of 1846 he was present at an operation per- formed by Robert Liston on a patient rendered unconscious by the inhalation of sulphuric ether. The success of the proceeding was so marked that Simpson immediately began to use it in midwifery practice. He continued, however, to search for other substances having similar effects, and in March 1847 he read a paper on chloroform to the Medico-Chirurgical Society of

Edinburgh, in which he fully detailed the history of the use of anaesthetics from the earliest times, but especially dwelt upon the advantages of chloroform over ether. He advocated its use, not only for the prevention of pain in surgical operations, but also for the relief of pain in obstetrical

practice, and his un- compromising advocacy of its use in the latter class of cases gave rise to one of the angriest and most widespread contro- versies of the time. In 1847 he was appointed a physician to the queen in Scotland. In 1859 he advocated the use of acu- pressure in place of ligatures for arresting the bleeding of cut arteries, but of more importance were his improvements in the methods of gynaecological diagnosis and obstetrics. His contributions to the literature of his profession were very numer- ous, embracing Obstetric Memoirs and Contributions (2 vols.), Homoeopathy, Acupressure, Selected Obstetrical Works, An- aesthesia and Hospitalism and Clinical Lectures on the Diseases of Women. He also took an active interest in archaeology, and two volumes of his Archaeological Essays, edited by Dr J. Stuart, were published at Edinburgh in 1873. Simpson, who had been created a baronet in 1866, died in Edinburgh on the 6th of May 1870, and was accorded a public funeral; his statue in bronze now stands in West Princes Street Gardens, Edinburgh.

See John Duns, Memoir of J. Y. Simpson (1873); E. B. Simpson, Sir James Simpson (1896) ; and H. L. Gordon, Sir J. Y. Simpson and Chloroform (1897).

SIMPSON, MATTHEW (1811-1884), American bishop of the Methodist Episcopal Church, was born in Cadiz, Ohio, on the 21st of June 1811. He studied medicine in 1830-1833 and began to practise, and in 1833 was licensed as a preacher of the Methodist Episcopal Church. He was pastor of the Liberty Street Church of Pittsburg in 1835, and of a church at Williams- port (now Monongahela) in 1836. In 1837 he was ordained elder and was appointed professor of natural science in Allegheny College, Meadville, in which Madison College had been merged in 1833; and in 1838 he was elected professor and immediately afterwards president of the newly established Indiana Asbury (now De Pauw) University, Greencastle, Indiana, to which he went in 1839; this position he held until 1848. He was editor of the Western Christian Advocate, which he made a strong temperance and anti-slavery organ, from 1848 to 1852. He was elected a bishop in May 1852, and in 1857, with Dr McClintock, visited Great Britain as a delegate to the British Wesleyan Conference, and travelled in the Holy Land. He was an intimate and trusted friend of President Lincoln, who considered his advice of great value, and at whose grave in Springfield he spoke the last words. He addressed the Garfield Memorial Meeting at Exeter Hall, London, on the 24th of September 1881. He died on the 18th of June 1884 in Philadelphia.

He published A Hundred Years of Methodism (1876) ; a Cydopedia of Methodism (1878); Lectures on Preaching (1879), delivered before the Theological Department of Yale College ; and a volume of his Sermons (1885) was edited by George R. Crooks, whose Life of Bishop Matthew

Simpson (New York, 1890) should be consulted.

SIMPSON, THOMAS ‘ (1710-1761), English mathematician, was born at Market Bosworth in Leicestershire on the 20th of August 1 7 10. His father was a stuff weaver, and, intending to bring his son up to his own business, took little care of the boy’s education. Young Simpson was so eager for knowledge that he neglected his weaving, and in consequence of a quarrel was forced to leave his father’s house. He settled for a short time at Nuneaton at the house of a Mrs Swinfield, whom he afterwards married, where he met a pedlar who practised fortune- telling. Simpson was induced to cast nativities himself, and soon became the oracle of the neighbourhood; but he became con- vinced of the imposture of astrology, and he abandoned this calling. After a residence of two or three years at Derby, where be worked as a weaver during the day and taught pupils in the evenings, he went to London. The number of his pupils in- creased; his abilities became more widely known; and he was enabled to publish by subscription his Treatise of Fluxions in 1737. This treatise abounded with errors of the press, and contained several obscurities and defects incidental to the author’s want of experience and the disadvantages under which

he laboured. His next publications were A Treatise on the Nature and Laws of Chance (1740); Essays on Several Curious and Useful ■ Subjects in Speculative and Mixed Mathematicks (1740); The Doctrine of Annuities and Reversions deduced from General and Evident Principles (1742); and Mathematical Disserta- tions on a Variety of Physical and Analytical Subjects (1743). Soon after the publication of his Essays he was chosen a member of the Royal Academy at Stockholm; in 1743 he was appointed professor of mathematics in the Royal Military Academy at Woolwich; and in 1745 he was admitted a fellow of the Royal Society of London. In 1745 he published A Treatise of Algebra, with an appendix containing the construction of geometrical problems, and in 1747 the Elements of Plane Geometry. The latter book, unlike many others with the same title, is not an edition of Euclid’s Elements, but an independent treatise, and the solutions of problems contained in it (and in the appendix to the Algebra as well) are in general exceedingly ingenious. In his Trigonometry, Plane and Spherical, with the Construction and Application of Logarithms, which appeared in 1748, there is a tolerably uniform use of contractions for the words sine, tangent, &c, prefixed to the symbol of the angle. The Doctrine and Application of Fluxions (1750) was more comprehensive than his earlier work on the same subject and was so different that he wished it to be considered as a new book and not as a j second edition of the former. In

1752 appeared Select Exercises for Young Proficients in the Mathematicks, and in 1757 his Miscellaneous Tracts on Some Curious and Very Interesting Subjects in Mechanics, Physical Astronomy and Speculative Mathematics, the last and perhaps the greatest of all his works. From the year 1735 he had been a frequent contributor to the Ladies' Diary, an annual publication partly devoted to the solution of mathematical problems, and from 1754 till 1760 inclusive he was the editor of it. He died at Market Bosworth

on the 14th of May 1761.

See Charles Hutton, Mathematical and Philosophical Dictionary

(1815).

SIMROCK, KARL JOSEPH (1802-1876), German poet and

man of letters, was born on the 28th of August 1802 at Bonn, where his father was a music publisher. He studied law at the universities of Bonn and Berlin, and in 1823 entered the Prussian civil service, from which he was expelled in 1830 for writing a poem in praise of the French July revolution. Afterwards he was admitted as lecturer at the university of Bonn, where in 1850 he was made a professor of Old German literature, and in which city he died on the 18th of July 1876. Simrock estab- lished his reputation by his excellent modem rendering of the Nibelungenlied (1827), and of the poems of Walther von der Vogelweide (1833).

Among other works translated by him into modern German were the Arme Heinrich of Hartmann von Aue (1830),. the Parzival and Tilurel of Wolfram von Eschenbach (1842), the Tristan of Gottfried of Strassburg (1855), and the Heldenbuch (1843-1849), which he supplemented with independent poems. Before the publication of this work he had shown an original poetical faculty in Wieland der Schmied (1835) ; and in 1844 he issued a volume of Gedichle in which there are many good lyrics, romances and ballads. In 1850 appeared Lauda Sion, and in 1857 the Deutsche Sionsharfe, collections of Old German sacred poetry. Of his republications the most popular and the most valuable were the Deutschen Volksbiicher, of which fifty- five were printed between 1839 and 1867. His best contribution to scholarship was his Handbuch der deutschen Mythologie (1853-1855). At an early stage of his career Simrock took a high place among students of Shakespeare by his Quellen des Shakespeare in Novellen, Marchen und Sagen (1831); and afterwards he translated Shake- speare's poems and a considerable number of his dramas. The large number of editions through which Simrock's translations from the Middle High German have passed (the Nibelungenlied more than forty) bear

witness to their popularity. An edition of his Ausgewahlte Werke in 12 vols, has been published by G. Klee (i9°7)-

See N. Hocker, Karl Simrock, sein Leben und seine Werke (1877) ; H. Diintzer, " Erinnerungen an Karl Simrock," in Monatsschrift fur Westdeutschland (1877), and E. Schroder's article in Allg. deutsche Biographie.

SIMS, GEORGE ROBERT (1847-), English journalist and dramatic author, was born on the 2nd of September 1847. He was educated at Hanwell College and at Bonn, and com- menced journalism in 1874 as successor to Tom Hood on Fun.

His first play, Crutch and Toothpick, was produced at the Royalty Theatre in April 1879, and was followed by a number of plays of which he was author or part-author. After long runs at west end houses, many of these became stock pieces in suburban and provincial theatres. His most famous melodramas were: The Lights of London (Princess's theatre, September 1881), which ran for nearly a year; In the Ranks (Adelphi, Oct. 1883), written with H. Pettit, which ran for 457 nights; Harbour Lights (1885), which ran for 513 nights; Two Little Vagabonds (Princess's Theatre, 1896-1897). He was part-author with Cecil Raleigh of the burlesque opera, Little Christopher Columbus (1893), and among his musical plays were Blue-eyed Susan (Prince of Wales's, 1892) and The Dandy Fifth (Birmingham, 1898). His early volumes of light verse were very popular, notably The Dagonet Ballads (1882), reprinted from the Referee. How the Poor Live (1883) and his articles on the housing of the poor in the Daily News helped to arouse public opinion on the subject, which was dealt with in the act of 1885.

SIMSBURY, a township of Hartford county, Connecticut, U.S.A., traversed by the Farmington river and about 10 m. N.W. of Hartford. Pop. (1910) 2537. Area about 38 sq. m. The township is served by the New York,»New Haven & Hartford and by the Central New England railways, which meet at Simsbury village. Among the manufactures are fuses, cigars and paper. A tract along the Tunxus (now Farmington) river, called Massacoe or Saco by the Indians, was ceded to whites in 1648, and there were settlers here from Windsor as early as 1664. In 1670 the township was incorporated as Simsbury. In 167s, during King Philip's War, Simsbury was abandoned; and in 1676 it was burnt and pillaged by the Indians; but it was resettled in the following year. Steel seems to have been made here from native iron in 1727, and in 1739 the General Court of Connecticut granted to three citizens of Simsbury a fifteen years' monopoly of making steel in the colony. Owing to the pine forests pitch and tar were important manufactures in early times. From the N. of Simsbury the township of

Granby (pop. 1910, 1383) was set off in 1786. In this part of the township a copper mine was worked between 1705 and 1745, and smelting and refining works were built in 1721. In 1773 the mine was leased by the General Court and was fitted up as a public gaol and workhouse (called Newgate Prison), the prisoners being employed in mining. Some Tories were imprisoned here after 1780; many of them escaped in May 1781. The prison was rebuilt in 1790 and was used until 1827. The W. of Simsbury was set off in 1806 as Canton (pop. in 1900, 2678).

*See N. A. Phelps, History of Simsbury, Granby and Canton from 1642 to 1845 (Hartford, 1845). *.*

SIMSON, MARTIN EDUARD VON (1810-1899), German jurist and politician, was born at Konigsberg, in Prussia, on the 10th of November 1810, of Jewish parentage. After the usual course at the gymnasium of his native town, he entered its university in 1826 as a student of jurisprudence, and specially of Roman law. He continued "his studies at Berlin and Bonn, and, having graduated doctor juris, attended lectures at the ficole de Droit in Paris. Returning to Konigsberg in 1831 he established himself as a Privatdozent in Roman law, becoming two years later extraordinary, and in 1836 ordinary, professor in that faculty at the university. Like many other distinguished German jurists, -pari passu with his professorial activity, Simson followed the judicial branch of the legal profession, and, passing rapidly through the subordinate stages of auscultator and assessor, became adviser (Rath) to the Landgericht in 1846. In this year he stood for the representation of Konigsberg in the National Assembly at Frankfort-on-Main, and on his election was immediately appointed secretary, and in the course of the same year became successively its vice-president and president. In his capacity of president he appeared, on 3rd April 1849, in Berlin at the head of a deputation of the Frankfort parliament to announce to King Frederick William IV. his election as German Emperor by the representatives of the people. The king, either apprehensive of a rupture with Austria, or fearing detriment to the prerogatives of the Prussian crown should he

accept this dignity at the hands of a democracy, refused the offer. Simson, bitterly disappointed at the outcome of his mission, resigned his seat in the Frankfort parliament, but in the summer of the same year was elected deputy for Konigsberg in the popular chamber of the Prussian Landtag. Here he soon made his mark as one of the best orators in that assembly. A member of the short-lived Erfurt parliament of 1850, he was again summoned to the presidential chair.

On the dissolution of the Erfurt assembly, Simson retired from politics, and for the next few years devoted himself ex- clusively to his academical and judicial duties. It was not until 1859 that he re-entered public life, when he was elected deputy for Konigsberg in the lower chamber of the Prussian Landtag, of which he was president in i860 and 1861. In the first of these years he attained high judicial office as president of the court of appeal at Frankfort on the Oder. In 1867, having been elected a member of the constituent assembly of the North German Federation, he again occupied the presidential chair, as he did also in the first regular Diet and the Zoll-parliament which succeeded it. On 18th December 1870 Simson arrived at the head of a deputation in the German headquarters at Versailles to offer the imperial crown to the king of Prussia in the name of the newly-elected Reichstag. The conditions under which Prussia might justly aspire to the hegemony in Germany at last appeared to have been accomplished, no obstacles, as in 1849, were in the way of the acceptance of the crown by the leading sovereign of the confederation, and on 18th January 1871 King William of Prussia was proclaimed with all pomp German Emperor in the Salle des Glaces at Versailles. Simson continued as president of the Reichstag until 1874, when he retired from the chair, and in 1877 resigned his seat in the Diet, but at Bis- marck's urging, accepted the presidency of the supreme court of justice (Reichsgericht), and this high office he filled with great distinction until his final retirement from public life in 1891. In 1888 the emperor Frederick bestowed upon Simson the order of the Black Eagle.

His political career coincides with the era of German struggles towards unity. As a politician he was one of the leaders of modern Liberalism, and though always loyal when appeals were made to patriotism, such as government demands for the army, he remained obdurate on constitutional questions; and he resolutely opposed the reactionary policy of the Prussian Con- servatives. On his retirement from the presidency of the Reichsgericht, he left Leipzig and made his home in Berlin, where he died on the 2nd of May 1899.

His Life was written by his son, Bernard von Simson, under the title Eduard von Simson, Erinnerungen aus seinem Leben (1900).

(P. A. A.)

SIMSON, ROBERT (1687-1768), Scottish mathematician, the eldest son of John Simson of Kirktonhill in Ayrshire, was born on the 14th of October 1687. He was intended for the church, but the bent of his mind was towards mathematics, and, when a prospect opened of his succeeding to the mathematical chair at the university of Glasgow, he p oceeded to London for further study. After a year in London he returned to Glasgow, and in

171 1 was appointed by the university to the professorship of mathematics, an office which he retained until 1761. He died on the 1st of October 1768.

Simson's contributions to mathematical knowledge took the form of critical editions and commentaries on the works of the ancient geometers. The first of his published writings is a paper in the Philosophical Transactions (1723. vol. xl. p. 330) on Euclid's Porisms (g.f.). Then followed Sectionum conicarum libri_ V. (Edinburgh, 1735), a second edition of which, with additions, appeared in 1750. The first three books of this treatise were trans- lated into English, and several times printed as The Elements of the Conic Sections. In 1749 was published Apollonii Pergaei locorum planorum libri II., a restoration of Apollonius's lost treatise, founded on the lemmas given in the seventh book of Pappus's Mathematical Collection. In 1756 appeared, both in Latin and in English, the first edition of his Euclid's Elements. This work, which contained only the first six and the eleventh and twelfth books, and to which in its English version he added the Data in 1762, was for long the standard text of Euclid in England. After his death restorations of Apollonius's treatise De sectione determinata and of Euclid's treatise De porismatibus were printed for private circulation in

1776 at the expense of Earl Stanhope, in a volume with the title Roberti Simson opera quaedam reliqua. The volume contains also dissertations on Logarithms and on the Limits of Quantities and Ratios, and a few problems illustrative of the ancient geometrical analysis.

See W. Trail, Life and Writings of Robert Simson (1812); C. Hutton, Mathematical and Philosophical Dictionary (1815).

SIMSON, WILLIAM (1800-1847), Scottish portrait, landscape and subject painter, was born at Dundee in 1800. He studied under Andrew Wilson at the Trustees' Academy, Edinburgh, and his early pictures — landscape and marine subjects — found a ready sale. He next turned his attention to figure painting, producing in 1829 the " Twelfth of August," which was followed in 1830 by " Sportsmen Regaling " and a " Highland Deer-stalker." In the latter year he was elected a member of the Scottish Academy; and, having acquired some means by portrait-painting, he spent three years in Italy, and on his return in 1838 settled in London, where he exhibited his " Camaldolese monk showing Relics," his " Cimabue and Giotto," his " Dutch Family," and his " Columbus and his Child " at the Convent of Santa Maria la Rabida. He died in London on the 29th of August 1847. Simson is greatest as a landscapist; his " Solway Moss—Sunset," exhibited in the Royal Scottish Academy of 1831 and now in the

National Gallery, Edinburgh, ranks as one of the finest examples of the early Scottish school of landscape. His elder brother George (1 791-1862), portrait-painter, was also a member of the Royal Scottish Academy, and his younger brother David (d. 1874) practised as a landscape-painter.

SIN (O. Eng. syn: a common Teutonic word, cf. Dutch zonde, Ger. Siinde), a general term for wickedness or a wicked act. As psychology recognizes a distinction of pleasure and pain, and metaphysics of good and evil, so morality assumes the difference between right and wrong in action, good and bad in character; but the distinction in psychology and metaphysics applies to what is, the difference in morality is based on a judgment of what is by what ought to be. When the act or the character does not correspond with the standard, this want of correspondence may in different relations be variously described. In relation to human society, and the rules it imposes on its members, action that ought not to be done is crime; a habit which is injurious to a man's own moral nature, especially if it involves evil physical consequences, is described as vice. If man is thought of as under the authority of God, any transgression of or want of conformity to the law of God is defined as sin. Crime is a legal, vice a moral, and sin a religious term. Sin may be distinguished from guilt as follows: guilt is the liability to penally, that is, to the suffering conceived not as the natural consequence, but as the expression of the divine displeasure, which sin as a breach of divine law involves. Sin is a term applied not only to actions, but also to dispositions and motives. In the theological phrase original sin it means the inherited tendency to do wrong.

There have been two great controversies in the Christian Church on this question, the Augustinian-Pelagian and the Calvinistic-Arminian, one in the 5th century and the other in the 17th. Pelagius declared the capacity of every man to become virtuous by his own efforts, and summoned the members of the Church in Rome to enter on the way of perfection in monasticism. His friend Caelestius was in 412 charged with and excommunicated for heresy because he regarded Adam as well as all his descendants as naturally mortal, denied the racial consequences of Adam's fall, asserted the entire innocence of the new-born, recognized sinless men before the coming of Christ. Pelagius him- self desired to avoid controversy, and with mental reservations denied these statements of his friend; but he did not escape suspicion, and his condemnation in 418 was the signal for a literary polemic, which lasted ten years, and in which Julian of Eklanum was the most brilliant but reckless combatant on the side of Pelagius. In the East the freedom of the will was so insisted on, that one may regard Greek theology as essentially Pelagian. In the West thei e was unanimity only on three points : the necessity of baptism for the remission of sins, the inheritance of sin as a result of Adam's fall, and the indispensableness of tlje divine grace in the attainment of goodness. Pelagius insisted that

sin was an act, not a state, an abuse of the freedom of the will, and that each man was responsible and liable to punishment only for his own acts. This extreme individualism he qualified only in two respects, he admitted a principle of imitation, the influence of bad example, habit and customs, may be inherited and com- municated. Divine grace is not necessary for human virtue. It is granted only according to act, and merits as the law in enlightening, warning or promising reward. To this Augustine opposed the view that Adam's sin is, as its penalty, transmitted to all his descendants, both as guilt and as weakness. The trans- mission is not by imitation, but by propagation. The essence and mode of operation of original sin is concupiscence, which, as of the devil, subjects man in his natural state to the devil's dominion. Even infants are involved in Adam's condemnation. Sin is a necessity in each individual, and there is a total corruption of man's nature, physically as well as morally. Into the details of the controversy it is not necessary to go any further. While the authority of Augustine received lip-homage, the doctrine of the Roman Catholic Church became more Pelagian, and in the Tridentine decrees and still more in the ethics of the Jesuits, in spite of the opposition of Jansenism, Pelagianism at last triumphed. The Reformation restored the teaching of Augustine; in Calvinism especially the sovereignty of the divine and the impotence of the human will were emphasized; and against this exaggeration Arminianism was a protest. Of the five articles of the Remonstrance of 1610 only two now concern us: the possibility of resisting the grace which is indispensable to salvation, and the possibility of falling away from grace even after conversion. The Arminian system was an attempt to modify the Calvinistic theory in a moral interest, so as to main- tain human responsibility, good and ill desert; but to this moral interest the system sacrificed the religious interest in the sufficiency and the sovereignty of divine grace. Its adherents necessarily laid emphasis on human freedom. As regards original sin they taught that the inclinations to evil inherited from Adam are not themselves blameworthy, and only consent to them involves real guilt. It is not just, however, to Arminian- ism to identify it with Pelagianism, as it does strive to make clear man's need of divine grace to overcome sin and reach holiness. In the Evangelical Revival of the 18th century Arminianism was represented by Wesley, and Calvinism by Whitefield.

SIN, the name of the moon-god in Babylonia and Assyria, also known as Nannar, the " illuminer." The two chief seats of his worship were Ur in the S., and Harran considerably to the N., but the cult at an early period spread to other centres, and temples to the moon-god are found in all the large cities of Babylonia and Assyria. He is commonly designated as En-zu,

i.e. " lord of wisdom," and this attribute clings to him throughout all periods. During the period (c. 2600-2400 B.C.) that Ur exercised a large measure of supremacy over the Euphrates valley, Sin was naturally regarded as the head of the pantheon. It is to this period that we must trace such designations of the god as " father of the gods," " chief of the gods," " creator of all things," and the like. We are justified in supposing that the cult of the moon-god was brought into Babylonia by the Semitic nomads from Arabia. The moon-god is par excellence the god of nomadic peoples, their guide and protector at night when, during a great part of the year, they undertake their wanderings, just as the sun-god is the chief god of an agricultural people. The cult once introduced would tend to persevere, and the develop- ment of astrological science culminating in a calendar and in a system of interpretation of the movements and occurrences in the starry heavens would be an important factor in maintaining the position of Sin in the pantheon. The name of Sin's chief sanctuary at Ur was E-gish-shir-gal, " house of the great light " ; that at Harran was known as E-khul-khul, " house of joys." On seal-cylinders he is represented as an old man with flowing beard, with the crescent as his symbol. In the astral-theological system he is represented by the number 30, and the planet Venus as his daughter by the number 15. The number 30 stands obviously in connexion with the thirty days as the average extent of his course until he stands again in conjunction with the sun.

The " wisdom " personified by the moon-god is likewise an expression of the science of astrology in which the observation of the moon's phases is so important a factor. The tendency to centralize the powers of the universe leads to the establishment of the doctrine of a triad consisting of Sin, Shamash and Ishtar (?.».), personifying the moon, sun and the earth as the life- force. (M. Ja.)

SINAI. 1. The Biblical Mount Sinai. In judging of the points of controversy connected with Sinai we are brought face to face with the question of the historicity of the Hebrew records involved. Though new attempts to fix the stations of the wilderness wandering appear every year, critics have long agreed that the number of forty for the years of wandering and for the stations are round numbers, and that the details are not based on historical tradition of the Mosaic age. This does not exclude the possibility that the names of some or all of the stations belong to real places and are based on more or less careful research on the part of the writers who record them. As regards the Moun- tain of the Law in particular, if the record of Exod. xix. seq. is strictly historical, we must seek a locality where 600,000 fighting men, or some two million souls in all, could encamp and remain for some time, finding pasture and drink for their ■ cattle, and where there was a mountain (with a wilderness at its foot) rising so sharply that its base could be fenced in, while yet it was easily ascended, and its summit

could be seen by a great multitude below. In the valley there must have been a flowing stream. The peninsula of Sinai does not furnish any locality where so great a host could meet under the conditions specified, and accordingly many investigators give up the statistics of the number of Hebrews and seek a place that fulfils the other con- ditions. But when we consider that the various records em- bodied in the Pentateuch were composed long after the time of Moses, and that the authors in all probability never saw Sinai, and had no exact topographical tradition to fall back on, but could picture to themselves the scene of the events they recorded only by the aid of imagination, the topographical method of identifying the Mountain of the Law becomes very questionable. The Pentateuchal writers are not at one even about the name of the mountain. It used to be thought that Horeb was the name of the mountain mass as a whole, or of its southern part, while Sinai was the Mountain of the Law proper, but it has been shown by Dillmann that the Elohist and Deuteronomy always use the name Horeb for the same mountain which the Jahvist and the Priestly Code call Sinai. The Elohist belonged to Northern Israel, but Judges v. 5 shows that even in Northern Israel the other name Sinai was not unknown. And it might be shown, though that cannot be done here, that the several accounts vary not only as regards the name but in topographical details. Thus all that can be taken as historically fixed is that after leaving Goshen the Hebrews abode for some time near a mountain called Sinai or Horeb, and that this mountain or range was held to be holy as a seat of the Deity (Exod. ii. 1; 1 Kings xix.).

Where, then, was this mountain? The Midianites, of whom according to one source Jethro was priest, probably always lived E. of the Gulf of "Akaba; yet we can hardly follow Beke in seeking Sinai beyond that gulf, but must rather think of some point in the so-called peninsula of Sinai, which lies between the Gulfs of 'Akaba and Suez, bounded on the N. by the Wilderness el-Tih, which slopes gently towards the Mediterranean. To the south of this wilderness rises the Jebel el-Tih, a mass composed mainly of Nubian sandstone and cretaceous limestone, which attains in fantastic forms an altitude of some 3000 ft. ; its ridges converge towards the S. and are cut off by great valleys from the mass now known as Mount Sinai. The latter is composed of primitive rocks — granite, porphyry, diorite, gneiss, &c. The sandstones of Jebel el-Tih are rich in minerals; inscriptions of Amenophis III. and Thothmes III. found on the spot show that the ancient Egyptians got turquoise at Serablt al-Khadem; and at Maghara, where inscriptions occur bearing the names of kings from Semerkhet and Khufu down to Rameses II. These mines were worked by criminals and prisoners of war, and the

waste products of copper foundries indicate that the peninsula was once better wooded than now, of which indeed we have express testimony of post-Christian date. At present the dominant feature is bare walls of rock, especially in the primitive formations; the steep and jagged summits have a striking effect, which is increased by the various colours of the rock and the clearness of the atmosphere. The deep-cut valleys are filled by rushing torrents after rain, but soon dry up again. In the S. the centre of the main mountain mass is Mount Catherine (8540 ft.), Omm Shomar to the S.E. being little lower; this peak and N. of it Mount Serbal (6750 ft.), which rises more immediately from the plain, dominate the Ka'ah, a waste expanse of sand strewn with pebbles, which occupies the S.W. margin of the peninsula. In the Ka'ah is the village of Tur, and at the S. promontory (Ras Mohammed) is the little hamlet of Sherm. The Sinai group as a whole is called by the Arabs Jebel al-Tur; the name Slna in Arabic comes only from books. The area of the peninsula is about 11,200 sq. m.; the population is four to five thousand souls, chiefly Bedouins of various tribes, whose common name, derived from Tur, is Towara. They have sheep and goats, with which they retire in summer to the higher lands, where there is good pasture ground, and where springs are comparatively common. On the chalk and sandstone water is scarcer than among the primitive rocks, and often brackish. Though the rocks are bare, there is always vegetation in the dales, especially acacias and tamarisks; from the latter (T.

mannifera) manna is still derived in quantities that vary with the rainfall. On the hills grow aromatic plants, especially Thymaceae. The fauna includes the ibex, hyrax and hyaena; the panther too is sometimes found. Flights of quail have been observed. In some valleys there are well-kept gardens and good date-palms; the most noted oasis is that of Feiran, in the N.W. of the peninsula, which is watered by a perennial stream. Whether Feiran is the Rephidim of Exod. xvii. is a question which, like the identifica- tion of the other stations of the Israelites, depends on the localiza- tion of the Mountain of the Law.

There is no genuine pre-Christian tradition on this subject. The chief authority for the ancient sanctity of Mount Sinai is Antoninus Martyr (end of the 6th century), who tells that the heathen Arabs in his time still celebrated a moon feast there. As sin means " moon," this feast has been connected with the name of Sinai, but the proposed etymology is not certain. Of heathen origin, too, are the many Nabataean inscriptions of Sinai, found especially in the Wady Mokatteb (in the N.W.), and sometimes accompanied by rude drawings. The language and character are Aramaic, but the proper names are mainly those of Arabs, who passing by graved their names on the rocks. That they were pilgrims to Sinai cannot be made out with certainty. The inscriptions date from the early years of the Christian era, when the Nabataean kingdom was at its height.

In early Christian times many anchorites inhabited Sinai, living for the most part in the caves, which are numerous even in the primitive rocks. Then monasteries were built, the most famous being the great one of St Catherine in Wady el-Der (the valley of the monastery). On Serbal, too, there were many granite dwellings, and in the neighbouring Pharan (Phoenicion), which was a bishop's see, there were, as the ruins show, churches and convents.

The question then is whether when the hermits first settled in the peninsula there existed a tradition as to the place of the Mountain of the Law, and whether they chose for their residence a spot which was already traditionally consecrated by memories significant to the Christian as well as to the Jew. No assertion of the existence of such a tradition is to be found in Josephus, who only says that Sinai was the highest mountain of the district — a description which might apply to Serbal as seen from the plain below. Eusebius uses expressions which may also seem to point to Serbal as the place of the law-giving, and it must be admitted that the tradition which seeks the holy site in the group of Jebel Musa. (i.e. the mass of which Mount Catherine is the highest peak) is not older than the time of Justinian, so that the identification with Mount Serbal seems to have greater

antiquity in its favour. In later times Jebel Musa. and Serbal had each its own tradition, and the hoJy places were pointed out at each; thus from the monastery of St Catherine a path of granite steps was constructed up to " the Mountain of the Law," but similar steps are found at Serbal. That these traditions are not decisive, however, is admitted, more or less, even by those moderns who, like Lepsius, Ebers, Bartlett, give their voice for Serbal. Most authorities still prefer Jebel Musa or some point in that group, but they again differ in details. First of all there is much difficulty in determining the route by which the Hebrews approached the mountain. Then comes the question of finding a suitable plain for their encampment under the mountain, which is best met if, with Robinson, Stanley, Palmer and others, the plain is taken to be that of al-Rahe and the overhanging moun- tain to be Jebel Sufsafeh. The latter is over 6300 ft. high, and consists of pasture ground; it does not fit all the details in Exodus, but this objection is quite as strong against the tradi- tional site on Jebel Musa (Mount Moses), which lies farther S. Jebel Musa has been accepted by Tischendorf, Laborde, Ritter, Strauss, Farrar, and many others; on this view the Israelites must have encamped in the narrow Wady al-Seya'iyeh, N. of the mount. But the absence of exact topographical detail on the part of the Biblical narrators, who always speak of Sinai as if it were a single summit and give no hint about several summits of which it is one, shows that in their time there was no real tradition on the matter, and that all attempts at identification are necessarily vain.

*Literature. — Burckhardt, Travels in Syria, &c. (London, 1822); Leon de Laborde, Voyage de I' Arabic Petree (Paris, 183c— 1836); Robinson, Biblical Researches (London, 1841); Lepsius, Reise (Berlin, 1845); Stanley, Sinai and Palestine; Fraas, Aus d. Orient (Stuttgart, 1867); Ordnance Survey of the Pen. of Sinai (South- ampton, 1869, 3 vols.); Palmer, Desert of the Exodus (Cambridge, 1871); Ebers, Durch Gosen zum Sinai (2nd ed., Leipzig, 1881); Baker Greene, The Hebrew Migration (London, 1883); Hull, Mount Seir, Sinai and West Palestine (London, 1885). See also the Palestine * Society's Quarterly Statement, passim. (A. So.)*

2. The Peninsula: Recent Research. — The peninsula of Sinai is about 230 m. in extreme length and 150 m. wide, or nearly the size of Ireland. It is practically waterless and barren, the population being not a thousandth of that on an equal area in England. The S. part is a high mass of schists and granite, deeply cut into valleys; it is overlaid by carboniferous sandstone, and limestone, capped with tertiary basalt, flows in the mining region. The N. part is an expanse of cretaceous limestone and nummulitic tertiary limestone, sloping down to the Mediter- ranean. The steep valley of the Gulf of Suez has been greatly deepened — if not formed — since the tertiary limestone was deposited, the beds dipping down sharply to the sea.

The only water supply of any importance is that in the Wady Feiran; elsewhere only small water-holes preserve enough for a few persons, but fresh water can be obtained along the shore route by digging.

The difficulty about the numbers of the Israelites who lived here has lately been treated on a fresh basis. That they were not more numerous than the previous inhabitants is shown by the difficulty in conquering the Amalekites at Rephidim. In the census lists of the Book of Numbers the hundreds of people in each tribe are in most cases 4 or 500; 2, 3, 6 or 700 are rare; o, 1, 8 or 900 do not occur. The hundreds are therefore inde- pendent of the thousands prefixed to them: and as aldf means both a " thousand " and a " family," it is proposed that the original census was in numbers of tents or families, and hundreds of people; and that later the family numbers were mistaken for thousands. Other points agree in this view, such as the number of persons in a family, the similarity of hundreds in the census before and that after the wanderings, and the actual size of Goshen, from which they came, and the population of Sinai where they settled. Thus the total numbers were 5730 people. The internal evidence that the census lists are original documents is very strong, though they have been misunderstood by later compilers. It is impossible to suppose a population trained in Egypt not having the ability to keep some tribal

records of numbers and movements such as were the basis of the existing re-edited narrative.

The history of the Egyptian settlements has been investigated. They began in the 1st Dynasty, shown by the tablet of the con- quest by King Semerkhet (5280 B.C.) above the mines of turquoise at Wady Maghara. Seneferu (4750 B.C.) was already working at Serabit for turquoise. Other kings who left records here are Sanekht (Illrd Dynasty), Khufu (IV th), Sahura, Ranuser, Menkauhor (Vth), Amenemhat I., Senusert I., Senusert II., Senusertlll., Amenemhatll., Amenemhat III., Amenemhat IV. (Xllth), Aahmes I., Amenhotep I., Tahutmes I., Hatshepsut, Tahutmes III., Tahutmes IV., Amenhotep III. (XVIIIth), Rameses I., Sety I., Rameses II., Merenptah, Sety II., Tausert, Setnekht (XlXth), Rameses III., IV., V. and VI. (XXth). The monuments are mostly inscriptions recording the mining expedi- tions and offerings made to the goddess of turquoise. The original shrine of the goddess was a cave; this was hewn out and buildings were gradually added before it to a length of 230 ft. The records show that no fewer than twenty-five different grades of officials took part in the work of mining, which was highly organized as regards direction, technical ability,

labour and transport, often as many as 700 men being employed. Over 400 objects with kings' names have been found in the fragments of the offerings which were left in the shrine. The worship at Serabit was that of Hathor, mistress of turquoise. She is identical with Athtar or Ishtar, the Semitic goddess of Arabia. The features of the worship were entirely Semitic and not Egyptian. An enormous mass of burnt-offerings is shown by the bed of ashes before the sacred cave; tanks for ablutions are found in the temple courts, altars of incense are in the shrine itself, and also conical stones; and chambers or shelters for dreaming before the temple are a main feature. All of these belong to Semitic worship, and they show that before Mosaism the elements of the worship were the same as are found in later times.

For all the recent research see W. M. Flinders Petrie, Researches in Sinai (1906). (W..M. F. P.)

SINAIA, a town of Rumania, about 12 m. S. of the Hungarian frontier at Predeal, on the railway from Ploesci to Kronstadt in Transylvania. Pop. (1900), 2210. Sinaia resembles a large model village, widely scattered among the pine forests of the lower Carpathians, and along the banks of the Prahova, a swift alpine stream. The monastery of Sinaia, founded by Prince Michael Cantacuzino in 1695, was the residence of the royal family until the present chateau was built. It consists of two courts surrounded by low buildings. In the centre of each court is a small church built in the Byzantine style. The monks possess a library, in which are kept valuable jewels belonging to the Cantacuzene family. Castle Peles or Pelesh, the modern palace, named after the hill on which it stands, is of a mixed style of architecture. The interior is fitted with magnificent wood carvings and stained glass windows illustrating the principal scenes of " Carmen Sylva's " writings. Until 1850 Sinaia con- sisted of little more than the monastery and a group of huts. In 1864, however, the monastic estate was assigned to the Board of Civil Hospitals, by which a hospital and baths were opened and the mineral springs developed. Sinaia soon became the favourite summer resort of Bucharest society, and rapidly developed in' all its equipment.

SINALOA, a N. state of Mexico, bounded N. by Sonora and Chihuahua, E. by Durango, S. by Tepic, and W. by the Gulf of California, with a coast line of nearly 400 m. Area, 33,671 sq. m. Pop. (1900), 296,701, largely Indians. The surface consists of a narrow coastal zone where tropical conditions prevail, a broad belt of mountainous country covered by the ranges of the Sierra Madre Occidental and their intervening valleys where oak and pine forests are to be found, and an intervening zone among the foothills of the Sierra Madre up to an elevation of 2000 ft., where the conditions are subtropical. The state is traversed by numerous streams, the

largest of which have broad valleys among the foothills. The largest of these are the Culiacan, Fuerte and Sinaloa, the last two having short navigable courses across the lowlands.

Rain is plentiful everywhere, except in the extreme north, where the conditions are arid. The climate of the low-lying coast lands is hot and malarious, but in the mountains it is cool and healthy. Cereals and mezcal are produced on the uplands, and sugar, rum, coffee, tobacco, grape spirits and fruit in the lower zones. There are excellent cotton lands in the state and the production of this staple was largely developed during the American Civil War, but it has since declined. Grazing receives considerable attention in the uplands, where the temperature is favourable and the pasture- age good, and hides are largely exported. Mining, however, is the chief industry, Sinaloa being one of the richest mineral-producing states in the republic. Gold, silver, copper, iron and lead are found. There are also salt deposits and mineral springs. The best-known silver mines are the Rosario, from which about $90,000,000 had been extracted up to the last decade of the 19th century, and the Nuestra Sefiora de Guadalupe de los Reyes, discovered early in the 19th century and yielding over $85,000,000 before its close. The forest products of the state include rubber,. resins, cabinet and dye- woods, deerskins, orchilla and ixtle fibre. Up to the beginning of the 20th century Sinaloa had only one short railway, which con- nected Culiacan with its port Altata. Since then the Mexican branch of the (American) Southern Pacific railway from Nogales to Guaymas has been extended S.E. along the coast. Sinaloa has excellent natural harbours, only two of which — Mazatlan and Altata — are much used. The bays of Agiobampo and Topolobampo are prospective railway terminals with fine harbours. The capital of the state is Culiacan Rosales (commonly called Culiacan), on the Culiacan river 59 m. from its port, Altata, at the mouth of the same river, with which it is connected by rail. It is a well-built town, with some thriving manufactures, including cotton goods, cigarettes, liqueurs, &c. It is the see of a bishop and has a fine cathedral. Culiacan (pop. in 1900, 10,380) is the distributing centre for a large district between Guaymas and Mazatlan. The most important town is Mazatlan, one of the leading ports of Mexico on the Pacific coast, and the commercial centre for S. Sinaloa and N. Durango. Other towns are Mocorito (pop. 9971 in 1895), Sinaloa and Fuerte, all in the N. of the state, Rosario (pop. 8448 in 1900), and San Ignacio in the S.

SINAN PASHA (1515-1596), Turkish soldier and statesman, was an Albanian of low origin. In 1 569 he was appointed governor of Egypt and was occupied until 1 571 in the conquest of Yemen. In 1574 he commanded the great expedition against Tunis, which, in spite of the brave defence by the Spanish and Italian garrison, was added to the Ottoman empire. In 1580 Sinan commanded the army against Persia and was

appointed grand vizier, but was disgraced and exiled in the following year, owing to the rout of his lieutenant Mahommed Pasha, at Gori, in an attempt to provision the Turkish garrison of Tiflis. He subse- quently became governor of Damascus and, in 1589, after the great revolt of the Janissaries, was appointed grand vizier for the second time. Another revolt of Janissaries led to his dismissal in 1591, but in 1593 he was again recalled to become grand vizier for the third time, and in the same year he commanded the Turkish army against Hungary. In spite of his victories he was again deposed in February 1 595, shortly after the accession of Mahommed III., and banished to Malghara; but in August was in power again and on the march to Wallachia. The unhappy course of this campaign, culminating in the fall of Gran, brought him once more into disfavour, and he was deprived of the seal of office (November 19). The death of his successor, Lala Mahommed, three days later, was looked on as a sign from heaven, and Sinan became grand vizier for the fifth time. He died suddenly on the 3rd of April 1 596.

Bold, overbearing and unscrupulous, Sinan recoiled from no baseness to put a rival out of the way; while his insolence was not confined to foreign ambassadors, but was exercised towards his opponents in the sultan's presence. He had a barbarous hatred not only for Christians but for all civiliza- tion. The immense fortune which he left is a proof of his rapacity.

Another Sinan Pasha was governor of Anatolia at the time of Mahommed II. 's death in 1481. He was a brother-in-law of Bayezid II. and defeated Prince Jem's troops at Brusa. In Selim I.'s reign he served with great distinction in the Persian and Egyptian cam- paigns and fell at the battle of Ridania, where the Mamelukes were defeated, in 1517.

A third Sinan Pasha, brother of the grand vizier Rustem Pasha, was grand admiral under Suleiman I. and died about 1553.

See J. v. Hammer-Purgstall, Gesch. des Osmanischen Reiches (2nd ed.. Pesth. 1840), and authorities there cited.

SINCLAIR, the name of an old Scottish family, members of which have held the titles of earl of Orkney and earl of Caithness. The word is a variant of Saint Clair.

Sir William Sinclair, or Saint Clair (c. 1260-c. 1303), was the descendant of a line of Anglo-Norman barons, one of whom obtained the barony of Rosslyn from King David I. in the 12th century. Sir William took part in

the dispute over the succession to the crown of Scotland in 1292, and was one of the leaders of the Scots in their revolt against Edward I. One of his sons was William Sinclair (d. 1337), bishop of Dunkeld, who was responsible for the defeat of an English force at Donibristle in Fife in 13 17. Sir William's eldest son was Sir Henry Sinclair (d. 1330), the friend of Robert the Bruce; and Sir Henry's son was Sir William Sinclair, who was slain by the Saracens in August 1330, while journeying through Spain to Palestine with Sir James Douglas, the bearer of the heart of Bruce. This Sir William Sinclair married Isabel, daughter of Malise, earl of Strathearn, Caithness and Orkney (d. c. 1350), and their son Sir Henry Sinclair (d. c. 1400) obtained the earldom of Orkney by a judgment of the Norwegian king Haakon VI. in 1379. He then helped to conquer the Faeroe Islands, and took into his service the Venetian Travellers, Niccolo and Antonio Zeno, sailing with Antonio to Greenland. This prince of Orkney, as he is sometimes called, was succeeded by his son Henry (d. 1418), who was admiral of Scotland, and then by his grandson William (c. 1404-1480), the founder of the beautiful chapel at Rosslyn.

William, the 3rd earl of his line, whose earldom of Orkney was a Norwegian dignity, was made chancellor of Scotland in 1454 and Lord Sinclair and earl of Caithness in 1455. He took some part in public affairs in Scotland, and when in 1470 the Orkney Islands were ceded by Norway to King James III. he resigned all his rights therein to his sovereign and was known merely as earl of Caithness. His eldest son, William, having offended his father by his wasteful habits, the earl settled his earldom on his eldest son by another marriage, also called William, who was killed at Flodden in 15 13. The elder William, however, in- herited the title of Lord Sinclair, and the family was thus split into two main branches. John, the 3rd earl, was killed in 1529 while attempting to seize the Orkney Islands.

George, 4th earl of Caithness (c. 1525-1582), a son of the 3rd earl, was a Roman Catholic and a supporter of Mary Queen of Scots, but he was mainly occupied with acts of violence in the north of Scotland. His grandson George, the 5th earl (c. 1566- 1643), was outlawed and compelled to fly to the Shetlands. He left many debts, and his great-grandson and successor, George, the 6th earl (d. 1676), who was childless, arranged that his estates should pass to a creditor, Sir John Campbell, afterwards earl of Breadalbane. Campbell was created earl of Caithness in 1677, but the title was also claimed by George Sinclair (d. 1698), a grandson of the 5th earl, and in 1681 the privy council decided in his favour. When Alexander, the 9th earl, died in 1765 the title was successfully claimed by William Sinclair (d. 1779), a descendant of the 4th earl, who became the 10th earl. James, the 1 2th earl (1 766-1823), was descended from another branch of the 4th earl's family, and his grandson James, the 14th earl (1821-1881), was a representative peer for

Scotland from 1858 to 1868, and was created a peer of the United Kingdom as Baron Barrogill in 1866. He was interested in scientific matters, and published Lectures on Popular and Scientific Subjects

(1877).

The title of Lord Sinclair passed from William, the 2nd lord, who died about 1488, to John (1610-1676), who became the 9th lord in 1615. At first a covenanter, afterwards he became a royalist, and was taken prisoner at the battle of Worcester. He died with- out male issue and the title became dormant. His estates, how- ever, passed to his grandson, Henry St Clair (1660-17 23), the son of his daughter Catherine (d. 1666) and her husband, John St Clair of Herdmanston, and in 1677 Henry was created Lord Sinclair with the precedence of the older title. He had two sons, John Sinclair (1683-1750) the Jacobite, and James Sinclair, who became a general in the British army, and was also ambassador it Vienna and Turin and a member of parliament for many

years After the attainder of John, in consequence of his share in the rising of 1715, the family estates were settled on James, but he resigned them to his elder brother when the latter was pardoned in 1726. The pardon, however, did not include the restoration of the title. Earlier in life John Sinclair had killed a man named Shaw in a duel and had afterwards shot this man's brother. He was tried by court-martial and sentenced to death, but was pardoned. An account of the proceedings in the court-martial was edited by Sir Walter Scott for the Roxburghe Club (Edin- burgh, 1828). Sinclair himself wrote Memoirs of the Rebellion, published by the Roxburghe Club in 1858.

Neither of the brothers left male issue, and the title devolved upon a cousin, Charles St Clair (d. 1775), who was not included in the attainder. Charles did not claim it, but in 1782 his grandson Charles (1768-1863) was declared to be Lord Sinclair. He was a Scottish representative peer from 1807 to 1859 and is the ancestor of the present holder of the title.

Three brothers were also noted Sinclairs: — Oliver, the friend of James V. and the leader of the Scots at the rout of Solway Moss; Henry (1508-1565), bishop of Ross and president of the court of session, who made some additions to Hector Boece's Chronicles of Scotland; and John (d. 1566), bishop of Brechin.

See Sir R. Douglas, The Peerage of Scotland, new ed. by Sir J. B. Paul; G. E. (Cokayne), Complete Peerage; Sinclair, The Sinclairs of England (1887); Sir R. Gordon and G. Gordon, The Earldom of Sutherland (Edinburgh, 1813), and Hay, Genealogy of tlie Sinclairs of Roslin (1835).

SINCLAIR, SIR JOHN, Bart. (1754-1835), Scottish writer on finance and agriculture, was the eldest son of George Sinclair of Ulbster, a member of the family of the earls of Caithness, and was born at Thurso Castle on the 10th of May 1754. After studying at Edinburgh, Glasgow and Trinity College, Oxford, he was admitted to the faculty of advocates in Scotland, and called to the English bar, but never practised. In 1780 he was returned to parliament for Caithness, and subsequently repre- sented several English constituencies, his parliamentary career extending, with few interruptions, until 181 1. He established at Edinburgh a society for the improvement of British wool, and was mainly instrumental in the creation of the Board of Agriculture, of which he was the first president. His reputation as a financier and economist had been established by the publica- tion, in 1784, of his History of the Public Revenue of the British Empire; in 1793 widespread ruin was prevented by the adoption of his plan for the issue of exchequer bills; and it was on his advice that, in 1797, Pitt issued the " loyalty loan " of eighteen millions for the prosecution of the war. His services to scientific agriculture were no less conspicuous. He supervised the com- pilation of the valuable Statistical Account of Scotland (21 vols., 1 791-1799), and also that of the General Report of Scotland, issued by the Board of Agriculture; and from the reports compiled by this society he published in 1819 his Code of Agriculture. He was a member of most of the continental agricultural societies, a fellow of the Royal Societies of London and Edinburgh, as well as of the Antiquarian Society of London, and president of the Highland Society in London. Originally a thorough supporter of Pitt's war policy, he later on joined the party of " armed neutrality." In 1805 he was appointed by Pitt a commissioner for the con- struction of roads and bridges in the N. of Scotland, in 1810 he was made a member of the privy council and, next year, received the lucrative sinecure office of commissioner of excise. He died on the 21st of December 1835.

Sir John Sinclair, who was created a baronet in 1780, was twice married, first to a daughter of Alexander Maitland, by whom he had two daughters, and secondly to Diana, daughter of the first lord Macdonald, by whom he had thirteen children. His eldest son, Sir George Sinclair (1790-1868) was a writer and a member of parliament, representing Caithness at intervals from 1811 till 1841. His son, Sir John George Tollemache Sinclair, the 3rd baronet, was member for the same constituency from 1869 to 1885. The first baronet's third son, John (1797-1875), became archdeacon of Middlesex; the fifth son, William (1804-1878), was prebendary of Chichester and was the father of William Macdonald Sinclair (b. 1850), who in 1889 became archdeacon of

London; the fourth daughter, Catherine (1800-1864), at one time enjoyed some vogue as an author.

See Correspondence of the Right Hon. Sir John Sinclair, Bart., with Reminiscences of Distinguished Characters (2 vols., London, 1831); and Memoirs of the Life and Works of the Right Hon. Sir John Sinclair (2 vols., Edinburgh, 1837).

SIND, a former province of India, now a division of the Bombay-presidency. It is the most northerly portion of the presidency, lying between 23 35′ and 28 29′ N. and between 66° 40′ and 71 10′ E., having an area of 53,116 sq. m. and a population (1001) of 3,410,223. It includes the six districts of Karachi, Hyderabad, Thar and Parkar, Larkhana, Sukkur and Upper Sind Frontier, together with the native state of Khairpur. It differs widely in physical features and climate, no less than in the language, dress and customs of the people, from the rest of the presidency, from which it is cut off by the deserts or the sea. It is bounded on the N. by Baluchistan and the Punjab; on the E. by the desert tracts of W. Rajputana; on the S. by the Runn of Cutch and the Indian Ocean; and on the W. by Baluchistan. Physical features. — Sind proper, or the central alluvial plain watered by the Indus, lies between the Kohistan or hilly country that rises to the Kirthar range on the Baluchistan border, and the Registan or Thar desert that stretches E. into Rajputana. The Kohistan in years of good rainfall yields abundant fodder for cattle and camels, and supports a scanty tillage on the banks of the hill streams or nais, one of which, named the Hab, forms the boundary between Sind and Baluch- istan. Central Sind lies on both banks of the Indus, which flows S. in a bed that has been raised by the deposit of silt above the surrounding country. Except where its bed is confined by rocks, as at Sukkur, Rohriand along the edge of the Kohistan from Lakhi to Jhirak, the river constantly changes its course, especially in the delta, the head of which is now opposite Shah- bandar. Central Sind depends on the yearly inundation of the Indus, which begins to rise in March and reaches its highest point about the middle of August. The water is distributed by a very ancient system of canals, which has been greatly improved and extended since the British conquest. The soil is a plastic clay desposited by the river.

The great geographical feature in Sind is the lower Indus, which passes through the entire length of the country, first in a S.W. direction, then turning somewhat to the E., then returning to a line more directly S., and finally inclining to the W., to seek an outlet at the sea. The distant line of mountains between Sukkur and Sehwan, the steep pass overhanging the water at Lakhi, and the hill country below Sehwan give a distinctive

character to the right bank. Sind has been aptly likened to Egypt. If the one depends for life and fertility on the Nile, so does the other on the Indus. The cities and towns are not so readily to be compared. Hyderabad, notwithstanding its remarkable fortress and handsome tombs, can scarcely vie in interest as a native capital with Cairo; nor can Karachi, as a Europeanized capital, be said to have attained the celebrity of Alexandria. The province contains many monuments of archaeological and architectural interest.

Owing to the deficiency of rain, the continuance of hot weather in Sind is exceptional. Lying between two monsoons, it just escapes the influence of both. The S.W. monsoon stops short at Lakhpat in Cutch, the N.W. monsoon at Karachi, and even here the annual rainfall is not reckoned at more than 6 or 8 in. At times there is no rain for two or three years, while at others there is a whole season's rainfall in one or two days. The average temperature of the summer months rises to 95° F., and the winter average is 6o°, the summer maximum being 120 and the winter minimum 28 . The temperature on the sea-coast is much more equable than elsewhere. In northern Sind we find frost in winter, while both here and in Lower Sind the summer heat is extreme and prolonged. This great heat, combined with the poisonous exhalations from the pools left after the annual inundation and the decaying vegetable deposits, produces fever and ague, to which even the natives fall a prey.

Agriculture. — The salt of the delta is the only mineral product of commercial importance. Timber and fuel are supplied chiefly by the babul (Acacia arabica), bahan (Populus euphratica), kandi (Pro- sopis spicigera) and iron wood (Tocoma undulata), and fruit by the date, mango and pomegranate. The chief rabi or spring crops, sown from August to October and reaped from February to April, are wheat, barley, gram, oilseeds and vegetables. The chief winter

or kharif crops, sown from May to July and reaped from October to December, are the millets (bajri and juar), rice, urad (Phaseolus radiatus), mung (Phaseolus mungo), cotton and indigo. Efforts are being made to introduce the long-stapled Egyptian cotton. Agri- culture is almost entirely dependent upon irrigation from the Indus.

Manufactures. — Among the chief manufactures may be mentioned gold, silver, and silk embroideries, carpets, cloths, lacquered ware, horse-trappings and other leather-work, paper, pottery, tiles, swords and matchlocks, and the boxes and other articles of inlaid work introduced from Shiraz. Lac work, a widely extended industry in India, is also in vogue in Sind. Variously coloured lac is laid in succession on the boxes while turning on the lathe, and the design is then cut through the different

colours. Hyderabad was long famous for its silks and cottons, silver and gold work and lacquered ornaments, and the district could once boast of skilled workmen in arms and armour; but these old industries are now on the decline. In the cloths called sudi, silk is woven with the striped cotton — a practice possibly due to the large Mahommedan population of the country, as no Moslem may wear a garment of pure silk. Chundari, or knotting, is another method of decorating cotton and silk goods. The extension of cotton cultivation in Sind has caused a brisk de- velopment in ginning factories of recent years. The Sind cotton- printers are the most skilful and tasteful in the Bombay presidency. Cotton carpets, rugs, horse-cloths, towels and napkins are manu- factured at the gaols. Woollen saddle-cloths, blankets and felts are also made. Sind produces the best pottery of India. The art was introduced or developed by the Mahommedans, whose rulers gave it every encouragement. Magnificent tombs and mosques, now in ruins, testify to the skill of the ancient potters. Leather is worked in a variety of articles, such as saddle-covers for camels and horses, shoes, leggings and accoutrements. In 1904 two new flour and rice-cleaning mills were started at Sukkur.

Trade. — The trade of Sind is carried on through Karachi with foreign countries, and across the land frontier with Afghanistan, Baluchistan and Seistan. Karachi is the great port for the grain trade of all N. India, and is also the great strategic military port for the N.W. frontier. The chief articles of import are cotton and woollen goods, iron and steel, mineral oil, sugar, tea and machinery; while the chief exports are wheat and other grains, cotton, wool, oilseeds, hides and skins, and bones. On the land frontier the chief articles of import are horses, ponies, mules, sheep and goats, woollen and cotton piece-goods, wheat, gram and pulse, rice, fruits and nuts, provisions, stores, leather, ghee, raw wool, silver, assafoetida, drugjs, hides, fish, seeds, manufactured silk, spices and tobacco; while the exports are cotton twist and yarn, piece-goods, leather, metals, coal and coke, wheat, husked rice, liquors, ghee, sugar, tea, tobacco, wool and silver.

Fauna. — The last tiger in Sind was shot about 1885. Among other wild animals are the hyaena, the gurkhar or wild ass (in the S. of the Thar and Parkar district), the wolf, jackal, fox, wild hog, antelope, pharho or hog deer, hares and porcupines. Of birds of prey, the vulture and several varieties of falcon may be mentioned. The flamingo, pelican, stork, crane and Egyptian ibis frequent the shores of the delta. Besides these there are the ubara (bustard) or tilur, the rock-grouse, quail, partridge and various kinds of parrots. Waterfowl are plentiful; in the cold season the lakes or dhandhs are covered with wild geese, kulang, ducks, teal, curlew and snipe. Among other animals to be noted are scorpions, lizards, centipedes and many snakes.

The domestic animals include camels (one-humped), buffaloes, sheep and goats, horses and asses (small but hardy), mules and bullocks. Of fish there are, on the sea-coast, sharks, saw-fish, rays and skate; cod, sir, cavalho, red-snapper, gassir, begti, dangara and buru abound. A kind of sardine also frequents the coast. In the Indus, the finest flavoured and most plentiful fish is the palo, generally identified with the hilsa of the Ganges. Dambhro (Labeo rohita) and mullet, morako (Cirrhina mrigala), gandan (Notopterus hapirat), khago or catfish (Rita buchanani), popri (Barbus sarana), shakur, jerkho and singhdri (Macrones aor) are also found. Otter, turtle and porpoise are frequently met with ; so too are long-snouted crocodiles and water-snakes.

Forests. — The area of reserved forest in Sind is 1065 sq. m. The forests are situated for the most part on the banks of the Indus, and extend S. from near Rohri to the middle delta. They are narrow strips of land, from 2 to 3 m. in length, and ranging from 2 furlongs to 2 m. in breadth. The largest are between 9000 and 10,000 acres in area, but are subject to diminution owing to the encroachments of the stream. The wood is principally babul (Acacia arabica), bahan (Populus euphratica) and kandi (Prosopis spicigera). The tali (Dalbergia Sissoo) grows to some extent in Upper Sind ; the iron-wood tree (Tocoma undulata) is found near the hills in the Mehar districts. There are, besides, the nim (Melia Azadirachta), the pipal (Ficus religiosa), the ber (Zizyphus Jujuba). The delta has no forests, but its shores abound with mangrove trees. Of trees introduced are the tamarind (Tamarindus indica), several Australian wattle trees, the water-chestnut (Trapa natans), the aula (Emblica officinalis), the bahera (Terminalia Bellerica), the carob tree (Ceratonia Siliqua), the China tallow (Stillingia sebifera), the bel (Aegle Marmelos) and the manah (Bassia latifolia). There is a specially organized forest department.

Irrigation. — The Indus at its source is 16,000 ft. above sea-level. At Attock it'is still 2000 ft. above the sea. It is, therefore, a rapid river, which brings down a great quantity of silt from the mountains and deposits it in the Sind valley. The bed of the river is always rising, and has to be constantly watched to prevent its overflowing its banks, while the quantity of silt that the water contains makes it very valuable to the cultivator. The inundation canals of the Indus have, therefore, been carried to a high degree of perfection, though the water of the river cannot be fully utilized until the proposed barrage is constructed at Sukkur. The chief of the existing canals are: on the right bank of the Indus, the Desert, Undarwah, Begari, Mahiwah, Sukkur, Ghar, Sattah, Sind and Western Nara canals;

and on the left bank the Eastern Nara, Hiral, Jamrao, Dad, Nasrat, Fuleli and Hasanali canals. Within the area watered by these canals all vegetation is luxuriant; but beyond the reach of the silt- laden waters the dry and hardened ground is almost bare.

Railways. — Sind is traversed by the North- Western railway, which follows the Indus from the Punjab to the sea at Karachi. The Indus is twice bridged : at Rohri where the main line crosses the river and a branch goes off to Quetta; and at Kotri, opposite Hyderabad, whence a narrow-gauge line was opened into Rajputana in 1900, and another branch runs S. to Budin in the delta. A chord line connects Hyderabad with Rohri, to evade the erosion of the Indus, giving an alternative route from Karachi to Quetta and the N.W. frontier. One of the main purposes of the Indus valley line is the strategic defence of that frontier.

Population. — The great majority of the inhabitants of Sind are of Hindu descent, converted to Islam. They speak a language of their own, which is akin to that of the Punjab, though retaining many archaic peculiarities. Mahommedans, who form more than three-fourths of the total, may be divided into Sindis proper and naturalized Sindis. The Sindi proper is a descendant of the original Hindu. In sect he is a Suni, though the Talpur mirs adopted the Shiah persuasion. There is, as a rule, no distinction of caste, except that followers of certain vocations — such as weavers, leather-workers, sweepers, huntsmen — are considered low and vile. The six different classes of naturalized Sindis are — the four families of the Saiyids (the Bokhari, Mathari, Shirazi and Laghari); the Afghans; the Baluchis; the slaves or Sidis — originally Africans; the Memans; and the Khwajas. More than half of the Hindus are Lohanas, originally traders, who have almost monopolised government service and the professions. Brahmans are few and uninfluential. Sikhs are numerous.

Administration. — Sind is administered as a non-regulation province, under a commissioner, who resides at Karachi. The highest court, independent of the High Court at Bombay, is that of the judicial commissioner, consisting of three judges, one of whom must be a barrister specially qualified to deal with mercantile cases. The Karachi brigade, forming part of the Quetta or fourth division of the Southern army, is distributed in cantonments at Karachi, Hyderabad and Jacobabad.

History. — Sind has a history of its own, distinct from the rest of India. In the early centuries of the Christian era it was ruled by a Buddhist dynasty, with capitals at Alor and Brahmanabad. It was the first part of the peninsula to be invaded by the Mahom- medans, under Mahommed bin Kasim, a general of the caliph, in 711. The invasion was by sea, from the mouth of the Indus; and for nearly three centuries Sind remained

nominally subject to the Arab caliphs. Though conquered by Mahmud of Ghazni in the course of his raids into India, Sind long preserved a semi-independence under two local dynasties, the Sumras and the Sammas, both of Rajput descent but Mahommedans in religion. The latter had their capital at Tatta, in the delta of the Indus, which continued to be a seaport until the 18th century. The Sammas were followed by the Arghuns, of foreign origin, and the Arghuns by the short-lived Turkhan dynasty. It was not till the time of Akbar, who had himself been born at Umarkot in Sind, that the province was regularly incorporated in the Delhi empire. When that empire broke up on the death of Aurangzeb, local dynasties again arose. The first of these was the Kalhoras, who were succeeded by the Talpurs, of Baluch descent, who were ruling under the title of Mirs, with their capital at Hyderabad, when the British first entered into close relations with the country. The East India Company had established a factory at Tatta in 1758; but the Talpur mirs were never friendly to trade, and the factory was withdrawn in 1775. In 1830 Alexander Burnes

was permitted to pass up the Indus on his way to the court of Ranjit Singh at Lahore, and two years later Henry Pottinger concluded a commercial treaty with the mirs. It was, however, the expedition to Afghanistan in 1838 for the restoration of Shah Shuja that forced on matters. The British army under Sir John Keane marched through Sind, and the mirs were compelled to accept a treaty by which they paid a tribute to Shah Shuja. surrendered the fort of Bukkur to the British, and allowed a steam flotilla to navigate the Indus. The crisis did not arrive till 1842, when Sir Charles Napier arrived in Sind and fresh terms were imposed on the mirs. The Baluch army resented this loss of independence, and attacked the residency near Hyderabad, which was bravely defended by Outram. Then followed the decisive battle of Meeanee and the annexation of Sind. A course of wise, firm and kindly administration inaugurated by Sir Charles Napier himself, and continued by Sir Bartle Frere, Sir W. Merewether and later commissioners, has since made the province peaceful and prosperous.

See H. M. Birdwood, The Province of Sind (Society of Arts, 1903) ; and Sir Richard Burton, Scinde (1851).

SINDBAD THE SAILOR, VOYAGES OF, a collection of Arabic travel-romances, partly based upon real experiences of Oriental navigators in the seas S. of Asia and E. of Africa (especially in the 8th-ioth centuries); partly upon ancient poetry, Homeric and other; partly upon Indian and Persian collections of mirabilia. In Sindbad's First Voyage, from Bagdad and Basra, the incident of the Whale-Back Island may be compared with the Indian Ocean whales of Pliny and Solinus, covering four jugera, and the pristis sea-monster of the same authorities, 200 cubits long; Al Kazwini tells a similar tale of a colossal tortoise. Such Eastern stories are probably

the original of the whale-island in the Irish travel-romance of St Brandan. With the Island of the Mares of King Mihraj, or Mihrjan, we may find (rather imperfect) parallels in Homer's Iliad (the mares impreg- nated by the wind), in Ibn Khurdadbih and Al Kazwini, and in Wolf's account of the three Ilhas de Cavallos near Ceylon, so called from the wild horses with which they abounded, to which the Dutch East India merchants of the 17th century sometimes sent their mares for breeding purposes. Sindbad's account of the Kingdom of Mihraj (Mihrjan) is perhaps derived from the Two Musulman Travellers of the 9th century; it would seem to refer to one of the greater East Indian islands, perhaps Borneo. With the Rukh (" roc ") of the Second Voyage we may compare Al Kazwini, and, more particularly, Ibn Al Wardi, who mentions the Island of the Rukh among the isles of the China Sea, and relates two incidents parallel to adventures with the rukh of Sindbad's Second and Fifth Voyages. Marco Polo in a famous passage describes this monstrous bird in detail, locates it apparently to the S. of Madagascar, and relates how one of its supposed feathers had been taken to the grand khan of the Mongols. Sindbad's Valley of Diamonds has fairly complete parallels in Al Kazwini, in Benjamin of Tudela, in Marco Polo and in the far earlier Epiphanius, bishop of Salamis in Cyprus, who died a.d. 403. As to the Mountain, or Island, of Apes in the Third Voyage, Ibn Al Wardi and Idrisi each recognizes an island of this kind, the former in the China Sea, the latter near Sokotra. Sindbad's negro cannibal adventure, next following, reproduces almost every detail of the Cyclops story in the Odyssey; among the Spice Islands, and perhaps at Timor, may be located the island rich in sandal-wood, where the wanderer rejoins his friends. The cannibal land of the Fourth Voyage, producing pepper and coco-nuts, where Sindbad's companions were offered food which destroyed their reason, has suggested the Andamans to some inquirers and certain districts of Sumatra to others; with this tale we may compare the lotus-eating of the Odyssey, Plutarch's story of Mark Antony's soldiers maddened and killed by an " insane " and fatal root in their Parthian wars, a passage in Davis's Account of Sumatra in 1599, and more com- plete parallels in Ibn Al Wardi and Al Kazwini. The burial of Sindbad in, and his escape from, the cavern of the dead is faintly foreshadowed in the story of Aristomenes, the Messeniaa hero, and in a feference of St Jerome to a supposed Scythian

custom of burying alive with the dead those who had been dear to them; the fully-developed Sindbad tale finds an echo in " Sir John Mandeville." For the " Old Man of the Sea," in the Fifth Voyage, we may also refer to Al Kazwini, Ibn Al Wardi and the romance of Seyf Zu-1 Yezen; Sindbad's

tyrannical rider has usually been explained as one of the huge apes of Borneo or Sumatra, improved to make a better story. The account of pepper, somewhat later in this Voyage, has a good deal in common with Idrisi's; Sindbad's pearl-fishing is probably to be located in the famous beds off Ceylon, of which Marco Polo has an excellent description. The romance of Seyf Zu-1 Yezen has a voyage along a subterranean river similar to that of Sindbad on his Sixth Voyage; the elephant adventure of the Seventh Voyage adds another to the many stories of the elephant's sagacity which were already told in every southern country, and of which we have many examples in Pliny's Historia Naturalis, and in Aelian's Historia Animalium.

See Richard Hole, Remarks on the Arabian Nights' Entertainments, in which the Origin of Sindbad's Voyages . . . is particularly con- sidered (London, 1797) ; Eusebius Renaudot's edition of the Two Musulman Travellers (1718, translated into English, 1733, as A ncient A ccounts of India and China by two Mahommedan Travellers . . . in the Qth Century) ; J. T. Reinaud, Relations des voyages fails par les Arabes et les Per sans dans I'Inde et d la Chine dans le IX" siecle (1845); E. W. Lane's translation of the Arabian Nights (London, 1859), especially the notes in vol. iii. pp. 77-108; M. J. de Goeje, La Legende de Saint Brandan (1890) ; C. R. Beazley, Dawn of Modern Geography (1897), i. 235-238, 438-450. Besides the works noticed in the text of this article, the 12th-century Romance of Duke Ernest of Bavaria, written in German rhyme by Henry of Veldeck about 1 160, gives parallels to Sindbad's flight through the air (tied to his rukh) in Voyage II., to the subterranean river-excursion in Voyage VI., and to some other incidents. (C. R. B.)

SINDHI (properly Sindhi, the language of Sindh, i.e. Sind) AND LAHNDA (properly Lahnda or Lahindd, western, or LahndS-di boll, the language of the west), two closely connected forms of speech belonging, together with Kashmiri (q.v.), to the N.W. group of the outer band of Indo-Aryan languages. In the following pages it will be assumed that the reader is familiar with the main facts stated in the articles Indo-Aryan Languages and Prakrit.

In 1901 Sindhi (including Kachchhl) was spoken by 3,494,971 people, and Lahnda by 3,337,917, — the former in Sind and Cutch, and the latter in the W. Punjab and adjoining tracts (for further details on this point see the article Lahnda). The parent Prakrit, from which Lahnda is sprung, must once have extended over the greater part of the Punjab, but, as explained under Indo-Aryan Languages, the population of the Midland expanded so as to cover the E. and centre of that province, and the language (Panjabi) now there spoken is a mixed one, Midland in its main characteristics, but snowing more and more traces of its old Lahnda basis as we go W. The wave of Midland progress exhausted itself in the barren

tract of the west-central Punjab, and W. of about the seventy-third degree of E. longitude Lahnda holds decisive sway. The facts are very much the same with regard to the mixed language of Rajputana. Here the expansion of the Midland language was stopped by the desert, beyond which lies Sindhi. Lahnda and Sindhi, the W. outposts of Indo-Aryan speech, have accordingly for centuries occupied a peculiarly isolated position, and have in many respects struck out common lines of independent growth. This process was aided by the presence of PiSaca languages (see Indo-Aryan Languages). In early times there were Pisaca colonies along the Indus, right down to its delta, and both Sindhi and Lahnda have borrowed many peculiarities from their dialects.

Sindhi is directly derived from the Vracada Apabhrarhsa Prakrit (see Prakrit). The name of the Apabhrarhsa from which Lahnda is derived is not known, but it must have been closely allied to Vracada. Sindhi has one important dialect, Kachchhl, spoken in Cutch. Here the language has come into contact with Gujarati and is somewhat mixed with that form of speech. For the dialects of Lahnda, and the various names under which that language is known, see the article Lahnda.

Owing to their geographical position both Sind and the W. Punjab were early subject to Mahommedan inroads. The

bulk of the population is Mussulman, and their languages make free use of words borrowed from Persian and (through Persian) from Arabic. The written character employed for Lahnda is usually that modification of the Persian alphabet which has been adopted for Hindostani. The same is the case for Sindhi, except that further modifications have been introduced to represent special sounds. In both languages, Hindus also employ a script akin to the well-known Nagari alphabet (see Sanskrit). It is the same as the " Landa " (a word distinct from " Lahnda ") or " clipped " character current all over the Punjab and is very imperfect, being seldom legible to any one except its original writer, and not always so to him.

Phonetics. 1 — The phonetic system of both languages in most respects resembles that of other Indo-Aryan vernaculars. Space will not allow us to do more than draw attention to the main points of difference. In other Indo-Aryan languages a final short vowel is generally elided. This rule is also followed in Lahnda, but the genius of Sindhi requires every word to end in a vowel, and hence these short vowels are still retained. Thus, Skr. naras, a man, Pr. naro, Ap. naru, L. nar, but S. nar". In Sindhi these final short vowels are, as in Kashmiri, very lightly pronounced, so that they are hardly audible to a person unacquainted with the language. They are therefore printed in these pages as small letters above the line. In the cognate Kashmiri a short i or u affects by epenthesis the pro- nunciation of

*a preceding vowel, just as in English the silent vowel e added to " mar " changes its pronunciation to " mare." So, in Kashmiri, mar" is pronounced mor. Lahnda, especially when dropping the final short vowel, has similar epenthetic changes. Thus chohar(u), a boy, becomes chohur; shahar(u), a city, becomes first shdhur and then, further, shdhur (d like the a in " all ") ; while choharii), a girl, becomes chohir. The oblique singular (see below) of chohur is chohar, for chohar{a) with a final a instead of a final «, and hence the vowel of the second syllable is unchanged. Similarly, the oblique form of shdhur is shahar, while the oblique form of chohir is still chohir, because it also originally ended in *. Similar epenthetic changes have not been noted in Sindhi. In that language and in Lahnda the short vowel i, when preceded or followed by h, or at the end of a word, is pronounced as a short e. Thus S. kiharo, of what kind, and S. mihit', a mosque, are respectively pronounced keharo and mehet". When i is so pronounced, it will be written as e or e in the following pages.*

In Prakrit almost the only consonants which had survived were double letters, and in most of the Indo-Aryan vernaculars these have been simplified, the preceding vowel being lengthened in com- pensation. Thus, Ap. kammu, a work, Hindostani, kam. In Panjabi and Lahnda the double consonant is generally retained, as in kamm, but in Sindhi, while the double consonant is simplified, the vowel, as in the Pisaca languages, remains short; thus, kam". This non- lengthening of the vowel in such cases is typical of Sindhi, words like S. ag°, fire, from Ap. aggi, being quite exceptional. It even happens that an original long vowel coming before a conjunct consonant is shortened when the conjunct is simplified. Thus, Skr. turyam, S. tun, a trumpet.

In Sindhi, as in Pisaca, a sibilant is liable to be changed into h. Thus, Skr. maihsam, S. mas u or mah", flesh; Skr. deSas, S. des u or deh", a country. In L. the s is generally, but not always, preserved. As in most Indo-Aryan languages a medial d becomes the hard ? ; thus, S. juran", to join ; L. ghord, a horse. As in the Pisaca languages, there is great confusion between cerebrals and dentals. There was the same tendency in Vracada Apabhrarhsa, and it is more common in Sindhi than in Lahnda. Thus, Skr. tamrakas, S. Jdmo, copper; Skr. dandas, S. Sand", a staff. Moreover, in Sindhi, t and d become regularly cerebralized before r, as in Ap. putru, S. pu(r", a son; Ap. drakhd, S. drakh", a vine. The cerebral I does not appear in Sindhi, but it has survived from Prakrit in Lahnda, being subject to the same rules as in Marathi (q.v.). When / represents a Prakrit single I, it becomes /, but if it represents a Prakrit U, it remains a simple dental /. It may be remarked that the same rule seems to have applied in the Prakrit spoken by the Pisacas.

Sindhi has a series of strengthened consonants — g, J, d, and 5. They are

pronounced ” with a certain stress in prolonging and somewhat strengthening the contact of the closed organ, as if one tried to double the sound at the beginning of a word.’ They often, but not always, represent an original double letter. Thus, Ap. laggau, S. logo, applied ; Ap. garuau, S. garo, heavy, but S. earo, mangy; Ap. vijjd S.vija, science; L. jat ,S. fat”, a Jat; Ap. vaddau, S. vadS, great; Ap. ddlia, S. doll, a_sedan-chair; Ap. dubbalu, S.

Declension. — Both languages have lost the neuter gender, _ all nouns being either masculine or feminine. The rules for distinguish- ing gender are much as in Hindostani. As in other Indo-Aryan languages, nouns may be either strong or weak, the strong forms being derived from nouns with the pleonastic Sanskrit suffix ka (see Hindostani and Marathi), In Sindhi a masculine weak form

1 Abbreviations : Skr. = Sanskrit ; bhrarhsa ; L. = Lahnda ; S. = Sindhi.

Pr. = Prakrit ; Ap. = Apa-

SINDHI AND LAHNDA

HS

*in ” corresponds to the strong one in o, and feminine weak forms in “and ‘ to a strong one in *. In Lahnda weak forms have dropped the final short vowel, and the strong forms end in a (masc.) and i (fern.).*

As explained in the articles above referred to, almost the only old case that has survived throughout the declension of both languages is the general oblique. This is used for any oblique case, the particular case required being as a rule further defined by the help of a postposition. The general oblique case, without any denning postposition, is specially employed for the case of the agent. There are also examples of the survival of the old locative and of the old ablative. Thus S. math”, top, loc. math’, on the top; L. Ambi, at Amb; L. vela, time, rofl-de vile, at the time of food; L. jangil, for jangali, in the forest. This locative is of regular occurrence in the case of Sindhi weak masculine nouns in “. For the old ablative, we have S. ghar”, L. ghar, a house, abl. S. gharo, L. ghari, and so others. The locative termination can be referred to the Ap. locative termination -hi or -hi, and the ablative i or 3 to the Ap. -ha or -hit. The nominative plural, and the general oblique case of both numbers are formed as in the following examples: —

Comparison is effected as in Hindostani by putting the noun with which comparison is made in the ablative case. Sometimes special postpositions are employed for this form of the ablative.-

Case.

. Singular.

Plural.

Sindhi.

Lahnda.

Sindhi.

Lahnda.

Nominative Accusative . Agent Dative . Ablative

Genitive Locative

ghoro

ghoro

ghore

ghore-khe

ghori,

ghore-kha

ghore-jo

ghore-ml

ghora

ghora

ghore

ghore-nU

ghore-to

ghore-dd ghore-vic

ghoza

ghora

ghor.i

ghoran'-khe

ghoranei,

ghoran'-khi

ghoran'-jo

ghor.an'-mi

ghor.e

ghore

gher.ei

ghoreS-nU

ghor.ei-to

ghorei-di ghorei-vic

The usual pronouns are as follows, pronounced as in German : —

I — S. in, 8, mi or m&; L. mi

In the Lahnda forms a is

Singular.

Plural.

Nominative.

Oblique.

Nominative.

Oblique.

Sindhi.

Lahnda.

Sindhi.

Lahnda.

Sindhi.

Lahnda.

Sindhi.

Lahnda.

Weak Noun —

Masc.

ghar” , a house

ghar

ghar”

ghar

ghar”

ghar

gharan’, ghara, ghare

ghari

Fern. .

jibh”,

jibbh

jibh”

jibbh

jibhtt,

jibbhi

Jibhun’,

jibbha

a tongue

Jibha

Jibha, jibhi

,, ...

ag>,

agg

ag’

agg

ageu

agga

agean”,

aggi

fire

aged., dgii

Strong Noun —

Masc.

ghoro, a horse

ghora.

ghore

ghore

ghora

ghore

ghoran’, ghora, ghori

ghorea

Fern. .

ghori,

ghori

ghori”

ghori

ghoriU

ghorii

ghorin’,

ghoria

a mare

ghoria, ghorii

obi. S. I We— S. S. asi ; my — S. Of us, asadd. Thou-

., mi, mu; L. mi. asl; L. assi; obi. L. assi. Of me, muh”-jo ; L. mera.

our — S. asi-jo; L.

In Lahnda the final short vowel of the weak forms has been dropped, but in some cases the final u of the masculine and the final i of the feminine have been preserved by epenthesis, as explained under the head of phonetics. The origin of the nominative plural and of the various oblique forms is explained in the article Hindo- stani. In the same article is discussed the derivation of most of the postpositions employed to define the various oblique forms and to make real cases. There are as follows: S. khe, L. n-tt, to or for; S. khi, L. to, f rom ; S. jo, sando, L. da, of; S. mi, L. vie, in. It will be observed that the Lahnda forms are identical with those found in Panjabi. In both languages the accusative case is the same as the nominative, unless special definiteness is required, when, as usual in Indo-Aryan vernaculars, the dative is employed in its place. The agent case is the oblique form without any postposition. The S. khe is a corruption of Ap. kaahi, Skr. krte; and similarly kha from Ap. kaahu, Skr. krtdt. S. sando, like the Rajasthani hands and the Kashmiri sand” or hand”, is by origin the present participle of the verb, substantive, ghar”sando, meaning literally ” existing (in connexion) with the house,” hence ” of the house.” We may

com pare the Bengali use of haite, on being, to mean " from." All these postpositions are added to the oblique form. We thus get the declension of the strong masculine noun S. ghoro, L. ghora, a

Those, they — S. ho; L. oh,

S. L. t&; obi. S. to; L. ta, ta, tudh. You — S. tavht, avhi; L. tussi; obi. S. tavhi, avhi; L. tussi. Of thee, thy— S. tah e -jd; L. (era. Of you, your — S. tavhi-jo, avhi- jo; L. lusada. tuhada.

This, he, she, it — S. hi; L. eh; obi. S. hin", in"; L. is. These, they — S. he; L. eh, «°n;' obi. S. hin', in'; L. inhi.

That, he, she, it — S. hit; L. oh; obi. S. hun", un"; un; obi. S. hun', un'; L.

L. us. unhi.

That, he, she, it — S. so; obi. tah'. Those, they — S. se; obi. tan'. We should expect corresponding forms for Lahnda, but they are not given in the grammars.

Self — S. pan"; L. ape. Own — S. pih"-jo; L. apna. Cf. Panjabi dp, Kashmiri pan".

Who — S. L. jo; obi. S. jah'; L. ja; plur. nom. S. je; L. jo; obi. S.jan'; L. jinhi.

Who ? — S. ker"; L. kaun; obi. S. kdh'; L. ki; plur. nom. S. kef; L. kaun; obi. S. kan'; L. kinhi.

What? — S. chd; L. ca; obi. S. chd; L. kitt.

Any one — S. L. koi; obi. S. kahi; L. kdhe.

The derivation of most of these forms can be gathered from the article Hindostani. Others, such as assi, tussi, pan", are borrowed from Pisaca.

The north-western group of Indo-Aryan vernaculars, Sindhi, Lahnda, and Kashmiri, are distinguished by the free use which they make of pronominal suffixes. In Kashmiri these are added only to verbs, but in the other two languages they are also added to nouns. These suffixes take the place of personal pronouns in various cases and are as follows : —

First Person.

Second Person.

Third Person.

Singular.

Plural.

Singular.

Plural.

Singular.

Plural.

Nom.

Other Cases.

Nom.

Other Cases.

Nom.

Other Cases.

Nom.

Other Cases.

Nom.

Agent.

Other Cases.

Nom.

Agent.

Other Cases.

Sindhi . Lahnda

s' m

m', mi m

si se

a, ha

(not as

gen.)

se

e i

e

i

u

ve

V”

ve

None

None

J s

s e s

None None

u ne

n e , »”, ne

horse, as shown in the next column. When there are optional methods of making the oblique form only one is given. The others can be employed in the same way.

As in most other Indo-Aryan vernaculars, the genitive is really a possessive adjective, and agrees with the person or thing possessed in gender, number and case, exactly as in Panjabi.

An adjective agrees with its qualified noun in gender, number and case. In Lahnda, as in Hindostani, the only adjectives which change in these

respects are strong adjectives in a. In Sindhi weak forms in ” also change the u to ‘ or ” in the feminine. Thus, S. cano, L. canga, good, fem. S. carji, L. cangi; S. nidhar”, helpless, fern. nidhar” or nidhar”. The plural and oblique forms are made as in the case of nouns. If a postposition is used with the noun it is not also used with the adjective. Thus, L. cangii ghor.ii-dd, of good mares.

All these suffixes are remnants of the full pronominal forms. In all cases they can be at once explained by a reference to the originals in Pisaca, rather than to those of other Indo-Aryan languages. 1 It will here be convenient to consider them only in connexion with nouns. In such cases they are usually in the genitive case. Thus, S. piu, a father; pium”, my father; piu’, thy father; piuv”, your father; pius”, his father; piun’ or piun”, their father. There being in Sindhi no suffix of the genitive plural of the first personal pronoun, there is no compound for ” our father.” For that, as in the beginning of the Lord’s Prayer, we must employ the full ex- pression, asi-jo piu. In Lahnda we have piu, a father; pium, my

1 See G. A. Grierson, The Pisaca Languages of North-Western India (London, 1906), pp. 44 ff.

father; piii.se, our father; pim, thy father; piuve, your father; pius, his father; piune, their father. A junction vowel is often inserted between these suffixes and the main word to assist the pronunciation. Further examples will be found under the head of verbs.

Conjugation. — As in Marathi (g.n.) there are, in both languages, two conjugations, of which one (intransitive) has a and the other (transitive) e or i for its characteristic letter. The differences appear in the present participle and, in Sindhi, also in the con- junctive participle, the present subjunctive and imperative. The two latter are the only original synthetic tenses which have survived in Sindhi, but in Lahnda the old synthetic future is also in common use. Both languages have a passive voice formed by adding ij or 17 to the root. This form is not employed for the past participle or for tenses derived from it. The following are the principal parts of the regular verb in each conjugation: —

Infinitive Present participle Past participle Conjunctive participle

First Conjugation.

Sindhi.

halan", halandd, halid, hall,

Lahnda.

halan, to go. haldd, going. haled, gone. hali, having gone.

Second Conjugation.

Sindhi.

mdran", marindo, mario, mare,

Lahnda.

mdran, to kill. mdrendd, killing. mdred, killed. mari, having killed

It will be observed that, as in most other Indo-Aryan vernaculars, the past participle of the transitive verb is passive in signification. There is therefore no need of a past participle for the passive voice. The Sindhi present participle of the passive voice follows a different rule of formation, and, in Lahnda, it omits the letter j, thus S. mdribd (Pr. mdriawac), L. mdrindd, being killed. In other respects the passive, S. mdrijan", L. mdrijan, to be killed, is conjugated like a regular verb of the first conjugation. The passive is directly derived from the Outer Prakrit passive in ijja. The origin of the other forms is dealt with under Hindostani and Marathi.

The present subjunctive is the direct descendant of the old Prakrit (q.v.) present indicative. It is conjugated as follows: —

Person.

Singular.

Plural.

First _ Conjugation.

Second Conjugation.

First Conjugation.

Second Conjugation.

Sindhi and Lahnda.

Sindhi.

Lahnda.

Sindhi.

Lahnda.

Sindhi.

Lahnda.

1. 2.

3-

hali hale hale

maris mdrii marie

mari marii mare

ha ha halan”

la Id

halin

maria mario mdrin”

§ £ §

The imperative is formed very similarly. In Lahnda the future is mdresi (Pr. mdrissam), I shall kill, conjugated like mdri. The Sindhi future is formed by adding the nominative pronominal suffixes to the present participle. It will be remembered that there are no nominative suffixes of the third person. For that person, therefore, the simple participie is employed. There are slight euphonic changes of the termination of the participle in the other persons. Thus, halandd, he will go; halandus”, I shall go; and so on.

The past tense is formed from the past participle, with pronominal suffixes added in both languages. As in the transitive verb the past participle is passive in signification, the subject (see article Hin- dostani) must be put in the agent case, and the participle agrees in gender and number with the direct object, or, if the object is put in the dative case instead of the accusative, is treated impersonally in the masculine. Examples of this tense are: —

Intransitive verb — S. halid, L. haled, he went; S. L. hali, she went; S.

haliu-s”,h. haleu-m, I (masc.) went; S. halia-s’,h. haliu-m, I (fem.) went, and so on.

Transitive verb — S. mario, L. mdred, he was killed ; S. L. mart, she was killed; S. mdriu-m”, L. mdreu-m, he was killed by me, I killed him ; S. maria-m”, L. mdriu-m, she was killed by me, I killed her; S. pdtishdk” saji gdlh’ budhdi, the-whole matter (fem.) was- related (fem.) by-the-king (agent), the king related the whole matter; S. tah’-khe sdth” chadib, with-reference-to-her, by-the-cara- van, it-was-abandoned (impersonal), i.e. the caravan abandoned her.

There are numerous compound tenses formed by conjugating the verb substantive with one or other of the participles. The usual forms of the present and past of this verb are as follows : —

Person.

Present, ” I am,” &c. (com. gen.).

Past, ” I was,” &c. (masc.).

Singular.

Plural.

Singular.

Plural.

Sindhi.

Lahnda.

Sindhi.

Lahnda.

Sindhi.

Lahnda.

Sindhi.

Lahnda.

ahiyi

dhi

dhe

hi hi he

dhiya dliiyo fihin”

hat

ho

bin

hos’ hui ho

hdus

hui

ha

huasi

hua”

ha

hdse have hain

The past has slightly different forms with a feminine subject. Sindhi examples of the compound tenses are halandd ahiyi, I am going; halandd hos”, I was going; halid ahiyi, I have gone; and so on. The Lahnda tenses are made on the same principles.

We have seen the important part that pronominal suffixes play in the conjugation of the verb. But their use is not confined to the examples given above. Additional suffixes may be added to indicate the object, direct or remote. Thus, S. mdrii, thou mayest kill; marii-m”, thou mayest kill me; mdrid (he) was killed; mdrii-t (for mdrid-%), (he) was killed by-him, he killed him; marii-i-m”, it (impersonal) -was killed by-him with-reference-to-me, i.e. he killed me ; dinB-l-s”, was-given by-him to-him, he gave to him.

Numerous verbs have irregular past participles, derived directly from the Prakrit past participles, instead of being made by adding id to the root.

These must be learnt from the grammars. We may mention a few very common ones: S. karan", L. karan, to do, to make, past participle S. kid, kitd, L. kita; S. dian", L. dean, to give, past participle S. dind, L. dittd; S. labhan", L. labbhan, to be obtained, past participle S. ladhd, L. laddha. The many compound verbs are formed much as in Hindo stani, and must be learnt from the grammars.

Literature. — Sindhi and Lahnda possess no literature worthy of the name. Such as they have consists of translations from Arabic and Persian. There is, however, as usual in uncul- tivated dialects, in both languages a large stock of folk-songs — rude poems dealing with the popular traditions of the country. Some of these have been published in Colonel Sir Richard Temple's Legends of the Panjab (3 vols., Bombay, 1 884-1900). The late Professor Trumpp published one text of some importance under the title of Sindhi Literature, the Divan of Abd-ul-Latif , known by the name of Shdha jd Risdld (Leipzig, 1866).

Authorities. — G. A. Grierson, " Vracada and Sindhi," in Journal of the Royal Asiatic Society (1902), p. 47; G. Stack, Grammar and Dictionary (both Bombay, 1849); E. Trumpp, Grammar (London and Leipzig, 1872). This last is still the standard work on the language, although much of the philological portion is now out of date. It was the pioneer of the comparative study of the modern Indo-Aryan vernaculars. G. Shirt, Udharam Thavurdas and S. F. Mirza, Sindhi- English Dictionary (Karachi, 1879).

W. St Clair Tisdall's Simplified Punjabi Grammar (London, 1889) also deals, in an appendix, with Lahnda. E. O'Brien, Glossary of the Multani Language (fst ed., Lahore, 1881 ; 2nd ed., revised by J. Wilson and Hari Kishen Kaul, Lahore, 1903) ; T. Bomford, " Rough Notes on the Grammar of the Language spoken in the Western Panjab," in Journal of the Asiatic Society of Bengal, vol. lxiv. (1895), pt. i. pp. 290 ff . ; the same, " Pronominal Adjuncts in the Language spoken in the Western and Southern Parts of the Panjab," ib. vol. lxvi. (1897), pt. i. pp. 146 ff. ; A. Jukes, Dictionary of the Jatki or Western Panjabi Language (Lahore and London, 1900) ; J. Wilson, Grammar and Dictionary of Western Panjabi as spoken in the Shahpur District (Lahore, 1899).

For both languages the authorities quoted under the articles Indo- Aryan Languages and Prakrit may be consulted with advantage. Vol. viii. of the Linguistic Survey of India contains full particulars of both in great detail. (G. A. Gr.)

SIN-EATER, a man who for trifling payment was believed to take upon himself, by means of food and drink, the sins of a deceased person. The

custom was once common in many parts of England and in the highlands of Scotland, and survived until recent years in Wales and the counties of Shropshire and Here- fordshire. Usually each village had its official sin-eater to whom notice was given as soon as a death occurred. He at once went to the house, and there, a stool being brought, he sat down in front of the door. A groat, a crust of bread and a bowl of ale were handed him, and after he had eaten and drunk he rose and pro- nounced the ease and rest of the dead person, for whom he thus pawned his own soul. The earlier form seems to have been more realistic, the sin-eater being taken into the death-chamber, and, a piece of bread and possibly cheese having been placed on the breast of the corpse by a relative, usually a woman, it was afterwards handed to the sin-eater, who ate it in the presence of the dead. He was then handed his fee, and at once hustled and thrust out of the house amid execrations, and a shower of sticks, cinders or whatever other missiles were handy. The custom

of sin-eating is generally supposed to be derived from the scapegoat (q.v.) in Leviticus xvi. 21, 22. A symbolic survival of it was witnessed as recently as 1893 at Market Drayton, Shropshire. After a preliminary service had been held over the coffin in the house, a woman poured out a glass of wine for each bearer and handed it to him across the coffin with a ” funeral biscuit.” In Upper Bavaria sin-eating still survives: a corpse cake is placed on the breast of the dead and then eaten by the nearest relative, while in the Balkan peninsula a small bread image of the deceased is made and eaten by the survivors of the family. The Dutch docd-koecks or ” dead-cakes, ” marked with the initials of the deceased, introduced into America in the 17th century, were long given to the attendants at funerals in old New York. The ” burial-cakes ” which are still made in parts of rural England, for example Lincolnshire and Cumberland, are almost certainly a relic of sin-eating.

SINECURE (Lat. sine cura, without care), properly a term of ecclesiastical law, for a benefice without the cure of souls (bene- licium sine cura). In the English Church such sinecures arise when the rector has no cure of souls nor resides in the parish, the work of the incumbent being performed by a vicar; such sinecure rectories were expressly granted by the patron; they were abolished by the Ecclesiastical Commissioners Act 1840. Other ecclesiastical sinecures are certain cathedral dignities to which no spiritual function attached or incumbencies where by reason of depopulation and the like the parishioners have dis- appeared or the parish church has been allowed to decay. Such cases have ceased to exist. The term is also used of

any office or place, to which a salary, emoluments or dignity but no duties are attached. The British civil service and royal household were loaded with innumerable offices which by lapse of time had become sinecures and were only kept as the reward of political services or to secure voting power in parliament. They were extremely prevalent in the 18th century and were gradually abolished by statutes during that and the following century.

SINEW (O. Eng. sinu, sionu, cf. Dutch zenuw, Ger. Sehne, possibly allied to Skt. snava, tendon, cf. Ger. Schnur, string), a tendon, a cord-like layer of fibrous tissue at the end of a muscle forming the attachment to the bone or other hard part. The broad, flat tendons are usually called fasciae (see Muscular System and Connective Tissue). The word is used figura- tively of muscular or nervous strength, and particularly, in " sinews of war, " of the power of money.

SINGAPORE (Malay, Singapura, i.e. "The City of the Lion"), a town and island situated at the S. extremity of the Malay Peninsula in 1° 20′ N., 103° 50′ E. Singapore is the town? most important part of the crown colony of the Straits Settlements, which consists with it of Penang, Province Wellesley and the Dindings, and Malacca. The port is one of the most valuable of the minor possessions of Great Britain, as it lies midway between India and China, and thus forms the most important halting-place on the great trading-route to the Far East. It is strongly fortified by forts and guns of modern type upon which large sums have been expended by the imperial government, aided by a heavy annual military contribution payable by the colony and fixed at 20% of its gross revenue. Its geographical position gives it strategic value as a naval base; and as a commercial centre it is without a rival in this part of Asia. Its prosperity has been greatly enhanced by the rapid development of the Federated Malay States on the mainland. It possesses a good harbour; docks and extensive coaling- wharves, which have been acquired by government from the Tanjong Pagar Dock Company, and are undergoing considerable extensions; an admiralty dockyard; and many facilities for shipping. It is also resorted to by native sailing craft from all parts of the Malay Archipelago. On the island oi Pulau Brani stand the largest tin-smelting works in existence, which for many years have annually passed through their furnaces more than half the total tin output of the world. Singapore has also establishments for tinning pineapples, and a large biscuit factory. The town possesses few buildings of any note, but government

house, the law-courts, the gaol, the lunatic asylum and the Hong- Kong and Shanghai Bank are exceptions, as also is the cathedra] of St Andrew. There are three Roman Catholic churches, a Free Kirk, an American mission, and several chapels belonging to Nonconformist sects. The mosques and Chinese and Hindu temples are numerous. There are

extensive military barracks at Tanglin. There is a good race-course and polo-ground, a fine cricket-ground on the esplanade, three golf courses, and several clubs.

The island is 27 m. long by 14 m. broad, and is separated from the native state of Johor, situated on the mainland of the Malay Peninsula, by a strait which, at its narrowest point, is less than § m. in width. A line of railway connects the / s / a a

Climate. — The climate of Singapore is always humid and usually very hot. There is hardly any seasonal change to be observed, and the dampness of the climate causes the heat to be more oppressive than are higher temperatures in drier climates. The mean atmo- spheric pressure in Singapore during 1906 was 29-908 in. The highest shade temperature for the year was 92 ° F. registered in March; the lowest 72-5° F., registered in November. The mean was 80-3° F. The range for the year was 14-5° F. The temperature of solar radiation was in 1906: highest in the sun 153-8°, recorded in March; the lowest 143-4°, recorded in June. The highest temperature of nocturnal radiation on grass was 73-1°, recorded in May, and the lowest 67-2°, recorded in January. The mean for 1906 was 71°. Re- lative humidity: highest 92, recorded in December; lowest, 72, recorded in April; mean for 1906, 81. N. and N.E. winds prevail from the middle of October to the end of April, and S. and S.W. winds from the middle of May to the end of September. The mean velocity of winds for 1906 was no m. ; the maximum recorded being 148 in May, the minimum velocity recorded being 76 in December. The rainfall of Singapore for 1906 was 129-64 in. ; the heaviest rainfall for any one month being 15-23 in. recorded in January, the smallest being 4-98 in. recorded in May. There were 182 rainy days during the year, the average annual number of the past decade being 176.

Population. — The following shows the composition of the popula- tion, which numbered in all 228,555 ln I 9° I : Europeans 3824, Eurasians 4120, Chinese 164,041, Malays 36,080, Indians, 17,823, other nationalities 2667. The births registered in Singapore during 1898 numbered 3751, namely, i960 males and 1791 females, being a ratio of 16-55 P er mille. The deaths registered during the same period numbered 7602, namely, 5894 males and 1708 females, a ratio 01 33 ‘54 P er mille. The excess of deaths over births is due to the fact that there are comparatively few women among the Chinese; the steady increase of the population in the face of this fact is to be attributed entirely to immigration, mainly from China, but to a minor extent from India also. The persons classed above under ” other nationalities ” are representatives of almost every Asiatic nation of importance, and of many African races, Singapore being one of the most cosmopolitan cities in the world.

Administration and Trade. — As Singapore is the chief administrative

centre of the colony, the governor, who is also ex officio high commissioner of the Federated Malay States, British North Borneo, Brunei, Sarawak and governor of Labuan, has his principal residence here. Here also are chief offices of the various heads of the govern- ment departments, and here the legislative council of the colony holds its sessions. The town is governed by a municipality composed partly of ex officio, nominated and elected members.

Finance. — The revenue of Singapore for 1906 amounted to $5,942,661, exclusive of $26,650 received on account of land sales. The chief sources of revenue were licences (which include the farms let for the collection of import duties in opium, wine and spirits) $4,248,856, nearly half the revenue of the settlement; post and telegraphs $424,645 ; railway receipts $196,683; and land revenue $104,482. The expenditure of the settlement during 1906 amounted to $5,39 2 >3 8 °- Of this $1,416,392 was expended on personal emoluments, and $1,116,548 on other charges connected with the administrative establishments; $1,763,488 was spent on military services, exclusive of expenses connected with the volunteer force; $183,075 on the upkeep and maintenance of existing public works; and $569,884 on new public works.

Trade. — The trade of Singapore is chiefly dependent upon the position which the port occupies as the principal emporium of the Federated Malay States and of the Malayan archipelago, and as the great port of call for ships passing to and from the Far East, The total value of the imports into Singapore in 1906 was $234,701,760, and the exports in the same year were valued at $202,210,849. The ships using the port during 1906 numbered 1886 with an aggregate tonnage of 3,805,566 tons, of which 1261 were British with an aggregate tonnage of 2,498,968 tons. The retail trade of the place is largely in the hands of Chinese, Indian and Arab traders, but there are some good European stores. The port is a free port, import duties being payable only on opium, wines and spirits.

History. — A tradition is extant to the effect that Singapore was an important trading centre in the 12th and 13th centuries, but neither Marco Polo nor Ibn Batuta, both of whom wintered in Sumatra on their way back to Europe from China, have left anything on record confirmatory of this. It is said to have been attacked and devastated by the Javanese in 1252, and at the time when it passed by treaty to the East India Company in 1819, Sir Stamford Raffles persuading the sultan and tumenggong of Johor to cede it to him, it was wholly un- inhabited save by a few fisherfolk living along its shores. It was at first subordinate to Benkulen, the company's

principal station in Sumatra, but in 1823 it was placed under the administraticn of Bengal. It was incorporated in the colony of the Straits Settlements when that colony was established in 1826.

See Life of Sir Stamford Raffles; Logan's Journal of the Malay Archipelago; the Journal of the Straits Branch of the Royal Asiatic Society (Singapore); Sir Frank Swettenham, British Malaya (London, 1906); Blue-Book of the Straits Settlements (1906); The Straits Directory, iqo8 (Singapore, 1908). (H. Cl.)

SINGER, SIMEON (1840-1906), Jewish preacher, lecturer and public worker. He was born in London, and after a short stay at a Hungarian school, entered as one of its pupils the Jews' College, of which he was subsequently for a time the head- master. In 1867 he became minister of the Borough Synagogue, London. In the following year he married. He moved to the new West End Synagogue in 1878, and remained the minister of that congregation until his death. He was the first to introduce regular sermons to children; as a preacher to the young Singer showed rare gifts. His pulpit addresses in general won wide appreciation, and his services were often called for at public functions. In 1897 he strongly opposed the Diggle policy at the London School Board, but he refused nomination as a member. In 1800 the Rabbinical Diploma was conferred on him by Lector Weiss of Vienna, but again he evidenced his self-denial by declin- ing to stand for the post of associate Chief Rabbi in the same year. Singer was a power in the community in the direction of moderate progress; he was a lover of tradition, yet at the same time he recognized the necessity of well-considered changes. In 1892 at his instigation the first English Conference of Jewish Preachers was held, and some reforms were then and at other times intro- duced, such as the introduction of Bible Readings in English, the admission of women as choristers and the inclusion of the express consent of the bride as well as the bridegroom SX the marriage ceremony.

Singer did much to reunite Conservatives and Liberals in the community, and he himself preached at the Reform Synagogue in Manchester. He had no love for the minute critical analysis of the Bible, but he was attracted to the theory of progressive revelation, and thus was favourably disposed to the modern treatment of the Old Testament. His cheery optimism was at the basis of this

attitude, and strongly coloured his belief in the Messianic ideals. He held aloof, for this very reason, from all Zionist schemes. His interest in the fortunes of foreign Jews led him to make several continental journeys on their behalf; he was one of the leading spirits of the Russo-Jewish Committee, of the Inter- national Jewish Society for the Protection of Women and of other philanthropic organizations. Despite his devotion to

public work, Singer published some important works. In 1896 the Cambridge University Press published Talmudical Fragments in the Bodleian Library of which Singer was joint author. But his most famous work was his new edition and English translation of the Authorized Daily Prayer Book (first published in 1870), a work which has gone through many large editions and which has probably been the most popular (both with Jews and Chris- tians) of all books published by an English Jew.

See The Literary Remains of the Rev. Simeon Singer (3 vols., 1908), with Memoir. (t a.)

SINGHBHUM, a district of British India, in the Chota Nagpur division of Bengal. The administrative headquarters are at Chaibasa. Area 3891 sq. m. Its central portion consists of a long undulating tract of country, running E. and W., and enclosed by great hill ranges. The depressions lying between the ridges comprise the most fertile part, which varies in elevation above sea-level from 400 ft. near the Subanrekha on the E. to 750 ft. around the station of Chaibasa. S. of this an elevated plateau of 700 sq. m. rises to upwards of 1000 ft. In the W. is an ex- tensive mountainous tract, sparsely inhabited by the wildest of the Hos; while in the extreme S.W. is a still grander mass of mountains, known as " Saranda of the seven hundred hills, " rising to a height of 3500 ft. From the Layada range on the N.W. of Singhbhum many rocky spurs strike out into the district, some attaining an elevation of 2900 ft. Among other ranges and peaks are the Chaitanpur range, reaching an elevation of 2529 ft., and the Kapargadi range, rising abruptly from the plain and running in a S.E. direction until it culminates in Tuiligar Hill (2492 ft.). The principal rivers are the Subanrekha, which with its affluents flows through the E. of the district; the South Koel, which rises W. of Ranchi, and drains the Saranda region; and the Baitarani, which touches the S. border for 8 m. About two-thirds of Singhbhum district is covered with primeval forest, containing some valuable timber trees; in the forests tigers, leopards, bears and several kinds of deer abound, and small herds of elephants occasionally wander from the Meghasani Hills in Mayurbhanj.

In 1901 the population was 613,579, showing an increase of 12% in the decade. More than one-half belong to aboriginal tribes, mostly Hos. The chief crop is rice, followed by pulses, oil-seeds and maize. There are three missions in the district — S.P.G., Lutheran and Roman Catholic — which have been very successful among the aboriginal tribes, especially in the spread of education. The isolation of Singhbhum has been broken by the opening of the Bengal-Nagpur railway, which has protected it from the danger of famine, and at the same time given a value to its jungle products.

Colonel Dalton, in his Ethnology of Bengal, says that the Singhbhum Rajput

chiefs have been known to the British government since 1803, when the marquess Wellesley was governor-general of India; but there does not appear to have been any intercourse between British officials and the people of the Kolhan previous to 1819. The Hos or Larka Kols, the aboriginal race of Singhbhum, would allow no stranger to settle in, or even pass through, the Kolhan; they were, however, subjugated in 1836, when the head-men entered into engagements to bear allegiance to the British government. The country remained tranquil and prosperous until 1857, when a rebellion took place among the Hos under Parahat Raja. After a tedious campaign they surrendered in 1859, and the capture of the raja put a stop to their disturbances.

SINGLE-STICK, a slender, round stick of ash about 34 in. long and thicker at one end than the other, used as a weapon of attack and defence, the thicker end being thrust through a cup-shaped hilt of basket-work to protect the hand. The original form of the single-stick was the " waster, " which appeared in the 16th century and was merely a wooden sword used in practice for the back-sword (see Sabre-fencing), and of the same general shape. By the first quarter of the 17th century wasters had become simple cudgels provided with sword-guards, and when, about twentv- five years later, the basket-hilt came into general use, it was

employed with the cudgel also, the heavy metal hilt of the back- sword being discarded in favour of one of wicker-work. The guards, cuts and parries in single-stick play were at first identical with those of back-sword play, no thrusts being allowed (see Fencing). The old idea, prevalent in England in the 16th century, that hits below the girdle were unfair, disappeared in the 1 8th century, and all parts of the person were attacked. Under the first and second Georges back-sword play with sticks was immensely popular under the names " cudgel-play " and " single- sticking," not only in the cities but in the country districts as well, wrestling being its only rival. Towards the end of the 18th century the play became very restricted. The players were placed near together, the feet remaining immovable and all strokes being delivered with a whip-like action of the wrist from a high hanging guard, the hand being held above the head.- Blows on any part of the body above the waist were allowed, but all ex- cept those aimed at thehead were employed only to gain openings, as each bout was decided only by a " broken head," i.e. a cut on the head that drew blood. At first the left hand and arm were used to ward off blows not parried with the stick, but near the close of the 18th century the left hand grasped a scarf tied loosely round the left thigh, the elbow being raised to

protect the face. Thomas Hughes's story, Tom Brown's School Days, contains a spirited description of cudgel-play during the first half of the 19th century. This kind of single-sticking practically died out during the third quarter of that century, but was revived as a school for the sabre, the play being essentially the same as for that weapon (see Sabre-fencing). The point was introduced and leg hits were allowed. By the beginning of the 20th century single- stick play had become much neglected, the introduction of the light Italian fencing sabre having rendered it less necessary. Stick- play with wooden swords as a school for the cutlas is common in some navies. The French cane-fencing (g.v.) has a general similarity to single-stick play, but is designed more for defence with a walking-stick than as a school for the sabre.

See Broadsword and Single-stick, by R. G. Allanson Winn and C. Phillips-Wolley (London, 1898); Manual of Instruction for Single- stick Drill (London, 1887, British War Office) ; Schools and Masters of Fence, by Egerton Castle (London, 1892); The Sword and the Centuries, by A. Hutton (London, 1901).

SINGORA, or Songkla (the Sangore of early navigators), a port on the E. coast of the Malay Peninsula and the head- quarters of the high commissioner of the Siamese division of Nakhon Sri Tammarat. It is situated in 7 12′ N. and 100° 35′ E. It was settled at the beginning of the 19th century by Chinese from Amoy, the leader of whom was appointed by Siam to be governor of the town and district. Having been more than once sacked by Malay pirates, the town was encircled, about 1850, by a strong wall, which, as both Chinese governors and Malay pirates, are now things of the past, supplies the public works department with good road metal. The population, about 5000, Chinese, Siamese and a few Malays, is stationary, and the same may be said of the trade, which is all carried in Chinese junks. The town has become an important administrative centre; good roads connect it with Kedah and other places in the Peninsula, and the mining is developed in the interior. In 1906 railways surveys were undertaken by the government with a view to making Singora the port for S. Siam; but this harbour, formed by the entrance to the inland sea of Patalung, would require dredging to be available for vessels of any size.

SINOPE, Turk. Sinub, a town on the N. coast of Asia Minor in the vilayet of Kastamuni, on a low isthmus which joins the promontory of Boz Tepe to the mainland. Though it possesses the only safe roadstead between the Bosporus and Batum, the difficulties of communication with the interior, and the rivalry of Ineboli on the W. and Samsun on the E. have prevented Sinope from becoming a great commercial centre. It is shut off from the plateau by forest-clad mountains, a carriage road over the hills to Boiavad and thence by Vezir-Keupru to Amasia was begun about 20 years ago, but

has never been completed even as far as Boiavad. Consequently the trade is small; the annual exports are about £80,000, and the imports £50,000. Population, 5000 Moslems and 4000 Christians, chiefly Greeks

and Armenians. On the isthmus, towards the mainland, stands a huge but for the most part ruined castle, originally Byzantine and afterwards strengthened by the Seljuk sultans; and the Mahommedan quarter is surrounded by massive walls. Of early Roman or Greek antiquities there are only the columns, architraves and inscribed stones built into the old walls; but the ancient local coinage furnishes a very beautiful and interesting series of types.

See M. Six's paper in the Numismatic Chronicle (1885), and MM. Babelon & Reinach, Recueil des monnaies grecques d'Asie Mineure

(1904).

Sinope l^Livonrt}) , whose origin was assigned by its ancient inhabitants to Autolycus, a companion of Hercules, was founded 630 B.C. by the Ionians of Miletus, and ultimately became the most flourishing Greek settlement on the Euxine, as it was the terminus of a great caravan route from the Euphrates, through Pteria, to the Black Sea, over which were brought the products of Central Asia and Cappadocia (whence came the famous " Sinopic " red earth). In the 5th century B.C. it received a colony of Athenians; and by the 4th it had extended its authority over a considerable tract of country. Its fleet was dominant in the Euxine, except towards the W., where it shared the field with Byzantium. When in 220 B.C. Sinope was attacked by the king of Pontus, the Rhodians enabled it to maintain its independence. But where Mithradates IV. failed Pharnaces suc- ceeded; and the city, taken by surprise in 183 B.C., became the capital of the Pontic monarchy. Under Mithradates VI. the Great, who was born in Sinope, it had just been raised to the highest degree pf prosperity, with fine buildings, naval arsenals and well-built harbours, when it was captured by Lucullus and nearly destroyed by fire (70 B.C.). In 64 B.C. the body of the murdered Mithradates was brought home to the royal mausoleum. Under Julius Caesar the city received a Roman colony, but was already declining with the diversion of traffic to Ephesus, the port for Rome, and in part to Amisos (Samsun). In the middle ages it became subject to the Greek Empire of Trebizond, and passed into the hands of the Seljuk Turks, and in 146 1 was incorporated in the Ottoman Empire. In November 1853 the Russian vice-admiral Nakhimov destroyed here a division of the Turkish fleet and reduced a good part of the town to ashes.

(J. G. C. A.)

SINTER, a word taken from the German (allied to Eng. ” cinder “) and applied to certain mineral deposits, more or less porous or vesicular in texture. At least two kinds of sinter are recognized — one siliceous, the other calcareous. Siliceous sinter is a deposit of opaline or amorphous silica from hot springs and geysers, occurring as an incrustation around the springs, and sometimes forming conical mounds or terraces. The pink and white sinter-terraces of New Zealand were destroyed by the eruption of Mount Tarawera in 1886. Mr W. H. Weed on studying the deposition of sinter in the Yellowstone National Park found that the colloidal silica was largely due to the action of algae and other forms of vegetation in the thermal waters {glh Ann. Rep. U.S. Geol. Surv., 1889, p. 613). Siliceous sinter is known to mineralogists under such names as geyserite, fiorite and michaelite (see Opal) .

Calcareous sinter is a deposit of calcium carbonate, exemplified by the travertine, which forms the principal building stone of Rome (Ital. travertino, a corruption of tiburtino, the stone of Tibur, now Tivoli) . The so-called ” petrifying springs, ” not uncommon in limestone-districts, yield calcareous waters which deposit a sintery incrustation on objects exposed to their action. The cavities in calcareous sinter are partly due to the decay of mosses and other vegetable structures which have assisted in its precipitation. Even in thermal waters, like the hot springs of Carlsbad, in Bohemia, which deposit Sprudelstein, the origin of the deposits is mainly due to organic agencies, as shown as far back as 1862 by Ferd. Cohn. Whilst calcareous deposits in the open air form sinter-like travertine, those in caves constitute stalagmite.

Iron-sinter is a term sometimes applied to cellular bog iron-ore.

(F. W. R.)*

15°

SION— SIOUX FALLS

SION [Ger. Sitten], the capital of the Swiss canton of the Valais. It is on the railway between St Maurice (255 m. distant) and Brieg (33 m. distant). Sion is one of the most picturesque little cities in Switzerland, being built around two prominent hillocks that rise from the level valley of the Rhone. The north hillock is crowned by the castle of Tourbillon (built 1294, burnt 1788), which was long the residence of the bishops. The south hillock bears the castle of Valeria, long the residence of the canons (it now contains an historical museum) with the interesting 13th century church of St Catherine. In the town below is the 15th century cathedral, and the Majoria castle (burnt in 1788) the former residence of the ” major ” (or

mayor of the city). There are various other curious objects in the city, which is built on the banks of the Sionne torrent, and is at a height of 1680 ft. above the sea-level. In 1900 Sion contained 6048 inhabitants (mainly Romanists), of whom 1481 were German- speaking and 4446 French-speaking.

Sion [Sedunum] dates from Roman times, and the bishop's see was removed thither from Martigny [Ododurum] about 580. In 999 the bishop received from Rudolf III., king of Burgundy, the dignity of count of the Valais, and henceforward was the temporal as well as the spiritual lord of the Valais, retaining this position, at least in part, till 1798.

See also J. Gremaud, Introduction to vol. v. (Lausanne, 1884) of his Documents relatifs d Vhistoire du Vallais; R. R. Hoppeler, Beitrdge zur Geschichte des Wallis im Mittelalter (Zurich, 1897); B. Rameau, Le Vallais historique (Sion, 1886). (W. A. B. C.)

SION COLLEGE, in London, an institution founded as a college, gild of parochial clergy and almshouse, under the will (1623) of Dr Thomas White, vicar of St Dunstan's in the West. The clergy who benefit by the foundation are the incumbents of the City parishes, of parishes which adjoined the city bounds when the college was founded, and of parishes subsequently formed out of these. The original buildings in London Wall were on a site previously occupied by Elsing Spital, a hospital for the blind founded in 1329, and earlier still by a nunnery. They comprised the almshouses, a hall and chapel, and the library added to the foundation by Dr John Simson, rector of St Olave's, Hart Street, one of White's executors. There were also, at least originally, apartments for students. In 1884 the almshouses were abolished, and the almsfolk became out-pensioners. It was subsequently found possible to extend their numbers from the original number of 10 men and 10 women to 40 in all, and to increase the pension. In r886 Sion College was moved to new buildings on the Victoria Embankment, and is now principally known for its theological library which serves as a lending library to members of the college, and is accessible to the public. A governing body appointed by the members to administer the foundation consists of a president, two deans and four-assistants.

SIOUX, a tribe of North American Indians. The name is an abbreviation of the French corruption Nadaouesioux of the Algonquian name Nadowesiwug, " little snakes. " They call themselves Dakotas (" allies "). They were formerly divided into seven clans: hence the name they sometimes used, Otceti Cakowin, " the seven council-fires. " There was a further dis- tribution into eastern and western Sioux. The former were generally sedentary and agricultural, the latter nomad horsemen. The

Sioux were ever conspicuous, even among Indians, for their physical strength and indomitable courage. Their original home was east of the Alleghanies, but in 1632 the French found them chiefly in Minnesota and Wisconsin. Thereafter driven westward by the Ojibwa and the French, they crossed the Missouri into the plains. The Sioux fought on the English side in the War of Independence and in that of 1812. In 1815 a treaty was made with the American government by which the right of the tribe to an immense tract, including much of Minnesota, most of the Dakotas, and a large part of Wisconsin, Iowa, Missouri and Wyoming, was admitted. In 1835 missions were started among the eastern Sioux by the American Board, and schools were opened. In 1837 the tribe sold all their land east of the Missis- sippi. In 1851 the bulk of their Minnesota territory was sold, but a hitch in the carrying out of the agreement led to a rising

and massacre of whites in 1857 at Spirit Lake on the Minnesota- Iowa border. There was peace again till 1862, when once again the tribe revolted and attacked the white settlers. A terrible massacre ensued, and the punitive measures adopted were severe. Thirty-nine of the Indian leaders were hanged from the same scaffold, and all the Minnesota Sioux were moved to reservations in Dakota. The western Sioux, angry at the treat- ment of their kinsmen, then became thoroughly hostile and carried on intermittent war with the whites till 1877. In 1875 and 1876 under their chief, Sitting Bull, they successfully re- sisted the government troops, and finally Sitting Bull and most of his followers escaped into Canada. Sitting Bull returned in 1881. In 1889 a treaty was made reducing Sioux territory. Difficulties in the working of this, and religious excitement in connexion with the Ghost Dance craze, led to an outbreak in 1890. Sitting Bull and three hundred Indians were killed at Wounded Knee Creek, and the Sioux were finally subdued. They are now on different reservations and number some twenty- four thousand. See Indians, North American.

SIOUX CITY, a city and the county-seat of Woodbury county, Iowa, U.S.A., at the confluence of the Big Sioux with the Missouri river, about 156 m. N.W. of Des Moines. Pop. (1890) 37,806; (1900) 33,111, of whom 6592 were foreign-born (including 1460 Swedish, 1176 German and 1054 Norwegian); (1910, census) 47,828. It is served by the Chicago, Milwaukee & Saint Paul, the Chicago & North- Western, the Chicago, Saint Paul, Minneapolis & Omaha, the Chicago, Burlington & Quincy, the Illinois Central, and the Great Northern railways. The bluffs approach the Missouri more closely at this point than elsewhere in the state, so that little more than manufacturing establishments and business blocks are built on the bottom lands, and the residences are spread over the slope and summit of the bluffs. The city has a public library (housed in the city hall) and eight parks (in- cluding Riverside on the Big Sioux), with a total area of more than 500 acres. Among the principal buildings are the city hall, the

post office, the Young Men's Christian Association building, and the High School. There are several boat clubs and a country and golf club. Two miles S. of the city is a monument to Sergeant Charles Floyd of the Lewis and Clark expedition, who died here in r8o4; and 1 m. W. of the city is the grave of War Eagle, a Sioux chief. Among the educational institutions are Morningside College (Methodist Episcopal, 1894), 3 m. from the business centre of the city, which had in 1 908-1 909 34 in- structors and 672 students; the Sioux City College of Medicine (1889), and St Mary's School. The principal hospitals are the Samaritan, the St Joseph's Mercy, and the German Lutheran. Sioux City is the see of a Roman Catholic bishop. The Chicago, Milwaukee & Saint Paul, the Great Northern, and the Chicago, Saint Paul, Minneapolis & Omaha have shops here; meat packing is an important industry, and the city has large stock yards. As a manufacturing centre, it ranked first in 1900 and third in 1905 among the cities of the state; the value of its factory pro- duct in 1905 was $14,760,751. Its manufactures include slaughtering and meat-packing products, cars and car repairing, linseed oil, bricks and tiles (made from excellent clay found in and near the city). The city does a large wholesale and dis- tributing business. Sioux City was settled about 1850, was platted in 1854, becoming the headquarters of a United States Land Office, was incorporated in 1856, and was chartered as a city in 1857. It was the starting-point of various expeditions sent against the Sioux Indians of the Black Hills.

SIOUX FALLS, a city and the county-seat of Minnehaha county, South Dakota, U. S. A., on the Big Sioux river, about 12 m. N.W. of the N.W. corner of Iowa. Pop. (1890), 10,177; (1900) 10,266, of whom 1858 were foreign-born; (1905), 12,283; (1910), 14,094. It is the largest city in the state. Sioux Falls is served by the Chicago, Milwaukee & St Paul, the Chicago, Rock Island & Pacific, the Great Northern, the Illinois Central, the Chicago, St Paul, Minneapolis & Omaha (North-Western lines), and the South Dakota Central railways. In the city are the State Penitentiary, the State Children's Home, the South Dakota School for Deaf Mutes, a United States Government

Building, the County Court House, Sioux Falls College (Baptist; co-educational; founded in 1883), All Saints School (Protestant Episcopal), for girls, and a Lutheran Normal School (1889). The city is the see of a Roman Catholic and of a Protestant Episcopal bishop. The river falls here about 100 ft. in half a mile and provides good water power for manufactures. The total value of the factory products increased from

$883,624 in 1900 to $1,897,790 in 1905, or 114-8%. Sioux Falls is a jobbing and wholesaling centre for South Dakota and for the adjacent parts of Iowa and of Minnesota. A quartzite sandstone, commonly known as jasper or " red granite, " is extensively quarried in the vicinity, and cattle raising and farming are important industries of the surrounding country. A settlement was made at Sioux Falls in 1856, but this was abandoned about six years later on account of trouble with the Indians. A permanent settlement was established in 1867, and Sioux Falls was incorporated as a village in 1877 and was chartered as a city in 1883.

SIPHANTO, Sipheno or Siphno (anc. Siphnos), an island of the Greek Archipelago, in the department of the Cyclades, 30 m S.W. of Syra. It has an area of 28 sq. m., and the popula- tion of the commune is 3777 (1907). A ridge of limestone hills — whose principal summits, Hagios Elias and Hagios Simeon, are crowned by old Byzantine churches — runs through the island; for about 2 m. along the western slope stretches a series of villages, each white-washed house with its own garden and orchard. One of these, called after the name of an ancient town Apollonia, is the modern capital; Kastro is an " old-world Italian town " with medieval castle and fortifications, and an old town-hall bearing date 1365. Inscriptions found on the spot show that Kastro stands on the site of the ancient city of Siphnos; and Mr Bent identifies the other ancient town of Minoa with the place on the coast where a Hellenic white marble tower is distinguished as the Pharos or lighthouse, and another as the tower of St John. Churches and convents of Byzantine architecture are scattered about the island. One building of this class is especially interesting — the school of the Holy Tomb or school of Siphnos, founded by Greek refugees from Byzantium at the time of the iconoclastic persecutions, and afterwards a great centre of intellectual culture for the Hellenic world. The endowments of the school are now made over to the gymnasium of Syra. In ancient times Siphnos was famous for its gold and silver mines, the site of which is still easily recognized by the excavations and refuse-heaps. As in antiquity so now the potters of the island are known throughout, the Archipelago. Siphnos was said to have been colonized by Ionians from Athens. It refused tribute to Xerxes, and sent one ship to fight on the Greek side at Salamis.

The wealth of the ancient Siphniotes was shown by their treasury at Delphi, where they deposited the tenth of their gold and silver; but, says the legend, they once failed to do this, and Apollo in his anger flooded their mines. That the mines were invaded by the sea is still evident; and by Strabo's time the inhabitants of the island were noted for their poverty. During the Venetian period it was ruled first by the Da Corogna family and after 1456 by the Gazzadini, who were expelled by the Turks in 1617.

SIPHON, or Syphon (Lat. sipho; Gr. wv, a tube), an instrument, usually in

the form of a bent tube, for conveying liquid over the edge of a vessel and delivering it at a lower level. The action depends upon the difference of the pressure on the liquid at the extremities of the tube, the flow being towards the lower level and ceasing when the levels eoincide. The instrument affords a ready method of transferring liquids. The tube is made of glass, indiarubber, copper or lead, according to the liquid which is to be transferred. The simple siphon is used by filling it with the liquid to be decanted, closing the longer limb with the finger and plunging the shorter into the liquid; and it must be filled for each time of using. Innumerable forms have been devised adapted for all purposes, and provided with arrange- ments for filling the tube, or for keeping it full and starting it into action automatically when required. Pipes conveying the water of an aqueduct across a valley and following the contour of the sides are sometimes called siphons, though they do not depend on the principle of the above instrument. In the siphon

used as a container for aerated waters a tube passes through the neck of the vessel, one end terminating in a curved spout while the other reaches to the bottom of the interior. On this tube is a spring valve which is opened by pressing a lever. The vessel is filled through the spout, and the water is driven out by the pressure of the gas it contains, when the valve is opened. The " Regency portable fountain, " patented in 1825 by Charles Plinth, was the prototype of the modern siphon, from which it differed in having a stopcock in place of a spring valve. The " siphon champenois " of Deleuze and Dutillet (1829) was a hollow corkscrew, with valve, which was passed through the cork into a bottle of effervescent liquid, and the " vase siphoide " of Antoine Perpigna (Savaresse pere), patented in 1837, was essentially the modern siphon, its head being fitted with a valve which was closed by a spring.

SIPPABA {Zimbir in Sumerian, Sippar in Assyro-Babylonian), an ancient Babylonian city on the east bank of the Euphrates, north of Babylon. It was divided into two quarters, " Sippar of the Sun-god " (see Shamash) and " Sippar of the goddess Anunit, " the former of which was discovered by Hormuzd Rassam in 1881 at Abu-Habba, 16 m. S.E. of Bagdad. Two other Sippars are mentioned in the inscriptions, one of them being " Sippar of Eden, " which must have been an additional quarter of the city. It is possible that one of them should be identified with Agade or Akkad, the capital of the first Semitic Babylonian Empire. The two Sippars of the Sun-god and Anunit are referred to in the Old Testament as Sepharvaim. A large number of cuneiform tablets and other monuments has been found in the ruins of the temple of the 'Sun-god which was called E-Babara by the Sumerians, Bit-Uri by the Semites. The Chaldaean Noah is said by Berossus to have buried the records, of the antediluvian world here — doubtless because the name of Sippar was supposed to be connected with sipru, " a

writing " — and according to Abydenus {Fr. 9) Nebuchadrezzar excavated a great reservoir in the neighbourhood. Here too was the Babylonian camp in the reign of Nabonidos, and Pliny (N.H. vi. 30) states that it was the seat of a university. See Hormuzd Rassam, Babylonian Cities (1888). (A. H. S.)

SIPUNCULOIDEA, marine animals of uncertain affinities, formerly associated with the Echiuroidea • (q.v.) in the group Gephyrea. Externally, the body of a Sipunculoid presents no projections: its surface is as a rule even, and often glistening, and the colour varies from whitish through yellow to dark brown. The anterior one-quarter or one-third of the body is capable of being retracted into the remainder, as the tip of a glove-finger may be pushed into the rest, and this retractile part is termed the introvert. At the tip of the introvert the mouth opens, and is surrounded in Sipunculus by a funnel-shaped, ciliated lophophore (figs. 1 and 2). In Phascolosoma and Phascolion this funnel- shaped structure has broken up into a more or less definite group of tentacles, which in Dendrostoma are arranged in four groups. In Aspidosiphon and Physcosoma the tentacles are usually arranged in a horse-shoe, which may be double, overhanging the mouth dorsally. On the surface of the funnel-shaped lopho- phore are numerous ciliated grooves, and each of the tentacles in the tentaculated forms has a similar groove directed towards the mouth. These grooves doubtless serve to direct currents of water, carrying with them small organisms towards the mouth.

The skin consists of a layer of cuticle, easily stripped off, secreted by an ectodermal layer one cell thick. Within this is usually a sheath of connective tissue, which surrounds a layer of circular muscles; the latter may be split up into separate bundles, but more usually form a uniform sheet. Within the circular muscles is a layer of longitudinal muscles, very often broken into bundles, the number of which is often of specific importance. Oblique muscles sometimes lie between the circular and longitudinal sheaths. On the inner surface is a layer of peritoneal epithelium, which is frequently ciliated, and at the bases of the retractor muscles is heaped up and modified into the repro- ductive organs. The ectoderm is in some genera modified to form certain excretory glands, which usually take the form of papillae with an apical opening. These papillae give the surface a roughened aspect; the use of their secretion is unknown. They are best developed in Physcosoma.

When the body of a Sipunculoid is opened, it is seen that the body- cavity is spacious and full of a corpusculated fluid, in which the various organs of the body float. The most conspicuous of these is

the long, white alimentary canal, crowded with mud. The mouth is devoid of armature, and passes without break into the oesophagus; this is surrounded by the retractor muscles, which are inserted into the skin around the mouth, and have their origin in the body- wall, usually about one-third or one-half of the body-length from the anterior end (figs. I and 2). Their function is to retract the introvert, which is protruded again by the contraction of the circular muscles of the skin; these, compressing the fluid of the body-cavity, force

forward the anterior edge of the introvert. The number of muscles varies from one (Onchnesoma and Tylosoma) to four, the latter being very common. The alimentary canal is U-shaped, the dorsal limb of the U terminating in the anus, situated not very far from the level of the origin of the retractor muscles. The limbs of the U are further twisted to- gether in a looser or tighter coil, the axis of which may be traversed by a " spindle muscle arising from the pos- terior end of the body. No glands open into the ali- mentary canal, but a diver- ticulum, which varies enor- mously in size, opens into the rectum. As is so often the case with animals which eat mud and sand, and extract what little nutri- ment is afforded by the organic debris therein, the walls of the alimentary canal are thin and appar- ently weak. All along one side is a microscopic ciliated groove, into which the mud does not seem to enter, and along which a continuous stream of water may be kept up. Possibly this is respiratory— there are no special respiratory organs. A so-called heart lies on the dorsal surface of the oeso- phagus; it is closed behind, but in front it opens into a circumoesophagealring, which gives off vessels into the lophophore and ten- tacles. The contraction of this heart, which is not rhythmic, brings about the expansion of the tentacles and lophophore. This sys- tem is in no true sense a vascular system ; there are no capillaries, and the fluid it contains, which is cor- pusculated, can hardly have a respiratory or nutritive function. It is simply a hydrostatic mechanism for expanding the tentacles. The excretory organs are typical nephridia, with an internal ciliated opening into the body-cavity, and an external pore. One surface of the tube is pro- longed into a large sac lined with glandular excretory cells. The organs are typi- cally two, though one is often absent, e.g. in Phas- colion. They serve as channels by which the re- productive cells leave the body, and they are some- times spoken of as " brown tubes." There is a well-

Fig. 1. — Sipunculus nudus, L., with introvert and head fully extended, laid open by an incision along the right side to show the internal organs.

a, Mouth.

b, Ventral nerve-cord.

c, " Heart."

d, Oesophagus.

e, Intestine.

/, Position of anus.

g, Tuft-like organs.

h, Right nephridium.

i, Retractor muscles.

j. Diverticulum on rectum. The

spindle-muscle is seen overlying

the rectum.

minute circular nerves, which run round the body in the skin and break up into a very fine nerve plexus. There are no distinct ganglia, but ganglion cells are uniformly distributed along the ventral side of the cord. The whole is anteriorly somewhat loosely slung to the skin, so as to allow free play when the animal is extend- ing or retracting its introvert. A pit or depression, known as " the cerebral organ,' opens into the brain just above the mouth; this usually divides into two limbs, which are deeply pigmented and have been called eyes.

Sipunculoids are dioecious, and the ova and spermatozoa are formed from the modified cells lining the body-cavity, which are heaped up into a low ridge running along the line of origin of the retractor muscles. The ova ana the mother-cells of the spermatozoa break off from this ridge, and increase in size considerably in the fluid of the body-cavity. Fertilization is external ; and in about three days a small ciliated larva, not unlike that of the Echiuroids, but with no trace of segmentation, emerges from the egg-shell. This little creature, which has many of the features of a Trochosphere larva, swims about at the surface of the sea for about a month and grows rapidly. At the end of this time it undergoes a rapid metamorphosis :

developed brain dorsal to the mouth; this gives off a pair of oesophageal commissures, which surround the oesophagus and unite in a median ventral nerve-cord which runs between the longitudinal muscles to the posterior end of the body. From time to time it gives off

Fig. 2. — Right half of the anterior end of Sipunculus nudus, L., seen from the inner side and magnified.

a, Funnel-shaped grooved ten- c', " Heart."

tacular crown leading to d, Brain.

the mouth. e, Ventral, and e, dorsal re- ft, Oesophagus. tractor muscles, c, Strands breaking up the /, Ventral nerve-cord.

cavity of the tentacular g, Vascular spaces in tentacular

crown into vascular spaces. crown.

it loses many of its larval organs, cilia, takes in a quantity of water into its body-cavity, sinks to the bottom of the sea, and begins life in its final form.

The following genera of Sipunculoids are recognized: — (i.) Sipun- culus. This, with Physcosoma, has its longitudinal muscles divided up into some 17-41 bundles. It has no skin papillae. The members of this genus attain a larger size than any other species, and the genus contains some 16-17 species, (ii.) Physcosoma (fig. 3) has its body covered with papillae, and usually numerous rows of minute hooks encircling the introvert. It is the most numerous genus, and consists for the most part of shallow-water (less than 50 fathoms) tropical and subtropical forms. They often live in tubular burrowings in coral-rock. The following three genera have their longitudinal muscles in a continuous sheath : — (iii.) Phascolosoma, with some 25 species, mostly small, with numerous tentacles, (iv.) Phascolion, 10 species, small, living in mollusc-shells and usually adopting the coiled shape of their house; only one kidney, the right, persists, (v.) Dendrostoma, with 4-6 tentacles, a small genus found in tropical shallow water, (vi.) Aspidosiphon, with 19 species, is easily dis- tinguished by a calcareous deposit and thickened shield at the posterior end and at the base of the introvert, which is eccentric. (vii.) Cloeosiphon has a calcareous ring, made up of lozenge-shaped plates, round the base of its centric introvert, (viii.) Petalostoma, a

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minute form with two leaf-like tentacles, is found in the English Channel, (ix.) Onchnesoma, with 2 species, and (x.) Tylosoma, with 1 species, have no tentacles, only one brown tube, and only one retractor muscle. Both genera are found off the Norwegian coast. The last named is said to have numerous papillae and no introvert.

Fig. 3. — A semi-diagrammatic figure of the anterior end of half a Physctsoma, seen from the inner side. The introvert is fully everted and the lophophore expanded. The collar which surrounds the head is not fully extended. Two rows only of hooks are shown.

1, Lophophore.

2, Pigmented pit leading to brain

3, Section of dorsal portion of meso- blastic " skeleton."

it is con-

Pit ending in eye.

The brain.

Blood-sinus of dorsal side sur- rounding brain and giving off branches to the tentacles.

Collar.

Retractor muscle of head.

Hook.

Sense-organ.

Nerve-ring.

12, Coelom of upper lip; tinuous with 21.

13, Mouth.

14, Lower lip. Blood-sinus of ventral side, con- tinuous with 6.

Ventral portion of mesoblastic

" skeleton." Ventral nerve-cord. Coelom, continuous with 1 2 and 2 1 . Oesophagus.

20, Dorsal vessel arising from the

blood-sinus 6.

21, Coelom.

15. 16

17, 18,

19.

Authorities. — Selenka, ” Die Sipunculiden,” Semper’s Reisen (1883), and Challenger Reports, xiii. (1885); Sluiter, Natuurk. Tijdschr. Nederl. Ind. xli. and following volumes; Andrews, Stud. Johns Hopkins Univ. iv. (1887-1890); Ward, Bull. Mus. Harvard, xxi. (1891); Hatschek, Arb. Inst. Wien, v. (1884); Shipley, Quart. J. Micr. Sci. xxxi. (1890), xxxii. (1891), and xxxiii. (1892); P. Zool. Soc. London (1898), and Willey’s Zoological Results, pt. 2 (1899); Horst, Niederland. Arch. Zool., Supplementary, vol, i. (A. E. S.)

SIQUIJOR, a town of the province of Negros Oriental, Philip- pine Islands, on a small island of the same name about 14 m. S.E of Dumaguete, the capital of the province. Pop. (1903) after the annexation of San Juan, 19,416. There are sixty-four barrios or villages in the town, but only one of these had in 1903 more than 1000 inhabitants. The language is Bohol-Visayan. The principal industry is the raising of coco-nuts and preparing them for market. Other industries are the cultivation of tobacco, rice, Indian corn and hemp, and the manufacture of sinamay, a coarse hemp cloth. The island is of coral formation; its highest point is. about 1 700 ft.

SIR (Fr. sire, like sieur a variant of seigneur, 1 from Lat. senior, comparative of senex, ” old “), a title of honour. As a definite style it is now confined in the dominions of the British crown to baronets, knights of the various orders, and knights bachelor. It is never used with the surname only, being prefixed to the Christian name of the bearer; e.g. Sir William Jones. In formal written address, in the case of baronets the abbreviation Bar’, Bart, or B’ (baronet) is added after the surname, 2 in the case of knights of any of the orders the letters indicating his style (K.G., K.C.B., &c). In conversation a knight or baronet is addressed by the prefix and Christian name only {e.g. “Sir William”). The prefix Sir, like the French sire, was originally applied loosely to any person of position as a mere honorific distinction (as the equivalent of dominus, lord), as it still is in polite address, but Selden (Titles of Honor, p. 643) points out that as a distinct title ” pre- fixed to the Christian names in compellations and expressions of knights ” its use ” is very ancient,” and that in the reign of Edward I. it was ” so much taken to be parcel of their names ” that the Jews in their documents merely transliterated it, instead of trans- lating it by its Hebrew equivalent, as they would have done in the case of e.g. the Latin form dominus.

How much earlier this custom originated it is difficult to say, owing to the ambiguity of extant documents, which are mainly in Latin. Much light is,

however, thrown upon the matter by the Norman-French poem Guillaume le Mareschal, 3 which was written early in the 13th century. In this Sire is obviously used in the general sense men- tioned above, i.e. as a title of honour applicable tc all men of rank, whether royal princes or simple knights. The French king's son is " Sire Loeis " (/. 17741), the English king's son is " Sire Richard li filz le roi " (/. 17376); the marshal himself is " Sire Johan li Mareschals " (17014). We also find such notable names as " Sire Hubert de Burc " (11, 17308, 17357) and " Sire Hue de Bigot " —

" Qui par lignage esteit des buens, E apres son pere fu cuens," 4

and such simple knight's as " Sire Johan d'Erlee " (Early in Berks), the originator of the poem, who was squire to William the Marshal, or " Seingnor Will, de Monceals," who, though of very good family, was but constable of a castle. Throughout the poem, moreover, though Sire is the form commonly used it is freely interchanged with Seignor and Monseignor. Thus we have " Seingnor Hue. de Corni " (/. 10935), " Sire Hug. de Corni " (I. 10945) and " Mon- seingnor Huon de Corni " (/. 10955). Occasionally it is replaced by Dan (dominus), e.g. the brother of Louis VII. of France is " Dan Pierre de Cortenei " (I. 2 131). Very rarely the e of Sire is dropped and we have Sir: e.g. " Sir Will." (I. 12513). Sometimes, where the surname is not territorial, the effect is closely approximate to more modern usage: e.g. " Sire Aleins Basset," " Sire Enris li filz Gerolt " (Sir Henry Fitz Gerald), " Sire Girard Talebot," " Sire Robert Tresgoz."

It is notable that in connexion with a name the title Sire in the poem usually stands by itself : sometimes mis (my) is prefixed, but never li (the). Standing alone, how- ever, Sire denominates a class and the article is prefixed: e.g. les seirs d'Engleterre — the lords of England — (/. 15837). 6 "Sire," " Seignor " are used in addressing the king or a great noble.

It is thus not difficult to see how the title " Sir " came in England to be " prefixed to the expressions of knights." Knight- hood was the necessary concomitant of rank, the ultimate proof of nobility. The title that expressed this was " Sire " or " Sir " prefixed to the Christian name. In the case of earls or barons it might be lost in that of the higher rank, though this was not

1 Certainly not " from Cyr, nvp, a diminutive of the Greek word Kbpios " (F. W. Pixley, A History of the Baronetage, 1900, p. 208).

2 For not very obvious reasons some baronets now object to the contracted form " Bart.," which had become customary. See Pixley, op. cit. p. 212.

3 Edited in 3 vols., with notes, introduction and mod. French translation by

Paul Meyer for the Soc. de l'Histoire de France (Paris, 1891).

4 " Who was of good lineage and after his father became earl." 6 Cf. I. I8682. N'entendi mie bien li sire _

Que mis sire Johan volt dire.

universal even much later: e.g. in the 14th century, Sir Henry Percy, the earl marshal, or Sir John Cobham, Lord Oldcastle. The process by which the title lost all connotation of nobility would open up the whole question of the evolution of classes in England (see Gentleman) . In the case of baronets the prefix "Sir" before the Christian name was ordained by King James I. when he created the order.

The old use of " Sir " as the style of the clergy, representing a translation of dominus, would seem to be of later origin; in Guillaume le Mareschal even a high dignitary of the church is still maistre (master): e.g. " Maistre Pierres li cardonals " (/. 1 1399). It survived until the honorific prefix " Reverend " became stereotyped as a clerical title in the 17th century. It was thus used in Shakespeare's day: witness " Sir Hugh Evans," the Welsh parson in The Merry Wives of Windsor. In the English universities there is a curious survival of this use of " Sir " for dominus, members of certain colleges, technically still " clerks," being entered in the books with the style of " Sir " without the Christian name (e.g. " Sir Jones ").

In ordinary address the title " Sir," like the French Monsieur, is properly applied to any man of respectability, according to circumstances. Its use in ordinary conversation, as readers of Boswell will realize, was formerly far more common than is now the case; nor did its employment imply the icast sense of inferiority on the part of those who used it. The general decay of good manners that has accompanied the rise of democracy in Great Britain has, however, tended to banish its use, together with that of other convenient forms of politeness, from spoken intercourse. As an address between equals it has all but vanished from social usage, though it is still correct in addressing a stranger to call him " Sir." In general it is now used in Great Britain as a formal style, e.g. in letters or in addressing the chairman of a meeting; it is also used in speaking to an acknowledged superior, e.g. a servant to his master, or a subaltern to his colonel. " Sir " is also the style used in addressing the king or a prince of the blood royal (the French form " Sire " is obsolete).

In the United States, on the other hand, or at least in certain parts of it, the

address is still commonly used by people of all classes among themselves, no relation of inferiority or superiority ■ being in general implied.

The feminine equivalent of the title "sir" is legally " dame" (domino); but in ordinary usage it is "lady," thus recalling the original identity of the French sire with the English " lord." (W. A. P.)

SIRAJGANJ, a town of British India, in the Pabna district of Eastern Bengal and Assam, on the right bank of the Jamuna or main stream of the Brahmaputra, 6 hours by steamer from the railway terminus at Goalundo. It is the chief river mart for jute in northern Bengal, with several jute presses. The jute mills were closed after the earthquake of 1897. Pop. (1901)

23,114-

SIRDAR, or Sardar (Persian sardar, meaning a leader or officer), a title applied to native nobles in India, e.g. the sirdars of the Deccan. Sirdar Bahadur is an Indian military distinction; and Sirdar is now the official title of the commander-in-chief of the Egyptian army.

SIREN, a name derived from the Greek Sirens (see below) for an acoustical signalling instrument specially used in lighthouses, &c. (see Lighthouse), and applied by analogy to certain other forms of whistle. In zoology the siren (Siren lacertina), or " mud-eel " of the Americans, one of the perennibranchiate tailed batrachians, is the type of the family Sirenidae, chiefly distinguished from the Proie.idae by the structure of the jaws, which, instead of being beset with small teeth, are covered by a horny sheath like a beak; there are, however, rasp-like teeth on the palate, and a few on the inner side of the lower jaw, in- serted on the splenial bone. The body is eel-like, black or blackish, and only the fore-limbs are present, but are feeble and furnished with four fingers. It grows to a length of three feet and inhabits marshes in North and South Carolina, Florida and Texas. A second closely-allied genus of this family is Pseudobranchus, differing in having a single branchial aperture on each side instead

of three, and only three fingers. The only species, P. striatus, is a much smaller creature, growing to six inches only, and striated black and yellow; it inhabits Georgia and Florida.

As E. D. Cope has first shown, the siren must be regarded as a degenerate rather than a primitive type. He has observed that in young specimens of Siren lacertina (the larva is still un- known) the gills are rudimentary and functionless, and that it is only in large adult specimens that they are fully developed in structure and function; he therefore concludes that the sirens

are the descendants of a terrestrial type of batrachians, which passed through a metamorphosis like the other members of their class, but that more recently they have adopted a permanently aquatic life, and have resumed their branchiae by reversion. From what we have said above about Proteus and similar forms, it is evident that the " perennibranchiates " do not constitute a natural group.

See E. D. Cope, " Batrachia of North America," Bull. U.S. Nat- Mus. No. 34 (1889), p. 223.

SIRENIA, the name (in reference to the supposed mermaid-like appearance of these animals when suckling their young) of an order of aquatic placental mammals, now represented by the manati (or manatee) and dugong, and till recently also by the rhytina. Although in some degree approximating in external form to the Cetacea, these animals differ widely in structure from the members of that order, and have a totally distinct ancestry.

The existing species present the following leading characteristics. The head is rounded and not disproportionate in size as compared with the trunk, from which it is scarcely separated by any externally visible constriction or neck. Nostrils valvular, separate, and placed above the fore-part of the obtuse, truncated muzzle. Eyes very small, with imperfectly formed eyelids, capable, however, of con- traction, and with a well-developed nictitating membrane. Ear without any conch. Mouth of small or moderate size, with tumid lips beset with stiff bristles. General form of the body depressed fusiform. No dorsal fin. Tail flattened and horizontally expanded. Fore-limbs paddle-shaped, the digits being enveloped in a common cutaneous covering, though sometimes rudiments of nails are present. No trace of hind-limbs. External surface covered with a tough, finely wrinkled or rugous skin, naked, or with sparsely scattered fine hairs.

The skeleton is remarkable for the massiveness and density of most of the bones, especially the skull and ribs, which add to the specific gravity of these slow-moving animals, and aid in keeping them to the bottom of the shallow waters in which they dwell, while feeding on aquatic vegetables. The skull presents many peculiarities, among which may be indicated the large size and backward position of the nasal aperture, and the downward flexure of the front of both jaws. The nasal bones are absent, or rudimentary and attached to the edge of the frontals, far away from the middle line ; but in some extinct species these bones, though small, are normal in situation and relations. In the spinal column none of the vertebrae are united together to form a sacrum, and the flat ends of the bodies do not ossify separately, so as to form disk-like epiphyses in the young state, as in nearly all other mammals. The anterior caudal vertebrae

have well-developed chevron-bones. In one genus (Manatus) there are only six cervical vertebrae. There are no clavicles. The humerus has a small but distinct trochlear articulation at the elbow- joint; and the bones of the fore-arm are about equally developed, and generally welded together at both extremities. The carpus is short and broad, and the digits five in number, with moderately elongated and flattened phalanges, which are never increased beyond the number usual in Mammalia. The pelvis is rudimentary, con- sisting of a pair of bones suspended at some distance from the verte- bral column.

Two kinds of teeth, incisors and molars, separated by a wide interval, are generally present. The former may be developed into tusks in the upper jaw, or may be quite rudimentary. The molars vary much in character. In one genus (Rhytina) no teeth of any kind are present, at least in the adult. In all, the anterior part of the palate, and a corresponding surface on the prolonged symphysis of the lower jaw, are covered with rough horny plates of peculiar structure, which doubtless assist in mastication. The tongue is small and fixed in position, with a surface resembling that of the aforesaid plates. The salivary glands are largely developed. The stomach is compound, being divided by a valvular constriction into two principal cavities, the first of which is provided with a glandular pouch near the cardiac end, and the second usually with a pair of elongated, conical, caecal sacs or diverticula. The intestinal canal is long, and with very muscular walls. There is a caecum, either simple, conical, and with extremely thick walls, as in Halicore, or cleft, as in Manatus. The apex of the heart is deeply cleft between the ventricles. The principal arteries form extensive and complex network-like structures, retia mirabilia. The lungs are long and

narrow, as, owing to the oblique position of the diaphragm, the thoracic cavity extends far back over the abdomen. The epiglottis and arytenoid cartilages of the larynx do not form a tubular pro- longation. The brain is comparatively small, with the convolutions on the surface of the cerebrum few and shallow. The kidneys are simple, and the testes abdominal. The uterus is bicornuate. The placenta is non-deciduate and diffuse, the villi being scattered generally over the surface of the chorion except at the poles. The umbilical vesicle disappears early. The teats are two, and pectoral or rather post-axillary in position.

In vol. lxxvii. of the Zeitschrift fur wissenschaftliche Zoologie Mr L. Freund describes in detail the osteology of the flippers of the dugong as displayed in

" sciograph " pictures. These show that the carpus of the adult consists of three large bones. Of the two in the first row, one consists of the fused radiale and intermedium, and the other of the ulnare plus the pisiform and the fifth carpale, the lower bone being composed of the four inner carpalia. In the manati the reduction of the carpus has been carried to a less extent, the radiale 'being in some instances distinct from the intermedium, while in other cases in which these two bones are fused the four inner carpalia remain separate.

Sirenians pass their whole life in water, being denizens of shallow bays, estuaries, lagoons and large rivers, and not met with in the high seas far away from shore. Their food consists entirely of aquatic plants, either marine algae or freshwater grasses, upon which they browse beneath the surface, as the terrestrial herbivorous mammals do upon the green pastures on shore. To visit these pastures, they come in with the flood-tide and return with the ebb. They are generally gregarious, slow and inactive in their movements, mild, inoffensive, and apparently unintelligent in disposition. Though occasionally found stranded by the tide or waves, there is no evidence that they voluntarily leave the water to bask or feed on the shore. The habit of the dugong of raising its round head out of water, and carrying its young under the fore fin, seems to have given rise, among the early voyagers in the Indian Ocean, to the legendary beings, half human and half fish, in allusion to which the name Sirenia was bestowed by Illiger. The species now existing are few. One species, Rhytina gigas of the North Pacific, was exterminated through the agency of man during the 18th century; and the others, being valuable for their flesh as food, for their hides, and especially for the oil obtained from the thick layer of fat which lies immediately beneath their skin, diminish in numbers as civilized populations occupy the regions forming their natural habitat. The species are confined to the tropical regions of the shores of both sides of the Atlantic and the great rivers which empty themselves into that ocean, and to the coasts of the Indian Ocean from the Red Sea to North Australia.

As regards dentition (or the want thereof) the three modern genera are remarkably different ; and while on this and other grounds some writers refer them to as many separate families, by others they are all included in the Manatidae.

In the manatis (Manatus) the incisors, | in number, are rudi- mentary, and concealed beneath the horny mouth-plates, and

end of the series; with square, enamelled crowns, the grinding surface raised into tuberculated transverse ridges. The upper teeth with two ridges and three roots, the lower with an additional (posterior) ridge or heel and two roots. The cervical vertebrae present the anomaly of being reduced to

six in number, the usual vertebral formula being C 6, D 15-18, L and C, a 25-29. Rostrum of the skull, formed by the union of the premaxillae in front of the nasal aperture, shorter than the length of the aperture and scarcely deflected from the basi-cranial axis. Tail entire, rounded or shovel- shaped. Rudimentary nails on the fore-limbs. Caecum cleft.

Manatis inhabit the shores of, and the great rivers which empty themselves into, the Atlantic within the tropics. The American (M. australis) and African (M. senegalensis) forms are generally considered distinct species, though they differ but little from each other in anatomical characters and in habits. There is also the small M. inunguis of the Amazon, which has no nails. They are rather fluviatile than marine, ascending large rivers almost to their sources (see Manati).

In the dugong (Halicore) the upper jaw is furnished with a pair of large, nearly straight, tusk-like incisors, directed downwards and forwards, partially coated with enamel. In the male they have persistent pulps, and bevelled cutting edges, which project a short distance from the mouth, but in the female, though they remain through life in the alveolar cavity, they are not exserted, and, the pulp cavity being filled with osteodentine, they soon cease to grow. In the young there is also a second small deciduous incisor on each side above. At this age there are also beneath the horny plate which covers the anterior portion of the mandible four pairs of slender conical teeth lodged in wide socket-like depressions which

Fig. i.— Skull of African Manati (Manatus senegalensis). From Mus. Roy. Coll. Surgeons.

disappearing before maturity. Molars about f#, but rarely more than £ present at one time ; the anterior teeth falling before the posterior come into use; similar in characters from beginning to

Fig. 2. — American Manati (Manatus australis).

become absorbed before the animal reaches maturity. The molars are usually J, sometimes |, altogether, but not all in place at once, as the first falls before the last rises above the gum; they are more or less cylindrical in section, except the last, which is compressed and grooved laterally, without distinction into crown and root, increasing in size from before backwards, with persistent pulps and no enamel. The summits of the crowns are tuberculated before wearing, afterwards flattened or slightly concave. Skull with rostrum formed by the union of the premaxillae in front of the nasal aperture, longer than the aperture itself, bending downwards at a right angle with the basi-cranial axis, and enclosing the sockets of the large tusks. Anterior part of the lower jaw bent down in a corresponding manner.

Vertebrae: C 7, D 18-19, L and C 30. Tail broadly notched in the middle line, with two pointed lateral lobes. No nails on the fore-limbs. Caecum single. The genus is repre- sented by H. tabernaculi from the Red Sea, H. dugong from the Indian seas and H. australis from Australia. (See Dugong.)

The last genus is represented only by the extinct Rhytina gigas, of Bering Sea, in which there were no teeth, their place being supplied functionally by the dense, strongly-ridged, horny mouth-plates. Premaxillary rostrum about as long as the anterior narial aperture, and moderately deflected. Vertebrae: C 7, D 19, L and C 34-37. Head very small in proportion to the body. Tail with two lateral pointed lobes. Front limbs small and truncated. Skin naked and covered with a thick, hard, rugged, bark-like epidermis. Stomach without caecal appendages to the pyloric cavity. Caecum simple. See Rhytina.

Extinct Sirenia. — In past times the Sirenia were represented by a number of extinct generic types ranging over all the temperate and probably tropical regions, and extending from the Pliocene to the Eocene epoch. In the Pliocene of Europe the group is represented by Felsinotherium, in the Miocene by Metaxytherium, and in the Oligo- cene by Halitherium; the latter having an acetabular cavity to the pelvis and a rudimentary femur. From Halitherium, which has a somewhat maniti-like dentition, although there are few cheek-teeth, there is a transition through the other two genera to Halicore; Felsinotherium having a large pair of tusk-like upper teeth. In Halitherium milk-molars were developed. In Miosiren, of the Belgian Miocene, the teeth were differentiated into i. \, p. l,m.|. Remains of several early types of sirenians have been obtained from the Eocene deposits of Egypt. The least generalized of these is Eosiren, an animal differing from the modern forms chiefly by the retention of traces of the second and third pairs of incisors and of the

canines, and the somewhat less degree of reduction in the pelvis, which has a complete acetabulum for the head of the femur. The front teeth (incisors and canine) have, however, been thrust to the sides of the jaw, possibly to make room for a horny plate on the palate. In the somewhat earlier Eotherium the incisors and canines are larger and occupy the normal position in the front of the jaws ; while the pelvis has a closed obturator foramen and a complete acetabulum, suggestive that a functional thigh-bone or femur was still retained. The most primitive member of the group with which we are yet acquainted is the very imperfectly known

Prorastomus, from the Eocene of the West Indies, in which a complete and fully differentiated dentition is accompanied by the absence of that deflection of the front part of the jaws which constitutes one of the most striking features of all the foregoing representatives of the order ; — a feature which Dr C. W. Andrews has pointed out must be of great value to short-necked, long-bodied creatures feeding on the herbage at the bottom of the water in which they dwell.

The foregoing Egyptian fossil sirenians afford important evidence with regard to the ancestry of the order. Many years ago it was suggested by the French naturalist de Blainville that the Sirenia are related to the Proboscidea. This is supported by the occurrence of the remains of some of the most primitive sirenians with those of the most primitive proboscideans in the Eocene formations of Egypt; confirmatory evidence being yielded by the similarity of the brain and to some extent of the pelvis in the ancestral forms of the two groups. As regards the living members of the two groups, both have pectoral teats, abdominal testes, and a cleft apex to the heart; while the cheek-teeth of the sirenians are essentially of the same type as those of the early proboscideans. There seems also to be a certain similarity in the mode of succession of the teeth in the more specialized members of the two groups, although in the sirenians this specialization has displayed itself in an abnormal augmentation of the number of the teeth, while in the proboscideans, on the other hand, it has taken the form of an increase in the complexity of the individual teeth, especially those at the hinder part of the series. Finally, although the Proboscidea have a deciduate and the Sirenia a zonary nondeciduate placenta, yet there are certain similarities in the structure of this organ in the two groups which may indicate genetic affinity.

Literature. — O. Thomas and R. Lydekker, " On the Number of Grinding-Teeth possessed by the Manatee," Proc. Zoo/. Soc. (1897); G. R. Lepsius, " Halitherium schinzi, die fossile Sirene des Mainzer- Beckens," Abhandl. Mittelrhein. Geol. Vereins (1881 and 1882); O. Abel, " Die Sirenen der mediterranen Tertiarbildungen Osterreichs, " Abhandl. k. k. geol. Reichsansta.lt, Wien, vol. xix. (1904); and " tJber Halitherium bellunense, eine Ubergangsform zur Gattung Metaxy- therium," Jahrbuch k. k. geol. Reichsanstalt, Wien, vol. lv. (1905); C. W. Andrews, Descriptive Catalogue of the Vertebrata from the Fayum (British Museum, 1906). *(R. L.*)*

SIRENS (Gr. Xupfjvts), in Greek mythology, the daughters of Phorcys the sea-god, or, in later legend, of the river-god Achelous and one of the nymphs. In Homer they are two in number (in later writers generally three); their home is an island in the western sea between Aeaea, the island of Circe, and the rock of Scylla. They are nymphs of the sea, who, like the Lorelei of German legend, lured mariners to destruction by their sweet

song. Odysseus, warned by Circe, escaped the danger by stopping the ears of his crew with wax and binding himself to the mast until he was out of hearing (Odyssey xii.). When the Argonauts were passing by them, Orpheus sang so beautifully that no one had ears for the Sirens, who, since they were to live only until some one heard their song unmoved, flung themselves into the sea and were changed into sunken rocks (Apollodorus i. 9; Hyginus, Fab. 141). They were said to have been the playmates of Persephone, and, after her rape by Pluto, to have sought for her in vain over the whole earth (Ovid, Metam. v. 552). When the adventures of Odysseus were localized on the Italian and Sicilian coasts, the Sirens were transferred to the neighbourhood of Neapolis and Surrentum, the promontory of Pelorum at the entrance to the Straits of Messina, or elsewhere. The tomb of one of them, Parthenope, was shown in Strabo's (v. p. 246) time at Neapolis, where a gymnastic contest with a torch-race was held in her honour.

Various explanations are given of the Sirens. As sea-nymphs, they represent the treacherous calm of ocean, which conceals destruction beneath its smiling surface; or they signify the enervating influence of the hot wind (compare the name Sirius), which shrivels up the fresh young life of vegetation. Or, they symbolize the magic power of beauty, eloquence and song; hence their images are placed over the graves of beautiful women and maidens, of poets and orators (Sophocles, Isocrates).

Another conception of them is that of singers of the lament for the dead, for which reason they are often used in the adornment of tombs, and represented beating their breasts and tearing their hair or playing the flute or lyre. In early art, they were repre- sented as birds with the heads of women; later, as female figures with the legs of birds, with or without wings.

See H. Schrader, Die Sirenen (1868); Preller- Robert, Griechische Mythologie (1894), pp. 614-616; G. Weicker, De Sirenibus quaes- tiones selectae (Leipzig, 1895), in which the writer endeavours to show that the Sirens, like the Harpies, were originally the souls of the dead, their employment on tombstones expressing the desire to find a permanent abode for the souls; and Der Seelenvogel in der alten Literatur und Kunst (1902), with bibliography; J. E. Harrison, Myths of the Odyssey (1882), Mythology and Monuments of Athens (1890) and Prolegomena to the Study of Greek Religion (1908) ; J. P. Postgate, in Journal of Philology, ix. (1880), who considers the Sirens to have been birds; W. E. Axon, R. Morris, D. Fitzgerald in the Academy, Nos. 484, 486, 487 (1881); A. Baumeister, Denkmdler des klassisciten Altertums, iii. (1888).

SIRGUJA, or Surguja, one of the Chota Nagpur feudatory states, which

was transferred in 1905, from Bengal to the Central Provinces. It is bounded on the N. by the state of Rewa and the districts of Mirzapur and Ranchi, on the E. by Ranchi, on the S. by the Bilaspur district of the Central Provinces and the states of Udaipur and Jashpur, and on the W. by the state of Korea. It is very hilly, with elevated table-lands affording good pasturage, and cut up by numerous ravines. The rivers are the Kanhar, Rer, Mahan, Sone and Sankh, the last being formerly known as the Diamond river. Hot springs exist in the state. Extensive s&l forests cover a large area, affording shelter to herds of wild elephant, bison, and many sorts of deer, and also to tigers, bears and other beasts of prey. Area, 6089 sq. m.j pop. (1901) 351,011; estimated revenue, £8000. The residence of the maharaja is at Bisrampur.

SIRHIND, a tract of land in the Punjab, India. It consists of the north-eastern portion of the plain between the Jumna and Sutlej rivers, and is watered by the Sirhind canal. Sirhind is not an administrative division, but historically the name includes the districts of Umballa, Ludhiana, and Ferozepore, together with the states of Patiala, Jind and Nabha.

The Sirhind canal serves the Umballa and Ludhiana districts, and the Patiala, Jind and Nabha states. It draws its water- supply from the Sutlej near Rupar, where the head-works are situated. The canal, which was opened in 1882, has 538 m. of main and branch canals, and irrigates nearly 2000 sq. m.

The town of Sirhind, in the state of Patiala, had a population in 1901 of 5415- It is of very early, but uncertain, foundation, and had a period of great prosperity under the Moguls. Its ancient ruins cover a large extent, and include two fine domed tombs of the 14th century. It is held accursed by the Sikhs, owing to the barbarous murder of the son of Guru Govind by the Mahommedan governor in 1 704.

SIRICIUS, pope from December 384 to November 399, suc- cessor of Damasus. Siricius was averse from countenancing the influence of the monks, and did not treat Jerome with the favour with which he had been honoured by preceding popes, with the result that Jerome left Rome and settled at Bethlehem. Some years later, however, Siricius condemned the anti-ascetic doctrines of Jovinianus. Several of the decretal letters of Siricius are extant, in which, at the request of certain groups of Western bishops, he sets forth the rules of ecclesiastical discipline. It was under his pontificate that a general council was convened at Capua in 391, at which various Eastern affairs were brought forward. Theophilus, bishop of Alexandria, at the request of Siricius, had two important disputes settled by two councils held in 393 at Caesarea and Contantinople, relating respectively to the sees of Antioch and Bostra. The council of Capua,

inspired by the pope, deferred to the council of Macedonia the affair of Bonosus, bishop of Sardinia, who had been accused of heresy. To safeguard the authority of the Holy See over the bishops of Illyricum, Siricius entrusted his powers to the bishop of Thes- salonica, who was henceforth the vicar of the pope in those provinces. In 386 Siricius had protested against the attitude of I Bishop Ithacius, the accuser of Priscillian, and this protest he

resolutely maintained, although he disapproved of the doctrines taught by the Spanish doctor. It was during his pontificate that the last attempt to revive paganism in Rome was made (392-394) by Nicomachus Flavianus. Siricius died on the 26th of November 399. (L. D.)*

SIRKAR (Persian sarkar, meaning " head of affairs"), a term used in India in three distinct senses; for the government or supreme authority, for a division of territory under the Moguls, otherwise spelt circar (q.v.), and for a head servant in Bengal.

SIRMIO, a promontory at the southern end of the Lacus Benacus (Lake of Garda), projecting 2! m. into the lake. It is celebrated from its connexion with Catullus, for the large ruins of a Roman villa on the promontory have been supposed to be his country house. A post-station bearing the name Sirmio stood on the high-road between Brixia and Verona, near the southern shore of the lake. On the shore below is the little village of Sermione, with sulphur baths.

SIRMOND, JACQUES (1559-1651), French scholar and Jesuit, was born at Riom, Auvergne, on the 12th or the 22nd of October 1559. He was educated at the Jesuit College of Billom; having been a novice at Verdun and then at Pont-a-Mousson, he entered into the order on the 26th of July 1576. After having taught rhetoric at Paris he resided for a long time in Rome as secretary to R. P. Aquaviva (1 590-1608); in 1637 he was confessor to Louis XIII. He died on the 7th of October 1651. Father Sirmond was a most industrious scholar, and his criticisms were as enlightened as was possible for a man living in those times. He brought out many editions of Latin and Byzantine chroniclers of the middle ages: Ennodius and Flodoard (1611), Sidonius Apollinaris (1614), the life of St Leo IX. by the archdeacon Wibert (1615), Marcellinus and Idatius (1619), Anastasius the librarian (1620), Eusebius of Caesarea (1643), Hincmar (1645), Hrabanus Maurus (1647), Rufinus and Loup de Ferrieres (1650), &c, and above all his edition of the capitularies of Charles the Bald {Karoli

Calvi et successorum aliquot Franciae regum capitula, 1623) and of the councils of ancient France {Concilia antiquae Galliae, 1629, 3 vols., new ed. incomplete, 1789). An essay in which he denies the identity of St Denis of Paris and St Denis the Areopagite (1641), caused a very lively controversy from which his opinion came out victorious. His Opera varia, where this essay is to be found, as well as a description in Latin verse of his voyage from Paris to Rome in 1590, have appeared in 5 vols. (1696; new ed. Venice, 1728). To him is attributed, and no doubt correctly, Elogio di cardinale Baronio (1607).

See the Bibliotheque des Peres de la Compagnie de Jisus by Father Carlos Sommervogel, tome vii. (1896).

SIRMUR, or Sarmor (also called Nahan, after the chief town), a native state of India, within the Punjab. It occupies the lower ranges of the Himalaya, between Simla and Mussoorie. Area 1 198 sq. m. The state is bounded on the N. by the hill states of Balsan and Jubbal, on the E. by the British district of Dehra Dun, from which it is separated by the rivers Tons and Jumna, on the S.W. by Umballa district, and on the N.W. by the states of Patiala and Keonthal. Except a very small tract about Nahan, the chief town and residence of the raja, on the south-western extremity, where a few streams rise and flow south-westward to the Saraswati and Ghaggar rivers, the whole of Sirmur lies in the basin of the Jumna, which receives from this tract the Giri and its feeders the Jalal and the Palur. The Tons, the great western arm of the stream called lower down the Jumna, flows along the eastern boundary of Sirmur, and on the right side receives from it the two small streams Minus and Nairai. The surface generally declines in elevation from north to south; the chief elevations on the northern frontier (Chor peak and station) are about 12,000 ft. above the sea. The valley of the Khiarda Dun, which forms the southern part of the state, is bounded on the S. by the Siwalik range, the hills of which are of recent formation and abound in fossil remains of large verte- brate animals. Though the rocks of Sirmur consist of formations usually metalliferous, the yield of mineral wealth is small. The forests are very dense, so much so that the sportsman finds difficulty in making his way through them in search of deer and

other game, with which they abound. The climate of Sirmur varies with the elevation; the northern extremity has very little rain; but large and excellent crops are everywhere to be obtained by irrigation. The population in 1901 was 135,687, showing an increase of 9% in the decade. Estimated gross revenue, £40,000. The chief, whose title is raja, is a Rajput of high lineage. The raja Shamsher Perkash, G.C.S.I., who died in 1898, ruled with remarkable ability and success. A younger son commanded the Imperial Service sappers in the Tirah campaign of 1896-97, and was rewarded with the rank of honorary captain in the Indian army and the

distinction of CLE. Attempts have been made to establish an iron foundry, and to develop mines of slate and mica.

The town of Nahan is situated about 40 m. S. of Simla, 3057 ft. above the sea-level. The palace of the raja and several other houses are built of stone in European style. It had a population in 1901 of 6256.

SIROCCO, a name applied to two quite distinct types of local ■ wind. The first type is the characteristic wind of the winter rainy season in the Mediterranean region, and is associated with the eastern side of local depression or cyclones, in which the weather is moist, cloudy and rainy, the prevailing directions being south and south-east. The second type is the intensely dry dust-laden wind of the desert which receives this name in Sicily and southern Italy especially, where the general direction is south-east or south-west. Local winds of this latter type receive a great variety of names in different parts of the Mediterranean and surrounding regions (see Leveche, Leste, Khamsin, Simoom).

SIROHI, a native state of India, in the Rajputana agency. Area 1964 sq. m. The country is much broken up by hills and rocky ranges; the Aravalli range divides it into two portions, running from north-east to south-west. The south and south-east part of the territory is mountainous and rugged, containing the lofty Mount Abu, an isolated mass of granite rock, culminating in a cluster of hills, enclosing several valleys surrounded by rocky ridges, like great hollows. On both sides of the Aravallis the country is intersected with numerous water channels, which run with considerable force and volume during the height of the rainy season, but are dry for the greater part of the year. The only river of any importance is the Western Banas. A large portion of the state is covered with dense jungle, in which wild animals, including the tiger, bear and leopard, abound. Many splendid ruins bear witness to the former prosperity and civilization of the country. The climate is on the whole dry; in the south and east there is usually a fair amount of rain. On Abu the average annual rainfall is about 64 in., whereas in Erinpura, less than 50 m. to the north, the average fall is only between 12 and 13 in. Pop. (1901) 154,544, showing a decrease of 17% in the decade, due to the results of famine. Gross revenue £28,000, tribute £450.

During the early years of the 19th century, Sirohi suffered much from wars with Jodhpur and the wild Mina hill tribes. The protection of the British was sought in 1817; the pretensions of Jodhpur to suzerainty over Sirohi were disallowed, and in 1823 a treaty was concluded with the British government. For services rendered during the Mutiny of 1857 the chief received a remission of half his tribute. The chief, whose title is maharao, is a Deora Rajput of the Chauhan clan, and claims descent from the last

Hindu king of Delhi. The state is traversed by the Rajputana railway.

The town of Sirohi is 28 m. N. of Abu-road station. Pop. (1901) 5651. It has manufactures of sword-blades and other weapons. The Crosthwaite hospital, which is built and equipped on modern principles, was opened by Sir Robert Crosthwaite in December 1897.

SIRSA, a town of British India, in Hissar district of the Punjab, situated on a dry bed of the river Ghaggar, and on a branch of the Rajputana railway, midway between Rewari and Ferozepur. Pop. (1901) 15,800. It occupies an ancient site, and was refounded in 1837 as the head-quarters of a British district. It is an important centre of trade with Rajputana, and has manu- factures of cotton cloth and pottery. The former district of

Sirsa was part of the territory conquered from the Mahrattas in 1803, when it was almost entirely uninhabited. It required reconquering from the Bhattis in 1818; but it did not come under British administration until 1837. During the Mutiny of 1857 Sirsa was for a time wholly lost to British rule. On the restoration of order the district was administered by Punjab officials, and in the following year, with the remainder of the Delhi territory, it was formally annexed to that province. In 1884 it was sub-divided between the districts of Hissar and Ferozepur.

SIS (anc. Sision or Siskia, later Flaviopolis or Flavias), the chief town of the Khozan sanjak of the Adana vilayet of Asiatic Turkey, situated on the left bank of the Kirkgen Su, a tributary of the Jihun (Pyramus) and at the south end of a group of passes leading from the Anti-Taurus valleys to the Cilician plain and Adana. It was besieged by the Arabs in 704 but relieved by the Byzantines. The Caliph, Motawakkil took it and refortified it; but it soon returned to Byzantine hands. It was rebuilt in 1186 by Leo II., king of Lesser Armenia, who made it his capital. In 1374 it was taken and demolished by the sultan of Egypt, and it has never recovered its prosperity. It is now only a big village of some 3000 inhabitants. It has had, however, a great place in Armenian ecclesiastical history from the times of St Gregory the Illuminator to our own. Gregory himself was there consecrated the first Catholicus in a.d. 267, but transferred his see to Vagarshabad (Echmiadzin, Etchmiadzin), whence, after the fall of the Arsacids, it passed to Tovin. After the constitution of the kingdom of Lesser Armenia, the catholicate returned to Sis (1294), the capital, and remained there 150 years. In 1441, Sis having fallen from its high estate, the Armenian clergy proposed to remove the see, and on the refusal of the actual Catholicus,

Gregory IX., installed a rival at Echmiadzin, who, as soon as Selim I. had conquered Greater Armenia, became the more widely accepted of the two by the Armenian church in the Ottoman empire. The Catholicus of Sis maintained himself nevertheless, and was supported in his pretensions by the Porte up to the middle of the 19th century, when the patriarch Nerses, declaring finally for Echmiadzin, carried the government with him. In 1885 Sis tried to declare Echmiadzin schismatic, and in 1895 its clergy took it on themselves to elect a Catholicus without reference to the patriarch; but the Porte annulled the election, and only allowed it six years later on Sis renouncing its pretensions to independence. The present Catholicus has the right to prepare the sacred myron (oil) and to preside over a synod, but is in fact not more than a metropolitan, and regarded by many Armenians as schismatic. The lofty castle and the monastery and church built by Leo II., and containing the coronation chair of the kings of Lesser Armenia, are inter- esting. (D. G. H.)

SISAL HEMP, or Henequen, of Florida and the Bahamas, theproductof A gaverigida, variety sisalana, anative of Yucatan, but found in other parts of Central America and distributed to the West Indies, where it is being increasingly cultivated.

Agave (q.v.) is a member of the order Amaryllidaceae ; and a well-known species of the genus, Agave americana, the century plant, will suggest the habit of the sisal hemp, which, however, differs in the absence of prickles along the margin of the fleshy leaf. After six or seven years the flowering stalk or " pole " develops from the centre of the leaf-cluster, and grows to the height of 15 or 20 ft. The flowers are borne in dense clusters at the ends of short lateral branches, and closely resemble those of Agave americana. After they have begun to wither, buds are developed from the point of union with the flower-stalk; these form tiny plants, which, when several inches long, become detached and fall to the ground. Those that fall in a suitable place take root and are soon large enough to transplant. After flowering the plant perishes, but is renewed by suckers springing from the base of the stem; these suckers are then planted, and the leaves should be ready for cutting in about four years. The other method of planting is by means of " pole " plants just described. In collecting the fibre the leaves are cut off at the base, the spine at the top end removed, and the leaves carried in bundles to the machines. Here two scraping wheels remove the pulp

from the leaves. The leaves are put into the machine at one side, and delivered clean at the other. One half is cleaned by the first wheel, then the cleaned portion is held while the second wheel cleans the remainder of the leaf; all the operations are auto- matically performed. In Yucatan, the leaves measure from 4 to 5 ft. in length, about 4 in. in width, and § in. in thickness. They are lance-shaped and weigh from i§ lb to if lb on an

average. As only about 3 to 4% of the weight is available for fibre, the average yield of 1000 leaves is from 50 to 60 lb. The yield per acre is estimated at about half a ton. It has been proposed to treat the pulp, &c, with a view to extracting the chemical substances, but we are not aware that any successful attempt has been made. The fibre is yellowish-white, straight, smooth and clean, and a valuable cordage fibre second only to manila fibre in strength. It is used extensively for cordage and binder twine, both alone and in conjunction with manila, and is also used for bags, hammocks and similar articles.

The plants thrive on arid rocky land, growing, for instance, on the Florida Keys upon the almost naked coral rock. Their northern limit of cultivation is determined by frost, which the plants will not stand; in Florida this is represented by the line of 2 7 N. An inferior fibre is obtained from the leaves of another species. Agave decipiens, which is found wild along the coasts and keys of Florida. It is known as the false sisal hemp, and can at once be distinguished from true sisal by its spiny leaf -margin.

SISKIN (Dan. sidsken, Ger. Zeisig and Zeising) , long known in England as a cage-bird called by dealers the Aberdevine or Abadavine, names of unknown origin, the Fringilla spinus of Linnaeus, and Carduelis spinus of modern writers, belongs to the Passerine family Fringillidae. In some of its structural characters it is most nearly allied to the goldfinch (q.v.), and both are placed in the same genus by systematists; but in its style of coloration, and still more in its habits; it resembles the redpolls (cf. Linnet), though without their slender figure, being indeed rather short and stout of build. Yet it hardly yields to them in activity or in the grace of its actions, as it seeks its food from the catkins of the alder or birch, regardless of the attitude it assumes while so doing. Of an olive-green above, deeply tinted in some parts with black and in others lightened by yellow, and beneath of a yellowish-white again marked with black, the male of this species has at least a becoming if not a brilliant garb, and possesses a song that is not unmelodious, though the resemblance of some of its notes to the running-down of a piece of clockwork is more remarkable than pleasing. The hen is still more soberly attired; but it is perhaps the siskin's disposition to familiarity that makes it so favourite a captive, and, 'though as a cage-bird it is not ordinarily long-lived, it readily adapts itself to the loss of liberty. Moreover, if anything like the needful accommodation be afforded, it will build a nest and therein lay its eggs: but it rarely succeeds in bringing up its young in confinement. As a wild bird it breeds constantly, though locally, throughout the greater part of Scotland, and has frequently done so in England, but more rarely in Ireland. The greater portion, however, of the numerous bands which visit the British Islands in autumn and winter doubtless come from the Continent — perhaps even from far to the 'eastward, since its range stretches across Asia to Japan, in which country

it is as favourite a cage-bird as with us. The nest of the siskin is very like that of the goldfinch, but seldom so neatly built; the eggs, except in their smaller size, much resemble those of the greenfinch (q.v.).

A larger and more brightly coloured species, C. spinoides, inhabits the Himalayas, but the siskin has many other relatives belonging to the New World, and in them serious modifications of structure, especially in the form of the bill, occur. Some of these relatives lead almost insensibly to the greenfinch (ut supra) and its allies, others to the goldfinch (ut supra), the redpolls and so on. Thus the siskin perhaps may be regarded as one of the less modified descendants of a stock whence such forms as those just mentioned have sprung. Its striated plumage also favours this view, as an evidence of permanent immaturity or generalization of form, since striped feathers are so often the earliest clothing of many of these birds, which only get rid of them at their first moult. On this theory the yellowbird or North- American " goldfinch," C. tristis, would seem, with its immediate allies, to rank among the highest forms of the group, and the pine-goldfinch, C. pinus, of the same country, to be one of the lowest —

the cock of the former being generally of a bright yellow hue, with black crown, tail and wings — the last conspicuously barred with white, while neither hens nor young exhibit any striations. On the other hand, neither sex of the latter at any age puts off its striped garb — the mark, it may be pretty safely asserted, of an inferior stage of development. The remaining species of the group, mostly South- American, do not seem here to need particular notice. (A. N.)

SISLEY, ALFRED (1840-1899), French landscape painter, was born in Paris in 1839, of English parents. He studied painting under Gleyre, and was afterwards influenced, first by Corot, and then by the impressionists Monet and Renoir. He worked both in France and in England, and made the Seine, the Loing and the Thames the subjects of many pictures that are remarkable for the subtle appreciation of the most delicate colour effects. Success was not given him during his life, which was one of constant poverty and hard struggle. Purchasers of his pictures were few and far between, although the prices rarely exceeded a few pounds. Only after his death, which occurred at Moret-sur-Loing in 1899, did his work find appreciation, and at the Viau sale in Paris, in 1907, his small painting of " The Seine at Port-Marly " realized £652, whilst ten other landscapes sold at prices ranging from £200 to £400. He was essentially a colourist who, like Monet, delighted in recording the changing effects of light in the

successive hours of the day, and paid very little attention to composition and draughtsmanship. The impressionist exhibition at the Grafton Galleries, London, in 1905, included several characteristic examples of his work. Sisley is^lso represented at the Luxembourg in the Caillebotte collection.

SISMONDI, JEAN CHARLES LEONARD DE (1773-1842), whose real name was Simonde,was born at Geneva, on the 9th of May 1773. His father and all his ancestors seem to have borne the name Simonde, at least from the time when they migrated from Dauphine to Switzerland at the revocation of the edict of Nantes. It was not till after Sismondi had become an author that, observing the identity of his family arms with those of the once flourishing Pisan house of the Sismondi, and finding that some members of that house had migrated to France, he assumed the connexion without further proof and called himself De Sismondi. The Simondes, however, were themselves citizens of Geneva of the upper class, and possessed both rank and property, though the father was also a village pastor. The future historian was well educated, but his family wished him to devote himself to commerce rather than literature, and he became a banker's clerk at Lyons. Then the Revolution broke out, and as it affected Geneva the Simonde family took refuge in England, where they stayed for eighteen months (1793-1794). Disliking, it is said, the climate, they returned to Geneva, but found the state of affairs still unfavourable; there is even a legend that the head of the family was reduced to sell milk himself in the town. The greater part of the family property was sold, and with the proceeds they emigrated to Italy, bought a small farm at Pescia near Lucca, and set to work to cultivate it themselves. Sismondi worked hard here, both with his hands and his mind, and his experiences gave him the material of his first book, Tableau de I'agriculture toscane, which, after returning to Geneva, he published there in 1801. In 1803 he published his Traite de la richesse commerciale, his first work on the subject of political economy, which, with some differences of view, continued to interest him to the end of his life.

As an economist, Sismondi represented a humanitarian protest against the dominant orthodoxy of his time. In his first book he followed Adam Smith, but in his principal subsequent economic work, Nouvcaux Principes d'economie politique (1819), he insisted on the fact that economic science studied the means of increasing wealth too much, and the use of wealth for producing happiness too little. He was not a socialist; but, in protesting against laisser faire and invoking the intervention of government " to regulate the progress of wealth," he was an interesting precursor of the German " socialists of the chair."

Meanwhile he began to compile his great Histoire des Ri- publiques

Italiennes du moyen dge, and was introduced to Madame rle Stael. With her he became very intimate, and after being

regularly enrolled in the society of Coppet he was invited or commanded (for Madame de Stael's invitations had something of command) to form one of the suite with which the future Corinne made the journey into Italy, resulting in Corinne itself during the years 1804-1805. Sismondi was not altogether at his ease here, and he particularly disliked Schlegel, who was also of the company. But during this journey he made the acquaintance of the countess of Albany, Louisa of Stolberg, widow of Charles Edward, and all her life long gifted with a singular faculty of attracting the affection (Platonic and other) of men of letters. She was now an old woman, and Sismondi's relations with her were of the strictly friendly character, but they were close and lasted long, and they produced much valuable and interesting correspondence. In 1807 appeared the first volumes of the above mentioned book on the Italian republics, which (though his essay in political economy had brought him some reputation and the offer of a Russian professorship) first made Sismondi prominent among European men of letters. The completion of this book, which extended to sixteen volumes, occupied him, though by no means entirely, for the next eleven years. He lived at first at Geneva, and delivered there some interesting lectures on the literature of the south of Europe, which were continued from time to time and finally published; and he held an official post — that of secretary of the chamber of commerce for the then department of Leman. In 1813 he visited Paris for the first time, and abode there for some time, mixing much in literary society. Although a Liberal and in his earlier days almost an Anglo- maniac, he did not welcome the fall of the empire. During the Hundred Days he defended Napoleon's constitutional schemes or promises, and had an interview with the emperor himself, which is one of the chief events of a not very eventful life. After the Restoration he left Paris. On completing (181 7) his great book on the Italian republics, he undertook (1818) a still greater, the Histoire des Francais, which he planned on a vast scale, and of which during the remaining twenty-three years of his life he published twenty-nine volumes. His untiring industry enabled him to compile many other books, but it. is on these two that his fame chiefly rests. The earlier displays his qualities in the most favourable light, and has been least injuriously affected by subsequent writings and investigations; but the Histoire des Francais, as a careful and accurate sketch on the great scale, has now been superseded. Sainte-Beuve has with benevolent sarcasm surnamed the author " the Rollin of French History," and the praise and the blame implied in the comparison are both perfectly well deserved. In April 1819 Sismondi married an English lady, Miss Allen, whose sister was the wife of Sir James Mackintosh, and the marriage appears to have been a very happy one. His later years were chiefly spent

at Geneva, in the politics of which city he took a great, though as time and changes went on a more and more chagrined, interest. Indeed, in his later days he became a kind of reactionary. He died at Geneva on the 25th of June 1842.

Besides the works above mentioned he had executed many others, his custom for a long period of years being never to work less than eight hours a day. The chief of these are Litterature du midi de V Europe (1813), an historical novel entitled Julia Severa ou Van 492 ■ (1822), Histoire de la Renaissance de la liberty en Italie (1832), Histoire de la chute de I'empire romain (1835), Precis de I'histoire des Francais, an abridgment of his own book (1839), with several others, chiefly political pamphlets.

Sismondi's journals and his correspondence with Channing, with the countess of Albany and others have been published chiefly by Mile. Mongolfier (Paris, 1843) and M. de Saint-Rene Taillandier (Paris, 1863). The latter work serves as the chief text of two admirable Lundis of Sainte-Beuve (September 1863), republished in the Nouveaux Lundis, vol. vi.

SISSEK (Hungarian, Sziszek; Croatian, Sisak), a town of Croatia-Slavonia, in the county of Agram; situated at the confluence of the Save and Kulpa, 30 m- by rail S.E. by S. of Agram. Pop. (1900) 7047. Sissek has a considerable trade in grain and timber. Its only noteworthy building is an ancient castle, constructed of brick.

As the vestiges of its Roman walls tend to prove, Sissek was a large and flourishing city under Roman rule. Augustus made it

a military station; Tiberius chose it as his headquarters against the Pannonian rebels; and from Septimius Severus, who made it the centre of a military government, it gained the name of Septimia Sissia. A Segesta, on the Save, is mentioned by Appian, and Strabo distinguishes between this town and the neighbouring Siscia. It seems likely, as St Aymour suggests, that two towns, the native Segesta and the Roman fortress called by Strabo 17 Sicrwa Qpovpiov, ultimately united under the single name of Siscia. In the 3rd century, under Gallienus and Probus, the city contained the chief imperial mint and treasury; and an engraved coffer, found in Croatia, dating from the 4th century, and representing the five foremost cities of the Empire, includes Siscia along with Rome, Byzantium, Carthage and Nicomedia. Its bishopric was removed to Salona, in 441, when Attila appeared, and thenceforward the city declined. For a brief period, in the

7th and 8th centuries, the conquering Slavs made it one of their Zupanates, or governments; but in the 10th century it was sacked by the Magyars, and in 1092 its territories were bestowed upon the cathedral chapter of Agram by Ladislaus I., king of Hungary. Under the walls of its castle, built by this chapter in 1544, the Turks were thrice defeated in 1593. At a fourth venture the city fell, only to be evacuated in 1594. It witnessed a final Turkish defeat in 1641.

See C. de St Aymour, Les Pays sud-slaves de I'Autriche-Hongrie (1883), ch. ii.

*SISTER, the correlative of brother (q.v.) , a female in her relation to the other children born of the same parents, also one who has acquired such relationship by marriage, a sister-in-law, or by adoption. The O. Eng. word was sweostor; cf. Dutch zuster, Ger. Sckwester, Goth, swistar; in M. Eng. this appears as suster; the Scandinavian form appears in Icel. systir, Swed. systor, Dan. siistor, and this has curiously taken the place of the true English form suster. Outside Teut. are found Lat. soror for sosor, Skt. svasti; the origin is not known, but it may be related with Skt. svasti, happiness, joy. The Lat. consobrinus, which has given " cousin," is from con-sobrinus, sosbrinus, from the stem of soror, sister. As " brother " and " brethren " are used for the male members of a religious body or community, so also is " sister " for the female members; more particularly it is applied to the members of a female religious order or community, a " sisterhood," in the Roman and other churches, who are de- voted to a religious life, works of charity or mercy, whether bound by irrevocable vows or not. **

SISTERHOODS (Modern Anglican). The dissolution of religious houses in England (1536-1340) under Henry VIII. swept away more than 140 nunneries, and the Anglican Church was left without sisterhoods for three centuries. But as these had for 900 years formed part of her system, there were protests from time to time and attempts at restoration. Amongst such protests, which generally dwelt a good deal on the want of provision for unmarried women, may be mentioned three in successive centuries. The historian Fuller would have been glad " if such feminine foundations had still continued," those " good shee-schools," only without vows (Bk. vi.). Richardson the novelist, in Sir Charles Grandison, wishes there could be a Protestant nunnery in every county, " with a truly worthy divine, at the appointment of the bishop of the diocese, to direct and animate the devotion of such a society "; in 1829 the poet Southey, in his Colloquies (cxiii.), trusts that "thirty years hence .this reproach also may be effaced, and England may have its Beguines and its sisters of mercy. It is grievously in need of them." Also small practical efforts were made in the religious household? of Nicholas Ferrar at Little Gidding, 1625, and of William Law

at King's Cliffe, 1743; and under Charles II., says Fr. Bede, Autob., "about 12 Protestant ladies of gentle birth and considerable means " founded a shortlived convent, with Sancroft, then Dean of St Paul's, for director.

Southey's appeal had weight, and before the thirty years had passed compassion for the needs of the destitute in great cities, and the impulse of a strong Church revival, aroused a body of laymen, among whom were included Mr Gladstone, Sir T. D. Acland, Mr A. J. Beresford-Hope, Lord Lyttelton

and Lord John Manners (chairman) , to exertions which restored sisterhoods to the Church of England. On 26th March 1845 the Park Village Community was set on foot in Regent's Park, London, to minister to the poor population of St Pancras. The " Rule " was compiled by Dr Pusey, who also gave spiritual supervision. In the Crimean War the superior and other sisters went out as nurses with Florence Nightingale. The community afterwards united with the Devonport Sisters, founded by Miss Sellon in 1849, and together they form what is known as Ascot Priory. The St Thomas's sisterhood at Oxford commenced in 1847; and the present mother-superior of the Holy Trinity Convent at Oxford, Marian Hughes, dedicated herself before witnesses to such a life as early as 1841 (Liddon's Life of Dr Pusey, hi.).

Four sisterhoods stand together as the largest: those of Clewer, Wantage, All Saints and East Grinstead; and the work of the first may stand as a specimen of that of others. The " Community of St John the Baptist " at Clewer, near Windsor, arose in 1849 through the_ efforts of Mrs Tennant and the vicar, afterwards warden of the society, the Rev. T. T. Carter, to save fallen women. Under the first superior, Harriet Monsell, the numbers grew apace, and are now above 200. Their services to society and the Church include 6 houses for fallen women, 7 orphanages, 9 elementary and high schools and colleges, 5 hospitals, mission work in 13 parishes and visiting in several " married quarters " of barracks. Many of these are important institutions, and their labours extend over a wide area ; two of the settlements are in India and two in the United States. A list of 26 sisterhoods is given in the Official Year-Book of the C.E. (1900), to which may be added 10 institutions of deaconesses, many of whom live in community under rule. The Episcopal Church of Scotland has 3 sisterhoods; and they are found also at Toronto, " Saint John the Divine "; Brisbane, " Sacred Advent "; Grahamstown, " Resurrec- tion"; Bloemfontein, "St Michael and All Angels"; Maritzburg, " Saint John the Divine." The Year-Book (1911) of the Protestant Episcopal Church of America (Anglican) mentions 18 American sister- hoods and 7 deaconess homes and training colleges.

Practically all Anglican sisterhoods originated in works of mercy, and this fact largely accounts for the rapidity with which they have won their way to the good will and confidence of the Church. Their number is believed to exceed 3000, and the de- mand for their services is greater than the supply. Bishops are often their visitors, and Church Congresses, Convocation and Lambeth Conferences have given them encouragement and regulation. This change in sympathy, again, has gained a hearing from modern historians, who tend more and more to discredit the wholesale defamation of the dissolution period. This charitable activity, however, distinguishes the modern sister from the nuns of primitive and medieval times, who were cloistered and con- templative, and left external works to deaconesses, or to laywomen of a " third order," or to the freer societies like the Beguines. St Vincent de Paul is considered to have begun the new era .with his institution of " Sisters of Charity " in 1634. Another modern feature is the fuller recognition of family ties: Rule 29 of the Clewer sisters directs that " the sisters shall have free intercourse with relations, who may visit them at any time." But in most essential respects modern sisterhoods follow the ancient traditions. They devote themselves to the celibate life, have property in common, and observe a common rule of prayer, fellowship and work. Government is by a sister superior, assisted by various officers. The warden and chaplain are clergy, and the visitor is commonly a bishop. In one important regard there has been hesitation, and authorities like Dr Littledale and Bishop Grafton contend strongly for the primitive ideal of the convent as family, with a constitutional government, as against the later and wide- spread Jesuit ideal of the convent as regiment, with a theory of despotic rule and absolute obedience. If some early mistakes in the restoration of sisterhoods were due to this exaggerated doctrine of obedience, the doctrine itself may be trusted to disappear among a Church and people accustomed to free institu- tions and to respect for individuality.

Authorities. — T. T. Carter, Memoir of Harriet Monsell; Dr R. F. Littledale, Papers on " Sisterhoods " in the Monthly Packet (July 1874-November 1879); Pari. Report on Convent, and Monast. Inst. (1870); Lina Eckenstein, Woman under Monasticism; Bishop Grafton, Vocation. (J. O. N.)

SISTOVA (Bulg. Svishtov), the capital of the department of Sistova, Bulgaria, on the right bank of the Danube, 40 m. W.

of Rustchuk. Pop. (1906), 13,408. Despite the lack of railway communication, and the migration of the Turkish inhabitants after the Russo-Turkish War (1877-1878), Sistova is an important commercial centre, exporting wine and grain and importing petroleum.

Sistova is identified with the Roman colony Novae mentioned by Ptolemy. The exact site appears to have been Staklen, to the west of the present town, which has gradually moved east- ward since the 16th century, when it was almost destroyed in the Turkish wars. It was at Sistova that the peace of 1790 was signed, by which the Austrian-Turkish boundary was determined. The town was burned in 1810 by the Russians; but after 1820 it began to revive, and the introduction of steam traffic on the lower Danube (1835) restored its prosperity. The Walachian town of Alexandria was founded by fugitives from Sistova in

1878.

SISTRUM (Gr. atiarpov, Ger. Rappel), an ancient Egyptian instrument of percussion of indefinite musical pitch, a kind of metal rattle. The sistrum consists of a metal frame in the shape of an egg, fastened to a handle, frequently surmounted by a grotesque head or by a figure of the sacred lioness Sekhet. The frame is crossed by four metal horizontal rods passing through holes large enough to allow them to rattle when the sistrum is shaken, the rods being prevented from slipping out altogether by little metal stops in the shape of a leaf; sometimes metal rings are threaded over the rods to increase the jingling. The sistrum is played also by beating it with a metal stick. This ancient instrument was extensively used by the priests in the temple of Isis to attract the attention of worshippers to different parts of the ritual. The Egyptians attributed to it, as well as to the tambourine, the power of dispersing and terrifying evil spirits and more especially the Typhon. Queen Cleopatra 1 made use of a large number of sistra at the battle of Actium (31 B.C.), and accordingly the instrument was satirically called Queen Cleopatra's war trumpet. (K. S.)

SISYPHUS, in Greek mythology, son of Aeolus and Enarete, and king of Ephyra (Corinth). He was the father of the sea-god Glaucus and (in post-Homeric legend) of Odysseus. He was said to have founded the Isthmian games in honour of Melicertes, whose body he found lying on the shore of the Istnmus of Corinth (Apollodorus iii. 4). He promoted navigation and commerce, but was avaricious and deceitful. From Homer onwards Sisyphus was famed as the craftiesi of men. When Death came to fetch him, Sisyphus put him into fetters, so that no one died till Ares came and freed Death, and delivered Sisyphus into his custody. But Sisyphus was not yet at the end of his resources. For before he died he told his wife that when he was gone she was not to offer the usual sacrifice to the dead. So in

the under world he complained that his wife was neglecting her duty, and he per- suaded Hades to allow him to go back to the upper world and expostulate with her. But when he got back to Corinth he positively refused to return, until forcibly carried off by Hermes (Schol. on Pindar, 01. i. 97). In the under world Sisyphus was compelled to roll a big stone up a steep hill; but before it reached the top of the hill the stone always rolled down, and Sisyphus had to begin all over again {Odyssey, xi. 593). The reason for this punishment is not mentioned in Homer, and is obscure; according to some, he had revealed the designs of the gods to mortals, according to others, he was in the habit of attacking and murdering travellers. The subject was a common- place of ancient writers, and was depicted by the painter Poly- gnotus on the walls of the Lesche at Delphi (Pausanias x. 31). According to the solar theory, Sisyphus is the disk of the sun that rises every day and then sinks below the horizon. Others see in him a personification of the waves rising to a height and then suddenly falling, or of the treacherous sea. It is suggested by Welcker that the legend is symbolical of the vain struggle of man in the pursuit of knowledge. The name Sisyphus is generally explained as a reduplicated form of ao6s (= " the very wise ") ; Gruppe, however, thinks it may be connected with (ricrus (" a

•Virgil, Aen. viii. 696; Lucan x. 63; Ovid, Am. ii. 13. 11; Mart xiv. 54.

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goat's skin"), the reference being to a rain-charm in which goats' skins were used. S. Reinach {Revue archeologique, 1904) finds the origin of the story in a picture, in which Sisyphus was repre- sented rolling a huge stone up Acrocorinthus, symbolical of the labour and skill involved in the building of the Sisypheum. When a distinction was made between the souls in the under world, Sisyphus was supposed to be rolling up the stone per- petually as a punishment for some offence committed on earth; and various reasons were invented to account for it.

The way in which Sisyphus cheated Death is not unique in folk- tales. Thus in a Venetian story the ingenious Beppo ties up Death in a bag and keeps him there for eighteen months; there is general rejoicing; nobody dies, and the doctors are in high feather. In a Sicilian story an innkeeper corks up Death in a bottle; so nobody dies for years, and the long white beards are a sight to see. In another Sicilian story a monk keeps Death in his pouch for forty years (T. F. Crane, Italian Popular Tales, 1885). The German parallel is Gambling Hansel, who kept Death up a tree for seven years, during which no one died (Grimm, Household Tales). The Norse parallel is the tale of the Master Smith (E. W. Dasent, Popular Tales from the Norse). For a Lithuanian parallel, see A. Schleicher, Litauisehe Marchen,

Sprichworte, Rdtsel und Lieder (1857) ; for Slavonic parallels, F. S. Krauss, Sagen und Marchen der Sildslaven, ii. Nos. 125, 126; see also Frazer's Pausanias, iii. p. 33; O. Gruppe, Grie- chische Mythologie (1906), ii., p. 1021, note 2.

SITAPUR, a town and district of British India in the Lucknow division of the United Provinces. The town is on the river Sarayan, half-way between Lucknow and Shahjahanpur, and on the Lucknow-Bareilly railway, 55 m. N.W. from Lucknow. Pop. (1 901) 22,557. It is a cantonment, garrisoned by a portion of a British regiment. It has a considerable trade, principally in grain.

The District of Sitapur has an area of 2250 sq. m. It presents the appearance of a vast plain, sloping imperceptibly from an elevation of 505 ft. above sea-level in the north-west to 400 ft. in the south-east. The country is well-wooded with numerous groves, and well cultivated, except in those parts where the soil is barren and cut up by ravines. It is intersected by numerous streams, and contains many shallow ponds and natural reservoirs, which overflow during the rains, but become dry in the hot season. Except in the eastern portion, which lies in the doabs between the Kewani and Chauka and the Gogra and Chauka rivers, the soil is as a rule dry, but even this moist tract is interspersed with patches of land covered with saline efflorescence called reh. The principal rivers are the Gogra, which is navigable by boats of large tonnage throughout the year, and the Chauka. The climate is considered healthy, and the cantonments of Sitapur are famous for the low mortality of the British troops stationed there. The annual rainfall averages about 38 in.

In 1901 the population was 1,175,473, showing an increase of 9 % in the decade. The principal crops are wheat, rice, pulses, millets, barley, sugar-cane and poppy. The district is traversed by the Lucknow-Bareilly section of the Rohilkhand and Kumaon railway. The history of Sitapur is closely associated with that of the rest of Oudh. The district figured prominently in the Mutiny of 1857, when the native troops quartered in the canton- ments fired on their officers, many of whom were killed, as were also several military and civil officers, with their families, in attempting to escape.

See Sitapur District Gazetteer (Allahabad, 1905).

SITKA (formerly New Archangel), a city and historically the most notable settlement of Alaska, on the W. coast of Baranof Island, in Sitka Sound, in lat. 57° 03′ N. and long. 135 19′ W. (from Greenwich), and about 100 m. S.S.W. of Juneau. Pop. (1890) 1193 (300 white and 893 natives); (1910) 1039. It is served by steamer from Seattle, Washington; there is cable connexion with the United States, and a six-day mail service from

Pacific ports, via Juneau. The city is prettily situated on an island-studded and mountain-locked harbour, with a back- ground of forest and snow-capped mountain cones; an extinct volcano, Mt Edgecumbe (3467 ft.), on Kruzof Island, is a con- spicuous landmark in the bay. Sitka's mean annual tempera- ture is 2 higher than that of Ottawa, and its climate is more equable. The mean annual temperature is about 43° F.; the

monthly means range from $3° (January) to 56° (August), and the extreme recorded temperature from — 4 to 87° F. Two- thirds of the days of the year are cloudy; on about 208 days in the year it rains or snows; the normal rainfall is 88- 1 in., the extreme recorded rainfall (in 1886) is 140-26 in. The city in- cludes an American settlement and an adjoining Indian village. In addition to U.S. government buildings (marine hospital and barracks, agricultural experiment station, wireless telegraph station and magnetic observatory), there are two public schools (one for whites and one for Thlinkets), the Sheldon Jackson (ethnological) Museum, which is connected with the Presbyterian Industrial Training School, a parochial school of the Orthodox Greek (Russian) Church, a Russian-Greek Church, built in 1816, and St Peter's-by-the-Sea, a Protestant Episcopal mission, built in 1899. Sitka is the see of a Greek Catholic and of a Protestant Episcopal bishop. In its early history it was the leading trading post of Alaska. After the discoveries of gold in the last decade of the 19th century it wholly lost its commercial primacy, but business improved after the discovery of gold in 1905 on Chicagoff Island, about 50 m. distant. There is a very slight lumber industry; salmon fisheries are of greater import- ance. In the surrounding region there are gold and silver mines. Old Sitka or Fort Archangel Gabriel, about 6 m. from the present town, was founded in May 1799. The fort was over- whelmed by the Thlinkets in 1802, but was recaptured by the Russians in September 1804. The settlement was removed at this time by Alexander Baranof to the present site. Thereafter until 1867 it was the chief port and (succeeding Kodiak) the seat of government of Russian America; it is still the headquarters of the Assistant Orthodox Greek bishop of the United States. The formal transfer of Alaska from Russian to American posses- sion took place at Sitka on the 18th of October 1867. During the next ten years Alaska was governed by the department of war, and Sitka was an army post. It was the seat of govern- ment of Alaska until 1906, when Juneau became the capital.

SITTINGBOURNE, a market town in the Faversham parlia- mentary

division of Kent, England, on a navigable creek of the Swale, 44ˆ m. E.S.E. of London by the South Eastern and Chatham railway. Pop. of urban district (1901) 8943. It con- sists principally of one long street (the Roman Watling Street) and the northern suburb of Milton, a separate urban district (pop. 7086), celebrated for its oysters, the fishery of which used to employ a large number of the inhabitants. Brick and cement making is an important industry, and there are corn and paper mills. The export trade in corn and import trade in coal is considerable. St Michael's church, originally Early English, underwent extensive restoration in 1873. An earthwork known as Castle Rough, in the marshes below Milton, was probably the work of Hasten the Dane in 892, and Bayford Castle, a mile distant occupies the site of one said to have been built in opposi- tion by King. Alfred. Tong Castle is about 2 m. E. of Sitting- bourne It consists of a high mound surrounded by a moat, and is said to have been erected by Hengest. Fragments of masonry exist about the mound. The story of the founding of the castle resembles that connected with the city of Carthage. Vortigern is said to have granted Hengest as much land as an ox-hide could encompass, and the hide being cut into strips the site of Tong Castle was accordingly marked out. The same tradition attaches to Tong Castle in Shropshire. Tradition also asserts, according to the 12th century chronicler, Geoffrey of Monmouth, that it was in Tong Castle that Vortigern met Rowena, Hengest's daughter, and became so enamoured of her as to resign his kingdom to her father. In the time of Richard II. Tong Castle belonged to Edmund Mortimer, earl of March.

Sittingbourne (Sasdungburna, Sidyngbourn) is mentioned in Saxon documents in 989 and frequently in contemporary records of the 13th and 14th centuries. The first charter was not ob- tained until 1573, when it was incorporated by Elizabeth under the title of a " guardian and free tenants " of the town of Sitting- bourne. A weekly market was granted, two fairs yearly at Whitsuntide and Michaelmas, and many other privileges. This charter obtained until in 1599 a second one incorporated the

town by the name of " mayor and jurats " and regranted the market and fairs together with some additional privileges, among others that of returning members to parliament, which, however, was never exercised.

SITTING BULL (c. 183 7-1890), a chief and medicine man of the Dakota Sioux, was born on Willow Creek in what is now North Dakota about 1837, son of a chief named Jumping Bull. He gained great influence among the reckless and unruly young Indians, and during the Civil War led attacks on white settle- ments in Iowa and Minnesota. Though he had pretended to make peace in 1866, from 1869 to 1876 he frequently attacked whites or Indians friendly to whites. His refusal to return to the reservation in 1876, led to the campaign in which General George A.

Custer (q.v.) and his command were massacred. Fearing punishment for his participation in the massacre, Sitting Bull with a large band moved over into Canada. He returned to the United States in 1881, and after 1883 made his home at the Standing Rock Agency. Rumours of a coming Indian Messiah who should sweep away the whites, and Indian dissatis- faction at the sale of their lands, created such great unrest in Dakota in 1880-1890 that it was determined to arrest Sitting Bull as a precaution. He was surprised and captured by Indian police and soldiers on Grand river on the 15th of December 1890, and was killed while his companions were attempting to rescue him.

SIVA, in Hindu mythology, a god who forms the supreme trinity with Brahma and Vishnu. As Brahma is the creator and Vishnu the preserver, so Siva is the destroyer. His name does not occur in the Vedas, but in later Hinduism he is an important divinity. Though Siva's personal appearance is fully described in the Puranas, it is in the form of the linga (phallic emblem) that he is almost universally worshipped. Death being a transition to a new form of life, the destroyer is really a re-creator, and thus Siva is styled the Bright or Happy One. He is exclusively a post-Vedic god, though he has been identified by the Hindus with the Rudra of the Vedas, and numerous features of Siva's character and history are developed from those of Rudra. See further Brahmanism and Hinduism.

SIVAGANGA, a town of British India, in the Madura district of Madras, 25 m. E. of Madura. Pop. (1901) 9097. It contains the residence of a zamindar, whose estate covers an area of 1680 sq. m. and pays a permanent land revenue of £20,000. The succession has been the subject of prolonged litigation.

SIVAJI (1627-1680), founder of the Mahratta power in India, was born in May 1627 He was the son of Shahji Bhonsla, a Mahratta soldier of fortune who held a jagir under the Bijapur government. From an early age he excelled in horsemanship and the use of weapons, and regarded himself as appointed to free the Hindus from the Mahommedan yoke. With this object he formed a national party among the Hindus of the Deccan, and opposed in turn the vassal power of Bijapur and the imperial armies of the Mogul of Delhi. By dint of playing off his enemies against each other and by means of treachery, assassination and hard fighting, Sivaji won for the Mahrattas practical supremacy in western India. In 1659 he lured Afzul Khan, the Bijapur general, into a personal conference, and killed him with his own hand, while his men attacked and routed the Bijapur army. In 1666 he visited the Mogul emperor, Aurangzeb, at Delhi, but on his expressing dissatisfaction at not being treated with sufficient dignity, he was placed under arrest. Having effected his escape in a sweetmeat basket, he raised the standard of revolt, assumed the title of raja, and the prerogative of

coining money in his own name. But whilst at the height of his power he died on the 5th of April 1680 at the age of fifty-three. Sivaji was an extraordinary man, showing a genius both for war and for peaceful administration; -but he always preferred to attain his ends by fraud rather than by force. He is the national hero of the Mahrattas, by whom he is regarded almost as a deity.

See Grant Duff, History of the Mahrattas (1826); Krishnaji Ananta, Life and Exploits of Sivaji (1884); and M. G Ranade, Rise of the Maratha Power (Bombay, 1900).

SIVAS, one of the largest and most important vilayets of Asia Minor, lying between 38 30′ and 41 N. and 35 30′ and 39° E. It is rich in mineral wealth — silver, lead, copper, iron, manganese, arsenic, alum, salt and coal; and has several hot and cold mineral springs, and large forests of fir, pine, beech and oak. The climate is good, the average elevation of the province being over 3500 ft., and the soil fertile. Wheat and barley are largely grown on the plateau, and in the lower districts there are extensive fruit orchards and vineyards. The port of the vilayet is Samsun (q.v.), whence a chaussee runs through Amasia, Tokat, and Sivas to Kharput; but Sivas is also connected by road with the minor Black Sea ports, Unieh, Ordu and Kerasund. The rates for transport are, however, prohibitive. Angora is the nearest railway point.

Sivas (anc. Megalopolis-Sebasteia) , altitude 4420 ft., is also the name of the chief town of the vilayet (and of a sanjak of the same name). It is situated in the broad valley of the Kizil Irmak, on one .of its right bank tributaries, the Murdan Su. Pop. over 43,000, fully two-thirds Mussulman. The climate is healthy but severe in winter. Coarse cotton cloth and woollen socks are manufactured. The medresses (colleges), built in the 13th century by the Seljuk sultans of Rum, are amongst the finest remains of Moslem art in Asia Minor. In one of them is the tomb of its founder, Izz ud-din Kai Kausl. (1210ˆ1219). Near the town is the Armenian monastery of the Holy Cross, in which are kept the throne of Senekherim and other relics. There are several Armenian churches of interest, a flourishing American mission with church and schools, and a Jesuit mission. Under Diocletian Sebasteia became the capital of Armenia Minor, and in the 7th century that of the Sebasteia Theme. Justinian rebuilt the walls and, under the Byzantine emperors, it was second only to Caesarea in size and wealth. In 1021 Senekherim, king of the Armenian province of Vaspuragan (Van), ceded his dominions to Basil II., and became the Byzantine viceroy of

Sebasteia and the surrounding country. This position was held by his successors until the town fell into the hands of the Turko- mans after the defeat of Romanus II. by the Seljuks (107 1). After having been ruled for nearly a century by the Danishmand amirs, it was taken (1172) by the Seljuk sultan of Rum, and in 1224 was rebuilt by Sultan Ala-ed-din Kaikobad I. In 1400, when captured by Timur, the city is said to have had 100,000 inhabitants, and to have been famous for its woollen stuffs. On this occasion the bravest defenders were massacred, and 4000 Armenians were buried alive. Mahommed the " Conqueror " restored the citadel, and the place has ever since been an import- ant Ottoman provincial capital. Early in the 19th century, like all other Ottoman towns, it was terrorized by janissaries, with whom Mahmud II. commissioned the great Dere Bey of Yuzgat, Chapan Oglu, to deal in 1818. The news of his drastic success provoked a dangerous riot in Stambul, which postponed by some years the final tragedy of the janissaries. From 1880 to 1882 Sivas was the residence of the British military consul- general for Asia Minor; but it has now only an American vice- consulate. Mechithar, the founder of the Mechitharists (q.v.) and of the famous monastery at Venice, was born (1676) at Sivas.

(C. W. W.,D. G. H.) SIVORI, ERNESTO CAMILLO (1815-1894), Italian violinist, was born at Genoa on the 25th of October 1815, and was taught by Restano, Paganini, Costa and Dellepiane. His talent was extraordinarily precocious. From 1827 Sivori began the career of a travelling virtuoso, which lasted almost without interruption until 1864. He played Mendelssohn's concerto for the first time in England, in 1846, and was in England again in the seasons of 18 51 and 1864. He lived for many years in Paris, and died at Genoa on the 18th of February 1894.

SIVRI-HISSAR, " Pointed-Castle," a town of Asia Minor, in the Angora vilayet, situated 8 m. N. of the site of Pessinus, at the foot of a lofty double-peaked ridge of rock, which bears the ruins of a Byzantine castle. It is a road and commercial centre, with a trade in opium and mohair. The population includes a large Armenian community. The town occupies the site of ancient Palia, re-founded and re-named Justinianopolis by the

emperor Justinian. It was one of the chain of fortresses on the Byzantine military road across Asia Minor, and became the chief city of Galatia Salutaris about a.d. 700, succeeding to the heritage of Pessinus, whose metropolitan transferred his seat to the new capital, and held the title of " archbishop of Pessinus or of Justinianopolis."

SIWA, an oasis in the Libyan Desert, politically part of Egypt. It is also known as the oasis of Amnion or Jupiter Ammon ; its ancient Egyptian name was Sekhet-am, " Palm-land." The oasis lies about 350 m. W.S.W. of Cairo, its chief town, also called Siwa, being situated in 29 12′ N.,

25°3o'E. The oasis is some 6 m. long by 4 to 5 wide. Ten miles north-east is the small oasis of Zetun, and westward of Siwa extends for some 50 m. a chain of little oases. The population of Siwa proper (1907 census) was 3884. The.'inhabitants are of Libyan (Berber) stock and have a language of their own, but also speak Arabic. The oasis is extremely fertile and contains many thousands of date palms. The town of Siwa is built on two rocks and resembles a fortress. The houses are frequently built on arches spanning the streets, which are narrow and irregular.

The oasis is famous as containing the oracle temple of Ammon, which was already famous in the time of Herodotus, and was consulted by Alexander the Great. The remains of the temple are in the walled village of Aghormi, 2 m. E. of the town of Siwa. It is a small building, with inscriptions dating from the 4th century B.C. The oracle fell into disrepute during the Roman occupation of Egypt, and was reported dumb by Pausanias, c. a.d. 160. Siwa was afterwards used as a place of banishment for criminals and political offenders. After the Mahommedan conquest of Egypt Siwa became independent and so remained until conquered by Mehemet Ali in 1820. It is now governed by its own sheikhs under the supervision of an Egyptian mamur responsible to the mudir of Behera.

Siwa contains many relics of antiquity besides the ruins of the temple of Ammon. Near that temple are the scanty remains of another temple of the same century, Umm Beda, with reliefs depicting the prince of the oasis making offerings to Ammon, "lord of oracles." At JebelMuta, 1 m. N.E. of Siwa, are tombs of Ptolemaic and Roman date; 10 m. E. of Aghormi is a well- preserved chapel, with Roman graves; at Kasr Rumi is a Doric temple of the Roman period.

The oasis lies close to the Tripolitan frontier and is largely dominated by the sect of the Senussi (q.v.), whose headquarters were formerly at Jarabub, 80 m. to the north-west. The Senussi successfully prevented various explorers penetrating westward beyond Siwa. The first European to reach Siwa since Roman time was W. G. Browne, who visited the oasis in 1792. He was followed in 1798 by F. Hornemann. Both these travelleis started from Cairo; in 1820 General H. Minutoli gained the oajis from the Gulf of Solum. In 1869 Gerhard Rohlfs reached Siwa via Tripoli, and subsequently the ruins were examined by Professor G. Steindorff. After the occupation of Egypt by the British steps were taken to enforce the authority of the government in Siwa, where order proved difficult to maintain. There were serious disturbances in 1909, and as a result In 19 10 a telegraph line was built across the desert from Alexandria to the oasis.

See G. Steindorff, Durch die Libysche Wiiste zur Amonsoase (Biele- feld and Leipzig, 1904) ; A. Silva White, From Sphinx to Oracle (London n.d.,

1898); Murray's Handbook for Egypt (nth ed., London, 1907) ; T. B. Hohler, Report on the Oasis of Siva (Cairo 1900) ; also the works of the earlier travellers named. (F. R. C.)

SIWALIK HILLS, a name given to the foot-hills of the Hima- layas in Dehra Dun district of the United Provinces of India, and in Nahan state and Hoshiarpur district of the Punjab. The range runs parallel with the Himalayan system from Hardwar on the Ganges to the banks of the Beas, with a length of 200 m. and an average width of 10 m. The elevation varies from 2000 to 3500 ft. Geologically speaking the Siwaliks belong to the tertiary deposits of the outer Himalayas, and are chiefly composed of low sandstone and conglomerate hills, the solidified and upheaved detritus of the great range in their rear The inter- mediate valley lying between the outer hills and the MussOorie

mountains is known as the Dehra Dun (or Dehra valley) and contains a considerable Eurasian colony and some British tea- planters. The principal pass is that of Mohan by which the main road from Saharanpur to Dehra and Mussoorie traverses the range. The Siwalik formation (distinguished for its extraordinary wealth of palaeontological remains) is found on the North- West Frontier occupying much the same position relatively to the Suliman range as it does to the Himalayas, i.e. it faces the plains and becomes the outermost wall of the hills.

SIWARD (d. 1055), earl of Northumbria, was a Dane by birth and probably came to England with Canute. He became earl of Deira after the death of Eadwulf Cutel, earl of Northumbria, about 1038, and earl of all Northumbria after murdering Eadwulf, earl of Bernicia, in 1041. He supported Edward the Confessor in his quarrel with Earl Godwine in 1051, and was appointed earl of Huntingdon soon after this date. In 1054 Siward invaded Scotland in the interests of his kinsman Malcolm Canmore, and he completely routed King Macbeth in a battle in which his son Osbeorn was killed. Early in 1055 the earl died at York. Shake- speare introduces Siward and his son, whom he calls young Siward, into the tragedy of Macbeth, and represents the old man as saying when he heard that his son's wounds were in front, " Had I as many sons as I have hairs, I would not wish them to a fairer death." Siward, a man of unusual strength and size, is said to have risen from his bed at the approach of death, and to have died dressed in all his armour. He built a minster near York which he dedicated to St Olaf, and where he was buried; and one of his sons was Earl Waltheof.

See E. A. Freeman, The Norman Conquest, vols. ii. and iii. (1870- 1876) ; and W. F. Skene, Celtic Scotland (1876-1880).

SIXTUS, the name of five popes.

Sixtus I. (Xystus) was the sixth bishop of Rome (c. 1 16-12 5) and took the name on that account. Sixtus II., successor of Stephanus I. as bishop of Rome in 257, suffered martyrdom under Valerian on the 6th of August 258. He restored the relations with the African and Eastern Churches which had been broken off by his predecessor on the question of heretical baptism. Dionysius succeeded him.

Sixtus III. was bishop of Rome from the 31st of July 432 to the 19th of August 440. Before his elevation to the pontificate he had been suspected of favouring the Pelagians, but when he became pope he disappointed their expecta- tions, and repelled their attempts to enter again into com- munion with the Church. During his pontificate the dispute was settled between Cyril of Alexandria and John of Antioch, who had been at variance since the council of Ephesus, but he himself had some difficulties with Proclus of Constantinople with regard to the vicariate of Thessalonica. (L. D.)*

Sixtus IV. (Francesco . della Rovere), pope from the 9th of August 147 1 to the 12th of August 1484, was born of a poor family near Savona in 1414. He entered the Franciscan order at an early age and studied philosophy and theology at the universities of Padua and Bologna. He speedily acquired a great reputation as an eloquent preacher, and, after filling the offices of procurator at Rome and provincial of Liguria, he was chosen general of his order in 1464. Three years later he was, to his own surprise, made cardinal-priest of St Pietro in Vincoli by Paul II., whom he succeeded as pope. Some writers have maintained that this sudden elevation of the most recent member of the Sacred College was due to bribery in the conclave, whilst the apologists of Sixtus affirm it was due to the friend- ship of the powerful and upright Cardinal Bessarion, and explain that the pope, having been brought up in a mendicant order, was inexperienced and did not appreciate the liberality of his donations after his election. There is no doubt that the expendi- tures of his pontificate were prodigal. Sixtus sent Cardinal Caraffa with a fleet against the Turks, but the expedition was unsuccessful. He continued to condemn the Pragmatic Sanction in France, and denounced especially the ordinance of Louis XI. which required (8th of January 1475) the royal placet for the publication of all papal decrees. He likewise continued his predecessor's negotiations with the Tsar Ivan III. for the

reunion of the Russian Church with the Roman see and for support against the Turks, but without result. He was visited in 1474 by King Christian of

Denmark and Norway, and in the following year (12th of June) he established the university of Copenhagen. Sixtus soon abandoned his universal policy in order to concentrate attention on Italian politics, and the 1 admirable energy which he had shown at first was clouded by the favours which he now heaped upon unworthy relations. Not content with enriching them by gifts and lucrative offices, he made their aggrandizement the principal object of his policy as a secular prince. Sixtus was cognisant of the conspiracy of the Pazzi, plotted (1478) by his nephew, Cardinal Riario, against Lorenzo de' Medici. He entered into a fruitless and inglorious war with Florence, which kept Italy for two years (1478-80) in confusion. He next incited the Venetians to attack Ferrara, and then, after having been delivered by their general, Roberto Malatesta, from a Neapolitan invasion, he turned upon them and eventually assailed them for refusing to .desist from the hostilities which he had himself instigated. He relied on the co-operation of Lodovico Sforza, who speedily forsook him; and vexation at having peace forced upon him by the princes and cities of Italy is said to have hastened his death. Several events of his pontificate are noteworthy: he granted many privileges to the mendicant orders, especially to the Franciscans; he endeavoured to suppress abuses in the Spanish Inquisition; he took measures against the Waldenses; he approved (1475) the office of the Immaculate Conception for the 8th of December; in 1478 he formally annulled the decrees of the council of Con- stance; and he canonized St Bonaventura (14th of April 1482). The most praiseworthy side of his pontificate was his munificence as a founder or restorer of useful institutions, and a patron of letters and art. He established and richly endowed the first foundling hospital, built and repaired numerous churches, constructed the Sistine Chapel and the Sistine Bridge, improved church music and instituted the famous Sistine choir, commis- sioned paintings on the largest scale, pensioned men of learning, and, above all, immortalized himself as the second founder of the Vatican library. These great works, however, were not accomplished without grievous taxation. Annates were increased and simony flourished. Though himself pious, of blameless morality, hospitable to a fault, and so exempt from avarice, says his secretary Conti, that he could not endure the sight of money, it was Sixtus's misfortune to have had no natural outlet for strong affections except unworthy relatives; and his great vices were nepotism, ambition and extravagance. He died on the 12th of August 1484, and was succeeded by Innocent VIII.

See L. Pastor, History of the Popes, vol. iv., trans, by F. I. Antrobus (London, 1898); M. Creighton, History of the Papacy, vol. iv. (London, 1901); F. Gregorovius, Rome in the Middle Ages, vol. vii., trans, by Mrs G. W. Hamilton (London, 1900-1902) ; Jacob Burck- hardt, Geschichte der Renaissance in Italien (4th ed., 1904); J. A. Symonds, Renaissance in

Italy; E. Frantz, Sixtus IV. u. die Republik Florenz (Regensburg, 1880); I. Schlecht, "Sixtus IV. u. die deut- schen Drucker in Rom," in S. Ehses, Festschrift zu elfhundertjahrigen Jubilaum des Campo Santo (Freiburg, 1897); Aus den Annateh- Registern der Papste Eugen IV., Pius II., Paul II. u. Sixtus IV., ed. by K. Hayn (Cologne, 1896). (C. H. Ha.)

Sixtus V. (Felice Peretti), pope from 1585 to 1590, was born at Grottamara, in Ancona, on the 13th of December 1521. He was reared in extreme poverty; but the story of his having been a swineherd in his youth appears to be open to question At an early age he entered a Franciscan monastery. He soon gave evidence of rare ability as a preacher and a dialectician. About 1552 he came under the notice of Cardinal Carpi, pro- tector of his order, Ghislieri (later Pius V.) and Caraffa (later Paul IV.), and from that time his advancement was assured. He was sent to Venice as inquisitor general, but carried matters with a high hand, became embroiled in quarrels, and was forced to leave (1560). After a brief term as procurator of his order, he was attached to the Spanish legation headed by Buoncampagno (later Gregory XIII.) 1565. The violent dislike he conceived for Buoncampagno exerted a marked influence upon his subse- quent actions. He hurried back to Rome upon the accession oi

Pius V., who made him apostolic vicar of his order, and, later (1570), cardinal. During the pontificate of Gregory XIII. he lived in retirement, occupied with the care of his villa and with his studies, one of the fruits of which was an edition of the works of Ambrose; not neglecting, however, to follow the course of affairs, but carefully avoiding every occasion of offence. This discreetness contributed not a little to his election to the papacy on the 24th of April 1585; but the story of his having feigned decrepitude in the Conclave, in order to win votes, is a pure invention. One of the things that commended his candidacy to certain cardinals was his physical vigour, which seemed to promise a long pontificate.

The terrible condition in which Gregory XIII. had left the ecclesiastical states called for prompt and stern measures. Against the prevailing lawlessness Sixtus proceeded with an almost ferocious severity, which only extreme necessity could justify. Thousands of brigands were brought to justice: within a short time the country was again quiet and safe. Sixtus next set to work to repair the finances. By the sale of offices, the establishment of new " Monti " and by levying new taxes, he accumulated a vast surplus, which he stored up against certain specified emergencies, such as a crusade or the defence of the Holy See. Sixtus prided himself

upon his hoard, but the method by which it had been amassed was financially unsound: some of the taxes proved ruinous, and the withdrawal of so much money from circulation could not fail to cause distress. Immense sums, however, were spent upon public works. Sixtus set no limit to his plans; and what he achieved in his short pontificate is almost incredible; the completion of the dome of St Peter's; the loggia of Sixtus iri the Lateran; the chapel of the Praesepe in Sta Maria Maggiore; additions or repairs to the Quirinal, Lateran and Vatican palaces; the erection of four obelisks, including that in the piazza, of St Peter's; the opening of six streets; the restoration of the aqueduct of Severus (" Acqua Felice ") ; besides numerous roads and bridges, an attempt to drain the Pontine marshes, and the encouragement of agriculture and manufacture. But Sixtus had no appreciation of antiquity: the columns of Trajan and Antoninus were made to serve as pedestals for the statues of SS Peter and Paul; the Minerva of the Capitol was converted into " Christian Rome " ; the Septizonium of Severus was demolished for its building materials.

The administrative system of the church owed much to Sixtus. He limited the College of Cardinals to seventy; and doubled the number of the congregations, and enlarged their functions, assigning to them the principal role in the transaction of business (1 588) . The Jesuits Sixtus regarded with disfavour and suspicion. He meditated radical changes in their constitution, but death prevented the execution of his purpose. In 1589 was begun a revision of the Vulgate, the so-called Editio Sixtina.

In his larger political relations Sixtus, strangely enough, showed himself visionary and vacillating. He entertained fantastic ambitions, such as the annihilation of the Turks, the conquest of Egypt, the transporting of the Holy Sepulchre to Italy, the accession of his nephew to the throne of France. The situation in which he found himself was embarrassing: he could not countenance the designs of heretical princes, and yet he distrusted Philip II. and viewed with apprehension any extension of his power. So, while he excommunicated Henry of Navarre, and contributed to the League and the Armada, he chafed under his forced alliance with Philip, and looked about for escape. The victories of Henry and the prospect of his conversion to Catholicism raised Sixtus's hopes, and in corresponding degree determined Philip to tighten his grip upon his wavering ally. The pope's negotiations with Henry's representative evoked a bitter and menacing protest and a categorical demand for the performance of promises. Sixtus took refuge in evasion, and temporized until death relieved him of the necessity of coming to a decision (27th of August 1 500).

Sixtus died execrated by his own subjects; but posterity has recognized in him one of the greatest popes. He was impulsive, obstinate, severe,

autocratic; but his mind was open to large ideas, and he threw himself into his undertakings with an energy

and determination that often compelled success. Few popes can boast of greater enterprise or larger achievements.

Lives of Sixtus are numerous: Cicarella's, in Platina, De iritis pontiff. Rom., is by a contemporary of the pope, but nevertheless of slight importance; Leti's Vita di Sisto V (Amsterdam, 1693, translated into English by Farneworth, 1779) is a caricature, full of absurd tales, utterly untrustworthy, wanting even the saving merit of style; Tempesti's Storia delta vita e geste di Sisto Quinto (Rome, 1 754-1 755) is valuable for the large use it makes of the original sources, but lacks perspective and is warped by the author's blind admiration for his subject; Cesare's Vita di Sisto V (Naples, 1755) is but an abridgment of Tempesti. Of recent works the best are Hiibner, Sixte-Quint, &c. (Paris, 1870, translated into English by H. E. H. Jerningham, London, 1872); and Capranica, Papa Sisto, storia del s. XVI (Milan, 1884). See also Lorentz, Sixtus V. u. seine Zeit (Mainz, 1852); Dumesnil, Hist, de Sixte-Quint (Paris, 1869, 2nd ed.); Segretain, Sixte-Quint el Henri IV (Paris, 1861, strongly Ultramontane) ; Ranke's masterly portrayal, Popes (Eng. trans., Austin), i. 446 sq., ii. 205 sq.; and v. Reumont, Gesch. der Stadt Rom, iii. 2, 575 sq., 733 sq. Extended bibliographies may be found in Herzog-Hauck, Realencyklopddie, s.v. "Sixtus V."; and Cambridge Mod. Hist. iii. 835 sq. (T. F. C.)

SIZAR, one of a class of students at a college of Cambridge University and at Trinity College, Dublin, who, being persons of limited means, are received for lower fees, and obtain free commons, lodgings or other assistance towards their education during their terms of residence. At Oxford there was formerly a similar class, known as "Battelers" or " Batlers," who originally waited on the Fellow of the College who had nominated them, and a still more humble class, the " servitors," who, perhaps, answered more to a " subsizar " at Cambridge. The name " sizar " is to be connected with the " sizes " or " sizings " (" size " being a shortened form of " assize "), that is the specified portions of food and drink issued at a fixed price from the buttery of the college; the sizar was so styled either because as one of his former duties he had to fetch the "sizes" for others, or because he obtained his own free. The menial duties of " sizars " at Cambridge have long become obsolete.

SIZE, a general term for bulk or quantity; also an agglutinant consisting of undried glue. The two words, though they are so widely separate in meaning, are by etymology the same. " Size " (Lat. assidere, to sit down to) is a shortened form of " assize," through the French and Italian respectively. The O. Fr. assis, assise, and Eng. " assize," meant a sitting of

a deliberative or other body; hence decree, ordinance of such a body, specifically of such as regulated weights, measures, prices; thus it came to mean a standard of measure price, quantity thus fixed, and so merely quantity or measure, in which sense it remains in the shortened form " size." In the sense of an agglut- inant, " size" is an adaptation of Ital. sisa, a shortened form of assisa (Lat. assidere), and seems to have meant by derivation " that which painters use to make the colours sit well or suitably."

SKAGERRACK, the arm of the North Sea which gives access to the Cattegat and so to the Baltic. It is about 140 m. long and 75 broad. On the Danish shore, which is low and beset with sand-banks, the strait is shallow. Towards the steep Norwegian coast its deepest part is found, 443 fathoms.

For the currents, temperature and salinity of the water, &c, see North Sea.

SKAGWAY (a native name said to mean " home of the north wind"), a city in S.E. Alaska, in lat. 59 28′ N. and long. 135° 20′ W., at the mouth of the river Skagway, on an indentation of Taiya Inlet, a branch of Chilkoot Inlet, leading out of Lynn Canal. Pop. (1910) 872. It is the seaward terminus of the Yukon & White Pass railway, by which goods and passengers reach the Klondike; and is connected with Dawson by telegraph and- with Seattle by cable, and with Seattle, San Francisco and other Pacific ports by steamers. The climate is comparatively dry (annual precipitation about 21-75 in-); between 1898 and 1902 the minimum recorded temperature was" io° (March), the maximum 92° (July), and the greatest monthly range 73 (March). Though settled somewhat earlier, Skagway first became important during the rush in 1896 for the Klondike gold-fields, for which it is the most convenient entrance by the I trail over White Pass, the 'lower of the two passes to the

headwaters of the Yukon. A postToffice was established here in November 1897.

SKARGA, PIOTR (1532-1612), Polish writer and reformer, was born at Grojec near Warsaw in 1532. He was a member of the noble Pawenski family, but his pseudonym of Skarga (from " skarga" a " complaint" or " accusation") speedily superseded his real name. Educated at Grojec and Cracow, he began life as a tutor to the family of Andrew Tenczynski, castellan of Cracow, and, some years later, after a visit to Vienna, took orders, and from 1563 was attached to the cathedral church of Lemberg.

His oratory was so successful that he determined to become a missionary-preacher among the people, in order the better to combat the social and political evils of the day. By way of preparation he studied theology in Italy from 1568 to 1570, and finally entered the Society of Jesus. On his return he preached successively at Pultusk, Jaroslaw and Plock under the powerful protection of Queen Anne Jagielonika. During a sub- sequent mission to Lithuania he converted numerous noble families, including the Radziwills, and held for some years the rectorship of the Jesuit Academy at Wilna, where he composed his Lives of the Saints. In 1 584 he was transferred to the new Jesuit College at Cracow. He was protected by the valiant Stephen Bathory, and the first act of the pious Sigismund III., on ascending the Polish throne, was to make Skarga his court preacher, an office he held for twenty-four years (1588-1611). With perfect fearlessness and piercing eloquence, he rebuked the sioth, the avarice, and the lawlessness of the diets which were doing their best to make government in Poland impossible. Sometimes, as for instance during the insurrection of Zebrzy- dowski, Skarga intervened personally in politics, and on the side of order and decency, for his loyalty to the crown was as un- questionable as his devotion to the Church. Wearied out at last, he begged to be relieved of his office of preacher, quitted the court, and resided for the last few months of his life at Cracow, where he died on the 27th of September 161 2.

The most important of his works are : Lives of the Saints (Wilna, 1579. 27th edition, 1884); Sermons on Sundays and Saints' Days (1st ed., Cracow, 1595, Latin ed., Cracow, 1691J; Sermons preached before the Diet (last and best edition, Cracow, 1904) and numerous other volumes of sermons, some of which have already run through thirty editions. Of less importance are his very numerous polemical works, though his famous book On the Unity of the Church of God (1st edition, Wilna, 1577) directed against the dissenters, especially the Greek Orthodox schismatics, will always have an historical interest.

See Izydor Dzieduszycki, Peter Skarga and his Age. (Pol.) (Cracow, 1850-1851). (R. N. B.)

SKAT, a game of cards, much played in central and northern Germany. It is generally supposed to have been invented about 1 81 7 by an advocate of the name of Hempel in Saxe-Altenburg. There is, however, some reason for believing that the game is of much earlier origin and was played by the Slav inhabitants of Saxe-Altenburg long before that date. In the home of the game of skat (Saxony and Thuringia) the old German single-ended cards are usually employed, while in north and south Germany French cards are ordinarily used. The German cards are thirty- two in number and of four suits, — Schellen (bells), the equivalent of diamonds; Roth (red), hearts; Griin (green), spades; and Eichel (acorn) , clubs. The eight cards of

each suit are the seven, eight, nine, ten, Wenzel or knave, queen, king, ace. This arrange- ment denotes at once the value of the single cards, each following card being higher in value than the preceding; i.e. hearts are higher than diamonds, spades than hearts, and clubs (the highest colour) takes spades, hearts and diamonds. Again 8 takes 7, 9 takes 8 and 7; but the knave (called Wenzel or U titer) is an exception (see below).

The game is played by three persons; where four play, the dealer takes no part in the play though he shares in the winnings and losings of the opponents of the player. The cards are dealt from right to left — or (as skat players say) in the direction the coffee-mill is turned. After the cards have been shuffled and cut, the dealer first deals three cards to each player, then four and again three, laying aside two cards (the skat). Each player has now ten cards in his hand, which he arranges in suits.

The Wenzel or knaves occupy a peculiar position. They are not regarded as colour cards, but are essentially trumps and take all other trumps. The player sitting to the left of the dealer is "first hand," and if he himself intends to make a game, invites the others to declare theirs, or if he wishes to reserve all rights to himself, simply says " Ich bin vorn " — " I have the lead, " and then his next neighbour on the left has to offer a game. If this neighbour holds such cards as to give him no prospect of winning he passes, and his neighbour to the left has the right to offer a game. If he in his turn passes, then the first hand is at liberty to determine the game or declare " Ramsch " (see below). But if the first neighbour thinks he can risk a game, he offers one. If the first hand reserves this game (see above " I have the lead"), either because he intends to play it himself or to play a higher game, the second hand must go higher or pass, i.e. renounce a game, and then his neighbour to the left has the right to offer, and if he again passes and does not offer a higher game than that which the first hand intends to play, the latter determines the game to be played.

The usual games in skat are the following. First the simple colour game, which is, however, seldom played by skat enthusiasts. The player has here the right to take up the skat, and to determine the suit of the game; but here the rule is that the colour must not be lower in value than that of the game offered, though it may be higher. For instance, if spades are offered, the player cannot take hearts as trumps, though he may take clubs, because they are higher in value than spades.

Next to the colour game comes " tourney the player turning up one of the skat cards, the suit of which becomes trumps. If a knave be turned up the player may announce " grando." Then comes the game of " solo," where the player declares which suit shall be trumps, and the skat remains intact. The highest " solo," still higher than clubs, is " grando." In this game only

the four knaves are trumps. If the hand playing grando thinks he can make all the tricks, he declares open grando — i.e., shows his hand. If in open grando a single trick be lost, the player loses the game. If one of the players holds such cards as to enable him to force his opponents to take all the tricks, he can declare nullo. But here the game is lost if even a single trick falls to the player. In nullo, the knaves are regarded as colour, i.e. are not trumps. Nullo can be played open, if there is no probability of the player taking a single trick. Simple nullo counts higher than diamond solo; open nullo comes after clubs solo. In Ramsch, which takes place when none of the

E layers will risk a game, each player takes (as in whist) all the tricks e makes — but only knaves are trumps — and the loser is he who makes most points. The value of the individual cards given in figures is as follows. The seven, eight and nine count nothing, the knave counts 2, the queen 3, king 4, ten 10 and ace 1 1 points. This gives the value of the whole game as 120 points. The game is won if the player gets one above the half of this sum, i.e. 61. The hand that does not make 30 is " Schneider," that is" cut," and " Schwarz " (black) if he does not make a single point.

Skat is almost invariably played for money, and the calculation is made thus. Every game and every suit have a set value: — ■ Colour game . . 3, 4, 5 and 6, according to the suits Tourne . . . . 5, 6, 7, 8 and 12 (the last the grando). Solo . . . . 9, 10, 11, 12 and 16 (grando).

These figures are increased by the number of " matadores." Suppose a player of club solo holds all four knaves and the ace and ten of clubs, he has a game with 6 matadores. By matadores is accordingly meant an uninterrupted sequence, e.g. from the knave of clubs down to the seven of trumps. If the player has then all four knaves and all the cards of the trump suit in his hand (or in the skat), he has a game with 1 1 matadores. But if a single card is missing in the series, only the matadores of higher value than the missing card count. If, for instance, the knave of hearts is missing, the game in question has only 3 matadores. To the number of matadores is added I if the game is simply won, 2 if won with Schneider (cut), and 4 if the opponents are Schwarz (black). Thus, if a spade solo with 5 mata- dores is won with Schneider, the winner makes 5+2X11 = 77 points.

SKATING (Dutch schaats, a skate), a mode of progression on ice with the aid of appliances called skates, attached to the sole of the shoe by straps, clamps or screws. The earliest form of skate that we know is that of the bone " runners" (still preserved in museums) worn by the primitive Norsemen. These were bound to the foot with thongs. The Norse sagas speak with pride of the national achievements in skating, and the early

development of the art was due principally to the Norsemen, Swedes, Danes, Finns and the Dutch. Whatever its origin in Great Britain, skating was certainly a common sport in England in the 12th century, as is proved by an old translation of

Fitz-Steven's Description of London, published in 11 80, in which the following words occur: —

" When the great fenne or moore (which watereth the walls of the citie on the North side) is frozen, many young men play on the yce . . . asome tye bones to their feete and under their heeles, and shoving themselves with a little picked staffe do slide as swiftlie as a birde fiyeth in the aire or an arrow out of a cross-bow."

At what period the use of metal runners was introduced is unknown, but it was possibly not long after the introduction into northern Europe, in the 3rd century after Christ, of the art of working in iron. By the time of Charles II. skating had become popular, with the aristocracy as well as with the people, as is proved by entries in the diaries of Pepys and Evelyn.

Skating does not appear to have been known in America before its colonization by Europeans, though bone slides were used to a limited extent by certain Eskimo tribes.

The modern skate is in the form of a steel blade mounted upon a wood or metal base. In the old-fashioned skate the wooden base was strapped to the boot and kept firm by low spikes or screws that entered the sole. The next step in development was the " club-skate," originally Canadian, a patent appliance adjusted by clamps to fit the sole. There are several varieties of club-skates still popular. They have a broad blade with slightly curved edge, and are more suitable for figure-skating than for speed. The best skaters now use skates fixed permanently to special skating-boots.

As in ancient times, skating is most practised by the Scandi- navians, Finns, Dutch and British, to whom in modern days have been added the Germans, Swiss, Austrians, and especially the Canadians and Americans. All these nations have central organizations which control skating, the British, founded in 1879, being the National Skating Association. The American, founded in 1884, is also called the National, Skating Association, and generally co-operates with the Canadian Amateur Skating Association, founded in 1888.

Speed Skating. — Of the earliest skating races no records have been kept. That racing was a popular pastime in Holland two centuries and longer ago is proved by the numerous paintings of the time depicting racing scenes. In England the first skating match recorded was that in which Youngs of Mepal beat Thomson of Wimblingdon, both men of the Fens, in the year 1814. The Fen country has remained the chief English home of skating, owing to the abundance of ice in that district, and most British champions have been Fensmen, notably the Smarts of Welney. In January 1823 the Sporting Magazine recorded the first amateur match, which was between teams of six gentlemen from March and Chatteris, Mr Drake of Chatteris finishing first. In the same year a match took place for a silver bowl on the Maze Lake, Hertfordshire, over a course 5 m. long, the winner being Mr Blenkinsop. Racing, more or less intermittent, continued annually, the Fen skaters generally triumphing. In 1854 appeared the celebrated William (" Turkey ") Smart, who, after defeating Larmen Register in that year, remained champion for more than a decade. His nephew George (" Fish") Smart won the championship in 1ˆ78 and held it until 1889, only to relinquish it to his younger brother James. The first amateur championship of England was held in 1880 at Hendon, and was won by Mr F. Norman, a Fen skater.

Owing to the great area of Canada and the northern United States, and the long and cold winter, the sport of skating is indulged in to a greater extent in North America than anywhere else, and local matches have been held for years in many places. Owing to the reputation of Charles June, who was considered to be the best American skater from 1838 for many years, his place of residence, Newburgh, N.Y., on the Hudson river, became the headquarters of American speed skating. This city also is the birthplace of the Donoghue family, who may be called the Smarts of Amei ica. The most noted members of this family were Mr T. Donoghue and his two sons, Tim and J. F. Donoghue, each in his day the fastest skater in the world, Joseph Donoghue winning every event at the international championship meeting at Amsterdam in 1891. There is practically no professional skating in America.

Skating received a great impetus during the last decade of the 19th century, profiting both by the growing devotion of athletics and by increased facilities of communication, which led to inter- national competitions and the institutions of skating clubs in Switzerland and elsewhere, especially those of Davos, St Moritz and Grindelwald, where ice is available every winter. Although skating instruments are so simple, the evolution of the skate has advanced considerably, contributing to marked improvement in the skater's skill. In speed-skating an epoch was marked, first, by the almost universal adoption of the Norwegian type of racing skate; and, secondly, by the institution in 1892, at an inter- national congress held in

Holland, of annual races for the cham- pionships of Europe and of the world.

The Norwegian skate, introduced and perfected (1887-1902) by Axel Paulsen and Harald Hagen, is constructed with a view to lightness, strength, and diminution of friction. The blade, of specially hardened steel, is set in a hollow horizontal tube of aluminium, and connected by similar vertical tubes with foot- plates riveted to a closely-fitting boot with thin leather sole. It is 16-171 in. long and 5-2 millimetres thick {i.e. -019-078 in.), the average employed for hard ice being f mm., often thinner towards the heel. This thickness is suitable for hard ice, but for softer ice tV or A m – is preferable. The blade is flat on the ice throughout, except for an inch in front; this flatness distributes the weight, and with the extreme thinness of blade reduces friction to a minimum. The edges are right-angled and sharp.

The skater's style has been modified. The blade, when planted on the ice with weight upon it, describes a nearly straight line, the last few feet only curving slightly outwards as the skate leaves the ice. Hence the stroke of the best modern skaters is almost, if not entirely, on the inside edge, a gain in directness and speed, the outside edge being used for curves only. The length of stroke has tended to diminish. Contrasted with the 12-18 yards' stroke attributed to the old English champion, W. "Turkey" Smart, which was partly on the outside edge, the modern racing stroke rarely exceeds 10 yds., and is usually nearer 6 or 7. Particular instances vary with conditions of ice, &c, but at St Petersburg, in 1896, Eden's stroke in the 10,000 metre race averaged about 7! yds., that of P. Oestlund at Davos, in 1900, the same (for one lap, 8 yds.). J. F. Donoghue's stride in 1891 was computed at about 6 yds. The general effect has been vastly increased speed, and a conjoint cause is the stricter training under- gone before important races.

The races held annually since 1892-1893 for the championships of Europe and of the world, under the auspices of the International Skating Union, have assembled representatives from the skating countries of Europe and from America.

The races are four in number, over distances of 500, 1500, 5000 and 10,000 metres, and to obtain the title of champion a skater must win three races and finish in the fourth. In addition, each country, when possible, holds its own championship races.

In England races are still skated, with rare exceptions, on straight courses, with a sharp turn round a post or barrel, the distance prescribed for N.S.A. championships being Ij m. with three turns. The Continental and international system involves a course with straight sides and curved ends of such a radius that no slackening of speed is necessary. In both instances

the competitors race two at a time on a double track, and the time test is used. Each skater must keep his own course, to prevent either from using the other as pace- maker or wind-shield. The international regulations (Eiswettlauf- Ordnung) prescribe that, if a single track be used, the hindmost skater must keep at a minimum distance of 5 metres from the other, on pain of disqualification. The advantage of inner curve on a Continental course is given alternately, and a space left open between the tracks at one point for the skaters to cross.

The curves are skated with a step-over-step action, and the direc- tion is always from right to left. Hence, on entering the curve the right foot is brought across in front and set down on the inside edge, the left passing behind on the outside edge, and being in its turn set down on an outside edge in front. The strokes thus form a series of tangents to the curve, and are little shorter than in the straight. With a radius of 25 and 30 metres, as at Davos, the curves can be skated with safety at full speed.

The following are the amateur speed records at the principal distances :

Distance.

m. s.

Name.

Nationality.

500 metres (546 yds.)

44l

R. Gundersen

Norway

1,000 „ (1093 yds.)

1 34

P. Oestlund

,,

1,500 ,, (1639 yds.)

2 22|

P. Oestlund

,,

5,000 „ (3 m. 188 yds.)

8 37!

J. Eden

Holland

10,000 ,, (6 m. 376 yds.)

17 5o|

P. Oestlund

Norway

i68

SKEAT, W. W.

The following times and distances have also been recorded in America :

Distance.

h. m. s.

Name.

ioo yds .

9f

J. S. Johnson

4 m. . . .

35k

H. P. Mosher

i m. ...

2 36

J. Neilson

2 m. ...

5 42?

0. Rudd

5 m. ...

14 24

0. Rudd

10 m.

31 “l-

J. S. Johnson

50 m. . . .

3 15 59f

J. F. Donoghue

ioo m. .

7 11 381

J. F. Donoghue

See contemporary records in the Field, Outing, and other sporting journals, as well as the annual almanacs; A Bibliography of Skating, by F. W. Foster (London, 1898); Skating, in the Badminton Library (1892) ; Skating, in the Oval Series (1897) ; ” Skating,” article in the Encyclopaedia of Sport (1899); Skating, in the Isthmian Library (1901); Skating, by W. T. Richardson (New York, 1903).

Figure Skating. — This variety of skating, as subjected to definite rules, is quite modern, having originated in the 19th century, though the cutting of figures on the ice was regarded as an accomplishment by skaters long before.

Although the ” Edinburgh Skating Club,” founded in 1642, is the oldest skating organization in Great Britain, the ” Skating Club” of London, formed in 1830, is the most important, and for many years practically controlled figure skating. Many other important figure skating clubs now exist in Great Britain, for entrance into which a certain standard of proficiency is demanded. Figure skating championships are now held in many countries under the auspices of the national associations, the world’s championship meeting being held by the International Skating Union. In

England great impetus has been given to figure skating by the multiplication of clubs (e.g. Wimbledon, founded 1870, Thames Valley, Crystal Palace, &c.) in addition to the original " Skating Club" and those in Switzerland already mentioned; and from the construction of numerous artificial rink's, such as at Niagara and Prince's Club in London, as well as by the encouragement afforded by the National Skating Associa- tion, which offers 1st, 2nd and 3rd class badges (and a special or " Diamond" badge for figure skating) for figure tests as well as for speed; in 1893 the Association founded a " London Skating Council," while in 1898 and in 1902 it held the figure skating championship of the world in London. In America comparatively little interest is shown in this branch of the sport.

In the British style of figure skating, which is not recognized by the International Skating Union, the body is held as nearly as possible upright, the employed leg is kept straight, the un- employed leg carried behind, the arms hang loosely at the sides, and the head is turned in the direction of progress. In the so- called Anglo-Swiss style, affected by British skaters trained at Davos and St Moritz, the upright, almost rigid position is insisted on, even the unemployed leg being held straight. Much more latitude is allowed by the Continental school, though no definite rules of form have been laid down. The knee of the employed leg is slightly bent, and the unemployed leg is in constant action, being used to balance the body during the execution of the figures. The Continental is less difficult in execution than the British style, but its movements are less graceful. There are, of course, local modifications, the strictest exponents of the English school being the Davos and St Moritz skaters, while the Continental varies from the complete abandon of the French to the more restrained style of the Germans; Canadians cultivate also grape-vines and other two-footed figures. The essential features are, however, identical. Thus Englishmen consider of secondary importance loops, cross-cuts, continuous and hand-in-hand skating, though such figures are included in the 1st class test of the N.S.A., and devote themselves mainly to " combined figures." Combined figures have been defined as " symmetrical execution of a figure by one or more pairs of skaters." Originally known as the " skating club figures," they have been gradually developed, and in 1891 delegates from the principal clubs established a regular terminology. The ideal number of skaters for a combined figure is four, though sixes and eights are seen, one being chosen " caller" of the movement to

be skated. Various sets of " calls'" are arranged at the discretion of different clubs, and consist ordinarily of " turns " and " changes." The N.S.A. offer a challenge shield for an annual competition in combined figure skating. There has, however, been a marked tendency towards unification of style, through Englishmen adopting Continental methods, rendered almost a necessity by the circumscribed area of artificial rinks. In

1901 the Figure Skating Club was established for this purpose, and its members attained such success that an English lady, Mrs Syers, gained the second place in the world's championship competition in 1902, and with her husband won the International Pair Skating in that year, and again in 1904; and in 1906 she won the ladies' amateur championship of the world, established in that year.

The World's Figure Skating Championship was won in 1896 by Fuchs, Austria; 1897, G. Hiigel, Austria; 1898, H. Grenander, Sweden; 1899 and 1900, G. Hiigel, Austria; 1901, 1902, 1903, 1904, U. Salchow, Sweden. The competition consists of two parts, (a) compulsory figures, (b) free skating, the latter affording scope for the performance of dance steps and brilliant individual figures, such as the " sitting pirouette," and the " star," consist- ing of four crosses (forward rocker, back loop, back counter), invented by Herr Engelmann and splendidly rendered by Herr Salchow.

The skates used for the English and Continental styles are shorter than those used for speed-skating, and differ in radius, though both are of the same type, i.e. a blade fastened to the boot by sole-plates, the " Mount Charles " pattern being the one generally adopted by Englishmen. The English radius is 7 ft., or now more usually 6 ft. ; the foreign, 5I or even 5 ft., and the result is seen in the larger curves skated on the former, and the greater pace obtained owing to de- creased friction; at the same time, the difficulty of making a turn is greater. The English skate has generally right-angled edges and blade of same thickness throughout, except in the " Dowler " variety, which is thicker towards the extremities. The foreign skate is some- times thicker in the middle than at the ends.

See Skating, in the Badminton Library (1892) ; Skating, in the Oval Series (1897) ; A System of Figure-Skating, by T. Maxwell Witham (5th ed., 1897); On the Outside Edge, by G. H. Fowler (1897); Combined Figure-Skating, by George Wood (1899); "Skat- ing," in the Encyclopaedia of Sport (1899); Handbook of Figure- Skating, by G. H. Brown (Springfield, Mass., 1900) ; Lessons in Skating, by G. A. Meagher (1900) ; Figure-Skating, by M. S. Monier- Williams, in the Isthmian Library (1901); How to become a Skater, by G. D. Phillips, in Spalding's Athletic Library, New York. See also Roller-Skating.

SKEAT, WALTER WILLIAM (1835-), English philo- logist, was born in London on the 21st of November 1835, and educated at King's College, Highgate Grammar School, and Christ's College, Cambridge, of which he became a fellow in July i860. In 1878 he was elected Ellington and Bosworth Professor of Anglo-Saxon at Cambridge. He completed Mitchell Kemble's edition of the Anglo-Saxon Gospels, and did much other work both in Anglo-Saxon and in Gothic, but is perhaps most generally known

for his labours in Middle English, and for his standard editions of Chaucer and Piers Plowman (see Lang- land) . As he himself generously declared, he was at first mainly guided in the study of Chaucer by Henry Bradshaw, with whom he was to have participated in the edition of Chaucer planned in 1870 by the University of Oxford, having declined in Bradshaw's favour an offer of the editorship made to himself. Bradshaw's perseverance was not equal to his genius, and the scheme came to . nothing for the time, but was eventually resumed and carried into effect by Skeat in an edition of six volumes (1894), a supplementary volume of Chaucerian Pieces being published in 1897. He also issued an edition of Chaucer in one volume for general readers, and a separate edition of his Treatise on the Astrolabe, with a learned commentary. His edition of Piers Plowman in three parallel texts was published in 1886; and, besides the Treatise on the Astrolabe, he edited numerous books for the Early English Text Society, including the Bruce of John Barbour, the romances of Havelock the Dane and William of Palerne, and ˆElfric's Lives of the Saints (4 vols.). For the Scottish Text Society he edited The Kingis Quair, usually ascribed to James I. of Scotland, and he published an edition (2 vols., 1871) of Chatterton, with an investigation of the sources

of the obsolete words employed by him. In pure philology Skeat's principal achievement is his Etymological English Dictionary (4 parts, 1879-1882; rev. and enlarged, 1910), the most important of all his works, which must be considered in connexion with the numerous publications of the English Dialect Society, in all of which, even when not edited by himself, he had a hand as the founder of the society and afterwards its president.

His other works include: Specimens of English from 1394 to 1ˆ97 (1871); Specimens of Early English from 1298 to 1393 (1872), in conjunction with R. Morris; Principles of English Etymology (2 series, 1887 and 1891); A Concise Dictionary of Middle English (1888), in conjunction with A. L. Mayhew; A Student's Pastime (1896), a volume of essays; The Chaucer Canon (1900); A Primer of Classical and English Philology (1905), &c, &c.

SKEFFINGTON, SIR WILLIAM (c. 1463-1535), lord deputy of Ireland, belonged to a Leicestershire family and was sheriff of Leicestershire and Warwickshire under Henry VII. He was master of the ordnance and a member of parliament during the reign of Henry VIII., and in 1529 was appointed deputy in Ireland for Henry's son, the duke of Richmond, the nominal lord lieutenant of that country. He crossed over in August 1529,

but his power was so circumscribed by instructions from Henry that the head of the Fitzgeralds, Gerald, 9th earl of Kildare, and not Skefnngton, was the real governor of Ireland. This state of affairs lasted for three years and then in 1532 the deputy was recalled. In 1 534, Kildare being in prison in England and his son Thomas, afterwards the 10th earl, being in revolt, Skefnngton was again appointed deputy. After some delay he landed at Dublin in October 1534 and marched at once to relieve Drogheda, but further progress in the work of crushing the rebellion was seriously delayed by his illness. However, in the spring of 1535 he was again in the field. He took Maynooth, the heavy artillery used by him on this occasion earning for him his surname of " the gunner "; he forced some of Kildare's allies to make peace and he captured Dungarvan. He died on the 31st of December 1535.

SKEGNESS, a seaside resort in the S. Lindsey, or Horncastle parliamentary division of Lincolnshire, England; 131 m. N. by E. from London by the Great Northern railway. Pop. of urban district (1901) 2140. Since 1873, when railway connexion was given with Firsby on the Grimsby branch line, the place has undergone a complete transformation, and now possesses good hotels and a pier. There are broad, firm sands, on which account Skegness is much visited. On bank holidays and similar occasions thousands of excursionists come from the manufacturing towns within reach. It is said that a former Skegness, an important haven, was obliterated by the encroach- ments of the sea; Leland, writing in the middle of the 16th century, states that proofs of this were then extant.

SKELETON. In most animals, and indeed in plants, the shape could not be maintained without a thickening and harden- ing of certain parts to form a support for the whole. These hardened parts are called the skeleton (Gr. , I dry), because they dry up and remain after the rest of the body has disappeared. In animals the skeleton is usually, and in higher animals always, rendered more rigid and permanent by the deposit in it of lime salts, thus leading to the formation of bone. Sometimes, as in most of the lower or invertebrate animals, the skeleton is on the surface and thus acts as a protection as well as a framework. This is known as an exoskeleton. In the higher or vertebrate animals there is an internal or endoskeleton and the exoskeleton is either greatly modified or disappears.

The following descriptive account is divided into (1) axial, or skeleton of the trunk, (2) appendicular or skeleton of the limbs, (3) skull, (4) visceral skeleton, or those parts which originally form the gill supports of water breathing vertebrates, (5) the exoskeleton, which is considered under the heading Skin and Exoskeleton. These divisions, although they seem logical, cannot in practice be strictly adhered to, especially in the case of the visceral skeleton, because doing so would involve, among other things,

separating the description of the upper jaw from that of the rest of the skull. For the microscopical structure of bone see Connective Tissues.

Axial.

The axial skeleton, from a strictly scientific point of view, should comprise a good deal of the skull as well as the spinal column, ribs and breast bone, but, as the skull (?.».) is dealt with in a separate article, the three latter structures alone are dealt with here.

The Spine, Spinal or Vertebral Column, chine or backbone in man consists of a number of superimposed bones which are named vertebrae, because they can move or turn somewhat on Spine

each other. It lies in the middle of the back of the neck and trunk; has the cranium at its summit; the ribs at its sides, which in their turn support the upper limbs ; whilst the pelvis, with the lower limbs, is jointed to its lower end. The spine consists in an adult of twenty-six bones, in a young child of thirty-three, certain of the bones in the spine of the child becoming ankylosed or blended with each other in the adult. These blended bones lose their mobility and are called false vertebrae; whilst those which retain their mobility are the true verte- brae. The bones of the spine are arranged in groups, which are named from their position — vertebrae of the neck or cervical; of the chest, thoracic, formerly called dorsal; of the loins, lumbar; of the pelvis, sacral; and of the tail, coccygeal or caudal; and the number of vertebrae in each group may be expressed in a formula. In man the formula is as follows: — C7Thi2L s S 6 Coci = 33 bones, as seen in the child; but the five sacral vertebrae fuse together into a single bone — the sacrum — and the four coccygeal into the single coccyx. Hence the sacrum and coccyx of the adult are the false, whilst the lumbar, dorsal and cervical are the true vertebrae.

The vertebrae are irregularly-shaped bones, but as a rule have certain characters in common. Each possesses a body and an arch, which enclose a ring, with certain processes and notches. The body, or centrum, is a short cylinder, which by its upper and lower surfaces is connected by means of fibro- cartilage with the bodies of the verte- brae immediately above and below. The collective series of vertebral bodies forms the great column of the spine. The arch, also called neural arch, because it encloses the spinal marrow or- nervous axis, springs from the back of the cen- trum, and consists of two symmetrical Q 7 halves united behind in the middle line. rj 12 Each half has an anterior part or pedicle, l 6 and a posterior part or lamina. The g B rings collectively form the spinal canal. CociThe coccygeal The processes usually spring from the CC The series of' twelve arch. The spinous process projects r ;tj s on one s ; c j e _

backward from the junction of the two p s The presternum laminae, and the collective series of Ms The meso-sternum. these processes gives to the entire Xs column the spiny character from which has arisen the term spine, applied to it. The transverse processes project out- ward, one from each side of the arch. The articular processes project, two upward and two downward, and are for connecting adjacent vertebrae together. The notches, situated on the upper and lower borders of the pedicles, form in the articulated spine the intervertebral foramina through which the nerves pass out of the spinal canal.

The vertebrae in each group have characters which specially dis- tinguish them. In man and all mammals, with few exceptions, whatever be the length of the neck, the cervical vertebrae Cervical are seven in number. In man the body of a cervical V ertebrat. vertebra is comparatively small, and its upper surface is transversely concave; the arch has long and obliquely sloping laminae; the ring is large and triangular; the spine is short, bifid, and horizontal; the transverse process consists of two bars of bone, the anterior springing from the side of the body, the posterior from the arch, and uniting externally to enclose a foramen (vertebrarterial) through which, as a rule, the vertebral artery passes; the articular processes are flat and oblique, and the upper pair of notches are deeper than the lower. The first, second and seventh cervical vertebrae have characters which specially distinguish them. The first, or atlas, has no body or spine: its ring is very large, and on each side of the ring is a thick mass of bone, the lateral mass, by

Fig. i.— The Axial

Skeleton. The cervical vertebrae. The thoracic. The lumbar. The sacral.

The xiphisternum. The dotted line VV represents the vertical axis of the spine.

Thoracic vertebrae.

>t

which it articulates with the occipital bone above and the second vertebra below. The second vertebra, axis, or Vertebra dentata, has its body surmounted by a thick, tooth-like odontoid process, which is regarded as

the body of the atlas displaced from its proper vertebra and fused with the axis. This process forms a pivot round which the atlas and head move in turning the head from one side to the other; the spine is large, thick and deeply bifid. The

seventh, called Vertebra prominens, is distinguished by its long prominent spine, which is not bifid, and by the small size of the foramen at the root of the transverse process. In the human spine the distinguishing char- acter of all the cervical vertebrae is the foramen at the root of the trans- verse process.

The thoracic vertebrae, formerly called dorsal, are twelve i.i number in the human spine. They are intermediate in size and position to the cervical and lumbar vertebrae, and are all distinguished by having one or two smooth surfaces on each side of the body for articulation with the head of one or two ribs. The arch is short and with imbricated laminae; the ring is nearly circular; the spine is oblique, elongated and bayonet- shaped; the transverse processes are directed back and out, not bifid, and with an articular surface in front for the tubercle of a rib ; and the articular processes are flat and nearly vertical. The first, twelfth, eleventh, tenth and sometimes the ninth, thoracic verte- brae are distinguished from the rest. The first is in shape like the seventh cervical, but has no foramen at the root of the transverse process, and has two articular facets on each side of the body ; the ninth has sometimes only one facet at the side of the body; the tenth, eleventh, and twelfth have invariably only a single facet on the side of the body, but the eleventh and twelfth have stunted transverse processes, and the twelfth has its lower articular processes shaped like those of a lumbar vertebra. The lumbar vertebrae in man are five in number. They are the lowest of the true vertebrae, and vertebrae. ?' so ˆ e largest, especially in the centrum. The arch has short and deep laminae; the ring is triangular; the spine is mas- sive and hatchet-shaped; the trans- verse processes are long and pointed ; the articular are thick and strong, the superior pair concave, the inferior convex, and the inferior notches, as in the thoracic vertebrae, are deeper than the superior. In the lumbar vertebrae and in the lower thoracic an accessory process projects from the base of each transverse process, and a mammillary tubercle from each superior articular process. The fifth lumbar vertebra has its body much deeper in front than behind and its spine is less massive.

The sacrum is composed of five originally separate vertebrae fused

into a single bone. It forms Sacrum. the upper and back waJ1 of

the pelvis, is triangular in form, and possesses two surfaces, two borders, a base, and an apex. The anterior or pelvic surface is concave, and is marked

by four transverse lines, which indicate its original subdivision into five bones, and by four pairs of foramina, through which are transmitted the anterior sacral nerves. Its posterior surface is convex; in the middle line are four spines, because in the last sacral vertebra the spinal canal is not closed behind. On each side of these are two rows of tubercles, the inner of which are the conjoined articular and mammillary processes, the outer the transverse processes of the originally distinct vertebrae. Between these rows four pairs of foramina are found transmitting the posterior sacral nerves from the sacral canal, which extends

From Arthur Thomson, Cunning- barn's Text-Book of Anatomy.

Fig. 2. — Vertebral Column as seen from behind.

through the bone from base to near the apex, and forms the lower end of the spinal canal. By its borders the sacrum is articulated with the haunch-bones — by its base with the last lumbar vertebra, by its apex with the coccyx. The human sacrum is broader in proportion to its length than in other mammals ; this great breadth gives solidity to the lower part of the spine, and, conjoined with the sjze of the lateral articular surfaces, it permits a more perfect junction with the haunch-bones, and is correlated with the erect position. Owing to the need in woman for a wide pelvis, the sacrum is broader than in man. (For details see A. M. Paterson, " The Human Sac- rum," Sci. Trans. R. Dublin Soc. vol. v. ser. 2.)

The coccyx consists of four or five vertebrae in the human spine though the last one is sometimes suppressed. It is the rudimentary tail, but instead of projecting back, as in mammals _ generally, is curved forward, and is not visible externally, Coccyx. an arrangement which is also found in the anthropoid apes and in Hoffmann's sloth. Not only is the tail itself rudimentary in man, but the vertebrae of which it is composed are small, and represent merely the bodies and transverse processes of the true vertebrae. As there are no arches, the ring is not formed, and the spinal canal does not extend, therefore, beyond the fourth piece of the sacrum. The first coccygeal vertebra, in addition to a body, possesses two processes or horns, which are the superior articular processes.

The human spine is more uniform in length in persons of the same race than might be supposed from the individual differences in stature, the variation in the height of the body in adults being due chiefly to differences in the length of the lower limbs. The average length of the spine is 28 in. ; its widest part is at the base of the sacrum, from which it tapers down to the tip of the coccyx. It diminishes also in breadth from the base of the sacrum upwards to the region of the neck. Owing to the projection of the spines behind and the transverse processes on each side, it presents an

irregular outline on those aspects; but in front it is more uniformly rounded, owing to the convex form of the antero-lateral surfaces of the bodies of its respective vertebrae. In its general contour two series of curves may be seen, an antero-posterior and a lateral. The antero-posterior is the more important. In the infant at the time of birth the sacro- coccygeal part of the spine is concave forward, but the rest of the spine, except a slight forward concavity in the series of thoracic vertebrae, is almost straight. When the infant begins to sit up in the arms of its nurse, a convexity forward in the region of the neck appears, and subsequently, as the child learns to walk, a convexity forward in the region of the loins. Hence in the adult spine a series of convexo-concave curves are found, which are alternate and mutually dependent, and are associated with the erect attitude of man. A lateral curve, convex to the right, opposite the third, fourth, and fifth thoracic vertebrae, with compensatory curve convex to the left immediately above and below, is due apparently to the much greater use of the muscles of the right arm over those of the left, drawing the spine in that region somewhat to the right. In disease of the spine its natural curvatures are much increased, and the deformity known as humpback is produced. As the spine forms the central part of the axial skeleton, it acts as a column to support not only the weight of the body, but of all that can be carried on the head, back and in the upper limbs : by its transverse and spinous processes it serves also to give attachment to numerous muscles, and the transverse processes of its thoracic vertebrae are also for articulation with the ribs.

The Thorax, Pectus, or Chest is a cavity or enclosure the walls of which are in part formed of bone and cartilage. Its skeleton consists of the sternum in front, the twelve thoracic _. vertebrae behind, and the twelve ribs, with their corre- Thorax. sponding cartilages, on each side.

The sternum or breast bone is an elongated bone which inclines downward and forward in the front wall of the chest. It consists of three parts — an upper, called manubrium or presternum ; a middle, the gladiolus or mesosternum ; and a lower, the steraum – ensiform process or xiphisternum. Its anterior and posterior surfaces are marked by transverse lines, which indicate not only the subdivision of the entire bone into three parts, but that of the meso- sternum into four originally distinct segments. Each lateral border of the bone is marked by seven depressed surfaces for articulation with the seven upper ribs: at each side of the upper border of the presternum is a sinuous depression, where the clavicle, a bone of the upper limb, articulates with this bone of the axial skeleton. The xiphisternum remains cartilaginous up to a late period of life, and from its pointed form has been named the ensiform cartilage.

The ribs or costae, twenty-four in number, twelve on each side of the

thorax, consist not only of the bony ribs, but of a bar of cartilage continuous with the anterior end of each bone, c called a costal cartilage, so that they furnish examples of a “>srae- cartilaginous skeleton in the adult human body; in aged persons these cartilages usually become converted into bone. The upper seven ribs are connected by their costal cartilages to the side of the sternum, and are called sternal or true ribs; the lower five do not reach the sternum, and are named asternal or false, and of these the two lowest, from being comparatively unattached in front, are called free or floating. Another and perhaps more useful classification is to speak of the first seven ribs as vertebro-sternal, the next three as vertebro-costal, and the last two as vertebral. All the ribs are

articulated behind to the thoracic vertebrae, and as they are sym- metrical on the two sides of the body, the ribs in any given animal are always twice as numerous as the thoracic vertebrae in that animal. They form a series of osseocartilaginous arches, which

From Arthur Thomson, Cunningham’s Text-Book of Anatomy.

Fig. 3. — The Thorax as seen from the Front.

extend more or less perfectly around the sides of the chest. A rib is an elongated bone, and as a rule possesses a head, a neck, a tubercle and a shaft. The head usually has two articular surfaces, and is connected to the side of the body of two adjacent thoracic vertebrae ; the neck is a constricted part of the bone, uniting the head to the shaft; the tubercle, close to the junction of the shaft and neck, is the part which articulates with the transverse process of the vertebra. The shaft is com- pressed, possesses an inner and outer surface, and an upper and lower border, but from the shaft being somewhat twisted on itself, the direction of the surfaces and borders is not uniform throughout the length of the bone. The ribs slope from their attachments to the spine, at first outward, downward and back- ward, then downward and forward, and where the curve changes from the backward to the SoP forward direction an angle is formed on the rib. The angle and the tubercle are at the same place in the first rib and in each succeeding rib the angle is a little farther from the tubercle SpP_ than in the last.

The first, tenth, eleventh and twelfth ribs articulate each with only one vertebra so that there is only one surface on the head. The

surface of the first rib which is not in contact with the lung is directed upward, forward and outward while that of the second rib is much more outward; the eleventh and twelfth ribs are rudimentary, have neither neck nor tubercle, and are pointed anteriorly. The ribs are by no means uniform in length: they increase from the first to the seventh or eighth, and then diminish to the twelfth; the first and twelfth are therefore the shortest ribs. The first and second costal cartilages are almost horizontal, but the others are directed upward and. inward.

In its general form the chest may be likened to a barrel which is wider below than above. It is rounded at the sides and flattened in front and behind, so that a man can lie either on his back or his belly. Its upper opening slopes downward and forward, is small in size, and allows the passage of the windpipe, gullet, large veins and nerves into the chest, and of several large arteries out of the chest into the neck. The base or lower boundary of the cavity is much larger than the upper, slopes downward and backward, and is occupied by the diaphragm, a muscle which separates the chest from the cavity of the abdomen. The transverse diameter is greater than the antero- posterior, and the antero-posterior is greater laterally, where the lungs are lodged, than in the mesial plane, which is occupied by the heart.

Embryology. — The first appearance of any stiffening of the embryo is the formation of the notochord, which in the higher vertebrates is a temporary structure and is not converted into cartilage or bone. It also differs from the bony skeleton in that it is derived from the entoderm or inner of the three. layers of the embryo while the bony skeleton is formed from the mesoderm or middle layer and, just as the entoderm is an older layer of the embryo

than the mesoderm, so the notochord or entodermal skeleton precedes, both in embryology and in phylogeny or comparative anatomy, the bony mesodermal skejeton.

In the accompanying figure (fig. 4) the notochord is seen in section fully formed and lying between the entoderm and the neural canal. Its first formation is at an earlier period than this, before the neural groove has closed into a canal, and it appears at first as an tfpWard groove from the most dorsal part of the entoderm in what will later on be the cervical region of the embryo. The groove, by the union of its edges, becomes a tube, sometimes spoken of as the chordal tube, but the cavity of this is soon obliterated by the growth of its cells, so that a solid elastic rod is formed which grows forward as far as the pituitary region of the skull and backward to where the end of the coccyx will be.

While the development of the notochord is going on the mesoderm on each side of it is dividing itself into a series of masses called mesodermic somites (see fig. 4, PS) or protovertebrae. This process begins in the cervical region and proceeds forward and backward until thirty-eight pairs have been formed for the neck and trunk and probably four extra ones for the occipital region of the skull. Each of these somites consists of three parts: that nearest the surface ectoderm is the cutaneous lamella (fig. 4, CL). Deep to this and separated in the earlier-formed somites by a space is the muscle layer (fig. 4, ML) while deepest of all and nearest the nerve cord and notochord is the scleratogenous layer (fig. 4, SL). It is this layer which gradually meets its fellow of the opposite side and encloses the nerve cord and the notochord in continuous tubes of mesodermal tissue, thus forming the membranous vertebral column, which is perforated for'the exit of the spinal nerves, but the intervals between the successive mesodermic somites are still marked by the tissue being rather denser there. The next stage is that of chondrification or the conversion into cartilage of each segment of the membranous vertebral column surrounding the notochord. In this way the bodies of the cartilaginous vertebrae are formed and each of these is segmental, that is, it corresponds to a muscle segment and a spinal nerve. The cartilaginous neural arch, however, which surrounds the nerve cord is intersegmental and is formed in the denser fibrous tissue which separates each somite from the next. This also applies to the cartilaginous ribs which appear in the fibrous intervals (myo-

SB

CC CL

CO EC

EN

Central canal. Cutaneous lamella

of protovertebral

somite. Coelom. Ectoderm. Entoderm.

SG SL

From Alfred H. Young and Arthur Robinson, Cunningham's Text-Book of Anatomy. m

Fig. 4. — Transverse Section of a Ferret Embryo, showing further differentiation of

the mesoderm.

ML Muscular layer of meso- dermic somite.

N Notochord.

NC Neural crest.

PA Primitive aorta.

PS Mesodermic somite.

SB Spongioblast.

SC Spinal cord.

GC Germinal cell.

Spinal ganglion. Scleratogenous layer of protovertebral somite. Somatic mesoderm. Somatopleure. SpM Splanchnic mesoderm. SpP Splanchnopleure.

SoM SoP

commata) between the muscle plates (myotomes), and so it is easy to realize that each typical rib must articulate with the bodies of two adjacent vertebrae, but with the neural arch, through its trans- verse process, of only one.

The intersegmental tissue between the bodies of the vertebrae becomes the intervertebral discs and in the centre of these a pulpy

mass is found which contains some remnants of the notochord. Elsewhere this structure is pressed out of existence and there is no further use for it when the cartilaginous vertebrae are once formed. One other series of structures must be mentioned though they do not

25 24 2 7

From Arthur Thomson, Cunningham's Text-Book of Anatomy.

Fig. 5. — Ossification of Vertebrae.

Cervical Vertebra. Centre for body. Superior epiphysial plate. Anterior bar of transverse process

developed by lateral extension from

pedicle. Neuro-central synchondrosis. Inferior epiphysial plate.

Lumbar Vertebra.

6 Body.

7 Superior epiphysial plate.

8 Epiphysis for mammillary process.

9 Epiphysis for transverse process.

10 Epiphysis for spine.

1 1 Neuro-central synchondrosis.

12 Inferior epiphysial plate.

Dorsal Vertebra.

13 Centre for body.

14 Superior epiphysial plate, appears

about puberty; unites at 25th year.

15 Neuro-central synchondrosis does not

ossify till 5th or 6th year.

16 Appears at puberty; unites at 25th

year.

17 Appears at puberty; unites at 25th

year.

18 Appears about 6th week.

Axis.

19 Centre for transverse process and

neural arch; appears about 8th week.

20 Synchondroses close about 3rd year.

but the ventral ends of the ninth and sometimes the eighth probably remain as the xiphisternum, indeed a fibrous band is sometimes seen joining the caudal end of that structure to the ninth rib. The fusion of the two parallel bars begins at their cephalic ends and sometimes is interrupted toward the caudal end, thus leading to cleft or perforate sternum. At the cephalic end of each sternal bar, close to the place where the clavicles articulate, is an imperfectly separated patch of cartilage which usually fuses completely with the presternum, though sometimes it remains distinct and may later acquire a separate centre of ossification and so form a separate episternal bone on each side. If the sternum is to be regarded as the fused ventral ends of the thoracic ribs, the episternal elements are probably the remnants of the ventral ends of the seventh cervical ribs. The question of the morphological meaning of the sternum and surrounding parts cannot be settled entirely by a study of their development even when combined with what we know of their comparative anatomy or phylogeny. Professor A. M. Paterson (The Human Sternum, London, 1904) takes a dif- ferent view from the foregoing and regards the sternum as derived from the shoulder girdle. To this point of view we shall return in the section on comparative anatomy.

The last stage in the development of the axiaf skeleton is the ossification of the cartilage; bony

21 Centre for summit of odontoid pro- centres appear first in each half of

the neural arches

cess; appears 3rd to 5th year, fuses of the vertebrae arid a little later (tenth week) 8th to 1 2th year. double centres are deposited in the centra though

22 Appears about 5th or 6th month ; these are so close together and fuse so rapidly that

unites with opposite side 7th to 8th their double nature is often only indicated by their month. oval or dumb-bell-like appearance. The bone in the

23 Synchondrosis closes from 4th to 6th two halves of the neural arch spreads and fuses in

the mid dorsal line, and later on joins the ossified

epiphysial plate; appears centrum ventral to the facet for the rib. This point puberty, unites about 25th of junction remains as a narrow strip of cartilage for

a long time and is known as the neuro-central r double centre for body; suture or synchondrosis. The head of the rib

24

year. Inferior about year. 25 Single

appears about 5th month. Atlas. 26 Posterior arch and lateral masses developed from a single centre on either side, which appears about 7th week.

therefore articulates with the developmental neural arch instead of the centrum. About the age of puberty secondary centres or epiphyses appear at the tips of the transverse and spinous processes and as thin plates just above and below the body (see fig. 5 — 2 and 3). These are fully united by the . • . , , . , . twenty-fifth year. In the lower two cervical verte-

27 Anterior arch and portion of superior ferae / here i/ often a separate centre for the part

articular surface developed from correspond i ng t0 t h e rib, while the lumbar have an

single or double centre, appearing extra epiphysis for the mamm iHary process. The

during 1st year. atlas has one centre for each side of the dorsal part

Dorsal Vertebra. of the arch and one (probably two fused) for the

28 Epiphysis for transverse process; ventral part, which has already been referred to as

appears about puberty, unites about a hypochordal bar. In the axis, in addition to the 25th year. ordinary centres, there is one for each side of the

29 Epiphysis appears" about puberty; odontoid process and one for the tip (see fig. 5—

unites about 25th or 27th year. 20, 21, 22). The sacral vertebrae have the usual

30 Centre for neural arch on either side ; centres, except that the anterior part of the lateral

appears about 6th or 7th week, the mass (costal element) has a separate centre and laminae unite from birth to 15th that there are two extra centres on each side of month. the whole sacrum where it articulates with the ilium

Centre for body; appears about 6th (see fig. 6).

week, unites with neural arch from The ribs ossify by one primary centre appearing

31

5th to 6th year.

play any great part in human development. In the intersegmental tissue ventral to each of the intervertebral disks a transverse rod of cells, known as a hypochordal bar, is formed which connects the heads of two opposite ribs. In man the greater number of these either disappear or form the middle fasciculus of the stellate ligament which joins the head of the rib to the intervertebral disk, but in the case of the atlas the rod chondrifies to form the anterior (ventral) arch which is therefore intersegmental, while the segmental body of the atlas, through which the notochord is passing, joins the axis to form the odontoid process. These hypochordal bars are interesting as the last remnant in man of the haemal arch of the vertebrae of fishes (see subsection on comparative anatomy). In the cervical region the ribs are very short and form the ventral boundary of the foramen for the vertebral artery. They are so short that little movement occurs between

them and the rest of the vertebra, hence no joints are formed and the rib element becomes fused with the centrum and transverse process, leaving the vertebrarterial canal between. Sometimes in the seventh cervical vertebra the rib element is much longer and then of course more movement occurs, and instead of fusing with the rest of the vertebra it remains as a separate cervical rib with definite joints.

The sternum is developed according to G. Ruge by a fusion of the ventral ends of the ribs on each side thus forming two parallel longi- tudinal bars which chondrify and eventually fuse together in the mid line. The anterior seven or sometimes eight ribs reach the sternum,

about the sixth week and by secondary ones

for the tubercle and head. The sternum is ossified

by centres which do not appear opposite the attachment of

the ribs but alternately with them, so that although the original

From Arthur Thomson, Cunningham's Text-Book of Anatomy.

Fig. 6. — Ossification of Sacrum — a,a, Centres for bodies; 5,5, Epiphysial plates on bodies; c,c, Centres for costal elements; d,d, Centres for neural arches ; e,e, Lateral epiphyses.

cartilaginous structure is probably intersegmental the bony segments are segmental like those of the vertebral centra. As seven ribs articulate with the sternum six centres of ossification between them might be looked for, but there is so little room between the points of attachment of the sixth and seventh ribs that centres do not occur

here as a rule. Consequently five centres are found; those for the two higher segments being single while the lower ones are often double. J^ater on in life a centre for the xiphisternum appears.

At birth.

At 3 years From Arthur Thomson, Cunningham's Text-Book of Anatomy.

Fig. 7. — Ossification of the Sternum. In this figure the second as well as

the third segment of the body possesses two centres.

1 Appears about 5th or 6th

month.

2 Appear about 7th month;

unite from 20 to 25.

3 Appear about 8th or 9th

month; III. segment unites with II. about puberty; IV. segment unites with III. early childhood. [later.

4 Appears about 3rd year or

. For further details see C. S. McMurrich, The Development of the Human Body (London, 1906). This includes bibliography, but G. Ruge's paper on the development of the sternum (Morph. Jahrb. vi. 1880) is of special importance.

Comparative Anatomy. — Just as in development the [notochord forms the earliest structure for stiffening the embryo, so in the animal kingdom it appears before the true backbone or vertebral column is evolved. This is so important that the older phylum of Vertebrata has now been expanded into that of Chordata to include all animals which either permanently or temporarily possess a noto- chord. In the subphylum Adelochorda, which includes the worm- like Balanoglossus, as well as the colonial forms Rhabdopleura and Cephalodiscus, an entodermal structure, apparently corresponding to the notochord of higher forms, is found in the dorsal wall of the pharynx. In the subphylum Urochorda or Tunicata, to which the ascidians or sea-squirts belong, the notochord is present in the tail region only and as a rule disappears after the metamorphosis from the larval to the adult form. In the Acrania, which are represented by Amphioxus (the lancelet). and are sometimes classed as the lowest division of the subphylum Vertebrata, the notochord is permanent and extends the whole length of the animal. Both this and the nerve cord dorsal to it are enclosed in tubes of mesodermal connective tissue which are continuous with the fibrous myocom- mata between the myotomes. Here then is a notochord and a

membranous vertebral column resembling a stage in man's develop- .. „ˆ .„„ ,

ment. In the Cyclostomata (hags and lampreys) the notochord and' –

adaptations to their bipedal locomotion and power of flight, its sheath persist through life, but in the adult lamprey (Petromyzon) cartilaginous neural arches are developed. In cartilaginous ganoid fishes like the sturgeon, the notochord is persistent and has a strong fibrous sheath into which the cartilage from the neural arches encroaches while in the elasmobranch fishes (sharks and rays) the cartilaginous centra are formed and grow into the notochord, thus causing its partial absorption. The growth is more marked peri- pherally than centrally, and so each centrum when removed i« seen to be deeply concave toward both the head and tail ; such a vertebra is spoken of as amphicoelous and with one exception is always found in fishes which have centra. In the body fish (Teleostei) and mud- fish (Dipnoi) the vertebrae are ossified.

If a vertebra from the tail of a bony fish like the herring be ex- amined, it will be seen to have a ventral (haemal) arch surrounding the caudal blood-vessels and corresponding to the dorsal or neural arch which is also present. In the anterior or visceral part of the body the haemal arch is split and its two sides spread out deep to the muscles and lying between them and the coelom to form the ribs. In the elasmobranchs on the other hand the ribs lie among the muscles as they do in higher vertebrates, and the fact that both kinds of ribs are coexistent in the same segments in the interesting and archaic Nilotic fish Polypterus bichir shows that they are de- veloped independently of one another. The sternum is never found in fishes with the possible exception of the comb-toothed shark (Notidanus). Among the Amphibia the tailed forms (Urodela) have amphicoelous vertebrae in embryonic life and so have some of the

adult salamanders, but usually the intercentral remnants of the notochord are pressed out of existence by the forward growth of the centrum behind it, so that in the adult each vertebra is only concave behind (opisthocoelous). In the Anura (frogs and toads), on the other hand, the centra are usually concave forward (procoelous) and some oT the posterior ones become fused into a long delicate bone, the urostyle. The ribs of urodeles have forked vertebral ends and are thus attached to the centrum as well as to the neural arch of a vertebra; this forking is supposed to be homologous with the double ribs of Polypterus already referred to. The sternum as a constant structure first appears in amphibians and is more closely connected with the shoulder girdle than with the ribs, the ventral ends of which, except in the salamander Necturus, are rudimentary. It is not certain whether it is the homologue of the sternum of the fish Notidanus, but the subject is discussed by T. J. Parker and A. M. Paterson (The Human Sternum, London, 1904, p. 50), and still requires further research. If the sternum be regarded as a segmental structure or series of segmental structures corresponding to the centra of the vertebrae there is no reason why it should not develop independently of the intersegmental ribs

and, when the ribs are suppressed, gain a secondary connexion with the shoulder girdle In Reptilia the centra of the vertebrae are usually procoelous, though there are a few examples, such as the archaic Tuatera lizard (Sphenodon), in which the amphicoelous arrangement persists. There are several cervical vertebrae instead of one, which is all the amphibians have. The odontoid bone is usually separate both from the atlas and axis while, between the atlas and the skull, there are rudiments of an extra intervertebral dorsal structure or pro-atlas in some forms such as the crocodile and Sphenodon lizard. Two sacral vertebrae (i.e. vertebrae articulating with the ilium) are generally present instead of the one of the Amphibia, but they are not fused together as in mammals. In the tail region haemal arches are often found enclosing the caudal artery and vein as they are also in urodele amphibians; in some species these are separate and are then spoken of as chevron bones. In the Crocodilia intervertebral disks first appear. Ribs are present in the cervical, thoracic and lumbar regions, and in the Chelonia (tortoises) the cervical ones blend with the vertebrae as they do in higher forms. In crocodiles a definite vertebrarterial canal is established in the cervical region which henceforward becomes permanent. The shafts of the ribs are sometimes all in one piece as in snakes or they may be developed by three separate centres as in Sphenodon with intervening joints. In these cases dorsal, intermediate and ventral elements to each shaft are present. In Crocodilia and Sphenodon there are spurs from each thoracic rib which overlap the next rib behind and are known as uncinate processes; they are developed in connexion with the origin of the external oblique muscle of the abdomen and are very constant in birds. The ventral elements of some of the hinder ribs are found in the Crocodilia lying loose in the myocommata of the rectus and obliquus internus (inscriptiones tendineae) and are known as abdominal ribs, while the sacral vertebrae articulate with the ilium through the intervention of short rods of bone, sometimes called pleurapophyses, which are no doubt sacral ribs. The sternum of reptiles is a broad plate of cartilage which may be calcified but is seldom converted into true bone; it always articulates with the coracoids (see section Appendicular) anteriorly and with a variable number of ribs laterally and posteriorly. It should not be confounded with the dagger-shaped interclavicle which, like the clavicles, is a membrane bone and overlaps the sternum ventrally. It is also probable that the interclavicle is morphologically quite distinct from the episternum, of which vestiges aie present in man and are referred to above in the section on embryology (see fig. 27). In birds the characteristics are largely reptilian with some specialized adaptations to their bipedal locomotion and power of flight. One effect of this is that the two true sacral vertebrae become secondarily fused with the adjacent lumbar, caudal and even thoracic, and these again fuse with the ilium so that the posterior part of a bird's trunk is very rigid. The neck, on the other hand, is very movable and the centra

articulate by means of saddle-shaped joints which give the maximum of movement combined with strength (see Joints). The caudal vertebrae are fused into a flattened bone, the pygostyle, to support the tail feathers. In the fossil bird Archaeopteryx the centra are amphicoelous and the long tail has separate caudal vertebrae. The ribs are few and consist of dorsal (vertebral) and ventral (sternal) parts; the former almost always have uncinate processes. Free cervical ribs are often present and Archaeopteryx possessed abdominal ribs. The sternum is very large and in flying birds (Carinatae) has a median keel (carina) projecting from it, while the non-flying, ostrich-like birds (Ratitae) have no such structure.

In Mammalia the centra articulate by means of the intervertebral disks and it is only in this class that the epiphysial plates appear though these are absent in the Monotremata (duck-mole, &c.) and Sirenia (sea-cows). The cervical vertebrae are with a few exceptions (two-toed and three-toed sloths and the manatee or sea-cow) always seven in number, and some, usually all, of them have a vertebrar- terial canal in the transverse process. In some of the Cetacea they are fused together. In the Ornithorhynchus the odontoid is a separate bone, as it is in many reptiles, but this part includes the facets by means of which the axis and atlas articulate. The thoracic

vertebrae vary from ten in some of the whales and the peba armadillo to twenty-four in the two- toed sloth, though thirteen or fourteen is the commonest number. In the anterior part of the thoracic region the spines point backward, while in the posterior thoracic and lumbar regions they have a forward direction. There is always one spine in the posterior thoracic region, which is vertical, and the vertebra which bears this is known as the anticlinal vertebra. The

az

Fig. 8. — Anterior Surface of Sixth Cervical Vertebra of Dog.

s Spinous process. az Anterior zygapophysis. v Vertebrarterial canal. t Transverse process. V Its costal lamella. «

Fig. 9. — Side View of the First Lumbar Vertebra of a Dog {Canis familiaris). s Spinous process. m Metapophysis. az Anterior zygapophysis. pz Posterior zygapophysis. a Anapophysis. / Transverse (costal) pro- cess.

lumbar vertebrae vary frcm two in the Omithorhynchus and some of the armadillos to twenty-one in the dolphin, the average number being probably six. Both the mammillary and accessory tubercles (meta- and ana-pophyses) are in some forms greatly enlarged. It is usually held that the former are morphologically muscular pro- cesses while the latter represent the transverse processes of the thoracic vertebrae. In the American edentates additional articular processes (zygapophyses) are developed, so that these animals are sometimes divided from the old-world edentates and spoken of as Xenarthra.

Lying ventral to the intervertebral disks in many mammals small paired ossicles are occasionally found; these are called inter- centra and are ossifications in the hypochordal bar (see subsection on embryology). They probably represent the places where the chevron bones or haemal arches would be attached and are the serial homologues of the anterior arch of the atlas (see fig. 10).

Boulenger has pointed out that these intercentra, either as paired or median ossicles, are often found in lizards (P.Z.S., i8<}i,p. 114). The sacrum consists of true sacral vertebrae, which directly articulate with the sacrum, and false, which are caudal vertebrae fused with- the others to form a single bone. There is also reason to believe that vertebrae which are originally lumbar become secondarily included in the sacrum because in the development of man the pelvis is at first attached to the thirtieth vertebra, but gradually shifts forward until it reaches the twenty -fifth, twenty-sixth and twenty-seventh ; the twenty- fifth or first sacral vertebra has, however, a frequent tendency to revert to the lumbar type and sometimes may do so on one side but not on the other. A. Paterson, on the other hand, brings forward evidence to prove that the human sacrum undergoes a backward rather than a forward shifting (Scientif. Trans. R. Dublin Society, vol. v., ser. 11, p. 123). Taking the vertebrae which fuse together as an arbitrary definition of the sacrum, we find that the number may vary from one in Cercopithecus patas to thirteen in some of the armadillos, and, if the Cetacea are included, seventeen in the bottle-nosed dolphin, Tursiops. Four seems to be about the average of sacral vertebrae in the mammalian class and of these one or two are true sacral. In some of the Edentata the posterior sacral vertebrae are fused with the ischium, in other words the great sacro-sciatic ligament is ossified. The lateral

After F. G. Parsons, "On Anatomy of Alherura Africana," Proc. Zool. Soc, 1894.

Fig. 10. — The Intercentra of the Lower Part of the Vertebral Column, a, a, a, Intercentra.

centres of ossification which form the articular surface for the ilium probably represent rib elements. The caudal or tail vertebrae vary from none at all in the bat Megaderma to forty-nine in the pangolin {Manis macrura). The anterior ones are remarkable for usually having chevron bones (shaped like a V) on the ventral surface of the intercentral articulation. These protect the caudal vessels and give attachment to the ventral tail muscles. The ribs in mammals correspond in number to the thoracic vertebrae. In mono- tremes the three parts of the rib (dorsal, intermediate and ventral) already noticed in the reptiles are found, but usually the intermediate part is sup- pressed. The ventral part generally remains cartilaginous as it does in man though sometimes it ossifies as in the armadillos. In the typical pronograde mammals the shape of the ribs differs from that of the higher Primates and man : they are so curved that the dorso-ventral diameter of the thorax is greater than the transverse while in the higher Primates the thorax is broader from side to side than it is dorso-ventrally. In this respect the bats agree with man and the lemurs with the pronograde mammals.

In some whales the first rib articulates by an apparently double head with two verte- brae; this is probably the result little way from the vertebral

Fig. ii. — Anterior Surface of Fourth Caudal Vertebra of Por- poise (Phocaena communis), s Spinous process. Metapophysis. Transverse process. Chevron bone.

m

t

h

of a cervical ” column, and

rib joining the result

homologous with those cases in man in which a cervical rib joins the first thoracic as it sometimes does. In the toothed whales, of which the porpoise is an example, the more posterior ribs lose their heads and necks and only articulate with the transverse processes. The sternum of mammals typically consists of from seven to nine narrow segments or sternebrae, the first of which (presternum) is often broader than those behind. As a rule the second rib articulates with the interval between the first and second pieces, but sometimes, as in the gibbon, it is the third rib which does so. When this is the case, as it sometimes is in man, the first two sternebrae have pro- bably fused (see A. Keith, Journ. Anat. and Phys. xxx. 275). The segmental character of the separate sternebrae contrasts strongly with the

intersegmental of the ribs. When the pectoralis major muscle is largely developed, as in the mole and bats, the sternum, especially the presternum, develops a keel as in birds. In the toothed whales there is usually a cleft or perforation throughout life between the two lateral halves of the sternum. In the whalebone whales the mesosternum is suppressed and consequently only the first ribs reach the ster- num; this is of great interest when the oblique position of the diaphragm (see art. Diaphragm) in these animals is remembered, and makes one suspect that the development of the sternum in mam- mals is dependent on and subservient to the attachment of the dia- phragm. The broad- ened thorax of the anthropomorpha is ac- companied by a broad- ened sternum and the sternebrae of the mesosternum fuse to- gether early, though in the orang they not only remain separate but each half of them re- mains separate until the animal is half grown. The episternum is re presented by small ossicles which occasionally occur in man, while in the Omithorhynchus and the tapir there is a separate bone in front (cephalad) of the presternum which in the former animal is distinct at first from the interclavicle, and this probably represents the episternum, though it was called by W. K. Parker by the noncom- mittal name of probsteon.

For further details and literature see S. H. Reynolds, The Verte- brate Skeleton (Cambridge, 1897); W. H. Flower and H. Gadow,

Fig. 12. — Sternum and strongly ossified Sternal Ribs of Great Armadillo (Priodon gigas). ps, Presternum; xs, xiphisternum.

Osteology of the Mammalia (London, 1885); R. Wiedersheim, Comparative Anatomy of Vertebrates, adapted and translated by W. N. Parker (London, 1907) ; R. Wiedersheim and G. Howes, The Structure of Man (London, 1897); C. Gegenbaur, Vergleich. Anal. der Wirbeltiere, Band i. (Leipzig, 1901).

A ppendicular. The bony framework of the two appendages or extremities, as the upper and lower limbs are called, is built up on the same plan in both. Each consists of a limb girdle (shoulder and hip girdles) connecting it with the axial skeleton, a proximal single bone segment (humerus, femur), a distal double bone segment (radius, ulna; tibia, fibula), the hand and foot segments (carpus, metacarpus; tarsus, metatarsus) and the digits (phalanges). It should be understood that in the following descriptions the

terms internal and external are used in relation to the mid-line of the body and not to that of the limb.

The upper limb in man may be subdivided into a proximal part or shoulder, a distal part or hand, and an intermediate shaft, which consists of an upper arm or brachium, and a forearm or ante-brachium. In each of these subdivisions certain bones are found : in the shoulder, the clavicle and scapula ; upper arm, the humerus; in the forearm, the radius and ulna, the bone of the upper arm in man being longer than the bones

of the forearm ; in the hand, the car- pal and metacar- pal bones and the phalanges. The scapula and clavicle together form an imperfect bony arch, the Scapular Arch or Shoulder Girdle ; the shaft and hand form a free divergent Ap-

Upper limb.

in the

Fig. 13. — Diagrammatic Section to represent the Relations of the Shoulder Girdle to the Trunk.

V A thoracic vertebra.

C A rib.

St ‘ The sternum.

Sc The scapula.

Cr The coracoid.

CI

M

The clavicle.

The meniscus at p e n d a g e. The its sternal end. shoulder girdle is

H The humerus.

the direct medium of connexion be- tween the axial skeleton and the divergent part of the limb; its anterior segment, the clavicle, articulates with the upper end of the sternum, whilst its posterior segment, the scapula, approaches, but does not reach, the dorsal spines.

*The clavicle, or collar bone (fig. 14), is an elongated bone which extends from the upper end of the sternum horizontally outward, Clavicle. *° articulate with the acromion process of the scapula. It presents a strong sigmoidal curve, which is associated with the transverse and horizontal direction of the axis of the human shoulder. It is slender in the female, but powerful in muscular males; its sternal end thick and somewhat triangular; its acromial end, flattened from above downward, has an oval articular surface for the acromion. Its shaft has four surfaces for the attachment of muscles; and strong ligaments connecting it with the coracoid, is attached to the under surface, nea-" the outer end, whilst near the inner a strong ligament passes between it and the first rib.*

The scapula, or shoulder blade (fig. 14), is the most important bone of the shoulder girdle, and is present in all mammals. It lies at the upper and back part of the wall of the chest,

Scapula.

reaching from the second to the seventh rib. Its form is

plate-like and triangular, with three surfaces, three borders, and three angles. Its costal or ventral surface is in relation to the ribs, from which it is separated by certain muscles: one, called sub- scapularis, arises from the surface itself, which is often termed subscapular fossa. The dorsum or back of the scapula is traversed from behind forward by a prominent spine, which lies in the proper axis of the scapula, and subdivides this aspect of the bone into a surface above the spine, the supraspinous fossa, and one below the spine, the infra-spinous fossa. The spine arches forward to end in a broad flattened process, the acromion, which has an oval articular surface for the clavicle; both spine and acromion are largely de- veloped in the human scapula in correlation with the great size of the trapezius and deltoid muscles, which are concerned in the elevation and abduction of the upper limb. The borders of the scapula, directed upward, backward, and downward, give attach- ment to several muscles. The angles are inferior, antero-superior, and postero-superior. The antero-superior is the most important; it is truncated, and has a large, shallow, oval, smooth surface, the glenoid fossa, for articulation with the humerus, to form the shoulder joint. Overhanging the glenoid fossa is a curved beak-like process, the coracoid, which is of importance as corresponding with the separate coracoid bone of monotremes, birds and reptiles. The line of demarcation between it and the scapula proper is marked on the upper border of the scapula by the supra-scapular notch

The humerus, or bone of the upper arm (fig. 14), is a long bone, and consists of a shaft and two extremities. The upper extremity possesses a

convex spheroidal smooth surface, the head, „ merous for articulation with the glenoid fossa of the scapula; it ” is surrounded by a narrow constricted neck, and where the neck and shaft become continuous with each other, two processes or tuberosities are found, to which are attached the rotator muscles arising from the scapular fossae. Between the tuberosities is a groove in which the long tendon of the biceps rests. A line drawn through the head of the humerus perpen- dicular to the middle of its articular surface, forms with the axis of the shaft of the bone an angle of 40°. The shaft of the humerus is triangular in section above, but flattened and expanded below; about midway down the outer surface is a rough ridge for the insertion of the deltoid muscle, and on the inner surface another rough mark for the insertion of the coraco brachialis. A shallow groove winds round the back of the bone, in which the musculo-spiral nerve is lodged. The lower extremity of the humerus consists of an articular and a non-articular portion. The articular has a small head or capitellum externally for the radius, and a pulley or trochlea internally for the movements of the ulna in flexion and extension of the limb. The non-articular part has a projection both on its inner and outer aspect; these are known as the internal and external condyles, and of these the internal is the more prominent; each is surmounted by a supracondylar ridge, and the internal condyle and ridge attach the muscles passing to the flexor surface of the fore- arm, while the external are for those passing to the extensor surface.

A small, downwardly directed, hook- like process of bone is occasionally found above the internal condyle and is the vestige of the supracondylar fora- men found in so many of the lower animals (see below Comparative Anatomy). Before describing the two bones of the forearm, the range of movement which can take place between them should be noticed. In one position, which is called supine, they lie parallel to each other, the radius being the more external bone, and the palm of the hand being directed

forward; in the other or prone position u ˆ

the radius crosses obliquely in front of \J>{x Upper Limb the ulna, and the palm of the hand is ,-, p< • , directed backward. Not only the bones c Jr lav , • of the forearm, but those of the hand £. Acromion orocess are supposed to be in the supine position £ c Acromion process, when they are described. Cr Cora C01 d process of

— ■'.. ... – scapula.

Humerus. Radius. Ulna. _ Opposite the eight

moving on the capitellum of the humerus; M Opposite ‘“thj?” five

fhp nittpr mnrcrin nf the run is alsn ˆjˆw~ ..%.

metacarpal bones.

Fig. 14. — The Appen- dicular Skeleton of the

The radius (fig. 14) is the outer bone of it

the forearm, and like all long bones t>

possesses a shaft and two ex- Radius II

tremities. The upper extremity ‘ ˆ

or head has a shallow, smooth cup for

P Pollex, or thumb.

the outer margin of the cup is also smooth, for articulation with the ulna and orbicular ligament;- below the cup f, J”°“ex, is a constricted neck, and immediately lly TvprMlV below the neck a tuberosity for the in- »ˆ ™V Qale – sertion of the biceps. The shaft of the •■, ‘ 1 KS’ c. bone possesses three surfaces for the Little nnger.

attachment of muscles, and a sharp inner border for the in- terosseous membrane. The lower end of the bone is much broader than the upper, and is marked posteriorly by grooves for the lodgment of tendons passing to the back of the hand : from its outer border a pointed styloid process projects down- ward ; its inner border has a smooth shallow fossa (the sig- moid cavity of the radius) for articulation with the ulna, and its broad lower surface is smooth and concave, for articu- lation with the scaphoid and semilunar bones of the wrist.

The ulna (fig. 14) is also a long bone. Its upper end is subdivided into two strong processes by a deep fossa, the greater sigmoid cavity, which possesses a smooth surface for articulation with Ulna.

the trochlea of the humerus. The anterior or coronoid _ process is rough in front for the insertion of the brachialis anticus, whilst the posterior or olecranon process gives insertion to the large triceps muscle of the upper arm. Immediately below the outer border of the great sigmoid cavity is the small sigmoid cavity for articulation with the side of the head of the radius. The shaft of

the bone has three surfaces for the attachment of muscles, and a sharp outer border for the interosseous membrane. The lower end, much smaller than the upper, has a pointed styloid process and a smooth articular surface, the outer portion of which is for the lower end of the radius, the lower part for moving on a cartilage of the wrist joint called the triangular fibro-cartilage.

The hand consists of the carpus or wrist, of the metacarpus or palm, and of the free digits, the thumb and four fingers. Anatomists H . describe it with the palm turned to the front, and with its

axis in line with the axis of the forearm. The carpal or wrist bones (fig. 14) are eight in number and small in size : they are arranged in two rows, a proximal, — i.e. a row Carous next the forearm, — consisting of the scaphoid, semilunar, ‘ cuneiform and pisiform ; and a distal, — i.e. a row next the bones of the palm, — consisting of a trapezium, trapezoid, os magnum and unciform; the bones in each row being named in the order they are met with, from the radial or outer to the ulnar or inner side of the wrist. It is unnecessary to give a separate de- scription of each bone. Except the pisiform or pea-shaped bone, which articulates with the front of the cuneiform, each carpal bone is short and irregularly cuboidal in shape; its anterior (or palmar) surface and its posterior (or dorsal) being rough, for the attachment of ligaments; its superior and inferior surfaces being invariably smooth, for articulation with adjacent bones; whilst the inner and outer surfaces are also smooth, for articulation, except the outer surfaces of the scaphoid and trapezium (the two external bones of the carpus), and the inner surfaces of the cuneiform and unciform (the two internal bones). Occasionally extra bones are found, but they are apparently the remnants of cartilaginous elements found in the hand of the early embryo (see G. Thilenius, Morph. Arbeiten, v., 1896).

The metacarpal bones, or bones of the palm of the hand, are five in number (fig. 14). They are miniature long bones, and each possesses a shaft and two extremities. The metacarpal of the thumb is the shortest, and diverges outward from the rest; its carpal extremity is saddle-shaped, for articulation with the trapezium ; its shaft is somewhat compressed, and its phalangeal end is smooth and rounded, for the first phalanx of the thumb. The four other metacarpal bones belong to the four fingers ; they are almost parallel to each other, and diminish in size from the second to the fifth. Their carpal ends articulate with the trapezoid, os magnum and unciform: their shafts are three-sided: their phalangeal ends articulate with the proximal phalanges of the fingers.

The number of digits in the hand is five. They are distinguished by the names of pollex or thumb, index, medius, annularis and _. „ minimus. Their skeleton consists of fourteen bones,

uigns. named phalanges, of which the thumb has two, and each

of the four fingers three. The phalanx next the metacarpal bone is the proximal, that which carries the nail, the terminal or ungual phalanx, whilst the intermediate bone is the middle phalanx. Each is a miniature long bone, with two articular extremities and an intermediate shaft, except the terminal phalanges, which have an articular surface only at their proximal ends, the distal end being rounded and rough, to afford a surface for the lodgment of the nail.

The Inferior or Pelvic Extremity, or Lower Limb, consists of a proximal part or haunch, a distal part or foot, and an intermediate shaft subdivided into thigh and leg. Each part has its appropriate skeleton (the thigh-bone in man being longer than the leg-bones). The bone of the haunch (os innomina- tum) forms an arch or pelvic girdle, which articulates behind with the side of the sacrum, and arches forward to articulate with the opposite

haunch-bone at the pubic symphysis. It is the direct medium of connexion between the axial skeleton and the shaft and foot, which form a free divergent appendage.

The os innominatum, or haunch-bone, is a Fig. 15. — Diagrammatic section to repre- large irregular plate- sent the relations of the Pelvic Girdle to like bone, which forms

Lower limb.

downward. Below the acetabulum is a large hole, the obturator or thyroid foramen, which is bounded by the ischium and pubes; behind and above the acetabulum is the deep sciatic notch, which is bounded by the ischium and ilium, and below this is the small sciatic notch.

The ilium (fig. 16) in man is a broad plate-like bone, the lower end of which aids in forming the acetabulum, while the upper end forms the iliac crest, which, in man, in conformity with the general expan- sion of the bone, is elongated into the sinuous crest of the ilium. This crest is of great importance, for it affords attachment to the broad muscles which form the wall of the abdominal cavity. One surface of the ilium is external, and marked by curved lines which subdivide it into areas for the origin of the muscles of the buttock; another surface is anterior, and hollowed out to give origin to the iliacus muscle; the third, or internal, surface articulates

posteriorly with the sacrum, whilst anteriorly it forms a part of the wall of the true pelvis. The external is

separated from the anterior surface

by a border which joins the anterior

end of the crest, where it forms a

process, the anterior superior spine.

About the middle of this border is

the anterior inferior spine. Between

the external and internal surfaces is

a border on which are found the

posterior superior and inferior spines;

between the anterior and internal

surfaces is the ilio-pectineal line,

which forms part of the line of

separation between the true and

false pelvis.

The pubis (fig. 16) is also a three- sided, prismatic, rod-like bone, the

fundamental form of which Pubis.

is obscured by the modi- fication in shape of its inner end. In

human anatomy it is customary to

regard it as consisting of a body and

of two branches, an upper and a

lower ramus.

The upper ramus runs downward,

forward and inward from the aceta- bulum to the body of the pubis, which

is a plate of bone placed nearly hori- zontally in the upright position of ■«ff» v

the subject and articulating with its ” Fig, 16. — The Appendicular

fellow of the opposite side at the Skeleton of the Left Lower

symphysis pubis (see Joints). Pro- Limb.

jecting forward from the junction of II Ilium.

the body and upper ramus is the Is Ischium.

the Trunk.

V A sacral vertebra.

II The ilium.

P The two pubic bones meeting in front at

the symphysis. F The femur.

the lateral and inferior boundary of the cavity of the pelvis. In early life it consists of three bones — ilium, ischium and pubis — which unite about the twenty-fifth year into a single bone. These bones converge, and join to form a deep fossa or cup, the acetabulum or cotyloid cavity, on the outer Pelvh surface of the bone, which lodges the head of the thigh-

rlrdle ˆone at the hip-joint. One-fifth of this cup is formed by

™ ‘ the pubes, and about two-fifths each by the ischium and

ilium. At the bottom of the acetabulum is a depression, to the sides of which the ligamentum teres of the hip-joint is attached. From the acetabulum the ilium extends upward and backward, the ischium downward and backward, the pubis forward, inward and

fubic spine, an important landmark Pb Pubis, the three parts of in surgery, and to this the ilio-pec- ‘ ‘ ‘ ‘ ‘ ‘

tineal line, already mentioned, may be traced.

The lower ramus is really more horizontal than the upper (which used to be called the horizontal ramus), and runs backward and outward from the body to meet the ramus of the ischium and so form the subpubic arch.

The ischium (fig. 16), like the ilium and pubis, has the fundamental form of a three-sided prismatic ischium. rod. One extremity (the upper) completes the acetabulum, whilst the lower forms the large V. prominence, or tuber ischii. The surfaces of the bone are internal or pelvic, antero-external, and postero- external. The pelvic and postero

the innominate bone.

Femur.

Patella.

Tibia.

Fibula.

Opposite the seven tarsal bones.

Os calcis, forming promi- nence of heel.

Opposite the five meta- tarsal bones.

Hallux or great toe.

Second.

Third. IV. Fourth.

Fifth or little toe.

dotted line HH repre- sents the horizontal plane, whilst the dotted line V is in line with the vertical axis of the spine.

Mt

H

II.

III.

The

external surfaces are separated from each other by a sharp border, on which is seen the ischial spine. The pelvic and antero-external surfaces are separated by a border, which forms a part of the boundary of the obturator foramen ; but the margin between the antero- and postero-external surfaces

is feebty marked. The tuberosity, a thick, rough and strong process, gives origin to several powerful muscles : on it the body rests in the sitting posture ; a flattened ramus ascends from it to join the lower ramus of the pubis, and completes both the pubic arch and the margin of the obturator foramen.

By the articulation of the two innominate bones with each other in front at the pubic symphysis, and with the sides of the sacrum Pelvis behind, the osseous walls of the cavity of the Pelvis are

formed. This cavity is subdivided into a false and a true pelvis. The false pelvis lies between the expanded wing-like portions of the two ilia. The true pelvis lies below the two ilio-pectineal lines and the base of the sacrum, which surround the upper orifice or brim of the true pelvis, or pelvic inlet ; whilst its lower orifice or outlet is bounded behind by the coccyx, laterally by the ischial tuberosities, and in front by the pubic arch. In the erect attitude the pelvis is so inclined that the plane of the brim forms with the horizontal plane an angle of from 60° to 65°. The axis of the cavity is curved, and is represented by a line dropped perpendicularly from the planes of the brim, the cavity and the outlet; at the brim it is directed downward and backward, at the outlet downward and a little for- ward. Owing to the inclination of the pelvis, the base of the sacrum is nearly 4 in higher than the upper border of the pubic symphysis. The female pelvis is distinguished from the male by certain sexual characters. The bones are more slender, the ridges and processes for muscular attachment more feeble, the breadth and capacity greater, the depth less, giving the greater breadth to the hips of a woman ; the inlet more nearly circular, the pubic arch wider, the distance between the tuberosities greater, and the aceta- bulum smaller in the female than in the male. The greater capacity of the woman's over the man's pelvis is to afford greater room for the expansion of the uterus during pregnancy, and for the expulsion of the child at the time of birth.

The femur or thigh-bone (fig. 16) is the longest bone in the body, and consists of a shaft and two extremities. The upper extremity _ or head has a smooth hemispherical surface, in which an

emar. va\ roughened fossa, for the attachment of the liga- mentum teres of the hip, is found ; from the head a strong elongated neck passes downward

and outward to join the upper end of the shaft ; the place of j unction is marked by two processes or trochanters ; to the external or great trochanter are attached many muscles; the internal or lesser trochanter gives attachment to the psoas and iliacus. A line drawn through the axis of the head and neck forms with a vertical line drawn through the shaft an angle of 30 ; in a woman this angle is a little less obtuse than in a man, and the obliquity of the shaft of the femur is slightly greater in the former than in the latter. The shaft is almost cylindrical about its centre, but expanded above and below; its front and sides give origin to the extensor muscles of theleg; behind there is a rough ridge, which, though called linea aspera, is really a narrow surface and not a line ; it gives attachment to several muscles. The lˆwer end of the bone presents a large smooth articular surface for the knee-joint, the anterior portion of which forms a trochlea or pulley for the movements of the patella, whilst the lower and posterior part is subdivided into two convex condyles by a deep fossa which gives attachment to the crucial ligaments of the knee. The inner and outer surfaces of this end of the bone are rough, for the attachment of muscles and the lateral ligaments of the knee.

The femur constitutes usually about 0-275 of the individual stature; but this proportion is not constant, as this bone forms a larger element in the stature of a tall than of a short man. The human femur presents also a concave popliteal surface, thus differing from that of Pithecanthropus, whose popliteal surface is convex. In the bones of some races the dorsal ridge of the thigh-bone (linea aspera) projects as a prominent crest causing the bones to appear " pilastered," a condition the amount of which is indicated by the increased relative length of the sagittal of the coronal diameter of the bone. Pilastering, though characteristic of lower and primitive races of man, is never found in the anthropoids. The upper third of the femur in some races is sagittally flattened, a condition which is called platymeria. Its degree is indicated by the excess of the coronal over the sagittal diameter in this region.

The patella or knee-pan (fig. 16) is a small triangular flattened bone developed in the tendon of the great extensor muscles of the leg. Its anterior surface and sides are rough, for the attachment of the fibres of that tendon; its posterior surface is smooth, and enters into the formation of the knee-joint.

Between the two bones of the leg there are no movements of pronation and supination as between the two bones of the forearm. The tibia and fibula are fixed in position ; the fibula is always external, the tibia internal.

The tibia or shin-bone (fig. 16) is the larger and more important of the two bones of the leg; the femur moves and rests upon its Tlbl upper end, and down it the weight of the body in the

erect position is transmitted to the foot. Except the femur, it is the longest bone of the skeleton, and consists of a shaft and two extremities. The upper extremity is broad, and is expanded into two tuberosities, the external of which has a small articular facet inferiorly, for the head of the fibula; superiorly, the tuber- osities have two smooth surfaces, for articulation with the condyles of the femur; they are separated by an intermediate rough surface, from which a short spine (really a series of elevations) projects, which gives attachments to the interarticular crucial ligaments and semilunar cartilages of the knee, and lies opposite the intercondylar fossa of the femur. The shaft of the bone is three-sided; its inner

surface is subcutaneous, and forms the shin ; its outer and posterior surfaces are for the origin of muscles; the anterior border forms the sharp ridge of the shin, and terminates superiorly in a tubercle for the insertion of the extensor tendon of the leg; the outer border of the bone gives attachment to the interosseous membrane of the leg. The lower end of the

bone, smaller than the upper, is pro- longed into a broad process, internal malleolus, which forms the inner prominence of the ankle : its under surface is smooth for articulation with the astragalus; externally it articulates with the lower end of the fibula.

The tibia in most civilized races is triangular in the section of its shaft, but in many savage and prehistoric races it is two-edged. The condition is named platycnemia, and is indicated by the pro- portional excess of the sagittal over the coronal diameter. The foetal tibia has its head slightly bent backward with regard to the shaft, a condition which usually disappears in the adult, but which is shown in the prehistoric tibae found in the cave of Spy. In races that squat on their heels the front margin of the lower end of the tibia is marked by a small articular facet for the neck of the astragalus.

The fibula, or splint-bone of the leg (fig. 16), is a slender long bone with a shaft and two extremities. The upper end or head articulates with the outer tuberosity of the tibia. The shaft is four- p ,. . sided, and roughened for the origins of the muscles. Mbaia. Separating the anterior from the internal surface is a slender ridge for the attachment of the interosseous membrane. The lower end has a strong process {external malleolus) projecting downward to form the outer prominence of the ankle, and a smooth inner surface for articulation with the astragalus, above which is a rough surface for the attachment of ligaments which bind together the tibia and fibula.

The foot consists of the tarsus, the metatarsus and the five free digits or toes. The human foot is placed _ ,

in the prone position, with the sole or plantar surface in relation to the ground ; the dorsum or back of the foot directed upward; the axis of the foot at about a right angle to the axis of the leg ; and the great toe or hallux, which is the corresponding digit to the thumb, at the inner border of the foot. The human foot, therefore, is a pentadactylous, plantigrade foot.

The bones of the tarsus or ankle (fig. 16, Tr), are seven in number, and are arranged in three transverse _, rows — a proximal, next the arsus.

*bones of the leg, consisting of the astra- galus and os calcis, a middle, of the scaphoid and a distal next the meta- tarsus, consisting of the cuboid, ecto- * meso- and ento-cuneiform. If the tarsal _ , , bones be looked at along with those of FlG .- J 7-— Bones of the the metatarsus and toes, the bones of the r ‘g ht Human * oot. foot may be arranged in two longitudinal* ***■£■ rsus – columns — an outer, consisting of the os ˆ Metatarsus, calcis, cuboid and the metatarsal bones ■*** *” phalanges. and phalanges of the fourth _ and fifth c t-alcaneum. toes; an inner column consisting of the a Astragalus, astragalus, scaphoid, three cuneiform -and c ° V T U • j*

the metatarsal bones and phalanges of the ” JNa vl cular. first, second and third toes. The tarsal, c 2 like the carpal bones, are short and, with c 3 the exception of the cuneiforms which are c wedge-shaped, irregularly cuboidal; the dorsal and plantar surfaces are as a rule rough for ligaments, but as the astragalus is locked in between the bones of the leg and the os calcis, its dorsal and plantar surfaces, as well as the dorsum of the os calcis, are smooth for articulation; similarly, its lateral surfaces are smooth for articulation with the two malleoli. The posterior surface of the os calcis projects backward to form the prominence of the heel. With this exception, the bones have their anterior and posterior surfaces smooth for articulation. Their lateral surfaces are also articular, except the outer surface of the os calcis and cuboid, which form the outer border; and the inner surface of the os calcis, scaphoid and ento-cuneiform, which form the inner border of the tarsus. Supernumerary bones are occasionally found as in the hand.

The metatarsal bones and the phalanges of the toes agree in number and general form with the metacarpal bones and the phalanges in the hand. The bones of the great toe or hallux are Toes

more massive than those of the other digits, and this digit, – unlike the thumb or pollex, does not diverge from the other digits, but lies almost parallel to them.

Embryology. — The development of the appendicular skeleton takes

Internal cuneiform. c 2 Middle cuneiform. c 3 External cuneifonh.

The digits are in- dicated by Roman numerals, counting from the tibial to the fibular side.

place in the core of mesenchyme in the centre of each limb. 1 This substance first becomes changed into cartilage, except perhaps in the case of the clavicle, though there is at present some doubt as to how much of this bone is chondrified before ossification reaches it.

The present belief is that, although a deposit of lime salts constitut- ing the process of calcification may and frequently does occur in cartilage, true ossification or the orderly disposal of that deposit into bony tissue can only take place through the intervention of osteo- blasts and osteoclasts, and as

these cells are not formed in cartilage they must make their way in from the surrounding fibrous tissue which constitutes the perichondrium.

The factors which determine the general shape and proportionate size of each limb bone are at work while the cartilage is being formed, because each future bone has a good cartilaginous model laid down before ossification begins. Calcification usually begins at one point in each bone, unless that bone be a compound one formed by the fusion of two or more elements which were distinct in lower verte- brate types, as is the case with the os innominatum.

It is interesting to notice that this centre of calcification, which will later on be the centre of ossification, is usually in the middle of the shaft of a long bone, or, when a cuboidal block of cartilage is dealt with, as in the case of the carpal and tarsal bones, in that place which is farthest away from the periphery, and which is likely to be least well nourished. There seems, too, to be a general tendency for larger masses of cartilage to begin calcifying before smaller ones. Contrasting these facts with the behaviour of tumours, which contain cartilage and which are liable to undergo a process of calcareous degeneration, the present writer is led to suspect that the calcification which precedes ossification in cartilage may be a degenerative change brought about by ill-nutrition. However this may be, there is little doubt that the calcification, once established, acts as an attraction for blood-vessels, which probably bring with them osteoblasts, and the subsequent ossification is a process which needs and receives a plenteous supply of nourishment. After a long bone has reached a certain size it very often has extra centres of ossification developed at its ends as well as at places where important muscles have raised lever-like knobs of cartilage on the model. These extra centres are called epiphyses, and it is convenient to distinguish three varieties of these: (a) pressure epiphyses at the joint ends of long bones; (6) traction epiphyses, where muscles pull; and © atavistic epiphyses, the mechanical causes of which are more remote, but which represent structures of greater import in the lowlier vertebrates. With regard to the pressure epiphyses, they form a cap which protects the epiphysial line, or plate of cartilage, by means of which the bone in- creases in length, but they are certainly not essential to the growth of a bone, because they often do not appear until the bone has been growing for a long time, while in birds they are not found at all. The traction epiphyses are, in the opinion of the writer, originally pieces of cartilage which have the same nature as sesamoid cartilages developed in the play of a tendon, where it presses against a neigh- bouring cartilaginous model of a bone, and which, instead of remain- ing separate structures throughout life, as is the case with the patella, fuse early with the model against which they are pulled, and so form a knob. For practical purposes the coracoid process of man may be regarded as an example of an atavistic epiphysis or perhaps of two atavistic

epiphyses. (For further details on this subject see the writer's papers on epiphyses, Jour. Anat. and Phys. vol. xxxvii. P- 3 r 5; v °l- xxxviii. p. 248; vol. xxxix. p. 402.)

Turning now to the development of the individual bones of the axial skeleton, the clavicle, as has been mentioned, is partly fibrous, and partly cartilaginous, but the exact proportions are still imperfectly

Sternal epiphysis ossifies about 20th year; fuses about 25th year.

Primary centre appears about 5th or 6th month of foeta! life.

From Arthur Thomson, Cunningham's Text-Book of 'Anatomy.

Fig. 18. — Ossification of the Clavicle.

known ; its primary centre is the earliest of all in the body to appear, while its sternal epiphysis does not come till the bone is fully grown, and so can have no effect on the growth of the bone. It is probably one of the atavistic class, and is often regarded as the vestige of the precoracoid (see subsection on comparative anatomy) , though it may represent the inter-clavicle, which, as has been pointed out in the article on the axial skeleton, is quite distinct from the episternum. It sometimes fails to appear at all.

The centres for the scapula are shown in the accompanying figures (fig. 19). G. B. Howes regarded the subcoracoid centre as the atavistic epiphysis representing the coracoid bone of lower verte-

1 By mesenchyme is meant that part of the mesoderm, or middle layer of the embryo, in which the cells are irregularly scattered in a matrix, and are not arranged in definite rows or sheets as in the coelomic membrane.

brates, while the human coracoid he looked upon as the equivalent of the epicoracoid. The epiphyses in the vertebral border are ata- vistic and represent the supra-scapular element (see section below on Comparative Anatomy).

In the humerus the centre for the shaft appears about the eighth week of foetal life, which is the usual time for primary centres. The head, trochlea and capitellum have pressure epiphyses, while those for the tuberosities and condyles are of the traction variety.

The ulna is a very interesting bone because there is no pressure epiphysis for its upper end. The upper epiphysis shown in fig. 21 does not encroach upon the articular surface, but is a pure traction epiphysis developed in the triceps tendon and serially homologous with the patella (a sesamoid bone)

in the lower limb.

In the radius there are two terminal pressure epiphyses and one traction for the insertion of the biceps.

The carpus ossifies after birth, one centre for each bone occurring in the following order: os magnum, 11 to 12 months; unciform, 12

Primary centre appears about 2nd m. foetal life.

Acromial centres appear 15-16 yrs. ; fuse about 2 5 yrs. Secondary centres for coracoid appears about end 1st year; fuses about 18 yrs.

Appears about

16-17 yrs.; fuses

about 20 yrs.

Subcoracoid centre appears ro yrs. ; fuses 16-17 yrs.

Appears about 1 7 yrs. ; fuses about 20 yrs.

Appears about 16 or 17 yrs. ; fuses 18-20 yrs.

Appears 16-17 yrs. fuses 20-25 yrs. From Arthur Thomson, Cunningham's Text-Book of Anatomy.

Scapula at end of First Year. Scapula about the Age of Puberty. Fig. 19. — Ossification of the Scapula.

to 14 months; cuneiform, 3 years; semilunar, 5 to 6 years; trap- ezium, 6 years; scaphoid, 6 years; trapezoid, 6 to 7 years; pisiform, 10 to 12 years.

Up to the third month of foetal life a separate cartilage for the os centrale (see subsection on comparative anatomy) is found, but this later on fuses with the scaphoid. It will be noticed that, broadly speaking, the larger cartilaginous masses ossify before the smaller.

The metacarpal bones have one centre each for the shaft and one epiphysis for the head, except that for the thumb which has one centre for the shaft and one epiphysis for the proximal end.

The phalanges develop in the same way that the metacarpal bone of the thumb does.

The os innominatum has three primary centres for the ilium, ischium and

pubis.

The special centres for the crest of the ilium are probably a serial repetition of those for the vertebral border of the scapula (see fig. 19) ; that for the anterior inferior spine is a purely human traction epiphysis connected with the use of the straight head of the rectus femoris in the upright position. The centre for the pubic symphysis probably represents the epipubis of amphibians, while that for the tuberosity of the ischium is the hypoischium of reptiles (see sub- section on comparative anatomy). The most anterior of the epi- physes in the acetabulum is the os acetabuli of lower mammals, while the occasional one for the spine of the pubis is often looked on as the vestige of the marsupial bone of monotremes and marsupials. It will thus be seen that many of the secondary centres of the os innominatum are of the nature of atavistic epiphyses.

The femur has two pressure epiphyses, one for the head and another for the lower end, and two traction for the great and small trochanters.

The cartilaginous patella does not appear until the third month of foetal life, that is well after the quadriceps extensor cruris, in the tendon of which it is formed, is defined. Its ossification begins in the third year. The patella is usually looked upon as the largest and most typical example of a sesamoid bone in the body.

The tibia has a pressure epiphysis at either end, but that for the upper comes down in front so as to include a good deal of the tubercle. In almost any other mammal, and often in man himself, it may be

seen that this down-growth is a traction epiphysis developed in the quadriceps tendon below the patella and joining the main upper epiphysis before uniting with the diaphysis or shaft. The fibula has two pressure epiphyses, the lower of which appears

At birth. About 5 years. About 12 years.

From Arthur Thomson, Cunningham's Text-Book of Anatomy.

Fig. 20. — Ossification of the Humerus.

1 Appears early in 2nd month foetal life.

2 For tuberosity, appears 2 to 3 years.

3 For head, appears within first 6 months.

4 For internal condyle, appears about 5 years.

5 For capitellum, appears 2 to 3 years.

6 Appears about 12 years.

7 Centres for head and great tuberosity

coalesce about 5 years.

8 Centre for small tuberosity fuses with

other centres about 7 years.

9 Appears about 11 or 12 years.

10 Inferior epiphysis fuses with shaft about

16 to 17 years.

11 Superior epiphysis fuses with shaft

about 25 years.

12 Fuses with shaft about 17 to 18 years.

first. The general rule with the long bones of the extremities is that the epiphysis nearest the elbow or farthest from the knee is the first to appear and the last to join. The writer accounts for the neglect of this rule in the case of the fibula by the fact that the lower cartil- aginous end is larger than the upper (see fig. 26).

In the tarsus the cartilages are at an early stage arranged in three

Fuses with shaft about 16 years

Appears about 10 years

_>»

£

Appears about 6 years

Fuses with shaft 20-23 years

At birth. About 12 years. About 16 years.

From Arthur Thomson, Cunningham's Text-Book of Anatomy.

Fig. 21. — The Ossification of the Ulna.

rows in just the same way that those of the hand are, but in the proximal row the middle one (intermedium), corresponding to the semilunar in the hand, fuses with the one on the tibial side to form the astragalus, though sometimes a vestige of it seems to persist

as a little bone at the back of the astragalus, known as the e

trtgonum.

The centre for the calcaneum appears in the sixth month of foetal

life, that for the astragalus in the seventh, the cuboid about birth, the external, middle and internal cuneiforms in the first and second years, while the navicular is the last to appear in the third year. It will be noticed that, although ossification occurs in the bigger cartilaginous masses earliest, e.g. calcaneum astragalus and cuboid, the large navicular is the last cartilage to ossify, and this is an exception to the general rule which is probably caused by some factor which we do not at present understand.

The calcaneum has a very definite traction epiphysis developed in the insertion of the tendo Achillis behind.

The development of the metatarsal bones and phalanges of the foot is the same as that of the hand.

For further details and literature see J. P. M'Murrich's Development of the Human Body (London, 1906) and D. J. Cunning- ham's Text-Book of Anatomy (Edinburgh

1906).

Comparative Anatomy. — It is only when the class of pisces is reached that paired ap- pendages are found, and there are two main theories to account for their first occurrence. The one which is at present most favoured is that in some ancestral fishes two folds ran along the ventro-lateral part of the body, like the bilge keels of a boat, and that these joined one another in the mid-ventral line behind the cloacal orifice to form the median caudal fin. Into these folds the segments of the body including myotomes and myocom-

mata, extended. Later on parts of these ridges were suppressed, but in the pectoral and pelvic regions they were retained to form the paired fins. This theory was first fore- shadowed by Goodsir, and has been elaborated by Balfour, Dohrn and many others. It is supported by the fact that in some elasmo- branch embryos the whole length of the folds can be traced. , , ^, . „ , . The second theory is that the limbs are

elaborated gills; this was proposed by C. Gegenbaur, and has

lately been supported by Graham Kerr. It is probable that the

limb girdles are of later evolution than the skeleton of the fins

themselves.

In the elasmobranch fishes (sharks and rays) there is a crescentic

Fuses with shaft 18-20 years

About 16 years.

Unites with shaft 20-25 years At birth. About 12 years. About 16 years. From Arthur Thomson, Cunningham's Text-Book of Anatomy.

Fig. 22.— The Ossification of the Radius.

bar of cartilage (pectoral girdle), concave upward, which gridles the ventral and lateral parts of the body; it is divided into a dorsal part (scapula) and a ventral part (precoracoid and coracoid) by a

facet for the articulation of the fin. This of course is the glenoid Pectoral cav ity. I n some forms, e.g. the shark Heptanchus, there zirdle ls a perforation in the ventral part of the bar on each

side, which possibly indicates the division between the precoracoid and coracoid elements.

In many of the bony fish (Teleostei) the outline is obscured by a

Appears about later end of 2nd m. of foetal life

Appears about is years; fuses 22-25 years

Appears about 4th m. of foetal life

Appears about 15 years: fuses 22- 25 years

Appears about 18 years Appears about 18 years

Unite about 10 years

At birth. About 12 or 13 years.

From Arthur Thomson, Cunningham's Text-Book of Anatomy.

Fig. 23. — Ossification of the Innominate Bone.

series of bones which connect the girdle with the skull and may be the precursors of the clavicle.

In the Amphibia the dorsally-placed scapula (fig. 27, S) has more dorsally still a cartilaginous plate, the supra-scapula (fig. 27, S.S), which may be calcified. The precoracoid (fig. 27, P.C) and coracoid (C) are quite distinct, the former being in front (cephalad) and over- laid by a dermal bone, the clavicle (CI). The attachment of the coracoids to the sternum has been noticed in section Axial of this article. Uniting the ventral ends of the precoracoid and coracoid is the epicoracoid on each side (fig. 27, E.C).

In the Reptilia the same general plan is evident, but in the lizards

Appears about early part, of first year Appears about 2-3 years

Fuses with shaft about 18-19 years/

Usually appears in

the gth month of

foetal life

*Fuses with shaft about 20-22 years At birth. Abouf*T2 years. About 16 years.*

From Arthur Thomson, Cunningham's Text-Book of Anatomy.

Fig. 24. — Ossification of Femur.

the ventral ends of the two clavicles are united by a median dagger- like

dermal bone, the interclavicle (fig. 27, I.C), which lies on a plane superficial to the sternum and epicoracoids.

In birds the scapula has the shape of a sabre blade, and there is a rudimentary acromion process, though this is also indicated in some

reptiles. The pre- and epi-coracoids are aborted, but the coracoids are very strong. The clavicles and interclavicle unite into a V- shaped bar which forms the furcula or " merrythought."

In the Mammalia the Monotremata(Ornithorhynchusand Echidna) retain the reptilian arrangement of large coracoids and epicora- coids articulating with the sternum, while the clavicles and inter-

Fuses with shaft about 20-24 years

May appear – Appearsˆ independently

before birth about 1 1 years

Fuses with shaft about 20-24 years

Appears about 3-4 years

Appears about ij years

Fuses about 1 8th i At birth. About 12 years. About 16 years. From Arthur Thomson, Cunningham's Text-Book of Anatomy.

Fig. 25. — Ossification of the Tibia.

clavicle are also largely developed; the scapula too is more bird- like in shape than mammalian. In the higher mammals the scapula develops a spine and usually an acromial process, and has a triangular outline.ˆ As long as the forelimb is used for support, the vertebral border is the shortest of the three, and the long axis of the bone runs from this border to the glenoid cavity; but when the extremity is used for prehension, as in the Primates, or for flight, as in the Chir- optera, the vertebral border elongates and the distance from it to the glenoid cavity decreases so that the long axis is now parallel with that of the body instead of being transverse.

Above the monotremes too the coracoid becomes a mere knob for muscles, and no longer articu- lates with the sternum. There is thus a sudden transition from the way in which the forepart of the body is propped up on the forelimbs when the coracoid is functional (as in reptiles) to the way in which it is suspended like a suspension bridge between the two scapulae in

pronograde mammals, the serratus magnus muscles form- ing the chains of the bridge (see fig. 2Q.

The clavicle is often entirely suppressed in mammals; this is the case in most of the Ursidae, all the Pinnipedia, Manis among edentates, the Cetacea, Sirenia, all Ungulata and some of the Rodentia. It is complete in all the Primates, Chiroptera, Insectivora (except Potamogale), many of the Rodentia, most Edentata, and all the Marsupialia except Perameles. In the Monotre- mata it is fused with a well- developed interclavicle, but in other mammals the inter- clavicle is either suppressed or possibly represented by the sternal epiphysis of the clavicle of the Primates. The pre- coracoid as a distinct structure

entirely disappears, though vestiges of it may remain in cartilaginous parts of the clavicle.

The chief modifications of the humerus are the development of the pectoral ridge, which is large whenever the pectoral muscles are strong, and is represented in man by the outer lip of the bicipital groove and the supracondylar foramina. In the tuatera lizard (Sphenodoh)

Appears about 2nd year

At birth.

Fuses with shaft about 1 9 years

About About

12 years. 16 years.

From Arthur Thomson, Cunningham's Text-Book of Anatomy.

Fig. 26. — Ossification of Fibula.

the

APPENDICULAR!

SKELETON

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The humerus,

there are two of these, one on the outer side for the musculo- spiral

nerve, and one on the inner for the median nerve; in other living and fossil reptiles one or other of these may be present. The three bars bounding these two foramina in Sphenodon are sometimes regarded as indications that the humerus

contains vestiges of three fin rays in its evolution from the fin of the

fish. In the mammals the internal supracondylar (entepicondylar)

foramen is most erratic in its appearance and disappearance, very few orders being without some family or genus which shows it. In some mammals, e.g. dog, a supratrochlear foramen is present just above the trochlea ; it transmits nothing. Epiphyses are found in this, as in other long bones, in amphibians, reptiles and mammals, but not in birds.

In the tailless am- Fig 27. — Diagrammatic Representa- phibians (Anura) the

tion of a Generalized Form of Shoulder radius and ulna are fused,

Girdle.

S Scapula.

C Coracoid.

G Glenoid cavity.

CI Clavicle.

I.C Interclavicle.

P.C Precoracoid.

while in the Urodela E.C Epicoracoid. and reptiles they are St Sternum. always distinct. In some

E.S Epi- or omo- lizards (Iguana, Spheno- stemum (dotted don, &c.) the olecranon deep to inter- epiphysis remains a clavicle). distinct sesamoid bone

just as the patella does, and this is also the case in some bats. In the pronograde mammals the radius is in a position of permanent pronation, and is a much more important bone than the ulna, which is sometimes suppressed, so that little more than the olecranon process remains (e.g. horse, giraffe). In the lower Primates the ulna articulates directly with the cuneiform and (some- times) pisiform bones, and is not shut off from the

carpus by a meniscus as in man.

Tire carpus of the higher vertebrates may be reduced from a gener- alized type by the fusion or suppression of certain of its elements. A perfect generalized type is not known to exist in any vertebrate, though it is very closely approached by the carpus. primitive reptile Sphenodon. In such a type the bones are arranged in three rows; proximal, nearest the forearm, middle and distal. There are five bones in the proximal row, which bear the

Radius

anil

ulna.

In the Reptilia the carpus is often very generalized, as in Spheno- don and Chelydra (see fig. 30).

In the birds the radiale and ulnare are distinct, but the distal bones are fused with the metacarpus to form a' carpo-metacarpus. In Mammalia various examples of fusion and suppression occur. All that space will here allow is to attempt to show how the human carpus is derived from the generalized type. In man the radiale, radiale marginale, and centrale radiale fuse to form the scaphoid ; the semilunar is the intermedium; the cuneiform the ulnare; and the pisiform the ulnare marginale.

The trapezium and trapezoid are distalia I. and II.; the os magnum distale III. fused with the centrale ulnare; while distalia IV. and V. have either fused to form the unciform, or, as some believe, distale V. has been suppressed.

In some mammals the radiale marginale is very large, e.g. mole and elephant, and is regarded as a stage in the evolution of a digit on the radial side of the pollex, hence named the prepollex. In the Cape jumping hare (Pedeles) this digit is two-jointed and bears a rudi- mentary nail. Feebler indications of another digit on the ulnar side of the carpus, called the post-minimus, are sometimes seen in relation with the pisiform, which is therefore no longer regarded as a sesamoid bone, but, with the radiale marginale, as a stage in the progress from a pentadactylous to a heptadactylous manus. The centrale radiale

Fig. 28. — Diagrams representing the change of Mechanism in supporting the Thorax in the Reptilian (A) the Mammalian (B) types of Shoulder Girdle.

St Sternum. H Humerus. The dotted line

C Coracoid. represents the serratus

S Scapula. magnus muscle.

Tr Section of trunk, following names, beginning at the outer or radial side of the wrist: (1) Radiale marginale (fig. 29, R.M); (2) Radiale ®; (3) Inter- medium (1); (4) Ulnare (U) ; (5) Ulnare marginale (U.M). In the middle row there are two: (1) Centrale radiale (C.R);(2) Centrale ulnare (C.U). 1 In the distal row there are again five bones, which are spoken of as the first, second, third, fourth and fifth distalia. Sphenodon has all these bones except the radiale marginale. In many of the urodele amphibians, e.g. the salamander and newt (Molge), the carpus is very generalized, the only elements wanting being the radiale marginale, ulnare marginale, centrale ulnare and distale V. In the tailless forms (Anura), however, it is more special- ized, although the radiale marginale is sometimes present and by some morphologists is spoken of as the prepollex. When only four distalia are present it is doubtful whether the fifth is suppressed, or whether it has fused with the fourth.

1 In the giant salamander of Japan (Megalo-batrachus) three centralia are sometimes found, so that possibly the generalized carpus should have three instead of two of these elements in the middle row.

Rad. Uln.

Fig. 29. — Diagram of a generalized carpus.

Rad.

Uln. R.M

R

I

U

U.M

C.R

C.U

D

M

Radius. Ulna.

Radiale margin- ale (prepollex). Radiale. Intermedium. Ulnare.

Ulnare marginale. Centrale radiale. Centrale ulnare. Distalia. Metacarpalia.

Fig. 30. — Dorsal Surface of the Right Manus of a Water Tortoise (Chelydra serpentina). After Gegen- baur.

U Ulna. R Radius. u Ulnare. i Intermedium. r Radiale. c Centrale.

1-5 The five bones of the distal row of the carpus. m l m b The five meta carpals.

persists as a distinct bone throughout life in many monkeys, as also does the radiale marginale.

In the suppression of digits in vertebrates a regular sequence occurs; the. pollex is the first to go, then the minimus, index and annularis one after another, so that an animal like the horse, which has only one digit, has lost all except the medius.

In the mammals the number of the phalanges usually corresponds with that of man, though in the lower vertebrates they are often much more numerous.

When the extremity is modified to form a paddle, as in Ichthyo- saurus and the Cetacea, the phalanges are often greatly increased in number.

In the elasmobranch fishes the pelvic girdle is a repetition of the pectoral though it is not quite so well marked. The acetabulum corresponds to the glenoid cavity, and the part of the girdle dorsal to this is the ilium; the ventral part, uniting , ˆ. c

with its fellow in the mid-line, is the ischio-pubis, the two gr e ‘

elements of which are sometimes separated by a small foramen for the passage of a nerve. When this is the case the anterior (cephalic) part is the pubis, and is in series with the precoracoid, while the ischium (caudad) repeats the coracoid.

In Amphibia the connexion between the ilium and sacrum becomes established, and some of the extinct Labyrinthodontia have separate pubic and ischial symphyses, though in existing forms the ischium and pubis are generally fused.

In the Urodela there is usually a bifid cartilage just in front (cephalad) of the pubes, in the mid-line, which is called the epipubis (see subsection on embryology).

In the Reptilia the ilium always projects backward towards the

tail; the ischia usually meet in a ventral ischial symphysis, from which a cartilage or bone projects backward to support the anterior lip of the cloacal orifice; this is the hypoischium, a structure which is

traceable throughout the Verte- /v'-~\C brata to man (see fig. 31).

Aaawx The hypoischium and epipubis

are parts of a cartilaginous pelvic sternum, the former representing are xiphisternum and the latter the episternum of the shoulder girdle (see F. G. Parsons, " Epi- physes of the Pelvis," J. Anat. and Phys. vol. xxxvii. p. 315). The pubis may or may not form a symphysis; occasionally it is double and then a pre- and post- pubis are recognized.

In birds the ilium extends for- ward and backward, and is fused Fig. 31. — Pelvis of Sphenodon with the vertebral column, as has

Lizard, A Pubic symphysis. B Ischial symphysis. C Epipubis. D Hypoischium.

(The dotted part is cartila- ginous, the white and darkly shaded parts bony.)

been noticed in section Axial of this article. The ischia and pubes do not form a symphysis except in the struthious birds (ostrich and rhea). The acetabulum is always perforate.

In mammals the ilium projects forward toward the head, and an ischio-pubic symphysis is common, though sometimes it is only pubic as in man. In Echidna among the monotremes the acetabulum is perforate as in birds. In the mono- tremes and marsupials part of the external oblique muscle is ossified to form the marsupial bones; these are sometimes regarded as part of the epipubis, though it is more probable that they are merely adaptive strengthenings of the external oblique to support the traction of the pouch.

A cotyloid bone (os acelabuli) is usually present, at all events in early life, and it often shuts out the pubis from taking any part in the formation of the acetabulum.

The femur is comparatively a very stable bone. Sometimes, especially in the odd-toed ungulates (Perissodactyla) , the gluteal Femur ridge forms a large third trochanter, while in most mammals, though not in ungulates, there are two sesamoid bones, called fabellae, developed in the gastrocnemius just above the condyles.

The patella first appears in the reptiles, though it is not present

in all of them. Most of the Lacertilia show it as a small sesamoid

structure in the quadriceps extensor tendon. It is

present in all birds and mammals, with the exception of

some bats. In most marsupials it remains cartilaginous throughout

life.

The tibia and fibula fuse in the Anura and also in some mammals (e.g. rodents). The fibula is often nearly or quite suppressed in birds and mammals, while in birds the tibia fuses with the Vh'V proximal row of tarsal bones, so that the ankle joint is

fibula. obliterated and a tibio-tarsus formed. In the marsupials

the upper'end of the fibula is large and may articulate with the femur in certain positions of the knee, but, as a whole, it reaches its maxi- mum development in the Carnivora in the aquatic suborder of which (Pinnipedia) it is as large as the tibia. It is curious that the only epiphysis which occurs in the long bones of birds is in the head of the tibia of the Gallinaceae.

In the tarsus the bones are arranged on the same generalized plan as in the carpus; the proximal row consists of tibiale marginale, T tibiale, intermedium, fibulare and fibulare_ marginale ; the

tarsus. m iddle row as far as we know only contains one centrale, while the distal row has five distalia.

It is more difficult to trace the fate of these structures in existing vertebrates than it is with the carpal bones. In man the astragalus probably contains the tibiale, tibiale marginale and intermedium, the latter structure possibly

accounting for the occasional os tri- gonum, already mentioned in the subsection on embryology. The fibulare and fibulare marginale probably form the calcaneum, though it is unlikely that the epiphysis at the back of that bone represents any integral part of a generalized tarsus. The centrale persists as the navicular, while the three cuneiform represent tarsalia I., II. and III. and the cuboid tarsalia IV. and V., unless V. is suppressed as some believe. Vestiges of a prehallux are found in the Cape jumping hare and other rodents, though they are usually more closely connected with the navicular and internal cuneiform than with the bones of the proximal row. The large size of the hallux in man is an adapta- tion to the erect position.

Most of the remarks already made about the metacarpals and phalanges of the hand apply equally to the foot, though there is a greater tendency to reduction of digits in the hind limb than in the fore.

For further details and literature see S. H. Reynolds, TheVertebrate Skeleton (Cambridge, 1897); W. Flower and H. Gadow, Osteology of the Mammalia (London, 1885); R. Wiedersheim, Comparative Anatomy of Vertebrates, adapted by W. N. Parker, (London 1907); C. Gegenbaur, Vergleich Anat. der Wirbeltiere (Bd. i.) (Leipzig, 1901).

Visceral.

In the lower vertebrates as well as in the embryo of man, a number of cartilaginous or bony arches encircle the mouth and pharynx (anterior part of the food tube), just as hoops encircle a barrel. There is little doubt that, when they first appeared in the history of evolution, all these bars supported gills and bounded gill slits, but in all existing types the first arch has been modified to surround the mouth and to act as both upper and lower jaws, gaining in different animals a more or less complete connexion with the cranium or brain-containing part of the skull. The first of these visceral arches, therefore, is known as the oral or jaw arch and, as has been shown, the muscles in connexion with it are supplied by the fifth nerve (see Muscular System; and Nerve: Cranial). The second visceral arch is the hyoid and is accompanied by the seventh or facial nerve. The third visceral or first branchial arch of most writers has the ninth or glosso-pharyngeal for its nerve supply, while the arches behind this are supplied by the vagus or tenth nerve.

It will be seen, on reading the subsections devoted to embry- ology and comparative anatomyˆ that in man the maxilla, palate, internal pterygoid plate, malar and tympanic bones as well as the ear ossicles, mandible, hyoid bone and thyroid cartilage are developed in connexion with this visceral skeleton. Of these the ear ossicles are described in the article Ear, the thyroid cartilage in that on the Respiratory System, while the other

bones, with the exception of the hyoid, are treated under the head of Skull. It therefore only remains to describe here the hyoid bone of man.

The hyoid bone, so called from its likeness to the Greek letter v, lies in the upper part of the neck in close connexion with the root of the tongue and just above the thyroid cartilage of the larynx. It con- sists of a body across the mid-ventral line and a great and small cornu on each side (see fig. 1).

The body (basihyal) is rectangular with its long axis placed hori- zontally; behind it is markedly concave both from above down-

*STEfWO-HYUJD**

MUO-HYOID

CENlO-fltOlD/

From Gray's Anatomy, Descriptive and Surgical.

Fig. 32. — Hyoid Bone, anterior surface (enlarged).

ward and from side to side. In front it attaches several muscles, but behind it is smooth and is separated from the thyrohyoid membrane by a bursa. From its upper border this membrane runs downward to the thyroid cartilage. The great cornua (thyrohyals) are attached to each side of the body by cartilage until middle life and afterwards by bony union. They curve upward and backward round the side of the pharynx and are laterally compressed. To their inner surfaces the thyrohyoid membrane is attached, while their knob-like ends are connected with the superior cornua of the thyroid cartilage by the lateral thyrohyoid ligaments.

The small cornua (ceratohyals) are conical structures about a quarter of an inch long attached to the upper part of the body at its junction with the great cornua. It is only in late life that they become united with the body by bony union, if they ever do so. At their apices they are connected with the tips of the styloid pro- cesses by the long stylohyoid ligaments (epihyals).

Embryology. — In the early embryo (see Mouth and Salivary Glands) the mandibular processes grow forward on each side of the slit-like stomatodaeum or primitive mouth, and at length join one another in the mid- ventral line. From the proximal part of each of these another process, the maxillary, grows forward (ventrad), only more slowly, to blend with the fronto-nasal process. In each of these processes cartilage is formed in the lower vertebrates, which in the case of the mandible (lower jaw) reaches to the mid-ventral line and

forms what is known as Meckel's cartilage; but in the maxillary process the stage of chondrification is suppressed in man and other mammals, and the palato-quadrate cartilaginous bar which is so evident in embryo fishes and amphibians is not formed. It will thus be seen that both the maxillary and mandibular bars are derivatives of the first visceral arch. In the maxillary process a membrane bone is formed which blends with the sphenoid to form the internal pterygoid plate, while in front (ventrad) of this the upper jaw (maxilla) is developed in membrane by several centres. Of these, according to the usual description, (1) forms the body of the bone on the outer side of the infraorbital canal; (2) forms the body of the bone on the inner side of that canal; (3) forms the nasal process and the socket for the canine tooth ; (4) makes the posterior three- quarters of the palatine process; while (5) and (6) form the pre- maxilla, each of the latter contributing a socket for one of the two incisor teeth. When these premaxillary sutures fail to unite, the de- formity known as " cleft palate " is produced and this may occur either between the lateral incisor and the canine or between the central and lateral incisor teeth. The recent researches of Professor E. Fawcett point to the conclusion that these centres are not really as numerous as is generally thought. He regards (1) and (2) as a single centre which grows up round the infraorbital canal, while the premaxilla he finds need not necessarily have two centres. The maxillary antrum is first developed as an outgrowth from the cartilaginous olfactory capsule into the membranous maxilla, though the cartilage soon disappears. The palate bone is developed by one centre which is formed in what will be the vertical plate of that bone in the membrane, behind the centre or centres for the body of the maxilla and at a little later date (see E. Fawcett, Journ. Anat. and Phys. vol. 40, p. 400).

The mandibular or Meckel's cartilage is continued up into the tympanum where it joins the proximal end of the cartilage of the second or hyoid arch, and it is from this junction (hyomandibular plate) that, according to H. Gadow, Anat. Anzeiger, Bd. 19, p. 396, the malleus and incus bones of the middle ear are developed (see Ear). Between the slender process of the malleus and the region of the inferior dental foramen, the cartilage later on disappears and its fibrous sheath forms the long internal lateral or sphenomandibular ligament (see fig. 33, L.I.L).

Hitherto each half of the lower jaw has been considered to be com- posed of several distinct skeletal elements, homologous with the elements found in the jaws of lower vertebrates. This view is still held' by Professor K. von

Bardeleben, who contends that there are present in the lower jaws of man and mammals six separate elements, the os mentale, coronoid, condyloid, angular, marginal and dentary. The researches of B. Henneberg, Professor E. Fawcett and of Dr A. Lowe, however, are so complete and correspond so closely that one cannot help believing that the human lower jaw, at all events, is ossified from one centre only on each side, which appears in membrane near the symphysis and extends into a small part of Meckel's cartilage near the incisor tooth germs. From this centre, which represents the dentary of lower vertebrates, the whole adult bony jaw is formed and the greater part of Meckel's cartilage disappears by a process of resorption. But, although this bone is mainly membranous, patches of cartilage appear in the coronoid and condylar processes as well as near the symphysis and perhaps at the angle. These, however, do not ossify by separate centres, but are invaded by the main dentary ossification already described. It seems evident, therefore, that in man the process of ossification is slurred over although some of the original elements of the lower vertebrates are repeated as temporary cartilaginous masses, e.g. coronary, condylar and angular. (See E. Fawcett, " Thesis for the Degree of Doctor of Medicine," University Library, Edinburgh, 1906; also A. Lowe, " Development of Lower Jaw in Man," Proc. Anat. Soc. of the University of Aberdeen, 1905, p. 59. In the latter paper the literature is reviewed.)

At birth the two halves of the mandible are separate as they are throughout life in many mammals (e.g. rodents), but in man they join together about the end of the first year.

It has been stated that within the tympanum the dorsal or proximal ends of the first and second visceral arches unite to form the hyo- mandibular plate from which, following H. Gadow, the malleus and incus are derived. The stapes is also probably formed from the proximal end of the second or hyoid arch (see fig. 33, St), and just ventral to this the cartilage of the arch fuses with that of the periotic capsule, where it is later on ossified as the tympanohyal element of the temporal bone (fig. 33, T.H). From this point the cartilage becomes free from the skull and runs round the pharynx until it meets its fellow of the opposite side in the mid-ventral line. That part of the cartilage which is nearest the skull remains as the stylohyal element (fig- 33. S.H) and this later on ossifies to form the styloid process which fuses with the tympanohyal between twenty and twenty-five. For some distance beyond the stylohyal element the cartilage de- generates into fibrous tissue forming the stylohyoid ligament; this represents the epihyal element, and occasionally instead of degenerat- ing it ossifies to form an abnormal bone (fig. 33, E.H). Near the middle line the cartilage persists as the ceratohyal element or lesser cornu of the hyoid bone (fig. 33, C.H), while the most ventral part, where it fuses with its fellow of the opposite side as well as with the ventral part of the third arch, is the basihyal or

body of the hyoid bone (fig. 33. B.H).

The dorsal part of the cartilage of the third arch is wanting, but its lateral part forms the thyrohyal or great cornu of the hyoid bone (fig. 33, Th.H), while its ventral part fuses with its fellow of the opposite side as well as with the ventral part of the second arch to form the body of the hyoid bone. The fourth and fifth arches only develop cartilage in their ventro-lateral parts and fuse to form the thyroid cartilage of the larynx (fig. 33, Th.C) (see Respiratory System).

For further details see J. P. McMurrich, Development of the Human Body (1906) ; A. Keith, Human Embryology and Morphology (1905) ; H. Gadow, " Modifications of the first and second Visceral Arches," Phil. Trans, vol. 179 (1888), and " The Evolution ot the Auditory Ossicles," Anat. Anzeiger, Bd. xix. (1901).

Comparative Anatomy. — In the Amphioxus the pharynx is stiffened by chitinous bars which lie between the gill slits, but it is unlikely that

4th. Arch 5U1. Arch

Fig. 33. — Diagram to show the fate of the Visceral Arches in man and (with modifications) other mammals. Membrane bones white. Cartilage and cartilage bones black. Cartilage which has degenerated into ligaments dotted.

P.M

Premaxilla.

St

Stapes.

Max.

Maxilla.

T.H

Tympanohyal.

Pal.

Palate.

S.H

Stylohyal (styloid process).

Pt

Pterygoid (internal ptery-

E.H

Occasional epihyal cartil-

goid plate).

age or bone in stylohyoid

T.R

Tympanic ring (quad- rate?).

ligament.

C.H

Ceratohyal (lesser cornu of

Mand .Mandible surrounding

hyoid bone).

Meckel's cartilage (black).

B.H

Basihyal (body of hyoid

"L.I.L

Long internal lateral liga-

bone).

ment.

Th.H

Thyrohyal (great cornu of

M

Malleus.

hyoid bone).

I

Incus.

Th.C

Thyroid cartilage of larynx.

these are really homologous with the visceral skeleton of higher forms, though, in serving the same purpose, they are certainly analogous.

Among the Cyclostomata (hags and lampreys) there is an arrange- ment known as the " branchial basket," which has a more super- ficial position than the visceral arches of fish and probably corre- sponds to the extra-branchials of those vertebrates. The oral and hyoid arches are very rudimentary and probably have degenerated in consequence of the suctorial mode of nourishment. In the Elasmo- branchii (sharks and rays) the visceral skeleton is entirely cartilagin- ous. In the more primitive types such as the comb-toothed shark (Notidanus) the oral and hyoid arches are quite distinct. The oral arch consists of the upper jaw, or palato-quadrate cartilage, and the lower jaw, or Meckel's cartilage; these articulate with one another posteriorly and also with the skull. Behind these and distinct from them is the hyoid arch. Such a type of suspensorium or jaw articula- tion is called autostylic. In the rays, on the other hand, the oral arch is connected with the skull by the proximal segment of the hyoid arch, which, since it connects both the hyoid and mandibular (oral) arches with the skull, is called the hyomandibular cartilage. This type of suspensorium is termed hyosiylic.

Below the hyomandibular cartilage the hyoid arch has two other

segments, the ceratohyal laterally and the basihyal ventrally where it fuses with its fellow of the opposite side. Sometimes an epihyal intervenes between the hyomandibular and the ceratohyal. Behind the hyoid arch are usually five branchial arches, though in Hept- anchus there are as many as seven. These are divided into a number of segments, and outside these there is often another series of arches called extra-branchials which are probably homologous with the branchial basket of the Cyclostomata.

The chimaeroid fishes are called Holocephali because in them the palato-quadrate bar is fused with the rest of the skull. In the bony ganoids and teleosteans (Teleostomi) the palato-quadrate bar ossifies to form the palatine, ecto-, meso- and meta-pterygoids and quadrate bones from before backward, while outside these is another row of dermal bones formed by the premaxilla, maxilla and jugal or malar.

In the lower jaw, Meckel's cartilage is ossified at its proximal end to form the articular bone, but distally it remains and is partly en- cased by the dentary, and more posteriorly by the angular, both of

an

MT

ET

Na ME

CR

Fr Pa IP SO

Per

BS

Pt

AS

OS

Fig. 34. — Longitudinal and Vertical Section of the Skull of a Dog (Canis familiaris), with mandible and hyoid arch.

PS PI

Anterior narial aperture.

Maxillo-turbinal bone.

Ethmo-turbinal.

Nasal.

Ossified portion of the raes- ethmoid.

Cribriform plate of the ethmo-turbinal.

Frontal.

Parietal.

Interparietal.

Supra-occipital. ExO Ex-occipital. BO Basi-occipital.

Periotic.

Basi-sphenoid.

Pterygoid.

Alisphenoid.

Orbito-sphenoid.

which are membrane bones quadrate and the articular.

The jaw joint therefore is between the In comparing this description with the section on human embryology it will be seen that certain bones, like the palate and pterygoids, which in the fish are ossifications in cartilage, become in the higher vertebrates membrane bones, and so it is clear that too great stress must not be laid on the histological history of a bone in determining its morphological significance.

The branchial arches of the Teleostomi closely resemble those of the Elasmobranchii except that they are ossified and that the extra- branchials have disappeared.

In the Dipnoi (mudfish) the suspensorium is autostylic, and either five or six branchial arches are present. In the Amphibia, too, the suspensorium is autostylic, the palato-quadrate bar remains largely cartilaginous, though its posterior part is often ossified to form the quadrate. The membranous premaxilla, maxilla, palatine, pterygoid, yuadratojugal and squamosal bones are developed in connexion with it, though it is interesting to notice that the pterygoid is sometimes partly cartilaginous and the quadrato- jugal is absent in the tailed forms (Urodela). In the lower jaw a splenial element has appeared, and in the frog a cartilaginous mento-meckellian bone develops close to the symphysis. In the larval stages there are rudiments of four branchial arches behind the hyoid, but in the adult these are re- duced in the Anura and their ventral ends are united into a broad basilingual plate.

In the Reptilia the site of the palato-quadrate bar is surrounded by the same series of bones that are found in the Amphibia, but in lizards and chelonians a para-quadrate bone is found which, according to E. Gaupp, is the precursor of the tympanic ring of mammals. In the crocodiles the maxilla and palate grow inwards to meet one another and so form a hard palate. The mandible has dentary, splenial, angular, surangular, articular and coronoid ossifications and in some cases a mento-meckellian as well. The quadrate bone with which it still articulates is becoming included in the wall of the tympanic cavity, and, according to H. Gadow, it is this bone and not the para-quadrate which will become the tympanic of mammals. The hyoid arch is sometimes suppressed in snakes, but in Sphenodon its continuity with the columella or stapes can be demonstrated.

The branchial skeleton is reduced with the cessation of branchial respiration and only the ventral parts of two arches can be seen; these unite to form a plate with the hyoid (basihyobranchial) and with this the glottis is closely connected. In birds the morphology of the visceral skeleton is on the reptilian plan, and, although the modi- fications are numerous, they are not of special interest in elucidating the problems of human morphology. 1 In the Mammalia the premaxilla, maxilla, palate and pterygoid bones can be seen in connexion with the region where the palato- quadrate cartilage lay in the lower Vertebrata (see fig. 34). The premaxilla bears the incisor teeth, and except in man the suture between it and the maxilla is evident on the face if a young enough animal be looked at. The maxilla bears the rest of the teeth and articulates laterally with the jugal or malar, which in its turn articulates posteriorly with the zygomatic pro- cess of the squamosal, so that a zygomatic arch, peculiar to mammals, is formed. Both the maxilla and palate form the hard

Calate as in crocodiles, though the pterygoid bone does not do so ut fuses with the sphenoid to form the internal pterygoid plate (see fig. 34, Pt). The mandible no longer articulates with the quadrate but forms a new articulation, by means of the con- dyle, with the glenoid cavity of the squamosal, and many modern morphologists, including the writer, are inclined to agree with H. Gadow that the quadrate has probably become the tympanic bone. In many mammals (e.g. Carnivora) this bone swells out to form the bulla tympani. The derivation of the auditory ossicles has been discussed in the section on embryology as well as in the article Ear. The presence of a chain of ossicles is peculiar to the Mammalia.

In many of the lower mammals (e.g. Ungulata and Carnivora) the hyoid arch is much more completely ossified than it is in man, tympano-, stylo-, epi-. cerato- and basihyal elements all being bony (see fig. 34). It is of interest to notice that in the hares and rabbits the body of the hyoid has occasionally been found in two pieces, indicating its derivation from the

second and third visceral arches. The fourth and fifth arches, which form the thyroid cartilage in mammals, are considered in the article Respiratory System.

/For further details see S. H. Reynolds, The Vertebrate. Skeleton (Cambridge, 1897); W. Flower, Osteology of the Mammalia (London, 1885); R. Wiedersheim, Comparative Anatomy of Vertebrates, adapted and translated by W. N. Parker (London, 1907) ; C. Gegenbaur, Vergleich. Anal, der Wirbeltiere, Bd. i. (Leipzig, 1901). (F. G. P.)

SKELTON, JOHN (c. 1460-1529), English poet, is variously asserted to have belonged to a Cumberland family and to have been a native of Diss in Norfolk. He is said to have been The mandible is displaced down- educated at Oxford. He certainly studied at Cambridge, and wards, to show its entire form; the he is probably the " one Scheklton " mentioned by William

1490 Caxton writes of him, in the preface toThe Boke ofEneydos compyled by Vyrgyle, in terms which prove that he had already won a reputation as a scholar. " But I pray mayster John Skelton," he says, " late created poete laureate in the unyversite of Oxenforde, to oversee and correct this sayd booke . . . for him I know for suffycyent to expowne and englysshe every dyffyculte that is therin. For he hath late translated the epystlys of Tulle, and the boke of dyodorus siculus, 1 and diverse other works … in polysshed and ornate termes craftely . . . I suppose he hath drunken of Elycons well." The laureateship referred to was a degree in rhetoric. Skelton received in 1493 the same honour at Cambridge, and also, it is said, at Louvain. He found a patron in the pious and learned countess of Richmond, Henry VII. 's mother, for whom he wrote Of Marines Lyfe the Peregrynacioun, a translation, now lost, of Guillaume de Deguille- ville's Pelerinage de la vie humaine. An elegy " Of the death of the noble prince Kynge Edwarde the forth," included in some of the editions of the Mirror for Magistrates, and another (1489)

Presphenoid.

Palatine. Vo Vomer. Mx Maxilla. PMx Premaxilla.

sh

eh

ch

bh

th

s

cp

cd

a

id

Stylo-hyal.

Epi-hyal.

Cerato-hyal.

Basihyal.

Thyro-hyal.

Symphysis of mandible.

Coronoid process.

Condyle.

Angle.

Inferior dental canal.

which the condyle is articulated.

1 The MS. of this translation is preserved at Corpus Christi College, Cambridge.

on the death of Henry Percy, fourth earl of Northumberland, are among his earliest poems. In the last decade of the century he was appointed tutor to Prince Henry (afterwards Henry VIII.). He wrote for his pupil a lost Speculum principis, and Erasmus, in dedicating an ode to the prince in 1500, speaks of Skelton as " unum Britannicarum literarum lumen ac decus." In 1498 he was successively ordained sub-deacon, deacon and priest. He seems to have been imprisoned in 1502, but no reason is known for his disgrace. Two years later he retired from regular attendance at

court to become rector of Diss, a benefice which he retained nominally till his death. Skelton frequently signed himself " regius orator " and poet-laureate, but there is no record of any emoluments paid in connexion with these dignities, although the Abbe du Resnel, author of Recherches sur les poeles couronnez, asserts that he had seen a patent (1513-1514) in which Skelton was appointed poet-laureate to Henry VIII. As rector of Diss he caused great scandal among his parishioners, who thought him, says Anthony a Wood, more fit for the stage than for the pew or the pulpit. He was secretly married to a , woman who lived in his house, and he had earned the hatred of the Dominican monks by his fierce satire. Consequently he came under the formal censure of Richard Nix, the bishop of the diocese, and appears to have been temporarily suspended. After his death a collection of farcical tales, no doubt chiefly, if not entirely, apocryphal, gathered round his name — The Merie Tales of Skelton. During the rest of the century he figured in the popular imagination as an incorrigible practical joker. His sarcastic wit made him some enemies, among them Sir Christopher Garnesche or Garneys, Alexander Barclay, William Lilly and the French scholar, Robert Gaguin (c. 1425-1502). With Garneys he engaged in a regular " flyting," undertaken, he says, at the king's command, but Skelton's four poems read as if the abuse in them were dictated by genuine anger. Earlier in his career he had found a friend and patron in Cardinal Wolsey, and the dedication to the cardinal of his Replycacion is couched in the most flattering terms. But in 1522, when Wolsey in his capacity of legate dissolved convocation at St Paul's, Skelton put in circulation the couplet: " Gentle Paul, laie doune thy sweard For Peter of Westminster hath shaven thy beard."

In Colyn Cloute he incidentally attacked Wolsey in a general satire on the clergy, but Speke, Parrot and Why come ye nat to Courte ? are direct and fierce invectives against the cardinal who is said to have more than once imprisoned the author. To avoid another arrest Skelton took sanctuary in Westminster Abbey. He was kindly received by the abbot, John Islip, who continued to protect him until his death on the 21st of June 1529. The inscription on his tomb in the neighbouring church of St Margaret's described him as votes pierius.

In his Garlande of Laurell Skelton gives a long list of his works, only a few of which are extant. The garland in question was worked for him in silks, gold and pearls by the ladies of the countess of Surrey at Sheriff Hutton Castle, where he was the guest of the duke of Norfolk. The composition includes compli- mentary verses to the various ladies concerned, and a good deal of information about himself. But it is as a satirist that Skelton merits attention. The Bowge of Court is directed against the vices and dangers of court life. He had already in his Boke of the Thre Foles drawn on Alexander Barclay's version of the Narrenschijf of Sebastian Brant, and

this more elaborate and imaginative poem belongs to the same class. Skelton, falling into a dream at Harwich, sees a stately ship in the harbour called the Bowge of Court, 1 the owner of which is the Dame Saunce Pere. Her merchandise is Favour; the helmsman Fortune; and the poet, who figures as Drede (modesty), finds on board Favell (the flatterer), Suspect, Harvy Hafter (the clever thief), Dysdayne, RyoUe, Dyssymuler and Subtylte, who all explain themselves in turn, until at last Drede, who finds they are secretly his enemies, is about to save his life by jumping overboard, when he wakes with a start. Both of these poems are written in the

'Bowge — Fr. louche; court rations. The term is explained as the right to eat at the king's table.

seven-lined Chaucerian stanza, but it is in an irregular metre of his own that his most characteristic work was accomplished. The Boke of Phyllyp Sparowe, the lament of Jane Scroop, a schoolgirl in the Benedictine convent of Carowe near Norwich, for her dead bird, was no doubt inspired by Catullus. It is a poem of some 1400 lines and takes many liberties with the formularies of the church. The digressions are considerable. We learn what a wide reading Jane had in the romances of Charlemagne, of the Round Table, The Four Sons of Aymon and the Trojan cycle. Skelton finds space to give his opinion of Chaucer, Gower and Lydgate. He seems fully to have realized Chaucer's value as a master of the English language. Gower's matter was, he said, " worth gold," but his English he regarded as antiquated. The verse in which the poem is written, called from its inventor " Skeltonical," is here turned entirely to whimsical use. The lines are usually six-syllabled, but vary in length, and rhyme in groups of two, three, four and even more. It is not far removed from the old alliterative English verse, and well fitted to be chanted by the minstrels who had sung the old ballads. For its comic admixture of Latin Skelton had abundant example in French and Low Latin macaronic verse. He makes frequent use of Latin and French words to carry out his exacting system of frequently recurring rhymes. This breathless, voluble measure was in Skelton's energetic hands an admirable vehicle for invective, but it easily degenerated into doggerel. By the end of the 16th century he was a " rude rayling rimer " (Puttenham, Arte of English Poesie), and at the hands of Pope 2 and Warton he fared even worse. His own criticism is a just one: —

" For though my ryme be ragged,

Tattered and jagged,

Rudely rayne beaten,

Rusty and moughte eaten,

It hath in it some pyth."

Colyn Cloute represents the average country man who gives his opinions on the state of the church. There is no more scathing indictment of the sins of the clergy before the Reformation. He exposes their greed, their ignorance, the ostentation of the bishops and the common practice of simony, but takes care to explain that his accusations do not include all and that he writes in defence of, not against, the church. He repeatedly hits at Wolsey even in this general satire, but not directly. Speke, Parrot has only been preserved in a fragmentary form, and is exceedingly obscure. It was apparently composed at different times, but in the latter part of the composition he openly attacks Wolsey. In Why come ye nat to Courte? 'there is no attempt at disguise. The wonder is not that the author had to seek sanctuary, but that he had any opportunity of doing so. He rails at Wolsey's ostentation, at his almost royal authority, his overbearing manner to suitors high and low, and taunts him with his mean extraction.. This scathing invective was not allowed to be printed in the cardinal's lifetime, but it was no doubt widely circulated in MS. and by repetition. The charge of coarseness regularly brought against Skelton is based chiefly on The Tunnynge of Elynoure Rummynge, a realistic description in the same metre of the drunken women who, gathered at a well-known ale-house kept by Elynour Rummynge at Leatherhead, not far from the royal palace of Nonsuch. " Skelton Laureate against the Scottes " is a fierce song of triumph celebrating the victory of Flodden. " Jemmy is ded And closed in led, That was theyr owne Kynge," says the poem; but there was an earlier version written before the new r s of James IV. 's death had reached London. This, which is the earliest singly printed ballad in the language, was entitled A Ballade of the Scottysshe Kynge, and was rescued in 1878 from the wooden covers of a copy of Huon de Bordeaux. " Howe the douty Duke of Albany, lyke a cowarde knight " deals with the campaign of 1523, and contains a panegyric of Henry VIII. To this is attached an envoi to Wolsey, but it must surely have been

2 (Spence, Anecdotes, p. 87) : Pope said: " Skelton's poems are all low and bad, there is nothing in them that is worth reading," and (in Satires and Epigrams, v. 38) " And beastly Skelton heads of houses quote."

misplaced, for both the satires on the cardinal are of earlier date.

Skelton also wrote three plays, only one of which survives. Magnificence is one of the best examples of the morality play. It deals with the same topic as his satires, the evils of ambition ; its moral, " how suddenly worldly wealth doth decay," being a favourite one with him. Thomas Warton in his History of English Poetry described another piece Nigramansir, printed by Wynkyn de Worde in 1 504, and dealing with simony and the love of money in the church; but no copy is known to exist, and some suspicion has been cast on Warton's statement.

Illustration of the hold Skelton had on the public imagination is supplied from the stage. A play (1600) called Scogan and Skelton, by Richard Hathway and William Rankins, is mentioned by Henslowe. In Anthony Munday's Downfall of Robert, earl of Huntingdon, Skelton acts the part of Friar Tuck, and Ben Jonson in his masque, The Fortunate Isles, introduced " Skogan and Skelton in like habits as they lived."

Very few of Skelton's productions are dated, and their titles are here necessarily abbreviated. Wynkyn de Worde printed the Bowge of Court twice. Divers Balettys and dyties solacious devysed by Master Skelton Laureat, and Skelton Laureate agaynsle a comely Coystroune . . . have no date or printer's name, but are evidently from the press of Richard Pynson, who also printed Replycacion against certain yong scoters, dedicated to Wolsey. The Garlande or Chapelet of Laurell was printed by Richard Faukes (1523); Magnificence, A goodly interlude, . . . probably by John Rastell about 1533, reprinted (1821) for the Roxburghe Club. Hereafter foloweth the Boke of Phyllyp Sparowe was printed by Richard Kele (1550 ?), Robert Toy, Antony Kitson (1560?), Abraham Veale (1570?), John Walley, John Wyght (1560 ?). Hereafter foloweth certaine bokes compyled by mayster Skelton . . . including " Speke, Parrot," " Ware the Hawke," " Ely- noure Rummynge " and others, was printed by Richard Lant (1550?), John King and Thomas March (1565 ?), by John Day (1560). Here- after foloweth a title boke called Colyn Cloule and Hereafter . . . why come ye nat to Courte ? were printed by Richard Kele (1550 ?) and in numerous subsequent editions. Pithy, plesaunt and profitable workes of maister Skelton, Poete Laureate. Nowe collected and newly published was printed in 1568, and reprinted in 1736. A scarce reprint of Elinour Rummin by Samuel Rand appeared in 1624.

See The Poetical Works of John Skelton; with Notes and some account of the author and his writings, by the Rev. Alexander Dyce (2 vols., 1843). A selection of his works was edited by W. H. Williams (London, 1902). See also Zur Charakteristik John Skeltons by Dr Arthur Koelbing (Stuttgart, 1904); F. Brie, "Skelton Studien " in Englische Studien, vol. 38 (Heilbronn, 1877, etc.); A. Rey, Skelton's Satirical Poems . . , (Berne, 1899); A. Thtimmel, Studien ilber John Skelton (Leipzig- Reudnitz, 1905) ; G.

Saintsbury, Hist. ofEng. Prosody (vol. i., 1906) ; and A. Kolbing in the Cambridge History of English Literature (vol. iii., 1909).

SKELTON AND BROTTON, an urban district in the Cleveland parliamentary division of the North Riding of Yorkshire, England, 17 m. E. by S. of Middlesbrough by a branch of the North-Eastern railway, with stations at Brotton and North Skelton. Pop. (1901) 13,240. This is one of the largest town- ships in the Cleveland ironstone district, and its industrial population is wholly employed in the quarries. The modern Skelton Castle incorporates part of the ancient stronghold of Robert de Brus who held it from William the Conqueror. A modern church replaces the ancient one, of which there are ruins, and a fine Norman font is preserved. The large ironstone quarries have not wholly destroyed the beauty of the district. The Cleveland hills rise sharply southward, to elevations some- times exceeding 1000 ft., and are scored with deep and picturesque glens. On the coast, which is cliff bound and fine, is the watering place of Saltburn by the Sea.

SKENE, WILLIAM FORBES (1809-1892), Scottish historian and antiquary, was the second son of Sir Walter Scott's friend, James Skene (1775-1864), of Rubislaw, near Aberdeen, and was born on the 7th of June 1809. He was educated at Edinburgh High School, in Germany and at the university of St Andrews, taking an especial interest in the study of Celtic philology and literature. In 1832 he became a writer to the signet, and shortly afterwards obtained an official appointment in the bill department of the Court of Session, which he held until 1865. His early interest in the history and antiquities of the Scottish Highlands bore its first fruit in 1837, when he published The Highlanders of Scotland, their Origin, History and Antiquities.ˆ His chief work,

however, is his Celtic Scotland, a History of Ancient Alban (3 vols., Edinburgh, 1876-1880), perhaps the most important contribuˆ tion to Scottish history written during the 19th century. In 1879 he was made a D.C.L. of Oxford, and in 1881 historiographer royal for Scotland. He died in Edinburgh on the 29th of August

1892.

The most important of Skene's other works are : editions of John of Fordun's Chronica gentis Scotorum (Edinburgh, 1871-1872); of the Four Ancient Books of Wales (Edinburgh, 1868) ; of the Chronicles of the Picts and Scots (Edinburgh, 1867) ; and of Adamuan's Vita S. Columbae (Edinburgh, 1874); an Essay on the Coronation Stone of Scone (Edinburgh, 1869); and Memorials of the Family of Skene of Skene (Aberdeen, 1887).

SKETCH (directly adapted from Dutch schets, which was taken from Ital. schizzo, a rough draft, Lat. schedium, something hastily made, Gr. SKI (pronounced " skee," Icel. scidh, snow-shoe, properly " piece of wood "), the wooden snow-shoe on which the inhabit- ants of Scandinavia and neighbouring countries travel over the snow. Implements for this purpose were used by many nations of antiquity. Xenophon (Anab. iv. 5) describes the shoes or pattens of skins with which the horses of the Armenians were shod, to prevent them from sinking into the snow, and Procopius made mention of the ancient Lapps, known in Scandinavia as " Skrid- Finnen," or sliders. Snow-shoes have always been used by the Mongols of north-western Asia. From the evidence of the old Norse sagas they must have been general in Scandinavia long before the Christian era. Uller, the god of winter, is always spoken of as walking upon skis, the curved toes of which gave rise to the legend that they were really ships upon which the god was wafted over hill and dale. Skis have been used time out of mind by Lapps, Finns and Scandinavians for hunting and journeying across the frozen country. The first skis of which there is any record were elongated, curved frames covered with leather. Those of the Skrid-Finnen of the 16th century were leather shoes, pointed at the toe, about 3 ft. long, into which, a few inches from the reax end, the feet were thrust up to the ankles. The form of the shoe varied in different districts. Modern skis are not, like the North American snow-shoe, made of broad frames covered with a thong web, but long, narrow, nearly flat pieces of ash, oak or spruce, pointed and turned up for about a foot at the toe. Their length is usually the distance their wearer can reach upwards with his hand, that for the average man being about 7 ft. 6 in., although some advocate less length. : ' i

Their width at the broadest part is about 5 in., and theii greatest thickness (just under the foot) about ij in., tapering towards both ends. The under surface is usually perfectly smooth, although some skis are provided with narrow strips running lengthwise on the under surface, .to prevent side-slipping. The feet, encased in stout deer-hide shoes, heelless or nearly so, are fastened to the middle of the skis by an arrange- ment of straps, called the binding. A staff from 4 to 5 ft. long completes the touring outfit. On level ground the skis ar« allowed to glide over the snow without being lifted from it, th« heels being raised while the toes remain fast to the skis. Al this gait very long steps can be taken. Climbing hills one musl walk zigzag, or even directly sideways step by step. Genth slopes can be ascended straight ahead by planting the skis obliquely. Downhill the skis become a sledge upon which greal velocity is attained. The staff is used as a brake in coasting and is provided with a small disc a few inches from the lowei end, to prevent it sinking into the snow.

Skiing as a sport began.about i860 in the Norwegian districl of Telemark and rapidly spread over all the Scandinaviai

peninsula. The climax of the racing season is the great inter- national ski tournament held annually in February at Holmen- kollen, 6 m. from Christiania. This " Norwegian Derby " is divided into two parts, the first devoted to jumping contests, the other to long-distance racing. The take-off for the jumping contests is built into the side of a hill, and each competitor must jump three times. No staff is allowed and no jump is counted if the jumper falls in alighting. The distances covered are extra- ordinary, 134 I ft. being the record. The jumper, who starts some distance up the hill, descends at top speed, stoops as he nears the take-off and launches himself into the air with all his force. He maintains an erect position until he reaches the ground, alighting with bended knees, on both feet, one a little in advance of the other, and " giving " with his legs to overcome the force of the fall and to preserve his balance. Another feature is double jumping, performed by two persons hand in hand. The highest prize is the King's Cup. The principal distance race is over a difficult course of about 20 m. The record for 25 kilometres (15 J m.) is 2 hours, 7 min. A Lapp once covered 220 kilometres (about 138 m.) in 21 hrs., 22 min., the country being level. Skiing is very popular in Norway with both men and women; in fact it may be called the national sport of Norway.

The sport has been introduced into other countries where the winter is severe, and has become very popular in Switzerland and the United States, especially in Minnesota and the Rocky Mountain country. The principal club in the British Isles is the " Ski Club of Great Britain." The mails between Chile and the Argentine Republic are carried in winter by relays of Norwegian ski-runners, about 300 being employed. The skis worn by them are usually shod with horn. Skis cannot be used with advantage during a thaw or where the snow is less than 6 in. deep. On this account, and because of their general un- wieldiness, they are less convenient in thick forests than the Indian snow-shoe, though faster in the open country.

Ski have been used for military purposes by the Northern peoples for several centuries, and of late years other nations which have mountainous regions of snow have turned their attention to this most useful mode of winter marching. The army of Sweden— under Gustavus Adolphus and his successors one of the foremost in Europe — employed infantry provided with ski in its military operations. In Norway special units so provided were organized in 1710. Recently (1902) the Alpine infantry of France and Italy have taken up the question. In Briancon, attached to the 159th regiment of French infantry, is an ecole militaire de ski (established 1903) which trains the Chasseurs Alpins of the 1st line, and also the regional

troops which are intended to take part in the defence of the south- eastern frontier of France. These regiments as a rule furnish one officer, one non-commissioned officer and a few soldiers each to every course of instruction, which lasts two months. At the end of the first month the skieur is expected in full marching order to cover 60 kilometres (37! m.) of Alpine territory in the day. The ski are put to a variety of ingenious uses; to form a stretcher-sledge for wounded men; and if rapidity of movement is desired, a horse or pony pulls the skieur along by means of long reins attached to the horse's girth. Even camps in the mountains are improvised. The skieur is thickly clothed and muffled, and his eyes are protected against snow-blindness by blue or black spectacles. Some of the performances of soldiers on ski have been notable. Captain Bernard, chief of the icole of Briancon, ascended the cols of Arsin6 (2400 metres) and of the Cauterel (2080 metres) in 16 hours with a party of 25 men. In Russia some Finland troops in full marching order executed a long hunting march in Carelia. In 29 days they covered 860 kilometres. In Switzerland a skieur took less than 1 1 hours to cover 25 kilometres, including altitudes of 1547 metres. In order to witness this competition, which took place in Glarus, the soldiers from the S. Gothard garrison made a march of 48 kilometres including the ascent of the Klausengrass (2000 metres). A Norwegian soldier named Holte covered with one leap a distance of 21 m. 20 cm., and his companion Heyder- dabl later achieved 24.

In Italy each company of Alpini has an annual credit for the provision of ski. Their duties in war time are almost the same as those of mounted infantry— exploration and communication, and the seizure of advanced positions.

In the seven months of snow on these frontiers the garrisons of the lonely posts cannot go out save on ski or snow-shoes, as to the respective merits of which military opinion is divided.

See Norway's National Sport, by T. W. Schreiner, Outing, vol. 37; Auf Schneeschuhen durch Grbnland, by F. Nansen (Ham- burg, 1891); Ski-running, edited by E. C. Richardson (London, 1904) ; Year-Book of the Ski Club of Great Britain.

SKIBBEREEN, a market town of county Cork, Ireland, on the river Hen about 3 m. from its estuary, 535 m. S.W. of Cork by the Cork, Bandon and South Coast railway. Pop. (1901) 3208. The river is navigable for small vessels to Skibbereen itself, and for larger ones to Old Court on the estuary; and the town is a flourishing fishing-station. Trade in corn and other agricultural produce is considerable. This district suffered terribly in the famine of 1847, and hundreds of victims were buried in pits in the graveyard adjoining the ruined Cistercian cell of Abbeystrowry, a mile west

of the town. The Hen offers fishing, late in the season, for brown and sea trout. The main railway continues south to Baltimore, and a light railway runs to the pleasant seaside village of Skull (or Schull), 15 m. W. Skibbereen is governed by an urban district council.

SKIEN, a seaport of southern Norway, in Bratsberg ami (county) , on the river Skien, 5 m. below its issue from Lake Nord, and 6 m. above its outflow into Frier Fjord. Pop. (1900) 11,343. It was mostly rebuilt after a fire in 1886. Here Henrik Ibsen, the dramatist, was born in 1828. In 1892 a canal ascending 189 ft. by means of 17 locks was made between lakes Bandak and Nord, giving access to the Telemark district by way of Dalen. The whole distance between the lakes is 40 m., and several fine falls, as the Ulefos, Eidsfos, and Vrangfos, are passed. The engineering is noteworthy. In the town and district are numerous saw-mills, planing, cotton-spinning and flour-mills, factories for wood-pulp and domestic commodities, also a copper mine (at Omdal). The exports are ice, timber (including tele- graph poles for the British government), wood-pulp and copper, and the imports coal and china-clay. The town (the ancient Skida) dates from the 14th century. A fine view is obtained from the Bratsberg Kiev, S. E. of the town, with ruins of a chapel.

SKIERNIEWICE, a town of Russian Poland, in the govern- ment of Warsaw, 41 m. by rail S.W. from the city of Warsaw. Pop. (1897) 9846. It was formerly the see of the archbishop of Gnesen, primate of Poland. Here is an imperial castle, in which the emperors of Russia, Austria and Germany met in conference on the isth-i7th of September 1884. Cloth and linen are manufactured.

SKIMMER, the English name bestowed by T. Pennant 1 in 1 781 on a North American bird which had already been figured and described by M. Catesby (B. Carolina, i. pi. 90) as the " Cut-water," — as it appears still to be called on some parts of the coast, 2 — 'remarkable for the unique formation of its bill, in which the maxilla, or so-called upper mandible, is capable of much vertical movement, while the lower mandible, which is considerably the longer of the two, is laterally compressed so as to be as thin as a knife-blade. This bird is the Rhynchops nigra of Linnaeus, who, however, united with it what proves to be an allied species from India that, having been indicated many years before by Petiver {Gazoph. naturae, tab. 76, fig. 2), on the authority of Buckley, was only technically named and described in 1838 by W. Swainson (Anim. Menageries, p. 360) as R. albicollis. A third species, R. flavirostris, inhabits Africa; and examples from South America, though by many writers regarded as identical with R. nigra, are considered by Howard Saunders (Proc. Zool. Society, 1882, p. 522) to form a fourth, the R. melanura of Swainson (ut supra, p. 340). All these

1 " I call it Skimmer, from the manner of its collecting its food with the lower mandible, as it flies along the surface of the water " (Gen. of Birds, p. 52).

2 Other English names applied to it in America are " Razorbill," " Scissorbill, and " Shearwater."

resemble one another very closely, and, apart from their singularly- formed bill, have the structure and appearance of Terns (q.v.). Some authors make a family of the genus Rhynchops, but it seems needless to remove it from the Laridae (see Gull). In breeding-habits the Skimmers thoroughly agree with the Terns, the largest species of which group they nearly equal in size, and indeed only seem to differ from them in the mode of taking their food, which of course is correlated with the extraordinary formation of their bill. (A. N.)

SKIN AND EXOSKELETON, in anatomy. The skin (A.-S. scinn) is the covering of the whole body, and is continuous at the different orifices with the mucous membrane. It acts firstly as a protective layer, secondly as a regulator of the temperature, thirdly as an excretory organ and fourthly as a tactile and sensory organ in which nerves end.

The skin varies in thickness from -5 mm. in the eyelids to 4 or more mm. in the palms and soles; it is also very thick over the back of the body. Two main layers are recognized iii the

Stratum Iucidum

From Robert Howden in Cunningham's Text-Book of Anatomy.

Fig. i. — Vertical section of Epidermis and Papillae of Corium (highly magnified).

skin ; superficially there is the scarf skin or epidermis and more deeply the dermis or true skin. The epidermis under the micro- scope is seen to consist of five layers. On the surface is the horny layer or stratum corneum (see fig. 1) composed of layers of scale- like cells, the walls of which are turned into the horny substance keratin. Deep to this is a thin layer of scale-like cells without keratin known as the stratum Iucidum. Deeper still is a layer, the stratum granulosum, in which the cells are not so flattened and contain granules of a substance known as eleidin. In the fourth layer, stratum mucosum or stratum Malpighii, the cells are polygonal and are connected

together by delicate prickle-like processes. It is in the deeper layers of these cells that the pig- ment of the negro's skin is found. The fifth and deepest layer of the epidermis is the stratum germinativum, in which there is only one layer of columnar cells. The whole of the epidermis is non-vascular, and it will be noticed that as the different layers approach the surface the cells become more and more flattened'. The true skin, dermis or corium is composed of a felted network of white fibrous tissue with a small number of yellow elastic fibres interspersed. It is divided into two layers.

The superficial or papillary layer lies next to the epidermis and is raised into a number of papillae or conical projections which fit into corresponding depressions on the deep surface of

the epidermis. In sensitive parts like the palms and soles these papillae are specially prominent and form wavy lines, each of which consists of a double row between which the ducts of the sweat glands «pass on their way to the surface. So large are the papillae in these situations that the epidermis is also raised into ridges, and these in the fingers form the characteristic whorls so valuable for purposes of identification. The papillae contain leashes of blood-vessels, and in some of them are special tactile corpuscles in which the nerves end (see Nervous System).

In the deeper or reticular layer of the true skin the fibrous feltwork is looser and encloses pellets of fat. It also contains a network of blood-vessels and nerves, and in some places a layer of striped or unstriped muscle. Where hairs are present the hair follicles lie in this deeper layer, which gradually merges with the subcutaneous fatty tissue (see fig. 2).

As appendages of the skin are found the hairs, the nails and the sebaceous and sweat glands.

Hair. — The hairs are found in man on the scalp, eyelids, eyebrows, armpits, pubic region, vestibule of the nose, external auditory meatus, face, ventral surface of the trunk and dorsal surfaces of the leg, forearm and hand; indeed the only places which are quite free from them are the palms of the hands, soles of the feet and the glans penis. In some places, such as the armpits, pubic region and the face of the male they grow to a considerable length at and after puberty. They are of great anthropological interest since they differ in colour and texture in different races, sometimes being straight, sometimes wavy, sometimes curly. The amount and distribution of long hairs also vary with the race. In section it is only the straight hairs which are circular; wavy and curly hairs are oval. In the centre of each hair is the medulla or pith, though this is not always present; it is composed ctf nucleated cells containing pigment, fat and air spaces. Outside this is the fibrous layer or corteXj also containing pigment and air

spaces, while most superficially is the cuticle made up of overlapping scales. The hair grows at its root from a hair follicle (see fig. 2), which is a tubular inpushing of the epidermis into the true skin or, in the case of large hairs, deeper still into the superficial fascia. It is divided into an inner and outer root sheath, the former representing the more superficial layers of the epidermis, the latter the deeper layers. At the bottom of the follicle the hair enlarges to form the bulb, and into the lower part of this a vascular papilla projects from the true skin. The cells of the hair are derived from, and are continuous at the bulb with those of the outer root sheath, and therefore with the deeper layers of the epidermis.

The hair follicle always projects somewhat obliquely into the skin, and attached to the side toward which it is leaning is a small band of non-striated muscular fibres called arrector pili. When this acts it diminishes the obliquity of the hair and so makes it " bristle " or " stand on end," while a general con- traction of these small muscles leads to the familiar condition of " gooseflesh."

Nails. — The nails are specially thickened parts of the epidermis, and are divided into a root and a body. The former is concealed by a fold of skin, and the corium on which it lies is known as the nail matrix. The body of the nail also lies on the corium, or true skin, which forms the nail bed and is very sensitive. This body of the nail is formed by the stratum germinativum and stratum mucosum in its deeper part, and more superficially by the stratum Iucidum, which is here very much thickened and converted into keratin or horn. Near the root of each nail is a semi-lunar area which is more opaque than the rest and forms the white lunula.
Sweat Glands. — Sebaceous glands are found wherever there are hairs, however rudimentary, and open by their ducts into the superficial part of the hair follicle (see fig. 2). Their deeper or secreting part divides into a number of bag-like alveoli composed of cells, which secrete oil droplets. There may be two or three glands to each hair follicle, and their size does not vary directly with that of the hair, since they are very large in the nose, where the hairs are quite rudimentary. They are also found on the labia minora and nipples, where no hairs are. Sudoriparous or sweat glands (see fig. 2) are found all over the surface of the body,

but are specially numerous on the palms and soles. It is esti- mated that in the palm there are nearly 3000 to a square inch, while in the skin of the back they do not reach 500 to the same area. In the armpits and groins they are very large. Each consists of a single long tube, lined by columnar epithelium, and coiled up into a ball or glomerulus in the subcutaneous tissue, after which it pierces the corium and epidermis to reach the surface

at the porus sudorijerus. Where the stratum corneum of the epidermis is thick the duct is twisted like a corkscrew as it goes through.

The glands of Moll in the eyelids and. the ceruminous or wax glands of the ear are modified sweat glands; the former, when inflamed, cause a ” sty.”

Embryology

The skin is derived partly from the ectoderm and partly from the mesoderm of the embryo. The whole of the epidermis

Duct of sweat gland

I89

■” Oblique section through Papilla of hair a Pacinian corpuscle From Robert Howden, in Cunningham’s Text-Book of Anatomy.

Fig. 2. — Vertical section of the Skin (schematic).

and its appendages are ectodermal, and in the early embryo consist ofa single layer of cells; later on this becomes double and the superficial layer is called the epitrichium, which, after the sixth month, is cast off and mixes with the secretion of the large sebaceous glands to form the soapy vernix caseosa with which the foetus is coated at birth. In the meantime the cells of the deeper layer divide and form the various layers of the epidermis already enumerated It is held, however, by some observers that part of the epitrichium remains as the stratum corneum. The mesodermal cells belong to the mesenchyme, and form the fibrous tissue of the true skin as well as the arrectores pilorum muscles and, in the scrotum, the dartos layer of unstnped muscle. In the sixth month fatty tissue appears in the deeper parts, and so the fat of the superficial fascia or sub- cutaneous tissue ls.formed. The nails are said to appear as thicken- ings of the epidermis at about the ninth week, quite at the tips of the digits. Later on they shift to the dorsal side, and in doing so carry the nerves in the nail bed with them. This is tne only explanation available of the fact that the ventral nerves to the tips of the fingers encroach on the dorsal area. By about the twelfth week the nails are perfectly formed, but tney do not reach the level of the finger tips until the eighth month. The hairs are developed in the third month of foetal life by ingrowths of the stratum mucosum ot the epidermis into the corium During the fourth and fifth months the body becomes covered by fine unp : gmented hairs which are known as lanugo; these begin to disappear about the eighth month, but some remain until after birth. On the scalp, however, the hair at birth is otten more deeply pigmented than that which succeeds it The sebaceous and sweat glands, like the hair follicles, are ingrowths of the stratum mucosum of the epidermis

into the corium. The former

become very large in the later months of embryonic life, and secrete a large part of the above-mentioned vernix caseosa. The develop- ment of the mammary gland from modified sebaceous glands has already been referred to (see Mammary Gland).

For further details see J. P. M'Murrich, Development of the Human Body (London, 1906) ; J. C. Heisler, Text-book of Embryology (London, !907); Quain s Anatomy, vol. i. (London, 1908).

Comparative Anatomy In the larval (gastrula) stage of the Amphioxus (lancelet) cilia are present on the surface, and in the superficial epidermal cells of some fishes and amphibian larvae there is a striated laver on the free edge which is looked upon as a relic of ancestral cilia."

Skin Glands.— The skin glands of the Cyclostomata (hags and lampreys) and fishes are generally unicellular and secrete slime which protects the surface of the body ; the amount of slime poured cut by some of the cyclostomes is enormous. Many of these slime cells from their shape, are spoken of as goblet cells. Some of the tele ostean fish have poison glands at the bases of their dorsal fins and opercula.

In the mud fish (Dipnoi) and amphibians multicellular

spherical glands appear as involutions of the ectoderm

S3 Sometimes, as in the so-called parotids of the toad, these form

. | large masses. Reptiles and birds are singularly wanting in

•1 s u S lands > though the latter have a large uropygial gland at

w the root of the tail which secretes oil to lubricate the

feathers; it is the chief constituent of the " parson's nose "

of the fowl. In mammals, except the Cetacea, the sebaceous

and sudoriparous glands already described in man are found ;

some of the former sometimes attain a large size, as in the inter-

digital gland of the sheep, Midler's gland at the back of the

a pig s knee and the suborbital gland of ruminants. In addi-

“•§ . tlon .£° these > special scent-producing glands are often found £ in different parts, the most remarkable of which, perhaps, are the scent glands beneath the tail of the skunk, while in male monotremes there is a special poison gland in the leg which is connected with a spur in the foot.

Pigment.— Pigment cells are present both in the dermis and epidermis of fishes and amphibians, and the pigment may be either intra- or extra-cellular. In many cases it is under the control of the nervous system, so that forms like the flat-fish and the common frog can adapt their coloration to that of their g background. In animals permanently excluded from the light, .a pigment is absent. In reptiles movable pigment cells are often ˆ found, as in the chameleon, while in birds the pigment is some- _§ times of great brilliancy in the necks and wattles. In mam- „ mals, as in man, the pigment is confined to the cells of the stratum mucosum layer of the epidermis.

1 Scales — In the elasmobranch fishes scales are found com- 3 £° sed of en amel superficially, and of dentine and bone deeply ■§ ihey are developed from the epidermis and dermis, and in ” almost every way resemble the teeth of these animals, which

are only modifications of them. The bony basal part of each scale is plate-like, hence this kind of scale is known as placoid. In the ganoid fishes, such as the sturgeon, much larger plaques called ganoid scales form a complete armature. In the teleos- tean fishes the scales overlap like tiles and are either cycloid . having a smooth border, or ctenoid, in which the free posterior border is serrated. Existing amphibians are usually remark- able for absence of any skin armour, though in fossil forms _ (Stegocepha a) it was very complete. The reptilian class is specially noticeable for the production of epidermal scales, which undergo many modifications. In the Ophidia they are cast off periodically in one mass as the snake’s slough,

while in the Chelonia they form the different varieties of tortoise-shell. Bony structures developed in the dermis, may underlie these epidermal horny thickenings, arid are very strongly developed in the dorsal and ventral bony shields of the Chelonia (carapace and plastron), which secondarily fuse with the true endoskeleton. The armadillo is the only mammal which has a true bony exoskeleton.

Feathers.— Birds are remarkable for the possession of feathers, which are highly modified scales. The embryonic or down feathers are simple, and consist of a brush of hair-like barbs springing from a basal quill or calamus. From the whole length of each barb a series of smaller barbules comes off like branches of a shrub. The adult or contour feathers are formed at the bottom of the same follicles which lodge the down feathers and, by their growth, push these out. At f St u u y a u e nothln S more than enlarged down feathers, but soon one ol the barbs grows enormously, and forms a main shafUor rachis to which the other barbs are attached on either side. From the sides of the barbs grow the barbules, just as in the down feathers, and these in the case of the large wing feathers (remiges) and tail leathers (rectnees) are connected by minute hooks so that the feather vane as opposed to the shaft, has a more resistant texture than it has in the feathers of the back or breast. The bird's moult is comparable to the casting of the scales in the reptiles.

Hairs . — Hairs are only found in the mammalian class, and are divided into the long tactile bristles or vibrissae and the smaller hairs which maintain the warmth of the body. In some animals the hair ot the body is composed of long, stiff hairs, which are probably

specialized for protective purposes, and short, soft hairs, which form the fur and keep in the warmth. Sometimes these long hairs are greatly enlarged and hardened to form protective spines as in the porcupine, hedgehog, spiny mouse and spiny ant-eater (Echidna).

Horns. — Horns are of three kinds: (i) antlers, (2) hollow horns and (3) hairy horns of the rhinoceros.

Antlers are growths of true bone and, except for their very vascular covering of skin (velvet), are not exoskeletal structures. They grow with great rapidity, and in the deer family are renewed each year. As soon as their growth is finished the skin covering dries up and strips off. The small horns of giraffes are also bony structures though permanent.

The hollow horns of the ruminants (Bovidae) are cases of hardened epidermis which fit over a bony core and are permanent. They are found in both sexes, and in this differ from the antlers of the deer, which, except in the reindeer, are confined to the male. In the prongbuck (Antilocapra) the hollow horns are shed periodically.

The hairy horns of the rhinoceros are a mass of hairs cemented together by cells. The hairs grow from dermal papillae, but differ from true hairs in not being sunk into hair follicles.

Claws and Hoofs. — These are modifications of nails, but whereas in nails and claws the structures are confined to the dorsal aspect of the digits, in hoofs they spread to the plantar surface as well. It has been shown in the embryological section of this article that the nail appears at the very tip of the digit, and in this position it remains in many amphibians, e.g. giant salamander, while in hoofed mammals it develops both ventrally and dorsally. In the Felidae the claws are retractile, but the real movement occurs between the middle and terminal phalanges of the digits.

Spurs.— Spurs are quite distinct from nails and claws; they are very common in birds as horny epidermal sheaths covering bony outgrowths of the radial side of the carpus, metacarpus or meta- tarsus. The spur- winged goose has a carpal spur; in the screamers (Palamedea and Chauna) the spur or spurs are metacarpal, while in many gallinaceous birds (e.g. common fowls and pheasants) metatarsal spurs are found. In the mammals the male monotremes (Echidna and Ornithorhynchus) have spurs attached to an extra (? sesamoid) bone in the hind leg, perforated for the duct of the already mentioned poison gland.

Beaks. — Certain fishes belonging to the family Mormyridae have a fleshy prolongation of the lower Tip, and ate hence termed beaked fishes. In the Amphibia Siren and the tadpoles of most Anura (frogs and toads) have small horny beaks. In the Reptilia horny beaks are found in the Chelonia, while in birds beaks are constant and replace the teeth in modern species. In mammals a horny beak is found in Ornithorhynchus, though it coexists with true teeth in the young and with horny pads in adult specimens. In all these cases the beaks are formed from cornified epidermal scales.

Baleen. — The baleen which is found in the mouths of the Balae- nidae or whalebone whales is a series of flattened triangular horny plates arranged on either side of the palate. The inner edges and apices of these are frayed out into long fibres which act as strainers. In Balaena mysticetus, the Greenland whale, there are nearly four hundred of these plates, the longest of which often exceed 10 ft. In its development baleen resembles rhinoceros horn in that it consists of a number of epidermal hair-like fibres cemented

together and growing from dermal papillae, though not from true hair follicles. For further details and literature see R. Wiedersheim, Comparative Anatomy of Vertebrates, translated by W. N. Parker (London, 1907) ; S. H. Reynolds, TheVertebrate Skeleton (Cambridge, 1897).

(F. G. P.)

Ethnology

The colour of the human skin has always held an important place among physical criteria of race. Physiology explains colour as a consequence of climate and even diet. The pigment or colour- ing matter under the epidermis, or rather under the second or Malpighian skin, is not peculiar to the Negroid and other coloured races, but is common to all human beings. It is simply more abundant in certain peoples, and this abundance is attributed to the stimulating action of the solar heat, combined with moisture and an excess of vegetable food, yielding more carbon than can be assimilated, the character being then fixed by heredity. Theodor Waitz quotes examples proving " that hot and damp countries favour the darkening of the skin," and that the same race inclines to be darker in low marshy districts than on the hills. C. R. Lepsius asserts that the hotter" the climate the darker the negro, pointing out that if you follow the line of greatest heat from Africa into Asia, it is in those regions of the latter continent that the darkest Asiatics are found. Many apparent exceptions to this general law occur, but they may be explainable as due to local causes. Thus Schweinfurth (Heart of Africa) believes that the reddish tint of the Bongos and other of the peoples inhabiting the hot, moist White Nile district is due to the

ferruginous nature of the laterite soil: the hue of the A-Zandeb (Niam-Niam) of the Welle valley being possibly explicable in the same way. In South America all shades of complexion intermingle. Thus in Bolivia the coppery Maropas, the dark brown Aymaras, the yellowish Moxos, and the light Mosetenos, Siriones, and Guarayos are, so to speak, neighbours. In Austral- asia there is the contrast between the yellow-brown Malays and the sooty-black Tasmanians. Such deviations from the colour-law may be attributed to descent (dark peoples migrating to cold, light to tropical countries), or to such varied causes as dryness, moisture, food and the vegetable peculiarities of the land, by all of which the complexion may be affected, and the influence of temperature mitigated.

The colour of the human skin cannot, then, be regarded as an entirely trustworthy racial test, even blackness not being an exclusively negro characteristic. It serves, however, to divide Man into three fundamental types corresponding to the three great ethnic groups, viz. the White, the

Yellow and the Black man. The first predominate in Europe, the second in Asia, while the third have their chief centres in Africa and Melanesia. Inter- breeding and, in a lesser degree, the influence of environment have caused the occurrence within the three main groups of almost every shade and tint of complexion. Thus the colour of the skin affords a faulty basis of ethnological classification, since in the same ethnic group it varies so widely and races of one group resemble in this particular races of another. The so-called Red Indians are usually classified as a fourth group, but they are not really red-skinned. The name has come about through their custom of smearing their faces with red ochre. But among the American aborigines, side by side with the yellow, olive brown or even black (e.g. the Charruas of Uruguay), there are tribes of reddish-yellow or coppery hue. This tint is found also in certain African tribes. The palms of the hands and the soles of the feet of negroes are never black, but always yellowish, and in all coloured races the back of the body is a shade darker than the front.

It is noteworthy that the skin of the coloured races is always of a lighter tint in the newly-born than in the adult ; the negro baby is born a light grey colour, and the dark pigment is absent in the negro foetus. On the eighth day, sometimes as early as the third, the negro infant changes its colour to a hue nearly as dark as that of its parents. It would seem as if the blackness is associated with the general thickening of the skin and is an accompaniment of the general organic adaptation of the negro to his hot malarious climate. The effects of sunburn vary with different races. It is with the races having intermediate pigmentation, such as the dark Europeans and the yellow peoples, that the effect is most noticeable. With the former the sun burns the skin uniformly, making them of the tint of mulattoes. The colour so acquired is merely temporary. It diminishes in winter, and disappears entirely on their return to a cold temperate climate. With the Asiatics the sun causes different tints. The skins of the Indo-Chinese and the Malays become dark olive. The Fuegians and Galibis turn brick-colour or dull red. The Chinese skin turns darker in winter and paler in summer. Among certain peoples whose skins are naturally dark the parts of the body exposed to the light and air are often lighter than those covered by their clothes. This is the case with the Fuegians and the Sandwich Islanders. The fair European skin reddens under the sun, passing from pale red to brick red or to patches of deep red.

SKIN DISEASES. The diseases of the skin do not essentially differ from those of the other organs of the body. Like these, the skin is composed of cells resting on a connective tissue framework, in which run the vessels which nourish it and the nerves which keep up its communications with the rest of the body. But it has certain differences from other organs, some dependent on its structure and some on its exposed position. Thus, instead of, like the kidney, to which it may best be com- pared, having its

epithelium faced by epithelium, all lies open, and the various processes are all " one-sided." There are no depths to be attacked, and any diseases, if they spread, must do so superficially; spreading as they often do equally in all directions, the diseases of the skin have a tendency to' assume a circular form, independently of any parasitic cause, though when such cause is present the patches are of a more perfectly circular shape. Further, from the extent of its superficial area and its exposed position, the skin is liable to be attacked by more forms

of irritation, parasitic or other, than any other organ of the body. Every stage and variety of disease is open to view; minute differences, minor or important, are at once noted; and thus it is that the recognized distinct maladies of the skin are so numerous. In no other organ, with the partial exception of the eye, can the changes be watched from day to day; in none can so many stages of the same disease be simultaneously observed; and in no other is it so simple a matter to remove and instantly fix for microscopic examination the living tissue.

The multitude of its affections renders the difficulties of arrang- ing the diseases of the skin very great, and the absence of any generally accepted scheme of classification has always been and still remains one of the main obstacles to their intelligent study. The older systems, constructed before the days of bacteriology, were commonly based on the form which the eruption assumed (scaly, moist, purulent), but they usually contained in addition a certain number of diseases under the heading of Parasitic. Though obviously illogical, such systems served well enough while the recognized parasitic diseases were few, such as those caused by such gross parasites as the Acarus scabiei (the itch mite), the pediculi (lice), and the hyphomycetic fungi such as the Achorion Schoenleinii. The discoveries of bacteriology have enormously enlarged this class, but the difficulty is that one and the same disease is regarded as parasitic by one authority, as dependent on nerve influence by another, while a third assumes an agnostic position.

The following is a useful working classification.

1. The Dermatoneuroses. — (a) Sensory: anaesthesia, hyper- aesthesia, pruritus; (b) vaso-motor: urticaria, erythema multiforme, angio-neurotic oedema, pellagra, purpura, certain forms of eczema, erythema pernio (chilblains), erythema nodosum, herpes, cheiropom- pholyx, alterations of pigment; (c) trophic: sclerodermia, perforating ulcer, Charcot's bed-sore,

the lesions of certain forms of leprosy, Raynaud's disease, Morvan's disease, pemphigus, lupus erythematosus, the skin lesions of syringomyelia ; (d) glandular, according to the gland affected, — as the sweat-glands, hyperidrosis, haematidrosis, bromi- drosis, miliaria papulosa, or prickly heat; the sebaceous glands, rosacea, seborrhoea ; the hair follicles, alopecia, greyness.

2. Local Inoculable Diseases. — The agents producing these are parasitic in origin and may be divided into those caused by animal parasites, vegetable parasites and various micro-organisms, (a) Animal parasites: scabies, due to the Acarus scabiei or itch mite; pediculosis, guinea-worm disease, due to the Dracunculus medinensis; trichinosis, due to the cysticercus cellulosae; elephantiasis, due to the filaria sanguinis hominis; various eruptions produced by accidental parasites such as the harvest bug (leptus autumnalis) , the jigger or sand flea {Dermatophilus penetrans), met with in the tropics. (b) Vegetable parasit.es: ringworm, caused by the Trichophyton tonsurans; favus, caused by the Achorion Schonleinii; tinea versicolor, caused by the Microsporon Furfur; erythrasma, due to the Microsporon minutissimum; actinomycosis, due to the Acti- nomyces or ray fungi; mycetoma or Madura foot, due to Dyscomyces; aspergillosis and pinto, caused by an unknown fungus; streplothrix infections other than from the ray fungus, sporotrichosis; blastomy- cetic dermatitis, due to a fungus of the yeast family. ' (c) Micro- organisms: impetigo contagiosa, caused by inoculation with strepto- cocci; furunculosis or boils, due to the staphylococcus pyogenes aureus and albus; carbuncle, a deeper infection also caused by staphylococci; anthrax, caused by the bacillus anthracis; sycosis, due to a staphylococcic infection of the hairy parts; acne, due to a bacillus called by Gilchrist the bacillus acnes, thought to be identical with the micro-organism of Sabouraud and Unna; furunculosis orientalis (Delhi boil, Aleppo boil, Biskra button), a tropical disease in which the parasite is not yet identified; certain forms of eczema, notably the pustular forms.

3. General Inoculable Diseases. — Tuberculosis, manifesting itself as lupus vulgaris, verruca necrogenica, erythema induratum or as tuberculous ulcerations. In all these Koch's bacillus has been identified. Syphilis, caused by the Spirochaeta pallida of Scbaudinn and Hoffmann, in which there are primary, secondary and tertiary skin lesions. Leprosy due to the bacillus lepra. Yaws (framboesia), caused by a specific parasite, the Spirochaeta pertenius. Glanders, due to inoculation with the bacillus mallei. Added to these are erysipelas and the various exanthematous fevers.

4. Diseases of uncertain Aetiology. — Psoriasis, pityriasis rubra, pityriasis rosea.

5. Eruptions due to Drugs. — These may follow on the internal

administration of chloral belladonna, copaiba, phenazone, mercury, quinine, tar, stramonium, sulphonal, salicylic acid and the salicylates and bromides.

6. New Growths. — Benign: cheloid and fibroma, naevus pigmen- tosa, vascular naevi, telangiectasis, lymphangioma, myoma, mycosis fungoides, papilloma, adenoma, moluscum contageosum, rhinoscleroma,

cysts and warts (including corns and horny growths). Malignant: sarcoma, carcinoma, rodent ulcer, Paget' s disease.

The skin is liable to the same pathological conditions as other structures of the body, such as changes in vascularity, inflammations, invasion by parasites and new growths together with changes due to the special structure of the skin such as hypertrophy and atrophy, disorders of the sweat glands and sebaceous glands and alterations of pigment. Some of the groups of diseases classed as the der- matoneuroses are manifestations of widely different diseases; thus anaesthesia and hyperaesthesia occur in hysteria; while the acute bed-sore of Charcot (a form of local gangrene) and perforating ulcer are generally due to an inflammatory condition of the nerve trunks. In the group of diseases known as purpura, where haemorrhages of varying size make their appearance on different parts of the skin, the lesion is considered to be due to a toxin or autotoxin acting directly on the vascular walls. In some cases we know it to be inorganic, such as phosphorus or mercury, in others organic as smallpox, measles, typhus or tuberculosis; or the haemorrhages may occur in connexion with new growths such as sarcoma and lymphadenoma. Why these very different causes should combine to produce the phenomenon of haemorrhage is not clear.

The disease known as urticaria or nettle-rash is probably due to some irritant poison circulating in the blood, but the causes pro- ducing it vary from constitutional diseases such as gout and malaria to certain articles of diet which act as gastro-intestinal irritants such as pork and shell-fish. It has been known also to follow on mental emotion and is said to be frequent in the neurotic diathesis, but an attack may be set up by any local irritant such as stings or bites. The pathology of the lesions in this disease is as follows: reacting to some irritant, the blood-vessels dilate, serum is poured out from them into the tissues around, and compressing the vessels from without empties them of blood. This explains the white centre of the urticarial weal, the red margin of which is the clinical expression of the dilated and uncompressed vessels at the border. In those diseases grouped together under the name of erythema, although the majority of authors place them under the heading of inflammation, there is a good deal suggestive of a close relation to urticaria. Some cases are caused by the

ingestion of certain drugs, a good many are directly associated with the rheumatic poison, while others are apparently connected with fermentative changes in the gastro- intestinal tract. Thus all those examples of the disease with the cause of which we are approximately acquainted are readily enough attributed to some circulating irritant. This disease differs histologi- cally from urticaria in the persistent dilatation of the vessels. Although serum is poured out from them as freely as in urticaria, the dilatation of the vessels is so active that they are not compressed as in that disease, while the presence of numerous cells around the vessels seems to suggest a more severe irritant, and the fact that the lesions are clinically more persistent further confirms that suggestion.

When certain irritants are applied to the skin we know before- hand what effects they will produce. Thus croton oil produces a vesicular and pustular eruption, that of cantharides is vesicular or bulbous, while other drugs are followed by results dependent on their concentration, ranging from a mere redness produced by dilute applications to actual death of the skin from concentrated ones. With the milder irritants which produce the results clinically known as eczema we have invariably more or less pronounced certain definite phenomena. The blood-vessels dilate; serum is exuded from them — it may be merely into the deeper layers of the skin, or it may reach into and among the epidermic cells, or burst its way through these and appear in drops on the surface. The epithelial cells are, immediately if the irritation be slight, later if it be more severe, stimulated to increased activity of growth and production; and this activity, often misdirected, is so great that the normal process of hardening in the cells is interfered with, and we have what is known as parakeratosis (irregular cornification) and the conse- quent production of scales. Should this be the prominent pathologi- cal change, the exudation spends itself among the cells of the scales, and a condition pathologically moist appears to the clinical observer as a dry eruption. Thus according to the reaction — which is pre- sumably largely dependent on the irritant to which it is due — we have various degrees and forms of inflammation of the skin, all of them covered clinically by the term eczema. When such a dermatitis is produced experimentally by the application of such an irritant as croton oil we can more or less accurately predict the duration of the inflammation, which gradually becomes less and less and usually terminates in dry scaling. So in eczema, as long as the irritant con- tinues to act, so long will its results be evident on the skin. Un- fortunately the irritant which is the cause of eczema is still a matter of dispute.

In studying other inflammations we have the advantage of de- finitely knowing their cause. Thus in impetigo contagiosa we know, mainly owing to the work of Saboraud, that the cause of the disease is the streptococcus pyogenes. The first result of inoculation is a minute red spot (dilatation of

the vessels) , which is ra pidly followed by the appearance on the surface of a vesicle or bleb (exudation of serum), which is soon converted into a pustule, the whole dries up into a scab, which when thrown off discloses a healthy or slightly reddened skin. Fresh areas may be constantly attacked.

In ringworm, where the cause of the disease is the growth in the

Selective distribu- tion.

superficial layers of the skin of one or other of the different varieties of fungus grouped together under the common name of ringworm, a reaction more resembling that of eczema is produced. There is the same dilatation of the vessel with exudation of fluid, sometimes reaching the surface in the form of vesicles, sometimes spending itself through and among the epidermic cells and only evidenced clinically by the presence of more or less scaling. In other cases the exudation early becomes purulent (this is said to occur regularly when the disease is contracted from the horse), a change which, though occasionally noted, is by no means frequent in eczema.

The inflammations of the corium or deeper layer of the skin are due, with very few exceptions, to the growth of well-known organ- isms. Erysipelas, furuncle, anthrax and glanders are diseases which run an acute course and rapidly terminate, the two former usually in re- covery, the two latter often fatally. The other more chronic affections all follow one course; in their earlier stages there is a new growth of connective tissue cells in their lowest forms (granuloma), and this later breaks down, either rapidly, as in syphilis, or slowly, as in tuberculosis and leprosy. Most of these diseases leave behind them a well-defined scar.

The new growths of the skin are the same as those found else- where. Only two present special characters requiring notice here. Keloid is a peculiar form of fibroma which, although benignant as regards any general infection, invariably recurs locally after re- moval. Rodent ulcer is a form of cancer which occurs usually on the face, and whose malignancy is almost entirely local. The class of atrophies of the skin comprises those diseases where the atrophy is primary, and those where it succeeds to previous hypertrophic or inflammatory changes. Anomalies of pigmentation are those of excess and lack. Chloasma, in which dark patches appear, most frequently on the face, is usually associated with disease of some internal organ, such as the liver or uterus, being frequently observed in pregnancy. The cause of vitiligo, in which the pigment normally present

disappears from certain areas, a phenomenon more striking in coloured than in white races, is unknown.

Diseases of the skin tend to manifest themselves in certain parts of the body; i.e. certain diseases exert a selective influence on the sites of their eruption. Symmetry is characteristic of eczema, psoriasis, drug rashes and the eruptions of specific fevers, while others, such as herpes zoster, ring-worm, tertiary syphilis and new growths, tend to be asymmetrical. Eczema selects the flexor aspect of the limbs and the neighbourhood of folds of skin and opposed surfaces, while psoriasis favours the extensor surfaces and the outer side of the elbows and knees. In certain diseases of nervous origin, notably in herpes zoster, the eruption follows the course of a certain nerve. In the face we get erythema, lupus erythematosus, rosacea, eczema, actinomycosis, &c, and syphilitic and malignant ulcers. Rodent ulcer usually selects the face, and generally the nose or orbit. The face too is usually the selective site of lupus vulgaris. The scalp is the chief site oi two varieties of lesion — the pustular, as in pustular eczema and impetigo contagiosa, or the dry and scaly eruptions, as psoriasis, ringworm and squamous syphilides. The genital organs are the seat of vesicular eruptions such as herpes or eczema or occasionally scabies; they are also the seat of ulcers, chiefly venereal, and of secondary syphilides. Scabies or itch tends to occur on the hands, and the characteristic burrows are noticeable between the fingers. The hands too are subject to various forms cf eruption known as trade eruptions, due to the handling of paraffin, tar, sugar, salt, lime, sulphur, &c. The lesions mostly simulate eczema, and are frequent amongst tanners, dyers, chemists, bakers and washer- women, and workers in the electro-plating trade. Exposure to the X-rays sets up a form of dermatitis, either an acute erythematous form due to a single prolonged exposure or a chronic form affecting operators who have been exposed over prolonged periods. Ulceration and considerable destruction of the epidermis may take place together with the occurrence of warty growths which tend to become epitheliomatous.

For an account of the treatment of the best known skin diseases see under their separate headings.

SKINNER, JAMES (1778-1841), British military adventurer in India, son of Lieut. Colonel Hercules Skinner, was born in India in 1778, his mother being a Rajput lady. At the age of eighteen he entered the Mahratta army under de Boigne, where he soon showed military talents; and he remained in the same service under Perron until 1803, when, on the outbreak of the Mahratta War, he refused to serve against his countrymen. He joined Lord Lake, and raised a regiment of irregular horse called " Skinner's Horse " or the " Yellow Boys," which became the most famous regiment of light cavalry in the India of that day. He was present at the siege of Bharatpur,

and in 1818 was granted a jagir yielding Rs. 20,000 a year, appointed lieutenant colonel in the British service and made C.B. He had an intimate knowledge of the character of the natives of India, and his advice was highly valued by successive governor-generals and com-

manders-in-chief. He died at Hansi on the 4th of December 1 841 , and was buried in a church at Delhi which is called after his name.

See J. Baillie Fraser, Military Memoir of Lieut.-Colonel James Skinner (185 1).

SKINNER, JOHN (17 21-1807), Scottish author, son of John Skinner, a parish schoolmaster, was born at Balfour, Aberdeen- shire, on the 3rd of October 1721. He had been intended for the Presbyterian ministry, but, after passing through Marischal College, Aberdeen, and teaching for a few years, he took orders in the Episcopal Church, and was appointed to the charge of Longside in 1742. Very soon after Skinner joined the Episcopalians they became, in consequence of the Jacobite rebellion in 1745, a much persecuted remnant. Skinner's church was burnt; his house was plundered ; for some years he had to minister to his congrega- tion by stealth; and in 1753 he suffered six months' imprison- ment for having officiated to more than four persons besides his own family. After 1760 the penal laws were less strictly en- forced, but throughout the century the lot of the Episcopalian ministers in Scotland was far from comfortable, and only the humblest provisions for church services were tolerated. He died at the house of his son, John Skinner, bishop of Aberdeen, on the 16th of June 1807. It is by his few songs that Skinner is generally known. A correspondence took place between him and Burns, who considered his " Tullochgorum " " the best Scotch song Scotland ever saw," and procured his collaboration for Johnson's Musical Museum. Other of his lyrics are: " The Monymusk Christmas Ba'ing," a football idyll; " The Ewie wi' the Crookit Horn " and " John o' Badenyon." His best songs had stolen into print; a collection was not published till 1809, under the title of Amusements 0} Leisure Hours. Throughout his life Skinner was a vigorous student, and published in 1788 an Ecclesiastical History of Scotland (2 vols.) in the form of letters.

A Life of Skinner, in«connexion with the history of Episcopacy in the north of Scotland, was published by the Rev. W. Walker in 1883. His songs and poems were edited by H. G. Reid (1859).

SKINNER'S CASE, the name usually given to the celebrated dispute between the House of Lords and the House of Commons over the question of the original jurisdiction of the former house in civil suits. In 1668 a London merchant named Thomas Skinner presented a petition to Charles

II. asserting that he could not obtain any redress against the East India Company, which, he asserted, had injured his property. The case was referred to the House of Lords, and Skinner obtained a verdict for £5000. The company complained to the House of Commons which declared that the proceedings in the other House were illegal. The Lords defended their action, and after two conferences between the Houses had produced no result the Commons ordered Skinner to be put in prison on a charge of breach of privilege; to this the Lords replied by fining and imprisoning Sir Samuel Barnardiston, the chairman of the company. Then for about a year the dispute slumbered, but it was renewed in 1669, when Charles II. advised the two Houses to stop all pro- ceedings and to erase all mention of the case from their records. This was done and since this time the House of Lords has tacitly abandoned all claim to original jurisdiction in civil suits.

See Lord Holies, The Grand Question concerning the Judicature of the House of Peers (1689) ; T. P. Taswell-Langmead, English Con- stitutional History (1905) ; L. O. Pike, Constitutional History of the House of Lords (1894); and H. Hallam, Constitutional History, vol. iii. (1885).

SKIPPON, PHILIP (d. 1660), English soldier in the Civil Wars, was born at West Lexham, Norfolk. At an early age he adopted the military profession and in 1622 was serving with Sir Horace Vere in the Palatinate. He took part in most of the battles and sieges of the time in the Low Countries. At the sieges of Breda in 1625 and 1637 he was wounded, and under his old commander, Lord Vere, he was present when Bois-le-Duc ('s Hertogenbosch) and Maestricht were attacked in 1629. A veteran of considerable experience, Captain Skippon returned to England in 1639, and was immediately appointed to a command in the (Honourable) Artillery Company. In 1642 the Civil I War was fast approaching, and in January Skippon was made

commander of the City troops. He was not present at Edgehill, but he rode up and down the lines of his raw militiamen at Turnham Green, cheering and encouraging them in the face of the king's victorious army. Essex, the Lord General of the Parliament forces, soon made Skippon his major-general, a post which carried with it the command of the foot and the complicated duty of arranging the line of battle, He was with Essex at Gloucester, and at the first battle of Newbury distin- guished himself at the head of the infantry. At the end of 1644 the amazing desertion of Essex when his army was surrounded at Lostwithiel left Skippon in command; compelled to surrender without firing a shot, the old soldier bore himself

with calmness and fortitude in this adversity. At the second battle of Newbury he and Essex's old foot had the satisfaction of recapturing six of the guns they had lost at Lostwithiel. The appointment as major-general of the New Model Army soon followed, as, apart from his distinguished services, there was scarcely another man in England with the knowledge of detail requisite for the post. In this capacity he supported Fairfax as loyally, as he supported Essex, and at Naseby, though dangerously wounded, he would not quit the field. For his conduct on this decisive fieid the two Houses of Parliament thanked him, and they sent him special physicians to cure him of his wound. It was long before he was fit to serve in the field again. He only reappeared at the siege of Oxford, which he directed. At the end of the war he was selected for the command of the forthcoming Irish expedition, with the rank of marshal-general. The discontent of the soldiery, however, which ended in open mutiny, put an end to a command which Skippon had Only accepted under great pressure. He bore a part in all the movements which the army leaders now carried out. A Presbyterian himself, he endeavoured to preserve a middle position between his own sect and the Independents, and to secure by any means a firm treaty with the king. The army outstripped Fairfax and Skippon in action. The major-general Was named as one of the king's judges, but, like his chief, did not take his place. During the Commonwealth period he held high office, military and civil, but ceased to influence passing events. He was one of the members of Cromwell's House of Lords, and, in general, was universally respected and beloved. Age and infirmities prevented him from taking any part in the revolutions, which culminated in the restoration of the Monarchy, and in March 1660 he died. Skippon was a deeply religious man, and wrote several books of devotion for the use of soldiers. One of his few sayings in Parliament, that on the fanatic Naylor, has become famous: " If this be liberty, God deliver us from such liberty! " See Vicars, English Worthies (1647).

SKIPTON, a market town in the Skipton parliamentary division of the West Riding of Yorkshire, England, 26 m. N.W. of Leeds by the Midland railway, served also by the Lancashire and Yorkshire railway. Pop. of urban district (1901) 11,986. It is picturesquely situated in the hilly district of the upper valley of the river Aire, the course of which is followed by the Leeds and Liverpool canal. The strong castle built by Robert de Romille in the time of the Conqueror was partly demolished in 1648, but was restored by the countess of Pembroke. Of the ancient building of de Romille all that remains is the western doorway of the inner castle. In the castle grounds are the remains of the ancient chapel of St John. The church of the Holy Trinity, mainly Perpendicular, was also partly de- molished during the Civil War, but was restored by the countess of Pembroke. The free grammar-school was founded in 1548 by William Ermysted, a canon

of St Paul's, London. There are also science and art schools. There are extensive woollen and cotton factories, and, in the neighbourhood, a large limestone quarry.

Skipton was the capital of the ancient district of Craven. At the Norman accession it became part of the possessions of Earl Edwin, and was granted to Robert de Romille. Subse- quently it went to the Albemarle family, but was, again vested in the Crown, and Edward II. bestowed it on, Piers de Gaveston. In 131 1 it came into the possession of the Cliffords. The castle xxv. 7

was taken by the parliamentary forces in 1645 after a desultory siege of three years.

SKIRRET, known botanically as Sium Sisarum (natural order Umbellif erae) , a fleshy-rooted perennial, the roots of which are boiled, and afterwards served up like salsify. It requires a free, deep and much enriched soil, and is generally raised from seeds, which should be sown in drills a foot apart about the end of March, the bed being well-watered in dry weather. The roots will be in use about November, and will continue fresh through the winter if carefully stored.

SKIRVING, ADAM (1719-1803), Scottish song-writer, was born in Haddington in 17 19. He became a farmer at Garleton, near Haddington, and died in April 1803. He was buried at Athelstaneford. His reputation rests on two Jacobite ballads on the battle of Prestonpans, one of which, "Hey, Johnnie Cope, are Ye Waking Yet?" has a well-deserved place in most collections of Scottish songs.

SKITTLES (from O. Eng. sceoten, to shoot), a game played on the green or an alley with a number of " pins " of wood, which are knocked down by an oval, flattened missile called the cheese, about 10 lb in weight, thrown by the player. The game has been in existence for centuries in many countries under different names, quilles in France, Kegelspiel in Germany, skayles, kails, closh, cloddynge, roly-poly, Dutch bowls, &c, in Great Britain. In early days in England " sheepe's joynts " were thrown at the pins, and in many varieties of the game, for instance in the German and Dutch, balls were used, which were rolled along the ground at the pins. As now played, nine large, oval-headed pins are set up in a square, three pins on each side, with a corner angle presented to the player, who stands about 21 ft. from the pins. One step in advance is allowed in delivery. The object is to knock down the greatest number of pins in the fewest throws. In the eastern counties of England four pins only, one on each corner, are generally used. In Dutch skittles the centre pin is called the " king-pin " and often has a crown on its head. The object of this game is to knock down the " king "

without touching any of the other pins, or to knock down all the other pins and leave the king. In Germany and Holland balls have always been used, and the game in that form was introduced into America from the latter country early in the 18th century, but is not now played there, being replaced by bowling.

SKOBELEV, MIKHAIL DIMITRIBVICH (1843-1882), Russian general, was born near Moscow on the 29th of September 1843. After graduating as a staff officer at St Petersburg he was sent to Turkestan in 1868 and, with the exception of an interval of two years, during which he was on the staff of the grand duke Michael in the Caucasus, remained in Central Asia until 1877. He commanded the advanced guard of General Lomakine's column from Kinderly Bay, in the Caspian, to join General Verefkin, from Orenburg, in the expedition to Khiva in 1874, and, after great suffering on the desert march, took a prominent part in the capture of the Khivan capital. Dressed as a Turko- man, he intrepidly explored in a hostile country the route from Khiva to Igdy, and also the old bed of the Oxus. In 1875 he was given an important command in the expedition against Khokahd under General Kaufmann, showing great capacity in the action of Makram, where he out-man ceuvred a greatly superior force and captured 58 guns, and in a brilliant night attack in the retreat from Andijan, when he routed a large force with a handful of cavalry. He was promoted to be major-general, decorated with the order of St George, and appointed the first governor of Fergana. In the Turkish War of 1877 he seized the bridge over the Sereth at Barborchi in April, and in June crossed the Danube with the 8th corps. He commanded the Caucasian Cossack Brigade in the attack of the Green Hills at the second battle of Plevna. He captured Lovtcha on the 3rd of September, and distinguished himself again in the desperate fighting on the Green Hills in the third battle of Plevna. Promoted to be a lieutenant- general, and given the command of the 16th Division, he took part in the investment of Plevna and also in the fight of the 9th of December, when Osman Pasha surrendered, with his army. In January 1878 he crossed the Balkans in a severe snowstorm,

defeating the Turks at Senova, near Schipka, and capturing 36,000 men and 90 guns. Dressed with care in white uniform and mounted on a white horse, and always in the thickest of the fray, he was known and adored by his soldiers as the " White General." He returned to Turkestan after the war, and in 1880 and 1881 further distinguished himself in retrieving the disasters inflicted by the Tekke Turkomans, captured Geok-Tepe, and, after much slaughter, reduced the Akhal-Teke country to submission. He was

advancing on Askabad and Kalat i-Nadiri when he was disavowed and recalled. He was given the com- mand at Minsk. In the last years of his short life he engaged actively in politics, and made speeches in Paris and in Moscow in the beginning of 1882 in favour of a militant Panslavisra, predicting a desperate strife between Teuton and Slav. He was at once recalled to St Petersburg. He was staying at a Moscow hotel, on his way from Minsk to his estate close by, when he died suddenly of heart disease on the 7th of July 1882.

SKOPTSI (Russian skopets, a eunuch), a secret religious sect of Russia. It is an offshoot of the sect known as the " People of God " or Khlysti (see Russia: Religion). It was in 1771 in the government of Orel that the Skoptsi were first discovered by the authorities. A peasant, Andrei Ivanov, was convicted of having persuaded thirteen other peasants to mutilate themselves. His assistant was another peasant, known as Selivanov. A legal investigation followed. Ivanov was knouted and sent to Siberia: Selivanov fled, but was arrested in 177s, Skoptsism, however, increased, and Selivanov escaped from Siberia and proclaimed himself the Son of God incarnate in the person of Peter III. Peter had been popular among the Raskolnihi (schismatics, or dissidents) because he granted them liberty of conscience, and among the peasants because when pillaging the convents he divided their lands among the labourers. Selivanov claimed the title "God of Gods and King of Kings," and . announced his accomplishment of the salvation of believers through a self-inflicted mutilation. For eighteen years he lived in St Petersburg, in the house of one of his disciples, receiving double homage as Christ and tsar. In 1797 he was rearrested by order of Paul I. and imprisoned in a madhouse. Under Alexander I. Selivanov regained his liberty, but in 1820 was again shut up, this time in a monastery at Suzdal, where he died in 1832 in his hundredth year. Skoptsism was, however, not exterminated, and grave scandals constantly arose. The most remarkable feature of this extraordinary sect has always been the type of people who joined it. Nobles, military and naval officers, civil servants, priests and merchants were to be found in its ranks, and so rapidly did the numbers increase that 515 men and 240 women were transported to Siberia between 1847 and 1866 without seriously threatening its existence. In 1872 many trials of Skoptsi took place all over Russia. In 1874 the sect numbered at least 5444, including 1465 women. Of these 703 men and 160 women had mutilated themselves. Repres- sive measures proving useless, an unsuccessful attempt was made to kill the sect by ridicule: Skoptsi were dressed up in women's clothes and paraded with fools' caps on through the villages. In 1876 130 Skoptsi were sentenced in a batch to transportation. To escape prosecution some of the sect have emigrated, generally to Rumania, where they are known as Lipovans. But though the law is strict— every eunuch being compelled to register—

Skoptsism still continues to hold its own in Russia.

As their title indicates, the main feature of the sect is sexual mutilation. This they call their " baptism of fire." Of this there are two kinds, the " lesser " and " greater seal " (i.e. partial and complete mutilation) In this the Skoptsi maintain that they are fulfilling Christ's counsel of perfection in Matt. xix. 12 and xviii. 8, 9. A terrible operation with similar purpose is sometimes performed on the women. The earliest records of such female mutilations date from 1815. Usually the breasts only are amputated. The Skoptsi do not absolutely condemn marriage, and some are allowed to have one child, those at Bucharest two, before being fully admitted. They are not pessimists, desiring the end of the species, but aim rather at the perfection of the individual. Their religious ceremonies include hymn-singing, addresses and frenzied dancing ending in ecstasy, like that of the Khlysti and the Mussulman dancing der- vishes. Strict oaths of secrecy are demanded from all members,

who form a kind of mutual-aid association. Meetings are held late at night in cellars, and last till dawn. At these the men wear long, wide, white shirts of a peculiar cut with a girdle and large white trousers. Women also dress in white. Either all present wear white stockings or are barefoot. They call themselves " White Doves." They have a kind of eucharist, at which pieces of bread consecrated by being placed for a while on the monument erected at Schlusselberg to Selivanov are given the communicants. The society has not always been content with proselytism. Bribes and violence have been often used.- Children are bought from poor parents and brought up in the faith. The Skoptsi are millenarians, and look for a Messiah who will establish an empire of the saints, i.e. the pure, But the Messiah, they believe, will not come till the Skoptsi number 144,000 (Rev. xiv. I, 4),' and all their efforts are directed to reaching this total. The Skojˆtsi's favourite trade is that of money-changer, and on 'Change in St Petersburg there was for long a bench known as the "Skoptsi's bench." Of late years there is said to haye been a tendency on the part of many Skoptsi to consider their creed fulfilled by chaste living merely.

See Anatole Leroy-Beaulieu, The Empire of the Tsars (Eng. trans., 1896), vol. iii. ; E. Pelikan, GescMchtiich-medizinische Uniersuchungen iiber das Skopzentumin Russland (Giessen, 1876); K. K. Grass, Die geheime heilige Schrift der Skopzen (Leipzig, 1 904) and Die russischen Sekten (Leipzig, 1907, tc).

SKOWHEGAN, a township and the county-seat of Somerset county, Maine, U.S.A., on the Kennebec river, about 30 m; N. of Augusta. Pop. (1890) 5068, (1900) 5180, of whom 4266 were inhabitants of Skowhegan village; (1910) 5341. Skowheganis the terminus of a branch of the Maine

Central railway. The township covers an area of about 50 sq. m., and has a public library, a fine court house and Coburn Park. The farms of the township are devoted largely to dairying. Paper and pulp, wooden-ware, woollen and worsted goods, &c, are manufactured. Skowhegan was' settled as a part of Canaan about 1 770. In 18 14 the township of Bloomfield was erected out of the southern portion of Canaan. In 18231 a second township was erected out of what then remained; this was called Milbufn at first, but in 1836 the former Indian name, Skowhegan, said to mean " spearing " or "watching place," was adopted. Blbomfield was annexed to Skowhegan in 1 8(5-1. The village of Skowhegan was incorporated about 1856. SKRAM, PEDER (<;. 1500-1581), Danish senator and naval hero, born between 1491 and 1503, at his father's estate at Urup near Horsens in Jutland. He first saw service in the Swedish war of Christian II. at the battle of Brannkyrka, 1518, and at the battle of Upsala two years later he saved the life of the Danish standard-bearer. For his services in this war he was rewarded with an estate in Norway, where he settled for a 'time with his young consort Elsebe Krabbe. During " Grevens Fejde," or " the CountY War," Skram, whose reputaˆ tion as a sailor was already established, was sent by the Danish government to assist Gustavus Vasa, then in alliance with Christian IH. against the partisans of Christian II., to organize the untried Swedish fleet; and Skram seems; for the point is stiil obscure, to have shared the chief command with the Swedish Admiral Mans Some. Skram greatly hampered the movements of the Hanseatic fleets who fought on the side of Christian II., captured a TVhole Lubeck squadron off Svendborg, and prevented the revictualling of Copenhagen by Lubeck. But the incurable suspicion Of Gustavus I. minimized the successes of the allied fleets throughout 1535. S'krarn's services were richly rewarded by Christian III., who knighted him at his coronation, made him a' senator and endowed 1 him with ample estates. The broad- shouldered, yellow-haired admiral was an out-and-out patriot and greatly contributed as a senator to the victory of the Danish party over the German in the councils of Christian III. In 1555, feeling too infirm to go to sea, he resigned his post of admiral; but when' the Scandinavian Seven Years' War broke out seven years later, and the new king, Frederick II., offered Skram the chief command, the old hero did not hesitate a moment. With a large fleet he put to sea in August 1562 arid compelled the Swedish admiral, after a successful engagement off the coast of Gotland, to take refuge behind the Skerries. This, however, was his sole achievement, and he was superseded at the end of the year by Herluf Trolle. Skram now retired from active service, but was twice (1565-1568) unsuccessfully besieged by the Swedes in his castle of Laholm, which he and his

wife defended with great intrepidity. •■ His estates in Halland were also repeatedly ravaged by the enemy. Skr&m died, at an advanced age, at UVup on the iith of July 1581.

Skram's audacity won for him the nickname of " Denmark's dare-devil," and he contributed perhaps more than any other Dane of his day to destroy the Hanseatic dominion of the Baltic. His humanity was equally remarkable; he often im- perilled his life by preventing his crews from plundering.

See Axel Larsen, Dansk-Norske Heltehistorier (Copenhagen, 1893).

(R. N. B.)

SKRZYNECKI, JAErtZYGMUNT (1787-1860), Polish general, was born in Galicia in 1787. After completing his education at the university of Lemberg, he entered the Polish Legion formed in the grand duchy of Warsaw, as a common soldier and won his lieutenancy at the battle of Raszyn in 1809. At the battle of Leipzig he greatly distinguished himself and at Arcis-sur-Aube, in 1814, saved Napoleon ffonV the sudden on- slaught of the enemy by sheltering him in the midst of his battalion. On the formation of the kingdom of Poland in 1815 Skrzynecki was put in command of five infantry regiments of the line, and on joining the insurrection of 1830 was entrusted with the organization of the Polish army. After the battle of Grochow, he superseded Prince Radziwill as commander in chief; but avoided all decisive operations as he hoped for the pacific intervention of the powers in favour of Poland. In the beginning of March 1831 he even entered into correspondence with the Russian Field- marshal Diebitsch, who was taken very ill both at Paris and London. When at last Skrzynecki did take the offensive his opportunity was gom?, and he com- mitted more than one tactical blunder. At Ostrolenka (26th of May 18.31) he showed his usual valour and considerable ability, but after a bloody contest DiebitSch prevailed and Skrzynecki fell back upon Warsaw, where he demanded a recon- struction of the government and his own appointment as dictator. To this the diet would not consent, though it gave Skrzynecki a vote of confidence. But public opinion was now running strongly against him and" he was forced on th ment he finally settled at Cracow, where he died' in i860. Skrzynecki Was remarkable for his personal Courage and made an excellent -general of divisioˆ, Wit he was unequal to the heavier responsibility of supreme comniknd, and did much harm in that capacity by his irresolution. He wrote Two Victorious Days (Pol.) (Warsaw, 1841); »nd Mis Erreurs (Paris, 1835).

See 5. /. N. Montalembert ' et sa correspondence inidite avec le generalisstnu Skrzynecki' (Montligeon, 1903); Ignacy Pradzynski, The last

four Polish Commanders (Pol.) (Posen, 1865). (R. N. B.)

SKUA, 1 the name for a long" while given to certain of the Laridae (see Gull), birds which sufficiently differ in structure, appearance and habits to justify their separation as a distinct genus, Slercorarius {Lestris of some writers), or even subfamily, Slercorariinae. Swift of flight, powerfully armed, but, above all endowed with extraordinary courage, they pursue their weaker cousins, making the latter disgorge' their already swallowed prey, which is nimbly caught before it reaches the water; and this habit, often observed by sailors and fishermen, has made these predatory, and parasitic birds locally known as "Teasers," "Boatswains, 2 and, from a misconception Of their

1 Thus written by Hoier (circa 1604) as that of a Faeroese bird (hodie Skiiir) an example of which he sent to Clusius (Exotic. Auc- tarium, p. 367). The word being thence copied by Willughby has been generally adopted by English authors, and applied by them to all the congeners of the species to which it was originally peculiar.

2 This name in seamen's ornithology applies to several other kinds of binds, and, though perhaps first given to those of this group, is nowadays most commonly used for the species of Tropic-bird (?.v.), the projecting middle feathers of the tail in each kind being

intent, " Dunghunters." On land, however, whither they resort to breed, they seek food of their own taking, whether small mammals, little birds, insects or berries; but even here their uncommon courage is exhibited, and they will defend their homes and offspring with the utmost spirit against any intruder, repeatedly shooting down on man or dog that invades their haunts, while every bird almost, from an eagle down- wards, is repelled by buffets or something worse.

The largest species known is the Slercorarius catarrhactes of ornith- ologists — the " Skooi " or " Bonxie " of the Shetlanders, a bird in size equalling a herring-gull, Larus argentatus. The sexes do not differ appreciably in colour, which is of a dark brown, somewhat lighter beneath; but the primaries have at the base a patch of white, visible even when the wings are closed, and forming, when they are spread, a conspicuous band. The bill and feet are black. This is a species of comparatively limited range, breeding only in some two or three localities in the Shetlands, about half a dozen in the Faeroes, 3 and hardly more in Iceland. Out of the breeding-season it shows itself in most parts of the North Atlantic, but never seems to stray farther south than Gibraltar or Morocco, and it is therefore a matter of much interest to find the Southern Ocean inhabited by a bird — the " Port Egmont Hen " of Cook's Voyages — which so closely resembles the

Skua as to have been for a long while regarded as specifically identical with it, but is now usually recognized as distinct under the name of S. antarcticus. This bird, characterized by its stout deep bill and want of rufous tint on its lower plumage, has an extensive range, and would seem to exhibit a tendency to further differentiation, since Howard Saunders, in a monograph oi the group (Proc. Zool. Society, 1876, pp. 317-332), says that- it presents three local forms — one occurring from New Zealand to Norfolk Island and past Kerguelen Land to the Cape of Good Hope, another restricted to the Falklands, and the third hitherto only met with near the south-polar ice. On the western coast of South America, making its way into the Straits of Magellan, and passing along the coast so far as Rio Janeiro, is found S. chilensis, distinguished among other characters by the cinnamon tint of its lower plumage. Three other smaller species of the genus are known, and each is more widely distributed than those just mentioned, but the home of all is in the more northern parts of the earth, though in winter two of them go very far south, and, crossing the equator, show themselves on the seas that wash the Cape of Good Hope, Australia, New Zealand and Peru. The first of them is 5. pomatorhinus (often incorrectly spelt pomarinus), about the size of a common gull, Larus canus, and presenting, irrespective of sex, two very distinct phases of plumage, one almost wholly sooty-brown, the other parti- coloured— -dark above and white on the breast, the sides of the neck being of a glossy straw-colour, and the lower part of the neck and the sides of the body barred with brown ; but a singular feature in the adults of this species is that the two median tail-feathers, which are elongated, have their shaft twisted towards the tip, so that in flight the lower surfaces of their webs are pressed together vertically, giving the bird the appearance of having a disk attached to its tail. The second and third species so closely resemble each other, except in size, that their distinctness was for many years unperceived, and in consequence their nomenclature is an almost bewildering puzzle. H. Saunders (loc. cit.) thinks that the larger of them, which is about the size of a black-headed gull, should stand as S. crepidatus, and the smaller as S. parasiticus, though the latter name has been generally used for the larger when that is not termed, as it often is, S. richard- soni, a name that correctly applies only to whole-coloured examples, for this species too is dimorphic. Even its proper English name ‘ is disputable, but it has been frequently called the Arctic gull or Arctic skua, and it is by far the commonest of the genus in Britain, and perhaps throughout the northern hemisphere. It breeds abundantly on many of the Scottish islands, and in most countries lying to the northward. The nest is generally in long heather, and contains two eggs of a dark olive-colour, suffused with still darker brown patches. Birds of either phase of plumage pair indiscrimin- ately, and the young show by their earliest feathers whether they will prove whole or parti-coloured; but in their immature plumage the upper surface is

barred with pale reddish brown. The smallest species, commonly known in English as the long-tailed or Buffon's

generally likened to the marlinespike that is identified with the boatswain's position; but perhaps the authoritative character assumed by both bird and officer originally suggested the name.

- *It has long been subjected to persecution in these islands, a reward being paid for its head. On the other hand, in the Shetlands a fine was exacted for its death, as it was believed to protect the sheep against eagles. Yet for all this it would long ago have been extirpated there, and have ceased to be a British bird in all but name, but for the special protection afforded it by several members of two families (Edmonston and Scott of Melby), long before it was protected by modern legislation.*

4 It is the " Fasgadair " of the Hebrides, the " Shooi " of the Shetlands, and the " Scouti-allen " of the fishermen on the east coast of Scotland.

skua, is not known to exhibit the remarkable dimorphism to which the two preceding are subject. It breeds abundantly in some seasons on the fells of Lapland, its appearance depending chiefly on the presence of lemmings (Lemmus norvegicus), on which it mainly preys. All these three species occasionally visit the southern coasts of Europe in large flocks, but their visitations are highly irregular.

(A. N.) ,

SKULL, the skeleton of the head, composed of 22 bones, 8 of which form the skeleton of the cranium, 14 that of the face. Except the lower jaw, which is movable, the bones are all firmly united by immovable joints. In the following article it is considered more profitable to treat the skull as a whole than to detail the bones separately, and for this purpose a normal European skull will be studied from in front {norma facialis), from above {norma verlicalis), from the side (norma lateralis), from behind {norma occipitalis) and from below {norma basalts) . Afterwards the interior of it will be considered by means of sections.

The Skull from in front {norma facialis) (see fig. 1). The fore- head region is formed by the frontal bone, the two halves of which usually unite in the second year; sometimes, however, they fail to do so and then a suture {metopic) may remain to an advanced age. The lower limit of the forehead

is formed by the upper margin of the orbit on each side, and by the articulation between the frontal and nasal bones near the mid line. At the junction of the inner and

middle third of each supra- orbital margin is the supra- orbital notch for the nerve of that name. Above each supra-orbital margin is an elevation, better marked in adult males, called the supra- ciliary ridge, while between these ridges in the middle line is a slight prominence; the glabella. Below the fore- head the two nasal bones form the skeleton of the upper part of the, nose ; tjhey articulate with one another in the mid line, but laterally they are joined by a suture to the nasal processes of the maxillae which run up to articulate with the frontal at the internal orbital pro- cess, thus forming the inner margin of the orbit.

Externally the malar bones (fig. 1, g) articulate with the frontal at the external orbital process and form the lower and outer quadrant of the orbital margin.

The maxillae or upper jaws (fig. 1, M) form the greater part of the skeleton of the face ; they complete the lower and inner quadrant of the orbit, and below the nasal bones leave the anterior nasal aperture {apertura pyriformis) between them, and project slightly at the middle of the lower border of this aperture to form the anterior nasal spine. About a quarter of an inch below the infra-orbital margin and just below the articulation with the malar the infra- orbital foramen, for the infra-orbital branch of the fifth nerve, is seen on each side. The lower parts of the maxillae form the alveolar margin in which all the upper teeth are set. Laterally each maxilla is prolonged out into a buttress, the zygomatic process, which sup- ports the malar bone.

Below the maxillae the mandible or lower jaw is seen in perspective (fig. I, m). The horizontal part or body is in two halves up to the second year, but after that complete bony union takes place, forming the symphysis. Above the body of the mandible is an alveolar margin containing the sockets of the lower teeth, while below, near the mid line, the bone projects forward to a variable extent and so forms the mental prominence (fig. 1,0), one of the special character- istics of a human skull. Below the second bicuspid tooth on each side is the mental foramen for the exit of the mental branch of the fifth nerve.

The Orbit. — Each orbit is a pyramidal cavity, the base of the pyramid being in front, at the orbital margin, and the apex behind, at the optic foramen, where the optic nerve and ophthalmic artery pass through. The four sides of the pyramid form the roof, floor, inner and outer walls of the orbit. The roof is arched from side to side and is made up of the frontal

bone anteriorly, and the lesser wing of the sphenoid posteriorly. The floor is chiefly formed by the maxilla, though the malar forms a little of it in front. There is a groove for the infra-orbital nerve running forward in it, but before the margin of the orbit is reached the groove becomes a tunnel. The inner wall is antero-posterior and parallel with its fellow of the

opposite orbit; in front it is formed by the nasal process of the maxilla, behind which the lachrymal bone articulates; together they enclose a vertical groove, for the lachrymal sac, which leads down into the nose, through the naso-lachrymal canal, transmitting the nasal duct : (see Eye). Behind the lachrymal bone is the orbital plate of, the ethmoid and in the suture between this and the frontal the anterior and posterior ethmoidal foramina are seen. Posteriorly the ethmoid articulates with the sphenoid, while at its lower and hinder part a small piece of the palate bone comes into the orbit. The outer wall of the orbit slopes backward and inward, the two opposite sides therefore converge as they run back. The malar bone, in front, and the great wing of the sphenoid, behind, form this wall. Between the roof and the outer wall there is a slit in the

Eosterior part of the orbit called the sphenoidal fissure because it lies etween the great and small wings of the sphenoid; it transmits the third, fourth, first division of the fifth and sixth cranial nerves, as well as the ophthalmic vein.

Another slit called the spheno-maxillary fissure lies in the line of junction of the outer wall and floor, it leads into the spheno-maxil- lary and zygomatic fossae and transmits the second division of the fifth nerve and some veins.

The Skull from above {norma verlicalis). When looked at from above the frontal bone is seen forming the anterior part of the vertex and articulating with: the two parietals posteriorly by a nearly transverse serrated suture {coronal suture). Running back from the middle of this is the median sagittal suture extending as far as the lambda on the norma occipitalis. The point where the sagittal and coronal sutures join is the bregma, the site of the lozenge-shaped anterior fontanelle in the.infaiU's skull, but this closes during the second year of life. Small ossicles called Wormian bones are often found in the cranial sutures, and one of these (the interfrontal or os anii-epilepticum) is sometimes found at the bregma. About two- thirds of the way back the sagittal suture becomes less serrated and on each side of it the small parietal foramen may be seen. This only transmits a small emissary vein (see Veins) in the adult, but, as will be seen later, is of considerable morphological interest. As middle life is reached the cranial sutures tend to become obliterated and the bones can no longer be separated; this fusion begins at the places, where the sutures are least

deeply serrated, and as a rule the sagittal suture disappears between the two parietal foramina between thirty and forty years of age.

The Skull from the side {norma lateralis). On looking at the accompanying figure (fig- 2) it will be seen that the calvaria or brain

Fig. 2. — Profile of the Skull.

Fr, Frontal bone.

Pa, Parietal.

SO, Supra-occipital.

Sq, Squamous-temporal.

MT.Mastoid-temporal.

Ty, Tympanic.

St, Styloid-temporal.

As, Ah-sphenoid.

E, Os planum of ethmoid.

L, Lachrymal.

N, Nasal.

Mx, Superior maxilla. Ma, Malar. Mn, Mandible. bh, Basi-hyal. th, Thyro-hyal. ch, Cerato-hyal. em, External meatus. cs, Coronal suture. Is, Lambdoidal suture. ss, Squamous suture.

case forms all the upper part, while the face is below the anterior half. Taking the calvaria first the side view of the frontal bone (figv 2, Fr) is seen extending back as far as the coronal suture {cs). just above Fr is an' elevation on each side, the frontal eminence, better seen in female than in male skulls. The junction between the frontal and malar (Ma) at the outer margin of the orbit has already been referred to as the external angular process and is an important

landmark for measurements, and from it a curved line (the temporal crest)

runs back crossing the coronal suture to reach the parietal bone (Pa, fig. 2) ; as it runs back this line divides into two. Below the crossing of the temporal crest the coronal suture is less serrated than above, and here it becomes obliterated first. The quadrilateral outline of the parietal bone is seen as well as its articulations; above it touches its fellow of the opposite side ; in front, the frontal (Fr); below the great wing of the sphenoid or alisphenoid (As), the squamous part of the temporal or squamosal (Sq) and the mastoid part of the temporal (MT), while behind it articulates with the supra-occipital (SO), through the lambdoid suture (Is). All four angles of the parietal are points of special interest; the antero- superior angle or bregma has been already noticed, and it will be seen to lie nearly above the ear opening or external auditory meatus in the temporal bone (em). The antero-inferior angle where the frontal, parietal and alisphenoid meet is the pterion and is the site of an occasional Wormian bone (epipteric) . The posterior superior angle is the lambda and will be better seen on the norma occipitalis, while the posterior inferior angle, where the parietal, supra-occipital, and mastoid temporal bones meet, is known as the asterion and marks the lateral sinus within the cranium. A little above and behind the middle of the parietal bone, and just above the superior temporal crest, is the parietal eminence where ossification starts. The squamous part of the temporalbone overlaps the parietal at the squamous suture, while from its lower part the zygomatic process projects forward to articulate with the malar. At the root of this process is the glenoid cavity where the condyle of the lower jaw articulates, and just behind this the external auditory meatus is seen (em). Behind this again the mastoid temporal is prolonged down into a nipple-shaped swelling, the mastoid process (MT), con- taining air cells and only found in the adult human skull, while just in front of the external auditory meatus is the styloid process (St), connected with the hyoid bone by the stylo-hyoid ligament (dotted). In the side view of the face the nasal and maxillary bones are seen, and from this point of view it will be noticed that just below the nasal aperture the maxillae, where they join, are produced forward into a little spur, the anterior nasal spine, which is a purely human characteristic. At the side of the maxilla the malar or jugal (Ma) bone is placed, and its lozenge-shaped outline is apparent; it forms the anterior part of the zygomatic arch. When the mandible is disarticulated and removed the posterior part of the maxilla is seen, and behind it the external pterygoid plate of the sphenoid. Between these two bones there is a vertical slit-like opening into a cave, the spheno-maxillary fossa, which communicates with the orbit through the spheno-maxillary fissure, with the nasal cavity through the spheno- palatine foramen, with the cranial cavity through the foramen rotundum, and with the mouth through the posterior palatine canal, as well as having other smaller openings.

The side view of the mandible or lower jaw shows the body, already seen from in front, and the ramus projecting up from the back part of it at an angle of from I io° to 120° in the adult. Before the teeth come and after they are lost theanglc is greater. The point just above ch (fig. 2) is known as the angle of the jaw. At the upper part of the ramus are two projections; the most anterior is the coronoid process for the attachment of the temporal muscle, while posteriorly is the condyle which articulates with the glenoid cavity of the temporal bone.

The Skull from behind (norma occipitalis) (fig. 3). From this point of view the posterior ends of the parietal bones (PP), with

the sagittal suture between them, are seen. Below these comes the supra-occipital bone (fig. 3, O) separated from them by the lambdoid suture which is deeply ser- rated and a frequent site of Wormian bones. Where the sagittal and lambdoid sutures meet is the lambda (L), and here a small Wormian bone is sometimes found, called the preinter parietal. In the mid line about a hand's breadth (2f-3 in.) below the lambda is a prominence, the external occipital protuberance or inion, for the attachment of the ligamentum nuchae, while running out on each side from this are the superior curved lines which attach muscles of the neck.

The Skull from below (norma basalis) (fig. 4). Starting from in front, the superior alveolar arcade with the teeth sockets is seen. This in a European skull approaches a semicircle, but in lower races the sides become more parallel ; this is known as a hypsiloid arcade. Within the arcade is the hard palate formed by the maxillae in front (fig. 4, m), and the palate bones (p) behind.

Fig. 4.

At the front of the median suture between the maxillae is the anterior palatine canal which, if it is looked into closely, will be seen to lead into four small foramina, two antero-posterior known as Scarpa's foramina, for the naso-palatine nerves, and two lateral called Stensen's foramina for small arteries and the re- mains of the mouth opening of Jacobson's organ (see Olfactory System). In young skulls a suture runs outward from the anterior palatine canal to between the lateral incisor and canine sockets, and sometimes another runs from the same place to between the central and lateral incisor teeth.

At each postero-lateral angle of the palate are the posterior palatine canals for the descending palatine nerves. The posterior mar- gin of the hard palate is a free edge which forms the lower boundary of the pos- terior nasal apertures or choanae and attaches the soft palate (see Pharynx). Be-

hind the alveolar arcade on each side are the external and internal pterygoid plates of the sphenoid; the external is a muscular process for the attachment of the pterygoid muscles, while the internal ends below in the hook-like hamular process which is directed backward and outward. Dividing the posterior nasal aperture into two is the vertical hind edge of the vomer (v), which articulates above with the body of the sphenoid (basi-sphenoid), and just behind this the sphenoid is united by bone with the basioccipital (b), though up to twenty years of age there is a synchondrosis (see Joints) called the basilar suture) between them. It is therefore very easy to tell an adult's skull from that of a young person. Passing back in the mid line the foramen magnum (f) is seen, through which pass the spinal cord and its membranes, the vertebral arteries and the spinal accessory nerves. A little in front of this is a small tubercle, the pharyngeal spine, to which the constrictors of the pharynx are attached. On each side of the fora- men magnum and in front of its mid transverse diameter are the condyles ©, which articulate with the atlas, while just above these are the anterior condylar foramina, one on each side, for the exit of the hypoglossal nerves.

External to the pterygoid plates the base of the skull is formed by the ali-sphenoid, which projects backward into a point, the spine of the sphenoid, and just in front of this is the small foramen spinosum for the passage of the middle meningeal artery. In front and a little internal to the foramen spinosum is a larger opening, the foramen ovale, through which the third division of the fifth nerve leaves the skull. Into the re-entering angle between the ali-sphenoid and basi-occipital is fitted the petrous part of the temporal, which, however, does not quite fill the gap but leaves a space on each side of the site of the basilar suture to be closed in by fibro-cartilage, and this is known as the middle lacerated foramen. On the lower surface of the petrous bone is the round opening of the carotid canal through which the internal carotid artery and its accompanying sympathetic nerves pass into the skull, while more externally the styloid process projects downward and forward and is more or less ensheathed at its root by the rampart-like ridge of the vaginal process. Between the styloid process and the occipital condyle lies the jugular or posterior lacerated foramen through which pass the lateral and inferior petrosal sinuses, and the glosso-pharyngeal, vagus and spinal accessory nerves. The bone which bounds this foramen behind, and which bears the posterior two-thirds of the occipital condyle, is the ex-occipital part of the occipital. A little behind and external to the styloid process is the tip of the mastoid process, just internal to which is the deep antero-posterior groove for the digastric muscle, and internal to that another slighter groove for the occipital artery. Behind the styloid process and between it and the mastoid is the stylo-mastoid foramen through which the facial nerve passes, while in front of the process the glenoid cavity can

be seen in its entirety, bounded in front by the eminentia articularis and divided into an anterior articular part and a posterior tympanic plate by the Glaserian fissure. Just internal to the glenoid cavity is the opening of the bony Eustachian tube.

The posterior part of the norma basalis behind the foramen magnum is formed by the supra-occipital part of the occipital bone, so that all the four parts of the bone, which are separate up to the third year, help in the formation of that large opening. Between the foramen magnum and the external occipital protuberance and superior curved line already noticed, the bone attaches the deep muscles of the neck.

The Interior of the Cranium. If the roof of the skull be sawn off the interior or cerebral surface of both the vault and the base

may be examined. The vault shows the cerebral aspects of parts of the frontal, parietal and occipital bones, and of the sutures between them. In the mid line is a shallow antero-posterior groove for the superior longitudinal blood sinus, and on each side of this

irregular depressions are often seen for the Pacchionian bodies (see B rain) . The base (fig. 5) is divided into three fossae, anterior, middle and posterior, each being behind and on a lower level than the one in front of it.

The anterior cranial fossa is formed by the cribriform plate of the ethmoid, near the mid line, freely perforated for the passage of the olfactory nerves. In the mid line, near the front, is a triangular plate rising up which attaches the falx cerebri (see Brain) and is called the crista galli. On each side of this is the nasal slit for the nasal branch On each side of the the frontal, while the

Fig. 5.

of the first division of the fifth nerve, cribriform plate is the orbital plate of back part of the fossa has for its floor the body of the sphenoid (pre-sphenoid) near the mid line and the lesser wing (orbito-sphenoid) on each side. Each lesser wing is prolonged back into a tongue-like process, the anterior chnoid process, just internal to which is the optic foramen (fig. 5, 11), and the two foramina are joined by the optic groove for the optic commissure. Behind this groove is a transverse elevation, the olivary eminence (22), which marks the junction of the pre- and basi- sphenoid

parts of the body of the sphenoid bone.

The middle cranial fossa is like an hour-glass placed transversely, as there is a central constricted, and two lateral expanded, parts. The central part forms the pituitary fossa (fig. 5, 3) for the pituitary body (see Brain) and is bounded behind by the wall-like dorsum sellae, at the sides of which are the posterior clinoid processes (5, 4). The olivary eminence, pituitary fossa and dorsum sellae together resemble a Turkish saddle and are often called the sella turcica. The lateral expanded part of the middle cranial fossa is bounded in front by the great wing of the sphenoid (alisphenoid), behind by the front of the petrous part of the temporal (periotic) and laterally by the squamous part of the temporal (squamosal). Between the ali- sphenoid and orbitosphenoid is the sphenoidal fissure already noticed in the orbit, and a little behind this, piercing the alisphenoid, is the posterior opening of the foramen rotundum, through which the second division of the fifth nerve passes into the spheno-maxillary fossa. Further back the alisphenoid is pierced by the foramen ovale (0) and foramen spinosum (s), both of which have been already noticed on the norma basalis. From the latter a groove for the middle meningeal artery runs forward and outward, and soon divides into anterior and posterior branches, the former of which deepens into a tunnel near the pterion. At the apex of the petrous bone and at the side of the dorsum sellae is the middle lacerated foramen ©, already noticed, and running inward to this from an aperture in the petrous bone is a groove for the great superficial petrosal nerve which is overlaid by the Casserian ganglion of the fifth nerve.

The posterior cranial fossa is pentagonal in outline, having an anterior border formed by the dorsum sellae, two antero-lateral borders, by the upper borders of the petrous bones, and two postero- lateral curved borders, by the grooves for the lateral sinuses (fig. 5, 11). In the middle of this fossa is the foramen magnum, bounded by the four parts of the occipital bone, which unite during child- hood. In front of the foramen magnum the floor of the fossa is formed by the basi-occipital and basi-sphenoid bones, which unite soon after twenty and form a steep slope, downward and backward, known as the clivus (b). This is slightly grooved from side to side, and lodges the pons and medulla (see Brain) and the basilar artery.

On each side of the basi-occipital the posterior surface of the petrous bone bounds the fossa, and lying over the suture between them is the groove for the inferior petrosal venous sinus which leads backward and outward to the jugular foramen already noticed on the norma basalis. About the middle of the posterior surface of the petrous bone is the internal auditory meatus, through which pass the facial and auditory nerves, the pars intermedia (see Nerves, Cranial) and the auditory artery. Close to the antero-lateral part of

the foramen magnum is the inner opening of the anterior condylar foramen which is sometimes double for the two bundles of the hypoglossal nerve, and a little in front of and outside this is a heaping up of bone called the tuberculum jugulare, which marks the union of

the basi- and ex-occipital bones. The hindmost limit of the posterior fossa in the mid line is marked by an elevation called the internal occipital protuberance, and at this point the grooves for the superior longitudinal (s), and two lateral sinuses (11) join to form the torcular Herophili (see Veins). Running from the internal occipital pro- tuberance toward the foramen magnum in the mid line is the internal occipital crest, which attaches the falx cerebelli (see Brain) and on each side of this is the cerebellar fossa.

From the internal occipital protuberance the two wide grooves for the lateral venous sinuses (11) run nearly horizontally outward till they reach the posterior inferior angles of the parietal bones; here they turn downward with an S-shaped curve, grooving the mastoid portion of the temporal and later on the exoccipital bones, until they reach the jugular foramina. To the edges of the hori- zontal parts of these grooves, and to the upper edge of the petrous bones the tentorium cerebelli is attached.

The Skull in Sagittal Section. If the skull be sawn down just to the right of the mid line and the left half be looked at, the appear- ance will be that reproduced in fig. 6. The section of the cranial bones shows that they are formed of an outer and inner table of hard bone, while between the two is a layer of cancellous tissue called the diploe. In certain places the diploe is invaded by ingrowths from the air passage which separate the two tables and form the air sinuses of the skull, though it is important not to confuse these with the intracranial blood or venous sinuses. In the section under con- sideration two of these spaces, the frontal (fs) and the sphenoidal (PS) air sinuses are seen. , Behind the frontal sinus is the crista

Fig. 6.— Section through the Skull immediately to the right of the

Mesial Plane (see also lettering in fig. 2) : BO, Basi-occipital. SC, Septal cartilage of nose.

EO, Ex-occipital. V, Vomer.

PT, Petrous-temporal. PI, Palate.

BS, Basi-sphenoid. Pt, Pterygoid of sphenoid.

PS, Pre-sphenoid (the letters are fs, Frontal sinus.

placed in the sphenoidal Pf, Pituitary fossa.

sinus). fm, Foramen magnum.

OS, Orbito-sphenoid. a, Angle.

ME, Mes-ethmoid. s, Symphysis of lower jaw.

galli already mentioned, while below is the bony septum of the nose formed, by the mes-ethmoid plate (ME), the vomer (V), and the line of junction of the palatine processes of the two maxillae and two palate bones. The re-entering angle between the mes-elhmoid and vomer is filled in the recent state by the septal cartilage (SC).

Below the face is the inner surface of the body and ramus of trie mandible, and half-way down the latter is the inferior dental foramen where the inferior dental branch of the fifth nerve accompanied by its artery passes into the inferior dental canal in the substance of the bone to supply the lower teeth. Just in front of this foramen is a little tongue of bone called the lingula attaching the spheno-mandi- bular (long internal lateral) ligament, while running downward and forward from this is the mylo-hyoid ridge with the groove of the same name just below it.

If the cut surface of the right half of the skull be looked at, the outer wall of the nasal cavity will be seen with the three turbinated bones each overhanging its own meatus, but the anatomy of this part has already been dealt with in the article on the olfactory system (q.v.).

For further details see any standard anatomical textbook — Quain, Gray, Cunningham, &c. For charm of style, The Human Skeleton by G. M. Humphry (London, 1858), although somewhat out of date, is unsurpassed.

Embryology.

The notochord (see Skeleton: Axial) extends forward to the ventral surface of the middle cerebral vesicle (see Brain) or as far

as the place where the dorsum sellae will be. It is partly surrounded by the mesenchyme just as it is completely in the rest of the axial skeleton, and this mesenchyme extends dorsally on each side to wrap round the nerve cord, which is here the brain. In this way the brain becomes enclosed in a primitive membranous cranium, the inner part of which persists in its

primitive condition as the dura mater, while the outer part may chondrity, chondrify and ossify, or ossify without a cartilage stage. That part of the cranium which is in front of the notochord is called prechordal, while the posterior part into which the notochord extends is chordal. On each side of the notochord chondrification takes place and a basicranial plate of cartilage is formed which soon meets its fellow of th^jopposite side; and forms the floor of the skull as far forward as the dorsum sellae, and as far back as the external occipital protuberance. Laterally it comes in contact with the mesenchyme surrounding the internal ear, which is also chondrifying to form the cartilaginous periotic capsule, and the two structures fuse together to form a continuous floor for the back of the skull. A. Froriep has shown that in the hinder occipital region of the calf there are evidences of four vertebrae having been incorporated with the basicranial plate, that is to say that the plate and its coalesced vertebrae represent five mesodermic somites (" Zur Entwickelungsgeschichte der Wirbelsaule, insbeson- dere des Atlas und Epistropheus und der Occipitalregion," Archiv fur Anal. u. Phys., Anat. Abth., 1886). It has more recently been shown by Levi that the same thing is true for man. K. Gegenbauer has pointed out that the primitive membranous skull shows, in the chordal region, signs of metameric segmentation in the way in which the cranial nerves pierce the dura mater one 'behind the other. These segments, however, had lost their distinctness even before the cartilaginous cranium had become developed, so that there is no real segmental value in the elements of this, still less in those of the bony skull. The only place in which segmental elements can be dis- tinguished is in the occipital region, which is in structure transitional between the head and vertebral column. The notochord, it has been shown, ends just behind the place where the stomodaeum pouches up through the cranial base to form the anterior part of the pituitary body (see Brain). Where it ends two curved bars of cartilage are formed, which run forward till they meet the olfactory capsules, which are also now chondrifying. These bars are the prechordal cartilages or trabecular cranii and enclose between them the cranio-pharyngeal canal by which the pituitary body ascends, but later on, as they grow, they join together and cut off the pituitary body from the pharynx. By their growth outward they form the floor of the prechordal part of the chondro-cranium, so that from them is developed that part of the cartilaginous skull which will later on be part of the basisphenoid, the presphenoid, orbito- sphenoid and alisphenoid regions. It has hitherto been assumed that this process held good for man, but recent research shows that the anterior part of the base of the skull chondrifies in the same way that ice appears on a pond and that the trabeculae are at no time definite structures. Chondrification of the nasal capsules is later than that of the parts of the skull behind, so that there is a steady progress in the process from the occipital to the ethmoidal region. There is a median centre of

chondrification, the mesethmoid cartilage, which projects down into the fronto-nasal process (see Olfactory System), and two lateral ectethmoid cartilages which eventually join with the mesethmoid to form the cartilaginous ethmoid.

The cartilaginous base of the cranium is now formed, but the vault is membranous. While the base has been developing the two anterior visceral arches have been also forming and have gained an attachment to the cranium, but the formation and fate of these is recorded in the article Skeleton (Visceral). About the sixth week of foetal life ossification begins at different points in the membranous vault of the skull. In this way the frontal, parietal, supra-occipital,

and a little later the squamous part of the temporal bones are formed. About the eighth week, too, the lachrymal, nasal and vomer appear in the membrane lying superficial to dif- ferent parts of the olfactory capsule. All these are dermal bones, comparable to the deeper parts of the scales of fishes, and developed in the mesenchyme lying deep to and in con- tact with the ecto- derm. It is therefore necessary to think of the primitive skull as a three-layered structure, the deepest layer persisting as the dura mater, the middle forming the chondro-cranium, which ossifies to form the base, and a super- ficial layer close to the skin or mucous membrane (ectoderm), from which the bones of the vault and superficial parts of the olfactory

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Cunningham';

Text Book

Arthur Thomson, Anatomy.

Fig. 7. — Ossification of Sphenoid. — o, Pre- sphenoid; b, Orbito-sphenoids ; c, Ali- sphenoids; d. Internal pterygoid plates; e, Basi-sphenoid.

capsules are derived. At the four angles of the parietal, ossification

is checked for some time to form fontanelles, of which the bregma is

the most important, and at each of these points, as well as elsewhere

in the sutures, accessory

*centres of ossification may **

occur to form "Wormian

bones.

Along the middle line of the base of the skull the same progress of ossification from behind forward is seen that was noticed in the process of chondrifica- tion. Bilateral centres for the basioccipital appear about the sixth week, for the basisphenoid in the eighth, and for the pre- sphenoid in the tenth, while the lateral mass of the ethmoid does not ossify till the fifth month and the mesethmoid not until the first year of extra- uterine life. In the lateral part of the base the ex- occipitals and alisphenoids begin to ossify about the eighth week and the pre- splienoids about the tenth. In connexion with the alisphenoid there is a small extra centre of morphological interest only, which forms a little tongue-shaped process ° < called the lingula, pro- c > jecting back into the < ˆi middle lacerated foramen e < and apparently corre- sponding to the sphenotic ft bone of lower vertebrates, i

Arthur Thomson, in Cunningham's Text-Book of Anatomy. Fig. 8. — Ossification or Occipital Bone.

a, Basilar centre.

b, Exoccipital.

c, Ossicle of Kerkring.

d, Supra-occipital (from cartilage).

e, Fissure between supra-occipital and interparietal.

Interparietal (from membrane). Fissure between interparietals.

The auditory or periotic capsule, like the olfactory, is late in ossifying; it has four centres (pro-otic, epiotic, opisthotic and pterotic) which do not come until the fifth month.

Some parts of the chondro-cranium do not ossify at all ; this is the case in the anterior part of the mesethmoid, which remains as the septal cartilage of the nose, while, as has been already pointed out, a buffer of cartilage persists between the basioccipital and basi- sphenoid until the twentieth year of life.

From what has been said it is evident, and it will be still more evident if the article Skeleton (Visceral) be looked at, that some of the bones of the adult skull are compounded of various contributions from the different elements which make up the adult cranium. These, recapitulated, are (1) the dura mater or entocranium, which in man does not ossify except perhaps in the

crista galli. (2) The chondro-cranium or meso- cranium. (3) The superficial part of the mesenchyme (ecto- cranium) from which dermal bones are formed. (4) The olfactory and auditory sense capsules. (5) The visceral arches. (6) Some fused verte- brae posteriorly.

The occipital bone, for ex- ample, has the basioccipital, exoccipital and basal part of the supra-occipital derived from the chondro-cranium and fused vertebrae, while the vault_ part of the supra- occipital has four dermal centres of ossification corre- sponding to the interparietal ‘ and preinterparietal bones of lower mammals (see fig. 4). In the accompanying figure the ‘ latter centres have fused with tion of their line of junction

Text-

b a

Arthur Thomson, in Cunningham’s Book of A natomy.

Fig. 9. — The Outer Surface of the Right Temporal Bone at Birth, o, Tympanic ring.

Inner wall of tympanum. Fenestra rotunda. Foramen ovale. Mastoid. Mastoid process. Masto-squamosal suture, foramen for transmission vessels. 1, Squamo-zygomatic.

the interparietal, but an indica- is seen on each side of g. The bone of Kerkring © is an abnormality, the meaning of which is not understood.

The_ temporal is also a very composite bone; in it the petro- mastoid portion represents the auditory sense capsule; the tabular

with of

external auditory meatus is formed by the outgrowth of the tym- panic ring (fig. 9, a) which is probably part of the first visceral arch (see Skeleton, Visceral) ; the squamozygomatic part is a dermal bone, while the styloid process is a part of the second visceral arch.

The mastoid process is not present at birth, but appears about the second year and becomes pneumatic about puberty. From what has been seen of the skull bones in the above necessarily concen- trated and abridged account, it is obvious that they do not corre- spond to the traces of

segmentation as indicated by the cranial nerves, and for this and other reasons the " vertebrate theory of the skull " is no longer believed in.

For further details and references see Quain's Anatomy (London, 1908); Cunningham's Anatomy (Edinburgh, 1906); The Develop- ment of the Human Body, J. P. McMurrich (London, 1906).

Comparative Anatomy.

In this section only those parts of the skull which form the covering for the brain and the capsules for the olfactory and auditory apparatus are considered. Those parts of the face and jaws which are developed in connexion with the visceral arches are dealt with in the article Skeleton (Visceral). In the Acrania (Amphioxus) the enlarged anterior end of the nerve cord is merely surrounded by fibrous tissue continuous with the sheath of thez/est of the nerve cord; there is therefore, in a sense, no true cranium.

In the Cyclostomata (hags and lampreys) a cartilaginous cranium is developed, the anterior part of which forms an unpaired olfactory capsule connected with the rest of the cranium by fibrous tissue only. In the floor, just in front of the anterior end of the notochord, an aperture, the basi-cranial fontanelle, remains unchondrified for the passage of the pituitary diverticulum into the skull.

In the Elasmobranchii (sharks and rays) and Holocephali (Chimaera) among the fishes the skull is still a complete cartilaginous box, though calcification of the cartilage often takes place. Taking the skull of the dogfish as a type, two large olfactory capsules are seen in front, and behind these the cranial brain-box is narrowed, being excavated at its sides for the great orbits. More posteriorly the auditory capsules widen the skull, and on the posterior (caudal) aspect the foramen magnum is seen with an occipital condyle on each side of it for the first vertebra to articulate with. On the upper (dorsal) surface of the skull are two apertures in the middle line"; the more anterior of these is sometimes called the anterior fontanelle, though it has nothing to do with the bregma, described in man's skull, but forms a rudimentary median orbit for the pineal eye (see Brain). The posterior fontanelle is a depression which leads into two lateral tubes, each of which passes into the auditory capsule and is known as an aqueductus vestibuli (see Ear).

In the cartilaginous ganoid fishes (sturgeon), which, like the elasmobranchs, are of great antiquity, the chondro-cranium is partly ossified so that ali- and orbito-sphenoids are found; in addition to this a large number of dermal bones have made their appearance, such as nasals,

frontals, parietals, supra and post tem- porals, while in the roof of the mouth and pharynx a long membrane bone, the parasphenoid, is formed, and lies ventral to and strengthens the cartilaginous base of the skull. It will be noticed that these fish are important morphological landmarks, because in them the almost unchanged chondro-cranium coexists with a dermal ecto- cranium.

In the bony ganoids such as the " bow fin " (Amia) the dermal bones are still more numerous and, among others, squamosals, pro- otics and exoccipitals appear. These fish are also remarkable for a fusion of the anterior part of the vertebral column with the occipital region of the skull, an arrangement recalling Froriep's observations on the skull of the calf embryo mentioned in the section on em- bryology.

In the bony fishes (Teleostei) the membrane or dermal bones are still more numerous, and many of them are unrepresented in the mammalian skull, while others, which are there quite rudimentary, are very large. The chondro-cranium tends to disappear in the vault, but the base is fully ossified. Among other cartilage bones the five ossifications of the auditory capsule are seen, the pro-, epi-, opisth-, pter- and sphen-otics, all of which are found as centres of ossification in man. In the cod, for example, the sphenotic, which is represented in man by the little lingula sphenoidale, is larger than the alisphenoid.

In the Dipnoi (mud-fish) the chondro-cranium is very slightly ossified, only exoccipitals being found, but there is the, same coales- cence with anterior vertebrae which was noticed in the ganoids. Dermal bones are plentiful.

In the Amphibia the chondro-cranium persists and is only ossified in front by the girdle bone or sphenethmoid, and behind by the pro- otics and exoccipitals, the latter of which bear the two condyles. The anterior fontanelle is well marked in the chondro-cranium, but is completely overlaid and concealed by the dermal fronto-parietals. The membrane bones though large are much less numerous than in the bony fishes.

In the Reptilia the skull varies immensely in the different orders, but speaking broadly, the chondro-cranium is less distinct than in

the Amphibia, except in the ethmoidal region. In the base of the skull the basioccipital and basisphenoid are tending to replace the membranous parasphenoid, and instead of two exoccipital condyles only one in the mid line is present, though this in many forms (e.g. Chelonia) consists of three parts, a median borne on the basioccipital and two lateral on the exoccipitals. The parietal foramen is usually definitely marked in the dermal part of the skull and forms a median orbit for the pineal eye; this is

especially the case in the Lacertilia (lizards). Except in the Ophidia (snakes) and Amphisbaenidae (worm-iike lizards) there is a fibro-cartilaginous septum between the orbits so that the cranial cavity does not reach forward to the ethmoidal repon. The pro-, epi- and opisth-otic bones are all developed, but the epiotic usually fuses with the supra-occipital and the opisthotic with the exoccipital.

In the Crocodilia the first attempt at pneumaticity is seen in the basisphenoid, which is traversed by a complicated system of Eus- tachian passages leading eventually to the tympanum. In the class Aves the general scheme of the reptilian skull is maintained, though the bones fuse together very early, thus obliterating the sutures between them. Almost all of them have air in their interior, and so are said to be pneumatic.

The single occipital condyle, if looked at in a young specimen, is seen to consist of a basioccipital and two exoccipital elements, though these are indistinguishable in the adult. The parasphenoid is represented by a broad plate which is called the basitemporal. The pro-, epi- and opisth-otic bones fuse together to form the auditory capsule.

In the Mammalia the calvaria varies considerably in the different orders, the characteristic features being best marked in adult males. Usually the different bones are interlocked by sutures, as in man, until adult life, but in some orders (e.g. Monotremata, Edentata and Carnivora) they fuse together quite early.

In the basicranium the cartilage bones presphenoid, basisphenoid, and basioccipital, are so well developed that the parasphenoid has disappeared. In the basisphenoid of the rabbit the cranio-pharyn- geal canal (see section on embryology) persists as a foramen at the bottom of the pituitary fossa. In the lower orders the face lies well in front of the brain case, as it does in reptiles and amphibians, but as the Primates are reached the increasing size of the calvaria causes it to overlie the face. Many of the bones are pneumatic, the process reaching its maximum in the elephant and the adult male gorilla. The periotic. capsule blends with the squamosal and tympanic to form the petrous bone, though it is practically only in man that the second visceral arch ossifies on to this as a styloid process. There are usually two occipital condyles which have basi- and exoccipital elements, though there are many mammals in which there is one large crescentic condyle surrounding the anterior half of the foramen magnum.

Ossification of the processes of the dura mater occurs in the tentorium cerebelli of the carnivora and in the falx cerebri of the ornithorhynchus and porpoise. The orbits are in most mammals continuous with the temporal fossae. Sometimes, as in many of the ungulates and in the lemurs,

they are outlined by a bony ring, but it is not until the higher Primates are reached that the two cavities are shut off and even then a vestige of their original con- tinuity remains in the spheno-maxillary fissure.

For further details see W. H. Flower, Osteology of the Mammalia (London, 1885) ; S. H. Reynolds, The Vertebrate Skeleton (Cambridge, 1897); R. Wiedersheim; C. Gegenbaur, Vergleich. Anat. der Wirbelthiere (Leipzig, 1901). (F. G. P.)

Cranial Surgery

Surgery of the Skull. — Fractures of the vault of the skull may occur without the bone being driven in to compress the brain, and in such cases their existence may be revealed only after death. But if there is also a severe scalp wound the line of fracture may be traced in the bare bone as a thin red crack. " Think lightly," said the old physician, " of no injury to the head." The patient with a suspected fracture of the skull is put to bed in a dark, quiet room, and he is watched. It may be that the crack has extended across a bony groove in which an artery is running, and, the artery being torn, haemorrhage may take place within the skull and the symptoms of compression of the brain may supervene. Experiments upon the lower animals have taught the surgeon how to recognize the exact spot at which the compression is situated. One set of muscles after another being thrown out of work in regular order, he knows exactly where the bleeding is going on, so, having made a hole in the skull by trephining, he turns out the clot and secures the leaking vessel.

Compression of the brain may be the direct and immediate result of a head-injury, a piece of the vault of the skull being driven in, and a local or a general paralysis of muscles being at

once observed. In addition to the muscular paralysis, which may enable the surgeon to localize the spot at which there is pressure upon the brain, there is the grave symptom of coma or insensibility. And, as in deep sleep, there is often loud snoring, due to the vibration of the paralysed soft-palate. The heart being loaded with imperfectly aerated blood, the face is dusky or livid, and the pulse is slow and full. No notice is taken by the man of a loud shout into his ear, and on the surgeon raising his eyelids the pupils are found dilated and fixed, which signifies that the reflex to light is lost — a very grave sign. There may be complete paralysis of one side or of both sides of the body. Not only may the pressure of a blood-clot, an abscess, a foreign body (such as a bullet) or a depressed piece of the skull- wall give rise to coma, but so may a syphilitic, a malignant or an innocent tumour, and in cases in which the administration of iodide of potassium fails to afford relief, the operation of trephining may perhaps be resorted to, as giving the only chance of recovery. As regards treatment — short of trephining — it may be advisable to relieve the heart by bleeding. Inasmuch as the reflex actions are in abeyance, it will be necessary to have the bladder regularly emptied. The man should be placed on his side in bed, so that his tongue may not fall back and choke him, and if it is thought inadvisable to bleed him, a full dose of calomel should be administered.

For the operation of trephining, the head is shaved and the skin rendered aseptic, a large horse-shoe flap is then turned down and the skull laid bare. With an instrument on the principle of a centre-bit, a disk of bone of the size of a florin, a crown or a napkin-ring — or even larger — is then taken out of the skull wall, and the dura mater is opened up if the cause of the compres- sion is beneath it; otherwise, on the disk of bone being removed, the particular condition is dealt with without opening the dura mater. When the clot or the tumour, or whatever it is, has been removed, the disk of bone which, during the operation, has been kept in a warm liquid, is cut up into pieces which are put back into the opening and the skull flap is brought up into its proper position.

Fractures of the base of the skull are always serious, in that they may run across important nerves and large blood-vessels; passing through the roof of the nose, or the ear, they may be compound — that is to say, they may communicate with air- cavities from which pathogenic germs may readily enter the injured tissues. Thus, the dangers of sepsis are added to those of concussion or compression of the brain. Fractures of the base of the skull are often associated with bleeding from the nose, mouth or ear, or with extravasation of blood over the eyeball. Facial paralysis is the result of the line of fracture passing across the bony channel in which the seventh or

facial nerve is running. When the fracture passes across the temporal bone and the middle ear, and ruptures the membrane of the tympanum, not only blood may escape from the ear, but an apparently unlimited amount of cerebro-spinal fluid. In all cases the ear should be made surgically clean, and watch and guard kept against the entrance of septic micro-organisms. When the fracture extends through the anterior part of the base of the skull this same clear fluid may escape from the nose . In both cases its appearance implies that the dura mater has been lacerated and the' sub-dural space opened.

Concussion of the brain (stunning) may result from a blow upon the head or from a fall from a height. The symptoms may be those of a mere giddiness, and a feeling of stupidity, which may quickly pass off, or they may be those of severe shock (see Shock) . The person may die from the concussion, or he may slowly or quickly recover. The insensibility may be for a time complete . The pulse may be small, quick and imperceptible, and, no blood being pumped up by the enfeebled heart, the face will be pale and the surface of the body cold. The respiratory move- ments are likely to be sighing and shallow, or scarcely perceptible. As a rule, the pupils react to light, contracting as the lids are raised. This shows that the light-reflex is not lost, and is a good omen. One of the first signs of returning consciousness is that the person vomits, and after this he gradually comes round.

As a result of the injury, however, he may remain irritable, and liable to severe headaches or to lapses of memory.

Surgery of the Brain. — Abscess of the brain is most likely to be the result of extension inwards of septic inflammation from the middle ear, or of a fracture of the skull which passes across the aural, nasal or pharyngeal air-space, giving the opportunity for the entrance of the germs of suppuration. As the collection of pus forms, persistent headache is complained of together with, perhaps, localized pain or tenderness. A constant feature of intra-cranial pressure, whether the result of tumour or of abscess, is the presence of headache and of vomiting. Later the patient becomes drowsy. On looking into the back of the eyeball by the ophthalmoscope, it is noticed that the optic nerve is congested ("choked"), the result of the increased intra-cranial pressure. The pulse becomes strangely slow, and is apt to drop a beat now and then. The temperature is high. The patient may have attacks of giddiness, and he is subject to fits of an epileptic nature; growing steadily worse, he may be found paralysed on one side, or on both sides, and, becoming insensible, may pass away in the deep sleep known as coma.

The symptoms of tumour of the brain are much like those of abscess, though they come on more slowly and steadily; and inasmuch as the

disease is not septic, the temperature may be undisturbed, or but little raised above normal. In the case of the abscess or the tumour being on the left side of the brain, and involving the speech centre (Broca's convolution), the patient becomes aphasia

Tumours of the brain are likely to be sarcomatous (see Cancer) , but they may occur as the result of tuberculous or syphilitic deposit, or of infection by the ova of the dog's tape-worm — hydatid cyst.

In cases of suspected cerebral tumours in which there is even a bare possibility of the patient having been the subject of syphilis, iodide of potassium is prescribed in large doses. Indeed, whilst waiting the development of further symptoms in any obscure case, it is usual to try the effect of this drug, the good influence of which is by no means confined to cases of syphilis. If in spite of the administration of the iodide the symptoms are increasing, the question of opening the skull and exploring the region may arise. Before the days of anaesthetics and of anti- septics such a procedure could scarcely have been considered, but now the operation can be undertaken in suitable cases with a good hope of success.

If the case be one of abscess secondary to disease of the middle ear, the skull will probably be opened in the continuation of the operation by which the septic disease in the temporal bone was cleared away, the aperture having been enlarged by the use of the trephine, gouge or chisel. The side of the head is shaved and rendered aseptic before the operation is begun, and when the dura mater has been incised search is made for pus by the use of a grooved director. Pus having been found, the cavity is treated by gentle irrigation and drainage. When the operation is undertaken for a cerebral tumour the whole of the head is shaved and the skin duly prepared, so that the operation may be carried out with the least possible risk of the occurrence of sepsis. A large horse-shoe incision having been made, the flap of skin and muscle is turned down, and a disk of the skull-wall, about 2 in. in diameter, is removed by a trephine, worked by electricity or by the hand. The thick covering of the brain, the dura mater, is thus exposed, and if the presence of a tumour (or an abscess) has caused an excess of intra-cranial pressure, the membrane will bulge into the opening. The dura mater is then incised and turned down, and if the tumour is upon the cortex of the brain, and not too extensive, it is taken away. It may be necessary, however, to enlarge the opening made in the skull, and to break through a considerable mass of brain-tissue before the tumour can be removed. Bleeding having been arrested by pressure with a firm plug of gauze, a soft drainage tube is introduced and the dura mater is stitched in position. The disk of bone (which, since its removal, has been kept in some salted warm water) may be replaced before the horse-shoe flap is stitched in position, a notch having been cut in its border to allow for the drainage. In some

cases the large horse-shoe flap is so made as to include a part of the bony wall of the skull. The flap of bone is shaped by wire saws and then forcibly broken out by elevators.

The general result oi operations for the removal of tumours of the brain is far from being satisfactory. But it must be remem- bered that without operation the outlook is without hope. In- asmuch as many of the tumours are destitute of a limiting wall, a considerable mass of brain-tissue has to be traversed in order to remove the growth, and the ultimate result, so far as the impairment of functions is concerned, is a serious disappoint- ment. If, however, the tumour is found to be encapsuled, its removal is sometimes quite easily effected, and perfect recovery is then likely to be the result. (E. O.*)

SKUNK (probably derived from " Seecawk," the Cree name for the skunk; another form given is " seganku "), an evil- smelling North American carnivorous mammal. Its existence was first notified to European naturalists in 1636, in Gabriel Sagard-Theodat's History of Canada, where, in commencing his account, he describes it as " enfans du diable, que les Hurons appelle Scangaresse, . . . une beste fort puante," &c. This shows in what reputation the skunkwas then held, a reputation which has become so notorious that the mere name of skunk is one of opprobrium. The skunks, of whom there are several species, arranged in three genera, are members of the family Mustelidae (see Carnivora). The common skunk {Mephitis mephitica) is a native of North America, extending from Hudson Bay to the middle United States. It is a beautiful animal, about the size of a cat, though of a stouter and heavier build, with rich lustrous black fur, varied on the back by a patch or streak of white. The muzzle is long and pointed, the eyes are sharp and bead-like, and the grey or white tail is long and unusually bushy. The premolars number f .

The following account of the skunk is extracted from Dr C. H. Merriam's Mammals of the Adirondack Region, New York, 1884:

" The skunk preys upon mice, salamanders, frogs and the eggs of birds that nest on or within reach from the ground. At times he eats carrion, and if he chances to stumble upon a hen's nest the eggs are liable to suffer; and once in a while he acquires the evil habit of robbing the hen-roost, but as a rule skunks are not addicted to this vice. Of all our native mammals perhaps no one is so uni- versally abused and has so many unpleasant things said about it as the innocent subject of the present biography; and yet no other

species is half so valuable to the farmer. Pre-eminently an insect- eater, he destroys more beetles, grasshoppers and the like than all our other mammals together, and in addition to these he devours vast numbers of mice.

" He does not evince that dread of man that is so manifest in the vast majority of our mammals, and when met during any of his circumambulations rarely thinks of running away. He is slow in movement and deliberate in action and does not often hurry him- self in whatever he does. His ordinary gait is a measured walk, but when pressed for time he breaks into a low shuffling gallop. It is hard to intimidate a skunk, but when once really frightened he manages to get over the ground at a very fair pace. Skunks remain active throughout the greater part of the year in this region, and hibernate only during the severest portion of the winter. They differ from most of our hibernating mammals in that the inactive period is apparently dependent solely on the temperature, while the mere amount of snow has no influence whatever upon their move- ments.

" Skunks have large families, from six to ten young being com- monly raised each season; and as a rule they all live in the same hole until the following spring."

The overpowering odour which has brought the skunk into such notoriety arises from the secretion of the anal glands. These glands, although present in all Mustelidae, are especially developed in skunks, but are so entirely under control that at ordinary times these animals are cleanly and free from smell. Similar glands are possessed by nearly all Carnivora, but in the skunks are enormously enlarged, and provided with thick muscular coats. The secretion — often propelled by the muscles surrounding to a distance of from 8 to 1 2 ft. — is a clear yellowish liquid, with a marvellously penetrating ammoniacal and nauseous smell. Dr Merriam writes, " I have known the scent to become strikingly apparent in every part of a well-closed house, in winter, within five minutes after a skunk had been killed at a distance of more than a hundred yards," and under favourable conditions

it may be perceived at a distance of more than a mile. Instances are also on record of persons having become unconscious after inhaling the smell. '

The long-tailed skunk (M . macrura), a native of central and southern Mexico, differs from the typical species by having two white stripes along its sides, and by its longer and bushier tail. The little striped skunk (Spilogale putorius), found in the southern United States, and ranging southwards to Yucatan and Guate- mala, is smaller than M . mephitica, and marked with four inter- rupted longitudinal white stripes on a black

ground. There are likewise differences in the skull; and this species is also distin- guished from other skunks by its arboreal habits.

The conepatl (Conepatus mapurito) represents a third genus, with several species, confined to tropical and South America. In this group there is one pair less of premolars (p. J) ; the build is heavier than in Mephitis; the snout and head are more pig- like, and the nostrils open downwards and forwards instead of laterally on the sides of the muzzle. (O. T.; R. L.)*

SKY (M. Eng. skie, cloud; O. Eng. skua, shade; connected with an Indo-European root sku, cover, whence " scum," Lat. obscurus, dark, &c), the apparent covering of the atmosphere, the overarching heaven.

The Colour of the Sky.— It is a matter of common observation that the blue of the sky is highly variable, even on days that are free from'clouds. The colour usually deepens toward the zenith and also with the elevation of the observer. It is evident that the normal blue is more or less diluted with extraneous white light, having its origin in reflections from the grosser particles of foreign matter with which the air is usually charged. Closely associated with the colour is the polarization of the light from the sky. This takes place in a plane passing through the sun, and attains a maximum about 90° therefrom. Under favourable conditions more than half the light is polarized.

As to the origin of the normal blue, very discrepant views have been held. Some writers, even of good reputation, have held that the blue is the true body colour of the air, or of some in- gredient in it such as ozone. It is a sufficient answer to remark that on this theory the blue would reach its maximum develop- ment in the colour of the setting sun. It should be evident that what we have first to explain is the fact that we receive any light from the sky at all. Were the atmosphere non-existent or absolutely transparent, the sky would necessarily be black. There must be something capable of reflecting light in the wider sense of that term.

A theory that has received much support in the past attributes the reflections to thin bubbles of water, similar to soap-bubbles, in which form vapour was supposed to condense. According to it, sky blue would be the blue of the first order in Newton's scale. The theory was developed by R. Clausius (Pogg. Ann. vols. 72, 76, 88), who regarded it as meeting the requirements of the case. It must be noticed, however, that the angle of maxi- mum polarization would be about 76 instead of oo°.

Apart from the difficulty of seeing how the bubbles could arise, there is a formidable objection, mentioned by E. W. Briicke (Pogg. Ann. 88, 363), that the blue of the sky is a much richer colour than the blue of the first

order. Briicke also brought forward an experiment of great importance, in which he showed that gum mastic, precipitated from an alcoholic solution poured into a large quantity of water, scatters light of a blue tint. He remarks that it is impossible to suppose that the particles of mastic are in the form of bubbles. Another point of great importance is well brought out in the experiments of John Tyndall (Phil. Mag. (4), 137, 388) upon clouds precipitated by the chemical action of light. Whenever the particles are sufficiently fine, the light emitted laterally is blue in colour and, in a direction perpendicular to the incident beam, is completely polarized.

About the colour there can be no prima facie difficulty; for, as soon as the question is raised, it is seen that the standard of linear dimension, with reference to which the particles are called small, is the wave-length of light, and that a given set of particles would (on any conceivable view as to their mode of action)

produce a continually increasing disturbance as we pass along the spectrum towards the more refrangible end.

On the other hand, thaj: the direction of complete polarization should be independent of the refracting power of the matter composing the cloud has been considered mysterious. Of course, on the theory of thin plates, this direction would be determined by Brewster's law; but, if the particles of foreign matter are small in all their dimensions, the circumstances are materially different from those under which Brewster's law is applicable.

The investigation of this question upon the elastic solid theory will depend upon how we suppose the solid to vary from one optical medium to another. The slower propagation of light in gas or water than in air or vacuum may be attributed to a greater density, or to a less rigidity, in the former case; or we may adopt the more complicated supposition that both these quantities vary, subject only to the condition which restricts the ratio of velocities to equality with the known refractive index. It will presently appear that the original hypothesis of Fresnel, that the rigidity remains the same in both media, is the only one that can be reconciled with the facts; and we will therefore investigate upon this basis the nature of the secondary waves dispersed by small particles.

Conceive a beam of plane polarized light to move among a number of particles, all small compared with any of the wave- lengths. According to our hypothesis, the foreign matter may be supposed to load the aether, so

as to increase its inertia without altering its resistance to distortion. If the particles were away, the wave would pass on unbroken and no light would be emitted laterally. Even with the particles retarding the motion of the aether, the same will be true if, to counterbalance the increased inertia, suitable forces are caused to act on the aether at all points where the inertia is altered. These forces have the same period and direction as the undisturbed luminous vibrations themselves. The light actually emitted laterally is thus the same as would be caused by forces exactly the opposite of these acting on the medium otherwise free from disturbance, and it only remains to see what the effect of such force would be.

On account of the smallness of the particles, the forces acting throughout the volume of any individual particle are all of the same intensity and direction, and may be considered as a whole. The determination of the motion in the aether, due to the action of a periodic force at a given point, is discussed in the article Diffraction of Light (§ n). Before applying the solution to a mathematical investigation of the present question, it may be well to consider the matter for a few moments from a more general point of view.

In the first place, there is necessarily a complete symmetry round the direction of the force. The disturbance, consisting of transverse vibrations, is propagated outwards in all directions from the centre; and, in consequence of the symmetry, the direction of vibration in any ray lies in the plane containing the ray and the axis of symmetry; that is to say, the direction of vibration in the scattered or diffracted ray makes with the direc- tion of vibration in the incident or primary ray the least possible angle. The symmetry also requires that the intensity of the scattered light should vanish for the ray which would be pro- pagated along the axis; for there is nothing to distinguish one direction transverse to the ray from another. The application of this is obvious. Suppose, for distinctness of statement, that the primary ray is vertical, and that the plane of vibration is that of the meridian. The intensity of the light scattered by a small particle is constant, and a maximum, for rays which lie in the vertical plane running east and west, while there is no scattered ray along the north and south line. If the primary ray is un- polarized, the light scattered north and south is entirely due to that component which vibrates east and west, and is therefore perfectly polarized, the direction of its vibration being also east and west. Similarly any other ray scattered horizontally is perfectly polarized, and the vibration is performed in the hori- zontal plane. In other directions the polarization becomes less and less complete as we approach the vertical.

The observed facts as to polarization are thus readily explained,

and the general law connecting the intensity of the scattered light with the wave-length follows almost as easily from con- siderations of dimensions.

The object is to compare the intensities of the incident and scattered light, for these will clearly be proportional The number (') expressing the ratio of the two amplitudes is a function of the following quantities: — (T) the volume of the disturbing particle; (r) the distance of the point under consideration from it; (X) the wave-length; (b) the velocity of propagation of light; (D) and (E)') the original and altered densities: of which the first three depend only upon space, the fourth on space and time, while the fifth and sixth introduce the consideration of mass. Other elements of the problem there are none, except mere numbers and angles, which do not depend upon the fundamental measurements of space, time and mass. Since the ratio (i), whose expression we seek, is of no dimensions in mass, it follows at once that D and D' occur only under the form D : D', which is a simple number and may therefore be disregarded. It remains to find how i varies with T, r, X, b.*

Now, of these quantities, b is the only one depending on time; and therefore, as i is of no dimensions in time, b cannot occur in its expression. Moreover, since the same amount of energy is pro- pagated across all spheres concentric with the particle, we recognize that i varies as r. It is equally evident that i varies as T, and therefore that it must be proportional to T/Xr, T being of three dimensions in space. In passing from one part of the spectrum to another, X is the only quantity which varies, and we have the important law: —

When light is scattered by particles which are very small com- pared with any of the wave-lengths, the ratio of the amplitudes of the vibrations of the scattered and incident lights varies inversely as the square of the wave-length, and the ratio of intensities as the inverse fourth power.

*The light scattered from small particles is of a much richer Dlue than the blue of the first order as reflected from a very thin plate. From the general theory (see Interference of Light, § 8), or by the method of dimensions, it is easy to prove that in the latter case the intensity varies as X – *, instead of X -4 .*

The principle of energy makes it clear that the light emitted laterally is not a new creation, but only diverted from the main stream. If I represent the intensity of the primary light after traversing a thickness x of the turbid medium, we have

*dl = —hl-*dx,*

where h is a constant independent of X. On integration,

*log(I/Io) = h*x (I)*

if Io correspond to x — o, — a law altogether similar to that of ab- sorption, and showing how the light tends to become yellow and finally red as the thickness of the medium increases (Phil. Mag.,

1871, 41. PP- 107. 274)- , , , , ,

Sir William Abney has found that the above law agrees remark- ably well with his observations on the transmission of light through water in which particles of mastic are suspended {Proc. Roy. Soc,

1886).

We may now investigate the mathematical expression for the disturbance propagated in any direction from a small particle upon which a beam of light strikes. Let the particle be at the origin of coordinates, and let the expression for the primary vibration be

f — sm.{nt— kx) . . . . (2)

The acceleration of the element at the origin is —re 2 sin nt; so that the force which would have to be applied to the parts where the density is D' (instead of D), in order that the waves might pass on undisturbed, is, per unit of volume,

(D'-D)n 2 sinre/.

To obtain the total force which must be supposed to act, the factor T (representing the volume of the particle) must be introduced. The opposite of this, conceived to act at the origin, would give the same disturbance as is actually caused by the presence of the particle. Thus by equation (18) of § 11 of the article Diffraction of Light, the secondary disturbance is expressed by

.. D f — D w"Tsin sin {nt — kr) f ~ D 4×6 2 ., r D' — DxTsinA . , . , , D }£jr-sm(nt-kr)

(3) 1

The preceding investigation is based upon the assumption th»» in passing from one medium to another the rigiditj' of the aether does not change. If we forego this assumption, the question is

1 In strictness the force must be supposed to act upon the medium in its

actual condition, whereas in (18), previously cited, the medium is supposed to be absolutely uniform. It is not difficult to prove that (3) remains unaltered, when this circumstance is taken into account; and it is evident in any case that a correction would depend upon the square of (D' — D).

necessarily more complicated; but, on the supposition that the changes of rigidity (AN) and of density (AD) are relatively small, the results are fairly simple. If the primary wave be represented by

S = e- ik * (4)

the component rotations in the secondary wave are

where

_ p /_ ANyz\ V N W'

r \D r + N TV' p/_AD x ANz 2 -* 2 \ \ D ~r + N r)

P =

N

ik'T e-ikr 4ir r

(5)

(6)

The expression for the resultant rotation in the general case would be rather complicated, and is not needed for our purpose. It is easily seen to be about an axis perpendicular to the scattered ray (x, y, z), inasmuch as

xi>i --ydi +z«3 = o.

Let us consider the more special case of a ray scattered normally ♦o the incident ray, so that * =o. We have

i'+ +ws^P 5

($)>"(«

■;

(7)-

If AN, AD be both finite, we learn from (7) that there is no direction perpendicular to the primary (polarized) ray in which the secondary light vanishes. Now experiment tells us plainly that there is such a direction, and therefore we are driven to the conclusion that either AN or AD must vanish.

The consequences ot supposing AN to be zero have already been traced. They agree very well with experiment, and require us to suppose that the vibrations are perpendicular to the plane ot polarization. So far as (7) is concerned the alternative supposition that AD vanishes would answer equally well, if we suppose the vibrations to be executed in the plane of polarization; but let us now revert to (5), which gives

PAN yz

'-"TT7'

■ +

*PAN xy_*

N r>'

= +

PAN z 2 - 2*

N

(a)

According to these equations there would be, in all, six directions from O along which there is no scattered light, — two along the axis of y normal to the original ray, and four (y = o, z= ±x) at angles of 45 with that ray. So long as the particles are small no such vanishing of light in oblique directions is observed, and we are thus led to the conclusion that the hypothesis of a finite AN and of vibra- tions in the plane of polarization cannot be reconciled with the facts. No form of the elastic solid theory is admissible except that in which the vibrations are supposed to be perpendicular to the plane of polarization, and the difference between one medium and another to be a difference of density. only (Phil. Mag., 1871, 41, p. 447).

It is of interest to pursue the applications of equation (3) so as to connect

the intensity of the scattered and transmitted light with the number and size of the particles (see Phil. Mag., 1899, 47, p. 375). In order to find the whole emission of energy from one particle (T), we have to integrate the square of (3) over the surface of a sphere of radius r. The element of area being 2wr 2 sin d4, we have

/

*'sin **

2irr 2 sin 2

_8jr

" 3

(9)

so that the energy emitted from T is represented by

8tt 3 (D'-py p 3 D 2 " X 4 ' •

on such a scale that the energy of the primary wave is unity per unit of wave-front area.

The above relates to a single particle. If there be n similar particles per unit volume, the energy emitted from a stratum of thickness dx and of unit area is found from (9) by the introduction of the factor ndx. Since there is no waste of energy upon the whole, this represents the loss of energy in the primary wave. Accordingly, if E be the energy of the primary wave,

whence where

idE 87r% (D'-D) 2 T2 Edx 3 D 2 X 4 '

E = Eoe-A .*

l _ 8-^n (D'-D) 2 – P 3 D 2 X 4 '

• (10)

. (11) . (12)

If we had a sufficiently complete expression for the scattered light, we might investigate (12) somewhat more directly by considering the

resultant of the primary vibration and of the secondary vibrations which

travel in the same direction. If, however, we apply this process to (3), we find that it fails to lead us to (12), though it fur- nishes another result of interest. The combination of the secondary waves which travel in the direction in question have this peculiarity : that the phases are no more distributed at random. The intensity of the secondary light is no longer to be arrived at by addition of individual intensities, but must be calculated with consideration of the particular phases involved. If we consider a number of particles which all lie upon a primary ray, we see that the phases of the secondary vibrations which issue along this line are all the same.

The actual calculation follows a similar course to that by which Huygens's conception of the resolution of a wave into components corresponding to the various parts of the wave-front is usually

verified (see Diffraction of Light). " ' ' "

*occupy a thin stratum dx perpen- dicular to the primary ray x. Let AP (fig. 1) be this stratum, and O the point where the vibration is to be estimated. If AP = p, the element of volume is dx2irpdp, and the number of particles to be found in it is deduced by the introduction of the factor ». Moreover, if OP = r, and AO = x, then r 2 = * 2 +p 2 , and pdp = rdr. Fig. i.*

The resultant at O of all the secondary vibrations which issue from the stratum dx is by (3), with sin equal to unity,

Consider the particles which

ndx

/; e

— D vT 27T,,. . ,

Jj— ˆ3 C0S X (™ ~~ r) 2vTdr <

„J D'-D irT – 2a-,,, .

*ndx — g x~ sm X ' ~ *) '*

(13)

To this is to be added the expression for the primary wave itself, supposed to advance undisturbed, viz. cos(2ir/X)(6i— x), and the resultant will then represent the whole actual disturbance at O as modified by the particles in the stratum dx.

It appears, therefore, that to the order of approximation afforded by (3), the effect of the particles in dx is to modify the phase, but not the intensity, of the light which passes them. If this be repre- sented by

cos-ˆ-(bt — x— 6), (14)

8 is the retardation due to the particles, and we have

5=»TD'-D)/2D . . . . (15)

If M be the refractive index of the medium as modified by the particles, that of the original medium being taken as unity, then S = (m — i)dx, and

,

M-i=»T(D'-D)/2D. . . . (16)

If m' denote the refractive index of the material composing the particles regarded as continuous, D'/D=ˆ' 2 , and

reducing to

/-i=|bT(m' 2 -i), >-i=mT(m'-i),.*

(17) (18)

in the case when (/— 1) can be regarded as small.

It is only in the latter case that the formulae of the elastic solid theory are applicable to light. On the electric theory, now generally accepted, the results are more complicated, in that when (p-' — l) is not small, the scattered ray depends upon the shape and not merely upon the volume of the small obstacle. In the case of spheres we are to replace (D'-D)/D by 3(K'-K)/(K'+2K), where K, K' are the dielectric constants proper to the medium and to the obstacle respectively (Phil. Mag., 1881, 12, p. 98); so that instead of (17)

„ t _ 3 «Tm' 2 -i " I_ 12 TF+i ■

On the same suppositions (12) is replaced by

On either theory

/z = 327r 3 (ju-i) 2 /3»A<,

• (19)

(20)

(21)

a formula giving the coefficient of transmission in terms of the refraction, and of the number of particles per unit volume. As Lord Kelvin has shown (Baltimore Lectures, p. 304, 1904) (16) may also be obtained by the consideration of the mean density of the altered medium.

Let us now imagine what degree of transparency of air is admitted by its molecular constituents, viz. in the absence of all foreign

matter. We may take X = 6Xio -5 cms., ju — 1 =0-0003; whence from (21) we obtain as the distance x, equal to i/h, which light must travel in order to undergo alteration in the ratio e : 1,

1. = 4”4Xl0- 15 Xre.

(22)

*The completion of the calculation requires a knowledge of the value of n, the number of molecules in unit volume under standard conditions, which, according to Avogadro’s law, is the same for all gases. Maxwell estimated 1-9X10”, but modern work suggests a higher number, such as 4-3 X10 19 (H. A. Wilson, Phil. Mae., 1903; see A. Schuster, Theory of Optics, § 178). If we substitute the latter value in (22) we find * = 19X10″ cm. = 190 kilometres.*

Although Mount Everest appears fairly bright at 100 miles’ distance, as seen from the neighbourhood of Darjeeling, we cannot suppose that the atmosphere is as transparent as is implied in the above numbers; and, of course, this is not to be expected, since there is certainly suspended matter to be reckoned with. Perhaps the best data for a comparison are those afforded by the varying brightness of stars at different altitudes. P. Bouguer and others estimate about 0-8 for the transmission of light through the entire atmosphere from a star in the zenith. This corresponds to 8-3 kilometres of air at standard pressure. At this rate the transmission through 190 kilometres would be (-8) 23 or o-0o6 in place of « -1 or 0-37. Or again if we inquire what, according to (2.1), would be the trans- mission through 8-3 kilometres, we find 1—0-044=0-956.

The general conclusion would appear to be that, while as seen from the earth’s surface much of the light front the sky is due to comparatively gross suspended matter, yet an appreciable proportion is attributable to the

molecules of air themselves, and that at high elevations where the blue is purer, the latter part may become predominant. '

For a further discussion founded Upon the observations of Q. Majorana and A. Sella, reference may be made to Lord Kelvin's Baltimore Lectures, p. 317, where a higher estimate of the value of n is favoured. It may be remarked that it is only the constant part of sky -light that can be due to detached molecules. Ordinary observation of the landscape shows that there is another part, highly variable from day to day, and due to suspended matter, much of which is fine enough to scatter light of blue quality.

The experiments of Tyndall upon precipitated clouds have been already referred to. So long as the precipitated particles are very fine, the light dispersed in a perpendicular direction is sky-blue and fully polarized. At a further stage of their growth} the particles disperse in the perpendicular direction a light which is no longer fully polarized. When quenched as far as possible by rotation of a nicol prism, it exhibits a residue of a more intense blue colour; and further it is found that the direction of the most nearly complete polarization becomes inclined to the direction of the primary rays.

A discussion of these and other questions upon the basis of the electromagnetic theory of light is given in the Phil. Mag., 1881, 12, p. 81. Here we must be content with a statement of some of the results. So long as the particles are supposed to be very small and to differ little from their environment in optical properties, there is little difference between the electric and the elastic solid theories, and the results expressing the character of the scattered light are equivalent to (5). Whatever may be the shape or size of the particles, there is no scattered light in a direction parallel to the primary electric displacements. In order to render an account of Tyndall's " residual blue " it is necessary to pursue the approximation further, taking for simplicity the case of spherical shape. We learn that the light dispersed in the direction of primary vibration is_ not only of higher order in the difference of optical quality, but is also of order k'c % in comparison with that dispersed in other directions, where c is the radius of the sphere, and fe = 2ir/X as before. The incident light being white, the intensity of the component colours scattered in this direction varies as the inverse eighth power of the wave-length, so that the resultant light is a rich blue.

As regards the polarization of the dispersed light as dependent on the angle at which it is emitted, we find that although, when terms of the second order are included, the scattered light no longer vanishes in the same direction as before, the peculiarity is not lost but merely transferred to

another direction. The angle 8 through which the displacement occurs is measured backwards, i.e. towards the incident ray, and its value is given by

AK #- ” K 25*

(23)

AK being the difference of specific inductive capacities. Experiments upon this subject are not difficult. In a darkened room a beam of sunlight (or electric light) is concentrated by a

large lens of 2 or 3 ft. focus ; and in the path of the light is placed a glass beaker containing a dilute solution of sodium thiosulphate (hyposulphite of soda). On the addition, well stirred, of a small quantity of dilute sulphuric acid, a precipitate of sulphur slowly forms, and during its growth manifests exceedingly well the pheno- mena under consideration. The more dilute the solutions, the slower is the progress of the precipitation. A strength such that there is a delay of 4 or 5 minutes before any effect is apparent will be found suitable, but no great nicety of adjustment is necessary.

In the optica! examination we may, if we prefer it, polarize the primary light; but it is usually more convenient to analyse the scattered light. In the early stages of the precipitation the polariza- tion is complete in a perpendicular direction, and incomplete in oblique directions. After an interval the polarization begins to be incomplete in the perpendicular direction, the light which reaches the eye when the nicol is set to minimum transmission being of a beautiful blue, much richer than anything that can be seen in the earlier stages. This is the moment to examine whether there is a more complete polarization in a direction somewhat oblique; and it is found that with 9 positive there is, in fact, a direction of more complete polarization, while with 9 negative the polarization is more imperfect than in the perpendicular direction itself.

The polarization in a distinctly oblique direction, however, is not perfect, a feature for which more than one reason may be put for- ward. In the first place, with a given size of particles, the direction of complete polarization indicated by (23) is a function of the colour of the light, the value of being 3 or 4 times as large for the violet as for the red end of the spectrum. The experiment is, in fact, much improved by passing the primary light through a coloured glass. Not only is the oblique direction of maximum polarization more definite and the polarization itself more complete, but the observation is easier than with white light in consequence of the uniformity in the colour of the light scattered in various directions. If we begin with a blue glass, we may observe the gradually increasing obliquity of the direction of

maximum polarization; and then by exchanging the blue glass for a red one, we may revert to the original condition of things, and observe the transition from perpendicularity to obliquity over again. The change in the wave-length of the light has the same effect in this respect as a change in the size of the particles, and the comparison gives curious information as to the rate of growth.

But even with homogeneous light it would be unreasonable to expect an oblique direction of perfect polarization. So long as the particles are all very small in comparison with the wave-length, there is complete polarization in the perpendicular direction; but when the size is such that obliquity sets in, the degree of obliquity will vary with the size of the particles, and the polarization will be complete only on the very unlikely condition that the size is the same for them all. It must not be forgotten, too, that a very moderate increase of dimensions may carry the particles beyond the reach of our approximations.

The fact that at this stage the polarization is a maximum, when the angle through which the light is turned exceeds a. right angle, is the more worthy of note, as the opposite result would probably have been expected. By Brewster's law (see Polarization of Light) this angle in the case of regular reflection from a plate is less than a right angle ; so that not only is the law of polarization for a very small particle different from that applicable to a plate, but the first effect of an increase of size is to augment the difference.

The simple theory of the dispersion of light by small particles suffices to explain not only the blue of the zenith, but the com- parative absence of small wave-lengths from the direct solar rays, and the brilliant orange and red coloration of the setting sun and of the clouds illuminated by his rays. The hyposulphite experiment here again affords an excellent illustration. But we must not expect a simple theory to cover all the facts. It is obvious that the aerial particles are illuminated not only by the direct solar rays, but also by light dispersed from other parts of the atmosphere and from the earth's surface. On this and other accounts the coloration of the sky is highly variable. The transi- tion from blue to orange or red at sunset is usually through green, but exceptional conditions may easily disturb the normal state of things. The brilliant sunset effects observed in Europe after the Krakatoa eruption may naturally be attributed to dust of unusual quality or quantity in the upper regions of the atmo- sphere (see Dust).

Related to abnormalities of colour we may expect to find corre- sponding polarization effects. Of this nature are the neutral points, where the polarization changes character, observed by F. J. D. Arago, J. Babinet and Sir D. Brewster, for an account of which reference may be made to E. Mascart, Traite d'optique. The normal polarization at the zenith, as

dependent upon the position of the sun, was the foundation of Sir C. Wheatstone's polar clock. (R.)

SKTE, the largest island of the Inner Hebrides, Inverness- shire, Scotland. From the mainland it is separated by the Sound of Sleat, Kyle Rhea, Loch Alsh and the Inner Sound, and from the Outer Hebrides by the Minch and Little Minch. At Kyle Rhea andKyleakin, on the western end of Loch Alsh, the channel is only about \ m. wide, and there is a ferry at both points. The length of the island from S.E. to N.W. is 485 m., but its coast is deeply indented, so that no part of the interior is more than 5 m. from the sea. It has a total area of 411,703 acres or 643 sq. m. From 20,627 in 1821 its population had grown to 23,082 in 1841, but since that date it has steadily diminished and was 15,763 in 1891, and in 1901 only 13,833 (or 21 to the sq. m.), 2858 of • whom spoke Gaelic only and 9837 Gaelic and English. The chief arms of the sea are Lochs Snizort and Dunvegan in the N., Loch Bracadale in the W., Lochs Scavaig and Eishort in the S. and Loch Sligachan in the E. The mountains generally assume commanding and picturesque shapes. The jagged mass of the Cuillins (Coolins) dominates the view whether by land or sea. Their highest point is SgurrnaBanachdich (3234 ft.), and at least six other peaks exceed 3000 ft. To the north of Loch Slapin stands the group of Red Hills, of which the highest points are Ben Caillich (2403) and Ben Dearg More (2323 ft.), and north of Lord Macdonald's forest near Loch Ainort rises Ben Glamaig (2537 ft.). About 8 m. N. of Portree is the curious basaltic group of the Storr (2360), consisting of pinnacles and towers, the most remarkable of which, " The Old Man," forms a landmark for sailors. Towards the north of the island, not far from Staffin Bay, is Quiraing (1779 ft.), a basaltic mass with a variety of quaint shapes, of which the best known are " The Needle," " The Prison " and " The Table," the last named a plateau of level turf 1500 ft. above sea-level, measuring 120 ft. by 60 ft. In the peninsula of Duirinish are the two circular hills of Healaval More (1538 ft.) and Healaval Beg (1601), usually styled " Mac- leod's Tables," while the two pyramidal rocks rising out of the sea, near the southernmost point of Duirinish, are called " Macleod's Maidens." The only important lake is the wild and gloomy Loch Coruisk, overshadowed by the precipices of the Cuillin. It is commonly approached by boat from Loch Scavaig, from the shore of which it is about 1 m. distant. It is r£ m. long by £ m. broad.

The greater part of the island, all the western and central part, is occupied by igneous plateaux consisting of basaltic lava flows of Tertiary age alternating with intrusive sills of dolerite; they are penetrated by numerous

basic dikes and by a smaller number of acid ones. The Cuillin hills owe their striking features to the intrusion of a great laccolitic mass of gabbro within the basalts. East of these hills a large area is covered by acid intrusions — granite felsite, &c. — including the Red Hills, Marsco and Glamaig. The western portion of the island has suffered the disturbances of the N.W. highland thrusting. Torridonian rocks occupy the whole of Sleat, with the exception of a strip between the Point of Sleat and Ormsay Island which is composed of Dalradian schists. In the north of Sleat the Torridonian Sandstones have been thrust on top of Cambrian Durness limestones. Soay is wholly Torridonian. In the narrow part of the island between Broadford Bay on the N.E. and Lochs Staffin, Eishart and Scavaig on the S.W., and in a narrow strip on the east coast, also in Loch Bay, there is an interesting series of Mesozoic rocks beginning with Triassic conglomerates and marls, and passing upwards through Rhaetic, Lower Lias (Broadford Bay), Middle Lias and Upper Lias (Strathaird, Portsea, Prince Charlie's Cove), to beds representing the Great Oolite and Oxford Clay (Loch Staffin, Uig, &c). A lignite bed of Tertiary age has been worked in a small way at Portsea, and diatomite is excavated from some ancient lake deposits at Loch Cuithir, Loch Monkstadt, Loch Mealt and other places. There is abundant evidence of glacial action on the lower ground.

The rainfall amounts to 80 in. for the year. The mean temperature for the year is 47°'5 F., for January 39°-5 F. and for July 56°-5 F. Most of the land is moor and hill pasture, with cultivated patches here and there, chiefly on Lochs Snizort and Bracadale, the Sound of Sleat, Kyleakin and Portree. The crofters do best with turnips and potatoes. The climate is better adapted for sheep and cattle (West Highland) than for crops, and the sheep farms include some of the finest in Scotland and carry famous stocks, principally black-faced with some Cheviots. The condition of the crofters, which was pitiable in the extreme, has been improved by the Crofters' Holdings Act of 1886. The old black huts have been replaced, in those parishes where stone is obtainable, by well-built houses. Between 1840 and 1 880 ejection had certainly been carried to great lengths.

and, in consequence of the emigration that followed, was mainly responsible for the serious decline of the population. The railways to Strome Ferry, Kyle of Loch Alsh and Mallaig, by rendering markets more accessible, effected an improvement in the fisheries, which have always been a mainstay of the inhabitants. The fisheries include herring, cod, ling and salmon, and oysters are reared in some places. Seals are not uncommon at certain points, but the walrus and sperm whale, once occasional visitants, are now rarely if ever seen. It is significant of the change in the circumstances 'of the people that recruiting is now sluggish, though once Skye supplied more soldiers to the British army than any other area of similar size and population. Whisky is distilled at several places,

the Talisker brand of the distillery at Carbost, on the western shore of Loch Harport, being well known.

The/inhabited isles off the coast of Skye are mainly situated near the eastern shore. Of thes6 the principal is Raasay (pop. 419). Brochel Castle, now a ruin, stands on the eastern coast. The island is 13 m. long, by about 3! m. at its widest. Off its north-western shore lies the isle of Flodda. To the north of Raasay, separated by a narrow strait; is South Rona (Seal Island, from the Gaelic ron, a seal), 4 J m. long with a maximum breadth of 1 J m. , and is a lighthouse, the light of which is visible for 21 m. Scalpay, immediately south of Raasay, has a hill of 1298 ft., and the Sound of Scalpay, parting it from the mainland, abounds with oysters, The other isles are Pabbay in Broadford Bay, Ornsay in the Sound of Sleat, and Soay near Loch Scavaig.

Portree (pop. 872), the capital, lies at the head of a fine harbour about the middle of the eastern seaboard. Steamers run daily in connexion with the mail train at Mallaig, and there is, besides, other communication by steamer with Oban and other ports on the mainland and in the islands. Among the buildings in the town are the Episcopal church of St Columba, erected in 1884 to the memory of Bishop George R. Mackarne/SS, the Ross Cottage Hospital, the Combination poorhouse and the court- house, and there is a factory for tweeds, plaids, carpets and other woollens. The exports are principally sheep, cattle, wool, salmon and other fish. The name, of the town was derived from the fact that James V. landed there on the occasion of his tour in the Western Highlands. The place thus became, in Gaelic, .Port-an Righ, or the King's Harbour. It was to Portree that Flora Macdonald (1722-1790) conducted Prince Charles Edward when he escaped frorn Benbecula, Prince Charlie's Cave is situated on the coast about 5 m. north of the harbour. Among other places in Skye> associated with the Young Pretender are Prince Charles's Point near Monkstadt, on the west of the peninsula of Trotternish, where he landed with Flora Macdonald, and Kings- burgh, on the eastern shore of Loch Snizort. The castle at Dun- vegan, of the Macleods of Macleod, was erected in the 9th century and extended by, later chieftains, especially by Alastair Crotach, 6r the Humpback, in 1458, and by Rofy (Roderick) More, who was knighted by James VI. Built on a rocky promontory which is difficult of access, the fortress must have been almost impreg- nable in the era of clan warfare. Among the interesting relics preserved in it are the Fairy Flag, a yellow silk banner captured from a Saracen general by a crusading Macleod, and Rory More's drinking-horn, which held two quarts and had to be drained at a single draught by the new chief before he could wield authority. The MacCrimmons, the famous race of hereditary pipers, hailed from this quarter of Skye and were attached to the Macleods of Dunvegan. At Duntulm is the ancient castle of the Maedonalds, another of the great

Skye chieftains. Close to it is the Hill of Pleas, where, in former days, the chieftain sat dispensing justice in the fashion .of primitive times. The modern seat of Lord Macdonald is Armadale Castle, a fine Gothic mansion on the shore of the Sound of Sleat.

SLADE, FELIX (1 790-1 868), English art collector and patron, was born at Lambeth, London, in August 1 790, the son of Robert Slade, a Surrey landowner, from whom he inherited considerable means. He became widely known as a purchaser of books and engravings, and made a valuable collection of glass. He died unmarried on the 29th of March 1868, leaving personalty to the value of £i6q,ooo. He bequeathed the bulk of his art collection to the British Museum, and £35,000 for the endowment of art 1 professorships, to be known as Slade Professorships, at Oxford,

Cambridge, and University College, London. University College received the additional bequest of six art scholarships.

SLANDER, a false tale or report, defamation. The word is a doublet of " scandal " and comes through the O. Fr. esclandre, which, through the earlier forms scandele, eicandele, escandre, is derived from Lat. scandalum (see further Scandal). In law, slander is the malicious defamation of a person in his reputation, profession or business, by words (see Libel and Slander).

SLANG, in what is now the usual sense, a general name for the class of words and senses of words, more or less artificial or affected in origin or use, which are not recognized as belonging to the standard vocabulary of the language into which they have been introduced, but have an extensive currency in some section of society either as a means of concealing secrets or as intentionally undignified substitutes for those modes of expression that are employed by persons who value themselves on propriety of speech.

As thus defined, slang includes many varieties of speech, which are current respectively among different sections of the population. The one, however, which most perfectly answers to the definition, and may be regarded as the primary type, is the artificial jargon, partly cryptic and partly facetious, used by Vagrants and professional thieves. It is true that the name of slang is now seldom applied to this jargon; it is more commonly designated by its older name of " cant."- Nevertheless in the 1 8th century it was chiefly used in this particular application; The earliest example of the word hitherto discovered occurs in Toldervy's History of Two Orphans, published

in 1756. One of the characters in this story is a man who, " in return for the numerous lies which he told, was called the cannon-traveller "; and it is said of him that " he had been upon the town, and knew the slang well." It is not clear whether " slang " here has its modern sense, or whether it means the ways of fast life in London. A more unequivocal instance, two years later in date, is quoted in Jf. C. Hotten's Slang Dictionary (1864) from a book entitled Jonathan Wild's Advice to his Successor, apparently One of the many catchpenny publications that were called forth by the popularity of Fielding's burlesque romances. No copy of this book is in the British Museum 6r the Bodleian Library, and inquiries have failed to discover any trace of its existence; but there is no reason to doubt that Hotten had seen it. The passage, as quoted by him, is as follows: " Let proper Nurses be assigned to take care of these Babes of Grace (i.e. young thieves). . . . The Master who teaches them should be a man well versed in the Cant Language, commonly called the Slang Patter, in which they should by all means excel." Four years later, in 1762, the word is found with a different and now obsolete meaning, in Foote's play The Orators. A fast young Oxford man, invited to attend a lecture on oratory, is asked, " Have you not seen the bills?" He replies," What, about the lectures? ay, but that's all slang, I suppose." Here the word seems to be equivalent to " humbug." In the 1st edition of Hugh Kelly's comedy, The School for Wives, there is a passage (omitted in some of the later reprints) in which one of a company of sharpers, who pretend to be foreigners and speak broken English,- says: " There's a language called slang, that we sometimes talk in. . . . It's a little rum tongue, that we understand among von another." Francis Grose's Dictionary of the Vulgar Tongue (1785) has the entry " Slang, the cant language"; and after this instances of the word are abundant. In the early part of the 19th century it appears in literature chiefly as a general term of condemnation for " low-lived " and undignified modes of expression. It seems probable that the word came from some dialect of the north of England; but this is difficult to establish, as most of the dialect glossaries date from a time long after it had obtained general currency, so that it would escape the notice of the compilers as being outside their proper scope. The English Dialed Diction- ary mentions only the sense of " abusive language," which is said to be current in Yorkshire and the Lake Country. Some reason for believing that the word is genuinely dialectal — an inheritance from the language of the Scandinavian settlers in the north of England — is afforded by the coincidence of its uses with those

of the modern Norwegian verb slengja (etymologically equivalent to the English " to sling ") and related worsts, as given in the dictionary of Ivar Aasen. Slengja kjeften (literally, to sling the jaw), means to pour out abuse; the compound slengje-ord (ord = word) is explained by Aasen as " a new

word without any proper reason," which comes very near to the notion of a " slang word." The English word has, in cant speech, certain applica- tions to matters other than those of language; and although these have not been found recorded at any very early date, they may possibly be old, and may contribute to the determination of the primary sense. Any particular mode of thieving or of making a living by fraudulent means is called a " slang "; and the same term is applied to the particular line of business of a showman or a troupe of strolling players. Further, the word is used adjectively to designate fraudulent weights and measures, and the early slang dictionaries explain the verb slang as mean- ing " to defraud." The precise relation between these various senses cannot be determined, but they seem to agree in having some reference to what is lawless or irregular, and this general notion may be regarded as having a certain affinity to the mean- ing of the verb " to sling," with which the word is probably etymologically allied. It is unlikely that the word slang, in the senses here under consideration, has any direct connexion with the homophonous word meaning " a strip of land."

The modern extended application of the term, which is closely paralleled by that of the French synonym argot, is not difficult to account for. In the first place, the boundaries of the world in which slang — in the original sense — is current are somewhat indeterminate. It is, for instance, not easy to draw the line between the peculiar language of " rogues and vagabonds " and that of the lowest order of travelling showmen and strolling players, or between this latter and the strictly analogous body of expressions common to all grades of the histrionic profession. Similarly, the prize-ring, the turf, the gaming-table and all the varieties of "fast" and "Bohemian" life have their own eccentric vocabularies, partly identical with, and in general character altogether resembling, the slang of the criminal and vagrant classes. In the second place, a little consideration is sufficient to show that thieves' cant is only one species of an extensive genus, its specific difference consisting in the unessential circumstance that its use is confined to one particular class of persons. ,

Although the term " slang " is sometimes used with more or less intentional inexactness, and has often been carelessly defined, the notion to which it corresponds in general use seems to be tolerably precise. There are two principal characteristics which, . taken in conjunction, may serve to distinguish what is properly called slang from certain other varieties of diction that in some respects resemble it. The first of these is that slang is a conscious offence against some conventional standard of propriety. A mere vulgarism is not slang, except when it is purposely adopted, and acquires an artificial currency, among some class of persons to whom it is not native. The other distinctive feature of slang is that it is neither a part of the ordinary language, nor an attempt to supply its deficiencies. The slang

word is a deliberate sub- stitute for a word of the vernacular, just as the characters of a cipher are substitutes for the letters of the alphabet, or as a nickname is a substitute for a personal name. The latter comparison is the more exact of the two; indeed nicknames, as a general rule, may be accurately described as a kind of slang, A slang expression, like a nickname, may be used for the purpose of concealing the meaning from uninitiated hearers, or it may be employed sportively or out of aversion to dignity or formality of speech. The essential point is that it does not, like the words of ordinary language, originate in the desire to be understood. The slang word is not invented or used because it is in any respect better than the accepted term, but because it is different. No doubt it may accidentally happen that a word which originates as slang is superior in expressiveness to its regular synonym (much as a nickname may identify a person better than his name does), or that in time it develops a shade of meaning which the ordinary language cannot convey. But when such a word comes

to be used mainly on account of its intrinsic merit, and not because it is a wrong word, it is already ceasing to be slang. So long as the usage of good society continues to proscribe it, it may be called a vulgarism; but unless the need which it serves is supplied in some other way, it is likely to find its way into the standard speech.

The account here given of the distinctive characteristics of slang conflicts with the view of those writers who so define the term as to make it include all words and uses of words that are current only among persons belonging to some particular; class, trade or profession. But such an extended application of the word is not supported by general usage. It is true that it is not uncommon to apply the name of slang to the technical language of trades and professions, or even of arts and sciences. This, however, is really a consciously metaphorical use, and is intended to convey the imputation that the employment of technical language has no better motive than the desire to be unintelligible to the uninitiated, to or excite admiration by a display of learning. If the imputation were true, the designation would be strictly applicable. Technical and scientific terms may justly be stigmatized as slang when they are used pretentiously without any good reason, but not when they are chosen because, to those who understand them, they afford a clearer, more precise, or more convenient expression of the meaning than is found in the ordinary vocabulary. At the same time, it is true that every trade or profession has a real slang of its own; that is to say, a body of peculiar words and expressions that serve as flippant or undignified

substitutes for the terms that are recog- nized as correct. It happens not infrequently that words of this kind, owing to frequency of use and^ the development of specific meanings, lose the character of slang and pass into the category of accepted technicalities.

A class of words that has a certain affinity with slang, though admitting of being clearly distinguished from it, consists of those which are proscribed from the intercourse of reputable society because they express too plainly ideas that are deemed indelicate, or because they are brutally insulting. Such words share with slang the characteristic that they are ordinarily employed only in intentional defiance of propriety; they differ from it in being really part of the original vernacular, and not of an artificial vocabulary which is substituted for it. The customary euphem- isms which take the place of these condemned words are, of course, far removed from slang; but the name is strictly ap- plicable to those grotesque metaphors which are sometimes sub- stituted, and emphasize the offensiveness of the notion instead of veiling it.

The known history of European slang begins (leaving out of account the meagre references in German documents hereafter to be mentioned) with the " Ballades " of Francois Villon in the 15th century. The French argot of these compositions contains much that is still obscure, but the origin of some of its words is evident enough. Facetious expressions relating to the destined end of the malefactor are prominent. Paroir and montjoye (for which later the less ironical monte d. regret was substituted) are nicknames for the scaffold. Acollez, hanged, corresponds to the English " scragged "; the synonymous grup seems to be an onomatopoeic formation sug- gestive of choking. There are some derivatives formed with the suffix art: riflart is a police-officer, abrouart fog. A few words from foreign languages occur: audinos, prayer, is the Latin audi nos of the litanies; arton, bread, is obviously Greek, and its appearance in the 15th century is somewhat hard to account for. Moller, to eat, may perhaps be the Latin molere to grind. Arise, the ear, is no doubt the Latin ansa, handle. In the 15th century and later the ranks of vagabondage were often recruited from the class of poor students, so that the presence of some words of learned origin in the vocabulary of the vagrant and criminal classes is not surprising. Among the prominent features of later French slang may be noted the use of the suffix mare to form derivatives such as perruguemare, a wig-maker, and the practice of rendering conversation unintelligible to outsiders by tacking on some unmeaning ending to every word.

In Germany the word Rotwalsch (the modern Rotwelsch, still the name for the cant of vagrants) occurs as early as the middle of the 1 3th century, and during the following century there appear lists of slang terms for various species of malefactors and begging impostors. The earliest attempt

at a vocabulary of " Rotwelsch " is that of Gerold Edlibach, compiled about 1490. A second vocabulary, containing nearly the same set ot words, is contained in the famous Liber vagatorum, first printed in 15 10 in High German; versions in

Low German and .the dialect of the Lower Rhine appeared shortly afterwards. An edition of this work printed in 1529 has a preface by Martin Luther. The most remarkable feature of the jargon represented in these eady glossaries is the large number of Hebrew words that it contains. It is not Clear whether this fact indicates that Jews formed a large proportion of the German vagabond class at the beginning of the 16th century; the explanation may be simply that the Hebrew words contributed by Jewish vagrants found acceptance because they were unintelligible to ordinary people. However this may be, the later dictionaries of " Rotwelsch " not only retain most of the Hebrew words found in the earliest authorities, but add greatly to their number. There are some words from Italian, asbregan, to beg, from pregare, and barlen, to speak, from parlare. The language of the gipsies seems to have contributed nothing, nor are there any words from Latin or Greek. Some of the ' words are ordinary German words used mataphorically, like wetterhan (weathercock) for a hat, zwicker (twitcher) for the hangman, brief (letter) for a playing-card. Others are descriptive compounds such as breitfuss (broad-toot) for a duck or goose, or derivatives formed by means of the suffixes -hart (or -art) and -ling, as grunhart (from griin, green), a field, glathart (from glatt, smooth), a table, fluckart (Ivomflug, flight), a bird, funckart (from funke, spark), fire, flossart (from floss, stream), water, flossling, a fish, liissling (from lilssnen to listen), the ear. It is noteworthy that modern Dutch thieves' cant, as presented in the dictionary of I. Teirlinck, is closely similar in its principles of formation, and in many of its actual words, to that of the early German vocabularies.

The earliest English "cant " or " Pedlers' French," as exhibited in R. Copland's The Hye Waye to the Spyttel House (1517), John Awdeley's Fraternitye of Vacabond.es (1561), Thomas Harman's Caueat for Cursetoufs (1567) and various later writers, bears a close resemblance in its general character to the German Rotwelsch of the Liber vagatorum, the most noteworthy point of difference being the absence of Hebrew words. The suffix corresponding to the -hart and -ling of German slang is -mans, as in lightmans, day, darkmans, night, ruffmans, the woods. The word cheat, a thing (whether this is etymologically connected with, the verb to cheat is uncertain), is used to form a great variety of descriptive compounds, such as grunting cheat, a pig, bleting cheat, a sheep, cackling cheat, a cock or capon, mofiing cheat, a napkin, smelling cheat, the nose, pratling 'cheat, the tongue. There are some ordinary English words used as descriptive nicknames for things, as glasyers, eyes, stampes, legs, stampers,

shoes, prauncer, a horse, glymmar, fire, lap, buttermilk or whey, high pad, the highway, pek, meat. Obviously of Latin origin are grannam, corn, pannam, bread, cassan, Cheese. Commission, a shirt, is from the Late Latin camisia; it afterwards appears shortened to mish. Perhaps boon and bene, good, may be Latin, but a French origin is possible. Vyle, a town, is probably French ; dense a vyle, the country, seems to be a compound of this. A few words seem to be of Dutch or Low German origin, as bung, a purse (Low Ger. pung), kinchin, a child, cranke, a malingerer, and perhaps feague or feak (Low Ger. fegen), which appears in modern slang as fake. Certainly from this source is the gambling term foist, to palm a die, which has become recognized English in a figurative sense. Harman's list includes a considerable number of words of obscure and perhaps undiscoverable origin, as lowre, to see, lowre, money, wyn, a penny, trine, to hang, cofe or cove, a man, mort, a woman. Attempts to discover an etymology for some of these in Romany are unsuccessful. Ken, a house, is used by English gipsies, but may be an importation from cant. Even in later English slang the number of Romany words is surprisingly small; pal, originally meaning brother, is one of the few certain examples.

From the 17th century onwards it has been more and more difficult to distinguish between the cant of thieves and vagrants and the slang of other classes more or less characterized by disorderly habits of life, such as pugilists, the lower orders of strolling players, professional gamblers and persons of all ranks addicted to low pleasures. Many words that were once peculiar to the outcasts from society are now in general slang use. While a few of the words of the " Pedlers' French " of the 1 6th century have survived to the present or recent times, the majority have been superseded by later inventions. The older slang names of coins or sums of money, for instance, are nearly all obsolete, and their modern synonyms, mostly of obscure origin, cannot be traced very far back. Quid, a guinea or sovereign, was used in the 17th century; bob, a shilling, bull, a crown piece, tanner, a sixpence, and others, are of 19th-century date. In recent times the vocabulary of low-class slang has ob- tained several words from Yiddish or Jewish-German, such as goyinof, a thief (Hebrew gannabh as pronounced by German Jews), foont, a pound (German Pfund), ooftish, contracted to oof, money (from the German auftischen, to regale a person with something); A peculiar growth of the 19th century is the so-called " back slang," current chiefly among London costermongers, which is a cryptic jargon formed by pronouncing words backwards, as in ecilop or slop for " police," " eno dunop and a flah," one pound and a half, thirty shillings. What is called " riming slang," consisting of such fantastic expressions as mutton-pie for eye, lord of the manor for " tanner," i.e. sixpence, is a jocular invention which does not seem to have had any considerable currency except in the columns of the sporting newspapers.

The varieties of slang that have their origin and currency in the reputable classes of society owe their existence partly to impatience with the constraint of ceremonious propriety of speech, and partly to the kind of esprit de corps which leads those who are associated in any c.mmon pursuit, or whose mutual intercourse is especially intimate, to take pleasure in the possession of modes of speech that are peculiar to their own " set. – ' The former feeling is naturally strongest among those who are under the control of superiors in whose presence they have to observe an uncongenial formality of expression. It is therefore only what might be expected that every public school and every university has its own elaborately developed slang vocabulary, and that there is also a good deal of slang that is common to schoolboys and to undergraduates in general. Even among persons of riper years there are many to whom cere- monious speech is unwelcome. The motive for the creation of slang is therefore widely diffused throughout all classes. Besides the general slang that is current among all who rebel against the laws of conventional decorum of language, there are innumerable special varieties. As a rule, every trade and profession, and every closely associated group of persons, has its own slang; indeed, there are probably few family circles that have not certain peculiar expressions used only within the household. It may be noted that some classes of workmen — printers and tailors for example — are more than others remarkable for the copiousness of their trade slang. The theatrical profession has in all countries an abundant vocabulary of sportively meta- phorical and allusive words and phrases. The slang current in the orderly portions of society, in England at least, does not present many insoluble puzzles of etymology, the words of obscure origin being for the most part such as have been imported from a lower level. There is no difficulty in accounting for the many jocularly similative uses of ordinary words, such as " tin " for money, "bags" for trousers, " tile " for hat. Especially characteristic of university slang is the distortion of the form of words, sometimes with the appending of a conventional termina- tion, as in the German student's " schleo " for schlecht, " Kneo " for Kneipe, " Bim " for Busen, " Respum " for Respekt, or the English " rugger " and " soccer " for the Rugby and Association varieties of the game of football, "tosher" for unattached student, " progging " for the disciplinary function of the proctor, " ekker " for exercise, " congratters " or " congraggers " for congratulations. Such shortened forms of words as " thou " for thousand, " exes " for .expenses, " exam " for examination, " vac " for vacation, " photo " for photograph, " bike " for bicycle, may reasonably be classed as slang when they are used with intentional impropriety or flippancy, but many such forms, on account of their convenient brevity, have acquired a

degree of currency that entitles them to rank as respectable colloquial English.

It is generally admitted that in the United States the currency of slang is wider, and its vocabulary more extensive, than in other English-speaking countries. Indeed, an American encyclopaedia has the entry " Slang, see Americanisms." The two things, of course, are not identical, and some of those American expressions that are in England regarded and used as slang have no such character in their native country. But the invention of new words of grotesque sound and ludicrously descriptive point is a favourite form of humour in America, and the freedom with which these coinages are used in many newspapers contrasts with the more sober journalistic style usual in England. Much of the current slang of America is used only in the land of its origin, and it is not uncommon to meet with newspaper articles of which an untravelled Englishman would hardly be able to understand a sentence, and on which the dictionaries of American- isms afford little light. The American contribution to the current slang of the British Isles consists mainly of words and expressions that are recommended by their oddity, such as " scallywag," " absquatulate," " skedaddle," " vamoose " (from the Span. vdmos, let us go), and words relating to political life, such as " mugwump " (originally an Indian word meaning " great chief "), " carpet-bagger," and " gerrymander." Australia,

also, as may be seen from the novels of Rolf Boldrewood and other writers, possesses an ample store of slang peculiar to itself, but of this " larrikin " is the only word that has found its way into general use in the mother-country.

To the philologist the most interesting question connected with slang is that relating to the importance of the share which it has in the development of ordinary language. It is probably true that the standard vocabulary of every modern European language includes some words that were originally slang; but there is certainly much exaggeration in the view that has been sometimes maintained, that slang is one of the chief sources from which languages obtain additions to their means of ex- pression. The advocates of this view point to the fact that a certain number of Italian and French words descend, not from the Latin words of identical meaning, but from other words which in vulgar Latin were substituted for these by way of jocular metaphor. Thus the Italian testa, Fr. tete, head, repre- sent the Lat. testa, pot or shell; the Fr.joue, cheek, corresponds by strict phonetic law to the Late Lat. gabata, porringer. It may be conceded that in these instances, and a few others, words of popular Latin slang have become the accepted words in the languages descended from Latin. But the number of instances of this kind is, after all, inconsiderable in comparison with the extent of the whole popular vocabulary; and the conditions under which the Romanic

languages were developed (from Latin as spoken by peoples mainly of non-Latin origin) are somewhat abnormal. A consideration of the essential characteristics of slang, as previously explained in this article, will show that it is only to a limited extent that it is likely to be absorbed into the general language. It has been pointed out that slang words, for the most part, do not express notions which ordinary language cannot express quite as efficiently. This fact implies a note- worthy limitation of the capabilities of slang as a source from which the deficiencies of a language can be supplied. As the prevailing tendency of words is toward degradation of meaning, one of the most frequently recurring needs of language is that of words of dignified and serious import to take the place of those which have become cheapened through ignoble use. It is obvious that slang can do nothing to meet this demand. The less frequent want of terms of contempt or reprobation may, of course, be supplied by adoptions from slang; and in the exceptional instances in which, as has already been indicated, a slang word has no synonym in ordinary speech, it may very naturally find its way into recognized use.

On the whole, the debt of modern standard English to slang of all kinds is probably smaller than most persons would suppose. A few words have been furnished by thieves' cant, and, as might be expected, most of these relate to criminal or vicious practices. No one will be surprised to learn that rogue and bully, and the verbs to filch and to foist, are derived from this source. On the other hand, one would hardly have expected to find " drawers, hosen " in Harman's vocabulary of " Pedlers' French " in 1567. The word soon came into general use, probably because (though not euphemistic in original intention) it suited the same affected notion of delicacy which led to the substitution of "shift" for " smock." There are some words, such as prig, to steal, which were once vagrant slang, but are now universally understood and widely used, without, however, losing their " slangy " character. The utmost that can be said is that they are on the debatable ground between slang and merely jocular language.

Although it often happens that words belonging to the more reputable kinds of slang undergo some improvement in status — acquiring some degree of toleration in refined circles where they would once have been considered offensive — there are few in- stances in which such a word has come to be regarded as unex- ceptionable English. One example of this is prig (a distinct word from the term of thieves' cant already mentioned), which originally denoted a person over-scrupulous in his attire and demeanour, but has now acquired a different sense, in which it supplies a real need of the language. Other words that were once slang but are so no longer are mob, humbug, tandem (apparently

a university joke founded on ■" at length " as the dictionary rendering of the Latin adverb).

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SLATE (properly Clay Slate; in M. Eng. slat or sclat, from O. Fr. esclat, a small piece of wood used as a tile; esclater, to break into pieces, whence modern Fr. iclat, the root being seen also in Ger. schleissen, to split), in geology, a fissile, fine-grained argillaceous rock which cleaves or splits readily into thin slabs having great tensile strength and durability. Many other rocks are improperly called slate, if they are thin bedded and can be used for roofing and similar purposes. One of the best known of these is the Stonesfield slate, which is a Jurassic limestone occurring near Oxford and famous for its fossils. Slates properly so-called do not, except on rare occasions, split along the bedding, but along planes of cleavage, which intersect the bedding usually at high angles. The original material was a fine clay, sometimes with more or less of sand or ashy ingredients, occasionally with some lime; and the bedding may be indicated by alternating bands of different lithological character, crossing the cleavage faces of the slates, and often in terrupting the cleavage, or rendering it imperfect. Cleavage is thus a superinduced structure, and its explanation is to be found in the rearrangement of the minerals, and the development of a certain degree of crystallization by pressure acting on the rock. Slates belong mostly to the older geological systems, being commonest in Pre-Cambrian, Cambrian and Silurian districts, though they may be found of Carboniferous

or even of Tertiary age, where mountain-building processes have folded and compressed these more recent formations. The action of pressure is shown also by the fossils which sometimes occur in slates; they have been drawn out and distorted in such a way as to prove that the rock has undergone deformation and has behaved like a plastic mass. Evidence of the same kind is afforded by the shape of the knots and concretions

sometimes present in the slate. If the bedding be traced, either in the slates or in the other rocks which accompany them, flexures will be frequently observed (the folding often being of an isoclinal type), while reversed faulting, or thrusting, is usually also con- spicuous.

The origin of slaty cleavage is in some measure obscure. This structure is by no means confined to slates, though always best exemplified in them, owing prob- j ably to the fine- grained, argillaceous materials of which they consist. Grits, igneous rocks, ash- beds and limestones may and often do show cleavage. Coarse rocks and rocks consisting of hard minerals are always imperfectly cleaved. The cleav- age of slates must be distinguished from cleavage of minerals, the latter being due to different degrees of cohesion along definite crystal- lographic planes. The connexion of cleavage with pres sure, however, is unmistakable. It is never exhibited except by rocks which have been sub- !

jected to the tangential stresses set up in the earth's crust by fold- ing. These stresses may operate in several ways. They will alter the shape of mineral particles by broadening them in a direction at right angles to the principal pressures, while they are thinned in the direction in which the pressure acted. Probably the size of the particle will be slightly reduced. This method of reasoning,' however, does not carry us far, as the minerals of slates vary considerably in form. Pressure will also tend to produce : an expansion of the rock mass in a direction (usually nearly vertical^ at right angles t« the compression, for such rocks as slates are distinctly plastic in great masses. This flowage will help to orientate the particles in the direction of movement; and, opera- ting conjointly with the flattening above explained, will accentuate the liability to cleave in a definite set of planes. The recrystalliza- tion induced by pressure is probably of still greater importance. Slates consist largely of thin plates of mica arranged parallel' to the cleavage faces. This mica has developed in the rock as it was folded and compressed. In the moist and plastic slate the mineral particles slowly enlarged by the addition of new crystal- line molecules. Those faces which were perpendicular to the pressure would grow slowly, as the great pressure would promote solution, and inhibit deposition; the edges or sides, on the other hand, being less exposed to the pressure would receive fresh deposits. In this way thin laminae would form, lying at right angles to the direction of greatest stress. Micas and other platy minerals (such as chlorite), which naturally grow most rapidly on their edges, would show this tendency best, and such minerals usually form a large part of the best slates; but even

Sketch (by Du Noyer) of a block of varie- gated slate from Devil's Glen, Co. Wicklow. The crumpled bands mark the bedding, and the fine perpendicular striae in front are the cleavage planes; the fine lines ;on the darkened side merely represent shadow, and must not be taken for planes

of division in the rock. It will be observed that the cleav- age planes do not pass through the White bands.

quartz and felspar, which under ordinary conditions form more equidimensional crystals, would assume lenticular forms. In the necessary co-operation of these three causes, viz. flattening of particles by compression, orientation of particles by flow and formation of laminar crystals, the fundamental explanation of slaty cleavage is found. The planes of cleavage will be approxi- mately perpendicular to the earth pressures which acted in the district; hence the strike of the cleavage (i.e. its trend when followed across the country) will be persistent over considerable areas.

Where the rock masses are not homogeneous (e.g. slates alter- nating with gritty bands), the cleavage is most perfect in the finest grained rocks. In passing from a slate to a grit the direction of the cleavage changes so that it tends to be more nearly per- pendicular to the bedding planes. A structure akin to cleavage, often exemplified by slates especially when they have been some- what contorted or gnarled, is the Ausweichungsclivage of Albert Heim. It is produced by minute cnimplings on the cleavage faces all arranged so that they lie along definite planes crossing the cleavage. These slight inflections of the cleavage may be sharp-sided, and may pass into small faults or steps along which dislocation has taken place. A secondary or false cleavage, less perfect than the true cleavage, may thus be produced (see Petrology, PI. IV. fig. 7). The faces of slates have usually a slightly silky lustre due to the abundance of minute scales of mica ail lying parallel and reflecting light simultaneously from their pearly basal planes. In microscopic section the best slates show much colourless mica in small, thin, irregular scales. Green chlorite is usually also abundant in flakes like those of the mica. The principal additional ingredient is quartz in minute lens-shaped grains. The size of the individual particles may be approximately one-five -hundredth of an inch. Minute rods or needles of rutile are also common in slates, and well-formed cubes of pyrites are often visible on the splitting faces. The brownish colour of some slates is due to limonite and haematite, but magnetite occurs in the darker coloured varieties. Other minerals which occur in the rocks of this group are calcite, garnet, biotite, chloritoid, epidote, tourmaline and graphite or dark carbonaceous materials.

By advancing crystallization and increased size of their com- ponents, slates pass gradually into phyllites, which consist also of quartz, muscovite

and chlorite. In the neighbourhood of intrusive granites and similar plutonic igneous rocks, slates undergo " contact alteration," and great changes ensue in their appearance, structure and mineral composition. They lose their facile cleavage and become hard, dark-coloured, slightly lustrous rocks, which have a splintery character Or break into small cuboidal fragments. These are known as " hornfelses " (q.v.). Farther away from the granite the slates are not so much altered, but generally show small rounded or ovoid spots, which may be darker or lighter in colour than the matrix. The spots contain a variety of minerals, sometimes mainly white mica or chlorite. In these spotted slates andalusite, chiastolite, garnet and cordierite often occur; chiastolite is especially characteristic; cordierite occurs only where the alteration is intense. The chiastolite-slates show elongated, straight-sided crystals with black cores (see Petrology, PI. IV. fig. 9), which, on transverse section, have the form of a cross constituting the two diagonals of the rhombic or squarish pattern of the mineral. These crystals may be half an inch to several inches in length; they are usually more or less completely weathered to white mica and kaolin. In other cases, especially near mineral veins, slates are filled with black needles of tourmaline or are bleached to pale grey and white colours, or are silicified and impregnated with mineral ores. Frequently in districts where slates are much crumpled they are traversed by numerous quartz veins, which have a thickness varying from several inches up to many feet, and may occasionally be auriferous. (J. S.F.)

Slates are widely used for roofing houses and buildings of every description, and for such purposes they are unequalled, the better sorts possessing all the qualities necessary for protection against wind, rain and storm. The finer varieties are made into writing

slates, and in districts where cross cleavage exists slate pencils are made. Slabs are also manufactured, and, being readily cut, planed, dressed and enamelled, are used for chimney pieces, billiard tables, wall linings, cisterns, paving, tomb-stones, ridge rolls, electrical switch-boards and various other architectural and industrial purposes.

Slate rocks are quarried both above ground and below ground, according as they lie near to or distant from the surface. When they are near the surface, and their dip corresponds with the slope of the ground, they are in the most favourable position, and are worked in terraces or galleries formed along the strike of the beds and having a height of about 50 ft. The galleries are generally carried on in sections of 10 yds., worked across the beds, and may rise to any height or be sunk below the surrounding level by excavations. When the rock is much removed from the surface, or inconveniently situated for open workings, it is quarried in underground chambers reached by levels driven through the intervening mass and across

or along the beds. Or it may be necessary to sink shafts as in coal-pits before the rock is arrived at, but the cost of doing so forms a serious drawback. The material is sometimes won by the aid of channelling machines which make a series of cuts at right angles to each other in the face of the rock; a block is then broken off at its base by wedges forced into the cuts, and its removal permits access to other blocks. When blasting is resorted to, advantage is taken of the natural cuts Or joints, as the rock is readily thrown or worked off these. The explosive used should be of such a character as to throw out or detach masses of rock without much splintering, which would destroy the blocks for slate-making. From the mass thrown out by the blast, or loosened so as readily to come away by the use of crowbars, the men select and sort all good blocks and send them in waggons to the slate huts to be split and dressed into slates. Two men are employed at this operation — one splitting and the other dressing, performing their work in a sitting posture. The splitter places a block on end between his knees, and with chisel and mallet splits it into as many plates as possible of the usual thickness for roofing purposes — namely, a quarter of an inch more or less according to the size and strength required. These plates are then placed horizontally by the dresser on a vertical iron" stand," and cut with a sharp knife into slates Of various sizes suitable for the market. For an enumeration of these sizes, see Roofs, where also will be found an account of the different Varieties of slates and of the ways in which they are fixed.

SLATE ISLANDS, a group belonging to the parish of Kilbrandon and Kilchattan off the coast of Lome, Argyllshire, Scotland. They comprise Seil, Easdale, Torsay, Luing and Shuna, and owe their name to the fact that they are composed mainly of meta- morphic rocks, Easdale, Torsay and Luing being entirely slate, Seil mostly slate with some porphyrite in the north, and Shuna gneissose. The quarries provide occupation for most of the inhabitants. The steamers to and from Oban usually call at Luing and Easdale. Seil (pop. 424), the most northerly, is con- nected with the mainland by means of Clachan bridge on its north-east side, near Rue. It measures 4 m. N. and S. by 2 m. E. and W. at its widest, and contains Kilbrandon church. Off a promontory on its west coast, divided only by a narrow strait, is the comparatively flat island of Easdale (pop. 284), measuring roughly | m. each way. The quarries have been worked since 1630 and yield some eight million slates every year. The experi- ment of leasing them to the workers on co-operative lines has been tried unsuccessfully. Luing (pop. 620) is situated S. of Seil, is 6 m. long and 1ˆ m. broad. Torsay (pop. 7), 1 m. long by ˆ m. broad, lies off its north-east, and Shuna (pop. 8), 2§ m. long by 1 J- m. broad, off its south-east, shore.

SLATER, JOHN FOX (1815-1884), American philanthropist, son of John Slater (Samuel Slater's brother and partner), was born in Slatersville,

Rhode Island, on the 4th of March 181 5. He was educated in academies at Plainfield, Connecticut, and Wrentham and Wilbraham, Massachusetts. At seventeen he entered his- father's woollen mill in Hopeville, Conn., of which he took charge in 1 83 6 . This and other mills he owned in partnership with his brother, William S. Slater, until 1873, when his brother took over the Slatersville Mills and he assumed sole ownership of the mills at Jewett City, Conn. In 1842 he re- moved from Jewett City to Norwich; there he helped to endow the Norwich Free Academy, to which his son presented the Slater Memorial Hall; and there he died on the 7th of May 1884. In 1882 he had made over to a board of ten trustees, incorporated in New York state, $1,000,000 for " the uplifting of the lately emancipated population of the Southern states,

and their posterity, by conferring on them the benefits of Christian education." Among the original trustees of the Slater Fund were Rutherford B. Hayes, Morrison R. Waite, William E. Dodge, Phillips Brooks, Daniel C. Gilman, Morris K. Jesup and the donor's son, William A. Slater; and among members chosen later were Melville W. Fuller, William E. Dodge, Jr., Henry C. Potter, Cleveland H. Dodge and Seth Low. In 1909 by careful investment the fund had increased, in spite of expenditures, to more than $1,500,000. The fund has been of great value in aiding industrial schools in the South, its largest beneficiaries being the Hampton Normal and Agricultural Institute of Hampton, Virginia, the Tuskegee Normal and Industrial In- stitute of Tuskegee, Alabama, Spelman Seminary in Atlanta, Georgia, Claflin University in Orangeburg, S.C., and Fisk University, in Nashville, Tennessee. At Winston-Salem, N.C., is the Slater State Normal and Industrial School, founded' in 1892 and named after the founder of the fund. Other state normal schools for negroes have received assistance from the fund; and in some cases it has contributed directly to the school boards of Southern cities.

SLATER, SAMUEL (1768-1835), American textile manu- facturer, was born in Belper, Derbyshire, England, on the 9th of June 1768. In 1783, the year after his father's death, he was apprenticed to Jedediah Strutt, his neighbour and a partner of Richard Arkwright in spinning cotton, and served under him six and a half years. Learning that the Pennsylvania legislature had granted £100 in 1789 to the inventor of a power carding machine, he removed to the United States in that year, but was unable because of British laws to bring with him drawings of cotton-spinning machinery. He wrote to Moses Brown of Providence, R.I., who had made unsuccessful attempts to manufacture cotton cloth, and in January 1790

on Brown's invitation went to Pawtucket, R.I., where he entered into a partnership with William Almy (Moses Brown's Son-in-law) and Smith Brown, a kinsman of Moses Brown, designed (from memory) machines for cotton-spinning, and turned out some yarn in December of the same year. In 1799 he established in his mills one of the first Sunday Schools in America. In 1801 he built a factory in Rehoboth, Mass., and with his brother John, who joined him in 1804, established in 1806 the manufacturing village of Slatersville, in Smithfield township, Rhode Island. He began the manufacture of woollen cloth in 1815-1816 at Oxford, now Webster, Mass., where he had built cotton mills in 181 2. In his later years he was interested in other textile mills and in iron foundries in Rhode Island. He died at Webster, Mass., on the 21st of April 1835. He has been called the " father of American manufactures " and it is no exaggeration to call him the founder of American cotton manufacturing.

See G.S. White, M emoir of Samuel Slater (2nd ed., Philadelphia,

1846).

SLATIN, SIR RUDOLF CARL VON (1857-), Anglo- Austrian soldier and administrator in the Sudan, was born on the 27th of June 1857 at Ober St Veit near Vienna. At the age of seventeen he made his first journey to the Sudan, reaching Khartum by the Nile route in October 1875 in company with Theodor von Heuglin (q.v.). Thence he went through Kordofan to Dar Nuba, exploring the mountains of that region. He returned to Khartum in consequence of a revolt of the Arabs against the Egyptian government. There Slatin met Dr Emin (Emin Pasha) and with him purposed visiting General C. G. Gordon at Lado, Gordon at that time being governor of the equatorial provinces. Slatin, however, was obliged to return to Austria without accomplishing his desire, but Emin went to Lado and at Slatin 's request ■ recommended the young traveller to Gordon for employment in the Sudan. In 1878, while Slatin was serving as a lieutenant in the crown prince Rudolf's regi- ment in the Bosnian campaign he received a letter from Gordon inviting him to the Sudan, of which country Gordon had become governor-general. At the close of the campaign Slatin received permission to go to Africa and he arrived at Khartum in January 1879. After a brief period during which he was financial

inspector, . Slatin was appointed mudir (governor) of Dara, the south-western part of Darfur, a post he held until early in 1 88 1, when he was promoted governor-general of Darfur and given the rank of bey. Whjle administering Dara, Slatin con- ducted a successful campaign against one of the Darfur princes in revolt, and as governor of Darfur he endeavoured to remedy many abuses. He had scon to meet the rising power of the mahdi Mahommed Ahmed (q.v.). Early in 1882 the Arabs in southern Darfur

were in revolt. With insufficient resources and no succour from Khartum, Slatin gallantly defended his province. Though victorious in several engagements he lost ground. His followers attributing his non-success to the fact that he was a Christian, Slatin nominally adopted Islam. But all hope of maintaining Egyptian authority vanished with the news of the destruction of Hicks Pasha's army and in December 1883 Slatin surrendered, refusing to make any further sacrifice of life in a hopeless cause. In the camp of the mahdi an attempt was made to use him to induce Gordon to surrender. This failing, Slatin was placed in chains, and on the morning of the 26th of January 1885, an hour or two after the fall of Khartum, the head of Gordon was brought to the camp and shown to the captive. Slatin was kept at Omdurman by the khalifa, being treated alternately with savage cruelty and comparative indulgence. At length, after over eleven years' captivity, he was enabled, through the instrumentality of Sir Reginald (then Major) Wingate of the Egyptian Intelligence Department, to escape, reaching Egypt in March 1895. In a remarkable book, Fire and Sword in the Sudan, written in the same year and issued in English and German in 1896, Slatin gave not only, as stated in the sub-title, " a personal narrative of fighting and serving the dervishes " but a connected account of the Sudan under the rule of the khalifa. Raised to the rank of pasha by the khedive, Slatin received from Queen Victoria the Companionship of the Bath. On the eve of his surrender to the mahdi at Christmas 1883 he had resolved, if he regained his liberty, to use the know- ledge he would acquire while in captivity for the eventual benefit of the country, and after a year's rest he took part, as an officer on the staff of the Egyptian army, in the campaigns of 1897-98 which ended in the capture of Omdurman. For his services in these campaigns he was made a K.C.M.G. and in 1899 was ennobled by the emperor of Austria. In 1900 he was appointed Inspector-General of the Sudan, in which capacity his mastery of Arabic and his profound knowledge of the land and peoples proved invaluable in the work of reconstruction undertaken by the Anglo-Egyptian government in that country. In 1907 he was made an honorary major-general in the British army.

SLAUGHTER-HOUSE, or Abattoir. In the United Kingdom slaughter-houses are of two kinds, those which belong to in- dividual butchers and those which belong to public authorities; the former are usually called private slaughter-houses, the latter public slaughter-houses. Private slaughter-houses in existence in England before the passing of the Public Health Act 1875 were established without licence by the local authority, except in those towns to which the provisions of the Towns Improvement Clauses Act 1847, relating to slaughter-houses, were applied by special Act. By the Act of 1875 these provisions were extended to all urban districts. Subse- quently to 1890 urban authorities adopting Part III. of the Public Health

(Amendment Act) of that year could license for limited periods of not less than one year all slaughter-houses coming into existence after such adoption. In London, slaughter-houses have been licensed since 1855. Private slaughter-houses are fre- quently situated at the rear of the shop in which the meat is sold. Each consists of a compartment in which the animals are killed, and in association with this are the pounds in which a few animals can be kept pending slaughter. These buildings are regulated by by-laws made under the Public Health Act by the several urban sanitary authorities. The by-laws usually provide for the floor to be made of jointless paving, to ensure that the earth shall not be fouled in the process of slaughtering; for the walls to be cemented to a certain height above the floor, to provide a surface which can be easily cleaned; for the doors

Private.

Public.

to be of sufficient width to enable cattle to enter the slaughter- house without difficulty; and for the poundage to have floor- space sufficient for each animal. These by-laws also provide for water-supply to the slaughter-house for cleansing, and to the pounds for the use of the animals, for the periodical lime- whiting of the premises, and for the observance of care to prevent the blood escaping into the drains. Private slaughter-houses, especially those which were established without licence, are often in too close proximity to inhabited buildings. In towns in which by-laws are not strictly enforced they are often sources of nuisance. Private slaughter-houses are also objectionable on other grounds. They lead to the driving of cattle through the towns on the way to the slaughter-house, sometimes to the danger of the inhabitants, and they render impossible any sys- tematic inspection of meat. It is in connexion with the increasing demand for such meat-inspection that the objections to private slaughter-houses are most manifested; and hence, in countries in which the law provides for the obligatory inspection of meat, private slaughter-houses are ceasing to exist, and public abattoirs are being substituted for them.

Public slaughter-houses are of great antiquity and owe their beginnings to Roman civilization. In 300 B.C. animals were slaughtered in the open air in the Forum in Rome. Later, to meet the convenience of butchers, a house on the river Tiber was given to them for the purposes of their trade. This house had been occupied by a Roman citizen named Macellus. The building appears to have retained his name, and hence the macellum of Livy's time

subsequently erected in the Forum, which, inter alia, is believed to have con- tained rooms for the slaughter of animals. The rooms actually used for slaughter were lanienae, from laniare, but the word macellum has been preserved in the Italian macellare, to slaughter, and in the German metzgen or metzgeln, and in the English massacre.

Public slaughter-houses existed in many large towns of Germany in medieval times under the name of Kultelhofe; they were mostly situated on the rivers, which provided an ample supply of water, and afforded means for the removal of blood. Some of these Kuitelhdfe continued to exist within recent years. No law other than a town law governed their establishment and management. They were owned or controlled by the butchers' corporations or gilds, but all butchers were not members of the gilds; and this appears to have led to a ministerial order in Prussia in 1826, which made it inadmissible to require every butcher to slaughter in them. Shortly after the middle of the 19th century the prevalence of trichinosis compelled a return to the use of public slaughter-houses; and the enactment of laws in 1868 and 1 881 in Prussia, and similar laws in other German states, empowered urban authorities to require that all animals killed in towns should be slaughtered in public slaughter-houses. (Schwarz, Bau, Einrichtung und Betrieb ojjentlicher Schlachl- und Viehhofe.)

In France, in the 15th and 16th centuries, numerous towns were provided with public slaughter-houses. It was required that they should be used by all persons killing animals the flesh of which was to be sold; but their position and the conditions they created were such as urgently to demand amelioration, and some effort was made in this direction in 1567. It was not, however, until the time of Napoleon I. that it was decided that the atrocious nuisance which these slaughter-houses created should be removed. By decrees passed in 1807 and 1810 public slaughter-houses were required to be provided in all large towns in France, the needs of Paris being determined by a Commission, which recommended the establishment of five abattoirs or public slaughter-houses. In 1838 the requirement that public slaughter- houses should be provided in large centres was extended to all towns in France, and it was further required that the slaughter- houses should be situated at a distance from dwelling-houses. In 1867 the large abattoir of La Villette was constructed to meet the needs of Paris, two of the five constructed under the decrees of Napoleon being closed. In 1898 the additional abattoir of Vaugirard was opened, and the remainder of the five were

closed except Villejuif, which was restricted in its use to the slaughter of horses for human food.

In Belgium public slaughter-houses have been provided in all the large and

many of the small towns. In Switzerland there are public slaughter-houses in nearly all places having more than two thousand inhabitants. In Italy a law of 1890 required that public slaughter-houses should be erected in all communities of more than six thousand inhabitants. In Austria a law of 1850 required the provision of such places in all the large and medium-sized towns. In Norway and Sweden a law of 1892 required the provision of public slaughter-houses; but it has only partially been fulfilled. In Denmark there are public slaughter- houses in a few towns, including Copenhagen. In the Nether- lands and Rumania a number of public slaughter-houses have been provided. It is in Germany, however, that the greatest progress has been made, and especially in Prussia, where, Pro- fessor Ostertag of Berlin states, they have " grown out of the ground " (Handbuch der Fleischbeschau) ; so much so that in 1897 there were 321 public slaughter-houses in the kingdom, 40 of which were provided in the period 1895-1897. A later work (Les Abattoirs publics, by J. de Loverdo, H. Martel and Mallet, 1906) gives the number of public slaughter-houses as 839 in Germany, 84 in England, 912 in France and nearly 200 in Austria. In some other countries public slaughter-houses have been provided, but they are of a primitive form.

In England the power to provide public slaughter-houses was given by the Public Health Act 1848 to the local authorities of cities, towns, boroughs, &c, to which the Act was applied „ by Order; and later, was given to all urban sanitary Kegaa- authorities by section 169 of the Public Health Act 1875. s '

These authorities have, however, suffered from the disadvantage that they have had no power to control the continuance of private slaughter-houses (except in so far as these were annually licensed), and they have therefore been unable to ensure that the public provision would be used by the butchers. In Ireland and Scotland much the same powers exist; but in Scotland, if the burgh com- missioners provide a public slaughter-house, no other slaughter- house can be used. Some English local authorities have obtained in local acts powers similar to those possessed by the burgh com- missioners in Scotland. The need for still wider control is, however, manifest. Belfast may be cited as an illustration of a town in which a public slaughter-house has been provided, and in which there are no private slaughter-houses, but which receives a quantity of meat from private slaughter-houses erected beyond the boundaries of the city. The outcome of these difficulties is that the power of local authorities to provide public slaughter-houses has been but sparingly used. There is no law requiring that meat shall be inspected before sale for human food, hence there is no obligation upon butchers to make use of public establishments for the slaughter of their cattle. This, indeed, is the position of some of the Continental slaughter- houses; but the increasing strictness of the laws as to

meat-in- spection, and especially in requiring that all animals shall be inspected at the time of slaughter, is making the use of public slaughter-houses obligatory. Such a law now exists in Belgium, where it has served as a model to other countries. An Imperial German law of 1900 extends to all parts of that country the same requirement, and enacts that " neat cattle, swine, sheep, goats, horses, and dogs, the meat of which is intended to be used for food for man, shall be subjected to an official inspection both before and after slaughter." Antecedent to that year it was in force in southern Germany, in Brunswick and Saxony, but only in some parts of northern, western and central Germany. A similar law exists in Norway and Sweden, but, as already stated, provision of public slaughter-houses is still meagre; in Austria-Hungary there is a similar requirement, but Ostertag states that the administration is lacking in uniformity; in Italy, he writes, the regulation of meat-inspection having been left to provincial authorities, thorough reform is impossible. In the British colonies advance is being made. New Zealand has a number of public slaughter-houses. The Meat Supervision Act of Victoria empowers the Board of Health to make regulations for ensuring the wholesomeness of meat supplies. Regulations have been made for Melbourne. Cattle are killed in public slaughter-houses and the carcases are stamped, thus showing in which slaughter-house they have been killed.

The planning and construction of public slaughter-houses have been the subject of excellent treatises by German writers, among whom may be mentioned Dr Oscar Schwarz, of Stolp, construe- and Herr Osthoff, a former city architect of Berlin, to iion whose works the writer of this article is largely indebted for information. After inspection of the public slaughter-houses in England and in a number of Continental cities, the writer considers that those of Germany are most deserving of description.

The slaughter-house should be situated outside the town, or so

placed as to be isolated, and approached by wide roads, so that if cattle are driven through them there should not be interference with the traffic. If possible, the slaughter-house should be con- nected with the railway system by a branch line, with a platform which has an impervious surface capable of being readily cleansed and disinfected. The most convenient shape of the site is a rectangle or square, having one side abutting on the principal road and another side bounded by the railway. A cattle-market is usually provided in connexion with the slaughter-house, and the position should be such that cattle brought by train can be taken immediately into the cattle-

market and from the market or the railway to the slaughter-house. The cattle-market should be entirely separate from the slaughter- house area. Osthoff states (Schlachthofe fur kleine und mittelgrosse Stddte) that the area of the slaughter-house should be as follows: — ■

Sq. Metres. Towns of 5,000- 7,000 inhabitants . 040 per inhabitant.

,, 7,000-10,000 ,, . 0-35 ,, ,,

10,000-50,000 ,, . 0-30 ,, ,,

„ over 50,000 „ . 0-25 „ „

It is of course assumed that the population derives the whole of its meat-supply from this source.

The parts required, according to Dr Oscar Schwarz, are: (1) an administrative block; (2) a slaughtering-hall, with a special room for scalding swine; (3) cattle lairs; (4) room for scalding and cleansing tripe and intestines; (5) an engine-house; (6) separate slaughtering- room, with la,irs for animals suffering from, or suspected to be suffering from, contagious disease.

In small towns the slaughtering-hall and room for cleansing intestines may, to save cost of construction, be under the same roof. A necessary adjunct is a cold chamber, to which carcases can be removed from the slaughtering-hall. The actual slaughter- ing compartment has been built on two plans—one providing a separate slaughtering-room for each butcher, the other a common slaughtering-hall. The latter is greatly to be preferred, inasmuch as it is the only arrangement which gives adequate opportunity for inspection by the officials whose duty it is to examine the meat. The slaughter-house in Berlin was constructed on the separate-TOom system; but the system gave rise to difficulties of inspection. During recent years in Germany the practice has been to construct slaughter-houses with common halls. The part occupied by each butcher at the time of slaughtering is, however, sufficiently dis- tinguishable, and at Hamburg the position of the hooks hanging from above divides the hall into separate areas, each of which has an entrance from without. Schwarz gives the following as the most convenient arrangement of the buildings: The administrative building (with the house of the superintendent) at the entrance, so that from it the entrance and whole place can be seen. In the vicinity should be a weighing-machine for cattle. The centre of the area is occupied by the slaughtering-halls, and the lairs belonging to them are only separated from them by a road or passage way. The manure-house and tripe-house must be easily accessible from all the slaughtering-halls, but not in direct communication

with them, or smell from them may enter the hall.

The manure-house must abut upon a road, to enable its contents to be removed without passing through the premises. Next to the tripe and pig-scalding houses is the engine-house. The building for diseased animals, with the slaughter-house for them, must be isolated from all other buildings. All buildings should be so arranged that they may be capable of extension as the population of the town increases. By the provision of grass plots and trees every effort should be made to relieve the premises of the dreary appearance they will otherwise present.

Cold chambers, although not included among the absolute essentials for small slaughter-houses, are an almost necessary adjunct, for they serve for the preservation of the meat after slaughter, and are indeed absolutely necessary when the slaughter-house is of large size. The cold chamber should be situated opposite the slaughtering- halls, so that carcases can be conveyed by overhead carriers directly from these halls to it. Within the cold chamber'are separate com- partments or cages of different sizes, rented by butchers, who are thus able to preserve their meat and draw upon their supply as their business may require. The cold chamber is therefore a great convenience to the butchers, and is a source of profit to the authority owning the slaughter-house. A frequent adjunct to large German slaughter-houses is the " Freibank," at which is sold at low price cooked meat of quality which renders it unfit to be sold under ordinary conditions.

Much depends upon the design and details of construction of the several component parts of a public slaughter-house, upon the provision of adequate lighting and ventilation of the buildings, upon the construction of walls, floors, and fittings which are imper- meable and can be readily cleansed, and upon the provision of an abundant water-supply. It is essential that the buildings should be well lighted, especially those which are used for the slaughtering operations, or for any detailed examination of meat which may be needed — such, for instance, as for trichinae. The material generally used for the floor of the slaughtering-hall is cement or granolithic pavement which must not present so smooth a surface as to be

slippery. The floor must have an adequate fail, so that the washings may discharge into a system of drainage.

The plans of the public slaughter-house of Neusalz on the Oder and of Dusseldorf well illustrate the provision which is now made respectively for a small and for a large town. The writer is indebted to Dr Schwarz for the plan and a description of the slaughter-house at Neusalz. It was completed in October 1899, and is erected on the Oder below the town, on land of an

area of 8500 square metres. The building was carefully planned by the town architect, Herr Brannaschk, so as to admit of increase within the next 10-20 years. Brickwork is used for the construction of the buildings, and the roofs are of wood and cement. The walls of all the rooms except those of the administrative block are lined partly with polished stone, partly with cement, to a height of two metres above the floor. The floors consist of stone slabs set in cement (fig. 1).

The administrative block (A) is situated at the entrance and is a three-storey building, containing an office, a room for examination of meat for trichinae, and dwelling-rooms for the superintendent. In the central block (B) two slaughter-halls are provided (a) for swine and (b) for cattle and sheep. With these are associated (e) an engine-house, (d) a boiler and fuel room, (e) a workshop, (/) a passage communicating with the two slaughter-halls, (g) a cold chamber, (h) ante-rooms to the cold chamber, (i) dressing-rooms for assistants, and (k) stabling. The cold chamber has an area of 169 square metres and contains 28 cells of various sizes. In order to attain an even temperature of 2° C. to 4° C, air rendered cold by

< River Oder

Slaughterhouse Street fwytazxtnam

Thejtgurel gore measurements in metres.

Fig. 1. — Plan of Public Slaughter-house at Neusalz on the Oder (1899).

the ammonia process is conveyed to the room by channels. In the engine-house © are a 48-horse-power engine, the cooling machines, and the water-pump, which pumps water from a well into two cisterns situated in a water-tower over the passage between the two slaughter-halls. In the outbuilding © are (o) and (6) the gut- washing rooms for cattle and swine respectively, (c) an ante-room with (d) openings for manure to be thrown into carts. The road (e) slopes downwards, so as to enable a cart to be driven below the openings through which the manure is discharged. In the out- building (D) are (a) a horse slaughtering-room, (b) a stable, (c) a bathroom, (d) a room in which the floor washings are treated chemically or by filtration before discharge into the river, and (e) a urinal. In the outbuilding (£) are (a) a stable for sick animals, (b) a slaughter-house for diseased animals, (c) a sterilizing-room for meat to be subsequently sold in (d) the " Freibank," (e) a stable for horses, and (f) a cart-shed. The slaughter-house is lighted with electric light. The cost of the buildings is about £19,000, and provides for a population of 20,000 to 25,000 inhabitants.

The slaughter-house at Dusseldorf is on a more extensive scale. It was erected at an estimated cost of from £162,000 to £175,000, and covers an area of about 23-2 acres. Provision is made for each department to be practically doubled in size. It is unnecessary to describe it in 'any detail, but it may be noted that it has a market associated with it, and that separate slaughter-halls are provided for large cattle, for small cattle (sheep and calves), and for swine (fig. 2). The population of Dusseldorf was 212,949 in 1900

Fig. 2. — Han of Public Slaughter-house and Cattle-market, Dtisseldorf (1

The average cost of slaughter-houses in Germany is given by Osthoff, of Berlin {Handbuch der Hygiene), as 7 to 8 marks per inhabitant if no cold chamber is provided, and from 10 to 12 marks per inhabitant if there is a cold chamber, or, in more detail, as follows : —

Number of Inhabitants.

Cost of Slaughter-house per Inhabitant, in Marks.

Without Cold Chamber.

With Cold Chamber.

5,000- 6,000 6,000- 8,000 8,000-15,000 15,000-20,000

Over 20,000

8

7 6

7 8

12 10

9 10 10

Slaughter-houses in Germany pay their own expenses, the fees received for the use of the slaughter-house, and for examination of meat and stamping after examination, providing a sufficient sum for this purpose. The fees vary in different places. From the works of Osthoff and Schwarz it would appear that these fees average about one pfennig per kilogramme of the

living animal, or about half a farthing per ft of meat.

The corporation of the city of London have erected a slaughter- house at their cattle market in Islington in which slaughtering is done in a large hall divided by partitions into separate compartments. The compartments are not let to separate butchers but are used in common. The partitions do not extend to the ceiling, but are sufficiently high to prevent the slaughtering in one compartment being seen by the occupants of other compartments, and thus they necessarily provide less opportunity for inspection than is afforded by the open-slaughtering halls of Germany. The fees charged are is. 6d. per head for bullocks, 4d. for calves, 2d. for sheep, and 6d. per head for pigs. The accofhmodation is estimated as sufficient for the slaughter of 400 cattle, 1200 sheep, and 1200 calves and pigs Der day.

The centralization of the slaughtering and packing industries in the United States has not required slaughter-houses on the same plan as in Europe. Acts of Congress of 1890, 1891 and

1895 endeavoured to provide some amount of inspection, but sufficient appropriations were never made to carry it out, and there were also certain loopholes in the legislation. Although there were from time to time frequent cases of sickness directly traceable to the consumption of canned meats from the great packing centres, it was not until the publication of Upton Sinclair's The Jungle (1906), which dealt with the conditions in the Chicago packing yards, that steps were taken adequately to guard the public against insanitary conditions. A commission of inquiry was appointed by President Roosevelt, and as a result of its report there was passed in 1906 a national meat inspection law. This act required the department of agriculture to appoint inspectors to examine and inspect all cattle, sheep, swine and goats before being allowed to enter into any slaughtering, pack- ing, meat-canning, rendering or similar establishments. All such animals found to show any symptoms of disease must be set apart and slaughtered separately. All carcases must be inspected and labelled as either "inspected and passed" or " inspected and condemned." The act also provides for the inspection (and condemnation if necessary) of all meat food products as well as for the sanitary examination of all slaughtering, packing and canning establishments. Inspection and examination is now carried out very carefully at all stages of the industry, from inspection of the animals before they enter the slaughtering establishments up to the finished product.

The important feature of the Chicago and certain other western American cities slaughter-houses is their adaptation for rapidly dealing with the animals which they receive. At the Chicago slaughter-houses the cattle to be slaughtered are driven up a winding viaduct, by which, in certain of the

houses, they eventually reach the roof. Each animal now passes into a narrow pen, where it is at once stunned by a blow on the head. It then falls through a trap- door in the pen into an immense slaughtering-room, where the hind legs are secured, and the animal hoisted by a wire rope suspended from a trolley-line. A knife is then plunged into its throat and the

carcase made to travel along the line. The carcase is next lowered to the floor, the hide taken off, the head and feet cut off, and the internal parts removed. The carcase again travels along the trolley- line to a place where it is divided into halves, which then, after washing, travel to the refrigeration-room, being trimmed while on the way. The extent of the business may be judged by the fact that over 400 cattle are killed per hour in the slaughtering-room. The cooling-rooms are so large that 13,000 halves of beef hang there at one time. The method of dealing with sheep is very similar. The animals are driven into narrow alleys, then into the slaughter- room, where their throats arc cut. They next travel along a route where their skins and the internal organs are removed, and finally pass into the cooling-rooms. Swine are raised in the slaughter- room on to the trolley-line by a chain attached to the animals' feet and to a solid disk or wheel, which in revolving carries them until a mechanical contrivance throws the chain upon the trolley-line, where a knife is plunged into their throat. In its subsequent passage the carcase is scalded, scraped by a machine through which it passes, later decapitated, the internal parts removed, and the interior washed. The carcase then travels to the cooling-room.

In 1904 a British departmental (Admiralty) committee on the humane slaughtering of animals recommended that all animals should be stunned before being bled, and, with a view to sparing animals awaiting slaughter the sights and smells of the slaughter- house, that " cattle should, when possible, be slaughtered screened off from their fellows. This can be arranged in moderate-sized abattoirs by dividing up the side of the slaughter-chamber opposite to the entrance doors into stalls somewhat similar to those in a stable, but considerably wider. For quiet home-grown cattle a width of 10 ft. is sufficient, but where wilder cattle have to be killed a wider space is probably desirable. It is important that these stalls should be so arranged as not to screen the operations of slaughter from the view of the inspecting officials. Immediately after the carcases have been bled, they should be moved on to and ' dressed ' in an adjoining room, screened off from the view of animals entering the slaughter-chamber. This is easily accomplished by hitching a rope (from the winch, if necessary)

round the head or forelegs of the carcase, and by dragging it along the floor for the short distance into the ‘ dressing room. ‘ The slaughter-stall should then at once be flushed down with the hose, so as to remove all traces of blood. This method leaves the slaughter spaces clear for the next, batch of animals, whereas under the existing system there is either a loss of time through the slaughter spaces being blocked up with dressing operations, or else the next batch of animals on being brought into the slaughter-chamber are confronted with mutilated and disem- bowelled carcases.”

The provision of public slaughter-houses enables control to be exercised over the methods of slaughtering. The above-mentioned committee state that they practically tested a large number of appliances designed for felling and stunning animals previous to ” pithing,” among which they mention the Bruneau and Baxter masks, the Greener patent killer, the Blitz instrument, and the Wackett punch, all of which are suitable for quiet cattle or horses. In view of the difficulty of adjusting these instruments in the case of wild or restive animals, the committee express the opinion that the poll-axe when used by an expert is on the whole the most satis- factory implement, but they recommend that no man should be permitted to use the poll-axe on a living animal until he has gone through a thorough course of training, firstly upon a dummy animal and secondly upon dead bodies. Calves, the committee state, should be stunned by a blow on the head with a club. With respect to the method of slaughter of sheep the committee discuss the method usually adopted in England, which is ” to lay the sheep on a wooden crutch and then to thrust a knife through the neck below the ears, and with a second motion to insert the point, from within, between the joints of the vertebrae, thus severing the spinal cord.” Observations made for the committee by Professor Starling showed that the interval between the first thrust of the knife and complete loss of sensibility varied from five to thirty seconds, and they there- fore recommended that sheep should be stunned before being stuck, a practice required in Denmark, many parts of Germany, and Switzerland. It is necessary that the sheep should be struck on the top of the head between the ears and not on the forehead. The insensibility produced by the blow was found to last fully twenty seconds, a period sufficiently long for the killing to be completed if the animal is laid on the crutch before being stunned. The stunning of pigs, the committee recommended, should be insisted upon in all cases, and not, as sometimes at present, only practised in the case of large pigs which give trouble or with a view to the avoidance of noise.

The Jewish method of slaughter by cutting the throat is con- demned by the committee after careful observation and after re- ceiving reports by Sir Michael Foster and Professor Starling, the chief objection to this method being that it fails in the primary requirements of rapidity, freedom from

unnecessary pain, and instantaneous loss of sensibility.

The use of public slaughter-houses has not been found to affect the prices of meat, although one of the numerous arguments used by butchers against being required to slaughter in public slaughter- houses was that they would have this effect. Inquiry on this

subject by a Swedish veterinary surgeon of Stockholm, Kjerrulf, of 560 towns possessing public slaughter-houses, elicited replies from 388. Of these, 261 towns declared that as a result of the compulsory use of the abattoirs and compulsory meat inspection the price of meat had not been raised. In the case of twenty-two towns prices rose temporarily but soon reverted to their normal level. In many cases it was alleged that the temporary rise was due, not to the abattoir, but to other causes, notably the scarcity of live stock {Our Slaughter-house System by C. Cash, and The German Abattoir by Hugo Heiss, 1907).

The increasing recognition in European countries of the need for inspection, at the time of slaughter, of the flesh of all cattle intended to suppy food for man, the necessity for the provision of public slaughter-houses to make such inspection practicable, the convenience which these slaughter-houses afford to those engaged in the business of butcher, combine to ensure that, at any rate in all populous places, they will in time entirely supersede private slaughter-houses, which offer none of these advantages. No doubt the provision of public slaughter-houses will continue to be opposed by the butchers' trade so long as private slaughter houses are permitted, and, as already stated, local authorities in England are discouraged from making public provision by their inability to prevent the continuance of the use of all existing private slaughter-houses. Probably the extension to English local authorities of the power which the law of Scotland gives to the commissioners of Scottish burghs of closing private slaughter-houses when a public slaughter-house has been provided, would facilitate the much-needed substitution of public for private slaughter-houses. (S. F. M.)

SLAVE COAST. The name given to that part of the coast of West Africa extending from the river Volta to the Niger delta; forming part of the Guinea coast (see Guinea). From the beginning of the 16th to the end of the 18th century this region was a principal resort of the Europeans engaged in the slave trade. Politically the Slave Coast is divided between Germany, France and Great Britain, the German section forming part of Togoland (?.».), the French section the seaboard of Dahomey (q.v.), and the British section the Lagos province of Nigeria (see Lagos).

SLAVERY. It appears to be true that, in the words of Dunoyer, the economic regime of every society which has recently become sedentary is

founded on the slavery of the industrial professions. In the hunter period the savage warrior does not enslave his vanquished enemy, but slays him; the women of a conquered tribe he may, however, carry off and appropriate as wives or as servants, for in this period domestic labour falls almost altogether on their sex. In the pastoral stage slaves will be captured only to be sold, with the exception of a few who may be required for the care of flocks or the small amount of cultivation which is then undertaken. It is in proportion as a sedentary life prevails, and agricultural exploitation is practised on a larger scale, whilst warlike habits continue to exist, that the labour of slaves is increasingly introduced to provide food for the master, and at the same time save him from irksome toil. Of this stage in the social movement slavery seems to have been, as we have said, a universal and inevitable accompaniment.

But wherever theocratic organizations established themselves slavery in the ordinary-sense did not become a vital element in the social system. The members of the lowest class were not in a state of individual subjection: the entire caste to which they belonged was collectively subject. It is in the communities in which the military order obtained an ascendancy over the sacerdotal, and which were directly organized for war, that slavery (as the word is commonly understood) had its natural and appropriate place. It is not merely that in its first establishment slavery was an immense advance by substitut- ing for the immolation of captives, often accompanied by cannibalism, their occupation in labour for the benefit of the victor. This advantage, recalled by an old though erroneous '

1 Servus is not cognate with servare, as has often been supposed ; it is really related to the Homeric «pepos and the verb efpu, with which the Latin sera is to be connected. It may be here mentioned that slave was originally a national na:me; it meant a man of Slavonic race captured and made a bondman to the Germans. " From the Euxine to the Adriatic, in the state of captives or subjscts, . . . they [the Slavonians] overspread the land, and the national appellation of the Slaves has been degraded by chance or malice from the significa- tion of glory to that of servitude " (Gibbon, Decline and Fall, ch . lv.). The historian alludes to the derivation of the national name from slava, glory. See Skeat's Elym. Diet., s.v. ; see also Slavs.

etymology, is generally acknowledged. But it is not so well understood that slavery discharged important offices in the later social evolution — first, by enabling military action to prevail with the degree of intensity and

continuity requisite for the system of incorporation by conquest which was its final destination; and, secondly, by forcing the captives, who with their descendants came to form the majority of the population in the conquering community, to an industrial life, in spite of the antipathy to regular and sustained labour which is deeply rooted in human nature. As regards the latter consideration, it is enough to say that nowhere has productive industry developed itself in the form of voluntary effort; in every country of which we have any knowledge it was imposed by the strong upon the weak, and was wrought into the habits of the people only by the stern discipline of constraint. From the former point of view the free- man, then essentially a warrior, and the slave were mutual auxiliaries, simultaneously exercising different and comple- mentary functions — each necessary to the community. In modern slavery, on the other hand, where the occupations of both parties were industrial, the existence of a servile class only guaranteed for some of them the possibility of self-indulgent ease, whilst it imposed on others the necessity of indigent idleness. It was in the Roman state that military action — in Greece often purposeless and, except in the resistance to Persia, on the whole fruitless — worked out the social mission which formed its true justification. Hence at Rome slavery also most properly found its place, so long as that mission was in progress of accomplish- ment. As soon as the march of conquest had reached its natural limit, slavery began to be modified; and when the empire was divided into the several states which had grown up under it, and the system of defence characteristic of the middle ages was substituted for the aggressive system of antiquity, slavery gradually disappeared, and was replaced by serfdom.

We have so far dealt with the political results of ancient slavery, and have found it to have been in certain respects not only useful but indispensable. When we consider its moral effects, whilst endeavouring to avoid exaggeration, we must yet pro- nounce its influence to have been profoundly detrimental. In its action on the slave it marred in a great measure the happy effects of habitual industry by preventing the development of the sense of human dignity which lies at the foundation of morals. On the morality of the masters — whether personal, domestic, or social — the effects of the institution were disastrous. The habit of absolute rule, always dangerous, was peculiarly corrupting when it penetrated every department of daily life, and when no external interference checked individual caprice in its action on the feelings and fortunes of inferiors. It tended to destroy the power of self-command, and exposed the master to the baneful influences of flattery. As regards domestic morality, the system offered constant facilities £pr libertinism, and tended to subvert domestic peace by compromising the dignity and ruining the happiness of the wife. The sons of the family were familiarized with vice, and the general tone of

the younger generation was lowered by their intimate association with a despised and de- graded class. These deplorable results were, of course, not uni- versally produced; there were admirable exceptions both among masters and among slaves — instances of benevolent protection on the one side and of unselfish devotion on the other; but the evil effects without doubt greatly preponderated.

Greece. — We find slavery fully established in the Homeric period. The prisoners taken in war are retained as slaves, or sold (27. xxiv. 752) or held at ransom (//. vi. 427) by the captor. Some- times the men of a conquered town or district are slain and the women carried off (Od. ix. 40). Not unfrequently free persons were kidnapped by pirates and sold in other regions, like Eumaeus in the Odyssey. The slave might thus be by birth of equal rank with his master, who knew that the same fate might befall himself or some of the members of his family. The institution does

Historic period — sources ot slavery.

Heroic times.

service, were put in possession of a house and property qf their own (Od. xiv. 64). Grote's idea that the women slaves were in a more pitiable condition than the males does not seem justified, except perhaps in the case cf the alelrides, who turned the household mills which ground the flour consumed in the family, and who were some- times overworked by unfeeling masters {Od. xx. 110-119). Homer marks in a celebrated couplet his sense of the moral deterioration commonly wrought by the condition of slavery (Od. xvii. 322).

It is, however, in historic Greece, where we have ample docu- mentary information, that it is most important to study the system. The sources of slavery in Greece were: (1) Birth, the condition being hereditary. This was not an abundant source, women slaves being less numerous than men, and wise masters making the union of the sexes rather a reward of good service than a matter of speculation (Xen. Oecon. 9. 5). It was in general cheaper to buy a slave than to rear one to the age of labour. (2) Sale of children by their free parents, which was tolerated, except in Attica, or their exposure, which was per- mitted, except at Thebes. The consequence of the latter was some- times to subject them to a servitude worse than death, as is seen in the plays of Plautus and Terence, which, as is well known, depict Greek, not Roman, manners. Freemen, through indigence, some- times sold themselves, and at Athens, up to the time of Solon, an insolvent debtor became the slave of his creditor. (3) Capture in war. Not only Asiatics and Thracians thus became slaves, but in the many wars between Grecian states, continental or colonial, Greeks were reduced to slavery by men of

their own race. Cailicratidas pro- nounced against the enslavement of Greeks by Greeks, but violated his own principle, to which, however, Epaminondas and Pelopidas appear to have been faithful. (4) Piracy and kidnapping. The descents of pirates on the coasts were a perpetual source of danger; the pirate was a gainer either by the sale or by the redemption of his captives. If ransomed, the victim became by Athenian law the slave of his redeemer till he paid in money or labour the price which had been given for him. Kidnappers (andrapodistae) carried off children even in cities, and reared them as slaves. Whether from hostile forays or from piracy, any Greek was exposed to the risk of enslavement. (5) Commerce. Besides the sale of slaves which took place as a result of the capture of cities or other military operations, there was a systematic slave trade. Syria, Pontus, Lydia, Galatia, and above all Thrace were sources of supply. Egypt and Ethiopia also furnished a certain number, and Italy a few. Of foreigners, the Asiatics bore the greatest value, as most amenable to command, and most versed in the arts of luxurious refinement. But Greeks were highest of all in esteem, and they were much sought for foreign sale. Greece proper and Ionia supplied the petty Eastern princes with courtesans and female musicians and dancers. Athens was an important slave market, and the state profited by a tax on the sales ; but the principal marts were those of Cyprus, Samos, Ephesus and especially Chios.

The slaves were employed either in domestic service — as house- hold managers, attendants or personal escorts — or in work of other kinds, agricultural or urban. In early Attica, and even _ down to the time of Pericles, the landowners lived in the Employ- country. The Peloponnesian War introduced a change ; m . ea . s and after that time the proprietors resided at Athens, and s a » es « the cultivation was in the hands of slaves. In manufactures and commerce, also, servile gradually displaced free labour. Speculators either directly employed slaves as artisans or commercial and banking agents, or hired them out, sometimes for work in mines or factories, sometimes for service in private houses, as cooks, flute-players, &C, or for viler uses. There were also public slaves; of these some belonged to temples, to which they were presented as offerings, amongst them being the courtesans who acted as hieroduli at Corinth and at Eryx in Sicily ; others were appropriated to the service of the magistrates or to public works; there were at Athens 1200 Scythian archers for the police of the city; slaves served, too, in the fleets, and were employed in the armies, — commonly as workmen, and exceptionally as soldiers.

The condition of slaves at Athens was not in general a wretched one. Demosthenes (In Mid. p. 530) says that, if the barbarians from whom the slaves were bought were informed of the condition mild treatment they received, they would entertain a great, esteem for the Athenians. Plautus in more than one place thinks it necessary to explain to the spectators of his

plays that slaves at Athens enjoyed such privileges, and even licence, as must be surprising to a Roman audience. The slave was introduced with certain customary rites into his position in the family; he was in practice, though not by law, permitted to accumulate a private fund of his own; his marriage was also recognized by custom; though in general excluded from sacred ceremonies and public sacrifices, slaves were admissible to religious associations of a private kind ; there were some popular festivals in which they were allowed to participate; they had even special ones for themselves both at Athens and in

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consider (as Grote suggests) that " aft dasses were much on a level in taste, sentiment and instruction." The male slaves were employed in the tillage of the land and the tending of cattle, and the females in domestic work and household manufactures. The principal slaves often enjoyed the confidence of their masters and had important duties entrusted to them; and, after lengthened and meritorious

tomb of their master, who sometimes erected monuments in testi- mony of his affection and regret. They often lived on terms of intimacy either with the head of the house or its younger members; but it is to be feared that too often this intimacy was founded, not on mutual respect, as in the heroic example of Ulysses and Eumaeus, but on insolent self-assertion on the one side and a spirit of

unworthy compliance on the other, the latter having its raison d'Hre in degrading services rendered by the slave. Aristophanes and Plautus show us how often resort was had to the discipline of the lash even in the case of domestic slaves. Those employed in workshops, whose overseers were themselves most commonly of servile status, had probably a harder lot than domestics; and the agricultural labourers were not unfrequently chained, and treated much in the same way as beasts of burden. The displeasure of the master some- times dismissed his domestics to the more oppressive labours of the mill or the mine. A refuge from cruel treatment was afforded by the temples and altars of the gods and by the sacred groves. Nor did Athenian law leave the slave without protection. He had, as Demosthenes boasts, an action for outrage like a freeman, and his death at the hand of a

stranger was avenged like that of a citizen (Eurip. Hec. 288), whilst, if caused by his master's violence, it had to be atoned for by exile and a religious expiation. Even when the slave had killed his master, the relatives of the house could not themselves inflict punishment ; they were obliged to hand him over to the magistrate to be dealt with by legal process. The slave who had just grounds of complaint against his master could demand to be sold ; when he alleged his right to liberty, the law granted him a defender and the sanctuaries offered him an asylum till judgment should be given. Securities were taken against the revolt of slaves by not associating those of the same nationality and language ; they were sometimes fettered to prevent flight, and, after a first attempt at escape, branded to facilitate their recovery. There were treaties between states for the extradition of fugitives, and contracts of mutual assurance between individuals against their loss by flight. Their inclination to take advantage of opportunities for this purpose is shown by the number that escaped from Athens to join the Spartans when occupying Decelea. There were formidable revolts at the mines of Laurium, and more than once in Chios. The evidence of slaves — women as well as men — was often, with the consent of their masters, taken by torture; and that method is generally commended by the orators as a sure means of arriving at the truth. The slave could purchase his liberty with his peculium by agree- ment with his master. He could be liberated by will, or, during his Em and- master's life, by proclamation in the theatre, the law palion. courts, or other public places, or by having his name inscribed in the public registers, or, in the later age of Greece, by sale or donation to certain temples — an act which did not make the slave a hierodulus but a freeman. Conditions were sometimes attached to emancipation, as of remaining for life or a definite time with the former master, or another person named by him, or of performing some special service; payments or rights of succession to property might also be reserved. By manumission the Athenian slave became in relation to the state a metic, in relation to his master a client. He was thus in an intermediate condition between slavery and complete freedom. If the freedman violated his duties to his patron he was subject to an action at law, and if the decision were against him he was again reduced to slavery. He became a full member of the state only, as in the case of foreigners, by a vote in an assembly of six thousand citizens; and even this vote might be set aside by a graphe paranomon. Slaves who had rendered eminent services to the public, as those who fought at Arginusae and at Chaeronea, were at once admitted to the status of citizens in the class of (so-called) Plataeans. But it would appear that even in their case some civic rights were reserved and accorded only to their children by a female citizen. The number of freedmen at Athens seems never to have been great. (See further Greece, Ancient History, §5.)

*It is well known that Aristotle held slavery to be necessary and natural, and, under just conditions, beneficial to both parties in Theoretic * ne re ‘ a t> on — views which were correct enough from the views on Political side, regard being had to the contemporary slavery social state. His practical motto, if he is the author of the Economics attributed to him, is — ” no outrage, and no familiarity.” There ought, he says, to be held out to the slave the hope of liberty as the reward of his service. Plato condemned the practice, which the theory of Aristotle also by implication sets aside as inadmissible, of Greeks having Greeks for slaves. In the Laws he accepts the institution as a necessary though embarrassing one, and recommends for the safety of the masters that natives of different countries should be mixed and that they should all be well treated. But, whilst condemning harshness towards them, he encourages the feeling of contempt for them as a class. The later moral schools of Greece scarcely at all concern themselves with the institution. The Epicurean had no scruple about the servitude of those whose labours contributed to his own indulgence and tran- quillity. The Stoic regarded the condition of freedom or slavery as an external accident, indifferent in the eye of wisdom; to him it was irrational to see in liberty a ground of pride or in slavery a subject of complaint ; from intolerable indignity suicide was an ever-open means of escape. The poets — especially the authors of the New Corned}’ — strongly inculcate humanity, and insist on the funda- , mental equality of the slave. The celebrated ” homo sum ” is a translation from Alexis, and the spirit of it breathes in many passages of the Greek drama. A fragment of Philemon declares, as if in reply to Aristotle, that not nature, but fortune, makes the slave. Euripides, as might be expected from his humanitarian cast of sentiment, and*

the ” premature modernism ” which has been remarked in him, rises above the ordinary feelings of his time in regard to the slaves. As Paley says, he loves ” to record their fidelity to their masters, their sympathy in the trials of life, their gratitude for kindness and considerate treatment, and their pride in bearing the character of honourable men. . . . He allows them to reason, to advise, to suggest; and he even makes them philosophize on the follies and the indiscretions of their superiors ” (compare Med. 54; Orest. 869; Hel. 728; Ion. 854; Frag. Melan. 506; Phrix. 823). But we are not to suppose that even he, latitudinarian and innovator as he was, could have conceived the possibility of abolishing an in- stitution so deeply rooted in the social conditions, as well as in the ideas, of his time.

(For the Helots in Laconia, see Helots.)

Rome. — We have already observed that the Roman system of life was that in which slavery had its most natural and relatively legitimate place; and accordingly it was at Rome that, as Blair has remarked, the institution was more than anywhere else ” extended in its operation and methodized

in its details."

We must distinguish from the later slavery at Rome what Mommsen calls " the old, in some measure innocent " slavery, under which the farmer tilled the land along with his slave, or, if he possessed more land than he could manage, Sources. placed the slave — either as a steward, or as a sort of lessee obliged to render up a portion of the produce — over a detached farm. Though slaves were obtained by the early victories of Rome over her Italian neighbours, no large number was employed on the small holdings of those periods. But the extension of properties in the hands of the patricians, and the continued absences of citizens required by the expanding system of conquest, necessarily brought with them a demand for stave labour, which was increasingly supplied by captives taken in war. Of the number furnished from this source a few particulars from the time of the mature republic and the first century of the empire will give some idea. In Epirus, after the victories of Aemilius Paullus, 150,000 captives were sold. The prisoners at Aquae Sextiae and Vercellae were 90,000 Teutons and 60,000 Cimbri. Caesar sold on a single occasion in Gaul 63,000 captives. But slavery, as Hume has shown, is unfavourable to population. Hence a regular commerce in slaves was established, which was based on the " systematically-prosecuted hunting of man," and indicated an entire perversion of the primitive institution, which was essentially connected with conquest. The pirates sold great numbers of slaves at Delos, where was the chief market for this kind of wares; and these sales went on as really, though more obscurely, after the successful expedition of Pompey. There was a regular importation to Rome of slaves, brought to some extent from Africa, Spain and Gaul, but chiefly from Asiatic countries — Bithynia, Galatia, Cappadocia and Syria. A portorium-r-a.pparent\y one-eighth for eunuchs, one- fortieth for others — was paid on their import or export, and a duty of 2 or 4 % on their sale.

There were other sources from which slavery was alimented, though of course in a much less degree. Certain offences reduced the guilty persons to slavery (servi poenae), and they were employed in public work in the quarries or the mines. Originally, a father could sell his children. A creditor could hold his insolvent debtor as a slave, or sell him out of the city (trans Tiberim). The enslave- ment of creditors, overwhelmed with usury in consequence of losses by hostile raids or their own absence on military service, led to the secession to the Mons Sacer (493 B.C.). The Poetelian law (326 B.C.) restricted the creditor's lien (by virtue of a nexum) to the goods of his debtor, and enacted that for the future no debtor should be put in chains; but we hear of debtors addicti to their creditors by the tribunals long after — even in the time of the Punic Wars.

There were servi publici as well as privati. The service of the magistrates

was at first in the hands of freemen; but the lower offices, as of couriers, servants of the law courts, of prisons „ and of temples, were afterwards filled by slaves. The f m P”>y m execution of public works also came to be largely com- menu. mitted to them — as the construction of roads, the cleansing of the sewers and . the maintenance of the aqueducts. Both kinds of functions were discharged by slaves, not only at Rome, but in the rural and provincial municipalities. The slaves of a private Roman were divided between the familia rustica and the familia wrbana. At the head of the familia rustica was the villicus, himself a slave, with the wife who was given him at once to aid him and to bind him to his duties. Under him were the several groups employed in the different branches of the exploitation and the care of the cattle and flocks, as well as those who kept or prepared the food, clothing and tools of the whole staff and those who attended on the master in the various species of rural sports. A slave prison (ergastulum) was part of such an establishment, and there were slaves whose office it was to punish the offences of their fellows. To the familia urbana. belonged those who discharged the duties of domestic attendance, the service of the toilet, bath, table and kitchen, besides the enter- tainment of the master and his guests by dancing, singing and other arts. There were, besides, the slaves who accompanied the master and mistress out of doors, and were chosen for their beauty and grace as guards of honour, for their strength as chairmen or porters,

or for their readiness and address in remembering names, delivering messages of courtesy and the like. There were also attached to a great household physicians, artists, secretaries, librarians, copyists, preparers of parchment, as well as pedagogues and preceptors of different kinds — readers, grammarians, men of letters and even philosophers— all of servile condition, besides accountants, managers and agents for the transaction of business. Actors, comic and tragic, pantomimi, and the performers of the circus were commonly slaves, as were also the gladiators. These last were chosen from the most warlike races — as the Samnites, Gauls and Thracians. Familiae of gladiators were kept by private speculators, who hired them out; they were sometimes owned by men of high rank.

Several special examples and other indirect indications show that the wealthier Romans possessed large familiae. This may be inferred from the columbaria of the house of Livia and of other great houses. The slaves of Pedanius Secundus, who, in spite of a threatened outbreak of the indignant populace, were all put to death because they had been under their master’s roof when he was murdered, were four hundred in number. Pliny tells us

that Caecilius, a freedman of the time of Augustus, left by his will as many as 41 16. The question as to the total number of slaves at Rome or in Italy is a very difficult one, and it is not, perhaps, possible to arrive with any degree of certainty at an approximate estimate. Gibbon sup- poses that there were in the Roman world in the reign of Claudius at least as many slaves as free inhabitants. But Blair seems right in believing that this number, though probably correct for an earlier period, is much under the truth for the age to which it is assigned. He fixes the proportion of slaves to free men as that of three to one for the time between the conquest of Greece (146 B.C.) and the reign of Alexander Severus (a.d. 222-235). The entire number of slaves in Italy would thus have been, in the reign of Claudius, 20,832,000. By the original Roman law the master was clothed with absolute dominion over the slave, extending to the power of life and death, which is not surprising when we consider the nature of the patria Laws. potestos. The slave could not possess property of any kind ;

whatever he acquired was legally his master's. He was, however, in practice permitted to enjoy and accumulate chance earnings or savings, or a share of what he produced, under the name of peculium. A master could not enter into a contract with his slave, nor could he accuse him of theft before the law; for, if the slave took anything, this was not a subtraction, but only a displacement, of property. The union of a male and female slave had' not the legal character of a marriage; it was a cohabitation {contubernium) merely, which was tolerated, and might be terminated at will, by the master; a slave was, therefore, not capable of the crime of adultery. Yet general sentiment seems to have given a stronger sanction to this sort of connexion; the names of husband and wife are freely used in relation to slaves on the stage, and even in the laws, and in the language of the tombs. For entering the military service or taking on him any state office a slave] was punished with death. He could not in general be examined as a witness, except by torture. A master, when accused, could offer his slaves for the " question," or demand for the same purpose the slaves of another; and, if in the latter case they were injured or killed in the process, their owner was indemnified. A slave could not accuse his master, except of adultery or incest (under the latter name being included the violation of sacred things or places) ; the case of high treason was afterwards added to these. An accused slave could not invoke the aid of the tribunes. The penalties of the law for crime were specially severe on slaves.

Columella, like Xenophon, favours a certain friendliness and familiarity in one's intercourse with his farm slaves. Cato ate and Treatment drank tne same coarse victuals as his slaves, and even had of slaves. tne cn ildren suckled by his wife, that they might imbibe a fondness for the family. But he had a strict eye to profit in all his dealings with them. He allowed the contubernium of male and female slaves at the price of a money payment

from their peculium. Columella regarded the gains from the births as a sufficient motive for encouraging these unions, and thought that mothers should be rewarded for their fecundity; Varro, too, seems to have taken this view. The immense extension of the rural estates {latifundia) made it impossible for masters to know their slaves, even if they were disposed to take trouble for the purpose. Effective superintendence even by overseers became less easy; the use of chains was introduced, and these were worn not only in the field during working hours but at night in the ergastulum where the slaves slept. Urban slaves had probably often a life as little enviable, especially those who worked at trades for speculators. Even in private houses at Rome, so late as the time of Ovid, the porter was chained. In the familia urbana the favourites of the master had good treatment, and might exercise some influence over him which would lead to their receiving flattery and gifts from those who sought his vote or solicited his support. Doubtless there was often genuine mutual affection ; slaves sometimes, as in noted instances during the civil wars, showed the noblest spirit of devotion to their masters. Those who were not inmates of the household, but were employed outside of it as keepers of a shop or boat, chiefs of workshops, or clerks in a mercantile business, had the advantage of greater freedom of action. The slaves of the leno and the lanista were probably in most cases not only degraded but unhappy. The lighter punish-

ments inflicted by masters were commonly personal chastisement or banishment from the town house to rural labour; the severer were employment in the mill (pistrinum) or relegation to the mines or quarries. To the mines also speculators sent slaves; they worked half-naked, men and women, in chains, under the lash and guarded by soldiers. Vedius Pollio, in the time of Augustus, was said to have thrown his slaves, condemned sometimes for trivial mistakes or even accidents, to the lampreys in his fishpond. Cato advised the agriculturist to sell his old oxen and his old slaves, as well as his sick ones; and sick slaves were exposed in the island of Aesculapius in the Tiber; by a decree of Claudius slaves so exposed, if they recovered, could not be reclaimed by their masters.

Though the Roman slaves were not, like the Spartan Helots, kept obedient by systematic terrorism, their large numbers were a constant source of danger. The law under which the slaves of Pedanius were put to death, probably introduced under Augustus and more fully enacted under Nero, is sufficient proof of this anxiety, which indeed is strongly stated by Tacitus in his narrative of the facts. There had been many conspiracies amongst the slaves in the course of Roman history, and some formidable insurrections. The growth of the latifundia made the slaves more and more numerous and formidable. Free labour was discountenanced. Cato, Varro and Columella all agree that slave labour was to be preferred to free except in unhealthy regions and for large occasional operations, which probably tran- scended

the capacity of the permanent familia rustica. Cicero and Livy bear testimony to the disappearance of a free plebs from the country districts and its replacement by gangs of slaves working on great estates. The worst form of such praedial slavery existed in Sicily, whither Mommsen supposes that its peculiarly harsh features had been brought by the Carthaginians. In Sicily, accord- ingly, the first really serious servile insurrections took place. The rising under Eunus in 133 B.C. was with some difficulty suppressed by Rupilius. Partial revolts in Italy succeeded; and then came the second Sicilian insurrection under Trypho and Athenio, followed by the Servile War in Italy under Spartacus (q.v.). Clodiusand Miloused bands of gladiators in their city riots, and this action on the part of the latter was approved by Cicero. In the First Civil War they were to be found in both camps, and the murderers of Caesar were escorted to the Capitol by gladiators. Antony, Octavius, and Sextus Pompeius employed them in the Second Civil War; and it is recorded by Augustus on the Monumentum Ancyranum that he gave back to their masters for punishment about 30,000 slaves who had absconded and borne arms against the state. Under Tiberius, at the death of Caligula, and in the reign of Nero there were threatening movements of the slaves. In the wars from Otho to Vespasian they were em- ployed, as Tacitus tells us, even by the most scrupulous generals.

Blair, in comparing the Greek and Roman systems of slavery, points with justice to the greater facility and frequency of emancipa- tion as the great superiority of the latter. No Roman slave, he Says, " needed to despair of becoming both a freeman and a citizen." Manumission was of two kinds — justa or regular, and minus justa. Of manumissio justa there were four modes: (1) by adoption, rarely resorted to; (2) by testament, already recognized in the Twelve Tables; (3) by census, which was of exceptional use, and did not exist later than the time of Vespasian; and (4) by vindicta, which was the usual form. In the last method the master turned the slave round, with the words " liber esto," in the presence of the praetor, that officer or his lictor at the same time striking the slave with his rod. The manumissio minus justa was effected by a sufficient manifesta- tion of the will of the master, as by letter, by words, by putting the pileus (or cap of liberty) on the slave, or by any other formality which had by usage become significant of the intention to libeYate, or by such an act as making the slave the guardian of his children. This extra-legal sort of manumission was incomplete and precarious; even after the lex Junia Norbana (A.D. 19), which assimilated the position of those so liberated to that of the Latin colonists, under the name of Latini juniores, the person remained in the eye of the law a slave till his death and could not dispose of his peculium.

A freedman, unless he became such by operation of law, remained client of his master, and both were bound by the mutual obligations arising out of

that relation. These obligations existed also in the case of freedmen of the state, of cities, temples and corporations. The freedman took his former master's name ; he owed him deference (obsequium) and aid (officium) ; and neglect of these obligations was punished, in extreme cases even with loss of liberty. Conditions might be annexed by the master to the gift of freedom, as of continued residence with him, or of general service or some particular duty to be performed, or of a money payment to be made. But the praetor Rutilius, about the beginning of the 1st century B.C., limited the excessive imposition of such conditions, and his restrictions were carried further by the later jurists and the imperial constitutions. Failing natural heirs of an intestate freedman, the master, now

Eatron, succeeded to his property at his death; and he could dispose y will of only half his possessions, the patron receiving the other half. Freedmen and their sons were subject to civil disabilities; the third generation became ingenui (full citizens). Thus, the slave element tended to merge itself in the general popular body.

It was often a pecuniary advantage to the master to liberate his slave; he obtained a payment which enabled him to buy a substitute, ar.djat the same time gained a client. This of course presupposes the

recognition of the right of the slave to his peculium; and the same is implied in Cicero's statement that a diligent slave could in six years purchase his freedom. Augustus set himself against the undue multiplication of manumissions, probably considering the rapid succession of new citizens a source of social instability, and recommended a similar policy to his successor. The lex Aelia Sentia (about a.d. 3) forbade manumission, except in strictly limited cases, by masters under 20 years of age or of slaves under 30; and the lex Furia Caninia (about a.d. 7) fixed the proportion of a man's slaves which he could liberate by testament, and forbade more than a hundred being so enfranchised, whatever might be the the number of the familia. Under the empire the freedmen rose steadily in influ- ence; they became admissible to the rank of equites and to the senate; they obtained provincial governments, and were appointed to offices in the imperial household which virtually placed them at the head of administrative departments (see Pallas and Narcissus). Freedmen of humbler rank, on the other hand, filled the minor offices in the administrative service, in the city cohorts, and in the army; and we shall find that they entered largely into the trades and professions when free labour began to revive. They appeared also in literature, e.g. Tiro, the amanuensis of Cicero; Hyginus, the

librarian of Augustus; Livius Andronicus, Caecilius, Statius, Terence, Publilius Syrus, Phaedrus and Epictetus.

In the 2nd century of the Christian era we find a marked change with respect to the institution of slavery, both in the region of thought and in that of law. Already the principles of reason and humanity had been applied to the subject by Seneca. But it was in the 2nd century, as we have said, that " the victory of moral ideas " in this, as in other departments of life, became " decisive. . . . Dio Chrysostom, the adviser of Trajan, is the first Greek writer who has pronounced the principle of slavery to be contrary to the law of nature " (Mark Pattison). And a parallel change is found in the practical policy of the state. The military vocation of Rome was now felt to have reached its normal limits; and the emperors, understanding that, in the future, industrial activity must prevail, prepared the abolition of slavery as far as was then possible, by honouring the freedmen, by protecting the slave against his master, and by facilitating manumissions. The general tendency both of the imperial constitutions and of the maxims of the legists is in favour of liberty. The practices of exposure and sale of children, and of giving them in pledge for debt, are forbidden. Diocletian forbade a free man to sell himself. Kidnappers (plagiarii) were punished with death. The insolvent debtor was withdrawn from the yoke of his creditor. While the slave trade was permitted, the mutilation of boys and young men, too often practised, was punished with exile and even with death. In redhibitory actions (for the annulment of sales), if a slave were returned to the seller, so must also be his parents, brothers and personae contubernio conjunctae. In the inter- pretation of testaments it was to be assumed that members of the same family were not to be separated by the division of the succession. The law also favoured in special cases the security of the peculium, though in general principle it still remained the property of the master. The state granted to public slaves the right of bequeathing half their possessions; and private persons sometimes permitted similar dispositions even to a greater extent, though only within the familia. Hadrian took from masters the power of life and death and abolished the subterranean prisons. Antoninus Pius punished him who killed his own slave as if he had killed another's. Already in the time of Nero the magistrates had been ordered to receive the slave's complaint of ill-treatment; and the lex Petronia, belonging to the same or an earlier period, forbade masters to hand over their slaves to combats with wild beasts. Antoninus directed that slaves treated with excessive cruelty, who had taken refuge at an altar or imperial image, should be sold ; and this provision was extended to cases in which the master had employed a slave in a way degrading to him or beneath his character. M. Aurelius gave to masters an action against their slaves for any cause of complaint, thus bringing their relation more directly under the surveillance of law and

public opinion. A slave's oath could still not be taken in a court of law; he was interrogated by the "question"; but the emperors and jurists limited in various ways the application of torture, adding, however, as we have mentioned, to the cases in which it could previously be appealed to that of the crime of majestas. For certain alleged offences of the master the slave could bring an action, being represented for the purpose by an adserlor. Emancipation was facilitated. The power of imposing conditions on testamentary manumissions was restricted, and these conditions interpreted in the sense most favourable to freedom. The emperor could confer liberty by presenting a gold ring to a slave with the consent of the master, and the legal process called restitutio natalium made him a full citizen. It was decided that liberty could not be forfeited even by a prescrip- tion of sixty years' duration.

The rise of Christianity in the Roman world still further improved the condition of the slave. The sentiments it created were not only favourable to the humane treatment of the class in the Influence p resen t j but were the germs out of which its entire libera- tion was destined, at a later period, in part to arise. It is sometimes objected that the Christian church did not denounce slavery as a social crime and insist on its abolition. We have seen that slavery was a fundamental element of the old Roman

of Chris- tianity.

constitution. When the work of conquest had been achieved, it could not be expected that a radical alteration should be suddenly wrought either in the social system which was in harmony with it, or even in the general ideas which had grown up under its influence. The latter would, indeed, be gradually affected; and accordingly we have observed a change in the policy of the law, indicating a change in sentiment with respect to the slave class, which does not appear to have been at all due to Christian teaching. But the institution itself could not be at once seriously disturbed. The results must have been disastrous, most of all to the slave population itself. Before that end could be accomplished, an essentially new social situation must come into existence. But in the meantime much might be done towards further mitigating the evils of slavery, especially by impressing on master and slave their relative duties and controlling their behaviour towards one another by the exercise of an independent moral authority. This was the work open to the Christian priesthood, and it cannot be denied that it was well dis- charged. Whilst the fathers agree with the Stoics of the 2nd century in representing slavery as an indifferent circumstance in the eye of religion and morality, the contempt for the class which the Stoics too often exhibited is in them replaced by a genuine sympathy. They protested against the multiplication of slaves from motives of vanity in the houses of the great, against the gladiatorial combats (ulti- mately abolished

by the noble self-devotion of a monk) and against the consignment of slaves to the theatrical profession, which was often a school of corruption. The church also encouraged the emanci- pation of individual slaves and the redemption of captives. And its influence is to be seen in the legislation of the Christian emperors, which softened some of the harshest features that still marked the institution. But a stronger influence of Christianity appears in Theodosius, and this influence is at the highest in the legislation of Justinian. Its systematic effort is, in his own words, " pro libertate, quam et fovere et tueri Romanis legibus et praecipue nostra numini peculiare est. ' ' Law still refused in general to recognize the marriages of slaves; but Justinian gave them a legal value after emancipation in establishing rights of succession. Unions between slaves and free women, or between a freeman and the female slave of another, continued to be forbidden, and were long punished in certain circum- stances with atrocious severity. As witness, the slave was still subject to the question; as criminal, he was punished with greater rigour than the freeman. If he accused his master of a crime, unless the charge was of treason, he was burnt. But he could maintain a legal claim to his own liberty, not now merely through an odsertor, but in person. A female slave was still held incapable of the offence of adultery; but Justinian visited with death alike the rape of a slave or freedwoman and that of a free maiden. Already the master who killed his slave had been punished as for homicide, except in the case of his unintended death under correction ; Constantine treated as homicide a number of specially-enumerated acts of cruelty. Even under Theodosius the combats of the amphitheatre were permitted, if not encouraged, by the state authorities; these sports were still expected from the candidates for public honours. Combats of men with beasts were longest continued ; they had not ceased even in the early years of the reign of Justinian. A new process of manu- mission was now established, to be performed in the churches through the intervention of the ministers of religion; and it was provided that clerics could at any time by mere expression of will liberate their slaves. Slaves who were admitted' to holy orders, or who entered a monastery, became freemen, under certain restrictions framed to prevent . fraud or injustice. Justinian abolished the personal conditions which the legislation of Augustus had required to be satisfied by the master who emancipated and the slave who was manumitted, and removed the limitation of number. The liberated slave, whatever the process by which he had obtained his freedom, became at once a full citizen, his former master, however, retaining the right of patronage, the abolition of which would probably have discouraged emancipation.

Transition to Serfdom. — The slavery of the working classes was not directly changed into the system of personal freedom. There was an intermediate stage which has not always been sufficiently discriminated

from slavery. We mean the regime of serfdom. In studying the origin of this transitional state of things, four principal considerations have to be kept in view. (1) As Gibbon observes, the completion of the Roman system of conquest reduced the supply of slaves. It is true that, when the barbarian invasions began in the 3rd century, many captives were made, who, when not enrolled in the army, were employed in agriculture or domestic service; but the regular importation was increasingly diminished. This improved the condition of the slave by rendering his existence an object of greater value to his master. It was clearly to the interest of each family to preserve indefinitely its own hereditary slaves. Hence the abolition of the external slave trade tended, in fact, to put an end to internal sales, and the slaves became attached to the households or lands of their masters. (2) The diminished supply

of slaves further acted in the direction of the rehabilitation of free labour. A general movement of this kind is noticeable from the 2nd century onwards. Freemen had always been to some extent employed in the public service. In private service superior posts were often filled by freedmen; the higher arts — as medicine, grammar, painting — were partly in the hands of freedmen and even of ingenui; the more successful actors and gladiators were often freedmen. In the factories or workshops kept by wealthy persons slave labour was mainly employed; but free artisans sometimes offered their services to these estab- lishments or formed associations to compete with them. We have seen that free persons had all along been to some extent employed in the cultivation of land as hired labourers, and, as we shall presently find, also as tenants on the great estates. How all this operated we shall understand when we examine the remarkable organization of the state introduced by Diocletian and his successors. (3) This organization established in the Roman world a personal and hereditary fixity of professions and situations which was not very far removed from the caste system of the East. The purpose of this was doubtless to resist by a strong internal consolidation the shock of the invasions, to secure public order, to enforce industrious habits, and to guarantee the financial resources of the state. Personal independence was largely sacrificed, but those still more important ends were in a great measure attained. This system, by diminishing the freeman's mastery over himself and his power to determine his occupation, reduced the interval between him and the slave; and the latter on the one hand, the free domestic servant and workshop labourer on the other, both passed insensibly into the common condition of serfdom. (4) The corresponding change, in the case of the rural slaves, took place through their being

merged in the order of coloni. The Roman colonus was originally a free person who took land on lease, contracting to pay to the proprietor either a fixed sum annually or (when a colonus par- liarius) a cer.tain proportion of the produce of the farm. Under the emperors of the 4th century the name designated a cultivator who, though personally free, was attached to the soil, and transmitted his condition to his descendants; and this became the regular status of the mass of Roman cultivators. The class of coloni appears to have been composed partly of tenants by contract who had incurred large arrears of rent and were detained on the estates as debtors (obaerati), partly of foreign captives or immigrants who were settled in this condition on the land, and partly of small proprietors and other poor meri who voluntarily adopted the status as an improvement in their position. They paid a fixed proportion of the produce (pars agraria) to the owner of the estate, and gave a determinate amount of labour (operae) on the portion of the domain which he kept in his own hands {mansus dominicus). The law for a long time took no notice of these customary tenures, and did not systematically constitute them until the 4th century. It was indeed the requirements of the fiscus and the conscription which impelled the imperial govern- ment to regulate the system. The coloni were inscribed (adscripli) on the registers of the census as paying taxes to the state, for which the proprietor was responsible, reimbursing himself for the amount. In a constitution of Constantine (a.d. 332) we find the colonus recognized as permanently attached to the land. If he abandoned his holding he was brought back and punished; and any one who received him had not only to restore him but to pay a penalty. He could not marry out of the domain; if he took for wife a colona of another proprietor, she was restored to her original locality, and the offspring of the union were divided between the estates. The children of a colonus were fixed in the same status. They and their descendants were retained, in the words of a law of Theodosius, " quodam aeternitatis jure," and by no process could be relieved from their obligations. By a law of Anastasius, at the end of the 5th century, a colonus who had voluntarily come into an estate was by a tenure of thirty years for ever attached to it. The master (dominus) could inflict on his coloni " moderate chastisement," and could chain them if they attempted to escape, but they had a legal remedy against him for unjust demands or injury to them or

theirs. In no case could the rent or the labour dues be increased. The colonus could possess property of his own, but could not alienate it without the consent of the master. Thus, whilst the members of the class were personally free, their condition had some incidents of a semi-servile character. They are actually designated by Theodosius, " servi terrae cui nati sunt." And Salvian treats the proposition " coloni divitum fiunt " as equi- valent to " vertuntur in servos." This is indeed an exaggeration; the

colonatus was not an oppressive system; it afforded real security against unreasonable demands and wanton disturbance, and it was a great advance on the system of the familia rustica. But the point which is important is that there was a certain approximation between the condition of the colonus and the slave which tended towards the fusion of both in a single class.

Besides the coloni there were on a great estate — and those of the 4th century were on a specially large scale — a number of praedial slaves, who worked collectively under overseers on the part of the property which the owner himself cultivated. But it was a common practice to settle certain of the slaves (and possibly also of the freedmen) on other portions of the estate, giving them small farms on conditions similar to those to which the coloni were subject. These slaves are, in fact, described by Ulpian as quasi coloni. They had their own households and were hence distinguished as casati. In law these slaves were at first absolutely at the disposal of their masters; they had no property in the strict sense of the word, and could be sold to another proprietor and separated from their families. But the landlord's interest and the general tone of feeling alike modified practice even before the intervention of legislation; they were habitually continued in their holdings, and came to possess in fact a per- petual and hereditary enjoyment of them. By a law of Valen- tinian I. (377) the sale of these slaves was interdicted unless the land they occupied were at the same time sold. The legal dis- tinction between the coloni and the slave tenants continued to exist after the invasions; but the practical difference was greatly attenuated. The colonus often occupied a servile mansus, and the slave a mansus originally appropriated to a colonus. Intermarriages of the two classes became frequent. Already at the end of the 7th century it does not appear that the distinction between them had any substantial existence.

The influence of the Northern invasions on the change from slavery to serfdom was, in all probability, of little account. The change would have taken place, though perhaps not so speedily, if they had never occurred. For the developments of the Middle Ages see Serfdom and Villenage.

Modern Slave Trade. — Not very long after the disappearance of serfdom in the most advanced communities comes into sight the new system of colonial slavery, which, instead of being the spontaneous outgrowth of social necessities and subserving a temporary need of human development, was politically as well as morally a monstrous aberration.

In 1442, when the Portuguese under Prince Henry the Navigator were exploring the Atlantic coast of Africa, one of his officers, Antam Gonsalves, who had captured some Moors, was directed by the prince to carry them back colonies. to Africa. He received from the Moors in exchange for them

ten blacks and a quantity of gold dust. This excited the cupidity of his fellow-countrymen; and they fitted out a large number of ships for the trade, and built several forts on' the African coast. Many negroes were brought into Spain from these Portuguese settlements, and the colonial slave trade first appears in the form of the introduction into the newly-discovered western world of descendants of these negroes. When Nicolas de Ovando was sent out in 1502 as governor of Haiti, whilst regulations, destined to prove illusory, were made for the pro- tection of the natives of the island, permission was given to carry to the colony negro slaves, born in Seville and other parts of Spain, who had been instructed in the Christian faith. It appears from a letter of Ovando in 1503 that there were at that time numbers of negroes in Haiti; he requested that no more might be permitted to be brought out. In 1510 and the following years

King Ferdinand ordered a number of Africans to be sent to that colony for the working of the mines.

Before this time Columbus had proposed an exchange of his Carib prisoners as slaves against live stock to be furnished to Haiti by Spanish merchants. He actually sent home, in 1494, above 500 Indian prisoners taken in wars with the caciques, who, he suggested, might be sold as slaves at Seville. But, after a royal order had been issued for their sale, Queen Isabella, interested by what she had heard of the gentle and hospitable character of the natives and of their docility, procured a letter to be written to Bishop Fonseca, the superintendent of Indian affairs, suspending the order until inquiry should be made into the causes for which they had been made prisoners, and into the lawfulness of their sale. Theologians differed on the latter question, and Isabella directed that these Indians should be sent back to their native country.

Bartolome de las Casas, the celebrated bishop of Chiapa, accompanied Ovando to Haiti, and was a witness of the cruelties from which the Indians suffered under his administra- tion. He came to Spain in 1517 to obtain measures in their favour, and he then made the suggestion to Charles that each Spanish resident in Haiti should have licence to import a dozen negro slaves. Las Casas, in his Historia de las Indias (lib. iii. cap. 101), confesses the error into which he thus fell. Other good men appear to have given similar advice about the same time, and, as has been shown, the practice was not absolutely new; indeed the young king had in 1516, whilst still in Flanders, granted licences to his courtiers for the importation of negroes into the colonies, though Jimenes, as regent of Castile, by a decree of the same year forbade the practice. The suggestion of Las Casas was no doubt made on the ground that the negroes could, better than the Indians, bear the labour in the mines, which was rapidly exhausting the numbers of the latter. 1 He has sometimes on this plea been exonerated from all censure; but, though entitled to honour for the zeal which he showed on behalf of the natives, he must bear the blame for his violation or neglect of moral principle. His advice was unfortunately adopted. " Charles," says Robertson, " granted a patent to one of his Flemish favourites, containing an exclusive right " of supplying 4000 negroes annually to Haiti, Cuba, Jamaica and Porto Rico. " The favourite sold his patent to some Genoese merchants for 25,000 ducats"; these merchants obtained the slaves from the Portuguese; and thus was first systematized the slave trade between Africa and America.

The first Englishman who engaged in the traffic was Sir John Hawkins

(q.v.). The English slave traders were at first altogether England, occupied in supplying the Spanish settlements. Indeed the reign of Elizabeth passed without any English colony having been permanently established in America. But in 1620 a Dutch ship from the coast of Guinea visited Jamestown in Virginia, and sold a part of her cargo of negroes to the tobacco-planters. This was the first beginning of slavery in British America ; the number of negroes was afterwards continually increased — though apparently at first slowly — by importation, and the field-labour was more and more performed by servile hands, so that in 1790 the state of Virginia contained 200,000 negroes.

The African trade of England was long in the hands of exclusive companies ; but by an act of the first year of William and Mary it became free and open to all subjects of the crown. The African Company, however, continued to exist, and obtained from time to time large parliamentary grants. By the treaty of Utrecht the asiento, 2 or contract for supplying the Spanish colonies with 4800 negroes annually, which had previously passed from the Dutch to the French, was transferred to Great Britain; an English company was to enjoy the monopoly for a period of thirty years from 1st May 1713. But the contract came to an end in 1739, when the complaints of the English merchants on one side and of the Spanish officials on the other rose to such a height that Philip V. declared his

'The Spaniards, in the space of fifteen years subsequent to the discovery of the West Indies, had, as Robertson mentions, reduced the natives of Haiti irom a million to 60,000.

2 The Spaniards were prevented from forming establishments on the African coast by the Bull of Demarcation (" Inter caetera ") of Pope Alexander VI. (1493), which forbade their acquiring territory to the east of the meridian line of 100 m. west of the Azores. They could therefore supply their American possessions with slaves only by contracts with other powers.

determination to revoke the asiento, and Sir Robert Walpole was forced by popular feeling into war with Spain. Between 1680 and 1700 about 140,000 negroes were exported by the African Company, and 160,000 more by private adventurers, making a total of 300,000. Between 1700 and the end of 1786 as many as 610,000 were trans- ported to Jamaica alone, which had been an English possession since 1655. Bryan Edwards estimated the total import into all the British colonies of America and the West Indies from 1680 to 1786 at 2,130,000, being an annual average oi 30,095. The British slave trade reached its utmost extension shortly before the War of American Independence. It was then earned on principally from Liverpool, but also from London, Bristol and Lancaster: the entire number of slave ships sailing from those ports was 19? and in them space was

provided for the transport of 47,146 negroes. During the war the number decreased, but on its termination the trade im- mediately revived. When Edwards wrote (1791), the number of European factories on the coasts of Africa was 40-. of these 14 were English, 3 French, 15 Dutch, 4 Portuguese and 4 Danish. As correct a notion as can be obtained of the numbers annually exported from the continent about the year 1790 by traders of the several European countries engaged in the traffic is supplied by the following state- ment:—" By the British, 38,000; by the French, 20,000; by the Dutch, 4000; by the Danes, 2000; by the Portuguese, 10,000; to !Si 74.000;" Thus more than half the trade was in British hands. The hunting of human beings to make them slaves was greatly aggravated by the demand of the European colonies. The native chiefs engaged in forays, sometimes even on their own subjects.for the purpose of procuring slaves to be exchanged Bmctg oi for Western commodities. They often set fire to a village tbe s,aVe by night and captured the inhabitants when trying to trade – escape. Thus all that was shocking in the barbarism of Africa was multiplied and intensified by this foreign stimulation. Exclusive of the slaves who died before thev sailed from Africa, I2j % were lost during their passage to the West Indies; at Jamaica 4ˆ % died whilst in the harbours or before the sale and one-third more in the " season, ing." Thus, out of every lot of 100 shipped from Africa 17. died in about 9 weeks, and not more than 50 lived to be effective labourers in the islands. The circumstances of their subsequent life on the plantations were not favourable to the increase of 'their numbers In Jamaica there were in 1690,40,000; from that year till 1820 there were imprted 800,000; yet at the latter date there .were only 340,000 in the island. One cause which prevented the natural in- crease of population was the inequality in the numbers of the sexes > in Jamaica aldne there was in 1789 an excess of 30,000 males. '

Movement against the Slave, Trade. When the nature of the slave trade began to be understood by the public, all that was best in England was adverse to it. Among those ■ ' ' who denounced it— besides some whose names are now ™0"ha. little known, but are recorded in the pages of Clarkspn— were Baxter, Sir Richard Steele (in Inkle, and Yarico), the poets Southern (in Oroonoko), Pope, Thomson, Shenstone, Dyer, Savage and above all Cowper (see his Charity, and Task, bk. 3), Thomas Day (author of Sandford and Merton) , Sterne, Warburton, Hutcheson, Beattie, John Wesley, Whitfield, , Adam Smith, Millar, Robertson, Dr Johnson, Paley, Gregory, Gilbert Wake- field, Bishop Porteus, Dean Tucker. The question of the legal existence of slavery in Great Britain and Ireland was raised in consequence of an opinion given in 1729 by Yorke and, Talbot, attorney-general and solicitor-general at the time, to the effect that a slave by coming into those countries from the West Indies did not become free, and might be compelled by his master to return to the plantations. Chief -*

Justice Holt had expressed, a contrary opinion; and the matter was brought to,, a final issue by Granville Sharp in the case of the negro Somerset! Jt was decided by Lord Mansfield, in the name of the whole bench, on the 22nd of June 1772, that as soon as a slave set his foot on the soil of the British islands he became free. In 1776 it was moved in the House of Commons by David Hartley, son of the author of Observations on Man, that; " the slave trade was contrary to the laws of God and the rights of men"; but this motion— the first which was made on the subject — failed.

The first persons in England who took united practical action against the slave trade were the Quakers, following the expression of sentiment which had emanated so early as 1671 from their founder George Fox. In 1727 they declared it to be " not a commendable or allowed" practice; in 1761 they excluded from their society all who should be found concerned in it, and issued appeals to their members and the public against the system. In 1783 there was formed among them, an association " for the relief and liberation of the negro slaves in the West

Indies, and for the discouragement of the slave trade on the coast of Africa." This was the first society established in England for the purpose. The Quakers in America had taken action on the subject still earlier than those in England. The Pennsyl- vanian Quakers advised their members against the trade in 1696; in 1754 they issued to their brethren a strong dissuasive against encouraging it in any manner; in 1774 all persons concerned in the traffic, and in 1776'all slave holders who would not emanci- pate their slaves, were excluded from membership. The Quakers in the other American provinces followed the lead of their brethren in Pennsylvania. The individuals among the American Quakers who laboured most earnestly and indefatigably on behalf of the Africans were John Woolman (1720-1773) and Anthony Benezet (1713-1784), the latter a son of a French Huguenot driven 1 from France by the revocation of the edict of Nantes. The former confined his efforts chiefly to America and indeed to his coreligionists there; the latter sought, not without success, to found a universal propaganda in favour of abolition. A Pennsylvanian society was formed in 1 774 by James Pemberton and Dr Benjamin Rush, and in 1787 (after the war) was recon- structed on an enlarged basis under the presidency of Franklin. Other similar associations were founded about the same time in different parts of the United States. The next important movement took place in England. Dr Peckard, vice-chancellor of the university of Cambridge, who entertained strong con- victions against the slave trade, proposed in 1785 as subject for a Latin prize dissertation

the question, " An liceat invitos in servitutem dare." Thomas Clarkson obtained the first prize, translated his essay into English in an expanded form, and published it in 1786 with the title Essay on the Slavery and Commerce of the Human Species. In the process of its publication he was brought into contact with several persons already deeply interested in the question; amongst others with Granville Sharp, William Dillwyn (an American by birth, who had known Benezet), and the Rev. James Ramsay, who had lived nineteen years in St Christopher, and had published an Essay on the Treatment and Conversion of the African Slaves in the British Sugar Colonies. The distribution of Clarkson's book led to his forming connexions with many persons of influence, and especially with William Wilberforce (q.v.). A committee was formed on the 22nd of May 1787 for the abolition of the slave trade, under the presidency of Granville Sharp. It is unquestionable that the principal motive power which originated and sustained their efforts was Christian principle and feeling. The most earnest and unremitting exertions were made by the persons so associated in investigating facts and collecting evidence, in forming branch committees and procuring petitions, information and support of those who pleaded the cause in parliament. To the original members were afterwards added several remarkable persons, amongst whom were Josiah Wedgwood, Bennet Langton (Dr Johnson's' friend), and, later, Zachary Macaulay, Henry Brougham and James Stephen.

In consequence of the numerous petitions presented to parlia- ment, a committee of privy council was appointed by the crown in 1788 to inquire concerning the slave trade; and Pitt moved that the House of Commons should early in the next session take the subject into consideration. Wilberforce's first motion for a committee of the whole House upon the question was made on the 19th of March 1789, and this committee pro- ceeded to business on the r2th of May of the same year. After an admirable speech, Wilberforce laid on the table twelve resolutions which were intended as the basis of a future motion for the abolition of the trade. The discussion of these was post- poned to the next session, and in 1 790-1 791 evidence was taken upon them. At length, on the 18th of April of the latter year, a motion was made for the introduction of a bill to prevent the further importation of slaves into the British colonies in the West Indies. Opinion had been prejudiced by the insurrections in St Domingo and Martinique, and in the British island of Dominica; and the motion was defeated by 163 votes against 88. Legislative sanction was, however, given to the establish- ment of the Sierra Leone Company, for the colonization of a district on the west coast of Africa and the discouragement of

the slave trade there. It was hoped at the time that that place would become the centre from which the civilization of Africa would proceed; but this expectation was not fulfilled. On the 2nd of April 1792 Wilberforce

again moved that the trade ought to be abolished; an amendment in favour of gradual abolition was carried, and it was finally resolved that the trade should cease on the 1st of January 1796. When a similar motion was brought forward in the Lords the consideration of it was postponed to the following year, in order to give time for the examination of wit- nesses by a committee of the House. A bill in the Commons in the following year to abolish that part of the trade by which British merchants supplied foreign settlements with slaves was lost on the third reading; it was renewed in the Commons in 1 794 and carried there, but defeated in the Lords. Then followed several years during which efforts were made by the abolitionists in parliament with little success. But in 1806, Lord Grenville and Fox having come into power, a bill was passed in both Houses to put an end to the British slave trade for foreign supply, and to forbid the importation of slaves into the colonies won by the British arms in the course of the war. On the 10th of June of the same year Fox brought forward a resolution " that effectual measures should be taken for the abolition of the Africaa slave trade in such a manner and at such a period as should be deemed advisable," which was carried by a large majority. A similar resolution was successful in the House of Lords. A bill was then passed through both Houses forbidding the employment of any new vessel in the trade. Finally, in 1807, a bill was presented by Lord Grenville in the House of Lords providing for the abolition of the trade, was' passed by a large majority, was then sent to the Commons (where it was moved by Lord Ho wick), was there amended and passed, and received the royal assent on the 25th of March. The bill enacted that no vessel should clear out for slaves from any port within the British dominions after the 1st of May 1807, and that no slave should be landed in the colonies after the rst of March 1808.

In r8o7 the African Institution was formed, with the primary objects of keeping a vigilant watch on the slave traders and procuring, if possible, the abolition of the slave trade by the other European nations. It was also to be made an instrument for promoting the instruction of the negro races and diffusing in formation respecting the African continent.*

The Act of 1807 was habitually violated, as the traders knew that, if one voyage in three was successful, they were abundantly remunerated for their losses. This state of things, it was plain, must continue as long as the trade was only a contraband com- merce, involving merely pecuniary penalties. Accordingly, in 181 1, Brougham carried through parliament a bill declaring the traffic to be a felony punishable with transportation., Some years later another act was passed, making it a capital offence; but this was afterwards repealed. The law of 1811 proved effectual and brought the slave trade to an end so far as the British dominions were concerned. Mauritius, indeed, continued it for a time. That island, which had been ceded by France in 1810, three years after the abolition, had special

facilities for escaping observation in consequence of the proximity of the African coast ; but it was soon obliged to conform.

The abolition of the French slave trade was preceded by struggles, and excesses. The western part of St Domingo, nominally belonging to Spain, had been occupied by buccaneers, who were recognized and supported by the French government, and Prance. had been ceded to France at the peace of Ryswick in 1697. So vast was the annual importation of enslaved negroes into this colony before 1791 that the ratio of the blacks to the whites was as 16 to 1. In that year there were in French St Domingo 480,000 blacks, 24,000 mulattoes and only 30,000 whites. The French law for the regulation of slavery in the plantations, known as the Code Noir (framed under Louis XIV. in 1685), was humane in its spirit; but we are informed that its provisions were habitually disregarded by the planters, whilst the free mulattoes laboured under serious griev- ances and were exposed to irritating indignities. A " Soci6t6 des Amis des Noirs " was formed in Paris in 1788 for' the abolition, not only of the slave trade, but of slavery itself. The president was Condorcet, and amongst the members were the due de la Roche- foucault, the Abbe 1 Gregoire, Brissot, Claviftre, Potion and La Fayette; Mirabeau was an active sympathizer. The great motor

of the parallel effort in England was the Christian spirit ; in France it was the enthusiasm of humanity which was associated with the revolutionary movement. There were in 1789 a number of mulattoes in Paris, who had come from San Domingo to assert the rights of the people of colour in that colony before the national assembly. The Declaration of the Rights of Man in August 1 789 seemed to meet their claims, but in March 1790 the assembly, alarmed by rumours of the discontent and disaffection of the planters in San Domingo, passed a resolution that it had not been intended to comprehend the internal government of the colonies in the constitution framed for the mother country. Vincent Oge, one of the mulatto dele- gates in Paris, disgusted at the overthrow of the hopes of his race, returned to San Domingo, and on landing in October 1790 addressed a letter to the governor announcing his intention of taking up arms on behalf of the mulattoes if their wrongs were not redressed. He rose accordingly with a few followers, but was soon defeated and forced to take refuge in the Spanish part of the island. He was after- wards surrendered, tried and sentenced to be broken on the wheel. When the news of this reached Paris, it created a strong feeling against the planters; and on the motion of the Abbe Gregoire it was resolved by the assembly on the 15th of May 1791 "

that the people of colour resident in the French colonies, born of free parents, were entitled to, as of right, and should be allowed, the enjoyment of all the privileges of French citizens, and among others those of being eligible to seats both in the parochial and colonial assemblies." On the 23rd of August a rebellion of the negroes broke out in the northern province of San Domingo, and soon extended to the western province, where the mulattoes and blacks combined. Many enormities were com- mitted by the insurgents, and were avenged with scarcely inferior barbarity. The French assembly, fearing the loss of the colony, re- pealed on the 24th of September the decree of the preceding May. This vacillation put an end to all hope of a reconciliation of parties in the island. Civil commissioners sent out from France quarrelled with the governor and called the revolted negroes to their assistance. The white inhabitants of Cape Francois were massacred and the city in great part destroyed by fire. The planters now offered their allegiance to Great Britain; and an English force landed in the colony. But it was insufficient to encounter the hostility of the re- publican troops and the revolted negroes and mulattoes; it suffered from disease, and was obliged to evacuate the island in 1798. On the departure of the British the government remained in the hands of Toussaint l'Ouverture (q.v.). Slavery had disappeared; the blacks were employed as hired servants, receiving for their remuneration the third part of the crops they raised ; and the population was rapidly rising in civilization and comfort. The whole island was now French, the Spanish portion having been ceded by the treaty of Basel. The wish of Toussaint was that San Domingo should enjoy a practical independence whilst recognizing the sovereignty and exclusive commercial rights of France. The issue of the violent and treacher- ous conduct of Bonaparte towards the island was that the blacks drove from their soil the forces sent to subdue them, and founded a constitution of their own, which was more than once modified. There can be no doubt that the government of the Restoration, in seeking to obtain possession of the island, had the intention of re- establishing slavery, and even of reopening the slave trade for the purpose of recruiting the diminished population. But Bonaparte abolished that trade during the Hundred Days, though he also failed to win back the people of San Domingo, or, as it was now called by its original name, Haiti, to obedience. The Bourbons, when again restored, could not reintroduce the slave trade; the notion of conquering the island had to be given up; and its independence was formally recognized in 1825 (see Haiti).

*England had not been the first European power to abolish the slave trade; that honour belongs to Denmark; a foyal order was issued on the 16th of May 1792 that the traffic TT** 8 should cease in the Danish possessions from the end of movement. J 8o2. The United States had in 1 794 forbidden any par- ticipation by American subjects in the slave trade to*

foreign countries; they now prohibited the importation of slaves . from Africa into their own dominions. This act was passed on the 2nd of March 1807; it did not, however, come into force till 1st January 1808. At the congress of Vienna (November 1814) the principle was acknowledged that the slave trade should be abolished as soon as possible; but the determination of the limit of time was reserved for separate negotiation between the powers. It had been provided in a treaty between France and Great Britain (May 30, 1814) that no foreigner should in future introduce slaves into the French colonies, and that the trade should be absolutely interdicted to the French themselves after the 1st of June 1819. This postponement of abolition was dictated by the wish to intro- duce a fresh stock of slaves into Haiti, if that island should be recovered. Bonaparte, as we have seen, abolished the French slave trade during his brief restoration, and this abolition was confirmed at the second peace of Paris on the 20th of November, 181 5, but it

was not effectually carried out by French legislation until March 1818. In January 1815 Portuguese subjects were prohibited from prosecuting the trade north of the equator, and the term after which the traffic should be everywhere unlawful was fixed to end on the 21st of January 1823, but was afterwards extended to February 1830; England paid £300,000 as a compensation to the Portuguese. A royal decree was issued on the 10th of December 1836 forbidding the export of slaves from any Portuguese posses- sion. But this decree was often violated. It was agreed that the Spanish slave trade should come to an end in 1820, England paying to Spain an indemnification of £400,000. The Dutch trade was closed in 1814; the Swedish had been abolished in 1813. By the peace of Ghent, December 1814, the United States and England mutually bound themselves to do all in their power to extinguish the traffic. It was at once prohibited in several of the South American states when they acquired independence, as in La Plata, Venezuela and Chile. In 1831 and 1833 Great Britain entered into an arrangement with France for a mutual right of search within certain seas, to which most of the other powers acceded; and by the Ashburton treaty (1842) with the United States provision was made for the joint maintenance of squadrons on the west coast of Africa. By all these measures the slave trade, so far as it was carried on under the flags of European nations or for the supply of their colonies, ceased to exist.

Meantime another and more radical reform had been in pre- paration and was already in progress, namely, the abolition of slavery itself in the foreign possessions of the several states of Europe. When the English slave trade had Aat,m been closed, it was found that the evils of the traffic, m0V emeat. as still continued by several other nations, were greatly aggravated. In consequence of the activity of the British cruisers the traders made great efforts to carry as many slaves as possible in every voyage, and practised

atrocities to get rid of the slaves when capture was imminent. It was, besides, the interest of the cruisers, who shared the price of the captured slave-ship, rather to allow the slaves to be taken on board than to prevent their being shipped at all. Thrice as great a number of negroes as before, it was said, was exported from Africa, and two-thirds of these were murdered on the high seas. It was found also that the abolition of the British slave trade did not lead to an improved treatment of the negroes in the West Indies. The slaves were overworked now that fresh supplies were stopped, and their numbers rapidly decreased. In 1807 there were in the West Indies 800,000; in 1830 they were reduced to 700,000. It became more and more evident that the evil could be stopped only by abolishing slavery altogether.

An appeal was made by Wilberforce in 182 1 to Thomas Fowell Buxton to undertake the conduct of this new question in parliament. An anti-slavery society was established in 1823, the principal members of which, besides Wilberforce and Buxton, were Zachary Macaulay, Dr Lushington and Lord Suffield. Buxton moved on the 5th of May 1823 that the House should take into con- sideration the state of slavery in the British colonies. The object he and his associates had then in view was gradual abolition by establishing something like a system of serfdom for existing slaves, and passing at the same time a measure emancipating all their children born after a certain day. Canning carried against Buxton and his friends a motion to the effect that the desired ameliorations in the condition and treatment of the slaves should be recommended by the home government to the colonial legislatures, and enforced only in case of their resistance, direct action being taken in the sjngle instance of Trinidad, which, being a crown colony, had no legislature of its own. A well-conceived series of measures of reform was accordingly proposed to the colonial authorities. Thereupon a general outcry was raised by the planters at the acquiescence of the government in the principles of the anti-slavery party. A vain attempt being made in Demerara to conceal from the know- ledge of the slaves the arrival of the order in council, they became impressed with the idea that they had been set free, and accordingly refused to work, and, compulsion being resorted to, offered resistance. Martial law was proclaimed; the disturbances were repressed with great severity; and the treatment of the missionary Smith, which was taken up and handled with great ability by Brougham, awakened strong feeling in England against the planters. The question, how- ever, made little progress in parliament for some years, though Buxton, William Smith, Lushington, Brougham, Mackintosh, Butterworth, and Denman, with the aid of Z. Macaulay, James

Stephen, and others, continued the struggle, only suspending it during a period allowed to the local legislatures for carrying into effect the measures expected from them. In 1828 the free people of colour in the colonies were placed on a footing of legal equality with their fellow-citizens. In 1830 the public began to be aroused to a serious prosecution of the main issue. It was becoming plain that the planters would take no steps tending to the future liberation of the slaves, and the leaders of the movement determined to urge the entire abolition of slavery at the earliest practicable period. The government continued to hesitate and to press for mitigations of the existing system. At length in 1833 the ministry of Earl Grey took the question in hand and carried the abolition with little difficulty, the measure passing the House of Commons on the 7th of August 1833 and receiving the Royal assent on the 28th. A sum of 20 millions sterling was voted as compensation to the planters. A system of apprenticeship for seven years was established as a transi- tional preparation for liberty. The slaves were bound to work for their masters during this period for three-fourths of the day, and were to be liable to corporal punishment if they did not give the due amount of labour. The master was, in return, to supply them with food and clothing. All children under six years of age were to be at once free, and provision was to be made for their religious and moral instruction. Many thought the postponement of emanci- pation unwise. Immediate liberation was carried out in Antigua, and public tranquillity was so far from being disturbed there that the Christmas of 1833 was the first for twenty years during which martial law was not proclaimed in order to preserve the peace. Notwith- standing protracted and strenuous opposition on the part of the government, the House of Commons passed a resolution against the continuance of the transitional system. When this was done the local legislatures saw that the slaves would no longer work for the masters; they accordingly cut off two years of the indentured apprenticeship, and gave freedom to the slaves in August 1838 instead of 1840.

The example of Great Britain was gradually followed by the other European states, and some American ones had already taken action of the same kind. The immediate emancipation of the slaves in the French colonies was decreed by the provisional government of 1848. In 1858 it was enacted that every slave belonging to a Portuguese subject should be free in twenty years from that date, a system of tutelage being established in the meantime. This law came into operation on the 29th of April 1878, and the status of slavery was thenceforth illegal throughout the Portuguese possessions. The Dutch emanci- pated their slaves in 1863. Several of the Spanish American states, on declaring their independence, had adopted measures for the discontinuance of slavery within their limits. It was abolished by a decree of the Mexican republic on 1 5th September 1829. The government of Buenos Aires enacted that all children born to slaves

after the 31st of January 1813 should be free; and in Colombia it was provided that those born after the 16th of July 1821 should be liberated on attaining their eighteenth year.

Three of the most important slave systems still remained in which no steps towards emancipation had been taken — those of the Southern United States, of Cuba and of Brazil.

Slavery was far from being approved in principle by the most eminent of the fathers of the American Union. Washington in his will provided for the emancipation of his own slaves; he said to Jefferson that it was "among his first wishes to see some plan adopted by which slavery in his country might be abolished by law," and again he wrote that to this subject his own suffrage should never be wanting. John Adams declared his abhorrence of the practice of slaveholding, and said that " every measure of prudence ought to be assumed for the eventual total extirpation of slavery from the United States." Franklin's opinions we have already indicated; and Madison, Hamilton, and Patrick Henry all reprobated the principle of the system. Jefferson declared in regard to slavery, " I tremble for my country when I reflect that God is just." The last-named statesman, at the first Continental Congress after the evacuation by the British forces, proposed a draft ordinance (March 1st 1784) for the government of the North-West Territory, in which it was provided that " after the year 1800 there shall be neither slavery nor involuntary servitude in any of the said states, otherwise than in punish- ment of crime." This proviso, however, was lost; but in the Ordinance of 1787 (13 July) for the government of the territory

of the United States north-west of the Ohio river, which was introduced by Nathan Dane and probably drafted by Manasseh Cutler, slavery was forbidden in the Territory. At the con- vention of Philadelphia in 1787, where the constitution was drafted, the sentiments of the framers were against slavery; but South Carolina and Georgia insisted on its recognition as a condition of their joining the Union, and even an engagement for the mutual rendition of fugitive slaves was embodied in the federal pact. The words " slave " and " slavery " were, however,' excluded from the constitution, " because," as Madison says," they did not choose to admit the right of property in man " in direct terms; and it was at the same time provided that Congress might interdict the foreign slave trade after the expiration of twenty years. It must not be forgotten that either before or soon after the formation of the Union the Northern States — beginning with Vermont in 1777, and ending with New Jersey in 1804 — either

abolished slavery or adopted measures to effect its gradual abolition within their boundaries. But the principal operation of (at least) the latter change was simply to transfer Northern slaves to Southern markets.

We cannot follow in detail the several steps by which the slave power for a long time persistently increased its influence in the Union. The acquisition of Louisiana in 1803, which gave a new field for the growth of the slave power, though not made in its interest, the Missouri Compromise (1820), the annexation of Texas (1 84 5) , the Fugitive Slave Law (1 8 50) , the Kansas-Nebraska bill (1854), the Dred Scott decision (1857), the attempts to acquire Cuba (especially in 1854) and to reopen the foreign slave trade (1859-1860), were the principal steps — only some of them successful — in its career of aggression. They roused a deter- mined spirit of opposition, founded on deep-seated convictions. The pioneer of the more recent abolitionist movement was Benjamin Lundy (1 789-1839). He was followed by William Lloyd Garrison (1805-1879), Elijah P. Lovejoy (1802-1837) — a martyr, if ever there was one — Wendell Phillips, Charles Sumner, John Brown (b. 1800, hanged 1859), all of whom were in their several ways leading apostles or promoters of the cause. The best intellect of America outside the region of practical politics has been on the anti-slavery side. William E. Channing, R. W. Emerson, the poets Bryant, Longfellow, pre-eminently Whittier and Whitman, have spoken on this theme with no uncertain sound. The South, and its partisans in the North, made desperate efforts to prevent the free expression of opinion respecting the institution, and even the Christian churches in the slave states used their influence in favour of the maintenance of slavery. But in spite of every such effort opinion steadily grew. Public sentiment in the North was deeply stirred by the Uncle Tom's Cabin (1852) of Mrs Harriet Beecher Stowe, which, as Senior said, under the disguise of a novel was really a pamphlet against the Fugitive Slave Law. It gradually became apparent that the question could not be settled without an armed conflict. The election of Abraham Lincoln as president in November i860 was the signal for the rising of the South. The North at first took arms simply to maintain the Union; but the far- sighted politicians from the first, and soon the whole nation, saw that the real issue was the continued existence or the total abolition of slavery. (See United States.)

The war was practically closed by the surrender at Appomattox (gth April 1865), but already in 1862 slavery in the Territories had been abolished by Congress; on the 22nd. of September of the same year Lincoln (q.v.) had issued the preliminary emancipation proclamation, followed on the 1st of January 1863 by the emancipation of all slaves in the states in arms against the Union; and in December 1865 a constitutional amendment was ratified abolishing and forever prohibiting slavery through- out the United States.

The Spanish slave code, promulgated in 1789, is admitted on all hands to have been very humane in its character; and, in con- sequence of this, after Trinidad had become an English Cuba. possession, the anti-slavery party resisted — and success- fully — the attempt of the planters (1811) to have the Spanish law in that island replaced by the British. But notwithstanding thij

mildness of the code, its provisions were habitually and glaringly violated in the colonies of Spain, and in Cuba particularly the con- ditions of slavery were very bad. The slave population of the island was estimated in 1792 at 84,000; in 1817 at 179,000; in 1827 at 286,000; and in 1843 at 436,000. An act was passed by the Spanish legislature in 1870, providing that every slave who had then passed, or should thereafter pass, the age of sixty should be at once free, and that all yet unborn children of slaves should also be free. The latter, however, were to be maintained at the expense of the proprietors up to their eighteenth year, and during that time to be kept, as apprentices, to su>_h work as was suitable for their age. This was known as the Moret Law, having been carried through the house of representatives by Sefior Moret y Prendergast, then minister for the colonies. By the census of 1867 there was in Cuba a total popula- tion of 1,370,211 persons, of whom 764,750 -were whites and 605,461 black or coloured ; and of the latter number 225,938 were free and 379. 5 2 3 were slaves. In 1873 the Cubans roughly estimated the population at 1,500,600 — of whom 500,000, or one-third, were slaves. Mr Crowe, consul-general in the island, in 1885, stated that " the institution was rapidly dying, — that in a year, or at most two, slavery, even in its then mild form, would be extinct."

There was a convention between Great Britain and Brazil in 1826 for the abolition of the slave trade, but it was habitually Brazil violated in spite of the English cruisers. In 1830 the

traffic was declared piracy by the emperor of Brazil. England asserted by the Aberdeen Act (1845) the right of seizing suspected craft in Brazilian waters. Yet by the connivance of the local administrative authorities 54,000 Africans continued to be annually imported. In 1850 the trade is said to have been decisively put down. The planters and mine proprietors cried out against this as a national calamity. The closing of the traffic made the labour of the slaves more severe, and led to the employment on

the planta- tions of many who before had been engaged in domestic work; but the slavery of Brazil had always been lighter than that of the United States. On 28th September 1871 the Brazilian chambers decreed that slavery should be abolished throughout the empire. Though existing slaves were to remain slaves still, with the exception of those possessed by the government, who were liberated by the act, facilities for emancipation were given; and it was provided that all children born of female slaves after the day On which the law passed should be free. They were, however, bound to serve the owners of their mothers for a term of 21 years. A clause was in- serted to the effect that a certain sum should be annually set aside from fines to aid each province in emancipating slaves by purchase. Seven years before the passing of this act the emperor, whose influence had always been exerted in favour of freedom, had liberated his private slaves, and many Brazilians after 1871 followed his example. Finally, in 1888 the chambers decreed the total abolition of slavery, some 700,000 persons being accordingly freed.

In the colonies of more than one European country, after the prohibition of the slave trade, attempts were made to replace it Disguised ˆy a s y st:em of importing labourers of the inferior races slave under contracts for a somewhat lengthened term; and

*trade * ms was * n severa ˆ instances found to degenerate into a*

sort of legalized slave traffic About 1867 we began to hear of a system of this kind which was in operation between the South Sea Islands and New Caledonia and the white settlements in Fiji. It seems to have begun in really voluntary agreements; but for these the unscrupulous greed of the traders soon substituted methods of fraud and violence. The natives were decoyed into the labour ships under false pretences, and then detained by force; or they were seized on shore or in their canoes and carried on board. The nature of the engagements to go and work on the plantations was not fully explained to them, and they were hired for periods exceeding the legal term. The area of this trade was ere long further extended. In 1884 attention was drawn in a special degree to the Queensland traffic in Pacific Islanders by the " Hopeful " trials, and a government commission was appointed to inquire into the methods followed by labour ships in recruiting the natives of New Guinea, the Louisiade Archipelago, and the D'Entrecasteaux group of islands. The result of the investigations, during which nearly five hundred witnesses were examined, was the disclosure of a system which in treachery and atrocity was little inferior to the old African slave trade. These shameful deeds made the islanders regard it as a duty to avenge their wrongs on any white men they could entice upon their shores. The bishop of Melanesia, John Coleridge Patteson, fell a victim to this retaliation on the island of Nukapu 20th September 1871.

We have seen that the last vestiges of the monstrous anomaly of modern colonial slavery are disappearing from all civilized states and their foreign possessions. It now remains to consider the slavery of primitive origin which has existed within recent limes, or continues to exist, outside of the Western world.

In Russia, a country which had not the same historical ante- cedents with the Western nations, properly so called, and which is in fact more correctly classed as Eastern, whilst slavery had dis- appeared, serfdom was in force down to our own days. The rural population of that country, at the earliest period accessible to

our inquiries, consisted of (1) slaves, (2) free agricultural labourers, and (3) peasants proper, who were small farmers or cottiers and members of a commune. The sources of slavery were there, R„ ss /an as elsewhere, capture in war, voluntary sale by poor ser /y OOI freemen of themselves, sale of insolvent debtors, and the action of the law in certain criminal cases. In the 18th century we find the distinction between the three classes named above effaced and all of them merged in the class of serfs, who were the property either of the landed proprietors or of the state. They were not even adscripti glebae, though forbidden to migrate; an imperial ukase of 1 72 1 says, " the proprietors sell their peasants and domestic servants, not even in families, but one by one, like cattle." This practice, at first tacitly sanctioned by the government, which received dues on the sales, was at length formally recognized by several imperial ukases. Peter the Great imposed a poll-tax on all the members of the rural population, making the proprietors responsible for the tax charged on their serfs; and the " free wandering people " who were not willing to enter the army were required to settle on the land either as members of a commune or as serfs of some proprietor. The system of serfdom attained its fullest development in the reign of Catherine II. The serfs were bought, sold, and given in presents, sometimes with the land, sometimes without it, sometimes in families and sometimes individually, sale by public auction being alone for- bidden, as " unbecoming in a European state." The proprietors could transport without trial their unruly serfs to Siberia or send them to the mines for life, and those who presented complaints against their masters were punished with the knout and condemned to the mines. The first symptoms of a reaction appear in the reign

The slavery of the Mahommedan East is usually not the slavery of the field but of the household. The slave is a member of the family, and is treated with tenderness and affection. The Mahom- Koran breathes a considerate and kindly spirit towards tnedan the class, and encourages manumission. The child of a slave slavery girl by her master is born free, and the mother is usually raised to be a free wife. The traffic in slaves has been repeatedly

declared by the Ottoman Porte to be illegal throughout its dominions, and a law for its suppression was published in 1889, but it cannot be said to be extinct, owing to the laxity and too often the complicity of the government officials. In Egypt it has practically died out.

In the days of the colonial slave trade its African centre was the region about the mouths of the rivers Calabar and Bonny, whither the captive negroes were brought from great distances Africa. in the interior. As many slaves, Clarkson tells us, came annually from this part of the coast as from all the rest of Africa besides. The principal centres from which the supply was furnished

to Egypt, Turkey, Arabia, and Persia were three in number. (1) The central Sudan appeared to be one vast hunting-ground. Captives were brought thence to the slave market of Kuka in Bornu, where, after being bought by dealers, they were, to the number of about 10,000 annually, marched across the Sahara to Murzuk in Fezzan, from which place they were distributed to the northern and eastern Mediterranean coasts. Their sufferings on the route were dreadful ; many euccumbed and were abandoned. Rohlfs informs us that " any one who did not know the way " by which the caravans passed " would only have to follow the bones which lie right and left of the track." Negroes were also brought to Morocco from the Western Sudan and from Timbuktu. The centre of the traffic in Morocco was Sidi Hamed ibn Musa, seven days' journey south of Mogador, where a great yearly fair was held. The slaves were forwarded thence in gangs to different towns, especially to Marrakesh, Fez and Mequinez. About 4000 were thus annually imported, and an ad valorem duty was levied by the sultan, which produced about £4800 of annual revenue. The control now exercised by the French over the greater part of the western Sudan has deprived Morocco of its chief sources of supply. Slavery, however, still flourishes in that empire. (2) The basin of the Upper Nile, extending to the great lakes, was another region infested by the slave trade; the slaves were either smuggled into Egypt or sent by the Red Sea to Turkey. The khedive Ismail in 1869 appointed Sir Samuel Baker to the command of a large force with which he was " to strike a direct blow at the slave trade in its distant nest." The work begun by him was continued by Colonel C. G. Gordon (1874 to 1879), but under the Mahdi and the Khalifa the slave trade was revived. Since the reconquest of the eastern Sudan by an Anglo-Egyptian force in 1898 effective measures have been taken to suppress slave raiding and as far as possible slavery itself. The conquest of the central Sudan states by France — completed in 1910 by

the subjugation of Wadai — has practically ended the caravan trade in slaves across the Sahara. (3) There was for long a slave trade from the Portuguese possessions on the East African coast. The stream of supply came mainly from the southern Nyasa districts by three or four routes to lbo, Mozambique, Angoche and Quilimane. Madagascar and the Comoro Islands obtained most of their slaves from the Mozambique coast. It was believed in 1862 that about 19,000 passed every year from the Nyasa regions to Zanzibar, whence large supplies were drawn for the markets of Arabia and Persia up to 1873. The mission of Sir Bartle Frere to the suitan of Zanzibar in 1873 brought about a treaty for the suppression of the slave trade. It is said that, whereas 10,000 slaves formerly passed the southern end of the Nyasa every year, in 1876 not more than 38 were known to have been conveyed by that route. Lieutenant O'Neill, British consul at Mozambique, writing in 1880, fixed at about 3000 the number then annually ex- ported from the coast between the rivers Rovuma and Zambesi. With the establishment of a British protectorate at Zanzibar, and of British and German protectorates on the mainland of East Africa and in the region of the head-waters of the Nile, the East African slave trade received its death-blow. Slavery itself has been abolished in the Zanzibar, British, German and Portuguese dominions, and had ceased in Madagascar even before its conquest by the French. The complete control of the seaboard by European powers has rendered the smuggling of slaves to Arabia and Persia a difficult and dangerous occupation.

A new era was opened up by the discovery of the course of the Congo by H. M. Stanley, the founding of the Congo Free State by Leopold II. of Belgium and the partition of the greater part of Africa between various European powers. Though the history of the Congo Free State affords a painful contrast to the philanthropic professions of its founder, in other parts of the continent the establish- ment of protectorates by Great Britain, France and Germany was followed by strenuous, and largely successful, efforts to put down slave raiding. In parts where European authority remained weak, as in the hinterland of the Portuguese province of Angola and the adjacent regions of Central Africa, native potentates continued to raid their neighbours, and from this region many labourers were (up to 1910) forcibly taken to work on the cocoa plantation in St Thomas (q.v.). With the accession of Albert I. to the Belgian throne in 1909 a serious endeavour was made to improve the state of affairs in the. Congo. At the close of the first decade of the 20th century it might be said that over the greater part of Africa slave raiding was a thing of the past.

Clarkson first, and Buxton afterwards, whilst they urged all other means for the suppression or discouragement of the slave trade and slavery, saw clearly that the only thoroughly effectual method would be the development ' of legitimate commerce in Africa itself. When Buxton published in 1840

his book entitled The Slave Trade and its Remedy, this was the remedy he contem- plated. The unfortunate Niger expedition of 1841 was directed to similar ends; and it has been more and more felt by all who were interested in the subject that here lies the radical solution of the great problem. It was for some time thought that from Sierra Leone as a centre industry and civilization might be diffused amongst the nations of the continent; and in 1822 the colony (which in 1847 became the independent republic) of Liberia had been founded by Americans with a similar object ; but in neither case have these expectations been adequately fulfilled.

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SLAVONIC, OLD. In the article Slavs (under Languages) will be found a fairly complete account of Old Slavonic in its first form, as it is taken as representing, save for a few peculiarities noticed in their place, the Proto-Slavonic. The reasons are there given for believing it to be the dialect of Slavs settled somewhere between Thessalonica and Constantinople and represented now by the Bulgarians and Macedonians.

After the language had been fixed by the original translations of the New

Testament and other Church books it was no more consciously adapted to the dialects of the various peoples, but was used equally among the Croats (whose books were accom- modated to the Roman use and written in Glagolitic), Serbs and

Russians. These insensibly altered them to make the words easier and allowed their native languages to show through; and the same was the case with the Bulgarians, whose language soon began to lose some of the characteristics of O.S. Hence our earliest MSS. already show departure from the norm which can be established by comparison; about a dozen (8 Glagolitic) MSS. and fragments afford trustworthy material dating from the ioth and nth centuries, but even then the S. Slavs were weak in distinguishing i and y, the Russians mixed up a with u, ? with ja and so on; but in the actual texts great conservatism prevailed, whereas any additions, such as colophons or marks of ownership, betray the dialect of the writer more clearly, and such scraps and a few deeds are our earliest authorities for Servian and Russian. But the Church language as insensibly modified continued to be the literary language of Croatia until the 16th century, of Russia until 1700, and of Bulgaria, Servia and Rumania until the early part of the 19th century, and is still the liturgical language of Dalmatia, the Balkans, Russia and the Ruthenian Uniates.

Its literature was enriched in the second generation by the works of Clement, bishop of Ochrida, and John, exarch of Bulgaria, and other writers of the time of Tsar Simeon, but it is almost all ecclesiastical in character. Perhaps the most interesting book in Church Slavonic is the Russian chronicle, but that has many old Russian forms. Otherwise certain translations of Greek Apocrypha are of importance, especially when the Greek original is lost, e.g. the Book of Enoch; other Apocrypha in Church Slavonic are said to have been written by Jeremias, a Bogomil priest, but they are probably derived from Eastern sources. The Slavonic text of the Bible is not of importance for textual criticism, as the translation was made late, and even so has never been studied from that point of view. The whole Bible was not finished till the 15th century, some of the less necessary books being translated from the Vulgate.

SLAVS. Judged by the language test, and no other is readily available, the Slavs are the most numerous race in Europe, amounting to some 140,000,000 souls. Outside Europe there are the Russians in Siberia, a mere extension of the main body, and a large number of emigrants settled in America, where, however, although most of the nationalities have their

own newspapers, the second generation of immigrants tends to be assimilated.

Divisions and Distribution. — The Slavs are divided geo- graphically into three main groups, Eastern, North- Western and Southern; linguistically also the same division is convenient.

The Russians stand by themselves as the Eastern group. They hold all the East European plain from the 27 th meridian to the Urals, the Finnish and Tatar tribes making up but a small proportion of the population: beyond these limits to the east they stretch into central Siberia and thence in narrow bands along the rivers all the way to the Pacific; on the west the Ruthenians (q.v.) of Galicia form a wedge between the Poles and the Magyars and almost touch the 20th meridian. The Russians must number 100,000,000.

The North-Western group includes the Poles, about 15,000,000, in the basin of the Vistula; the Kashubes (q.v.), about 200,000, on the coast north-west of Danzig; the High and Low Sorbs (q.v.) or Wends in Lusatia, 180,000 Slavs completely sur- rounded by Germans; the Cechs (Czech, q.v.) in the square of Bohemia, making up with their eastern neighbours, the Moravians, a people of 6,000,000 in northern Austria surrounded on three sides by Germans. In the north of Hungary, connecting up Ruthenians, Poles and Moravians, but most closely akin to the latter, are 2,500,000 Slovaks (q.v.). With the Sorbs, Poles and Kashubes are to be classed the now teutonized Slavs of central Germany, who once stretched as far to the north-west as Rugen and Holstein and to the south-west to the Saale. They are gener- ally called Polabs (q. v.), or Slavs on the Elbe, as their last sur- vivors were found on that river in the eastern corner of Hanover. The Southern Slavs, Slovenes (q.v.), Serbo-Croats (see Servia) and Bulgarians (see Bulgaria), are cut off from the main body by the Germans of Austria proper and the Magyars, both

of whom occupy soil once Slavonic, and have absorbed much Slavonic blood, and by the Rumanians of Transylvania and the Lower Danube, who represent the original Dacians romanized. These Slavs occupy the main mass of the Balkan Peninsula downwards from the Julian Alps and the line of the Muhr, Drave and Danube. North of this all three races have consider- able settlements in southern Hungary. Their southern boundary is very ill-defined, various nationalities being closely intermingled. To the south-west the Slavs march with the Albanians, to the south-east with the Turks, and to the south and along the Aegean coasts they have the Greeks as neighbours.

Although the Southern Slavs fall into these three divisions, linguistically the

separation is not sharp, nor does it coincide with the political frontiers. Roughly speaking, the eastern half of the peninsula is held by the Bulgarians, some 5,000,000 in number, the western half by the Serbo-Croats, of whom there must be about 8,000,000. This is the most divided of the Slavonic races; its members profess three forms of religion and use three alphabets — the Serbs and Bosnians being mostly Orthodox and using the Cyrillic alphabet, but including many Mussulmans; the Croats being Roman Catholics, writing with Latin letters; and the Dalmatians also Roman Catholics, but using, some of them, the ancient Glagolitic script for their Slavonic liturgy. The language also falls into three dialects independent of the religions, and across all these lines run the frontiers of the political divisions — the kingdom of Servia (more correctly written Serbia); the kingdom of Montenegro; the Turkish provinces of Old Servia and Novibazar, still in Turkish hands; those of Bosnia and Herzegovina, annexed by Austria; the coast-line and islands of Istria and Dalmatia, which also form part of Austria; and the kingdom of Croatia, which is included in the dominion of Hungary, to say nothing of outlying colonies in Hungary itself and in Italy. In the extreme north-west, in Carniola, in the southern parts of Styria and Carinthia, and over the Italian border in the province of Udine and the Vale of Resia live the Slovenes, something under 1,500,000, much divided dialectically. Between the Slovenes and the Croats there are transition dialects, and about 1840 there was an attempt (Illyrism) to establish a common literary language. In Macedonia and along the border are special varieties of Bulgarian, some of which approach Servian. Akin to the Macedonians were the Slavs, who once occupied the whole of Greece and left traces in the place- names, though they long ago disappeared among the older population. Akin to the Slovenes were the old inhabitants of Austria and south-west Hungary before the intrusion of the Germans and Magyars.

History'. — This distribution of the Slavs can be accounted for historically. In spite of traditions (e.g. the first Russian chronicle of Pseudo-Nestor) which bring them from the basin of the Danube, most evidence goes to show that when they formed one people they were settled to the north-east of the Carpathians in the basins of the Vistula, Pripet and Upper Dnestr (Dniester). To the N. they had their nearest relatives, the ancestors of the Baltic tribes, Prussians, Lithuanians and Letts; to the E. Finns; to the S.E. the Iranian population of the Steppes of Scythia (q.v.); to the S.W., on the other side of the Carpathians, various Thracian tribes; to the N.W. the Germans; between the Germans and Thracians they seem to have had some contact with the Celts, but this was not the first state of things, as the Illyrians, Greeks and Italians probably came between. This location, arrived at by a comparison of the fragmentary accounts of Slavonic migrations and their distribution in historic time, is confirmed by its

agreement with the place taken by the Slavonic language among the other Indo-European languages (see below), and by what we know of the place-names of eastern Europe, in that for this area they seem exclusively Slavonic, outside it the oldest names belong to other languages. The archaeological evidence is not yet cleared up, as, for the period we have to consider, the late neolithic and early bronze age, the region above defined is divided between three different cultures, represented by the fields of urns in Lusatia and Silesia, cist graves with cremation in Poland, and the poor and little-known graves of the Dnepr

(Dnieper) basin. This variety may to some extent be due to the various cultural influences to which the same race was exposed, the western division lying on the route between the Baltic and Mediterranean, the central being quite inaccessible, the eastern part in time showing in its graves the influence of the Steppe people and the Greek colonies in Scythia. There is a gradual transition to cemeteries with Roman objects which shade off into such as are certainly Slavonic.

The physical type of the Slavs is not sufficiently clear to help in throwing light upon the past of the race. Most of the modern Slavs are rather short-headed, the Balkan Slavs being tall and dark, those of central Europe dark and of medium height, the Russians on the whole rather short though the White and Little Russians are of medium height; in complexion the southern Russians are dark, the northern light, but with less decided colour than fair western Europeans. In spite of the prevalent brachycephaly of the modern Slavs, measurements of skulls from cemeteries and ancient graves which are certainly Slavonic have shown, against all expectation, that the farther back we go the greater is the proportion of long heads, and the race appears to have been originally dolichocephalic and osteologically indistinguishable from its German, Baltic and Finnish neighbours. In its present seats it must have assimilated foreign elements, German and Celtic in central Europe, Finnish and Turkish in Great and Little Russia, all these together with Thracian and Illyrian in the Balkans; but how much the differences between the various Slavonic nations are due to admixture, how much to their new homes, has not been made clear.

In spite of the vast area which the Slavs have occupied in historic times there is no reason to claim for them before the migrations a wider homeland than that above defined beyond the Carpathians; given favourable circumstances a nation multiplies so fast (e.g. the Anglo-Saxons in the last hundred and twenty years) that we can set no limits to the area

that a com- paratively small race could cover in the course of four centuries. Therefore the mere necessity of providing them with ancestors sufficiently numerous does not compel us to seek for the Slavs among any of the populous nations of the ancient world. Various investigators have seen Slavs in Scythians, Sarmatians, Thracians, Illyrians, and in fact in almost all the barbarous tribes which have been mentioned in the east of Europe, but we can refer most of such tribes to their real affinities much better than the ancients, and at any rate we can be sure that none of these were Slavs.

There is no evidence that the Slavs made any considerable migration from their first home until the 1st century a.d. Their first Transcarpathian seat lay singularly remote from the knowledge of the Mediterranean peoples. Herodotus (iv. 17, 51, 105) does seem to mention the Slavs under the name of Neuri (q.v.), at least the Neuri on the upper waters of the Dnestr are in the right place for Slavs, and their lycanthropy suggests modern Slavonic superstitions; so we are justified in equating Neuri and Slavs, though we have no direct statement of their identity. Other classical writers down to and including Strabo tell us nothing of eastern Europe beyond the immediate neigh- bourhood of the Euxine.

Pliny (N.H. iv. 97) is the first to give the Slavs a name which can leave us in no doubt. He speaks of the Venedi (cf. Tacitus, Germania, 46, Veneti); Ptolemy (Ceog. hi. 5. 7, 8) calls them Venedae and puts them along the Vistula and by the Venedic gulf, by which he seems to mean the Gulf of Danzig: he also speaks of the Venedic mountains to the south of the sources of the Vistula, that is, probably the northern Carpathians. The name Venedae is clearly Wend, the name that the Germans have always applied to the Slavs. Its meaning is unknown. It has been the cause of much confusion because of the Armorican Veneti, the Paphlagonian Enetae, and above all the Enetae- Venetae at the head of the Adriatic. Enthusiasts have set all of these down as Slavs, and the last with some show of reason, as nowadays we have Slovenes just north of Venice. However, inscriptions in the Venetian language are sufficient to prove that it was not Slavonic. Other names in Ptolemy which almost certainly denote Slavonic tribes are the Veltae on the Baltic,

ancestors of the Wiltzi, a division of the Polabs (q.v.), the Sulani and the Saboci, whose name is a Slavonic translation of the Transmontani of another source.

Unless we are to conjecture Stlavani for Ptolemy's Stavani, or to insist on the resemblance of his Suobeni to Slovene, the name Slav first occurs in Pseudo-Caesarius (Dialogues, ii. no; Migne, P.G. xxxviii. 985, early 6th century), but the earliest definite account of them under that name is given

by Jordanes (Getica, v – 34; 35 > c – 55° A.D.): Dacia . . . ad coronae speciem arduis Alpibus emunita, iuxta quorum sinistrum lalus, qui in aquilone vergit, ab ortu Vistulae fluminis per immensa spatia Venetharum populosa natio consedit. Quorum nomina licet nunc per varias familias et loca mutentur, principaliter tamen Sclaveni et Antes nominantur. Sclaveni a civitate Novietunense (Noviodunum, Isakca on the Danube Delta) . . . usque ad Danastrum el in boream Viscla tenus commorantur . . . Antes vero, qui sunt eorum fortissimi, qua Fonticum mare curvatur a Danastro exten- duntur usque ad Danaprum; cf. xxiii. 119, where these tribes are said to form part of the dominions of Hermanrich. Sclaveni, or something like it, has been the regular name for the Slavs from that day to this. The native form is Slovene; in some cases, e.g. in modern Russian under foreign influence, we have an a instead of the o. The combination si was difficult to the Greeks and Romans and they inserted /, th or most commonly c, which continues to crop up. So too in Arabic Saqaliba, Saqldb. The name has been derived from slovo, a word, or slava, glory, either directly or through the -slav which forms the second element in so many Slavonic proper names, but no explanation is satisfactory. The word " slave " and its cognates in most European languages date from the time when the Germans supplied the slave-markets of Europe with Slavonic captives. The name Antes we find applied to the Eastern Slavs by Jordanes; it may be another form of Wend. Antae is used by Procopius (B.C. iii. 14). He likewise distinguishes them from the Sclaveni, but says that both spoke the same language and both were formerly called Spori, which has been identified with Serb, the racial name now surviving in Lusatia and Servia. Elsewhere he speaks of the measureless tribes of the Antae; this appellation is used by the Byzantines until the middle of the 7th century.

The sudden appearance in the 6th-century writers of definite names for the Slavs and their divisions means that by then the race had made itself familiar to the Graeco-Roman world, that it had spread well beyond its original narrow limits, and had some time before come into contact with civilisation. This may have been going on since the 1st century a.d., and evidence of it has been seen in the southward movement of the Costoboci into northern Dacia (Ptolemy) and of the Carpi to the Danube (a.d. 200), but their Slavonic character is not established. A few ancient names on the Danube, notably that of the river Tsierna (Cerna, black), have a Slavonic look, but a coincidence is quite possible. The gradual spread of the Slavs was masked by the wholesale migrations of the Goths, who for two centuries lorded it over the Slavs, at first on the Vistula and then in south Russia. We hear more of their movements because they were more immediately threatening for the Empire. In dealing with Ptolemy's location of the Goths and Slavs we must regard the former as superimposed upon the latter and occupying the same territories. This domination of the Goths

was of enormous importance in the development of the Slavs. By this we may explain the presence of a large number of Germanic loan words common to all the Slavonic languages, many of. them words of cultural significance. " King, penny, house, loaf, earring " all appear in Slavonic; the words must have come from the Goths and prove their strong influence, although the things must have been familiar before. On the other hand " plough " is said to be Slavonic, but that is not certain. When the Huns succeeded the Goths as masters of central Europe, they probably made the Slavs supply them with contingents. Indeed their easy victory may have been due to the dissatisfaction of the Slavs. Priscus (Muller, F.H.G. iv. p. 69, cf. Jord. Get. xlix. 258) in his account of the camp of Attila mentions words which may be Slavonic, but have also been explained from German. After the fall of

the Hunnish power the Eastern Goths and Gepidae pressed southwards and westwards to the conquest of the Empire, and the Lombards and Heruli followed in their tracks. When next we get a view of northern Germany we find it full of Slavs, e.g. from Procopius (B.G. ii. 15) we know that they held the Mark of Brandenburg by 512; but this settlement was effected without attracting the attention of any contemporary writer. Modern historians seem to adopt their attitude to the process according to their view of the Slavs; German writers, in their contempt for the Slavs, mostly deny the possibility of their having forced German tribes to leave their homes, and assume that the riches of southern Europe attracted the latter so that they willingly gave up their barren northern plains; most Slavonic authors have taken the same view in accordance with the idealistic picture of the peaceful, kindly, democratic Slavs who contrast so favourably with the savage Germans and their war-lords; but of late they have realised that their ancestors were no more peaceful than any one else, and have wished to put down to warlike pressure from the Slavs all the southward movements of the German tribes, to whom no choice was left but to try to break through the Roman defences. A reasonable view is that the expansion of the Eastern Germans in the last centuries B.C. was made at the expense of the Slavs, who, while no more peaceful than the Germans, were less capable than they of combining for successful war, so that Goths and others were dwelling among them and lording it over them; that the mutual competitions of the Germans drove some of these against the Empire, and when this had become weakened, so that it invited attack, some tribes and parts of tribes moved forward without any pressure from behind; this took away the strength of the German element, and the Slavs, not improbably under German organization, regained the upper hand in their own lands

and could even spread westwards at the expense of the German remnant.

Almost as uncertain is the exact time when the Southern Slavs began to move towards the Balkans. If already at the time of Trajan's conquests there were Slavs in Dacia, it would account for the story in Ps. Nestor that certain Volchi or Vlachi, i.e. Romance speakers, had conquered the Slavs upon the Danube and driven them to the Vistula, for the place that the name of Trajan has in Slavonic tradition, and for the presence of an agricultural population, the Sarmatae Limigantes subject to the nomad Sarmatae (q.v.), on the Theiss. In any case, we cannot say that the Slavs occupied any large parts of the Balkan Penin- sula before the beginning of the 6th century, when they appear in Byzantine history as a new terror; there seems to have been an invasion in the time of Justin, and another followed in 527 (Procopius, B.G. iii. 40 and Hist. Arc. 18). At the same time as the Slavs, the Huns, the Bulgars, and after 558 the Avars, were also making invasions from the same direction. The first and last disappeared like all nomads, but the Bulgars, making them- selves lords of one section of the Slavs, gave it their own name. By 584 the Slavs had overrun all Greece, and were the worst western neighbours of the Eastern Empire. Hence the directions how to deal with Slavs in the Strategicum of the emperor Maurice (c. 600) and the Tactics of Leo.

By the end of the following century they were permanently settled throughout the whole of the Balkan Peninsula. (For their further history see Servia, Bulgaria, Bosnia, Dalmatia, Croatia-Slavonia.) These Southern Slavs, though divided into nationalities, are closely akin to one another. There is no reason to think the Serbo- Croats an intrusive wedge, although Constantine Porphyrogenitus (De adm. Imp. 30-33) speaks of their coming from the north in the time of Heraclius— the middle of the 7th century. Their dialects shade into one another, and there is no trace of any influence of the North-Western group. Constantine was probably led astray by the occurrence of the same tribal names in different parts of the Slavonic world. Meanwhile the Southern Slavs were cut off from the rest of the race by the foundation in the 6th century of the Avar kingdom in Pannonia, and after its destruction in the 7th, by the spread of the Germans south-eastwards, and finally by the incursion of

another Asiatic horde, that of the Magyars, who have maintained themselves in the midst Of Slavs for a thousand years. Their conquests were made chiefly at the expense of the Slovenes and the Slovaks, and from their languages they have borrowed many words in forms which have now disappeared.

Of the history of the Eastern Slavs, who were to become the Russian people, we know little before the coming of the Swedish Rus, who gave

them their name and organization; we have but the mention of Antae acting in concert with the other Slavs and the Avars in attacking the Empire on the lower Danube, and scattered accounts cf Mussulman travellers, which show that they had reached the Don and Volga and stretched up northward to Lake Ilmen. The more southerly tribes were tributary to the Khazars. An exact definition of the territory occupied by each Slavonic people, and a sketch of its history from the time that it settled in its permanent abode, will be found either under its own name or under that of its country.

Culture and Religion. .— i-F 'or all the works treating of Slavonic antiquities we cannot draw a portrait of the race and show many distinguishing features. Savage nations as described by the Greeks and' Romans are mostly very much alike, and the testimony of language is not very easy to use. The general impression is one of a people which lived in small communistic groups, and was so impatient of authority that they scarcely combined for their own defence; and in spite of individual bravery only became formidable to others when cemented together by some alien element: hence they all at one time or another fell under an alien yoke; the last survivals of Slavonic licence being the vece of Novgorod, and the Polish diet with its unpractical regard for any minority. The Slavs were acquainted with the beginnings of the domestic arts, and were probably more given to agriculture than the early Germans, though they practised it after a fashion which did not long tie them to any particular district-ˆfor all writers agree in telling of their errant nature. They were specially given to the production of honey, from which they brewed mead. They also appear to have been -notable swimmers and to have been skilled in the navigation of rivers, and even to have indulged in maritime piracy on the Aegean, the Dalmatian coast and most of all the Baltic, where the island of Riigen was a menace to the Scandinavian and German sea-power; The Oriental sources also speak of some aptitude for commerce; Their talent for music and singing was already noticeable. Of their religion it is strangely difficult to gain any real information. The word Bogu, " god," is reckoned a loan word from the Iranian Baga. The chief deity was the Thunderer Perun (cf. Lith. Perkunas) , with whom is identified S varog, the god of heaven ; other chief gods were called sons of Svarog, Dazbog the sun, Chors and Veles, the god of cattle. The place of this latter was taken by St Blasius. A hostile deity was Stribog, god of storms. There seem to have been no priests, temples or images among the early Slavs. In Russia Vladimir set up idols and pulled them down upon his conversion to Christianity; only the Polabs had a highly developed cult with a temple and statues and a definite priesthood. But this may have been in imitation of Norse or even Christian institutions. Their chief deity was called Triglav, or the three-headed; he was the same as Svetovit, appar- ently a sky god in whose name the monks

naturally recognized Saint Vitus. The goddesses are colourless personifications, such as Vesna, spring, and Morana, the goddess of death and winter. The Slavs also believed, and many still believe, in Vily and Rusalki, nymphs of streams and woodlands; also in the Baba- Jaga, a kind of man-eating witch, and in Besy, evil spirits, as well as in vampires and werewolves. They had a full belief in the immortality of the soul, but no very clear ideas as to its fate. It was mostly supposed to go a long journey to a paradise (raj) at the end of the world and had to be equipped for this. Also the soul of the ancestor seems to have developed into the house or hearth god (Domovoj, Kret) who guarded the family. The usual survivals of pagan festivals at the solstices and equinoxes have continued under the form of church festivals.

Christianity among the Slavs. — The means by which was effected the conversion to Christianity of the various Slavonic

nations has probably had more influence upon their subsequent history than racial distinctions or geographical conditions.

Wherever heathen Slavonic tribes met Chrietendom missionary effort naturally came into being. This seems first to have been the case along the Dalmatian coast, where the cities retained their Romance population and their Christian faith. From the 7th century the Croats were nominally Christian, and subject to the archbishops of Salona at Spalato and their suffragans. Frpm the beginning of the 9th century Merseburg, Salzburg and Passau were the centres for spreading the Gospel among the Slavonic tribes on the south-eastern marches of the Frankish empire, in Bohemia, Moravia, Pannonia and Carinthia. Though we need not doubt the true zeal of these missionaries, it was still a fact that as Germans they belonged to a nation which was once more encroaching upon the Slavs, and as Latins (though the Great Schism had not yet taken place) they were not favourable to the use of their converts' native language. Still they were probably the first to reduce the Slavonic tongues to writing, naturally using Latin letters and lacking the skill to adapt them satisfactorily. Traces of such attempts are rare; the best are the Ereisingen fragments of Old Slovene now at Munich.

In the eastern half of the BaliSan Peninsula the Slavs had already begun to turn to Christianity before their conquest by the Bulgars. These latter were hostile until Boris, under the influence of his sister and of one Methodius (certainly not the famous one), adopted the new faith and put to the sword those that resisted conversion (a.d. 865). Though his Christianity came

from Byzantium, Boris seems to have feared the influence of the Greek clergy and applied to the Pope for teachers, submitting to him a whole series of questions. The Pope sent clergy, 'but would not grant the Bulgarians as much independence as they asked, and Boris seems to have repented of his application to him. He raised the question at the Council of Constantinople (a.d. 870), which decided that Bulgaria was subject to the Eastern Church. Cyril and Methodius. — In the same way Rostislav, prince of Greater Moravia, fearing the influence of Latin missionaries, applied to Byzantium for teachers who should preach in. f the vulgar tongue (a.d. 861). The emperor chose two brothers, sons of a Thessalonian Greek, Methodius and Constantine (generally known as Cyril by the name he adopted upon becoming a monk). The former was an organizer, the latter a scholar, a philosopher and a linguist. His gifts had been already exercised in & mission to the Crimea; he had brought thence the relics of S. Clement, which he finally laid in their resting-place in Rome. But the main reason for the choice was that the Thessalonians, surrounded as they were by Slavonic tribes, were well known to speak Slavonic perfectly. On their arrival in Moravia the brothers began to teach letters and the Gospel, and also to translate the necessary liturgical books and instruct the young in them. But soon (in 864) Rostislav was attacked by Louis the German and reduced to complete obedience, so that there could be no question of setting up a hierarchy in opposition to the dominant Franks, and the attempts to establish the Slavonic liturgy were strongly opposed. Hearing of the brother's work Pope Nicholas I. sent for them to Rome. On their way they spent some time with Kocel, a Slavonic prince of Pannonia, about Platten See, and he much favoured the Slavonic books. In Venice the brothers had disputes as to the use of Slavonic service- books; perhaps at this time these found their way to Croatia and Dalmatia. On their arrival in Rome Nicholas was dead, but Adrian II. was favourable to them and their translations, and had the pupils they brought with them ordained. In Rome Constantine fell ill, took monastic vows and the name of Cyril, and died on the 14th of February 869. Methodius was conse- crated archbishop of Pannonia and Moravia, about 870, but Kocel could not help him much, and the German bishops had him tried and thrown into prison; also in that very year Rostislav was dethroned by Svatopluk, who, though he threw off the Frankish yoke, was not steadfast in supporting the Slavonic liturgy. In 873 Pope John VIII. commanded the liberation of Methodius and allowed Slavonic services, and for the next few years the work of Methodius went well. In 879 he was again called to

Rome, and in 880 the Pope distinctly pronounced in his favour and restored him to his archbishopric, but made a German, Wiching, his suffragan. Methodius died in 885, and Wiching, having a new pope, Stephen V. (VI.), on his side, became his successor. So the Slavonic service-

books and those that used them were driven out by Svatopluk and took refuge in Bulgaria, where the ground had been made ready for them. Boris, having decided to abide by the Greek Church, welcomed Clement, Gorazd and other disciples of Methodius. Clement, who was the most active in literary work, laboured in Ochrida and others in various parts of the kingdom.

In spite of the triumph of the Latino-German party, the Slavonic liturgy was not quite stamped out in the west; it seems to have survived in out-of-the-way corners of Great Moravia until that principality was destroyed by the Magyars. Also during the life of Methodius it appears to have penetrated into Bohemia, Poland and Croatia, but all these countries finally accepted the Latin Church, and so were permanently cut off from the Orthodox Servians, Bulgarians and Russians.

These details of ecclesiastical history are of great importance for understanding the fate of various Slavonic languages, scripts and even literatures. From what has been said above it appears that Cyril invented a Slavonic alphabet, translated at any rate a Gospel lectionary, perhaps the Psalter and the chief service- books, into a Slavonic dialect, and it seems that Methodius translated the Epistles, some part of the Old Testament, a manual of canon law and further liturgical matter. Clement continued the task and turned many works of the Fathers into Slavonic, and is said to have made clearer the forms of letters. What was the alphabet which Cyril invented, where were the invention and the earliest translations made by him, and who were the speakers of the dialect he used, the language we call Old Church Slavonic (O.S.)? As to the alphabet we have the further testimony of Chrabr, a Bulgarian monk of the next genera- tion, who says that the Slavs at first practised divination by means of marks and cuts upon wood; then after their baptism they were compelled to write the Slavonic tongue with Greek and Latin letters without proper rules; finally, by God's mercy Constantine the Philosopher, called Cyril, made them an alphabet of 38 letters. He gives the date as 855, six or seven years before the request of Rostislav. If we take this to be exact Cyril must have been working at his translations before ever- he went to Moravia, and the language was presumably that with which he had been familiar at Thessalonica— that of southern Macedonia, and this is on the whole the most satisfactory view. At any rate the phonetic framework of the language is Buhaiiaa. more near to certain Bulgarian dialects than to any other, but the vocabulary seems to have been modified in Moravia by the inclusion of certain German and Latin words, especially those touching things of the Church. These would appear to have been already familiar to the Moravians through the work of the German missionaries. Some of them were superseded when O.S. became the language of Orthodox Slavs. Kopitar and Miklosich maintained that O.S. was Old Slovene as spoken by

the subjects of Kocel, but in their decision much was due to racial patriotism. Something indeed was done to adapt the language of the Translations to the native Moravian; we have the Kiev fragments, prayers after the Roman use in which occur Moravisms, notably c and z where O.S. has It and zd, and fragments at Prague with Eastern ritual but Cech peculiarities. Further, the Freisingen fragments, though their language is in the main Old Slovene and their alphabet Latin, have some connexion with the texts of an O.S. Euchologium from Sinai.

Alphabets. — Slavonic languages are written in three alphabets according to religious dependence; Latin adapted to express Slavonic sounds either by diacritical marks or else by conven- tional combinations of letters among those who had Latin services; so-called Cyrillic, which is the Greek Liturgical Uncial of the 9th century enriched with special signs for Slavonic letters— this is used by all Orthodox Slavs; and Glagolitic, in the " spectacled " form of which certain very early O.S. documents were written, and which in another, the " square," form has survived

as a liturgical script in Dalmatia, where the Roman Church still allows the Slavonic liturgy in the dioceses of Veglia, Spalato, Zara and Sebenico. and in Montenegro; the Croats now employ Latin letters for civil purposes.

The annexed table gives these alphabets — the Glagolitic in both forms with numerical values (columns 1-3); the Cyrillic in its fullest development (4, 5), with the modern version of it made for Russian (6) by Peter the Great's orders; Bulgarian uses more or less all the Russian letters but the reversed e and the last two, while keeping more old Cyrillic letters, but its orthography is in such a confused state that it is difficult to say which letters may be regarded as obsolete; Servian (7) was reformed by Karadzic (Karajich (q.v.)) on the model of Russian, with special letters and ligatures added and with unnecessary signs omitted. The old ways of writing Slavonic with Latin letters were so con- fused and variable that none of them are given. The Cechs first attained to a satisfactory system, using diacritical marks in- vented by Hus; their alphabet has served more or less as a model for all the other Slavonic languages which use Latin letters, and for that used in scientific grammars, not only of Slavonic but of Oriental languages. Column 8 gives the system as applied to Croat, and corresponding^ exactly to Karadzic's reformed Cyrillic. Column 9 gives the Cech alphabet with the exception of the long vowels, which are marked by an accent; in brackets are added further signs used in other Slavonic languages, e.?. Slovene and Sorb, or in strict transliterations of Cyrillic.

Polish (10) still offers a compromise between the old arbitrary combinations of letters and the Cech principle of diacritical marks. The last column shows a convenient system of transliterating Cyrillic into Latin letters for the use of English readers without the use of diacritical marks; it is used in most of the .ion- linguistic articles in the Encyclopaedia Britannica which deal with Slavs. With regard to Glagolitic (derived from Glagol, a word) and Cyrillic, it is clear that they are closely connected. The language of the earliest Glagolitic MSS. is earlier than that of the Cyrillic, though the earliest dated Slavonic writing surviv- ing is a Cyrillic inscription of Tsar Samuel of Bulgaria (a.d. 993). On the whole Glagolitic is likely to be the earlier, if only that no one would have made it who knew the simpler Cyrillic. It certainly bears the impress of a definite mind, which thought out very exactly the phonetics of the dialect it was to express, but made its letters too uniformly complicated by a love for little circles. A sufficiently large number of the letters can be traced back to Greek minuscules to make it probable that all of them derive thence, though agreement has not yet been reached as to the particular combinations which were modified to make each letter. Of course the modern Greek phonetic values alone form the basis. The numerical values were set out according to the order of the letters. Some subsequent improvement, especi- ally in the pre-iotized vowels, can be traced in later documents. The presumption is that this is the alphabet invented by Cyril for the Slavs who formerly used Greek and Latin letters without system.

When brought or brought back to Bulgaria by Clement and the other pupils of Methodius, Glagolitic took root in the west, but in the east some one, probably at the court of Simeon, where everything Greek was in favour, had the idea of taking the arrangement of the Glagolitic alphabet, but making the signs like those of the Uncial Greek then in use for liturgical books, using actual Greek letters as far as they would serve, and for specifically Slavonic sounds the Glagolitic signs simplified and made to match the rest. Where this was impossible in the case of the complicated signs for the vowels, he seems to have made variations on the letters A and B. With the uncials he took the Greek numerical values, though his alphabet kept the Glagolitic order. Probably the Glagolitic letters for s and H have exchanged places, and the value 800 belonged to ■>, as the order in Cyrillic is u,, M,ui, 41. Who invented Cyrillic we know not; Clement has been said to have made letters clearer, but only in a secondary source and he seems to have been particularly devoted to the tradition of Methodius, and he was bishop of Ochrida, just where Glagolitic survived longest.

GLAGOLITIC

CYRILLIC

LATIN

PHONETIC

Old

New

Num.

Old Num. Russ,

Serb. Croat Ccch&c, Polish

VALUES

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Mention must be made of Bruckner's theory that Cyril invented Cyrillic first, but degraded it into Glagolitic to hide its Greek origin from the Latin clergy, the whole object of his mission

being hostility to Rome, whereas in Orthodox countries this caution was soon seen to be unnecessary. The Glagolitic alphabets in the table are copied from Codex Marianus (nth century) and the Reims gospel, an O.S. MS. of the 14th century, on which the kings of France took their coronation oath.

As to the special sounds which these various scripts expressed, we may notice in the vocalism a ' endency to broaden the short vowels and to narrow the long ones, a process which has left results even where distinctions of quantity no longer exist; further, the many changes which can be followed in historic time and are due to the destruction of the old rule of open syllables by the disappearance of the half vcwels i and it, or to their developing into full vowels where indispensable for pronunciation (No. I. inf.). But the ruling principle which has determined the physiognomy of Slavonic speech is the degree in which consonants have been affected by the following vowel. Where this has been broad a, 0, u, y, a, U, this has resulted only in an occasional labialization most noticeable in the case of /; where it has been narrow, i, e, e, (once ea or e), e, I, and f, the result has been palatal- ization or " softening " in various degrees, ranging from a slight change in the position of the tongue producing a faint j sound in or just after the consonant — expressed in column 9 by the sign ', and in Cyrillic by the pre-iotizing of the following vowel — to the development out of straightforward mutes and sibilants of the sibilants, palato-sibilants and affricates z, s, 5, S, f, dz, c, di, £, Sc, &c. (see No. 9 and V. inf.).

Slavonic Languages. — The Slavonic languages belong to the Indo-European (I.E.) family. Within that family they are very closely connected with the Baltic group, Old Prussian, Lithuanian (Lithu.) and Lettish, and we must regard the linguistic ancestors of both groups as having formed one for some time after they had become separated from their neighbours. If the original home of the I.E. family is to be set in Europe, we may take the Balto-Slavs to have represented the north-eastern extension of it. The

Balto-Slavs have much in common with the northerly or German group, and with the easterly or Aryan group, their next neighbours on each side. The Aryans likewise split into two divisions, Iranian and Indian, whereof the former, in the Sar- matians, remained in contact with the Slavs until after the Christian era, and gave them some loan words, e.g. Bogu — Pers. Baga (god); Russian, Sobaka; Median, Qpaka (dog). The south- eastern or Thracian group (Armenian) and beyond it the Illyrian (Albanian) made up the four groups which have sibilants for I.E. non-velar gutturals (see inf. No. 9), and in this stand apart from most European groups, but in other respects the Balto- Slavs were quite European.

The Baltic group and the Slavs were separated by the marshes of White Russia, and after their early oneness did not have much communication until the Slavs began to spread. Since then the Baltic languages have borrowed many Slavonic words. After the Aryans had moved eastwards Slavonic was left in contact with Thracian, but we know so little about it that we cannot measure their mutual influence. On the other side the Germans, beginning as the next group t© the Balto-Slavs, and having thereby much in common with them (so much so that Schleicher wanted to make a Germano-Slavo-Baltic group), have never ceased to influence them, have given them loan words at every stage and have received a few in return.

After the Baltic group had separated from the Slavonic, we must imagine a long period when Slavonic (SI.) was a bundle of dialects, showing some of the peculiarities of the future languages, but on the whole so much alike that we may say that such and such forms were common to them all. This stage may be called Proto-Slavonic. Except for the few cases where Old Church Slavonic (O.S.) has either definitely South Slavonic characteristics or peculiar characteristics of its own, as written down by Cyril it represents with wonderful completeness Proto- Slavonic at the moment of its falling apart, and words cited below may be taken to be O.S. unless otherwise designated. Some of the main characteristics of the Slavonic languages as a whole in relation to I.E. are indicated below; restrictions and secondary factors are necessarily omitted. As a rule O.S.

represents the Slavonic languages fairly well, while Latin or Greek equivalents are given as the most familiar examples of I.E. Hypothetical forms are starred.

1. I.E. i becomes (>) i, gosti: hostls (ace. pi.); I.E. i>$, vidova: vidua; I.E. j>j,jucha: jus (broth).

2. I.E. e becomes £, seme: semen; I.E. &> 6. bera: fero.

3. I.E. & and u are alike o in SI., orati: arare; ostni: octo; I.E. 6 in end syllables, >u; vozii: 6%os; I.E. o and are alike a, bratric: f rater; duva: duo.

4. I.E. u becomes y, ty: tu; I.E. u>ii, snucha: nurus, Sanskr. snuid : I.E. u>v, veza: veho.

*5. I.E. r and / both long and short survived as vowels, *vlM written vliku, Sanskr. vxkas, " wolf "; consonantal r and / sur- vived unchanged.*

6. I.E. m and n both long and short: the former gave i or H; suto: centum; the latter e or a, deseti: decern. Consonantal m and n mostly survived before a vowel, after it they coalesced with it to make the nasal vowels a and e; pqti: pontis; petti:

7T6/17TTOS.

7. I.E. Aspirates are represented by corresponding sonants, bera: fero; medu (" honey," " mead "): jxtdv; mlgla: o/xixXi?.

8. I.E. j often becomes ch; vetuchu: vetus; not always, synu: Lithu. silnus, " son "; otherwise ch generally renders Gothic h in loan words; chlebu: hlaibs, "loaf"; chyzii: hus, "house."

9. I.E. velar gutturals k, g, gh and labio-velars, 1< g> gh become in SI. k, g, g, kljuci: clavis; qglii: angulus; migla: o/iixM; kiito: quis, govedo: /3o0s, Sanskr. gaits'; snegU: nix, nivem, but the Palato-gutturals k, g, gh become SI. s, z, z; deseti: decern; zrino: granum; zima: hiems; Lithu. i, 5, i; deszimtis, zirnis, zema.

10. (a) Gutturals k, g, ch (for s) before e, e (for e), i, i, e and j early in the Proto-Sl. period became I, z, $, vliie, voc. of vliM: ~hi>Ke; zelqdi: glandis; pluse, 3rd pi. fr. pluchu: eirKevaav.

(b) Later k, g, ch before S, i (for oi or ai), and sometimes after i, i, e, > c, dz (z), s. Vlice loc. cf. o'ikoi; lezi, imperat. of lega, " lie ": Xˆyots; dusi, dusechU, nom. loc. pi. of duchu, " spirit "; k&nezf: Ger. kuning: " king;"

*(c) I.E. or Proto-Sl. sj, zj became S, i, siti, Lithu. siuti, Lat. suo, " sew "; nozi for *nozjo, " knife."*

(d) Non-guttural consonants followed by j (tj, dj, nj; pj, bj, vj, mj) gave different results (except nj) in different languages (see below No. V.), but in Proto-Sl. there was already a tendency for the j to melt into and so change the consonant.

n. Proto-Sl. gradually got rid of all its closed syllables, hence—

(a) Final consonants were dropped- DomU: domus.

(b) Diphthongs became simple vowels ai, oi > e; UvM: laevus; vide: ol8a; ei > i; vidu: elSos; au, eu, ou > u; ucho: auris.

12. Proto-Slavonic had long, short and very short or half vowels (those expressed above by i and it). It had a musical accent, free in its position with different intonations when it fell upon long syllables. (For the fate of these in different modern languages see below, No. VIII.)

13. The phenomena of vowel gradation {Ablaut) as presented by Slavonic are too complicated to be put shortly. In the main they answer to the I.E., e.g. O.S. birati, bera, sil- boru: 5i-<£pqs, <£«/xo, 6pos.

In their morphology the SI. languages have preserved or developed many interesting forms. Nouns have three genders, three numbers in O.S., Slovene, Serbo-Croat and Sorb (other tongues have more or less numerous traces of the Dual), and, except Bulgarian, seven cases — Nom., Voc. (not in Gt. Russian or Slovene), Ace, Gen., Dat., Instrumental and Locative. Tha AM. has coincided with the Genitive.

The -0, -a and -i declensions have gained at the expense of the consonantal stems, and phonetic change has caused many cases to coincide especially in the i decl. The comparative of the Adj. is formed on I.E. models with s < sj corresponding to Latin r < s, minii, gen. mlnisa, cf. minus, minoris. The pro nominal declension is less well preserved. There is no article, but i (6s) has been added to the adj. to make it definite; also in Bulgarian and in some dialects of Russian tu is postfixed as a real article.

The SI. verb has lost most of the I.E. voices, moods and tenses.

The passive only survives in the pres. and past participles; of the finite moods there are but the ind and opt. (almost always used as an imperat.) left; its only old tenses are the pres. and the aor., to which it has added an impf. of its own. There is an inf. (in -ti, being an old dat.) and a supine in -tU, an accusative. Of active participles there are a pres. and a past and a second past part, used in making compound tenses. There are a solitary perfect form, veil: olSa, and a solitary fut. part, byse, gen. byiesta: cj>v0(tovtos. The verb has two stems; from the pres. stem is formed the ind. pres. and impf., the imperat. and the act. and pass. pres. participles.*

All other forms are based upon the infinitive stem. Personal Endings: —

Non-Thematic.

» ■* • .

Sing. Du. Plur.

i. -mi -vS -mil

2. -si -ta -te

3. -ti -te -eti

Thematic.

Sing. Du. Plur.

-(m) -ve -mu

-si -ta -te

-ti -te -{n)li

SECONDARY.

Sing. Du. Plur.

-(m) -ve -mii

-(s) -ta -te

-it) -te -(nl)

1st Sing. In thematic verbs the vowel + m has given a, but there has been a tendency to replace it according to the non- thematic analogy, which has necessitated changes in 1st plur.

2nd Sing, -si has given -si everywhere but in O.S.

3rd Sing, -ti has been dropped everywhere but in Russian, where the literary language has IU. The Dual only survives in Serb, Sorb, Slovene and O.S., and in these the forms are confused.

1st plur. -mii has developed alfull vowel where the 1st sing, has replaced the -m.

The secondary endings have lost their -m, -s, -t and-w/ by phonetic change.

*Non-thematic presents are, jesmi, eiyui, sum; dami (redupl. for *dadmi), SLdoivu; jami, edo; vlmi, Sanskr. vedmi, "I wit"; imdmi (new form of emo), " I have."*

*The aorist has no augment; it is sigmatic and non-sigmatic. The latter or 2nd aor. (cf . Horn. impf. ˆkpov, $«pe) survived only in consonant stems and that in O.S. and Old Cech, pekH = 'eirtccov. It was common in the 2nd and 3rd sing, (where the s forms would not be clear) pece < *peke-s,*peke-t = treaces, eictcot. The sigmatic aorist very rarely and only in consonant stems in O.S. keeps its s, vesii < *vedsH. In stems ending in k, r or a vowel, s > ch; bychu = i(t>voa and this ch >$ before e. The ordinary later form for consonant stems inserts a vowel, vedochu. The aorist has survived in S. Slavonic and in Sorb, and is found in the older stages of the other tongues. The same languages (except Slovene) have kept the impf. which was present in Proto-Sl. but does not go back to I.E., being formed on the analogy of the aor. With the aor. has coalesced the opt. bimi, " be," used with the 2nd past part, to make a conditional. Stem of pres. part. act. ends in nt but the consonant decl. has become an {o decl., so we have vezy v, gen. vezqlta < *vezonlja as against ixovros. Pres. part. pass, ends in -mu; it has survived more or less in Russian, elsewhere is obsolescent. Past part. act. I. is formed with I.E. ues; nom. sing. masc. -uos (tiSccs) gave H, vedii, having led, byvu, having been; but in fern, and oblique cases formed as from io stem s remained, hence Russian vedsij, byvHj. Past part. act. II. in / cf. Lat. bibulus from bibo, used with an auxiliary to form past and conditional. Past part. pass, in t or »; tert& = tritus. Znan% = known. I.E. future having been lost, futurity is expressed by an auxiliary badq (ero) chosta (will), &c. with the inf. or by the pres. form of the perfective veyb. The passive is expressed either by the use of the passive participles or by the reflexive se, which can refer to the 1st and 2nd persons as well as to the 3rd.*

Syntactical peculiarities of the Slavonic languages that may be noted are a tendency to use the genitive instead of the accu- sative (which has often coincided in form with the nominative) in the case of living beings, masculine 0 stems, and in the plur. ;

the use of the genitive for the accusative or even nominative in

negative clauses; the dative absolute and the dative as subject

to an infinitive; the instrumental instead of the nominative as

a predicate, and in orat&o obliqua the preservation of the tense of the original statement instead of our way of throwing it into the past.

In the use of the verbs the development of " aspects " makes up for the few tenses. Actions (or states) expressed by a verbal form have a beginning, a continuance and an end. There are, however, some (momentaneous) actions whose beginning and end come together and allow no continuance. All verbs fall into two great divisions, imperfective, which express the continuance of an action, without regard to its beginning or end, and perfective, which express the points of beginning or ending. The continuance of an action may be unbroken or may consist of like acts which are repeated. So imperfective verbs are divided into durative, as nesti, " to be carrying," and iterative, as nositi, " to be wont to carry "; the repeated acts of the iterative can either be each of them momentaneous, e.g. Cech, sifileti, " to shoot," i.e. " be firing single shots," or each have some continuance, e.g. nositi above, or we can even express the occasional repetition of groups of momentaneous actions, e.g. Cech. stfilivati, " to have the habit of going out shooting."

Among perfective verbs we have (1) momentaneous, expressing action which has no continuance, kriknati, " to give a cry," sesti, " to take a seat "; (2) finitive, expressing not the continu- ance of the action, though that there has been, but its end or completion, napl&niti, "to fill to the brim"; (3) ingressive, expressing the moment of beginning an action, vuzl' ubiti, " to fall in love with."

As perfective verbs do not express continuance, an idea ' implied in the present, they cannot require a present form, so this is used for perfective futures; e.g. sedq (pres. form from perfective sfsti) = " I shall take.a seat," as opposed to imperfective badq siditi, ". I shall be sitting." If a preposition is compounded with a idurative verb as nesti, " to carry " (in general), " to be carrying," it makes it perfective, as iznesii, " to carry out " (one ; single action brought to a conclusion), so Eng. "sit" is usually imperfective, " sit down " perfective, If an iterative has a preppsition it is mostly used as a durative; iznositi can mean, "habitually to carry out" but more often = " to be carrying out," that is, it supplies the imperfective form to iznesti. The development of this system has enabled some Slavonic languages, e.g. Russian, to do with only two tenses, pres. and past, to each verb morphologically considered, per- fective and imperfective verbs supplementing each other; e.g. if .we take a Greek verb, the pres. (ind. and infin.) and imperf, correspond to the present, inf. and past of a Russian imperfective verb; the aor. indie, and inf. are represented by the perfective past and infin., which has also to do duty for the Greek perfect and plup.; the future and the future perfect in Greek dp not express the same distinctions as the imperfective future and perfective future (in form a present) in SI., the Greek giving chronological prder of action, but not giving the distinction of aspect, though the, future perfect is naturally perfective.

The. prepositions are very much like those in other I.E. lan- guages both in actual Jorms and in use.

The formation of the sentence is not naturally complicated; but SI. has in times past been largely influenced by Greek, Latin and German with their involved periods; latterly there has been a tendency to follow the simpler models of French and English. Such being the Slavonic languages as a whole and regarded in their relationship to I. E-,, they may now be considered in their relationship to each other, and some of the principal character- istics enumerated upon which their internal classification has been founded. More or less complete accounts of each language will be found.under its name.

Distinctive, Points of Different SI. Languages. 1 — I. {&, i). The fate of the Proto-Sl. half vowels ic, i, still preserved in O.S., e. g. s&n&, " sleep, " dtni, " day," is various; as a rule they disappear, U entirely (though when final still written in R.), i leaves a trace by softening the preceding consonant. But if needed to ek.e out

x Bulg. = Bulgarian; C. = Cech ; Kas. = KaSube ; Lit. R. = Little Russian; P. = Polish;- R. = Russian, i.e. Great Russian; Ser. ˆ Servian; Wh. R. = White Russian.

consonants, in Sorb, Slovak, Lit. R. and mostly in Gt. R., &, i develop into full vowels 0, e — R. sonu, gen. sua; d'eni, gen. in' a. In Polish and Cech both > e, but in P. i softens the preceding cons., in C. it usually does not — rP. sen, dziefi; C. sen, den; in Slovene and Ser. they are not distinguished, Slovene u, a or e, san, dan or

*II. (y.) y only remains in Gt. Russian, Polish and Sorb though still written in Cech; it has elsewhere become i, but in Polish it becomes * after k and g, in Sorb and R. after k, g, ch-ˆ O.S. kysnqti, " go sour," gybnqti, " perish," chytrU, " cunning "; P. kisnqt, gin ad, chyter; R. kisnuti, gibnuti, chit' eric.*

III. (r, I.) The treatment of the liquids varies greatly.

(a) r is always a lingual trill, never alveolar. In S. Slav, it is only softened before j and } — O.S. zorja, " dawn." In N.W. and E. Slav, r became r' before i, i, e, e, e and./. Russian and Slovak have remained at this stage, C., Polish, Kas. have made r into r (rz) in which r and z are run into one. (See Table I.) But

C. srdce, trh, vlk, since; P. ierce, targ, wilk, slonce; R. s'erdce, torgu, volkii., solnce.

(e) Proto-Sl. rii, ri f lit, U had in S. Slav, and partly in C. the same fate as r, I; in Polish and R. the vowel comes after the liquid. O.S. 'bruvi, "brow," kristu, "cross," plM, " flesh," sliza, " tear "; Ser. brv, krst, put, suza; Slovene, brv, krst, polt, solza; C. brv, but plet'; P. brew, krzest, plec, {s)lza; R. brovi, kr'estu, ploti, sl'eza.

(/) Proto-Sl. or, ol, er, el before a consonant.

*(i.) Type ort, olt (ert, elt are not certain) beginning a word. — The liquid mostly comes first, sometimes the same vowel persists in all languages, e.g. Proto-Sl. *ordlo (Lithu. drklas, aratrum) , O.S. , Bulg., Ser., Slovene, R. ralo, C. Polab. P., radio. But Proto-Sl. *eldii (Lithu. eldija), O.S. alUdiji, ladiji, "boat," Ser., Slovene, ladja, R. lodija, C. lodi, Polab, Itid'a and *orm (Pruss. arms), O.S. ravinu, " even," Ser. rdvan, Bulg. Slovene, rdven, R. rov'enu, C. rovny,F. rdwny show Russian agreeing with N.W. Slav against S. Slav. The difference probably depends on intonation.*

(ii.) Type tort, tolt, tert, lelt with a consonant before as well:

Table I.

1

i

e

?

c

j

O.S. . . . Russian Polish . . .

zveri, " beast "

zveri

zwierz

vcriti, "believe "

ver'iti

wierzyt

remeni, " strap " r'em'eni

rzemien

tresa tresesi, " tremo " tr'asu tr'as'osi ttzqse trzesiesz

rlka, " river "

r'eka

rzeka

zorja, "dawn" ■

zor'a

zorza

P. e for orig. a does not soften — P. reka: O.S. rqka, " hand."

In Sorb such a change only happened after k, p, t, in which case High S. has f (written f), Low S. S, but in Low S., r after k, p, t becomes s even before hard vowels: Proto-Sl. tri, "three," High S.tsi, Low S.lsi; Proto-Sl. kraj, "edge," High S. kraj, Low S. ksaj.

(b) I occurs in three varieties, I, I, V , but each language has generally either middle / alone or else I and /'. Lit. R. and Bulg. have all three. I has been arrived at in C. and Slovene by the loss of the distinctions, perhaps under German influence; Ser. has I and V, final l>o; but I occurs in dialects of all lan- guages and was no doubt in O.S., Proto-Sl. and even Balto-Slav. It has a velar and a labial element and in most languages tends to appear as 0, u, t> or w, though this is only written in Ser. and Lit. R. O.S. dalu, " gave," R. dalU, Lit. R. dav, Wh. R. dav, _daw, P. dal (dialect dau), C. dal, Ser. dao. I' is very soft, like Fr. ville.

(c) N.W. Slav, keeps tl dl whereas S. Slav, (except some cases of Slovene padl, plella, &c.) and R. drop the t and d—C. padl, " fell," radio, " aratrum," pletl, " plaited" ; O.S. and R. palu, ralo, plelu, but R. drops I of masc. sing, past, part. II. after other consonants. O.S. neslu, C. nesl, R. n'esu, " carried."

id) Proto-Sl. r, I or perhaps ur, ir, ul, il gave S- Slav., C. and Slovak r, I written in O.S. rii, ri, lu, li indifferently, though soft

the various treatments of this combination are among the chief criteria for

classification, esp. the Russian speciality called full vocalism (polnoglasie) torol, tolot, teret, telet (or tolot, teloi) which is probably archaic, is one of the chief reasons for putting Russian in a separate division; Polish and Sorb come nearest to it, with trot, Hot, tret, tlet, but the N.W. division is not uniform as Kasube and the extinct Polab have the interesting forms tort, llit, trit, tlat, which are partly archaic, partly a transition to the most novel forms of the southern group to which Cech and Slovakˆin this particular accede, trat, tlat, tret, tilt, but after I and z Cech has tlat for tlet. Deviations due to intonation have not been set forth. (See Table II.)

Table IL

Proto-Sl. Stem.

R.

P.

Polab, Kas.

C.

S. SI. e.g. O.S.

**gord- " hortus," " town "*

gorodU

grod

gord

hrad

gradu

**molt- " hammer " . ;*

molotU

mfot

mlat

mlat

mlatu

**berg- Ger. ” berg,” ” shore ”*

b’er’egU

brzeg

brig

bfeh

bregH

**melk- ” milk “...*

moloko

mleko

mlak —

mleko

mliko

**helm- ” hdm ” . . .*

sel’emu of Selomib

Hemrt

**gelb- ” groove ” . . .*

zelobil | zldb

(Kas.) Hob

zlab

zlebU

IV. The Proto-Slavonic nasals a and e could be either long or short. This distribution is fairly kept in languages which have quantity and governs the results in Polish in which the nasal sound is preserved. The examples below show the main repre- sentatives. Traces of nasal pronunciation survive in Bulgarian, Slovene and Kasube. (See Table III.)

Table

III.

Proto-Sl.

O.S.

Bulg. usu.

Ser.

Slovene.

c.

Sorb, High, Low.

R.

P.

Kasube.

611, on; in, en.

a; e.

ii, or d; e.

u; c.

d, 0; e, e.

u, ou; e, e.

u; a, je; e, I.

u;ja.

c,a;je,ja.

a; i, I.

**mSnka, ” pain ”*

mqka

m&ka

muka

mdka, monka,

muka

muka

muka

meka

mqka

**monkd, ” flour ”*

mqka

mUnka

muka

moka, muka

mouka

muka

mukd

mqka

mqka

**desgmti, “ten ”*

deseti

deseti

deset

deset

deset

dzesac, zases

d’e’s’ati

dziesiet

dzesic

**penlt, ” five ”*

peti

peti

pel

pit

p’el

pjec, pes’

p’ati

pia£ > piec

pic or plinc

and hard may once have been distinguished. Of this group Slovene and Ser. later allowed the / to become ol, ou or u. Sorb, Polish and R. developed various vowels, partly according to the original quality, partly according to other influences, e.g. O.S. sridice, ” heart,” trugu, “market,” dˆ&m, ” wolf,” slunice, “sol”; Ser. srdce, trg, vuk, sunce; Slovene srdce, trg, volk, solnce;

In Kasube q remains; e becomes nasalized i or i and this may lose the nasal or restore it as a full n or m; it has also nasalized all the other vowels and has the power of using nasals in loan- words, e.g. testamqt, as did O.S. e.g. koleda, kalendae, sqdU = sund. Polab has (i and e — ronka, O.S. rqka, “hand,” mengsie — mesa, ” carnis,” but swante = svelu, ” holy.”

kv. g

V. Softening (Palatalization, &c). — Nothing has so much affected Slavonic speech as the effect of i, i, e, i, e and j on pre- ceding consonants, and the variations produced are among the chief points of difference

between the languages.

(a) The gutturals felt this first of all, k, g, ch, become (I.) I, z, i and (II.) c, ds(z), s, and these changes are universal (see 10,

*a, b above) except that after the separation of the Slavs the same process was continued in the S. and E. branches even when a 11 intervened, whereas the N.W. branch remained untouched. Proto-Sl. *kvetu, " flower," *gvezda, " star "(vulchvi), magi; O.S. cvetu, dzvesda, (vlHsvi); R. cveM, zvezda; but Cech kvet, hvhda; P. kwiat, gwiazda.*

(b) The action of j was the most general, influencing the dentals in all languages and in some the labials as well, whereas

the narrow vowels act on the dentals only and that not in all languages. The results of Proto-Sl. tj, dj in O.S. and Bulg. are the most surprising, giving st' ' , id', by way of si and zdz (as is shown by their agreeing with the results of Proto-Sl.

VII. Common Slav je and ju beginning a word appear in R. as and u; O.S. jedinU, " one," jucha, " broth "; R. odinii, ucha.

VIII. Proto-Sl., as we have seen, had long, short and very short or half vowels and a musical accent with differing intonations. O.S. was probably similar, but we have no sufficient materials for determining its quantities or accents as quantity! systematic writing of the latter only came in from the

14th century. The fate of the half vowels we have seen (I.). Traces of former long vowels are very clearly to be seen in Sorb, Polish and Lit. R., and less clearly in Bulg. and Gt. R., all of which have lost distinctions of quantity; Slovene can have long vowels only under the accent. In Kasube, C., Slovak and Serbo- Cr. there are also unaccented long syllables. Russian has kept the place of the original accent best, next to it Bulgarian; consequently it seems very capricious, appearing on different syllables in different flexions, but it has become merely expiratory. In Slovene it is still musical, but is, so to speak, steadier. For the

Proto-Slav.

O.S.

Bulg.

Mac.

Serbo-Croat and Slovene.

C.

P.

R.

**svetja, ” candle ” . *medja,” boundary” . *peklj, ” stove ” . *moglj, ” power ” .*

svest’a mezd’a pesti mosti

svesta mezda pesti mosti

svek’a meg’a

svijel’a svjeca svica med’a media meja pec pec moc moc

svlce meze pec moc

Swieca miedza piec moc

sveca m’eza p’eci

moci

-i

stj, skj, e.g. prelist’enu, ” deceived,” ist’a, ” I seek,” cf. R.liscenA, iscit). Some Macedonians have the strange result k’ and g’. Among the Serbo-Croats we find every grade between /’, d’, and c’,dz’,orc, dz, the Slovenes having c’ , j (our y), the Cechs and Sorbs c, z, the Poles and Polabs c, dz, and the Russians eandz; the fate of ktj and gtj has been the same as that of tj throughout. (c) Before the narrow sounds i, i, e, I and the descendants of e there has resulted a later softening which has gone farthest in – Low Sorb, producing S and z, and in High Sorb and

Polish, c and dz, not so far in Gt. R. where t’ d’ remain, Wh. R. is intermediate with now t, dz, now t’ , d’ ; in C. even t’ d’ only come before i, i and e. In S. Slavonic this effect is dialectical. C. tllo, ” body,” dilati, ” make,” deset, ” ten “; P. cialo, dzielo, dziesiei; High Sorb, dzesac; Low Sorb, iaseS; Wh. R. celo, dielo, dzesac; Gt. R. t’elo, d’elo, d’es’ati.

{d) S, z, m, before j gave s, z, ri throughout (No. 10, c, d, above). Before the narrow vowels theygive $, z, n in Sorb, Polish, Slovak and Russian, but Cech has no s or z or ft before e nor always before i; S. Slavonic has »’

before/. Other- wise in it such softening is only dialectical, but Bulgarian forms a transition to Russian.

(e) In Polish and Sorb we have the labials p', b' (f'),v',m' softening before j and the narrow vowels, in Cech only before $, in Slovak nowhere. In S. Slavonic they only soften p. b. f. v. b e f ore j anc j t j, en the/ appears as /' (pi', bl' , vl', ml'), invariably in Serb, generally in Slovene, generally too in Russian, but there before the narrow sounds of newer for- mation they can all be softened in the ordinary way (p', b', f, v', m'), in Bulgarian this / has disappeared and we have p' , b' , v' , m'. But O.S. followed the S. Slav, rule; and the I was probably once present in N.W. Slav. It remains everywhere in one or two roots — O.S. pl'uja (tttvco for sp}u}o), R. pl'uju, P. pluje, otherwise O.S. zeml'a, R. z'eml'a, P. ziemia, " humus."

On the whole the various languages do not differ much in principle in the treatment of j, but softening before i, i, e, e, e, seems to have its extreme point in P., Kas. and Polab, spreading from them to Sorb, White Russian and Gt. Russian; Cech, Slovak and Lit. Russian have it in a far less degree, and in S. Slavonic it is very little developed.

VI. Right across the Slavonic world from W. to E. g has become h, leaving the N. and the S. untouched. This change is found in Cech, Slovak, High but not Low Sorb, is traceable in Polish, and characteristic in White, South Gt. Russian and Lit. Russian, also in the Russian pronunciation of Ch. Slavonic. The h produced is rather the spirant gh than the true aspirate. Low Sorb, R., O.S., &c, gora, P. gdra, "moun- tain." C, Slovak, High Sorb, Wh. and Lit. R. hora.

g > h.

intonations Serbo-Croat is the chief guide, but here the accent intonation is spread over two syllables, in Croatian (ca dialect), the main stress is usually on the old place, in Servian (sto dialect) it has shifted back one. In N.W. Slavonic, with the exception of Kasube in which it is free, the accent is fixed, in C., Slovak and Sorb on the first syllable of the word, in Polish on the penultimate.

On the whole it may be said that the geographical classification of the Slavs into N.W., S. and E. Slavs is justified linguistically, though too much stress must not be laid upon it as the lines of division are made less definite by the approximation of the languages which come next each other, the special characteristics of each group are generally represented in dialects of the others if not in the written languages; also some peculiarities (e.g. VL, g > h) run right across all boundaries, and secondary softening runs from N. to S., becoming less as it goes away from Poland (V., c) . In fact, the

triple division might be purely arbitrary but for the fact that the belt of Germans, Magyars and Rumanians has made impossible the survival of transitional dialects con- necting up Cech with Slovene, Slovak with Servian, Russian with Bulgarian. Slovak, as it were, just fails to be a universal link : in the north Russian and Polish have much in common, but Lithuania made some sort of barrier and the difference of religion favoured separate development.

In the north Polish is closely connected with Kasube, and this with Polab, making the group of L'ach dialects in which the nasals survived (IV.). The two Sorb dialects link the L'achs on to the Cechs and Slovaks, the whole making the N.W. group with its preference for c, z, s as against c, z, f (which were perhaps unknown to Polab, V. b), its b' as against W (V. e), its keeping kv' and gv' (V. a), //and dl (III. c), its f (III. a, not in Slovak) and the fixed accent (VIII. not in Kas.). The whole group (except Sorb) agrees with R. in having lost the aor. and impf. Yet C. and Slovak agree with S. Slav, in trat, tret (III, /, ii.) in survival of r and I (III. d) and of quantity (VIII.). Again, Slovene has occasional //, dl (III. c), and its accent and quantity are not quite southerly, but its many dialects shade across to Croat and Servian, and they must all be classed together for the fate of tj, dj (V. b) and a, e (IV.). The Sopcy and Macedonians, among their numer- ous dialects, make a bridge between Servian and Bulgarian. The special mark of the latter is tj, dj > sl, zd, which is the main philological argument for making O.S. Bulgarian. In general S. Slav, shows less soft letters than N.W. and E. (V. c and d). It shares with Russian bl < bj (V. e), tl, dl > I (III. c), kv', gv' > ci zv (V. a) and the general loss of

Russian stands by itself by its torot, tolot (III. /, ii.) and its

treatment of tj and dj (V. b) and the place of its accent (VIII.) in all of which it is rather archaic, while je > o, ju > u (VII.) is its own innovation. In its secondary softenings Lit. R., Gt. R. and Wh. R. make a gradual bridge between S. Slav and Polish (V. c-e). In common with Polish, R. further has the retention of y (II.) and the loss of the aor. and impf.

Finally, within historic time certain dialects have influenced others through literary and political intercourse. O.S. has influenced all the Orthodox Slavs and the Croats, so that Russian is full of words with O.S. forms pronounced a la Russe {a > u, f > ja, st' > sc, &c). Cech has almost overshadowed Slovak and early afforded literary models to Polish. Polish has overshadowed Kasube and much influenced Little and White Russian

and Great Russian in a less degree. Russian has in its turn supplied modern Bulgarian with a model. Again, other tongues have contributed something; in common Slavonic there are already German loan words, and others have followed in various periods, especially in Cech and Polish, while the very structure of Slovene and Sorb has been affected. Polish has adopted many Latin words. Bulgarian and Servian received many Turkish words. Russian took over many Eastern words in the Tatar period, and the common vocabulary of Western civilization since the time of Peter the Great, but on the whole, though the Slav easily takes to a fresh language, he has kept his own free from great admixture.

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SLAVYANSK, a town of Russia, in the government of Kharkov, 158 m. by rail S.E. of the town of Kharkov, on the Torets river and close by several salt lakes, from which salt is extracted. Pop. (1897) 15,644. There are soap, candle and tallow-works. Slavyansk carries on a brisk trade in salt, cattle and tallow. The ancient name of Slavyansk was Tor. The town, which is supposed to occupy the site of a former settlement of the Torks (Turks), who inhabited the steppes of the Don, was founded in 1676 by the Russians to protect the salt marshes. Having an open steppe behind it, this fort was often destroyed by the Tatars. Its salt trade became insignificant in

the 1 8th century and only revived towards the end of the 19th century.

SLEAFORD, a market town in the North Kesteven or Sleaford parliamentary division of Lincolnshire, England, in a fertile and partly fenny district on the river Slea. Pop. of urban district (1901) 5468. It is 112 m. N. by W. from London by the Great Northern railway, being the junction for several branch lines and for the March-Doncaster joint line of the Great Northern and Great Eastern companies. The church of St Denis is one of the finest in the county, exhibiting transitional Norman work in the base of the western tower, which is crowned by an Early English spire, which, however, is mainly a copy of the original. The nave is of beautiful late Decorated work with an ornate south porch. There is a splendid carved rood screen of oak. The chancel is Perpendicular. There are a few picturesque old houses. The district is very fertile, and the trade of the town is principally agricultural, while malting is also carried on.

The discovery of numerous coins of the Constantine period, the earthworks of the castle-area, and its proximity to the ford by which Ermine- Street crossed the Witham, point to the prob- ability of Sleaford (Slaforde, Lafford) being on the site of a Roman settlement or camp, and that the Saxons occupied the site before their conversion to Christianity is evident from the large cemetery discovered here. Domesday Book records that the manor had been held from the time of Edward the Confessor by the bishops of Lindsey, whose successors, the bishops of Lincoln, retained it until it was surrendered to the Crown in 1546. It soon after- wards passed to the family of Carr and from them, by marriage, in 1688 to John Hervey, afterwards earl of Bristol. The quadri- lateral castle, with its square towers and massive keep, was built by Alexander, bishop of Lincoln, and became one of the chief episcopal strongholds. King John rested here in 12 16 after his disastrous passage of the Wash, and in 1430 Bishop Richard Fleming died here. The castle was in good repair on its surrender in 1 546, but was dismantled before 1600. Sleaford never became a municipal or parliamentary borough, and the government was manorial, the bishops possessing full jurisdiction. The towns- folk were, however, largely organized in the gilds of Corpus Christi, St John and Holy Trinity, accounts for which are extant from the year 1477. The origin of the markets and fairs is un- known, but in answer to a writ of quo warranto of the reign of Edward I., the bishop declared that they had been held from time immemorial.

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SLEEMAN, SIR WILLIAM HENRY (1788-1856), Indian soldier and administrator, was born at Stratton, Cornwall, on the 8th of August 1788. He was the son of Philip Sleeman, yeoman and supervisor of excise. In 1809 he joined the Bengal army, served in the Nepal War(i8i4-i8i6), and in 1820 became assistant to the governor-general's agent in the Saugor and Nerbudda

territories. He is best known for his suppression of the Thugs or religious murderers in India, becoming superintendent of the operations against them in 1835, and commissioner for the suppression of Thuggi and Dacoity in 1839. During these operations more than 1400 Thugs were hanged or transported for life, one of whom confessed to having committed over 700 murders. Detection was only possible by means of informers, for whose protection from the vengeance of their associates a special gaol was established at Jubbulpore. Sleeman was resident at Gwalior 1843-1840, and at Lucknow 1849-1856. He was opposed to the annexation of Oudh by Lord Dajhousie, but his advice was disregarded. He died at sea on his way home on the 10th of February 1856.

See Sir H. Sleeman, Rambles and Recollections of an Indian Official (1844; 2nd edition, 1893), and A Journey through Oudh (1858).

SLEEP (O. Eng. slapan; Ger. schlafen; cf. Lat. labi, to glide, and " slip "), a normal condition of the body, occurring periodic- ally, in which there is a greater or less degree of unconsciousness due to inactivity of the nervous system and more especially of the brain and spinal cord. It may be regarded as the condition of rest of the nervous system during which there is a renewal of the energy that has been expended in the hours of wakefulness; for in the nervous system the general law holds good that periods of physiological rest must- alternate with periods of physiological activity, and, as the nervous system is the dominating mechanism in the body, when it reposes all the other systems enjoy the same condition to a greater or less extent. Rest alternates with work in all vital phenomena. After a muscle has contracted frequently at short intervals, a period of relaxation is necessary for the removal of waste products and the restitution of energy; the pulsating heart, apparently working without intermission, is in reality not doing so, as there are short intervals of relaxation between individual beats in which there is no expenditure of energy; the cells in a secreting gland do not always elaborate, but have periods when the protoplasm is comparatively at rest. Nervous action also involves physico-chemical changes of matter and the expenditure of energy.

This is true even of the activity of the brain associated with sensation, perception, emotion, volition and other psychical phenomena, and therefore the higher nervous centres require rest, during which they are protected from the stream of impressions flowing in from the sense-organs, and in which waste matters are removed and the cerebral material is recuperated for another time of wakeful activity. (See also Hypnotism, and the physiological sections of the articles Brain, and Muscle and Nerve.)

The coincidence of the time of sleep with the occurrence of the great terrestrial phenomena that cause night is more apparent than real. The oscillations of vital activity are not correlated to the terrestrial revolutions as effect and cause, but the occurrence of sleep, in the majority of cases, on the advent of night is largely the result of habit. Whilst the darkness and stillness of night are favourable to sleep, the state of physiological repose is deter- mined more by the condition of the body itself. Fatigue will normally cause sleep at any time of the twenty-four hours. Thus many of the lower animals habitually sleep during the day and prowl in search of food in the night; some hibernate during the winter season, passing into long periods of sleep during both day and night; and men whose avocations require them to work during the night find that they can maintain health and activity by sleeping the requisite time during the day.

The approach of sleep is usually marked by a desire for sleep, or sleepiness, embracing an obscure and complicated group of sensations, resembling such bodily states of feeling as hunger, thirst, the necessity of breathing, &c. All of these bodily states, although on the whole ill-defined, are referred with some precision to special organs. Thus hunger, although due to a general bodily want, is referred to the stomach, thirst to the fauces, and breath- ing to the chest; and in like manner the desire for sleep is referred chiefly to the region of the head and neck. There is a sensation of weight in the upper eyelids, intermittent spasm of the sub-hyoid muscles causing yawning, and drooping of

the head. Along with these signs there is obscuration of the

intelligence, depression both of general sensibility and of the special senses, and relaxation of the muscular system. The half- closed eyelids tend more and more to close; the inspirations become slower and deeper; the muscles supporting the lower jaw become relaxed, so that the mouth opens; the muscles of the back of the neck that tend to support the head also relax and the chin droops on the breast; and the limbs relax and tend to fall into a line with the body. At the same time the hesitating utterances of the sleepy man indicate vagueness of thought, and external objects gradually cease to make an impression on the senses. These are the chief phenomena of the advent of sleep. After it has supervened there are many gradations in

its depth and character. In some cases the sleep may be so light that the individual is partially conscious of external impressions and of the disordered trains of thought and feeling that pass through his mind, constituting dreams, and these may be more or less vivid, according to the degree of consciousness remaining. On the other hand, the sleep may be so profound as to abolish all psychical phenomena : there are no dreams, and when the sleeper awakes the time passed in this unconscious state is a blank. The first period of sleep is the most profound. After a variable period, usually from five to six hours of deep sleep, the faculties awaken, not simultaneously but often fitfully, so that there are transient periods of consciousness. This is the time of dreaming. As the period of waking approaches the sensibility becomes more acute, so that external impressions are faintly perceived. These impressions may influence and mould the flow of images in the mind of the sleeper, frequently altering the nature of his dreams or making them more vivid. The moment of waking is usually not instantaneous, but is preceded by an intermediate state of partial consciousness, and a strange play of the mental faculties that has more of the character of an " intellectual mirage " than of consecutive thought.

The intensity of sleep has been measured by Kohlschiitter by the intensity of the sound necessary to awaken the sleeper. This intensity increases rapidly during the first hour, then decreases, sometimes rapidly, sometimes slowly, during the next two or three hours, and then very slowly until the time of waking, This statement agrees generally with experience. As a rule the deeper the sleep the longer it lasts.

Various physiological changes have been observed during sleep, but much remains to be done in this direction. The pulse becomes less frequent; the respiratory movements are fewer in number and are almost wholly thoracic, not abdominal; all the secretions are reduced in quantity; the gastric and intestinal peristaltic movements are less rapid; the pupils of the eye are contracted and during profound sleep are not affected by light; and the eyeballs are rotated upwards. The pupils dilate slightly when strong sensory or auditory stimuli are applied, and they dilate the more the lighter the sleep ; at the moment of waking they become widely dilated. Whilst muscular relaxation is general, there seems to be increased contraction of certain sphincter muscles, as the circular fibres of the iris and the fibres concerned in closing the eyelids. The state of the circulation of the brain has been frequently investigated. The older view was that there was a degree of plethora or congestion of the vessels of the brain, as is the state of matters in coma, to which the state of sleep has a superficial resemblance. Coma, however, is not sleep, but a condition of inactivity of the cerebral matter owing to the accumulation of dark venous blood in its vessels. This has been actually observed in cases where it was possible to see the brain. During sleep the surface of the exposed brain has been observed to become

pale and to shrink somewhat from the sides of the opening (Johann Blumenbach, 1752-1840). A careful experimental research was conducted by Arthur E. Durham in i860, in which he trephined a portion of bone as large as a shilling from the parietal region of a dog, and, to obviate the effects of atmospheric pressure, inserted a watch glass into the aperture so that the surface of the brain could be seen. His results are summarized thus: —

" (1) Pressure of distended veins on the brain is not the cause of sleep, for during sleep the veins are not distend 3d ; and, when they

are, symptoms and appearances arise which differ from those which characterize sleep. (2) During sleep the brain is in a comparatively bloodless condition, and the blood in the encephalic vessels is not only diminished in quantity, but moves with diminished rapidity. (3) The condition of the cerebral circulation during sleep is, from physical causes, that which is most favourable to the nutrition of the brain tissue; and, on the other hand, the condition which prevails during waking is associated with mental activity, because it is that which is most favourable to oxidation of the brain sub- stance, and to various changes in its chemical constitution. (4) The blood which is derived from the brain during sleep is distri- buted to the alimentary and excretory organs. (5) Whatever in- creases the activity of the cerebral circulation tends to preserve wakefulness; and whatever decreases the activity of the cerebral circulation, and, at the same time, is not inconsistent with the general health of the body, tends to induce and favour sleep. Such circumstances may act primarily through the nervous or through the vascular system. Among those which act through the nervous system may be instanced the presence or absence of impressions upon the senses, and the presence or absence of exciting ideas. Among those which act through the vascular system may be men- tioned unnaturally or naturally increased or decreased force or frequency of the heart's action."

Dr William A. Hammond and Dr Silas Weir Mitchell (b. 1830) repeated and extended Durham's observations, with the same general results (1866), and Ehrmann, Salath6 (1877), Francois Franck (1877) and Mosso (1881), by more refined methods of observation arrived at the same general conclusions. Angelo Mosso (b. 1846) in particular applied with great success the graphic method of registration to the study of the movements of the brain and of the circulation during sleep. He made observa- tions on three persons who had lost a portion of the cranial vault

and in whom there was a soft pulsating cicatrix. They Were a woman of thirty-seven years of age, a man of thirty-seven years and a child of about twelve years. By special arrangements, Mosso took simultaneous tracings of the pulse at the wrist, of the beat of the heart, of the movements of the wall of the chest in respiration, and of the movements of the denuded brain. Further, by means of the plethysmograph — an instrument of Mosso's own invention — he obtained tracings showing changes in the volume of the hand and forearm; and he succeeded in showing that during sleep there is a diminished amount of blood in the brain, and at the same time an increased amount in the extremities. He showed further that there are frequent adjust- ments in the distribution of the blood, even during sleep. Thus a strong stimulus to the skin or to a sense organ — but not strong enough to awaken the sleeper— caused a contraction of the vessels of the forearm, an increase of blood pressure, and a determination of blood towards the brain; and, on the other hand, on suddenly awakening the sleeper, there was a contraction of the vessels of the brain, a general rise of pressure, and an accelerated flow of blood through the hemispheres of the brain. So sensitive is the whole organism in this respect, even during sleep, that a loudly spoken word, a sound, a touch, the action of light or any moderate sensory impression modified the rhythm of respiration, determined a contraction of the vessels of the forearm, increased the general pressure of the blood, caused an increased flow to the brain, and quickened the frequency of the beats of the heart. These observations show how a physiological explanation can be suggested of the influence of external impressions in modifying the dreams of a sleeper. Further, Mosso found that during very profound sleep these oscillations disappear: the pulsatory movements are uniform and are not affected by sensory impres- sions, and probably this condition exists when there is the absolute unconsciousness of a " dead " sleep. By such methods as have been employed by Mosso, three movements of the brain have been observed — (1) pulsations, corresponding to the beats of the heart; (2) oscillations, or longer waves, sometimes coincid- ing with the heart beats, or more generally consisting of longer festoons, carrying each a number of smaller waves, and believed to correspond generally to the respiratory movements; and (3) undulations, still longer and less marked elevations and depressions, first clearly observed by Mosso, and believed by him to indicate rhythmic contractions of the vessels of the pia mater and of the brain. This view is in keeping with the observa- tions of Franz Cornelius Donders (b. 1818), Adolf Kussmaul

(b. 1822), Tenner and others on changes of calibre observed in the cerebral vessels, and with the experiments of many physio- logists, showing that the vessels of the pia mater, like other vessels, are controlled by the vaso-motor system of nerves. It may therefore be considered certain that

during sleep there is an anaemia, or partially bloodless condition, of the brain, and that the blood is drawn off to other organs, whilst at the same time this anaemic condition may be modified by changes in the circulation or in the respiratory mechanism caused by position, by sensory impressions or by sudden changes in the state of repose of the muscles. The examination of the retina (which may be regarded as a cerebral outwork) by the ophthalmoscope during sleep also shows a comparatively bloodless condition. Such are the facts; the deficiency in the way of a theoretical explanation is that physiologists cannot satisfactorily account for the anaemic condition causing unconsciousness. Sudden haemorrhage from the brain and nerve-centres, or a sudden cessation of the supply of blood to the brain, as occurs in syncope (failure of the heart's action — a faint), no doubt causes uncon- sciousness, but in these circumstances there is a tendency to convulsive spasm. Such spasm is usually absent in sleep, but sudden jerks of the limbs may sometimes be observed during the time when there is the confusion of ideas preceding the passage into sleep.

During sleep the amount of carbonic acid eliminated is very much reduced, indicating that molecular changes in the tissues do not occur to the same extent as in the waking state. This is also shown by the fact that less heat is produced. Hermann von Helmholtz (b. 182 1) states that the amount of heat produced by a man weighing 67 kilogrammes (147 -4ft)) is about 40 calories per hour during sleep, as against 112 calories per hour while awake. This diminished production of heat may be largely accounted for by the quiet condition of the muscles of locomotion, but it also indicates diminished tissue changes throughout the body. In profound sleep the bodily temperature may fall from -6° to -2° Fahr. In consequence of diminished oxidation changes during sleep, it is not improbable that excess of nutrient matter may then be stored up in the form of fat, and that thus the proverb " He who sleeps dines " is based on a correct appreciation of the fact that sleep tends to produce plethora or obesity.

Whilst it is easy to state that sleep is caused by fatigue of the nervous system, it is more difficult to explain what the precise changes are that produce the state of unconsciousness. Various hypotheses have been advanced, but it cannot be said that any one is wholly satisfactory. Aware that the fatigue of muscle is associated with the accumulation of sarcolactic acid, Thierry William Preyer (b. 1841) surmised that the activity of nervous matter might be interfered with by the accumulation in the nerve-centres of some such acid, or of its soda salt (lactate of soda), but this view has not been supported by the results of experiment, as the injection into the blood of a dose of lactate of soda has hot produced sleep. Pfliiger has observed that frogs deprived for a considerable time of oxygen passed gradually into a state resembling profound sleep, and he has advanced the theory that there is no organ of the body so quickly affected by deprivation

of oxygen as the brain. According to Eduard F. W. Pfliiger (b. 1829), the phenomena of life depend on a dissociation of living matter, and in particular the activity of the cerebral substance connected with psychical states depends on dissociation changes in the grey matter. To excite the dissociation, however, oxygen is necessary. The oxygen unites with certain of the compounds set free by the dissociation, forming, amongst other substances, carbonic acid. If such matters as these that unite with oxygen are in sufficient amount to use up all the oxygen, the grey matter of the brain suffers from a deficiency of oxygen (or from its absence), and also from the accumulation of -carbonic acid. According to such a theory, cerebral activity depends on cerebral respiration, and sleep is a kind of cerebral asphyxia. Some such condition is not improbable, but it must.be stated that the evidence at present in support of it is meagre. Possibly, in attempting to account for the phenomenon of sleep, too much importance has been attributed to the changes occurring in the

brain, forgetting that not merely brain matter but every tissue of the body becomes exhausted by work, and that sleep may be partly due to phenomena occurring throughout the body and not in the brain alone.

All the phenomena of sleep point to a diminished excitability of the cerebral nerve-centres and of the spinal cord. Contrary to what is often stated, there can be no doubt that reflex action is in partial abeyance and that the spinal cord is in a state of partial inactivity as well as the brain. The only nerve-centres that do not sleep are those absolutely essential to life, such as those connected with the heart, with respiratory movements, and with the distribution of blood by the vaso-motor arrange- ments; and Mosso's experiments indicate that even these have a certain amount of repose in profound sleep.

There is little doubt that all living beings require periods of repose alternating with periods of activity. Many plants close their flowers and bend their petioles at certain times of the day. These phenomena, called " the sleep of plants," depend apparently on changes in solar radiation, and there is no reason to believe that during the time of quiescence any reparative processes go on, as during the sleeping period of animals. Naturalists have observed many of the lower animals apparently in a state of sleep. Insects, crustaceans, fishes, reptiles, may all be observed occasionally to be almost motionless for considerable periods of time. The sleeping of birds is familiar to all, and in these there are anatomical arrangements by which the bird may, like the crane, sleep perched on one

leg, or grasping a branch with both feet, like perching birds generally, without any muscular effort and consequently without fatigue.

The amount of sleep required by man varies according to age, sex and habit. The popular notion that a child sleeps half its time, an adult one-third, whilst an old person may do little except eat and sleep is not far wrong. In early life the cerebral faculties appear to be easily exhausted and during the frequent and prolonged sleeps of infancy the brain rests and the vegetative changes connected with nutrition and growth go on actively. As life advances, less sleep is required, until in adult life a period of seven or eight hours is sufficient. As a rule, women require more sleep than men, but much depends on habit. Thus most women bear the loss of sleep in the first instance better than men, because they have been accus- tomed more to loss or irregularity of sleep. The effect of habit is well seen in nurses, both male and female, who will often be able to work for weeks continuously with snatches of sleep, not amounting to more than two or three hours daily. Sooner or later, however, even in these cases nature asserts her demands, and prolonged sleep is necessary to maintain health and vigour. Wakefulness during the time when one ought to be asleep is frequently a distressing con- dition, undermining the strength and incapacitating for active and efficient work (see Insomnia).

It is a matter of common observation not only that certain persons require more sleep than others but that they have less power of resisting its onset and of awaking. This condition may become morbid, constituting a veritable nervous disease, to which the name " maladie du sommeil " or hypnosia may be given. It may be described as invincible sleep, and it may continue for weeks and for months, terminating in convulsive seizures, and even death. A persistent drooping of the upper eyelid has been observed even during waking hours. Dr W. Ogle has observed in such cases an engorgement of the cervical ganglia of the sympathetic; but this may have nothing to do with the condition. Cases of very pro- longed sleep are not uncommon, especially amongst hysterical persons, lasting four, seven or ten days. On awaking the patient is exhausted and pale, with cold extremities, and not infrequently, after a brief interval of waking, passes off into another lethargic sleep. Something similar to this may be seen in very aged persons towards the close of life. (See also Dreams, Somnambulism and Hypnotism.)

Among older works, see article " Sommeil " in the Dictionnaire encyclopidique des sciences medicates, where a bibliography is given and where also there is an account of the medico-legal questions connected with sleep and somnambulism; Macnish, Physiology of Sleep; Durham, " On the Physiology of Sleep," in Guy's Hospital Reports (i860); Kohlschiitter, "Die Mechanik des Schlafes," in Z.f. ration. Med., vol. xxxiii. (1869); Pfluger, "

Theorie des Schlafes, " in Pfluger's Archiv, vol. x. (1875); Mosso, Uber den Kreislauf des Blutes im menschlichen Gehirn (Leipzig, 1881). Also Manacei'ne, Sleep, its Physiology, Pathology, Hygiene and Psychology (Eng. trans. 1897), with bibliography. (J. G. M.)

SLEEPER, a term used with many technical applications for a piece of timber, metal, &c, used as a support; in carpentry it is such a piece of timber laid on low cross walls as a plate to receive ground joists; in shipbuilding, a strengthening timber for the bows and stern frame; the most frequent use of the term is for a timber or steel support on which the chairs are fixed for carrying the rails on a railway; in America these are called

" ties " (see Railways). The common explanation of the origin of the word is to connect it with " sleep," the timbers supposed to be lying at rest. The real source of the word is the Norv/egian skip, a piece of timber used for dragging things over, a roller, especially used of timbers laid in a row in making a road. This word Skeat (Etymol. Diet.,- 1898) connects with " slab," a flat piece of stone or wood. The French term dormant is used in carpentry, but as part of the frame of a window or door.

SLEEPING-SICKNESS (Trypanosomiasis) , a remarkable para- sitic disease, familiar among West African natives since the beginning of the 19th century, and characterized by protracted lethargy, fever and wasting. It is attributed to the trypanosoma gambiense, a parasite which was discovered in the frog by Gruby in 1847, and in 1880 by Griffith Evans in horses afflicted with the disease called " surra " in India. In 1895 Surgeon-Major (afterwards Sir) D. Bruce found a trypanosoma similar to Evans's in cases of what was known in cattle as " tsetse-fly disease"; and though the trypanosoma had not then actually been found in man, Bruce suggested that this was akin to the human " sleeping-sickness " which had now extended into the Congo Free State, Uganda and elsewhere, and was causing great mortality, many Europeans having died of the disease. In 1903 Castelani found the trypanosoma in the cerebro-spinal fluid of human patients afflicted with the disease. The question of the pathology of " sleeping-sickness " was vigorously taken up, and in June 1907 an international conference was held in London for the purpose of organizing research on the subject. As was pointed out by Lord Fitzmaurice (18th of June), in his opening address, it was already accepted that trypanosoma gambiense was the cause of the disease, and it was even then " all but proved " that the parasite was conveyed by at least one species of tsetse fly (glossina palpalis), the distribution of which was limited to the neighbourhood of open water. It had further been ascertained, experimentally in animals, and therapeutically in man, that the infection once acquired could be controlled, to some extent, by various substances — arsenic, certain colours, dyes, in combinations of arsenic and colour dyes,

e.g. atoxyl — and by mercury. It remained a question how far certain unascertained factors were at work in the spread of the disease, and for this purpose the British government invited the co-operation of all the powers interested in tropical Africa in considering certain problems, annual or biennial conferences being suggested, and the formation of a central bureau, in order to organize the research. These problems were: (1) to determine whether the tsetse fly (glossina palpalis) was a direct or indirect conveyor of the parasite; (2) whether the parasite underwent necessary developmental changes in the tsetse fly; (3) if so, whether the developed germs were conveyed by the original fly or its larva when arrived at the imago stage; (4) how long an infected glossina palpalis remained infected; (5) whether other species of glossina were concerned; (6) the geographical distribution and habits of the fly; (7) whether and how far the spread of infection was the work of any of the vertebrate fauna (other than man); (8) to suggest preventive methods for exterminating the glossina, or protecting uninfected districts by segregation or otherwise; (9) to study the therapeutics of the disease. In the history of modern pathology, this organization of research in respect of " sleeping-sickness " must hold an important place as the application of state effort on behalf of the advancement of science. (See Neuropathology and Parasitic Diseases.)

Authorities. — Sir P. Manson, Lane Lectures on Tropical Diseases (i9 5) ;.W. F. M. Marshall, " Trypanosomiasis or Sleeping-Sickness," in Review of Neurology and Psychiatry (February 1906) ; F. W. Mott, A rchives of Neurology, vol. iii. (1907) ; Reports of the Sleeping-Sickness Commission; Castellani, " Researches on the Aetiology of Sleeping- Sickness," Journal of Tropical Medicine (June 1903).

SLEET (either from Nor. sletta, of the same meaning, or related to Ger. Schlosse, hailstone), that form of precipitation of water vapour condensed from the atmosphere, which reaches the ground in a partly frozen condition. Sleet may originate in the upper atmosphere either as rain, in which case, to become partly frozen, it must have fallen into a stratum of air colder than that in which it originated, or as snow, when the opposite must have

taken place, i.e. the snow in its descent must have encountered an air-temperature slightly above the freezing-point.

SLEEVE (0. Eng. slieve, slyf, a word allied to " slip," cf. Dutch sloof, apron), that part of a garment which covers the arm, or through which the

arm passes or slips. The pattern of the sleeve is one of the characteristics of fashion in dress, varying in every country and period. Various survivals of the early forms of sleeve are still found in the different types of academic or other robes (g.v.). Where the long hanging sleeve is worn it has, as still in China and Japan, been used as a pocket, whence has come the phrase " to have up one's sleeve," to have something con- cealed ready to produce. There are many other proverbial and metaphorical expressions associated with the sleeve, such as "to wear one's heart upon one's sleeve," " to laugh in one's sleeve," &c. In technical usage a " sleeve " is a tube into which another tube is inserted, which in the case of small tubes is called a thimble.

SLEIDANUS, JOHANNES (1506-1556), German historian, the annalist of the Reformation, was born at Schleiden near Aix-la- Chapelle. He studied ancient languages and literatures at Liege and Cologne, and law and jurisprudence at Paris and Orleans. Whilst among the humanists of Liege, he had adopted Protestant opinions, and entering the service of Cardinal du Bellay, was employed in the futile negotiations of the French court to make an alliance with the German Protestants against the emperor Charles V. In 1542 he settled at Strassburg. Sleidanus had been accustomed to copy all papers bearing upon the Reformation to which he had access, and Martin Bucer, who had seen his collection, proposed to Philip of Hesse to appoint him historian of the Reformation, giving him a salary and access to all necessary documents. After some delay the heads of the league of Schmalkalden agreed to the proposal, and Sleidanus began his great work, finishing the first volume in 1 545. In that year he was recalled to diplomacy, and went to England in a French embassy to Henry VIII. While there he collected materials for his history. On his return he represented Strassburg at the diets of Frankfort and Worms, and went on to Marburg to explore the archives of Philip of Hesse. The war of the league of Schmalkalden interfered with this work, and also prevented the payment of Sleidanus, who in his difficulties applied to England for aid, and at Cranmer's intercession received a yearly pension from Edward VI., which, however, was not long continued. In 1 551 Sleidanus went to the council of Trent as representative from Strassburg, charged also with full powers to act for the imperial cities of Esslingen, Ravensburg, Reutlingen, Biberach and Lindau. He was afterwards appointed professor of law in Strassburg, and finished his great task in 1554, though lack of money and other misfortunes compelled him to delay printing. Sleidanus died in poverty at Strassburg in October 1556. The book appeared in the preceding year — Commentariorum de statu religionis et reipublicae, Carolo V. Caesare, libri XXVI.; it was translated into English by John Daws in 1560 and by G. Bohum in 1689. It was so impartial that it pleased no one, not even Melanchthon. It remains the most valuable contemporary history of the

times of the Reformation, and contains the largest collection of important documents.

See H. Baumgarten, Uber Sleidanus Leben und Briefwechsel (1878), and Sleidans Briefwechsel (1881); and A. Hasenclever, Sleidan-Sludien (Bonn, 1905).

SLEIGH, Sled or Sledge (Dan. slaede, Dutch slede, akin to "slide"), a vehicle on runners instead of wheels, for travelling over snow or ice. Various forms are used according as the object is utility or sport. The sleighs used in Coasting are referred to in the article under that heading; but for ordinary means of conveyance horse-drawn sleighs are employed as carriages in countries such as Russia, Scandinavia, and North America, where the roads are snow-bound in the cold season; and in the Arctic regions dogs are harnessed to them.

SLIDELL, JOHN (1793-1871), American political leader and diplomatist, was born in New York City in 1793. He graduated from Columbia College in 1810, engaged in business for a short time, then studied law, and became one of the leaders of the

bar at New Orleans, Louisiana, where he settled permanently in 1825. He was a member of the national House of Repre- sentatives as a state's rights Democrat from 1843 to 1845, when he resigned and was sent by President Polk on a secret mission to Mexico, with power to adjust the difficulties growing out of the annexation of Texas to the United States, and to acquire by purchase both New Mexico (including the present Arizona.) and Upper California. He was not, however, received by the Mexican government. From 1853 to 1861 he was a representative of Louisiana in the United States Senate, and was an influential working member of important committees, though he seldom took part in debate. During this period he was intimately associated with James Buchanan, and is supposed to have had an important part in bringing about Buchanan's nomination for the presidency in 1856. When Louisiana seceded in 1861, Slidell withdrew from the Senate, and late in 1861 was sent by the Confederate Government as commissioner to France. With James M. Mason (q.v.), the Confederate commissioner to England, he was taken from the British steamer " Trent " by Captain Charles Wilkes of the United States navy, and was imprisoned at Fort Warren in Boston harbour. In January 1862, at the demand of England, the Confederate commissioners were released, and Slidell proceeded to France. His mission there was to secure the recognition of the Confederate States; in this he was unsuccessful, but he was able to keep France sympathetic, and to help to secure supplies for the Confederate army and navy. After the war he remained abroad, settling in England, and his daughter married a French nobleman. He died in London on the 29th of July 187 1.

SLIGO, a county of Ireland in the province of Connaught, bounded N. by the Atlantic, E. by Leitrim, S.E. by Roscommon, and S. and W. by Mayo. The area is 452,356 acres or about 707 sq. m. The coast-line is very irregular, and in some places rises into grand escarpments and terraces.

The principal inlets are Killala Bay and Sligo Bay, the latter subdivided into Brown Bay, Drumcliffe Bay and Ballysadare Bay. Near the coast are the islands of Inishmurray and Coney and other smaller islets. Though Sligo cannot be compared for scenery with the western parts and north coast of County Mayo, it is well wooded and possesses several beautiful lakes and rivers and some ranges of hills finely situated and grouped. In the north are the lime- stone elevations of Ben Bulbin (1712 ft.) and Knocknarea (1078), contrasting with the adjacent rugged gneiss mountains, among which are King's Mountain (1527) and Gullogherboy (1430). On the boundary with Leitrim, Truskmore reaches a height of 2ri3 ft. In the west are the ranges of the Slieve Gamph and Ox Mountains, upwards of 1300 and 1600 ft. respectively. The Curlew Mountains, an abrupt ridge of limestone gravel, upwards of 800 ft. in height, with flattened summit, separate Sligo from Roscommon. The principal rivers are the Moy, forming for a part of its course the boundary with Mayo, and flowing south- westward and then northward into Killala Bay; the Easky, flowing northward from Lough Easky; and Ballysadare, with its branches the Owenmore, Owenbeg, and Arrow, or Unshin; and the Garvogue, or Garavogue, flowing from Lough Gill. Except the finely-situated Lough Gill (extending into Leitrim), Lough Arrow, and Lough Gara, all of which exceed 3000 acres in extent, none of the lakes has so large an area as 400 acres. The salmon, sea-trout and trout fishing is generally excellent in these waters, especially during the autumn, but Lough Arrow also provides sport during the Mayfly season.

This county essentially consists of Carboniferous Limestone, broken by the Dalradian axis of the Ox Mountains. The gneisses of this range, which obviously result from the intermingling of granite and a series of schists and quartzites, form a ridge of rocky hills, smoothed by glaciation, on the flanks of which Carboniferous shales rest. Above these, the limestone is boldly developed, forming great scarped tablelands north of Sligo, with some sandstone on the summit of Truskmore. Knocknarea, conspicuous from Sligo, is an outlier of the Upper Limestone. Lough Gill is picturesquely bounded by the gneissic range on the south and these high carboniferous masses on the north. The limestone also produces fine features in the south of the county, in Keishcorran and round Lough Arrow. East of this point, it forms the slopes of the Leitrim and Roscommon

coalfield, the summits being capped by the Millstone Grit series; while on the south, bounded by a fault, rises the Old Red Sandstone range of the Curlew Hills. Lead was mined at Ballysadare, and the clay-ironstone from*

the east of the county was at one time smelted. Industries. — There is considerable variety both in the character of the soil and in the agricultural advancement in different parts of the county. In some parts it is a light sandy loam resting on a freestone bottom, and in the lower districts a rich and deep mould prevails resting on a substratum of limestone. Owing to the moist- ness of the climate cattle feeding is found to be the most remunerative method of farming, as may be gathered from the increasing or well- maintained numbers of cattle, sheep and poultry. Oats and potatoes are the principal crops, but the acreage devoted to them decreases, and the proportion of tillage to pasturage is roughly as I to_3J. Coarse woollens and linens are manufactured for home consumption, and there are tanneries, distilleries, and breweries in the principal towns. A considerable general trade is carried on at the ports of Ballina (on the Moy) and Sligo. The fisheries on the coast are valuable, and there are important salmon fisheries at the mouths of the rivers. The town of Sligo is the chief centre.*

The Sligo branch of the Midland Great Western railway enters the county from the S.E., with a branch S.W. from Kilfree to Ballaghaderreen in county Mayo; the Limerick and Sligo line of the Great Southern and Western enters from S.W. ; and the Sligo, Leitrim and Northern counties, from Enniskillen (county Fermanagh), and Manor Hamilton (county Leitrim), from the N.E. These lines unite at Collooney and share the railway from this junction to the town of Sligo.

Population and Administration. — The population (94,416 in 1891, 84,083 in 1901) decreases at a rate considerably above the average of the Irish counties, and emigration is heavy. Of the total about 90 % are Roman Catholics and about 7 % Protestant Episcopalians. About 88% is rural population. The county town is Sligo (pop. 10,870) ; Ballymote and Tobercurry (or Tubbercurry) are small inland market towns. The county is divided into six baronies. Assizes are held at Sligo and quarter-sessions at Ballymote, Easky and Sligo. For parliamentary representation the county has since 1885 formed two divisions (North and South), each returning a member. The county is mainly in the Protestant diocese of Kilmore, and in the Roman Catholic dioceses of Ardagh, Achonry, Elphin and Killala.

History.— The county was created by Sir Henry Sydney in 1579. On Carrowmore, between Sligo and Ballysadare, there is a remarkable collection of ancient stone monuments (see Sligo, town). At Drumcliffe (5 m. N. of Sligo) are the only round tower remaining in the county and a beautiful Celtic cross 13 ft. in height. The principal monastic ruins are the abbey of St Fechan at Ballysadare, with a church of the nth or 1 2th century; the abbey of Sligo; and a remarkable group of buildings on the island Inishmurray, which include a cashel or walled enclosure; three

oratories, one of which contains an oaken figure in ecclesiastical garb; two holy wells; and also altars, pillar stones, inscribed slabs (one of which is unique among those of its kind in Ireland in having an inscription partly in Latin) , and several examples of beehive cells. This settlement is associated with Molaise, a saint of the early 6th century (not identical with the Molaise of Devenish in Loch Erne), and the remains still attract pilgrims, who revere the oaken figure mentioned as an image of the saint, though it is more probably the figurehead of a vessel.

SLIGO, a municipal borough, seaport and market town, and the county town of county Sligo, Ireland. Pop. (1901) 10,870. It lies at the head of an arm of Sligo Bay on the north-west coast, on the river Garvogue, 134J m. N.W. from Dublin by the Midland Great Western railway. This company shares with the Great Southern and Western and the Sligo, Leitrim, and Northern Counties railways the line to Collooney Junction, 6| m. S., from which the former runs S. to Limerick and the latter E. to Ennis- killen. The situation of Sligo is beautiful; the bay is separated from the fine Lough Gill by less than 4 m. of a richly wooded valley, with flanking hills exceeding 1000 ft. in elevation. Sligo takes rank with Galway and Limerick as one of the three principal ports of the west coast of Ireland. Regular communication by steamer is maintained with Liverpool and Glasgow, and a con- siderable export trade is carried on in grain, flour, pork and cattle; while coals, iron, timber and provisions are imported. There is a depth on the harbour bar of 16 ft. at low water, and there are commodious quays and basins. Harbour commissioners control the port. Brewing, flour-milling and saw-milling are the

chief industries, and there is an important butter-market. Monthly fairs are held. Sligo is a centre of. salmon and sea- fishing industries.

The Dominican Abbey, founded in 1252 by Maurice Fitzgerald, Lord-Justice, is one of the finest monastic ruins in Ireland. It was partly destroyed by fire in 1414 and again in 1642. Three sides of the cloisters remain, and the lofty quadrangular tower at the junction of the nave and chancel is entire. The east window is of the date of the original structure. The principal modern church is the Roman Catholic cathedral (1869) for the diocese of Elphin in the Norman style with a finely sculptured doorway. There is also a Roman Catholic college.

A castle was built at Sligo by Maurice Fitzgerald in 1242, which in 1270 was taken and destroyed by O'Donnel; in 1310 it was rebuilt by Richard, earl of Ulster, and was again partly destroyed in 1369 and 1394. Of this and the walls with which the town was fortified there are no remains. Early in the reign of James I. the town received a market and two annual fairs; in 16 13 it was incorporated and received the privileges of a borough; and

in 162 1 it received a charter of the staple. In 1641 it was besieged by the Parliamentary forces under Sir Charles Coote, but was afterwards evacuated, and occupied by the Royalists till the termination of the war. In 1688 it declared in favour of James II., and, after being captured by the Ennis- killeners, was retaken by General Sarsfield, but ultimately surrendered to the earl of Granard. The borough was dis- franchised in 1870. Under the Local Government (Ireland) Act, 1898 it retains its mayor and corporation, but the latter has practically the status of an urban district council.

The country neighbouring to Sligo presents fine coast scenery, west coast of Ireland, while inland it is wild and mountainous. Three m. S.W. of the town, on Carrowmore, is a remarkable collection of megalithic remains, including cromlechs, stone circles, and burial cairns, which has been taken to mark the site of the traditional battle of North Moytura. On Knocknarea (1078 ft.), south of Sligo, is a huge cairn, which tradition sets down as the burial-place of Queen Mab (Meave of Connaught). Five m. N. of Sligo is Drumcliffe, with its round tower and Celtic cross. Rosses, on Sligo Bay, is a favourite resort. Sligo is a centre for salmon and trout fishing.

SLING (from M. Eng. slingen, to fling, throw with a jerk, Icel. slyngva, cf. Ger. schlingen, to twist), an implement for casting missiles, also from its resemblance in form to the implement, a hanging loop used as a support for a wounded limb, a chain with hooks used for raising or lowering heavy goods or objects, &c. The sling as a weapon is probably the earliest form of device known to mankind by which an increase of force and range was given to the arm of a thrower of missiles. Sling stones from the stone age have been frequently found (see Arms and Armour) . The form of the weapon is of two kinds; the sling proper consists of a small strap or socket of leather or hide to which two cords are attached; the slinger holds the two ends in one hand, whirls the socket and missile rapidly round the head and, loosing one cord sharply, despatches the missile; the other type is the staff sling, in which the sling itself is attached to a short staff, held in both hands. This was used for heavier missiles especially in siege operations during the middle ages. There are many refer- ences to slings and to slingers in the Bible; the left-handed slingers of Benjamin were famous (Judges xx. 16) . The Assyrian monuments show the sling of the ordinary type and slingers were used in the ancient Egyptian army, but not before the 8th century B.C. The sling (Gr. afavSovri, Lat. funda) is not mentioned in Homer; Herodotus (vii. 158) speaks of the slingers in the army offered by Gelon to serve against the Persians; it seems to have been a weapon chiefly used by barbarian troops. The Acarnanians, however, were expert slingers (Thuc. ii. 81), and so also were the Achaeans, who later invented the sling which discharged a shaft with an iron bolt head (Livy xlii. 65, from Polybius). In the Roman army by the time of the Punic Wars

the slingers (funditores) were auxiliaries from Greece, Syria and Africa. The Balearic islanders, who were in Hannibal's army, were always famous as slingers. In medieval times the sling was much used in the Frankish army, especially in defending trenches, while the staff-sling was used against fortifications

*in the *4th century. They were used down to the 16th and 17th centuries to throw grenades.*

SLIVEN, Slivno or formerly Selimnia (Turk. Islimye), a town of Bulgaria, in Eastern Rumelia, at the southern foot of the Balkan Mountains, 105 m. E.N.E. of Philippopolis and near the southern entrance of the defile known as the Iron Gate. Pop. (1006), 25,049. There are numerous mosques in the town, but the greater part of the Turkish population emigrated after the Russo-Turkish War of 1877-78. Sliven contains the govern- ment factory, founded in 1834, for the manufacture of military clothing; it is the chief centre in Bulgaria for the rough and fine homespuns known as aba and shayak, and its wine is locally celebrated. Extensive mulberry orchards .have been planted in connexion with the silk industry.

Sliven, the Stlifanos of the Byzantine writers, owed its former strategic importance to its position on one of the trans-Balkan highways to Adrianople and the south. In the middle ages it was a subject of dispute between Byzantium and Bulgaria. After its capture by the Turks (1388) it was one of the voinik towns which remained exempt from taxes and were allowed to elect their own voivode; but these privileges were lost in the 1 Oth century. In 1829 Sliven was occupied by the Russian army under Rudiger and Gorchakov.

SLOANE, SIR HANS (1660-1753), British collector and physician, was born on the 16th of April 1660 at Killyleagh in county Down, Ireland, where his father had settled at the head t>f a Scotch colony sent over by James I. He had as a youth a taste for collecting objects of natural history and other curiosities. This led him to the study of medicine, which he went to London to pursue, directing his attention to botany, materia medica and pharmacy. His collecting propensities made him useful to John Ray and Robert Boyle. After four years in London he travelled through France, spending some time at Paris and Montpellier, and taking his M.D. degree at the university of Orange in 1683. He returned to London with a considerable collection of plants and other curiosities, of which the former were sent to Ray and utilized by him for his History of Plants. Sloane was

quickly elected into the Royal Society, and at the same time he attracted the notice of Thomas Sydenham, who gave him valuable introductions to practice. In 1687 he became fellow of the College of Physicians, and proceeded to Jamaica the same year as physician in the suite of the duke of Albemarle. The duke died soon after landing, and Sloane's visit lasted only fift-een months; but during that time he got together about 800 new species of plants, the island being virgin ground to the botanist. Of these he published an elaborate catalogue in Latin in 1696; and at a later date (1707-1725) he made the experiences of his visit the subject of two folio volumes. He became secretary to the Royal Society in 1693, and edited the Philosophical Transactions for twenty years. His practice as a physician among the upper classes was large. In the pamphlets written concerning the sale by Dr William Cockburn (1669-1739) of his secret remedy for dysentery and other fluxes, it was stated for the defence that Sloane himself did not disdain the same kind of professional conduct; and some colour is given to that charge by the fact that his only medical publication, an Account of a Medicine for Soreness, Weakness and other Distempers of the Eyes (London, 1745) was not given to the world until its author was in his eighty-fifth year and had retired from practice.

In 1716 Sloane was created a baronet, being the first medical practitioner to receive an hereditary title, and in 1719 he became president of the College of Physicians, holding the office sixteen years. In 1722 he was appointed physician-general to the army, and in 1727 first physician to George II. In 1727 also he suc- ceeded Sir Isaac Newton in1:he presidential chair of the Royal Society; he retired from it at the age of eighty. Sloane's memory survives more by his judicious investments than by anything that he contributed to the subject matter of natural science or even of his own profession. His purchase of the manor of Chelsea in 171 2 has perpetuated his memory in the name of a " place, " a street, and a square. His great stroke as a collector was to acquire (by bequest, conditional on paying off

certain debts) in 1701 the cabinet of William Courten, who had made collecting the business of his life. When Sloane retired from active work in 1741 his library and cabinet of curiosities,' which he took with him from Bloomsbury to his house in Chelsea, had grown to be of unique value. On his death on the nth of January 1753 he bequeathed his books, manuscripts, prints, drawings, pictures, medals, coins, seals, cameos and other curiosities to the nation, on condition that parliament should pay to his executors £20,000, which was a good deal less than the value of the collection. The bequest was accepted on those terms by an act passed the same year, and the collection, together with George II. 's royal library, &c, was opened to the public at Bloomsbury as the British Museum in 1759. Among his other acts of munificence may be mentioned his gift to the Apothecaries' Company of the botanical or physic garden, which they had

rented from the Chelsea estate since 1673.

See Weld, History of the Royal Society, i. 450 (London, 1848); and Munk, Roll of the College of Physicians, 2nd ed., i. 466 (London,

1878).

SLOCUM, HENRY WARNER (1827-1894), American general, was born at Delphi, Onondaga county, New York, on the 24th of September 1827. and graduated at the United States Military Academy in 1852. He resigned from the army in 1856 to practise law at Syracuse, N.Y., and in 1859 he was a member of the state Assembly. When the Civil War broke out he became colonel (May 1861) of the 27th New York Volunteers, and was promoted brigadier-general of volunteers (August 1861) and major-general of volunteers (July 1862). He fought in all the Virginia cam- paigns from the first battle of Bull Run, where he led a regiment, to Gettysburg, where he commanded the XII. corps. With that corps he was transferred in the autumn of 1863 under Hooker's command to the Tennessee Valley, and took part in the battle of Chattanooga. He remained with the Army of the Cumberland after his corps was merged into that of Hooker, took part in the Atlanta campaign, and after Hooker's retirement succeeded to the command of the XX. corps (late XL and XII.). He com- manded the Atlanta garrispn, and with Sherman took part in the " march to the sea," and subsequently in. the Carolinas campaign from Savannah to Goldsboro, as commander of the left wing. He resigned from the army in September 1865, resumed professional practice at Brooklyn, and was a Democratic representative in Congress in 1869-1873 and again in 1883-1885. In 1876-1884 he was president of the Brooklyn city board of public works. He died at Brooklyn on the 14th of April 1894. A monument of General Slocum by Frederick MacMonnies was unveiled at Brooklyn, N.Y., on the 30th of May 1905.

SLODTZ, REMG MICHEL or MICHEL ANGE (1705-1764), French sculptor, was born at Paris. He passed seventeen years at Rome, where he was chosen to execute a statue of St Bruno, one of the best modern works of the class in St Peter's. He was also the sculptor of the tomb of Marquis Capponi in St John of the Floren- tines. Other works of his are to be seen at the church of St Louis of France and at Santa Maria della Scala. After his return to France in 1747, Slodtz, in conjunction with his brothers, Antoine Sebastien and Paul, produced many decorative works in the churches of Paris, and, though much has been destroyed, his most considerable achievement — the tomb of Languet de Gergy in St Sulpice (commissioned in 1750) — still exists. Slodtz was, like his brothers, a member of the Academy of Painting and Sculpture, and many particulars of his life are preserved in a memoir written by Cochin, and also in a letter from the

same to the Gazette litteraire, which was reproduced by Castilhon in the Necrologe of 1 766.

Slodtz's father, Sebastien (1655-1726), was also a sculptor, born at Antwerp ; he became a pupil of Girardon and worked mostly under him at Versailles and the Tuileries. His chief works were " Hannibal " in the Tuileries garden, a statue of St Ambrose in the Palais des Invalides, and a bas-relief " Saint Louis sending missionaries to India."

See C. N. Cochin, Mem. ined. (Paris, 1881); Barbet de Jouy, Sculpture moderne du Louvre (Paris, 1856); Duissieux, Artistes francais d Vetranger (Paris, 1852).

SLOGAN, the war-cry of the Highland clans. It was the gathering call of the clan, often the name of the clan, the place of meeting, and the like, and was uttered when charging in battle. The Gaelic word, of which " slogan " is the English adaptation, is sluagh-ghairm, from sluagh, army, host, and gairm, call, cry. A variant form of " slogan " is " slogorne," which has given rise to an invented word " slughorn," used by Chatterton (Battleof Hastings, ii. 10) and by Browning (Childe Roland) as if the term meant some kind of war-trumpet or horn. Skeat (Elym. Diet. 1898, Errata and Addenda) has shown that Chatterton used an edition of Gavin Douglas's translation of Virgil, where" slogorne " is spelled " slughorne," and the context, " The deaucht trumpet blawis the brag of were; the slughorne, enseule or the wache cry went for the battall all suld be reddy," misled him.

SLONIM, a town of Russia, in the government of Grodno, 155 m. by rail S.E. of the city of Grodno and 20 m. from the railway from Moscow to Warsaw, on the high craggy banks of the Shchara. Pop. (1883), 21,110; (1897) 15,893, including many Jews. It derives its importance from the river, which is navigable and joins the Oginsky canal, connecting the Niemen with the Dnieper. Corn, tar, and especially timber are exported. Slonim is mentioned in 1040, when Yaroslav, prince of Kiev, defeated the Lithuanians in its neighbourhood. In 1241 the Mongols pillaged it and burned its wooden fort. Owing to its position between Galician Russia and Lithuania it often changed hands, until it was conquered by the Lithuanians in the 14th century. From 1631 to 1685 it was the seat of the Lithuanian diet and became a flourishing city. In the 18th century, under the hetman Oginsky, a canal was dug to connect the Shchara with the Dnieper. Oginsky embellished the city and founded there a printing-office.

Russia annexed the town in 1795.

SLOOP, a type of small sailing-vessels which have one mast rigged " fore and aft," carrying a mainsail, gaff-topsail, jib and fore staysail. There is little in rig to distinguish a sloop from a " cutter," and the terms are used indiscriminately; sometimes a distinction is drawn by a sloop having a fixed and a cutter a running bowsprit. In the sailing and early steam days of naval warfare, a " sloop " was a small corvette, ship-rigged, with all the guns mounted on the upper deck. Like so many nautical terms the word was borrowed from the Dutch, viz. sloep, boat. This is generally taken to be an adapta- tion of the Fr. chaloupe. Span, and Port, chalupa, cf. Ital. scia- luppa, Eng. " shallop," a light boat. These probably represent some native word borrowed by Spanish or Portuguese sailors in the East or American Indies. Other etymologists distinguish the Dutch and French words and refer sloep to the common Teutonic root, meaning to glide, to creep, seen in " slip," Ger. schleifen, schliefen, &c.

SLOTH, the name for the various representatives of a group of arboreal tropical American mammals belonging to the order Edentata (q-v.). Sloths are some of the most completely arboreal of all mammals, living entirely among the branches of trees; and usually hanging beneath them, back downwards, and clinging with the hook-line organs to which the terminations of their limbs are reduced. When obliged to descend to the ground, which they rarely, if ever, do voluntarily, sloths — owing to the unequal length of their limbs and the peculiar conforma- tion of their feet, which allow the animals to rest only on the outer edge— crawl along a level surface with considerable diffi- culty. Though generally slow and inactive, even when in their natural haunts, they can on occasions travel with considerable rapidity along the branches, and as they do not leap, like most other arboreal creatures, they avail themselves of the swaying of the boughs by the wind to pass from tree to tree. They feed on leaves and young shoots and fruits, which they gather in their mouth, the fore-limbs aiding in dragging boughs within reach, but not being used as hands. When sleeping, sloths roll themselves up in a ball, and, owing to the dry shaggy character of their hair, are inconspicuous among the mosses and lichens with which the trees of their native forests abound. The con- cealment thus afforded is heightened in some species by the peculiar greenish tint of the hair, due not to the colour of the

hair itself, but to the presence upon its surface of an alga, the lodgment of which is facilitated by the fluted or rough surface of the exterior, and its growth is promoted by the dampness of the atmosphere in the gloomy tropical forests. Sloths are

The Unau or Two-toed Sloth (Choloepus hoffmanni).

nocturnal, silent, inoffensive and solitary animals, and produce usually but one young at birth. They appear to show an almost reptilian tenacity of life, surviving the most severe injuries and large doses of poisons, and exhibiting longer persistence of irritability of muscular tissue after death than other mammals. Several other animals, such as the African potto-lemurs, and the Asiatic lorises, are popularly called sloths.

SLOUGH, a market town in the Wycombe parliamentary division of Buckinghamshire, England, 18 m. W. of London by the Great Western railway. Pop. of urban district (1901), 11,453. It lies in the flat valley of the Thames, nearly 2 m. from the river at Eton and Windsor, and is wholly modern in appearance. The chief public building is the Leopold Institute and Public Hall (1887), a memorial of Prince Leopold, Duke of Albany. The British Orphan Asylum is also in the town. The parish church of Upton-cum-Chalvey, St Laurence, has a Norman doorway and other portions of the same period. It is the burial- place of Sir William Herschel, who lived in the vicinity, set up his great telescope here, and made many of his astronomical discoveries.

SLOVAKS (SlovAk, fern. Slovenka, adj. slovensky, formerly called Slovene, but to be distinguished from the Slovenes of Carinthia, in Magyar Tdt), a Slav people numbering about 2,500,000 and mostly living in the northern counties of Hungary. On the west they extend into the neighbouring districts of Lower Austria and Moravia where they march with the Germans and the kindred Moravians, being bounded by the river Morava and the Jablunka Mountains; on the north they touch the Poles along the frontiers of Silesia and Galicia; on the east about 22 E. they meet the Little Russians along an indented boundary; on the south they have the Magyars as neighbours along a line joining Pressburg and Zemplin. Within these limits, save for the Germans in the towns, the Slovaks are not much mixed: they have isolated settlements throughout the western half of Hungary extending far enough south to meet similar settlements of Servians. Their chief centre is S. Marton on the Turocz. The Slovaks seem to have occupied this territory in the 5th or 6th century a.d. and tdso to have stretched far to the south; they formed part of Samo's empire (middle of 7th century), but were subject to the Avars and the Franks, and then formed part of Great Moravia until that kingdom was in 907 conquered by the Magyars, who displaced or assimilated the southern Slovaks and have ever since been lords of the rest, save for a short time when they were under Boleslav the Brave (a.d. 973) of Poland, and early in the 14th century when a local

magnate, Count Matthew of Trenan, made himself an independent ruler. In 1848-1849, when the Magyars rose against Austria, the Slovaks rose against the Magyars, but were handed back to them on the conclusion of peace. The Magyars have always treated the Slovaks as an inferior race and have succeeded in assimilating many districts where the prefix Tot in place-names shows the former presence of Slovaks: those who take the Magyar language and attitude are called Magyarones. The Magyars, in pursuance of this policy, do their best to suppress the Slovak nationality in every way, even to the extent of taking away Slovak children to be brought up as Magyars, and denying them the right to use their language in church and school. The result is a large emigration to America. (See letters by Scotus Viator in Spectator, 1906 sqq.)

The Slovaks are a peaceful, rather slow race of peasants (their aristocracy is Magyarized), living almost exclusively upon the land, which they till after the most primitive methods. Where this does not yield sufficient, they wander as labourers and especially as tinkers all over Austria-Hungary and even into South Russia. They are fond of music, and their songs have been collected.

The Slovak language is most closely connected with Cech, the difference being bridged by the transitional dialects of Moravia: though Miklosich has classed it as a variety of Cech, it is better to take it separately, since it has not been subjected to the special changes which have in that language assimilated the vowels to the foregoing palatal consonants, nor developed the ƒ which is char- acteristic of the other North-Western Slavonic tongues, but has remained in a more primitive stage and preserved (as might be expected from its central position in the Slavonic world) many points of agreement, phonetic, morphological and lexical, with South Slavonic and Russian. The alphabet is founded on the Cech, the accent is always on the first syllable, long vowels are indicated by acute accents. There are usually reckoned to be three groups of dialects, Western, Central and Eastern; the first being nearest to Cech, the last to Little Russian; the Central dialects exhibit less decided features. The Slovak dialects spoken in Moravia have been well investigated by Bartos, the others still await satisfactory treat- ment, as does the question of the relation of Slovak to other Slavonic groups.

From the time of the Hussites and still more after the Reformation, Cech missionaries, colonists and refugees had brought with them their Bible and service books; Cech became the literary language, and is still the church language of the Slovak Protestants. The use of the local tongue was the result of a desire on the part of the Roman Catholic clergy to get at their people. A. Bernolak (1762-1813), who first systematized the orthography and made a dictionary, taking Western Slovak as his basis, was a priest,

and so was Jan Holly (1 785-1 849), who wrote epics and odes in the classical taste. A new start was made in the 'forties by L'udevit Stur, Josef Hurban and M. Hodza who adopted the central dialect, united the Catholic and Protestant Slovaks in its use and successfully opposed the attempts to keep the Slovaks to the use of Cech. However, Safa?ik the great Slavist and the poet Kollar continued to write in Cech, the argument being that Slavs should unite to oppose the enemies of the race: but without their language the Slovaks, having no traditions of inde- pendent political life, would have nothing to cling to. The chief Slovak writers since Stur (mostly poets) have been O. Sladkovic, S. Chalupka, V. Paulina-Tot, and at present Orszag-Hviezdoslav and Svetozar Hurban-Vajansky. During the 'sixties the Slovaks founded three gymnasia and a Matica, or literary, linguistic and educational society, such as has been the centre of revival for the national life of other Slavonic nations. These were all closed and their property confiscated by the Magyars in the early 'seventies, but the struggle continues, and national self-consciousness is too strong for the attempts at Magyarization to have much probability of success.

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(E. H. M.)

SLOVENES [Slovenci, Ger. Winden, to be distinguished from the Slovaks (q.v.) and from the Slovinci (see Kashubes) west of Danzig], a Slavonic people numbering about 1,300,000. The chief mass of them lives in Austria, occupying Carniola (Krajina, Krain), the southern half of Carinthia (Chorutania, Korosko, Karnten) and Styria (Stajersko, Steiermark) and some of the northern part of Istria; a small division of them is found over the Italian border in the vale of Resia; others in the extreme south-west of Hungary. Their neighbours on the south-west are Italians, on the west and north Germans: history and place- names point to Slovenes having formerly held parts of Tirol, Salzburg and Austria Proper; and on the east they have given up south-west Hungary to the Magyars; to the south they have the kindred race of the Croats. The boundary on this side is difficult to fix, as the transition is gradual and a certain dialect of Croatian (marked by the use of kaj = " what ") is by some con- sidered to have been originally Slovene (see Croatia-Slavonia). Even within the limits above defined the Slovenes are much mixed with Germans, especially in the towns; only in Carniola are they fairly solid. Here they call themselves Krajinci rather than Slovenes, in fact everywhere the general term gives place to local name, because the race is so much split up geographically, dialectically and politically that consciousness of unity is of rather recent growth. The main intellectual centre has been Laibach (Ljubljana) and next to it Klagenfurt (Celovec); in Graz (Gradec) the German element, and in Gbrz (Gorica) the Italian, predominates.*

The Slovenes arrived in these parts in the 7 th century, appar- ently pressed westwards by the Avars. By a.d. 595 they were already at war with the Bavarians, later they formed part of Samo's great Slavonic empire and were not quite out of touch with other Slavs. On its collapse they fell under the yoke of the Bavarians and Franks. At first they had their own princes, but in time these gave place to German dukes and margraves, who had, however, to use the native tongue on certain occasions. These fiefs of the empire finally fell to the Habsburgs and never gave them any trouble, hence their language has had freer play than that of most of the Austrian Slavs: they have been allowed to use it in primary and secondary schools and to some extent in local administration. The Slovenes were very early (beginning with the 8th century) Christianized by Italian and Geiynan missionaries; to them we owe the Freisingen fragments, confessions and part of a sermon, the earliest monuments, not merely of Slovene but of any Slavonic. The MS. dates from c. 1000, but the composition is older. The language is not pure Slovene, but seems to be an adaptation of an Old

Slavonic trans- lation. Yet it is enough to show that Old Slavonic is not Old Slovene. Kocel, a prince on the Platten See, to whom Cyril and Methodius (see Slavs) preached on their way to Rome, was probably a Slovene, but no traces of their work survive in this quarter. Except for a few 15th-century prayers and formulae we do not find any more specimens of Slovene until the Reforma- tion, when Primus Truber translated a catechism, the New Testament and other works (Tubingen, 1550-1582), and J. Dalmatin issued a splendid Bible (Wittemberg, 1584), with an interesting vocabulary to make his work intelligible to any Slovene or Croat: at the same time and place A. Bohorizh {zh = l) issued a good grammar (Arclicae Ilorulae, &c). To counteract this the Roman Catholics translated the work of their English apologist Stapleton, but their final policy was to burn all the Slovene books they could find, so that these are extremely rare. The policy was successful and only about 15% of the

Slovenes are Protestants. Slovene woke to a new life in the latter part of the 18th century. Valentin Vodnik was the first poet (see Arch. f. Slav. Phil. (1001), xxiii. 386, xxiv. 74), but his successor France Preseren (1800-1840) appears to have been really great, worthy of a larger circle of readers. Other poets have been A. Janezic, S. Gregorcic and Murn-Aleksandrov; Erjavec was a story-teller, Jurcic a novelist, but as usual with these beginnings of literature the same man may make a grammar, issue an almanack, and try all kinds of poetry. The two great Slavists Kopitar and Miklosich were Slovenes, but were led astray by race feeling to insist upon Old Slavonic being Old Slovene. They were succeeded by G. Krek and V. Oblak.

The chief centres of Slovene letters are the Matica or Linguistic and Literary Society and the Lyceum at Laibach. The Matica publishes a chronicle (Letopis) and there are many periodicals, chief of which are the Ljubljansky Zvon and Kres, the latter published at Klagenfurt. The liberal and clerical organs carry on a lively polemic.

The Slovene language is the most westerly of the South Slavonic group. It is very closely allied to Serbo-Croatian, but shows some points of resemblance to tech (retaining dl and //, loss of aorist, &c). It is split into eight dialects which differ among themselves widely. The people of Resia are sometimes classed quite apart. In phonetics Slovene is remarkable for the change of the original tj dj into i and j (our y) respectively, of ? into «, and for the coincidence of the old half vowels i and u in a dull e. In morphology it has retained the dual of both nouns and verbs more perfectly than any other

living language, also the supine and several periphrastic tenses: it has lost its aorist and imperfect, and its participles have mostly been fixed as so-called gerunds or verbal adverbs. The language has suffered much from Germanisms and even developed an article which has since been purified away. There is a free accent and the accented syllables may be long or short. The Resia dialect has preserved the Proto-Slavonic accent very exactly. The Slovenes have always used the Latin alphabet more or less clumsily : recently the orthography has been reformed after the manner of Cech, but uniformity has not yet been reached.

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SLUM, a squalid, dirty street or quarter in a city, town or village, inhabited by the very poor, destitute or criminal classes; over-crowding is frequently another characteristic (see Housing). The word is a comparatively recent one and is of uncertain origin. It has been doubtfully connected with a dialectal use of " slump " in the sense of a marshy, swampy place; cf. Ger. Schlamm, mud, and Eng. dialect slammock, slattern (Skeat, Etym. Diet., 1910).

SLUYS, BATTLE OF, fought on Saturday the 24th of June 1.330, one of the two sea-fights in which King Edward III. of England commanded in person, the other being that called Espagnols-sur-Mer (q.v.). The place of the encounter was in front of the town of Sluis, Sluys, or in French Ecluse, on the inlet between West Flanders and Zeeland. In the middle of the 14th century this was an open roadstead capable of holding large fleets. It has now been silted up by the river Eede. A French fleet, which the king, in a letter to his son Edward the Black Prince, puts at 190 sail, had been collected in preparation for an invasion of England. It was under the command of Hue Quieret, admiral for the king of France, and of Nicholas Behuchet, who had been one of the king's treasurers, and was probably a lawyer. Part of the fleet consisted of Genoese galleys serving as mercenaries under the command of Barbavera. Although English historians speak of King Edward's fleet as inferior in number to the French, it is certain that he

sailed from Orwell on the 22nd of June with 200 sail, and that he was joined on the coast of Flanders by his admiral for the North Sea, Sir Robert Morley, with 50 others. Some of this swarm of vessels were no

doubt mere transports, for the king brought with him the house- hold of his queen, Philippa of Hainault, who was then at Bruges. As, however, one of the queen's ladies was killed in the battle, it would appear that all the English vessels were employed. Edward anchored at Blankenberghe on the afternoon of the 23rd and sent three squires to reconnoitre the position of the French. The Genoese Barbavera advised his colleagues to go to sea, but Behuchet, who as constable exercised the general command, refused to leave the anchorage. He probably wished to occupy it in order to bar the king's road to Bruges. The disposition of the French was made in accordance with the usual medieval tactics of a fleet fighting on the defensive. Quieret and Behuchet formed their force into three or four lines, with the ships tied to one another, and with a few of the largest stationed in front as outposts. King Edward entered the road, stead on the morning of the 24th, and after manceuvring to place his ships to windward, and to bring the sun behind him, attacked. In his letter to his son he says that the enemy made a noble defence " all that day and the night after." His ships were arranged in two lines, and it may be presumed that the first attacked in front, while the second would be able to turn the flanks of the opponent. The battle was a long succession of hand-to-hand conflicts to board or to repel boarders. King Edward makes no mention of any actual help given him by his Flemish allies, though he says they were willing, but the French say that they joined after dark. They also assert that the king was wounded by Behuchet, but this is not certain, and there is no testimony save a legendary one for a personal encounter between him and the French commander, though it would not be improbable. The battle ended with the almost total destruc- tion of the French. Quieret was slain, and Behuchet is said to have been hanged by King Edward's orders. Barbavera escaped to sea with his squadron on the morning of the 25th, carrying off two English prizes. English chroniclers claim that the victory was won with small cost of life, and that the loss of the French was 30,000 men. But no reliance can be placed on medieval estimates of numbers. After the battle King Edward remained at anchor several days, and it is probable that his fleet had suffered heavily.

Authorities. — The story of the battle of Sluys is told from the English side by Sir Harris Nicolas, in his History of the Royal Navy, vol. ii. (London, 1847); and from the French side by M. C. de la Ronciere, Histoire de la marine francaise, vol. i. (Paris, 1899). Both make copious references to original sources. (D. H.)

SLYPE, a variant of " slip " in the sense of a narrow passage; in

architecture, the name for the covered passage usually found in monasteries between the transept and the chapter-house, as at Winchester, Gloucester, Exeter and St Albans.

SMACK, a general term for a small decked or half-decked vessel, sailing under various rigs and used principally for fishing. The word, like so many sea terms, was borrowed from the Dutch, where smak, earlier smacke, is the name of a coasting vessel; it is generally taken as a corruption of snack, cf. Swed. snacka, Dan. snackke, a small sailing-vessel, and is to be referred to the root seen in " snake," " snail," the original meaning a gliding, creeping thing. " Smack," taste, and ." smack," a smart sounding blow or slap, also used of the sound of the lips in kissing or tasting, must be distinguished. In the first case the word is in O.E. smaec and is common to Teutonic languages, cf. Dan. smag, Ger. schmecken, &c; the second word is onomatopoeic, cf. " smash," and is also found in other Teutonic languages. It is not connected with the word meaning " taste," though no doubt confused owing to the sense of smacking the lips.

SMALL ISLES, a parish of islands of the Inner Hebrides, Inverness-shire, Scotland. It consists of the islands of Canna, Sanday, Rum, Eigg and Muck, lying, in the order named, like a crescent with a trend from N.W. to S.E., Canna being the most northerly and Muck the most southerly. They are separated from Skye by Cuillin Sound and from the mainland by the Sound of Ardnamurchan. The surface is moorland, pasture and mountain. They are rich in sea-fowl, the most common being the eider duck, puffin, Manx shearwater, black

guillemot, kittiwake and herring gull. The fisheries include cod, ling and herring. The rainfall amounts to 56 in. for the year, and the temperature is fairly high, the mean for the year being 47 5′ F. Steamers call at Eigg at regular intervals and less often at Rum and Canna. Canna (pop. 49), an island of basaltic rock, is situated about 10 m. from the nearest point of Skye, and measures 45 m. from E. to W. and 1 j m. from N. to S. Potatoes, barley and a little oats are grown, and the pasture being good the cattle are larger than most of the Hebridean breeds. The harbour is screened from south-westerly gales by the isle of Sanday. The antiquarian remains include a weather-worn sculptured stone cross and the ruins of a chapel of St Columba. Compass Hill (450 ft.) on the E. is so named from the alleged disturbance of the compasses of vessels passing within its sphere of influence. Sanday (pop. 44), another basaltic island, lies close to the S.E. of Canna. It measures if m. from E. to W. and 34 m. from N. to S. Some 3!

m. S.E. of Canna is the island of Rum (pop. 149), which is situated 85 m. from the nearest point of Skye, and measures 8f m. N. to S. and 8 m. from E. to W. Geologically, its northern half is composed of Torri- donian sandstone, with basalt at points between the West coast and the centre, of gabbro in the south-east, with a belt of gneis- sose rocks on its east seaboard and of quartz-porphyry in the south-west. It is mountainous in the south. Among the higher peaks are Askival (2659 ft.), Ashval (2552), Sgor-nan-Gillean (2503) and Allival (2368). On the north-west shore is a cliff where bloodstones are quarried. The mountains are a haunt of red deer. The harbour of the village of Kinloch, at the head of Loch Scresort, is resorted to during gales from the N.W. and S. Fully 4 m. S.E. and 75 m. from the nearest point of the mainland lies the island of Eigg, or Egg (pop. 211), measuring from N. to S. S m. and from E. to W. 3! m. It is in the main basaltic, but a band of quartz-porphyry runs from the centre in a north-westerly direction to the coast, and there is some oolitic rock on the north shores. On the north-east coast is a cave with a narrow mouth, opening into a hollow 255 ft. long. In it Macleod of Skye, towards the end of the 16th century, ordered 200 Macdonalds, inhabitants of the isle — men, women and children — to be suffocated, their bones being found long afterwards. The people are chiefly engaged in fisheries and cattle-rearing. Three m. S.W. is the island of Muck (pop. 42), which is about 15 m. long by 2\ m. broad and lies fully 5 m. from the nearest point of Ardnamurchan. It is almost wholly basaltic, but has some oolite at the head of the bay on its north side.

SMALLPOX, or Variola (varus, " a pimple "), an acute infectious disease characterized by fever and by the appearance on the surface of the body of an eruption, which, after passing through various stages, dries up, leaving more or less distinct cicatrices. (For pathology see Parasitic Diseases.) Few diseases have been so destructive to human life as smallpox, and it has ever been regarded with horror alike from its fatality, its loathsome accompaniments and disfiguring effects, and from the fact that no age and condition of life are exempt from liability to its occurrence. Although in most civilized countries its ravages have been greatly limited by the protection afforded by vaccination, yet epidemic outbreaks are far from uncommon, affecting especially those who are unprotected, or whose pro- tection has become weakened by lapse of time.

Much obscurity surrounds the early history of smallpox. It appears to have been imported into Europe from Asia, where it had been known and recognized from remote antiquity. The earliest accounts of its existence reach back to the middle and end of the 6th century, when it was described by Procopius and Gregory of Tours as occurring in epidemic form in Arabia, Egypt and the south of Europe. In one of the narratives of the expedition of the Abyssinians against Mecca (c. 550) the usual miraculous

details are combined with a notice of smallpox break- ing out ameng the invaders. 1 Not a few authorities, however,

'See Noldeke, Geschichte der Perser . . . aus Tabari (Leiden, 1879). P- 218. Noldeke thinks that this notice may be taken from genuine historical tradition, and seems to find an allusion to it in an old poem.

regard these accounts as referring not to smallpox, but to plague. The most trustworthy statements as to the early existence of the disease are found in an account by the 9th-century Arabian physician Rhazes, by whom its symptoms were clearly described, its pathology explained by a humoral or fermentation theory, and directions given for its treatment. During the period of the Crusades smallpox appears to have spread extensively through Europe, and hospitals for its treatment were erected in many countries. But at this period and for centuries after- wards the references to the subject include in all likelihood other diseases, no precise distinction being made between the different forms of eruptive fever. Smallpox was known in England as early as the 13th century, and had probably existed there before. It appears to have been introduced into America by the Spaniards in the early 16th century, and there, as in Europe and throughout the known world, epidemics were of frequent occurrence during succeeding centuries.

The only known factor in the origin of smallpox is contagion — this malady being probably the most contagious of all diseases. Its outbreak in epidemic form in a locality may frequently be traced to the introduction of a single case from a distance. The most direct means of communicating smallpox is inoculation. By far the most common cause of conveyance of the disease, however, is contact with the persons or the immediate surround- ings of those already affected. The atmosphere around a small- pox patient is charged with the products of the disease, which likewise cling to clothing, furniture &c. The disease is probably communicable from its earliest manifestations onwards to its close, but it is generally held that the most infectious period extends from the appearance of the eruption till the drying up of the pustules. Smallpox may also readily be communicated by the bodies of those who have died from its effects. No age is exempt from susceptibility to smallpox. Infants are occasion- ally born with the eruption or its marks upon their bodies, proving that they had undergone the disease in utero. Dark-skinned races are said to suffer more readily and severely than whites. One attack of smallpox as a rule confers immunity from any re- currence, but there are numerous exceptions to this rule. Over- crowding and all insanitary surroundings favour the spread of smallpox where it has broken out ; but the most influential con- dition of all is the amount of protection afforded to a community by previous attacks and by vaccination (q. v.). Such protection, although for a time most effectual, tends to

become exhausted unless renewed. Hence in a large population there is always likely to be an increasing number of individuals who have become susceptible to smallpox. This probably explains its occasional and even apparently periodic epidemic outbreaks in large centres, and the well-known fact that the most severe cases occur at the beginning — those least protected being necessarily more liable to be first and most seriously attacked.

Symptoms. — While the symptoms of smallpox are essentially the same in-character in all cases, they are variously modified according to the form which the disease may assume, there being certain well-marked varieties of this as of most other infectious maladies. The following description applies to an average case. After the reception into the system of the smallpox contagion the onset of the symptoms is preceded by a period of incubation, during which the patient may or may not complain. This period is believed to be from about ten to fourteen days. In cases of direct inoculation of the virus it is considerably shorter. The invasion of the symptoms is sudden and severe, in the form of a rigor followed by fever (the primary fever) , in which the tempera- ture rises to 103 or 104 Fahr. or higher, notwithstanding that perspiration may be going on. A quick pulse is present, together with thirst and constipation, while intense headache accompanied with vomiting and pain in the back is among the most char-acteristic of the initial symptoms. Occasionally the disease is ushered in by convulsions. These symptoms continue with greater or less intensity throughout two entire days, and during their course there may occasionally be noticed on various parts of the body, especially on the lower part of the abdomen and inner sides of the thighs, a diffuse redness accompanied by

slight spots of extravasation (petechiae), the appearance some- what resembling that of scarlet fever. These ” prodromal rashes,” as they are termed, appear to be more frequent in some epidemics than in others, and they do not seem to have any special signifi- cance. They are probably more frequently seen in cases of the mildest form of smallpox (formerly termed varioloid), referred to below as modified smallpox. On the third day the character- istic eruption begins to make its appearance. It is almost always first seen on the face, particularly about the forehead and roots of the hair, in the form of a general redness; but upon this surface there may be felt by the finger numerous elevated points more or less thickly set together. The eruption, which is accompanied by heat and itching, spreads over the face, trunk and extremities in the course of a few hours — continuing, however, to come out more abundantly for one or two days. It

is always most marked on the exposed parts; but in such a case as that now described the individual " pocks " are separated from each other (discrete). On the second or third day after its appearance the eruption undergoes a change — the pocks becoming vesicles filled with a clear fluid. These vesicles attain to about the size of a pea, and in their centre there is a slight depression, giving the char- acteristic umbilicated appearance to the pock. The clear contents of these vesicles gradually become turbid, and by the eighth or ninth day they are changed into pustules containing yellow matter, while at the same time they increase still further in size and lose the central depression. Accompanying this change there are great surrounding inflammation and swelling of the skin, which, where the eruption is thickly set, produce much disfigurement and render the features unrecognizable, while the affected parts emit an offensive odour, particularly if, as often happens, the pustules break. The eruption is present not only on the skin, but on mucous membranes, that of the mouth and throat being affected at an early period; and the swelling produced here is not only a source of great discomfort, but even of danger, from the obstruction thus occasioned in the upper portion of the air-passages. The voice is hoarse and a copious flow of saliva comes from the mouth. The mucous membrane of the nostrils is similarly affected, while that of the eyes may also be involved, to the danger of permanent impairment of sight. The febrile symptoms which ushered in the disease undergo marked abatement on the appearance of the eruption on the third day, but on the eighth or ninth, when the vesicles become converted into pustules, there is a return of the fever (secondary or suppurative fever), often to a severe extent, and not in- frequently accompanied by prominent nervous phenomena, such as great restlessness, delirium or coma. On the eleventh or twelfth day the pustules show signs of drying up (desiccation), and along with this the febrile symptoms decline. Great itching of the skin attends this stage. The scabs produced by the dried pustules gradually fall off and a reddish brown spot remains, which, according to the depth of skin involved in the disease, leaves a permanent white depressed scar — this " pitting " so characteristic of smallpox being specially marked on the face. Convalescence in this form of the disease is as a rule uninterrupted. Varieties. — There are certain varieties of smallpox depending upon the form it assumes or the intensity of the symptoms. Confluent smallpox (variola conflu-ens), while essentially the same in its general characters as the form already described, differs from it in the much greater severity of all the symptoms even from the onset, and particularly in regard to the eruption, which, instead of showing itself in isolated pocks, appears in large patches run together, giving a blistered aspect to the affected skin. This confluent condition is almost entirely confined to the face, and produces shocking disfigurement, while subsequently deep scars remain and the hair may be lost. The mucous membranes suffer in a similar degree of severity, and dangerous

complications may arise from the presence of the disease in the mouth, throat and eyes. Both the primary and secondary fevers are extremely severe. The mortality is very high, and it is generally estimated that at least 50% of such cases prove fatal, either from the violence of the disease or from one or other of the numerous complications which are specially apt to attend

upon it. Convalescence is apt to be slow and interrupted. Another variety is that in which the eruption assumes the haemorrhagic form owing to bleeding taking place into the pocks after their formation. This is apt to be accompanied with haemorrhages from various mucous surfaces (particularly in the case of females), occasionally to a dangerous degree and with symptoms of great prostration. Many of such cases prove fatal. A still more serious form is that termed malignant, toxic or purpuric smallpox, in which there is intense streptococcus septi- caemia, and the patient is from the onset overwhelmed with the poison and quickly succumbs — the rash scarcely, if at all, appearing or showing the haemorrhagic or purpuric character. Such cases are, however, comparatively rare. The term modified smallpox is applied to cases occurring in persons constitutionally but little susceptible to the disease, or in whom the protective influence of vaccination or a previous attack of smallpox still to some extent exists. Cases of this mild kind are of very common occurrence where vaccination has been systematically carried out. As compared with an average case of the unmodified disease as above described this form is very marked, the dif- ferences extending to all the phenomena of the disease. (1) As regards its onset, the initial fever is much milder and the pre- monitory symptoms altogether less in severity. (2) As regards the eruption, the number of pocks is smaller, often only a few and mostly upon the body. They not infrequently abort before reaching the stage of suppuration: but should they proceed to this stage the secondary fever is extremely slight or even absent. There is little or no pitting. (3) As regards complications and injurious results, these are rarely seen and the risk to life is insignificant.

Various circumstances affect the mortality in ordinary smallpox and increase the dangers attendant upon it. The character of the epidemic has an important influence. In some outbreaks the type of the disease is much more severe than in others, and the mortality consequently greater.

In 1901 and 1903 there were epidemics in the United States in which it was only 2 . The mortality in the Philadelphia epidemic is given by Welch and Schamberg as 26-89 °i in 7204 cases, while in the .Glasgow epidemic of 1900-1901, it reached 51-6 in the un- vacciijlated and 10-4% in the vaccinated. Belovtare some particu- lars of the annual death rate. ˆ

Smallpox Death Rate, England and Wales.

Years.

*Number of Deaths from Smallpox.**

Deaths from

Smallpox

to every

Million living.

1902 1903 1904

1905 1906 1907 1908

2464

760

507

116

21

10

12

75 23 15

4

o-6

o-3 o-3

**Deaths entered as being from chicken-pox are not included, though many are probably due to the graver disease.*

Smallpox is most fatal at the extremes of life, except in the case of vaccinated infants, in whom there is immunity from the disease. Again, any ordinary case with discrete eruption is serious, and a case of confluent or even semi-confluent character is much more grave, while the haemorrhagic variety is frequently, and the toxic always, fatal. Numerous and often

dangerous complications, although liable to arise in all cases, are more apt to occur in the severer forms, and in general at or after the supervention of the secondary fever. The most important are inflammatory affections of the respiratory organs, such as bronchitis, pleurisy or pneumonia, diphtheritic conditions of the throat, and swelling of the mucous membrane of the larynx and trachea. Destructive ulceration affecting the eyes or ears is a well- known and formidable danger, while various affections of the skin, in the form of erysipelas, abscess or carbuncles, are of not infrequent occurrence.

The prophylaxis of smallpox depends on successful vaccination and re-vaccination (see Vaccination), together with the estab- lishment of smallpox hospitals for the treatment of the disease when it has broken out, to which the patient should be at once removed, and those who have been in contact with the patient should be promptly re-vaccinated. The efficiency of the

taxis and treatment.

protection given by vaccination and systematic re-vaccination is demonstrated by the almost entire suppression of the disease in Germany (see Dr Bruce Low's Report to the Local Govern- Prophy ment Board, 1903-1904). Mrs Garrett Anderson,writing to The Times in September 1903, showed the enormous expense laid on the rates in England for the main- tenance of smallpox hospitals in order to counteract inefficient vaccination. London with a population of 6J millions reserves 2500 beds in a hospital removed from the city; Berlin with a population of 2 millions reserves 12 beds in the pavilion of a general hospital; Dresden with a population of 500,000 reserves 20 beds in the Friedrichstadt Hospital, but no case was admitted for 10 years previous to the Report. In Stuttgart (population 200,000) a hut of six beds is set aside for smallpox, but it has fallen into bad repair from disuse. Smallpox cases in Germany are usually sporadic cases introduced by foreigners. Where persons have been exposed to the infection of smallpox, if immediate vaccination fails to protect them from the disease, it has been shown to considerably modify the type. The plan of identification and surveillance of all contact cases has given good results. In the Bristol epidemic of 1908 there were 35 cases and 9 deaths. The contacts numbered 1354, and 16,398 visits of inspection were paid.

The patient should lie on a soft bed in a well-ventilated but somewhat darkened room and be fed with the lighter forms of nutriment, such as

milk, soups, &c. The skin should be sponged occasionally with tepid water, and the mouth and throat washed with an antiseptic solution. In a severe case, with evidence of much prostration, stimulants may be advantageously employed. The patient should be always carefully watched, and special vigilance is called for where delirium exists. This symptom may sometimes be lessened by sedatives, such as opium, bromides or chloral. With the view of preventing pitting many applica- tions have been proposed, but probably the best are cold or tepid compresses of l%ht weight kept constantly applied over the face and eyes. The water out of which these are wrung may be a weak solution of carbolic or boracic acid. When the pustules have dried up the itching this produces may be much relieved by the application of oil or vaseline.

What is known as the red light treatment, in which the actinic or chemical rays are excluded, has been advocated by Prof. Niels Finsen of Copenhagen and others. He considers it valuable only in that it protects the pustule from the deleterious effects of light, and he and other observers claim that if resorted to early it abolishes suppuration in the pustules, lessens scarring and shortens the course of the disease. Medical opinion in England is divided as to its merit. Herbert Peck of Chesterfield, in 244 cases so treated in 1902-1905, had only 6 deaths, a mortality of 2-4%, while the case mortality during the same period was, Lancashire 58%, Derbyshire 6%, Cheshire 6-4%, Liverpool 2-7% and Manchester 5-6% in cases treated without red light. An interesting fact in connection with the treatment is its great antiquity in China and Japan, while in England in the middle ages smallpox patients wore red garments and lay in beds where the light filtered through red curtains.

Complications are to be dealt with as they arise, and the severer forms of the disease treated in reference to the special symptoms presented. In cases where the eruption is tardy of appearing and the attack threatens to assume the toxic form, marked benefit attends the use of the wet pack. Disinfectants should be abundantly employed in the room and its vicinity, and all clothing, &c, in contact with the patient should be exposed to the vapour of formalin. Beclere, Thomson and Brownlee have advocated the use of the serum of immunized heifers. The dose, however, requires to be very large, being equivalent to one-fiftieth part of the body weight in adults and one-twentieth part in children.

Inoculation. — Previously to the introduction of vaccination iq.v.) the method of preventive treatment by what was known as inoculation had been employed. This consisted in introducing into the system — in a similar way to the method now commonly employed in vaccina- tion — the smallpox virus from a mild case with the view of repro- ducing the disease also in a mild form in the person inoculated, and

thus affording him protection from further attack. This plan had apparently been resorted to by Eastern nations from an early period in the histoty of the disease. During the latter part of the Ming dynasty there was introduced into China a system of inoculation in which the method was to blow the pulverizedgerm-laden crusts from a small-pox pustule through a silver tube into the nostril, the left being chosen in a male, the right in a female. Inoculation was known tp be extensively practised in Turkey in the beginning of the 1 8th century, when, chiefly through the letters of Lady Mary Wortley Montagu, it became known and was speedily adopted in England. There is no doubt, both from the statistics of the Smallpox and Inoculation Hospital, London, and from the testimony of physicians throughout the country, that this practice made a marked impression upon the fatality of the disease, and was itself attended with ex- tremely little risk to life. The objections to it, howeyer, were great, for, although usually conveying the smallpox in a mild form, it not infrequently took effect severely, and, while death might be averted, the disfiguring results of the disease remained. Further, each inocu- lated person upon whom the operation took effect became for the time being a possible source of infection to others, and in point of fact the practice tended to spread the disease and so to increase the general mortality. Although inoculation continued to be practised for a number of years subsequently to Jenner's great discovery, it gradually became displaced by vaccination, and in 1840 an Act of Parliament was passed rendering smallpox inoculation unlawful in England.

SMALRIDGE, GEORGE (1663-17 19), English bishop, was born at Lichfield, where he received his early education, this being completed at Westminster school and at Christ Church, Oxford. His political opinions were largely modelled on those of his friend Francis Atterbury, with whom he was associated at Oxford and elsewhere. After being a tutor at Christ Church, he was minister of two chapels in London, and for six or seven years he acted as deputy for the regius professor of divinity at Oxford ; his Jacobite opinions, however, prevented him from securing this position when it fell vacant in 1707. In 17 11 he was made dean of Carlisle and canon of Christ Church, and in 17 13 he succeeded Atterbury as dean of Christ Church. In the following year he was appointed bishop of Bristol, but retained his deanery. In 1 7 15 Smalridge refused to sign the declaration against the pre- tender, James Edward, defending his action in his Reasons for not signing the Declaration. In other ways also he showed animus against the house of Hanover, but his only punishment was his removal from the post of lord almoner to the king. He died on the 27th of September 17 19. The bishop was esteemed by Swift, Steele, Whiston and other famous men of his day, while Dr Johnson declared his sermons to be of the highest class. His Sixty Sermons, preached on Several Occasions,

was published in 1726; other editions 1827, 1832, 1853 and 1862.

SMALTITE, a mineral consisting of cobalt diarsenide (CoAs 2). It crystallizes in the cubic system with the same hemihedral symmetry as pyrites; crystals have usually the form of cubes or cubo-octahedra, but are imperfectly developed and of some- what rare occurrence. More often the mineral is found as compact or granular masses. The colour is tin-white to steel- grey, with a metallic lustre; the streak is greyish black. Hard- ness 55 ; specific gravity 6-5. The cobalt is partly replaced by iron and nickel, and as the latter increases in amount there is a passage to the isomorphous species chloanthite (NiAs 2). It occurs in veins with ores of cobalt, nickel, copper and silver: the best known locality is Schneeberg in Saxony. The name smaltite was given by F. S. Beudant, in 1832, because the mineral was used in the preparation of smalt for producing a blue colour in porcelain and glass. (L. J. S.)

SMART, CHRISTOPHER (1722-1771), English poet, son of Peter Smart, of an old north country family, was born at Ship- bourne, Kent, on the 1 ith of April 1722. His father was steward for the Kentish estates of William, Viscount Vane, younger son of Lord Barnard of Raby Castle, Durham. Christopher Smart received his first schooling at Maidstone, and then at the grammar school of Durham. He spent part of his vacations at Raby Castle, and his gifts as a poet gained him the patronage of the Vane family. Henrietta, duchess of Cleveland, allowed him a pension of £40 which was paid until her death in 1742. Thomas Gray, writing to his friend Thomas Wharton in 1747, warned him to keep silence about Smart's delinquencies lest they should

come to the ears of Henry Vane (afterwards earl of Darlington), and endanger his allowance. At Cambridge, where he was entered at Pembroke College in 1739, he spent much of his time in taverns, and got badly into debt, but in spite of his irregularities he became fellow of his college, praelector in philosophy and keeper of the common chest in 1745. In November 1747 he was compelled to remain in his rooms for fear of his creditors. At Cambridge he won the Seaton prize for a poem on " one of the attributes of the Supreme Being " in 1750 (he won the same prize in 1751, 1752, 1753 and 1755); an d a farce entitled A Trip to Cambridge, or The Grateful Pair, acted in 1747 by the students of Pembroke, was from his pen. In 1750 he contributed to The Student, or The Oxford and Cambridge Monthly Miscellany. During one of his visits to London he had made the acquaintance of John Newbery, the publisher, whose step-daughter, Anna

Maria Carman, he married, with the result of forfeiting his fellow- ship in 1753. About 1752 he permanently left Cambridge for London, though he kept his name on the college books, as he had to do in order to compete for the Seaton prize. He wrote in London under the pseudonym of " Mary Midnight " and " Pent- weazle." He had edited The Midwife, or the Old Woman's Magazine (1751-1753), and had a hand in many other " Grub Street " productions. Some criticisms made by " Sir " John Hill (i7i6?i775) on his Poems on Several Occasions (1752) provoked his satire of the Hilliad (1753), noteworthy as providing the model for the Rolliad. In 1756 he finished a prose transla tion of Horace, which was widely used, but brought him little profit. He agreed in the same year to produce a weekly paper entitled The Universal Visitor, for which Samuel Johnson wrote some numbers. In 1751 Smart had shown symptoms of mental aberration, which developed into religious mania, and between 1756 and 1758 he was in an asylum. Dr Johnson visited him and thought that he ought to have been at large. During his confine- ment he conceived the idea of the single poem that has made him famous, " A Song to David," though the story that it was indented with a key on the panels of his cell, and shaded in with charcoal, may be received with caution. It shows no trace of morbid origin. After his release Smart produced other religious poems, but none of them shows the same inspiration. His wife and children had gone to live with friends as he was unable to support them, and for some time before his death, which took place on the 21st of May 1771, he lived in the rules of King's Bench, and was supported by small subscriptions raised by Dr Burney and other friends.

Of all that he wrote, " A Song to David " will alone bear the test of time. Unlike in its simple forceful treatment and impressive directness of expression, as has been said, to anything else in 18th- century poetry, the poem on analysis is found to depend for its unique effect also upon a certain ingenuity of construction, and the novel way in which David's ideal qualities are enlarged upon. This will be more readily understood on reference to the following verse, the first twelve words of which become in turn the key-notes, so to speak, of the twelve succeeding verses: —

" Great, valiant, pious, good, and clean,

Sublime, contemplative, serene, Strong, constant, pleasant, wise !

Bright effluence of exceeding grace ;

Best man ! — the swiftness, and the race, The peril, and the prize." The last line is characteristic of another peculiarity in " A Song to David," the effective use of alliteration to complete the initial energy of the stanza in many instances. But in the poem throughout is revealed a poetic quality

which eludes critical analysis.

From the Poems of the late Christopher Smart (1791) the " Song to David " (pr. 1763) was excluded as forming a proof of his mental aberration. It was reprinted in 1819, and has since received abundant praise. In an abridged form it is included in T. H. Ward's English Poets, vol. iii., and was reprinted in 1895, and in 1901 with an introduction by R. A. Streatfeild. Smart's other poems are in- cluded in Anderson's British Poets. Christopher Smart is one of Robert Browning's subjects in The Parleyings with Certain People (1887). See also the contributions to Notes and Queries of March 25th and May 6th, 1905, by the Rev. D. C. Tovey, who has read, and in some places revised, the above article.

SMART, SIR GEORGE THOMAS (1776-1867), English musician,, was born in London, his father being a music-seller. He was a choir-boy at the Chapel Royal, and was educated in

music, becoming an expert violinist, organist, teacher of singing and conductor; and in 181 1 he was knighted by the lord- lieutenant of Ireland, having conducted a number of successful concerts in Dublin. Sir George Smart was, from that time onwards, one of the chief musical leaders and organizers in England, conducting at the Philharmonic, Covent Garden, the provincial festivals, &c, and in 1838 being appointed com- poser to the Chapel Royal. He was a master of the Handelian traditions, was personally acquainted with Beethoven and a close friend of Weber, who died in his house. His church music and glees include some well-known compositions. He died in London on the 23rd of February 1867. His brother Henry (1778-1823), father of the composer Henry Smart (q.v.), was also a prominent musician in his day.

SMART, HENRY (1813-1879), English organist and musical composer, born in London on the 26th of October 1813, was a nephew of Sir George Smart (q.v.). He studied firsc for the law, but soon gave this up for music. In 1831 he became organist of Blackburn parish church, where he wrote his first important work, a Reformation anthem; then of St Giles's, Cripplegate; St Luke's, Old Street; and finally of St Pancras, in 1864, which last post he held at the time of his death on the 6th of July 1879, less than a month after receiving a government pension of £100 per annum. Although Smart is now known chiefly by his com- positions for the organ, which are numerous, effective and melodious, if not strikingly original, he wrote many vocal works, including some of the best specimens of modern part songs. His cantata, The Bride of Dunkerron, was written for the Birmingham festival of 1864; Jacob for Glasgow, in 1873; and his opera, Bertha, was produced with some success at the Haymarket in 1855. In the last fifteen years of his life Smart was practically blind.

SMART, JOHN (c. 1740-1811), English miniature painter, was born in Norfolk; he became a pupil of Cosway, and is frequently alluded to in his correspondence. This artist was director and vice-president of the Incorporated Society of Artists, and ex- hibited with that society. He went to India in 1788 and obtained a number of commissions in that country. He settled down in London in 1797 and there died. He married Edith Vere, and is believed to have had only one son, who died in Madras in 1809. He was a little man, of simple habits, and a member of the Society of Sandemanians. Many of his pencil drawings still exist in the possession of the descendants of a great friend of his only sister. Several of his miniatures are in Australia and belong to a cadet branch of the family. His work is entirely different to that of Cosway, quiet and grey in its colouring, with the flesh tints elaborated with much subtlety and modelled in exquisite fashion. He possessed a great knowledge of anatomy, and his portraits are drawn with greater anatomical accuracy and possess more distinction than those of any miniature painter of his time.

See The History of Portrait Miniatures, by G. C. Williamson, vol. ii. (London, 1904). (G. C. W.)

SMEATON, JOHN (1724-1792), English civil engineer, was born at Austhorpe Lodge, near Leeds, on the 8th of June 1724. He received a good education at the grammar school of Leeds. At an early age he showed a liking for the use of mechanical tools, and in his fourteenth or fifteenth year contrived to make a turning- lathe. On leaving school in his sixteenth year he was employed in the office of his father, an attorney, but, after attending for some months in 1 742 the courts at Westminster Hall, he requested to be allowed to follow some mechanical profession. He became apprentice to a philosophical instrument maker, and in 1750 set up in business on his own account. Besides improving various mathematical instruments used in navigation and astronomy, he carried on experiments in regard to other mechanical appliances, amongst the most important being a series on which he founded a paper— for which he received the Copley medal of the Royal Society in 1759— entitled An Experimental Inquiry concerning the Native Powers of Water and Wind to turn Mills and other Machines depending on a Circular Motion. In 1754 he made a tour of the Low Countries to study the great canal

works of foreign engineers. Already by his papers read before the Royal Society and his intercourse with scientific men his abilities as an engineer had become well known, and in 1756 application was made to him to

reconstruct the Eddystone lighthouse, which had been burnt down in December of the previous year. After the completion of the new tower in 1759, Smeaton's advice was frequently sought in regard to important engineering projects, including the construction of canals (especially the Forth and Clyde canal), the drainage of fens, the designing of harbours and the repair and erection of bridges, though many of the schemes he drew up were not carried out on account of the general lack of capital. He was also employed in designing numerous waterwheels, windmills, pumps, and other mechanical appliances. A considerable portion of his time was devoted to astronomical studies and observations, on which he read various papers before the Royal Society. A year before his death he announced that he wished " to dedicate the chief part of his remaining time to the description of the several works performed under his direction," but he completed nothing more than the Narrative of the Building of the Eddystone Light-house, which had already appeared. He died at Austhorpe on the 28th of October 1792, and was buried in the old parish church of Whitkirk.

See John Holmes, A Short Narrative of the Genius, Life and Works of the late Mr John Smeaton (1793); and S. Smiles, Lives of the Engineers.

SMEDLEY, FRANCIS [Frank] EDWARD (1818-1864), English novelist, was born at Great Marlow, Buckinghamshire, on the 4th of October 1818, a member of a Flintshire family. A cripple from his birth, he was educated privately, and contri- buted his first book, Scenes from the Life of a Private Pupil, anonymously to Sharpe's London Magazine in 1 846-1 848. His first essay proved so successful that it was expanded into Frank Fairleigh, and published in book-form in 1850. His next book Lewis A rundel: or the Railroad of Life was originally contributed to the same magazine, which he for some time edited, and was published in book-form in 1852. Of his other writings the best- known is Harry Coverdale's Courtship (1855). These are all capital stories, racily told. Either Hablot Knight Browne (" Phiz ") or George Cruikshank supplied illustrations for most of his books. Smedley died in London on the 1st of May 1864.

SMEDLEY, WILLIAM THOMAS (1858-), American artist, was born in Chester county, Pennsylvania, of a Quaker family, on the 26th of March 1858. He worked on a newspaper, then studied engraving and art in Philadelphia, in the Pennsylvania Academy of the Fine Arts, and — after making a tour of the South Seas — in Paris under Jean Paul Laurens. He settled in New York City in 1880; in 1882 went with the Marquis of Lome through Canada, preparing sketches for Picturesque Canada; and in 1905 became a member of the National Academy of Design. Most of his work was magazine and book illustration for stories of modern life, but he painted portraits and water colours, and received the Evans Prize of the American Water Color Society in 1 890, and a bronze medal at the Paris

Exposition of 1900.

SMELL (connected etymologically with " smoulder " and " smoke "), a sensation excited by the contact with the olfactory region(see Olfactory Organ, for anatomy) of certain substances, usually in a gaseous condition and necessarily in a state of fine subdivision. The sense is widely distributed throughout the animal kingdom. The lower animals, especially those breathing in water, become cognizant of the presence of odoriferous matter near them without touch, vision or hearing, and we suppose that they do so by some sense of taste or smell, or a combination of both. In such cases smell has been appropriately termed " taste at a distance," by which is meant that particles of matter may be diffused through the water so as to come into contact with the terminal organ, and give rise to a sensation such as would have been excited had the matter from which the particles emanated come directly into contact with the nerve-endings. It is therefore of no great importance whether such sensations in humlple aquatic organisms are termed taste or smell. In the

higher air-breathing animals, however, the senses are differen- tiated: that of taste is found at the entrance of the alimentary canal, whilst that of smell guards the opening of the respiratory tract This view assists in the interpretation of various structures met with in the lower forms which have been fairly regarded by naturalists as olfactory organs. It has not yet been decided whether the sense of smell depends, in the first instance, on a chemical or on a physical process. All that can be said is that sensory impulses are excited when odoriferous particles come into contact with the free ends of peculiar rod-like cells found in the olfactory mucous membrane. The free olfactory surface is always covered with a thin layer of fluid, and all odoriferous matters must be dissolved in this fluid so as to reach the rod-cells. There is here an analogy with the conditions found in the sense of taste, where sapid substances must be soluble in the fluid of the mouth. The intensity of the sensation of smell depends on the size of the area of the olfactory membrane affected. No satisfactory classification of odours can be given.

The interior of the nose (see Olfactory Organ and Epi- thelial and Endothelial Tissue) is divided physiologically into two portions — (1) the upper (regio olfactoria), which embraces the upper part of the septum, the upper turbinated

From Klein's Alias of Histology

Longitudinal section through the olfactory membrane of guinea- pig. Xabout 400. I, Olfactory epithelium on free surface; 2, Plexus of olfactory nerve-fibres; 3, Pouches of serous glands containing epithelial cells.

bone, and a portion of the middle turbinated bone; and (2) the lower portion of the cavity {regio respiratoria). The olfactory region proper has a thicker mucous membrane than the res- piratory; it is covered by a single layer of epithelial cells, often branched at their lower ends and containing a yellow or brownish red pigment; and it contains peculiar tubular glands named " Bowman's glands." The respiratory portion contains ordinary serous glands. In the olfactory region also are the terminal organs of smell. These are long narrow cells passing to the sur- face between the columnar epithelium covering the surface. The body of the cell is spindle-shaped and it sends up to the surface a delicate rod-like filament, whilst the deeper part is continuous with varicose nerve -filaments, the ends of the olfactory nerve.

Physical Causes of Smell.- — Electrical or thermal stimuli do not usually give rise to olfactory sensations. J. Althaus states that electrical stimulation caused a sensation of the smell of phosphorus. To excite smell it is usually supposed that substances must be present in the atmosphere in a state of fine subdivision, or existing as vapours or gases. The fineness of the particles is remarkable, because if the air conveying an odour be filtered through a tube packed with cotton wool and inserted into the nose a smell is still discernible. This proceeding completely removes from the air micro-organisms less than the ■nnfWTffh of an inch in diameter. A grain or two of musk will scent an apartment for years and at the end of the time no appreciable loss of weight can be detected. Substances exciting smell are no doubt usually gases or vapours. Sir William Ramsay has endeavoured to connect the sense with the chemical

constitution of the substance. The following gases have no smell: — hydrogen, oxygen, nitrogen, water gas, marsh gas, olefiant gas, carbon monoxide, hydrochloric acid, formic acid vapour, nitrous oxide and ammonia. (It is necessary, of course, to distinguish between the sensation of smell and the irritant action of such a gas as ammonia.) The gases exciting smell are chlorine, bromine, iodine, the compounds of the first two with oxygen and water, nitric peroxide, vapours of phosphorus and sulphur, arsenic, antimony, sulphurous acid, carbonic acid, almost all the volatile compounds of carbon except those already mentioned, some compounds of selenium and tellurium, the compounds of chlorine, bromine and iodine with the above- named elements, and some metals. Chlorine, bromine, iodine, sulphur, selenium and tellurium, which are volatile and give off vapour at ordinary temperatures, have each a characteristic smell. Ramsay points out that as a general rule substances having a low

molecular weight have either no smell or simply cause irritation of the nostrils. He also shows that in the carbon compounds increase of specific gravity as a gas is associated to a certain point with a sensation of smell. Take the marsh gas or methane series commonly called the paraffins. The first two have no smell; ethane (fifteen times as heavy as hydrogen) has a faint smell; and it is not till butane (thirty times heavier than hydrogen) that a distinct sensation of smell is noticed. Again, a similar relation exists among the alpohols. Methyl alcohol has no smell. Ethyl, or ordinary alcohol free from ethers and water, has a faint smell; " and the odour rapidly becomes more marked as we rise in the series, till the limit of volatility is reached, and we arrive at solids with such a low vapour tension that they give off no appreciable amount of vapour at the ordinary temperature." Acids gain in odour with increase in density in the form of gas. Thus formic acid is devoid of smell; acetic acid has a characteristic smell; and the higher acids of the series — propionic, butyric, valerianic — increase in odour. It would appear also that " the character of a smell is a property of the element or group which enters into the body producing the smell, and tends to make it generic." Many compounds of chlorine, hydrogen, compounds of sulphur, selenium and tellurium, the paraffins, the alcohols, the acids, the nitrites, the amines, the pyridine series, the benzene group, have each a characteristic odour. To produce the sensation of smell a sub- stance must have a molecular weight at least fifteen times that of hydrogen. For instance, the specific gravity of marsh gas is eight (no smell), of ethane fifteen (faint smell), of propane twenty-two (distinct smell). Again prussic acid, has a specific gravity of fifteen, and many persons fail to detect its odour. There is a relation between the molecular weight of a gas and the presence or absence of odour. Gases of less than a certain molecular weight are odourless, and it is significant that to some persons hydrocyanic acid, which has a low molecular weight, gives rise to no sensation of smell. It has also been pointed out by J. B. Haycraft that chemical compounds of elements belonging to the same group, according to the well-known periodic law of Mendeleeff, have sometimes odours of a similar character (see article " Smell," Schafer's Physiology, vol. ii. p. 1254). T. Graham pointed out that odorous substances are in general readily oxidized. J. Tyndall showed that many odorous vapours have a considerable power of absorbing heat. Taking the absorptive capacity of the air as unity, the following absorptions were observed in the respective cases: —

Name of Perfume.

Absorption 1 per 100.

Name of Perfume.

Absorption

per 100.

Patchouli

30

Lavender .

60

Sandal-wood .

3 2

Lemon

65

Geranium ‘

33

Portugal .

67

Oil of cloves

33-5

Thyme

68

Otto of roses .

36-5

Rosemary .

74

Bergamot .

44

Oil of laurel .

80

Neroli ….

47

In comparison with the air introduced in the experiments the weight of the odours must be almost infinitely small. " Still we find that the least energetic in the list produces thirty times the

effect of the air, whilst the most energetic produces 100 times the same effect." '

Venturi,- B. Prevost and Liegeois have studied the well- known movements of odoriferous particles, such as camphor, succinic acid, &c, when placed on the surface of water, and they have suggested that all odoriferous substances in a state of fine subdivision may move in a similar way on the moist surface of the olfactory membrane, and thus mechanically irritate the nerve- endings. This explanation is too coarse; but it is well known that the odours of flowers are most distinctly perceived in the morning, or after a shower, when the atmosphere contains a considerable amount of aqueous vapour. It would appear also that the odours of animal effluvia are of a higher specific gravity than the air, and do not readily diffuse— a fact which may account for the pointer and bloodhound keeping their noses to the ground. Such smells are very persistent and are apparently difficult to remove from any surface to which they have become attached. The smell of a corpse may haunt a living person for days, notwithstanding copious ablutions and change of clothes.

Special Physiology of Smell, — It is necessary that the air containing the odour be driven forcibly against the membrane. Thus the nostrils may be filled with eau de Cologne in normal saline solution, or with air impregnated with sulphuretted hydrogen, and still no odour is experienced if the person does not breathe: When a sniff is made the air within the nasal passages is rarefied, and, as the air rushes in to equilibrate the pressure, it is forcibly propelled against the olfactory surface. When the air stream enters the nostrils, it passes vertically upwards, bends round and sweeps backwards and downwards at the level of the middle turbinated bones towards the posterior nares. There is a motion of the air over the olfactory surface. The olfactory surface must be moist ; if it is dry, or is covered with too thick a layer of mucus (as in catarrh), the sense is much weakened or lost. The first moment of contact is the most acute and the sense quickly becomes blunted. The first scent of a flower is the strongest and sweetest; and after a few minutes' ex- posure the intensity of even a foetid odour may not be perceived. This fact may be accounted for on the supposition that the olfactory membrane becomes quickly coated with a

thin layer of matter, and that the most intense effect is produced when the odoriferous substances are applied to a clean surface. The intensity of smell depends on (1) the area of olfactory surface affected, and (2) the degree of concentration of the odoriferous matter. It is said that musk to the amount of the two-millionth of a milligram, and one part of sulphuretted hydrogen in 1,000,000 parts of air, may be perceived. The smell of mercaptan has been experimentally de- tected when the dilution was I to 50,000,000,000, and it was cal- culated that the weight of mercaptan so detected in 50 cc. of air was 1/400,000,000 of a milligram (E. Fischer and Penzolalt). If the two nostrils are filled with different odorous substances, there is no mixture of the odours, but we smell sometimes the one and some- times the other. Morphia, mixed with sugar and taken as snuff, paralyses the olfactory apparatus, while strychnine makes it more sensitive (Lichtenfels and Frolich). There is no evidence that there are in the olfactory region different end organs or olfactory cells for different odours. The sense, however, may be fatigued by one odour so that other odours are not experienced. Thus camphor may so fatigue the sense that ether and eau de Cologne cannot excite smell. As a rule, we experience odours by the simultaneous use of both nostrils. Stimulation of either nostril would give rise to the sensaˆ tion, while there is a fusion of sensations when both are affected. If, by means of a tube, an odour is conveyed into one nostril, while an odour of a different kind is directed into the other, there may be either a compound sensational effect, a sort of double-odour, or one odour may so predominate as entirely to destroy the other. The fusion of odours is not complete, and it is similar to the effect of combining, say blue and red, in stereoscopic vision. When one odour destroys the other, the obliteration must take place in the cerebral centre. Certain odours are antagonistic, such as musk and oil of bitter almonds, volatile oils and iodoform, ammonia and acetic acid. It is not unlikely that when one odour predominates among many, this may be due not to any chemical action of one substance over another, but that the missing sensations may be accounted for by their failure to excite the olfactory region of the cerebrum in the presence of a stronger stimulus.

The delicacy of the sense is much greater in many of the lower animals than in man, and it is highly probable that the dog or cat obtain information by means of this sense which a human being cannot get. Odours may excite in the minds of many animals vivid impressions, and they have probably a memory of smells which the human being does not possess. Even in man the sense may be greatly improved by exercising it. A boy, James Mitchell, was born

1 Tyndall, Contributions to Molecular Physics in Domain of Radiant Heat, p. 99.

blind, deaf and dumb, and chiefly depended on smell for keeping up a connexion with the outer world. He readily observed the presence of a stranger in the room and he formed his opinions of persons apparently from their characteristic smells (see Dugald Stewart's Works, iv. 300). In some rare cases, the sense of smell is congenitally absent in human beings, and it may be much injured by the practice of snuffing or by diseases of the nose affecting the olfactory membrane. Subjective impressions of smells, like spectral illusions or sounds in the ears, are occasionally, but rarely, observed in cases of hysteria and in the insane. Excessive smoking injures the sense. Finally, it may be observed that the sense of odour gives information as to the characters of food and drink and as to the purity of the air. Some persons are sensitive to certain smells while they do not recognize others, such as hydrocyanic acid or mignonette. In the lower animals also, the sense is associated with the sexual functions. (J. G. M.)

SMELT (Osmerus eperlanus; Fr. eperlan; Scotch sparling or spirling), the common small European fish of the genus Osmerus, family Salmonidae. It breeds, unless land-locked, in salt or brackish water, and though it often enters rivers it does not ascend beyond tidal influence. Like other British Salmonids it spawns in winter. The true smelt inhabits the coasts of northern and central Europe, and allied species are known from the Atlantic and Pacific coasts of North America (Osmerus mordax, O. thaleichthys, O. Japonicus).

SMERDIS (Pers. Bardiya; by Ctesias, Pers. 8, called Tany- oxarces; by Xenophon, Cyrop. viii. 7. 11, who takes the name from Ctesias, Tanaoxares; by Justin i. 9, Mergis; in Aeschylus, Pers. 774, Mardos), a Persian king of infamous memory; the prevalent Greek form Smerdis has assimilated the Persian name to the Greek (Asiatic) name Smerdis or Smerdies, which occurs in the poems of Alcaeus and Anacreon. Smerdis was the younger son of Cyrus the Great who, according to Ctesias, on his deathbed appointed him governor of the eastern provinces (cf. Xen. Cyrop. viii. 7, n). Before Cambyses set out to Egypt, he secretly caused him to be murdered (Darius in the Behistun Inscr. i. 10), being afraid that he might attempt a rebellion during his absence. His death was not known to the people, and so in the spring of 522 a usurper pretended to be Smerdis and proclaimed himself king on a mountain near the Persian town Pishiyauvada. Owing to the despotic rule of Cambyses and his long absence in Egypt, " the whole people, Persians, Medes and all the other nations," acknowledged the usurper, especially as he granted a remission of taxes for three years (Herod, iii. 68). Cambyses began to march against him, but

seeing that his cause was hopeless, killed himself in the spring of 521 (but see further Cambyses) . The real name of the usurper was, as Darius tells us, Gaumata, a Magian priest from Media; this name has been preserved by Justin i. 9 (from Charon of Lampsacus?), but given to his brother (called by Herodotus Patizeithes), who is said to have been the real promoter of the intrigue; the true name of the usurper is here given as Oropastes; by Ctesias as Sphendadates.

The history of the false Smerdis is narrated by Herodotus and Ctesias according to official traditions ; Cambyses before his death confessed to the murder of his brother, and in public explained the whole fraud. But, as Darius said, nobody had the courage to oppose the new king, who ruled for seven months over the whole empire. Some contracts dating from his reign have been found in Babylonia, where his name is spelt Barziya (for the chronology cf. Ed. Meyer, Forschungen zur alien Geschichte, ii. 472 fL). Darius says that he destroyed some temples, which Darius restored, and took away the herds and houses of the people (Behistun Inscr. i. 14). We have no means of explaining this statement, nor can we fully understand all the incidents con- nected with his usurpation; but the attempts of modern authors to prove that Gaumata in reality was the genuine Smerdis and Darius a usurper have failed. It is certain that Smerdis trans- ferred the seat of government to Media; and here in a castle in the district of Nisaya he was surprised and killed by Darius and hij six associates in October 521. His death was annually cele- brated in Persia by a feast called " the killing of the magian," at which no magian was allowed to show himself (Herod, iii. 79, Ctes. Pers. 15).

In the next year, another pseudo-Smerdis, named Vahyazdata, rose against Darius in eastern Persia and met with great success. But he was finally defeated, taken prisoner and executed (Behistun Inscr. iii. 40 ff . ; perhaps he is identical with the King Maraphis " the Maraphian," name of a Persian tribe,who occurs as successor in the list of Persian kings given by Aeschylus, Pers. 778).

See Darius (I.) and Persia, Ancient History. (Ed. M.)

SMETANA, FRIEDRICH (1824-1884), Bohemian composer and pianist, was born at Leitomischl in Bohemia on the 2nd of March 1824. He made such rapid progress in his studies under Ikavec, at Neuhaus, that at the age of six he appeared in public as pianist so successfully that his father's opposition to a musician's career was overcome. He then went to Proksch, at Prague, until he left for Leipzig to make the acquaintance of Schumann and Mendelssohn. Limited means prevented him from studying with the latter, and he returned to Prague, where he at once became Konzert-meister to the Emperor Ferdinand. In 1848 he married Katharina Kolar, pianist,

and with her founded a music school at Prague. At the same time he met Liszt, who subsequently influenced him greatly, and with whom he afterwards stayed at Weimar. In 1856 Smetana accepted Alexander Dreyschock's suggestion to go as conductor of the Philharmonic Society at Gothenburg. There he remained five years, when, owing to his wife's ill-health, he returned to Prague after a successful concert tour. The death of his wife at Dresden on their return caused Smetana to change his mind, and he went back to Sweden. But the opening of the Interims Theater in 1866, and the offer of its conductorship, induced his return. In Sweden he had already written Hakon Jarl, Richard III., and Wallenstein's Lager, and had completed his opera Die Brandenburger in Bohmen (5th January 1866). Five months later it was followed by his best-known opera, Die verkaufte Braut, and in 1868 Dalibor was given. Between 1874 and 1882 he produced Zwei Witwen, Hubicka (Der Kuss), Tajewstvi (Das Geheimnis), Certova Siena, and Die Teufelsmauer, as well as the " grand prize " opera Libuse, written for the opening of the National Theatre at Prague, nth June 1881. In Die Teufels- mauer were clear signs of decay in Smetana's powers, he having already in 1874 lost his sense of hearing. To celebrate his sixtieth birthday a fete was arranged by the combined Bohemian musical societies; but on that day Smetana lost his reason and was removed to a lunatic asylum, where he died on the 1 2th of May 1884. A great deal of his pianoforte music is interesting, the StammbuchblUtter, for example; while his series of symphonic poems, entitled Mein Vaterland (Vlast), and his beautiful string- quartet, Aus meinem Leben, have made the tour of the civilized world. He was an admirable pianist, and in many ways justified his countrymen's title of the " Czechisch Beethoven."

SMETHWICK, a municipal and county borough in the Hands- worth parliamentary division of Staffordshire, England, 3 m. W. of Birmingham on the Great Western and the London & North Western railways. Pop. (1891) 36,106; (1901) 54,539. There are large glass, chemical and machine works; nuts and bolts are made, and lighthouse fittings are a specialty. Adjoining Smeth- wick on the E. is the district of Soho, famous as the scene of the engineering experiments of James Watt during his partnership with Matthew Boulton (c. 1770). The town of Smethwick is a modern growth about an ancient village, the name of which appears in Domesday. The borough, incorporated in 1899 (county borough, 1907), is under a mayor, 6 aldermen and 18 councillors. Area, 1929 acres.

SMILES, SAMUEL (1812-1904), British author, was born at Haddington, Scotland, on the 23rd of December 1812. He was the eldest of eleven children left, on their father's death, to be supported by their mother on slender means. To her spirit and example must be attributed some of the enthusiasm for self- reliance and self -education, that was later embodied

in Dr Smiles's writings and led to their popularity and influence. Educated at the Haddington Grammar School and at Edinburgh University, where he studied medicine and graduated in 1832, Smiles tried, unsuccessfully, to practise in his native village among 3000 healthy Scotsmen and in competition with seven

other doctors. He added to his income by lecturing on chemistry and by writing for the press, and, finally abandoning the medical profession, he confined himself to journalism, and from 1838 till 1844 edited the weekly Leeds Times. Though he gave up regular journalism in 1844, he continued to be a frequent con- tributor to periodicals. From 1845 till 1854 he was secretary of the Leeds and Thirsk railway, and from 1854 till 1866 of the South Eastern railway. During his residence in Leeds he had oppor- tunities of studying the characters of the remarkable men whose biographies he afterwards wrote. Here he came in contact with George Stephenson, whose Life by him, published in 1857, passed through five editions in its first year and was the precursor of a series of biographies of leaders in the world of industry, such as Lives of the Engineers (3 vols., 1861-1862), Industrial Biography (1863), James Brindley and the Early Engineers (1864), Lives of Boulton and Watt (1865), Life of Thomas Telford (1867), The Life of a Scotch Naturalist (Thomas Edward) (1876), Robert Dick (1878), George Moore (1878), Men of Invention and Industry (1884), Life and Labour (1887), A Publisher and his Friends (a history of the house of John Murray) (1801), Jasmin (1891), Josiah Wedgwood (1894). In 1859 had appeared his most success- ful book, Self Help, a volume of popular ethics; 20,000 copies were sold the first year, and by 1889 the sales had reached 150,000 copies, while the book had been translated into 17 languages. Its success suggested others of similar purpose, like Character (187 1), Thrift (1875), Duty (1880). Smiles also published two works dealing with the history of the Huguenots and a History of Ireland. His works are not only admirable for their simple and yet forcible style, but for the many useful and practical lessons which they enforce. Wholesome and stimulating, their whole tendency is to inculcate sound principles of life and the building up of manly and upright character. Dr Smiles was made hon. LL.D. of Edinburgh University in 1878, and in 1897 received from the king of Servia the Cross of Knight Commander of the Order of St Sava, He died in Kensing ton in his ninety-second year, on the 16th of April 1904. His Autobiography was edited (1905) by T. Mackay.

SMILLIE, JAMES DAVID (1833-1909), American artist, was born in New York City on the 16th of January 1833. His father, James Smillie

(1807-1885), a Scottish engraver, emigrated to New York in 1829, was elected to the National Academy of Design in 1851, did much, with his brother William Cumming (1813-1908), to develop the engraving of bank-notes, and was an excellent landscape-engraver. The son studied with him and in the National Academy of Design; engraved on steel vignettes for bank-notes and some illustrations, notably F. O. C. Darley's pictures for Cooper's novels; was elected an associate of the National Academy in 1865 — the year after he first began painting — and an academician in 1876; and was a founder (1866) of the American Water Color Society, of which he was treasurer in 1866-1873 and president in 1873-1878, and of the New York Etching Club. Among his paintings, in oils, are " Evening among the Sierras " (1876) and " The Cliffs of Normandy " (1885), and in water colour, " A Scrub Race " (1876) and " The Passing Herd" (1888). He wrote and illustrated the article on the Yosemite in Picturesque America. He died on the 14th of September 1909. His brother, George Henry Smillie (1840-), studied under his father and under James M. Hart, became a member of the National Academy of Design in 1882, and, like his brother, painted both in oils and in water colour. His favourite subjects were scenes along the New England coast. In 1881 he married Nellie Sheldon Jacobs (b. 1.854), a painter of genre pictures in oils and water colour.

SMIRKE, ROBERT (1752-1845), English painter, was born at Wigton near Carlisle in 1752. In his thirteenth year he was apprenticed in London with an heraldic painter, and at the age of twenty he began to study in the schools of the Royal Academy, to whose exhibition he contributed in 1786 a "Narcissus" and a " Sabrina,'.' which were followed by many works, usually small in size, illustrative of the English poets, especially Thomson. In 1791 Smirke was elected an associate of the Royal Academy, and two years later a full member. In 1814 he was nominated

keeper to the Academy, but the king refused to sanction the appointment on account of the artist's revolutionary opinions. He was engaged upon the Shakespeare gallery, for which he painted " Katharina and Petruchio," " Prince Henry and Falstaff " and other subjects. He also executed many clever and popular book-illustrations. His works, which are frequently humorous, are pleasing and graceful, accomplished in draughtsmanship and handled with considerable spirit. He died in London on the 5th of January 1845.

SMITH, ADAM (1 723-1 790), English economist, was the only child of Adam Smith, comptroller of the customs at Kirkcaldy in Fifeshire, Scotland, and of Margaret Douglas, daughter of Mr Douglas of Strathendry, near Leslie. He was born at Kirkcaldy on the 5th of June 1723, some months after the death of his father. When he was three years old he was taken on a visit to his uncle at Strathendry, and when playing

alone was carried off by a party of " tinkers." He was at once missed, and the vagrants pursued and overtaken in Leslie wood. He received his early education in the school of Kirkcaldy under David Miller, amongst whose pupils were many who were afterwards distinguished men. Smith showed great fondness for books and remarkable powers of memory; and he was popular among his schoolfellows. He was sent in 1737 to the university of Glasgow, where he attended the lectures of Dr Hutcheson; and in 1740 he went to Balliol College, Oxford, as exhibitioner on SnelPs foundation. He remained at that university for seven years. At Glasgow his favourite studies had been mathematics and natural philosophy; but at Oxford he appears to have devoted himself almost entirely to moral and political science and to ancient and modern languages. He also laboured to improve his English style by translation, particularly from the French. After his return to Kirkcaldy he resided there two years with his mother, continuing his studies, not having yet adopted any plan for his future life. In 1748 he removed to Edinburgh, and there, under the patronage of Lord Karnes, gave lectures on rhetoric and belles-lettres. About this time began his acquaintance with David Hume, which afterwards ripened into friendship. In 1751 he was elected professor of logic at Glasgow, and in 1752 was transferred to the chair of moral philosophy, which had become vacant by the death of Thomas Craigie, the successor of Hutcheson. This position he occupied for nearly twelve years, which he long afterwards declared to have been " by far the most useful, and therefore by far the happiest and most honourable period of his life." His course of lectures was divided into four parts— (1) natural theology; (2) ethics; (3) a treatment of that branch of morality which relates to justice, a subject which he handled historically after the manner of Montesquieu; (4) a study of those political regulations which are founded, not upon the principle of justice, but that of expediency, and which are calculated to increase the riches, the power and the prosperity of a state. Under this view he considered the political institutions relating to com merce, to finances, to ecclesiastical and military establishments. He first appeared as an author by contributing two articles to the Edinburgh Review (an earlier journal than the present, which was commenced in 1755, but of which only two numbers 1 were published), — one on Johnson's Dictionary and the other a letter to the editors on the state of literature in the different countries of Europe. In 1759 appeared his Theory of Moral Sentiments, embodying the second portion of his university course, to which was added in the 2nd edition an appendix with the title, " Considerations concerning the first Formation of Languages. " After the publication of this work his ethical doctrines occupied less space in his lectures, and a larger develop- ment was given to the subjects of jurisprudence and political economy. Stewart gives us to understand that he had, as early as 1752, adopted the liberal views of commercial policy which he afterwards preached; and this we should have been in- clined to

believe independently from the fact that such views

1 These two numbers were reprinted in 1818. Smith's letter to the editors is specially interesting for its account of the Encyclopidie and its criticism of Rousseau's pictures of savage life.

were propounded in that year in the Political Discourses of Hume.

In 1762 the senatus academicus of Glasgow conferred on him the honorary degree of doctor of laws. In 1763 he was invited to take charge of the young duke of Buccleuch on his travels. He accepted, and resigned his professorship. He went abroad with his pupil in February 1764; they remained only a few days at Paris and then settled at Toulouse, at that time the seat of a parlement, where they spent eighteen months in the best society of the place, afterwards making a tour in the south of France and passing two months at Geneva. Returning to Paris about Christmas of 1765, they remained there till the October of the following year. Smith at this time lived in the society of Quesnay, Turgot, d'Alembert, Morellet, Helv6tius, Marmontel and the duke de la Rochefoucauld. His regard for the young nobleman 1 last named dictated the omission in the later editions of his Moral Sentiments of the name of the celebrated ancestor of the duke, whom he had associated with Mandeville as author of one of the " licentious systems " reviewed in the seventh part of that work. Smith was much influenced by his contact with the members of the physiocratic school, especially with its chief, though Dupont de Nemours probably goes too far in speaking of Smith and himself as having been " con-disciples chez M. Quesnay." Smith afterwards described Quesnay as a man " of the greatest modesty and simplicity," and declared his system of political economy to be, " with all its imperfections, the nearest approximation to truth that had yet been published on the principles of that science." In October 1766 tutor and pupil returned home, and they ever afterwards retained strong feelings of mutual esteem. For the next ten years Smith lived with his mother at Kirkcaldy, only paying occasional visits to Edinburgh and London; he was engaged in close study during most of this time. He describes himself to Hume during this period as being extremely happy. He was occupied on his Inquiry into the Nature and Causes of the Wealth of Nations, which there is some reason for believing he had begun at Toulouse. That great work appeared in 1776. 2 After its publication, and only a few months before his own death, Hume wrote to congratulate his friend — " Euge! bellei dear Mr Smith, I am much pleased with your performance, and the perusal of it has taken me from a state of great

anxiety. It was a work of so much expectation, by yourself, by your friends, and by the public, that I trembled for its appearance, but am now much relieved. Not but that the reading of it necessarily requires so much attention, and the public is disposed to give so little, that I shall still doubt for some time of its being at first very popular, but it has depth, and solidity, and acuteness, and is so much illustrated by curious facts that it must at last attract the public attention." Smith attended Hume during a part of his last illness, and soon after the death of the philosopher there was published, along with his autobiography a letter from Smith to W. Strahan (Smith's publisher) in which he gave an account of the closing scenes of his friend's life and expressed warm admiration for his character. This letter excited some rancour among the theologians, and Dr George Home, afterwards bishop of Norwich, published in 1777 A Letter to Adam Smith on the Life, Death and Philosophy of his Friend David Hume, by one of the people called Christians. But Smith took no notice of this effusion. 3 He was also attacked by Arch-

1 The duke undertook a translation of the Theory of Moral Senti- ments, but the Abbe Blavet's version appeared (1774) before his was completed and he then relinquished the design. An earlier French translation had been published (1764) under the title Mitaphysique de I'dme; and there is a later one — the best — by the marquis de Condorcet (1798, 2nd ed., 1830).

2 J. E. Thorold Rogers published in the Academy, 28th February 1885, a letter of Smith to William Pulteney, written in 1772, from which he thought it probable that the work lay " unrevised and unaltered " in the author's desk for four years. A similar conclusion seems to follow from a letter of Hume in Burton's Life, ii. 461.

3 A story was told by Sir Walter Scott, and is also related in the Edinburgh Review, of an " unfortunate rencontre," arising out of the publication of the same letter, between Smith and Dr Johnson, during the visit of the latter to Glasgow. The same story is given in a note in Wilberforce's Correspondence, the scene being somewhat vaguely laid in " Scotland." But it cannot be true; for Johnson

bishop W. Magee (1766-1831) for the omission in subsequent editions of a passage of the Moral Sentiments which that prelate had cited with high commendation as among the ablest illustra- tions of the doctrine of the atonement. Smith had omitted the paragraph in question (an omission which had escaped notice for twenty years) on the ground that it was unnecessary and mis- placed; but Magee suspected him of having been influenced by deeper reasons.

The greater part of the two years which followed the publica- tion of the Wealth of Nations Smith spent in London, enjoying the society of eminent persons, amongst whom were Gibbon, Burke, Reynolds and Topham Beauclerk. In 1778 he was appointed, through the influence of the duke of Buccleuch, one of the com- missioners of customs in Scotland, and in consequence of this fixed his residence at Edinburgh. His mother, now in extreme old age, lived with him, as did also his cousin, Miss Jane Douglas, who superintended his household. Much of his now ample in- come is believed to have been spent in secret charities, and he kept a simple table at which, " without the formality of an invitation, he was always happy to receive his friends." " His Sunday suppers," says M'Culloch, " were long celebrated at Edinburgh." One of his favourite places of resort in these years was a club of which Dr Hutton, Dr Black, Dr Adam Ferguson, John Clerk the naval tactician, Robert Adam the architect, as well as Smith himself, were original members, and to which Dugald Stewart, Professor Playfair and other eminent men were after- wards admitted. Another source of enjoyment was his small but excellent library; it is still preserved in his family. 4 In 1787 he was elected lord rector of the university of Glasgow, an honour which he received with " heartfelt joy." If we can believe a note in Wilberforce's Correspondence, he visited London in the spring of the same year, and was introduced by Dundas 5 to Pitt, Wilber- force and others. From the death of his mother in 1 784, and that of Miss Douglas in 1788, his health declined, and after a painful illness he died on the 17th of July 1790.

Before his decease Smith directed that all his manuscripts except a few selected essays should be destroyed, and they were accordingly committed to the flames. Of the pieces preserved by his desire the most valuable is his tract on the history of astronomy, which he himself described as a " fragment of a great work " ; it was doubtless a portion of the " connected history of the liberal sciences and elegant arts " which, we are told, he had projected in early life. Among the papers destroyed were probably, as Stewart suggests, the lectures on natural religion and jurisprudence which formed part of his course at Glasgow, and also the lectures on rhetoric which he delivered at Edinburgh in 1748. To the latter Hugh Blair seems to refer when, in his work on Rhetoric and Belles-Lettres (1783), he acknowledges his obligations to a manuscript treatise on rhetoric by Smith, part of which its author had shown to him many years before, and which he hoped that Smith would give to the public. Smith had promised at the end of his Theory of Moral Sentiments a treatise on jurisprudence from the historical point of view.

As a moral philosopher Smith cannot be said to have won much acceptance for his fundamental doctrine. This doctrine is that all our moral sentiments arise from sympathy, that is, from the principle of our nature " which leads

us to enter into the situations of other men and to partake with them in the passions which those situations have a tendency to excite." Our direct sympathy with the agent in the circumstances in which he is placed gives rise, according to this view, to our notion of the propriety of his action, whilst our indirect sympathy with those whom his actions have benefited or injured gives rise to our notions of merit and demerit in the agent himself. It seems justly alleged against this system by Dr Thomas Brown that " the moral sentiments, the origin of which it ascribes to our secondary feelings of mere sympathy, are assumed as previously existing in the original emotions with which the secondary feelings are said to be in unison." A second objection urged, perhaps with less justice, against the theory is that it fails to account for the

made his tour in 1773, whilst Hume's death did not take place till 1776. Smith seems not to have met Johnson in Scotland at all. It appears, however, from Boswell's Life, under date of 29th April 1778, that Johnson had on one occasion quarrelled with Smith at Strahan's house, apparently in London ; it is clear that the " unlucky altercation " at Strahan's must have occurred in 1761 or 1763, and could have had nothing to do with the letter on Hume's death.

4 See Catalogue of the Library of Adam Smith, edited with notes and introduction, by James Bonar (1894).

' An interesting letter of Smith to Dundas (1st November 1779) on free trade for Ireland is printed in the Eng. Hist. Review, No. 2.

authoritative character which is felt to be inherent in our sense of right and wrong — for what Butler calls the " supremacy of conscience."

It is on the Wealth of Nations that Smith's fame rests. But it must at once be said that it is plainly contrary to fact to represent him, as some have done, as the creator of political economy. The subject of social wealth had always in some degree, and increasingly in recent times, engaged the attention of philosophic minds. The study had even indisputably assumed a systematic character, and, from being an assemblage of frag- mentary disquisitions on particular questions of national interest, had taken the form, notably in Turgot's Reflexions, of an organ- ized body of doctrine. The truth is that Smith took up the science when it was already considerably advanced; and it was this very circumstance which enabled him, by the production of a classical treatise, to render most of his

predecessors obsolete.

Even those who do not fall into the error of making Smith the creator of the science, often separate him too broadly from Quesnay and his followers, and represent the history of modern economics as consisting of the successive rise and reign of three doctrines — the mercantile, the physiocratic and the Smithian. The last two are, it is true, at variance in some even important respects. But it is evident, and Smith himself felt, that their agreements were much more fundamental than their differences; and, if we regard them as historical forces, they must be con- sidered as working towards identical ends. They both urged society towards the abolition of the previously prevailing in- dustrial policy of European governments; and their arguments against that policy rested essentially on the same grounds.

The history of economic opinion in modern times, down to the third decade of the 19th century, is, in fact, strictly bipartite. The first stage is filled with the mercantile system, which was rather a practical policy than a speculative doctrine, and which came into existence as the spontaneous growth of social condi- tions acting on minds not trained to scientific habits. The second stage is occupied with the gradual rise and ultimate ascendancy of another system founded on the idea of the right of the individual to an unimpeded sphere for the exercise of his economic activity. With the latter, which is best designated as the " system of natural liberty," we ought to associate the memory of the physiocrats as well as that of Smith, without, however, maintaining their services to have been equal to his.

The teaching of political ecomomy was associated in the Scottish universities with that of moral philosophy. Smith conceived the entire subject he had to treat in his public lectures as divisible into four heads, the first of which was natural theo- logy, the second ethics, the third jurisprudence; whilst in the fourth " he examined those political regulations which are founded upon expediency, and which are calculated to' increase the riches, the power, and the prosperity of a state." The last two branches of inquiry are regarded as forming but a single body of doctrine in the well-known passage of the Theory of Moral Sentiments in which the author promises to give in another discourse " an account of the general principles of law and government, and of the different revolutions they have undeigone in the different ages and periods of society, not only in what concerns justice, but in what concerns police, revenue and arms, and whatever else is the subject of law." This shows how little it was Smith's habit to separate (except provisionally), in his conceptions or his researches, the economic phenomena of society from all the rest. The words above quoted have, indeed, been not unjustly described as containing " an anticipation, wonderful for his period, of general sociology."

*There has been much discussion on the question — What is the scientific method followed by Smith in his great work? By some it is considered to have been purely deductive, a view which Buckle has perhaps carried to the greatest extreme. He asserts that in Scotland the inductive method was unknown, and that although Smith spent some of the most important years of his youth in England, where the inductive method was supreme, he yet adopted the deductive method because it was habitually followed in Scotland. That the inductive spirit exercised no influence < *n Scottish philosophers is certainly not*

true; Montesquieu, whose method is essentially inductive, was in Smith's time closely studied by Smith's fellow-countrymen. What may justly be said of Smith is that the deductive bent was not the predominant character of his mind, nor did his great excellence lie in the " dialectic skill " which Buckle ascribes to him. What strikes us most in his book is his wide and keen observation of social facts, and his perpetual tendency to dwell on these and elicit their significance, instead of drawing conclu- sions from abstract principles by elaborate chains of reasoning.

That Smith does, however, largely employ the deductive method is certain; and that method is legitimate when the premises from which the deduction sets out are known universal facts of human nature and properties of external objects. But there is another species of deduction which, as Cliffe Leslie has shown, seriously tainted the philosophy of Smith— in which the premises are not facts ascertained by observation, but the a priori assumptions which we found in the physiocrats. In his view, Nature has made provision for social wellbeing by the principle of the human constitution which prompts every man to better his condition: the individual aims only at his private gain, but is " led by an invisible hand " to promote the public good; human institutions, by interfering with this principle in the name of the public interest, defeat their own end; but, when all systems of preference or restraint are taken away, " the obvious and simple system of natural liberty establishes itself of its own accord." This theory is, of course, not explicitly presented by Smith as a foundation of his economic doctrines, but it is really the secret substratum on which they rest. Yet, whilst such latent postulates warped his view of things, they did not entirely determine his method. His native bent towards the study of things as they are preserved him from extravagances into which many of his followers have fallen. But besides this, as Leslie has pointed out, the influence of Montesquieu tended to counterbalance the theoretic prepos- sessions produced by the doctrine of the jus naturae. We are even informed that Smith himself in his later years was occupied in preparing a commentary on the Esprit des lois. He was thus affected by two different and incongruous systems of thought — one setting out from an imaginary code of nature intended for the benefit of man, and leading to an optimistic view

of the economic constitution founded on enlightened self- interest; the other following inductive processes, and seeking to explain the several states in which the human societies are found existing, as results of circumstances or institutions which have been in actual operation. And we find accordingly in his great work a combination of inductive inquiry with a priori speculation founded on the " Nature " hypothesis.

Some have represented Smith's work as of so loose a texture and so defective in arrangement that it may be justly described as consisting of a series of monographs. But this is certainly an exaggeration. The book, it is true, is not framed on a rigid mould, nor is there any parade of systematic divisions and subdivisions. But, as a body of exposition, it has the real unity which results from a mode of thinking homogeneous throughout and the general absence of such contradictions as would arise from an imperfect digestion of the subject.

Smith sets out from the thought that the annual labour of a nation is the source from which it derives its supply of the necessaries and conveniences of life. He does not of course contemplate labour as the only factor in production ; but it has been supposed that by empha- sizing it at the outset he at once strikes the note of difference between himself on the one hand, and both the mercantilists and the physiocrats on the other. The improvement in the productiveness of labour depends largely on its division ; and he proceeds accordingly to give his unrivalled exposition of that principle, of the grounds on which it rests, and of its greater applicability to manufactures than to agri- culture, in consequence of which the latter relatively lags behind in the course of economic development. The origin of the division of labour he finds in the propensity of human nature " to truck, barter or exchange one thing for another." He shows that a certain accumulation of capital is a condition precedent of this division, and that the degree to which it can be carried is dependent on the extent of the market. When the division of labour has been established, each member of the society must have recourse to the others for the supply of most of his wants ; a medium of. exchange is thus found to be necessary, and money comes into use. The exchange of goods

against each other or against money gives rise to the notion of value. This word has two meanings — that of utility, and that of purchasing power; the one may be called value in use, the other value in ex- change. Merely mentioning the former, Smith goes on to study the latter. What, he asks, is the measure of value? what regulates the amount of one thing which will be

given for another? " Labour," Smith answers, " is the real measure of the exchangeable value of all commodities." " Equal quantities of labour at all times and places, are of equal value to the labourer." " Labour alone, therefore, never varying in its own value, is alone the ultimate and real standard by which the value of all commodities can at all times and places be estimated and compared. It is their real price; money is their nominal price only." Money, however, is in men's actual trans- actions the measure of value, as well as the vehicle of exchange; and the precious metals are best suited for this function, as varying little in their own value for periods of moderate length ; for distant times, corn is a better standard of comparison. In relation to the earliest social stage, we need consider nothing but the amount of labour employed in the production of an article as determining its ex- change value; but in more advanced periods price is complex, and consists in the most general case of three elements — wages, profit and rent. Wages are the reward of labour. Profit arises as soon as stock, being accumulated in the hands of one person, is employed by him in setting others to work, and supplying them with materials and subsistence, in order to make a gain by what they produce. Rent arises as soon as the land of a country has all become private property; " the landlords, like all other men, love to reap where they never sowed, and demand a rent even for its natural produce." In every improved society, then, these three elements enter more or less into the price of the far greater part of commodities. There is in every society or neighbourhood, an ordinary or average rate of wages and profit in every different employment of labour and stock, regu- lated by principles to be explained hereafter, as also an ordinary or average rate of rent. These may be called the natural rates at the time when and the place where they prevail; and the natural price of a commodity is what is sufficient to pay for the rent of the land, the wages of the labour, and the profit of the stock necessary for bringing the commodity to market. The market price may rise above or fall below the amount so fixed, being determined by the proportion between the quantity brought to market and the demand of those who are willing to pay the natural price. Towards the natural price as a centre the market-price, regulated by competition, con- stantly gravitates. Some commodities, however, are subject to a monopoly of production, whether from the peculiarities of a locality or from legal privilege: their price is always the highest that can be got; the natural price of other commodities is the lowest which can be taken for any length of time together. The three component parts or factors of price vary with the circum- stances of the society. The rate of wages is determined by a " dis- pute " or struggle of opposite interests between the employer and the workman. A minimum rate is fixed by the condition that they must be at least sufficient to enable a man and his wife to maintain themselves and, in general, bring up a family. The excess above this will depend on the circumstances o\ the country, and the con- sequent demand

for labour — wages being high when national wealth is increasing, low when it is declining. The same circumstances determine the variation of profits, but in an opposite direction; the increase of stock, which raises wages, tending to lower profit through the mutual competition of capitalists. " The whole of theadvantages and disadvantages of the different employments of labour and stock must, in the same neighbourhood, be either perfectly equal or con- tinually tending to equality " ; if one had greatly the advantage over the others, people,would crowd into it, and the level would soon be restored. Yet pecuniary wages and profits are very different in different employments — either from certain circumstances affecting the employments, which recommend or disparage them in men's notions, or from national policy, " which nowhere leaves things at perfect liberty." Here follows Smith's admirable exposition of the causes which produce the inequalities in wages and profits just referred to,, a passage affording ample evidence of his habits of nice observation of the less obvious traits in human nature, and also of the operation both of these and of social institutions on economic facts. The rent of land comes next to be considered, as the last of the three elements of price. Rent is a monopoly price, equal, not to what the landlord could afford to take, but to what the farmer can afford to give. " Such parts only of the produce of land can commonly be brought to market, of which the ordinary price is sufficient to replace the stock which must be employed in bringing them thither, together with the ordinary profits. If the ordinary price is more than this, the surplus part will naturally go to the rent of the land. If it is not more, though the commodity may be brought to market, it can afford no rent to the landlord. Whether the price is or is not more depends on the demand." " Rent, therefore, enters into the price of commodities in a different way from wages and profits. High or low wages and profit are the causes of high or low price ; high or low rent is the effect of it."

*Rent, wages and profits, as they are the elements of price, are also the constituents of income; and the three great orders of every civilized society, from whose revenues that of every other order is ultimately derived, are the landlords, the labourers and the capital**

ists. The relation of the interests of these three classes to those of society at large is different. The interest of the landlord always coincides with the general interest : whatever promotes or obstructs the one has the same effect on the other. So also does that of the labourer: when the wealth of the nation is progressive, his wages are high ; they are low when it is stationary or retrogressive. ' ' The interest of the third order has not the same connexion with the general interest of the society as that of the other two; . . . it is always in some respects different from and opposite to that of

the public.”

The subject of the second book is ” the nature, accumulation and improvement of stock.” A man’s whole stock consists of two portions — that which is reserved for his immediate consumption, and that which is employed so as to yield a revenue to its owner. This latter, which is his ” capital,” is divisible into the two classes of ” fixed ” and ” circulating.” The first is such as yields a profit without passing into other hands. The second consists of such goods, raised, manufactured or purchased, as are sold for a profit and replaced by other goods; this sort of capital is therefore constantly going from and returning to the hands of its owner. The whole capital of a society falls under the same two heads. Its fixed capital consists chiefly of (1) machines, (2) buildings which are the means of procuring a revenue, (3) agricultural improve- ments and (4) the acquired and useful abilities of all members of the society (since sometimes known as ” personal capital “). Its circulating capital is also composed of four parts — (1) money, (2) provisions in the hands of the dealers, (3) materials and (4) com- pleted work in the hands of the manufacturer or merchant. Next comes the distinction of the gross national revenue from the net — the first being the whole produce of the land and labour of a country, the second what remains-after deducting the expense of maintaining the fixed capital of the country and that part of its circulating capital which consists of money. Money, ” the great wheel of circulation,” is altogether different from the goods which are circulated by means of it; it is a costly instrument by means of which all that each individual receives is distributed to him; and the expenditure required, first to provide it, and afterwards to maintain it, is a deduction from the net revenue of the society. In development of this consideration, Smith goes on to explain the gain to the com- munity arising from the substitution of paper money for that composed of the precious iftetals; and here occurs the remarkable illustration in which the use of gold and silver money is compared to a highway on the ground, that of paper money to a wagon way through the air. In proceeding to consider the accumulation of capital, he is led to the distinction between productive and unpro- ductive labour — the former being that which is fixed or realized in a particular object or vendible article, the latter that which is not so realized. The former is exemplified in the labour of the manu- facturing workman, the latter in that of the menial servant. A broad line of demarcation is thus drawn between the labour which results in commodities or increased value of commodities, and that which does no more than render services : the former is productive, the latter unproductive. ” Productive ” is by no means equivalent to ” useful “: the labours of the magistrate, the soldier, the church- man, lawyer and physician, are, in Smith’s sense, unproductive. Productive labourers alone are employed out of capital; unpro- ductive labourers, as well as those who

do not labour at all, are all maintained by revenue. In advancing industrial communities, the poitkin of annual produce set apart as capital, bears an increasing proportion to that which is immediately destined to constitute a revenue, either as rent or as profit. Parsimony is the source of the increase of capital ; by augmenting the fund devoted to the main- tenance of productive hands, it puts in motion an additional quantity of industry, which adds to the value of the annual produce. What is annually saved is as regularly consumed as what is spent, but by a different set of persons, by productive labourers instead of idlers or unproductive labourers; and the former reproduce with a profit the value of their consumption. The prodigal, encroaching on his capital, diminishes, as far as in him lies, the amount of productive labour, and so the wealth of the country; nor is this result affected by his expenditure being on home-made, as distinct from foreign commodities. Every prodigal, therefore, is a public enemy; every frugal man a public benefactor. The only mode of increasing the annual produce of the land and labour is to increase either the number of productive labourers or the productive powers of those labourers. Either process will in general require additional capital, the former to maintain the new labourers, the latter to provide improved machinery or to enable the employer to introduce a more complete division of labour. In what are commonly called loans of money, it is not really the money, but the money's worth, that the borrowel wants; and the lender really assigns to him the right to a certain portion of the annual produce of the land and labour of the country. As the general capital of a country increases, so also does the par- ticular portion of it from which the possessors wish to derive a revenue without being at the trouble of employing it themselves, and, as the quantity of stock thus available for loans is augmented, the interest diminishes, not merely " from the general causes which make the market price of things commonly diminish as their quantity increases," but because, with the increase of capital, " it becomes gradually more and more difficult to find within the country a

profitable method of employing any new capital " — whence arises a competition between different capitals, and a lowering of profits, which must diminish the price which can be paid for the use of capital, or in other words the rate of interest. It was formerly wrongly supposed, and even Locke and Montesquieu did not escape this error, that the fall in the value of the precious metals consequent on the discovery of the American mines was the real cause of the general lowering of the rate of interest in Europe. But this view, already refuted by Hume, is easily seen to be erroneous. " In some countries the interest of money has been prohibited by law. But, as

something can everywhere be made by the use of money, some- thing ought everywhere to be paid for the use of it," and will in fact be paid for it; and the prohibition will only heighten the evil of usury by increasing the risk to the lender. The legal rate should be a very little above the lowest market rate ; sober people will then be preferred as borrowers to prodigals and projectors, who at a higher legal rate would have an advantage over them, being alone willing to offer that higher rate.

As to the different employments of capital, the quantity of pro- ductive labour put in motion by an equal amount varies extremely according as that amount is employed — (i) in the improvement of lands, mines or fisheries, (2) in manufactures, (3) in wholesale or (4) retail trade. In agriculture " Nature labours along with man," and not only the capital of the farmer is reproduced with his pro- fits, but also the rent of the landlord. It is therefore the employ- ment of a given capital which is most advantageous to society. Next in order come manufactures; then wholesale trade — first the home trade, secondly the foreign trade of consumption, last the carrying trade. All these employments of capital, however, are not only advantageous, but necessary, and will introduce themselves in the due degree if left to individual enterprise.

These first two books contain Smith's general economic scheme ; and we have stated it as fully as was consistent with the brevity here necessary, because from this formulation of doctrine the English classical school set out, and round it the discussions of more modern times in different countries have in a great measure revolved.

The critical philosophers of the 1 8th century were often destitute of the historical spirit, which was no part of the endowment needed for their principal social office. But some of the most eminent of them, especially in Scotland, showed a marked capacity and pre- dilection for historical studies. Smith wae among the latter; Karl Knies and others justly remark on the masterly sketches of this kind which occur in the Wealth of Nations. The longest and most elaborate of these occupies the third book; it is an account of the course followed by the nations of modern Europe in the successive development of the several forms of industry. It affords a curious example of the effect of doctrinal prepossessions in obscuring the results of historical inquiry. Whilst he correctly describes the European movement of industry, and explains it as arising out of adequate social causes, he yet, in accordance with the absolute principles which tainted his philosophy, protests against it as in- volving an entire inversion of the " natural order of things." First agriculture, then manufactures, lastly foreign commerce; any other order than this he considers " unnatural and retrograde."

The fourth book is principally devoted to the elaborate and. ex- haustive

polemic against the mercantile system which finally drove it from the field of science, and has exercised a powerful influence on economic legislation. When protection is now advocated, it is commonly on different grounds from those which were in current use before the time of Smith. He believed that to look for the restora- tion of freedom of foreign trade in Great Britain would have been " as absurd as to expect that an Oceana or Utopia should be estab- lished in it." His teaching on the subject is not altogether un- qualified ; but, on the whole, with respect to exchanges of every kind, where economic motives alone enter, his voice is in favour of freedom. He has regard, however, to political as well as economic interests, and on the ground that " defence is of much more importance than opulence " pronounces the Navigation Act to have been " perhaps the wisest of all the commercial regulations of England." Whilst objecting to the prevention of the export of wool, he proposes a tax on that export as somewhat less injurious to the interest of growers than the prohibition, whilst it would "afford a sufficient advantage" to the domestic over the foreign manufacturer. This is, perhaps, his most marked deviation from the rigour of principle ; it was doubtless a concession to popular opinion with a view to an attainable practical improvement The wisdom of retaliation in order to procure the repeal of high duties or prohibitions imposed by foreign govern- ments depends, he says, altogether on the likelihood of its success in effecting the object aimed at, but he does not conceal his contempt for the practice of such expedients. The restoration of freedom in any manufacture, when it has grown to considerable dimensions by means of high duties, should, he thinks, from motives of humanity, be brought about only by degrees and with circumspection — though the amount of evil which would be caused by the immediate abolition- of the duties is, in his opinion, commonly exaggerated The case in which J S Mill justified protection — that, namely, in which, an industry well adapted to a country is kept down by the acquired ascendancy of foreign producers — is referred to by Smith ; but he is opposed to the admission of this exception for reasons which do not appear to be conclusive He is perhaps scarcely consistent in ap-

proving the concession of temporary monopolies to joint-stock com- panies undertaking risky enterprises " of which the public is after- wards to reap the benefit." 1

He is less absolute in his doctrine of governmental non-interference when he comes to consider in his fifth book the " expenses of the sovereign or the commonwealth." He recognizes as coming within the functions of the state the erection and maintenance of those public institutions and public works which, though advantageous to the society, could not repay, and therefore must not be thrown upon, individuals or small groups of individuals. He remarks in a just historical spirit that the performance of these functions

requires very different degrees of expense in the different periods of society. Besides the institutions and works intended for public defence and the administration of justice, and those required for facilitating the commerce of the societv. he considers those necessary for promoting the instruction of the people. He thinks the public at large may with propriety not only facilitate and encourage, but even impose upon almost the whole body of the people, the acquisition in youth of the most essential elements of education. He suggests as the mode of enforcing this obligation the requirement of submission to a test examination " before any one could obtain the freedom in any corporation, or be allowed to set up a trade in any village or town corporate." Similarly, he is of opinion that some probation, even in the higher and more difficult sciences, might be enforced as a con- dition of exercising any liberal profession, or becoming a candidate for any honourable office. The expense of the institutions for religious instruction as well as for general education, he holds, may without injustice be defrayed out of the funds of the whole society, though he would apparently prefer that it should be met by the voluntary contributions of those who think they have occasion for such education or instruction.

To sum up, it may be said that the Wealth of Nations certainly operated powerfully through the harmony of its critical side with the tendencies of the half century which followed its publication to the assertion of personal freedom and "natural rights." It discredited the economic policy of the past, and promoted the overthrow of institutions which had come down from earlier times, but were un suited to modern society. As a theoretic treatment of social economy, and therefore as a guide to social reconstruction and practice in the future, it is provisional, not definitive. But when the study of its subject comes to be systematized on the basis of a general social philosophy more complete and durable than Smith's, no contribu- tions to that final construction will be found so valuable as his.

Buckle has the idea that the two principal works of Smith, the Theory of Moral Sentiments and the Wealth of Nations, are mutually complementary parts of one great scheme, in which human nature is intended to be dealt with as a whole — the former exhibiting the operation of the benevolent feelings, the latter of what, by a singular nomenclature, inadmissible since Butler wrote, he calls " the passion of selfishness." In each division the motive contemplated is re- garded as acting singly, without any interference of the opposite principle. This appears to be an artificial and misleading notion. Neither in the plan of Smith's university course nor in the well-known passage at the end of his Moral Sentiments is there any indica- tion of his having conceived such a bipartite scheme. The object of the Wealth of Nations is surely in no sense psychological, as is that of the Moral Sentiments. The purpose of the work is to exhibit social phenomena, not to demonstrate their source in the mental constitu- tion of the individual.

The following may be referred to for biographical details : Dugald Stewart, Biographical Memoir of Adam Smith, originally read (1793) before the Royal Society of Edinburgh, and afterwards prefixed to Smith's Essays on Philosophical Subjects; J. A. Farrer, Adam Smith (1881); R. B. Haldane, Life of Smith (1887), and the very full and excellent Life of Adam Smith by John Rae (1895). Additional particulars are given in Brougham's Men of Letters and Science, Burton's Life of Hume and Alexander Carlyle's Autobiography; and some characteristic anecdotes of him will be found in Memoirs of the Life and Works of Sir John Sinclair (1837). For comments on his Theory of Moral Sentiments, see, besides Stewart, as cited above, Dr T. Brown's Philosophy of the Human Mind, lects. 80 and 81 ; Sir J. Mackintosh's Dissertation on the Progress of Ethical Philosophy ; and the art. Ethics in the present work. On the Wealth of Nations, see the prefaces to M'Culloch's, Rogers's, Shield Nicholson's and Cannan's editions of that work; Rogers's Historical Gleanings (1869); the art. " Smith " in Coquelin and Guillaumin's Dictionnaire de I'eco- nomie politique; Bagehot's Economic Studies (1880); and Cossa's Guide to the Study of Political Economy (Eng. trans., 1880), chap. v. See also Professor Shield Nicholson's Project of Empire (1909), which is a critical study of the Economics of Imperialism, with special reference to the ideas of Adam Smith; and Professor W. J. Ashley's essay in Compatriots Club Lectures (1905) on " Political Economy and the Tariff Problem." See also Professor W. J Ashley's Select Chapters and Passages from the " Wealth of Nations " (1895). (J. K. I,; X)

1 Professor Bastable calls attention to the interesting fact that the proposal of an export duty on wool and the justification of a temporary monopoly to joint-stock companies both appear for the first time in the edition of 1784

SMITH. ALBERT RICHARD (1S16-1860), English author and public entertainer, was born at Chertsey, Surrey, on the 24th of May 1816. He studied medicine in Paris, and his first literary effort was an account of his life there, which appeared in the Mirror. He gradually relinquished his medical work for light literature. Though a journalist rather than a literary figure, he was one of the most popular men of his time, and a favourite humorist in the vein of humour then in vogue. He was one of the early contributors to Punch and was also a regular contri- butor to Bentley's Miscellany, in whose pages his first and best book, The Adventures of Mr Ledbury, appeared in 1842. His other books were, Christopher Tadpole (1848), issued in monthly parts, Pottleton's Legacy (1849), and a series of so-called natural histories, The Gent, The Ballet Girl, The Idler upon Town

and The Flirt. Albert Smith also wrote extravaganzas and adapted some of Charles Dickens's stories for the stage. He founded and edited a monthly magazine called The Man in the Moon, from 1847 to 1849. In 1851 he ascended Mont Blanc, and the year after produced at the Egyptian Hall the descriptive entertain- ment, which he called " Mont Blanc," describing the ascent of the mountain and the Englishman abroad. This success was followed by other entertainments of the kind, among them " China." Smith married in 1859 a daughter of Robert Keeley, the comedian. He died in Fulham, London, on the 23rd of May 1 860. Smith received great help from his brother, Arthur W. W. Smith (1825-1861), who had also been educated for medicine. He managed the entertainments at the Egyptian Hall from 1852 to i860. He also planned Charles Dickens's readings in 1858, and made arrangements for a second series, but died before they were completed.

SMITH, ALEXANDER (1830-1867), Scottish poet, son of a lace-designer, was born at Kilmarnock on the 31st of December 1830. His parents being too poor to send him to college, he was placed in a linen factory to follow his father's trade of a pattern designer. His early poems appeared in the Glasgow Citizen, in whose editor, James Hedderwick, he found a sympathizing and appreciative friend. A Life Drama and other Poems (1853) was a work of promise, ran through several editions, and gained Smith the appointment of secretary to Edinburgh University in 1854. As a poet he was one of the leading representatives of what was called the "Spasmodic" School, now fallen into oblivion. Smith, P. J. Bailey and Sydney Dobell were satirized by W. E. Aytoun in 1854 in Firmilian: a Spasmodic Tragedy. In the same year Sydney Dobell came to Edinburgh, and an acquaintanceship at once sprang up between the two, which resulted in their collaboration in a book of War Sonnets (1855), inspired by the Crimean War. After publishing City Poems (1857) and Edwin of Deira (1861), a Northumbrian epic poem, Smith turned his attention to prose, and published Dreamthorp: Essays written in tlte Country (1863) and A Summer in Sky e. His last work was an experiment in fiction, Alfred Hagart's Household (1866), which ran first through Good Words. He died on the 5th of January. 1867.

A memoir of Smith by P. P. Alexander was prefixed to a volume entitled Last Leaves.

SMITH, ANDREW JACKSON (1815-1897), American soldier, was born in Bucks county, Pennsylvania, on the 28th of April 1815 and graduated at West Point in 1838. He was engaged on active service on. the south-west frontier and in Mexico, and afterwards in Indian warfare in Washington and Oregon terri- tories, becoming first lieutenant in 1845, captain in 1847, and major in 1861. In the latter year, on the outbreak of the Civil

War, he became a colonel of volunteer cavalry in the Federal army, rising early in 1862 to the rank of brigadier-general U.S. V., and to the chief command of the cavalry in the Missouri department. Assigned afterwards to the Army of the Tennessee, he took part in the first attack on Vicksburg and the capture of Arkansas Post, and commanded a division of the XIII. corps in the final Vicksburg campaign. Later he led a division of the XVI. corps in the Red River expedition of Gen. N. P. Banks, and received the brevet of colonel for his services at the action of Pleasant Hill. In May 1864 he became lieutenant-colonel U.S.A.

and major-general U.S.V., and during the greater part of the year was employed in Missouri against the Confederate general Sterling Price. Thence he was summoned to join forces with G. H. Thomas at Nashville, then threatened by the advance of Gen. J. B. Hood. He bore a conspicuous share in the crowning victory of Nashville (XVI. corps in the final campaign in the South. Just before the close of the war he was breveted brigadier-general U.S.A. for his services at the action of Tupelo, Mississippi, and major-general U.SA. for Nashville. He resigned his volunteer commission in 1866 and became colonel of the 7th U.S. Cavalry. In 1869, however, he resigned in order to become postmaster of St Louis, where he died on the 30th of January 1897.

SMITH, CHARLES EMORY (1842-1908), American journalist and political leader, was born in Mansfield, Connecticut, on the 18th of February 1842. In 1849 his family removed to Albany, New York, where he attended the public schools and the Albany Academy. He graduated at Union College in 186 1, was a recruit- ing officer on the staff of General John F. Rathbone (1819-igoi) in 1861-1862, taught in the Albany Academy in 1862-1865, and was editor of the Albany Express in 1865-1870; joined the staff of the Albany Journal in 1870, and was editor-in-chief of this paper from 1876 to 1880. In 1879-1880 he was a regent of the University of the State of New York. From 1880 until his death he was editor and part proprietor of the Philadelphia Press. He was active as a Republican in "state and national politics; was chairman of the Committee on Resolutions of the New York State Republican Conventions from 1874 to 1880 (excepting 1877), and was president of the convention of 1879; and was a delegate to several National Republican Conventions, drafting much of the Republican platforms of 1876 and 1896. In 1890-1892 he was United States minister to Russia, and during that, period had charge of distributing among the Russian famine sufferers more than $100,000 in money, and five shiploads of food. He was postmaster-general in the cabinet of Presidents McKinley and Roosevelt from April 1898 until January 1902, and did much to develop the rural free delivery system. He died in Philadelphia on the 19th of January 1908.

SMITH, CHARLES FERGUSON (1807-1862), American soldier, graduated from West Point Academy in 1825, and a few years later became an instructor there, rising eventually to be com- mandant. As a battalion commander he distinguished himself at the Mexican War, at Palo Alto, Resaca, Monterey and Churubusco. He commanded the Red River expedition of 1856, and served under Albert Sidney Johnston in Utah (1857-1860). On the outbreak of the Civil War in 1861 he accepted a commis- sion as brigadier-general of Union volunteers, and found himself under the command of Grant, who had been his pupil at West Point. This difficult situation was made easy by Smith's loyalty to his young chief, and the old soldier led his division of raw volunteers with success at Fort Donelson. His ripe experience, dignity, and unselfish character made him Grant's mainstay in the early days. He went up the Tennessee with the first expedition, but at Savannah, Tennessee, met with a serious accident. His senior brigadier led his division at the battle of Shiloh and he died on April 25, 1862. The early close of his career in high command deprived the Union army of one of its best leaders, and his absence was nowhere more felt than on the battlefield of Shiloh, where the Federals paid heavily for the inexperience of their generals. A month before his death he had been made major-general of volunteers.

SMITH, CHARLOTTE (1 749-1 806), English novelist and poet, eldest daughter of Nicholas Turner of Stoke House, Surrey, was born in London on the 4th of May 1749. She left school when she was twelve years old to enter society. She married in 1765 Benjamin Smith, son of a merchant who was a director of the East India Company. They lived at first with her father-in-law, who thought highly of her business abilities, and wished to keep her with him; but in 1774 Charlotte and her husband went to live in Hampshire. The elder Smith died in 1776, leaving a com- plicated will, and six years later Benjamin Smith was imprisoned for debt. Charlotte Smith's first publication was Elegiac Sonnets

and other Essays (1784), dedicated by permission to William Hayley, and printed at her own expense. For some months Mrs Smith and her family lived in a tumble-down chateau near Dieppe, where she produced a translation of Manon Lescaut (1785) and a Romance of Real Life (1786), borrowed from Les Causes Cilebres. On her return to England Mrs Smith carried out a friendly separation between herself and her husband, and thenceforward devoted herself to novel writing. Her chief works are: — Emmeline, or the Orphan of the Castle (1788); Celestina (1792); Desmond (1792); The Old Manor House (1793); The Young Philosopher (1798);

and Conversations introducing Poetry (1804). She died at Tilford, near Farnham, Surrey, on the 28th of October 1806. She had twelve children, one of whom, Lionel (1778-1842), rose to the rank of lieutenant-general in the army. He became K.C.B. in 1832 and from 1833 to 1839 was governor of the Windward and Leeward Islands.

Charlotte Smith's novels were highly praised by her contem- poraries and are still noticeable for their ease and grace of style. Hayley said that Emmeline, considering the situation of the author, was the most wonderful production he had ever seen, and not inferior to any book in that fascinating species of composition (Nichols, Illustrations of Literature, vii. 708). The best account of Mrs Smith is by Sir Walter Scott, and is based on materialsupplied by her sister, Mrs Dorset, with a detailed criticism of her work by Scott (Misc. Prose Works, 1841, i. 348-359). Charlotte Smith is best remembered by her charming poems for children.

SMITH, COLVIN (1795-1875), Scottish portrait-painter, was born at Brechin, Scotland, in 1795. He studied in London in the schools of the Royal Academy and worked in Nollekens's studio. He then proceeded to Italy, where he executed some fine copies from Titian; and at Antwerp he made studies from the works of Rubens. Returning to Scotland in 1827, he settled in Edinburgh, occupying the house and studio which had formerly belonged to Raeburn. Soon he attained a wide practice as a portrait-painter, and among his sitters were Lord Jeffrey, Henry Mackenzie, author of The Man of Feeling, and many of the most celebrated Scotsmen of the time. His portrait of Sir Walter Scott was so popular that he executed some twenty replicas of it, for seven of which he received fresh sittings. His works are distinguished by excellent draftsmanship, by directness and simplicity of treatment, and by well-marked individuality. He died in Edinburgh on the 21st of July 1875.

SMITH, EDMUND KIRBY (1824-1893), Confederate general in the American Civil War, was the son of Joseph Lee Smith (1776-1846), an American lawyer and soldier, who served with credit in the War of 1812 and rose to the rank of colonel U.S.A. His elder brother, Ephraim Kirby Smith (1807-1847), also a soldier, fell at Molino del Rey; and Joseph Lee Kirby Smith, Ephraim's son, who took the Federal side in the Civil War, was mortally wounded at the battle of Corinth, having at the age of twenty-six attained the rank of brevet-colonel U.S.A. Edmund Kirby Smith was born at St Augustine, Fla., on the 16th of May 1824, and graduated at West Point in 1845, being assigned to the infantry. In the Mexican War he was breveted first lieutenant, and captain for gallantry at Vera Cruz and Cerro Gordo and at Contreras-Churubusco. He was assistant pro- fessor of mathematics at West Point from 1849 to 1852 and was later engaged in Indian warfare on the Texas frontier. In 1 86 1 he attained the rank of

major. When Florida seceded he resigned his army commission and entered the Confederate service as a lieutenant-colonel. He was made a brigadier-general on the 17th of June 1861, and was wounded at the battle of Bull Run {q.v.) . In command of the Confederate forces in the Cumber- land Gap region Kirby Smith took part in General Bragg's invasion of Kentucky in the autumn of 1862, and inflicted upon the Federal forces a severe defeat at Richmond, Ky., on the 30th of August; and was present at the battles of Perry ville and Murfreesboro (Stone River). From February 1863 to the fall of the Confederacy he was in command of the trans-Missis- sippi department, and was successful in making this section of the Confederacy (isolated from, the rest by the fall of Vicksburg) self-supporting. He instituted a regular system of blockade- running, and met and defeated the Red River expedition under

General N. P. Banks in 1864. Kirby Smith and his troops surrendered on the 26th of May 1865, being the last armed forces of the Confederate States to do so. After the war, he was from 1866 to 1868 president of the Atlantic and Pacific Telegraph company, from 1868 to 1876 president of the Western Military Academy, from 1870 to 1875 chancellor of the university of Nashville, and from 1875 to his death professor of mathematics at the university of the South, Sewanee, Tennessee. He died at Sewanee on the 28th of March 1893.

SMITH, FRANCIS HOPKINSON (1838-), American author, artist and engineer, was born in Baltimore, Maryland, on the 23rd of October 1838, a descendant of Francis Hopkinson, one of the signers of the Declaration of Independence. He became a contractor in New York City and did much work for the Federal government, including the stone ice-breaker at Bridgeport, Connecticut, the jetties at the mouth of the Con- necticut river, the foundation for the Bartholdi Statue of Liberty in New York harbour, the Race Rock Lighthouse off New London, Conn., and many life-saving stations. His vacations were spent sketching in the White Mountains, in Cuba, in Mexico, and afterwards in Venice, Constantinople and Holland. He pub- lished various volumes of travel, illustrated by himself; they include Old Lines in New Black and White (1885) ; W ell-Worn Roads (1886); A White Umbrella in Mexico (1889); Gondola Days (1897), and The Venice of To-Day (1897). His novels and short stories are especially felicitous in their portrayal of the Old South. Among them are: Col. Carter of Carter sville (1891), which was successfully dramatized; A Day at La Guerre's and other Days (1892); A Gentleman Vagabond (1895); Tom Grogan (1896); Caleb West, Master-Diver (1898); The Other Fellow (1899); The Fortunes of Oliver Horn (1902), which has reminiscences of his artist friends; Col. Carter's Christmas (1904); At Close Range (1905); The Tides of Barnegat (1906); The Veiled Lady (1907); The Romance of an Old Fashioned Gentleman (1907); Peter (1908); and Forty Minutes

Late and Other Stories (1909).

SMITH, GEORGE (1789-1846), British publisher, founder of the firrri of Smith, Elder & Co., was born in Scotland in 1789. From Elgin, where he was apprenticed to a bookseller, he migrated to London, where he found employment first with Rivingtons, and afterwards with John Murray. In 1816 Smith and another Scot, Alexander Elder, began business at 158 Fenchurch Street as booksellers and stationers; and in 1819 they became pub- lishers also. It was here that George Smith (2) (1824-1901), the most famous member of the firm, was born on the 19th of March 1824; and in the same year the business was removed to 65 Cornhill. At the age of fourteen George Smith (2I came into the business, and in 1843 he took over the control of the publishing department. On his father's death in 1846 the responsibility of the business devolved principally upon him, and under his management it increased thirteen times in twenty years. A large portion of the business was connected with foreign agencies and banking, especially with India, but this was relinquished in 1868 to his partner Henry S. King, who now separated from the firm, retaining the old premises at Cornhill, while Smith removed the publishing business, now under his sole control, to 1 5 Waterloo Place. For over thirty years Smith was the friend and publisher of Ruskin, and it was with him that Jane Eyre found a publisher. In 1855 was started the Overland Mail, a weekly periodical for Indian readers, and the Homeward Mail, containing Indian news for English readers. By Smith, Elder & Co. were issued works by Darwin, Ruskin, Thackeray, Robert and Mrs Browning, Wilkie Collins Matthew Arnold, Miss Martineau, James Payn and Mrs Humphry Ward. In 1866 was published Trollope's Last Chronicles of Barset, for which £3000 was paid. In January 1 86a the first of George Smith's three great undertakings. was begun, the Cornhill Magazine being issued in that month under the editorship of Thackeray. The second venture was the founding in 1865 of the Pall Mall Gazette (see Newspapers). The third and most important was the publication of the Diction- ary of National Biography, the first volume of which was issued in 1882; it was completed in 1901, in 66 volumes; and this*

monumental work was the crowning effort of a successful career. Smith was a rich man, not only from his publishing business, but on account of his large ownership in. the mineral water Apollinaris and other ventures. His second son, Alexander Murray Smith, joined the firm in 1890, and with him was associ- ated in 1894 his brother-in-law Reginald J. Smith, who in 1899 became acting partner. George Smith himself died at Byfleet,

near Weybridge, on the 6th of April 1901.

See the memoir (1901) of George Smith (2) prefixed to vol. i. of the supplement to the Dictionary of National Biography; reminis- cences contributed to the Comhill Magazine (Nov. 1900-Feb. 1901) by George Smith ; an article by Sir Leslie Stephen in the same magazine (May 1901); and the special number of the Comhill in January 1910, published on its 50th anniversary.

SMITH, GEORGE [" George Smith of Coalville "] (1831-1895), English philanthropist, was born near Tunstall, Staffordshire, on the 16th of February 1831. His father was a brickmaker, and when nine years old George Smith was working thirteen hours a day in the brickfields. Nevertheless he contrived to obtain some education, so that in time he improved his position, becoming manager of a brick and tile works. In 1857 he discovered, at Coalville, Leicestershire, valuable seams of clay, and on the strength of this discovery organized a large brick-making business there. He advocated legislation in the interests of brickmakers, and in particular called attention to the cruelty suffered in the brickfields by child-workers, whose claims he pressed at the Social Science congresses. In 1871 he published The Cry of the Children. This work awoke the interest of the (seventh) earl of Shaftesbury and of A. J. Mundella, and, in the same year, was passed an act providing for the government inspection of brick-yards, and the regulation of juvenile and female labour there. Smith's share in this act aroused great antagonism, and at the end of 1872 he was dismissed from his position at Coalville, and reduced to great poverty. Nevertheless he turned his attention to the conditions of life of the hundred thousand persons living on canals. As the result of his representations on the subject the Canal Boats Bill was introduced by Mr Sclater-Booth (afterwards Lord Basing). This bill, which came into force in 1878, provided for the education of children on ca.nal boats, and regulated the sanitary condition of life on board. In 1884 was passed another bill strengthening the provisions of the first. From that date onwards Smith devoted his attention to improving the condition of Gipsy children which he had described in his Gipsy Life (1880). A Moveable Dwellings Bill embodying his views was several times introduced into parliament, but always defeated. In 1885 Smith received a grant from the royal bounty fund. He died at Crick near Rugby on the 21st of June 1895.

See George Smith of Coalville, the Story of an Enthusiast, by E. Hodder (1896).

SMITH, GEORGE (1840-1876), English Assyriologist, was born on the 26th of March 1840 at Chelsea, London. His father was a working man, and at fourteen the boy was apprenticed to Messrs Bradbury and Evans to

learn bank-note engraving. He had already shown a keen interest in the explorations of Layard and Rawlinson, and during the next few years he devoted all his spare time to studying the cuneiform inscriptions at the British Museum. His earnestness attracted the attention of Sir Henry Rawlinson, who permitted him the use of his room at the museum and placed the many casts and squeezes of the inscrip- tions at his disposal. Smith was thus enabled to make his first discovery (the date of the payment of the tribute by Jehu to Shalmanezer). and Sir Henry suggested to the trustees of the Museum that he should be associated with himself in the prepara- tion of the third volume of Cuneiform Inscriptions of Western Asia. Accordingly, in 1867, Smith was appointed assistant in the Assyriology department, and the earliest of his successes was the discovery of two inscriptions, one fixing the date of the total eclipse of the sun in the month Sivan in May 763 B.C., and the other the date of an invasion of Babylonia by the Elamites in 2280 B.C. In 1871 he published Annals of Assur-bani-pal, transliterated and translated, and communicated to the newly- founded Society of Biblical Archaeology a paper on " The Early History of Babylonia," and an account of his decipherment of the

Cypriote inscriptions. In 1872 Smith achieved world-wide fame by his translation of the Chaldaean account of the Deluge, which was read before the Society of Biblical Archaeology on the 3rd of December. In the following January Sir Edwin Arnold, the editor of the Daily Telegraph, arranged with Smith that he should go to Nineveh at the expense of that journal, and carry out excavations with a view to finding the missing fragments of the Deluge story. This journey resulted not only in the discovery of the missing tablets, but of fragments which recorded the suc- cession and duration of the Babylonian dynasties. In 1874 Smith again left England for Nineveh, this time at the expense of the Museum, and continued his excavations at Kouyunjik. An account of his work is given in Assyrian Discoveries, published early in 1875. The rest of the year was spent in fixing together and translating the fragments relating to the Creation, the re- sults of which work were embodied in The Chaldaean Account of Genesis. In. March 1876 the trustees of the British Museum despatched Smith once more to excavate the rest of Assur-bani- pal's library. At Ikisji, a small village about 60 m. N.E. of Aleppo, he was prostrated by fever, and finally died at Aleppo on the 19th of August. He left a wife and children, on whose behalf a public subscription was made.

SMITH, GEORGE ADAM (1856-), Scottish divine, was born in Calcutta on the 19th of October 1856, where his father, George Smith, CLE., was then principal of the Doveton College. He was educated at Edinburgh in the Royal High School, the University and New College. After studying at Tubingen and Leipzig and travelling in Egypt and Syria, he entered the ministry of the Free Church of Scotland and was appointed professor of

Old Testament subjects in the Free Church College at Glasgow 1892. In 1909 he was appointed principal of the University of Aberdeen.

Among his works are The Book of Isaiah (2 vols., 1888-1890); The Book of the Twelve Prophets (2 vols., 1876-1877); Historical Geo- graphy of the Holy Land (1894); Jerusalem (2 vols., 1907); The Preaching of the Old Testament to the Age (1893); The Life of Henry Dr.ummond (1898).

SMITH, GERRIT (1 797-1874), American reformer and phil- anthropist, was born in Utica, New York, on the 6th of March 1797. After graduating at Hamilton College in 1818, he assumed the management of the vast estate of his father, Peter Smith (1768-183 7), long a partner of John Jacob Astor, and greatly in- creased the family fortune. About 1828 he became an active worker in the cause of temperance, and in his home village, Peterboro, he built one of the first temperance hotels in the country. He became an abolitionist in 1835, after seeing an anti- slavery meeting at Utica broken up by a mob. In 1840 he took a leading part in the organization of the Liberty party, and in 1848 and 1852 he was nominated for the presidency by the remnant of this organization that had not been absorbed by the Free Soil party. An " Industrial Congress " at Philadelphia also nominated him for the presidency in 1848, and the "Land Reformers "in 1856. In 1840 and in 1858 he was a candidate for the governorship of New York on an anti-slavery platform. In 1853 he was elected to the National House of Representatives as an independent, and issued an address declaring that all men have an equal right to the soil; that wars are brutal and un- necessary; that slavery could be sanctioned by no constitution, state or federal; that free trade is essential to human brother- hood; that women should have full political rights; that the Federal government and the states should prohibit the liquor traffic within their respective jurisdictions; and that govern- ment officers, so far as practicable, should be elected by direct vote of the people. At the end of the first session he resigned his seat. After becoming an opponent of land monopoly, he gave numerous farms of fifty acres each to indigent families, and also attempted to colonize tracts in N. New York with free negroes; but this experiment was a failure. Peterboro became a station on the " underground railroad "; and after 1850 Smith furnished money for the legal expenses of persons- charged with infractions of the Fugitive Slave Law. With John Brown, to whom he gave a farm in Essex county, New York, he became very intimate, and from time to time supplied him with funds, though it seems

without knowing that any of the money would be employed in an attempt to incite a slave insurrection. Under the excitement following the raid on Harper's Ferry he became temporarily insane, and for several weeks was confined in an asylum in Utica. He favoured a vigorous prosecution of the Civil War, but at its close advocated a mild policy toward the late Confederate states, declaring that part of the guilt of slavery lay upon the North. He even became one of the securities for Jefferson Davis, thereby incurring the resentment of Northern radical leaders.

In religion as in politics Gerrit Smith was a radical. Believing that sectarianism was sinful, he separated from the Presbyterian Church in 1843, and was one of the founders of the Church at Peterboro, a non-sectarian institution open to all Christians of whatever shade of belief. His private benefactions were bound- less; of his gifts he kept no record, but their value is said to have exceeded $8,000,000. Though a man of great wealth his life was one of marked simplicity. He died on the 28th of December 1874, while on a visit to relatives in New York City.

See O. B. Frothingham, Gerrit Smith: a Biography (New York,

1879).

SMITH, 60LDWIN (1823-1910), British historian and publicist, was born at Reading on the 13th of August 1823. He was educated at Eton and Magdalen College, Oxford, and after an undergraduate career of exceptional brilliancy was elected to a fellowship at University College. He threw his keen intellect and trenchant style into the cause of university reform, the leading champion of which was another fellow of University College, Arthur Penrhyn Stanley. On the Royal Commission of 1850 to inquire into the reform of the university, of which Stanley was secretary, he served as assistant-secretary; and he was secretary to the commissioners appointed by the act of 1854. His position as an authority on educational reform was further recognized by a seat on the Popular Education Commission of 1858. In 1868, when the question of reform at Oxford was again growing acute, he published a brilliant pamphlet, entitled The Reorganization of the University of Oxford. Besides the abolition of tests, effected by the act of 187 1, many of the reforms there suggested, such as the revival of the faculties, the reorganization of the professoriate, the abolition of celibacy as a condition of the tenure of fellowships, and the combination of the colleges for lecturing purposes, were incorporated in the act of 1877, or subsequently adopted by the university. He gave the counsel of perfection that " pass " examinations ought to cease; but he recognized that this change " must wait on the reorganization of the educational institutions immediately below the university, at which a passman ought to finish his career." His aspiration that colonists and Americans should be

attracted to Oxford has been realized by Mr Rhodes's will. On what is perhaps the vital problem of modern education, the question of ancient versus modern languages, he pronounced that the latter " are indispensable accomplishments, but they do not form a high mental training " — an opinion entitled to peculiar respect as coming from a president of the Modern Language Association. The same conspicuous openness of mind appears in his judgment, delivered after he had held the regius professorship of Modern History at Oxford from 1858 to 1866, that " ancient history, besides the still unequalled excellence of the writers, is the best instrument for cultivating the historical sense." As a historian, indeed, he left no abiding work; the multiplicity of his interests prevented him from concentrating on any one subject. His chief historical writings — The United Kingdom: a Political History (1899), and The United States: an Outline of Political History (1803) — though based on thorough familiarity with their subject, make no claim to original research, but are remarkable examples of terse and brilliant narrative.

The outbreak of the American Civil War proved a turning- point in his life. Unlike most men of the ruling classes in England, he warmly championed the cause of the North, and his pamphlets, especially one entitled Does the Bible sanction American Slavery? (1863), played a prominent part in converting English opinion. Visiting America on a lecture tour in 1864, he received an enthusiastic welcome, and was entertained at a

public banquet in New York. In 1868 he threw up his career in England and settled in the United States, where he held the professorship of English and Constitutional History at Cornell University till 1871. In that year he removed to Toronto, where he edited the Canadian Monthly, and subsequently founded the Week and the Bystander. He did not, however, cease to take an active interest in English politics. He had been a strong sup- porter of Irish Disestablishment, but he refused to follow Glad- stone in accepting Home Rule. He expressly stated that "if he ever had a political leader, his leader was John Bright, not Mr Gladstone." Speaking in 1886, he referred to his " standing by the side of John Bright against the dismemberment of the great Anglo-Saxon community of the West, as I now stand against the dismemberment of the great Anglo-Saxon community of the East." These words form the key to his views of the future of the British Empire. He always maintained that Canada, separated by great barriers, running north and south, into four zones, each having unimpeded communication with the adjoining portions of the United States, was destined by its natural configuration to enter into a commercial union with them, which would result in her breaking away from the British empire, and in the union of the Anglo-Saxons of the American continent into one great nation. These views are most fully stated in his Canada and the Canadian Question (1891). Though describing himself as " anti-

imperialistic to the core," he was yet deeply penetrated with a sense of the greatness of the British race. Of the British empire in India he said that " it is the noblest the world has seen. . . . Never had there been such an attempt to make conquest the servant of civilization. About keeping India there is no question. England has a real duty there." His fear was that England would become a nation of factory-workers, thinking more of their trade-union than of their country. These forebodings were intensified in his Common- wealth or Empire? (1902) — a warning to the United States against the assumption of imperial responsibilities. Among other causes that he powerfully attacked were liquor prohibition, female suffrage and State Socialism. All these are discussed in his Essays on Questions of the Day (revised edition, 1894). He also published sympathetic monographs on Cowper and ' Jane Austen, and attempted verse in Bay Leaves and Specimens of Greek Tragedy. In his Guesses at the Riddle of Existence (1897), he abandons the faith in Christianity expressed in his lecture of 1861 on Historical Progress (where he forecast the speedy reunion of Christendom on the " basis of free conviction ") , and writes in a spirit " not of Agnosticism, if Agnosticism imports despair of spiritual truth, but of free and hopeful inquiry, the way for which it is necessary to clear by removing the wreck of that upon which we can found our faith no more." In his later years he expressed his views in a weekly journal The Farmer's Sun, and published in 1904 My Memory of Gladstone, while occasional letters to the Spectator showed that he had lost neither his interest in English politics and social questions nor his remarkable gifts of style. He died at his residence, The Grange, Toronto, on the 7th of June 1910.

Goldwin Smith left in manuscript a book of reminiscences, which was edited by Mr Arnold Haul tain, his private secretary.

SMITH, HENRY BOYNTON (181 5-1877), American theologian, was born in Portland, Maine, on the 21st of November 1815. He graduated at Bowdoin College in 1834; studied theology at Andover, where his health failed, at Bangor, and, after a year (1836-183 7) as librarian and tutor in Greek at Bowdoin, in Germany at Halle, where he became personally intimate with Tholuck and Ulrici, and in Berlin, under Neander and Hengsten- berg. He returned to America in 1840, was a tutor for a few months (1840-1841) at Bowdoin, and in 1842, shut out from any better place by distrust of his German training and by his frank opposition to Unitarianism, he became pastor of the Congregational Church of West Amesbury (now Merrimac), Massachusetts. In 1847-1850 he was professor of moral philo- sophy and metaphysics at Amherst; and in 1850-1854 was Washburn professor of Church history, and in 1854-1874 Roosevelt professor of systematic theology, at Union Theological

Seminary. His health failed in 1874 and he died in New York City on the 7th of February 1877. Of the old school of the " New England Theology," Smith was one of the foremost leaders of the new school Presbyterians. His theology is most strikingly contained in the Andover address, " Relations of Faith and Philosophy," which was delivered before the Porter Rhetorical Society in 1849. He always made it clear that the ideal philosophy was Christocentric: he said that Reformed theology must " 'Christologize ' predestination and decrees, regeneration and sanctification, the doctrine of the Church, and the whole of the Eschatology."

His son Henry Goodwin Smith (b. i860) was pastor of the Freehold (New Jersey) Presbyterian Church in 1886-1896, and from 1897 to 1903 was professor of systematic theology in Lane Theological Seminary.

From notes of his lectures, William S. Karr prepared two volumes of Dr Smith's theological writings, Introduction to Christian Theology (1883) and System of Christian Theology (1884). Dr Smith contri- buted articles on Calvin, Kant, Pantheism, Miracles, Reformed Churches, Schelling and Hegel to the American Cyclopaedia, and contributed to McClintock and Strong's Cyclopaedia; and was editor of the American Theological Review (1859 sqq.), both in its original form and after it became the American Presbyterian and Theological Review and, later, the Presbyterian Quarterly and Prince- ton Review.

See E. L. (Mrs H. B.) Smith, Henry Boynton Smith, His Life and Works (Mew York, 1881), and Lewis F. Stearns, Henry Boynton Smith (Boston, 1892), in the American Religious Leaders series.

SMITH, SIR HENRY GEORGE WAKELYN, Bart. (1787- 1860), British general, son of John Smith, surgeon, of Whittlesey, Cambridgeshire, was born at that place on the 28th of June 1787. Harry Smith — for throughout life he adopted the more familiar form of his Christian name — was educated privately and entered the army in 1805. His first active service was in South America in 1806, and he subsequently served through the Peninsular War from the concentration at Salamanca in November 1808 to the battle of Toulouse on the 10th of April 18 14. On the day follow- ing the storming of Badajos (the 6th of April 1812) a well-born Spanish lady, whose entire property in the city had been de- stroyed, presented herself at the British lines seeking protection from the licence of the soldiery for herself and her sister, a child of fourteen, by whom she was accompanied. The latter, whose name was Juana Maria de Los Dolores de Leon, had but recently emerged from a convent ; but notwithstanding her years she was married to Harry Smith a few days later. She remained with

him throughout the rest of the war, accompanying the baggage train, sleeping in the open on the field of battle, riding freely among the troops, and sharing all the privations of cam- paigning. Her beauty, courage, sound judgment and amiable character endeared her to the officers, including the duke of Wellington, who spoke of her familiarly as Juanita; and she was idolized by the soldiers. At the close of the war Harry Smith volunteered for service in the United States, where he was pre- sent at the battle of Bladensburg (the 24th of August 1814), and witnessed the burning of the capitol at Washington; which, as he said, " horrified us coming fresh from the duke's humane warfare in the south of France." Returning to Europe he was brigade- major at Waterloo; and in 1828 was ordered to the Cape of Good Hope, where he commanded a division in the Kaffir War of 1834-36. In 1835 he accomplished the feat of riding from Cape Town to Graham's Town, a distance of 600 m., in less than six days; and having restored confidence among the whites by his energetic measures, he was appointed governor of the new Province of Queen Adelaide, where he gained unbounded in- fluence over the native tribes, whom he vigorously set himself to civilize and benefit. But though supported by Sir Benjamin D'Urban, the high commissioner, the ministry in London reversed his policy and — to quote Smith's own words — "directed the Province of Queen Adelaide to be restored to barbarism." Smith himself was removed from his command, his departure being deplored alike by the Kaffirs and the Dutch; and numbers of the latter, largely in consequence of this policy of Lord Glenelg, began the migration to the interior known as " the great trek." Harry Smith was now appointed deputy-adjutant-general of

the forces in India, where he took part in the Gwalior campaign of 1843 (for which he received a K.C.B.) and the Sikh War of 1845-46. He was in command of a division under Sir Hugh Gough at the battles of Moodkee and Ferozeshah, where he conspicuously distinguished himself, but was insufficiently sup- ported by the commander-in-chief. After the second of these actions Sir Harry Smith was appointed to an independent com- mand, and on the 28th of January 1846 he inflicted a crushing defeat on the Sikhs at Aliwal on the Sutlej. At Sobraon on the 10th of February he again commanded a division under Gough. For the great victory of Aliwal he was awarded the thanks of parliament; and the speech of the duke of Wellington was perhaps the warmest encomium ever bestowed by that great commander on a meritorious officer. Sir Harry was at the same time created a baronet; and as a special distinction the words " of Aliwal " were by the patent appended to the title. In 1847 he returned to South Africa as governor of Cape Colony and high commissioner, to grapple with the difficulties he had fore- seen eleven years before (see Cape Colony: History). He took command of an expedition to deal with the disaffected Boers in the Orange River Sovereignty, and fought the action of Boom-

plaats on the 29th of August 1848. In December 1850 war broke out with the Kaffirs; Sir Harry Smith was insufficiently supplied with troops from England; and though his conduct of the operations was warmly approved by the duke of Wellington and other military authorities, Lord Grey, in a despatch never submitted to the queen, recalled him in 1852 before the Kaffirs had been compktely subdued. He protested strongly against the abandonment of the Orange River Sovereignty to the Boers, which was carried out two years after his departure, and he actively furthered the granting of responsible government to Cape Colony. His Spanish wife was his constant companion in his second as in his earlier sojourn in South Africa, where her memory is recalled by the town of Ladysmith in Natal (rendered famous by the Boer War of 1899-1902), as is that of her husband by Harrismith in the Orange Free State; while Aliwal North, founded in 1849 and named after his great Indian victory, further commemorates Sir Harry Smith. On his return to England he held a military appointment for some years, and died in London on the 12th of October i860. Juana, Lady Smith, survived till 1872.

See Autobiography of Sir Harry Smith, edited by G. C. Moore Smith (1901); R. S. Rait," Life of Viscount Gough (1903); Wilmot and Chase, Annals of the Cape Colony (1869) ; J. Nobie, South Africa (1877); Theal's History of South Africa, vol. iv. (R. J. M.)

SMITH, HENRY JOHN STEPHEN (1826-1883), English mathematician, was born in Dublin on the 2nd of November 1826, and was the fourth child of his parents. When Henry Smith was just two years old his father died, whereupon his mother left Ireland for England. After being privately educated by his mother and tutors, he entered Rugby school in 1841. Whilst under the first of these tutors, in nine months he read all Thucydides, Sophocles and Sallust, twelve books of Tacitus, the greater part of Horace, Juvenal, Persius, and several plays of Aeschylus and Euripides. He also studied the first six books of Euclid and some algebra, besides reading a considerable quantity of Hebrew and learning the Odes of Horace by heart. On the death of his elder brother in September 1843 Henry Smith left Rugby, and at the end of 1844 gained a scholarship at Balliol College, Oxford. He won the Ireland scholarship in 1848 and obtained a first class in both the classical and the mathematical schools in 1849. He gained the senior mathe- matical scholarship in 1851. He was elected fellow of Balliol in 1850 and Savilian professor of geometry in 1861, and in 1874 was appointed keeper of the university museum. He was elected F.R.S. in 1861, and was an LL.D. of Cambridge and Dublin. He served on various royal commissions, and from 1877 was the chairman of the managing body of the meteorological office. He died at Oxford on the 9th of February 1883.

After taking his degree he wavered between classics and mathe- matics, but finally chose the latter. After publishing a few short papers relating to theory of numbers and to geometry, he devoted himself to a thorough examination of the writings of K. F. Gaus6,

P. G. Lejeune-Dirichlet, E. E. Kuromer, &c, on, the theory of numbers. The main results of these researches, which occupied him from I854 to 1864, are contained in his Report on the Theory of Numbers, which appeared in the British Association volumes from 1859 to 1865. This report contains not only a complete account of all that had been done on this vast and intricate subject but also original contributions of his own. Some of the most important results of his discoveries were communicated to the Royal Society in two memoirs upon " Systems of Linear Indeterminate Equations and Congruences" and upon the " Orders and Genera of Ternary Quadratic Forms" {Phil. Trans., 1861 and 1867). He did not, however, confine himself to the consideration of forms involving only three indeterminates, but succeeded in establishing the prin- ciples on which the extension to the general case of n indeterminates depends, and obtained the general formulae, thus effecting what is probably the greatest advance made in the subject since the publican tion of Gauss's Disquisitiones arithmeticae. A brief abstract of Smith's methods and results appeared in the Proc. Roy. Soc. for 1864 and 1868. In the second of these notices he gives the general formulae without demonstrations. As corollaries to the general formulae he adds the formulae relating to the representation of a number as a sum of five squares and also of seven squares. This class of representation ceases when the number of squares exceeds eight. The cases of two, four and six squares had been given by K. G. J. Jacobi and that of three squares by F. G. Eisenstein, who had also given without demonstration some of the results for five squares. Fourteen years later the Academie Francaise, in ignorance of Smith's work, set the demonstration and completion of Eisenstein's theorems for five squares as the object of their " Grand Prix des Sciences Mathematiques." Smith, at the request of a member of the commission by which the prize was proposed, undertook in 1882 to write out the demonstration of his general theorems so far as was required to prove the results for the special case of five squares. A month after his death, in March 1883, the prize of 3000 francs was awarded to him. The fact that a question of \which Smith had given the solution in 1867, as a corollary from general formulae governing the whole class of investigations to which it belonged, should have been set by the Academie as the subject of their great prize shows how far in advance of his contemporaries his early researches had carried him. Many of the

propositions contained in his dissertation are general ; but the demonstrations are not supplied for the case of seven squares. He was also the author of important papers in which he extended to complex quadratic forms, many of Gauss's investigations relating to real quadratic forms. After 1 864 he devoted himself chiefly to elliptic functions, and numerous papers on this subject were published by him in the Proc. Lond. Math. Soc. and elsewhere. At the time of his death he was engaged upon a memoir on the Theta and Omega Functions,, which he left nearly complete. In 1868 he was awarded the Steiner prize of the Berlin Academy for a geometrical memoir, Sur quelques problemes cubiques et biquadratiques. He also wrote the introduction to the collected edition of Clifford's Mathematical Papers (1882). The three subjects to which Smith's writings relate are theory of numbers, elliptic functions and modern geometry; but in all that he wrote an "arithmetical" mode of thought is apparent, , his methods and processes being arithmetical as distinguished from algebraic. , , He had the most intense admiration of Gauss. He Was president of the mathematical and physical section of the British Association at Bradford in 1873 and of the London M atne matical Society in 1874- 1876. His Collected Papers were edited by J. W. L. Glaisher and published in 1894.

An article in the Spectator of the 17th of February 1883, by Lord Justice Bowen, gives perhaps the best idea of Smith's extraordinary personal qualities and influence. See also J. W..L. Glaisher's memoir in the Monthly Notices of the Roy. Ast. Soc. (vol, xliv., 1884).

SMITH, HENRY PRESERVED (1 847-) , American Biblical

scholar, was born in Troy, Ohio, on the 23rd of October 1847. He graduated at Amherst College in 1869 and studied theology in Lane Theological Seminary in 1869-1872, in Berlin in 1872- 1874 and in Leipzig in 1876-1877. He was instructor in church history in 1874-1875, and in Hebrew in 1875-1876, and was assistant -professor in 1877ˆ1879 and professor in 1879-1893 of Hebrew and Old Testament exegesis in Lane Theological Semin- ary. In 1892 he was tried for heresy by the Presbytery of Cincinnati, was found guilty of teaching (in a pamphlet entitled Biblical Scholarship and Inspiration, 1891) that there were "errors of historic fact," suppressions of "historic truths," &c, in the books of Chronicles, and that the " inspiration of the Holy Scriptures is consistent with the unprofitableness of portions of the sacred writings,"— in other words, that inspiration does not imply inerrancy, — and he was suspended from the ministry. Dr Smith retired from the denomination, and in 1893, upon becoming a professor at Andover Theological Seminary, entered the ministry of the Congregational Church. From 1897 to 1906

he was a professor in Amherst College, and in 1907 became ? professor in

the Meadville (Pennsylvania) Theological School.

He published The Bible and Islam (1897), Commentary on the Books of Samuel (1899, in the " International Critical Commentary ") and Old Testament History (1903, in the " International Theologica) Library"). In Inspiration and Inerrancy (Cincinnati, 1893), he reprinted the papers on which the heresy charge was made, ano' outlined the case.

SMITH, JAMES (1775-1839), and HORACE (1779-1849), authors of the Rejected Addresses, sons of a London solicitor, were born, the former on 10th February 1775 and the latter on 31st December 1779, both in London. The occasion of their happy jeu d'esprit was the rebuilding of Drury Lane theatre in 1812, after a fire in which it had been burnt down. The managers had offered a prize of £50 for an address to be recited at the re- opening in October. Six weeks before that date the happy thought occurred to the brothers Smith of feigning that the most popular poets of the time had been among the competitors and issuing a volume of unsuccessful addresses in parody of their Various styles. They divided the task between them, James taking Wordsworth, Southey, Coleridge and Crabbe, while Byron, Moore, Scott and Bowles were assigned to Horace. 1 Seven editions were called for within three months. The Rejected Addresses are the most widely popular parodies ever published in England, and take classical rank in literature. The brothers fairly divided the honours: the elder brother's Wordsworth is evenly balanced by the younger's Scott, and both had a hand in Byron. A striking feature is the absence of malice; none of the poets caricatured took offence, while the imitation is so clever that both Byron and Scott are recorded to have said that they could hardly believe they had not written the addresses ascribed to them. The only other undertaking of the two brothers was Hot ace in London (1813). James Smith made' another hit in writing Country Cousins, A Trip to Paris, A Trip to America, and other lively skits for Charles Mathews who said he was " the only man who can write clever nonsense." His social reputation as a wit stood high. He was reputed one of the best of talkers in an age when the art was studied, and it was remarked that he held his own without falling into the great error of wits- sarcasm. But in his old age the irreverent Fraser's put him in its gallery of living portraits as a gouty and elderly but pains- taking joker. He died in London on the 24th of December 1839. After making a fortune as a stockbroker, Horace Smith followed in the wake of Scott and wrote about a score of historical novels — Brambletye House (1826), Tor Hill (1826), Reuben A psley (1827), Zillah (1828), The New Forest (1829), Walter Colylon (1830), &c. His sketches of eccentric character are brilliant and amusing; but he was more of an essayist than a story-teller. Three volumes of Gaieties and Gravities, published by him in 1826, contain many witty essays both in prose and in verse, but the only single piece that has taken a permanent place is the "

Address to the Mummy in Belzoni's Exhibition." In private life Horace Smith was not less popular than his brother, though less ambitious as a talker. It was of him that Shelley said: " Is it not odd that the Only truly generous person I ever knew who had money enough to be generous with should be a stock- broker? He writes poetry and pastoral dramas and yet knows hOw to make money, and does make it, and is still generous." Horace Smith died at Tunbridge Wells on 12th July 1849.

SMITH, JOHN (1579-1631), usually distinguished as Captain John Smith, sometime president of the English colony in Virginia, was the elder son of George Smith, a well-to-do tenant- farmer on the estate of Lord Willoughby d'Eresby at Willoughby, near Alford in Lincolnshire. The life of this Virginian hero falls conveniently into five periods. The first of these, up to 1596, that of his early youth, is thus described by himself in his Travels: "He was born (1579) in Willoughby in Lincolnshire, and was a scholar in the two free schools of Alford and Louth.

1 The particulars of the authorship are given in the 1 8th edition (1820), and in the memoir of his brother by Horace prefixed to a collection of fugitive pieces (1840). James contributed the first stanza to the imitation of Byron, but otherwise they worked inde- pendently.

His parents, dying (April 1596) When he was thirteen (or rather sixteen) years of age, left him a competent means, which he, not being capable to manage, little regarded. His mind being even then set upon brave adventures, he sold his satchel, books and all he had, intending secretly to get to sea, but that his father's death stayed him. But now the guardians of his estate more regarding it than him, he had liberty enough, though no means, to get beyond the sea. About the age of fifteen years, he was bound an apprentice to Master Thomas Sendall of [King's] Lynn, the greatest merchant of all those parts; but, because he would not presently send him to sea, he never saw his master in eight years after."

The second period, 1 596-1604, is that of his adventures in Europe, Asia and Africa. He first went to Orleans in attendance on the second son of Lord Willoughby. Thence he returned to Paris, and so by Rouen to Havre, where, his money being spent, he began to learn the life of a soldier under Henry IV. of France; On the conclusion. (1599) of peace with the League, he went with Captain Joseph Duxbury to Holland and served there some time, probably with the English troops in Dutch pay. By this time he had gained a wide experience in the art of war, not merely as an infantry

officer, but also in those more technical studies which are now followed by the Royal Engineers. At length he sailed from Enkhuisen to Scotland, and on the voyage had a narrow escape from shipwreck upon Holy Island near Berwick. After some stay in Scotland he returned home to Willoughby, " where, within a short time being glutted with too much company, wherein he took small delight, he retired himself into a little woody pasture, a good way from any town, environed with many hundred acres of other woods. Here by a fair brook he built a pavilion of boughs, where only in his clothes he lay. His study was Machiavelli's Art of War and Marcus Aurelius; his exercise a good horse with his lance and ring; his food was thought to be more of venison than anything else; what [else] hewanted his man biought him. The country wondering at such a hermit, his friends persuaded one Signior Theadora Polaloga, rider to Henry, earl of Lincoln, an excellent horseman and a noble Italian gentleman, to insinuate [himself] into his woodish acquaintances, whose languages and good discourse and exercise of riding drew Smith to stay with him at Tatters-all. . . . Thus — when France and the Netherlands had taught him to ride a horse and use his arms, with such rudiments of war as his tender years, in those martial schools, could attain unto, he was desirous to see more of the world, and try his fortune against the Turks, both lamenting and repenting to have seen so many Christians slaughter one another."

Next came his wanderings through France from Picardy to Marseilles. There he took ship for Italy in a vessel full of pilgrims going to Rome. These, cursing him for a heretic, and swearing they would have no fair weather so long as he was on board, threw him, like another Jonah, into the sea. He was able to get to a little uninhabited island, from which he was taken off the next morning by a Breton ship of 200 tons going to Alexandria, the captain of which, named La Roche, treated him as a friend. In this ship he visited Egypt and the Levant. On its way back the Breton ship fought a Venetian argosy of 400 tons and captured it. Reaching Antibes (Var) later on> Captain La Roche put Smith ashore with 500 sequins, who then proceeded to see Italy as he had already seen France. Passing through Tuscany he came to Rome, where he saw Pope Clement VIII. at mass, and called oh Father R. Parsons. Wandering on to Naples and back to Rome, thence through Tuscany and Venice, he came to Gratz in Styria. There he received informa- tion about the Turks who were then swarming through Hungary, and, passing on to Vienna, entered the emperor's service.

In this Turkish war the years 1601 and 1602 soon passed away; many desperate adventures does he narrate (unconfirmed by contemporary records, and doubted by some modern critics), and one in particular covered him with honour. At Regal, in the presence of two armies, as the champion of the Christians, he killed three Turkish champions in

succession. On 1 8th November 1602, at the battle of Rothenthurm, a pass in Transylvania,

where the Christians fought desperately against an overpowering force of Crim Tatars, Smith was left wounded on the field of battle. His rich dress saved him, for it showed that he would be worth a ransom. As soon as his wounds were cured he was sold for a slave and then marched to Constantinople, where he was presented to Charatza Tragabigzanda, who fell in love with him. Fearing lest her mother should sell him, she sent him to her brother Timor, pasha of Nalbrits, on the Don, in Tatary. To her unkind brother this kind lady wrote so much for his good usage that he half suspected as much as she intended; for she told him, he should there but sojourn to learn the language, and what it was to be a Turk, till time made her master of herself. But the Timor, her brother, diverted all this to the worst of cruelty. For,: within an hour after his arrival, he caused his ‘ drubman ‘ to strip him naked, and shave his head and beard so bare as his hand. A great ring of iron, with a long stalk bowed like a sickle, was riveted about his neck, and a coat [put on him] made of ulgry's hair, guarded about with a piece of an undressed skin. There were many more Christian slaves, and nearly a hundred forsados of Turks and Moors, and he being the last was the slave of slaves to them all." W T hile at Nalbrits the English captain kept his eyes open, and his account of the Crim Tatars is careful and accurate. " So long he lived in this miserable estate, as he became a thresher at a grange in a great field, more than a league from the Timor's house. The pasha, as he oft used to visit his granges, visited him, and took occasion so to beat, spurn and revile him, that forgetting all reason Smith beat out the Timor's brains with his threshing bat, for they have no flails, and, seeing his estate could be no worse than it was, clothed himself in the Timor's clothes, hid his body under the straw, filled his knapsack with corn, shut the doors, mounted his horse and ran into the desert at all adventure." For eighteen or nineteen days he rode for very life until he reached a Muscovite outpost on the river Don; here his irons were taken off him, and the Lady Callamata largely supplied all his wants. Thence he passed, attracting all the sympathy of an escaped Christian slave, through Muscovy, Hungary and Austria until he reached Leipzig in December 1603. There he met his old master, Prince Sigismund, who, in memory of his gallant fight at Regal, gave him a grant of arms and 500 ducats of gold. Thence he wandered on, sightseeing, through Germany, France and Spain, until he came to Saffi, from which seaport he made an excursion to the city of Morocco and back.

While at Saffi he was blown out to sea on board Captain Merham's ship, and had to go as far as the Canaries. There Merham fought two Spanish ships at once and beat them off. Smith came home to England with him, having a thousand ducats in his purse.

The third period, 1605-1609, is that of Captain Smith's experiences in Virginia. Throwing himself into the colonizing projects which were then coming to the front, he first intended to have gone out to the colony on the Oyapok in South America; but, Captain Leigh dying, and the reinforcement miscarrying, " the rest escaped as they could." Hence Smith did not leave England on this account. But he went heartily into the Virginian project with Captain Bartholomew Gosnold and others. He states that what he got in his travels he spent in colonizing. " When I went first to these desperate designs, it cost me many a forgotten pound to hire men to go, and procrastination caused more to run away than went. I have spared neither pains nor money according to my ability, first to procure His Majesty's letters patents, and a company here, to be the means to raise a company to go with me to Virginia, which beginning here and there cost me nearly five years' [1604-1609] work,andmore than five hundred pounds of my own estate, besides all the dangers, miseries and incumbrances I endured gratis." Two colonizing associations were formed — the London Company for South Virginia and the Western Company for North Virginia. Smith was one of the patentees of the Virginia charter of 1609. The colony which Sir W. Raleigh had established at Roanoke island off the American coast had perished, mainly for want of supplies from England, so that really nothing at all was known of

the Virginian coast-line when the first expedition left London on 19th December 1606; and therefore the attempt was bound to fail unless a convenient harbour should be found. The expedition consisted of three ships (the " Susan Constant," 100 tons, Captain C. Newport; the " God Speed," 40 tons, Captain B. Gosnold; and a pinnace of 20 tons, Captain J. Ratcliffe), with about 140 colonists and 40 sailors. They made first for the West Indies, reaching Dominica on 24th March 1607. At Nevis, their next stopping-place, a gallows was erected to hang Captain Smith on the false charge of conspiracy; but he escaped, and, though afterwards the lives of all the men who plotted against him were at his mercy, he spared them. Sailing northwards from the West Indies, not knowing where they were, the expedition was most fortunately, in a gale, blown into the mouth of Chesapeake Bay, discovering land on 26th April 1607. Anchoring, they found the James river, and, having explored it, fixed upon a site for their capital in the district of the chief or weroance of Paspaheh, its chief recommendation being that there were 6 fathoms of water so near to the shore that the ships could be tied to the trees. Orders had been sent out for the government of the colony in a box, which was opened on 26th April 1607. Captains B. Gosnold, E. M. Wingfield, C. Newport, J. Smith, J.

Ratcliffe, J. Martin and G. Kendall were named to be the council to elect an annual president, who, with the council, should govern. Wingfield was, on 13th May, elected the first president; and the next day they landed at James Town and commenced the settlement.

All this while Smith was under restraint, for thirteen weeks in all. His enemies would have sent him home, out of a sham commiseration for him; but he challenged their charges, and so established his innocency that Wingfield was adjudged to give him £200 as damages. After this, on 20th June 1607, Smith was admitted to the council.

As in going to America in those days the great difficulty was want of water, so in those colonizing efforts the paramount danger was from want of food. " There were never Englishmen left in a foreign country in such misery as we were in this new discovered Virginia. We watched every three nights [every third night], lying on the bare cold ground, what weather soever came, and warded all the next day, which brought our men to be most feeble wretches. Our food was but a small can of barley sodden in water to five men a day. Our drink, cold water taken out of the river, which was, at a flood, very salt, at a low tide, full of slime and filth, which was the destruction of many of our men." So great was the mortality that out of 105 colonists living on the 22nd June 1607 67 died by the following 8th January. The country they had settled in was sparsely popu- lated by many small tribes of Indians, who owned as their paramount chief, Powhatan, who then lived at Werowocomoco, a village on the Pamunkey river, about 12 m. by land from James Town. Various boat expeditions left James Town, to buy food in exchange for copper. They generally had to fight the Indians first, to coerce them to trade, but afterwards paid a fair price for what they bought.

On 10th December 1607 Captain Smith, of whom it is said " the Spaniard never more greedily desired gold than he victail," with nine men in the barge, left James Town to get more corn, and also to explore the upper waters of the Chickahominy. They got the barge up as far as Apocant. Seven men were left in it, with orders to keep in midstream. They disobeyed, went into the village, and one of them, George Cassen, was caught; the other six, barely escaping to the barge, brought it back to James Town. It so happened that Opecanchanough (the brother of Powhatan, whom he succeeded in 1618, and who carried out the great mass- acre of the English on Good Friday 1621) was in that neighbour- hood with two or three hundred Indians on a hunting expedition. He ascertained from Cassen where Smith was, who, ignorant of all this, had, with John Robinson and Thomas Emry, gone in a canoe 20 m. farther up the river. The Indians killed Robinson and Emry while they were sleeping by the camp fire, and went after Smith, who was away getting food. They surprised him, and.

though he bravely defended himself, he had at last to

surrender. He then set his wits to confound them with his superior knowledge, and succeeded. Opecanchanough led him about the country for a wonder, and finally, about 5th January 1608, brought him to Powhatan at Werowocomoco. " Having feasted him after their best barbarous manner they could, a long consultation was held; but the conclusion was two great stones were brought before Powhatan; then as many as could laid hands on Smith, dragged him to them, and thereon laid his head. And, being ready with their clubs to beat out his brains, Poca- hontas, the king's dearest daughter, when no entreaty could prevail, got his head in her arms and laid her own upon his to save him from death. Whereat the emperor was contented Smith should live, to make him hatchets, and her bells, beads and copper; for they thought him as well of all occupations [handi- crafts] as themselves."

The truth of this story w T as never doubted till 1859, when Dr Charles Deane of Cambridge, Mass., edited Wingfield's Dis- course; in reprinting Smith's True Relation of 1609, Deane pointed out that it contains no reference to this hairbreadth escape. Since then many American historians and scholars have concluded that it never happened at all; and, in order to be consistent, they have tried to prove that Smith was a blustering braggadocio, which is the very last thing that could in truth be said of him. The rescue of a captive doomed to death by a woman is not such an unheard-of thing in Indian stories. If the truth of this deliverance be denied, how then did Smith come back to James Town loaded with presents, when the other three men were killed, George Cassen in particular, in a- most horrible manner? And how is it, supposing Smith's account to be false, that Pocahontas afterwards frequently came to James Town, and was, next to Smith himself, the salvation of the colony? The fact is, nobody doubted the story in Smith's lifetime, and he had enemies enough. 1

Space fails to describe how splendidly Smith worked after his deliverance for the good of the colony, how he explored Chesa- peake Bay and its influents, how (when all others had failed) the presidency was forced on him on 10th September 1608; how he tried to get corn from Powhatan at Werowocomoco on 12 th January 1609, but he fled to Orapakes, 40 m. farther off; how with only eighteen men he cowed Opecanchanough in his own house at Pamunkey, in spite of the hundreds of Indians that were there, and made him sell corn; how well he administered the colony, making the lazy work or starve.

Meanwhile the establishment of this forlorn hope in Virginia had stirred up a general interest in England, so that the London Company were able in June 1609 to send out 9 ships with 500 colonists. Smith had now got the

Indians into splendid order; but from the arrival on nth August of the new-comers his authority came to an end. They refused to acknowledge him, and robbed and injured the Indians, who attacked them in turn. Smith did his best to smooth matters, while the rioters were plotting to shoot him in his bed. In the meantime he was away up the river. On his return, " sleeping in his boat, accidentally one fired his powder bag, which tore his flesh from his body and thighs, 9 or 10 in. square, in a most pitiful manner; but to quench the tormenting fire frying him in his clothes he leaped overboard into the deep river, where, ere they could recover him, he was nearly drowned." Thus disabled, he was sent home on 4th October 1609 and never set foot in Virginia again. Nemesis 1 Pocahontas never visited James Town after Smith went to England in October 1609, until she was brought there a state prisoner in April 1613 by Captain S. Argall, who had obtained possession of her by treachery on the Potomac river. The colony, while treating her well, used her as a means to secure peace with the Indians. In the meantime, believing Smith to be dead, she fell in love with an English gentleman, John Rolfe, apparently at that time a widower. They were married about 1st April 1614. Subsequently she em- braced Christianity. Sir T. Dale, with Rolfe and his wife, landed at Plymouth on 12th June 1616. Before she reached London, Smith petitioned Queen Anne on her behalf; and it is in this petition of June 1616 that the account of his deliverance by the Indian girl first appears. After a pleasant sojourn of about seven months, being well received both by the court and the people, Pocahontas with her husband embarked for Virginia in the George, Captain S. Argall (her old captor), but she died off Gravesend about February 1617.

overtook the rioters the winter after he left, which is known in Virginian story as " the starving time." Out of 490 persons in the colony in October 1609 all but 60 died by the following March.

The rest of Smith's life can only be briefly touched upon- The fourth period, 1610-1617, was chiefly spent in exploring Nusconcus, Canada and Pemaquid or North Virginia, to which, at his solicitation, Prince Charles gave the name of New England. His first object was to fish for cod and barter for furs, his next, to discover the coast-line with the view to settlement. Two attempts, in 1615 and 1617, to settle at Capawuck failed, but through no fault of his. It was in connexion with these projects that the Western Company for North Virginia gave him the title of admiral of New England. We cannot better conclude this sketch of his active operations than in his own words printed in 163 1. " Having been a slave to the

Turks; prisoner among the most barbarous savages; after my deliverance commonly discovering and ranging those large rivers and unknown nations with such a handful of ignorant companions that the wiser sort often gave me up for lost; always in mutinies, wants and miseries; blown up with gunpowder; a long time a prisoner among the French pirates, from whom escaping in a little boat by myself, and adrift all such a stormy winter night, when their ships were split, more than £100,000 lost which they had taken at sea, and most of them drowned upon the Isle of Rhe — not far from whence I was driven on shore, in my little boat, &c. And many a score of the worst winter months have [I] lived in the fields; yet to have lived near thirty-seven years [1593-1630] in the midst of wars, pestilence and famine, by which many a hundred thousand have died about me, and scarce five living of them that went first with me to Virginia, and yet to see the fruits of my labours thus well begin to prosper (though I have but my labour for my pains), have I not much reason, both privately and publicly to acknowledge it, and give God thanks? "

The last period, 1618-1631, of Smith's life was chiefly devoted to authorship. In 1618 he applied (in vain) to Francis Bacon to be numbered among his servants. In 1619 he offered to lead out the Pilgrim Fathers to North Virginia; but they would not have him, he being a Protestant and they Puritans. The charter of the London Virginia Company was annulled in 1624. A list of his publications will be found at the end of this article. Thus having done much, endured much and written much, while still contemplating a History of the Sea, Captain John Smith died on 21st June 1631, and was buried in St Sepulchre's Church, London.

Two of the sixty survivors of " the starving time," Richard Potts and William Phettiplace, thus nobly expressed in print, so early as 161 2, their estimate of Smith: " What shall I say? but thus we lost him [4th October 1609] that in all his proceedings made justice his first guide and experience his second; ever hating baseness, sloth, pride and indignity more than any dangers; that never allowed more for himself than his souldiers with him; that upon no danger would send them where he would not lead them himself; that would never see us want what he either had, or could by any means get us; that would rather want than borrow or starve than not pay; that loved actions more than words, and hated falsehood and cozenage than death; whose adventures were our lives, and whose loss our deaths."

A fairly complete bibliography will be found in Professor Edward Arber's reprint of Smith's Works (Birmingham, 1884), 8vo. The order of their first appearance is, A True Relation, &c. (1608) (first attributed to a gentleman of the colony, next to Th. Watson, and finally to Captain Smith); A Map of Virginia, ed. by W[illiam] S[immonds] (Oxford, 1612); A Description of New England (1616); New England's Trials (1620) ; New England's

Trials, 2nd ed. (1622) ;' The General History of Virginia, New England and the Summer Isles (1624); An Accidence for all Young Seamen (1626); the same work recast and enlarged as A Sea Grammar (1627), both works continuing on sale for years, side by side; The True Travels, &c. (1630); Advertisements for the Unexperienced Planters, &c. (1631)! Of some of the smaller texts limited 4to editions have been pub- lished by Dr C. Deaneand J. Carter Brown. Seethe MacLehoseedition U907) ot the Generalt Hiswrie, True Travels and Sea Grammar' A. G. Bradley's Captain John Smith (1905), Charles Poindexter's Cap- tarn John Smith and his Critics (1893) , John Fiske's Old Virginia (1897) and for criticism of Smith'scredibilityL. L. Kropf inNotes and Queries for 1890, Alexander Brown's Genesis of the United States (1890) and E D. Neill's History of theVirginia Company of London (1869). (E. A.)

SMITH, JOHN RAPHAEL (1752-1812), English painter and mezzotint engraver, a son of Thomas Smith of Derby, the landscape painter, was born in 1752. He was apprenticed to a linen-draper in Derby, and afterwards pursued the same business in London, adding, however, to his income by the production of miniatures. He then turned to engraving and executed his plate of the " Public Ledger," which had great popularity, and was followed by his mezzotints of " Edwin the Minstrel " (a portrait of Thomas Haden), after Wright of Derby, and " Mercury Inventing the Lyre," after Barry. He reproduced some forty of the works of Reynolds, some of these plates ranking among the masterpieces of the art of mezzotint, and he was appointed engraver to the prince of Wales. Adding to his artistic pursuits an extensive connexion as a print-dealer and publisher, he would soon have acquired wealth had it not been for his dissipated habits. He was a boon companion of George Morland, whose figure-pieces he excellently mezzotinted. He painted subject-pictures such as the " Unsuspecting Maid," " Inattention " and the " Moralist," exhibiting in the Royal Academy from 1779 to 1790. Uponthe decline of his business as a printseller he made a tour through the N. and midland counties of England, producing much hasty and indifferent work, and settled in Doncaster, where he died on the 2nd of March 181 2.

As a mezzotint engraver Smith occupies the very highest rank. His prints are delicate, excellent in drawing and finely expressive of colour. His small full-lengths in crayons and his portraits of Fox, Home Tooke, Sir Francis Burdett and the group of the duke of Devonshire and family support his claims as a successful draughts- man and painter. He had a very thorough knowledge of the principles and history of art, and was a brilliant conversationalist.

SMITH, JOSEPH, Jr. (1805-1844), the founder, in April 1830, of the Church of Jesus Christ of Latter-Day Saints, was born in Sharon, Vermont,

on the 23rd of December 1805. He was killed by a mob in a jail at Carthage, Illinois, on the 27th of June 1844. (See Mormons.)

SMITH, MORGAN LEWIS (1822-1874), American general, was born in Oswego county, New York, on the 8th of March 1822. In 1843 he settled in Indiana, and later had some military experience in the United States army. At the outbreak of the Civil War he raised the 8th Missouri regiment, of which he was elected colonel in 186 1. He commanded a brigade at the capture of Fort Donelson, and did good service at Shiloh. In July 1862 he was made a brigadier-general U.S.V., and served under Sherman in the river expedition against Vicksburg. At the battle of Chickasaw Bayou he received a severe wound, from which he recovered only in time to join the Army of the Tennessee before Chattanooga. He led his division iff the battles of the Chattanooga campaign, as also, in the following year, in the Atlanta campaign. At the battle of Atlanta he commanded Logan's corps. Afterwards he was placed in charge of Vicksburg. General Sherman said of M. L. Smith, " He was one of the bravest men in action I ever knew." He died at Jersey City on the 29th of December 1874.

His brother, Giles Alexander Smith (1829-1876), also a distinguished soldier of the Federal army, was born in Jefferson county, N.Y., on the 29th of September 1829. At the beginning of the Civil War he joined the Missouri volunteers, in which he became a captain. He took part in the capture of Fort Donelson, the battle of Shiloh and the Operations against Corinth, becoming, later in 1862, colonel of a regiment which he led at Chickasaw Bayou. After the final campaign against Vicksburg he was promoted brigadier-general of volunteers. He was wounded at the battle of Chattanooga. He took part in the Atlanta campaign, the " March to the Sea " and the Carolinas campaign, rising to the rank of major-general of volunteers. After the war he declined the offer of a colonelcy in the regular army, and was subsequently engaged in politics, retiring from public life in 1872. He died at Bloomington, 111., on the 8th of November 1876.

SMITH, RICHARD BAIRD (1818-1861), British engineer officer, son of a surgeon in the royal navy, was born on the 31st of December 1818. He was educated at Lasswade and Addis- combe, and joined the Madras Engineers in 1838. Being transferred to the Bengal Engineers, he served through the second

Sikh war, and was present at the battles of Batliwal, AHwal and Sobraon. He was then for some years employed on canal work, and when the Mutiny

broke out was in charge of Roorkee. He promptly concentrated the Europeans in the workshops, and though the native sappers deserted, his forethought pre- vented any loss of life. When Delhi was invested he was ap- pointed chief engineer in charge of the siege works. He reached Delhi on the 2nd of July, and immediately advised General Barnard to assault the city. Barnard died while the advice was still under consideration, and his successor, General Reed, could not be induced to follow it; and when Reed in turn was succeeded by Archdale Wilson, the besiegers were so weakened by losses that the moment for a successful attack had passed. Baird Smith, however, prevented Wilson from relaxing his hold on Delhi until the arrival of John Nicholson with reinforce- ments from the Punjab, and of the siege train from Phillour. Nicholson then joined Baird Smith in compelling Wilson to make the assault, which proved successful, on the 14th of September. Baird Smith was ably assisted by Captain Alexander Taylor, but Nicholson was unjust to Baird Smith in assigning to Taylor the chief credit for the siege operations. After the capture of Delhi he returned to Roorkee and to civil employment, and for a time the value of his military services was insufficiently recognized. After the Mutiny he was made A.D.C. to Queen Victoria, became secretary to the government of India in the public works department, and gained well-deserved credit in the famine of 1861. But the onerous character of this work, following a wound and illness at Delhi, broke down his constitu- tion, and he died at sea on the 13th of December 1861. He married a daughter of De Quincey, who long survived him. : See Colonel H. M. Vibart, Richard Baird Smith (1897). . SMITH, ROBERT (1680-1 768), English mathematician, was born in 1680, probably at Lea near Gainsborough. After attend- ing Leicester grammar school he entered Trinity College, Cam- bridge, in 1708, and becoming minor fellow in 17 14, major fellow in 171 5 and senior fellow in 1739, was chosen master in 1742, in succession to Richard Bentley. From 1716 to 1760 he was Plumian professor of astronomy, and be died in the master's lodge at Trinity on the 2nd of February 1768. Besides editing two works by his cousin, Roger Cotes, who was his predecessor in the Plumian chair, he published A Compleat System of Opticks in 1738, which gained him the sobriquet of " Old Focus," and Harmonics, or the Philosophy of Musical Sounds in 1749. He was the founder of the Smith's prizes at Cambridge, having by his will left £3500 South Sea, stock to the university, a portion of the interest from which was to be divided yearly between the two junior B.A.'s who had made the greatest progress in mathematics and natural philosophy.

SMITH, SYDNEY (1771-1845), English writer and divine, son of Robert Smith, was born at Woodford, Essex, on the 3rd of June 1 7 71. His father, a man of restless ingenuity and activity, " very clever, odd by nature, but still more odd by design," who bought, altered, spoiled and sold

about nineteen different estates in England, had talent and eccentricity enough to be the father of such a wit as Sydney Smith on the strictest principles of heredity; but Sydney himself attributed not a little of his constitutional gaiety to an infusion of French blood, his maternal grandfather being a French Protestant refugee of the name of Olier. Sydney was the second of a family of four brothers and one sister, all remarkable for their talents. While two of the brothers, Robert Percy, known as " Bobus," after- wards advocate-general of Bengal, and Cecil, were sent to Eton, Sydney was sent with the youngest to Winchester, where he rose to be captain of the school, and with his brother, so dis- tinguished himself that their schoolfellows signed a round-robin " refusing to try for the college prizes if the Smiths were allowed to contend for them any more, as they always gained them." At some time during his Oxford career he spent six months in France, being duly enrolled for safety's sake in the local Jacobin club. In 1789 he had become a scholar of New College, Oxford; he received a fellowship after two years' residence, took his degree in 1 792 and proceeded M.A. in 1 796. It was his wish then to read

for the bar, but his father would add nothing to his fellowship, and he was reluctantly compelled to take holy orders. He was ordained priest at Oxford in 1 796, and became a curate in the small village of Nether Avon, near Amesbury, in the midst of Salisbury Plain. The place was uncongenial enough, but Sydney Smith did much for the inhabitants, providing the means for the rudiments of education, and thus making better things possible. The squire of the parish, Michael Hicks-Beach, invited the new curate to dine, was astonished and charmed to find such a man in such a place , and engaged him after a time as tutor to his eldest son. It was arranged that they should proceed to the university of Weimar, but, before reaching their destination Germany was disturbed by war, and " in stress of politics " said Smith, "we put into Edinburgh." This was in 1798. While his pupil attended lectures, Smith was not idle. He studied moral philosophy under Dugald Stewart, and devoted much time to medicine: and chemistry. He also preached in the Episcopal chapel, where his practical brilliant discourses attracted many hearers.

In 1800 he published his first book, Six Sermons, preached in Charlotte Street Chapel, Edinburgh, and in the same year, married, against the wishes of her friends, Catharine Amelia Pybus. They settled at No. 46 George Street, Edinburgh, where, as everywhere else, Smith made numerous friends, among them the future Edinburgh Reviewers. It was towards the end of his five years' residence in Edinburgh, in the eighth or ninth storey or flat in a house in Buccleuch Place, the elevated residence of the then Mr Jeffrey, that Sydney Smith proposed the setting up of a review as an organ for the young -malcontents with things as they were. " I was appointed editor," he says in the preface to' the collection of his contributions, " and

remained long enough in Edinburgh to edit the first number (October 1802) of the Edinburgh Review. The motto I proposed for the Review was ' Tenui musam meditamur avena.' — ' We cultivate literature on a little oatmeal.' But this was too near the truth to be admitted, and so we took our present grave motto 1 from Publius Syrus, of whom, none of us, I am sure, had ever read a single line." He continued to write for the Review for the next quarter of a century, and his brilliant articles were a main element in its success.

He left Edinburgh for good in 1803, when the education of his pupils was completed, and settled in London, where he rapidly became known as a preacher, a lecturer and a social lion. His success as a preacher, although so marked that there was often not standing-room in Berkeley Chapel, Mayfair, where he was morning preacher, was not gained by any sacrifice of dignity. He was also " alternate evening preacher " at the Foundling Hospital, and preached at the Berkeley Chapel and the Fitzroy Chapel, now St Saviour's Church, Fitzroy Square. He lectured on moral philosophy at the Royal Institution for three seasons, from 1804 to 1806: and treated his subject with such vigour, freshness and liveliness of illustration that the London world crowded to Albemarle Street to hear him. He followed in the main Dugald Stewart, whose lectures he had attended in Edinburgh; but there is more originality as well as good sense in his lectures, especially on such topics as imagination and wit and humour, than in many more pretentious systems of philosophy. He himself had no high idea of these entertaining performances, and threw them in the fire when they had served their purpose — providing the money for furnishing his house. But his wife rescued the charred MSS. and published them in 1850 as Elementary Sketches of Moral Philosophy.

With the brilliant reputation that Sydney Smith had acquired in the course of a few seasons in London, he would probably have obtained some good preferment had he been on the powerful side in politics. Sydney Smith's elder brother " Bobus " had married Caroline Vernon, aunt of the 3rd Lord Holland, and he was always a welcome visitor at Holland House. His Whig friends came into office for a short time in 1806, and presented him with the living of Foston-le-Clay in Yorkshire. He shrank from this banishment for a time, and discharged his parish duties through a curate; but Spencer Perceval's Residence Act was I l Judex damnatur cum nocens absolvitur.

passed in 1808, and after trying in vain to negotiate an exchange, he quitted London in 1809, apd moved his household to York- shire. The Ministry of " All the Talents " was driven out of office in 1807 in favour of a " no popery " party, and. in that year appeared the first instalment of Sydney Smith's most famous production, Peter Plymley's Letters, on the subject of Catholic emancipation, ridiculing the opposition of the country clergy. It was published as A Letter on the Subject 0} the Catholics to my brother Abraham who lives in the Country, by Peter Plymley. Nine other letters followed before the end of 1808, when they appeared in collected form. Peter Plymley's identity was a secret, but rumours got abroad of the real authorship. Lord Holland wrote to him expressing his own opinion and Grenville's, that there had been nothing like it since the days of Swift {Memoir, i. 151). He also pointed out that Swift had lost a bishopric for his wittiest performance. The special and temporary nature of the topics advanced in these pamphlets has not prevented them from taking a permanent place in literature, secured for them by the vigorous, picturesque style, the generous eloquence and clearness of exposition which Sydney Smith could always command. In his country parish of Foston, with no educated neighbour within 7 m., Sydney Smith accommodated himself cheerfully to his new circumstances, and won the hearts of his parishioners as quickly as he had conquered a wider world. There had been no resident clergyman in his parish for 150 years; he had a farm of 300 acres to keep in order; a rectory had to be built. All these things were attended to beside his contributions to the Edinburgh Review. " If the chances, of life ever enable me to emerge," he nevertheless writes to Lady Holland, " I will show you I have not been wholly occupied by small and sordid pur- suits." He continued to serve the cause of toleration by ardent speeches in favour of Catholic emancipation; his eloquence being specially directed against those who maintained that a Roman Catholic could not he believed on his oath. " I defy Dr Duigenan," 1 he pleaded, addressing a meeting of clergy in 1823, " in the full vigour of his incapacity, in the strongest access of that Protestant epilepsy with which he was so often convulsed, to have added a single security to the security of that oath." At this time appeared one of his most vigorous and effective polemics, A Letter to tlie Electors upon the Catholic Question (1826). Sydney Smith, after twenty years' service in Yorkshire, obtained preferment at last from a Tory minister, Lord Lyndhurst, who presented him with a prebend in Bristol cathedral in 1828, and afterwards enabled him to exchange Foston for the living of Combe Florey, near Taunton, which he held conjointly with the living of Halberton attached to his prebend. From this time he discontinued writing for the Edinburgh Review on the ground that it was more becoming in a dignitary of the church to put his name to what he wrote. It was expected that when the Whigs came into power Sydney Smith would be made a bishop. There

was nothing in his writings, as in the case of Swift, to stand in the way. He had been most sedulous as a parochial clergyman. Doctoring his parishioners, he said, was his only rural amuse- ment. His religion was wholly of a practical nature, and his fellow-clergy had reasons for their suspicion of his very limited theology, which excluded mysticism of any sort. " The Gospel," he said, " has no enthusiasm." His scorn for enthusiasts and dread of religious emotion found vent in middle life in his strictures on missionary enterprise, land bitter attacks on Method- ism, and later in many scoffs at the followers of Pusey. Still, though he was not without warm friends at headquarters, the opposition was too strong for them. One of the first things that Lord Grey said on entering Downing Street was, " Now I shall be able to do something for Sydney Smith "; but he was not able to do more than appoint him in 1831 to a residentiary canonry at St Paul's in exchange for the prebendal stall he held at Bristol. He was as eager a champion of parliamentary reform as he had been of Catholic emancipation, and one of his best fighting speeches was delivered at Taunton in October 1831 when he made his well-known comparison of the House of Lords, who

1 Patrick Duigenan, M.P. for the dty of Armagh, a Protestant agitator.

had just thrown out the Reform Bill, with Mrs Partington of Sidmouth, setting out with mop and pattens to stem the Atlantic in a storm. Some surprise must be felt now that Sydney Smith's reputation as a humorist and wit should have caused any hesitation about elevating him to an episcopal dignity, and perhaps he was right in thinking that the real obstacle lay in his being known as " a high-spirited, honest, uncompromising man, whom all the bench of bishops could not turn upon vital ques- tions." With characteristic philosophy, when he saw that the promotion was doubtful, he made his position certain by resolv- ing not to be a bishop and definitely forbidding his friends to intercede for him.

On the death of his brother Courtenay he inherited £50,000, which put him out of the reach of poverty. His eldest daughter, Saba (1802-1866), married Sir Henry Holland. • His eldest son, Douglas, died in 1829 at the outset of what had promised to be a brilliant career. This grief his father never forgot, but nothing could quite destroy the cheerfulness of his later life. He retained his high spirits, his wit, practical energy and powers of argu- mentative ridicule to the last. His Three Letters to Archdeacon Singleton on the Ecclesiastical Commission (1837-38-39) and his Petition and Letters on the repudiation of debts by the state of Pennsylvania (1843), are as bright and trenchant as his best contributions to the Edinburgh Review. He died at his house in Green Street, London, on the 22nd of February 1845 an d was buried at Kensal Green.

Sydney Smith's other publications include: Sermons (2 vols., 1809); The Ballot (1839); Works (3 vols., 1839), including the Peter Plymley and the Singleton Letters and many articles from the Edin- burgh Review; A Fragment on the Irish Roman Catholic Church (1845) ; Sermons at St Paul's . . . (1846) and some other pamphlets and sermons. Lady Holland says (Memoir, i. 190) that her father left an unpublished MS., compiled from documentary evidence, to exhibit the history of English misrule in Ireland, but had hesitated to publish it. This was suppressed by his widow in deference to the opinion of Lord Macaulay.

See A Memoir of the Reverend Sydney Smith by his daughter, Lady Holland, with a Selection from his Letters edited by Mrs [Sarah] Austin (2 vols., 1855); also A Sketch of the Life and Times of . . . Sydney Smith (1884) by Stuart J. Reid; a chapter on "Sydney Smith " in Lord Houghton's Monographs Social and Personal (1873) ; A. Chevrillon, Sydney Smith et la renaissance des idSes libirales en Angleterre au XIX" sihcle (1894); and especially the monograph, with a full description of his writings, by G. W. E. Russell in Sydney Smith (English Men of Letters series, 1905). There are numerous references to Smith in contemporary correspondence and journals.

SMITH, SIR THOMAS (1513-1577), English scholar and diplomatist, was born at Saffron Walden in Essex on the 23rd of December 1513. He became a fellow of Queens' College, Cambridge, in 1530, and in 1533 was appointed a public reader or professor. He lectured in the schools on natural philosophy, and on Greek in his own rooms. In 1 540 Smith went abroad, and, after studying in France and Italy and taking a degree of law at Padua, returned to Cambridge in 1542. He now took the lead in the reform of the pronunciation of Greek, his views after con- siderable controversy being universally adopted. He and his friend Sir John Cheke were the great classical scholars of the time in England. In January 1543/4 he was appointed first regius professor of civil law. He was vice-chancellor of the university the same year, and became chancellor to the bishop of Ely, by whom he was ordained priest in 1546. In 1547 he became provost of Eton and dean of Carlisle. He early adopted Protestant views, a fact which brought him into prominence when Edward VI. came to the throne. During Somerset's protectorate he entered public life and was made a secretary of state, being sent on an important diplomatic mission to Brussels. In 1548 he was knighted. On the accession of Mary he was deprived of all his offices, but in the succeeding reign was promin- ently employed in public affairs. He became a member of parlia- ment, and was sent in .1562 as ambassador to France, where he remained till 1566; and in 1572 he again went to France in the same capacityfor a short time. He remained one of Elizabeth's most trusted Protestant counsellors, being appointed. in 1572 chancellor of , the order of the Garter and a secretary

of state. He died on the 12th of August 1577. In 1661 the grandson of his

brother George was created a baronet, and from him the title has descended to the Smith family of the present day.

His best-known work, entitled De Republiea Anglorum: the Maner of Government or Policie of the Realme of England, was pub- lished posthumously in 1583, and passed through many editions. His epistle to Gardiner, De recta et emendata linguae Graecae pro- nunciatione, was printed at Paris in 1568; the same volume includes his dialogue De recta et emendata linguae Anglicanae scriptione. A number of his letters from France are in the foreign state papers.

See A. F. Pollard's article in the Diet. Nat. Biog. A life by Strype was published in 1698 (Oxford edition, 1820).

SMITH, THOMAS SOUTHWOOD (1788-1861), English physician and sanitary reformer, was born at Martock, Somerset- shire, on the 21st of December 1788. While a medical student in Edinburgh he took charge of a Unitarian congregation. In 1816 he took his M.D. degree, and began to practice at Yeovil, Somer- set, also becoming minister at a chapel in that town, but removed in 1820 to London, devoting himself principally to medicine. In 1824 he was appointed physician to the London Fever Hospital, and in 1830 published A Treatise on Fever, which was at once accepted as a standard authority on the subject. In this book he established the direct connexion between the impoverishment of the poor and epidemic fever. He was frequently consulted in fever epidemics and on sanitary matters by public authorities, and his reports on quarantine (1845), cholera (1850), yellowfever (1852), and on the results of sanitary improvement (1854) were of international importance. He died at Florence on the 10th of December 1861.

SMITH, WILLIAM (fl. 1596), English sonneteer. He published in 1596 a sonnet sequence entitled Chloris, or the Complaint of the passionate despised Shepheard. He was a disciple of Spenser, to whom the two first sonnets and the last are addressed. He signed his name W. Smith, and has sometimes been confused with the playwright Wentworth Smith, who collaborated with John Day, William Haughton and others (1601-1603).

SMITH, WILLIAM (c. 1730-1819), English actor, the son of a city tea merchant, was educated at Eton and went up to Cam- bridge, but his wild pranks soon ended his college career and brought him back to London. His

first stage appearance was in 1753 at Covent Garden, where he remained for twenty years, playing important parts. In 1774 he was at Drury Lane under Garrick's management. His forte was gay comedy, and he was ˆ the original, indeed unrivalled, Charles Surface. It was in this part that he made his farewell appearance in 1788. He died on the 13th of September 1819. His sporting tastes and social connexions — he married the sister of a peer— led to his being called " Gentleman Smith," a sobriquet his manners seem to have justified. He is to be distinguished from an older English actor, William Smith (d. 1696), the friend of Betterton.

SMITH, WILLIAM (1760-1839), English geologist, appropri- ately termed " the Father of English geology," and known among his acquaintances as " Strata Smith," was born at Churchill in Oxfordshire on the 23rd of March 1769. Deprived of his father, an ingenious mechanic, before he was eight years old, he depended upon his father's eldest brother, a farmer at Over Norton, who was but little pleased with his nephew's love of collecting " pundibs " (Terebratulae) and "pound-stones" (the large Echinoid Clypeus, then frequently employed as a pound weight by dairy women), and with his propensity for carving sundials on soft brown " oven-stone " of his neighbour- hood. The uncle was, however, better satisfied when the boy, after studying the rudiments of geometry and surveying, began to take interest in the draining of land; and there is no doubt that William Smith profited in after life by the practical experi- ence he gained with his relative. At the age of eighteen he became assistant to Edward Webb, surveyor, of Stow-on-the- Wold, and traversed the Oolitic lands of Oxfordshire and Gloucestershire, the Lias clays and red marls of Warwickshire and other districts, studying their varieties of strata and soils. In 1 79 1 his observations at Stowey and High Littleton in Somersetshire first impressed him with the regularity of the strata. In 1793 he executed the surveys and levellings for the line . A the Somersi t Coal Canal, in the course of which he con-

firmed a previous supposition, that the strata lying above the coal were not horizontal, but inclined in one direction — to the E. — so as to terminate successively at the surface.

On being appointed engineer to the canal in 1794 he was deputed to make a tour of observation with regard to inland navigation. During this tour, which occupied nearly two months, he journeyed to York and Newcastle and returned through Shropshire and Wales to Bath; he carefully examined the geological structure of the country, and corroborated his general- ization of a settled order of succession in the strata. After residing for two or three years at High Littleton he removed in 1795 to Bath, and three years later purchased a small estate at Tucking Mill, Midford, about 3 m. distant from the city, where he engaged in the last duties he performed as

resident engineer to the Coal Canal (1738-1799). His numerous journeys had, satisfied him of the practicability of making a map to show the ranges of the different strata across England, and in 1794 he coloured his first geological map — that of the vicinity of Bath.

At this time he made acquaintance with the Rev. Benjamin Richardson (d. 1832), from 1796 rector of Farleigh Hungerford, who possessed a good collection of local fossils, but knew nothing of the laws of stratification. He had a sound knowledge of natural history, and he greatly aided Smith in learning the names and true nature of the fossils, while Smith arranged his specimens in the order of the strata. By this new friend Smith was introduced to the Rev. Joseph Townsend (1738-1816), rector of Pewsey, and on a notable occasion in 1799 Smith dictated his first table of British Strata, written by Richardson and now in the possession of the Geological Society of London. It was headed Order of the Strata, and their imbedded Organic Remains, in the neighbourhood of Bath; examined and proved prior to 17 qq. In 18 13 Townsend published, with due acknow- ledgment, much information on the English strata communicated by William Smith, in a work entitled The Character of Moses established for veracity as an historian, recording events from the Creation to the Deluge. Meanwhile Smith was completing and arranging the data for his large Geological Map of England and Wales, with part of Scotland, which appeared in 1815, in fifteen sheets, engraved on a scale of 5 m. to 1 in. The map was reduced to smaller form in 1819; and from this date to 1822 twenty-one separate county geological maps and several sheets of sections were published in successive years, the whole constituting a Geological Atlas of England and Wales. Smith's collection of fossils was purchased in 1816-1818 by the British Museum. In 181 7 a portion of the descriptive catalogue was published under the title of a Stratigraphical System of Organized Fossils. Prior to this, in 18 16, he commenced the publication of Strata Identified by Organized Fossils, with figures printed on paper to correspond in some degree with the natural hue of the strata. In this work (of which only four parts were published, 1816-1819) is exemplified the great principle he established of the identifica- tion of strata by their included organic remains. In January 1 83 1 the Geological Society of London conferred on Smith the first Wollaston medal; on which occasion Sedgwick in an eloquent address referred to Smith as " the Father of English Geology "; and the government conferred upon him a life- pension of £100 per annum. The degree of LL.D. he received from Dublin, at the meeting of the British Association in that city in 1835. In 1838 he was appointed one of the commissioners to select building-stone for the new Houses of Parliament. The last years of his life were spent at Hackness (of which he made a good geological map), near Scarborough, and in the latter town. His usually robust health failed in 1839, and on 28th August of that year

he died at Northampton. He was buried at St Peter's church, and a bust by Chantrey was placed in the nave. In 1891 the earl of Ducie erected a monument to his memory at his native place, Churchill.

His Memoirs, edited by his nephew, John Phillips, appeared in 1844.

SMITH, SIR WILLIAM (1813-1893), English lexicographer, was born at Enfield in 1813 of Nonconformist parents. He was originally destined for a theological career, but instead was articled to a solicitor. In his spare time he taught himself

classics, and when he entered University College he carried off both the Greek and Latin prizes. He was entered at Gray's Inn in 1830, but gave up his legal studies for a post at University College school, and began to write on classical subjects. He next turned his attention to lexicography. His first attempt was the Dictionary of Greek and Roman Antiquities, which appeared in 1842. The greater part of this was written by himself. In 1849 followed the Dictionary of Greek and Roman Biography, and the Greek and Roman Geography in 1857. In this work some of the leading scholars of the day were associated with him. In 1850 he published the first of the school diction- aries; and in 1853 he began the Principia series, which marked a distinct step in the school teaching of Greek and Latin. Then came the Students' Manuals of History and Literature, in which the Greek history was the editor's own work. In carrying out this task Smith was most ably seconded by John Murray, the publisher, who, when the original publishers of the dictionaries got into difficulties, volunteered to take a share in the under- taking. The most important, perhaps, of the books edited by William Smith were those that dealt with ecclesiastical subjects. These were the Dictionary of the Bible (1860-1865) ; the Dictionary of Christian Antiquities (1875-1880), undertaken in collaboration with Archdeacon Cheetham; and the Dictionary of Christian Biography (1877-1887), jointly with Dr Henry Wace. The Atlas, on which Sir George Grove collaborated, appeared in 1875. From 1853 to 1869 Smith was classical examiner to the University of London, and on his retirement he became a member of the Senate. He sat on the Committee to inquire into questions of copyright, and was for several years registrar of the Royal Literary Fund. He edited Gibbon, with Guizot's and Milman's notes, in 1854-1855. In 1867 he became editor of the Quarterly Review, which he directed with marked success until his death on the 7th of October 1893, his remarkable memory and accuracy, as well as his tact and courtesy, specially fitting him for such a post. He was D.C.L. of Oxford and Dublin,

and the honour of knighthood was conferred on him the year before his death.

SMITH, WILLIAM FARRAR (1824-1903), American general, was born at St Albans, Vermont, on the 17th of February 1824, and graduated from West Point in 1845, being assigned to the engineer branch of the army. He was twice assistant professor of mathematics at West Point (1846-1848 and 1855-1856). During the first campaign of the Civil War he was employed on the staff, in August 1861 became brigadier-general of volunteers, and was breveted lieutenant-colonel U.S.A. for his gallantry at the action of White Oak Swamp. In July 1862 he received promotion to the rank of major-general U.S.V. Smith led his division with conspicuous valour at Antietam, and was again breveted in the regular army. On the assignment of General Franklin to a superior command Smith was placed at the head of the VI. corps of the Army of the Potomac, which he led at the disastrous battle of Fredericksburg (q.v.). The recriminations which followed led to the famous general order in which several of the senior officers of the army were dismissed and suspended by General Burnside. Smith was one of these, but it is to his credit that he did not leave the army, and as a brigadier-general he commanded troops in Pennsylvania during the critical days of the Gettysburg campaign. Later in 1863 he was assigned to duty as chief engineer of the Army of the Cumberland. As such he conducted the engineer operations which reopened the " cracker-line " from Chattanooga (q.v.) to the base of supplies. Of this action the House Committee on military affairs reported in 1865 that " as a subordinate, General W. F. Smith had saved the Army of the Cumberland from capture, and afterwards directed it to victory." Smith was now again nominated for the rank of major-general U.S.V., and Grant, who was much impressed with Smith's work, insisted strongly that the nomina- tion should be confirmed, which was accordingly done by the Senate in March 1864. Grant, according to his own statement, " was not long in rinding out that the objections to Smith's promotion were well grounded," but he never stated the grounds of his complaint, and Smith, in the " Battles and Leaders " series, maintained that they were purely of a personal character. For

the Virginian campaign of 1864 Smith was specially assigned by Grant to command the XVIII. corps, Army of the James, and he took part in the battle of Cold Harbor and the first operations against Petersburg, after which, while absent on leave, he was suddenly deprived of his command by Grant. He resigned from the volunteers in 1865, and from the U.S. army in 1867. From 1864 to 1873 he was president of the International Telegraph Company, and in 1875-1881 served on the board of police commissioners of New York, becoming president of this in 1877. After 1881 he was engaged in civil engineering work. He died at Philadelphia on the 28th of

February 1903.

SMITH, WILLIAM HENRY (1808-1872), English author, was born at Hammersmith, London, in 1808. He was educated at Radley School, and in 182 1 was sent to Glasgow University. In 1823 he entered a lawyer's office, in which he remained for five years. He was called to the bar, but had no practice. He contributed to the Literary Gazette and to the Athenaeum, under the name of " Wool-gatherer," attracting some attention by the delicacy and finish of his style. Ernesto, a philosophical romance, appeared in 1835, two poems, Guidone and Solitude, in 1836, and in 1839 he formed a connexion with Blackwood's Magazine, for which he acted as philosophical critic for thirty years. In 1846 a visit to Italy led to the writing of a tale entitled Mildred, which was too purely reflective to be successful. In 1851 he declined the chair of moral philosophy at Edinburgh, being unwilling to abandon his quiet, studious life in the Lake District. There he completed his philosophic romance Thorndale (1857), which was considered at the time to be a work of real intellectual value. A similar production, Gravenhurst, appeared in 1862; a second edition contained a memoir of the author by his wife. Smith died at Brighton on 28th March 1872. He also wrote two plays, oneof which, Athelwold, was produced by Macready in 1843. It was published with his other tragedy, Sir William Crichton, in 1846.

SMITH, WILLIAM HENRY (1825-1891), English man of business and statesman, was born in London on the 24th of June 1825. His father was the founder of the great distributing firm of W. H. Smith & Son, in the Strand, and at an early age he became a partner and devoted himself to the business. He betrayed no political aspirations until 1865, when he came for- ward as a Conservative to contest Westminster against John Stuart Mill and the Hon. Mr Grosvenor. Defeated on that occasion, he triumphed in 1868, winning a victory when his party was in general vanquished on all sides. The prestige thus obtained combined with wealth and his business abilities to recommend him to Disraeli, who in 1874 made him secretary to the Treasury. In 1877 he gained cabinet rank as first lord of the Admiralty; in 1885 he was successively secretary for War and chief secretary for Ireland; in 1886 he was again at the War Office; and when late in that year Lord Randolph Churchill's resignation necessitated a reconstruction of the ministry, Mr Smith found himself first lord of the Treasury and leader of the House of Commons. He was no orator, and made no pretence to genius, but his success in these high offices was complete, and was admittedly due, not merely to business ability, but to the universal respect which was gained by his patience, good temper, zeal for the public service, and thorough kindness of heart. He died at Walmer Castle (which he occupied as Warden of the Cinque Ports) on the 6th of October 1891. In recognition of his services a peerage in her own right was conferred on his

widow, with the title of Viscountess Hambleden. Lady Hamble- den (b. 1828) had been a Miss Danvers, and before marrying Mr Smith had been the wife of Mr B. A. Leach, by whom she had a family. Her eldest son by the second marriage, the Hon. W. F. D. Smith (b. 1868), rowed in the Oxford boat, and on his father's death became head of the business; in 1891 he was elected Conservative M.P. for the Strand (London), and was re-elected in 189-2, 1895, 1900 and 1906. He married in 1894 Lady Esther Gore, daughter of the earl of Arran.

SMITH, WILLIAM ROBERTSON (1846-1894), Scottish philo- logist, physicist, archaeologist, Biblical critic, and editor, from I 188 1, of the 9th edition of this Encyclopaedia, was born on the

8th of November 1846 at Keig in Aberdeenshire, where his father was Free Church minister. He was educated at home and at Aberdeen University, where he attained the highest academic distinctions, winning among other things the Ferguson mathe- matical scholarship, which is Open to all graduates of Scottish universities under three years' standing. In 1866 he entered the Free Church College at Edinburgh as a student of theology. During two summer sessions he studied philosophy and theology at Bonn and Gottingen, making friends in all branches of learning. From 1868 to 1870 he acted as assistant to the professor of natural philosophy in Edinburgh University. During this period he was not only most successful as a teacher, but produced much original work — especially in the experimental and mathe- matical treatment of electricity — which is still regarded as standard. ,In 1870 he was appointed and ordained to the office of professor of Oriental languages and Old Testament exegesis at the Free Church College, Aberdeen, and here he began that series of theological investigations which, characterized as they were by learned research and the use of the most scientific methods, were destined to make his name famous. He was the pupil and personal friend of many leaders of the higher criticism in Germany, and from the first he advocated views which, though now widely accepted, were then regarded with apprehension. The articles on Biblical subjects which he contributed to the 9th edition of the Encyclopaedia Britannica distressed and alarmed the authorities of the Free Church. In 1876 a committee of the General Assembly of that Church reported on them so adversely that Smith demanded a formal trial, in the course of which he defended himself with consummate ability and eloquence. The indictment dropped, but a vote of want of confidence was passed, and in 1881 Smith was removed from his chair. During this long struggle he was sustained by the conviction that he was fighting for

freedom, and at the end of the trial he was probably the most popular, if not the most powerful, man in Scotland. Marks of sympathy were showered on him from all sides.

In 1875 he was appointed one of the Old Testament revisers; in 1880-1882 he delivered by invitation, to very large audiences in Edinburgh and Glasgow, two courses of lectures on the criticism of the Old Testament, which he afterwards published (The Old Testament in the Jewish Church, first edition 1 881, second edition 1892, and The Prophets of Israel, 1882, which also passed through two editions); and soon after his dismissal from his chair he joined Professor Baynes in the editorship of the Encyclopaedia Britannica, and after Professor Baynes's death remained in supreme editorial control till the work was completed. His versa- tility, firmness combined with tact, width of view, and pains- taking struggle for accuracy were largely responsible for the maintenance of its high standard. But he did not let his other duties interfere with his Semitic studies. He visited Arabia, Egypt, Syria, Palestine, Tunis and southern Spain, and had an intimate knowledge of, and personal acquaintance with, not only the literature, but the life of the East. His early friendship with J. F. McLennan, that most original student of primitive marriage, had a great influence on Smith's studies, and his attention was always strongly attracted to the comparative study of primitive customs and their meaning. His chief con- tributions to this branch of learning were his article Sacrifice in the Encyclopaedia Britannica, his Kinship and Marriage in Early Arabia (Cambridge, 1885), and above all his Lectures on the Religion of the Semites (1st edition 1889, 2nd edition 1894). His originality and grasp of mind enabled him to seize the essential among masses of details, and he had in a marked degree the power of carrying a subject farther than his predecessors.

In 1883 Robertson Smith was appointed Lord Almoner's Professor of Arabic at Cambridge, which henceforth became his home. He occupied rooms in Trinity College till 1885, when he was elected to a professorial fellowship at Christ's College. In 1886 he became university librarian, and in 1889 Adams Pro- fessor of Arabic. In 1888-1891 he delivered, as Burnett lecturer, three courses of lectures at Aberdeen on the primitive religion of the Semites. Early in 1890 grave symptoms of constitutional disease manifested themselves, and the last years of his life were

full of suffering, which he bore with the utmost courage and patience. He never ceased to work, and when near his end was actively engaged in planning the Encyclopaedia Biblica, which he had hoped to edit. He died at Cambridge on the 31st of March 1894, and was buried at Keig. Small and slight in person and never robust in health, Robertson Smith was yet a man of ceaseless and fiery energy; of an intellect extraordinarily alert and

quick, and as sagacious in practical matters as it was keen and piercing in speculation; of an erudition astonishing both in its range and in its readiness; of a temper susceptible of the highest enthusiasm for worthy ends, and able to inspire others with its own ardour; endowed with the warmest affections, and with the kindest and most generous disposition, but impatient of stupidity and ready to blaze out at whatever savoured of wrong and injustice. The sweetness and purity of his nature combined with his brilliant conversational powers to render him the most delightful of friends and companions.

See also James Bryce, Studies xn Contemporary Biography (1903).

(A.E.S.)

SMITH, SIR WILLIAM SIDNEY (1764-1840), English admiral, was the second son of Captain John Smith of the Guards, and was born at Westminster on the 21st of July 1764. He entered the navy, according to his own account, " at the beginning of the American War," being only about eleven years of age. For his bravery under Rodney in the action near Cape St Vincent in January 1780, he was on the 25th of September appointed lieutenant of the " Alcide," 74. After serving in the actions against the French fought by Graves off Chesapeake in 1781 and by Rodney at the Leeward Islands in 1782, he was on the 6th of May of the latter year promoted to be commander of the " Fury " sloop, and on the 18th of October advanced to the rank of captain. His ship having been paid off in the beginning of 1784, he spent two years in France and afterwards visited Spain. From 1790 to 1792 he advised the king of Sweden in the war with Russia, receiving for his services the honour of knighthood. After his re- turn to England he was sent on a mission to Constantinople, and having joined Lord Hood at Toulon from Smyrna in December 1793, he, though only on half pay, was actively employed in the attempt to burn the enemy's ships and arsenal. In the following years he was engaged in the Channel hunting French privateers; but, having with the boats of his squadron boarded in Havre-de- Grace harbour a lugger which was driven by the tide above the French forts, he was on the 19th of April 1796 compelled to surrender and sent a prisoner to Paris. By means of forged orders for his removal to another prison he made his escape from the Temple, and, crossing the Channel in a small skiff picked up at Havre, arrived in London on the 8th of May 1798. In October he was appointed to the command of the " Tigre," 80, and was sent to the Mediterranean. By a very curious decision of the govern- ment he was joined in commission with his brother Spencer Smith, minister at Constantinople. Learning of Bonaparte's approach to St Jean d'Acre, he hastened to its relief, and on the 16th of March 1799 captured the enemy's flotilla, after which he successfully defended the town, compelling Napoleon on the 20th of May to raise the

siege and retreat in disorder, leaving all his artillery behind. For this brilliant exploit he received the special thanks of the Houses of Parliament and was awarded an annuity of £1000. On the 24th of January 1800 he took upon himself to make the convention of El Arish, by which the French Were to have been allowed to evacuate Egypt. His action was disallowed by his superiors, who insisted that the French must surrender. Sub- sequently he co-operated with Abercromby, under whom he commanded the naval brigade at the battle of Aboukir, where he was wounded. On his return to England he was in 1802 elected M.P. for the city of Rochester. In March 1803 he was commissioned to watch the preparations of the French for an invasion of England. Having on the 9th of November 1805 been promoted to be rear-admiral of the blue, he was in the following January despatched on secret service for the protection of Sicily and Naples. His conduct was as usual brilliant, but, also as usual, his vanity and self-assertion led him into quarrels with the military officers. He relieved Gaeta and captured Capri, but

on the 25th of January 1807 received orders to proceed to Malta, whence he joined Sir John Duckworth, who was sent to act against the Turks. On the 7 th of February, with the rear division of the squadron, he destroyed the Turkish fleet and spiked the batteries off Abydos. In November following he was sent to blockade the Tagus, and was mainly instrumental in embarking the Portuguese prince regent and royal family for Rio de Janeiro, after which he was sent as commander-in-chief to the coast of S. America in February 1808. At Rio. he was entangled in another quarrel with the British minister, Lord Strangford, and was summarily recalled in 1809. On the 31st of July 1810 he was made vice-admiral of the blue, and on the 18th of July 181 2 was despatched as second in command under Sir Edward Pellew (afterwards Viscount Exmouth) to the Mediterranean, but the expedition was uneventful. His term of active service practically closed in 1814. He was made K..C.B. in 1815 and in 1821 admiral. The later years of his life were spent at Paris, where he died on the 26th of May 1840. His restless self- assertion brought him into collision with many of his Contempor- aries, including Nelson and Sir John Moore. Colonel Bunbury's Narrative of some Passages in the Great War with France contains a most amusing account of his theatrical vanity. But though by nature a boaster he was both daring and ingenious.

See Barrow, Life of Admiral Sir W. S. Smith (2 vols., 1848). SMITH, a worker in metals. The O. Eng. smid, Du. smid, Ger. Schmied, &c, are from an obsolete Teut. verb smeithan, to forge. The root is seen in Gr. c)ji\r), a

graver's tool. It is apparently not connected with " smooth," where an original tn has been lost. There is no foundation for the old etymological guess which identifies " smith " with " to smite, " as the one who smites or beats iron. When used without such qualification as appears in " goldsmith," " silversmith," &c, the term means a worker in iron, especially as indicating a " blacksmith," one who forges iron, as opposed to " whitesmith," the finisher and polisher of iron, or " tinsmith," a worker in tin. The word has originated one of the commonest of English surnames, sometimes taking various archaic forms (Smyth, Smythe, Smigth, &c; also German Schmidt).

SMITH COLLEGE, an American institution for the higher education of women, at Northampton, Massachusetts. It was founded by the will of Sophia Smith (1796-1870) of Hatfield, who gave money to Smith Academy in Northampton and to Andover Theological Seminary, and who left about $365,000 " for the establishment and maintenance of an institution for the higher education of young women, with the design to furnish them means and facilities for education equal to those which are afforded in our colleges for young men "; she chose Northampton as the site of the college and selected the trustees. The college was chartered in 1871 and was opened in 1875.

On the college campus in the central part of Northampton are : College Hall, with administrative offices, an assembly hall, and lecture rooms; Seelye Hall, with department offices and recitation rooms; a library, completed in 1910 and containing 30,000 volumes in that year; an auditorium, with a large organ and a seating capacity of 2500; the Lilly Hall of Science; Chemistry Hall; an astronomical observatory; Music Hall; the Hillyer Art Gallery, with an en- dowment of 850,000 for the increase of its collections; the Students' Building for the social life of the students; the Lyman Plant House and the Botanic Garden; the Alumnae Gymnasium; the Allen Recreation Field; sixteen (in 1910) dwelling-houses for the students on the plan of private homes, not dormitories; an infirmary, and Sunnyside, a home for convalescents. Entrance requirements differ little from those of the College Entrance Examination Board. All undergraduate courses are largely elective and lead to the degree of Bachelor of Arts. Graduate courses lead to the degrees- of Master of Arts and Doctor of Philosophy, the latter degree being rarely conferred and " only in recognition of high scholarly attain- ment and of ability to carry on original research." In 1909-1910 there were 104 teachers and 1635 students (of whom 8 were graduate students), and the college had an endowment of about $1,300,000. The annual tuition charge was $100 until 1909, when it became Si 50. There are six fellowships, of $500 each, which are granted for graduate research ; and there are many undergraduate scholarships, and loans are made to needy students by the

Smith Students' Aid Society (1897). The College contributes to the American Classical Schools at Athens and Rome, to the Zoological Station at Naples, and to the Marine Biological Laboratory at Woods Hole, Massachusetts. The

first president of the college from 1873 to September 19 10 was Lawrenus Clark Seelye. (b,, 1837), a graduate of Union College and of Andover Theological Seminary.

SMITH'S FALLS, a town and outport of Lanark county, Ontario, Canada, on the Rideau river and canal, and the Canadian Pacific railway, 28 m. N.W. of Brockville, Pop. (1901) 5155. It contains saw, shingle, woollen and planing mills, and large agricultural implement works, and has regular steamer connexion with Kingston and Ottawa by the Rideau river and canal.

SMITHSON, HENRIETTA CONSTANCE (1800-1854), Irish actress, was the daughter of a theatrical manager. She made her first stage appearance in 1815 at the Crow Street theatre, Dublin, as Albina Mandeville in Reynolds's Will. Three years later she made her first London appearance at Drury Lane as Letitia Hardy. She had no particular success in England; but in Paris, in 1828 and 1832, whither she first went with Macready, she aroused immense enthusiasm as Desdemona, Virginia, Juliet and Jane Shore. She had a host of admirers, among them Hector Berlioz {q.v.), whom she married in 1833. They separated in 1840,/ At the time of her marriage her popularity was already over and she was deeply in debt. A benefit was given her, but she had the mortification of seeing a rival applauded when she herself was coldly received. She retired from the stage, and died on the 3rd of March 1854.

SMITHSON, JAMES (1765-1829), British chemist and mineral- ogist and founder of the Smithsonian Institution at Washington, a natural son of Hugh Smithson, 1st duke of Northumberland, by Mrs Elizabeth KeateMacie, a granddaughter of Sir George Hungerford of Studjey, was born in France in 1765. He was educated at Pembroke College, Oxford, where he graduated in 1786, and was known in early life as James Lewis (or Louis) Macie. He took the name of James Smithson about the year 1800. His attention was given to chemistry and mineralogy, and he published analyses of calamines and other papers in the Annals of Philosophy and Phil'. Trans. The mineral name " smithsonite " was originally given in his honour by Beudant to zinc carbonate, but having also been applied to the silicate, the name is now rarely used. In 1784 he accompanied Faujas St Fond in his journey to the Western Isles, and in the English translation of the Travels iii England, Scotland and the Hebrides (1799) Smithson is spoken of as " M. de Mecies of London." He was

elected F.R.S. in 1787. He died'at Genoa on the 27th of June 1829. By his will he bequeathed upwards of £100,000 to the United States of America to found the Smithsonian Institution. The institution (see below) was founded by act of Congress on the 10th of August 1846.

See "James Smithson and his Bequest" (with portraits), by W. J. Rhees, and " The Scientific Writings of James Smithson," edited' by W. J. Rhees, Smithsonian Misc. Coll., vol. xxi. (l879->- 1880). .:..-.. ■■ . ■

SMITHSONIAN INSTITUTION, an American institution of learning in Washington, D.C., founded by the bequest of James Smithson (q.v.), who seems to have known of Joel Barlow's plan for a national institution of learning in the city of Washing- ton in accordance with George Washington's recommendation in his farewell address of 1796. His estate was left to a nephew, Henry James Hungerford, with the stipulation that should Hungerford die without issue the whole estate should go "to the United States of America to found at Washington, under the name of the Smithsonian Institution, an establishment for the increase and diffusion of knowledge among men." Hunger- ford died without issue in 1835. There was much opposition in America to the acceptance of Smithson's bequest, especially by John C. Calhoun and others who held that Congress had no power under the Constitution to accept such a gift, but the gift was accepted, largely through the efforts of John Quincy Adams; and Richard Rush, sent to England as agent for the United States, quickly obtained a verdict for the American claim to the estate. In September 1838 £104,960 in gold sovereigns was delivered from the clipper " Mediator " to the Philadelphia mint, where it was recoined into American money, $508,318-46; in 1867, after the death of Hungerford's mother, a residuary legacy of $26,210 was received and the fund then

amounted to $650,000. An act of the 7th of July 1838 {repealed in 1 841) directed the investment of the money in state bonds, and $500,000 was invested in Arkansas bonds which proved worthless, but Congress, considering that it was a trustee of the fund, made an appropriation to cover the loss. By other gifts, notably that of $216,000 from Thomas George Hodgkins (d. 1 892) of Setauket, Long Island, New York, the fund was increased : in 1010 it amounted to $944,918, drawing interest at 6%.

There were many different suggestions as to how the fund should be used. The character of the National Institute (called National Institution before 1843), which was organized in 1840 " to promote science and the useful

arts and to establish a national museum of history," had a great influence in shaping the act (approved on the 10th of August 1846) establishing the Smithsonian Institution and providing for an " establishment " by this name composed of the president, vice-president, secretaries of state, treasury, war and navy, the postmaster- general, the attorney-general,' the chief-justice of the supreme court and the commissioner of the patent office of the United States, the mayor of the city of Washington (amended in 1871 to read: governor of the District of Columbia), and such other persons as they may elect honorary members. 2 The same act provided for the government of the Institution by a Board of Regents composed of the vice-president of the United States, the mayor of the city of Washington (amended in 187 1 as above) , i-hree members of the Senate (appointed by its president), three members of the House of Representatives 3 (appointed by its speaker), two members of the National Institute of the City of Washington (chosen by joint resolution of the Senate and House of Representatives), and four others, inhabitants of four different states; the Board chose from its members a chancellor (in practice the vice-president of the United States until 1850 and since then the chief -justice). The act provided for the delivery to the Board of Regents and the maintenance in the buildings, which were to be erected according to the act, of " all objects of art and of foreign and curious research, and all objects of natural history," &c, belonging to the United States, including the collections of Smithson; and it enacted that any applicant for copyright should deliver one copy of the work to be copyrighted to the librarian of the Smithsonian Institution and another to the Librarian of Congress. 4 Thanks to the efforts of J. Q. Adams, provision was made for the use of the income of the fund only and the principal was permanently invested.

The Regents met on the 7th of September 1846. Those appointed were: George Evans, Sidney Breese and Isaac S. Pennybacker, senators; Robert Dale Owen, William J. Hough and Henry W. Hilliard, members of the House of Repre- sentatives; Rufus Choate, Gideon Hawley, Richard Rush and William C. Preston, by joint resolution, from, four different states; and Alexander Dallas Bache and General Joseph G. Totten, from the National Institute. They elected (Dec. 1846) as first secretary and director of the Institution, Joseph Henry, then professor of natural philosophy in the College of New Jersey (Princeton University), who presented in his first annual report (Dec. 1847) a "program of organization; " 5 The first paragraph contained the following: — " To Increase Know- ledge: It is proposed (1) to stimulate men of talent to make original researches, by offering suitable rewards for memoirs containing new truths; and (2) to appropriate annually a portion of the income for particular researches, under the direction of

1 The Secretary of the Interior was added in 1877 and the Secretary of

Agriculture in 1894.

- *No honorary members have been chosen since 1873, and an amendment of 1894 omits the provision for their election.*

3 In January 1847 James D. Westcott objected to the constitution- ality of the act because by it members of Congress were appointed (contrary to section 6, part ii. of the Constitution) to civil offices under the authority of the United States created during their term of office in Congress.

4 In 1865 the actual granting of copyright was transferred from the Smithsonian Institution to the Library of Congress.

5 Reprinted in Smithsonian Institution Miscellaneous Collections, r}. >\i. pp. 399-406.

suitable persons. To Diffuse Knowledge: It is proposed (1) to publish a series of periodical reports on the progress of different branches of knowledge; and (2) to publish occasionally separate treatises on subjects of general interest."

Henry was executive head (secretary) of the Institution from 1846 until his death in 1878 and its organization is due largely to him. He opposed the scheme for the gradual formation of a general library under the charge of the Institution, and in 1855 committed the Board of Regents to a repeal of the previous practice of spending one-half of the annual income on the museum and library, and this action was approved by an investigating congressional committee. 6 Partly because of the prominence given to meteorological research when Henry was at the Albany Academy, and partly through the influence of James Pollard Espy (1785-1860), in 1846 a plan was presented for the unification and systematization of weather observation under the Institution, and in December 1847 an appropriation was made for such meteorological research; in 1849 telegraphic transmission of meteorological intelligence collected by the Institution was begun; in 1850 a standard " Smithsonian barometer " (Arnold Guyot's improvement of Ernst's improved Fortin "cistern barometer") was first distributed; weather maps were successfully made in 1856; and in 1870 the meteorological work of the Institution was incorpor- ated as the Weather Bureau, independent of the Institution. After 1854 Henry's annual reports contained a " general appendix " with reports of lectures, such as were held under the auspices of the Institution until 1865, summaries of correspondence, special papers, &c. Before 1870 meteorology bulked largely in these reports; after that year there was more North American archaeology and ethnology.

Spencer F. Baird, Henry's successor, incorporated in the general appendix annual reports on the progress of the sciences, and he perfected Henry's system of " international exchanges," under which the Institution, through agents in the principal cities of Europe, ex- changes its own publications, those of other departments of the United States government, and those of learned societies for foreign publications. Baird had been at the head of the United States National Museum, a branch of the Institution, before he became secretary of the Institution, and it was particularly developed during his administration. It was built up around the collections of the United States Patent Office, which were turned over to it in 1858, and those of the National Institute, transferred to the Smithsonian Institution in 1861, when the Institute was dissolved. A part of the collection (including Smithson's collection) was destroyed by fire in 1865. The small art collection which remained was exhibited in the Corcoran Gallery until 1896. A new building for the Museum was erected in 1881. Mrs Harriet Lane Johnston (1833-1903) left her art collection to a national gallery of art, when such a gallery should be established, and in 1906 the Supreme Court of the District of Columbia decreed that the art collection of the National Museum was a '" National Gallery " and turned this collection over to the National Museum, whose art collections have been called since that time the National Gallery of Art and have been enlarged by the. gift from Charles L. Freer of Detroit of more than 2300 pieces (since 1904) , including the work of American artists (especially Whistler, Tryon and T. W. Dewing) and of Japanese and Chinese masters, and by the gift of about 90 American paintings from W. T. Evans of New York City. The museum gained much valuable archaeological and ethno- logical material from the exploring parties sent out under J. W. Powell, excellent ichthyological specimens through Baird's position as United States Fish Commissioner, and general collections from the exhibits made at the Centennial Exhibition of 1876 by the United States government; and it has a good herbarium. The Bureau of American Ethnology was established as a branch of the Institution in 1879, when the various organizations doing survey work in the West united as the United States Geological Survey and anthropo- logical and ethnological research was transferred to the Smithsonian Institution. The director of the Bureau of Ethnology in 1879-1902 was J. W. Powell; he was succeeded by William H. Holmes.

Secretary Baird planned an astrophysical observatory and in 1887 appointed as assistant secretary of the Institution, to take charge of the observatory, Samuel P. Langley (q.v.) , who succeeded as secretary ' upon Baird's death in the same year. In 1890 a small observatory was built in the Smithsonian Park; in 1891 an appropriation was made for astrophysical work and $5000 was contributed by the executors of Dr J. H. Kidder (1842-1889). Langley's principal research in the observatory

was on the nature of the infra-red portion of the spectrum. His name is also closely connected with his paper entitled Experiments in Aerodynamics (1891), and with the experiments and mathematical studies carried on under the Institu- tion which proved that a machine other than a balloon could be made which would produce enough mechanical power to support itself and fly. Under the terms of the Hodgkins bequest prizes wer e

- *Congress was long jealous of the power of the Board of Regents; and in Congress there was for many years open opposition notably on the part of Andrew Johnson, to the very existence of the Institu- tion.*

‘ In January 1907, after Langley’s death, Charles Doolittle Walcott (b. 1850), a geologist, director of the U.S. Geological Survey in 1 894-1007, became secretary of the Institution.

offered in 1893 for research and investigation of atmospheric air in connexion with the welfare of mankind ; in 1895 an award of $10,000 was made to Lord Rayleigh and Sir William Ramsay for their discovery of argon; and a medal was awarded to Sir James Dewar in 1899 and one to Sir J. J. Thomson in 1901. During Langley’s administration the American Historical Association was incorporated in 1889 as a branch of the Institution, to whose secretary it makes its annual reports ; and the National Society of the Daughters of the American Revolution was similarly incorporated in 1 896. By acts of Congress of the 2nd of March 1889 and the 30th of April 1890 the National Zoological Park was established under the Institution; and in a park of 266 acres in the valley of Rock Creek a small collec- tion was installed. In Langley’s Annual Reports the summaries of the advance of science were omitted in 1889 and thereafter special papers of interest to professional students were published in their place. The Smithsonian Park occupies a square equivalent to nine city blocks, almost exactly the same size as the Capitol grounds. The oldest building, that of the Institution proper, was erected in 1847-1855; it is Seneca brown stone in a mingled Gothic and Romanesque style, designed by James Renwick, and occupies the S. W. corner of the grounds. E. of it is the building of the United States National Museum (330 ft. sq.), erected in 1881 ; and on the N. side of the park is the new building of the National Museum (1903). On the grounds is a bronze statue of Joseph Henry by W. W. Story.

The Institution publishes : Annual Reports (1846 seq.), in which the Reports of the National Museum were included until 1884 — since then

they appeared as " part ii." of that Report; The Smithsonian Contributions to Knowledge (quarto, 1848 sqq.); The Smithsonian Miscellaneous Collections (octavos, 1 862 sqq.); Proceedings of the United Slates National Museum (1878 sqq.); Bulletin of the United Stales National Museum (1875 sqq.), containing larger monographs than those printed in the Proceedings; and occasional Special Bulletins; Annual Reports of the Bureau of American Ethnology (1880 sqq.); Bulletin (1877 sqq.), including The Handbook of American Indians North of Mexico (1907), part i. being Bulletin 30; and Contributions to North American Ethnology (1877 sqq.); Annals of the Aslrophysical Observatory (1900 sqq.); and Annual Reports of the American Historical Association (1890 sqq.).

Authorities. — See Wm. J. Rhees, A List of Publications of the Smithsonian Institution, 1846-1903 (Washington, 1903), being No. 1376 of the Smithsonian Miscellaneous Collections; also The Smithsonian Institution, 1846-1896: The History of its First Half- CenMry (Washington, 1897), edited by George Brown Goodie, assistant secretary of the Institution; Wm. J. Rhees, Smithson and His Bequest {ibid. 1880), and The Smithsonian Institution, 1846- 1899 (ibid. 1901) ; and Richard Rathbun, The National Gallery of Art (ibid. 1909), being Bulletin 70 of the U.S. National Museum.

SMOHALLA, or Shmoquala (i.e. " preacher "), chief of the Wanapum tribe of North American Indians and founder of the religious sect called Dreamers, was born about 1820. On one occasion after a tribal fray he was left for dead, but recovered and journeyed through California, Mexico, Arizona and Nevada to his old home on the upper Columbia, Washington, where he announced that he had been in the spirit world and had returned with a new revelation. This consisted in a return to primitive Indian customs, and a priesthood and ritual based on the Roman Catholic type. Besides Sunday services the Dreamers hold a service for the commemoration of the dead in early spring, and thanksgivings for salmon and for berries in April and in October respectively. Smohalla had frequent trances and his influence extended over most of the tribes of eastern Washington, and Oregon and western Idaho. The sect gave some trouble in 1870 by refusing to come under reservation restrictions. A church was established at Priest's Rapids on the upper Columbia, and one at Union Gap on the Yakima reservation.

See James Mooney, " The Ghost-dance religion," in 14th Ann. Rep. Bureau of Ethnology (Washington, 1896).

SMOKE (from 0. Eng. smeocan, to smoke, reek, cf. Dutch smook, Ger. Schmauch, probably allied to Gr. aiivxav), the vapour or volatile matter which escapes from a burning substance during combustion, especially the

visible vapour produced by the burning of coal, wood, peat or vegetable substances generally. In this article the various legislative and other measures recom- mended or adopted for the abating of the nuisance caused by the excessive production of smoke are dealt with. For smoking of tobacco see Tobacco and Pipe, and for opium-smoking Opium.

Smoke Abatement. — The nuisance created by coal smoke seems to have been recognized in London since 1306, when a citizen was tried, condemned and executed for burning " sea cole " in the city of London; but it is only in more modern times that the question has been regarded as one of real practical

importance. In 1785 the first smoke-abating invention was patented by James Watt, and in 1800 a mechanical stoker was patented by Robertson. In 1815 Cutler patented the first would-be smokeless grate for domestic purposes; and his principle of feeding underneath was afterwards adopted by Dr Neil Arnott. In 1819 a parliamentary select committee was appointed " to inquire how far persons using steam-engines and furnaces could erect them in a manner less prejudicial to public health and comfort." In 1843 another select committee recommended the introduction of a bill prohibiting the produc- tion of smoke from furnaces and steam-engines. In 1845 yet another select committee reported that such an act could not in the existing state of affairs be made to apply to dwelling-houses. The Acts of 1845 an d l &47 followed as the results of these inquiries; and since then there has been much legislation brought to bear on factories and railways.

The Public Health Act 1875 contains the statutory law as to the emission of smoke and applies throughout the country, except to London and a few large provincial towns such as Manchester, Liverpool, Sheffield, Leeds, Bradford and Nottingham, where smoke nuisances are controlled by special local acts. The law applying to the Metropolis is identical with that which governs the country at large, and is contained in the Public Health (London) Act 1891.

Section 91, sub-section 7, of the Public Health Act 1875 enacts: " Any fireplace or furnace which does not, as far as practicable, consume the smoke arising from the combustible used therein, and which is used for working engines by steam, or in any mill, factory, dyehouse, brewery, bakehouse or gaswork, or in any manufacturing or trade process whatsoever " ; and sub-sec. 8, " any chimney (not being the chimney of a private dwelling-house) sending forth black smoke in such quantity as to be a nuisance, shall be deemed to be a nuisance liable to be dealt with summarily in manner provided by this act."

A further clause provides that for the purposes of sub-sec. 7 the offence is not merely the emission of smoke, but the use of a fire- place or furnace " which does not as far as practicable consume the smoke," and this enables a technical defence to be raised which in practice has been found to destroy the efficacy of sub-sec. 7. Under sub-sec. 8 the mere fact of sending forth black smoke in such quantity as to be a nuisance is an offence, unless it be emitted from the chimney of a private dwelling-house. This sub-section is therefore always resorted to by sanitary authorities who initiate prosecutions for smoke nuisances. It has been decided that where black smoke issued from a chimney several times a day for varying periods the magistrate was justified in finding that the smoke issued in "such quantity as to be a nuisance," although it was not shown that any particular person, or property, was injuriously affected thereby (South London Electric Supply Corporation v. Perrin (1901) 2 K.B. 186). It has also been held that smoke need not be injurious to health in order to be a nuisance (Gaskell v. Bayley, 30 L.T.N.S. 316). It therefore follows that the issue of black smoke from ordinary factory chimneys is per se a nuisance. From a practical point of view, however, it is often found difficult to identify exactly the colour of the smoke, the appearance of which varies in accordance with the position of the observer, and the light behind or in front of the smoke. To aid inspectors various smoke charts and instruments have been devised, none of which is wholly satisfactory. The best chart is the Ringlemann smoke scale, made by ruling black lines at right angles on a white background. It has six shades, numbered 0-5, obtained by graduating the thickness of the lines.

The difficulty of accurately defining the colour of smoke has led to a movement, initiated by the London County Council, for securing the deletion of the word " black " from the Public Health Act, so as to leave to magistrates the duty of deciding a question of fact — whether the smoke complained of constituted a nuisance. The Nottingham Improvement Act 1874 (sec. 74) contains the most efficacious provisions in regard to smoke nuisances which are to be met with in England. It enables steps to be taken in cases where the engines or furnaces are not suitable, and if they are properly constructed, but negligently used, it enables the fireman or other responsible employee to be fined.

Although steam-engines and factories consume individually much more coal than dwelling-houses, they alone are not respon- sible for the smoke nuisance, for there is little doubt that domestic fires are mainly responsible for the smoky condition of the atmosphere of our towns, for they continue to evolve smoke undeterred by legislation. In 1881, however, a movement was begun by the National Health Society and the Kyrle Society, which resulted in a smoke abatement exhibition being held at

South Kensington. At the close of the exhibition a national smoke abatement institution, with offices in London, was formed. In the United Kingdom the subject takes an important place in the programme of the Royal Sanitary Institute, whilst the Coal Smoke Abatement Society is devoted to improving the prevailing conditions, especially in the Metropolis, and has organized a number of exhibitions and conferences on the subject. Several smoke abatement committees exist in the provinces.

A knowledge of the nature of coal and of its combustion is essential for an understanding of the smoke problem. For the purposes of this article coals may be classified as smoke-producing or bituminous, and smokeless, the former including all those varieties most commonly used as fuel. The elementary constituents of such coals are carbon (generally about 80%), hydrogen, nitrogen, oxygen arid sulphur, and they also contain a varying quantity of earthy impurity or ash. The process which occurs in a coal fire consists of two distinct operations. The first, which requires a comparatively low tempera- ture and is independent of the presence of air, is one of destructive distillation, similar to that which occurs iji the retorts of gasworks. It results in the decomposition of the coal, and the formation of the following substances: — (r) hydrogen, marsh-gas, carbon monoxide, ethylene, benzene, other hydrocarbons of the paraffin and benzenoid series, water — all of which are either gaseous at the temperature at which they are formed or capable of being converted into gas at some- what higher temperatures, and all of which are combustible except the water; (2) ammonia and other nitrogenous compounds and certain compounds of sulphur, which are also volatile and com- bustible ; (3) coke, which consists of carbon (and ash) and is non- volatile but combustible. It is these products of distillation, not the coal itself, that burn, in the strict sense of the word ; and this second process requires the presence of air and also a much higher tempera- ture than the. first. If the combustion is perfect, the only products are (1) water-vapour, (2) carbon dioxide, (3) nitrogen and (4) sulphur dioxide, the first of which contains all the hydrogen originally present in the coal, the second all the carbon, the fourth all the sulphur, while the nitrogen is libera ted as such together with the very much larger volumes of nitrogen derived from the air which has supplied the necessary oxygen. These products are discharged through the chimney.

Two things are necessary for ensuring such complete^ combustion, viz. an adequate, but not too large, supply of air, properly ad- ministered, and the maintenance of the requisite temperature. In practice, however, these conditions are never perfectly fulfilled, and consequently the combustion of

coal is always more or less imperfect and gives rise to a complex mixture of vapours, This mixture. con- tains not only the combustion products already mentioned, but also the following unburnt or partly burnt distillation products:— (5) hydrogen, (6) hydrocarbons, (7) carbon monoxide, (8) unburnt carbon in a very finely divided state, and also considerable volumes of unused air.

Usually the name "smoke" is applied to this vaporous mixture discharged from a chimney only when it contains a sufficient amount of finely divided carbon to render it dark- coloured and distinctly visible. The quantity, however, of this particular ingredient is apt to be overrated. It always bears an extremely small proportion to the vast volumes of water-vapour, carbon dioxide and nitrpgen with which it is mixed ; it probably never amounts, even in the worst cases, to 3% of the weight of the coal from which it is formed; and its importance, reckoned in terms of so much fuel wasted, is certainly not greater than that of the unburnt hydrogen and hydrocarbons. It is perhaps best to use the name "smoke " for all the products of imperfect combustion (s to 8) which are avoidable, as contrasted with the necessary and unavoidable ingredients (1 to 4). The problem of smoke abatement is thus seen to resolve itself into the problem of the production of perfect combustion.

The solution of this problem would lead to an important saving in fuel. It has been calculated that at least twice as much coal is used in boiler fires and six times as much in domestic fires as is theoretically required for the production of the effects obtained. A considerable portion of this loss is certainly un- avoidable; nevertheless, much of this enormous waste could be prevented by improved methods of combustion. Another advantage is the gain in cleanliness and public convenience; not only would there be an end to sooty chimneys, but the atmosphere of towns would no longer be polluted by unburnt carbon; whose total quantity is enormous, though the amount contained in any given puff of smoke is very small. The "London" or "pea-soup "fog would be avoided, not because

fogs would become any less frequent than now in London and other large cities, hut, because they would lose their distinctive grimy opacity. '..,-■

An investigation of London fogs was made in 1901-1903 by the Meteorological Council with the assistance of the London County Council, from which it appeared that 20% of fogs were entirely due to smoke, and that in every case the density and duration of fogs was enormously added to by smoke.

It is, often stated that these fogs are caused by the smoke that blackens them; but this is an error. The combustion of coal is certainly responsible

for their existence, but it is the sulphur of the coal (oxidized ultimately to sulphuric acid), and not the carbon, that is the active agent. So long as coal, is burnt at all this manu- facture of sulphuric acid and of fogs must continue; it is not to be got rid of by improved methods of combustion, though the character of the fogs, may be materially improved. The evil effects of town air on plant life and human lungs, also often attributed to preventible smoke, are in like manner due to this non-preventible sulphuric acid. Sixteen million tons of coal are annually used in London for heating purposes, and it has been shown by Dr Rideal that, as the sulphur content of this coal ranges from I to 2 %. there is diffused in the air of the metropolis from half a million to a million tons of sulphuric acid every year. The extent to which smoke and fog affect life and injure property is, perhaps, a matter of opinion. It has, however, been proved that the death-rate enormously expands in foggy weather, and the Hon. Rollo Russell has made a careful calculation showing the extra cost which the smoke nuisance annually imposes Upon London. The figure at which he has arrived is £5,470,000, including damage to buildings, fabrics and works of art.

The amount of coal consumed each year in the country was calculated by the Royal Commission on coal supplies to amount to 160,000,000 tons, of which 36,000,000 or 19-2 % are consumed for domestic purposes, and 53,000,000 tons are used in ordinary factories. Thirteen million tons are taken by railways, 15,000,000 by gasworks and 28,000,000 tons by the iron and steel industries.

The methods that have' been suggested for the abolition of smoke may be divided into two great classes, viz. those that seek to attain this end by improving the appliances for the burning of bituminous coal, and those that propose to abolish its use and substitute for it some other kind of fuel. The proposals of the first class may be divided into those applicable to domestic purposes and those appli- cable to boiler fires and other large-scale operations. Those of the second class may be divided according to the nature of the fuel which they suggest. The innumerable inventions of the first class. depend for their success (so far as they are successful) on the attention bestowed on the scientific requisites for complete combustibnj viz. a sufficient but not too great supply of air, the thorough admixture of this air with the products of the destructive distillation of the coal, and the maintenance of a high temperature within the fire. In the old and crude methods the facts which most militate against the attainment of these desiderata are — (1) that large masses of fresh fuel are thrown on at the top, which cool down the fire where the highest temperature is required ; (2) that the products of the distillation of this fresh fuel, heated from below, do not get properly mixed with air till they have been drawn up the chimney; (3) that unduly large volumes of cold air are continually being

sucked up through the fire, cooling it and carrying its heat away from where it is wanted, and yet without remedying the second evil. In the improved methods regularity of supply of both fuel and air is sought so as to maintain a steady evolution of distillation products, a steady temperature, and a steady and complete combustion. In many cases it is sought to warm fresh air before it enters the room by a regenerative system, the. heat being taken from the escaping gases which would otherwise carry it up the chimney ; and in some cases the air which feeds the fire is heated in the same why.

Tests applied at the South Kensington Exhibition of 1882 and in recent years by the Coal Smoke Abatement Society acting in con- junction with the Office of Works, for domestic grates and stoves, have included a chemical examination of the chimney gases, ob- servations of the " smoke-shade " as indicating the proportion of Unburnt carbon, and a record of the amount of coal burnt, of the rise of temperature produced, of the radiation, and of the amount of heat lost hy being carried away through the chimney. Domestic grates and stoves are divided into six classes : — (1) open grates having ordinary bottom grids and upward draught; (2) open grates haying solid floors (adapted for " slow combustion ") and upward draught; (3) open grates fed from below, supplied with fresh fuel beneath the incandescent fuel; (4) open grates fed from the back or from the sides or from hoppers; (5) open grates having downward or backward or lateral draught ; (6) close stoves. Each of these classes is subdivided according as the apparatus is "air-heating" or " non-air-heating," i.e. according as an attempt is or is not made to save heat on the regenerative principle. The following conclusions, among others, have been arrived at: — (4) the air-heating principle has not been applied with success except in class 5 ; (b) close stoves (class 6) are superior to open grates (total average of classes 1-5) in respect of freedom from smoke and of general heating effect, but

they are greatly inferior in radiating power; (c) the ".slow-com- bustion " principle giyes a high radiation factor, with a lower consumption of fuel, but is otherwise not successful; (d) the class of air-heating grates with downward, backward, or lateral draughts and with a large surface of fire-brick for radiating heat is, on the whole, most efficient (see Heating). '

In boiler fires, both for locomotives and for fixed appliances, the desiderata are essentially the same as in the case of domestic fires; the principles involved are consequently also the same, though the appliances are necessarily different. These improvements' may "be all classed under one or

other of two heads, according as the mode of supplying the fuel or the mode of supplying the air is the subject of the improvement. These two kinds of improvement may of course be combined.

In the old forms of furnace fresh fuel, as it is wanted, is supplied by hand labour, the furnace doors being opened and large quantities of coal thrown in. One result of this is the inrush of great volumes of cold air, which, aided by the equally cold fuel, lowers the general temperature of the furnace. Mechanical stokers meet this difficulty by supplying the coal regularly in small quantities at a time. They may be divided into " coking " stokers, which deliver the coal at the front and gradually push it backward; " sprinkling " stokers, which scatter it generally over the surface of the grate; and " underfeed " stokers, which raise it from below so that the products of its dis- tillation pass through the already incandescent fuel. The mechanism by which these results are attained is often of a complex nature.

It is generally recognized that air cannot be efficiently supplied to the furnace if admitted only in front, and accordingly many plans have been devised for supplying it also at the back and sides. In some cases currents of air are induced by steam-jets ; but this plan has not always proved successful. The inventions on the regenerative principle are more generally satisfactory. In them the air, before entering the furnace, is made to circulate through chambers heated externally by the products of combustion, and, having thus acquired a high temperature and absorbed heat that would otherwise have been lost, is admitted through openings at the bridge. Many of these appliances are almost absolutely smokeless, and they are much in use, as they have been shown to effect great economy in coal consumption.

It must not be forgotten, however, that with the use of trained stokers a high degree of boiler efficiency is reached by hand-firing alone Indeed, it has been proved by actual tests that, when pitted against untrained, men, skilled stokers have raised the thermal efficiency of their plant by over 16%, without creating smoke nuisances. In Germany stokers are trained under careful state super- vision, and similar work has been started at the Borough Polytechnic Institute by the London County Council.

The advocates of the total or partial disuse of smoke-producing coals are variously in favour of anthracite, coke, electric power, liquid fuel or gas.

In some factories, such as malting works, anthracite and other coals containing a high percentage of carbon may be and have long been advantageously used as fuel. They yield a much smaller percentage of distillation products than ordinary coals, and produce no smoke or almost none. But they are difficult to ignite, and in small fires difficult to keep

burning without forced draught; they give very little flame, and are comparatively expensive, so that they are under considerable disadvantage as compared with the usual kinds of coal. Many grates and stoves have been devised for burning anthracite for domestic heating, and some of them are successful and economical ; but, in view of the national prejudice in favour of a bright and open fire, it is not likely that anthracite will ever replace bituminous coal to any great extent in the British Isles, where the great coal-fields undoubtedly are the natural sources of fuel.

This remark, however, does not apply to the use of coke and of gas, which are themselves made from coal. Coke is produced in large quantities, both for its own sake and as a by-product in the manu- facture of gas for lighting purposes, and is largely used in various kinds of furnaces It gives no smoke, but it resembles anthracite also in being but ill adapted for use in open grates on account of the difficulty of ignition and the absence of flame.

One of the most notable features of the smoke abatement movement in recent years has been the manufacture of smokeless fuels capable of being readily and satisfactorily burnt in ordinary household grates. The use of such fuels is growing and will, in conjunction with the enormous expansion in the use of gas- cookers and heating appliances, do much to eliminate smoke nuisances from private houses. Over 750,000 gas-cookers are in use in the metropolis alone, and their aggregate effect in preventing the emission of smoke from kitchen chimneys must be very great.

Liquid fuel or natural petroleum, which has come into excep- tional prominence during recent years as a beating agent, owes its success to its relatively smokeless combustion and high efficiency. The same applies to gaseous fuel, which includes in addition to ordinary coal gas other mixtures of gases which

burn with a high heating value and with no deleterious vapours or smoke (see Pcel: Liquid and Gaseous). Electricity is now als6 being largely utilized in factories for power purposes, and is thus bearing its share in solving the problem of smoke abatement.

See Official Report of the Smoke Abatement Committee (London; 1882) ;.W. C. Popplewell, The Prevention of Smoke (1901); W. Nicholson, Smoke Abatement (1905); also the publications of the London Coal Smoke Abatement Society; Booth and Kershaw, Smoke Prevention and Fuel Economy (1904) ; Reports of the LaiDs in certain Foreign Countries in regard to Emission of Smoke from Chimneys (Foreign Office Return), Cd. 2347 (1905) ; LondonFoglnquiry (1901-1902) (Reports to and by the Meteorological Council).

(O. M.;L. W. Ch.)

SMOLENSK, a government of middle Russia, belonging partly to Great Russia and partly to White Russia, bounded by the governments of Moscow and Kaluga on the E., Orel and Cherni- gov on the S., Mogilev and Vitebsk on the W., and Pskov and Tver on the N. It covers an area of 21,632 sq. m. in the W. of the great central plateau, its N. districts extending towards the hilly region of the Valdai. The rivers being deeply cut in the plateau, the surface is also hilly in the W. districts (Smolensk, Doro- gobuzh), whence it slopes away gently towards vast plains on the E. and S. Carboniferous limestones, containing a few deposits of coal (in Yukhnov) and quarried for building purposes, occupy the E. of Smolensk; chalk appears in the S. extremity; while tertiary sands, marls and ferruginous clays cover all the W. The whole is overlain with a thick sheet of boulder clay, with irregular extensions to the N.; post-tertiary sands are spread over wide surfaces; and peat-bogs fill the marshy depressions. The soil, mostly clay, is generally unfertile, and stony and sandy in several districts. The rivers Vazuza and Gzhat, both flowing into the Volga, and the Moskva and the Ugra, tributaries of the Oka, are channels for floating timber. The two tributaries of the Dvina — the Kasplya and the Mezha — are of much more import- ance, as they and their affluents carry considerable numbers of boats to Riga. The Dnieper takes its origin in Smolensk and drains it for more than 300 m.; but neither this river nor its tributaries (Vop, Vyazma, Sozh and Desna), whose upper courses belong to Smolensk, are navigable; timber only is floated down some of them. Many small lakes and extensive marshes occur in the N.W. More than one-third of the area is under forests. The climate is like that of middle Russia generally, although the moderating influence of the damp climate of W. Europe is felt to some extent. The average yearly temperature at the city of Smolensk is 45-5° Fahr. (January, 13- 5 ; July, 67-2°).

The estimated population in 1906 was 1,762,400. It is chiefly composed of White Russians (55%) in the W., and Great Russians (43%) in the E. Most of the inhabitants (98%) belong to the Orthodox Greek Church ; the rest are Noncon- formists. The government is divided into twelve districts, the chief towns of which are Smolensk, Byelyi, Dorogobuzh, Dukhov- shina, EInya, Gzhatsk, Krasriyi, Poryechie, Roslavl, Sychevka, Vyazma and Yukhnov.

Notwithstanding the unproductive soil and the frequent failures of crops (especially in the N.W.), the chief occupation is agriculture. Out of the total area 383 % is held by the village communities, 52 % by private persons and 2j% by the crown; 7% is uncultivable. Nearly 30% of the surface is arable land, and over 20% is under meadows. The principal crops are rye, wheat, oats, barley, buck- wheat and potatoes. Grain has to

be imported. Improved agri- cultural implements are beginning to be manufactured within the government, and to be used by the landlords, and partly also by the peasants. Flax and hemp are important crops, and some tobacco is grown. The live stock of the peasantry suffer from a want of meadow and pasture land, which is chiefly in private ownership. The peasantry are mostly very poor, in consequence not only of the French invasion in 1812, the effects of which are still felt, but also of insufficient allotments and want of meadows. In the way of mining phosphorite only is extracted. The most important industries are cotton, oil and paper mills, distilleries and breweries. The timber trade and boat-building are important sources of income, but more than one-half of the male population of west Smolensk leave their homes every. year in search, of work, principally as navvies throughout Russia, A lively traffic is carried on on the rivers, principally the Kasplya, the Obzha and the Ugra, corn, hemp, hempseed, linseed and especially timber being shipped. A considerable quantity of corn is imported into the W. districts.

Smolensk is crossed by two important railways, from Moscow to Warsaw and from Riga to Saratov ; a branch line connects Vyazma with Kaluga. (P. A. K.; J. T. Be.)

SMOLENSK, a town of Russia, capital of the government of the same name, on both banks of the Dnieper, at the junction of the railways from Moscow to Warsaw and from Riga to Orel, 252 m. by rail W.S.W. of Moscow. Pop. (1000) 57,405. The town, with the ruins of its old kreml, or citadel, is built on high crags on the left bank of the Dnieper. Its walls, built during the reign of Boris Godunov (1598-1605), are rapidly falling into decay. But the city has much improved of late years. It has monuments in commemoration of the war of 1812 and of the Russian musical composer, M. I. Glinka (1885). It has three public libraries, an historical and archaeological museum, a people's palace, and several scientific societies. The cathedral was erected in 1676-177 2, on the site of a more primitive building (dating from 1101), which was blown up in 1611 by the defenders of the city during a siege by the Poles. The picture of the Virgin brought to Russia in 1046, and attributed to St Luke, which is kept in this cathedral, is much venerated throughout central Russia. Two other churches, built in the 13th century, have been spoiled by recent additions. Smolensk is neither a com- mercial nor a manufacturing centre.

Smolensk is one of the oldest towns of Russia, and is mentioned in Nestor's Chronicle as the chief town of the Slav tribe of the Krivichis, situated on

the great commercial route " from the Varyaghs to the Greeks." It maintained a lively traffic with Constantinople down to the nth century, when the principality of Smolensk included Vitebsk, Moscow, Kaluga and parts of the present government of Pskov. The princes of Kiev were often recognized as military chiefs by the vyeche (council) of Smolensk, who mostly preferred Mstislav and his descendants and Rostislav, son of Mstislav, became the ancestor of a series of nearly inde- pendent princes of Smolensk. From the 14th century these fell under the influence of the Lithuanian rulers, and in 1408 Smolensk was annexed to Lithuania. In 1449 the Moscow princes re- nounced their claims upon Smolensk; nevertheless this im- portant city, with nearly 100,000 inhabitants, was a constant source of contention between Moscow and Lithuania. In 1514 it fell under Russian dominion; but during the disturbances of 161 1 it was taken by Sigismund III. of Poland, and it remained under Polish rule until 1654, when the Russians retook it. In 1686 it was definitely annexed to Russia. In the 18th century it played an important part as a basis for the military operations of Peter the Great during his wars with Sweden. In 181 2 it was well fortified; but the French, after a two days' battle, defeated the Russians here and took the city, when it suffered much.

SMOLENSKIN, PEREZ [Peter] (1842-1885), Russian Jewish novelist, was born near Mogilev (Russia) in 1842; he died at Meran (Austria) in 1885. His story is the Odyssey of an erring son of the Ghetto. He joined and left the opposite parties of the rationalists and the mystics, and followed a variety of precarious occupations. He settled in Odessa, where he familiarized himself with several European languages, and became an anti- nomian in religion, though he never left the Jewish fold. He became the rallying-point for the revolt of young Jewry against medievalism, the leader, too, in a new movement towards Jewish nationalism. His Hebrew periodical, the Dawn (Ha-shahar), exercised a powerful influence in both directions. Shortly before his death he became deeply interested in schemes for the coloniza- tion of Palestine, and was associated with Laurence Oliphant. Smolenskin was the first to dissociate Messianic ideals from theological concomitants. Smolenskin's literary fame is due to his Hebrew novels. He may be termed the Jewish Thackeray. In style and method his work resembles that of the English novelist. There is little doubt but that Smolenskin, had he written in any language but Hebrew, would be regarded as one of the great novelists of the 19th century. Of his novels only the best need be named here. A Wanderer on the Path of Life (Ha- to'eh be-darkhe ha-Hayim) is the story of an orphan, Joseph, who passes through every phase of Ghetto life; the work (i868'i87o) is an autobiography, the form of which was sug

gested by David Copperfield, but there is no similarity to the manner of Dickens. More perfect in execution is the Burial of the Ass (Qeburath

ffamor) which appeared in 1874. A third novel, The Inheritance (Ha-yerushah), issued in 1880-1881, depicts life in Odessa and Rumania.

See N. Slouschz, The Renascence of Hebrew Literature, chs. ix., x., xi. (I. A.)

SMOLLETT, TOBIAS GEORGE (1721-1771), British novelist, was born in the old grange of Dalquhurn, near Bonhill, in the vale of Leven, parish of Cardross, Dumbartonshire, and was christened on the 19th of March 1721. His father Archibald (youngest son of Sir James, the laird of Bonhill, a zealous Whig judge and promoter of the Union of 1707) had made what was deemed in the family an improvident marriage. Archibald died in 1723, and Sir James did what he could for the widow and her family during his lifetime. The elder son James was sent into the army. Tobias was sent to Dumbarton school, then in excellent repute under the grammarian John Love. When the grandfather died in 1731 there was no further provision, and after qualifying for a learned profession at Glasgow University, Tobias was apprenticed in 1736 for five years to a well-known surgeon in that city. This early " deception " conspired to make him angry, resentful and suspicious of motive; but he was neither vindictive nor ungenerous. If his tendency to satire and caricature made him enemies, his enthusiasm for Scottish history made him friends, and, in spite of peccadilloes, the ' ' bubbly-nosed callant with a stane in his pouch," as Dr Gordon called him, seems as an apprentice to have won his master's regard. The lad's ambition would not allow him to remain in Glasgow. The example of Thomson and Mallet was contagious, and at the age of eighteen Smollett crossed the border in set form to conquer England with a tragedy, The Regicide, based on Buchanan's description of the death of James I.

The story of the journey is told with infinite spirit in the early chapters of Roderick Random. The failure of the play, his darling composition and certainly the worst thing he ever wrote, became the stock grievance of Smollett's life. For some months no one could be induced to read it, and the unrequited author would have been reduced to starvation had not a friend of the family procured him the position as surgeon's mate on H.M.S. " Cumberland. " The fleet was ordered to attack Cartagena, the great stronghold of Spanish America, and the siege, which occupied most of the year 1741, proved the Walcheren expedition of the 1 8th century. Smollett as an eye-witness has left us a memorable picture of the miseries endured by soldiers and sailors, which historians have been content to accept as a first-hand authority in spite of the fact that it is embedded in the pages of a licentious novel. When the enterprise was abandoned the fleet returned to Jamaica. There Smollett fell in love with the daughter of a planter, Nancy Lascelles, whom he married on returning to England. Before this, having removed his name from the navy books (May 1744), he had set up as a

surgeon in Downing Street; but he attracted attention more as a wit than as a leech. " Jupiter " Carlyle testifies to his brilliant accom- plishments, and to the popularity he attained by his indignant verses " The Tears of Scotland," resenting Culloden. In the same year (July 1746) his name appeared upon the title-page of a political satire entitled Advice, followed characteristically in 1747 by Reproof, both of them "imitations from Juvenal" in the manner of Pope. He revenges himself in his satires on the should-have-been patrons of his play.

Disappointed alike in the drama, his profession and his wife's dowry, Smollett devoted his attention in a happy hour to fictitious adventure. Richardson had published the first part of Pamela in 1741, and Fielding his Joseph Andrews in 1742. But Smollett owed less to these models than to his studies in Cervantes, Swift, Defoe and above all Le Sage. His hero, who gives his first novel its capital name, Roderick Random, recounts like Gil Bias a life of varied adventure in the company of a servant, in which he enters the service of a physician and meets with old schoolfellows, thieves, notes of the bank of engraving, prison, semi-starvation and in the end an unexpected fortune. The author draws on

his adventures on the English highway and in the cockpit of a king's ship. Virtually he revealed the seaman to the reading world — divined his character, sketched his outlines, formulated his lingo, discovered his possibilities to such purpose that, as Scott says, every one who has written about the navy since seems to have copied more from Smollett than from nature. Pungent observation allied to a vigorous prose, emancipated to a rare degree from provincialism or archaism, were perhaps the first of Smollett's qualifications as a novelist. Such coherence as his novels have owes more to accidental accumulation than to constructive design. The wealth of amusing incident, the rapidly moving crowd of amusing and eccentric figures, atones for a good many defects. Smollett's peculiar coarseness and ferocity were gradually eliminated from English fiction, but from Tom Jones right down to Great Expectations his work was regularly ransacked for humour. There was no author's name on the title of the two small volumes of Random; Lady Mary Wortley Montagu thought a work so delightful could only be by Fielding, in whose name it was actually translated into French. But Smollett made no secret of the authorship, went to Paris to ratify his fame, and published his derelict play as " by the author of Roderick Random," hoping thus, as he said, to intimidate his discarded patrons. The incident well reveals the novelist's " systema nervosum maxime irritabile," of which his medical advisers spoke.

Smollett now became a central figure among the group of able doctors who hailed from north of the Tweed, such as Clephane, Macaulay, Hunter, Armstrong, Pitcairne and William Smellie, in the revision of whose system of Midwifery the novelist bore a part. He must have still designed to combine medicine with authorship, for in June 1750 he obtained the degree of M.D.from Marischal College, Aberdeen. But in the autumn of this year he already had another novel in prospect, and went over to Paris with a new acquaintance, Dr Moore (author of Zeluco), who soon became his intimate and was destined to become his biographer. The influence of this visit is marked in Smollett's second novel, The Adventures of Peregrine Pickle (4 vols., 1751). Like its predecessor, a loosely constructed string of episodes and adven- tures in which a still greater scope is afforded to the author for eccentric display, Pickle proved from the first a resounding success, both in England and France. The chief centres of attraction are the grotesque misanthrope of Bath, Cadwallader Crabtree, the burlesque scenes afforded by the physician (a caricature of Akenside) and Pallet the painter in Paris, and the so-called " garrison," with its inhabitants, Hatchway and Pipes and the inimitable Trunnion — whose death-scene fully exhibits Smollett's powers for the first time-the prototype of so many character portraits from Uncle Toby to Cap'n Cuttle. Trunnion's grotesque ride to church reappears in John Gilpin; the misan- thrope, practising satire under cover of feigned deafness, reappears in the Mungo Malagrowther of Scott, who frankly admits further debts to Smollett in the preface to the Legend of Montrose. The " garrison " unquestionably suggested the " castle " of Tristram Shandy and the " fortress " of Mr Wemmick. Indeed it is no exaggeration to say that the tideway of subsequent fiction is strewn on every hand with the disjecta membra of Smollett's happy phrases and farcical inventions. Pickle himself is if possible a bigger ruffian than Random; in this respect at any rate Smollett clings to the cynical tradition of the old romances of roguery. The novel is marred to an even greater extent by interpolations and personal attacks than its predecessor; the autobiographical element is slighter and the literary quality in some respects inferior.

Smollett's third novel, Ferdinand Count Fathom, appeared in 1753, by which time the author, after a final trial at Bath, had definitively abandoned medicine for letters, and had settled down at Monmouth House, Chelsea, a married man, a father and a professional writer, not for patronage, but for the trade. In this capacity he was among the first to achieve a difficult inde- pendence. In Fathom Smollett endeavours unquestionably to organize a novel upon a plan elevated somewhat above mere agglomeration. It looks as if he had deliberately set himself to

show that he too, as well as the author of Tom Jones, could make a plot. The squalor and irony of the piece repel the reader, but it is Smollett's

greatest feat of invention, and the descriptive power, especially in the first half, reveals the latent imaginative power of the author. Few novels have been more systematically plundered, for Fathom was the studio model of all the mystery and terror school of fiction commencing with Radcliffe and Lewis. With Fathom the first jet of Smollett's original invention was spent. The novel was not particularly remunerative, and his expenses seem always to have been profuse. He was a great frequenter of taverns, entertained largely, and every Sunday threw open his house and garden to unfortunate " brothers of the quill," whom he regaled with beef, pudding and potatoes, port, punch and " Calvert's entire butt-beer."

To sustain these expenses Smollett consented to become a literary impresario upon a hitherto unparalleled scale. His activity during the next six years was many-sided, chiefly in the direction of organizing big and saleable " standard " works for the booksellers and contracting them out to his " myrmidons." Thus we see him almost simultaneously editing Don Quixote, making a triumphant visit to Scotland, inaugurating a new literary periodical the Critical (Feb. 1756) by way of corrective to Griffith's Monthly Review, organizing a standard library History of England in quarto and octavo, with continuations, and a seven-volume compendium of Voyages, for which he wrote a special narrative of the siege of Cartagena, supplementary to his account in Roderick Random. In 1758 he projected and partly wrote a vast Universal History, and in January 1760 he brought out the first number of a new sixpenny magazine, the British, to which he contributed a serial work of fiction, the mediocre Adventures of Sir Launcelot Greaves. By these Herculean labours as a compiler Smollett must have amassed a considerable sum, to which the £200 received from the now forgiven " Mar- mozet " (Garrick) for the sixth performance of the patriotic extravaganza, The Reprisal, or the Tars of Old England, must have come as a welcome addition. The Critical Review was already responsible for plenty of thorns in the editorial cushion when in 1762 Smollett undertook the additional task of editing the Briton. He had already been ridiculed, insulted, fined and imprisoned in the Marshalsea (this last for an attack on Admiral Sir Charles Knowles). He was now to support the North British favourite of George III. in the press against all comers, not we may reasonably suppose without substantia) reward. Yet after incurring all this unpopularity, at a time when the London mob was more inflamed against Scotsmen than it has ever been before or since, and having aroused the animosity of such former allies as Wilkes and his friend Churchill, Smollett was to find himself unceremoniously thrown over by his chief, Lord Bute, on the ground that his paper did more to invite attack than to repel it.

The Briton expired or was killed by the North Briton in February 1763, and for the moment Smollett allowed himself to be beckoned back by the

booksellers to such tasks as a universal gazetteer and a translation of Voltaire in 38 volumes, and we hear of him prescribing work to his minions or receiving their homage and demanding their copy as of old. "In April, however, his only daughter died at the age of fifteen, and, already over-wrought and almost broken down from sedentary strain, the tension proved too much and Smollett was never the same man again. His wife earnestly begged him to " convey her from a country where every object seemed only to nourish grief," and he followed her advice. The result was two years' sojourn abroad, mainly upon the Riviera, which Smollett, who may be termed the literary discoverer of Nice, turned to such excellent purpose in his Travels (2 vols., 1766), remarkable alike for their acidity and for their insight. On his arrival from Italy, where he had provided material for Sterne's portrait of the distressful " Smelfungus," Smollett seemed at first decidedly better and appeared to be getting over some of the symptoms of his pulmonic complaint. But his health was thoroughly undermined by rheumatism, and the pain arising from a neglected ulcer which had developed into a chronic sore helped to sap his strength. As soon, therefore,

as the Travels were out of hand Smollett resolved on a summer journey to Scotland. The society of Edinburgh, then at the apogee of its brilliance, paid due attention to the famous Dr Smollett. He was visited by Hume, Home, Robertson, Adam Smith, Blair, Carlyle, Cullen and the Monros. He went to Glasgow to see Dr Moore (where he patted the head of the future hero of Corufia), and stayed with his cousin, James Smollett, in his newly built mansion of Cameron. His mother, who

hardly knew his toil-worn visage until it relaxed into his old roguish smile, died in this autumn, and he was still in a pre- carious state of health when he proceeded to Bath, spending the Christmas of 1766 in Gay Street, where his complaint at last took 1 turn for the better, and where it is possible that he may have commenced a rough draft of Humphrey Clinker.

In 1 768 he was again in London, and with a return of his vital energy came a recrudescence of the old savagery. The History and Adventures of an Atom is a very clever, but abominably coarse, Rabelaisian satire upon the whole conduct of public affairs in England from the beginning of the Seven Years' War down to the date of publication. He lashes out on all sides without fear or favour. The king, Chatham, Bute and North are bespattered with filth, the acridity of which owes something to Gulliver, with aid as to local colour from the Jesuit and other accounts of Japan which had come under his ken as a compiler of travels. After its publication

in 1769, without other serious consequences, Smollett's health completely relapsed, and in December (a consulate in the Mediterranean having been refused him) he left England finally, and settled first at Pisa and then near Antignano, a few miles out of Leghorn. There, during the autumn of 1770, he penned his immortal Humphrey Clinker, in which he reverts to his favourite form of itinerant letters, a rare example of late maturity of literary power and fecundity of humour. The sardonic humour, persistent curiosity and keen faculty of observation shown in the Travels are here combined with the mellow contentment of the voyager who has forgotten the small worries of transport and with the enthusiasm of the veteran who revisits the scenes of his youth. The character drawing, too, though still caustic, seems riper and more matured. Smollett's speculative and informing 18th-century mind is here content for the -most part, like Goldsmith's, merely to amuse.

Smollett died at Leghorn aged fifty on the 17th of September 1771, and was buried in the old English cemetery there. Three years later the Smollett obelisk was put up at Renton (it now stands in the parish school-ground) , half-way between Dumbarton and Balloch. The best portrait belongs to the Smollett family, Cameron House, Loch Lomond (engraved by Freeman, 1831). The genuineness of the others, if we except that in the Hunterian Museum, Glasgow, is doubtful. The novelist has been confused with the Dr Smollett, the contemporary of Dr William Hunter, who figures in Rowlandson's " Dissecting Room " {Royal Coll. of Surgeons Cat., 1000).

Hume said that Smollett was like a coco-nut, rough outside, but full of human kindness within. He was easily ruffled by the rubs of fortune of which he had more than his fair share. Hence the adjectives corrosive and splenetic so often applied to a nature essentially both generous and tender. After Fielding, Smollett counts as the greatest purveyor of comic prose-epic of con- temporary life to his generation, if not to his century. Scott and Dickens regarded him as fully Fielding's equal. Hazlitt and Thackeray thought otherwise. Equally rationalist and pagan with Fielding, Smollett is more of a pedagogue and less of the instinctive scholar and wit than his predecessor. His method in its broad outlines is similar, historic and ambulant rather than philosophic or poetic, but he has more potential romance or poetry about his make-up than the mystery-hating Fielding. In the recognized requirements of prose-epic such as plot, character, scene, reflection and diction, Smollett could fairly hold his own. His prose, which carries on the robust tradition from Swift and Defoe to Johnson and Jeffrey, is more modern in tone than that of his great rival. In fictions such as Tom Jones, Roderick Random and the like, England could at length feel that it possessed compositions which might claim kinship and

comparison with Cervantes and Le Sage. Much that these writers attempted

has been done again in a style better adjusted to the increasing refinement of a later age. But Smollett's great powers of observation and description, his caustic and indignant turn of speech, will long render him an invaluable witness in the century which he so well represents. Much that he did was mere hackwork, but at his best he ranks with the immortals.

The estimate formed of Smollett's work during the past generation has probably been a diminishing one, as we may infer in part from the fact that there is no standard Life and no definitive edition of the works. The chief collective editions are as follows: 6 vols., Edinburgh, 1790; 6 vols., London, 1796, with R. Anderson's Memoir; Works, ed. J. Moore, 1797 (re-edited J. P. Browne, 8 vols., 1872); Works, ed. Henley and Seccombe, Constable (12 vols., 1899- 1902). To which must be added a one- volume Miscellaneous Works, ed. Thomas Roscoe (1841); Selected Works (with a careful life by David Herbert) (Edinburgh, 1870); Ballantyne's edition of the Novels with Scott's judicious memoir and criticism (2 vols., 1821); and Professor G. Saintsbury's edition of the Novels (12 vols., 1895). There are short Lives, by Robert Chambers (1867), David Hannay (1887) and O. Smeaton (1897). Additional information of recent date will be found in the' article on Smollett in the Diet. Nat.Biog., Masson's British Novelists (and other books on the development of English Fiction), H. Graham's Scottish Men of Letters in the Eighteenth Century, Blackwood's Mag. for May 1900; and the present writer's introduction to Smollett's Travels through France and Italy (World's Classics, 1907). (T. Se.)

SMUGGLING (O. Eng. smeogan, smugan, to creep, with the idea of secrecy) , a breach of the revenue laws either by the importation or the exportation of prohibited goods or by the evasion of customs duties on goods liable to duty. Legislation on the subject in England has been very active from the 14th century down- wards. In the reign of Edward III. the illicit introduction of base coin from abroad led to the provision of the Statute of Treasons 13s 1 ! making it treason to import counterfeit money as the money called " Lushburgh." Such importation is still an offence, though no longer treason. After the Statute of Treasons a vast number of acts dealing with smuggling, were passed, most of which will be found recited in the repealing act of 1825. In the 18th and the early years of the 19th century, smuggling (chiefly of wine, spirits, tobacco and bullion) was so generally practised in Great Britain as to become a kind of national failing. The prevalence of the offence may be judged from the report of Sir J. Cope's committee in 1732 upon thefrauds on the revenue. The smuggler of the 18th century finds an apologist in Adam Smith, who writes of him as " a person who, though no doubt highly blamable for violating the laws of his country, is frequently incapable of violating those of natural justice, and would have been in every respect an excellent citizen had not the laws of his country made that a crime which nature never meant to be so." The

gradual reduction of duties brought the offence in the United Kingdom into comparative insignific- ance, and it is now almost confined to tobacco, though the sugar duty has led to smuggling of saccharin.. Most of the existing legislation on the subject of smuggling is contained in the Customs Consolidation Act 1876.

The main provisions are as follows. Vessels engaged in smuggling are liable to forfeiture and their owners and masters to a penalty not exceeding £500. Smuggled and prohibited goods are liable to forfeiture. Officers of customs have a right of search of vessels and persons. Fraudulent evasion or attempted evasion of customs duties renders the offender subject to forfeit either treble the value of the goods or £100 at the election of the commissioners of customs. Heavy penalties are incurred by resistance to officers of customs, rescue of persons or goods, assembling to run goods, signalling smuggling vessels, shooting at vessels, boats, or officers of the naval or revenue service, cutting adrift customs vessels, offering goods for sale under pretence of being smuggled, &c. Penalties may be recovered either by action or information in the superior courts or by summary proceedings. In criminal proceedings the defendant is competent and compellable to give evidence. The Merchant Shipping Act 1894 makes any seaman or apprentice, after conviction for smuggling whereby loss or damage is caused to the master 01 owner of a ship, liable to pay to such master or owner such a sum as is sufficient to reimburse the master or owner for such loss or damage, and the whole or a proportional part of his wages may be retained in satisfaction of this liability. Additional provisions as to smuggling are also contained in the Customs and Inland Revenue

Act 1879, an d the Customs and Inland Revenue Act 1881. A I smuggling contract is generally illegal. But it may be valid, and the

vendor may recover the price of goods, even though he knew the buyer intended them to he smuggled, unless he actually aids in the smuggling so as to become particeps criminis. Contracts to defraud the revenue of a foreign state are, according to English decisions, not illegal. There is a German decision, more consonant with international morality ; to the opposite effect.

The penalties for smuggling in the United States will be found mainly in tit. xxxiv. ch. 10 of the Revised Statutes. The seaman guilty' of smuggling is liable to the same penalty as in England, and in addition to imprisonment for twelve months, s. 4596.

See Stephen Dowell's History of Taxation (2nd ed., 1888), and Luke Owen Pike's History of Crime in England (1873-1876) ; and for general accounts of smuggling see \V. D. Chester, Chronicles of the Customs Department (1885) ; H. N. Shore, Smuggling Days and Smuggling Ways (1892); Alton and Holland, The King's Customs (1908) ; C. G. Harper, The Smugglers: Picturesque Chapters in the Story of an Ancient Craft (1909).

SMYBERT (orSMiBERT), JOHN (1684-1751); Scottish American artist, was born at Edinburgh in 1684, and died in Boston, Massachusetts, in 1751. He studied under Sir James Thornhill, and in 1728 accompanied Bishop Berkeley to America, with the intention of becoming professor of fine arts in the college which Berkeley was planning to found in Bermuda. The college, however, was never established, and Smybert settled in Boston, where he married in 1730. In 1731 he painted " Bishop Berkeley and His Family," now in the dining-hall, Yale University, a group of eight figures. He painted portraits of Jonathan Edwards and Judge Edmund Quincy (in the Boston Art Museum) , Mrs Smybert, Peter Faneuil and Governor John Endecott (in the Massachusetts Historical Society), John Lovell (Memorial Hall, Harvard University), and probably one of Sir William Pepperrell; and examples of his works are owned by Harvard and Yale Universities, by Bowdoin College, by the Massachusetts Historical Society, and by the New England Historical and Genealogical Society. A son, Nathaniel Smybert (1734-17 56), was born in Boston on the 20th of January 1734, and died there on the- 8th of November 1756. He was a pupil of his father, and dying at the age of twenty-two, left several important canvases, notably a portrait of Dorothy Wendell (in the Collection of Dr John L. Hale, Boston).

SMYRNA (Ismir), in ancient times one of the most important and now by far the greatest of the cities of Asia Mindr, has preserved an unbroken continuity of record and identity of name from the first dawn of history to the present time.

1. The Ancient City. — It is said to have been a Lelegian city before the Greek colonists settled in Asia Minor. The name, which is said to be derived from an Amazon called Smyrna, is indubitably Anatolian, having been applied also to a quarter of Ephesus, and (under the cognate form Myrina) to a city of Aeolis, and to a tumulus in the Troad. The Aeolic settlers of Lesbos and Cyme, pushing eastwards by Larissa and Neonteichus and over the Hermus, seized the valley of Smyrna. It was the frontier city between Aeolis on the N. and Ionia on the S., and was more accessible on the S. and E. than on the N. and W. By virtue of its situation it was necessarily a commercial city, like the Ionian colonies. It is therefore not surprising that the Aeolic element grew weaker; strangers or refugees from the Ionian Colophon settled in the city, and finally Smyrna passed into the hands of the Colophonians and became the thirteenth of the Ionian states.

The change had taken place before 688, when the Ionian Onomastus of Smyrna won the boxing prize at Olympia, but it was probably then a recent event. The Colo- phonian conquest is mentioned by Mimnermus (before 600 B.C.), who counts himself equally a Colophonian and a Smyrnaean. The Aeolic form of the name, Hfxvpva, was retained even in the Attic dialect, and the-epithet "Aeolian Smyrna" remained long after the conquest. The situation of Smyrna on the path of commerce between Lydia and the west raised it during the 7th century to the height of power and splendour. It lay at the head of an arm of the sea, which reached far inland and admitted the Greek trading ships into the heart of Lydia. One of the great trade routes which cross Anatolia descends the Hermus valley past Sardis, and then diverging from the valley passes S. of Mt Sipylus and crosses a low pass into the little valley, about'? m. long and 2 broad, where Smyrna lies between the mountains and

the sea. Miletus, and later Ephesus, situated at the sea end of the other great trade route across Anatolia, competed for a time successfully with Smyrna, but both cities long ago lost their harbours and Smyrna remains without a rival.

When the Mermnad kings raised the Lydian power and aggressiveness Smyrna was one of the first points of attack. Gyges (c. 687-652) was, however, defeated on the banks of the Hermus; the situation of the battlefield shows that the power of Smyrna extended far to the E., and probably included the valley of Nymphi (Nif). A strong fortress, the ruins of whose ancient and massive walls are still imposing, on a hill in the pass between Smyrna arid Nymphi, was probably built by the Smyr- naean Ionians to command the valley of Nymphi. According to Theognis (about 500 B.C.), " pride destroyed Smyrna." Mimner- mus laments the degeneracy of the citizens of his day, who could no longer stem the Lydian advance. Finally, Alyattes III. (609-560) conquered the city, and Smyrna for 300 years lost its place in the list of Greek cities. It did not cease to exist, but the Greek life and political unity were destroyed, and the Smyrnaean state was organized on the village system ((ifclro kw/xtiSov). It is mentioned in a fragment of Pindar, about 500 B.C., and in an inscription of 388 B.C. A small fortification of early style, rudely but massively built, on the lowest slope of a hill N. of Burnabat, is perhaps a fortified village of this period. Alexander the Great conceived the idea of restoring the Greek city; the two Nemeses who were worshipped at Smyrna are said to have suggested the idea to him in a dream. The scheme was, according to Strabo, carried out by Antigonus (316-301), and Lysimachus enlarged and fortified the city (301-281). The acropolis of the ancient city had been on a steep peak about 1250 ft. high, which overhangs the N.E. extremity of the gulf; its ruins still exist, probably in much the same condition as they were left by Alyattes. The later city was founded on the

modern site partly on the slopes of a rounded hill called Pagus near the S.E. end of the gulf, partly on the low ground between the hill and the sea. The beauty of the city, clustering on the low ground and rising tier over tier on the hillside, is frequently praised by the ancients and is celebrated on its coins.

The " crown of Smyrna " seems to have been an epithet applied to the acropolis with its circle of buildings. Smyrna is shut in on the W. by a hill now called Deirmen Tepe, with the ruins of a temple on the summit. The walls of Lysimachus crossed the summit of this hill, and the acropolis occupied the top of Pagus. Between the two the road from Ephesus entered the city by the " Ephesian gate," near which was a gymnasium. Closer to the acropolis the outline of the stadium is still visible, and the theatre was situated on the N. slopes of Pagus. The line of the walls on the E. side is unknown; but they certainly embraced a greater area than is included by the Byzantine wall, which ascends the castle hill (Pagus) from the Basmakhane railway . station. Smyrna possessed two harbours — the outer, which was simply the open roadstead of the gulf, and the inner, which was a small basin, with a narrow entrance closed by a rope in case of need, about the place now occupied by bazaars. The inner harbour was partially filled up by Timur in 1402, but it had not entirely disappeared till the beginning of the 19th century. The modern quay has encroached considerably on the sea, and the coast-line of the Greek time was about 90 yds. farther S. The streets were broad, well paved and laid out at right angles; many were named after temples: the main street, called the Golden, ran across the city from W. to E., beginning probably from the temple of Zeus Akraios on the W. side of Pagus, and running round the lower slopes of Pagus (like a necklace on the statue, to use the favourite terms of Aristides the orator) towards-Tepejik outside the city on the E., where probably the temple of Cybele, the Metroon; stood. Cybele, worshipped under the name of Meter Sipylene, from Mt Sipylus, which bounds the Smyrna valley – on the N., was the tutelar goddess of the city. The plain towards the sea was too low to be properly drained and hence in rainy weather the streets were deep with mud and water. The river Meles,which flowed by Smyrna, is famous in literature

and was worshipped in the valley. The most common and consistent tradition connects Homer with the valley of Smyrna and the banks of the Meles; his figure was one of the stock types on Smyrnaean coins, one class of which was called Homerian; the epithet " Melesigenes " was applied to him; the cave where he was wont to compose his poems was shown near

the source of the river; his temple, the Homereum, stood on its banks. The steady equable flow of the Meles, alike in summer and winter, and its short course, beginning and ending near the city, are celebrated by Aristides and Himerius. The description applies admirably to the stream which rises from abundant fountains, now known as Diana's bath, E. of the city, and flows into the S.E. extremity of the gulf. The belief that the torrent, almost dry except after rains, which flows by Caravan bridge, is the ancient Meles, flatly contradicts the ancient descriptions.

In the Roman period Smyrna was the seat of a conventus which included S. Aeolis and great part of the Hermus valley. It vied with Ephesus and Pergamum for the title " First (city) of Asia." A Christian church existed here from a very early time, having its origin in the considerable Jewish colony. Poly- carp was bishop of Smyrna and was martyred there a.d. 155. The bishops of Smyrna were originally subject to the metropolitan of Ephesus; afterwards they became independent (avTOK£akoi) , and finally were honoured with metropolitan rank, having under them the bishops of Phocaea, Magnesia ad Sipylum, Clazomenae, Sosandrus (Nymphi?), Archangelus (Temnos?) and Petra (Menemen?).

When Constantinople became the seat of government the trade between Anatolia and the W. lost in importance, and Smyrna declined apace. A Turkish freebooter named Tsacha seized Smyrna in 1084, but it was recovered by the generals of Alexius Comnenus. The city was several times ravaged by the Turks, and had become quite ruinous when the emperor John Ducas Vatatzes about 1222 rebuilt it. But Ibn Batuta found it still in great part a ruin when the famous chieftain Aidin had conquered it about 1330 and made his son Amur governor. It became the port of the Aidin amirate. Soon afterwards the Knights of Saint John established themselves in the town, but failed to conquer the citadel. In 1402 Timur stormed the town and massacred almost all the inhabitants. The Mongol conquest was only temporary, but Smyrna was resumed by the Seljuks of Aidin and has remained till the present day in Mahommedan hands. Until the reign of Abdul Mejid it was included for administrative purposes in the eyalet of Jezair (the Isles) and not in that of Anadoli. The represen- tative of the Capitan Pasha, who governed that eyalet, was, however, less influential in the city than the head of the Kara Osman Oglu's of Manisa (see Manisa). From the early 17th century till 1825, Smyrna was the chief provincial factory of the British Turkey Company, as well as of French, Dutch and other trading corporations. The passages with gates at each end within which most Frank shops in modern Smyrna lie, are a survival of the semi-fortified residences of the European merchants.

2. The Modern City, capital of the Aidin vilayet, and the most important town of Asia Minor. Pop. more than 250,000, of which fully a half is

Greek. It is one of the principal ports of the Ottoman empire, and has a large trade, of which the greater part is with Great Britain. The chief items of export are figs, tobacco, valonia, carpets, raisins and silk, to the value of some three million sterling. The imports are estimated at a million more. About 7006 steamships visit the port annually. Until 1894 the two railways from Smyrna to the interior belonged to British companies; but in 1897 the Smyrna-Alashehr line passed into the hands of a French syndicate, which completed an extension to Afium Kara-hissar and virtually (though not actually) effected a junction with the Anatolian railway system. This line has branches to Burnabat and Soma. The Smyrna- Aidin line has been extended to Dineir, and powers have been obtained to continue to Isbarta and Egerdir. It has branches to Buja, Seidikeui, Tireh, Odemish, Sokia, Denizli and Ishekli.

Modern Smyrna is in all but government a predominantly Christian town (hence the Turks know it as giaour Ismir) . There is a large European element (including about 800 British subjects), a great part of which lives in two suburban villages, Burnabat and Buja, but has business premises in the city. The European and Greek quarters rapidly increase, mainly to the N. ; while the fine quays, made by a French company, are backed by a line of good buildings. The streets behind, though clean and well kept, are very narrow and tortuous. A fine new Konak (govern- ment offices) has been built, and another important new structure is the pier of the Aidin Railway Co. at Point. The development of this railway is the most conspicuous sign of progress.

Smyrna is a headquarters of missions of all denominations and has good schools, of which the International College is the best. There is a British consul-general, with full consular establishment, including a hospital.

See general authorities for Asia Minor, especially the travellers, almost all of whom describe Smyrna. Also B. F. Slaars, Etude sur Smyrne (1868); and W. M. Ramsay, Letters to the Seven Churches (1904) and article in Hastings's Diet, of the Bible (1902).

(W. M. Ra.; D. G. H.)

SMYTH, CHARLES PIAZZI (1819-1900), British astronomer, was born at Naples on the 3rd of January 1819. He was called Piazzi after his godfather, the Italian astronomer of that name, whose acquaintance his father, Admiral Smyth, had made at Palermo when on the Mediterranean station. His father subse- quently settled at Bedford and equipped there an observatory, at which Piazzi Smyth received his first lessons in astronomy. At the age of sixteen he went out as assistant to Sir Thomas Maclear at the Cape of Good Hope, where he observed Halley's comet and the great comet

of 1843, and took an active part in the verification and extension of La Caille's arc of the meridian. In 1845 he was appointed astronomer royal for Scotland and professor of astronomy in the university of Edinburgh. Here he completed the reduction, and continued the series, of the observations made by his predecessor, Thomas Henderson (see Edinburgh Observations, vols, xi.xv.). In 1856 he made experimental observations on the Peak of Teneriffe with a view to testing the astronomical advantages of a mountain station. The Admiralty made him a grant of £500 f° r tne purpose, and a yacht — the " Titania " — of 140 tons and a fine 7! in. equatorial telescope were placed at his disposal by friends. The upshot of the expedition was to verify Newton's surmise, that a " most serene and quiet air . . . may perhaps be found on the tops of the highest mountains above the grosser clouds." The scientific results were detailed in a Report addressed to the lords com missioners of the admiralty, 1858, in a communication to the Royal Society (Phil. Trans, cxlviii. 465) and in the Edinburgh Observations, vol. xii. A popular account of the voyage is contained in Teneriffe, an Astronomer's Experiment, 1858. In 1871-1872 Piazzi Smyth investigated the spectra of the aurora, and zodiacal light. He recommended the use of the " rainband " for weather prediction (Jour. Scottish Meteor. Society, v. 84), and discovered, in conjunction with Professor A. S. Herschel, the harmonic relation between the rays emitted by carbon monoxide. In 1877-1878 he constructed at Lisbon a map of the solar- spectrum (Edin. Phil. Trans, xxix. 285), for which he received the Macdougall-Brisbane prize in 1880. Further spectroscopic researches were carried out by him at Madeira in 1880 (Madeira Spectroscopic, 1882), and at Winchester in 1884 (Edin. Phil. Trans, vol. xxxii. pt. ii.). He published besides Three Cities in Russia (1862), Our Inheritance in the Great Pyramid (1864), Life and Work at the Great Pyramid (1867), and a volume On the Antiquity of Intellectual Man (1868). In 1888 he resigned his official position and retired to the neighbourhood of Ripon, where he died on the 21st of February 1900.

See Month. Notices Roy. Astr. Society, lxi. 189; Observatory, xxiii. 145, 184; R. Copeland in Astr. Nach. No. 3636, and Pop. Astronomy (1900), p. 384; Nature, lxii. 161 (A. S. Herschel); Andre and Rayet, V Astronomie pratique, ii. 12. (A. M. C.)

SMYTH (or Smith), JOHN (c. 1570-1612), English non- conformist divine, commonly called the Se-baptist, was born

aboui 1570, and was educated at Christ's College, Cambridge, where he

proceeded M.A. in 1593. He was probably vicar of Hutton Cranswicke in the E. Riding of Yorkshire from 1593 to 1600, when he was elected lecturer or preacher of the city of Lincoln, an office of which he was deprived in October 1602 for having " approved himself a factious man by personal preaching and that truly against divers men of good place." Two volumes of his Lincoln sermons, The Bright Morning Star (1603), an exposition of Psalm xxii., and A Pattern of True Prayer (1605), were dedicated to Lord Sheffield, who had acted as arbiter between the preacher and the corporation. While preparing these books he became connected with the Separatist movement in Scrooby and Gainsborough, joined the Gains- borough church, and became its pastor. 1 With Thomas Helwys, John Murton (or Morton) and others, he migrated to Amsterdam at the end of 1607 to escape religious persecution, and in that city practised as a physician, and became the leader of " the second English church " (see Congregationalism). About this time he wrote his Principles and Inferences concerning the Visible Church in support of Robert Browne's theory of ecclesiastical polity, which was followed by Parallels, Censures and Observa- tions, a reply to the Christian Advertisements of Richard Bernard (1 568-1641), vicar of Worksop, a puritan who remained in the Anglican church. In 16o8, too, appeared The Differences of the Churches of the Separation, in which he justified his non-com- munion with Johnson's church on the curious ground that it was no part of primitive and apostolic order to use a translation of scripture during worship, or at any rate to have it open before one while preaching (Christ having " closed the book " at Nazareth before His sermon). Under Mennonite influence he went farther, and by March 1609 when he published The Char- acter of the Beast, he had become a Baptist (see Baptists, sect. II.), contending against infant baptism because (1) it has neither precept nor example in the New Testament, (2) Christ com- manded to make disciples by teaching them and then to baptize them. He and his company were then faced by the dilemma that their own infant baptism did not count, and Smyth solved the problem by first baptizing himself (hence the name Se-Baptist), probably by affusion, and then administering the rite to Helwys and the others. Afterwards with 41 others he decided that instead of baptizing himself he should have been baptized by the Mennonites, in spite of their heretical view of the Person of Christ, and applied for admission to their fellowship. They were some- what suspicious of a man who had never held one position for long, and demanded a statement of doctrines, which he gave them in twenty articles written in Latin, and in The Last Book of John Smyth, called the Retractation of his Errors, together with a con- fession of faith in 100 Propositions. A friendly Mennonite al- lowed Smyth's church to meet in his bakery, but Smyth himself died of consumption in August 1612, more than two years before the remaining members of his band, by then reduced to 31, were admitted (January 161 5) into the Mennonite

communion. Helwys and Morton returned to England, and established the first English Baptist churches.

Smyth was, like the other Cambridge men of his day, especially the Separatists, the bondservant of logic, and wherever he saw " the beckoning hand of a properly constructed syllogism " he was ready to follow. Yet none of those who, in his generation, took the great step had, according to Bishop Creighton, " a finer mind or a more beautiful soul. None of them succeeded in expressing with so much reasonableness and consistency their aspirations after a spiritual system of religious belief and practice. None of thei.i founded their opinions on so large and liberal a basis." In his last declaration he expressed his sorrow for the censures he had passed on Anglicans and Brownists alike, and wrote " All penitent and faithful Christians are brethren in the communion of the outward church, by what name soever they are known; and we salute them all with a holy kiss, being heartily grieved that we should be rent with so many sorts and schisms; and that only for matters of no moment."

See J. H. Shakespeare, Baptist and Congregational Pioneers (London, 1906); H. M. Dexter, The England and Holland of the Pilgrims

(London and Boston, 1906). (A. J. G.)

1 He was never vicar of Gainsborough, and must not be confused with the John Smyth who was imprisoned in the Marshalsea in

1592-

SMYTH, SIR WARINGTON WILKINSON (1817-1890), British geologist, was born at Naples on the 26th of August 1817, his father, Admiral W. H. Smyth (1788-1865), being at the time engaged in the Admiralty Survey of the Mediterranean. He was educated at Westminster and Bedford schoels, and after- wards at Trinity College, Cambridge, where he graduated B.A. in 1839. Having gained a travelling scholarship he spent more than four years in Europe, Asia Minor, Syria and Egypt, paying great attention to mineralogy and mining, examining coalfields, metalliferous mines and salt-works, and making acquaintance with many distinguished geologists and mineralogists. On his return to England in 1844 he was appointed mining geologist on the Geological Survey, and in 1851 lecturer at the School of Mines, a post which he held until 1881 when he relinquished the chair of mineralogy but continued as professor of mining. In later years he became chief mineral inspector to the Office of Woods and Forests, and also to the Duchy of Cornwall. He was elected F.R.S. in 1858. He became president of the Geo- logical Society of London in 1866-1868, and in 1879 he was chairman of a Royal Commission appointed to inquire into accidents in

mines, the work in connexion with which continued until 1886. He contributed sundry papers to the Memoirs of the Geological Survey, the Quarterly Journal of the Geological Society and the Transactions of the Royal Geological Society of Cornwall. He was author also of A Year with the Turks (1854), and of A Treatise on Coal and Coal-mining (1867). He was knighted in 1887. He died in London on the 19th of June 1890, and was buried at St Erth, not far from his country home at Marazion in Cornwall.

A portrait and some reminiscences of W. W. Smyth will be found in the Memoir of Sir A. C. Ramsay (1895), by Sir A. Geikie.

SMYTH (or Smith), WILLIAM (c. 1460-1514), bishop of Lincoln, was a Lancashire man by birth, and probably passed some of his early days at Knowsley under the roof of Margaret, countess of Richmond and Derby, the mother of Henry VII. He appears to have been a member of Lincoln College, Oxford, and in 1485, just after the battle of Bosworth, he was made keeper of the hanaper of the chancery. Two of Edward IV's daughters were entrusted to his keeping; he was a member of the royal council and he obtained the livings of Combe Martin, Devon, of Great Grimsby and of Cheshunt, Hertfordshire. In 1491 he was made dean of St Stephen's, Westminster, and two years later bishop of Coventry and Lichfield. The bishop was a member of Prince Arthur's council in the marches of Wales, and in 1501, five years after he had been translated to the bishopric of Lincoln, he became lord president of Wales. About 1507 he and Sir Richard Sutton (d. 1524) set to work to found a new college in Oxford. They rebuilt Brasenose Hall, added other existing halls to it, and having obtained a charter in 1512, called it The King's haule and college of Brasennose. Smyth, who was one of the executors of Henry VII. 's will, retired from public life just after this King's death, owing probably to some differences between Bishop Richard Fox and himself; he was, however, president of Wales until his death at Buckden in Huntingdonshire on the 2nd of January 1514. Although an able and scholarly man, Smyth had little sympathy with the new learning. He bestowed rich livings upon his relatives, one of whom, Matthew Smyth, was the first principal of Brasenose College. In addition to his liberal gifts to Brasenose College he gave money or land to Lincoln and to Oriel Colleges; he founded a school at Farn worth, Lancashire, and he refounded the hospital of St John at Lichfield. From 1 500 to 1 503 he was chancellor of Oxford University.

SNAIL. In England the word " snail " in popular language is associated with Gasteropods which inhabit land or fresh water, and which possess large conspicuous spiral shells; terrestrial Gasteropods, in which the shell is rudimentary and concealed, are distinguished as " slugs." In Scotland the word " slug " is absent from the vernacular vocabulary, both shell-bearing

and shell-less inland molluscs being known as snails. Marine Gastero- pods are occasionally termed " sea-snails," and the compounds " pond-snails," " river-snails," " water-snails " are in common use. The commonest land-snails are those species which

constitute the family Helieidae, order Pulmonata r plume and are typical Pectini branchs of the sub-order Taenioglossa, most of the members of which are marine.

The family Helieidae has a world-wide distribution. In Helix the spire forms a more or less obtuse-angled cone; there are above 1200 species, of which 24 are British. Helix nemoralis, L., of which H. hortensis is a variety, is one of the commonest forms. Helix pomatia, L., is the largest species, and is known as the " edible snail "; it is commonly eaten in France and Italy, together with other species. It was formerly believed to have been introduced into Britain by the Romans, but there is no doubt that it is a native. In Succinea the cone of the spire is acute-angled ; three species are British. In VUrina the spire is very flat and the surface glassy. In Bulimus the spire is elongated With a pointed apex. Pupa is named from its resemblance to a chrysalis, the apex being rounded. The shell of Clausilia is sinistral and its aperture is provided with a hinged plate. The commoner European slugs of small size all belong to the genus Limax, in which the opening of the mantle-chamber is posterior. L. flavus is the cellar slug. L. agrestis, L. arborum, L. maximus occur in gardens and fields. The larger black slugs are species of Arion, of which two are British, A. ater and A. hortensis. Testacella haliotidea is common in Great Britain and throughout Europe.

The species of Helix are all herbivorous, like the Pulmonata generally ; snails and slugs are welt-known enemies to the gardener. The animals being hermaphrodite copulate reciprocally. The eggs of Helix are laid separately in the earth, each contained in a calcified shell ; those of Limax are also separate, but the shell is gelatinous. Helix hibernates in a torpid condition for about four months, and during this period the aperture of the shell is closed by a calcareous membrane secreted by the foot.

The Limnaeidae occur in all parts of the world. Limnaeus contains the largest species. L. pereger, Miiller, is ubiquitous in Great Britain and common all over Europe. All the species are usually infested with Cercariae and Rediae, the larval forms of Trematode parasites of vertebrates. L. truncatulus harbours the Cercaria of Fasciola hepatica, the liver-fluke,

which causes, rot in sheep. Ancylus, which occurs in rivers, has a minute limpet-like shell. Planorbis has the spire of the shell in one plane. Physa is smaller than Limnaeus and has the upper part of the spire much shorter. In the Auriculidae the aperture is denticulated. Auricula is confined to the East Indies and Peru. Carychium minimum is British.

Of the Cyclostomidae only one species, Cyclostoma elegans, Miiller, is British ; it hides under stones and roots. The Helicinidae are exotic, ranging from the West Indies to the Philippines; Of the Aciculidae, which are all minute, Acicula lineata is British.

The Ampullar idae are confined to the tropics. Ampullaria has very long tentacles and a long siphon formed by the mantle. Valvatv is common in fresh waters throughout Britain; the gill when the animal is expanded is protruded beyond the mantle-chamber. The Paludinidae are common in the N. hemisphere. Paludirtd-‘ and Bithynia are both British genera. In Paludina the whorls of the spiral are very prominent ; the genus is viviparous. Bithynia is smaller and the shell smoother.

Nerilina has a very small spire, the terminal portion of the shell containing nearly the whole animal. •

For the morphology and classification of snails, see Gastropoda. A history of the British forms is given in Gwyn Jeffreys’s British Conchotomy (1862), and by Forbes and Hanley in British Mollusca. For speciegraphical details, see Woodward’s Manual of the Mollusca (1875), and Bronn’s Tierreich (Weichtiere). For Fasciola, hepatica, see Thomas, Quart. Journ. Mic. Sci. (,1862).

SNAKE-BIRD (the ” darter ” of many authors, and the Plotus anhinga 1 of ornithology), the type of a small but very well- marked genus of birds, Plotus, belonging to the family Phalacro- coracidae which contains the cormorants and shags. The name commonly given to it by the English in N. America was derived from its “long slender head and neck,” which, its body being submerged as it swims, ” appears like a snake rising erect out of the water ” (J. Bartram’s MS., quoted by G. F. Ord in A. Wilson’s Am. Ornithology, ix. 81). Snake-birds bear a general resemblance both outwardly and in habits to Cormorants (q.v.), but are much more slender in form and have both neck and tail much elongated. The bill also, instead of being tipped with a maxillary hook, has its edges beset with serratures directed backwards, and is sharply pointed— in this respect, as well as in the attenuated neck, likening the Snake-birds to the Herons; but the latter do not generally transfix their prey as do the former.

The male of the American species, which ranges from Illinois to the S. of

Brazil, is in full breeding-plumage a very beautiful bird, with crimson irides, the bare skin round the eyes apple-green and that of the chin orange, the head, neck and most part of the body

Indian Snake-Bird (from S. R. Tickell's Drawing in the Library of the Zoological Society).

clothed in black glossed with green ; but down each side of the neck runs a row of long hair-like white feathers, tinged with pale lilac. The much elongated scapulars, and the small upper wing-coverts bear each a median white mark, which On the former is a stripe pointed at either end, and on the latter a broad ovate patch. 2 The iarger ; wing-coverts are dull white, but the quill-feathers of the wings and tail are black, the last broadly tipped with brownish-red, passing into greyish-white, and forming a conspicuous band when the tail is spread in form of a fan, as it often is under water. 3 The l;en differs much in appearance from the cock, having the head, heck and breast of a more or less deep buff, bounded beneath by a narrow chestnut band; but otherwise her plumage is like that of her mate, only not so bright in colour. The Snake-bird frequents the larger rivers or back-waters connected with them, where it may be seen resting motionless on some neighbouring tree, generally choos- ing a dfead branch, or on a " snag "projecting from the bottom, whence it plunges beneath the surface, in pursuit of its prey, to emerge, in the manner before related, showing little more than its slender head and neck. Its speed and skill under water are almost beyond exaggeration, and it exhibits these qualities even in captivity, taking — apparently without effort — fish after fish, however rapidly they may swim arid twist, and only returning to its perch when its appetite is appeased or its supply of food exhausted. At liberty it will indulge in long flights, and those of the male at the breeding-

1 " Anhinga," according to Marcgrav, who first described this bird {Hist; rer. nat: Brasiliae, p. 218), was the name it bore among the natives.

2 These feathers are very characteristic of each species of the genus, and in India, says Jerdon, are among the Khasias a badge of royalty.

3 This peculiarity, first pointed out to the writer by A. D. Bartlett, who observed it in birds in the Zoological Society's possession, doubtless suggested the name of '■' Water-Turkey " by which in some places Plotus anhinga is said to be known.

season are ostentatiously performed in the presence of his mate, around

whom he plays in irregular zigzag courses. The nest is almost always in trees or bushes overhanging the water's edgˆe, and is a large structure of sticks, roots and moss, in which are laid four eggs with the white chalky shell that is so characteristic of most Steganopodous birds. Not infrequently several or even many nests are built close together, and the locality that suits the Snake bird suits also many of the herons. 1 The African snake-bird, P. congensis (or levaillanti of some authors), inhabits the greater part of that continent N. from Natal ; but, though met with on the White Nile, it is not known to have occurred in Egypt, a fact the more remarkable seeing that Canon Tristram found it breeding in con- siderable numbers on the Lake of Antioch, to which it is a summer visitor, and it can hardly reach its home without passing over the intervening country. The male bird is easily distinguishable from the American species by its rufous coronal patch, its buff throat and its chestnut greater wing-coverts. A third species, Pi melano- gaster, ranges from Madagascar to India, Ceylon, Borneo, Java and China. This so closely resembles the last-mentioned that the differences between them cannot be briefly expressed. The Australian region also has its snake-bird, which is by some regarded as forming a fourth species, P. novae-hollandiae; but others unite it to that last mentioned, which is perhaps somewhat variable, and it would seem (P.Z.S.,- 1877, p. 349) that examples from New Guinea differ somewhat from those inhabiting Australia itself.

The anatomy of the genus Plotus has been dealt with more fully than that of most forms. Beside the excellent description of the American bird's alimentary canal furnished to Audubon by Mac- gillivray, other important points in its structure have been well set forth by A. H. Garrod and W. A. Forbes in the Zoological Proceedings (1876, pp. 335-345, pis. xxvi.-xxviii. : 1878, pp. 679-681; and 1882, pp. 208-2 1 2) , showing among other things that there is an appreciable anatomical difference between the species of the New World and of the Old ; while the osteology ot P. melanogaster has been admirably described and illustrated by A. Milne-Edwards in A. Grandidier's great Oiseaux de Madagascar (pp. 691-695, pis. 284, 285). In all the species the neck affords a feature which seems to be unique. The first seven of the cervical vertebrae form a continuous curve with its concavity forward, but the eighth articulates with the seventh nearly at a right angle, and, when the bird is at rest, lies horizontally. The ninth is directed downwards almost as abruptly, and those which succeed present a gentle forward convexity. The muscles moving this curious framework are as curiously specialized, and the result of the whole piece of mechanism is to enable the bird to spear with facility its fishy prey. (A. N.)

SNAKE-FLY, the name given to neuropterous insects of the genus Raphidia, closelyallied to the alder-flies, remarkable for the elongation of the head and prothorax to form a neck and for the presence in the female of a long

ovipositor. The larva, which is active and carnivorous, is terrestrial, and lives in rotten timber.

SNAKE-ROOT. In most countries where snakes abound some root or herb is used by the natives as an antidote for the bites of venomous species, and many herbs have consequently received the name of snake-root. Botanically speaking, the name properly belongs to Ophiorrhiza Mungos, the Mungoose plant, a plant of the natural order Rubiaceae, used in the E. Indies for the purpose above indicated. In medicine, however, the roots of A ristolochia Serpentaria, Polygala Senega and Cimicifuga racemosa were understood by this name, being distinguished as the Virginian, seneca and black snake-roots. The root of Aristolochia reticulata is known in the United States as Red river or Texan snake-root.

The roots or rhizome of Liatris spicala, Eryngium aquaticum and Eupatorium aliissimum have all been used in N. America for snake-bites, the first two being known as button snake-root and the last as white snake-root. The rhizome of Asarum canadense passes under the name of Canadian snake-root. All of these con- tain acrid or aromatic principles which, when a warm decoction of the drug is taken, exercise a powerfully diaphoretic or, in some cases, diuretic action, to which any benefit that may be derived from their use must be attributed.

SNAKES, an order (Ophidia) in the class of Reptiles. They may be characterized as very elongated reptiles without limbs (unless with tiny vestiges of posterior limbs), without eyelids and external ear openings, with the teeth anchylosed to the supporting bones, a bifid slender tongue which is telescoped into its basal half, and with a transverse vent. These characters apply to all snakes, although none are peculiar to them. The

1 The curious but apparently well-attested fact of the occurrence in England, near Poole, in June 1851, of a male bird of this species (Zoologist, pp. 3601, 3654) has been overlooked by several writers who profess to mention all cases of a similar character.

vast majority of snakes are further characterized by having the right and left halves of the under-jaws connected by an elastic band; a median, longitudinal furrow in the skin below and behind the chin; the whole palatal apparatus is but loosely connected with the skull, nowhere articulating with it. The quadrate is indirectly articulated with the skull, first by the horizontal, movable squamosal, secondly by the columella auris. The quadrato-mandibular joint is placed in a level far behind the occiput.

More detail concerning skull, scales and teeth will be found in the

diagnostic descriptions of the various families fyide infra) ; for further anatomical information the reader is referred to the article Reptiles [Anatomy).

The snakes are the most highly specialized branch of the Sauria or Squamata, i.e. of scaly reptiles with movable quadrate bones; with a transverse vent, near the posterior lateral corners of which" open the eversible, paired copulatory organs. In the article Lizard attention is drawn to the many characters which make it difficult, if not impossible, to give diagnoses applicable to all lizards and all snakes. Both these' groups seem to have reached their climax but recently, while the tortoises, crocodiles and sphenodon are on the descending scale, mere remnants of formerly much more numerous and cosmopolitan development.

The number of recent species of snakes is about 1600. The order is practically cosmopolitan, with the exception of New Zealand and certain absolutely isolated oceanic islands, like the Hawaiian islands and the Azores. The N. limit approaches that of the permanently frozen subsoil, going into the arctic circle in Scandinavia, elsewhere sinking to about 54° N.; in the S. hemisphere the 45th parallel may indicate their limit. The number of species and individuals steadily decreases in the cooler temperate zones, whilst it reaches its maximum in the tropics. Every kind of terrain is tenanted, from dense, moist and hot forests at the level of the sea to arid deserts, high plateaus and mountains. In accordance with this general distribution snakes show a great amount of differentiation with regard to their mode of life and general organization; and from the appearance alone of a snake a safe conclusion can be drawn as to its habits.

Dr A. Glinther characterizes the chief categories as : follows:— (1) Burrowing snakes, which live under ground and but rarely appear on the surface. They have a cylindrical rigid body, covered with generally smooth and polished scales ; a short strong tail; a short rounded or pointed head with narrow mouthf" teeth few in number; small or '" rudimentary eyes; no abdominal scutes or only narrow ones. They feed chiefly on invertebrate animals, and none are poisonous. (2) Ground snakes rarely ascending b-ushes or entering water. , Their body- is cylindrical, flexible in every part, covered with smooth or keeled scales, and provided with broad ventral and subcaudal scutes. The non-poisonous kinds of ground snakes are the typical and least specialized snakes, and more numerous than any of the other kinds. They feed chiefly on terrestrial verte- brates. The majority are non-poisonous; but the majority of poisonous snakes must be referred to this category. (3) Tree snakes, which are able to climb bushes or trees with facility or pass even the greater part of their existence on trees. Their body is generally compressed and slender; their broad ventral scutes are often

cariuate on the sides. Those kinds which have a less elongate and cylindrical body possess a distinctly prehensile tail. The eye is generally large. Their coloration consists often of bright hues, and sometimes resemfeles that of their surroundings. They feed on animals which likewise lead an arboreal life, rarely on eggs. Poisonous as well as innocuous snakes are represented in this category. (4) Freshwater snakes, living in or frequenting fresh waters; they are excellent swimmers and divers. The nostrils are placed on the top of the snout and can be closed whilst the animal is under water. Their body is covered with small scales and the ventral scutes are mostly harrow; the tail tapering; head flat, rather short; and the eyes of small' size. They feed on fish, frogs and other aquatic animals, and are innocuous and viviparous. (5) Sea snakes are

distinguished by the compressed, rudder-shaped tail. They are unable to move on land, feed on fishes, are viviparous and poisonous.

The majority of snakes are active during the day, their energy increasing with the increasing temperature; whilst some delight in the moist sweltering heat of dense tropical vegetation, others expose themselves to the fiercest rays of the midday sun. Not a few, however, lead a nocturnal life, and many of them have, accordingly, their pupil contracted into a vertical or more rarely a horizontal slit. Those which inhabit temperate latitudes hibernate. Snakes are the most stationary of all vertebrates; as long as a locality affords them food and shelter they have no inducement to change it. Their dispersal, therefore, must have been extremely slow and gradual. Although able to move

Fig. i. — Diagram of Natural Locomotion of a Snake.

with rapidity, they do not keep in motion for any length of time. Their organs of locomotion are the ribs, the number of which is very great, nearly corresponding to that of the vertebrae of the trunk. They can adapt their motions to every variation of the ground over which they move, yet all varieties of snake locomotion are founded on the following simple process. When a part of the body has found some projection of the ground which affords it a point of support, the ribs are drawn more closely together, on alternate sides, thereby producing alternate bends of the body. The hinder portion of the body being drawn after, some part of it © finds another support on the rough ground or a projection; and, the anterior bends being stretched in a straight line, the front part of the body is propelled (from a to d) in consequence. During this peculiar locomotion the numerous broad

shields of the belly are of great advantage, as by means of their free edges the snake is enabled to catch and use as points of support the slightest projections of the ground. A pair of ribs corresponds to each of these ventral shields. Snakes are not able to move over a perfectly smooth surface. The conventional representation of the progress of a snake, in which its undulating body is figured as resting by a series of lower bends on the ground whilst the alternate bends are

Fig. 2. — Diagram of Conventional Idea of a Snake's Locomotion.

raised above it, is an impossible attitude, nor do snakes ever climb trees in spiral fashion, the classical artistic mode of repre- sentation. Also the notion that snakes when attacking are able to jump off the ground is quite erroneous; when they strike an object, they dart the fore part of their body, which was retracted in several bends, forwards in a straight line. And sometimes very active snakes, like the cobra, advance simultane- ously with the remainder of the body, which, however, glides in the ordinary fashion over the ground; but no snake is able to impart such an impetus to the whole of its body as to lose its contact with the ground. Some snakes can raise the anterior part of their body and even move in this attitude, but it is only about the anterior fourth or third of the total length which can be thus erected.

With very few exceptions, the integuments form imbricate scale- like folds arranged with the greatest regularity; they are small and pluriserial on the upper parts of the body and tail, large and uniserial on the abdomen, and generally biserial on the lower side of the tail. The folds can be stretched out, so that the skin is capable of a great degree of distension. _ The scales are sometimes rounded behind, but generally rhombic in shape and more or less elongate; they may be quite smooth or provided with a longitudinal ridge or heel in the middle line. The integuments of the head are divided into non-imbricate shields or plates, symmetrically arranged, but not corresponding in size or shape with the underlying cranial bones or having any relation to them. The form and number of the scales and scutes, and the shape and arrangement of the head-shields, are of great value in distinguishing the genera and species, and it will

therefore be useful to explain in the accompanying woodcut (fig. 3) the terms by which these parts are designated. The skin does not form eyelids; but the epidermis passes over the eye, forming a transparent disk, concave like the glass of a watch, "behind which the eye moves. It is the first part which is cast off when the snake sheds its skin ; this is done several times in the year, and the epider- mis comes off in a single piece, being, from the mouth towards the tail, turned inside out during the process.

The tongue in snakes is narrow, almost worm-like, generally of a black colour and forked, that is, it terminates in front in two extremely fine filaments. It is often exserted with a rapid motion, sometimes with the object of feeling some object, sometimes under the influence of anger or fear.

Snakes possess teeth in the maxillaries, mandibles, palatine and pterygoid bones, sometimes also in the intermaxillary; they may be absent in one or the other of the bones mentioned. In the innocuous snakes the teeth are simple and uniform Dt ” m ‘ OB – in structure, thin, sharp like needles, and bent backwardˆ ; their function consists merely in seizing and holding the prey. In some all the teeth are nearly of the same size; others possess in front of the jaws (Lycodonts) or behind in the maxillaries (Diacrasterians) a tooth more or less con- spicuously larger than the rest; whilst others again are distinguished by this larger posterior tooth being grooved along its outer face. The snakes with this grooved kind of tooth have been named Opis- thoglyphi, and also Sus- pecti, because their saliva is more or less poisonous.

In the true poisonous snakes the maxillary dentition has undergone a special modification.

The so-called colubrine

venomous snakes, which

retain in a great measure

an external resemblance

to the innocuous snakes,

have the maxillary bone

not at all, or but little,

shortened, armed in front

with a fixed, erect fang,.

which is provided with

a deep groove or canal

for the conveyance of the

poison, the fluid being

secreted by a special /,

poison-gland. One or /',

more small ordinary teeth v,

may be placed at some

distance behind this

poison-fang. In the other

venomous snakes (viper-

ines and crotalines) the

maxillary bone is very

short, and is armed with

a single very long curved

fang with a canal and

aperture at each end.

Although firmly anchy-

losed to the bone, the

tooth, which when at rest laid backwards, is erectile,

of

Snake

Fig. 3. — Head-shields (Ptyas korros). r, Rostral.

Posterior frontal. Anterior frontal. Vertical.

Supraciliary or supraocular. Occipital. , Nasals. Loreal.

Anterior ocular or orbital, or prae- orbital or anteocular. Postoculars. u, u, Upper labials. t, t, Temporals. Mental. Lower labials. Chin-shields.

s,

0,

n, n

I,

P,

m,

c, c,

the bone itself being mobile and rotated round its transverse axis. One or more reserve teeth, in various stages of development, lie between the folds of the gum and are ready to take the place of the one in function whenever it is lost by accident, or shed.

The poison is secreted in modified upper labial glands, or in a pair of large glands which are the homologues of the parotid salivary glands of other animals. For a detailed account see West, /. Linn. Soc. xxv. (1895), p. 419; xxvi. (1898), p. 517; and xxviii. (1900). A duct leads to the furrow or canal of the tooth. The Elapinae have comparatively short fangs, while those of the vipers, especially the crotaline snakes, are much longer, sometimes nearly an inch in length. The Viperidae alone have " erectile " fangs. The mechanism is explained by the diagrams (fig. 4). The poison-bag lies on the side of the head between the eye and the mandibular joint and is held in position by strong ligaments which are attached to this joint and to the maxilla so that the act of opening the jaws and concomitant erection of the fangs automatically squeezes the poison out of the glands.

Snakes are carnivorous, and as a rule take living prey only; a few feed habitually or occasionally on eggs. Many swallow

their victim alive; others first kill it by smothering it between the coils of their body (constriction). The effects of a bite by a poisonous snake upon a small mammal or bird are almost instantaneous, preventing its escape; and the snake swallows its victim at its leisure, sometimes hours after it has been killed. The prey is always swallowed entire, and, as its girth generally much exceeds that of the snake, the progress of deglutition is very laborious and slow. Opening their jaws to their fullest extent, they seize the animal generally by the head, and pushing alternately the right and left sides of the jaws forward, they press the body through their elastic gullet into the stomach, its outlines being visible for some time through the distended walls of the abdomen. Digestion is quick and much accelerated by the quantity of

saliva which is secreted during the progress of de- glutition, and in venomous snakes probably also by the chemical action of the poison. The primary function of the poison- apparatus is to serve as the means of procuring their food, but

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Fig. 4. — Poison Apparatus of Rattlesnake. Upper figures: dia- grams of skull with fangs at rest. Lower figures : same, with fangs protruded. G, prefrontal; M, maxilla; J, poison-fang; Tr, trans- palatine; Pt, pterygoid ; p, palatine; Q, quadrate; Sq, squamosal ; Pm, premaxilla; T.a, articular; Pe and Di, muscles.

it also serves for defence. Only very few poisonous snakes (like Naja daps) are known to resent the approach of man so much as to follow him on his retreat and to attack him. Others are much less inclined to avoid collision with man than innocuous kinds. They have thus become one of the greatest scourges to mankind, and Sir J. Fayrer has demonstrated that in India alone annually some 20,000 human beings perish from snake-bites. Therefore it will not be out of place to add here a chapter on snake poison and on the best means (ineffectual though they be in numerous cases) of counteracting its deleterious effects. An excellent account of the nature and of the effect of the venom of snakes, by Charles J. Martin, is in Allbutt’s System oj Medicine. The following condensed account has been abstracted from it.

The poison is a clear, pale-yellow fluid which reacts acid, and contains about 30 % of solids, but this varies according to the state of concentration. Most venoms are tasteless, but cobra poison is said to be disagreeably bitter. Dried venom keeps indefinitely, and dissolves readily in water. It keeps also in glycerine. It contains albuminous bodies in solution, and is in fact a pure solution of two or more poisonous proteids, which are the active agents, with a small quantity of an organic acid or colour- ing matter. The venom is destroyed by reagents which precipitate proteids in an insoluble form, or which destroy them, e.g. silver nitrate or permanganate of potash. Hypochlorites have the same effect. But carbolic acid and caustic potash destroy it only after a day or two, consequently they are not a remedy.

The venom is generally introduced into the subcutaneous tissue, whence it reaches the general circulation by absorption through th« lymph and blood-vessels. When introduced directly into a vein, the

effects are instantaneous. It is absorbed by the conjunctiva, but, excepting cobra poison, not by the mouth or alimentary canal, provided there be no hollow teeth and no abrasions. The venom of the various kinds of snakes acts differently.

The Symptoms of Cobra Poison.— Burning pain, followed by sleepiness and weakness in the legs after half an hour. Then profuse salivation, paralysis of the tongue and larynx, and inability to speak. Vomiting, incapacity of movement. The patient seems to be con- scious. Breathing becoming difficult. The heart's action is quick- ened. The pupil remains contracted and reacts to light. At length breathing ceases, with or without convulsions, and the heart slowly stops. Should the patient survive, he returns rapidly to complete health.

Rattlesnake Poison. — The painful wound is speedily discoloured and swollen. Constitutional symptoms appear as a rule in less than fifteen minutes: prostration, staggering, cold sweats, vomiting, feeble and quick pulse, dilatation of the pupil, and slight mental disturbance. In this state the patient may die in about twelve hours. If he recovers from the depression, the local symptoms begin to play a much more important part than in cobra-poisoning : great swelling and discoloration extending up the limb and trunk, rise of temperature and repeated syncope, and laboured respiration. Death may occur in this stage. The local haemorrhagic extravasation frequently suppurates, or becomes gangrenous, and from this the patient may die even weeks afterwards. Recovery is sudden, and within a few hours the patient becomes bright and intelligent.

Symptoms of Bite from the European Viper. — Local burning pain ; the bitten limb soon swells and is discoloured. Great prostration, vomiting and cold, clammy perspiration follow within one to three hours. Pulse very feeble, with slight difficulty in breathing, and restlessness. In severe cases the pulse may become imperceptible, the extremities may become cold, and the patient may pass into coma. In from twelve to twenty-four hours these severe constitu- tional symptoms usually pass off, but in the meantime the swelling and discoloration have spread enormously. Within a few days re- covery usually occurs somewhat suddenly, but death may occur from the severe depression, or from the secondary effects of sup- puration.

The symptoms of the bite from the Daboia or Vipera russeli resemble the effects of rattlesnake poison, but sanious discharges from the rectum, &c, are an additional and prominent feature. The recovering patient suffers from haemorrhagic extravasations in various organs, besides from the lungs, nose, mouth and bowels. Kidney haemorrhage and albuminuria is a

constant symptom. The pupil is always dilated and insensitive to light.

Bite of Australian Elapine Snakes. — Pain and local swelling. The first constitutional symptoms appear in fifteen minutes to two hours. First faintness and irresistible desire to sleep. Then alarming prostration and vomiting. Pulse extremely feeble and thread-like, and uncountable. The limbs are cold and the skin is blanched. Respiration becomes shallow with the increasing coma. Sensation is blunted. The pupil is widely dilated and insensible to light. There is sometimes passing of blood. If the patient survives the coma, recovery is complete and as a rule rapid, without secondary symptoms.

The Australian venom and that of all viperine snakes, perhaps also that of the cobra, if introduced rapidly into the circulation, occasions extensive intravascular clotting. If the venom is slowly absorbed, the blood loses its coagulability, owing to the breaking down of the red blood-corpuscles, most so with vipers, less with Australian snakes, least so with the cobra. The cobra venom is supposed to extinguish the functions of the various nerve-centres of the cerebro-spinal system, the paralysation extending from below upwards, and it has a special affinity for the respiratory centre. The toxicity or relative strength of the cobra venom has been calcu- lated to be sixteen times that of the European viper. Snakes can poison each other, even those of the same kind.

Treatment. — Apply a ligature above, not on the top of, the situa- tion of the bite, twist the string tightly with a stick. Then make a free incision into the wound. Sucking out is dangerous! Then bandage the limb downwards, progressing towards the wound ; re- peat this several times. Do not keep the ligature longer. than half an hour. Then let the circulation return, and apply the ligature again. In any case do not keep the ligature on for more than an hour for fear of gangrene. Direct application into the widened wound of calcium hypochlorite, i.e. bleaching powder, is very good, or of a 1% solution of permanganate of potash, or Condy s fluid. Vigorous cauterization with nitrate of silver, driving the stick into the widened wound, is also good, and it is a remedy which one can carry in the pocket. Quick amputation of the finger is the best remedy of all if a large snake has bitten it.

Internal Remedies.— The administration of enormous doses of alcohol is to be condemned strongly. Small, stimulating doses, and repeated, are good, but stimulation can be more effectively produced by ammonia or strychnine. Hypodermic injection of strychnine, in some cases as much as one to two grains (but not into a vein!), has in some cases had good results; but injection of ammonia, instead of doing any good, has disastrous sloughing results. There is only one fairly reliable treatment, that by serum

therapeutics, the injection of considerable quantities of serum of animals which have

Classifi- cation.

been partially immunized by repeated doses of [that particular] snake-venom. Unfortunately this treatment will not often be avail- able. Several mamn als and birds are supposed to he immune by nature against snake-venom. Some more or less immune creatures are the mongoose, the hedgehog and the pig, the secretary-bird, the honey buzzard, the stork and probably other snake-eaters.

Snakes are oviparous; they deposit from ten to eighty eggs of an ellipsoid shape, covered with a soft leathery shell, in places where they are exposed to and hatched by moist heat. The parents pay no further attention to them, except the pythons, which incubate their eggs by coiling their body over them, and fiercely defend them. In some families, as many freshwater snakes, the sea snakes, Viperinae and Crotalinaej the eggs are re'ained in the oviduct until the embryo is fully developed; These snakes bring forth living young.

The classification of snakes has undergone many vicissitudes. J. Muller (Zeitschrj. Physiol., 1831, p. 265) divided them into Ophidia macrostomata and O. microstomata. A. M. C. Dumeril (Catal. methodique, Mus. d' Hist. Nat., Paris, 1851, p. 199) distinguished between Opbterodonta, Aglyphodonta, Proteroglypha and Solenoglypha. H. Stannius (Zoolomie d. Amphib., 1856) made a further improvement by combination of the principles used by his predecessors, and he divided the Angiostomata.or narrow-mouthed snakes intp Tor- tricina, Typhlopina and Uropeltacea; the Eurystqmata into Iobola or poisonous, and A sinea or innocuous snakes. Meanwhile J. E. Gray (Cat. Snakes, Brit. Mus., 1849) had distinguished only between Viperina and Colubrinia. A. Giinther {Cat. Colubrine Snakes, Brit. Mus., 1858; " Reptiles of British India," Ray Soc, 1864; article Snakes, Ency. Brit., 9th ed.) recognized at last four sub-orders: — Hopoterodontes, Colubriformes, Colu- briformes venenosi, Viperiformes-, the most serious drawback being the merging of the Peropoda in the non-poisonous Colu- briformes. E. D, Cope (Proc. Ac. Phiiad., 1864, p. 230) resorted to the modifications of the squamosal, ecto- and endopterygoid bones, the condition of the vestigial limbs, and the teeth:— – Scolecophidia (Typhlopidae) , Catodonta (Glauconiidae), Tor T tricina (Ilysiidae and Uropeltidae), Asinea, Proteroglypha and

Solenoglypha, He adhered to this arrangement in his last comprehensive work {Crocodilians, Lizards and Snakes of North America, 1898, Smithsonian Inst., 1900), but combined the Asinea and Proteroglypha as Colubroidea, subdividing these into Peropoda, Aglyphodonta, Glyphodonta, Proteroglypha and Platycerca (Hydrophinae). In his last work he used, with doubtful success, the variations of the penes and the lungs as additional characters, chiefly for the grouping of the great mass of the Colubroid snakes. G. A. Boulenger {Cat. Snakes, Brit. Mus., 1893-1896). accepted Cope's principles, and mainly by combining the Asinea of Stannius and Cope with the Protero- glypha as. Colubridae — wherein he was followed by Cope, as mentioned above — and separating therefrom the Peropoda or Boidae, he has produced a logically-conceived system, by far the best hitherto proposed. It is followed in the present article. Boulenger's phylogenetic system stands as follows: —

Uropeltidae

Ilysiidae

I

Viperidae

I

C. Opisthoglypha

1

C. Proteroglypha Amblycephalidae

I I :

Xenopeltidae Colubridae Aglypha

Typhlopidae Boidae Glauconiidae

This means that the Boidae retain most primitive characters. Likewise primitive, but in various respects degraded, mainly owing to burrowing habits, are the Typhlopidae with the Ily- siidae, and Uropeltidae as a terminal branch, and on the other hand the Glauconiidae. The solitary Xenopeltis is in several ways intermediate between Boidae and. Ilysiidae. The rest of the snakes are supposed to have started from

mandible to the aglyphous or innocuous Colubridae, whence, further differentiation in three new lines has taken place, — (1) the harmless

Amblycephalidae as a side-issue, (2) the very poison- ous proteroglyphous Elapidae, (3) the moderately or incipiently poisonous Opisthoglypha, out of some of which seem to have arisen the venomous Viperidae.

I. No ectopterygoid; pterygoid not extending to quadrate; no supfatemporal or squamosal; prefrontal forming a suture with nasal; coronoid present; vestiges of pelvis present.

Maxillary vertical, loosely attached, toothed; mandible toothless; a single pair of pelvis bones: Typhlopidae.

Maxillary bordering the mouth, forming sutures with the pre- maxillary, prefrontal and frontal, toothless; lower jaw toothed; pubis and ischium present, the latter forming a symphysis: Glauconiidae.

II. Ectopterygoid present; upper and lower jaws toothed.

A. Coronoid present , prefrontal in contact with nasal.

1. Vestiges of hind-limbs; supra temporal present.

Squamosal large, suspending the quadrate: Boidae. Squamosal small, intercalated in the cranial wall: Ilysiidae.

2. No vestiges of limbs: squamosal absent: Uropeltidae.

B. Coronoid absent; squamosal present.

1. Maxillary horizontal ; pterygoid reaching quadrate or

mandible.

Prefrontal in contact with nasal : Xenopeltidae. Prefrontal not in contact with nasal : Colubridae.

2. Maxillary horizontal ; pterygoid not reaching quadrate or

mandible: Amblycephalidae.

3. Maxillary vertically erectile, perpendicularly to ectoptery-

goid, and reaching quadrate or mandible: Viperidae.

For ordinary practical purposes this synopsis is useless, most of the anatomical characters being visible only in the macerated skull. The following characterization of the families is. based upon more accessible features.

Eyes vestigial or hidden; lower jaw toothless; without enlarged ventral scales: Typhlopidae.

Eyes vestigial; teeth restricted to the lower jaw; without en- larged ventral scales : Glauconiidae.

Eyes very small; head not distinct; teeth in the upper and lower jaws ; ventral scales scarcely enlarged ; tail extremely short, ending obtusely and covered with peculiar scales: Uropeltidae.

Eyes functional, free, with vestiges of the hind-limbs appearing as claw-like spurs on each side of the vent.

Ventral scales scarcely enlarged : Ilysiidae. Ventral scales transversely enlarged : Boidae.

Eyes free; with a pair of poison-fangs in the front part of the mouth, carried by the otherwise toothless, much shortened, and vertically erectile maxillaries; ventral scales transversely enlarged : Viperidae.

All the remaining snakes combine the following characters . the maxillaries are typically horizontal, not separately movable, with a series of teeth. The mandible is toothed but has no coronoid bone. There are no vestiges of limbs or of their girdles. The eyes are free.

Dentary movably attached to the tip of the articular bone of the mandible. Skin beautifully iridescent: Xeno- peltidae.

Without a mental groove ; the ends of the pterygoids are free, not reaching the quadrate. Head thick and very distinct: Amblycephalidae.

With a median longitudinal groove between the shields of the skin: Colubridae.

Family 1. Typhlopidae. — Burrowing snakes, mostly small, which have the body covered with smooth, shiny, uniform cycloid scales. The teeth are restricted to the small maxillary bones. The quadrates slant obliquely forward and are attached directly to the prootics, owing to the absence of squamosals. The prefrontals are in lateral contact with the nasals. The vestiges of the pelvis are reduced to a single bone on each side, and there are no traces of limbs. The eyes are hidden by shields of the skin. The mouth is very narrow, and the halves of the under-jaw are not distensible. About 100 species of these rather archaic snakes are known; in adaptation to their burrowing life and worm and insect diet, they have undergone degradation. The tail is- mostly very short and sometimes ends in

some primitive, non- degenerate, therefore boa-like group, leading by loss of the vestiges of the hind-limbs and loss of the coronoid bone of the

Fig. 5. — Typhlops bothriorhynchus, from India, natural size. •

a horny spine. They are widely distributed in all tropical and sub- tropical countries, even in such solitary places as Christmas Island, but they do not occur in New Zealand. The chief genus is Typhlops,

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of which, for instance, 7”. braminus ranges from southern Asia, the islands of the Indian Ocean and the Malay Islands to southern Africa.

Family 2. Gl auconiidae. — Burrowing like the Typhlopidae, which they much resemble externally, but the maxillaries retain their normal position and are toothless, teeth being restricted to the lower jaw, which is short, stout, and not dis- tensible. The pelvic girdle and the hind-limbs show the least reduction found in any recent snakes, ilia, pubes and ischia being still distin- guishable, the last even retaining their sym- physis, and there are small vestiges of the femurs. About 30 species, mostly of the genus Glaucoma, in south-western Asia, Africa, Madagascar, the Antilles and both Americas, G. dulcis ranging northwards into Texas, G. humilis into California. Family 3. Ilysiidae. — Mostly burrowing. The scales of the long, cylindrical body are smooth and small, scarcely enlarged on the ventral side. The tail is extremely short and blunt. The head is very small and not distinct from the neck, a usual feature in burrowing snakes and lizards. The gape of the mouth is narrow. The quadrate bones are short and stand rather vertically. The squamosals form part of the cranial wall, being firmly wedged in between the quadrate, prootic and occipital bones. Vestiges of the pelvis and hind-limbs are small, but they terminate in claw-like spurs which protrude

p IG (, Three between the scales on either side of the vent,

Views of Head of as ‘ n tne Boidae. The small eyes are some- Typhlops bra- times covered by transparent shields. About minus (I n d i a) ” half-a- dozen species only are known in South magnified. ‘ America, Ceylon, the Malay Islands and Indo-

China. They are viviparous like the Typhlo- pidae, upon which they feed besides worms and insects. Ilysia s. Tortrix scytale, one of the ” coral- snakes ” of tropical South America, is beautiful coral-red with black rings, grows to nearly a yard in length, and is said sometimes to be worn as a

necklace by native ladies.

Family 4. Uropeltidae (Rhinophidae). — Burrowing snakes of Ceylon and southern India, with a very short tail, which ends in a peculiar, often obliquely truncated, shield, hence the name. The eyes are very small. The scales of the body are smooth and are but little larger on the belly. The coloration is mostly beautiful, black and red. The Uropeltidae are in various respects intermediate between the two last and the next family. The quadrates are directly attached to the skull, the squamosals being absent. Teeth are carried in both jaws. There are no vestiges of hind-limbs or of the pelvis.

These tail-shielded snakes, of which about 40 species are known, are viviparous and burrow in the ground, preferring damp mountain- forests. Uropeltis grandis, the only species of the type-genus, is confined to Ceylon; about 18 in. in length, it is blackish above, yellow below, often with small spots on the upper and the under surface. Rhinophis sanguineus lives in southern India; it is black above with a bluish gloss, the belly is bright red with black spots, like the convex tail-shield.

Family 5. Boidae. — Typical, often very large, snakes, which have vestiges of pelvis and hind-limbs, the latter appearing as claw-like spurs on each side of the vent. The scales of the upper surface are usually small and smooth, while those of the belly form one broad series. The quadrate is carried by the horizontally-elongated squa- mosal, which rests loosely upon the skull. The prefrontals are in contact with the nasals. Sharp, recurved teeth are carried by the mandibles, the pterygoids, palatines, maxillaries, and in the Python- inae by the premaxillaries also. The Boidae comprise some 60 species, which have been grouped into many fancy genera. The range of the family extends over all the tropical and subtropical countries, including islands, except New Zealand.

Sub-family 1. Pythoninae. — With a pair of supraorbital bones between the prefrontal, frontal and postfrontal bones. The pre- maxilla generally carries a few small teeth. The subcaudal scales are mostly in two rows. The pythons (q.v.) are restricted to the palaeo- tropical and Australian regions, with the sole exception of Loxocemus bicolor in southern Mexico.

Sub-family 2. Boinae. — Without supraorbital bones. The pre- maxilla is toothless. The subcaudal scales form mostly a single row. Widely distributed. Boa (q.v.) in tropical America and with two species in Madagascar. Eunectes murinus, the Anaconda (q.v.), Charina, e.g. bottae, a small sand-snake from Oregon to California. Eryx jaculus, also a sand-snake, from North Africa to Central Asia, and extending into Greece. Enygrus, ranging from New- Guinea to the Fiji Islands. Casarca dussumieri,

differing from Boa chiefly by the rough and strongly-keeled scales, is confined to Round Island near Mauritius. This makes the occurrence of a species of Corallus in Madagascar less remarkable, while all the others live in Central and South America.

Family 6. Xenopei.tidae. — One species, Xenopeltis unicolor, in south-eastern Asia and Malay Islands. Boulenger rightly considers

this snake in various ways intermediate between the Ilysiidae, Boidae and Colubridae. The prefrontal bones are still in contact with the nasals as in the previous families, but the coronoid bones of the mandibles are absent as in the remaining families, and this loss also occurs in the Boine Charina. The most remarkable feature is the dentary bone, which is movably attached to the much-elongated articular bone (cf. Polyodontophis of Colubrinae), the movability being enhanced by the absence of the coronoid. The quadrate is short and thick, and is carried by the broad and short squamosal, which lies flat against the skull, reminding in this respect of Ilysia. The smooth, black and brown scales of the back are highly iridescent, hence the generic name of this peculiar snake, which reaches the length of one yard.

Family 7. Colubridae. — Maxillaries horizontal and forming the greater portion of the upper jaw, which is toothed like the lower jaw; coronoid of mandible absent. Pterygoids connected with the quadrates which are carried by the squamosals, and these are loosely attached to the skull. Prefrontals not in contact with the basals. Ectopterygoids present. No vestiges of limbs or pelvis. This family comprises about nine-tenths of all recent species of snakes and is cosmopolitan, New Zealand being the most notable exception. The 1300 to 1400 species contain terrestrial, arboreal and aquatic forms, many of which are highly specialized.

Boulenger, adopting Dumeril's terms, has divided them into three parallel series: —

A. Aglypha.— All the teeth are solid, and not grooved. Harmless, non-poisonous.

B. Opislhoglypha. — One or more of the posterior maxillary teeth are grooved. Most of these snakes, which number about 300 species, are moderately poisonous.

C. Proteroglypha. — The anterior maxillary teeth are grooved or " perforated." About 200 very poisonous species, e.g. cobras, coral snakes and sea-snakes.

The second and third series containing only about 400 species, the Aglypha

still present the appalling number of 1000 species, and even the grouping of this mass into three sub-families does not lighten the task of arranging the chaos, since one of these sub-families contains only one, and the other but a very few species. We have therefore still 1000 species, all so closely allied that they together are but of sub-family rank. They possess few reliable characters ; their modifications are not weighty, and it is almost certain that some of these characters, and even combinations thereof, have been developed independently and in different countries. Many of the so-called genera, or groups of genera, are consequently not to be used either as witnesses of blood-relationship or of geographical distribution.

Some of the usual characters employed for systematic purposes, for the making of convenient keys, are the following: The number of rows of scales across the body and in a longitudinal direction; shape and structure of scales, whether smooth or with a longitudinal keel ; arrangement of the shields on the head ; shape of t he con- tracted pupil. Above all, the dentition, which exhibits almost endless modifications, in most cases is difficult to ascertain and to appreciate in its subtle distinctions. Internal, skeletal characters, useless for ordinary practical purposes, are the various apophyses on the ventral side of the vertebrae and the penial armaments fancied by Cope.

It is impossible here to mention any but the more obvious genera and groups of colubrine snakes.

Series A. Aglypha. — Sub-family 1. Acrochordinae. — The few genera and species of these ugly-looking snakes are mostly aquatic, inhabiting rivers and estuaries of S.E Asia; but one, Nothopsis, lives on the Isthmus of Darien, and another, Stoliczkaia, is found in the Khasia Hills of N.E. India. Acrochordus javanicus has no en- larged ventral shields; the flat, viperish-looking head is covered with small granules, with the eyes and nostrils well on the upper surface. Chersydrus ranges from Madras to New Guinea ; the body and tail are laterally compressed and form a ventral fold which is covered with tiny scales like the rest of the body. The main anatomical justification of this sub-family is given by the postfrontal bones, which, besides bordering the orbits posteriorly, are extended forwards so as to form the upper border of the orbits, separating the latter from the frontals.

Sub-family 2. Colubrinae. — The postfrontal bones are restricted to the posterior border of the orbits. The maxillary and dentary bones carry teeth on their whole length. This sub-family contains about 1000 species; few of them reach a length of more than two yards, some of the largest belonging to the Indian Zaocys s. Cory- phodon,Vfhich grow to 10 ft. Most of them are oviparous. Some are more or less aquatic, others are absolutely arboreal .others again prefer dry, sandy or rocky localities according to their food. The sub-familv is cosmopolitan, excepting the New Zealand sub-region, and finds its natural N. limit on the permanently frozen underground, where hibernation is of course impossible. Only a few out of the more than 120 genera can be mentioned here.

Coluber in Europe, Asia and North America. C. longissimus_ s. flavescens s. aesculapii was probably the species held in veneration by the ancient Romans. It grows to a length of 5 ft., climbs ex- tremely well, feeds chiefly on mice, and becomes very tame. Its coloration varies from pale golden brown to black; the scales are

smooth and shiny. Its original home is Italy and S.E. Europe, whence it has spread N. into S. Germany. Its occurrence at widely distant and isolated localities was formerly supposed to be due to its introduction by the Romans. C. corais, from the S. states of N. America far into S. America, reaches 8 ft. in length. C. (Pity- ophis) sayi, C. catenifer and others in N. America.

Coronella, widely distributed excepting Australia and S. America. C.

austriaca s. laevis, the " smooth snake " of Europe, in England, in Hampshire and Dorsetshire, eats chiefly lizards; owing to its coloration, which varies much, it is often mistaken for the viper. C. getula is one of the many N. American species. Zamenis of Europe, Asia, N. Africa, N. and Central America, with many species, e.g. Z. mucosus the Indian "rat-snake, " Z. constrictor in the United States. Some species of the Central and S. American genus Urotheca bear an extraordinary resemblance in coloration to the pretty, black, red and yellow poisonous Elaps. Dendrophis of India and Australia (e.g. D. pictus of India), and Leptophis s. Ahaetulla (e.g. L. iiocerus, neotropical) may be taken as examples of long and slender tree-snakes.

Tropidonotus, with near 100 species, is cosmopolitan with the exception of New Zealand. Some of the species, like the Indian T. quincunciatus and T. stolatus and the N. American T. ordinatus, are perhaps more abundant as regards the number of individuals than any other snake. T. natrix, the grass or ringed snake, is very common in Europe, including England but not Scotland or Ireland; easily recognized even at a distance by two yellow or white spots which it has behind its head. It grows rarely to a length of 4 ft.; it never bites, and feeds chiefly on frogs, toads and fishes, but mice are never taken. Its eggs, which are of the size and shape of a dove's egg, are from fifteen to thirty in number, are deposited in mould or under damp leaves, and are glued together into one mass.

Polyodontophis of Madagascar, S.E. Asia and Central America is remarkable for having the dentary bones loosely attached to the apex oi the elongated articular bone. Calamaria of Indo-China is in example of burrowing snakes, with a short tail and small eyes; in Typhlopophis of the Philippines the eyes are concealed.

Sub-family 3. Rhachiodontidae, represented by Dasypeltis scabra of tropical and S. Africa. Characterized by possessing only a few teeth, on the posterior part of the maxillaries, on the palatines and

Fig. 7. — Dasypeltis unicolor, in the act of swallowing an egg

dentaries; some of the vertebrae in the lower region of the neck have strongly developed hypapophyses (not provided with a cap of enamel, as has often been asserted), which are directed forwards and pierce the oesophagus. The principal diet of these peculiar snakes seems to consist of eggs. In Cape Colony they are known as " eyervreter, " i.e. egg-eater. A snake, scarcely 20 in. in length, and with a body not thicker than a man's little finger, is able to swallow a hen's egg, a feat which seems quite impossible. As the egg passes at last through the alarmingly distended neck, the snate makes some slight contortions and the swelling collapses, the shell

having been filed through by the saw-like apparatus. Whilst the contents are thus retained without loss, the crumpled shell is then vomited out. This peculiar arrangement occurs also in an Indian snake, Eiachiston, which represents, however, a sub-family of the Opistho- glypha. In another, probably also egg-eating snake, the Indian

Coronelline Nymphophidiutn, the same effect is reached by two prominences at the base of the skull.

Series B. Opisthoglypha. — One, or a few, of the posterior maxillary teeth have a groove or furrow in front, which conducts the secretion of the enlarged upper labial glands. They are all more or less poisonous, paralysing their prey before, or during the act of swallowing; the poison-fangs standing so far back in the mouth, these snakes cannot easily inflict wounds with them on man; more- over, the poison is not very strong and not available in large quan- tities. It may well be doubted whether Opisthoglypha form one genuine group instead of a heterogeneous assembly. They comprise about 300 species of terrestrial, arboreal and aquatic forms, and as a group they are almost cosmopolitan, including Madagascar, but excepting new Zealand.

Sub-family 1. Dipsadomorphinae. — Nostrils lateral; dentition well developed. Long-tailed, terrestrial and arboreal forms. The tree-snakes are mostly green above with the under parts white or yellow.

Coelopeltis, with concave, or grooved scales; C. lacertina s. monspessulanus, one of the largest European snakes in Mediterranean countries and south-western Asia.

Dipsadomorphus, Dipsas, Leptognathus, Dryophis, Dendrophis and other closely allied genera are typical, very long-bodied and long- tailed tree-snakes, chiefly tropical. The graceful form of their body, the elegance and rapidity of their movements, and the ex- quisite beauty of their colours have been the admiration of all who have had the good fortune to watch them in their native haunts. The majority lead an exclusively arboreal life; only a few descend to the ground in search of their food. They prey upon every kind of arboreal animal — birds, tree-frogs, tree-lizards, &c. All seem to be diurnal, and the larger kinds attain to a length of about 4 ft. The most beautiful of all snakes are perhaps certain varieties of Chry- sopelea ornata, a species extremely common in the Indian Archi- pelago and many parts of the continent of tropical Asia. One of these varieties is black, with a yellow spot in the centre of each scale ; these spots are larger on the back, forming a series of tetrapetalous flowers; the head is similarly ornamented. Another variety has a red back, with pairs of black crossbars, the bands of each pair being separated by a narrow yellow space; sides

brown, dotted with black;

belly dark green, the outer portion of each ventral shield being yellow, with a blackish spot.

The features by which the tree- snakes are distinguished are still more developed in the whip-snakes (Dryophis), whose excessively slender body has been compared to the cord of a whip. Although arboreal, like the former, they are nocturnal in their habits, having a horizontal instead of a round pupil of the eye. They are said to be of a fierce dis- position, feeding chiefly on birds. In some of the species the elongate form of the head is still more ex- aggerated by a pointed flexible appendage of the snout (Passerita), which may be nearly half an inch in length, or leaf-like, as in the Madagascar Langaha. The Mexican Trimorphodon much resemble viperine snakes with the flat, tri- angular head, narrow neck, slit-like pupil and pugnacious disposition. A still more remarkable resemblance exists in the shape and striking, red, black and yellow coloration between Scolecophis aemulus of Chihuahua and the poisonous Elaps fulvius, the American coral-snake, but Cope has been careful to point out that these two creatures are not known to inhabit the same district.

Sub-family 2. Elachistodonidae. — Represented by Elachistodon westermanni of Bengal, with the same peculiar dentition and with sharp hypapophyses on the vertebrae of the lower neck, as described of Dasypeltis (see above).

Sub-family 3. Homalopsinae. — The nostrils of these absolutely aquatic, viviparous snakes are valvular and placed on the upper surface of the snout. The eyes are small, with vertical pupils. About two dozen ugly-looking species inhabit rivers and estuaries from Bengal to Australia. Cerberus rhynchops; Hypsirhina plum- bea, Homalopsis; Hipistes hydriniis of Siam has a compressed body, and much resembles the Hydrophinae in general appearance and its partly marine life. Herpeton of Cambodia has a pair of long tentacles on the snout and is said to have a partly vegetable diet !

Series C. Proteroglypha. — The anterior maxillary teeth are deeply grooved, or so folded as to appear hollow or perforated. Behind these enlarged poison-fangs follows a series of smaller, solid

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SNAKES

teeth, hence the terra " proteroglypha," which is intended to mean that the anterior teeth are grooved. These snakes are ail very poisonous, mostly viviparous and found in all tropical and sub- tropical countries, with the exception of Madagascar and New Zealand.

Sub-family 1. Elapinae. — Terrestrial, with a cylindrical tail, comprising about 150 species which have been grouped into numerous genera, mostly upon very slight differences. The most remarkable are the following. Naja tripudians and N. haje, the cobra (q.v.). The largest species is the N. bungarus s. elaps, the " hamadryad," " snake-eating cobra," or king-cobra of Indian countries, reaching more than 12 ft. in length, and living mainly upon other snakes. Sepedon haemackates, of S. Africa, is named by the Boers " roode

Fig. 8. — Indian Whip-Snake. Passerita mycterizans.

koper kapel" or " ring-hals," i.e. banded neck, the latter name being, however, often applied also to the cobra. It resembles in colour some varieties of the latter snake, and, like this, it has the power, though in a less degree, of expanding its hood. But its scales are keeled and its form is more robust. It is equally active and courage- ous, not rarely attacking persons who approach too near to its resting-place. In confinement it evinces great ferocity, opening. its mouth and erecting its fangs, from which the poison is seen to flow in drops. During such periods of excitement it is even able, by the pressure of the muscles on the poison-duct, to eject the fluid to some distance; hence it shares with the cobra a third Dutch name, that of " spuw slang " (spitting snake). It grows to a length of 2 or 3 ft. Another kind is the " schapsticker " (sheep stinger), 5. rhombeatus. It is extremely common in S. Africa, and extends far N. along the

Fig. 9. — Head of Herpeton tentaculatum.

E. as well as W. coast. It is of smaller size than the preceding, and causes more injury to animals, such as sheep, dogs, &c. than to man. It varies in colour, but a black mark on the head like an inverted V remains nearly always visible.

The species of Bungarus, four in number, are extremely common in India, Burma, and Ceylon, and are distinguished by having only one row of undivided sub-caudal shields. Three of the species have the body ornamented with black rings, but the fourth and most common (B. coeruleus), the " krait" of Bengal, possesses a dull and more uniform colora- tion. The fangs of the bunga- rums are shorter than those of the

cobras, and cannot penetrate so deeply into the wound. Their bite is therefore less dangerous and the effect on the general system slower, so that there is more prospect of recovery by treatment. Nevertheless, the krait is probably the most destructive snake to human life in India, since it is very common and often creeps into the houses. Doliophis intestinalis of Indo-China has enormously developed poison glands, which extend down the whole anterior third of the body, in front of the heart.

No part of the world possesses so many snakes of this sub-family as Australia, where, in fact, they replace the non-venomous colubrine snakes; many of them are extremely common and spread over a considerable area. Fortunately the majority are of small size, and their bites are not followed by more severe effects than those from the sting of a hornet. Only the following are dangerous to man and larger animals: the " death-adder," Acanthosis antarctieus, easily recognized by the peculiar end of the tail which is compressed and terminates in a thin horny spine; common throughout Australia to the Moluccas, scarcely one yard in length; the " black snake " (Pseudechis porphyriacus) , likewise common throughout the Australian continent, especially in low marshy places, and upwards of 6 ft. in length; it is black, with each scale of the outer series red at the base; when irritated it raises the fore part of its body and flattens out its neck like a cobra, the females are sometimes known as "brown adders"; the "tiger-snake," Nolechis scutatus (s. Hoplocephalus curtus), with a similar distribution, and also common in Tasmania, from 5 to 6 ft. long, and considered the most dangerous of the tribe. Good descriptions and figures of all these snakes are given in Krefft's Snakes of Australia (Sydney, 1869, 4to).

Several genera of the Elapinae lead a more or less burrowing life ; their body is of a uniform cylindrical shape, terminating in a short tail, and covered with short polished scales; their head is short, the mouth rather narrow, and the eye small. They are the tropical American Elaps, the Indian Callophis, the African Poecilophis and the Australian Vermicella. The majority are distinguished by the beautiful arrangement of their bright and highly ornamental colours ; many species of Elaps have the pattern of the so-called coral-snakes, their body being encircled by black, red and yellow rings — a pattern

Fig. 10.— A Poisonous Snake {Elaps fulvius) swallowing a similarly coloured Opisthoglyphous Snake (Homalocranium semicinctum).

which is peculiar to snakes, venomous as well as non-venomous, of the fauna of tropical America. Although the poison of these narrow- mouthed snakes is probably as virulent as that of the preceding, man has much less to fear from them, as they bite only under great provocation. Moreover,

their bite must be frequently without serious effect, owing to their narrow mouth and the small size of their poison- fangs. They are also comparatively of small size, only a few species rarely exceeding a length of 3 ft., for instance Elaps futvius, which extends into the S. states of N. America.

Sub-family 2. Hydrophinae. — Tail laterally compressed; marine. Of sea-snakes some fifty species are known. All are inhabitants of the tropical Indo-Pacific ocean, and most numerous in and about the Persian Gulf, in the East Indian Archipelago, and in the seas between S. Japan and N. Australia. One species which is extremely common (Pelamis bicolor), and which is easily recognized by the black colour of its upper and the yellowish tints of its lower parts (both colours being sharply defined), has extended its range W. to the sea round Madagascar, and E. to the Gulf of Panama. One species, however, Distira semperi, is confined to the landlocked freshwater Lake Taal at Luzon in the Philippines. Sea-snakes are viviparous and pass their whole life in the water; they soon die when brought on shore. The scales are very small, often very much reduced, and there are frequently no enlarged ventrals on the compressed belly, but Platurus has broad ventrals. Their motions in the water are almost as rapid as they are uncertain and awkward when the animals are removed out of their proper element. Their nostrils are placed quite at the top of the snout. These openings are small and provided with a valve interiorly, which is opened during respiration, and closed when the animal dives. They have very capacious lungs, extending back- wards to the anus; by retaining air in these extensive lungs they are able to float on the surface of the water and to remain under water for a consider- able length of time. Sea-snakes shed their skin frequently; but it peels off in pieces as in lizards, and not as in the freshwater snakes, in which the integuments come off entire. Several species are remarkable for the extremely slender and prolonged anterior part of the body, and very small head. The eye is small, with round pupil, which is so much contracted by the light when the snake is taken out of the water that the animal becomes blinded and is unable to hit any object it attempts to strike. The tongue is short, and the sheath in which it lies concealed opens near to the front margin of the lower jaw; scarcely more than the two terminating points are exserted from the mouth when the animal is in the water. The mouth shuts in a somewhat different way from that of other snakes: the middle of the rostral shield is produced downwards into a small lobule, which prevents the water from entering the mouth; there is generally a small notch on each side of the lobule for the passage of the two points of the tongue. The food of sea-snakes consists

entirely of small fish; among them species with very strong spines. As all these animals are killed by the poison of the snake before they are swallowed, and as their muscles are perfectly relaxed, their armature is harmless to the snake, which begins to swallow its prey from the head, and de- presses the spines as deglutition proceeds. Sea-snakes belong to the most poisonous species of the whole order. Accidents are rarely caused by them, because they are extremely shy and swim away on the least alarm ; but, when surprised in the submarine cavities forming theirnatural retreats, they will, like any other poisonous terrestrial snake, dart at the disturbing object; and, when out of the water, they attempt to bite every object near them, even turning round to wound their own bodies. They cannot endure captivity, dying in the course of two or three days, even when kept in capacious tanks. The greatest size to which some species attain, according to positive observation, is about 12 ft., and therefore far short of the statements as to the length of the so-called sea-serpents (q.v.). Boulenger has written an interesting account of sea-snakes in Natural Science, i. (1892), p. 44 seq.

Family 8. Amblycephalidae. — The pterygoids are widely separated from the quadrates, not reaching beyond the level of the occipital condyle. This condition can be ascertained without dissection, when the mouth is opened widely. The squamosals are reduced, to pad-like vestiges. Otherwise these snakes agree with the aglyphous Colubridae. Externally they are easily distinguished by the absence of a longitudinal groove on the skin. The head is thick, very distinct from the neck and the pupil is vertical, so that these harmless snakes look rather viperish. About 30 species, with several genera, are known from the oriental and neotropical regions. Amblycephalus, e.g. monticola, with compound body, in S.E. Asia.

Family 9. Viperidae.— The maxillaries are very short, movably pivoting upon the prefrontals and also attached to the ectopterygoids, so that they can be erected together with the large poison fangs, which, besides reserve teeth, are the only maxillary teeth. There are also teeth on the palatines, anterior portion of the pterygoids, and on the short dentaries. The short squamosals are very loosely attached to the skull. The prefrontals are not in contact with the

Fig. 11. — Sea-Snake, Pelamis bicolor.

nasals. The poison-fangs are " solenoglyphous," perforated, having a wide hole on the anterior side at the base, in connexion with the duct of the large, paired, poison-glands, the presence of which adds considerably to the characteristic broadness of the head. The hole leads into a canal, which opens as a semi-canal towards the end of the tooth. The supply of reserve teeth is indefinite ; frequently one or two are lying ready and of equal size

to the functional fangs.

All the Viperidae are very poisonous and all, except the African Atractaspis, are viviparous. They include terrestrial, semi-aquatic and burrowing types; none of them with any signs of degradation; on the contrary they belong to the most highly organized of snakes. The family is cosmopolitan, excepting Madagascar and the whole of the Australian region.

Sub-family I. Viperinae, vipers (q.v.) or adders. — Without an ex- ternal pit between eye and nose, and the maxillary bone is not hollowed out above. Absolutely restricted to the Old World, with 9 genera comprising about 40 species.

Sub-family 2. Crotalinae. — With a deep cavity or pit on either side between the eye and the nose, lodged in the hollowed-out maxillary bone. The lining of these pits is amply supplied with branches from the trigeminal nerves, but the function is still quite unknown. About 60 species of pit-vipers are recognizable. They can easily be divided into 4 genera: Crotalus and Sistrurus with a rattle at the end of the tail and restricted to America (see Rattlesnake) ; secondly, pit-vipers without a rattle: Ancistrodon, with large shields covering the upper surface of the head; with about 10 species, e.g. A. halys in the Caspian district, others in the Himalayas, Ceylon and Sunda islands. Notable American species are the following: A. piscivorus, the " water-viper " from Carolina and Indiana to Florida and Texas. This creature is semi-aquatic and lives" chiefly on fishes; it grows to a length of about 5 ft. ; the general colour is reddish to dark brown,

Lachesis viridis of India.

even blackish, with darker cross-bands or C-shaped markings; a dark, light-edged band extends from the eye to the angle of the mouth. The under parts are yellowish, more or less spotted or quite black. A. contortrix the " moccasin-snake " or " copper-head," so called because of its yellow to pink or pale-brown ground colour, with dark crossbars or triangular marks. The under surface is yellow to reddish, with dark specks. Full-grown specimens are about 1 yd. in length. The moccasin-snake ranges fromMassachusetts and Kansas to Florida and Texas and into Mexico, preferring swampy I localities or meadows with high grass, where it hunts for small mammals and birds. It is easily distinguished from other North

American pit-vipers by the possession of a loreal shield, i.e. a shield

intercalated between the two preoculars and the posterior nasal; below the loreal lies the pit.

The moccasin and the water- viper have occasionally been men- tioned under the name of Trigonocephalus cenchris, one of the many synonyms.

Lachesis has the upper surface of the head covered, with very small shields, or with scales, and contains about 40 species, in S. and Central America, the Antilles and also in S.E. Asia. The most ill-famed is L. s. Bothrops s. Craspedocephalus lanceolatus, which inhabits the greater part of S. America, extending into Mexico and the Lower Antilles, notably Martinique, Guadaloupe and Santa Lucia, where it is known as the " Fer de Lance "; Mexicans call it " rabo de hueso " or bone-tail, on account of the curiously coloured and spike-like tip of the tail. It is a very quick and highly irascible beast and even known to turn on its pursuer. It grows to a length of 6 ft., lives in swamps, plantations, forests, on the plains and on the hills, and is very prolific, producing dozens of young, which at birth are 10 in. long and as vicious as their parents.

L. s Trimeresurus graminens s. viridis s. erythurus is one of the Asiatic species, ranging over the whole of India to Hong-kong, Timor and even to the Andaman and Nicobar Islands. It is arboreal, bright green above; the end of the prehensile tail is usually bright red. (H. F. G.)

SNAPDRAGON, or Antirrhinum (Gr. pis, pwos, snout, from the shape of the flower), a plant of the natural order Scrophulariaceae (q.v.), native to central and south Europe, occurring as an alien on old walls in Britain. It is an old-fashioned garden perennial of easy cultivation. Antirrhinum majus, sown in heat, and forwarded until the general time for planting out, becomes a summer annual, and may be so treated; but under a slower and more hardy regime it may be sown in boxes in August, and pricked off into other boxes and wintered in a frame. So treated, and planted out in well-prepared beds of good friable garden soil, it will become very showy and effective. The " Tom Thumb " or dwarf strain, obtainable in self and mixed colours, is a very valuable plant for bedding. The named sorts are pro-pagated by cuttings, and wintered in a frame. Some of the double-flowered sorts are interesting. There are forms with white, yellow, rose, crimson, magenta, and variously mottled and striped flowers, some of them of great beauty, but the named sorts are too fugitive to make it desirable to record a list.

SNEEK, a town in the province of Friesland, Holland, to the west of Sneek lake, 14 m by rail S.S.W. of Leeuwarden, with which it is also connected by canal. Steam tramways connect it S.E. with Heerenveen and N.W. with Bolsward and Harlingen. Pop. (1900) 12,075. Sneek is one of the great

butter and cheese markets of the province. One of the former city gates (161 5) remains, and there are a town hall, communal buildings (1863), court-house, weigh-house, synagogue and churches of various denominations, in one of which is the tomb of the naval hero of the 16th century, Lange, or Groote Pier (Long or Great Peter). The horse-fair of Sneek is widely attended, and there is a consider- able activity in trade and shipping.

SNEEZING (O. Eng. fneosung, from fneosan, to sneeze, cf. Dutch fniezen, allied to the obsolete neeze, and ultimately to be referred to root seen in Gr. irveiv, to breathe; the initial s is due to association with numerous words, such as snort, snuff, snore, &c), a violent expiration of air from the nose and mouth; it is an involuntary reflex respiratory act; caused by irritation of the nerve endings of the mucous membrane of the nose or by stimulation of the optic nerve by a bright light. The irrita tion may be due to the swelling of the nasal mucous membrane, which occurs in catching cold, sneezing being often a premonitory or accompanying symptom, or to foreign bodies in the nose, as by inhalation of snuff or other " errhines " or " sternutatories." A venerable and widespread belief survives in the custom of saying " God bless you " when a person sneezes. The Hindus say " live," to which the answer " with you " is given (E. B. Tylor, Primitive Culture, i. 101). A sneeze was considered a sign or omen from the gods by the Greeks and Romans; it was one of the many common everyday occurrences which if coming at an important moment could be interpreted as presaging the future. There are many allusions to it in classical literature, e.g. Homer, Od. xvii. 561, Plutarch, Themist. 13, Xenophon, Anab. iii. 2 and Catullus, Carm. 45. There are references to it

in Rabbinical literature, and it has been found in Otaheite, Florida and the Tonga Islands.

SNELL, HANNAH (1723-1792), the " female soldier," was born at Worcester on the 23rd of April 1723, being the daughter of a hosier. In order to seek her husband, who had ill-treated and abandoned her, in 1745 she donned man's attire and enlisted as a soldier in Guise's regiment of foot, but soon deserted, and shipped on board the sloop " Swallow " under her brother-in- law's name of James Gray. The " Swallow " sailed in Bosca wen's fleet to the East Indies, and took part in the siege of Araapong. Hannah served in the assault on Pondicherry and was wounded, but she succeeded in extracting the bullet without calling in a surgeon. When recovered she served before the mast on the " Tartar " and the " Eltham, " but when paid off she resumed woman's costume. Her adventures were published as The Female Soldier, or the Surprising Adventures of Hannah Sneli (1750), and she afterwards gave exhibitions in military uniform in London. She died insane in Bethlehem Hospital on the 8th of February

1792.

SNELL, JOHN (1629-1679), founder of the Snell exhibitions at Oxford, was born in 1629 in Ayrshire, Scotland, the son of a blacksmith. He joined the royalists during the civil war, and fought in several battles, including Worcester. Thereafter he took refuge in Cheshire, where he met Sir Orlando Bridgeman, whose clerk he became, being raised to the offices of court - crier and seal-bearer as his patron was promoted to those of judge and Lord Keeper. Later he was secretary to the Duke of Monmouth and had the management of his Scottish estates. He died at Oxford on the 6th of August 1679, leaving a bequest for sending students from Glasgow University to an Oxford college or hall. The Court of Chancery decided in 1693 that Balliol should receive the beneficiaries.

SNELL, WILLEBRORD (1591-1626), commonly known as Snellitjs, Dutch astronomer and mathematician, was born at Leiden in 159 1. In 1 613 he succeeded his father Rudolph Snell (1546-1613) as professor of mathematics in the university of Leiden. In 161 5 he planned and carried into practice a new method of finding the dimensions of the earth, by determining the distance of one point on its surface from the parallel of another, by means of a triangulation. His work Eratosthenes Batavus, published in 161 7, describes the method and gives as the result of his operations between Alkmaar and Bergen-op- Zoom a degree of the meridian equal to 55,100 toises= n 7,449 yds. (A later recalculation gave 57,033 toises =121,569 yds., after the application of some corrections to the measures indicated by himself.) Snell also distinguished himself as a mathematician, and discovered the law of refraction, in 1621 (see Light). He died at Leiden on the 30th of October 1626.

In addition to the Eratosthenes Batavus he published Cyclometria sive de circuli dimenHone (162 1), and Tiphys Batavus s. Histiodromice, de navium cursibus et re navali (1624). He also edited Coeli et siderum in eo errantium ob.servationes Hassiacae (161 8), containing the astro- nomical observations of Landgrave William IV. of Hesse. A trigo- nometry (Doctrina triangulorum,) by him was published a year after his death.

SNIPE (O. Eng. Snite, Icel. Snipa, Dutch Snip, Ger. Schnepfe), one of the commonest Limicoline birds, in high repute no less for the table than for the sport it affords. It is the Scolopax gallinago of Linnaeus, but by later writers it has been separated from that genus, the type of which is the Woodcock {q.v.), and has been named Gallinago caelestis. Though considerable numbers are still bred in the British Islands, notwithstanding the diminished area suitable for them, most of those that fall to the gun are undoubtedly of foreign origin, arriving from Scandinavia towards the close of summer or later, and many will outstay the winter if the weather be not

too severe, while the home-bred birds emigrate in autumn to return the following spring. Of later years British markets have been chiefly supplied from abroad, mostly from Holland.

The variegated plumage of the Snipe is subject to no incon- siderable variation, especially in the extent of dark markings on the belly, flanks, and axillaries, while examples are occasionally seen in which no trace of white, and hardly any of buff or grey,

is visible, the place of these tints being taken by several shades of chocolate-brown. Such examples were long considered to form a distinct species, the 5. sabinii, but its invalidity is now admitted. Other examples in which buff or rust-colour pre- dominates have also been deemed distinct, and to those has been applied the epithet russata. Again, a slight deviation from the ordinary formation of the tail, whose rectrices normally number 14, and present a rounded termination, has led to the belief in a species, S. brehmi, now wholly discredited. But, setting aside two European species, there are at least a score, belonging to various parts of the world. • Thus N. America produces G. ivilsoni, so like the English Snipe as not to be easily distin- guished except by the possession of 16 rectrices, and Australia has G. australis, a larger and somewhat differently coloured bird with 18 rectrices. India, while affording a winter resort to the common species, which besides Europe extends its breeding range over the whole of N. Asia, has also at this season the Pin -tailed Snipe, E. stenura, in which the number of rectrices is still greater, varying from 20 to 28, it is said, though 22 seems to be the usual number. This curious variability, deserving more attention than it has yet received, only occurs in the outer feathers of the series, which are narrow in form and extremely stiff, there being always 10 in the middle of ordinary breadth.

Those who only know the Snipe as it shows itself in the shoot- ing-season, when without warning it rises from the boggy ground uttering a sharp note that sounds like scape, scape, and, after a few rapid twists, darts away, if it be not brought down by the gun, to disappear in the distance after a desultory flight, have no con- ception of the bird's behaviour at breeding-time. Then, though flushed quite as suddenly, it will fly round the intruder, at times almost hovering over his head. But, if he have patience, he will see it mount aloft and there execute a series of aerial evolutions of an astounding kind. After wildly circling about, and reaching a height at which it appears a mere speck, where it winnows a random zigzag course, it abruptly shoots downwards and aslant, and then as abruptly stops to

regain its former elevation, and this process it repeats many times. A few seconds after each of these headlong descents a mysterious sound strikes his ear — compared by some to drumming, and by others to the bleating of a sheep or goat, 1 which sound evidently comes from the bird as it shoots downwards, and then only. It is now generally accepted that these sounds are produced by the vibration of the webs of the outer tail-feathers, the webs of which are modified. A similar sound may be made by affixing those feathers to the end of a rod and drawing them rapidly downwards in the same position as they occupy in the bird's tail while it is performing the feat. 2 The air will also ring with loud notes that have been syllabled tinker, tinker, tinker, while other notes in a different key, something like djepp, djepp, djepp rapidly uttered, may be heard as if in response. The nest is always on the ground, and is a rather deep hollow wrought in a tuft of herbage and lined with dry grass-leaves. The eggs are four in number, of a dark olive colour, blotched and spotted with rich brown. The young when freshly hatched are beautifully clothed in down of a dark maroon, variegated with black, white and buff.

The Double or Solitary Snipe of English sportsmen, 5. major, a larger species, also inhabits N. Europe, and may be readily re- cognized by the white bars in its wings and by its 16 or occasion- ally 18 rectrices. It has also a very different behaviour. When flushed it rises without alarm-cry, and flies heavily. In the breeding season much of its love-performance is exhibited on the ground, and the sounds to which it gives rise are of another character; but the exact way in which its " drumming " is effected has not been ascertained. Its gesticulations at this time have been well described by Professor Collett in a communication

1 Hence in many languages the Snipe is known by names signifying " Flying Goat," " Heaven's Ram," as in Scotland by " Heather- bleater."

2 Cf. Meves, Oefvers. K. Vei.-Akad. Fork. (1856), pp. 275-277 (transl. Naumannia, 1858, pp. 116, 117), and Proc. Zool. Society (1858), p. 202, with Wolley's remarks thereon, Zool. Garten (1876), pp. 204-208; P. H. Bahr (Proc. Zool. Soc. of London, 1907, p. 12) has given a full account of the subject, with diagrams of the modified feathers.

to H. E. Dresser's Birds of Europe (vii. 635-637). It visits Great Britain every year at the close of summer, but in very small numbers, and is almost always seen singly — not un- commonly in places where no one could expect to find a Snipe.

The third species of which any details can here be given is the Jack- 3 or Half-Snipe, 5. gallinula, the smallest and most beauti- fully coloured of the group. Without being as numerous as the common or full Snipe, it is of

frequent occurrence in Great Britain from September to April (and occasionally both earlier and later) ; but it breeds only, so far as is known, in N. Scandinavia and Russia; and the first trustworthy information on that subject was obtained by J. Wolley in June 1853, when he found several of its nests near Muonioniska in Lapland. 4 Instead of rising wildly as do most of its allies, it generally lies so close as to let itself be almost trodden upon, and then takes wing silently, to alight at a short distance and to return, to the same place on the morrow. In the breeding-season, however, it is as noisy and conspicuous as its larger brethren while executing its aerial evolutions.

As a group the Snipes are in several respects highly specialized. We may mention the sensitiveness of the bill, which, though to some extent noticeable in many Sandpipers (q.v.), is in Snipes carried to an extreme by a number of filaments, belonging to the fifth pair of nerves, which run almost to the tip and open immediately under the soft cuticle in a series of cells that give this portion of the surface of the premaxillaries, when exposed, a honeycomb-like appearance. Thus the bill becomes a most delicate organ of sensation, and by its means the bird, while probing for food, is at once able to distinguish the nature of the objects it encounters, though these are wholly out of sight. So far as is known the sternum of all the Snipes, except the Jack-Snipe, departs from the normal Limicoline formation, a fact which tends to justify the removal of that species to a separate genus, LimnocryptesJ- (A. N.)

SNIP SNAP SNOREM, an old game at cards, sometimes called Earl of Coventry. There are several methods of playing, but in the commonest a full whist pack is used and any number cf players may take part. The pack is dealt, one card at a time, and the eldest hand places upon the table any card he likes. Each player in his turn then tries to match the card played just before his, making use of a prescribed formula if successful. Thus, if a king is played, the second player lays down another king (if he can) calling out " Snip! " The next player lays down the third king, saying " Snap! " and the next the fourth king with the word " Snorem. " A player not being able to pair the card played may not discard, and the holder of " Snorem " has the privilege of beginning the next round. The player who gets rid of all his cards first wins a counter from his companions for each card still held by them.

SNOILSKY, CARL JOHAN GUSTAF, Count (1841-1903), Swedish poet, was born at Stockholm on the 8th of September 1841. He was educated at the Clara School, and in i860 became a student at Upsala. He was trained for diplomacy, which he quitted for work at the Swedish Foreign Office. As early as 1861, under the pseudonym of " Sven Trost," he began to print poems, and he soon became the centre of the brilliant literary society of the

capital. In 1862 he published a collection of lyrics called Orchideer (" Orchids "). During 1864 and 1865 he was in Madrid and Paris on diplomatic missions. It was in 1869, when he first collected his Dikter under his own name, that Snoilsky took rank among the most eminent contemporary poets. His

3 Though this word is clearly not intended as a nickname, such as is the prefix which custom has applied to the Daw, Pie, Redbreast, Titmouse or Wren, one can only guess at its origin or meaning. It may be, as in Jackass, an indication of sex, for it is a popular belief that the Jack-Snipe is the male of the common species; or, again, it may refer to the comparatively small size of the bird, as the " jack " in the game of bowls is the smallest of the balls used, and as fisher- men call the smaller Pikes Jacks.

4 His account was published by Hewitson in May 1855 (Eggs Br. Birds, 3rd ed., ii. pp. 356-358).

5 The so-called Painted Snipes, forming the genus Rhynchaea, demand a few words. Four species have been described, natives respectively of S. America, Africa, India with China, and Australia. In all of these it appears that the female is larger and more brilliantly coloured than the male, and in the Australian species she is further distinguished by what in most birds is emphatically a masculine property, though its use is here unknown- — namely, a complex trachea, while the male has that organ simple. He is also believed to undertake the duty of incubation.

Sonneter in 1871 increased his reputation. Then, for some years, Snoilsky abandoned poetry, and devoted himself to the work of the Foreign Office and to the study of numismatics. In 1876, however, he published a translation of the ballads of Goethe. Snoilsky had in 1876 been appointed keeper of the records, and had succeeded Bishop Genberg as one of the eighteen of the Swedish Academy. But in 1879 he resigned all his posts, and left Sweden abruptly for Florence with the Baroness Ruuth- Piper, whom he married in 1880. Count Snoilsky sent home in 1 88 1 a volume of Nya Dikter (New Poems). Two other volumes of Dikter appeared in 1883 and 1887, and 1897; Savonarola, a poem, in 1883, and Hvitafrun (" The White Lady ") in 1885. In 1886 he collected his poems dealing with national subjects as Svenska bilder (2nd ed., 1895), which ranks as a Swedish classic. In 1891 he returned to Stockholm, and was appointed principal librarian of the Royal Library. He died at Stockholm on the 19th ot May 1903. His literary influence in Sweden was very great ; he always

sang of joy and liberty and beauty, and in his lyrics, more than in most modern verse, the ecstasy of youth finds expression. He is remarkable, also, for the extreme delicacy and melodiousness of his verse-forms.

His Samlade dikter were collected (Stockholm, 5 vols.) in 1903-1904.

SNORRI STURLASON (n 70-1 241), the celebrated Icelandic historian, the youngest son of a chief in the Vestfirdir (western fiords), was brought up by a powerful chief, Jon Loptsson, in Odda, who seems first to have awakened in him an interest for history and poetry. . His career begins with his marriage, which made him a wealthy man; in 1206 he settled at Reykjaholt, where he constructed magnificent buildings and a bath of hewn stones, preserved to the present day, to which water was con- ducted from a neighbouring hot spring. He early made himself known as a poet, especially by glorifying the exploits of the contemporary Norse kings and earls; at the same time he was a learned lawyer, and from 121 5 became the logsdguma&r, or president of the legislative assembly and supreme court of Iceland. The prominent features of his character seem to have been cunning, ambition and avarice, combined with want of courage and aversion from effort. By royal invitation he went in 12 18 to Norway, where he remained a long time with the young king Haakon and his tutor Earl Skuli. When, owing to disputes between Icelandic and Norwegian merchants, Skuli thought of a military expedition to Iceland, Snorri promised to make the inhabitants submit to Haakon of their own free will. Snorri himself became the lendrmadr, vassal or baron, of the king of Norway, and held his lands as a fief under him. On his return home Snorri sent his son to the king as a hostage, and made peace between Norway and Iceland, but his power and influence were used more for his own enrichment and aggrandizement — he was logsogumadr again from 1222 to 1232 — than for the advan- tage of the king. Haakon, therefore, stirred up strife between Snorri's kinsman Sturla and Snorri, who had to fly from Reykja- holt in 1236; and in 1237 he left the country and went back to Norway. Here he joined the party of Skuli, who was meditat- ing a revolt. Learning that his cousin Sturla in Iceland had fallen in battle against Gissur, Snorri's son-in-law, Snorri, although expressly forbidden by his liege lord, returned to Iceland in 1239 and once more took possession of his property. Meanwhile Haakon, who had vanquished Skuli in 1240, sent orders to Gissur to punish Snorri for his disobedience either by capturing him and sending him back to Norway or by putting him to death. Gissur took the latter course, attacked Snorri at his residence, Reykjaholt, and slew him on the 22nd of September

1241.

Snorri is the author of the great prose Edda (see Edda), and of the

Heimskringla or Sagas of the Norwegian Kings, a connected series of biographies of the kings of Norway down to Sverri in 1 177. The later work opens with the Ynglinga Saga, a brief history of the pre- tended immigration into Sweden of the Aesir, of their successors in that country, the kings of Upsala, and of the oldest Norwegian kings, their descendants. Next come the biographies of the succeeding Norwegian kings, the most detailed being those of the two missionary Icings Olaf Tryggvason and St Olaf. Snorri's sources were partly succinct histories of the realm, as the chronological sketch of Ari;

partly more voluminous early collections of traditions, as the Noregs Konungatal (Fagrskinna) and the Jarlasaga; partly legendary biographies of the two Olafs; and, in addition to these, studies and collections which he himself made during his journeys in Norway. His critical principles are explained in the preface, where he dwells on the necessity of starting as much as possible from trustworthy contemporary sources, or at least from those nearest to antiquity — the touchstone by which verbal traditions can be tested being con- temporary poems. He inclines to rationalism, rejecting the marvel- lous and recasting legends containing it in a more historical spirit; but he makes an exception in the accounts of the introduction of Christianity into .Norway and of the national saint St Olaf. Snorri strives everywhere to impart life and vigour to his narrative, and he gives the dialogues in the individual character of each person. Especially in this last he shows a tendency to epigram and often uses humorous and pathetic expressions. Besides his principal work, he elaborated in a separate form its better and larger part, the History of St Olaf (the great Olafs Saga). In the preface to this he gives a brief extract of the earlier history, and, as an appendix, a short account of St Olafs miracles after his death ; here, too, he employs critical art, as appears from a comparison with his source, the Latin legend. See further Iceland, Literature, and Edda.

SNOW (in 0. Eng. sndw; a common Indo-European word; cf. in Teutonic languages, Ger. Schnee, Du. sneeuw; in Slavonic snieg', Lith. snegas; Gr. via, Lat. nix, nivis, whence the Romanic forms, Ital. neve, Fr. neige, &c; Ir. and Gael, sneachd; the original sense of the root may be to moisten, cf. Skt. sneha, moisture), that form of precipitation of water- vapour con- densed from the atmosphere which reaches the ground in a frozen and crystalline condition. Snow thus occurs when the processes of condensation and fall take place at a temperature below 32° F. The crystals, which vary greatly in form, belong to the hexagonal system. They are formed upon a nucleus, in the same way as a raindrop, and sometimes reach the ground singly, but more commonly in small coherent masses or flakes. If in its passage from the upper atmosphere snow passes through a temperature above 32° F. it reaches the ground as sleet or rain (according to the degree of heat encountered), and thus after a fall of rain over lowlands, the higher parts

of mountains in the vicinity may be seen to have received the fall as snow.

See further Climate and Meteorology ; and for the transforma- tion of snow into ice under pressure, see Glacier.

SNOWDON (Wyddfa, view-place, Eryri, eagle-place), the highest elevation in N. Wales. It is formed chiefly of slates, grits and porphyries of the Cambrian and Silurian systems. It consists of five " ribs " converging at the summit, 3560 ft. above sea-level. Between these lie such depressions as Cwm Glas (blue or green vale) to the N., and Cwm y Han (clearing, town or church vale) to the S. Snowdon is demarcated from the surrounding hills by passes famous for their scenery, such as that of Llanberis (q.v,) to the N.E. and Aberglaslyn to the S. These two passes are joined by Nant Gwynnant (stream, or valley, of the white or happy valley, or stream), skirting the S.E. flanks of the Snowdon massif. Nant Colwyn runs N.W. to Carnarvon. A rack-and-pinion railway (opened in 1897) ascends from Llan- beris to the summit of the mountain (4J m.). Snowdonia, as the locality is sometimes called, contains several lakes, e.g. Peris and Padarn at Llanberis; Glaslyn and Llydaw between Cribgoch (red crest) and Lliwedd; Cwellyn and others W. of the hill itself; and Gwynnant and Dinas (Y Ddinas) in Nantgwynnant.

SNOWDROP, Galanthus nivalis, the best known representative of a small genus of the order Amaryllidaceae, all the species of which have bulbs, linear leaves and erect flower-stalks, destitute of leaves but bearing at the top a solitary pendulous bell-shaped flower. The white perianth is six-parted, the outer three segments being larger and more convex than the inner series. The six anthers open by pores or short slits. The ovary is three-celled, ripening into a three-celled capsule. The snowdrop is a doubtful native of Great Britain, but is largely cultivated for market in Lincolnshire. There are numerous varieties, differing in the size of the flower and the period of flowering. Other distinct species of snowdrop are the Crimean snowdrop, G. plicatus, with broad leaves folded like a fan, and G. Elwesii, a native of the Levant, with large flowers, the three inner segments of which have a much larger and more conspicuous green blotch than the commoner kinds. All the species thrive in almost

any soil or position, and when once planted should be left to themselves.

SNOW-LEOPARD, or Ounce (Felts uncia,) a large member of the cat family, from the high mountain regions of Central Asia. It resembles the

leopard in general conformation, but has longer fur, grey in colour, marked with large dark rosettes. The dimensions of the head and body are about 4 ft. 4 in., tail 3 ft., and the height 2 ft. This animal lives among rocks, and preys upon wild sheep and goats, and probably large rodents or birds. It carries off sheep, goats and dogs from villages, and even kills ponies, but, it is said, has never been known to attack man (Blanford). Examples Shown in the Zoological Gardens of London have been fairly tame and playful.

SNOW-LINE. In the higher latitudes, and in the most elevated parts of the surface of the earth, the atmosphere may be normally so cold that precipitation is chiefly in the form of snow, which lies in great part unmelted. The snow-line is the imaginary line, whether in latitude or in altitude, above which these conditions exist. In the extreme polar regions they exist at sea- level, but below lat. 78° the snow-line begins to rise, since at the lower elevations the snow melts in summer. In N. Scandinavia the line is found at about 3000 ft. above the sea, in the Alps at about 8500 ft., and on high mountains in the tropics at about 18,000 to 19,000 ft. These figures, however, can only be approxi- mate, as many considerations render it impossible to employ the term " snow-line " as more than a convenient generalization.

SNOW-SHOES, a form of footgear devised for travelling over snow. Nearly every American Indian tribe has its own particular shape of shoe, the simplest and most primitive being those of the far north. The Eskimos possess two styles, one being triangular in shape and about 18 in. in length, and the other almost circular. Southward the shoe becomes gradually narrower and longer, the largest being the hunting snow-shoe of the Crees, which is nearly 6 ft. long and turned up at the toe. Of snow-shoes worn by people of European race that used by lumbermen is about 35 ft. long and broad in proportion, while the tracker's shoe is over 5 ft. long and very narrow. This form has been copied by the Canadian snow-shoe clubs, who wear a shoe about 35 ft. long and 15 to 18 in. broad, slightly turned up at the toe and terminat- ing in a kind of tail behind. This is made very light for racing purposes, but much stouter for touring or hunting.

Snow-shoes are made of a single strip of some tough wood, usually hickory, curved round and fastened together at the ends and supported in the middle by a light cross-bar, the space within the frame thus made being filled with a close webbing of dressed caribou or neat's-hide strips, leaving a small opening just behind the cross-bar for the toe of the moccasined foot. They are fastened to the moccasin by leather thongs, sometimes by buckles. The method of walking is to lift the shoes slightly and slide the overlapping inner edges over each other, thus avoiding the unnatural and fatiguing " straddle-gait " that would other- wise be necessary. Immoderate snow-shoeing leads to serious lameness of the feet and ankles which the

Canadian voyageurs call mal de raquelte. Snow-shoe racing is very common in the Canadian snow-shoe clubs, and one of the events is a hurdle-race over hurdles 3 ft. 6 in. high. Owing to the thick forests of America the snow-shoe has been found to be more suitable for use than the Norwegian ski, which is, however, much used in the less-wooded districts.

SNUFF (from " to snuff, " i.e. to inhale, to draw in through the nose; cf. Dutch snuf, scent, Ger. Schnupfen, a cold, catarrh, and Eng. " snuffle, " " sniff, " &c), the name of a powdered prepara- tion of tobacco used for inhalation (for the manufacture see Tobacco). The practice of inhaling snuff became common in England in the 17th century, and throughout the 18th century it was universal. At first each quantity inhaled was fresh grated (Fr. rdper), whence the coarser kinds were later known as " rappee. " This entailed the snuff-taker carrying with him a grater with a small spoon at one end and a box to hold the grated snuff at the other. Early 18th-century graters made of ivory and other material are in existence. Later the box and the grater were separated. The art and craft of the miniature

painter, the enameller, jeweller and gold- and silver-smith was bestowed upon the box. The humbler snuff-takers were content with boxes of silver, brass or other metal, horn, tortoise-shell or wood. The mull (q.v.), a silver-mounted ram's head, is a large table snuff-box. Though " snuff-taking " ceased to be fashion- able at the beginning of the 19th century, the gold and jewelled snuff-box has continued to be a typical gift of sovereigns to those whom they delight to honour.

This, word " snuff " must be distinguished from that meaning the charred inch of a candle or lamp, which is a variant of " snip " or " snop, " to cut off, trim, cf . Dan. snubbe. Constant trimming or snuffing of candles was a necessity until obviated by the modern methods of candle manufacture, and the snuffers con sisted of a pair of scissors with a closed box forming a receptacle for the charred wick cut off; the snuffers usually had three small feet which allowed them to stand on a tray. Made of silver, silver-gilt or other metal, " snuffers " were formerly a decorative article of plate in the equipment of a household. There is a beautiful example of silver snuffers with enamel decorations in the British Museum. These belonged to Cardinal Bainbridge and date from the reign of Henry VIII.*

SNYDERS, FRANZ ˆ579-1657), Flemish painter of animals and still life, was born and died at Antwerp. In 1593 he was studying under Pieter Breughel the younger, and afterwards received instruction from Hendrick van Balen, the first master of Van Dyck. He devoted himself to painting flowers, fruit and subjects of still life, but afterwards turned to animal-painting, and executed with the greatest skill and spirit hunting pieces and

combats of wild animals. His composition is rich and varied, his drawing correct and vigorous, his touch bold and thoroughly expressive of the different textures of furs and skins. His excellence in this department excited the admiration of Rubens, who frequently employed him to paint animals, fruit and still life in his own pictures, and he assisted Jordaens in a similar manner. In the lion and boar hunts which bear the name of Snyders the hand of Rubens sometimes appears. He was appointed principal painter to the archduke Albert, governor of the Low Countries, for whom he executed some of his finest works. One of these, a " Stag-Hunt, " was presented to Philip III., who commissioned the artist to paint several subjects of the chase, which are still preserved in Spain.

SOANE, SIR JOHN (1753-1837), English architect and art collector, was born near Reading of a humble family whose name of Swan he afterwards altered to Soan or Soane. His talent as a boy attracted the attention of George Dance, junior, the archi- tect, who with other friends helped him on. He won the Royal Academy's silver (1772) and gold (1776) medals, and a travelling studentship, and went to Italy to study (1777-1780). Returning to England he got into practice as an architect, and in 1784 married a rich wife. He became architect to the Bank of England, which he practically rebuilt in its present form, and did other important public work. He became an A.R.A in 1795, and R.A. in 1802, and professor of architecture to the Royal Academy in 1806. In 1831 he was knighted. In his house in Lincoln's Inn Fields he brought together a valuable antiquarian museum (now the Soane Museum) , which in 1835 he presented to the nation with an endowment; and there he died in 1837. (See Museums.)

SOAP, a chemical compound or mixture of chemical compounds resulting from the interaction of fatty oils and fats with alkalis. In a scientific definition the compounds of fatty acids with basic metallic oxides, lime, magnesia, lead oxide, &c, should also be included under soap; but, as these compounds are insoluble in water, while the very essence of a soap in its industrial relations is solubility, it is better to speak of the insoluble compounds as " plasters, " limiting the name " soap " as the compounds of fatty acids with soda and potash. Soap both as a medicinal and as a cleansing agent was known to Pliny (H.N. xxviii. 51), who speaks of two kinds — hard and soft — as used by the Germans. He mentions it as originally a Gallic invention for giving a bright hue to the hair (" rutilandis capillis"). There is reason to believe that soap came to the Romans from Germany, and that the detergents in use in earlier times and mentioned as soap

in the Old Testament (Jer. ii. 22; Mai. iii. 2, &c.) refer to the ashes of plants and other such purifying agents (comp. vol. x. p. 697).

Soap appears to have been first made from goat's tallow and beech ash; in the 13th century the manufacture was established at Marseilles from olive oil, and in England during the next century. The processes and extent of the manufacture were revolutionized at about the beginning of the 19th century by Chevreul's classical investigations on the fats and oils, and by Leblanc's process for the manufacture of caustic soda from common salt.

Previous to Chevreul's researches on the fats (1811-1823) it was believed that soap consisted simply of a binary compound of fat and alkali. Claude J. Geoff roy in 1741 pointed out that the fat or oil recovered from a soap solution by neutralization with a mineral acid differs from the original fatty substance by dissolving readily in alcohol, which is not the case with ordinary fats and oils. The significance of this observation was overlooked; and equally un- heeded was a not less important discovery by Scheele in 1783. In preparing lead plaster by boiling olive oil with oxide of lead and a littie water — a process palpably analogous to that of the soap-boiler — he obtained a sweet substance which, called by himself " Olsuss " (" principium dulce Oleorum "), is now known as " glycerin." These discoveries of Geoffroy and Scheele formed the basis of Chevreul's researches by which he established the constitution of oils and the true nature of soap. In the article Oils it is pointed out that all fatty oils and fats are mixtures of glycerides, that is, of bodies related to the alcohol glycerin C 3 H 5 (OH) 3 , and some fatty acid such as palmitic acid (CicH 3 i0 2)H. Under suitable conditions C 3 H 5 (OH) 3 +3(C I(> H 3I 2)H give C 3 H 5 (C 16 H 31 2) 3 +3H 2 Glycerin. Palmitic Acid. Palmitin. Water.

The corresponding decomposition of a glyceride into an acid and glycerin takes place when the glyceride is distilled in superheated steam, or by boiling in water mixed with a suitable proportion of caustic potash or soda. But in this case the fatty acid unites with the alkali into its potash or soda salt, forming a soap —

C,H 6 (C.,H M CMa+3NaOH=3NaC, e H, 1 2 +C,H5(OH), Palmitin. Caustic Soda. Soap. Glycerin.

Of the natural fats or glycerides contained in oils the most important in addition to palmitin are stearin and olein, and these it may be sufficient to regard as the principal fatty bodies concerned in soap- making.

The general characters of a soap are a certain greasiness to the touch, ready solubility in water, with formation of viscid solutions which on

agitation yield a tenacious froth or " lather," an indisposi- tion to crystallize, readiness to amalgamate with small proportions of hot water into homogeneous slimes, which on cooling set into jellies or more or less consistent pastes. Soaps give an alkaline reaction and have a decided acrid taste; in a pure condition — a state never reached in practice — they have neither smell nor colour. Almost without exception potash soaps, even if made from the solid fatty acids, are " soft," and soda soaps, although made with fluid olein, are " hard "; but there are considerable variations according to the prevailing fatty acid in the compound. Almost all soda soaps are precipitated from their watery solutions by the addition of a sufficiency of common salt. Potash soap with the same reagent undergoes double decomposition — a proportion being changed into a soda soap with the formation of potassium chloride. Ammonia soaps have also been made, but with little commercial success; in 1906 H. Jackson patented the preparation of ammonium oleate directly in the washing water, and it is claimed that for cleansing articles it is only necessary to immerse them in the water containing the pre paration and then rinse.

Soap when dissolved in a large amount of water suffers hydrolysis, with formation of a precipitate of acid salt and a solution con- taining free alkali. The reaction, however, is very complicated. Chevreul found that a neutral salt soap hydrolysed to an acid salt, free alkali, and a small amount of fatty acid. Rotondi in 1885, however, regarded a neutral soap as hydrolysing to a basic salt, soluble in both hot and cold water, and an acid salt, insoluble in cold and sparingly soluble in hot. Chevreul's views were confirmed in 1894 by Krafft and Stern. The extent to which a soap is hydrolysed depends upon the acid and on the concentration of the solution; it is also affected by the presence of metallic salts, e.g. of calcium and magnesium. As to the detergent action of a soap, Berzelius held that it was due to the free alkali liberated with water; but it is difficult to see why a solution which has just thrown off most of its fatty acids should be disposed to take up even a glyceride, and, moreover, on this theory, weak cold solutions, in which the hydrolysis is consider- able, should be the best cleansers, whilst experience points to the use of hot concentrated solutions. It is more likely that the cleansing power of soap is due to the inherent property of its solution to emulsionize fats. This view is supported by Hillyer (Jour. Amer. Chem. Soc, 1903, p. 524), who concluded that the cleansing power depended upon several factors, viz. the emulsionizing power, the

property of penetrating oily fabrics, and lubricating impurities so that they can be readily washed away.

Resin soaps are compounds of soda or potash with the complex acids (chiefly abietic) of which coniferous resins consist. Their formation is not

due to a true process of saponification; but they occupy an important place in compound soaps.

Manufacture. — Numerous varieties of soaps are made; the purposes to which they are applied are varied; the materials employed embrace a considerable range of oils, fats and other bodies; and the processes adopted undergo many modifications. As regards processes of manufacture soaps may be made by the direct combination of fatty acids, separated from oils, with alkaline solutions. In the manufacture of stearin for candles, &c, the fatty matter is decomposed, and the liquid olein, separated from the solid fatty acids, is employed as an ingredient in soap- making. A soap so made is not the result of saponification but of a simple combination, as is the case also with resin soaps. All other soaps result from the combination of fatty oils and fat with potash or soda solutions under conditions which favour saponification. The soap solution which results from the combination forms soap-size and is a mixture of soap with water, the excess alkali, and the glycerin liberated from the oil. In such condition ordinary soft soaps and certain kinds of hard soap are brought to the market. In curd soaps, however, which form the basis of most household soap, the uncombined alkali and the glycerin are separated by " salting out, " and the soap in this condition contains about 30% of water. Soap may be framed and finished in this state, but almost invariably it receives a further treatment called " refining " or " fitting," in which by remelting with water, with or without the subsequent addition of other agents to harden the finished product, the soap may be made to contain from 60 to 70% of water and kept present a firm hard texture.

Almost any fatty substance can be employed in soap-making J but the choice is naturally restricted by the price of the fat and also the quality of the soap desired. The most important of the animal fats are those of the ox and hog, and of the vegetable oils cotton-seed and coco-nut ; it is also to be remembered that resin, although not a fat, is also important in soap-making. Ox and sheep tallow, with the addition of resin, are the primary materials for making the hard yellow or primrose soaps ; these tallows are often adulterated. The cheaper mottled and brown soaps have for their basis bone fat, ob- tained by treating bones with superheated steam or other methods. Lard yields lard oil, which is mainly applied in making hard toilet soaps. Curd soap and London grey mottled are prepared from kitchen or ship fat, whilst fuller's fat is employed in the manufacture of soft soaps. Of the vegetable oils, in addition to cotton-seed and coco-nut, olive oil is the basis of soaps for calico printers and silk dyers; castor oil yields transparent soaps (under suitable treatment), whilst crude palm oil, with bone fat, is employed for making brown soap, and after bleaching it yields ordinary pale or mottled. The alkalis are used almost exclusively in the condition of caustic lyes — solutions of their respective hydrates in water.

Caustic soda is now obtained direct from the soda manufacturer, and one operation, causticizing the soda, is thus spared the soap-boiler. Potash lyes also may be bought direct, but in some cases they are sharpened or causticized by the soap-boiler himself from the carbonate.

The processes of soap manufacture may be classified (a) according to the temperatures employed into (1) cold processes and (2) boiling processes, or (b) according to the nature of the starting material — acid or oil and fat — and the relative amount of alkali, into (1) direct saturation of the fatty acid with alkali, (2) treating the fat with a definite amount of alkali with no removal of unused lye, (3) treating the fat with an indefinite amount of alkali, also with no separation of unused lye, (4) treating the fat with an indefinite amount of alkali with separation of waste lye. In the second classification (2) is typical of the " cold " process, whilst (1), (3), (4) are effected by the " boiling " process.

The cold process, which is only applicable to the manufacture of soaps from readily sapOnifiable oils, such as those of the coco-nut oil group and also from castor oil, is but little used. In it the oils at 35° C. are stirred with concentrated alkali in an iron or wooden tub, whereupon saponification ensues with a development of some heat; the mixture being well agitated. After a few hours the mixture becomes solid, and finally transparent ; at this point the perfume is added, and the product framed and crutched (see under Marine Soap). By blending the coco-nut oil with other less saponifiable substances such as tallow, lard, cotton-seed oil, &c, and effecting the mixing and saponification at a slightly higher temperature, soaps are obtained which resemble milled toilet soaps. Soaps made by this process contain the glycerin originally present in the oil, but, in view

of their liability to contain free alkali and unsaponified oil, the process has been largely (jiven up.

The process of soap-boiling is carried out in large iron boilers called " soap pans " or " coppers," some of which have capacity for a charge of 30 tons or more. The pan proper is surmounted by a great cone or hopper called a curb, to provide for the foaming up of the boiling mass and to prevent loss- from overflowing. Formerly the pans were heated by open firing from below; but now the almost universal practice is to boil by steam injected from per- forated pipes coiled within the pan, such injection favouring the uniform heating of the mass and causing an agitation favourable to the ultimate mixture and saponification of the materials. Direct firing is used

for the second boiling of the soap mixture; but for this superheated steam may with advantage be substituted, either applied by a steam jacket round the pan or by a closed coil of pipe within it. In large pans a mechanical stirring apparatus is pro- vided, which in some cases, as in Morfit's steam " twirl," is formed of the steam-heating tubes geared to rotate. Autoclaves, in which the materials are boiled under pressure, are also employed for certain soaps.

The process of manufacturing soaps by boiling fatty acids with caustic alkalis or sodium carbonate came into practice with the de- velopment of the manufacture of candles by saponifying fats, for it provided a means whereby the oleic acid, which is valueless for candle making, could be worked up. The combination is effected in open vats heated by a steam coil and provided with a stirring appliance ; if soda ash be used it is necessary to guard against boiling over. (See under Curd Soap.)

Curd Soap. — This variety is manufactured by boiling the fat with alkali and removing the unused lye, which is afterwards worked up for glycerin. The oil mixture used differs in the several manu- facturing countries, and the commercial name of the product is correspondingly varied. In Germany tallow is the principal fat; in France olive oil occupies the chief place and the product is known as Marseilles or Castile soap; and in England tallow and palm oil are largely used. But in all countries a mixture of several oils enters into the composition of curd soaps and the proportions used have no fixity. For each ton of soap to be made from 12 to 16 cwt. of oil is required. The soap pan is charged with the tallow or other fat, and open steam is turned on. So soon as the tallow is melted a quantity of weak lye is added, and the agitation of the injected steam causes the fat and lye to become intimately mixed and pro- duces a milky emulsion. As the lye becomes absorbed, a condition indicated by the taste of the goods, additional quantities of lye of increasing strength are added. After some time the contents of the pan begin to clear and become in the end very transparent. Lye still continues to be poured in till a sample tastes distinctly alkaline — a test which indicates that the whole of the fatty acids have been taken up by and combined with the alkali. Then without further addition of alkali the boiling is continued for a few minutes, when the soap is ready for salting out or " graining." Either common salt or strong brine in measured quantity is added to t;he charge, and, the soap being insoluble in such salt solution, a separation of con- stituents takes place: the soap collects on the surface in an open granular condition, and the spent lye sinks to the bottom after it has been left for a short time to settle. Suppose that a pure soap without resin is to be made — a product little seen in the market — the spent lye is run off, steam is again turned on, pure water or very weak lye run in. and the contents boiled up till the whole is thin, close and clear. The soap is from this again grained off or salted out, and the

underlye so thrown down carries with it coloured impurities which may have been in the materials or which arise from contact with the boiler. Such washing process may have to be repeated several times when impure materials have been used. The spent lye of the washing being drained off, the soap is now " boiled for strength." Steam is turned on, and, the mass being brought to a clear condition with weak lye or water, strong lye is added and the boiling continued with close steam till the lye attains such a state of concentration that the soap is no longer soluble in it, and it will separate from the caustic lye as from a common salt solution. The contents of the pan are once more allowed to cool and settle, and the soap as now formed constitutes a pure curd coap, carrying with it some pro- portion of uncombined alkali, but containing the minimum amount of water. It may be skimmed off the underlye and placed direct in the frames for solidification ; but that is a practice scarcely at all followed, the addition of resin soap in the pan and the subsequent " crutching in " of silicate of soda and adulterant mixings being features common to the manufacture. The lye from the strengthen- ing boil contains much alkali and is used in connexion with other boilings.

Mottled Soap.— A curd soap prepared from kitchen fat or bone grease always carries with it into the cooling frame a considerable amount of coloured impurity, such as iron sulphate, &c. When it is permitted to cool rapidly the colouring matter remains uniformly disseminated throughout the ma6s; but when means are taken to cause the soap to cool and solidify slowly a segregation takes place : the stearate and palmitate form a semi-crystalline solid, while the oleate, solidifying more slowly, comes by itself into translucent veins, in which the greater part of the coloured matter is diawn. In this way curd, mottled or marbled soap is formed, and such mottled

appearance was formerly highly valued as an indication of freedom from excess of water or other adulteration, because in fitted soaps the impurities are either washed out or fall to the bottom of the mass in cooling. Now, however, the mottled soaps, blue and grey, are produced by working colouring matter, ultramarine for blue, and manganese dioxide for grey, into the soap in the frame, and mottling is very far from being a certificate of excellence of quality. Yellow Soap consists of a mixture of any hard fatty soap with a variable proportion — up to 40 % or more— of resin soap. That sub- stance by itself has a tenacious gluey consistence, and its inter- mixture in excess renders the resulting compound soft and greasy. The ordinary method of adding resin consists in stirring it in small fragments into the fatty soap in the stage of clear-boiling; but a better result is obtained by separately preparing a fatty soap and the resin soap, and combining the two in the pan after the underlye has been salted out and removed from the fatty soap. The compound then receives its strengthening

boil, after which it is fitted by boiling with added water or weak lye, continuing the boil till by examination of a sample the proper consistency has been reached. On settling the product forms three layers : the uppermost is a thin crust of soap which is worked up again in the pan ; the second is the desired soap ; next there is a dark-coloured weak soap termed nigre, which, because it contains some soap and alkali is saved for future use; underneath these is a solution of alkaline salts with a little free alkali.

Treatment of Settled Soap. — The upper layer having been removed, the desired soap is ladled out or ran off to a crutcher, which is an iron pan provided with hand or mechanical stirring appliances. It is here stirred till it becomes ropy, and the perfume, colour or any other substance desired in the soap is added. The soap is now ready for framing. The frames into which hard soaps are ladled for cooling and solidification consist of rectangular boxes made of iron plates and bound and clamped together in a way that allows the sides to be removed when required; wooden frames are used in the case of mottled soaps. The solidification is a very gradual process, depend- ing, of course, for its completion on the size of the block; but before cutting into bars it is essential that the whole should be set and hardened through and through, else the cut bars would not hold together. Many ingenious devices for forming bars have been pro- duced; but generally a strong frame is used, across which steel wires are stretched at distances equal to the size of the bars to be made, the blocks being first cut into slabs and then into bars.

Marine Soap. — These soaps are so named because they are not insoluble in a strong solution of salt; hence they form a lather and can be used for washing with sea-water. Being thus soluble in salt water it cannot, of course, be salted out like common soaps ; but if a very concentrated salt solution is used precipitation is effected, and a curd soap is separated so hard and refractory as to be practically useless. Coco-nut soap (see above) is typical of this class. Its property of absorbing large proportions of water, up to 86 %, and yet present the appearance of a hard solid body, makes the material a basis for the hydrated soaps, smooth and marbled, in which water, sulphate of soda, and other alkaline solutions, soluble silicates, fuller's earth, starch, &c. play an important and bulky part. Coco- nut soap also forms a principal ingredient in compound soaps meant to imitate curd and yellow soaps. Two principal methods of prepar- ing such compound soaps are employed. I n the first way the ordinary oil and the coco nut oil are mixed and saponified together as de- scribed above. According to the second plan, the ordinary oil is treated as for the preparation of a curd soap, and to this the coco- nut soap separately saponified is added in the pan and both are boiled together till they form a homogeneous soap.

Silicate Soaps. — A further means of enabling a soap to contain large

proportions of water and yet present a firm consistence is found in the use of silicate of soda. The silicate in the form of a concen- trated solution is crutched or stirred into the soap in a mechanical mixing machine after the completion of the saponification, and it appears to enter into a distinct chemical combination with the soap. While silicate soaps bear heavy watering, the soluble silicate itself is a powerful detergent, and it possesses certain advantages when used with hard waters.

Soft Soap. — Soft soaps are made with potash lyes, although in practice a small quantity of soda is also used to give the soap some consistence. There is no separation of underlyes in potash soap, consequently the product contains the whole constituents of the oils used, as the operation of salting out is quite impracticable owing to the double decomposition which results from the action of salt, pro- ducing thereby a hard principally soda soap with formation of potassium chloride. Owing to this circumstance it is impossible to fit " or in any way purify soft soap, and all impurities which go into the pan of necessity enter into the finished product. The making of soft soap, although thus a much less complex process than hard soap making, is one that demands much skill and experience for its success. From the conditions of the manufacture care must be taken to regu- late the amount and strength of the alkali in proportion to the oil used, and the degree of concentration to which the boiling ought to be continued has to be determined with close observation.

Toilet Soaps, &c. — Soaps used in personal ablution in no way differ from the soaps previously alluded to, and may consist of any of the varieties. It is of consequence that they should, as far as possible, be free from excess of alkali and all other salts and foreign

ingredients which may have an injurious effect on the skin. The manufacturer of toilet soap generally takes care to present his wares in convenient form and of agreeable appearance and smell ; the more weighty duty of having them free from uncombined alkali is in many cases entirely overlooked. Transparent soaps are prepared by dis- solving ordinary soap in strong alcohol and distilling off the greater portion of the alcohol till the residue comes to the condition of a thick transparent jelly. This, when cast into forms and allowed to- harden and dry slowly, comes out as transparent soap. A class of transparent soap may also be made by the cold process, with the use of coco-nut oil, castor oil and sugar. It generally contains a large amount of uncombined alkali, and that, with its unpleasant odour of coco-nut oil, makes it a most undesirable soap for

personal use. Toilet soaps of common quality are perfumed by simple melting and stirring into the mass some cheap odorous body that is not affected by alkalis under the influence of heat. The finer soaps are perfumed by the cold method ; the soap is shaved down to thin slices, and the essential oil kneaded into and mixed with it by special machinery, after which it is formed into cakes by pressure in suitable moulds. The greater quantity of high-class toilet soaps are now made by a milling process. A high class soap, which after framing contains about 30% of water, is brought down to a water content of 11-14% by drying in chambers through which warm air is circulated. The soap is now milled in the form of ribbons with the perfume and colour- ing matter, and the resulting strips are welded into bars by forcing through a heated nozzle. The bars are then cut or moulded into tablets, according to the practice of the manufacturer.

Glycerin soap ordinarily consists of about equal parts of pure hard soap and glycerin (the latter valuable for its emollient pro- perties). The soap is melted by heat, the glycerin is stirred in, and the mixture strained and poured into forms, in which it hardens but slowly into a transparent mass. With excess of glycerin a fluid soap is formed, soap being soluble in that body, and such fluid soap has only feeble lathering properties. Soap containing small propor- tions of glycerin, on the other hand, forms a very tenacious lather, and when soap bubbles of an enduring character are desired glycerin is added to the solution. Soaps are also prepared in which large proportions of fine sharp sand, or of powdered pumice, are incorpor- ated, and these substances, by their abrading action, powerfully assist the detergent influence of the soap on hands much begrimed by manufacturing operations. 1

Medicated soaps, first investigated scientifically by Unna of Hamburg in 1886, contain certain substances which exercise a specific influence on the skin. A few medicated soaps are prepared for internal use, among which are croton soap and jalap soap, both gentler cathartics than the uncompounded medicinal principles. Medicated soaps for external use are only employed in cases of skin ailments, as prophylactic washes and as disinfectant soaps. Among the principal varieties are those which contain carbolic acid and other ingredients of coal tar, salicylic acid, petroleum, borax, camphor, iodine, mercurial salts, sulphur and tannin. Arsenical soap is very much employed by taxidermists for the preservation of the skins of birds and mammals.

Miscellaneous Soaps. — The so-called ” floating soaps ” are soaps made lighter than water either by inserting cork or a metallic plate so as to form an air space within the tablet. The more usual method is to take milling soap, neutralize it with sodium bicarbonate or a mixture of fatty acids, and, after perfuming, it is aerated by mixing the hot soap with air in a

specially designed crutcher. Shaving soaps, which must obviously be free from alkali or any substance which irritates the skin, are characterized by readily forming a permanent lather. This property is usually obtained by mixing soft and hard soaps, or, more rarely, by adding gum tragacanth to a hard soap. In the textile trades the wool scourer employs a neutral olive-oil soap, or, on account of its cheapness, a neutral curd or curd mottled brand ; the cotton cleanser, on the other hand, uses an alkaline soap, but for cleaning printed cottons a neutral olive-oil curd soap is used, for, in this case, free alkali and resin are objectionable; olive-oil soap, free from caustic alkali, but often with sodium carbonate, is also used in cleansing silk fibres, although hard soaps free from resin are frequently employed for their cheapness. Soaps of smaller moment are the pearl ash soaps used for removing tarry stains; ox-gall soaps for cleaning carpets; magnesia, rouge and chalk soaps for cleaning plate, &c.

Soap Analysis. — The most important points in soap analysis are (1) determination of the fatty matter, (2) of the total alkali, (3) of the substances insoluble in water, (4) of the water. The first is carried out by saponifying the soap with acid in the heat when the fatty acids come to the surface. If it fails to form a hard cake on cooling, a known weight of wax may be added and the product re-heated. The cake on weighing gives the free acid. The total alkali is de- termined by incinerating a weighed sample in a platinum dish, dis- solving the residue in water, filtering and titrating the filtrate with standard acid. The residue on the filter paper gives (3) the sub- stances insoluble in water. The water in a soap is rarely directly determined ; when it is, the soap, in the form of shavings, is heated to 105 C. until the weight is constant, the loss giving the amount of

1 " Soap powders " and " soap extracts " are powdered mixtures of soaps, soda ash or ordinary sodium carbonate.

water, With genuine soaps, however, it suffices to calculate the fatty acids as anhydrides and add to this the amount of alkalis, and estimate the water by difference. The complete analysis involves an examination of the fatty matter, of the various forms in which the alkalis are presents-free and combined glycerin, &c.

Commerce. — Marseilles has long been recognized as the most im- portant centre of the soap trade, a position that city originally achieved through its ready command of the supplies of olive oil. The city is still very favourably situated for obtaining supplies of oils both local and foreign, including sesame, ground nut, castor oil, &c. In England, during the reign of Charles I., a monopoly of soap-making was farmed to a corporation of soap-boilers in London — a proceeding which led to serious complications. From 1712 to 1853 an excise duty ranging from id. to 3d. was levied on soap made in

the United Kingdom, and that heavy impost (equal when 3d. to more than cost) greatly impeded the development of the industry. In 1793, when the excise duty was 2jd. on hard and I fd. on soft soap, the revenue yielded was a little over £400,000; in 1815 it was almost £750,000; in 1835, when the duty was levied at iˆd. and id. res- pectively (and when a drawback was allowed for soap used in manufactures), the revenue was almost £1,000,000; and in 1852, the last year in which the duty was levied, it amounted to £1,126,046, with a drawback on exportation amounting to £271,000.

Medicine. — Two preparations of hard soap (sodium oleate), made by acting on olive oil with caustic soda, are used in medicine: (1) Emplastrum saponis, made with lead plaster; (2) Pilula saponis composita, which contains one in five parts of opium. Soft or green soap (potassium oleate), made by acting on olive oil with caustic potash, is also used ; its preparation (Linamentum saponis) is known as opodeldoc. Curd soap is also used, and is chiefly a stearate of sodium. The chief use of hard soap is in enemata, and as a suppository in children suffering from constipation; it also forms the basis of many pills; given in warm water it forms a ready emetic in cases of poisonmg. Soft soap is used by dermatologists in the treatment of chronic eczema, and opodeldoc is a domestic remedy for stiffness and sprains. Medicated soaps are made by adding the drug to either hard soap or curd soap in the desired proportions. Useful com- binations are: borax 10%, carbolic acid 5%, ichthyol 5%, sublimed sulphur 10%, thymol 2$%, &c.

See L. L. Lamborn, Modern Soaps, Candles and Glycerin (1906); W. H. Simmons and H. A. Appleton, The Handbook of Soap Manu- facture (1908) ; also J. Lewkowitsch, Oils, Fats and Waxes.

SOAP-BARK, the inner bark of Quillaja saponaria, a large tree which grows in Chile. Reduced to powder, it is employed as a substitute for soap, since it forms a lather with water, owing to the presence of a glucoside saponin, sometimes distinguished as Quillai saponin. The same, or a closely similar substance, is found in soap wort {Saponaria officinalis) , in senega root {Poly gala senega) and in sarsaparilla; it appears to be chemically related to ‘digitonin, which occurs in digitalis. The saponins (with few exceptions) have the general formula (C„Ha,_ 8 Oio, and by the action of dilute acids they are hydrolysed into sugars and sapogenins, which are usually inert pharmacologically. An alternative name for them, and especially for those which are pharmacologically active, is sapotoxins; on this nomenclature the hydrolytic products are termed saponins. Applied as a snuff to the mucous membrane of the nose, saponin (either in soap- bark or in senega root) promotes a violent sneezing. Solutions injected under the skin are violent local irritants and general depressants.

SOBAT, a river of N.E. Africa, the most southerly of the great eastern affluents of the Nile. It is formed by the junction of various streams which rise in the S.W. of the Abys- sinian highlands and N.W. of Lake Rudolf. The length of the Sobat, reckoning from the source of the Baro, the chief upper stream, to the confluence with the Nile is about 460 m. The Baro rises in about 36 10′ E., 7 50′ N. at an altitude of some 7000 ft. It has a general W. direction with a slight N. tendency. It is joined by numerous other streams which also rise on the Abys- sinian plateau. These mountain torrents descend the escarpment of the plateau between great walls of rock, the Baro dropping 3000 ft. in 45 m. It then flows through a narrow gorge at an altitude of about 2000 ft., the mountains on either side towering 3000 to 4000 ft. above the river bed. Just east of 35′ E. the Birbir, descending from the plateau, joins the Baro and brings with it a large volume of water. Some 40 m.' lower down the hills are left behind, the rocks and rapids in the bed of the Baro cease, and the river flows W. across a vast plain with many windings and several divergent channels. From Gambela, a town on its N. bank 20 m. below the Birbir junction, the river is

navigable by steamers during flood time (June-December) to the point of confluence with the White Nile. From the N. the Baro is joined by two considerable rivers which also rise in the rampart of hills that separates Abyssinia from the Sudan, but its chief tributaries are from the S. In about 33° 20′ E., 8° 30′ N., it is joined by the Pibor. This river issues from the swamp region east of Bor on the Bahr-el-Jebel stretch of the Nile and flows N.E. and N. It is joined from the E. and S. by various streams having their sources on the W. slopes of the Kaffa plateau. Of these the chief are the Gelo — which breaks through a gap in the mountains in a series of magnificent cascades — and the Akobo. The Akobo rises in about 6° 30′ N., 35° 30′ E., and after leaving the mountains flows N.W. through flat swampy tracts. The whole region of the lower Pibor and Baro is one of swamps, caused by the rivers overflowing their banks in the rainy season. At its junction with the Baro the Pibor is over 100 yds. wide, with a depth of 8 ft. and a speed of 2-3 ft. per second.

Below the confluence of the Pibor and Baro the united stream, now known as the Sobat, takes a decided N.W. trend, passing for some distance through a region of swamps. Just" beyond the swamps and some 40 m. below the confluence, is the fortified post of Nasser. From this point the ground on either side of the river gradually rises, though on the S. it is liable to inundation during flood time. From Nasser to the junction of the

Sobat with the Nile the river has a course of about 180 m. As it approaches the Nile the Sobat flows in a well-defined channel cut in the alluvial plains through which it passes. The banks become steep, the slope rapid and the current strong. Several khors join it from N. and S., some being simply spill channels. These channels or " loops " are a characteristic feature of the river. The Sobat enters the Nile almost at right angles in o° 22′ N., 31° 31′ E. It is 400ft. wide at its mouth and has adepth of 18 to 20 ft. at low water and of 30 ft. when in flood. The colour of the water when in moderate flood is that of milk, and it is from this circumstance that the Nile gets its name of Bahr-el-Abiad, i.e. White River. In full flood the colour of the Sobat is a pale brick red. The amount of alluvium brought down is considerable. For the part played by the Sobat in the annual rise of the Nile see Nile.

The Sobat was ascended for some distance in 1841 by the Egyptian expedition despatched in the previous year to explore the upper Nile. The post of Nasser (see above) was founded in 1874 by General C. G. Gordon when governor of the equatorial provinces of Egypt, and it was visited in 1876 by Dr W. Junker, the German explorer. The exploration of the river system above Nasser was carried out in the last decade of the 10th century by the Italian explorer V. Bottego, by Colonel (then Captain) Marchand, of the French army, who, on his way from Fashoda to France, navigated the Baro up to the foot of the mountains; and by Captain M. S. Wellby, Majors H. H. Austin and R. G. T. Bright, of the British army, and others. By the agreement of the 15th of May 1902 between Great Britain and Abyssinia the lower courses of the Pibor and Baro rivers to their point of confluence form the frontier between the Anglo- Egyptian Sudan and Abyssinia. See Nile, Sudan and Abyssinia. (W, E. G. ; F. R. C.)

SOBRAON, a decisive battle in the first Sikh War (see Sikh Wars). It was fought on the 16th of February 1846, between the British (15,000) under Sir Hugh Gough and the Sikhs (20,000) under Tej Singh and Lai Singh. The Sikhs had fortified them- selves in a bend on the left bank of the Sutlej, with the river in their rear. The battle began with a two hours' artillery duel, in which the Sikh guns were the more powerful, and the British heavy guns expended their ammunition. Then the infantry advanced with the bayonet, and after a fierce struggle took the Sikh entrenchments. The Sikh losses were estimated at from 5000 to 8000. This battle ended the first Sikh War.

SOBRIQUET, a nickname or a fancy name, usually a familiar name given by others as distinct from a " pseudonym " assumed as a disguise. Two early variants are found, soibriquet and soubriquet; the latter form is still often used, though it is not

the correct modern French spelling. The first form suggests a derivation from sot, foolish, and briquet, a French adaptation of Ital. brichetto, diminutive of bricco, ass, knave, possibly connected with briccone, rogue, which is supposed to be a derivative of Ger. brechen, to break; but Skeat considers this spelling to be due to popular etymology, and the real origin is to be sought in the form soubriquet. Littre gives an early 14th century soubsbriquet as meaning a " chuck underthe chin," and thiswould be derived from soubs, mod. sous (Lat. sub), under, and briquet or bruchel, the brisket, or lower part of the throat.

SOCAGE, a free tenement held in fee simple by services of an economic kind, such as the payment of rent or the perform- ance of some agricultural work, was termed in medieval English law a socage tenement. In a borough a similar holding was called a burgage tenement. Medieval law books derived the term from socus, ploughshare, and took it to denote primarily agricultural work. This is clearly a misconception. The term is derived from O. Eng. soc, which means primarily suit, but can also signify jurisdiction and a franchise district. Historically two principal periods may be distinguished in the evolution of the tenure. At the close of the Anglo-Saxon epoch we find a group of freemen differentiated from the ordinary ceorls because of their greater independence and better personal standing. They are classified as sokemen in opposition to the villani in Domesday Book, and are chiefly to be found in the Danelaw and in East Anglia. There can hardly be a doubt that previously most of the Saxon ceorls in other parts of England enjoyed a similar condition. In consequence of the Norman Conquest and of the formation of the common law the tenure was developed into the lowest form of freehold. Legal protection in the public courts for the tenure and services deemed certain, appear as its characteristic feature in contrast to villainage. Certainty and legal protection were so essential that even villain holdings were treated as villain socage when legal protection was obtainable for it, as was actually the case with the peasants on Ancient demesne who could sue their lords by the little writ of right and the Monstraverunt. The Old English origins of the tenure are still apparent even at this time in the shape of some of its incidents, especially in the absence of feudal wardship and marriage. Minors inheriting socage come under the guardianship not of the lord but of the nearest male relative not entitled to succession. An heiress in socage was free to contract marriage without the interference of the lord. Customs of succession were also peculiar in many cases of socage tenure, and the feudal rule of primogeniture was not generally enforced. Commutation, the enfranchisement of copyholds, and the abolition of military tenures in the reign of Charles II. led to a gradual absorption of socage in the general class of freehold tenures.

See Pollock and Maitland, History of English Law, i. 471 ff. ; F. W.

Maitland, Domesday Book and Beyond, 66 ff. ; P. Vinogradoff, Villainage in England, 113 ff., 196 ff.; English Society in the nth Century, 431 ff. (P. Vi.)

SOCIAL CONTRACT, in political philosophy, a term applied to the theory of the origin of society associated chiefly with the names of Hobbes, Locke and Rousseau, though it can be traced back to the Greek Sophists. According to Hobbes {Leviathan), men lived originally in a state of nature in which there were no recognized criteria of right and wrong, no distinction of meum and tuum. Each person took for himself all that he could; man's life was " solitary, poor, nasty, brutish and short." The state of nature was therefore a state of war, which was ended by men agreeing to give their liberty into the hands of a sovereign, who thenceforward was absolute. Locke (Treatise on Government) differed from Hobbes in so far as he described the pre-social state as one of freedom, and held that private property must have been recognized, though there was no security. Rousseau (Cohtrat social) held that in the pre-social state man was unwar-like and even timid. Laws resulted from the combination of men who agreed for mutual protection to surrender individual freedom of action. Government must therefore rest on the consent of the governed, the volonte gen&rale. Though it is quite obvious that the theory of a social contract (or compact,

as it is also called) contains a considerable element of truth — that loose associations for mutual protection preceded any elaborate idea or structure of law, and that government cannot be based exclusively on force — yet it is .open to the equally obvious objection that the very idea of contract belongs to a more advanced stage in human development than the hypothesis itself demands. Thus the doctrine, yielding as a definite theory of the origin of society to the evidence of history and anthrop- ology, becomes interesting primarily as revolt against medieval and theocratic theories of the state.

SOCIALISM, a term loosely formed from the Latin adjective socialis (socius, a comrade), and first used of certain doctrines of Robert Owen (g.v.). " Socialist " occurs in a discussion between Robert Owen and the Rev. J. H. Roebuck at Manchester (publ. Heywood, Manchester, 1837), pp. 27, 133. From the context it seems a nickname. But the title " Owenist " was disliked by many supporters (see Co-operative Magazine, 1826, p. 28) and " Co-operator " was acquiring a different sense. The new term was used in 1838 in France (by Pierre Leroux), and figures in 1840 in

Reybaud's Socialistes modernes.

Definition. — Socialism is that policy or theory which aims at securing by the action of the central democratic authority a better distribution, and in due subordination thereunto a better production, of wealth than now prevails.

This definition may not entirely cover the ancient and medieval theories to which the name has been given by modern writers (see also Anarchism, Communism, Co-operatton). It hardly covers the schemes of Robert Owen himself. But just as chemistry is not alchemy, or astronomy astrology, modern socialism is not to be identified with Utopian fancies, and need not be so defined as to embrace them. For a like reason it need not be so defined as to include every tenet of leading socialistic writers. We must disentangle their socialism from what is superadded to it and not involved in the socialistic idea.

The word began in the days of Owen; but, as there were utilitarians before Mill made the name current, so there were socialists before Owen. Socialism, as a policy, begins with the beginnings of politics. As a theory, it begins whenever the state is perceived to have a distinct office from other factors in the order of society, and that office is so magnified that the whole or main charge of the economic resources of the people is assigned to the state, whether for production or for distribution. There was anarchism among the Cyrenaics and Cynics. Phaleas of Chalcedon was a communist. There is state socialism in the Republic of Plato, and much remains in the Laws. It is true that in those days society and state are not clearly distinguished. When Aristotle tells us that " man is by nature a political animal " (Politics, i. 1), the adjective is ambiguous. But the individual and the state are not confused ; they are even, by the Cynics, too far separated.

State and individual were also well apart in Rome, under the Roman system of legal rights — public, private, real, and personal. There were socialistic measures in Rome, panis et cir censes; and there were agrarian, to say nothing of usury laws. But trade and industry were not usually regarded as worthy subjects for the state and the statesman to touch at all. There are instances of municipal socialism in Italy and the provinces under the Roman Empire (S. Dill, Roman Society front Nero to Marcus Aurelius, 1005, pp. 218, 220, 222). In the middle ages feudalism was more akin to paternal government than to individualism; but it was, politically, too undemocratic to approach a true socialism. On its decadence something like a de facto municipal socialism made its appearance. The gilds of the great cities, imperium in imperio, regulated production and incidentally distribution. They did not prevent the existence of millionaires like the Fuggers, but they brought even these rich men under their rules. The

equality was greater than the liberty, though neither was complete, to modern notions.

With the breaking up of the gilds came what is commonly called individualism. Thenceforward over against the control- ling government of the monarch or the commonwealth was to stand the commercial competition of free individuals. It is one

of our modern problems to determine whether this individualism is doomed or not. It has never existed pure and unmixed. Between the time of the gilds and the time of the trade unions lies the time, say in England in the 16th and 17th centuries, 'when there were enterprising trade and busy industry, with enough of power surviving in the old organizations to prevent absolute anarchy. As invention followed invention in the i8tb century, industry changed its form and became great instead of small. That is to say , it tended to become more and more an affair of large capital and large workshops, and, instead of the industrial individualism of small masters and independent " manufacturers," who were still " hand " workers, there was appearing the industrial collectivism of the factory system, where manufacture was nothing without its machinery, its colossal division of labour and its strict technical discipline and drill. There was a short period in England when employers were allowed to draw advantage from the change without any hind rance from the state. But in no greater time than one generation the regulation of factories began, the period of anarchy ended, and the commercial competition of free individuals began to be surrounded with safeguards, more or less effective.

Modern socialism, as defined above, is (a) opposed to the policy of laissez-faire, which aims at the least possible inter- ference with industrial competition between private persons or groups of persons, and (b) suspicious of a policy of mere regula- tion, which aims at close surveillance and control of the pro- ceedings of industrial competitors, but would avoid direct initiative in production and direct attempts to level the in- equalities of wealth. The leading idea of the socialist is to convert into general benefit what is now the gain Of a few. He shares this idea with the anarchist, the positivist, the co-operator and other reformers; but, unlike them, to secure his end he would employ the compulsory powers of the sovereign state, or the powers of the municipality delegated by the sovereign. In the former case we have state socialism, in the latter municipal. Where there is direction or diversion of industry by the public force mainly for the benefit of a few, this is hardly socialism. It employs the same machinery, the public force; and it secures a revenue which may possibly be used for the general benefit, as in the case of protective duties. But in such cases the general benefit is only a possible incident. So far (for example) as protection succeeds in keeping out the foreign competitors, the main result is the

assured gain or prevented loss of a few among the citizens. Socialism by intention and definition would secure benefits not for a few, a minority, or even a majority, but for all citizens. Communism has the same end in view; and socialism and communism (q.v.) are often confused in popular thought. But the communist need not be a socialist ; he may be an anarchist, an opponent of all government; while the socialist need not be a communist. The socialists of the 20th century rarely, if ever, demand that all wealth be held in common, but only that the land, and the large workshops, and the materials and means of production on a large scale shall be owned by the state, or its delegate the municipality. The despotism of gilds would not now be tolerated. The strictest public regulation of trade and industry will probably continue to be that of the state, rather than of the municipality, for local rules can be evaded by migra- tion, the state's only by emigration. But the smaller bodies are likely to display more adventurous initiative; and it is significant that they appear in the imagination nearer to the individual than the state even of a small people can ever appear to its own citizens. Yet it is not the smallest unit, the parish, that has shown most activity in England, but the county, a unit arith- metically nearer to the state than to the individual.

It might be plausibly argued that the movement of modern events has been rather towards a kind of anarchism (q.v.) than a kind of socialism, if it were not for the element of compulsion (quite contrary to anarchism). Even the English poor law, universally called socialistic, is administered locally and the degree of socialism varies with the parishes. When the state's regulation went further and further in a succession of Irish Land Acts (1870, 1881, 1903), it assumed a socialistic character; the

face of agricultural industry was transformed for the benefit of the majority, if hardly of the whole, by the action of the state. But the result has been a state-aided individualism. The attempt to transform all industries by protection has not been made by the English state in these days. It remains broadly' true that, since the English state became more democratic (Reform Acts of 1832, 1867, 1884), its socialism has become more and more of the municipal character. The end in view having more to do with economics than with politics, it mattered little theoretically whether the power exercised was that of the central authority acting directly or the delegated power in the hands of the smaller public bodies.

This has been the course of events in England with little conscious theory or principle on the part of the people or even of its leaders. It is certainly a

partial fulfilment of the aspirations of those whose theory or principle is socialism. The most important form of modern socialism, which may be called for convenience " social democratic " socialism, is founded on economic theory more or less clearly understood; it is therefore often described as economic or scientific socialism. Many men have become socialists less from logic than from sympathy with suffering. But modern socialism without disowning sentiment knows the need of facts and sound reasoning better than its predecessors, whom it calls Utopian. While among civilized peoples the suffering has on the whole grown less, the influence of socialism has grown greater; and this is largely owing to the efforts made by the best socialists to reason faithfully and collect facts honestly. The remarkable extension of socialism in Germany may be traced in great part to the special circum- stances which have made social democracy the chief effective organizer of working men in that country. But modern socialism is not a purely German product. To scientific socialism England, France and Germany have all made contribution.

Its theoretical basis came, in two curiously different ways, from practical England. The idea that the underpaid labour of the poor is the main source of the wealth of the rich is to be found not only in Godwin and Owen but in the minor English land- reformers and revolutionary writers of the 18th and early 19th centuries, such as T. Spence, W. Ogilvie, T. Hodgskin, S. Read, W. Thompson. The positions of Ricardo that value is due to labour and that profits vary inversely as wages were taken by Marx (without Ricardo's modifications) as established doctrines of orthodox political economy. It was declared to be a scientific truth that under modern industrial conditions the " exploita- tion " of the labourer is inevitable. In the theory of rent the exploitation of the tenant by the landlord was already admitted by most economists. It was for the socialists to show that the salvation both of tenant and labourer lay in the hands of the central authority, acting as the socialists would have it act.

France had been prepared for socialism by St Simon and Fourier. The revolutions of 1830 and 1848, though on the whole unsuccessful in directly organizing labour, made socialistic ideas circulate widely in Europe. Men began to conceive of a political revolution which should be also a social revolution, or of a social and industrial revolution which should be also political. We may say broadly that the socialism of 1910 was either inspired by the ideas of that time or is coloured by them. Modern scientific socialism was thus about fifty years old towards the end of the first decade of the 20th century. It would have little claim to be scientific if it had undergone no change in that time; but the change was not greater than the change in orthodox economic doctrine, which indeed it had followed.

Its adherents may be classified (1) according to theory and (2) according

to policy, though, as scientific socialism is really both theory and policy, being a political claim founded on an economic argument, the distinction is sometimes a matter of emphasis.

There are theorists who find the exploitation of the tenant by the landlord to be the main evil whether it involves the degradation of the labourer or not. As some theologians confine their criticism to the Old Testament, so Henry George and Professor A. Loria, shunning the name of socialist, would not

directly attack the system of modern large capitals but the appropriation of land. The social-democrat attacks both. He either takes Marx as guide, or, allowing Marx to be vulnerable, he stands on received economic doctrines with the addition of a political theory. He may himself rest content with the national- izing of the means of production or he may tend towards communism.

In policy there is a difference between those scientific socialists who admit of no compromise with the existing order and the other scientific socialists who are willing to work with the existing order. The straitest sect would keep quite aloof from ordinary politics. The first step towards compromise is to allow the formation of a socialistic party in the legislature, bearing a protest against all other existing parties. This is the rule on the continent of Europe. The next step is to allow members of the party to be also members of other existing political parties; this is common in England and her colonies. The political history of scientific socialism is to a large extent the history of its attempts to avoid, to effect and to utilize the compromise.

There is, of course, a large body of socialists outside any organ- ization. Partly from the teachings of socialists and partly from literary descriptions of the aims and reasons of socialism, there are multitudes who think socialistically without defining their own position with the exactness of the scientific socialist. It is often these amateurs who fall readily into Utopias and who confound the boundaries between socialism and communism. This is done for example by such writers as H. G. Wells and Upton Sinclair. The temptation is evident. The borderland between large production and small may be sometimes debate- able; and, as soon as the socialistic nationalizing of large production is extended to small, the way is open to the Utopias of communism. Communism is an idea far more Utopian than socialism. Like the idea of a kingdom of heaven or a millennium, it springs often from a spiritual enthusiasm that feels sure of its end and, at first at least, recks little of the means.

The enthusiasm may spring from a real conversion of the sort described in the Republic of Plato (vii. 516). Even scientific socialism, depending theoretically on close adherence to economic principles, depends practically on this conversion. It is as with Christianity, which depends on its theology but also on its change of heart; till we have refuted both we have not

refuted Christianity. So a change of heart, which is also a change of view, is to socialism, as a religion, what economic and political theory is to it as a creed. All that is best in anarchism shares this spiritual feature with socialism. It is of a higher type than the human sympathy which went with Utopian socialism; it includes that sympathy and more. It requires a mental somersault of the kind taken by Hegel's metaphysician and (analogically) by Dante at the earth's centre. The observer begins to see the world of men all over again, throwing from him all the prejudice of his class and abstracting from all classes. This abstraction may be less hard for those who belong to a class that has little-, than for those of a class that has much, as religious conversion is held to be easier for the poor. But it is not really easy for any. The observer tries to conceive what is at bottom the difference between rich and poor. Casuists can show that the line is a vanishing one, and that there are large groups of cases where the distinction is unsubstantial. Such borderlands are still the sporting ground of economists and philosophers and biologists. We could hardly contend, however, that no distinctions are true which break down at the border. It seems unsafe to say there is no war of classes, because at their nearest extremities the classes pass into each other. At the utmost we might infer that the best way to bring the war to an end was to crowd the nearest extremities. At present, taking the contrast not at its least or greatest but at its mean, we find it no fancy. The features that make the lower as distinguished from the higher are of different quality and kind, not merely of amount. They are described perhaps most fully by Tolstoy in Que faire ?, but they are brought to the ken of every one of the rich who can overhear the daily talk of the poor,

enter into their daily cares and put himself in their place. If he makes the somersault and is " converted," all the little and great privileges of the rich seem now to have as many presump- tions against them as were before in their favour. Why should he have so much comfort and they so little? why should he be secure when they live from hand to mouth? why should art and science and refinement be thrown in his own way and be hardly within their reach at all? Such and similar ponderings are not far from a revolt against inequality, whether the revolt takes the shape of anarchism or of socialism. It carries us beyond the paternal socialism of Carlyle and Ruskin or even of the author of Sybil, relying as Disraeli did on the " proud control " of the old English state, which was occasionally and spasmodic- ally constructive as well as controlling, but was always actuated by a feeling Like that of a chief to his clansmen. The exponents of paternal socialism have no clear consciousness of the change in the state itself. They think

they can still use the old tools. They see that the people have changed, but they do not see that if the past cannot be revived for a people neither can it be revived for a state. The idea of lordship (as distinguished from leadership) is becoming intolerable; and this restiveness may contain a safeguard against one of the worst risks of socialism, bureaucracy. Before the governing bureaucracy had destroyed all originality and eccentricity, the sovereign people would have discovered for itself that " tyranny is a poor provider."

Great Britain. — In England a certain academic interest in socialism was created by Mill's discussions on the subject in his Political Economy (1848) and a more practical interest by the appearance of the Christian Socialists. " The red fool-fury of the Seine " caused prejudice even against such harmless en- thusiasts. The People's Charter (in the 'thirties) had no socialistic element in it. Socialism first showed signs of becoming a popular movement in England after the lecturing tour of Henry George (1881-1882) in advocacy of the nationalizing of the land. About that very time (1880) the Democratic (afterwards in 1883 the Social Democratic) Federation was formed by advocates of the whole socialistic programme. A secession took place in 1884 when William Morris, H. M. Hyndman and Belfort Bax founded the Socialist League. William Morris parted company with the league in 1890, and seems to have become more anarchist than socialist. Edward Bellamy's Looking Backward (1887) made some impression among intellectual people in England; but Robert Blatchford's Merrie England (1894) made much more way amongst the multitude, followed up as it was by his newspaper the Clarion. – There were still few signs of a strong party. The first members of the Fabian Society (1888) were by definition opportunists, and though the Fabian Essays (1889) were socialistic they were the declarations of men willing to use the ordinary political machinery and accept reforms in the present that might point to a socialistic solution in the very far distance. Most of the Fabians became hard-working radicals of the old type, with general approval. England does not love even the appearance of a revolution. Nevertheless a change has come over the spirit of English politics in the direction desired by socialists, though hardly through any efforts of theirs. The change was predicted by Herbert Spencer in i860 (Westm. Rev. April) some years before household suffrage (1867). In The Man versus the Stale (1885) he demonstrates that liberal legisla- tion which once meant the removal of obstacles now meant the coercion of the individual. Though a large part of the coercive measures enumerated by Spencer are rather regulation than socialism, undoubtedly there is here and there a socialistic provision. Thomas Hill Green's dictum, " It is the business of the State to maintain the conditions without which a free exercise of the human faculties is impossible " (Liberal Legislation and Freedom of Contract, 1881), did not in appearance go much further than

Herbert Spencer's that " it is a vital requirement for society and for the individual to recognize and enforce the conditions to a normal social life " (The Man versus the Slate, p. 102); but the former saw clearly that the policy of the future must go beyond mere regulation. Too much importance has been attached to a saying of Sir William Harcourt in 1888,

" We are all Socialists now." He meant no more than that we are all social reformers who will use the aid of the state without scruple if it seems necessary. He did not mean that the English people had adopted a general principle of socialism. Except in the case of free trade, it is hard to discover a general principle in English politics. The English people judge each case on the merits, and as if no general principle ever affected the merits. Regulation and not initiative is the prevailing feature of the action of government even now. The railways are still in private hands. The state railways, canals and forests of India, though John Morley (afterwards Viscount Morley) " made a present of them to the Socialists " (House of Commons, 20th July 1906), are the public works of a modern benevolent despotism, and do not go very far beyond those of its ancient prototype. They are the works not of the Indian but of an alien demo- cracy. Contrariwise, in England itself, possessed of a fair measure of self-government, crown lands, government dock- yards, army, fleet, post office were in existence when there was no thought of state socialism; they are not modern innova- tions but time-honoured institutions.

The same is true of a great part of municipal socialism. It existed in the middle of the 19th century, and no local community would have been deterred from having its own water-supply or gas works by any fear of socialism. The fear is still less deterrent now; and we have seen electric lighting, tramways, parks, markets, ferries, light railways, baths and wash-houses, house property, river steamers, libraries, docks, oyster beds, held by towns like Glasgow, Birmingham, Manchester, Liverpool, Leeds, Bradford, Huddersfield, Colchester. Sometimes the management is economical, sometimes wasteful; but in all cases the undertakings have been supported by a majority who care little for general theory and everything for local interests. The " unity of administration " successfully advocated by Edwin Chadwick in the later Victorian period, and requiring " competition for the field but not in the field," is not inconsistent with municipal socialism. This last has been provided with new machinery by the establishment of county and district councils (1888), parish councils (1894) and even the perhaps-otherwise-intended metropolitan borough councils (1899). Till 1907, when the progressive party in the London County Council were heavily defeated, that council was certainly moving in the path of municipal socialism. But, in its achievements as distinguished from its claims, it had not overtaken, still less surpassed, Birmingham or Glasgow. Municipal socialism in Britain finds many critics; it has the drawbacks of all democratic self-government.

It is sometimes wasteful; but it is seldom corrupt ; and there is no general desire for a return to a less adventurous policy. In the country districts democracy is still imperfectly conscious of its own power. There are acts on the statute book that would well equip a parochial socialism; but socialists seem to be able to do little more than accelerate slightly what seems to be the inevitably slow pace of political reform in England. Whether the extension of the franchise to women will quicken the rate of reform is uncertain.

With every allowance, the change in English politics has been real, and it has been due in a great measure to the growth of organization among working men. The old trade unionism passed out of its dark ages by the aid of legislation (in 1871), which was for thirty years (till the Taff Vale decision in 1901, the older view being restored by the Trades Disputes Act 1906) considered to give to the trade unions the advantages of a corporation without the drawbacks. At the same time, through a better law of small partnerships (Industrial and Provident Societies Acts 1852, 1862, 1876), the co-operative societies were making rapid progress. Compulsory education (1870) increased the intelligence of the labouring classes and therewith their power to use their opportunities. Labour legislation, removing truck, making inspection and regulation of factories more stringent (see the consolidating Act of 1878 and the Factory and Workshop Act 1901) and providing compensation for accidents (1906), was forwarded by both political parties. This was not socialism but regulation. The old unionists werr

radicals of the old type. Not so the unionists who came first into prominence with the Dock Strike in London in 1889. The way had been prepared by demonstrations of the unemployed in 1887 and 1888. When unionism embraced unskilled labourers, and at the same time pressed on the federation of all trades societies and their joint action, when, too, in the trade union congresses the intervention of the "state was repeatedly claimed as essential to the success not only of an eight hours' day but of such socialistic measures as nationalization of the land, it was manifest that there was a new leaven working. The larger the numbers included in the trades societies the more their organization was bound to depart from that of the mass meeting, and to become indirect instead of direct self-government, government by representatives, and more and more by specially trained representatives. This was a tendency towards bureaucracy, or government by officials, not the highest type of popular government. A better preparation for democratic government has been

given by the co-operative societies. If it be true that under a coming socialism the working class must dominate, then every phase of organization must be welcomed which widens their experience of self-government, more especially in the handling of industrial and commercial affairs. This last kind of education has been well given by co-operation, though chiefly through capital and hired labour on the old pattern of the ordinary employers. Co-partnership societies, best exemplified in the midland districts of England, are more democratic; but their numbers are few. The claims of the workman are somewhat in advance of his education. On the other hand it seems impossible in England to secure moderate concessions without extravagant claims.

Germany. — In Germany it was long an axiom that socialists must leave ordinary politics and political machinery severely alone as an evil thing. The short and futile struggle for constitu- tional liberty in 1848-1849 had driven most of those who were " thinking social istically " into abandonment of political reform and into plans of fundamental change amounting to revolution. Karl Mario (1810-1865) and K. J. Rodbertus (q.v.) contented themselves with laborious and profound studies not intended to bear immediate fruit in practice. Marx and Lassalle were not so pacific. The former was from the first (see his Manifesto of 1847) inclined to give socialism an international character, taking also no pains to distinguish it from communism. Lassalle desired it for his own nation first. Both of them were in a sense Hegelians. From Hegel they had learned that the world of men, like the world of things, was in constant process of development ; but unlike Hegel they regarded human evolution as purely materialistic, effected always by a struggle between classes in society for the outward means of well-being. Feudalism, itself the result of such a struggle, had given place to the rule of the middle classes. The struggle to-day is between the middle classes and the working classes. At present those who do not possess capital are obliged to work for such wages as will keep them alive, and the gains from inventions and economics are secured by the employers and capitalists. The labourer works at his cost price, which is " the socially necessary wages of subsistence " (the bare necessaries of a civilized life); but he produces much more than his cost, and the surplus due to his " unpaid labour " goes to the employer and capitalist. This is what Lassalle called the " brazen law of wages," founded on Ricardo's supposed doctrine that (a) the value of an article that is not a monopoly is determined by its cost in labour, and (b) the wages of labour tend to be simply the necessaries of life. The tendency of the labouring population to increase beyond the means of steady employment is a frequent benefit to the capitalists in the periodic expansions of investment and enterprise, arising in response to new inventions and discoveries. Large business in modern economy swallows up small. Not only the independent artisans and

workers in domestic industries, but the small capitalists and employers who cannot afford to introduce the economies and sell at the low prices of their large rivals are disappearing. But the growth of the proletariat, together with the concentration of business into fewer hands and larger companies, will cause the

downfall of the present system of industry. The proletariat will realize its own strength; and the means and materials of production will be concentrated finally into the hands of the commonwealth for the good of all. This revolution, like that which overturned feudalism, is simply the next stage of an evolution happening without human will, fatally and necessarily, by virtue of the conditions under which wealth is produced and snared in our times.

Such was in substance the view of all the German socialists of the last half of the 19th century. Even Rodbertus had advanced a claim of right on behalf of working men to the full produce of their labour, but thought the times not ripe for socialism. The others made no such reservations. Lassalle planned a centralized organization of workmen led by a dictator, and called on the government of Prussia to establish from the public funds co-operative associations such as his opponent Schulze-Delitzsch had hoped to plant by self help. His socialism was rather national than universal. Marx looked beyond his own nation. He founded the International Union of Working Men in 1864, the year of Lassalle's tragic death. Before the common danger of police prosecutions and persecution the followers of Lassalle and Marx were united at the congress of Gotha in 1875. The name social democrats had crept into use about 1869 when the followers of Marx founded at a congress in Eisenach the social democratic working men's party. The party began to be a power at the congress of Gotha. It is a power now, but its doctrines and policy have undergone some change.

The last quarter of the 19th century witnessed (1) the repressive laws of 1878, (2) their repeal in 1890, (3) the three Insurance Laws and (4) a quickened progress of German industry and wealth during thirty years of peace and consolidation.

Bismarck's government, alarmed by attempts on the life of the emperor and by the increased number of votes given to socialistic candidates for the reichstag, procured the passing of the Exceptional Powers Act (Ausnahme Gcselz) in 1878. The legislation at this time resembled the Six Acts of 18 19 in England. Combined action and open utterance in Germany became almost impossible; and for organs of the press the social democrats had recourse to Zurich. Liebknecht and Bebel could still raise their voices for them in parliament, for Bismarck failed in his attempt to deprive members of their immunities (March 1879). But the agitation as a whole was driven

underground; and it speaks well for the patience and self-control of the people that no wide- spread excesses followed. The declaration of the Social Demo- cratic congress at Wyden, Switzerland, in 1880, that their aims should be furthered " by every means " instead of the old phrase " by every lawful means," was a natural rejoinder to the law that deprived them of the lawful means; and it seems to have had no evil consequences. In 1881 repression was so far relaxed that trade unions were allowed to recover legal standing. In 1890 the reichstag refused to renew the law of 1878 for a fifth period; and finally in 1899 it repealed the law forbidding the amalgama- tion of workmen's unions, and specially aimed at the new social- istic unions, the natural allies of the social democrats. The vexatious prosecutions and condemnations for Majestats- beleidigung (/we majestt) following 1890 did the- cause more good than harm. The socialistic voters increased from 437,438 in 1878 to 1,800,000 in 1894 and 2,120,000 in 1898, while the elected members increased from 12 in 1877 to 46 in 1894 and 56 in 1898. By 1903 the voters had increased to three millions and in the elections of February 1907 they were 3,240,000. The socialists, however, in 1907 found themselves represented by 43 members as against 79 in 1903. The reduced representation was due to a combination of the other parties against them, the matters at issue not being industrial policy, but colonial government and naval expenditure. The increase in the number of voters remains a proof that the power of the party in Germany has rather in- creased than diminished. In 1908 they gained seven seats in the Prussian Diet, where they had hitherto been unrepresented. Yet " remedial measures " had been passed which were intended to make socialism unnecessary. Bismarck, who admired Lassalle and had no scruples about the intervention of the state, had

planned a series of measures for the insurance of workmen against sickness, accidents and old age, measures duly carried out n 1883, 1884 and 1 891, respectively. The socialists not unreason- ably regarded the government as their convert. They could point to two other " unwilling witnesses," the Christian Socialists and the " Socialists of the Chair."

In the Protestant parts of Germany the socialists as a rule were social democrats, in the Catholic as a rule they were Christian Socialists. As early as 1863 and 1864 Dr Dollinger and Bishop Ketteler, followed by Canon Moufang, had represented socialistic sentiment and doctrine. Ketteler, who had been under the influence of Lassalle, had hopes that the church would make productive associations her special care. Moufang would have depended more on the state than on the church. All were awake to the evils

of the workmen's position as described by the social democrats, and they were anxious that the Catholic church should not leave the cure of the evils to be effected without her assistance. Ketteler died in 1877; and the pope's encyclical of the 28th of December 1878 bore no trace of his influence, mixing up as it did socialists, nihilists and communists in one common condemnation. The encyclical De conditione opificum of 1 89 1 might show that the views of the Christian Socialists had penetrated to headquarters; but the encyclical on Christian Democracy of 1901 (January) betrays no sympathy with them. The Protestant church in Germany has been hampered by fear of offending the government; but it contains a vigorous if tiny body of Christian Socialists. Rudolf Todt, a country pastor, was their prophet. His book on Radical German Socialism and Christian Society (1878) led Dr Stocker, the court chaplain, to found an association for " Social Reform on Christian Prin- ciples." This was denounced rather unfairly by politicians of all ranks as an organized hypocrisy. Its influence was shortlived, and its successor, the "Social Monarchical Union" (1890), shared the unpopularity of Stocker, its founder. Even the Socialists of the Chair, middle class Protestants as they were, would have nothing to say to it, but preferred to go a way of their own.

From the year 1 858 there had existed a league of economists and statesmen called the "economic congress" (Volkswirtschafl- licher Kongress), a kind of English Cobden Club, though it aimed chiefly at free trade among all sections of the German people in particular. After the Empire its work seemed finished; and a new society was formed, the " Union for a Policy of Social Reform" (Verein fur Socialpolitik). Professors G. Schmoller, W. Roscher, B. Hildebrand, A. Wagner, L. J. Brentano, the statistician E. Engel and others met at Halle in June 1872, and a meeting of their supporters followed at Eisenach in October of that year. These Katheder-Socialisten or Socialists of the Chair (academic socialists) agreed with the social democrats in recog- nizing the existence of a " social question," the problem how to make the labourers' condition better. To the old-fashioned economist this was no problem for the legislature; competition solved its own problems. But, while the social democrats looked for social revolution, the academic socialists were content to work for social reform, to be furthered by the state. The state was, to them, " a great moral institution for the education of the race." They were a company of moderate state socialists, relying on the state and the state as it then was. They did much gratuitous service to the government in the preliminary in- vestigations preceding the great insurance laws.

The German people were made a little more inclined to state socialism than before by the efficiency displayed by the bureau- cracy in the wars of 1866 and 1870. If the Insurance Laws are found to work well, this inclination may be confirmed, and the idea of a revolution may fall into the

background. The attitude of the social democratic party became less uncompromising than in earlier days. Since they regained their liberty in 1890, their leaders have kept them well in hand. Their principal journal Vorwarts was conducted with great ability. Their agitation became as peaceful as that of trade unionists or co-operators in England. They ceased to denounce the churches. They tried to gain sympathy, quite fairly, by taking up the cause of any distressed workers, or even ill-used natives in colonies, and urging

redress from the state. The present state had become to them almost unconsciously their own state, a means of removing evils and not a mere evil to be removed. The anarchists had been disowned as early as 1880. The extreme socialists who demanded return to the old tactics were cast out at Erfurt in 1891, and became " Independent Socialists."

The controversy between friends and critics of socialism still rages in learned circles, producing a prodigious quantity of literature year by year; but the old strictures of Treitschke and Schaffle seem now to have lost a little of their point. Though the programme adopted at Gotha in 1875 was not entirely or even seriously altered, the parts of it due to Lassalle fell into the background. For many years Marx and not Lassalle was the great authority of the party. Marx died in 1883, but remained an oracle till 1894, when (just before his own death in 1895) Engels published the last volume of his friend's book on capital. The volume was expected to solve certain logical difficulties in the system. Instead of this, it caused a feeling of disappoint- ment, even among true believers. Many, like Bebel and Kautsky, kept up the old adoration of Marx; but many, like Eduard Bernstein, rightly felt that to give up Marx is not to give up socialism, any more than to give up Genesis is to give up theology. Bernstein openly proposed in congress that the old doctrines and policy of the party, involving as they do the despair of reform and insistence on the need of revolution, should be dropped. He had not carried his point in 1908, but his influence seemed to be increasing. The death of Liebknecht (August 1900) re- moved from the ranks of the social democrats one of their most heroic figures, but also one of the strongest opponents of such a change of front. Yet Liebknecht himself had made concessions. It was impossible for a man of his shrewdness to close his eyes to what the state had done for the German workman. It was impossible, too, to ignore the progress that Germany had made in wealth and industry since the creation of the Empire in 1871. Germany has been fast becoming a manufacturing country; and, though the growth of large manufacturing towns in the Rhine valley and elsewhere has multiplied socialists, it has added to the income of the German workman. He is further from poverty and distress; and his socialism means an endeavour after a larger life, not, as formerly, a mere struggle against starvation. It is likely, therefore, to have less and less of

mere blindness and violence in it.

The German socialists were chiefly interested in securing such an extension of the franchise in Prussia as would make their representation in the Prussian parliament correspond as near to the number of their adherents as in the Reichstag itself. They had only gained seven seats in the former in June 1908, though they had perhaps half a million of adherents in Prussia. They seemed for good or for evil to be taking the place of the old radical party. The position in Austria was somewhat different. The first general elections held under a really democratic suffrage (May 1907) resulted in the return of eighty social democrats and sixty Christian socialists to the Reichsrath, as compared with eleven and twenty-six in the unreformed parliament. They were opposed (as anti-clerical and clerical) on many questions, but they made it certain that economic and industrial policy affecting the whole nation would rival and perhaps out-rival the questions of racial supremacy and haute politique that absorbed the attention of the old Reichsrath.

France. — In France the socialists have found it harder to work in the parliamentary harness. Marx had said long ago that for the success of socialism besides English help there must be " the crowing of the Gallic cock." French enthusiasm for social revolution is feeble in the country districts but very strongly pronounced in the large towns. The Communards of 1871 might be called municipal socialists of a sort, but their light went out in that annee terrible. Something like a movement towards organized socialism began in 1880 on the return of some prominent members of the old commune from exile. A congress was held at Havre under the leadership of J. Guesde and J. A. Ferroul; it adopted a " Collectivist" programme, Collectivisme meaning state socialism. A minority under J. F. E. Brousse and J. F. A.

Joffrin broke away (in 1881) from the main body and stood out for municipal socialism, decentralization and, later (1887), self- governing workshops aided by public money. Co-operative workshops are already subsidized in France from the public funds, and favoured by preferences in public works and other privileges, without striking results. The Broussistes are also called Possibilistes, as content with such socialism as is immediately practicable. They supported, for example, agrarian reform on the present basis of private property (Marseilles, 1892). After several unsuccessful negotiations, the amalgamation of the Collectivists, Possibilists and Blanquistes (extreme revolu- tionaries)) was accomplished in 1899.

But the body had not the cohesion of the German party. Though the socialists in the Chamber acted more or less loyally together, they were not closely controlled by the organization outside. In consequence (like Mr John Burns in England in 1905-1906) those who accepted office usually came under a cloud. This happened to M. Millerand when he became minister of commerce in the Waldeck Rousseau government of 1899, and in a less degree to M. Jaures when he became vice-president of the Chamber. M. Millerand was, indeed, expelled from the party, and at the socialist congress of Amsterdam (August 1904) a strongly worded resolution con- demned any participation by socialists in bourgeois (middle-class) government. The vote was not unanimous, and the resolution itself was attributed to the German Bebel. An attempt was made in Paris (April 1905) to bind the various parties of French socialists more closely together by forming a new "Social- ist party, the French Section of the International Labour Union," It laid down stringent rules for the guidance of socialist deputies. In comparison with the steady united action of the Germans, the proceedings of the French socialists, perhaps from their greater political liberty, seems a wayward guerilla warfare. The French state is not on principle averse from intervention. It has been always more ready than in England to interfere with competitive trade and to take the initiative on itself. It controls the Bank of France, owns most of the railways, and directs secondary as well as primary education. After the disputes at Carmaux (in 1892) it proposed to take over the mines. There is no general poor law; but ojd-age pensions have been voted, and workmen's compensation is as old as 1888. State socialism might have gone farther if French bureaucracy had not proved less efficient than German.

Though there are socialistic French professors there can hardly be said to be a body of academic socialists in France. The strongest economic writing is still that of the orthodox economists, P. E. Levasseur, P. P. Leroy-Beaulieu, Yves Guyot. Even Professor Charles Gide, though reformer, is not socialist. Of the two party periodicals La Revue socialiste is moderate, Le Mouvement socialiste hardly so. The latter is in many ways more akin to anarchism than state socialism. Socialism has its allies in the sporadic Christian socialism of the Churches, both Catholic and Protestant, and in the solidarists who would trans- form the existing system of employment without abolishing private property. The school of Le Play, though devoted to social reform, can hardly be called an ally of socialism.

Netherlands. — Socialism has found a kindlier soil, in Belgium and Holland, and these countries have been the favourite meeting-place in recent years of congresses of all denominations of socialists. In Belgium the Flemish social democratic party led by de Paepe united in 1879 with the Brabantine or Walloon. They organized trade unions. They helped the liberals in 1893 to procure the extension of the suffrage. In 1907 they had

thirty representatives in parliament. The flourishing co-operative societies, Vooruit (Forwards) in Ghent and Maison du people of the Brussels bakers, were the work of their members. Its success in co-operation is almost the distinctive feature of Belgian socialism. Socialists helped to procure the adoption by Belgium of a system of old-age pensions for the poor in 1000, and of the cheap trains which do so much for the workmen in town and country. In Holland, which is not a crowded manu- facturing country but even now largely agricultural and pastoral, the socialists are less formidable, if that be the right word. They

came into line with the German socialists in 1889. Social reform proceeds with or without their aid. There has been a factory act since 1889 and an act for workmen's insurance against accidents since 1900. Municipal socialism has made progress. The great railway strike of 1903 aroused public interest in the condition of the workman, but the legislation that followed was rather regulative than socialistic.

Switzerland. — Switzerland, for generations a refuge to exiles, shows them hospitality without sharing their views. There is little legislation of a socialistic nature; socialists are to be found here and there, especially in the German cantons.

Scandinavia. — Scandinavia stands less apart from European movements than formerly, but industrial legislation is rather regulative than socialistic. Hjalmar Branting, one of the most prominent socialists, was in 1908 a member of the Swedish parlia- ment. The trade unions of Denmark are largely socialistic, but Denmark is no nearer complete conversion than England.

Italy, Spain. — Socialism might be thought to find a better soil in Italy and Spain. Italy has been described as " all prole- tariat." But a great depth of poverty fits a people rather for the anarchism of violence than for socialism. The social demo- crats have made way, notwithstanding, and in 1895 returned fifteen members to parliament. Milan is still the capital of the movement. Laveleye had the idea that revolution was hopeless in Italy because Rome was uninhabitable every summer. But social democracy in Germany, its own country, is not bound up with Berlin. Italy as a whole must make progress in social and political development before it can receive the new ideas and still more before it can grow beyond them. The burden of taxes leads to revolts of sheer despair, followed by repression which has extended to socialistic clubs (Jasci dei lavoratori) and even workmen's unions. State socialism in the form of state railways has not been very efficient. Factory legislation is behind that of other civilized countries, and is of very recent origin (1902). Old-age pensions were introduced in 1898, and accidents insurance on the German model in the

same year. Municipal socialism, finding some trammels removed, had in the first decade of the 20th century begun to show itself in the large towns. In Spain there is a Socialist Federation; there are socialist newspapers; and there seems to be no doubt that the cause has gained ground, even as against anarchism. It may perhaps yet be a power in the legislature. It is mainly in Russia that anarchism has the field to itself.

Russia. — In spite of the hopes excited by the Duma, reformers in Russia have been strongly tempted to be anarchists, even of a violent type. Democracy had special difficulties in reaching legislative power. Partly for this reason, " social democracy" has had a subordinate place. The Russian socialists have, some of them, rebelled against the view once essential to socialistic orthodoxy: that Russia must pass through the stage of " capitalism" before reaching the stage of "collectivism." Marx him- self (in 1877) conceded that the progress might be direct from the system of village communities to the ideal of social demo- cracy. Capitalism is already extending itself, and the con- sistency of the theory need not have been broken. Even so, in the absence of democratic government, the prospects of socialism are doubtful. In Finland there were in 1908 eighty socialist members in a parliament of two hundred. The party might console itself by the thought that over the whole Russian empire many more were socialists than could declare themselves so.

Australia. — In contrast to nearly all the countries of "Old Europe," the self-governing colonies of Greater Britain stand out as nothing if not demoaratic. Nowhere is democracy sturdier than in Australia, the separate states of which have since 1900 been federated as one commonwealth. But while it has a pro- tective tariff and makes no pretence of a laissez-faire policy, the central government is less socialistic than the separate con- federated states. The progress even of these has been, as in England, rather in municipal than in state socialism. It is true that crown lands, mines and railways figure more largely. But to find state socialism in its vigour we must pass to New Zealand.

New Zealand. — Removed 1 200 m. from Australia, its nearest civilized neighbour, secured by English naval power and " com- passed by the inviolate sea," New Zealand is better suited for the experiment of a closed socialistic state than perhaps any other country in the known world. It began its new career in 1880-1890, too late for perfect success but not too late to secure a large measure of public ownership of what elsewhere becomes private property. It owns not only the railways but two-thirds of

the whole land, letting it on long leases. It sets a limit to large estates. It levies a progressive income tax and land tax. It has a labour department, strict factory acts and a law of compulsory arbitration in labour disputes (1895). There are old-age pensions (1898), government insurance of life (1871) and against fire (1905). Women have the suffrage, and partly in consequence the restriction of the liquor traffic is severe. There is a protective tariff, and oriental labour is excluded. The success of the experiment is not yet beyond doubt; compulsory arbitration, for example, did not work with perfect smoothness, and was amended in 1908. But there has been no disaster. The decline of the birth-rate has been greater than in Britain. It is fair to add that the experiment is probably on too small a scale to show what might happen in larger countries. New Zealand has only 100,000 sq. m. of territory and about one million of inhabitants, mainly rural and of picked quality. The conditions of combined isolation and security are not easily obtained elsewhere. The action of the state has been in the great majority of instances rather regulative than construc- tive.

Canada. — This last feature is still more marked on the great North American continent. The Dominion of Canada, from its foundation by confederation in 1867, has given its land away too freely. The Dominion, indeed, has only had the land of new territories to dispose of; the original states are the owners of their own unsettled lands. The Dominion government owns the Intercolonial railway but contents itself with subsidies to the rest, over which it has a very imperfect control (by its Railway Commission). It levies royalties on Yukon gold, carries out public works, especially affecting the means of transport between province and province; and in theory whatever functions are not specially reserved to the provinces fall to the Dominion government. The provincial governments, however, show the greater activity. Ontario owns mines and railroads, Nova Scotia coal and iron fields. " The operation of public utilities " by the municipalities is encouraged. Over Canada with the rise of large towns there has been an advance of municipal socialism, not only in the largest, like Toronto, but in the newer and smaller, such as Port Arthur on Lake Superior, where half the local expenditure is paid by public works. Municipal socialism is still in advance of state socialism. Yet the Dominion has a democratic franchise, paid members, a labour department and free education. The democratic basis is not lacking; but the nature of the country is not such as to make it likely that Canada will lead the way in socialistic experiments. The protective tariff, by developing groups of manufacturing in- dustries before their time, introduced into Canada some of the troublesome features of urban civilization in older countries. Accordingly trade unions became better organized. Trusts (like that of the grocers, 1908) began to show themselves. But socialistic propaganda was mainly confined to the mining districts, especially in the far west.

United States. — The great American republic would seem a better field for socialistic experiment, having more men, more states and ample political liberty. But state socialism, in the strict sense of the action of the central supreme authority, is limited by the Federal constitution, and any functions unassigned to the central authority by the constitution fall to the separate states. The separate states have rarely gone farther in a social- istic direction than England itself. In the way of restriction and regulation they have often done more (see Bryce, Atner. Commonwealth, part, v., chap. 95). From 1876 the separate states have had an admitted right to control undertakings having the nature of monopoKes. The railways are in private hands;

and it was not until 1887 by the Interstate and Commerce Act (followed in 1888 by the Railway and Canals Act) that the Federal power secured control over the means of transport running beyond one state into anothen In the same way the Anti-Trust Law of 1890 gave control over the great combinations for " forestalling and engrossing " the supply of articles of necessity or wide use. Socialists have regarded trusts as the stepping-stones to state socialism; but the American people would seem to prefer to see government controlling the trusts rather than itself displacing them.

Trade unionism has made better progress under the Federation of Labor than in the more ambitious Knights of Labor (1878). Like their English counterparts, the societies in the United States include numbers of socialists, and perhaps even more followers of Henry George in advocacy of the nationalization of the land and the " single tax." The death of Henry George (1897) has not ended his influence. On the other hand the socialists without compromise have had a "Socialistic Labor Party " since 1877. Bellamy's socialistic Utopia, Looking Backward (1888), caused nearly as great a sensation as Henry George's Progress and Poverty (1879). It led to the movement called " Nationalism," the scope of which was the nationalizing • of the means of production generally. Of a less literary sort was the influence of " Populism " and the People's party (formed in 1889). Mixed up with the politics of W. J. Bryan in 1896, it lost a little of its uncompromising socialistic flavour.

General Criticisms.— If the ideal of state socialism be viewed in an equally critical spirit, many of the objections brought by the moderate anarchists are seen to have their weight. A strong central government to which all power was given over all the chief industries in the country would, they say, be contrary to liberty. Our leaders would be too likely to become again our masters. Supervision would become irksome. Great powers would be a temptation to abuse of power. A democracy with a strong central government would need to leave much to its chosen guardians, and to retain the same men in the position of guardians till they fully learned the

difficult business of their office; but this in the end means either what we have now, a government by elected leaders, who, once elected, consult our wishes only on rare occasions, — or a government by per- manent officials, which means liberty to go on in the old ways but great fear and jealousy of new ways, in fact, order without progress, no liberty of change.

This criticism becomes rather stronger than weaker if we press the doctrine of the supremacy of the working-classes, a doctrine that figures largely with some socialists. We are told that having been nothing, the working-classes will be everything; having so long been the ruled, they will be the rulers; they have produced for all the rest, the product will now be theirs instead of another's. This doctrine is not essential to socialism; it is indeed hardly consistent therewith. It would not be fair to press it, for no men know better than the scientific socialists that under modern conditions it is in most cases quite impossible to say what is the product of one man's labour. Articles are not made at one stretch by one individual. The contributions of the various hands and minds concerned from first to last in the production of a pocket-knife or a pair of trousers would travel over our stage like Banquo's ghostly descendants in a line that seemed to have no ending. What the socialists demand, when they are not declaiming to uncritical sympathizers, is not that a man should have what he- makes but that what is made by great capitals or on great estates should be so distributed that it is not engrossed by individuals, but satisfies the wants of as many as possible. There is no superior enlightenment in the ordinary unskilled or even skilled manual labourer to fit him above others for supreme power. According to socialists and anarchists and indeed all of us who are not incurable optimists, the hungry generations have trodden the working man down too much to make him instantly or even speedily fit to do the work of govern- ment himself. He is of like passions wiih ourselves. He will be perfectly qualified in process of time to share in such respons- ible work. But at present he needs training.

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SOCIAL SETTLEMENTS

The anarchists for their part do not desire the concentration of industry and the rule of it from the centre by anybody, working man or not — and they think the social democrats quite wrong in believing the concentration inevitable. They point to the fact that at the present moment there is a partial revival of domestic industries, assisted by gas and electricity. These are the small industries of people with small means; they make a less imposing figure before the public than the great trusts, such as the Steel Trust, and the Shipping Trust. The sums involved are so immense that it might seem impossible for competitors to cope with the trusts; therefore, it

is thought, the trusts will soon rule alone, and, lest they should rule ill, the state should take their place. A great combination approaches monopoly, and a far-rea„ching, wide-stretching monopoly (say of the carrying trade) might mean a public danger. Should we listen to our friends the socialists and avert the danger by making the state the monopolist?

There seems no proof of the necessity of this extreme step. Where there is political danger the old-fashioned method of regulation and control by the state seems quite equal to the occasion. As yet the trusts are on their trial and their success is not certain, still less their abuse of the success when it comes. Their monopoly is not an absolute monopoly; and they have a wholesome consciousness of the possibility of competitors. A government trust would have none such. In some instances there would be the further difficulty that to prevent political friction it would need to be a trust of several nations— an idea difficult to realize on such a scale and in such matters.

The English mind does not turn readily to state trusts; but it finds no difficulty in municipal and local trusts. Private local monopolies, like those of the water companies in London, were as troublesome to the locality as any universal monopoly of the article could be; and the remedy which even London must find for the troubles will be the municipal trust. There are few instances in England of successful appropriation by the state of a business formerly competitive; railways are still only regulated. But there are so many examples of successful appropriation by the local authorities that the future absorption by them or the central authority of habitually unruly companies which have contrived in any way to abuse their monopoly may be deemed almost certain. The great demand of the scientific socialists is thus likely in England at least to break up into smaller separate demands that will obtain their answer separately by patient political action.

Socialism is making progress, but not to any great extent state socialism. New Zealand itself, where it has perhaps done most and best, is not a proof to the contrary, the province of Ontario in Canada having twice the area and population. Rather is it true that the state is more decidedly regulative. The ultimate result, to judge by the old countries, may be that each nation will include a community of groups more or less socialistic in organization, but will not itself be a socialistic state. The socialistic experiment is more likely to be tried by provinces than by states, by districts than by provinces, by towns than by districts. They all get their compulsory powers, as delegated to them, from the central authority; but the central authority itself has shown little power of originative action, and it lacks the minute knowledge of the people on the spot. The one or two great industries and businesses (railways, post office, telegraphs, forests, census, coinage, in some countries) that have formed the chief public works that are

everybody's business and nobody's business, will probably remain a state concern; but the limits to the state's activity except in regulation soon arrive. On the other hand, there is no visible assignable limit to municipal or local socialism, as long as the state's parliament leaves it a free course. If the localities choose to make social experiments there seems no rule of general policy to prevent them, if we put aside experiences of financial failure or of the tendency to corruption. The great fear conjured up by the vision of socialism has been the fear of a new despotism. The despotisms of some hundreds of local bodies are likely to checkmate one another, or at least always likely by their varieties of pattern

to provide a means of escape for individuals unhappy under the rule of any one of them.

Anarchism, when at all rational, resolves the state-into it» component municipalities and small groups. The question which carries us beyond anarchism is how such groups can last and be secure without a central state. They could only be so on the assumption of a change in human nature of which there is nc sign. It seems not improbable that in the far future the strong central government will be so democratic and at the same time so wise with the wisdom of a great representative council that all that is sound in the contentions and aspirations of anarchists and socialists will be secured by it. Before such a future arrives, we can best prepare for it by seeing to it whether in a new country or an old that our representative system represents us at our best. Our small councils and our great councils will not of themselves become cleaner for having larger powers. If they are not clean they are a public danger. If they are clean, the coming socialism, whatever be its precise complexion, need have no terrors. It too will represent the people at their best .

Bibliography. — For the writings of Owen, Marx, &c, see under their names. For the general history see John Rae's Contemporary Socialism. For German socialism more particularly W. H. Dawson's German Socialism and Ferdinand Lassalle. See also Karl Marx and the Close of his System, by B6hm Bawerk (translated by Mrs J. M. Macdonald, 1898), Der Verein filr Socialpolitik und seine Wirk- samkeit auf dem Gebiete der gewerblichen A rbeiterfrage, by Dr E. Conrad (1906). For English recent developments, J. Ramsay Macdonald's Socialismand Society, as well as Sidney Webb's Socialism in England; also articles in The Times (London) during January 1909. For Australia and New Zealand, W. P. Reeves's Slate Experi- ments in Australia and Nevi Zealand (1902). For the United States J. G. Brooks's Social Unrest (1903). For municipal socialism see Major Darwin's Municipal Trade (1903), and Dr F. C. Howe's Municipal Ownership in Great Britain (Bulletin of U.S. Bureau of Labor) ; also Municipal and Private Operation of Public Utilities (Report of National Civic Federation,

New York, 1907) and Munici- pal Corporations (Reproductive Undertakings) (Return to House of Commons, 1902), 141 pages of statistics. On the nationalizing of railways see debate in House of Commons nth February 1908; also the article Railways : Economics. For Italy, Bolton King's "Recent Social Legislation in Italy," Economic Journal (1903); and for France, J. L. Jaures' Histoire du socialisme, and Ch. Gide's "Economic Literature in France," Economic Journal (1907). (J. B.)

SOCIAL SETTLEMENTS, associations of. men and women of the educated classes who take up residence in the poqcei; quarters of great cities for the purpose of bringing cul- ture, knowledge, harmless recreation, and especially personal influence to bear upon the poor in order to better and brighten their lives. Practically, the watchword of such settlements is personal service. To Arnold Toynbee (q.v.) may be given the credit of leading the way in this direction, and the Hall which Canon Barnett established (in 1885) to his memory in the east end of London was the first material embodiment of the movement. Since then many settlements of the same or similar nature have sprung up in Great Britain and America some too on the continent of Europe and some in India aad Japan. The sympathies of young men at the universities have been enlisted towards the movement, and an Oxford house, a Cambridge house, and other university missions have been founded in London. There are also many in connexion, with various religious bodies. The practical spirit is shown in the formation of gilds, camps and institutes. Lads and girls, and even children, are gathered together; efforts being made to organize for them not only educational and religious opportuni- ties, but harmless recreation, while the dwellers in the settlements share in the games and identify themselves most sympathetically with all the recreations. Many of the residents take also a considerable share in the work of local administration. Women's settlements probably are more general in the United States than in Great Britain; but in both countries they carry out a great variety of useful work, providing medical mission dispensaries, district nurses, workrooms for needle-women^ hospitals for women and children, &c.*

See W. Reason, University and Social Settlements (1898); S; Coitv Neighbourhood Guilds (1892); G. Montgomery, Bibliography 0/ College, Social, University and Church Settlements (Boston, 19,00). .

SOCIETIES, LEARNED

SOCIETIES, LEARNED. Under Academies will be found a general account of the principal bodies of which that word forms part of the titles, usually denoting some kind of state support or patronage But that account excludes a number of important scientific, archaeological, and literary societies, chiefly founded and carried on by private collective effort. Most of the

insti- tutions hereinafter mentioned are still flourishing. Fine art societies are not included.

In their modern form learned and literary societies have their origin in the Italian academies of the Renaissance: private scientific societies arose chiefly during the 19th century, being due to the necessity of increased organization of knowledge and the desire among scholars for a common ground to meet, com pare results, and collect facts for future generalization. These bodies rapidly tend to increase in number and to become more and more specialized, and it has been necessary to systematize and co-ordinate their scattered work. Many efforts have been made from time to time to tabulate and analyse the literature published in their proceedings, as, for instance, in the Repertorium of Reuss (1801-1821) and the Catalogue of Scientific Papers of the Royal Society (1867-1902) forphysics and natural science, with its subject indexes and the indexes of Walther (1845) and Koner (1852-1856) for German historical societies. A more recent example may be found in G. L. Gomme's Index of Archaeo- logical Papers (1907). . A further development of the work done by societies was made in 1822, when, chiefly owing to Humboldt, the Gesellschaft deutscher Naturforscher und Arzte first met at Leipzig. This inauguration of the system of national congresses was followed in 1831 by the British Association for the Advance- ment of Science, which has served as the model for similar societies in France, America, Italy, Australia and South Africa. The merit of introducing the idea of migratory congresses into France is due to the distinguished archaeologist, M. Arcisse de Caumont (1802-1873), who established the Association Normande, which from 1845 held a reunion in one or other of the towns of the province for the discussion of matters relating to history, archae- ology, science and agriculture, with local exhibitions. From the same initiation came the Congres Archeologique de France (1834), which was organized by the SocietS Francaise pour la Conserva- tion des Monuments Historiques, the Congres Scientifique, which held its first meeting at Caen in 1833 (directed by the Institut des Provinces) , and the Congres des SocieUs Savantes des Departe- ments, which for many years after 1850 held its annual sittings at Paris. The idea received the sanction of the French govern- ment in 1 86 1, when a Congres des Societes Savantes was first convoked at the Sorbonne by the minister of public instruction, who had in 1846 produced an Annuaire des Societis Savantes. In Italy Charles Bonaparte, prince of Canino, started an associa- tion with like objects, which held its first meeting at Pisa in 1839. Russia has had an itinerant gathering of naturalists since 1867. International meetings are a natural growth from national congresses. Two remarkable examples of these cosmopolitan societies are the Congres International d' Archeologie et d' Anthro- pologic Prehistoriques, founded at Spezzia in 1865, and the

United Kingdom. — First in antiquity and dignity among English societies comes the Royal Society (q.v.) of London, which dates from 1660. In 1683 William Molyneux, the author of The Case of Ireland Stated, exerted himself to form a society in Dublin after the pattern of that of London. In consequence cf his efforts and labours the Dublin Philosophical Society was established in January 7684, with Sir William Petty as first president. The members subsequently acquired a botanic garden, a laboratory and a museum, and placed themselves in communication with the Royal Society of London. Their meetings after 1686 were few and irregular, and came to an end at the commencement of hostilities between James II. and William III. The society was reorganized in 1693 at Trinity College, Dublin, where meetings took place during several years. On 25th June 173 1, chiefly owing to the exertions of Dr S. M. Madden, the Dublin Society for Improving Husbandry, Manufactures, and other Useful Arts came into existence. In January 1737 they commenced to publish the Dublin Society's Weekly Observations, and in 1746 the society was placed on the civil establishment, with an allowance of £500 a year from the government. A charter of incorporation was granted in 1750, and seven years later the

Royal Dublin Society for the first time owned a house of its own, and in the following year began the drawing school, which subse- quently did so much for Irish art. Between 1761 and 1767 govern- ment grants to the amount of £42,000 for promoting national agriculture and manufactures were distributed by the society, which claims to be the oldest scientific body in the United Kingdom after the Royal Society of London. It has published Transactions (1799, &c); and its Proceedings (1764-1775; 1848, &c.) and Journal (1856-1876, &c.) are still issued. The Dublin Univ. Phil. Soc. issues Proceedings. For the Royal Irish Academy, see Academies.

The Royal Physical Society of Edinburgh was instituted in 1771, and incorporated in 1 788 ; it is exclusively devoted to natural history and the physical sciences. With it have been merged many other societies, such as the Chirur go- Medical in 1796, the American Physical in 1796, the Hibernian Medical in 1799, the Chemical in 1803, the Natural History in 18 12 (which brought in Brougham and Mackintosh) and the Didactic in 1813. It issues Transactions and Proceedings (1858, &c). From the Philosophical Society of Edinburgh (1731) was developed the Royal Society of Edinburgh, whose charter is dated 29th March 1783. It was to comprise a physical and a literary class; among the members of the latter were Robertson, Hume, Burke and Reid, and among those of the former Hutton, Black, Playfair, Dugald Stewart and Watt. The literary division

has been much less productive than the other. A second charter was obtained in 181 1. The society has published Transactions (4to, 1788, &c.) and Proceedings (8vo, 1832, &c). The Royal Scottish Soc. of Arts (1821) publishes Transactions.

The Linnean Society for the promotion of zoology and botany was founded in 1788 by Dr (afterwards Sir) J. E. Smith, in order to supplement the work of the Royal Society, and obtained a royal charter in 1802. The herbarium and collections of Linnaeus, with the founder's additions, were purchased after his death. It removed from Sir Joseph Banks's old house in Soho Square to Burlington House (London) in 1857, an d assumed the apartments it now occupies in 1873. It has published Proceedings (1849, &c). The Journal (8vo, 1856, &c.) and the Transactions (4to, 1 791, &c.) are divided into zoological and botanical sections. The Society fcr the Encouragement of Arts, Commerce, and Manufactures took its origin in 1753 from an academy established in the Strand by the landscape painter William Shipley. Attention was paid to the application of science to practical purposes, a subject passed over by the Royal Society. Exhibitions of pictures by native artists were held, and the first exhibitions of the Royal Academy took place in its rooms. A fresh start in a new career was made by the Society of Arts (since 1909 known as the Royal Society of Arts) in 1847, when it obtained a charter and the presidency of the Prince Consort. The International Exhibition of 1851 sprang from the smaller exhibitions previously held in its rooms. The East Indian section dates from 1869, the foreign and colonial and the chemical sections from 1874. Its organs have been Transactions (1783-1849) and the Journal (1853, &c). Sir Joseph Banks, Count Rumford and other fellows of the Royal Society started the Royal Institution in 1799, when a site was purchased in Albemarle Street for " an establishment in London for diffusing the knowledge of useful mechanical improvements," to " teach the application of science to the useful purposes of life." The institution was incorporated in the following year. One of the most important epochs in the history of chemistry must be dated from the establishment of the laboratory where Davy and Faraday pursued their investigations. Belonging to the institution are foundations for professorships in natural philosophy, chemistry and physiology. Courses of lectures on special subjects are given as well as discourses (once a week) of a more general and literary character. Its Journal has been issued since 1802. The London Institution was established on a similar basis in 1805 and incorporated in 1807. The building in Finsbury Circus was erected in 1819. The British Association for the Advancement of Science was instituted at York on 27th September 1831, an imitation of the itinerant scientific parliament held in Germany since 1822 (already referred to), and arose from a proposal by Sir D. Brewster. A meeting is held annually at some place in the British empire chosen at a previous meeting. The object

of the association is to promote science, to direct general attention to scientific matters, and to facilitate intercourse between scientific workers. Abstracts of the proceedings and reports of committees are published in the annual Report (1833, &c). The Historical Society of Science (1841) printed a couple of volumes; and the Ray Society (1844), instituted for the printing of original and scarce old works in zoology and botany, still flourishes. The Royal Colonial Institute was founded in 1868 and incorporated in 1882. It pro – , ides a place of meeting for gentlemen connected with the colonies and British India, undertakes investigations into subjects relating to the British empire, has established a museum and library, and gives lectures in its new, building in Northumberland Avenue (London). It has published Proceedings since 1870. The Victoria Institute, or Philosophical Society of Great Britain, was founded in 1865 to form a connecting bond between men of science and others engaged in investigating important questions of philosophy and science, more especially those bearing upon the truths revealed in Holy Scripture. Its organ is the Journal (1867, &c). The Royal Asiatic Society and the East India Association (1866) publish Journals. The African Society meets at the Imperial Institute and publishes a

Journal. The Selborne Soc. (1885) promotes nature study and issues a Mag. The foundation in 1 82 1 of the Society for the Encourage- ment of the Useful Arts in Scotland, now usually known as the Royal Scottish Society of A rts, lor the promotion of the useful arts and such branches of science as bear upon them, was due to Sir D. Brewster, Sir J. Mackintosh and others; it was incorporated in 1841, and has published Transactions since that year.

The leading provincial societies of Great Britain of a general character are as follows :— Aberdeen, Nat. Hist. Soc. (1863), Trans.; Phil. Soc. (1840). Alloa, Soc. of Nat. Hist, and Arch. (1863), Proc. (1865, &c). Banff, Banffshire Field Club and Sc. Soc. (1880), Proc. Bath, Nat. Hist, and Antiq. Field Club (1866), Proc. (1867, &c); Roy. Lit. and Sc. Inst. (1825), Proc; Bath Lit. and Phil. Assn. Bedford, Bedfordshire Nat. Hist. Soc. (1875), Trans. Belfast, Nat. Hist, and Phil. Soc. (1821), Proc. (1852, &c), museum; Naturalists' Field Club (1863), Proc. (1875, &c). Berwickshire Naturalists' Club (1831), Proc. (1834, &c). Birkenhead, Lit. and Sc. Soc. (1857). Birmingham, Nat. Hist, and Phil. Soc. (1858), Trans.; Birmingham and Midland Institute Sc. Soc. (1870), Trans, of archaeological section (1871, &c); Phil. Soc. (1876) has a fund for promotion of original research, Proc. ; Midland Union of Nat. Hist.

Societies (1877), Midland Naturalist. Bolton, Lit. and Phil. Soc. (1871). Bradford, Phil. Soc. (1865) ; Bradford Scientific Assn. (1875), Journal. Brighton, Brighton and Hove Nat. Hist, and Phil. Soc. (1855), Proc. Bristol, Naturalists' Soc. (1862), Proc. (1866, &c). Burnley, Lit. and Sc. Club (1873), Trans. Burton-on-Trent, Nat. Hist, and Arch. Soc. (1876), Trans. Cambridge, Phil. Soc. (1819; incorporated 1832), for the promotion of philosophy and natural science, owns museum and library, Proc. (1843, &c), Trans. (1821, &c). Cardiff, Naturalists' Soc. (1867), Trans. Chester, Soc. of Nat. Sc, Lit. and Arts (1871). Cork, Royal Inst. (1807), library; Cuvierian and Arch. Soc. (1836). Cornwall Royal Inst., at Truro (1818), devoted to natural philosophy, natural history, and antiquities, Journal (1864, &c); Royal Cornwall Polytechnic Soc, at Falmouth (1833; founded by the daughters of R. W. Fox and others), for the encouragement of science and the fine and industrial arts, Trans. (1835, &c). Cumberland Assoc, for the Advancement of Lit. and Sc. (1876), provided a means of union for the local societies of Cumberland and Westmoreland, Trans. Derby- shire Arch, and Nat. Hist. Soc. (1878), Journal. Berry Nat. Hist, and Phil. Soc. (1870). Devonshire Assoc for the Advancement of Sc. (1862). Dorset Nat. Hist, and Antiq. Field Club (1875), Proc. Dum- friesshire \and Galloway Sc, Nat. Hist, and Antiq. Soc (1876), Trans. Dundee, Naturalists' Soc (1873). Eastbourne, Nat. Hist. Soc (1867), Proc. (1869, &c). East of Scotland Union of Naturalists' Societies (1884), Trans. Ebbw Vale, Lit. and Sc. Inst. (1850). Elgin, Elgin and Morayshire Lit. and Sc. Assoc. (1836). Essex Field Club (1880), museums at Stratford and Chingford. Exeter, Naturalists' Club and Arch. Assoc. (1862). Glasgow, Roy. Phil. Soc. (1802), Proc. (1844, &c.); Nat. Hist. Soc. (1851), Proc. (1868, &c); Soc of Field Naturalists (1872), Trans. (1872, &c.) ; Andersonian Naturalists' Soc. Gloucester, Lit. and Sc. Assoc. (1838). Greenock, Phil. Soc. (1861). Halifax, Phil, and Lit. Soc. (1830), museum and library. Hereford, Woolhope Naturalists' Field Club, Hereford Pomona and Trans. (1866, &c). Hertfordshire Nat. Hist. Soc. and Field Club, formed in 1879 from the Watford Nat. Hist. Soc. (1875), Trans. High Wycombe, Nat. Hist. Soc. (1865), Magazine (1866, &c). Hull, Lit. and Phil. Soc. (1822), Trans. (1824, &c). Inverness, Sc. Soc. and Field Club (1875). Isle of Wight Phil, and Sc. Soc. (1850). Kent (East) Nat. Hist. Soc. at Canterbury (1858), Trans. Leeds, Phil, and Lit. Soc. (1820); Naturalists' Club (1870), Trans. Leicester, Lit. and Phil. Soc. (1835), Trans. Lewes, Lewes and East Sussex Nat. Hist. Soc. (1864). Liverpool, Lit. and Phil. Soc. (1812; united with Nat. Hist. Soc. in 1844), Proc. (1845, &c); Philomathic Soc. (1825), Trans. ; Polytechnic Soc. (1838), Journal (1838, &c); Naturalists' Field Club (i860). Manchester, Lit. and Phil. Soc. (1781), two sections, one physical and mathematical, the other for microscopy and natural history — the original statements respecting the atomic theory were given by Dalton in the Memoirs (1789,

&c), also Proc. ; Field Naturalists' and Arch. Soc. (i860), Proc; Scientific Students' Assoc. (1861). Montrose, Nat. Hist, and Antiq. Soc (1836), museum. Newbury, District Field Club (1870), Trans. (1871, &c). Newcastle on-Tyne, Lit. and Phil. Soc. (1793), library; Northumberland, Durham and Newcastle Nat. Hist. Soc. (1829), a museum (opened in 1884), Trans. Norfolk, Norfolk and Norwich Naturalists' Soc. (1869), Trans. (1870, &c). Nottingham, Lit. and Phil. Soc. (1864) ; Natural- ists' Soc. (1852), Trans. Orkney Antiq. and Nat. Hist. Soc (1837), museum. Oxford, Ashmolean Nat. Hist. Soc. (1828), Proc. Paisley, Phil. Institution (1808), free library andV museum; Mr Coats pre- sented his observatory in 1882. Penzance, Nat. Hist, and Antiq. Soc. (1839), museum, Proc. (1845, &<:.)• Perth, Lit. and Antiq. Soc. (1784); Perthshire Soc. of Nat. Sc. (1867), Proc. (1869, &c), the Scottish Naturalist (1870, &c). Peterhead, Buchan Field Club (1887), Trans. Plymouth, Plymouth Inst, and Devon and Cornwall Nat. Hist. Soc. (1812), museum, art gallery and library. Preston Sc. Soc, affiliated with British Assn. Richmond, Richmond and North Riding Naturalists' Field Club (1863), Trans. Ripon, Naturalists' Club and Sc Assoc. (1882). Rochdale Lit. and Sc. Soc, Trans. Scarborough, Phil, and Arch- Soc. (1831), museum and library. Severn Valley Naturalists' Field Club, at Bridgenorth (1863). Sheffield, Lit. and Phil. Soc. (1822) ; Museums Assoc. (1889), Proc. and Journ. Shetland

Lit. and Sc. Soc. at Lerwick (1861). Shropshire and North Wales Nat. Hist, and Antiq. Soc. (1835), at Shrewsbury. Somersetshire Arch, and Nat. Hist. Soc, at Taunton (1849), Proc. (1851, &c). Southampton, Hartley Institution (founded under bequest of H. R. Hartley in 1859, incorporated 1862), for the promotion of scientific, antiquarian and Oriental studies and the fine arts, owns a museum and library. Staffordshire (North) Field Club and Arch. Soc. (founded as a natural history society in 1865; enlarged 1877), meets at Stone, Trans. Stirling, Nat. Hist, and Arch. Soc (1878), Trans. Stockport, Soc. of Naturalists (1884), Trans. Suffolk Inst, of Arch, and Nat. Hist., at Bury St Edmunds (1848), Proc. (1848, &c), The East Anglian (1859, &c). Swansea, Royal Institution of South Wales (founded 1 835; incorporated 1883), with a museum and library, promotes natural history and applied science, literature and fine arts, local history and antiquities. Tamworth, Nat. Hist., Geolog. and Antiq. Soc. (1871). Teign Naturalists' Field Club (1858). Torquay, Nat. Hist. Soc (1844), museum and library. Tweedside and Kelso Physical and Antiq. Soc (1834). Warrington, Lit. and Phil. Soc. (founded in 1870 upon the Micr. Soc). Warwickshire Nat. Hist, and Arch. Soc. (1836); Warwickshire Field Club (1854). Whitby, Lit. and Phil. Soc. (1822). Whitehaven Sc. Assn., Journal. Wiltshire Arch, and Nat. Hist. Soc, at Devizes (1853), Wiltshire Magazine (1853, &c). Windsor, Windsor and Eton Sc Soc, Trans. Witney, Nat. Hist, and Lit. Soc. (1858). Yorkshire Phil. Soc.

(1822), the museum in the grounds of St Mary's Abbey, York, contains a remarkable collection of Roman remains; Naturalists' Union of the natural history and scientific societies of the county (founded in 1861 as the West Riding Consoli- dated Naturalists' Soc, reorganized in 1876), publishes the Naturalist (1876, &c), Trans.

Australia and New Zealand : Adelaide, Phil. Soc, Trans. (1865, &c); South Australian Inst. (1836), library; Roy. Soc. of S. Australia (1853), Trans., Proc, Reports. Auckland, A uckland Inst. Brisbane, Queensland, Phil. Soc (i860), now the Roy. Soc. of Queensland (1884), Proc Christchurch, Phil. Inst. Hobart Town, Roy. Soc. of Tas- mania, Papers and Proc. (1843, &c). Melbourne, Roy. Soc of Victoria, Trans, and Proc. '(1854, &c); Nat. Hist. Soc; Tool, and Acclim. Soc, Proc. (1872, &c). Sydney, Roy. Soc. of N.S. Wales (1821), Proc (1867, &c); Linnean Soc. of N.S. Wales (1874), Proc. (1875, &c); Phil. Soc, Trans. (1862, &c); Australasian Assoc, for Advancement of Sc, Reports of Annual Meetings (held at different place each year) (1888, &c). Wellington, New Zealand Inst., Trans, and Proc. (1868, &c).

Canada: Halifax, Nova Scotia Inst, of Sc, Proc. and Trans. (1862, &c). Montreal, Nat. Hist. Soc. of Montreal (1827), Canadian Recof Sc. Ottawa, Roy. Soc. of Canada, Trans. (3 ser.) (1882, &c); Lit. and Sc. Soc. (1870), Trans. (1897, &c). St John, Nat. Hist. Soc of N. Bruns. (1862), Bulletins (26 vols.). Toronto, Canadian Inst. (1849), Trans. and Proc. (1852, &c); Roy. Canadian Acad, of Arts (1880). Winni- peg, Hist, and Sc Soc.

South Africa: Cape Town, South Afr. Phil. Soc, Trans. (1878 &c).

West Indies: Kingston, Roy. Soc. of Arts of Jamaica, Trans. (1854, &c); Port of Spain, Sc. Assoc, of Trinidad, Proc. (1866, &c). India, &c. : Calcutta, Asiatic Soc. of Bengal (1784), Journal (1832, &c; 1865, &c), Bibl. Indica (1848, &c), Mem. (1905, &c). Singapore, Roy. Asiatic Soc. (Straits Br.), Journal (1880, &c). Shanghai, Roy. Asiatic Soc. (N. China Br.), Journal (1857, &c). Cairo, Inst. Egyptien (1859). Mauritius, Roy. Soc. of Arts and Sc, Proc. (1846, &c.) and Trans. (1848, &c).

United States. — The Smithsonian Institution (q.v.), the most important scientific body in America, is dealt with in a separate article. The first scientific society in the United States originated from a Proposal for Promoting Useful Knowledge among the British Plantations, issued by Dr Franklin in 1743. In the following year the American Philosophical Society was founded at Phila- delphia, with Thomas Hopkinson as president and Franklin as secretary. With it was united on 2nd January 1769 another Phila- delphia society, The Junto (1758), the records of which have been preserved. The American Philosophical Society is still in vigorous life, and

*is an exclusively scientific body and the oldest organized society in the United States for the pursuit of philosophical investiga- tion in its broadest sense. It publishes Transactions (4*0, 1 77 1, &c.) and Proceedings (8vo, 1838, &c). Second in point of date comes the American Academy of Arts and Sciences of Boston, incorporated in 1780 with the object of furthering the study of the antiquities and natural history of the country. Its Memoirs (4to, 1785, &c.) and Proceedings (8vo, 1846, &c.) are still published. The Connecticut Academy of Arts and Sciences was incorporated at New Haven in 1799. At first only devoted to matters connected with the state of Connecticut, it now embraces the whole field of the sciences and useful arts. It has issued Memoirs (1810-1816), and now publishes Trans- actions (1866, &c). One of the leading societies in the United States, the Academy of Natural Sciences of Philadelphia, founded in 1812 and incorporated in 18 17, possesses an excellent library; the natural history museum is especially rich in conchology. It issues a Journal (1817, &c.) and Proceedings (1843, &c). The American Entomological Society is merged with it. The Franklin Institute of the same city, incorporated in 1825, possesses a library, gives lectures and issues a Journal (1826, &c). The Boston Society of Natural History was founded upon the Linnean Society (1814) in 1830 and incorporated*

*in 1 83 1. It possesses a library and a cabinet of specimens. It has published the Boston Journal of Natural History (8vo, 1837- 1863), Memoirs (4*0, 1866, &c.) and Proceedings (1841, &c). The Lyceum of Natural History, New York, was incorporated in 1818 and has published Annals from 1823 (1824, &c.) and Proceedings (1870, &c). In 1875 the name was changed to New York Academy of Sciences. A number of American naturalists and geologists, having held meetings in various cities between 1840 and 1847, resolved themselves at their Boston congress in the latter year into the American Association for the Advancement of Science, which was incorporated in 1874. Its object is " by periodical and migratory meetings to promote intercourse between American scientists." It has published Proceedings (1849, &c). The National Academy of Sciences was incorporated at Washington in 1863 with a view to making the knowledge of specialists available for the service of government. There are two classes of members, those in mathe- matics and physics and those in natural history. It has issued Annuals (Cambridge, 1865, &c.) and Reports, as well as Memoirs (1866, &c). The Academies of Sciences at San Francisco (1853), St Louis (1856, incorporated 1857), and Chicago (1857, incorporated 1865) deserve special mention.*

Among the remaining societies of a general scientific character are — Albany Inst. (1829), Trans. (1830-1893), Proc. (1873-1882). Ann

*Arbor, Mich. Ac. of Sc. (1894). Baltimore, Maryland Acad, of Sc, Trans. (1901). Boston, Col. Soc of Mass. (1892), Trans. Brooklyn Inst, of Arts and Sc. Buffalo, Soc. of Nat. Sc. (1861), Bull. Cincinnati, Soc. of Nat. Hist. (1870), Journal (1878, &c); Cin. Museum Assoc. (1881). Cleveland, Acad, of Nat. Sc. (1852), Annals and Proc; The Cleveland Society [Archaeol. Inst, of America] (1893). Columbus, Ohio State Acad, of Sc. (1891), Publ. Des Moines, Iowa Acad. 0] Sc. (i8*Sj), Proc; Hartford, Sc. Soc (1806); formerly Hartford Soc. of Nat. Sc. (1885), Bull. (1902, &c.). Indianapolis, Indiana Acad, of Sc. (1885), Proc. (1891, &c). Ithaca, Amer. Phil. Assoc. (1902). Lincoln, Nebraska Acad, of Sc. (1891), Publ. Los Angeles, South California Acad, of Sc. (1891), Bull. Madison, Wisconsin Acad, of Sc. Arts and Letters, Trans. (1870, &c). Milwaukee, Wisconsin Nat. Hist. Soc. (1857), Bull. {Minneapolis, Minnesota Acad, of Sc, Bull. (1873, &c). Minneapolis Acad, of Fine Arts (1883), Bull. (1905). New Orleans, Atkenie Louicianais (1876), Comptes Rendus. New York, Amer. Inst, of the City of New York (1829), Journal (1834), Trans. (1841, &c); Amer. Inst, for Sc. Research (1904), Proc. and Journal. Portland (Maine), Soc. of Nat. Hist. (1850), Proc. (1862, &c.). Poughkeepsie, Vassar, Brothers' Inst. (1874), Proc. (1874, &c., 1876, &c.). Rochester Acad, of Nat. Sc. (1881) Trans. Salem (Mass.), Essex County Nat. Hist. Soc. (1833; now merged in the Essex Institute) published the American Naturalist (1867-1868), afterwards issued by the Peabody Acad, of Science, as well as Proc. (1856, &c.) and Bulletin (1869, &c). San Francisco, Tech. Soc. of the Pacific Coast (1884), Trans, in Journal of the Assoc, of Engineering Societies. Santa Barbara Society of Natural History (1876), Bull. (1887). Sioux City, Acad, of Sc. and Letters (1887), Proc. (1903, &c). Topeka, Kansas Acad, of Science (1868), Trans. Washington, Phil. Soc. of Washington (1871), Bull. (1874, &c). Wilkes-Barre, Wyoming Hist, and Geol. Soc. (1858), Proc. and Coll. (1858, &c.).*

France. — The Institut de France (see Academies), which includes five separate academies, stands at the head of all French societies. The Societe Philotechnique, founded in 1795 and recognized as of public usefulness by a decree of nth May 1861, had for its object the encouragement and study of literature, science and the fine arts; literary organ was an Annuaire (1840, &c). The Societe d'En- couragement pour V Industrie Nationale was founded in 1801 for the amelioration of all branches of French industry, and was recog- nized by the state in 1824; Bulletin. The Acadimie Nationale, Agricole, Manufacturiere, Commerciale was founded by the due de Montmorency in 1830, and offers prizes and medals, and brings out a Bulletin (1830, &c). The Association Francaise pour I'Avance- ment des Sciences (1872), founded on the model of the British Asso- ciation, holds migratory meetings and publishes Comptes rendus. With it has been amalgamated the Association Scientifique de France, founded by Le Verrier

in 1864.

The departmental societies are very numerous and active. The chief are the following: Abbeville, Soc. d' Emulation (1797), Mem. (1833, &c). Agen, Soc. d'Agr., Sc. et Arts (1784), Recueil (1800, &c,). Aix, Acad, des Sc, &c (1829), based on Soc. des Amis de la Sc. (1765), Mem. (1819, &c). Alais, Soc Sc. et Litt. (1868), Bull. (1868, &c.). Amiens, Acad., based on Soc. Litt. (1750), Mem. (1835, &c.) ; Soc. Linneenne (1838), Mem. (1866, Sec.). Angers, Soc. Acad, de Maine-et-Loire (1857), Mem. (1857, &c); Soc. d'Agr., fife (1799), Mem. (1831, &c.) ; Soc. Linn, de M.-et-L. (1852), Annates (1853, &c). Angoulfime, Soc. d'Agr., fife, de la Charente (1803), Annates (1819, &cj. Annecy, Soc. Florimontane (1851), Annates (1851, &c.) and Rev. Savoisienne (1851). Apt, Soc. Litt., Sc. et Art. (1863), Annates (1865, &c). Arras, Acad. (1737), Mem. (1818, &c.) and other publica- tions. Autun, Soc. Eduenne (1836), Mem. (1872, &c.) and other publications. Auxerre, Soc.desSc (1847), Butt. (1847, &c). Avignon, Acad.de Vaucluse (formerly the Lycie d'Agr., fife, 1801), Mem. (1804), Documents and Cartulaires. Bar-le-Duc, Soc. desˆLettres, &c. (1870), Mem. (1871, &c.). Bayeux, Soc. des Sc, Arts et B.-Lett. (1841),

Mim. (1842, &c). Beauvais, Soc. Acad. (18.47), Mem. (1847, &c), Comptes Rendus (1882, &c). Belfort, Soc. d'Emulation (1872), Bull. (1872). Besancon, Acad, des Sc, fife (1752; suppressed in 1793; re-established 1805), Proc. verb. (1754, &c), Mem. (1838, &c); Soc. d'Emulation (1840), Mem. (184.1, &c). Beziers, Soc. Arch., Sc, &c. (1834), Bull. (1836, &c). Blois, Soc. des Sc. et Lettres de Loir et-Cher (1832), Mem. (1833, &c). Bordeaux, Acad. (1712 ; suppressed 1793; re-established 1816), Acles (1839, &c); Soc. Linn. (1818), Bull. (1826-1829) and Actes (1830, &c); Soc. des Sc. (1850), Mim. (1855, &c). Boulogne, Soc. Acad. (1864), Mim. (i86a, &c). Bourg, Soc. d'Emulation (1755), Journal (1817-1868) and Annates (1868, &c). Bourges, Soc. Hist., fife, du Cher (1849), Mim. (1857, &c). Brive la Gaillarde, Soc. Sc, Hist, et Archeol. (1878), Bull. (1879, &c). Caen, Acad. (1652), Rec. (1731-1816), Mem. (1825); Soc. Linn. (1823), Mem. (1824, &c), and Bull. (1855, &c); Assoc Normande (1831) , Annuaire (1835, &c). Cahors, Soc. des Etudes Litt., Sc. et Artistiques (1872), Bull. (1873, &c). Cambrai, Soc. d'Emulation (1804), Mim. (1808, &c). Cannes, Soc. des Sc. (1868), Mim. (i860, &c). Carcassonne, Soc. d'Etudes, fife (1889), Bull. (1890, &c). Chambery, Acad. (1819), Mim. (1825, &c). Chateaudun, Soc. Dunoise (1864), Bull. (1864, &c). Cherbourg, Soc. Acad. (1755), Mim. (1833, &c); Soc. Nat. (1851), Mem. (1852, Sic). Clermont- Ferrand, Acad. (1747), Annates (1828, &c.) and Bull. (1881, &c). Dijon, Acad. (1725; suppressed 1793; re-established 1800), Mem. (1769, &c). Douai, Soc. d'Agr., fife, du Nord (1799), Mem. (1826, &c). Draguinan, Soc. d'Etudes Sc. (1855), Bull. (1856, &c).

*Dunkirk, Soc Dunkerquoise (1851), Mim. (1853, &c). Epinal, Soc. d'Emulation (1825), Journal (1825-1827), Siances (1828-1830), Annates (1828, &c). Evreux, Soc. Libre d'Agr., fife (1798), Re- cueil. Gap, Soc. d'Etudes (1881), Bull. (1882, &c). Grenoble, Acad. Delphinale (1789), based on Soc. Litt. (1772), Bull. (1836, &c). Havre, Soc. d'Etudes Diverses (1833), Recueil (1834, &c). Laon, Soc. Acad. (1850), Bull. (1852, &c). La Roche, Soc d'Emulation (1854), Annuaire (1855, &c). La Rochelle, Acad. (1732; suppressed 1791; reconstituted in 1803 as Lycie Rochelais and in 1853 under its former name), Annates (1854, &£•)• Le Havre, Soc. des Sc et Arts (1868), Bull. (1868, &c). Le Mans, Soc. d'Agr., fife, de la Sarthe (founded in 1 761; reorganized on several occasions, and finally in 1839), Bull. (1833, &c). Le Puy, Soc. d'Agr., Sc, &c (1819), Annates (1826, &c.) and Bull. (1836, &c). Lille, Soc. des Sc, fife (founded 1802 as Soc. d' Amateurs), Mim. (1802, &c.) ; Soc. d'Etudes, Bull. (1899). Limoges, Soc. d'Agr., Sc, 6rc, de la Haute-Vienne (1759), Bull. (1822, &c.)» Lons-le-Saunier, Soc. d'Emulation (1817), Mini. (1818, &c). Lyons, Acad. (1724), Mem. (1854, &c.) ; Soc. d'Agr., Hist. Nat.,&c. (1761), Comptes rend. (1806, &c.j and Mim. (1838, &c); Soc. Linn. (1822), Annates (1836, &c). Macon, Acad. (1805) , Comptes rend. (1806-1847) and Annales (1851, &c.). Marseilles, Acad. (1726; in 1766 called Soc. des Sciences; suppressed in 1793; reorganized in 1799, and finally in 1802), Recueil (1727-1786) and Mim. (1803, &c). Meaux, Soc. Libre d'Agr., Sc, fife (1798; reorganized in 1820), Publ. (1833, &c). Mende, Soc. d'Agr., fife, de la Lozere (1819), Mim. (1827, &c.) and Bull. (1850, &c). Montauban, Acad. (1730), Recueil (17*12-1750 and 1869, &c). Montbcliard, Soc. d'Em. (1850), Mim. (1852, &c). Montpellier, Acad, (iounded in 1706 as Soc. Royale; suppressed in 1793; finally reorganized in 1846), Mim. (1847, &c.) ; Soc d'Horti- cult., fife, de VHerault (i860}, A\nnales (i860, &c). Moulins, Soc. d'Em. (1846), Bull. (1846, &c). Nancy, Acad, de Stanislas (1750), Mem. (1754, &c); Soc. des Sc (1873), founded on Soc. des Sc. Nat. de Strasbourg (1828), Mim. (1830, &c.) and Bull. (1866, &c); Soc. d'archiol.,&c. (1848) Mim. (1849, Sue), Journal (1852, &c). Nantes, Soc Acad, de la Loire-Inf. (1848), founded in 1798 as Institut De- partmental, Annales (1830, &c). Nevers, Soc. Nivernaise (1851), Bull. (1851, &c.). Nice, Soc. des Lettres, fife (1861), Annales (1865, &c). Nlmes, Acad. (1682,, Mim. (1805); Soc. d'Etude des Sc.Nat. (1871), Bull. (1873, &c). Niort.'Soe de Statist. Sc, fife, des Deux-Sevres(i836), Mim. (1836, &c.) and Bull. (1852, &c). Orleans, Acad, de Sainte- Croix v l863), Led. et Mem. (1865, &c); Soc. d'Agr., Sc, fife (1809), Bull. (1810-1813), Ann. (1818-1837), and Mem. (1837, &c). Pau, Soc. des Sc, Lettres, fife. (1841), Bull. (1841, &c). Perigueux, Soc. d'Agr., Sc, fife, de la Dordogne (1820), Annales (i8ao, &c). Perpignan, Soc. Agr., fife et Litt. (1833), Bull. (1834, &c). Poitiers, Soc. d'Agr., Belles-Letlres, fife (1789), Bull. (1818, &c). Privas, Soc. des*

Sc. Nat. et Hist. (1861), Bull. (1861, &c). Reims, Acad. Nat. (1841), Siances (1844, &c). Rochefort, Soc. de Giog. Lettres, Sc. et Arts (1878), Bull. (1879, Sic). Rodez, Soc. des Lettres, Sc, fife, de I'Aveyron (1836), Mim. (1838, &c.) and Prods-Verb. (1864, &c). Rouen, Acad. (1744). Prieis Analyt. (1744, &c.) ; Soc. Libre d' Emulation, fife (1790), Bull. (1797, &c); Soc. des Amis des Sc. Nat. (1864), Bull. (1865, &c). Saint-Brieuc, Soc. d'Em., Bull, et Mim. (1861, Sic.). Saint- Die, Soc. Philomatique (1875), Bull. (1876, &c). Saint-Etienne, Soc. d'Agr., fife, de la Loire (1822), Annales (1857). Saint-Lo, Soc. d'Agr., fife (1833), Mem., fife (1837, &c). Saint-Quentin, Soc. Acad. (1825), Mem. (1830, &c). Semur, Soc des Sc. Hist, et Nat. (1842), Bull, (1864, Sic). Soissons, Soc. Arch., Hist, et Sc. (1846), Mim. (1847, &c). Tarbes, Soc. Acad, des Hautes-Pyrinies (1853), Bull. (1854, &c). Toulon, Soc. Acad, du Var (181 1), Mim. (1832, &c). Toulouse, Acad, (founded in 1640; known to 1704 as Soc. des Lanternistes and by other names to 1807, when present title was acquired), Hist, et Mem. (1782-1790) and Mim. (1827, &c); Soc. d'Hist. Nat. (1866), Bull, (1867, &c.) ;Soc. des Sc, (1873), Bull. (1872, &c). Tours, Soc,

d'Agr., fife., d' Indre-et-Loire (founded in 1761 as Soc. Roy. d'Agr.), Recueil (1763 and 1803-1810) and Annates (1821, &c). Troyes, Soc. Acad., based on Soc. Acad, de VAube (1798), Mem. (1801, &c). Valenciennes, Soc. d'Agr., Sc. et Arts (1831), Mem. (1833, &c; 1865, ,.&c.) and Revue Agricole (1849, &c). Vannes, Soc. Poly- malhique du Morbihan (1826), Proc.-verb. (1827, &c.) and Bull. (1857, &c). Vend5me, Soc. Arch., Sc. et Litt. (1862), Bull. (1862, &c). Verdun, Soc. Philomath. (1822), Mem. (1840). Versailles, Soc. d'Agr. et des Arts (1798), Mem. (1799-1864) and Bull. (1866, &c); Soc. des Sc. Nat. et Med. (1832), Mem. (1835, &c.) ; Soc. des Sc. morales, fife. (1798), Mem. (1847-1897), Revue (1899, &c). Vesoul. Soc. d'Agr., fife., de la Haute-Saone (1801 ; reorganized in 1819 and 1832), Recueil Agronom. (1836, &c), Mem. (1859, &c), and Bull. (1869, &c). Vitry-le-Francois, Soc. des Sc. et Arts (1861), Bull. (1867, &c). Constantine (Algeria), Soc. Archeol. (1852), Annuaire et Recueil (1853. &c.).

Germany and Austria-Hungary. — Agrara, Jugo-slavenska Aka- demija or South Slav. Acad. (1866), various publications; Croatian Nat. Hist. Soc. (1885). Altenburg, Naturforsch. Ges. d. Osterlandes (1 8 1 7) , Mittheil. Augsburg, Naturforsch. Ver.(i 846) , Ber. (1 848 , &c.) . Bamberg, Naturforsch. Ges. (1834), Ber. (1852, &c). Berlin, Ges. naturf. Freunde (1773), Sitzungsber. (l86o,&c.) ; Deutsch-asiatischeGes. (1902),

Zeitschrift. Blankenburg, Naturwiss. Ver. des Harzes (1831), Ber. (1841, &c.). Bonn, Naturh.-Verein (1843), Verhandl. (1844, &c.) ; Gorres Ges. (1876), Hist. Jahrbiich. (1879, &c); Niederrhein. Ges. (18 1 8, reorganized, 1839). Bremen, Naturwiss. Ver. (1864), Abhandl. (1868, &c). Breslau, Schles. Ges. f. vaterl. Kultur (1803), Jahresber. (1804, &c). Bromberg, Deutsche Ges. f. Kunst u. Wiss. (1902) with 7 sections, Jahresber. (1902, &c). Brunn, K. k. Mahr.Schles. Ges., Mittheil (1821, &c). Budapest, K. Magyar Termeszettudomdnyi Tdrsulat or Roy. Hung. Soc. of Nat. Sciences (1841) , many publications, monthly proceedings of zoological, chemical and botanical sections. Cassel, Ver. f. Naturkunde, Jahresber. (1837, &c). Colmar, Soc. d'Hist. Nat. (1 859) , Bull. (1 860, &c.) . Cracow, Towarzystwo Naukowe, afterwards Akademija Umiejetnosci or Acad, of Science (1815), with several sections each publishing proceedings; the Acad, issues a Bulletin (1873, &c). Danzig, Naturforsch. Ges., Versuche (1745 !757) and Schriften (1820, &c.) ; Bot.zoolog. Ver. (1878). Donaue schingen, Ver. f. Gesch. u. Naturgesch. (1801), Schriften. Dresden, Naturwiss. Ges. Isis (1833), Sitzungsber. (1861, &c); Ges. f. Natur-u. Heilkunde (1818), Jahresber. (1848, &c); Ges. f. Botanik u. Zoo- logie, Nunquam Otiosus (1870, &c). Diirkheim, Pollichio, Naturwiss. Ver., Jahresber. (1843, &c). Elberfeld, Naturwiss. Ver., Jahresber. (1851, &c). Emden, Naturforsch. Ges. (1814), Jahresber. (1837, &c). Erfurt, Kgl. Pr. Akad. gemeinnutz. Wiss., Acta (1757, &c), Abhandl. (i860, &c). Frankfort, Seckenbergische naturforsch. Ges. (1817), Museum (1834-1845) and Abhandl. (1854, &c). Freiburg (in Baden), Naturforsch. Ges. (1821), Ber. (1858, &c). Fulda, Ver. f. Natur- kunde (1865), Ber. (1870, &c). Giessen, Oberhess. Ges. f. Natur- und Heilkunde (1833), Ber. (1847, &c). Gorlitz, Oberlausitzer Ges. d. Wiss. (1779), Magazin (1822); Naturforsch. Ges. (1811), Abhandl. (1827, &c). Gorz, Soc. Imp. Reale, Mem. Gottingen, K. Ges. d. Wissensch. (1751, 1893), Gbtt. gelehrte Anzeigen, Abhandl. (1845, &c.) and Nachr. (1845, &c). Gratz, Naturwiss. Ver. Mittheil. (1863, &c). Greifswald, Naturwiss. Ver. von Neu-Vorpommern, Mittheil. (1869, &c). Halle, Naturf. Ges. (1779), Abhandl. (1853, &c); Naturwiss. Ver. (1848), Zeitschrift (1853, &c). Hamburg, Naturwiss. Ver. (1837), Abhandl. (1846, &c). Hanau, Wetterauische Ges. (1808), Jahresber. (1852, &c). Heidelberg, Naturhisi.med. Ver., Verhandl. (1857, &c.) ; Akad. der Wiss. Stiftung H. Lanz (1909). Hermannstadt, Sieben- biirgisch. med. Ver.f. Naturwiss., Verhandl. (1849, &c). Innsbruck, Ferdinandeum, Beitrage (1825-1834) and Neue Zeitschrift (1835, &c). Jena, K. Leopold.-Carol. Akad. Athenaeum (1875, &c.); K. Leopold.-Carol. D. Akad. d. Naturf., Leopoldina (1859, &c.) ; Med.naturwiss. Ges. Jen., Zeitschr. (1864, &c). Karlsruhe, Natur wiss. Ver. (1863), Verhandl. (1864, &c). Klausenburg, Siebenburg. Museum, Annalen. Leipzig, Ges. Deut. Naturf orscher u. Arzte (1822), Tageblatt (1836, &c), Verhandl.; K. Sachs. Ges. d. Wiss. (1846),*

Ber. (1846, &c.) and Abhandl. (1850, &c.) ; Deutsche morgenldnd. Ges. (1845), Zeitschrift (1847, &c), Abhandl. (1857, &c). Lemberg, Ges. v. Galizien, Ber. Liineburg, Naturwiss. Ver., Jahresber. (1852, &c). Magdeburg, Naturwiss. Ver., Abhandl. (1869, &c). Mainz, Rhein. naturforsch. Ges. (1834). Mannheim, Ver. f. Naturk., Jahresber. (1834, &c.). Marburg, Ges. z. Beforderung der gesamtem Naturwiss., founded in 1816 as Kurhessische Akademie, Schriften (1823, &c.) and Sitzungsber. (1866, &c). Meissen, Ver. f. Erdk., Isis (1845). Metz, Acad., based on Soc. des Lettres, fife. (1819), Mem. (1828, &c.) ; Soc. d'Hist. Nat., Mem. (1843) and Bull. (1844, &c). Munich, Miinchener Orient. Ges. (1901), Beitrage. Nuremberg, Naturhist. Ges. (1801), Abhandl. (1852, &c), Mittheilungen ; Naturhist. Ges. (1801), Mittheil. and Abhandl. Posen, Deutsche Ges. f. Kunst. u. Wiss. (1901). Prague, K. Bohm. Ges. (1770, 1784) consists of two classes, receives a state subsidy, Abhandl. (1785, &c.) and Sitzungsber. (1859, &c.) ; Natur- hist. Ver. Lotos, Lotos (1851, &c.) ; Ges. zur Forderung deutscher Wiss., Kunst. u. Lit. in Bohmen (1891), state subsidy and many private bequests, Mittheil. and other publications. Pressburg, Ver.f. Naturk., Verhandl. (1856, &c). Ratisbon, Zoolog.-mineralog. Ver. (1846, since 1883 called Naturwiss. Ver.), Abhandl. (1849, &c). Reichenbach (Voigtland, Saxony), Ver.f. Naturk. (1859), Mittheil. Rostock, Verein f. Freunde der Naturgescfochte (1847), Archiv. Roveredo, I.R. Accad.

(1750), Atti (1826, &c). Strassburg, Soc. des Sc. Agr. et Arts (1802), Mem. (1811, &c.) and Bull. (1843, &c.) ; Wissenschaftl. Ges. (1906), Schriften (1906, &c). Stuttgart, Ver.f. vaterl. Naturk. (1845),. Jahresber. (1850, &c). Thorn, Copernicus Ver. (1854). Trieste, Soc Adriatica, Boll. Ulm, Ver.f. Mathcm. u. Naturwiss. (1865), Verhandl.- Vienna, K. k. Zoolog.bot. Ges., Verhandl. (1851, &c.) ; Verein 2. Verb.. Naturwiss. Kentnisse, Schriften (1862, &c). Wiesbaden, Nassauischer Ver.f. Naturk. (1829), Jahrbiicher (1844, &c). Zweibriicken, Natur hist. Ver. (1863), Jahresber. (1864, &c).

Switzerland. — Basel, Naturforsch. Ges. (1817), Ber. (1835, &c> and Verhandl. (1835, &c). Bern, Soc. Helvetique des Sciences Nat.. (1815), Actes (1816, &c), Comptes rendus (1879), Memoires (1829,. &c). Chur, Naturforsch. Ges., Jahresber. (1856, &c). Geneva, Soc. de Phys. et d'Hist. Nat., Mem. (1821, &c.) ; Societe des Arts (Athenee), founded by H. B. de Saussure in 1776; Institut National genevois- (1853), Mem. and Bull. Lausanne, Soc. Vaudoise des Sc. Nat., Bull. (1 842 , &c.) . Neuchatel , Soc. des Sc. Nat. , Mem. (1 835 , &c.) and Bull. (1844, &c.). St Gall, Naturwiss. Ges., Ber. (i860, &c). Solothurn, Naturhist. Kantonal-Ges., Jahresber. (1825, &c). Zurich, Natur- forsch. Ges. (1746), Abhandl. (1761-1856), Mittheil. (1846, &c), and Vierteljahrsschr. (1856, &c.) ; Allg. Schweizer Ges. f. d. Naturwiss., Verhandl., Anzeiger, and Denkschr.

(1829, &c).

Italy. — Congresso degli Scienziali Italiani, Atti (1844-1845); Riunione degli Sc. Ital., Atti (1839-1847; 1873, &c). Bologna, Accad. delle Sc.-delV Istit. di Bologna (1714), Rendic. (1833, &c), and Mem. (1850, &c). Brescia, Accad., afterwards Ateneo, Comment. (1808, &c). Catania, Accad. Gioenia di Sc. Nat., Atti (1825, &c). Florence, R. Museo di Fis. e Stor. Nat., Annali (1808, &c.) ; Soc. Asiatica Italiana (1886), Giornale. Lucca, R. Accad. Lucchese (1584), Atti (1821, &c). Messina, R. Accad. Peloritana. Milan, Accad. Fis. Med. Statist., Diario ed Atti (1846, &c.) ; R. Istit. Lombardo, Mem. (1819, &c), Giornale (1840, &c), Atti (i860, &c), and Rendic. (1864, &c); Soc. Ital. delle Sc. Nat., Atti (i860, &c.) and Mem. (1865, &c). Modena, R. Accad. di Sc, fife., Mem. (1833, &c.) ; Soc. Ital. delle Sc, Mem. (1782, &c). Naples, R. Istit. d'Incoragg. alle Sc. Nat. (1806), Atti_ (1811, &c.)_; Soc. Reale di Napoli (1808), consists of three sectional academies. Padua, R: Accad. di Sc, Lett., ed Arti (1779), Saggi (1786, &c.) and Revista (1851, &c). Palermo, R. Accad. di Scienze. (1722). Rome, Soc. Ital. per il progresso delle Scienze (1907). Venice, R. Istit. Veneto di Sc. (1838), Atti (1841, &c.) and Mem. (1843, &c); Ateneo Veneto, two sections, literature and science. Verona, Accad. d'Agricoltura, Scienze, Lettere, Arti e Commercio (1768), Atti and Memorie.

Belgium. — Brussels, Soc. Roy. des Sc. Nat. et Med. (1822), Journ. de Med. (1842-1895) and Annates (1892, &c.) ; Soc. Roy. Linn. (1835), Bull. (1872, &c); Soc. scientifique de Bruxelles (1875), Revue (1877, &c.), Annates (1877, &c). Ghent, K. Vlaamische Acad. (1886). Liege, Soc. Roy. des Sc. (1835), Mem. (1843, &c). Mons, Soc. Prov. des Sc, &c, du Hainaut (1833), Mem. (1839, &c).

Holland.— Amsterdam, K. Nederlandsch Insiituut, Proc.verb. (1808, &c), Verhandel. (1812, &c), Tijdschrift (1847); Genootschap ter Beford. der Natuur, fife., Kunde, Maanblad (1807, &c.) and Werken (1870, &c); Hollandsche Maatschappij , Werken (1810, &c.) ; Maat- schappij ter Befordering van het Natuurkundig onderzoek der Nederl. Kolonien (1890), branches in Batavia and Paramaribo, Notulen,. Bulletins, &c. Arnheim, Natuurkundig Genootschap, Tijdschrift (1844, &c). Bois-le-Duc, Provinc Genootschap, Handelingen (1837, &c). Groningen, Natuurk. Genootschap, Versl. (1862, &c). Haarlem, Hollandsche Maatschappij der Wetensch. (1752), Verhandel. (1 754, &c.) » The Hague, K. Zoolog.-Botanisch Genootschap, Versl. (1864, &c). Luxembourg, Soc. des Sc. Nat., Publ. (1853, &c). Middelburg, Zeeuwsch Genootschap der Wetensch., Verhandel. (1769, &c.<) and Archief (1856, &c). Utrecht, Provinc. Genootschap van Kunsten en Wetensch. (1773), Verhandel. (1781, &c.) and Aanteekeningen (1845, &c.) promotes the study of medicine, natural history, law and literature. Batavia, Bataviaasch Genootschap van Kunsten

en Wetensch. (1778), Verhandel. (1781, &c), Tijdschrift (1853, &c), and Notulen (1862, &c.) ; Natuurk. Vereeniging in Nederl. Indie (1850), Tijdschrift (1851-1865) and Verhandel. (1856, &c).

Denmark. — Copenhagen, K. Danske Videnskabernes Selskab, based on Kjbbenhavnske Selskab (1743-1813), Skrifter (1781, &c.) and Afhandlinger (1824, &c.) ; Naturhist. Forening, Meddelelser (1849, &c). Reykjavik, Islenzka N atturufraedisfelag (1889), annual reports.

Sweden. — Gottenburg, K. Vetenskaps och Vitterhets Samhatte, Handlingar (1778, &c). Stockholm, K. Svenska Vetenskaps Akademi, Handlingar (1740, &c.) and Arberattelser (1820, &c). Upsala, K. Vetenskaps Societeten (1710), Acta (1720, &c).

Norway. — Christiania, Physiographiske Forening, Mag. for Natur-Vidensk. (1832, &c.) ; Videnskabs-Selskabet (1857), Forhandl. (1859, &c), Skrifter (1894, &c). Throndhjem, K. Norske Vidensk.-Selskab, Skrifter (1817, &c).

Spain. — Barcelona, R. Acad, de Buenas Letras, the oldest Spanish society, Mem. and Boletin; R. Acad, de Ciencias y Artes (1763). Madrid, R. Acad, de Cien. Exactas, Fis., y Nat. (1847), Mem. (1850, &c); Soc. Expan. de Hist. Nat., Anales (1872, &c). San Fernando, R. Acad., Mem.

Portugal. — Coimbra, Instituto de Coimbra (1852). Lisbon, Soc. Porttigueza de Sciencias Naturais (1907), Bulletin' (1907, &c).

Russia. — Siezd Russkikh Yestestvoispytately (Meeting of Ruts. Naturalists) , first meeting at St Petersburg 1867-1868, Trudy or

Trans. {\to, 1868, &c). Dorpat, Naturforsch. Ges. (1853), Sitzungsber. (1853, &c.) Archiv (1854, &c) and Trudy (1884, &c.) ; Gelehrte Estnische Ges., Verhandl. (1840, &c), Schriften (1863-1869) and Sit-Mngsber. (1 86 1 , &c.) . Ekaterinburg, Soc. of Naturalists (1 870) , Zapiski. Helsingfors, Societas pro Fauna et Flora Fennica (1821), Acta (1875, &c); Finska Vetenskaps-Soc. (1838), three sections. Kaminietz, Naturforsch. Ges. Kazan, Soc. of Naturalists at University, Protokoly (1870, &c.) and Trudy (1872, Sc.). Kharkoff, Soc. of Scientists at Univ., Trudy (1870, &c.) and Protokoly (1870, &c). Kieff, Soc. of Naturalists, Zapiski. Lemberg, Polish Soc. for the Advancement of Science (1901). Moscow, Imp. Soc. of the Friends of Nat. Hist., Anthrop., &c. (1863), Izviestiya or Bull. (1865, &c.) ; Soc. Imp. des Naturalistes (1805), Mem.

(4to, 1806) and Bull. (8vo, 1829, &c). Odessa, Soc. of Natural- ists of New Russia, Zapiski (1872, &c.) and Protokoly (1874, &c.).' Riga, Naturforsch.-Ver. (1845), Corr.-Blatt (1846, &c.) and Arbeiten (1865, &c). St Petersburg, Imp. Soc. of Naturalists (1868), Trudy (1870, &c). Saratov, Soc. of Naturalists (1895), Trudy (1899, &c.). Warsaw, Soc. of Friends of Sc, Roczniki (1802-1828); Warsaw Naturalists' Soc. (1889).

Rumania. — Bucharest, Acad. Romdna (1866), Annalile (1867, &c); Soc. de Stiinte (1891); Soc. Politechnica (1881). Jassy, Soc. Stiinfifica si Literara (1889).

GREECE. — Athens, iXoXoyuios avWoyosTlapvaacros (1865), ilapcaffcos and other publications; "H iv 'Aff-qvais ''E.-wiar-miavi.Kˆ 'Erai/wia (1888), since 1899 styled Swaia 'AxaSiˆta.

Central and South America. — Bogota, Soc. de Naturalistas Colombianos, Contribuciones (i860, &c). Buenos Aires, Soc. Cienti- fica Argentina (1872), Anales (1876, &c). Caracas, Soc. de Ciencias, Bolelin (1868, &c). Cordova, Acad. Nacion., Bol. (1874, &c). Guatemala, Instit. Nac; Academia (1888); Ateneo (1903), 7 sections. Havana, Acad, de Cien. (1861), Anales (1864, &c). La Paz (Bolivia), Academia Aymara (1901). Mexico, Soc. Mex. de Hist. Nat. (1868), La Naturaleza (1869, &c.) ; Academia Mejicana (1875), Memorias (1876-1896); Acad. Mex. de Sciencias (1894), Anales. Rio de Janeiro, Palestra Cient., Archivos (1858, &c). Santiago, Soc. de Hist. Nat.

Japan. — Tokyo, Asiatic Soc. of Japan (1872), Trans. (1874, &c); Deutsche Ges. f. Natur- u. Volkerskunde Ostasiens (1873), Mitteil. (1873, &c).

II. Mathematics Many of the general scientific societies (see class i.) have mathe- matiQal and other special sections. Among defunct English societies may be mentioned the Mathematical Society, which used to meet in Spitalfields (1717-1845) and possessed a library, and the Cambridge Analytical Society, which published Memoirs (4to, 1813). The London Mathematical Society (1865, incorporated 1894), Proc. (1865, &c), the Mathematical Assn. (1871)", Gazette, and the Edinburgh Mathe- matical Society (1883), Proc. (1883, &c), are still flourishing.

United States: American Mathem. Soc. (reorganized 1894), meets at Columbia University, Bull, and Trans. France: Paris, Soc. Mathem. de France (1872), Bull. (1873, &c). Germany and Austria-Hungary: Berlin, Mathem. Ver. der Univ. (1861), Ber. (1876, &c.) ; Berliner Mathem. Ges. (1901), Sitzungsber. Budapest, Mathematikai es Phys. Tdrsulat (1891). Cassel, Geometer-Ver. (1878). Dresden, Ver. praklisch. Geometer (1854),

Jahresber. (1861, &c). Essen, Feldmesser-Ver. (1869). Gottingen, Mathemat. Ver. (1868). Hamburg,- Mathemat. Ges. (1690), Miltheil. Konigsberg, Geometer- Ver. (1 872) . Leipzig, Deutsche Mathem. Vereinigung (1 89 1) , founded at Halle, Jahresb. Strassburg, Geometer-Ver. (1881). Stuttgart, Deutscher Geometer-Ver., Zeitschrift (1872, &c). Holland: Amsterdam, Genoolschap der Mathemat. Wetensch. Kunstoeffinengen (1782-1788), Mengehuerken (1793-1816), and Archief (1856, &c). Spain: Valla- dolid, R. Acad, de Matematicas (1803, &c), now dissolved. Russia: Kazan, Phys. and Math. Soc. (1880). Moscow, Mathemat. Soc. (1867). Japan: Mathemat. Soc. of Tokyo, Journal (1878, &c).

III. Astronomy The first International Astronomical Congress met at Heidelberg in 1863, and the first international conference for photographing the heavens at Paris in 1887. The Royal Astronomical Society was founded in 1820 under the title of Astronomical Society of London, and was incorporated on the 7th of March 1831. It occupies rooms in Burlington House, and has published Memoirs (1882, &c.) and Monthly Notices (1831, &c). There are also the British Astronom. Soc. in London, and societies at Bristol (1869), Reports; Leeds (1859), Manchester and Liverpool (1881); Toronto, Roy. Astr. Soc. of Canada (1890), Trans. (1890), Proc. (1902), Journal (1907, &c.) ; Madison, Astronomical and Astrophysical Soc. of America (i~

San Francisco, Astr. Soc. of the Pacific (1889), Publ.; Paris, Soc. Astr. (1887), Bull.; Berlin, Kgl. Astr. Recheninstitut (1897); Leipzig, A slronomische Ges. (1863), Publ. (1865, &c.) and Vierteljahrsschrift (1866, &c); Turin, Soc. Astr. Hal. (1906), Revista; Brussels, Soc. Beige d'Astr., de Meteorol. et de Physique du Globe (1893), Bull. mens. ; Antwerp, Soc. d'Astr. (1905), Gazette; St Petersburg, Russ. Astr. Soc. (1890), Inveslija (1896, &c); and Mexico, Soc. Astr. (1902), Boletin (1902, &c).

IV. Physics The first International Electrical Congress was held at Paris in 1881. The Physical Society of London was founded in 1874 and registered

under the Companies Act; it publishes Proceedings (1874, &c). The London Electrical Society (1836) did useful work in its Trans- actions (1837-1840, vol. i.) and Proceedings (1841-1843). Sir W. Siemens was one of the originators of the Institution of Electrical Engineers (founded in 1871 and registered in 1883). It owns the Ronalds library of electricity and magnetism and publishes a Journal. In London there are also the Faraday Soc. (1903), Trans, and Proc, and the Optical Soc.

United States: Philadelphia, Amer. Electrochem. Soc, Trans. (1902). New

York, Nat. Elec. Light Assn. (1885), Proc. (1885) ;Amer. Phys. Soc. (1899), Bull. (1899) included since 1903 in the Physical Review; Am. Inst, of Electr. ting. (1884), Trans, and Proc. France: Cambrai, Soc. MagnUique, Archives (1845). Paris, Soc. Franc, de Phys. (recognized as of public utility on the 15th of January 1881), Bull. • Soc. Int. des Illectriciens (1883), Bull. Germany: Berlin, Physikalische Ges. (1843), Fortschritte der Physik (1847, &c.) ; Elek- trotechnisch. Ver. (1879), Ztschr. (1880, &c). Breslau, Physikalischer Ver. Frankfort, Physikalischer Ver. (1824), Jahresber. (1841, &c), and Wetterkarten daily. Konigsberg, Phys.bkon. Ges. (1790), Schr. (1859, &c). Italy: Naples, R. Accad. delle Sc. Fis. e Matem., Rendic (1856, &c.) and Atti (1863). Rome, Soc. degli Spettroscopisti Hal.; Soc. Ital. di Fisica (1897), // nuovo cimento. Holland: Rotterdam, Bataafsch. Genootschap van Proefondervindelijke wijs begeerte, Vcrhandel. (1774, &c). Russia: St Petersburg, Russ. Physico-Chemical Soc, Journal (1869, &c).

V. Chemistry

Pharmaceutical societies are placed in class xiii. (Medicine, &c). The Chemical Society of London for the promotion of chemistry and the sciences immediately connected with it was instituted on, the 23rd of February 1 841 ; a charter of incorporation was obtained in 1848. It publishes Memoirs (1843, &c), and Quarterly Journal (1849, &c). Chemistry and its connexion with the arts, and agri- cultural and technical matters, form the subjects of the Institute of Chemistry, founded on the 2nd of September 1877 and incorporated in 1885. It publishes Proc. The Society of Chemical Industry (1881) was incorporated in 1907, and publishes a Journal. The Society of Public Analysts publishes the Analyst (1876, &c). The oldest of the numerous photographic societies is the Royal Photographic Society of Great Britain (1853), which issues a Journal. The Royal College of Chemistry was founded in July 1845, and had a brief career; it pub- lished Reports (1849). The Cavendish Society was instituted in 1846 for the publication and translation of works and papers on chemistry. It came to an end in 1872 after having issued 30 vols.

United States: New York, American Chemical Soc. (1876), Proc. (i8y6),Journ. (1879) and Abstracts (1907). Washington, Chem. Soc. (1884), Bull, now the Journal of the Amer. Chem. Soc. France : Paris, Soc. Chimique (1857), Bull. (1861, &c). Germany: Berlin, Deutsche Chemische Ges. (1867), Ber. (1868, &c.) ; Deutsche Bunsen-Ges. (1894), Ztschr. fur Elektrochemie; Verein Chem. Reichsanstalt. Frank- fort, Chem. Ges. Jena, Chem. Laborat. Leipzig, Ver. Deutscher Chem. (1888), based on the Ver. Analyt. Chemiker, Ztschr. (1900, &c). Wiirzburg, Chemische Ges. (1872). Bohemia: Prague, Spolek Chemiku Ceskych or Soc. of Bohemian Chemists, Zpravy or Trans, (1872, &c). Belgium: Brussels, Soc. Chim. de

Belgique, formerly Assoc Beige des Chimistes (1887), Bull.

VI. Geology, Mineralogy and Palaeontology The first International Congress of Geology took place at Bologna in 1878. The Geological Society of London, founded in 1807 and in- corporated in 1826, is the largest and most important in Great Britain; it has published Proceedings (1 834-1 846), Transactions (1811, &c), and a Quarterly Journal (1845, &c). The Geologists' Association was instituted in 1858, and issues Proceedings (1859, &c). The Mineralogical Society (1876) has united with it the Crystallogical Society; it issues the Mineralogical Magazine (1876, &c). The Palaeontographical Society Was founded in 1847 for the delineation and description of British fossils; it issues Publications (4to, 184ˆ7, &c). The Royal Geological Society of Cornwall (1814) devotes special attention to the mining interests of the county, and publishes Trans- actions (1818, &c). It holds its meetings at Penzance. The Geo- logical Society of Edinburgh (1834) issues Transactions (1870, &c). The Royal Geological Society of Ireland (1832) principally studied the geology of the country. It published a Journal (1837, &c). There are also the Geological Associations of Leeds (1874) and Liver- pool (1880), Trans., and the Societies of Liverpool (1859), Proc, and Manchester (1838), Trans.

South Africa: Johannesburg, Geol. Soc. of S. A. (1895), Trans. (1895, &c). United States: Louisville, Ky., Ohio Falls Geolog. Soc. San Francisco, California State Geolog. Soc. (1876). New York, Geol. Soc. of Amer. (1888), Bull. Washington, Geol. Soc. of Washing- ton (1893). France: Lille, Soc. Geol. du Nord (1870), Annates (1874, &c). Havre, Soc. Geol. de Normandie, Bull. (1873, &c). Paris, Soc. Geol. de Franse (1830, recognized 1832), awards the Prix Viquesnel (£40) every three years, Bull. (1830, &c.) and Mem. (1833, &c); Soc. Prang, de Mineralogie (1878, recognized 1886), for- merly Soc. Mineral, de France, Bull. (1879, &c). Saint-Etienne, Soc. d'Ind. Minerale (1855), Bull. (1855, &c). Germany and Austria- Hungary: Berlin, Deutsche Geol. Ges. (1848), Ztschr. (1849, &c), Monatsberichte (1903, &c); Budapest, Magyarhoni Foldtani Tarsulat

1850) or Hungarian Geolog. Soc. (1850), Ffildlani Kozlbny. Briinn, Wernerscher Geol. Ver., Jahresber. Darmstadt, Mittelrheinischcr Geolog. Ver. (1851), Mittheil. (1855, 8k.). Dresden, Gebirgs-Ver. (1855). Switzerland: Schwetzerische Geolog. Ges. (1882), section of Allg. Schw. Ges. Zurich, Schweiz. Paldontol. Ges. (1874), Abhandl, (1875, &c). Italy: Rome, Soc. Sismol. Ital. (1895), Boll. ; Soc. Geol. Ital., founded at the second International Geological Congress. Belgium: Antwerp, Soc.

PaUontol. (1857), Bull. Brussels, Soc, Beige de Geol., de Paleont. et d'Hydrol. (1887), Bull. , Mem. and Proc- verb. Charleroi, Soc. PaUontol. (1863), Documents et Rapports (1866, &c). Liege, Soc. Geol. de Belgique, Annates (1874, &c.)- Sweden: Stockholm, Geologiska Forening (1871), Fbrhandlingar (1872, &c). Russia: St Petersburg, Imp. Russian Mineralog. Soc. (1816), Trans., pub. in Russian, German and French (1830, &o). Argen- tine Republic : Buenos Aires, Soc. Paleontol. Mexico: Mexico, Soc. Geol. Mexicana (1904), Bol.

VII. Meteorology

The International Meteorological Congress first met at Brussels in 1853. The Royal Meteorological Society (1850) of London was in- corporated in 1866; its organ is Quarterly Journal (1873, &c). To this must be added the British Rainfall Society; the Scottish Meteorological Society holds its meetings at Edinburgh and issues a Journal (1866, &c). Port Louis (Mauritius), Meteorolog. Soc, Trans. (1853, &c). Paris, Soc. Meteorolog. de France (1852), Annuaire (1853, &c.) and Nouvelles Meteorolog. (1868, &c). Berlin, Deutsche Meteor. Ges. (1883), Ztschr. Hamburg, Deutsche Meteoro- log. Ges. (1883), Ztschr. Magdeburg, Ver. f. landwirtsch. Wetter- kunde (1881). Meissen, Gesellsch., Isis. Vienna, Osterreich. Ges. f. Meteorol., Zeitschrift (1866, &c). Modena, Soc. Meteorolog. Ital. Gothenburg, Kungl. Vetenskaps- och Vitterhets-samhallet (1778), Handligar.

VIII. Microscopy

The Royal Microscopical Society (1839, incorporated 1866), with Transactions (1842-1868) and Journal (1869, &c); the Quekett Microscopical Club (1865), with a Journal (1868, &c.) ; and the Postal Microscopic Society (1873), also with a Journal, are located in London. There are suburban societies at Ealing (1877), Hackney (1877), Highbury (1878), South London (1871), and Sydenham (1871). In the provinces may be mentioned those at Bath (1859), Birmingham (1880), Bolton (1877), Bradford (1882), Bristol (1843), Carlisle, Chichester (Trans.), Croydon (1870, Trans.), Dublin (1840), East Kent (1858), Edinburgh, Liverpool (1868, Trans.), Manchester(l88o), and Sheffield (1877). In the United States the State Microscop. Soc. of Illinois publishes the Lens (1872, &c); Buffalo, Amer. Soc. of Microscopists ; New York, Microscop. Soc; Urbana, Amer. Micros. Soc (1878), Proc (1879), Trans. (1895, &c). Brussels, Soc. Beige de Microscop. (1875), Proc-verb. (1875, &c.) and Annates (1876, &c). Berlin, Ges. f. Mikroskop. (1877), Ztschr. (1878, &c). Hanover, Ges. f. Mikroskop. (1879), Jahresber.

IX. Botany and Horticulture Linnaean societies, which usually deal with

both zoology and botany, are placed in the general class (No. L). The Congres International d' Horticulture first met at Brussels in 1864, and the Congres International de Botanique at Amsterdam in 1865. The Royal Botanic Society of London (incorporated 1839) has gardens in the inner circle of Regent's Park, and issues a Quarterly Record (1880, &c). The Royal Horticultural Society (established in 1804, incorpor- ated in 1809) has gardens at Chiswick, and publishes a Journal (1846, &c). The chief provincial societies are — Aberdeen, North of Scotl. Hortic. Assoc. (1879), Trans. Arbroath, Hortic. Assoc. (1880). Birmingham, Bot. and Hortic. Soc. (1829), gardens. Dublin, Roy. Hortic. Soc. (1830). Liverpool, Bot. Soc. (1906). Edinburgh, Bot. Soc. (1836), Proc. (1837, &c.) and Trans. (1844, &c); Royal Scottish Arboric. Soc. (1854), Trans.; Cryptogamic Soc. of Scotl. (1875). Canada: Kingston, Bot. Soc. of Canada (i860), Annals (1861, &c).

United States: Baltimore, Bot. Soc. Amer. (1894). Boston, Hortic. Soc. (1829). New York, Torrey Botanical Club (1858, re- organized 1867), Bull. (1870, &c). San Francisco, State Hortic. Soc. Washington, Bot. Soc. of Wash. (1901). France: Beauvais, Soc. d'Hortic. et de Bot. (1864), Bull. (1864, &c). Bordeaux, Soc. d'Hortic. Chartres, Soc. d'Hortic. et de Viticulture. Chauny, Soc. de Pomologie, Dijon, Soc. d'Hortic. Fontenay-le-Comte, Soc. d'Hortic. Lisieux, Soc. d'Hortic. et de Bot. (1866), Bull. (1866, &c). Lyons, Soc. d'Hortic. Pratique (1844), Bull. (1844, &c.) Soc. Bot. (1872), Annates (1872, &c); Soc. Pomologique (1872), Bull. (1872, &c). Moulins, Soc. d'Hortic. Nimes, Soc. d'Hortic. Niort, Soc. d'Hortic. Orleans, Soc. d'Hortic. (1839), Bull. (1841, &c). Paris, Soc. Nat. d' Hortic. , (1827; declared of public utility 1852), Journal; Soc. Bot. de France, Bull. (1854), Mem. (1905, &c). Roaen, Soc Centr. d'Hortic Saint Germain-en-Laye, Soc. d'Hortic. Senlis, Soc. d'Hortic. Troyes, Soc. d'Hortic. Versailles, Soc. d'Hortic. Germany and Austria- Huhgary: Berlin, Bot. Ver. (1859), Verhandl. (1859, &c); Deutsche Bot. Ges. (1882), Bcrichte (1883, &c); Horticult. Ges. Blankenburg, Bot. Ver. Bonn, Bot. Ver. (1818), Jahresber. (1837, Ac.). Danzig, Westpr. Bot.-sool. Ver. (1878), Jahresber. Dresden,

"Flora": Ges. fur Bot. u. Gartenbau (1826), Sitzungsbtt. Erfurt, Gartenbau Ver. Frankfort, Gartenbau Ges. Freiburg, Bot. Ver. Gorlitz, Gartenbau Ver. Gotha, Thuringer Gartenbau Ver. Klagenfurt, Karntnerische Gartenbau Ges. Landshut, Bot. Ver. (1864). Meiningen, Ver. f. Pomologie u. Gartenbau. Munich, Bayerische Botanische Ges., Mittheil. (1890). Ratisbon, K. Bayerische Bot, Ges. (1790), Flora (1818, &c.) and Repertorium (1864, &c). Reutlingen, Pomolog. Inst. Sondershausen, Bot. Ver. Stuttgart, Gartenbau Ges., Flora. Vienna, K. k. Gartenbau Ges. ; Botan. Ver., Verhandl. (1851, &c). Weimar, Ver. f. Blumisiik. Wurzburg, Bot. Inst., Arbeiten (1871, &c). Italy: Milan, Soc. Crittog. Ital., Atti (1878,

&c). Belgium: Antwerp, Soc. Roy. d'Hortic et d'Agr.; Soc. Phytologique, Annates (1864, &c). Bruges, Soc d'Hortic. etdela Bot. Brussels, Soc. Roy. de Bot. with State Botanical Garden (1862), BulL (1862, &c); Soc Roy. de Flore; Soc. Centr. d' Arboric, Annales'. Liege, Soc. Roy. d'Hortic. Holland: Ghent, Kruidkundig Genoot- schap Dodonaea (1887), Tijdschr. Leiden, Nederl. Bot. Vereen. Luxembourg, Soc. de Bot., Recueil (1874, &c). Nimeguen, Nederl. Bot. Vereen, Archief (1871, &c). Denmark: Copenhagen, Bot. Forening, Tidsskrift (1866, &c).

X. Zoology

Societies dealing with natural history in general, or zoology and botany together, come under class i. The first International Orni- thological Congress was held at St Petersburg. The Zoological Society of London (1826, incorporated 1 829) is famous for its collection of animals at Regent's Park. It publishes Proceedings (8vo, 1830, &c.) and Transactions (4to, 1835, &c). In London also are the British Ornithologists' Union (1859); Entomological Society of London (1833), Trans. (1834, &c.) ; National Fish Culture Association (1883); Malacolog. Soc. (1893). The Concholog. Soc. (1876) meets at Manchester, which also has an Entomolog. Soc. (1902). Tht Marine Biological Association of Great Britain (1884), for the study of marine food fishes and shell-fish, has a laboratory at Plymouth. The Royal Zoological Society of Ireland (1831) has gardens in the Phoenix Park. There is the British Beekeepers' Association (1874). Australia and New Zealand: Auckland, Acclimatisation Soc. Brisbane, Acclimat. Soc. Christchurch, Acclimat. Soc. Melbourne, Zoolog. and Acclimat. Soc. of Victoria, Report (1861, &c.) ; Australasian Ornitho. Union (1896), The Emu. Sydney, Acclimat. Soc. of N.S. Wales, Report (1862, &c.) ; Entomolog. Soc. of N.S.W., Trans. (1863, &c). Wellington, Weslland Nat. and Acclimat.' Soc. Africa: Cape Town, Zoolog. Soc. Port Louis (Mauritius), Soc. d 'Acclimat. Canada: Toronto, Entomolog. Soc; Beekeepers' Assoc.

United States: Cambridge, Nuttall Orntthologg. Club, Bull. (1876) and Memoirs (1886) ; and Entomolog. Club, Psyche (1874, & c -) '< Amer. Soc Zoologists (1890). Cincinnati Soc. of Nat. Hist. (1870), Journs. (1879). Illinois Central Beekeepers' Association. New York, Entom. Soc. (1892), Journal; N. Y. Zoolog. Soc. (1895), Rep. Guide Book. Pasadena, Cooper Ornith. Club (1893) founded at San Jose, Pacific Avifauna (1900, &c.), The Condor (1899, &c). Philadelphia, Zoolog. Soc. (1859), Report (1874, &c); and Amer. Entomolog. Soc. (1859), Proc. (1861-1866), Trans. (1867, &c). Washington, Amer. Ornith. Union (1883), The Auk (1884, &c); Biolog. Soc. (1901); and Entomolog. Soc. (1884), Proc. France: Alais, Soc. Sericicole, Bull. (1876, &c). Amiens, Soc. a" Apiculture, Bull. (.1875, &c). Clermont, Soc. Centr. d'Apicult., Bull.

(1875, &c). Lille, Inst. Zoolog. d Wimereux, Travaux (1877, &c). Paris, Soc. Nat. d'Ac- climat. (1854), Bull. Mensuel (1854, &c.) and Chron. Bimens. (1875, &c); Soc. Zoolog. de France, Bull. (1876, &c); Soc. Entomolog. de France, Annales (1832); and Soc. de Biologic (1848), Cumptes Rendus (1849, &c). Germany and Austria-Hungary: Wander- versammlung Deutscher Bienenzuchter, Verhandl. (1856, &c). Ben- dorf, Akklimat.-Ver. Berlin, Akklimat.-Ver. (1856), Zeitschr. (1858, &c); Central-Inst. f. Akklimat., Mittheil. (1859, &c); Deutsche Zoolog. Ges.; Deutsche Ornithol. Ges. (1850), Journal (1853, & c); Deutsche Fischerei Ver., Publikat. (1871, &c); Berliner Entomolog. Ges. (1856), Entomolog. Zeitschr. (1857, &c.) ; D. Entomol. Ges. (1881), Ztschr.; Ver. zum Befdrd. des Seidenbaues, Jahresber. (1869, &c); Physiolog. Ges. (1875), Verhandl. (1877, &c). Breslau, Physiolog. Inst., Studien (1861, &c.) ; Ver. f. Schles. Insektenkunde, Zeitschr. (1847, &c). Brunswick, Deutsche Ornitholog. Ges. Carlsruhe, Badischer Ver. f. Geflugelzucht, Monatsblatt (1872, &c). Franken bere, Bienenwirthschaftl. Haupt-Ver., Sachs. Bienenfreund (1865, &c). Frankfort, Zoolog. Ges., Der Zoolog. Garten (i860, &c); Deutsche Malakozoolog. Ges. (1868), Jahrbilcher (1874-1887) and Nach- richtsblatt (1869, &c). Halberstadt, Deutsche Ornitholog. Ges. Halle, Ornitholog. Central-Ver. Hamburg, Zoolog. Ges., Ber. (1862, &c). Hanover, Bienenwirthschaftl. Central-Ver., Centralblait (1865, &c). Leipzig, Sachs. Seidenbau Ver., Zeitschr. (1868, &c). Munich, Entomolog. Ver. (1876); Fischerei Ver., Mittheil. (1876, Sec.). Nord- lingen, Ver. Deutscher Bienenwirlhe, B.-Zeitung (1845, &c). Ratisbon Zoolog.-mineralog. Ver. (see class i.). Stettin, Ornitholog. Ver. (1873), Jahresber. (1873, &c); Entomolog. Ver. (1837), Ent. Zeitung (1840, &c). Trieste, Zoolog. Inst. u. Zoology Station (1875), Arbeiten (1878, &c). Troppau, Schles. Bienenzucht-Ver. (1873). Vienna, Entomolog.

Ver.; Embryolog. Inst., Mittheil. (1871, &c); Ornitholog. Ver.

Wurzburg, Zoolog. -zootomisches Inst. (1872), Arbeiten (1874, &c).

Switzerland: Bern, Schweiz. Entomolog. Ges. (1858), Mitteil. (i86i,

1 &c). Geneva, Assoc. Zoolog. du Leman; Soc. Ornitholog. Suisse

SOCIETIES, LEARNED

(1865), Bull. (1866, &c). Zurich, Internat. Entomologenverein (1886) Soaetas Enlomologica (1886, &c). Italy: Casale, Soc Bacologica, Boll (1866, &c). Florence, Soc. Allantina Ital., La Sericoltura (186s &c); Soc Entomolog. Ital., Boll. (1869, &c). Naples, Zoolog. Station Mittheil. (1878). Palermo, Soc. diAcclimaz., Atti (1861, &c) I isa, Soc. Malacolog. Ital., Boll. (1875, &c). Rome, Soc. di Pisicolt. Ital. (1872). Belgium:

Antwerp, Soc. Roy. de Zoologie (1843) with Jardtn Zool. and Mus. Brussels, Soc. Roy. de Zoologie et Malacolo- gtque de Beige (1863), Annates (1870, &c); Soc. Entomolog. de Belgique (1856), Annates and Bull. (1857, &c). Holland: Amsterdam, A. Zoolog. Genootschap "Natura Artis Magistra " (1838) Btjdragen (1848), Jaarboekje (1852, &c.) and Tijdschr. (1863! &c), zoolog garden and museum. The Hague, Nederl. Entomolog. Vereen., Tijdschr. (1857, &c). Rotterdam, Nederl. Dierkundige Vereen. Tijdschr. (1874, &c). Norway: Bergen, Selskabet for Norges Fiskener. Christiania, Det Biol. Selskab. (1894), Aaresber /ˆo DE ? : Sto £ kh °lm, Entomolog. Fbrening (1879), Ent. Tidskrift (1880, &c). Russia: Moscow, Acclimat. Soc. St Petersburg i?«s- sian Entomolog. Soc. (1859), Horae societatis entom. ross. Argen- tine Republic: Buenos Aires, Soc. Zoolog. Argentina, Period. Zoolog. (1875, &c); Soc. Entomolog. Argent.

XI. Anthropology

The Congres International d'Anthropologie et d'Archeologie Pre- histonques held its first meeting at Neuchatel in 1866; it issues Comptes rendus (1866, &c). The Royal Anthropological Institute of Great Britain and Ireland was founded in 1871 upon the Ethno- logical Society (1843), which published a Journal (1848-1856) and Transactions (1859-1869), and the Anthropological Society (1863) which issued Memoirs (1863-1869) and the Anthropological Review (1864-1870). The Institute brings out a Journal (1871, &c)

Sydney, Roy. Anthropolog. Soc. (1896). Bombay, The Gatha Soc. (1903), occasional pamphlets.

United States: Cleveland, Amer. Inst. Anthrop. (1890), Journal. New York, Amer. Ethnolog. Soc. (.1842), Trans. (1845- 1853) and Bull. (.1860-1861) ; formerly Anthropolog. Inst., Journ ('871). Washington, Anthropolog. Soc. (1879), Trans. (1882, &c.)- Amer. Anthrop. Assoc. (1902), Amer. Anthropologist. Havana (Cuba), Soc. Antrop. France: Grenoble, Soc. dauphinoise d'Ethn et d Anthrop. (1894), Bull. (1894, &c). Lyons, Soc. d' Anthrop. (1881), Bull. (1881,. &c). Paris, Soc. d'Anthropologie (1859- re- cognized 1864), Bull, and Mem. (i860, &c); Soc. d'Ethnogr , Annuaire (1862, &c), and Revue (1869, &c); Soc. des Traditions Populaires (1886) Revue (1886, &c). Germany and Austria-Hungary: Berlin, Ges. f. Anlhropologie, &c. (1869), Ztschr. (1870, &c) and Verhandl. (i87i,&c); Deutsche Ges. fur Anthrop., Ethn. &c. (1870), Archiv (1866, &c). Brunswick, Deutsche Ges. f. Anthro- pologic, Archiv (1870, &c.) and Corr-Blall (1874, &c.). Budapest Magyar Neprajzt Tdrsasdg (1889) , Ethnographia (1889, &c). Cologne' Ver. zur Forderung des Stadt-Rautenstrauch-Joest Museums fur Volkerkunde (1904), Jahresber. (1904, &c). Gorlitz, Ges.fiir Anthrop. &c. (1888), Jahreshefte.

Gottingen, Anthropolog. Ver., Mittheil (1874, &c.). Kiel, Anthrop. Ver. (1877), Mitteil. (1888, &c.)! Leipzig, Ver. f. Anthropolog., Ber. (1871, &c), afterwards joined to the Ver. der Erdk. Munich, Ges. f. Anthropolog. &c. (1870), Beitr (1876, &c). Stuttgart,Anthropolog. Ges. (1871), Fundber. (1801, &c) Vienna, Anthropolog. Ges. (1870), Mittheil. (1870, &c). Italy: Florence, Soc. Ital. di Antropologia (1868), Archivio (1871, &c). Belgium: Brussels, Soc. d' Anthrop., Bull. (1882, &c). Sweden' Stockholm, Svenska Sdllskapet for Antrop. (1873), Tidskrift (1873 &c). Spain: Madrid, Soc. Antropolog. Esp.. Revisla (1875 &c) Russia: St Petersburg, Russian Anthrop. Soc. (1888), Protokoty- zasedanij (1901, &c).

XII. Sociology (Economic Science, Statistics, Law, Education) The international societies are the Association Internationale pour le Progres des Sciences Sociales and the Congres International de Statistique which first met at Brussels in 1853. Both have issued Comptes rendus. The Congres International de Bienfaisance may be traced to a suggestion at the Congres Penilentiaire held at Frankfort in 1847. The first meeting took place at Brussels in 1856. The Inst. Internat. de Sociologie (1893) has its headquarters at Paris. The National Association for the Promotion of Social Science (1857) had united with it in 1864 the Society for Promoting the Amendment of the Law. It held a yearly migratory meeting, and published Transactions (1858, &c.) and Social Science (1866, &c). The Socio- logical Soc, the Eugenics Education Soc. and the Roy. Economic Soc. are established in London. The Royal Statistical Society (1834) incorporated 1887, publishes a Journal (1839, &c); Cobden Club (1866), for the diffusion of the political and economical principles with which Cobden's name is associated, has issued a variety of publications; Institute of Actuaries (incorp. 1884); Institute of Chartered Accountants (1880); Institute of Bankers (1879); the Society of Incorporated Accountants and Auditors (1885), and the Chartered Institute of Secretaries, also meet in London. There are also the Manchester Statistical Society (1833), with Transactions; the Faculty of Actuaries in Scotland and the Scottish Society of Economists (1897), both meeting at Edinburgh; and the Statistical and Social Inquiry Society of Ireland (1847), with a Journal at Dublin. After the Inns of Court (q.v.), the most important of

British legal societies is the Law Society (1827, incorporated 1832, remcorp. 1845); it began courses of lectures for students in 1833 and was appointed registrar of solicitors ten years later, and ob- tained supplementary charters in 1845 and 1878. This society has a fine building, with library and examination hall in Chancery Lane London, rhere are over 70 provincial societies, most of them being associated with the parent

body. The Verulam Society (1846) published a few books and came to an end. The Selden Society established in 1887 for the promotion of the study of the history of ˆ W, D P r lnts an "ent records. The headquarters of the Association for the Kejorm and Codification of the Law of Nations are in London but coherences are held in various continental towns. The Chartered Institute of Patent Agents (founded 1882, incorporated 1891) issues lransachons. The Juridical Society of Edinburgh (1773) published five editions of a Complete System of Conveyancing. The Ascham Society was founded in 1879 for the improvement of educational methods; and the Society for the Development of the Science of Educa- tion (1875) issued Transactions.

*United States: Baltimore, Amer. Pol. Sc. Assoc. (1903) Proc Boston, Amer. Soc. Sc. Assoc; Amer. Statist. Assoc. (1839), Collec- tions (1847, &c.). Cambridge, Amer. Econ. Assoc. (1886). New York. Am. Inst of Social Service, Social Service (i8 99 ,&c.) ; Actuarial Soc. of A mer.{ 1 899) ; Philadelphia, ,4 mer. A cad. Pol. and Social Sc. (1 899) A n- nals; American Bar Assoc, Reports; Assn. of Amer. LawSchoolsIiqoi). Washington, Amer. Soc. of Int. Law (1906), Journal; Nat Educ Assoc (1857), Proc. France: Grenoble, Soc. de Statist. (1838), Bull I 3 8 *o •}; Mars e"les, Soc. de Statist. (1827), Repertoire (1837, &c); Soc. Sc. industr (1871), Bull. (1872, &c). Paris, Soc Int. des Etudes Pratiques d'Econ. (1856, recognized 1869); Soc. Fran, de Statist. Univ. (1829), Journal issued jointly with Acad. Nat. since 1849; Soc de Statist, de Paris (i860, recognized 1869), Journ. (i860, &c); Soc. de Legislation Comparee (1869, recognized 1873) Bull ' Annuaire de Leg. Franc., and Ann. de Leg. £tran.; Soc. pour I'Instr Element (181 5, recognized 1831), Bull.; Soc. de Linguistique (1864), Mem. (1868, &c); Soc de V Enseignement Superieure (1878), Rev (1881, &c); Soc. d'Econ. Sociale (1856), Les Ouvriers des deux mondes (1857, &c), La Reforme sociale (1881, &c); Soc. d'Econ. Pol. (1842) Annates (1846-1847), Bull. (1888, &c.) ; Soc. del'Ecoledes Uiartes (1839), Mem. St Maixent, Soc de Statist, des Deux-Sevres loulouse, Acad, de Legis. (1851), Rec (1851, &c). Germany and fˆ? IA "S ? GARY: D ebreczen, Magyar Kir Gazdasdgi Akad. (1868) Berlin, Volkswirths. Ges. (i860), Volkswirths. Zeitfragen Vr 79 J § C, V Ver f Deutsche Volkswirths. (1876), Ztschr. (1880, &c.) ; Ver. f Forderung d. Handelsfreiheit (1878), Mittheil. (1879, &c.) ; Ver f.d Statist.- Jurist Ges. (1859), Jahresber. (1863, &c). Dresden, Statishscher Ver. (1831), Mittheil. Frankfort, Statistische Ges.; Jurishsche Ges. (1866), Rundschau (1867, &c.) ; Akad. fur Sozial-u. Handelswissenschaften (1901). Freiburg, Badische Heimat (1893). Volkeskunde. Halle, Kantgesellschaft (1904), Kantstudien. Lai-*

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Ligue de I' Enseignement (1864), Bull.; Soc. Centr. des Instituteurs Beiges (i860), Le Progres; Inst. Solvay de Sociologie (1901). Holland: Amsterdam, Ver. voor de Statist, in Nederland Jaarboekje (1849, &c.) and Jaarcijfers (1882, &c). Spain: Madrid, Junta Estadist; R. Acad, de Jurisprudencia y Legis. (1763 1826)- R. Acad, de Ciencias Mor. y Pol. (1857). Russia: Moscow, Juri- dical Soc. St Petersburg, Pedagogical Soc. Egypt: Cairo, Bureau Central de Statist. Havana (Cuba), Soc Econ. de Amigos del Pais (1792), Memorias. Japan: Tokio, Statist. Soc.

XIII. Medicine and Surgery The first meeting of the Congres Medical International was held at Pans m 1867; a Bulletin has been issued annually since 1868, and the first Surgical Congress was held in Paris in 1885. The first Congres Penodique Internat. d' Ophthalmologic took place at Brussels in j- 7 u L e Ro 7. Colle g es of Physicians and of Surgeons of London, Edinburgh and Dublin do not come within our scope. The Medical Society of London (1773) is the oldest in the metropolis; it has issued Memoirs (1787-1805), Transactions (1810, &c), and Proceedings (1872, &c.). The Royal Society of Medicine was formed, by Royal charter in 1907 by the amalgamation of the following societies: Roy. Med. and Chir. Soc (1805), Pathological Soc. (1846), Epi- demiological Soc (1850), Odontol.Soc of Gt. Britain (1856), Obstetrical -± oc : M, 8 58), Clinical Soc. (1867), Dermatological Soc. of London (1882) British Gynaecological Soc (1884), Neurolog. Soc. (1886), British Laryneol. Rhmol. and Otological Assoc. (1888), Laryngol. Soc (1893) Soc of Anaesthetists (1893), Dermatol. Soc of Gt. Brit, and Ireland (1894), Otological Soc (1899), Soc. for Study of Diseases in Children (1900), British Electro-therapeutic Soc. (1901) and the Therapeutical Soc. (1902). Most of these societies have separate Transactions or Proceedings. Other London societies (past and present) include the Abernethian Society (1795), which issues Proceedings; British Dental Association (1880), with a Journal (1880, &c.) ; British Homoeopathic Association (1859), with Annals (i860, &c); British Medical Association (1832), which has more than forty home and colonial branches, and publishes British Medical Journal (1857, &c.) ; Hahne- mann Publishing Society (1852), Materia Medica (1S52, &c)- Harvetan Society (1831); Hunterian Society (18 19), Trans ■ Lister Institute (incorp. 1891); Medico-Legal Soc. of London, Trans-

Medico-Psycholog. Assn. of Gt. Britain and Ireland (1841, incorp. 1895); New Sydenham Society (1858), which published Biennial Retrospect (1867, &c), and translations and reprints of books and papers of value,

succeeded the old Sydenham Society (1844-1858), which issued 40 vols.; Ophthalmological Society (1880), Trans.; Pharmaceutical Society (1841), with museum, Pharmaceutical Journal (1842, &c); Physiological Association (1876), Journ. of Physiology (1878, &c); Rontgen Soc, Journal; Royal Institute of Public Health (1886, incorp. 1892), Journ. Royal Sanitary Institute (1876, incorp. 1888), the council of which appoints examiners, directs Parkes Museum, founded in 1876 in memory of Dr E. A. Parkes; Society of Medical Officers of Health (1856), Trans, and Public Health; Soc. of Public A nalysts, A nalyst. The provincial societies are very numerous and include: Bradford, Med. Chir. Soc. (1863); Bristol, Med. Chir. Soc; Cardiff, Med. Soc. (1870); Liverpool, Sch. of Tropical Med. (1898, incorp. 1905), Memoirs; Manchester, Med. Soc. (1848); Newcastle-upon-Tyne, North, and Durham Med. Soc. (1848). Dublin, Roy. Acad, of Med. in Ireland (1882), Trans. (1883, &c.) ; Pharmac. Soc. of Ireland (1875). Edinburgh, Roy. Med. Soc. (1737; charter 1778); Harv'eian Soc. (1752); Medico- Chirurg. Soc. (1821), Trans. (1824, &c.) ; and Obstetrical Soc. (1840). Aberdeen, Med. Chir. Soc. (1789). Glasgow,- Medico- Chirurg. Soc. (1866), based upon Med. Soc. and Med.-Chirurg. Soc. (both 1814), joined by Path. Soc. in 1907.

Australia: Melbourne, Med. Soc. of Victoria, Austr. Med. Journ. (1856, &c). Canada: Montreal, Union Med. du Canada, Revue (1872, &c); Canada Med. Assoc, Trans. (1877, &c). India: Bom- bay, Med. and Physical Soc, Trans. (1838, &c). Calcutta, Med. Soc, Trans. (1883, &c).

United States: Amer. Pub. Health Assoc, Reports (1873, &c); Amer. Dental Assoc, Trans, (i860, &c.) ; and Amer. Inst, of Homoeop., Trans. (1878, &c). The headquarters of the American Medical Association (1847) are at Chicago; it publishes a Journal. The American Surgical Association (1880) unites at Washington every third year with the Congress of American Physicians and Surgeons. The State medical associations include those of Alabama, Trans. (1869, &c); Georgia, Trans. (1873, &c.) ; Maine, Trans. (1853, &c.) ; Missouri, Trans. (1851, &c); and South Carolina, Trans. The State medical societies include those of Arkansas, Trans. (1877, &c.) ; California, Trans. (1870, &c); Illinois, Trans. (1851, &c.) ; Kansas, Trans. (1867, &c.) ; Michigan, Trans. (1869, &c); Minnesota, Trans. (1874, &c); Nebraska, Trans. (1869, &c); New Jersey, Trans. (1859, &c); Pennsylvania, Trans. (1851, &c.) ; Rhode Island, Trans. (1877, &c.) ; Texas, Trans. (1874) ; and Wisconsin, Trans. (1880, &c). To these have to be added the following town associations. Albany, Med. Soc, Journal (1807, &c). Baltimore, Med. and Chirurg. Faculty of Maryland, Trans. (1856, &c). Boston, Amer. Gynaecolog. Soc, Trans. (1876, &c.) ; Mass. Medico-Legal Soc, Trans. (1878, &c). Denver, Acad, of Med. (1903). New York, Acad, of Med., Trans. (1847, &c.) and Bull, (i860, &c); Med. Soc, Trans. (1815, &c); Medico-Chirurg. Soc, Trans. (1878, &c); Amer. Surg.

Assoc, Trans. (1883, &c.) ; Medico-Legal Soc, Sanitarian (1873, &c.) ; Amer. Ophthalmolog. Soc, Trans. (1865, &c); Path. Soc. (1844), Trans. (1875-1879), Proc (1888, &c). Philadelphia, Med. Soc, Trans. (1850, &c); Obstet. Sec, Trans. (1869, &c); Amer. Pharm. Assoc, Proc; Patholog. Soc. (1857), Trans. (1897, &c.) ; Coll. of Physicians (1787); Amer. Soc. of Tropical Med. (1903). Richmond, Med. Soc, Trans. (1871, &c).

France: Besancon, Soc. de Mid. (1845), Bull. (1845, &c). Bordeaux, Soc. de Med. (1798), Journ. (1829, &c.) ; Soc. de Pharm. (1834), Bull, (i860, &c); Soc. de Med. et de Chirurg.; Soc. d'Anat. et de Physiol. (1879), Bull. (1880). Caen, Soc. de Mid. (1799; known by its present name since 1875), Journal (1829), Mem. (1869). Chambery, Soc de Mid. (1848), Comptes rend. (1848, &c.) and Bull. (1859, &c). Grenoble, Soc de Mid. Havre, Soc. de Pharm. (1858), Mem. Lille, Soc. de Mid. (1843), Bull. (1845, &c). Lyons, Soc Nat. de Med. (1789), Le Lyon mid. (1869, &c). Marseilles, Soc. de Mid. (1800), Comptes rend. (1826-1853) and Le Mars. mid. (1869, &c); Soc Mid.-Chirurg. (1872). Paris, Soc. de Med. Pratique (1808), Bull. ; Acad. Nat. de Med. (1820); Soc. Nat. de Chirurg. (1843, reorganized 1859), Mim. (1847, &c.) and Bull. (1851, &c); Soc. Anat. (1803), Bull. (1826, &c); Soc Clinique, Bull. (1877, &c); Soc. Mid. des Hopitaux, Bull. (1849, &c.) ; Soc. Mid. Legale; Soc de Pharm. (1803), Journ. (1815, &c); Soc. de Therapeutique; Soc. Fran, de Hygiene; Soc. Centr. de Mid. Vitirinaire (1844), Bull.; Assoc. Int. de I'Inst. Marey (1898) (for examining physiological methods and apparatus), Bull., Travaux. Rouen, Soc. de Mid. (1821), Union Mid. (1861, &c); Soc. Libre des Pharmaciens (1802), Bull. Toulouse, Soc. de Med. (1801), Bull, and Revue (1867, &c). Tours,. Soc. Mid. (1801). Germany and Austria-Ht;ngary: Deutscher Arztevereins- bund (1872), Verhandl.; Central Ver. d. Zahnarzte (1859), Mittheil.; D. Veterinarrath (1874); D. Apotheker-Ver. (1820), Archiv (1822, &c). Berlin, Ver. f. Heilkunde (1832), Magazin (1835, &c); Ges. f. Geburtshulfe u. Gynaekologie (1876), Ztschr. (1877, &c.) ; Ges. f. Heilkunde (1855); Berl. Med. Ges. (i860), Verhandl. (1865, &c); Physiolog. Ges. (1875), Verhandl. (1877, &c); D. Ver. f. Med. Statistik (1868); Ver. Homoop. Arzte (1871), Ztschr. (1882, &c); D. Ges. f. Chirurgie (1872), Verhandl. Bonn, Verband der Arztl. Vereine (1865). Breslau. Ver. f. Physiolog. Heilkunde (1848), Ztschr. (1850, &c); Verband d. Schles, Arzte-Ver. (1878). Cologne, Rhein.

Med.Chirurg. Ver. (1848), Organ (1852, &c). Darmstadt, Arztl, Kreisver. (1844). Dresden, Ges. f. Natur u. Heil-Kunde (1818), Jahresber. (1848, &c). Erlangen, Physik.Med. Soc. (1808), Sitzungs ber. (1870, &c). Frankfort, Arztl. Ver. (1845), Jahresber. (1857, &c). Hamburg, Arztl. Ver. (1816); Deutsche Ges. fur Gesch. der Medizin (1901), Mitteil. Hanover, Ver. Analyt. Chemiker (1878). Heidelberg, Ophthal. Ges. (1857). Jena. Med.-naturwissenschaftliche Ges. (1854), Zeitschr. (1874,

&c). Konigsberg, Ver. f. wiss. Heilkunde (1851). Leipzig, Med. Ges. (1829); Ges. f. Geburtshulfe (1854), Mittheil.; Homoop. Central-Ver. (1829); Magdeburg, D. Chirurgen-Ver. (1844), Ztschr. (1847, &c). Munich, Arztl. Ver. (1833), Int.- Blatt (1854, &c). Strasburg, Soc de Mid. (1842), Mim. (1850, &c.) ; Soc. Veterin. (1864); Medizinisch.- Naturwissenschaftlicher Ver. (1873). Stuttgart, Wurttemb. Arztl. Ver. (1831), Corr.-Blatt (1832, &c); Hahnemannia (1868), Mittheil. (1873, &c.) ; Apotheker-Ver. (1822), Pharm. Wochenblatt (1861, &c). Vienna, K. k. Ges. der Arzte, Ztschr. (1844, &c); Ges. fur innere Medizin u. Kinderheilkunde, Med. Wochenschrift. Weimar, Med.naturwiss. Ver. (1863). Wlirz burg, Physikal.med. Ges. (1849), Verhandl. (1850, &c). Switzer land: Geneva, Soc. Mid. Zurich, Soc. de Med.; Schweiz. Apotheker-Ver. Italy: Bologna, Soc Med.chirurg. Genoa, Accad. Med. chirurg. Milan, Soc. Ital. d' Igiena. Modena, Soc. Med.-chirurg. Naples, Real Accad. Med.-chirurg. Palermo, R. Accad. delle Sc. Med. (1649), Atti (1889, &c). Rome, R. Istit. Fisico-patologico. Turin, Accad. Real Med.chirurg. Belgium : Antwerp, Soc. de Med. (1839), Annates. Brussels, Acad. Roy. de Mid. (1841), Bull. (1841, &c.) and Mem. (1843, &c); Soc. Roy, de Pharm. (1845), Bull.; Soc. d'Anat. Patholog. (1846), Annates; Soc. Beige de Med. Homoeop.; Soc. Roy. des Sc. Mid. et Nat. (1822), Journal (1842, &c), Annales (1892, &c), Bulletin (1843, &c.) ; Inst. Solvay de Physiol. (1894), with electro physiological, chemical, embryological and other laboratories, and lecture hall. Ghent, Soc. de Mid. (1834), Annales. Li6ge, Soc. Med.- chirurg. Holland: Amsterdam, Genootschap ter Bevordering der Genees- en Heel-Kunde, Verhandel. (1841, &c); Nederl. Maatschappij ter Bevord. der Pharmacie. Batavia (Java), Geneeskundige Vereent- ging. Denmark: Copenhagen, K. Med. Selskab; Veterinaer Selskab, Norway: Christiania, Med. Selskab, Magazin (1840, &c). Sweden: Stockholm, Farmaceutiska Inst.; Svenska Lakaresdllskapet (1808), Handl. (1813, &c). Upsala, Ldkareforenig, Forhandl. (1865, &c). Spain: Madrid, R. Acad. Med. (1732). Portugal: Lisbon, Soc de Sc. Med. (1835), Jornal (1835, &c); Soc. Pharm. Lusitana. Russia: Dorpat, Pharm. Soc. Helsingfors, Finska Lakaresdllskapet (1835), Handl. (1841). Moscow, Phys.med. Soc. Riga, Soc. of Practical Physicians. St Petersburg, Soc. of Practical Physicians; Imp. Pharm. Soc Vilna, Imp. Med. Soc. (1805), Protokoly. Warsaw, Med. Chirurg. Soc. Tomsk (Siberia), Soc. of Naturalists and Physicians (1 889) , Protocol. Rumania : J assy , Soc. of Naturalists and Physicians (1 830) , Buletinul. Greece : Athens, Soc. Med. Turkey : Constanti- nople, Soc. Imp. de Mid.; Soc. de Pharm. Central and South America: Buenos Aires, A soc. Med. Caracas, Escuela Med. Guada- lajara (Mexico), Soc. Med. Merida (Mexico), Soc. Med. Mexico, Acad, de Med.; Soc. Med. Monte Video, Soc. de Med. Rio de Janeiro, Institute Oswaldo Cruz, formerly Instituto de Manguinhos (for the pro- motion of experimental pathology) ; Soc. Med. e Cirurgia. Santiago, Soc. Med.

Japan: Tokyo, Soc. for Adv. of Med. Sc, Trans. (1885, &c).

XIV. Engineering and Architecture

The principal English society dealing with mechanical science is the Institution of Civil Engineers (established in 181 8, incorporated in 1828), which publishes Transactions (4to, 1836-1842) and Minutes of Proceedings (8vo, 1837, &c). George Stephenson was the first president of the Institution of Mechanical Engineers, which was founded at Birmingham in 1847, removed to London in 1877, and registered under the Companies Act in 1878. It holds migratory meetings and publishes Proceedings. The Society of Engineers (1854), with Transactions (1861, &c.) ; the Civil and Mechanical Engineers' Society (1859); the Iron and Steel Institute (1869, incorp. 1899), with Journal and Mem. ; the Surveyors' Institution (1868, incorporated in 1 881), which publishes Transactions and holds professional examina- tions; the Aeronautical Society of Great Britain (1866), the Institu- tion of Electrical Engineers (1871, incorp. 1883), Journal; the Institution of Mining Engineers has associated with it many branch institutions in the provinces, Journal ; the Institute of Gas Engineers (1863); the Illuminating Engineers' Soc. (1909); the Institute of Metals; and the Instn. of Mining and Metallurgy, meet in London. There are institutions in the provinces at Bradford, Bristol, Cardiff (1857, incorp. in 1881), Chesterfield (1871), Dublin (1835, incorp. in 1857), Glasgow (1857, with Transactions), Liverpool (1875), Middlesbrough (1864), Newcastle-upon-Tyne (1852, incorp. in 1876, with Transactions), Nottingham (1871), Dudley (1866), and Belfast (1892).

The leading architectural society is the Royal Institute of British Architects,ˆ founded in 1834, incorporated in 1837, and granted new charters in 1887 and 1908. It appoints examining professional boards and publishes Transactions (1836; 1879, & c) an d Proceedings (1879, &c). There are also the associations of Birmingham (1873), Edinburgh (1850), Exeter (1843), Glasgow (1868), Leeds (1876), Leicestershire (1855), Liverpool (1848), Manchester (1875), Newcastle upon-Tyne, and the societies of Manchester (1865) and Oxford (1837).

The, Architectural Association of London publishes a Sketch Book (1870, &c). The Architectural Publishing Society (1848) has published Essays (1 848-1 852), and since 1852 has been bringing out a Dictionary of Architecture. There is also a Society of Architects (1884, incorp. 1893). The Roy. Inst, of Architects of Ireland meets in Dublin and publishes a

Journal.

United States: New York, Inst, of Mining Engineers. Amer. Soc. of Civ. Eng. Trans.; Amer. Soc. of Mech. Eng., Trans.; Amer. Inst, of Min. Eng.; Amer. Inst, of Architects (1857); Washington, Society of Naval Eng. France: Lyons, Soc. Acad, a" Arch. (1830), Annates (1867, &c). Paris, Soc. des Ingenieurs Civils, Annuaire (1848, &c.) ; Soc. Cent, des Architects, Bull. (1851 , &c.) and Annates (1875, &c); it has held a congress since 1875. Saint- Etienne, Soc. de ['Industrie Min. (1855), Bull. Germany and Austria-Hungary: Berlin, Ver. Deutscher Ingenieure, Ztschr. (1857) and Wochenschrift (1877, &c.) ; Ver.f. Eisenbahnkunde; Akad. des Bauwesens; Architekten-Ver., Ztschr. Breslau, Ver. f. Ges. der Bild. Kiinste (1862). Constance, Miinsterbau Ver. (1 881). Dresden, Sachs. Ingen.-u. Architekten-Ver., Protok. Hanover, Arch.-u. Ingen. Ver., Ztschr. Klagenfurt, Berg-und Hiitten-Mdnnischer Ver. Leoben, K. k. Berg-Akad. Munich, Bayr. Arch.- u. Ingen.Ver., Ztschr. Prague, Arch. und Ingen.Ver. Vienna, Osterr. Ingen. u. Arch. Ver., Ztschr.; Ges. f. Bild. Kiinste. Switzerland: Lausanne, Soc. Vaudoise des Ingen. el des Arch. Zurich, Ver. Schweiz. Ingen. «. Arch. Italy: Turin, Soc. degli Ingeneri, Atti (1868-1870). Belgium: Brussels, Assoc, des Ingen. Liege, Assoc, des Ingen. (1847), Annuaire (1851, &c). Holland: Amsterdam, Maatschappij ter Bevordering der Bouwkunst, Bouwkundige Bijdragen (1843, &c). The Hague, Kon. Inst, van Ingen., Verslag (1848, &c), Verhandel. (1848, &c.) and Tijdschr. (1870, &c). Spain and Portugal : Lisbon, Assoc, dos Engenheiros Civ. Port. ; Soc. dos Architectos e Archeologos. Madrid, Soc. Central de Arquitectos.

XV. Naval and Military Science The Royal United Service Institution, first known as the Naval and Military Library and Museum (1831), took the name of the United Service Institution in 1839, and was incorporated in i860; its professional museum is housed in the banqueting hall at Whitehall; it publishes a Journal (1857, &c). The Institution of Naval Architects (i860) publishes Transactions (4to, i860, &c). The Royal Artillery Institution (1838), which issues Minutes of Pro- ceedings (1858, &c), is at Woolwich, and the Royal Engineers' Institute (1873), which issues-Roya/ Engineers' Professional Papers, at Chatham. The Navy Records Soc. (1893) publishes works connected with the history of the British Navy. Canada: Toronto, Military Inst. India: Simla, United Service Institution.

United States: New York, Military Service Inst. (1878), Journal (1879, &c); Soc. of Naval Architects and Marine Eng., Proc. Anna- polis, U.S. Naval Institute (1873), Proc. France: Paris, Reunion des Officiers, now Cercle Militaire, Bull. (1871, &c). Germany and Austria-Hungary: Munich, Militdr. Ges. (1868), Jahrbuch. (1871, &c). Vienna, K. k.

Milit.Geogr. Inst., Arbeiten (1871, &c). Holland: Utrecht, Vereen. tot Verspreiding van Kennis aangaande s' Lands Verdediging, Jaarsverslag (1872, &c.) and Werhen. Norway : Christiania, Militaere Samfund, Nordsk Milit. Tidsskrift (1848, &c). Denmark: Copenhagen, Krigsvidenskabelige Selskab, Milit. Tids skrift (1872, &c).

XVI. Agriculture and Trades The Royal Agricultural Society of England began as the English Agricultural Society in 1838 and was incorporated in 1840. It holds annually one migratory meeting in some part of England or Wales and meetings in. London, where are its headquarters; it publishes a Journal (1840, &c). Among provincial agricultural societies and associations may be mentioned — Aberdeen, Roy. Northern Agr. Soc. (1843). Arbroath, Angus Agr. Assoc. Banbury (1834). Basing- stoke, Roy. Counties Agr. Soc. (1859). Bath, Bath and West of Engl. Soc. and Southern Counties Assoc, (founded in 1777, enlarged in 1852, and reorganized in 1866), Letters and Papers (1780-1816) and Journal (1852, &c). Belfast, Chemico-Agr. Soc. of Ulster (1845), Proc; N.E. Agr. Assoc, of Ireland. Birkenhead, Wirraland Birkenhead Agr. Soc (1842). Brecknock (1855). Carluke (1833). Chelmsford, Essex Agr. Soc. (1858). Chertsey (1833). Doncaster (1872). Dublin, Roy. Agr. Soc. of Ireland (1841). Edinburgh, Highland and Agr. Soc. of Scotland (1784, incorporated in 1787), Trans. (1799, &c). Halifax (1839, enlarged in 1858). Ipswich, Suffolk Agr. Assoc. (1831). Otley, Wharfedale Agr. Soc. Paisley, Renfrewshire Agr. Soc. (1802). Warwick. Worcester (1838). Africa: Cape Town, Agr. Soc. Australia: Sydney, Agr. Soc. of N. 3. Wales. British Guiana: Georgetown, Roy. Agr. and Commercial Soc. Canada: Montreal, Soc. d'Agr. India: Calcutta, Agr. and Hortic. Soc, Journ. (1842, &c).

United States: There were agricultural societies formed at Philadelphia and in South Carolina in 1785. The New York Soc. for '.he Promotion of Agriculture, Arts and Manufactures (1791), the Massachusetts Soc. for Prom. Agriculture (l79 2). and Columbian Agr. Soc. (1809), issued publications. Albany, State Agr. Soc. (1832), The Cultivator and Journal. Atlanta, State Agr. Soc. Boston, Inst, of Technology. Hoboken, Stevens Inst, of Technol. Madison, State Agr. Soc. Trans. (1852, &c). Sacramento, Soc. of Agr. and Hortic San

Francisco, Agr. and Hort. Soc. Troy, Rensselaer Polytechnic Inst. (1824). Worcester Polytechnic Institute (1865), Journ. (1897, &c).

France: Algiers, Soc d'Agr. (1840), Bull. Agen, Soc. d'Agr. (1776), Rec. (1800, &c). Amiens, Soc. Industrielle (1861), Bull. Angers, Soc. d'Agr. (1799), formerly Acad, d' Angers, Proc.-verb. (1846-1854), Mem. (1831, &c), Documents (1896, &c). Bordeaux, Soc. d'Agr. Boulogne, Soc. d'Agr.

Caen, Assoc. Normande pour I' Agr., I 'Industrie, &c. (1831), Annuaire (1835, &c); Soc. d'Agr. et de Commerce (1762), Mem. (1853-1858) and Bull. (1827, &c). Chalons-sur-Marne, Soc. d'Agr., &c. (1750), Comptes rendus (1807- 1855), Mem. (1855, &c). Douai, Soc. d'Agr., &c. (1799), Souv. (1861-1885), Mem. (1826, &c). Elbeuf, Soc. Industr. (1858), Bull. Grenoble, Soc d'Agr. et d'Hortic. (1835), Sud-Est (1855, &c). Le Mans, Soc. du Materiel Agr. (1857), Bull. Lyons, Soc. des Sc. Industr. (1862), Annates. Montpellier, Soc. d'Agr. (1799), Bull. (1808, &c). Nancy, Soc. Centr. d'Agr. Paris, Soc. Nat. d'Agr. de France (1761 ; reconstructed in 1878 with a view of advising Government on agri- cultural matters), M&m. and Bull. Perpignan, Soc. Agr. Scientifique et Litt. (1833), Bull. (1834, &c). Reims, Soc. Industr. (1833), Bull. (1858, &c). Rouen, Soc. Industr. (1872), Bull. ; Soc. Libre d' Emula- tion, Commerce et Industrie (1790), Bull. (1797). Saint-Jean- d'Angely, Soc. d'Agr. (1819), Bull. (1833, &c). St Quentin, Soc. Industr. (1868), Bull. Toulouse, Soc d'Agr. Vesoul, Soc. d Encourage- ment d'Agr. (1883), Bull. Germany and Austria-Hungary: The migratory Congress Deutscher Volkswirthe first met at Gotha in 1 858. Agram, Kroatisch-Slav. Landwirths. Ges., Blatter. Augsburg, Land- wirths. Ver., Landw. Blatter. Berlin, Vereinigt. Berliner Kauflevte u. Industr.; Bonn, Landwirthsch. Central-Ver. Bremen, Landwirths. Ver. Breslau, Landwirths. Central- Ver. ; Schles. Central Gewerbe- Ver. Budapest, Ungar. Ackerbau Ges. Mittheil.; Industrielle Ges. Cassel, Landwirths. Cemtral-Ver., Mittheil. Cracow, Ackerbau Ges , Annalen. Danzig, Volkswirths. Ges. (1850). Darmstadt, Landwirths. Ver.. Ztschr. Dresden, K. Okonomie Ges.; K. Sachs. Polytechnicum. Fiirth, Gewerbe-Ver Gratz, K. k. Steiermarkische Landwirths. Ges. Greifswald, baltischer Central-Ver. Halle, Landwirths. Central-Ver. Hanover, Gewerbe-Ver. Innsbruck, K. k. Landwirths. Ges., Wochen- schr.; Kdrnt. Industrie- u. Gewerbe-Ver. Jena, Landwirths. Inst. Kassa, Magyar Kir. Gazdasdgi Akad. or Academy for Agriculture Klausenburg, Magyar Kir. Gazdasdgi Akad. (1869). Konigsberg, Ostpreuss. Landwirths. Central- Ver. Leipzig, Landwirths. Kreis- Ver. ; Potytechn. Ges. Linz, K. k. Landwirths. Ges. Lubeck, Landwirths. Ver., Mittheil. Miihlhausen, Soc. Industr., Bull. Munich, Land- wirths. Kreis- Ver. ; Polytechn. Ver. Nuremberg, Polytechn. Ver. Prague, Bohmischer Gewerbe-Ver.; Industrie Ges., Mittheil. a"d Annalen. Ratisbon, Landwirths. Kreis- Ver., Bauernfreund. Stutt- gart, if. Wurttemb. Central-Stelle, Wochenblatt. Trieste, Ackerbau Ges. Tubingen, Landwirths. Ver. Vienna, K. k. Reichs Landwirths. Ges., Ztschr. Wiesbaden, Gewerbe-Ver. Switzerland: Bern, Okonom. Ges. Lausanne, Soc. d'Agr. de la Suisse Romande. Zurich, Ver. f. Landwirths. u. Gartenbau. Italy: Bologna, Soc. Agraria, Annali. Cagliari, Soc. Agr. ed Econom. Florence, Soc. Econom. ed Agr., Rendiconti. Milan, Soc. Agr. di Lombardia ; Soc. Gen. degli Agricolt. Ital.; Soc. d'Incoragg. di Arti e Mestieri, Discorsi. Perugia, Soc. Econom. ed Agr., Atti. Turin, Accad. Reale di Agricolt.; Assoc. Agr. Ital., Esercitazioni.*

Verona, Accad. d' 'Agricolt. Belgium : Soc. Centr. d'Agricult. (1854), Bull. Ghent, Soc. Roy. d'Agr. et de Bot. Liege. Soc. d'Agr., Journ. (1850, &c). Verviers, Soc. Industr. et Commerc. (1863), Bull. Holland: Amsterdam, Aardrijskundig Genootschap; Vereeniging voor Volksvlijt. Denmark: Copenhagen, K. Landhuus- holdnings Selskab; Det Statist. Tabelvaerk. Norway: Christiania, Polytekniske Forening. Sweden: K. Landtbruks Akademien. Spain and Portugal: Barcelona, Soc. Econom., Actas. Lisbon, Inst. Real de Agric; Soc. Promotora de Industr. Madrid, Soc. Econom. Matritense, Anales. Oporto, Acad. Polytechn. Russia: Dorpat, K. Livldndische Okonom. Ges., Jahrbuch. Kazan, Imp. Econom. Soc. Moscow, Imp. Soc. of Agriculturists. Odessa, Imp. Agronom. Soc. of S. Russia. Riga, Technical Soc. St Petersburg, Imp. Econom. Soc, Trans.; Technical Soc. Rumania: Bucharest, Soc. Politechnica (1881), Buletinul. South America: Rio de Janeiro, Soc. de Agr.

XVI I. Literature, History and Archaeology The Congres International des Orientalistes first met at Paris in 1873. The Congres Bibliographique International held its first meeting in 1878, and the Congrbs des Americanistes its first meeting in 1875. The first Internat. Conference of Librarians took place in London in 1877. Congresses of Archivists, Librarians and Bibliographers were held at Brussels in 1910. The Royal Society of Literature (1823, in- corporated in 1825) with Transactions (4to, 1829-1839; 8vo, 1843, &c), and the Royal Asiatic Society (1823), with Journal (1834. &c), have their headquarters in London, as well as the follow- ing literary societies, all of which issue publications: Aris- totelian (1879), Ballad (1868), Chaucer (1868), Dante (1881), Early English Text (1864), East India Association (1866), Hellenic Studies (1879), Incorp. Soc of Authors (1884), Institute of Journalists, Irish Lit., Japan (1892) , Library Association (1877), ˆLibrary Assistants (1895), Malone (1906), Oriental Translation Fund (1828), Pali Text (1882), Philological (1842), Roxburghe Club (1812), Shorthand, Viking Club (1892), Wyclif (1882). The Lancashire and Cheshire Historic Society (1848), at Liverpool, the Manchester Literary Club, with

Transactions and Papers (1874, &c.) > and the Manx Society (1858), at Douglas, may also be mentioned. In Glasgow are the Ballad Club (1876), and the Scottish Soc. of Lit. and Art (1886), and in Dublin the Nat. Lit. Soc. of Ireland (1892).

The oldest and most important society in England dealing with history and archaeology is the Society of Antiquaries of London, which enthusiasts

trace to an association founded by Archbishop Parker in 1572. The meetings were not publicly recommenced until 1707 ; the present body was incorporated in 1 751 ; it publishes Vetera Monu- menta (fol., 1747, &e.), Archaeologia (4to, 1770, &c), and Proceedings (3vo, 1849, &c). The Royal Archaeological Institute (1843), issuing the Archaeological Journal (1845, &c.) ; the British Archaeological Association (1843), with Journal (1846, &c.) ; the Royal Numismatic Society (1836), issuing the Numismatic Chronicle (1838, &c.) ; and the Royal Historical Society (1 868) , publishing Transactions, and the works of the Camden Society (1838), belong to London, as well as the follow- ing societies, all of which issue publications: Bibliographical (1892), British School at Athens, British School at Rome, British Record (1888, incorp. 1893, incl. Index Soc. 1878). Canterbury and York Catholic Record X'994), Egypt Expl. Fund (1883), Genealog. and Biogr., Cymmrodorion (1751-1773, revived in 1820), Dilettanti (1734), Folk Lore (1879), Harleian (1869), Huguenot (1885), London and Middle- sex Archaeol. (1855), London Topogr. Soc, Middlesex County Records (1884), Palaeographical, Palestine Expl. Fund, Parish Registers, Pipe Roll (1883), Soc. Bibl. Archaeol. (1870), Soc. for Prot. Anc. Buildings (1877). Outside London are the Roy. Soc. of Antiquaries of Ireland founded in 1849 as the Kilkenny Arch. Soc, changed to Roy. Hist, and Arch. Assn. in 1869 and to present title in 1890; the Society of Antiquaries of Scotland (1780), at Edinburgh, and the Irish Archaeo- logical and Celtic Society, at Dublin. Among others are — Aberdeen, New Spalding Club (1886); Bedfordshire Archaeological and Archi- tect. Soc (1844); Bristol, Bristol and Gloucester Arch. Soc. (1876); Cambrian Arch. Assoc. (1846); Cambridge Antiq. Soc. (1840); Carlisle, Cumb. and Westm. Antiq. and Arch. Soc. (1866); Devizes, Wiltshire Arch, and Nat. H. Soc (1853) ; Durham, Surtees Soc. (1834) ; Colchester, Essex Arch. Soc. (1852); Edinburgh, Bibliogr. Soc (1890), Scottish Hist. (1886); Exeter, Diocesan Arch. Soc. (I841); Glasgow Arch. Soc. (1856) ; Kent Arch. Soc. (1857); Lane and Cheshire Antiq. Soc. (1883). Leeds Thoresby Soc (1889) ; Manchester, Chetham SoC. (1843); Newcastle-on-Tyne Soc. of Antiq. (1813) ; Norwich, Norfolk and Norwich Arch. Soc. (1846); Oxford, Architect, and Hist. Soc. (1839), and Hist. Soc. (1884) ; Purbeck Soc. ; Reading, Berkshire Arch, and Architectural Soc. (1871); Surrey Arch. Soc; Sussex Arch. Soc. (1846); Welshpool, Powys Land Club (1867); and Yorkshire Arch. Soc. (1863).

Canada: Halifax, Nova Scotia Hist. Soc. (1878), Coll. Montreal, Soc. Hist., Mem. (1859, &c.) ; Numism. and Antiq. Soc. (1872), Journ. (1872, &c). Quebec, Lit. and Hist. Soc. (1824), Trans. (1837, &c). Toronto, Ontario Hist. Soc. (1888, 1898), Rep. ; Lit. and Hist. Soc. China: Hong-Kong, Roy. Asiatic Soc Shanghai, Roy. Asiatic Soc, Journ. (1858, &c). India: Bombay, Roy. Asiatic Soc (Branch) (1804), Journal (1844, &c).

Calcutta, Asiatic Society of Bengal, Journ. (1832, &c.) and Proc (1865, &c.) ; Indian Research Soc. (1907), Trans. Colombo, Roy. Asiatic Soc, Journ. (1844, &c). Madras, Lit. Soc. (1818), journal (1827, &c). Singapore, Roy. Asiatic Soc

United States: The central antiquarian body in the United States is established at Washington — the Archaeological Institute of Amer. (1879), which publishes Amer. Journ. Arch. (1897, &c), and has affiliated with it 28 societies, including the Boston Society (1879), Cincinnati Soc. (1905), Iowa Soc. (1902), Wisconsin Soc. (1889), New York Soc. (1884), San Francisco (1906), North West Soc. (Seattle) (1906). Albany, Institute and Hist, and Art Soc, Trans. (1792- 1819, 1830-1893), Proc. (1865-1882). Baltimore, Maryland Hist. Soc. (1844). Boston, Mass. Hist. Soc. (1791), Collections (1792, &c.) and Proc. (1859, &c); New Engl. Hist.-Gen. Soc. (1845), Genealog. Register (1847) ; Amer. Oriental Soc. (1843), Journ. (1849, &c.) ; Amer. Library Assoc. (1876), Liby. Journal; Soc. Bibl. Lit. and Exegesis (1880), Journal (1882, &c.) ; Bostonian Soc. (1881), Proc. (1882, &c). Brookline Hist. Soc. (1891). Buffalo, Hist. Soc. (1862). Cambridge, Hist. Soc. (1905), Proc. (1906, &c.) ; Dante Soc. (1881). Chicago, Hist. Soc. (1856). Cincinnati, Hist, and Phil. Soc. of Ohio (1831), Publns. (1906). Concord, Hist. Soc, Coll. (1824, &c). Frankfort, Kentucky State Hist. Soc. (1836), Reg. Hartford, Amer. Philolog. Soc (1869); Hist. Soc. (1825), Coll. (i860, &c). Lincoln, Nebraska State Hist. Soc. (1867), Trans. (1885-1893), Proc (1894, &c). Madison, Hist. Soc, Coll. (1849, &c). Minneapolis, Hist. Soc, Coll. (1869, &c). Mont- pelier, Hist. Soc. of Vermont, Coll. (1869, &c). New Haven, Amer. Orient. Soc. (1842), Journal (1849, &c). New Orleans, Louisiana Hist. Soc. (1867), Publns. (1895, &c). New York, Hist. Soc. (1804), Publns. (1868, &c); Geneal. and Biogr. Soc. (1869), Record (1870); Bibliogr. Soc. (1904), Proc. (1906, &c), Bull. (1907, &c); Amer. Numis. Soc, Proc. (1882). Philadelphia, Hist. Soc (1824), Mem. (1826, &c); Numism. and Arch. Soc. (1858), Proc. (1867, &c); Shakspere Soc (1852). Portland, Maine Hist. Soc, Coll. (1831, &c). Providence, Hist. Soc. (1822), Coll. (1827, &c). Richmond, Virg. Hist, and Phil. (1831), Publ. (1874, &c). St Louis, Missouri Hist. Soc. (1866), St Paul, Minnesota Hist. Soc. (1849), Coll. Savannah, Georgia Hist. Soc. (1839), Proc. Topeka, Hist. Soc. (1 875), Trans. (1881, &c). Washington, Arch. Soc. (1902) ; Columbia

Hist. Soc. (1894), Rec; Amer. Hist. Assn. (1884), Amer. Hist.'Rev. (1895, &c). Worcester, Amer. Antiq. Soc. (1812), Proc. and Arch. Amer. (1820, &c).

France: The Congrls Archiologique de la France first met in 1834. Algiers, Soc. Hist. (1856), Revue (1856, &c). Amiens, Soc. des Antiq. (1836), Mem. (1838, &c.) and Bull. Angouleme, Soc. Arch, et Hist. (1844), Bull.

Bordeaux, Soc. Archiol. (1873) ; Soc. des Arch. Hist. (1858), Archives Hist. (1858, &c). Bourges, Soc. Hist, et Litt. (1849), Bull, et Mim. (1852, &c). Caen, Soc. des Antiq. de Normandie (1823), Mim. (1824, &c.) and Bull, (i860, &c); Soc. Fran. d'Arch. (1834), Comptes rend. (1834, &c.) and Bull. Mens. (1835, &c). Chalon-sur-Saone, Soc. d'Hist. et d'Arch. (1844), Mim. (1844, &c). Chambery, Soc. Savoisienne d'Hist. et d'Arch. (1855), Mem. (1856, &c). Constantine, Soc. Arch. (1852), Recueil. Dijon, Comm. des Antiquites (1831), Mem. (1882, &c). Lille, Comm. hist, du Nord (1839), Bull. (1843. &c). Limoges, Soc. Hist, et Arch. (1845), Bull.; Soc. des Archives hist. (1886), Archives (1887, &c). Lyons, Soc. Hist., Litt. et Arch. (1807), Mem. (i860, &c). Mont- pellier, Soc. Arch. (1833), Mem. (1835, &c). Nancy, Soc. d'Arch. de Lorraine (1845), Mem. (1850, &c.) and Journ. (1852, &c). Nantes, Soc. Arch. (1845), Bull. (1859, &c). Orleans, Soc. Arch, et Hist. (1848), Mem. (1851, &c.) and Bull. Paris, Soc Nat. des Antiq. de Fr. (1813) (based on the Academie Celtique, 1804), Mem. (1805, &c.) and Bull. (1817, &c); Soc de I'Hist. de France (1833), Annuaire (1837) and nearly 400 vols, besides; Soc. de I'&cole Nat. des Charles (1839), Documents (1873, &c); Soc. Asiatique (1822), Journal Asiat. (1822, &c), &c. ; Soc. d'Arch. et de Numism. (1865) ; Soc. de I'Hist. du Prot. Fran. (1866) ; Soc. de Linguistique; Soc. Bibliogr. (1868), Polybiblion. ; Soc. Philol. (1867), Actes (1869, &c); Soc. des &udes Hist. (1833), Revue (1834, See); Soc. d'Hist. Moderne (1901), Bull.; Soc. d'Hist. Contemp. (1890); Soc. de I'Hist. de la Revolution Fran. (1888); Soc. d'Hist. Diplomatique (1886); Soc. des Bibliophiles Fran. (1820); Soc. des Anciens Textes Fran. (1875), Bull. Poitiers, Soc. des Antiq. (1834), Mem. Rouen, Soc. de I'Hist. de Norm. (1869), Bull. (1870, &c.) and 75 vols, besides; Comm. des Antiquites (1818), Bull. (1867, &c). Saint-Omer, Soc. des Antiq. (1831), Mem. (1833, &c.), Toulouse, Soc. Arch. (1831), Mem. (1831-1868), Bull. (1869, &c); Acad, des Jtux fioraux (1323, reorganized 1773), Rec. (1696, &c). Tours, Soc. Arch. (1840), Mim. (1842, &c). Germany and Austria- Hungary: Gesam. Ver. d. D. Gesch. u. Alt. Vereine (1852). Agram, Ges.f. Siid-Slav. Alterth. Aix-la-Chapelle, Geschichtsver. (1879), Ztschr. (1879, &c). Altenburg, Gesch. u. Alterthums Ges. (1838), Mittheil. (1841, &c). Augsburg, Hist. Ver. (1820, reorganized in 1834), Jahresber. (1835, &c). Baden, Alterthums-Ver. (1844), Schriften. Bamberg, Hist. Ver. (1830), Ber. (1834, &c). Berlin, Ver. f. Gesch. d. Mark Brandenb. (1836), Forschungen (1841, &c); Ver.f. d. Gesch. Berlins (1865), Schriften; Hist. Ges. (1871), Mittheil. (1873, &c); Archdolog. Ges. (1842), Sitzungsber., Archaol. Zeitung; Numism. Ges. (1843), Jahresber. (1845, &c), Herold (1869) ; Phil. Ges. (1843), Der Gedanke (1861, #c.) ; Ges.f. D. Philologie (1877), Jahresber. (1879, &c); D. Bibliogr. Ges. (1902), Ztschr. (1903, &c); Ver. D. Bibliothekare (1900), Jahrbuch (1902); D. Orient-Ges. (1898), Mitleil. Bonn, Ver.f. Alterth. (1841), Jahresber. ; Soc. Philologa (1854).

Brandenburg, Hist. Ver. (1868), Jahresber. (1870, &c). Braunsberg, Hist. Ver. (1856). Breslau, Ver.f. Gesch. u. Alt. Schl. (1846), Ztschr. (1856, &c), Scriptores rerum Silesicarum (1847, &c.) ; Breslauer Dichterschule (i860). Budapest, Hungarian Hist. Soc (1867), Szdzadok. Cassel, Ver. f. Hess. Gesch. (1834), Ztschr. (1837, &c). Cologne, Hist. Ver. (1854), Annalen (1855, &c.) ; Ges. fur rheinische Geschichtskunde (1881). Cracow, Hist. Soc. Danzig, Westpreuss. Geschichtsver. (1879), Ztschr., Mitteil., Akten. Darmstadt, Hist. Ver. (1834), Archiv (1835, &c). Dresden, K. Sachs. Alt. Ver. (1825), Jahresber. (1835, &c.) and Mittheil. (1835, &c). Frankfort, Ges. f. Deutschlands Sit. Geschichtskunde (1819; since 1875 under guidance of Central-Dir. d. Mon. Germ.), Mon. Germ. (1826, &c); Ges. f. Gesch. u. Kunst (1837), Mittheil. (1858, &c); Freies D. Hochstift in Goethe's Vaterhaus (1859); Ver. fur Gesch. u. Alt. (1857), Archiv. Halle, Thiir.-Sachs. Ver. (1819), Mittheil. (1822, &c); D. Morgenl. Ges. (1844), Ztschr. (1847, &c.) and Abhandl. (1859, &c.). Hanover, Hist. Ver. (1835), Ztschr. Kiel, Ges.f. Gesch. Schl.Holst. (1833, re organized in 1873), Archiv (1833, &c.) and Ztschr. (1870, &c). Konigsberg, Altertumsges. Prussia (1844), Sitzungsber. Leipzig, D. Ges. z. Erforschung vaterl. Spr. u. Alterth. (1697, reorganized in 1824), Jahresber. (1825, &c.) and Mittheil. (1845, &c); Fiirstlich Jablonowski's Ges. (1768), Acta (1772, &c.) ; Borsenver. d. D. Buch- hdndler (1825), Borsenblatt (1834, & c); Hist. Theolog. Ges. (1814) Lubeck, Hansischer Ges. Ver. (1870). Munich, Hist. Ver. (1837), Archiv (1839, &c); Alterthums Ver. (1864). Nuremberg, Pegnesischer Blumenorden (1644), had united with it in 1874 the Lit. Ver. (1839), Prague, Ver.f. Gesch. Ratisbon, Hist. Ver. (1830), Verhandl. (1832, &c). Rostock, Ver. fur. Alt. (1883), Beitrdge (1890, &c). Schwenn, Ver.f. Meckl. Gesch. u. Alterthumsk. (1835), Jahrbuch (1835, &c.) and other publications. Strassburg, Soc. pour la conservation des Monu- ments Historiques d' Alsace (1855), Bull. (1855, also since 1889 with German title Mitteilungen). Stuttgart, Lit. Ver. (1839), Bibliothek (1843, &c); Wurttemb. Alterth. Ver. (1843). Jahreshefte (1844) and many records, handbooks, &c. Tubingen, Lit. Ver. (1839), BMiothek (1842, &c). Vienna, K. k. Orient. Akad.; K. k. Heraldische Ges. " Adler" (1870), Jahrbiicher (1874, &c); Ver. fur Osterr. Volks- kunde (1894), Ztschr. Weimar, D. Shakespeare Ges. (1864, Jahrbuch

(1865, &c); Goethe Ces. (1885), Schriften (1885, &c); Ges. der Bibltophilen (1899). Wiesbaden, Ver. f. Nass. Alterth. (182 1), Annalen (1830, &c). Wiirzburg, Hist. Ver. (1831), Archiv (1833). Switzerland: Basle, Hist. u. A ntiq. Ges. (1836). Berne, Allgemeine Geschichtforschende Ges. (1840). Freiberg, Soc. d'Hist. Geneva, Soc. d'Hist. et d'Arch. (1838). Lausanne, Soc. d'Hist.; Soc. Vaudoise d'Hist. et d'Arch. (1902), Revue. St Gall, Hist. Ver. (1859), Mitteil. (1862, &c). Zurich, Soc. d'Hist. ; Antiq. Ges., Denkmdler. Italy: Bologna, Reg. Deputazione di Storia Patria. Catania, Soc. di Storia Patria (1903). Ferrara, Deput. Ferrarese di Storia Patria (1884). Florence, Societa Colombaria (1823); Soc. Dantesca Italiana (1888); R. Deputazione Tosc. di Storia Patria (1862). Genoa, Soc. di Storia Patria (1857). Milan, Soc. Numis. Ital.; Soc. Storica Lombarda. Naples, Soc. Nap. di Storia Patria (1875). Palermo, Soc. Sic. di Storia Patria (1873), Doc. Parma, R. Deputazione di Storia Patria. Rome, Accad. Rom. di Arch.; Soc. Rom. di Storia Patria (1877), Archivio (1877, &c); 1st. di Corr. Arch.; Brit, and Amer. Arch. Soc; Soc. Filol. Rom. (1901); Istituto Stor. Ital. (1883), Fonti (1887, &c); K. Deutsch. Archaolog. Inst., Arch. Zing. (1843-1885) and Jahrb. Turin, Real Deputaz. di Stor. Patr. (1833). Venice, R. Dep. Ven. di Storia Patria. Verona, Soc. Lett. (1808). Belgium: Antwerp, Acad. d'Archeol. (1842), Bull. (1865, &c). Bruges, Soc. pour I'Hisl. et les Antiq. de la Flandre (1839), Publ. Brussels, Soc. de VHist. de Belgique (1858), Publ.; Soc. Roy. de Numism. (1841), Revue; Soc. des Bibliophiles (1865); Soc. d'Archeol. (1887), Annuaire, Annates; Inst. Int. de Bibliogr. (1895), Repertoire. Ghent, Soc. Roy. des Beaux- Arts et de la Litt. (1808), Annates (1844, &c); Willems Fond (1851) ; Maatschappij de Vlaamsche Bibliophilen (1839) ; Soc. d'Hist. et d'ArcMol. (founded 1893 as Cercle Hist, et Archeol.), Bull. Liege,' Inst. Archiol. (1850), Bull. (1852, &c). Louvain, Soc. Litt. (1839), Idem, and Publ. Mons, Cercle Archiol. (1856), Annates (1857, &c). Namur, Soc. Archeol. et Musee de Namur (1845), Annates. Tournai, Soc. Hist, et Litt. (1846), Bull. (1849, &<:.)• Verviers, Soc. Arch. Ypres, Soc. Hist. (1861). Holland: Leiden, Acad. Lugduno- Batava; Maatschappij der Nederlandsche Letterkunde (1766) Tijdschrifl. Luxembourg, Inst. ArchM. (1846, reorganized in 1862), Annates (1849, &c). Utrecht, Hist. Genootschap (1845). Den- mark: Copenhagen, Island. Litt. Selskab; K. Danske Selskab (1745), Magazin; K. Nordisk Oldskrift Selskab, Aarboger (1866, &c), Fortuisminder (1890, &c.). Reykjavik (Iceland), Fornleifarfelag; Hid islenzka Bokmentafelag (1816), Skirnir. Norway: Christiania, Norske Hist. Forming (1869); Norske Oldskrift Selskab; Foreningen til Norske Fortidsminde maerkers Bevaring (1844). Sweden: Stock- holm, K. Witterhets Hist, och Antiq. Akad. ; Svenska Akad. ; Sv. Forn- skriftsdllskapet (1843) Proc; K. Samfundet for utgifvande af hand- skrifter rorande Skandinaviens hist. (1815-1817), Handl. (1816,

&c.). Spain: Barcelona, R. Acad, de Buenas Letras. Madrid, R. Acad, de Cienc. Mor. y Pol. ; R. Acad. Esp. Arq. ; R. Acad, de la Hist. (1738). Russia: Helsingfors, Finska Litt. Sdllskapet (1831), Ztschr. (1841); Finnish Archaeol. Sot. (1870), Tidskrift (1874, &c.) ; Hist. Soc. (1875), Arkisto (1876, &c). Kazan, Soc. of Arch. Hist, and Ethnogr. (1877), Izvestija (1878). Mitau, Courland Soc. of Lit. and Art. Moscow, Imp. Russ. Soc. of Hist, and Antiq.; Archaeolog. Soc. (1864). Narva, Archaeolog. Soc. Odessa, Hist, and Antiq. Soc. (1839), Zapiski (1844, &c). Riga, Lett. Lit. Ges.; Hist, and Antiq. Soc. (1834), Mitteil. (1873, &c). St Petersburg, Russ. Hist. Soc. (1866), Sbornik (1867, &c); Imp. Soc. for Study of Ancient Lit. (1877); Imp. Russ. Archeol. Soc. (1846); Russ. Bibliogr. Soc. (1899); Soc. for Orient. Studies, with numerous branches; Neo- Philol. Soc. (1885). Greece: Athens, Soc. Archeol.; Amer. School Class. Studies (1882); Acole Franc. d'Athenes (1846); British School at Athens (1886); 'kpxaxoKoyucii 'ETaiptia (Arch. Soc.) (1837), 'Eˆij/itpk. Turkey: Constantinople, Soc. for Adv. of Turkish Lit. ; Greek Lit. Soc. ; Hellenic Philolog. Soc. Bulgaria : Sofia, Bulg. Lit. Soc. (1869), now the Bulgarian Acad. (1910), Period. (1870, &c). South America : Rio de Janeiro, Inst. hist, e geogr. (1838). Japan : Yokohama, Asiatic Soc. of Japan, Trans. (1874, &c).

XVIII. Geography The Congres International pour les Progrh des Sciences Geogra- phiques first met in 1 87 1. The Royal Geographical Society of London, founded in 1830, had joined to it in the following year the African Association (1788), the successor of the Saturday Club; the Palestine Association (1805) became merged with it in 1834. It publishes Journal (1832, &c.) and Proceedings (1857, &c). The Hakluyt Society (1846) has printed more than 136 vols, of rare voyages and travels. The Alpine Club (1858), whose publications are Peaks, Passes and Glaciers (1859-1862) and Journal (1863, &c), meets in London. The Royal Scottish Geographical Society (1884) has its centre at Edinburgh, and issues the Scottish Geographical Magazine. Liverpool, Tyneside and Manchester have also Geographical Societies. Australia: Adelaide, R. Geogr. Soc. of Australasia (1885), Proc. Brisbane, R. Geogr. Soc. of Australasia (1885). Melbourne, Roy. Geogr. Soc. of Australasia (1883). Sydney, Geogr. Inst. Canada: Quebec, Geogr. Soc. India: Bombay, Geogr. Soc, Trans. (1836, &c). Egypt: Cairo, Soc. Khidiviale de Geogr. (1875), Bull. (1876, &c).

United States: Baltimore, Geogr. Soc (1902). Chicago, Geogr. Soc. (1894). Hamilton, Assoc of Amer. Geogr. (1904). New York, Amer. Geogr. Soc. (1852), Bull. (1852-1857), Journ. later Bull. (1859,

&c), and Proc. (1 862-1 865). Philadelphia, Geogr. Soc. (1891). San

Francisco, Geogr. Soc. (1891), Bull. Washington, Nat. Geogr. Soc. (1852), Magazine (1888). France : Algiers, Soc. Geogr. (1896), Bull. Bordeaux, Soc.de Geogr. Commerciale (1874) , Bull. Dijon, Soc. Bourg. de GSogr. et d'Hist. (1881), Mem. (1884, &c). Lyons, Soc de Geogr. (1873), Bull Marseilles, Soc.deGeogr. (1876), Bull. Montpellier, Soc. Languedocienne de Geogr. (18 78), Bull. Nancy, Soc. de Geogr. (1878). Bull. Paris, Soc.deGeogr. (1821; 1827), Bull. Toulouse, Soc.de Geogr. (1882), Bull. Germany and Austria-Hungary: D. Alpen-Ver. (1869), Ztschr. u. Jahrb. (1869, &c). Berlin, Ges.f. Erdkunde (1828), Ztschr. (1853, &c), and Verhandl. (1873, &c); Ges. zur Erforschung Aquat. Afrikas (1873), Corr.-Blait; Afrik. Ges. (1878), Mittheil.; D. Geographentag (1881), Verhandl. Bremen, Geograph. Ges. (1876), Geogr. Blatter. Budapest, Hung.-Geogr. Soc. (1872). Carlsruhe, Badische Geogr. Ges. (1880), Verhandl. Cassel, Ver. f. Erdk. (1882). Darmstadt, Ver.f. Erdk. (1845), Notizblatt (1854, &c). Dresden, Ver. f. Erdk. (1863), Jahresber. (1865-1901), Mitteil. (1905, &c). Frank- fort, Ver. f. Geogr. u. Statist. (1836), Jahresber. Giessen, Ges. fur Erd.u. Volkerkunde (1896). Halle, Ver.f. Erdk. (1873). Hamburg, Geogr. Ges. (1873), Jahresber. Hanover, Geogr. Ges. (1878), Jahresber. Jena, Geogr. Ges. (1880), Mittheil. Leipzig, Ver. f. Erdk. (1861), Jahresber. Liibeck, Geogr. Ges. (1882). Munich, Geogr. Ges. (1869), Jahresber. Vienna, K. k. Geogr. Ges., Mitt. (1857, &c.) ; Ver. der Geogr. Weimar, Geogr. Inst. Switzerland : Berne, Inst. Geogr. ; Geogr. Ges. (1873), Jahresber. (1879, &c.) ; Schweiz. Alpen-Club. Geneva, Soc. de Geogr., Mem. (i860, &c). Zurich, Karten- Ver. Italy: Rome, Soc. Geogr. Ital., Bull. (1868, &c). Turin, Circolo Geogr. Ital. (1868). Belgium: Antwerp, Soc. Beige de Geogr. (1870), Bull. ; Soc Roy. de Geogr. (1876), Bull. Brussels, Soc. Beige de Geogr. (1876). Hol- land: Amsterdam, K. Nederl. Aardrijkskundig Genool. (1873), Tijdschrifl (1874, &c.) ; Landkundige Genootschap. Denmark: Copenhagen, Geogr. Selskab. Norway : Christiania, Det norske geogr. Selskab (1889). Spain and Portugal: Lisbon, Soc. de Geogr., Bol. (1875, &c.). Madrid, Soc. Geogr., Bol. (1876, &c). Russia: Hel- singfors, Geogr. Soc. (1888), Tidskrift; Sdllskapet for Finlands geografi (1888). Irkutsk, Geogr. Soc, Bull. (1871, &c). St Petersburg, Imp. Russ. Geogr. Soc, Mem. (1845, &c), and Bull. (1865, &c). Tiflis, Geogr. Soc, Mem. (1852, &c). Rumania: Bucharest, Societatea Geografica Rom&na (1875), Bull. Egypt: Cairo, Soc. Khidiviale de Geogr., Bull. (1876, &c). Japan: Tokyo, Geogr. Soc Central and South America: Buenos Aires, Inst. Geogr. Argent. La Paz, Soc. Geogr. (1889), Bol. Lima, Soc. Geogr. (1888), Bol. Mexico, Soc. de Geogr. y Estad., Bol. (1833, &c.). Rio de Janeiro, Soc. de Geogr.

Bibliography.— The Catal. of Printed Books in the British Museum (1841), folio, s.v. " Academies," contains a list of all the publications of societies at that time in the museum. This has been rearranged and greatly enlarged as

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*SOCIETY ISLANDS (French Archipel de la Societe). an archi- pelago of the Pacific Ocean, in the eastern part of Polynesia, between i6° and 18° S., 148 and i55°W., with a total land area of 637 sq. m., belonging to France. (For map, see Pacific Ocean.) The principal island is Tahiti (?.».). Part of the archipelago was discovered by Pedro Fernandez Quiros in 1607. In 1767 Samuel Wallis re-discovered it, and named it King George's Island. In 1768 Louis de Bougainville visited Tahiti, claimed it as French, and named it La Nouvelle Cythere. On the 1 2th of April 1769 the British expedition to observe the transit of Venus, under the naval command of James Cook, arrived at Tahiti. On this first voyage (he subsequently re- visited the islands twice) he named the Leeward group of islands Society in honour of the Royal Society, at the instigation of which the expedition had been sent; Tahiti and the adjacent islands he called Georgian, bui the first name was subsequently adopted for the whole group. In 1772 and 1774 the islands were visited by a Spanish government expedition, and some attempt was made at colonization. In 1788 Lieutenant Bligh of the " Bounty " spent some time at Tahiti, to which island the his- torical interest now passes**

The archipelago is divided into two groups — the Leeward (ties sous le Vent) and the Windward Islands (Ties du Vent) — by a clear channel of 60 m. in breadth. The Leeward Islands are Tubai or Motuiti, a small uninhabited lagoon island, the most northern of the group; Marua or Maupiti — " Double Mountain," the most western; Bola- Bola or Bora-Bora; Huaheine; Raiatea or Ulietea (Spanish. Prin- cessa), the largest island of this cluster, and Tahaa, which approach each other very closely, and are encircled by one reef. To the west lie the small groups of coral islets — Mopiha (Lord Howe), Ura (Scilly) and Bellingshausen (discovered by Otto von Kotzebue, 1824). To the Windward Islands belong Tapamanu or Maiaiti (Wallis's Sir Charles Saunders's Island and Spanish Pelada) ; Moorea or Eimeo (Wallis's Duke of York Island and Spanish San Domingo) ; Tahiti — Cook's Otaheite (probably Quiros's Sagittaria ; Wallis's King George's Island, Bougainville's Nouvelle Cythere and Spanish Isla d'Amat) ; Tetuaroa — " The Distant Sea " (? Quiros's Fugitiva; Bougainville's Umaitia and Spanish Tres Hermanos) ; and Maitea (? Quiros's La Dezana, Wallis's Osnaburg Island, Bougainville's Boudoir and Pic de la Boudeuse and Spanish Cristoval), the most eastern and southern of the archipelago. Tetuaroa and Tubai, besides the three western Leeward Isles, are coral atolls. The length of the Tetuaroa reef ring is about six miles; it bears twelve palm-covered islets, of which several are inhabited, and has one narrow boat-passage leading into the lagoon. With the exception just named, the islands, which agree very closely in geological structure, are moun- tainous, and present, perhaps, the most wonderful example of volcanic rocks to be found on the globe. They are formed of trachyte, dolerite and basalt. There are raised coral beds high up the moun-

tains, and lava occurs in a variety of forms, even in solid flows; but all active volcanic agency has so long ceased that the craters have been almost entirely obliterated by denudation. Hot springs are unknown, and earthquakes are slight and rare. Nevertheless, under some of these flows remains of plants and insects of species now living in the islands have been found — a proof that the forma tion as well as the denudation of the country is, geologically speaking, recent. In profile the islands are rugged and elevated (7349 ft. in Tahiti, Moorea 4045 ft., Raiatea 3389, Bola-Bola 2165). A moun- tain, usually with very steep peaks, forms the centre, if not the whole island ; on all sides steep ridges descend to the sea, or, as is oftener the case, to a considerable belt of flat land. These moun- tains, excepting some stony crags and cliffs, are clothed with dense forest, the soil being exceptionally fertile. All voyagers agree that ter varied beauty of form and colour the Society Islands are unsur- passed in the Pacific. Innumerable rills gather in lovely streams, and, after heavy rains, torrents precipitate themselves in grand cascades from the mountain cliffs— a feature so striking as to have attracted the attention of all voyagers, from Wallis downwards. Round most of the islands there is a luxuriant coral growth; but, as the reefs lie at no great distance, and follow the line of the coast, the inter-island channels are comparatively safe. Maitea, which rises from the sea as an exceedingly abrupt cone, and Tapamanu, appear to be the only islands without almost completely encircling barrier-reefs. The coasts are fairly indented, and, protected by these reefs, which often support a chain of green islets, afford many good harbours and safe anchorages. In this respect the Society Islands have the advantage of many Polynesian islands.

The populations of the chief islands are: Tahiti 10,300, Moorea 1600, Raiatea and Tahaa 2300, Huaheine 1300, Bola-Bola 800; and that of the whole archipelago is about 18,500.

SOCINUS, the latinized form of the Italian Sozini, Sozzini or Soccini, a name born by two Italian theologians.

L Lelio Francesco Maria Sozini (1525-1K62) was born at

Siena on the 29th of January 1525. His family descended from Sozzo, a banker at Percena, whose second son, Mino Sozzi, settled as a notary at Siena in 1304. Mino Sozzi's grandson, Sozzino (d. 1403), was ancestor of a line of patrician jurists and canonists, Mariano Sozzini senior (1397-1467) being the first and the most famous, and traditionally regarded as the first freethinker in the family. Lelio (who spells his surname Sozini, latinizing it Sozinus) was the sixth son of Mariano Sozzini junior (1482-1556) by his wife Camilla Salvetti, and was educated as a jurist under his father's eye at Bologna. He told Melanchthon that his desire to

reach the fonies juris led him to Biblical research, and hence to rejection of " the idolatry of Rome " He gained some knowledge of Hebrew and Arabic (to Bibliander he gave a manuscript of the Koran) as well as Greek, but was never a laborious student. His father supplied him with means, and on coming of age he repaired to Venice ; the headquarters of the evangelical movement in Italy. A tradition, first published by Sand in 1678, amplified by subse- quent writers, makes him a leading spirit in alleged theological conferences at Vicenza, about 1546; the whole account (abound- ing in anachronisms, including the story of Sozini's flight) must be rejected as fabulous. At this period the standpoint of Sozini was that of evangelical reform; he exhibits a singular union of enthusiastic piety with subtle theological speculation. At Chiavenna in 1547 he came under the influence of Camillo of Sicily, a gentle mystic, surnamed Renato, whose teaching at many points resembled that of the early Quakers. Pursuing his religious travels, his family name and his personal charm ensured him a welcome in Switzerland, France, England and Holland. Returning to Switzerland at the close of 1548, with commendatory letters to the Swiss churches from Nicolas Meyer, envoy from Wittenberg to Italy, we find him (1549-1550) at Geneva, Basel (with Sebastian Miinster) and Zurich (lodging with Pellican). He is next at Wittenberg (July 1550 to June 1551), first as Melanchthon's guest, then with Johann Forster for improvement of his Hebrew. From Wittenberg he returned to Zurich (end of 1551), after visiting Prague, Vienna and Cracow. Political events drew him back to Italy in June 1552; two visits to Siena (where freedom of speech was for the moment possible, owing to the shaking off of the Spanish yoke) brought him into fruitful contact with his young nephew Fausto. He was at Padua (not Geneva, as is often said) at the date of Ser- vetus's execution (Oct. 27, 1553). Thence he made his way to Basel (January 1554), Geneva (April) and Zurich (May), where he took up his abode.

Calvin, like Melanchthon, received Sozini with open arms. Melanchthon (though a phrase in one of his letters has been strangely misconstrued) never regarded him with theological suspicion. To Calvin's keen glance Sozini's over-speculative tendency and the genuineness of his religious nature were equally apparent. A passage often quoted (apart from the context) in one of Calvin's letters (January 1, 1552) has been viewed as a rapture of amicable intercourse; but, while more than once uneasy apprehensions arose in Calvin's mind, there was no breach of correspondence or of kindliness. Of all the Reformers, Bullinger was Sozini's closest intimate, his warmest and wisest friend. Sozini's theological difficulties turned on the resur- rection of the body, predestination, the ground of salvation (on these points he corresponded with Calvin), the doctrinal basis of the original gospel (his queries to Bullinger), the nature of repentance (to Rudolph Gualther), the sacraments (to Johann Wolff). It

was the fate of Servetus that directed his mind to the problem of the Trinity. At Geneva (April 1554) he made incautious remarks on the common doctrine, emphasized in a subsequent letter to Martinengo, the Italian pastor. Bullinger, at the instance of correspondents (including Calvin), questioned Sozini as to his faith, and received from him an explicitly ortho- dox confession (reduced to writing on the 15th of July 1555) with a frank reservation of the right of further inquiry. A month before this Sozini had been sent with Martino Muralto to Basel, to secure Ochino as pastor of the Italian church at Zurich; and it is clear that in their subsequent intercourse the minds

of Sozmi and Ochino (a thinker of the same type as Camillo, with finer dialectic skill) acted powerfully on each other in the radical discussion of theological problems. In 1556 by the death of his father (who left him nothing by will), Sozini was involved in pecuniary anxieties. With influential introductions (one from Calvin) he visited in 1558 the courts of Vienna and Cracow to obtain support for an appeal to the reigning duke at Florence for the realization of his own and the family estates. Curiously enough Melanchthon's letter introducing Sozini to Maximilian II. invokes as an historic parallel the hospitable reception rendered by the emperor Constans to Athanasius, when he fled from Egypt to Treves. Well received out of Italy, Sozini could do nothing at home, and apparently did not proceed beyond Venice. The Inquisition had its eye on the family; his brother Cornelio was imprisoned at Rome; his brothers Celso and Camillo and his nephew Fausto were " repu- tati Luterani," and Camillo had fled from Siena. In August 1559 Sozini returned to Zurich, where his brief career was closed by his death on the 14th of May 1562, at his lodging in the house of Hans Wyss, silk-weaver. No authentic portrait of him exists; alleged likenesses on medals, &c, are spurious. The news of his uncle's death reached Fausto at Lyons through Antonio Maria Besozzo. Repairing to Zurich Fausto got his uncle's few papers, comprising very little connected writing but a good many notes. Fausto has so often been treated as a plagiarist from Lelio that it may be well to state that his indebtedness, somewhat over-estimated by himself, was twofold: (1) He derived from Lelio in conversation (1552-1553) the germ of his theory of salvation; (2) Lelio's paraphrase (1561) of apxh in John i. 1 as " the beginning of the gospel " gave Fausto an exegetical hint for the construction of his Christology. Apart from these suggestions, Fausto owed nothing to Lelio, save a curiously far-fetched interpretation of John viii. 58 and the stimulus of his pure character and shining qualities. The two men were of contrasted types. Lelio, impulsive and inquisitive, was in quest of the spiritual ground

of religious truths; the drier mind of Fausto sought in external authority a basis for the ethical teaching of Christianity.

Sozini's extant writings are: (1) De sacramentis dissertatio (1560), four parts, and (2) De resurreclione (a fragment) ; these were first printed in F. et L. Socini, item E. Soneri tractatus (Amsterdam, 1654). To these may be added his Confession (1555), printed in Hottinger, Hist, eccles. N.T. ix. 16, 5 (1667); and about twenty-four letters, not collected, but may be found dispersed, and more or less correctly given in Illgen, in Trechsel, in the Corpus reformatorum edition of Calvin's works, and in E. Burnat, L. Socin (1894) ; the handwriting of the originals is exceedingly crabbed. Sand adds a Rhapsodia in Esaiam prophetam, of which nothing is known. Beza suspected that Sozini had a hand in the De haerelicis, ah sint persequendi (1553); and to him has also been assigned the Contra libellum Calvini (1554); both are the work of Castellio, and there is no ground for attributing any part of them to Sozini. Beza also assigned to him (in 1567) an anonymous Explicalio (1562) of the proem of St John's Gospel, which was the work of Fausto; this error, adopted by Zanchi, has been a chief source of the misconcep- tion which treats Lelio as a heresiarch. In Franc Guinio's Defensio cath. doct. de S. Trin. (1590-1591) is an anonymous enumeratio of motives for professing the doctrine of the Trinity, by some ascribed to Lelio; by others, with somewhat more probability, to Fausto.

For the life of L. Sozini the best guide is Trechsel, Die prot. antilrin. vor F. Socin, vol. ii. (1844) ; but there are valuable materials in Illgen, Vita L. Socini (1814), and especially Symbolae ad vitam et doctrinam L. Soc, &c. (1826). R. Wallace, Antilrin. biog. (1850), gives the ordinary Unitarian view, relying on Bock, Da Porta and Lubieniecki. See also Theological Review (fuly 1879), and Bonet- Maury's Early Sources of Eng. Unit. Christ, (trans. E. P. Hall, 1884). Use has been made above of unprinted sources.

II. Fausto Paolo Sozzini (1 530-1604) was born at Siena on the 5th of December 1539, the only son of Alessandro Sozzini, " princeps subtilitatum," by Agnese, daughter of Borghese Petrucci, a descendant of Pandotfo Petrucci, the Cromwell of Siena. Unlike his uncle Lelio, Fausto spells his' surname Sozzini, latinizing it Socinus. His father died in 1541, in his thirty-second year. Fausto had no regular education, being brought up at home with his sister Fillide, and spent his youth in desultory reading at Scopeto, the family country-seat. To the able women of his family he owed the strong moral impress xxv. II

which marked him through life; his early intellectual stimulus came from his uncle Celso, a nominal Catholic, but an esprit fort, founder of the short-lived Accademia dei Sizienti (1554), of which young Fausto was a

member. In 1556 his grandfather's will, leaving him one-fourth of the family estates, made him inde- pendent. Next year he entered the Accademia degli intronati, the centre of intellectual life in Siena, taking the academic name " II Frastagliato," his badge Un mare turbato da venti, his motto Turbant sed extollunt. About this time Panzirolo (De claris legg. inlerpp., first published 1637) describes him as a young man of fine talent, with promise of a legal career; but he despised the law, preferring to write sonnets. In 15 58-1 5 59 the suspicion of Lutheranism fell on him in common with his uncles Celso and Camillo. Coming of age (1561) he went to Lyons, probably engaging in mercantile business; he revisited Italy after his uncle Lelio's death; we find him in 1562 on the roll of the Italian church at Geneva; there is no trace of any relations with Calvin; to Lyons he returned next year. The evangelical position was not radical enough for him. In his Explicalio (1562) of the proem to St John's Gospel he already attributes to our Lord an official, not an essential, deity; a letter of 1563 rejects the natural immortality of man (a position subsequently developed in his disputation with Pucci). Towards the end of 1563 he returned to Italy, conforming to the Catholic Church, and for twelve years, as. his unpublished letters show, was in the service, of Isabella de Medici, daughter of the grand-duke Cosimo of Tuscany (not, as Przypkowski says, in the service of the grand- duke). This portion of his life he regarded as wasted; till 1567 he gave some attention to legal duties, and at the instance of "a great personage" wrote (1570) his treatise De auctoritate s. scripturae. In 157 1 he was in Rome, probably with his patroness. He left Italy at the end of 1575, and after Isabella's death (strangled by her husband in 1576) he declined the over- tures of her brother Francesco, now grand-duke, who pressed him to return. Francesco was doubtless aware of the motive which led Sozzini to quit Italy; there is every reason to believe Przypkowski's statement that the grand-duke agreed to secure to him the income of his property so long as he published nothing in his own name. Sozzini now fixed himself at Basel, gave himself to close study of the Bible, began translating the Psalms into Italian verse, and, in spite of increasing deafness, became a centre of theological debates. His discussion with Jacques Couet on the doctrine of salvation issued in a treatise De Jesu Christo servatore (finished July 12, 1578), the circulation of which in manuscript commended him to the notice of Giorgio Blandrata (q.v.), court physician in Poland and Transylvania, and ecclesiastical wire puller in the interests of heterodoxy.

Transylvania had for a short time (1559-1571) enjoyed full re- ligious liberty under an anti-Trinitarian prince, John Sigismund. The existing ruler, Christopher Bathori, favoured the Jesuits; it was now Blandrata's object to limit the " Judaic " tendencies of the eloquent anti-Trinitarian bishop, Francis David (1510- 1579), with whom he. had previously co-operated. A

charge of the gravest sort against Blandrata's morals had destroyed his influence with David. Hence he called in Sozzini to reason with David, who had renounced the worship of Christ. In Sozzini's scheme of doctrine, terms in themselves orthodox were employed in a heretical sense. Thus Christ was God, though in nature purely human, namely as un Dio subalterno, al quale in un dato tempo il Dio supremo cedette il governo del mondo (Cantu). In matter of worship Sozzini distinguished between adoralio Christi, the homage of the heart, imperative on all Christians, and invocatio Christi, the direct address of prayer, which was simply permissive (Blandrata would have made it imperative) ; though in Sozzini's view, prayer, to whomsoever addressed, was received by Christ as mediator, for transmission to the father. In November 1578 Sozzini reached Kolozsvar (Klausenburg) from Poland, and did his best, during a visit of four months and a half under David's roof, to argue him into this modified doctrine of invocation. The upshot was that David from the pulpit exerted all his powers in denouncing all cultus of Christ. His civil trial followed, on a charge of innovation. Sozzini

hurried back to Poland before it began He cannot be accused of complicity with what he calls the lage of Blandrata; he was no party to David's incarceration at D6va, where the old man miserably perished in less than three months. He was willing that David should be prohibited from preaching pending the decision of a general synod; and his references to the case show that (as in the later instances of Jacobo Paleology, Christian Franken and Martin Seidel) theological aversions, though they never made him uncivil, froze up his native kind- ness and blinded his perceptions of character. Blandrata ultimately conformed to the Catholic Church; hence Sozzini's laudatory dedication to him (1584) of his De Jesu Christi nalura, in reply to the Calvinist Andrew Wolan, though printed in his works, was not used. The remainder (1 579-1604) of Sozzini's life was spent in Poland. Excluded at first by his views on baptism (which he regarded as applicable only to Gentile con- verts) from the Minor or anti-Trinitarian ChuTch (largely ana- baptist), he acquired by degrees a predominant influence in its synods. He converted the Arians from their avowal of our Lord's pre-existence, and from their rejection of the invocatio Christi; he repressed the semi-Judaizers whom he failed to convince. Through correspondence with friends he directed also the policy of the anti-Trinitarian Church of Transylvania. Forced to leave Cracow in 1583, he found a home with a Polish noble, Christopher Morsztyn, whose daughter Elizabeth he married (1586). She died in the following year, a few months after the birth of a daughter, Agnese (1587-1654), afterwards the wife of

Stanislas Wiszowaty, and the progenitress of numer- ous descendants. In 1587 the grand-duke Francesco died; to this event Sozzini's biographers attribute the loss of his Italian property, but his unpublished letters show that he was on good terms with the new grand-duke, Ferdinando. Family disputes had arisen respecting the interpretation of his grandfather's will; in October 1590 the holy office at Siena disinherited him, allowing him a pension, apparently never paid. Failure of supplies from Italy dissolved the compact under which his writings were to remain anonymous, and he began to publish in his own name. The consequence was that in 1598 a mob expelled him from Cracow, wrecking his house, and grossly ill-using his person. Friends gave him a ready welcome at Luslawice, 30 miles east from Cracow ; and here, having long been troubled with colic and the stone, he died on the 4th of March 1604. A limestone block with illegible inscriptions marks his grave. 1 His engraved portrait is prefixed to his works (the original is not extant) ; an oil-painting, formerly at Siena, xannot be considered authentic.

Sozzini's works, edited by his grandson Andrew Wiszowaty and the learned printer F. Kuyper, are contained in two closely printed folios (Amsterdam, 1668). They rank as the first two volumes of the Bibliotheca fratrum polonorum, though the works of Crell and Schlichting were the first of the series to be printed. They include all Sozzini's extant theological writings, except his essay on pre- destination (in which he denies that God foresees the actions of free agents) prefixed to Castellio's Dialogi IV. (1578, reprinted 1613) and his revision of a school manual Instfumentum doctrinarum aristotelicum (1586). His pseudonyms, easily interpreted, were Felix Turpio Urbevetanus, Prosper Dysidaeus, Gratianus Prosper and Gratianus Turpio Gerapolensis (= Senensis). Some of his early verse is in Ferentilli's Scielta di stanze di diversi autori toscani (1579, 1594); other specimens are given in Cantfi and in the Athenaeum (Aug. 11, 1877); more are preserved at Siena. Sozzini Considered that his ablest work was his Contra atheos, which perished in the riot at Cracow (1598). Later he began, but left incomplete, more than one work designed to exhibit his system as a whole. His reputation as a thinker must rest upon (1) his De auctoritate s. scripturae (1570) and (2) his De Jesu Christo servatore (1578). The former was first published (Seville, 1588) by Lopez, a Jesuit, who claimed it as his own, but prefixed a preface maintaining (contrary to a fundamental position of Sozzini) that man by nature has a knowledge of God. A French version (1592) was approved by the ministers of Basel ; the English translation by Edward Coombe (1731) was undertaken in consequence of the commendation in a charge (1728) by Bishop Smalbroke, who observes that Grotius had borrowed from it in his De veritate Christ, rel. In small

1 No trace is discoverable on the stone of the alleged epitaph : — " Tota

ruit Babylon ; destruxit tecta Lutherus, Calvinus muros, sed fundamenta Socinus,"

compass it anticipates the historical argument of the " credi- bility " writers; in trying it by modern tests, it should be remem- bered that Sozzini, regarding it (1581) as not adequately meeting the cardinal difficulties attending the proof of the Christian religion, began to reconstruct its positions in his Lectiones sacrae (unfinished). His treatise on the Saviour renders a real service to theology, placing orthodoxy and heresy in new relations of fundamental antagonism, and narrowing the conflict to the main personal benefit of religion. Of the person of Christ in this treatise he says nothing; its one topic is the work of Christ, which in his view operates upon man alone; the theological sagacity of Sozzini may be n.easured by the persistency with which this idea tends to recur. Though his name has been attached to a school of opinion, he disclaimed the r61e of a heresiarch, and declined to give his unreserved adhesion to any one sect. His confidence in the conclusions of his own mind has earned him the repute of a dogmatist ; but it was his constant aim to reduce and simplify the fundamentals of Christianity Not without some ground does the memorial tablet at Siena (inscription by Brigidi, 1879) characterize him as vindicator of human reason against the supernatural. Of his non-theological doctrines the most important is his assertion of the unlawfulness, not only of war, but of the taking of human life in any circumstances. Hence the comparative mildness of his proposals for dealing with religious and anti-religious offenders, though it cannot be said that he had grasped the complete theory of toleration. Hence, too, his contention that magisterial office is unlawful for a Christian.

Authorities.— For the biography of Sozzini the best materials are his letters; a collection is in his works; others are given by Cantil ; more are preserved at Siena and Florence ; his correspondence is open and frank, never sparing his weak points. The earliest life (prefixed to his works) is by S. Przypkowski (1636) ; in English, by J. Bidle (1653). This is the foundation ot the article by Bayle, the Memoirs by J. Toulmin (1777), and the article by R. Wallace (Antitrin. Biog., 1850). Cantu's sketch in Gli Eretici d'ltalia (1866) gives a genealogy of the Sozzini (needing revision). The best defence of Sozzini in his relations with David is by James Yates (Christ. Pioneer, Feb. 1834) ; a less favourable view is taken by David's Hungarian biographer Elek Jakab [David F. Enileke, 1879). Of his system — best known through the Racovian Catechism (1605, planned by Sozzini and carried out by others, principally Valentine Schmalz) ; in English, by T. Rees (1818) — there is a special study by O. Fock, Der Socinianismus (1847). See also The Sozzini and thetr School, by A. Gordon (Theol. Rev., 1879; cf. Christian Life, Aug. 25, 1883). Use has been made above of unpublished papers in the archives of Florence, with others in the archives,

communal library and collection of Padre Toti at Siena. (A. Go.)*

SOCIOLOGY, a science which in the most inclusive sense may be defined as that of human society, in the same manner that Biology may be taken to imply the science of life. The word Sociologie was first used by Comte in 1839 as an equivalent of the expression, social physics, previously in use, and was intro- duced, he said, to describe by a single term that part of natural philosophy which relates to the positive study of the fundamental laws of social phenomena. The word is a hybrid, compounded from both Latin and Greek terms. It is now generally accepted in international usage; none of the terms, such as politics, political science, social economy, social philosophy and social science which have been suggested instead of it having succeeded in taking its place.

There has been in the past a certain hesitation, especially in England, to admit sociology as the title of a particular science in itself until it was made clear what the subject must be considered to cover. In certain quarters sociology is still often incorrectly spoken of as if it implied the practical equivalent of the science of politics. Henry Sidgwick, for instance, con- sidered the word as usually employed in this sense, and while he himself recognized that sociology must have a wider scope than politics, he thought that in practice " the difference between the two subjects is not indeed great " {Elements of Politics). This view of sociology, which at one time widely prevailed, dates from an earlier period of knowledge. The difference between sociology and the science of politics is wide and is due to funda- mental causes, a true perception of which is essential to the proper study of the science of society. It is a feature of organisms that as we rise in the scale of life the meaning of the present life of the organism is to an increasing degree subordinate to the larger meaning of its life as a whole. Similarly, as the advance from primitive society to society of a more organic type takes place, a marked feature of the change is the development of the principles through which the increasing subordination of the

present interests of society to the future interests of society is accomplished. It is, however, characteristic of the last-mentioned principles that their operation extends beyond the political con- sciousness of the state or nation, and that this distinction becomes more and more marked in the higher societies. The scope and meaning of sociology as a science is, therefore, quite different from the scope and meaning of the science of politics. In other quarters, again, the word sociology is often incorrectly

used as no more than a covering term for subjects which are fully treated in various subdivisions of social science. Thus when the science of society is distinguished from the special social sciences which fall within its general purview, it may be considered, says Lester F. Ward, that " we may range the next most general departments as so many genera, each with its appropriate species — that is, the classification of the sciences may be made strictly synoptical. When this is done it will be possible for philosophers, like good systematists, to avoid making their ordinal characters include any properly generic ones, or their generic characters include any that are only specific. Thus understood, sociology is freed from the unnecessary embarrassment of having hanging about it in more or less disorder a burden of complicated details, in a great variety of attitudes which make it next to impossible to secure due attention to the fundamental principles of so vast a science. These details are classified and assigned each to its proper place (genus or species), and the field is cleared for the calm contemplation of the central problem of determining the facts, the law and the principles of human association " (Outlines of Sociology). This definition, good as it is in some respects, does not make clear to the mind the essential fact of the science, namely, that the principles of sociology involve more than the generalized total of the principles of the subordinate sciences which it is said to include. In Herbert Spencer's writings we see the subject in a period of transition. Spencer placed his Principles of Sociology between his Principles of Psychology and Principles of Ethics. This fact brings out the unsettled state of the subject in his time, while it also serves to exhibit the dominance of the ideas of an earlier stage. For psychology, which Spencer thus places before sociology, cannot nowadays be fully, or even in any real sense scientifically, dis- cussed apart from sociological principles, once it is accepted that in the evolution of the human mind the principles of the social process are always the ultimate controlling factor.

Sociology, therefore, as a true science in itself, must be regarded as a science occupied quite independently with the principles which underlie human society considered as in a con- o/Socto/o«y.di l i on ° development. In this sense the conclusions of sociology cannot be fully stated in relation to the phenomena dealt with in any of the divisions of social science, and they must be taken as implying more than the sum total of the results obtained in all of them. The sociologist must always keep clearly before him that the claims of sociology in the present conditions of knowledge go considerably beyond those involved in any of the foregoing positions. As it is the meaning of the social process which in the last resort controls everything, even the evolution of the human mind and all its contents, so none of the sciences of human action, such as ethics, politics, economics or psychology can have any standing as a real science except it*

obtains its credentials through sociology by making its approach through the sociological method. It is in sociology, in short, that we obtain the ruling principles to which the laws and principles of all the social sciences stand in controlled and subordinate relationship.

The fathers of the science of society may be said to be the Greek philosophers, and in particular Plato and Aristotle. The Sociology Laws and the Republic of the former and the Ethics among the and Politics of the latter have, down to modern times, Greeks. anc j notwithstanding the great difference in the stand- point of the world and the change in social and political conditions, exercised a considerable influence on the develop- ment of the theory of society. To the Greeks the science of society presented itself briefly as the science of the best method of attaining the most perfect life within the consciousness of

the associated life of the State. " In this ideal of the State," says Bluntschli, " are combined and mingled all the efforts of the Greeks in religion and in law, in morals and social life, in art and science, in the acquisition and management of wealth, in trade and industry. The individual requires the State to give him a legal existence: apart from the State he has neither safety nor freedom. The barbarian is a natural enemy, and conquered enemies become slaves. . . . The Hellenic State, like the ancient State in general . . . was all in all. The citizen was nothing except as a member of the State. His whole existence depended on and was subject to the State. . . . The State knew neither moral nor legal limits to its power " (Theory of the State).

It was within the limits of this conception that most of the Greek theories of society were constructed. The fundamental conception of the Roman writers was not essentially different, although the opportunism of the Romanˆ J,,,,ˆ " State, when it became a universal power embrac ing the social and religious systems of many peoples, is some degree modified it; so that with the growth of jus gentium outside the jus civile, the later writers of the empire brought into view an aspect of the State in which law began to be to some extent distinguished from State morality. With the spread of Christianity in Western Europe there commenced a stage in which the social structure, and with it the theory of society, underwent profound modifications. These changes are still in progress, and the period over which they extend has pro- duced a great and increasing number of writers on the science of society. The conceptions of each period have been intimately related to the character of the influences controlling development at the time. The writers up to the 14th century are nearly all absorbed in the great controversy between the spiritual and temporal power which was defining itself during this stage in Western history. In the period of the Renaissance and the Reformation the modern development of the theory of

society may be said to begin. Machiavelli is the first great name in this period. Bodin with other writers up to the time of Mon- tesquieu carry the development forward in France. The Dutch writer Grotius, although chiefly recognized at the time as an authority on international law, had much influence in bringing into view principles which mark more directly the transition to the modern period, his Be jure belli et pads, issued in 1625, being in many respects an important contribution to the theory of society. Hobbes and Locke are the principal representatives of the influential school of writers on the principles of society which the period of the political and religious upheaval of the 17th century produced in England. The ideas of Locke, in particular, exercised a considerable influence on the subsequent development of the theory of the State in Western thought. From the 17th century forward it may be said, strictly speaking, that all the leading contributions to the general body of Western philosophy have been contributions to the development of the science of society. At the time of Locke, and to a large extent in Locke's writings, there may be distinguished three distinct tendencies in the prevailing theory of society. Each of these has since become more definite, and has progressed along a particular line of development. There is first the empirical tendency, which is to be followed through the philosophy of Hume down to the present day, in what may be called — to borrow an idea from Huxley — the physiological method in the modern study of the science of society. A second tendency — -which developed through the critical philosophy of Kant, the idealism of Hegel, and the historical methods of Savigny in the field of jurisprudence and of the school of Schmoller in the domain of economics — finds its current expression in the more characteristically German conception of the organic nature of the modern State. A third tendency — which is to be followed through the writings of Rousseau, Diderot, d'Alembert and the literature of the French Revolution — found its most influential form of expression in the 19th century in the theories of the English Utilitarians, from Bentham to John Stuart Mill. In this development it is a theory of the utilitarian State which is principally in view. In

its latest phase it has progressed to the expression which it has reached in the theories of Marxian Socialism, in which the corresponding conception of the ascendancy of the economic factor in history may now be said to be the characteristic feature. All of these developments, the meaning of which has now been absorbed into the larger evolutionary conception to be described later, must be considered to have contributed towards the foun-

dation of modern sociology. The definition of the relations to each other of the positions they have severally brought into view is the first important work of the new science.

At the period between 1830 and 1842, when Comte published the Philosophic positive, the conditions were not ready for a science of society. The Darwinian doctrine of evolution by natural selection had not yet been enunciated, and knowledge of social phenomena was limited and very imperfect. As an instance of the character of the change that has since been in progress, it may be mentioned that one of Comte's main positions — that, indeed, to which most of the characteristic conceptions of his system of philosophy were related — was that "the anatomical and physiological study of individual man " should precede the theory of the human mind and of human society. Here the position is the one already referred to which has prevailed in the study of the social sciences down into recent times. It was supposed that the governing principles of society were to be discovered by the introspective study of the individual mind, rather than that the clue to the governing principles of the individual mind was only to be discovered by the study of the social process. It must now be considered that no really fundamental or far-reaching principle of human development can be formulated as the result of Comte's position. For with the application of the doctrine of evolution to society a position is becoming defined which is almost the reverse of it, namely, that the development of the individual, and to a large extent of the human mind itself, must be regarded as[the correlative of the social process in evolution. The study of the principles of the process of social evolution would therefore in this sense have to come before the complete study of the individual, and even to precede the construction of a system of psychology scientific in the highest sense. Comte, apart from his want of mastery of the historical method in dealing with sociological development, possessed, on the whole, little insight into the meaning of the characteristic problem in which the human mind is involved in its social evolution, and to the definition of which not only the processes of Western history, but the positions successively developed in Western thought, must all be considered as con- tributing. His great merit was the perception of the importance of the biological method in the science of society, the comprehen- sion of the fact that there can be no science of society if its divisions are studied apart from each other; and finally, and although it led at the time to the formulation of no important principle of human development, the intuition that sociology was not simply a theory of the State, but the science of what he called the associated life of humanity.

It has to be observed that, preceding the application of the doctrine of evolution to society, most of the contributions to The i} u ii n g social science have a certain aspect in which they Principle of resemble each other. While in current theories Early Sod- society tends to be presented as

evolving, consciously oiogkaiˆ or unC onsciously, under stress of natural selection, tioas: /nffu-towards social efficiency, the earlier contributions eaceof were merely theories of the meaning and object Gree Con- of society as a medium for the better realization of ” p ‘ˆ” o/ human desires. In this presentation of the sub- ject the influence of the Greek conception of the State upon modern sociology may be traced down to the present day. At the beginning of the modern period it reappears in Machiavelli (Titus Linus, i., hi., and The Prince). It is represented in modified form in Hobbes (Leviathan), and in Locke (Two Treatises of Government), each ; ef whom conceived man as desiring to leave the state of nature and as conscioi sly founding civilized society, “in order that he might obtain*

the benefits of government ” in the associated State. It is continued in Rousseau and the writers of the French Revolu- tion, who similarly imagined the individual voluntarily leaving an earlier state of freedom to put ” his person and his power under the direction of the general will ” (Social Contract). It is characteristic of Jeremy Bentham (e.g. Principles of Morals and Legislation, i.) and of J. S. Mill (e.g. Utilitari- anism and Political Economy, iv., vi.). Finally, it survives in Herbert Spencer, who in like manner sees man originating society and submitting to political subordination in the asso- ciated State ” through experience of the increased satisfaction derived under it ” (Data of Ethics). It continues at the present day to be characteristic of many European and some American writers on sociology, who have been influenced both by Spencer and the Latin theory of the State, and who therefore, conceiving sociology not so much as a science of social evolution as a theory of association, proceed to consider the progress of human associa- tion as the development of a” process ” of catering to human desire for satisfactions of varying degrees of complexity.” All these ideas of society bear the same stamp. They conceive the science of society as reached through the science of the individual, the associated State being regarded only as a medium through which he obtains increased satisfactions. In none of them is there a clear conception of an organic science of society with laws and principles of its own controlling all the meaning of the individual.

With the application of the doctrine of evolution the older idea in which society is always conceived as the State and as existing to give increased ” satisfaction ” is replaced The Doc- by a new and much more extended conception. In trine ot the evolutionary view, the development of human Evo,utlon ‘ society is regarded as the product of a process of stress, in which progress results from natural selection along the line not of least effort in realizing human desire, but of the highest social efficiency in the struggle for existence of the materials of which society is composed. In the intensity of this process society, evolving towards higher efficiency, tends to become increasingly organic, the distinctive feature being the growing

subordination of the individual to the organic social process. All the tendencies of development — political, economic, ethical and psychological — and the contents of the human mind itself, have therefore to be regarded as having ultimate relations to the governing prin- ciples of the process as a whole. The science of social evolution has, in short, to be considered, according to this view, as the science of the causes and principles subordinating the individual to a process developing by inherent necessity towards social efficiency, and therefore as ultimately over-ruling all desires and interests in the individual towards the highest social potentiality of the materials of which society is composed. The conflict between the old and the new conceptions may be distinguished to an increasing degree as the scope of modern sociology has gradually become defined; and the opposing ideas of each may be observed to be sometimes represented and blended, in varying degrees of complexity, in one and the same writer.

It was natural that one of the first ideas to be held by theor- ists, as soon as sociology began to make progress to the position of a real science, was that society must be considered Plrst Cgam to be organic, and that the term " social organism " ceptlonsot should be brought into use. An increasing number Society as of writers have been concerned with this aspect of f" Organ- the subject, but it has to be noted as a fact of much interest that all the first ideas of society as an organism move within the narrow circle of the old conception of the State just described. The " social organism " in this first stage of theory is almost universally confused with the State. The interests of the social organism are therefore confused with the interest of the individuals which men saw around them in the State. The science of society was accordingly regarded as no more than the science of realizing most effec- tively here and now the desires of those comprising the existing State. Sidgwick, for instance, considered the science of politics and the science of sociology as practically coincident,

and his Elements of Politics, extraordinary to relate, contains only a few words in which it is recognized that the welfare of the community may be interpreted to mean the welfare not only of living human beings, but of those who are to come hereafter; while there is no attempt to apply the fact to any law or principle of human development. Bentham's utilitarian philosophy, like that of the two Mills, was based almost entirely on the idea of the State conceived as the social organism. Writers like Herbert Spencer {Sociology) and Schaffle, who was for a time minister of commerce for Austria (Bau und Leben des socialen Korpers), instituted lengthy comparisons between the social organism considered as the State and the

living individual organ- ism. These efforts reached their most characteristic expression in the work of the sociologists who have followed G. Simmel in lengthy and ingenious attempts at classifying associations, considering them " as organizations for catering to human desire." In all these efforts the conception of the State as the social organism is vigorously represented, although it is par- ticularly characteristic of the work of sociologists in countries where the influence of Roman law is still strong, and where, consequently, the Latin conception of the State tends to influence all theories of society as soon as the attempt is made to place them on a scientific basis. The sterilizing effect for long pro- duced on sociology by this first restricted conception of the social organism has been most marked. It is often exemplified in ingenious attempts made, dealing with the principles of sociology, to construct long categories of human associations, based on quite superficial distinctions. None of the comparisons of this kind that have been made have contributed in any marked degree to the elucidation of the principles of modern society. Paul Leroy-Beaulieu's criticism of SchafHe's efforts at compari- sons — anatomical, physiological, biological and psychological — between the individual organism and the State as a social organism applies to most of the attempts of this period to insti- tute biological comparisons between the life of the social organ- ism and that of organisms in general, " the mind sinks over- whelmed under the weight of all these analogies, these endless divisions and subdivisions to which they give rise. . . . The result is not in proportion to the effort " (V&tat moderne et ses fonctions).

In tracing the direction of this conflict between the newer and older tendencies in modern sociology, it is in Herbert Spencer's writings that the student will find presented in Spencer clearest definition the characteristic difficulty with which the old view has tended to be confronted, as the attempt has continued to be made to enunciate the principles of human development from the standpoint that society is to be considered as a " social organism," but while as yet there is no clear idea of a social organism with its own laws and its own consciousness quite distinct from, and extending far beyond those governing the interests of the individuals at present com- prising the State.

With the application of the doctrine of evolution to society considered as an organism, a position has been brought into view of great interest. It is evident in considering the application of natural selection to human society that there is a fact, en- countered at the outset, which is so fundamental that it must be held to control all the phenomena of social evolution. It is nowadays a commonplace of knowledge, that the potential efficiency of an organism must always be taken to be greater than the sum total of the potential efficiency of all its members acting as individuals. This arises in the first instance from the fact, to be observed on all hands in life, of the

effects of organiz- ation, of division of labour, and of specialization of work. But in an organism of indefinitely extended existence like hun\ah society, it arises in a special sense from the operation of principles giving society prolonged stability. By these principles indi- vidual interests are subordinated over long periods of time to the larger interests of organic society in which the individuals for the time being cannot participate; and it is from this cause that civilization of the highest type obtains its characteristic potency and efficiency in the struggle for existence with lower types.

There follows from this fact, obvious enough once it is mentioned, an important inference. This is that in the evolution of society natural selection will, in its characteristic results, reach the individual not directly, but through society. That is to say, in social evolution, the interests of the individual, qua individual, cease to be a matter of first importance. It is by development in the individual of the qualities which will contribute most to the efficiency of society, that natural selection will in the long run produce its distinctive results in the human individual. It is, in short, about this function of socialization, involving the increasing subordination of the individual, that the continued evolution of society by natural selection must be held to centre. Societies in which the individuals resist the process quickly reach the limits of their progress, and have to give way in the struggle for existence before others more organic in which the process of subordination continues to be developed. In the end it is the social organizations in which the interests of the individual are most effectively included in and rendered subservient to the interests of society considered in its most organic aspect that, from their higher efficiency, are naturally selected. In other words, it is the principles subordinating the individual to the efficiency of society in those higher organic aspects that project far beyond the life-interests of its existing units which must ultimately control all principles whatever of human association.

Spencer, in an elaborate comparison which he made (Essays, vol. i., and Principles of Sociology) between the social organism and the individual organism brought into view a Spencer and position which in its relation to this capital fact of Natural human evolution exhibits in the clearest manner Selection. how completely all the early evolutionists, still under the influence of old conceptions, failed at first to grasp the signifi- cance of the characteristic problems of the social organism. Spencer's comparison originally appeared in an article published in the Westminster Review for January i860 entitled " The Social Organism." This article is in many respects one of the most noteworthy documents in the literature of the last half of the 19th century. In comparing the social with the indi- vidual organism Spencer proceeded, after noting the various aspects in which a close analogy between the two can be estab- lished, to make, as regards

society, an important distinction by which the nature of the difficulty in which he is involved is immediately made apparent. While in an individual organism, he pointed out, it is necessary that the lives of all the parts should be merged in the life of the whole, because the whole has a corporate consciousness capable of happiness or misery, it is not so with society. For in society, He added, the " living units do not and cannot lose individual consciousness, since the community as a whole has no corporate consciousness." Spencer proceeded, therefore, to emphasize the conclusion that " this is an ever- lasting reason why the welfare of citizens cannot rightly be sacrificed to some supposed benefit of the State; but why, on the other hand, the State is to be maintained solely for the benefit of citizens." The extraordinary conclusion is indeed reached by Spencer that " the corporate life in society must be subservient to the lives of the parts, instead of the lives of the parts being subservient to the corporate life." It will be here clearly in evi- dence that the " social organism " which Spencer had in view was the State. But it, will be noticed at the same time how alto- gether remarkable was the position into which he was carried. Spencer, like most thinking minds of his time, had the clearest vision, constantly displayed in his writings, of the scientific importance of that development in history which has gradu- ally projected the conception of the individual's rights outside all theories of obligation to the State. He wrote at a time when the attention of the Western mind in all progressive move- ments in Western. politics had been for generations fixed on that development in which the liberties of the individual as against the State had been won. This development had involved nearly all Western countries in a titanic struggle against the institutions of an earlier form of society resting on force organ- ized in the State. Spencer, therefore, like almost every advanced

writer of his period, had constantly before him the character- istic fact of his age, namely, that the meaning of the individual had come to be in some way accepted as transcending all theories of the State and all theories of his obligations to the State. The position was, therefore, very remarkable. Spencer has been for long accepted by the general mind as the modern writer who more than any other has brought into use the term "social organism," and who has applied the doctrine of evolu- tion to the theory of its life. Yet here we see him involved in the apparent self-stultification of describing the social organism to us as that impossible thing, an organism " whose corporate life must be subservient to the lives of the parts instead of the lives of the parts being subservient to the corporate life." It was obvious that some profound confusion existed. The science of society was evidently destined to carry us much farther than this. If natural selection was to be

taken as operating on society, and therefore as tending to produce the highest efficiency out of the materials that comprise it, it must be effecting the subordination of the interests of the units to the higher corporate efficiency of society. But one of only two conclusions could therefore result from Spencer's position. If we were to regard the " social organism " as an organism in which the corporate life must be subservient to the lives of the parts, instead of the lives of the parts being subservient to the corporate life, it would be necessary to hold that the individual had succeeded in arrest- ing the characteristic effects of natural selection on society. But for the evolutionist, whose great triumph it had been to reveal to us the principles of natural selection in universal operation throughout life elsewhere, to have to regard them as suspended in human society would be an absurd anti-climax. Such being scarcely conceivable as a final position, it remained only to infer that natural selection must still be subordinating individual interests to some larger social meaning in the evolutionary process. But in this case, society must be subject to principles which reach farther than those Spencer conceived: it must be organic in some different and wider sense than he imagined, and the analogy of the " social organism " as confined within the consciousness of ascendant interests in the political State must be considered to be a false one.

We had, in short, reached a capital position in the history of sociology from which an entirely new horizon was about to A Sew become visible. The principles of society organic Horizon to in a wider sense than had hitherto been conceived Sociology. were a t, ou t t be brought into the discussion. All the phenomena of the creeds and ethical systems of humanity, of the great systems of religion and philosophy, with the problems of which the human mind had struggled over immense stretches of time as the subordinating process had unfolded itself in history, were about to be brought into sociology. And not now as if these represented some detached and functionless development with which the science of society was not directly concerned, but as themselves the central feature of the evolutionary process in human society. The stage in the history of sociology charac- terized by the confusion of the principles governing the social organism with those governing the State, the stage which had lasted from the time of the Greeks to Spencer, and which had witnessed towards its close Sidgwick's statement that the science of sociology was in effect coincident with the science of politics, was thus bound to be definitely terminated by the application to the science of society of the doctrine of evolution. Yet Spencer, despite his popular association with the doctrine of evolution, is thus not to be reckoned as the first of the philo- sophers of this new stage. His place is really with the last great names of the preceding period. For his conception of society was that of Bentham, Mill and Sidgwick. His Principles of Sociology as a contribution to modern

evolutionary science is necessarily rendered to a large extent futile by the sterilizing conception of a social organism " in which the corporate life must be sub- servient to the lives of the parts." It is indeed in the reversal of this conception that the whole significance of the application of the doctrine of evolution to the science of society consists. Henceforward we shall have to regard the social process in

evolution as a process with its own interests, its own psychology, its own consciousness and its own laws, all quite distinct from the political consciousness of the modern State, though indi- rectly controlling and governing the consciousness of the State so thoroughly that there can be no true science of the latter without a science of the former.

The new situation created in sociology as the doctrine of evolution began to be applied to the science had features of great interest. The advance had been made to a central f Bt p lrsl position along two entirely distinct lines. The Darwinians army of workers was, in consequence, divided into > < > Sociology. two more or less isolated camps, each largely in ignorance of the relation of its own work to that in the other section. It is often said as a reproach to sociology in the period through which we are passing that it attracts the kind of recruits who are not best equipped for its work, while it repels the kind of mind of philosophical training and wide outlook which it ought to enlist in its service and for which it has most urgent need, the loss to sociology both in credit and efficiency being immense. This is the result of a peculiar situation. Those who are best qualified to understand the nature and scope of the problems with which sociology has to deal cannot fail to have the conviction strongly developed in them that the Darwinian principles of evolution which reveal to us what may be described as the dynamics of the universal life process have very important relations to the dynamics of the social process. The situa tion which has arisen in sociology, however, is a very curious one, although it is one easy to understand when the causes are explained. When the endeavour is made to follow Darwin and the early Darwinians through the facts and researches which led to the formulation of the law of natural selection it may be observed how their preoccupation was almost exclusively with the details of the struggle for existence not in societies, but as it was waged between individuals. This was so as a matter of course, from the character of the facts which wild nature supplied, reinforced as they were, by observations on domestic animals and the practices of breeders.

Darwin made no systematic study of society; and outside human society the struggle through which natural selection has operated has been mainly between individuals. It is, of course, sometimes remarked that the social life exists among animals and that the laws of the social life and of the herd are to be observed there, but as a matter of fact there is nothing whatever

elsewhere in life to compare with what we see taking place in human society, namely, the gradual integration— still under all the stress of natural selection expressing its effects in the person of the individual — of an organic social process resting ultimately on mind. The laws of this process are necessarily quite different from the laws of the other and simpler process in operation lower down in life. If we regard the classes from which sociology as a science should be able to draw its most efficient recruits we see that at the present day they fall mainly into two camps. There are in the one camp the exponents of biological principles, often trained in one or more of the departments of biological science, who are attempting the application to human society' of the principles with which they have become familiar elsewhere in life. There are in the second camp the exponents of various aspects of social philosophy. When the exponent of Darwinian principles advances to the study of society he is naturally strong in the conviction that he has in his hands a most potent instrument of knowledge which ought to carry him far in the organization of the social sciences and towards the unification of the leading principles underlying the facts with which they deal. But what we soon begin to see is that his training has been, and that his preoccupation still continues to be, with the facts and principles of the struggle for existence between individuals as displayed elsewhere in life. He does not easily realize, if he has not been trained in social philosophy, how infinitely more com- plex all the problems of natural selection have become in the social integration resting on mind which is taking place in human affairs; or how the social efficiency with which he has become now concerned is something quite distinct from the individual

efficiency with which he has been concerned elsewhere. He does not readily comprehend how the institutions which he sees being evolved in history have, in their effects on the individual, laws quite different from those which he applies in the breeding of animals; or how the dualism which has been opened in the human mind, as natural selection acts first of all on the individual in his own struggle with his fellows, and then, and to a ruling degree, acts on his as a member of organic society in the evolution of social efficiency, has in the religious and ethical systems of the race a phenomenology of its own, stupendous in extent and absolutely characteristic of the social process, which remains a closed book to him and the study of which he is often apt to consider for his purposes as entirely meaningless. AH this became rapidly visible in the first approach of the early Darwinians to the science of society.

Darwin, as stated, had attempted no comprehensive or systematic study of society. But in a few chapters of the Descent Darwin ˚f Man he h'ad discussed the qualities of the human mind, including the social and moral feelings, from the point of view of the doctrine of natural selection enunciated in the Origin of Species. The standpoint he took up was, as might be expected, practically that of Mill and Spencer and other writers of the period on social subjects, from whom he quoted freely. But the, note of bewilderment was remarkable. The conclusion remarked upon as implied in Spencer's theory of the social organism, but which Spencer himself hesitated to draw, namely, that natural selection was to be regarded as suspended in human society, Darwin practically formulated. Thus at times Darwin appeared to think that natural selection could effect but comparatively little in advanced society. " With highly civilized nations," he says, " continued progress depends to a subordinate degree on natural selection." While Darwin noted the obvious useful- ness of the social and moral qualities in many cases, he felt constrained at the same time to remark upon their influence in arresting, as appeared to him, the action of natural selection in civilization. " We civilized men," he continues, " do our utmost to check the process of elimination (of the weak in body and mind); we build asylums for the imbeciles, the maimed and the sick; we institute poor laws; and our medical men exert their utmost skill to save the life of every one to the last moment." There is here in evidence no attempt to connect the phenomena thus brought into view with some wider principle of the evolutionary process which evidently must control them. There is no perception visible in Darwin's mind of these facts as constituting the phenomenology of a larger principle of natural selection; or of the higher organic efficiency in the struggle for existence of societies in which the sense of responsibility to life thus displayed has made most progress; or of the immense significance in social evolution as distinct from individual evolution of that deepening of the social con- sciousness of which this developing spiritual sense of responsi- bility to our fellow creatures is one of the outward marks characteristic of advanced societies.

In the year 1889 Alfred Russel Wallace in a statement of his conception of the doctrine of evolution in his book, Darwinism, Wallace brought more clearly into view the fundamental difficulty of the early Darwinians in applying the doctrine of natural selection to society. In the last chapter of the book Mr Wallace maintained that there were in " man's intellectual and moral nature . . . certain definite portions . . . which could not have been developed by variation and natural selection alone." Certain faculties, amongst which he classed the mathematical, artistic and metaphysical, the latter covering qualities with which he considered priests and philosophers to be concerned, were, he asserted, " altogether removed from utility in the struggle for life," and were, therefore, he thought, " wholly unexplained by

the theory of natural selection." In this elementary conception which still survives in popular literature, the same confusion between individual efficiency and social efficiency has to be remarked upon. And there is in evidence the same failure to perceive that it is just these intellectual and

moral qualities which are the absolutely characteristic products of natural selection in advanced society, in that they contribute to the highest organic social efficiency. Wallace in the result proposed to consider man, in respect of these higher portions of his mind, as under the influence of some cause or causes wholly distinct from those which had shaped the development of life in its other characteristics. The weakness of this position was immediately apparent. To remove man as regards qualities so directly associated with his social evolution from the influence of the law of natural selection was felt to be a step backwards. The effect produced on the minds of the younger school of evolutionists was deep. It operated, indeed, not to convince them that Wallace was right, but to make them feel that his conception of natural selection operating in human society was still in some respect profoundly and radically incomplete.

A few years later, Huxley, though approaching the matter from a different direction, displayed a like bewilderment iti attempting to apply the doctrine of evolution to the phenomena of organic society. With his mind fixed on the details of the individual struggle for existence among animals, Huxley reached in the Romanes lecture, delivered at Oxford in 1893, a position little different from that in which Wallace found himself. In this lecture Huxley actually proceeded to place the ethical process in human society in opposition to the cosmic process, to which latter alone he considered the struggle for existence and the principle of natural selection belonged. " Social progress," he went on to say, " means a checking of the cosmic process at every step and the substitution for it of another which may be called the ethical process; the end of which is not the survival of those who may happen to be the fittest, in respect of the whole of the conditions which obtain, but of those who are ethically the best." Thus the remarkable spectacle already witnessed in Spencer, Darwin and Wallace of the evolutionist attempting to apply his doctrines to human society, but having to regard his own central principle of natural selection as having been suspended therein is repeated in Huxley. The futility of contemplating the ethical process as something distinct from the cosmic process was at once apparent. For the first lesson of evolution as applied to society must be that they are one and the same. So far indeed from ethical process checking the cosmic process, it must be regarded as the last and highest form of the cosmic process. The sense of subordination and sacrifice which forms the central principle of all the creeds of -Humanity, so far from being, as

Wallace imagined, "altogether removed from utility" is, indeed, the highest form of social efficiency through which natural selection is producing its most far-reaching effects in the evolution of the most advanced and organic types of civilization.

A similar tendency continued to be in evidence in other directions. In an effort made a few years later to found a society for the study of sociology in Great Britain a very characteristic feature of the first papers contributed was the attempt to apply elementary biological generalizations regarding natural selection to a highly complex organism like human society, the writers having in most cases made no previous extensive or special study of the social process in history. The confusion between what constitutes individual efficiency in the individual and that higher social efficiency in the individual which everywhere controls and overrules individual efficiency was very marked. An early paper contributed in 1904 was by Mr (afterwards Sir) Francis Galton, one of the last and greatest of the early Darwinians Galton had made many original contributions to the doctrine of evolution, and had been occupied previously with researches into individual efficiency as displayed among families, his Hereditary Genius being a notable book of this type. The object of his paper was to explain the scope and aim of a ne science, " eugenics," which he defined as the science which deals with all the influences that improve the inborn qualities of the race and develop them to the utmost advantage. Galton found no difficulty whatever in setting up his sociological standards for the best specimens of the race. Even the animals in the Zoological Gardens, he*

said, might be supposed to know the test specimens of their class. In society the list of best qualities would include health, energy, ability, manliness and the special aptitudes required by various professions and occupations. Everything in " the scientific breeding of the human race " was to be much as in the breeding of animals; for Galton proposed to leave morals out of the question as involving»too many hopeless difficulties. This was the basis of the scheme of qualities from which he proposed to proceed to the improved breeding of society. The proposal furnishes one of the most striking and characteristic examples which have appeared of the deep-seated confusion prevailing in the minds of the early Darwinians between social efficiency and individual efficiency. Even from the few minor examples of society among the lower animals the true sociological criticism of such standards in eugenics might easily be supplied. For at the point at

which the social insects, for instance, began their social integration all their standards were in the qualities which gave success in the struggle for existence between indi- viduals. Had they, therefore, understood eugenics only in this light and in Galton's sense, they would have condemned at the first the beginnings of the peculiar social efficiency of the queen bee which now makes her devote her life entirely to egg-laying; still more would they have condemned the habits of the drones, through long persistence in which they have become degenerate as individuals; and in particular they would have condemned the habits of the workers which have led to their present undeveloped bodies and abortive individualistic instincts. But all these things have contributed in the highest degree to the social efficiency of the social insects and have made the type a winning one in evolution. The social integration of the social insects has been comparatively simple and did not, like that of human society, rest ultimately on mind, yet even in this elementary example it was evident what ruin and disaster would result from miscalled scientific breeding of the race if undertaken within the limits of such restricted conceptions of social efficiency. Galton's preoccupation, as in the case of most biological and medical schemes of improvement in the past, was with those individualistic qualities which contribute to the individual's success in the struggle for existence with his fellows. But it has been continuously obvious in history that individuals of the very highest social efficiency, the great organic minds of the race who, often quite unsuccessful in their lives as judged by individualistic standards, and who, often quite unperceived and unappreciated by their contemporaries, have been the authors of ideas, or moral conceptions or works of such organic importance that they have carried the race from one social horizon into another, have been just those individuals who would have entirely failed to pass the kind of prize-animal standards which Galton proposed to set up.

Galton's essay may be said to close that first epoch in the application of biological conceptions to sociology which The Close °P ened witn Spencer's essay in i860. With the of the First extending conception of the organic interests of stage of society during the intervening period the idea of Darwinian soc j a i efficiency had altered profoundly. For instance, ry ' a supposed standard of efficiency, which like Malthu- sianism represented to Mill at the opening of the period the last conclusion of science, had become towards the close scarcely more than a standard of " race suicide." It was not surprising that in these circumstances the representatives of those sciences which rested on a knowledge of the social process in history and philosophy continued to look coldly on the attempt of the first Darwinians to apply Darwinian principles to sociology. True, the development in their own sciences had been almost equally sterile, for they had themselves as yet no reasoned conception of the enormous importance of the Darwinian principle of evolution to these sciences in its capacity to reveal to them the

dynamics of the social process. But they had watched the development of institutions in history ; they had studied the growth of social types and the integration of great systems of belief; and they had struggled with the capital problems of the human mind in psychology and philosophy as the process had

continued. The two armies of workers continued to , be organized into isolated camps, each with the most restricted conceiKion of the nature and importance of the work done by the other and of its bearing upon their own conclusions. One of the most remarkable results of such a situation — a result plainly visible in the valuable collection of essays edited by Professor Seward which was issued from the Cambridge University Press in commemoration of the centenary of Darwin's birth — is the extremely limited number of minds in our time of sufficient scope of view to be able to cover the relation of the work of both sets of these workers to sociology.

It remains now to consider the relation to the position in modern sociology of the extended conception that society must be considered to be organic in some wider sense than the first Darwinians thus imagined it and also Extension in some wider sense than that in which Sidgwick to Sociology imagined it when he said that sociology was in effect ottheBvo- coincident with the science of politics. The present coaea"aoa writer has laid it down elsewhere (The Two Principal Laws of Sociology: Bologna) that there is a fundamental principle of sociology which has to be grasped and applied before there can be any real science of sociology. This principle may be briefly stated as follows: —

The social process is primarily evolving in the individual not the qualities which contribute to his own efficiency in conflict with his fellows, but the qualities which contribute to society's efficiency in the conflict through which it is gradually rising towards a more organic type.

This is the first law of evolutionary sociology. It is this principle which controls the integration which is taking place under ail forms in human society — in ethical systems, in all political and economic institutions, and in the creeds and beliefs of humanity — in the long, slow, almost invisible struggle in which under a multitude of phases natural selection is discriminating between the standards of nations and types of civilization.

Dealing first with political and economic institutions; the position reached in Spencer's sociology may be said to represent the science of society in a state of transition. It represents it, that is to say, in a stage at which the Greek theory of society has become influenced by the doctrine of evolution applied to modern conceptions, but while as yet no synthesis has been achieved between the conflicting and even mutually exclusive ideas which

are involved. The Greek theory of society is repre- sented in Spencer in his practical identification of " the social organism " with the State. The modern idea, however, which carries Spencer far beyond the principles of Greek society: — • as these principles were summarized, for instance, in the passage already quoted from Bluntschli — is clearly in evidence. It may be observed to be expressed in the recognition of a principle resident in modern society which in some manner projects , the individual's rights outside and beyond the whole theory and meaning of the State: In other words, in society as, Spencer conceives it, " the welfare of citizens cannot rightly be sacrificed to some supposed benefit of' the State "; whereas, according to the Greek theory and the theory of Roman law, the citizen's whole existence depended on and was subject to the State. " The State knew neither moral nor legal limits to its power." If, however, it be considered that modern society has made progress beyond the Greek, and if it be accepted that the theory of evolution involves the conclusion that society .progresses towards increased efficiency in a more organic type, there follows from the foregoing an important inference. This is that it now becomes the task of modern sociology, as a true science, to show that the principle in modern civilization which distinguishes it from society of the Greek period — namely, that principle which Spencer rightly recognized, despite the contradictions in which he became involved, as rendering the life of the individual no longer subservient to the corporate life of the State — is itself $. principle identified not with individualism but with the increasing subordination of the individual to a more organic type of society. It must, in short, remain for the evolutionist, working by the

historical method scientifically applied, to present the interven- ing process in history — including the whole modern movement towards liberty and enfranchisement, and towards equality of conditions, of rights and of economic opportunities — -not as a process of the increasing emancipation of the individual from the claims of society, but as a process of progress towards a more organic stage ot social subordination than has prevailed in the world before.

When society is considered as an organism developing under the influence of natural selection along the line of the causes which contribute to its highest potential efficiency, and there- fore tending to have the mean centre of its organic processes projected farther and farther into the future, it is evident that it must be the principles and ideas which most effectively subordi- nate over long periods of time the interests and the capacities of the individuals of which it is composed to the efficiency of the whole which

will play the leading part in social evolution. In primitive society, the first rudiments of social organization undoubtedly arose, not so much from conscious regard to The Basis expediency or "increased satisfactions" as from of Modern fitness in the struggle for existence. " The first Sociology, organized societies must have been developed, like any other advantage, under the sternest conditions of natural selection. In the flux and change of life the members of those groups of men which in favourable conditions first showed any tendency to social organization became possessed of a great advantage over their fellows, and these societies grew up simply because they possessed elements of strength which led to the disappearance before them of other groups of men with which they came into competition. Such societies continued to flourish, until they in their turn had to give way before other associations of men of higher social efficiency " (Social Evolution, ii.). In the social process at this stage all the customs, habits, institu- tions, and beliefs contributing to produce a higher organic efficiency of society would be naturally selected, developed and perpetuated. It is in connexion with this fact that the clue must be sought to the evolution of those institutions and beliefs of early society which have been treated of at length in researches like those of M'Lennan, Tylor, Lubbock, Waitz, Letourneau, Quatrefages, Frazer, and others of equal importance. For a long period in the first stages the highest potentiality of the social organization would be closely associated with military efficiency. For in the evolution of the social organism, as has been said, while the mean centre of the processes involving its organic identity would tend to be projected into the future, it would at the same time always be necessary to maintain efficiency in current environment in competition with rival types of lower future potentiality. Amongst primitive peoples, where a great chief, law-giver and military leader appeared, the efficiency of organized society resting on military efficiency would, as a matter of course, make itself felt in the struggle for existence. Yet as such societies would often be resolved into their component elements on the death of the lea"cter, the overruling importance — on the next stage of the advance towards a more organic type — of ideas which would permanently subordinate the materials of society to the efficiency of the whole would make itself felt. Social systems of the type in which authority was perpetuated by ancestor-worship — in which all the members were therefore held to be joined in an exclusive religious citizenship founded on blood relationship to the deities who were worshipped, and in which all outsiders were accordingly treated as natural enemies, whom it would be a kind of sacrilege to admit to the rights of the State — would contain the elements of the highest military potentiality. The universal mark which ancestor-worship has left on human institutions in a certain stage of social develop- ment is doubtless closely associated with this fact. The new and th<» older tendencies in sociology are here also in contrast; for whereas Herbert Spencer has been content to explain ancestor-

worship as arising from an introspective and compara- tively trivial process of thought assumed to have taken place in the mind of early man in relation to a supposed belief in ghosts {Principles of Sociology, 68-207), the newer tendency is to

consider science as concerned with it in its relation to the character- istic principles through which the efficiency of the social organ- ization expressed itself in its surroundings. The social, political and religious institutions disclosed in the study of the earliest civilizations within the purview of history must be considered to be all intimately related to the ruling principles of this military stage. The wide reach and significance of the causes governing the process of social evolution throughout the whole of this period may be gathered from treatises like Seebohm's Structure of Greek Tribal Society, Maine's Ancient Law, History of Institu- tions, and Early Law and Custom, Fowler's City-State of the Greeks and Romans, and in a special sense from the comparative study of Roman law, first of all as it is presented in the period of the Twelve Tables, then as the jus civile begins to be influenced by the jus gentium, and lastly as its principles are contrasted with those of English common law in the modern period. In most of the philosophical writings of the Greeks, and in particular in the Ethics and Politics of Aristotle, and in many of the Dialogues of Plato, the spirit of the principles upon which society was constructed in this stage may be perceived as soon as progress has been made with comparative studies in other directions.

A very pregnant saying of T. H. Green was that during the whole development of man the command, " Thou shalt love thy neighbour as thyself " has never varied. Whajt Bxtensloa ot has varied is only the answer to the question — Who the Sense of is my neighbour ? If in the light of this profoundly Human Re- true reflection we watch the progress of society from spoas y – primitive conditions to the higher stages, it may be observed to possess marked features. Where all human institutions, as in the ancient civilizations, rested ultimately on force; where outsiders were regarded as natural enemies, and conquered enemies became slaves; where, as throughout all this phase of social evolution, a rule of religion was a rule of law identified with the principles of the State (Maine, Ancient Law); where the State itself was absolute as against the individual, knowing "neither moral nor legal limits to its power"; and where all the moral, intellectual and industrial life of the community rested on a basis of slavery — the full limits of the organic principle of social efficiency would in time be reached. The conditions would be inherent in which all social institutions would tend to become closed absolutisms organized round the conception of men's desires in the present. And the highest outward expression in which the tendencies in ethics, in politics, and in religion must necessarily culminate would be the military State, bounded in its energies

only by the resistance of others, necessarily acknowledging no complete end short of absolute dominion, and therefore staying its course before no ideal short of universal conquest. This was the condition in the ancient State. It happened thus that the outward policy of the ancient State to other peoples became, by a fundamental principle of its life, a policy of military conquest and subjugation, the only limiting principle being the successful resistance of the others. The epoch of history moved by inherent forces towards the final emergence of one supreme military State, in an era of general conquest, and culminated in the example of universal dominion which we had in the Roman world before the rise of the civilization of our era.

*The influence upon the development of civilization of the wider conception of duty and responsibility to one's fellow men which was introduced into the world with the spread of « s infta- Christianity can hardly be over-estimated. The ence on extended conception of the answer to the question — s < >c ' a/ £< *• Who is my neighbour? which has resulted from the characteristic doctrines of the Christian religion — a con- ception transcending all the claims of the family, group, state, nation, people or race, and even all the interests comprised in any existing order of society — has been the most powerful evolu- tionary force which has ever acted on society. It has tended gradually to break up the absolutisms inherited from an older civilization and to bring into being an entirely new type of social efficiency.*

As society under this influence continued to be impelled to develop towards a still more organic type, the greatly higher In History potentiality of a state of social order which, while Projected preserving the ideal of the highly organized state (fa the" anc ^ t ^ e cuj rent efficiency of society in competition Future) has with lower types, was influenced by conceptions always that dissolved all those closed absolutisms, and re-*

Mntt"""' l ease d human energies into a free conflict of forces Efficiency by projecting the principles of human responsibility (fa the outside the State, became apparent. In many of

Present). the religions of the East such conceptions have been inherent, Christianity itself being a characteristically Eastern religion. But no Eastern people has been able to provide for them the permanent defensive military milieu in history in which alone their potentiality could be realized. The significance of modern Japan in evolution consists largely in the answer she is able to give to the question as to whether she will be able to provide in

the future such a milieu for such a conception among an Eastern people.

The significance of the culmination of the military epoch in the ancient classic civilizations of the Western world, which preceded the opening of the era in which we are living, and of the fact that the peoples of the same descent who were destined to carry on the civilization of the existing era represent the supreme military stock by natural selection, not only of the entire world, but of the evolutionary process itself in human history, will therefore be evident .

With the spread, accordingly, amongst peoples of this origin, and in such a defensive military milieu in history, of a new The conviction of responsibility to principles extending

Principle of beyond the consciousness of the political State, Efficiency in there began a further and more organic stage of ci° d m"'ti tne ev °l ut i° nar y process in society. The gradual Is the dissolution in the era in which we are living of all

Enfranchise- the closed absolutisms within the State, in which men of the human action and ideas had hitherto been confined, Future. j g a pp aren tiy the characteristic phenomenon of this*

stage. Progress is towards such a free and tolerant, but intense and efficient, conflict of forces as was not possible in the world before. It is, it would appear, in this light that we must regard the slow dissolution of the basis of ideas upon which slavery rested; the disintegration of the con- ceptions which supported the absolute position of the occupying classes in the State; the undermining of the ideas by which opinion was supported by the civil power of the State in the religious struggles of the middle ages; the growth of the concep- tion that no power or opinion in the State can be considered as the representative of absolute truth; the consequent develop- ment of party government amongst the advanced peoples, with the acknowledgment of the right of every department of inquiry to carry results up to that utmost limit at which they are con- trolled only by the results obtained in other departments of activity with equal freedom; the growth of the conception, otherwise absurd, of the native equality of men; the resulting claim, otherwise similarly indefensible, of men to equal voting power irrespective of status or possessions in the State which has been behind the movement towards political enfranchise- ment; and, finally, the development of that conviction which is behind the existing challenge to all absolute tendencies in economic conditions in the modern world — namely, that the distribution of wealth in a well-ordered State should aim at realizing political justice. There are all the features of an integrating process in modern history. They must be considered as all related to a

controlling principle inherent in the Christian religion which has rendered the evolutionary process in society more organic than in any past stage-^- namely, the projection of the sense of human responsibility outside the limits of all the creeds and interests which had in previous stages embodied it in the State (Kidd, Prin. West. Civil.). The meaning, in short, which differentiates our civilization from that of the ancient civilizations of Greece and Rome is that modern Western civilization represents in an ever-increasing degree the

enfranchisement of the future in the evolutionary process. So great has become the prestige of our civilization through the oper- ation of this principle in it that its methods and results are being eagerly borrowed by other peoples. It is thereby so materially influencing the standards of conduct and culture thoughout the world that the developments which other nations are under- going have in a real sense tended to become scarcely more than incidents in the expansion of Western civilization.

*We live in the presence of colossal national armaments, and in a world, therefore, in which we are continually met with the taunt that force is still everywhere omnipotent. It Modern may be perceived, however, that beneath all outward Militarism appearances a vast change has been taking place. * therefore In the ancient civilizations the tendency to con- Defensive quest was an inherent principle in life of the military not an State. It is no longer an inherent principle in the Offensive modern State. The right of conquest is indeed still PWflc*

In thus regarding the. social process in Western history, the projected efficiency of which now, after many centimes of development, begins to realize itself to an increasing /B(HvM . degree in determining competition with other types ism is only » of society throughout the world, it may be observed Process of that the result by which a synthesis of the older moreOrganlc and later views may be attained is already in ^^ a ^" sight. It was pointed out that if the principle which Spencer rightly recognized in modern society as rendering the, life of the individual no longer subservient to the corporate life of the State was to be accepted as a principle of progress distinguishing modern civilization from, that of the Greek period, it would be necessary for the sociologist to exhibit it not as indicating the larger independence of the individual, but as a principle identified with the increasing subordination of the indi- vidual to a more organic type of society. Here, therefore, this result is in process of accomplishment. The intervening process in history— including the whole modern movement towards liberty and enfranchisement, towards equality of conditions, towards equality of political rights and towards equality of economic opportunities — is presented as a process of development towards a more*

advanced and organic stage of social subordination than has ever prevailed in the world before (Princ. West. Civil, xi.). In this light, also, it may be observed how the claim of sociology to be the most advanced of all the theo- retical sciences is justified. For if the historical process in the civilization of' the era in which we are living is thus to be regarded as a process implying the increasing subordination of the individual to a more organic type of society, then the study of sociology as embracing the principles of the process must evidently involve the perception and comparison of the meaning of the fundamental positions disclosed in the history of political progress, of the problems with which the human mind has successively struggled in the phases of religious development, and, lastly, of the positions with which the intellect has been confronted as the stages of the subordinating process have

gradually come to define themselves in history. The positions outlined in the developments already referred to which have come down through Hume and Huxley, through Kant and Hegel, through Grotius and Savigny, through Roscher and Schmoller, through the expression which English utilitarianism has reached in Herbert Spencer as influenced by the English theory of the rights of the individual on the one hand, and in Marxian Socialism as influenced by the Latin conception of the omnipotence of the State on the other, have thus all their place, meaning and scientific relations in the modern study of sociology. It must be considered that the theory of organic evolution by natural selection and the historical method will continue in an increasing degree to influence the science of society.

The sociological law that " the social process is primarily evolving in the individual not the qualities which contribute The Claim ot to his own efficiency in conflict with his fellows, Sociology as but those qualities Which contribute to society's the Matter efficiency in the conflict through which it is gradually Science. risinjg towards a more organic type," carries us into the innermost recesses of the human mind and controls the science of psychology. For it is thus not the human mind which is consciously constructing the social process in evolution ; it is the social process which is constructing the human mind in evolution. This is the ultimate fact which raises sociology to its true position as the master science. Nor is there any materialism in such a conception. It is in keeping with the highest spiritual ideal of man that the only conception of Truth or the Absolute which the human mind can hold at present is that which is being evolved in it in relation to its own environment which is in the social process.

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SOCRATES, son of the statuary Sophroniscus and of the midwife Phaenarete, was born at Athens, not earlier than 471 nor later than May or June 469 B.C. As a youth he received the customary instruction in gymnastics and music; and in after years he made himself acquainted with geometry and astronomy and studied the methods and the doctrines of the leaders of Greek thought and culture. He began life as a sculptor; and in the 2nd century ax>. a group of the Graces, supposed to be his work, was still to be seen on the road to the Acropolis. But he soon abandoned art and gave himself to what may best be called education, conceiving that he had a divine commission, witnessed by oracles, dreams and signs, not indeed to teach any positive doctrine, but to convict men of ignorance mistaking itself for knowledge, and by so doing to promote their intellectual and moral improvement. He was on terms of intimacy with some of the most distinguished of his 1 Athenian contemporaries, and, at any rate in later life, was personally known to very many of his fellow citizens. His domestic relations were, it is said, unhappy. The shrewishness of his wife Xanthippe became proverbial with the ancients, as it still is with ourselves. Ari- stotle, in his remarks upon genius and its degeneracy (Rhet. ii. 15), speaks of Socrates's sons as dull and fatuous; and in Xeno- phon's Memorabilia, one of them, Lamprocles, receives a formal rebuke for undutiful behaviour towards his mother.

Socrates served as a hoplite at Potidaea (432-429), where on one occasion he saved the life of Alcibiades, at Delium (424), and at Amphipolis (422). In these campaigns bis bravery and endurance were conspicuous. But, while he thus performed the ordinary duties of a Greek citizen with credit, he neither attained nor sought political position. His " divine voice," he said, had warned him to refrain from politics, presumably because office would have entailed the sacrifice of his principles and the abandonment of his proper vocation. Yet in 406 he was a member of the senate; and on the first day of the trial of the victors of Arginusae, being president of the prytanis, he resisted — first, in conjunction with his colleagues, afterwards, when they yielded, alone — the illegal and unconstitutional propbsal of Callixenus, that the fate of the eight generals should be decided by a single vote of the assembly. Not less courageous than this opposition to the " civium ardor prava jubentium " was his disregard of the " vultus instantis tyranni " two years later. During the reign of terror of 404 the Thirty, anxious to implicate in their crimes men of repute who might otherwise have opposed their plans, ordered five citizens, one of whom was Socrates, to go to Salamis and bring thence their destined victim Leon. Socrates alone disobeyed. But, though he was exceptionally obnoxious to the Thirty — as appears, not only in this incident, but also in their threat of punishment under a special ordinance forbidding " the teaching of the art of argument"; — it was reserved for the reconstituted democracy to bring him to trial and to put him to death. In 399, four years after the restoration and the amnesty, he was indicted as an offender against public morality. His accusers were Meletus the poet, Anytus the tanner and Lycon the orator, all of them members of the democratic or patriot party who had returned from Phyle with Thrasybulus. The accusation ran thus: " Socrates is guilty, firstly, of denying the gods recognized by the state and introducing new divinities, and, secondly, of corrupting the young." In his unpremeditated defence, so 'far from seeking to conciliate his judges, Socrates

defied them. He was found guilty by 280 votes, it is supposed, against 220. Meletus having called for capital punishment, it now rested with the accused to make a counter-proposition; and there can be little doubt that, had Socrates without further remark suggested some smaller but yet substantial penalty, the proposal would have been accepted. But, to the amazement of trie judges and the distress of his friends, Socrates proudly declared that for the services which he had rendered to the city he deserved, not punishment, but the reward of a public bene- factor — maintenance in the Prytaneum at the cost of the state; and, although at the

close of his speech he professed himself willing to pay a fine of one mina, and upon the urgent entreaties of his friends raised the amount of his offer to thirty minas, he made no attempt to disguise his indifference to the result. His attitude exasperated the judges, and the penalty of death was decreed by an increased majority. Then in a short address Socrates declared his contentment with his own conduct and with the sentence. Whether death was a dreamless sleep, or a new life in Hades, where he would have opportunities of testing the wisdom of the heroes and the sages of antiquity, in either case he esteemed it a gain to die.- In the same spirit he refused to take advantage of a scheme arranged by his friend Crito for an escape from prison. Under ordinary circumstances the condemned criminal drank the cup of hemlock on the day after the trial; but in the case of Socrates the rule that during the absence of the sacred ship sent annually to Delos no one should be put to death caused an exceptional delay. For thirty days he remained in imprisonment, receiving his intimates and conversing with them in his accustomed manner. How in his last conversation he argued that the wise man will regard approaching death with a cheerful confidence Plato relates in the Phaedo; and, while the central argument — which rests the doctrine of the soul's immortality upon the theory of ideas — must be accounted Platonic, in all other respects the narrative, though not that of an eye-witness, has the air of accuracy and truth.

Happily, though Socrates left no writings behind him, and indeed, as will hereafter appear, was by his principles precluded from dogmatic exposition, we have in the 'AiroiivT)iwvtvua.Ta. or Memoirs and other works of Xenophon records of Socrates's conversation, and in the dialogues of Plato refined applications of his method. Xenophon, having no philosophical views of his own to develop, and no imagination to lead him astray — being, in fact, to Socrates what Boswell was to Johnson — is an excellent witness. The 'AToiurquavebfiaTa or Memorabilia are indeed confessedly apolo- getic, and it is easy to see that nothing is introduced which might embitter those who, hating Socrates, were ready to persecute the Socratics; but the plain, straightforward narrative of Socrates's talk, on many occasions, with many dissimilar interlocutors, carries with it in its simplicity and congruity the evidence of substantial justice and truth. Plato, though he understood his master better, is a less trustworthy authority, as he makes Socrates the mouthpiece of his own more advanced and even antagonistic doctrine. Yet to all appearance the Apology is a careful and exact account of Socrates's habits and principles of action; the earlier dialogues, those which are commonly called " Socratic," represent, with such changes only as are necessitated by their form, Socrates's method ; and, if in the later and more important dialogues the doctrine is the doctrine of Plato, echoes of the master's teaching are still discoverable,

approving themselves as such by their accord with the Xenophontean testimony. In the face of these two principal witnesses other evidence is of small importance.

Personal Characteristics.— What, then, were the personal characteristics of the man? Outwardly his presence was mean and his countenance grotesque. Short of stature, thick- necked and somewhat corpulent, with prominent eyes, with nose upturned and nostrils outspread, with large mouth and coarse lips, he seemed the embodiment of sensuality and even stupidity. Inwardly he was,' as his friends knew, " so pious that he did nothing without taking counsel of the gods, so just that he never did an injury to any man, whilst he was the benefactor of his associates, so temperate that he never preferred pleasure to right, so wise that in judging of good and evil he was never at fault — -in a word, the best and the happiest of men." " His self-control was absolute; his powers of endurance were unfailing; he had so schooled himself to moderation that his scanty means satisfied all his wants." "To want nothing," he said himself,

"is divine; to want as little as possible is the nearest possible approach to the divine life"; and accordingly he practised temperance and self-denial to a degree which some thought ostentatious and affected. Yet the hearty enjoyment of social pleasures was another of his marked characteristics; for to abstain from innocent gratification from fear of falling into excess would have seemed to him to imply a pedantic formalism or a lack of self-control. In short, his strength of will, if by its very perfection it led to his theoretical identification of virtue and knowledge, secured him in practice against the ascetic extravagances of his associate Antisthenes.

The intellectual gifts of Socrates were hardly less remarkable than his moral virtues. Naturally observant, acute, and thoughtful, he developed these qualities by constant and systematic use. The exercise of the mental powers was, he conceived, no mere occupation of leisure hours, but rather a sacred and ever-present duty; because, moral error being intel- lectual error translated into act, he who would live virtuously must first rid himself of ignorance and folly. He had, it may be conjectured, but little turn for philosophical speculation ; yet by the careful study of the ethical problems which met him in himself and in others he acquired a remarkable tact in dealing with questions of practical morality; and in the course of the lifelong war which he waged against vagueness of thought and laxity of speech he made himself a singularly apt and ready reasoner.

While he regarded the improvement, not only of himself but also of others, as a task divinely appointed to him, there was in his demeanour nothing exclusive or pharisaicaL On the contrary, deeply conscious of his own limitations and infirmities, he felt and cherished a profound sympathy with

erring humanity, and loved with a love passing the love of women fellow men who had not learnt, as he had done, to overcome human frailties and weaknesses. Nevertheless great wrongs roused in him a righteous indignation which sometimes found expression in fierce and angry rebuke. Indeed it would seem that Plato in his idealized portrait gives his hero credit not only for a deeper philosophical insight but also for a greater urbanity than facts warranted. Hence, whilst those who knew him best met his affection with a regard equal to his own, there were, as will be seen hereafter, some who never forgave his stern reproofs, and many who regarded him as an impertinent busybody.

He was a true patriot. Deeply sensible of his debt to the city in which he had been born and bred, he thought that in giving his life to the teaching of sounder views in regard to ethical and political subjects he made no more than an imperfect return; and, when in the exercise of constitutional authority that city brought him to trial and threatened him with death, it was not so much his local attachment, strong though that sentiment was, as rather his sense of duty, which forbade him to retire into exile before the trial began, to acquiesce in a sentence of banishment when the verdict had been given against him, and to accept the opportunity of escape which was offered him during his imprisonment. Yet his patriotism had none of the narrow- ness which was characteristic of the patriotism of his Greek con- temporaries. His generous benevolence and unaffected philan- thropy taught him to overstep the limits of the Athenian demus and the Hellenic race, and to regard himself as a " citizen of the world."

He was blest with an all-pervading humour, a subtle but kindly appreciation of the incongruities of human nature and conduct. In a less robust character this quality might have degenerated into sentimentality or cynicism; in Socrates, who had not a trace of either, it showed itself principally in what his contemporaries knew as his "accustomed irony." Profoundly sensible of the inconsistencies of his own thoughts and words and actions, and shrewdly suspecting that the like inconsistencies were to be found in other men, he was careful always to place himself upon the standpoint of ignorance and to invite others to join him there, in order that, proving all things, he and they might hold fast that which is good. " Intellectually the I acutest man of his age," says W. H. Thompson in a brilliant

and instructive appendix to his edition of Plato's Phaedrus, " he represents himself in all companies as the dullest person present. Morally the purest, he affects to be the slave of passion and borrows the language of gallantry to describe a benevolence too exalted for the comprehension of his

contemporaries. He is by turns an tpaartis, a irpoaywyos, a ixacrpoTrds, a hcluvtikos, disguising the sanctity of his true vocation by names suggestive of vile or ridiculous images. The same spirit of whimsical paradox leads him, in Xenophon's Banquet, to argue that his own satyr-like visage was superior in beauty to that of the hand- somest man present. That this irony was to some extent calculated is more than probable; it disarmed ridicule by antici- pating it; it allayed jealousy and propitiated envy; and it possibly procured him admission into gay circles from which a more solemn teacher would have been excluded. But it had for its basis a real greatness of soul, a hearty and unaffected disregard of public opinion, a perfect disinterestedness, an entire abnegation of self. He made himself a fool that others by his folly might be made wise; he humbled himself to the level of those among whom his work lay that he might raise some few among them to his own level; he was 'all things to all men, if by any means he might win some.' " It would seem that this humorous depreciation of his own great qualities, this pretence of being no better than his neighbours, led to grave misappre- hension amongst his contemporaries. That it was the founda- tion of the slanders of the Peripatetic Aristoxenus can hardly be doubted.

ˆ Socrates was further a man of sincere and fervent piety. " No one," says Xenophon, " ever knew of his doing or saying anything profane or unholy." There was indeed in the popular mythology much which he could not accept. It was incredible, he argued, that the gods should have committed acts which would be disgraceful in the worst of men. Such stories, then, must be regarded as the inventions of lying poets. But, when he had thus purified the contemporary polytheism, he was able to reconcile it with his own steadfast belief in a Supreme Being, the intelligent and beneficent Creator of the universe, and to find in the national ritual the means of satisfying his religious aspirations. For proof of the existence of " the divine," he appealed to the providential arrangement of nature, to the uni- versality of the belief, and to the revelations and warnings which are given to men through signs and oracles. Thinking that the soul of man partook of the divine, he maintained the doctrine of its immortality as an article of faith, but not of knowledge While he held that, the gods alone knowing what is for man's benefit, man should pray, not for particular goods, but only for that which is good, he was regular in prayer and punctual in sacrifice. He looked to oracles and signs for: guidance in those matters, and in those matters only, which could not be resolved by experience and judgment, and he further supposed himself to receive special warnings of a mantic character through what he called his " divine sign " (daifuivtov, Saiˆdviov rrqyjeiov).

Socrates's frequent references to his " divine sign " were, says Xenophon, the origin of the charge of " introducing new divinities " brought against

him by his accusers, and in early Christian times, amongst Neoplatomc philosophers and fathers of the church save rise to the notion that he supposed himself to be attended by a

genius or daemon. Similarly in our own day spiritualists have attributed to him the belief-which they justify-in "an intelligent spiritual being who accompanied him through life— in other words, a guardian spirit " (A. R. Wallace). But the very pre- cise testimony of Xenophon and Plato shows plainly that Socrates did not regard his "customary sign " either as a divinity or as a genius. According to Xenophon, the sign was a warning/ either to do or not to do, wh,ch it would be folly to neglect, not superseding J!Tl P r . udence – ˆut dealing with those uncertainties in respect oi which other men found guidance in oracles and tokens; Socrates believed in it profoundly, and never disobeyed, it. According to Plato, the sign was a voice which warned Socrates to refrain from some act which he contemplated; he heard it frequently and on the most trifling occasions; the phenomenon dated from his early years, and was, so far as he knew, peculiar to himself. These 2S h l V Jt ˆ e "i v ? nousl y interpreted. Thus it has been maintained that, in laying claim to supernatural revelations

Lˆnv "% (> l) ˆ 0mn?I i!fi a Pi °- Us f ? ud > (2) indul 8 ed his " accustomed irony, (3) recognized the voice of conscience, (4) indicated a general

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belief in a divine mission, (5) described " the inward voice of his individual tact, which in consequence partly of his experience and penetration, partly of his knowledge of himself and exact approba- tion of what was in harmony with his individuality, had attained to an unusual accuracy," (6) was mad (" etaitfou "), being subject not only to hallucinations of sense but also to aberrations of reason Xenophon s testimony that Socrates was plainly sincere in hi< belief excludes the first and second of these theories; the character oi the warnings given, which are always concerned, not with the moral worth of actions, but with their uncertain results, warrants the rejection of the third and the fourth; the fifth, while it suffi- ciently accounts for the matter of the warning, leaves unexplained its manner, the vocal utterance; the sixth, while it plausibly explains the manner of the warning, goes beyond the facts when it attributes lu fifrˆu° nall u y ° f matter ; Jt re raains for us, then, modifying the_nfth hypothesis, that of Diderot, Zeller and others, and thi sixth, that of Lelut and LittnS, and combining the two, to suppose that Socrates was subject, not indeed to delusions of mind but to hallucinations of the sense of hearing, so that the rational sug gestions of his own brain, exceptionally valuable in consequence of the accuracy and delicacy of his highly cultivated tact,

seemed to him to be projected without him, and to be returned to him through the outward ear. It appears that, though in some of the blst known instances— for example, those of Cowper and Sidney Walker ˆhallucinations of the sense of hearing, otherwise closely resembling Socrates s divine sign, have been accompanied by partial derange- ment of reason, cases are not wanting in which " the thoughts ratio 1 mt ° external sensoriaI impressions" are perfectly

The eccentricity of Socrates's life was not less remarkable than the oddity of his appearance and the irony of his conver- sation. His whole time was spent in public— in the market-place, the streets, the gymnasia. Thinking Mode 0,u,e ' with Dr Johnson that " a great city is the school for studying life, he had no liking for the country, and seldom passed the gates. " Fields and trees," Plato makes him say, " will not teach me anything; the life of the streets will." He talked to all comers— to the craftsman and the artist as willingly as to the poet or the politician— questioning them about their affairs about the processes of their several occupations, about their notions of morality, in a word, about familiar matters in which they might be expected to take an interest. The ostensible purpose of these interrogatories was to test, and thus either refute or explain, the famous oracle which had pronounced him the wisest of men. Conscious of his own ignorance, • he had at first imagined that the god was mistaken. When however experience showed that those who esteemed themselves wise were unable to give an account of their knowledge, he had to admit that, as the oracle had said, he was wiser than others, in so far as, whilst they, being ignorant, supposed themselves'to know he, being ignorant, was aware of his ignorance. Such, according to the Apology, was Socrates's account of his procedure and its results. But it is easy to see that the statement is coloured by the accustomed irony. When in the same speech Socrates tells his judges that he would never from fear of death or from any other motive disobey the command of the god, and that if they put him to death, the loss would be, not his, but theirs, since they would not readily find any one to take his place, it becomes plain that he conceived himself to hold a cotnmission to educate and was consciously seeking the intellectual and moral improve- ment of his countrymen. His end could not be achieved without the sacrifice of self. His meat and drink were of the poorest- summer and winter his Coat was the same; he was shoeless and shirtless. " A slave whose master made him live as you live " says a sophist in the Memorabilia, "would run away" But by the surrender of the luxuries and the comforts of life Socrates secured for himself the independence which was necessary thai; he might go about his appointed business, and therewith he was content.

His message was to all, but it was variously received. Those who heard him perforce and occasionally were apt to regard his teaching either with

indifference or with irritation, curtempo. —with indifference, if, as might be, they failed to raiyjudg see in the elenchus anything more than elaborate meata – trifling; with irritation, if, as was probable, they perceived that, m spite of his assumed ignorance, Socrates was well aware of the result to which their enforced answers tended. Amongst*

those who deliberately sought and sedulously cultivated his acquaintance there were some who attached themselves to him as they might have attached themselves to any ordinary sophist, conceiving that by temporary contact with so acute a reasoner they would best prepare themselves for the logomachies of the law courts, the assembly and the senate. Again, there were others who saw in Socrates at once master, counsellor and friend, and hoped by associating with him " to become good men and true, capable of doing their duty by house and household, by relations and friends, by city and fellow-citizens " (Xenophon). Finally, there was a little knot of intimates who, having some- thing of Socrates's enthusiasm, entered more deeply than the rest into his principles, and, when he died, transmitted them to the next generation. Yet even those who belonged to this inner circle were united, not by any common doctrine, but by a common admiration for their master's intellect and character.

For, the paradoxes of Socrates's personality and the eccentricity of his behaviour, if they offended the many, fascinated the few. _. , " It is not easy for a man in my condition," says the

Panegyric, intoxicated Alcibiades in Plato's Symposium, " to describe the singularity of Socrates's character. But I will try to tell his praises in similitudes. He is like the piping Silenes in the statuaries' shops, which, when you open them, are found to contain images of gods. Or, again, he is like the satyr Marsyas, not only in outward appearance — that, Socrates, you will yourself allow — but in other ways also. Like him, you are given to frolic — I can produce evidence to that; and above all, like him, you are a wonderful musician. Only there is this difference — what he does with the help of his instru- ment you do with mere words; for whatsoever man, woman or child hears you, or even a feeble report of what you have said, is struck with awe and possessed with admiration. As for myself, were I not afraid that you would think me more drunk than I am, J would tell you on oath how his words have moved me— ay, and how they move me still. When I listen to him my heart beats with a more than Corybantic excitement; he has only to speak and my tears flow. Orators, such as Pericles, never moved me in this way — never roused my soul to the

thought of my servile condition; but this Marsyas makes me think that life is not worth living so long as I am what I am. Even now, if I were to listen, I could not resist. So there is nothing for me but to stop my ears against this siren's song and fly for my life, that I may not grow old sitting at his feet. No one would think that I had any shame in me; but I am ashamed in the presence of Socrates."

The Accusation and Us Causes. — The life led by Socrates was not likely to win for him either the affection or the esteem of the vulgar. Those who did not know him personally, Prejudice. seein 8 him with tne e Y es ˚f the comic poets, con- ceived him as a " visionary " {ˆraapohbyoi) and a " bore " (a5oXeffxi?s). Those who had faced him in argument, even if they had not smarted under his rebukes, had at any rate winced under his interrogatory, and regarded him in consequence with feelings of dislike and fear. But the eccentricity of his genius and the ill will borne towards him by individuals are not of themselves sufficient to account for the tragedy of 399. It thus becomes necessary to study the circumstances of the trial, and to investigate the motives which led the accusers to seek his death and the people of Athens to acquiesce in it.*

Socrates was accused (1) of denying the gods recognized by the state and introducing instead of them strange divinities (Saitwvia.) , and (2) of corrupting the young. The Accusation. nrst ˚ these charges rested upon the notorious fact that he supposed himself to be guided by a divine visitant or sign (daiiioviov). The second, Xenophon tells us, was supported by a series of particular allegations: (a) that he taught his associates to despise the institutions of the state, and especially election by lot; (b) that he had numbered amongst his associates Critias and Alcibiades, the most dangerous of the representatives oi the oligarchical and democratical parties respectively; (c) that he taught the young to disobey parents and guardians and to prefer his own auth6rity to theirs; (i) that he was in the habit of*

Its Weak- ness.

quoting mischievous passages of Homer and Hesiod to the prejudice of morality and democracy.

It is plain that the defence was not calculated to conciliate a hostile jury. Nevertheless, it is at first sight difficult to under- stand how an adverse verdict became possible. If strength Socrates rejected portions of the conventional of the mythology, he accepted the established faith and Defence. performed its offices with exemplary regularity. If he talked of a hoxfioviov, the 5 cu/ wviov was no new divinity, but a mantic sign divinely accorded to him, presumably by the gods of the state. If he questioned the

propriety of certain of the institutions of Athens, he was prepared to yield an unhesitating obedience to all. He had never countenanced the misdeeds of Critias and Alcibiades, and indeed, by a sharp censure, had earned the undying hatred of one of them. Duty to parents he inculcated as he inculcated other virtues; and, if he made the son wiser than the father, surely that was not a fault. The citation of a few lines from the poets ought not to weigh against the clear evidence of his large-hearted patriotism; and it might be suspected that the accuser had strangely misrepresented his application of the familiar words.

To the modern reader Xenophon's reply, of which the fore- going is in effect a summary, will probably seem sufficient, and more than sufficient. But it must not be forgotten that Athenians of the old school approached the sub- ject from an entirely different point of view. Socrates was in all things an innovator — in religion, inasmuch as he sought to eliminate from the theology of his contemporaries " those lies which poets tell"; in politics, inasmuch as he distrusted several institutions dear to Athenian democracy; in education, inasmuch as he waged war against authority, and in a certain sense made each man the measure of his own actions. It is because Socrates was an innovator that we, who see in him the founder of philosophical inquiry, regard him as a great man; it was because Socrates was an innovator that old-fashioned Athenians, who saw in the new-fangled culture the origin of all their recent distresses and disasters, regarded him as a great criminal. It is, then, after all in no wise strange that a majority was found first to pronounce him guilty, and afterwards, when he refused to make any submission and professed himself in- different to any mitigation of the penalty, to pass upon him the sentence of death. That the verdict and the sentence were not in any way illegal is generally acknowledged.

But, though the popular distrust of eccentricity, the irritation of individuals and groups of individuals, the attitude of Socrates himself, and the prevalent dislike of the intellectual occasion movement which he represented, go far to account of the for the result of the trial, they do not explain the Attack. occasion of the attack. Socrates's oddity and brusquerie were no new things; yet in the past, though they had made him unpopular, they had not brought him into the courts. His sturdy resistance to the demos in 406 and to the Thirty in 404 had passed, if not unnoticed, at all events unpunished. His political heresies and general unorthodoxy had not caused him to be excluded from the amnesty of 403. Why was it, then, that in 399, when Socrates's idiosyncrasies were more than ever familiar, and when the constitution had been restored, the toleration hitherto extended to him was withdrawn? What were the special circumstances which induced three members of the patriot party, two of them leading politicians, to unite their efforts against one who apparently was so little formidable?

*For an answer to this question it is necessary to look to the history of Athenian politics. Besides the oligarchical party, properly so called, which in 411 was represented by Political the Four Hundred and in 404 by the Thirty, and the Reasons democratical party, which returned to power in *»'*• 410 and in 403, there was at Athens during the last years of the Peloponnesian War a party of " moderate oligarchs," antagon- istic to both. It was to secure the co-operation of the moderate party that the Four Hundred in 411 promised to constitute the Five Thousand, and that the Thirty in 404 actually constituted*

the Three Thousand. It was in the hope of realizing the aspirations of the moderate party that Theramenes, its most prominent representative, allied himself, first with the Four Hundred, afterwards with the Thirty. In 411 the policy of Theramenes (q.v.) was temporarily successful, the Five Thousand superseding the Four Hundred. In 404 the Thirty outwitted him; for, though they acted upon his advice so far as to consti- tute the Three Thousand, they were careful to keep all real power in their own hands. But on both occasions the " polity " — for such, in the Aristotelian sense of the term, the constitution of 41 1-4 10 was, and the constitution of 404-403 professed to be — was insecurely based, so that it was not long before the " unmixed democracy " was restored. The programme of the " moderates " — which included (1) the limitation of the fran- chise, by the exclusion of those who were unable to provide themselves with the panoply of a hoplite and thus to render to the city substantial service, (2) the abolition of payment for the performance of political functions, and, as it would seem, (3) the disuse of the lot in the election of magistrates — found especial favour with the intellectual class. Thus Alcibiades was amongst its promoters, and Thucydides commends the constitution established after the fall of the Four Hundred as the best which in his time Athens had enjoyed. Now it is expressly stated that Socrates disliked election by lot; it is certain that, regarding paid educational service as a species of prostitution, he would account paid political service not a whit less odious; and the stress laid by the accuser upon the Homeric quotation (Iliad ii. 188-202) — which ends with the lines baiyjbvC , krpknas rjco, (col &X\wx» nvdov &Kove ot ako Qkprepol doi • aii &' cbrroXquos «cot fipaX/as, ovre tot' h TroX«/u£[) tvapld/xios oPr' hi fiovhy — becomes intelligible if we may suppose that Socrates, like Theramenes, wished to restrict the franchise to those who were rich enough to serve as hoplites at their own expense. Thus, as might have been anticipated, Socrates was a " moderate," and the treatment which he received from both the extreme parties suggests — even if with Grote we reject the story told by Diodorus (xiv. 5), how, when

Theramenes was dragged from the altar, Socrates attempted a rescue — that his sympathy with the moderate party was pronounced and notorious. Even in the moment of democratic triumph the " moderates " made themselves heard, Phormisius proposing that those alone should exercise the franchise who possessed land in Attica ; and it is reasonable to suppose that their position was stronger in 399 than in 403. These considerations seem to indicate an easy explanation of the indictment of Socrates by the democratic politicians. It was a blow struck at the " moderates," Socrates being singled out for attack because, though not a professional politician, he was the very type of the malcontent party, and had done much, probably more than any man living, to make and to foster views which, if not in the strict sense of the term oligarchical, were confessedly hostile to the " unmixed democracy." His eccentri- city and heterodoxy, as well as the personal animosities which he had provoked, doubtless contributed, as his accusers had fore- seen, to bring about the conviction; but, in the judgment of the present writer, it was the fear of what may be called " philo- sophical radicalism " which prompted the action of Meletus, Anytus and Lycon. The result did not disappoint their expecta- tions. The friends of Socrates abandoned the struggle and retired into exile; and, when they returned to Athens, the most prominent of them, Plato, was careful to confine himself to theory, and to announce in emphatic terms his withdrawal from the practical politics of his native city.

Method and Doctrine.— Socrates was not a " philosopher," nor yet a " teacher," but rather an " educator," having for his function _' to rouse, persuade and rebuke " (Plato, Apology, 30 E). Hence, in examining his life's work it is proper to ask, not What was his philosophy? but What was his theory, and what was his practice, of education? It is true that he was brought to his theory of education by the study of previous philosophies, and that his practice led to the Platonic revival ; but to attribute to him philo- sophy, except in that loose sense in which philosophy is ascribed to one who, denying the existence of such a thing, can give an account of his disbelief, is misleading and even erroneous.

Socrates's theory of education had for its basis a profound and consistent scepticism; that is to say, he not only rejected the con- flicting theories of the physicists — of whom " some sce D Hciszn conceived existence as a unity, others as a plurality; p some affirmed perpetual motion, others perpetual rest; some declared becoming and perishing to be universal, others altogether denied such things " — but also condemned, as a futile attempt to transcend the limitations of human intelligence, their tj>i\oia, their " pursuit of knowledge for its own sake." Unconsciously, or more probably consciously, Socrates rested his scepticism upon the Protagorean doctrine that man is the measure of his own sensa- tions and feelings; whence he inferred, not only that knowledge such as the philosophers had

sought, certain knowledge of nature and its laws, was unattainable, but also that neither he nor any other person had authority to overbear the opinions of another, or power to convey instruction to one who had it not. Accordingly, whereas Protagoras and others, abandoning physical speculation and coming forward as teachers of culture, claimed for themselves in this new field power to instruct and authority to dogmatize, Socrates, unable to reconcile himself to this inconsistency, proceeded with the investigation of principles until he found a resting-place, a iroC

That it was in this way that Socrates was brought to regard " dialectic," " question and answer," as the only admissible method of education is, in the opinion of the present writer, no niatectkal matter of mere Conjecture. In the review of theories Method. of knowledge which has come down to us in Plato's Theoetetus mention is made (172 B) of certain " incomplete Protagoreans," who held that, while all opinions are equally true, one opinion is better than another, and that the " wise man " is one who by his arguments causes good opinions to take the place of bad ones, thus reforming the soul of the individual or the laws of a state by a process similar to that of the physician or the farmer (166 D seq.) ; and these " incomplete Protagoreans " are identified with Socrates and the Socratics by their insistence (167 D) upon the characteristically Socratic distinction between disputation and dialectic, as well as by other familiar traits of Socratic converse. In fact, this passage becomes intelligible and significant if it is supposed to refer to the historical Socrates; and by teaching us to regard him as an " incomplete Protagorean " it supplies the link which connects his philosophical scepticism with his dialectical theory of education. It is no doubt possible that Socrates was unaware of the closeness of his relationship to Protagoras; but the fact, once stated, hardly admits of question.

In the application of the " dialectical " or " maieutic " method two processes are distinguishable — the destructive process, by which the worse opinion was eradicated, and the constructive . process, by which the better opinion was induced. In ˆJˆ° general it was not mere " ignorance " . with which Hrocesses ' Socrates had to contend, but " ignorance mistaking itself for knowledge " or " false conceit of wisdom " — a more stubborn and a more formidable foe, who, safe so long as he remained in his intrenchments, must be drawn from them, circumvented, and surprised. Accordingly, taking his departure from some appar- ently remote principle or proposition to which the respondent yielded a ready assent, Socrates would draw from it an unexpected but undeniable consequence which was plainly inconsistent with the opinion impugned. In this way he brought his interlocutor to pass judgment upon himself, and reduced him to a state of " doubt ' or ' perplexity" (kropla). " Before I ever met you," says Meno in the dialogue which Plato called by his name (79 E), I was told that you

spent your time in doubting and leading others to doubt ; and it is a fact that your witcheries and spells have brought me to that condition; you are like the torpedo: as it benumbs any one who approaches and touches it, so do you. For myself, my soul and my tongue are benumbed, so that I have no answer to give you." Even if. as often happened, the respondent, baffled and disgusted by the 'e\eyxos or destructive process, at this point withdrew from the inquiry, he had, in Socrates's judgment, gained something; for, whereas formerly, being ignorant, he had supposed himself to have knowledge, now, being ignorant, he was in some sort conscious of his ignorance, and accordingly would be for the future more circumspect in action. If, however, having been thus convinced of ignorance,

the respondent did not shrink from a new effort, Socrates was ready to aid him by further questions of a suggestive sort. Consis- tent thinking with a view to consistent action being the end of the inquiry, Socrates would direct the respondent's attention to instances analogous to that in hand, and so lead him to frame for himself a generalization from which the passions and the prejudices of the moment were, as far as might be, excluded. In this constructive process, though the element of surprise was no longer necessary, the interrogative form was studiously preserved, because it secured at each step the conscious and responsible assent of the learner.

Of the two processes of the dialectical method, the iXeyxos or destructive process attracted the more attention, both in conse- quence of its novelty and because many of those who Maleutkla w ;ningly or unwillingly submitted to it stopped short Plato and at tne sta g e f " perplexity." But to Socrates and his Xeaophon. i n ti ma tes the constructive process was the proper and necessary sequel. It is true that in the dialogues of Plato the destructive process is not always, or even often, followed by construction, and that in the Memorabilia of Xenophon construction is not always, or even often, preceded by the destructive process. There is, however, in this nothing surprising. On the one hand, Xenophon, having for his principal purpose the defence of his master against vulgar calumny, seeks to show by effective examples the excellence of his positive teaching, and accordingly is not careful to distinguish, still less to emphasize, the negative procedure. On the other hand, Plato, his aim being not so much to preserve Socrates's positive teaching as rather by written words to stimulate the reader to self-scrutiny, just as the spoken words of the master had stimu- lated the hearer, is compelled by the very nature of his task to keep the constructive element in the background, and, where Socrates would have drawn an unmistakable conclusion, to confine himself to enigmatical hints. For

example, when we compare Xenophon's Memorabilia, iv. 6, 2-4, with Plato's Euthyphro, we note that, while in the former the interlocutor is led by a few sugges- tive questions to define " piety " as " the knowledge of those laws which are concerned with the gods," in the latter, though on a further scrutiny it appears that "piety " is " that part of justice which is concerned with the service of the gods," the conversation is ostensibly inconclusive. In short, Xenophon, a mere reporter of Socrates's conversations, gives the results, but troubles himself little about the steps which led to them ; Plato, who in early manhood was an educator of the Socratic type, withholds the results that he may secure the advantages of the elenctic stimulus.

*What, then, were the positive conclusions to which Socrates carried his hearers? and how were those positive conclusions obtained? Turning to Xenophon for an answer to Induction tnese questions, we note (1) that the recorded conversa- *""[tions are concerned with practical action, political,*

Definition. mora] i or artistic; (2) that in general there is a process from the known to the unknown through a generalization, expressed or implied ; (3) that the generalizations are sometimes rules of con- duct, justified by examination of known instances, sometimes definitions similarly established. Thus, in Memorabilia, iv. I, 3, Socrates argues from the known instances of horses and dogs that, the best natures stand most in need of training, and then applies the generalization to the instance under discussion, that of men ; and in iv. 6, 13-14, he leads his interlocutor to a definition of " the good citizen," and then uses it to decide between two citizens for whom respectively superiority is claimed. Now in the former of these cases the process — which Aristotle would describe as " example " (vapabeiyna), and a modern might regard as " induction " of an uncritical sort — sufficiently explains itself. The conclusion is a provisional assurance that in the particular matter in hand a certain course of action is, or is not, to be adopted. But it is necessary to say a word of explanation about the latter case, in which, the general- ization being a definition, that is to say, a declaration that to a given term the interlocutor attaches in general a specified meaning, the conclusion is a provisional assurance that the interlocutor may, or may not, without falling into inconsistency, apply the term in question to a certain person or act. Moral error, Socrates conceived, is largely due to the misapplication of general terms, which, once affixed to a person or to an act, possibly in a momeflt of passion or prejudice, too often stand in the way of sober and careful reflection. It was in order to exclude error of this sort that Socrates insisted upon t6 6plf«cr0cu ko66\ov with iiraKTu(ol Ai-yot for its basis. By requiring a definition and the reference to it of the act of person in question, he sought to secure in the individual at any fate consistency of thought, and, in so far, consistency of action. Accordingly he spent his life in seeking and

helping others to seek " the what " (t& ti), or the definition, of the various words by which the moral quality of actions is described, valuing the results thus obtained not as contributions to knowledge, but as means to right action in the multifarious relations of life.

While, however, Socrates sought neither knowledge, which in the strict sense of the wofd he held to be unattainable, nor yet, except as a means to right action, true opinion, the k kd resu ' ts °f observation accumulated until they formed, Knowledge. not peˆapg a system of ethics, but at any rate a body of ethical doctrine. Himself blessed with a will so powerful

that it moved almost without friction, he fell into the error of ignoring its operations, and was thus led to regard knowledge as the sole condition of well-doing. Where there is knowledge — that is to say, practical wisdom (tfrpovqer is) , the only knowledge which he recognized — right action, he conceived, follows of itself ; for no one knowingly prefers what is evil; and, if there are cases in which men seem to act against knowledge, the inference to be drawn is, not that knowledge and wrongdoing are compatible, but that in the cases in question the supposed knowledge was after all ignorance. Virtue, then, is knowledge, knowledge at once of end and of means, irre- sistibly realizing itself in act. Whence it follows that the several virtues which are commonly distinguished are essentially one. " Piety," " justice," " courage "and " temperance " are the names which " wisdom " bears in different spheres of action: to be pious is to know what is due to the gods ; to be just is to know what is due to men; to be courageous is to know what is to be feared and what is not ; to be temperate is to know how to use what is good and avoid what is evil. Further, inasmuch as virtue is knowledge, it can be acquired by education and training, though it is certain that one soul has by nature a greater aptitude than another for such acquisition.

But, if virtue .is knowledge, what has this knowledge for its object? To this question Socrates replies, Its object is the Good. What, then, is the Good? It is the useful, the advantageous. Utility, the immediate utility of the individual, thus TˆV 7 "! becomes the measure of conduct and the foundation Oood.

of all moral rule and legal enactment. Accordingly, each pre- cept of which Socrates delivers himself is recommended on the ground that obedience to it will promote the pleasure, the comfort, the advancement, the well-being of the individual ; and Prodicus's apologue of the Choice of Heracles, with its commonplace offers of worldly reward, is accepted as an adeguate statement of the motives of virtuous action. Of the graver difficulties of ethical theory Socrates has no conception, having, as it would seem, so perfectly absorbed, the lessons of what Plato calls " political virtue " that

morality has become with him a second nature, and the scrutiny of its credentials from an external standpoint has ceased to be possible. His theory is indeed so little systematic that, whereas, as has been seen, virtue or wisdom has the Good for its object, he sometimes identifies the Good, with virtue or wisdom, thus falling into the error which Plato (Republic vi. 505 C), perhaps with distinct reference to Socrates, ascribes to certain " cultivated thinkers." In short, the ethical theory of Socrates, like the rest of his teaching, is by confession unscientific ; it is the statement of the convictions of a remarkable nature, which statement emerges in the course of an appeal to the individual to study consistency in the interpretation of traditional rules of conduct. For a critical exami- nation of the ethical teaching which is here described in outline, see Ethics.

The Socratics.ˆ It has been seen that, so. far from having any system, physical or metaphysical, to enunciate, Socrates rejected " the pursuit of knowledge for its own sake " as a delusion and a snare, — a delusion, inasmuch as knowledge, properly so called, is unattainable, and a snare, in so far as the pursuit of it draws us away from the study of conduct. He has therefore no claim to be regarded as the founder of a philosophical school. But he had made some tentative contributions to a theory of morality ; he had shown both in his life and in his death that his principles stood the test of practical application; he had invented a rrethod having for its end the rectification of opinion; and, above all, he had asserted " the autonomy of the individual intellect." Accor- dingly, not one school but several schools sprang up amongst his associates, those of them who had a turn for speculation taking severally from his teaching so much as their pre-existing tendencies and convictions allowed them to assimilate. Thus Aristippus of Cyrene interpreted hedonistically the theoretical morality ; Antis- thenes the Cynic copied and caricatured the austere example; Euclides of Megara practised and perverted the elenctic method; Plato the Academic, accepting the whole of the Socratic teaching, first developed it harmoniously in the sceptical spirit of its author, and afterwards, conceiving that he had found in Socrates's agnosti- cism the germ of a philosophy, proceeded to construct a system which should embrace at once ontology, physics, and ethics. From the four schools thus established sprang subsequently four other schools, — the Epicureans being the natural successors of the Cyre- naics, the Stoics of the Cynics, the Sceptics of the Megarians, and the Peripatetics of the Academy. In this way the teaching of Socrates made itself felt throughout the whole of the post-Socratic philosophy. Of the influence which he exercised upon Aristippus, Antisthenes and Euclides, the "incomplete Sociatics," as they are commonly called, as well as upon the " complete Socratic," Plato, something must now be said.

The " incomplete Socratics " were, like Socrates, sceptics; but, whereas Aristippus, who seems to have been in contact with Pro- tagoreanism before

he made acquaintance with Socrates, came to scepticism, as Protagoras had done, from the "eoavj™ standpoint of the pluralists, Antisthenes, like his iocra j 3 – former master Gorgias, and Euclides, in whom the ancients*

Socratic Schools.

rightly saw a successor of Zeno, came to scepticism from the stand-

Coint of Eleatic henism. In other words, Aristippus was sceptical ecause, taking into account the subjective element in sensation, he found himself compelled to regard what are called " things " as successions of feelings, which feelings are themselves absolutely distinct from one another; while Antisthenes and Euclides were sceptical because, like Zeno, they did not understand how the same thing could at the same moment bear various and inconsistent epithets, and consequently conceived all predication which was not identical to be illegitimate. Thus Aristippus recognized only feelings, denying things; Antisthenes recognized things, denying attributions; and it is probable that in this matter Euclides was at one with him. For, though since Schleiermacher many historians, unnecessarily identifying the cl&S>t> <£(Xoi of Plato's Sophist with the Megarians, have ascribed to Euclides a theory of " ideas," and on the strength of this single passage thus conjecturally interpreted have added a new chapter to the history of Megarianism, it is difficult, if not impossible, to see how, if the founder of the school had broken loose from the trammels of the Zenonian paradox, his successors, and amongst them Stilpo, should have reconciled themselves, as they certainly did, to the Cynic denial of predication.

While the " incomplete Socratics " made no attempt to overpass the limits which Socrates had imposed upon himself, within those limits they occupied each his department. Aristippus, a citizen of the world, drawn to Athens by the fame of Socrates, and retained there by the sincere affection which he conceived for him, inter- preted the ethical doctrine of Socrates in accordance with his own theory of pleasure, which in its turn came under the refining influence of Socratcs's, theory of poirr)ai.s. Contrariwise, Antisthenes, a rugged but not ungenerous nature, a hater of pleasure, troubled himself little about ethical theory and gave his life to the imitation of his master's asceticism. Virtue, he held, depended upon " works," not upon arguments or lessons; all that was necessary to it was the strength of a Socrates (Diog. Laert. vi. n). Yet here too the Socratic theory of 0pinj

Of the relations in which the metaphysic of Plato stood to the Socratic

*search for definitions there are of necessity almost as many theories as there are interpretations of the Platonic system. Hence in this place the writer must content himself with a summary statement of his own views. Initiated into philosophical speculation by the Hera- clitean Cratylus, Plato began his intellectual life as an absolute sceptic, the followers of Heraclitus having towards the end of the 5th century pushed to its conclusion the unconscious scepticism of their master. There would have been then nothing to provoke surprise, if, leaving speculation, Plato had given himself to politics. In 407, however, he became acquainted with Socrates, who gave to his thoughts a new direction. Plato now found an occupation for his intellectual energies, as Socrates had done, in the scrutin}' of his beliefs and the systematization of his principles of action. But it was not until the catastrophe of 399 that Plato gave himself to his life's work. An exile, cut off from political ambitions, he came forward as the author of dialogues which aimed at producing upon readers the same effect which the voice of the master had pro- duced upon hearers. For a time he was content thus to follow in the steps of Socrates, and of this period we have records in those dialogues which are commonly designated Socratic. But Plato had too decided a bent for metaphysics to linger long over propaedeutic studies. Craving knowledge — not merely provisional and subjective knowledge of ethical concepts, such as that which had satisfied Socrates, but knowledge of the causes and latys of the universe, such as that which the physicists had sought — he asked himself what was necessary that the " right opinion " which Socrates had obtained by abstraction from particular instances might be converted into " knowledge " properly so called. In this way Plato was led to assume for every Socratic universal a corresponding unity, eternal, immutable, suprasensual, to be the cause of those particulars which are called by the common name. On this assumption the Socratic definition or statement of the " what " of the universal, being ob- tained by the inspection of particulars, in some sort represented the unity, form, or " idea " from which they derived their characteristics, and in so far was valuable; but, inasmuch as the inspection of the particulars was partial and imperfect, the Socratic definition was only a partial and imperfect representation of the eternal, immutable, suprasensual, idea. How, then, was the imperfect representation of the idea to be converted into'a perfect representation? To this question Plato's answer was ˆaeue *nd tentative. By constant*

Plato's Meta- physical Theories.

revision of the provisional definitions which imperfectly represented the ideas he hoped to bring them into such shapes that they should culminate in the definition of the supreme principle, the Good, from which the ideas themselves derive their being. If in this way we could pass from uncertified general notions, reflections of ideas, to the Good, so as to be able to say,

not only that the Good causes the ideas to be what they are, but also that the Good causes the ideas to be what we conceive them, we might infer, he thought, that our definitions, hitherto provisional, are adequate representations of real existences. But the Platonism of this period had another ingredient. It has been seen that the Eleatic Zeno had rested his denialof plurality upon certain supposed difficulties of predication, and that they continued to perplex Antisthenes as Well as perhaps Euclides and others of Plato's contemporaries. These difficulties must be disposed of, if the new philosophy was to hold its ground; and accordingly, to the fundamental assertion of the existence of eternal immutable ideas, the objects of knowledge, Plato added two subordinate propositions, namely, (1) " the idea is immanent in the particular," ana (2) " there is an idea wherever a plurality of particu- lars is called by the same name." Of these propositions the one was intended to explain the attribution of various and even inconsistent epithets to the same particular at the same time, whilst the other was necessary to make this explanation available in the case of common terms other than the Socratic uniyersals. Such was the Platonism of the Republic and the Phaedo, a provisional ontology, with a scheme of scientific research, which, as Plato honestly con- fessed, was no more than an unrealized aspiration. It was the non- Socratic element which made the weakness of this, the earlier, theory of ideas. Plato soon saw that the hypothesis of the idea's immanence in particulars entailed the sacrifice of its unity, whilst as a theory of predication that hypothesis was insufficient, because applicable to particulars only, not to the ideas themselves. But with clearer views about relations and negations the paradox of Zeno ceased to perplex; and with the consequent withdrawal of the two supple- mentary articles the development of the fundamental assumption of ideas, eternal, immutable, suprasensual, might be attempted afresh. In the more definite theory which Plato now propounded the idea was no longer a Socratic universal perfected and hy posta- tizecl, but rather the perfect type of a natural kind, to which type its imperfect members were related by imitation, whilst this relation was metaphysically explained by means of a " thoroughgoing idealism " (R. D. Archer-Hind). Thus, whereas in the earlier theory of ideas the ethical universals of Socrates had been held to have a first claim to hypostatization in the world of ideas, they are now peremptorily excluded, whilst the; idealism which reconciles plurality and unity gives an entirely new significance to so much of the Socratic element as is still retained.

The growth of the metaphysical system necessarily influenced Plato's ethical doctrines; but here his final position is less remote from that of Socrates. Content in the purely Socratic t

period to elaborate and to record ethical definitions ˆJjf? s . such as Socrates himself might have propounded, Plato, ∼ .* as soon as the*

theory of ideas offered itself to his theories. imagination, looked to it for the foundation of ethics as of all other sciences. Though in the earlier ages both of the individual and of the state a sound utilitarian morality of the Socratic sort was useful, nay valuable, the morality of the future should, he thought, rest upqn the knowledge of the Good. Such is the teaching of the Republic. But with the revision of the metaphysical system came a complete change in the view which Plato took of ethics and its prospects. Whilst in the previous period it had ranked as the first of sciences, it was now no longer a science; because, though Good absolute still occupied the first place, Good relative and all its various forms — justice, temperance, courage, wisdom — not being ideas, were incapable of being " known." Hence it is that the ethical teaching of the later dialogues bears an intelligible, though perhaps unexpected, resemblance to the simple practical teaching of the unphilosophical Socrates. ,

Yet throughout these revolutions of doctrine Plato was ever true to the Socratic theory of education. His manner indeed changed; for, whereas in the earlier dialogues the characteristics of the master are studiously and skilfully preserved, in the later dialogues Socrates first becomes metaphysical, then ceases to be protagonist, and at last disappears from the scene. But in the later dialogues, as in the earlier, Plato's aim is the aim which Socrates in his conversation never lost sight of, namely, the dialectical improvement of the learner.

Bibliography. — Of the histories of Greek philosophy the most convenient for the study of Socrates's life and work is Zeller's Philo- sophie d. Griechen. The part in question has been translated into English under the title of Socrates and the Socratic Schools (London, 1877). For a list of special treatises, see Ueberweg in his Grundriss d. Geschichte d. Philosophie. The following sources of information may be specially mentioned: F. Schleiermacher, " Ueber d. Werth d. Sokrates als Philosophen," in Abh. d. berliner Akad. d. Wissensch. (1815) and Werke, iii. 2, 287-308, translated into English by C. Thirlwall in the Philological Museum (Cambridge, 1 833), ii. 5387555; L. F. Lflut, Du Demon de Socrate (Paris, 1836, 1856), reviewed by E. Littr6 in Medecine et medecins (Paris, 1872); G. Grote, History of Greece, ch. lxviii., and Plato and the Other Companions

of Sokrates (London, 1865); C. F. Hermann, De Socratis accusa- tonbus (Gottingen, 1854) ; W. H. Thompson, The Phaedrus of Plato (London, 1868), Appendix I.; Joel, Der echte und der Xenophontische Sokrates (1901). For the view taken in the present article with regard to the iaiiibvwv, see the writer's paper " On the btun&viov of Socrates," in the Journal of Philology, v.; and cf. Chr. Meiners, Vermischte phtiosophiscke Schriflen (Leipzig, 1776) — " in moments of Schwarmerei ' Socrates took for the voice of an attendant genius what was in reality an instantaneous presentiment in regard to the issue of a contemplated act." For a fuller statement of the writer's view of Plato's relations to Socrates, see a paper on Plato's Republic, V1 ' 5P&P se . q " in the Journal of Philology, vol. x., and a series of papers on Plato s Later Theory of Ideas," in vols, x., xi., xiii., xiv., xv., xxv. of the same periodical. See also Sophists and Ethics. (H. Ja.)

SOCRATES, the name of a famous 5th-century church historian. In the course of the last twenty-five years (425-450) of the reign of Theodosius II. (the first thoroughly Byzantine emperor) at least six church histories were written in Greek within the limits of the Eastern Empire — those, namely, of Philostofgius the Arian, of Philip of Side, of Socrates, of Sozomen, of Theodoret and of Hesychius. Of these the first, no longer extant except in fragments, seems to have been the most important. Those of Philip and of Hesychius (the former an untrustworthy and dreary performance mentioned by Socrates [vii. 26, 27]) have also perished. The remaining three are now our main sources for church history from Constantine to Theodosius II. None of them has ventured upon a fresh treatment of the period dealt with by Eusebius; all three begin their narratives about the point where his closes. In the West the Church History of that author had already been continued by Rufinus and his Chronicle by Jerome, and the work of Rufinus was certainly known to the Byzantines. Nor did these write independently of each other, for Sozomen (q.v.) certainly had before him the work of Socrates, and Theodoret (q.v.) knew both of them. The three histories together became known in the West from the 6th century through the selection which Cassiodorus caused to be made from them, and it is to this selection (if we leave Rufinus and Jerome out of account) that the middle ages were mainly indebted for all they knew of the Arian controversies, and of the period generally between the Councils of Nice and Ephesus.

The 'EicKXrjffiao-riKij Icrropia of Socrates, still extant in seven books, embracing the period from. 306 to 439, was written in 439, or within a few years thereafter. He was born and brought up at Constantinople. The date of his birth is uncertain, but it cannot have been far from 380. Of the facts of his life we know practically nothing, except that he was not a cleric

but a " scholasticus " or advocate. Of the occasion, plan and object of his work he has himself informed us in the prologues to his first, second, fifth and sixth books. It is dedicated to one Theodorus, who had urged him to write such a history. He had no thorough preparation for the task, and for the period down to the death of Constantius (361) was practically dependent on Rufinus. After his work was finished he [became a student of Athanasius' writings and came to see how untrustworthy his guide had been. He accordingly rewrote his first two books (see H. E. ii. 1) certainly before 450 and probably before 444 (see Geppert p. 8), and it is only this revision that has reached lis. The chief sources from which he drew were: (1) the Church History, the Life of Constantine and certain theological works of Eusebius; (2) the Church History of Rufinus; (3) certain works of Athanasius; (4) the no longer extant Zwayuyli rciv

Pamphilus' Apologia pro Origene. (On his sources see Jeep, and especially Geppert.) Jeep alleges (pp. 149 sqq.), but without adequate proof, that he made use of Philostorgius. As regards profane history his materials were exceedingly defective. Thus, for example, he confesses that his reason for not giving an account of the wars of Constantine is his inability to ascertain anything certain about them (v. praef.). His reckonings by Olympiads are generally wrong, the error arising chiefly from carelessness. He is greatly indebted to oral tradition and to the testimony of eye-witnesses, especially of members of the Novatian community in Constantinople; some things also he has set down from per- sonal knowledge. The contents of the closing books are for the most part derived from oral tradition, from the narratives of friends and countrymen, from what was still generally known and current in the capital about past events, and from the ephemeral literature of the day.

The theological position of Socrates, so far as he can be said to have had one, is at once disclosed in his unlimited admiration for Ungen. All the enemies of the great Alexandrian he regards merely as empty and vain obscurantists; for the orthodoxy of his hero he appeals to Athanasius. Closely connected with his high regard for Ongen are his appreciation of science generally and the moderation of his judgment on all dogmatic questions. According to him, EXXtji-uciJ TmMa is quite indispensable within the Church • many Greek philosophers were not far from the knowledge of God, as is proved by their triumphant arguments against atheists and gainsayers of divine providence. The apostles did not set them- selves against the study of Greek literature and science; Paul had even made a thorough study of them himself. The Scriptures it is true, contain all that appertains to faith and life, but give no clue to the art of confuting gainsayers. Greek science, therefore, must not be banished from the Church, and the tendency within the Church so to deal with it is wrong. This point of view was the common one of the majority of educated

Christians at that period, and is not to be regarded as exceptionally liberal. The same holds true of the position of Socrates in regard to dogmatic questions. Up. the one hand, indeed, orthodoxy and heresy are symbolized to his mind by the wheat and the tares respectively; he clings to the naive opinion of Catholicism, that contemporary orthodoxy has prevailed within the Church from the first; he recognizes the true laith only in the mystery of the Trinity ; he judges heretics who have been already condemned as interlopers, as impudent innovators, actuated by bad and self-seeking motives; he apologizes for having so much as treated of Arianism at all in his history of the Church; he believes in the inspiration of the ecclesiastical councils as much as in that of the Scriptures themselves. But, on the other hand, he takes absolutely no interest in dogmatic subtleties and clerical disputes ; he regards them as the source of great evils, and expresses his craving for peace: " one ought to adore the ineffable mystery in silence. This attitude, which was that of most educated Byzantine laymen, has in particular cases made it possible for him to arrive at very free judgments. Even granting that some feeble remains of antique reserve may have contributed to this, and even although some of it is certainly to be set down to his disposition and temperament, still it was his religious passivity that here deter- mined the character of Socrates and made him a typical example of the later Byzantine Christianity. If Socrates had lived about the year 325, he certainly would not have ranked himself on the side of Athanasius, but would have joined the party of mediation. But— the iitooiawt has. been laid down, and must be recognized as correctly expressing the mystery; only one ought to rest satisfied with that word and with the repudiation of Arianism. Anything more, every new distinction, is mischievous. The controversy in its details is a vvKronaxla to him, full of misunderstandings. Some-' times he gives prominence, and correctly, to the fact that the disputants partially failed to understand one another, because they had separate interests at heart— those on the one side desiring above everything to guard against polytheism, those on the other being most afraid of Sabellianism. He did not fail, however, to recognize also that the controversies frequently had their root in mere emula- tion, slander and sophistry. Not unfrequently he passes very sharp judgments on whole groups of bishops. In the preface to his fifth book he excuses his trenching on the region of political history on the ground of his desire to spare his readers the disgust which perusal ot the endless disputes of the bishops could not fail to excite, and in that to his sixth book he prides himself on never having flattered even the orthodox bishops. This attitude of his has given him a certain measure of impartiality. Constantius, and even Julian — not Valens, ,t is true— are estimated very fairly. The Arian Goths who died tor their religion are recognized as genuine martyrs. His characterizations o£ Cyril and Nestorius, and his narrative and criti- cism of the beginnings of the Christological controversy, are models ot candour

and historical conscientiousness. In frequent instances, moreover, he acknowledges his own incompetency to give an opinion

and hands the question over to the clergy. For the clergy as a whole, in spite of his criticism of individuals, he has the very highest respect, as also for the monks, without himself making any inordinate religious professions. In a special excursus of considerable length he has paid a tribute of the highest order to monachism, and in his characterization of Theodosius II. also (where he has made use of the brightest colours) he does not fail to point out that in piety the emperor could almost compete with the monks. But, apart from these two chapters (iv. 23, vii. 22), it is but seldom that one could learn from the pages of Socrates that there was such a thing as monasticism in those days. To his mind the convent is not far removed from the church, and as a layman he is not at all inclined to accept the principles of monachism as applying to himself or to square his views of history in accordance with them. He has even gone so far as formally to express his sympathy with Paphnutius, the champion of the right of bishops to marry.

As a source for the period within which he wrote, the work of Socrates is of the greatest value, but as " history " it disappoints even the most modest expectations. Eusebius, after all, had some conception of what is meant by " church history," but Socrates has none. " As long as there is peace there is no material for a history of the church " ; but, on the other hand, neither do heresies by rights come into the story. What, then, is left for it? A collection of anecdotes and a series of episodes. In point of fact this is the view actually taken by Socrates. His utter want of care and consistency appears most clearly in his vacillation as to the relations between ecclesiastical and political history. At one time he brings in politics, at another he excuses himself from doing so. He has not failed to observe that Church and State act and react upon each other; but he has no notion how the relation ought to be conceived. Nevertheless, his whole narrative follows the thread of political — that is to say, of imperial — history. This indeed is characteristic of his Byzantine Christian point of view; church history becomes metamorphosed into a history of the emperors and of the state, because a special church history is at bottom impossible. But even so one hardly hears anything about state or court except great enterprises and anecdotes. Political insight is wholly wanting to Socrates; all the orthodox emperors blaze forth in a uniform light of dazzling splendour; even the miserable Arcadius is praised, and Theodosius II. figures as a saint whose exemplary piety turned the capital into a church. If in addition to all this

we bear in mind that in his later books the historian's horizon is confined to the city and patriarchate of Constantinople, that he was exceedingly ill informed on all that related to Rome and the West, that in order to fill out his pages he has introduced narratives of the most unimportant description, that in not a few instances he has evinced his credulity (although when compared with the majority of his contemporaries he is still entitled to be called critical), it becomes sufficiently clear that his History, viewed as a whole and as a literary production, can at best take only a secondary place. One great excellence, however, cannot be denied him, his honest and sincere desire to be impartial. He tried also, as far as he could, to distinguish between the certain, the probable, the doubtful and the untrue. He made no pretence to be a searcher of hearts and frequently declines to analyse motives. He has made frank confession of his nescience, and in certain passages his critical judgment and sober sense and circumspection are quite striking. He writes a plain and unadorned style and shuns superfluous words. Occasionally even there are touches of humour and of trenchant satire — always the sign of an honest writer. In short, his learning and knowledge can be trusted little, but his goodwill and straightforwardness a great deal. Considering the circumstances under which he wrote, it can only be matter for con- gratulation that such a man should have become our informant and that his work has been preserved to us.

Finally, it looks as if Socrates was either himself originally a Novatianist who had afterwards joined the Catholic Church, or stood, through his ancestors or by education, in most intimate relations with the Novatianist Church. In his History he betrays great sympathy with that body, has gone with exactness into its history in Constanti- nople and Phrygia, and is indebted for much of the material of his work to Novatianist tradition and to his intercourse with prominent members of the sect. Both directly and indirectly he has declared that Novatianists and Catholics are brothers, that as such they ought to seek the closest relations with one another, and that the former ought to enjoy all the privileges of the latter. His efforts, however, had only this result, that he himself afterwards fell under suspicion of Novatianism.

Editions and Literature. — Socrates' History has been edited by Stephanus' (Paris, 1544; Geneva, 1612), Valesius (Paris, 1659 sqq.), Reading (Cambridge, 1720), Hussey (Oxford, 1853, reissued by Bright, 1878). It is also to be found in volume lxvii. of Migne's Patrologia, and there is an Oxford school edition (1844) after Reading. The latest English translation, revised by Zenos, is published in the Nicene and post Nicene Fathers, 2nd series, vol. ii. There are Testi- monia vetcrum in Valesius and more fully in Hussey; and Nolte's paper in Tubing. Quartalschr. (1859, P- 518 seq.), contains emendations in Hussey's text, and notes towards the history of the

text and editions; see also Overbeck, in Theol. lit. Ztung. (1879), no. 20.

Special studies have been made by. Baronius, Miraeus, LabW,

Valesius, Halloix, Scaliger, Ceillier, Cave, Dupin, Pagi, Ittig, Tille- mont, Walch, Gibbon, Schroeckh, Lardner. See also Voss, De histor. graecis; Fabricius-Harless, Biblioth. gr., vol. vii.; Rossler, Bibliothek d. Kirchenvater ; Holzhausen, De fontibus quibus Socr., Soz., ac Theod. in scribenda historia sacra usi sunt (Gottingen, 1825); Staudlin, Gesch. u. Lit. d. K.-G. (Hanover, 1827); Baur, Epochen (1852); Harnack, " Socrates u. Sozomen " in Herzog-Hauck's Real- encykl., 2nd ed. ; Loeschke, " Sokrates," ibid., 3rd. ed. Detached details are given also in works upon Constantine (Manso), Julian (Mucke, Rode, Neumann, Rendall), Damasus (Rade), Arianism (Gwatkin's Studies of Arianism, which gives a severe but trust-worthy criticism of Rufinus and discusses the manner in which Socrates was related to him), the emperors after Julian (De Broglie, Richter, Clinton, the Weltgeschichte of Ranke, the Gesch. d. ost- rbmischen Reich.es unter den Kaisern Arcadius u. Theod. II. (1885) of Gtildenpenning, and the Kaiser Theodosius d. Gr., Halle (1878) of Guldenpenning and Iffland, the last-named work discussing the relation of Socrates to Sozomen), the barbarian migrations (Wieters- heim, Dahn), the Goths (Waltz, Bessel, Kauffmann and Scott's Ulfilas, 1885). Lastly, reference may be made to Sarrazin, De Theodoro Lector e, Theophanis fonte praecipuo (1881, treats of the relation between Socrates and Sozomen, and of the completeness of the former's work) ; Jeep, Quellenuntersuch. 2. d. griech. Kirchen-historikern (1884); Geppert, Die Quellen des Krrchenhistorikers Socrates Scholasticus (1898). (A. Ha.; A. C. McG.)

SODALITE, a group of rock-forming minerals comprising the following isomorphous species: —

Sodalite . . Nai(AlCl)Al 2 (Si0 4) 3

Haiiynite . . (Na,, Ca) 2 (NaS04-Al)Al 2 (Si04) 3

Noselite . . Na 4 (NaS04-Al)Al s (SiO 4),

Lazurite . . Na4(NaS 3 -Al)Al 2 (Si0 4) 3

They are thus sodium (or calcium) aluminium silicates, with chloride, sulphate or sulphide. In their orthosilicate formulae, as above written, and in their cubic crystalline form they present a certain resemblance to the members of the garnet group. Crystals usually have the form of the rhombic dodecahedron, and are often twinned with interpenetration on an octahedral plane. They are white, or often blue in colour, and have a vitreous lustre. The hardness is sJ, and the specific gravity 2-2-2-4. These

minerals are characteristic constituents of igneous rocks rich in soda, and they also occur in metamorphic limestones. The species sodalite (so named because it contains soda) occurs as well-formed, colourless crystals in the ejected limestone blocks of Monte Somma, Vesuvius, and in the sqdalite-syenite of Juliane- haab in south Greenland. Massive blue material is common in the elaeolite-syenites of southern Norway, Gyergyo-Ditr6 in Transyl- vania, Miyask in the Urals, Litchfield in Maine, Dungannon in Ontario, Ice river in Kootenay county, British Columbia, &c. ; at the three last-named localities it is found as large masses of a bright sky-blue colour and suitable for cutting as an ornamental stone. Recently, large masses with a pink colour, which quickly fades on exposure to Tight, have been met with in elaeolite-pegmatite at Kishangarh in Rajputana. Haiiynite, or hauyne (named after R. J. Haiiy), occurs as bright blue crystals and grains in the lavas (phonolite, tephrite, &c.) of Vesuvius, Rome, the Eifel, &c. Nose- lite, or nosean, is found as greyish crystals in the sanidine bombs of the Eifel. Lazurite is an important constituent, together with sorrie haiiynite and sodalite, of lapis-lazuli {q,.v.). (L. J. S.) ■_

SODEN, a town and spa of Germany, in the Prussian pro- vince of Hesse-Nassau, pleasantly situated in the valley of the Sulzbach under the southern slope of the Taunus range, 10 m. from Frankfort-on-Main and 4 m. N. from Hochst by rail. Pop. (1905), 191 7. The chief interest of the place centres in its brine springs which are largely impregnated with carbonic acid gas and oxide of iron, and are efficacious in chronic catarrh of the respiratory organs, in liver and stomach disorders and women's diseases. The waters are used both internally and externally, and are largely exported. Soden lozenges (Sodener Pastillen), condensed from the waters, are also in great repute. Soden has a large and well-appointed Kurhaus, an Evangelical and a Roman Catholic church, and a hospital for indigent patients.

See Haupt, Soden am Taunus (Wilrzburg, 1902); and Kohler, Der Kurort Soden am Taunus und seine Umgebungen (Frankfort,i873).

SODEN, HERMANN, Feeiherr von (1852-), German

biblical scholar, was born in Cincinnati on the 16th of August 1852, and was educated at the university of Tubingen. He was minister of Dresden-Striesen in 1881 and in 1887 became minister of the Jerusalem Church in Berlin. In 1889 he became privat- dozent in the university of Berlin, and four years later was

appointed extraordinary professor of divinity. His earlier works include Philip perbrief (1890); " Untersuchungen iiber neutest. Schriften " in the Protest. Jakrb. theolog. Studien and Schriflkommentar (1895-1897); Und was tut d. evangel. Kirche? (3rd. ed. 1890); Reisebriefe aus Palastina (2nd ed. 1901); Palastina und seine Gesch. (2nd ed. 1904); Die wichtigsten Frageh im Leben Jesu (1904); Urchristliche Liter atur gesch. (1904). His most important book is Die Schriften des neuen Testaments, in ihrer altesten erreichbaren Textgestalt hergestellt auf Grund ihrer Texlgeschichte (Berlin, Bd. I., 1902-1910); certainly the most important work on the text of the New Testament which had been published since Westcott and Hort's New Testament in the Original Greek (see Bible: New Testament).

Von Soden introduces, besides a new notation of MSS. (see Bible, N.T. MSS. and versions), a new theory of textual history. He thinks that in the 4th century there were in existence three recen- sions of the text, which he distinguishes as K, H and I, with the following characteristics and attestations.

K corresponds roughly to Westcott and Hort's Syrian Antiochian text; it was probably made by Lucian in the 4th century. This was in the end the most popular form of text, and is found in a more or less degenerate state in all late MSS. The purest representatives are 6i(0), «75 (V), 92, (461), 94, 1027 (S), 1126 (476 = scrivener's k) el79 (661). Later recensions of K are called K and K 1 , and there are also others ot less importance which represent the combination of K with other texts.*

H represents Westcott and Hort's Neutral and Alexandrian texts between which von Soden does not distinguish.

It is found in eleven MSS. in varying degrees of purity: 81(B), 52 («),«3 (G), 56 (*), S 48 (33), ***26 (Z), e 5 6 (L), e76 (A) €1026 (892), S 371 (1241) and e 376 (579). Between these MSS. there is no very intimate connexion except between 5 1 and 5 2 (B and .x) which represent a common original (5 1-2). S'~*** *is the best representative of H, but it has been contaminated by the Egyptian versions, and sometimes by the K and / texts and by Origen, though not to any great extent.*

The other H MSS. are none of them equal in value to the two great uncials. They have all been influenced by K, I, and by the text of. parallel passages, to a greater extent than 5 1-2 , or than either of the two witnesses to 5 1 "" 2 , but some of them have less Egyptian corruption.

The origin of the H text must be regarded as unquestionably Egyptian, in view of the fact that it was used by all the Egyptian Church writers after the end of the 3rd century, and von Soden adopts the well-known

hypothesis, first made popular by Bousset, that it represents the recension of Hesychius.

I does not quite correspond to anything in Westcott and Hort's system, but has points of contact with their " Western " text. It is found in a series of subgroups of MSS. known as H T , J, I, and others of less importance (about eleven subgroups are suggested). Of these H r is a family containing Cod. /and its allies (8254,6346, 5 457, S467, &c), e288 (22) and some allied MSS. €203 (872), ei83 and t 1 131 ; J is the well-known Ferrar group; and /" contains 5 5 (D), '93 (5°5),eI33 (7oo),el68 (28), e 050 and some others. It is necessary to note that von Soden is able to place D in this group because he regards it as owing many of its most remarkable readings to contami- nation with the Latin version. I is, according to von Soden, a Palestinian recension connected with Eusebius, Pamphilus and Origen.*

After establishing the text of /, H and K; von Soden reconstructs an hypothetical text, I-H-K, which he believes to have been their ancestor. He then tries to show that this text was known to all the writers of the 3rd and 2nd centuries, but has naturally to account for the fact that the quotations of these writers and the text of the early versions often diverge from it. The explanation that he offers is that the Diatessaron of Tatian was widely used and corrupted all extant texts, so that the Old Syriac, the Old Latin, the quotations of Irenaeus, Clement, Tertulhan and others may be regarded as various combinations of the Tatianic text and I-H-K. Finally, he tries to show that the Tatianic text is itself in the main merely a corrupt form of I-H-K altered in order to suit the necessities of Tatian's plan.

For criticism of tljis important theory up to 1909 see Nestle's Eirifiihrung in das grie'chische neue Testament, pp. 274-278 (3rd ed., Gottingen, 1909), and K. Lake's Professor II. von Soden' s Treatment of the Text of the Gospels, Edinburgh, 1908). (K. L.)

S&DERHAMN, a seaport of Sweden, in the district (Ian) of Gefleborg, on an inlet of the Gulf of Bothnia, near the mouth of the Ljasne River, 183 m. N. by W. of Stockholm by rail. Pop. (1900), 11,258. This is one of the principal centres of the timber export trade, having saw-mills, planing-mills and wood-pulp works. There are also ironworks and breweries. Vessels drawing 15 ft. have access to Branthall, where they generally load. The harbour is at the suburb of Stugsund. It is usually

ice-bound for some four months in winter. The town was given municipal privileges by Gustavus Adolphus in 1620, but is modern in appearance, having been rebuilt after fires in i860 and

1865.

SODERINI, PIERO (1450-1513), Florentine statesman, was elected gonfalonier for life in 1502 by the Florentines, who wished to give greater stability to their republican institutions, which had been restored after the expulsion of Piero de' Medici and the martyrdom of Savonarola. His rule proved moderate and wise, although he had not the qualities of a great states- man. He introduced a system of national militia in the place of foreign mercenaries, and during his government the long war with Pisa was brought to a close with the capture of that City by the Florentines in 1509. Grateful to France, who had assisted him, he always took the French side in Italian politics. But in 1 51 2 the Medici with the help of a Spanish army returned to Florence, deposed Soderini and drove him into exile. He took refuge at Ragusa in Dalmatia, where he remained until the election of Pope Leo X., who summoned him to Rome and con- ferred many favours on him. Soderini lived in Rome, working for the good of Florence, to which he was never allowed to return, until his death.

See Razzi, Vita di Pier Soderini (Padua, 1737), also the articles Florence and Medici.

SODERTELGE, a town of Sweden, in the district (Ian) of Stockholm, 23 m. W.S.W. of Stockholm by rail. Pop. (1900), 8,207. It is beautifully situated on a bay of Lake Malar, which is here connected with the Baltic by the Sodertelge canal, ijm, in length, with a minimum depth of 10 ft. This is on the route followed by the G6ta Canal steamers between Stockholm and Gothenburg: it was opened in 1819, though a canal was begun here in the first half of the 15th century at the instigation of the patriot Engelbrecht. The town contains an ancient church, believed to date from c.noo. Here and in the neighbourhood are the residences of many of the business class of Stockholm ; and the town, is in favour as a summer resort, having mineral springs and baths. There are engineering shops producing railway stock and motors, jute spinning and weaving mills, and match and joinery works.

SODIUM [symbol Na, from Lat. natrium; atomic weight 23-00 (0=i6)], a chemical element belonging to the group of alkali metals. It is abundantly and widely diffused in nature, but always in combination. Sodium chloride, or common salt (q.v.), is exceedingly common, being the chief salt present in sea-water, besides occurring in extensive stratified deposits. Sodium carbonates are also widely dispersed in nature, forming constituents of many mineral waters, and occurring as prin- cipal saline components in natron or trona lakes, as efflores- cences in Lower Egypt, Persia and China, and as urao in Mexico, Colombia and Venezuela. The solid crusts found at the bottom of the salt lakes of the Araxes plain in Armenia contain about

16% of carbonate and 80 of sulphate. In Colombia there occurs a double salt, Na2COyCaCGy5H!0, known as gay-lussite. In Wyoming, California and Nevada enormous deposits of carbonates, mixed in some cases with sulphate and with chloride, occur. About Szegedin in Hungary and all over the vast pusztas (steppes) between the Theiss and the Danube, and from the Theiss up to and beyond Debreczin, the soil con- tains sodium carbonate, which frequently assumes the form of crude alkaline crusts, called " szekso," and of small saline ponds. A purified specimen of such Debreczin soda was found to contain as much as 90 % of real carbonate, NaCOj, and 4 of common salt Natural sulphate occurs in an anhydrous con- dition as thenardite, Na< >S04, at Tarapaca, Chile, and in the rock-salt deposits at Espartinas near Aranjiiez, Spain. Hy- drated sulphates occur at several localities in the province of Madrid and in other provinces of Spain, and at Muhlingen in Aargau, and copious deposits of glauberite, the double sulphate of sodium and calcium, are met with in the salt-mines of Vil- larrubia in Spain, at Stassfurt, and in the province of Tarapaca, Chile, &c. A native nitrate of soda is obtained in great abund- ance in the district of Atacama and the province of Tarapaca,

and is imported into Europe in enormous quantities as cubic nitre for the preparation of saltpetre. Cryolite, a fluoride of aluminium and sodium, is extensively mined in Greenland and elsewhere for industrial purposes. These form the principal natural sources of sodium compounds — the chloride as rock salt and in sea-water being of such predominating importance as quite to outweigh all the others. But it is questionable whether, taken altogether, the mass of sodium they represent is as much as that disseminated throughout the rocky crust in the form of soda felspar (i.e. as silicate of soda) and in other soda-contain- ing rocks. From this source all soils contain small proportions of sodium in soluble forms, hence the ashes of plants, although they preferably imbibe potassium salts, contain traces and sometimes notable quantities of sodium salts. Sodium salts also form essential ingredients in all animal juices.

Although many sodium compounds have been known from very remote times, the element was not isolated until 1807, when Sir H. Davy obtained it by electrolysing caustic soda. This method was followed by that proposed by Gay-Lussac and Thenard, who decomposed molten, caustic soda with red-hot iron; and this in turn was succeeded by Brunner's process of igniting sodium carbonate with charcoal. Deville made many improvements, but the method remained wasteful and uneconomical, and in 1872 the metal cost 4s. a pound. In 1886, however, Castner replaced

the carbonate by caustic soda, and materially cheapened the cost of production; but this method was discarded for an electrolytic one, patented by Castner in 1890. Electrolytic processes had, in fact, been considered since 185 1, when Charles Watt patented his method for the production of sodium and potassium from fused chlorides. Among the difficulties here to be contended with are the destructive action of fused chlorides and of the reduced alkali metals upon most non-metallic sub- stances available for the containing vessel and its partition, and also of the anode chlorine upon metals; also the low fusing-point (95 C. for sodium, and 62 C. for potassium) and the low specific gravity of the metals, so that the separated metal floats as a fused layer upon the top of the melted salt. Again, pure sodium chloride melts at about 775° C, while sodium boils at 877° C, so that the margin of safety is but small if loss by vaporization is to be prevented. Borchers endeavoured to con- tend against the first difficulty by employing an iron cathode vessel and • a chamotte (fire-clay) anode chamber united by a specially constructed water-cooled joint. The other difficulty is to some extent met by using mixed chlorides (e.g. sodium, potassium and strontium chlorides for sodium extraction), as these melt at a lower temperature than the pure chloride. In Castner's process (as employed at Oldbury and Niagara Falls and in Germany) fused caustic soda is electrolysed. The apparatus described in the patent specification is an iron cylinder heated by gas rings below, with a narrower cylinder beneath, through which passes upwards a stout iron cathode rod cemented in place by caustic soda solidified in the narrower vessel. Iron anodes are suspended around the cathode, and between the two is a cylinder of iron gauze at the bottom with a sheet-iron continuation above, the latter being provided with a movable cover. During electrolysis, oxygen is evolved at the anode and escapes from the outer vessel, while the sodium deposited in globules on the cathode floats upwards into the iron cylinder, within which it accumulates, and from which it may be re- moved at intervals by means of a perforated iron ladle, the fused salt, but not the metal, being able to pass freely through the perforations. The sodium is then cast into moulds. Sodium hydroxide has certain advantages compared with chloride, although it is more costly; its fusing-point is only 320 C, and no anode chlorine is produced, so that both containing vessel and anode may be of iron, and no porous partition is necessary.

Metallic sodium possesses a silvery lustre, but on exposure to moist air the surface is rapidly dulled by a layer of the hydroxide. It may be obtained crystallized in the quadratic system by melting in a sealed tube containing hydrogen, allowed to cool partially, and then pouring off the still liquid portion

by inverting the tube. The specific gravity is 0-9735 at l S'5°

(Baumhauer). At ordinary temperatures the metal has the consistency of wax and can be readily cut; on cooling it hardens. On heating it melts at 95-6 (Bunsen) to a liquid resembling mercury, and boils at 877-5° (Ruff and Johannsen, Ber., 1905, 38, p. 3601), yielding a vapour, colourless in thin layers but a peculiar purple, with a greenish fluorescence, when viewed through thick layers. (For the optics of sodium vapour see R. W. Wood, Physical Optics.) According to A. Matthiessen, sodium ranks fourth to silver, copper and gold as a conductor of electricity and heat, and according to Bunsen it is the most electropositive metal with the exception of caesium, rubidium and potassium. The metal is very reactive chemically. Exposed to moist air it rapidly oxidizes to the hydroxide; and it burns on heating in air with a yellow flame, yielding the monoxide and dioxide. A fragment thrown on the surface of water rapidly disengages hydrogen, which gas, however, does not inflame, as happens with potassium; but inflammation occurs if hot water be used, or if the metal be dropped on moist filter paper. Sodium also combines directly, sometimes very energetically, with most non-metallic elements. It also combines with dry ammonia at 300-400° to form sodamide, NaNH 2 , a white waxy mass when pure, which melts at 155°. Heated in a current of carbon dioxide sodamide yields caustic soda and cyanamide, and with nitrous oxide it gives sodium azoimide; it deflagrates with lead or silver nitrate and explodes with potassium chlorate. Sodamide was introduced by Claisen (Ber., 1905, 38, p. 693) as a condensing agent in organic chemistry, and has since been applied in many directions. Sodium is largely employed in the manufacture of cyanides and in reduction processes leading to the isolation of such elements as magnesium, silicon, boron, aluminium (formerly), &c; it also finds application in organic chemistry. With potassium it forms a liquid alloy resembling mercury, which has been employed in high temperature thermometers (see Thermometry).*

Compounds. In its chemical combinations sodium is usually monovalent; its salts are generally soluble in water, the least soluble being the metantimonate.

Sodium hydride, NaH, is a crystalline substance obtained directly from sodium and hydrogen at about 400 . It burns when heated in dry air, and ignites in moist air; it is decomposed by water, giving caustic soda and hydrogen. Dry carbon dioxide is decomposed by it, free carbon being produced; moist carbon dioxide, on the other hand, gives sodium formate.

Several oxides are known. A suboxide, NasO, appears to be formed as a grey mass when a clean surface of the metal is exposed to air, or when pure air is passed through the metal just above its melting point (De Forcrand, Compt. rend., 1898, 127, pp. 364, 514). The monoxide, Na 2 0, is obtained by heating the metal above 180 ° in a limited amount of

slightly moist oxygen (Hplt and Sims, Journ. Chem. Soc, 1894, i. 442) ; it may also be prepared by heating the nitrate or nitrite with metallic sodium, free nitrogen being eliminated (German patent, 142467, 1902). It forms a grey mass, which melts at a red heat and violently combines with water to give the hydroxide. The hydroxide or caustic soda, NaOH, is usually manufactured from the carbonate or by electrolysis of salt solution (see Alkali Manufacture). When anhydrous it is a colourless opaque solid which melts at 310°, and decomposes at about 1100 . It is very soluble in water, yielding a strongly alkaline solution; it also dissolves in alcohol. It absorbs moisture and carbon dioxide from the atmosphere. Several hydrates are known : 2NaOH-7H 2 is obtained as large monoclinic crystals by cooling a solution of specific gravity I 365 to -8°; Pickering (Journ. Chem. Soc, 1893, 65, p. 890) obtained NaOH-H 2 from hot concentrated solutions and NaOH-2H 2 from a solution of the hydroxide in 968% alcohol. (See also De Forcrand, Compt. rend., 1901, 133,

P- 22 3 :) . . . ”.,..

Sodium dioxide, Na 2 02, is formed when the metal is heated in an excess of air or oxygen. In practice the metal is placed on aluminium trays traversing an iron tube heated 10,300°, through which a current 01 air, freed from moisture and carbon dioxide, is passed; the process is made continuous, and the product contains about 93 % Na 2 2 . When pure, sodium dioxide has a faint yellowish tinge, but on exposure it whitens (W. R. Bousfield and T. M. Lowry, Phil. Trans., 1905; A. 204, p. 253). When dissolved in water it yields some NaOH and H 2 2 ; on crystallizing a cold solution NajOsSHjO separates as large tabular hexagonal crystals, which on drying over sulphuric acid give Na 2 2 2H2O, the former is also obtained by precipitating a mixture of caustic soda and hydrogen peroxide solutions with alcohol. Acids yield a sodium salt and free oxygen or hydrogen peroxide ; with carbon dioxide it gives sodium carbonate

and free oxygen; carbpn monoxide gives the carbonate; whilst nitrous and nitric oxides give the nitrate. A solution- in hydro- chloric acid, consisting of the chloride and hydrogen peroxide, is used for bleaching straw under the name of soda-bleach; with calcium or magnesium chlorides this solution gives a solid product which, when dissolved in water, is used for the same purpose (Castner, Joum. Soc. Chem. Ind., 1893, p. 603). Sodium dioxide is chiefly employed as an oxidizing agent, being used in mineral analysis and in various organic preparations; it readily burns paper, wood, &c, but does not evolve oxygen unless heated to a high temperature. Sodyl

hydroxide, NaHOs, exists in two forms: one, Na-O-OH, obtained from hydrogen peroxide and sodium ethylate; the other, 0:Na-OH, from absolute alcohol and sodium peroxide at 0°. They are strong oxidizing agents and yield alkaline solutions which readily evolve oxygen on heating. Sodium trioxide, NaaOj, is said to be formed from an excess of oxygen and a solution of sodam- monium in liquid ammonia. Water decomposes it, giving oxygen and the dioxide.

Generally speaking, sodium salts closely resemble the correspond- ing potassium salts, and their methods of preparation are usually the same. For sodium salts not mentioned below reference should be made to articles wherein the acid is treated, unless otherwise indicated.

Sodium combines directly with the halogens to form salts which are soluble in water and crystallize in the cubic system. The fluoride, NaF, is sparingly soluble in water (1 part in 25). For the chloride see Salt. The bromide and iodide crystallize from hot solutions in anhydrous cubes; from solutions at ordinary tempera- tures in monoclinic prisms with 2H2O; and at low temperatures with 5HjO. According to M. Loeb (Joum. Amer. Chem. Soc, 1905, 27, p. 1019) the iodide differs from the other haloid salts in separating from solution in alcohols with " alcohol of crystallization." Sodium sulphide, Na s S, obtained by saturating a caustic soda solution with sulphuretted hydrogen and adding an equivalent of alkali, is em ployed in the manufacture of soluble soda glass. Sodium sulphite, NaiSOi, which is employed as an antichlor, is prepared (with 7H1O) by saturating a solution of sodium carbonate with sulphur dioxide, adding another equivalent of carbonate and crystallizing. The anhydrous salt may be prepared by heating a saturated solution of the hydrated salt. H. Hartley and W. H. Barrett (Journ. Chem. Soc, 1909, 95, p. 1184) failed to obtain a decahydrate which had been previously described. The acid sulphite, NaHSOa, obtained by saturating a cold solution of the carbonate with sulphur dioxide and precipitating by alcohol, is employed for sterilizing beer casks. Sodium sulphate, NasSO<, known in the hydrated condition (with ioHjO) as Glauber's salt, is manufactured in large quantities for conversion into the carbonate or soda (see Alkali Manufac- ture). It has long been doubted whether sodium yielded an alum ; this was settled by N. I. Surgunoff in 1909 (Abst. Joum. Chem. Soc. ii. 1001), who obtained cubic crystals from a supersaturated solution of sodium and aluminium sulphates below 20 , higher temperatures giving monoclinic crystals. The acid sulphate, NaHSO, also known as bisulphate of soda, is obtained as large asymmetric prisms by crystallizing a solution of equivalent quantities of the normal sulphate and sulphuric acid above 50 °. The acid salts NajH(SO<)i and Na»H(S04)s-HiO are obtained from the normal sulphate and sulphuric acid (J. D'Ans, Ber., 1906, 39, p. 1534).*

*The manufacture of sodium carbonate, commonly called soda, is treated under Alkali Manufacture. The anhydrous salt is a colourless powder or porous mass, having an alkaline taste and reaction. It melts at 1008 . On solution in water, heat is evolved and hydrates formed. Common washing soda or soda-crystals is the decahydrate, NasCOyioHaO, which appears as large clear monoclinic crystals. On exposure, it loses water and gives the monohydrate, Na 2 CO s -HjO, a white powder sold as "crystal carbonate " ; this substance, which is also formed on heating the decahydrate to 34 , crystallizes in the rhombic system. Both these hydrates occur in the mineral kingdom, the former as natron and the latter as thermonatrite. The heptahydrate, Na 2 C03-7H 2 0, is obtained by crystallizing a warm saturated solution in a vacuum; it appears to be dimorphous. The acid carbonate or bicarbonate of soda, NaHCOs, is produced in the ammonia-soda process for alkali manufacture. Another acid carbonate, Na 2 C03-2NaHCO3-3H2O, is the mineral trona or urao. We may here notice the " percar- bonates " obtained by Wolffenstein and Peltner (Ber., 1908, 41, pp. 275, 280) on acting with gaseous or solid carbon dioxide on Na«Oj, Na*0j and NaHOj at low temperatures; the same authors obtained a perborate by adding sodium metaborate solution to a 50 % solution of sodium peroxide previously saturated with carbon dioxide. For sodium nitrite see Nitrogen ; for sodium nitrate see Saltpetre ; for the cyanide see Prussic Acid ; and for the borate see Borax.*

Of the sodium silicates the most important is the mixture known as soluble soda glass formed by calcining a mixture of white sand, soda-ash and charcoal, or by dissolving silica in hot caustic soda under pressure. It is a colourless transparent glass mass, which dissolves in boiling water to form a thick liquid. It is employed in certain printing processes, as a cement for artificial stone and for mending glass, porcelain, &c, and also for making the so-called silicated soaps (see Soap).

Sodium is most distinctly recognized by the yellow coloration which volatile salts impart to a Bunsen name, or, better, by its emission spectrum which has a line (double), the Fraunhofer D, line, in the yellow (the wave-lengths are 5896 and 5890). The atomic weight was determined by Stas to be 22-87 (H = 1) ; T. W. Richards and R. C. Wells (Journ. Amer. Chem. Soc, 1905, 27, p. 459) obtained the value 23-006 (O = 16).

Medicine.

Pharmacology. — The metal sodium is not used in medicine, but many of .its salts are employed. Besides liquor sodii ethylatis the following salts and preparations are used in the British Pharma- copoeia. (1) Sodii carbonis, known as washing soda ; this carbonate on heating yields sodii carbonis exsiccaius and sodii bicarbonas ; from the latter is made trochiscus sodii

bicarbonatis. (2) Sodii phosphas. From sodium phosphate are made sodii phosphas effervescens and sodii hypophosphis (see Phosphorus). (3) Sodii sulphas (Glauber's salt), with its sub-preparation sodii sulphas effervescens. (4) Soda tartarata (Rochelle salt), a tartrate of sodium and potassium, from which is made pulvis sodae tartaratae effervescens, known as Seidlitz powder. (5) Sodii cilro-tarlras effervescens, a mixture of sugar, sodium bicarbonate, citric and tartaric acids. (6) Sodii chloridum, common salt. (7) Sodii sulphis.

For sodii bromidum, iodidum and salicylatum see Bromine, Iodine and Salicylic Acid respectively. For sodii arsenas and cacodylale see Arsenic. Sapo durus (hard soap) is a compound of sodium with olive oil, and sapo animalis (curd soap) is chiefly sodium stearate.

Toxicology. — Poisoning by caustic soda is rare, but occasionally it takes place by swallowing soap lees (sodium carbonate), which may contain some impurities of caustic soda. The symptoms and treatment are the same as described under Potassium. The salts of sodium resemble potassium in their action on the alimentary tract, but they are much more slowly absorbed, and much less diffusible; therefore considerable amounts may reach the small intestine and there act as saline purgatives. They are slowly absorbed into the blood, and are a natural constituent of the blood plasma, which derives them from the food. Sodium is excreted by all the mucous surfaces and by the liver and kidneys. On the latter they act as diuretics, but less powerfully than potassium, increasing the flow of water and the output of urea and rendering the urine less acid. They are said to diminish the secretion of the bronchial mucous membrane.

Therapeutics: External Use. — The liquor sodii ethylatis is a powerful caustic and is used to destroy small naevi and warts. A lotion of sodium bicarbonate is useful to allay itching. Solutions of sodium sulphite are used as mild antiparasitics. Internal use. — Sodium chloride is occasionally used in Warm water as an emetic, and injections of it into the rectum as a treatment for thread worms. A P'9 % solution forms what is termed normal saline solution, which is frequently injected into the tissues in cases of collapse, haemorrhage and diarrhoea. It forms a valuable treatment in diabetic coma and eclampsia, acting by diluting the toxins in the blood. From this has developed the intramuscular injection of diluted sea- water in the treatment of gastro-enteritis, anaemia and various skin affections. Sodium chloride is an important constituent of the waters of Homburg, Wiesbaden, Nauheim and Kissingen. Sodium bicarbonate is one of our most useful gastric sedatives and antacids, relieving pain in hyperchloridia. It is the constituent of most stomachic mixtures. Effervescent soda water is a mild gastric sedative. Sodium phosphate and sulphate are cholagogue purga- tives and are used in the treatment of gallstones. The sulphate is the

chief constituent of Marienbad and Carlsbad waters. Large doses of these salts are used to remove fluid in dropsy. Soda tar- tarate is purgative and diuretic, as is the citro-tartarate. These purgative sodium salts are most useful in the treatment of chronic constipation, and of the constipation associated with gout and hepatic dyspepsia. They should be dissolved in warm water and taken in the morning, fasting. In visceral gout and chronic catarrhal conditions of the stomach a course of alkaline waters is distinctly beneficial. Sodium salts have not the depressant effect so marked in those of potassium.

SODOM AND GOMORRAH, in biblical geography, two of five cities (the others named Admah, Zeboïim and Bela or Zoar) which were together known as the " cities of the Kikkar " (circle), somewhere in the neighbourhood of the Dead Sea. They occupied a fertile region, chosen by Lot for his dwelling (Gen. xiii. 10-12). They were attacked by the four great East- ern kings and spoiled, but restored by the intervention of Abram and his men coming to the aid of Lot (Gen. xiv.). They were proverbial for wickedness, for which they were destroyed by a rain of " fire and brimstone " (Gen. xix.). The site of the cities, the historicity of the events narrated of them and the nature of the catastrophe that destroyed them, are matters of , hot dispute. Modern names, more or less similar to the ancient appellations, have been noted in different parts of the Dead

Sea area; but no certain identification can be based on these similarities. The most striking coincidence is Jebel Usdum, by some equated with confidence to Sodom. The names are radically identical; but the hill is merely a salt-ridge 600 ft. high and 7 m. long, and cannot possibly represent an ancient city. The most that can be said is that the names have lingered in the Jordan valley in a vague tradition — very likely helped by, if not entirely due to, literary accounts of the catastrophe- just as has the name of Lot himself in the Arab name of the Dead Sea. The catastrophe has been explained as a volcanic eruption, or an explosive outburst of gas and oil stored and accumulating at high pressure. The latter, to which parallels in geologically similar regions in America are not unknown, is the most probable natural explanation that can be offered.

(R. A. S. M.)

SODOMA, IL (1477-1540), the name given to the Italian painter Giovanni Antonio Bazzi (who until recent years was erroneously named Razzi). He is said to have borne also the name of " Sodona " as a family name, and

likewise the name Tizzioni; Sodona is signed upon some of his pictures. While " Bazzi " was corrupted into " Razzi," " Sodona " may have been corrupted into " Sodoma "; Vasari, however, accounted for the name differently, as a nickname from his personal char- acter. This version appears to have been inspired by Bazzi's pupil and subsequent rival Beccafumi. In R. H. Cust's recent work on the painter another suggestion is made. Vasari tells a story that, Bazzi's horse having won a race at Florence, a cry of " Who is the owner ? " went up, and Bazzi contemptu- ously answered " Sodoma," in order to insult the Florentines (according to Milanesi) ; and Mr Cust offers the suggestion of the Italian friend, that the racing name was really a clipped form of So doma, " I am the trainer." Whatever the real origin, the name was long supposed to indicate an immoral character.

Bazzi was of the family de Bazis, and was born at Vercelli in Lombardy in 1477. His first master was Martino Spanzotto, by whom one signed picture is known; and he appears to have been in his native place a scholar of the painter Giovenone. Acquiring thus the strong colouring and other distinctive marks of the Lombard school, he was brought to Siena towards the close of the 15th century by some agents of the Spannocchi family; and, as the bulk of his professional life was passed in this Tuscan city, he counts as a member of the Sienese school, although not strictly affined to it in point of style. He does not seem to have been a steady or laborious student in Siena, apart from some attention which he bestowed upon the sculptures of Jacopo della Quercia. Along with Pinturicchio, he was one of the first to establish there the matured style of the Cinquecento. His earliest works of repute arc seventeen frescoes in the Benedictine monastery of Monte Oliveto, on the road from Siena to Rome, illustrating the life of St Benedict, in con- tinuation of the series which Luca Signorelli had begun in 1498; Bazzi completed the set in 1502. Hence he was invited to Rome by the celebrated Sienese merchant Agostino Chigi, and was employed by Pope Julius II. in the Camera della Segnatura in the Vatican. He executed two great compositions and various ornaments and grotesques. The latter are still extant; but the larger works did not satisfy the pope, who engaged Raphael to substitute his " Justice," " Poetry," and " Theology." _ In the Chigi Palace (now Farnesina) Bazzi painted some subjects from the life of Alexander the Great; " Alexander in the Tent of Darius " and the " Nuptials of the Conqueror with Roxana " (by some considered his masterpiece) axe more particularly noticed. When Leo X. was made pope (1513) Bazzi presented him with a picture of the " Death of Lucretia " (or of Cleopatra, according to some accounts) ; Leo gave him a large sum of money in recom- pense and created him a cavaliere. Bazzi afterwards returned to Siena and at a later date went in quest of work to Pisa, Vol- terra, and Lucca. From Lucca he returned to Siena, not long before his

death, which took place on the 14th of February 1549 (the older narratives say 1554)- He had squandered his pro- perty and is said (rather dubiously) to have died in penury in the great hospital of Siena. Bazzi had married in youth a lady

of good position, but the spouses disagreed and separated pretty soon afterwards. A daughter of theirs married Bartolommeo Neroni, named also Riccio Sanese or Maestro Riccio, one of Bazzi's principal pupils.

It is said that Bazzi jeered at thˆ History of the Painters written by Vasari, and that Vasari consequently traduced him ; certainly he gives a bad account of Bazzi's morals and demeanour, and is niggardly towards the merits of his art. According to Vasari, the ordinary name by which Bazzi was known was " II Mattaccio " (the Madcap, the Maniac) — this epithet being first bestowed upon him by the monks of Monte Oliveto. He dressed gaudily, like a mountebank; his house was a perfect Noah's ark, owing to the strange miscellany of animals which he kept there. He was a cracker of jokes and fond of music, and sang some poems composed by himself on indecorous subjects. In his art Vasari alleges that Bazzi was always negligent — his early success in Siena, where he painted many portraits, being partly due to want of competition. As he advanced in age he became too lazy to make any cartoons for his frescoes, but daubed them straight off upon the wall. Vasari admits, nevertheless, that Bazzi produced at intervals some works of very fine quality, and during his lifetime his reputation stood high. The general verdict is that Bazzi was an able master in expression, motion and colour. His taste was something like that of Da Vinci, especially in the figures of women, which have grace, sweetness and uncommon earnestness. He is not eminent for drawing, grouping or general elegance of form. His easel pictures are rare; there are two in the National Gallery in London.

It is uncertain whether Bazzi was a pupil of Leonardo da Vinci, though Morelli (in his Italian Pictures in German Galleries) speaks of his having " only ripened into an artist during the two years (1498-1500) he spent at Milan with Leonardo"; and some critics see in Bazzi's " Madonna " in the Brera (if it is really by Bazzi) the direct influence of this master. Modern criticism follows Morelli in supposing that Raphael painted Bazzi's portrait in "The School of Athens"; and a drawing at Christ Church is supposed to be a portrait of Raphael by Bazzi.

His most celebrated works are in Siena. In S. Domenico, in the chapel of St Catherine of Siena, are two frescoes painted in 1526, showing Catherine in ecstasy, and fainting as she is about to receive the Eucharist from an angel — a beautiful and pathetic treatment. In the oratory of S. Bernardino, scenes from the history of the Madonna, painted by Bazzi in conjunction

with Pacchia and Becca- fumi (1536-1538) — the "Visitation" and the " Assumption "- i – are noticeable. In S. Francesco are the " Deposition from the Cross " (1513) and " Christ Scourged " ; by many critics one or other of these paintings is regarded as Bazzi's masterpiece. In the choir of the cathedral at Pisa is the " Sacrifice of Abraham," and in the Uffizi Gallery of Florence as " St Sebastien."

See for further details, Giovanni Antonio Bazzi, by Robert H. Hobart Cust (1906), which contains a full bibliography. (W. M. R.)

SODOR AND MAN, the name of the bishopric of the Church of England which includes the Isle of Man and adjacent islets. In 1 1 54 the diocese of Sodor was formed to include the Heb- rides and other islands west of Scotland (Norse Sudr-eyjar, Sudreys, or southern isles, in distinction from Nordr-eyjar, the northern isles of Orkney and Shetland) and the Isle of Man. It was in the archdiocese of Trondhjem in Norway. (The con- nexion of the Isle of Man with Norway is considered s.v. Man, Isle of). A Norwegian diocese of Sodor had been in existence previously, but its history is obscure, and the first union of Man with it in 1098 by Magnus Barefoot is only traditional. The Norwegian connexion was broken in 1266, and in 1334 Man was detached from the Scottish islands. The cathedral of Sodor was on St Patrick's Isle at Peel (?.«.), and it is possible that the name Sodor being lost, its meaning was applied to the isle as the seat of the bishop. The termination " and Man " seems to have been added in the 17th century by a legal draughtsman ignorant of the proper application of the name of Sodor to the bishopric of Man. By the latter part of the 16th century the terms Sodor and Man had become interchangeable, the bishopric being spoken of as that of Sodor or Man. Till 1604 the bishops invariably signed themselves Sodorensis; after that date and till 1684, sometimes Soderensis and sometimes " Sodor and Man," and after 1684 always " Sodor and Man." The see, while for some purposes in the archdiocese of York, has its own convocation. The bishop sits in the House of Lords, but has no vote.

See A. W. Moore, History of the Isle of Man (London, 1900).

SOEST, a town of Germany, in the Prussian province of Westphalia, situated in a fertile plain {Soesler Borde), 33 m. E.

of Dortmund, on the main railway Cologne-Elberfeld-Berlin, Pop. {1005), 17,394. Its early importance is attested by its seven fine churches (six

Protestant), of which the most striking are St Peter's, the Wiesenkirche, a gem of Gothic aichitecture, Maria zur Hohe — St Mary-on-the-height— with beautiful mural frescoes, founded in 1314 and restored in 1850-1852, and the Roman Catholic cathedral, founded in the 10th century by Bruno, brother of Otto the Great (the present building was erected in the 12th century). This last, with its very original fagade, is one of the noblest ecclesiastical monuments of Germany. Remains of the broad wall, now partly enclosing gardens and fields, and one of the gates remain; but the thirty-six strong towers which once defended the town have disappeared and the moats have been converted into promenades. The town-hall (1701) contains valuable archives, and among the numerous educational establishments must be mentioned the gymnasium, founded in 1534, through the instrumentality of Melanchthon, an evangelical teachers' seminary, an agricultural school, and a blind asylum. Iron- working, the manufacture of soap, hats, sugar, cigars, bricks and tiles, linen-weaving, tanning and brewing, together with market-gardening and farming in the neighbourhood, and trade in cattle and grain are the leading industries.

Mentioned in documents as early as the 9th century, Soest was one of the largest and most important Hanseatic towns in the middle ages, with a population estimated at from 30,000 to 60,000. It was one of the chief emporiums on the early trading route between Westphalia and Lower Saxony. Its code of municipal laws (Schran; jus susatense), dating from 1 144 to 1 165, was one of the earliest and best, and served as a model even to Liibeck. On the fall of Henry the Lion, duke of Saxony, Soest passed with the rest of Angria to Cologne. In the 15th century the strife between the towns- men and the archbishops broke out in open war, and in 1444 the strong fortifications of the town withstood a long siege by an army of 60,000 men. The women of Soest are said to have distinguished themselves in this contest (Soester Fehde). Papal intervention ended the strife, and Soest was permitted to remain under the protection of the dukes of Cleves. The prosperity of the town waned in more modern times: in 1763 its population was only 3800; in 1816 it was 6687;

See Vogeler, Soest, seine Altertiimer und Sehensiviirdigkeiten (Soest, 1890); Hausberg, Die soester Fehde (Trier, 1882); Siimmer- manri, Die Wandmalereien in der Kirche Maria zur Hohe in Soest (Soest, 1890) ; Aldenkirchen, Die mitteldlterliche Kunst in Soest (Bonn, 1875) ; Ludorff und Vogeler, Kunstdenkmdler des Kreises Soest (Soest,

SOFA, a long couch with stuffed back, arms and seat, to hold two or more persons. The word is of Arabic origin, and is an adaptation of suffah, couch, from root saffa — to draw up in line. According to Richardson, Diet, of Eng. Lang, quoted by Skeat, the Arabic sujfah was particularly a reclining place of wood or stone placed before the doors of Oriental houses.

In the history of furniture the sofa was a development of the straight backed settee. It was not so much therefore a long chair or combination of chairs, as a seat or couch for reclining. The early 19th- century type had a back with a single arm at one end, the other being left open. The most favoured modern form is that known as the Chesterfield, with double arms and back, heavily padded. (See also Settee.)

SOPALA, a Portuguese seaport on the east coast of Africa, at the mouth of a river of the same name, in 20 12′ S. Pop, (1000), about 1000. The town possesses scarcely a trace of its former importance, and what trade it had was nearly all taken away by the establishment of Beira (q.v.) a little to the north in 1890. Sofala Harbour, once capable of holding a hundred large vessels, is silting up and is obstructed by a bar. Ruins exist of the strong fort built by the Portuguese in the 16th century. Previous to its conquest by the Portuguese in 1505 Sofala was the chief town of a wealthy Mahommedan state, Arabs having established themselves there in the 12 th century or earlier. At one time it formed part of the sultanate of

Kilwa (q.v.). Sofala was visited by the Portuguese Jew, Pefo de Covilhao, in 1489, who was attracted thither by the reports of gold-mines of which Sofala was the port. The conquest of the town followed, the first governors of the Portuguese East African possessions being entitled Captains- General of Sofala. (See Portuguese East Africa.) Thome Lopes, who accompanied Vasco da Gama to India in 1 502 and left a narrative of the voyage (first printed in Ramusio, Viaggi e Navegationi) , identifies Sofala with Solomon's Ophir and states that it was the home of the Queen of Sheba. This identification of Sofala with Ophir, to which Milton alludes (Par. Lost, xi. 399-401) is untenable.

The small island of Chiloane, with a good harbour, 40 m. S. of Sofala, has been colonized from Sofala (the township being named Chingune) as has also the island Santa Carolina, in the Bazaruto archipelago.

See Bull. Geogr. Soc. Mozambique (1882) for an account of the Sofala mines; and, generally, Idrisi, Climate, i. § 8, O. Dapper, Description de I'Afrique (Amsterdam, 1686) ; T. Baines, The Gold Regions of South Africa (1877); G. McC. Theal's Records of South Eastern Africa (1 898-1903); Sir R. Burton's notes to his edition of Camoens.

SOFFIONI (sometimes spelt suffioni), a name applied in Italy to certain volcanic vents which emit jets of steam, generally associated with hydrogen sulphide and carbon dioxide, sometimes also with a little ammonia and marsh-gas. The soffioni are usually arranged jn groups, and are best represented in the Maremma of Tuscany, where they contain a small pro-portion of boric acid, for which they are utilized industrially. For such

natural steam-holes, the French geologists often use the term soufflards in place of the Italian soffioni.

SOFFIT (from Fr. soffile, Ital. soffitta, a ceiling, formed as if from suffictus for suffixus, Lat. suffigere, to fix underneath), a term in architecture given to the underside of any construc- tional feature; as for instance that of an arch or an architrave whether supported by piers or columns; also to the underside of a flight of stairs, and in the classic entablature to the utider'- side of the projecting cornice.

SOFIA (Bulgarian Sredetz, the middle town, a name now little used), the capital of Bulgaria, situated almost in the centre of an upland plain, about 1700 ft. above sea-level, between the Western Balkans on the N. and Mt Vitosh on the S. Pop. (1907) 82,187. Two small tributaries of the river Iskei", the Perlovetz and the Eleshnitza or Boyana, flow respectively on the east and west sides of the town. Since 1880 the city has been almost entirely renovated in the " European " style; the narrow tortuous lanes and mean houses of the Turkish epoch have almost disappeared, and a new town with straight parallel streets has been constructed in the eastern suburb. The oldest building in Sofia is the little round chapel of St George in the Jewish quarter — originally, it is said, a Roman temple; then a church, then a mosque, and now a church once more. Of the principal mosques the large Buyuk Djamia, with nine metal cupolas, has become the National Museum; the Tcherna Djamia or Black Mosque, latterly used as a prison, has been transformed into a handsome church; the Banya- bashi Djamia, with its picturesque minaret, is still used by Moslem worshippers. Close to the last-named in the centre of the town, are the public baths with hot springs (temperature 'I17 F). In the cathedral or church of Sveti Krai (the Saint King), a modern building, are preserved the remains of the Servian king Stefan Urosh II. A large new cathedral dedicated to St Alexander Nevski was in course of construction in 1907; the foundation stone was taken from the church of St Sophia; The palace of the prince, occupying the site of the Turkish konak was built by Prince Alexander in 1880-1882; it has been greatly enlarged by King Ferdinand. In front of the palace is the public garden or Alexander Park. The theatre, the largest in south-eastern Europe, was completed in 1906. Other important buildings are the Sobranye, or parliament house, the palace of the synod, the ministries of war and commerce, the univer- sity with the national printing press, the national library, the officers' club and several large military structures. A small

mausoleum contains the remains of Prince Alexander; there are monuments to the tsar Alexander II., to Russia, to the medical officers who fell in the war of 1877 and to the patriot Levsky. A public park has been laid out in the eastern suburbs. The city is well drained and possesses a good water supply; it is lighted by electricity and has an electric car system. It con- tains breweries, tanneries, sugar, tobacco, cloth, and silk fac- tories, and exports skins, cloth, cocoons, cereals, attar of roses, dried fruit, &c. Sofia forms the centre of a railway system radiating to Constantinople (300 m.), Belgrade (206 m.) and central Europe, Varna, Rustchuk and the Danube, and Kiustendil near the Macedonian frontier. The climate is heaithy; owing to the elevated situation it is somewhat cold, and is liable to sudden diurnal and seasonal changes; the tem- perature in January sometimes falls to 4° F. below zero and in August rises to ioo°. The population, of which more than two- thirds are Bulgarians, and about one-sixth Spanish Jews, was 20,501 in 1881, 30,428 in 1888, 46,593 in 1893 and 82,187 m 1 9°1- History. — The colony of Serdica, founded here by the emperor Trajan, became a Roman provincial town of considerable importance in the 3rd and 4th centuries a.d., and was a favourite residence of Constantine the Great. Serdica was burnt by the Huns in a.d. 447; few traces remain of the Roman city, but more than one hundred types of its coins attest its importance. The town was taken by the Bulgarians under Krum in a.d. 809; the name Serdica was converted into Sredetz by the Slavs, who associated it with sreda (middle), and the Slavonic form subsequently became the Byzantine Triaditza. The name Sofia, which came into use towards the end of the 14th century is derived from the early medieval church of St Sophia, the massive ruins of which stand on an eminence to the east of the town. The church, which was converted into a mosque by the Turks, was partly destroyed by earthquakes in 1818 and 1858. The town successfully resisted the attacks of the smperor Basil II. in 987; between 1018 and 1186, under Byzan- tine rule, it served as a frontier fortress. During this period a number of prisoners of the Petcheneg tribe were settled in the neighbourhood, in all probability the ancestors of the Shop tribe which now inhabits the surrounding districts. In 1382 Sofia was captured by the Turks; in 1443 it was for a brief time occupied by the Hungarians under John Hunyady. Under Turkish rule the city was for nearly four centuries the residence of the beylerbey or governor-general of the whole Balkan Peninsula except Bosnia and the Morea. During this period the population increased and became mainly Turkish; in 1553 the town possessed eleven large and one hundred small mosques. In the latter half of the 15th century Sofia, owing to its situation at the junction of several trade routes, became an important centre of Ragusan commerce. During the Turco-Russian campaign of 1829 it was the headquarters of Mustafa Pasha of Skodra, and was occupied by the Russians for a few days. On the 4th of January 1878 a Russian army again entered Sofia

after the passage of theJBalkans by Gourko; the bulk of the Turkish population had previously taken flight. Though less central than Philippopolis and less renowned in Bulgarian history than Trnovo, Sofia as selected as the capital of the newly-created Bulgarian state in view of its strategical position, which commands the routes to Constantinople, Belgrade, Macedonia and the Danube. (J. D. B.)

SOGDIANA (Sugdiane, O. Pers. Sughuda), a province of the Achaemenian Empire, the eighteenth in the list in the Behistun inscription of Darius (i. 16), corresponding to the modern districts of Samarkand and Bokhara; it lay north of Bactriana between the Oxus and the Jaxartes, and embraced the fertile valley of the Zerafshan (anc. Polytimetus). Under the Greeks Sogdiana was united in one satrapy with Bactria, and subse- quently it formed part of the Bactrian Greek kingdom till the Scythians (see Scythia) occupied it in the middle of the 2nd century B.C. The valley of the Zerafshan about Samarkand retained even in the middle ages the name of the Soghd of Samarkand. Arabic geographers reckon it as one of the four fairest districts in the world.

SOGNE FJORD, a great inlet of the west coast of Norway, penetrating the mainland to a distance of 136 m. It is the longest fjord in Norway, and the deepest, approaching 700 fathoms in some parts. Sognef est at its entrance is 50 m. by water from Bergen, in 61° 5′ N. The general direction from the sea is easterly. For the first 50 m. the sombre flanking mountains are unbroken by any considerable branch, but from this, point several deep, narrow inlets ramify, penetrat- ing the Jostedalsbrae and Jotunf jeld to the north and the north- ward extension of the, Hardangerf jeld to the south, walled in at their heads by snow-clad mountains and frequented by travellers on account of the magnificent scenery. The principal are Fjaerlands, Sogndals and Lyster fjords to the north, Aardals fjord to the east, Laerdals and Aurlands fjords to the south. From the last branches the Naero fjord, with a [precipitous valley of great beauty (Naerodalen) at its head, traversed by a road, from Gudvangen on the fjord, across the Stalheim Pass to Vossevangen. The other principal villages are Vadheim on the outer fjord, the terminus of the road from Nordfjord; Balholm and Fjaerland (centres for visiting the fine glaciers of Jostedal) ; Lekanger, Sogndal, and Laerdalsoren, whence a road strikes south-east for the Valders and Hallingdal districts.

SOHAM, a town in the Newmarket parliamentary division of Cambridgeshire, England, 5 m. S.E. of Ely by a . branch of the Great Eastern railway. Pop. (1,901), 4230. It lies in the midst of the flat fen country. To the west a rich tract, still known as Soham Mere, marks the place of one of the many wide and shallow sheets of water in the district now drained. The church of St Andrew is cruciform and had formerly a

central tower; the existing western tower is of fine and ornate Perpendi cular work. The body of the church, however, is mainly transi- tional Norman with additions principally Decorated> including a beautiful east window, much ancient woodwork, and other details of interest. The grammar school dates from 1687. The road from Soham to Ely was constructed as a causeway across the fens by Hervey le Breton, first bishop of Ely (1109-1131). The trade of the town is agricultural, fruit-growing and market- gardening being largely carried on in the vicinity.

SOIGNIES (or Soignes, the Walloon form), a busy and flourish- ing town of the province of Hainaut, owing its prosperity to the important blue granite quarries in the neighbourhood. It contains a fine abbey church of the 12th century and in the cemetery connected with it are many tombstones of the 13th and 14th centuries. Pop. (1904), 10,480.

The forest of Soignies extended in the middle ages over the southern part of Brabant up to the walls of Brussels, and is immortalized in Byron's Childe Harold. Originally it was part of the Ardenne forest, and even at the time of the French Revolu- tion it was very extensive. The first blow towards its gradual contraction was struck when Napoleon ordered 22,000 oaks to be cut down in it to build the celebrated Boulogne flotilla for the invasion of England. King William I. of the Netherlands continued the process in the belief that he was thus adding to the prosperity of the country, and from 29,000 acres in 1820 the forest was reduced to 11,200 in 1830. A considerable portion of the forest in the neighbourhood of Waterloo Was- assigned in 181 5 to the duke of Wellington, and to the holder of the title as long as it endured. This portion of the forest was only converted into farms in the time of the second duke. The Bois-de.la Cambre (456 acres) on the outskirts of Brussels was formed out of the forest, and beyond it stretches the Eoret de Soignies, still so called, to Tervueren, Groenendael,: and Argenteuil close to Mont Saint Jean and Waterloo.

SOIL, 1 the term generally applied to that part of the earth's

1 This word comes through O. Fr. soil from a Late Latin usage of solea for soil or ground, which in classic Lat. meant the sole of the foot, also a sandal. This was due to a confusion with solum, ground, whence Fr. sol. Both solea and solum are, of course, from the same root. To be distinguished from this word is " soil," to make dirty, to stain, defile. The origin is the O. Fr. soil or souil, the miry wallowing ground of a wild boar, whence the hunting phrase " to take soil," of a beast of the chase taking to water or marshy ground. The derivation is therefore from Lat. soillus, pertaining t

substance which is stirred or tilled by implements such as ploughs and spades. Below this is the subsoil. The soil through being acted upon by the air, heat, frost and other agencies usually consists of finer particles than those comprising the bulk of the subsoil. It contains more roots, and as a rule, is darker in colour than the subsoil on account of the larger proportion of decaying vegetable matter present in it: it is also looser in texture than the subsoil. The subsoil not unfrequently contains materials which are deleterious to the growth of crops, and roots descending into it may absorb and convey these poisonous substances to other parts of the plant or be themselves damaged by contact with them. On this account deeper tillage than usual, which allows of easier penetration of roots, or the carrying out of operations which bring the subsoil to the surface, must always be carefully considered.

At first sight few natural materials appear to be of less interest than the soil; yet its importance is manifest on the slightest reflection. From it, directly or indirectly, are obtained all food materials needed by man and beast. The inorganic materials within it supply some of the chief substances utilized by plants for their development and growth, and from plants animals obtain much of their sustenance.

Origin of the Soil. — It is a matter of common observation that stones of monuments, walls or buildings which are exposed to the air sooner or later become eaten away or broken up into small fragments under the influence of the weather. This disintegration is brought about chiefly by changes in tempera- ture, and by the action of the rain, the oxygen, and the carbon dioxide of the air. During the daytime the surface of the stone may become very warm, while at night it is speedily cooled. Such alterations in temperature produce strains which frequently result^ in the chipping off of small fragments of the material composing the stone,. Moreover the rain penetrates into the small interstices between its particles and dissolves out some of the materials which bind the whole into a solid stone, the surface then becoming a loose powdery mass which falls to the ground below or is carried away by the wind. The action of frost is also very destructive to many stones, since the water within their cracks and crannies expands on freezing and splits off small pieces from their surfaces. In the case of lime stones the carbon dioxide of the air in association with rain and dew eats into them and leads to their disintegration. The oxygen of the air may also bring about chemical changes which result in the production of soluble substances removable by rain, the insoluble parts being left in a loosened state.

These "weathering" agents not only act upon stories of buildings, but upon

rocks of all kinds, reducing them sooner or later into a more or less fine powder. The work has been going on for ages, and the finely comminuted particles of rocks form the main bulk of the soil which covers much of the earth's surface, the rest of the soil being composed chiefly of the remains of roots and other parts of plants.

If the whole of the soil in the British Islands were swept into the sea and the rocks beneath it laid bare the surface of the country would ultimately become covered again with soil produced from the rocks by the weathering processes just described. Moreover where there was no transport or solution of the soil thus produced it would necessarily show some simil- arity in composition to the rock on which it rested. The soils overlying red sandstone rocks Would be reddish and of a sandy nature, while those overlying chalk would be whitish and contain considerable amounts of lime. In many parts of the country soils exhibiting such relationships, and known as sedentary soils, are prevalent, the transition from the soil to the rock beneath being plainly visible in sections exposed to view in railway cuttings, quarries and other excavations. The upper layer or soil proper consists of material which has been subjected

swine, sus. " To sully," to besmirch, to cover with " mire " (O. Eng. sol cf. Ger siihkn) is a quite distinct word. Lastly there is a form " soil," used by agriculturists, of the feeding and fattening of cattle with green food such as vetches. This is from O. Fr. saoler, saouler, mod. soAler, Lat. satullus, full-fed (satur, satiated, satis, enough).

to ages of weathering; the bulk of it is composed of finely comminuted particles of sand, clay and other minerals, among which are imbedded larger or smaller stones of more refractory nature. On descending into the substratum the finer material decreases and more stones are met with; farther down are seen larger fragments of unaltered rock closely packed, and this brash or rubble grades insensibly into the unbroken rock below.

In many districts the soil is manifestly unconnected in origin with the rock on which it rests, and differs from it in colour, composition and other characters. There are transported or drift soils, the particles of which have been brought from other areas and deposited over the rocks below. Some of the stiff boulder clays or " till " so prevalent over parts of the north of England appear to have been deposited from ice sheets during the glacial period. Perhaps the majority of drift soils, however, have been moved to their present position by the action of the water of rivers or the sea.

As fast as the rock of a cliff is weathered its fragments are washed to the ground by the rain, and carried down the slopes by small streams, ultimately finding their way into a river along which they are carried until

the force of the water is insufficient to keep them in suspension, when they become deposited in the river bed or along its banks. Such river-transported material or alluvium is common in all river valleys. It is often of very mixed origin, being derived from the detritus of many kinds of rocks, and usually forms soil of a fertile character.

Quality of Soil. — The good or bad qualities of a soil have reference to the needs of the crops which are to be grown upon it, and it is only after a consideration of the requirements of plants that a clear conception can be formed of what characters the soil must possess for it to be a suitable medium on which healthy crops can be raised.

In the first place, soil, to be of any use, must be sufficiently loose and porous to allow the roots of plants to grow and extend freely. It may be so compact that root development is checked or stopped altogether, in which case the plant suffers. On the other hand it should not be too open in texture or the roots do not get a proper hold of the ground and are easily disturbed by wind: moreover such soils are liable to blow away, leaving the underground parts exposed to the air and drought.

The roots like all other parts of plants contain protoplasm or living material, which cannot carry on its functions unless it is supplied with an adequate amount of oxygen: hence the necessity for the continuous circulation of fresh air through the soil. If the latter is too compact or has its interstices filled with carbon dioxide gas or with water — as is the case when the ground is water-logged — the roots rapidly die of suffocation just as would an animal under the same conditions. There is another point which requires attention. Plants need very considerable amounts of water for their nutrition and growth; the water- holding capacity is, therefore, important. If the soil holds too much it becomes water-logged and its temperature falls below the point for healthy growth, at any rate of the kinds of plants usually cultivated on farms and in gardens. If it allows of too free drainage drought sets in and the plants, not getting enough water for their needs, become stunted in size. Too much water is bad, and too little is equally injurious.

In addition, the temperature of the soil largely controls the yield of crops which can be obtained from the land. Soil whose temperature remains low, whether from its northerly aspect or fiom its high water cdntent or other cause, is unsatisfactory, because the germination of seeds and the general life processes of plants cannot go on satisfactorily except at certain tempera- tures well above freezing-point.

A good soil should be deep to allow of extensive root develop- ment and, in the case of arable soils, easy to work with imple- ments. Even when all the

conditions above mentioned in regard to texture, water-holding capacity, aeration and temperature are suitably fulfilled the soil may still be barren: plant food- material is needed. This is usually present in abundance although it may not be available to the plant under certain

circumstances, or may heed to be replenished or increased by additions to the soil of manures or fertilizers (see Manure).

Chief Constituents of the Soil. — An examination of the soil shows it to be composed of a vast number of small particles of sand, clay, chalk and humus, in which are generally imbedded larger or smaller stones. It will be useful to consider the nature of the four chief constituents just mentioned and their bearing upon the texture, water-holding capacity and other characters which were referred to in the previous section.

Sand consists of grains of quartz or flint, the individual particles of which are large enough to be seen with the unaided eye or readily felt as gritty grains when rubbed between the finger and thumb. When a little soil is shaken up with water in a tumbler the sand particles rapidly fall to the bottom and form a layer which resembles ordinary sand of the seashore or river banks. Chemically pure sand is silicon dioxide (SiCy or quartz, a clear transparent glass-like mineral, but as ordinarily met with, it is more or less impure and generally coloured reddish or yellowish by oxide of iron. A soil consisting of sand entirely would be very loose, would have little capacity to retain water, would be liable to become very hot in the daytime and cool at night and would be quite unsuitable for growth of plants.

The term clay is often used by chemists to denote hydrated silicate of alumina (Al 2 03 4 2Si02-2H20), of which kaolin or china clay is a fairly pure form. This substance is present in practically all soils but in comparatively small amounts. Even in the soils which farmers speak of as stiff clays it is rarely present to the extent of more than I or 2 %. The word ” clay ” used in the agricultural sense denotes a sticky intractable material which is found to consist of exceedingly fine particles (generally less than 005 mm. in dia meter) of sand and other minerals derived from the decomposition of rocks, with a small amount of silicate of alumina. The peculiar character which clr.y possesses is probably due not to its chemical composition but to its physical state. When wet it becomes sticky and almost impossible to move or work with farm implements; neither air nor water can penetrate freely. In a dry state it becomes hard and bakes to a brick. It holds water well and is consequently cold, needing the application

of much heat to raise its temperature. It is obvious, therefore, that soil composed entirely of clay is as useless as pure sand so far as the growth of crops upon it is concerned. Chalk consists, when quite pure, of calcium carbonate (CaCOa), a white solid substance useful in small amounts as a plant food- material, though in excess detrimental to growth. Alone, even when broken up into small pieces, it is unsuitable for the growth of plants.

Humus, the remaining constituent of soil, is the term used for the decaying vegetable and animal matter in the soil. A good illustra- tion of it is peat. Its water-holding capacity is great, but it is often acid, and when dry it is light and incapable of supporting the roots of plants properly. Few of the commonly cultivated crops can live in a soil consisting mainly of humus.

From the above account it will be understood that not one of the four chief soil constituents is in itself of value for the growth of crops, yet when they are mixed, as they usually are in the soils met with in nature, one corrects the deficiencies of the other. A perfect soil would be such a blend of sand, clay, chalk and humus as would contain sufficient clay and humus to prevent drought, enough sand to render it pervious to fresh air and prevent water- logging, chalk enough to correct the tendency to acidity of the humus present, and would have within L various substances which would serve as food- materials to the crops.

Generally speaking, soils containing from 30 to' 50 % of clay and 50 to 6o o/ of sand with an adequate amount of vegetable residues prove the most useful for ordinary farm and garden crops; such blends are known as " loams," those in which clay predominates being termed clay loams, and those ˆn which the sand predominates sandy loams. "Stiff clays" contain over 50% of clay; "light sands " have less than 10 %. In the mechanical analysis of the soil, after separation of the stones and fine gravel by means of sieves, the remainder of the finer earth is subjected to various processes of sifting and deposition from water with a view of determining the relative proportions of sand, silt and clay present in it. Most of the material termed " sand " in such analyses consists of particles ranging in diameter from -5 to -05 mm., and the " silt " from -05 to -005 mm., the " clay " being composed of particles less than •005 mm. in diameter. The'proportional amount of these materials in a sandy soil on the Bagshot beds and a stiff Oxford clay is given below: —

Soil on

Soil on

Bagshot Beds.

Oxford Clay.

Coarse sand 1—2 mm. .

32 %

11 %

Fine sand -2—04 mm.

40 „

11] ,,

Silt -04—01 mm.

12 „

19 „

Fine silt -01—004 mm.

8 „

19 -.

Clay below -004 mm.

8 ,, ‘

4° •.

The pore-space within the soil, i.e. the space between the parti- cles composing the soil, varies with the size of these particles and with the way they are arranged or packed. It is important, since upon it largely depends the movement of air and water in the land. It is generally from 30 to 50 % of the total volume occupied by the soil.

Where the soil grains are quite free from each other the smaller grains tend to fill up the spaces between the larger ones; hence it might be concluded that in clays the amount of pore-space would be less than in coarser sands. This is the case in ” puddled ‘ clays, but in ordinary clay soils the excessively minute particles of which they largely consist tend to form groups of comparatively large composite grains and it is in such natural soils that the pore-space is largest.

Chemical Composition of the Soil. — It has been found by experiment that

plants need for their nutritive process and their growth, certain chemical elements, namely, carbon, hydrogen, oxygen, nitrogen, sulphur, phosphorus, potassium, magnesium, calcium and iron. With the exception of the carbon and a small proportion of the oxygen and nitrogen, which may be partially derived from the air, these elements are taken from the soil by crops. The following table shows the amounts of the chief constituents removed by certain crops in lb per acre : —

Crop.

Nitro- gen.

Phos- phoric Acid.

Potash.

Lime.

Mag- nesia.

lb

ft

lb

lb

lb

Wheat ….

50

21

29

9

7

Meadow hay

49

12

51

32

14

Turnips

no

33

149

74

9

Mangels

149

53

300

43 ,

42

Plants also remove from the soil silicon, sodium, chlorine, and other elements which are, nevertheless, found to be unessential for the growth and may therefore be neglected here.

Leguminous crops take some of the nitrogen which they require from the air, but most plants obtain it from the nitrates present in the soil. The sulphur exists in the soil chiefly in the form of sulphates of magnesium, calcium and other metals; the phosphorus mainly as phosphates of calcium, magnesium arid iron; the potash, soda and other bases as silicates and nitrates; calcium and magne- sium carbonates are also common constituents of many soils.

In the ordinary chemical analyses of the soil determinations are made of the nitrogen and various carbonates present as well as of the amount of phosphoric acid, potash, soda, magnesia and other components soluble in strong hydrochloric acid.

Below are given examples of the analyses of a poor sandy soil and an ordinary loam :— •

Poor sandy Soil on Bagshot Beds.

Loam or Lias.

Nitrogen ….. Phosphoric a&d

Carbonate of Lime

• in “1

•18 „

•19 .. •23 „

•17 % •32 „ •57 –

1-22 ,,

Since the dry weight of the first foot of soil over an acre is about 4,000,000 lb the poor sandy soil contains within it : —

Nitrogen . 7,600 lb

Phosphoric acid 7,200 ,,

Potash . . . . . 7,600 „

Lime 9,200 ,,

From the figures given previously of the amount of nitrogen, potash and phosphoric acid removed by a wheat or mangel crop it would appear that this soil has enough of these ingredients in it to yield many such crops; yet experience has shown that these crops cannot be grown on such a poor sandy soil unless manures contain- ing phosphates, potash and nitrogen are added.

Many attempts have been made to correlate the results of the analyses of a soil with its known cropping power, but there is yet much to be learnt in regard to these matters. A great proportion of the food constituents which can be extracted by strong hydro- chloric acid are not in a condition to be taken up by the roots of plants; they are present, but in a ” dormant ” state, although by tillage and weathering processes they may in time become “avail- able ” to plants. Analyses of this character would appear to indicate the permanent productive capacity of the soil rather than its immediate power of growing a crop.

Soils containing less than -25 % of potash are likely to need special application of potash fertilizers to give good results, while those containing as much as -4 or -5% do not usually respond to those manures. Where the amount of phosphoric acid (P2O1,) is less than -05% phosphatic manures are generally found to be beneficial; with more than • 1 % present these fertilizers are not usually called for except perhaps in soils containing a high percentage of iron

compounds. Similarly soils with' less than- 1 % of nitrogen are likely to be benefited by applications of nitrogenous „ manures. Too much stress, however, cannot be laid upon these figures, since the fertility of a soil is very greatly influenced by texture and physi- cal constitution, perhaps more so by these factors than by chemical composition.

At present it is not possible to determine with accuracy the amount of immediately available plant food-constituents in a soil : no doubt the various species of plants differ somewhat in their power of absorbing these even from the same soil. The method introduced by Dyer of dissolving out the mineral constituents of the soil with a I % solution of citric acid, which represents about the average acidity of the roots of most common plants, yields better results. In the case of arable soils, where the amount of phosphoric acid determined by this method falls below oi , phos phatic manuring is essential for good crops. The writer has found that many pasture soils containing less than -025 or -03 ■, respond freely to applications of phosphates; probably in such cases even the weak acid iscapable of dissolving out phosphates from the humus or other compounds which yield little or none to the roots of grasses and clovers. In soils where the potash available to citric acid is less than -005 %, kainit and other potash fertilizers are needed.

Water in the Soil. — The importance of an adequate supply of water to growing crops cannot well be over-estimated. During the life pf a plant there is a continuous stream of water passing through it which enters by the root-hairs in the soil and after passing along the stem is given off from the stomata of the leaves into the open air above ground. It has been estimated that an acre of cabbage will absorb from the land and transpire from its leaves more than ten tons of water per day when the weather is fine.

In addition to its usefulness in maintaining a turgid state of the young cells without which growth cannot proceed, water is itself a plant food-material and as absorbed from the soil contains dissolved in it all the mineral food constituents needed by plants for healthy nutrition. Without a sufficient supply plants remain stunted and the crop yield is seriously reduced, as we see in dry seasons when the rainfall is much below the average. If one condition is more necessary than another for good Crops it is a suitable supply of water, for no amount of manuring or other treatment of the soil will make up for a deficient rainfall. The amount needed for the most satisfactory nutrition varies with different plants. In the case of fair average farm crops it has been shown that for the production of one'ton of dry

matter contained in them from 300 to 500 tons of water has been absorbed and utilized by the plants. This may be more than the rainfall, in which case irrigation or special control of the water supply may be necessary.

The water-holding capacity of a soil depends upon the amount of free space between the particles of which it is composed into which water can enter. In most cases this amounts to from 30 to 50% of the volume of the soil.

When the pore-space of the soil is filled with water it becomes water-logged and few plants can effect absorption by their roots under such conditions. The root-hairs die from want of air, and the whole plant soon suffers. Fields of wheat and other cereals rarely recover after a week's submergence, but orchards and many trees when at rest in winter withstand a flooded or water-logged condition of the soil for two or three weeks without damage. The most satisfactory growth is maintained when the amount of water present is not more than 40 to 60% of what would saturate it. Under such conditions each particle of soil is surrounded by a thin film of water and in the pore-space air can freely circulate. It is from such films that the root-hairs absorb all that plants require for their growth. The movement of water into the root-hairs is brought about by the osmotic action of certain salts in their cell-sap. Crops are, however, unable to absorb all the water present in the soil, for when the films become very thin they are held more firmly or cling with more force to the soil particles and resist the osmotic action of the root-hairs. Plants have been found to wither and die in sandy soils containing i"/ of water, and in clay soils in which there was still present 8 % of water.*

When a long glass tube open at both ends is filled with soil and one end is dipped in a shallow basin of water, the water is found to move upwards through the soil column just as oil will rise in an ordinary lamp wick. By this capillary action water may be trans- ferred to the upper layers of the soil from a depth of several feet below the surface. In this manner plants whose roots descend but a little way in the ground are enabled to draw on deep supplies. Not only does water move upwards, but it is transferred by capil- larity in all directions through the soil. The amount and speed of movement of water by this means, and the distance to which it may be carried, depend largely upon the fineness of the particles composing the soil and the spaces left between each. The ascent of water is most rapid through coarse sands, but the height to which it will rise is comparatively small. In clays whose particles, are exceedingly minute the water travels very slowly but may ultimately reach a height of many feet above the level of the " water-table " below. While this capillary movement of water is of great impor- tance in supplying the needs of plants it has its disadvantages, since water may be transferred to the surface of the soil, where it evapo-

rates into the air and is lost to the land or the crop growing upon it. The loss in this manner was found to be in one instance over a pound of water per day per square foot of surface, the " water-table " being about 4 or 5 ft. below.

One of the most effective means of conserving soil moisture is by " mulching," i.e. by covering the surface of the soil with some loosely compacted material such as straw, leaf- refuse or stable- manure. The space between the parts of such substances is too large to admit of capillary action ; hence the water conveyed to the surface of the soil is prevented from passing upwards any further except by slow evaporation through the mulching layer. A loose layer of earth spread over the surface of the soil acts in the same way, and a similarly effective mulch may be prepared by hoeing the soil, or stirring it to a depth of one or two inches with harrows or other implements. The hoe and harrow are therefore excellent tools for use in dry weather. Rolling the land is beneficial to young crops in dry weather, since it promotes capillary action by reducing the soil spaces. It should, however, be followed by a light hoeing or harrowing.

In. the semi-arid regions of the United States, Argentina and other countries where the average annual rainfall lies between 10 to 20 in., irrigation is necessary to obtain full crops every year. Good crops, however, can often be grown in such areas without irrigation if attention is paid to the proper circulation of water in the soil and means for retaining it or preventing excessive loss by evaporation. Of course care must be exercised in the selection of plants — such as sorghum, maize, wheat, and alfalfa or lucerne — ■ which are adapted to dry conditions and a warm climate.

So far as the water-supply is concerned — and this is what ulti- mately determines the yield of crops — the rain which falls upon the soil should be made to enter it and percolate rapidly through its interstices. A deep porous bed in the upper layers is essential, and this should consist of fine particles which lie close to each other without any tendency to stick together and " puddle " after heavy showers. Every effort should be made to prepare a good mealy tilth by suitable ploughing, harrowing and consolidation.

In the operation of ploughing the furrow slice is separated from the soil below, and although in humid soils this layer may be left to settle by degrees, in semi-arid regions this loosened layer becomes dry if left alone even for a few hours and valuable water evaporates into the air. To prevent this various implements, such as disk harrows and specially constructed rollers, may be used to consolidate the upper stirred portion of the soil and place it in close capillary relationship with the lower unmoved layer. If the soil is allowed to become dry and pulverized, rain is likely to run off or " puddle " the surface without penetrating it more than a very short distance.

Constant hoeing or harrowing to maintain a natural soil mulch layer of 2 or 3 in. deep greatly conserves the soil water below. In certain districts where the rainfall is low a crop can only be obtained once every alternate year, the intervening season being devoted to tillage with a view of getting the rain into the soil and retaining it there for the crop in the following year.

Bacteria in the Soil. — Recent science has made much progress in the investigation of the micro-organisms of the soil. Whereas the soil used to be looked upon solely as a dead, inert material con- taining certain chemical substances which serve as food constituents of the crops grown upon it, it is now known to be a place of habitation for myriads of minute living organisms upon whose activity much of its fertility depends. They are responsible for many important chemical processes which make the soil constituents more available and better adapted to the nutrition of crops. One cubic centimetre of soil taken within a foot or so from the surface contains from I J to 2 millions of bacteria of many different kinds, as well as large numbers of fungi. In the lower depths of the soil the numbers decrease, few being met with at a depth of 5 or 6 ft.

The efficiency of many substances, such as farm-yard manure, guanos, bone-meal and all other organic materials, which are spread over or dug or ploughed into the land for the benefit of farm and garden crops, is bound up with the action of these minute living beings. Without their aid most manures would be useless for plant growth. Farm-yard manure, guanos and other fertilizers undergo decomposition in the soil and become broken down into compounds of simple chemical composition better suited for absorp- tion by the roots of crops, the changes involved being directly due to the activity of bacteria and fungi. Much of the work carried on by these organisms is not clearly understood; there are, however, certain processes which have been extensively investigated and to these it is necessary to refer.

It has been found by experiment that the nitrogen needed by practically all farm crops except leguminous ones is best supplied in the form of a nitrate; the rapid effect of nitrate of soda when used as a top dressing to wheat or other plants is well known to farmers. It has long been known that when organic materials such as the dung and urine of animals, or even the bodies of animals and plants, are applied to the soil, the nitrogen within them becomes oxidized, and ultimately appears in the form of nitrate of lime, potash or some other base. The nitrogen in decaying roots, in the dead stems and leaves of plants, and in humus generally is sooner or later changed into a nitrate, the change being effected by bacteria. That

the action of living organisms is the cause of the production of nitrates is supported by the fact that the change does not occur when the soil is heated nor when it is treated with disinfectants which destroy or check the growth and life of bacteria. The process resulting in the formation of nitrates in the soil is spoken of as nitrification.

The steps in the breaking down of the highly complex nitrogenous proteid compounds contained in the humus of the soil, or applied to the latter by the farmer in the form of dung and organic refuse generally, are many and varied; most frequently the insoluble proteids are changed by various kinds of putrefactive bacteria into soluble proteids (peptones, &c), these into simpler amido-bodies, and these again sooner or later into compounds of ammonia. The urea in urine is also rapidly converted by the uro-bacteria into ammonium carbonate. The compounds of ammonia thus formed from the complex substances by many varied kinds of micro-organ- isms are ultimately oxidized into nitrates. The change takes place in two stages and is effected by two special groups of nitrifying bacteria, which are present in all soils. In the first stage the ammonium compounds are oxidized to nitrites by the agency of very minute motile bacteria belonging to the genus Nitrosomonas. The further oxidation of the nitrite to a nitrate is effected by bacteria belonging to the genus Nitrobacter.

Several conditions must be fulfilled before nitrification can occur. In the first place an adequate temperature is essential; at 5° or (f C. (41 "-43" F.) the process is stopped, so that it does not go on in winter. In summer, when the temperature is about 24° C. (75° F.), nitrification proceeds at a rapid rate. The organisms do not carry on their work in soils deficient in air; hence the process is checked in water-logged soils. The presence of a base such as lime or mag- nesia (or their carbonates) is also essential, as well as an adequate degree of moisture : in dry soils nitrification ceases.

It is the business of the farmer and gardener to promote the activity of these organisms by good tillage, careful drainage and occasional application of lime to soils which are deficient in this substance. It is only when these conditions are attended to that decay and nitrification of dung, guano, fish-meal, sulphate of am- monia and other manures take place, and the constituents which they contain become available to the crops for whose benefit they have been applied to the land.

Nitrates are very soluble in water and are therefore liable to be washed out of the soil by heavy rain. They are, however, very readily absorbed by growing plants, so that in summer, when nitrifica- tion is most active, the nitrates produced are usually made use of by crops before loss by drainage

takes place. In winter, however, and in fallows loss takes place in the subsoil water.

There is also another possible source of loss of nitrates through the activity of denitrifying bacteria. These organisms reduce nitrates to nitrites and finally to ammonia and gaseous free nitrogen which escapes into the atmosphere. Many bacteria are known which are capable of denitrification, some of them being abundant in fresh dung and upon old straw. They can, however, only carry on their work extensively under anaerobic conditions, as in water- logged soils or in those which are badly tilled, so that there is but little loss of nitrates through their agency.

An important group of soil organisms are now known which have the power of using the free nitrogen of the atmosphere for the forma- tion of the complex nitrogenous compounds of which their bodies are largely composed. By their continued action the soil becomes enriched with nitrogenous material which eventually through the nitrification process becomes available to ordinary green crops. This power of " fixing nitrogen," as it is termed, is apparently not possessed by higher green plants. The bacterium, Clostridium pasteurianum, common in most soils, is able to utilize free nitrogen under anaerobic conditions, and an organism known as Azotobacter chroococcum and some others closely allied to it, have similar powers Which they can exercise under aerobic conditions. For the carrying on of their functions they all need to be supplied with carbohydrates or other carbon compounds which they obtain ordinarily from humus and plant residues in the soil, or possibly in some instances from carbohydrates manufactured by minute green algae with which they live in close union. Certain bacteria of the nitrogen- fixing class enter into association with the roots of green plants, the best-known examples being those which are met with in the nodules upon the roots of clover, peas, beans, sainfoin and other plants belonging to the leguminous order.

That the fertility of land used for the growth of wheat is improved by growing upon it a crop of beans or clover has been long recognized by farmers. The knowledge of the cause, however, is due to modern investigations. When wheat, barley, turnips and similar plants are grown, the soil upon which they are cultivated becomes depicted of its nitrogen ; yet after a crop of clover or other leguminous plants the soil is found to be richer in nitrogen than it was before the crop was grown. This is due to the nitrogenous root residues left in the land. Upon the roots of leguminous plants characteristic swollen nodules or tubercles are present. These are found to contain large numbers of a bacterium termed Bacillus radicicola or Pseudomonas radicicola. The bacteria, which are present in almost all soils, enter the root-hairs of their host plants and ultimately stimulate the

production of an excrescent nodule, in which they live. For a time after entry they multiply, obtaining the nitrogen necessary for their nutrition and growth from the free nitrogen of the air, the carbohydrate required being supplied by the pea or clover plant in whose tissues they make a home. The nodules increase in size, and analysis shows that they are exceedingly rich in nitrogen up to the time of flowering of the host plant. During this period the bacteria multiply and most of them assume a peculiar thickened or branched form, in which state they are spoken of as bacteroids. Later the nitrogen-content of the nodule decreases, most of the organisms, which are largely composed of proteid material, becoming digested and transformed into soluble nitrogenous compounds rwhich are conducted to the developing roots and seeds. After the decay of the roots some of the unchanged bacteria are left in the soil, where they remain ready to infect a new leguminous crop.

The nitrogen-fixing nodule bacteria can be cultivated on artificial media, and many attempts have been made to utilize them for practical purposes. Pure cultures may be made and after dilution in water or other liquid can be mixed with soil to be ultimately spread over the land which is to be infected. The method of using them most frequently adopted consists in applying them to the seeds of leguminous plants before sowing, the seed being dipped for a time in a liquid containing the bacteria. In this manner organisms obtained from red clover can be grown and applied to, the seed of red clover ; and similar inoculation can be arranged for .other species, so that an application of the bacteria most suited to the particular crop to be cultivated can be assured. In many; cases it has been found that inoculation, . whether of the soil or of the seed, has not made any appreciable difference to the growth of the crop, a result no doubt due to the fact that the soil had already contained within it an abundant supply of suitable organisms. But in other instances greatly increased yields have been obtained where inoculation has been practised. More or less pure cultures of the nitrogen-fixing bacteria belonging to the Azotobacter group have been tried and recommended for application to poor land in order to provide a cheap supply of nitrogen. The application of pure cultures of bacteria for improving the fertility of the land is still in an experimental stage. There is little doubt, however, that in the near future means will be devised to obtain the most efficient work from these minute organisms, either by special artificial cultivation and subsequent application to the soil, or by improved methods of encouraging their healthy growth and activity in the land where they already exist. •

Improvement of Soils. — The fertility of a soil is dependent upon a number of factors, some of which, such as the addition of fertilizers or manures, increase the stock of available food materials in the soil (see Manure), while others, such as application of clay or humus, chiefly influence the

fertility of the land by improving its physical texture.

The chief processes for the improvement of soils which may- be discussed here are: liming, claying and marling, warping, paring and burning, and green manuring. Most of these more or less directly improve the land by adding to it certain plant food constituents which are lacking, but the effect of each process is in reality very complex. In the majority of cases the good results obtained are more particularly due to the setting free of " dormant " or" latent " food constituents and to the amelioration of the texture of the soil, so that its aeration > drainage, temperature and water-holding capacity are altered for the better.

The material which chemists call calcium carbonate is met with in a comparatively pure state in chalk. It is present in variable amounts in limestones of all kinds, although its white- ness may there be masked by the presence of iron oxide Liming.

and other coloured substances. Carbonate of lime is also a consti- tuent to a greater or lesser extent in almost all soils. In certain sandy soils and in a few stiff clays it may amount to less than \ %, while in others in limestone and chalk districts there may be 50 o 80 present. Pure carbonate of lime when heated loses 44% of its weight, the decrease being due to the loss of cartoon dioxide gas. The resulting white product is termed calcium oxide lime, burnt lime, quicklime, cob lime, Or caustic lime. This substance absorbs and combines with water very greedily, at the same time becoming very hot, and falling into a fine dry powder, calcium hydroxide or slaked lime, which when left in the open slowly combines with the carbon dioxide of the air and becomes calcium carbonate, from which we began.

When recommendations are made about liming land it is necessary to indicate more precisely than is usually done which of the three classes of material named above — chalk, quicklime or slaked lime-— is intended. Generally speaking the oxide or quicklime has a 'more rapid and greater effect in modifying the soil than slaked lime, and this again greater than the carbonate or chalk.

Lime in whatever form it is applied has a many-sided influence in the fertility of the land. It tends to improve the tilth and the

capillarity of the soil by binding sands together somewhat and by opening up clays. If applied in too great an amount to light soils and peat land it may do much damage by rendering them too loose and open. The addition

of small quantities of lime, especially in a caustic form, to stiff greasy clays makes them much more porous and pliable. A lump of clay, which if dried would become hard and intractable, crumbles into pieces when dried after adding to it i % of lime. The lime causes the minute separate particles of clay to flocculate or group themselves together into larger compound grains between which air and water can percolate more freely. It is this power of creating a more crumbly tilth on stiff clays that makes lime so valuable to the farmer. Lime also assists in the decomposition of the organic matter or humus in the soil and promotes nitrification ; hence it is of great value after green manuring or where the land contains much humus from the addition of bulky manures such as farm-yard dung. This tendency to destroy organic matter makes the repeated application of lime a pernicious practice, especially on land which contains little humus to begin with. The more or less dormant nitrogen and other constituents of the humus are made immediately available to the succeeding crop, but the capital of the soil is rapidly reduced, and unless the loss is replaced by the addition of more manures the land may become sterile. Although good crops may follow the application of lime, the latter is not a direct fertilizer or manure and is no substitute for such. Its best use is obtained on land in good condition, but not where the soil is poor. When used on light dry land it tends to make the land drier, since it destroys the humus which so largely assists in keeping water in the soil. Lime is a base and neutralizes the acid materials present in badly drained meadows and boggy pastures. Weeds, therefore, which need sour conditions for development are checked by liming and the better grasses and clovers are encouraged. It also sets free potash and possibly other useful plant food-constituents of the soil. Liming tends to produce earlier crops and destroys the fungus which causes finger-and-toe or club-root among turnips and cabbages.

Land which contains less than about f % of lime usually needs the addition of this material. The particular form in which lime should be applied for the best results depends upon the nature of the soil. In practice the proximity to chalk pits or lime kilns, the cost of the lime and cartage, will determine which is most economical. Generally speaking light poor lands deficient in organic matter will need the less caustic form or chalk, while quick- lime will be most satisfactory on the stiff clays and richer soils. On the stiff soils overlying the chalk it was formerly the custom to dig pits through the soil to the rock below. Shafts 20 or 30 ft. deep were then sunk, and the chalk taken from horizontal tunnels was brought to the surface and spread on the land at the rate of about 60 loads per acre. Chalk should be applied in autumn, so that it may be split by the action of frost during the winter. Quicklime is best applied, perhaps, in spring at the rate of one ton per acre every six or eight years, or in larger doses— 4 to 8 tons — every 15 to 20 years. Small dressings applied at short intervals give the most

satisfactory results. The quicklime should be placed in small heaps and covered with soil if possible until it is slacked and the lumps have fallen into powder, after which it may be spread and harrowed in. Experiments have shown that excellent effects can be obtained by applying 5 or 6 cwt. of ground quicklime.

Gas-lime is a product obtained from gasworks where quicklime is used to purify the gas from sulphur compounds and other objec- tionable materials. It contains a certain amount of unaltered caustic lime and slacked lime, along with sulphates and sulphides of lime, some of which have an evil odour. As some of these sulphur compounds have a poisonous effect on plants, gas-lime cannot be applied to land directly without great risk or rendering it incapable of growing crops of any sort — even weeds — for some time. It should therefore be kept a year or more in heaps in some waste corner and turned over once or twice so that the air can gain access to it and oxidize the poisonous ingredients in it.

Many soils of a light sandy or gravelly or peaty nature and liable to drought and looseness of texture can be improved by the addition CI 1 nd °^ ‘ ar B e amounts of clay of an ordinary character. M a, L? ga Similarly soils can be improved by applying to them “’ marl, a substance consisting of a mixture of clay with*

variable proportions of lime. Some of the chalk marls, which are usually of a yellowish or dirty grey colour, contain clay and 50 to 80 % of carbonate of lime with a certain proportion of phosphate of lime. Such a material would not only have an influence on the texture of the land but the lime would reduce the sourness of the land and the phosphate of lime supply one of the most) valuable of plant food- constituents. The beneficial effects of marls may also be partially due to the presence in them of available potash.

Typical clay-marls are tenacious, soapy clays of yellowish-red or brownish colour and generally contain less than 50 % of lime. When dry they crumble into small pieces which can be readily mixed with the soil by ploughing. Many other kinds of marls are described; some are of a sandy nature, others stony or full of the remains of small shells. The amount and nature of the clay or marl to be added to the soil will depend largely upon the original composition of the latter, the lighter sands and gravel requiring more clay than those

of firmer texture. Even stiff soils deficient in lime are greatly improved in fertility by the addition of marls. In some cases as little as 40 loads per acre have been used with benefit, in others 180 loads have not been too much. The material is dug from neighbour- ing pits or sometimes from the

fields which are to be improved, and applied in autumn and winter. When dry and in a crumbly state it is harrowed and spread and finally ploughed in and mixed with the soil.

On some of the strongest land it was formerly the practice to add to and plough into it burnt clay, with the object of making the land work more easily. The . burnt clay moreover carried a with it potash and other materials in a state readily „ . available to the crops. The clay is dug from the land Burning. or from ditches or pits and placed in heaps of 60 to 100 loads each, with faggot wood, refuse coals or other fuel. Great care is necessary to prevent the heaps from becoming too hot, in which case' the clay becomes baked into hard lumps of brick-like material which cannot be broken up. With careful management, however, the clay dries and bakes, becoming slowly converted into lumps which readily crumble into a fine powder, in which state it is spread over and worked into the land at the rate of 40 loads per acre.

*The paring and burning of land, although formerly practised as an ordinary means of improving the texture and fertility of arable fields, can now only be looked upon as a practice pˆ-ig-ˆ d to be adopted for the purpose of bringing rapidly into _ . cultivation very foul leys or [land covered with a coarse Bu ™ ** turf. The practice is confined to poorer types of land, such as heaths covered with furze and bracken or fens and clay areas smothered with rank grasses and sedges. To reduce such land to a fit state for the growth of arable crops is very difficult and slow without resort to paring and burning. The operation consists of paring off the tough sward to a depth of I to 2 in. just sufficient to effectually damage the roots of the plants forming the sward and then, after drying the sods and burning them, spreading the charred material and ashes over the land. The turf is taken off either with the breast plough — a paring tool pushed forward from the breast or thighs by the workman — or with specially constructed paring ploughs or shims. The depth of the sod removed should not be too thick or burning is difficult and too much humus is destroyed unnecessarily, nor should it be too thin or the roots of the herbage are not effectually destroyed.*

The operation is best carried out in spring and summer. After beirg pared off the turf is allowed to dry for a fortnight or so and is then placed in small heaps a yard or two wide at the base, a little straw or wood being put in the middle of each heap, which is then lighted. As burning proceeds more turf is added to the outside of the heaps in such a manner as to allow little access of air. Every care should be taken to burn and char the sod thoroughly without permitting the heap to blaze. The ashes should be spread as soon as possible and covered by a shallow ploughing. The land is then 'usually sown with some rapidly growing green crop, such as rape, or

with turnips.

Paring and burning improves the texture of clay lands, particularly if draining is carried out at the same time. It tends to destroy insects and weeds, and gets rid of acidity of the soil. No operation brings old turf into cultivation so rapidly. Moreover the beneficial effects are seen in the first crop and last for many years. Many of the mineral plant food-constituents locked up in the coarse herbage and in the upper layers of the soil are made immediately available to crops. The chief disadvantage is the loss of nitrogen which it entails, this element being given off into the air in a free gaseous state. It is best adapted for application to clays and fen lands and should not be practised on shallow light sands or gravelly soils, since the humus so necessary for the fertility of such areas is reduced too much and the soil rendered too porous and liable to suffer from drought.

Many thousands of acres of low-lying peaty and sandy land adjoin- ing the tidal rivers which flow into the Humber have been improved by a process termed " warping." The warp consists yyarol of fine muddy sediment which is suspended in the tidal- war P "B- river water and appears to be derived from material scoured from the bed of the Humber by the action of the tide and acertain amount of sediment brought down by the tributary streams which join the Humber some distance from its mouth. The field or area to be warped must lie below the level of the water in the river at high tide. It is first surrounded by an embankment, after which the water from the river is allowed to flow through a properly constructed sluice in its bank, along a drain or ditch to the land which is prepared for warping. By a system of carefully laid channels the water flows gently over the land, and deposits its warp with an even level surface. At the ebb of the tide the more or less clear water flows back again from the land into the main river with sufficient force to clean out any deposit which may have accumulated in the drain leading to the warped area, thus allowing free access of more warp- laden water at the next tide. In this manner poor peats and sands may be covered with a large layer of rock soil capable of growing excellent crops.

The amount of deposit laid over the land reaches a thickness of two or three feet in one season of warping, which is usually practised

between March and October, advantage being taken of the spring tides during these months. The new warp is allowed to lie fallow during the winter after being laid out in four-yard " lands " and becomes dry enough

to be sown with oats and grass and clover seeds in the following spring. The clover-grass ley is then grazed for a year or two with sheep, after which wheat and potatoes are the chief crops grown on the land.

Green manures are crops which are grown especially for the purpose of ploughing into the land in a green or actively growing state. The _ crop during its growth obtains a considerable amount of

„ . carbon from the carbon dioxide of the air, and builds it up

a u ng. j ntQ compounds which when ploughed into the land become humus. The carbon compounds of the latter are of no direct nutritive value to the succeeding crop, but the decaying vegetable tissues very greatly assist in retaining moisture in light sandy soils, and in clay soils also have a beneficial effect in rendering them more open and allowing of better drainage of superfluous water and good circulation of fresh air within them. The ploughing-in of green crops is in many respects like the addition of farm-yard manure. Their growth makes no new addition of mineral food-constituents to the land, but they bring useful substances from the subsoil nearer to the surface, and after the decay of the buried vegetation these become available to succeeding crops of wheat or other plants. Moreover, where deep-rooting plants are grown the subsoil is aerated and rendered more open and suitable for the development of future crops.

The plants most frequently used are white mustard, rape, buck- wheat, spurry, rye, and several kinds of leguminous plants, especially vetches, lupins and serradella. By far the most satisfactory crops as green manures are those of the leguminous class, since they add to the land considerable amounts of the valuable fertilizing con- stituent, nitrogen, which is obtained from the atmosphere. By nitrification this substance rapidly becomes available to succeeding crops. On the light, poor sands of Saxony Herr Schultz, of Lupitz, made use of serradella, yellow lupins and vetches as green manures for enriching the land in humus and nitrogen, and found the addition of potash salts and phosphates very profitable for the subsequent growth of potatoes and wheat. He estimated that by using leguminous crops in this manner for the purpose of obtaining cheap nitrogen he reduced the cost of production of wheat more than 50 %. The growing crops should be ploughed in before flowering occurs; they should not be buried deeply, since decay and nitrification take place most rapidly and satisfactorily when there is free access of air to the decaying material. When the crop is luxuriant it is necessary to put a roller over it first, to facilitate proper burial by the plough. The best time for the operation appears to be late summer and autumn. (J. Pe.)

Soil and Disease. — The influence of different kinds of soil as a factor in

the production of disease requires to be considered, in regard not only to the nature and number of the micro- organisms they contain, but also to the amount of moisture and air in them and their capacity for heat. The moisture in soil is derived from two sources — the rain and the ground-water. Above the level of the ground-water the soil is kept moist by capillary attraction and by evaporation of the water below, by rainfall, and by movements of the ground- water; on the other hand, the upper layers are constantly losing moisture by evapo- ration from the surface and through vegetation. When the ground- water rises it forces air out of the soil; when it falls again it leaves the soil moist and full of air. The nature of the soil will largely influence the amount of moisture which it will take up or retain. In regard to water, all soils have two actions — namely, permeability and absorbability. Permeability is practically identical with the speed at which percolation takes place; through clay it is slow, but increases in rapidity through marls, loams, limestones, chalks, coarse gravels and fine sands, reaching a maximum in soil saturated wjth moisture. The amount of moisture retained depends mainly upon the absorb ability of the soil, and as it depends largely on capillary action it varies with the coarseness or fineness of the pores of the soil, being greater for soils which consist of fine particles. The results of many analyses show that the capacity of soils for moisture increases with the amount of organic substances present; decomposition appears to be most active when the moisture is about 4%, but can continue when it is as low as 2%, while it appears to be retarded by any excess over 4%. Above the level of the ground- water all soils contain air, varying in amount with the degree of looseness of the soil. Some sands contain as much as 50% of air of nearly the same composition as atmospheric air. The oxygen, however, decreases with the depth, while the carbon dioxide increases.

Among the most noteworthy workers at the problems involved in the question of the influence of soil in the production of disease we find von Foder, Pettenkofer, Levy, Fleck, von Naegeli, Schleesing, Muntz and Warrington. The study of epidemic and endemic diseases generally has brought to light an array of facts which very strongly suggest that an intimate association exists between the soil and the appearance and propagation of certain diseases; but although experiments and observations allow this view to be looked upon as well established, still the precise r&le played by the soil in an aetiological respect is by no means so well understood as to make it possible to separate the factors and dogmatize on their effects. The earliest writers upon cholera emphasized its remark- able preference for particular places ; and the history of each succes- sive epidemic implies, besides an importation of the contagion, certain local conditions which may be either general sanitary defects or peculiarities of climate and soil. The general evidence indicates that the specific bacteria of

cholera discharges are capable of a much longer existence in the superficial soil layers than was formerly supposed; consequently it is specially necessary to guard against pollution of the soil, and through it against the probable contamina- tion of both water and air. The evidence, however, is not suffi- ciently strong to warrant a universal conclusion, the diffusion of cholera appearing to be largely dependent upon other factors than soil states. Again, all accounts of diphtheria show a tendency on the part of the disease to recur in the same districts year after year. The questions naturally suggest themselves — Are the reappearances due to a revival of the contagion derived from previous outbreaks in the same place, or to some favouring condition which the place offers for the development of infection derived from some other quarter; and have favouring conditions any dependence upon the character and state of the soil? Greenhow in 1858 stated that diphtheria was especially prevalent on cold, wet soils, and Airy in 1 88 1 described the localities affected as " for the most part cold, wet, clay lands." An analysis of the innumerable outbreaks in various parts of Europe indicates that the geological features of the affected districts play a less important part in the incidence of the disease than soil dampness. In this connexion it is interesting to note the behaviour of the diphtheritic contagion in soil. Experi- ments show that pure cultures, when mixed with garden soil con- stantly moistened short of saturation and kept in the dark at a temperature of 14° C, will retain their vitality for more than ten months; from moist soil kept at 26° C. they die out in about two months; from moist soil at 30 C. in seventeen days; and in dry soil at the same temperature within a week. In the laboratory absolute soil dryness is as distinctly antagonistic to the vitality of the diphtheria bacillus as soil dampness is favourable. Both statisti- cally and experimentally we find that a damp soil favours its life and development, while prolonged submersion and drought kill it. We may consider that, in country districts, constant soil moisture is one of the chief factors; while in the case of urban outbreaks mere soil moisture is subsidiary to other more potent causes.

Again, many facts in the occurrence and diffusion of enteric fever point to an intimate connexion between its origin and certain con- ditions of locality. Epidemics rarely spread over any considerable tract of country, but are nearly always confined within local limits. Observations made at the most diverse parts of the globe, and the general distribution area of the disease, show that mere questions of elevation, or even configuration of the ground, have little or no influence. On the other hand, the same observations go to show that the disease is met with oftener on the more recent formations than the older, and this fact, so far as concerns the physical characters of the soil, is identical with the questions of permeability to air and water. Robertson has shown that the typhoid bacillus can grow very easily in certain soils, can persist in soils through the

winter months, and when the soil is artificially fed, as may be done by a leaky drain or by access of filthy water from the surface, the micro-organism will take on a fresh growth in the warm season. The destructive power of sunlight is only exercised on those organisms actually at the surface. Cultures of the typhoid organism planted at a depth of 18 in. were found to have grown to the surface. In the winter months the deeper layers of the soil act as a shelter to the organism; which again grows towards the surface during the summer. The typhoid organism was not found to be taken off from the decomposing masses of semi-liquid filth largely contaminated with a culture of bacillus typhosus; but, on the other hand, it was abundantly proved that it could grow over moist surfaces of stones, &c. Certain disease-producing organisms, such as the bacillus of tetanus and malignant oedema, appear to be universally distributed in soil, while others, as the bacillus typhosus and spirillum cholerae, appear to have only a local distribution. _ The conditions which favour the vitality, growth and multiplication of the_ typhoid bacillus are the following: the soil should be pervious; it should be permeated with a sufficiency of decaying — preferably animal — organic matters; it should possess a certain amount of moisture, and be subject to a certain temperature. Depriving the organism of any of these essential conditions for its existence in the soil will secure our best weapon for defence. The optimum temperature adapted to its growth and extension is 37 C. =o.8 -4 F. Sir Charles I Cameron attributes the prevalence of typhoid in certain areasan

Dublin to the soil becoming saturated with faecal matter and specifi- cally infected. The ratio of cases to population living in Dublin on loose porous gravel soil for the ten years 1 881-189 1 was 1 in 94, while that, of those living on stiff clay soil was but 1 in 145. " This is as we should expect, since the movements of ground air are much greater in loose porous soils than in stiff clay soils." A foul gravel soil is a most dangerous one on which to build. For warmth, for dryness, for absence of fog, and for tacility of walking after rain, just when the air is at its purest and its best, there is nothing equal to gravel ; but when gravel has been rendered foul by infil-tration with organic matters it may easily become a very hotbed of disease. s , (J. L. N.)

SOISSONS, a city of northern France, in the department of Aisne, 65 m. N.E. of Paris by the railway to Laon. Pop. (1906), 11,586. Soissons, pleasantly situated amongst wooded hills, stands on the left bank of the Aisne, the suburbs of St Vaast and St Medard lying on the right bank. The cathedral of Notre-Dame was begun in the second half of the 12th century

and finished about the end of the 13th. It is 328 ft. long and 87 wide, and the vaulting of the nave is 100 ft. above the pave- ment. The single tower dates from the middle of the 13th century and is an imitation of those of Notre-Dame of Paris, which it equals in height (216 ft.). The south transept, the oldest and most graceful portion of the whole edifice, terminates in an apse. The facade of the north transept dates from the end of the 13th century. The apse and choir retain some fine 13th-century glass. Considerable remains exist of the magnifi- cent abbey of St Jean-des-Vignes, where Thomas Becket resided for a short time. These include the ruins of two cloisters (the larger dating from the 13th century), the refectory, and above all the imposing facade of the church (restored). Above the three portals (13th century) runs a gallery, over which again is a large window; the two unequal tower's (230 and 246 ft.) of the 15 th and early 16th centuries are surmounted by beautiful stone spires, which command the town. The church of St Leger, which belongs to the 13th century, was formerly attached to an abbey of the Genovefains. Beneath are two Romanesque crypts. The royal abbey of Notre-Dame, now a barrack, was founded in 660 for monks and nuns by Leutrade, wife of Ebroiin, the celebrated mayor of the palace. The number of the nuns (216 in 858), the wealth of the library in manuscripts, the valuable relics, the high birth of the abbesses, the popularity of the pilgrimages, all contributed to the importance of this abbey, of which there exist only inconsiderable remains. The wealthiest of all the abbeys in Soissons, and one of the most important of all France during the first two dynasties, was that of St M6dard, on the right bank of the Aisne, founded about 560 by Clotaire I., beside the villa of Syagrius, which had become the palace of the Frankish kings. St Medard, apostle of Vermandois, and kings Clotaire and Sigebert, were buried in the monastery, which be- came the residence of 400 monks and the meeting-place of several councils. It was there that Childeric III., the last Merovingian, was deposed and Pippin the Short was crowned by the papal legate, and there Louis the Pious was kept in captivity in 833. The abbots of St Medard coined money, and in Abelard's time (12th century) were lords of 220 villages, farms and manors. At the battle of Bouvines (1214) the abbot commanded 150 vassals. In 1530 St Medard was visited by a procession of 300,000 pilgrims. But the religious wars ruined the abbey, and, although it was restored by the Benedictines in 1637, it never recovered its former splendour. Of the churches and the conventual buildings of the ancient foundation there hardly remains a trace. The site is occupied by. a deaf and dumb institution, the chapel of which stands over the crypt of the great abbey church, which dates from about 840. In the crypt is a stone coffin, said to have been that of Childebert II., and close at hand is an underground chamber, reputed to have been the place of captivity of Louis the Pious.

The civil buildings of the town are not of much interest. The h6tel-de-ville contains a library and a museum with collec- tions of paintings and antiquities. The foundation of the h6tel- dieu dates back to the 13 th century. The town has a large botanical garden. Soissons is the seat of a bishop and a sub- prefect, and has tribunals of first instance and of commerce,

a communal college and higher ecclesiastical seminary. Among the industrial establishments are iron and copper foundries, and factories for the production of boilers, agricultural imple- ments and other iron goods, straw hats, glass and sugar. Grain, haricot beans of exceptional quality, and timber are the principal articles of trade.

Soissons is generally identified with the oppidum of Gallia Belgica, called Noviodunum by Caesar. Noviodunum was the capital of the Suessiones, who occupied twelve towns, and whose king, Divitiacus, one of the most powerful in Gaul, had extended his authority even beyond the sea among the Britons. In 58 B.C. Galba, king of the Suessiones, separated from the confederation of the Belgians and submitted to the Romans. At the beginning of the empire Noviodunum took the name of Augusta Suessionum, and afterwards that of Smssiona, and became the second capital of Gallia Belgica, of which Reims was the metropolis. The town was before long surrounded with a regular wall and de- fended by a citadel, and it became the starting-point of several military roads (to Reims, Chateau-Thierry, Meaux, Paris, Amiens and St Quentin). Christianity was introduced by St Crispin and St Crispinian, men of noble birth, who, however, earned their livelihood by shoemaking, and thus became patrons of that craft. After their martyrdom in 297 their work was continued by St Sinitius, the first bishop of Soissons. After the barbarians had crossed the Rhine and the Meuse Soissons became the metropolis of the Roman possessions in the north of Gaul, and on the defeat of Syagrius by CloVis the Franks seized the town. It was at Soissons that Clovis married Clotilde, and, though he afterwards settled at Paris, Soissons was the capital of his son Clotaire, and afterwards of Chilperic I., king of Neustria. It was not till the time of Chilperic's son, Clotaire II., that the kingdom of Soissons was incorporated with that of Paris. Pippin the Short was at Soissons proclaimed king by an assembly of leudes and bishops, and he was there crowned by the papal legate, St Boniface, before being crowned at Saint Denis by the pope himself. Louis the Pious did penance there after being deposed by the assembly at Compiegne. Under Charles the Fat (886) the Normans failed in an attempt against the town, but laid waste St M6dard and the neighbourhood. In 923 Charles the Simple was defeated outside the walls by the supporters of Rudolph of Burgundy, and Hugh the Great besieged and partly burned the town in 948. Under the first Capets Soissons was held by hereditary counts (see below), frequently at war with

the king or the citizens. The communal charter of the town dates from 1131. At a synod held at Soissons in 1121 the teachings of Abelard were condemned, and he was forced to retract them. In 1155, at an assembly of prelates and barons held at Soissons, Louis VII. issued a famous decree forbidding all private wars for a space of ten years; and in 1325 Charles the Fair replaced the mayor of Soissons by a royal provost dependent on the bailiwick of Vermandois, the inhabi- tants retaining only the right of electing four echevins. The town had to suffer severely during the war of the Hundred Years; in 1414, when it was held by the Burgundians, it was captured and sacked by the Armagnacs under the dauphin ; and this same fate again befell it several times within twenty years. The Treaty of Arras (1435) brought it again under the royal authority. It was sacked by Charles V. in 1544 and in I 5°S by thfe Huguenots, who laid the churches in ruins, and, supported by the prince of Conde, count of Soissons, kept possession of the town for six months. During the League Sbissons eagerly joined the Catholic party. Charles, duke of Mayenne, made the town his principal residence, and died there in 161 1. A European congress was held there in 1728. In 1814 Soissons was captured and recaptured by the allies and the French. In 1813, after Waterloo, it was a rallying point for the vanquished, and it was not occupied by the Russians till the 14th of August. In 1870 it capitulated to the Germans after a bombardment of three days.

Counts of Soissons. — In the middle ages Soissons was the chief town of a countship belonging in the 10th and nth centuries to a family which apparently sprang from the

counts of Vermandois. Renaud, count of Soissons, gave his property in 1141 to his nephew Yves de Nesl'e. ■ By successive marriages the countship of Soissons passed to the houses of Hainaut, Chatillon-Blois, Coucy, Bar and Luxem- burg. Marie de Luxemburg brought it, together with the counties of Marie and St Pol, to Francis of Bourbon, count of Vend6me, whom she married in 1487. His descendants, the princes of Conde, held Soissons and gave it to their cadets. Charles of Bourbon, count of Soissons (1566-1612), son of Louis, prince of Conde, whose political vacillations were due to his intrigues with Henry IV. 's sister Catherine, became grand master of France and governor of Dauphine and Normandy. His son, Louis of Bourbon (1604-1641), took part in the plots against Marie de Medici and Richelieu, and attempted to assas- sinate Richelieu. He had only one child, a natural son, known as the Chevalier de Soissons. The countship passed to the house of Savoyˆ Carignan by the marriage in

1625 of Marie de Bourbon- Soissons with Thomas Francis of Savoy. Eugene Maurice of Savoy, count of Soissons (1635ˆ1673), married the beautiful and witty Olympia Mancini, a niece of Cardinal Mazarin, and obtained high military posts through his wife's influence. He defeated the Spaniards at the battle of the Dunes in 1658; took part in the campaigns at Flanders (1667), Franche-Comte (1668) and Holland (1672); and was present as ambassador extraordinary of France at the coronation of Charles II. of England. His wife led a scandalous life, and was accused of poisoning her husband and others. She was the mother of Louis Thomas Amadeus, count of Soissons, and of the famous Prince Eugene of Savoy. In 1734 the male line of the family of Savoy-Soissons became extinct, and the heiress, the princess of Saxe-Hildburghausen, ceded the countship of Soissons to the house of Orleans, in whose possession it remained until

1780.

SOKE (O. Eng. soc, connected ultimately with sccan, to seek), a word which at the time of the Norman Conquest generally denoted jurisdiction, but was often used vaguely and is probably incapable of precise definition. In some cases it denoted the right to hold a court, and in others only the right to receive the tines and forfeitures of the men over whom it was granted when they had been condemned in a court of competent jurisdic- tion. Its primary meaning seems to have been "seeking"; thus " soka faldae " was the duty of seeking the lords court, just as " secta ad molendinum " was the duty of seeking the lords mill. The " Leges Henrici " also speaks of pleas " in socna, id est, in quaestione sua " — pleas which are in his investigation. It is evident, however, that not long after the Norman Conquest considerable doubt prevailed about the correct meaning of the word. In some versions of the much used tract Interpretationes uocabulorum soke is defined " aver fraunc court," and in others as " interpellacio maioris audientiae," which is glossed some- what ambiguously as " claim & justis et requeste." Soke is also frequently associated to " sak " or " sake " in the alliterative jingle " sake and soke," but the two words are not etymologi- cally related. " Sake " is the Anglo-Saxon " sacu," originally meaning a matter or cause (from sacan, to contend), and later the right to have a court. Soke, however; is the commoner word, and appears to have had a wider range of meaning. The term " soke," unlike sake," was sometimes used of the district over which the right of jurisdiction extended.*

Mr Adolphus Ballard has recently argued that theˆ interpreta- tion of the word " soke " as jurisdiction should only be accepted where it stands for the fuller phrase, " sake and soke," and that soke standing by itself denoted services only. There are certainly many passages in Domesday Book which support his contention, but there are also other passages in which soke

seems to be merely a short expression for " sake and soke." The difficulties about the correct interpretation of these words will probably not be solved until the normal functions and jurisdiction of the various local courts have been more fully elucidated.

" The sokemen " were a class of tenants, found chiefly in the eastern counties, occupying an intermediate position between

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the free tenants and the bond tenants or villains. As a genera] rule they were personally free, but performed many of the agricultural services of the villains. It is generally supposed they were called sokemen because they were within the lord's soke or jurisdiction. Mr Ballard, however, holds that a sokeman was merely a man who rendered services, and that a sokeland was land from which services were rendered, and was not nece% sarily under the jurisdiction of a manor. The law term, socage, used of this tenure, is a barbarism, and is formed by adding the French age to soc.

See F. W. Maitland, Domesday Book and Beyond; J. H. Round, Feudal England; F. H. Baring, Domesday Tables; A. Ballard, The Domesday Inquest; J. Tait, review of the last-mentioned book in English Historical Review for January 1908; Red Book of the Ex- chequer (Rolls Series), iii. 1035. (G. J. T.)

SOKOTO, an important Fula state of west central Sudan, now a province of the British protectorate of Nigeria. The sultan of Sokoto throughout the 19th century exercised an over- lordship over the Hausa states extending east from the Niger to Bornu and southward to the Benue and Adamawa. These states ahd Sokoto itself, known variously as the Sokoto or Fula empire arid Hausaland,,came (c. 1900-1903) under direct British control, but the native governments are maintained. The pro- vince of Sokoto occupies the north-west corner of the British protectorate, and is bounded west and north by French territory. South and east it adjoins other parts of the British protectorate. Bordering north on the Sahara, it contains much arid land, but south-west the land is very fertile. Running through it in a south-westerly direction is the Gublih Kebbi or Sokoto river, which joins the Niger in 115° N. 4 E. On a tributary of this river is the town of Sokoto.

The Sokoto or Fula empire was founded at the beginning of the 19th century. The country over which the Fula ruled has, however, a history going back to the middle ages. Between the Niger and the kingdom of Bornu (q.v.) the country was inhabited by various black tribes, of whom the Hausa occupied the plains. Under the influence of Berber and Arab tribes, who embraced Mahommedanism, the Hausa advanced in civiliza-

tion, founded large cities, and developed a considerable trade, not onty with the neighbouring countries, but, via the Sahara, with the Barbary states. The various kingdoms which grew up round each large town had their own ruler's, but in the first half of the 16th century they all appear to have owned the sway of the Songhoi kings (see Timbuktu). On the break up of the Songhoi empire the north-eastern part of Hausaland became more or less subject to Bornu, whose sultans in the 17th century claimed to rule over Katsena and Kano. In this century arose a dynasty of the Habe, a name now believed to be identical with Hausa, who obtained power over a large area of the northern portion of the present British protectorate. The Hausa, whose conversion to Mahommedanism began in the 12th century, were still in the 18th century partly pagans, though their rulers were followers of the Prophet. These rulers built up an elaborate system of government which left a considerable share in the management of affairs to the body of the people. Dwelling among the Hausa were a number of Fula, mostly herdsmen, and these were devout Mahommedans. One of the more culti- vated teachers of this race, named Othman Dan Fodio, had been tutor to the king of Gobir (a district north of Establish- Sokoto). He incurred the wrath of that king, who, meat of angered at some act of defiance, ordered the massacre pu,afla,e – of every Fula in his dominions. The Fula flocked to Fodio 's aid, and in the battle of Koto or Rugga Fakko (1804) the king of Gobir was utterly defeated. Thereupon Fodio unfurled the green banner of Mahomet and preached a. jihad or religious war. In a few years the Fula had subdued most of the Hausa states, some, like Kano, yielding easily in order to preserve their trade, others, like Katsena, offering a stubborn resistance. Gobir and Kebbi remained unconquered, as did the pagan hill tribes. The Fula were also defeated in their attack on Bornu. In most places they continued the system of government which had grown up under the Habe, the chiefs or emirs of the various

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.states being, however, tributary to Dan Fodio. This sheik I established himself at Sokoto, and with other titles assumed that of Sarikin Muslimin (king of the Mahommedans). As such he became the recognized spiritual head of all the Mahommedans of west central Sudan, a headship which his successors retained unimpaired, even after the loss of their temporal position to the British in 1903. On the death of Fodio (c. 183:9) the empire was divided between a son and a brother, the son, famous under the name of Sultan Bello, ruling at Sokoto, the brother at Gando. All the other Fula emirs were dependent on these two sultanates. The Fula power proved,

before many years had gone by, in many respects harmful to the country. This was especially the case in those districts where there was a large pagan population. Slave-raiding was practised on a scale which devastated and almost depopulated vast regions and greatly hampered the commercial activity of the large cities, of which Zaria and Kano were the most important. The purity of the ancient administration , was abandoned. The courts of justice became corrupt, administrative power was abused and degener- ated into a despotism controlled only by personal considerations, oppressive taxes destroyed industry and gradually desolated the country. Soon after the Fula had established themselves Europeans began to visit the country. Hugh Clapperton, an Englishman, was at Sokoto in 1823 and again in 1827, dying there on the 13th of April of that year. Heinrich Barth made a prolonged stay in various Hausa cities at dates between 1851 and 1855. To Barth is due a great deal of our knowledge of the country. In Barth's time American merchants were established on the Niger, bartering goods in exchange for slaves. This traffic was carried on through Niipe " to the great damage," says Barth, " of the commerce and the most unqualified scandal of the Arabs, who think that the English, if they would, could easily prevent it." The over-seas traffic in slaves did not continue long after the date (1851) to which Barth referred, but' slave-raiding by the Fula went on unchecked up to the moment of the British occupation of the country. At Sokoto the sultanship continued in the hands of Fodio's descendants, and the reigning sultan concluded in 1885 a treaty with the Royal Niger Company (then called the National African Company) which gave to the company certain rights of sovereignty throughout his dominions.

*In 1900 the rights of the company were transferred to the Crown. In the course of the years 1900, 1901, 1902, British Submission authority was established in the states bordering to British on the Niger and the Benue and in Bornu. The **• northern states declined to fulfil the conditions of*

the treaties negotiated with the Niger Company or to submit to the abolition of the slave trade, and in 1902 Sokoto and Kano openly defied the British power. A campaign was undertaken against them in the opening months of 1903 in which the British troops were entirely successful. Kano was taken in February 1903, and Sokoto after some resistance made formal submission on the 22nd of March following. From that day British authority was substituted for Fula authority through- out the protectorate. The emir of Sokoto took an oath of allegiance to the British Crown and Sokoto became a British province, to which at a later period Gando was added as a sub- province — thus making of Sokoto one of the double provinces of the protectorate.

The double province thus constituted has an area of about 35,000 sq. m.,

with an estimated population of something over 500,000. It includes the ancient kingdoms of Zamf ara on the east and Argunga or Kebbi on the west. The dominions of the emir of Sokoto have suffered some diminutions by reason of British agreements with France relating to the common frontier of the two European powers in the western Sudan. The emir felt deeply the loss of territory ceded to France in 1904 but accepted the settlement with much loyalty. Like the emir of Kano the new emir of Sokoto worked most loyally with the British administration. The province has been organized on the same principle as the other provinces of Northern Nigeria. A British resident of the first class has been placed at Sokoto and

assistant residents at other centres. British courts of justice have been established and British governors are quartered in the province. Detachments of civil police are also placed at the principal stations. The country has been assessed under the new system for taxes and is being opened as rapidly as possible for trade. After the establishment of British rule farmers and herdsmen reoccupied districts and the inhabitants of cities flocked back to the land, rebuilding villages which had been deserted for fifty years. Horse breeding and cattle raising form the chief source of wealth in the province. There is some ostrich farming. Except in the sandy areas there is extensive agriculture, including rice and cotton. Special crops are grown in the valleys by irrigation. Weaving, dyeing and tanning are the principal native industries. Fair roads are in process of construction through the province. Trade is increasing and a cash currency has been introduced.

The emir of Gando, treated on the same terms as the emirs of Kano and Sokoto, proved less loyal to his oath of allegiance and had to be deposed. Another emir was installed in his place and in the whole double province of Sokoto-Gando prosperity has been general. In 1906 a rising attributed to religious fanaticism occurred near Sokoto in which unfortunately three white officers lost their lives. The emir heartily repudiated the leader of the rising, who claimed to be a Mahdi inspired to drive the white man out of the country. A British force marched against the rebels, who were overthrown with great loss in March 1906. The leader was condemned to death in the emir's court and executed in the market place of Sokoto, and the incident was chiefly interesting for the display of loyalty to the British administration which it evoked on all sides from the native rulers. (See also Nigeria; Fula; and Hausa.)

See the Travels of Dr Barth (London 1857) ; Lady Lugard, A Tropical Dependency (London, 1905) ; P. L. Monteil, De Saint Louis a Tripoli par le lac Tchad (Paris, 1895) ; C. H. Robinson, Hausaland (London, 1896); The Annual Reports on Northern Nigeria, issued since

rby the Colonial Office, London; Sir F. D. Lugard, " Northern ria," in Geo. Journ. vol. xxiii., and Major J. A. Burdon, " The FuTani Emirates," ibid, vol xxiv. (both London, 1904). Except the last-named paper most of these authorities deal with many other subjects besides the Fula. (F. L. L.)

SOKOTRA (also spelt Socotra and formerly Socotora), an island in the Indian Ocean belonging to Great Britain. It is cut by 12 30′ N., 54 E., lies about 130 m. E.N.E. of Cape Guardafui and about 190 m. S.E. of the nearest part of the coast of Arabia and is on the direct route to India by the Suez Canal. It is 72 m. long by 22 m. broad and has an area estimated at from 2000 to 3000 sq. m. It is the largest and most easterly member of a group of islands rising from adjacent coral banks, the others being Abd el Kuri, The Brothers (Semha and Darzi), and Kal Farun.

Physical Features.— From the sea Sokotra has an imposing appearance. The centre culminates in a series of rugged pinnacles — the Haghier mountains, which rise to nearly 5000 ft. above a high (1500 ft.) abutting and undulating limestone plateau, deeply channelled by valleys. At many parts of the north coast the edges of this plateau reach the shore in precipitous cliffs, but in others low plains, dotted with bushes and date-palms, front the heights behind. The southern shore is bordered nearly its entire length by a belt of drifted sand, forming the Nuget plain. On this side of the island there are but one or two possible anchoring grounds, and these only during the north-east monsoon. On the north coast there are no harbours; but fairly safe anchorages, even in the north-east winds, are available off Hadibu or under Haulaf, a few miles distant, and at Kallansayia, at the north-west end of the island.

Geology. — The fundamental rocks of the island are gneisses, through which cut the feldspathic granites which form the Haghier massif. Through these, again, pierce other granites in dikes or lava flows, and overlying the whole are limestones of Cretaceous and Tertiary age, themselves cut through by later volcanic eruptions. " In the Haghier hills," to quote Professor Bonney, " we have probably a fragment of a continental area of great antiquity, and of a land surface which may have been an ‘ ark of refuge ‘ to a terres- trial fauna and flora from one of the very earliest periods of this world's history."

Climate. — From October to May the weather is almost rainless except in the mountains, where there are nightly showers and heavy mists. During this season the rivers, which are roaring torrents throughout the monsoon, are almost all lost in the dry, absorbent

plains. ■ The temperature of the coast area varies from 65 ° F. in the night to 85 F. in the day — in the hot season it may reach 95 F. ; and on the mountains (3500 it.), from 52° F. to 72° F. In the low grounds fever of an acute and hematuric form is very prevalent.

Flora and Fauna. — The fauna contains no indigenous mammals, a wild ass which roams the eastern plains, perhaps its oldest denizen, is probably of Nubian origin; while the domestic cattle, a peculiar, unhumped, small, shapely, Alderney-like breed, may be a race gradually developed from cattle imported at a distant period trom Sind or Farther India. There are 67 species of birds known from Sokotra, of which 15 are endemic; of 22 reptiles, 3 genera and 14 species are peculiar; and of the land and fresh-water shells, to whose distribution great importance attaches, 44 species out of 47 are confined to the island. Among the other invertebrate groups there is also a large proportion of endemic species.

The flora is even more peculiar than the fauna. Aloes, dragon's- blood (Dracaena), myrrh, trankincense, pomegranate, and cucumber (Dendrocycios) trees are its most famous species. The phanerogams number 570, apportioned to 314 genera, and of these over 220 species and 98 genera are unknown elsewhere. The flora and also (though to a less degree) the fauna present not only Asian and Central African affinities, but, what is more interesting, Mascarene, South African and Antipodean-American relationships, indicating a very different distribution of land and water and necessitating other bridges of communication than now exist. The natural history of Sokotra, unravelled by the study of its geology and biology, has been summarized by Professor Balfour as follows : —

" During the Carboniferous epoch there was in the region of Sokotra a shallow sea, in which was deposited, on the top of the fundamental gneisses of this spot, . . . the sandstone of which we have such a large development in Nubia. . . . During the Permian epoch Sokotra may have been a land surface, forming part of the great mass of land which probably existed in this region at that epoch, and gave the wide area for the western migration of life which presently took place, and by which the eastern affinities in Sokotra may be explained. In early and middle Tertiary times, when the Indian peninsula was an island, and the sea which stretched into Europe washed the base of the Himalayan hills, Sokotra was in great part submerged and the great mass of limestone was de- posited ; but its higher peaks were still above water, and formed an island, peopled mainly by African species — the plants being the fragmentary remains of the old African flora — but with an admixture of eastern and other Asian forms. Thereafter it gradu- ally rose, undergoing violent volcanic disturbance."

By this elevation " Madagascar would join the Seychelles, which in turn . . . would run into the larger Mascarene Islands. In this way, then, Africa would have an irregular coast-line, prolonged greatly south of the equator into the Indian Ocean, and running up with an advance upon the present line until it reached its north- west limit outside and south of Sokotra. Thence an advanced land surface of Asia would extend across the Arabian Sea into the Indian peninsula.'.' Sokotra thus " again became part of the mainland, though it is likely for only a short period, and during this union the life of the adjacent continent covered its plains and filled its valleys. Subsequently it reverted to its insular condition, in which state it has remained." The Antipodean-American element in the Sokotran flora probably arrived via the Mascarene Islands or South Africa from a former Antarctic continent.

Inhabitants. — The inhabitants, believed to number from 10,000 to 12,000, are composed of two, if not more, elements. On the coast the people are modern Arabs mixed with negro, Indian and European blood ; in the mountains live the true Sokotri, supposed to be origin- ally immigrants from Arabia, who have been isolated here from time immemorial. Some of them are as light-skinned as Europeans, tall, robust, thin-lipped, straight-nosed, with straight black hair; others are shorter and darker in complexion, with round heads, long noses, thick lips, and scraggy limbs, indicating perhaps the commingling of more than one Semitic people. Their manner of life is simple in the extreme. Their dwellings are circular, rubble- built, flat, clay-topped houses, or caves in the limestone rocks. They speak a language allied to the Mahra of the opposite coast cf Arabia. Both Mahra and Sokotri are, according to Dr H. Miiller, daughter-tongues of the old Sabaean and Minaean, standing in the same relation to the speech of the old inscriptions as Coptic does to that of the hieroglyphics. The Sokotran tongue has been, he believes, derived from the Mahra countries, but it has become so differentiated from the Mahra that the two peoples understand each other only with difficulty. Sokotri is the older of the two languages, and retains the ancient form, which in the Mahran has been modified by Arabic and other influences. Hadibu, Kallansayia and Khadup are the only places of importance in the island. Hadibu, or Tamarida (pop. about 400) the capital, is picturesquely situated on the north coast at the head of the open bay of Tamarida on a semicircular plain enclosed by spurs of the Haghier mountains. A dense grove of date palms surrounds the village.

Trade and Products. — The chief export is ghi or clarified butter, which is sent to Arabia, Bombay and Zanzibar. Millet, cotton and tobacco are grown in small quantities. The most valuable vegetable products are aloes and the dragon's-blood tree. The Sokotran aloe

is highly esteemed ; in the middle ages the trade was mostly in these products and in ambergris. The people live mainly on dates and milk. They own large numbers of cattle, sheep and goats. Dates are both home-grown and imported.

History. — Sokotra has claims to be reckoned one of the most ancient incense-supplying countries. Among 'the " harbouTS of incense " exploited by various Pharaohs during some twenty- five centuries it is impossible to believe that the island could be missed by the Egyptian galleys on their way to the" Land of Punt," identified by several writers with Somaliland; nor that, though the roadsteads of the African coast were perhaps oftener frequented, and for other freights besides myrrh and frankin- cense, the shores of Sokotra were neglected by such ardent explorers as those, for instance, of Queen Hatshepsut of the 18th dynasty. They would have found on the island, which is probably referred to under the name " Terraces of Incense " (from its step-like contours), the precious'" auta trees " — whose divine dew, for use in the service of their gods, was their special quest — in greater abundance and in a larger number of species than any other country.

To the Greeks and Romans Sokotra was known as the isle of Dioscorides; this name, and that by which the island is now known, are usually traced back to a Sanskrit form, Dvlpa-Sak- hadhara, " the island abode of bliss," which again suggests an identification with the vrjaoi evSaifiovts of Agatharchides (§ 103). The. Periplus of the Erythraean Sea speaks of the island as peopled only in One part by a mixed race of Arab, Indian and Greek traders. It was subject to the king of the Incense Country, and was a meeting-place of Arabian and Indian ships. Cosmas in the 6th century says that the people spoke Greek and were largely Christian, with a bishop sent from Persia. The Arab geographers also had a tradition of an early Greek settlement (which they ascribe to Alexander), but also of later Persian influence, followed by a settlement of Mahra tribes, who partly adopted Christianity. The Sokotri appear to have remained Nestorian Christians, with a bishop under the metro- politan of Persia, through the middle ages, though there are indi- cations pointing to a connexion with the Jacobite church. As early as the 10th century Sokotra was a haunt of pirates; in the 13th century Abulfeda describes the inhabitants as " Nestorian Christians and pirates " but the island, was rather a station of the Indian corsairs who harassed the Arab trade with the Far East. The population seems in the middle ages to have been much larger than it is now; Arabian writers estimate the fighting men at 10,000.

The Portuguese under Tristao da Cunha and Albuquerque seized Sokotra in 1507 in pursuance of the design to control all' the trade routes between Europe and the East; Sokotra being supposed to command the entrance to

the Red Sea. But on the capture of Goa and the building of a fortress there Albuquerque caused the fort which da Cunha had had built at Coco (Tamarida to be dismantled (1511), and though Portuguese ships subsequently raided the island they made no other settlement on it. The Portuguese found that Sokotra was held by Arabs from Fartak, but the " natives " (a different race) were Christians, though in sad need of conversion. This pious work Portuguese priests attempted, but with scant success. However, as late as the middle of the 17th century the Carmelite P. Vincenzo found that the people still called themselves Christians, and had a strange mixture of Jewish, Christian and Pagan rites. The women were all called Maria. No trace of Christi- anity is now found in the island, all the inhabitants professing Islam.

A certain dependence (at least of places on fhe coast) on some sovereign of the Arabian coast had endured before the occupa- tion of Tamarida by da Cunha, and on the withdrawal of the Portuguese this dependence on Arabia was resumed. In the 19th century Sokotra formed part of the dominions of the sultan of Kishin. The opening of the Suez Canal route to India, led to the island being secured for Great Britain. From 1876 onward a small subsidy has been paid to the sultan of Kishin by the authorities at Aden; and in 1886 the sultan concluded

a treaty formally placing Sokotra and its dependencies under the protection of Great Britain. Sokotra is regarded as a depen- dency of Aden, but native rule is maintained, the local governor or viceroy of the sultan of Kishin being a member of that chief's family, and also styled sultan. Since it came under British control the islarfd has been visited by various scientific expedi- tions. Professor Bayley Balfour made an investigation in 1880, expeditions were headed by Drs Riebeck and Schweinf urth in 188 j, by Theodore Bent in 1897, and by Dr H. O. Forbes and Mr Ogilvie-Grant (who also visited Abd-el-Kuri) in 1898-1899. Simultaneously with the last named a further expedition, conducted by Professor D. H. Muller, under the auspices of the Imperial Academy of Sciences of Vienna, visited Sokotra, Abd-el-Kuri and some other islets of the group to investigate their geology and languages. With the Indian government the relations of the Sokotri have occasionally been strained, owing to their -nratical tendencies.

Abd-el-Kuri island lies 60 m. W.S.W. of Sokotra, and 53 m. E.N.E. from Cape Guardafui, is 20 m. long by 3! m. in width. At either end the island is hilly, the central part being a low plateau. On the north side is a sandy beach ; on the south, cliffs rise abruptly from the ocean. The highest part of

the island is towards its eastern end, where the hills rise to 1670 ft. It is largely arid and there are no permanent streams. Its zoology resembles that of Sokotra, but the fauna includes land shells and scorpions peculiar to Abd-elr KurL The inhabitants, who number one to two, hundred, speak Sokotri and Arabic and are chiefly engaged in diving for pearl shell on the Bacchus Bank N.E. of the island. They live chiefly on turtle (which abounds in the island), fish and molluscs. The land is nowhere cultivated.

Kal Farun is the name of two rocky islets rising nearly 300 ft. above the sea 13 m. N.N.E. of the western end of Abd-el-Kuri. Birds flock to them in great numbers; in consequence they are completely covered with guano, which gives them a snow-white appearance. The Brothers (often called by the older navigators The Sisters) lie between Abd-el-Kuri and Sokotra. Semha is 6j m. long and 3 m. broad. It has rocky shores and rises in a table-shaped mountain to 244O ft. As in Abd-el-Kuri ambergris is found on its shores and turtles abound. There is running water all the year. It is a fishing ground of the Sokotri. Darzi lies 9 m. E. by S. of Semha, is 3J m. long by I m. broad and rises almost perpendicularly from the sea to 1500 ft. The top is flat. The coral banks which surround Sokotra and The Brothers are united and are not more than 30 fathoms below sea-level; a valley some 100 fathoms deep divides them from the bank around Abd-eUKuri, while between Abd-el-Kuri and Cape Guardafui are depths of over 500 fathoms.

See, for the history of Sokotra, Yule, Marco Polo (1903 ed.) ii- 406-410, and, besides the authorities there cited, Yakut, s.v. ; Hamda.ni p. 52 ; Kazwini ii. 54. Consult also the Commentaries of Afonso Palboquerque, W. de G. Birch's translation (London 1875- 1884). For the state of the island at the beginning of the 18th century see the account of the French expedition to Yemen in 1708 (Viaggio neW Arabia Felice: Venice, 1721); and', for the 19th' 'century, J. R. Wellsted, City of the Caliphs, vol. il. (London, 1840), and Mrs J. T. Bent, Southern Arabia, Soudan and Sokotra (London, 1900). For the topography, &c, see Red Sea and Gulf of Aden Pilot (5th ed. London, 1900). For special studies see I. B. Balfour, Botany of Socoira (Edinburgh, 1888); G. Schweinfurth, Das Volk von Socotra (Leipzig, 1883) ; H. O. Forbes (edited by), The Natural History of Sokotra and Abd-el-Kuri (Liverpool, 1903); F. Kossmat, Geologic ■ der Inseln Sokotra, Semha und Abd el Kuri (Vienna, 1902) ; R. V. Wett- stein in Vegetationsbilder (3rd series, 5th pt., Jena, 1906). See also J. Jackson, Socotra, Notes bibliographiques (Paris, 1892), a complete bibliography to the year of publication. (H. O. F. ; X.)

SOLANACEAE, in botany, an order of Dicotyledons belonging to the sub-class Sympetalae (or Gamopetalae) and to the series Tubiflorae, containing 75 genera with about 1500 species, widely distributed through the tropics,

but passing into the temperate zones. The chief centre of the order lies in Central and South America; 32 of the genera are endemic in this region. It is represented in Britain by three genera including 4 species: Hyoscyamus m'ger "(henbane), Solanum Dulcamara (Bittersweet) and 5. nigrum and Atropa Belladonna (Deadly Nightshade).

The plants are herbs, shrubs or small trees. Solanum nigrum, a common weed in waste places, is a low-growing annual herb; 5. Dulcamara is an irregularly climbing herb perennial by means of a widely creeping rhizome; Atropa Belladonna is a large perennial herb. The genus Solanum, to which belong more than half the rtifmber of species in the order, contains plants of very various habits including besides herbs, shrubs and trees. The leaves are generally alternate, but in the- flower-bearing parts of the stem are

often in pairs, an arrangement which, like the extra-axillary position of the flowers or cymes, results from a congenital union of axes. Thus in Datura (thorn apple) (fig. I A), where the branching is dichasial, the leaf which originates at any given node becomes

Fig. 1. — Diagrams illustrating branch development in Solanaceae, in A. Datura Stramonium, B. Atropa Belladonna. I, II, III, Flowers on inflorescences of successive orders; 6, bract of I; a, /S, bracts of II; a', @', bracts of III, and so on. In A the branching is dichasial and the bracts are adnate to their axillary shoots up to the points at which the next branches arise ; thus o and /S appear to arise from axis II, though in reality originating on axis I. In B the branching is. cincinnal, one of the two branches at each node is undeveloped and its, bract a, a', a" is smaller than the other member of the pair, /S, /?', which is adnate to and apparently carried up on its axillary branch.

raised upon its axillary shoot as far as the next higher node, from which it appears to spring. In Atropa Belladonna (fig. I B) one of the branches at each node is undeveloped and there is a pair of unequal leaves; the smaller subtends the branch which has not developed, the larger has been carried up from the node below.

An interesting anatomical feature is the presence in the stem of bicollateral bundles— that is, the vascular bundles have phloem on the inside as well as on the outside of the xylem.

The hermaphrodite, generally regular, flowers have the parts in fives, 5 sepals, 5 petals, 5 stamens in alternating whorls, and two carpels, which are generally placed obliquely (see fig. 2 , floral diagram). The sepals persist and often become enlarged in the fruit. The

Fig. 2.— Floral diagram of Fig. 3. — Floral diagram of

Solanum — the arrow indicates Schizanthus—th& arrow indicates

the oblique symmetry of the the oblique symmetry. Two

flower: stamens only are functional.

corolla is regular and rotate as in Solanum (fig. 2), or bell-shaped as in Atropa, or somewhat irregular as in Hyoscyamus; in the tribe Salpiglossideae, which forms a link with the closely allied order Scrophulariaceae, it is zygomorphic, form- ing, e.g. as in Schizanthus (fig. 3), a two- lipped flower. The stamens are inserted on the corolla tube and alternate with its lobes ; in zygomorphic flowers only two or four fertile stamens are present; the bilocular anthers open by slits or pores (fig. 4). The flowers are generally conspicuous and adapted to insect pollination ; honey is secreted on the disk at the base of the ovary or at the bottom of the corolla tube between the stamens. The ovary is usually bilocular, but in Capsicum becomes uni- locular above, while in some cases an in-growth of a secondary septum makes it 4-celled as in Datura, or irregularly 3- to 5-celled as in Nicandra. The anatropous ovules are generally numerous on swollen axile placentas, sometimes few as in Cestrum, a large American geflus with tubular flowers, species of which are grown in Britain as green-house plants; the simple style bears a bilobed or sometimes capitate stigma (fig. 5). The fruit is a many-seeded berry, as in Solanum, or

Fig. 4.— Stamen of a species of Solanum, showing the divergence of the anther-lobes at the base, and the dehis- cence by pores at the apex a.

capsule, as in Datura, where it splits lengthwise, and Hyoscyamus (fig.

6), where it opens by a transverse lid forming a pyxidium. The embryo /-ˆ is bent or straight and embedded in endo-

sperm. The persistent calyx may serve to protect the fruit or aid in its distribution, as in the bladdery structure enveloping the fruit of Physalis or the prickly calyx of species of Solatium.

The order is divided into 5 tribes; the division is based on the greater or less curvature of the embryo, the number of ovary cells and the regular or zygomorphic character of the flower. The great majority of the genera belong to the tribe Solaneae, which is characterized by a 2-celled ovary.

Lycium is a genus of trees or shrubs, often thorny, with a cylindrical or narrowly bell- shaped corolla and a juicy berry; L. europ- aeum is a straggling climber often cultivated under the name of tea-plant. For Atropa see Nightshade; A. Belladonna yields the drug atropin. For Hyoscyamus see Hen- bane. Physalis, with 45 species mostly in

Fig. 5. — The pistil of Tobacco (Nicotiana Ta- bacum), consisting of the ovary 0, containing ovules, the style s, and the capitate stigma g. The pistil is placed on the receptacle r, at the extremity of the pe- duncle.

Fig. 6. — Seed-vessel (pyxidium) of Henbane (Hyoscyamus niger) opening by circumscissile dehis- cence.

the warmer parts of North and South America, includes P. alkekengi, " winter cherry," and P. peruviana, " Cape gooseberry." Capsicum (q.v.) is widely cultivated forits fruit, which are the so-called chillies. Solatium contains 900 species, among which are S. tuberosum (potato; q.v.), S. Lycopersicum (tomato-; q.v.), and the two British species already mentioned. For Mandragora see Mandrake. To the tribe Datureae, characterized by a 4-celled ovary, belongs Datura; D. Stramonium (thorn apple), sometimes found as an escape in Britain, is officinal. Nicotiana, to which belong the tobacco plant (iV. tabacum) and other cultivated species, and Petunia, are American genera belonging to the tribe Cestreae, in which the embryo is straight or only slightly bent, as it is also in the tribe Salpiglossideae, which is characterized by the zygomorphy of the flowers; Salpiglossis and Schizanthus are known in cultivation.

SOLAR, SOLLER (Lat. solarium, Ft.- galetas, Ital. solaio), in architecture, a room in some high situation, a loft or garret, also an elevated chamber in a church from which to watch the lamps burning before the altars. The Latin solarium was used principally of a sundial, but also of a sunny part of a house.

SOLARIO, ANTONIO (c. 1382-1455), Italian painter of the Neapolitan school, commonly called Lo Zingaro, or The Gipsy. His father is said to have been a travelling smith. To all appearance Antonio was born at Civita in the Abruzzi, although it is true that one of his pictures is signed " Antonio de Solario Venetus," which may possibly be accounted for on the ground that the signature is not genuine. Solario is said to have gone through a love-adventure similar to that of the Flemish painter, Quintin Massys. He was at first a smith, and did a job of work in the house of the prime Neapolitan painter Colantonio del Fiore; he fell in love with Colantonio 's daughter, and she with him; and the father, to stave him off, said if he would come back in ten years an accomplished painter the young lady should be his. Solario studied the art, returned in nine years, and

claimed and obtained his bride. The fact is that Colantonio' del Fiore is one of those painters who never existed; consequently his daughter never existed, and the whole story, as relating to these particular personages, must be untrue. Whether it has any truth, in relation to some unidentified painter and his daughter, is a separate question which we cannot decide, Solario made an extensive round of study— first with Lippo Dalmasio in Bologna, and afterwards in Venice, Ferrara, Florence and Rome. On returning to Naples he rapidly took the first place in his art. His principal performance is in the court of the

monastery of S. Severino-ˆ-twenty large frescoes illustrating the life- of St Benedict, now greatly decayed; they present a vast variety of figures and details, with dexterous modelling and colouring. Sometimes, however, Lo Zingaro 's colour is crude, and he generally shows weakness of draughtmanship in hands and feet. His tendency is that of a naturalist — the heads lifelike and individual, and the landscape backgrounds better invented and cared for than in any contemporary. In the Studj gallery of Naples are three pictures attributed to this master, the most remarkable one being a "Madonna and Child Enthroned with Saints." The heads here are reputed to be mostly portraits. Solario initiated a mode of art new in Naples; and the works painted between his time and that of Tesauro (c. 1470) are locally termed " Zingareschi." He had many scholars, but not of pre-eminent standing — Nicola Vito, Simone Papa, Angiolillo Roccadirame, Pietro and Ippolito dal Donzello. It has. often been said that Solario painted in oil, but of this there is no evidence.

SOLAR SYSTEM, in astronomy, the group of heavenly bodies, comprising the sun and the bodies which move around the sun as a centre of attraction, of which the Earth is one. These bodies may be classified as follows: first the Sun, 0, distinguished as containing much the greater part of all the matter composing the system, being more than 600 times as massive as all the other bodies combined. It is this great mass which makes it the central one of the system. It is also, so far as is known, the only incandescent body of the system, and therefore the only one that shines by its, own light. Secondly, planets. The bodies of this class consist of eight major planets moving round the sun at various distances, and of an unknown number of minor planets, much smaller than the major planers, forming a separate group. Thirdly, satellites., or secondary planets revolving around the major planets, and therefore accompanying them in their revolutions around the sun. A fourth class of bodies, the constitution of which is still in some doubt, comprises comets and meteors. These differ in- that comets are visible either in a telescope or to the naked eye, and seem to be -either wholly or partially, of .a nebulous or gaseous character, while meteors are, individually at least, invisible to us except as they become incandescent by striking the atmosphere of the earth. It is, however,

an open question whether a comet is other than an accumulation of meteoric bodies (see Comet).

The major planets are separated into two groups of four each, between which the minor planets, for the most part, revolve. The arrangement of the major planets, with the- numbers of their respective satellites thus far known, in the order of distance from the sun, is as follows: —

The first group in order— the smaller major ˆplanets- comprises :~-

Mercury, g , with, no known satellite;

Venus, 9, with no known satellite;

The Earth, ©, with one satellite, the moon;

Mars, cj 1 , with two satellites. Outside of this group lies the zone of minor planets or asteroids.

The outer group of major planets comprises: —

Jupiter, %, with eight satellites;

Saturn, 1?, with ten satellites;

Uranus,. <§ or ift, with four satellites;

Neptune, ˆ , with one satellite. The distances separating the individual orbits in each group seem to approximate to a certain order of progression, expressed in Bode's law (see Bode). But there is an obvious gap between the two groups of major planets which is filled by the group of minor planets. Taking the mean distance of this group as that of a planet, the distance of the major planets closely , approximates tp Bode's law, except in the case-. of -Neptune!.

A remarkable feature of the solar system, which distinguishes it from all other known systems in the, universe, is the symmetry of arrangement and motion of its greater bodies. All the major planets and many of the minor planets revolve in elliptic

orbits so nearly circular in form that the unaided eye would not notice the deviation from that form. But as the orbits are not centred on the sun, which is in a focus of each, the displacement of the seeming circle would be

readily seen in the case of Mercury and of Mars. The same statements are true of the orbits of the satellites around their primaries. The major planets all move around the sun in the same direction, from west to east, in orbits but little inclined to each other. All the known minor planets have the same common direction, but their orbits generally have a greater eccentricity and mutual inclination. The general rule is that the satellites also move round in the same direction, and in orbits of moderate inclination. Exceptions occur in the case of the satellites of Uranus, which are nearly perpendicular to the plane of the orbit. The satellite of Neptune, and one satellite, Phoebe, of Saturn, are also quite exceptional, the direction of motion' being retrograde.

For the elements of the orbits, and the general character of the several planets see Planet. Details as to each are found under the respective names of the several planets. (S. N.)

SOLDER (derived through the French from Lat. soldare, to make solidus, firm), an alloy easily melted and used for uniting as by a metallic cement two metal surfaces, joints, edges, &c. (See Brazing and Soldering.)

SOLE (Solea), the most valuable of European flat-fishes. 1 For most people who look at fish merely from the culinary point of view, soles are of two kinds: true soles, with such varieties as Dover soles and Brixham soles (slips being the name applied to young specimens), and lemon soles, an inferior fish, which is no sole at all, but a sort of dab (Glyptocephalus microcephalus). Leaving out the latter, there are five species on the British coasts; the common sole (Solea vulgaris) the French sole, or sand sole lemon sole of Yarrell (5. lascaris), the thick-back (S. variegata), and the solenette or little sole (S. luted). All these agree in the right side being coloured and bearing the eyes, in the elongate form, in the small eyes (separated by a space covered with scaly skin, in the small, twisted mouth, with minute teeth on the colourless side only), and with the snout projecting beyond the mouth and more or less hooked. All true soles are. excellent, but the common species is the only one which, from its larger size, growing to a length of 26 in. and attaining maturity at a length of about 10 in., regularly appears on all the markets. It occurs from the south-west coast of Scandinavia, Mecklenburg and Great Britain to the Mediterranean. Most of the best fishing grounds for soles lie comparatively near land, though the spawning takes place some miles away.

Much information on the life history of the sole will be found in the monograph by J. T. Cunningham (Plymouth, 1890).

SOLEMN (Lat. sollemnis, sollennis, less correctly solennis, yearly, annual; from sollus = totus, whole, entire, Gr. &\os, and annus, year), properly that

which occurs annually, hence at stated intervals, regular, established; the term being particularly used of religious rites or ceremonies which recur at stated inter- vals, hence festive, sacred, marked by religious ceremony or ritual, and so grave, impressive, serious, the most general current usage. Another branch of meaning stresses the formal, customary aspect; and hence in such phrases as " solemn act," probate in " solemn form," it means that which is done with all due forms and ceremonies.

SOLENT, THE, a strait of the English Channel, between the mainland (the coast of Hampshire, England), and the north- western coast of the Isle of Wight, forming the western entrance to Southampton Water, Spithead being the eastern. Its length, from the eastern shore of Southampton Water to the Needles rocks off the western extremity of Wight, is 15 m. The general breadth is from 25 to 3 m., but between Stone Point on the mainland and Egypt Point on the north coast of Wight it narrows to if m.; and 3$ m. north of the Needles there springs from the mainland a great shingle bank, mostly only a few yards in breadth above water, but nearly 2 m. in length.

1 The American sole (Achirus fasciatus) is a small flat-fish of inferior quality.

It reduces the breadth of the Solent to a little over £ m., and broadens at the end, on which stands Hurst Castle, an important fortification daiing from the time of Henry VIII. Here Charles I. was imprisoned in 1648. The coast of the mainland is low but picturesque, and is broken by the shallow estuaries of the Beaulieu River and the Lym, with the small port of Lymington upon it. The coast of Wight rises more steeply. On this side the Medina estuary opens northward, and those of the Newtown and the Yar north-westward into the strait. At the mouth of Southampton Water is a projecting bar resembling but smaller than that of Hurst Castle, and like it bearing a Tudor fortress, Calshot Castle. The Solent is frequently the scene of yacht races. The configuration of the coast causes a double tide in the strait.

SOLESMES, a village of western France on the left bank of the Sarthe in the department of Sarthe, 29 m. W.S.W. of Le Mans by road. In 1010 a priory was founded at Solesmes and placed under the authority of the abbey of La Couture of Le Mans. Suppressed at the revolution, it was established as a Benedictine monastery in 1830. In 1837 it was raised to the rank of abbey and became a centre of learning ; the music here was also famous. A nunnery was afterwards founded beside it, but both institutions were abandoned after the passing of the associations law in 1001. The monastery, rebuilt at the end of the 19th century, forms a lofty mass of buildings on the river bank. Its church (13th and 16th centuries) is interesting only for the possession of two masterpieces of sculpture of

uncertain authorship, executed approximately between 1490 and 1550. The most striking represents the burial of Christ and is sheltered by a stone structure, the front of which is beautifully carved. An arched opening in this front reveals the central group of eight figures surrounding the tomb, that of Mary Magdalen in the foreground being remarkably lifelike and expressive. The other work similarly enclosed represents the burial of the Virgin and is the later of the two in date and in the pure Renais- sance style. Sculptures representing Jesus among the Doctors and other scenes are also in the church.

SOLETO, a village of Apulia, Italy, in the province of Lecce, from which it is 11 m. S. by rail, situated 299 ft. above sea- level. Pop. (1901), 3349. The Romanesque church of S. Stefano contains Byzantine frescoes of the 14th century similar to those in the subterranean chapel of the Santi Stefani at Vaste, south of Otranto, and others showing the formation of an independent style. The fine, richly decorated campanile adjoining the former cathedral was erected in 1397.

SOLEURE (Ger. Solothum), one of the cantons of north- western Switzerland. Its total area is 305-5 sq. m., of which 294 sq. m. are reckoned as "productive," 111-3 sq. m. being covered by forests and 29 sq. m. by vineyards Save two small districts in its southern portion the whole canton is situated in the Jura range, while it is said to be the most irregular in shape of all the Swiss cantons, this being accounted for by the fact that it consists simply of the territories won at different dates by the town from which it takes its name. It includes most of the Aar valley between the towns of Bienne and Aarau, neither of which is in the canton, while in its northern portion the waters join the Birs River, and in its southern portion is the last bit of the Emme before its junction with the Aar. It comprises three isolated districts, of which one (Steinhof) on the south is an " enclave " in the canton of Bern, while the others, Hofstet- ten, that includes the famous pilgrimage resort of Mariastein, and Klein Ltitzel, are on the Alsatian frontier, and bounded by the cantons of Bern and of Basel. The highest point in the canton is the Hasenmatt (4748 ft.) which forms the culminating summit of the Weissenstein ridge, that rises just north-west of the town of Soleure, and boasts of an hotel well-known as a great centre for the air and whey cure. The canton is well supplied in its southern portion with railways, the main line from Bienne to Aarau running through it past the great junction of Olten, where the direct lines from Lucerne by the St Gotthard, from Bern, from Zurich, and from Basel all unite. Formerly the districts composing the canton were in the dioceses cf Lausanne,

Basel and Constance, but since the complete reorganization of 1814 they are all in the diocese of Basel, the bishop of which has his chair in Soleure. In 1900 the population was 100,762, of whom 97,930 were German-speaking, 1912 French-speaking, and 829 Italian-speaking, while 69,461 were " Catholics " (the census does not distinguish between Romanists and Christian Catholics, who are still fairly strong here), 31,012 Protestants, and 159 Jews. The capital is Soleure, while the only other important town is Olten (6969 inhabitants). Between Soleure and Granges or Grenchen (5202 inhabitants) is the village of Selzach, where since 1893 a passion-play has been performed every summer by the inhabitants.

Till about 1850 the canton was mainly agricultural and pastoral, its pastures numbering 209, capable of supporting 4179 cows and of an estimated capital value of 2,395,215 francs. Nowadays it is distinguished for the variety of its industries, especially in and around Soleure and Olten, among them being watch-making, shoe-factories, cotton-spinning and cement factories.

The canton is divided into ten administrative districts, that comprise 132 communes. The present cantonal constitution dates from 1887, but was revised as to some important points in 1895. The Kantonsratj or legislative assembly, is elected (since 1895 according to the principles of proportional repre- sentation) by all citizens over twenty years of age, in the pro-portion of one member to 800 inhabitants. Since 1895 the people have elected the Regierungsrat or executive, consisting of five members. In both cases the period of office is four years, though on the demand of 4000 citizens a popular vote must be taken as to whether the existing members shall continue to sit or not. In the canton the " obligatory refer- endum " and the " initiative " have obtained since 1875. By the former all laws passed by the legislative assembly, and all financial resolutions involving the expenditure of 100,000 francs, or of an annual sum of 15,000 francs, must be approved by a popular vote. By the latter 2000 citizens can compel the legislative assembly to consider any proposal for making a new law or for amending an old one. Further, the demand of the majority of the assembly or of 3000 citizens is sufficient to necessitate a popular vote as to the advisability of revising the constitution, the revised draft itself requiring a further popular vote. The two members of the federal St&nderat and the five members of the federal Nationalrat are also chosen by a popular vote.

Authorities. — J. Amiet, Das St Ursus Pfarr-Stift d. Sladt Soleure, 6 pts. (Soleure, 1 878-1 890), and Die Grundungs-Sage der Schwester- siddte, Solothurn, Zurich, und Trier (Soleure, 1890); G. Bloch, Bilder aus d, Amba.ssadorenherrscha.jt in Soleure, 1554-1791, (Biel, 1898); W. Flury,

Die industrielle Entwickelung d. Kant. S. (Soleure, 1908); K. Meisterhans, Alteste Geschichle d. Kant. Soleure bis 687 (Soleure, 1900) ; J. R. Rahn, Die Mittelalt. Kunstdenkmdler d. Cant. Soleure (Zurich, 1893) ; K. E. Schuppli, Geschichle der Stadtverfassung von Soleure (Basel, 1897); P. Strohmeier, Der Kant. Soleure (St Gall and Bern, 1836); A. Striiby, Die Weidewirthschaft im Kant. Soleure (Soleure, 1896); and E. Tatarinoff, Die Betheiligung Solclhurns am Schwabenkrieg, 149Q (Soleure, 1899).

(W. A. B. C.)

SOLEURE, the capital of the Swiss canton of that name, is an ancient little town, almost entirely situated on the left bank of the Aar. It was a Roman castrum, remains of which still exist, on the highway from Avenches to Basel, while its position at the foot of the Jura and close to the navigable portion of the Aar has always made it a meeting-point of various routes. Five railway lines now branch thence, while a sixth has been recently added, the tunnel beneath the Weissenstein to Moutier Grandval having been completed. It was strongly fortified in 1667-1727, but since 1830 these defences have been removed for reasons of practical convenience. Its chief building is the minster of SS Ursus and Victor, which dates from the 18th century, though it stands on the site of a far older edifice. Since 1828 it has been the cathedral church of the bishop of Basel, but in 1874 its chapter was suppressed. The ancient clock tower has a quaint 16th-century clock, while the older portions of the town-hall date still further back. The early

17th-century arsenal contains the finest collection of aimour and old weapons in Switzerland, while the modern museum houses a splendid collection of fossils from the Jura, the specimens of Alpine rocks collected by F. J. Hugi (1796-1855), a native of Soleure, and a Madonna by the younger Holbein. The building now used as the cantonal school was formerly the residence of the French ambassadors to the Swiss confederation from 1530 to 1797. There are some fine 16th-century fountains in the little town, which in its older portions still keeps much of its medieval aspect, though in the modern suburbs and in the neighbouring villages there is a certain amount of industrial activity. The Polish patriot Kosciusko died here in 181 7; his heart is preserved at Rapperswil, but his body is buried at Cracow. In 1900 the town had 10,025 inhabitants, almost all German-speaking, while there were 6098 "Catholics" (either Romanists or Christian Catholics), 3814 Protestants and 81 Jews. In 1904 there were twenty churches or chapels in the town itself. One mile north of the town is the Hermitage of St Verena, in a striking rock gorge, above which rises the Weissenstein ridge, the hotel on which (4223 ft.) is much frequented in summer for the air and whey cure as well as for the glorious Alpine panorama that it commands.

A 16th-century rhyme claims for the town of Soleure the fame of being the oldest place in " Celtis " save Trier. Certainly its name, " Salodurum," is found in Roman inscriptions, and its position as commanding the approach to the Rhine from the south-west has led to its being more than once strongly fortified. Situated just on the borders of Alamannia and Burgundy, it seems to have inclined to the allegiance of the latter, and it was at Soleure that in 1038 the Burgundian nobles made their final submission to the German king, Conrad II. The medieval town grew up round the house of secular canons founded in the 10th century in honour of St Ursus and St Victor (two of the Theban legion who are said to have been martyred here in 302) by Queen Bertha, the wife of Rudolph II., king of Burgundy, and was in the diocese of Lausanne. The prior and canons had many rights over the town, but criminal jurisdiction remained with the kings of Burgundy, then passed to the Z&hringen dynasty, and on its extinction in 12 18 reverted to the emperor. The city thus became a free imperial city, and in 1252 shook off the jurisdiction of the canons and took them under its protection. In 1295 we find it allied with Bern, and this connexion is the key to its later history. It helped Bern in 1298 in the great fight against the nobles at Dornbuhl, and again at Laupen in 1339 against the jealous Burgundian nobles. It was besieged in 13 18 by Duke Leopold of Austria, but he was compelled to withdraw. In the 14th century the government of the town fell into the hands of the gilds, whose members practically filled all the public offices. Through Bern, Soleure was drawn into association with the Swiss Confederation. An attempt to surprise it in 1382, made by the Habsburgs, was foiled, and resulted in the admittance of Soleure in 1385 into the Swabian League and in its sharing in the Sempach War. Though Soleure took no part in that battle, it was included in the Sempach ordinance of 1393 and in the great treaty of 1394 by which the Habsburgs renounced their claims to all territories within the Confederation. In 141 1 Soleure sought in vain to be admitted into the Confederation, a privilege only granted to her in 148 1 at the diet of Stans, after she had taken part in the Aargau, Italian, Toggenburg, and Burgundian Wars. It was also in the 15th century that by purchase or conquest the town acquired the main part of the territories forming the present canton. In 1529 the majority of the " communes " went over to the reformed faith, and men were sent to fight on Zwingli's side at Kappel (1531), but in 1533 the old faith regained its sway, and in 1586 Soleure was a member of the Golden, or Borromean, League. Though the city ruled the surrounding districts, the peasants were fairly treated, and hence their revolt in 1653 was not so desperate as in other places. Soleure was the usual residence of the French ambassador from 1530 to 1797, and no doubt this helped on the formation of a "patriciate," for after 1681 no fresh citizens were admitted, and later

we find only twenty-five ruling families distributed over the eleven gilds. Serfage was abolished by Soleure in 1785. The old system of the city ruling over eleven bailiwicks came to an end in March 1708, when Soleure opened its gates to the French army, and it was one of the six " directorial " cantons under the 1803 constitution. In 1814 the old aristocratic government was set up again, but this was finally broken down in 183 1, Soleure in 1832 joining the league to guarantee the maintenance of the new cantonal constitutions. Though distinctly a Roman Catholic canton, it did not join the " Sonderbund," and voted in favour of the federal constitutions of 1848 and 1874.

(W. A. B. C.) SOLFATARA, a volcanic vent emitting vapours chiefly of sulphurous character, whence the name, from the Italian solfo ˆsulphur). The typical example is the famous Solfatara, near Puzzuoli, in the Phlegraean Fields, west of Naples. This is an old crater which has not been in active eruption since A. d. 1108, but which is continuously exhaling heated vapours, chiefly hydrogen sulphide, sulphur dioxide and steam. These issue from orifices in the crust, on the walls , of which are yellow incrustations of sublimed sulphur, sometimes orange-red by association with arsenic sulphide, whilst the trachytic rocks of the volcano are bleached and corroded by the effluent vapours, with formation of such products as gypsum and alum. Sal ammoniac occurs among the sublimates. The term solfatara has been extended to all dormant volcanoes of this type; and a ' volcano which has ceased to emit lava or ashes but still evolves heated vapours, is said to have passed into the " solfataric stage." Examples are to be found in many volcanic districts. By French geologists the term soufri&re is used instead of the Italian solfatara. (See Volcanoes.)

SOLFERINO, a village of Lombardy, Italy, in the province of Mantua, 5 m. S.W. of San Martino della Battaglia (a railway station 72 m. E. of Milan on: the line to Verona), situated 410 ft. above sea-level, on the south-west edge of the hills bordering the Lake of Garda on the south. Pop. (1901), 1350. It was the scene of a battle fought on the 24th of June 1859 between the allied Franco-Sardinian army under Napoleon III. and Victor Emanuel, and the Austrian army commanded by Francis Joseph II., in which, after a severe contest, the latter retired over the Mincio "(see Italian Wars). The battle fought by the Sardinians on the left wing of the allied army is often called by the separate title of San Martino, from a hamlet near the Brescia-Verona railway, about which it was fought. From this battle, a certain shade of blue was designated by the name of Solferino, and was very popular for some years, though now, unlike its companion " magenta," it is forgotten.

SOLI (mod. Mezetlii), an ancient town of Asia Minor, on the coast of Cilicia, between the rivers Lamus and Pyramus, from each of which it is about 62 m. Colonists from ˆrgos in Greece and Lindus in Rhodes are described as the founders of the town, which is first mentioned at the time of the expedition of the younger Cyrus. In the 4th century B.C. it was so wealthy that Alexander exacted a fine of 200 talents. In the Mithradatic War, Soli was destroyed by Tigranes, but it was subsequently rebuilt by Pompey, who settled there many of the pirates whom he had captured, and called the town Pompeiopolis. Soli was the birthplace of Chrysippus the Stoic and of the poets Philemon and Aratus. The bad Greek spoken there gave rise to the term

SOLI, a Greek city on the north coast of Cyprus, lying at Soliais in the metalliferous country round Karavortasi near Lefka, on the south side of M6rphou Bay. Its kingdom was bounded by the territories of Marion, Paphos, Tamassus and Lapathus. It was believed to have been founded after the Trojan War (c. 1180) by the Attic hero Acamas; but no remains have been found in this district earlier than the Early Iron Age

(c. 1000-800). The town of " Sillu," whose king Irisu was an ally of Assur-bani-pal of Assyria in 668 B.C., is commonly sup- posed to represent Soli. 1 In Hellenic times Soli had little political importance, though it stood a five months' siege from the Persians soon after 500 B.C.; its copper mines, however, were famous, and have left copious slag heaps and traces of small scattered settlements. A neighbouring monastery is dedicated to "Our Lady of the Slagheaps " (Panagia Skour- gidti'ssa). But the copper seems to have been exhausted in Roman times, and thereupon Soli became desert.

See W. H. Engel, Kypros (Berlin, 1841; classical authorities); J. L. Myres and M. Ohnefalsch-Richter, Cyprus Museum Catalogue, (Oxford, 1899; antiquities): G. F. Hill, Brit. Mus. Cat. Coins of Cyprus (London, 1904; coins). (J. L. M.)

SOLICITOR, in England, an officer of the Supreme Court of Judicature qualified to conduct legal proceedings for his clients: see also Attorney. Previous to the reign of Henry III. the common law considered it indispensable that the parties to a suit should be actually present, but the privilege of appearing by attorney was conceded in certain cases by special dispensa- tion. The passing of the statute of Merton and subsequent enactments made it competent for both parties in all judicial proceedings to appear by attorney. Previous to the passing of the Judicature Act of 1873 there was a distinction between the terms " solicitor " and " attorney." Solicitors appear to have been at first distinguished from attorneys, as not having the attorney's power to bind their principals, but latterly the distinction was between attorneys as the agents formally appointed in

actions at law, and solicitors who took care of pro- ceedings in parliament, chancery, privy council, &c. In practice, however, and in ordinary language, the terms were synonymous. Down to the 17th century the solicitor of the chancery courts was considered inferior to the attorney of the common law courts, but the rapid growth of equity jurisdic- tion gave the solicitor an importance in no degree inferior to his fellow practitioner at the common law. Until 1873 it was usual for attorneys to be admitted as solicitors as well, but the Judica- ture Act of that year enacted that all persons admitted as solicitors, attorneys or proctors of an English court shall hence- forth be called solicitors of the Supreme Court. Regulations regarding the qualification of attorneys are found as far back as the 20 Edward I. (1292), and the profession has been strin gently regulated by a series of statutes passed during the 19th century, notably the Solicitors Act 1843 and the Solicitors Acts 1877 and 1888.

Every person, before he can become a duly qualified solicitor, must serve an apprenticeship or clerkship to a practising solicitor for a term of years varying from three to five, he must pass all the necessary examinations, he must be duly admitted and entered on the roll of solicitors kept by the Incorporated Law Society and must take out an annual certificate to practise. The organization of the profession is in the hands of the Incorporated Law Society. Established originally in 1827, in succession to an earlier society dating back to 1739, it was incorporated in 1831. It began courses of lectures for students in 1833 and ten years later was constituted registrar of attorneys and solicitors. In i860 it obtained the power of suing unqualified solicitors and in 1888 it was given the custody of the roll of solicitors, on the abolition of the office of the clerk of the Petty Bag. The Solicitors Act of 1888 vested in the In- corporated Law Society the power of investigating complaints as to the professional conduct of solicitors, as well as power to refuse to renew the annual certificate of a solicitor, subject to the solicitor's right of appeal. The statutory committee of the Incorporated Law Society may make application to the court to strike a solicitor off the rolls without preliminary inquiry by the committee where he has been convicted of a criminal offence, but where he is alleged to have been guilty of unprofessional conduct or a statutory offence the committee first hold a preliminary inquiry. Apart from its judicial administrative authority it has exercised powerful influ- ence in the attitude which it has frequently taken towards proposed legislation. Membership of the society, which is not compulsory, is open to any duly qualified practising solicitor, on approval by the council. No person, however duly qualified, can be admitted as a solicitor till he has attained jthe age of twenty-one years. Though admitted as a solicitor and his name entered on the roll he is not at liberty to practise until he has taken out his annual certificate, the fees for which vary according as the applicant

1 E. Schrader, Abh. K. Preuss. Ak. Wiss. (1879), pp. 31-36.

intends to practise in London or the provinces. Solicitors now have a right to practise in any court, i.e. in every division of the High Court, in every inferior court, in the ecclesiastical courts (as proctors), in the court of appeal, in the privy council and in the House of Lords. Their right of audience, however, is re- stricted. They may appear as advocates in most of the inferior courts, as before justices, magistrates, coroners, revising barristers and county courts. They have no right of audience, however, in the Mayor's court, London, nor in the High Court of Justice, privy council or House of Lords, where, from time immemorial, the right has pertained to the bar, but they have right of audience in chambers and certain bankruptcy matters. Since the Con- veyancing Act 1 88 1 solicitors may do all kinds of conveyancing, which formerly was considered the exclusive business of the bar. The Conveyancing Act 1881 having made great changes in the practice of conveyancing, it became necessary to place the re- muneration of solicitors upon a new basis. This was done by the Solicitors Remuneration Act, passed on the same day as the Conveyancing Act. It provides for the framing of general orders, fixing the principles of remuneration with reference inter alia to the skill and responsibility involved, not, as was generally the case before, with reference simply to the length of the documents per- used or prepared. A solicitor is not responsible for statements made by him in his professional capacity as an advocate, and all communications which pass between a solicitor and his client are privileged, so also is any information or document which he has obtained in his professional capacity on behalf of his client. The relation of solicitor and client disqualifies the former from dealing with his client on his own behalf, while it gives him a lien, on pro- fessional services, over the deeds, &c, of the client in his possession. A solicitor's remuneration is minutely arranged by statute and he has no power of recovering more from his client than his statutory charges, and he is liable to be sued for damages for negligence in his client's behalf. Certain personal privileges belong to a solicitor. He is free from serving on juries, nor need he, against his will, serve as a mayor, alderman, sheriff, overseer or churchwarden.

In Scotland solicitors in the Supreme Court are not, as in England, the only persons entitled to act as law agents. They share the privilege with writers to the signet in the Supreme Court, with agents at law and procurators in the inferior courts. They were formed into a society in 1784 and incorporated in 1796, and are usually recognized as members of the College of Justice. This difference is, however, now of little importance, as

by the Law Agents Act 1873 any person duly admitted a law agent is entitled to practise before any court in Scotland. In the United States the term solicitor is used in some states in the sense of a law agent practising before a court of equity.

Many of the great public offices in England and the United States have their solicitors. In England the treasury solicitor fills an especially important position. He is responsible for the en- forcement of payments due to the treasury, and conducts generally its legal business. The office of king's proctor is also combined with that of treasury solicitor. Under his powers as king's proctor the treasury solicitor acts as administrator of the personal estate of an intestate which has lapsed to the crown, and intervenes in cases of divorce where collusion is alleged (see under Proctor). Under the Prosecution of Offences Act 1884 he also acted as director of public prosecutions, and was sometimes called Crown Solicitor. By the Prosecution of Offences Act 1908 the office of director of public prosecutions was separated from that of treasury solicitor and made a separate appointment. In Ireland, solicitors called crown solicitors are attached to each circuit, their duty being to prepare the case for the crown in all criminal prosecutions. In the United States the office of solicitor to the treasury was created by Act of Congress in 1830. His principal duties are to take measures for protecting the revenue and to deal with lands acquired by the United States by judicial process or vested in them by security for payment of debts.

See E. B. V. Christian, A Short History of Solicitors; Cordery on Solicitors; and A. P. Poley, Law Affecting Solicitors.

SOLICITOR-GENERAL, in England, one of the law officers of the crown, appointed by letters patent. He is always a member of the House of Commons and of the political party in power, changing with it. His duties are practically the same as those of the attorney-general (q.v.), to whom he is subordi- nate, and whose business and authority would devolve upon him in case of a vacancy in the office. He receives a salary of £6000 a year, in addition to fees for any litigious business he may conduct on behalf of the crown. The position of the solicitor-general for Scotland in the main corresponds with that of the English solicitor-general. He is next in rank to the lord-advocate. In the United States the office of solicitor- general was created by Act of Congress in 1870.

S0LIN6EN, a town of Germany, in the Prussian Rhine Province, on a height above the Wupper, 13 m. S.E. of

Dusseldorf, and 20 m. N.E. of Cologne by rail. Pop. (1905), 49,018. Solingen is one of the chief seats of the German iron and steel industry, its

speciality consisting in all kinds of cutlery, Solingen sword-blades have been celebrated for centuries, and are widely used outside Germany, while bayonets, knives, scissors, surgical instruments, files, steel frames and the like are also produced in enormous quantities. These articles are largely made by the workmen at their own homes and supplied to the depots of the large dealers; there are about 20,000 workers in steel in Solingen and the vicinity. Solingen received its municipal charter in 1374. Sword-blades have been made here since the early middle ages, and tradition affirms that the art was introduced during the Crusades by smiths from .Damascus. •

SOLINUS, GAIUS JULIUS, Latin grammarian and compiler, probably flourished during the first half of the 3rd century a.d. He was the author of , Collectanea rerum memorabilium, a description of curiosities in a chorographical framework. Adventus, to whom it is dedicated, is identified with Oclatinius Adventus, consul a.d. 218. It contains a short description of the ancient world, with remarks on historical, social, religious and natural history questions. The greater part is taken from Pliny's Natural. History and the geography of Pomponius Mela. According to Mommsen, Solinus also used a chronicle (possibly by Cornelius Bocchus) and a Chorographia pliniana, an .epitome of Pliny's work with additions made about the time of Hadrian. Schanz, however, suggests the Roma and Pratum of Suetonius. The Collectanea was revised in the 6th century under the title of Polyhistor (subsequently taken for the author's name). It was popular in the middle. ages, hexameter abridgments being current under the names of Theodericus and Petrus Diaconus.

The commentary by Saumaise in his Plinianae exercitationes (1689) is indispensable; best edition by Mommsen (1895),, with valuable introduction on the MSS., the authorities used by Solinus, and subsequent compilers. See also Teuffel, Hist. Of Roman Literature (Eng. trans., 1900), 389; and Schanz, Geschidhte der rom- ischen Lilteratur (I904), iv. I. There is an old English translation by A. Golding (1587).

SOLIPSISM (Lat. solus, alone, ipse, self), a philosophical term, applied to an extreme form of subjective idealism which denies that the human mind has any valid ground for believing in the existence of anything but itself. " It may best be defined, per- haps, as the doctrine that all existence is experience, and that there is only one experient. The Solipsist thinks that he is the one!" (Schiller). It is presented as a solution of the problem of explaining the nature of our knowledge of the external world. We cannot know things-in- themselves: they exist for us only in our cognition of them, through the medium of sense-given data. In F. H. Bradley's words {Appearance and Reality): " I cannot transcend experience, and experience is my experi- ence. From this it follows that nothing beyond myself exists; for what is experience is its (the self's) states."

See Idealism ; also F. C. S. Schiller, Mind, New Series (April 1909).

SOlJs, ANTONIO DE (1610-16S6), Spanish dramatist and historian, was born in 1610 at Alcala de Henares (less probably, Plasencia), and studied law at Salamanca, where he pro- duced a comedy entitled Amor y obligacidn, which was acted in 1627. He became secretary to the count of Oropesa, and in 1654 he was appointed secretary of state as well as private secretary to Philip IV. Later he obtained the lucrative post of chronicler of the Indies, and, on taking orders in 1667, severed his connexion with the stage. He died at Madrid on the 19th. of April 1686. Of his ten extant plays, two have some place in the history of the drama. El Amor al uso was adapted by Scarron and again by Thomas Corneille as L' Amour a la mode, while La Gitanilla de Madrid, itself founded on the novela of Cervantes, has been . utilized directly or indirectly by P. A. Wolff, Victor Hugo and Longfellow. The titles of the remain- ing seven are Triunfos de amor y fortuna, Euridice y Orjeo, El Alcdzar del secreto, Las Amazonas, El Doctor Carlino, Un Bobo hace cienio, and Amparar el enemigo. Amor y obligacidn survives in a manuscript at the Biblioteca Nacional. The

Hisloria de la conquista de Mijico, covering the three years between the appointment of Cortes to command the invading force and the fall of the city, deservedly ranks as a Spanish prose classic. It was published in 1684; an English translation by Townshend appeared in 1724.

SOLITAIRE (Fr. for " solitary "), a game played on a board indented with 33 or 37 hemispherical hollows, with the same number of balls or marbles. An unoccupied hollow is left by removing one ball, and the balls, or pieces, are then captured as in draughts. No moves are allowed in diagonal directions or over more than one space at a time.

SOLO, or Solo Whist, a card game which is a modification of whist, the chief distinctive feature being that a single player generally has to oppose the other three. The game came into vogue in England towards the end of the 19th century. The following " declarations " can be made, the order being impor- tant: (1) proposition; (2) acceptance; (3) solo; (4) misere; (5) abondance (or abundance); (6) misire ouverte; (7) abondance d&clarfe (declared abundance). Proposition and acceptance go together, as will be seen; of the rest " solo " can be declared over " proposition," misire over solo, and so on. The stakes- regarding sixpence as the unit — are: for proposition, sixpence; for solo, sixpence (sometimes a shilling); for misere,

a shilling; for abundance, eighteenpence; for open misire, two shillings; for declared abundance, three shillings. A further stake may be arranged for " overtricks," to be paid to the player for every trick made above the number proposed, and for " undertricks," to be paid by the player for every trick below that number.

A full pack is used; players cut as at whist for deal and seats; the cards may be dealt singly, but are more commonly dealt by threes, with a single card for the last round. The last card is turned up and left exposed for a round, whether it is used for trumps or not. One deal constitutes a game. The laws of whist obtain, where applicable, in such matters as following suit, revoking, the passing of the deal, &c. The player on the dealer's left is first to declare or pass: if he proposes, any player may accept, the right going first to the player on ; his left, but any player when his turn comes may make a higher declaration than any that has gone before him, though a player whose call has been superseded may amend his call afterwards. If all the players pass, either there is a new deal, or by arrangement there is a general misere, when the player who takes the most tricks — sometimes, the last trick- pays a single stake all round.

The Declarations. — (1) Proposal: This is an invitation to another player to " accept," i.e. to join the proposer in an attempt to make eight tricks. (2) Solo: Here a player undertakes to win five tricks, playing against the other three in combination. (3) Misere: This is a declaration by a player that he will not win a single trick. There are no trumps, but the turn-up card is left exposed for the first round. If the caller wins a trick the game is at an end (there are no overtricks or undertricks), but he has a right to see the opponents' hands, to be sure that no revoke has been made. A trick that has been turned may not be seen afterwards. (4) Abundance is a declaration that a player will make nine tricks single-handed. The caller makes any suit trumps, but abundance in the turn-up suit takes precedence over abundance in other suits. The trump suit must be declared after the other players have passed, before the first round is played. (5) Misire ouverte: This call is a declaration to lose all thirteen tricks, but after the first trick the caller's cards are placed on the table, though he may play them as he pleases. (6) Declared Abundance: This is a declaration of the caller to make all thirteen tricks by his own hand. He makes his own trumps and always leads, but a declara- tion in the suit of the turn-up card takes precedence over other's. The game ends when the caller loses a trick. There are no under- tricks.

SOLOGNE (Secalaunia from Lat. secale, rye), a region of north-central France extending over portions of the department of Loiret, Loir-et-Cher and Cher. Its area is about 1800 sq. m., and its boundaries are, on the N. the river Loire, on the S. the Cher, on the E. the districts of Sancerre and

Berry. The Sologne is watered by the Cosson and the Beuvron, tributaries of the Loire, and the Sauldre, an affluent of the Cher, all three having a west-south-westerly direction. The pools and marshes which are characteristic of the region are due to the impermeability

of its soil, which is a mixture of sand and clay. The conse- quent unhealthiness of the climate has been greatly mitigated since the middle of the 19th century, when Napoleon III. led the way in the reclamation of swamps, the planting of pines and other trees and other improvements. Arable farming and stock-raising are fairly flourishing in the Sologne, but there is little manufacturing activity, the cloth manufacture of Romorantin being the chief industry. Game is abundant, and the region owes much of its revived prosperity to the creation of large sporting estates.

SOLOLA, the capital of the department of Solola, in Guate- mala; on the northern shore of lake Atitlan, 46 m. W.N.W. of Guatemala city. Pop. (1905), about 17,000. Solola is the ancient capital of the Cakchiquel Indians, who form the bulk of the population. In the city coarse cloth, pottery, cigars and soap are manufactured, and there is a large prison and reformatory. Among the surrounding mountains are large and successful coffee plantations, owned by German settlers. On the 1 8th of April 1902 Solola was wrecked by an earthquake, but as most of the houses were constructed of wood it was speedily rebuilt.

SOLOMON 1 (10th century B.C.), the son of David by Bath- sheba, and his successor in the kingdom of Israel. The many floating and fragmentary notes of various dates that have found a place in the account of his reign in the book of Kings (q.v.) show how much Hebrew tradition was occupied with the monarch under whom the throne of Israel reached its highest glory; and that time only magnified in popular imagination the proportions of so striking a figure appears from the opinions entertained of him in subsequent writings. The magnificence and wisdom of Solomon (cf. Matt. vi. 29; Luke xi. 31) and the splendour of his reign present a vivid contrast to the troublous ages which precede and follow him, although the Biblical records prove, on closer inspection, to contain so many incongruous elements that it is very difficult to form a just estimate of his life and character. A full account is given of the circumstances of the king's accession (contrast the summary notices, 1 Kings xxii. 41 seq., 2 Kings xv. 1, xxi. 24, xxiv. 18, &c). He was not the true heir to the throne, but was the son of David by Bathsheba, wife of Uriah the Hittite, whom David sent to his death " in the forefront of the battle." The child of the illegitmate union died; the second was called Jedidiah (" beloved of Yah [weh]") or ShSlomoh (the idea Of requital or recompense may be im- plied) ; according to 1 Chron. iii. 5, on the other hand, Solomon was the fourth, or rather the fifth, child of Bathsheba and David. The episode forms the

prelude to family rivalries. David's first-born, Amnon, perished at the hands of the third son, Absalom, who lost his life in his revolt (2 Sam. xiii.-xx.). The second, Chileab, is not mentioned in the history, and the fate Of the fourth, who regarded himself as the future king, is described in 1 Kings i., ii. Bathsheba, relying upon David's promise that Solomon should succeed him, vigorously advanced her son's claims with the support of Zadok the priest, the military officer Benaiah, and David's bodyguard; Adonijah, for his part, had David's old priest Abiathar, the commander Joab, and the men of Judah. A more serious breach could scarcely be imagined. The adherents of Solomon gained the day, and with his accession a new regime was inaugurated, not, however, without bloodshed.

Solomon's age at his accession is not recorded. The tradition that he was only twelve (1 Kings ii. 12 Septuagint; or fourteen, Jos. Ant. viii. 7, 8) may rest upon iii. 7 (" I am but a little child "; if this is not hyperbole), or upon the chronological scheme embodied in 2 Sam. xiii. 23, 38, xiv. 28, xv. 7. It agrees with his subordinate position in portions of ch. i., but his independent actions in ch. ii. suggest a more mature age, and according to xi. 42, xiv. 21, his son Rehoboam was already born (but contrast again xii. 24 Septuagint, 2 Chron. xiii. 7). See further, Ency. Bib. col. 4681, n. 5-

1 Heb. Shelomoh, as though " his peace "; but the true meaning is uncertain; evidence for its connexion with the name of a god is given by H. Winckler and Zimmern, KeilinschrSu. das Alte Test., 3rd ed., pp. 224, 474 seq. The English form follows the 2o\(huoi> of N.T. and Josephus; the Lat. Salomo agrees with "EaK&nav (one of several variant forms shown in MSS. of the LXX.).

The acute observation that 2 Sam. ix.-xx.; 2 Kings i. ii. 1-9, 13 sqq., were evidently incorporated after the Deuteronomic re- daction of the books of Samuel (K. Budde, Samuel, p. xi.) is con- firmed by the framework of Kings with its annahstic material similar to that preserved in 2 Sam. v.-viii., xxi.-xxiv. ; 1 Kings ii. 10-12. With this may belong iii. 3 (the compiler's judgment) ; and especially v. 3 sqq., where reference is made to David's incessant wars (2 Sam. viii.). That 2 Sam. ix.xx., &c, had previously been omitted by the Deuteronomic redactor himself (Budde) cannot be proved. These post Deuteronomic narratives preserve older material, but with several traces of revision, so that I Kings i. ii. now narrate both the end of David's reign and the rise of Solomon (see I. Benzinger's commentary on Kings, p. xi.; C. Holzhey, Buck d. Konige, p.

17). The latter, however, is their present aim, and some attempt appears to have been made in them to exculpate one whose accession finds a Judaean parallel in Jehoram (2 Chron. xxi. 1-4). Thus it has been held that David's charges (ii. 1-9) were written to absolve Solomon, and there is little probability in the story that Adoniiah after his pardon really requested the hand of Abishag (ii. 13-25), since in Oriental ideas this would be at once viewed as a distinct encroachment upon Solomon's rights as heir (cf. W. R. Smith, Kinship and Marriage, 2nd ed., p. no).

Every emphasis is laid on the wisdom of Solomon and his wealth. Yahweh appeared to Solomon in a dream and offered to grant whatever he might ask. Confessing his inexperience, the king prayed for a discerning heart, and was rewarded with the gift of wisdom together with riches and military glory. There follows an example of his sagacity: the famous story of the steps he took to determine which of two claimants was the mother of a child (iii. 16-28) .' His wisdom excelled that of Egypt and of the children of the East; by the latter may be meant Babylonia, or more probably the Arabs, renowned through all ages for their shrewdness. Additional point is made by emphasizing his superiority over four renowned sages, sons of Mahol; but the allusion to these worthies (who are incorporated in a Judaean genealogy, 1 Chron. ii. 6) is no longer intelligible. He is also credited with an interest in botany and natural history (iv. 33), and later Jewish legend improved this by ascribing to him lordship over all beasts and birds and the power of understanding their speech. To this it added the sovereignty over demons, from a wrong inter- pretation of Eccles. ii. 8 (see Lane, Arabian Nights, introd., n. 2i, and ch. 1, n. 25). As his fame spread abroad, people came to hear his wisdom, and costly presents were showered upon him. The sequel was the visit of the Queen of Sheba (1 Kings iv. 29-34; x.). The interesting narrative appears in another light when we consider Solomon's commercial activity and the trading intercourse between Palestine and south Arabia. 2 His wealth was in proportion to his wisdom. Trad- ing journeys were conducted with Phoenician help to Ophir and Tarshish. With the horse-breeding districts of the north he traded in horses and chariots (x. 28 seq.; see Mizraim), and gold accumulated in such enormous quantities that the income for one year may be reckoned at about £4,100,000 in weight (x. n seq., 14 sqq.). Silver was regarded as stones; the precious cedars of Lebanon as sycamores. His realm extended from Tiphsah (Thapsacus) on the Euphrates to the borders of Egypt (iv. 21, 24), and it agrees with this that he gains important conquests in the north (2 Chron. viii. 3 seq.; but see 1 Kings ix. 18). He main- tained a very large harem (xi.), and among his wives was the daughter of an Egyptian Pharaoh. For his distinguished con- sort, who brought Gezer as a dowry, a special palace was built (iii. 1, ix. 16, 24), and this was only one of many building enter- prises. The description of the

magnificent temple of Jerusalem,

1 For parallels, see R. Flint in Hastings's Diet. Bib. iv. 562, n. 1. For the Pompeian wall-painting representing Solomon's judgment (the figures are pygmies!), see A. Jeremias, Altes Test, im Lichte d. alt. Ortenls 2nd ed., p. 492 seq. (with illustration and references).

2 For Mahommedan stories of Solomon, the hoopoe and the queen of Sheba, see the Koran, Sur. xxvii., which closely follows the second Targum to Esther i. 2, where the Jewish fables may be read in full. On this story, see also J. Halevy, £cole pratique des hautes itudes (1905), pp. 5-24, and the Chinese parallel in the Mittheilungen of the Berlin Seminar for Oriental Languages (1904), vii. i. pp. 1 17-172. For the late legends of Solomon see M. Griln- baum, Neue Beitragc zur semit. Sage, pp. 198-237 (Leiden, 1893); G. Salzberger, Die Salome-Sage in der semitischen Literatur (Berlin,

1907).

which occupies considerable space in Solomon's history (v.- viii.), appears in more elaborate form in the chronicler's later work. The detailed record stands in contrast to the brief account of his other buildings, e.g. the palace, which, from an Oriental point of view, was of the first importance (vii. 1-12). But the Temple and palace were adjoining buildings, separated only by a wall (cf. Ezek. xlii. 20, xliii. 7 seq.), and it cannot be said that the former had originally the prominence now ascribed to it. Nor can the accounts given by Deuteronomic writers of its significance for the religious worship of Israel be used for an estimate of contemporary religion (v. 1-6, viii.). Whatever David had instituted at Jerusalem, it is at Gibeon that Solomon observed the opening sacrificial ceremonies, and there he received the divine revelation, " for that was the great high-place " (iii. 4 sqq.). Though this is justified by a late writer (iii. 2), subsequent history shows that the high-places, like the altars to heathen deities in Jerusalem itself, long re- mained undisturbed; it was the Deuteronomic reformation, ascribed to Josiah, which marked the great advance in the religion of Yahweh, and under its influence the history of the monarchy has been compiled. Moreover, with the emphasis which is laid upon the Jerusalem Temple is to be associated the new superiority of Zadok, the traditional ancestor of the Zadok- ites, the Jerusalem priests, whose supremacy over the other Levitical families only enters into the history of a much later age (see Levites).

In fact, Solomon, the pious saint, is not tne soiomon of the earlier writings. Political, commercial and matrimonial alli- ances inevitably left their mark upon national religion, and the introduction of foreign cults which ensued is characteristically viewed as an apostasy from Yahweh of which he was

guilty in his old age. 3 The Deuteronomic writer finds in it the cause of the subsequent separation of the two kingdoms (xi. 1-13), and he connects it with certain external troubles which prove to have affected the whole course of his reign. The general impression of Solomon's position in history is in fact seriously disturbed when the composite writings are closely viewed. On the one side we see genial internal conditions prevailing in the land (iv. 20, 25), or the exalted position of the Israelites as officials and overseers, while the remnant of the pre-Israelite inhabitants serve in labour gangs (ix. 20 sqq.). On the other hand is the mass of toiling Israelites, whose oppressed condition is a prelude to the later dissensions (1 Kings v. 13 sqq.; cf. 1 Kings xii.; see the divergent tradition in 2 Chron. ii.). The description of Solomon's administration not only ignores the tribal divisions which play an important part in the separation of Israel from Judah (xii. 16; cf. 2 Sam. xix. 43-xx. 2), but represents a kingdom of modest dimensions in which Judah apparently is not included. Some north Judaean cities might be named (iv. 9 seq.), but south Judah and Hebron the seat of David's early power find no place, and it would seem as though the district which had shared in the revolt of Adonijah was freed from the duty of furnishing supplies. But the document has intricate textual peculiarities and may be the Judaean adaptation of a list originally written from the standpoint of the north-Israelite monarchy. Further speculation is caused when it is found that Solomon fortifies such cities as Megiddo, Beth-horon and Tamar, and that the Egyptian Pharaoh had slain the Canaanites of Gezer (ix. 15 sqq.). We learn, also, that Hadad, a young Edomite prince, had escaped the sanguinary campaign in the reign of David (2 Sam. viii. 13 seq.), and had taken refuge in Egypt. He was kindly received by Pharaoh, who gave him the sister of his queen Tahpenes to wife. On David's death he returned and ruled over Edom, thus not merely controlling the port of Elath and the trade-routes, but even (according to the Septuagint) oppressing Israel (xi. 14-22, 25, see Septuagint on v. 2 2). 4 Moreover, an Aramaean dependant

3 On the relation between trade and religion in old Oriental life, see the valuable remarks by G. A. Smith, Ency. Bib. col. 5157 seq.

- *The narrative contains composite features (see the literature cited in article Kings). There is a curious resemblance between one form of the story and the Septuagint account of the rise of 1 Jeroboam {q.v.).*

of Hadadezer, king of Zobah, to the north of Palestine (see David's war, 2

Sam. viii. 3 sqq., x. 6 sqq.), deserted his lord, raised a band of followers and eventually captured Damascus, where he established a new dynasty. Like Hadad, " he was an adversary to Israel all the days of Solomon" (xi. 23-25). To these notices must also be added the cession of territory in north Palestine to Hiram, king of Phoenicia (ix. n). It is parentheti- cally explained as payment for building materials, which, how- ever, are otherwise accounted for (v. 6, 11); or it was sold for 120 talents of gold (nearly ˆ750,000 sterling), presumably to assist Solomon in continuing his varied enterprises — but the true nature of the transaction has been obscured, although the consequences involved in the loss of the territory are unmis- takable. If these situations can with difficulty find a place in our picture of Solomon's might, it is clear that some of them form the natural introduction to the subsequent history, when his death brought internal discontent to a head, when the north under Jeroboam refused allegiance to the south, and when the divided monarchy enters upon its eventful career by the side of the independent states of Edom, Damascus and Phoenicia.

It is now generally recognized in histories of the Old Testament that a proper estimate of Solomon's reign cannot start from narratives which represent the views of Deuteronomic writers, although, in so far as late narratives may rest upon older material more in accordance with the circumstances of their age, attempts are made to present reconstructions from a combination of various elements. Among the recent critical attempts to recover the underlying traditions may be mentioned those of T. K. Cheyne (Ency. Bib., art. " Solomon ") and H. Winckler (Keil- inschr. u. d. Altc Test., 3rd. ed., pp. 233 sqq.). But, in general, where the traditions are manifestly in a later form they are in agreement with later backgrounds, and it is questionable whether earlier forms can be safely recovered when it is held; that they have been rewritten or when the historical kernel has been buried in legend or myth. It is impossible not to be struck with the growing development of the Israelite tribes after the invasion of Palestine, their strong position under David, the sudden ex- pansion of the Hebrew monarchy under Solomon, and the subse- quent slow decay, and this, indeed, is the picture as it presented itself to the last writers who found in the glories of the past both consolation for the present and grounds for future hopes. But this is not the original picture, and, since very contradictory- representations of Solomon's reign can be clearly discerned, it is necessary in the first instance to view them in the light of an independent examination of the history of the preceding and following periods where, again, serious fluctuation of standpoint is found. Much therefore depends upon the estimate which is formed of the position of David (q.v.). See also Jews: History, § 7 seq ; Palestine: Old Testament History.

On Solomon's relation to philosophical and proverbial literature, see

Proverbs. Another aspect of his character appears in the remarkable " Song of Solomon," on which see Canticles. Still another phase is represented in the monologue of Ecclesiastes (q.v.) In the Book of Wisdom again, the composition of an Egyptian Hellenist, who from internal evidence is judged to have lived somewhat earlier than Philo, Solomon is introduced uttering words of admonition, imbued with the spirit of Greek philosophers, to heathen sovereigns. The so-called Psalter of Solomon, on the other hand, a collection of Pharisee psalms written in Hebrew soon after the taking of Jerusalem by Pompey, and preserved to us only in a Greek version, has nothing to do with Solomon or the traditional conception of his person, and seems to owe its name to a transcriber who thus distinguished these newer pieces from the older " Psalms of David " (see Solomon, Psalms of). (S. A. C.) 1*

SOLOMON ISLANDS (Ger., Salomoinseln), an archipelago of the Western Pacific Ocean, included in Melanesia, and forming a chain (in continuation, of that of the Admiralty Islands and New Mecklenburg in the Bismarck Archipelago) from N.W. to S.E. between 154° 40′ and 162° 30′ E., 5 and n° S., with a total land area of 17,000 sq. m. (For map, see Pacific Ocean.) A comparatively shallow sea surrounds the islands and indicates physical Connexion with the Bismarck Archipelago and New Guinea, whereas directly east of the Solomons there 1 Some sentences from W. R. Smith's article in Ency. Brit., 9th ed., have been retained and in places modified.

are greater depths. The principal island at the north-west end of the chain is Bougainville (3900 sq. m.), and that at the south-east San Cristoval or Bauro. Between these the chain is double, consisting (from the north-west) of Choiseul (2260 sq. m.), Isabel (Ysabel, of about the same area as Choiseul) and Malaita (2400 sq. ni.) to the north, and Vella Lavella, Ronongo, Kul- ambangra, Kausagi, Marovo (New Georgia or Rubiana) and the Hammond Islands, and Guadalcanal or Guanbata (2500 sq. m.). Between and around these main islands there are many smaller islands. Ongtong Java, a coral reef of many islets, lies considerably north of the main group to which, geographically, it can hardly be said to belong. 3 Bougainville, the largest of the group, contains Mt Balbi (10,170 ft.), and two active volcanoes. In Guadalcanar is Mt Lammas (8000 ft.), while the extreme heights of the other islands range between 2500 and 5000 ft. The islands (by convention of 1899) are divided unequally between Great Britain and Germany, the boundary running through Bougainville Strait, so that that island and Buka belong to Germany (being officially administered from Kaiser Wilhelm's Land), but the rest (South Solomons) are British.

The islands are well watered, though the streams seem to be small; the coasts afford some good harbours. All the large and some of the small

islands appear to be composed of ancient volcanic rock, with an incrustation of coral limestone showing here and there along the coast. The mountains generally fall steeply to the sea. There is some level land in Bougainville, but little elsewhere. Deep valleys separate the gently rounded ridges of forest-clad mountains, lofty spurs descend from the interior, and, running down to the sea, terminate frequently in bold rocky headlands 800 to 1000 ft. in height, as in San Cristoval (north coast). On the small high island of Florida there is much undulating grass-land interspersed with fine clumps of trees; patches of cultivated land surround its numerous villages, and plantations on the hill-sides testify to the richness of its soil. The whole chain of islands appears to be rising steadily. Some of the smaller islands are of recent calcareous formation. Barrier and fringing reefs, as well as atolls, Occur in the group, but the channels between the islands are dangerous Chiefly from the strong currents which set through them..

The climate is very damp and debilitating. The rainfall is unusually heavy. Fever and ague prevail on the coast. The healthiest portions are the highlands, where most exposed to the south-east trades. The dry season, with north-west winds, lasts from December to May. Vegetation is luxuriant; magnificent forests clothe the mountains, and sandalwood, ebony and lignum vitae, besides a variety of palms, are found in them. Mangrove swamps are common on the coasts. The probable geological connexion with New Guinea would account for the Papuan character of the fauna of the Solomons, which form the eastern limit of certain Papuan types. The existence of peculiar types in the Solomons, however, points to an early severance. Mammals are not numerous ; they include the cuscus, several species of bat, and some rats of great size. There are various peculiar species of frogs, lizards and snakes, including the great frog Rana Guppyi, from 2 to 3 lb in weight. Of birds, several parrots and other genera are character- istically Papuan and are unknown east of the Solomons.

Population. — The Solomon islanders are of Melanesian (Pa- puan) stock, though in different parts of the group they vary considerably in their physical characteristics, in some islands approaching the pure Papuan, in some showing Polynesian crossings and in others resembling the Malays. As a race they are small and sturdy, taller in the north than in the south. Projecting brows, deeply sunk dark eyes, short noses, either straight or arched, but always depressed at the root, and moderately thick lips, with a somewhat receding chin, are general characteristics. The mesocephalic appears to be the preponderant form of skull; though this is unusual among Melanesian races. In colour the skin varies from a black-brown to a copperish.hue, but the darker are the most common shades. The hair is naturally dark, but is often dyed red or fawn, and crisp, inclining to woolly. The islanders of the Bougainville Straits have lank, almost straight, black hair and very dark skins.

To strangers the natives have long had the reputation of being treacherous. They are cannibals, infanticide is common, and head

2 Guadalcanal of the Spanish discoverers.

3 This group, so named by Abel Tasman in 1643, is also called Leucnewa or Lord Howe, and is densely inhabited by natives said to be of Polynesian, origin.

hunting was formerly prevalent. The average lot of the women is that of slaves. In sbme cases there is belief in a good spirit in- habiting a pleasant land, and an evil spirit associated with a volcano; also in a future life. The language is of pure Melanesian type, though a number of dialects are spoken. The natives are good agriculturists. The Solomon Islands are, in the Pacific, the eastern limit of the use of the shield. The canoes are skilfully built of planks sewn together and caulked. The high carved piow and stern give the craft almost a crescent shape. These and the gun- wale are tastefully inlaid with mother-of-pearl and wreathed with shells and feathers.

The British islands are under a resident commissioner, and have some trade in copra, ivory, nuts, pearl shell and other produce. Coco-nuts, pine-apples and bananas, with some cocoa and coffee, are cultivated on small areas. The German islands have a small trade in sandalwood, tortoise-shell, &c. The total population may be roughly estimated at 180,000.

History. — The Spanish navigator Alvaro Mendana must be credited with the discovery of these islands in 1567, though it is somewhat doubtful whether he was actually the first Euro- pean who set eyes on them. In anticipation of their natural riches he named them Islas de Salomon. The expedition sur- veyed the southern portion of the group, and named the three large islands San Cristoval, Guadalcanal and Ysabel. On his return to Peru, Mendana endeavoured to organize another ex- pedition to colonize the islands, but it was not before June 1595 that he, with Pedro Quiros as second in command, was able to set sail for this purpose. The Marquesas and Santa Cruz islands were now discovered; but on one of the latter, after various delays, Mendana died, and the expedition collapsed.

Even the position of the Solomon Islands was now in uncer- tainty, for the Spaniards, fearing lest they should lose the bene- fits expected to accrue from these discoveries, kept secret the narratives of Mendana and Quiros. The Solomon Islands were thus lost sight of until, in 1767, Philip Carteret

lighted on their eastern shores at Gower Island, and passed to the north of the group; without, however, recognizing that it formed part of the Spanish discoveries. In 1768 Louis de Bougainville found his way thither. He discovered the three northern islands (Buka, Bougainville and Choiseul), and sailed through the channel which divides the two last and bears his name. In 1769 a French navigator, M- de Surville, was the first, in spite of the hostility of the natives, to make any lengthened stay in the group. He gave some of the islands the French names they still bear, 1 and brought home some detailed information concerning them which he called Terre des Arsacides (Land of the . Assassins) ; but their identity with Mendana's Islas de Salomon was soon established by French geographers. In 1788 the English lieu- tenant Shortland coasted along the south side of the chain, and, supposing it to be a continuous land, named it New Georgia; and in 1792 Captain Edward Manning sailed through the strait which separates Ysabel from Choiseul and now bears his name. In the same year, and in 1793, d'Entrecasteaux surveyed portions of the coast-line of the large islands. Dumont d'Urville in 1838 continued the survey.

Traders now endeavoured to settle in the islands, and mis- sionaries began to think of this fresh field for labour, but neither met with much success, and little was heard of the islanders save accounts of murder and plunder. In 1845 the French Marist Fathers went to Isabel, where Mgr Epaulle, first vicar- apostolic of Melanesia, was killed by the natives soon after landing. Three years later this mission had to be abandoned; but in 1881 work was again resumed. In 1856 John Coleridge Patteson, afterwards bishop of Melanesia, had paid his first visit to the islands, and native teachers trained at the Melanesian mission college subsequently established themselves there. About this date the yacht " Wanderer " cruised in these seas, but her owner, Mr Benjamin Boyd, was kidnapped by the natives and never afterwards heard of. In 1873 the " foreign- labour " traffic in plantation hands for Queensland and Fiji extended its baneful influence from the New Hebrides to these islands. In 1893 the islands Malaita, Marovo, Guadalcanar 1 He called Gower, Inattendue; Ulava, Contrariety ; and named Port Praslin, the harbour at the north-west of Ysabel.

and San Cristoval with their surrounding islets were annexed by Great Britain, and the final delimitation of German and British influence in the archipelago was made by the conven- tion of the 14th of November 1899.

See H. B. Guppy, The Solomon Islands (London, 1887), where full references to earlier works are given; C. Ribbe, Zwei Jahre unlet den Kannibalen der Salomon-Inseln (Dresden, 1903).

SOLOMON, ODES OF, a collection of 42 hymns, probably dating from the end of the 1st century, known to the early Christian Church (as is proved

by the quotations and comments in the 3rd century gnostic book, Pistis Sophia, and a short extract in the Institutes of Lactantius). They were recovered by Dr Rendel Harris in 1908 from a 16th-century Syriac manuscript (containing also the Psalms of Solomon, see below) in his possession. The first, second, and part of the third odes are missing, but the first has been restored from the Pistis Sophia. Of their authorship nothing is known, " Solomon " being a recognized pseudonym. While there are thoughts and expres- sions which lend themselves to gnostic use, there is nothing in the odes which is of distinctively gnostic origin. Many of them, indeed, are unmistakably Christian, and the writer of the Pistis Sophia seems to have regarded them as almost if not quite canonical, a fact which secures at latest a 2nd-century origin. Dr Harris indeed would date several of them between a.d. 75 and 100. They contain few traces of the New Testament, and the words " gospel " and " church " are not found. Here and there a Johannine atmosphere is detected, though not sufficiently to justify the assumption that the author knew the writer, of the Fourth Gospel. References to the life and teaching, of Christ are rare, though the Virgin Birth is alluded to in Ode 19 in a passage marked by legendary embellishment, and the descent into Hades is spoken of in quite the apocryphal style in Ode 42. These odes are probably among the latest in thebook.' There are no clear allusions to baptism and none at all to the eucharistic celebration. One passage speaks of ministers (per- haps = deacons) who are entrusted with the water of life to hand to others; the word "priest" occurs once, at the beginning of Ode 20, " I am a priest of the Lord, and to Him I do priestly service, and to Him I offer the sacrifices of His thought," The odes, which are perhaps the product of a school of writers, > and were originally written in Greek, vary in execution and spiritual tone, but are generally characterized by a buoyant feeling of Christian joy. Harnack considers that they form a Jewish Grundschrift, with a number of Christian interpolations; only two are " purely Christian," while several " colourless " ones are more likely Jewish. He finds in them a link between the piety and theology of the Testaments of the Twelve Patriarchs and that of the Johannine gospel and epistles.

See J. Rendel Harris, The Odes and Psalms of Solomon (1909);, An Early ■ Christian Psalter (1909) ; Joh. Flemming and A. Harnack, Ein judisch-christliches Psalmbuch aus dem ersten Jahrhundert (Leipzig, 1910) ; The Times (April 7, 1910) ; W. E. Barnes, in Journ. of Theol. Studies, xi. 615, and The Expositor (July 1910); F. Spitta, in Zeitschrift fur N.T. Wissenschaft, xi. 193.

SOLOMON, PSALMS OF. These psalms, eighteen in all, enjoyed but small consideration in the early Christian Church; for only six direct references to them are found in early Chris- tian literature, though in the Jewish Church they must have played an important role; for they were used in the worship

of the synagogue.

They were of course not written by Solomon, but were sub- sequently ascribed to him. The fact that they do not con- tain a single reference to Solomon is in favour of their having been first published anonymously. On the other hand, their author (or authors) may have placed over them the superscrip- tion " Psalms of Solomon " in order to gain currency for this new collection under the shelter of a great name of the past.

*MSS. and Texts. — Before the publication of Swete's second, edition and the edition of von Gebhardt, only five MSS., A, H, V, M, P (of which H represents the Copenhagen MS.) were known, and these were utilized to the full in the splendid edition of Ryle and James (*a\juo£ XokonUvras , Psalms of : the Pharisees commonly called the Psalms of Solomon, the Text newly revised from all the MSS.. 1891). In Swete's edition (The Old Testament in Greek, 1 1894) there was given in addition to the above a collation of the Vatican*

*MS. R. Finally in 1895, von Gebhardt published from five MSS. his edition entitled *aXˆo£ Zvfˆn&vros, Die Psalmen Salomos zum erstenmale mit Benutzung der Athoshandschriften und des Cod. Casanatensis herausgegeben. The five MSS. used by this last editor are C, H, J, L, R, of which C, J, L are exploited for the first time and represent respectively the MSS. Casanatensis, Iberiticus and Laura- Kloster. He represents the affinities of the MSS. in the following table, where Z stands for the archetype : —*

Z

R

T

H-i

I

H

M P Thus H is the only MS. common to this edition and that of Ryle and James; for Gebhardt regards the secondary MSS. V, M, P as not deserving consideration. Notwithstanding there is a much finer critical training for

the student in the textual discussions and retroversions in the latter edition than in the former.

Translations. — Wellhausen, Die Pharisder und die Sadducaer (1874), T 3I sqq. This translation is unfortunately based on the editio princeps of De la Cerda published in 1626. Pick's translation which appeared in the Presbytertan Review for October 1883, pp. 775-813, is based on the same text and is imperfect owing to a faulty knowledge of English. Ryle and James {op. cit.). Kittel's translation (Kautzsch, Apokr. u. Pseudep. i. 1900, ii. 127 sqq.) was made from von Gebhardt's text.

The Original Language. — All modern scholars are practically agreed that the Psalms were written in Hebrew. It is unnecessary to enter into this question here, but a point or two might be mentioned which call for such a presupposition, (i.) First we find that, after the manner of the canonical Psalms, the musical symbol SiaxpaKfia, (170) is inserted in xvii. 31 and xviii. 10, a fact which points to their use in the divine worship in the synagogue, (ii) Next we find that a great number of passages cannot be understood unless by retroversion into, Hebrew, when the source of the error becomes transparent. One such instance occurs in ii. 29, tov elwtiv tˆv xnrtpˆaviav tov SpaicovTos hi kriyxˆ. Here tlirtlv, which is utterly meaningless, = if«S a corruption of "i'pˆ> or TfnH "to change," "turn" (WeUhausen). Thus we arrive at the sense required, " To turn the pride of the dragon into dishonour, (iii.) Finally, there are Several passages where the text exhibits the future tense, when it ought to give the past imperfect. This pheno- menon can easily be explained as a false rendering of the Hebrew imperfect. 1

Date.— The date can be determined from references to con- temporary events. Thus the book opens with the alarms of war (i. 2, viii. 1), in the midst of a period of great prosperity (i. 3, 4, viii. 7), but the prosperity is merely material, for from the king to the vilest of his subjects they are altogether sinful (xvii. 2i, 22). The king, moreover, is no descendant of David, but has usurped his throne (xvii. 6-8). But judgment is at hand. " A mighty striker " has come from the ends of the earth (viii. 16), who when the princes of the land greeted him with words of welcome (viii. 18), seized the city (viii. 21), cast down its walls (ii. 1), polluted its altar (ii. 2), put its princes and counsellors to the sword (viii. 23), and carried away its sons and daughters captive to the west (viii. 24, xvii. 14). But the dragon who con- quered Jerusalem (ii. 29), and thought himself to be more than man (ii. 32, 33), at last meets with shameful death on the shores of Egypt (ii. 30, 31).

The above allusions are easy to interpret. The usurping kings who are not descended from David are the Maccabeans. The " mighty striker " is

Pompey. The princes who welcomed his approach are Aristobulus II. and Hyrcanus II. Pompey carried off princes and people to the west, and finally perished on the coast of Egypt in 48 B.C. Thus Ps. ii. was written soon after 48 B.C., while Ps. i., viii., xvii. fall between 63 and 48 b.c, for they presuppose Pompey's capture of Jerusalem, but show no knowledge of his death. Ps. v., vii., ix., xiii., xv.

1 In addition to Ryle and James, Introd. pp. lxxvii.-lxxxvii., see Peries, " Die Erklarung der Psalm. Sal." (Oriental. Litteraturzeit., 1902, v. 7-10).

belong apparently to the same period, but iv. and xii. to an earlier one. On the whole Ryle and James are right in assigning 70-40 b.c. as the limits within which the psalms were written.

Authorship. — The authors were Pharisees. They divide their countrymen into two classes — " the righteous " (ii. 38-39, iii- 3S> 7, 8), and " the sinners " (ii. 38, iii. 13, iv. 9) ; " the saints " (iii. 10) and " the transgressors " (iv. n). The former are the Pharisees; the latter the Sadducees. The authors protest against the Asmonaean (i.e. the Maccabees) for usurping the throne of David and laying violent hands on the high priest- hood (xvii. 5, 6, 8), and proclaim the coming of the Messiah, the true son of David (xvii. 23-25), who is to set all things right and establish the supremacy of Israel. The Messiah is to be pure from sin (xvii. 41), purge Jerusalem from the defilement of sinners and of the Gentiles (xvii. 29, 30, 36), destroy the hostile nations and extend his righteous rule over all the remaining peoples of the earth (xvii. 27, 31, 32, 34, 38). 2

Ps. xvii., xviii. and i.-xvi. can hardly be assigned to the same authors. The hopes of the Messiah are confined to the former, and a somewhat different eschatology underlies the two works (see Charles, Eschatology: Hebrew, Jewish and Christian, 220-225).

In addition to the literature mentioned above, also in Ryle and James's edition and Schtirer, Gesch. des jiid. Volkes, 3rd ed., iii. 150 sqq, see Ency. Bib. i. 241-245. (R. H. C.)

SOLON (7th and 6th century B.C.), Athenian statesman, the son of Execestides of the family of Codrus, was born about 638 B.C. The prodigality of his father made it necessary for Solon to maintain himself by trade, especially abroad. In his youth he became well known as the author of amatory poems and later of patriotic and didactic verse. Hence his inclusion among the Seven Sages. Solon's first public service was the recovery of Salamis from the Megarians. A law had been passed forbidding any reference to the loss of the island; Solon solved the difficulty by

feigning madness, and reciting an inflammatory poem in the agora. It appears that Solon was appointed to recover the " fair island " and that he succeeded in expelling the Megarians. Sparta finally arbitrated in favour of the Athenians (c. 596), who ascribed their success to Solon. About a year later he seems to have moved a decree before the Amphictyons declaring war on Cirrha. At this period the distress in Attica and the accumulating discontent of the poorer classes, for whom Draco's code had proved inadequate, reached its height. Solon was summoned by all classes unanimously to discover a remedy; under the legal title of Archon, he received unlimited powers which he exercised in economic and constitutional reforms (see below). From various sources we learn that these reforms met with considerable opposition, to escape from. which Solon left Athens for ten years. After visiting Egypt, he went to Cyprus, where Philocyprus, king of Aepea, received him with honour. Herodotus (v. 113) says that Philocyprus, on the ad- vice of Solon, built himself a new town called, after his guest, Soli. The story that Solon visited Croesus in Lydia, and made to him the famous remark — " Call no man happy till he is dead " — is unfortunately discredited by the fact that Croesus seems to have become king nearly thirty years after Solon's legis- lation, whereas the story must be dated within ten years of it. Subsequently Solon returned to Athens, to find civil strife re- newed, and shortly afterwards his friend (perhaps his relative) Peisistratus made himself tyrant. About 558 B.C. Solon died, and, according to the story in Diogenes Laertius i. 62 (but see Plutarch's Solon, 32), his ashes were scattered round the island of Salamis. If the story is true, it shows that he was regarded as the oecist of Salamis.

Reforms. — The date of Solon's archonship has been usually fixed at 594 B.C. (01. 46. 3), a date given by Diog. Laert. (i. 62) on the evidence of the Rhodian Sosicrates (fl. 200-128 B.C.; see Clinton, Fast. Hell. ii. 298, and Busolt, 2nd ed., ii. 259). The date 594 is confirmed by statements in the Aristotelian Con- stitution of Athens (ch. 14). For various reasons, the dates 592,

1 The conception of the Messiah is vigorous, but the influence of such a conception was hurtful ; for by connecting the Messianic with the popular aspirations of the nation, the former were secular- ized and the way prepared for the ultimate destruction of the nation.

$91 and even 590 have been suggested by various historians (for the importance of this question see the concluding paragraph of this article). The historical evidence for the Solonian reforms has always been

unsatisfactpry. There is strong reason to conclude that in the 5th and 4th centuries there was no general tradition as to details. In settling differences there is no appeal to tradition, and this though there occur radical and insoluble contradictions. Thus the Constitution of Athens (ch. vi.) says that the Seisachtheia (" shaking off of burdens ") consisted in a cancelling of all debts public and private, whereas Androtion, an elder contemporary, denies this specifically, and says that it consisted in the reduction of the rate of interest and the debasement of the coinage. The Constitution (ch. x.) denies the existence of any connexion between the coinage reform and the relief of debtors. The absence of tradition is further confirmed by the fact that the Constitution always appeals for corroboration to Solon's Poems. Of the Laws it is probable that in the 4th century, though some dealing with agrarian distress were in existence, those embodying the Seisachtheia were not, and few if any of the purely constitutional laws re- mained. The main source of the account in the Constitution is, therefore, the Poems of Solon, from which numerous quota- tions are made (see chs. 5-12).

The reforms of Solon may be divided under three heads — economic, constitutional and miscellaneous. They were necessary owing mainly to the tyrannical attitude of the rich to the poorer classes. Of these many had become slaves in lieu of payment of rent and loans, and thus the land had fallen gradually into the hands of the capitalists. It was necessary to readjust the economic balance and to provide against the evil of aristocratic and capitalist predominance.

A. Economic Reforms. — Solon's economic reforms consisted of the Seisachtheia and certain commercial laws (e.g. prevention of export trade except i-n olive oil, Plut. Sol. 24). Among all the problems connected with the Seisachtheia, it is clear (1) that Solon abolished the old Attic law of debt which permitted loans on the security of the debtor's person; (2) that he restored to freedom those who had been enslaved for debt; (3) that he refused the de- mand for the division of the land (t?s hvabaaulK). As to the can- celling of all debts (xpt&v diro/tM-^) there is some controversy; Gilbert and Busolt maintain that all debts were cancelled ; strong reasons, may however, be advanced against it. It is possible that the statement in the Constitution is a hypothesis to explain the restoration of the slaves to freedom. Further, Solon seems to have regulated the accumulation of land (cf. in Rome the legislation of Tiberius Gracchus) and the rate of interest ; and to have simplified commerce by replacing the Pheidonian standard by the Euboic, which was in Use among the Ionian traders, in commerce with whom he foresaw that prosperity lay. It Is impossible here to enter into the details of the controversy in connexion with Solon's land reforms; it must suffice to give the bare outlines of the dispute. There is no question that (1) the distressed class whom Solon sought to re- lieve were the Hektemors,

and that (2) the achievement on which he prided himself was the removal of the &poi or stones which were seen everywhere in Attica, and were symbolic of the slavery of the soil. Almost all writers say that these Spot were mortgage-pillars: that they were originally boundary stones and that when land was mortgaged the terms of the agreement were carved on the stones, as evidence. Now firstly, though such mortgage-pillars existed in the time of Demosthenes, none are found earlier than the year 400 B.C., nor is there any reference before that year to this special sense of the word. If then these stones which Solon removed were mortgage-pillars, it is strange that none should have been found till two hundred years later. Secondly, it is highly improbable that the terms on which land was then cultivated admitted of mortgaging at all. The Hektemors, who, according to the Constitu- tion, paid the sixth part of their produce as rent, 1 were not free-holders but tenants, and therefore, could not mortgage their land at all. From this it follows that when Solon said ne had " re- moved the stones " he referred to the fatal accumulation of land by landowners. The tenants failed to pay rent, were enslaved, and the " boundary stone " of the landowner was moved forward to include their land. Thus the removal of the Spoi was a measure against the accumulation of land in the form of enclosures (reˆ icij) , and fits in with the statement at the end of chapter iv. of the Constitution,

■*Others say they were: (1) labourers who received one-sixth of the produce as wages; (2) tenants who paid five-sixths as rent and kept one sixth, or (3) tenants who paid one-sixth as rent and kept five-sixths. As to (3) it is said such tenants could not have been in real distress, and as to (1) and (2) it is said that such a position would have meant starvation from the first.*

" the land was in the hands of a few." It should be noted (1) that from this releasing of the land it follows that Solon's law against lending on the security of the person must have been retrospective (i.e. in order to provide a sufficient number of freeholders for the land released) ; and (2) that it is one of the most remarkable facts in Athenian economic history that when at the end of the Pelopon- nesian War a proposal was brought forward to limit the franchise to freeholders, it was found that only five thousand failed to satisfy this requirement.

B. Constitutional Reforms.— It is on this part of his work that Solon's claim to be considered a great statesman is founded. By his new constitution he laid the foundations of the Athenian democracy and paved the way for its later developments. It should be noted in the first place that the following account is written on the assumption that the Draconian constitution de- scribed in chapter iv. of the Constitution of Athens had never existed (see Draco). In some respects that alleged constitution is more

democratic than Solon's. This, coupled with the fact that Solon is always spoken of as the founder of democracy, is one of the strongest reasons for rejecting the Draconian constitution. It will be seen that Solon's state was by no means a perfected democracy, but was in some respects rather a moderate oligarchy in which political privilege was graduated by possession of land. To Solon are gener- ally ascribed the four classesˆPentacosiomedimni, Hippeis, Zeugitae and Thetes. Of these the first consisted of those whose land pro- duced as many measures (medimni) of corn and as many measures (melretae) of oil and wine as together amounted to 500 measures. The Hippeis (the horsemen, i.e. those who could provide a war- horse for the service of the state) were rated at over 300 and under 500 medimni; the third class (those who tilled their land with a yoke of oxen) at 200 medimni and the Thetes below 200 medimni. The Zeugites probably served as heavy-armed soldiers, and the Thetes were the sailors of the state. It is likely that the Zeugites were mainly Hektemors (see above) whom Solon converted into freeholders. Whether Solon invented these classes is uncertain, but it seems clear that he first put them into definite relation with the political organism. The Thetes (who included probably the servants of the Eupatridae, now secured as freemen), the fisher-' men of the Paralia (or sea-coast), and the artisans (cerameis) of Athens) for the first time received political existence by their admis- sion to the sovereign assembly of the Ecclesia (q.v.). Of these classes the first alone retained the right of holding the offices of archon and treasurer; other offices were, however, opened to the second and third classes (sc, the Poletae, the Eleven and the Colacretae; see Cleisthenes [I.] footnote). It is of the utmost importance to observe that the office of Strategus (q.v.) is not mentioned in connexion with Solon's reform. It is often said that Solon used his classification as the basis of a sliding scale of taxation. Against this, it is known that Peisistratus, whose faction was essentially the poorer classes, established a uniform 5% tax, and it is highly unlikely that he would, have reversed an existing arrangement which was particularly favourable to his friends. The admission of the Thetes to the Ecclesia was an important step in the direction of democracy (for the powers which Solon gave to the Ecclesia, see Ecclesia). But the greatest reform of Solon was undoubtedly the institution of the Heliaea (or courts of justice). The jury were appointed by lot from all the citizens (including the Thetes), and thus the same people elected the magistrates in the Ecclesia and subsequently tried them in the Heliaea. Hence Solon trans- ferred the sovereign power from the areopagus and the magistrate! to the citizens as a whole. Further, as the archons, at the expiry of their year of office, passed into the areopagus, the people exer- cised control over the personnel of that body also (see Areopagus). In spite of the alleged Draconian constitution, alluded to above, it is still very generally held that Solon invented the Boule or Council of Four Hundred, one hundred from each of the old tribes. The

importance of this body as an advisory committee of the Ecclesia, and the functions of the Prytaneis are explained under Boule\ It is sufficient here to point out that, according to Plutarch's Solon (ch. 19) the state henceforth rested on two councils " as on anchors," and that the large ppwers exercised by the Cleisthenean Boule were not exercised by the Solonian. From this, and the articles Areopagus, BoulS, Ecclesia and Greek Law, it will be seen that Solon contrived an absolutely organic constitution of a " mixed " type, which had in it the seeds of the great democratic growth which reached its maturity under Pericles. It should be added here, in reference to the election of magistrates under Solon's con- stitution, that there is discrepancy between the Politics and the Constitution; the latter says that Solon gave to the Thetes nothing but a share in the Ecclesia and the courts of justice, and that the magistrates were elected by a combination of selection and lot (kXtjp&toi k vpoKpirav), whereas the Politics says that Solon gave them only the power to elect the magistrates and try them at the end of their year. It seems likely for other reasons that the former scheme should be assigned to the years after Marathon, and, there- fore, that the account in the PoliHcs is correct (but see Archon).*

C. Miscellaneous. — The miscellaneous laws of Solon are inter- esting primarily as throwing light upon the social condition of Athens at the time (see Evelyn Abbot, History of Greece, I. xiii. § 18).

In the matter of trade it has been said that he favoured one export only, that of olive oil, in which Athens was peculiarly rich; further he encouraged the settlement of aliens (metoeci) engaged in commerce, and compelled fathers to teach their sons a useful trade under penalty of losing all right to support in old age. The influence of women Solon regarded as most pernicious. Wealthy wives he forbade; no bride might bring more than three changes of raiment and a little light furniture to the house; all brothels and gymnasia were put under stringent state-control (see Prostitution). Solon also regulated intestate succession, the marriage of heiresses, adoption, the use and sinking of wells, bee-farming, the planting of olives and figs, the cutting down of olive trees, the calendar. Further, he ordained that each citizen must show how he obtained his living (Herod, ii. 177) and must, under penalty of losing the franchise, adhere to one or other party in a sedition (for these laws see Plutarch's Solon, chs. 20-24).

The laws were inscribed on Kyrbeis or tablets framed in wood which could be swung round (hence also called axones). The boule as a body swore to observe the laws, and each archon undertook to set up a life-size golden

statue at Delphi if he should be convicted of transgressing them.

Solon appears to have supplemented his enactments by a law that they should remain in force for one hundred years, and accord- ing to another account that his laws, though not the best, should stand unchanged for ten years (Plut. Solon, 25; Herod, i. 29). Yet according to the Constitution of Athens (chs. 11-13) (without which the period from Solon to Peisistratus was a blank), when Solon went abroad in 593(?) the city was disturbed, and in the fifth year dissension became so acute that no archon was elected (for the chronological problem, see J. E. Sandys, Constitution of Athens, ch. 13, note); again four years later the same anarchia (i.e. noarchon elected) occurred. Then four years later the archon Damasias (582 ?) continued in office illegally for twot,years and two months. The office of the archon was then put into commission of ten : five from the Eupatrids, three from the Agroeci and two from the Demi- urgi, and for twenty years the state was in a condition of strife. Thus we see that twelve years of strife (owing to Solon's financial reforms) ended in the reversal of Solon's classification by assess- ment. We are, therefore, driven to conclude that the practical value of his laws was due to the strong and enlightened govern- ment of Peisistratus, whose tyranny put an end to the quarrels between the Shore, the Upland and the Plain, and the stasis of rich and poor.

See editions with notes of Constitution of Athens (q.v.); histories of Greece later than 1891 (e.g. Busolt, &c). See also Gilliard, Quelques reformes de Solon (1907); Cavaignac, in Revue de Philol., 1908. All works anterior to the publication of the Constitution are so far out of date, but reference should be made to the work ofGrote. (J.M. M.)

SOLSTICE (Lat. solstilium, from sol, sun, and sistere, to stand still), in astronomy either of the two points at which the sun reaches its greatest declination north or south. Each solstice is upon the ecliptic midway between the equinoxes, and there- fore 90 from each. The term is also applied to the moment at which the sun reaches the point thus defined.

SOLUNTUM (Gr. SoXotts or SoXoOs), an ancient town of Sicily, one of the three chief Phoenician settlements in the island, situated on the north coast, 10 m. E. of Panormus (Palermo), 600 ft. above sea-level, on the S.E. side of Monte Catalfano (1225 ft.), in a naturally strong situation, and commanding a fine view. The date of its first occupation is, like that of Panor- mus, unknown. It continued to be a Carthaginian possession almost uninterruptedly until the First Punic War, when, after the fall of Panormus, it opened its gates to the Romans. In the Roman period it seems to have been of no great importance; an inscription, erected by the citizens in honour of Fulvia Plau- tilla, the wife of Caracalla, was found there in

1857. It was perhaps destroyed by the Saracens and is now entirely deserted. Excavations have brought to light considerable remains of the ancient town, belonging entirely to the Roman period, and a good deal still remains unexplored. An archaic oriental Artemis sitting between a lion and a panther, found here, is in the museum at Palermo, with other antiquities from this site. With the exception of the winding road by which the town was approached on the south, the streets, despite the unevenness of the ground, which in places is so steep that steps have to be introduced, are laid out regularly, running from east to west and from north to south, and intersecting at right angles. They are as a rule paved with slabs of stone. The houses were constructed of rough walling, which was afterwards plastered over; the natural rock is often used for the lower part of the walls. One of the largest of them, with a peristyle, is currently, though

wrongly, called the Gymnasium. Near the top of the town are some cisterns cut in the rock, and at the summit is a larger house than usual, with mosaic pavements and paintings on its walls. . (T. As.)

SOLUTION (from Lat. solvere, to loosen, dissolve). When a solid such as salt or sugar dissolves in contact with water to form a uniform substance from which the components may be regained by evaporation the substance is called a solution. Gases too dissolve in liquids, while mixtures of various liquids show similar properties. Certain solids also consist of two or more components which are united so as to show' similar effects. All these cases of solution are to be distinguished from chemical compounds on the one hand, and from simple mixtures on the other. When a substance contains its components in definite proportions which can only change, if at all, by sudden steps, it may be classed as a chemical compound. When the relative quantities of the components can vary continuously within certain limits, the substance is either a solution or a mixture. The distinction between these two classes is not sharp; though when the properties of the resultant are sensibly the sum of those of the pure components, as is nearly the case for a complex gas such as air, it is usual to class it as a mixture. When the properties of the resultant substance are different from those of the components and it is not a chemical compound we define it as a solution.

Historical. — Solutions were not distinguished from definite chemical compounds till John Dalton discovered the laws of definite and multiple proportions, but many earlier observations on the solubility of solids in wa'ter and the density of the resulting solutions had been made. As early as 1788 Sir Charles Blagden (1 748-1820) made measurements of the freezing points of salt solutions, and showed that the depression of freezing point was roughly proportional to the amount of salt dissolved. About 1850 Thomas Graham published his famous experiments on diffusion, both with and without a separating membrane. In .1867 botanical investigations by

M. Traube, and in 1877 others by W. Pfeffer, made known the phenomena of the osmotic pressure which is set up by the passage of solvent through a membrane impermeable to the dissolved substance or solute. The importance of these experiments from the physical point of view was recognized by J. H. van't Hoff in 1885, who showed that Pfeffer's results indicated that osmotic pressure of a dilute solution conformed to the well-known laws of gas pressure, and had the same absolute value as the same number of mole- cules would exert as a gas filling a space equal to the value of the solvent. The conception of a semi-permeable membrane, permeable to the solvent only, was used by van't Hofi as a means of applying the principles of thermodynamics to the theory of solution.

Another method of applying the same principles is due to J. Willard Gibbs, who considered the whole problem of physical and chemical equilibrium in papers published in 1877, though the application of his principles only began to make extensive progress about . twenty years after the publication of his purely theoretical investigations. The phenomena of solution and of vapour pressure constitute cases of equilibrium, and conform to the laws deduced by Gibbs, which thus yield a valuable method of investigating and classifying the equilibria of solutions.

Solubility. — Some pairs of liquids are soluble in each other in all proportions, but, in general, when dealing with solutions of solids or gases in liquids, a definite limit is reached to the amount which will go into solution when the liquid is in contact with excess of the solid or gas. This limit depends on the nature of the two components, on the temperature and on the pressure. When the limit is reached the solution is said to be saturated, and the system is in equilibrium. If the solution of a solid more soluble when hot be cooled below the saturation point, the whole of the solid sometimes remains in solution. The liquid is then said to be supersaturated. But here the conditions are different owing to the absence of solid. If a crystal bf the solid be added, the condition of supersaturation is destroyed,

and the ordinary equilibrium of saturation is reached by precipi- tation of solid from solution.

The quantity of substance, or solute, which a given quantity of liquid or solvent will dissolve in presence of excess of the solute measures the solubility of the solute in the given solvent in the conditions of temperature and pressure. The solubilities of solids may be expressed in terms of the

mass of solute which will dissolve in 100 grammes of water.

The following may be taken as examples : —

Solute.

Chemical Constitution of the Solid.

Solubility

at 0° C.

at 20° C.

at ioo°C.

Sodium chloride

NaCl

35-7

36-0

39-8

Potassium nitrate . Barium chloride Copper sulphate Calcium carbonate

KNO3 BaCl 2 CuSO, CaC0 3

133

3°-9

15-5 0-0018

31-2 35-7

22-0

247-0 58-8 73-5

0-00I&

Silver nitrate .

AgNO,

121-9

227-3

(at i 9 °-5

IIII-O

(at no)

When dealing with gases it is usually more convenient to express the solubility as the ratio of the volume of the gas absorbed to the volume of the absorbing liquid. For gases such as oxygen and nitrogen dissolved in water the solubility as thus defined is inde- pendent of the pressure, or the mass of gas dissolved is propor- tional to the pressure. This relation docs not hold for very soluble gases, such as ammonia, at low temperatures. As a general rule gases are less soluble at high than at low temperatures — unlike the majority of solids. Thus oxygen, 4-89 volumes of which dissolve at atmospheric pressure in 1 volume of water at 0° C, only dissolves to the extent of 3-10 volumes at 20° and 1-70 volumes at 100°.

Cause of Solubility. — At the outset of the subject we are met by a fundamental problem, to which no complete answer can be given: Why do certain substances dissolve in certain other substances and not in different substances? Why are some pairs of liquids miscible in each other in all proportions, while other pairs do not mix at all, or only to a limited extent? No satisfactory correlation of solubility with chemical or other properties has been made. It is possible to state the conditions of solubility in terms of the theory of available energy, but the result comes to little more than a re-statement of the problem in other terms. Nevertheless, such a re-statement is in itself sometimes an advance in knowledge. It is certain then that when dissolution occurs the available energy of the whole system is decreased by the process, while when equilibrium is reached and the solution is saturated the available energy is a minimum. When a variable quantity is at a minimum a slight change in the system does not affect its value, and therefore, when a solution is saturated, the increase in the available energy of the liquid phase produced by dissolving in it some of the solid must be equal to the decrease in the available energy of the solid phase, cam»d by the abstraction from the bulk of that part dissolved. The general theory of such equilibria will be studied later under the head of the phase rule.

It is possible that a correlation may be made between solubility and the energy of surface tension. If a solid is immersed in a liquid a certain part of the energy of the system depends on, and is proportional to, the area of contact between solid and liquid. Similarly with two liquids like oil and water, which do not mix, we have surface energy proportional to the area of contact. Equilibrium requires that the available energy and therefore the area of contact should be a minimum, as is demon- strated in Plateau's

beautiful experiment, where a large drop of oil is placed in a liquid of equal density and a perfect sphere is formed. If, however, the energy of surface tension between the two substances were negative the surface would tend to a maximum, and complete mixture would follow. From this point of view the natural solubility of two substances involves a negative energy of surface tension between them.

Gibbs's Phase Rule. — A saturated solution is a system in equili- brium, and exhibits the thermodynamic relations which hold for all such systems. Just as two electrified bodies are in equilibrium when their electric potentials are equal, so two parts of a chemical and physical system are in equilibrium when there is equality between the chemical potentials of each com- ponent present in the two parts. Thus water and steam are in

equilibrium with each other when the chemical potential of water substance is the same in the liquid as in the vapour. The chemical potentials are clearly functions of the composition of the system, and of its temperature and pressure. It is usual to call each part of the system of uniform composition through- out a phase; in the example given, water substance, the only component is present in two phases — a liquid phase and a vapour phase, and when the potentials of the component are the same in each phase equilibrium exists.

If in unit mass of any phase we have n components instead of one we must know the amount of n — \ components present in that unit mass before we know the exact composition of it. Thus if in one gramme of a mixture of water, alcohol and salt we are told the amount of water and salt, we can tell the amount of alcohol. U, instead of one phase, we have r phases, we must find out the values of r(n — 1) quantities before we know the composition of the whole system. Thus, to investigate the composition of the system we must be able to calculate the value of r (re — 1) unknown quantities. To these must be added the external variables of temperature and pressure, and then as the total number of variables, we have r (re + l) + 2.

To determine these variables we may form equations between the chemical potentials of the different components — quantities which are functions of the variables to be determined. If in and in denote the potentials of any one component in two phases in contact, when there is equilibrium, we know that mi=M2. If a third phase is in equilibrium with the other two we have also /ji = /x3. These two equations involve the third relation 112 = 113, which therefore is not an independent equation. Hence with three phases we can form two independent equations for each component. With r phases we can form r — \ equations for each component, and with n components and r phases we obtain «(r — 1) equations.

*Now by elementary algebra we know that if the number of inde- pendent equations be equal to the number of unknown quantities all the unknown quantities can be determined,*and can possess each one value only. Thus we shall be able to specify the system com- pletely when the number of variables, viz. r (re — 1) +2, is equal to the number of equations, viz. n(r — 1); that is when r — n + 2. Thus, when a system possesses two more phases than the number of its components, all the phases will be in equilibrium with each other at one definite composition, one definite temperature and one definite pressure, and in no other conditions. To take the simplest case of a one component system water substance has its three phases of solid ice, liquid water and gaseous vapour in equilibrium with each other at the freezing point of water under the pressure of its own vapour. If we attempt to change either the temperature or the pressure ice will melt, water will evaporate or vapour con- dense until one or other of the phases has vanished. We then have in equilibrium two phases only, and the temperature and pressure may change. Thus, if we supply heat to the mixture of ice, water and steam ice will melt and eventually vanish. We then have water and vapour in equilibrium, and, as more heat enters, the tem- perature rises and the vapour-pressure rises with it. But, if we fix arbitrarily the temperature the pressure of equilibrium can have one value only. Thus by fixing one variable we fix the state of the whole system. This condition is represented in the alge- braic theory when we have one more unknown quantity than the number of equations; i.e. when r(n — 1) + 2=n{r — 1) + 1 or r = n--i, and the number of phases is one more than the number of components. Similarly if we have F more unknowns than we have equations to determine them, we must fix arbitrarily F co- ordinates before we fix the state of the whole system. The number F is called the number of degrees of freedom of the system, and is measured by the excess of the number of unknowns over the number of variables. Thus F = rin — 1) + 2 — n(r — i)=re — r + 2, a result which was deduced by J. Willard Gibbs (1839-1903) and is known as Gibbs's Phase-Rule (see Energetics).*

The phenomena of equilibrium can be represented on diagrams. Thus, if we take our co-ordinates to represent pressure and tem- perature, the state of the systems p with Ice, water and vapour in equilibrium is represented by the point O where the pressure is that of the vapour of water at the freezing point and the tem- perature is the freezing point under that pressure. If all the ice be melted, we pass along the vapour pressure curve of water OA. If all the water be frozen, we have the vapour pressure curve of ice OB; while, if the pressure be raised, so that all the vapour vanishes, we get the curve OC of equilibrium between the pressure and the freezing point of water. The slope of these curves is determined by the so-called " latent heat equation "

Fig. 1.

(see Thermodynamics), dp/dt = 'Klt(v2—v 1), where p and t denote the pressure and temperature, X the heat required to change unit mass of the systems from one phase to the other, and Vz — Vi the resulting change in volume. The phase rule combined with the latent heat equation contains the whole theory of chemical and physical equilibrium.

Application to Solutions. — In a system containing a solution we have to deal with two components at least. The simplest case is that of water and a salt, such as sodium chloride, which crystallizes without water. To obtain a non-variant system, we must assemble four phases — two more than the number of components. The four phases are (i) crystals of salt, (2) crystals of ice, (3) a saturated solution of the salt in water, and (4) the vapour, which is that practically of water alone, since the salt is non-volatile at the temperature in question. Equili- brium between these phases is obtained at the freezing point of the saturated solution under the pressure of the vapour. At that pressure and temperature the four phases can co-exist, and, as long as all of them are present, the pressure and temperature will remain steady. Thus a mixture of ice, salt and the saturated solution has a constant freezing point, and the composition of the solution is constant and the same as that of the mixed solids which freeze out on the abstraction of heat. This con- stancy both in freezing point and composition formerly was considered as a characteristic of a pure chemical compound', and hence these mixtures were described as components and given the name of " cryohydrates."

In representing on a diagram the phenomena of equilibrium in a two-component system we require a third axis along which

*to plot the composition of a variable phase. It is usual to take three axes at right * angles to each other to repre- sent pressure, temperature and the composition of the variable phase. On a plane figure this solid diagram must be drawn in perspec- tive, the third axis C being imagined to lie out of the plane of the paper. The phase-rule diagram that we Fig. 2. construct is then a sketch*

of a solid model, the lines of which do not really lie in the plane of the paper.

Let us return to the case of the system of salt and water. At the cryohydric point O we have four phases in equilibrium at a definite pressure,

temperature and composition of the liquid phase. The condition of the system is represented by a single point on the diagram. If heat be added to the mixture ice will melt and salt dissolve in the water so formed. If the supply of ice fails first the temperature will rise, and, since solid salt remains, we pass along a curve OA giving the relation between temperature and the vapour pressure of the saturated solution. If, on the other hand, the salt of the cryohydrate fails before the ice the water given by the continued fusion dilutes the solution, and we pass along the curve OB which shows the freezing points of a series of solutions of constantly increasing dilution. If the process be continued till a very large quantity of ice be melted the resulting solution is so dilute that its freezing point B is identical with that of the pure solvent. Again, starting from O, by the abstraction of heat we can remove all the liquid and travel along the curve OD of equilibrium between the two solids (salt and ice) and the vapour. Or, by in- creasing the pressure, we eliminate the vapour and obtain the curve OF giving the relation between pressure, freezing point and composition when a saturated solution is in contact with ice and salt.

If the salt crystallizes with a certain amount of water as well as with none, we get a second point of equilibrium between four phases. Sodium sulphate, for instance, crystallizes below 32-6° as Na 2 S04-loH 2 0, and above that temperature as the anhydrous solid Na 2 S04. Taking the point O to denote the state of equilibrium between ice, hydrate, saturated solution and vapour, we pass along OA till a new solid phase, that of Na2S0 4 , appears at 32-6°; from this point arise four curves, analogous to those diverging from the point O.

For the quantitative study of such systems in detail it is convenient to draw plane diagrams which are theoretically projections of the curves of the solid phase rule diagram on one or other of these planes. Experiments on the relation between

temperature and concentration are illustrated by projecting the curve OA of fig. 2 on the /c-plane. The pressure at each point should be that of the vapour, but since the solubility of a solid does not change much with pressure, measurements under the constant atmospheric pressure give a curve practically identical with the theoretical one.

Fig. _ 3 gives the equilibrium between sodium sulphate and water in this way. B is the freezing point of pure water, O that

40°

3d 20°

10°

2

P

o°

B

b

1

Molecular Percentage of /V« a

SO4

Water

Phenol

3

Fig. 3.

of a saturated solution of Na2S04-ioH 2 0. The curve OP repre- sents the varying solubility of the hydrate as the temperature rises from the cryohydric point to 32-6°. At that temperature crystals of the anhydrous Na 2 S04 appear, and a new fixed equilibrium exists between the four phases — hydrate, anhydrous salt, solution and vapour. As heat is supplied, the hydrate is transformed gradually into the anhydrous salt and water. When this process is complete the temperature rises, and we pass along a new curve giving the equilibrium between anhydrous crystals, solution and vapour. In this particular case the solubility decreases with rise of temperature. This behaviour is exceptional.

Two Liquid Components. — The more complete phenomena of mutual solubility are illustrated by the case of phenol and water.

In fig. 4 A represents the freezing point of pure water, and AB the freezing point curve showing the depression of the freezing point as phenol is added. At B is a non- variant system made up of ice, solid phenol, saturated solution and vapour. BCD is the solubility curve of phenol in water. At C a new liquid phase appears — the solution of water in liquid phenol, the solubility of which is represented by the curve DE. At D the composition of the two liquids becomes identical, and at temperatures above D, 68°C the

liquids are soluble in each other in all proportions, and only one liquid phase can exisc. If the two substances are soluble in each other in all proportions at all temperatures above their melting points we get a diagram reduced to the two fusion curves cutting each other at a non- variant point. This behaviour is illustrated by the case of silver and copper (fig. 5). 20 l o At the non-variant point the two metals freeze out together and the composi- 10O ° ” tion of the liquid is the < < ''' same as that of the mixed 906- solid which crystallizes from it. The solid is then known as a eutectic alloy.

A liquid in which the com- position is nearly that of the eutectic shows the changes in the rate of fall of tempera- ture as it is allowed to cool. First a small quantity of one of the pure components begins to crystallize out, and the rate of cooling is thereby diminished owing to the latent heat liberated by the change of state. This process continues till the composition of the liquid phase reaches that of the eutectic, when the whole mass solidifies on the further loss of heat without change of temperature, giving a very definite freezing point. The process of cooling is thus repre- sented by a path which runs vertically downwards till it cuts the

Siluer

Fig. 5.

Copper

freezing point curve, and then travels along it till the non-variant point is reached. In this way two temperature points are obtained in the investigation — the higher giving a point on the equilibrium curve, the lower showing the non-variant point.

Other pairs of alloys, showing more complicated relations, are described in Alloy. Experiments on alloys are, in some ways, easier to make than on pairs of non-metallic substances, partly owing to the possibility of polishing sections for microscopic examina- tion, and the investigation of alloys has done much to elucidate the general phenomena of solution, of which metallic solution constitutes a special case.

When the two components form chemical compounds with each other, the phenomena of mutual solubility become more complex.

jjCu For a simple case to serve as an introduction, let us again turn to

alloys. Copper and antimony form a single compound SbCu 2 . If either copper or anti- mony be added to this compound, the freezing point is lowered just as it would be if a new sub- stance were added, to a solvent. Thus on each side of the point B repre- senting this compound, the curve falls. Proceeding along the curve in either direction, we come to a non-variant or eutectic point. In one case (represented by the point A in the figure) the solid which freezes out is a conglomerate of crystals of the compound with those of antimony, in the other case C with those of copper. Thus in interpreting complicated freezing point curves, we must look for chemical compounds where the curve shows a maximum, and for a eutectic or cryohydrate where two curves meet at a minimum point.

We are now ready to study a case where several compounds are formed between the two components. A good example is the

equilibrium of ferric chloride and water, studied by B. Roozeboom. The experi- mental curve of solubility is shown in fig. 7. At A we have the freezing point of

Eure water, which is lowered y the gradual addition of ferric chloride in the manner shown by the curve AB. At B we have the non-variant cryohydric point at which ice, the hydrate Fe 2 Cl c i2H 2 0, the saturated solution and the vapour are in equilibrium at 55 C. As the proportion of salt is increased, the melting point of the con glomerate rises, till, at the maximum point C, we have the pure compound the hy- drate with twelve molecules 30 of water. Beyond C, the Fig. 7. addition of salt lowers the

melting point again, till at D we obtain another non-variant point. This indicates the appearance of a new compound, which should exist pure at E, the next maximum, and, led by these considerations, Roozeboom discovered and isolated a previously unknown hydrate, Fe 2 Cl 6 7-H 2 0. In a similar way the curve FGH, between 30 and 55 , shows the effect of the hydrate Fe 2 Cl 6 -5H 2 0, and the curve HJK that of the hydrate Fe 2 Cl 6 -4H 2 0, which, when pure, melts at 73-5° — the point J on the diagram. At the point K, 66°, begins the solubility curve of the anhydrous salt, Fe 2 Cl«, the fusion point of which when pure is beyond the limits of the diagram. Let us now trace the behaviour of a solution of ferric chloride which is evaporated to dryness at a constant temperature of 31°. The phenomena may be investigated by following a hori- zontal line across the diagram. When the curve BC is reached, Fe 2 Cl6-i2H 2 separates out, and the solution solidifies. Further renewal of water will cause first liquefaction, as the curve CD is passed, and then resolidification to Fe 2 Cl 6 -7H 2 when DE is cut. Again the solid will liquefy and once more become solid as Fe 2 CU-5H 2 0. Still further evaporation causes these crystals to effloresce and pass into the anhydrous salt. As we have seen, the maxima of the

various curve-branches at C, E, G, and J corre- spond with the melting points of the various hydrates at 37 , 32‘5°, 56° and 73-5° respectively; and at these points melting or solidifica- tion of the whole mass can occur at constant temperature. But we have also found this behaviour to be characteristic of the non- variant or transition points, which, in this case, are represented by the points B,D,F,Hand K (-55 , 27-4°, 30°, 55° and 66°). Thus

in two ways at least a constant melting point can be obtained in a two-component system.

Solid Solutions. — In all the cases hitherto considered, the liquid phase alone has been capable of continuous variation in composition. The solid phases each have been of one definite substance. Crystals of ice may lie side by side with crystals of common salt, but each crystalline individual is either ice or salt; no one crystal contains both components in proportions which can be varied continuously. But, in other cases, crystals are known in which both components may enter. Such pheno- mena are well known in the alums — double sulphates of alu- minium with another metal. Here the other metal may be one, such as potassium, or two, such as potassium and sodium, and, in the latter case, the proportion between the two may vary continuously throughout wide limits. Such structures are known as mixed crystals or solid solutions.

The theoretical form of the freezing point diagrams when solid solutions are present depends on the relation between the available energy and the composition in the two phases. This relation is known when the amount of either component present in the other is very small, for it is then the relation for a dilute system and can

B A

Fig. 8.

Fig. 9.

Fig. 10.

Fig. 11.

be calculated. But at intermediate compositions we can only guess at the form of the energy-composition curve, and the freezing point composition curve, deduced from it, will vary according to the supposition which we make. With the most likely forms for the energy curves we get the accompanying diagrams for the relation between freezing point and concentration.

It will be noticed that in all these theoretical curves the points of initial fusion and solidification do not in general coincide; we reach a different curve first according as we approach the diagram from below, where all is solid, or from above, where all is liquid. Again, it will be seen that the addition of a small quantity of one component, say B, to the other, A, does not necessarily lower the melting point, as it does with systems with no solid solutions ; it is quite as likely to cause it to rise. The second and third figures, too, show that the presence of solid solutions may simulate the phenomena of chemical combination, where the curve reaches a maximum, and of non-variant systems where we get a minimum. The fourth figure shows that, in some cases, it should be possible for solid solutions to be present in a limited part of the field only, being absent between the two nearly vertical lines in fig. 11. Experiment has revealed the existence of systems in which these phenomena are displayed. As an example we may take the case of mixtures of naphthalene and /3-naphthol, substances which form solid solutions in each other. The freezing and melting point curves are exactly similar to theoretical curves of fig. 8, the point A representing pure naphthalene and B pure /3-naphthol. When the equilibria become more complex difficulties of interpre- tation of the experimental results often arise. It is often very difficult to distinguish between a chemical compound, for example, and the case of solid solution represented by fig. 9. All available evidence, from the freezing point curve and from other sources must be scrutinized before an opinion is pronounced. But the elucida- tion of the complicated phenomena of solid solutions would have been impossible without the theoretical knowledge deduced from the principle of available energy.

Supersaturation. — When a crystal of the solid phase is present the equilibrium of a solution is given by the solubility curves we have studied. If, however, a solution be cooled slowly past its saturation point with no solid present, crystallization does not occur till some lower temperature is reached. Between the saturation point and this lower temperature, the liquid holds in solution more of the solute than corresponds with equilibrium, and is said to be supersaturated. A familiar example is to be found in solutions of sodium sulphate, which may be cooled much below their saturation point and kept in the liquid state till a crystal of the hydrate NaaS(VioH 2 is dropped in, when solidifi- cation occurs with a large evolution of latent heat. These phenomena are explicable if we consider the energy relations,

for the intrinsic energy of a system will contain terms depending on the

area of contact between different phases, and, for a given mass of material, the area will be greater if the substance is finely divided. Hence the conditions necessary to secure equilibrium when the solid phase is present are not the same as those necessary to cause crystallization to start in a number of crystals at first excessively minute in size. The corresponding phenomenon in the case of vapours is well known. Dust-free air will remain supersaturated with water-vapour in conditions where a dense cloud would be formed in presence of solid dust- nuclei or electric ions which serve the same purpose.

If a solution of a salt be stirred as it cools in an open vessel, a thin shower of crystals appears at or about the saturation temperature. These crystals grow steadily, but do not increase in number. When the temperature has fallen about io° C. below this point of saturation, a dense shower of new crystals appear suddenly. This shower may be dense enough to make the liquid quite opaque. These phenomena have been studied by H. A. Miers and Miss F. Isaac. If the solution be confined in a sealed glass tube, the first thin shower is not formed, and the system remains liquid till the secondary dense shower comes down. From this and other evidence it has been shown that the first thin shower in open vessels is produced by the accidental presence of tiny crystals obtained from the dust of the air, while the second dense shower marks the point of spon- taneous crystallization, where the decrease in total available energy caused by solidification becomes greater than the increase due to the large surface of contact between the liquid and the potentially existing multitudinous small crystals of the shower.

If the temperature at which this dense spontaneous shower of crystals is found be determined for different concentrations of solution, we can plot a " supersolubility curve," which is found generally to run roughly parallel to the " solubility curve " of steady equilibrium between liquid and already existing solid. When two substances are soluble in each other in all proportions, we get solubility curves like those of copper and silver shown in fig. 5. We should expect to find supersolubility curves lying below the solubility curves, and this result has been realized experimentally for the supersolubility curves of mixtures of salol (phenyl salicylate) and betol (/3-naphthol salicylate) represented by the dotted lines of fig. 12.

In practical cases of crystallization in nature, it is probable that these phenomena of supersaturation often occur. If a liquid mixture

of A and B (fig. 12) were inocu- lated with crystals of A when its composition was that represented by x, cooled very slowly and stirred, the conditions would be those of equilibrium throughout. When the temperature sank to a, on the freezing point curve, crystals of pure A would appear. The

residual liquid would thus become richer in B, and the tem- perature and composition would pass along the curve till E, the eutectic point, was reached. The 100 liquid then becomes saturated ” with B also, and, if inoculated with B crystals, will deposit B alongside of A, till the whole mass is solid. But, if no solid be present initially, or if the cooling be rapid, the liquid of composition x becomes supersaturated and may cool till the supersaturation curve is reached at b, and a cloud of A crystals comes down. The temperature may then rise and the concentration of B increase in the liquid in a manner represented by some such line as b f. The conditions may then remain those of equilibrium along the curve / E, but before reaching / the solution may become supersaturated with B and deposit B crystals spontaneously. The eutectic point may never be reached. The possibility of these phenomena should be borne in mind when attempts are made to interpret the structure of crystalline bodies in terms of the theory of equilibrium.

Osmotic Pressure. — The phase rule combined with the latent heat equation enables us to trace the general phenomena of equilibrium in solutions, and to elucidate and classify cases even of great complexity. But other relations between the different properties of solutions have been investigated by another series of conceptions which we shall proceed to develop. Some botanical experiments made about 1870 suggested the idea of semi-permeable membranes, i.e. membranes which allow a solvent to pass freely but are impervious to a solute when dis- solved in that solvent. It was found, for instance, that a film of insoluble copper ferrocyanide, deposited in the walls of a

*i**

X

N]

sa

x

J

b

—ˆE

y-”

*“***

_ *w -»w uw ou

A Percentage of Salol In Mixture B

Fig. 12.

porous vessel by the inward diffusion and meeting of solutions of copper sulphate and potassium ferrocyanide, would allow water to pass, but retained sugar dissolved in that liquid. It was found, too, when water was placed on one side of such a membrane, and a sugar solution in a confined space on the other, that water entered the solution till a certain pressure was set up when equilibrium resulted.

The importance of these experiments from the point of view of the theory of solution, lay in the fact that they suggested the con- ception of a perfect or ideal semi-permeable partition, and that of an equilibrium pressure representing the excess of hydrostatic pressure required to keep a solution in equilibrium with its pure solvent through such a partition. Artificial membranes are seldom or never perfectly semi-permeable — some leakage of solute nearly always occurs, but the imperfections of actual membranes need no more prevent our use of the ideal conception than the faults of real engines invalidate the theory of ideal thermodynamics founded on the conception of a perfect, reversible, frictionless, heat engine. Further, in the free surface the solutions of an involatile solute in a volatile solvent, through which surface the vapour of the solvent alone can pass, and in the boundary of a crystal of pure ice in a solution, we have actual surfaces which are in effect perfectly semi- permeable. Thus the results of our investigations based on ideal conceptions are applicable to the real phenomena of evaporation and freezing.

Dilute Solutions. — Before considering the more complicated case of a concentrated solution, we will deal with one which is very dilute, when the theoretical relations are much simplified. The vapour pressure of a solution may be pˆssare. measured experimentally by two methods. It may be compared directly with that of the pure solvent, as the vapour- pressure of a pure liquid is determined, by placing solvent and solution respectively above the mercury in two barometer tubes, and comparing the depressions of the mercury with the height of a dry barometer at the same temperature. This method was used by Raoult. On the other hand, a current of dry air may be passed through the series of weighed bulbs containing solution and solvent respectively, and the loss in weight of each determined. The loss in the solution bulbs gives the mass of solvent absorbed from the solution, and the loss in the solvent bulbs the additional mass required to raise the vapour pressure in the air-current to equilibrium with the pure solvent. The relative lowering of vapour pressure of the solution compared with that of

the solvent is measured by the ratio of the extra mass absorbed from the solvent bulbs to the total mass absorbed from both series of bulbs. Experiments by this method have been made by W. Ostwald and J. Walker, and by Lord Berkeley and E. G. J. Hartley.

The vapour pressure of the solution of a non- volatile solute is less than the vapour pressure of the pure solvent. Hence if two vessels, one filled with solvent and one with solution, be placed side by side in an exhausted chamber, vapour will evapo- rate from the solvent and condense on the solution. The solution will thus gain solvent,, and will grow more and more dilute. Its volume will also increase, and thus its upper surface will rise in the vessel. But as we ascend in an atmosphere the pressure diminishes; hence the pressure of the vapour in the chamber is less the higher we go, and thus eventually w T e reach a state of equilibrium where the column of vapour is in equilibrium at the appropriate level both with solvent and solution. Neglecting the very small buoyancy of the vapour, the hydrostatic pressure P at the foot of the column of solution is h g p where h is the height of the column and p the mean density of the solution. If the height be not too great, we may assume the density of the vapour to be uniform, and write the difference in vapour pressure at the surfaces of the solvent and of the solution as p — p'= hgcr. Hence we find that p — p' =P

In practice the time required to reach these various conditions of equilibrium would be too great for experimental demonstration, but the theoretical consideration of vapour pressures is of funda- mental importance. Let us suppose that we possess a partition such as that described above, which is permeable to the solvent but not to the solute when dissolved in it, and let us connect the solution and solvent of fig. 13 with each other through such a partition. If sol- vent were to flow one way or the other through the partition, the

height of the column of solution would rise or fall and the equili- brium with the vapour be disturbed. A continual circulation might thus be set up in an isothermal enclosure and maintained with the performance of an unlimited supply of work. This result would be contrary to all experience of the impossibility of " perpetual motion," and hence we may conclude that through such a semi-permeable wall, the solvent and the solution at the foot of the column would

(T

It

Jl

ii.

Fig. 13.

be in equilibrium under the excess of hydrostatic pressure repre- sented when the solution is very dilute by P = (p—p l)p/

Another relation becomes evident if we use as a semi-permeable partition a " vapour sieve " as suggested by G. F. Fitzgerald. If a number of small enough holes be drilled through a solid substance which is not wetted by the liquid, our knowledge of the phenomena ol capillarity shows us that it needs pressure to force the liquid into the holes. A piston made of such a perforated substance, therefore, may be used to exert pressure on the liquid, while all the time the vapour is able to pass. By evaporation and condensa- tion, then, the solvent can pass through this perforated partition, which thus acts as a perfect semi-permeable membrane. When the solution and solvent are in equilibrium across the partition, the vapour pressure of the solution has been increased by the application of pressure till it is equal to that of the solvent. In any solution, then, the osmotic pressure represents the excess of hydrostatic pressure which it is necessary to apply to the solution in order to increase its vapour pressure to an equality with that of the solvent in the given conditions.

Similar considerations show that, since at its freezing point the vapour pressure of a solution must be in equilibrium with that of ice, the depression of freezing point produced by dissolving a sub- stance in water can be calculated from a knowledge of the vapour pressure of ice and water below the freezing point of pure water. But another method of investigation will illustrate new ways of treating our subject.

By imagining that a dilute solution is put through a thermo- dynamic cycle we may deduce directly relations between its osmotic pressure and its freezing point. Let us Point, freeze out unit mass of solvent from a solution at its freezing point T— dT and remove the ice, which is assumed to be the ice of the pure solvent. Then let us heat both ice and solution through the infinitesimal temperature range dT to the freezing point T of the solvent, melt the ice by the application of an amount of heat L, which measures its latent heat of fusion, and allow the solvent so formed to enter the solution reversibly through a semi-permeable wall into an engine cylinder, doing an amount of work Vdv. By cooling the resultant solution through the range dT we recover the original state of the system. The well-known expression

for the efficiency of the cycle of reversible operation gives us

PdvfL = dT/T or dT = TPdv/L as a value for the depression of the freezing point of the solution compared with that of the pure solvent.

The freezing point of a solution may be determined experimentally. The solution is contained in an inner tube, surrounding which is an air space. Then comes an outer vessel, in which a freezing mixture can be placed. This solution is stirred continuously and the tem- perature falls slowly below the freezing point, till the supersaturation point is reached, or until a crystal of ice is introduced. The solution then freezes, until the heat liberated is enough to raise the tem-

perature to the point of equilibrium given by the tendency of the solution taken in contact with ice to approach the true freezing point on one side and the temperature of the enclosure on the other. To get the true freezing point then, it is well to arrange that the temperature of the enclosure should finally be nearly that of the freezing point to be observed. One way in which this has been secured is by obtaining the under cooling by temporary cooling of» the air space by a spiral tube in which ether may be evaporated, the outer vessel being filled with ice in contact with a solution of equivalent concentration to that within. Modifications of this method have been used by many observers, among others by Raoult, Loomis, H. C. Jones, and by_ E. H. Griffiths and T. G. Bedford, who compared directly the freezing points of dilute solutions with those of the pure solvent in similar conditions by the accurate methods of platinum thermometry.

Another application of the theory of energy enables us to co- ordinate the osmotic pressure of a dilute solution with the pressure of a gas occupying the same space. On Absolute the fundamental hypotheses of the molecular theory, Value ot we must regard a solution as composed of a number Osmotic of separate particles of solute, scattered through- out the solvent. Each particle may react in some way on the solvent in its neighbourhood, but if the solution be so dilute that each of these spheres of influence is unaffected by the rest, no further addition of solvent will change the connexion between one particle of solute and its associated solvent. The only effect of adding solvent will be to separate further from each other the systems composed of solute particle as nucleus and solvent as atmosphere; it will not affect the action of each nucleus on its atmosphere. Thus the result will be the same whatever the nature of the inter- action may be. If solvent be allowed to enter through a semi- permeable wall into an engine cylinder, the work done when the solution within is already dilute will be the same whatever the nature of the interaction between solute and solvent, that is, whatever be the nature of the solvent itself. It will even be the same in those cases where, with a volatile solute, the presence of a solvent may

be dispensed with, and the solute exist in the same volume as a gas. Now the work done by allowing a small quantity of solvent to enter reversibly into an osmotic cylinder is measured by the product of the osmotic pressure into the change in volume. Hence the osmotic pressure is measured by the work done per unit change of volume of the solution. The result of our consideration, therefore, is that the osmotic pressure of a dilute solution of a volatile solute must have the same value as the gaseous pressure the same number of solute particles would exert if they occupied as gas a volume equal to that of the solution.

The reasoning given above is independent of the temperature, so that the variation with temperature of the osmotic pressure of a dilute solution must be the. same as that of a gas, while Boyle's law must equally apply to both systems. Experimental evidence confirms these results, and extends them to the cases of non-volatile solutes — as is, indeed, to be expected, since volatility is merely a matter of degree. When the solution ceases to be dilute in the thermodynamic sense of the word, that is, when the spheres of influence of the solute particles intersect each other, this reasoning ceases to apply, and the resulting modifica- tion of the gas laws as applied to solutions becomes a matter for further investigation, theoretical or experimental. In the limit then, when the concentration of the solution becomes vanishingly small, theory shows that the osmotic pressure is equal to the pressure of a gas filling the same space. Experiments with membranes of copper ferrocyanide have verified this result for solutions of cane-sugar of moderate dilutions. But the most accurate test of the theory depends on measurements of freezing points.

A quantity of gas measured by its molecular weight in grammes when confined in a volume of one litre exerts a pressure of 22-2 atmospheres, and thus the osmotic pressure of a dilute solution divided by its concentration in gramme-molecules per litre has a corresponding value. But we have seen that the depression of dT of the freezing poinjt of a dilute solution is measured by TPdv/h. Putting the absolute temperature of the freezing point of water as 273 °, the osmotic pressure P as 22-2 atmospheres or 22-4Xlo 6 , C.G.S. units per unit concentration, L the latent heat as 79-4 X 4-I84XI0 7 in the corresponding units, and dv the volume change

in the solution for unit mass of solvent added we get for the quantity d l jc, where c is the concentration of the solution, the value i-857° C. per unit concentration. Experimental measurements of freezing points of various

non-electrolytic solutions have been made by Raoult, Loomis, Griffiths, Bedford and others and numbers ranging round 1-85 found for this concentration. Equally good comparisons have been obtained for solutions in other solvents such as acetic acid 3-88, formic acid 2-84, benzene 5-30, and nitro- benzene 695. Such a concordance between theory and experiment not only verifies the accuracy of thermodynamic reasoning as applied to dilute solutions, but gives perhaps one of the most con- vincing experimental verifications of the general validity of thermo- dynamic theory which we possess.

Another verification may be obtained from the phenomena of vapour pressure. Since, in dilute solutions, the osmotic pressure has the gas value, we may apply the gas equation PV = nRT = npvi to osmotic relations. Here n is the number of gramme-molecules of solute, T the absolute temperature, R the gas constant with its usual " gas " value, p the vapour pressure of the solvent and Hi the volume in which one gramme-molecule of the vapour is confined. In the vapour pressure equation p~p' = P, we have the vapour density a equal to M/Vi, where M is the molecular weight of the solvent. The density of the liquid is MN/V, where N is the number of solvent molecules, and V the total volume of the liquid. Sub- stituting these values, we find that the relative lowering of vapour pressure in a very dilute solution is equal to the ratio of the numbers of solute and solvent molecules, or {p — p')/p = »/N.

The experiments of Raoult on solutions of organic bodies in water and on solutions of many substances in some dozen organic solvents have confirmed this result, and therefore the theoretical value of the osmotic pressure from which it was deduced.

Although even good membranes of copper ferrocyanide are rarely perfectly semi-permeable, and in other membranes such as india- rubber, &c, which have been used, the defects from the theoretical values of the equilibrium pressure are very great, yet, in the light of the exact verification of theory given by the experiments described above, it is evident that such failures to reach the limiting value in no wise invalidate the theory of osmotic equilibrium. They merely show that, in the conditions of the particular experiments, the thermodynamic equilibrium value of the osmotic pressure cannot be reached — the thermodynamic or theoretical osmotic pressure (which must be independent of the nature of the membrane provided it is truly semi-permeable) is a different thing from the equilibrium pressure actually reached in a given experiment, which measures the balance of ingress and egress of solvent through an imperfect semi-permeable membrane.

Dilute solutions of substances such as cane-sugar, as we have seen, give

experimental values for the connected osmotic properties — pressure, freezing point and vapour aˆtrofytes. pressure — in conformity with the theoretical values. All these solutions are non-conductors of electricity. On the other hand, solution of mineral acids and salts conduct the current with chemical decomposition— they are called electrolytes. In order to explain the electrical properties of a solution, for instance of potassium chloride, we are driven to believe that each molecule of the salt is dissociated into two parts, potassium and chlorine, each associated with an electric charge equal in amount but opposite in sign. The movement in opposite directions of these charged ions constitutes the electric current in the solution. To explain the electrical properties of sulphuric acid in aqueous solution, the supposition of three ions, two of hydrogen and one of the chemical group SO4, is necessary. Now measurements of osmotic properties of these solutions show that their osmotic pressures are abnormally great and that, at extreme dilution, the ratio of their osmotic pressures to that of equivalent solutions of non-electrolytes is equal to the number of ions indicated by the electrolytic properties. From the osmotic side also, then, electrolytic dissociation is indicated, and indeed, it was from this side that the idea was first suggested by S. Arrhenius in 1887. The subject is dealt with in Electrolysis and Conduction, Electric: § In Liquids.

Concentrated Solutions. — Having dealt with the relations between the properties of an ideally dilute solution, we now turn to the consideration of the general case where the simplifying assumption of great dilution is not made.

The height of the column of solution in -fig. 13 required for osmotic equilibrium through a semi-permeable wall below is now very great, since the osmotic pressure of strong solutions may reach many hundred atmospheres. Hence we must not assume that the density of the vapour in the surrounding

atmosphere is constant, or that the solution, when equilibrium is reached, is of uniform concentration throughout. The osmotic pressure (defined as the difference in the hydro- static pressures of the solution and solvent when pressure. their vapour pressures are equal and they are consequently in equilibrium through a perfect semi-permeable membrane) may also depend on the absolute values of the hydrostatic pressures, as may the vapour pressure of the liquids.

To investigate the osmotic pressure of a strong solution we may consider the hydrostatic pressure required to increase its vapour pressure to an equality with that of the solvent. The relation between hydrostatic pressure and the vapour pressure of a pure liquid may be obtained at once by considering the rise of liquid in a capillary tube. The difference in vapour

pressure at the top and at the bottom of the column is p—p' =Pa/p, as shown above for a column of solution. Writing v for 1/0-, the specific volume of the vapour at the pressure p, and V for i/p, the specific volume of the liquid at the pressure P, and restricting the result to small changes, we get vdpˆVdP.

In considering the corresponding relation for a solution instead of a pure liquid, possible differences in concentration make the column method difficult of application, and it is better to attach the problem by means of an imaginary cycle of isothermal operation. The simplest way to do this is to imagine a vapour-sieve piston through which the vapour but not the liquid can pass. As we have explained above, such a vapour sieve may be constructed by boring a number of small enough holes through a solid not wetted by the liquid.

Let us imagine unit mass of solution of volume V confined in a cylinder ABC between a fixed vapour sieve B and a solid piston A

Solution

= Vapour

*Fig. 14. by which a pressure P is applied. The vapour at pressure * in equilibrium with the liquid is bounded by a solid piston C, which we can also move to change the pressure or volume.*

With such an imaginary apparatus, H. L. Callendar has shown that the variation of vapour pressure of a solution with pressure is given by the expression WdP=vdp, where V is the change in volume of the solution when unit mass of solvent is mixed with it. The corresponding relation for a pure liquid can be regained by considering that at infinite dilution the liquid becomes pure solvent, and the change of volume becomes equal to the volume V of solvent added.

The osmotic pressure Po is the difference of the hydrostatic pressures P' and P of the solution and the solvent when their vapour pressures are equal. Hence <2P = iP'-dP and dP /iP = (V-V')/V' or dPo/dP' = (V—V')/V. If V = V there is no change in osmotic pressure with hydrostatic pressure, and osmotic pressure depends on concentration and temperature only.

The relation between the equilibrium pressures P and P' for solution and solvent corresponding to the same value po of the vapour pressure is obtained by integrating the equation V'dP' = vdp between corresponding limits for solution and solvent. We get

fP'W'dP' = fP° vdp and /"P VJP = fPc vdp,

J P' J Pi J P J P

*whence / ', ™ **P ' " f] VdP** = / «***

where p and p' are the vapour pressures of solvent and solution each under its own vapour pressure only.

If we measure the osmotic pressure Po when the solvent is under its own vapour pressure only, that is, when P = p = po, the term involving V vanishes, and the limit of integration P' becomes Po+£. If we assume that V, the volume change on dilution, varies regularly or not appreciably with pressure, we may write the first integral as V(JPo+p—p') where V' now denotes its mean value between the limits.

To evaluate the second integrals vdp we may subtract a constant b to represent the defect of the volume of the vapour from the ideal volume R// £. This gives

V'{Vo+p-p') = Rf log (pip') -b(p-p').

For most experimental purposes the small terms involving the

factor {p—p') may be neglected, and we have, approximately,

PoV' = R(log (pip').

From this equation the osmotic pressure Po required to keep

a solution in equilibrium as regards its vapour and through a

semi- permeable membrane with its solvent, when that solvent is under its own vapour pressure, may be calculated from the results of observations on vapour pressure of solvent and solution at ordinary low hydrostatic pressures. The chief difficulty lies in the deter- mination of the quantity V, the change in volume of the solution under the pressure Po when unit mass of solvent is mixed with it. This determination involves a knowledge of the density and of the compressibility of the solution; the latter property is difficult to measure accurately.

In some solutions such as those of sugar the change in volume on dilution is nearly equal to the volume of solvent added ; V then becomes equal to V,

the specific volume of the solvent. The osmotic pressures of strong sugar solutions were measured successfully by a direct method with semi-permeable membranes of copper ferro- cyanide by Lord Berkeley and E. G. J. Hartley, who also determined the vapour pressures by passing a current of air successively through weighed vessels containing solution and water respectively.

Their table of comparison published in 1906 shows the following agreement : —

Concentration in

grammes per litre of

solution.

Osmotic pressure at o° C. in atmospheres.

From vapour pressures.

From direct measurement.

420 540 660 750

44-3 (at 12-6°)

69-4 101-9 136-0

43-97

67-5I

100-78

133-74

It seems likely that measurements of vapour pressure and com- pressibility may eventually enable us to determine accurately osmotic pressures in cases where direct measurement is impossible.

The slope of the temperature vapour pressure curves in the neighbourhood of the freezing point of the solvent is given by Freezing tne latest heat equation. The difference in the two Point— slopes for water and ice is dp/dT — dp' fd T = L/Tti, Solutions. wne re l i the latent heat of fusion, is the difference between the heats of evaporation for ice and water, and v is the specific volume of the vapour.

The difference in the lowering of vapour pressures dp— dp' may be put equal to V, where P is the osmotic pressure, and V the specific volume of the solvent. We then get VrfP = LdT/T.

In order to integrate this expression we need to know L and v as functions of the temperature and pressure. The latent heat L

at any temperature is given by L = Lo— \ g (s-s')dT, where Lo

is value at T and s—s' is the difference in the specific heats of water and ice. The probable error in neglecting any variation of specific heat is small, and we may calculate L from the values of Lo — (s~- s') (T — T), where s—s' is about 0-5 calories. The variation of L with pressure is probably small.

The volume of a gramme of water also depends on temperature and pressure. Approximately one degree lowering of freezing point corresponds with a change of 12 atmospheres in the osmotic pressure. From the known coefficients of compressibility and thermal expansion we find that V may be represented by the linear equation V = 1-000+0-0008 A, where A is the lowering of the freezing point below 0°.

Putting in these values and integrating we have, neglecting terms involving A\ P = l2-o6 A— 0-021 A where P is the osmotic pressure in atmospheres.*

H. W. Morse and J. C. W. Frazer, who have made direct measure- ments of osmotic pressure of solution of cane-sugar, have also measured the freezing points of corresponding solutions. From these results the equation just given has been examined by G. N. Lewis.

Concentration in gramme- molecules per litre of water.

Depression of the freezing point = A.

Osmotic pressure.

Calculated from A.

Observed.

01

o-5

I-O

0-195

0-985 2-07

2-35

n-8

249

2-44

n-8

24-8

Thus the theory of the connexion of osmotic pressure with freezing point (like that with vapour pressure) seems to give results which accord with experiments.

At the limit of dilution, when the concentration of a solution approaches zero, we have seen that thermodynamical theory,

verified by experiment, shows that the osmotic frvssure. P ressure nas the same value as the gas pressure of

the same number of molecules in the same space. Gases at high pressures fail to conform to Boyle's law, and solu-

tions at moderate concentrations give osmotic pressures which increase faster than the concentration. The variation of gases from Boyle's law is represented in the equation of Van der Waals by subtracting a constant b from the total volume to represent the effect of the volume of the molecules themselves. The corresponding correction in solutions consists in counting only the volume of the solvent in which the solute is dissolved, instead of the whole volume of the solution.

■*4U*

A-

100 80 60

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11/

P

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40

+

80

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Molecules pet

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voter

1

23456760

Fig. 15.

In fig. 15 the curve I represents Boyle’s law if the volume is taken to be that of the solution, and the curve II if the volume is that of the solvent. Even this correction is not sufficient in solution of sugar, where the theoretical curve II lies below the experimental observations. A further correction may be made by adding more empirical terms to the equation, but a more promising idea, due to J. H. Poynting and H. L. Callendar is to trace the effect of possible combination of molecules of solute with molecules of the solvent. These combined solvent molecules are thus removed from existence as solvent, the effective volume of which is reduced to that of the remaining free molecules of solvent. The greater the number of water molecules

attached to one sugar molecule, the less the residual volume, and the greater the theor- etical pressure. Callendar finds that five molecules of water in the case of cane-sugar or two molecules in the case of dextrose are required to bring the curves into conformity with the observations of Berkeley and Hartley, which in fig. 15 are indicated by crosses.

Solubility and Heat of Solution. — The conceptions of osmotic pressure and ideal semi-permeable membranes enable us to deduce other thermodynamic relations between the different properties of solutions. As an example, let us take the following investigation : —

*An engine cylinder may be imagined to possess a semi-permeable bottom and to work without friction. If it be filled with a solution and the bottom immersed in the pure solvent, pressure equal to the osmotic pressure must be exerted on the piston to maintain equilibrium. Such a system is in the thermo- dynamic equilibrium. The slightest change in the load will cause motion in one direc- tion or the other — the system is thermodynamically reversi- ble. Such an arrangement may be put through a cycle of operations as in Carnot's engine (see Thermodynamics) and all the laws of reversible engines applied to it. If the solution in the cylinder be kept saturated by the presence ˆ IG – I *>-*

of crystals of the solute, crystals will dissolve as solvent enters, and the solution remains saturated throughout. By an imaginary cycle of operations we may then justify the application to solutions of the latent heat have already assumed as applicable. \/T(v2—i>i), P is the osmotic pressure, ture and X the heat of solution of when dissolving to form a volume

A n-, rrT M%

equation which we In the equation dP/dT = T the absolute tempera- unit mass of the solute of saturated solution

in an osmotic cylinder. This process involves the performance of

an amount of osmotic work P(»2 — Vi). If the heat of solution be measured in a calorimeter, no work is done, so that, if we call this calorimetric heat of solution L, the two quantities are connected by the relation L = X + P(f2— Vi). If L is zero or negligible, X=ˆP(» 2 -!; 1) and we have <2P/<2T=-P/T or dP/P=-dT/T, which on integration gives log P = log T + C, or P = &T, i.e. the osmotic pressure is proportional to the absolute temperature. This result must hold good for

any solution, but if the solution be dilute when saturated, that is, if the solubility be small, the equation shows that if there be no heat effect when solid dissolves to form a saturated solution, the solubility is independent of temperature, for, in accordance with the gas laws, the osmotic pressure of a dilute solution of constant concentration is proportional to the absolute temperature. It follows that if the thermodynamic heat of solution be positive, that is, if heat be absorbed to keep the system at constant temperature, the solubility will increase with rising temperature, while if heat be evolved on dissolution, the solubility falls when the system is heated.

In all this investigation it should be noted that the heat of solu- tion with which we are concerned is the heat effect when solid dissolves to form a saturated solution. It is not the heat effect when solid is dissolved in a large excess of solvent, and may differ so much from that effect as to have an opposite sign. Thus cupric chloride dissolves in much water with an evolution of heat, but when the solution is nearly saturated, it is cooled by taking up more of the solid.

In a very dilute solution no appreciable heat is evolved or absorbed when solvent is added, but such heat effects are Osmotic generally found with more concentrated solutions. Pressure The result is to change the relation between tempera- and Tem- ture and the osmotic pressure of a solution of constant pera ure. concen tration, a relation which, in very dilute solutions, is a direct proportionality.

The equation of available energy (see Energetics) $A = U + TdA/dT$ may be applied to this problem. The available energy A is the work which may be gained from the system by a small rever- sible isothermal operation with an osmotic cylinder, that is Pdv. If I is the heat of dilution per unit change of volume in a calorimeter where all the energy goes to heat, the change in internal energy U is measured by Idv. We then have

Pdv = ldv + T-^{Pdv).

Neglecting the volume change with temperature this gives $P = l--TdP/dT$ for the relation required. In the case where / is negligible we have $P/dP = T/dT$, which on integration shows that the osmotic pressure, as in the special case of a dilute solution, is proportional to the absolute temperature.

Theories of Solution. — The older observers, noticing the heat effects which often accompany dissolution, regarded solutions as chemical compounds of varying composition. The physical investigation of osmotic pressure, and its correlation by Van't Hoff with the pressure of a gas, brought forward a new aspect of the phenomena, and suggested an identity of physical modus

operandi as well as of numerical value. On this view, the function of the solvent is to give space for the solute to diffuse, and the pressure on a semi-permeable membrane is due to the excess of solvent molecules entering over those leaving in conse- quence of the smaller number which impinge on the membrane from the side of the solution; the defect in the number must be proportional, roughly at any rate, to the number of solute molecules, present, that is, to the strength of the solution.

Whatever view, if any, be adopted as to the nature of a solu- tion, the thermodynamic relations we have investigated equally hold good. It is the strength and weakness of thermodynamic methods that they are independent of theories of constitution. The results are true whatever theory be in vogue, but the results throw no light on the problem of which theory to choose. All the thermodynamic relations we have deduced hold on any theory of solution and favour no one theory rather than another. Whether osmotic pressure be due to physical impact or to chemical affinity it must necessarily have the gas value in a dilute solution, and be related to vapour pressure and freezing point in the way we have traced. But for any theory of solution to be tenable, it must at least be consistent with the known thermo- dynamic relations, verified as those relations are by experiment.

On certain assumptions required for the extension of the methods of the kinetic theory of gases to liquids, L. Boltzmann offered a demonstration of the law of osmotic pressure in dilute

solutions, based on the idea that the mean energy of translation of a molecule should be the same in the liquid as in the gaseous state. But, whether or not the assumption underlying this demonstration be accepted, the similarity between solution and chemical action remains, and the osmotic law has been examined from this side by J. H. Poynting and by H. L. Callendar. The fundamental phenomenon they take to be the identity of vapour pressure, and consider the combination necessary to reduce the vapour pressure of a solution to the right value. If each mole- cule of the solute combines with a certain number of molecules of the solvent in such a way as to render them inactive for evapora- tion, we get a lowering of vapour pressure. Let us assume that the ratio pjp' of the vapour pressures of the solvent and solution is equal to the ratio of the number of free molecules of solvent to the whole number of molecules in the solution. Each molecular complex, formed by solution and solvent, is treated as a single molecule. If there are n molecules of solute to N of solvent originally, and each molecule of solute combines with a molecule of solvent, we get for the ratio of vapour pressures pjp' — (N — a«)/(N — a»+»), while the relative lowering of vapour pressure is (p — p')lp = nj(N — an).

In the limit of dilution when n is very small compared with N this gives

Raoult's experimental law that the relative lowering is w/N, which we deduced from the osmotic law, and conversely from which the osmotic law follows, while for more concentrated solutions agreement is obtained by assigning arbitrary values to a, which, as we have seen, is 5 in the case of cane-sugar.

Certain solvents, such as water, liquid ammonia or liquid hydrocyanic acid, possess the power of making some solutes, such as mineral salts and acids, when dissolved in them, con- ductors of electricity. The special properties of these solutions are dealt with under Electrolysis and Conduction, Elec- tric, § In Liquids. Attempts have been made to co-ordinate this ionizing power of solvents with their dielectric constants, or with their chemical properties. On the lines of Poynting's theory of solution, each ion in electrolytes must combine with one or more molecules of solvent.

Diffusion in Solutions. — The passage of dissolved substances through animal and vegetable membranes was the subject of many early experiments. It was found that substances like mineral salts, which crystallize well from solution, passed such membranes with comparative ease, while the jelly-like substances such as albumen passed with extreme slowness if at all. The first to make systematic experiments on the free diffusion of dissolved substances with no separating membrane was Thomas Graham (1804-1860), who immersed in a large volume of water a wide-mouthed bottle containing a solution, and after some time measured the quantity of substance which had diffused into the water. Again the two classes of substances mencioned above were found to be distinguished, and Graham called the slowly diffusible non-crystalline bodies colloids, in contrast to the quickly diffusible crystalloids. Graham showed that the diffusion was approximately proportional to the difference in con- centration, and on these lines a theory of diffusion was founded on the lines of Fourier's treatment of the conduction of heat.

The quantity of substance which diffuses through unit area in one second may be taken as proportional to the difference in. con- centration between the fluids at that area and at another parallel area indefinitely near it. This difference in concentration is proportional to the rate of variation — dc/dx of the concentration c with the distance x, so that the number of gramme-molecules of solute which, in a time dt, cross an area A of a long cylinder of. constant cross section is dN = —DA(dc/dx)dt, where D is a constant known as the diffusion constant or the diffusivity.

The osmotic pressure of a solution depends on the concentration; and, if we regard the difference in that pressure as the effective force driving the dissolved substance through the solution, we are able to obtain the equation

of diffusion in another form. When the solution is dilute enough for the osmotic pressure to possess " the gas " value the equation becomes —

dN '= ~ˆr A dl dt '

where R is the usual gas constant, T the absolute temperature, and F the force required to drive one gramme-molecule of the solute through the solution with unit velocity.

By comparison with the first equation we see that RT/F is equal to D, the diffusion constant. This constant can be measured experimentally, and for such a substance as sugar or water comes out about 0-3 at 20° C, the unit of time being the day. Hence the force required to drive one gramme-molecule of sugar through water with a velocity of one centimetre per second may be calculated as some thousands of millions of kilogrammes weight.

In the case of electrolytes we can go further, and calculate the diffusion constant itself from the theory of electrolytic dissociation (see Conduction, Electric, § In Liquids). On that theory the ions of a dilute solution migrate independently of each other. Since some ions are more mobile than others, a separation will ensue when water is placed in contact with a solution, the faster moving ion penetrating quicker into the water under the driving force of the osmotic pressure gradient. This separation causes a difference of potential, which can be calculated and is found to agree with the values obtained experimentally. The separation also sets up electro- static forces, which increase until they are strong enough to drag the slower moving ions along faster, and to retard the naturally faster ions till they travel at the same rate. The resistance offered by the liquid, and therefore the force F, required to drive one gramme- molecule through the liquid with unit velocity is the sum of the corresponding quantities for the individual ions. Now the veloci- ties u and v of the opposite ions under unit potential gradient, and therefore U and V under unit force, are known from electrical data. Thus F, which is equal to i/U + i/V, is known. The osmotic pressure of an electrolyte consisting of two ions is double that of a non-electrolyte. Hence for a binary electrolyte the diffusion constant is measured by 2RT/F or. 2UVRT/(U+V). This result gives a value of D for dilute hydrochloric acid equal to 2-49 to compare with the observed value of 2-30. Other substances give equally good agreements; thus sodium chloride has a calculated . constant of 1 -12 and an observed one of i-ii. Such concordance gives strong support to the theory of diffusion outlined

above.

Colloidal Solutions. — Besides a large number of animal and vegetable substances, many precipitates formed in the course of inorganic chemical reactions are non-crystalline and appear in the colloidal state, instances are the sulphides of antimony and arsenic and the hydroxides of iron and alumina. Some of these colloids dissolve in water or other liquids to form solutions called by Graham hydrosols; Graham named the solids formed by the setting or coagulation of these liquids hydrogels. Solutions of colloids in solvents such as water and alcohol seem to be divisible into two classes. Both mix with warm water in all proportions, and will solidify in certain conditions. One class, represented by gelatin, will redissolve on warming or diluting, while the other class, containing such substances as silica, albumen, and' metallic, hydrosulphides, will solidify on heating or on the addition of electrolytes to form a solid " gel " which cannot be redissolved. Solidification of the first kind may be termed " setting," that of the second " coagulation."

The power of coagulation of colloids shown by electrolytes depends in a curious manner on the chemical valency of the effective ion. The average of the coagulative powers of salts of univalent, divalent and trivalent metals have been found by experiment to be proportional to the numbers 1:35: 1023. If we assume that a certain minimum electric charge must be brought into contact with a group of colloid particles to produce coagulation, twice as many univalent ions must collect to produce the same effect as a number of divalent ions, and three times as many as an effective number of trivalent ions. We can calculate, by the help of the kinetic theory and the theory of chances, the fre- quency with which the necessary conjunctions of ions will occur, and show that the general law will be that the coagulative powers should be in the ratios of 1 : x : x 2 . Putting £ = 32, we get 1:32: 1024 to compare with the experimental numbers. The ordinary surface energy of a two-phase system tends to diminish the area of contact, and thus to help the growth of the larger aggregates required for coagulation. A natural electric charge on the particles would oppose this tendency, and tend to increase the free surface and thus promote disintegration and solution. The function of the electrolyte may be to annul such a natural charge and thus allow the non-electric surface energy to produce coagulation. This explanation is supported by some experiments by W. B. Hardy, who found that certain colloids did possess electric charges, the sign of which depended on whether the sur- rounding liquid was slightly acid or slightly alkaline. At the neutral point, when the particles possessed no charge, their

stability was destroyed, and they were precipitated. But recent experiments have shown that the simple theory of coagulation here outlined needs

amplification in certain directions. The phenomena seem to be dependent on variables such as time, and are more complicated than seemed likely at first.

The size of the suspended particles in colloidal solutions varies greatly. In some solutions they are visible under a good microscope. In other cases, while too small to be directly visible, they are large enough to scatter and polarize a beam of light. In yet other solutions, the particles are smaller again, and seem to approach in size the larger molecules of crystalloid substances. It is not yet agreed whether colloid solution is the same in kind though different in degree from crystalloid solution or is a phenomenon of an entirely different order.

References. — The properties and theory of solutions are treated in all works on general physical chemistry; Ostwald's discussion in his Lehrbuch was translated into English in 1891 by M. M. P. Muir entitled Solution. Special works are W. C. D. Whetham, Theory of Solution (1902) ; W. Rothmund, Loslichkeit (1907). Solubility tables are given in Landolt, Bornstein and Meyerhoffers, Tabellen (1905) ; A. M. Comey, Dictionary of Solubilities (Inorganic) (1896); A. Seidell, Dictionary of the Solubilities of Inorganic and Organic Substances (1907). (W. C. D. W.)

SOLUTRIAN EPOCH, in archaeology, the name given by G. de Mortillet to the second stage of his system of cave-chronology, and that synchronous with the third division of the Quaternary period. It is so called from the Solutre Cave, Macon district, S&one-et-Loire. The period is characterized by two series of chipped flints, one modelled on the laurel-leaf, the other on that of the willow. Those of the first series are artistically chipped upon the two faces and the end, and are readily distinguishable from the flints of the preceding Mousterian epoch. Large thin spear-heads; scrapers with edge not on the side but on the end: flint knives and saws, but all still chipped, not ground or polished; long spear-points, with tang and shoulder on one side only, are also characteristic implements of this epoch. Bone or horn, too, was used. The Solutrian work exhibits a transitory stage of art between the flint implements of the Mousterian and the bone implements of the Madelenian epochs. The fauna includes the horse, reindeer, mammoth, cave lion, rhinoceros, bear and urus. Solutrian " finds " have been also made in the caves of Les Eyzies and Laugerie Haute, and in the Lower Beds of Cresswell Cave (Derbyshire).

SOLWAY FIRTH, an estuarine inlet of the Irish Sea, between England and Scotland. If its mouth be taken as between St Bee's Head on the English and Burrow Head on the Scottish coast, its length is 50 m. The breadth at the mouth is 32 m.; near the head, where the Solway viaduct of the Caledonian rail- way crosses the firth, it is nearly if m. The general

direction is north-easterly from the mouth. The Scottish counties bordering the firth are Wigtownshire, Kirkcudbright and Dumfriesshire; the English coast belongs to Cumberland. On the English side the low Solway Plain borders the firth, except for a short distance above St Bees Head. The Scottish shore, however, is not continuously flat, and such elevations as Criffell (1866 ft.), Bengairn (1250) and Cairnharrow (1497), above Wigtown Bay, rise close to it. The shore line is broken on both sides by the estuaries of several rivers. Thus in Scotland the Cree and other streams enter Wigtown Bay; the Dee, Kirk- cudbright Bay; Auchencairn Bay and Rough Firth receive numerous small streams, and the Nith discharges through a long estuary. The Annan has its mouth near the town of that name; and the Esk and Eden at the head of the firth, in Cumberland. On this shore Morecambe Bay receives the Wampool and Waver from the plain, the Ellen has its mouth at Maryport, and the Derwent from the Lake District at Workington. The waters of the firth are shallow, and a tidal bore occurs periodically. The fisheries are extensive, and though there are no ports of the first magnitude on the firth, a considerable shipping trade is carried on at Whitehaven, Harrington, Workington, Maryport and Silloth in Cumberland, and at Annan, Kirkcudbright, Creetown and Wigtown on the Scottish side.

SOMA (Sanskrit for " pressed juice," from the root su, to press), in Hindu mythology the god who is a personification of the soma plant (Asclepias acida), from which an intoxicating milky juice is squeezed. Soma is the Indian Bacchus, and one of the most important of the Vedic gods. All the 114 hymns of the ninth book of the Rig Veda are in his praise. He is celebrated as a dual divinity with Indra, Agni, Pushan or Rudra, in other books. The preparation of the soma juice was a very sacred ceremony, and the worship of the god is very old, soma being identifiable with the Avestan homa, prepared and cele- brated in the Indo-Iranian period. The plant's true home is heaven, and soma is drunk by gods as well as men, and it is under its influence that Indra is related to have created the universe and fixed the earth and sky in their place. In post- Vedic literature soma is a regular name for the moon, which is regarded as being drunk up by the gods and so waning, till it is filled up again by the sun. In both the Rig Veda and Zend Avesta soma is the king of plants; in both it is a medicine which gives health, long life and removes death. In both the celestial is distinguished from the terrestial soma, and the liquor from the god. The first soma is supposed to have been stolen from its guardian demon by an eagle, this soma-bringing eagle of Indra being comparable with the nectar-bringing eagle of Zeus, and with the eagle which, as a metamorphosis of

Odin, carried off the mead.

See A. A. Macdonell, Vedic Mythology (Strassburg, 1897).

SOMALILAND, a country of East Africa, so named from its Somali inhabitants. It is also known as the " Eastern Horn of Africa," because it projects somewhat sharply eastwards into the Indian Ocean, and is the only section of the continent which can be spoken of as a peninsula. In general outline it is an irregular triangle, with apex at Cape Guardafui. From the apex the north side extends over 600 m. along the south shore of the Gulf of Aden westwards to Tajura Bay, and the east side skirts the Indian Ocean south-west for over 1000 m. to the mouth of the Juba. Somali also inhabit the coast region and considerable areas inland, as far south as the Tana river. The country between the Tana and Juba rivers now forms part of British East Africa (?.».), and in this article is not included in Somaliland. Inland the limits of Somaliland correspond roughly with the Shoan and Harrar Hills, and the Galla dis- trict south of Shoa and east of Lake Rudolf. The 40 east may be taken as the western limit of Somali settlements. The triangular space thus roughly outlined has a total area of about 356,000 sq. m. The population is estimated at about 1,100,000, but no trustworthy data are available. It is partitioned between Great Britain, Italy, France, and Abyssinia as under: —

Area in sq. m.

Population.

British Somaliland . French Somaliland . Italian Somaliland . Abyssinian Somaliland l .

Total

68,000

12,000

146,000

130,000

300,000

50,000

400,000

350,000

356,000

1,100,000

Somaliland was not generally adopted as the name of the country until the early years of the 19th century. The northern and central districts were previously known as Adel, the north- east coast as Ajan. By the ancients the country was called regio romataica, from the abundance of aromatic plants which it produced.

Physical Features. — The whole region is characterized by a re- markable degree of physical uniformity, and may be broadly described as a vast plateau of an average elevation of 3000 ft., bounded westwards by the Ethiopian and Galla highlands and northwards by an inner and an outer coast range, skirting the south side of the Gulf of Aden in its entire length from the Harrar uplands to Cape Guardafui. The plateau, known as the Ogaden plateau, everywhere presents the same monotonous aspect of a boundless steppe clothed with a scanty vegetation of scrubby plants and herbaceous growths.

The incline is uniformly to the south-east, and apart from the few coast streams that reach the Gulf of Aden during the rains, all the running waters are collected in three rivers— the Nogal in the north, the Webi Shebeli in the centre, and the Juba (q.v.)

1 See also Abyssinia.

in the south — which have a parallel south-easterly direction towards the Indian Ocean. But so slight is the precipitation that the Juba alone has a permanent discharge seawards. The Nogal sends down a turbulent stream during the freshets, while the Shebeli, notwithstanding the far greater extent of its basin, does not reach the sea. At a distance of about 12 m. from the coast it is inter- cepted by a lone line of dunes, which it fails to pierce and is thus deflected southwards, flowing in this direction for nearly 170 m. parallel with the coast, and then disappearing in a swampy de- pression (the Bali marshes) before reaching the Juba estuary. 2

Geology. — The Somaliland plateau is chiefly composed of gneiss and schist. In the north the plateau is overlain by red and purple unfossiliferous sandstones, capped near its edge by a cherty lime- stone also unfossiliferous but possibly of Lower Cretaceous age. The plains inland from Berbera, and the maritime margins between the coast and foot of the plateau, consist of limestones of Lower Oolitic age with Belemnites subhastatus. At Duba some limestones may belong to the Lower Cretaceous.

Climate. — In general the climate is dry and bracing all over the plateau.

Temperature is as a rule high but with considerable variation, from 60° F. or less in the early morning to ioo° or over in the early afternoon. On an average the coast-belt temperatures are some io c higher than those of the plateau. Four seasons are recognized — January-April, very dry and great heat ; May-June, cooler and the " heavy " rains; July-September, the season of extreme heat and the south-west monsoon ; October- December, the " light " rains. The " heavy " rains are little experienced in the coast districts. The rainfall is from 4 to 8 in. a year. In con- sequence of the elevation of. the plateau and the dryness of the air, the heat is less oppressive than is indicated by the tempera- tures recorded. Malaria prevails in the valley of the Webi Shebeli. Flora. — The highlands, which in an almost continuous line traverse East Africa, have to a great extent isolated the flora of Somaliland in spite of the general resemblance of its climate and soil to the country on the western side of the band of high ground. In the northern mountainous regions of Somaliland the flora resembles, however, to some extent, that of the Galla country and Abyssinia. On the plateau many forms common elsewhere in East Africa, such as the Borassus palm and the baobab tree, are missing. The greater part of the country is covered either with tall coarse grasses (these open plains being called ban), or more commonly with thick thorn-bush or jungle, among which rise occasional isolated trees. The prevalent bush plants are khansa (umbrella mimosa), acacias, aloes, and, especially, Boswellia and Commiphora, which yield highly fragrant resins and balsams, such as myrrh, frankincense (olibanum) and " balm of Gilead." The billeil is a thorn-bush growing about 10 ft. high and covered with small curved hooks of great strength. The bush contains also numerous creepers, one of the most common being known as the armo. It is a vivid green and has large, fleshy, heart-shaped leaves. Of the thorns, the guda and the wadi often grow from 30 to 50 ft. high and have large flat-topped branches. In places there are forests of these trees. On the summit of the Golis range the cedars form forests. Among the larger trees are the mountain cedar, reaching to 100 ft. ; the gob, which bears edible berries in appearance something like the cherry with the taste of an apple, grows to some 80 ft., and is found fringing the river beds; the hassadan, a kind of euphorbia, attaining a height of about 70 ft. ; and the darei, a fig tree. There are patches of dense reeds, reaching 10 ft. high, and thickets of tamarisk along the river beds, and on either side the jungle is high and more luxuri- ant than on the open plateau. Of herbaceous plants the kissenia, the sole representative of the order Loasaceae, which is common in America but very rare elsewhere, is found in Somaliland, which also possesses forms belonging to the eastern Mediterranean flora.

Fauna. — Somaliland is rich in the larger wild animals. Among them are the lion (Somali name libah) and elephant, though these have been to a

large extent driven from the northern coast districts; the black or double-horned rhinoceros, common in central Ogaden; leopards, abundant in many districts, and daring — they have given their name to the Webi Shebeli ("River of the Leopards"); panthers; spotted and striped hyenas (the latter rare); foxes, jackals, badgers and wild dogs; giraffes and a great variety of antelopes. The antelopes include the beisa oryx, fairly common and widely distributed; the greater and lesser kudu (the greater kudu is not found on the Ogaden plateau) ; the Somali hartebeest (Bubalis Swaynei), found only in the Haud and Ogo districts; waterbuck, rare except along the Webi Shebeli and the Nogal ; the dol or Somali bushbuck; the dibatag or Clarke's gazelle; the giraffe-like gerenuk or Waller's gazelle, very common ; the aoul or Soemmering's gazelle, widely distributed ; the dero {Gazella Speki) ; and the small dikdik or sakaro antelope, found in almost every thicket. The zebra (Equus grevyi) is found in Ogaden and places to the south, the wild ass in the northern regions. There are wart hogs, baboons (maned and maneless varieties), a tree monkey, jumping shrews, two kinds of squirrel, a small hare, rock rabbits

2 It is probable that a divergent branch leaves the Shebeli some distance above the swamps and that at high water an overflow into the Juba occurs (see Geog. Journ., Nov. 1909).

and a weasel-like animal which hunts in packs. Ostriches are found in the open plains; the rivers swarm with crocodiles, but hippopotami are rare. Birds of prey are numerous and include eagles, vultures, kites, ravens and the carrion stork. Among game birds are three varieties of bustard, guinea fowl, partridges, sand grouse and wild geese. Snakes are common, an adder, a variegated rock snake and a

Hadramut with forty followers about the 13th century. Other traditions trace their origin to the Himyaritic chiefs Sanhaj and Samamah, said to have been coeval with a King Afrikus, who is supposed to have conquered Africa about a,d. 400! These legends should perhaps be interpreted as pointing to a

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Bargal

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SOMALILAND

English Miles

20 40 60 80 100

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black snake called muss being those most dreaded. Mosquitoes are rarely troublesome; gadflies, and a large spider (hangeyu), which spins a web resembling golden silk, are common, as are scorpions and centipedes. Termites rear sharp pointed " hills," often over 20 ft. high. A species of lizard grows nearly 4 ft. long.

Inhabitants. — The Somali belong to the Eastern (Ethiopic) Hamitic family of tribes, of which the other chief members are the neighbouring Galla and Afar, the Abyssinian Agau and the Beja tribes between the Nubian Nile and the Red Sea. They have been identified with the people of Punt, who were known to the Egyptians of the early dynasties. The Somali, however, declare themselves to be of Arab origin, alleging their progenitor to have been a certain Sherlf Ishak b. Ahmad, who crossed from

Etnzry Walker >c.

series of Arab immigrations, the last two of which are referred to the 13th and 15th centuries. But these intruders seem to have been successively absorbed in the Somali stock; and the Arabs never succeeded in establishing permanent communities in this region. Their influence has been very slight even on the Somali language, whose structure and vocabulary are essentially Hamitic, with marked affinities to the Galla on the one hand and to the Dankali (Afar) on the other.

The present Somali peoples are possessed of no general type. They are not pure Hamites, and their physical characteristics vary considerably, showing signs of interbreeding with Galla, Afar, Arabs, Abyssinians, Bantus and Negroes. They are a

race of magnificent physique, tall, active and robust, with fairly regular features, but showing Negro blood in their frequently black complexion and still more in their kinky and even woolly hair. Their colour varies from the

Arab hue to black, and curiously enough the most regular features are to be found among the darkest groups.

There are four classes in Somaliland: (i) nomads who breed ponies, sheep, cattle and camels, live entirely on milk and meat, and follow the rains in search of grass; (2) settled Somali, com- paratively few, living in or near the coasts; (3) outcast races, not organized in tribes but living scattered all over Somaliland; they are hunters, workers in iron and leather, and the chief collectors of gum and resin; (4) traders. The national dress is the " tobe," a simple cotton sheet of two breadths sewn together, about 15 ft. long. Generally it is thrown over one or both shoulders, a turn given round the waist, and allowed to fall to the ankles. The " tobes " are of all colours from brown to white. A ceremonial " tobe " of red, white and blue, each colour in two shades, with a narrow fringe of light yellow, is sometimes worn. Old men shave the head and sometimes grow a beard. Middle-aged men wear the hair about an inch and a half long; young men and boys in a huge mop; while married women wear it in a chignon, and girls in mop-form but plaited.

The Somali are a fighting race and all go armed with spear, shield and short sword (and guns when they can get them). During the rains incessant intertribal lootings of cattle take place. Among certain tribes those who have killed a man have the right to wear an ostrich-feather in their hair. They are gi;eat talkers, keenly sensitive to ridicule, and quick-tempered.

Women hold a degraded position among the Somali (wives being often looted with sheep), doing most of the hard work. The Somali love display; they are inordinately vain and avari- cious; but they make loyal and trustworthy soldiers and are generally bright and intelligent.

The Somali have very little political or social cohesion, and are divided into a multiplicity of rers or fakidas (tribes, clans). Three main divisions, however, have been clearly determined, and these are important both on political and ethnical grounds.

I. The Hashiya (Abud's Asha), with two great subdivisions: Daroda, with the powerful Mijertins, War-Sangeli, Dolbohanti and others; and Isliak, including the Gadibursi, Issa (Ai'ssa), Habr- Wal, Habr-Tol, Habr-Yuni, Babibli, Bertiri. All these claim descent from a member of the Hashim branch of the Koreish (Mahomet's tribe), who founded a powerful state in the Zaila district. All are Sunnites, and, although still speaking their Somali national tongue, betray a large infusion of Arab blood in their oval face, somewhat light skin, and remarkably regular features. Their domain comprises the whole of British Somaliland, and probably most of Italian Somaliland.

II. The Hawiya, with numerous sub-groups, such as the Habr- Jalet, Habr-Gader, Rer-Dollol, Daji, Karanle, Badbadan, Kunli, Bajimal and Ugass-Elmi; mostly fanatical Mahommedans forming the powerful Tarika sect, whose influence is felt throughout all the central and eastern parts of Somaliland. The Hawiya domain comprises the Ogaden plateau and the region generally between the Nogal and Webi-Shebeli rivers. Here contact has been chiefly with the eastern Galla tribes.

III. The Rahanwin, with numerous but little-known sub-groups, including, however, the powerful and warlike Abgals, Barawas, Gobrons, Tuni, Jidus and Kalallas, occupy in part the region between the Webi-Shebeli and Juba, but chiefly the territory extending from the Juba to the Tana, where they have long been in contact, mostly hostile, with the Wa-Pokomo and other Bantu peoples of the British East Africa Protectorate. Of all the Somali the Rahanwin betray the largest infusion of negroid blood.

Of the outcast races the best known are the Midgan, Yebir, and Tomal. The Midgan, who are of slightly shorter stature than the average Somali, are the most numerous of these peoples. They are great hunters and use small poisoned arrows to bring down their game. The Yebir are noted for their leather work, and the Tomal are the blacksmiths of the Somali.

Prehistoric Remains. — The discovery of flint implements of the same types as those found in Egypt, Mauritania, and Europe show Somaliland to have been inhabited by man in the Stone age. That the country was subsequently occupied by a more highly civilized people than the Somali of to-day is evidenced by the ruins which are found in various districts. Many of

these ruins are attributable to the Arabs, but older remains are traditionally ascribed to a people who were " before the Galla." Blocks of dressed stone overgrown by grass lie in regular formation; a series of parallel revetment walls on hills commanding passes exist, as do relics of ancient water-tanks. This ancient civilization is supposed to have been swept away by Mahommedan conquerors; before that event the people, in the opinion of several travellers, professed a degraded form of Christianity, which they had acquired from their Abyssinian neighbours. Of more recent origin are the ruins known as Galla graves {Taalla Galla). These are cairns of piled stones, each stone about the size of a man's head. The cairns are from 12 to 15 ft. high and about 8 yds. in diameter. Each is cir- cular with a central depression.

Exploration. — Somaliland was one of the last parts of Africa to be explored by Europeans. The occupation of Aden by the British in 1839 proved the starting-point in the opening up of the country, Aden being the chief port with which the Somali of the opposite coast traded. The task of

mapping the coast was largely undertaken by officers of the Indian navy, while the first explorers of the interior were officers of the Indian army quartered at Aden — Lieut. Cruttenden (1848), Lieut, (afterwards Captain Sir Richard) Burton, and Lieut. J. H. Speke (the discoverer of the Nile source). In 1854 Burton, unaccompanied, penetrated inland as far as Harrar. Later on the expedition was attacked by Somali near Berbera, both Bur- ton and Speke being wounded, and another officer, Lieut. Stroyan, R.N., killed. For twenty years afterwards no attempt was made to open up the country. The occupation of Ber- bera by the Egyptians in 1875 was, however, followed by several journeys into the interior. Of those who essayed to cross the waterless Haud more than one lost his life. In 1883 a party of Englishmen — F. L. and W. D. James (brothers), G. P. V. Ayl- mer, and E. Lort-Phiilips — penetrated from Berbera as far as the Webi-Shebeli, and returned in safety. At the instance of the Indian government surveys of the country between the coast and the Webi-Shebeli and also east towards the Wadi Nogal were executed by Major H. G. C. Swayne and his brother Captain E. J. E. Swayne between 1886 and 1892. Meanwhile a French traveller, G. Revoil, had (1878-1881) made three jour- neys in the north-east corner of the protectorate, especially in the Darror valley. The first person who reached the Indian Ocean, going south from the Gulf of Aden, was an American, Dr A. Donaldson Smith (b. 1864). He explored (1894-1895) the headstreams of the Shebeli, reached Lake Rudolf, and even- tually descended the Tana river to the sea, his journey thus taking him through southern Somaliland. Meantime the greater part of the eastern seaboard having fallen under Italian influence, the exploration of the hinterland had been undertaken by travellers of that nationality. In 1890 Brichetti-Robecchi made a journey along the eastern coast from Obbia to beyond Cape Guardafui. In the following year he went from Mukdishu to Obbia, and thence crossed through Ogaden to Berbera on the Gulf of Aden. In the same year Prince Eugenio Ruspoli made a journey southwards from Berbera, while two other Italians penetrated to Imi on the upper Shebeli, which place was also reached in 1903 by H. G. C. Swayne. In 1892 Captain Vittdrio Bottego and a companion left Berbera and made their way past Imi to the upper Juba, which Bottego explored to its source, both travellers finally making their way via Lugh to the east coast. Prince Ruspoli in 1893 reached Lugh from the north, thence turning north-west. He was killed in the Galla country by an elephant. In 1895 Bottego, with three European companions, left Brava to investigate the river system north of Lake Rudolf, and succeeded in tracing the Omo to that lake. Subsequently in the Abyssinian highlands the expedition was attacked by Galla and Captain Bottego was killed. Dr Sacchi, who was returning to Lugh with some of the scientific results of the mission, was also killed by natives. An English expedition under H. S. H. Cavendish (1896-1897) followed somewhat in Donaldson Smith's steps, and the last named

traveller again crossed Somaliland in his journey from Berbera via Lake Rudolf

to the Upper Nile (1899-1900). In 1902-1903 a survey of the Galla-Somali borderlands between Lake Rudolf and the upper Juba was executed by Captain P. Maud of the British army. Military operations during 1901-4 led to a more accurate knowledge of the south-eastern parts of the British protector- ate and of the adjacent districts of Italian Somaliland. British Somaliland The British Somaliland protectorate extends along the Gulf of Aden for about 400 m. from the Lahadu Wells, near Jibuti, in the west, to Bandar Ziyada in 49 E., 180 m. W. of Cape Guardafui, and stretches from the coast inland for a breadth varying from 80 to 220 m. The protectorate is bounded W. by French Somaliland, S.W. by Abyssinian territory, and S.E. and E. by Italian Somaliland. About 50,000 persons are settled in the coast towns; the rest are nomads.

Topography, &c. — Physically the protectorate may be described as almost mountainous in contrast with the somewhat monotonous plains of the interior. Between the Harrar plateau and Cape Guardafui the coast ranges maintain a mean altitude of from 4000 to 5000 ft., and fall generally in steep escarpments down to the narrow strip of sandy lowlands skirting the Gulf of Aden. At some points the rugged cliffs, furrowed by deep ravines, approach close to the sea ; elsewhere the hills leave a considerable maritime plain between their base and the shore line. South of Berbera are two ranges nearly parallel with the coast. They increase in eleva- tion landwards, culminating in the inner and loftier Golis range, about 9500 ft. high, its crest covered with mountain cedar. The country between the two ranges is known as Guban. South of the Golis the ground falls gradually to the central plateau known as the Haud, a waterless but not unfertile district. The Haud (only the northern part of which is British territory — the rest is Abyssinian) consists partly of thorn jungle, the haud of the Somali, partly of rolling grass plains, called ban, and partly of semi-desert country called aror. Westward of Berbera the ascent to the high country is not so abrupt as in the east but is made by several steps, the moun- tains forming a chaotic mass. Eastwards the mountain system, the Jebel Sangeli, maintains the same general character as far as Bandar Gori (Las Korai), where the precipitous northern cliffs approach within 200 or 300 yards of the gulf, their bare brown rocks and clays presenting the same uninviting appearance as the light brown hills skirting the Red Sea Immediately south of the Jebel Sangeli are the comparatively fertile Jidali and Gebi districts or river valleys — the Gebi flowing east in the direction of Ras Hafun, while

the Jidali has a southerly course towards the Wadi Nogal. Its water's are lost in the arid stony plateau of the Sorl. To this succeeds the Nogal district, separated both from the Sorl and the Hand by ranges of low hills. The Nogal and the neigh- bouring regions of the Haud are also known, from the tribes inhabit- ing them, as the Dolbahanta country. The prevailing formations appear to be granites which are veined with white quartz, and under- lie old sedimentary brown sandstone and limestone formations.

The average annual rainfall at Berbera is about 8 in., and more than half of this amount has fallen in one day. The mean annual rainfall is greater on the slopes of the ranges by which the moisture- bearing clouds are intercepted. These slopes are the home of aromatic flora which yields myrrh and frankincense.

The chief domestic animals are the camel and the ass, both of prime stock. The camels make excellent mounts, swift and hardy; and the extensive caravan trade is everywhere carried on exclu- sively by means of these pack-animals. The Somali have also large herds of cattle — oxen, sheep and goats. They possess a hardy breed of ponies, for which the Dolbahanta country is famed.

Chief Towns. — Berbera {q.v.) is the capital and chief seaport of the protectorate. About 45 m. west of Berbera is the exposed port of Bulhar. Close to the French frontier stands the seaport of Zaila ,-(q.v.). East of Berbera are Las Korai, Karam, Hais and other small seaports. Inland the most important settlement is Hargeisa (i.e. little Harrar), 60 m. S.S.W. of Bulhar, a centre for caravans from Shoa and Ogaden. Sheikh, Burao and Bohotle are all on the caravan route from Ogaden to Berbera.

Industries and Trade. — Fibre is obtained from the aloe plants, this industry being in the hands of women; ostriches are reared for the sake of their feathers, and large quantities of gum and resin are collected. But the wealth of the people consists chiefly in their livestock. Trade is largely with Harrar and the Ogaden country — both Abyssinian possessions. The important exports are gums and resin, fibre, hides, ivory, ostrich feathers, coffee, ghee, live- stock, gold ingot6 from Abyssinia and mother-of-pearl; the shells being found along the coast from Zaila to beyond Berbera. There is also a profitable shark fishery in the hands of Arabs. The imports are mainly white longcloth, grey shirting, rice, jowaree, dates and sugar. Jowaree is displacing rice as the staple food of the Somali. The trade with Abyssinia suffers owing to the absence of railway communication, which the neighbouring French colony possesses. Thus in 1 899-1900 the total value of trade was £751,900, the French railway being then but just begun; in 1902-1903, the railway being

completed during the year, the value of trade was but £487,900. The average annual value of trade for 1904-1909 was about £500,000.

History. — An Arab sultanate, with its capital at Zaila (Zeyla) , was founded by Koreishite immigrants from the Yemen in, it is said, the 7th century a.d. In the 13th century it had become a comparatively powerful state, known as the empire of Adel. In the 16th century the capital of the state (in which Arab influence was a decreasing factor) was transferred to Harrar (q.v.). The state was greatly harassed by Galla invaders in the 17th century, and broke up into a number of petty in- dependent emirates and sultanates under Somali' chiefs. Zaila became a dependency of Yemen and thus nominally part of the Turkish empire. The British connexion with the Somali coast dates from the early years of the 19th century; the first treaty between the British and Somali having been signed in i827afterthe plundering of an English ship by the Habr- Wal. In 1840 various treaties were concluded by Captain Robert Moresby of the Indian Navy " on the part of the English Government in India " with the sultan of Tajura and the governor of Zaila, who engaged not to enter into treaties with any other foreign power. At the same time Musha Island, at the entrance to the Gulf of Tajura, was bought by the British " for ten bags of rice," Bab Island, in the same gulf, and Aubad Island, off Zaila, were also purchased, the object of the East India Company being to obtain a suitable place " for the harbour of their ships without any prohibition whatever." From this time onward the Indian government exercised considerable influence on the Somali coast, but British authority was not definitely established, and in 1854 Richard Burton's expedition was attacked at Ber- bera. In 1874-1875 the ambition of Ismail Pasha, khedive of Egypt, who claimed jurisdiction over the whole coast as far as Cape Guardafui, led him to occupy the ports of Tajura, Berbera and Bulhar as well as Harrar in the hinterland. Ismail also obtained (July 1875) a firman from the sultan of Turkey making over Zaila to Egypt in return for an increase of £15,000 yearly to the tribute paid to the Porte. In 1884, in consequence of the revolt of the mahdi in the Egyptian Sudan, the khedival garrisons were withdrawn. Thereupon Great Britain, partly to secure the route to the East via the Suez Canal, which the occupation of the country by another power might menace, occupied Zaila, Berbera and Bulhar, officials being sent from Aden to govern the ports. With respect to Zaila Turkey Establish- was given the option of resuming possession, but meat of a advantage was not taken of the offer (see Lord British Pro- Cromer's Modem Egypt, 1908, vol. ii.). During tectorate – 1884, 1885, 1886 treaties guaranteeing British protection were concluded with various Somali tribes and in 1888 the limits of the British and French spheres were defined, all claims to British jurisdiction in the Gulf of Tajura and the islands of Musha and Bab being abandoned. The other inland boundaries of the protectorate were defined

by agreements with Italy (1894) and Abyssinia (1897).

In 1899 troubles arose between the administration and a mullah of the Habr Suleiman Ogaden tribe, who had acquired great influence in the Dolbahanta country and had married into the Dolbahanta Ali Gheri. This mullah, Mahommed bin Abdullah by name, had made several pilgrimages to Mecca, where he had attached himself to a sect which enjoined strict observance of the tenets of Islam and placed an interdiction on the use of the leaves of the kat plant — much sought after by the coast Arabs and Somali for their stimulating and in- toxicating properties. At first the mullah's influence was exerted for good, and he kept the tribes over whom he had con- trol at peace. Accredited with the possession of supernatural powers he gathered around him a strong following. In 1899 the mullah began raiding tribes friendly to the British; in August of that year he occupied Burao, 80 m. south and east of Ber- bera, and declared himself the mahdi. In the autumn of 1900 the mullah was again harassing the tribes on the southern border of the British protectorate and the neighbouring Abys- sinian districts. The tribes hostile to the mullah sought British protection, and C;olonel (afterwards Sir) E. J. E. Swayne raised a Somali levy of 1500 men, and in May 1901 occupied Burao.

On the 2nd of June a small force, zeribaed under Captain Mal- colm McNeill, was attacked by the mullah's followers but re- pulsed after desperate fighting. Colonel Swayne thrice defeated the enemy, who lost 1200 men and 600 taken prisoners, and the mullah fled across the Haud, taking refuge with the Mijertin in Italian territory. In December 1901 the mullah was, however, once more raiding in the neighbourhood of Burao, and in May Wars with IQ ° 2 Colonel Swayne led another expedition against the Mullah him, the Somali levies being strengthened by the 2nd Mahomme

Another campaign being deemed necessary, reinforcements bringing the fighting force up to 7000 men were sent out, and Major-General Sir C. C. Egerton assumed supreme command, Manning retaining command of the first column. In October 1903 a new forward movement was begun, the mullah being still in the eastern Nogal, while he had also seized the Italian seaport of Illig, north of Obbia. In a pitched battle fought on the 10th of January 1904 at Jidballi in the Nogal country the enemy were routed, losing over 1000 men in killed alone, while the British loss in killed and wounded was 58. The mullah and his chief adviser, a Haji Sudi, formerly an interpreter on a British warship, were not at the battle, and with his Ali

Gheri followers he now fled north across the Sorl, apparently intending, if further pressed to retreat to Illig. This port was accordingly for a short time (April 1904) occupied by a British naval force. By May the mullah had been driven out of the British protectorate and became a refugee among the Mijertin. It was decided therefore to abandon offensive opera- tions. In 1905 the Italians effected an arrangement apparently satisfactory to all parties (see § Italian Somaliland).

For some three years the mullah remained quiescent, but in Evacuation IQ °8 he quarrelled with the Mijertins and in 1909 he ofthe was again raiding tribes in the British protector- lnterior. ate The British government (the Asquith cabinet) came to the conclusion that another expedition against

the mullah would be useless; that they must either build a railway, make roads and effectively occupy the whole of the protectorate, or else abandon the interior completely. The latter course was decided upon, and during the first months of 1910 the advanced posts were withdrawn and the British administration confined to the coast towns. In support of this decision it was urged that it was no good pursuing people whom it was impossible to catch, that the isolated posts in the interior had not been able to protect the friendly tribes; and that the semi-desert nature of the country did not justify any attempt at economic development. (The proposal to build a railway from Zaila or Berbera to Harrar, which would have competed with the French line from Jibuti for the trade of southern Abyssinia, had been vetoed on grounds of general policy.) Before the withdrawal arrangements — more or less ineffective — were made for arming and organizing the tribes in the protectorate in their own defence.

From 1884 to 1898 the protectorate was attached for administra- tive purposes to Bombay, and was immediately dependent on Aden ; in the last-named year it was transferred to the Foreign Office, and in 1905 passed under the control of the Colonial Office. From 1902 to 1906 Colonel Swayne was commissioner; he was succeeded by Captain H. E. S. Cordeaux, who had served in Somaliland since 1898. Legislative power is in the hands of the commissioner, and revenue is obtained largely from customs. The revenue, £22,000 in 1900-1901, was £30,000 in 1908-1909, while the expenditure, £51,000 in the first-named year, was £134,000 in 1908-1909. Deficits are made good by grants from the imperial treasury.

French Somaliland

French Somaliland {Cdte franqaise des Somalis) lies at the entrance to the Red Sea. The sea frontier extends from Ras Dumeira on the Straits of Bab-el-Mandeb, a little north of Perim Island, to Ras Gurmarle, a few miles

south of the Gulf of Tajura. The protectorate is bounded N. by the Danakil country; S. by British Somaliland; W. by the Harrar province of Abyssinia. It extends inland at its greatest depth about 130 m.

The country consists chiefly of slightly elevated arid plains, largely waterless save along the southern frontier. The only good harbour along the coast is at Jibuti. The Gulf of Tajura is 28 m. across at its entrance and penetrates inland 36 m. At its western end an opening 870 yds. wide leads into the circular bay of Gubbet- Kharab (Hell's Mouth), behind which rise a chaotic mass of volcanic rocks, destitute of vegetation and presenting a scene of weird desola- tion. A pass through the hills gives access to Bahr-Assal; the last of a chain of salt lakes beginning 60 m. inland in the depression in which the waters of the Hawash (see Abyssinia) lose themselves. It is conjectured that at some remote period the Hawash flowed into Tajura Bay and that the present condition of the country is the result of volcanic upheaval. Assal Lake, according to this theory, formed part of the sea bed. It is now 5 m. inland from Gubbet- Kharab, is 5 m. long by 4 broad, and lies 490 ft. below sea level. About 160 ft. above the present level of the lake a white band marks distinctly a former level. The waters of Bahr-Assal are deeplj impregnated with salt, which, in thick crusts, forms crescent-shaped round the banks- — dazzling white when reflected by the sun. Two streams, one saline and at a temperature of 194 F., flow into thr- lake. The climate of the protectorate is very hot, but not unhealthy for Europeans if reasonable precautions be taken.

Inhabitants and Towns. — The inhabitants are, on the north side of the Gulf of Tajura, chiefly Danakils (Afars, q.v.); on the southern shore Galla and Somali. There are a number of Arabs, Abyssinians, Indians, and about 2000 Europeans and Levantines. The chief town and seat of administration is Jibuti (q.v.), pop. about 15,000, which has taken the place of Obok (q.v.), on the opposite (northern) side of the Gulf of Tajura. Also situated on the gulf are the small towns of Tajura, Sagallo, Gobad and Ambabo.

Trade and Communications. — The collection of salt from Bahr- Assal is an industry of some importance. In 1903 a beginning was made in the cultivation of cotton in the dry river beds, where water can always be obtained at a depth of 10 ft. On the coast turtle and mother-of-pearl fishing are carried on. But the value of the protectorate depends upon the carrying trade with Harrar and the supplying of victuals and coals to French warships. In 1897 the building of a railway from Jibuti towards Harrar was begun. By Christmas 1902 the railway, called the Imperial Ethiopian railway, was completed to Dire Dawa (or Adis Harrar), 30m. short of Harrar, and 188 by rail from Jibuti, of which but 64 m. are in French terri- tory. By a law passed by the French chambers in 1902 a subvention of £20,000 a year for fifty years was granted to the company owning the

railway (see further Abyssinia).

The exports are chiefly coffee, hides, ivory (all from Abyssinia), gum, mother-of-pearl and a little gold; the imports cotton and othet

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European stuffs, cereals, beverages, tobacco and arms and ammuni- tion for the Abyssinians. The total volume of trade in 1902, the year of the completion of the railway, was £725,000, in 1905 it had risen to £1,208,000 — imports £480.000, exports £728,000.

History.— French interest in the Somali and Danakil coasts dates from the days of the Second Empire. Count Stanislas Russell, a naval officer, was sent on a mission to the Red Sea in 1857, and he reported strongly on the necessity of a French estab- lishment in that region in view of the approaching completion of the Suez Canal. The only result of his enterprise was the abortive treaty for the cession to France of Zula (q.v.), now in the Italian colony of Eritrea. In 1856, however, M. Monge, vice-consul of France at Zaila, had bought Ambabo, and shortly afterwards Henri Lambert, French consul at Aden, bought the town and territory of Obok. Lambert (who was assassinated by Arabs, June 1859) had the support of his government, which viewed with alarm the establishment (1857) of the British on Perim Island, at the entrance to the Red Sea. The cession of Obok was ratified by a treaty (signed on the nth of March 1862) between the French government and various Danakil chiefs. It was not, however, until 1883 that, in consequence of events in Egypt and the Sudan (see Egypt: History), formal possession was taken of Obok by the French government. In 1884 Leonce Lagarde, subsequently French minister to Abyssinia, was sent to administer the infant colony. Between 1883 and 1887 treaties with Somali sultans gave France possession of the whole of the Gulf of Tajura. An agreement with Great Britain (February 1888) fixed the southern limits of the protectorate; protocols with Italy (January 1900 and July 1901) the northern limits. The frontier towards Abyssinia was fixed by a conven- tion of March 1897 with the Negus Menelik. In this direction the protectorate extends inland some 56 m. In 1889 a Cossack chief, Captain Atchinoff, who had occupied Sagallo, was forcibly removed by the French authorities (see Sagallo). The transference of the seat of government to Jibuti in May 1896 and the building of the railway to Harrar gave the protec- torate a stability which it had previously lacked. Its import- ance to France is, nevertheless, chiefly strategic and political. It serves as a coaling station for men-of-war and as a highroad to Abyssinia.

Italian Somaliland

Italian Somaliland extends on the coast from Bandar Ziyada, a point on the Gulf of Aden intersected by 49° E., eastward to Cape Guardafui, and thence southward to the mouth of the river Juba in o° 15′ S. Bounded N. and E. by the Indian Ocean it is separated S. from British East Africa by the Juba. Westward it is bounded by Abyssinian and British Somaliland. From the east coast the protectorate extends inland from 100 to 300 m.

The coast-line is largely rock-bound and little indented, and throughout the 1200 m. of its extent there is not one good harbour. The northern shore, along the Gulf of Aden, is backed by table- lands separated by the beds of mountain torrents — generally dry. From the table-land rise hills, such as Jebel Kurma, which have an altitude of 4000 ft. or more. The coast rises in a succes- sion of hills (fringed by a narrow margin of beach) until Cape Guardafui is reached. Cape Guardafui isin 11° 75′ N., 51 26′32″E., and forms, as it were, the tip of the Horn of Africa. The cape, which faces north and east, presents on its northern face a nearly vertical wall of rock rising from the sea to a height of 900 ft. The water is deep right to the base of the cliff and owing to the winds and the strength of the ocean currents, navigation is dangerous. 1 he headland is known to the Somali as Girdif or Yardaf — whence in all probability comes the European form Guardafui. But in the hngua^ franca of the Levant the Italian word guarda means " beware," a meaning also attached to the Portuguese word guardafu.

Rounding Guardafui the coast trends southwards, and some 90 m. from that cape is Ras Hafun or Medudda — the most easterly point of the continent of Africa— being in 10° 45′ S., 51 27′ 52″ E., or about a mile and a half east of Guardafui. Ras Hafun consists of a rocky peninsula rising 600 ft. above the sea, and is connected with the mainland by an isthmus 12 m. long. A little south is the mouth of the Darror, a usually dry watercourse with a length of oyer 200 m., which rises, as the Gebi, in the north-east of the British protectorate. From this point a zone of upheaved coral rocks skirts the shore for some distance.

Chief Towns. — The chief towns are on the coast. They are Mukdishu (q.v.), pop. about 5000, Brava (4000), Marka (5000),

Warsheik (3000) and Yub. These are all in the southern part of the protectorate between 0° 15′ S. and 2° 19′ N., and are known generically as El-Benadir (the ports), a name also applied to the coast betvreen the ports. Yub (Tub) is a small town at the mouth of the Juba river. In every case the port is much exposed and unapproachable for months together. Obbia, 5° 22′ N., and Illig in 7 60′ N., are points of departure for the Ogaden and Dolbahanta countries. Alula, on the Culf of Aden, is the chief town of the

Mijertin Somali.

In the interior is Lugh, a populous city on the left bank of the Juba, about 240 m. from the coast, and further inland is Dolo at the confluence of the Daua and Ganale to form the Juba. These places are entrep6ts for the trade of the interior, especially with the Boran district.

In the coast towns of the eastern seaboard there are Swahili, Arab and Indian settlements, and tribes, such as the Ama.-an, of mixed Arab and Somali blood.

Agriculture and Trade. — Though much of the land is barren, the soil is fairly fertile in the valleys of the Webi Shebeli and Wadi Nogal. But the most fertile district is the valley of the lower Juba, where for over 100 m. is a strip of land varying from a few hundred yards to some 4 m. wide, annually inundated by the rise of the river. Here are cultivated rich crops of millet and other grains. In other districts lack of water impedes cultivation, though after the rains pasturage is abundant, and resinous plants are so varied and numerous as to justify the ancient name of the region.

Ivory, cattle, butter, coffee, cotton, myrrh, gums and skins are exported from the Benadir country. In the northern ports there is a similar but smaller trade and one also in ostrich feathers. The chief imports are textile fabrics, rice and petroleum. During 1896-1897 the value of the Benadir trade was £120,000; in 1906- 1907 it had risen to over £250,000.

History. — The Somali coast, as has been seen, early fell under Moslem influence. The towns on the eastern seaboard, of which Mukdishu and Brava were the chief, formed part of the Zenj " empire " (see Zanzibar) and shared its fate, being conquered in turn by the Portuguese (16th century), the imans of Muscat (1 7th century), and the sultans of Zanzibar (1866). On account, probably, of the inhospitable nature of the shore the northern portion of the protectorate appears to have been little subject to hostile invasion. By treaties with Somali sultans in 1889 and by subsequent agreements with Great Britain, Zanzibar and Abyssinia, the coast east of the British Somali protectorate fell within the Italian sphere of influence (see Africa, § 5) . In August 1892 the sultan of Zanzibar leased the Benadir ports of Italy for fifty years. They were administered first by the Filonardi Com- pany, and from 1898 by the Benadir Company. By an agree- ment dated the 13th of January 1905 the sultan of Zanzibar ceded his sovereign rights in the Benadir ports to Italy in return for the payment of a lump sum of £144,000. Thereafter the Italian government assumed the direct administration of the ports, a purely commercial undertaking replacing the Benadir Company. In 1 905 also Great Britain leased to Italy

a piece of land near Kismayu to facilitate communications with the Benadir country. In 1908 a royal decree placed that part of the country between the Juba and the sultanate of Obbia under a civil governor.

A notable event in the history of the protectorate was the co-operation of the Italian authorities in the campaigns against the Mullah Abdullah. In 1904 negotiations were opened with the mullah by the Italians, and by arrangement with the sultan of Obbia and the sultan of the Mijertins the territory between Ras Aswad and Ras Bowen, which was claimed by both parties, was handed over to the mullah. This region, that of the lower Nogal, included the port of Illig. Here Mahommed b. Abdullah established himself under Italian surveillance, and by an agree- ment dated the 5th of March 1905, peace was declared between the mullah, the Italians, British and Abyssinians, and all other Somali tribes. In 1908-1909, however, fighting was renewed, the mullah and the Mijertins failing to agree. Italian (native) troops were sent to the district to restore order. The mullah also attacked tribes living in the British protectorate (see § 2).

The station of Lugh, the most advanced point occupied by Italy, had been founded by Captain Bottego in 1895. After the treaty of Adis Adowa, recognizing the independence of Abyssinia, had been concluded in 1896, negotiations were opened for defining the Italian-Abyssinian frontier in the Somali regions. In 1897 an agreement was come to that from the point on the

British Somaliland frontier where 47 E. intersected 8° N. the frontier line should be drawn, at a distance of about 180 m. from the Indian Ocean, to the Juba. At the close of 1907 the Negus Menelik, in return for a pecuniary indemnity (£120,000), agreed to a modification of the 1897 line, whereby the Italian protectorate was extended north oF Lugh to Dolo. From Dolo the frontier goes east to the Webi Shebeli, whence the 1897 line is followed to the British-Abyssinian frontier. By this arrangement (ratified by a convention dated the 16th of May 1908) the Benadir coast obtained a suitable hinterland.

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SOMBRERO, a wide-brimmed hat, made of felt, largely worn throughout South and Central America, but originating in Spain. The Spanish word is derived from sombra, shade, generally taken to be from Lat. sub umbra, beneath the shade; but the etymology, like that of " sombre," dark, gloomy, has been disputed.

SOMERS, JOHN SOMERS (or Sommers), Baron (1651-1716), English lord chancellor, was born on the 4th of March 165 1, near Worcester, the eldest son of John Somers, an attorney in large practice in that town, who

had formerly fought on the side of the Parliament, and of Catherine Ceaverne of Shropshire. After being at school at Worcester he was entered as a gentleman commoner at Trinity College, Oxford, and afterwards studied law under Sir Francis Winnington, who became solicitor-general, and joined the Middle Temple. He appears, in addition to his legal studies, to have written several poems and pamphlets. He soon became intimate with the leaders of the country party, especially with Essex, William Russell, and Algernon Sidney, but never entered into their plans so far as to commit himself beyond recall. He was the author of the History of the Succession of the Crown of England, collected out of Records, &c, and was reputed to have written the Just and Modest Vindication of the Two Last Parliaments, which was put forward as the answer to

Charles II.'s famous declaration of his reasons for dissolving them. This, however, was by Sidney, though probably Somers was responsible for the final draft. When the grand jury of Middlesex threw out the bill against Shaftesbury, and were vehemently attacked for so doing, Somers wrote in defence of the rights of grand juries. In 1683 he was counsel for thesheriffs Pilkington and Shute before the court of King's Bench, and secured a reputation which continually increased until the trial of the seven bishops, in which he was junior counsel. " Somers rose last. He spoke little more than five minutes, but every word was full of weighty matter; and when he sat down his reputation as an orator and a constitutional lawyer was established." In the secret councils of those who were planning the revolution Somers took a leading part, and in the Convention Parliament was elected a member for his native town. He was immediately appointed one of the managers for the Commons in the conferences between the houses, and in arguing the questions whether James II. had left the throne vacant by abdication and whether the acts of the Convention Parliament were legal — that parliament having been summoned without the usual writs — he displayed great learning and legal subtlety. He was further distinguished by being made chairman of the committee which drew up the celebrated Declaration of Right.

In May 1689 Somers was made solicitor-general. He now became William III.'s most confidential adviser. In the con- troversy which arose between the Houses on the question of the legality of the decision of the court of King's Bench regarding Titus Oates, and of the actionjaf the Lords in sustaining this decision, Somers was again the leading manager for the Commons, and has left a clear and interesting account of the debates. He was next employed in January 1690 as chairman of the select committee of the House of Commons on the Corpora- tion Bill, by which those corporations which had surrendered their charters to the Crown during the last two reigns were restored to their rights; but he refused to associate himself with the violent measures of retaliation which the Whigs on that

occasion endeavoured to include in the bill. In April a speech by him carried through the lower house, without opposition, the bill which declared all the laws passed by the Convention Parliament to be valid. As solicitor-general he had to conduct the prose- cution of Preston and Ashton in 169 1, and did so with a modera- tion and humanity which were in marked contrast to the customs of the former reigns. He was soon after appointed attorney-general, and in that capacity strongly opposed the bill for the regulation of trials in cases of high treason. On the 23rd of March 1693, the great seal having meanwhile been in commission, Somers was appointed lord-keeper, with a pension of £2000 a year from the day on which he should quit his office, and at the same time was made a privy councillor. He had previously been knighted. Somers now became the most prominent member of the Junto, the small council which comprised the chief members of the Whig party. When William left in May 1695 to take command of the army in the Netherlands, Somers was made one of the seven lords-justices to whom the adminis- tration of the kingdom during his absence was entrusted; and he was instrumental in bringing about a reconciliation between William and the princess Anne.

In April 1697 Somers was made lord chancellor, and was created a peer by the title of Baron Somers of Evesham. When the discussion arose on the question of disbanding the army, he summed up the case against disbanding, in answer to Trenchard, in a remarkable pamphlet called " The Balancing Letter." In August 1698. he went to Tunbridge Wells for his health. While there he received the king's letter announcing the first Partition Treaty, and at once replied with a memorandum representing the necessity in the state of feeling in England of avoiding further war. When the king, on the occasion of the Disbanding Bill, expressed his determination to leave the country, Somers boldly remonstrated, while he clearly expressed in a speech in the Lords the danger of the course that was being taken. Hitherto Somers's character had kept him free from attack at the hands

of political opponents; but his connexion in 1699 .with the notorious Captain William Kidd, to the cost of whose expedition Somers had given £1000, afforded an opportunity; the vote of censure, however, proposed upon him in the House of Commons for giving Kidd a commission under the great seal was rejected by 1 99 to 131. The attack was renewed shortly on the ground of his having accepted grants of Crown property to the amount of £1600 a year, but was again defeated. On the subject of the Irish forfeitures a third attack was made in 1700, a motion being brought

forward to request the king to remove Somers from his counsels and presence for ever; but this again was rejected by a large majority. In consequence, however, of the incessant agitation William now requested Somers to resign; this he refused to do, but gave up the seals to William's mes- senger. In 1 701 he was impeached by the Commons on account of the part he had taken in the negotiations relating to the Partition Treaty in 1698, and defended himself most ably before the house, answering the charges seriatim. The im- peachment was voted and sent up to the Lords, but was there dismissed. On the death of the king Somers retired almost entirely into private life. He was president of the Royal Society from 1699 to 1704. He was, however, active in 1702 in opposing the Occasional Conformity Bill, and in 1706 was one of the managers of the union with Scotland. In the same year he carried a bill regulating and improving the proceedings of the law courts. He was made president of the council in 1708 upon the return of the Whigs to power, and retained the office until their downfall in 1710. He died on the 26th of April 1716. Somers was never married, but left two sisters, of whom the eldest, Mary, married Charles Cocks, whose grandson, Sir Charles Cocks, bart., became the second Lord Somers in 1784, the title subsequently descending in this line.

For a contemporary character of Somers Addison's paper in the Freeholder for the 14th of May 1716 should be referred to; and there is in Macaulay's History (iv. 53) an eloquent and worthy tribute to his stainless character and comprehensive learning. A catalogue of his publications will be found in Walpole's Royal and Noble Authors. (O. A.)

SOMERSET, EARLS AND DUKES OF. In the nth century Somerset and Dorset were under the jurisdiction of one sheriff, and for a considerable period titles derived from each of these shires were borne by the same person. (See Dorset, Earls,

MARqUESSES AND DUKES OF.)

The earldom of Somerset in the Beaufort family dated from 1397, in which year it was granted by Richard II. to John Beaufort (c. 1373-1410), the eldest of the three illegitimate, but afterwards legitimated, sons of John of Gaunt, duke of Lancaster, by Catherine, wife of Sir Hugh Swynford, and daughter of Sir Payne Roelt. He was followed in the earldom successively by his three sons: Henry, who died unmarried in 1418; John (1404-1444), who in 1443 was created earl of Kendal and duke of Somerset, both of which titles became extinct at his death; and Edmund, who was created earl of Dorset in 1441, marquess of Dorset in 1443, and duke of Somerset in 1448. (See Somerset, Edmund Beaufort, Duke of.) On the execution of Edmund's son Henry, 5th earl and 2nd duke of Somerset, by the Yorkists in 1464, his titles were forfeited by act of parliament; but' his

brother Edmund was from that date styled duke of Somerset by the Lancastrian party till his death in May 1471, when the house of Beaufort became extinct. (See Beaufort.) In 1499 Henry VII. nominated his infant son Edmund to the dukedom of Somerset at his baptism, but the child, who died within a few months, was probably never formally created a peer; the title, conjoined with the dukedom of Richmond, was, however, borne by Henry Fitzroy, illegitimate son of Henry VIII., from 1525 till his death without heirs in 1536.

Edward Seymour, duke of Somerset (q.v.), known as the Protector, was the first of the line of dukes to which the holder of the title at the present day belongs, having been created Viscount Beauchamp of Hache, Co. Somerset, in 1536; earl of Hertford in 1537; and in 1547 Baron Seymour and duke of Somerset. His honours, which were entailed on the issue of xxv. 13

his second in priority to that of his first marriage, being forfeited by attainder in 1552, Robert Carr became earl of Somerset (q.v.) in 1613, but died without male issue in 1645, when his title became extinct. A curious incident in the history of this title was the grant by Charles I. in 1644 of a commission to Edward Somerset, son of Henry, 1st marquess of Worcester, empowering him to fill up certain blank patents of peerage with a promise of the title of duke of Somerset for himself. After the Restoration this instrument was cancelled in consequence of a resolution of the House of Lords declaring it to be " in prejudice to the peers "; and the grantee, who had meantime succeeded to the marquessate of Worcester, surrendered his claim to the dukedom of Somerset in September 1660. In the same month the duke dom of Somerset and barony of Seymour were restored to William Seymour (1 588-1660), great-grandson of the Protector, who in 1621 inherited the titles of earl of Hertford and Baron Beau- champ which had been granted to his grandfather Edward Seymour in 1559, and who, in 1640, had himself been created marquess of Hertford. This nobleman, who in early life had incurred the displeasure of James I. by marrying the king's cousin, Lady Arabella Stuart, and had been imprisoned in the Tower for the offence, had later an exceptional claim on the gratitude of the royal house of Stewart, for he fought with distinc- tion on the royalist side in the civil war, and was one of four lords (the others being the duke of Richmond, and the earls of Lindsey and Southampton) who petitioned the Commons to be allowed to assume responsibility for the actions of Charles I. and to suffer death in his place. He died in November 1660, a few weeks after his restoration to the dukedom, and, having outlived his three eldest sons, was succeeded by his grandson William, 3rd duke of Somerset (c. 1651-1671). As the latter died unmarried, his sister Elizabeth brought to her husband, Thomas Bruce, 2nd earl of Ailesbury, the great estates of Tottenham Park and Savernake Forest in Wiltshire; while the Somerset title devolved on John Seymour (c. 1628-1675), the

2nd duke's fifth and youngest son. At the death of the latter without issue in April 1675 the marquessate of Hertford became extinct, and his cousin Francis Seymour (1658-1678) became 5th duke of Somerset. This nobleman was the eldest surviving son of Charles Seymour, 2nd Baron Seymour of Trowbridge, whose father Sir Francis Seymour (c. 1 590-1664), a younger brother of the 2nd duke of Somerset, was created a baron in 1641.

Charles Seymour, 6th duke of Somerset (1662-1748), succeeded his brother Francis, the 5th duke, when the latter was shot in 1678 at the age of twenty, by a Genoese gentleman named Horatio Botti, whose wife Somerset was said to have insulted at Lerici. Charles, who thus inherited the barony of Seymour of Trowbridge along with the dukedom of Somerset, was educated at Trinity College, Cambridge; and in 1682 he married a great heiress, Elizabeth, daughter of Joceline Percy, earl of Northumberland, who brought him immense estates, including Alnwick Castle, Petworth, Syon House and North- umberland House in London. (See Northumberland, Earls and Dukes of.) In 1683 Somerset received an appointment in the king's household, and two years later a colonelcy of dragoons; but at the revolution he bore arms for the prince of Orange. Having befriended Princess Anne in 1692, he became a great favourite with her after her accession to the throne, receiving the post of master of the horse in 1702. Finding him- self neglected by Marlborough, he made friends with the Tories, and succeeded in retaining the queen's confidence, while his wife replaced the duchess of Marlborough as mistress of the robes in 171 1. In the memorable crisis when Anne was at the point.of death, Somerset acted with Argyll, Shrewsbury and other Whig nobles who, by insisting on their right to be present in the privy council, secured the Hanoverian succession to the Crown. He retained the office of master of the horse under George I. till 1716, when he was dismissed and retired into private life; he died at Petworth on the 2nd of December 1748. The duke's first wife having died in 1722, he married secondly, in 1726, Charlotte, daughter of the 2nd earl of Nottingham. He was a remarkably handsome man, and inordinately fond of taking a

conspicuous part in court ceremonial; his vanity, which earned him the sobriquet of " the proud duke," was a byword among his contemporaries and was the subject of numerous anecdotes; Macaulay's description of him as " a man in whom the pride of birth and rank amounted almost to a disease," is well known. His son Algernon (1684-1750), by his first wife Elizabeth Percy, was called to the House of Lords as Baron Percy in 1722;

and after succeeding his father as 7th duke of Somerset in 1748, was, on account of his maternal descent, created Baron Warkworth and earl of Northumberland in 1749, with remainder to Sir Hugh Smithson, husband of his daughter Elizabeth; and also Baron Cockermouth and earl of Egremont, with remainder to the children of his sister, Lady Catherine Wyndham. At his death without male issue in February 1750 these titles therefore passed to different families in accordance with the remainders in the patents of their creation; the earldom of Hertford, the barony of Beauchamp, and the barony of Seymour of Trowbridge became extinct; and the dukedom of Somerset, together with the barony of Seymour, devolved on a distant cousin, Sir Edward Seymour, 6th baronet of Berry Pomeroy, Devonshire. (See Seymour, or St Maur.)

The Seymours of Berry Pomeroy were the elder branch of the family, being descended from the protector Somerset by his first marriage, the issue of which had been excluded from succes- sion to the titles and estates until after the failure of the issue of his second marriage (see above), which failure occurred on the death of the above-named Algernon, 7th duke. Sir Edward Seymour (1695-1757), who thus became 8th duke of Somerset, was grandson of Sir Edmund Seymour, Speaker of the House of Commons in the reign of Charles II. His two sons succeeded in turn to the dukedom, and his grandson Edward Adolphus, nth duke (1775-1855J, was a mathematician and scientist of some distinction. The latter's son Edward Adolphus, 12th duke (1804-1885), was educated at Eton and Christ Church, Oxford, and from 1830 till he succeeded to the peerage in 1855 he was a Liberal member of the House of Commons as Lord Seymour, first for Okehampton, and afterwards for Totnes. He held various offices in Lord Melbourne's administration from 1835 to 1 841; was a member of Lord John Russell's cabinet in 185 1; and first lord of the admiralty from 1859 to 1866. In 1863 he was created Earl St Maur of Berry Pomeroy. He refused to join W. E. Gladstone's ministry in 1868, but he gave independent support to the chief measures of the government. He died in November 1885. In 1830, while still Lord Seymour, he married Jane Georgiana, youngest of the three celebrated daughters of Thomas Sheridan, who was the " Queen of Beauty " at the famous Eglinton Tournament in 1839. The duke was the author of Christian Theology and Modern Scepticism (1872), and Monarchy and Democracy (1880). As his two sons both died unmarried in his lifetime, the family titles, except the earldom of St Maur, which became extinct, devolved on his two brothers successively; the younger of whom, Algernon Percy Banks, 14th duke (1813-1894), was succeeded by his son Algernon (b. 1846) as 15th duke of Somerset.

The title of Earl St Maur adopted by the 12th duke in 1863 is said to have been the original form of the family name of which Seymour was a later corruption, and since the last- mentioned date it has been assumed as the

family surname of the dukes of Somerset.

See Seymour, or St Maur, and the authorities there cited.

(R. J. M.) SOMERSET, EDMUND BEAUFORT, Duke or (c. 1404-1455), was the younger son of John, earl of Somerset, and grandson of John of Gaunt, duke of Lancaster. He was taken prisoner at Bauge in 142 1 during his first campaign, and did not return to England till 1431. He was then styled earl of Mortain, and in 1432 was one of the envoys to the council of Basel. In 1436 he served at the relief of Calais, two years later he commanded with some success in Maine, and in 1440 recovered Harfleur. Next year he was made earl, and in 1443 marquess of Dorset. In 1444 on the death of his elder brother he became duke of Somerset. As head of the Beaufort party he was the rival of

Richard of York, whom in 1446 he superseded as lieutenant of France. He lacked statesmanship, and as a general could do nothing to stop French successes. The loss of Rouen and Normandy during the next four years was precipitated by his incompetence, and his failure naturally made him a special object of Yorkist censure. The fall of Suffolk left Somerset the chief of the king's ministers, and the Commons in vain peti- tioned for his removal in January 1451. In spite of York's active hostility he maintained his position till Henry's illness brought his rival the protectorate in March 1454. For a year he was kept a prisoner in the Tower " without any lawful pro- cess." On the king's recovery he was honourably discharged, and restored to his office as captain of Calais. Mistrust of Somer- set was York's excuse for taking up arms. The rivalry of the two leaders was ended by the defeat of the Lancastrians and death of Somerset at St Albans on the 22nd of May 1455. Though loyal to his family, Somerset was without capacity as a leader. It was a misfortune for Henry VI. that circumstances should have made so weak a man his chief minister. Thomas Basin, the French chronicler, describes Somerset as a handsome, courteous and kindly man. By his wife, Eleanor, daughter and co-heiress of Richard Beauchamp, earl of Warwick, he had two sons, Henry and Edmund, who were executed by Edward IV. after the battles of Hexham and Tewkesbury.

For further information see Sir James Ramsay's Lancaster and York (Oxford, 1892), and C. Oman's Political History of England, I 377~ I 485 (1906), with authorities there cited. (C. L. K.)

SOMERSET, EDWARD SEYMOUR, Duke or (c. 1506-1552), protector of England, born about 1 506, was the eldest surviving son of Sir John Seymour of Wolf Hall, Wiltshire, by his wife Margaret, eldest daughter of Sir Henry Wentworth of Nettlested, Suffolk. The Seymours claimed descent from a companion of William the Conqueror, who took his name from St

Maur-sur- Loire in Touraine; and the protector's mother was really descended from Edward III. His father was knighted by Henry VII. for his services against the Cornish rebels at Blackheath in 1497, was present at the two interviews between Henry VIII. and Francis I. in 1520 and 1532, and died on the 21st of December 1536. Edward was " enfant d'honneur " to Mary Tudor at her marriage with Louis XII. in 15 14, served in Suffolk's campaign in France in 1523, being knighted by the duke at Roze on the 1 st of November, and accompanied Wolsey on his embassy to France in 1527. Appointed esquire of the body to Henry VIII. in 1529, he grew in favour with the king, who visited his manor at Elvetham in Hampshire in October 1535. On the 5th of June 1536, a week after his sister Jane's marriage to Henry, he was created Viscount Beauchamp of Hache in Somerset, and a fortnight after Edward VI. 's birth in October 1537, he was raised to the earldom of Hertford.

Queen Jane's death was a blow to his prospects, and in 1538 he was described as being " young and wise " but of " small power." He continued, however, to rise in political importance. In 1 541, during Henry's absence in the north, Hertford, Cranmer and Audley had the chief management of affairs in London; in September 1542 he was appointed warden of the Scottish marches, and a few months later lord high admiral, a post which he almost immediately relinquished in favour of the future duke of Northumberland (q.v.). In March 1544 he was made lieu- tenant-general of the north and instructed to punish the Scots for their repudiation of the treaty of marriage between Prince Edward and the infant Mary Queen of Scots. He landed at Leith in May, captured and pillaged Edinburgh, and returned a month later. In July he was appointed lieutenant of the realm under the queen regent during Henry's absence at Boulogne, but in August he joined the king and was present at the surrender of the town. In the autumn he was one of the commissioners sent to Flanders to keep Charles V. to the terms of his treaty with England, and in January 1545 he was placed in command at Boulogne, where on the 26th he brilliantly repelled an attempt of Marshal de Biez to recapture the town. In May he was once more appointed lieutenant-general in the north to avenge the Scottish victory at Ancrum Moor; this he did by a savage foray

into Scotland in September. In March 1546 he was sent back to Boulogne to supersede Surrey, whose command had not been a success; and in June he was engaged in negotiations for peace with France and for the delimitation of the English conquests. From October to the end of Henry's reign he was in attendance on the king, engaged in that unrecorded struggle

for predomi- nance which was to determine the complexion of the government during the coming minority. Personal, political and religious rivalry separated him and Lisle from the Howards, and Surrey's hasty temper precipitated his own and his father's ruin. They could not acquiesce in the Imperial ambassador's verdict that Hertford and Lisle were the only noblemen of fit age and capacity to carry on the government; and Surrey's attempt to secure the predominance of his family led to his own execution and to his father's imprisonment in the Tower.

Their overthrow had barely been accomplished when Henry VIII. died on the 28th of January 1547. Preparations had already been made for a further advance in the ecclesiastical reformation and for a renewal of the design upon Scotland; and the new government to some extent proceeded on the lines which Chapuys anticipated that Henry VIII. would have followed had he lived. He had no statutory power to appoint a protector, but in the council of regency which he nominated Hertford and Lisle enjoyed a decisive preponderance; and the council at its first meeting after Henry's death determined to follow precedent and appoint a protector. Hertford was their only possible choice; he represented the predominant party, he was Edward VI. 's nearest relative, he was senior to Lisle in the peerage and superior to him in experience. Seven weeks later, however, after Lord-Chancellor Wriothesley, the leading Catholic, had been de- prived of office Hertford, who had been made duke of Somerset, succeeded in emancipating himself from the trammels originally imposed on him as protector; and he became king in everything but name and prestige.

His ideas were in striking contrast with those of most Tudor statesmen, and he used his authority to divest the government of that apparatus of absolutism which Thomas Cromwell had perfected. He had generous popular sympathies and was by nature averse from coercion. " What is the matter, then ? " wrote Paget in the midst of the commotions of 1549, " By my faith, sir, . . . liberty, liberty. And your grace would have too much gentleness." In his first parliament, which met in November 1547, he procured the repeal of all the heresy laws and nearly all the treason laws passed since Edward III. Even with regard to Scotland he had protested against his instructions of 1 544, and now ignored the claim to suzerainty which Henry VIII. had revived, seeking to win over the Scots by those promises of autonomy, free trade, and equal privileges with England, which many years later eventually reconciled them to union. But the Scots were not thus to be won in 1 547 : " What would you say," asked one, " if your lad were a lass, and our lass were a lad? " and Scottish sentiment backed by Roman Catholic influence and by French intrigues, money and men, proved too strong for Somerset's amiable invitations. The Scots turned a deaf ear to his persuasions; the protector led another army into Scotland in September 1547, and won the battle of Pinkie (Sept. 10) . He trusted to

the garrisons he established throughout the Lowlands to wear down Scottish opposition; but their pressure was soon weakened by troubles in England and abroad, and Mary was transported to France to wed Francis II. in

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Somerset apparently thought that the religious question could be settled by public discussion, and throughout 1547 and 1 548 England went as it pleased so far as church services were concerned; all sorts of experiments were tried, and the country was involved in a grand theological debate, in which Protestant refugees from abroad hastened to join. The result convinced the protector that the government must prescribe one uniform order which all should be persuaded or constrained to obey; but the first Book of Common Prayer, which was imposed by the first Act of Uniformity in 1549, was a studious compromise between the new and the old learning, very different from the

aggressive Protestantism of the second hook imposed after Somerset had been removed, in 1552. The Catholic risings in the west in 1549 added to Somerset's difficulties, but were not the cause of his fall. The factious and treasonable conduct of his brother, the lord high admiral, in whose execution (March 20, 1549) the protector weakly acquiesced, also impaired his authority; but the main cause of his ruin was the divergence between him and the majority of the council over the questions of constitutional liberty and enclosures of the commons. The majority scouted Somerset's notions of liberty and deeply resented his championship of the poor against greedy landlords and capitalists. His efforts to check enclosures by means of parliamentary legislation, royal proclamations, and commissions of inquiry were openly resisted or secretly foiled, and the popular revolts which their failure provoked cut the ground from Somerset's feet. He was divided in mind between his sympathy with the rebels and his duty to maintain law and order. France, which was bent on ruining the protector's schemes in Scotland and on recovering Boulogne, seized the opportunity to declare war on August the 8th ; and the outlying forts in the Boulonnais fell into their hands, while the Scots captured Haddington.

These misfortunes gave a handle to Somerset's enemies. Warwick combined on the same temporary platform Catholics who resented the Book of Common Prayer, Protestants who thought Somerset's mildness paltering with God's truth, and the wealthy classes as a whole. In September he concerted measures with the ex-lord-chancellor Wriothesley; and in October, after a vain effort to rouse the masses in his favour, Somerset was deprived of the protectorate and sent to the Tower. But the hostile coalition broke up as soon as it had to frame a construc- tive policy; Warwick jockeyed the Catholics out of the council and prepared to advance along

Protestant lines. He could hardly combine proscription of the Catholics with that of Somer- set, and the duke was released in February 1550. For a time the rivals seemed to agree, and Warwick's son married Somerset's daughter. But growing discontent with Warwick made Somer- set too dangerous. In October 1551, after Warwick had been created duke of Northumberland, Somerset was sent to the Tower on an exaggerated charge of treason, which broke down at his trial. He was, however, as a sort of compromise, condemned on a charge of felony for having sought to effect a change of government. Few expected that the sentence would be carried out, and apparently Northumberland found it necessary to forge an instruction from Edward VI. to that effect. Somerset was executed on the 22nd of January 1552, dying with exemplary patience and fortitude. His eldest son by his second wife was re-created earl of Hertford by Elizabeth, and his great-grandson William was restored as 2nd duke of Somerset in 1660. His children by his first wife had been disinherited owing to the jealousy of his second; but their descendants came into the titles and property when the younger line died out in 1 7 50.

See A. F. Pollard's England Under Protector Somerset (1900; full bibliography, pp. 327-330), also his article in Diet. Nat. Biog. and vol. vi. of Political History of England (1910). (A. F. P.)

SOMERSET, ROBERT CARR (or Kee), Earl or (c. 1590-1645), Scottish politician, the date of whose birth is unrecorded, was a younger son of Sir Thomas Ker of Ferniehurst by his second wife, Janet, sister of Sir Walter Scott of Buccleuch. He accompanied James I. as page to England, but being then discharged from the royal service, sought for a time to make his fortune in France. Returning to England he happened to break his arm at a tilting match, at which James was present, and was recognized by the king. Entirely devoid of all high intellectual qualities, Carr was endowed with good looks, excellent spirits, and considerable personal accomplishments. These advantages were sufficient for James, who knighted the young man and at once took him into favour. In 1607 an opportunity enabled the king to confer upon him a more substantial mark of his affection. Sir W. Raleigh had through his attainder forfeited his life-interest in the manor of Sherborne, but he had previously executed a con- , veyance by which the property was to pass on his deatn to fiis

eldest son. This document was, unfortunately, rendered worth- less by a flaw which gave the king eventual possession of the property. Acting on Salisbury's suggestion, James resolved to confer the manor on Carr. The

case was argued at law, and judgment was in 1609 given for the Crown. Lady Raleigh received some compensation, apparently inadequate, and Carr at once entered on possession. His influence was already such that in 1610 he persuaded the king to dissolve the parliament, which had shown signs of attacking the Scottish favourites. On the 25th of March 161 1 he was created Viscount Rochester, and subsequently a privy councillor, while on Lord Salisbury's death in 161 2 he began to act as the king's secretary. On the 3rd of November 1613 he was advanced to the earldom of Somerset, on the 23rd of December was appointed treasurer of Scotland, and in 1614 lord chamberlain. He supported the earl of North- ampton and the Spanish party in opposition to the old tried advisers of the king, such as Lord-Chancellor Ellesmere, who were endeavouring to maintain the union with the Protestants abroad, and who now in 1614 pushed forward another candidate for the king's favour. Somerset, whose head was turned by the sudden rise to power and influence, became jealous and peevish, and feeling his position insecure, obtained in 161 5 from the king a full pardon, to which, however, the chancellor refused to put the Great Seal. He still, however, retained the king's favour, and might possibly have remained in power for some time longer but for the discovery of the murder of Sir Thomas Overbury. Before 1600, while still only Sir Robert Carr, Somerset had begun an intrigue with Lady Essex. Supported by the king, the latter obtained a decree of nullity of marriage against Lord Essex in September 161 3, and in December she married the earl of Somerset. Ten days before the court gave judgment, Sir Thomas Overbury, who apparently knew facts concerning Lady Essex which would have been fatal to her success, and had been imprisoned in the Tower, was poisoned. No idea seems to have been entertained at the time that Lady Essex and her future husband were implicated. The crime, however, was not dis- closed till September 1615. Coke and Bacon were set to unravel the plot. After four of the principal agents had been convicted and punished, the earl and countess were brought to trial. The latter confessed, and of her guilt there can be no doubt. Somer- set's share is far more difficult to discover, and probably will never be fully known. The evidence against him rested on mere presumption, and he consistently declared himself innocent. Probabilities are on the whole in favour of the hypothesis that he was not more than an accessory after the fact. James, who had been threatened by Somerset with damaging disclosures, let matters take their course, and both earl and countess were found guilty. The sentence was not carried into effect against either culprit. The countess was pardoned immediately, but both remained in the Tower till January 1622. The earl appears to have refused to buy forgiveness by concessions, and it was not till 1624 that he obtained his pardon. He only once more emerged into public view when in 1630 he was prosecuted in the Star Chamber for communicating a paper of Sir Robert Dudley's to the earl of Clare, recommending the establishment of arbitrary

government. He died in July 1645, leaving one daughter, Anne, the sole issue of his ill-fated marriage, afterwards wife of the 1 st duke of Bedford.

See the article by S. R. Gardiner in Diet. Nat. Biog., with authori- ties there cited, and the same author's History of England; State Trials II. ; Life and Letters of Bacon, ed. by Spedding; Studies in Eng. Hist., by Gairdner and Spedding.

SOMERSET, LORD ROBERT EDWARD HENRY (1 776-1842), British soldier, was the third son of the 5th duke of Beaufort, and elder brother of Lord Raglan. Joining the 15th Light Dragoons in 1703, he became captain in the following year, and received a majority after serving as aide-de-camp to the duke of York in the Dutch expedition of 1799. At the end of 1800 he became a lieutenant-colonel, and in 1801 received the command of the 4th Light Dragoons. From 1799 to 1802 he represented the Monmouth boroughs in the House of Commons, and from 1803 to 1823 sat for Gloucestershire. He commanded his regiment at the battles of Talavera and Busaco, and in 1810

received a colonelcy and the appointment of A.D.C. to- the king. In 181 1, along with the 3rd Dragoon Guards, the 4th Light Dragoons fought a notable cavalry action at Usagre, and in 1812 Lord Edward Somerset was engaged in the great charge of Le Marchant's heavy cavalry at .Salamanca. His conduct on this occasion (he captured five guns at the head of a single squadron) won him further promotion, and he made the remain- ing campaigns as a major-general at the head of the Hussar brigade (7th, 10th and 15th Hussars). At Orthes he won further distinction by his pursuit of the enemy; he was made K.C.B., and received the thanks of parliament. At Waterloo he was in command of the Household Cavalry Brigade, which distinguished itself not less by its stern and patient endurance of the enemy's fire than by its celebrated charge on the cuirassiers of Milhaud's corps. The brigadier was particularly mentioned in Wellington's despatches, and received the thanks of parliament as well as the Maria Theresa and other much-prized foreign orders. He died a general and G.C.B. in 1842.

SOMERSETSHIRE, a south-western county of England, bounded N. and N.W. by the Bristol Channel, N. and N.E. by Gloucestershire, N.E. and E. by Wiltshire, S.E. by Dorsetshire, S.W. and W. by Devonshire. The area is 1630-3 sq. m. In shape the county resembles an ill-drawn crescent, curving inward where Bridgwater Bay bends south-west and broader at its eastern than at its western horn. It falls into three natural divisions, being in fact a broad alluvial plain bordered by two hill-regions. The Mendip range, breaking off from the high ground near Wiltshire, extends north-west towards the channel, where it ends with Brean Down; while the island of Steep Holm stands as an outpost between the heights of Somerset and

Glamorgan. The summit of the Mendips is a long table-land, reaching an extreme height, towards the western end, of 1068 ft. in Black Down, sloping away gently towards the lower hills of the north, but rising on the south in an abrupt line, broken by many coombes or glens; the most striking of which are the cliffs of Ebbor Rocks, near Wells, and the gorge of Cheddar (q.v.), which winds for nearly a mile between huge and fantastic rocks. South of the Mendips lies a broad plain watered by the Parrett and the Brue, and known generally as Sedgemoor, but with different names in different parts. This plain, intersected by ditches known as. rhines, and in some parts rich in peat, is broken by isolated hills and lower ridges, of which the most conspicuous are Brent Knoll near Burnham, the Isle of Avalon, rising with Glastonbury Tor as its highest point, and the long low ridge of Polden ending to the west in a steep bluff. West of Sedgemoor the second great region of hills extends from Devonshire to the sea. It consists of the Black Down, Brendon and Quantock hills, with Exmoor Forest {q.v.) in the extreme west. This entire district is famous for the grandeur of its bare and desolate moors, and the bold outlines and height of its mountains; the chief of which are Dunkery, in Exmoor (1707 ft.) ; Lype Hill, the westernmost point of the Brendon range (1391 ft.); and Will's Neck, among the Quantocks (1261 ft.). The two principal rivers of Somerset are the Avon and the Parrett. The Avon, after forming for a short distance the boundary with Wiltshire, crosses the north-eastern corner of the county, encircling Bath, and forms the boundary with Gloucestershire till it reaches the sea 6 m. beyond Bristol. It is navigable for barges as far as Bath. The Parrett from South Perrott in Dorset, on the borders of Somerset, crosses the centre of the county north-westwards by Bridgwater, receiving the Yeo and Cary on the right, and the Isle and Tone on the left. Among other streams are the Axe, which rises at Wookey Hole in the Mendips and flows north- westward along their base to the Bristol Channel near Blackrock; the Brue, which rises to the east of Bruton, near the borders of Wiltshire, and enters the Bristol Channel near the mouth of the Parrett; and the Exe (with its tributary the Barle), which rises in Exmoor forest and passes southward into Devon. Some of the Somersetshire streams, especially the Exe and Barle, are in high favour with trout fishermen. Weston-super-Mare is a flourishing seaside resort, and Minehead and other coast villages are also frequented.

Geology. — The oldest formation in the county is the Devonian, which extends eastwards from Devonshire across Exmoor to the Brendon and Quantock hills, and consists of sandstones, slates and limestones of marine origin. The Old Red Sandstone, the supposed estuarine or lacustrine

equivalent of the Devonian, is a series of red sandstones, marls and conglomerates, which rise as an anticline in the Mendips (where they contain volcanic rocks), and also appear in the Avon gorge and at Portishead. The Carbon- iferous Limestone, of marine origin, is well displayed in the Mendip country (Cheddar Cliffs, &c.) and in the Avon gorge; at Weston- super-Mare it contains volcanic rocks. The Coal Measures of the Radstock district (largely concealed by Trias and newer rocks) consist of two series of coal-bearing sandstones and shales separated by the Pennant Sandstone; locally the beds have been intensely folded and faulted, as at Vobster. Indeed, all the formations hitherto mentioned were folded into anticlines and synclines before the deposition of the Triassic rocks. These consist of red marls, sandstones, breccias and conglomerates, which spread irregularly over the edges of the older rocks; the so-called Dolomitic Con- glomerate is an old shingle-beach of Triassic (Keuper Marl) age. The Rhaetic beds are full of fossils and mark the first invasion of the district by the waters of the Jurassic sea. The Lias consists of clays and limestones ; the latter are quarried andare famous for their ammonites and reptilian remains. Above the Lias comes the Lower or Bath Oolite Series (Inferior Oolite group. Fuller's Earth and Great Oolite group), chiefly clays and oolitic limestone; the famous Bath Stone is got from the Great Oolite. The Oxford Clay is the chief member of the Middle or Oxford Oolite Series. Above these follow the Upper Cretaceous rocks, including the Gault, Upper Greensand and Chalk, which extend into the county from Wiltshire near Frome and from Dorset near Chard. There are apparently no true glacial deposits. Low-lying alluvial flats and peat-bogs occupy much of the surface west of Glastonbury. Caves in the Carboniferous Limestone {e.g. Wookey Hole, near Wells) have yielded Pleistocene mammalia and palaeolithic implements. The thermal waters of Bath (120 F.) are rich in calcium and sodium sulphates, &c. The chief minerals are coal, freestone and limestone, and ores of lead, zinc and iron.

Agriculture. — The climate partakes of the mildness of the south- western counties generally. A high proportion, exceeding four- fifths of the total area of the county, is under cultivation. _ In a county where cattle-feeding and dairy-farming are the principal branches of husbandry, a very large area is naturally devoted to pasture; and there are large tracts of rich meadow land along the rivers, where many of the Devonshire farmers place their herds to graze. Floods, however, are common, and the Somerset Drainage Act was passed by parliament on the nth of June 1877, providing for the appointment of commissioners to take measures for the drainage of lands in the valleys of the Parrett, Isle, Yeo, Brue, Axe, Gary and Tone. Cheese is made in various parts, notably the famous Cheddar Cheese, which is made in the farms lying south of the Mendips. Sheep-farming is practised both in the lowlands and on hill pastures, Leicesters and

Southdowns being the favourite breeds. In the Vale of Taunton heavy crops of wheat are raised ; this grain, barley and oats being raised on about equal areas. Turnips, swedes and mangolds occupy most of the area under green crops. Somerset ranks after Devon and Hereford in the extent of its apple orchards, and the cider made from these apples forms the common drink of the peasantry, besides being largely exported. Wild deer are still found on Exmoor, where there is a peculiar breed of ponies, hardy and small. The Bristol Channel and Bridgwater Bay abound in white- and shell-fish; salmon and herring are also caught, the principal fishing stations being Porlock, Minehead and Watchet.

Other Industries. — Coal, from the Mendips, and freestone, largely quarried near Bath, are the chief mineral products of Somerset, although brown ironstone, zinc, limestone and small quantities of slate, gravel, sand, sulphate of strontia, gypsum, ochre r Fuller's earth, marl, cement, copper and manganese are also found. Lead mining is carried on near Wellington, and lead washing in the Mendips ; but these industries, like the working of spathose iron ore among the Brendon hills, are on the wane. The chief manufactures are those of woollen and worsted goods, made in a large number of towns; silk made at Frome, Taunton and Shepton Mallet ; gloves at Yeovil, Stoke, Martock and Taunton; lace at Chard; linen and sailcloth at Crewkerne ; horsehair goods at Bruton, Castle Cary and Crewkerne ; crape at Dulverton and Shepton Mallet. Tobacco, snuff and spirits are also manufactured ; and there are large potteries at Bridgwater, where the celebrated bath-brick is made, and at Weston-super- Mare; carriage works at Bath and Bridgwater; engineering and machine-works also at Bridgwater. On the Avon, copper and iron are smelted, while several other rivers provide power for cotton, worsted and paper mills. The bulk of the export trade passes through Bristol, which is situated mainly in Gloucestershire, though it has large docks on the Somerset side of the Avon, and others at Portishead.

Communication. — Somerset is well furnished with railways. The Great Western runs between Frome, Radstock, Bath and Bristol, and from Bristol it curves south-west through Weston and Bridgwater to Taunton, dividing there and passing on into Devon.

Branches leave the main line for Portishead, Clevedon and Minehead on the north, and for Witham Friary via Wells, Yeovil via Langport, and Chard via Ilminster on the south. The South-Western main line from London passes through the south-west of Somerset, running from Templecombe to Axminster in Devon, and the Somer- set and Dorset runs from Bath to Shepton Mallet via Radstock. The Kennet and Avon Canal flows from Bradford in Wiltshire to Bath, and there joins the Avon, meeting on its way the two branches of the Somersetshire Coal Canal which flow

from Paulton and Radstock. The Taunton and Bridgwater Canal flows into the River Parrett.

Population and Administration. — The area of the ancient county is 1,043,409 acres, with a population in 1891 of 484,337, and in 1901 of 508,256. The area of the administrative county is 1,037,484 acres. The county contains 40 hundreds and two liberties. The municipal boroughs are — Bath, a city and county borough (pop. 49,839), Bridgwater (15,209), Chard (4437), Glastonbury (4016), Taunton (21,087), Wells, a city (4840)1 Yeovil (9861). The urban districts are — Burnham (2897), Clevedon (5900), Crewkerne (4226), Frome (11,057), Highbridge (2233), Ilminster (2287), Midsomer Norton (5809), Minehead (r>5n), Portishead ('2544), Radstock (3355), Shepton Mallet (5238), Street (4018), Watchet (1 880), Wellington (7283), Weston- super-Mare (19,845), Wiveliscombe (141 7). Among other towns may be mentioned Bruton (1788), Castle Cary (1902), Cheddar (1975), Keynsham (3512) and Wincanton (1892). The county is in the western circuit, and assizes are held at Taunton and Wells. It has one court of quarter sessions, and is divided into 22 petty sessional divisions. The boroughs of Bath and Bridgwater have separate courts of quarter sessions and commissions of the peace, and those of Taunton, Wells and Yeovil have separate commis- sions of the peace. The total number of civil parishes is 485. Somerset is in the diocese of Bath and Wells, excepting small parts in the dioceses of Bristol and Salisbury; it contains 508 ecclesiastical parishes or districts, wholly or in part. There are seven parliamentary divisions — Northern, Wells, Frome, Eastern, Southern, Bridgwater and Western or Wellington, each return- ing one member; while the parliamentary borough of Bath returns two members, and that of Taunton one member; and the county includes the greater part of the southern division of the parliamentary borough of Bristol.

History. — In the 6th century Somerset was the debatable borderland between the Welsh and Saxons, the latter of whom pushed their way slowly westward, fighting battles yearly and raising fortifications at important points to secure their conquered lands. Their frontier was gradually advanced from the Axe to the Parrett, and from the Parrett to the Tamar, Taunton being a border fort at one stage and Exeter at another. By 658 Somerset had been conquered by the West Saxons as far as the Parrett, and there followed a struggle between the kingdoms of Wessex and Mercia, decided by a great victory of Ine in 710, which led to the organization of the lands east of the Parrett as part of the kingdom of Wessex. There were still occasional inroads by the Welsh, Taunton Castle being captured in 721, but from the 8th century the West Saxon kings were rulers of what is now known as Somersetshire. About this time the bishopric of Wells was founded, and the monastery of Glastonbury restored by Ine. The next

hundred and fifty years were the period of Danish invasions. Egbert, king of Wessex, became Bretwalda or overlord of all England in 827, and under him Wessex with the other frontier kingdoms was organized for defence against the Danes, and later the assessment of danegeld led to the sub-division of Wessex for financial and military purposes, which crystallized into the divisions of hundreds and tithings, probably with the system of assessment by hidation. King Alfred's vic- tory in 878, followed by the Peace of Wedmore, ended the incur- sions of the Danes for a time, but a hundred years later they were again a great danger, and made frequent raids on the west coast of Somerset. At some time before the Conquest, at a date usually given as 1016, though evidence points to a much earlier and more gradual establishment, England was divided into shires, one of which was Somerset, and tradition gives the name of the first earl as Hun, who was followed by Earnulf and Sweyn, son of Godwin. There has been curiously little variation in the territory

included in the county, from the date of the Gheld Inquest in 1084 to the second half of the 19th century, when certain minor alterations were made in the county boundary. These have been practically the only changes in the county boundary for 900 years, if we except the exclusion of Bristol from the county jurisdiction in 1373.

At the Conquest Somerset was divided into about 700 fiefs held almost entirely by the Normans. The king's lands in Somerset were of great extent and importance, and consisted in addition to the ancient demesne of the Crown of the lands of Godwin and Earl Harold and the estates of Queen Edith who died in 1074. The bishop of Winchester owned a vast property of which Taunton was the centre, and about one-tenth of the county was included in the estates of the bishop of Coutances, which were akin to a lay barony and did not descend as a whole at the bishop's death. The churches of Glastonbury, Athelney and Muchelney still owned vast lands, but Norman spoliation had deprived them of much that they had held before the Conquest. Among the great lay tenants who divided the conquered lands were the count of Mortain (the Conqueror's half-brother), Roger de Corcelles, Walter de Douai, Roger Arundel and William de Mohun. About this time or a little later many Norman castles were built, some of which have survived. The castles at Richmont (near West Harptree), Nunney, Farleigh, Bridgwater, Stoke Courcy, Taunton and Dunster were probably the most important. Somerset was very rich in boroughs at the time of Domesday, which points to a considerable development of trade before the Conquest; Bath, Taunton, Ilchester, Frome, Milborne Port, Bruton,

Langport and Axbridge were all boroughs in 1087, and there was the nucleus of a borough at Yeovil. Somerton, Ilchester and Taunton were successively the meeting-places of the shire court. There were joint sheriffs for Somerset and Dorset until 1566 when a separate sheriff for each county was appointed. In the 7th century Somerset, as part of the kingdom of Wessex, was included in the diocese of Winchester. The new bishopric of Sherborne, founded in 704, contained Somerset until 910 when the see was divided into the dioceses of Salisbury, Exeter and Wells, the latter including the whole county of Somerset. The diocese was divided into three archdeaconries, Bath with two deaneries, Wells with seven and Taunton with four. Disputes between the chapters of Bath and Wells as to the election of the bishop led to a compromise in 1245, the election being by the chapters jointly, and the see being known as the bishopric of Bath and Wells. There has always been a strongly marked division of the county into East and West Somerset, a relic of the struggles between the Welsh and Saxons, which was recognized for parliamentary purposes by the act of 1832. Somer- set contained 37 hundreds in 1087, and now contains 41. There have been considerable modifications of these hundredal divi- sions by aggregation or subdivision, but since the 1 5th century there has been little change. The meeting-place of the hundred courts was at the village or town which gave its name to the hundred in the cases of Bruton, Cannington, Carhampton, Chew, Chewton, Crewkerne, Frome, Glaston Twelve Hides, Huntspili, Kilmersdon, Kingsbury East, Milverton, North Curry, North Petherton, Norton Ferris, Pitney, Portbury, Somerton, South Petherton, Taunton, Tintinhull, Wellow, Wells Forum and Winterstoke. The hundred of Abdick and Bulstone met at Ilford Bridges in Stocklinch Magdalen, Andersfield hundred court was held at the hamlet of Andersfield in the parish of Goathurst, Bath Forum hundred met at Wedcombe, Bemp- stone at a huge stone in the parish of Allerton, Brent and Wrington at South Brent, Catsash at an ash tree on the road between Castle Cary and Yeovil, Hartcliffe and Bedminster at a lofty cliff between the parishes of Barrow Gurnes and Winford, Horethorne or Horethorne Down near Milborne Port, Whitstone at a hill of the same name near Shepton Mallet, Williton and Freemanors in the village of Williton in the parish of St Decumans, and Whitley at Whitley Wood in Walton parish. In the case of Kingsbury the meeting-place of the hundred is not known. The great liberties of the county were Cranmore, Wells and Leigh, which belonged to the abbey of

Glastonbury; Easton and Amrill and Hampton and Claverton, which were the liberties of the abbey of Bath; Hinton and Norton, which belonged to the Carthusian priory of Hinton; Witham Priory, a liberty of the house of that name; and Williton Freemanor, which belonged for a time to the Knights Templars.

The chief families of the county in the middle ages were those of De Mohun, Malet, Revel, De Courcy, Montacute, Beauchamp and Beaufort, which bore the titles of earls or dukes of Somerset from 1396 to 1472. Edward Seymour was made duke of Somerset in 1547, and in 1660 the title was restored to the Seymour family, by whom it is still held. The marquess of Bath is the representative of the Thynne family, which has long been settled in the county, and the predecessors of the earl of Lovelace have owned land in Somerset for three centuries. Hinton St George has been the seat of the Poulet family since the 1 6th century. The De Mohun family were succeeded in the 14th century by the Luttrells, who own great estates round Dunster Castle. The families of Hood, Wyndham, Acland, Strachey, Brokeley, Portman, Hobhouse and Trevelyan have been settled in Somerset since the 16th century.

Somerset was too distant and isolated to take much share in the early baronial rebellions or the Wars of the Roses, and was really without political history until the end of the middle ages. The attempt of Perkin Warbeck in 1497 received some support in the county, and in 1547 and 1549 there were rebellions against enclosures. Somerset took a considerable part in the Civil War, and with the exception of Taunton, was royalist, all the strong- holds being garrisoned and held for the king. Waller was defeated at Landsdown near Bath in 1643, and Goring at the battle of Allermoor in 1645. This defeat was followed by the capture of the castles held by the royalists. Bridgwater and Bath fell in July 1645, Sherborne Castle was taken in August, and after the capture of Nunney, Farleigh and Bristol in September 1645 the whole county was subdued, and very heavy fines were inflicted upon the royalists, who included nearly all the great landowners of the county. Somerset was the theatre of Mon- mouth's rebellion, and he was proclaimed king at Taunton in 1685. The battle of Sedgmoor on the 4th of July was followed in the autumn by the Bloody Assize held by Judge Jeffreys.

Somerset has always been an agricultural county. Grain was grown and exported from the nth to the end of the 18th century. Cider-making has been carried on for centuries. Among other early industries, salmton and herring fisheries on the west coast were very profitable, and mining on the Mendips dated from the pre- Roman period. Stone quarrying at Hambdon Hill and Bath began very early in the history of the county ; and the lead mines at Welling- ton and the slate quarries at Wiveliscombe and Treborough have been worked for more than a century. Coal has been mined at Radstock from a very remote date, but it did not become of great importance commercially until the county was opened up by canals and railways in the 19th century. Sheep-farming was largely carried on after the period of enclosures, and the woollen trade flourished in Frome, Bath, Bridgwater, Taunton and many other towns from the 14th to the 19th

centuries. Glove-making was centred at Stoke and Yeovil at the end of the 18th century and became an important subsidiary occupation in many country districts. The county was represented in the parliament of 1290 and probably in the earlier parliamentary councils of Henry III. In 1295 it was represented by two knights, and twelve boroughs returned two burgesses each. There have been many fluctuations in the borough representation, but the county continued to return two members until 1832, when it was divided into Somerset East and Somerset West, each of which divisions returned two members. Two additional members were returned after 1867 for a third— the Mid-Somerset — division of the county, until by the act of 1885 the whole county was divided into seven divisions.

Antiquities. — The great possessions of the bishopric and of the abbey of Glastonbury led to a remarkable lack of castles in the mid part of the county, and also tended to overshadow all other ecclesiastical foundations. Even in the other parts of the county castles are not a prominent feature, and no monastic churches remain perfect except those of Bath and its cell, Dunster. At the dissolution of monasteries Bath was suppressed, the monastery of Glastonbury was destroyed, as were most of the smaller monasteries also. Of those which have left any remains, Woodspring, Montacute (Cluniac) and Old Cleeve (Cistercian)

are the most remarkable. Athelney, founded by Alfred on the spot where he found shelter, has utterly perished. Montacute and Dunster fill a place in both ecclesiastical and military history. The castle of Robert of Mortain, the Conqueror's brother, was built on the peaked hill (mons acutus) of Leodgaresburh, where the holy cross of Waltham was found. The priory arose at the foot. Dunster, one of the few inhabited castles in England, stands on a hill crowned by an English mound. Besides these there are also remains at Nunney and Castle Cary. In ecclesiastical architecture the two great churches of Wells and Glastonbury supply a great study of the development of the Early English style out of the Norman. But the individual architectural interest of the county lies in its great parish churches, chiefly in the Perpendicular style, which are especially noted for their magnificent towers. They are so numerous that it is not easy t» select examples, but besides those at Bath, Taunton and Glastonbury, the churches at Bridgwater, Cheddar, Crewkerne, Dunster, Ilminster, Kingsbury, Leigh-on-Mendip, Martock and Yeovil may be specially indicated. Of earlier work there is little Norman, and hardly any pre-Conquest, but there is a characteristic local style in some of the smaller buildings of the 14th century. The earlier churches were often cruciform,

and sometimes with side towers. In domestic remains no district is richer, owing to the abundance of good stone. Clevedon Court is a very fine inhabited manor-house of the 14th century, and the houses, great and small, of the 15th, 16th and 17th centuries are very numerous. Indeed, the style has never quite gone out, as the gable and the mullioned window have lingered on to this day. Barrington Court in the 16th century and Montacute House in the 17 th are specially fine examples. There are also some very fine barns, as at Glastonbury, Wells and Pilton.

See J. Collinson, History and Antiquities of the County of Somerset (Bath, 1791) ; W. Phelps, History and Antiquities of Somerset (London, 1839); R. \V. Eyton, Domesday Studies: Analysis of the Somerset Survey (London, 1880); F. T. Elworthy, West Somerset Word-Book (Dialect Society, London, 1886); Roger, Myths and Worthies of Somerset (London, 1887); C. R. B. Barrett, Somerset Highways, Byways and Waterways (London, 1894); C. Walters, Bygone Somerset (London, 1897); Victoria County History: Somerset; also various publications by the Somerset Record Society, the Proceedings of the Somerset Archaeological and Natural History Society, and Somerset Notes and Queries.

SOMERSWORTH, a city of Strafford county, New Hamp- shire, U.S.A., on the Salmon Falls river, 5 m. N. of Dover, and opposite the town of Berwick, Maine, industrially a part of Somersworth. Pop. (1890) 6207; (1900) 7023 (3166 foreign- born); (1910) 6704. Somersworth is served by the Boston & Maine railroad, and is connected by electric line with Rochester and Dover. The river furnishes good water power, and the city's chief interests are in the manufacture of cotton and woollen goods, and boots and shoes. It has a public library. In the south- west part is Central Park, lying along the shore of Willand's Pond. The municipality owns and operates the waterworks. A settlement was established here in the latter part of the 17th century, when the territory was a part of Dover. In 1729 the parish of Summersworth was organized; in 1754 this parish was erected into the town of Somersworth; in 1821 the first company was formed to develop the water-power and establish cotton and woollen mills; in 1849 the southern half of the town was set- off and incorporated as Rollinsford; and in 1893 Somers- worth was chartered as a city.

See W. D. Knapp, Somersworth, an Historical Sketch (1894).
SOMERVILE, WILLIAM (1675-1742), English poet, eldest son of a country gentleman, was born at Edstone, Worcestershire, on the 2nd of September 1675. He was educated at Winchester College and at New College, Oxford. After his father's death in 1705 he lived on his estate, devoting himself especially to field sports, which supplied the subjects of his best-known poems. His publications were The Two Springs (1725), a fable; Occa- sional Poems. . . (1727) ; The Chase (1735) Hobbinol, or the Rural

Games (1740), a burlesque poem; and Field Sports (1742), a poem on hawking. Somervile died on the 19th of July 1742.

His Chase passed through many editions. It was illustrated by Bewick (1796), by Stothard (1800), and by Hugh Thomson (1896), with a preface by R. F. Sharp.

SOMERVILLE, MARY (1780-1872), British scientific writer, was the daughter of Admiral Sir William George Fairfax, and was born on the 26th of December 1780 in the manse of Jedburgh, the house of her mother's sister, wife of Dr Thomas Somerville (1741-1830), author of My Own Life and Times, whose son was her second husband. She received a rather desultory education, and mastered algebra and Euclid in secret after she had left school, and without any extraneous help. In 1804 she married her cousin, Captain Samuel Greig, who died in 1806; and in 181 2 she married another cousin, Dr William Somerville (1771-1860), inspector of the army medical board, who encour- aged and greatly aided her in the study of the physical sciences. After her marriage she made the acquaintance of the most eminent scientific men of the time, among whom her talents had attracted attention before she had acquired general fame, Laplace paying her the compliment of stating that she was the only woman who understood his works. Having been requested by Lord Brougham to translate for the Society for the Diffusion of Useful Knowledge the MScanique Celeste of Laplace, she greatly popularized its form, and its publication in 1831, under the title of The Mechanism of the Heavens, at once made her famous. Her other works are the Connexion of the Physical Sciences (1834), Physical Geography (1848), and Molecular and Microscopic Science (1869). Much of the popularity of her writings was due to their clear and crisp style and the underlying enthusiasm for her subject which pervaded them. In 1835 she received a pension of £300 from government. She died at Naples on the 28th of November 1872. In the following year there appeared her Personal Recol- lections, consisting of reminiscences written during her old age, and of great interest both for what they reveal of her own character and life and the glimpses they afford of the literary and scientific society of bygone times.

SOMERVILLE, a city of Middlesex county, Massachusetts, U.S.A., on the Mystic river, adjoining Boston (Charlestown), Cambridge, Medford and Arlington. Pop. (1890), 40,152; (1900), 61,643, of whom 17,232 were foreign-born; (1910 census), 77,236. Of the foreign-born in 1900 6400 were English-Canadians, 5542 were Irish, 1321 were English, 610 were French-Canadians, 590 were Italians, 576 were Scotch and 556 were Swedish. Somerville is served by the Boston & Maine railroad and by suburban electric railway lines. It is a residential and manufacturing suburb of Boston, of which, industrially, it forms a part; it is included in

the metro- politan water, sewer and park districts, and in the Boston postal district. It comprises an irregular (land) area of 4-06 sq. m. in the Mystic Valley and along a range of hills or ridges, of which the largest are Prospect, Spring, Winter, Central and Clarendon hills. Among its public buildings and institutions are a fine public library (1872) with 80,000 volumes in 1908, the city hall, a state armoury, Somerville Hospital, the city poor house, a Roman Catholic home for the aged, and two high schools (English and classical). Among the parks are Broadway Park, Central Hill Park, Prospect Hill Park, Lincoln Park, and Nathan Tufts Park. The total value of the city's factory product in 1905 was $22,955,197, an increase of 14-4 per cent, over that of 1900; in 1890 the product value was only $7,307,522. The establishments include slaughtering and meat-packing houses, whose product is by far the most valuable in the city, bleacheries, finishing factories, glassworks, machine shops, tube works, jewelry factories, and a desk factory. There are also lumber and coal yards. Blue slate-stone used for building purposes is quarried.

Somerville, originally a part of Charlestown, was settled in 1630. Six hundred acres, the " Ten Hills Farm," were granted here in 1631 to John Winthrop, who built and launched here in that year the " Blessing of the Bay," the first ship built in Massachusetts. For more than a century it was a sparsely settled farming community, the only article of manufacture

being bricks. On the 19th of April 1775 the British columns returning from Concord were harassed by the farmers here, as in the other towns along the line of march. Several of the hills of Somerville (e.g. Prospect and Central Hills) were fortified during the siege of Boston. On Prospect Hill on the 18th of July 1775 Israel Putnam raised the "Appeal to Heaven" flag, and here also is said to have been raised on the 1st of January 1776 one of the earliest of the Continental standards, the Union Jack and Stripes. On Powder House Hill (originally Quarry Hill), in Nathan Tufts Park, there still stands an interesting old slate-stone powder house, a circular building, 30 ft. high, with a conical cap, originally built (about 1703) for a windmill, deeded in 1747 to the Massachusetts Bay Colony, used in 1756-1822 as a powder house, and now marked by a bronze tablet erected by the Massachusetts Society of the Sons of the Revolution; on the 1st of September 1774, General Gage seized 250 half barrels of powder stored here in anticipa tion of the outbreak of hostilities; in 1775 the powder house became the magazine of the American forces besieging Boston, and at that time Nathanael Greene maintained his headquarters at the Samuel

Tufts House, and Charles Lee had his head- quarters at the Oliver Tufts House, in Somerville. After the battle of Saratoga some of Burgoyne's officers were housed here. The opening of the Middlesex Canal through the town in 1803 and of the Boston & Lowell railroad in 1835 gave an impetus to the town's growth. In 1834 an Ursuline Convent, built in 1827 on Mt Benedict, was sacked and destroyed by an anti-Catholic mob. In 1842 Somerville was separated from Charlestown and incorporated under its present name; it was chartered as a city in 1871.

See T. H. Hurd, History of Middlesex County (3 vols., Philadelphia, 1890); S. A. Drake, History of Middlesex County (2 vols., Boston, 1880); E. A. Samuels, Somerville Past and Present (Boston, 1897); Miss M. A. Haley, The Story of Somerville (Boston, 1903).

SOMERVILLE, a borough and the county-seat' of Somerset county, New Jersey, U.S.A., in the north central part of the state, on the Raritan river, about 36 m. S.W. of New York City. Pop. (1890), 3861; (1900), 4843, of whom 560 were foreign-born; (1905), 4782; (1910), 5069. It is served by the Central Railroad of New Jersey and by inter-urban electric lines. Adjoining the borough on the west is the town of Raritan (pop. in 1910, 3672). Places of interest in Somerville are the Old Parsonage of the Dutch Reformed Church, built in 1750- 1751 of brick imported from Holland by the Rev. Theodorus Jacobus Frelinghuysen, the first pastor; the Wallace House, built in 1778 and occupied by General Washington as his head-quarters during the following winter, when the main army was in camp at Bound Brook; and Duke's Park (partly in Raritan), the immense private estate (laid out as a park and open to the public) of James B. Duke, president of the American Tobacco Company. Somerville has a fine county court house (1909) of Alabama white marble. Among the borough's manufactures are stoves, ranges, soil pipe, brick, woollen goods and shirts. Settlements were made within the present limits of Somerville in the last quarter of the 17 th century, and the village was at first called Raritan, all that part of the Raritan Valley from Bound Brook to the junction of the north and south branches of the river, and including the present Somerville and Raritan, then being popularly called " Raritans." The present name was adopted in 1801. Somerville became the county-seat in 1 783, after the destruction of the court-house in what is now the borough of Millstone (in Hillsborough township, about 6 m. south of Somerville) on the 27th of October 1779 by British troops under Colonel John Graves Simcoe ; it was incorporated as a town in 1863, and as a borough in 1909.

SOMME, a department of northern France, formed in 1790 of a large part of the province of Picardy (comprising Vermandois, Santerre, Amienois, Ponthieu, Vimeu, and Marquenterre) and a small portion of Artois. Pop. (1906), 532,567. Area 2423 sq. m. It is bounded on the N. by Pas-de-

Calais, E. by Aisne, S. by Oise, and S.W. by Seine-Inferieure, and its sea-coast extends

28 m. along the English Channel. Two streams flowing into the

Channel — the Authie on the north and the Bresle on the south- west — bound it in these directions. The surface consists of great rolling plains, generally well cultivated and very fertile. The highest point, about 700 ft. above the sea, lies in the south- west, not far from Aumale. From the mouth of the Authie to the Bay of the Somme the coast is lined with a belt of sand dunes about 2 m. broad, behind which is the Marquenterre, a tract of 50,000 acres reclaimed from the sea by means of dykes and traversed by drainage canals. The Bay of the Somme, obstructed by dangerous sandbanks, contains the three fishing ports of Crotoy, St Valery, which is also the chief commercial port, and Le Hourdel. Next come the shingle banks, behind which the low fields of Cayeux (25,000 acres) have been reclaimed; and then at the hamlet of Ault commence the chalk cliffs, which continue onwards into Normandy.

The river Somme rises to the N.N.E. of St Quentin in the department of Aisne, where it has a course of about 25 m.; it traverses the department of Somme from the south-east to the north-west for a distance of about 125 m., through a marshy valley abounding in peat. Commanded by Ham, Peronne, Amiens and Abbeville, this valley forms a northern line of defence for Paris. Apart from the water-power it supplies, the Somme is of great commercial value, being accompanied by a canal all the way from its source wherever it is not itself navig- able. From Abbeville to St Valery its lower course forms a maritime canal 165 ft. wide, 12 ft. deep, and 8 to 9 m. long, capable of bearing at high tide vessels of 300 tons burden. From St Valery to the open sea the current hollows out a very variable bed accessible at certain tides for vessels of 500 tons. The most important affluents of the Somme — the Ancre from the north-east by way of Albert and Corbie, the Avre from the south-east by Roye, and the Selle from the south by Conty — join the main streams at Amiens. The Authie and the Bresle are respectively 63 and 45 m. long. The latter ends in a maritime canal about 2 m. long between Eu and Treport.

The mean temperature is lower than that of Paris (49 ° F. at Abbeville). The mean annual rainfall is 33 in. at Abbeville. The department, especially in the north-east, is one of the best cultivated in France. Beetroot for sugar is the staple crop of the Peronne arrondissement ; cereals, chiefly wheat, fodder and mangel-wurzels, oil plants, poppy, colza, flax, hemp and potatoes are grown through- out the department, the latter more largely on the seaboard. Stock- raising of all kinds is successfully carried on. No wine is growti, the principal drinks being beer and cider. Market gardening is of

great importance round Amiens. Peat-cutting is actively carried on, the best qualities and the deepest workings being in the valley of the Somme, between Amiens and Abbeville. Phosphate of lime is also an important mineral product. The manufacture of a great variety of textile goods, especially velvet (Amiens), of beet sugar and alcohol, and of locks, safes and the like (in the Vimeu), are charac- teristic industries of the department, which also carries on oaw- milling, flour-milling, brewing, dyeing, ironfounding and forging, printing and the manufacture of paper, chemical products, machines and ironmongery, hosiery (in the Santerre), &c. Cereals, horses of the Boulogne or Norman breed, cattle, hemp and linen, and the manufactured goods are the exports of the department. St Valery (pop. 3389) exports vegetables and farm-products (to England), and shingle for the manufacture of earthenware. Besides the raw materials for the manufacturing industries, wines and timber, the latter largely imported at St Valery, dyestuffs and coal are imported. The department is served principally by the Northern railway, and its canals and rivers provide 140 m. of navigable waterway. Administratively the department comprises 5 arrondissements (those of Amiens, the capital, Abbeville, Doullens, Montdidier and Peronne), 41 cantons and 836 communes. The department belongs to the academie (educational circumscription) of Lille, and consti- tutes the diocese of Amiens, which city is also the seat of a court of appeal and the headquarters of the region of the II. army corps, wherein the department is included.

The most noteworthy places are Amiens (the capital), Abbeville, Montdidier, Peronne, Doullens, St Riquier, Crecy and Ham, which are treated under those headings. The following places may also be mentioned: Albert (pop. 6656), after Amiens and Abbeville the most populous town in the department and a centre for machine construction; Villers-Bretonneux (pop. 4447), a centre of hosiery manufacture; Corbie, once celebrated for its Benedictine abbey (founded in the 7th century) the church of which (i6th-i8th century) is still to be seen; L'Etoile, with the well-preserved remains of a Roman camp; Folleville, which has a church (15th century) contain- ing the fine Renaissance tomb of Raoul de Lannoy ; Picquigny, with

the remains of a chateau of the 14th, 15th and 16th centuries, once one of the chief strongholds of Picardy; Rue, where there is a fine chapel of the 15th century; and Tilloloy, which has a Renaissance church.

SOMMER, in architecture, a girder or main beam of a floor; if supported

on two storey posts and open below, it is called a bress or breast-summer. The word is also spelled " summer," and is the same as " sumpter," a pack-horse, Fr. sommier, O. Fr., saume, from Low Lat. salma, pack, burden, Gr. cnry/m, aaTTHV, to fasten a pack on a horse.

SOMMEHFELD, a town of Germany, in the Prussian province of Brandenburg, on the Lubis, 40 m. S.E. of Frankfort-on-Oder, by the railway from Berlin to Breslau. Pop. (1905), 12,251. It has a Roman Catholic church, three Evangelical churches, several schools and a hospital. Its manufactures of woollen cloth are important; and it also contains finishing and dye- works, an ironfoundry, boiler-works and breweries.

SOMMERS, WILLIAM (d. 1560), court fool of Henry VIII., is said to have been brought to the king at Greenwich by Richard Fermor, about 1525. He was soon in high favour with Henry, whose liberality to Sommers is attested by the accounts of the royal household. The jester possessed a shrewd wit, which he exercised even on Cardinal Wolsey. He is said to have warned his master of the wasteful methods of the exchequer and to have made himself the advocate of the poor. His portrait is shown in a painting of Henry VIII. and his family at Hampton Court, and he again appears with Henry VIII. in a psalter which belonged to the king and is now in the British Museum. He was probably the William Sommers whose death is recorded in the parish of St Leonard's, Shoreditch, on the 15th of June

1560.

For his position in 16th- and 17th-century literature see T. Nash, Pleasant Comedie called Summers' last Will and Testament (pr. 1 600) ; S. Rowlands, Good Newes and Bad Newes (1622); and a popular account, A Pleasant Historie of the Life and Death of William Som- mers (reprinted 1794). See also John Doran, History of Court Fools

(1858).

SOMNAMBULISM (from Lat. somnns, sleep, and ambulare, to walk), or sleep-walking, the condition under which people are known to walk along while asleep, apparently unconscious of external impressions, return to bed, and when they awake have no recollection of any of these occurrences. Sometimes the actions performed are of a complicated character and bear some relation to the daily life of the sleeper. Thus a cook has been known to rise out of bed, carry a pitcher to a well in the garden, fill it, go back to the house, fill various vessels carefully and without spilling a drop of water, then return to bed, and have no recollection of what had transpired. Again, somnambulists have been observed to write letters or reports, execute drawings, and play upon musical instruments. Frequently they have gone

along dangerous paths, executing delicate movements with precision.

Four types of somnambulists may be noticed: (1) those who speak without acting, a common variety often observed in children and not usually considered somnambulistic; (2) those who act without speaking, also well known and the most common type; (3) those who both act and speak, more exceptional; and (4) those who both act and speak and who have not merely the sense of touch active but also the senses of sight and hearing. The fourth class is the most extreme type and merges into the physiological condition of mesmerism or hypnotism (q.v.), and it is necessary here only to notice it in connexion with the subject of sleep. Many observations indicate that, at all events in some cases, the somnambulist engaged, for example,' in writing, has a mental picture of the page before him and of the words he has written. He does not see what he really writes. This has been proved by causing persons to write on a sheet of paper lying on the top of other sheets. After he had been allowed to write a few sentences, the sheet was carefully withdrawn and he continued his writing on the next sheet, beginning on the new sheet at the corresponding point where he left off on the first one. Moreover, the somnambulist , by force of habit, stroked t's and dotted i's at the exact places

where the t's and i's would have been had he written continuously on one sheet, showing that what he was conscious of was not what was before him, but the mental picture of what he had done.

The following table, modified from two such tables given by Benjamin Ball (b. 1833) and Chambard in their classical article " Sjomnambulisme " in the Dictionnaire encyclopedique des sciences medicales, shows the relation of the various intermediate conditions of sleeping and awaking and of the dreaming and somnambulistic states. The horizontal stroke indicates the presence of the condition the name of which heads the column: —

Organic life.

Conscious- ness.

Imagin- ative faculties.

Co-ordi- nating faculties.

Power of movement

and sensibility.

Normal waking state Sleep, 1st degree. ,, 2nd degree ,, 3rd degree Deep sleep …. Waking, 1st degree ,, 2nd degree (speci- ally dreaming state) . ,,

3rd degree. . Complete waking Dreaming state- . Ordinary somnambulism — (2) above. Profound somnambulism (perfect unconscious- ness)

Somnambulistic dream (movements in a dream)

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The somnambulist acts his dream. His condition is that of a vivid dream in which the cerebrum is so active as to influence centres usually concerned in voluntary movements. Under the dominant idea he executes the movements that this idea would naturally excite in the waking state. Many of his movements are in a sense purposive; his eyes may be shut so that the movements are executed in the dark, or the eyes may be open so that there is a picture on the retina that may awaken no consciousness, and yet may, by reflex mechanisms, be the starting-point of definite and deliberate movements. In many cases he does not hear, the audi- tory centres not responding; but in others suggestive words may alter the current of his dream and lead him to perform other actions than what he intended to do. On awaking there is either no memory of what has taken place or the dim recollection of a fading dream.

It is important to notice that there is scarcely any action of which a somnambulist may not be capable, and immoral acts from which the individual would shrink in waking hours may be per- formed with indifference. Considering the abrogation of self-con- trol peculiar to the physiological condition, it is evident that no moral responsibility can be attached to such actions. In cases where somnambulistic propensities place a person in danger, an endeavour should be made to induce him to return to bed without awaking him; as a rude awakening may produce a serious shock to the nervous system. Inquiry should then be made into the exciting cause of the somnambulistic dream, such as a particular train of thought, over-excitement, the reading of special books, the recollec- tion of an accident or of a crisis in the person's history, with the view of removing the cause if possible. It should never be forgotten that somnambulism, like chorea, hysteria and epilepsy, is the expression of a general morbid predisposition, an indication of a nervous diathesis, requiring careful treatment so as to avoid more dangerous maladies.

See also Sleep and Muscle and Nerve (physiology).

SOMNATH, an ancient decayed city of Kathiawar in the province of Bombay, India. Pop. (1901), 8341. It is situated on a bay of the Arabian

Sea. The port, which is called Vera- wal, is distinct from the city proper (Deva-Pattan, Somnath- Pattan, or Prabhas). The latter occupies a prominence on th© south side of the bay, is surrounded by massive fortifications, and retains in its ruins and numerous tombs many traces of its former greatness as a commercial port. But the city was most famous for the temple just outside its walls in which stood the great idol or rather columnar emblem of Siva called Somnath (Moon's lord), which was destroyed by Mahmud of Ghazni. The famous " Gates of Somnath," which were supposed to have been carried off by Mahmud to Ghazni, had probably no connexion with Somnath. They are built of deodar (n ft. in height and 0j in width) and are richly carved in geometric

Saracenic patterns. The gates were attached to the building covering Mahmud's tomb at Ghazni until their removal to India, under Lord Ellenborough's orders, on the evacuation of Afghani- stan in 1842. They are now contained in the arsenal at Agra.

SOMNUS, the Latin name for the personification of sleep, in Greek Hypnos ("Ttttos). He is the son of Night and the twin brother of Death, with whom he dwells in the darkness of the underworld. At first the difference between the two is strongly marked. While Death is cruel and merciless, and never lets go his prey once seized, Sleep is gentle and kindly, the bestower of rest and pleasant dreams, the soother of care and sorrow. Even Keus is unable to resist his influence, and on two occasions was put to sleep by him at the instance of Hera. In time, however, the conception of Death was greatly modified, until at last he was depicted as a beautiful boy, with or without wings. In like manner, Sleep came to be used as a euphemism for Death. In art the representations of Sleep are numerous and varied. On the chest of Cypselus, Ni%ht was depicted holding in her hands two sleeping children — one white (Sleep), the other black (Death). His most common form is that of a vigorous young man, with wings on his forehead; his attributes a stalk of poppy, and a horn from which he drops slumber upon those whom he puts to rest. In Ovid (Metam. xi. 592) the home of Sleep is placed in a dark grotto in the land of the Cimmerians, where he dwells surrounded by a band of Dreams.

See Homer, Iliad xiv. 231 — xvi. 672; Hesiod, Theog. 212, 758; Pausanias, v. 18, I.

SONATA (From Ital. sonare, to sound), in music, originally merely a piece " played " as opposed to " cantata," a piece sung, though the term is said

to have been applied once or twice to a vocal composition. By the time of Corelli two polyphonic types of sonata were established, the sonata da chiesa and the sonata da camera.

The sonata da chiesa, generally for one or more violins and bass, consisted normally of a slow introduction, a loosely fugue'd allegro, a cantabile slow movement 1 and a lively finale in some such " binary " form (see Sonata Forms) as suggests affinity with the dance-tunes of the Suite (q.v.). This scheme, however, is not very clearly defined, until the works of Bach and Handel, when it becomes the sonata par excellence and per- sists as a tradition of Italian violin music even into the early 19th century in the works of Boccherini.

The sonata da camera consisted almost entirely of idealized dance-tunes. By the time of Bach and Handel it had, on the one hand, become entirely separate from the sonata, and was known as the suite, partita, ordre or (when it had a prelude in the form of a French opera-overture) the overture. On the other hand, the features of sonata da chiesa and sonata da camera became freely intermixed. But Bach, who does not use those titles, yet keeps the two types so distinct that they can be recognized by style and form. Thus, in his six solo violin sonatas, Nos. 1, 3 and 5 are sonate de chiesa, and Nos. 2, 4 and 6 are called partitas, but are admissible among the sonatas as being sonate da camera.

The sonatas of Domenico Scarlatti (q.v.) are a special type determined chiefly by those kinds of keyboard technique that are equally opposed, on the one hand, to contrapuntal style, and, on the other hand, to the supporting of melodies on a life- less accompaniment. Longo's complete collection of Scarlatti's sonatas shows that, short of the true developed sonata-style, there is nothing between the old sonata da chiesa and Beet- hovenish experiments in unorthodox "complementary keys" that Scarlatti does not carry off with a delightfully irresponsible " impressionism " that enables him to be modern in effect without any serious modern principle. Great, however, as the variety of his forms is now known to be, and numerous as are

1 A movement is a piece of music forming a complete design, or at least not merely introductory; and within such limits as either to contain no radical change of pace or else to treat changes of pace in a simple and symmetrical alternation of episodes. The first complete movement of a sonata seldom leads without break to the others, except in modern examples; but the later movements are often connected.

the newly published slow movements, the normal Scarlatti sonata is that which the concern-player popularizes ; fireworks in binary form, with a

perfunctory opening, a crowd of pregnant ideas in the complementary key, and, after the double bar, a second part reproducing these ideas as soon as possible in the tonic. The sonatas of Paradies are mild and elongated work of this type with a graceful and melodious little second move, ment added. The manuscript on which Longo bases his editioh of Scarlatti frequently shows a similar juxtaposition of move- ments, though without definite indication of their connexion The style is still traceable in the sonatas of the later classics., whenever a first movement is in a uniform rush of rapid motion, as in Mozart's violin sonata in F (Kochel's Catalogue, No. 377), and in several of Clementi's best works.*

The sonata in its main classical significance is a work for one or two instruments consisting of a group of movements, four movements being the full scheme; the last movement in the same key as the first ; each movement normally in one tempo, complete in design, independent from the other movements in themes, but aptly related to them in key and style; and constructed in the Sonata Forms (q.v.).

Though, since the time of Bach (when trios were called sonatas), the term is not applied to works for more than two instruments, the full (and even the normal) characteristics of this most important of all instrumental art-forms are rarely revealed except in trios, quartets, &c, and symphonies.

SONATA FORMS, in music. The sonata forms (see Sonata above) cover the whole ground of instrumental music from C. P. E. Bach to the advent of the instrumental lyric as matured by Schumann and of the symphonic poem originated by Liszt. They also have a profound influence on classical opera and vocal music, and hence, by repulsion, upon Wagner, whose life-work consisted in emancipating the music-drama from them. The conditions which developed them were the conditions which made Gluck's reform of opera possible; for they are at once the means and the expression of that 18th-century change in the language of music which made it a truly dramatic medium. Hence our present task is the discussion of the largest and most central problems pure music has ever dealt with; and, while the external technicalities are numerous and prominent, they are significant only so long as we maintain their connexion with those problems with which the true masters (and only the true masters) of the sonata forms are concerned. Much, then, that is essential to the true sonata forms must come under the headings of instru- mentation, harmony, and other musical categories. But here we must confine ourselves to the purely formal aspect, allowing only such allusion to other aspects as will help us to see behind superficial appearances.

1. The Sonata Style. — The sonata forms are representative of the type of music that attracts us primarily by its design and its larger contrasts, and

only in the second place by the vitality of its texture. In Bach's art the reverse is the case; we listen chiefly to the texture, and our delight in the larger designs, though essential, is seldom more than subconscious. Art-forms existed already in Bach's time, in which the shape, and not the texture, was the object of attention, but these were lighter forrrfs. Bach himself was the greatest master of them, but he never transcended what was then their legitimate limit as an art which is related to his larger work much as decorative designs are related to architecture. Bach's suites and partitas (see Suite) contain (apart from their great preludes, in which other principles are involved) one form embodied in several different dance rhythms, which is the germ from which the sonata was developed. It is sometimes known as the " binary " form; but as some eminent writers classify its later develop- ment as " ternary," we shall here avoid both terms, and refer to it in its earlier manifestations as the " suite " form, and in its later as the " sonata " form. In the suite it may be repre- sented by the following diagram: —

*J&dulatian**

where the long horizontal line represents the main key, the short horizontal lines represent a second key, the perpendicular line represents the division into two portions, 1 and the letters represent the phrases. This form is often typified in the com- pass of a single melody without change of key or marked divi- sion, as in that beautiful English tune " Barbara Allen," where the half-close on the dominant in the fourth bar is symmetrically reproduced as the full close on the tonic at the end (see Melody, example i). On a larger scale it admits of great variety and elaboration, but the style of the classical suite never allows it to become much more than the musical analogue of a pattern on a plate. The passage from the material in the main key to that in the foreign key (from A to B in the above diagram) is continuous and unnoticeable, nor is the second part of the design which leads to the return of B in the tonic noticeably different in style or movement from the earlier part. It has a slightly greater range of key, for the sake of variety, but no striking contrast. Lastly, the rhythms, and such texture as is necessary to keep the details alive, are uniform throughout.

Now, the essential advance shown by the true sonata forms involves a direct denial of all these features of the suite style. No doubt one natural consequence of working on a larger scale is that the sonata composer tends to use several contrasting themes where the suite composer used only one; and an equally natural consequence is that the shape itself is almost

invariably amplified by the introduction of a recapitulation of A as well as of B in the tonic, so that our diagram would become modified into the following: —

Development in. variowa keys

AB

But these facts do not constitute a vital difference between sonata and suite forms. They do not, for instance, enable composers like Boccherini and the later Italian violin writers to emancipate themselves from the influence of the suite forms, though the designs may be enlarged beyond the bursting point. The real difference lies, indeed, in every category of the art, but primarily in a variety of rhythm that carries with it an entirely new sense of motion, and enables music to become not only, as hitherto, architectural in grandeur and decorative in detiil, but dramatic in range. The gigue of Bach's C major suite for violoncello, and the allemande of his D major clavier partita, will show that the suite forms were amply capable of digesting a non-polyphonic style and a group of several con- trasted themes; but they still show the uniformity of rhythm and texture which confines them to the older world in which visible symmetry of form is admissible only on a small scale. Haydn can write a movement, perhaps shorter than some of Bach's larger dance movements, containing only one theme and mainly polyphonic in texture, as in the finale of his tiny string quartet in D minor, Op. 42; but the transformations of his one theme will be contrasted in structure, the changes of rhythm will be a continual surprfse, the passage from the first key to the second will be important and emphatic, and at every point the difference in scope between his sonata music and Bach's suite music will be as radical as that between drama and lyric. The process of this change was gradual; indeed, no artistic revolution of such importance can ever have been accomplished more smoothly and rapidly. Yet Philipp Emmanuel Bach, the first to realize the essentials of the new style, obtained his object only at the cost of older elements that are essential to artistic completeness. And Haydn himself was hardly able to reinfuse such vitality of texture as would give the new form permanent value, before he was forty years of age.

Haydn's earlier string quartets, from Op. 1 to Op. 33, present one of the most fascinating spectacles of historical development in all music. He was content to begin at a lower level of brilliance

1 In all stages of development it has been usual to repeat at least the first portion. The repetition is indicated by a sign and may be ignored in analysis, though Haydn, Beethoven and Brahms have sometimes produced special effects by it. The repetition of the second part is now obsolete, and

that of the first nearly so.

than some of his contemporaries; because from the outset his object was the true possibilities of the new style, and no luxuriance of colour could blind him to the lifelessness of an art that is merely suite-form spun out. Haydn's earliest quick move- ments in sonata forms are often as short as any suite movement, except when he writes for orchestra, where he is influenced by the style of the operatic overture as we find it in Gluck and in the symphonies of Philipp Emmanuel Bach In his slow movements he at first more often than not worked in the style and form of the operatic aria; and in so mature a piece as the quartet in G major, Op. 17, No. 5, he not only en- dorses Philipp Emmanuel Bach's evident conviction that opera- tic recitative is within the scope of the sonata, but convinces us that he is right. It was easy for the early composers of sonatas to introduce theatrical features into their instrumental music; for the very fact that the sonata forms were in poly- phonic days the forms of lighter music is a consequence of their original identity with the forms of stage-music and dance (see Overture and Symphony). But it needed a very great com- poser to realize not only the radically dramatic character of a sonata form in which the rhythm and texture is emanci- pated from the metrical bondage of the suite, but also its true limitations as pure instrumental music. As Haydn's work proceeded, so did the freedom of his rhythm and its consequent inner dramatic life increase; while the external operatic influences soon disappeared, not so much because they were out of place, as because opera itself " paled its ineffectual fires " in the daylight of the pure instrumental drama with its incomparably swifter and terser action. Polyphony, on the other hand, steadily increased, and was so openly encouraged that in the first set of Haydn's quartets which is entirely free from archaism {Op. 20) three of the finales are regular fugues. And from that time onward there is hardly a work of Haydn's in which highly organised fugato passages are not a frequent means of contrast. 2. The Sonata Form. — In the last-mentioned quartets . of Haydn and the works of Mozart's boyhood, the normal sonata form, as we now accept it, is firmly established, and may be represented as follows: —

1.

" subject

If subject

EXPOSITION

mocu development

subject 2"? subject

*I RECAPITULATION *

This diagram is, no doubt, equally true of Philipp Emmanuel Bach's form; and thus we see how little the external shape of a movement tells us as to the ripeness or genuineness of the specimen. Apart from this, much confusion of thought is caused by the unfortunate terms " first and second subject," which have misled not only many teachers but nearly all pseudo-classical composers into regarding the exposition of the move- ment as' consisting essentially of two themes expanded to the requisite size by appropriate discourse. When we use the terms " first and second subject," then, let us be understood to mean any number of different themes, in any variety of proportion, but separable into two groups of which the first is in the tonic while the second is in another related key, which is called the complementary key. The exposition of a move- ment in sonata form contains, then, these two "subjects" and represents these two keys; and unless the work is too large or too emotional for merely decorative emphasis, the exposition is generally repeated. Then the development follows. It is normally founded on the materials of the exposi- tion, but neither confines itself steadily to any key nor leaves its material as it found it. On the contrary, its function is to provide a wide range of modulation, and to put the materials into fresh light by regrouping them (see Melody, examples 2-7). It cannot be too strongly insisted that in the sonata forms there are no rules whatever for the number of themes and their relative prominence among themselves and in their development. After the development the first subject returns in the tonic, with an effect which, after so many changes of key, is always reassuring as regards

design, and sometimes intensely dramatic. The second subject follows, also in the tonic. This recapitulation is normally very exact, except for the alteration necessary to bring the second subject into the tonic instead of the complementary key, an alteration which, of course, will chiefly affect the first subject, if, indeed, the original transition was not so simple that it could be merely suppressed. In highly organized works, however, this point is often marked by some special stroke of genius, and even in the most exact recapitulations the great masters make minute changes which throw the second subject into higher relief. Modern criticism tends to dismiss the recapitulation as .a conventional and obsolescent feature; but this is a great mistake. The classics, from Scarlatti to Brahms, give overwhelming proof that it is a primary instinct of com- posers with a living sense of form to

conceive of all kinds of exposition as predestined to gain force by recapitulation, especially in any part that resembles a second subject. Haydn we shall find to be an extreme case; but we have only to regard his true second subject as residing in the very end of his exposi- tion, and his mature work will then illustrate the point with special force. Beethoven seems to give one notorious detail to the contrary effect, in the first movement of his C minor symphony, but the passage only proves the rule more forcibly when seen in its context. The powerful phrase that announced the second subject is in the recapitulation transferred from the resounding triumph of the horns to the impotent croaking fury of the bassoons. This looks like a mere inconvenient result of the fact that in 1808 the horns could not transfer the phrase from E flat to C without a change of crook. But in earlier works Beethoven has made them change crooks on far less provocation; and besides, he could easily have contrived a dozen tone-colours more dignified than that of the bassoons. The point must, then, be one of Beethoven's touches of Shake- spearian grotesqueness; and certainly it draws attention to the recapitulation. But even if we dismiss it with impatience we are then immediately confronted with a new melodic and harmonic poignancy in the subsequent crescendo, produced by changes as unobtrusive and as essential to the life of the whole as are the deviations from mechanical symmetry in the forms of leaves and flowers. With the recapitulation the bare essentials of sonata form end; but the material will probably, in works on a large scale, furnish ample means of adding a more emphatic conclusion, which is then called the coda. In Beetho- ven's hands the coda ranges from a dramatic non-existence, as in. the distant thunder in which the first movement of the D minor sonata expires, to the mighty series of new develop- ments and climaxes which, in the 3rd and 9th symphonies and many other works, tower superbly above the normal structure. Haydn's later treatment of sonata form is very free. He shows a sense of space and breadth which, if second to Beet- hoven's, can only be said to be so because the terms of Haydn's art did not give it fuller expression. The scale on which he worked was so small that he soon found that a regular recapitula- tion took up all the room he wanted for larger growths to a brilliant climax. Moreover, he found that if his second subject began with material in sharp contrast to the first, it tended to make his movements sound too undeveloped and sectional for his taste; and so in his later works he generally makes his second subject on the same material as his first, until the very end of the exposition, where an exquisitely neat new theme forms the close. This cadence-theme also rounds off the whole movement with an appearance of regularity which has led to the belief that Haydn, like Mozart, observes a custom of rigid recapitula- tion from which Beethoven was the first to emancipate the form. The truth is that the brilliant new developments which oust the recapitulation almost entirely in Haydn's form are more like Beethoven's codas than anything else in earlier

music, and the final appearance of the neat cadence-theme at the end is, from its very formality, the most brilliant stroke of all. Lastly, these tendencies are characteristic, not of Haydn's early, but of his late work. They have been described as " showing form in the making "; but this is far from true. They show

form in an advanced state of development; and further pro- gress was only possible by the introduction of new qualities which at first had a decidedly restraining effect.

Mozart's greater regularity is due, not to a more formalizing tendency than Haydn's, but to the fact that he works on a larger scale and with a higher polyphony. In actual length, Mozart's movements are so much greater than Haydn's that sharply contrasted themes and regular recapitulations do not hamper him. On the contrary, they give his designs the necessary breadth. This was not more his aim than Haydn's; but he had the opportunities of a later generation and the example of Haydn's own earlier work, besides a vast experi- ence of composition (both in contrapuntal and sonata forms) that began in his miraculous infancy and made all technical difficulties vanish before he was fifteen. At sixteen he was writing string-quartets in which his blending of polyphonic and sonata style is more surprising, though less subtle, than Haydn's. At twenty-two he was treating form with an expansiveness which sometimes left his music perilously thin, though he was never merely redundant. The emphatic reiterations in the Paris symphony are not mannerisms or formulas; they are the naturally simple expression of a naturally simple material. In a series of easy-going works of this kind he soon learnt the conditions of breadth on a large scale; and, by the time he came under the direct influence of Haydn, every new polyphonic, rhythmic and instrumental resource enlarged the scale of his designs as fast as it increased their terseness and depth. His career was cut short, and his treatment of form reached its limit only in the direction of emotional expression. The sonata style never lost with him its dramatic character, but, while it was capable of pathos, excitement, and even vehemence, it could not concern itself with catastrophes or tragic climaxes. The G minor symphony shows poignant feeling, but its pathos is not that of a tragedy; it is there from first to last as a result, not a foreboding nor an embodiment, of sad experiences. In the still more profound and pathetic G minor quintet we see Mozart for once transcending his limits. The slow movement rises to a height not surpassed by Beethoven himself until his second period; an adequate finale is unattainable with Mozart's resources, and he knows it. He writes an introduction, beautiful, mysterious, but magnificently reserved, and so reconciles us as he best can to the enjoyment of a lighthearted finale which has only here and there a note of warmth to suggest to us any pretension of compatability with what went before.

Beethoven discovered all the new resources needed to make the sonata a means of tragic expression, and with this a means of expressing a higher rapture than had ever been conceived in music since Palestrina. He did not, as has sometimes been said, emancipate sonata forms from the stiffness of the recapitu- lation. On the contrary, where he alters that section it is almost invariably in order to have, not less recapitulation, but more, by stating some part of the second subject in a new key before bringing it into the tonic. Here, as has been suggested above, the effect of his devices is, both in minutiae and in surprises, to throw the second subject into higher relief. Every one of the changes which appear in the outward form of his work is a development from within; and, as far as any one principle is more fundamental than others, that development is primarily har- monic. We have elsewhere mentioned his practice of organizing remote or apparently capricious modulations on a steady sequential progression of the bass, thereby causing such har- monies to appear not as mere surprises or special effects (a form in which they have a highly artistic function in Mozart and Haydn) but as inevitable developments (see Beethoven and Harmony) . The result of this and a host of similar principles is an incalculable intensification of harmonic and emotional expression. Let us compare the opening of the second subject of Haydn's quartet in A major, Op. 20, No. 6, with the corre- sponding passage in the first movement of Beethoven's sonata, Op. 2, No. 2. Haydn executes the masterly innovation of a second subject that before establishing its true key passes through a series of rich modulations. He begins in E minor,

rapidly passing through G and A minor, and so to the dominant of E, in various phases of tender humour and cheerful climax. The keys are remote but not unrelated, the modulations are smooth, and the style is that of a witty improvization. Beet- hoven's second subject is intensely agitated; its modulation begins like Haydn's as regards key, but its harmonies are startling and its pace tremendous. Its regular rising bass carries it in two steps to a totally unrelated key, through which it is urged by the same relentless process with increasing speed, and when it is at last driven to the threshold of the key which it seeks as its home there is a moment of suspense before it plunges joyfully into its cadence. Such resources as this enable Beethoven to give rational dramatic force to every point in his scheme, and so they soon oust those almost symbolical formulas of transition and cadence which are a natural feature in Mozart's music and a lifeless convention in imitations of it. The growth of Beet- hoven's forms is externally most evident in his new freedom of choice for the complementary key. Hitherto the only possible key for the second subject

was in major movements the dominant, and in minor movements the relative major or dominant minor. A sonata which begins by treating all directly related keys as mere incidents in establishing the tonic, will very probably choose some remoter key as its main contrast; and it is worth while trying the opening of the Waldstein sonata (Op. 53) with the simple alteration of C sharp and A natural for C natural and A sharp in the bass of the twenty-first bar, so as to bring the whole transition to the second subject on to the orthodox dominant of G, in order to see, on the one hand, how utterly inadequate that key is as a contrast to the opening, and, on the other hand, how unnecessarily long the transition seems when that is the key which it is intended to establish.

3. The Sonata as a whole. — The history of the Waldstein sonata marks the irrevocable transition from Mozart to Beet- hoven (see iv. 88) ; and in his rejection of the well-known Andante in F (which was originally intended for its slow move- ment) Beethoven draws attention to the problem of the sonata as a whole, and the grouping of its movements. The normal sonata, in its complete (or symphonic) form, consists of four movements: firstly, a quick movement in that sonata form par excellence to which our discussion has been hitherto confined; then two middle movements, interchangeable in position, the one a slow movement in some lighter form, and the other a dance movement (the minuet, or scherzo) which in earlier examples is of hardly wider range than a suite movement. The finale is a quick movement, which may be in sonata form, but generally tends to become influenced by the lighter and more sectional rondo form, if indeed it is not a set of variations, or even, in the opposite extreme, a fugue. Aesthetically, if not historically, this general scheme is related to that of the suite, in so far as it places the most elaborate and highly organized movement first, corresponding to the allemande and courante; while the slow movement, with its more lyric character and melodious expres- sion, corresponds to the sarabande; the minuet or scherzo to the lighter dance tunes or " Galanterien " (such as the gavotte and bourree) , and the lively finale to the gigue. But just as the whole language of the sonata is more dramatic, so are the contrasts between its movements at once sharper and more essential to its unity. Hence, the diversity of outward forms within the limits of these four movements is incalculable.

The first movement is almost always in the sonata form par excellence, because that admits of higher organization and more concentrated dramatic interest than any other. Often after such a movement a slow piece in the form conveniently known as A B A, or simple " ternary " form {i.e. a broad melody in one key, followed by a contrasted melody in another, and concluded by a recapitulation of the first) is found to be a welcome relief, and of great breadth of effect. Of course in all true classics the very

simplicity of such movements will be inspired by that sense of rhythmic freedom and possibility of development that per- manently raises sonata forms from the level of a mere decorative -design ; nor, on the other hand, is there any limit to the complexity

of form possible to a slow movement, except that imposed by the inevitable length of every step in its slow progress. Still, the tendency of slow movements, even more than of finales, is to prefer a loose and sectional organization. Sonata form is frequently used in them by Haydn and Mozart with the success attainable only by the greatest masters of rhythmic flow; but even in their works the development is apt to be episodic in character, and is very often omitted.

The minuet, in Haydn's and Mozart's hands, shows a surprising amount of rhythmic variety and freedom within the limits of a dance tune; but Haydn, as is well known, sighed for its develop- ment into something larger; and, though Beethoven had long emerged from his " first period " before he could surpass the splendid minuet in Haydn's quartet in G major, Op. 77, No. 1, he achieved in the scherzo of his Eroica symphony the first of a long line of movements which establish the scherzo (q.v.) as an essentially new art-form.- ....

The only condition that affects the forms of finales is that a sonata involves a considerable stretch of time, and therefore its end must be so designed as to relieve the strain on the atten- tion. In a drama or a story the deeper artistic necessity for this is masked by the logic of cause and effect, which automatically produces the form of an intrigue ending in a denouement. In music the necessity appears in its purest form. There is no need for finales to be less serious than first movements; or even, in certain ways, less complex; but the attention which could be' aroused at the outset by problems must be maintained at the end by something like a solution. Hence the use of the lighter rondo forms, which, by dividing the work into shorter and more distinct sections, make the development easier without unduly limiting its range. Hence, also, the influence of rondo style upon such finales as are cast in true sonata form; and hence, lastly, the paradox that the fugue has occasionally been found a possible means of expression for the finale of a dramatic sonata. For the complexity of the fugue, though incessant, is purely a complexity of texture, and the mind in following that texture instinctively abandons any effort to follow the form at all, finding repose in the change of its interests.

Now, just as within the typical scheme of first and second sub- ject development and recapitulation in the first movement, there is room for genius in the contrasting of different rhythms and proportions, so, within the limits of the simple four-moveˆ ment scheme of the whole sonata is

there room for genius in the contrast of various types and degrees of organization. The complete four-movement scheme seldom appears in works for less than three instruments. Beethoven was the first to adopt it for solo sonatas, and he soon thought fit to make omissions. In Haydn's work for less than four instruments it was not even necessary that the " sonata " form itself should be represented at all. Its essential spirit could be realized in the melodic and rhythmic freedom of a group or couple of more sectional move- ments, nor did Beethoven (in Op. 26 and Op. 27, No. 1) consider such works unworthy of the name of sonata, or (in Op. 54) incapable of expressing some of his most original ideas. No design is known to pure instrumental music that is not possible as a movement of a sonata, if it has the characteristic freedom of rhythm and is not much over a quarter of an hour in length. There is no form that has not been so applied; and, indeed, the only instrumental form that has maintained a larger develop- ment outside than inside the scheme of the sonata is that of variations (q.v.). 1

As the scope and complexity of the sonata style grew, so did the interdependence of its movements become more evident. With Mozart and Haydn it is already vital, as we have seen in the crucial case of Mozart's G minor quintet ; but the differences between one scheme and another are not remarkable until we study them closely; and, except in key-relationship, it would be difficult to trace anything more concrete than principles of con- trast as interacting between one movement and another. But Beethoven's dramatic power finds as free expression in the contrasts between whole movements as it finds within the move- ments themselves. In his later works, the increase in harmonic

range, with the consequent prominence of remoter key-relation- ships, necessitating the dwelling on these keys at greater length causes the key-system of each movement to react on the others to an extent that would be purposeless in the art of Haydn and Mozart. Thus in the B flat trio, Op. 97, we find such remote keys as G major, D flat and D major placed in positions of great functional importance, until we come to the finale, which keeps us in suspense by its very low and quiet key-colour, contrasting so oddly with its bacchanalian temper. But when the whole main body of this finale has passed before us in the drab colours of tonic, dominant and sub-dominant, the coda marvellously explains everything by opening with an enharmonic modulation to the most distant key yet attained except as a transitory modulation.

As Beethoven proceeded, his growing sense of the functional expression of musical forms enabled him to modify and strengthen them until their interaction was as free as its principles were exact. In the C sharp minor quartet (Op. 131) the opening fugue is functionally an enormously developed introduction. The following allegro, in the startling key of D major, the " arti- ficial" flat supertonic, is a first movement, with its development suppressed, and with certain elements of rondo style as a neces- sary contrast to the preceding fugue. The startling effect produced by this key of D major necessitates . a simple and limited key-system within the movement itself, thus accounting for the absence of a development. The remaining movements fall into their place among the keys that lie between the keys of D major and C sharp minor. Thus the slow movement (to which the brief allegro moderato forms a dramatic introduction) is a great set of variations in A major, and the strictness of its variation form allows no change of key until the two brilliant bursts of remoter harmony, F and C, in the coda. Then follows a scherzo of extremely simple design, in E major, with a small part of its trio in A. A short introduction in G sharp minor, the dominant, completes the circle of related keys and leads to the finale which (though cast in a compound of rondo and sOnata form that would allow it a free range of modulation) contents itself with very simple changes, until towards the end, where it systematically demonstrates the exact relationship of that first surprising key of D major to C sharp minor.

4. The Unity of the Sonata. — The gigantic emotional range of Beethoven's work is beyond the scope of technical discussion, except in so far as the technical devices themselves suggest their emotional possibilities. The struggle between decadence and reaction since the time of Beethoven indicates on the one side the desire to rival or surpass Beethoven in emotional expression without developing the necessary artistic resources; and, on the other side, a tendency to regard form as a scheme which the artist first sets up and then fills out with material. Early in the 19th century these tendencies gave rise to controversies which are not yet settled; and before we discuss what has taken place since Beethoven we must consider the connexion between sonata movements in a last new light.

Historical views of art are apt to be too exclusively progressive and to regard higher and lower degrees of organization in an art-form as differing like truth and falsehood. But in trying to prove that the megatherium could not survive under present conditions, we must beware of arguing that it never existed; nor must we cite the fact that man is a higher organism in order to argue that a jelly-fish is neither organic nor alive. Organiza- tion in art, as elsewhere, may be alive and healthy in its lowest forms. The uniformity of key in the suite forms is low organiza- tion; but it is not inorganic until a mild seeker after novelty, like A. G. Muffat, tries to introduce more keys than it will hold. The interdependence of movements

in Haydn and Mozart is not such high organization as the ideal form of the future, in which there is no more breaking up of large instrumental works into separate movements at all; but neither is it a mere survival from the decorative contrasts of the suite. Evolutionists must not forget that in art, as in nature, the survival of the fit means the adaptability to environment. And the immortal works of art bring their proper environment with them into later ages.

The large instrumental forms have, until recent times, remained grouped into sonata movements, because their expression is so concentrated and their motion so swift that they cannot, within the limits of a single design, give the mind time to dwell on the larger contrasts they themselves imply. Thus, in the " Sonata Appassionata," the contrast between the first subject and the main theme of the second is magnificent; but that calm second theme lasts just the third part of a minute before it breaks off. Now, though the third part of a minute bears about the same proportion to the whole design as five hundred lines does to the design of Paradise Lost; though, moreover, this theme recurs three times later on, once in an exact recapitulation, and twice transformed in terribly tragic climaxes; yet the mind refuses to be whirled in less than ten minutes through a musical tragedy of such Shakespearian power without opportunity for repose in a larger scheme of contrasts than any attainable by the perfection and breadth of the single design within these limits. Hence the need for thu following slow set of variations on an intensely quiet tune, which, by its rigorous confinement to the tonic of a nearly related key, its perfect squareness of rhythm, and the absolute simplicity and strictness of its variations, reveals the true pathos of the first movement by contrast with its own awful repose; until its last chord, the first in a new key, falls like a stroke of fate, and carries us headlong into the torrent of a finale in which nothing dares oppose itself to those sublime forces that make the terror of tragedy more beautiful than any mere appeal for sympathy. Thus the dramatic interdependence of sonata movements is very strict. Yet the treatment by each movement of its own thematic material is so complete that there is little or no scope for one movement to make use of the themes of another. Such instances as may be suspected in Beethoven's later works (for example, the similarity of opening themes in various movements of the sonatas, Op. 106 1 and Op. no) are too subtle to be felt more than subconsciously; while the device of clearly quoting an earlier movement occurs only in three intensely dramatic situations (the introductions to the finales in Op. 101, the violoncello sonata, Op. 102, No. r, and the 9th symphony) where its whole point is that of a surprise.

5. The Sonata since Beethoven. — It is unlikely that really vital sonata work will ever be based on a kind of Wagnerian Leit- motif system, until the whole character of instrumental form shall have attained the state of

things in which the move- ; ments are not separated at all. There has been no ambitious or " progressive " composer since Beethoven who has not, almost as a matter of etiquette, introduced the ghosts of his earlier movements into his finale, and defended the procedure as the legitimate consequence of Beethoven's Op. 101. But, while there is no a priori reason for condemning such devices, they illustrate no principle, new or old. The nearest approach to some such principle is furnished once by Schumann, who always ingeniously adapts the outward forms of the sonata to his own peculiar style of epigrammatic and antithetic expression, discarding as beyond his scope the finer aspects of freedom and continuity of rhythm, and constructing works which bear much the same relation to the classical sonata as an elaborate mosaic bears to an easel-picture. Dealing thus with a looser and more artificial type of organization, Schumann was able in bis D minor symphony to construct a large work in which the movements are thermatically connected to an extent which in more highly organ- ized works would appear like poverty of invention, but which here furnishes a rich source of interest. Many other experi- ments have been tried since Beethoven, by composers whose easy mastery is that of the artist who, from long practice in putting material into a ready-made form, becomes interested in the construction of new ready-made forms into which he can continue to put the same material. A sense of beauty is not a thing to be despised, even in pseudo-classical art; and neither the many beautiful, if mannered, works of Spohr, which disguise one stereotyped form in a bewildering variety of instrumental

1 In Op. 106 the first two notes of the slow movement were an afterthought added (as Beethoven told his publisher) for the purpose of producing such a connexion.

and literary externals, nor the far more important and essentially varied works of Mendelssohn deserve the contempt which has been the modern correction for their high position in their day. But we must not forget that the subject of sonata forms is no mere province, but covers the whole of classical instrumental music; and we must here pay attention only to the broadest essentials of its central classics, mentioning what diverges from them only in order to illustrate them. Schubert's tendencies are highly interesting, but it would carry us too far to attempt to add to what is said of them in the articles on Music and Schubert.

The last great master of the sonata style is Brahms. A larger scale and more dramatic scope than Beethoven's seems unattain- able within the

limits of any music identifiable with the classical forms; and the new developments of Brahms lie too deep for more than a bare suggestion of their scope here. Much of the light that can as yet be shed upon them will come through the study of Counterpoint and Contrapuntal Forms (q.v.). Outwardly we may see a further evolution of the co- herence of the key-system of works as wholes; and we may especially notice how Brahms's modern use of key-relationships makes him carry on the development of a first movement rather in a single remote key (or group of keys) than in an incessant flow of modulations which, unless worked out on an enormous scale (as in the 2nd and 4th symphonies), will no longer present vivid enough colours to contrast with those of the exposition. Beethoven's last works already show this tendency to confine the development to one region of key. Another point, fairly easy of analysis, is Brahms's unlimited new resources in the transformation of themes. Illustrations of this, as of older principles of thematic development, may be found in musical type in the article Melody (examples 8-10). But no mere formal analysis or argument will go further to explain the greatness of Brahms than to explain that of Beethoven, Haydn or Mozart. Yet by that outward sign of dramatic mastery in the true sonata style, that variety of rhythmic motion which we have taken as our criterion, Brahms has not only shown in every work his kinship with Haydn, Mozart and Beethoven, but in one particular work he has given us documentary evidence of his faith in it. In his last years he revised, or rather recomposed, his first piece of chamber music, the trio in B major, Op. 8. The new material differs from the old, not only as a fresh creative impulse, but also in the simple fact that it moves literally four times as fast. Such rapidity is not shown by any external display of energy; indeed there is incomparably more repose in the new version than in the old. But the comparison of the two clearly demonstrates that the true sonata style is, now, as at the outset, primarily a matter of swift action and rhythmic variety; and nothing more certainly indicates the difference between the true style and the lifelessness of decadence or academicism than this sense of motion and proportion.

In so far as the tendencies of modern instrumental music represent an artistic ideal which is foreign to that of the sonata without being false, they represent a different type of motion, wider in its sweep, and consequently slower in its steps. The forms such a motion will produce may owe much to the sonata when they are realized, but they will certainly be beyond recognition different. In all probability they constitute the almost unconscious aims of the writers of symphonic poems (q.v.) from Liszt onwards, just as the classical sonata constituted the half-conscious aim of more than one quaint writer of 18th- century programme-music. But the growing importance and maturity of the symphonic poem does not exclude the continued development of the sonata forms, nor has it so far realized

sufficient consistency and independence of style to take as high a place in a sound artistic consciousness. The wider sweep of what we may conveniently call " ultra-symphonic " rhythm owes its origin to Wagner's life-work, which consisted in evolving it as the only musical medium by which opera could be emanci- pated from the necessity of keeping step with instrumental music Small wonder, then, that the new art of our time is as yet, like that of Haydn's youth, stage-struck; and that all our popular criteria suffer from the same obsession. One thing is

certain, that there is more artistic value and vitality in a sym- phonic poem which, whatever its defects of taste, moves at the new pace and embodies, however imperfectly, such forms as that pace is fit for, than in any number of works in which the sonata form appears as a clumsy mould for ideas that belong to a different mode of thought. If from the beginnings exemplified by the symphonic poems of the present day a new art-form arises in pure instrumental music that shall stand to the classical sonata as the classical sonata stands to the suite, then we may expect a new epoch no less glorious than that which seems to have closed with Brahms. Until this aim is realized the sonata forms will represent the highest and purest ideal of an art-form that music, if not all art, has ever realized.

See also Beethoven ; Concerto ; Ha rmonv ; Overture ; Rondo ; Scherzo; Serenade; Symphony; Variations. (D. F. T.)

SONCINO, a town of Lombardy, Italy, in the province of Cremona, 11 m. E. of Crema by steam tramway, 282 ft. above sea-level. Pop. (1901), 6150 (town); 8136 (commune). It contains a handsome castle built in 1469-1475 for Galeazzo Maria Sforza by Benedetto Terrini (cf. L. Beltrami, II Castello di Soncino, Milan, 1890). The town was the seat of a Hebrew printing-press founded in 1472, but suppressed in 1597, when the Jews were expelled from the duchy of Milan.

SONDERBURG, a seaport and seaside resort of Germany, in the Prussian province of Schleswig-Holstein, on the S.W. coast of the island of Alsen, of which it is the chief town, and 17 m. by steamboat N.E. from Flensburg. Pop. (1905), 7047. It is connected with the mainland by a pontoon bridge, and has a castle, now used as barracks, in the beautiful chapel of which many members of the Sonderburg-Augustenburg line lie buried; a Lutheran church and a town hall. There is an excellent harbour, and a considerable shipping trade is done. The town, which existed in the middle of the 13th century, was burnt down in 1864 during the assault by the Prussians upon the Diippler trenches.*

SONDERSHAUSEN, a town of Germany, capital of the principality of Schwarzburg-Sondershausen, situated in a plain 37 m. by rail N. of Erfurt.

Pop. (1905), 7383. . It possesses a castle, with natural history and antiquarian collections, and a parish church (restored 1891), with the mausoleum (1892) of the reigning princes. There are manufactures of woollens and pins.

SONDRIO, a town of Lombardy, Italy, capital of the province of Sondrio, in the Valtellina, 1 140 ft. above sea-level, on the river Adda, 26 m. E. of Lake Como and 82 m. by rail N.E. of Milan. Pop. (1901), 4425 (town); 7707 (commune). The Valtellina, of which Sondrio is the capital, produces a considerable quantity of red wine. Sondrio also has silk-works. Above the town to the north rise the snowclad peaks of the Bernina group. The railway goes on to Tirano, 16 m. farther east, from which diverge, the Bernina and Stelvio roads.

SONE, or Son, a river of central India which has been identified with the Erannoboas of the Greek geographers. With the exception of the Jumna it is the chief tributary of the Ganges on its right bank. It rises in the Amarkantak highlands about 3500 ft. above sea-level, the Nerbudda and Mahanadi also having their sources in the same table-land. From this point it flows north-west through an intricate mass of hills, until it strikes the Kaimur range, which constitutes the southern wall of the Gangetic plain. > Here it turns east and continues in that direc- tion until it falls into the Ganges about 10 m. above Patna, after a total course of 465 m. Its upper waters drain about 300 m. of wild hilly country, which has been imperfectly explored; while in its lower section of 160 m. it traverses the British districts of Mirzapur, Shahabad, Gaya and Patna. The Sone canals, fed by the river, form a great system of irrigation in the province of Behar. The headworks are situated at Dehri about 25 m. below the point where the river leaves the hilly ground. The weir across the Sone at this point is believed to be the longest con- structed in a single unbroken piece of masonry, the length between abutments being 12,469 ft. A main canal is taken off on either bank of the river, and each of these is divided into branches.

according to the requirements of the ground. The system consists of some 370 m. of canals and 1200 m. of distributaries, irrigating 555,000 acres. The Sone canals were begun in 1869, and came into operation in 1874; they form a valuable protection to the rice crop of Behar.

SONG, either an actual ” singing ” performance, or in a literary sense a short metrical composition adapted for singing or actually set to music. In

the second sense of the word it must strictly be lyrical in its nature; but musicians and others fre- quently use the word in the wider sense of any short poem set to music. A " song," as a form of poem, usually turns on some single thought or emotion, expressed subjectively in a number of stanzas or strophes. Almost every nation is in possession of an immense store of old simple ballads (q.v.), which are the spontaneous outcome of the inspiration of the people (" folk- songs"), and represent in a remarkable degree their tastes, feelings and aspirations; but in addition to these, there are, of course, the more finished and regular compositions born of the conscious art of the civilized poet.

In a purely literary sense the song may exist, and does largely exist, without any necessary accompaniment of music. With the accession of Elizabeth the attention of the English poets was immediately drawn to the importance of this branch of lyrical literature. The miscellanies, one of which Master Slender would have paid more than forty shillings to have in his pocket on a celebrated occasion, were garlands of songs, most of them a little rude in form, only mere " packets of bald rhymes." But about 1590 the popularity of the song having greatly in- creased, more skilful writers were attracted to its use, and the famous England's Helicon of 1600 marked the hey-day of Eliza- bethan song-writing. In this Shakespeare, Sidney, Lodge, Barnfield and Greene, to name no others, were laid under contribution. Lyly, with such exquisite numbers as " Cupid and my Campaspe " (1584), had preceded the best anthologies, and is really the earliest of the artist-songsters of England. Among superb song-writers who followed were Marlowe (" Come live with me and be my love"), Campion ("My sweetest Lesbia") Ben Jonson ("Drink to me only with thine eyes") and Fletcher (" Here ye Ladies, thatdepise "),mostof these being dramatists, who illuminated their plays, and added a delicate ornament to them, by means of those exquisite lyrical interpolations. Side by side with such poets, and a little later, began to flourish the school of cavalier song-writers, for whose purpose the lyric was self-sufficient. They added to our literature jewels of perennial lustre— Wither, with his " Shall I wasting in despair," Herrick with " Bid me to live " and " Gather ye Rosebuds," Carew with " Ask me no more where June bestows," Waller with " Go, lovely Rose," Suckling with " Why so pale and wan, fond Lover?" and Lovelace with " Tell me not, Sweet, I am unkind." This was the classic age of the true British song, which survived all other forms of poetry after the decay of taste, and continued to flourish in the hands of Dryden, Sedley, Aphra Behn and Rochester down to the last decade of the 18th century. That outburst of song was followed by nearly a hundred years during which the simplest and more direct forms of lyrical utterance found comparatively little encouragement. Just before the romantic revival the song reasserted its position in literature, and achieved the most splendid successes in the hands

of Burns, who adapted to his purpose all kinds of fragmentary material which had survived up to his time in the memories of rustic persons. In Scotland, indeed, the song was rather revived and adorned than resuscitated; in England it may be said to have been recreated by Blake. At the opening of the 19th century it became the vehicle of some of the loveliest fancies and the purest art of Coleridge, Keats, Shelley, Byron and Landor; while in a later day songs of rare perfection were composed by Tennyson and by Christina Rossetti. (E.G.)

Song in Music. The history of song as a musical form falls into two main divisions, the one belonging to the folk-song, the other to the art -song. Though the line of demarcation between the two

cannot be definitely drawn, for they have acted and reacted upon each other ever since music existed as a cultivated art, yet it may reasonably be maintained that the folk-song, which lies at the base of all music, preserves, and has in all ages preserved, characteristics such as must always distinguish the rude and unconscious products of the human mind, working more by instinct than by method, from the polished and conscious products of the schools. For the purposes then of this article, art-song may be distinguished from folk-song by the fact that it is the work of trained musicians and is designed, at any rate after the close of the 16th century, for voice with instrumental accompaniment, whereas we shall restrict the term folk-song to such melodies as appear to have been the work of untutored minds, and to have arisen independently of any felt necessity for harmonic support.

The early history of song on its musical side may be regarded as the history of the evolution of melody: and since what is known of melody before the end of the 16th century, apart from the folk-song, is extremely slight, it is in the folk-song itself that this evolution is primarily to be studied. Previously to the period named the instrumental accompaniment to vocal melody, both in the folk-song and in the art-song, played an entirely insignificant part. Afterwards the new conception of harmony which came in with the 17th century not only shifted the basis of melody itself but made the instrumental accompaniment an essential feature of artistic song. Though it lies beyond the province of this article to discuss fully the complex questions involved in the evolution of vocal melody, some slight sketch is a necessary preliminary to a proper understanding of the subject under consideration.

It may be assumed that in the course of ages the uncouth vocal utterances of primitive man developed, under the influence of an instinct for expressing his inner nature through _ . . a more expressive medium than language alone, into sounds of more or less definite pitch, bearing

intelligible relation- ships one to another; and that from these emerged short phrases, in which rhythm probably played the principal part, reiterated with that interminable persistency, which many travellers have noted as characteristic of savage nations in the present day. A further stage is reached when some such primitive phrase is repeated at a different level by way of contrast and variety, but melody in any true sense of the word does not begin till two different phrases come to be combined in some sort of scheme or pattern. When the power to produce such combinations become common in a nation, its musical history may be said to have begun. 1 Racial characteristics are displayed in the choice of notes out of which such phrases are formed. But in all races it may be surmised that the main determining cause in the first instance is that natural rise and fall of the voice which gives expressiveness and meaning to speech, even though contributory causes arising from the imitative faculty common to man may perhaps be admitted — such as the sound of the wind, the waves of the sea, the cries of animals, the notes of birds, the striking of one object against another, and finally the sounds made by primitive instruments. The tendency of the speaking voice to fall a fourth and to rise a fifth has often been noted. It is probable that these intervals were among the first to be defined, and that the many modes or scales, underlying the popular melodies of the various nations of the world, were the result of different methods 1 If the one phrase is represented by A , and the other by B, the commonest melodic schemes presented by the folk-songs of the world may be viewed thus— Ah, AAB, ABB, ABA, ABAB, AABB, AABA, ABBA. Of these, those in which the opening phrase A is repeated at the conclusion are the most satisfactory, for both instinct and reason are gratified by a connexion between the beginning and the end.

As exact conformity to pattern becomes wearisome and is alien to the progressive instinct, the element of surprise is introduced into the above schemes by various modifications of the repeated phrase on its second appearance, or by the entrance of an entirely new phrase C. In some fine melodies there is no repstition of phrase, a number of different phrases being knit, by principles, which defj analysis, into one structure. Such melodies imply a melodic sense of an exceptional order. Many melodies involve more than foui phrases ; of these the rondo form should be mentioned — ABA CAD A

of determining the intervening sounds. It has been generally assumed that the fall of a fourth is the interval earliest arrived at by the instinct of the Indo-European race — and that inter- vening sounds were added which

resulted eventually in the three possible forms of the diatonic tetrachord, the earliest being that which is characteristic of the ancient Dorian mode or scale (the basis of the Greek musical system) in which two tetrachords, having the semitone between the lowest note and the next above it, are superimposed (see Bourgault Ducoudray, Introduction to jo Chansons de Grece et d'Orient).

It must, however, be remembered that the popular instinct knows nothing about tetrachords or scales, which are abstractions, and only creates melodies, or at least successions of sounds, which are the outward expression of inward feelings. The Greek theorists therefore, in recording certain modes as being in use in their day, were in effect merely stating results arrived at by analysing popular melodies — and from the persistence with which the Greeks, and following them, most of the musical historians of Europe, have insisted upon a tetrachordal basis for the art of music it may be assumed that in these melodies a basis of four diatonic notes was a conspicuous feature.

It is a feature which marks a considerable number of folk- songs heard in Greece at the present day, and also of many folk- songs which are not Greek, the Breton, for example (see Bour- gault Ducoudray, Chansons de Basse-Bretagne) . The interval of a fourth is nearly always prominent too in the music of savages. If it is natural to connect these facts with the drop of a fourth, characteristic of the speaking voice, it is dangerous to assume an exclusively " tetrachordal period " of primitive song, at any rate till it can be shown that melodies based on other principles did not exist side by side with those that are tetrachordal. From the rise of a fifth and the fall of a fourth, the octave, which results from combining these intervals, may well have become familiar at a very early epoch. Indeed a prolonged howl begin- ning on a high note and descending a full octave in semitones — or notes approximately resembling semitones — is recorded both of the Caribs and of the natives of Australia, so that familiarity with the octave need not presuppose an advanced stage of musical development.

To pass from the sphere of mere speculation nearer to the domain of history, it may be asserted with confidence that the oldest form of song or chant which can be established is found in certain recitation formulae. These, as is natural, will be found to be derived from the rise and fall of the voice in speech. It is therefore not surprising that O. Fleischer {Sammelbande der internationalen Musik-Gesellschaft, Jan.-Mar. 1902) is able to trace practically identical formulae in the traditional methods of reciting the Vedas, the Koran, the Jewish and Christian liturgies. The s ; mplest form consists of four notes (a diatonic tetrachord), a rec'ting note, preceded by two notes rising to it, and followed by a fall, or cadence, for the close, the voice rising above the reciting note in order to emphasize

important words, or according to the nature of the sentence. An extended form is both natural and common.

I

oe

r£

V

E£

£

^m

1

q=t

£=*

*i**

The influence of these and similar formulae ‘ upon popular melodies can be illustrated by countless examples (for which

1 The derivation of such formulae from more primitive incan- tations of magicians and medicine-men is a possible and plausible theory (see J. Combarieu, La Musique: ses lots et son evolution. Paris, 1907).

the reader is referred to I.M.G.). As characteristic as any is the melody of the Christian hymn which begins

e£e£e£

^

Te lu – cis an – te ter – mi – num, and concludes

^£=j^g= g

Sis prae – sul et cus – to – di – a. Another is the Hungarian folk-song: Nem Szoktam.

*jgEggg^a^*

Many French songs have been collected in recent years, of which the following formula, or variations of it, form an essential feature: —

I

asfeˆsSSEj E

This corresponds closely with the third example given above. That the melodies in question are of great antiquity may be inferred from the fact that they are almost confined to the oldest class of folk-song, that which celebrates May Day and the begin-‘ ning of spring. M. Tiersot {La Chanson populaire en France, Paris, 1889) plausibly finds in them a survival of a melodic fragment, which may have belonged to pagan hymns in honour of spring, basing his supposition upon the fact that the phrase in question occurs in the melody of the Easter hymn ” O Filii et Filiae.” The medieval Church, acting on principles familiar in all ages, may well have helped to merge a pagan in a Christian festival by adopting, not merely old rites and observances, but the actual melody with which these had for ages been associated. A similar survival in French folk-song is that of the melody of the Tonus peregrinus, the chant used for the psalm ” When Israel came out of Egypt ” (mentioned in the 9th century by Aurelian Reome as being very old). Its appearance, like that of the Easter hymn, in songs, which on other grounds can be proved to be of great antiquity, points to the probability of its being of popular origin. It also bears equally strong marks of being derived from a recitation formula, as indeed its appropriation for chanting a psalm sufficiently indicates.

Endeavours to detach other primitive formulae from the popular melodies in which they are enshrined form a branch of folk-lore now being actively pursued. It may be hoped that ” comparative melodology ” — if the phrase may be coined — will (do for this department of musical knowledge what the science of comparative philology has done for language. Oscar Fleischer (I.M.G. i. 1) has endeavoured to trace the history in Europe of the primitive phrases belonging to the melody of ” Les Series ” (or Unus esl Deus) as given by De Villemarque in Barzaz-Breiz

4-Q2

SONG

No. i , in the musical appendix, as also of the opening phrase in the old Christian hymn, ” Conditor alme siderum ” (attributed to Bishop Ambrose): —

I

h

.£_

£EE£e£ e3EE£EJ

The phrase here belongs to a melody in the Phrygian mode, but when it is used in major melodies its characteristic notes are those of the common chord, with a rise to the sixth at the point of climax, corresponding to the rise in the recitation formulae given above.

By what processes the notes of the common chord became universally established it is not possible to determine, but it may be said in a general way that the reference to a given tonic was felt in all ages to be a necessary condition even of the simplest melody, and that, as the melodic instinct grew, an almost equal necessity was found for a point of contrast, and that this point of contrast became with most nations of Aryan origin the fifth note above the tonic, at any rate in the more popular scales. Combarieu (La Musique, p. 121) observes that we owe the use of the octave, the fifth and the fourth to the South and East, but that the importance of the third in our modern musical system is due to the instinctive genius of the West and North, i.e. to England and Scandinavia (see also Hugo Riemann, Geschichte der Musiktheorie, Leipzig, 1898, and Wooldridge, Oxford History of Music, i. 161-162, where the well-known quotation from Giraldus Cambriensis, or Gerald Barry, of the 12th century, establishing the fact of part-singing in England, is given). If, as has been shown, the origin of many melodies can be traced to formulae originally used for chanting or reciting, it must not be forgotten that formulae thus derived assume very different characters under the influence of more decided rhythms than that of speech. To accompany bodily movements (which by a natural law become rhythmical when often repeated) with music, vocal or instrumental, is an almost universal human instinct, whether to alleviate the burden or the monotony of labour, as in rowing, sowing, spinning, hammering and a score of other pursuits, or to promote pleasure and excitement, as in the dance.

It is unsafe to infer, as some have done, from the custom, known in all ages, of dancing and singing at the same time, that song arose as a mere accessory to the dance. It is more probable that the dance has its origin in the mimetic actions, which are the natural accompaniment of rudimentary song. At the same time, no one will deny that races with ballads of their own early made use of them for the dance, and that, especially on the rhythmical side, melody owes to the dance an incalculable debt. 1

It may be assumed then that upon some such basis as has been roughly

indicated the different nations of the world have developed each their own musical phraseology, emanating from and answering to their several needs and temperaments and that the short melodic phrases, out of which folk-tunes are made, have their roots in a past as distant as that in which the elements of language were formed, and that the popular instinct which through countless ages has diversified those forms and arranged them into melodies, whose constructions are mostly susceptible to analysis, is the same instinct as that which has given to language its grammar and its syntax.

In proceeding now to the actual history of song in Europe, it must be remembered that it is inseparably connected with History of poetry. Melody till within comparatively recent Song la times continued to fulfil its original function of Europe. 1 enhancing the value and expressiveness of language. For poetry of the epic kind with the long lines common to early European peoples, some such forms of chanting as have been indicated must have sufficed.

1 For the growth of the refrain from communal dancing and singing, see C. J. Sharp, English Folk-Songs, p. 93. Nor should the association of dancing with all primitive religious ceremonies be forgotten — see K. J. Freeman, Schools of Hellas (1907).

Melody, as we understand it, with compact form and balanced phrases, could only have existed if and when the same qualities appeared in popular poetry. This was probably the case long before the taste for long epic narratives began to disappear in favour of more concise forms of ballad and of lyric. The stanza form must have been generally familiar in the early middle ages from the Latin hymns of the Church, and these hymns themselves are likely to have been formed, in part at any rate, on models which were already known and popular.

*We have definite information that in the early middle ages two sorts of popular poetry existed — the historical ballads (descen- dants of those alluded to by Tacitus in his Germania as characteristic of the Germans, and as constituting song** their only historical records), and popular songs of a character which caused them to be described as cantica nefaria by St Augustine; the council of Agde (506) forbade Christians to frequent assemblies where they were sung: St Cesaire, bishop of Aries, speaks of the chants diaboliques sung by country folk, both men and women; the Council of Chalons menaced the women, who seem to have been the chief offenders, with excom- munication and whipping; lastly Charlemagne, whose love for the better class of song is attested by the fact that he ordered a collection of them to be made for his own use, said of the other " canticum turpe et luxuriosum circa ecclesias agere omnino, quod et ubique*

vitandum est." Beyond the fact of their existence we know nothing of these songs of the early middle ages. Their influence on the popular mind was vigorously resisted, as we have seen, by the Church, and for many centuries efforts were made to supplant them by songs, the subjects of which were taken from the Gospel narratives and the lives of the saints, so that folk-song and church song strove together for popularity. Doubtless the church song borrowed musical elements from its rival: nor was the folk-song uninfluenced in its turn by the tradi- tional music of the Church. In considering this latter music, it is important to distinguish between the melodies adapted to the prose portions of the ritual without definite rhythm, and those of the hymns, where the metre of the Latin verses and their stanza form necessitated a corresponding rhythm and musical form. Rhythm in music, which has its origin and counterpart in the regular bodily movements involved in various departments of labour and in the dance, must, as has already been said, have always been an essential feature of popular melody, and it is reasonable to conclude from its absence in the plain-song, and indeed for many centuries in the compositions of musicians, which had the plain-song for their basis, that these hymns, which repre- sented the popular part of the Church services, were also repre- sentative of the popular tastes of the time. In all ages the Church has drawn largely from popular song for the melodies of its hymns. It is moreover in the highest degree improbable that the Church should have been able to evolve out of its inner consciousness, without pre-existing models, a melody — to take a single instance — like that of " Conditor alme siderum " — the survival of which in innumerable European folk-songs has already been alluded to.

Numerous additions to the store of plain-song melodies were made by the monastic composers of the middle ages- the most notable is that of the Dies Irae, of which the words are attributed to Thomas de Celano (d. 1250).

Reference should also be made to the music of the liturgical dramas or mysteries, popular in medieval times: The Lamentation of Rachel, The Wise and Foolish Virgins and The Prophets of Christ, are given, both text and music, in Coussemaker's L'Har- monie au moyen dge. They reflect the severe style of the plain- song, and were probably intended for cultivated rather than popular audiences. The same is probably true of the secular songs quoted in the same work. These have a special interest as being the earliest specimens of song which have come down to us in Christian times. The best known is the " Complainte," on the death of Charlemagne (quoted in many histories), the digni- fied, if somewhat dreary, melody of which revolves mostly on the first three notes of a major scale, once rising to the fourth (thus recalling the old recitation formula). Rhythm is practically

absent. On the other hand, the song in honour of Otto III. has definite rhythm and a degree of tunefulness. The " modus Ottino " was a well-known air, which, unlike the rest of those quoted by Coussemaker, was probably of popular origin, for the Latin words do not fit the melody and probably represent a free translation from an original in the vernacular tongue. 1 Modus Ottinc.

^

^

*^=s — *—*

Mag – nus Cae – sar Ot – to, quern hie mo – dus

*P**

e3=1

re – fert, in no – mi – ne Ot – tine die – tus, quadam

B

3

s

S

noc – te mem-bra su – a dum col- lo – cat Pa – la – ti – um

^

ti

3

su – bi – to in – flam – ma – tur.

(12 more stanzas.)

More remarkable still is a "Chanson de Table" of the 10th century, a really graceful melody, the quotation of which may serve to destroy the illusion that the major scale, so often described as modern, has any other claim to the title than the fact that it has been preserved by modern musicians, while

others have been discarded.

e£

£

=t

m

Jam, dul-cis a – mi – ca, ve – ni – to, quam si – cut cor

A 1 — !-

— fr-1— 1 H 1 1-*

*y j * -^*

*— d — d — ¯ - — *~ — * — — si —*

-J-J-:

me-um di – li-go;

In – tra in cu – bi – cu-lum

^HHHE

me-um, or- na-men-tis cunc – tis or – na -turn.

In the same collection may be found, beside other historical songs, two odes of Boethius and two odes of Horace, set to music;' but whether the melodies given represent medieval music or Roman music, corrupted or not, it is. impossible to aetermine. These songs have been dwelt upon, for they not only represent some kinds of music that were sung in the 9th and 10th centuries, but indicate the sources from which later on the work of the troubadours was derived. They may be summed up as a church-song and folk-song, and the songs by more or less cultured persons made after these models. For the subsequent history of the art the folk-song represents by far the most potent influence, but the melodies quoted by Coussemaker which might be regarded as the works of the popular instinct afford in- sufficient data for safe generalization. More direct evidence is to be found in the 12th-century pastoral play — Le Jeu de Robin et de Marion, till within recent years considered as the work of Adam de la Hale, but since the able criticisms of M. Tiersot in the work referred to above, likely henceforth to be regarded as

1 This melody, which is plainly derived from recitation, with A as tonus carrens, closely resembles that of Ljomur, a folk-song of the Faeroe islanders, noted by H. Thuren in 1902 and identified by him with a piece of recitation (" Fili care") from a 12th-century

Drame liturgique " (deciphered by O. Fleischer, Neumenstudien, Bd. II. p. 23). See Folkesangen paa Farperne, H. Thuren (Copenhagen, 1908). Identity of style between a popular song of the 9th century, a drame liturgique of the 12th and a folk-song still sung in the 20th is sufficiently striking — especially in view of the fact that in the Faeroe Islands instrumental music is practically unknown.

- *Lord Ashburnham has a Virgil of the 10th century, " dans lequel les discours directs de l'Eneide sont accompagnes de notations rousicales" (Coussemaker).*

the oldest collection of folk-songs in existence; for the original compositions which Maitre Adam has bequeathed to posterity preclude us from believing that he could have originated the dainty airs contained in that play, of which Robin m'aime is generally familiar, and is still to be heard on the lips of peasants in the north of France (see Tiersot, p. 424, n.). If M. Tiersot's view is correct, the melodies in Robin et Marion may be taken to represent the popular style of an epoch considerably anterior to the date of the play itself (though allowance must be made for the correcting hand of a professional musician) which is our excuse for introducing them at this place.

Before speaking of the songs of troubadours, trouveres and minnesingers, allusion must be made to a class of men who played a part the importance of which both in the social and political life of the middle ages is attested by innumerable chroniclers and poets, viz. the skalds, bards or minstrels — the chief depositories of the musical and poetical traditions of the several countries to which they belonged. They varied greatly in rank. Some were attached to the retinue of kings and nobles, whilst others catered for the ear of the peasantry (eventually to be classed with jugglers, acrobats, bearwards and the like, sharing the unenviable reputation which attached to these representatives of popular medieval amusements). That these latter were also welcome at the halls of the great, is an estab- lished fact, which may serve as a reminder that in feudal times the distinction that now exists between the music of the culti- vated classes and of the peasantry was but slight. The style of the church music was as universally familiar as the style of the folk-song. For musicians, both of high and low degree, no other models existed. This fact is patently clear when the songs of the troubadours, trouveres and minnesingers are studied. Those minstrels continued the traditions of the better class of their predecessors, with

strivings after a more polished, elaborate and artistic style. In forming their style upon an admixture of folk-song and church-song they in fact assimilated neither, and created a mongrel product without real vitality — a product that left practically no mark upon the subsequent development of the art. The astonishing skill which they exhibited in adapting the language of poetry to the most complicated metrical forms deserted them when they touched the question of musical form and of melody. Indeed their music, except in rare instances, was an adornment which the poetry could have dispensed with, and may be regarded in the main simply as a concession to the immemorial custom of treating music and poetry as inseparable : arts.

The real importance of these courtly minstrels in the history of song consists in their having firmly established the rhyming stanza as the vehicle for the expression of lyrical feeling, for with the rhyming stanza a corresponding compact and sym- metrical melodic form was bound to come. It was, however, reserved for the popular instinct, and not for trouveres and minnesingers, to develop this form (it is probable too that some at least of the stanza forms employed belonged first to popular poetry and were afterwards developed and elaborated by these musicians of the great houses). The scheme upon which the lyrical stanza was usually based was one in which two similar parts (called by the German Meister singers, Stollen or props, and constituting the Aufgesang or opening song) were followed by an independent third part, the length of which was not prescribed (called Abgesang or concluding song). The complete stanza was called Lied and was knit together by different schemes of rhyme. For the first part the trouveres and Meister singers were content with some simple phrase, often borrowed direct from the folk-song, repeating it, as was natural, for the exactly similar second part: then for the third the style was apt to change towards the ecclesiastical and to wander aimlessly on to an unconvincing conclusion. The popular in- stinct was finer, for we find in innumerable folk-songs, belonging to the 14th and 15th centuries, that the greater length of the Abgesang was seized upon as an opportunity, not merely for introducing fresh material, after the repetition of the phrase attachedto the two Stollen, but also for a return to that phrase,

ov some reminiscence or variation of it, by way of conclusion, thus producing a compact form, answering to the natural requirements of the artistic sense. Thus the favourite scheme of the troubadours, which may be represented as AAB, had developed in the folk-song into the scheme AABA — and this scheme has served for thousands of popular melodies throughout Europe. In some rare cases the contrasting portion might be

conceived as implying modulation into the key of the dominant, thus foreshadowing the form of the first movement in modern sonatas and symphonies. 1 But the present writer is sceptical, from the evidence afforded by folk-song melodies recently collected, of an instinct for modulation among a peasantry unfamiliar with harmonic music. Be that as it may, the courtly minstrels both of France and Germany rendered a real service to music in following the popular verdict in favour of the major scale or Ionian mode, and in so doing prepared the way for modern harmony, which is based upon a particular relationship of contrast between the notes composing the chord of the tonic and those composing the chords of the dominant and the sub- dominant — a relationship inherent in no other scale of the Gregorian system but the Ionian. On it the secret of musical form in the modern sense depends, for it brings with it the power of modulation (unknown to medieval times), i.e. the power of treating the same note as belonging to different tone centres (G, for instance, as the dominant of the scale of C, and also as the tonic of the scale of G), and the further power, by means of the chord of the dominant seventh, of proceeding from one tone centre to another. As long then as musicians held the Ionian scale at arm's length, progress in the modern direction was impossible. They did indeed arrive eventually at the goal, partly through the practice of using popular melodies as the foundation, or canto fermo, of masses and motets, and of arrang- ing the melodies themselves for choirs of voices, and also through the increasing need, as the art of part-writing became more elaborate and better understood, of modifying the strict char- acter of the modes by the introduction of accidentals, till, as Sir Hubert Parry remarks, " after centuries of gradual and cautious progress they ultimately completed a scale which they had known all along, but had rather looked down upon as an inferior specimen of its kind." The melodic instinct, thus developing consciously in the minds of trained musicians, and unconsciously in the makers of folk-songs, arrived eventually at the same result. But the major scale once firmly estab- lished, the trained musician based upon it a new art of harmony; lurther, he modified existing minor scales for harmonic purposes, leaving the old traditional scales as the almost exclusive posses- sion of the folk-song (which has cherished and preserved them in their pristine integrity up to the present day) and working out the problem of musical composition, and of melody itself, on a new foundation. 2

The fall of the Hohenstaufen dynasty, and the troublous times that ensued in Europe, involved the removal of the patronage to which the higher kinds of minstrelsy owed their position and their influence. Song passed with the close of the age of chivalry from the noble to the burgher class. The Minnesingers were succeeded by the Meister singers, the first gild of whom is said to have been established in 131 1 by Heinrich von Meissen

(popularly known as Frauenlob) at Mainz. In their hands song was treated more in the spirit of a trade than an art, and subjected to many absurd and pedantic regulations. In Wagner's famous opera is given a very accurate and faithful

1 For examples see Bohme, Altdeutsches Liederbuch, Nos. 131 and 195.

"■ Modal folk-song melodies are often tested by their conformity or otherwise to the modes as known from medieval composers. This is to limit our conception of natural forces by the use made of them by a few men at a particular epoch for special purposes. If a mode can be said to exist for a purpose, that purpose is melody : to apply to modal folk-melodies the canons laid down by composers with whom melody was a quantity ncgligeable is sheer perversity. Recent discoveries in the field of folk-song place us in a far better position for understanding the true nature of the modes than medieval composers : for in the folk-song their free development has not been hampered by restrictions, which were a necessary condition ai polyphonic work.

picture of their methods and ideals. Their importance in the history of song consists not so much in actual work achieved as in the enthusiasm widely spread through their means in the class from which most of the great German composers were eventually to spring.

The real interest for the historian of song centres during this period not in the attempts of minstrels and burgher gilds to improve upon the folk-song, but in the folk-song itself. Those who have studied the large collection of medieval melodies contained in Bohme's Altdeutsches Liederbuch for Germany, and in Duyse's Het oude Nederlandshe Lied for the Nether-lands, will on other grounds than those mentioned above be ready to confirm this judgment. It is not too much to say that they contain many of the noblest melodies which the world possesses, earnest and dignified in spirit, broad of outline, and knit together in all their parts with rare and unconscious art, on principles of structure which are carefully analysed in the chapter on folk-song in Sir Hubert Parry's The Art of Music. To the examples there quoted may be added the wonderful Tagelied (" Der Dag wil nict verborghen sin"), Ik sek adieu, Lieblich hab sich gesellet, Abschied von Innspruck (of which both Bach and Mozart are reported to have said that they would rather have been the author than of any of their own composi- tions), and " Entlaubet ist der Walde " (which, like so many of the popular songs of the 14th and 15th centuries, was utilized by the Reformers for one of their finest hymns).

A characteristic feature of many of these songs, both German and Dutch, is the melisma, or vocal flourish, of the concluding phrase, derived, if German

historians are to be trusted, from the vocalization on the last syllable of the word Alleluia, which in the early Church represented the congregational portion of its services and which afterwards developed into the sequences, so popular in the middle ages.

A similar feature is not uncommon in French melodies of the same period (see V Amour de moi, Vrai Dieu d' amour, and Reveillez-vous, Piccars, in Chansons du xtf siecle, by Gaston Paris and Gevaert, Paris, 1875). If the charming English song " The Nightingale " (Medieval and Plainsong Society) is of popular origin, it may serve as an indication that these melismata were also common in England (cf. also " Ah! the sighs that come from my heart," which belongs to the reign of Henry VIII.).

It is in the highest degree unfortunate that no collections were made of English popular songs of the middle ages: every- thing points to the fact that quantities of them existed. The importance of song in the social life of every class is attested by all the chroniclers and poets. An age that produced " Sumer is a cumin in " (1240) must have been prolific of melody. It is impossible to regard it as an isolated phenomenon. The beauty of songs by early composers, and of others, which are possibly of popular origin, met with in the reigns of Henry VII., Henry VIII., Edward VI. and Elizabeth (see Wooldridge's edition of Chappell's Popular Music of the Olden Time) argue a great and healthy activity in the preceding centuries. It is sufficient to mention Morley's "It was a lover and his lass" and " O Mistress mine," or " The Three Ravens," which though it first appeared in print in 161 1 is undoubtedly a folk-song belonging to a much earlier period (for versions still to be heard see Kidson's Traditional Times). The same is probably true of " A poor soul sat sighing " and many others. It is to be remarked, however, that printed versions of popular songs can seldom be relied upon as faithfully representing their original form, or even the form in which they were sung at a particular epoch. Editors have seldom resisted the temptation of tamper- ing with popular airs, if by so doing they can render them more attractive to polite tastes. Within recent years, however, the collection and publication of folk-songs, has been undertaken in a different spirit — and it is possible in most countries to study the folk-songs in versions which have been taken direct from the lips of the peasantry and are presented without editorial alterations. The question as to the propriety of such alterations, or the larger question of what is suitable in the way of

instrumental accompaniment, need not be discussed here more than to point out that the strictly scientific point of view — which seeks to

understand the folk-song in its native simplicity — should not be mixed up with that of the artist who aims at adding to the world's store of beautiful music.

It is to be deplored that the English composers of the 15th and 16th centuries did not follow the example of Dutch, German and French musicians, who utilized popular melodies as the foundation or canto fermo of their masses and motets (one example only is known, " O Westron Wynde ") and also arrange them in parts for music-loving circles (to a limited extent this appears to have been done in England, e.g. the Freemen's Songs in Deuteromela). But in England, as in other European countries, survivals of medieval melodies are still to be found among the peasantry in quantities which vary according to the degree in which modern music has penetrated to country districts. In Germany, for instance, where musical culture has been most widely spread, the medieval folk-song, according to Herr Bohme, is no longer heard; it is possible, however, that this statement may be contradicted or modified, if the same systematic search for the Germanic folk-song, which has been made recently in France, England and elsewhere, is undertaken before it is too late. Melodies formed by composers under the principles of modern harmonic music have largely usurped their place. 1

The folk-song is eventually killed by the products of the musical manufactories of the town. The peasantry provided with songs from outside is relieved from the necessity of pro- viding for its own needs, or of cherishing with the love of earlier times its own traditional inheritance. It is true that for many centuries numbers of composed songs have found their way into the popular repertory and have there undergone in many in- stances transformations which serve as a complete disguise to their real origin: but in general a fine ear can detect these intruders. Fcr even when they have suffered change or transformation in passing through a new environment the stamp of an individual or a period remains, whereas the folk-song of tradition is the work not of one age, but of many, not of the individual, but the collective mind. For songs made by uncultivated persons, and passed on to others without the aid of writing or of printing, soon lose in the course of oral transmission even such traces of individual authorship as they may once have possessed. Moreover the makers of folk-songs are concerned with nothing so little as the assertion of their own individuality. They know that it is the most familiar that is the most acceptable. Novelty has no charms for themselves or their audiences. Instinct as well as policy keep them to recognized types and formulae; and the innumerable variations which these undergo from age to age are probably far more frequently due to lapses of memory than to capacity for invention. Major tunes inadvertently sung in minor modes, or vice versa, or the accidental application of a tune to verses, for which it was not originally intended,

give rise in many cases to practically new melodies. Though an author might be named, if it were possible to know the history of a folk-melody, for each change that it has assumed in the course of its history, it is clear that authorship of this kind is not what we mean when we name Dibdin as the author of " Tom Bowling." The theory that the folk-song is but the degenerate offspring of a cultivated ancestry, that the peasantry ■ have, in fact, taken their music from a superior class, and trans- formed it to suit their own tastes and idioms, has been and is still held apparently by many (see Closson, Chansons populaires beiges; and Combarieu, La Musique, p. 114). This is tanta- mount to the assumption that the presence among songs of the

1 The error must be guarded against of supposing that melodies, heard to-day among the peasantry, which suggest medieval times, are necessarily medieval in origin. It has been already indicated that dorian, aeolian and mixolydian modes (to name those which are most prevalent) are natural modes, not church modes; they are still employed by folk-singers in many parts of Europe. A melody in the modern major scale is just as liable at the present day to submit to transformation into the mixolydian or some other mode, as melodies in other modes are liable to become major.

peasantry of beautiful melodies involves pre-existing musical civilization, and that the popular instinct is incapable, without cultivation, of creating melodies that are artistically beautiful. It would be difficult to support this assumption in the case of the German and Dutch medieval songs, to which reference has been made; the cases that could be cited, in which well-known airs of the town have passed to the country and suffered trans-formation, are insufficient data for establishing a general rule as to the origin of folk-songs. Indeed, the very fact of such transformation tends to prove the existence of a strictly popular music, into whose idiom the town music is transformed. To deny that uncultivated peasants can create melody is to forget that the languages even of savages have their grammar and syntax, as well as qualities that are rhythmical and musical, and that even among civilized people those same qualities existed long before they were analysed and tabulated by grammarians, and further developed by trained literary men. The case of melody is strictly analogous to that of languages. As every country has its own store of folk-songs in which national characteristics find expression through idioms which differentiate its songs from those of other countries, it would be arbitrary to select the songs of one country rather than those of another for separate discussion.

The history of the art-song has now to be considered, of solo song, that is, with instrumental accompaniment as an essential part. Songs for two or more voices with or without accompaniment, though they properly Art-Sonz belong to the subject of this article, are passed over, for they but

exhibit the tendencies manifested in solo song when applied to more complicated forms. Operatic songs and arias are likewise omitted (except in the early Italian period), as belonging to a branch of music which requires separate treat- ment (see Aria; Opera). Instrumental song arose during the 1 6th century, a time in which composers, released by the spirit of the Renaissance from the exclusive service of the Church, were already becoming active in secular directions. The madrigal was the favourite form of composition and was rapidly approaching its period of maturity: it was now to be superseded as the popular diversion of cultivated society by solo song. The habit had already sprung up of supplying voices that might be missing in a madrigal by instruments: if all the voices but one were absent, the effect of a solo with instrumental accompani- ment was realized. A still nearer approach to solo song was made when singers, selecting one part of a madrigal for the voice, themselves played the rest on lute or chilarrone. In such performances the voice part was likely to receive most attention — even in madrigal-singing it was not unknown for the soprano to embroider her part with gruppetti and ornamental passages (see Kiesewetter's Schicksale u. Beschajfenheit des Weitlichen Gesanges_, p. 72, for an example of a simple part as embellished by the well-known Signora Vittoria Archilei) — and the accom- paniment to undergo processes of simplification, thus preparing the way for melodies, simple or ornate, with unobtrusive accom- paniments, and perhaps also contributing to the invention of that declamatory or recitative style, attributed to Cavalieri, Peri and Caccini, the founders of oratorio and opera. Such melodies are found in Caccini's famous Nuove Musiche, published in Venice in 1601 (" Feri Selvaggi " may serve as a beautiful, specimen of simple melody; " Cor mio " is typical of the ornate style, " Deh! dove son fuggite " of the declamatory: the last two are quoted in Kiesewetter, Geschichte und Beschajfenheit des Weitlichen Gesanges, p. 73). Caccini claimed in the preface to that work to be the first to invent songs " for a single voice to the accompaniment of a simple instrument." It is true that his friends in Rome (his native city), at whose houses these new compositions were performed, assured him that they had never heard the like before, and that his style exhibited possibil- ities for the expression of feeling, that were excluded, when the voice sang merely one part in a contrapuntal work. But, about thirty years before Caccini, lutenists in France had anticipated his innovations, and composed solo songs, with lute accompani- ments, in which is evidenced the struggle, not always successful,

to break away from, polyphonic traditions. Le Roy's Airs de Cour, published in 1571, may be cited in proof of this statement. Of these airs "

Je suis amour " is somewhat in the declamatory recitative style of Caccini's Nuove musiche (see Sammelbande, Int. Musik Gesellschaft, article " Airs de Cour of Adrien le Roy," by Janet Dodge). Generally speaking, it may be said of early French songs that they were longer in shaking off the influence of the past than the songs of the Italians, many tricks of ex- pressions, belonging to polyphonic times, surviving both in voice parts and accompaniments. In the voice parts sometimes the influence of popular song is evident, at others they are neither melodious nor yet declamatory, but merely suggest a single part in a polyphonic composition, while the accompaniments for the lute are generally a mixture of chords used with harmonic effects, and certain polyphonic tricks inherited from the past two centuries. In England two books of " Ayres," for a single voice with lute accompaniment, one by Jones, and another by Campion and Rosseter, were published in 1601; Jones in his preface claims that his songs were the first of the kind, and Rosseter says that those of Campion had been for some time " privately imparted to his friends." Both sets therefore seem to be independent of Caccini's Nuove musiche, the influence of which was not felt for some years. In England the break with the past was less violent and sudden than in Italy; for the established practice of arranging popular songs and dances as lute solos led naturally to, and profoundly influenced, the later " ayres " with lute accompaniment. As Dr Walker remarks (History of Music in England, p. 121, Clarendon Press, 1907), " A folk-song of 1 500, a song of Thomas Campion and a song of Henry Lawes are all bound together by a clear and strong tie." In a simple and unpretentious way these first English attempts at solo-song were singularly successful. The best of them, such as Rosseter's " And would you see my Mistress' face? " and Campion's " Shall I come if I swim? " rank as master- pieces of their kind. Both in structure and in feeling they exactly catch the essentials of the lyrics of the period. Their daintiness and charm make it easy to forgive an air of artifi- ciality, which was after all inevitable — if the songs were to represent the spirit of their environment. 1

Meanwhile Italian composers, who, in spite of the frottole, villote, villanelle, balletti and falalas (arrangements in vocal parts of popular melodies common in the last half of the 16th century) seem to have been unaffected in the new song movement by popular influences, went straight from the polyphonic to the recitative style, and advanced with extraordinary rapidity. Melody was quickly added to relieve the monotony of recitative which must have been acutely felt by the hearers of the early operas, and considerable advance in this direction was made by Cavalli and Cesti (see Oxford History of Music, vol. iii., for details of their methods). Monteverde, though a greater genius than either of them, did not succeed in forcing the daring qualities of his own conceptions on others. The famous lament of Ariadne was the expression of an individual genius

casting all rules aside for the sake of poignant emotional effect rather than the begin- ning of a new epoch in song. Carissimi and Rossi in oratorio and cantata (a word which then merely described a piece that was sung, as sonata a piece that was played, and consisted generally of alternate recitative and aria) brought the organiza- tion of melody to a high degree of elaboration, far beyond anything attempted by Cavalli and Cesti. In their hands the declamatory methods of Monteverde were made subordinate to larger purposes of design. A broad and general characterization

1 John Dowland, the chief of English lutenists, published his first book of songs and ayres in four parts in 1597, " So made that all the parts together or either of them severally may be sung to the lute, orpherion or viol da gamba." Though not strictly speaking solo- songs they are too important not to be mentioned. Three other books followed in 1600, 1603 and 1612, in the second of which appears the famous " Flow my tears " (Lachrymae) for two voices, but al- most equally effective as a solo, and doubtless often used as such. It is published in vol. vii. of Euterpe (Breitkopf & Hartel, London), which also contains a valuable monograph on English lutenists and lute music by Miss Janet Dodge. Dowland's few solo-songs are unimportant.

of emotional situations was more natural to them and to their successors than a treatment in which points are emphasized in detail. It was moreover inevitable in these early developments of musical style, in which melody had to play the leading part, that such sacrifices as were necessary in balancing the rival claims of expression and form should be in favour of the latter rather than the former. But the formal perfection of melody was not the only problem which 17th-century Italian composers had to face. The whole question of instrumental accompani- ment had to be worked out; the nature and capacities of in- struments, including the voice itself, had to be explored; the reconciliation of the new art of harmony with the old art of counterpoint to be effected. It speaks volumes for the innate musical sense and technical skill of the early Italian composers that the initial stage of tentative effort passed so quickly, and that at the close of the 17th century we are conscious of breathing an atmosphere not of experimental work, but of mature art. Alessandro Scarlatti (1659-1725) sums up the period for Italy. That much of his work is dry, a mere exhibition of consummate technical skill without inspiration, is not surprising when the quantity of it is realized, and also the unfavourable conditions under which operatic composers had to work, but the best of it is singularly noble in conception and perfect in design. The same is true of the best work of Legrenzi, Stradella, Caldara, Leonardo Leo, Durante, work which was of incalculable im- portance for the development of musical, and particularly of vocal, art, and which will always, for minds attuned to

its atmo- sphere of classical intellectuality, severity and self-restraint, possess an abiding charm: but comparatively few specimens have retained the affections of the world at large. Carissimi's " Vittorta," Scarlatti's " O Cessate " and " Le Violette " are the most notable exceptions (" Pieta, Signore " is not included, as no one now attributes it to Stradella).

The almost universal preference of the Italians in the 17th and 1 8th centuries for the aria in da capo form involved serious sacrifices on the dramatic and emotional side: for although this form was but an elaboration of the folk-song type, ABA, yet it involved, as the folk-song type did not, the repetition note merely of the melody of the opening part, but of the words attached to it. It is this double repetition which from the point of view of dramatic sincerity forms so disturbing an element. But composers, as has been remarked, were too much occupied with exploring the formal possibilities of melody to establish a really intimate connexion between music and text (Monteverde being a notable exception), a detailed interpretation of which lay outside their scheme of song. Elaboration of melody soon came to involve much repetition of words, and this was not felt as an absurdity so long as the music was broadly in accord with the atmosphere or situation required. A few lines of poetry were thought sufficient for a fully developed aria. Ex- ceptions are however to be found in what is known as the recitativo arioso — of which remarkably fine specimens appear in some of Scarlatti's cantatas — and in occasional songs in slighter form than the tyrannous da capo aria, such as Caldara's " Come raggio di sol " — which foreshadows with its dignified and expressive harmonies the Schubertian treatment of song.

Before Scarlatti's death in 1725 symptoms of decline had appeared. He was himself often compelled to sacrifice his finer instincts to the popular demand for mere vocal display. A race of singers, who were virtuosi rather than artists, dominated the taste of the public, and forced composers to furnish oppor- tunities in each r61e for a full display of their powers. An opera was expected to provide for each favourite five kinds of aria! (aria cantabile, aria di portamento, aria di mezzo carattere, aria parlante and aria d' agilild). It was not long before easier and more obvious types of melody, expressing easier and more obvious feelings, became the fashion. The varied forms of accompani- ment, in which a good contrapuntal bass had been a conspicuous feature, were wasted upon a public which came to hear vocalists, not music; and stereotyped figures, of the kind which second- rate art after the first half of the 18th century has made only too familiar, took the place of sound contrapuntal workmanship,

till the Italian school, which had stood as a model for the world, became identified with all that was trivial, insipid, conventional, melodramatic. Not that the Italian tendency in the direction of mere tunefulness was in itself either unhealthy or unworthy. It was indeed a necessary reaction from the severe earlier style, as soon as that style began to lose its earnestness and sincerity, and to pass into cold and calculating formalism. But the spirit of shallowness and frivolity which accompanied the reaction involved the transference of musical supremacy from Italy to Germany, the only country, which, while accepting what was necessary to it of Italian influences, steadily remained true to its own ideals.

Before speaking of German song, it is necessary to glance at what was being done outside of Italy in the 1 7 th century. Reference has already been made to the French as pioneers in establishing solo song to lute accompaniment, which here, as in Italy, origi- nated in adaptations of polyphonic compositions. But in France from the first the main influence was derived from popular sources, the native folk-song and the vaudeville, the ditties of country and of town. In both that union of grace, simplicity and charm, characteristic of the French nation, tended to produce an art of dainty unpretentious attractiveness, in strong contrast to the serious and elaborate Italian work. It preserved these characteristics in spite of the artificial atmosphere of the French court, in which it mainly flourished up to the time of the Revolution, in spite too of the somewhat different influences which might have been expected to affect it, derived from opera, the mania for which did not, as in Italy, kill the smaller branch of vocal music. Brunettes, musettes, minuets, vaude- villes, bergerettes, pastourelles, as the airs de cour were styled according to the nature of the poetry to which they were attached, may be found in Weckerlin's Echos du temps passS, but the reader must beware of judging the real character of these songs from that which they assume under the hands of the modern arranger.

With the latter part of the 18th century came in the languid and sentimental romance, in which the weaker phases of Italian melody are felt as an enervating influence. The romance became after the Revolution the most popular form of polite song, lead- ing by degrees to that purely melodious type of which Gounod may be considered the best representative, and which other composers, such as Godard, Massenet, Widor, have been for the most part content to follow and develop, leaving to more adventurous spirits the excitement of exploring less obviously accessible regions.

In England, as in France and Italy, the beginning of the 17th century brought into existence solo song. Its beginnings have already been alluded to in speaking of the songs of Rosseter, Jones, Campion and Dowland. The

work of H. Lawes, and his contemporaries, Wiliam Lawes, Coleman and Wilson, was equally unpretentious and simple. A gem here and there, such as " Gather ye Rosebuds " (W. Lawes), is the student's reward for a mass of uninspired, though not ungraceful, work in which is to be noted an attempt to come to closer quarters with poetry, by " following as closely as they could the rhyth- mical outlines of non-musical speech: they listened to their poet friends reciting their own verses and then tried to produce artificially exact imitations in musical notes " (Ernest Walker, History of Music in England, p. 130), producing what was neither good melody nor good declamation. Such tentative work, in spite of Milton's sonnet to H. Lawes, could only have a passing vogue, especially with a Purcell so near at hand to show the world the difference between talent and genius, between amateurish effort and the realized conceptions of a master of his craft. Songs like " Let the dreadful Engines " and " Mad Bess of Bedlam " reach a level of dramatic intensity and de- clamatory power, which is not surpassed by the best work of contemporary Italian composers. " I attempt from love's sickness to fly " is so familiar in its quiet beauty that we are apt to forget that melodies so perfectly proportioned were quite new to English art (though Dr Blow's " The Self-banished " deserves fully to stand with it side by side). Monteverde's

" Lament of Ariadne " has already been alluded to. It is interesting to contrast its emotional force, obtained by daring defiance of rule, with the equally intense, but more sublime pathos of Purcell's " Lament of Dido," in which song a ground bass is used throughout. The " Elegy on the death of Mr John Playford " (quoted in full by Dr Walker, p. 176 of his history) exhibits the same feature and the same mastery of treatment. The " Morning Hymn " is scarcely less remarkable, and has likewise a ground bass. Purcell died in 1695; Bach and Handel were then but ten years old, and Scarlatti had still thirty years to live— facts of which the significance may be left to speak for itself.

It is among the ironies of musical history that so great a beginning was not followed up. There are echoes of Purcell in the generation that succeeded him, in Croft, Greene, Boyce and Arne: but they quickly died away. The genius of Handel first and of Mendelssohn later seem to have prevented English- men from thinking musically for themselves. At least this is the orthodox explanation: but it should be borne in mind that a list of English composers, who have been willing to sacrifice ease and prosperity to a life of devotion to artistic ideals, would be exceedingly difficult to draw up and would certainly not include many of the best-known names. From the death of Purcell to the Victorian era there is no consistent development of artistic song that is worth recording in detail. The only songs that have survived are of the melodious order; of these Arne contributes several that are still acceptable for an air of freshness and gracefulness which marks them as

his own. " Where the Bee sucks " and " Blow, blow, thou Winter Wind " are typical of his style at its best, as " The Soldier tired of War's Alarms " is typical of it at its worst. Song writers that followed him, Shield, Hook, Dibdin, Storace, Horn, Linley (the elder) and Bishop, were all prolific melodists, who have each left a certain number of popular songs by which their names are remembered, and which are still pleasant enough to be heard occasionally; but there is no attempt to advance in any new direction, no hint that song could have any other mission than to gratify the public taste for tuneful melodies allied to whatever poetry — pastoral, bacchanalian, patriotic or senti- mental — lay readiest to hand.

The musical genius of Germany, which has created for the world the highest forms as yet known of symphony, oratorio and opera, is not less remarkable as the originator of the Lied — the term by which are most easily progress. conveyed the modern conceptions of ideal song. Germany is moreover the only country in which in orderly and progressive development the art of song may be traced from the simple medieval Volkslied to the elaborate productions of Schubert, Schumann and Brahms. If Germany is united to the rest of Europe in her debt to Italy, still her final conceptions of song belong to herself alone. And these conceptions have more profoundly influenced the rest of Europe than any Italian conception ever influenced Germany. When the rest of Europe was content with the vapid outpourings of Italian and pseudo- Italian puerilities, an acute observer could have read the signs in Germany, from which the advent of a Schubert might have been foretold. The student therefore is more profitably employed in studying the phases of song-development in Germany than in any other country. German ideals and German methods of technique have permeated the best modern song-work of coun- tries differing as widely in idiom as Russia, Norway, France and England.

It is not necessary to dwell, except in very general terms, upon German song of the 17th century. There had been no development corresponding with that which produced the airs de cour of France and the ayres of England. The very literature necessary for such development was wanting. Indeed German art was too profoundly affected by the spirit which produced the Reformation to develop freely in secular directions. Even in the domain of the Volkslied the sacred songs can scarcely have been less numerous than the secular; and at the Reforma- tion adaptations of secular airs to sacred words constituted

borrowings on a very large scale. In the 17th century the work of the

Italian monodists was bound eventually to stimulate German composers to make songs, but their main interest lay in larger choral-instrumental works, in which solo songs natur- ally appear, not in song as an independent branch of art. A good general view of such isolated songs as appeared can be obtained from Reimann's collections Das deulsche geistliche Lied and Das deulsche Lied (Simrock). In spite of some stiffness and awkwardness, these 17th-century songs exhibit a loftiness of aim, a touching earnestness and sincerity, which mark them off as quite distinct from any work done elsewhere at the same time. On the other hand there is not that sure grasp of their material, nor the melodic and declamatory power, which make Purcell in England stand out pre-eminently as the greatest song composer of the 17th century. The treatment of the aria by Bach and Handel is discussed in separate articles (see Aria; Bach; Handel), which render unnecessary any further comment here. Nor need we pause to consider the vastly inferior work of lesser composers such as Telemann, Marpurg and Agricola, most of which is confined to opera, oratorio and cantata. Our concern is rather with the smaller lyrical forms, and to these the absence of suitable poetry was for long an insurmountable barrier. It was not till the middle of the 18th century that the reform in German poetry associated with the name of Martin Opitz (who translated Rinuccini's text of Dafne, J. Peri's first opera, for Heinrich Schiitz) bore real fruit.

At the outset it is necessary to make a broad distinction between the more distinctly popular form of song, known as the Volkstumliches Lied, in which the same music served for each stanza of a poem (as in the Volkslied itself, on which the Volks- tumliches Lied was modelled), and the Kunstlied, or, to adopt the more descriptive term, the durch-componirtes Lied, in which the music forms a running commentary on a poem, without respect to its form — or, if stanza form is preserved, varying the music in some stanzas or in all in accordance with their poetical significance. Generally speaking the former aims at a wider audience than the Kunstlied, the appreciation of which, when it is worth appreciating, involves some degree of culture and intelligence, inasmuch as it aims as a rule at interpreting more complex and difficult kinds of poetry. In the 18th century the simpler Volkstumliches Lied in strophic form was most in favour, and those who care to trace its history in the hands of popular composers like J. A. Hiller, J. A. P. Schulz, Reichhardt, Berger and Zelter, can easily do so by consulting Hartel's Liederlexicon (Leipzig, 1867) or one of a number of similar publications. Side by side with the outpouring of somewhat obvious and senti- mental melodiousness, which such volumes reveal, it must be remembered that the attention of greater men to instrumental composition, the growing power to compose for keyed instru- ments (which began to replace the lute in the middle of the 17th century), and the mechanical improvements, through which spinet, clavichord and harpsichord were

advancing toward the modern pianoforte, were preparing the way for the modern Lied, in which the pianoforte accompaniment was to play an increasingly important part. C. P. E. Bach (d. 1788) alone of his contemporaries gave serious attention to lyrical song, selecting the best poetry he could get hold of, and aspiring to something beyond merely tuneful melody. The real outburst of song had to wait for the inspiration which came with Goethe and Schiller.

It is unfortunate that Haydn and Mozart, pre-eminently endowed with every gift that makes for perfect song except that of literary discernment, should have left us so little of real value. There is indeed much to admire in some of Haydn's canzonets, of which " My Mother bids me bind my Hair " fully deserves its continued popularity, while Mozart's " Schlafe mein Prinzchen " — if it is Mozart's — and a few others, like these in simple strophic form, are isolated treasures which we could not afford to los a . But in only two songs by Mozart, " Abendempfindung " and " Das Veilchen," is the goal, to which the art was to advance, clearly discerned and in the latter case perfectly attained. Both are durchcomponirt, that is, they

follow the words in detail; in both the general spirit, as well as each isolated point of beauty in the verses, is seized and portrayed with unerring insight. " Abendempfindung " is indeed seriously marred by some carelessness in accentuation (worse examples may be seen in " An Chloe ") and by annoying repetition of words, due to the development of the melody into a formal and effective climax. In the process the balance of the poem is destroyed, and the atmosphere of suffused warmth and tenderness, which pervades the rest of the song, is almost lost. The lyrical mood passes into one in which the operatic aria is suggested on the one hand, and on the other the formality of instrumental methods of developing melody. Not till Schubert were these traditions, fatal to the pure lyric, finally overthrown, and the conditions of true union between music and poetry perfectly realized. In " Das Veilchen " however, where Mozart touched a poem that was worthy of his genius and appealed to his extra- ordinarily fine dramatic instinct, he produced a masterpiece — rightly regarded as the first perfect specimen of the durch- componirles Lied. Every incident in the flower's story is minutely followed, with a detailed pictorial and dramatic treatment (involving several changes of key, contrasts be- tween major and minor, variations of rhythm and melody, declamatory or recitative passages) which was quite new to the art. The accompaniment too takes its full share, illustrating each incident with exquisite fancy, delicacy and discretion — and all with no violence done to the form of the poem.

With Beethoven song was suddenly exalted to a place among the highest branches of composition. Taken in hand with the utmost seriousness by the

greatest musician of the age and associated by him for the most part with lyrical poetry of a high order, it could at last raise its head, and, freed from the conventional formalities of the salon, look a larger world con- fidently in the face. It cannot, however, be admitted that Beet- hoven, in spite of several noble songs, was an ideal song com- poser. His genius moved more easily in the field of abstract music. The forms of poetry were to him rather a hindrance than a help. His tendency is to press into his melodies more meaning than the words will bear. The very qualities in fact which make his instrumental melodies so inspiring tell against his songs. Though his stronger critical instinct kept him as a rule from the false accentuation which marred some of the work of Haydn and Mozart, yet, like them, he often failed to escape from the instrumentalist's point of view, especially in the larger song-forms. The concluding melody of " Busselied " would be equally effective played as a violin solo: the same might be said of the final movements of " Adelaide " and of the otherwise noble cycle " An die feme Geliebte " — movements in which the words have to adapt themselves as well as they can to the exigencies of thematic development, and to submit to several displacements and tiresome repetitions. In songs of a solemn or deeply emotional nature Beethoven is at his best, as in that cycle, to sacred words of Gellert, of which " Die Ehre Gottes aus der Natur " stands as a lasting monument of simple but expressive grandeur, in " Trocknet nicht," in " Partenza," " In questa tomba," in the first of his four settings of Goethe's " Nur wer die Sehnsucht kennt," and more than all, in the cycle " An die feme Geliebte," which represents a further stage reached in song on the road marked out by Mozart in " Das Veilchen." We have left behind the pretty artificialities so dear to the 18th century, that play around fictitious shepherds and shepherdesses, and entered the field of deeper human feeling with the surrounding influences upon it of nature and romance. The new spirit of the age, represented in German poetry by the lyrics of Burger, Voss, Claudius and Holty, members of the famous Gottinger Hainbund, and more notably by those of Goethe and Schiller, communicates itself in Beethoven to song, which now assumes its rightful position of joint interpreter. It needs no deep study of Beethoven's songs to perceive that the accompaniment has assumed, especially in the " Liederkreis, " an importance, im- measurably greater than in the songs of any previous composer It begins to act the part of the chorus in Greek drama and tc

provide both a background and a commentary to the central personages.

The tentative and uninspired work of Zelter, Reichardt, Schulz and others,

when they attempted anything beyond a merely tuneful melody in the strophic form, may be passed over, but a word is due to J. R. Zumsteeg, because in spite of the sometimes childish simplicity of his work he yet, in the kind of use which he made of modulation as a means of lyrical expression, anticipated, more than any other composer of songs, one of the chief features of the greatest song writer of all ages, Franz Schubert. Schubert's " Erlkonig " was written a few months before Beethoven's " Liederkreis," " Gretchen am Spinn- rade " about a year before the " Erlkonig." He was eighteen when he composed the latter, in 1815. Lyrical song, divorced from all hindering elements and associations, whether of salon or theatre, was here at the threshold of his short career in almost full maturity and plenitude of power. It is sufficiently remark- able that a lad with so little education should have composed such music: it is more astonishing still that he should have penetrated with such unerring insight into the innermost secrets of the best poetry. Two of the necessary qualifications for a great song composer were thus at last united. Schubert pos- sessed the third — a knowledge of the human voice, partly intuitive, partly the result of his experience as a chorister boy. The beauty of his melodies is scarcely more striking than the gratefulness of their purely vocal qualities. The technique of singing had indeed been understood for nearly two centuries; but Schubert was the first to divine fully its emotional range, and to dissociate it in lyrical work from all traditions of the schools. From the beginning to the end of his career he never penned a note or a phrase because it was vocally effective. What he wrote for the voice to sing was there because for him the poetry could not have it otherwise. This was inherent in his method of working, in which he relied implicitly upon his musical in- spiration for a response, usually instantaneous, to the inordinate receptivity of his mind to the impressions of poetry. To read through a poem was for him not only to seize its innermost significance, and every salient point of language or of form, but also to visualize the scheme by which both the whole and the parts could be translated and glorified through the medium of music. As the singer Vogl, the first of his profession to appreciate him, remarked, " He composed in a state of clair- voyance." Hence the impossibility of summarizing in a short space the innovations he introduced, for new poems invariably suggested new types of song. His settings of Goethe's lyrics (that is, the best of them) differ as essentially from his settings to those of W. Muller in the cycles "Die Scheme Mullerin" and " Die Winterreise," as these again from his settings of Heine. Hardly a single development in subsequent phases of the art (except those which eliminate the melodious element) is not foreshadowed in one or other of his six hundred (and more) songs. Brahms, perhaps the greatest of his successors, said that there was something to be learned from every one of Schu- bert's songs. He was as perfectly at home in the durchcompo- nirtes Lied as in the simple strophic type or the purely de- clamatory (" Der

Wegweiser," " Nahe des Geliebten," " Der Doppelganger " may serve as familiar but supreme examples of each). Certain features may be selected for emphasis, first, his use of modulation as a means of emotional expression. " Du liebst mich nicht " traverses in two pages more keys than would serve most composers for a whole symphony, whilst the discords on the words " Die Sonne vermissen " and " Was bliih'n die Narcissen " gave a piercingly thrilling effect, which is quite modern. The modulations in " Wehmuth " illustrate the subtle atmospheric effects which he loved to produce by sudden contrasts between major and minor harmonies. More familiar instances occur in " Gute Nacht," " Die Rose," " Rosamunde." Secondly, his inexhaustible fertility in devising forms of accompaniment, which serve to illustrate the pictorial or emotional background of a poem; we have the galloping horses (and the horn) in "Die Post," the spinning wheel in " Gretchen," murmuring brooks in many songs from " Die Scheme Mullerin " and in " Liebesbot-

schaft," the indication of an emotional mood in " Die Stadt " or " Litanei." Occasionally, it is true, the persistence of a. particular figure and rhythm induces monotony, as in " Ave, Maria!" or " Normans Gesang," but generally Schubert has plenty of means at his command to prevent it, such as the presence of an appropriate subsidiary figure making its appear- ance at intervals, as in " Halt," " Der Einsame," or some enchanting ritornello, by which a phrase of the vocal melody is echoed in the accompaniment, as in " Liebesbotschaft," " An Sylvia," " Standchen " and " Fischerweise." Thirdly, the sud- den entrance of declamatory passages, as in " Der Neugier'ge," " Am Feierabend," in " Gretchen," at the famous " Ach sein Kuss," and in " Erlkonig " at " Mein Vater, mein Vater." Fourthly, the realistic touches by which suggestions in a poem are incorporated into the accompaniment, such as the cock crowing in " Friihlingstraum," the convent bell in " Die Junge Nonne," the nightingale's song in " Ganymed " or the falling tears in " Ihr Bild." Finally should be noted the extreme rarity of any slips in the matter of the just accentuation of syllables, and this is especially remarkable in a song writer who relies so much upon pure melody as Schubert, for to preserve a per- fect melodic outline which shall do not the least violence to a poet's text, presents far more difficult problems than the de- clamatory style. Yet Schubert is as successful in " Liebes- botschaft " as in " Prometheus." Purists may be disturbed by the repetitions of words involved in the magnificent " Dithy- rambe " — but Schubert cannot be expected to betray a sensi- tiveness which is really post-Wagnerian. Nor is it just to a composer of over 600 songs to fasten for critical purposes on those which do not represent him at his best. His best level is so often attained as to make attacks on points which he has missed — as in some of the songs from Wilhelm Meister — some- what beside the mark. It is usually the work of enthusiasts who wish to exalt others at

Schubert's expense. For further details the reader is referred to the brilliant essay on Song with which Mr Hadow concludes vol. v. of the Oxford History of Music. It must suffice here to point out in a general way that in wideness of scope and aim, in intensity of expression Schubert produced the same transformation in the lyrical field that Beethoven had produced in the larger forms of sonata, string t quartet and symphony. Beethoven's work was necessary before Schubert could arise, but Schubert's conceptions and methods were the fruit of his own genius. Of his contemporaries Loewe deserves mention for his singular success in overcoming the difficulties involved in setting long ballads to # music. To preserve homogeneity in a form in which simple narration presents perpetually shifting changes of action, of picture, of mood, is a problem which Schubert himself only once trium- phantly solved. Weber contributed nothing to song, except in his operas, of permanent value, beyond a few strophic songs of a popular nature. He disqualified himself for higher work by that singular preference for vapid and trivial verse which so often led Haydn and Mozart astray. Mendelssohn's literary tastes took him to the best poetry, but he made but little attempt as a rule, to penetrate beyond its superficial and obvious import. His own lovable personality is far more clearly revealed in his songs than the spirit of his poets. Differences of literary style affected the style of his music perhaps less than that of any other distinguished composer. He attained his highest level in " Auf Fliigeln des Gesanges," the first of the two songs to Zuleika, and Nachtlied. It is noteworthy that there is no trace of Schubert's influence. Had Schubert not lived, Mendelssohn's songs would have been just the same. Hence in spite of graceful and flowing melodies, elegant but simple in form, and instinct with that polished taste and charm of manner which endeared both him- self and his works to his own generation, his songs have exercised no permanent influence upon the art. Their immediate in- fluence, it is true, was enormous: it is felt occasionally in Schumann, only too often in Robert Franz, and a host of lesser composers in many countries besides his own, such as Gade, Lindblad, Sterndale Bennett, and others who need not be I specified.

Of far greater importance is the work of Robert Schumann, I whose polyphonic methods of technique and peculiarly epigram- matic style enabled him to treat complex phases of thought and feeling which had hardly become prominent in Schubert's time with quite extraordinary success. Both by temperament and by choice he is identified with the so-called romantic move- ment, a movement in which both poetry and music have tended more and more to become rather a personal revelation than " a criticism of life." Thus with Schubert the note of univer- sality, the

abiding mark of the classical composers, is stronger than the impress of his own personality. With Schumann the reverse is the case. If the romantic movement gave a new impetus of vast importance both to music and literature, yet it had its weaker side in extremes of sensibility, which were not always equivalent to strength of feeling. Mendelssohn's songs admittedly err on the side of pure sentimentality — Schumann, with Liszt, Jensen and Franz, frequently betrays the same weakness, but his best work, his settings to Heine (especially the Dichterliebe) , the Eichendorff " Liederkreis," Chamisso's " Frauenliebe u. Leben " (with some reservations), besides a fair number of other songs, such as " Widmung," " Der Nussbaum," " Ihre Stimme," and his one completely successful ballad, " Die beiden Grenadiere," are strong in feeling and full of poetic and imaginary qualities of the very highest order. The new poetry called for new methods of treatment. These Schumann, instinctively an experimenter, provided, first, by a closer attention to the minutiae of declamation than had hitherto been attempted — and herein syncopation and suspension furnished possibilities unsuspected even by Schubert — secondly by increasing the role of the pianoforte accompani ment — and in this he was helped on the one hand by novel methods of technique, of which himself and Chopin were the chief originators, and on the other by his loving study of Bach, which imparted a polyphonic treatment, quite new to song. In nearly all Schubert's songs, and in quite all of Mendelssohn's, the melody allotted to the voice maintained its position of supremacy. In Schumann it not infrequently becomes the secondary factor, the main r61e of lyric interpreter passing to the accompaniment, as in " Es ist ein Floten u. Geigen " or " Roselein." He also gave quite a new prominence to the opening and closing instrumental symphonies, which become in his hands no merely formal introduction or conclusion but an integral part of the whole conception and fabric of the Lied. This may be illustrated by many numbers of the Dichterliebe, but most remarkable is the final page, in which the pianoforte, after the voice has stopped, sums up the whole tenour of the cycle. This feature has been seized upon by many subsequent composers, but by few with Schumann's rare insight and judg- ment. In Franz, for instance, the concluding symphony is often introduced without necessity, and becomes a mere irritating mannerism. In Brahms however it is developed, both at the opening and close of many songs, to an importance and preg- nancy of meaning which no other composer has attained.

A third point in Schumann's method is his fondness for short interrupted phrases (often repeated at different levels) in place of the developed Schubertian melodies; it is alluded to here because of the great extension of the practice by later composers, too often, as in the case of Franz, without Schumann's tact. On many grounds, then, Schumann may be regarded as

having widely extended the conception of the Lied; his example has encouraged later composers to regard no lyric poetry as too subtle for musical treatment. Unfortunately in presenting com- plexity of mood Schumann was not invariably careful to pre- serve structural solidity. Many later composers have followed the occasional looseness of design which is his fault, without approaching the beauty of spirit, in which he stands alone.

A bold experimenter in song was Franz Liszt, whose wayward genius, with its irrepressible bent towards the theatrical and melodramatic, was never at home within the limits of a short lyric. It is true that there is sincerity of feeling, if not of the deepest kind, in " Es muss ein Wunderbares sein " and " Uber alien Gipfeln"; but concentrated emotion, which involves for

its expression highly organized form, was alien to Liszt's genius, which is more truly represented in songs like " Die Lorelei," " Kennst du das Land," " Am Rhein " — in which are presented a series of pictures loosely connected, giving the impression of clever extemporizations on paper. It is not sufficiently recognized that such work is far easier to produce than a successful strophic song, even of the simplest kind, because the composer ignores the fact that a formal lyric implies formal music, and that the most formal poetry is often the most emo- tional. Critics, who measure the advance of song by the increase in number of those that are durchcomponirt, and the decreasing output of those which have the same music to each stanza, are in danger of forgetting the best qualities both of music and of poetry. Formless music never interpreted a finely formed poem, and unless the durchcomponirtes Lied has more form instead of less than the strophic song, it is artistically valueless. The popularity therefore of " Die Lorelei " is not so much a tribute to Liszt's genius as an example of the extent to which gifted singers and undiscerning critics can mislead the public. Mere scene painting, however vivid, however atmospheric— and these qualities may be conceded to Liszt and to others who have followed his example— takes its place upon the lower planes of art.

The admiration expressed by Liszt and Wagner for the songs of Robert Franz, and the cordial welcome extended by Schumann to those which first made their appearance, have led to an undue estimate of their importance in many quarters. They are characterized by extreme delicacy both of feeling and of workmanship, but the ingenuity of his counterpoint, which he owed to his intimate knowledge of Bach and Handel, cannot conceal the frequent poverty of inspiration in his melodic phrases nor the absence of genuine constructive power. To build a song upon one or two phrases repeated at different levels and coloured by changing harmonies to suit the requirements of the poetic text (as in " Fur Musik " and " Du bist elend ") is a dangerous substitute for the power to formulate large and ex- pressive

melodies. But it is the method which Franz instinc- tively preferred and elaborated with skill. His songs are mostly very short and in the strophic form, some alteration being nearly always reserved to give point to the last verse. His tricks of style and procedure so quickly become familiar as to exhaust the patience even of the most sympathetic student. But the sincerity of his aims, the idealistic and supersensitive purity of his mind (which banished as far as possible even the dramatic element from his lyrics), its receptiveness to the beauties of nature and all that is chaste, tender and refined in human character render his songs an important contribution to our knowledge of the intimate side of German feeling, and compensate in some degree for the lack of the larger qualities of style and imagination. All his best qualities are represented in the beautiful setting of Lenau's " Stille Sicherheit." Those who care to study his limitations may compare his settings of Heine's lyrics with the masterpieces of Schumann in the same field, or the dulness of his " Verborgenheit " (Morike) with the romantic fervour imparted to that poem by the later genius of Hugo Wolf.

A higher value than is usually conceded attaches to the songs of Peter Cornelius, a friend of Liszt and Wagner, but a follower of neither. Before he came under their influence he had under- gone a severe course of contrapuntal training, so that his work, though essentially modern in spirit, has that stability of structure which makes for permanence. He was, moreover, an accom- plished linguist, a brilliant essayist, and a poet. That perfect fusion between poetry and music, which since Schubert has increasingly been the ideal of German song, is realized in an exceptional manner when, with Cornelius as with Wagner, librettist and musician are one person. More exquisite declama- tion is hardly to be found in the whole range of song than in the subtly imaginative " Auftrag," whilst for nobility of feeling, apart from technical excellencies of the highest order, the " Weihnachtslieder," the " Brautlieder " and much of the sacred cycle " Vater Unser," are hardly surpassed even by Schumann

at his best, and point to Cornelius as one of the most beautiful and original spirits of the 19th century.

In the song-work of the 19th century, though Schubert remains the rock upon which it has been built, Schumann represents the most directly inspiring influence, even when, as in the case of Adolph Jensen (whose spontaneously melodious and graceful, if not very deep, songs deserve mention), there are importations from such widely divergent sources as those of Mendelssohn and Wagner.

The application of the principles of Wagnerian music-drama to lyrical work, allied, as was natural, with the exaggerations and unconventionalities of Liszt and Berlioz, was sooner or later bound to come, bound also for a time to issue in confusion ; to rescue song from which was the work of two men of genius, who, though approaching the task from standpoints removed by the whole distance of pole to pole, may be considered as placing the crown of final achievement upon the aspirations of 19th-century song — Hugo Wolf and Johannes Brahms.

Wolf exhibits an entirely unconventional and original style. He is as untroubled by tradition as Schubert, whom he resembles not often, as in " Fussreise," and " Der Gartner," in pure melodiousness, but in the intensity of his power to penetrate to the very heart of poetry. To him may also be most fitly applied the epithet clairvoyant. He is the first who published songs for voice and pianoforte, not songs with pianoforte accompaniment, thus finally asserting the identity of singer and accompanist in true lyrical interpretation.

The unerring sagacity of Brahms discerned that the pos- sibilities of song on the lines set by Schubert were far from being exhausted: his practical mind preferred to develop those pos- sibilities rather than to seek after strange and novel methods, conforming thus in song to his practice in other branches of composition. A broad melodic outline is for him an essential feature: equally essential is a fine contrapuntal bass. In form the majority of his songs follow the orthodox ABA pattern, the central portion being so organized as to offer, with the least possible introduction of new unrelated material, a heightened contrast with the opening portion by means of new treatment and new tonalities and at the same time to justify itself by producing the mood in which the return to the opening portion is felt as a logical necessity. Chromatic effects in Brahms's scheme of melody are rarely introduced till the middle section, the opening being almost invariably diatonic. It must however be admitted that Brahms's formal perfection involves occasion- ally an awkward handling of words, and that in a few instances (see Magelone-lieder, Nos. 3 and 6), they are frankly sacri- ficed to that formal development of his material which has been criticized in the cases of Mozart and Beethoven. No part of his songs deserves closer study than the few bars of instru- mental prelude and conclusion, in which is enshrined the very essence of his conception of a poem. It may almost be said that, since Schumann set the example, the first and the last word has passed from the voice to the instrument. Accompanist, like singer, must understand poetry as well as music: but with no composer is his responsibility greater than with Brahms. Complete mastery in close organization of form was allied in Brahms not only with the warmth and tenderness of romance, but with the imagination and insight of a profound thinker. Concentration of style and of thought have

nowhere in the whole history of song been combined on a plane so high as that which is reached, with all perfection of melodic and harmonic beauty, in " Schwermuth," " Der Tod das ist die kuhle Nacht," " Mit vierzig Jahren," " Am Kirchhof ," " O wiisst' ich doch den Weg zuriick " and the " Vier ernste Gesange," which closed the list of his 197 songs. The alliance to song of so dangerous a companion as philosophy, or at any rate of thoughts which are philosophical rather than lyrical, proved no obstacle to Brahms's equal success in the realm of romance. This side of his genius may be illustrated by numerous songs from the Magelone cycle (notably " Wie froh und frisch " and " Ruhe, suss, Liebchen ") and by others, of which " Liebestreu," " Die Mainacht," " Feldeinsamkeit," " Wie rafft' ich mich auf in der Nacht,"

" Minnelied " and " Wir wandelten " are a few examples picked at random.

It has already been indicated that Brahms was a deep student of Schubert. If he had not Schubert's absolute spontaneity of melody, he restored it to its Schubertian place of supreme importance. In spite of all the tendencies of his age he never shirked that supreme test of a composer, the power to originate and organize melody: but it is melody often of a type so severe in its outline and proportions as to repel those hearers who are unable to attain to his level of thought and feeling. All mere prettiness and elegance are as alien to his nature as even the slightest approach to sentimental weakness on the one hand, or to realistic scene-painting on the other, so that for the world at large his popularity is jeopardized by an attitude which is felt to be uncompromisingly lofty and severe. It has hardly yet had time to reconcile itself to the union of modern lyrical poetry with a style whose elaborate contrapuntal texture differs as much from the delicate polyphony of Schumann as that in its turn differed from the broad harmonic system of Schubert. But that Brahms was never difficult without reason, or elaborate when he might have been simple, appears plainly from the preference he felt for his slighter songs in the V olkstiimlich style and form, rather than for those which were durchcom- ponirt. He was strongly influenced by the Volkslieder of his country, the words of which he loved to repeat to himself, as they suggested ideas even for his instrumental compositions. His arrangements of Volkslieder mark an epoch in that field of work. 1

In the history of song Brahms's name is likely to stand for the closing of a chapter. It is difficult to conceive of more com- plete wdrk on lines that are essentially classical. The soundest traditions find in him their justification and their consummation. He has enshrined the best thought and the noblest feeling of his age in forms where elaboration and complexity of detail serve essential purposes of interpretation, and are never used as a brilliant

artifice to conceal foundations which are insecure.

It is not proposed to discuss the work and tendencies of contemporary German composers — of whom Felix Weingartner (b. 1863), Max Reger (b. 1873) and Richard Strauss have at- tracted the largest share of attention. The above summary, though necessarily incomplete and confined only to the most conspicuous names, may yet provide some points of view from which the songs of other countries than Germany may be re- garded, especially those in which German conceptions and German methods of technique have been dominant factors. Actual settings of German lyrics figure largely in the works of many non-German composers, and these it is hard to judge except by German standards. But, strongly as German influence has been felt in Russia, for instance, in Norway and in Finland, yet the last half century has seen the rise of more distinctly national schools of song in all these countries, and to this result the cult of the folk-song has very largely contributed. Glinka, Rimsky-Korsakov, Borodin, Balakirev, Cesar Cui (b. 1835), and Moussorgsky in Russia, Nordraak (1842-1866) and Grieg in Norway, Sibelius (b. 1865) in Finland, are conspicuous names in this connexion.

The Latin countries have, as is natural, been but little subject to German influences; of these France alone seems to be working her way towards a solution of artistic problems Modern which has interest for those who live beyond her French borders and which bears emphatically her own hall-Song. mark. The melodious style of Gounod, which has so powerfully affected composers like Massenet, Godard and Widor, has 'Their value may be tested by comparing them with the small volume containing arrangements by R. Franz, which are sympatheti- cally done but without inspiration, with those of Tappert, which are models of what such things ought not to be, and with the dull, uninviting work of A. Saran. Many of Reimann's arrangements, however, deserve cordial recognition as both sympathetic and scholarly. One fact emerges clearly from the study of folk-song arrangements, in Germany and elsewhere, that success depends upon qualities which are as rare as, and are seldom dissociated from, the power of original composition. Only a great composer can be a great arranger.

begun to yield during the last quarter of a century to tendencies which correspond closely with those of the impressionist move- ments in French literature and painting. The deeper side of the movement, in which a strong element of mysticism plays an important part, is represented in the best songs of Cesar Franck, Faure and Bruneau, a notable group of composers,

whose occasional extravagances are atoned for by original impressions of nature in her more unusual moods, and- by much that arrests attention both in thought and style. The songs of Duparc (b. 1848) and Vincent dTndy likewise repay study. Nothing can be clearer than that traditional methods were inadequate, if modern French poetry was to find interpretation in the sister sphere of music; but how far the work of composers such as those named is likely to be regarded as final, it is premature to ask. The world had hardly had time to feel at home with them before it was called upon to face what it is difficult not to regard as representing the extreme limits of impressionistic style in Debussy. We are still too much accustomed to melody and rhythm, to harmonies that have some intelligible principle in their successions, to judge securely of music which is neither melodious nor rhythmical nor in the accepted sense harmonious. We are still too much accustomed to music regulated by analys- able laws to feel at ease with music that seems, at any rate at present, to acknowledge none. Whether the work of Debussy is the beginning of a new epoch the future alone can decide, but it is permissible to feel apprehensive of an art which is based upon impressions rather than upon convictions; and the value of impressions is apt to be measured more by the degree in which they are fugitive, elusive, evanescent, or merely peculiar to the composer's temperament, than by the relation which they bear to permanent elements in nature or humanity. Hence in the modern school of song-writers, which finds its culmination in Debussy, the quality of unselfconsciousness is the one which seems most difficult for them to attain. In French art we are too often reminded how close the sublime is to the ridiculous, the dramatic to the theatrical, pathos to bathos, truth to paradox. Even in the quieter pictures we are conscious of a forced atmosphere, an unnatural calm, not the abiding peace of a landscape by Corot or Millet. Lastly, the opinion of Bruneau {La Musique francaise, p. 233) that prose will in time supplant poetry in drama and song is, at least to those to whom form is still an essential element of beauty, a disquieting omen for the future. The best qualities of the French nation, its unaffected gaiety, its sincerity, grace, humour, pathos, tenderness, are far more touchingly and truthfully revealed in the simple melodies of the countryside — or in the less pretentious songs (of which Bruneau and Massenet have given examples, as well as many others) formed upon their model.

Limitations of space do not form the only reason for dealing in a cursory manner with English songs of the 19th century. Modern A. more valid one is to be found in the absence, English until its two closing decades, of great names to Song. which can be attached the history of any orderly

development, of any well-conceived and definite ideals. The authors of the very limited number of good songs are too often the authors of others in larger quantities which are bad, and that not in every case owing to failure of inspiration but to a lowering of ideals in order to gratify the tastes of an unin- telligent public on the one hand, and the demands of exacting publishers on the other. That a healthier art might have arisen is indicated by the presence of such songs as Hatton's " To Anthea," Loder's unexpectedly fine setting of " The Brooklet " (the words of which Schubert had already immortalized in its original German version as " Wohin "), Sullivan's fresh and original settings of several Shakespearian lyrics, and of Tennyson's uninspired cycle of verses entitled " The Songs of the Wrens," and Clay's " I'll sing thee songs of Araby." The name of Sterndale Bennett stands out as that of a composer who remained steadfastly true to his ideals. His output was indeed a small one, and covered a somewhat limited range of style and feeling: but the thought, like the workmanship, is always of delicate and beautiful quality. Though Mendelssohn's influence is

apparent he has a touch which is all his own. " To Chloe in sickness," " Forget-me-not," " Gentle Zephyr " and " Sing, Maiden, sing," have certainly not yet lost their charm. Stern- dale Bennett marks the beginning of higher ideals in English song — but it is only within the last twenty-five years that we have begun to see their realization, owing to the training of many English musicians in German schools and to the increasing familiarity of the musical public with the best German Lieder. The lead has been taken by Parry and Stanford — composers who have published large numbers of songs in great variety of styles, and with uniform seriousness of aim and treatment. Parry's delightfully fresh early work is represented at its best . in " A Spring Song," " A Contrast," and " Why does azure deck the skies?" The transition to a later manner is marked by the four anacreontic odes; and several small volumes of lyrics have since made their appearance. If some of these miss the true lyrical note, of which absolute spontaneity is an essential condition, yet a lofty level of thought and workmanship is always manifest, rising to highest inspiration perhaps in " When we two parted," " Through the ivory gate," and " I'm weaving Sweet Violets." Stanford has essayed songs in many styles, suited to poems drawn from many periods, but he is most himself and most successful in Keats's weird and dramatic ballad " La Belle dame sans merci," in Browning's cavalier songs, in the cycle of sea songs (H. Newbolt) and above all in the Irish idyll (Moira O'Neill) — where in six pieces of rarest beauty the composer has revealed different phases of Irish feeling, pathos and humour with a poetical and imaginative power unequalled in British art. It is hard to imagine a more perfect alliance between poetry and music, from the general conception of each song down to the minutest detail of declamation, than is found here. As an arranger of Irish melodies — of

which four volumes have been published — Stanford has also shown himself a com- plete master. Cowen, Mackenzie and Elgar have contributed few songs worthy of reputations gained in larger forms of com- position. Of the work done and being done by younger com- posers much might be said. There is activity in many directions; a cycle of songs by Arthur Somervell from Tennyson's Maud is an artistic work of very real value, beautiful and original as music, and forming a highly interesting commentary upon the poem. R. Vaughan Williams, in the more difficult . task of setting six sonnets from Rossetti's House of Life and in three of Stevenson's Songs of Travel, has displayed imaginative qualities of a remarkable order. Not less original is the highly finished and poetical work of H. Walford Davies. Somewhat slighter in style and thought, but instinct with true lyrical tenderness and charm, are the songs of Roger Quilter, drawn mainly from the Elizabethan period, and the poems of Herrick. Various songs by Maude V. White, W. H. Hadow, Hamilton Harty, Harold Darke, Ernest Walker, Donald Tovey, William Wallace and others give evidence, with the work already men- tioned, of a revolution in the treatment and conception of song in England, which is full of promise for the future. Its fulfilment how r ever is likely to depend upon a change in the prevailing conditions, under which professional vocalists have a financial interest in popularizing inferior productions. Good songs, apart from the initial difficulty of finding a publisher, are thus penalized from the start, whilst the larger and less instructed portion of the public, which forms its taste upon what the singers of the day provide, remains ignorant of precisely those works which are most necessary for its enlightenment.

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Geschichte des deutscken Liedes, 1874) ! Schneider, Das musikalische Lied (1863) ; E. Walker, History of Music in England (1907) ; W. Nagel, Geschichte der Musik in England (1894-1897); C. J. Sharp, English Folk-songs, some Conclusions (1907) ; J. Tiersot, Histoire de la chanson populaire en France (1889) ; Lavoix, La Musique francaise (1891).

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The Song of Birds The characteristic modulated voice of birds is the outstanding example of natural " song " in the animal world. The essential requirements of a vocal organ, the pressure of vibratory mem- branes or chord, are found in the bird's syrinx (see Bird), but how these membranes act in particular, and how theii tension is modified by the often numerous syringeal muscles, we do not know. The voice of birds is produced entirely by the syrinx; the larynx no doubt modifies it, but the tongue seems to play no part in it. The " loosening of the tongue " by cutting its frenum; in order to assist a bird in talking &c, is an abso- lutely silly operation. The possession of the most elaborate syrinx is not enough to enable a bird to sing. In this respect they are like ourselves: special mental faculties are required to control the apparatus. Anatomically the raven has the same elaborate syrinx as the thrush or the nightingale, and yet the raven cannot " sing " although it can modulate its voice and can even learn to talk. As a rule the faculty of singing is restricted to the males, although the females

possess the same organs; moreover, birds vary individually. Some learn to sing marvellously well, while others remain tyros in spite of the best education. But given all the necessary mental faculties, birds sing only when they are in such a healthy condition that there is a surplus of energy. This, of course, is greatest during the time of propagation, when much of the surplus of the general metabolism comes out — to use homely words — in unwonted functions, such as dancing, posing, spreading of feathers and giving voice. Every one of these muscular exertions is a spasm, releasing some energy, and — again in homely parlance — relieving the mind. In many cases these antics and other manifestations become rhythmical, and music consists of rhythmical sounds. Of course birds, like other creatures, are to a certain extent reflex machines, and they often sing because they cannot help it, just as male frogs continue to croak long after the pairing season, and not necessarily because they or their mates appreciate those sounds. But birds stand mentally on such a high level that we can scarcely doubt that in many cases they enjoy, and therefore sing their song. Many a tame bird, a canary, starling, magpie, will repay its keeper with its song, out of season, for any kindness shown to it, or for his mere presence.

If we regard any sound made by a bird under the all-powerful influence of love or lust as its " song," then probably every bird is possessed of this faculty, but in the ordinary acceptance of the term very few, besides the oscines, can sing, and even this group contains many which, like the ravens and the crows,

are decidedly not songsters. On the other hand, it seems unfair not to call the charming series of notes of the dove its song.

D. Barrington in a very remarkable paper (" Experiments and Observations on the Singing of Birds," Phil. Trans., 1773, pp. 249-291) defines a bird's song " to be a succession of three or more different notes, which are continued without interruption during the same interval with a musical bar of four crotchets in an adagio movement, or whilst a pendulum swings four seconds." The late A. Newton (Ency. Brit., 9th ed., iii. 771; see also Diet. Birds, s.v. " Song," pp. 892-894), taking a much wider view of " song," proceeds as follows: —

" It seems impossible to draw any but an arbitrary line between the deep booming of the emeu, the harsh cry of the guillemot (which, when proceeding from a hundred or a thousand throats, strikes the distant ear in a confused murmur like the roar of a tumultuous crowd), the plaintive wail of the plover, the melo- dious whistle of the wigeon, ' the cock's shrill clarion/ the scream of the eagle, the hoot of the owl, the solemn chime of the bell-bird, the whip-cracking of the manakin, the chaffinch's joyous burst, or the hoarse croak of the raven, on the one hand, and the bleating

of the snipe or the drumming of the ruffled grouse, on the other. Innumerable are the forms which such utterances take. In many birds the sounds are due to a com- bination of vocal and instrumental powers, or, as in the cases last' mentioned, to the latter only. But, however produced— and of the machinery whereby they are accomplished there is not room here to speak — all have the same cause and the same effect. The former has been already indicated, and the latter is its consummation. Almost coinstantaneously with the hatch- ing of the nightingale's brood the song of the sire is hushed, and the notes to which we have for weeks hearkened with rapt admiration are changed to a guttural croak, expressive of alarm and anxiety, inspiring a sentiment of the most opposite character. No greater contrast can be imagined, and no instance can be cited which more completely points out the purpose which ' song ' fulfils in the economy of the bird, for if the nightingale's nest at this early time be destroyed or its contents removed, the cock speedily recovers his voice, and his favourite haunts again resound to his bewitching strains. For them his mate is content again to undergo the wearisome round of nest-building and incubation. But should some days elapse before disaster befalls their callow care, his constitution under- goes a change and no second attempt to rear a family is made. It would seem as though a mild temperature, and the abundance of food by which it is generally accompanied, prompt the phy- siological alteration which inspires the males of most birds to indulge in the ' song ' peculiar to them. Thus after the annual moult is accomplished, and this is believed.to be the most critical epoch in the life of any bird, cock thrushes, skylarks, and others begin to sing, not indeed with the jubilant voice of spring but in an uncertain cadence which is quickly silenced by the super- vention of cold weather. Yet some birds we have which, except during the season of moult, hard frost, and time of snow, sing almost all the year round. Of these the redbreast and the wren are familiar examples, and the chiffchaff repeats its two- noted cry, almost to weariness, during the whole period of its residence in this country.

" Akin to the ' song of birds,' and undoubtedly proceeding from the same cause, are the peculiar, gestures which the males of many perform under the influence of the approaching season of pairing, but these again are far too numerous here to describe with particularity. It must suffice to mention a few cases. The ruff on his hillock in a marsh holds a war-dance. The snipe and some of his allies mount aloft and wildly execute unlooked-for evolutions almost in the clouds. The woodcock and many of the goatsuckers beat evening after evening the same aerial path with its sudden and sharp turnings. The ring-dove rises above the neighbouring trees and then with motionless wings slides down to the leafy retreat they afford. The capercally and blackcock, perched on a commanding eminence, throw themselves into postures that defy the skill of the caricaturist — other

the strangest attitudes and run in circles till the turf is worn bare. The peacock in pride spreads his train so as to show how nearly akin are the majestic and the ludicrous. The bower- bird, not content with its own splendour, builds an arcade,, decked with bright feathers and shining shells, through and around which he paces with his gay companions. The larks and pipits never deliver their song so well as when seeking the upper air. Rooks rise one after the other to a great height and, turning on their back, wantonly precipitate themselves many yards towards the ground, while the solemn raven does not scorn a similar feat, and, with the tenderest of croaks, glides supinely alongside or in front of his mate."

The following may be cited as the principal treatises on the subject, besides Barrington's paper quoted above: J. Blackwall, Mem. Litt. Phil. Soc, Manchester (1824), pp. 289-323; also in Froriep's Nolizen (1825), col. 292-298; F. Savart, Memoir sur la voix des oiseaux, Froriep's Notizen (1826), col. I-10; C. L. Brehm, Naumannia (1855), pp. 54-59, 96-101, 181-195; and Journ. f. Ornith. (1855, PP- 34-8-35 1 : 1856, pp. 250-255); C. Gloger, Journ. f. Ornith. (1859), pp. 439-459; J. £. Harting, Birds of Middlesex (London, 1866), where the notes of many of the common English birds are musically expressed; J. A. Allen, Bull. Comp. Zool. Harvard (1871), ii. 166-450; L. Paolucci, // Canto degli uccelli (Milan, 1878), and Milano soc. ital. atti. 20 (1877), pp. 125-247; C. L. Hett, A Dictionary of Bird Notes (Brigg, 1898) ; C. A. Witchell, Bird-Song and its Scientific Teaching (Gloucester, 1892); F. S. Mathews, Field Book of Wild Birds and their Music (New York, 1904). See also W. Warde Fowler, A Year With the Birds (1886). (H. F. G.)

SONGHOI, Sonrhay, Surhai, &c, a great negroid race in- habiting a large tract of country on both banks of the middle Niger. They formed a distinct state from the 8th to the 16th century, being at one period masters of Timbuktu (q.v.) and the most powerful nation in the western Sudan. The origin of this people, who are said still to number some two millions, though their national independence is lost, has been a source of much dispute. Heinrich Barth, who has given the fullest account of them, reckoned them as aborigines of the Niger valley; but he also tried to connect them with the Egyptians. The people them- selves declare their original home to have been to the eastward, but it seems unlikely that they or their culture are to be connected at all with the Nile valley. According to the Tarik & Sudan, a 17th century history of the Sudan written by

Abderrahman Sadi of Timbuktu, the first king of the Songhoi was called Dialliaraan (Arabic Dia min al Jemen, " he is come from Yemen ") , and the account given in this Arabic manuscript leaves little doubt that he was an Arab adventurer who, as has been fre- quently the case, became chief of a negro people and led them westward. The Songhoi emigration must have begun towards the middle of the 7th century, for Jenne, their chief city, was founded one hundred and fifty years after the Hejira (about a.d. 765), and it represents the extreme western point in their progress. From a hundred to a hundred and twenty years would be about the time which must be allowed for the years of wandering and those of settlement and occupation in the Songhoi countries. In the north they have mixed with the Ruma " Moors," and in the south with the Fula. The Songhoi, then, are probably Sudanese negroes much mixed with Berber and even Arab blood, who settled among and crossed with the natives of the Niger valley, over whom they long ruled.

In their physique they bear out this theory. Although often as black as the typical West African, their faces are fre- quently more refined than those of pure negroes. The nose of the Songhoi is straight and long, pointed rather than flat; the lips are comparatively thin, and in profile and jaw "projection they are easily distinguishable from the well-known nigritic type. They are tall, well-made and slim. In character, too, they are a contrast to the merry light-heartedness of the true negro. Barth says that of all races he met in negroland they were the most morose, unfriendly and churlish. The Songhoi language, which, owing to its widespread use, is, with Hausa, called Kalam al Sudan ("language of the Sudan") by the Arabs, is often known as Kissur. According to Friedrich Muller it resembles in structure none of the neighbouring tongues, though its vocabulary shows Arab influence. Keane states that the language " has not the remotest connexion with any form

of speech known to have been at any time current in the Nile valley."

See Heinrich Barth, Travels and Discoveries in Northern and Central Africa (1857-1858); A. H. Keane, Man Past and Present (Cambridge, 1899); Brix Forster in Globus, lxxi. 193; Felix Dubois, Timbuctoo the Mysterious (1897); Lady Lugard, A Tropical Depen- dency (1905).

SONNEBERG, a town of Germany, in the duchy of Saxe- Meiningen, situated in a narrow valley of the Thuringian forest, 13 m. by rail N.E. of Coburg. Pop. (1905), 15,003. It is famous for its manufacture of toys; its other industries are the making of glass and porcelain articles, electrical works and breweries. The town possesses a fine Gothic church, and a hydropathic establishment.

SONNENTHAL, ADOLF VON (1834-1909), Austrian actor, was born of Jewish parentage in Budapest on the 21st of Decem- ber 1834. Though brought up in penury and apprenticed to a working tailor, he yet cultivated the histrionic art, and was fortunate in receiving the support of a co-religionist, the actor Bogumil Dawison, who trained him for the stage. He made his first appearance at Temesvar in 1851, and after engagements at Hermannstadt and Graz came in the winter of 1855-1856 to Konigsberg in Prussia, where his first performance was so successful that he was engaged by Heinrich Laube for the Burgtheater in Vienna, making his first appearance as Mortimer in Schiller's Maria Stuart. Under Laube's careful tuition he developed within three years into an actor of the first order, excelling both in tragedy and comedy; and in 1882, after 25 years of brilliant service at the Court Theatre, he was given a patent of nobility. In 1884 he became manager-in-chief of the theatre; and in -1887-1888 acted as artistic adviser. He visited the United States in 1885, and again in 1899 and 1902, achieving great success. His chief parts were Nathan in Lessing's Nathan der Weise, Wallenstein, and Der Meister von Palmyra.

SONNET (Ital. Sonetto, dim. of Suono, Fr. Sonnet). The sonnet in the literature of modern Europe is a brief poetic form of fourteen rhymed verses, ranged according to prescription. Although in a language like the English it does no doubt require considerable ingenuity to construct a satisfactory sonnet of octave and sestet running upon four rhymes, this ingenuity is only a means to an end, the end being properly that a single wave of emotion, when emotion is either too deeply charged with thought, or too much adulterated with fancy, to pass spon- taneously into the movements of pure lyric, shall be embodied in a single metrical flow and return. Whether any given sonnet be composed like that of Pier delle Vigne (of two quatrains with rhymes running a, b, a, b, a, b, a, b, and of two tercets with rhymes running, c, d, e, c, d, e), or whether the verses be arranged (on the authority of Shakespeare and Drayton) in three quatrains of alternate rhymes clinched by a couplet, or, as in the sonnet of Petrarch, in an octave of two rhymes and a sestet of either two or three rhymes — in each case the peculiar pleasure which the ear derives from the sonnet as a metrical form lies in the number and arrangement of the verses being prescribed, and distinctly recognizable as being prescribed. That the impulse to select for the rendering of single phases of feeling or reflection a certain recognized form is born of a natural and universal instinct is perhaps evidenced by the fact that, even when a metrical arrangement discloses no structural law demanding a prescriptive number and arrangement of verses, the poet will nevertheless, in certain moods, choose to restrict himself to a prescribed number and arrangement, as in the cases of the Italian stomello, the Welsh triban, and the beautiful rhymeless short ode of Japanese poetry. And perhaps, if we probed the matter deeply, we should find that the

recognized prescription of form gives a sense of oneness that nothing else save the refrain can give to a poem which, being at once too long for a stanza in a series and too short to have the self-sustaining power of the more extended kinds of poetic art, suffers by suggesting to the ear a sense of the fragmentary and the inchoate. It is not then merely the number of the verses, it is also their arrange- ment as to rhymes— an arrangement leading the ear to expect

a prescribed sequence and then satisfying that expectation — which entitles a form of fourteen verses to be called a sonnet.

Hence the so-called irregular sonnets of S. T. Coleridge, which lead the ear of the reader to expect the pleasure of a prescribed arrangement when what they have to offer is a pleasure of an exactly opposite kind — the pleasure of an absolute freedom from prescribed arrangement — are unsatisfactory, while (as the present writer has often pointed out) the same poet's fourteen-line poem, " Work without Hope," in which the reader expects and gets freedom from prescription, is entirely satisfactory. This same little poem of Coleridge's also affords an excellent illustration of another point in connexion with the sonnet. If we trace the history and the development of the sonnet from Pier delle Vigne to D. G. Rossetti we shall find that the poet's quest from the very first has been to write a poem in fourteen verses so arranged that they should, better than any other number and arrangement of verses, produce a certain melodic effect upon the ear, and an effect, moreover, that should bear iteration and reiteration in other poems similarly constructed. Now if we ask ourselves whether, beautiful as is this poem, " Work without Hope," taken as a single and original metrical arrangement, we should get out of a series of poems modelled line for line upon it that pleasure of iteration which we get out of a series of Petrarchan sonnets, we shall easily see why the regular sonnet of octave and sestet on the one hand : and what is called the Shakespearean sonnet on the other, have survived all other competing forms.

In modern Europe the sonnet has always had a peculiar fascination for poets of the first class — poets, that is, in whom poetic energy and plastic power are equally combined. It would seem that the very fact that the sonnet is a recognized structure suggestive of mere art — suggestive in some measure, indeed, of what Schiller would call " sport " in art — has drawn some of the most passionate poets in the world to the sonnet as the medium of their sincerest utterances. Without being coldly artificial, like the rondeau, the sestina, the ballade, the villanelle, &c, the sonnet is yet so

artistic in structure, its form is so universally known, recognized, and adopted as being artistic, that the too fervid spontaneity and reality of the poet's emotion may be in a certain degree veiled, and the poet can whisper, as from behind a mask, those deepest secrets of the heart which could otherwise only find expression in purely dramatic forms.

That the sonnet was invented, not in Provence, as French critics pretend, but in Italy in the 13th century, is pretty clear, but by whom is still perhaps an open question. S. Waddington and several other critics have attributed to Fra Guittone the honour of having invented the form. But J. A. Symonds has reminded us that the sonnet beginning Perd ch' amore, attributed to Pier delle Vigne, secretary of state in the Sicilian court of Frederick, has claims which no student of early Italian poetry can ignore.

As regards English sonnets, whether the Petrarchan and the Shakespearean are really the best of all possible forms we need not inquire. But, inasmuch as they have become so vital and so dominant over other sonnet forms that whenever we begin to read the first verse of an English sonnet we expect to find one or other of these recognized rhyme-arrangements, any departure from these two arrangements, even though the result be such a magnificent poem as Shelley's " Ozymandias," disappoints the expectation, baffles the ear, and brings with it that sense of the fragmentary and the inchoate to which we have before alluded. If, however, some writer should arise with sufficient originality of metrical endowment and sufficient poetic power to do what Keats, in a famous experiment of his, tried to do and failed — impress the public ear with a new sonnet structure, impress the public ear so powerfully that a new kind of expectance is created the moment the first verse of a sonnet is recited — then there will be three kinds of English sonnets instead of two.

With regard to the Petrarchan sonnet, all critics are perhaps now agreed that, while the form of the octave is invariable, the form of the sestet is absolutely free, save that the emotions should govern the arrangement of the verses. But as regards

the division between octave and sestet, Mark Pattison says, with great boldness, but perhaps with truth, that by blending octave with sestet Milton missed the very object and end of the Petrarchan scheme. Another critic, however, Hall Caine, contends that by making " octave flow into sestet without break of music or thought " Milton consciously or unconsciously in- vented a new form of sonnet; that is to say, Milton, in his use of the Petrarchan octave and sestet for the embodiment of intellectual substance incapable of that partial disintegration which Petrarch himself always or mostly sought, invented a species of sonnet which is English in impetus, but Italian, or, partially Italian, in structure. Hence this critic, like William

Sharp, divides all English sonnets into four groups: (1) sonnets of Shakespearean structure; (2) sonnets of octave and sestet of Miltonic structure; (3) sonnets of contemporary structure, i.e. all sonnets on the Petrarchan model in which the metrical and intellectual "wave of flow and ebb " (as originally formulated by the present writer in a sonnet on the sonnet, which has appeared in most of the recent anthologies) is strictly observed, and in which, while the rhyme-arrangement of the octave is invariable, that of the sestet is free; (4) sonnets of miscellaneous structure.

With regard to what is called the contemporary form — a Petrarchan arrangement with the sestet divided very sharply from the octave- — the crowning difficulty and the crowning triumph of the sonnet writer has always been to so handle the rhythm of the prescribed structure as to make it seem in each individual sonnet the inevitable and natural rhythm demanded by the emotion which gives the individual sonnet birth, and this can perhaps only be achieved when the richness and apparent complexity of the rhyme-arrangement is balanced by that perfect lucidity and simplicity of syntax which is the special quest of the " sonnet of flow and ebb."

The wave theory has found acceptance with such students of the sonnet as Rossetti and Mark Pattison, J. A. Symonds, Hall Caine, and William Sharp. Symonds, indeed, seems to hint that the very name given by the Italians to the two tercets, the volta or turn, indicates the metrical meaning of the form. " The striking metaphorical symbol," says he, " drawn from the observation of the swelling and declining wave can even in some examples be applied to sonnets on the Shakespearean model; for, as a wave may fall gradually or abruptly, so the sonnet may sink with stately volume or with precipitate subsidence to its close. Rossetti furnishes incomparable examples of the former and more desirable conclusion; Sydney Dobell, in ' Home in War Time,' yields an extreme specimen of the latter."

And now as to the Shakespearean sonnet. Some very acute critics have spoken as if this form were merely a lawless succes- sion of three quatrains clinched by a couplet, and as if the number of the quatrains might just as well have been two or four as the present prescribed number of three. If this were so, it would unquestionably be a serious impeachment of the Shakespearean sonnet, for, save in the poetry of ingenuity, no metric arrangement is otherwise than bad unless it be the result of a deep metrical necessity.

If the prescriptive arrangement of three quatrains clinched by a couplet is not a metrical necessity, if it is not demanded in order to prevent the couplet from losing its power, such an arrangement is idle and worse than idle; just as in the case of the Petrarchan sonnet, if it can be shown that the

solid unity of the outflowing wave can be maintained as completely upon three rhymes as upon two, then the restriction of the octave to two rhymes is simple pedantry. But he who would test the metrical necessity of the arrangement in the Shakespearean sonnet has only to make the experiment of writing a poem of two quatrains with a couplet, and then another poem of four quatrains with a couplet, in order to see how inevitable is the metrical necessity of the Shakespearean number and arrange- ment for the achievement of the metrical effect which Shakespeare, Drayton and others sought. While in the poem of two quat- rains the expected couplet has the sharp epigrammatic effect of the couplet in ordinary stanzas (such as that of ottava rima,

and as that of the " Venus and Adonis " stanza), destroying that pensive sweetness which is the characteristic of the Shake- spearean sonnet, the poem of four quatrains is just sufficiently long for the expected pleasure of the couplet to be dispersed and wasted.

The quest of the Shakespearean sonnet is not, like that of the sonnet of octave and sestet, sonority, and, so to speak, metrical counterpoint, but sweetness; and the sweetest of all possible arrangements in English versification is a succession of decasyllabic quatrains in alternate rhymes knit together and clinched by a couplet — a couplet coming not so far from the initial verse as to lose its binding power, and yet not so near the initial verse that the ring of epigram disturbs the " linked sweetness long drawn out " of this movement, but sufficiently near to shed its influence over the poem back to the initial verse. A chief part of the pleasure of the Shakespearean sonnet is the expectance of the climacteric rest of the couplet at the end (just as a chief part of the pleasure of the sonnet of octave and sestet is the expectance of the answering ebb of the sestet when the close of the octave has been reached); and this expectance is gratified too early if it comes after two quatrains, while if it comes after a greater number of quatrains than three it is dispersed and wasted altogether.

The French sonnet has a regular Petrarchan octave with a sestet of three rhymes beginning with a couplet. The Spanish sonnet is also based on the pure Italian type, and is extremely graceful and airy. The same may be said of the Portuguese sonnet — a form of which the illustrious Camoens has left nearly three hundred examples. (T. W.-D.)

See also English Literature: 3. Elizabethan; Sidney Lee on the Elizabethan sonnet in Arber's English Garner (1904) ; J. A. Noble, The Sonnet in

England (1893) ; M. Jasinski, Histoire du sonnet en France (1903) ; C. A. Lentzner, Das Sonnett in d. eng. Dichtung bis Milton (1886); S. Waddington, English Sonnets by Living Writers (188.1), and Sonnets of Europe (1886) ; T. Hall Caine, Sonnets of Three Centuries (1882) ; William Sharp, Sonnets of this Century (1886), and American Sonnets (1889) ; John Dennis, English Sonnets (1873).

SONNINO, SIDNEY, Baron (1847-), Italian statesman and financier, was born at Florence on the nth of March 1847. Entering the diplomatic service at an early age, he was appointed successively to the legations of Madrid, Vienna, Berlin and Versailles, but in 1871 returned to Italy, to devote himself to political and social studies. On his own initiative he conducted exhaustive inquiries into the conditions of the Sicilian peasants and of the Tuscan mUayers, and in 1877 published in co-operation with Signor Leopoldo Franchetti a masterly work on Sicily {La Sicilia, Florence, 1877). In 1878 he founded a weekly economic review, La Rassegna Seitimanale, which four years later he con- verted into a political daily journal. Elected deputy in 1880, he distinguished himself by trenchant criticism of Magliani's finance, and upon the fall of Magliani was for some months, in 1889, under-secretary of state for the treasury. In view of the severe monetary crisis of 1893 he was entrusted by Crispi with the portfolio of finance (December 1893), and in spite of determined opposition dealt energetically and successfully with the deficit of more than £6,000,000 then existing in the exchequer. By abolishing the illusory pensions fund, by applying and amending the Bank Laws, effecting economies, and increasing taxation upon corn, incomes from consolidated stock, salt and matches, he averted national bankruptcy, and placed Italian finance upon a sounder basis than at any time since the fall of the Right. Though averse from the policy of unlimited colonial expansion, he provided by a loan for the cost of the Abyssinian War in which the tactics of General Baratieri had involved the Crispi cabinet, but fell with Crispi after the disaster at Adowa (March 1896). Assuming then the leadership of the constitutional opposition, he combated the alliance between the Di Rudini cabinet and the subversive parties, criticized the financial schemes of the treasury minister, Luzzatti, and opposed the " democratic " finance of the fast PeWonx administration as likely to endanger financial stability. After the modification of the Pelloux cabinet (May 1899) he became leader of the ministerial majority, and bore the brunt of the struggle

against Socialist obstruction in connexion with the Public Safety Bill. Upon the formation of the Zanardelli cabinet (Feb. 1901) he once more became leader of the constitutional opposition, and in the autumn of the year founded a daily organ, // Giornale d' Italia, the better to propagate moderate Liberal ideas. Although highly esteemed for his integrity and genuine ability, it was not until February 1906 that he was called upon to

form a ministry, on the fall of the Fortis cabinet. He immedi- ately set about introducing certain urgent reforms, suppressed all subsidies to the press, and declared his intention of governing according to law and justice. In May, however, an adverse vote of the Chamber on a purely technical matter led to his resignation.

SONORA, a northern state of Mexico, bounded N. by the United States, E. by Chihuahua, S. by Sinaloa and W. by the Gulf of California. It is the second largest state in the republic, having an area of 76,900 sq. m. Pop. (1900), 221,682, a large part being Indian. The surface of the state is much broken by the Sierra Madre Occidental, which extends through it from north to south and covers its entire width with parallel ranges, enclosing fertile valleys. Four important rivers traverse the state from east to west with courses of 145 to 390 m. and discharge into the Gulf of California, viz.: the Altar, or Asuncion, Sonora, Yaqui and Mayo. The longest is the Yaqui, which has its source on the eastern side of the Sierra Tarahumare in Chihuahua and breaks through several ranges of the Sierra Madre before reaching the gulf near Guaymas. The smaller tributaries of these rivers of Sonora are often only dry canyons in the dry season. Agriculture has been developed only to a limited extent in Sonora, because of its aridity, lack of irrigation facilities, lack of railways and roads, and the unsettled state of the country. The soil of the sierra valleys is fertile, and when it is irrigated forage and cereal crops may be grown in abundance. Sugar- cane, tobacco, maguey, cotton, in small quantities, and fruits are also produced. There are excellent pasture lands, especially in the upland districts, and stock-raising is an important and profitable industry. Land is held in large estates, some of them upwards of 100 sq. m. in area. The mineral resources include silver, gold, copper, lead, tin, iron and coal, and mining is the chief industry. The lack of transportation facilities has been partly relieved by the construction of a branch of the Southern Pacific (American) from Nogales southward to Guaymas and the Sinaloa frontier, from which it has been extended to Mazatlan. Guaymas is the only port of importance on the coast, but it has a large trade and is visited by the steamers of several lines. The capital of the state (since 1882) is Hermosillo (pop. 1900, 17,618), on the Sonora river, no m. north of Guaymas, with which it is connected by rail. It suffered much in 1865-1866 from the savage struggle between Imperialists and Repub- licans, and in subsequent partisan warfare. Other important towns are Alamos (pop. 1895, 6197), 132 m. E.S.E. of Guaymas, Moctezuma, 90 m. north of Hermosillo, and Ures, the old capital of Sonora and seat of a bishopric, 33 m. north- east of Hermosillo.

The first Jesuit mission in Sonora, founded among the Mayos in 1613, seems to have been the first permanent settlement in the state, although Coronado passed through it and its coast had been visited by early

navigators. The hostility of certain tribes prevented its rapid settlement. Ures was founded in 1636, and Arizpe in 1648. Near the end of the century Sonora and Sinaloa were divided into two districts, in 1767 the Jesuit missions were secularized, in 1779 the government of the province was definitely organized by Caballero de Croix, and in 1783 Arizpe became the provincial capital. The bishopric of Sonora was created in 1781 with Arizpe as its seat. Up to this time the history of the province is little else than a record of savage warfare with the Apaches, Seris, Yaquis and other tribes. The development of rich gold and silver mines brought in more Spanish settlers, and then the record changes to one of partisan - warfare, -which continued down to the administration 1 of President Porfvrio "Diaz. 1 SONPUR, a feudatory state of India, in the Orissa division

of Bengal, to which it was transferred from the Central Provinces

in 1905. Area, 906 sq. m. Pop. (1901), 169,877, showing a decrease of 13% in the decade, due to the results of famine. Estimated revenue £8000, tribute £600. The chief is a Rajput of the Patna line. Rice and timber are exported, and iron ore is said to abound. The town of Sonpur is on the Mahanadi river just above the point where it enters Orissa. Pop. (1901),

8887.

SONSONATE, the capital of the department of Sonsonate, Salvador; on the river Sensunapan and the railway from San Sal- vador to the Pacific port of Acajutla, 13 m. south. Pop. (1905), about 17,000. Sonsonate is the centre of a rich agricultural district, and one of the busiest manufacturing towns in the republic. It produces cotton cloth, pottery, mats and baskets, boots and shoes, sugar, starch, cigars and spirits. Through Acajutla it exports coffee and sugar, and imports grain for distribution to all parts of the interior.

SOOT (0. Eng. sot, cf. Icel. sot, Dan. sod; possibly from root sed, to sit), the black substance produced in the process of the combustion of fuel and deposited in finely granulated particles on the interior of chimneys or pipes through which the smoke passes. Soot is a natural nitrogenous manure (q.v.), and its value depends on the ammonia salts contained in it.

SOPHIA (1630-1714), electress of Hanover, twelfth child of Frederick V., elector palatine of the Rhine, by his wife Elizabeth, a daughter of the English king James I., was born at the Hague on the 14th of October 1630.

Residing after 1649 at Heidelberg with her brother, the restored elector palatine, Charles Louis, she was betrothed to George William afterwards duke of Liineburg-Celle; but in 1658 she married his younger brother, Ernest Augustus, who became elector of Brunswick-Liineburg, or Hanover, in 1692. Her married life was not a happy one. Her husband was unfaithful; three of her six sons fell in battle; and other family troubles included an abiding hostility between her and Sophia Dorothea, the wife of her eldest son, George Louis. Sophia became a widow in 1698, but before then her name had been mentioned in connexion with the English throne. When considering the Bill of Rights in 1689 the House of Commons refused to place her in the succession, and the matter rested until 1 700 when the state of affairs in England was more serious. William III. was ill and childless; William, duke of Gloucester, the only surviving child of the princess Anne, had just died. The strong Protestant feeling in the country, the danger from the Stuarts, and the hostility of France, made it imperative to exclude all Roman Catholics from the throne; and the electress was the nearest heir who was a Protestant. Accordingly by the Act of Settlement of 1701 the English Crown, in default of issue from either William or Anne, was settled upon " the most excellent princess Sophia, electress and duchess- dowager of Hanover " and " the heirs of her body, being Pro-testant." Sophia watched affairs in England during the reign of Anne with great interest, although her son, the elector George Louis, objected to any interference in that country, and Anne disliked all mention of her successor. An angry letter from Anne possibly hastened Sophia's death, which took place at Herrenhausen on the 8th of June 17 14; less than two months later her son, George Louis, became king of Great Britain and Ireland as George I. on the death of Anne. Sophia, who corre- sponded with Leibnitz, was a strong woman both mentally and physically, and possessed wide and cultured tastes.

See Memoiren der Kurfiirstin Sophie von Hannover, edited by A. KScher (Leipzig, 1879; Eng. trans., 1888); Briefwechsel der JJerzogin Sophie von Hannover mil ihrem Bruder, &c, edited by E. Bodemann (Leipzig, 1885 and 1888) ; L. von Ranke, Aus den Briefen der Herzogin von Orleans, Elisabeth Charlotte, an die Kurfiirstin Sophie von Hannover (Leipzig, 1870) ; E. Bodemann, A us den Briefen der Herzogin, Elisabeth Charlotte von Orleans, an die Kurfiirstin Sophie von Hannover (Hanover, 1891); R. Fester, Kurfiirstin Sophie von Hannover (Hamburg, 1893); A. W. Ward, The Electress Sophia and the Hanoverian Succession (London, 1909) ; O. Klopp, Der Fall des Houses Stuart (Vienna, 1875-1888); Correspondance de Leibnitz avec I'electrice Sophie, edited by O. Klopp (Hanover, 1864-1875) ; and R. S. Rait, Five Stuart Princesses (London, 1902).

SOPHIA ALEKSYEEVNA (1657-1704), tsarevna and regent of Russia, was the third daughter of Tsar Alexius and Maria xxv. 14

Miloslavskaya. Educated on semi-ecclesiastical lines by the learned monk of Kiev, Polotsky, she emancipated herself betimes from the traditional tyranny of the terem, or women's quarters. Setting aside court etiquette, she had nursed her brother Tsar Theodore III. in his last illness, and publicly appeared at his obsequies, though it was usual only for the widow of the deceased and his successor to the throne to attend that ceremony. Three days after little Peter, then in his fourth year, had been raised to the throne, she won over the stryeltsy, or musketeers, who at her instigation burst into the Kreml, murdering everyone they met, including Artamon Matvyeev, Peter's chief supporter, and Ivan Naruishkin, the brother of the tsaritsa-regent Natalia, Peter's mother (May 15-17, 1682). When the rebellion was over there was found to be no government. Everyone was panic-stricken and in hiding except Sophia, and to her, as the only visible representative of authority, the court naturally turned for orders. She took it upon herself to pay off and pacify the stryeltsy, and secretly worked upon them to present (May 29) a petition to the council of state to the effect that her half-brother Ivan should be declared senior tsar, while Peter was degraded into the junior tsar. As Ivan was hopelessly infirm and half idiotic, it is plain that the absurd duumvirate was but a stepping-stone to the ambition of Sophia, who thus became the actual ruler of Russia. The stryeltsy were not only pardoned for their atrocities, but petted. A general amnesty in the most absolute terms was granted to them, and at their special request a triumphal column was erected in the Red Square of the Kreml, to commemorate their cowardly massacre of the partisans of Peter. When, however, instigated by their leader Prince Ivan Khovansky, who is suspected to have been aiming at the throne himself, and supported by the reactionary elements of the population, conspicuous among whom were the raskolniks or dissenters, they proceeded on the 5th of July to the great reception-hall of the palace in the Kreml to present a petition against all novelties, Sophia boldly faced them. Supported by her aunts and the patriarch, and secretly assured of the support of the orthodox half of the stryeltsy, she forbade all discussion and browbeat the rebels into submission. A later attempt on the part of Khovansky to overthrow her was anticipated and severely punished. By the 6th of November Sophia's triumph was complete. The conduct of foreign affairs she committed entirely to her paramour, Prince Vasily Golitsuin, while the crafty and experienced clerk of the council, Theodore Shaklovity, looked after domestic affairs and the treasury. Sophia's fond- ness for Golitsuin induced her to magnify his barely successful campaigns in the Crimea into brilliant triumphs which she richly rewarded, thus disgusting everyone who had the honour of the nation at heart. Most of the malcontents rested their hopes for the future on the young tsar Peter, who was the first to benefit by his sister's growing unpopularity. Sophia was shrewd enough to recognize that her position was becoming very insecure. When Peter reached man's estate

she would only be in the way, and she was not the sort of woman who is easily thrust aside. She had crowned her little brothers in order that she might reign in their names. She had added her name to theirs in state documents, boldly subscribing herself " Sovereign Princess of all Russia." She had officially informed the doge of Venice that she was the co-regent of the tsars. And now the terrible term of her usurped authority was approaching. In her extremity she took council of Shaklovity, and it was agreed (1687) between them that the stryeltsy should be employed to dethrone Peter. The stryeltsy, however, received the whole project so coldly that it had to be abandoned. A second con- spiracy to seize him in his bed (August 1689) was betrayed to Peter, and he fled to the fortress-monastery of Troitsa. Here all his friends rallied round him, including the bulk of the magnates, half the stryeltsy, and all the foreign mercenaries. From the 1 2th of August to the 7th of September Sophia endea- voured to set up a rival camp in the Kreml; but all her professed adherents gradually stole away from her. She was compelled I to retire within the Novo-Dyeyichy monastery, but without

taking the veil. Tsiine years later (1698), on suspicion of being concerned in the rebellion of the stryeltsy, she was shorn a nun and imprisoned for life under military supervision. As " Sister Susannah " she disappeared from history. Russian historians are still divided in their opinion concerning this extraordinary woman. While some of them paint her in the darkest colours as an unprincipled adventuress, the representative of a new Byzantinism, others simply regard her as the victim of circum- stances. Others, more indulgent still, acquit her of all blame; and a few, impressed by her indisputable energy and ability, evade a decision altogether by simply describing her as a prodigy. See J. E. Zabyelin, Domestic Conditions of the Russian Princes (Rus. ; Moscow, 1895) ; N. G. Ustryalov, History of the Reign of Peter the Great (Rus.; Petersburg, 1858); N. Y. Aristov, The Moscow Rebellions during the Regency of Sophia (Rus.; Warsaw, 1871); R. N. Bain, The First Romanovs (London, 1903). (R. N. B.)

SOPHIA DOROTHEA (1666-1726), wife of George Louis, elector of Hanover (George I. of England), only child of George William, duke of Brunswick-Luneburg-Celle, by a Huguenot lady named Eleanore d'Olbreuze (1639-1722), was born on the 15th of September 1666. George William had undertaken to remain unmarried, but his desire to improve the status of his mistress (whom in spite of his promise he married in 1676) and of

his daughter greatly alarmed his relatives, as these proceedings threatened to hinder the contemplated union of the Ltineburg territories. However, in 1682, this difficulty was bridged over by the marriage of Sophia Dorothea with her cousin George Louis, son of Duke Ernest Augustus, who became elector of Hanover in 1692. This union was a very unhappy one. The relatives of George Louis, especially his mother, the electress Sophia, hated and despised his wife, and this feeling was soon shared by the prince himself. It was under these circumstances that Sophia Dorothea made the acquaintance Qf Count Philipp Christoph von Konigsmark (q.v.), with whom her name is inseparably associated. Konigsmark assisted her in one or two futile attempts to escape from Hanover, and rightly or wrongly was regarded as her lover. In 1694 the count was assassinated, and the princess was divorced and imprisoned at Ahlden, remaining in captivity until her death on the 23rd of November 1726. Sophia Dorothea is sometimes referred to as the " princess of Ahlden." Her two children were the English king, George II., and Sophia Dorothea, wife of Frederick William I. of Prussia, and mother of Frederick the Great. Sophia's infidelity to her husband is not absolutely proved, as it is probable that the letters which purport to have passed between Konigsmark and herself are forgeries.

See Briefwechsel des Graf en Konigsmark und der Prinzessin Sophie Dorothea von Celle, edited by W. F. Palmblad (Leipzig, 1847) ; A. F. H. Schaumann, Sophie Dorothea Prinzessin von Ahlden, and Kurfiirstin Sophie von Hannover (Hanover, 1878) ; C. L. von Pollnitz, Histoire secrette de la duchesse d'Hanovre (London, 1732); W. H. Wilkins, The Love of an Uncrowned Queen (London, 1900) ; A. Kocher, " Die Prinzessin von Ahlden," in the Historische Zeitschrift (Munich, 1882); Vicomte H. de Beaucaire, Une Mesalliance dans la maison de Brunswick (Paris, 1884); and A. D. Greenwood, Lives of the Hanoverian Queens of England (1909), vol. i.

SOPHISTS (from Gr.

be, and in general were, regarded as sophists; but, as they conceived truth — so far as it was attainable — rather than success in life, in the law court, in the assembly, or in debate, to be the right end of intellectual effort, they were at variance with their rivals, and are commonly ranked by historians, not with the sophists, who confessedly despaired of knowledge, but with the philosophers, who, however unavailingly, continued to seek it. With the establishment of the great philosophical schools — first, of the Academy, next of the Lyceum — the philo- sophers took the place of the sophists as the educators of Greece. The sophistical movement was then, primarily, an attempt to provide a general or liberal education which should supple- ment the customary instruction in reading, writing, gymnastic and music. But, as the sophists of the first period chose for their

instruments grammar, style, literature and oratory, while those of the second and third developments were professed rhetoricians, sophistry exercised an important influence upon . literature. Then again, as the movement, taking its rise in the philosophical agnosticism which grew out of the early physical systems, was itself persistently sceptical, sophistry may be regarded as an interlude in the history of philosophy. Finally, the practice of rhetoric and eristic, which presently became prominent in sophistical teaching, had, or at any rate seemed to have, a mischievous effect upon conduct; and the charge of seeking, whether in exposition or in debate, not truth but victory — which charge was impressively urged against the sophists by Plato — grew into an accusation of holding and teaching immoral and unsocial doctrines, and in our own day has been the subject of eager controversy.

1. Genesis and Development of Sophistry. — Sophistry arose out of a crisis in philosophy. The earlier Ionian physicists, Thales, Anaximander and Anaximenes, in their attempts to trace the Multiplicity of things to a single material element, had been troubled by no misgivings about the possibility of knowledge. But, when Heraclitus to the assumption of fire as the single material cause added the doctrine that all things are in perpetual flux, he found himself obliged to admit that things cannot be known. Thus, though, in so far as he asserted his fundamental doctrine without doubt or qualification, he was a dogmatist, in all else he was a sceptic. Again, the Eleatic Parmenides, deriving from the theologian Xenophanes the distinction between kmoTijixT) and 86i;a, conceived that, whilst the One exists and is the object of knowledge, the Multiplicity of things becomes and is the object of opinion; but, when his successor Zeno provided the system with a logic, the consistent application of that logic resolved the fundamental doctrine into the single proposition " One is One," or, more exactly, into the single identity " One One." Thus Eleaticism. though professedly dogmatic, was inconsistent in its theory of the One and its attributes, and openly sceptical in regard to the world of nature. Lastly, the philosophers of the second physical succession — Empedocles, Anaxagoras, Leucippus — not directly attack- ing the great mystery of the One and the Many, but in virtue of a scientific instinct approaching it through the investigation of phenomena, were brought by their study of sensation to perceive and to proclaim the inadequacy of the organs of sense. Thus they too, despite their air of dogmatism, were in effect sceptics. In short, from different standpoints, the three philosophical successions had devised systems which were in reality sceptical, though they had none of them recognized the sceptical inference.

Towards the middle of the 5th century, however, Protagoras of Abdera, taking account of the teaching of the first, and possibly of the second, of the physical successions, and Gorgias of Leontini, starting from the teaching

of the metaphysical succession of Elea, drew that sceptical inference from which the philosophers had shrunk. If, argued Protagoras in a treatise entitled Truth, all things are in flux, so that sensation is sub- jective, it follows that " Man is the measure of all things, of what is, that it is, and of what is not, that it is not "; in other words, there is no such thing as objective truth. Similarly, Gorgias, in a work On Nature, or on the Nonent, maintained

(a) that nothing is, (b) that, if anything is, it cannot be known, (c) that, if anything is and can be known, it cannot be expressed in speech; and the summaries which have been preserved by Sextus Empiricus (Adv. Math. vii. 65-87) and by the author of the De Melisso, &c. (chs. 5, 6), show that, in defending these propositions, Gorgias availed himself of the arguments which Zeno had used to discredit the popular belief in the existence of the Many; in other words, that Gorgias turned the destructive logic of Zeno against the constructive ontology of Parmenides, thereby not only reducing Eleaticism to nothingness, but also, until such time as a better logic than that of Zeno should be provided, precluding all philosophical inquiry whatsoever. Thus, whereas the representatives of the three successions had continued to regard themselves as philosophers or seekers after truth, Protagoras and Gorgias, plainly acknowledging their defeat, withdrew from the ungrateful struggle.

Meagre as were the results which the earlier thinkers had obtained, the extinction of philosophy just at the time when the liberal arts became more technical and consequently less available as employments of leisure, threatened to leave a blank in Hellenic life. Accordingly Protagoras, while with the one hand he put away philosophy, with the other offered a substitute. Emphasizing the function of the teacher, which with the philo- sophers had been subordinate, and proclaiming the right end of intellectual endeavour to be, not " truth " (&Xij0eia) or "wisdom" (ta), which was unattainable, but "virtue" or " excellence " (aperq), he sought to communicate, not a theory of the universe, but an aptitude for civic life. " The lesson which I have to teach," Plato makes him say (Prot. 318 E), " is prudence or good counsel, both in respect of domestic matters that the man may manage his household aright, and in respect of public affairs, that he may be thoroughly qualified to take part, both by deed and by word, in the business of the state. In other words, I profess to make men good citizens." As instruments of education Protagoras used grammar, style, poetry and oratory. Thus, whereas hitherto the young Greek, having completed his elementary training in the schools of the ypan(iaTi(jTT]s, the KiBapitTTris,

and the TrcuSoTpifiris, was left to prepare himself for his life's work as best he might, by philo- sophical speculation, by artistic practice, or otherwise, one who passed from the elementary schools to the lecture-room of Protagoras received from him a " higher education." The programme was exclusively literary, but for the moment it enabled Protagoras to satisfy the demand which he had discovered and evoked. Wherever he went, his lecture-room was crowded with admiring pupils, whose homage filled his purse and enhanced his reputation.

After Protagoras the most prominent of the literary sophists was Prodicus of Ceos. Establishing himself at Athens, he taught " virtue " or " excellence," in the sense attached to the word by Protagoras, partly by means of literary subjects, partly in discourses upon practical ethics. It is plain that Prodicus was an affected pedant; yet his simple conventional morality found favour, and Plato (Rep. 600 C) couples him with Protagoras in his testimony to the popularity of the sophists and their teaching.

At Athens, the centre of the intellectual life of Greece, there was soon to be found a host of sophists; some of them strangers, others citizens; some of them bred under Protagoras and Prodicus, others self-taught. In the teaching of the sophists of this younger generation two points are observable. First, their independence of philosophy and the arts being assured, though they continued to regard " civic excellence " as their aim, it was no longer necessary for them to make the assertion of its claims a principal element in their exposition. Secondly, for the sake of novelty they extended their range, including scientific and technical subjects, but handling them, and teaching their pupils to handle them, in a popular way. In this stage of sophistry then, the sophist, though not a specialist, trenched upon the provinces of specialists; and accordingly Plato (Trot. 318 E) makes Protagoras pointedly refer to sophists who, " when young men have made their escape from the arts, plunge them

once more into technical study, and teach them such subjects as arithmetic, astronomy, geometry and music." The sophist of whom the Platonic Protagoras is here thinking was Hippias of Elis,who gave popular lectures, not only upon the four subjects just mentioned, but also upon grammar, . mythology, family history, archaeology, Homerology and the education of youth. In this polymath we see at once the degradation of the sophistry of culture and the link which connects Protagoras and Prodicus with the eristics, who at a later period taught, not, like Hippias, all branches of learning, but a universally applicable method of disputation.

Meanwhile, Gorgias of Leontini, who, as has been seen, had studied and rejected the philosophy of western Greece, gave to sophistry a new direction

by bringing to the mother country the technical study of rhetoric — especially forensic rhetoric (Plato, Gorg. 454 B; cf. Aristotle, JRJiet. 1354, b 26) — which study had begun in Sicily with Corax and Tisias nearly forty years before. Gorgias was already advanced in years and rich in honours when, in 427, he visited Athens as the head of an embassy sent to solicit aid against Syracuse. Received with acclamation, he spent the rest of his long life in central Greece, winning applause by the display of his oratorical gifts and acquiring wealth by the teaching of rhetoric. There is no evi- dence to show that at any period of his life he called himself a sophist; and, as Plato (Gorg. 449 A) makes him describe himself as a l>i]Toip, it is reasonable to suppose that he preferred that title. That he should do so was only natural, since his position as a teacher of rhetoric was already secure when Protagoras made his first appearance in the character of a sophist; and, as Protagoras, Prodicus and the rest of the sophists of culture offered a comprehensive education, of which oratory formed only a part, whilst Gorgias made no pretence of teaching " civic excellence " (Plato, Meno, 95 C), and found a substitute for philosophy, not in literature generally, but in the professional study of rhetoric alone, it would have been convenient if the distinction between sophistry and rhetoric had been maintained. But though, as will be seen hereafter, these two sorts of educa- tion were sometimes distinguished, Gorgias and those who succeeded him as teachers of rhetoric, such as Thrasymachus of Chalcedon and Polus of Agrigentum, were commonly called by the title which Protagoras had assumed and brought into familiar use.

Rhetorical sophistry, as taught by Gorgias with special reference to the requirements of the law courts, led by an easy transition to political sophistry. During the century which had elapsed since the expulsion of the Peisistratids and the establish- ment of the democracy, the Athenian constitution had developed with a rapidity which produced an oligarchical reaction, and the discussion of constitutional principles and precedents, always familiar to the citizen of Athens, was thus abnormally stimulated. The Peloponnesian War, too, not only added a deeper interest to ordinary questions of policy, but also caused the relations of dissentient parties, of allied and belligerent states, of citizens and aliens, of bond and free, of Greeks and barbarians, to be eagerly debated in the light of present experience. It was only natural then that some of those who professed to prepare young Athenians for public life should give to their teaching a distinctively political direction; and accordingly we find Isocrates recognizing teachers of politics, and discriminating them at once from those earlier sophists who gave popular instruction in the arts and from the contemporary eristics. To this class, that of the political sophists, may be assigned Lycophron, Alcidamas and Isocrates himself. For, though that celebrated personage would have liked to be called, not " sophist " but "

political philosopher," and tried to fasten the name of " sophist " upon his opponents the Socratics, it is clear from his own statement that he was commonly ranked with the sophists, and that he had no claim, except on the score of superior popu- larity and success, to be dissociated from the other teachers of political rhetoric. It is true that he was not a political sophist of the vulgar type, that as a theorist he was honest and patriotic, and that, in addition to his fame as a teacher, he

had a distinct reputation as a man of letters; but he was a professor of political rhetoric, and, as such, in the phraseology of the day, a sophist. He had already reached the height of his fame when Plato opened a rival school at the Academy, and pointedly attacked him in the Gorgias, the Phaedrus and the Republic. Thenceforward, there was a perpetual controversy between the rhetorician and the philosopher, and the struggle of educational systems continued until, in the next generation, the philosophers were left in possession of the field.

While the sophistry of rhetoric led to the sophistry of politics, the sophistry of culture led to the sophistry of disputation. It has been seen that the range of subjects recognized by Protagoras and Prodicus gradually extended itself, until Hippias professed himself a teacher of all branches of learning, including in his list subjects taught by artists and professional men, but handling them trom a popular or non-professional point of view. The successors of the polymath claimed to possess and to communicate, not the knowledge of all branches of learning, but an aptitude for dealing with all subjects, which aptitude should make the knowledge of any subject superfluous. In other words, they cultivated skill in disputation. Now skill in disputation is plainly a valuable accomplishment; and, as the Aristotelian logic grew out of the regulated discussions of the eristics and their pupils, the disputant sophistry of the 4th century deserves more attention and more respect than it usually receives from historians of Greek thought. But when men set themselves to cultivate skill in disputation, regarding the matter discussed not as a serious issue, but as a thesis upon which to practise their powers of controversy, they learn to pursue, not truth, but victory; and, their criterion of excellence having been thus perverted, they presently prefer ingenious fallacy to solid reasoning and the applause of bystanders to the consciousness of honest effort. Indeed, the sophists generally had a special predisposition to error of this sort, not only because sophistry was from the beginning a substitute for the pursuit of truth, but also because the successful professor, travelling from city to city, or settling abroad, could take no part in public affairs, and thus was not at

every step reminded of the importance of the " material " element of exposition and reasoning. Paradox, however, soon becomes stale, and fallacy wearisome. Hence, ' despite its original popularity, eristical sophistry could not hold its ground. The man of the world who had cultivated it in his youth regarded it in riper years as a foolish pedantry, or "at best as a propaedeutic exercise; while the serious student, necessarily preferring that form of disputation which recognized truth as the end of this, as of other intellectual processes, betook himself to one or other of the philosophies of the revival.

In order to complete this sketch of the development of sophistry in the latter half of the 5th century and the earlier half of the 4th, it is necessary next to take account of Socrates and the Socratics. A foe to philosophy and a renegade from art, Socrates took his departure from the same point as Protagoras, and moved in the same direction, that of the education of youth. Finding in the cultivation of " virtue " or " excellence " a substitute for the pursuit of scientific truth, and in disputation the sole means by which " virtue " or " excellence " could be attained, he resembled at once the sophists of culture and the sophists of eristic. But, inasmuch as the " virtue " or " excellence " which he sought was that of the man rather than that of the official, while the disputation which he practised had for its aim, not victory, but the elimination of error, the differences which separated him from the sophists of culture and the sophists of eristic were only less considerable than the resemblances which he bore to both; and further, though his whole time and attention were bestowed upon the education of young Athenians, his theory of the relations of teacher and pupil differed from that of the recognized professors of education, inasmuch as the taking of fees seemed to him to entail a base surrender of the teacher's independence. The principal character- istics of Socrates's theory of education were accepted, mutatis mutandis, by the leading Socratics. With these resemblances to the contemporary professors of education, and with these

differences, were Socrates and the Socratics sophists or not? To this question there is no simple answer, yes or no. It is certain that Socrates's contemporaries regarded him as a sophist; and it was only reasonable that they should so regard him, because in opposition to the physicists of the past and the artists of the present he asserted the claims of higher education. But, though according to the phraseology of the time he was a sophist, he was not a typical sophist — his principle that, while scientific truth is unattainable by man, right opinion is the only basis of right action, clearly differentiating him from all the other professors of " virtue." Again, as the Socratics — Plato himself, when he established himself at the Academy, being no excep- tion — were, like their master, educators rather than philosophers, and in their teaching laid especial stress upon discussion,

they, too, were doubtless regarded as sophists, not by Isocrates only, but by their contemporaries in general; and it may be conjectured that the disputatious tendencies of the Megarian school made it all the more difficult for Plato and others to secure a proper appreciation of the difference between dialectic, or discussion with a view to the discovery of truth, and eristic, or discussion with a view to victory. Changing circumstances, however, carry with them changes in the meaning and application of words. Whereas, so long as philosophy was in abeyance Socrates and the Socratics were regarded as sophists of an abnormal sort, as soon as philosophy revived it was dimly perceived that, in so far as Socrates and the Socratics dissented from sophistry, they preserved the philosophical tradition. This being so, it was found convenient to revise the terminology of the past, and to include in the philosophical succession those who, though not philosophers, had cherished the sacred spark. As for Socrates, he ranked himself neither with the philosophers, who professed to know, nor with the sophists, who professed to teach; and, if he sometimes described himself as a CKbcocs he was careful to indicate that he pretended to no other knowledge than that of his own limitations.

It would seem then, (1) that popular nomenclature included under the term " sophist " all teachers — whether professors, or like Socrates, amateurs — who communicated, not artistic skill, nor philosophical theory, but a general or liberal education; (2) that, of those who were commonly accounted sophists, some professed culture, some forensic rhetoric, some political rhetoric, some eristic, some {i.e. the Socratics) dialectic; (3) that the differences between the different groups of sophists were not inconsiderable, and that in particular the teaching of the rhe- toricians was distinct in origin, and, in so far as its aim was success in a special walk of life, distinct in character, from the more general teaching of the sophists of culture, the eristics, and the dialecticians, while the teaching of the dialecticians was discriminated from that of the rest, in- so far as the aim of the dialecticians was truth, or at least the bettering of opinion; and, consequently, (4) that, in awarding praise and blame to sophistry and its representatives, the distinctive characteristics of the groups above enumerated must be studiously kept in view.

Lapse of time and change of circumstances brought with them not merely changes in the subjects taught, but also changes in the popular estimate of sophistry and sophists. The first and most obvious sentiment which sophistry evoked was an enthusiastic and admiring interest. The sophist seemed to his youthful hearers to open a new field of intellectual activity and thereby to add a fresh zest to existence. But in proportion to the fascination which he exercised upon the young was the distrust which he inspired in their less pliable elders. Not only were they dismayed by the novelty of the sophistical teaching, but also they vaguely perceived that it

was subversive of authority, of the authority of the parent over the child as well as of the authority of the state over the citizen. Of the two conflicting sentiments, the favour of the young, gaining as years passed away, naturally prevailed; sophistry ceased to be novel, and attendance in the lecture-rooms of the sophists came to be thought not less necessary for the youth than attendance in the elementary schools for the boy. The lively enthusiasm

and the furious opposition which greeted Protagoras had now burnt themselves out, and before long the sophist was treated by the man of the world as a harmless, necessary pedagogue.

That sophistry must be studied in its historical development was clearly seen by Plato, whose dialogue called the Sophist contains a formal review of the changing phases and aspects of sophistical teaching. The subject which is discussed in that dialogue and it's successor, the Statesman, being the question " Are sophist, statesman, and philosopher identical or different?" the Eleate who acts as protagonist seeks a definition of the term " sophist " by means of a series of divisions or dichotomies. In this way he is led to regard the sophist successively — (1) as a practitioner of that branch of mer- cenary persuasion in private which professes to impart " virtue " and exacts payment in the shape of a fee, in opposition to the flatterer who offers pleasure, asking for sustenance in return; (2) as a practi- tioner of that branch of mental trading which purveys from city to city discourses and lessons about " virtue," in opposition to the artist who similarly purveys discourses and lessons about the arts; (3) and (4) as a practitioner of those branches of mental trading, retail and wholesale, which purvey discourses and lessons about " virtue " within a city, in opposition to the artists who similarly purvey discourses and lessons about the arts; (5) as a practitioner of that branch of eristic which brings to the professor pecuniary emolument, eristic being the systematic form of antilogic, and dealing with justice, injustice and other abstractions, and antilogic being that form of disputation which uses question and answer in private, in opposition to forensic, which uses continuous discourse in the law-courts; (6) as a practitioner of that branch of education which purges away the vain conceit of wisdom by means of cross- examination, in opposition to the traditional method of reproof or admonition. These definitions being thus various, the Eleate notes that the sophist, in consideration of a fee, disputes, and teaches others to dispute, about things divine, cosmical, metaphysical, legal, political, technical — in fact, about everything — not having know- ledge of them, because universal knowledge

is unattainable; after which he is in a position to define the sophist (7) as a conscious impostor who, in private, by discontinuous discourse, compels his interlocutor to contradict himself, in opposition to the &inxo\oymbs, who, in public, by continuous discourse, imposes upon crowds.

It is clear that the final definition is preferred, not because of any .intrinsic superiority, but because it has a direct bearing upon the question " Are sophist, statesman and philosopher identical or different?" and that the various definitions represent different stages or forms of sophistry as conceived from different points of view. Thus the first and second definitions represent the founders of the sophistry of culture, Protagoras and Prodicus, from the respective points of view of the older Athenians, who disliked the new culture, and the younger Athenians, who admired it; the third and fourth definitions represent imitators to whom the note of itinerancy was not applicable; the fifth definition represents the earlier eristics, contemporaries of Socrates, whom it was necessary to distinguish from the teachers of forensic oratory; the sixth is framed to meet the anomalous case of Socrates, in whom many saw the typical sophist, though Plato conceives this view to be unfortunate; and the seventh and final definition, having in view eristical sophistry fully developed, distinguishes it from bi)fio\oyiKri, i.e. political rhetoric, but at the same time hints that, though acxfucTiK-/) and 8ˆ0X071/07 may be discriminated, they are neverthe- less near akin, the one being the ape of philosophy, the other the ape of statesmanship. In short, Plato traces the changes which, in less than a century, had taken place in the meaning of the term, partly through changes in the practice of the sophists, partly through changes in their surroundings and in public opinion, so as to show by a familiar instance that general terms which do not describe natural kinds cannot have a stable connotation.

Now it is easy to see that in this careful statement Plato recog- nizes three periods. The- first four definitions represent the period of Protagoras, Prodicus, and their immediate successors, when the object sought was " virtue," " excellence," " culture," and the means to it was literature. The fifth and sixth definitions represent the close of the 5th century, when sophistry handled eristically, and perhaps, though Plato demurs to the inclusion, dialectically, ques- tions of justice, injustice and the like, iucavucr) or forensic rhetoric being its proximate rival. The seventh definition represents the first half of the 4th century, when sophistry was eristical in a wider field, having for its rival, not forensic rhetoric, but the rhetoric of the assembly. Plato's classification of educational theories is then substantially the classification adopted in this article, though, whereas here, in accordance with well-attested popular usage, all the educational theories mentioned are included under the head of sophistry, Plato allows to rhetoric, forensic and political, an inde- pendent position, and hints that

there are grounds for denying the title of sophist to the dialectician Socrates. Incidentally we gather two important facts — (1) that contemporary with the dialectic of Socrates there was an eristic, and (2) that this eristic was mainly applied to ethical questions. Finally, we may be sure that, if Plato was thus careful to distinguish the phases and aspects of sophistical development, he could never have fallen into the modern error of

bestowing upon those whom the Greeks called sophists either indiscriminate censure or indiscriminate laudation.

2. Relations of Sophistry to Education, Literature and Philosophy. — If then the sophists, from Protagoras to Isocrates, were before everything educators, it becomes necessary to inquire whether their labours marked or promoted an advance in educa- tional theory and method. At the beginning of the 5th century B.C. every young Greek of the better sort already received rudi- mentary instruction, not only in music and gymnastics, but also in reading and writing. Further, in the colonies, and especially the colonies of the West, philosophy and art had done something for higher education. Thus in Italy the Pythagorean school was, in the fullest sense of the term, an educational institution; and in Sicily the rhetorical teaching of Corax and Tisias was presumably educational in the same sense as the teaching of Gorgias. But in central Greece, where, at any rate down to the Persian Wars, politics, domestic and foreign, were all- engrossing, and left the citizen little leisure for self-cultivation, the need of a higher education had hardly made itself felt. The overthrow of the Persian invaders changed all this. Hence- forward the best of Greek art, philosophy, and literature gravitated to Athens, and with their concentration and conse- quent development came a general and growing demand for teaching. As has been seen, it was just at this peiiod that philosophy and art ceased to be .available for educational pur- poses, and accordingly the literary sophists were popular precisely because they offered advanced teaching which was neither philosophical nor artistic. Their recognition of the demand and their attempt to satisfy it are no small claims to distinction. That, whereas before the time of Protagoras there was little higher education in the colonies and less in central Greece, after his time attendance in the lecture-rooms of the sophists was the customary sequel to attendance in the elementary schools, is a fact which speaks for itself.

But this is not all. The education provided by the sophists of culture had positive merits. When Protagoras included in his course grammar, style, interpretation of the poets, and oratory, supplementing his own continuous expositions by disputations in which he and his pupils took part, he showed a not inadequate appreciation of the requisites of a literary education; and it may be conjectured that his comprehensive programme, which Prodicus

and others extended, had something to do with the development of that versatility which was the most notable element in the Athenian character.

There is less to be said for the teachers of rhetoric, politics and eristic, who, in limiting themselves each to a single subject — the rhetoricians proper or forensic rhetoricians to one branch of oratory, the politicians or political rhetoricians to another, and the eristics to disputation — ceased to be educators and became instructors. Nevertheless, rhetoric and disputation, though at the present day strangely neglected in English schools and universities, are, within their limits, valuable instruments; and, as specialization in teaching does not necessarily imply specialization in learning, many of those who attended the lectures and the classes of a rhetorician or an eristic sought and found other instruction elsewhere. It would seem then that even in its decline sophistry had its educational use. But in any case it may be claimed for its professors that in the course of a century they discovered and turned to account most of the instruments of literary education.

With these considerable merits, normal sophistry had one defect, its indifference to truth. Despairing of philosophy — that is to say, of physical science — the sophists were prepared to go all lengths in scepticism. Accordingly the epideictic sophists in exposition, and the argumentative sophists in debate, one and all, studied, not matter but style, not accuracy but effect, not proof but persuasion. In short, in their hostility to science they refused to handle literature in a scientific spirit. That this defect was serious was dimly apprehended even by those who frequented and admired the lectures of the earlier sophists; that it was fatal was clearly seen by Socrates, who, himself commonly regarded as a sophist, emphatically reprehended,

not only the taking of fees, which was after all a mere incident, I objectionable because it seemed to preclude independence of thought, but also the fundamental disregard of truth which infected every part and every phase of sophistical teaching. To these contemporary censures the modern critic cannot refuse his assent.

To literature and to oratory the sophists rendered good service. Themselves of necessity stylists, because their professional success largely depended upon skilful and effective exposition, the sophists both of culture and of rhetoric were professedly teachers of the rules of grammar and the principles of written and spoken discourse. Thus, by example as well as by

precept, they not only taught their hearers to value literary and oratorical excellence, but also took the lead in fashioning the style of their time. Their influence in these respects was weighty and impor- tant. Whereas, when sophistry began, prose composition was hardly practised in central Greece, the sophists were still the leaders in literature and oratory when Plato wrote the Republic, and they had hardly lost their position when Demosthenes delivered the Philippics. In fact, it is not too much to say that it was the sophists who provided those great masters with their consummate instrument, and it detracts but little from the merit of the makers if they were themselves unable to draw from it its finer tones.

The relation of sophistry to philosophy was throughout one of pronounced hostility. From the days of Protagoras, when this hostility was triumphant and contemptuous, to the days of Isocrates, when it was jealous and bitter, the sophists were declared and consistent sceptics. But, although Protagoras and Gorgias had examined the teaching of their predecessors so far as to satisfy themselves of its futility and to draw the sceptical inference, their study of the great problem of the day was preliminary to their sophistry rather than a part of it; arid, as the overthrow of philosophy was complete and the attrac- tions of sophistry were all-powerful, the question " What is knowledge? " ceased for a time to claim or to receive attention. There is, then, no such thing as a " sophistical theory of know- ledge." Similarly, the recognition of a " sophistical ethic " is, to say the least, misleading. It may have been that the sophists' preference of seeming to reality, of success to truth, had a mischievous effect upon the morality of the time; but it is clear that they had no common theory of ethics, and there is no warrant for the assumption that a sophist, as such, specially interested himself in ethical questions. When Protagoras asserted "civic excellence " or " virtue " to be the end of educa- tion, he neither expressed nor implied a theory of morality. Prodicus in his platitudes reflected the customary morality of the time. Gorgias said plainly that he did not teach " virtue." If Hippias, Polus and Thrasymachus defied conventional morality, they did so independently of one another, and in this, as in other matters, they were .disputants maintaining paradoxical theses, rather than thinkers announcing heretical convictions. The morality of Isocrates bore a certain resemblance to that of Socrates. In short, the attitude of the sophists towards inquiry in general precluded them, collectively and individually, from attachment to any particular theory. Yet among the so-called sophists there were two who had philosophical leanings, as appears in their willingness to be called by the title of philosopher. First, Socrates, whilst he conceived that the physicists had mistaken the field of inquiry, absolute truth being unattainable, maintained, as has been seen, that one opinion was better than another, and that consistency of opinion, resulting in consistency of action, was the end which the human intellect properly pro- poses to itself. Hence, though

an agnostic, he was not unwilling to be called a philosopher, in so far as he pursued such truth as was attainable by man. Secondly, when sophistry had begun to fall into contempt, the political rhetorician Isocrates claimed for himself the time-honoured designation of philosopher, " herein," says Plato, " resembling some tinker, bald-pated and short of stature, who, having made money, knocks off his chains, goes to the bath, buys a new suit, and then takes advantage of the poverty and desolation of his master's daughter

to urge upon her his odious addresses " (Rep. vi. 495 E). It will be seen, however, that neither Socrates nor Isocrates was philosopher in any strict sense of the word, the speculative aims of physicists and metaphysicians being foreign to the practical theories both of the one and of the other.

As for the classification of sophistical methods, so for their criticism, the testimony of Plato is all-important. It may be conjectured that, when he emerged from the purely Socratic phase of his earlier years, Plato gave himself to the study of contemporary methods of education and to the elaboration of an educational system of his own, and that it was in this way that he came to the metaphysical speculations of his maturity. It may be imagined further that, when he established himself at the Academy, his first care was to draw up a scheme of education, including arithmetic, geometry (plane and solid), astronomy, harmonics and dialectic, and that it was not until he had arranged for the carrying out of this programme that he devoted himself to the special functions of professor of philosophy. However this may be, we find amongst his writings — intermediate, as it would seem, between the Socratic conversations of his first period of literary activity and the meta- physical disquisitions of a later time— a series of dialogues which, however varied their ostensible subjects, agree in having a direct bearing upon education. Thus the Protagoras brings the educa- tional theory of Protagoras and the sophists of culture face to face with the educational theory of Socrates, so as to expose the limita- tions of both ; the Gorgias deals with the moral aspect of the teach- ings of the forensic rhetorician Gorgias and the political rhetorician Isocrates, and the intellectual aspect of their respective theories of education is handled in the Phaedrus; the Meno on the one hand exhibits the strength and the weakness of the teaching of Socrates, and on the other brings into view the makeshift method of those who, despising systematic teaching, regarded the practical poli- tician as the true educator; the Euthydemus has for its subject the eristical method ; finally, having in these dialogues characterized the current theories of education, Plato proceeds in the Republic to develop an original scheme. Plato's criticisms of the sophists are then, in the opinion of the present writer, no mere obiter dicta, introduced for purposes of literary adornment or dramatic effect, but rather the expressions of profound and reasoned conviction, and, as such, entitled at

any rate to respect. For the details of Plato's critique the reader should go not to the summaries of commentators, but to the dialogues themselves. In this place it is sufficient to say that, while Plato accounts no education satis- factory which has not knowledge for its basis, he emphatically prefers the scepticism of Socrates, which, despairing of knowledge, seeks right opinion, to the scepticism of the sophists, which, despairing of knowledge, abandons the attempt to better existing beliefs.

3. The Theory of Grote. — The post-Platonic historians and critics, who, while they knew the earlier sophistry only through tradition, were eyewitnesses of the sophistry of the decadence, were more alive to the faults than to the virtues of the movement. Overlooking the differences which separated the humanists from the eristics, and both of these from the rhetoricians, and taking no account of Socrates, whom they regarded as a philo- sopher, they forgot the services which Protagoras and Prodicus, Gorgias and Isocrates had rendered to education and to litera- ture, and included the whole profession in an indiscriminate and contemptuous censure. This prejudice, establishing itself in familiar speech, has descended from antiquity to modern times, colouring, when it does not distort, the narratives of biographers and the criticisms of commentators. " The sophists," says Grote, " are spoken of as a new class of men, or sometimes in language which implies a new doctrinal sect or school, as if they then sprang up in Greece for the first time — ostentatious impostors, flattering and duping the rich youth for their own personal gain, undermining the morality of Athens, public and private, and encouraging their pupils to the unscrupulous prosecution of ambition and cupidity. They are even affirmed to have succeeded in corrupting the general morality, so that Athens had become miserably degenerated and vicious in the latter years of the Peloponnesian War, as compared with what she was in the time of Miltiades and Aristeides;" and, although amongst the pre-Grotian scholars there were some who saw as clearly as Grote himself that "the sophists are a much- calumniated race " (G. H. Lewes), it is certain that historians of philosophy, and editors of Plato, especially the " acumen plumbeum Stallbaumii," had given ample occasion for the energetic protest contained in the famous sixty-seventh chapter of Grote's History of Greece. Amongst the many merits of that

admirable scholar, it is one of the greatest that he has laid " the fiend called die Sophistik," that is to say, the theory that sophistry was an organized conspiracy against law and morals. Nevertheless, in this matter he is always an advocate; and it may be thought that, while he successfully

disposes of the current slander, his description of his clients needs correction in some important particulars. Hence the following paragraphs, while they will resume and affirm his principal results, will qualify and impugn some of his positions.

In so far as he is critical, Grote leaves little to be desired. That the persons styled sophists " were not a sect or school, with common doctrines or method," is clear. Common doctrine, that is to say, common doctrine of a positive sort, they could not have, because, being sceptics, they had nothing which could be called positive doctrine; while there was a period when even their scepticism was in no wise distinctive, because they shared it with all or nearly all their contemporaries. Neither were they united by a common educational method, the end and the instruments of education being diversely conceived by Pro- tagoras, Gorgias and Isocrates, to say nothing of the wider differences which separate these three from the eristics, and all the four normal types from the abnormal type represented by Socrates.

Again, it is certain that the theoretical and practical morality of the sophists, regarded as a class, was " neither above nor below the standard of the age." The taking of fees, the pride of professional success, and the teaching of rhetoric are no proofs either of conscious charlatanism or of ingrained depravity. Indeed, we have evidence of sound, if conventional, principle in Prodicus's apologue of the " Choice of Heracles," and of honourable, though eccentric, practice in the story of Pro- tagoras's treatment of defaulting pupils. But, above all, it is antecedently certain that defection from the ordinary standard of morality would have precluded the success which the sophists unquestionably sought and won. In fact, public opinion made the morality of the sophists, rather than the sophists the morality of public opinion. Hence, even if we demur to the judgment of Grote that " Athens at the close of the Peloponnesian War was not more corrupt than Athens in the days of Miltiades and Aristeides," we shall not " consider the sophists as the corrupters of Athenian morality," but rather with Plato lay the blame upon society itself, which, " in popular meetings, law courts, theatres, armies and other great gatherings, with uproarious censure and clamorous applause" {Rep. vi. 492), educates young and old, and fashions them according to its pleasure.

Nor can we regard " Plato and his followers as the authorized teachers of the Greek nation and the sophists as the dissenters." On the contrary, the sophists were in quiet possession of the field when Plato, returning to Athens, opened the rival school of the Academy; and, while their teaching in all respects accom- modated itself to current opinion, his, in many matters, ran directly counter to it.

But if thus far Grote's protest against prevalent assumptions carries an

immediate and unhesitating conviction, it may be doubted whether his positive statement can be accounted final. " The appearance of the sophists," he says, " was no new fact. . . . The paid teachers — whom modern writers set down as the sophists, and denounce as the modern pestilence of their age — were not distinguished in any marked or generic way from their predecessors." Now it is true that before 447 B.C., besides the teachers of writing, gymnastics and music, to whom the young Greek resorted for elementary instruction, there were artists and artisans who not only practised their crafts, but also communicated them to apprentices and pupils, and that accordingly the Platonic Protagoras recognizes in the gymnast Iccus, the physician Herodicus, and the musicians Agathocles and Pythoclides, forerunners of the sophists. But the forerunners of the sophists are not to be confounded with the sophists themselves, and the difference between them is not far to seek. Though some of those who resorted to the gymnasts, physicians and musicians derived from them such

substitute for " higher education " as was before 447 generally obtainable, it was only incidentally that professional men and artists communicated anything which could be called by that name. Contrariwise, the sophists were always and essentially professors of the higher education; and, although in process of time specialization assimilated sophistry to the arts, at the outset at any rate, its declared aim — the cultivation of the civic character — sufficiently distinguished sophistical education both from professional instruction and from artistic training. It is true too that in some of the colonies philosophy had busied itself with higher education; but here again the forerunners of the sophists are easily distinguished from the sophists, since the sophists condemned not only the scientific speculations of their predecessors, but also their philosophical aims, and offered to the Greek world a new employment for leisure', a new intellectual ambition.

Nor is it altogether correct to say that " the persons styled sophists had no principles common to them all and distinguishing them from others." Various as were the phases through which • sophistry passed between the middle of the 5th century and the middle of the 4th, the sophists — Socrates him'self being no exception — had in their declared antagonism to philosophy a common characteristic; and, if in the interval, philosophical speculation being temporarily suspended, scepticism ceased for the time to be peculiar, at the outset, when Protagoras and Gorgias broke with the physicists, and in the sequel, when Plato raised the cry of " back to Parmenides," this common characteristic was distinctive.

Further, it may be doubted whether Grote is sufficiently care- ful to distinguish between the charges brought against the sophists personally and the criticism of their educational methods. When the sophists are represented as conscious imposters who " poisoned and demoralized by

corrupt teaching the Athenian moral character," he has, as has been seen, an easy and complete reply. But the question still remains— Was the education provided by Protagoras, by Gorgias, by Isocrates, by the eristics and by Socrates, good, bad or indifferent? And, though the modern critic will not be prepared with Plato to deny the name of education to all teaching which is not based upon an ontology, it may nevertheless be thought that normal sophistry — as opposed to the sophistry of Socrates — was in various degrees unsatisfactory, in so far as it tacitly or confessedly ignored the " material " element of exposition by reasoning.

And if Grote overlooks important agreements he seems also to understate important differences. Regarding Protagoras, Gorgias and Isocrates as types of one and the same sophistry (pp. 487, 493, 495, 499, 544, 2nd ed.), and neglecting as slander or exaggeration all the evidence in regard to the sophistry of eristic (p. 540), he conceives that the sophists undertook " to educate young men so as to make them better qualified for statesmen or ministers," and that " that which stood most prominent in the teaching of Gorgias and the other sophists was, that they cultivated and improved the powers of public speaking in their pupils." Excellent as a statement of the aim and method of Isocrates, and tolerable as a statement of those of Gorgias, these phrases are inexact if applied to Protagoras, who, making " civic virtue " his aim, regarded statesmanship and administra- tion as parts of " civic virtue", and consequently assigned to oratory no more than a subordinate place in his programme, while to the eristics — whose existence is attested not only by Plato, but also by Isocrates and Aristotle — and to Socrates — ■ whom Grote himself accounts a sophist — the description is plainly and palpably inappropriate.

Grote's note about the eristical sophists is perhaps the least satisfactory part of his exposition. That " there were in Athens persons who abused the dialectical exercise for frivolous puzzles " he admits; but " to treat Euthydemus and Dionysodorus as samples of ' the Sophists ' is, " he continues, " altogether un- warrantable." It would seem, then, that, while he regards rhetoric as the function of normal sophistry, taking indifferently as his types Protagoras, Gorgias and Isocrates, he accounts Euthydemus and Dionysodorus (together with Socrates) as sophists, but as sophists of an abnormal sort, who may therefore be neglectedˆ Now this view is inconsistent with the evidence of Plato, who, in the

Sophist, in his final and operative definition, gives prominence to the eristical element, and plainly accounts it the main character- istic not

indeed of the sophistry of the 5th century, but of the sophistry of the 4th. It must be presumed, then, that, in virtue of his general suspicions of the Platonic testimony, Grote in this matter leaves the Sophist out of account. There is, however, another theory of the significance of Plato's allusions to eristical sophistry, that of Professor H. Sidgwick, whose brilliant defence of Grote is an indispensable supplement to the original document. Giving a hearty general assent to Grote's theory, Sidgwick never- theless introduces qualifications similar to some of those which are suggested in this article. In particular he. allows that " there was at any rate enough of charlatanism in Protagoras and Hippias to prevent any ardour for their historical reputation," that the sophists generally " had in their lifetime more success than they deserved," that it was " antagonism to their teaching which developed the genius of Socrates," and, above all, that, " in his anxiety to do justice to the Sophist, Grote laid more stress than is at all necessary on the partisanship of Plato." Now this last admission precludes Sidgwick from neglecting, as Grote had done, the evidence of the Euthydemus. Pointing out that the sophists of that dialogue " profess eis dperijs iinnkXaav Trporpbˆai. by means of dialogue," that " they challenge the interlocutor inrixa-p \6yor," that " their examples are drawn from common objects and vulgar trades," that " they maintain positions that we know to have been held by Megarians and Cynics," he infers that " what we have here presented to us as ' sophistic ' is neither more nor less than a caricature of the Megarian logic "; and further, on the ground that " the whole conception of Socrates and his effect on his contemporaries, as all authorities combine to represent it, requires us to assume that his manner of discourse was quite novel, that no one before had systematically attempted to show men their ignorance of what they believed themselves to know," he is " dis- posed to think that the art of disputation which is ascribed to sophists in the Euthydemus and the Sophistes (and exhaustively analysed by Aristotle in the Htpl isTi.KS>v IXe-yxw) originated entirely with Socrates, and that he is altogether responsible for the form at least of this second species of sophistic." To this theory the present writer is unable to subscribe. That Plato was not care- ful to distinguish the Megarians and the Cynics from the eristical sophists, and that the disputants of the 4th century affected some of the mannerisms of the greatest disputant of the 5th century, he willingly concedes. But he cannot allow either that the Megarians and the Cynics were the only eristics, or that eristical sophistry began with Socrates. Plainly this is not the place for a full ex- amination of the question; yet it may be remarked — (1) that the previous history of the sophists of the Euthydemus, who had been professors of tactics (Xenophon, Mem. iii. 1, 1), swordsmanship, and forensic argumentation, implies that they came to eristic not from the sophistry of Socrates, but from that of the later human- ists, polymaths of the type of Hippias ; (2) that the fifth and sixth definitions of the Sophist, in which " that branch of eristic which

brings pecuniary gain to the practitioner " is opposed to the " patience-trying, purgative elenchus " of Socrates, indicate that contemporary with Socrates there were eristics whose aims were not his; (3) that, whereas the sophist of the final definition " dis- putes, and teaches others to dispute, about things divine, cosmical, metaphysical, legal, political, technical, in fact, about all things," we have no ground for supposing that the Megarians and the Cynics used their eristic for any purpose except the defence of their logical heresies.

Nor is it possible to accept the statements that " the splendid genius, the lasting influence, and the reiterated polemics of Plato have stamped the name sophist upon the men against whom he wrote as if it were their recognized, legitimate and peculiar designation," and that " Plato not only stole the name out of general circulation, in order to fasten it specially upon his opponents the paid teachers, but also connected with it express discreditable attributes which formed no part of its primitive and recognized meaning and were altogether distinct from, though grafted upon, the vague sentiment of dislike associated with it." That is to say, Grote supposes that for at least eight and forty years, from 447 to 399, the paid professors had no profes- sional title; that, this period having elapsed, a youthful opponent succeeded in fastening an uncomplimentary title not only upon the contemporary teachers, but also, retrospectively, upon their predecessors; and that, artfully enhancing the indignity of the title affixed, he thus obscured, perverted and effaced the records and the memories of the past. Manifestly all three propositions are antecedently improbable. But more than this: whereas in the nomenclature of Plato's contemporaries Pro-tagoras, Gorgias, Socrates, Dionysodorus and Isocrates were all of them sophists, Plato himself, in his careful investigation summarized above, limits the meaning of the term so that it

shall include the humanists and the eristics only. Now, if his use of the term was stricter than the customary use, he can hardly be held answerable for the latter.

Nor is Grote altogether just in his account of Plato's attitude towards the several sophists, or altogether judicious in his appreciation of Plato's testimony. However contemptuous in his portraiture of Hippias and Dionysodorus, however severe in his polemic against Isocrates, Plato regards Protagoras with admiration and Gorgias with respect. While he emphasizes in the later sophists the consequences of the fundamental error of sophistry — its indifference to truth — he does honour to the genius and the originality of the leaders of the movement. Indeed, the author of this article finds in the writings of Plato a grave and discriminating study of the several forms of sophistry, and no trace whatsoever of that blind hostility which should warrant us in neglecting his clear and precise evidence.

In a word, the present writer agrees with Grote that the sophists were not a sect or school with, common doctrine or method ; that their theoretical and practical morality was neither above nor below that of their age, being, in fact, determined by it; and that Plato and his followers are not to be regarded as the authorized teachers of the Greek nation, nor the sophists as the dissenters, but vice versa. At the same time, in opposi- tion to Grote, he maintains that the appearance of the sophists marked a new departure, in so far as they were the first professors of " higher education " as such; that they agreed in the rejection of "philosophy"; that the education which they severally gave was open to criticism, inasmuch as, with the exception of Socrates, they attached too much importance to the form, too little to the matter, of their discourses and arguments; that humanism, rhetoric, politic and disputation were characteristic not of all sophists collectively, but of sections of the profession; that Plato was not the first to give a special meaning to the term " sophist " and to affix it upon the professors of education; and, finally, that Plato's evidence is in all essentials trustworthy.

Bibliography.— On the significance of the sophistical move- ment, see E. Zeller, Philosophic d. Griechen, i. 932-1041 (4th ed., Leipzig, 1876); Presocratic Philosophy, ii. 394-516 (London, 1881); G. Grote, History of Greece, ch. lxvii. (London, 1851, &c.) ; E. M. Cope, " On the Sophists," and " On the Sophistical Rhetoric," in Journ. Class, and Sacr. Philol. vol. ii. (Cambridge, 1855), and vol. iii. (1857), an erudite but inconclusive reply to Grote; H. Sidgwick, " The Sophists," in Journ. of Philol., vol. iv. (Cambridge, 1872), and vol. v. (1874), a brilliant defence of Grote; A. W. Benn, The Greek Philosophers i. 53-107 (London, 1882). For lists of treatises upon the life and teaching of particular sophists, see Ueberweg, Grundriss d. Gesch. d. Philos., i. §§ 27-32 {History of Philosophy, London, 1880). On the later use of the term " sophist," see Rhetoric. (H. Ja.)

SOPHOCLES (495-406 B.C.), Greek tragic poet, was born at Colonus in the neighbourhood of Athens. His father's name was Sophillus; and the family burial-place is said to have been about a mile and a half from the city on the Decelean Way. The date assigned for the poet's birth is in accordance with the tale that young Sophocles, then a pupil of the musician Lamprus, was chosen to lead the chorus of boys in the celebration of the victory of Salamis (480 B.C.). The time of his death is fixed by the allusions to it in the Frogs of Aristophanes and in the Muses, a lost play of Phrynichus, the comic poet, which were both produced in 405 B.C., shortly before the capture of Athens. And the legend which implies that Lysander allowed him funeral honours is one of those which, like the story of Alexander and Pindar's house at Thebes, we can at least wish to be founded on fact, though we should probably substitute Agis for Lysander. Apart from tragic victories, the event of Sophocles' life most fully authenticated is his appointment at the age of fifty-five as one of the

generals who served with Pericles in the Samian War (440-439 B.C.). Conjecture has been rife as to the possi- bility of his here improving acquaintance with Herodotus, whom he probably met some years earlier at Athens. But the distich quoted by Plutarch —

'Qidriv 'Hpo6oT revfctv XoˆokXtjs krkoiv &v

Ilefr' eirl irevrifKopTa —

is a slight ground on which to reject the stronger tradition according to which Herodotus was ere this established at Thurii;

and the coincidences in their writings may be accounted for by their having drawn from a common source. The fact of Sophocles' generalship is the less surprising if taken in connexion with the interesting remark of his biographer (whose Life, though absent from the earliest MS. through some mischance, bears marks of an Alexandrian origin) that he took his full share of civic duties, and even served on foreign embassies. The large acquaintance- ship which this implies, not only in Athens, but in Ionic cities generally, is a point of main importance in considering the opportunities of information at his command. And, if we credit this assertion, we are the more at liberty to doubt the other state- ment, though it is not incredible, that his appointment as general was due to the political wisdom of his Antigone.

The testimony borne by Aristophanes in the Frogs to the amiability of the poet's temper (6 5′ evaoXos ittv tvdad', evudXos 5′ iKti) agrees with the record of his biographer that he was univer- sally beloved. And the anecdote recalled by Cephalus in Plato's Republic, that Sophocles welcomed the release from the passions which is brought by age, accords with the spirit of his famous Ode to Love in the Antigone. The Sophocles who, according to Aristotle (Rhet. iii. 18), said of the government of the Four Hundred that it was the better of two bad alternatives (probably the same who was one of the probuli) , may or may not have been the poet. Other gossiping stories are hardly worth repeating — as that Pericles rebuked his love of pleasure and thought him a bad general, though a good poet; that he humorously boasted of his own " generalship " in affairs of love; or that he said of Aeschylus that he was often right without knowing it, and that Euripides represented men as they are, not as they ought to be. (This last anecdote has the authority of Aristotle.) Such trifles rather reflect contemporary or subsequent impressions of a superficial kind than

tell us anything about the man or the dramatist. The gibe of Aristophanes (Pax 695 seq.), that Sophocles in his old age was become a very Simonides in his love for gain, may turn on some perversion of fact, without being altogether fair to either poet. It is certainly irreconcilable with the remark (Vit. anon.) that in spite of pressing invitations he refused to leave Athens for kings' courts. And the story of his indictment by his son Iophon for incompetence to manage his affairs — to which Cicero has given some weight by quoting it in the De sencctule — appears to be really traceable to Satyrus (fl. c. 200 B.C.), the same author who gave publicity to the most ridiculous of the various absurd accounts of the poet's death — that his breath failed him for want of a pause in reading some passage of the Antigone. Satyrus is at least the sole authority for the defence of the aged poet, who, after reciting passages from the Oed. Col., is supposed to have said to his accusers, " If I am Sophocles I am no dotard, and if I dote I am not Sophocles." On the other hand, we need not the testimony of biographers to assure us that he was devoted to Athens and renowned for piety. He is said to have been priest of the hero Alcon, and himself to have received divine honours after death.

That the duty of managing the actors as well as of training the chorus belonged to the author is well known. But did Aeschylus act in his own plays ? This certainly is implied in the tradition that Sophocles, because of the weakness of his voice, was the first poet who desisted from doing so. In his Thamyras, however, he is said to have performed on the lyre to admiration, and in his Nausicaa (perhaps as coryphaeus) to have played gracefully the game of ball. Various minor improvements in decoration and stage carpentry are attributed to him — whether truly or not who can tell ? It is more interest- ing, if true, that he wrote his plays having certain actors in his eye; that he formed an association for the promotion of liberal culture; and that he was the first to introduce three actors on the stage. It is asserted on the authority of Aristoxenus that Sophocles was also the first to employ Phrygian melodies. And it is easy to believe that Aj. 693 seq., Track. 205 seq., were sung to Phrygian music, though there are strains in Aeschylus (e.g. Choeph. 152 seq., 423 seq.) which it is hard to distinguish essentially from these. Ancient critics had also noted his familiarity with Homer, especially with the Odyssey, his power

of selection and of extracting an exquisite grace from all he touched (whence he was named the " Attic Bee "), his mingled felicity and boldness, and, above all, his subtle delineation of human nature and feeling. They observed that the balanced proportions and fine articulation of his work are such that in a single half line or phrase he often conveys the impression of an entire character. Nor is this verdict of antiquity likely to be reversed by modern criticism.

His minor poems, elegies, paeans, &c, have all perished; and of his hundred and odd dramas only seven remain. These all belong to the period of his maturity (he had no decline) ; and not only the titles but some scanty fragments of more than ninety others have been preserved. Several of these were, of course, satyric dramas. And this recalls a point of some importance, which has been urged on the authority of Suidas, who says that " Sophocles began the practice of' pitting play against play, instead of the tetralogy." If it were meant that Sophocles did not exhibit tetralogies, this statement would have simply to be rejected. For the word of Suidas (a.d. 950) has no weight against quotations from the lists of tragic victories (didaaKaXicu) , which there is no other reason for discrediting. It is distinctly asserted on the authority of the 5i5a

The small number of tragic victories attributed to Sophocles, in proportion to the number of his plays, is only intelligible on the supposition that the dramas were presented in groups.

If the diction of Sophocles sometimes reminds his readers of the Odyssey, the subjects of his plays were more frequently chosen from those later epics which subsequently came to be ■ embodied in the epic cycle — such as the Aethiopis, the Little Iliad, the Iliupersis, the Cypria, the Nosli, the Telegonia (all revolving round the tale of Troy), the Thebaica, the OixaXias aXcotrts, and others, including probably, though there is no mention of such a thing, some early version of the Argonautic story. In one or other of these heroic poems the legends of all the great cities of Hellas were by this time embodied; and though there must also have been a cloud of oral tradition floating over many a sacred spot, Sophocles does not seem, unless in his Oedipus Coloneus, to have directly drawn from this. He was content to quarry from the epic rhapsodies the materials for his more concentrated art, much as Shakespeare made use of Hollingshed or Plutarch, or as the subjects of Tennyson's Idylls of the King were taken from Sir Thomas Malory. As Sophocles has been accused of narrowing the range of tragic sympathy from Hellas to Athens, it deserves mention here that, ■ of some hundred subjects of plays attributed to him, fifteen only are connected with Attica, while exactly the same number belong to the tale of Argos, twelve are Argonautic, and thirty Trojan. Even Corinthian heroes (Bellerophon, Polyidus) are not left out. It seems probable on the whole that, within the limits allowed by convention, Sophocles was guided simply by his instinctive perception of the tragic capabilities of a particular fable.

To say that subsidiary or collateral motives were never present to Sophocles in the selection of a subject would, however, be beyond the mark. His first drama, the Triptolemus, must have been full of local colouring; the A] ax appealed powerfully to ' the national pride ; and in the Oedipus Coloneus some faint echoes I even of oligarchical partisanship may be possibly

discerned

(see below). But, even where they existed, such motives were collateral and subsidiary; they were never primary. All else was subordinated to the dramatic, or, in other words, the purely human, interest of the fable. This central interest is even more dominant and pervading in Sophocles than the otherwise supreme influence of religious and ethical ideas. The idea of destiny, for example, was of course inseparable from Greek tragedy. Its prevalence was one of the conditions which presided over the art from its birth, and, unlike Aeschylus, who wrestles with gods, Sophocles simply accepts it, both as a datum of tradi- tion and a fact of life. But in the free handling of Sophocles even fate and providence are adminicular to tragic art. They are instruments through which sympathetic emotion is awakened, deepened, intensified. And, while the vision of the eternal and unwritten laws was holier yet, for it was not the creation of any former age, but rose and culminated with the Sophoclean drama, still to the poet and his Periclean audience this was no abstract notion, but was inseparable from their impassioned contemplation of the life of man — so great and yet so helpless, aiming so high and falling down so far, a plaything of the gods and yet essentially divine. This lofty vision subdued with the serenity of awe the terror and pity of the scene, but from neither could it take a single tremor or a single tear. Emotion was the element in which Greek tragedy lived and moved, albeit an emotion that was curbed to a serene stillness through its very depth and intensity.

The final estimate of Sophoclean tragedy must largely depend upon the mode in which his treatment of destiny is conceived. That Aeschylus had risen on the wings of faith to a height of prophetic vision, from whence he saw the triumph of equity and the defeat of wrong as an eternal process moving on toward one divine event — that he realized sin, retribution, responsibility as no other ancient did — may be gladly conceded. But it has been argued that because Sophocles is saddened by glancing down again at actual life — because in the fatalism of the old fables he finds the reflection of a truth — he in so far takes a step backward as a tragic artist. This remark is not altogether just. His value for what is highest in man is none the less because he strips it of earthly rewards, nor is his reverence for eternal law less deep because he knows that its workings are sometimes pitiless. Nor, once more, does he disbelieve in Providence, because experience has shown him that the end towards which the supreme powers lead forth mankind is still unseen. Not only the utter devotion of Antigone, but the lacerated innocence of Oedipus and Deianira, the tempted truth of

Neoptolemus, the essential nobility of Ajax, leave an impress on the heart which is ineffaceable, and must elevate and purify while it .remains. In one respect, however, it must be admitted that Sophocles is not before his age. There is an element of unrelieved vindictiveness, not merely inherent in the fables, but inseparable from the poet's handling of some themes, which is only too consistent with the temper of the " tyrant city." Aeschylus represents this with equal dramatic vividness, but he associates it not with heroism, but with crime.

Sophocles is often praised for skilful construction. But the secret of his skill depends in large measure on the profound way in which the central situation in each of his fables has been conceived and felt. Concentration is the distinguishing note of tragedy, and it is by greater concentration that Sophocles is distinguished from other tragic poets. In the Septem contra Thebas or the Prometheus of Aeschylus there is still somewhat of epic enlargement and breadth; in the Hecuba and other dramas of Euripides separate scenes have an idyllic beauty and tender- ness which affect us more than the progress of the action as a whole, a defect which the poet sometimes tries to compensate by some novel denouement or catastrophe. But in following a Sophoclean tragedy we are carried steadily and swiftly onward, looking neither to the right nor to the left ; the more elaborately any scene or single speech is wrought the more does it contribute to enhance the main emotion, and if there is a deliberate pause it is felt either as a welcome breathing space or as the calm of brooding expectancy.

The result of this method is the union, in the highest degree, of simplicity with complexity, of largeness of design with absolute finish, of grandeur with harmony. Superfluities are thrown off without an effort through the burning of the fire within. Crude elements are fused and made transparent. What look like ornaments are found to be inseparable from the organic whole. Each of the plays is admirable in structure, not because it is cleverly put together, but because it is so completely alive.

The seven extant tragedies probably owe their preservation to some selection made for educational purposes in Alexandrian times. A yet smaller " sylloge " of three plays {Ajax, Electra, Oedipus Tyrannus) continued current amongst Byzantine stu- dents and many more copies of these exist than is the case with the other four. Of these four the Antigone seems to have been the most popular, while an inner circle of readers were specially attracted by the Oedipus Coloneus.

No example of the poet's earliest manner has come down to us. The Antigone certainly belongs to the Periclean epoch, and while Creon's large professions (lines 175-190) have been supposed to reflect the policy of the Athenian statesman, the heroine's grand appeal to the unwritten laws may

have been suggested by words which an Attic orator afterwards quoted as having been spoken by Pericles himself: " They say that Pericles once exhorted you that in the case of persons guilty of impiety you should observe not only the written laws, but also those unwritten, which are followed by the Eumolpidae in their instructions — laws which no man ever yet had power to abrogate, or dared to contradict, nor do the Eumolpidae themselves know who enacted them, for they believe that whoso violates them must pay the penalty not only to man, but to the gods" ([Lysias] contra Andocidem, § x. p. 104).

Modern readers have thought it strange that Creon when convinced goes to bury Polynices before attempting to release Antigone. It is obvious how this was necessary to the cata- strophe, but it is also true to character, for Creon is not moved by compunction for the maiden nor by anxiety on Haemon's account, but by the fear of retribution coming on himself and the state, because of the sacred law of sepulture which he has defied. Antigone is the martyr of natural affection and of the religion of the family. But, as Kaibel pointed out, she is also the high-born Cadmean maiden, whose defiance of the oppressor is accentuated by the pride of race. She despises Creon as an upstart, who has done outrage not only to eternal ordinance, but to the rights of the royal house.

The Ajax, that tragedy of wounded honour, still bears some traces of Aeschylean influence, and may be even earlier than the Antigone. But it strikes the peculiarly Sophoclean note, that the great and noble spirit, although through its own or others' errors it may be overclouded for a time and rejected by con- temporaries amongst mankind, is notwithstanding accepted by the gods and shall be held in lasting veneration. The con- struction of the Ajax has been adversely criticized, but without sufficient reason. If it has not the concentration of the Anti- gone, or of the Oedipus Tyrannus, it has a continuous movement which culminates in the hero's suicide, and develops a fine depth of sympathetic emotion in the sequel.

In the King Oedipus the poet attains to the supreme height of dramatic concentration and tragic intensity. The drama seems to have been produced soon after the outbreak of the Peloponnesian War, but certainly not in the year of the plague — else Sophocles, like his predecessor Phrynichus, might be said to have reminded his countrymen too poignantly of their home troubles. " The unwritten laws " are now a theme for the chorus. The worship of the Delphic Apollo is associated with a profound sense of the value and sacredness of domestic purity, and in the command to drive out pollution there is possibly an implied reference to the expulsion of the Alcmaeonidae.

The Electra, a less powerful drama, is shown by the metrical indications to

be somewhat later than the Oedipus Rex. The harshness of the vendetta is not relieved as in Aeschylus by long- drawn invocations of the dead, nor, as in Euripides, is it made a subject of casuistry. Electra's heroic impulse, the offspring

of filial love, through long endurance hardened into a " fixed idea," is irrepressible, and Orestes, supported by Pylades. goes directly to his aim in obedience to Apollo. But nothing can exceed the tenderness of the recognition scene — lines 1 098-1321, and the description of the falsely reported chariot race (681-763) is full of spirit.

In the Trachinian Maidens there is a transition towards that milder pathos which Sophocles is said to have finally approved {qdiKbiTaTov nod ixpiOTov). The fate of Deianira is tragic indeed. But in her treatment of her rival, Iole, there are modern touches reminding one of Shakespeare. The play may have been produced at a time not far removed from the peace of Nicias; and if this were so Deianira's prayer that her de- scendants may never undergo captivity — lines 303-305 — might remind Athenian matrons of the captive Heracleids from Pylos, descendants through Hyllus of Deianira herself. The " modern " note is even more conspicuous in the Philoctetes, where the inward conflict in the mind of Neoptolemus, between ambition and friendship, is delineated with equal subtlety and force, and the contrast of the ingenuous youth with the aged solitary, in whom just resentment has become a dominant idea, shows great depth of psychological insight. The tragic catastrophe of the Oedipus Tyrannus and the Trachiniae is absent here. The contending interests are reconciled by the intervention of the deified Heracles. But even more clearly than in the Ajax the heroic sufferer, rejected by men, is accepted by the gods and destined to triumph in the end. The Philoctetes is known to have been produced in the year 408 B.C., when Sopho- cles was 87 years old. The Oedipus Coloneus is said to have been brought out after the death of Sophocles by his grandson in the archonship of Micon, 402 B.C.

The question naturally arises, why a work of such surpassing merit should not have appeared in the lifetime of the poet. The answer is conjectural, but acquires some probability when several facts are taken into one view. It is surely remarkable' that in a drama which obviously appeals to Athenian patriotism, local sanctities should obtain prominence to the exclusion of the corresponding national shrines on the Acropolis. It has been thought that the aged poet felt a peculiar satisfaction in cele- brating the beauty and sacredness of his native district. This may well have been so, but could

hardly supply a sufficient motive for a work destined to be presented to the assembled Athenians in the Dionysiac theatre. But there was a crisis in Athenian politics when " Colonus of the Knights " acquired a national significance. Those who organized the constitution of the Four Hundred made the precinct of Poseidon at Colonus the place of meeting, and probably sacrificed at the very altar which is consecrated by Theseus in this play. There must have been some reason for this. May it not have been that the occu- pants of the whole region, including the Academy, belonged mostly to the oligarchic faction? May not those who honoured Colonus by frequenting it — lines 62 and 63 — have belonged to the order of knighthood? The name Colonus Hippius (or toiv linrkdiv) would then have an appropriate meaning, and the equestrian statue of the eponymous hero (line 59) would be symbolical. In times of political agitation Colonus would then be regarded like St Germain, as the aristocratic quarter, while the Peiraeus was that of the extreme democracy, a sort of Fau- bourg St Antoine. It was there that the counter-movement reached its culmination. If so much be granted, is it not possible that this play, so deeply tinged with oligarchic influence, may have been thought too dangerous, and consequently withheld from production until after the amnesty, when the name of Sophocles was universally beloved, and this work of his old age could be prudently made public by his descendant? The knights in Aristophanes (424 B.C.) make their special appeal to Poseidon of the chariot race and to the Athene of victory. The Coloniates celebrate the sons of Theseus as worshippers of Athene Hippia, and of Poseidon.

Theseus in Euripides (Supplices) is the first citizen of a republic. In this drama he is the king whose word is law, and he is warned by Oedipus to avoid the madness of revolutionary

change (lines 15361-538). The tragic story of Oedipus is resumed, but in a later and deeper strain of thoughtful emotion. Once more the noble spirit, rejected by man, is accepted by the gods. The eternal laws have been vindicated. Their decrees are irreversible, but the involuntary unconscious criminal is not finally condemned. He has no more hope in this world, but is in mysterious communion with unseen powers. The sufferer is now a holy person and an author of blessing. An approach is even made to the New Testament doctrine of the sacredness of sorrow.

Whatever may have been the nature of a Sophoclean tetra- logy, the practice which at one time prevailed of describing the Oedipus Rex, Oedipus Coloneus and Antigone as " the Theban trilogy " was manifestly erroneous and misleading. The three plays belong to different periods in the life-work of the poet, and the Antigone is the earliest of the three.

The spectator of a Sophoclean tragedy was invited to witness the supreme

crisis of an individual destiny, and was possessed at the outset with the circumstances of the decisive moment. Except in the Trachiniae, where the retrospective soliloquy of Deianira is intended to emphasize her lonely position, this exposition is effected through a brief dialogue, in which the protagonist may or may not take part. In the Oedipus Tyrannus the king's entrance and his colloquy with the aged priest intro- duce the audience at once to the action and to the chief person. In the Ajax and Philoctetes the entrance or discovery of the hero is made more impressive by being delayed. Immediately after the prologos the chorus enter, numbering fifteen, either chanting in procession as in the Antigone and Oedipus Tyrannus, or dispersedly as in the Oedipus Coloneus and Philoctetes, or, thirdly, as in the Electra, where, after entering silently during the monody of the heroine, and taking up their position in the orchestra, they address her one by one. With a remarkable exception, to be noted presently, the chorus, having once entered, remain to the end. They always stand in some carefully adjusted relation to the principal figure. The elders of Thebes, whose age and coldness throw into relief the fervour and the desolation of Antigone, are the very men to realize the calamity of Oedipus, and, while horror-stricken, to lament his fall. The rude Salaminian mariners are loyal to Ajax, but can- not enter into his grief. The Trachinian maidens would gladly support Deianira, who has won their hearts, but they are too young and inexperienced for the task. The noble Argive women can sympathize with the sorrows of Electra, but no sympathy can soothe her distress.

The parodos of the chorus is followed by the first scene or epeisodion, with which the action may be said to begin. For in the course of this the spectator's interest is strongly roused by some new circumstance involving an unforeseen complication — the awakening of Ajax (4?.), the burial of Polynices (Ant.) , the dream of Clytaemnestra (EL), the dark utterance of Teiresias (Oed. Tyr.), the arrival of Lichas with Iole (Track.), the report of Isrriene announcing Creon's coming (Oed. Col.), the sudden entreaty of Philoctetes crossed by the entrance of the pretended mariner (Phil.). The action from this point onwards is like a steadily flowing stream into which a swift and turbulent tribu- tary has suddenly fallen, and the interest advances with rapid and continuous climax until the culmination is reached and the catastrophe is certain. The manner in which this is done, through the interweaving of dialogue and narration with the various lyrical portions, is very different in different dramas, one of the principal charms of Sophocles being his power of ingenious variation in the employment of his resources. Not less admir- able is the strength with which he sustains the interest after the peripeteia, 1 whether, as in the Antigone, by heaping sorrow upon sorrow, or, as in the first Oedipus, by passing from horror to tenderness and unlocking the fountain of tears. The extreme point of boldness in arrangement is reached in the Ajax, where the chorus and

Tecmessa, having been warned of the impending

1 A tragic action has five stages, whence the five acts of the modern drama: the start, the rise, the height, the change, the close.

danger, depart severally in quest of the vanished hero, and thus leave not only the stage but the orchestra vacant for the soliloquy that precedes his suicide.

No such general description as has been here attempted can give even a remote impression of the march of Sophoclean tragedy — by what subtle yet firm and strongly marked grada- tions the plot is unfolded; how stroke after stroke contributes to the harmonious totality of feeling; what vivid interplay, on the stage, in the orchestra, and between both, builds up the majestic, ever-moving spectacle. Examine, for example, the opening scene or irpoKoyos of the Oedipus Tyrannus. Its function is merely to propound the situation; yet it is in itself a miniature drama. First there is the silent spectacle of the eager throng of suppliants at the palace gate — young children, youths and aged priests. To them the king appears, with royal condescension and true public zeal. The priest expresses their heartfelt loyalty, describes the distress of Thebes, and, extolling Oedipus's past services, implores him to exercise his consummate wisdom for the relief of his people. The king's reply unveils yet further his incessant watchfulness and anxious care for his subjects. And he discloses a new object to their expectancy and hope. Creon, a royal person, had been sent to Delphi, and should ere then have returned with the response of Apollo. At this all hearts are trembling in suspense, when Creon is seen approaching. He is wreathed with Apollo's laurel; he looks cheerfully. What has Phoebus said? Another moment of suspense is interposed. Then the oracle is repeated — so thrilling to the spectator who understands the story, so full of doubt and hope and dread to all the persons of the drama: " It is for the blood of Laiiis — his murderers are harboured in the land of Thebes. The country must be purged." That is the cul- minating point of the little tragedy. While Oedipus asks for information, while in gaiety of heart he undertakes the search, While he bids the folk of Cadmus to be summoned thither, the spectators have just time to take in the full significance of what has passed, which every word that is uttered sends further home. All this in 150 lines!

Or, once more, consider the employment of narrative by this great poet. The Tyrannus might be again adduced, but let us turn instead to the Antigone and the Trachiniae. The speech of the messenger in the Antigone,

the speeches of Hyllus and the Nurse in the Trachiniae, occur at the supreme crisis of the two dramas. Yet there is no sense of any retardation in the action by the report of what has been happening else- where. Much rather the audience are carried breathlessly along, while each speaker brings before their mental vision the scene of which he had himself been part. It is a drama within the drama, an action rising from its starting-point in rapid climax, swift, full, concentrated, until that wave subsides, and is followed by a moment of expectation. Nor is this all. The narrative of the messenger is overheard by Eurydice, that of Hyllus is heard by Deianira, that of Nurse by the chorus of Maidens. And in each case a poignancy of tragic significance is added by this circumstance, while the speech of the Messenger in the Antigone, and that of Hyllus in a yet higher degree, bind together in one the twofold interest of an action which might otherwise seem in danger of distracting the spectator's sympathies.

So profound is the contrivance, or, to speak more accurately, such is the strength of central feeling and conception, which secures the grace of unity in complexity to the Sophoclean drama.

The proportion of the lyrics to the level dialogue is consider- ably less on the average in Sophocles than in Aeschylus, as might be expected from the development of the purely dramatic element, and the consequent subordination of the chorus to the protagonist. In the seven extant plays the lyrical portion ranges from one-fifth to nearly one-third, being highest in the Antigone and lowest in the Oedipus Tyrannus. The distribu- tion of the lyrical parts is still more widely diversified. In the Electro, for instance, the chorus has less to do than in the Oedipus Tyrannus, although in the former the lyrics constitute

one-fourth, and in the latter only one-fifth of the whole. But then the part of Electra is favourable to lyrical outbursts, whereas it is only after the tragic change that Oedipus can appropriately pass from the stately senarius to the broken language of the dochmiac and the " lamenting " anapaest. The protagonists of the Ajax and the Philoctetes had also large opportunities for vocal display.

The union of strict symmetry with freedom and variety, which is throughout characteristic of the work of Sophocles, is especially noticeable in his handling of the tragic metres. In the iambics of his dialogue, as compared with those of Aeschylus, there is an advance which may be compared with the transition from " Marlowe's mighty line " to the subtler harmonies of Shakespeare. Felicitous pauses, the linking on of line to line, trisyllabic feet introduced for special effects, alliteration both hard and soft, length of speeches artfully suited to character and situation, adaptation of the caesura to the feeling expressed, are some of the points which occur

most readily in thinking of his senarii. A minute speciality may be noted as illustrative of his manner in this respect. Where a line is broken by a pause towards the end and the latter phrase runs on into the following lines, elision sometimes takes place between the lines, e.g. (Oed. Tyr., 332-333) : —

'TSyi> oCt' huavTOv ovre a' &\yw£>. H tout" dXXus £Xe7x e 's; This is called synaphea, and is peculiar to Sophocles.

*He differentiates more than Aeschylus does between the metres to be employed in the Koiifioi (including the Koˆ/mrt/cd) and in the choral odes. The dochmius, cretic, and free anapaest are employed chiefly in the koˆoL In the stasima he has greatly developed the use of logaoedic and particularly of glyconic rhythms, and far less frequently than his predecessor indulges in long continuous runs of dactyls or trochees. The light trochaic line *>> —·i> — , so frequent in Aeschylus, is comparatively rare in Sophocles. If, from the very severity with which the choral element is subordinated to the purely dramatic, his lyrics have neither the magnificent sweep of Aeschylus nor the " linked sweetness " of Euripides, they have a concinnity and point, a directness of aim, and a truth of dramatic keeping, more perfect than is to be found in either. And even in grandeur it would be hard to find many passages to bear comparison with the second stasimon, or central ode, either of the Antigone (euSaijuoi'es olai ko.kSh>) or the first Oedipus (ei /xoi %vvdri kpovTi.). Nor does anything in Euripides equal in grace and sweetness the famous eulogy on Colonus (the poet's birthplace) in the Oedipus Coloneus. j*

Bibliography. — Sophocles was edited (probably from the Venetian MSS.) by Aldus Manutius, with the help of Musurus, in 1502. The Juntine editions in which the text of Aldus was slightly modified with the help of Florentine MSS. were published in 1522, 1547, respectively. An edition of the Scholia, very nearly corre- sponding to those on the margin of the Medicean or chief Laurentian MS. (La or L) has previously appeared at Rome in 1518. The first great modification of the text was due to Turnebus, who had access to the Parisian MSS. ; but he was not fortunate in his selection. The earliest editors had been aware that the traditional arrange- ment of the metres was faulty, but little way had been made towards a readjustment. Now it so happens that the Parisian MS. T, which is a copy of the recension of Triclinius, an early 14th-century scholar, contains also the metrical views of the same editor; and, having found (as he erroneously supposed) a sound authority, Turnebus (1552) blindly adopted it, and was followed in this by H. Stephanus (1568), and by Canter in Holland (1579), who was the first to recognize the arrangement of the odes in strophe and antistrophe. The error was to a large extent corrected by Brunck (1786), who rightly preferred Par. A (2712), a 13th-

century MS., belonging, as it happened, to the same family with Ven. 467, which Aldus had mainly followed. Thus after nearly three centuries the text returned (though with conjectural variations) into the former channel. Musgrave's edition was published posthumously in 1800, and Gilbert Wakefield had published a selection shortly before. Erfurdt in Germany then took up the succession, and his edition formed the basis of Hermann's, whose psychological method set the example of a new style of commentary which was adopted by Wunder. A new era commenced with Peter Elmsley's collation of the Laurentian MS. (made in 1818, but only published in full after his death). His transcription of the Scholia still exists in the Bodleian Library. The most important German commentaries

since Hermann's have been those of Schneidewin, G. Wolff and Wecklein. L. Campbell's edition of the plays and fragments (1871-1881) was quickly followed by Jebb's edition of the seven plays (1881-1896). Editions of one or more dramas most worth consulting are Elmsley's Oedipus Tyrannus and Oedipus Coloneus, Bockh's Antigone, Lobeck's Ajax, J. W. Donaldson's Antigone, O. Jahn's Electra and J. William White's Oed. Tyr. A monograph on the Antigone by Kaibel is also well worth mention- ing. Translations: in verse, by Francklin, Potter, Dale, Plumptre, L. Campbell, Whitelaw; in prose by R. C. Jebb. The chief German translations are those of Solger (1824), Donner (1839), Hartung (1853) and Tbudichum. The French prose translation by Leconte de Lisle, and the Italian in verse by Bellotti deserve special mention. The Antigone was produced at Berlin with Mendelssohn's music in 1841 and the Oedipus Coloneus in 1845. They have been reproduced in English several times — the A nligone notably with Helen Faucit (Lady Martin) in the title-role in 1845. The Oedipe Roi (trans. La Croix) and the Antigone (trans. Vacquerie) have been frequently performed in Paris. A performance of the Oedipus Tyrannus in Greek at Harvard University, U.S.A. (1880), was remarkably successful. Of dissertations immediately devoted to Sophocles those of Lessing, Patin, Dronke and Evelyn Abbott (in Hellenica) are especially noteworthy. (L. C.)

SOPHOMORE, the name in American universities (corre- sponding to " sophister " at Cambridge, England, and Trinity College, Dublin) for a student who has completed his first year of academic studies. It is a corruption of the earlier " sophi- more," due to a supposed derivation from uo4>6s, wise, and /icSpos, foolish, alluding to the air of wisdom assumed by students after their freshman's year was concluded. The earlier word " sophimore " (cf. " Laws of Yale Coll., 1774," in Hall's College Words) represents " sophismer," a doublet of " sophister," and means an arguer or

debater (cf. the Cambridge use of " wrangler "), and is formed from the Greek cb

SOPHRON, of Syracuse, writer of mimes, flourished about 430 B.C. He was the author of prose dialogues in the Doric dialect, containing both male and female characters, some serious, others humorous in style, and depicting scenes from the daily life of the Sicilian Greeks. Although in prose, they were regarded as poems; in any case they were not intended for stage representation. They were written in pithy and popular language, full of proverbs and colloquialisms. Plato is said to have introduced them into Athens and to have made use of them in his dialogues; according to Su'idas, they were Plato's constant companions, and he even slept with them under his pillow. Some idea of their general character may be gathered from the 2nd and 15th idylls of Theocritus, which are said to have been imitated from the 'kKtarpiai and 'lo-Qjuoˆovaai of his Syracusan predecessor. Their influence is also to be traced in the satires of Persius. The fragments will be found in H. L. Ahrens's De graecae linguae dialectis (1843), ii. (app.). Latest edition by C. J. Botzon (1867); see also his De Sophrone et Xenarcho mimographis (1856).

SOPHRONIUS, Greek " sophist " and theological writer, was born at Damascus. For many years he was a monk in the monastery of Theodosius, near Jerusalem, removed to Alex- andria, whence he was driven out by the advance of the Persians, and finally settled in Palestine, where he became (634) suc- cessor of Modestus in the patriarchate of Jerusalem. After his elevation he showed himself a staunch supporter of orthodox principles and one of the most determined opponents of the Monothelites. In 636, when Jerusalem surrendered to the Arabs under Omar, he succeeded in obtaining important con- cessions for the Christians in the exercise of their worship. He did not long survive the capture of the city, and after his death the see remained unfilled for 29 years. Sophronius was a prolific writer, both in prose and verse, in various departments of literature. His chief work is a long account of the Egyptian saints and martyrs Cyrus and John, and of the miraculous cures effected by them, valuable for its information con- cerning the topography of Egypt. The Life of Mary of Egypt, who abandoned immorality for a life of the strictest penance in Palestine for 48 years, is generally attributed to him. He was also the author of anacreontic odes, hymns, and epigrams.

Works in J. P. Migne, Patrologia graeca, lxxxvii., and list in Fabricius, Bibliotheca graeca, ix. 162; see also L. de St Aignan, Vie de Sophronius (Orleans, 1884) ; C. Krumbacher, Geschichte der byzantinischen Litteratur (1897); and for Sophronius and Omar, Gibbon, ch. 51.

SOPRANO (a variant of Ital. sovrano, supreme, sovereign, Late Lat.

superanus, from super, above), the term applied in music to the highest natural range of the human voice, and often restricted to that range in the female voice, " treble " being used of a boy's voice. Male soprani, either natural or artificially produced, as formerly in the castrati of the papal choirs (see Eunuch), are also found. The female voice whose range is intermediate between that of a soprano or a contralto is termed " mezzo-soprano."

SOPRON (Ger. Oedenburg; Med. Lat. Sopronium), a town of Hungary, capital of the county of the same name, 140 m. W. of Budapest by rail. Pop. (1900), 30,628, about 60 % Germans. It lies in an extensive valley enclosed on all sides by the outskirts of the Rosalien mountains, a group belonging to the eastern outliers of the Alps. In the principal square are the Benedictine church, built at the end of the 13th century and restored in the 15th century, and the town hall, completed in 1894. The Dominican church, built in 1674; the church of St Michael, in the Gothic style, completed in 1484, the most interesting church in the town; and the old tower, 200 ft. high, are all worth notice. Sopron has a thriving industry in sugar, soap, vinegar, bell- founding and machinery, and it carries on an active trade in cereals, fruit and wine. Large cattle markets are also held here. Within the county a good quality of wine is produced, especially near the little town of Ruszt (pop. 1608) and at the village of Balf (Ger., Wolfs) on the shores of the Neusiedler lake. In the neighbourhood of Sopron is the Brennberg, with extensive coal-mines. Sopron was a Roman colony under the name of Scarabantia. It was afterwards occupied by German settlers and became a royal free town in the nth century. Matthias Corvinus granted the town special privileges in 1464. An important Diet of Hungarian Protestants took place here in 1681.

About 12 m. north, at the foot of the Leitha mountains, lies the town of Kismarton (Ger. Eisenstadt; pop., 2951), which contains a magnificent castle of the Esterhazy family, built in 1683 and en- larged in 1805. About 10 m. north-west lies Nagymarton (Ger. Mattersdorf; pop., 3789); and not far from it, on the frontier of Austria, the well-preserved castle of Forchtenstein, the cradle of the Esterhazy family. About 12 m. east, not far from the Neusiedler lake, lies Esterhaza, with a beautiful castle in the French Renaissance style, belonging to Count Esterhazy. About 9 m. south-east lies the village of Nagyczenk (Ger. Zinkendorff), with the castle of the Szechenyi family.

SORA, a city of Campania, Italy, in the province of Caserta, 77 m. N. by W. of that town on the railway between Roccasecca and Avezzano, 920 ft. above sea-level. Pop. (1901), 6,050 (town); 16,022 (commune). It is built in a plain on the banks of the Liris. This part of the valley is the seat of some im- portant manufactures, especially of paper-mills. The original

cathedral, consecrated by Pope Adrian IV. in 1155, was de- stroyed by the earthquake of 1634. On the precipitous rock above the town (1768 ft.) which guards the Liris valley and the entrance to the Abruzzi are remains of polygonal walls; here, possibly, was the citadel of the original Volscian town. There are also remains of medieval fortifications. In the town itself there are no remains of antiquity nor buildings of interest. The district around Sora is famous for the costumes of its peasants.

Sora, an ancient Volscian town, was thrice captured by the Romans, in 345, 314 and 305 B.C., before they managed, in 303, by means of a colony 4000 strong, to confirm its annexa- tion. In 209 it was one of the colonies which refused further contributions to the war against Hannibal. By the lex Julia it became a municipium, but under Augustus it was colonized by soldiers of the legio IV. Sorana, which had been mainly enrolled there. It belonged technically to Latium Adjectum. The castle of Sorella, built on the rocky height above the town,

was in the middle ages a stronghold of some note. Charles I. of Anjou made Sora a duchy for the Cantelmi ; it was afterwards seized by Pius II., but, being restored to the Cantelmi by Sixtus IV., it ultimately passed to the Delia Rovere of Urbino. Against Caesar Borgia the city was heroically defended by Giovanni di Montefeltro. It was purchased by Gregory XIII. for n,ooo ducats and bestowed on the Buoncompagni, the ancestors of the line of Buoncompagni-Ludovisi. In ancient times Sora was the birthplace of the Decii, Attilius Regulus, and Lucius Mummius; and among its later celebrities is Cardinal Baronius. (T. As.)

SORACTE, a mountain in the province of Rome, Italy. It is a narrow, isolated limestone ridge, some 5 m. S.E. of Civita Castellana, and 35 m. in length. The highest summit is 2267 ft. above sea-level; just below it is a monastery removed there from the summit in 1835; it was originally founded about 748 by Carloman, son of Charles Martel (the altar has, indeed, fragments of sculptures of this period), and until modern times was occupied by Trinitarian monks. On the actual summit is a church. Owing to the isolated position of the mountain the view is magnificent, and Soracte is a conspicuous object in the landscape, being visible from Rome itself. It is thus mentioned by Horace ("vides ut alta stet nive candidum Soracte?" Carm. i. 9), and Virgil, who mentions Apollo as its guardian deity, though no traces of his temple exist; and in reality it was sacred to Dis Pater and the gods of the lower world. At the bottom of the mountain on the east is a disused limestone quarry. The village of S. Oreste at the south-east end of

the ridge owes its name to a corruption of the ancient name. In the communal palace is a fine processional cross of the nth century in the Byzantine style (see Romische Quartalschrift, 1905, 209 — Archaologie) .

SORANUS, Greek physician, born at Ephesus, lived during the reigns of Trajan and Hadrian (a.d. 98-138). According to Su'idas, he practised in Alexandria and subsequently in Rome. He was the chief representative of the school of physicians known as " methodists." Two treatises by him are extant : On Fractures (in J. L. Ideler, Physici et medici minores, i. 1841) and On Diseases of Women (first published in 1838, later by V. Rose, in 1882, with a 6th-century Latin translation by Moschio, a physician of the same school). Of his most important work (On Acute and Chronic Diseases) only a few fragments in Greek remain, but we possess a complete Latin translation by Caelius Aurelianus (5th century). The Life of Hippocrates (in Ideler) probably formed one of the collection of medical biographies by Soranus referred to by Su'idas, and is valuable as the only authority for the life of the great physician, with the exception of articles in Suidas and Stephanus of Byzantium (s.v. Kojs). The Introduction to the Science of Medicine (V. Rose, Anecdota graeca, ii. 1870) is considered spurious.

See article by J. Hahn, in Dechambre's Dictionnaire encyclo- pedique des sciences medicates, 3rd series, torn. 10; W. Christ, Geschichte der griechischen Litteratur (1898); J. Ilberg, Die Uber- lieferung der Gynaekologie des Soranos von Ephesos (Leipzig, 1910).

SORANUS, BAREA, Roman senator, lived in the reign of Nero. His gentile name was possibly Servilius. In 52 he was consul suffectus, and (perhaps in 61) proconsul of Asia. The upright and considerate manner in which he treated the pro- vincials won him their affection, but at the same time brought upon him the hatred of Nero, who felt specially aggrieved because Soranus had refused to punish a city which had defended the statues of its gods against the Imperial commissioners. Soranus was accused of intimacy with Rubellius Plautus (another object of Nero's hatred), and of endeavouring to obtain the goodwill of the provincials by treasonable intrigues. One of the chief witnesses against him was Egnatius Celer of Berytus, his client and former tutor. Soranus was condemned to death (in 65 or 66), and committed suicide. His daughter Servilia, who was charged with having consulted the sorcerers, professedly in regard to her father's fate, but in reality with evil designs against the emperor, was involved in his downfall. The accuser, who was condemned to death in the reign of Vespasian

for his conduct on this occasion, is a standing example of ingratitude and treachery.

Tacitus, Annals, xvi. 30, 32; Hist. iv. 10; Juvenal iii. 116; Dio Cassius lxii. 26.

SORAU, a town of Germany, in the Prussian province of Brandenburg, on the Sorebach, 54 m. S.E. of Frankfort-on- Oder by rail, and at the junction of lines to Cottbus and Gorlitz. Pop. (1905), 16,410. One of the oldest towns in Lower Lusatia, Sorau contains a number of ancient buildings, among which the most prominent are several of the churches (one dating from 1204), the town hall, built in 1260, and the old palace of 1207 (now a prison). The new palace, erected in 17 n by Count Erdmann II. of Promnitz, is utilized for government offices. The varied manufactures of the town comprise cloth, linen, wax candles, starch, glass and porcelain.

Sorau is said to have existed in 840, and to have belonged to the abbey of Fulda till the 12th century. It received civic rights in 1260. With the surrounding district, known as the barony of Sorau, it became the seat of successive noble families; and in 1400 it was united with the barony of Triebel. The last Count of Promnitz, whose ancestor had purchased both baronies from Frederick of Bohemia in 1556, sold them in 1765 to the elector of Saxony for an annuity of 12,000 thalers (£1800). In 1815 Saxony ceded them to Prussia.

SeeWorbs, Geschichte der Herrschaft Sorau und Triebel (Sorau, 1826).

SORBONNE, the name given originally to the college founded by Robert de Sorbon in Paris; hence applied afterwards popu- larly to the theological faculty, and so to the institution which is now the seat of the Academie of that city (see Universities). The Sorbonne owes its origin and its name to Robert of Sorbon, near Reims (1201-1274), who went to Paris about the beginning of the reign of St Louis in order to qualify for the priesthood, attained high repute by his sanctity and eloquence, and was appointed by the king to be his confessor. Assisted by royal liberality, he built a modest establishment in which were accommodated seven priests charged with the duty of teaching theology gratuitously; to this he added a college of preparatory studies, all under the direction of a provisor, under whom was an annual prior who had the actual management. The new institution was authorized in 1252 by a deed signed by Queen Blanche, on behalf of Louis IX. (who was in Palestine) ; and in 1257 a site was given by the king in the heart of the Latin quarter. It was declared " useful to religion " by Pope Alex- ander IV. in 1259, and papal bulls authorizing and confirming the college were granted in 1263 and 1268. Destined originally for poor students (and called domus magistrorum pauperrima, " most poor house of masters "), the Sorbonne soon became a meeting-place for all the students of the university of Paris, who resorted thither to hear the lectures of the most learned theologians of the period — Guillaume de Saint Amour,

Eudes de Douai, Laurent l'Anglais, Pierre d'Ailly. At the close of the century it was organized into a full faculty of theology, and under this definite form it conferred bachelors', licentiates' and doctors' degrees, and the severity of its examinations gave an exceptional value to its diplomas. The so-called " these sorbonique," instituted towards the beginning of the 14th century, became the type of its order by the length and difficulty of its tests. Ultimately the professors of the Sorbonne came to be resorted to not only for lectures and examinations, but also for dogmatic decisions and judgments in canon law; the clergy of France and of the whole Catholic world had recourse to them in difficult cases, and the Curia Romana itself more than once laid its doubts before them, giving them the title of " Concilium in Gallia subsistens." To the Sorbonne belongs the glory of having introduced printing into France in 1469: within its precincts it assigned quarters for Ulric Gering and two companions in which to set up their presses. The Sorbonne took a leading part in the religious discussions which agitated France during the 16th and 18th centuries, and its influence thus inevitably extended to political questions. During the insanity of Charles VI. it helped to bring about the absolutior of Jean Sans-Peur for the assassination of the duke of Orleans

Shortly afterwards it demanded and supported the condemnation 1 of Joan of Arc; during the Reformation it was the animating spirit of all the persecutions directed against Protestants and unbelievers: without having advised the massacre of St Bartholomew, it did not hesitate to justify it, and it inflamed the League by its vigorous anathemas against Henry III. and the king of Navarre, _ hesitating to recognize the latter even after his abjuration. From this point dates the beginning of its decadence, and when Richelieu in 1626 ordered the recon- struction of its church and buildings the following prophetic couplet was circulated —

"Instaurata ruet jamjam Sorbona. Caduca Dum fuit, inconcussa stetit ; renovata peribit."

The declaration of the clergy in 1682, which it subscribed, proved fatal to its authority with the Curia Romana; it revived for a short time under Louis XV. during the struggle against Jansenism, but this was its last exploit; it was suppressed like the old universities in 1792.

When the university" of France was organized in 1808 the Sorbonne became the seat of the academie of Paris; and between 181 6 and 182 1 the faculties of theology (since disappeared), science and literature were

installed there. The university library was transferred to the Sorbonne in 1823. In 1868 was organized the Ecole des Hautes Etudes, and in 1897 the Ecole des Chartes also found its home at the Sorbonne.

In 1852 the Sorbonne was made the property of the city of Paris; a reconstruction of the buildings, projected by Napoleon III., was begun in 1884, under the architectural direction of Nenot, and completed in 1889. The old church containing the tomb of Richelieu was retained on account of its artistic merit. This new Sorbonne is one of the finest university edifices in the world, and has developed into the chief French centre of learning.

See A. Franklin, La Sorbonne (1875) ; Denifle, Documents relatifs & la fondation de I'universite de Paris (1883); J. A. Randolph, History of the Sorbonne.

SORBS, the tribal name of the Slavonic people, whom the Germans call Wends in Lusatia (Lausitz) ; they call themselves Serbs or Luzicane. Their country includes the western ex- tremity of the kingdom of Saxony and parts of the districts of Hoyerswerda, Muskau, Kottbus, Kalau, Spremberg and Sorau in Prussia; they are now surrounded on all sides by Germans, but they formerly had them as neighbours only on the west along the Fulda, while on the north towards Kopenick they marched with the Lutici, on the east with the Poles and Silesians along the Queiss and Bobr, and on the south were separated from the Bohemians by the mountains that now make the Austrian frontier. The Sorbs are divided into High and Low along a line from Sagatt to Muskau and Spremberg. They are in all about 180,000 in number; 80,000 Low Sorbs and 40,000 of the 100,000 High Sorbs are in Prussia, and 60,000 High Sorbs in Saxony. These have gained definite rights for their language in school and administration, so that Bautzen (Budysin), their capital, is the intellectual centre not only for Saxon subjects, but for all High Sorbs and to a great extent for Low Sorbs. The first monuments of both dialects belong to the Reformation period, these being translations 01 Luther's Catechism by Warichius and Moller. Some Sorbs are Protestants, though the Saxon Sorbs are mostly Roman Catholics.. Early in the 19th century the High Sorbs had a revival under the leadership of F. A. Klin, a lawyer and politician; A. Seidler, a considerable poet, and S. E. Smoler, an ethnographer and publicist. More recent writers are J. Cisinsk and J. Radyserb. A Macica or Literary and Linguistic Society was founded in 1847, and publishes a Casopis or Periodical. Meanwhile Low Sorb has remained almost unculti- vated owing to the pressure of the Prussian administration.

The two dialects stand between Polish and Cech: they have lost the nasal vowels, have the accent on the first syllable, and make tj into c, dj into 2,

like Cech, but they retain x and y and, like Polish, have grod for Cech grad. High Sorb has k, Low the original g. They have kept the old aorist and dual. Sorb is usually printed in German blackletter variously adapted; the Macica publishes some books spelt after the Cech system.

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SORBY, HENRY CLIFTON (1826-1908), English micro- scopist and geologist, was born at Woodbourne near Sheffield on the 10th of May 1826. He early developed an interest in natural science, and one of his first papers related to the excava- tion of valleys in Yorkshire. He subsequently dealt with the physical geography of former geological periods, with the wave- structure in certain stratified rocks, and the origin of slaty cleavage. He took up the study of rocks and minerals under the microscope, and published an important memoir On the Microscopical Structure of Crystals in 1858 (Quart. J own. Geol. Soc). In England he was one of the pioneers in petrography; he was awarded the Wollaston medal by the Geological Society of London in 1869, and when president of the society he published in his addresses the results of original researches on the structure and origin of limestones, and of the non-calcareous stratified rocks (1879-1880). He had previously been president of the Royal Microscopical Society. He wrote on the construc- tion and use of the micro-spectroscope in the study of animal and vegetable colouring matter, and in later essays he dealt with such varied subjects as the microscopical structure of iron and steel, and the temperature of the water in estuaries. He also applied his skill in making preparations of invertebrate animals for lantern-slides. In 1882 he was elected president of Firth College, Sheffield. He died on the 9th of March

1908.

SORCERY, magic, enchantment, witchcraft; the use of supposed supernatural powers by the agency of evil spirits called forth by spells, incantations, &c, on the part of the magician, sorcerer or witch. The word meant originally divina- tion by means of the casting or drawing of lots, and is derived from the O. Fr. sorcerie, sorcier, a sorcerer, Med. Lat. sortiarius, one who practises divination by lots, sortes (see Magic, Divina-

tion and Witchcraft).

SORDELLO, a 13th-century Italian troubadour, born at Mantua, who is praised by Dante in the De vulgari eloquio, and in the Purgatorio made the type of patriotic pride. He is also the hero of a well-known poem by Robert Browning. The real Sordello, so far as we have authentic facts about his life, hardly seems to justify these idealizations, though he was the most famous of the Italian troubadours. About 1220 he appears at Florence in a tavern brawl; and in 1226, while at the court of Richard of Bonifazio at Verona, he abducts his master's wife, Cunizza, at the instigation of her brother, Ezze- lino da Romano. The scandal resulted in his flight (1229) to Provence, where he seems to have been for some time. He entered the service of Charles of Anjou, and probably accom- panied him (1265) on his Naples expedition; in 1266 he was a prisoner in Naples. The last documentary mention of him is in 1269, and he is supposed to have died in Provence. His didactic poem, L' Ensenhamen d'onor,. and his love songs and satirical pieces have little in common with Dante's presentation, but the invective against negligent princes which Dante puts into his mouth in the 7 th canto of the Purgatorio is more ade- quately paralleled in his Serventese (1237) on the death of his patron Blacatz, where he invites the princes of Christendom to feed on the heart of the hero.

For Sordello's life and works see the edition of Cesare de Lollis (Halle, 1896) ; for Browning's poem see Stopford Brooke's Browning

(1902).

SORDINO, Sordoni, Sorduni, Italian terms somewhat promiscuously applied by various writers (1) to contrivances for damping or muting wind, string and percussion instruments (Sordini); (2) to a family of obsolete wind instruments blown by means of a double reed (Sordoni or Sordun) ; (3) to a stringed instrument. To these must also be added the Surdeilina or

Sordellina, a kind of musette invented (see Bagpipe) in Naples in the 17th century, and evidently named after class 2.

1. Under the Italian term sordini are comprised the dampers used with stringed instruments, such as the violin, and the dampers of keyboard instruments, all well known, and described with the instruments themselves. As a certain amount of misconception exists concerning the sordini (Fr. sourdines, Ger. Ddmpfer), used from the 16th century with the trumpet and later with the horn, they may be briefly described. It would appear that the

art has almost been lost of making mutes for trumpets and French horns, which should affect the timbre only, giving it a certain veiled mysterious quality similar to that of the sons Douches or hand- stopped notes, but affecting the pitch not at all. We read that when it is necessary to produce this peculiar timbre on the valve- horn, as for instance in Wagner's Rheingold, the rise of a semi tone in pitch caused by the introduction of the mute or the hand into the bell of the horn must be compensated by means of the second piston which lowers the pitch a semi-tone. 1

If the sordino used early in the 17th century had had this effect of raising the pitch, the fact would have been stated by such writers as Mersenne and Praetorius; it would, moreover, have rendered the mute useless with instruments on which no sort of com- pensation was possible. H. Domnich 2 and J. Frohlich, 3 however, describe the sordino which leaves the pitch unaffected : it con- sisted of a hollow cone of wood or cardboard, truncated at the apex to allow the air to pass through and escape through a hole in the base. The bore of the instrument thus continued through the cone of the mute was the essential point, and the proportions to be maintained between the diameters of the two bores were also, no doubt, of importance. Domnich expressly states that it was when Hampel substituted a plug of cotton-wool (therefore solid and providing no central passage for the air) for the mute, that he found the pitch of the horn raised a semi-tone. Domnich's evidence is of value, for his 'dther was a horn-player contemporary with Hampel, and he himself was the intimate friend and colleague of Punto, Hampel's most celebrated pupil.

2. The sordun or sordoni family are often confused with the dolcians (Fr. couriaud, Eng. single curtail, Ger. Kort or Kortholt), from which, however, they differed radically. This difference h'as not understood by Michael Praetorius, who acknowledges his mystification. The contra-bass sordun, he says, hardly half the length of the contra-fagotto, is yet practically of the same pitch, which is astonishing since the bore is only double once upon itself as in the fagotto. The kort likewise is of the same size as the bass sordun, and yet in pitch it is but a tenor. The following description of the construction and acoustic properties of the sordoni will clear up the mystery. The body consisted of a cylinder of wood in which were cut two parallel channels of narrow cylindrical bore, communicating with each other at the bottom through a bend, but not with ambient air. At the top of the cylinder was fitted a double-reed mouthpiece giving access to the column of air at one end of the bore, while the other was vented through a small hole in the side, similar to the finger-holes', in the tenor, bass and contra members of the family, the reed was attached to a curved brass crook similar to that of the fagotto. So far the description would almost apply to the dolcian also, but in the latter there is the radical difference that the bore of the channels is conical, so that it has the acoustic

properties of the open pipe. The sordun, however, having a cylindrical bore, has the acoustic properties of the stopped pipe, i.e. the sound waves are twice the length of the pipe, so that to produce a sound of any given pitch, for instance tor C, the bore need only be half the length, i.e. 4 ft. long. Over- blowing, on the sordoni, moreover, produced as first harmonic (the only one required for reed-blown instruments in order to produce the diatonic scale for the second octave) not the octave, but the twelfth, or number 3 of the series. This accounts for the fact that instruments of the fagotto and dolcian type require but 6 or 7 holes to give the diatonic scale throughout the compass, whereas the sordoni require 11 or 12 holes. Praetorius states that those figured by him (Plate XII.) have 12 open holes, and that some speci- mens have in addition two keys; a hole is also bored through the bottom of the instrument to allow the moisture condensed from the breath to be shaken out. The 12 holes are stopped by means of fingers and thumbs and by the ball of the hand or the fleshy under- paid of the joints of the fingers. The compass of the 5 sizes of sordoni was as follows :
— ■

§E

;to:

^

Contrabass.

m

:toi

rto =

3 =

?&" Tenor or Alto.

Basses

1 See Victor Mahillon, " Le Cor," Instruments a vent, pt. ii. (Brussels and London, 1907), pp. 34 and 53.

- *Methode de premier et de second cor (Paris, c. 1807), pp. 3 and 4.*
- *Vollstandige theor.prakt. Musiklehre fur alle bei dem Or chester gebrauchliche Instrumente (Cologne and Bonn, c. 181 1).*

Two sourdines belonging to the Museum of the Brussels Conserva- toire,

said to be facsimiles of some instruments belonging to the emperor Maximilian I.'s band, are reproduced in Captain C. R. Day's Descriptive Catalogue of Musical Instruments (London, 1891). They differ slightly in construction from the Italian instruments described by Praetorius. The straight crook is set in the side of the instru- ment, almost at right angles, the top of the cylinder is surmounted by a cap, and there are but 6 open holes, the rest being covered by brass keys in wooden boxes. The pitch of these instruments lies within a semi-tone of that of the contra-bass and bass of Praetorius.

(K. S.)

SOREL, AGNES (c. 1422-1450), mistress of King Charles VII. of France, was born of a family of the lesser nobility at Fromen- teau in Touraine. While still a girl she was attached to the service of Isabel of Lorraine, queen of Sicily, wife of Rene of Anjou, the brother-in-law of Charles VII. From 1444 until her death in 1450 she was the acknowledged mistress of the king, the first woman to hold that semi-official position which was to be of so great importance in the subsequent history of the old regime. Her ascendancy dated from the festivals at Nancy in 1444, the first brilliant court of Charles VII. Here her great beauty captivated the king, whose love for her remained constant until her death. He gave her wealth, castles and lands, and secured for her the state and distinction of a queen. This first public recognition of his mistress by a king of France scandal- ized all good people and awakened jealousy and intrigue. Her sudden death from dysentery, shortly after the birth of her fourth child, was accordingly attributed to poison. Burgundian historians even openly accused the Dauphin, afterwards Louis XL, of her death, and later the enemies of Jacques Cceur, in their search for crimes to be brought against him, used this rumour to charge him with the one crime most likely to turn the king against him. Her heart was buried in the abbey of Jumieges, her body in the collegiate church of Loches. Contemporary writers all bear witness to her extra- ordinary beauty, but no genuine portraits of her have come down to us.

Legend has made an entirely different character of this first official mistress of the French kings. The date of her birth was placed at about 1409, her liaison with the king dated from 1433. Then, so the story ran, she drew him from his indolence, continuing the work of Joan of Arc, both by nerving the king to warlike enterprises — she did apparently induce him to take part personally in the conquest of Normandy — and by surround- ing him with that band of wise advisers who really adminis- tered France during her ascendancy. Recent investigation has exploded this romantic story by simply showing that Charles VII. had not met her until ten years later than in the legend. Instead of being his sole good angel, she seems

rather to have demoralized the king, who, hitherto chaste, henceforth gave himself up to courtesans. Yet she favoured the best advisers of the king, and at least in this deserved the gratitude of the realm. Pierre de Breze seems especially to have used Agnes to gain his ascendancy over the king.

See A. Vallet de Viriville's articles in Bibliotheque de I'Acole des chartes (3rd series, torn, i.) ; and R. Duquesne, Vie et aventures galantes de la belle Sorel (1909).

SOREL, ALBERT (1842-1906), French historian, was born at Honfleur on the 13th of August 1842. He was of a character- istically Norman type, and remained all his life a lover of his native province and its glories. His father, a rich manufac- turer, would have liked him to succeed. to the business, but his literary vocation prevailed. He went to live in Paris, where he studied law, and after a prolonged stay in Germany entered the Foreign Office (1866). He had strongly-developed literary and artistic tastes, was an enthusiastic musician, even composing a little, and wrote both verses and novels, which appeared a little later (LaGrande Falaise, 1785-1793, in 1871, Le Docteur Egra in 1873): but he did not go much into society. He was anxious to know and understand present as well as past events, but he was above all things a student. In 1870 he was chosen as secretary by M. de Chaudordy, who had been sent to Tours as a delegate in charge of the diplomatic side of the problem of national defence; in these affairs he proved himself a most valuable collaborator;

he was unremitting in his labours, full of finesse, good temper and excellent judgment, and at the same time so discreet that we can only guess at the part he played in these terrible crises. After the war, when Boutmy founded the Ecole libre des sciences politiques, Sorel was appointed to teach diplomatic history (1872), a duty which he performed with striking success. Some of his courses have formed books: Le Traits de Paris du 20 novembre 1815 (1873); Histoire diplomatique de la guerre jranco-allemande (1875); we may also add the Pricis du droit des gens which he published (1877) in collaboration with his colleague Theodore Funck-Brentano. In 1875 Sorel left the Foreign Office and became general secretary to the newly-created office of the Presidence du sSnat. Here again, in a congenial position where, without heavy responsibilities, he could observe and review affairs, he performed valuable service, especially under the presidency of the due d'Audiffred Pasquier, who was glad to avail himself of his advice in the most serious crises of internal politics. His duties left him, however, sufficient leisure to enable him to accomplish the

great work of his life, L' Europe et la revolution francaise. His object was to do over again the work already done by Sybel, but from a less restricted point of view and with a clearer and more calm understanding of the chess-board of Europe. He spent almost thirty years in the prepara- tion and composition of the eight volumes of this history (vol. i., 1885; vol. viii., 1904). For he was not merely a conscientious scholar; the analysis of the documents, mostly unpublished, on French diplomacy during the first years of the Revolution, which he published in the Revue historique (vol. v.vii., x.~xiii.), shows with what scrupulous care he read the innumerable des patches which passed under his notice. He was also, and above all things, an artist. He drew men from the point of view of a psychologist as much as of a historian, observing them in their surroundings and being interested in showing how greatly they are slaves to the fatality of history. It was this fatality which led the rashest of the Conventionals to resume the tradition of the Ancien Regime, and caused the revolutionary propaganda to end in a system of alliances and annexations which carried on the work of Louis XIV. This view is certainly suggestive, but incomplete; it is largely true when applied to the men of the Revolution, inexperienced or mediocre as they were, and in- competent to develop the enormous enterprises of Napoleon I. In the earlier volumes we are readily dominated by the grandeur and relentless logic of the drama which the author unfolds before our eyes; in the later ones we begin to make some reser- vations; but on the whole the work is so complete and so power- fully constructed that it commands our admiration. Side by side with this great general work, Sorel undertook various detailed studies more or less directly bearing on his subject. In La Question d' Orient au XV III' siecle, les origines de la triple alliance (1878), he shows how the partition of Poland on the one hand reversed the traditional policy of France in eastern Europe, and on the other hand contributed towards the salvation of re- publican France in 1793. In the Grands ecrivains series he was responsible for Montesquieu (1887) and Mme de Stael (1891); the portrait which he draws of Montesquieu is all the more vivid for the intellectual affinities which existed between him and the author of the Leltres persanes and the Esprit des lots. Later, in Bonaparte ei Hoche en I7Q7, he produced a critical comparison which is one of his most finished works (1896); and in the Recueil des instructions donnies aux ambassadeurs he prepared vol. i. dealing with Austria (1884). Most of the articles which he contributed to various reviews and to the Temps newspaper have been collected into volumes: Essais d' histoire et de critique (1883), Lectures hisloriques (1894), Nouveaux essais d' histoire et de critique (1898), Etudes de liiterature et d'histoire (1901); in these are to be found a great deal of information and of ideas not only about political men of the last two centuries, but also about certain literary men and artists of Normandy. Honours came to him in abundance, as an eminent writer and not as a public official. He was elected a member of the

Academie des sciences morales et politiques (December 18, 1889) on the death of Fustel de Coulanges, and of the Academie frangaise (1894)

on the death of Taine. His speeches on his two illustrious predecessors show how keenly sensible he was of beauty, and how unbiased was his judgment, even in the case of those whom he most esteemed and loved. He had just obtained the great Prix Osiris of a hundred thousand francs, conferred for the first time by the Institut de France, when he was stricken with his last illness and died at Paris on the 29th of June 1906.

(C. B.)*

SOREL, CHARLES, Sieur de Souvigny (1597-1674), French novelist and miscellaneous writer, was born in Paris about 1597. Very little is known of his life except that in 1635 he was historiographer of France. He wrote on science, history and religion, but is only remembered by his novels. He tried to destroy the vogue of the pastoral romance by writing a novel of adventure, the Histoire comique de Francion (1622). The episodical adventures of Francion found many readers, who nevertheless reserved their admiration for the As tree it was intended to ridicule. Sorel decided to make his intention un- mistakable, and in Le Berger extravagant (3 vols., 1627) he wrote a burlesque, in which a Parisian shop-boy, his head turned by sentiment, chooses an unprepossessing mistress and starts life as a shepherd with a dozen sheep on the banks of the Seine. Sorel did not succeed in founding the novel of character, and what he accomplished was more in the direction of farce, but he struck a shrewd blow at romance. Among his other works are Polyandre (1648) and La Connaissance des bons livres (1673). He died in Paris on the 8th of March 1674.

SOREL, a town and port of entry of Quebec, Canada, capital of Richelieu county, 42 m. N.E. of Montreal, at the confluence of the Richelieu and St Lawrence rivers. Pop. (1901), 7057. It is on the Grand Trunk and the Quebec Southern railways, and is a port of call for the Montreal and Quebec river steamers. It contains iron and leather manufactories, and shipbuilding is carried on. It occupies the site of a fort built in 1665 by A. de Tracy to guard the route by way of the Richelieu to Lake Champlain and the Hudson, and is named after the first com- mandant of the garrison.

SORGHUM, a genus of grasses belonging to the Ijabe Andro- pogoneae, and including one of the most important tropical grains, Sorghum vulgare, great millet, Indian millet or Guinea corn. In India it is known as jawari (Hindustani), jowari (Bengali), cholum (Tamil), and jonna (Telugu), and in the West Indies as Negro or Guinea Corn. It is a strong grass, growing to a height of from 4 to 8 or even 16 ft.; the leaves are sheathing, solitary, and about 2 in. broad and 2\ ft. in length; the panicles are contracted and

dense, and the grains, which are enclosed in husks and protected by awns, are round, hard, smooth, shin- ing, brownish-red, and some- what larger than mustard seeds. The plant is cultivated in various parts of India and other countries of Asia, in the United States, and in the south of Europe. Its culms and leaves afford excellent fodder for cattle; and the grain, of which the yield in favourable situations is up- wards of a hundredfold, is used for the same purposes as maize, rice, corn and other cereals.

Speaking of its cultivation, Eduard Hackel (in his article on " Grasses " in Die natiirlichen Pflanzenfamilien) says the culture of Sorghum probably had its origin in Africa, where a variety

Sorghum vulgare.

known as durra is now cultivated over the entire continent, and has become the most important cereal; the natives also chew the stem, which contains sugar. In Europe it is raised less for bread than for mechanical purposes; the panicles are made into the so-called rice-brooms and into brushes. In Germany it is occasionally raised for green fodder. From the fruit the Kaffirs make an alcoholic drink, Tialva, and the negroes one known as Merisa. Allied species are S. bicolor, much valued in India as a forage-plant, and S. saccharatum, commonly called sorghum or Chinese sugar-cane, which is extensively cultivated in China, North India and Africa. The latter species is grown in America chiefly for the manufacture of molasses from its juice, and in France as a source of alcohol.

A full account of the cultivation and use of the species in India will be found in Sir G. Watt's Dictionary of the Economic Products of India (1893).

SORIA, a province of Spain, formed in 1833 of districts belonging to Old Castile, and bounded on the N. by Logrofio, E. by Saragossa, S. by Guadalajara and W. by Segovia and Burgos. Pop. (1900), 150,462; area, 3983 sq. m. Soria is a bleak and lofty region, bounded on three sides by mountains. A range of sierras culminating in the peaks of Urbion (7389 ft.) and Cebollera (7139 ft.) on the north, and the great Sierra del Moncayo (7707 ft.) on the east, separate the valley of the Duero (Douro) from that of the Ebro, while on the south it is divided from the valley of the Tagus by a continuation of the Sierra Guadarrama. Almost the whole of the province belongs to the region watered by the Duero and its affluents. This river rises among the southern slopes of Urbion and traverses the

province in a circuitous course, first to the south and then to the west. The other rivers are mostly affluents of the Duero, but a few of the tributaries of the Ebro have their sources within the limits of the province. The soil is not remarkable for fertility; a large proportion of the area being occupied with barren mountains, which are covered with snow for a great part of the year. There are, however, in some places extensive forests of pine, oak and beech ; while in others there are large tracts of pasture land, on which numbers of cattle, sheep and swine are reared. Grain and vegetables are raised, but neither of very good quality nor in sufficient quantities to supply the wants of the population. The climate is cold and dry, and the scenery grand, but austere. Most of the people are employed in farming and rearing cattle; but the cutting and sawing of timber and the preparation of charcoal also occupy a considerable number. There is a great want of roads; and, although three railways traverse the pro- vince, commerce is consequently very limited. Fine wool was formerly produced; but the only important articles of trade at present are timber, salt, asphalt, leather and cheese, which are sent to Madrid and Aragon. Salt and asphalt are the only minerals worked, though others are known to exist. The capital, Soria, is described below. The only other town with more than 3500 inhabitants is El Burgo de Osma (3509), an episcopal see. Between 1887 and 1900 the population decreased by nearly 7000; its density in the last-named year was 37-7 per sq. m., or lower than that of any other Spanish province except Cuenca (37-6). The gradual depopulation of many districts is due to the stagnation of industry, and the attraction of emigrants to large towns outside the province.

SORIA, the capital of the Spanish province of Soria; on the right bank of the river Duero (Douro), 155 m. N.E. of Madrid by the Madrid-Alcuneza-Soria railway. Pop. (1900), 7151. Soria has a provincial institute, schools for teachers of both sexes, many primary schools, savings banks, two hospitals, barracks, a theatre and a bull-ring. The churches of Santo Domingo and San Nicolas, the cloisters of the convent of San Juan, and several other ecclesiastical buildings are fine specimens of Romanesque work of the 12th and 13th centuries. Near the Duero are the ruins of the old citadel, and in many places the remains of the 13th century walls of the city are yet standing. The more modern streets are clean and well paved. The bridge across the Duero is a massive structure which formerly had a tower in the centre. The population is chiefly agricultural;

but there are also flour mills, tanneries, potteries, &c. ; and some trade in timber, wool and fruit is carried on. The Iberian and Carthaginian city of Numantia, captured in 133 B.C. by the Romans, after a long and heroic resistance, was situated 3 m. N., on a hill overlooking the confluence of the small river Tera with the Duero.

SOROKI, a town of south Russia, in the government of Bessarabia, 81 m. N.N.W. of Kishinev, in a narrow ravine on the right bank of the Dnieper. Pop. (1900), 25,523, Jialf of whom were Jews. It is an important river port for the export of corn, wool, fruit, wine and cattle. Formerly it was the old Genoese colony of Olchionia, and has still the ruins of a 13th-century Genoese castle. In the 1 5th century the Moldavians erected here a fort, which the Poles took in the 1 7th century. Peter the Great captured the place in 1711, but it was returned to the Turks, and was only definitely annexed to Russia in 181 2. (M. H. S.)

SOROLLA Y BASTIDA, JOAQUIN (1863-), Spanish painter, was born in Valencia, and received his art education first in his native town and under F. Pradilla, and then in Italy and Paris. His first striking success he achieved with " Another Margaret," which was awarded a gold medal in Madrid and was bought for the St Louis Gallery. He soon rose to general fame and became the acknowledged head of the modern Spanish school of painting. His picture of the " Fishermen's Return " was much admired at the Paris Salon and was acquired by the state for the Luxembourg Museum. His exhibit at the Paris Universal Exposition of 1900 won him a medal of honour and his nomination as Knight of the Legion of Honour. A special exhibition of his works — figure subjects, landscapes and por- traits — at the Georges Petit Gallery in Paris in 1906 eclipsed all his earlier successes and led to his appointment as Officer of the Legion of Honour. He is represented at the Berlin National Gallery, at the Venice and Madrid Museums, and in many private collections in Europe and America, especially in Buenos Aires. He painted portraits of King Alphonso and Queen Victoria Eugenie of Spain, and a magnificent portrait group of the family of Don Aureliano de Beruete. Three of his works were shown in London at the Spanish Exhibition, Guildhall, 1901.

SORREL, Rumex Acetosa, a member of the natural order Polygonaceae, a hardy perennial, native to Britain and found throughout the north temperate zone. The leaves are used in soups, salads and sauces. Sorrel grows freely in any good garden soil, and is increased by dividing the roots during the early part of spring. They should be planted in rows 15 to 18 in. apart. The leaves, when fully grown, are gathered singly. The common garden sorrel is much superior to the wild plant; but the Belleville, which is the kind generally cultivated near Paris, is still better, its leaves being larger and not so acid. The Blistered-leaved, which has large leaves with a blistered surface, has the advantage of being slow in running to seed. French Sorrel (Rumex scutatus) is a hardy perennial, distributed through Europe but not native in Britain, with densely-branched trailing stems. The leaves are roundish, heart-shaped and glaucous; they are more acid than those of the common sorrel.

SORRENTO (anc. Surrentum, q.v.), a city of Campania, Italy, in the province of Naples, 10 m. by 'electric tramway (along the highroad) S.W. from Castellammare di Stabia, and served also by steamer from Naples (16 m.). Pop. (1901), 6849 (town) ; 8832 (commune). It stands on cliffs about 160 ft. above sea-level on the north side of the peninsula that separates the Bay of Naples from the Bay of Salerno. Sorrento contains only a few ancient remains, and its present prosperity depends mainly on its reputation as a place of resort both in winter and in summer, its northerly aspect rendering it comparatively cool. Its climate is delightful and healthy, and it is situated amid pictur- esque coast scenery. The chief local industries are the inlaying of wood, silk and lace-making and straw-plaiting, and the growing of oranges and lemons. In ancient times the Surrentine wines had a great repute.

In 1 558 the corsair Pialy attacked the town and carried off two thousand prisoners. It was at Sorrento that Bernardo Tasso wrote his Amadigi; and Torquato Tasso, to whom a marble

statue has been erected in the Piazza, was born in the town in

1544-

SOSIGENES, Greek astronomer and mathematician, probably of Alexandria, flourished in the ist century B.C. According to Pliny (Nat. Hist, xviii. 25), he was employed by Julius Caesar in the reform of the Roman calendar (46 B.C.), and wrote three treatises, which he conscientiously corrected. From another passage of Pliny (ii. 8) it is inferred that Sosigenes maintained the doctrine of the motion of Mercury round the sun, which is referred to by his contemporary Cicero, and was also held by the Egyptians.

The astronomer is to be distinguished from the Peripatetic philosopher of the same name, who lived at the end of the 2nd century A.D. He was the tutor of Alexander of Aphrodisias, the most famous of the commentators on Aristotle. He wrote a work on Revolving Spheres, from which some important extracts have been preserved in Simplicius's commentary on Aristotle's De caelo (the subject is fully discussed by T. H. Martin, " Sur deux Sosigene," in Annates de lafac. des lettres de Bordeaux, i., 1879).

SOSITHEUS (c. 280 B.C.), Greek tragic poet, of Alexandria Troas, a member of the Alexandrian " pleiad." He must have resided at some time in Athens, since Diogenes Laertius tells us (vii. 5, 4) that he attacked the Stoic Cleanthes on the stage, and was hissed off by the audience. As Suidas

also calls him a Syracusan, it is conjectured that he belonged to the literary circle at the court of Hiero II. According to an epigram of Dioscorides in the Greek Anthology (Anth. Pal. vii. 707) he restored the satyric drama in its original form. A considerable fragment is extant of his pastoral play Daphnis or Lityerses, in which the Sicilian shepherd, in search of his love Pimplea, is brought into connexion with the Phrygian reaper, son of Midas, who slew all who unsuccessfully competed with him in reaping his corn. Heracles came to the aid of Daphnis and slew Lityerses.

See O. Crusius s.v. Lityerses in Roscher's Lexikon der griechischen und romischen Mythologie. The fragment of twenty-one lines in Nauck's Tragicorum graecorum fragmenta apparently contains the beginning of the drama. Two lines from the Aethlius (probably the traditional first king of Elis, father of Endymion) are quoted by Stobaeus (Flor. Ii. 23).

SOTADES, Greek satirist, of Maronea in Thrace (or of Crete), chief representative of the writers of coarse satirical poems, called kLvcuSoi, 1 composed in the Ionic dialect and in a metre named after him " sotadic." He lived in Alexandria during the reign of Ptolemy II. Philadelphus (285-247 B.C.). For a violent attack on the king, on the occasion of his marriage to his own sister Arsinoe, Sotades was imprisoned, but escaped to the island of Caunus, where he was afterwards captured by Patro- clus, Ptolemy's admiral, shut up in a leaden chest, and thrown into the sea (Athenaeus xiv. p. 620; Plutarch, De educatione puerorum, 14).

Only a few genuine fragments of Sotades have been preserved (see J. G. Hermann, Elementa doctrinae metricae, 1816); those in Stobaeus are generally considered spurious. Ennius translated some poems of this kind, included in his book of satires, under the name of Sota.

SOTER, pope from about 167 to 174. He wrote to the Church of Corinth and sent it aid. His letter is mentioned in the reply given by Dionysius, bishop of Corinth, and Harnack thinks it can be identified with the second so-called epistle of Clement to the Corinthians.

SOTHEBY, WILLIAM (1757-1833), English author, was born in London on the oth of November 1757. He was educated at Harrow, and subsequently procured a commission in a cavalry regiment. In 1780 he retired from the army on his marriage and devoted himself to literature, becoming a prominent figure in London literary society. His ample means enabled him to play the part of patron to many struggling authors, and his friends included Scott, Byron, Wordsworth, Coleridge, Southey, Hallam and Tom Moore. He himself soon acquired a consider- able reputation as a translator, his verse translation of Virgil's

1 The word is also used of the dancers in indecent ballets, to which such poems were probably written as an accompaniment. In Greek and Latin authors Kimi8os {cinaedus) generally means ” catamite.”

Georgics (1800) being specially praised by contemporary critics, while in later life he published translations of the Iliad and Odyssey. He also wrote several historical tragedies for the stage, of which one was acted, and some poems. He died on the 30th of December 1833.

SOTHERN, EDWARD ASKEW (1826-1881), English actor, was born in Liverpool on the ist of April 1826, the son of a merchant. He began acting as an amateur, and in 1849 drifted into a professional engagement with a dramatic company at St Heliers in Jersey, where he appeared as Claude Melnotte in Bulwer Lytton’s Lady of Lyons. Between then and 1858 he played in various companies without particular success, in Birmingham and in America, where he went in 1852. On the 12th of May 1858 Tom Taylor’s Our American Cousin, a play of no special merit, was brought out in New York, with Sothern in the small part of Lord Dundreary, a caricature of an English nobleman. He gradually worked up the humour of this part so that it became the central figure of the play. In 1861, when it was produced at the Haymarket Theatre, in London, he made such a hit that the piece ran for nearly five hundred nights: ” Dundreary whiskers ” became the fashion, and Dundreary this, that or the other made its appearance on every side. At various times Sothern revived the character, which retained its popu- larity in spite of all the extravagances to which he developed its amusing features; and his name will always be famous in con- nexion with this rdle. In T. W. Robertson’s David Garrick (1864) he again had a great success, his acting in the title-part, which he created, being wonderfully effective. He won wide popularity also from his interpretation of Sam Slingsby in Oxenford’s Brother Sam (1865). Sothern was a born comedian, and off the stage had a passion for practical joking that amounted almost to a mania. His house in Kensington was a resort for people of fashion, and he was as much a favourite in America as in the United Kingdom. He died in London on the 21st of January 1881.

Sothern had three sons, all actors, the second of them, Edward H. Sothern (b. 1859), being prominent on the American stage.

SOTHIC PERIOD, in ancient Egyptian chronology, the period in which the year of 365 days circled in succession through all • the seasons. The tropical year, determined as it was in Egypt by the heliacal rising of Sirius (Sothis), was almost exactly the Julian year of precisely 3651 days (differing from the true solar year, which was 11 minutes less than this).

The sothic period was thus 146 1 years.

See Egypt, Ancient, § F. " Chronology."

SOTO, FERDINANDO [Fernando, or Hernando] DE (1496?- 1542), Spanish captain and explorer, often, though wrongly, called the discoverer of the Mississippi (first sighted by Alonzo de Pineda in 1519), was born at Jerez de los Caballeros, in Estre- madura, of an impoverished family of good position, and was indebted to the favour of Pedrarias d'Avila for the means of pursuing his studies at the university. In 15 19 he accompanied d'Avila on his second expedition to Darien. In 1528 he explored the coast of Guatemala and Yucatan, and in 1532 he led 300 volunteers to reinforce Pizarro in Peru. He played a prominent part in the conquest of the Incas' kingdom (helping to seize and guard the person of Atahualpa, discovering a pass through the mountains to Cuzco, &c), and returned to Spain with a fortune of 180,000 ducats, which enabled him to marry the daughter of his old patron d'Avila, and to maintain the state of a nobleman. Excited by the reports of Alvaro Nunez (Cabeza de Vaca) and others as to the wealth of Florida (a term then commonly used in a much wider extension than subse- quently), he sold great part of his property, gathered a force of 620 foot and 123 horse, armed four ships, and obtained from Charles V. a commission as " adelantado of the Lands of Florida" and governor of Cuba. Sailing from San Lucar in April 1538, he first went to Havana, his advanced base of operations; starting thence on the 12th of May 1539 he landed in the same month in Espiritu Santo Bay, on the west coast of the present state of Florida. For nearly four years he led his men in fruitless search of gold hither and thither over the south-east of the North

American continent. His exact route is often doubtful; but it seems to have passed north into Georgia as far as 35′ N., then south to the neighbourhood of Mobile, and finally north-west towards the Mississippi. This river was reached early in 1541, and the following winter was spent on the Ouachita, in modern Arkansas and Louisiana, west of the Mississippi. As they were returning in 1542 along the Mississippi, De Soto died (either in May or June; the 25th of June is perhaps the true date), and his body was sunk in its waters. Failing in an attempt to push westwards again, De Soto's men, under Luis Moscoso de Alvarado, descended the Mississippi to the sea in nineteen days from a point close to the junction of the Arkansas with the great river, and thence coasted along the Gulf of Mexico to Panuco.

Of this unfortunate expedition three very different narratives are extant, of seemingly independent origin. The first was pub- lished in 1557 at Evora, and professes to be the work of a Portuguese gentleman of Elvas, who had accompanied the expedition: Relaxant verdadeira dos trabalhos q ho gouernador do Fernado d'Souto & certos fidalgos Portugueses passarom no d' scobrimeto da Provincia da Florida. Agora nouamete feita per hu fidalgo Deluas. An English translation was published by Hakluyt in 1609 (reprinted from the 161 1 edition by the Hakluyt Society [London, 1851]), and another by an anonymous translator in 1686, the latter being based on a French version by Citri de la Guette (Paris, 1685). The second narrative is the famous history of Florida by the Inca, Garcilasso de la Vega, who obtained his information from a Spanish cavalier engaged in the enterprise; it was completed in 1 59 1, first appeared at Lisbon in 1605 under the title of La Florida del Ynca, and has since passed through many editions in various languages. The third is a report presented to Charles V. of Spain in his Council of the Indies in 1544, by Luis Hernandez de Biedma, who had ac- companied De Soto as His Majesty's factor. It is to be found in Ternaux-Compans' " Recueil de pieces sur la Floride " in the Histo- rical Collections of Louisiana (Philadelphia, 1850) and in W. B. Rye's reprint for the Hakluyt Society of Hakluyt's translation of the Portuguese narrative (The Discovery and Conquest of Terra Florida, London, 1851).

See also Bancroft's History of the United States, vol. i. ; J. H. M'Culloch, Researches . . . concerning the aboriginal history of America (Baltimore, 1829) ; Albert Gallatin, " Synopsis of the Indian Tribes," in Archaeologia americana, vol. . ii. (Cambridge, Mass., 1836) ; E. G. Bourne (ed.), Narratives of the Career of Hernando de Soto in the Conquest of Florida (2 v., New York, 1904); J. W. Monette, History of tha Discovery and Settlement of the Valley of the Mississippi (New York, 1846, 2 vols.).

SOU (0. Fr. sol, Lat, solidus, sc. minimus), the name of the bronze 5-centime French coin, corresponding to the English " halfpenny." It is still colloquially used in France in reckoning, and the franc, 2 and 5-franc pieces are known as piece de vingt, quarante and cent sous respectively. The solidus was originally a gold coin, first struck c. a.d. 312 by Constantine to take the place of the aureus. In the Eastern Empire this gold coin was the standard down to 1453, an d, as the " bezant," circulated from Portugal to the Indies. In the West after Pippin gold coinage ceased and the solidus in silver became the standard, one pound of silver making 22 sols (solidi) and 264 denier s (denarii). Under Charlemagne one pound of silver =20 sols =240 deniers. The lime (libra), the sol and the denier formed the universal money of account throughout France until the Revolution; and they have left their mark on the English money symbols £ s. d., for pounds, shillings and pence.

SOUBISE, BENJAMIN DE ROHAN, Due de (? 1589-1642), Huguenot leader, younger brother of Henri de Rohan, inherited his title through his mother Catherine de Parthenay. He served his apprenticeship as a soldier under Prince Maurice of Orange- Nassau in the Low Countries. In the religious wars from 16 21 onwards his elder brother chiefly commanded on land and in the south, Soubise in the west and along the sea-coast. His exploits in the conflict have been sympathetically related by his brother, who, if he was not quite an impartial witness, was one of the best military critics of the time. Soubise's chief exploit was a singu- larly bold and well-conducted attack (in 1625) on the Royalist fleet in the river Blavet (which included the cutting of a boom in the face of superior numbers) and the occupation of Oleron. He commanded at Rochelle during the famous siege, and (if we may believe his brother) the failure of the defence and of the English attack on Rhe was mainly due to the alternate obstinacy of the townsfolk and the English commanders in refusing to

listen to Soubise's advice. When surrender became inevitable he fled to England, which he had previously visited in quest of succour. He died in 1642 in London. The Soubise title after- wards served as the chief second designation (not for heirs apparent, but for the chief collateral branch for the time being) of the house of Rohan-Chabot.

The name Soubise appears again in the military history of France in the person of Charles de Rohan, Prince de Soubise (1715-1787), peer and marshal of France, the grandson of the princesse de Soubise, who is known to history as one of t'ze rii stresses of Louis XIV. He accompanied Louis XV. in the campaign of 1744-48 and attained high military rank, which ' he owed more to his courtiership than to his generalship. Soon after the beginning of the Seven Years' War, through the influence of Mme de Pompadour, he was put in command of a corps of 24,000 men, and in November 1757 he sustained the crushing defeat of Rossbach. He was more fortunate, however, in his later military career, and continued in the service until the general peace of 1763, after which he lived the life of an ordinary courtier and man of fashion in Paris, dying on the 4th of July 1787.

SOUHAM, JOSEPH, Count (1760-1837), French soldier, was born at Lubersac on the 30th of April 1760, and served in the French army as a private from 1782 to 1790. In 1792, having shown himself active in the cause of the Revolution, he was elected commandant of a volunteer battalion, and by 1793 he had risen to the rank of general of division. He served with credit under Pichegru in Holland (1795), but in 1799 fell into disgrace on suspicion of being concerned in Royalist intrigues. He was reinstated in 1800 and served under Moreauinthe|Danube campaign of that year. During the Consulate he appears to have been involved in

conspiracies, and along with his old com- manders Moreau and Pichegru was disgraced for alleged par- ticipation in that of Georges Cadoudal. He regained his rank, however, in 1809, took a notable part in Gouvion St Cyr's opera- tions in Catalonia, and won the title of count by his conduct at the action of Vich, in which he was wounded. In 1812 Marshal Massena, in declining the command of Marmont's army which had just been defeated at Salamanca, recommended Souham for the post. The latter was thus pitted against Wellington, and by his skilful manoeuvres drove the English general back from Burgos and regained the ground lost at Salamanca. In 1813 he distinguished himself again at Liitzen and at Leipzig (when he was wounded). At the fall of the First Empire he deserted the emperor, and having suffered for the Royalist cause was well received by Louis XVIII., who gave him high commands. These Souham lost at the return of Napoleon and regained after the Second Restoration. He retired in 1832, and died on the 28th of April 1837.

SOULARY, JOSEPHIN [Joseph Marie] (1815-1891), French poet, son of a Lyons merchant of Genoese origin (Solari), was born on the 23rd of February 181 5. He entered a line regiment when he was sixteen, serving for five years. He was chef de bureau in the prefecture of the Rhone from 1845 to 1867, and in 1868 he became librarian to the Palais des arts in his native town. He died at Lyons on the 28th of March 1891. His works include A travers champs (1837); Les Cinq cord.es du luth (1838); Les Ephemeres (two series, 1846 and 1857); Sonnets humoristiques (1862); Les Figulines (1862); Pendant I 'invasion (1871); Les Rimes ironiques (1877); Jeux divins (1882), and two comedies. His CEuvres poetiques were collected in three volumes (1872-1883). His Sonnets humoristiques attracted great attention, and charmed their readers by the mixture of gaiety and tragedy. His mastery over the technical difficulties of his art, especially in the sonnet, won him the title of the " Benvenuto of rhyme."

See also Paul Marieton, Soulary el la Pleiade lyonnaise (1884). SOULT, NICOLAS JEAN DE DIEU, Duke of Dalmatia (1760- 1851), marshal of France, was-born at Saint-Amans-la-Bastide (now in department of the Tarn) on the 29th of March 1769, and was the son of a country notary at that place. He was fairly well educated, and intended for the bar, but his father's death when

he was still a boy made it necessary for him to seek his fortune, and he enlisted as a private in the French infantry in 1785. His superior education ensured his promotion to the rank of sergeant after six years' service, and

in July 1701 he became instructor to the first battalion of volunteers of the Bas-Rhin. He served w'th his battalion in 1792. By 1794 he was adjutant-general (with the rank of chef de brigade). After the battle of Fleurus, in which he greatly distinguished himself for coolness, he was promoted general of brigade by the representatives on mission. For vhe next five years he was constantly employed in Germany undei Jourdan, Moreau, Kleber and Lefebvre, and in 1799 he was promoted general of division and ordered to proceed to Switzerland. It was at this time that he laid the foundations of his military fame, and he particularly distinguished himself in Massena's great Swiss campaign, and especially at the battle of Zurich. He accompanied Massena to Genoa, and acted as his principal lieutenant throughout the protracted siege of that city, during which he operated with a detached force without the walls, and after many successful actions he was wounded and taken prisoner at Monte Cretto on the 13th of April 1800. The victory of Marengo restoring his freedom, he received the command of the southern part of the kingdom of Naples, and in 1802 he was appointed one of the four generals commanding the consular guard. Though he was one of those generals who had served under Moreau, and who therefore, as a rule, disliked and despised Napoleon, Soult had the wisdom to show his de- votion to the ruling power; in consequence he was in August 1803 appointed to the'command-in-chief of the camp of Boulogne, and in May 1804 he was made one of the first marshals of France. He commanded a corps in the advance on Ulm, and at Austerlitz (q.v.) he led the decisive attack on the allied centre. He played a great part in all the famous battles of the Grande Armie, except the battle of Friedland (on the day of which he forced his way into Konigsberg), and after the conclusion of the peace of Tilsit he returned to France and was created (1808) duke of Dalmatia. In the following year he was appointed to the com- mand of the II. corps of the army with which Napoleon intended to conquer Spain, and after winning the battle of Gamonal he was detailed by the emperor to pursue Sir John Moore, whom he only caught up at Corunna.

For the next four years Soult remained in Spain, and his military history is that of the Peninsular War (q.v.). In 1809, after his defeat by Sir John Moore, he invaded Portugal and took Oporto, but, busying himself with the political settlement of his conquests in the French interests and, as he hoped, for his own ultimate benefit as a possible candidate for the throne, he neglected to advance upon Lisbon, and was eventually dis- lodged from Oporto by Sir Arthur Wellesley, making a painful and almost disastrous retreat over the mountains. After the battle of Talavera he was made chief of staff of the French troops in Spain with extended powers, and on the 19th of No- vember 1809 won the great victory of Ocafla. In 1810 he invaded Andalusia, which he speedily reduced, with the exception of Cadiz.

In 181 1 he marched north into Estremadura, and took Badajoz, and when the Anglo-Portuguese army laid siege to it he marched to its rescue, and fought the famous battle of Albuera (May 16). In 1812, however, he was obliged, after Welling- ton's great victory of Salamanca, to evacuate Andalusia, and was soon after recalled from Spain at the request of Joseph Bonaparte, with whom, as with the other marshals, he had always disagreed. In March 1813 he assumed the command of the IV. corps of the Grande Arntee and commanded the centre at Liitzen and Bautzen, but he was soon sent, with unlimited powers, to the south of France to repair the damage done by the great defeat of Vittoria. His campaign there is the finest proof of his genius as a general, although he was repeatedly defeated by the English under Wellington, for his soldiers were but raw conscripts, while those of Wellington were the veterans of many campaigns.

Such was the military career of Marshal Soult. His political career was by no means so creditable, and it has been said of him that he had character only in front of the enemy. After

the first abdication of Napoleon he declared himself a Royalist, received the order of St Louis, and acted as minister for war from the 3rd of December 1814 to the nth of March 1815. When Napoleon returned from Elba Soult at once declared himself a Bonapartist, was made a peer of France and acted as major- general (chief of staff) to the emperor in the campaign of Water- loo, in which role he distinguished himself far less than he had done as commander of an over-matched army. At the Second Restoration he was exiled, but not for long, for in 1819 he was recalled and in 1820 again made a marshal of France. He once more tried to show himself a fervent Royalist and was made a peer in 1827. After the revolution of 1830 he made out that he was a partisan of Louis Philippe, who welcomed his adhesion and revived for him the title of marshal-general. He served as minister for war from 1830 to 1834, as ambassador extraordinary to London for the coronation of Queen Victoria in 1838, and again as minister for war from 1840 to 1844. In 1848, when Louis Philippe was overthrown, Soult again declared himself a republican. He died at his castle of Soultberg, near his birthplace, on the 26th of November 1851. Soult himself wrote but little. He published a memoir justifying his adhesion to Napoleon during the Hundred Days, and his notes and journals were arranged by his son Napoleon Hector (1801-1857), who published the first part (Memoires du marechal-giniral Soult) in 1854. Le Noble's Mimoires sur les operations des Franqais en Galicie are supposed to have been written from Soult papers.

See A. Salle, Vie politique du marechal Soult (Paris, 1834) ; A. de Grozelier, Le Marechal Soult (Castres, 185 1) ; A. Combes, Histoire anecdotique du marechal Soult (Castres, 1869).

SOUMET, ALEXANDRE (1788-1845), French poet, was born on the 8th of February 1788 at Castelnaudary, department of Aude. His father wished him to enter the army, but an early-developed love of poetry turned the boy's ambition in other directions. He was an admirer of Klopstock and Schiller, then little known in France, and reproached Mme de Stael with lack of enthusiasm for her subject in De V Allemagne. Soumet came to Paris in 1810, and some poems in honour of Napoleon secured his nomination as auditor of the Conseil d'Etat. His well-known elegy La Pauvre fille appeared in 1814, and two successful tragedies produced in 1822, Clytemnestre and Saill, secured his admission to the Academy in 1824. Jeanne d'Arc (1825) aroused great enthusiasm, and was the best of his plays. Among his other pieces Elisabeth de France (1828), a weak imitation of Schiller's Don Carlos, may be noted, but Soumet's real bent was towards epic poetry. His most considerable work is a poem inspired by Klopstock, La Divine tpopte, which describes the descent of Christ into Hades. Under Louis XVIII. he became librarian of Saint-Cloud, and subsequently was transferred to Rambouillet and to Compiegne. He died on the 30th of March 1845, leaving an unfinished epic on Jeanne d'Arc. His daughter Gabrielle (Mme Beauvain d'Altenheim) had collaborated with him in some of his later works.

SOUND, 1 subjectively the sense impression of the organ of

1 " Sound " is an interesting example of the numerous homony- mous words in the English language. In the sense in which it is treated in this article it appears in Middle English as soun, and comes through Fr. son from Lat. sonus; the d is a mere addition, as in the nautical term " bound " (outward, homeward bound) for the earlier " boun," to make ready, prepare. In the adjectival meaning, healthy, perfect, complete, chiefly used of a deep undis- turbed sleep, or of a well-based argument or doctrine, or of a person well trained in his profession, the word is in O. Eng. sund, and appears also in Ger. gesund, Du. gezond. It is probably cognate with the Lat. sanus, healthy, whence the Eng. sane, insanity, sanitation, &c. Lastly, there is a group of words which etymologists are in- clined to treat as being all forms of the word which in O. Eng. is sund, meaning " swimming." These words are for (1) the swim-bladder of a fish; (2) a narrow stretch of water between an inland sea and the ocean, or between an island and the mainland, &c, cf. Sound, The, below; (3) to test or measure the depth of anything, particu- larly the depth of water in lakes or seas (see Sounding, below). As a substantive the term is used of a surgical instrument for the exploration of a wound, cavity, &c, a probe. In these senses the word has frequently been referred to Lat. sub unda, under the water; and Fr. sombre, gloomy, possibly from sub umbra, beneath the shade, is given as a parallel.

hearing, and objectively the vibratory motion which produces the sensation of sound. The physiological and psychical aspects of sound are treated in the article Hearing. In this article, which covers the science of Acoustics, we shall consider only the physical aspect of sound, that is, the physical phenomena outside ourselves which excite our sense of hearing. We shall discuss the disturbance which is propagated from the source to the ear, and which there produces sound, and the modes in which various sources vibrate and give rise to the disturbance.

Sound is due to Vibrations. — We may easily satisfy ourselves that, in every instance in which the sensation of sound is excited, the body whence the sound proceeds must have been thrown, by a blow or other means, into a state of agitation or tremor, implying the existence of a vibratory motion, or motion to and fro, of the particles of which it consists.

Thus, if a common glass-jar be struck so as to yield an audible sound, the existence of a motion of this kind may be felt by the finger lightly applied to the edge of the glass; and, on increasing the pressure so as to destroy this motion the sound forthwith ceases. Small pieces of cork put in the jar will be found to dance about during the continuance of the sound; water or spirits of wine poured into the glass will, under the same circum- stances, exhibit a ruffled surface. The experiment is usually performed, in a more striking manner, with a bell-jar and a number of small light wooden balls suspended by silk strings to a fixed frame above the jar, so as to be just in contact with the widest part of the glass. On drawing a violin bow across the edge, the pendulums are thrown off to a considerable dis- tance, and falling back are again repelled, and so on.

It is also in many cases possible to follow with the eye the motions of the particles of the sounding body, as, for instance, in the case of a violin string or any string fixed at both ends, when the string will appear through the persistence of visual sensation to occupy at once all the positions which it successively assumes during its vibratory motion.

Sound lakes Time to Travel. — If we watch a man breaking stones by the roadside some distance away, we can see the hammer fall before we hear the blow. We see the steam issuing from the whistle of a distant engine long before we hear the sound. We see lightning before we hear the thunder which spreads out from the flash, and the more distant the flash the longer the interval between the two. The well-known rule of a mile for every five seconds between flash and peal gives a fair estimate of the distance of the

lightning.

Sound needs a Material Medium to Travel Through. — In order that the ear may be affected by a sounding body there must be continuous matter reaching all the way from the body to the ear. This can be shown by suspending an electric bell in the receiver of an air-pump, the wires conveying the current passing through an air-tight cork closing the hole at the top of the receiver. These wires form a material channel from the bell to the outside air, but if they are fine the sound which they carry is hardly appreciable. If while the air within the receiver is at atmospheric pressure the bell is set ringing continuously, the sound is very audible. But as the air is withdrawn by the pump the sound decreases, and when the exhaustion is high the bell is almost inaudible.

Usually air is the medium through which sound travels, but it can travel through solids or liquids. Thus in the air-pump experiment, before exhaustion it travels through the glass of the receiver and the base plate. We may easily realise its trans- mission through a solid by putting the ear against a table and scratching the wood at some distance, and through a liquid by keeping both ears under water in a bath and tapping the side of the bath.

Sound is a Disturbance of the Wave Kind. — As sound arises in general from vibrating bodies, as it takes time to travel, and as the medium which carries it does not on the whole travel for- ward, but subsides into its original position when the sound has passed, we are forced to conclude that the disturbance is of the wave kind, We can at once gather some idea of the nature of sound waves in air by considering how they are produced by a bell.

Let AB (fig. i) be a small portion of a bell which vibrates to and fro from CD to EF and back. As AB moves from CD to EF it pushes forward the layer of air m contact with it. That layer presses against and pushes forward the next layer and so on. Thus a push or a compression of the air is transmitted onwards in the direction OX. As AB returns from EF towards CD the layer of air next to it follows it as if it were pulled back by AB. Really, of course, it is pressed into the

Fig. i.

space made for it by the rest of the air, and flowing into this space it is extended. It makes room for the next layer of air to move back and to be extended and so on, and an extension of the air is transmitted onwards following the compression which has already gone out. As AB again moves from CD towards EF another compression or push is sent out, as it returns

from EF towards CD another extension or pull, and so on. Thus waves are propagated along OX, each wave consisting of one push and one pull, one wave emanating from each complete vibration to and fro of the source AB.

Crova's Disk. — We may obtain an excellent representation of the motion of the layers of air in a train of sound waves by means of a device due to Crova and known as " Crova's disk." A small circle, say 2 or 3 mm. radius, is drawn on a card as in fig. 2, and round this circle equidistant points, say 8 or 12, are

Fig. 2.

taken. From these points as centres, circles are drawn in succes- sion, each with radius greater than the last by a fixed amount, say 4 or s mm. In the figure the radius of the inner circle is 3 mm. and the radii of the circles drawn round it are 12, 16, 20, &c. If the figure thus drawn is spun round its centre in the right direction in its own plane waves appear to travel out from the centre along any radius. If a second card with a narrow slit in it is held in front of the first, the slit running from the centre outwards, the wave motion is still more evident. If the figure be photographed as a lantern slide which is mounted so as to turn round, the wave motion is excellently shown on the screen, the compressions and extensions being represented by the crowding in and opening out of the lines.

Another illustration is afforded by a long spiral of wire with coils, say 2 in. in diameter and \ in. apart. It may be hung up by threads so as to lie horizontally. If one end is sharply pressed in, a com- pression can be seen running along the spring.

The Disturbance in Sound Waves is Longitudinal. — The motion of a particle of air is, as represented in these illustrations, to and fro in the direction of propagation, i.e. the disturbance

is " longitudinal." There is no " transverse " disturbance, that is, there is in air no motion across the line of propagation, for such motion could only be propagated from one layer to the next by the " viscous " resistance to relative motion, and would die away at a very short distance from the source. But trans- verse disturbances may be propagated as waves in solids. For instance, if a rope is fixed at one end and held in the hand at the other end, a transverse jerk by the hand will travel as a trans- verse wave along

the rope. In liquids sound waves are longi- tudinal as they are in air. But the waves on the surface of a liquid, which are not of the sound kind, are both longitudinal and transverse, the compound nature being easily seen in watching the motion of a floating particle.

Displacement Diagram. — We can represent waves of longitudinal displacement by a curve, and this enables us to draw very important conclusions in a very simple way. Let a train of waves be passing from left to right in the direction A BCD (fig. 3). At every point

E ˆ -B.

;J3 MM C.

Fig. 3.

let a line be drawn perpendicular to AD and proportional to the displacement of the particle which was at the point before the disturbance began. Thus let the particle which was at L be at /, to the right or forwards, at a given instant. Draw LP upward and some convenient multiple of hi. Let the particle which was at M originally be at m at the given instant, being displaced to the left or backwards. Draw MQ downwards, the same multiple of Mm. Let N be displaced forward to n. Draw NR the same multiple of Nn and upwards. If this is done for every point we obtain a continuous curve APBQCRD, which represents the dis- placement at every point at the given instant, though by a length at right angles to the actual displacement and on an arbitrary scale. At the points ABCD there is no displacement, and the line AD through these points is called the axis. Forward dis- placement is represented by height above the axis, backward displacement by depth below it. In ordinary sound waves the dis- placement is very minute, perhaps of the order 10- 6 cm., so that we multiply it perhaps by 100,000 in forming the displacement curve.

Wave Length and Frequency. — If the waves are continuous and each of the same shape they form a ” train,” and the displacement curve repeats itself. The shortest distance in which this repetition occurs is called the wave-length. It is usually denoted by X. In fig. 3, AC = X. If the source makes n vibrations in one second it is said to have ” frequency ” n. It sends out n waves in each second. If each wave travels out from the source with velocity U the n waves emitted in one second must occupy a length U and therefore U = «X.

Distribution of Compression and Extension in a Wave. — Let fig. 4 be the displacement diagram of a wave travelling from left to right.

Q

A'QB'TC in a very short time. In that short time the displace- ment at H decreases from HP to HP' or by PP'. The motion of the particle is therefore backwards towards A. At J the displace- ment remains the same, or the particle is not moving. At K it increases by RR' forwards, or the motion is forwards towards B. At L the displacement backward decreases, or the motion is forward

Fig. 4.

At A the air occupies its original position, while at H it is displaced towards the right or away from A since HP is above the axis. Between A and H, then, and about H, it is extended. At J the dis- placement is forward, but since the curve at Q is parallel to the axis the displacement is approximately the same for all the points close to J, and the air is neither extended nor compressed, but merely displaced bodily a distance represented by JQ. At B there is no displacement, but at K there is displacement towards B represented by KR, i.e. there is compression. At L there is also displacement towards B and again compression. At M, as at J, there is neither extension nor compression. At N the displacement is away from C and there is extension. The dotted curve represents the distribution of compression by height above the axis, and of extension by depth below it. Or we may take it as representing the pressure — excess over the normal pressure in compression, defect from it in extension.

The figure shows that when the curve of displacement slopes down in the direction of propagation there is compression, and the pressure is above the normal, and that when it slopes up there is extension, and the pressure is below the normal.

Distribution of Velocity in a Wave. — If a wave travels on without alteration the travelling may be represented by pushing on the displacement curve. Let the wave AQBTC (fig. 5) travel to

Fig. 5. At M, as at J, there is no change, and at N it is easily seen that the motion is backward. The distribution of velocity then is represented by the dotted curve and is forward when the curve is above the axis and backward when it is below.

Comparing figs. 4 and 5 it is seen that the velocity is forward in compression and backward in extension.

The Relations between Displacement, Compression and Velocity. — The relations shown by figs. 4 and 5 in a general manner may easily be put into exact form. Let OX (fig. 6) be the direction

Pr^——R

O M

Fig. 6. of travel, and let x be the distance of any point M from a fixed point O. Let ON =x J rdx. Let MP=v represent the forward dis- placement of the particle originally at M, and NQ = y+

Let E be the bulk modulus of elasticity, defined as increase of pressure f decrease of volume per unit volume where the pressure increase is so small that this ratio is constant, u the small increase of pressure, and — {dyjdx) the volume decrease, then

E = u/(— dyjdx) or w /E= —dyjdx (1)

This gives the relation between pressure excess and displacement.

To find the relation of the velocity to displacement and pressure we shall express the fact that the wave travels on carrying all its conditions with it, so that the displacement now at M will arrive at N while the wave travels over MN. Let U be the velocity of the wave and let u be the velocity of the particle originally at N. Let MN=dx = Udi. In the time dt which the wave takes to travel over MN the particle displacement at N changes by QR, and QR=-udt, so that QR/MN = -«/U. But QR/MN = dy/dx. Then

w/U = —dyjdx _ _ (2)

This gives the velocity of any particle in terms of the displacement. Equating (1) and (2)

*/U = u/E (3)

which gives the particle velocity in terms of the pressure excess.

Generally, if any condition in the wave is carried forward unchanged with velocity U, the change of at a given point in time dt is equal to the change of as we go back along the curve a distance dx = Vdt at the beginning of dt.

d± = _J_d± dx Vdt ‘

The Characteristics of Sound Waves Corresponding to Loudness, Pitch and Quality. — Sounds differ from each other only in the three respects of loudness, pitch and quality.

The loudness of the sound brought by a train of waves of given wave-length depends on the extent of the to and fro excursion of the air particles. This

is obvious if we consider that the greater the vibration of the source the greater is the excursion of the air in the issuing waves, and the louder is the sound heard. Half the total excursion is called the amplitude. Thus in fig. 4 QJ is the amplitude. Methods of measuring the amplitude in sound waves in air have been devised and will be described later. We may say here that the energy or the intensity 'of the sound of given wave-length is proportional to the square of the amplitude.

The pitch of a sound, the note which we assign to it, depends on the number of waves received by the ear per second. This is generally equal to the number of waves issuing from the source per second, and therefore equal to its frequency of vibration. Experiments, which will be described most conveniently when

Then

44-0

SOUND

[VELOCITY

we discuss methods of determining the frequencies of sources, prove conclusively that for a given note the frequency is the same whatever the source of that note, and that the ratio of the frequencies of two notes forming a given musical interval is the same in whatever part of the musical range the two notes are situated. Here it is sufficient to say that the frequencies of a note, its major third, its fifth and its octave, are in the ratios of 4 : s : 6 : 8.

The quality or timbre of sound, i.e. that which differentiates a note sounded on one instrument from the same note on another instrument, depends neither on amplitude nor on frequency or wave-length. We can only conclude that it depends on wave form, a conclusion fully borne out by investigation. The dis- placement curve of the waves from a tuning-fork on its resonance box, or from the human voice sounding oo, are nearly smooth and symmetrical, as in fig. ja. That for the air waves from a violin are probably nearly as in fig. "jb.

Fig. 7.

Calculation of the Velocity of Sound Waves in Air. — The velocity with which waves of longitudinal disturbance travel in air or in any other fluid can be calculated from the resistance to com- pression and extension and the density of the fluid. It is con- venient to give this calculation before proceeding to describe the experimental determination of the velocity in air, in other gases and in water, since the calculation serves to some extent as a guide in conducting and interpreting the observations.

The waves from a source surrounded by a uniform medium at rest spread out as spheres with the source as centre. If we take one of these spheres a distance from the source very great as compared with a single wave-length, and draw a radius to a point on the sphere, then for some little way round

that point the sphere may be regarded as a plane perpendicular to the radius or the line of propagation. Every particle in the plane will have the same displacement and the same velocity, and these will be perpendicular to the plane and parallel to the line of propagation. The waves for some little distance on each side of the plane will be practically of the same size. In fact, we may neglect the divergence, and may regard them as " plane waves."

We shall investigate the velocity of such plane waves by a method which is only a slight modification of a method given by W. J. M. Rankine (Phil. Trans., 1870, p. 277).

Whatever the form of a wave, we could always force it to travel on with that form unchanged, and with any velocity we chose, if we could apply any " external " force we liked to each particle, in addition to the " internal " force called into play by the com- pressions or extensions. For instance, if we have a wave with displacement curve of form ABC (fig. 8), and we require it to travel

Fig. 8. on in time dt to A'B'C, where Ah' = \Jdt, the displacement of the particle originally at M must change from PM to P'M or by PP'. This change can always be effected if we can apply whatever force may be needed to produce it.

We shall investigate the external force needed to make a train of plane waves travel on unchanged in form with velocity U.

We shall regard the external force as applied in the form of a pressure X per square centimetre parallel to the line of propagation and varied from point to point as required in order to make the dis- turbance travel on unchanged in form with the specified velocity U. In addition there will be the internal force due to the change in volume, and consequent change in pressure, from point to point.

Suppose that the whole of the medium is moved backwards in space along the line of propagation so that the undisturbed portions travel with the velocity U. The disturbance, or the train of waves, is then fixed in space, though fresh matter continually enters the disturbed region at one end, undergoes the disturbance, and then leaves it at the other end.

Let A (fig. 9) be a point fixed in space in the disturbed region, B a fixed point where the medium is not yet disturbed, the medium

A

Fig. 9.

moving through A and B from right to left. Since the condition of the medium between A and B remains constant, even though the matter is continually changing, the momentum possessed by the matter between A and B is constant. Therefore the momentum entering through a square centimetre at B per second is equal to the momentum leaving through a square centimetre at A. Now the transfer of momentum across a surface occurs in two ways, firstly by the carriage of moving matter through the surface, and secondly by the force acting between the matter on one side of the surface and the matter on the other side. U cubic centimetres move in per second at B, and if the density is po the mass moving in through a square centimetre is poll. But it has velocity U, and therefore momentum poU 2 is carried in. In addition there is a pressure between the layers of the medium, and if this pressure in the undisturbed parts of the medium is P, momentum P per second is being transferred from right to left across each square centimetre. Hence the matter moving in is receiving on this account P per second from the matter to the right of it. The total momentum moving in at B is therefore P+POU 2 . Now consider the momentum leaving at A. If the velocity of a particle at A relative to the undisturbed parts is u from left to right, the velocity of the matter moving out at A is U— «, and the momentum carried out by the moving matter is p(U— tt) 2 . But the matter to the right of A is also receiving momentum from the matter to the left of it at the rate indicated by the force across A. Let the excess of pressure due to change of volume be u, so that the total " internal " pressure is P+S. There is also the " external " applied pressure X, and the total momentum flowing out per second is

X-r-P-r-fi-r-p(tJ-tt) 2 .

Equating this to the momentum entering at B and subtracting P from each

X+S+p(U-«) 2 = poU 2 . (4)

If y is the displacement at A, and if E is the elasticity, substituting for & and u from (2) and (3) we get

X _ E g pU ,(I g) = poU ,*

But since the volume dx with density p has become volume dx+iy with density p

"(i +2) =p »-

X-E|- r p„U 2 (I+ g)=p U 2 X = (E-p U 2)d;y/

Then

(5)

If then we apply a pressure X given by (5) at every point, and move the medium with any uniform velocity U, the disturbance remains fixed in space. Or if we now keep the undisturbed parts of the medium fixed, the disturbance travels on with velocity U if we apply the pressure X at every point of the disturbance.

If the velocity U is so chosen that E — poU 2 =o, then X=o, or the wave travels on through the action of the internal forces only, unchanged in form and with velocity

U = V(E/p). (6)

The pressure X is introduced in order to show that a wave can be propagated unchanged in form. If we omitted it we should have to assume this, and equation (6) would give us the velocity of propagation if the assumption were justified. But a priori we are hardly justified in assuming that waves can be propagated at all, and certainly not justified in assuming that they go on unchanged by the action of the internal forces alone. If, however, we put on external forces of the required type X it is obvious that any wave can be propagated with any velocity, and our investigation shows that when U has the value in (6) then and only then X is zero everywhere, and the wave will be propagated with that velocity when once set going.

It may be noted that the elasticity E is only constant for small volume changes or for small values of dyjdx.

Since by definition E= —v(dp/dv) = p(dp/dp) equation (6) becomes

U = V(#/dp). (7)

The value U = V(E/p) was first virtually obtained by Newton (Principia, bk. ii., § 8, props. 48-49). He supposed that in air Boyle's law holds in the extensions and compressions, or that p — kp, whence dp/dp = k=p/p. His value of the velocity in air is therefore

U = V {pip) (Newton's formula) .

At the standard pressure of 76 cm. of mercury or 1,014,000 dynes / sq. cm., the density of dry air at o° C. being taken as 0-001293, we get for the velocity in dry air at 0° C.

Uo = 28,000 cm. sec. (about 920 ft./sec.)

approximately. Newton found 979 tt./sec. But, as we shall see, all the determinations give a value of U< > in the neighbourhood of 33,000 cm./sec., or about 1080 ft./sec. This discrepancy was not ex- plained till 18 16, when Laplace {Ann. dechimie, 1 816, vol. iii.) pointed out that the compressions and extensions in sound waves in air alternate so rapidly that there is no time for the temperature inequalities produced by them to spread. That is to say, instead of using Boyle's law, which supposes that the pressure changes so exceedingly slowly that conduction keeps the temperature constant, we must use the adiabatic relation p = kpy, whence

dp/dp = yhpT 1 = yp/p, and U = V (yp/p) [Laplace's formula]. (8)

If we take 7 = 1-4 we obtain approximately for the velocity in dry air at 0° C .

Uo = 33.i5° cm./sec, which is closely in accordance with observation. Indeed Sir G. G. Stokes {Math, and Phys. Papers, iii. 142) showed that a very small departure from the adiabatic condition would lead to a stifling of the sound quite out of accord with observation.

If we put p = kp{i+at) in (8) we get the velocity in a gas at t°C,

U« = V{7*(l+ai)}. At o° C. we have U = V {yk), and hence

U« = U„V(i+aO

= Uo(i +0-00184/) (for small values of t). (9) The velocity then should be independent of the barometric pressure, a result confirmed by observation.

For two different gases with the same value of y, but with densi- ties at the same pressure and temperature respectively pi and p2, we should have

Ui/U 2 = V(Wpi), (10)

another result confirmed by observation.

Alteration of Form of the Waves when Pressure Changes are Con- siderable. — When the value of dy/dx is not very small E is no longer constant, but is rather greater in compression and rather less in extension than 7 P. This can be seen by considering that the relation between p and p

is given by a curve and not by a straight line. The consequence is that the compression travels rather faster, and the extension rather slower, than at the speed found above.

We may get some idea of the effect by supposing that for a short

time the change in form is negligible. In the momentum equation

(4) we may now omit X and it becomes

w+p(U-«) 2 = poU 2 .

Let us seek a more exact value for 01. If when P changes to P+w

volume V changes to V-v then (P+w)(V-»)? = PVv,

. t>(v , 7(7 + 1) v 2 \ Pd / 7 + 1 v \ whence M = P^+ ^J =y ^ \ l + ^~ y) ■

We have U — « = U(i Also since p(V— v) VpoU 2 (i-z./V).

Substituting in the momentum equation, we obtain

7P/ T 1 7 + 1 «

If U = V(7P/po) is the velocity for small disturbances put Uo for U in the small term on the right, and we have

2 V;

-«/L t)=U(i-p/V), since «/U = -dy/dx = vfV. = p V, or p = p /(l-p/V), then p(U-w) 2 =

whence

U 2 =

we may

"M^ti

or U=Uo+i(7+i)K- (11)

This investigation is obviously not exact, for it assumes that the form is unchanged, i.e. that the momentum issuing from A (fig. 9) is equal to that entering at B, an assumption no longer tenable when the form changes. But for very small times the assumption may perhaps be made, and the result at

least shows the way in which the velocity is affected by the addition of a small term depending on and changing sign with u. It implies that the different parts of a wave move on at different rates, so that its form must change. As we obtained the result on the supposition of unchanged form, we can of course only apply it for such short lengths and such short times that the part dealt with does not appreciably alter. We see at once that, where u — o, the velocity has its " normal " value, while where u is positive the velocity is in excess, and where u is negative the velocity is in defect of the normal value. If, then, a (fig. 10) represents the displacement curve of a train of waves, b will represent the pressure excess and particle velocity, and from (11) we see that while the nodal conditions of 6, with

like the breaking of a water-wave when the, crest gains on the next trough. In ordinary sound-waves the effect of the particle velocity in affecting the velocity of transmission must be very small.

Fig. 10.'

Experiments, referred to later, have been made to find the amplitude of swing of the air particles in organ pipes. Thus Mach found an amplitude 0-2 cm. when the issuing waves were 250 cm. long. The amplitude in the pipe was certainly much greater than in the issuing waves. Let us take the latter as o- 1 mm. in the waves — a very extreme value. The maximum particle velocity is 2irna (where n is the frequency and a the amplitude), or 27raU/X. This gives maximum « = about 8 cm./sec, which would not seriously change the form of the wave in a few wave- lengths. Meanwhile the waves are spreading out and the value of u is falling in inverse proportion to the distance from the source, so that very soon its effect must become negligible.

In loud sounds, such as a peal of thunder from a near flash, or the report of a gun, the effect may be considerable, and the rumble of the thunder and the prolonged boom of the gun may perhaps be in part due to the breakdown of the wave when the crest of maximum pressure has moved up to the front, though it is probably due in part also to echo from the surfaces of heterogeneous masses of air. But there is no doubt that with very loud explosive sounds the normal velocity is quite considerably exceeded. Thus Regnault in his classical experiments (described below) found that the velocity of the report of a pistol carried through a pipe diminished with the intensity, and his results have been confirmed by J. Violle and T. Vautier (see below). W. W. Jacques {Phil. Mag., 1879, 7, p. 219) investigated the transmission of a report from a cannon in different directions; he found that it rose to a maximum of 1267 ft./sec. at 70, to 90 ft. in the rear and then fell off.

A very curious observation is recorded by the Rev. G. Fisher in an appendix to Captain Parry's Journal of a Second Voyage to the Arctic Regions. In describing experiments on the velocity of sound he states'.that " on one day and one day only, February 9, 1822, the officer's word of command ' fire ' was several times heard distinctly both by Captain Parry and myself about one beat of the chronometer [nearly half a second] after the report of the gun." This is hardly to be explained by equation (11), for at the very front of the disturbance u = o and the velocity should be normal.

The Energy in a Wave Train. — The energy in a train of waves carried forward with the waves is partly strain or potential energy due to change of volume of the air, partly kinetic energy due to the motion _of the air as the waves pass. We shall show that if we sum these up for a whole wave the potential energy is equal to the kinetic energy.

The kinetic energy per cubic centimetre is iptt 2 , where p is the density and u is the velocity of disturbance due to the passage of the wave. If V is the undisturbed volume of a small portion of the air at the undisturbed pressure P, and if it becomes V— v when the pressure increases to P+w, the average pressure during the change may be taken as P + |u, since the pressure excess for a small change is proportional to the change. Hence the work done on the air is (P + J5)u, and the work done per cubic centimetre is (P+Jffl)p/V. The term P»/V added up for a complete wave vanishes, for P/V is constant and Sd = o, since on the whole the compression equals the extension. We have then only to con- sider the term §«5»/V.

But »/V =«/U from equation (2) and S> =Em/U from equation (3) Then $ffl»/V = iEM 2 /U 2 = ipw 2 from equation (6) Then in the whole wave the potential energy equals the kinetic Energy and the total energy in a complete wave in a column I sq. cm.

cross-section is W

= I puHx.

We may find here the value of this when we have a train of waves in which the displacement is represented by a sine curve of amplitude

■U/). For a discussion of this type of wave,

a, viz. y = see below. We have

and

. 27T,

a sin t(-*

dy 2tt tt 27t,

*tt= dJ = T Uacos T (**

-U0,

I pw-dx = o 3

*Pcos^x-Ut)^*

(12)

(13)

X 2

= 2 P 7r 2 U 2 a 2 /X The energy per cubic centimetre on the average is

2 P 7r 2 U 2 a 2 /X 2

and the energy passing per second through I sq. cm. perpendicular to the line of propagation is

2 P 7r ! U 3 a i 7X 2 (14)

The Pressure of Sound Waves. — Sound waves, like light waves, exercise a small pressure against any surface upon which they im- pinge. The existence of this pressure has been demonstrated experimentally by W. Altberg {Ann. der Physik, 1903, 11, p. 405). A small circular disk at one end of a torsion arm formed part of a solid wall, but was free to move through a hole inthewall slightly larger than the disk. When intense sound waves impinged on the wall, the disk moved back through the hole, and by an amount showing a pressure of the order given by the following investigation: —

Suppose that a train of waves is incident normally on the surface S (fig. Il), and that they are absorbed there without reflection.

Let ABCD be a column of air 1 sq. cm. cross-section. The pressure on CD is

equal to the momentum which it receives per second. On the whole the air S within ABCD neither gains nor loses momentum, so that on the

u whole it receives as much through AB as it gives up to CD. Fig. II. If P is the undisturbed pressure

and P+S the pressure at AB,

the momentum entering through AB per second is^ (P+£> +pu 2)dt. But f iPdt = P is the normal pressure, and as we only wish to find the excess we may leave this out of account.

The excess pressure on CD is therefore f a (ti+pitydt. But the values of S> +pu 2 which occur successively during the second at AB exist simultaneously at the beginning of the second over the distance U behind AB. Or if the conditions along this distance U could be maintained constant, and we could travel back along it uniformly in one second, we should meet all the conditions actually arriving at AB and at the same intervals. If then d£ is an element of the path, putting dt = d£fU, we have the average excess of pressure

p = p o (Z+pu)dt = ^^(Z+pu^dl.*

Here d£ is an actual length in the disturbance. We have fi and u expressed in terms of the original length dx and the displacement dy so that we must put d£ = dx+dy = (1 +dy/dx)dx, and

\dx.

We have already found that if V changes to V— v

since r/V = — dy/dx.

We also have pu = p u 2 /(i + dy/dx). Substituting these values and neglecting powers of dy/dx above the second we get*

But! -f-dx = o since the sum of the displacements = o. Then putting (dy/dx)' = (w/U) 2 , we have

= 2(7 + 1) average energy per cubic centimetre, (15)

a result first published by Lord Rayleigh (Phil. Mag., 1905, 10,

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If the train of waves is reflected, the value of p at AB will be the sum of the values for the two trains, and will, on the average, be doubled. The

pressure on CD will therefore be doubled. But the energy will also be doubled, so that (15) still gives the average excess of pressure

Experimental Determinations of the Velocity of Sound.

An obvious method of determining the velocity of sound in air consists in starting some sound, say by firing a gun, and stationing an observer at some measured distance from the gun. The observer measures by a clock or chronometer the time elapsing between the receipt of the flash, which passes practically instantaneously, and the receipt of the report. The distance divided by the time gives the velocity of the sound. The velocity thus obtained will be affected by the wind. For instance, William Derham (Phil. Trans., 1708) made a series of observations, noting the time taken by the report of a cannon fired on Blackheath to travel across the Thames to Upminster Church in Essex, 125 m. away. He found that the time varied between 55J seconds when the wind was blowing most strongly with the sound, to 6$ seconds when it was most strongly against the sound. The value for still air he estimated at 1142 ft. per second. He made no correction for temperature or humidity. But when the wind is steady its effect may be eliminated by " reciprocal " observations, that is, by observations of the time of passage of sound in each direction over the measured distance.

Let D be the distance, U the velocity of sound in still air, and w the velocity of the wind, supposed for simplicity to blow directly from one station to the other. Let T and T 2 be the observed times of passage in the two directions. We have U+w = D/Ti and U — w = D/Ts. Adding and dividing by 2

If Ti and T2 are nearly equal, and if_,T = §(Ti+T s), this is very nearly U = D/T.

The reciprocal method was adopted in 1738 by, a commission of the French Academy (Mimoires de I'academie des sciences, (1738). Cannons were fired at half-hour intervals, alternately at Montmartre and Montlhery, 17 or 18 m. apart. There were also two intermediate stations] at which observations were made. The times were measured by pendulum clocks. The result obtained at a temperature about 6° C. was, when converted to metres, U = 337 metres/second.

The theoretical investigation given above shows that if U is the velocity in air at t° C. then the velocity Uo at o° C. in the same air is independent of the barometric pressure and that Uo=U/(i+o-ooi840, whence U = 332 met. /sec.

In 1822 a commission of the Bureau des Longitudes made a series of

experiments between Montlhery and Villejuif, 11 m. apart. Cannons were fired at the two stations at intervals of five minutes. Chronometers were used for timing, and the result at 15-9° C. was U = 3ao-9 met. /sec, whence Uo = 330-6 met. /sec. (F. J. D. Arago, Comiaizsancc des temps, 1825).

When the measurement of a time interval depends on an observer, his " personal equation " cˆmes in to affect the estimation of the quantity. This is the interval between the ariival of an event and his perception that it has arrived, or it may be the interval between arrival a:.d his recoid of the arrival. This personal equation is different for different observers. It may differ even by a considerable fraction of a second. It is different, too, for different senses with the same observer, and different even for the same sense when the external stimuli differ in intensity. When the interval between a flash and" a ■ report is measured, the personal equations for the two arrivals are, in all probability, different, that for the flash being most likely less than that for the sound. In a long series of experi- ments carried out by V. Regnault in the years 1862 to 1866 on the velocity of sound in open air, in air in pipes and in various other gases in pipes, he sought to eliminate personal equation by dispensing with the human element in the observations, using electric receivers as observers. A short account of these experiments is given in Phil. Mag., 1868, 35, p. 161, and the full account, which serves as an excellent example of the extra-ordinary care and ingenuity of Regnault's work, is given in the Memoires de I'academie des sciences, 1868, xxxvii. On page 459 of the Memoire will be found a list of previous careful experiments on the velocity of sound. In the open-air experiments the receiver consisted of a large

cone having a thin india-rubber membrane stretched over its narrow end. A small metal disk was attached to the centre of the membrane and connected to earth by a fine wire. A metal contact-piece adjustable by a screw could be made to just touch a point at the centre of the disk. When contact was made it completed an electric circuit which passed to a recording station, and there, by means of an electro-magnet, actuated a style writing a record on a band of travelling smoked paper. On the same band a tuning-fork electrically maintained and a seconds clock actuating another style wrote parallel records. The circuit was continued to the gun

which served as a source, and stretched across its muzzle. When the gun was fired, the circuit was broken, and the break was recorded on the paper. The circuit was at once remade. When the wave travelled to the receiver it pushed back the disk from the contact-piece, and this break, too, was recorded. The time between the breaks could be measured in seconds by the clock signals, and in fractions of a second by the tuning-fork record. The receiving apparatus had what we may term a personal equation, for the break of contact could only take place when the membrane travelled some finite distance, exceedingly small no doubt, from the contact-piece. But the apparatus was used in such a way that this could be neglected. In some experiments in which contact was made instead of broken, Regnault determined the personal equation of the apparatus.

To eliminate wind as far as possible reciprocal firing was adopted, the interval between the two firings being only a few seconds. The temperature of the air traversed and its humidity were observed, and the result was finally corrected to the velocity in dry air at o° C. by means of equation (10).

Regnault used two different distances, viz. 1280 metres and 2445

metres, obtaining from the first U„ =331-37 met./sec.; but the

number of experiments over the longer distance was greater, and he

appears to have put more confidence in the result from them, viz.

Uo = 330-71 met./sec.

In the Phil. Trans., 1872, 162, p. I, is given an interesting deter- mination made by E. J. Stone at the Cape of Good Hope. In this experiment the personal equations of the observers were deter- mined and allowed for.

Velocity of Sound in Air and other Gases in Pipes. — In the memoir cited above Regnault gives an account of determinations of the velocity in air in pipes of great length and of diameters ranging from 0-108 metres to i-i metres. He used various sources and the method of electric registration. He found that in all cases the velocity decreased with a diameter. The sound travelled to and fro in the pipes several times before the signals died away, and he found that the velocity decreased with the intensity, tending to a limit for very feeble sounds, the limit being the same whatever the source. This limit for a diameter 11 m. was Uo=33o-6 met./sec, while for a diameter 0-108 it was 110 = 324-25 met./sec.

Regnault also set up a shorter length of pipes of diameter 0-108 m. in a court at the College de France, and with this length he could use dry air,

vary the pressure, and fill with other gases. He found that within wide limits the velocity was inde- pendent of the pressure, thus confirming the theory. Com- paring the velocities of sound Ui and U 2 in two different gases with densities pi and pi at the same temperature and pressure, and with ratios of specific heats 7ˆ 72, theory gives

Ui/U 2 = V{7Wwi). This formula was very nearly confirmed for hydrogen, carbon dioxide and nitrous oxide.

J. Violle and T. Vautier (Ann. chim. phys., 1890, vol. 19) made observations with a tube 0-7 m. in diameter, and, using Regnault's apparatus, found that the velocity could be represented by

33i-3(i+CVP), where P is the mean excess of pressure above the normal. According to von Helmholtz and Kirchhoff the velocity in a tube should be less than that in free air by a quantity depending on the diameter of the tube, the frequency of the note used, and the viscosity of the gas (Rayleigh, Sound, vol. ii. §§ 347-8).

Correcting the velocity obtained in the 0-7 m. tube by Kirch- hoff's formula, Violle and Vautier found for the velocity in open air at o c C.

Uo=33i-io met./sec. with a probable error estimated at ± o-io metre.

It is obvious from the various experiments that the velocity of sound in dry air at o° C. is not yet known with very great accuracy. At present we cannot assign a more exact value than

Ho = 331 metres per second.

Violle and Vautier made some later experiments on the propagation of musical sounds in a tunnel 3 metres in diameter (Ann. chim. phys., 1905, vol. 5). They found that the velocity of propagation of different musical sounds was the same. Some curious effects were observed in the formation of har- monics in the rear of the primary tone used. These have yet to. find an explanation.

Velocity of Sound in Water. — The velocity in water was measured by J. D. Colladon and J. K. F. Sturm (Ann. chim. phys., 1827 (2), 36, p. 236) in the water of Lake Geneva. A bell under water was struck, and at the same instant some gunpowder was flashed in air above the bell. At a station more than 13 kilometres away a sort of big ear-trumpet, closed by a mem- brane, was placed with the membrane under water, the tube rising above the surface. An observer with his ear to the tube noted the interval between the arrival of flash and sound. The velocity deduced at 8-i° C. was U=i43S met./sec, agreeing very closely with the value calculated from the

formula U 2 = E/p.

Experiments on the velocity of sound in iron have been made on lengths of iron piping by J. B. Biot, and on telegraph wires by Wertheim and Brequet. The experiments were not satis- factory, and it is sufficient to say that the results accorded roughly with the value given by theory.

Reflection of Sound.

When a wave of sound meets a surface separating two media it is in part reflected, travelling back from the surface into the first medium again with the velocity with which it approached. Echo is a familiar example of this. The laws of reflection of sound are identical with those of the reflection of light, viz. (1) the planes of incidence and reflection are coincident, and (2) the angles of incidence and reflection are equal. Experiments may be made with plane and curved mirrors to verify these laws, but it is necessary to use short waves, in order to diminish diffraction effects. For instance, a ticking watch may be put at the focus of a large concave metallic mirror, which sends a parallel " beam " of sound to a second concave mirror facing the first. If an ear-trumpet is placed at the focus of the second mirror the ticking may be heard easily, though it is quite inaud- ible by direct waves. Or it may be revealed by placing a sensitive flame of the kind described below with its nozzle at the focus. The flame jumps down at every tick.

Examples of reflection of sound in buildings are only too frequent. In large halls the words of a speaker are echoed or reflected from flat walls or roof or floor; and these reflected sounds follow the direct sounds at such an interval that syllables and words overlap, to the confusion of the speech and the annoyance of the audience.

Some curious examples of echo are given in Herschel's article on " Sound " in the Encyclopaedia Metropolitans, but it appears that he is in error in one case. He states that in the whispering gallery in St Paul's, London, " the faintest sound is faithfully conveyed from one side to the other of the dome but is not heard at any intermediate point." In some domes, for instance in a dome at the university of Birmingham, a sound from one end of a diameter is heard very much more loudly quite close to the other end of the diameter than elsewhere, but in St Paul's Lord Rayleigh found that " the abnormal loudness with which a whisper is heard is not confined to the position diametrically opposite to that occupied by the whisperer, and therefore, it would appear, does not depend materially upon the symmetry

of the dome. The whisper seems to creep round the gallery horizontally, not necessarily along the shorter arc, but rather along that arc towards which the whisperer faces. This is a consequence of the very unequal audibility of a whisper in front and behind the speaker, a phenomenon which may easily be observed in the open air" (Sound, ii. § 287).

Let fig. 12 represent a horizontal section of the dome through the source P. Let OPA be the radius through P. Let PQ represent a ray of sound making the angle 9 with the tangent at A. Let ON(= OP cos 6) »_ be the perpendicular on PQ. Then ˆ the reflected ray QR and the ray reflected at R, and so on, will all touch the circle drawn with ON as radius. A ray making an angle less than with the tangent will, with its reflections, touch a larger circle. Hence all rays between = *= will be confined in the space between the outer dome and a circle of radius OP cos 0, and the weakening of in- tensity will be chiefly due to vertical spreading.

Rayleigh points out that this clinging of the sound to the surface of a concave wall does not depend on the exactness of the spherical form. He suggests that the propagation of earthquake disturbances is probably affected by the curvature of the surface of the globe, which may act like a whispering gallery.

In seme cases of echo, when the original sound is a compound musical note, the octave of the fundamental tone is reflected much more strongly than that tone itself. This is explained by Rayleigh (Sound, ii. § 296) as a consequence of the irregu- larities of the reflecting surface. The irregularities send back a scattered reflection of the different incident trains, and this scattered reflection becomes more copious the shorter the wave- length. Hence the octave, though comparatively feeble in the incident train, may predominate in the scattered reflection constituting the echo.

Refraction of Sound. When a wave of sound travelling through one medium meets a second medium of a different kind, the vibrations of its own particles are communicated to the particles of the new medium, so that a wave is excited in the latter, and is propagated through it with a velocity dependent on the density and elasticity of the second medium, and therefore differing in general from the previous velocity. The direction, too, in which the new wave travels is different from the previous one. This change of direction is termed refraction, and takes place, no doubt, accord- ing to the same laws as does the refraction of light, viz. (1) The new direction or refracted ray lies always in the plane of incidence, or plane

which contains the incident ray (i.e. the direction of the wave in the first medium), and the normal to the surface separating the two media, at the point in which the incident ray meets it; (2) The sine of the angle between the normal and the incident ray bears to the sine of the angle between the normal and the refracted ray a ratio which is constant for the same pair of media. As with light the ratio involved in the second law is always equal to the ratio of the velocity of the wave in the first medium to the velocity in the second; in other words, the sines of the angles in question are directly proportional to the velocities.

Hence sound rays, in passing from one medium into another, are bent in towards the normal, or the reverse, according as the velocity of propagation in the former exceeds /P or falls short of that in the latter. Thus, for instance, sound is refracted towards the per- pendicular when passing into air from water, or into carbonic acid gas from air; the converse is the case when the passage takes place the opposite way.

It further follows, as in the analogous case of light, that there is a certain angle termed the critical angle, whose sine is found by dividing the less by

the greater velocity, such that all rays of sound meeting the surface separating two different bodies will not pass onward, but suffer total reflection back into the first body, if the velocity in that body is less than that in the other body, and if the angle of incidence exceeds the limiting angle.

The velocities in air and water being respectively 1090 and 4700 ft. the limiting angle for these media may be easily shown to be slightly above 155°. Hence, rays of sound proceeding from a distant source, and therefore nearly parallel to each other, and to PO (fig. .13), the angle POM being greater than 152°, will not pass into the water at all, but suffer total reflection. Under such circumstances, the report of a gun, however powerful, should be inaudible by an ear placed in the water.

Acoustic Lenses. — As light is concentrated into a focus by a convex glass lens (for which the velocity of light is less than for the air), so sound ought to be made to converge by passing through a convex lens formed of carbonic acid gas. On the other hand, to produce convergence with water or hydrogen gas, in both which the velocity of sound exceeds its rate in air, the lens ought to be concave. These results have been confirmed experimentally by K. F. J. Sondhauss (Pogg. Ann., 1852, 85. p. 378), who used a collodion lens filled with carbonic acid. He found its focal length and hence the refractive index of the gas, C. Hajech (Ann. chim. phys., 1858, (iii). vol. 54) also measured the refractive indices of various gases, using a prism containing the gas to be experimented on, and he found that

the deviation by the prism agreed very closely with the theoretical values of sound in the gas and in air.

Osborne Reynolds (Proc. Roy.Soc, 1874, 22, p. 531) first pointed out that refraction would result from a variation in the tempera- ture of the air at different heights. The velocity of sound in air is independent of the pressure, De™actfofl! re but varies with the temperature, its value at f C. being as we have seen

U = Uo(l + |oO, where U is the velocity at o° C, and a is the coefficient of expansion -00365. Now if the temperature is higher overhead than at the surface, the velocity overhead is greater. If a wave front is in a given position, as a 1 (fig. 14), at a given instant

*1 » 3 4 1*34*

a b

Fig/ 14.

the upper part, moving faster, gains on the lower, and the front tends to swing round as shown by the successive positions in a 2, 3 and 4; that is, the sound tends to come down to the surface. This is well illustrated by the remarkable horizontal carriage of sound on a still clear frosty morning, when the surface layers of air are decidedly colder than those above. At sunset, too, after a warm day, if the air is still, the cooling of the earth by radiation cools the lower layers, and sound carries excellently over a level surface. But usually the lower layers are warmer than the upper layers, and the velocity below is greater than the velocity above. Consequently a wave front such as b 1 tends to turn upwards, as shown in the successive positions b 2, 3 and 4. Sound is then not so well heard along the level, but may still reach an elevated observer. On a hot summer's day the temperature of the surface layers may be much higher than that of the higher layers, and the effect on the horizontal carriage of sound may be very marked.

It is well known that sound travels far better with the wind than against it. Stokes showed that this effect is one of refraction, due to variation of velocity of the air ■ from the surface upwards (Brit. Assoc. Rep., 1857, p. by wind. 22). It is, of course, a matter of- common observation that the wind increases in velocity from the surface upwards, An excellent illustration of this increase was pointed out by F. Osier in the shape of old clouds; their upper portions always appear dragged forward and they lean over, as it were, in the

DIFFRACTION]

direction in which the wind is going. The same kind of thing happens with sound-wave fronts when travelling with the wind.

The velocity of any part of a wave front relative to the ground will be the normal velocity of sound + the velocity of the wind at that point. Since the velocity increases as we go upwards the front tends to swing round and travel downwards, as shown in the successive positions a i, 2, 3 and 4, in fig. 14, where we must suppose the wind to be blowing from left to right. But if the wind is against the sound the velocity of a point of the wave front is the normal velocity— the wind velocity at the point, and so decreases as we rise. Then the front tends to swing round and travel upwards as shown in the successive positions b 1, 2, 3, and 4, in fig. 14, where the wind is travelling from right to left. In the first case the waves are more likely to reach and be perceived by an observer level with the source, while in the second case they may go over his head and not be heard at all.

Diffraction of Sound Waves.

Many of the well-known phenomena of optical diffraction may be imitated with sound waves, especially if the waves be short. Lord Rayleigh (Scientific Papers, iii. 24) has given various examples, and we refer the reader to his account. We shall only consider one interesting case of sound diffraction which may be easily observed. When we are walking past a fence formed by equally-spaced vertical rails or overlapping boards, we may often note that each footstep is followed by a musical ring. A sharp clap of the hands may also produce the effect. A short impulsive wave travels towards the fence, and each rail as it is reached by the wave becomes the centre of a new secondary wave sent out all round, or at any rate on the front side of the fence.

S' Fig. 15.

Let S (fig. 15) be the source very nearly in the line of the rails ABCDEF. At the instant that the original wave reaches F the wave from E has travelled to a circle of radius very nearly equal to EF — not quite, as 5 is not quite in the plane of the rails. The wave from D has travelled to a circle of radius nearly equal to DF, that from C to a circle of radius nearly CF, and so on. As these " secondary waves " return to S their distance apart is nearly equal to twice the distance between the rails, and the observer then hears a note of wave-length nearly 2EF. But if an observer is stationed at S' the waves will be about half as far apart and will reach him with nearly twice

the frequency, so that he hears a note about an octave higher. As he travels further round the frequency increases still more. The railings in fact do for sound what a diffraction grating does for light.

Frequency and Pitch.

Sounds may be divided into noises and musical notes. A mere noise is an irregular disturbance. If we study the source produc- ing it we find that there is no regularity of vibration. A musical note always arises from a source which has some regularity of vibration, and which sends equally-spaced waves into the air. A given note has always the same frequency, that is to say, the hearer receives the same number of waves per second what- ever the source by which the note is produced. Various instru- ments have been devised which produce any desired note, and which are provided with methods of counting the frequency of vibration. The results obtained fully confirm the general law that " pitch," or the position of the note in the musical scale, depends solely on its frequency. We shall now describe some of the methods of determining frequency.

SaVart's toothed wheel apparatus, named after Felix Savart (1791-1841), a French physicist and surgeon, consists of a brass wheel, whose edge is divided into a number of equal projecting

teeth distributed uniformly over the circumference, and which is capable of rapid rotation about an axis perpendicular to its plane and passing through its centre, by means of a series of multiplying wheels, the last of which is turned round by the hand. The toothed wheel being set in motion, the edge of a card or of a funnel-shaped piece of common notepaper is held against the teeth, when a note will be heard arising from the rapidly succeeding displacements of the air in its vicinity. The pitch of this note will rise as the rate of rotation increases, and becomes steady when that rotation is maintained uniform. It may thus be brought into unison with any sound of which it may be required to determine the correspond- ing number of vibrations per second, as for instance the note A3, three octaves higher than the A which is indicated musically by a small circle placed between the second and third lines of the G clef, which A is the note of the tuning-fork usually employed for regulating concert-pitch. A3 may be given by a piano. Now, suppose that the note produced with Savart's apparatus is in unison with A3, when the experimenter turns round the first wh°el at the rate of 60 turns per minute or one per second, and that the cir- cumferences of the various multiplying wheels are such that the rate of revolution of the toothed wheel is thereby increased 44 times, then the latter wheel will perform 44 revolutions in a second, and hence, if the number of its teeth be 80, the number of taps imparted to the card every second will amount to 44X80 or 3520. This, therefore, is the number of

vibrations corresponding to the note A 3 . If we divide this by 2 3 or 8, we obtain 440 as the number of vibrations answering to the note A. If, for the single toothed wheel, be substituted a set of four with a common axis, in which the teeth are in the ratios 4: 5: 6: 8, and if the card be rapidly passed along their edges, we shall hear distinctly produced the fundamental chord C, E, G, Ci and shall thus satisfy ourselves that the intervals C, E; C, G and C, Ci are {, | and 2 respectively.

Neither this instrument nor the next to be described is now used for exact work; they merely serve as illustrations of the law of pitch.

The siren of L. F. W. A. Seebeck (1805-1849) is the simplest form of apparatus thus designated, and consists of a large circular disk mounted on a central axis, about which it may be made seebeck's to revolve with moderate rapidity. This disk is per- sbvn forated with small round holes arranged in circles about the centre of the disk. In the first series of circles, reckoning from the centre the openings are so made as to divide the respective circumferences, on which they are found, in aliquot parts bearing to each other the ratios of the numbers 2, 4, 5, 6, 8, 10, 12, 16, 20, 24, 32, 40, 48, 64. The second series consists of circles each of which is formed of two sets of perforations, in the first circle arranged as 4:5, in the next as 3:4, then as 2:3, 3:5, 4:7. In the outer series is a circle divided by perforations into four sets, the numbers of aliquot parts being as 3 : 4 : 5 : 6, followed by others which we need not further refer to.

The disk being started, then by means of a tube held at one end between the lips, and applied near to the disk at the other, or more easily with a common bellows, a blast of air is made to fall on the part of the disk which contains any one of the above circles. The current being alternately transmitted and shut off, as a hole passes on and off the aperture of the tube or bellows, causes a vibratory motion of the air, whose frequency depends on the number of times per second that a perforation passes the mouth of the tube. Hence the note produced with any given circle of holes rises in pitch as the disk revolves more rapidly ; and if, the revolution of the disk being kept as steady as possible, the tube be passed rapidly across the circles of the first series, a series of notes is heard, which, if the lowest be denoted by C, form the sequence C, Ci, Ei, Gi, C2, &c. In like manner, the first circle in which we have two sets of holes dividing the circumference, the one into say 8 parts, and the other into 10, or in ratio 4:5, the note produced is a compound one, such as would be obtained by striking on the piano two notes separated by the interval of a major third (|). Similar results are obtainable by means of the remaining perforations.

A still simpler form of siren may be constituted with a good spinning-top, a perforated card disk, and a tube for blowing with. The siren of C. Cagniard

*de la Tour is founded on the same principle as the preceding. It consists of a cylindrical chest of brass, the base of which is pierced at its centre with an opening in which is fixed a brass tube projecting outwards, and ~ n , L, H intended for supplying the cavity of the cylinder with Cagniara ae compressed air or other gas, or even liquid. The top * our – of the cylinder is formed of a plate perforated near its edge by holes distributed uniformly in a circle concentric with the plate, and which are cut obliquely through the thickness of the plate. Immediately above this fixed plate, and almost in contact with it, is another of the same dimensions, and furnished with the same number, n, of openings similarly placed, but passing obliquely through in an opposite direction from those in the fixed plate, the one set being inclined to the left, the other to the right.*

This second plate is capable of rotation about an axis per- pendicular to its plane and passing through its centre. Now, let the movable plate be at any time in a position such that its holes are immediately above those in the fixed plate, and let the bellows by which air is forced into the cylinder (air, for simplicity, being

Fig. 16.

supposed to be the fluid employed) be put in action; then the air in its passage will strike the side of each opening in the movable plate in an oblique direction (as shown in fig. 1 6), and will therefore urge the latter to rotation round its centre. After i/nth of a revolution, the two sets of perforations will again coincide, the lateral impulse of the air repeated, and hence the rapidity of rotation increased. This will go on continually as long as air is supplied to the cylinder, and the velocity of rotation of the upper plate will be accelerated up to a certain maximum, at which it may be maintained by keeping the force of the current constant.

Now, it is evident that each coincidence of the perforations in the two plates is followed by a non-coincidence, during which the air-current is shut off, and that consequently, during each revolution of the upper plate, there occur n alternate passages and interceptions of the current. Hence arises the same number, of successive im- pulses of the external air immediately in contact with the movable plate, which is thus thrown into a state of vibration at the rate of n for every revolution of the plate. .The result is a note whose pitch rises as the velocity of rotation increases, and becomes

steady when that velocity reaches its constant value. If, then, we can determine the number m of revolutions performed by the plate in every second, we shall at once have the number of vibrations per second corresponding to the audible note by multiplying m by n. For this purpose the axis is furnished at its upper part with a screw working into a toothed wheel, and driving it round, during each revolution of the plate, through a space equal to the interval between two teeth. An index resembling the hand of a watch partakes of this motion, and points successively to the divisions of a graduated dial. On the completion of each revolution of this toothed wheel (which, if the number of its teeth be ioo, will com- prise ioo revolutions of the movable plate), a projecting pin fixed to it catches a tooth of another toothed wheel and turns it round, and with it a corresponding index which thus records the number of turns of the first toothed wheel. As an example of the applica- tion of this siren, suppose that the number of revolutions of the plate, as shown by the indices, amounts to 5400 in a minute, that is, to 90 per second, then the number of vibrations per second of the note heard amounts to cjora, or (if number of holes in each plate = 8) to 720.

H. W. Dove (1803-1879) produced a modification of the siren by which the relations of different musical notes may be more readily ascertained. In it the fixed and movable plates are each furnished with four concentric series of per- forations, dividing the circumferences into different aliquot parts, as, for example, 8, 10, 12, 16. Beneath the lower or fixed plate are four metallic rings furnished with holes corre- sponding to those in the plates, and which may be pushed round by projecting pins, so as to admit the air-current through any one or more of the series of perforations in the fixed plate. Thus may be obtained, either separately or in various combinations, the four notes whose vibrations are in the ratios of the above numbers, and which therefore form the fundamental chord (CEGCi). The inventor has given to this instrument the name of the many-voiced siren.

Helmholtz {Sensations of Tone, ch. viii.) further adapted the siren for more extensive use, by the addition to Dove's instrument

HelmhoHz's oi . another chest con- Double taming its own fixed

Siren. an< ˆ movable perforated

plates and perforated rings, both the movable plates being driven by the same current and revolving about a common axis. Annexed is a figure of this instru- ment (fig. 17).

Graphic Methods. — The relation between the pitch of a note and the frequency of the corresponding vibrations has also been studied by graphic

methods. Thus, if an elastic metal slip or a pig's bristle be at- tached to one prong of a tuning- if [^ <_ 1 1 fork, and if the fork, while in

K\ tap \ I I vibration, is moved rapidly over a

m\ \¥

lVitl \ V the at . tacned stv,e touching the

■ *xLLj '\ M JT\ plate lightly, a wavy line will be*

1 traced on the plate answering to

**— ' the vibrations to and fro of the*

fork. The same result will be ob- tained with a stationary fork and a movable glass plate; and, if the time occupied by the plate in moving through a given distance can be ascertained and the number of complete undulations exhibited on the plate for that distance, which is evidently the number of vibrations of the fork in that time, is reckoned, we shall have determined the numerical vibration-

Dove's Siren.

Fig. 17.

value of the note yielded by the fork. Or, if the same plate be moved in contact with two tuning-forks, we shall, by compar- ing the number of sinuosities in the one trace with that in the other, be enabled to assign the ratio of the corresponding numbers of vibrations per second. Thus, if the one note be an octave higher than the other, it will give double the number of waves in the same distance. The motion of the plate may be simply produced by dropping it between two vertical grooves, the tuning-forks being properly fixed to a frame above.

*Greater accuracy may be attained with a revolving-drum chrono- graph first devised by Thomas Young (Led. on Nat. Phil., 1807, i. 190), consisting of a cylinder which may be coated _ „ with lamp-black, or, better still, a metallic cylinder 7 * e *f ev ' < "" round which a blackened sheet of paper is wrapped. yns! ""• The cylinder is mounted on an axis and turned round, while the style attached to the vibrating body is in light contact with it, and traces therefore a wavy circle, which, on taking off the paper and flattening it, becomes a wavy straight line. The superiority of this arrangement arises from the comparative facility with which the number of revolutions of the cylinder in a given time may be ascertained. In R. Koenig's arrangement (Quelques experiences d'acoustique, p. 1) the axis of*

the cylinder is fashioned as a screw, which works in fixed nuts at the ends, causing a sliding as well as a rotatory motion of the cylinder. The lines traced out by the vibrating pointer are thus prevented from overlapping when more than one turn is given to the cylinder. In the phonauto- graph of E. L. Scott {Comptes rendus, 1861, 53, p. 108) any sound whatever may be made to record its trace on the paper by means of a large parabolic cavity resembling a speaking-trumpet, which is freely open at the wider extremity, but is closed at the other end by a thin stretched membrane. To the centre of this membrane is attached a small feather-fibre, which, when the reflector is suit- ably placed, touches lightly the surface of the revolving cylinder. Any sound (such as that of the human voice) transmitting its rays into the reflector, and communicating vibratory motion to the membrane, will cause the feather to trace a sinuous line on the paper. If, at the same time, a tuning-fork of known number of vibrations per second be made to trace its own line close to the other, a comparison of the two lines gives the number corresponding to the sound under consideration. The phonograph (q.t.) may be regarded as an instrument of this class, in that it records vibrations on a revolving drum or disk.

Lissajous Figures. — A mode of exhibiting the ratio of the fre- quencies of two forks was devised by Jules Antoine Lissajous (1822- 1880). On one prong of each fork is fixed a small plane mirror. The two forks are fixed so that one vibrates in a vertical, and the other in a horizontal, plane, and they are so placed that a converging beam of light received on one mirror is reflected to the other and then brought to a point on a screen. If the first fork alone vibrates, the point on the screen appears lengthened out into a vertical line through the changes in inclination of the first mirror, while if the second fork alone vibrates, the point appears lengthened out into a horizontal line. If both vibrate, the point describes a curve which appears continuous through the persistence of the retinal impression. Lissajous also obtained the figures by aid of the vibra- tion microscope, an instrument which he invented. Instead of a mirror, the objective of a microscope is attached to one prong of the first fork and the eyepiece of the microscope is fixed behind the fork. Instead of a mirror the second fork carries a bright point on one prong, and the microscope is focused on this. If both forks vibrate, an observer looking through the microscope sees the bright point describing Lissajous figures. If the two forks have the same frequency, it is easily seen that the figure will be an ellipse (including as limiting cases, depending on relative amplitude and phase, a circle and a straight line). If the forks are not of exactly the same frequency the ellipse will slowly revolve, and from its rate of revolution the ratio of the frequencies may be determined (Rayleigh, Sound, i. § 33). If one is the octave of the other a figure of 8 may be described, and so on. Fig. 18 shows curves given by intervals of the octave, the twelfth and the fifth.

The kaleidophone devised by Charles Wheatstone in 1827 gives these figures in a simple way. It consists of a straight rod clamped in a vice and carrying a bead at its upper free end. The bead is illuminated and shows a bright point of light. If the rod is circular in section and perfectly uniform the end will describe a circle, ellipse or straight line; but, as the elasticity is usually not exactly the same in all directions, the figure usually changes and revolves. Various modifications of the kaleidophone have been made (Rayleigh, Sound, § 38).

Koenig devised a clock in which a fork of frequency 64 takes the place of the pendulum (Wied. Ann., 1880, ix. 394). The motion of the fork is maintained by the clock acting through an escapement, and the dial registers both the number ~ oe f f of vibrations of the fork and the seconds, minutes and ˆ”“S-iork hours. By comparison with a clock of known rate oc ‘ the total number of vibrations of the fork in any time may be accurately determined. One prong of the fork carries a micro- scope objective, part of a vibration microscope, of whioh’ the eyepiece is fixed at the back of the clock and the Lissajous figure

made by the clock fork and any other fork may be observed. With this apparatus Koenig studied the effect of temperature on a standard fork of 256 frequency, and found that the frequency decreased by 0-0286 of a vibration for a rise of 1°, the frequency being exactly 256 at 26-2° C. Hence the frequency may be put as 256 {1—0-000113 (t — 26-2)}.

(From Lord Rayleigh’s Theory of Sound, by permission of Macmillan & Co., Ltd.)

Fig. 18.

Koenig also used the apparatus to investigate the effect on the frequency of a fork of a resonating cavity placed near it. He found that when the pitch of the cavity was below that of the fork the pitch of the fork was raised, and vice versa. But when the pitch of the cavity was exactly that of the fork when vibrating alone, though it resounded most strongly, it did not affect the frequency of the fork. These effects have been explained by Lord Rayleigh (Sound, i. § 117)-

In the stroboscopic method of H. M’Leod and G. S. Clarke, the full details of which will be found in the original memoir (Phil. Trans., 1880, pt. i. p.

1), a cylinder is ruled with equi- M'Leodaad distant w hite lines parallel to the axis on a black Clarke's ground. It is set so that it can be turned at any de- Strobo- sired and determined speed about a horizontal axis,

M°«ii

Method. now t j lat a f Qr ˆ w j t jj bfacfc pron g S i s held near the

cylinder with its prongs vertical and the plane of vibration parallel to the axis, and suppose that we watch the outer out- line of the right-hand prong. Let the cylinder be rotated so that each white line moves exactly into the place of the next while the prong moves once in and out. Hence when a white line is in a particular position on the cylinder, the prong will always be the same distance along it and cut off the same length from view. The most will be cut off in the position of the lines corresponding to the furthest swing out, then less and less till the furthest swing in, then more and more till the furthest swing out, when the appear- ance will be exactly as at first. The boundary between ,the grey cylinder and the black fork will therefore appear wavy with fixed undulations, the distance from crest to crest being the distance between the lines on the cylinder. If the fork has slightly greater frequency, then a white line will not quite reach the next place while the fork is making its swing in and out, and the waves will travel against the motion of the cylinder. If the fork has slightly less frequency the waves will travel in the opposite direction, and it is easily seen that the frequency of the fork is the number of white lines passing a point in a second ± the number of waves passing the point per second. This apparatus was used to find the temperature coefficient of the frequency of forks, the value ob- tained— ooon being the same as that found by Koenig. Another important result of the investigation was that the phase of vibra tion of the fork was not altered by bowing it, the amplitude alone changing. The method is easily adapted for the converse deter- mination of speed of revolution when the frequency of a fork is known.

The phonic wheel, invented independently by Paul La Cour and Lord Rayleigh (see Sound, i. § 68 c), consists of a wheel carrying t several soft- iron armatures fixed at equal distances ™- y ' e ˆ A ' s round its circumference. The wheel rotates between wh 1 tne P°' es °f an electro- magnet, which is fed by an*

• intermittent current such as that which is working an

electrically maintained tuning-fork (see infra). If the wheel be driven at such rate that the armatures move one place on in about the period of the current, then on putting on the current the electro- magnet controls the rate of the wheel so that the agreement of period is exact, and the wheel settles

down to move so that the electric driving forces just supply the work taken out of the wheel.

If the wheel has very little work to do it may not be necessary to apply driving power, and uniform rotation may be maintained by the electro-magnet. In an experiment described by Rayleigh such a wheel provided with four armatures was used to determine the exact frequency of a driving fork known to have a frequency near 32. Thus the wheel made about 8 revolutions per second. There was one opening in its disk, and through this was viewed the pendulum of a clock beating seconds. On the pendulum was fixed an illuminated silver bead which appeared as a bright point of light when seen for an instant. Suppose now an observer to be looking from a fixed point at the bead through the hole in the phonic wheel, he will see the bead as 8 bright points flashing out in each beat, and in succession at intervals of | second. Let us suppose that he notes the positions of two of these next to each other in the beat of the pendulum one way. If the fork makes exactly 32 vibrations and the wheel 8 revolutions in one pendulum beat, then the positions will be fixed, and every two seconds, the time of a complete pendulum vibration, he will see the two positions looked at flash out in succession at an interval of | second. But if the fork has, say, rather greater frequency, the hole in the wheel comes round at the end of the two seconds before the bead has quite come into position, and the two flashes appear gradually to move back in the opposite way to the pendulum. Suppose that in N beats of the clock the flashes have moved exactly one place back. Then the first flash in the new position is viewed by the 8Nth passage of the opening, and the second flash in the original position of the first is viewed when the pendulum has made exactly N beats and by the (8 N + i)th passage of the hole. Then the wheel makes 8 N + 1 revolutions in N clock beats, and the fork makes 32 N + 4 vibrations in the same time. If the clock is going exactly right, this gives a frequency for the fork of 32 + 4/N. If the fork has rather less frequency than 32 then the flashes appear to move forward and the frequency will be 32— 4/N. In Rayleigh's experiment the 32 fork was made to drive electrically one of fre- quency about 128, and somewhat as with the phonic wheel, the frequency was controlled so as to be exactly four times that of the 32 fork. A standard 128 fork could then be compared either optically or by beats with the electrically driven fork.

Scheibler's Tonometer. — When two tones are sounded together with frequencies not very different, " beats " or swellings-out of the sound are Tieard of frequency equal to the difference of frequencies of the two tones (see below). Johann Heinrich Scheibler (1777- 1838) tuned two forks to an exact octave, and then prepared a number of others dividing the octave into such small steps that the beats between each and the next could be counted easily. Let the forks be numbered o, 1, 2, . . . N. If the frequency

of o is n, that of N is 2n. Suppose that No. I makes »ii beats with No. o, that No. 2 makes mi beats with No. I, and so on, then the frequencies are

n, n+nti, n+mi--m 2 , . . ., n+mi+nti+ . . . + «N- Since n--mi+m 2 + . . . + m-$=2n, n—mi+m2+ . . . +j»n, and it follows that when n is known, the frequency of every fork in the range may be determined.

Any other fork within this octave can then have its frequency determined by finding the two between which it lies. Suppose, for instance, it makes 3 beats with No. 10, it might have frequency either 3 above or below that of No. 10. But if it lies above No. 10 it will beat less often with No. 11 than with No. 9; if below No. 10 less often with No. 9 than with No. 11. Suppose it lies between No. 10 and No. 11 its frequency is that of No. 10+3.

Manometric Flames. — This is a device due to Koenig (Phil. Mag., 1873, 45) an d represented diagrammatically in fig. 19. / is a flame

Fig. 19.

from a pinhole burner, fed through a cavity C, one side of which is closed by a membrane m; on the other side of the membrane is another cavity C, which is put into connexion with a source of sound, as, for instance, a Helmholtz resonator excited by a fork of the same frequency. The membrane vibrates, and alternately checks and increases the gas supply, and the flame jumps up and down with the frequency of the source. It then appears elongated. To show its intermittent character its reflection is viewed in a re- volving mirror. For this purpose four vertical mirrors are arranged round the vertical sides of a cube which is rapidly revolved about a vertical axis. The flame then appears toothed as shown. If several notes are present the flame is jagged by each. Interesting results are obtained by singing the different vowels into a funnel substituted for the resonator in the figure.

If two such flames are placed one under the other they may be excited by different sources, and the ratio of the frequencies may be approximately determined by counting the number of teeth in each in the same space.

The Diatonic Scale.

It is not necessary here to deal generally with the various musical scales. We shall treat only of the diatonic scale, which is the basis of European music, and is approximated to as closely as is consistent with convenience of construction in key-board instruments, such as the piano, where the eight white notes beginning with C and ending with C an octave higher may be taken as representing the scale with C as the key-note.

All experiments in frequency show that two notes, forming a definite musical interval, have their frequencies always in the same ratio wherever in the musical scale the two notes are situated. In the scale of C t the intervals from the key-note, the frequency ratios with the key-note, the successive frequency ratios and the successive intervals are as follows: —

Note . _. Interval with C

C

D

second

E major third

F fourth

G fifth

A major sixth

B

seventh

C

octave

Frequency

i

i

i

t

!

I

V

2

Successive fre-

1

10 9

tt

1

10 9

i

II

quency ratios. Successive in- tervals

major tone

minor tone

major semi- tone

major tone

minor tone

major tone

major semi- tone

If we pass through two intervals in succession, as, for instance, if we ascend through a fourth from C to F and then through a third from F to A, the frequency ratio of A to C is j[, which is the product of the ratios for a fourth f, and a third f . That is, if we add intervals we must multiply frequency ratios to obtain the frequency ratio for the interval which is the sum of the two.

The frequency ratios in the diatonic scale are all expressible either as

fractions, with i, 2, 3 or 5 as numerator and denomina- tor, or as products of such fractions; and it may be shown that for a given note the numerator and denominator are smaller than any other numbers which would give us a note in the immediate neighbourhood.

Thus the second f =f Xf X5, and we may regard it as an ascent through two fifths in succession and then a descent through an octave. The third £=5X^X5 or ascent through an interval f, which has no special name, and a descent through two octaves, and so on.

Now suppose we take G as the key-note and form its diatonic scale. If we write down the eight notes from G to g in the key of C, their frequency ratios to C, the frequency ratios required by the diatonic scale for G, we get the frequency ratios required in the last line: —

Notes on scale of C

Frequency ratios with C = I . Frequency ratios of diatonic scale

with G = 1

Frequency ratios with C = i, G = f

G

H

f

We see that all but two notes coincide with notes on the scale of C. But instead of A = $ we have f-J, and instead of /= f we have ff . The interval between f and H = 1 & + f = I h is termed a " comma," and is so small that the same note on an instrument may serve for both. But the interval between f and f-ji = 44 ■" t = iff i s quite perceptible, and on the piano, for instance, a separate string must be provided above /. This note is / sharp, and the interval Ml is termed a sharp.*

Taking the successive key-notes D, A, E, B, it is found that besides small and negligible differences, each introduces a new sharp, and so we get the five sharps, C, D, F, G, A, represented nearly by the black keys.

If we start with F as key-note, besides a small difference at d, we have as the fourth from it f X i = l i, making with B = V an interval \&%, and requiring a new note, B flat. This does not coincide with A sharp which is the octave below the seventh from Bor VxVXj= Hi- It makes with

it an interval = V = flHr = M4I, rather less than a comma; so that the same string in the piano may serve for both. If we take the new note B flat as key-note, another note, E flat, is required. E flat as key-note introduces another flat, and so on, each flat not quite coinciding with a sharp but at a very small interval from it.

It is evident that for exact diatonic scales for even a limited number of key-notes, key-board instruments would have to be provided with a great number of separate strings or pipes, and the corresponding keys would be required. The construc- tion would be complicated and the playing exceedingly difficult. The same string or pipe and the same key have therefore to serve for what should be slightly different notes. A compromise has to be made, and the note has to be tuned so as to make the compromise as little unsatisfactory as possible. At present twelve notes are used in the octave, and these are arranged at equal intervals 2". This is termed the equal temperament scale, and it is obviously only an approach to the diatonic scale.

Helmholtz's Notation. — In works on sound it is usual to adopt Helmholtz's notation, in which the octave from bass to middle C is written c d e f g a b c'. The octave above is c' a" e' f g' a' b' c". The next octave above has two accents, and each succeeding octave another accent. The octave below bass C is written CDEFGABc. The next octave below is Ci Di Ei Fi Gi Ai Bi C, and each preceding octave has another accent as suffix. The standard frequency for laboratory work is c = i28, so that middle £'=256 and treble c" =

5 12 –

The standard for musical instruments has varied (see Pitch,

Musical). Here it is sufficient to say that the French standard is

a' =435 with c" practically 522, and that in England the pitch is

somewhat higher.

The French notation is as under: —

CDEFGABc

Uti Rei Mi Fai Soli Lai Si! Ut 2 .

The next higher octave has the suffix 2, the next higher the suffix 3,

and so on. French forks are marked with double the true frequency,

so that Ut s is marked 512.

Limiting Frequencies for Musical Sounds. — Until the vibrations of a source have a frequency in the neighbourhood of 30 per second the ear can hear the separate impulses, if strong enough, but does not hear a note. Jt is not easy to determine the exact point at which the impulses fuse into a continuous tone, for higher tones are usually present with the deepest of which the frequency is being counted, and these may be mistaken for it. Helmholtz {Sensations of Tone, ch. ix.) used a string loaded at the middle point so that the higher tones were several octaves above the fundamental, and so not likely to be mistaken for it; he found that with 37 vibrations per second a very weak sensation of tone was heard, but with 34 there was scarcely anything audible left. A determinate musical pitch is not perceived, he says, till about 40 vibrations per second. At the other end of the scale with increasing frequency there is another limiting frequency somewhere about 20,000 per second, beyond which no sound is heard. But this limit varies greatly with different individuals and with age for the same individual. Persons who when young could hear the squeaks of bats may be quite deaf to them when older. Koenig constructed a series of bars forming a harmonicon, the frequency of each bar being calculable, and he found the limit to be between 16,000 and 24,000.

The Number of Vibrations needed to give the Perception of Pitch. — Experiments have been made on this subject by various workers, the most extensive by W. Kohlrausch {Wied. Ann., 1880, x. 1). He allowed a limited number of teeth on the arc of a circle to strike against a card. With sixteen teeth the pitch was well defined ; with nine teeth it was fairly determinate; and even with two teeth it could be assigned with no great error. His remarkable result that two waves give some sense of pitch, in fact a tone with wave- length equal to the interval between the waves, has been confirmed by other observers.

Alteration of Pitch with Motion of Source or Hearer: Doppler's Principle. — A very noticeable illustration of the alteration of pitch by motion occurs when a whistling locomotive moves rapidly past an observer. As it passes, the pitch of the whistle falls quite appreciably. The explanation is simple. The engine follows up any wave that it has sent forward, and so crowds up the succeeding waves into a less distance than if it remained at rest. It draws off from any wave it has sent backward and so spreads the succeeding waves over a longer distance than if it had remained at rest. Hence the forward waves are shorter and the backward waves are longer. Since U '=» X where U is the velocity of sound, X the wave-length, and n the frequency, it follows that the forward frequency is greater than the backward frequency.

The more general case of motion of source, medium and receiver

may be treated very easily if the motions are all in the line joining source and receiver. Let S (fig. 20) be the source at a given instant, and let its frequency of vibration, or the number of waves it sends out per second, be n. Let S' be its position one second later, its velocity being u. Let R be the receiver at a given instant, R' its position a second later, its velocity being v. Let the velocity of the air from S to R be w, and let U be the velocity of sound in still air.

*1?**

Fig. 20.

If all were still, the n waves emitted by S in one second would spread over a length U. But through the wind velocity the first wave is carried to a distance U + w from S, while through the motion of the source the last wave is a distance u from S. Then the n waves occupy a space U + w — u. Now turning to the receiver, let us consider what length is occupied by the waves which pass him in one second. If he were at rest, it would be the waves in length U + w, for the wave passing him at the beginning of a second would be so far distant at the end of the second. But through his motion v in the second, he receives only the waves in distance U + w— v. Since there are n waves in distance U + w — u the number he actu- ally receives is n(U'f w — z>)/(U + iv — u). If the velocities of source and receiver are equal then the frequency is not affected by their motion or by the wind. But if their velocities are different, the frequency of the waves received is affected both by these velocities and by that of the wind.

The change in pitch through motion of the source may be illustrated by putting a pitch-pipe in one end of a few feet of rubber tubing and blowing through the other end while the tubing is whirled round the head. An observer in the plane of the motion can easily hear a change in the pitch as the pitch-pipe moves to and from him.

Musical Quality or Timbre. — Though a musical note has definite pitch or frequency, notes of the same pitch emitted by different instruments have quite different quality or timbre. The three characteristics of a longitudinal periodic disturbance are its ampli- tude, the length after which it repeats itself, and its form, which may be represented by the shape of the

displacement curve. Now the amplitude evidently corresponds to the loudness, and the length of period corresponds to the pitch or frequency. Hence we must put down the quality or timbre as depending on the form.

The simplest form of wave, so far as our sensation goes — that is, the one giving rise to a pure tone — is, we have every reason to suppose, one in which the displacement is represented by a harmonic curve or a curve of sines, y = a sin m(x — e). If we put this in the form

y = a sin r(x — e), we see that j> = o, for x=e, e--\, e + %\,

e + 'X, and so on, that y is + from x — e to x = e--\, —from e + i\ to e + l\, and so on, and that it alternates between the values --a and— a.

The form of the curve is evidently as represented in fig. 21, and it may easily be drawn to exact scale from a table of sines. H

In this curve ABCD are nodes. OA = e is termed the epoch, being the distance from O of the first ascending node. AC is the shortest distance after which the curve begins to repeat itself; this length X is termed the wave-length. The maximum height of the curve HM=« is the amplitude. If we transfer O to A,

e = o, and the curve may be represented by y=a sin -rˆx.

A

If now the curve moves along unchanged in form in the direction ABC with uniform velocity U, the epoch « = OA at any time / will be VI, so that the value of y may be represented as

y=asmˆ(x-XJt). (16)

The velocity perpendicular to the axis of any point on the curve at a fixed distance x from O is

dy 2ir\Ja 2tt. TT „ . ˆ

37= X" cos T (-UQ. (17)*

The acceleration perpendicular to the axis is d?y_ 4 U . 2x. dP X 5 — sm-jj- U-UQ

47T 2 U 2

which is an equation characteristic of simple harmonic motion.

The maximum velocity of a particle in the wave-train is the amplitude of dy/dt. It is, therefore,

« m = 2jrUa/X =27r«a. (19)

xxv. 15

The maximum pressure excess is the amplitude of co = E«/U = (E/U)dy/dt. It is therefore

<3 m = (E / U) 2ifVa/\ — 2vnpVa. (20)

We have already found the energy density in the train and the energy stream in equations (13) and (14).

The chief experimental basis for supposing that a train of longi- tudinal waves with displacement curve of this kind arouses the sensation of a pure tone is that the more nearly a source is made to vibrate with a single simple harmonic motion, and therefore, presumably, the more nearly it sends out such a harmonic train, the more nearly does the note heard approximate to a single pure tone.

Any periodic curve may be resolved into sine or harmonic curves by Fourier's theorem. _

Suppose that any periodic sound disturbance, consist- £? s ing of plane waves, is being propagated in the T " eorem – direction ABCD (fig. 22). Let it be represented by a displacement curve AHBKC. Its periodicity implies that after a certain distance the displacement curve exactly repeats itself. Let AC be the

it L

FlG. 22. shortest distance after which the repetition occurs, so that CLDME is merely AHBKC moved on a distance AC. Then AC = X is the wave-length or period of the curve. Let ABCD be drawn at such level that the areas above and below it are equal; then ABCD is the axis of the curve. Since the curve represents a longitudinal disturbance in air it is always continuous, at a finite distance from the axis, and with only one ordinate for each abscissa.

Fourier's theorem asserts that such a curve may be built up by the superposition, or addition of ordinates, of a series of sine curves of wave-lengths X, JX, JX, fX. . . if the amplitudes a, b, c. . .and the epochs e, f, g. . . . are suitably adjusted, and the proof of the theorem gives rules for finding these quantities when the original curve is known. We may therefore put

$$y = a \sin r\{x — e) + b \sin \hat{}(x—f) + c \sin j(* — g) + \&c. \quad (21)$$

where the terms may be infinite in number, but always have wave- lengths submultiples of the original or fundamental wave-length X. Only one such resolution of a given periodic curve is possible, and each of the constituents repeats itself not only after a distance equal to its own wave-length X/», but evidently also after a distance equal to the fundamental wave-length X. The successive terms of (21) are called the harmonics of the first term.

It follows from this that any periodic disturbance in air can be resolved into a definite series of simple harmonic disturbances of wave-lengths equal to the original wave-length and its successive submultiples, and each of these would separately give the sensa- tion of a pure tone. If the series were complete we should have terms which separately would correspond to the fundamental, its octave, its twelfth, its double octave, and so on. Now we can see that two notes of the same pitch, but of different quality, or different form of displacement curve, will, when thus analysed, break up into a series having the same harmonic wave-lengths; but they may differ as regards the members of the series present and their ampli- tudes and epochs. We may regard quality, then, as determined by the members of the harmonic series present and their amplitudes and epochs. It may, however, be stated here that certain experiments of Helmholtz appear to show that the epoch of the harmonics has not much effect on the quality.

Fourier's theorem can also be usefully applied to the disturbance of a source of sound under certain conditions. The nature of these conditions will be best realized by considering the case of a stretched string. It is shown below how the vibrations of a string may be deduced from stationary waves. Let us here suppose that the string AB is displaced into

the form AHB (fig. 23) and is then let go. Let

Fig. 23. us imagine it to form half a wave-length of the extended train ZGAHBKC, on an indefinitely extended stretched string, the values of y at equal distances from A (or from B) being equal and opposite. Then, as we shall prove later, the vibrations of the string may be represented by the travelling of two trains in opposite directions each with velocity

V tension-;- mass per unit length each half the height of the train represented in fig. 23. For the superposition of these trains will give a stationary wave bet-veen A

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and B. Now we may resolve these trains by Fourier's theorem into harmonics of wave-lengths X, fX, fX, &c, where X = 2AB and the conditions as to the values of y can be shown to require that the harmonics shall all have nodes, coinciding with the nodes of the fundamental curve. Since the velocity is the same for all disturb- ances they all travel at the same speed, and the two trains will always remain of the same form. If then we resolve AHBKC into harmonics by Fourier's theorem, we may follow the motion of the separate harmonics, and their superposition will give the form of the string at any instant. Further, the same harmonics with the same amplitude will always be present.

We see, then, that the conditions for the application of Fourier's theorem are equivalent to saying that all disturbances will travel along the system with the same velocity. In many vibrating systems this does not hold, and then Fourier's theorem is no longer an appropriate resolution. But where it is appropriate, the disturb- ance sent out into the air contains the same harmonic series as the source.

The question now arises whether the sensation produced by a periodic disturbance can be analysed in correspondence with this Resonators g eom etrical analysis. Using the term " note " for the ' sound produced by a periodic disturbance, there is no doubt that a well-trained ear can resolve a note into pure tones of frequencies equal to those of the fundamental and its harmonics. If, for instance, a note is struck and held down on a piano, a little practice enables us to hear both the octave and the twelfth with the

fundamental, especially if we have previously directed our attention to these tones by sounding them. But the har- monics are most readily heard if we fortify the ear by an air cavity with a natural period equal to that of the harmonic to be sought. The form used by Helmholtz is a glove of thin brass (fig. 24) with a large hole at one end of a diameter, at the other end of which the brass is drawn out into a short, narrow tube that can be put close to the ear. But a card- board tube closed at one end, with the open end near the ear, will often suffice, and it may be tuned by more or less covering up the open end. If the harmonic corresponding to the resonator is present its tone swells out loudly.

This resonance is a particular example of the general principle that a vibrating system will be set in vibration by any periodic Forced VI- f° rce applied to it, and ultimately in the period of the bration and force, its own natural vibrations gradually dying down. Resonance Vibrations thus excited are termed forced vibrations, and their amplitude is greater the more nearly the period of the applied force approaches that of the system when vibrating freely. The mathematical investigation of forced vibra- tions (Rayleigh,5'

Now suppose that in addition to the internal force represented by — fix, an external harmonic force of period 2irlp is applied. Repre- senting it by — P sin pt, the equation of motion is now

Fig. 24. — Helmholtz Resonator.

X+n i x+^ sin pt = o.

(22)

*Let us assume that the body makes vibrations in the new period 2-irp, and let us put x = B sin pt; substituting in (22) we have -p*B+n>B + P/ M=o, whence*

■o — i\/r

(23)

"M p—n' and the " forced " oscillation due to — P sin pt is = _P sin M*

x M ' £ 2 -» 2 '

If p> n the motion agrees in phase with that which the applied force alone would produce, obtained by putting «=o. If p

pation in the vibrating machinery and by radiation into the medium, and

the amplitude only increases until this loss is balanced by the gain from the work done by the applied force.

According to Helmholtz, the ear probably contains within it a series of resonators, with small intervals between the periods of the successive members, while the series extends over the The Ear as whole range of audible pitch. We need not here enter „ . into the question of the structure constituting these A na i YSer resonators. Each of them is supposed to have its own natural frequency, and to be set into vibration when the ear receives a train of waves of that frequency. The vibration in some way arouses the sensation of the corresponding tone. But the same resonator will be appreciably though less affected by waves of frequency differing slightly from its own. Thus Helmholtz from certain observations {Sound, ii. § 388) thought that if the intensity of response by a given resonator in the ear to its own tone is taken as 1, then its response to an equally loud tone a semitone different may be taken as about jˆ. According to this theory, then, when a pure tone is received the auditory apparatus corresponding to that tone is most excited, but the apparatus on each side of it is also excited, though by a rapidly diminishing amount, as the interval increases. If the sensations corresponding to these neigh- bouring elements are thus aroused, we have no such perception as a pure tone, and what we regard as a pure tone is the mean of a group of sensations. The sensitiveness of the ear in judging of a given tone must then correspond to the accuracy with which it can judge of the mean.

Measurements of Intensity of Sound or Loudness. — Various devices have been successfully employed for making sounds of determinate loudness in order to test the hearing of partially deaf people. But the converse, the measurement of the loudness of a sound not produced at our will, is by no means so easy. If we compare the problem with that of measuring the illumina- tion due to a source of light, we see at once how different it is. In sound sensation we have nothing corresponding to white light. A noise such as the roar due to traffic in a town may correspond physically in that it could probably be resolved into a nearly continuous series of wave-lengths, but psychically it is of no interest. We do not use such noise, but rather seek to avoid it. We certainly do not wish to measure its loudness, and even if we did it might be difficult to fix on any unit of noisiness. Probably we should be driven to a purely physical unit, the stream of energy proceeding in any direction, and if the noise were great enough we might measure it possibly by the pressure against a surface.

The intensity of the stream of energy passing per second through a square centimetre when a given pure tone is sounded is more definite and can be measured. There are two practical methods. In the one, the energy of vibration of the source is measured, and the rate at which that energy

decreases is observed. The amount radiated out in the form of sound waves is deduced, and hence the energy of the stream at any distance is known. In the other, the waves produce a measurable effect on a vibrating system of the same frequency, and the amplitude in the waves can be deduced.

The first may be illustrated by Lord Rayleigh's experiments to determine the amplitude of vibration in waves only just audible (Sound, ii. § 384). He used two kinds of experiment, ,

but it will be sufficient here to indicate the second. A \T „,"? ***fork of frequency 256 was used as the source. The energy fV*** *." h , e of this fork with a given amplitude of vibration could "sqJLJ. ' be calculated from its dimensions and elasticity, and the amplitude was observed by measuring with a microscope the line into which the image of a starch grain on the prong was drawn by the vibration. The rate of loss of energy was calculated from the rate of dying down of the vibration. This rate of loss for each amplitude was determined (1) when the fork was vibrating alone, and (2) when a resonator was placed with its mouth under the free ends of the fork. The difference in loss in the two cases measured the energy given up to and sent out by the resonator as sound. The amplitude of the fork was observed when the sound just ceased to be audible at 27-4 metres away, and the rate of energy emission from the resonator was calculated to be 42 1 ergs / second. Assuming this energy to be propagated in hemispherical waves, it is easy to find the quantity per second going through 1 sq. cm. at the distance of the listener, and thence from the energy in a wave, found above, to determine the amplitude. The result was an amplitude of I-27XI0 -7 cm. Other forks gave results not very different.*

In a later series of experiments Lord Rayleigh (Phil. Mag., 1907, H> P-596) found that the least energy stream required to excite sensation did not vary greatly between frequencies of 512 and 256,

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but that the stream required increased rapidly as the frequency was reduced below 256.

The second method may be illustrated by the experiments of M. Wien (Wied. Ann., 1889, xxxvi. 834). He used a spherical Helm- holtz resonator resounding to the tone to be measured. The orifice which is usually placed to the ear was enlarged and closed by a corrugated plate like that of an aneroid barometer, and the motion of this plate was

indicated by means of a mirror which had one edge fixed, while the other was attached to a style fixed to the centre of the plate. When the plate vibrated the mirror was vibrated about the fixed edge, and the image of a reflected slit was broadened out into a band, the broadening giving the amplitude of vibration of the plate. From subsidiary experiments (for which the original memoir must be consulted) the pressure variations within the resonator could be calculated from the movements of the plate. The open orifice of the resonator was then exposed to the waves from a source of its own frequency. Helmholtz's theory of the resonator (Rayleigh, Sound, ii. § 311) gives the pressure variations in the incident waves in terms of those in the resonator, and so the pressure variation and the amplitude of vibration in the waves to be measured were determined.

For minimum audible sounds Wien found a somewhat smaller value of the amplitude than Rayleigh. It is remarkable that, as Lord Rayleigh says, " the streams of energy required to influence the eye and the ear are of the same order of magnitude." Wien also used the apparatus to find the decrease of intensity with increase of distance, and found that it was somewhat more rapid than the inverse square law would give.

In a later series of experiments {Science Abst. vi. 301) Wien used a telephone plate, of which the amplitude could be determined from the value of the exciting current, and he found that the smallest amplitude audible was 6-3 Xio- 10 cm.

W. Zernov (Ann. d. Physik, 1906, 21, p. 131) compared the indica- tions of Wien's resonator manometer with those of V. Altberg's sound pressure apparatus and found very satisfactory agreement.

Stationary Waves. — As a preliminary to the investigation of the modes of vibration of certain sources of sound we shall consider the formation of " stationary waves." These are not really waves in the ordinary sense, but the disturbance arising from the passage through the medium in opposite directions of two equal trains. The medium is divided up into sections between fixed points, and these sections vibrate. We can form stationary waves with ease by fixing one end of a rope — say 20 ft. long — and holding the other end in the hand. When the hand is moved to and fro transversely waves are sent along the rope and reflected at the fixed end. The direct and reflected systems are practically equal, and by suitably timing the vibrations of the hand for each case the rope may be made to vibrate as a whole, as two halves, as three-thirds and so on. When it vibrates in several sections, each section moves in the opposite way to its neighbours.

Let us suppose that two trains of sine waves of length X and amplitude a

are travelling in opposite directions with velocity U. We may represent the displacement due to one of the trains by

yi — a sin r(x — Vt).

(24)

say, eight equal parts as marked. Then move one train marked (I) fX to the right, and the other train (II) |X to the left, intro- ducing new parts of each train at one end, and sending out old parts at the other. Then we get fig. 26 (2), the dotted curve representing

where x is measured as in equation (16) from an ascending node as A in fig. 21. If we measure / from an instant at which the two trains exactly coincide, then as U for the other train has the opposite sign, its displacement is represented by

yz = a sin -ˆ(x+XJt). (25)

The sum of the disturbance is obtained by adding (24) and (25)

. 2ir r ,, . 2x

y = yi+y2 = 2a cos ylf sin -r-x, (26)

At any given instant / this is a sine curve of amplitude 2a cos (2?r/X) Vt, and of wave-length X, and with nodes at x = o, JX, X, . . . , that is, there is no displacement at these nodes whatever the value of /, and between them the displacement is always a sine curve, but of amplitude varying between +2a and —2a. The ordinate of the curve changes sign as we pass through a node, so that succes- sive sections are moving always in opposite directions and have opposite displacements. Each section then vibrates, and its amplitude goes through all its values in time given by 2?rtjT/X = 27r, or T=X/U, and the frequency is U/X. We may represent such a train of " stationary waves " by fig. 25, where the curves give the

Fig. 25. two extreme amplitudes. The points A, B, C, D are termed " nodes," and the points half-way between them " loops."

The general character of these results may be obtained by a graphic construction. Let fig. 26 (1) represent a wave-length of each train when they are coincident. It is sufficient to take a single wave-length. The dotted curve represents the superposition, which simply doubles each ordinate. Divide the wave-length into,

Fig. 26. the resultant with amplitude 1/V2 that of (1). Another movement of jX in each direction gives (3) with resultant a straight line, and so on for (4) and (5). In (5) the displacement is evidently equal and opposite to that in (1). Further displacement will give the figures (4). (3)1 (2), (1) again, but with (I) and (II) interchanged. When we get back to (1) each train has been displaced through X and the period is X/U. Further, the original nodes are always at rest, and the intervening sections vibrate to and fro.

The vibrations of certain sources of sound may be represented, at least as a first approximation, as consisting of stationary waves, and from a consideration of the rate of propagation of waves along these sources we can deduce their frequency when we know their length.

Sources of Sound. Elementary Theory of Pipes. — The longitudinal vibration of air in cylindrical pipes is made use of in various wind instruments. We shall deduce the modes of vibration of the air column in a cylindrical pipe from the consideration that the air in motion within the pipe forms some part of a system of stationary waves, one train being formed by the exciter of the disturbance, and the other being formed by the reflection of the train at the end of the pipe.

In order to justify the use of stationary waves we must show that two such trains can move in opposite directions over the same ground without modifying each other so long as the dis- placement in either is small. For this it is necessary that the total force on an element due to the sum of the displacements should be equal to the sum of the forces due to the two displace- ments considered separately. The medium then acts for the second train just as if it were undisturbed by the first. It is sufficient then to show that the excess of pressure at any point is the sum of the excesses due to either train separately.

If w is the total pressure excess, and if y is the total displacement at x, then « = Exchange of volume 4 original volume = — Kdyjdx. If yi and yt are the two separate displacements and if y = y--yi, then w = — E (dyi/dx + dyˆ/dx) = wi + a?. This proves the pro- position. It is a case of the principle of superposition of small disturbances.

Let us suppose that a system of stationary waves is formed in the air in a pipe of indefinite length, and let fig. 27 represent a part of the system. At the nodes A, B, C, D, E there is no displacement, but there are maximum volume and pressure changes. Consider, for instance, the point B. When the displacement is represented by AHBKC the particles on each side of B are displaced towards it

giving a compression, and since the slope is steepest there, or — dyjdx a maximum, the compression is also a maximum there. When the displacement is represented by AH'BK'C the particles on each side of B are displaced from it, giving an extension, and since the slope is again the steepest, the extension is a maximum.

H i- M '

TT K

Fig. 27.

At the loops, for instance at H, the displacement is a maximum. The tangent to the displacement curve is always parallel to the axis, that is for a small distance the successive particles are always equallv' displaced, and therefore always occupy the same volume. This means that at the loops while the motion is greatest there are no pressure changes. .

We have now to select such portion of this system as will suit the conditions imposed by any actual pipe. There are three distinct types which we will consider in succession.

1. Pipe Closed at One End, Open at the Other. — At the closed end there is no motion, for the pressure always constrains the air to remain in contact with the end. The closed end is therefore a node. At the open end, as a first approximation to be corrected later, there are no pressure changes, for any tendency to excess can be relieved by immediate expansion into the outer air, and any tendency to defect can be filled up by an inrush from the outer air. The open end is therefore a loop. It is to be noted that the exciter of the vibrations is in general at the open end, and that the two trains forming the stationary system consist of the direct waves from the exciter travelling into the tube, and the waves reflected back from the

In fig 27 we may have the length AH occupying the tube. In

In fig. 28 are represented the stationary wave systems of the first four modes, and any of the succeeding ones are easily drawn.

condition for a loop at the open end, that of no pressure variation, cannot be exactly fulfilled. This would require that the air outside should have no mass in order that it should at once move out and relieve the air at the end of the pipe from any excess of pressure, or at once move in and fill up any

defect. There are variations, therefore, at the open end, and these are such that the loop may be regarded as situated a short distance outside the end of the pipe. It may be noted that in practice there is another reason for pressure variation at the end of the pipe. The stationary wave method regards the vibration in the pipe as due to a series of waves travelling to the end and being there reflected back down the pipe. But the reflection is not complete, for some of the energy comes out as waves; hence the direct and reflected trains are quite equal, and cannot neutralize each other at the loop.

The position of the loop has not yet been calculated for an ordinary open pipe, but Lord Rayleigh has shown (Sound, ii. § 307) that for a cylindrical tube of radius R, provided with a flat extended flange, the loop may be regarded as about 0-82 R, in advance of the end. That is, the length of the pipe must be increased by 0-82 R before applying Bernoulli's theory. This is termed the " end correction."

Fig. 28. The reader will be able to make out the simultaneous motions and pressures at various points. It is obvious that the nodes are alter- nately in compression and extension, or vice versa, and that for 4 X on each side of a node the motion is either to it on both sides or from it on both sides. ,,

The first mode of vibration gives the " fundamental tone, and the succeeding modes are termed " overtones." The whole series forms the series of odd harmonics. A " stopped pipe " in an organ is a pipe of this type, and both the fundamental and the overtones may occur simultaneously when it is blown.

We may illustrate the successive modes of vibration by using as pipe a tall cylindrical jar, and as exciter a vibrating tuning-fork held over the mouth. The length of the pipe may be varied by pouring in water, and this is done until we get maximum resonance of the pipe to the fork. Thus if a fork 11(3 = 256 is used, the length of pipe for the fundamental at 0° C. is about 33,000/4X256 = 33 cms. If a fork Sol 4 = 768 is used the pipe resounds to it according to the mode of the first overtone. If the temperature is <° the length for given frequency must be increased by the factor 1 +0-001844.

Correction to Length at the Open End. — The approximate theory of pipes due to Bernoulli assumes a loop at the open end, but the

Fig. 29.

Using this result Rayleigh found the correction for an unflanged open end by sounding two pipes nearly in unison, each provided with a flange, and

counting the beats. Then the flange was removed from one and the beats were again counted. The change in virtual length by removal of the flange was thus found, and the open end correction for the unflanged pipe was o-6 R. This correction has also been found by David James Blaikley by direct experiment (Phil. Mag., 1879, 7, p. 339). He used a tube of variable length and determined the length resounding to a given fork, (1) when the closed end was the first node, (2) when it was the second node. If these lengths are h and h, then fe— /a = JX and i(h—h)—li is the correction for the open end. The mean value found was 0-576 R.

2. Pipe Open at Both Ends. — Each end is a loop. We must there- fore select a length of fig. 27 between two loops. The fundamental mode is that in. which H and K represent the ends of the pipe. In this case HK = JXi=/, and the frequency is »i = U/Xi = U/2Z. There is a node in the middle. In the next mode H and L represent the ends and HL = X 2 = Z and re 2 = U/X 2 = 2U/2/. In the third mode HM = ˆX 3 = / and » 3 = U/X 3 = 3U/2/, and so on.

In fig. 29 are represented the stationary wave systems of the first four modes. The whole series of fundamental and overtones gives the complete set of harmonics of frequencies proportional to 1, 2, 3, 4, . . . , and wave-lengths proportional to 1, §, \, ...

A metal or brass tube will serve as such a pipe, and may be excited by a suitable tuning-fork held at one end. To, obtain the virtual length we must add the correction for each open end, probably about 1-2 radius. If the frequency is 256 the corrected length for the fundamental is about (33,000/2X256) (1 +-001840 at P. The pipe will also resound to forks of frequencies 512, 768, 1024 and so on.

An open ” flue ” organ pipe is of this type. The wind rushing through the slit S (fig. 30) maintains the vibration in a way to be discussed later, and the opening O makes the lower end a loop.

The modes of vibration in an open organ pipe may be exhibited by means of Koenig’s manometric flames (Phil. Mag., 1873, vol. 45). The pipe is provided with manometric flames at its middle point, and at one-quarter and three-quarters of its length. When the pipe is blown softly the fundamental is very predominant, and I there is a node at the middle point. The flame there is much

affected by the nodal pressure changes, while the other two vibrate only slightly. If, however, the pipe is blown strongly, the funda- mental dies away, and the first overtone is predominant. Then the middle point is a loop, and the middle flame is only slightly affected, while the other two, now being at nodes, vibrate strongly.

3. Pipe Closed at Both Ends. — The two ends in such a pipe are nodes. It is evident that the overtones will Follow the same rule as for a pipe opened at both ends. This case is not exactly realized in practice, but it is closely approximated to in Kundl's dust-tube. A glass tube, the " dust-tube," 3 ft. or more in length, and perhaps 1 in. in diameter, has a little lycopodium powder introduced, and the powder is allowed to run all along the tube, which is then fixed horizontally. A closely-fitting adjustable piston is provided at one end. A glass or metal rod, the " sounder," is clamped at its middle point, and fixed along the prolongation of the axis of the dust-tube as in fig. 31, a loosely- fitting cork or card piston being fixed on one end of the sounder, which is inserted within the dust-tube. The other end of the sounder is stroked outwards with a damp cloth so as to make it sound its funda- mental. Stationary waves are formed in the air in the dust-tube if the length is rightly adjusted by the closely-fitting piston, and the lycopodium dust collects at the nodes in little heaps, the first being at the fixed end and the last just in front of the piston on the sounder. The stationary wave system adjusts itself so that its motion agrees with that of the sounder, which is therefore not exactly at a node. If U« is the velocity of longitudinal waves along the sounder, and I the length of the sounder, the frequency of vibration is VJ2I. If L is the distance between successive dust-heaps, i.e. half a wave- length, the frequency in the air is U/2L, where U is the velocity of sound in the pipe. Then, since the frequencies are the same, U/2L = U./2/orL// = U/U,.

Fig. 30.

Fig. 31.

The velocities in different gases may be compared by this appara- tus by filling the dust-tube with the gases in place of air. If L; is the internodal distance and Ui the velocity in a gas, L and U being the corresponding values for air, we have Ui/U = L,/L.

Kundt's dust-tube may also be employed for the determination of the ratio of the specific heats of a gas or vapour. If U is the Specific velocity of sound in a gas at pressure P with density p, Heats' and if waves of length X and frequency N are propagated (/alio. through it, then the distance between the dust-heaps is

d ~2~2N~2N \ p ‘

where 7 is the ratio of the two specific heats. If d is measured for two gases in succession for the same frequency N, we have

72_ PzPi i£_

7i PiPz di” where the suffixes denote the gases to which the quantities relate. If ti is known this gives 72. Kundt and Warburg applied the method to find 7 for mercury vapour (Pogg. Ann., 1876, 157, p. 356), using a double form of the apparatus in which there are two dust- tubes worked by the same sounding rod. This rod is supported at \ and J of its length where it enters the two dust-tubes, as represented diagrammatically in fig. 32. It is stroked in the middle so as to

1

amplitude are both double those in either train, so that the same relation holds.

Determinations of the pressure changes, or extent of excursion of the air, in sounding organ pipes have been made by A- Kundt (Pogg. Ann., 1868, 134, p. 163), A. J. I. Topler and . ,,, . . L. loltzmann (Pogt /nn. : vol. 141, or Rayleigh, «£f°’ Sound, ii. § 422a), and E. Mach (Optisch-akustischen _ Versuche, 1873). Mach’s method is perhaps the most direct. The pipe was fixed in a horizontal position, and along the top wall ran a platinum wire wetted with sulphuric acid. When the wire was heated by an electric current a fine line of vapour descended from each drop. The pipe was closed at the centre by a membrane which prevented a through draught, yet permitted the vibrations, as it was at a node. The vapour line, therefore, merely vibrated to and fro when the pipe was sounded. The extent of vibration at different parts of the pipe was studied through a glass side wall, a strohoscopic method being used to get the position of the vapour line at a definite part of the vibration. Mach found an excursion of 0-4 cm. at the end of an open pipe 123 cm. long. The amplitude found by the other observers was of the same order. For the vibration of air in other cavities than long cylindrical pipes we refer to Rayleigh’s Sound, vol. ii. chs. 12 and 16.

Propagation of Waves in Pipes of Circular Section. — Helmholtz investigated the velocity of propagation of sound in pipes, taking into account the viscosity of the air (Rayleigh, Sound, ii. § 347), and Kirchhoff investigated it, taking into account both the viscosity and the heat communication between the air and the walls of the pipe (loc. cit. ii. § 350). Both obtained the value for the velocity

*U V~RV2 J rNp) ‘ where U is the velocity in free air, R is the radius of the pipe, N the frequency, and p the air density. C is a constant, equal to the coefficient of viscosity in Helmholtz’s theory, but less simple in Kirchhoff’s theory. Experiments on the velocity in pipes were carried out by H. Schneebeli (Pogg. Ann., 1869, 156, p. 296) and by T. J. Seebeck (Pogg. Ann., 1870, 139, p. 104) which accorded with this result as far as R is concerned, but the diminution of velocity was found to be more nearly proportional to N – *. Kundt also obtained results in general agreement with the formula (Rayleigh, Sound, ii. § 260). He used his dust-tube method.*

Elementary Theory of the Transverse Vibration of Musical Strings.

We shall first investigate the velocity with which a disturbance travels along a string of mass m per unit length when it is stretched with a constant tension T, the same at all points. We shall then show that on certain limitations two trains of disturbance may be superposed so that stationary waves may be formed, and thence we shall deduce the modes of vibration as with pipes.

Fig. 32.

excite its second mode of vibration. The method ensures that the two frequencies shall be exactly the same. In the mercury experi- ment the sounding rod was sealed into the dust-tube, which was exhausted of air, and contained only come mercury and some quartz dust to give the heaps. It was placed in a high temperature oven, where the mercury was evaporated. The second tube containing air was outside. When a known temperature was attained the sounder was excited, and d\ and d\ could be measured. From the temperature, Pa/pj was known, and 72/71 could then be found. Taking 71 = 1-41, 72 was determined to be 1-66. Lord Rayleigh and Sir William Ramsay (Phil. Trans. A. 1895, pt. i. p. 187) also used a single dust-tube with a sounder to find 7 for argon, and again the value was i-66.

Determinations of Pressure Changes and Amplitude of Vibrations in Pipes. — If the maximum pressure change is determined, the amplitude is given by equation (20), viz. w m = 2imapU, for in the stationary wave system the pressure change and the

Fig. 33.

Let AB (fig. 33) represent the string with the ends AB fixed. Let a disturbance once set going travel along unchanged in form from A to B with velocity U. Then move AB from right to left with this velocity, and the

disturbance remains fixed in space. Take a point P in the disturbed part, and a point Q which the disturbance has not yet reached. Since the conditions in the region PQ remain always the same, the momentum perpendicular to AB entering the region at Q is equal to the momentum perpendicular to AB leaving the region at P. But, since the motion at Q is along AB, there is no momentum there perpendicular to AB. So also there is on the whole none in that direction leaving at P. Let the tangent at P make angle with AB. The velocity of the string at P parallel to PM is U sin <£, and the mass of string passing P is jmU per second, so that wU ! sin is carried outper second. But the tension at P is T, parallel to the tangent, and T sin parallel to PM, and through this — T sin <£ is the momentum passing out at P per second. Since the resultant is zero, «U J sin ~ T sin =0, or U 2 =T/m.

Now keep AB fixed, and the disturbance travels with velocity U. We might make this investigation more general by introducing a force X as in the investigation for air, but it hardly appears necessary.

To form stationary waves two equal trains must be able to travel in opposite directions with equal velocities, and to be superposed. We must show then that the force called out by the sum of the dis- turbances is equal to the sum of the forces called out by each train separately.

In order that the velocity shall remain unchanged the tension T must remain the same. This implies that the disturbance is so small that the length is not appreciably altered. The component of T

acting parallel to the axis or straight string is Tdx/ds, and when the disturbance is sufficiently small the curve of displacement is so nearly parallel to the axis that dx/ds=l, and this component is T. The component of T perpendicular to the axis is Tdy]ds = Tdy/dx. Now if yi and yi are the displacements due to the two trains separately, and y = yi+y2, the two separate forces are Tdyi/dx and Tdy>/dx, while that due to y is Tdy/dx. But since y = yi+y-2, Tdy/dx = Tdyi/dx+Tdy 1 /dx, or the condition for superposition holds when the displacement is so small that we may put dx/ds=i. Evidently this comes to neglecting a . Let two trains of _ equal waves moving in opposite directions along such a string of indefi- nite length form the stationary system of fig. 27. Since the nodes are always at rest we may represent the vibration of a

given string by the length between any two nodes. The fundamental mode is that in which A and B represent the ends of the string. In this case AB = | Xi=/ the length, and the frequency m = U/Xi = V/2I = (i/2/)V(T/m)- The middle of the string is a loop. In the next mode A and C represent the ends and AC = X 2 = / and «j = U/X 2 = 2U/2/ = (2/2/)V(T/m). In the third mode A and D represent the ends and AD = |X 3 = ; and re 3 = U/X 3 = 3U/2/ = (3/2ZH (T/m) and so on. In fig. 34 the stationary wave systems of the first four modes are represented.

The complete series of harmonics are possible modes. The experimental demonstration of these results is easily made by the sonometer or monochord (%• 35)- A string is fixed at C on the top of a hollow box, and

Fig. 34.

^?

by proper adjustment of its length and tension vibrates in unison and divides itself into one or more loops or ventral segments easily discernible by a spectator. If the length of the thread be kept invariable, a certain tension will give but one ventral segment ; the fundamental note of the thread is then of the same pitch as the note of the body to which it is attached. By reducing the tension to one quarter of its previous amount, the number of ventral segments will be seen to be increased to two, indicating that the first harmonic of the thread is now in unison with the solid, and consequently that its fundamental is an octave lower than it was with the former tension ; thus confirming the law that n varies as VT. In like manner, on further lowering the tension to one ninth, three ventral segments will be formed, and so on.

The law that, caeteris paribus, n varies inversely as the thickness may be tested by forming a string of four lengths of the single thread used before, and consequently of double the thickness of the latter, when, for the same length and tension, the compound thread will exhibit double the number of ventral segments presented by the single thread.

The other laws admit cf similar illustration.

Longitudinal Vibrations of Wires and Rods.

Subject to a limitation which we shall examine later, the velocity of a longitudinal disturbance along a wire or rod depends only on the material of the rod, and not upon the cross-section. Since the forces called into play by an extension or compression of the material are proportional to the cross-section, it follows that if we consider any case and then another case in which, with the same longitudinal disturbance, the cross-section is

doubled, the force in the second case is doubled as well as the mass to be moved. The acceleration therefore remains the same, and the velocity is unaltered. We shall find the velocity of propagation, just as in previous cases, from the consideration of transfer of momentum.

Suppose that a disturbance is travelling with velocity U unchanged in form along a rod from left to right. Let us move the rod from right to left, so that the undisturbed parts move with velocity U. Then the disturbance remains fixed in space. Let A be a point in

Fig. 35. passes over two edges AB, which serve as the fixed ends, and then over a pulley P, being stretched by a weight W. Between A and B a " bridge " D, i.e. another edge slightly higher than A or B, can be inserted in any position, which is determined by a graduated scale. The effective length of the string is then AD. Keeping the same tension, it may be shown that nl is constant by finding n for various lengths. Keeping AD constant and varying W it may be shown that « »VW. Lastly, by using different strings, it may be shown that, with the same T and I, n x V(i/m). ..

The various modes of vibration may also be exhibited. If D is removed and the string is bowed in the middle, the fundamental is brought out. If it is touched in the middle with a feather, the edge of a card, or the finger nail, and bowed a quarter of the way along the octave, the first overtone comes out. Each of the first few harmonics may be easily obtained by touching the string at the first node of the harmonic required, and bowing at the first loop, and the presence of the nodes and loops may be verified by putting light paper riders of shape A on the string at the nodes and loops. When the harmonic is sounded the riders at the loops are thrown off, while those at the nodes remain seated.

Not only may the fundamental and its harmonics be obtained seoarately, but they are also to be heard simultaneously, particularly the earlier ones, which are usually more prominent than those higher in the series. A practised ear easily discerns the coexistence of these various tones when a pianoforte or violin string is thrown into vibration. It is evident that, in such case, the string, while vibrating as a whole between its fixed extremities, is at the same time executing subsid ! ary oscillations about its middle point, its points

y

Fig. 36. of trisection, &c, as shown in fig. 36, for the fundamental and the first harmonic. When a string is struck or bowed at a point, any harmonic with a node at that point is absent. Since the quality of the note sounded depends on the mixture of harmonics, the quality therefore is to some

extent dependent on the point of excitation.

A highly ingenious and instructive method for illustrating the laws of musical strings was contrived by F. E. Melde. It consists i.i attaching to the loop or ventral segment of a vibrating body, e.g. a tuning-fork or a bell-glass, a silk or cotton thread, the other extremity being either fixed or passing over a pulley and supporting weights by which the thread may be stretched to any degree required. The vibrations of the larger mass are communicated to the thread, which

— A dx

u

Fig. 37.

the disturbance, and B a point in the undisturbed part. The material between A and B, though continually changing, is always in the same condition, and therefore the momentum within AB is constant. Hence the amount carried out at A is equal to that carried in at B.

Now momentum is transferred in two ways, viz. by the force acting between contiguous portions of a body and by the transfer of moving matter. At B there is only the latter kind, and since the transfer of matter is powoU, where po is the undisturbed density and So is the undisturbed cross-section, since its velocity is U the passage of momentum per second is poSnlh 1 . At A, if the velocity of the disturbance relative to undisturbed parts of the rod is u from left to right, the velocity relative to A is U-«. If p is the density at A, and £ the cross-section, then the momentum carried past A is pco(U — w) 2 . But if y is the displacement at A, dy/dx is the extension at A, and the force acting is a pull across A equal to Ydody/dx, where Y is Young's modulus of elasticity. Then we have

Ywody/

Now u/V = -dy/dx, (28)

for the particle at A moves over dy backwards, while the disturbance moves over U. Also since dx has been stretched to dx-j-dy

pa> (dx 4- dy) = po&odx or pH(i+dyjdx) =p «o. (29)

Substituting from (28) in (27)

Yfiog + pfiU 2 (1 + g) 2 = po&U, (30)*

and substituting from (29) in (30)

Y3og + PoffloU 2 (1 + g) = poSoU 2 , (31)

whence • Yfio = po

or U 2 =Y/p, (32)

where now p is the normal density of the rod. The velocity with which the rod must travel in order that the disturbance may be fixed in space is therefore U = V(Y/p), or, if the rod is kept fixed, this is the velocity with which the disturbance travels.

This investigation is subject to the limitation that the diameter of the cross-section must be small compared with the wave-length. When the rod extends or contracts longitudinally it contracts or

extends radially and in the ratio a, known as Poisson's ratio, which in metals is not far from . Let us suppose that the rod is circular, of radius r, and that the radial displacement of the surface is i. The longitudinal extension is-dy/dx, and therefore the radial contraction

, , , , Tr , . 2tt , TTl . 2-jrtrra 2ir , _.,.

is i)jr = adyldx. If then y =a sin — (x— vt), i) = — r — cos-r-(;c —

If r is of the order of A, rj is of the order of y; and the kinetic energy of the radial motion is of the same order as that of the longitudinal motion. But our investigation entirely leaves this out of account, and is therefore faulty. In fact, the forces are then no longer parallel to the axis. There are shears of the order dri/dx and the simple Young's modulus system can no longer be taken to represent the actual condition (see Rayleigh, Sound, i. § 157). But keeping r/X small we may as before form stationary waves, and it is evident that the series of fundamental and overtones will be just as with the air in pipes, and we shall have the same three types — fixed at one end, free at both ends, fixed at both ends — with fundamental frequencies respectively

W^hV^ and W7-

It

The overtones will be obvious.

For an iron wire Y/p is about io 12 /4, so that for a frequency of 500 in a wire fixed at both ends a length about 5 metres is required. If the wire is stretched across a room and stroked in the middle with a damp cloth the fundamental is easily obtained, and the first harmonic can be brought out by stroking it at a quarter the length from one end. A glass or brass rod free at both ends may be held by the hand in the middle and excited by stroking one end outwards with a damp cloth. If it is clamped at one-quarter and three- quarters of the length from the ends, and is stroked in the middle, the first harmonic sounds.

Young's modulus may be obtained for the material of a rod by clamping it in the middle and obtaining the frequency of the funda- mental when Y = 4l 2 n 2 p.

The value thus obtained is generally appreciably greater than that obtained by a statical method in which the rod is pulled out by an applied tension.

Rods of different materials may be used as sounders in a Kundt's dust tube, and their Young's moduli may be compared, since: —

... , ..., length of rod

velocity in rod = velocity in air X j-7 r— ? -3 — rr*

' distance between dust-heaps.

Torsional Vibrations of Rods and Wires. — The velocity of propaga- tion of a torsional disturbance along a wire of circular section may be found by the transfer of momentum method, remembering that we must now replace linear momentum by angular momentum. Let the disturbance be supposed to travel unchanged in form from left to right with velocity U. Now suppose that the wire or rod is moved from right to left with velocity U. The disturbance is then fixed in space. Let A be a point in the disturbance and B a point in the undisturbed portion. The condition of the matter between A and B remains constant, though fresh matter keeps coming in at B and an equal quantity leaves at A. Hence the angular momentum of the part between A and B remains constant, or as much enters at B as leaves at A. But at B there is no torsion, and no torsion couple of one part of the wire on the next. So that no angular momentum enters at B, and therefore on the whole none leaves at A. The transfer of angular momentum through A is of two kinds — first, that due to the passage of rotating matter, and, secondly, that due to the couple with which matter to the right of A acts upon matter to the left of A. The mass of matter moving through A per second is piro 2 U, where a is the radius of the wire and p is its density. If

6 is the angle of twist, the angular velocity is d8/dt. The radius of gyration of the section is Ja 2 . Hence the angular momentum conveyed per second outwards is ip-xa'XJdO/dt. The couple due to the twist of a wire of length / through

jl, and we may put ll = d6/dx. Since no angular momentum goes out on the whole

lmra 4 d8/dx + -2pTra 4 Ud8/dt=o. (33)

But the condition of unchanged form requires that the matter shall twist through (ddjdx)dx while it is travelling over dx, i.e. in time dx/V. ~, dd dx dB , dd .,dd

Thcn . Tt u = -s:/ ,cor 3i = – u s-

Substituting in (33) we get

U 2 = n/p. (34)

If we now keep the wire at rest the disturbance travels along it with velocity U = V(n/p), and it depends on the rigidity and density of the wire and not upon its radius.

It is easy to deduce the modes of vibration from stationary waves as in the previous cases. If a rod is clamped at one end and free at the other, the fundamental frequency is (i//)V (nip). For iron n!p is of the order io 11 , so that the frequency for a rod I metre long is about 3000. When a cart wheel is ungreased it produces a very . high note, probably due to torsional vibrations of the axle.

The torsional vibrations of a wire are excited when it is bowed. If small paper rings are put on a monochord wire they rotate through these vibrations when the wire is bowed.

Transverse Vibrations of Bars or Rods. — When a bar or rod is of considerable cross-section, a transversal disturbance calls into play forces due to the strain of the material much more important than the forces due to any tension which is ordinarily applied. The velocity of a disturbance along such a bar, and its modes of vibration, depend therefore on the elastic properties of the material and the dimensions of the bar. We cannot investigate the vibrations in an elementary manner. A full discussion will be found in Rayleigh's Sound, vol. i. ch. 8. We shall only give a few results.

The cases interesting in sound are those in which (1) the bar is free at both ends, and (2) it is clamped at one end and free at the other.

For a bar free at both ends the fundamental mode of vibration has two nodes, each 0-224 of the length from the end. The next mode has a node in the middle and two others each 0-132 from the end. The third mode has four nodes 0-094 an d 0-357 from each end, and so on. The frequencies are nearly in the ratios 3 2 : 5 2 : 7 2 . . . . Such bars are used in the harmonicon.

When one end is clamped and the other is free the clamped end is always a node. The fundamental mode has that node only. The next mode has a second node 0-226 from the free end; the next, nodes at o- 132 and 0-5 from the free end, and so on. The frequencies are nearly in the ratios 1:6-25:17-5. Such bars are used in musical boxes and as free reeds in organ pipes.

The most important example of this type is the tuning-fork, which may be regarded as consisting of two parallel bars clamped together at the base. The first overtone has frequency 6-25 that of the fundamental, and is not in the harmonic series. If the fork be mounted on a resonance box or held in front of a cavity resounding to the fundamental and not to the first overtone, the fundamental is brought out in great purity.

Vibrations of Plates. — These are for the most part interesting rather from the point of view of elasticity than of sound. We shall not attempt to deal with the theory here but shall describe only the beautiful mode of exhibiting the regions of vibration and of rest devised by E. F. F. Chladni (1756-1827). As usually arranged, a thin metal plate is screwed on to the top of a firm upright post at the centre of the plate, which is horizontal. White sand is lightly scattered by a pepper-box over the plate. The plate is then bowed at the edge and is thrown into vibration between nodal lines or curves and the sand is thrown from the moving parts or ventral segments into these lines, forming " Chladni's figures." The development of these figures by a skilful bower is very fascinating. As in the case of a musical string, so here we find that the pitch of the note is higher for a given plate the greater the number of ventral segments into which it is divided ; but the converse of this does not hold good, two different notes being obtainable with the same number of such segments, the position of the nodal lines being, however, different.

The upper line of annexed figures shows how the sand arranges itself in three cases, when the plate is square. The lower line gives the same in a sort of idealized form. Fig. 38, i, corresponds to the

\

3

Fig. 38.

lowest possible note of the particular plate used; fig. 38, 2, to the fifth higher; fig. 38, 3, to the tenth or octave of the third, the numbers of vibration in the same time being as 2 to 3 to 5.

If the plate be small, it is sufficient, in order to bring out the simpler sand-figures, to hold the plate firmly between two fingers of the same hand placed at any point where at least two nodal lines meet, for instance the centre in (1) and (2), and to draw a violin bow downwards across the edge near the middle of a ventral segment. But with larger plates, which alone will furnish the more complicated figures, a clamp-screw must be used for fixing the plate, and, at the same time, one or more other nodal points ought to be touched with the fingers while the bow is being applied. In this way, any of the possible configurations may be easily produced.

By similar methods, a circular plate may be made to exhibit nodal lines dividing the surface by diametral lines into four or a greater, but always even, number of sectors, an odd number being incompatible with the general law of stationary waves that the parts of a body adjoining a nodal line on either side must always vibrate oppositely to each, other.

Another class of figures consists of circular nodal lines along with diametral lines (fig. 39).

Circular nodal lines unaccompanied by intersecting lines cannot be produced in the manner described; but may be got either. by drill- ing a small hole through the centre, and drawing a horse-hair along its edge to bring out the note, or by attaching a long thin elastic rod to the centre of the plate, at right angles to it, holding the rod by the middle and rubbing it lengthwise with a bit of cloth powdered with

Fig. 39. resin, till the rod gives a distinct note; the vibrations are com-

municated to the plate, which consequently vibrates transversely, and causes the sand to heap itself into one or more concentric rings.

Paper, parchment, or any other thin membrane stretched over a square,

circular, &c, frame, when in the vicinity of a sufficiently powerful vibrating body, will, through the medium of the air, be itself made to vibrate in unison, and, by using sand, as in previous instances, the nodal lines will be depicted to the eye, and seen to vary in form, number and position with the tension of the plate and the pitch of the originating sound. The membrana tympani or drum of the ear, has, in like manner and on the same principles, the property of repeating the vibrations of the external air which it communicates to the internal parts of the ear.

Bells may be regarded as somewhat like circular plates vibrating with radial nodes, and with the edges turned down. Lord Rayleigh has shown that there is a tangential motion as well as a motion in and out. Ordinarily when a bell is struck the impulse primarily excites the radial motion, and the tangential motion follows as a matter of course.. When a finger-glass (an inverted bell), is excited by passing the finger round the circumference, the tangential motion is primarily excited and the radial follows it. Some discussion of the vibrations of bells will be found in Rayleigh, Sound, vol. i. ch. 10 (see also Bells).

Singing Flames. — A " jet tube," i.e. a tube a few inches long with a fine nozzle at the top, is mounted as in fig. 40, so as to rise out of a vessel to which coal-gas, or, better, hydro- gen, is supplied. The supply is regulated so that when the gas is lighted the flame is half or three-quarters of an inch high. A " sound- ing tube," say an inch in diameter, and some- what more than twice the length of the jet tube, is then lowered over the flame, as in the figure. When the flame is at a certain distance within the tube the air is set in vibration, and the sounding tube gives out its fundamental note continuously. The flame aDpears to lengthen, but if the reflection is viewed in a vertical mirror revolving about a vertical axis or in Koenig s cube of mirrors, it is seen that the flame is really intermittent, jumping up and down once with each vibration, sometimes apparently going within the jet tube at its lowest point. For a given jet tube there is a position of maximum efficiency easily ob- tained by trial. The jet tube, for a reason which will be given when we consider the maintenance of vibrations, must be less than half the length of the sounding tube.

A series of pipes of lengths to give any desired series of notes may be arranged. If two tubes in unison are employed, a pretty example of resonance may be obtained. One is adjusted so as just not to sing. The other is then made to sing and frequently the first will be set singing also.

Sensitive Flames and Jets. — When a flame is just not flaring, any one of a certain range of notes sounded near it may make it flare while the note is sounding. This was first noticed by John Le Conte (Phil. Mag., 1858, 15, p. 235), and later by W. F. Barrett {PhU. Mag., 1867, 33, p. 216).

Barrett found that the best form of burner for ordinary gas pressure might be made of glass tubing about I in. in diameter contracted to an orifice / 8 inch in diameter, the orifice being nicked by a pair of scissors into a V-shape. The flame rises up from the burner in a long thin column, but when an appropriate note is sounded it suddenly drops down and thickens. Barrett further showed by using smoke jets that the flame is not essential. John Tyndall (Sound, lecture vi. § 7 seq.) describes a number of beautiful experiments with jets at higher pressure than ordinary, say 10 in. of water, issuing from a pinhole steatite burner. The flame may be 16 in. high, and on receiving a suitably high sound it suddenly drops down and roars. The sensi- tive point is at the orifice. Lord Rayleigh (Sound, ii. § 370), using as a source a " bird-call," a whistle of high frequency, formed a series of stationary waves by reflection at a flat surface. Placing the sensitive flame at different parts of this train, he found that it was excited, not at the nodes where the pressure varied, but at the loops where the motion was the greatest and where there was little pressure change. In his Sound (ii. ch. 21) he has given a theory of the sensitiveness. When the velocity of the jet is gradually increased there is a certain range of velocity for which the jet is unstable,

-Supply

Fig. 40. — Singing Flame.

so that any deviation from the straight rush-out tends to increase as the jet moves up. If then the jet is just on the point of insta- bility, and is subjected as its base to alternations of motion, the sinuosities impressed on the jet become larger and larger as it flows out, and the flame is as it were folded on itself. Another form of sensitive jet is very easily made by putting a piece of fine wire gauze 2 or 3 in. above a pinhole burner and igniting the gas above the gauze. On adjusting the gas so that it burns in a thin column, just not roaring, it is extraordinarily sensitive to some particular range of notes, going down and roaring when a note is sounded. _ If a tube be placed over such a flame it makes an excellent singing tube. The flame of an incandescent gas mantle if turned low is frequently sensitive to a certain range of notes. Such a flame may jump down, for instance, to each tick of a neighbouring clock.

Savart's Liquid Jets. — If a jet of water issues at an angle to the horizontal from a round pinhole orifice under a few inches pressure, it travels out as an apparently smooth cylinder for a short distance, and then breaks up into drops which travel at different rates, collide, and scatter. But if a tuning-fork of appropriate frequency be set vibrating with its stalk in contact with the holder of the pipe from which the jet issues, the jet appears to go over in one continuous thread. Intermittent illumination, however, with

frequency equal to that of the fork shows at once that the jet is really broken up into drops, one for each vibration, and that these move over in a steady procession. The cylindrical form of jet is unstable if its length is more than ir times its diameter, and usually the irregular disturbances it receives at the orifice go on growing, and ultimately break it up irregularly into drops which go out at different rates. But, if quite regular disturbances are impressed on the jet at intervals of time which depend on the diameter and speed of outflow (they must be somewhat more than v times its diameter apart), these disturbances go on growing and break the stream up into equal drops, which all move with the same velocity one after the other. An excellent account of these and other jets is given in C. V. Boys' Soap Bubbles, lecture iii.

Maintenance of Vibrations. — When a system is set vibrating and left to itself, the vibration gradually dies away as the energy leaks out either in the waves formed or through friction. In order that the vibration may be maintained, a periodic force must be applied either to aid the internal restoring force on the return journey, or weaken it on the outgoing journey, or both. Thus if a pendulum always receives a slight impulse in the direction of motion just about the lowest point, this is equivalent to an increase of the restoring force if received before passage through the lowest point, and to a decrease if received after that passage, and in either case it tends to maintain the swing. If the bob of the pendulum is iron, and if a coil is placed just below the centre of swing, then, if a current passes through the coil, while and only while the bob is moving towards it, the vibration is maintained. If the current is on while the bob is receding the vibration is checked. If it is always on it only acts as if the value of gravity were increased, and does not help to maintain or check the vibration, but merely to shorten the period. In a common form of electrically maintained fork, the Electrically fork is set horizontal with its prongs in a vertical Maintained plane, and a small electro-magnet is fixed between pork. them. The circuit of the electro-magnet is made and broken by the vibration of the fork in different ways — say, by a wire bridge attached to the lower prong which dips into and lifts out of two mercury cups. The mercury level is so adjusted that the circuit is just not made when the fork is at rest. When it is set vibrating contact lasts during some part of the outward and some part of the inward swing. But partly owing to the delay in making contact through the carriage down of air on the contact piece, and partly owing to the delay in establishing full current through self, induction, the attracting force does not rise at once to its full valu& in the outgoing journey, whereas in the return journey the mercury tends to follow up the contact piece, and the full current continues up to the instant of break. Hence the attracting force does more work in the return journey than is-done against it in the outgoing, and the balance is available to increase the

vibration.

In the organ pipe — as in the common whistle — a thin sheet of air is forced through a narrow slit at the bottom of the embouchure and impinges against the top edge, which is made very g-_ a _ p/ De sharp. The disturbance made at the commencement ‘

of the blowing will no doubt set the air in the pipe vibrating in its own natural period, just as any irregular air disturbance will set a suspended body swinging in its natural period, but we are to con- sider how the vibration is maintained when once set going. When the motion due to the vibration is up along the pipe from the em- bouchure, the air moves into the pipe from the outside, and carries the sheet-like stream in with it to the inside of the sharp edge. This stream does work on the air, aiding the motion. When the motion is reversed and the air moves out of the pipe at the embou- chure, the sheet is deflected on to the outer side of the sharp edge, and no work is done against it by the air in the pipe. Hence, the stream of air does work during half the vibration and this is not abstracted during the other half, and so it goes on increasing the motion until the supply of energy in blowing is equal to the loss by friction and sound.

The maintenance of the vibration of the air in the singing tube has been explained by Lord Rayleigh (Sound, vol. ii. § 322 h) as due „. , to the way in which the heat is communicated to the

a & n X vibrating air. When the air in a pipe open at both

lube. ends is vibrating in its simplest mode, the air is

alternately moving into and out from the centre. During the quarter swing ending with greatest nodal pressure, the kinetic energy is changed to potential energy manifested in the increase of pressure. This becomes again kinetic in the second quarter swing, then in the third quarter it is changed to potential energy again, but now manifested in the decrease of pressure. In the last quarter it is again turned to the kinetic form. Now suppose that at the end of the first quarter swing, at the instant of greatest pressure, heat is suddenly given to the air. The pressure is further increased and the potential energy is also increased. There will be more kinetic energy formed in the return journey and the vibration tends to grow. But if the heat is given at the instant of greatest rare- faction, the increase of pressure lessens

the difference from the un- disturbed pressure, and lessens the potential energy, so that during the return less kinetic energy is formed and the vibration tends to die away. And what is true for the extreme points is true for the half periods of which they are the middle points; that is, heat given during the compression half aids the vibration, and during the extension half damps it. Now let us apply this to the singing tube. Let the gas jet tube be of somewhat less than half the length of the singing tube, and let the lower end of the jet tube be in a wider tube or cavity so that it may be regarded as an " open end." When the air in the singing tube is singing, it forces the gas in the jet tube to vibrate in the same period and in such phase that at the nozzle the pressure in both tubes shall be the same. The lower end of the jet tube, being open, is a loop, and the node may be regarded as in an imaginary prolongation of the jet tube above the nozzle. It is evident that the pressure condition will be fulfilled only if the motions in the two tubes are in the same direction at the same time, closing into and opening out from the nodes together. When the motion is upwards gas is emitted ; when the motion is downwards it is checked. The gas enters in the half period from least to greatest pressure. But there is a slight delay in ignition, partly due to expulsion of incombustible gas drawn into the jet tube in the previous half period, so that the most copious supply of gas and heat is thrown into the quarter period just preceding greatest pressure, and the vibration is maintained. If the jet tube is somewhat longer than half the sounding tube there will be a node in it, and now the condi- tion of equality of pressure requires opposite motions in the two at the nozzle, for their nodes are situated on opposite sides of that point. The heat communication is then chiefly in the quarter vibration just preceding greatest rarefaction, and the vibration is not maintained.

Interference of Sound.

When two trains of sound waves travel through the same medium, each particle of the air, being simultaneously affected by the disturbances due to the different waves, moves in a different manner than it would if only acted on by each wave singly. The waves are said mutually to interfere. We shall exemplify this subject by considering the case of two waves travelling in the same direction through the air. We shall then obviously be led to the following results: —

If the two waves are of equal length X, and are in the same phase (that is, each producing at any given moment the same ,.---.^ .■”■. state of motion in the

air particles), their com- bined effect is equivalent to that of a wave of the same length X, but by which the excursions of the particles are increased, being the sum of those due to the two component waves respectively, as In

fig. 41, 1.

If the two interfering waves, being still of same length X, be in opposite phases, or so that one is in advance of the other by £X, and consequently one produces in the air the opposite state of motion to the other, then the resultant wave is one of the same length X, but the excursions of the particles are decreased, being the difference between those due to the component waves as in fig. 41, 2. If the amplitudes of vibration which thus mutually interfere are moreover equal, the effect is the total mutual destruction of the vibratory motion.

Thus we learn that two musical notes, of the same pitch, conveyed to the ear through the air, will produce the effect of a single note of the same pitch, but of increased loudness, if they are in the same phase, but may affect the ear very slightly, if at all, when in opposite phases. If the difference of phase

be varied gradually from zero to-X. the resulting sound will

2

gradually decrease from a maximum to a minimum.

Among the many experimental confirmations which may be adduced of these proportions we will mention the following: —

Take a circular plate, such as is available for the production of Chladni's figures, and cut out of a sheet of pasteboard a piece of the shape ABOCD (fig. 42), consisting of two circular quadrants of the same diameter as the plate. Let, now, the plate be made in the usual manner to vibrate so as to exhibit two nodal lines coinciding with two rectangular diameters. If the ear be placed right above the centre of the plate, the sound will be scarcely audible. But, if the pasteboard be interposed so as to intercept the vibrating segments AOB, DOC, the note becomes much more dis- tinct. The reason of this is, that the segments of the plate AOD, BOC always vibrate in the same direction, but oppo- sitely to the segments AOB, DOC. Hence, when the pasteboard is in its place, there are two waves of same phase starting from the two former segments, and reaching the ear after equal distances of transmission through the air, are again in the same phase, and produce on the ear a conjunct impression. But when the paste- board is removed, then there is at the ear opposition of phase between the first and the second pair of waves, and consequently a minimum of sound.

A tubular piece of wood shaped as in fig. 43. » nd having a piece of thin membrane stretched over the openingat the top C, some dry sand being strewn over the membrane, is so placed over a circular or rectangular

vibrating plate that the ends A, B lie over the segments of the plate, such as AOD, COB in the previous figure, which are in the same state of motion. The sand at C will be set in violent movement. But if the same ends A, B be placed over oppositely vibrating segments (such as AOD, COD), the sand will be scarcely, if at all, affected.

If a tuning-fork in vibration be turned round before the ear, four positions will be found in which it will be inaudible, owing to the mutual interference of the oppositely vibrating prongs of the fork. On interposing the hand between the ear and either prong of the fork when in one of those positions, the sound becomes audible, because then one of the two interfering waves is cut off from the ear. This experiment may be varied by holding the fork over a glass jar into which water is poured to such a depth that the air-column within reinforces the note of the fork when suitably placed, and then turning the fork round.

Helmholtz's double siren is well calculated for the investigation of the laws of interference of sound. For this purpose a simple mechanism is found in the instrument, by means of which the fixed upper plate can be turned round and placed in any position relatively to the lower one. If, now, the apparatus be so set that the notes from the upper and lower chest are in unison, the upper fixed plate may be placed in four positions, such as to cause the air-current to be cut off in the one chest at the exact instant when it is freely passing through the other, and vice versa. The two waves, therefore, being in opposite phases, neutralize one another, and the result is a faint sound. On turning round the upper chest into any inter- mediate position, the intensity of the sound will increase up to a maximum, which occurs when the air in both chests is being admitted and cut off contemporaneously.

If two organ pipes in unison are mounted side by side on a wind- chest with their ends close together, and are blown for a very short time, they sound. But if the blowing is continued, usually in less than a second the sound dies away to a small fraction of that due to either alone. Yet the air within the pipes is vibrating more vigor- ously than ever, but in opposite phases in the two pipes. This may be shown by furnishing the pipes with manometric flames placed in the same vertical line. When the flames are viewed in a revolving mirror and the pipes are blown, each image of one flame lies between two images of the other. The essential fact, as pointed out by Lord Rayleigh (Scientific Papers, i. 409), is not the common wind chest, but the nearness of the open ends, so that the outrush from one pipe can supply the inrush to the other, and the converse. If, the two pipes are slightly out of tune when sounded separately together they sound a common note which may be higher than that due to either alone. Lord Rayleigh (loc. cit.) points out that this

A

B

Fig. 43.

is due to reduction of the end correction. When the air rushes out from one pipe, it has not to force its way into the open air, but finds a cavity being prepared for it close at hand in the other pipe, and so the extensions and compressions at the ends are more easily reduced. Even the longer pipe may be effectively shorter than the corrected shorter pipe when sounding alone.

. Beats. When two notes are not quite in unison the resulting sound is found to alternate between a maximum and minimum of loudness recurring periodically. To these periodical alternations has been given the name of Beats. Their origin is easily explic- able. Suppose the two notes to correspond to 200 and 203 vibrations per second; at some instant of time, the air particles, through which the waves are passing, will be similarly displaced by both, and consequently the joint effect will be a sound of some intensity. But, after this, the first or less rapidly vibrating note will fall behind the other, and cause a diminution in the joint displacements of the particles, till, after the lapse of one- sixth of a second, it will have fallen behind the other by half a vibration. At this moment, therefore, opposite displacements will be produced of the air particles by the two notes, and the sound due to them will be at a minimum. This will be followed by an increase of intensity until the lapse of another sixth of a second, when the less rapidly vibrating note will have lost another half-vibration relatively to the other, or one vibration reckoning from the original period of time, and the two com- ponent vibrations will again conspire and reproduce a maximum effect. Thus, an interval of one-third of a second elapses between two successive maxima or beats, and there are pro- duced three beats per second. By similar reasoning it may be shown that the number of beats per second is always equal to the difference between the numbers of vibrations in the same time corresponding to the two interfering notes. The more, therefore, these are out of tune the more rapidly will the beats follow each other.

The formation of beats may be illustrated by considering the disturbance at any point due to two trains of waves of equal ampli- tude a and of nearly

equal frequencies «i n?. If we measure the time from an instant at which the two are in the same phase the resultant disturbance is

y = a sin 2rnit-{-a sin 2tcn4 = 2a cos ir(wi — n%)t sin 7r(ni-|-nj)<, which may be regarded as a harmonic disturbance of frequency (ni+ni)l2 but with amplitude 2a cos ir(«i — n 2)2 slowly varying with the time. Taking the squares of the amplitude to represent the intensity or loudness of the sound which would be heard by an ear at the point, this is

4a 2 cos 2 ir(»i— ni)t = 2a 2 ji-(-cos 2t(»i— rh)t), a value which ranges between o and 4a 2 with frequency tti — «2. The sound swells out and dies down ni—nz times per second, or there are «i — n? beats per second. If, instead of considering one point in a succession of instants, we consider a succession of points along the line of propagation at the same instant, we evidently have waves of amplitude varying from 2a down to o, and then up to 20 again in distance U/(wi— «j).

The phenomena of beats may be easily observed with two organ- pipes put slightly out of tune by placing the hand near the open end of one of them, with two musical strings on a resonant chest, or with two tuning-forks of the same pitch mounted on their resonance boxes, or held over a resonant cavity (such as a glass jar), one of the forks being put out of tune by loading one prong with a small lump of beeswax. In the last instance, if the forks are fixed on one solid piece of wood which can be grasped with the hand, the beat will be actually felt by the hand. If one prong of each fork be furnished with a small plain mirror, and a beam of light from a luminous point be reflected successively by the two mirrors, so as to form an image on a distinct screen, when one fork alone is put in vibration, the image will move on the screen and be seen as a line of a certain length. If both forks are in vibration, and are prefectly in tune, this line may either be increased or diminished permanently in length according to the difference of phase between the two sets of vibrations. But if the forks be not quite in tune then the length of the image will be found to fluctuate between a maximum and a minimum, thus making the beats sensible to the eye. The vibro- graph is also well suited for the same purpose, and so in an especial manner is Helmholtz's double siren, in which, by continually turning round the upper box, a note is produced by it more or less out of tune with the note formed by the lower chest, according as the handle is moved more or less rapidly, and most audible beats ensue. We

have already explained how beats are used on Scheibler's tonometer to give a series of forks of known frequencies. Beats also afford an excellent practical guide in the tuning of instruments, but more so for the higher notes of the register, inasmuch as the same number of beats are given by a smaller deviation from unison by two notes of high pitch than by two notes

of low pitch. Thus, two low notes of 32 and 30 vibrations respectively, whose interval is therefore || or j4,i.e. a semitone, give two beats per second, while the same number of beats are given by notes of 32X16 (four octaves higher than the first of the preceding) or 512, and 514 vibrations, which are only slightly out of tune.

Beats and Dissonance. — As the interval between two tones, and consequently the number of beats, increases the effect on the ear becomes more and more unpleasant. The sound is jarring and harsh, and we term it a " dissonance " or " discord." In the middle notes of the musical register the maximum harshness occurs when the beats are about 30. Thus the interval b'c" with frequencies 495 and 528, giving 33 beats in a second, is very dissonant. But the interval b'\>c" gives nearly twice as many beats and is not nearly so dissonant. The minor third a'c" with 88 beats per second shows scarcely any roughness, and when the beats rise to 132 per second the result is no longer unpleasant.

We are then led to conclude that beats are the physical founda- tion for dissonance. The frequency of beats giving maximum dissonance rises as we rise higher in the musical scale, and falls as we descend. Thus b"c'" and b'\>c" have each 66 beats per second, yet the former is more dissonant than the latter. Again b'c" and CG have each 33 beats per second, yet the latter interval is practi- cally smooth and consonant. This beat theory of dissonance was first put forward by Joseph Sauveur (1653-1716) in 1700. Robert Smith (Harmonics, 2nd ed., 1759, p. 95) states that Sauveur " in- ferred that octaves and other simple concords, whose vibrations coincide very often, are agreeable and pleasant because their beats are too quick to be distinguished, be the pitch of the sounds ever so low; and on the contrary, that the more complex consonances whose vibrations coincide seldom are disagreeable because we can distinguish their slow beats; which displease the ear, says he, by reason of the inequality of the sound. And in pursuing this thought he found that those consonances which beat faster than six times in a second are the very same that musicians treat as concords; and that others which beat slower a re the discords ; and he adds that when a consonance is a discord at a low pitch and a concord at a high one, it beats sensibly at the former pitch but not at the latter." But Sauveur fixed the limiting number of beats for the discord far too low, and again he gave no account of dissonances such as the seventh, where the frequency of the beats between the funda- mentals is far beyond the number which is unpleasant. Smith, though recognizing the unpleasantness of beats, could not accept Sauveur's theory, and, indeed, it received no acceptance till it was rediscovered by Helmholtz, to whose investigations, recorded in his Sensations of Tone, we owe its satisfactory establishment.

Suppose that we start with two simple tones in unison; there is perfect

consonance. If one is gradually raised in pitch beating begins, at first easily countable. But as the pitch of the one rises the beats become a jar too frequent to count, and only perhaps to a trained ear recognizable as beats. The two tones are now dissonant, and, as we have seen, about the middle of the scale the maximum dissonance is when there are between 30 and 40 beats per second. If the pitch is raised still further the dissonance lessens, and when there are about 130 beats per second the, interval is con- sonant. If all tones were pure, dissonance at this part of the scale would not occur if the interval were more than a third. But we have to remember that with strings, pipes and instruments gener- ally the fundamental tone is accompanied by overtones, called also " upper partials," and beating within the dissonance range may occur between these overtones.

Thus, suppose a fundamental 256 has present with it overtone harmonics 512, 768, 1024, 1280, &c, and that we sound with it the major seventh with fundamental 480, and having harmonics 960, 1440, &c. The two sets may be arranged thus c 256 512 768 1024 1280

b 480 960 1440,

and we see that the fundamental of the second will beat 32 times per second with the first overtone of the first, giving dissonance. The first overtone of the second will beat 64 times per second with the third of the first, and at such height in the scale this frequency will be unpleasant. The very marked dissonance of the major seventh is thus explained. We can see, too, at once how the octave is such a smooth consonance. Let the two tones with their harmonic overtones be

256

512 768 1024 1280 1536 512 1024 1536.

The fundamental and overtones of the second all coincide with overtones of the first.

Take as a further example the fifth with harmonic overtones as under

256 512 768 1024 1280 1536 384 768 1 1 52 1536.

The fundamental and overtones of the second either coincide with or fall

midway between overtones in the first, and there is no approach to a dissonant frequency of beats, and the concord is perfect.

But obviously in either the octave or the fifth, if the tuning is imperfect, beats occur all along the line wherever the tones should coincide with perfect tuning. Thus it is easy to detect a want of tuning in these intervals.

The harshness of deep notes on instruments rich in overtones may be explained as arising from beats between successive over- tones. Thus, if a note of frequency 64 is sounded, and if all the successive overtones are present, the difference of frequency will be 64, and this is an unpleasant interval when we get to the middle of the scale, say to overtones 256 and 320 or to 512 and 576. Thus Helmholtz explains the jarring and braying which are sometimes heard in bass voices. These cases must serve to illustrate the theory. For a full discussion see his Sensations of Tone, ch. 10.

Dissonance between Pure Tones. — When two sources emit only pure tones we might expect that we should have no dissonance when, as in the major seventh, the beat frequency is greater than the range of harshness. But the interval is still dissonant, and this is to be explained by the fact that the two tones unite to give a third tone of the frequency of the beats, easily heard when the two primary tones are loud. This tone may be within dissonance range of one of the primaries. Thus, take the major seventh with frequencies 256 and 480. There will be a tune frequency 480—256 = 224, and this will be very dissonant with 256.

The tone of the frequency of the beats was discovered by Georg Andreas Sorge in 1740, and independently a few years later by Giuseppe Tartini, after whom it is named. It may easily be heard when a double whistle with notes of different pitch is blown strongly, or when two gongs are loudly sounded close to the hearer. It is heard, too, when two notes on the harmonium are loudly sounded. For- merly it was generally supposed that the Tartini tone was due to the beats themselves, that the mere variation in the amplitude was equivalent, as far as the ear is concerned, to a superposition on the two original tones of a smooth sine displacement of the same periodicity as that variation. This view has still some supporters, and among its recent advocates are Koenig and Hermann. But it is very difficult to suppose that the same sensation would be aroused by a truly periodic displacement represented by a smooth curve, and a displacement in which the period is only in the amplitude of the to-and-fro motion, and which is represented by a jagged curve. No explanation is given by the supposition; it is merely a statement which can hardly be accepted unless all other explana- tions fail.

Combination Tones. — Helmholtz has given a theory which certainly accounts for the production of a tone of the frequency of the beats and for other tones all grouped under the name of " combination tones " ; and in his Sensations of Tone (ch. 11) he examines the beats due to these combination tones and their effects in producing dissonance. The example we have given above of the major seventh must serve here. The reader is referred to the full discussion by Helmholtz. We shall conclude by a brief account of the ways in which combination tones may be produced. There appears to be no doubt that they are produced, and the only question is whether the theory accounts sufficiently for the intensity of the tones actually heard.

Combination tones may be produced in three ways: (1) In the neighbourhood of the source; (2) in the receiving mechanism of the ear; (3) in the medium conveying the waves.

*1. We may illustrate the first method by taking a case dis- cussed by Helmholtz (Sensations of Tone, app. xvi.) where the two sources are reeds or pipes blown from the same wind-chest. Let us suppose that with constant excess of pressure, p, in the wind-chest, the amplitude produced is proportional to the pressure, so that the two tones issuing may be represented by pa sin 2-u-nit and pb sin 2-*nit. Now as each source lets out the wind periodi- cally it affects the pressure in the chest so that we cannot re- gard this as constant, but may take it as better represented by p + \a sin (2irnit--e)+nb sin (2irn 2 t+f). Then the issuing dis- turbance will be*

[p+\a sin (2wn i t--e)+yb sin (2irnit--f)\a sin 2irnit+b sin 2ir« 2 /j = pa sin 2wnit + pb sin 2jrn 2 /

-t — — cos e — — cos (4irn l /+e) + ~ cos/ — j cos (47rtt 2 «+/) + —cos {2ir(»i— Th)t+e) — cos {2w(ni + n 2)t+e]

abii

aby.

H — cos J2ir(Ki — ni)t — f\ — cos (27t(m 1 M 2)</)

(35)

Thus, accompanying the two original pure tones there are (1) the octave of each; (2) a tone of frequency (»i — n 2); (3) a tone of frequency (ni+n 2). The second is termed by Helmholtz the difference tone, and the third the summation tone. The amplitudes of

these tones are proportional to the products of a and b multiplied by X or

m- These combination tones will in turn react on the pressure and produce new combination tones with the original tones, or with each other, and such tones may be termed of the second, third, &c, order. It is evident that we may have tones of frequency

hni kni hni—krh. hni + knz,

where h and k are any integers. But inasmuch as the successive orders are proportional to X X 2 X 3 , or m m 2 m 3 , and X and m are small, they are of rapidly decreasing importance, and it is not certain that any beyond those in equation (35) correspond to our actual sensations. The combination tones thus produced in the source should have a physical existence in the air, and the amplitudes of those represented in (35) should be of the same order. The conditions assumed in this investigation are probably nearly realized in a harmonium and in a double siren of the form used by Helmholtz, and in these cases there can be no doubt that actual objective tones are produced, for they may be detected by the aid of resonators of the frequency of the tone sought for. If the tones had no existence outside_ the ear then resonators would not increase their loudness. There is not much difficulty in detecting the difference tone by a resonator if it is held, say, close to the reeds of a harmonium, and Helmholtz succeeded in detecting the summation tone by the aid of a resonator. Further, Riicker and Edser, using a siren as source, have succeeded in making a fork of the appropriate pitch respond to both difference and summation tones (Phil. Mag., l8 95. 39. P- 34 1 – But there is no doubt that it is very difficult to detect the summation tone by the ear, and many workers have doubted the possibility, notwithstanding the evidence of such an observer as Helmholtz. Probably the fact noted by Mayer (Phil. Mag., 1878, 2, p. 500, or Rayleigh, Sound, § 386) that sounds of considerable intensity when heard by themselves are liable to be completely obliterated by graver sounds of sufficient force goes far to explain this, for the summation tones are of course always accompanied by such graver sounds.

2. The second mode of production of combination tones, by the mechanism of the receiver, is discussed by Helmholtz (Sensa- tions of Tone, App. xii.) and Rayleigh (Sound, i. § 68). It depends on the restoring force due to the displacement of the receiver not being accurately proportional to the displacement. This want of proportionality will have a periodicity, that of the impinging waves, and so will produce vibrations just as does the variation of pressure in the case last investigated. We may see how this occurs by- supposing that the restoring force of the receiving mechanism is represented by Xjc + m 2 . where x is the displacement and n* 2 is very small. Let an external force F act on the system, and for simplicity suppose its period is so great compared with that of the mechanism that we may*

take it as practically in equilibrium with the restoring force. Then F = \x +ij.x 2 . Now fix 2 is very small compared with X, so that x is nearly equal to F/X, and as an approx- imation, F_=Xx+mF 2 /X 2 , or * = F/ X-mF 2 /X 3 . Suppose now that F = o sin 2ir«i< +& sin 2-wn4, the second term will evidently produce a series of combination tones of periodicities 2«i, 2K 2> Mi — »2, and «i+re 2 , as in the first method. There can be no doubt that the ear is an unsymmetrical vibratorrand that it makes combination tones, in some such way as is here indicated, out of two pure tones. Probably in most cases the combination tones which we hear are thus made, and possibly, too, the tones detected by Koenig, and by him named " beat-tones." He found that if two tones of frequencies p and a are sounded, and if q lies between N£ and (N + i)£, then a tone of frequency either (N + i)p — q, or of frequency g-N£, is heard. The difficulty in Helmholtz ? s theory is to account for the audibility of such beat tones when they are of a higher order than the first. Riicker and Edser quite failed to detect their external existence, so that apparently they are not produced in the source. If we are to assume that the tones received by the ear are pure and free from partials, the loudness ol the beat- tones would appear to show that Helmholtz's theory is not a complete account.*

3. The third mode of production of combination tones, the pro- duction in the medium itself, follows from the varying velocity of different partsof the wave, as investigated at the beginning of this article. It is easily shown that after a time we shall have to superpose on the original displacement a displacement propor- tional to the square of the particle velocity, and this will intro- duce just the same set of combination tones. But probably in practice there is not a sufficient interval between source and hearer for these tones to grow into any importance, and they can at most be only a small addition to those formed in the source or the ear.

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SOUND, THE (Danish Oresund), the easternmost of the straits giving entrance to the Baltic Sea from the Cattegat, between the Danish island of Zealand and Sweden. Its extreme length reckoned from the promontory of Kullen to that of Falsterbo, both on the Swedish shore, is 70 m. Its narrowest point is between Helsingor in Denmark and Helsingborg in Sweden, which are 3 m. apart. Its extreme width, 30 m.,is towards the south, where Kjoge Bay indents the coast of Zealand. Three islands lie in it — Hven, belonging to Sweden, and Saltholm and Amager (which is separated from Zealand by a narrow channel at Copenhagen), belonging to Denmark. The strait between Amager and Saltholm is called Drogden, and is followed by the larger vessels passing through the Sound. The extreme depth of the Sound is about 14 fathoms. Navigation is open in winter, though three instances are recorded of the Sound being frozen completely over: in 1306, 1830 and 1836. From the 15th century Denmark levied " Sound dues " on foreign vessels passing through the strait, the Hanse traders and certain others being exempt. In the 17th century quarrels arose on this matter between Denmark and the Netherlands and Sweden, while in modern times the powers found the dues irksome, and in 1843 an<1 1853

protests were made by the representatives of the United States of America, but Denmark based her right on immemorial cus- tom, and adhered to it. In 1856 the matter came up in connexion with the renewal of the treaty of 1826 between the two countries; considerable tension resulted, and the possibility of reprisals by the United States against the Danish possessions in the West Indies was discussed. But the treaty was provisionally extended to the following year, and a conference in Copenhagen, at which most of the affected powers were represented, resulted in the remission of the dues from the 1st of April 1857, Denmark receiving a united compensation of 30,476,325 rix-dollars (equalling about £4,000,000), out of which the amount paid by the British government was £1,125,000. The annual income accruing to Denmark from the du:s during the ten previous years had been about 2,500,000 rix-dollars.

SOUNDING (for derivation see Sound above), the term used for measuring the depth of water (F rom Wharton's ff^rojrajfe s«™ y .) (and so, figuratively, of anything). The process of ascertaining the depth of the sea has been practised from very early times for purposes of navigation, but it is only since the introduction of submarine telegraphy that extensive efforts have been made to obtain a complete knowledge of the contour of the ocean-bed (see Ocean).

The operation of sounding is readily performed in shallow water by letting down a weight or " lead " attached to a cord, which is marked off into fathoms by pieces of leather, rag and twine. The bottom of the weight usually presents a hollow, which is filled with tallow, so that a portion of the material from the bottom may be brought up and give an indication of its nature as well as an assurance that it has really been touched.

For depths over 20 fathoms sounding machines are often employed, and for deep soundings they are practically indispen- sable. In them wire, the use of which for this purpose was introduced by Sir William Thomson (Lord Kelvin), has entirely superseded hemp gear. Its smooth surface and minute section, reducing friction to a minimum, give a rapidity of descent of about 100 fathoms per minute, and this velocity is not materially diminished even at great depths. Reeling in may be accom- plished at nearly the same rate. Soundings are thus obtained with a degree of accuracy not formerly possible. The apparatus is light, compact and automatic in its action. Soundings with wire can be carried out at night with the same facility as in daytime, and in almost any circumstances of wind and weather short of a strong gale, against which the ship could not steam or face the sea. A sounding of 1000 fathoms may be obtained in twenty-five minutes from the time the weight is lowered to the time the order is given to put the ship on her course, or in half that time if sounding from astern and going ahead on getting bottom; 2000 fathoms will require forty-five minutes and 3000

fathoms, seventy-five minutes. Beyond that depth, much greater caution being required, the time occupied is correspon- dingly increased, and reeling in must then be done very deliber- ately. A sounding of 5269 fathoms was obtained near the island of Guam by the U.S. cable-surveying ship "Nero." Soundings at such depths may occupy as long as five or six hours.

Among the sounding machines in general use the Lucas carries nearly 6000 fathoms of 20-gauge wire, and is fitted with two brakes — one a screw brake for holding the reel when required, the other an automatic brake for stopping the reel when the weights strike the bottom. A guider for the purpose of winding the wire uniformly on to the reel is also attached, and is worked by a small handle. After leaving the reel the wire passes over a registering wheel, the dial of which indicates the amount of wire run out. Similar machines of smaller size are supplied for use in boats. The large machine is represented in fig. 1.

Lucas Machine.

Fig.

A, Reel or drum.

B, Brake.

C, Brake lever.

D, Springs.

E, Regulating screw.

F, Hand wheel.

G, Swivelling frame.

1. — Lucas Machine.

H, Measuring wheel.

T, Indicator.

K, Stop.

L, Wire guiding roller.

M, Handle for working roller.

N, Bolt.

O, Screw Brake.

Heaving in is accomplished by means of a hemp " swifter " or driving belt, which conveys the motion of the drum of a donkey engine to the drum carrying the wire of the sounding machine. It being impracticable to regulate the speed of the engine by hand according to the heave of the ship, in order to obviate the sudden and excessive strains on the wire so caused, an ingenious mechanical arrangement has been fitted by which frictional disks, geared by cog-wheels and capable of adjustment are interposed on the axle connecting the grooved wheel actuated by the hemp swifter and the revolving drum carrying the wire. By this arrangement the latter can be controlled as desired, both in speed and direction of motion, by means of a lever regulating the strap on the frictional disks, which may be set by experiment to act at any given tension of the wire. As the tension approaches this limit, the velocity of revolution of the drum is automatically checked ; and if the tension further increases, the motion of the drum is actually reversed, thus causing the wire to run out, until the tension is relieved sufficiently to allow the frictional disks again to act in the direction of heaving in. The drum may be stopped instantly by moving the lever in the proper direction to throw the apparatus out of gear.

Galvanized-stee! wire of 20-gauge and 21-gauge is supplied on drums in lengths of 5000 fathoms. The 20-gauge wire when new has a breaking strain of 240 lb, and the smaller wire 190 lb. The large machines will hold sufficient quantity of the larger wire for the deepest soundings; there is therefore no longer any necessity for the smaller wire, and its use is not recommended. The zinc wears off to a considerable extent with constant use; it is necessary to pass the wire through an oily wad whenever soundings are suspended for a time, and the surface layers on the drum should be kept well coated with oil and covered over with oily waste. A fortnight's continuous use is about the limit to the trustworthiness of any piece of wire; no amount of care will prevent it from becoming brittle ; and directly it can be snapped by twisting in the hand, it should be condemned and passed on to the boats' machines. A magnifying glass will assist in examining its condition. Taut and even winding on the reel from the drum is most important ; otherwise, when heaving up after a sounding, the strain forces each layer as it comes in to sink down amongst the previous layers loosely reeled on, with the result that at the next sounding slack turns will sud- denly develop on running out, to the great risk of the wire. The wire is

liable to cut grooves in the interior of the swivelling frame; a, file must constantly be applied to smooth these down, or they will rip the splices. A roller of hard steel, underneath which wire passes, and which placed in rear of the swivelling frame, obviates this to a great extent.

Splices are made about 5 ft. in length, one wire being laid round the other in a long spiral of about one turn per inch. A seizing of fine wire is laid over each end and for 2 or 3 in. up the splice, no end being allowed to project, and solder is then applied the whole length of the splice. Three more seizings should be placed at intervals. Splices are the weakest parts of the wire, and their multiplication is to be avoided. They should be frequently examined and their position noted, so that in heaving in they may be eased round the wheel with the guider nearly in the centre, to avoid tearing.

Under 1000 fathoms a lead of 30 to 40 lb weight can be recovered, and no detaching rod is necessary. At a little risk Sounding to the wire, when sounding from astern up to that Rods and depth, the ship may go ahead directly bottom is Sinkers, struck, increasing speed as the wire comes in; the great saving in time thus effected will often justify the increased risk of parting the wire. For greater depths the " Driver rod" is the best detaching apparatus for slipping the sinkers; its construction is easier than that of the " Baillie rod," and with a piece of gas piping cut to the proper length the ship's blacksmith can make one in a day. Both rods are fitted with tubes to bring up a specimen of the bottom, and the same sinkers fit them both.

The " Driver rod " is shown in fig. 2. ABC is a tube about 2 ft. in length, fitted at the top with a flap valve D, working on a hinge at E. The lower part of the tube C screws on and off, and contains a double flap valve to retain the bottom specimen. The sinkers WW, each 25 lb in weight, conical in form, and pierced with a cylindrical hole through which the Driver rod passes loosely, are slung by wire or cod line secured to a flat ring or grummet shown at L and passing over the stud G. A stud K on each side of the tube fits loosely into the slot H in the lower part of the slipping lever MH. The weight of the apparatus being taken by the sounding wire, the sinkers remain suspended; but on striking the bottom, the wire slackens, and the weight of the sinkers drags the slip- ping lever down till the stud K bears against the upper part of the slot H. By this action the point M of the slipping lever is brought to bear against the upper end of the standard EF, being thereby forced outward sufficiently to ensure that the weight

r ri

Y

H' 4

w

V

Wftt L

\B

acting at the point G will tilt the slipping lever right over, and thus disengage the sling. The tube being then drawn up the sinkers are left behind. In descending, the valves at top and bottom, opening upwards, allow the water to pass through freely ; but on drawing up they are closed, thus retaining the plug of mud with which the tube is filled. For water under 2000 fathoms two conical weights are sufficient. In deeper water a third cylindrical weight of 20 lb should be put between them. It is important to interpose a piece of hemp line, some 10 fathoms long, between the end of the wire (into which a thimble is seized) and the lead or rod. This tends to prevent the wire from kinking on the lead striking the bottom. A piece of sheet lead, about 2 lb in weight, wrapped round the hemp just below the junction, keeps the wire taut while the hemp slacks. Small brass screw stoppers, fitted with a hempen tail to secure to a cleat, hold the wire during the sounding if necessary to repair splices or clear slack turns. In heaving in the springs are replaced with a spring balance, by which the amount of strain is seen and the deck engine worked accordingly. A system of signals is required by day and by night, by which the officer superintending the sounding can control the helm, main engines and deck engine.

Method of Sounding. — The machine is placed on a projecting platform on the forecastle. An endless hemp swifter, led through blocks with large sheaves, connects the sounding ma- chine and deck engine, and when heaving in is kept taut by a snatch block set up with a jigger. As the wire runs out, the regulating screw of the brake must be gradually screwed up, so as to increase the power of the brake in proportion to the amount of wire out. The regulating screw is marked for each 500 fathoms. In fairly smooth water the brake will at once act when the weight strikes the bottom and the reel stops. Under 3000 fathoms one spring only is sufficient, but beyond that depth two springs are required. If the ship is pitching heavily, the automatic brake must be assisted by the screw brake to ensure the reel not overrunning. The marks on the regulating screw are only intended as a guide ; the real test is that the brake is just on the balance, so as to act when the strain lessens, which may be known by the swivelling frame being just lifted off the stop. As the wire weighs 7! lb for each 500 fathoms, the 500- fathoms mark on the screw should be at the position in which the

screw has to be to sustain a weight of 7 J lb; the iooo-fathoms mark, 15 lb; and so on. This can be tested and the marks verified.

Handling the Ship. — Sounding from forward enables the ship to be handled with greater ease to keep the wire up and down, and especially so in a tide- way; but in verv heavy weather soundings may be obtained from a machine mounted over the stern, when it would be quite impossible to work on the forecastle. The spanker must be set with the sheet to windward, unless a strong weather tide renders it undesirable ; the ship's head must be kept in a direction which is the resultant of the direction and force of the wind and current ; and this is arrived at by altering the course while sounding, point by point, until the wire can be kept up and down by moving the engines slowly ahead as necessary. It should seldom, or never, be necessary to move the engines astern.

The temperature of the water is usually taken at intervals of 100 fathoms down to a depth of 1000 fathoms, and at closer intervals in the first 100 fathoms. If a second wire machine is available, the observations may be made from aft whilst the sounding is being taken forward. A 30-fo sinker is attached to the end of the wire, and the registering thermometers are secured to the wire by the metal clips at the back of the cases, at the required intervals. To avoid heavy loss, not more than four thermometers should be on the wire at one time. When sounding a thermometer is usually attached to the line a short distance above the lead.

The primary object of the machine called the " submarine sentry " is to supply an automatic warning of the approach of a ship to shallow water: it has been instrumental in discovering many un- suspected banks in imperfectly surveyed waters. By means of a

Fig. 2. — Driver Rod.

Observa- tions of Tempera- tare.

single stout wire the sinker, an inverted kite, called the "sentry,"

can be towed steadily for any length of time, at any required

vertical depth down to 40 fathoms with the red kite

Sentiy and 3 ° fathoms with the black kite i should it strike the bottom, through the water shallowing to less than the set depth, it will at once free

itself and rise to the surface, simul- taneously sounding an alarm on board, and thus giving instant

Fig. 3. — The Submarine Sentry.

warning. The vertical depth at which the sentry sets itself when a given length of wire is paid out is not changed by any variation of speed between 5 and 13 knots, and is read off on the graduated dial- plate on the winch. One set of graduations on the dial indicates the amount of wire out; the other two sets refer to the red and black kites respectively, and show the depth at which the sentry is towing. By this machine single soundings down to 40 fathoms can be taken at any time while the ship is under way. The sentry being let down slowly, the gong will indicate when the bottom is touched, and the dial corresponding to the kite used will show at once the vertical depth at the place where the sentry struck.

By removing the kite and substituting a lead, with atmospheric sounder or other automatic depth gauge, flying single soundings up to 100 fathoms can be obtained in the ordinary manner without stopping the ship. The winch is secured to the deck a short distance from the stern ; the towing wire passes from the drum under a roller fairlead at the foot of the winch, thence through an iron block with sheave of large diameter, suspended from a short davit on the stern rail and secured to the sling of the sentry. The dial being set to zero with the sentry at the water's edge, the ship's speed is reduced to 8 or 9 knots, and the wire paid out freely until the kite is fairly in the water, when the brake should be applied steadily and without jerking, veering slowly until the required depth is attained, when the pawl is put on the rachet wheel and the speed increased to 12 knots if desired when using the black kite or 10 knots with the red kite.

The kite in its position when being towed is indicated in fig. 3. The point of the catch C, passing through a thimble M in the short leg of the sling, is slipped into the hole at the top of trigger T, which is hinged at K and kept in its place by the spring S attached to the hook H. On the trigger striking the bottom the catch is released, the short leg of the sling slips off, and the sentry, which then rises to the surface, is left towing by the long leg. The winch is fitted with two handles for heaving in the wire ; one gives great power and slow speed, and the other, acting on the drum spindle direct, winds in quickly. The wire supplied with the machine has a steady breaking strain of about 1000 lb. Using the black kite at a speed of 7 knots, the strain on the wire is about 150 ft, and at 10 knots about 300 lb. The red kite increases the strain largely. (A. M. F.)*

SOUSA, LUIZ DE [Manoel de Sousa Coutinho] (1555-1632), Portuguese monk and prose-writer, was born at Santarem, a mem- ber of the noble

family of Sousa Coutinho. In 1576 he broke off his studies at Coimbra University to join the order of Malta, and shortly afterwards was captured at sea by Moorish pirates and taken prisoner to Argel, where he met Cervantes. A year later Manoel de Sousa Coutinho was ransomed, and landing

on the coast of Aragon passed through Valencia, where he made the acquaintance of the poet Jaime Falcao, who seems to have inspired him with a taste for study and a quiet life. The national disasters and family troubles increased this desire, which was confirmed when he returned to Portugal after the battle of Alcacer and had the sorrow of witnessing the Spanish invasion and the loss of his country's independence. Between 1584 and 1586 he married a noble lady, D. Magdalena de Vilhena, widow of D. John of Portugal, the son of the poet D. Manoel of Portugal, to whom Camoens had dedicated his seventh ode. Settling at Almada, on the Tagus opposite Lisbon, he divided his time between domestic affairs, literary studies and his military duties as colonel of a regiment. His patriotic dislike of an alien rule grew stronger as he saw Portugal exploited by her powerful partner, and it was ultimately brought to a head in 1599. In that year, to escape the pest that devastated Lisbon, the governors of the kingdom for Philip II. decided to move their quarters to his residence; thereupon, finding his protest against this arbitrary resolution unheeded, he set fire to his house, and to escape the consequences of his courageous act had to leave Portugal. Going to Madrid, he not only escaped any penalty, owing no doubt to his position and influence at the Spanish court, but was able to pursue his literary studies in peace and to publish the works of his friend Jaime Falcao (Madrid, 1600). Nothing is known of how he passed the next thirteen years, though there is a tradition that, at the instance of a brother resident in Panama, who held out the prospect of large commercial gains, he spent some time in America. It is said that fortune was unpropitious, and that this, together with the news of the death of his only child, D. Anna de Noronha, caused his return home about 1604. In 1613 he and his wife agreed to a separation, and he took the Dominican habit in the convent of Bemfica, while D. Magdalena entered the convent of the Sacramento at Alcantara. According to an old writer, the motive for their act was the news, brought by a pilgrim from Palestine that D. Magdalena's first husband had survived the battle of Alcacer, in which he was supposed to have fallen, and still lived; Garrett has immortalized the legend in his play Frei Luiz de Sousa. The story, however, deserves no credit, and a more natural explanation is that the pair took their resolution to leave the world for the cloister from motives of piety, though in the case of Manoel the captivity of his country and the loss of his daughter may have been contributory causes. He made his profession on the 8th of September 1614, and took the name by which he is known as a writer, Frei Luiz de Sousa. In

1616, on the death of Frei Luiz Cacegas, another notable Dominican who had collected materials for a history of the order and for a life of the famous archbishop of Braga, D. Frei Bartho- lomew of the Martyrs, the task of writing these books was confided to Frei Luiz. The Life of the Archbishop appeared in 1619, and the first part of the Chronicle of St Dominic in 1623, while the second and third parts appeared posthumously in 1662 and 1678; in addition he wrote, by order of the government, the Annals of D. John III., which were published by Herculano in 1846. After a life of about nineteen years spent in religion, he died in 1632, leaving behind him a memory of strict observance and personal holiness.

The Chronicle of St Dominic and the Life of the Archbishop have the defect of most monastic writings — they relate for the most part only the good, and exaggerate it without scruple, and they admit all sorts of prodigies, so long as these tend to increase devotion. Briefly, these books are panegyrics, written for edification, and are not histories at all in the critical sense of the word. Their order and arrangement, however, are admirable, and the lucid, polished style, purity of diction, and simple, vivid descriptions, entitle Frei Luiz de Sousa to rank as a great prose-writer. His metaphors are well chosen, and he employs on appropriate occasions familiar terms and locutions, and makes full use of those charming diminutives in which the Portuguese language is rich. His prose is characterized by elegance, sweetness and strength, and is remarkably free from the affectations and false rhetoric that characterized the age. In addition to his other gifts, Frei Luiz de Sousa was a good Latin poet. There are many editions of the Life of the A rchbishop, and it appeared in French (Paris, 1663, 1679 and 1825). in Italian (Rome, 1727-1728), in Spanish (Madrid, 1645 and 1727) and in English

(London, 1890). The Historia de S. Domingos may be read in a modern edition (6 vols., Lisbon, 1866).

Authorities. — Obras de D. Francisco Alexandre Lobo, ii. 61- 171 ; Innocencio da Silva, Diccionario bibliograpkico portuguez, v. 327, xvi. 72; Dr Sousa Viterbo, Manoel de Sousa Couiinho (Lisbon, 1902). (E. PR.)

SOUSLIK, or Suslik, the vernacular name of a European bur- rowing rodent mammal, nearly allied to the marmots, but of much smaller size and of more slender and squirrel-like build (see Rodentia). The species, Spermophilus (or Citillus) citillus, is rather smaller than an ordinary squirrel, with minute ears, and the tail reduced to a stump of less than an

inch in length. The general colour of the upper parts is yellowish grey, with or without a rusty tinge, which is, however, always notice- able on the head; while the underparts are lighter. The range of this species embraces south-east Europe, from southern Germany, Austria and Hungary to the south of Russia. Farther east it is replaced by more or less nearly allied species; while other species extend the range of the genus across central and northern Asia, and thence, on the other side of Bering Strait, all through North America, where these rodents are commonly known as gophers. Many of the species have medium or even long tails, while some are nearly double the size of the typical representative of the group. All, however, have large cheek-pouches, whence the name of pouched marmots, by which they are sometimes called; and they have the first front- toe rudimentary, as in marmots. They are divided into several subgeneric groups. One of the most striking American species is the striped gopher, S. (Ictidomys) tridecemlineatus , which is marked on each side with seven yellow stripes, between which are rows of yellow spots on a dark ground. The common souslik lives in dry, treeless plains, especially on sandy or clayey soil, and is never found either in forests or on swampy ground. It forms burrows, often 6 or 8 ft. deep, in which food is stored up and the winter sleep takes place. Each burrow has but one entrance, which is closed up when winter approaches; a second hole, however, being previously driven from the sleeping place to within a short distance of the surface of the ground. This second hole is opened the next year, and used as the ordinary entrance, so that the number of closed up holes round a burrow gives an indication of the length of time that it has been occupied. Sousliks feed on roots, seeds and berries, and occasionally on animal food, preying on eggs, small birds and mice. They bring forth in the spring from four to eight young ones, which, if taken early, may be easily tamed. Sousliks are eaten by the inhabitants of the Russian steppes, who consider their flesh an especial delicacy. (R. L.)*

SOUTANE, the French term adopted into English for a cassock especially used for the general daily dress worn by the secular Roman clergy in France, Italy, Spain and Portugal. The Med. Lat. subtaneus, adapted in O. Fr. as sotane, in Span, and Ital. as sotana, and Port, as sotaina, meant an under-skirt, and is formed from subtus, beneath, sub, under. (See Cassock.)
SOUTH, ROBERT (1634-17 16), English divine, was born at Hackney, Middlesex, in September 1634. He was educated at Westminster school and at Christ Church, Oxford. Before taking orders in 1658 he was in the habit of preaching as the champion of Calvinism against Socinianism and Arminianism. He also at this time showed a leaning to Presbyterianism, but on the approach of the Restoration his views on church govern- ment underwent a change; indeed, he was always regarded as a time-server, though by no means a self-seeker. On the 10th of August 1660 he was

chosen public orator of the university, and in 1 66 1 domestic chaplain to Lord Clarendon. In March 1663 he was made prebendary of Westminster, and shortly afterwards he received from his university the degree of D.D. In 1667 he became chaplain to the duke of York. He was a zealous advocate of the doctrine of passive obedience, and strongly opposed the Toleration Act, declaiming in unmeasured terms against the various Nonconformist sects. In 1676 he was appointed chaplain to Lawrence Hyde (afterwards earl of Rochester), ambassador-extraordinary to the king of Poland, and of his visit he sent an interesting account to Edward Pococke

in a letter, dated Dantzic, 16th December, 1677, which was printed along with South's Posthumous Works in 17 17. In 1678 he was presented to the rectory of Islip, Oxfordshire. Owing, it is said, to a personal grudge, South in 1693 published with transparent anonymity Animadversions on Dr Sherlock's Book, entitled a Vindication of the Holy and Ever Blessed Trinity, in which the views of William Sherlock (q.v.) were attacked with much sarcastic bitterness. Sherlock, in answer, published a Defence in 1694, to which South replied in Tritheism Charged upon Dr Sherlock's New Notion of the Trinity, and the Charge Made Good. The controversy was carried by the rival parties into the pulpit, and occasioned such keen feeling that the king interposed to stop it. During the greater part of the reign of Anne South remained comparatively quiet, but in 1710 he ranked himself among the partisans of Sacheverell. He declined the see of Rochester and the deanery of Westminster in 17 13. He died on the 8th of July 17 16, and was buried in West- minster Abbey.

South had a vigorous style and his sermons were marked by homely and humorous appeal. His wit generally inclines towards sarcasm, and it was probably the knowledge of his quarrelsome temperament that prevented his promotion to a bishopric. He was noted for the extent of his charities. He published a large number of single sermons, and they appeared in a collected form in 1692 in six volumes, reaching a second edition in his lifetime in 1715. There have been several later issues; one in two volumes, with a memoir (Bohn, 1845). His Opera posthuma latina, including his will, his Latin poems, and his orations while public orator, with memoirs of his life, appeared in 1717. An edition of his works in 7 vols, was published at Oxford in 1823, another in 5 vols, in 1842. See also W. C. Lake, Classic Preachers of the English Church (1st series, 1877). The contemporary notice of South by Anthony Wood in his Aihenae is strongly hostile, said to be due to a jest made by South at Wood's expense.

SOUTH AFRICA. As a geographical unit South Africa is usually held to be that part of the continent south of the middle course of the Zambezi. The present article (1) deals with that part of Africa as a whole, (2) outlines the constitution of the British possessions forming the Union of South

Africa, and (3) summarizes the history of the country from the time of its discovery by Europeans.

I. — General Features

In the geographical sense stated South Africa lies between 16° and 35° S. and 12 and 36 E., narrows from 1600 m. from west to east along its northern border to some 600 m. of coast facing south. Its greatest length south-west to north-east is also about 1600 m. It has an area of about 1,333,000 sq. m. It comprises the Union of South Africa (i.e. the provinces of the Cape of Good Hope, Natal, with Zululand, the Orange Free State and the Transvaal) ; Basutoland, Bechuanaland, Swazi- land and Southern Rhodesia, all British possessions; German South-West Africa, and the southern part of Portuguese East Africa. By some writers Northern Rhodesia is included in South Africa, but that district belongs more accurately to the central portion of the continent. Other writers confine the term to the British possessions south of the Zambezi, but in this case British South Africa is the proper designation. South African standard time, adopted in 1903, is that of 30 E., or two hours in advance of Greenwich.

Physical Features. — There is a marked uniformity in physical features throughout South Africa. The coast line, from the mouth of the Kunene on the west to the delta of the Zambezi on the east, is little indented and contains only two sheltered natural harbours of any size — Saldanha Bay on the west and Delagoa Bay on the east. At Port Natal, however, the removal of the sand bar at its entrance has made available a third magnificent harbour, while at Table Bay (Cape Town) and at other places ports have been constructed. South Africa presents, however, a solid land mass without peninsulas of any size or any large islands off its coasts. Moreover, behind the low-lying coast- lands, which extend in general from 50 to 250 m. inland, rise ramparts of hills shutting off the interior. This conforma- tion of the country has been a powerful influence in determining its history and development. Here and there the mountains,

which run in lines parallel to the coast, approach close to the sea, as at Table Bay. In the south-east, in the Drakensberg, they attain heights of 10,000 to 11,000 ft., elsewhere the highest points are between 8000 and 9000 ft. They form terrace-like steps leading to a vast tableland (covering about 900,000 sq. m.) with a mean elevation of 4000 ft., the highest part

of the plateau — the High Veld of the Transvaal — being fully 6000 ft. above the sea. In its southern part the plateau has a general tilt to the west, in the north it tilts eastward. This tilt determines the hydrographical system. In the south the drainage is to the Atlantic, chiefly through the Orange River, in the north to the Indian Ocean through the Zambezi, Limpopo and other streams. A large number of smaller rivers rise on the outer slopes of the mounta ; n ramparts and flow direct to the sea. In consequence of their great slope and the intermittent supply of water the rivers — except the Zambezi — are unnavigable save for a few miles from their mouths. The central part of the interior plateau, covering some 120,000 sq. m., is arid and is known as the Kalahari Desert. The western region, both plateau and coastlands, specially that part north of the Orange, is largely semi or wholly desert, while in the Cape province the terrace lands below the interior plateau are likewise arid, as is signified by their Hottentot name karusa (Karroo). The southern and eastern coastlands, owing to different climatic conditions (see infra) are very fertile.

The geological structure is remarkably uniform, the plateau consisting mainly of sedimentary deposits resting on crystalline rocks. The Karroo system (sandstones and marls) covers immense areas (see Africa, § Geology). Intrusive dikes — locally known as ironstone — by preventing erosion are often the cause of the flat-topped hills which are a common feature of the landscape. The Witwatersrand series of the Transvaal includes auriferous conglomerates which have been worked since 1886 and constitute the richest gold-mines in the world. The diamondiferous areas at Kimberley and in the Pretoria district are likewise the richest known. Coal beds are widely distributed in the eastern districts while there are large copper deposits in the west, both at the Cape and in German territory.

Climate. — The general characteristics of the climate are determined more by the physical conformation of the land than its proximity to the equator. The eastern escarpments (the Drakensberg, &c.) of the plateau intercept the rain-bearing winds from the Indian Ocean, so that over the greater part of the interior the rainfall is slight (5 to 24 in.). This, added to the elevation of the land, makes the climate in general dry, bracing and suitable for Europeans, not- withstanding that the northern part is within the tropics. Tem- perature is high, the mean yearly average lying between 60° and 70 F. Only along the south-eastern coast and in some of the river valleys is the climate of a markedly tropical character; here the rainfall rises to 50 in. a year and the coast is washed by the warm Mozambique current. The Cape peninsula and the western coast receive the cold currents from the Antarctic regions. Except in southern and western Cape Colony and along the Atlantic coast, summer is the rainy season.

Flora and Fauna. — In consequence of the deficient rainfall over the greater part of the country the flora is not luxuriant and there are no large forests. Coarse grasses are the characteristic vegetation of the tableland. On the plains where grasses cannot find sufficient moisture their place is taken by " bush," composed mainly of stunted mimosas, acacias, euphorbia, wild pomegranate, bitter aloes and herbaceous plants. Forest patches are found in the kloofs and seaward sides of the mountains; willows often border the water- courses; heaths and bulbous plants are common in some areas. In the semi-tropical regions south-east of the Drakensberg, i.e. the coastlands of Natal and Portuguese East Africa, the vegetation is abundant, and mangroves, palms, baobab and bombax trees flourish. Here, and also in the upper Limpopo valley, cotton, tobacco, and rubber vines are found. Among the timber trees are species of pine, cedar, ebony, ironwood, stinkwood and sneezewood. Flower- ing plants include numerous species of terrestrial orchids, the so- called arum lily {Richardia Africana), common in low-lying moist land, and the white everlasting flower, found abundantly in some regions of Cape Colony. Of non-indigenous flora are the oak, poplar,

bluegum, the Australian wattle, the vine, and almost every variety of fruit tree and European vegetables. In suitable regions tea, coffee, sugar and rice, as well as tobacco and cotton, are cultivated. In the western districts of the Cape viticulture is largely followed. The cereal most grown is maize (known in South Africa as mealies) ; kaffir corn, wheat, barley and oats are also largely cultivated. The

soil is everywhere rich, but the lack of perennial water and the absence of irrigation works on a large scale retards agriculture. Most of the veld is divided into huge farms devoted to the rearing of cattle, sheep, goats and horses. On the Karroo are numerous ostrich farms. Lucerne is very largely grown as fodder for the cattle.

The native fauna was formerly very rich in big game, a fact sufficiently testified by the names given by the early European settlers to mountains and streams. The lion, elephant, rhinoceros, hippopotamus, giraffe, buffalo, quagga, zebra and other large animals were, however, during the 18th and 19th centuries driven out of the more southern regions (though a few elephants and buffaloes, now carefully preserved, are still found at the Cape), the quagga being totally exterminated. In the Kalahari and in the eastern lowlands (from Zululand to the Zambezi delta) most of these animals are still found, as well as the eland, wildebeest and gemsbok. The leopard (called a tiger in South Africa) is still fairly common in all mountainous regions. Spotted hyenas and jackals are also numerous. The kudu is now the most common of the larger ante- lopes, the duiker and klipspringer are among the smaller antelopes still existing in large numbers. Baboons are common in some districts. Birds include the ostrich, great kori bustard, the eagle, vulture, hawk and crane, francolin, golden cuckoo, loorie, scarlet and yellow finches, kingfishers, parrots (in the eastern regions), pelicans and flamingoes. There are thirty varieties of snakes. Locusts are conspicuous among the common plagues of the country. In Rhodesia and on the east coast the tsetse fly is found and termites are widely distributed.

Inhabitants. — The aborigines of South Africa are represented by the Bushmen and Hottentots, now found in any racial purity only in the Kalahari and in the southern part of German South-West Africa. All the other natives, popularly called Kaffirs, are members of the Bantu-negroid family, of whom they here form three distinct branches: (1) the Zulu-Xosas, origin- ally confined to the south-east seaboard between Delagoa Bay and the Great Fish River, but later (19th century) spread by conquest over Gazaland, parts of the Transvaal, and Rhodesia (Matabeleland), (2) the Bechuanas, with the kindred Basutos, on the continental plateau from the Orange to the Zambezi, and ranging westwards over the Kalahari desert and the Lake Ngami region; (3) the Ova-Herero and Ova-Mpo, confined to

German South-West Africa between Walfish Bay and the Kunene River.

All these mixed Bantu peoples are immigrants at various periods from beyond the Zambezi. The Bechuanas, who occupy by far the largest domain, and preserve the totemic tribal system, were probably the first arrivals from the north or the north-sea coastlands. As early, probably, as the 8th century a.d. Arabs had formed a settlement on the coast at Sofala, 130 m. south of the mouth of the Zambezi, but they got no further south nor do they appear to have penetrated inland, though they traded for gold and other articles with the inhabitants of the northern part of the plateau — the builders of the zimbabwes and other ruins in what is now Rhodesia (q.v.) The Asiatic inhabitants of South Africa of the present day are mainly Indian

Population (1904).

Area in sq. m.

White.

Coloured.

Total.

British South Africa :

aj

‘ Cape of Good

ˆ.y

Hope .

276,995

579,741

1,830,063

2,409.804

o’C

Natal (with

§ < -

Zululand)

35.371

97,109

1,011,645

1,108,754

'S-S

Orange Free

►3 3 O

State . . .

50,392

142,679

244,636

387,315

in

Transvaal .

111,196

297,277

972,674

1,269,951

Southern Rhodesia .

H8,575

12,623

600, ooo 1

612,623

Basutoland

10,293

895

347,95?

348,848

Bechuanaland Pro-

tectorate. .

225.000 1

1,004

119,772

120,776

Swaziland.

Total British . .

6,536

898

84,586

85,484

864,358

1,132,226

5,211,329

6,343,555

German S.W. Africa .

322,450

7,1 IO 2

200, ooo 1

207,110

Portuguese East Africa

(southern part of)

145,00c 1

IO.OOO 1

1, 700, ooo 1

1,710,000

To

tal South Africa

1,331,808

1,149,336

7,111,329

8,260,665

Estimates.

1907.

coolies brought to Natal since i860. The white races represented are mainly Dutch and British; colonization by European races dating from the 17th century. There are a few thousand Germans and Portuguese, chiefly in the territories belonging to their respective countries. The table on p. 464 shows the inhabitants, white and coloured, in the different territories into which South Africa is divided, and also the area of these territories.

It will be seen that the population is sparse, less than 6J persons per square mile. (Excluding the Bechuanaland Protectorate and German South-West Africa, which contain very large desert areas, the population is slightly over

7 per square mile.) In British South Africa the coloured races are nearly five times as numerous as the whites. The great majority of the coloured inhabitants are Bantus of pure blood, but the total coloured population includes in the Cape province 298,334 persons of mixed blood (chiefly white and Hot- tentot) and in Natal 100,918 Asiatics. Save in the German colony the official returns do not discriminate between the nationality of the white inhabitants. Those of British and Dutch origin are probably about equal in numbers, but a very large proportion of the British inhabitants live in the towns, the country population being in most districts predominantly Dutch. The chief cities are Cape Town (pop. 1904, 77,668), Port Elizabeth (32,959), East London (25,220) and Kimberley (34,331) in the Cape province; Durban (67,847) in Natal; Johannesburg (155,642) and Pretoria (36,839) in the Transvaal ; and Bloemfontein (33,883) in the Orange Free State. Salisbury and Buluwayo are the chief towns in Southern Rhodesia. The only town of any size outside the British possession is Lourenco Marques (Pop. 1907, 9849) in Delagoa Bay.*

Economic Condition. — Originally regarded by Europeans merely as a convenient dep6t for ships on their way to India, the wealth of South Africa for long consisted in its agricultural and pastoral resources. Mealies and wheat were the principal crops. Wool, mohair and ostrich feathers were the chief exports, the only mineral exported being copper (from the Namaqualand mines). The open ing up of the diamond mines at Kimberley (1870) followed (1886) by the discovery of the Witwatersrand goldfields completely revolutionized the economic situation and profoundly modified the history of the country. They led, among other things, to the improvement of ports and the building of railways, so that by the close of the first decade of the 20th century the reproach of in- accessibility from which South Africa had suffered was no longer true. From the seaports of Cape Town, Port Elizabeth, East London, Durban, Lourenco Marques and Beira railway lines run to Kimberley, Bloemfontein, Johannesburg and Pretoria, while a trunk line extends north from Kimberley through Rhodesia (in which gold mining began on an extensive scale in 1898) and across the Zambezi below the Victoria Falls into the Congo basin, where it serves the Katanga mineral area. The distance from Cape Town to Katanga is over 2100 miles. The German territory is also pro- vided with railways, intended eventually to link with the British systems. The standard gauge is 3 ft. 6 in. and in 1910 some 12,000 m. of railway were open. In nearly every instance the railways are state owned. While gold and diamond mining continue the greatest of South African industries other sources of wealth have been added. In the Cape, Natal and the Transvaal coal mining is largely developed ; in the Transvaal and the Cape tobacco is grown extensively; sugar, tea and other tropical and sub-tropical produce are largely cultivated in Natal and the Portuguese territory, and, since 1905,

mealies have become an important article of export. There are few manufactures; among the chief are the making of wine and brandy in the Cape province, and flour-milling. Cattle and mealies constitute the most valuable possessions of the natives. The imports are of a general nature, textiles and food-stuffs being the most important.

Irrigation. — The scanty rainfall in many parts of South Africa and its unequal distribution necessitates a system of artificial irrigation unless much of the land be allowed to remain uncultivated. But in many regions the soil is deficient in phosphates and nitrates, and large irrigation works can be profitable only in districts where the soil is exceptionally fertile. Before 1877 little was done to make use of the water resources of the country. In that year the Cape legislature provided for the constitution of irrigation boards. Later boring operations were undertaken by the government, and the advice of engineers acquainted with Egyptian and Indian irriga- tion works sought. A report was drawn up by Sir (then Mr) Wm. Willcocks in 1901 in which he estimated that there were in the Cape, Orange Free State and the Transvaal, 3,000,000 acres which could be brought under irrigation at a cost of about £30,000,000. The value of the land, in its arid condition almost nil, when irrigated he placed at some £100,000,000. None of the South African govern- ments was, however, then in a position to undertake large works. At the Cape the census of 1904 gave 415,688 acres as the area under irrigation, an increase of 105,827 acres since 1891. In the Robertson district a canal (completed in 1904) 21 m. long took off from the Breede River and fertilized a large area, with the result that Robert- son ranks as the second richest district in the province. Over the

Karroo and other arid regions some 10,000 boreholes had been sunk to depths varying from 50 to 500 ft., their yield being 60,000,000 gallons a year. The value of land under artesian well irrigation (e.g. in the Graaff Reinet district) has increased from 20s. to £200 per morgen. More important, however, are the supplies to be derived from the control of flood water, millions of cubic feet Of the best soil being annually washed into the sea. The Boer govern- ments had done little to promote irrigation, but during 1905-1907 a strong intercolonial commission investigated the subject as it affected the Transvaal and Orange Free State, and their final report, issued at Pretoria in 1908, contains full particulars as to the irrigation possibilities in those provinces. At least 350,000 acres in the Trans- vaal could be remuneratively irrigated, and a proportionally large area in the Orange province. In Natal an act of 1904 gave power to the government to forward irrigation schemes. Under that act the Winterton Irrigation Settlement (18,000 acres) was formed on the upper Tugela. In 1909 an irrigation congress representative of all the governments of British South Africa was held at Robertson, in the Cape province.

Commerce. — All the British states and territories are members of postal, telegraphic and customs unions. The customs are of a protective character, while there is a rebate on goods from Great Britain and British possessions 1 (see below, History). There is internal free trade throughout the Union of South Africa. The customs tariff in the Portuguese possessions is of a highly protective nature; goods coming from Portugal pay one-tenth of the dues levied on foreign goods. In German South-West Africa no discrimination is made as to the country of origin of imports.

A South African Customs Statistical Bureau, which deals with the external trade of British South Africa, 2 was established in July 1905. The statistics issued by the bureau showed a total volume of trade in 1905 of £72,910,000 made up as follows: Imports £29,859,000 (including £4,208,000 received through Portuguese ports) ; exports £43,050,000. Of this amount £25,644,000 was put as the value of raw gold exported, and £9,257,000 as the value of the diamonds shipped. Only £414,000 worth of goods was exported via Portuguese ports. For 1907 the figures were: Value of total trade £74,153,000; imports £25,920,000, exports £48,233,000. Goods valued at £4,036,377 received through Portuguese ports are included in the imports, and goods valued at £507,000 shipped at Portuguese ports in the exports. The value of raw gold exported in 1907 was £29,510,000, of diamonds £8,973,000. In 1908 the figures were: Total trade £70,093,000; imports £24,438,000 (including £4,641,000 via Portuguese ports); exports £45,655,000 (including £513,000 from Portuguese ports). The raw gold exported was worth £32,047,000 but the export of diamonds fell to £4,796,000. In 1909 the value of the imports into British South Africa was returned at £29,842,000; the value of the exports at £51,151,000.' Of the imports over £16,850,000 came from the United Kingdom, over £2,240,000 from Australia, £2,450,000 from Germany, and £2,195,000 from the United States. Of the exports raw gold was valued at £33,303,000, diamonds at £6,370,000, wool at £3,728,000 and ostrich feathers at £2,091,000. The value of the imports through Delagoa Bay and other Portuguese ports was £6,795,000, the exports from Portuguese ports were valued at slightly over £500,000. In the four years the imports from the United Kingdom were about 58 %, from other parts of the empire 13 %. Of the exports the United Kingdom took some 95 % ; a considerable quantity of South African produce, especially wool, shipped to England ultimately however finds its way to other countries. Next to Great Britain the countries doing most trafle with South Africa are Australia and New Zealand, Germany, the United States, Canada, Brazil, India, Belgium, Holland and France.

Religion.— The great majority of the white inhabitants are Protestants. Most of those of Dutch descent are members of the Dutch Reformed Church (Nederduitsch Hervormde Kerk), the state church of the early Cape

colonists, or of churches formed by dis T sentient members of the original church such as the Gereformeerde Kerk (the " Dopper " Church), a branch (introduced in 1858) of the Separatist Reformed Church of Holland. These churches are Calvinistic in doctrine and Presbyterian in organization. Until 1843 the Cape synod was controlled by government commissioners; it was then given power to regulate its own internal affairs. There are separate synods with independent authority for the congrega- tions of the Dutch Reformed Churches in the Cape, Orange Free State and Transvaal provinces. The Doppers (" roundheads ■") and other dissentient bodies have also separate synods. Besides these churches there are a number of Lutheran congregations among the Dutch speaking, population.

The South Africans of British descent are divided, mainly, into Anglicans, Wesleyans and Presbyterians. The Baptists and Con- gregationalists are smaller bodies. All form independent churches in communion with the mother churches in Great Britain. The oldest established is that of the Presbyterians. The Anglican

1 The total amount rebated in 1908 was £430,017.

2 Including North-West Rhodesia.

3 For the six months January to June 1910 the figures were; imports £14,770,000; exports £24,442,000.

organization dates from 1847. Being declared by judicial decision in 1863 a voluntary body, the Anglicans formed " The Church of the Province of South Africa." It is divided into the dioceses of Cape Town, Graham's Town, Maritzburg (Natal), Kaffraria, Bloem- fontein, Pretoria, Zululand, Mashonaland and Lebombo. The last-named diocese is that part of Portuguese East Africa south of the Sabi river ; the Mashonaland diocese includes the Portuguese territory between the Sabi and the Zambezi. German South-West Africa is not included in the Anglican organization. The metropoli- tan is the archbishop of Cape Town. The constitution of the church was drawn up at a provincial synod in 1870. It accepts the doctrines of the Church of England, but acknowledges none save its own ecclesiastical tribunals, or such other tribunal as may be accepted by the provincial synod — in other words it rejects the authority of the English privy council. Bishop Colenso of Natal and other Anglicans did not accept the authority of the provincial synod, regarding themselves as in all respects

members of the Church of England. This was, especially in Natal, the cause of prolonged controversy among the members of the Anglican community. By 1901, however, the majority of the " Church of England party were represented in the provincial synod. Nevertheless the tempor- alities of this party remained in the hands of curators and not in the possession of the provincial church. In 1910 the practical amalgamation of the two bodies was effected (see further Natal).

The Roman Catholics are a comparatively small body ; the majority of their adherents are found in the Cape and Natal. At the head of their organizations are vicars-apostolic for the Cape (eastern district), the Cape (western district), Natal, Orange River, Kimberley and the Transvaal, and prefects-apostolic for Basutoland and Zambezi (or Rhodesia).

*All the churches maintain missions to the natives. The first to enter the field were the Jesuits and Dominicans, who laboured on the south-east coast and among the subjects of the monomotapa (see Portuguese East Africa). Their work lasted from about 1560 to 1760, but it has left little trace. The early 7? ** °" modern missions were all Protestant. A Moravian a *' es " mission to the Hottentots was begun in 1737, continued to 1744 and was re-established — against the wishes of the colonists — in 1792. Before the close of the century the London Missionary Society entered the field. The work of this society's agents has had a greater influence on the history of South Africa than that of any other religious body save the Dutch Reformed Church. Next in order came the VVesleyans and the Glasgow Missionary Society (Presbyterian), the last-named society founding in 1824 the station of Lovedale — now the most important institution in South Africa in connexion with native missions. In 1829 the Paris Evangelical Society (whose agents have laboured chiefly in Basuto and Barotse lands) sent out their first missionaries, who were closely followed by the agents of other societies (see Missions). The Roman Catholics entered the field later on. By the end of the 19th century fully S % of the total native population professed Christianity.*

The Jews form a small but influential community. There are some thousands of Mahommedans in the Cape (chiefly Malays) and larger numbers in Natal, where there is also a large Hindu popula- tion. At Lourencp Marques the Chinese colony has its own temple and religious services.

Law. 1 — The basis of the common law of British South Africa is the Roman-Dutch law as it existed in Holland at the end of the 18th century. This was simply the old Roman jurisprudence embodied in the legislation of Justinian, modified by custom and legislative decrees during the course of the centuries which witnessed the growth of civilization in Europe; and it is

to all intents and purposes the jurisprudence which was the foundation of the Code Napoleon. It was in part closely akin to the " modern Roman law " which is practised widely over the con- tinent of Europe, and even in Scotland, at the present day. The authorities upon the common law in South Africa are: the Dutch commentators upon the civil law, the statute law of Holland, the decisions of the Dutch courts, and, failing these, the corpus juris civilis itself.

In the period which has elapsed since the establishment of British rule at the Cape the law has been considerably modified and altered, both by legislation and by judicial decisions, and it is not too much to say that at the present time there exists hardly any material difference in principle over the greater part of the field of jurisprudence between the law of England and the law of South Africa. The law of contracts, the law of torts, the mercantile law, the law relating to shipping and insurance, not to mention other subjects, are practically identical with those of England; and even the criminal law is virtually the

1 For the sections here incorporated on South African law and language we are indebted to the late J. W. Leonard, K.C. (d. 1909), twice attorney-general of Cape Colony.

same, though the greater elasticity of the civil jurisprudence allows fewer opportunities for the escape of malefactors, notably in cases of fraud or falsity in any form, than exist under the law of England. The constitution of the courts is based on the example of the English judiciary, and the rules of evidence and procedure are practically the same in both criminal and civil cases as in England. All serious cases of crime are tried before a judge and jury, with the same formalities and safeguards as in England, while minor offences are dealt with by stipendiary magistrates possessing a limited statutory jurisdiction. In criminal cases it is necessary for the jury to find a unanimous verdict. In civil cases either party may demand a jury, a privilege which is seldom exercised ; but in a civil case the verdict of the majority of jurors prevails.

The most marked difference between the English and South African systems of law is, as might be expected, to be found in the law relating to real property. In South Africa there is a rigid and universal application of the principle of registration. The title to land is registered, in all cases; and so, with a few exceptions, is every servitude or easement, mortgage or charge, upon land. With regard to the devolution of property upon death, it may be remarked that the law of intestate succession applies equally to real and personal estate, there being no law of primogeniture. The rules of distribution in intestacy differ, however, very considerably from those established in England. There is absolute freedom of testamentary

disposition in the Cape province and in some other parts of South Africa. The effect of marriage upon the property of the spouses is, by the Roman-Dutch law and in the absence of any ante-nuptial contract to the contrary, to bring about a complete community of property, virtually a universal partnership between husband and wife, subject to the sole and absolute control of the husband while the marriage lasts. The courts have, however, the right to interfere for the protection of the wife in case of any flagrant abuse of the power thus vested in the husband. Ante-nuptial agreements may be of any nature the parties may choose. Such agreements must in all cases be publicly registered. Upon the dissolution of a marriage in community of property, or in the event of a judicial separation a communione bonorum, the property of the spouses is divided as upon the liquidation of a partnership. It is not necessary here to refer particularly to certain exceptions to this general rule in cases of divorce.

By the common law gifts between husband and wife during marriage are void as against creditors. This rule cannot be evaded even by ante-nuptial agreement. By the statute law of Natal post-nuptial agreements between spouses are permitted under certain conditions, to which it is not possible now to refer at length. Divorce is granted to either spouse for either adultery or malicious desertion, the distinctions established by the English law between husband and wife in respect of divorce being disregarded.

Language. — The languages spoken in South Africa by the inhabitants of European descent are English and Dutch, the latter chiefly in the form of a patois colloquially known as the Taal. (German and Portuguese are spoken in the possessions of those countries, but a knowledge of English or Dutch is frequent even in those territories.) The history of the Dutch language in South Africa is intimately bound up with the history of the South African Dutch people. The basis of the language as spoken to-day is that 17th-century Dutch of Holland which the first settlers brought to the country; and although the Dutch of Holland and the Dutch of South Africa differ very widely to-day, Cape Dutch differs less widely from the Dutch language of the 17th century than from the modern Dutch of Holland. The tongue of the vast majority of the Dutch-speaking inhabitants may thus be said to be a degenerate dialect of the 17th-century Dutch of Holland, with a very limited vocabulary. The limiting of the vocabulary is due to two reasons. In the first place, the early settlers were drawn principally from the peasant class, being chiefly discharged soldiers and sailors; and, further, when once settled, the necessity for making the language in- telligible to the natives by whom the settlers were surrounded led

to a still further simplification of speech structure and curtail- ment of the vocabulary. There thus grew up an ungrammatical dialect of Dutch, suited only to the most ordinary requirements of the everyday life of a rural population. It became a lan- guage with neither a syntax nor a literature. At the same time it remained in character almost entirely Dutch, no French — in spite of the incorporation into the population of the Hugue- not emigrants — and only a few Malay words finding a place in the Taal. But side by side with this language of everyday life a purer form of Dutch has continued to exist and find its uses under certain conditions. It must be borne in mind that the Boers of every grade have always been more or less sedulously instructed in religious subjects, at all events to the extent required to fit them for formal membership of their church, and in all their wanderings they have usually been attended by their pastors. The Dutch Bible and Catechism are written in pure Dutch. The language of the Dutch Bible is as majestic as that of the English version. Moreover, the services of the Church have always been conducted in grammatical though simple Dutch; and the clergy, in their intercourse with the people, have as a general rule abstained from conversing in the ordinary dialect. The Boer thus has but slight difficulty in reading and understanding pure Dutch. Under the influence of Africander nationalism strenuous efforts have been made to teach the language in the schools throughout the greater part of South Africa. In the Transvaal and Orange Free State education was imparted almost exclusively in Dutch. All public business in the government offices and law courts was conducted in the language, and the Transvaal at the time of its annexation by Great Britain was being gradually inundated by officials, railway servants and others introduced from Holland, who spoke modern Dutch. Officially throughout the Union of South Africa both languages are now on a footing of equality.

Throughout South Africa a number of words, mainly Dutch, are in general use 'by the English-speaking inhabitants and also, to a considerable extent, among the natives. The most common of these words, with their English meanings, are here set forth. When not otherwise stated the words are of Dutch origin : —

Spruit

Assegai .

Boschveld .

Bywoners

Daal . . .

Dorp

Drilt . . .

Ervan (sing, erf)

Fontein .

Hoek . . .

Inspan

Kaffir . . .

Karroo .

Kloof . . .

Kop . . .

Kopje

Kraal . . . Krantz (or Kranz)

Nek

Poort

Rand

Ruggens

Slim . Sluit

a spear used by the Kaffir tribes; a word adopted from the Portuguese, but of Berber origin.

a plain or open stretch of country covered with thin wood or bush. Often written bushveld.

(literally witnesses) ” poor whites,” the name given by the Boers to the landless whites, hangers-on at farms, &c. valley, village.

ford (a ” Taal ” word), plots of land, fountain, spring.

corner, angle, hook. Common in place-names, to harness.

(Arabic for unbeliever [in Islam]) a native of Bantu stock ; more loosely any native. ‘ any arid district ; now the name of definite regions (from the Hottentot), fissure or crevice, hence a ravine or narrow valley.

(literally head) a hill, generally rounded. Flat-topped hills are usually called tafel (table) or plat (flat) bergs, a little hill ; the name given to the isolated pointed hills which are a characteristic feature of the plains of South Africa, an enclosure, hence a native village. Prob- ably from the Portuguese, an overhanging wall of rock, hence a steep cliff, a precipice. A ” Taal ” word derived from the Dutch krans, a wreath, chaplet or cornice.

literally neck) mountain passes or passes literally gate \ between mountains, border, edge, hence a low and usually round range of hills.

ridges, applied to undulating slopes or un- irrigated hilly country, cunning, clever, adroit. (Dutch shot) ditch, gutter, small stream.

Stoep

Trek

Veld

Vlei . .

Uitspan . Uitlander

(literally shoot, spruiten, to spring up), stream, small river. The name given to intermittent streams liable to sudden freshets, (literally a step), the name given to the plat- form or veranda of a house. The stoep is shaded by a roof and is a favourite rendez- vous for the household and for visitors. Formerly all South African houses had stoeps, but in the central parts of the larger towns the buildings are now without verandas, (literally, pull, tug, trekken, to draw or pull), to leave a place, to take a journey; also the distance covered in a journey, field. The name given to open plains and to the grass-covered plateaus of the interior, a hollow filled with water during rainy weather, to unharness, outlander, i.e. a foreigner. Among other Dutch words frequently used in place-names may be instanced: rhenoster (rhinoceros) olifant (elephant), mooi (pretty), modder (mud), klip (cliff), berg (mountain), burg or stad (town), zwart (black), klein (little), groote (great), breede (broad), nieuw (new), zuur (sour), bokke (buck).

A number of Dutch weights and measures are also in general use. They include: muid =3 bushels; morgen =2-11654 acres. A Cape rood equals 12-396 English feet, and a Cape ton contains 2000 lb.

II. — Constitution or the Union of South Africa In accordance with the provisions of an act of the British Parliament (South Africa Act 1909) Cape Colony, Natal, the Transvaal and Orange River colonies were united under one government in a legislative union under the British crown. The Union of South Africa, as the new state is named, was established on the 31st of May 1910. Upon its formation the colonies named became provinces of the Union. In the case of the Orange River colony its title was changed to Orange Free State province. The colonial legislatures were abolished, provincial councils, with strictly subordinate and delegated powers, were set up, and provincial administrators (local men) replaced the various governors. The history of the movement which led to unification is given in the following section. The main provisions of the constitution 1 are as follows: —

The executive government of the Union is vested in the king and may be exercised by the sovereign in person. It is, however, administered by a governor-general, who holds office _. during the king's pleasure. The governor-general Kxecatlve can dismiss ministers and dissolve parliament. He is empowered to dissolve both houses of the legislature simultaneously or the House of Assembly alone. He can perform no official act when beyond the territorial limits of the Union, but he can appoint a deputy to act for him during temporary absences. The governor- general is paid £10,000 a year out of the consolidated funds of the Union. He is advised by an executive council, whose members he nominates. The council must include the ministers of state; ministers administering departments of state may not exceed ten in number. Ministers cannot hold office for a longer period than three months unless they are or become members of either house of parliament. The control and administration of native affairs (which before the Union was, except at the Cape, largely in the hands of the colonial governors personally) is vested exclusively in the governor in council and to the same authority is entrusted all matters specially or differentially affecting Asiatics throughout the Union.

The legislative power is vested in a parliament consisting of the Sovereign, a Senate, and a House of Assembly. The Senate consists of 40 members, 8 representatives from each province, and 8 members nominated by the governor-general in council. Four of the nominated members are selected on the ground mainly of their thorough acquaintance with " the reasonable wants and wishes " of the coloured races in South Africa. The presence of both nominated and elected members in the Senate is a novel provision in the con- stitution of the upper chambers of British colonial legislatures. The senators chosen in 1910 hold office for ten years. After 1920 the Union parliament may make any alteration it sees Tbe fit in the constitution of the senate. A senator must legislature. be a British subject of European descent, must be thirty years old. be a parliamentary voter in one of the provinces,

have lived for five years in the Union, and if an elected member be possessed of immovable property within the Union of the clear value of £500.

1 For a detailed examination of the constitution and a comparison of it with the federal constitutions of Canada and Australia see " South African Union," by A. Berriedale Keith, in the Journ. Soc. Comp. Legislation for October 1909.

[HISTORY

The House of Assembly consists (as originally constituted) of 121 members, elected by single-membered constituencies, each con- stituency containing as nearly as possible the same number of voters. Of these members the Cape Province returns 51, the Transvaal 36, and Natal and Orange Free State 17 each. As population increases the total number of members may be raised to 150. The seats allotted to each province are determined by its number of European male adults as ascertained by a quinquennial census, the quota for a constituency being obtained by dividing the total number of such adults in the Union as ascertained at the 1 904 census by the number of members at the establishment of the Union. The commission charged with the delimitation of constituencies is permitted to vary the quota as much as 15 % either way. Members of the House of Assembly must, like senators, be British subjects of European descent, they must be qualified to be registered as voters and have lived for five years within the Union. A general election must take place every five years, and all polls must be taken on the same day. There must be a session of parliament every year, so arranged that twelve months shall not elapse between the last day of one session and the first sitting of the next session. The qualifications of parliamentary voters are those which existed in the several colonies at the establishment of the Union, save that "no member of His Majesty's regular forces on full pay" can be registered as a voter. As the franchise laws in the several colonies differed the qualifications of voters in the provinces differ also. In the Transvaal and Orange Free State provinces the franchise is restricted to white adult male British subjects. In neither province is there any property qualification, but a six months' residence before registration is required. In Natal (g.v.) there is a low property qualification. In that province coloured persons are not by name debarred from the franchise, but they are in practice excluded. _ In the Cape province, where there is also a low property qualification, no colour bar exists and there are a large number of Kaffir voters (see Cape Colony:

Constitution). Parliament may alter the qualifica- tions for the vote, but no law which would deprive coloured persons in the Cape province of the franchise can be effective " unless the bill be passed by both houses of parliament sitting together and at the third reading be agreed to by not less than two-thirds of the total number of members of both houses."

Save as subject, ultimately, to the British parliament the Union parliament is a sovereign body. The provinces have no original authority, possessing only such powers as are delegated to them by the parliament. In certain cases the governor-general must reserve the royal assent to bills, e.g. any bill abolishing the coloured vote in the Cape province. The king is given the power to disallow any law within a year of it having received the assent of the governor- general.

With regard to bills the two houses are not in a position of equality. Bills appropriating revenue or moneys, or imposing taxation, must originate in the House of Assembly and may not be amended by the Senate. If a bill passed by the Assembly has been twice rejected by the Senate, provision is made for a joint sitting of both houses, when members vote and decide upon the measure concerned as one body. In the case of a money bill rejected by the Senate a joint sitting to decide its fate may be held in the same session in which the Senate has failed to pass the bill. Every minister of state may sit and speak in either house, but can vote only in the house of which he is a member. Re-election is not necessary on the appointment of a member as a minister of state. Members of parliament are paid £400 a year, £3 being deducted from this allowance for every day's absence during the session.

A Supreme Court of Judicature for South Africa was created at the establishment of the Union. The former Supreme, High and ~ Circuit Courts of the several colonies then became

Judicature provincial and local divisions of the Supreme Court of South Africa, which consists of two divisions, namely the Supreme Court and the Appellate Division. Appeals from the decisions of the provincial and local divisions of the court and from those of the High Court of southern Rhodesia, must be made to the appellate division of the Supreme Court. Unless special leave of the privy council be obtained there can be no appeal from the deci- sions of the Appellate Division, save in admiralty cases. This restriction of the power of appeal to the privy council is much greater than are the restrictions upon appeals from the Commonwealth of Australia, where appeals to the privy council lie by right from the several state Supreme Courts. The difference arises from the fact that the Commonwealth is a federation of states; whereas the Union of South Africa is but one state with but one Supreme Court. One result of this unification

of the courts of South Africa is that any provincial or local division of the Supreme Court in which an action is begun can order its transference to another division it that course be deemed more convenient. Moreover the judgments of each provincial division can be registered and enforced in any other division. The administration of justice throughout the Union is vested in a minister of state who has all the powers of the attorney- generals of the several colonies at the time of the Union, save that power as to the prosecution of crimes is vested in each province in an official appointed by the governor-general in council and styled the attorney-general of the province.

Among the general provisions of the constitution the most im-

portant is that both the English and Dutch languages are official languages of the Union and are treated on a footing of equality ; all records of parliament, and all notices of general public Q eneTa i importance or interest issued by the government of provisions, the Union must be in both languages. (Persons in the public service at the establishment of the Union cannot, however, be dispensed with because of lack of knowledge of either English or Dutch.) Other general provisions enact free trade throughout the Union, but the customs and excise leviable under the laws existing in any of the colonies at the establishment of Union remain in force unless parliament otherwise provides. All persons who had been naturalized in any of the colonies are naturalized throughout the Union. All rights and obligations under conventions and agreements which were binding on any of the colonies have devolved upon the Union.

The harbours of Cape Town, Port Elizabeth, East London and Durban are state owned, as are also nearly all the railways in the Union. All revenues derived from these services are paid into a separate fund. The administration of the railways, ports and har- bours is entrusted to a board of not more than three commissioners (appointed by the governor-general in council) presided over by a minister of state. Each commissioner holds office for five years and may be reappointed. The board is directed to administer its service on business principles, due regard being had to agricultural and industrial development, &c, within the Union. So far as may be the total earnings are not to be more than are sufficient to meet necessary outlays.

Provincial Administration. — While the Union parliament has full power to make laws for the whole of the Union, to provincial councils have been delegated the immediate control of affairs relating solely to the provinces. The subjects delegated to the councils include direct taxation within the provinces for local revenue purooses, the borrowing of money (on the sole credit of the provinces) with the consent of the ministry; agri- culture

(within the limits defined by parliament) and municipal institutions, divisional councils, and other local institutions. The control of elementary education was also guaranteed to the provincial councils up to 191 5, and thereafter until parliament otherwise provides.

The councils consist of not fewer than 25 members and not more than the number of members returned by the province to the House of Assembly. Each councillor represents a separate constituency, these constituencies, as far as possible, to be the same as the parlia- mentary constituencies. (In the Cape and Transvaal provinces they were the same in 1910; Natal and Orange Free State returning only 17 members to the House of Assembly, the parliamentary constituencies have been rearranged.) The qualifications for electors are the same as for parliament, and any person qualified to vote is qualified to be a member of the council. As in the Cape province coloured persons are qualified to vote, they are thus also qualified to be members of the provincial council. Any member of the provincial council who becomes a member of either House of Parliament thereupon ceases to be a member of such provincial council. Each provincial council continues for three years from the date of its first meeting and is not subject to dissolution save by effluxion of time.

The executive power in each province is invested in an officer appointed by the government and styled provincial administrator. He holds office for five years. The administrator is assisted by an executive committee of four persons elected from among its own members, or otherwise, by the provincial council on the proportional representation principle. The administrator and any other member of the executive committee, not being a member of the council, has the right to take part in the proceedings of the council, but has not the right to vote. The provincial councils have not the right to make laws, but ordinances, which must receive the assent of the governor-general in council before becoming valid. (F. R. C.)

III. — History The history of South Africa is, almost entirely, that of its colonization by European races, of their conflicts with, and influence over, its native inhabitants, and of the struggle for supremacy between the British and Dutch settlers. The little that is known concerning the doings of the natives before the appearance of the white man belongs to the domain of ethnology rather than of history. When the Portuguese first reached the southern part of Africa there was but one place in it where a civilized race held sway. This was at Sofala, the most southerly post of the East African Arabs. From that port the Arabs traded for ivory, slaves and (principally) gold with Bantu peoples of the far interior — the Rhodesia of to-day. These natives, whose earliest existing buildings may go back to the time of the Norman Conquest, were in a higher state of

development than the Bushmen and Hottentots living farther south. The part played by the various native races in modifying the character of the European colonization will be best considered as they successively came into contact with the white settlers. At this point it is only necessary to state that at the same time as the Europeans were slowly extending northward from the south-western point of the continent, a conquering race of Bantu negro stock, originating from somewhere beyond the Zambezi, was spreading southward along the western side of the country.

A. From the Discovery of the Cape to the Great Trek. — What led to the discovery of America led also to the discovery, exploita- tion and colonization of South Africa. In the 15th century the great Eastern trade with Europe was carried on by the Venetian Republic — Venice was the gate from West to East, and her fleets, richly laden with goods brought down to the shores of the Mediterranean in caravans, supplied Europe with the luxuries cf the Orient. It was in that century that Portugal rose to prominence as a maritime power; and being anxious to enjoy at first hand some of the commerce which had brought such prosperity to Venice, Portugal determined to seek out an ocean pathway to the Indies. It was with this intention that Bar- tholomew Diaz, sailing southwards, discovered the Cape of Good Hope in 1488. 1 Nine years after the discovery of the Cape by Diaz another Portuguese expedition was fitted out under Vasco da Gama. Da Gama entered Table Bay, but did not land. Thence he pushed on round the coast, landed in Mossel Bay, then sailing up the south-east coast he sighted land again on the 25th of December 1497, and named it in honour of the day, Natal. Still proceeding northwards he entered the Quilimane River and eventually reached India.

For many years subsequent to this date South Africa repre- sented merely an inconvenient promontory to be rounded on the voyage to the Indies. Ships stopped at different ports, or rather at such few natural harbours as the inhospitable coast offered, from time to time, but no attempt was made by the Portuguese to colonize the southern end of the continent. On the west coast their southernmost settlement for a long period was • Benguella, and the history of Angola (q.v.) had not until the last quarter of the 19th century any close connexion with that of South Africa. On the east coast the Portuguese were masters of Sofala by 1506, and a trading-post was first established in Delagoa Bay in 1545. Here alone Portugal obtained an impor- tant foothold in South Africa. But between Benguella on the west

and Lourengo Marques on the east the Portuguese made no attempt to form permanent settlements or trading stations along the coast. It was too barren a shore to prove attractive when the riches of East Africa and India were available.

The first Europeans to follow in the wake of the Portuguese voyagers were the English. In 1601 the English East India English Company fitted out a fleet of five vessels, which

East India sailed from Torbay. After four months at sea they Company. dropped their anchors in Table Bay, where they remained for seven weeks before proceeding eastwards. From that time forward Table Bay was used as an occasional port of call for British ships, and in 1620 two English captains formally took possession of the Cape in the name of James I. This patriotic act was not, however, sufficiently appreciated by either King James I. or the English East India Company to evoke any official confirmation on their part. Meanwhile the Dutch East India Company had been formed in Holland, and the Dutch had entered keenly into the competition for the glittering prizes of Eastern commerce. In 1648 one of their ships was stranded in Table Bay, and the shipwrecked crew were left to forage for themselves on shore for several months. They were so pleased with the resources of the country that on their return to Holland they represented to the directors of the company the great advantages that would accrue to the Dutch Eastern trade from a properly provided and fortified station of call at the Cape. The result was that in 1652 a fort and vegetable

1 The date usually assigned (i486), on the authority of De Barros, has been snown to be incorrect (see Diaz).

gardens were laid out at Table Bay by a Dutch expedition sent for the purpose under a surgeon named Jan van Riebeek.

In 1657 a few soldiers and sailors, discharged by the Dutch East India Company, had farms allotted them, and these men constituted the first so-called " free burghers." Dutch East By this step the station became a plantation or India settlement. More settlers were landed from time to Company. time, including a number of orphan girls from Amsterdam, and during 1 688-1 689 the colony was greatly strengthened by the arrival of some three hundred Huguenots (men, women and children), who were located at Stellenbosch, Drakenstein, Frenchhoek and Paarl. In process of time the French settlers were absorbed in the Dutch population, but they have had an enduring influence on the character of the people. The little settlement gradually spread eastwards, and in 1 7 54 the country as far as Algoa Bay was included in the colony. At this time the white colonists

numbered eight to ten thousand. They possessed numerous slaves, grew wheat in sufficient quantity to make it an article of export, and were famed for the good quality of their wines. But their chief wealth was in cattle. Such prosperity as they enjoyed was in despite of the system of government prevailing. All through the latter half of the 17th and the whole of the 18th century troubles arose from time to time between the colonists and the government. The adminis- tration of the Dutch East India Company was of an extremely despotic character. The most complete account of the com- pany's tenure and government of the Cape was written in 1857 by E. B. Watermeyer, a Cape colonist of Dutch descent resid- ing in Cape Town. He points out that it was after failing to find a route by the north-east to China and Japan that the Dutch turned their eyes to the Cape route. The Cape of Good Hope subsequently " became not a colony of the Republic of the United Provinces, but a dependency of the ' Nether- lands Chartered General East India Company ' for mercantile purposes; and to this fact principally can be traced the slow progress, in all but extension of territory, of a country which was settled by Europeans within thirty years of the time when the Pilgrim Fathers, the founders of a mighty empire, landed at Plymouth to plant democratic institutions and European civilization in the West."

On the settlement under van Riebeek, and the position in it which the so-called " free burghers " enjoyed, this candid Dutch writer throws an interesting light.

" The people," he says, " who came here with Riebeek himself were not colonists intending permanently to settle at the Cape. . . . The proposition that any freemen or burghers not in the pay of the company should be encouraged to cultivate the ground was first made about three years after Riebeek's arrival. Accordingly, some discharged sailors and soldiers, who received on certain condi- tions plots of ground extending from the Fresh River to the Liesbeek, were the first free burghers of the colony. . . . Here it is sufficient to say that, generally, the term ' free burgher ' was a complete misnomer. The first burghers were, in truth, a mere change from paid to unpaid servants of the company. They thought, in obtaining their discharge, that they had much improved their condition, but they soon discovered the reverse to be the fact. And henceforward, to the end of the last [18th] century we fird the constantly repeated and well-founded complaint, that the company and its officers possessed every advantage, while the freemen were not allowed even the fruit of their own toil. . . . The natural effect of this narrow and tyrannous rule was discontent, amounting often to disaffection. After a time every endeavour was made to escape beyond the immediate control of the authorities. Thus the ' trek- king ' system, with its attendant evils, the bane of South Africa, was born. By their illiberal spirit, which sought but temporary commercial advantage in connexion with the

Eastern trade, the Dutch authorities themselves, although generally humanely disposed towards the natives, created the system which caused their oppres- sion and extermination."

When it is borne in mind that the Dutch at the Cape were for one hundred and forty-three years under the rule of the Dutch East India Company, the importance of a correct appre- ciation of the nature of that rule to any student of South African history is obvious. No modern writer approaches Watermeyer either in the completeness of his facts or the severity of his indictment. Referring to the policy of the company, Watermeyer says: —

The Dutch colonial system as exemplified at the Cape of Good Hope, or rather the system of the Dutch East India Company (for the nation should not wholly suffer under the condemnation justly incurred by a trading association that sought only pecuniary profit), was almost without one redeeming feature, and was a dis- honour to the Netherlands' national name. In all things political it was purely despotic ; in all things commercial, it was purely monopolist. The Dutch East India Company cared nought for the progress of the colony — provided only that they had a refresh- ment station for their richly laden fleets, and that the English, French, Danes and Portuguese had not." Whatever tended to infringe in the slightest degree on their darling monopoly was visited with the severest penalties, whether the culprit chanced to be high in rank or low. An instance of this, ludicrous while grossly tyrannical, is preserved in the records. Commander van Quaelbergen, the third of the Dutch governors of the colony, was dismissed from the government in 1667, and expelled the service of the company, because he had interchanged civilities with a French governor bound eastwards, the United Provinces being then at peace with France. 1

Of this nature was the foreign policy of the Dutch company at the Cape of Good Hope; modified, indeed, in some degree from time to time, but governed by principles of jealous, stringent monopoly until the surrender of the colony by Commissioner Sluysken in 1795. The internal government of the colonists for the entire duration of the East India Company's rule was always tyrannical, often oppressive in the extreme. With proclamations, placaats and statutes abundantly filling huge tomes, the caprice of the governor was in truth the law. A mockery of popular institutions, under the name of a burgher council, indeed existed; but this was a mere delusion,

and must not be confounded with the system of local government by means of district burgher councils which that most able man, Commissioner de Mist, sought to establish during the brief government of the Batavian Republic from 1803 to 1806, when the Dutch nation, convinced and ashamed of the false policy by which they had permitted a mere money-making association to disgrace the Batavian name, and to entail degradation on what might have been a free and prosperous colony, sought to redeem their error by making this country a national colonial possession, instead of a slavish property, to be neglected, oppressed or ruined, as the caprice or avarice of its merchant owners might dictate.

From time to time servants in the direct employment of the company were endowed with the right of " freeburghers,"

but the company retained the power to compel them Boers. t0 return mt o i ts service whenever they deemed it

necessary. This right to enforce into servitude those who might incur the displeasure of the governor or other high officers was not only exercised with reference to the individuals themselves who had received this conditional freedom; it was, adds Watermeyer, claimed by the government to be ap- plicable likewise to the children of all such. The effect of this tyranny was inevitable: it drove men to desperation. They fled from oppression; and thus trekking began, not in 1835, as is gen- erally stated, but before 1700. From 1720 to 1780 trekking had gone steadily forwards. In 1780 van Plettenberg, the governor, proclaimed the Sneeuwbergen the northern boundary of the colony, expressing " the anxious hope that no more extension should take place, and with heavy penalties forbidding the rambling peasants to wander beyond." In 1789 so strong had feeling amongst the burghers become that delegates were sent from the Cape to interview the authorities at Amsterdam. After this deputation some nominal reforms were granted; but in 1795 a number of burghers settled in the Swellendam and Graaf Reinet districts drove out the officials of the company and established independent governments. The rebellion was accompanied by an assertion of rights on the part of the burghers or freemen, which contained the following clause, the spirit of which animated many of the Trek Boers: —

That every Bushman or Hottentot, male or female, whether made prisoner by commanders or caught by individuals, as well in time past as in future, shall for life be the lawful property of such burghers as may possess them, and serve in bondage from generation to generation. And if such Hottentots should escape, the owner shall be entitled to follow them up and to punish them, according to their merits in his discretion.

1 It was not until the time of Ryk Tulbagh (governor of the colony, 'yS 1-1 /? 1) that the Chamber of Seventeen permitted foreign ships to provision at Table Bay. Tulbagh was the most popular of the governors under the East India Company. During his governorship no new taxes were levied on the burghers. He was succeeded by van Plettenberg.

And as to the ordinary Hottentot, already in service, brought up at the places of Christians, the children of these shall be compelled to serve until their twenty-fifth year, and may not go into the service of any other save with their master's consent ; that no Hottentot, in future deserting his service shall be entitled to refuge or protection in any part of the colony, but that the authorities throughout the country shall immediately, whatever be the alleged cause of desertion, send back the fugitive to his master.

After one hundred and forty-three years the rule of the Dutch East India Company came to an end at the Cape. What its principles were we already have seen. Watermeyer recapitulates its effects as follows : —

The effects of this pseudo-colonization were that the Dutch, as a commercial nation, destroyed commerce. The most industrious race of Europe, they repressed industry. One of the freest states in the world, they encouraged a despotic misrule in which falsely-called free citizens were enslaved. These men, in their turn, became tyrants. Utter anarchy was the result. Some national feeling may have lingered, but, substantially, every man in the country, of every hue, was benefited when the incubus of the tyranny of the Dutch East India Company was removed.

To this one further note must be added. The Trek Boers of the 19th century were the lineal descendants of the Trek Boers of the 18th. What they had learnt of government from the Dutch East India Company they carried into the wilderness with them. The end of the 19th century saw a revival of this same tyrannical monopolist policy in the Transvaal. If Water- meyer's formula, " In all things political, purely despotic; in all things commercial, purely monopolist," was true of the govern- ment of the Dutch East India Company in the 18th century, it was equally true of Kruger's government in the latter part of the 19th.

The rule of the Dutch East India Company was extinguished (September 1795) by the occupation of the colony by the British, who acted on behalf of the prince of Orange, Holland having fallen under the control of the revolutionary government of France. Following the peace of Amiens the colony was handed over (February 1803) by Great Britain to a commissioner of the Batavian Republic. During the eight years the British held the Cape notable reforms in the government were effected, but the country remained essentially Dutch, and few British settlers ' were attracted

*to it. Its cost to the British exchequer during this period was £16,000,000. The Batavian Republic enter- tained very liberal views as to the administration of the country, but they had little opportunity for giving them effect. In less than three years (January 1806) the Cape was reconquered by the British, who were at war both with France and Holland. The occupation was at first of a provisional character, but by the third additional article to the convention with the Nether- lands of the 13th of August 1814 the country was definitely ceded to Great Britain. In consideration of retaining the Cape and the Dutch settlements now constituting British Guiana, Great Britain paid £6,000,000. The British gt tbe Ca * title to Cape Colony is thus based upon conquest, treaty and purchase. The wishes of the inhabitants were not consulted, and among them resentment was felt at the way in which their future was thus disposed of. The Europeans at the Cape at that time numbered about 27,000.*

*Before tracing the history of South Africa during the 19th century, the early relations of the white settlers with the natives may be briefly reviewed. The natives first encoun- Early Rela- tered at the Cape were the Hottentots (q.v.). They ticns with at that time occupied the Cape peninsula and sur- ** e Native rounding country, and in the early days of the aces ‘ settlement caused the colonists a considerable amount of trouble. An extract from the diary of van Riebeek in 1659 will best illustrate the nature of the relations existing between colonists and natives at that time: —*

3rd June. — Wet weather as before, to the prevention of our operations. Our people who are out against the plundering Hotten- tots, can effect nothing, neither can they effect anything against us ; thus during the whole week they have been vainly trying to get at our cattle, and we have been trying vainly to get at their persons: but we will hope that we may once fall in with them in fine weather, and that the Lord God will be with us.

Next to the Hottentots the white settlers encountered the Bushmen (q.v.). When first known to the early colonists they were inveterate stock thieves, and were treated as wild animals, to be shot whenever an opportunity occurred. 1 Such opposition as Hottentots and Bushmen were able to offer to European colonization was not difficult to overcome (see Cape Colony: History). The expansion of the colony was little retarded by native opposition until the Dutch encountered the Bantu negro tribes. As already

stated, the Bantus, like the Europeans, were invaders of South Africa, and the meeting of these rival invaders was the cause of many bloody conflicts. At first the Cape government endeavoured to come to an amicable arrangement with the new power threatening its eastern border, and in 1780 it was agreed that the Great Fish River should be the permanent boundary between the colonial and Bantu territories. The Bantus or Kaffirs (q.v.), as they were universally called, thenheld all the coast-lands between Delagoa Bay and the Great Fish River, and for many years they were strong enough to bar the further progress eastward of the white races. But the agreement of 1780 was impossible of fulfilment. The peace was broken in 1789 by an invasion of the colonial territory by the Kaffirs, and this conflict proved to be but the first of a series of Kaffir wars which lasted for a century. In 181 1 it was deemed neces- sary to expel the Kaffirs from the Zuurveld, and the British headquarters in that campaign became the site of Graham's Town. In 1817-1810 the Kaffirs returned and laid waste a large area. They were driven back and the country up to the Keiskama River annexed to the colony; but the disaster which nearly overwhelmed the eastern province convinced Lord Charles Somerset, then governor of the colony, of the necessity for a line British of frontier forts and a more numerous settlement of Settlers of colonists. Representations on the matter in England, l820 ' coupled with assurances from Somerset as to the

fertility of the district, induced the British government to vote £50,000 for the purpose of sending out a number of emigrants, Applications were called for, and no fewer than 90,000 were received. Of these, only 4000 were selected and shipped to South Africa. They were landed in 1820, in Algoa Bay, where they founded Port Elizabeth and the Albany settlement. Among these settlers were a number of married men with families. They were recruited from England, Ireland and Scotland, and came from all grades of society. Among them were cadets of old families, retired officers, professional men, farmers, trades- men, mechanics and labourers. They encountered many difficul- ties and some suffering in their early days, but on the whole they throve and prospered. Their descendants, the Atherstones, Bowkers, Barbers, Woods, Whites, Turveys, and a number of other well-known frontier families, are to-day the backbone of the eastern district of the Cape, and furnish the largest portion of the progressive element in that province. Among them was a gifted Scotsman named Thomas Pringle (1 789-1834). His poems, including " Afar in the desert I love to ride," depict the scenes of those early days in glowing lines. The vast spaces of the veld, the silence of the solitudes, the marvellous, varied and abundant animal life, the savage, half-weird character of the natives and the wild adventure of the early colonists have been caught with a true spirit of genius. Since his day no one, unless it be Olive Schreiner in The Story of an African Farm, has so vividly painted the life and the atmosphere of that

vast continent lying to the south of the Zambezi.

Various Protestant missions had sent agents among the natives during the closing years of the 18th century, and after the definite acquisition of the Cape by Great Britain the number of missionaries in the country greatly increased. Many became pioneers, settling in regions beyond the limits of British juris- diction. Others remained within Cape Colony, while several were stationed among the Kaffirs along the colonial border. The missionaries from the first often found themselves at variance

1 It appears that the first persons to treat the Bushmen other than as animals to be destroyed were two missionaries, Messrs J. J. Kicherer and Edwards, who in the early years of the 19th century devoted themselves to ameliorating the lot of these aborigines.

with the Dutch and also the British settlers, whose methods of dealing with the natives often deserved condemnation. At this period Dr John Philip (q.v.),oi the London Missionary Society, was the most prominent of the missionaries in the colony, and his influence was powerful with the home government. The publication in 1828 of his book Researches in South Africa had an important effect on the future of the country. The British government adopted his negrophil attitude, and made its agents at the Cape conform to it. The equality of all free Hottentots and other free persons of colour with the white colonists was decreed in that year (1820). Philip's action lacked discrimina- tion, and his faith in the natives was excessive. His charges greatly embittered the Boers, who were further aggrieved by the emancipation of the slaves. The Slave Emancipation Act, freeing all slaves throughout the British Empire, Emancipa- came into force in December 1834. 2 The slaves in "<"» of Cape Colony, who consisted of negroes from Mozam- s/aves – bique, natives of Madagascar, and of Hottentots and Malays were estimated at the time at 36,000. The Cape governments — - both Dutch and British — had been consistently averse from the importation of slaves in large numbers, and the great majority of the slaves were therefore Hottentots. The sum voted by the British government to slave-owners in Cape Colony, out of a total compensation paid of £20,000,000, was £1,250,000 (the official estimate of their value being £3,000,000). This money was only made payable in London, and the farmers were com- pelled to sell their claims for compensation to agents, who frequently paid a merely nominal price for them. In many instances farmers were unable to obtain native labour for a considerable time after the emancipation, and in several cases ruin was the result. A very bitter feeling was thus created among the Dutch colonists.

The championship of the natives by the missionaries led to attacks, in part justified, upon the policy of the missions not only by the Dutch, but by the

British colonists. The zeal of the missionaries frequently outran their discretion. This was especially the case in early days. They not only endeavoured to protect and guide the natives beyond the colonial border, but among the Hottentots within the colony they instilled notions of antipathy to the white farmers, and withdrew large numbers ‘ of them from agricultural pursuits. Their general attitude may be explained as a reaction against the abuses which they saw going on around them, and to a misconception of the character of the Hottentot and Bantu races. A longer experience of all the African negroid races has led to a considerable modification in the views originally held in regard to them. The Work of black man is not simply a morally and intellectually the Mis- undeveloped European, and education, except in rare s ‘ oaartes – instances, does not put him on an equality with the European. But, admitting all that may be justly urged against the extreme attitude of some of the missionaries, no unprejudiced man will deny that their work on the whole has been a good one. The fair fame of Great Britain has more than once been upheld in South Africa at the instigation and by the conduct of these intrepid pioneers. Robert Moffat and David Livingstone among the Bechuanas, E. Cassalis among the Basutos, Francois Coiljard among the Barotse, James Stewart in Cape Colony, to name but a few of the great missionaries, have all had an excellent influence upon the natives. They have (besides their purely spiritual work) opposed the sale of alcohol, denounced inhumanity from the farmers, encouraged the natives to labour and taught them mechanical arts. Technical education, begun about 1840, now occupies a position little, if at all, inferior to that of doctrinal teaching, and the effect is an excellent one. Strong testimony to the beneficial result of their labours was borne by a thoroughly impartial commission, presided over by Sir Godfrey Lagden, which in 1903-1905 investigated the status and condition of the natives of South Africa.

To return to the period of Dr Philip’s activity. 3 Largely upon a The slaves, after passing four years in a species of apprenticeship, were finally freed on the 1st of December 1838.

3 At this time (c. 1815-1840) numbers of persons brought discredit on the missionary cause by their illiteracy, narrow-minded prejudices

Treaty Stales.

his advice it was decided to create a band of native states on the northern and eastern frontiers of the colony. These treaty- states, as they were called, were intended to serve a double purpose; they would be a barrier protecting the colony from the inroads of hostile tribes, and they would enable native civilized nations to grow up (under the tute- lage of the missionaries) strong enough to protect themselves from the encroachments of the whites. In fact, neither cf these results followed. With one exception, that of Moshesh, the chief of the Basutos, none of the chiefs with whom treaties were made were men powerful enough to found kingdoms, nor had they, in most cases, any better right than their neighbours to the territory recognized as theirs by the British government. Moreover, to treat these men as independent or semi-independent princes was a complete mistake; the failure of the treaty state system is now seen to have been inevitable. The first treaty of this kind was concluded on the nth of December 1834 with a Griqua chief named Andries Waterboer. This chieftain lived north of the Orange river in the district now known as Griqua- land West, and ruled over some 4000 people, a bastard race sprung from the intercourse between Boers and native women. In 1843 two more of these treaty states were established, one under Adam Kok (the third of that name) and the other under Moshesh. Adam Kok had under him a small number of Griquas, who dwelt in the country east of that occupied by Waterboer (see Griqualand). And east of this country, again, was a tract of territory occupied by Basutos under Moshesh. In the same way Pondoland was established as a treaty state in 1844. The distinction between these states must be remembered to under- stand aright subsequent developments. Moshesh ruled over a region largely mountainous and over a people numerous and virile; Pondoland was somewhat remote and was densely in- habited by warlike Kaffirs; the two Griqua states were, however, missionary creations; they were thinly inhabited and occupied open plains easy of access — hence their ultimate collapse.

The year which witnessed the emancipation of the slaves and the creation of the first treaty state also saw the beginning of another disastrous Kaffir war. Fighting began in December 1834, and lasted nearly a year. The Kaffirs wrought great havoc, and Sir Benjamin D'Urban (q.v.), the governor, in order to secure peace, extended the boundary of the colony to the Kei river. The Kaffirs had suffered much injustice, especially from the commando-reprisal system, but they had also committed many injustices, and for the disturbed state of the border the vacil- lating policy of the Cape government was largely to blame. Sir Benjamin's policy — which had the cordial approval both of the Dutch and the British colonists — was one of close settlement by whites in certain districts and military control of the Kaffirs in other regions, and it would have done much to ensure peace. Lord Glenelg, secretary for the colonies in Lord Melbourne's second

administration, held that the Kaffirs were in the right in the quarrel, and he compelled D'Urban to abandon the conquered territory, a mistaken decision adopted largely on the advice of Dr Philip and his supporters. Thus at this time (1836) a critical state had arisen in South Africa. The colonists had lost their slaves, the eastern frontier was in a state of insecurity, native interests appeared to be preferred to those of the whites. The British immigrants of 1820 were still struggling against heavy odds; the Dutch colonists were in a state of great indignation. In these circumstances what is known as the Great Trek occurred. It lasted from 1836 to 1840. During that period no fewer than 7000 Boers (including women and children), impatient of British rule, emigrated from Cape Colony into the great plains beyond the Orange river, and across them again into Natal and into the fastnesses of the Zoutspanberg, in the northern part of the Transvaal.

In view of the vast consequences ensuing from this exodus of Dutch families from the Cape a somewhat detailed consideration

and in some cases lax sexual morality. These persons " assumed to themselves the important office of teachers in the missionary schools within the colony." See H. Cloete's The Great Boer Trek, lecture II.

The Great Trek.

of its causes is necessary. Material for forming a judgment will be found chiefly in the correspondence of Sir Benjamin D'Urban with the Colonial Office, in the statements made by the voor- trekkers, and in a series of lectures delivered in Pietermaritzburg in 1852-1855 by the Hon. Henry Cloete, whose statements as to the causes of the trek were founded on intimate knowledge and are impartially set forth. Piet Retief, the ablest of the leaders of the exodus, on the eve of leaving the colony published a de- claration at Graham's Town, dated January 22nd 1837, in which he declared the chief reasons animating the emigrants to be: —

1. We despair of saving the colony from those evils which threaten it by the turbulent and dishonest conduct of vagrants, who are allowed to infest the country in every part ; nor do we see any pros- pect of peace or happiness for our children in a country thus dis- tracted by internal commotions.

2. We complain of the severe losses which we have been forced to sustain by the emancipation of our slaves, and the vexatious laws which have been enacted respecting them.

3. We complain of the continual system of plunder which we have ever endured from the Kafirs and other colored classes, and particularly by the last invasion of the colony, which has desolated the frontier districts and

ruined most of the inhabitants.

4. We complain of the unjustifiable odium which has been cast upon us by interested and dishonest persons, under the cloak of religion, whose testimony is believed in England to the exclusion of all evidence in our favour; and we can foresee, as the result of this prejudice, nothing but the total ruin of the country. 1

These four points correspond to the " three great grievances " under which the farmers suffered, enumerated by Cloete as (1) The Hottentot Question (i.e. the first and fourth points of Retief 's manifesto combined); (2) The Slave Question; (3) The Kaffir Question. Enough has already been said as to the relations between the missionaries, the Boer farmers and the Hottentots; this grievance, however, " proved quite secondary to the intensity of feeling with which the colonists saw the steps taken by the government to deprive them of that labour (slave labour) over which they claimed an unquestionable right of property." 2 Then came the Kaffir War of 1834-1835, the reversal by the home government of the statesmanlike settlement of Sir Benjamin D'Urban, and the refusal of any compensation to the sufferers from the war, whose losses amounted to some £500,000. These, then, were the direct causes of the voluntary expatriation of the majority of the first trekkers, who included some of the best families in the colony, but they fail to explain the profound hostility to Great Britain which thereafter animated many, but not all, of the emigrants, nor do they account for the easy abandonment of their homes by numbers of the trekkers. The underlying fact which made the trek possible is that the Dutch- descended colonists in the eastern and north-eastern parts of the colony were not cultivators of the soil, but of purely pastoral and nomad habits, ever ready to seek new pastures for their flocks and herds, and possessing no special affection for any particular locality. In the next place these people, thinly scattered over a wide extent of territory, had lived for long under little restraint from the laws, and when in 181 5, by the institution of " Commissions of Circuit," justice was brought nearer to their homes, various offences were brought to light, the remedying of which caused much resentment. An effort to bring a man named Frederick Bezuidenhout to justice led to armed resistance and finally to the hanging of five men at Slachter's Nek in circumstances that made an indelible impression throughout the frontier (see Cape Colony: History). It intensified in the minds of many Boers the feeling of hostility towards the British already existing; some of the trekkers in 1836-1840 had taken part in and others had passively aided the rebellion of 181 5 — " the most insane attempt ever made by a set of men to wage war against their sovereign " (Cloete, op. cit. p. 28). What, however, was probably the most powerful motive of the Great Trek was the equality established by the British between the black and white races. In the eyes of the Boers the possi- bility

of equality between the whites and the natives was not

1 See F. R. Cana, South Africa from the Great Trek to the Union (London, 1909), pp. 295-297 for the full text of Retief's manifesto.

2 See H. Cloete, The History of the Great Boer Trek (London, 1899), p. 44.

admitted. This sentiment, which found formal recognition later on in the constitution of the South African Republic, was held in fullest foTe by the voortrekkers. Summing up, it may be said that the exasperation caused by just grievances unreme- died was no stronger a motive with the trekkers than the desire to be free from the restraints imposed on British subjects and the wish to be able to deal with the natives after their own fashion. The departure of so large a number of persons caused serious misgiving both to the Cape and the home governments. The trekkers had been told by the lieutenant-governor of the eastern province (Sir Andries Stockenstrom) that he was not aware of any law which prevented any British subject from settling in another country, and in the words of Piet Retief's declaration they quitted the colony " under the full assurance that the English government has nothing more to require of us, and will allow us to govern ourselves without its interference in future." The British government thought otherwise; they held that the trekkers could not divest themselves of their allegiance to the Crown. Moreover, though the farmers might leave British terri- tory they were still held to be liable to the jurisdiction of British courts. An act passed in 1836 (the Cape of Good Hope Punish- ment Act) empowered the colonial courts to deal with offences committed by British subjects in any part of South Africa up to the 25th degree of south latitude. Intended by its authors to protect the native tribes from aggression on the part of white men and to check the exploration by Europeans of the lands of the Kaffirs, Bechuanas, &c, the act led in fact to the assertion of British authority in regions beyond the Cape frontier.

B. From the Foundation of the Republics to Maji.la. — While the home government was seeking to prevent the expansion Foundation °^ tne white races the first steps had been taken of the Boer by a body of Englishmen to found a new colony at Republics Natal. Since 1824 a few traders had been settled and Natal. at p Qrt atal, an(j m jg formal petition was made that their settlement should be recognized as a British colony. The request was

refused, and not long afterwards (1837) some of the Dutch emigrant farmers under Retief entered the country by way of the Drakensberg. Retief, like his English prede- cessors at Port Natal (known also since 1835 as Durban), sought a formal grant of territory from the chief of the Zulu nation, the Zulus being the acknowledged overlords of the tribes living in Natal. Retief and his party were, however, treacher- ously murdered by Dingaan, the Zulu king (February 1838). Other trekkers followed in the wake of Retief, and attacking Dingaan avenged the massacre.

The Boers then established a republican government at Maritz- burg. Though most anxious to avoid any extension of responsibility in South Africa, Great Britain recognized the potential danger arising from the creation of an independent state on the coast. The Boers at first rejected offers of accommodation. Troops were then sent to the country, and finally a settlement was made by Henry Cloete, the British commissioner, with the Boer leaders, and Natal constituted a British colony in 1843. Many Boers, dissatisfied with this arrangement, withdrew beyond the Drakensberg. Natal shortly afterwards received a considerable number of emigrants from England, and the white inhabitants have since been predomi- nantly British. At first Natal was dependent on Cape Colony. In 1856 it was constituted a separate colony, but it did not possess self-government until 1893. A notable departure from the labour policy of the other states was made by Natal in i860, when Indian coolies were introduced. At the time the matter attracted little attention, but the Asiatic inhabitants speedily increased, and forty years later they outnumbered the whites (see Natal).

It had taken the British government nearly ten years to decide on the annexation of Natal; its policy towards the Boers settled north of the Orange was marked by the same hesitation (see Orange Free State). By 1847, when Sir Harry Smith became high commissioner, the failure of the treaty state policy was evident. Sir Harry, deeming no other course open to him, pro- claimed (February 1848) the country between the Orange and Vaal

rivers British territory, under the name of the Orange River Sovereignty. Sir Harry had, in the previous December, extended the northern frontier of Cape Colony to the Orange, Orange and had reoccupied the territory on the Kaffir border River Sove- which D'Urban had been forced to abandon. 1 The "fr"^. extension of British rule north of the Orange was opposed by Andries Pretorius, who, being defeated at Boomplaats, withdrew north of the Vaal, where, though not interfered with by the British, the Boers split up into several rival parties. In the Sove- reignty difficulties arose in denning the reserves of the native chiefs, and with the Basutos there were armed conflicts. The home government (the first Russell administration), which had reluctantly consented to confirm Sir Harry Smith's annexation

of the Orange River territory, on learning of these difficulties, and also that many of the burghers remained dissatisfied, changed their policy, and in 1851 the governor was informed that the ultimate abandonment of the Sovereignty was a settled point. 2 In fulfilment of their settled policy to keep the British South African dominions within the smallest possible limits, the cabinet decided to recognize the independence of the Boers living beyond the Vaal. This recognition, the necessary preliminary to the abandonment of the Orange River Sovereignty, was made in the Sand River Convention on the 17th of January j n a e pend- 1852. The Transvaal thus became an independent enceofthe state, or rather it formed a number of mutually Transvaal jealous communities, and it was not until 1864 that eco ” ze • they were all united. Despite their distracted condition the Transvaal Boers had no sooner obtained their independence than they began to make claims to authority in Bechuanaland. But the championship of the Bechuanas by Moffat, Livingstone and other missionaries, and their determination that the road to the interior should not be closed by the Boers, had its effect, and the Beers did not succeed in making themselves masters of the country (see Transvaal: History, and Bechuanaland). The British government meantime pursued its policy of abandon ment, and in February 1854, by the Bloemfontein Convention, forced independence upon the people of the Sovereignty, which now became the Orange Free State. A clause was inserted in the Bloemfontein Convention stating that Great Britain had no alliance with any native chiefs or gˆ”/ ree tribes to the north of the Orange, with the exception of the Griqua chief Adam Kok. Numerous protests were made by many of the inhabitants of the Orange River Sovereignty against the abandonment of it by the British government, but the duke of Newcastle, who was then colonial secretary in Lord Aberdeen’s administration, replied that the decision was in evitable (see Orange Free State).*

The abandonment of the Orange River Sovereignty marked the close of the eventful period in South African history which began eighteen years before with the Great Trek. At the begin- ning of that time there was but one civilized government in South Africa — Cape Colony; at its close there were five separate states or provinces, three, the Cape, Natal and British Kaffraria, owning allegiance to Great Britain, and two forming Boer republics — the Transvaal and Orange Free State. While vast additional territories had been occupied by British Results of a or Boers the unity of administration, which had Policy of marked the previous stages in the expansion of the Vaemaii0n ‘ white races in South Africa, had been lost. Whether or not a wiser policy on the part of Great Britain would have secured the continued allegiance of all the Boers it is impossible to say; the fact that numbers of Boers remained in Natal under British rule, and that the majority of the Boers who settled between the Orange and the Vaal desired to remain British subjects, points to that conclusion. With justice the Boers complained of the course actually adopted by the British authorities. They might at the outset either have let the trek Boers go, and

given them their blessing and liberty, or they might have controlled the trek and

1 Part of the territory thus reannexed was added to Cape Colony while the region between the Keiskamma and Kei was created a separate territory under the name of British Kaffraria.

2 Despatch of Earl Grey, dated October 2lst, 1851, printed in Correspondence Relative to the State oftlie Kaffir Tribes (C. Feb. 1853).

made effective their contention that the trekkers were still British subjects. As has been demonstrated the action taken was one of vacillation between these two courses, and was complicated by a native policy which, though well intentioned and intelligible, needlessly irritated the white colonists (British and Dutch) and did not prevent bloodshed. In the words of Mr Paul Botha, a Boer writer, England first blew hot and then blew cold. But in 1854 a definite standpoint appeared to have been reached — Great Britain would confine her energies to the Cape and Natal, leaving the republics to work out their own destinies undisturbed. It was at this juncture that Sir George Grey was sent to the Cape as governor. A gifted Gn ; and far-seeing man, he had no sooner arrived than he

addressed himself with energy and diligence to the great problems awaiting him. His first care was to ameliorate the condition of Cape Colony. He resolved that in dealing with the natives on the eastern frontier an attempt should be made to civilize them and thus do away with the necessity of periodical warfare. Grey's efforts to promote good government in Kaffraria received unexpected help in consequence of the extraordinary delusion among the Ama-Xosa in 1856, which resulted in the death of many thousands of natives (see Cape Colony: History). Land left derelict was occupied by colonial farmers, and over 2000 German immigrants were introduced by Sir George and settled along the frontier (1858- 1859). By this time the colonists of British descent predominated in the eastern provinces — a circumstance which had important bearings on the future of the colony.

Sir George Grey found it impossible to maintain a policy of total abstention from the affairs of the republics. The party in the Free State which had objected to independence being forced upon it was still strong and made overtures for union with the Cape; attempts were also made to unite the

Free State and the Transvaal. In the conflicts between the Free Staters and the Basutos Grey's intervention was sought. All the evi- dence before Sir George, and the study h«; made of the Boer character, convinced him that the barriers separating the various white communities were largely artificial. 'He sought to remedy the mistake which had been made, and in 1858 he sub- mitted a scheme of federation between the various South African states. In a memorable despatch to Sir E. Bulwer Lytton, then colonial secretary in the second Derby administration, he wrote (November 19, 1858): —

When the policy was adopted of dividing South Africa into many states, bound together by no ties of union, it was thought that the mother country derived no real benefit from the possession of this part of the African continent, except in holding the seaport of Simon's Bay. ... It was further thought that the occupation by Great Britain of the country beyond the Orange River had been a bubble and a farce, in which the Cape colonists were all interested; for that it was to them a great gaming table and out of the reach of the police. . . . Although these European countries lying beyond our colonies are treated as separate nations, their inhabitants bear the same family names as the inhabitants of this colony, and maintain with them ties of the closest intimacy and relationship. ... I think there can be no doubt that in any great public, or popular, or national question and movement the mere fact of calling these people different nations would not make them so, nor would the fact of a mere fordable stream running between them sever their sympathies or prevent them from acting in unison. . . . Experience has shown that the views which led to the dismemberment of South Africa were mistaken ones. . . . What therefore I would recommend would be that . . . measures should be taken which would permit of the several states and legislatures of this country forming among themselves a federal union.

When he penned this despatch Grey was well aware of the distraught condition of the Free State and the agitation for a change in its government. He held that the federation of that state with Cape Colony was preferable to its union or federation with the Transvaal, and it was with considerable satisfaction that he learned that on the 7th of December of the same year (1858) the Volksraad of the Free State had passed a resolution in favour of " a union or alliance with the Cape Colony " and sought to ascertain the views of the Cape legislature on the sub- ject. In bringing the matter before theCape parliament in March 1859 Grey stated that in his opinion it would confer a lasting

benefit upon Great Britain and upon the inhabitants of South Africa if it could succeed in devising a form of federal union. Unfortunately, Grey's views did not meet with the First Con- approval of the British government.

1 Had they been federation supported it is highly probable that federation would p “>P°sal. have been effected. But the golden opportunity was lost. When Grey attempted to persevere with his scheme he was recalled. He left Cape Town in August 1859, but on his arrival in England he found that there had been a change of ministry. The new colonial secretary, the duke of Newcastle, reinstated him, but with instructions not again to raise the federation issue. The first project for reunion thus came to naught, but from that time forward it was recognized in South Africa that federation would afford the best solution of most of the difficulties that beset the country. The Transvaal was perhaps the greatest sufferer through Grey’s failure, that country continuing for years in a distracted condition. The Free State, under the guidance of Sir John Brand, who became president in 1864, attained a considerable measure of prosperity. Its difficulties with the Basutos were at last composed, and Moshesh and his peopie were in 1868 definitely taken under British protection. The policy of non-interference proclaimed in 1854 had proved impracticable, and the annexation of Basutoland was an open confession of the fact. In 1871 the country was annexed to Cape Colony, but its pacification proved a task of great difficulty.

Up to the year 1870 the Dutch considerably outnumbered the British inhabitants; indeed, save in Natal, in the eastern province and in Cape Town, the British inhabitants were com- Economic paratively few. The industries were almost entirely Develop’ pastoral, and remained chiefly in the hands of the ment – Dutch: The continual feuds with the Kaffirs, and also the con- tinual desire to trek into new countries, all tended to keep back farming, and the country in the years 1867 to 1870 was in a gener- ally very depressed condition. But in 1870 the era of commer- cial expansion began. In that year, following smaller finds of diamonds on the banks of the Vaal and Orange rivers, the diamond mines of Du Toits Pan and Bultfontein were opened up. In 1869 gold had been found in the Lydenburg and Zoutpansberg districts in the Transvaal, and diggers had resorted tfyere from different parts of the world; moreover, in the far interior, in the territories of Mashonaland, Thomas Baines had reported dis- coveries of gold. Among the purely pastoral population ostrich- farming became a new industry and added a considerable asset to the wealth of Cape Colony. The revenue derived from the export of ostrich feathers in 1899 was recorded at half a million. It was, however, the discoveries of diamonds and gold that chiefly determined the development of the country. A large population grew up, first at Kimberley, afterwards at Barberton, and finally at Johannesburg — a population modern in its ideas, energetic, educated, cosmopolitan, appreciating all the resources that modern civilization had to offer them, and with a strong partiality for the life of the town or the camp rather than that of the farm and the veld. The majority

of the Boers remained very much what they had been in the 17th century. Their life of continual strife with natives, continual trekking to fresh pastures, had not been conducive to education or the enlarge- ment of intellectual outlook. In religion they were Calvinistic, fanatic, and their old traditions of Dutch East India government, together with their relation to the natives, developed a spirit of caste and even tyranny.

It was at this stage of affairs that responsible government was granted to Cape Colony (1872). From that time down to the annexation of the Transvaal in 1877, to quote TheCarnar- once more the homely phrase of Paul Botha, Great von Con- Britpin "blew hot" in South Africa. A great change federation in public sentiment towards the colonies generally Scneme – began to make itself felt in Great Britain in the late sixties and early seventies of the 19th century. The constitution of the Dominion of Canada (1867-1873) was an evidence of that feeling, 'Sir E. Bulwer Lytton wrote (Feb. 11, 1859): " H.M. Govern- ment are not prepared to depart from the settled policy of their predecessors by advising the resumption of British sovereignty in any shape over the Orange Free State,"

With the advent to power of the Disraeli ministry in 1874 the nascent Imperial spirit grew in strength. Lord Carnarvon (the 4th earl), when under-secretary for the colonies in 1858-1859, had regarded Grey's federation proposal with disfavour, but later, as secretary of state, he had introduced the bill for the federation of the Canadian provinces. He now returned to the Colonial Office filled with the idea of doing for South Africa what had been done in British North America. 1 Recent events in South Africa had appeared for a brief period to favour a union of its various colonies and states. The intimation of the impending grant of self-government to Cape Colony was regarded by both Boer republics as bringing nearer the prospect of their union with the British colonies. But just at that time differences arose between Great Britain and the republics as to the ownership of the Kimberley diamond fields which estranged the Boers (see Griqualand and Transvaal). In the Transvaal Pretorius was succeeded by T. F. Burgers, a man totally unfitted to govern a country distracted by factions, harassed by wars with natives, and with an almost depleted exchequer. Yet in the condition of the Transvaal Lord Carnarvon found another argument in favour of federation. Union with the neighbouring states would, he thought, cure its ills and promote the general welfare of South Africa. As a preliminary step he accepted an offer from J.

A. Froude to visit South Africa unofficially, and by travelling through its different states find out what were the obstacles to confederation and the means by which such obstacles could be removed. Froude landed at Cape Town on the 21st of September 1874, and having visited Natal, the Free State and Pretoria as well as Cape Colony, sailed for England on the 10th of January 1875. In the three and a half months he had spent in the country he had reached the conclusion expressed by the duke of Newcastle nearly twenty years previously, namely, that all England needed there was Table Bay — or the Cape peninsula — as a naval and military station. The South African states, he believed, might be left in internal affairs to work out their own future. These views coincided with those of Lord Carnarvon, who looked to federation as a means of relieving the Imperial government of some of the heavy responsibilities pressing upon it in South Africa, and he asked Froude to return to the Cape to take part in a conference in South Africa on the federation scheme. The offer was accepted, and Froude reached Cape Town again in June 1875. Lord Carnarvon's despatch (May 4, 1875), indicating his views, had preceded the arrival of Froude, and had incensed J. C. Molteno, the Cape premier, by its disregard of the colony's self-governing powers. A motion was carried in the Cape parliament affirming that any movement for federation should originate in South Africa and not in England. Froude on his arrival was much chagrined at the attitude taken by the Cape parliament, and conducted an oratorical campaign throughout the country in favour of federation. His speeches were lacking in judgment and tact, and created an unfavourable impression, The conference was not held, and Froude returned to England in the autumn. 2

Lord Carnarvon was far from abandoning his plan. The Transvaal was now in a condition bordering on anarchy, and numbers of its inhabitants were supposed to be looking to Great Britain for help. Another party in the Transvaal was seeking alliances with Germany and Portugal, and this danger of foreign interference was a further cause for action. In August 1876 the colonial secretary assembled a conference on South African affairs in London, nominating Froude as representative of Griqualand West. President Brand represented the Free State. Another member of the conference was Sir Theophilus Shepstone, (q.v.) Neither Cape Colony nor the Transvaal was represented,

1 At Sir Henry Barkly's request Lord Carnarvon's predecessor, Lord Kimberley, had in November 1871 given him (Sir Henry) authority to summon a meeting of representatives of the states and colonies to consider the " conditions of union," but the annexation of the diamond fields had occurred meantime and Sir Henry thought the occasion inopportune for such a conference.

2 For Freude's views and actions, see especially the blue book C- 139O V1H76), containing hia report to Lord Carnarvon.

and the conference was abortive, President Brand having no permission from his state to consider federation. That subject was, in fact,' not discussed by the delegates. In view of the troubles in the Transvaal, and in furtherance of Carnarvon's federation scheme, Shepstone was, on the 5th of October fol- lowing, given a dormant commission to annex the republic " if it was desired by the inhabitants and in his judgment necessary." The secretary of state sought the aid of Sir Bartle Frere as his chief agent in carrying through confederation, the then governor of Cape Colony and high commissioner for South Africa, Sir Henry Barkly, sharing the views of the Cape ministry that the time was inopportune to force such a step upon South Africa. In a letter dated the 13th of October, offering Frere the post Barkly was about to vacate, Lord Carnarvon wrote: —

. . . The war between the Transvaal republic and the natives has had this further effect, it rapidly ripened all South African policy. ... It brings us near to the object and end for which I have now for two years been steadily labouring — the union of the South African colonies and states. I am indeed now considering the details of a bill for their confederation, which I desire to introduce next session, and I propose to press, by all means in my power, my confederation policy in South Africa.

The time required for the work of confederating and of con- solidating the confederated states Lord Carnarvon estimated at not more than two years, and he was sanguine enough pirst to hope that Frere would stay on at the Cape ior Annexation two or three years "as the first governor-general °^ tne of the South African dominion. " Frere accepted ' the offer, but did not leave England until March 1877. Shep- stone preceded him, and in January 1877 had gone to Pretoria. His conferences with the leading men in the Transvaal and a consideration of the dangers which threatened it and the grave disorders within its borders satisfied Shepstone that he had no choice except to act upon his commission, and on the 12th of April he issued a proclamation annexing the country to the British Crown. During the interval between Shepstone's arrival in the country and the annexation the Volksraad had rejected the proposals for confederation laid before them in accordance with Lord Carnarvon's permissive bill, and had made no real attempt at reform. The annexation was acquiesced in by a considerable number of the white inhabitants. Shep- stone was convinced that it was the only step which could save the country from ruin. The subject is discussed at greater length under Transvaal. Frere, who had reached Cape Town on the 31st of March, learnt on the 16th of April that the annexation had

taken place. He was inclined to regard Shepstone's act as premature, and he realized that it stirred very deeply Dutch national feeling throughout South Africa. Though anxious ' to promote Carnarvon's policy, Frere found that native affairs called for immediate attention. The Basuto and Kaffir tribes were giving trouble, and the 40,000 trained Zulu warriors under Cetywayo threatened the peace both of Natal and the Trans- vaal. In the same month (Aug. 1877) in which the British parliament passed the act, foreshadowed by the secretary of state, " for the union under one government of such of the South African colonies and states as may agree thereto, " another war with the Kaffirs broke out. This conflict lasted until May 1878, and largely absorbed the energies of Sir Bartle Frere. 3 In the meantime a scheme of unification, as opposed to federation, put forward by the Molteno ministry — a scheme which in its essence anticipated the form of government established in 1910 — had met with no support from Frere or the home ministry. In January 1878 Lord Carnarvon resigned, and the driving force of the federation scheme thus disappeared. It was not, however, finally dropped until 1880. In July of that year proposals for a confederation conference were submitted to the Cape parliament. At that time Paul Kruger and Piet Joubert, delegates from the Transvaal Boers, were in Cape Town, and they used their influence to prevent the acceptance of the proposals, which were shelved by the ministry accepting " the 3 Serious troubles with the Basutos which began in 1879 reacted on the situation in the Transvaal and Natal. These troubles were finally ended in 1884, when the country was given up by the Cape and became a crown colony (see Basutoland).

previous question" (June 29). Thus ended an attempt which lacked the element essential to success — spontaneity.

Confederation had, for the time being, ceased to be a living issue some time before its formal shelving by the Cape par- liament. The Kaffir War of 1878 was followed by war with the Zulus. Frere, believing that the Zulu power was a standing menace to the peace of South Africa, and that delay in dealing with Cetywayo would only increase the danger, sent an ulti- matum to the chief in November 1878. The invasion of Zulu- land began in January 1879, and was speedily followed by the disaster at Isandhlwana and by the defence of Rorke's Drift and of Eshowe. But at the battle of Ulundi in July the Zulu power was crushed, and a little later Cetywayo was taken prisoner (see Zululand: History). The removal of the*

Zulu danger did not, however, restore harmony between the British and the Boers in the Transvaal. The mal- content Boers became a powerful element in the country. They were largely influenced by an important section of the Dutch community in western Cape Colony, which carried on a campaign against annexation, seeing in it a blow to the ideal they had begun to entertain of a united South Africa of a Dutch republican type. Sir Garnet Wolseley, at this period (June 1879-May 1880) high commissioner of South- East Africa, gave the Transvaal a legislative council, but the members were all nominated. This could not be regarded as a redemption of the promise of a liberal constitution, and it had an injurious, though limited, effect on the Boer community. 1 After the receipt in December 1879 of the reports of Mr Gladstone's speeches during his Midlothian campaign — in which he denounced annexation as obtained by means dishonourable to Great Britain — the Boers expected nothing less than the retrocession of the country.

There was one strong reason against retrocession, concerning which the Boers — if they gave it thought— would naturally be silent. To the British mind in general it was apparently non-existent. It had, however, been seen and its strength recognized by Sir Garnet Wolseley during his brief governor- ship of the Transvaal. Wolseley, in a despatch dated the 13th of November 1879 said: —

The Transvaal is rich in minerals; gold has already been found in quantities, and there can be little doubt that larger and still more valuable goldfields will sooner or later be discovered. Any such discovery would soon bring a large British population here. The time must eventually arrive when the Boers will be in a small minority, as the country is very sparsely peopled ; and would it not therefore be a very near-sighted policy to recede now from the position we have taken up here, simply because for some years to ' come the retention of 2000 or 3000 troops may be necessary to reconsolidate our power.

As Lord Morley in his Life of Gladstone says, " this pregnant and far-sighted warning seems to have been little considered by English statesmen of either party at this critical time or afterwards, though it proved a vital element in any far-sighted decision. "

The result of the general election of 1880 was to place Mr Gladstone in power. The new administration, notwithstanding Mr Gladstone's public utterances, declared their intention of retaining British sovereignty in the Transvaal, coupling with that decision a pious hope for the speedy accomplishment of confederation so as to allow of free institutions being given to Natal and the Transvaal. 2 The disillusionment occasioned by this decision caused the Boer delegates then at the Cape to help to wreck the

federation proposals (see supra). But if unwilling at the time to undo the work of Sir T. Shepstone, the Liberal cabinet were prepared to get rid of the chief British representative in South Africa — partly to please the extreme Radicals among their followers. Accordingly on the 2nd of August 1880 Frere received a telegraphic despatch from Lord

1 Had Shepstone's promise been redeemed at an early date, it might well have extinguished the agitation for independence.

2 It is remarkable that the Liberal government, despite this aspiration, and despite stronger language used by Mr Gladstone, did nothing to give the Boers any real self-government. Sir Bartle Frere pressed the new administration, as he had the Conservative government, on this point without effect.

Majuba.

Kimberley (the new secretary of state for the colonies) announcing his recall. 3 Frere's task was one of extreme delicacy; he chose to face difficulties rather than Recall of evade them, and had he been unfettered in his sir Bartle action might have accomplished much more than Frere – he was able to do; in its main lines his policy was sound. (See Frere, Sir Henry Bartle.)

Finding that the Gladstone administration would not give up the Transvaal voluntarily, the Boers now determined on rebellion. Hostilities began in December 1880, and eventually a series of engagements ended in the rout (Feb. 27, 1881) of a small British force which had occupied Majuba Hill the previous evening. The killed included the general in command, Sir George Colley. Meanwhile the resolution of Mr Gladstone and his colleagues to keep the Transvaal had been shaken by the Boer declaration of independence. After the first engage- ments this resolution was further weakened; and when, after a British reverse at Ingogo (Feb. 8), overtures were made by Mr Kruger on behalf of the Boers, the cabinet was strongly inclined to come to terms. The news of Majuba did not turn it from its purpose. Opinions will always differ as to the course adopted by the Liberal government. " We could not, " wrote Mr Gladstone, " because we had failed on Sunday last, insist on shedding more blood." It is at all events abundantly clear that had the Boers not resorted to arms they would not have gained the support of the cabinet. 4

Sir Evelyn Wood, who had succeeded Colley as general in command and governor of Natal, under instructions from home, concluded a treaty of peace on the 22nd of March. The terms agreed upon were elaborated in a convention signed at Pretoria in August following. By this instrument the

Transvaal was granted self-government subject to British suzerainty and the control of the foreign relations of the state. In 1884 the Glad- stone administration made further concessions by the London convention of that year. This last document still, however, reserved for Great Britain certain rights, including the power of veto over treaties concluded by the Transvaal with any power other than the Orange Free State. But the success of the Transvaal Boers both in war and diplomacy had quickened the sense of racial unity among the Dutch throughout the country, and there arose a spirit of antagonism between the Dutch and the British which affected the whole future of South Africa.

Before, however, dealing with the relations between the British and the Boers subsequent to 1881 brief reference may be made to affairs in which other powers were concerned ; affairs which were the prelude to the era of expansion associated with the career of Cecil Rhodes. In 1868 the Europeans in Great Namaqualand and Damaraland petitioned for annexation to Great Britain. Eventually (1878) only Walfish Bay Germany and a small strip of adjacent territory were annexed. In South In 1883 Germany entered the field and during Africa. 1884-1885, owing to the procrastinating policy of the Cape and British governments, all the coast between the Orange and the Portuguese frontier, save Walfish Bay, was placed under German protection (see Africa, §5). The eastern boundary of German South-West Africa was fixed in 1890, the frontier run- ning through the Kalahari Desert. Bechuanaland, the region between the German colony and the Transvaal, was secured for Great Britain. It was not on the west coast only that Germany made efforts to secure a footing in South Africa. In September 1884 an attempt was made to secure St Lucia Bay, on the coast of Zululand. Here, however, Great Britain stood firm. St Lucia Bay had been ceded to the British by the Zulu king Panda in 1843, and this cession has always been regarded as valid. Eventually Germany agreed to make no annexation on the east coast of Africa south of Delagoa Bay. With the proclamation of a British protectorate over the coast of Pondoland in January 1885 the coast -line from the 3 Frere sailed for England on the 15th of September. His successor, Sir Hercules Robinson, reached the Cape at the end of January 1881.

- *Morley's Life of Gladstone, bk. viii. ch. 3, " Majuba."*

mouth of the Orange to Delagoa Bay (save for the small stretch of

Amatonga shore-line) became definitely British.

To Delagoa Bay, or rather to the southern part of the bay, Great Britain had laid unsuccessful claim. On the northern bank of the chief estuary of the bay the Portuguese Bayf" na d Irom the 16th century onward . maintained a precarious foothold; it was their most southerly station on the east coast of Africa. In 1823 treaties had been concluded by the British with tribes inhabiting the southern shores of the bay. Neither the Portuguese nor the British claims seemed of much importance until the rise of the South African republic. Anxious for a seaport, the Transvaal Boers in turn laid claim to Delagoa Bay. This brought the dispute between Great Britain and Portugal to a head, the matter being referred in 1872 to the president of the French republic for arbitration. In 1875 an award was given by Marshal MacMahon entirely in favour of the Portuguese (see Delagoa Bay). As a port outside British control Delagoa Bay was a source of strength to the Boers, especially as the railway 1 was under their control. In the war which began in 1899 munitions of war and recruits for the Boers were freely passed through Delagoa Bay.

C. The Struggle for Supremacy between British and Dutch. — Bechuanaland, through which territory runs the route to the Bechuana- far interior — the countries now known as Rhodesia land — was acquired, despite the strong desire of the

Annexed. Gladstone administration to avoid further annexa- tions in South Africa. At first the encroachments on Bechuana territory by Boers from the Transvaal were looked upon with comparative indifference. The Boers respected neither tlie frontier laid down by the Pretoria convention nor that (modified in their favour) drawn in the London convention. But missionary influence was strong; it was reinforced by the growing • strength of the imperialistic spirit and by the fears excited by Germany's intrusion on the south-west coast. An expedition was sent out in October 1884 under Sir Charles Warren; the Boers, who had set up the " republics " of Goshen and Stellaland, were obliged to give way, and the country was annexed (see Bechuanaland). It was in connexion with this affair that Cecil Rhodes first came into prominence as a poli- tician. As a member of the Cape parliament he undertook a mission, before the arrival of Warren, to the Goshen and Stellaland Boers, endeavouring, unsuccessfully, to obtain from them a recognition of British sovereignty. The acquisition of Bechuanaland by Great Britain was the essential preliminary to the development of the schemes which Rhodes entertained for the extension of British rule into Central Africa. In his endeavours to realize this aim he had to contend with the new spirit of national consciousness animating the Boers, which found expression in the formation of the Afrikander Bond.

In its external, as in most of its internal policy, the Trans- vaal was controlled from 1881 onward by Paul Kruger, who The am- was elected president of the state in 1883. Yet kander Kruger was scarcely the real leader in the nationalist Bond. movement to which the successful revolt of 1880-81 gave strength. The support given by the Cape Colony Dutch to the malcontent Transvaal Boers has already been mentioned. During the 1880-81 revolt many Free State burghers, despite the moderating influence of President Brand, joined the Transvaal commandoes. Now a definite effort was made to build up a united South Africa on anti- British lines. In the latter part of 1881 a Dutch pastor at the Paarl, a town in western Cape Colony named Du Toit, in a paper called De Patriot, suggested the organization of an Afri- kander Bond; in the same year Carl Borckenhagen, a German resident in the Free State, advocated such a bond in his paper, the Bloemfontein Express. The Bond was formed, its work being almost confined to Cape Colony. It held its first congress at Graaf Reinet in 1882. In the " programme of principles " upon which its constitution was modelled it was set forth that:

1 For the international difficulties connected with the building of the railway from Delagoa Bay to Pretoria see LoureN£0-M arques.

While in itself acknowledging no single form of government as the only suitable form, and whilst acknowledging the form of govern- ment existing at present [the Bond] means that the aim of our national development must be a united South Africa under its own flag.

In the following year the Farmers' Protection Association was amalgamated with the Bond, and the joint organization fell under the control of J. H. Hofmeyr, the leader of the Dutch party in Cape Colony. Under Hofmeyr's politic control all declarations inconsistent with allegiance to the British Crown were omitted from the Bond's constitution. It remained, how- ever, a strong nationalist organization, which in practice was inimical not so much to the British connexion as to the British section of the population and to the development of the country on enlightened lines. (For the Afrikander Bond see further Cape Colony: History, and Hofmeyr.)

Not long after the Warren expedition the valuable gold fields which Sir Garnet Wolseley had foreseen would be discovered in the Transvaal were actually found. By 1886, the year in which Johannesburg was founded, the wealth of the Witwaters- rand fields was demonstrated. The revenue which these dis- coveries brought into the Transvaal treasury increased the im- portance of that state. The new industrial situation created had its effect on all parties in South Africa, and in some measure drew together the British and Dutch sections outside the Transvaal. A customs union between Cape Colony and the Free State was concluded in 1889, to which later on all the

other South African states, save the Transvaal, became parties. But Kruger remained implacable, bigoted, avaricious, deter- mined on a policy of isolation. In 1887 he made proposals for an alliance with the Free State. Brand refused to be ensnared in Kruger's policy, and the negotiations led to no agreement. (For details of this episode see Orange Free State: History.) Not many months afterwards (July 1888) the Free State lost by death the wise, moderating guidance of Sir John Brand. The new president, F. W. Reitz, one of the founders of the Bond, in 1889 committed the Free State to an offensive and defensive alliance with the Transvaal. Kruger thus achieved one of the objects of his policy. Within the Transvaal a great change was coming over the population. There flocked to the Rand many thousands of British and other Europeans, together with a considerable number of Americans. This influx was looked upon with disfavour by Kruger and his supporters, and, while the new comers were heavily taxed, steps were speedily taken to revise the franchise laws Kruger's so that the immigrants should have little chance of Hostility to becoming burghers of the republic. This exclusion t . ae J Jlt ' policy was even applied to immigrants from the other South African countries. A system of oppressive trade monopolies was also introduced. The situation with which the Boers were called upon to deal was one of great difficulty. They could not keep back the waves of the new civilization, they feared being swamped, and they sought vainly to maintain intact their old organization while reaping the financial benefit resulting from the working of the gold mines. The wider outlook which would have sought to win the Uitlanders (as they were called) to the side of the republic was entirely lacking. The policy actually followed was not even stationary; it was retrogressive.

Meanwhile, and partly through distrust of the Kruger policy, there was growing up in Cape Colony a party of South African Imperialists, or, as they have been called, Afrik- ander Imperialists, who came to a large extent under imperialists, the influence of Cecil Rhodes. Among these were W. P. Schreiner (afterwards premier of the colony) and J. W. Leonard (sometime attorney-general) and, to some extent, Hofmeyr. From the time of his entrance into politics Rhodes endeavoured to induce the leading men in the country to realize that a development of the whole country could and should be accomplished by South Africans for South Africans. He fully admitted that the cry which had become so popular since 1881 of " Africa for the Afrikanders " expressed a reasonable aspiration, but he constantly pointed out that its fulfilment could most

advantageously be sought, not, as the Kruger party and ex- tremists of the Bond believed, by working for an independent South Africa, but by working for the development of South Africa as a whole on democratic, self-reliant, self-governing lines, under the shelter of the British flag. Hofmeyr was among those whom Kruger's attitude drove into a loose alliance with Rhodes. In 1884, having the power in his hands when the Scanlen ministry fell, Hofmeyr had put into office a ministry dependent upon the Bond, and had talked of a possible Dutch rebellion in Cape Colony if the Boer freebooters in Bechuanaland were ejected; in 1890 Rhodes became premier with Hofmeyr's approval and support. Rhodes remained in office as prime min- ister until January 1896. During these six years the part he played in the development and public life of South Africa was greater than that of any other man. He used his period of power to put into execution his plans for the extension of British dominion over the country up to the Zambezi.

In 1888 Rhodes had succeeded in inducing Sir Hercules Robinson, the high commissioner, to allow J. S. Moffat, the British British resident at Bulawayo, to enter into a treaty

South Africa with Lobengula, the Matabele chief. Under this Company. [rea ty Lobengula bound himself not to make a treaty with any other foreign power, nor to sell or in any other way dispose of any portion of his country without the sanction of the high commissioner. This step prevented the country from falling into the hands of Germany, Portugal or the Boers. The treaty was followed by the formation of the British South Africa Company, which obtained a royal charter in 1889, and by the occupation of Mashonaland in 1890. Difficulties with the Portuguese followed, but the Salisbury administration firmly upheld British claims, with the result that the British sphere of influence was extended not only to the Zambezi but beyond to the shores of Lake Tanganyika (see Africa: § 5). In 1893 a war was fought with the Matabele by Dr L. S. Jameson, then administrator of Mashonaland, and Bulawayo was occupied. The name Rhodesia was conferred upon the country in 1894 (see Rhodesia). Living in Cape Town and at the head of the government, Rhodes used every effort to demonstrate to the Cape Colonists that the work he was doing in the north must eventually be to the advantage of Cape Colonists and their descendants. On the whole, Hofmeyr and his friends were well pleased at having secured the co-operation of the " big Englander " Rhodes, or, as he was at one time called by Mr J. X. Merriman, 1 an old parliamentary hand and treasurer-general during part of Rhodes's premiership, the " young burgher."

In 1891 the Bond Congress was held at Kimberley, and harmony appeared to reign supreme. During his term of office Mr Rhodes addressed himself to bringing the Bond, together all interests, as far as it was practicable to do

so. He showed that his views of the situation were broad and statesmanlike. His handling of the native ques- tion in Cape Colony gave general satisfaction. Rhodes was also a firm believer in the federation of the South African states and colonies, and he sought to promote this end by the develop- ment of inter-state and inter-colonial railway systems, and the establishment of common customs, tariffs, and inter-colonial free trade under a customs union. 2 The persistent opponent to both these measures was the Transvaal. In matters of domestic legislation, such as taxation and excise, Rhodes fell in to a considerable extent with Dutch prejudices.

While in the rest of South Africa there was a growing feeling of trust between the Dutch and British, accompanied by in- Flrst creasing trade and the development of agriculture,

Transvaal the condition of the Transvaal was becoming serious. Reform £t first the new-comers to the Rand had submitted ‘ to the economic and political burdens to which they were subjected, but as they grew in numbers and found their

1 Mr Merriman (b. 1841) was a son of N.J. Merriman (1810-1 bishop of Graham’s Town. He was a member of various Cape ministries from 1875 onwards.

8 For Rhodes’s scheme of commercial federation see further Cape Colony : History.

burdens increased they began to agitate for reforms. In 1892 (the year in which the railway from Cape Town reached the Rand), the National Union was founded at Johannesburg by ex- Cape Colonists of the Imperial progressive party. For three years petitions and deputations, public meetings and news- paper articles, the efforts of the enlightened South African party at Johannesburg and Pretoria, were all addressed to the endeavour to induce President Kruger and his government to give some measure of recognition to the steadily increasing Uitlander population. Urgent representations were also made by the British government. President Kruger remained as impenetrable as adamant. Nine-tenths of the state revenue was contributed by the Uitlanders, yet they had not even any municipal power. By a law of 1882 aliens could be naturalized and enfranchised after a residence in the country of five years, but between 1890 and 1894 the franchise laws were so altered as to render it practically impossible for any foreigner to become a burgher. By the law of 1894 the immigrant must have been at least 14 years in the country and be 40 years old before in the most favourable circumstances he could be admitted to the franchise. The Uitlanders once more petitioned, over 34,000 persons signing a memorial to the Raad for the extension of the franchise. The appeal was

refused (August 1895). Up to this period a section of the Uitlanders had believed that Kruger and his following would listen to reason; now all realized that such an expectation was vain. Rhodes, who had large interests in the Rand mines, had consistently endeavoured to conciliate the extreme Boer section in the Transvaal and win it over (as had happened in the case of the Cape Dutch) to a policy which should benefit the whole of South Africa. He was even willing to see the Transvaal obtain a seaport (at Kosi Bay, in Amatongaland) if in return it would join the customs union. This opportunity Kruger let shf>; and in May 1895, on the representation of Sir H. Loch, the Rose- bery administration annexed Amatongaland, thus making the British and Portuguese frontier conterminous. This action, finally blocking the Boer road to the sea, taken by a Liberal government, was clear indication that Great Britain was de- termined to maintain her supremacy in South Africa.

The situation in August 1895 was thus one of extreme tension. There had been a change of ministry in Great Britain and Joseph Chamberlain had become colonial secretary. Sir Hercules Robinson, who was regarded sympathetically by the Dutch population of South Africa, had succeeded Loch as high commissioner. Both high commissioner and the imperial government were hopeful that Kruger might even yet be induced to modify his policy; the Uitlanders now entertained no such hope and they prepared to appeal to arms to obtain redress of their grievances. The first proposals for an armed rising came from Rhodes in June, but it was not until November that the Uitlander leaders came to a definite understanding with the Cape premier as to the course to be pursued. To lay before South Africa the true position of affairs in the Transvaal Charles Leonard issued a manifesto as chairman of the National Union. It concluded with a list of demands (see Transvaal), their gist being " the establishment of this republic as a true republic " with equitable franchise laws, an independent judi- cature and free trade in South African products.

This manifesto, issued on the 26th of December, called a public meeting for the night of Monday the 6th of January 1896, " not with the intention of holding the meeting, but as a blind to cover the simultaneous rising in Johannesburg and seizing of the arsenal in Pretoria on the night of Saturday the 4th of January " (Fitzpatrick, The Transvaal from Within, ch. iii.). Had the Transvaal government given way, even at the last hour, the reformers would have been satisfied. Of this, however, there was no expectation. The arrangement with Rhodes included the use of an armed force belonging to the Chartered Company, and led by Dr Jameson. son # a /,f. Accordingly some troops were brought from Rhodesia and stationed near Mafeking, a few miles from the Transvaal frontier. For some weeks the plot appeared to progress

favourably. It might have succeeded but for a vital difference which arose between the Uitlanders in Johannesburg and Rhodes. As Charles Leonard's manifesto stated, the reformers as a body, desired to maintain the autonomy of the Transvaal and the republican form of government; Rhodes wished the revolution to be accomplished under the British flag. 1 " I was not going to risk my position," he stated subsequently, " to change President Kruger for President J. B. Robinson " (the only prominent Uitlander who stood aloof from the reform movement). This divergence of views manifested itself on Christmas Day 1895, and although, under pressure, Rhodes did not insist on the British flag, it was determined to postpone the rising. Jameson was so informed, nevertheless he precipitated the crisis by invading the Transvaal on the evening of December the 29th. The Transvaal government, meantime, had obtained some knowledge of what was being projected, and the Raid ended in a forced surrender (January 2, 1896) to a superior force of Boers. The Reform Committee, i.e. the Uitlander leaders, after holding Johannesburg for over a week, also sur- rendered, and by the 9th of January the plot had ended in complete failure. Mr Chamberlain still desired Kruger to grant immediate reforms and propounded a scheme of " Home Rule " for the Rand. The time was inopportune, however, for press- ing the Transvaal on the subject, and nothing was done. 2 .

The Jameson raid had a profound effect on the history of South Africa. It greatly embittered racial feeling throughout the country; it threw the Free State Boers completely on to the side of the Transvaal; it destroyed the alliance between the Dutch in Cape Colony and the Imperialists led by Rhodes. It did more, it divided British opinion, sympathy for the Boer republics leading in some cases to a disregard for the real griev- ances of the Uitlanders. It also gave a much desired oppor- tunity for the intrusion of other powers in the affairs of the Transvaal; 3 and it led Kruger to revive the scheme for a united South Africa under a Dutch republican flag. This scheme found many supporters in Cape Colony. A suspicion that the Colonial Office in London was cognizant of Rhodes's plans further excited Dutch national feeling, and the Bond once more became actively anti-British. Rhodes had resigned the premiership of the Cape a few days after the Raid, and during the greater part of 1896 was in Rhodesia, where he was able to bring to an end, in Sep- tember, a formidable rebellion of the Matabele which had broken out six months previously.

A section of the Dutch population was not however disposed to sacrifice the development of industries and commerce for racial considerations; while sharing the political aspirations of Kruger and Steyn the wiser among them wished for such a measure of reform in the Transvaal as would remove all justification for outside interference. Nevertheless the cleavage at the Cape between the Dutch and British grew. Sir Gordon Sprigg, who had become Premier of Cape Colony in succession to Rhodes, found his position untenable, and in October 1898 he was suc- ceeded by a Bond ministry under Mr W. P. Schreiner. The term " Progressive " was now formally adopted by the British mercantile communities in the large towns and among the sturdy farmers of British descent in the eastern province. On returning to South Africa after the Raid inquiry at Westminster in 1897,

1 In his evidence before the House of Commons Select Committee which inquired into the Raid, Rhodes did not object to the continued existence of the republic " for local matters," but desired a federal South Africa under the British flag; see Blue Book (165) 1897 p. 21 ; also Sir Lewis Michell's Life of Rhodes, vol. ii. ch. xxx.

2 Jameson and the other raiders were handed over to the British government for punishment. Four of the Reform leaders were condemned to death on the 27th of April, but the sentence was commuted to a fine of £25,000 each. For details of the Reform movement and Jameson Raid see Transvaal: History.

3 Rhodes informed the House of Commons Select Committee that the belief that the Boers intended to introduce the influence of another foreign power in the already complicated system of South Africa " greatly influenced " him in promoting the revolt. Germany at the time of the Raid was prepared to intervene, and on the 3rd of January 1896 the German Emperor, by telegram, congratulated Kruger that " without appealing to the help of friendly powers " the Boers had overcome Jameson.

Rhodes had intended to withdraw from Cape politics and devote his energies for a time entirely to Rhodesia, but the pressure put upon him by a section of the British colonists was so strong that he determined to throw in his lot with them.

In the Transvaal, meantime, the situation of the Uitlanders grew worse. The monopoly and concessions regime continued unchecked, the naturalization laws were not amended, while the judicature was rendered subservient to the executive (see Transvaal: History). The gold mining industry was fostered only so far as it served to provide revenue for the state, and large sums from that revenue were used in fortifying Pretoria and in the purchase of arms and ammunition. This process of arming the republic had begun

before the Raid; after that event it was carried on with great energy and was directed against Great Britain. Kruger also sought (unsuccessfully) to have the London Convention of 1884 annulled, and he entered into a closer union with the Free State. Great Britain watched the development of Kruger's plans with misgiving, but except on points of detail it was felt for some time to be impossible to bring pressure upon the Transvaal. The retirement of Lord Rosemead (Sir Hercules Robinson) from the post of high commissioner was, however, taken advantage of by the British government to appoint an administrator who should at the fitting opportunity insist on the redress of the Uitlanders' grievances.

*Sir Alfred Milner (see Milner, Viscount), the new high commissioner, took up his duties at the Cape in May 1897. He realized that one of the most potent factors in the miner situation was the attitude of the Cape Dutch, and appointed in March 1898 at Graaff Reinet Milner called upon "** Com – the Dutch citizens of the Cape, " especially those wlssloner – who had gone so far in the expression of their sympathy for the Transvaal as to expose themselves to charges of dis- loyalty to their own flag " to use all their influence, not in confirming the Transvaal in unjustified suspicions, not in en- couraging its government in obstinate resistance to all reform, but in inducing it gradually to assimilate its institutions, and the temper and spirit of its administration, to those of the free communities of South Africa, such as Cape Colony or the Orange Free State. Moreover the Graaff Reinet speech showed that Milner was aware of the dangerous policy being followed by the Bond. The Dutch party at the Cape was shown to be incurring a heavy responsibility, especially as its leaders were aware, in the words of Mr J. X. Merriman, of " the inherent rottenness " of the Kruger regime. That party soon afterwards had it in its power to bring pressure officially upon President Kruger, for it was a few months after the delivery of the speech that Mr Schreiner became premier. To some extent this was done — but in a manner which led the Transvaal Boers to count in any event on the support of the Cape Dutchmen. In the Transvaal, as has been said, affairs were steadily going from bad to worse. An Industrial Commission, appointed (under pressure) by Pre- sident Kruger in 1897 to inquire into a number of grievances affecting the gold industry, had reported in favour of reforms. The recommendations of the commission, if adopted, would have done something towards relieving the tension, but Presi- dent Kruger and his executive refused to be guided second by them. Once more the Uitlanders determined Transvaal to make a further attempt to obtain redress by Reform constitutional means, and the second organized Movemen • movement for reform began by the formation in 1897 of a branch of the South African League.*

At the end of 1898 the feelings of the Uitlanders were wrought up to fever pitch. The police service, which was violent where it should have been

reasonable, and blind where it should have been vigilant, had long been a source of great irritation. On the 18th of December a Boer policeman, in pursuit of an Eng- lishman named Edgar, whom he wished to arrest for an alleged assault on another man, entered his house and shot him dead. The deepest indignation was aroused by this incident, and was still further increased by the trivial way in which the case was dealt with by the court. The killing of Edgar was followed by

the breaking up of a public meeting at Johannesburg, and in March the Uitlanders handed to the high commissioner a petition for intervention with 21,684 signatures attached to it (see Transvaal: History).

On the 4th of May 1899 Sir Alfred Milner felt it his duty to The Case re P ort at some length by cable to Mr Chamberlain. for British The concluding passages of this message, which Interven- summed up the whole South African situation in a Uo ”’ masterly manner, were as follows: —

The case for intervention is overwhelming. The only attempted answer is that things will right themselves if left alone. But, in fact, the policy of leaving things alone has been tried for years, and it has led to their going from bad to worse. It is not true that this is owing to the Raid. They were going from bad to worse before the Raid. We were on the verge of war before the Raid, and the Transvaal was on the verge of revolution. The effect of the Raid has been to give the policy of leaving things alone a new lease of life, and with the old consequences.

The spectacle of thousands of British subjects kept permanently in the position of helots, constantly chafing under undoubted griev- ances, and calling vainly to Her Majesty’s government for redress, does steadily undermine the influence and reputation of Great Britain, and the respect for British government within the queen’s dominions. A certain section of the press, not in the Transvaal only, preaches openly and constantly the doctrine of a republic embracing all South Africa, and supports it by menacing references to the armaments of the Transvaal, its alliance with the Orange Free State, and the active sympathy which, in case of war, it would receive from a section of Her Majesty’s subjects. I regret to say that this doctrine, supported as it is by a ceaseless stream of malig- nant lies about the intentions of the British government, is produc- ing a great effect upon a large number of our Dutch fellow-colonists. Language is frequently

used which seems to imply that the Dutch have some superior right even in this colony to their fellow-citizens of British birth. Thousands of men peaceably disposed and, if left alone, perfectly satisfied with their position as British subjects, are being drawn into disaffection, and there is a corresponding exasperation on the side of the British.

I can see nothing which will put a stop to this mischievous propaganda but some striking proof of the intention of Her Majesty's government not to be ousted from its position in South Africa. And the best proofs alike of its power and its justice would be to obtain for the Uitlanders in the Transvaal a fair share in the govern- ment of the country which owes everything to their exertions. It could be made perfectly clear that our action was not directed against the existence of the republic. We should only be demand- ing tHe re-establishment of rights which now exist in the Orange Free State, and which existed in the Transvaal itself at the time of, and long after, the withdrawal of British sovereignty. It would be no selfish demand, as other Uitlanders besides those of British birth would benefit by it. It is asking for nothing from others which we do not give ourselves. And it would certainly go to the root of the political unrest in South Africa ; and though temporarily it might aggravate, it would ultimately extinguish the race feud, which is the great bane of the country.

In view of the critical situation Milner and Kruger met in conference at Bloemfontein on the 31st of May. Milner practically confined his demands to a five years' franchise, which he hoped would enable the Uitlanders to work out their own salvation. On his side Kruger put forward inadmissible demands (see Transvaal), and the conference broke up on the 5th of June without any result. A new franchise law, on a seven years' naturalization basis, was passed in July by the Transvaal volksraad, but the law was hedged about with many restrictions. Messrs Hofmeyr and Herholdt, the one the leader of the Bond and the other the Cape minister of agri- culture, visited Pretoria to reason with Kruger. They found him deaf to all arguments. The fact is that the Boers had made up their minds to a trial of strength with Great Britain for supremacy in South Africa. At the time which from a military standpoint they thought most opportune (October 9) an ultimatum was handed to the British agent at Pretoria, and a war was at once precipitated, which was not to close for over two and a half years. (A.P.H.; F.R.C.)

D. From the Annexation of the Dutch Republics to the Union. — An account of the Anglo-Boer War of 1899-1902 will be found under Transvaal. After the surrender of Cronje at Paarde- berg (February 1900) to Lord Roberts, Presidents Kruger and Steyn offered to make peace, but on terms which should include the acknowledgment of " the incontestable independence of

both republics as sovereign international states "; the Boers also sought, unavailingly, the intervention of foreign powers. The British government had decided that the con- tas< Efforts tinued existence of either republic was inadmissible; to Preserve on the 28th of May 1900 the annexation of the tneBoer Free State was formally proclaimed, and on the pu s ' 1st of September the Transvaal was also annexed to the British Empire. A few days later ex-President Kruger sailed from Lourenco Marques for Europe. The refusal of the German Emperor to receive him extinguished alike his political influence and all hopes that the Boers might still have entertained of help from foreign governments. At that time all the chief towns in both of the late republics were held by the British, and the Boers still in the field were reduced to guerilla warfare. Most of the men on their side who had come to the front in the war, such as General Louis Botha in the Transvaal, had been opponents of the Kruger regime; they now decided to continue the struggle, largely because they trusted that the Cape Dutch, and their sympathizers in Great Britain, would be able to obtain for them a re-grant of inde- pendence. The Cape Dutch all through 1901 and the first part of 1902 conducted a strong agitation in favour of the former republics, the border line between constitutional action and treason being in many cases scarcely distinguishable. The Cape Afrikanders also formed what was styled a " conciliation com- mittee " to help the party in Great Britain which still supported the Boer side. Messrs Merriman and Sauer went to England as delegates to plead the cause, but it was noted that Hofmeyi refused to join, and the appeal to the British public was a com- plete failure. The war had indeed stirred every part of the empire in support of the policy of the government, and from Australia, Canada, New Zealand and India, contingents wˆre sent to the front. No terms could be granted which did not include the explicit recognition of British sovereignty. At last the Boer commandos gave up the struggle and on the 31st of May 1902 their leaders signed articles of peace at Pretoria. Henceforth, save for the German and Portuguese possessions, on the west and east coasts respectively, there was but one flag and one allegiance throughout South Africa. With the elimination of the republics one great obstacle to federation was removed; while the establishment of self-government in the new colonies, promised (after a probationary period of " representa- tive institutions") in No. VII. of the peace articles, would give them an opportunity to enter into federal union on equal terms. The task of founding new and better administrative machinery in the new colonies was left to Lord Milner, and was begun even before the war had ended. The two new colonies TheWork of were for the time governed on crown colony lines. Reconstruc- But the co-operation of the people was at once sought tlon – by nominating non-official members to the leglislative councils,' and seats on the Transvaal council were offered to Louis Botha, C. J. Smuts and J. H. Delarey. The Boer leaders declined the offer — they preferred the position of untrammelled critics, and the

opportunity to work to regain power on constitutional lines when the grant of self-government should be made. Milner had thus an additional difficulty in his reconstruction work. The first necessity was to restart the gold mining industry on the Rand. The Uitlanders, who had fled from Johannesburg just before the war opened, began to return in May 1901, and by the time the war ended most of the refugees were back on the Rand and mining was resumed. A tax of 10% on their annual net produce, imposed in 1902, was the main available source of revenue. The repatriation of some 200,000 Boers followed, and the departments of justice, education and agriculture were remodelled. 1 In all that he did Milner had endeavoured to promote closer union. Thus the railway and constabulary of both the ex-republics were under a single management. In this

1 To aid him Milner had the services of some of the best men in the British service, e.g. Sir Godfrey Lagden, Sir Arthur Lawley, Sir J. Rose-Innes, Sir Richard Solomon. He also secured the help of a considerable number of young Oxford men who became known as " the Milner Kindergarten."

work the high commissioner had the support of Mr Chamberlain, v. ho paid a visit to South Africa which extended from Christmas 1002 to the end of February 1903. He sanctioned the calling of an inter-colonial conference, which led to a customs convention including all the British possessions in South Africa, and to united action regarding railway rates and native questions. 1

The great expenditure incurred during the war had led to much deception as to the growth of trade, while the large sums

spent on repatriation and other temporary work main- Labour. twined this deception for some time after the war had

ceased. But before 1903 had ended it was manifest that this had been a spurious activity, and a period of marked commercial depression, lasting until 1909, ensued. This de- pression was in considerable measure due to, and was largely aggravated by, the comparative inactivity of the Rand mines, and that inactivity was due in turn to the insufficiency of native labours-Kaffirs being employed to do all the unskilled work on the mines. At the close of 1903 the mine-owners, to meet the deficiency, asked for permission to import Chinese. The consent of the high commissioner and of

the home government was obtained, and in June 1904 the first batch of coolies reached the Rand, They came on three-years' indentures, over 50,000 Chinese being eventually brought over. This introduction of Chinese labour met with considerable opposition. The South African objections were economic and racial, based on the results which had followed the introduction of Indian coolies into Natal. In Natal these coolies had been allowed to remain after the completion of their indentures, and had succeeded in prac- tically monopolizing the petty trade of the country. They had also rapidly multiplied, so that by 1904 they were more numerous than the whites in the colony. The introduction of this large alien element, leading from 1895 onwards to the passing of restrictive measures in Natal, was a mistake which South Africans elsewhere had no desire to repeat. But these objections were overcome by regulations which made repatriation compulsory, and which definitely restricted the coolies to unskilled labour in the mines. These regulations also met the objections voiced by Australians and New Zealanders that the country won for Great Britain at such cost had been thrown open to hordes of Asiatics. In Great Britain, however, the restrictive regulations were precisely those which aroused criticism, the objection taken being that the conditions imposed were of a servile character, if they did not actually make the coolies " slaves. " In the attacks made upon the Unionist government this cry was loudly voiced by the Liberal party in England, and in the political campaign which followed, the " Chinese Slavery " issue un- doubtedly helped to swell the majority obtained by Sir H. Campbell-Bannerman in January 1906. Milner's own object in assenting to the introduction of the Chinese was — besides aiding to put the gold mining industry on a more stable basis — to obtain revenue for the great task he had on hand, " the re- starting of the colonies on a higher plane of civilization than they had ever previously attained "; and in respect of the working of the mines and consequently in providing revenue the intro- duction of the Chinese proved eminently successful; but in February 1906 the Campbell-Bannerman administration felt it incumbent to announce that no ordinance imposing " servile conditions " would be sanctioned. The point as to whether the original conditions were or were not servile was never legally tested, for eventually on the grant of self-government to the Transvaal the Botha cabinet decided (June 1907) not to renew the indentures nor to permit any new importation of coolies. The economic situation had in the meantime considerably altered, and the Transvaal was able to bring pressure upon Portugal to permit the recruiting of many thousands more Kaffirs from Mozambique province. By February 1910 the last of the coolies had been repatriated.

By the middle of 1904 the high commissioner and Mr Alfred Lyttelton, who had become secretary for the colonies, agreed that the work of reconstruction had so far progressed that steps

1 This action was on the lines of the commercial federation scheme of Cecil Rhodes, who had died in March 1902.

should be taken to give the Transvaal " representative govern- ment. " This decision was made public in July of that year, and was followed by marked political activity. The The Boers in the Transvaal, headed by Louis Botha, Lyttelton formed an association which was called Het Volk c ° aat ‘ tu – (the people), and in the Orange Colony a similar °"' organization, the Oranjie Unie, was formed. On the 31st of March 1905 the text of the new constitution was issued by letters patent. Short of granting full self-government it was of a liberal character. It provided that the legislative council was to consist of not fewer than six or more than nine official members, and, provisionally, of not fewer than thirty or more than thirty-five elected members. Seats were to be allotted on a voters' (not population) basis, and there was to be an automatic redistribution of seats as voters increased or de- creased in given localities. These provisions — subsequently adopted in the electoral law of the Union of South Africa — were made to secure equal rights for the British and Dutch sections of the community. The promulgation of the Lyttelton constitution was quickly followed by the retirement of Lord Milner. He left South Africa in April 1905, and was succeeded as high commissioner and governor of the Transvaal and Orange River colonies by Lord Selborne. But before the new constitution could be established a change of ministry in Great Britain put the Liberals in office, with Sir Henry Campbell-Bannerman as premier (Dec. 1906).

A sudden change was now made. Sir H. Campbell-Bannerman, with several of his colleagues in the ministry, held that the annexation of the republics had not been justified, but there was no question now, as there had been in government. 1881, of a restoration of independence; that matter the Boers themselves had settled by their acceptance of British sovereignty. The Liberal leader held, however, that the Boers should be given self-government at once. Experience, he declared 2 had proved, unfavourable to the working of representa- tive institutions, and it was safer and better to begin with respon- sible government. Moreover, the cabinet looked forward, without forcing it in any way, to the federation of South Africa. In the Transvaal the burghers of British origin were about equal in number with those of Dutch origin, and the fairly even balance of parties might be held to be a guarantee against retrogression; in the Orange River Colony it was notorious that the grant of self- government meant handing over the control of the country not simply to the Boers, but to that section of them which since the war had exhibited the greatest racial bitterness. In these circumstances the decision of the Liberal cabinet, however generous, was

fraught with peril. But the policy of complete trust in the Boers was a bold one, which was justified by success.

The new letters patent instituting self-government in the Transvaal were issued on the 12th of December 1906; the elections were held in February 1907, and gave the Het Vclk party a clear majority of seven (in a house numbering 69 members) over all other parties. General Botha became premier, with Mr Smuts as colonial secretary. In the Orange River Colony the first elections under the self-government constitution were held in November 1907, and out of 38 seats in the House of Assembly Oranjie Unie candidates secured 29. A ministry was formed with Mr A. Fischer as premier and Generals Hertzog and de Wet as prominent colleagues. These triumphs of the Dutch section of South Africans were followed in the general election in Cape Colony early in 1908 by a sweeping victory of the Bond, helped by the suffrages of re-enfranchised rebels. Dr Jameson — who had been premier of the colony since the Progressive victory at the election of 1904 — was succeeded as premier by Mr J. X. Merriman, who was regarded as a Bond nominee. Thus, working within constitutional lines, the Dutch Afrikanders had attained in three out of the four self-governing colonies, political supremacy. The situation in 1908 was, however, radically different from that which existed before the war of 1899-1902. Then half the white population of the Transvaal were as " helots "; now the 2 In a speech in the House of Commons, February 19, 1906.

ex-Uitlanders held 26 seats in the Transvaal parliament, and were able to exercise an effective influence over legislation.

Both the war of 1899-1002 and the grant of self-government to the new colonies were necessary preliminaries to the success of any unification scheme, but the causes which now led to the question of closer union being raised were not political but The Move- economic. Since the development of the diamond meat for and gold mining industries the coast colonies had Closer unduly neglected their own resources and had relied

chiefly on the forwarding trade. Hence there was jealousy and competition between the Cape and Natal and a tendency to use the railways (which were state owned) , by means of rebates, to counteract the effects of common customs dues. Then, too, an increasingly important factor was the competition of Lourenco Marques for the Rand trade. In a time of acute trade depression this commercial rivalry was disastrous to the welfare of South Africa. In March 1906 the customs convention was provisionally renewed (on a strongly protective basis, and with preference for British goods) but there was a distinct pros- pect of a tariff war when the convention expired in 1908. Again it was known that the Transvaal and Orange River colonies on their attainment of self-government would each demand full control of their own resources, to the detriment of the unitary services which Lord Milner had established. There were, more- over, dangerous differences on such questions as Asiatic immigration, the status of natives, mining, agriculture, &c. Thus the antagonism between the various states on economic lines was at the end of 1906 greater than any racial divisions. The leading South African statesmen realized that unless an effort to remedy this condition was made without delay affairs would go from bad to worse. In these circumstances Dr Jameson, as premier of Cape Colony, took the first overt step to reopening the question of federation. 1 In a minute dated the 28th of November 1906 the Cape ministry declared its belief that the questions which were causing so much friction should be capable of solution " by some duly constituted South African authority responsible to all parties in the country," and it appealed to Lord Selborne, as high commissioner, to review the situation in such a manner that the people of South Africa might form a competent judgment on the question. In answer to this appeal, which was backed by the Natal ministry, Lord Selborne drew up a despatch (dated Jan. 7, 1907) in which the whole case for closer union was set forth in a masterly manner. For insight and breadth of view the despatch ranks with that which Sir George Grey drew up in 1858. In the fifty years that had elapsed the case for closer union had become overwhelming and the dangers of isolation much greater. Four or five administrations, the despatch pointed out, were pursuing rival interests, whereas the country had but one interest. Reviewing one by one the questions on which rivalry existed, Lord Selborne showed that the internal self-government which each colony enjoyed accentuated the difficulty of dealing with these questions as a whole. 2 Stability — the thing

which South Africa required above everything else — was unattainable so long as there were five separate governments developing different systems in all branches of public life, but no national government with power to harmonize the whole. " The people of South Africa . . . are not self-governing in respect to South African affairs because they have no South African government with which to govern." Only by the creation of a central govern- ment could South Africa be wisely and successfully governed. 3

The opportunity for testing the strength of the movement for closer union came with the meeting of an inter-colonial conference in May 1908 to consider the thorny questions of tariff and railway rates. In the meantime the Jameson ministry

1 A number of members of the Transvaal administration during the Crown Colony period had worked steadily, in private, to promote closer union. Prominent among these men was Mr Lionel Curtis, at that time (1906) assistant colonial secretary.

2 Lord Selborne wrote in anticipation of the establishment, a few months subsequently, of self-government in the new, colonies.

- *For the text of the despatch and memorandums going into details see the Blue Book (Cd. 3564) July, 1907.*

had given place to the Bond nominee ministry with Mr Merriman as premier (see Cape Colony: History), but the movement initiated by Jameson had received the support of the Bond as well as that of the Botha administration. The delegates at the conference were all representative of the parties in power; that is, with the exception of the Natal delegates, they all represented Dutch ideals in politics. Nevertheless they unani- mously resolved " that the best interests and the permanent prosperity of South Africa can only be secured by an early union, under the crown of Great Britain, of the several self-governing colonies," and they recommended the calling of a national con- vention entrusted with the task of drawing up a draft constitu- tion. Thus for the first time for two generations both the chief white races of South Africa were found working in cordial co-operation. No appeal was made to the electorate, but the colonial parliaments rightly interpreted public opinion in endorsing the recommendations of the conference. Delegates representative of all parties were appointed, and the national convention to consider the question of union met at Durban in October 1908.

The most prominent members of the convention were Sir Henry de Villiers, 4 chief justice of Cape Colony (president), ex- President Steyn (vice-

president), Generals Botha, The de Wet and Delarey, Messrs Smuts, Schalk Burger, National Merriman and F. R. Moor (premier of Natal), Dr Convention. Jameson, Sir George Farrar and Sir Percy Fitzpatrick, the last two the leading representatives of the Transvaal Progressives (i.e. the ex-Uitlanders). The greatness of the opportunity was rightly stated by the governor of Natal (Sir Matthew Nathan), who declared that the convention might create a commonwealth which should add to and not draw upon the strength of the empire — a commonwealth which in culture as in power would be among the foremost nations of the world. After sitting at Durban for a month, the convention adjourned to Cape Town and concluded its elaboration of a draft constitution by February 1909. The fundamental points which the delegates had to settle concerned (a) the basis of parliamentary representation, (b) the status of the natives with respect to the franchise, (c) the position of the Dutch language, (d) the form of government.

The adjustment of tariff and railway rates gave little trouble when once it was agreed to consider the country as a unit. Points (a) and (b) both concerned the franchise, but each had its separate issue (a) raising the question of representation as it concerned the white population only. Suspicions had been raised that the attempt would be made to force union on a Dutch Afrikander basis, which might have resulted had the basis of representation adopted been the total European population. To this the Progressive party would not agree, and they gained support from Botha, Smuts and other prominent Dutch delegates for their contention that " equal rights " could only be secured by making the basis of representation the number of voters as distinct from the number of European inhabi- tants of any given area. As finally settled, the number of European male adults was chosen as the basis of representation. As the Transvaal and Orange colonies already possessed manhood suffrage, and as the property qualifications in the coast colonies were low, this alteration made little difference. Point (b) raised a graver issue still. The Cape delegates found themselves in isolation in advocating the extension of the electoral system which prevailed in their colony, where there was no colour bar to the exercise of the franchise. The merits of the Cape system — to minimize the differences between the white and native races, typified in the declaration of " equal rights to all civilized men " — or that of the opposite system (as warmly advocated by the Natal delegates as by those from the ex- Boer republics), which would keep the native races in permanent inferiority, cannot here be discussed ; it may be stated, however, that the admittance of Kaffirs to the franchise in the Cape had not been attended with the evil consequences feared. At the convention a way out of the difficulty — for a time at least — was found in a com- promise, namely, that in the state about to be created the franchise in each constituent part should be that

which existed before union was effected. Thus in the Cape the Kaffir would have a right to the franchise, but not in the other divisions of the country. _ Point (c) was decided by placing, for all official purposes, the English and Dutch languages on a footing of perfect equality. As to point (d) the

4 Sir Henry de Villiers (b. 1842), chief justice of Cape Colony since 1874, was created a peer of the United Kingdom in 1910 under the title of Baron de Villiers of Wynburg. He became in the same year chief justice of South Africa.

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issue was between a federal and a unitary form of government. Federation was supposed to afford protection to the smaller com- munities — Natal and the Orange River Colony — and in Natal there was much anxiety lest its interests should be overborne. Nevertheless the advocates of unification gained a complete victory and a form of government was agreed to which made the union of South Africa as close as that of the United Kingdom.

Among the other decisions of the convention were: the choice of Pretoria as the seat of administration and of Cape Town as the seat of the legislature, the renaming the Orange River Colony, Orange Free State Province; the provision of three membered con- stituencies and of proportional representation and the safe-guarding of the smaller communities by giving Natal and the Orange River colonies more members of parliament than they were entitled to on the voters basis.

The draft constitution was made public on the 9th of February 1909, and was adopted by the Transvaal parliament in its en- tirety. The Orange River parliament also approved with only slight alterations; the Natal parliament made some amend- ments, but they were of a minor character. The opposition to union among an influential number of old Natalians — intensely zealous for local independence — was however so marked that it was decided that before Natal was committed to union a referendum on the subject should be taken. Apart from this doubtful attitude of Natal, the chief danger to the draft con- stitution came from the Cape Dutch. The draft act, with its " one vote one value " principle, its three-membered con- stituencies and its scheme for proportional representation, threatened Dutch supremacy in the rural districts, and aroused the opposition of Hofmeyr, who secured the passage of amend- ments through the Cape parliament which destroyed the principle of equal rights. Such was the position when the convention reassembled in May at Bloemfontein to consider the amend- ment of the various legislatures. Through the firmness of the Transvaal

delegates, supported by the Progressives, the principle of equal rights was retained; the concession made to the Cape was. the abandonment of proportional representation, while one-membered constituencies were substituted for three-mem- bered constituencies. The document embodying the alterations in the draft act was signed on the 1 ith of May and the convention dissolved. In June the referendum on union was taken in Natal, and resulted in a complete rout of the separatists. There voted, for the draft act 11,121, against it 3701 — majority for union 7420. South Africans had thus after seventy years of discord agreed upon union. It was a momentous step, the essential pre- Passing of liminary to that fusion of the white races of South the Act of Africa upon which the prosperity of the country Union, depends; and a step rendering easier the ultimate

attainment of imperial union. A delegation carried the draft act to England, and, recast in the form of an imperial bill, it was submitted to the parliament at Westminster. The imperial government made but one alteration of consequence — that explicitly placing the control and administration of matters " specially or differentially affecting Asiatics "in the sole control of the union parliament. The bill passed through parliament unaltered, the only jarring note in the debates in either house concerning the exclusion of natives from the franchise (save in the Cape province). This decision was deplored by all parties in the British parliament, but it was recognized that to alter a decision deliberately come to by South African statesmen would wreck the union. The measure, known as the South Africa Act 1909 received the Royal Assent on the 20th of September, and subsequently the 31st of May 1910 — the eighth anniversary of the signing of the articles of peace at Pretoria — was fixed as the date for the formal establishment of the Union.

The interval between the passing of the South Africa Act and the establishment of union was employed by the various colonies in putting their houses in order. This task, on the economic side, was rendered easier by the gradual return of commercial prosperity. An agreement between the Transvaal and the Portuguese governments, concluded in April 1909, while the fate of the draft constitution was still in doubt, assigned to Lourenco Marques 50 to 55% of the import trade to the Rand, and (with certain exceptions) provided for free trade in native products between the Mozambique province and the Transvaal. The

Portuguese further agreed to facilitate the recruitment of natives in their territory for work in the Rand mines, and in consequence Kaffirs were obtained in sufficient numbers to replace the Chinese coolies as they were repatriated. The agreement was to last ten years, and provision was made for its recognition by the government of the Union. The native protectorates, Basutoland, Swaziland and Bechuanaland had been left by

the South Africa Act under direct imperial control. As to Natal and Zululand, there was a disposition to leave to the new govern- ment the task of dealing with the natives there but both the Transvaal and Natal adopted an Asiatic exclusion policy which gave rise to much friction. In the Orange River Colony, General Hertzog aroused much opposition by administering the education act in a way which forced the teaching of Dutch in a rather arbitrary fashion. This was a point of importance, inasmuch as, by the Act of Union, elementary education was left (for five years) in the hands of the provinces. The divergence of views was so great that shortly after the union had been established private schools were opened in opposition to those of the provincial administration.

In the autumn of 1909 it became known that Lord Selborne, whose services in bringing about the union were generally recog- nized, would not remain to represent the Crown in in- augurating the new form of government, and the choice Estai,u sae i % of the British government fell on the home secretary, Mr Herbert Gladstone (who was in March 1910 created Viscount Gladstone of Lanark) as first governor-general of the Union. Lord Gladstone had the responsibility of summoning the first prime minister of the Union — a task rendered more difficult as the decision had to be taken before the first election to the Union parliament was held. There had been a strong agitation for a coalition cabinet, and negotiations took place to this end between General Botha and Dr Jameson. These efforts ended in failure. They had met with the determined opposition of Mr Merriman (the Cape premier), of the Orange Free State Boers, and of the Bond, which had lost the counsel of Hofmeyr. That typical leader of the Cape Afrikanders had died in London, whither he had gone as one of the delegates to lay the draft con- stitution before the British parliament. Towards the end of May, Lord Gladstone called upon General Botha to form a ministry, which was constituted from the ranks of the existing cabinets and included Natal ministers as well as strong Boer partisans like Mr Fischer and General Hertzog. Mr Merriman declined to serve under General Botha. The formal proclamation of the Union took place on the 31st of May.

The first general election, held on the 15th of September, was, perhaps inevitably, fought to a large extent on racial lines. The Dutch Afrikander candidates stood as " Nationalists," while their opponents took the name of Unionists. In Natal the British section of the electorate (four-fifths of the whole) preferred to maintain an independent attitude. The elections, which resulted in a Nationalist majority of 13 over all other parties, showed that the Unionists were stronger than had been thought. They secured 37 seats, while 13 were held by Natal Independents. The polls were remarkable for the defeat of three ministers — General Botha (by Sir Percy Fitzpatrick) at Pretoria East, Mr Hull (by Sir George Farrar) on the Rand, and Mr Moor in Natal. General Botha decided to retain office, and seats for him and Mr

Hull were found by means of by-elections. Mr Moor was nominated to the senate, as were, among others, Mr W. P. Schreiner and ex-President Reitz (who became president of that body). On the 4th of November the first session of the Union Parliament was opened by the duke of Connaught.

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(F. R. C.)

SOUTHALL NORWOOD, an urban district in the Brentford parliamentary division of Middlesex, England, suburban to London, 12 m. W. of St Paul's

Cathedral, on the Great Western railway. Pop. (1891), 7896; (1901), 13,200. Brickfields, flour-mills and chemical works are established in the district, which is also largely residential. The Grand Junction Canal serves Southall. Cattle markets are held weekly under a grant of William III. The Elizabethan manor-house of Southall remains, and the parish church of Norwood, though greatly restored, has Early English and Decorated portions, a canopied tomb dated 1547 and brasses of the 17th century.

SOUTH AMBOY, a city of Middlesex county, New Jersey, U.S.A., on Raritan Bay at the mouth of the Raritan river, about 27 m. S.W. of New York City. Pop. (1900) 6349 (1700 foreign-born); (1910) 7007. It is served by the Pennsylvania, the Central of New Jersey, and the Raritan River railways. A railway drawbridge and a traffic bridge across the river connect the city with Perth Amboy. South Amboy is an important point for shipments of coal from the Pennsylvania mines. The Pennsylvania Railroad Company and the Susque- hanna Coal Company have coal docks here and the latter has great storage yards. Among the city's industries are the mining of clay and sand, and the manufacture of terra cotta. South Amboy, originally a part of South Amboy township (incorporated in 1798), was laid out in 1835, was incorporated as a borough in 1888, and became a city under a general state law in 1908.

SOUTH AMERICA. The early physical history of the South American continent as recorded in the rocks has been exten- Deveiopment sively obliterated or greatly obscured by the events of the of its later history. The early land areas are supposed

Continent. t0 b e only approximately suggested by the present exposures of granite and gneisses. The largest of these old land areas is along the east of the continent, extending with a few inter- ruptions from the mouth of the Rio de la Plata to within a short distance of the mouth of the Amazon river. North of the present Amazon valley and occupying the present highlands of Guiana, north-east Brazil, and south-east Venezuela was another one of these old land areas — a large island or a group of islands. A chain of islands extended from the Falkland Islands along what is now the entire west side of the continent. Upon these ancient shores were laid down the sedimentary beds of the Cambrian seas. At the close of the Cambrian period the continent was elevated, many of the former islands were joined together, and the continental land area was considerably enlarged. The Silurian seas, however, still covered the basin of the Paraguay, extending from the Serra do Mar on the Brazilian coast to the axis of the Andes on the west, and covering at the same time a considerable part of the basin of the Rio Sao Francisco, filling the straits between the Andes and the Matto Grosso highlands and opening east through the region now occupied by the lower Amazon valley.

During the Devonian period there was a still further enlarge- ment of the continent through elevation and the joining of islands, and the disappearance of the old Silurian sea in the basin of the Rio Sao Francisco on the east of the continent. In early Carboniferous times the sea still covered a narrow belt through

the lower part of the Amazon valley, and part of what is now the Andes lying south of the equator. During Permian times the basin of the Paraguay and the south-east coast of Brazil was covered with lagoons and swamps in which here and there coal beds were laid down. At the close of this period molten lavas broke through the earth's crust and flowed over and buried large areas in what is now Paraguay and south Brazil.

There was a general depression of the continent during the Cretaceous period and the ocean covered most of the continent as we now know it. The Serra do Espinhaco along the east coast of Brazil was above water and the coast line between the Rio de la Plata and Cape St Roque was little different from what it is at present. But through the highlands of Brazil from near Per- nambuco west there was a broad sound containing many islands extending to the base of the Andes and possibly connecting with the Pacific Ocean. In the extreme north there were also many islands, bays and sounds, while a continental mass occupied the region of the Antilles. To the south the Atlantic Ocean filled most of the lower Paraguay basin and washed the eastern bases of the Andes. There was shallow-water connexion during this period between South America and southern India, through the Antarctic regions, probably by way of Australia.

In Early Tertiary times great changes took place in the geography of South America. The continent rose much higher than its present elevation, the coast-lines were extended ocean- ward, and the continent was considerably larger than it is at present. The Abrolhos Islands on the east coast of Brazil were then a part of the mainland and the seashore was some 200 m. further east. The Falkland Islands were also at that time a part of the continent, and South America had land connexion through the Antarctic regions or through the south Pacific Ocean with New Zealand and Australia, and through the West Indies region with Cuba and North America. Toward the close of Tertiary times the continent sank again beneath the ocean and salt water flowed into the Amazon and Orinoco valleys, turning the Guiana highlands again into an island or group of islands, and again separating the continent from land connexion with other continents. The valleys of Rio Magdalena, Rio Cauca and Lake Maracaibo were bays that covered large areas of adjacent territory.

It was during the Tertiary period that the continent took on its most characteristic features. Volcanic activity culminated; the Andes rose from low ridges and islands near sea-level to be one of the greatest mountain systems of the globe. This elevation was partly due to the uplifting of the continent en masse, partly to faulting and folding of the rocks, and partly to the pouring out of lavas and the accumulations upon the surface about vents of other volcanic ejectments. This volcanic activity was not confined to the main range of the Andes, but extended into Venezuela and the islands along the north coast, to the plains of Patagonia, the highlands of the Parana basin and as far east as the islands of Fernando de Noronha. In recent times volcanic activity has greatly diminished over the continent and has entirely ceased along its eastern and north-eastern parts. The great elevation and depression of the continent deeply affected the climate over certain large areas. For example, along the east coast, where winds blew on-shore, the rainfall was greatly increased during the elevation, while the later depression brought about a corresponding diminution of the rainfall. In Pleistocene times the south of the continent stood somewhat lower than it does at present, so that the ocean covered the plains of Patagonia and La Plata. During the glacial epoch the south of the continent and as far north as latitude 27° on the west coast was covered with glaciers that flowed down from the high mountain ranges. On the east side of the mountains the glaciers did not extend so far north as they did on the west side. The glaciers through the high Andes were also larger and longer than they are at present; there were no glaciers in the eastern or Brazilian portion of the continent.

Physical Geography. — The South American continent rises abruptly from the ocean floor along nearly all of its coast, but the steepness of the continental margin is more marked on the

western than on the eastern side. From Valparaiso to the Isthmus of Panama, a distance of 3000 m., the great Andes themselves are but the upper or subaerial portions of mountains whose Submarine bases are 10,000 ft. below the surface of the Pacific Relief. Ocean. South of Valparaiso the 10,000-foot contour

lies well out from the coast, but opposite the Straits of Magellan it approaches within 150 m. of the coast-line. On the east side of the continent the 1000-foot contour passes to the east of the Falkland Islands showing that this group stands upon a submerged shelf or shoulder of the continent. From the mouth of the Rio de la Plata northward the 1000-foot

submarine contour keeps at a distance of from 50 to 150 m. off the shore nearly to Bahia, Brazil ; from Bahia northward and around Cape St Roque this same contour is close inshore, and the ocean-floor sinks abruptly to a depth of 5000 ft. North-west of Cape St Roque the continental shelf of shallow waters widens until opposite the mouth of the Amazon the 1000-foot contour is 300 m. off the coast. The broad shelf follows along this part of the coast as far as the island of Trinidad, west of which it narrows, though the islands along the northern shores of Venezuela all stand upon and form parts of this shallow continental shelf.

Geological lnformation\ G ■ .■ 'Iltoomp'leta. I ' ■ '

Quaternary t

Tertinrj/ tL

Basle Lauds, probably Mesoxoic ItH H Sandstones of uncertain, age, with intercailations of BasiaLava in the South

Uesozolc probably Triasft

Jurassic and Triassic 1

Coat-hearing shales with Gtossopterts KV.Vl

Wp • Palaeozoic I

Archean and metamorphosed Palaeozoic I

Younger Volcanic flocks I

many islands along this part of the coast, including Chiloe W;!hng- ton and the Tierra del Fuego group itself are but the high portions of these mountains that have remained above water, white Smyth Channel and the other sounds on the west coast and the Straits of Magellan 400 m. long and 4 to 20 m. wide, are the submerged valleys. In Smyth Channel at many places the glaciers flow nearly or quite down to sea-level. Some of the islands are steep-sided, barren and uninhabited peaks rising to an elevation of 4000 ft. above sea-level. North of 41 " S. the west coast is but little indented, and there are but few good ports. Along the northern part of the continent from Guayaquil to Panama the coastal belt is covered with tropical vegetation; but from a little south of Guayaquil to 30 S. much of the coast is a sandy, arid and barren alkali desert. Across this arid belt flow the streams that descend from the high mountains, and along these are fertile valleys. Many of the smaller streams, however, do not reach the sea but dry up on their way across the arid coastal plain.

The Cordillera is a broad ridge upon which rise many great isolated peaks. Near its northern end the range divides: one branch, the Western Cordillera, continuing northward near the coast ; the Merida branch swings eastward and ends with the northern side of the island of Trinidad, while a third division, the Sierra de Perija, runs north- ward between the valley of the Magdalena and Lake Maracaibo. The western slope of the main Cordillera is steep, and is scored by narrow steep-sided valleys; the eastern slope is usually more gentle, and the valleys are less precipitous. Upon the Cordilleran ridge rise many of the highest peaks in the world. The following are some of the most noted, with their elevations. 1

EracnrVatkcr sc.

The striking features of the land relief of South America are: (1) The great Andean mountain chain with its accompanying narrow plain lying between it and the Pacific Ocean. (2) The o'fff Brazilian plateau with the Serra do Mar and Serra do

Relief. Espinhaco near the Atlantic and spreading westward

and northward to the heart of the continent. (3) The highlands of Guiana and Venezuela between the Orinoco and the mouth of the Amazon. (4) The lowlands that spread out along the three main lines of continental drainage, namely the Orinoco, the Amazon and the Paraguay basins.

The physical features of the west coast are bold, and, in many parts, extremely picturesque. From Cape Horn, where the peaks of the submerged southern end of the Andes form the islands of Tierra del Fuego to the Isthmus of Panama, the great Cordillera follows the coast-line closely and at an even distance from it. The low coastal belt between the ocean and the mountains has an average width of about 40 m., and on rare occasions, when the weather is favourable, the mountains are visible from the sea nearly all the way from the Straits of Magellan to Panama. South of 41 ° S. the coast is characterized by a vast system of fjords and islands, probably produced by the recent submergence of a mountain system and the consequent invasion of its steep-sided valleys by the ocean. The

Peak.

Country.

Elevation.

Snow-line (approximate).

Aconcagua

Argentina

Mercedario

Argentina

Tupungato

Argentina

Illampu (Sorata)

Bolivia

Illimani

Bolivia

Chimborazo .

Ecuador

Juncal

Chile

Cotopaxi

Ecuador

Antisana

Ecuador

Cayambe

Ecuador

Tolima

Colombia

Misti .

Peru

Maipo

Argentina

Sierra de Santa Marta

Colombia

Pichincha

Ecuador

ft.

23,080

22,315 21,550

21,500 21,030

20,545

20,180

19,613

I9 > 335

19,186 18,300

17,934 17,670 16,640 15,918

ft.

17,500

16,700

15,500 16,000 15,000

The snow-line of the mountains is generally lower on the east than on the west side. Of the Andean peaks those of Cotopaxi, Tungu- ragua, Maipo and Sangai are the highest active volcanoes in the world. There are many glaciers in the Andes even beneath the equator itself; and though these glaciers are small and mostly confined to the highest peaks, toward its southern end along Smyth Channel and in the Straits of Magellan, they are large and flow far down the slopes, and at several places enter the sea.

The eastern side of the continent is in strong physical contrast with the western. North of the Strait of Magellan the coast is flat as far as the

northern part of Rio Grande do Sul. From latitude 29 30′ to 19° 30′ the Serra do Mar makes this the most picturesque portion of the east coast of South America. The mountains rise in many places directly from the seashore to an elevation of 2000 ft. In places these form bare granite walls, while in others they are covered from base to summit with the most luxuriant tropical vegetation. On this part of the coast are some of the finest and most beautiful harbours in the world, notably those of Rio de Janeiro, Santos and Victoria, formed by a depression that submerged the coastal valleys.

The range or group of mountain ranges known under the general name of Serra do Mar falls away toward the north and west in a gently sloping plateau commonly called the Brazilian highlands. On this Brazilian plateau the highest points of which the elevations are known are as follows : —

Peak.

Itatiaya . Itajuba or Tembe Organ Mountains Frade Caraga Itambe Itacolomi . Pyreneos .

Brazilian State.

Elevation.

Rio de Janeiro Sao Paulo Rio de Janeiro Espirito Santo Minas Geraes Minas Geraes Minas Geraes Goyaz

ft.

9823 7800 7321 6770 6412 5959 5748 4536

North of latitude 20 ° the high mountains swing inland and the coast is low as far as latitude 17 25'; north of this the coast is

1 Various authorities differ in their estimates of these elevations.

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bordered by a wall of brightly coloured bluffs from 50 to 250 ft. high which continue with occasional interruptions to the mouth of the Amazon.

About Cape St Roque the coast is covered with sand dunes. From the Abrolhos Islands northward to longitude 37° west of Cape St Roque, there are many coral reefs, some of them several miles off shore and many miles in length and breadth, while in other places they follow the coast-line for a hundred miles or more with a few interruptions, now touching the shore, and now standing out two or three miles from the land. Along the parts of the coast where the Coral reefs occur are also reefs of hard sandstone that are often mistaken for coral reefs. These stone reefs stand like artificial walls or breakwaters across the mouths of the smaller rivers and the choked up valleys, and thus form several important ports on the north-east coast: such are the ports of Pernambuco, Natal, Porto Seguro, and others of minor importance. North of the mouth of the Amazon the coast is low, much of it is swampy, and all of it is forest-covered as seen from the ocean. This low coast extends as far north and west as the headland north of the Gulf of Paria where the Merida or Venezuelan branch of the Andes reaches the sea.

In southern Venezuela and Guiana and northern Brazil is a plateau commonly known as the Guiana highlands, above which rise several peaks.

Peaks. Elevation.

ft.

Roraima 8740

Ouida 8500

Maraguaca 8230

Turagua 6000

This highland region is mostly forest-covered, but it contains also large areas of open grass-covered plains.

Earthquakes occur throughout the entire length of the Andes; the shocks are sometimes of sufficient violence to do serious damage to cities and towns and to destroy many lives. Such disturbances are almost unknown along the Brazilian side of the continent.

*The eastern coast of South America has remarkably few islands, and these are mostly small, except Trinidad off the coast of Venezuela Islands. am * tne islands of the Marajo group in the mouth of the Amazon. Trinidad (area 1755 sq. m.) is separated from the continent by the Gulf of Paria. Along the northern edge of the island is a range of mountains about 3000 ft. high, which are geologically the eastern end of the Cumana range of the*

Venezuelan mainland. On the south side of this island is the famous pitch lake ■ — the most extensive deposit of asphalt known. West and north of Trinidad, and lying farther off the coast, are several small islands of historical interest and commercial importance: Tobago, Margarita, Blanquilla and the Curacao group. Off Cape St Roque (230 m.) is the small Fernando de Noronha group of volcanic islands. The main island has an area of only 12 sq. m. Though this island is separated from the mainland by a channel 13,000 ft. deep, it really stands upon the submerged corner of the South American continent. The Rocas is a small island 80 m. west of Fernando de Noronha. The Falkland Islands in lat. 51 ° cover an area of 6500 sq. m. ; their shores are indented by long tortuous channels that have the appear- ance of having been made by the depression of a hilly land surface. One of these channels separates the two main islands. Mt Adams, the highest peak on the group, has an elevation of 2300 ft. The group stands upon the submerged edge of the continent, from which it is separated by a shallow sea. Its flora and fauna show that it was formerly a part of the mainland. The Tierra del Fuego group of islands, as well as the many islands both large and small that border the west coast as far north as latitude 42°, are all the higher portions of the continental margin left above water when this part of the continent was depressed. The islands of Juan Fernandez in the same latitude as Valparaiso, and the Galapagos group imme- diately under the equator are the only others on the west coast worthy of mention.

The Amazon, the Orinoco and the Paraguay or La Plata river systems jointly drain an area of 3,686,400 sq. m. Less imposing Rivers but yet ‘ ar S e an d important streams are the Magdalena in Colombia, the Essequibo in British Guiana and the Sao Francisco in Brazil. The Amazon (properly the Rio das Amazonas or river of the Amazons) and its tributaries is not only the largest of the South American rivers, but it is the largest in the world. The total navigable length of the main stream from Para to the head of navigation on the Huallaga in Peru is 3000 m.; and this does not include the hundreds of navigable parallel side channels that accom- pany the main stream from its mouth almost to the mouth of the javary. Above the falls again these streams are all navigable for long distances. Except at Obidos the Amazon is nowhere confined to a single channel, but it spreads over a vast flood-plain and flows with a sluggish current through thousands of side channels that anastomose with each other, so that one unfamiliar with the stream cannot distinguish the main channel. At several places the river is so wide that one looking across it sees a water horizon as if at sea. Much of the region is more like a great fresh- water sea filled with islands than an ordinary valley with a river running through it. For the most part the land along the stream is low, flat, marshy and at times under water. At a few places, however, notably at Erer6,

Obidos, Velha Pobre, Paru, Paraua-quara and Almeirim table- topped hills are visible from the river. The banks of the stream and of its side channels are everywhere covered with a dense forest. The valley, however, is not all forest-covered. From near the Oyapok on the Guyana frontier a series of open grassy campos, interrupted only by the wooded banks of streams, follow along the north side of the Amazon for about 500 m. and extend into British Guiana and the region of the headwaters of Rio Branco. The upper Amazon basin opens broadly northward connecting with the Orinoco drainage across a low watershed, while on the south it is separated by a low divide from the Paraguay basin. The Orinoco rises in the highlands between Venezuela and Brazil, flows westward and north- ward around this elevated region and then flows eastward into the Atlantic. Along its lower course the banks of the stream are covered with dense forests; in its upper course the mountainous highlands are visible along its right bank, while on its left are vast stretches of flat, treeless, grass-covered plains that extend to the foot-hills of the Cordillera de Merida. The main stream is navigable during a part of the year for a distance of 1000 m. or more.

Under the name of Rio de la Plata may be included the Uruguay and the Paraguay, which enter the ocean through the La Plata estuary, and the Parana which is the most important branch of the Paraguay. It is a noteworthy feature of the streams entering the Paraguay or La Plata basin that many of those flowing from the arid regions on the west are more or less brackish, while those from the rainy forest-covered regions of Brazil are all fresh-water streams. The upper Paraguay is a sluggish stream winding through grass- covered plains dotted over with palm trees. Above rise a few isolated peaks like so many islands in a great lake. The Gran Chaco is a vast plain, almost perfectly flat, covered with rank vegetation and mu;h of it with water, lying along the west side of the Rio Paraguay in northern Argentina and in Paraguay.

The Sao Francisco, the largest river that lies wholly in Brazil, rises in the highlands of Minas Geraes in latitude 21 ° and flows north-eastward parallel with the coast until it reaches latitude 9° 30′ where it bends sharply to the right and enters the Atlantic. It flows entirely through a hilly or mountainous country. It is navigable along its lower course nearly to the falls of Paulo Affonso, 140 m. from its mouth, and also above the falls. In Colombia the Magda- lena is a crooked muddy stream about 2000 m. long and navigable as far as Honda.

Most of the lakes of South America are mountain lakes in the Andes or along its base. Lake Titicaca in Bolivia is, in respect of elevation and position, the most remarkable of its size in the world. Its surface is 12,545 ft. above sea-level, £«». it has an area of nearly 5000 sq. m. and a maximum depth of 700 ft., and never freezes over. This lake discharges

into a marsh that is supposed to have no outlet. Lake Junin or Chinchaicocha on the plateau east of Lima has an altitude of 13,380 ft., and covers an area of 200 sq. m. Along the eastern base of the Andes in southern Argentina is a series of lakes whose basins were probably made by the glaciers that formerly flowed down from the mountains on the west. There are many lakes, both large and small, scattered over the flood-plains of the great rivers of South America, but these are mostly phases of river development. Along the coast-lines there are also occasional lakes of brackish water produced by the depression of the coast and the closing of the open mouths of estuaries thus formed, or by sand barrier beaches thrown up by the sea. Such is Lagoa dos Patos in southern Brazil and many smaller ones on the Brazilian coast. Lake Maracaibo on the coast of Venezuela is a large narrow-necked bay like those of Rio de Janeiro and Bahia, rather than a true lake.

Flora. — The warm, wet, tropical portions of South America are especially favourable to the development of plant life. This conti- nent has therefore furnished an unusually large number of the world's useful plants. Among these are several valuable woods, rubber- producing plants, cotton, potato, tomato, mandioca, pineapple, maize, cinchona, ipecac, vegetable ivory, coca, the chocolate plant and Paraguayan tea. Other tropical and sub-tropical plants such as coffee, sugar-cane, oranges and bananas have been introduced and are extensively cultivated. The flora of the continent embraces a large number of peculiar types that originated either in the highlands of Brazil or in the Andes.

The flora of the Amazon valley may be taken as the type of that of the moist tropical valleys. The forests are so dense, rank and matted with undergrowth as to be almost impenetrable. Palms are the most characteristic and beautiful trees, and reach their greatest development in the Amazon region. They take on a great variety of forms: some have trunks 100 ft. and more in height while others have no trunks at all, but spring like tufts from the ground; some are two feet or more in diameter, while others are as slender as a lead pencil. Bamboos grow to an enormous size and form dense thickets along certain streams. The shaded portions of the forests frequently abound inbeautiful ferns, some of which are so small as to be almost microscopic, while others reach the dimensions of trees. For the most part the plants of the open campos have a stunted appearance and the grasses are wiry and tough.

A noteworthy feature of these tropical forests is that they are seldom made up of trees of a single species or of but few species. In

the high table-lands of southern Brazil, however, the araucarian pine grows in beautiful forests as far north as Barbacena in the highlands near the headwaters of Rio Sao Francisco. In the north-west of the continent the western slopes of the Andes are covered with a dense tropical vegetation, while on the east the slopes are compara- tively bare. In the high mountains the flora is scanty and bears a general resemblance to that of the temperate regions; 60% of the genera are like those of the temperate zones, but the species are peculiar to the Andes. In the south of the continent plant life is necessarily less tropical.

Fauna. — The fauna of South America includes a large number of species but relatively a small number of individuals. With local exceptions this seems to be true of all the forms of life within the tropical portions of that continent. The land mammals are nearly all small ; the tapir is the largest of them, and is found only in the . northern two-thirds of the continent. There are many species of monkeys, all of them arboreal in their habits. The only reptiles that are at all abundant are lizards, and in some places alligators. The alligators do not extend south of the La Plata region. Of snakes only the boa constrictor and the water boa are large, and these, like all other kinds, are not abundant. Certain ruminants having long woolly hair are found only in the high Andes; these are the llamas, alpacas and vicunas. The llama has been domesticated and is used for carrying small burdens. The condor, the largest living bird of flight, inhabits the lofty Andes. The insects of the highest moun- tains are related generically, but not specifically, to those of the temperate latitudes of North America — a fact understood by biolo- gists to mean that there has been no migration across the inter- mediate region since the glacial epoch. Owing to temperature and climatic conditions the life forms of the high Andes, whether animal or plant, are more nearly related to those of the lower regions to the south than to those of the lower regions to the north.

The fresh-water fish fauna of the Amazon region is the richest in the world. The distribution of species shows that there has long been direct communication between the drainage of the three great river systems, namely, the Orinoco, the Amazon and the Paraguay. Inhabitants. — At the time of the discovery of the South American continent by Europeans, the races inhabiting it differed greatly among themselves in customs, languages and civilization. They had then generally developed the arts of spinning, weaving and the manufacture of pottery, and locally were skilled in certain kinds of metallurgy, sculpture, architecture and agriculture. These abori- ginal peoples have necessarily been profoundly affected by the inva- sion of European races and the importation of African races, but in some localities their descendants still form the bulk of the popula- tion, and the native

American languages are still spoken

Immediately after the discovery of South America the western and northern portions of the continent and the region of the Rio de la Plata began to be colonized by Spaniards, while the eastern portion was colonized by the Portuguese. To these races were added Africans, for many years imported as slaves, especially into Portu- guese territory. Of late there has also been a large immigration of Italians into Argentina and southern Brazil. In Argentina about 18% of the population is foreign-born, and of these 56% are Italian, 22% Spanish and II % French. In Chile only 2-3% of the popula- tion is of foreign birth.

Spanish is the language of the country from the eastern end of Venezuela through all the northern and western parts of the conti- nent and over a large part of the Paraguay basin. Throughout Brazil, which covers little less than half of the entire continent, the language is Portuguese. South America is therefore pre-eminently a Latin continent ; its few British, Dutch and German colonies count for less in the great ensemble of its population than do the depleted aboriginal races themselves.

Political Geography. — The continent was first visited by Euro- peans in 1498, when Columbus upon his third voyage touched Discovery. at ˆ e moutn ˚f tne Orinoco. Other navigators shortly followed and sailed along the northern and eastern coasts, and by 1509 the coast had been visited as far south as the Rio de la Plata. In 1513 Balboa discovered the Pacific Ocean in the Gulf of Panama, and in 1520 Magellan (properly Magalhaes) passed through the straits of Magellan and crossed the Pacific Ocean. Inland the. earliest explorations followed the Amazon river, but aside from the discovery of the size, course, and character of the river and its immediate shores, they were of but little importance. Great impulse to exploration and development was given by the silver mines of Peru and later by the discovery of gold and diamonds in the highlands of Brazil.

The early settlement of South America by Europeans began shortly after the discovery of the continent. These settlements were originally colonies under the control of Spain and of Portugal, and they remained for some time dependencies of the mother countries. Eventually, however, they became indepen-

dent. For many years most of these countries were more or less disturbed by internal dissensions and revolutions, but in process of time, and as industries and commerce have become better established, the governments have become more stable.

The political divisions of the continent are best seen upon an ordinary map,

and verbal descriptions of them are therefore omitted. Brazil is the largest and most important single country. The bulk of the remainder is divided into several Spanish-speak- ing republics that border the continent from Venezuela on the north to Patagonia on the south, while between Venezuela and the Brazilian frontier on the north-east are three comparatively small countries known as British Guiana, Dutch Guiana and French Guiana. These Guianas are the only places at which colonies under European control are established on the mainland of South America. There are, however, a few islands that belong to European countries, such as Trinidad, Tobago and the Falk- land Islands to Great Britain, and Curacao, Buen Ayre and Oruba to Holland.

Industries and Commerce. — The industry that gave the first great impetus to the settlement of South America by Europeans was mining. The silver deposits of the Andes awakened the cupidity of adventurers shortly after the discovery mining of the continent, and large numbers of Spaniards poured into that region. The mining of silver that had begun in that part of the world in prehistoric times has continued down to the present day. The Potosi mines of Bolivia are supposed to have yielded in all over a billion and five hundred million dollars' worth of silver. The guano of the coast of Peru and the nitre beds of Chile are now, and have long been, among the most important and valuable natural deposits of the kind in the world. In the world's production of borax Chile ranks third; in the production of tin Bolivia ranks third.

In 1693 gold was found in the highlands of Brazil, and within a few years Minas Geraes (" General Mines "), as the miningdistrict was called, came to be the leading gold-producing region of the world. The mines reached their greatest productiveness between 1752 and 1761, when the annual yield was worth about six million dollars. During the early period most of the gold came from placer washings. Many mines in the hard rocks have been opened, some have been worked out and exhausted, and some are still in operation. The total gold production of all South America for the year 1895 was estimated at about $13,000,000.

In 1729 or possibly a little earlier diamonds were also discovered in the gold districts of Brazil, and a fresh impetus was given to European immigration and to the importation of African slaves to work the mines. From that time down to the discovery of diamonds in South Africa Brazil was the leading producer of diamonds in the world. The diamonds are found in three widely separate districts: in the state of Minas Geraes in the vicinity of Diamantina, in the state of Bahia in the vicinity of Len$6es, and on the headwaters of the Paraguay river in the state of Matto Grosso. The Bahia region also produces carbonados, or the black diamonds used in the manu- facture of diamond drills. The best estimate possible places the

market value of the diamond production of Brazil from 1729 to 1885 at $100,000,000. Of late years Brazil has led the world in the production of monazite, which occurs on the coast of Bahia in the form of beach sands. In 1905 the output of manganese by Brazil was second only to that of Russia. There are enormous deposits of iron ore in Minas and Sao Paulo, though but little developed at present. The agates of southern Brazil are famous.

The forest industries are chiefly such as depend upon the natural products of tropical forests. They include the gathering of rubber, cacao, coca, ipecac, balsam copaiva, cinchona bark, palm fibre (piassaba), brazil-nuts and Paraguay tea.™]"' an< ' The bulk of the world's supply of cacao comes f rom A S" c " lture – Ecuador, Brazil, Venezuela and Colombia. There is much wood suited for fine cabinet work, but the facilities for supplying such woods are limited. The agricultural industries are chiefly those suited to tropical countries. Those that have reached the greatest development are the growing of sugar cane and the manufacture of sugar, and the growing and preparation for market of cotton, coffee and tobacco. Sugar is made mostly near the sea-coast from near Rio de Janeiro northward along the eastern side of the continent. Cotton is grown in the interior from Bahia northward, while the chief coffee-producing region is in the Brazilian states of Sao Paulo, Rio de Janeiro, Minas, Espirito Santo and Bahia. Wheat is one of the chief agricultural products of the Argentine Republic. The .most important pastoral industries are in the region about the Rio de la Plata, where wool growing and stock-raising have reached a marvellous development.*

The manufacturing industries are necessarily not so well developed as those of older countries. In the early history of the South American colonies the home countries were interested in the building up of an export trade, and manufacturing in the colonies was therefore discouraged, even by

Manufac- tures.

direct legislation, while trade with other than the parent countries was prohibited. For some time after the independence of the new countries, facilities for manufacture and transport were poor, while the lack of established commercial relations and facilities retarded their growth. The development of manufacturing industries has been more marked of late years, though internal development is still retarded by the lack of highways.

The exterior commercial relations of South America were at first

naturally and necessarily with Spain and Portugal. In time other

European countries established relations with the rising

° re ‘ S ‘ n South American cities, the relative importance of Spain

mm ‘ and Portugal in South American commerce has greatly diminished, and the bulk of trade is now with other countries.

Exports and Imports of Three South American Countries (In millions sterling, annually c. 1906-1910.)

Imports from

Exports to

Argentina < Chile . . J

United Kingdom Germany United States United Kingdom Germany . United States .

20 9 9 6

5 2

United Kingdom Belgium . Germany . United Kingdom Germany. United States .

15 8 8

11 5 3

Uruguay . J

I

United Kingdom Germany . France

2

i-i

1

France Argentina Germany .

i-5

1-4

1

Brazi Chile

Chief Exports of Three American Countries (In millions sterling.)

Animals and products 48

Agricultural products 23

Coffee 33

Rubber 19

Nitrates 17

Copper 2

*Argentina . *

y

Settlement. — The continent as a whole is but sparsely settled. The total population in 1905 was reckoned to be 38,482,000. About half of it, including all the most inaccessible portions, had a popula- tion probably not much exceeding what it had at the period of the discovery. It averaged five persons to the square mile, while in North America it was 13 and in Europe 104 to the square mile. The most thickly populated parts are on and near the sea-coast. On the east seaboard a more densely populated narrow belt follows the coast from near Natal just south of Cape St Roque to and south of Buenos Aires. About the cities of Perrambuco, Bahia, Rio de Janeiro, Sao Paulo, Rio Grande do Sul, Montevideo and Buenos Aires the areas of greater density widen, and, in some instances (notably near Rio de Janeiro, Sao Paulo and Buenos Aires) extend inland for several hundred miles. The considerably populated belt begins on the west coast about latitude 42 ° and follows northward and eastward to the island of Trinidad on the Venezuelan coast, though there are stretches of coast almost entirely unin- habited. Several of the largest cities of South America compare favourably with the finest cities of Europe. The best streets of Rio de Janeiro, Montevideo, Buenos Aires and Valparaiso are among the most attractive in any part of the world. The large cities are all well supplied with water, lighted with electricity, possess facilities for transport and are

supplied with public libraries, museums of science and arts and educational institutions.

Communications. — The commercial relations of South America with the outside world are maintained by a large number of regular and well-equipped lines of steamers running between its ports and European ports. There is also a large freight business done by steamers sailing at irregular periods, and by sailing vessels. Con- nexions with the interior of the continent were for a long time con- fined to navigation along the principal streams and to tedious overland travel on horseback along almost impassable trails. Since 1858, however, when the first 30-m. section of the Dom Pedro II railway from Rio de Janeiro to Queimados was opened, railways have extended far inland and even across the Andes. The boring of the tunnel completing railway connexion between Buenos Aires and Valparaiso was completed in November 1909. Railway building has been especially active in Brazil and in the Argentine Republic. From Rio de Janeiro and Sao Paulo lines now penetrate the highlands of Minas Geraes, while from Buenos Aires they cover the most productive portions of the Argentine Republic, and bring some portions of the interiors of these countries into close communi- cation with all parts of the world. In the meanwhile river and coastwise navigation has greatly developed.

The railway mileage of the various countries was approximately as follows in 1906: —

Miles of Railway.

Argentine Republic 11,460

Bolivia 700

Brazil 10,408

Chile 2,800

Colombia . Ecuador . Paraguay . Peru . Uruguay . Venezuela

Miles of Railway.

411

125

156 1,146 1,210

529

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SOUTHAMPTON, EARL OF, an English title borne by the families of Fitzwilliam and Wriothesley. In 1537 Sir William Fitzwilliam (c. 1490-1542), lord high admiral of England, was created earl of Southampton. A son of Sir William Fitzv/illiam of Aldwarke, near Rotherham, Fitzwilliam was a companion in boyhood of Henry VIII., and was knighted for his services at the siege of Tournai in 1513. Later he was treasurer of Cardinal Wolsey's household, and was sent several times to France on diplomatic business. As vice-admiral he commanded a fleet when England and France were at war in 1523. He was comptroller of the royal household, chancellor of the duchy of Lancaster, and keeper of the privy seal. He went to Calais to conduct Anne of Cleves to England and wrote in flattering terms to Henry about his bride. While marching with the English army into Scotland he died at Newcastle in October 1542. He left no sons and his titles became extinct.

In 1547 Thomas Wriothesley (1505-1550) was created earl of Southampton. Entering the service of Henry VIII. at an early age, Wriothesley soon made himself very useful to his royal master, and he was richly rewarded when the monasteries were dissolved, obtaining extensive lands between Southampton and Winchester. Having been on errands abroad, he was made one of the king's principal secretaries in 1 540, and was knighted in the same year; in spite of the fall of his patron, Thomas Cromwell, he rose higher and higher in the royal favour, and in 1 542 it was said that he almost governed everything in England. He sought to bring about an alliance between England and

Spain in 1543, and was created Baron Wriothesley of Titchfield in 1544. Having been lord keeper of the privy seal for a few months, he became lord high chancellor in 1544, in which capacity he became notorious by his proceedings against Anne Askew. He was one of the executors of Henry's will, and in accordance with the dead king's wishes he was created earl of Southampton in February 1547. However, he had committed an offence in appointing four persons to relieve him of his duties as lord chancellor and advantage was taken of this to deprive him of his office in March, when he also ceased to be a member of the privy council. Again in the council Southampton took a leading part in bringing about the fall of Somerset, but he had not regained his former position when he died on the 30th of July 1550. His successor was his son, Henry (1545-1581), the 2nd earl, one of the Roman Catholic nobles who conspired for the release of Mary Queen of Scots. He died on the 4th of October 1 58 1 and was succeeded by his son, Henry, the 3rd earl (see below).

For the career of the 1st earl see Lord Campbell, Lives of the Lord Chancellors; E. Foss, Judges of England; and the various state papers and letters of the reign of Henry VIII.

The 3rd earl was succeeded by his son Thomas (1607-1667) as 4th earl. When the dispute began between the king and the parliament he took the side of the latter, but soon the violence of its leaders drove him into the arms of Charles, one of whose most loyal advisers he remained thenceforward. He was however very anxious for peace, and treated on behalf of the king with the representatives of the parliament in 1643, and again at Uxbridge in 1645. Having paid over £6000 to the state, Southampton was allowed to live unmolested in England during the Common- wealth period, and on the restoration of Charles II. he was made lord high treasurer. As treasurer he was remarkable for his freedom from any taint of corruption and for his efforts in the interests of economy and financial order. He died without sons on 'the 16th of May 1667, when his titles became extinct. Much of his property passed to his eldest daughter Elizabeth (d. 1693), wife of Edward Noel, 1st earl of Gainsborough (1641- 1689). The name of the earl is perpetuated in London in South-ampton Row and Southampton Street, Holborn, where his London residence stood. After the death of Lady Gainsborough the London property of the earl passed to her sister Rachel, wife of William, Lord Russell, the patriot, and later to the dukes of Bedford.

In 1670 the mistress of Charles II., Barbara, countess of Castlemaine, was created duchess of Cleveland and countess of Southampton. Her son, Charles Fitzroy (1662-1730), was created duke of Southampton in 1675, this title becoming extinct when his son William died in May 1774.

The barony of Southampton was created in 1780 in favour of Charles Fitzroy (1737-1797), a grandson of Charles Fitzroy, 2nd duke of Grafton, he being thus, like the holders of the duke- dom of Southampton, descended from Charles II. and the duchess of Cleveland. The title is still held by his descendants. SOUTHAMPTON, HENRY WRIOTHESLEY, 3RD Earl or (1573-1624), one of Shakespeare's patrons, was the second son of Henry Wriothesley, 2nd earl of Southampton, and his wife Mary Browne, daughter of the 1st Viscount Montague. He was born at Cowdray House, near Midhurst, on the 6th of October 1573, and succeeded to the title in 1581, when he became a royal ward, under the immediate care of Lord Burghley. He entered St John's College, Cambridge, in 1585, graduating M.A. in 1589; and his name was entered at Gray's Inn before he left the university. At the age of seventeen he was presented at court, where he was soon counted among the friends of the earl of Essex, and was distinguished by extraordinary marks of the queen's favour. He became a munificent patron of poets. Nashe dedicated his romance of Jack Wilton to him, and

Gervase Markham his poem on Sir Richard Grenville's last fight. His name is also associated with Barnabe Barnes's Parthenophil and Parthenope, and with the Worlde of Wordes of John Florio, who was for some years in his personal service as teacher of Italian. But it is as a patron of the drama and especially of Shakespeare

that he is best known. " My Lord Southampton and Lord Rutland," x writes Rowland White to Sir Robert Sydney in 1599, " come not to the court . . . They pass away the time in London merely in going to plays every day " (Sydney Papers, ed. Collins, ii. 132). Venus and Adonis (1593) is dedicated to Southampton in terms expressing respect, but no special intimacy; but in the dedication of Lucrece (1594) the tone is very different. " The love I dedicate to your lordship is without end . . . What I have done is yours; what I have to do is yours; being part in all I have, devoted yours." Nicholas Rowe, on the authority of Sir William Davenant, stated in his Life of Shakespeare that Southampton on one occasion gave Shakespeare a present of £1000 to complete a purchase.

Nathan Drake in his Shakespeare and his Times (1819; vol. ii. pp. 62 seq.) first suggested that Lord Southampton was the person to whom the sonnets of Shakespeare were addressed. He set aside Thomas Thorpe's dedication to the " onlie begetter " of the sonnets, " Mr W. H.," by adopting the very unusual significance given by George Chalmers to the word " begetter," which he takes as equivalent to " procurer." " Mr W. H." was thus to be considered only as the bookseller who obtained the MS. Other adherents of the Southampton theory suggest that the initials H. W. (Henry Wriothesley) were simply reversed for the sake of concealment by the publisher. It is possible in any case that too much stress has been laid on Thomas Thorpe's mystification. The chief arguments in favour of the South- ampton theory are the agreement of the sonnets with the tone of the dedication of Lucrece, the friendly relations known to have existed between Southampton and the poet, and the correspon- dence, at best slight, between the energetic character of the earl and that of the young man of the sonnets. Mr Arthur Acheson {Shakespeare and the Rival Poet, 1903) brings much evidence in favour of the theory, first propounded by William Minto, that George Chapman, whose style is parodied by Shakespeare in the 21st sonnet and in Love's Labour's Lost, was the rival poet of the 78th and following sonnets. Mr Acheson goes on to suppose that Chapman's erotic poems were written with a view to gaining Southampton's patronage, and that that nobleman had refused the dedication as the result of Shakespeare's expostulations. The obscurity surrounding the subject is hardly lightened by the dialogue between H. W. and W. S. in Willobie his Avisa, a poem printed in 1 549 as the work of Henry Willobie (q.v.) If the sonnets were indeed addressed to Southampton, the earlier ones urging marriage upon him must have been written before the beginning (1595) of his intrigue

with Elizabeth Vernon, cousin of the Earl of Essex, which ended in 1 598 with a hasty marriage that brought down Queen Elizabeth's anger on both the contracting parties, who spent some time in the Fleet prison in consequence. The " Southampton " theory of the sonnets cannot be regarded as proved, and must in any case be considered in relation to other interpretations (see Shakespeare) .

Meanwhile in 1596 and 1597 Southampton had been actively employed, having accompanied Essex on his two expeditions to Cadiz and to the Azores, in the latter of which he distinguished himself by his daring tactics. In 1 598 he had a brawl at court with Ambrose Willoughby, and later in the same year he attended Sir Robert Cecil on an embassy to Paris. In 1599 he went to Ireland with Essex, who made him general of his horse, but the queen insisted that the appointment should be cancelled, and Southampton returned to London. He was deeply involved in Essex's conspiracy against the queen, and in February 1601 was sentenced to death. Sir Robert Cecil obtained the commu- tation of the penalty to imprisonment for life.

On the accession of James I. Southampton resumed his place at court and received numerous honours from the new king. On the eve of the abortive rebellion of Essex he had induced the players at the Globe theatre to revive Richard II., and on his release from prison in 1603 he resumed his connexion with the stage. In 1603 he entertained Queen Anne with a performance

Roger Manners, 5th earl of Rutland, a close ally and friend of Southampton.

of Love's Labour's Lost by Burbage and his company, to which Shakespeare belonged, at Southampton House.

Southampton took a considerable share in promoting the colonial enterprises of the time, and was an active member of the Virginia company's council. He seems to have been a born fighter, and engaged in more than one serious quarrel at court, being imprisoned for a short time in 1603. He was in more serious disgrace in 1621 for his determined opposition to Buckingham. He was a volunteer on the Protestant side in Germany in 1614, and in 161 7 he proposed to fit out an expedition against the Barbary pirates. In 1624 he and his elder son enrolled themselves as volunteers for the United Provinces of the Netherlands

against Spain. Immediately on landing they were attacked with fever, to which both succumbed, the father surviving until the 10th of November 1624.

There exist numerous portraits of Southampton, in which he is depicted with dark auburn hair and blue eyes, compatible with Shakespeare's description of a " man right fair. " Sir John Beaumont (1583-1627) wrote a well-known elegy in his praise, and Gervase Markham wrote of him in a tract entitled Honour in his Perfection, or a Treatise in Commendation of . . . Henry, Earl of Oxenford, Henry, Earle of Southampton, Robert, Earl of Essex (1624).

For further information see " Memoirs of Henry Wriothesley, the third Earl of Southampton," in Boswell's Shakespeare (1821), xx. 427 sqq., where many of the elegies on Southampton are printed; also Nathan Drake, Shakespeare and his Times (1817), ii. 1-20; Sidney Lee, Life of William Shakespeare (1898); Gerald Massey, The Secret Drama of Shakespeare's Sonnets (1888); Samuel Butler, Shakespeare's Sonnets Reconsidered (1899), where there is some distinctive criticism of the Southampton theory (ch. v.-vii.) ; an article by William Archer, " Shakespeare's Sonnets. The Case against Southampton," in the Fortnightly Review (Dec. 1897); and Sidney Lee's article on Southampton in the Diet. Nat. Biog., arguing in favour of his identity with the hero of the sonnets. P. Alvor in Das neue Shakespeare Evangelium (Munich, 1906), brings forward a theory that Southampton and Rutland were the authors of the Shakespeare tragedies and comedies respectively, and borrowed William Shakespeare's name to secure themselves from Elizabeth's suspicion.

SOUTHAMPTON, a municipal, county, and parliamentary borough of Hampshire, England, a seaport, and county in itself, 79 m. S.W. by S. from London by the London & South-Western railway. Pop. (1901), 104,824. It is finely situated near the head of Southampton Water, an inlet of the English Channel which forms the estuary of the river Test; on a peninsula bounded east by the river Itchen. There are considerable remains of the old town walls, dating from Norman times, but strength- ened on various later occasions. The most remarkable portion occurs on the western side, where for a distance of nearly 100 yds. the wall is arcaded on its exterior face. The wall was strengthened by towers at intervals, such as the Arundel Tower at the north-western corner. The site of the castle, on the western side near the water, is built over, but the wall is well seen here. The castle was originally a Saxon fortress, and was rebuilt on the erection of the walls. It was partly demolished in 1650, and in 1805 its reconstruction was begun by the marquess of Lansdowne, but was not completed. Near the site there are some very ancient houses, one of which, known as King John's Palace, is of the highest interest, as it is considered to be earlier than

any example of the 12 th century in England, and is well preserved. Of the ancient town gates the Bar or North Gate, South Gate, West Gate, and Blue Anchor Gate remain. The first three are important; the South and West gates date from the early 14th century, while Bar Gate, as it stands, is later, and retains excellent Decorated work. Numerous early vaults remain below the houses within the walls. The two old churches, St Michael's, the central tower and lofty spire of which rise from Norman arches, and Holy Rood, partly Decorated, are greatly modernized. St Michael's contains a Norman font of black marble, comparable with that in Winchester Cathedral. All Saints' Church dates from 1795, and among numerous modern churches St Mary's, erected from designs by G. E. Street, is noteworthy, and occupies the site of a Saxon church. The

chapel of St Julian, where French Anglican services are held, is of transitional Norman architecture, greatly altered by restoration. It was originally attached to the hospital of God's House, founded in the time of Henry III. for eight poor persons, the existing buildings of which are modern. In the chapel are buried the earl of Cambridge, Lord Scrope, and Sir Thomas Grey, who were executed in 141 5 outside the Bar Gate for con- spiracy against Henry V. The chapel was allocated as a place of worship by Queen Elizabeth to certain Protestant Walloon refugees. The priory of St Denys, an Augustinian foundation of 1 1 24, gives name to a suburb by the Itchen, and has left only fragmentary ruins.

In the municipal offices interesting ancient regalia and records are kept. The Gildhall, used as a court-house, is in the upper part of Bar Gate. Noteworthy modern buildings are the public library, corn exchange, custom-house, and assembly rooms. The Hartley Institution, founded under the will of Mr H. R. Hartley, contains a library, museum, art gallery, lecture hall, laboratories, and school of science and art associated with that of South Kensington, London; the foundation was created for

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the advancement of natural history, astronomy, antiquities, and classical and Oriental literature. The Edward VI. grammar school was founded in 1550 and reorganized in 1875, and occupies modern buildings. Alderman Taunton's trade school was founded in 1752, and includes a technical department. The ordnance survey office is the headquarters of the ordnance survey department of Great Britain and Ireland. The Royal South Hampshire Infirmary is the principal of numerous benevo- lent and charitable institutions. To the north of the old town are the East and West Parks and the Hampshire county cricket ground, and to the south the small Queen's Park. South- ampton Common, with its fine avenue, north of the

town, was formerly part of the manor of Shirley. There is a statue in the parks of Dr Isaac Watts, the theologian (1674-1748), a native of the town, in whose memory the Watts Memorial Hall was erected in 1875. The headquarters of the Royal Southampton and the Royal Southern Yacht Clubs are in the town.

The history of the modern importance of Southampton as a port begins with the creation of a pier and harbour commission in 1803, and the erection of the Royal Victoria Pier (opened by Princess, afterwards Queen, Victoria) in 1831. But its present prosperity really dates from the opening of railway communication with London in 1840. The harbour is one of the finest natural harbours in the kingdom, and has the advantage of a double tide, the tide of the English channel giving it high water first by way of the Solent and two hours later by way of Spithead. In 1892 the docks, which lie at the southern end of the peninsula, became the property of the London & South- western Railway Company. They measure about 300 acres, comprising extensive quays in both the Test and the Itchen

rivers, with 28 ft. and upwards of water at low water of ordinary spring tides, and over 15,000 lineal feet of accommodation; the Empress dock, i8| acres, with a depth of 26 ft. at low water spring tide; the outer dock, 16 acres, with 18 ft. at low water spring tide; and the inner dock, 10 acres. In 1907 the construc- tion of a new dock was undertaken, to cover 16 acres, with a depth of 40 ft. below low water. There are also two coal barge docks capable of floating 10,000 tons of coal at one time. There are five dry docks, having from 29 ft. to 12 ft. depth of water over blocks at neaps. The Prince of Wales, or No. 5 dry dock, opened in 1895, was at that time the largest single dock in the world; it is 750 ft. long by 87 J ft. wide at sill, and 112 ft. at cope level. In 1905 a sixth graving dock was opened, having a length of 875J ft., and a width of 90 ft. at sill and 125 ft. at cope level. The principal passenger steamers sailing from the port are those of the Royal Mail Steam Packet Company for the West Indies and the Pacific (via Panama) and for Brazil and the River Plate, &c, and the Union-Castle line for the Cape of Good Hope, Natal, East Africa, &c, both of which companies have their headquarters here. New York is served by the American line, the North German Lloyd line, &c. Regular steamers serve the Channel Islands, Cherbourg and Havre, the principal English ports, Dublin, Belfast and Glasgow; and local steamers serve Cowes (Isle of Wight) and other neighbouring ports. The South- western Company owns the local railway stations (Town and Dock and Southampton West, besides suburban stations), but through connexions are made with the north by

way of the Great Western and Great Central and the Midland and South-Western Junction railways. Among the principal imports are cocoa, coffee, grain (including Indian corn), fruit, provisions (including butter, eggs and potatoes from France and the Channel Islands) , wines and spirits, sugar, wool, and other foreign and colonial produce. Exports are all kinds of manufactured goods, such as cotton, linen, woollen, worsted and leather goods, machinery and hardware.

Southampton gives name to a suffragan bishopric in the diocese of Winchester. The parliamentary borough returns two members. The county borough was created in 1888. The town is governed by a mayor, sheriff, senior and junior bailiffs, 13 aldermen, and 39 councillors. The area, which includes the suburbs of Shirley, Freemantle and others, is 4501 acres.

History. — There was a Roman settlement of some importance on the site of the suburb of Bitterne on the E. bank of the Itchen. It was walled, and inscribed stones, coins, pottery, &c, have been found. It is probable that after the Danish invasions of the nth century the modern Southampton {Hantune, Suhamp- ton) gradually superseded the Saxon Hantune as the latter did the Roman settlement, the site being chosen for its stronger position and greater facilities for trade. It was a royal borough before 1086, and a charter of Henry II. (1154-5) declares that the men of Southampton shall hold their gild liberties and customs as in the time of Henry I. Richard I. in 1189 freed the burgesses from tolls and all secular customs. In n 99 John repeated the grant and gave them the farm of the customs of their own port and those of Portsmouth at a yearly rent of £200. Henry III. in 1256 granted all the liberties and customs enjoyed by Winchester. Grants and confirmations were made from the reign of Henry III. to Henry VI., that of 1401 (2 Henry IV.) granting further to the mayor and bailiffs cognisance of all pleas to be held in the Gildhall (guyhalda). The charter of incorpora- tion was given by Henry VI. in 1445, under which the town was governed by a mayor, 2 bailiffs and burgesses, while by charter of 1447 the neighbouring district was amalgamated with the new borough as a distinct county under the title of " the town and county of the town of Southampton." Further privileges were granted by successive kings, and a charter was finally given by Charles I. in 1640. Southampton has returned two members to parliament since 1295. The inhabitants appear to have had a prescriptive right to hold a cattle-market, which was confirmed by Henry IV. in 1400, and later by Elizabeth. Markets on Wednesday for cattle and Friday for corn are now held. Trinity fair, dating from the year 1443, is now a pleasure fair. In

medieval times Southampton owed its importance to the fact that it was the chief port of Winchester. It had a large import and export trade, and in the

13th century was the second wine port in England. Wool was very largely exported, and the fact that it was brought to this port to be shipped probably led to the first establishment of the woollen trade in the W. of England. The rise of London as a port, the prohibition of the export of wool, the loss of the Winchester market after the suppression of the monastic institutions, and the withdrawal of the court led to the gradual decline of trade from the 16th century onwards until railway facilities and the opening of new dockyards gave South- ampton the position it holds to-day.

See Victoria County History: Hampshire, iii. 490 seq. ; B. B. Woodward, History of Hampshire (London, 1861-9); Rev. Silvester Davies, History of Southampton (London, 1883).

SOUTHAMPTON, a township of Suffolk county, New York, occupying the western part (W. of Easthampton) of the south-eastern peninsula of Long Island, S. of the Peconic Bay and N. of the Atlantic Ocean. Pop. (1900), 10,371; (1910), ri,24o. Separated from the ocean by a narrow beach only, in the south-western part of the township are the nearly landlocked East Bay and Shinnecock Bay, and farther east are Mecox Bay (landlocked) and other ponds near the ocean. At Canoe Place, an old portage, Shinne- cock Bay and Peconic Bay are less than 3 m. apart. On the northern shore of the township are the small settlements called Flanders, Southport, Sebonac, North Haven and North Sea. Nearer the south shore and served by the Long Island railway are Speonk, Westhampton, Quogue, Good Ground, Shinnecock Hills, Southampton (pop. in 1910, 2509), Water Mill and Bridge- hampton, from which there is a branch line of the Long Island railway to Sag Harbor. Good sailing and sea-bathing are obtained at several places; and the golf links of the Shinnecock Golf Club, at Shinnecock Hills, is one of the best in the country. The first " summer cottages" were built near the village of Southampton in the latter part of the decade 1870-1880, and the summer colony was long called the "New York Annex" or the "Annex." The village of Southampton has been called the Newport of Long Island; in it is the Rogers Memorial Library (1893). The whale fishery was formerly important; it began here about 1660. The Shinnecock Indians long took part in it and many of the men of the tribe were lost in the wreck of the " Circassian " here on the 31st of December 1876. The Indians now on the reser- vation are mostly mixed bloods with a large proportion of negro blood. Southampton was settled in 1640, probably before Southold, by a "company of undertakers " formed in March 1639 at Lynn, Massachusetts, who received from James Forrett, agent of the proprietor, William Alexander, Lord Stirling, a patent dated the 17th of April 1640 for 8 m. square of land and whose deed from the Indians is dated the 13th of December 1640. Their first attempt to settle was broken up by the Dutch. The name may have been taken in

honour of Henry Wriothesley, earl of Southampton. The settlement was a commercial scheme, and in spite of the rigid Puritanism of Abraham Pierson, their first pastor and a sympathizer with New Haven, the people voted to attach themselves to Connecticut (1645). The Mosaic law was adopted for the government of the township. In 1678 Governor Edmund Andros, in a note to the home government, said: " Our principall places of trade are New York and Southampton, except Albany for the Indyans." The village of Southampton was incorporated in 1894.

See Geo. R. Howell, Early History of Southampton, L.I. (2nd ed., Albany, 1887), and the Town Records (4 vols., Sag Harbor, 1874- 1879), with notes by W. S. Pelletreau.

SOUTH AUSTRALIA, a British colonial state, forming part of the Commonwealth of Australia. (For map, see Australia). It lies between 129° and 141° E. long., has Queensland, New South Wales and Victoria on the E., Western Australia on the W., and the Southern Ocean on the S. Originally its northern line was '26° S. lat.; by the addition of the Northern Territory the area was extended from 380,070 sq. m. to 903,690, and the northern border carried to the Indian Ocean;

but by acts of 1910 this territory was made over to the federal government. It is, however, described below.

The southern coast-line shows two large gulfs, Spencer and St Vincent — the first 180 m. long, the other ioo. Spencer Gulf is open to the ocean, while St Vincent Gulf is partly shielded by Kangaroo Island, with Investigator Straits as its western and Backstairs Passage as its eastern entrance. Yorke Peninsula separates the two gulfs. Eyre's Peninsula is to the west of Spencer Gulf, and at its southern extremity are Port Lincoln, Sleaford Bay and Coffin's Bay, of which the first is the most important. Along the Great Australian Bight are several small bays, and the junction of South and Western Australia is on the Bight. Going eastward from the Gulf of St Vincent is Encounter Bay, through which there is an entrance to Lake Alexandrina, the mouth of the Murray river. The Coorong is the name given to the narrow sheet of water, nearly 200 m. long, formed by the Murray and separated from the ocean by a very narrow strip of land. Lace- pede andJRivoli Bays are the only other important indentations of this coast. In Northern Territory are several important indentations, Melville, Adam, Arnheim and Raffles Bays, Van Diemen's Gulf, Port Essington and Port Darwin (lat. 12° S.). The Gulf of Carpentaria divides

the territory from Cape Yorke Peninsula of Queensland, the more important inlets on the shore of the gulf in Northern Territory being Caledon Bay and Limmen Bight. The principal island belonging to South Australia is Kangaroo Island, situated at the mouth of the Gulf of St Vincent; it is also the longest Australian island, measuring 210 m. by 85 m. at its widest part. Off the north coast of Northern Territory are Melville and Bathurst Islands, the Wessel group, and Groote Eylandt in the Gulf of Carpentaria.

Mountain ranges are not an important feature of the country, which, on the whole, is level where not slightly undulating. In the south of the state the principal ranges run north and south ; the Mount Lofty range, beginning at Cape Jervis, runs parallel with St Vincent's Gulf and at one or two points touches 3000 ft., Mount Lofty, near Adelaide, having an elevation of 2330 ft. The Flinders range rises on the eastern shores of Spencer Gulf and extends north for several hundred miles, terminating near the so-called Lake Blanche; there are in this range several isolated peaks which attain 3000 ft., the most prominent being Mt Remarkable, 3100 ft., Mt Brown, about the same height, and Mts Arden and Serle, about 3000 ft. The Gawler range, running across Eyre's Peninsula, south of the lakes, attains an elevation of about 2000 ft. at several points. Beyond Lake Torrens the ranges tend in the direction of north-west and after- wards east and westerly; and occasional summits reach 5000 ft. Northern Territory is traversed by several minor ranges, but the country has not been thoroughly explored and the heights and direction of the ranges have not been in all cases determined; no elevation above 2000 ft. has, however, been discovered.

South Australia is by no means a well-watered country, but there are some fine streams in the north of Northern Territory. In South Australia proper the Murray enters the sea at Lake Alexandrina, after having received the drainage of three states. The Torrens, Wakefield, Hindmarsh, Tuman and Gawler are unimportant streams; on the banks of the first named is situated the city of Adelaide. From Queensland flows the Barcoo, or Cooper's Creek, into Lake Eyre, which also receives the Macumba, with its tributary the Alberga, and several other rivers. These are rivers only when they are filled with the torrential rains of the interior, and for the most part are depressions destitute of water. Northern Territory is marked by an absence of water except at the extreme north, where there are several fine rivers, some of which are navigable for over 100 m.; the most note- worthy are: the Roper, flowing into Limmen Bight in the Gulf of Carpentaria, the Liverpool, the South Alligator, the Adelaide, the Daly and the Victoria. There are numerous lakes shown on the maps of South Australia, but none are permanent; they are depressions filled by the rivers in times of flood, but otherwise waterless or containing shallow pools of salt water. (T. A.

C.)

Geology. — South Australia may be divided geologically into four parts, the geology of each of which is so distinct that they may be

conveniently considered apart. These divisions are (1) the Great Valley of South Australia and the adjacent highlands that border it, (2) the Lake Eyre Basin, (3) the Western Plateau, (4) the basin of the Lower Murray, with (5) the Northern Territory.

The western division consists of a plateau of Archean gneisses, granites and schists, which extend across Australia from the Eyre Peninsula on the south to the northern coasts on Port Darwin. In the south-western corner of the state the Archean plateau is separated from the Southern Ocean by the Cainozoic limestones of the Nullarbor plains, which extend from the shore of the Great Australian Bight to the foot of the great Victorian desert. Thence northward, the Archean rocks form the whole foundation of the country, until they end in a scarp, the " so-called coastal range," to the south of the Gulf of Carpentaria, and in the exposures near Palmerston, on Port Darwin. This plateau bears occasional deposits of later age. The chief of these are the Ordovician rocks of the Macdonnell Chain; they there trend approximately west-north- west to east-south-east, and represent part of the old Lower Palaeo- zoic mountain chain, which appears to have once extended across Australia from Kimberley to Adelaide and Tasmania. To the north-east of the Ordovician rocks of the Macdonnell Chain are the Cambrian deposits of Tempe Downs and the head of the Herbert river. Some Jurassic fresh- water deposits occur in basins on the plateau, having been proved by a bore, now being put down, in the hope of forming a flowing well at Lake Phillipson.

In contrast to the striking uniformity of the Western Plateau is the geological complexity of the part of South Australia known as " the Counties," including the settled districts in the south of the state around Spencer Gulf. The country is underlain by Archean and granitic rocks; they are exposed in the Gawler Range to the west, in the Archean outcrops near the New South Wales frontier, on the railway to Broken Hill, and at the foot of the highlands, along the western edge of the Murray basin. The highlands of South Australia consist mainly of contorted Lower Palaeozoic rocks, including the best representative in Australia of the Cambrian system. These Cambrian deposits, in addition to yielding a rich Cambrian fauna, contain a long belt of glacial deposits, the discovery of which is due to W. Howchin. These highlands form the whole of the mountainous country to the east of Lake Torrens; they extend southward to the highlands behind Adelaide, and form the axis of Kangaroo Island, while a branch from them forms the backbone of Yorke Peninsula. The highlands

end to the north along a line running approximately east and west through Mt Babbage and the Willouran and Hergott ranges, to the south of Lake Eyre. The country to the west of Lake Torrens is a plateau, capped by the Lake Torrens Quartzites, which are apparently of Upper Palaeozoic age. This plateau has been separated from the South Australian highlands by the formation of the rift valley, in which lie Lake Torrens ancl Spencer Gulf. St Vincent Gulf occupies a foundered area between the Mount Lofty ranges, the Yorke Peninsula and Kangaroo Island. The south-eastern corner of South Australia is occupied by the basin of the Lower Murray, which in middle Caino- zoic times was occupied by a sea, in which was laid down a thick series of marine sands and limestones. These rocks have yielded a rich fossil fauna from the cliffs beside the Murray. In the southern part of this district there is a western continuation of the basaltic sheets so conspicuous in Victoria. Some of them have been ejected from volcanoes, of which the vents are still well marked. The best extinct crater known is Mt Gambier.

The Lake Eyre basin occupies a vast depression to the north of the South Australian highlands; it is bounded to the west by a line of ridges and mountains of Archean and Lower Palaeozoic rocks, which connect the north-western end of the South Australian high- lands with the mountains on the Archean plateau at the head of the Macumba and the Finke rivers. The Lake Eyre basin was occupied in Lower Cretaceous times by a sea, which extended southward from the Gulf of Carpentaria ; and it appears to have been bounded to the south by the northern edge of the South Australian highlands. In this sea were laid down sheets of clays, known as the Rolling Downs formation. After the retreat of this sea the clays were covered by the Desert Sandstone, which has been cut up by denuda- tion into isolated plateaux and tent-shaped hills. On the margin of the Desert Sandstone in Queensland there are some marine beds interstratified with the Desert Sandstone, and the fossils fix its age as Upper Cretaceous. The origin of the Desert Sandstone has given rise to considerable discussion ; but it is no doubt in the main a terrestrial formation including some lake deposits. The surface is often converted into a vitreous quartzite by deposition of an efflorescent chert. Obsidian buttons are scattered over the central deserts, and have been regarded as of meteoric origin; they have also been considered prool of local volcanic action, but they have probably been scattered by the aborigines. Extensive estuarine deposits of Pliocene or early Pleistocene age, with a rich fauna of extinct marsupials and birds, occur on the plains to the east of Lake Eyre.

The Northern Territory includes the mountains of the Macdonnell Chain, and all the country thence to the northern coast. It consists of an Archean plateau, covered in places by Cambrian and Ordo- vician deposits. To the north of the Victoria river and the Roper

River, the country rises into a high, dissected table-land of Archean rocks; but round the coast there is a coastal plain including Permo-Carboniferous, Cretaceous and Cainozoic deposits. The Cretaceous deposits include ammonites of the varians type and a species of A ucella.

The chief mineral product of South Australia is copper, the mines of which occur in Cambrian limestones along the western edge of the South Australian highlands at Moonta, Wallaroo and Burra Burra. Gold occurs in numerous small mines in the South Australian highlands; and also in the Western Plateau, as in the Tarcoola goldfield; and in the Northern Territory, in the Arltunga goldfield, at the eastern end of the Macdonnell chain. Gold and tin are scattered in the Arnheim Peninsula of the Northern Territory; but hitherto the gold-mines of South Australia have been less important than those of any other of the Australian states. The only coal deposits are those formed in lacustrine deposits of Jurassic age, as at Leigh's Creek, east of Lake Torrens, where they have been mined.

Most of the geological information regarding South Australia is scattered in a series of reports, mainly by H. Y. L. Brown, published in the parliamentary papers of South Australia. There are also numerous reports by R. Tate, W. Howchin, &c. in the Trans. R. Soc. S. Austral. The geology of the Macdonnell range is described in the reports of the Horn Expedition, and the fauna of Lake Calla- bonna in Memoirs issued by Stirling and Zeitz, published by the Royal Society of South Australia. The literature is catalogued in Gill's Bibliography of South Australia (Adelaide, 1885), and that of the Lake Eyre basin and its adjacent islands in J. W. Gregory, The Dead Heart of Australia (1906). The Miocene marine fauna has been catalogued last by Dennant and Kitson, Records Geol. Survey, Victoria (1905), No. II. (J. W. G.)

Fauna. — South Australia is not separated from the neighbouring colonies by any natural boundaries; hence the fauna includes many animals which are also to be found in the land lying to the east and west. The northern half of the colony lies within the tropics, and possesses a tropical fauna, which is, however, practically identical with that of Northern Queensland. In spite of its immense extent north and south, and a corresponding diversity in climate, the colony is poorer in animal life than its neighbours. It possesses thirty-five genera of mammals. These include both genera of the order Monotremata — the Echidna, or spiny ant-eater, and the Ornithorhynchus, or duck-billed platypus, both of which are found also in Eastern Australia and Tasmania. The other order of Mam- malia

associated with Australia, the Marsupialia, is well represented in South Australia. It contains seven genera of Macropodidae or kangaroos, including the wailaby and kangaroo rat, four genera of Phalangistidae, or opossums, and five species of Dasyuridae, or " native cats." Two genera of this family are peculiar to the region — the Chaelocercus and the Antichinomys; the latter is found in the interior. It is a mouse-like animal with large ears, and is remarkable for the elongation of its fore-arm and hind-foot and for the complete absence of the hallux. The Phascolomys, or wombat, one of the largest of the marsupials, is also found in South Australia, and the curious Myrmecobius, or ant-eater of Western Australia. This remarkable animal is about the size of a squirrel ; it possesses fifty-two teeth (a greater number than any known quadruped), and, unlike the other members of its order, the female has no pouch, the young hanging from nipples concealed amongst the hair of her abdomen. The Choeropus,ˆ with peculiarly slender limbs and a pouch opening backwards, is found in the interior. The remaining Mammalia consist of the dingo, or native dog, and a few species of Muridae, the mouse family, and Cheiroptera, or bats. There are about 700 species of birds, including 60 species of parrots. Of the 9 families peculiar to the Australian region, 5 are well represented, including the Meliphagidae (honey-suckers), Cacatuidae (cockatoos), Platycercidae (broad-tailed and grass parakeets), Megapodidae (mound-makers) and Casuaridae (cassowaries). The last-named family is represented by the Dromaeus, or emu, which is hunted in some parts of the colony. Reptiles are fairly represented : there are fifteen species of poisonous snakes. The lizards are very peculiar; South and Western Australia contain twelve peculiar genera. No tailed Amphibia exist in the continent, but frogs and toads are plentiful.

Flora. — The plant species resemble those of the eastern colonies and Western Australia, but are more limited in variety. The colony, from its dryness, lacks a number known elsewhere. Enor- mous areas are almost destitute of forests or of timber trees. The Eucalyptus family, so valuable for timber and gum as well as for sanitary reasons, are fairly represented. Acacias are abundant, the bark of some being an article of commerce. Flinders range has much of the valuable sugar-gum, Eucalyptus Corynocalyx, which is being now preserved in forest reserves. Its timber is very hard and strong, not warping, resisting damp and ants. The head-flowered stringybark, Euc. capitellata, has a persistent bark. A sort of stringybark, Euc. tetrodonta, is found in Northern Territory. The gouty-stem tree (Adansonia) or monkey-bread of the north is a sort of baobab. About 500 northern plants are Indian. The Tamarindus indica occurs in Arnhem land, with native rice, rattans and wild nutmeg. The cedar is of the Indian variety. Pines are

numerous in the south, palms in the north ; among the most beautiful is the

Kentia acuminata. Banksias are very common in sandy districts. Flowering shrubs are common in the south. There are 130 known grasses in Northern Territory.

Fisheries. — Whaling was formerly an important industry about Encounter Bay, as sealing was in Kangaroo Island. The whales have migrated and the seals are exterminated. On the northern side trepang or beche-de-mer fishery is carried on, and pearl fisheries have been established. Of fish within colonial waters there are forty-two peculiar genera. The tropical north has similar fish to those of north Queensland, while those of southern bays resemble many of the species of Victoria, Tasmania and New South Wales. There are the barracouta, bonito, bream, carp, catfish, rock cod and Murray cod, conger, crayfish, cuttle, dogfish, eel, flatfish, flat- head, flounder, flying-fish, gadfish, grayling, gurnard, hake, John Dory, ray, salmon (so-called), schnapper, seahorse, shark, sole, squid, swordfish, whiting, &c. Though called by English names, the fish do not always correspond to those in Europe. The Murray cod is a noble fresh-water fish.

Climate. — The climate of South Australia proper is, on the whole, extremely healthy, and in many respects resembles that of southern Europe. In the south-eastern corner of the state the spring and winter seasons are most pleasant, and although the thermometer occasionally registers high in summer, the heat is dry and much more endurable than a much lesser heat in a moist climate. In the interior districts, however, the heat is sometimes very trying to Europeans. In Northern Territory the climate is . of a tropical character, except on the table-lands where it is comparatively cool. Observation has determined the area of the state adapted by reason of seasonal rains to the growth of wheat, and in this area crops are almost certain; agriculture outside this area is, however, purely speculative. The average rainfall at Adelaide taken for a period of 52 years was 21-204 m – As the rain falls at seasonable times the quantity is sufficient for cereal cultivation. The maxi mum shade temperature recorded at Adelaide Observatory in 1905 was 109-7 — the highest for any Australian city; the minimum was 34-8 and the mean temperature 61 -i.

Population. — The population of South Australia in i860 was 124,112, and the province was third in importance among the states forming the Australasian group. In 1870 the population stood at 183,797, and in 1880 at 267,573; i n 1890 it was 319,414; in 1901, 362,604; and at the end of 1905, 378,208. These figures are inclusive of the population of Northern Territory, the pro- vince of South Australia, properly so-called, containing 374,398 inhabitants, and Northern Territory, 3810, the respective density of the two divisions being one person per square mile and one per 128 sq. m. The estimated population of Adelaide in 1905 was 175,000. The number of males in 1905 was 197,487, and the females 180,721. The

births in the same year were 8868 and the deaths 3804, representing 23-44 and 10-05 per 1000 of population respectively. The birth-rate has declined greatly.

Dividing the years from 1861 to 1905 into five-yearly grcfups the following were the average birth-rates : —

Period.

1861-1865 1866-1870 1871-1875 1876-1880

Births per 1000 of Population.

44-14 40-60

37-24 38-28

38-52

Period.

1 886-1 890 1891-1895 1 896- -1 900 1900-1905

Births per 1000 of Population.

34-48 31-24 26-59 24-46

Illegitimate births are less frequent in South Australia than elsewhere in Australia; in 1905 the proportion of illegitimate to total births was

4-37%-

The death-rate has always been remarkably light, not having exceeded 13 per 1000 in any year since 1886. The averages for each quinquennial period from 1861 were as follows: —

Period.

Deaths per 1000 of Population.

1 Period.

Deaths per 1000 of Population.

1861-1865 1866-1870 1871-1875 1876-1880 1881-1885

15-70 15-01

15-83 14-90 14-71

1 886-1 890 1891-1895 1896-1900 1901-1905

1

12-55

12-08

n-93

10-78

i

The excess of births over deaths in 1905 was 5071 or 13-48 per 1000 of population. The number of marriages celebrated during 1905 was 2599; this represents a marriage-rate of 6-87 per 1000. The number of divorces and judicial separations during the ten years closing with 1905 was 72.

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The people are mainly of British race; out of 362,604 persons whose birthplace was ascertained at the census of 1001, 348,352 were of British or Australian parentage, the number born in the Commonwealth being 289,440, and in South Australia itself 271,671; 9396 were born on the continent of Europe, of whom 6664 were Germans, and 931 Scandinavians and 3253 were Chinese. The total foreign-born element of the population numbered only 3-73%.

The census showed the number of breadwinners in the state to be 153,296 — 120,328 males and 32,968 females. Agriculture, the main industry, provided employment for 34,186 persons, of whom 33,039 were males and 1147 females. Pastoral pursuits employed 4193, dairying 2868 and mining 6301. The industrial class may be divided into (a) persons engaged in manufacturing industries, 18,163 males, 6761 females; (b) persons engaged in the construction of buildings, railways, roads, &c. ; numbering 8652 ; and © persons engaged in other industrial pursuits, 7657 — these are chiefly persons whose census description is merely labourer. The commercial class, including trades of all kinds as well as persons engaged in finance, numbered 20,165, namely 17,080 males and 3085 females. The professional class comprised 5372 males and 3485 females, or a total of 8857 ; while the domestic class — comprising persons engaged in

providing board and lodging, hotel and restaurant keepers, as well as servants — numbered 17,981, namely 3452 males and 14,529 females. The foregoing classes show the distribution of employment amongst the 153,296 breadwinners; the remainder of the population, comprising 209,308 persons (64,094 males and 145,214 females) were dependent on the breadwinners.

Administration. — South Australia, as one of the states of the Commonwealth, returns six senators and seven representatives to the Federal parliament. The local parliament consists of a Legislative Council and a House of Assembly. The former has eighteen members, elected by the districts into which the state is divided for that purpose, the franchise being limited to persons with freehold or leasehold estate, and to occupiers of dwellings of £25 annual value; while the Assembly contains 42 members, elected by 13 districts; the electoral qualifications for the Assembly are the attainment of the age of 21 years, and having been upon the electoral roll not less than six months. Women have the right to vote.

Local Government. — Adelaide was the first Australian city to acquire the right of self-government; on the 31st of October 1840 the first municipal elections in Australia were held in that city. There are 33 municipal councils and 142 district councils in the settled parts of the state, the area under local government being about 43,000 sq. in. Local rates are assessed upon the assumed annual value of the properties liable to be rated ; and the amount of such assessed annual value was, in 1905, £2,739,808, and the capital value 55 millions. The revenue of the various local bodies in 1905 was £294,723, of which £170,235 was obtained from rates, £30,618 from government endowment and £93,870 from other sources; £130,489 was spent on public works. The total debt of the local bodies in that year was £102,261.

Education. — The South Australian system of popular education in its present form dates from 1878. It is compulsory, secular and free. The compulsory ages are over seven and under thirteen years, but children who have attained a certain standard of education are exempt from compulsory attendance. Religious instruction is not allowed to be given in state schools except out of ordinary school hours. Secondary instruction is in the hands of private and denominational establishments, and the university of Adelaide is well endowed and efficient. The state maintained in 1905 722 schools, with a gross enrolment of 59,026 pupils, and the average attendance was about 41,807. The sum expended in that year on public instruction was £181,583, and of that amount £150,000 was on account of primary instruction. Although education is free, the instruction department has a small revenue; this in 1905 amounted to £12,783, of which £6131 was derived from rents, £3630 from the sale of books and

school material, and £682 from fees; the greater portion of the fees comes from the advanced school for girls, the remainder being paid by pupils attending classes in agriculture held in the public schools. The average cost of primary instruction to the state, including cost of school premises and maintenance, is about £3,1 Is. 4jd. per scholar in average attendance. The revenue of the Adelaide University in 1905 was £21,462, 15s. 7d., of which £6639 was obtained from the government, £9845 from fees and £4979 from other sources. The number of students attending lectures during the same year was 595, of whom 366 had matricu- lated. Technical education is well advanced; the School of Mines and Industries, founded in 1899, had in 1905 an enrolment of 1600 students. Private schools numbered 213, with 725 teachers and 10,206 scholars. Of the teachers 559 were engaged in general instruction, while 166 were specially engaged in particular subjects.

The peculiarity of religion is the strength of the non-Episcopal churches. The Church of England, which includes over 40% of the population of the other Australian states, claims only 27 % in South Australia; and the Roman Catholic Church, whose adherents number 22% in the other colonies, numbers about 14% in South Australia. The Presbyterian churches have also fewer supporters, for only 5-5 % of the population belong to such churches, compared with 13% in the other colonies. To the Wesleyan churches 19 % of the population belong, to the Congregational churches 3-7%, Baptists 5-5%, Lutherans 7-5%, and other Protestants about 8 %.

Finance. — For the year ending June 1905 the state had a public revenue of £2,798,849, which is equal to £7, 10s. 2d. per inhabitant. This amount includes revenue received by the Commonwealth government on behalf of the state. The principal sources of public revenue were: customs duties (balance of amount collected by the Commonwealth government), £555,692; land, income and other taxes, £442,030; railways, £1,279,481; public lands, £192,337; other revenue, £527,843. In 1871 the revenue of the province was £778,000, or £4, 4s. 3d. per inhabitant; from that year it rose rapidly until in 1881 it stood at £2,172,000, or £7, 16s. iod, per head; in 1891 it was £2,732,000, or £8, lis. id. per head. The expenditure for the year ended the 30th of June 1905 was as follows: railway working expenses, £746,636 ; public instruction, £1 8 1 ,583 ; interest and charges of public debt, £1,049,643; other services, £915,261. The debt charges amount to £2, us. 8d. per head, and absorb 36-28 % of the total revenue of the state. Against this must be placed the net return from services upon which the loan moneys were expended; this amounts to about £746,459, so that the real burden of the state's debt is reduced to £303,184 per annum. On the 30th of June 1905 the public debt of the state stood at £28,727,895, which is equal to £78, is. id. per head; and the

purposes for which the debt was incurred were: railway construction and equipment, £13,732,567 ; water supply and sewerage, £4,993,638; telegraphs and telephones, £1,010,738; and other works and services not producing direct revenue, £8,990,952. These figures include the debt of the Northern Territory. The amount of the debt at certain periods beginning with 1 86 1 was: —

Year.

Total Debt.

Debt per Head.

£

£ s. d.

1861

866,500

6 16 8

1871

2,167,700

11 13 7

1881

11,196,800

39 2 1

1891

20,347,125

62 9 2

1901

26,423,805

73 2 6

1905

28,727,895

78 1 1

Defence. — As part of the Commonwealth the defence of South Australia is undertaken by the Federal government. On the 31st of December 1905 the defence force of the state totalled 5066 men, comprising 1262 partially paid troops, a paid staff of 37 and 3178 riflemen. In addition to the land force there is a corps of 127 men capable of being employed on local war vessels, or as a light artillery land force.

Minerals. — South Australia, though without coal, was the first Australian colony to have a metallic mine, and the first to possess a gold-mine. In 1841 the wheel of a dray, going over a hill near Adelaide, disclosed to view silver-lead ore. In the midst of the bad times in 1843 the Kapunda copper-mine was found. In 1845 the wonderful Burra Burra copper was first wrought. The land, 10,000 acres, cost £10,000; and for several years the dividends to shareholders were 800 % per annum. The first colonial mineral export was 30 tons of lead ore, value £128, in 1843. The copper declined as prices fell. It was £322,983 in 1885, when rates were £50 a ton, but £762,386 ten years before with over £90. In 1886 most of the mines were closed. Between 250 and 400 m. north of Adelaide a very rich copper district exists. Lead is very abundant. Manganese, nickel, bismuth, antimony and silver have been mined. Tin is seen in granitic places. Iron occurs in almost all formations and in all conditions. There is abundance of haematite, micaceous, bog and other ores rich in the metal. Talisker and other mines paid in silver. The wonderful Silverton, of Barrier Ranges, in a desert, is just outside the boundary, though 300 m. only from Adelaide while 600 from Sydney. Gold was got from a quartz vein at the Victoria mine, near Adelaide, as early as 1846, but did not pay the company. Partial gold working has been conducted at Echunga, &c, in southern hills. There are rich alluvial and quartz gold mines in Northern Territory, at from 100 to 150 m. south of Port Darwin. For the year 1884 the yield was £77,935. Of 1349 miners 1205 were Chinese. Gold is now worked at Waukaringa, 225 m. north of Adelaide. Copper, tin and silver are found in Northern Territory. Among other minerals asbestos, roofing slates and fine marbles may be named. Some forty years ago precious stones, especially garnets and sapphires, were gathered in the Barossa Hills. Carbonaceous material is found at the Coorong, &c, yielding 50% of oil. Lake Eyre has a rude coal. Kapunda marble quarry is a success. The great copper mines at Moonta and

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Wallaroo are still worked, but the production has greatly fallen off. In 1900 the value of copper raised in the province was £386,015, and the gross production to the end of that year amounted to £22,321,969. The production of copper in 1905 was £470,324. Gold to the value °f £85,555 was won m I 9°5> being chiefly obtained in Northern Territory; the total production of gold prior to that year was £2,764,336. The value of minerals other than gold and copper won during 1905 was £96,672. In 1871 the mineral production of the state was valued at £725,000, in 1881 at £421,000, in 1891 at £365,000 and in 1905 at £652,551.

Land System. — The aggregate area of South Australia, exclusive of the Northern Territory, is computed to be 380,070 sq. m., or 243,244,800 acres. About 136,828 sq. m., or a little more than one- third, represent the limits within which the country is at present occupied. The 46 counties proclaimed to date embrace an area of 80,453 sq. m. or 51,489,920 acres, of which 7,955,305 acres are purchased, 365,526 acres are partly purchased and 121,735 acres have been granted for public purposes, making the total area alienated, wholly or conditionally, 8,442,566 acres; 176,537 acres are set apart, but not granted, for forest purposes, and 42,870,817 acres are still in possession of the Crown but occupied under various kinds of tenure, chiefly for pastoral purposes. In addition to the land alienated, there are 17,104,062 acres held direct from the Crown by 19,511 lessees for farming or grazing purposes. Outside the counties are 299,617 sq. m. or 191,754,880 acres, of which 1105 acres are purchased, 23 granted for public purposes, 76,570,750 held by 497 lessees as sheep or cattle runs, leaving 115,184,130 acres open for pastoral settlement, if suitable.

Agriculture. — South Australia is essentially an agricultural state. In its first establishment the land was cut up for sale into eighty-acre lots with the view of settling the people on arrival, and concentrating them, instead of having them scattered as in the neighbouring colonies, in which pastoral pursuits completely dwarfed the farming industry. This wise provision made the colony for years the supplier of breadstuffs to Sydney, Melbourne, Brisbane, Perth and Auckland. As neighbours became wheat-producers, Adelaide merchants had to seek markets in Natal, Mauritius, the Cape, or even Europe. At all times the state has lent every assistance to agriculture. As the colony suffers more from drought than anything else, public reservoirs are constructed and artesian wells are sunk. Forest culture has especially attracted government attention. Reforesting and the establishment of nurseries for the trees, fruits and vegetables of other lands go hand in hand. Hundreds of thousands of trees are planted annually.

The chief industry is wheat-growing; out of 3,342,626 acres under cultivation in 1905, 1,757,036 acres were under wheat for grain and

317,924 under wheat for hay. In some parts of South Australia fine yields are obtained ; but taking it as a whole, the yield of the province is light. During the ten years 1891-1900 the return per acre varied from a minimum of 1-7 bushels in 1897 to a maximum of 6-1 bushels in 1893. South Australian wheat is of excellent quality and strength, and well known in European markets, to which the province has sent wheat since 1850. There has been little expansion of wheat cultivation since 1880; nor, indeed, has there been any material expansion in the total area under crop. Up to the year mentioned, every season showed an additional area devoted to culti- vation; but repeated failure of crops, due to want of seasonable rain, have disheartened farmers, and much land that was formerly culti- vated now lies fallow; 1,087,057 acres were fallow in 1905. The following is a statement of the area of wheat harvested for grain at specified intervals from 1861 : —

Year.

Acreage under Wheat.

Production.

Average Yield per Acre.

Acres.

Bushels.

Bushels.

1861

310,636

3,410,756

II-O

1871

692,508

3.967.079

57

1881

1,768,781

8,087,032

4.6

1891

1,552,423

6,436,488

5-6

1899

i,778,77o

8,778,900

4-9

1900

1,821,137

8,453.135

4-6

1901

I.9I3. 2 47

11,253,148

5-9

1905

1,757.036

20,143,798

11-46

The total area under crop during the same period was: 1861, 400,717 acres; 1871, 837,730 acres; 1881, 2,156,407 acres; 1891,1,927,689

acres; 1901, 2,369,680 acres. In 1905 other leading crops grown with this acreage were: oats, 56,950 acres; barley, 26,250 acres; potatoes, 9540 acres ; vines, 23,603 acres; other crops, 30,532 acres.

In viticulture the province has made considerable progress, and many Germans are employed in the industry. The production of wine for the year 1905 amounted to 2,845,853 gallons, while 16,714 cwt. of currants and 8697 cwt. of raisins were also made. The wine made is of excellent quality, and 718,660 gallons, of a total produc- tion of 2,845,853 gallons, were exported in 1905, principally to London.

The production of wool has been one of the chief industries since the foundation of the state, but of late years it has been much affected

by droughts and low prices, so that the export of locally-grown wool in 1901 was considerably less in quantity than in 1880, and little more than half as valuable. In 1861 the colony carried 3,038,000 sheep; in 1871, 4,412,000; in 1881, 6,811,000; in 1891, 7,745,000; in 1900, 5,283,247; and in 1905, 6,202,330. The quantity of wool exported in the year last named was equal to 45,214,766 ft, valued at £1,668,214. A s a cattle-breeding country South Australia does not take a prominent place beside the three eastern states of Aus- tralia. The province depastured, in 1905, 647,631 cattle as against 520,379 in 1904, 347,666 being in Northern Territory. In 1891 the number was 677,000, and 1881, 315,000. It was between 1881 and 1 89 1 that Northern Territory was stocked. The horses in South Australia number about 216,350; the number in 1881 was 159,678.

Although there are some 30,000 persons engaged in one form or other of manufacturing, only 18,664 are accounted for in the annual statistics of the state; these hands are employed in 1339 establish- ments. The horse-power employed in the manufactories is 11,756, the value of the plant being estimated at £1,730,000.

Commerce. — The tonnage of shipping entering the ports in 1905 was 2,625,997, which is equal to upwards of 6 tons per inhabitant, a very considerable ratio compared with most countries; but this tonnage is quite beyond the requirements of the province, whose trade represents only about 750,000 tons per annum, and is due to the fact that Adelaide is a place of call for all the great lines of steamships trading between Europe and Australia ; but when every allowance is made, it will be found that Adelaide is a great shipping centre and the third port of Australasia. The tonnage entering at Adelaide during 1905 was 2,106,854; at Port Pirie, 226,903; at Wallaroo, 105,228; and at Port Darwin, 116,981. The value of the total imports was £8,439,609, and the total exports £9,490,667.

The ports command the gfeater part of the trade of the Broken Hill and trans-Darling districts of New South Wales, and this trade is very valuable both to the merchants and the railways of the province. The trade at the periods specified was : —

Exports

Year.

Imports.

Exports.

Total Trade.

of Domestic Produce.

£

£

£

£

1861

1,976,018

2,032,311

4,008,329

1,838,639

1871

2,158,022

3,582,397

5,740,419

3,289,861

1881

5,320,549

4,508,754

9,829,303

3.755,78i

1891

10,051,123

10,642,416

20,693,539

4,810,512

1899

6,884,358

8,388,396

15,272,754

3,945,045

1900

8,131,782

8,122,100

16,253,882

3,770,983

1905

8,439,609

9,490,667

17,930,276

6,031,619

The great expansion following 188 1 was due to the opening up of trade with the western districts' of New South Wales. The exports of domestic

produce, the valuejof which is given in the last column, when compared with the other figures in the table, show how greatly the province depends upon its re-export trade. The chief items of trade are breadstuffs, wool arˆn minerals; the export of breadstuffs is very variable, depending Jo largely upon the rainfall, which in South Australia is extremely uncertain. In 1884 the value of wheat and flour exported pas £2,491,896, falling to £633,426 in 1886, and rising again to $2,197,735 in 1888. Since the year last named there have been great-fluctuations ; in 1898 the export fell to £261,898; in 1899 it was £785,341; in 1900, £837,642; in 1901, £1,329,059; in 1904, £1,649,414; and in 1905, £1,877,318.

Railways. — The first railway was opened in 1856, and connected Adelaide with its port, and the following year saw a line constructed to Gawler, 25 m. from Adelaide. The inability of the government to borrow money at reasonable rates greatly retarded the construc- tion of railways in the province, and in 1875 there were less than 200 m. of line : in the next ten years 800 m. were opened for traffic, and in 1905 there were 1746 m. in the state proper and 146 m. in Northern Territory. There were, in addition, 34 m. of privately owned lines. The cost of constructing and equipping the state lines stood at £14,766,465 and the net earnings at £538,890 ; this represents 3-64% on the capital invested. The actual interest paid by the state upon its outstanding loans was in the same year 3-79%: there was therefore a loss of 0-15% upon the working of the lines; but the state claims that the indirect benefits of railway construction far more than compensate for the direct loss. The gross earnings for the year 1905 were £1,318,521, and the working expenses £756,403 ; the net profit per average mile open being £297, and per train mile 34-68 pence. In 1905 the number of passengers carried was 9,870,821, and the goods tonnage 1,684,793. South Australia has two gauges, namely 508 m. of 5 ft. 3 in., and 1384 m. of 3 ft. 6 in. line. The line joining Adelaide with the Victorian border, as well as several of the trunk lines, is on the wider gauge.

Posts and Telegraphs. — In 1905 there were 711 post-offices in the state of which 299 were also telegraph stations. The business transacted was: letters and postcards transmitted, 26,230,337; newspapers, 6,717,787; packets, 1,659,775; and teiegrams, 1,244,126. The total revenue from these services for the year 1905 was £274,892, and the expenditure £259,656; in these sums are included the

telephone revenue and expenditure, the former amounting to £25,815.

These sums are exclusive of revenue received by the Commonwealth government. The use of telephones in Adelaide is rapidly extending; in 1905 there were eleven exchanges and 2284 telephones in actual use. There were 6092 m. of telegraph line in operation in that year; the state owns the principal overland line by which communication with Europe and the East is maintained.

Banking. — The assets of all the banks of issue trading in South Australia at the end of December 1905 amounted to £7,4 2 5>775> and the liabilities to £7,623,060; these latter comprised deposits at call and at interest, £6,866,281; notes and bills in circulation, £381,573 ; and other liabilities £52,929. Among the assets were coin and bullion £1,861,691. The South Australian people are very thrifty, and thirtv-one in every hundred have accounts with the savings banks. On the 30th of June 1905 the depositors numbered 126,821, the amount of their credit being £4,380,358, a sum equal to £34, 1 os. 9d. per depositor. Taking deposits in banks of issue and in savings banks together, the total was £11,186,639, which is equal to £29, 12s. 4d. per inhabitant.

Authorities. — E. G. Blackmore, The Law of the Constitution of South Australia (Adelaide, 1894); H. Y. L. Brown, A Record of the Mines of South Australia (Adelaide, 1890); John Ednie Brown, A Practical Treatise on Tree Culture in South Australia (Adelaide, 1881); J. F. Conigrave, South Australia: A Sketch of its History and Resources. A Handbook compiled for the Colonial and Indian Exhibition in London, 1886 (Adelaide, 1886); B. T. Finniss, The Constitutional History of South Australia, 1836-1857 (London, 1886) ; R. Gouger, The Founding of South Australia, edited by E. Hodder (London, 1898); William Harcus, South Australia: Its History, Resources, Productions and Statistics (London, 1876) ; Edwin Hodder, The History of South Australia, with maps (2 vols. 8vo., London, 1893); S. Xewland, The Far North Country (Adelaide, 1887); South Australian Year Book (1904-1905); T. A. Coghlan, Australia and Sew Zealand (1903-1904). (T. A. C.)

History. — Though the coast of Northern Territory was well known to Portuguese and Spanish navigators as early as perhaps 1 530, being called Great Java, it was not surveyed till 1644, when Tasman laid down the line of shore pretty accurately. The western part of the southern coast had been seen and named Nuyt's Land in 1627. But Flinders, by his discovery of the two great gulfs, Kangaroo Island and Encounter Bay, in 1802, was the first to reveal South Australia proper. Captain Sturt descended the Murray in 1830, and looked over the hills near Adelaide. The first to direct attention to a settlement there was Major Baron, who communicated with the colonial office in February 1831. His suggestion was to establish, at no charge to the British government, a private company, that should settle a

party on Yorke Peninsula. He believed a large river entered Spencer Gulf. In August Colonel Torrens and others proposed to purchase land between 132° and 141 — 500,000 acres at 5s. an acre. Some were in favour of Spencer Gulf, others of Kangaroo Island, and a few for the mainland towards the Murray. Memorialists in 1832 sought a charter for the South Australian Association, giving extensive powers of self-government. Land sales were to pay the passages of free labour, chiefly young married people, and no convicts were ever to be sent thither. Lord Goderich did not favour the scheme, and thought a colony with free institutions might prejudice the interests of New South Wales, while free trade would interfere with the English navi- gation laws. After much negotiation, the English authorities regarded the scheme more favourably, but would not consent to give the company the powers they sought. The company receded in their demands, and offered security for the proper observance of law and order, while depositing cash for the purchase of land. Captain Sturt in 1834 informed the colonial secretary that Spencer Gulf and Kangaroo Island were objec- tionable, but that the eastern side of St Vincent Gulf was the best locality. In 1835 the ministry got an act passed for the erection of a colony under commissioners appointed by the Crown, who would be responsible for their acts to the British government. It was arranged that a local government should be established when the settlement had 50,000 people. Mr George Fife Angas advanced a large sum as security to the state. Though the first settlers were sent to Kangaroo Island, all were afterwards gathered on the Adelaide plains. The colony was proclaimed under a gum tree on the 28th of December, 1S36. Great delay took place in the survey of land. The South Australian Company purchased large tracts from

the commissioners at 12s. per acre and sold at 20s. A general speculative spirit arrested progress. Governor Gawler went into extravagant outlay on public buildings, &c, and drew against orders upon the English treasury. Such difficulties arose that the British rulers had to suspend the charter in 1841 and make South Australia a Crown colony. A revival of prosperity took place when the farms were tilled and poverty had taught pru- dence. Copper and lead mines were subsequently discovered. Kapunda in 1843, and the Burra Burra copper-mine in 1845, greatly aided in the restoration of commercial credit. The gold fever in Victoria drew off numbers in 1852; but the good prices then realized for breadstuffs gave a great impetus to farming.

In 1856 the colony was given its own constitution and self- government. On the attainment of autonomy Governor MacDonnell, in closing the last session of the then partially nominated legislature, made use of the following words: " I confidently expect that the extended political power en- trusted to the people of this country, and the universal suffrage conceded by the new constitution, will prove in reality a safe and

conservative measure; and whilst conferring the utmost possible power of self-government, will render stronger and more enduring than ever the cherished ties of affection and loyalty which link this province to the throne of our respected and beloved sovereign." This prediction appears to have been amply verified: South Australia enjoys the reputation of being one of the most progressive and at the same time one of the most stable of existing communities. From its origin as the venture of private enterprise the state has passed through orderly stages of evolution up to the zenith of democratic government. Such alterations as have been made in the constitution have been in the direction of a still further enlargement of the franchise. Payment of members proved to be the corollary of manhood suffrage. In 1887 a temporary act was passed for the payment of £200 a year to each member of both houses, and in 1890 the law was made permanent. Thus was rendered possible the direct representation of all classes. Soon afterwards the parliamentary Labour party came into existence; this forms a considerable proportion of the membership of both houses, and includes in its ranks men of the highest intelligence, in- dustry and eloquence. In 1894 the principle of " one man one vote " was extended to that of " one adult one vote " by the inclusion of women as voters on terms of absolute equality with men. There is no bar to the election of women to parlia- ment whenever the electors think fit to be so represented. The delegates to the Federal convention and to the Common- wealth parliament were in South Australia elected by the combined vote of men and women. Elections were formerly held in successive batches, but since 1893 they have taken place simultaneously in all the districts. Electoral expenses are rigidly limited, both as to objects and amount, and a declaration of money thus expended has to be filed by every candidate. Experience has demonstrated that, owing to the intrusion of the personal element, general elections have often failed to afford conclusive evidence of the state of the popular will. Attention was therefore directed towards the referendum as a means of obtaining an unquestionable verdict on important public issues, although no general statute was formulated on the subject. In 1896, at the general elections, the following questions were submitted to the electors: " Do you favour (1) the continuance of the present system of education in the state schools? (2) the introduction of scriptural instruction in the state schools during school hours? (3) the payment of a capitation grant to denomi- national schools for secular results ? " An overwhelming majority pronounced in favour of (1) and against (2) and (3). Again, in 1899, a direct vote was similarly taken on the question of household franchise for the legislative council. Undoubtedly the practical application of the referendum in South Australia facilitated the adoption of this principle in the ratification and in the method of amendment of the Commonwealth constitu- tion. The right of the Second Chamber to suggest amendments to bills which it has not power to amend

was borrowed by the Commonwealth from the constitution of South Australia, as

also was the idea of a simultaneous dissolution of both houses as a means of overcoming possible deadlocks between the chambers. As one among many improvements in parliamentary procedure may be mentioned the practice of permitting bills lapsed owing to prorogation to be replaced on the notice paper in the ensuing session by motion without debate.

In partially settled countries such as South Australia the Crown lands policy rivals finance in engrossing the attention of the legisla- ture, but as time goes on the relative importance of these subjects varies in inverse ratio. The earlier budgets, compared with those of later years, when the country had become more fully developed, might be said to resemble the finances of the nursery, whereas the initial alien- ations of land, comprising the most central and most valuable blocks, necessarily surpassed later transactions in significance. Many phases of public opinion as to the method of disposing of the Crown lands have been witnessed. A general review indicates clearly that the change has been uniformly in the direction of removing impediments and increasing facilities for the settlement of the people, either as freeholders or as state tenants, on the land. Under the auction system the land was allotted to the highest bidder, with the result that the payment of the purchase-money frequently exhausted the resources of the settler, and subsequent relief had to be afforded by relaxation of the conditions of the agreement to purchase. Eventually land boards were created to allot selections to applicants at low rates and deferred purchase. Perpetual leases are now taking the place of absolute alienation. The tenure is equally good for all purposes of the bona-fide settler, and capital which would otherwise be sunk in acquiring the freehold is set free for making improvements, purchasing machinery and the manifold requirements of efficient husbandry. Small blocks of 20 acres, or not exceeding £100 of unimproved value, can be obtained by working men in the vicinity of towns, thus on the one hand affording the necessary supply of agricultural labour during the busy seasons, and on the other hand providing a homestead which the holder can with advan- tage cultivate at slack times when unemployed. Provision was made, under the Closer Settlement Act of 1897, for the repurchase of large estates for agricultural purposes; these lands are leased to farmers at an average rent of about 4! % on the value. The industry of wheat-growing has received an impetus through the system

of drilling in a small quantity of phosphatic manure with the seed. By this means exhausted lands have been restored almost to primi- tive fertility. Vine-growing has now become one of the staple industries, and, owing to stringent precautions, the state remains free from the scourge of phylloxera. The great bulk of Agriculture the unalienated land of South Australia is held in huge and Water, areas by Crown tenants, known as squatters, under pastoral leases, which now have a currency of 42 years, with security of tenure. In 1893, when the unemployed were very numerous, the government established co-operative village settle- ments on tracts of land adjoining the river Murray. Seven of these are now in existence as irrigation colonies. The water is raised from the river by rotary pumps, and distributed by means of channels, after the plan adopted at Renmark. By the application of water to the adjacent sun-steeped soil miles of worthless mallee scrub have been converted into vistas of vineyards, orange groves and orchards. The paramount importance of water-supply and con- servation has received ever-increasing recognition. The Beetaloo reservoir has a capacity of 800,000,000 gallons, and from its 695 m. of trunk mains a district of over 1,000,000 acres is reticulated. The supply of Adelaide and its vicinity has been reinforced by a reservoir at Happy Valley, having a contour of about 7 J m. at high- water mark, and containing 2,950,000,000 gallons. The reservoir was formed by the construction of an earthen embankment 2645 ft. long and 72 ft. high ; this is filled from the Onkaparinga river through half a mile of steel main, 6 ft. in diameter, and 3 J m. of tunnel. Works on a large scale have also been constructed at Bundaleer and Barossa. The custom for many years past has been to construct these and other great public works departmentally instead of by contract. Many artesian wells have been sunk on the routes for travelling stock in the interior. The bores of some of these exceed 3000 ft. in depth, and the supply varies from 200,000 to 1,000,000 gallons a day. Around some of these wells in the far north planta- tions of date-palms have yielded excellent results.

South Australia was founded when the tide of the laissez-faire regime was running high, and a patriotic bias inthe customs tariff was regarded as an unwarrantable restriction; it is therefore not surprising that free trade should at the outset have received many adherents. There were not wanting, however, some who saw clearly that a country almost entirely occupied in primary production would prove but a barren field for the cultivation of the many-sided activity necessary to a complete national life. It was also main- tained that if inducements were given to capital to embark inhome industries, a cheapening of the product, due to approximation of supply and demand, would ensue. In accordance with these views, a protective tariff was adopted in 1885. Two years later the duties were increased and extended. The establishment of manufactures

and new industries opened a career for youths of inventive and mechanical aptitude, and in several instances the predicted reduction in price of the protected article has been strikingly manifested.

One of the most notable developments in public policy consisted in the extension of the sphere of the state so as to embrace activities formerly considered to be solely within the province of private enterprise. Railways from the outset have Government been government undertakings, so also have been Enterprise. waterworks of any degree of magnitude; telegraphs and telephones, taken over by the Commonwealth, have always been regarded as state monopolies. A public trustee undertakes, when desired, the administration of estates. In 1895 a state bank was established to provide farmers with the necessary working capital at lowest current rates of interest. A state produce d£p6t was also organized at the same time to assist farmers in placing their produce to the best advantage on the world's markets. Produce is received by the department of agriculture, prepared for shipment, certified as to quality, and graded. Small parcels from a number of producers are grouped together in one consignment and shipped at the lowest rates. The government of South Australia also undertakes, if so desired, to act as agent in London for the con- signor, and to arrange for the sale of his produce; so that a farmer who has no representative at the port of destination, but is desirous of ascertaining whether a profitable trade can be established in any class of produce, has only to send the goods to the depSt, and await .the arrival of a cheque when the sales accounts come to hand. An advance amounting to three-fifths of the value of the produce at 5 % is made if desired. Wine shipped through the produce dep6t is analysed and examined in bulk by government experts, and if found to be both sound and pure is sent to the bonded d6p6t in London with a certificate to that effect: this is recorded on the label of the bottles in which it is retailed, under the name of the " Orion " brand. Cyanide works have been erected in various centres for treating ore raised by miners working in the neighbourhood. State smelters for copper ore have been built at Port Augusta, but are not now in operation. There is a Factory Act permitting the establishment of wages boards, and also legislation providing for a weekly half- holiday and the early closing of shops. A compulsory Conciliation Act deals with the prevention and settlement of industrial disputes. The Right Hon. C. C. Kingston was the pioneer in Australasia of legislation of this description. These measures were at first denounced by some as Socialistic, and were regarded by many as an undue interference with private enterprise. Some of the state aids were, however, speedily recognized as affording additional incentives to industry, and by enabling producers and workers to obtain a better return for their labour may fairly be held to have assisted rather than to have retarded private enterprise. In 1893 a bonus on butter exported to the world's markets was successful in

bringing into existence a fully equipped export trade. Public opinion in South Australia has little tolerance with laxity. Children are pre- vented from selling articles in the streets after 8 p.m., and are not allowed to fetch beer from public-houses. The age of consent has been raised to 17 years. The notification by medical men of cases of pulmonary tuberculosis to the local authorities is compulsory.

No pains have been spared to keep pace with modern improve- ments in popular education as an indispensable feature in democracy. South Australia holds in reverent and loving memory - ,. the name of John Anderson Hartley, the originator of uca on ‘ the state school system, who died in 1896, and to whose character as a man and genius as an organizer the schools of South Australia will remain as a perennial monument. School fees for children under the compulsory age of 13 were abolished in 1891, and in 1898 the older children were also admitted free. Students in training have now the advantage of a two-years’ course at the university. Technical education has received much attention. A foundation was long ago laid in the primary schools by the inclu- sion of drawing as a compulsory subject, and by affording facilities for manual training. In 1889 the South Australian School of Mines and Industries was established, and under the presidency of Sir Langdon Bonython proved a most valuable institution. Other technical schools are in operation in industrial and mining centres. A reserve of 2 acres is attached to all new country schools, and systematic lessons in practical agriculture are given by many teachers. In order to encourage tree-planting, a yearly school holiday devoted to this purpose, and known as Arbor Day, was established in 1886. With a similar object the state has dis- tributed, free of charge, 5,000,000 forest trees to 21,000 persons. Over 1,250000 vines have also been given away. The boys’ field club (1887), with the motto “The Naturalist loves Life,” under the direction of Mr W. C. Grasby, was one of the pioneers of Nature-study. A state secondary school for girls has been for many years self-supporting, and in 1897 secondary agricultural schools for boys were organized in Adelaide and other centres. Half the school hours of each day are spent in the class-room, the remainder being devoted to workshop, field and laboratory practice. An agri- cultural college at Roseworthy, 25 m. north of Adelaide, imparts a high-class theoretical and practical training in the various branches of agriculture, including viticulture and wine-making. The fee charged is £30 a year, including board and lodging. Information

as to practical and scientific husbandry is disseminated among the tarmers by means of an agricultural bureau, with numerous branches throughout the country. A journal is published conjointly by the departments of agriculture and industry, containing reports of the proceedings of the

bureaus and articles by government experts, together with industrial topics and matters of interest to artisans and also particulars furnished by the labour bureau as to prospects of employment in various districts. (J. A. Qo.)

SOUTH BEND, a city and the county-seat of St Joseph county, Indiana, U.S.A., at the head of navigation and on the southern bend (hence the name) of the St Toseph river of Michigan and (by rail) 86 m. E. by S. of Chicago. Pop. (1900), 35,999ˆ of whom 8601 were foreign-born (including 3053 Poles and

2402 Germans); (19×0, census), 53,684. Land area (1906), 6-2 sq. m. It is served by the Grand Trunk, the Lake Shore & Michigan Southern, the Michigan Central, the New Jersey Indiana & Illinois, the Chicago, Indiana & Southern, and the Yandaha railways, and by four inter-urban electric lines Among the principal buildings are the city-hall, the county court-house, the public library, and the Oliver Hotel In Notre Dame, a suburb, are St Mary's College and Academy (Roman Catholic, chartered 1855) for girls, and the university ot Notre Dame du. Lac (Roman Catholic, first opened in 1842, and chartered in 1844). In 1910 the university had 87 instructors, 1005 students, and a library of 60,000 volumes. It is the headquarters of the order of the Holy Cross, whose sisters have charge of St Mary's College and Academy. South Bend ranked fourth among the manufacturing cities of the state in 1905. Its industrial establishments include carriage and wagon works (those of the Studebaker Bros. Manufacturing Company being the largest in the world), plough and agricul- tural machine works— the Oliver Chilled Plow Works, founded by James Oliver (1823-1909), being particularly well known— the wood-working department of the Singer Sewing Machine Company, iron and steel foundries, flour-mills, and paper and pulp mills. The water-supply is obtained from 122 artesian wells, with a daily capacity of about 24,000,000 gallons. South Bend was the site of an Indian village and of a French trading post. It was settled about 1820, laid out about 1831 (when it became the county-seat of St Joseph county), incorporated as a village in 1835, and chartered as a city in 1865

SOUTH BETHLEHEM, a borough of Northampton county Pennsylvania, U.S.A., on the Lehigh river, about 57 m. N.w! of Philadelphia, and opposite Bethlehem, with which it is con- nected by bridges. Pop. (1900), 13,241, of whom 3322 were foreign-born and 115 were negroes; (1910 census), 19,973 It is served by the Lehigh Valley, the Philadelphia & Reading the Central of New Jersey and the Lehigh & New England railways. The borough is the seat of Lehigh University I his institution was founded in 1865 by Asa Packer, who then gave $500,000 and 60 acres (afterwards increased to 115 acres) of land in the borough, and by his will

left to the university library $500,000, and to the university an endowment of Si 500,000 and a large interest (about one-third) in his estate I he university was chartered in 1866; it embraces a school of technology, with courses in civil, mechanical, metallurgical mining, electrical and chemical engineering, electrometallurgy and chemistry, and a school of general literature (1878), with classical and Latin-scientific courses. In 1908-1909 it had 68 instructors, 1720 students, and a library of 127,000 volumes. 1 he principal buildings of the university are Packer Hall (1869), largely taken up by the department of civil engineering the chemical and metallurgical laboratory, the physical and elcc- I"". 1 eng'nˆnng laboratory, the steam engineering laboratory, \ ilharns Hall for mechanical engineering, &c, Saucon Hal! for the English department- Christmas Hall, with drawing-rooms and the offices of the Y.M.C.A., the Sayre astronomical observatory, the Packer Memorial Church, the university library (1897) dormitories (1907) given by Andrew Carnegie, Drown Memorial Hall, a students club, the college commons, and a gymnasium.

South Bethlehem is the see of a Protestant Episcopal bishop. The B-thlehem Steel Company manufactures here iron and steel, including Bessemer steels, armour plate, steel rails,

government ordnance, drop forgings, iron and steel castings stationary engines, gas engines, hydraulic pumps, projectiles' steel shaft and pig iron; zinc is smelted and refined- and there are large hosiery and knitting mills, and silk mills and cigar factories. The total value of the borough's factory products increased from $9,964,054 in 1900 to $15,275411 in i9°5, or 53-3 %.

In 1846 a water-cure was established where St Luke's hospital now stands, in the adjoining borough of Fountain Hill (pop. in 1 910, 1388), and for a few years this attracted a considerable number of visitors during the summer season In 1853 works were established for the manufacture of white oxide of zinc from a calamine found here, in the next year metallic zinc was produced, and in 1865 the first sheet zinc made in America was rolled here. The borough was incor- porated in 1865.

SOUTHBRIDGE, a township of Worcester county, Massachu- setts, U.S.A., on the Quinabaug river (which here falls 165 ft) about 20 m. S.S.W. of Worcester. Pop. (1900), 10,025 of whom 3468 were foreign-born; (1910 census), 12,592. Area, about 20 sq. m. The township is served by the New York, New Haven & Hartford railway, and by inter-urban (electric) lines to Worcester and Springfield. The Southbridge public library (1870) contained 22,000 volumes in 1910. Optical goods, cotton, woollen and

print goods, cutlery and shuttles are the principal manufactures; in 1905 the value of the total factory product was $4,201,853. The factory of the American Optical Company here is probably the largest of its kind in the world.

In 1 801 a poll parish, named the Second Religious Society of Charlton, and popularly called Honest Town, was formed from the west part of Dudley, the south-west part of Charlton and the south-east part of Sturbridge; and in 1816 this parish became the township of Southbridge.

Socfe C t y h „lf o e ufhtfd?e! iShed (l901 ˆ by the Q u: ˆbaug Historical SOUTH CAROLINA, a South Atlantic state of the United States of America, and one of the original thirteen, lying be- tween Latitudes 32 2′ and 35° 17′ N. and between longitudes 78 30 and 83 20 W. It is bounded N. by North Carolina E. by North Carolina and the Atlantic Ocean, S.E by the Atlantic Ocean, S.W. and W. by the Savannah, Tugaloo and Chattooga rivers, which separate it from Georgia. Its total area is 30,989 sq. m., and of this 494 sq. m. are water surface.

Surface Features.— South Carolina is mainly in the Coastal Plain and Piedmont Plateau regions, but in the north-west it extends slightly into the Appalachian Mountain region. Locally the Coastal Flam region is known as the low country, and the Pied- fhfnnˆT and ˆ APP alachia » Mountain regions are known as the up-country. The coast, about 200 m. in length, is generally

ow For 60 m south-west of the North Carolina border it is ul broken and lined with a smooth, hard beach of light-coloured sand, linL ? I « l S lt , b , ecomes .increasingly broken by estuaries and is

owl Tit r an4 I(T s f a – lslands t' lat in «ease in size and number t n rrm,tnlˆ 0! ' gia b?rde – n F ° r ?H° Ut I0 m – back from th e coast rLn Tu P L a, °. I ˆ lon . IS pecuped very largely by salt marshes. Jho,?; ˆ f? g stlII ., c °? tlnuin g flat, the surface rises at the rate of

r-irTd v \llZl r C f ° r 4 ° m ' ,° r m ? re; be y° nd this ft ris es more rapidly reaches a maximum elevation in Lexington county of about 700 ft. above the sea, and becomes increasingly broken Wo rolling plateaus and deep valleys to the Fall Line, which marts the boundary between the Coastal Plain and the Piedmont Plateau This line at which the south-east flowing rivers fall from higher levels in the crystalline, rocks of the Piedmont Plateau down to somewhat lower levels in the softer rocks of the Coastal P?ain passes in a general south-west direction from the North Carolina border north-east of Cheraw through Camden and Columbia to he Savannah river opposite Augusta, Georgia. The Piedmont Platen n region,

nsing gradually from an elevafion of aboit 500 ft a ong the Fall Line to 1000 ft. or more in the north-west, is a plateau so ± n “““atmg ridges and deeply cut valleys. In the small section of South Carolina which is traversed by the Appalachian Mountain region a tew mountains of the Blue Ridge rise abruptly from the foot-hills to 3413 ft in Mt Pinnacle, 3218 ft. in Caekrs Head, and 3157 ft. in Table Rock. The highest point in the state is Sassafras Mountain (-3548 ft.) in the Blue Ridge and on the North Carolina state line. . The mean elevation of the entire state is about 350 it. the principal rivers rise in the Appalachian Mountains

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SOUTH CAROLINA

and flow south- east into the Atlantic Ocean. In the middle section the Santee river is formed by the confluence of the Wateree, which is known in North Carolina as the Catawba, and the Congaree, which is in turn formed by the Broad and the Saluda, and the basin of this system embraces about one-half the area of the state. In the north-east the Great Pedee and its tributaries — the Little Pedee, Waccamaw and Lynches — are wholly within the Coastal Plain, but the main stream is a continuation below the Fall Line of the Yadkin river, which rises in the mountains of North Carolina. On the Georgia border the Chattooga river, rising in the Blue Ridge, becomes tributary to the Tugaloo, which in turn becomes tributary to the Savannah. The Combahee and the Edisto, in the south- east, and the Black, north of the Santee, are the principal rivers that rise within the Coastal Plain and flow direct to the ocean. In the Piedmont Plateau region the current of the rivers is usually swift, and not infrequently there are falls or rapids; but in the Coastal Plain region the current becomes sluggish, and in times of high water the rivers spread over wide areas.

Fauna. — The principal animals and birds in South Carolina are deer, rabbits, squirrels, opossums, musk-rats, raccoons, minks, geese, ducks, wild turkeys, ” partridge ” (quail or bobwhite), woodcock and snipe. Foxes, bears, wolves, lynx (wild cats) and otters are very rare, and pumas (panthers) and beavers long ago disappeared. Common among birds of prey are owls, hawks and kites, and there are many turkey buzzards. Song birds are numerous and of many varieties; among them are thrushes, mocking birds, blue birds, robins, wrens, chickadees, warblers, vireos, sparrows, bobolinks (reed birds or rice birds), meadow larks and orioles. In the bays and lower courses of the rivers are por- poises, whiting, sea bass, channel bass, shad, sturgeon, mullet, drum, bluefish, snappers, sheepshead, weakfish or squeteague, groupers, and several other kinds of fish. Oysters, crabs, shrimp and terrapins are also abundant here, and in the inland streams are some pike, perch, trout and catfish.

Flora. — From the number of palmettoes along the coast South Carolina has become popularly known as the Palmetto state. Scarcely less conspicuous for some distance from the ocean are the magnolias, the live oaks draped with long gray moss, and the reed- covered marshes. In the swamps there are cypresses and some gum and bay trees. In most of the uplands of the Coastal Plain region the long-leaf pine is predominant, but large water-oaks and undergrowths of several other oaks and of hickories are not uncommon. On the Piedmont Plateau and in some of the more hilly and heavy-soil sections below the Fall Line there is some short-leaf pine, but most of the trees in these sections are of the hardwood varieties: deciduous oaks are most common, but beech, birch, ash, maple, black walnut, chestnut, sycamore and tulip trees also abound. On the mountains are the cucumber tree, laurel, white pine and hemlock. Among indigenous trees, shrubs and vines that bear edible fruits or nuts the state has the black- berry, grape, pawpaw, persimmon, plum, crabapple, hickory, chestnut and hazel nut. The English walnut, pecan, apple, apricot, pear and cherry are also cultivated. Both medicinal and flowering plants are exceptionally abundant ; a few of the former are ginseng, snakeroot, bloodroot, hore-hound, thoroughwort, redroot (Ceano- thus Americanus), horse mint and wild flax, and prominent among the latter are jessamines, azaleas, lilies, roses, violets, honey-suckle and golden-rod. Venus's flytrap is found along the coast.

Climate. — Along the coast the climate is comparatively mild and equable. At Charleston, for example, the mean winter temperature is 51 F., the mean summer temperature 8i° F., the mean annual temperature 66° F., and the range of extremes from 104 F. to 7 F. or 97 F. Toward the north-west the mean winter temperature decreases to 47° F. at Columbia and to 40° F. at Greenville ; the mean summer temperature decreases only to 8o° F. as far as Columbia, but from there to Greenville decreases to 75° F.; and the mean annual temperature decreases to 62 ° F., at Columbia and to 58 F. at Greenville. The range of extremes increases to 108 F. (106 to -2°) at Columbia, and then decreases to I02°F. (97 to 5°) at Greenville. The greatest range of extremes in the state is from 11° F. at Santuck, Union county, in February 1899, to 106 F. at Columbia in August 1900. For the whole state the mean annual temperature is about 63 ° F., the mean summer temperature 79° F., and the mean winter temperature 44° F. In nearly all sections January is the coldest month and July the warmest. The mean annual rainfall for the state is about 49 in., and its distribution is excellent. Extremes for the various sections range only from 53-4 in. at Charleston to 44-4 in. at Stateburg, in Sumter county. Seventeen inches, or more than one-third, falls during the summer, and for the other seasons the range is only from 10 1 in. for autumn to 1 1 -6 in. for winter. Snow is uncommon in the south-east of the state, and whenever there is a snow-

storm the snow usually melts as it falls; but in the centre and north-west occasionally covers the ground to a depth of several inches. The prevailing winds are from the south-west along the coast, from the north-east in the north-central section, and from the west in the west section. Tornado winds sometimes occur in the west section, and the east section occasionally suffers from West Indian hurricanes.

Soils. — In general the soils of the Piedmont Plateau region

are such as have been formed by the disintegration of the under- lying rocks. These consist mostly of granite and gneiss, but in the north-central section there is trap -rock, and in the south-east section some slate. On the more level areas of the Piedmont Plateau the granitic soil is a grey mixture of sand and clay, but on the hillsides of the river basins it is a heavy clay of reddish colour, the sand having been washed down to form the soils of the Coastal Plain. In all sections of the Piedmont Plateau the subsoil is a reddish or yellowish clay. In the upper section oi the Coastal Plain region the soil is for the most part a loose sand, but lower down it becomes finer, more tenacious, and consequently more fertile.

Agriculture. — The number of farms in South Carolina was 93,864 in 1880, 115,008 in 1890 and 154,166 in 1900 — the number for the two last named years not including farms of less than 3 acres and of relatively small productivity. The total acreage in farms in 1880 was 13,457,613 acres, of which 4132 acres were improved; in 1890, 13,184,652 acres, of whicn 5,255,237 acres were improved; and in 1900, 13,985,014 acres, of which 5,755,74-1 acres were im- proved. The total value of farm property, with improvements, machinery and livestock, was $84,079,702 in 1880; $119,849,272 (average value per farm, $1042) in 1890; and $153,591,159 (average value, $989) in 1900; while the average value per acre of farm-land increased from $9.09 in 1890, to $10.98 in 1900. 01 farms of 1000 acres and more there were 1635 in 1880 and 1010 in 1900; of be- tween 500 acres and 1000 acres there were 3693 in 1S80 and 2314 in 1900; of 50 acres and less than 100 acres there were 13,612 in 1880 and 29,944 m 1900; of 20 acres and less than 50 acres there were 3688 in 1880 and 5261 in 1900. Farms worked by owners numbered 46,645 in 1880 and 60,471 in 1900; by cash tenants, 21,974 in l88 ° and 57,046 in 1900; by share tenants, 25,245 in 1880 and 37,838 in 1900. Of the 155,355 farms in the state in 1900, 85,381 were worked by negroes of whom 22-2% were owners- of their farms, 49-7 % cash tenants and 27-9 % share tenants.

The state long out-ranked all other states in the growing of rice, but this industry has declined, and South Carolina is now surpassed by both Louisiana and Texas. Cotton is the state's most valuable crop. The cotton

product of the state in 1889 was 747,190 bales, in 1899 it was 881,422 bales, and in 1909, 1,095,000 bales. The principal ceresls, with the amounts and values of the crops in 1899 and 1909 are: Indian corn, 17,429,610 bush. ($9,149,808) in 1899 and 37,041,000 bush. ($33,337,000) in 1909; wheat, 1,017,319 bush. ($958,158) in 1899 and 3,810,000 bush. ($5,563.00°) in 1909. Oats, 2,661,670 bush. ($1,226,575) in 1899 and 4,431,000 bush. ($3,190,000) in 1909. Rice, 47,360,128 lb ($1,366,528) in 1899, on 23,726 farms, nearly half of the total number (48,155) of rice farms in the United States, which, however, decreased to 476,000 bush. ($433,000) in 1909. The rye crop was 19,372 bush. ($18,405) in 1899, and 39,000 bush. ($55,000) in 1909. _ Other important ciops are: tobacco 19,895,970 lb ($1,297,293) in 1899, and 32,000,000 lb ($2,336,000) in 1909; hay and forage, 213,249 tons ($2,304,734) in 1899, and of hay alone 81,000 tons ($1,256,000) in 1909; potatoes, 3,369,957 bush. ($1,538,205) in 1899 and 765,000 bush. ($880,000) in 1909.

Mining. — The value of the mineral product of the state was $1,834,134 in 1902, $2,305,203 in 1907 and $2,081,001 in 1908. The total value of the products of manufacturing industries based on mining was $18,565,682 in 1900, or 17-2% of the total value of the product of all manufacturing industries. The most valuable single mineral is phosphate rock, which is found in a belt 70 m. long by 30 m. wide, extending from the mouth of the Broad river near Port Royal in the south-east to the headwaters of the Wando river in the north-east. The chief deposits are found in Berkeley, Dorchester, Charleston, Colleton and Beaufort counties, at the bottom of rivers, 20 to 30 ft. in depth, and on land at an elevation but little above mean tide. Its commercial value for the manu- facture of fertilizer was established in 1867, and the mining of it began soon afterwards in the Ashley River region. The amount mined in 1868 was 12,262 long tons; in 1902, 313,365 long tons; and in 1908, 225,495 long tons, valued at $989,881. The value of other minerals produced in 1908 was as follows: Granite, $297,874; clay, $110,636; and monazite, $13,494. The product and value of mineral waters was 786,754 gals. ($195,182) in 1907 and 271,572 gals. (§70,937) in 1908. Minerals which were not mined com- mercially in 1902 include asbestos, which occurs in Spartanburg and Pickens counties; fullers' -earth; graphite in Spartanburg and Greenville counties; iron ores in the north and north-west portions of the state; iron pyrites in Spartanburg and York counties; talc, bismuth, ochre, pyrites, galena, brown coal, malachite, phosphate of lead and barytes.

Manufactures. — The number of factories in South_ Carolina in 1900 was 1369, in 1905, 1399 1 ; the amount of capital invested in such establishments was $62,750,027 in 1900, and in 1905 $113,422,224; the

value of products in 1900 was $53,335,811; m 1905, $79,376,262; and the average number of wage earners in

'The special census of 1905 was confined to manufactures under the factory system, and the statistics above for 1900 have been reduced to the same standard to make them comparable with the statistics for 1905.

1900, 47,025, and in 1905, 59,441. Except in number, the rural establishments showed greater increases than the urban. 1 The number of rural establishments in 1900 was 1174; in 1905, 1179; and the number of urban establishments in 1900, 195; in 1905, 220; but the capitalization of the rural establishments increased from $50,057,922 in 1900 to $97,942,185 in 1905; while that cf the urban increased from $12,692,105 to $15,480,039; the value of the products of the rural establishments increased from $41,930,816 to $64,887,748; while that of the urban establishments increased from $11,404,995 to $14,488,514; and the number of employes in rural establishments increased from 36,616 to 50,744, while those in urban establishments increased from 7409 to 8697. More than half of the manufacturing establishments were engaged in the manufacture of cotton goods, of lumber and timber, of fertilizers, of cotton-seed oil and cake, of lumber and planing-mill products, of cars and general shop construction, and of hosiery and knit goods.

The manufacture of cotton goods was much the most important industry in 1900 and 1905, and showed a remarkable growth. The capital invested in this industry was $39,258,946 in 1900 and $ 82 . 337429′ in 1905; the value of the products was $29,723,919 in 1900 and $49,437,644 in 1905; the average number of wage- earners was 30,201 in 1900 and 37,271 in 1905; and the amount of wages, $5,066,840 in 1900 and $7,701,689 in 1905. The number of establishments in 1900 was 80, and in 1905, 127; the number of producing spindles in 1900 was 1,431,349, and in 1905, 2,864,092; and the number of looms in 1900, 42,663, and in 1905, 72,702. The use of domestic cotton increased from 485,024 bales in 1900 to 555.4 6 7 bales in 1905, and the amount paid for this cotton increased from $14,909,520 to $30,451,159. In the same period the amount of foreign cotton used increased from 210 bales in 1900 to 2633 bales in 1905, and the amount paid for it from $20,026 in 1900 to $318,020 in 1905. The principal product of the mills was plain cloths for printing or converting, of a quality finer than No. 28 warp, of which there were produced 322,850,981 sq. yds., valued at $14,007,496 in 1905, as compared with 97,343,526 sq. yds., valued at $3,171,198 in 1900. Other

products and their values in 1900 and 1905 were as follows: brown or bleached sheetings and shirtings, 283,105,383 sq. yds. ($11,553,073) in 1900 and 248,777,474 sq. yds. ($12,035,854) in 1905; yarns for sale, 24,859,616 ft ($3,461,090) in 1900 and 31.645,397 lb ($6,217,795) in 1905; drills, 116.467,224 sq. yds. ($5,375>°i7) in 1900 and 88,551,799 sq. yds'. ($5,344,146) in 1905; twills and sateens, 11,379 7 T 2 sq. yds. ($485,484) in 1900 and 45,220,488 sq. yds. ($2,175,651) in 1905.

The value of the products of other industries in 1900 and 1905 were as follows : Lumber and timber, $4,942,362 in 1900 and $6,791,451 in 1905; cotton-seed oil and cake, $3,103,425 in 1900 and $5,462,818 in 1905; fertilizers, $4,882,506 in 1900 and $3,637,576 in 1905; lumber and planing-mill products, including sash, doors and blinds, $1,016,328 in 1900 and $1,478,581 in 1905; hosiery and knit goods, $392,237 in 1900 and $1,078,682 in 1905; cars and general shop construction and repairs by steam railway companies, $691,361 in 1900 and $1,080,990 in 1905.

Forests. — The principal lumber resource of South Carolina is yellow (or " southern ") pine, and there is also a small quantity of cypress. The stand of yellow pine in the state in 1880 was esti- mated at 5316 million ft.; and in 1905 it was estimated at 3363 million ft. The value of the lumber product increased from $1,108,880 in 1850 to $5,207,184 in 1900. Some use is also made of the forest resources of the state in the manufacture of veneer, paper pulp, turpentine and other chemicals.

Fisheries. — The total yield of the state's fisheries in 1902 was 8,174,463 ft, valued to the fishermen at $263,023, which is an in- crease over that of 1897 of 2,894,017 ft and of $52,567 in value. The number of persons employed in 1902 was 3713, an increase over 1897 of 1574; the amount of capital invested in 1902 was $320,723, an increase over 1897 of $146,369. The oyster fishery represented in 1902 about 45% of the entire value of the state's fisheries, the catch in that year being 689,700 bush., valued at $118,460, an increase over 1897 of 474,800 bush, and $73,100. The amount and value of other catches in 1902 were as follows: whiting, 606,300 lb ($30,118); sea bass, 709,545 ft ($27,364); shad, 434.133 ft ($20,782); clam, 28,133 bush. ($12,940); shrimp, 306,500 ft ($12,452); terrapin, 27,521 ft ($5,580); mullet, 138,000 lb (»3"82); jewfish, 79,500 ft ($3738); channel bass, 102,000 ft ($355o); squeteague, 85,700 ft ($3059); shark, 90,000 ft ($1800). Other fish taken include the sheepshead, drum, grouper, striped bass and croaker.

Transportation. — The chief railway systems of South Carolina are the Southern, the Seaboard Air line and the Atlantic Coast line. The railway mileage of the state was 3335-48 m. on the 1st of January 1909. Inland

water communication is furnished by several navigable rivers. Between 1816 and 1826 the state expended upon internal improvements $1,712,626, a large part of which was appropriated for building canals round the rapids of five rivers;

l In this class are included the manufactures of only four cities, Charleston, Columbia, Greenville and Spartanburg, which in 1900 had populations of 8000 or more.

between 1878 and 1900 the United States government expended $6,063,692 upon seven rivers and three harbours. The Savannah River is navigable from Savannah to Augusta, Georgia (202 m.), where its mean low water depth is 3 ft., and from Augusta to Peters- burg, Georgia, for flatboats. Other navigable streams are the Waccamaw, to Bucksville (50 m.); the Great Pedee to Smith's Millo (52 m.); the Cooper, to Strawberry Ferry (30 m.); the Ashley, to Lambs (13 m.) ; the Edisto, to Guignard Landing (260 m.) ; the South Edisto, to the North Edisto (n m.); the Beaufort, to the Coosaw Rive.: (11 m.); and the Santee, to the confluence of the Congaree and Wateree rivers, which are navigable for flatboats. The ports of entry are Charleston, Beaufort and Georgetown.

Population. — The population in 1880 was 995,577; in 1890, 1 ; T 5 1 i 1 49; in 1900, 1,340,316; and in 1910, 1,515,400 In only one other state, Mississippi, in 1900 the negroes exceeded the whites; in South Carolina 58-4% of the total, or 782,321, were negroes or of negro descent, and 41-6% were whites; but there was a slight falling-off in the percentage of negroes, this having been 59'9% in 1890. Of the total population, 99-6% were native-born. There were, in 1900, 552,436 native whites; 5,528 persons of foreign birth, 121 Indians and 67 Chinese. Of the inhabitants born in the United States, 29,521 were natives of North Carolina, and 13,544 were natives of Georgia, and of the foreign-born 2075 were Germans, and 1131 were natives of Ireland. Of the total population, 17,628 were of foreign parentage — i.e. either one or both parents were foreign- born— and 2503 were of German and 1607 of Irish parentage on both the father's and the mother's side. In 1906 there were in the state 655,933 members of different religious denomina- tions, of whom the Baptist bodies were the strongest with 341,456 communicants; the Methodist bodies had 249,169 members; 35,533 were Presbyterians; 12,652 were Lutherans; 10,317 were Roman Catholics; and 8557 were Protestant Episcopalians. From 1890 to 1900 the urban population {i.e. in places with 4000 inhabitants) increased from 84,459 to 157,111; the semi-urban population {i.e. population of in- corporated places), or the approximate equivalent, having less than 4000 inhabitants) increased from 93,551 to 104,352; while the rural population {i.e. population outside of incorporated places) increased from 973,139 to 1,078,853. The principal*

cities are Charleston, Columbia (the capital), Spartanburg, Greenville, Sumter, Anderson and Rock Hill.

Administration. — South Carolina was governed from 1670 to 1 7 19 under the Carolina provincial charter of 1665, from 1719 to 1776 under commissions and instructions from the Crown, and after 1776 under the constitutions of 1776, 1778, 1790, 1865, 1868 and 1895. An amendment to the constitution may be proposed by either house of the legislature; if it is approved by two-thirds of the members elected to each it must then be submitted to the people to be voted on at the next general election for members of the state house of representa- tives, and if it receives a favourable vote of a majority and sub- sequently a majority vote in each house of the next general assembly it becomes part of the constitution. A constitutional convention to revise the constitution may be called by a two-thirds vote in each house, subsequently ratified by a majority vote of the electors of the state.

Effective protection against a possible restoration of negro rule seems to have been aimed at in the suffrage provisions of the new constitution. Two plans of registration were provided, one tempo- rary, the other permanent. Up to the 1st of January ˆqs a n persons otherwise qualified could register, provided they could read any section of the constitution or understand and explain it when read to them by the registration officer, and all persons so registered were qualified voters for life. The obvious intention was to disfranchise illiterate negroes, but not illiterate whites. Under the permanent plan, however, this distinction will gradually disappear. Those who should apply for registration after the 1st of January 1898 must be able to read and write any section of the constitution submitted to them by the registration officer, or must show that they have paid all taxes for the previous year on property worth $300 or more. Other requirements for voters

2 According to previous censuses the population was as follows:

1790, 249,073; 1800,345,591; 1810, 415,115; 1820,502,741; 1830,

581.185; 1840, 594.398; 1850, 668,507; i860, 703,708; 1870;

are : residence in the state for two years (except that ministers in charge of organized churches and teachers of public schools need have a residence in the state of six months only), in the county for one year, and in the polling precinct for four months, and the payment six months before election-time

of a poll-tax. Idiots, insane persons, paupers, convicts and persons convicted of certain crimes (enumerated in the constitution) and not pardoned by the governor are disqualified from registering or voting.

Under the constitution of 189 s the governor holds office for two years and is eligible for re-election. The governor and the lieutenant-governor must be thirty years old and must have been citizens of the United States and citizens and residents of the state for five years. The governor has a veto power, extending to the separate items in appropriation bills, which may be overcome by a two-thirds majority in each house of the General Assembly; three days (excluding Sunday) are allowed to the governor for vetoing bills or joint resolutions passed by the General Assembly, or only two days if the General Assembly adjourn before three days have elapsed. The lieutenant-governor is the presiding officer of the senate, and succeeds the governor if the governor is removed from office by impeachment, death, resignation or otherwise. Other administrative officers of the state, each elected for two years, are a secretary of state, a comptroller-general, an attorney- general, a treasurer, an adjutant and inspector-general, and a superintendent of education.

The state legislature is officially styled the General Assembly, and is composed of a Senate and a House of Representatives. The House of Representatives is composed of 124 members elected every two years and apportioned among the counties according to population; the Senate of one member from each county, elected for a term of four years, the term of one-half of the senators ending every two years. Annual sessions of the General Assembly are held, beginning on the second Tuesday in. January. In 1904 the legislature submitted an amendment providing for biennial sessions and it was ratified by a popular vote, but inasmuch as the constitution requires a subsequent ratification by the legislature, the question came "up again in the session of 1905. Attention was then called to the fact that the new amendment would make other changes in the constitu- tion necessary, and the matter was referred to a legal com- mission.

The judicial power is vested in a Supreme Court and two circuit courts, a court of common pleas having civil jurisdiction, and a court of general sessions having criminal jurisdiction. The supreme court consists of a chief justice and three associates, elected by a joint viva voce vote of the General Assembly for a term of eight years. In each of the eight circuits is a circuit judge elected in a similar manner for four years. The magis- trates or justices of the peace are appointed by the governor — a wise provision, because under the constitution of 1868 negroes were frequently elected who could neither read nor write.

Local Government. — The unit of local government in South Caro- lina is the county, which, the state constitution provides, " shall be a body politic and corporate." The constitution also provides for the establishment of a new county, " whenever one-third of the qualified electors within the area of each section of an old county proposed to be cut off to form a new county shall petition the governor for the creation of a new county," whereupon the governor " shall order an election within a reasonable time there- after," and if two-thirds of the voters vote "yes," the .General Assembly at the next session shall establish the new county, provided that no section of a county shall be cut off without tlie consent of two-thirds of those voting in such section; that no new county " shall contain less than one one hundred and twenty-fourth part of the whole number of inhabitants of the state, nor shall it have less assessed taxable property than one and one-half millions of dollars, nor shall it contain an area of less than four hundred square miles "; and that " no old county shall be reduced to less area than five hundred square miles, to less assessed taxable property than two million dollars, nor to a smaller population than fifteen thousand inhabitants." The General Assembly may alter county lines at any time, provided the proposed change is sanctioned by two-thirds of the voters in the section proposed to be cut off. The General Assembly may also provide for the consolidation of two or more counties if a majority of the voters concerned approve, " but such election shall not be held oftener than once in four years in the same counties." Counties are divided into townships and

under the constitution each " shall constitute a body politic and corporate," but in 1910 there were no separate township govern- ments, the existing division of counties into townships being for the purpose of convenience in adjusting taxes. Municipal government machinery is prescribed by a general state law which provides for the acquirement by municipalities of waterworks and lighting- plants, the levying and collection of taxes and the issuing of licences, and regulates bonded debts. Cities and towns are per- mitted to exempt, by ordinance, certain classes of manufactories from all taxes except for school purposes, provided such ordinances are ratified by a majority of the electors.

Miscellaneous Laws. — The elaborate precautions taken to prevent lynching are a peculiarity of the constitution of 1895. Any officer — state, county or municipal — who, through negligence or connivance, permits a prisoner to be seized and lynched, forfeits his office and becomes ineligible to hold any office of trust or profit in the state unless pardoned by the governor. The county in which the crime occurs is, without regard to the conduct of the officers, liable in damages of not less than $2000 to the legal representative of the person lynched; the county is authorized, however, to recover this amount from the persons engaged in the lynching.

A fourth unusual feature is that South Carolina has applied the principle of direct primary nominations to all elective officials from governor down. United States senators are in practice elected by the people, for the legislature merely registers the result of the primary. Since an absolute majority of the votes cast is required, it is often necessary to hold a second primary in which only the two leading candidates are considered (see act of the 22nd of December 1888, and ex parte Sanders, 53 S.C. 478). South Carolina is the only state in which divorce is not allowed in any circumstances; this is a con- stitutional provision. Divorces were not permitted before 1868 and the provisions of the constitution of that year and of an act of 1872, permitting divorce (for adultery or for wilful desertions for two years) were repealed in 1878. A married woman may hold, acquire and dispose of property as if she were single, and the descent of the estate of a husband dying intestate is the same as that of a wife dying intestate, the survivor being entitled to one- third of the estate if there are one or more children, and to one-half of the estate if there are no children or other lineal descendants. Tenancy by courtesy was abolished in 1883, but the right of dower still obtains; the widow's acceptance of a distributive share in her husband's estate, however, bars her dower. A homestead in lands to the value of $1000, the products of the same, and personal property to the value of $500 which belong to the head of a family or to the husband and wife jointly are exempt from attachment, levy or sale except for taxes, purchase money or debts contracted in making improvements or repairs. The exemption of the home- stead continues for the benefit of the widow or for the children alone, whether minors or not, provided it is occupied by some of them, and it may be partitioned among the children regardless of debts. The number of hours' labour for operatives and employes in cotton and woollen mills is limited to sixty a week and must not exceed eleven in any one day, except for making up lost time to the extent of sixty hours in any one year. A prohibition bill intro- duced in the legislature of 1892 was, through the influence of the Tillman Reform faction, replaced by a substitute measure, which established a dispensary system, based upon the Gothenburg plan. This system went into effect in July 1893 and was in force for thirteen years. Under it the state bought liquors, graded them in accordance with a chemical analysis, and sold them to con- sumers in packages of not less than one half pint; the dispensaries were open from sunrise to sunset, no sales were made to minors or drunkards, and no liquor was drunk on the premises; there was a state dispensary commissioner and a state board of control; and the profits were divided between the state, the counties and the municipalities, the share of the state being devoted to educa tional purposes. The state dispensary was opposed by the old conservative faction, by the saloon keepers, and by the radical prohibitionists. The Supreme Court of the state by a vote of two to one decided in April 1894 that the law was

unconstitutional, but in October a change in the personnel of the court brought about a reversal. The Supreme Court of the United States held on the 1 8th of January 1897 that the provisions of the statute forbidding the importation of liquor by anyone except certain state officials were in violation of the interstate commerce clause of the constitution {Scott v. Donald, 165 U.S. 58). Under the Brice bill, passed in 1904 and amended in 1905, which gave the people of each county the choice between dispensary and prohibition, with the proviso that if they adopt the latter they must pay the extra taxes necessary to enforce it, several counties adopted pro- hibition; and in 1907 the state dispensary system was abolished, all impure liquors were declared contraband, each county was required to vote to prohibit the sale of liquors or to establish a dispensary, the sale of intoxicating liquors was forbidden outside of cities and towns, and sales may be made only through county dispensaries, which may not sell at night or on Sunday, or to in- ebriates or minors. The constitution of 1895 forbade a restoration of the saloon system in its original form. An act of 1909 made it I a misdemeanour to solicit orders for liquor in the state.

SOUTH CAROLINA

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Education. — As early as 1710 public school education was pro- vided for indigent children. The present free-school system was established in 1868. The educational system is under the super- vision of the state superintendent of education, with the assistance of a board composed of the governor and not exceeding seven other persons appointed by the governor. The constitution of 1895 ordered a three-mills levy. The present high-school system dates from an act of 1907; and in 1909-1910 there were 131 high schools, six of which required a full four-years' course. The per capita expenditure according to enrolment was $4-98 for each white pupil and $1-42 for each negro pupil in 1899; in 1909 it was Sio-34 for each white pupil and $1-70 for each negro. The schools are supported by taxation; they formerly received the profits from the dispensary. The maximum local tax levy is eight-mills for elementary schools and two-mills for high schools. In 1908-1909 the total expenditures for 5066 public schools '(2712 for whites, 2354 for negroes) in the state was 81,898,886, of which 81,590,733 was for whites. The average yearly salary in 1908-1909 in white schools was $479-79 for men and 8249-13 for women teachers; in negro schools the corresponding salaries were $118-17 an d $91-45. The state sup- ports wholly or in part, the university of South Carolina (before 1906 South Carolina College), established at Columbia in 1801; the South Carolina Military Academy (locally called " The Citadel ") established at Charleston in 1845, Clemson Agricultural College (1889), at Clemson, Oconee county, with departments of agriculture, chemistry,

mechanics and electricity, textiles and military, and academic and preparatory courses; Winthrop Normal and Industrial College for Girls (1895) at Rock Hill, and the Coloured Normal, Industrial, Agricultural and Mechanical College (1896) at Orangeburg. Among the other higher institutions of learning are the college of Charleston (1790, non-sectarian), Newberry College (1858, Lutheran) at Newberry, the Presbyterian College of South Carolina (1880) at Clinton, Erskine College (1839, Asso- ciate Reformed Presbyterian) at Due West, Furman University (1852, Baptist) at Greenville, and Wofford College (1854, Methodist Episcopal South) at Spartanburg; for women, Converse College (1890, non-sectarian) at Spartanburg, the College for Women (1890, Presbyterian) at Columbia, Columbia College (1859, non- sectarian) near Columbia, Greenville Female College (1854, Baptist) at Greenville, Lander Female College (1872, until 1903 at Williams- ton, and until 1904 the Williamston Female College, Methodist Episcopal South) at Greenwood, and the Due West Female College (1859, Associate Reformed Presbyterian) at Due West; and for negroes, Claflin University (1869, Methodist Episcopal) at Orange- burg, Allen University (1881, African Methodist Episcopal) at Columbia, and several normal and industrial schools. There are theological seminaries at Columbia (1828, Presbyterian), at Due West (1837, Associate Reformed Presbyterian), and at Mount Pleasant (1898, Lutheran).

Charities, &c. — The state has no board of public charities, and under the present constitution the county commissioners are over- seers of the poor, except in Charleston and Columbia whose poor are provided for by the municipal authorities. The county com- missioners of each county have charge of the poor-house of the county, appoint its superintendent, physician and other officials, and report annually to the judge of the Court of General Sessions, who submits this report to the grand jury. Each poor-house must have sufficient tillable land to give employment to all paupers who are able to work. There is an institution for the deaf, dumb and blind (1849, since 1857 a state institution) at Cedar Springs, and a state hospital for the insane, founded in 182 1 at Columbia by Samuel Farrow (1760-1824) and opened in 1828. The state penitentiary is also at Columbia.

Finance. — The revenues of the state are derived mainly from the general property tax, fees, licences, dispensary profits and phosphate royalties. At the beginning of the Civil War the public debt was 83,814,862-91 and the credit of the state was sound. The obligations contracted in support of the war, amounting to about S3, 000, 000 were of course nullified by the Fourteenth Amend- ment. There were so many irregularities and so much corruption connected with the bond issues of reconstruction days that it is impossible to discover their exact amount. Estimates of the total debt in

1872 vary from 828,000,000 to $33,000,000. The first step towards repudiation was taken by the " carpet-bag " legislature of 1873, when it provided for the issue of consolidated bonds to replace the outstanding obligations at the rate of fifty cents on the dollar. Nearly six million dollars worth were declared null and voir 1 because issued without authority of law. After the return of the Democrats to power in 1877 a further investigation was made and the government finally assumed responsibility for $6,406,606. The greater part of this was funded under an act of October 1892, and provision was made for a sinking fund, derived mainly from the royalty on phosphate beds. In 1909 the funded debt amounted to 86,526,885. The legislature is forbidden to create any further debt except for the ordinary current business of the state, unless the proposition be submitted to the voters of the state and approved by a two-thirds majority. After the abolition of the state dis- pensary system in 1907 a State Dispensary Commission was created

for winding up the business of the dispensary and distributing about $900,000 (of which $100,000 was still due) of dispensary funds. Two companies brought suit for moneys owed for liquor sold to the state dispensary; the commission resisted the suit on the ground that as a court and as a representative of the state it could not be sued ; the circuit court and the circuit court of appeals overruled this plea and put the funds into the hands of a receiver; but in April 1909 this famous cause was closed by the decision of the Federal Supreme Court, upholding the commission and re- storing to it the fund. Banks are subject to the supervision of an examiner and in addition are required to make weekly reports to the comptroller-general.

History. — The history of South Carolina may be divided into four main periods: the period of discovery and exploration (1520-1663); the period of proprietary rule (1663-1719); the period of royal rule (1719-1776); and the period of statehood (from 1776). The first Europeans to visit the coast were a party of Spaniards from Cuba in 1520. In 1562 some French Protestants under Jean Ribaut made an unsuccessful attempt to establish a colony near the mouth of the Broad river (see Port Royal). In 1629, Charles I. granted to his attorney- general, Sir Robert Heath, all the territory lying between the 31st and the 36th parallels and extending through from sea to sea, but no settlement was made, and in 1663 the same territory was granted to the earl of Clarendon (1609-1674), and six other favourites of Charles II. A second charter in 1665 extended the limits to 29 and 36 30'. The proprietors were to legislate for the colony " by and with the advice, assent and approba- tion of the freemen." They were empowered, though not required, to grant religious freedom to Dissenters. Land was held in free and common socage, and the statute quia emptores was suspended, thus allowing subinfeudation. Concessions or immigration

circulars were issued in 1663 and 1665 offering most liberal terms to prospective colonists. This policy was soon abandoned. In the Fundamental Constitution, adopted by the proprietary board in 1669 John Locke and Lord Ashjey (1 621-1683) prepared for the colony an elaborate feudal system of government which would have been obsolete even in Europe (see North Carolina). Subsequent issues in 1670, 1682 (Jan. 12), 1682 (Aug. 17), and 1698 modified the original plan to some extent. The constitutions possess more than a mere antiquarian interest. They helped to arouse that feeling of discontent among the colonists which culminated in the overthrow of proprietary rule, and they encouraged the large plantation system which constituted the foundation of the slave-holding aristocracy.

The first permanent English settlement was made in April 1670 at Albemarle Point, on the west bank of the Ashley river, but as the situation proved unfavourable the government and most of the people moved over in 1680 to the neck between the Ashley and the Cooper rivers, the site of the present city of Charleston. The area of settlement was gradually extended along the coast in both directions, but did not penetrate far into the interior. The province was soon divided into three coast counties: Berkeley, extending from the Stono river to the Sewee and including Charleston; Craven to the north of the Sewee; and Colleton to the south of the Stono. In addition to those settlers who came direct from England there were many Englishmen from Barbadoes and French Protestants, both of which classes exercised considerable influence upon the history of the colony. It was largely due to the Barbadian connexion that South Carolina was for many years more closely associated with the island than with the continental colonies. Her political history during the colonial era is the story of a struggle between popular and prerogative interests, first between the people and the lords proprietors, later between the people and the Crown. From 1670 to 1700 the principal questions at issue were the refusal of the settlers to subscribe to the numerous editions of the Fundamental Constitutions and disputes over the collec- tion of quit-rents. Concessions were finally made which brought the government more directly under popular control. In 1692 the legislature was divided into two houses, and in 1693 the commons house, elected by the people, secured the privilege of initiating legislation. The truce was followed by a controversy

between Churchmen and Dissenters. A test act requiring members of the assembly to conform to the Church of England and to take the sacrament of the Eucharist according to the rites and usages of that Church (1704) was defeated only through the intervention of the Whig House of Lords in

England. By an act of the 30th of November 1706, which remained in force until the War of American Independence, the Church of England was made the established religion. After a few years of peace and prosperity there came another attack upon the proprietors which culminated in the revolution of 17 19 and the downfall of proprietary rule. Acting on the advice of Chief Justice Nicholas Trott (1663-1740) the proprietors adopted a reactionary policy, vetoed several popular laws, and refused to afford protection from the attacks of the Indians. The people rebelled, overthrew the existing government and elected their leader James Moore (1667-17 23) as governor. The result of the revolution was accepted in England, and the colony at once came under royal control, although the rights of the proprietors were not extinguished by purchase until 1729. Theoretically South Carolina and North Carolina constituted a single province, but, as the settlements were far apart, there were always separate local governments. Until 1691 each had its own governors, from 1 69 1 to 1712 there was usually a governor at Charleston and a deputy for the northern settlements, and after 17 12 there were again separate governors. The first attempt to define the boundary was made in 1732, but the work was not completed until 181 5.

The change from proprietary to royal government scarcely affected at all the constitutional development of the province. The popular branch of the assembly continued to encroach upon the powers of the governor and council. By 1760 the council had almost ceased to exercise any real control over legislation. They rarely initiated or amended a bill of any kind, never a revenue measure. Public officials chosen nomi- nally by the General Assembly were really the nominees of the lower house. In the conduct of his executive functions the governor found himself constantly hampered by committees of the Assembly. In other words, whether they were conscious of the fact or not, the South Carolinians throughout the colonial era were tending towards independence. The demands of the British government after 1760 were not especially unreasonable or tyrannical, but they were made upon a people who were too long accustomed to having their own way. As the spirit of rebellion developed the sentiment in favour of colonial union gained in strength. Thomas Lynch (c. 17 20-1 7 76), Christopher Gadsden (1724-1805), and John Rutledge (1739-1800) attended the Stamp Act Congress of 1765, an intercolonial committee of correspondence was appointed in 1773, and delegates were sent to the Continental Congress in 1774 and 1775. A council of safety appointed by a Provincial Congress practically took charge of the government in June 1775. The Assembly was formally dissolved on the 15th of September, Governor William Campbell (d. 1778) fled from the town, and royal government came to an end. In the conflict with the mother country the people had the advantage of long experience in fighting.

There had been wars with the Spanish in 1686, 1702-04, 1740, with the Spanish and French in 1706, with pirates in 1718, with the Yemassee Indians in 1715 and the Cherokees in 1760-61, and a slave uprising in 1739. The state suffered severely during the War of Independence, the numbers and influence of the Loyalists serving to embitter the conflict. In the summer of 1776 the British, under Sir Henry Clinton and Sir Peter Parker attempted to capture Charleston and summon the South Caro- lina Loyalists to their standard, but on the 28th of June the fleet was repulsed in an assault on Fort Moultrie. Clinton returned, however, early in 1780, and, as he surrounded the city on all sides with an overwhelming force, General Benjamin Lincoln, who was defending it with about 7000 men, surrendered (May 12) to avoid certain destruction. The British thereupon overran the whole state, and until near the close of the war a new American army, first under Horatio Gates and later under Nathanael Greene, was engaged in driving them out. The

principal engagements fought within the state were Camden (Aug. 16, 1780), King's Mountain (Oct. 7, 1780), Hobkirk's Hill (April 25, 1781), and Eutaw Springs (Sept. 8, 1781).

The most significant feature in the early history of the state was the struggle between the Low Country, which centred about Charleston, and the Up Country, which was settled largely by Scotch-Irish, who came down the mountain valleys from North Carolina, Virginia and Pennsylvania. The great planters of the low country had wealth, the small farmers of the up country had numbers. Under the first state constitution, adopted in March 1776, the low country element maintained the ascendancy which they had possessed during the colonial period. In 1786 they were forced to consent to the removal of the seat of government to Columbia (final removal, 1790) and in 1808 to a reapportionment of the representation, based partly on wealth and partly on numbers. There was to be one representative for every sixty-second part of the whole number of white inhabitants of the state and one for every sixty-second part of the taxes raised by the legislature. More harmonious relations were in time established, partly because of improvements in the methods of transport, but mainly as a result of outside pressure in the form of criticism of slavery and the adoption by the national government of an economic policy which favoured the manufacturers at the expense of the agricultural interests. In 1832 there was a majority from each section in favour of Nullification (q.v.) , and the legislature called the famous Nulli- fication Convention, which met at Charleston the 19th of November, and five days later passed the Ordinance of Nullifica- tion declaring that certain acts of Congress imposing import duties " are unauthorized by the Constitution of the United States and violate the true meaning and intent thereof, and are null and void and no law, nor binding upon this state, its officers or citizens."

President Jackson was ready to use force against the state; and the tariff, over which the whole disagreement had arisen, was changed in such a way as to effect a compromise with the state. From about 1828 to 1861 South Carolina superseded Virginia as the leader of the South. She stood for states' rights and free trade. John C. Calhoun was her political philosopher and George McDuffie her political economist. Her secession, on the 20th of December i860, was followed by the formation of the Southern Confederacy, the bombardment of Fort Sumter (April 12, 1861) and the Civil War (1861-65). Although few battles were fought within her limits, because of the distance from the frontier, South Carolina made many sacrifices in the interest of her section. With a white population of 291,300 at the beginning of the conflict, the state put into the field during the four years 62,838 effective men, with an enrolment, including reserves, of 71,083, of whom 22% were killed. on the field or died in prison. General W. T. Sherman's march across the state (February-March, 1865) was accomplished by an enormous destruction of property by fire and pillag -..

All the misfortunes of the war itself are insignificant when compared with the sufferings of the people during the era of Reconstruction (1865-1871). In accordance with the liberal views of President Andrew Johnson, the white people assumed control of affairs shortly after the close of hostilities, and James L. Orr (1822-1873) was chosen governor. Congress reversed this policy (1867), disfranchised the majority of the whites and transferred political power to negroes, Northern adventurers and disreputable native whites. There followed an orgy of crime and corruption. The Assembly Hall was furnished with clocks costing $600 dollars each, sofas at $200, and other articles in proportion. A restaurant and bar were kept in the State House at which the members of the legislature and their friends could procure refreshments free of cost. The debt of the state was increased from $5,000,000 in 1868 to more than $18,000,000 in 1872. Crime among the negroes became so frequent that the whites were compelled to form a secret organiza- tion for protection (see Ku Klux Klan). In the spring of 1868 the state adopted a new constitution in conformity with the Reconstruction Acts of Congress, and elected state officers and congressmen, and on the 25th of June the state was readmitted

to the Union. The inauguration of General Wade Hampton (1818-1902) as governor, and the final withdrawal of United States troops in 1877, marked the downfall of negro rule.

The political history of the state since 1877 presents some interesting

features. Practically the entire white population is Democratic, partly for historical reasons and partly because of a feeling that union is necessary to maintain white supremacy. The old warfare between the Up Country and the Low Country has been renewed in a modified form in the conflict between Reformers and Conservatives. The triumph of the Reformers culminated in the founding of Clemson Agricultural College (1889), the establishment of the state dispensary system for the sale of intoxicating liquors (1893), the election of Benjamin R. Tillman (b. 1847) to the United States Senate (1894) over M. C. Butler (1836-1909), and the work of the constitutional convention of 1895.

(chosen by the council)

(chosen by the council)

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Governors of South Carolina Proprietary Period (1670-1719) William Sayle Joseph West Sir John Yeamans Joseph West Joseph Morton Richard Kyrle Robert Quarry Joseph West Joseph Morton James Colleton Seth Sothell Philip Ludwell Thomas Smith Joseph Blake John Archdale Joseph Blake James Moore Sir Nathaniel Johnson Edward Tynte Robert Gibbes Charles Craven

Robert Daniel (deputy-governor)

Robert Johnson

Royal Period (1719-1776) James Moore . . . (elected by the people)

Sir Francis Nicholson

Arthur Middleton . (president of the council and

acting-governor)

Robert Johnson

Thomas Broughton . . . (lieutenant-governor) William Bull • . . . (president of the council,

lieutenant-governor)

James Glen

William Henry Lyttleton .

William Bull, the 2nd

Thomas Boone ….

William Bull, the 2nd

Lord Charles Greville Montague

William Bull, the 2nd

Lord Charles Greville Montague

William Bull, the 2nd

Lord Charles Greville Montague

William Bull, the 2nd

Lord William Campbell

Henry Laurens

1670 1 67 1 1672-

1674 1682- 1684 1684- 1685 1685- 1686- 1690- 1692- 1693- 1694 1694- 1696- 1700- 1702- 1710 1710 1711 1716 1717

1671

•*1672* ■*1674* ■*1682* ■*1684*

-1685

•*1686*

1690

■*1692*

-1693 -1694

-1696 -1700 -1702 -1710

-1711 -1716 -1717 -1719

1719-1721 1721-1729

1 724-1 729 1729-1735 1735-1737

(lieutenant-governor) (lieutenant-governor) (lieutenant-governor) (.lieutenant-governor) (lieutenant-governor)

John Rutledge Rawlins Lowndes John Rutledge John Matthewes . Benjamin Guerard William Moultrie . Thomas Pinckney Charles Pinckney William Moultrie Arnoldus Vanderhorsl Charles Pinckney Edward Rutledge John Drayton James B. Richardson Paul Hamilton Charles Pinckney John Drayton Henry Middleton Joseph Alston

(president of the council of safety) Statehood Period (1776-)

(president) (president)

1737- 1743- 1756- 1760- 1761- 1764- 1766- 1768 1768- 1769- 1771- 1773-

^775

1775-

1743 1756 1760 1 761 1764 1766

■*1768*

1769

1771

■*1773*

1775

-1776

Democrat-Republican

1776-1778- 1778-1779 1 779-1 782 1782-1783

1783-1785

1785-1787

I787-I7 8 9

1789-1792 1 792-1 794

I 794-1 796 I 796-1 798 I 798-1 800 I 800-1 802

1 802-1 804 1 804-1 806

I 806-1 808

1808-1810 1810-1812 1812-1814

David R. Williams

Democrat-Republican

1814-1816

Andrew Pickens

1816-1818

Tohn Geddes . . . .

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1818-1820

Thomas Bennett

”

1 820-1 822

John L. Wilson .

1 822-1 824

Richard I. Manning .

1 824-1 826

John Taylor . . . .

1826-1828

Stephen D. Miller

Democrat

1828-1830

James Hamilton, jun.

,,

1 830-1 832

Robert Y. Hayne

1 832-1 834

George McDuffie

1 834-1 836

Pierce M. Butler

1 836-1 838

Patrick Noble

1 838-1 840

B. K. Henegan

(acting)

1840

John P. Richardson

1 840-1 842

James H. Hammond .

1 842-1 844

William Aiken

1844-1846

David Johnson

1846-1848

Whitemarsh B. Seabrook .

1848-1850

John H. Means

1 850-1 852

John L. Manning

1852-1854

James H. Adams Robert F. W. Allston

1 854-1 856

1856-1858

William H. Gist

,

1 858-1 860

Francis W. Pickens

1 860-1 862

Milledge L. Bonham .

1 862-1 864

Andrew G. McGrath .

1F

1 864-1 865

Benjamin F. Perry

(provi-

sional)

1865

James L. Orr

Conservative

1865-1868

Gen. Edward R. S. Canby .

(military g

overnor)

1868-

Robert K. Scott .

Republican

1 868-1 872

Franklin]. Moses, jun.

1872-1874

Daniel H. Chamberlain

”

1 874-1 876

Wade Hampton .

Democrat

1876-1879

William D. Simpson

”

(acting)

1 879-1 880

Thomas D. Jeter

”

(acting)

1880

Johnson Hagood

1 880-1 882

Hugh S. Thompson

1 882-1 886

John C. Sheppard

(acting)

1886

John P. Richardson

1 886-1 890

Benjamin R. Tillman .

1 890-1 894

John G. Evans

1 894-1 897

William H. Ellerbe .

1 897-1 899

Miles B.McSweeney .

1 899-1 903

Duncan C. Hcyward .

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1903-1907

Martin F. Ansel .

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1907-1911

Coleman L. Blease

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1911-

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of South Carolina in the Revolution, 1776-1783 (2 vols., New York, 1901-1902). Older books on the subject are David Ramsay, History of the Revolution of South Carolina from a British Colony to an Independent State (2 vols., Trenton, 1785); William Moultrie, Memoirs of the American Revolution, so far as it related to the States of North and South Carolina and Georgia (2 vols., New York, 1802); John Drayton, Memoirs of the American Revolution relating to the Slate of South Carolina (2 vols., Charleston, 1821) ; and R. W. Gibbes, Documentary History of the American Revolution (3 vols., Columbia, 1853; New York, 1857). Very little has been written on the period since 1783. David F. Houston, Critical Study of Nullification in South Carolina (New York, 1896), is a concise, scholarly work. Hermann von Hoist's John C. Calhoun (Boston, 1892), is written from the extreme nationalistic and anti-slavery point of view. For the Civil War and Reconstruction, see James Ford Rhodes, History of the United States from the Compromise of 1850 (5 vols., New York, 1893-1904); James S. Pike, The Prostrate State; or South Carolina under Negro Government (New York, 1874) ; Carl Schurz, Report on the States of South Carolina, Georgia, &c. (Washing- ton, 1865, being 39th Congress, 1st session, Sen. Ex. Doc. 2); Hilary A. Herbert and others, Why the Solid South'! (Baltimore, 1890); and John P. Hollis, The Early Period of Reconstruction in South Carolina (Baltimore, 1905), containing an excellent discussion of the period from 1865 to 1868. For the religious history see Frederick Dalcho, An Historical Account of the Protestant Episcopal Church in South Carolina from the first Settlement of the Province to the War of the Revolution (Charleston, 1820) ; G. D. Bernheim, History of the German Settlements and of the Lutheran Church in North and South Carolina (Philadelphia, 1872). An excellent monograph on the controversy between the Up Country and the Low Country is William A. Schaper, Sectionalism and Representation in South Carolina (Washington, 1901). Among the chief printed sources are the North Carolina Colonial Records (10 vols., Raleigh, 1886- 1890), useful for the early period ; B. R. Carroll, Historical Collections of South Carolina (2 vols., New York, 1836) ; and the South Carolina Historical Society Collections (5 vols., Charleston, 1857, 1858, 1859, 1887 and 1897 — vol. v. contains the Shaftesbury Papers).

SOUTHCOTT, JOANNA (1750-1814), English religious fanatic, was born at Gittisham in Devonshire. Her father was a farmer and she herself was for a considerable time a domestic servant. She was originally a Methodist, but about 1792, be- coming persuaded that she possessed supernatural

gifts, she wrote and dictated prophecies in rhyme, and then announced herself as the woman spoken of in Rev. xii. Coming to London at the request of William Sharp (1749-1824), the engraver, she began to " seal " the 144,000 elect at a charge varying from twelve shillings to a guinea. When over sixty she affirmed that she would be delivered of Shiloh on the 19th of October 1814, but Shiloh failed to appear, and it was given out that she was in a trance. She died of brain disease on the 29th of the same month. Her followers are said to have numbered over 100,000, and only became extinct at the end of the 19th century.

Among her sixty publications, all equally incoherent in thought and grammar, may be mentioned: Strange Effects of Faith (1801-1802), Free Exposition of the Bible (1804), The Book of Wonders (1813-1814), and Prophecies announcing the Birth of the Prince of Peace (1814). A lady named Essam left large sums of money for printing and publishing the Sacred Writings of Joanna Southcott. The will was disputed by a niece on the ground that the writings were blasphemous, but the court of chancery sustained it.

See D. Roberts, Observations on the Divine Mission of Joanna Southcott (1807); R. Reece, Correct Statement of the Circumstances attending the Death of Joanna Southcott (1815).

SOUTH DAKOTA, one of the North Central states of the American Union, lying between 42 28′ and 45 57′ N. Lat. and 96° 26′ and 104 3′ W. long. It is bounded N. by North Dakota; E. by Minnesota and Iowa; S. by Nebraska; and W. by Wyoming and Montana. Lake Traverse and the Big Stone Lake separate the state in part from Minnesota; the Big Sioux River forms most of the boundary between South Dakota and Iowa; and the Missouri river separates the state in part from Nebraska. South Dakota has an extreme length, east and west, of 380 m., an extreme width, north and south, of 245 m., and a total area of 77,615 sq. m., of which 747 sq. m. are water-surface.

Topography. — With the exception of the Black Hills district in the south-west, the state is a wide rolling plain, with its eastern

portion a part of the Prairie Plains region, and its western portion a part of the Great Plains. The surface of this plain, however, ranges from level river valleys in the east to irregular plateaus broken by buttes and scored by canons in the west. The lowest part of the state is the surface of Big Stone Lake, t.bout 970 ft. above the sea ; the highest point is Harney Peak in the Black Hills, which rises to a height of 7216 ft. The state as a whole has a mean elevation of 2200 ft., with 270 sq. m. below 1000 ft.; 42,300 sq. m. between 1000 and 2000 ft. ; 23,000 sq. m. between 2000 and 3000 ft. ;

10,700 sq. m. between 3000 and 5000 ft. ; and 1380 sq. m. between 5000 and 8000 ft.

In the extreme north-east there is a range of low hills known as the Coteau des Prairies, which crosses the state in a S.S.E. direction through Marshall, Roberts, Grant and Deuel counties and maintains an almost constant altitude of from 1950 to 2050 ft. It forms the divide between the headwaters of the Minnesota river on the east and of the James river on the west. To the south and west of the Coteau des Prairies lie vast stretches of plains, including the valleys of the Big Sioux and James rivers. This region presents no striking topographic features except the numerous small lakes which occupy the hollows created by the continental ice-sheet. The greater part of the James River Valley lies in the bed of the extinct Lake Dakota, which was once a very narrow body of water extending northward from about the latitude of the present town of Mitchell for a short distance into what is now North Dakota. West of the James River Valley lies an elevated table-land, known as the Coteau du Missouri, which marks the water- parting between the James and the Missouri rivers, and has a general elevation of about 1800 ft. Along the west boundary of the state the general elevation of the Great Plains is about 3500 ft. As the part east of the river was once covered by the ice-sheet, its hills have been lowered and its valleys filled through the attrition of glaciers until the surface has a gently undulating appearance. West of the Missouri river the sheet of glacial drift is absent, and the lands everywhere show evidence of extensive stream erosion. The surface is broken by many clusters of small hills, such as the Fox Ridge in the central part of the state and the Cave Hills in the north-west, and in the vicinity of streams it is much cut up by deep ravines. In the south-west the results of this erosion are seen in an accentuated form in the region between the White river and the South Fork of the Cheyenne river, known as the Bad Lands or terres mauvaises. This area extends from the 101st meridian up the White river for about 120 m. and varies in width from 30 to 50 m. Here the land surface has been carved into forms in infinite variety. Many slender columns of clay, supporting masses of sandstone which have protected them from erosion, rise from the surface like gigantic toadstools. The sides of these ridges and pinnacles are bare of vegetation and display a variety of colours in buff, cream, pale green, grey and flesh. The most prominent features of the landscape rise from 150 to 300 ft. above the valleys; the latter and the flat tops of the mesas are sometimes covered with a scanty soil and a sparse growth of grass. These Bad Lands were once a fairly level plain, but intricate stream erosion produced the labyrinth of ravines and ridges for which the region is noted. The Bad Lands of the White river are also noted for their wealth of animal fossils, which have been found in such quantities as to cause geologists to believe that the vertebrates perished there in droves during a severe storm

or flood. Other Bad Lands, on a less impressive scale, are found along the Grand and the Moreau or Owl rivers. North-west of the Bad Lands of the White river lie the Black Hills (q.v.), an irregular dome-shaped uplift, about 125 m. long and 60 m. wide, lying partly in Wyoming, and with the main axis trending almost north-west and south-east. The uplift is completely enclosed by a rim of hog-back ridges from 300 to 600 ft. above the plain, and between this rim and the hills proper lies the Red Valley, a tract about 3 m. wide and bordered on the inner side by the main mass of limestone and crystalline rocks which have in general a height of 4000 or" 5000 ft. above the sea — some ridges and peaks rise higher still. Upon this limestone plateau there is a central area of high ridges, among them the rough crags of Harney, Custer and Dodge peaks. Between the ridges of the central area lie wide valleys and " parks." The streams flowing from the central area have cut deep gorges and canons, and among the ridges the granitic rocks have assumed many strange forms. Though rising from a semi-arid plateau, these mountains have sufficient rainfall to support an abundant plant growth, and have derived their name from the fact that their slopes are dark with heavy forests. Cathedral Park in the southern portion, Spearfish Canon in the north, and the extensive fossil forest at the foot of Mattie's Peak are noteworthy; while the Crystal Cave, near Piedmont, and the Wind Cave, near Hot Springs, are almost unrivalled.

With the exception of the extreme north-east, the state lies within the drainage system of the Missouri river. This stream enters the state near the centre of the northern boundary, pursues a winding south-easterly course, and from its intersection with the 43rd parallel of N. lat. to its junction with the Big Sioux river separates South Dakota from Nebraska. The Big Sioux river rises in the Coteau des Prairies in the north-east and flows almost directly south for nearly 200 m., in the lower part of its course forming

the boundary between South Dakota and Iowa. To the west of this stream and almost parallel with it is the James or Dakota river, which rises in North Dakota and follows a general course southward until it joins the Missouri river near Yankton. From the west the Missouri receives the Grand, Moreau or Owl, Cheyenne and White rivers. Of these the Cheyenne is the most important, being formed by two branches, the Belle Fourche and the South Fork, which, after almost completely encircling the Black Hills, unite at a point nearly 350 m. from their sources. Many of the smaller streams in the Black Hills lose their waters in their lower courses through seepage and evaporation. The Minnesota river has its source in the north-

east, and the Big Stone Lake, a body of water about 25 m. long and 3 m. wide, forms a connecting link between its headwaters and the rest of the stream. North of this lake lies Lake Traverse, 27 m. long and 3 m. wide, whose waters flow north into ythe Bois de Sioux river, whence they flow into the Red River (of the North). The portion of South Dakota east of the Missouri river is dotted with numerous lakes, ranging from small ponds to bodies of water from 10 to 15 m. in diameter. The plains, except in the south-east corner, are under- laid by sheets of water-bearing sandstone, which carry a volume of water under such pressure that in the valleys of the James river and the Missouri river and its western tributaries a strong surface flow may be obtained from artesian wells. In 1905 over a thousand wells had been sunk east of the Missouri, and the flow was. estimated at 7,000,000 gallons per day.

Fauna and Flora. — Large game within the state is practically extinct. The herds of bison, antelope and elk that once roamed the prairies have vanished, but a few mountain sheep still graze on the grass-covered mesas in inaccessible portions of the Bad Lands. There, too, the grey (or timber) wolf and the coyote are found. The species of small animals do not differ from those found in other parts of the Middle West.

The total woodland area has been estimated at 2500 sq. m., about 3-25 % of the land area, and of this amount 2000 sq. m. are in the Black Hills district. All the higher lands of this area are covered by forests; but the Red Valley, lying between the outer ridges and the main uplift, is treeless. Most of the forest consists of yellow pine, but the spruce, aspen, white birch, bur oak, box elder, red cedar, white elm and cottonwood are among the other varieties found. With the exception of narrow strips of woodland along the courses of the larger streams, the rest of the state consists of treeless prairie-lands, which are usually covered with valuable grasses. In the more arid regions the sage-brush and cactus make their appearance. Two national forests contained (1910) 2022 sq. m. Climate. — The climate of South Dakota is of a continental type. Owing to the northern latitude, comparatively high altitudes, and the great distance from the ocean, there are great annual variations of temperature and a very small amount of rainfall. The state is coldest in the north-east and warmest in the region south of the Cheyenne and west of the Missouri river. The isothermal lines trend from south-east to north-west. The winters are long and marked by exceedingly low temperatures, but as they are the driest season of the year, the extremes are not so disagreeable as they would be in a more humid region. The mean winter tempera- ture ranges from 13 F. at Aberdeen in the northern part of the James River Valley to 25° at Rapid City, in the Black Hills district. The absolute minima at these two places are respectively— 46° and -29 ; the absolute maxima, 111° and 106°, and the mean annual temperatures, 42 ° and 46 °. At Brookings, in the extreme

east, the mean annual temperature is 43°; the mean for the summer is 68° with an extreme recorded of 104°; the mean for the winter is 15° with an extreme recorded of 41°. At Ashcroft, in the ex treme north-west, the mean annual temperature is 44 ; the mean for the summer 68°; and for the winter 20°; while the highest and lowest temperatures ever recorded are respectively 114° and 44 °.

The average annual amount of rainfall for the state is about 20 in., ranging from 13-9 in. at Ashcroft to 25-9 in. at Aberdeen. It is usually greatest in the valleys of the James and Big Sioux rivers and least in the extreme north-central and north-western parts of the state. The average amount of rainfall for the spring is 6 or 7 in. ; for the summer, 8 or 9 in. ; for the autumn, 3 or 4 in. ; and for the winter, I or 2 in. The snows are generally light, and cattle may graze on the prairies during most of the winter; but there are occasional severe " blizzards," which are accompanied by intense cold and high winds.

Soils. — The glacial drift east of the Missouri river, unlike that of the New England states, is remarkably free from boulders and gravel, except in a few morainic belts. It is often locally enriched by vegetable mould, and is well adapted for wheat-growing. West of the Missouri river the drift gives place to a fine soil of sand and clay, with deposits of alluvium in the vicinity of streams. Though lacking in vegetable mould, these soils are generally capable of producing good crops where the water-supply is sufficient. The larger valleys of the Black Hills district contain fertile alluvial deposits washed from the neighbouring highlands, but in the plains adjoining these mountains the soils consist of a stiff gumbo suit- able only for pasture land. There are throughout the state occasional tracts in which, owing to deficient drainage, an excess of alkali

has accumulated, and which require special treatment before they can be made again productive.

Irrigation. — South Dakota in 1889 had only 15,717 acres of irrigated land. Ten years later this area had increased to 43,676 acres. Of the total, 38,453 acres were irrigated by streams and 5,223 acres by wells. The area irrigated by streams was con- fined largely to the Black Hills region, the water being supplied ' by the North Fork and the South Fork rivers, which are tributaries of the Cheyenne. The artesian basin of the east part of the state is fairly well developed, several wells having a flow of from 2000 to 4350 gallons per minute and a pressure of 150 lb to the square inch. Under the Reclamation Act passed by Congress in 1902 the irriga- tion of 100,000 acres in the Belle Fourche Valley adjacent to the Black Hills region was provided for. It provides for a dam across Owl Creek 6500 ft. long and 20 ft. wide on top, and for two main canals from this distributing

centre, one the north canal supplying water for the irrigation of 66,857 acres north of the Belle Fourche river and east of Owl Creek, and the other the south canal for the irrigation of 28,240 acres south of the Belle Fourche. Lateral canals are provided from the main canals to each farm.

Agriculture. — Agriculture is the leading industry in South Dakota; in 1900 out of 137,156 persons engaged in occupations, 82,857 followed agricultural pursuits. In 1890 the total acreage devoted to farming was 11,396,460, which in 1900 had increased to 19,070,616. The percentage of improved acreage, however, fell during the same period from 61 • I % in 1890 to 59-2 % in 1900. This was due largely to the opening up of land which had formerly not been utilized. The average size of farms (excluding farms under 3 acres with products valued at less than $500) was 227-2 acres in 1890 and 364-1 acres in 1900. The value of all farm property increased from $145,527,556 in 1890 to $297,525,302 in 1900. The average farm value also rose during these ten years from $2901 to $5654, and the value per acre advanced from $12-77 to $15-60. Fewer farms were worked by owners in 1900 than in 1890, the percentage in the former year being 78-2 and in the latter year 86-6. In 1900 share tenants worked 18-4% of the farms and cash tenants, 3-4%. The total value of farm products in 1899 was $66,082,419 as against $22,047,279 in 1889. Of the total product value in 1899, 78-3% was represented by cereals, South Dakota ranking sixteenth among the states in cereal production. Wheat constituted 60-7% of the total for all cereals, Indian corn 21 -i%, oats 11-9% and barley 5-8%. A considerable area was devoted to the cultivation of apples, plums and cherries. The total acreage of spring wheat, the state's leading crop, in 1909 was 3,375,000 with a yield of 47,588,000 bush, valued at $42,829,000, South Dakota ranking third among the states. Next in importance in 1909 came Indian corn with an acreage of 2,059,000 and a product of 65,270,000 bush. ($32,635,000). Oats had an acreage of 1,450,000 and a product of 49,600,000 bush. ($14,790,000). Barley was cultivated on 1,021,000 acres, the product amounting to 19,910,000 bush. ($8,960,000). In the quantity of barley produced the state ranked fifth. In its output of flax, grown almost entirely for the seed, the state held second rank with a product of 5,640,000 bush. ($8,516,000). The hay acreage was 536,000 and the production, 804,000 tons. Wheat grows chiefly in the east and north-east parts of the state, especially in Brown, Spink, Roberts, Day and Grant counties, the largest crop in 1899 being that of Brown county, 3,3 2 °,57° bush., or about one-twelfth of the state's product. Corn grows throughout the western half of the state, and especially in the south-western parts, in Lincoln, Clay, Union, Yankton and Bonhommie counties, the largest crop in 1899 being that of Lincoln county, 3,914,840 bush., nearly one-eleventh of the state crop. Oats has a distribution similar to that of corn, the largest crop in

1899 being that of Minnehaha county, i,666,fio busn., about one-nineteenth of the state crop. Barley grows principally in the eastern and southern parts of the state — Minnehaha, Moody, Lake and Brookings counties — the largest crop in 1899 being that of Minnehaha county, 932,860 bush., more than one-seventh of the state.

The state is especially well adapted for grazing, and during 1 890-1900 there was a large increase in the number of farm animals. The gain was chiefly confined to cattle, but the number of horses, sheep and swine also showed substantial increases. The value of all livestock in 1890 was $29,689,509 and in 1900, $65,173,432. The number and value respectively of the various farm ani- mals on the 1st of January 1910 were as follows: horses, 612,000 ($64,260,000), dairy cows, 656,000 ($21,648,000) ; other cattle, 1,341,000 ($28,832,000); swine, 805,000 ($8,936,000); and sheep,

829,000 ($3,316,000).

Mining. — The minerals of South Dakota, of which gold is the most important, are chiefly found in the Black Hills region. This section covers about 3500 sq. m. in the south-east part of the state and includes the counties of Lawrence, Custer, Meade, Pennington and Fall River. Silver follows gold in importance, but the other minerals met with, including gypsum, mica, petroleum, natural gas, granite, marble and tin are not found in paying quantities.

Gold was first discovered in French Creek, Custer county, on the 27th of July 1874 by miners who were with Custer's expedition. Gold was also found later in Lawrence county north of Custer..

and the Homestake Belt in the former county has ever since been the chief producer in the state. For ten years after the Black Hills were thrown open little gold was mined because of the lack of railway facilities. Cement deposits were discovered in the Black Hills region in 1876 and in the same year the first quartz mill was set up in Deadwood. In 1889 a cement plant was built at Yankton, and it is still worked although the output is small. Mica- mining was also carried on for a time but was soon abandoned. The first natural gas-well in the state was drilled at Pierre in 1892,

The total value of all mineral products in 1902 was $6,769,104, of which $6,464,258 were represented by gold and silver, $110,789 by sandstones and quartzites and $86,605 by limestones and dolomites; in 1908 the total

value was $8,528,234, which was an increase of more than $3,500,000 over the value in 1907. This increase was due almost entirely to the gain in the gold output which advanced in value from $4,138,200 in 1907 to $7,742,200 in 1908. The total amount of gold mined in 1908 was 374,529 fine ounces, the greater part coming from the Homestake Mine In 1908, 197,300 oz. of silver were obtained, valued at $105,500 as against $70,400 in 1907 and $101,086 in 1906.

Manufactures. — Manufacturing in South Dakota is of little importance and is confined chiefly to articles for home consumption. Between 1890 and 1900 the number of establishments increased from 499 to 1639, the capital invested from $3,207,796 to $7,578,895, and the value of products from $5,682,748 to $12,231,239. Under the factory system there were 624 establishments in 1900 and 686 in 1905; the capital invested in 1900 was $6,051,288 and in 1905 $7.585.142 ; and the value of the products was $9,529,946 in 1900 and $13,085,333 in 1905. Both in 1900 and 1905 flour and grist- mill products ranked first in value, the figures for 1900 being $3,208,532 and for 1905 $6,519,364. The second industry was the manufacture of cheese, butter and condensed milk, and the third, printing and publishing. Sioux Falls is the principal industrial centre.

Transportation. — The railway mileage of Dakota in 1870 (before the present states of South and North Dakota were erected) was only 75 m., and in 1880, 1225 m. In 1890 the mileage of South Dakota was 2610 m., in 1900, 2961 m., and in 1909, 3776 m. The principal systems are the Chicago, Milwaukee & St Paul, the Great Northern and the North-western. The principal waterway is the Missouri River, whose channel has an average depth at low water of about 2| ft. between Sioux City and Fort Benton, Montana, but the constant shifting of the channel makes navigation uncertain.

Population. — The total population of South Dakota in 1890

(the date of the first Federal census taken since its separate

existence as a state) was 328,808, and in 1900 it was 401,570;

the increase from 1890 to 1900 being (exclusive of persons on

Indian reservations) 16-8%. In 1910, according to the U.S.

census, the total was 583,888. Of the population in 1900,

380,714 were whites, 88,508 were foreign-born, 465 were negroes,

*and 20,225 were Indians. Of the Indians 9293 were taxed. The population on Indian reservations in 1890 was 19,792; in 1900, 17,683. The Indians on reservations and in Indian schools include members of the Yankton, Yanktonai, Oglala, Brule, Sisseton, Wahpeton, Flandreau, Sioux, Blackfeet, Mini-conjou, Sans Arc and Ute tribes, on the Standing Rock and Cheyenne River reservations in the north of the state, the Lower Brule and Crow Creek reservations in the central part, and the Pine Ridge and Rosebud reservations in the south. The figures for inhabitants born in the United States but not within the state show a preponderance of immigration from neighbouring states, there being, in 1900, 31,047 natives of Iowa, 24,995 natives of Wisconsin, 18,565 of Minnesota and 16,145 of Illinois, out of a total of 313,062. Of the total foreign-born population of 88,508, 19,788 were Norwegians, 17,873 Germans, 12,365 Russians, 5906 English Canadians, 5038 Danes, 3862 English and 3298 Irish. Of the total population 245,383 were of foreign parentage — i.e. either one or both parents foreign-born — and of those having both father and mother of foreign birth there were 44,516 of German parentage, 44,119 of Norwegian, 25,113 of Russian and 11,222 of Irish parentage. From 1890 to 1900, on the basis of places having 4000 inhabitants or more, the urban population increased from 10,177 m *&9° to 28,743 m 1900; so that there was the remarkable increase of 182-4% in urban population*

against an increase of 16-8% in the total population. In

1900 there were seven cities having 3000 or more inhabitants:

Sioux Falls with 10,266; Lead, 6210; Yankton, 4125; Aberdeen,

4087; Mitchell, 4055; Deadwood, 3498; and Waterton, 3352. 1

1 In 1905, according to a state census, there were nine cities with 3000 or more inhabitants, showing some changes in order of size:

In 1906 the total number of communicants of different religious denominations in the state was 161,951, of whom 61,014 were Roman Catholics, 45,018 Lutherans, 16,143 Methodists, 8599 Congregationalists, 7055 Protestant Episcopalians, 6990 Presby- terians and 6198 Baptists.

Administration. — The state is governed under its original constitution of 1889, with amendments of 1896, 1898, 1900, 1902, 1904 and 1909. The suffrage is granted to all males 2 resident in an election precinct for ten days, in the county for thirty days, in the state for six months, in the United States for one year, and 21 years of age, except those under guardianship or insane, and those convicted of treason or felony, unless restored to civil rights. The legislature may propose amend- ments to the constitution by a majority vote of all members elected to each of the two houses, or may issue a call for a constitutional convention by a two-thirds' majority. In either case the proposition must be ratified by popular vote at the next general election.

The chief administrative officers are a governor, secretary of state, auditor, treasurer (not eligible for more than two con- secutive terms), superintendent of public instruction, attorney- general, and commissioner of school and public lands, all elected biennially by direct popular vote. The governor and lieutenant-governor must be citizens of the United States, qualified electors of the state, at least thirty years old, and residents of the state for two years preceding the election. The governor may remit fines and forfeitures, and grant re- prieves, commutations and pardons, but in the more serious cases only on the recommendation of a board of pardons, composed of the presiding judge, the secretary of state, and the attorney-general. He has a veto power extending to items in appropriation bills, which may be overcome by a two-thirds' vote in each house. A lieutenant-governor, chosen biennially, presides over the senate.

The legislative department consists of a Senate (with not fewer than twenty-five and not more than forty-five members) and a House of Representatives (with not fewer than seventy- five and not more than 135 members) chosen biennially. Sena- tors and representatives must be

qualified electors, citizens of the United States, at least twenty-five years old, and residents of the state for two years next preceding election. The sessions of the legislature are biennial and are limited to sixty days. Bills may originate in either house, and either house may amend the bills of the other house. A constitutional amendment pro- viding for minority representation in the House of Representa- tives was rejected in 1889 by a large popular vote. South Dakota was the first American state to adopt the initiative and referendum. Under a constitutional amendment, adopted by popular vote on the 8th of November 1898, 5% of the legal voters of the state may require the legislature to submit to popular vote at the next general election measures which they wish enacted into law, or measures already passed by the legis- lature which have not yet gone into force. Exceptions to the referendum are made in the case of laws necessary for the immediate preservation of the public peace, health, or safety, or the support of the state government or the various state institutions. In practice the legislature has interpreted these exceptions so freely that nearly all important laws are passed with emergency clauses. The governor's veto does not apply to measures passed by popular vote.

The judicial department consists of the supreme court, circuit courts, county courts, justices of the peace, and police

Sioux Falls, 12,283; Lead, 8052; Aberdeen, 5841; Mitchell, 5719; Watertown, 5164; Deadwood, 4364; Yankton, 4189; Huron, 3783; Brookings, 3265. Pierre, the capital, had a population of 2794.

2 The constitution provided for the submission to the people in November 1890 of the question whether the word " male " in Article vii. of the constitution as adopted be omitted, but the popular vote in 1890 and again in 1898 did not favour this change. In the original constitution it was provided that any woman having the qualifica- tions as to age, residence and citizenship might vote at any election held solely for school purposes and " hold any office in this state except as otherwise provided in this constitution."

magistrates. The supreme court consists of five judges chosen for six years — the term for the first judges elected under the constitution of 1889 was four years. The state is divided into five districts and one judge is chosen from each district, although the election is made by the voters of the state at large. The court has appellate jurisdiction only, except for the power to issue writs of mandamus, quo warranto, certiorari, injunction and other

original and remedial writs. The state is divided into ten circuits, and one judge is elected by the voters of each circuit for a period of four years. The legislature may, by a two-thirds' vote of each house, increase the number of circuits or the number of judges. The circuit courts have original jurisdiction of all actions and causes, both at law and in equity and such appellate jurisdiction as may be conferred by law. In each county there is a county court with a county judge who is elected by popular vote for two years. The court has original jurisdiction in probate cases, in civil cases involving $1000 or less, and in criminal cases below the grade of felony. Under an act of 1893 three-fourths of a jury may render a verdict in lesser civil cases in county and circuit courts. The jurisdiction of justices of the peace is determined by law, but it is restricted by the constitution to cases involving $100 or less.

For the administration of local government the state is divided into counties (64 in 1910) and these in turn are sub- divided into townships and municipal corporations. Although the township exists throughout the state, in many cases it is organized only for school purposes and in many others its juris- diction is so restricted as not to extend to the villages and boroughs within its limits. The county authority is a board of commissioners elected on a general ticket, the township authority a board of supervisors or trustees. For each county there are a judge, clerk of the court, sheriff, auditor, registrar of deeds, treasurer, state's attorney, surveyor, coroner and superintendent of schools, all elected biennially.

Miscellaneous Laws. — A primary law enacted in 1905 authorizes the county convention of any party to provide for the nomination of candidates for county offices and the state legislature by direct vote. The state has had a varied experience in dealing with the liquor problem. A constitutional ordinance forbidding the manufac- ture, importation and sale of intoxicants was adopted on the 1st of October 1S89 by a vote of 40,234 to 34,510. The decision of the United States Supreme Court in the case of Leisy v. Hardin in 1890 (see North Dakota), and the lax enforcement of the ordinance in the larger towns soon resulted in an active movement for repeal. A state dispensary, similar to that of South Carolina (q.v.), was established in 1898 by a vote of 22,170 to 20,557, but it proved ineffective and was superseded in 1900 by the licence system. An attempt to introduce county local options was defeated in the election of 1908.

South Dakota long bore a notorious reputation for the laxity of its divorce laws. The grounds for action are still numerous. An act of 1907, ratified by popular vote in the election of 1908, raised the term of residence under which a person could apply for divorce from six months to one year, and provided that all cases should be tried openly at the regular term of court; and since the passage of this law Sioux Falls has ceased to be notorious for

its divorce colony from other states. Neither husband nor wife has any interest in the separate property of the other and the wife may convey her real estate, other than a homestead, without her husband's consent, but the husband must support his wife out of his property or by his labour if he is able, and if he is unable the wife must support him so far as possible out of her property. The one may enter into contract with the other respecting property, and they may hold property as joint tenants. The descent of the estate of a husband dying intestate is the same as that of a wife dying intestate; if there is only one child, or the issue of only one child, the surviving spouse is entitled to one-half of the estate; if more than one child, to one-third of the estate; and if no children, father, mother, brother or sister, to the whole of the estate. The homestead of any family in the state is exempt from attachment, lien or forced sale, except for taxes or purchase money, provided it has been properly recorded ; but it can embrace only one dwelling house, cannot include gold or silver mines, and is limited in value to $5000 to one acre if within a town plat, to 40 acres if it is in the country and was acquired under the laws of the United States relating to mineral lands, and to 160 acres of other land in the country. If the owner is married the homestead cannot be sold or mortgaged without the concurrence of both husband and wife. Upon the death of either husband or wife the exemption may be continued for the benefit of the surviving spouse,

and upon the death of both husband and wife the exemption may be continued until the youngest child is of age.

Education. — At the head of the public-school system is a super- intendent of public instruction chosen for two years. In each county there is a county superintendent, and in each school district a board of directors. When the state was admitted into the union two sections of land (1280 acres) in each township were set aside for educational purposes. The permanent school fund amounted to $4,852,567 on the 1st of July 1907. In 1908 the total expenditures for public schools were $3,152,006 ($1,633,594 being for teachers' salaries) and the total receipts were $3,853,695, of which $2,283,038 was from district taxes. In 1910 the total permanent school fund was $7,725,583 and the estimated value of the unsold lands held for the common schools and other educational endowments was $3,068,172. The schools are open to all pupils between the ages of six and twenty-one, and attendance for twelve weeks each year, eight of which must be consecutive, is compulsory for those between the ages of eight and fourteen. In the school year 1907-1908 77% of all persons of school age were enrolled in the public schools. The educational institutions of the state are all under the management of a board of regents of five members, who are appointed by the governor, with the approval of the senate for terms of six years. The leading state institutions are the state university (1882) at

Vermilion, the agricultural college (1884) and the agricultural experiment station at Brookings, the state school of mines (1886) at Rapid City, and norma! schools at Spearfish, Madison, Aberdeen and Springfield. The state university is under the control of the board of regents, and is maintained by the state and is the beneficiary of 86,000 acres of land grants from the Federal government. The city of Vermilion and Clay county and private persons have contri- buted largely to its support. It has a geological and mineralogical museum and under its supervision is carried on the state geological and natural history survey, the state geologist being head of the department of geology and mineralogy of the university. The uni- versity includes a college of arts and sciences, a school of commerce, an art department and colleges of law, music and engineering. The university (1910) had 51 instructors and 385 students. Denomi- national colleges are Yankton College (1882) and Redfield College (1887), both Congregational; Huron College (1883, Presbyterian), and Dakota Wesleyan University (1885; Methodist Episcopal) at Mitchell. The Norwegian Lutherans have a normal school at Sioux Falls, and the Roman Catholics have schools of higher grade at Sioux Falls, X>eadwood and Aberdeen.

Charitable Institutions, &c. — The state maintains a school for the blind at Gary, a school for deaf mutes at Sioux Falls, a tuberculosis sanatorium at Custer, a general hospital for the insane at Yankton, a school for the feeble-minded at Redfield, a soldiers' home at Hot Springs, a reform school at Plankinton, and a penitentiary at Sioux Falls. All penal and charitable institutions are subject to the control of a state board of charities and corrections composed of five members appointed by the governor. A children's home at Sioux Falls is partly under state control. There is a Federal hospital for insane Indians at Canton.

Finance. — The general property tax is the chief source of revenue for state, county and local purposes. There is a local board of assessment and equalization in each county and a general board for the state at large. Corporations are reached through the general property tax, but there is a small levy on fire insurance companies for the support of the local fire departments. An inheritance tax was adopted in 1905 which progresses in proportion to the distance of relationship and the amount of the inheritance. 1 Poll taxes are levied by the counties and townships for school and local purposes. The current revenues of the state for the year ending on the 1st of July 1909, including cash on hand at the beginning of the year, were $4,148,734; for the same year the expenditures were $3,358,847. There, is a small nominal indebtedness, less than the cash surplus in the treasury. The constitution fixes the debt limit at $100,000 over and above the share of the territorial debt assumed at the time of the formation of the state. The first national bank within the present limits of

the state was organized at Yankton in 1872.

History. — The first authentic explorations in what is now South Dakota were made by the Lewis and Clark expedition in 1804 and 1806. The " Yellowstone," a steamboat sent out by the American Fur Company, ascended the Missouri to Fort Pierre in 1831 and to the mouth of the Yellowstone river in 1832. Among the passengers on the second trip was the well- known painter and ethnologist, George Catlin, who spent several weeks at Fort Pierre studying the manners and customs of the Indians. Explorations were also made by Prince Maxi- milian of Neuwied in 1832, by John C. Fremont in 1838, by Edward Harris and John J. Audubon in 1843, and by various others. Fort Pierre, which was founded by the American Fur Company about 1832, was sold to the United States government

1 The rate for direct heirs and brothers and sisters is non-pro- gressive.

in 1855, and was converted into a military post. A settlement was made at Sioux Falls in 1856, but was abandoned about six years afterwards. In the meantime several small colonies had been established east of the Missouri River, but growth was much hampered by the Civil War and by Indians. Although it was not the centre of operations, the south of the territory suffered considerably in the various uprisings under Spotted Tail, Red Cloud and Sitting Bull in 1863-65, 1867, and 1875-76 (see North Dakota and Custer, George Armstrong). A railway (part of the Chicago, Milwaukee & St Paul system) was built from Sioux City to Yankton in 1872-1873, and in 1874 General Custer led an exploring expedition into the Black Hills, which resulted in the discovery of gold and the rapid settlement of a considerable portion of the west of the territory. A movement was at once begun to break up the great Sioux reservation, partly because it cut off this region from the older settlements east of the Missouri and partly because it contained a large amount of land which was very valuable for farming and grazing purposes. In 1876 the Indians ceded their title to lands in the Black Hills. Under the Dawes Allot- ment Act of February 1887, and a special statute of March 1889, an agreement was made with some Indians, and about 1 1 ,000,000 acres, or about half of the reserve, was thrown open to settlement on the 10th of February 1890. This included, roughly speaking, all of the land between the Missouri River and the Black Hills and between the White River and the Big Cheyenne and a strip extending north from the Black Hills to the North Dakota line between the 102nd and 103rd meridians. The remainder was divided into

six smaller reservations, Stand- ing Rock, lying partly in North Dakota, and Cheyenne River, Lower Brule, Crow Creek, Rosebud, and Pine Ridge in South Dakota. Angered by this sacrifice of their lands and excited by prophecies of the coming of the Messiah, a considerable number of the Indians went on the warpath, but after a short campaign they were defeated by General Nelson A. Miles in the battle of Wounded Knee on the 29th of December 1890, and were compelled to make their submission. Since that time the whites have steadily encroached on the reservations. About 56,560 acres of Lower Brule lands were opened for settlement in 1889, about 1,600,000 acres of Sisseton and Wahpeton lands 1 in 1892, 168,000 acres of the Yankton Sioux lands in 1895, 416,000 acres of the Rosebud lands in 1904, and 800,000 acres in 1908.

The territory included within the present limits of the state was a part of the district of Louisiana from 1803 to 1805, of the territory of Louisiana from 1805 to 181 2, and of the terri- tory of Missouri from 181 2 to 1820. After the formation of the state of Missouri in 1820 it remained unorganized, the section east of the Missouri River until 1834, and the section west until 1854. The eastern section was successively a part of the territories of Michigan 1834-1836, Wisconsin 1836-1838, Iowa 1838-1849 and Minnesota 1849-1858, and the western section a part of the territory of Nebraska 1854-1861. On the admission of Minnesota into the Union in 1858, the eastern section was again left unorganized until the 2nd of March 1861, when the territory of Dakota was created, including the present Dakotas and portions of Wyoming and Montana. With the organization of the territory of Idaho in 1863 and the settlement of the southern boundary in 1870 and 1882, the Dakotas acquired their present territorial limits (see North Dakota). The inhabitants of the south of the territory held a convention at Sioux Falls in 1885, adopted a state constitution on the 3rd of November, and applied for admission into the Union. A proposition to divide the territory into two states at the forty-sixth parallel was sanctioned by popular vote in the election of November 1887. Ip accordance with the Enabling Act, which received the President's approval on the 22nd of February 1889, a convention met at Sioux Falls on the 4th of the following July and re-adopted, with some slight verbal changes, the con- stitution of 1885. This was ratified at the polls on the 1st of October, together with a separate prohibition clause, which was 1 Part of this tract was situated in North Dakota.*

carried by a vote of 40,234 to 34,510 (see Administration). On the 2nd of November 1889 President Harrison issued a proclamation declaring South Dakota a state. Subsequently, notwithstanding a temporary set-back due to the panic of 1893, there was a rapid increase of population and wealth. The immigrants came mainly from the northern states and from Scandinavia. In national politics South Dakota has been consistently

Republican, except in the election of 1896, when, as a result of the hard times which followed the panic, the Populists and Democrats were able to form a coalition and carry the state for William J. Bryan.

Governors. Arthur C. Mellette . Charles H. Sheldon .

Andrew E. Lee Charles N. Herreid Samuel H. Elrod Coe I. Crawford Robert S. Vessey

Republican

1889-1893 1 893-1 897

Populist 1897-1901

Republican 1901-1905

1905-1907 1907-1909 1909-

Ribliography. — For physical description see the Bulletins of the South Dakota Geological Survey (Vermilion, 1894 sqq.) ; N. H. Darton, Geology and Underground Waters of South Dakota (Washington, 1909), Water Supply Paper 227 of the U.S. Geological Survey; James Edward Todd, " The Hydrographic History of South Dakota " in vol. xiii. of the Bulletin of the Geological Society of America (Rochester, 1902). And for administration and history see Hagerty, The Territory of Dakota (Aberdeen, 1889); E. L. Grantham, (ed.) Statutes of South Dakota (2nd revised ed., 2 vols., 1901); Dc-ane Robinson, A Brief History of South Dakota (New York, 1905); J. F. Kelly, Manual of the Township and Road Laws of South Dakota iqoj; the state constitution, biennial reports of the auditor, secretary of state and superintendent of public instruction, and annual reports of the railway commissioners, insurance department and treasurer.

SOUTHEND-ON-SEA, a municipal borough and watering- place in the south-east parliamentary division of Essex, England, on the estuary of the Thames. Pop. (1901), 28,857. Area, 5172 acres. It is 36 m. E. from London by the London, Tilbury & Southend railway; and is served also by the Great Eastern railway, and during the summer by steamers from London. It first sprang into notice from a visit of Queen Caroline in 1804, and as it is the nearest seaside resort to London it is much frequented. The bathing is good, but the tide recedes with great rapidity and for nearly a mile. The pier, which is over 1 1 m. in length, permits the approach of steamers at all tides. Westcliff-on-Sea, a western suburb, has a station on the London and Tilbury line. Westward again is Leigh-on-Sea (an urban district, pop. 3667); its lofty Perpendicular church tower is visible from

afar. At Hadleigh, 4m. west, there is a Salvation Army farm colony. The church of Hadleigh is Norman, with an eastern apse, and later additions. The castle was built in the 13th century, and two ruined towers and other frag- ments remain. Thorpe Bay is a residential suburb about mid- way between Southend and Shoeburyness. Eastwood, Great Wakering and Little Wakering are parishes in the neighbour- hood. Southend was incorporated a municipal borough in 1894, under a mayor, 6 aldermen, and 18 councillors; in 1910 these numbers were increased to 8 aldermen and 24 councillors.

SOUTHERNE, THOMAS (1660-1746), English dramatist, was born at Oxmantown, near Dublin, in 1660, and entered Trinity College in 1676. Two years later he was entered at the Middle Temple, London. His first play, The Persian Prince, or the Loyal Brother (1682), was based on a contemporary novel. The real interest of the play lay not in the plot, but in the political significance of the personages. Tachmas, the " loyal brother," is obviously a flattering portrait of James II., and the villain Ismael is generally taken to represent Shaftes- bury. The poet received an ensign's commission in Princess Anne's regiment, and rapidly rose to the rank of captain, but his military career came to an end at the Revolution. He then gave himself up entirely to dramatic writing. In 1692 he revised and completed Cleomenes fcr Dryden; and two years later he scored a great success in the sentimental drama of The Fatal Marriage, or the Innocent Adultery (1694). The piece is based on Mrs Aphra Behn's The Nun, with the addition of a comic

underplot. It was frequently revived, and in 1757 was altered by David Garrick and produced at Drury Lane. It was known later as Isabella, or The Fatal Marriage. The general spirit ot his comedies is well exemplified bv a line from Sir Anthony Love (1691) — "every day a new mistress and a new quarrel." This comedy, in which the part of the heroine, disguised as Sir Anthony Love, was excellently played by Mrs Mountfort, was his best. He scored another conspicuous success in Oroonoko, or The Royal Slave (1696). For the plot of this he was again indebted to the novel by Mrs Behn. In his later pieces " Honest Tom Southerne " did not secure any great successes, but he contrived to gain better returns from his plays than Dryden did, and he remained a favourite with his con- temporaries and with the next literary generation. He died on the 22nd of May 1746.

His other plays are: The Disappointment, or the Mother in Fashion (1684), founded in part on the Curioso Imperhnente in Don Quixote; The Wives'

Excuse, or Cuckolds make themselves (1692); The Maid's Last Prayer; or Any, rather than fail (1692); The Fate of Capua (1700); The Spartan Dame (1719), taken from Plutarch's Life of Aegis; and Money the Mistress (1729).

See Plays written by Thomas Southerne, with an Account of the Life and Writings of the Author (1774).

SOUTHEY, ROBERT (1774-1843), English poet and man of letters, was born at Bristol on the 12th of August 1774. His father, Robert Southey, an unsuccessful linendraper, married a Miss Margaret Hill in 1772. When be was three, Southey passed into the care of Miss Elizabeth Tyler, his mother's half- sister, at Bath, where most of his childhood was spent. She was a whimsical and despotic person, of whose household he has left an amusing account in the fragment of autobiography written in a series of letters to his friend John May. Before Southey was eight years old he had read Shakespeare and Beau- mont and Fletcher, while his love of romance was fostered by the reading of Hoole's translations of Tasso and Ariosto, and of the Faerie Qucenc. In 1788 he was entered at Westminster school. After four years there he was privately expelled by Dr William Vincent (1739-1815), for an essay against flogging which he contributed to a school magazine called The Flagellant. At Westminster he made friends with two boys who proved faithful and helpful to him through life; these were Charles Watkyn Williams Wynn and Grosvenor Bedford. Southey's uncle, the Rev. Herbert Hill, chaplain of the British factory at Lisbon, who had paid for his education at Westminster, determined to send him to Oxford with a view to his taking holy orders, but the news of his escapade at Westminster had preceded him, and he was refused at Christ Church. Finally he was admitted at Balliol, where he matriculated on the 3rd of November 1792, and took up his residence in the following January. His father had died soon after his matriculation.

At Oxford he lived a life apart, and gained little or nothing from the university, except a liking for swimming and a know- ledge of Epictetus. In the vacation of 1 793 Southey's enthusiasm for the French Revolution found vent in the writing of an epic poem, Joan of Arc, published in 1796 by Joseph Cottle, the Bristol bookseller. In 1794 Samuel Taylor Coleridge, then on a visit to Oxford, was introduced to Southey, and filled his head with dreams of an American Utopia on the banks of the Susquehanna. The members of the " pantisocracy " were to earn their living by tilling the soil, while their wives cared for the house and children. Coleridge and Southey soon met again at Bristol, and with Robert Lovell developed the emigration scheme. Lovell had married Mary Fricker, whose sister Sara married Coleridge, and Southey now became engaged to a third sister, Edith. Miss Tyler, however, would have none of " pantiso- cracy " and "

aspheterism,"and drove Southey from her house. To raise the necessary funds for the enterprise Coleridge and he turned to lecturing and journalism. Cottle generously gave Southey £50 for Joan of Arc; and, with Coleridge and Lovell, Southey had dashed off the drama, printed as the work of Coleridge, on The Fall of Robespierre. A volume of Poems by R. Southey and R. Lovell was also published by Cottle in 1795. Southey's uncle, Mr Hill, now desired him to go with him to

Portugal. Before he started for Corunna he was married secretly, on the 14th of November 1795, to Edith Fricker. On his return to England his marriage was acknowledged, and he and his wife had lodgings for some time at Bristol. He was urged to undertake a profession, but the Church was closed to him by the Unitarian views he then held, and medicine was distasteful to him. He was entered at Gray's Inn in February 1797, and made a serious attempt at legal study, but with small results. At the end of 1797 his friend Wynn began an allowance of £160 a year, which was continued until 1806, when Southey relinquished it on Wynn's marriage. His Letters written during a Short Residence in Spain and Portugal were printed by Cottle in 1797, and in 1 797-1 799 appeared two volumes of Minor Poems from the same press. In 1798 he paid a visit to Norwich, where he met Frank Sayers and William Taylor, with whose translations from the German he was already acquainted. He then took a cottage for himself and his wife at Westbury near Bristol, and afterwards at Burton in Hampshire. At Burton he was seized with a nervous fever which had been threatening for some time. He moved to Bristol, and after preparing for the press his edition of the works of Thomas Chatterton, undertaken for the relief of the poet's sister and her child, he sailed in r8oo for Portugal, where he began to accumulate materials for his history of Portugal. He also had brought with him the first six books of Thalaba the Destroyer (1801), and the remaining six were com- pleted at Cintra. The unrhymed, irregular metre of the poem was borrowed from Sayers.

In r8oi the Southeys returned to England, and at the invita- tion of Coleridge, who held out as an inducement the society of Wordsworth, they visited Keswick. After a short experience as private secretary to Isaac Corry, chancellor of the exchequer for Ireland, Southey in 1803 took up his residence at Greta Hall, Keswick, which he and his family shared thenceforward with the Coleridges and Mrs Lovell. His love of books filled Greta Hall with a library of over r4,ooo volumes. He possessed many valuable MSS., and a collection of Portuguese authorities probably unique in England. After 1809, when Coleridge left his family, the whole household was dependent on Southey's exertions. His nervous temperament suffered under the strain, and he found relief in keeping different kinds of work on hand at the same time, in turning from the History of Portugal to poetry. Madoc and Metrical Tales and Other Poems appeared in 1805, The

Curse of Kehama in 1810, Roderick, the last of the Goths, in 1814. This constant application was lightened by a happy family life. Southey was devoted to his children, and was hospitable to the many friends and even strangers who found their . way to Keswick. His friendship for Coleridge was qualified by a natural appreciation of his failings, the results of which fell heavily on his own shoulders, and he had a great admiration for Wordsworth, although their relations were never intimate. He met Walter Savage Landor in 1808, and their mutual admiration and affection lasted until Southey's death.

From the establishment of the Tory Quarterly Review Southey, whose revolutionary opinions had changed, was one of its most regular and useful writers. He supported Church and State, opposed parliamentary reform, Roman Catholic emancipation, and free trade. He did not cease, however, to advocate measures for the immediate amelioration of the condition of the poor. With William Gifford, his editor, he was never on very good terms, and would have nothing to do with his harsh criticisms on living authors. His relations with Gifford's successors, Sir J. T. Coleridge and Lockhart, were not much better. In 1813 the laureateship became vacant on the death of Pye. The post was offered to Scott, who refused'it and secured it for Southey. A government pension of some £160 had been secured for him, through Wynn, in 1807, increased to £300 in 1835. In 1817 the unauthorized publication of an early poem on Wat Tyler, full of his youthful republican enthusiasm, brought many attacks on Southey. He was also engaged in a bitter controversy with Byron, whose first attack on the " ballad-monger " Southey in English Bards and Scotch Reviewers nevertheless did not prevent them from meeting on friendly terms. Southey makes little reference

to Byron in his letters, but Byron asserts (Letters and Journals, ed. Prothero, iv. 271) that he was responsible for scandal spread about himself and Shelley. In this frame of mind, due as much to personal anger as to natural antipathy to Southey's principles, Byron dedicated Don Juan to the laureate, in what he himself called " good, simple, savage verse." In the introduction to his Vision of Judgment (1821) Southey inserted a homily on the " Satanic School " of poetry, unmistakably directed at Byron, who replied in the satire of the same name. The unfortunate controversy was renewed even after Byron's death, in con- sequence of a passage in Medwin's Conversations of Lord Byron.

Meanwhile the household at Greta Hall was growing smaller. Southey's

eldest son, Herbert, died in 18 16, and a favourite daughter in 1826; Sara Coleridge married in 1829; in 1834 his eldest 'daughter, Edith, also married; and in the same year Mrs Southey, whose health had long given cause for anxiety, became insane. She died in 1837, and Southey went abroad the next year with Henry Crabb Robinson and others. In 1839 he married his friend Caroline Bowles (see below). But his memory was failing, and his mental powers gradually left him. He died on the 21st of March 1843, and was buried in Crosthwaite churchyard. A monument to his memory was erected in the church, with an inscription by Wordsworth.

The amount of Southey's work in literature is enormous. His collected verse, with its explanatory notes, fills ten volumes, his prose occupies about forty. But his greatest enterprises, his history of Portugal and his account of the monastic orders, were left uncompleted, and this, in some sense, is typical of Southey's whole achievement in the world of letters; there is always some- thing unsatisfying, disappointing, about him. This is most true of his efforts in verse. In his childhood Southey fell in with Tasso, Tasso led him to Ariosto, and Ariosto to Spenser. These luxuriantly imaginative poets captivated the boy; and Southey mistook his youthful enthusiasm for an abiding inspiration. His inspiration was not genuinely imaginative; he had too large an infusion of prosaic commonplace in his nature to be a true follower of Ariosto and Spenser. Southey, quite early in life, resolved to write a series of epics on the chief religions of the world; it is not surprising that the too ambitious poet failed. His failure is twofold: he was wanting in artistic power and in poetic sympathy. When his epics are not wildly impossible they are incurably dull ; and a man is not fit to write epics on the religions of the world' when he can say of the prophet who has satisfied the gravest races of mankind — Mahomet was " far more remarkable for audacious profligacy than for any intellec- tual endowments." Southey's age was bounded, and had little sympathy for anything beyond itself and its own narrow interests; it was violently Tory, narrowly Protestant, defiantly English. And in his verse Southey truthfully reflects the feeling of his age. In the shorter pieces Southey's commonplace asserts itself, and if that does not meet us we find his bondage to his generation. This bondage is quite abject in The Vision of Judg- ment; Southey's heavenly personages are British Philistines from Old Sarum, magnified but not transformed, engaged in endless placid adoration of an infinite George III. For this complaisance he was held up to ridicule by Byron, who wrote his own Vision of Judgment by way of parody.

Some of Southey's subjects, " The Poet's Pilgrimage " for instance, he would have treated delightfully in prose; others, like the " Botany Bay Eclogues," " Songs to American Indians," " The Pig," " The Dancing Bear," should never have been written. Of his ballads and metrical tales many have passed into familiar use as poems for the young. Among these are

“The Inchcape Rock,” ” Lord ‘William,” “The Battle of Blenheim,” the ballad on Bishop Hatto, and ” The Well of St Keyne.”

Southey was not in the highest sense of the word a poet; but if we turn from his verse to his prose we are in a different world ; there Southey is a master in his art, who works at ease with grace and skill. ” Southey’s prose is perfect,” said Byron; and, if we do not stretch the ” perfect,” or take it to mean the supreme perfection of the very greatest masters of style, Byron was right.

In prose the real Southey emerges from his conventionality. His interest and his curiosity are unbounded as his Common- Place Book will prove; his stores of learning are at his readers’ service, as in The Doctor, a rambling miscellany, valued by many readers beyond his other work. For biography he had a real genius. The Life of Nelson (2 vols., 1813), which has become a model of the short life, arose out of an article contributed to the Quarterly Review; he contributed another excellent biography to his edition of the Works of William, Cowper (15 vols., 1833-1837), and his Life of Wesley; and the Rise and Progress of Methodism (2 vols., 1820) is only less famous than his Life of Nelson. But the truest Southey is in his Letters: the loyal, gallant, tender- hearted, faithful man that he was is revealed in them. Southey’s fame will not rest, as he supposed, on his verse; all his faults are in that — all his own weakness and all the false taste of his age. But his prose assures him a high place in English literature, though not a place in the first rank even of prose writers.

Southey’s love of romance appears in various volumes: Amadis of Gaul (4 vols., 1803); Palmerin of England (1807); Chronicle of the Cid (1808), and The byrth, lyf and actes of King Arthur . . . with an introduction and notes (1817). His other works are: Specimens of English Poets (3 vols., 1807); Letters from England by Don Manuel Espriella (3 vols., 1807), purporting to be a Spaniard’s impressions of England ; an edition of the Remains of Henry Kirke White (2 vols., 1807) ; Omniana or Horae Otiosiores (2 vols., 1812) ; Odes to . . . the Prince Regent . . . (18 14); Carmen Triumphale . . . and Carmina Aulica . . . (1814); Minor Poems . . . (181$); Lay of the Laureate (1816), an epithalamium for the Princess Charlotte; The Poet’s Pilgrimage to Waterloo (1816); Wat Tyler: a dramatic poem (1817); Letter to William Smith Esq., M.P. (1817), on the occasion of stric- tures made in the House of Commons on Wat Tyler; History of Brazil (3 vols., 1810, 1817, 1819) ; Expedition of Orsua and the Crimes of Aguirre (1821); A Book of the Church (2 vols., 1824) ; A Tale of Paraguay (1825); Vindiciae Ecclesiae Anglicanae, Letters to C. Butler, Esq., comprising essays on the Romish Religion and vindicating the Book of the Church (1826) ; History of the Peninsular War (3 vols., 1823, 1824, 1832); ” Lives of uneducated Poets,” prefixed to verses by John

Jones (1829); All for Love and The Pilgrim to Compostella (1829) ; Sir Thomas More, or Colloquies on the Progress and Prospects of Society (2 vols., 1829); Life of John Bunyan, prefixed to an edition (1830) of the Pilgrim's Progress; Select Works of British Poets from Chaucer to Jonson, edited with biographical notices . , . (1831) Essays Moral and Political . . . now first collected (2 vols., 1832); Lives of the Admirals, with an introductory view of the Naval History of England, forming 5 vols. (1833-1840) of Lardner's Cabinet Cyclo- paedia; The Doctor (7 vols., 1834-1847), the last two volumes being edited by his son-in-law, the Rev. J. Wood Warter; Common-Place Book (4th series, 1849-1851), edited by the same; Oliver Newman; a New England Tale (unfinished), with other poetical remains (1845), edited by the Rev. H. Hill. A collected edition of his Poetical Works (10 vols., 1837-1838) was followed by a one volume edition in 1847. Southey's letters were edited by his son Charles Cuthbert Southey as The Life and Correspondence of the late Robert Southey (6 vols., 1849-1850); further selections were published in Selections from the Letters of Robert Southey (4 vols., 1856), edited by J. W. Warter; and The Correspondence of Robert Southey with Caroline Bowles. To which are added: Correspondence with Shelley, and Southey's Dreams (1881), was edited, with an introduction, by Professor E. Dowden. An excellent selection from his whole correspondence, edited by Mr John Dennis, as Robert Southey, the story of his life written in his letters (Boston, Massachusetts, 1887), was reprinted in Bohn's Standard Library (1894). See aXsoSouthey (1879) in the English Men of Letters Series, by Professor E. Dowden, who also made the selection of Poems by Robert Southey (1895) in the Golden Treasury Series. A full account of his relations with Byron is given in The Letters and Journals of Lord Byron (vol. vi., 1901, edited R. E. Prothero), in an appendix entitled " Quarrel between Byron and Southey," pp. 377-399. Southey figures in four of the Imaginary Conversations of W. S. Landor, two of which are between Southey and Porson, and two between Southey and Landor.

Southey's second wife, Caroline Anne Southey (1786-1854), was the daughter of an East Indian captain, Charles Bowles. She was born at Lymington, Hants, on the 7th of October 1786. As a girl Caroline Anne Bowles showed a certain literary and artistic aptitude, the more remarkable perhaps from the loneli- ness of her early life and the morbidly delicate condition of her health — an aptitude however of no real distinction. When money difficulties came upon her in middle age she determined to turn her talents to account in literature. She sent anonymously to Southey a narrative poem called Ellen Fitzarthur, and this led to the acquaintanceship and long friendship, which, in 1839,

culminated in their marriage. Ellen Fitzarlhur (1820) may be taken as typical, in its prosy simplicity, of the rest of its author's work. Mrs Southey's poems were published in a collected edition in 1867. Among her prose writings may be mentioned Chapters on Churchyards (1829), her best work; Tales of the Moors (1828) ; and Selwyn in Search of a Daughter (1835). It was soon after her marriage that her husband's mental state became hopeless, and from this time till his death in 1843, and indeed till her own, her life was one of much suffering. She was not on good terms with her stepchildren, and her share in Southey's life is hardly noticed in Charles Cuthbert Southey's Life and Correspondence of his father. But with Edith Southey (Mrs Warter) she was always in friendly relations, and she supplied the valuable additions to Southey's correspondence published by J. W. Warter. She is best remembered by her correspon- dence with Southey, which, neglected in the official biography, was edited by Professor Dowden in 1S81. Mrs Southey died at Buckland Cottage, Lymington, on the 20th of July 1854, two years after the queen had granted her an annual pension of £200.

Besides the works already mentioned, Mrs Southey wrote The Widow's Tale, and other Poems (1822); Solitary Hours (prose and verse, 1826) ; Tales of the Factories (1833) ; The Birthday (1836) ; and Robin Hood, written in conjunction with Southey, at whose death this metrical production was incomplete.

SOUTHGATE, an urban district in the Enfield parliamentary division of Middlesex, England, 9 m. N. of St Paul's Cathedral, London, on the Great Northern railway. Pop. (1901), 14,993. It is pleasantly situated in a wooded district, and forms an outer residential suburb of the metropolis. Christ Church, in Early English style, is the work of Sir Gilbert Scott, and contains stained glass windows from the designs of Sir E. Burne- Jones and D. G. Rossetti. Close to New Southgate station is Colney Hatch Lunatic Asylum for the county of London, opened in 1851 and subsequently much enlarged.

SOUTH GEORGIA, an uninhabited British island in the South Atlantic Ocean, about 900 m. S. by E. of the Falklands, in 54°-55° S., 36°-38° W.; area 1600 sq. m. It is mountainous, with snowy peaks 6000 to 8000 ft. high, their slopes furrowed with deep gorges filled with glaciers. Its geological constitution — gneiss and argillaceous schists, with no trace of fossils — shows that the island is, like the Falklands, a surviving fragment of some greater land-mass now vanished, most probably indicating a former extension of the Andean system. At Royal Bay, on the south-east side, was stationed the German expedition sent out to observe the transit of

Venus in 1882. The island would be well suited for cattle or sheep farming but for its damp, foggy climate. The flora is surprisingly rich, and the German naturalists were able to collect thirteen flowering plants, mostly common also to the Falklands, but one allied to a form found in distant New Zealand. South Georgia is politically attached to the Falklands.

SOUTH HADLEY, a township of Hampshire county, Massa- chusetts, U.S.A., on the Connecticut river, about 12 m. N. of Springfield. Pop. (1900), 4526, of whom 1119 were foreign- born; (1910 census), 4894. Area, 18-5 sq. m. There are no steam railways, but an electric line connects South Hadley and South Hadley Falls with the New York, New Haven & Hartford and the Boston & Maine railways at Holyoke. The village of South Hadley, or the Center, lies at the south base of Mount Holyoke, about 4 m. from Holyoke and about 3 m. from South Hadley Falls; it is the seat of Mount Holyoke College. South Hadley Falls are connected with Holyoke by a bridge across the Connecticut river. The falls of the river afford water-power for paper mills, cotton and woollen mills, and saw mills. South Hadley was originally a part of the township of Hadley, but in 1753 the district of South Hadley was established, and in 1775 incorporated as a separate township.

SOUTH HOLLAND, a province of Holland, bounded W. by the

North Sea, N. by North Holland, E. by Utrecht and Gclderland,

S.E. by North Brabant, and S. by Zeeland. It has an area of

1166 sq. m., and a population (1905) of 1,287,363. Its south-

eastern and southern boundaries are defined by the estuaries called the New Merwede, the Hollandsch Diep, the Volkerak, the Krammer, and Grevelingen, and the province includes the delta islands of Goeree (Goedereede) and Overflakkee, Voorne and Putten, Rozenburg, Yselmonde, Hoeksche Waard, and Dord- recht. The natural division into dunes, geest grounds, and clay and low fen holds for South as well as for North Holland. Noord- wyk-on-Sea, Katwyk-on-sea, Scheveningen, and Ter Heide are watering-places and fishing villages. The Hook (Hoek) of Holland harbour, built at the mouth of the New Waterway (1866- 1872) from Rotterdam, is the chief approach to Central Europe from Harwich on the east coast of England. At the foot of the dunes are the old towns and villages of Sassenheim, close to which are slight remains of the ancient castle of Teilingen (12th century), in which the countess Jacoba of Bavaria died in 1433. Among other places of interest are Rynsburg, the site of a

convent for nobles founded in 1133 and destroyed in the time of Spanish rule; Voorschoten; Wassenaar, all of which were formerly minor lordships; Loosduinen, probably the Lugdunum of the Romans, and the seat of a Cistercian abbey destroyed in 1579; Naaldwyk, an ancient lordship; and 's Gravenza.nde, which possessed a palace of the counts of Holland in the 12th century, when it was a harbour on the Maas. The Hague, situated in the middle of this line of ancient villages, is the capital of the province. The market-gardening of the region called the West- land, between the Hague and the Hook of Holland, is remark- able, and large quantities of vegetables are exported to England. On the clay and low fen cattle-rearing and the making of the Gouda cheeses are the principal occupations. Flourishing centres of industry are found along the numerous river arms, including Maasluis, Vlaardingen, Schiedam, Rotter- dam, Gorinchem, and Dordrecht. Here also are some of the oldest settlements, such as Vianen on the Lek, Leerdam on the Linge, and Woudrichem or Woerkum at the junction of the Maas and Merwede. Woudrichem guards the entrance to the Merwede in conjunction with Fort Loevestein on the opposite shore. Vianen is supposed to be the Fanum Dianae of Ptolemy, and was the seat of an independent lordship which passed to the family of Brederode in 1418, and later to tne princes of Lippe-Detmold, from whom it was bought by the states in 1725. There is a fine tomb of Reinoud van Brederode (d. 1556) and his wife in the Reformed Church. The lordship of Leerdam arose out of a division of the lordship of van Arkel and descended to the house of Egmond. It was raised to a countship in 1492, and passed by marriage to the family of Orange-Nassau. The Reformed Church contains the tomb of John, last lord of van Arkel.

SOUTHINGTON, a township of Hartford county, Connecticut, U.S.A., about 15 m. S.W. of the city of Hartford' Within the township is the borough of Southington, served by the New York, New Haven & Hartford railroad. Pop. of the township (1910), 6516, which included that of the borough, 3714. The area of the township is 35 sq. m. The principal industry is the manufacture of hardware goods. Between 1809 and 1874 as many as 236 patents were granted to residents. Southington was originally a part of the township of Farmington. It was settled about 1697; in 1724 it became an independent parisi under the name of Panthorn. The township was incorporated in 1779, the borough in 1889.

See H. R. Timlow's Ecclesiastical and Other Sketches of Southington (Hartford, 1875).

SOUTH MELBOURNE, a city of Bourke county, Victoria, Australia, separated from Melbourne in 1855, proclaimed a city in 1883, and formerly known as Emerald Hill. Pop. (1901), 40,637. It returns three members [to parliament and contains the residence of the governor of the

colony. The wharves on the river Yarra and its numerous manufactures contribute to the wealth and importance of the city.

SOUTH MOLTON, a market town and municipal borough in the South Molton parliamentary division of Devonshire, England, on the river Mole, 197 m. W. by S. of London, by the Great Western railway. Pop. (1901), 2848. Besides the parish church

of St Mary Magdalene, a fine and massive Perpendicular building with an ancient pulpit of carved stone, there are a guildhall and market house. Linen goods are manufactured; fairs are held twice yearly, and numerous flour mills are worked by the river. The town is governed by a mayor, 4 aldermen, and 12 councillors. Area, 5910 acres.

South Molton (Sud Moutona) was probably the site of a very early settlement, the remains of a British camp being visible 2 m. south of the town, but its authentic history begins with the Domesday survey, which relates that the manor had been royal demesne of Edward the Confessor and now paid £10 a year to the Conqueror. In the 13th century it was held by Nicholas Fitz Martin of the earl of Gloucester for the service of finding a bow with three arrows to attend the earl when he should hunt in Gower. In 1246 Nicholas obtained a grant of a Saturday market and a fair at the feast of the Assumption (both maintained up to the present day), and in 1275 South Molton appears for the first time as a mesne borough under his overlordship. The borough subsequently passed to the Audleys, the Hollands, and in 1487 was granted for life to Margaret, duchess of Richmond, who in 1490 obtained a grant of a fair (which is still held) at the nativity of St John the Baptist. It returned two members to parliament in 1302, but no charter of incorporation was issued until that of Elizabeth in 1590, instituting a common council of a mayor and eighteen burgesses, three of whom were to be elected capital burgesses, with a recorder, steward of the borough court, two sergeants-at-mace, and a court of record every three weeks on Monday. A fresh charter was issued by Charles II. in 1684. This remained in force until the Municipal Corporations Act of 1833. The town formerly had a considerable manufacture of serges and shalloons, or light woollen linings, so called from Chalons-sur-Marne, France.

SOUTH NORWALK, a city of Fairfield county, Connecticut, U.S.A., at the mouth of the Norwalk river, on Long Island Sound, in the township of Norwalk, and 42 m. by rail N.E. of New York. Pop. (1900) 6591,

including 1528 foreign-born (many Hungarians) and 83 negroes; (1910) 8968. It is served by the main line and the Danbury division (of which it is a terminus) of the New York, New Haven & Hartford railway, by inter-urban electric lines, and by steamboats to New York. The business and manufacturing section is close to the river and only a few feet above it; behind this, along a ridge, is the residential district; along the Sound are summer cottages and pleasure resorts. West Avenue is a finely shaded drive. The city has a public library and a soldiers' monument. South Norwalk is chiefly a manufacturing and commercial city. It has a good harbour (in which there are three lighthouses), considerable coastwise trade, and important oyster fisheries. South Norwalk, long an unincorporated village called Old Well, was chartered as a city under its present name in 1870, and its charter was revised and amended in 1882, 1897 and 1909.

SOUTHOLD, a township of Suffolk county, New York, occupy- ing the peninsula at the N.E. of Long Island, and including the islands E.N.E. of this peninsula, Plum Island, on which defences protect the eastern entrance to Long Island Sound, Little Gull Island, on which there is a lighthouse, Great Gull Island, and Fisher's Island. Pop. (1900), 8301; (1910, U.S. census), 10,577. Excluding the islands to the east, the township is about 25 m. long and its average width is 2 m.; the Sound shore is broken only by Mattituck and Goldsmith's inlets, but the southern shore is broken with bays and necks of land. The surface is hilly, with occasional glacial boulders. The Long Island railway serves the principal villages of the township, Mattituck, Cutchogue, Peconic, Southold and Green- port (pop. in 1910, 3089), and from Greenport steamers run to Shelter Island, Sag Harbor, New London and New York. Beyond Greenport are the villages of East Marion and Orient. Greenport has some shipping and some oyster fisheries, as- paragus is grown at Mattituck, and Peconic Bay is noted for its scallops. Southold is a summer resort, and it is historically interesting as one of the first English settlements on Long Island. The first permanent settlement here was made in 1640; land was

bought from the Indians in August (a lease from the proprietor William Alexander, Lord Stirling, had been secured in 1639), and on the 2 1 st of October 1640 a Presbyterian church was organized under John Youngs, who came from New Haven and had been connected with a St Margaret's church in Suffolk, England, probably at Reydon, near South wold; and it is possible that the settlement was named from Southwold, though as it was commonly called " the South Hold " by early writers and a settlement on Wading River was called West Hold, the name was probably descriptive. A meeting-house was built in 1642, and biblical laws were enforced. Southold was originally one of the six towns under the New Haven jurisdiction, but in 1662 was placed under Connecticut; in 1664 it objected strongly to the

transfer of Long Island to the duke of York; in 1670 refused to pay taxes imposed by Governor Francis Lovelace of New York; in 1672 petitioned the king to be under Connecticut or to be a free corporation; in 1673, when the Dutch got control of New York, withstood the Dutch commissioners, with the help of Connecti- ■ cut; and, in 1674, after English supremacy was again estab- lished in New York, still hoped to be governed from Connecticut. The township was chartered by Governor Edmund Andros in 1676. Greenport was not settled until the first quarter of the 19th century, and was incorporated as a village in 1838.

See Epher Whitaker, History of Southold, L.I.: Its First Century (Southold, 1881); Southold Town Records (2 vols., Southold, 1882- 1884), and an address by C. B. Moore in Celebration of the 250th Anniversary of the Formation of the Town and the Church of Southold, L.I. (Southold, 1890).

SOUTH OMAHA, a city of Douglas county, Nebraska, U.S.A., on the high western bluffs of the Missouri, immediately adjoining Omaha on the south. Pop. (1900), 26,001, of whom 5607 were foreign-born; (1910, "census) 26,259. It is served by the Chicago, Burlington & Quincy, the Chicago Great Western, the Chicago, Milwaukee & St Paul, the Chicago, Rock Island & Pacific, the Illinois Central, the Missouri Pacific, the Union Pacific, the Chicago & North Western, and the short Omaha Bridge Terminal railways. The principal public buildings are the Federal building (housing the post office and the bureau of animal industry), the public library and the live-stock exchange. Next to Chicago and Kansas City it is the greatest slaughtering and meat-packing centre in the United States. In 1905 it produced 43-5 % ($67,415,177) of the total value of the factory product of the state, and of this output 97ˆ2% repre- sented the slaughtering and packing industry. South Omaha was chartered as a city of the second class in 1887, and in 1901 became a city of the first class. The present city dates from 1884, when the Union stockyards were established here.

SOUTH ORANGE, a township and a village of Essex county, New Jersey, U.S.A., in the N.E. of the state, about 15 m. W. of New York City. Pop. of the village (1900), 4608, of whom 1140 were foreign-born; (1905) 4932; (1910) 6014. Pop. of the town- ship, excluding the village (1900) 1630; (1905) 1946; (1910) 2979. The village is served by the Morris & Essex division of the Delaware, Lackawanna & Western railroad, and is con- nected with Orange and with Newark by electric lines. It is primarily a residential suburb of New York and Newark. On tue Orange mountain is Essex county park, a wild tract with forest roads. The western part of the township is locally known as Maplewood, the eastern as Hilton. South Orange has a public library and a town hall, and is the seat of Seton Hall College (Roman Catholic), named in honour of Mother Elizabeth Seton,

founded at Madison, N.J., in 1856, and removed to South Orange in i860. Among the landmarks of South Orange are an old stone house of unknown date, but mentioned in legal documents describing the surrounding property as early as 1680; the Baldwin House (c. 1717); and the Timothy Ball House (1743). Settlements were made within the present limits of the township in the latter part of the 17 th century by some of the founders of Newark. The township was created in 1861 from parts of the town of Orange and the township of Clinton. The citizens secured in 1869 a village charter providing a village president and a board of trustees; in 1904 the village was entirely

separated from the township, except as regards school govern- ment. In 1891 a tract of 150 acres, known as Montrose Park and containing many handsome residences, was annexed to the village.

See H. Whittemore, The Founders and Builders of the Oranges, (Newark, 1896).

SOUTHPORT, a municipal and county borough and seaside resort in the Southport parliamentary division of Lancashire, England, immediately S. of the embouchure of the Ribble into the Irish Sea, 185 m. N. by W. of Liverpool. It is served by the Lancashire & Yorkshire and London & North-Western rail- ways, and by the Southport & Cheshire Lines Extension system. Pop. (1001), 48,083. Its foreshore consists of a great expanse of firm, bright sands, and the mildness of its winter climate is attributed to the radiation of heat from them. Its proximity to Liverpool and Manchester has drawn to it a large resident population, and its visitors number many thousands annually. The promenade along the shore is 2 m. in length; in its centre is the pier, 1 m. long, down which tramcars are drawn by a stationary steam-engine. Other facilities for outdoor enjoyment are provided in Hesketh Park (presented to the town by the Rev. Charles Hesketh, formerly rector of North Meols, and one of the lords of the manor), the Botanic Gardens, Kew Gardens, South Marine Park, and the Winter Gardens. The last, laid out at a cost of £130,000, include a large conserva- tory, a fine enclosed promenade, a theatre and an aquarium. The principal public buildings are the town hall, the Cambridge Hall (used for concerts, &c), and an extensive range of markets. There are several infirmaries and hospitals, and a sanatorium for children. Southport has also a free library and art gallery, a literary and philosophical institute, and a college (Trinity Hall) for the daughters of Wesleyan ministers; and a museum and schools of science and art. An extensive service of electric

tramways is maintained. The first considerable house in South- port (an inn for the reception of sea-bathers) was built in 1701, and soon after other houses were erected on the site row known as Lord Street, but the population in 1809 was only 100. Birk- dale is a residential district adjacent to Southport on the south. In 1867 Southport received a charter of incorporation. It be- came a county borough in 1905. The corporation consists of a mayor, 10 aldermen and 30 councillors. Area, 5144 acres.

SOUTH PORTLAND, a city of Cumberland county, Maine, U.S.A., on Casco Bay, an arm of which separates it from Portland, with which it is connected by a ferry and four bridges. Pop. (1900) 6287 (763 foreign-born); (1910) 7471. South Portland is served by the Boston & Maine railway. It is the seat of the State (Reform) School for Boys. At Spring Point is Fort Preble, established in 1808 and now a coast artillery station; and at Portland Head is Fort Williams. The city has steel-rolling mills, car shops of the Boston & Maine railway, and ship-build- ing interests, and manufactures marine hardware and varnish. South Portland was part of the old town of Cape Elizabeth (pop. in 1900, 887) until March 1895; the legislature granted it a city charter in 1895, which was not accepted by the town until December 1898.

SOUTHSEA, a seaside resort of Hampshire, England, part of the municipal and parliamentary borough of Portsmouth, with a terminal station (East Southsea) on a branch of the London & South-Western and London, Brighton & South Coast railways. It forms the southern and residential quarter of Portsmouth, and overlooks Spithead, the inlet of the English Channel between the Isle of Wight and the mainland on the north-east. There are two piers, and a parade along the sea- wall; and the sea-bathing is good. Southsea Castle was built by Henry VIII. at the southern extremity of Portsea Island. (See Portsmouth.)

SOUTH SEA BUBBLE, the name given to a series of financial projects which originated with the incorporation of the South Sea Company in 171 1, and ended nine years later in general disaster.

The idea at the root of the parent scheme was that the state should sell certain trading monopolies to a company in return

for a sum of money to be devoted to the reduction of the national debt, and in the form which it took in 1711 it possibly owes its existence to Daniel Defoe, who discussed it frequently with Edward Harley (1664-1735), brother of Robert Harley, earl of Oxford. In 1711 the South Sea Company was formed, and was granted a monopoly of the British trade with South America and the Pacific Islands, the riches of which were popularly regarded as illimitable. Its promoters, mainly wealthy merchants, took over

nearly £10,000,000 of the national debt, on which they were to receive interest at the rate of 6 % in addition to £8000 a year for the expenses of arrangement. The £600,000 was secured on certain customs duties. The company prospered, and in 1713, when the Asiento treaty was signed with Spain, it received the lucrative monopoly of the slave trade with Spanish America. It was the special pride of the Tories, who regarded it as a rival to the Whig institution, the Bank of England. In 1 7 16 it obtained further concessions under the new Asiento treaty, and in 1717 it advanced a further sum of £2,000,000 to the government, but its prospects were greatly darkened by the outbreak !of war between England and Spain in 17 18. Yet it continued to thrive, and early in 1718 the king became its governor.

Towards the end of 17 19 the directors of the company put before the government, the head of which was Charles Spencer, 3rd earl of Sunderland, a more ambitious scheme. In return for further concessions the company offered to take over the whole of the national debt and to pay £3,500,000 for this privi- lege. At this time the amount of the debt was £51,300,000, the greater part of which consisted of terminable annuities, money lent to the state in return for a fixed income for life. The company would receive interest at the rate of 5% until 1727, when it would be reduced to 4%. The advantage which the government hoped to obtain from this bargain was obvious; it would rid itself of the unpopular and burdensome debt. The advantages hoped for by the company were much greater, although perhaps not equally obvious. The aim of the directors was to persuade the annuitants of the state to exchange their annuities for South Sea stock; the stock would be issued at a high premium and thus a large amount of annuities would be pur- chased and extinguished by the issue of a comparatively small amount of stock. Moreover, when this process had been carried out the company would still receive from the government a sum of something like £1,500,000 a year. Seriously alarmed at the proposals of the South Sea Company, the directors of the Bank of England offered the government £5,000,000 for the same privilege, but the company outbid them with an offer of £7>567,ooo. This was accepted, the necessary act of parliament being passed in April 1720. It is interesting to note that one of the most sturdy opponents of the scheme was Sir Robert Walpole.

The year I7r9, when the South Sea scheme was projected, was remarkably favourable to an undertaking of the kind. It was the year when France went delirious over John Law and his Mississippi Company, and the infection spread to England. But before April 1720, when everything was ready, a terrible reaction had begun in France, confidence and prosperity giving way to ruin and disaster. Nevertheless, the directors proceeded with their plan, and in a few weeks they had persuaded over one-half of the

government annuitants to become shareholders in the company. Meanwhile the stock of the company had been appreciating steadily in value, and when the new scheme was launched the public began to purchase it more eagerly than before. From 1285 at the beginning of the year the price rose to 330 in March, and in April the directors sold two and a quarter millions of stock at 300. In May the price rose to 550, in June to 890, and in July it touched 1000. At this tremendous premium the directors sold five millions of stock.

By this time the extraordinary success of the South Sea

Company had produced a crowd of imitators, and the result was

a wild mania of speculation, and its inevitable end — a crash.

Hundreds of companies were formed, some of them being

I fortunate enough to secure the active support of royal and titled

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personages; thus the prince of Wales, afterwards George II., became governor of the Welsh Copper Company. Some of these new companies, like the Royal Exchange and the London Assurance, were perfectly legitimate and honourable under- takings, but the great majority put forward the most audacious and chimerical proposals for extracting money from the public. One was " for a wheel for perpetual motion "; another was for a " design which will hereafter be promulgated," and it has been estimated that the total capital asked for by the promoters of these schemes amounted to £300,000,000. Profiting by the sad experience of France, the British government made an attempt to check this movement, and an act was passed for this purpose early in 1 7 20. A proclamation ofthenthofjune against the promoters of illegal companies followed, and the directors of the South Sea Company persuaded the lords justices, who were acting as regents during the absence of the king, to abolish 86 companies as illegal.

In August the fall in the price of South Sea stock began, and in September, just as the " insiders " had sold out, it became serious. Instead of being a buyer every one became a seller, and the result was that in a few days the stock of the South Sea Company fell to 175, while the stocks of many other companies were unsaleable. In November South Sea stock fell to 135, and in four months the stock of the Bank of England fell from 263 to 145. Thousands were ruined, and many who were committed to heavy payments fled from the country. The popular cry was for speedy and severe

vengeance, both on the members of the government and on the directors of the unfortunate company. Parliament was called together on the 8th of December 1720, and at once both houses proceeded to investigate the affairs of the company, the lower house soon entrusting this to a committee of secrecy. To stem the tide of disaster Sir Robert Walpole proposed that the Bank of England and the East India Company should each take over nine millions of South Sea stock, but al- though this received the assent of parliament it never came into force. More to the liking of the people was the act of January 1 7 21 which restrained the directors from leaving the kingdom and compelled them to declare the value of their estates. The committee of secrecy reported in February 1721, and it proved that there had been fraud and corruption on a large scale. The company's books contained entries which were entirely fictitious, and the favours which the directors had secured from the state had been purchased by gifts to ministers, some of whom had also made large sums of money by speculating in the stock. The chief persons implicated were John Aislabie (1670-1742), chan- cellor of the exchequer; James Craggs, joint postmaster-general; his son James Craggs, secretary of state; and to a lesser degree the earl of Sunderland and Charles Stanhope, a commissioner of the treasury. Aislabie, who was perhaps the most deeply implicated, resigned his office in January, and in March he was found guilty by the House of Commons of the " most notorious, dangerous and infamous corruption "; he was expelled from the house and was imprisoned. Both the elder and the younger Craggs died in March, while owing to the efforts of Walpole both Sunderland and Stanhope were acquitted, the latter by the nar- row majority of three. By act of parliament the estates of the directors were confiscated; these were valued at £2,014,123, of which £354,600 was returned to them for their maintenance, the balance being devoted to the relief of the sufferers.

Under the guidance of Walpole parliament then proceeded to deal with the wreck. £11,000,000 had been lent by the directors of the South Sea Company on the security of their own stock, the debtors of the company including 138 members of the House of Commons. This debt was remitted on payment of 10% of the sum borrowed, this being afterwards reduced to 5%, and the £7,567,000 due from the company to the govern- ment was also remitted. More serious, perhaps, was the case of those persons who had exchanged the substance of a government annuity for the shadow of a dividend on South Sea stock. They asked that the state should again guarantee to them their in- comes, but in the end they only received something like one-half of what they had enioved before the bubble.

The South Sea Company with a capital of nearly £40,000,000 continued to exist, but not to flourish. Various changes were made in the nature of its capital, and in 1750 it received £100,000 from the Spanish government for

the surrender of certain rights. Its commercial history then ended, but its exclusive privileges were not taken away until 1807. In 1853 the existing South Sea annuities were either redeemed or converted into government stock. The London headquarters of the company were the South Sea House in Threadneedle Street.

SOUTH SHETLAND, a chain of islands on the border of the Antarctic region, lying about 500 m. S.E. of Cape Horn, between 6i° and 63 10′ S. and between 53° and 63 W., and separated by Bransfield Strait from the region composed of Danco Land, Palmer Land, Louis Philippe Land, &c. The more considerable islands from west to east are Smith (or James), Low (or Jameson), Snow, Deception, Livingstone, Greenwich, Robert, Nelson, King George L, Elephant, and Clarence. Deception Island is remarkable as of purely volcanic origin. On the south-east side an opening 600 ft. wide gives entrance to an internal crater-lake (Port Forster) nearly circular, with a diameter of about 5 m. and a depth of 97 fathoms. Voyagers in 1828 and 1842 reported that steam still issued from numerous vents, but Otto Norden- skjold (Antarctica, London, 1905) found no exterior evidence of volcanic activity. Most of the islands are rocky and moun- tainous, and some of their peaks are between 6000 and 7000 ft. in height. Covered with snow for the greater part of the year, and growing nothing but lichens, mosses and some scanty grass, the South Shetlands are of interest almost solely as a haunt of seals, albatrosses, penguins and other sea-fowl. It has been supposed by many that the Dutch navigator Dirk Gerrits dis- covered the South Shetlands in 1598, but it appears probable that this story originated through confusion with another voyage in which Gerrits was not concerned (cf. H. R. Mill, Siege of the South Pole, p. 34 seq.). In 1819 William Smith of the English brig "Williams" observed the South Shetland coast on the 19th of February. Revisiting it in October, he landed on King George I. Island, taking possession for England; he also gave the whole chain the name it bears. In 1820 the naval lieutenant Edward Bransfield was sent in the " Williams " to survey the islands, which attracted the attention of American and British sealers, and became fairly well known through the visits of Antarctic explorers. A smaller group-ˆCoronation Island, Laurie Island, &c. — lying 200 m. east of the South Shet- lands, bears the name of South Orkney. It was discovered by the English captain, Powell, in 1821.

SOUTH SHIELDS, a seaport and municipal, county and parlia- mentary borough of Durham, England; at the mouth of the Tyne on its- right bank, opposite North Shields, on a branch of the North-Eastern railway. Pop. (1901), 97,263. It is connected with North Shields and Tynemouth by steam ferries. The principal buildings are the church of St Hilda, with a picturesque old tower; the town hall in the market-place, exchange, custom-house, mercantile marine offices, public library and museum, grammar

school, marine school, master-mariners' asylum and seamen's institute. There is a pleasant marine park. The principal industries are now the manufacture of glass and chemicals, and ship-building and ship refitting and repairing, for which there are docks capable of receiving the largest vessels. The Tyne dock has a water-area of 50 acres, the tidal basin of 10 acres, and the quays and yards about 300 acres. Coal from the collieries of the vicinity is largely exported. The trade returns of South Shields are included in the aggregate of the Tyne ports (see Newcastle-upon-Tyne). The South Pier at the mouth of the river is a massive structure about 1 m. in length, and the North Pier protects the river mouth from the Northumberland bank at North Shields. The parliamentary borough returns one member. The corporation consists of a mayor, 10 aldermen and 30 councillors. Area of municipal borough, 2044 acres.

On elevated ground near the harbour are the remains of a Roman fort guarding the entrance to the Tyne, where numerous coins, portions of an altar, and several sculptured memorial stones have been dug up, and testify to its occupation for a considerable

period. The site of the old station was afterwards occupied by a fort of considerable strength, which was captured by the Scots under Colonel Stewart on the 20th of March 1644. The town was founded by the convent of Durham about the middle of the 13th century, but on account of the complaints of the burgesses of Newcastle an order was made in 1258, stipulating that no ships should be laden or unladen at Shields, and that no " shoars " or quays should be built there. Until the 19th century it was little more than a fishing station. In 1832 it received the privilege of returning a member to parliament, and in 1850 a charter of incorporation.

SOUTHWARK, a central metropolitan borough of London, England, bounded N. by the river Thames, E. by Bermondsey, S.E. by Camberwell and W. by Lambeth. Pop. (1001), 206,180. It is a poor and crowded district, and a large industrial popu- lation is employed in the riverside wharves and in potteries, glassworks and other manufactures. There are also large brew- eries, and the Hop Exchange is a centre of the hop trade. The borough is connected with the City of London by Blackfriars, South wark and London bridges; the thoroughfares leading from these and the other road-bridges as far up as Lambeth converge at St George's Circus; another important junction is the " Elephant and Castle." Southwark is a bishopric of the Church of England created by act of 1904 (previously a suffragan bishopric in the diocese of Rochester), and also of the Roman

Catholic Church. The cathedral of St Saviour belonged to the Augustinian priory of St Mary Overy, or Overies (i.e. St Mary over the river), receiving its present name after the suppression of the monasteries. It is cruciform, with a central tower, and has been so restored as to preserve its ancient beauty. Its style is mainly Early English, and among those buried here are Gower, Fletcher and Massinger, the poets, and Edmund, brother of William Shakespeare. The Roman Catholic cathedral of St George is a Gothic building by A. W. Pugin, in St George's Road. Near the " Elephant and Castle " is the Metropolitan Tabernacle, the original building of which, burnt down in 1898, became famous under the Baptist preacher, Charles Spurgeon. The principal benevolent institu- tions are Guy's Hospital, St Thomas's Street, founded in 1721 by Thomas Guy, with an important medical school; and Bethlehem Royal Hospital for the Insane, commonly corrupted to Bedlam, the origin of which is found in a priory of the 13th century founded within the City, beside the modern Liverpool Street. Other institutions are the Evelina Children's Hospital, the Royal Eye Hospital and the Borough Polytechnic Institute. In Newing- ton Causeway is the Sessions House for the county of London (south of the Thames). The Robert Browning Settlement was founded in York Street, Walworth Road, in 1895 and incor- porated in 1903, and in Nelson Square is the Women's University Settlement. The municipal borough includes the western and part of the Bermondsey divisions of the parliamentary borough of Southwark, and the borough of Newington, divided into the western and Walworth divisions; each division returning one member. The borough council consists of a mayor, 10 aldermen and 60 councillors. Area, 1131-5 acres.

The history of Southwark is intimately connected with that of the City of London. At an early date it was incorporated, and its familiar title of " The Borough " still survives. It came, at least in part, under the jurisdiction of the City in 1327. The citizens of London having suffered from the depredations of thieves and felons who escaped into Southwark, petitioned parliament for protection. Accordingly, Edward III., by letters patent, granted them for ever the town and borough, a privilege confirmed by Edward IV. In this connexion was constituted the Bridge Ward Without, the alderman of which is elected not by the borough, but by the other aldermen from among themselves. The authority of the City over the borough is now merely nominal.

The junction in Southwark of the great roads from the south of England for the passage of the Thames sufficiently accounted for the early origin of Southwark. The name is taken from the southward works or fortifications of London. Numerous Roman remains have been found. Southwark witnessed various

episodes during the invasions of the Norsemen, and was fortified by the

Danes against the City in the reign of Ethelred the Unready. Besides the priory of St Mary Overy, there was the hospital of St Thomas, founded in 12 13 from- the neighbouring priory of Bermondsey, and forming the origin of the great modern hospital of the same name in Lambeth (q.v.). The many historical associations of Southwark, contemporary memorials of which are almost wholly swept away, centre upon the district bordering the river, and formerly known as Bankside. In this locality was Winchester House, a seat of the bishops of Winchester for five centuries from 1107. At Bankside were the Bear and the Paris Gardens, used for the popular sport of bear and bull baiting; and the Globe theatre, the scene of the production of many of Shakespeare's plays for fifteen years after its erection in 1599. Southwark was further noted for its inns and its prisons. Among the first, the name of the " Tabard " is well known from its mention by Chaucer in detailing the company of pilgrims for Canterbury. Charles Dickens had an early acquaintance with Southwark, as his father was confined in the Marshalsea, one of several prisons here. The prison, no longer extant, and the church of St George the Martyr, where many prisoners, including Bishop Bonner (d. 1561), were buried, figure in the novel Little Dorrit. The existing church dates from 1736.

SOUTHWELL, ROBERT (c. 1561-1595), English Jesuit and poet, son of Richard Southwell of Horsham St Faith's, Nor- folk, was born in 1560/61. The Southwells were affiliated with many noble English families, and Robert's grandmother, Elizabeth Shelley, figures in the genealogy of Shelley the poet. He was sent very young to the Roman Catholic college at Douai, and thence to Paris, where he was placed under a Jesuit father, Thomas Darbyshire. In 1580 he joined the Society of Jesus, after a two years' novitiate, passed mostly at Tournay. In spite of his youth he was made prefect of studies in the English college of the Jesuits at Rome, and was ordained priest in 1584. It was in that year that an act was passed, forbidding any English-born subject of the Queen who had entered into priest's orders in the Roman Catholic Church since her accession to remain in England longer than forty days on pain of death. But Southwell at his own request was sent to England in 1586 as a Jesuit missionary with Henry Garnett. He went from one Catholic family to another, administering the rites of his Church, and in 1589 became domestic chaplain to Ann Howard, whose husband, the first earl of Arundel, was in prison convicted of treason. It was to him that Southwell addressed his Epistle of Comfort. This and other of his religious tracts, A Short Rule of Good Life, Triumphs over Death, Mary Magdalen's Tears and a Humble Supplication to Queen Elizabeth, were widely circulated in manuscript. That they found favour outside Catholic circles is proved by Thomas Nash's imitation of Mary Magdalen's Tears in Christ's Tears over Jerusalem. After six years of successful labour Southwell was arrested. He was in the habit

of visiting the house of Richard Bellamy, who lived near Harrow and was under suspicion on account of his connexion with Jerome Bellamy, who had been executed for sharing in Anthony Babington's plot. One of the daughters, Anne Bellamy, was arrested and imprisoned in the gatehouse of Holborn. She revealed Southwell's movements to Richard Topcliffe, who im- mediately arrested him. He was imprisoned at first in Topcliffe's house, where he was repeatedly put to the torture in the vain hope of extracting evidence about other priests. Transferred to the gatehouse at Westminster, he was so abominably treated that his father petitioned Elizabeth that he might either be brought to trial and put to death, if found guilty, or removed in any case from " that filthy hole." Southwell was then lodged in the Tower, but he was not brought to trial until February 1595. There is little doubt that much of his poetry, none of which was published during his lifetime, was written in prison. On the 20th of February 1595 he was tried before the court of King's Bench on the charge of treason, and was hanged at Tyburn on the following day. On the scaffold he denied any evil intentions towards the Queen or her government.

St Peter's Complaint with other Poems was published in April

1595 without the author's name, and was reprinted thirteen times during the next forty years. A supplementary volume entitled Maeoniae appeared later in 1595, and A Foure fould Meditation of the foure last things in 1606. This, which is not included in Dr A. B. Grosart's reprint (1872) in the Fuller Worthies Library, was published by Mr Charles Edmonds in his Isham Reprints (1805). A Hundred Meditations of the Love of God, in prose, was first printed from a MS. at Stonyhurst College in 1873. Southwell's poetry is euphuistic in manner. But his frequent use of antithesis and paradox, the varied and fanciful imagery by which he realizes religious emotion, though they are indeed in accordance with the poetical conventions of his time, are also the unconstrained expression of an ardent and concentrated imagination. Ben Jonson told Drummond of Hawthornden that he would willingly have destroyed many of his own poems to be able to claim as his own Southwell's " Burning Babe," an extreme but beautiful example of his fantastic treatment of sacred subjects. His poetry is not, how- ever, all characterized by this elaboration. Immediately pre- ceding this very piece in his collected works is a carol written in terms of the utmost simplicity.

See Dr Grosart's edition already mentioned. Southwell's poems were also edited by VV. B. Turnbull in 1856. A memoir of him was drawn up soon

after his death. Much of the material was incor- porated by Bishop Challoner in his Memoir of Missionary Priests (1741), and the MS. is now in the Public Record Office in Brussels. See also Sidney Lee's account in the Diet. Nat. Biog. ; Alexis Possoz, Vie du Pere R. Southwell (1866) ; and a life in Henry Foley's Records of the English Province of the Society of Jesus. Historic facts illustra- tive of the labours and sufferings of its members in the 16th and 17th centuries, 1877 (i. 301-387). Foley's narrative includes copies of the most important documents connected with his trial, and gives full information of the original sources.

SOUTHWELL, a cathedral city in the Newark parliamentary division of Nottinghamshire, England, 16 m. N.E. of Nottingham by a branch of the Midland railway. Pop. (1901), 3161. The minster church of St Mary became a cathedral on the foundation of the episcopal see in 1884. The see covers the greater part of Nottinghamshire and Derbyshire, with small portions of Leicestershire, Lincolnshire and Staffordshire. The foundation of the earliest church here is attributed to the missionary Paulinus in the first half of the 7th century. Another followed, after the devastations of the Northmen, in 960, on the founda- tion of King Edgar. The building of the present church began in the reign of Henry I. Henry VIII. , after the dissolution of the monasteries, contemplated the erection of the church into a cathedral. The cathedral is a magnificent cruciform building, 306 ft. in length, with massive Norman nave (61 ft. wide), transepts, central and two western towers; and Early English choir with transepts. There is an octagonal chapter house, resembling that at York, exhibiting the Decorated style in highest development. It is connected with the church by a cloister. The archbishops of York had a palace here dating from the 15th century. The "great chamber "was restored in 1882, and since 1904 the building has been converted into a residence for the bishops of Southwell.

The erection of the church at Southwell (Sudwelle, Suwell, Suthwell), probably the cause of the origin of the town, is at- tributed to the archbishop of York in the 7th century. In 958 land at Southwell was granted to the archbishop by Edwy. A detailed description of the great manor is given in Domesday. Southwell remained under the lordship of the see of York until it was taken over by the ecclesiastical commissioners. It was called a borough in the 13th century and down to the 17th, but no charter of incorporation is known. The town never returned representatives to parliament. In the reign of Edward I. the archbishop claimed by prescriptive right a five-days' fair at Pentecost, a three-days' fair at the translation of St Thomas and a Saturday market. Fairs are now held in April and December. The market was still held on Saturdays in 1894, but was then very small.

SOUTHWOLD, a municipal borough and watering-place in the Lowestoft

parliamentary division of Suffolk, England, 12 m. S. by W. of Lowestoft, the terminus of the Southwold railway,

which connects with the Great Eastern at Halesworth. Pop. (1901), 2800. The church of St Edmund's is a Perpendicular flint structure. In 1900 a pier 270 yds. long was constructed, and serves as a calling-place for pleasure steamers. A fine com- mon south of the town is used for golf, lawn-tennis, cricket, and other sports. The town is governed by a mayor, 4 aldermen and 12 councillors. Area, 612 acres.

Southwold (Sudwold, Suwold, Suthwaud) owes its origin and prosperity to its herring fisheries, which were considerable in 1086, while the importance of its harbour increased with the decay of Dunwich. In 1461 the men of the town, tenants of the manor which had been granted by the monks of Bury St Edmunds to Gilbert, earl of Clare, and had passed to the Crown with the honour of Clare, claimed exemption from toll, pontage and similar dues as their prescriptive right. An act of 1489 incorporated the bailiffs and commonalty of the town and exempted them from harbour dues. These liberties were confirmed in 1505 by Henry VII., who also granted the corporation the town and manor to hold at fee-farm with certain rights of jurisdiction. Confirmatory chapters were granted by Henry VIII. , Edward VI., Elizabeth, James I. and Charles II., and the town was governed by a royal charter of 1689 until the Municipal Reform Act of 1835. The weekly market, now the property of the corporation, was granted to the abbot of St Edmunds as lord of the manor in 1227 together with' a yearly fair on the vigil of the feast of St Philip and St James. A fair is still held on Trinity Monday. In 1672 South- wold Bay, usually abbreviated as Solebay, was the scene of a battle between the English fleet under the duke of York and the Dutch under Ruyter, the French fleet holding aloof. The English suffered much, but the Dutch withdrew.

See ' ' Victoria County History ' ' : Suffolk ; T. Gardner, A n Historical account of Dunwich, Blilhburgh and Southwold (ed. 1754).

SOUTHWORTH, EMMA DOROTHY ELIZA NEVITTE (1810- 1899), American novelist, was born in Washington, D-C, on the 26th of December 1819. She studied in a school kept by her stepfather, Joshua L. Henshaw, and in 1840 married Frederick H. Southworth, of Utica, N.Y. After 1843 she supported herself by teaching . Her first story," The Irish Refugee, " was published in the Baltimore Saturday Visitor. Her first novel," Retribution," a serial for the National Era, published in book form in 1846, was so well received that she gave up teaching and became a regular contributor to various periodicals, especially the New York Ledger. She lived in Georgetown, D.C., until 1876, then in Yonkers, N.Y., and again in Georgetown, D.C., where she died on the 30th of June 1899.

Her novels numbered more than sixty ; some of them were trans- lated into German, French and Spanish ; in 1872 an edition of thirty- five volumes was published in Philadelphia. They include The Deserted Wife (1850) ; Mark Sutherland (1853) ; Hickory Hall (1855) ; Unknown (1874); Gloria (1877); The Trail of the Serpent (1879); Nearest and Dearest (1881); The Mother's Secret (1883); An Exile's Bride (1887); The Hidden Hand (1888); and Broken Pledges (1891).

SOUVESTRE, fiMILE (1806-1854), French novelist, was born on the 15th of April 1806. He was the son of a civil engineer, a native of Morlaix. He was by turns a bookseller's assistant, a private schoolmaster, a journalist, and master at the grammar schools of Brest and of Mulhausen. He settled in Paris in 1836, where he was made (1848) professor in a school for the instruction of civil servants. He began his literary career with a drama, played at the Theatre francais in 1828, the Siege de Missolonghi. In novel writing he did much better than for the stage, although he deliberately aimed at making the novel an engine of moral instruction. His best work is undoubtedly to be found in the charming Derniers Bretons (4 vols., 1835-1837) and Foyer breton (1844), where the folk-lore and natural features of his native province are worked up into story form, and in Un Philosophe sous les toils, which received in 1851 a well deserved academic prize. He also wrote a number of other works — novels, dramas, essays and miscellanies. He died in Paris on the 5th of July

1854.

SOUVRE, GILLES DE, Marquis de Courtanvaux, Baron de Lezines (c. i 540-1626), marshal of France, belonged to

an old family of the Perche. He accompanied the duke of Anjc:i to Poland in 1573, and was appointed master of the ward- robe and captain of Vincennes when Anjou became Henry III. He remained in favour, despite the opposition of the queen- mother, Catherine de Medicis, fought at Coutras, defended Tours against the Leaguers, was named chevalier de Saint Esprit and governor of Touraine (1585), and was one of the first to recognize Henry IV. (1589), who subsequently entrusted him with the education of the dauphin. Louis XIII. rewarded him with the title of marshal in 1613. He died in Paris in 1626.

SOUZA-BOTELHO, ADELAIDE FILLEUL, Marquise de (1761-1836), French writer, was born in Paris on the 14th of May 1 76 1. Her mother,

Marie Irene Catherine de Buisson, daughter of the seigneur of Longpre, near Falaise, married a bourgeois of that town named Filleul. It was reported, though no proof is forthcoming, that Mme Filleul had been the mistress of Louis XV. Her husband became one of the king's secre- taries, and Mme Filleul made many friends, among them Marmontel. Their eldest daughter, Julie, married Abel Francois Poisson, marquis de Marigny (1727-1781); Adelaide married in 1 7 7Q Alexandre Sebastien de Flahaut de la Billarderie, comte de Flahaut, a soldier of some reputation, who was many years her senior. In Paris she soon gathered round her a salon, in which the principal figure was Talleyrand. There are many allusions to their liaison in the diary of Gouverneur Morris. In 1785 was born her son Auguste Charles Joseph de Flahaut (q.v.), who was generally known to be Talleyrand's son. Mme de Flahaut fled from Paris in 1792 and joined the society of emigres at Mickleham, Surrey, described in Mine d'Arblay's Memoirs. Her husband remained at Boulogne, where he was arrested on the 29th of January 1793 and guillotined. Mme de Flahaut now supported herself by writing novels, of which the first, Adele de Senange (London, 1794), which is partly autobiographical, was the most famous. She presently left London for Switzer- land, where she met Louis Philippe, duke of Orleans. She travelled in his company to Hamburg, where she lived for two years, earning her living as a milliner. She returned to Paris in 1798, and on the 17th of October 1802 she married Jose Maria de Souza-Botelho Mourao e Vasconcellos (1758-1825), Portu- guese minister plenipotentiary in Paris. Her husband was recalled in 1804, and was offered the St Petersburg embassy; but in the next year he resigned, to settle permanently in Paris, where he had many friends, among them the historian Sismondi. He spent his time chiefly in the preparation of a beautiful edition of the Lusiads of Camoens, which he completed in 1817. Mme de Souza lost her social power after the fall of the First Empire, and was deserted even by Talleyrand, although he continued his patronage of Charles de Flahaut. Her husband died in 1825, and after the accession of Louis Philippe she lived in com- parative retirement till her death on the 19th of April 1836. She brought up her grandson, Charles, due de Morny, her son's natural son by Queen Hortense. Among her later novels were La Comtesse de Fargy (1822) and La Duchesse de Guise (183 1). Her complete works were published in 1811-1822.

See Baron A. de Maricourt, Madame de Souza et safamille (1907) ; Lettres inedites de J. C. L. de Sismondi . . . et de Madame de Souza (Paris, 1863), ed. St Rene Taillandier; Sainte-Beuve, Portraits de femmes (1844); and for Mme de Filleul, MM. de Goncourt, Les Mattresses de Louis XV. (i860) and J. F. Marmontel (1804).

SOVEREIGN, originally an adjective, meaning " supreme," especially having supreme or paramount power. The word in Middle English was

soverain or sovcreyn, and was taken through Old French from Low Latin superanus, chief, principal. The intrusive ” g,” which is due to a popular confusion of the termination of the word with ” reign,” dates, according to Skeat, from about 1 570. The form ” sovran,” borrowed by Milton from Italian sovrano, soprano, is chiefly found as a poetical usage. As a substantive ” sovereign ” is applied to the supreme head of a state (see Sovereignty), and to the standard English gold coin, worth 20 shillings or £1 (see Pound). The gold sovereign was first struck in the reign of Henry VII. (1489); it was of gold of the standard fineness (994-8) and weighed 240 grains. It

bore the figure of the king crowned, in royal mantle, seated on the throne, and holding the sceptre and orb. The sovereign was coined in successive reigns until that of James L, when the name ” unite ” was given to the coin to mark the union of the two kingdoms. The gold coinage of the kingdom was, until 1816, a secondary part of the monetary system, but in that year the silver standard was discontinued and a -gold standard adopted. The sovereign was chosen the new unit of the currency, and the first issue took place in 181 7. Its weight was fixed at 123-274 grains; its fineness at 916-66 or twenty-two carats. These standards of weight and fineness are those still in force. At the same time was issued the half-sovereign, of weight in proportion. The weight of 934I sovereigns is exactly equivalent to twenty Troy pounds, and the weight of each individual sovereign is calculated on this basis. The sovereign is eleven-twelfths pure gold and one-twelfth alloy, copper being usual. The light colour of early Australian sovereigns was due to the use of silver instead of copper. Five-pound pieces were coined in the reigns of Queen Victoria and Edward VII. They were also authorized in the reign of George III. (as were two-pound pieces), but the dies were not completed before the death of that sovereign. Specimens were, however, subsequently struck. There were also some pattern pieces struck in the reign of George IV. Two-pound pieces were issued in the reign of George IV.; they were struck in the reign of William IV., but not issued for circulation; they are current coins of the reigns of Victoria and Edward VII. (See also Mint; Money.)

SOVEREIGNTY. The word sovereignty (Fr. souverainete) is said to be derived from the medieval Latin word supremitas, i.e. suprema potestas, supreme power. (See Skeat’s Etymological Dictionary as to various forms of the w r ord, and Meyer, Lehrbuch des deutschen Staatsrechls, 15, as to its derivation.)

Sovereignty may be viewed in three ways: there is the historical explanation of its origin and growth, its rude beginning in the savage horde, its completion in the modern state; there is the analytical or juridical explanation; there is also what (for want of a better phrase) may be called

the organic explanation of sovereignty.

The following are some of the chief stages in the history of sovereignty: While society is in a rude state or only tribally organized there is no distinct sovereignty, no power which all persons habitually obey. Thus there is no sovereignty among wandering groups of Australian savages: each family is isolated, each horde is a loose and unstable collection. When the horde has become a tribe there may exist no definite sovereign. Distinct in time of war, the power of the chief may be fluctuating and faint in time of peace; even in time of war it may be subject to the authority of a council. Tribes of the same ethnic stock may form a sort of federation, permanent or temporary. " With the council of the con- federacy," it has been said, " and, more generally, in the con- federacy, sovereignty arises and the true political tradition is evolved " (F. H. Giddings, Principles of Sociology, p. 285). When the city and the state are conterminous the seat of sove- reignty becomes defined. Such was the condition of things in Greece, as considered by Aristotle in his Politics. He discusses the question what is the supreme power in the state (3. 10), which he defines as an aggregate of citizens (3. i.), and he recognizes that it may be lodged in one, a few, or many. In his view the distinctive mark of the state is not so much sovereignty (7. 4) as self-sufficiency; a state is not a mere aggregate of persons; it is a union of them sufficient for the purposes of life (7. 8) ; sufficiency being " to have all things and to want nothing " (7. 5. 1). The Roman jurists say little, and only incidentally, as to sovereignty. But in the middle ages, under the influence of the Roman law, and with the belief in the existence of an empire entitled to universal sway, an absolutist theory of sove- reignty was developed in the writings of the jurists who revived the study of that law: the emperor was sovereign; " quod principi placuit legis habet vigorem " (Institutes, i. 2. 6).

Those jurists often justified the plenitudo potestatis conceded to the emperor by the fact that he stood at the bˆad of Christendom.

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Among the theories prevalent in the middle ages was one that mankind formed a unity, with the pope and the emperor at the head of it: the universal Church and the universal emperor ruled the world (Rehm, Geschichte der Rechtswissenschaft, p. 198.) Even to Leibnitz, writing in the 17th century, it seemed that " totam Christianitatem unam velut Rempublicam componere, in qua Caesari auctoritas aliqua competit "

(Opera, 4. 330). When the power of the emperor was weakened, and the idea of a universal ruler was gone, a new test of sovereignty was applied — that of external independence; the true sovereign states were universitates superiorem non recognoscenles. There were times and countries in the middle ages in which the collective power of the community was small: many of the great corpora- tions were virtually autonomous; the central authority was weak; the matters as to which it could count upon universal obedience were few. In such circumstances the conception of sovereignty was imperfect. It has been suggested that the modern conception of it was evolved from the contest between three powers: the Church, the Roman Empire, of which the individual states in Europe were theoretically provinces, and the great landowners and corporations. Whatever may be the truth as to this, the modern theory is first clearly stated in Jean Bodin's book On the Commonwealth (French ed., 1576; Latin version, 1586), which was the first systematic study of sove- reignty. Bodin defines the state thus: " Respublica est famili- arum rerumque inter ipsas communium, summa potestate ac ratione moderata multitude" His theory, which corresponded on the whole to the state of things in France in the time of Louis XL, was a theory of despotism. It may be also described as a type of the mechanical or juridical theory of sovereignty. According to Bodin, there is in the state unlimited one power: " Majestas est summa in cives ac subditos legibusque soluta potestas " (i. 8). There exists a central force from which are derived all the powers which make or give effect to laws; a power which he describes sometimes as " majestas summa potestas summum imperium." This was the conception ex- pressed by Bossuet, " Tout l'etat est en la personne du prince," or in Louis XIV. 's saying, " L'etat e'est moi."

One favourite theory was that sovereignty originated in a social contract. It was assumed that the individual members of society, by express or implied pact, agree to obey some person or persons; sometimes it is described as an unqualified handing over; sometimes it is a transfer subject to qualifications, and with notice that in certain contingencies this will be withdrawn. Gierke, in his book Johannes Allhusius und die Entwickelung der naturrechtlichen Staatslheorie, shows (p. 76) that the conception of a treaty or agreement as the basis of the state was in the middle ages a dogma which passed almost unchallenged, and that this theory was maintained up to a late period. It is to be found in the writings of Thomas Aquinas (De Regimine principum, 266), Marsilius of Padua, Buchanan, J. de Mariana, and F. Suarez. It is the kernel of the theories of Hobbes, Rousseau, Filmer and Locke. Among the clearest and most logical exponents of this theory was Hobbes, who in his Leviathan expounded his notion of an agreement by which absolute power was irrevocably trans- ferred to the ruler. Pufendorf , with some variations, states the same

theory. In his view there is a pactum unionis, followed by a pactum subjectionis. The best-known exponent of this theory of the source of sovereignty is Rousseau, who assumes the exist- ence of a pacle social, the terms of which are: " Chacun de nous met en commun sa personne et toute sa puissance sous la supreme direction de la volonte generale; et nous recevons encore chaque membre comme partie indivisible de tout" (Du Contrat social, 1. c. 6).

It is convenient for the jurist to assume that in every state is one determined or determinable authority in which is vested sovereignty, and from which all other authorities derive their power. The assumption is not true of some states; the legal authority is divided among several persons or bodies. It is at best an unfruitful assumption; and the tendency of students of soci- ology is to treat discussions as to sovereignty much as modern physiologists treat discussions as to " vital force " or " vital

principle." Comte, Spencer, Bagehot, Durkheim and Giddings, for example, refer to it, if at all, only briefly and incidentally; they conceive society as an organism, or at all events as a growing whole, no one part or force being the cause of all others, and all interacting; society is not the product of any agreement or of force alone, but of a vast variety of interests, desires and needs. Now the state or government comes at a certain stage of organization: small groups are drawn together; powerful corporations fall into line; a national feeling develops; eventu- ally the state as we know it is formed. Sovereignty is a resultant of many forces. It may not exist as to some regions of conduct; as to others it may be weak and mutable; only in certain conditions is the sovereign power supreme as to all matters of conduct.

Among the different senses in which " sovereign " has been used are the following: — ■

a. " Sovereign " may mean titular sovereign- -the king in the United Kingdom, the kaiser in Germany.

b. The legal sovereign: the person or persons who, according to the law of the land, legislate or administer the government.

c. The political or constitutional sovereign: the body of persons in whom the actual power at any moment or ulti- mately resides. Sometimes this is designated " the collective sovereignty."

d. Sovereignty is also used in a wider sense, as the equivalent of the power, actual or potential, of the whole nation or society (Gierke, 3- 568).

The distinction between real and nominal sovereignty was familiar to

medieval writers, who recognized a double sovereignty, and distinguished between (1) the real or practical sovereignty resident in the people, and (2) the personal sovereignty of the ruler (Adolf Dock, Der Souveranitalsbegriff, &c, p. 13). By many writers sovereignty is regarded as resident not in any one organ, but in the Gesammlperson of the community (Maitland, Political Theories of the Middle Ages, xliii.).

Sometimes sovereignty is defined as the organized or general will of the community (Combothecra, Conception juridique de l'etat, p. 96). " Sovereignty is the organized will of an organized independent community. . . . The kings and parliaments who serve, as its vehicles." " Sovereignty resides in the community " (Woodrow Wilson, p. 1448). The same theory is often expressed by saying that the majority in a community, or a particular group, in fact, rules (Guizot, Representative Government, i. 167). This was the doctrine of the French Revolution. " Sachez que vous etes rois et plus des rois," said a revolutionary orator cited by Taine. It was the language of the founders of the American constitution and contemporary political writers; the language, for example, of Paine: " In republics such as there are estab- lished in America the sovereign power, or the power over which there is no control and which controls all others, remains where nature placed it — in the people " (Dissertations on Government, i.6) . The same theory assumes a more subtle form, especially in the writings of Hegelians. Sovereignty is with them a term descriptive of the real will of the community, which is not necessarily that of the majority. " If the sovereign power is to be understood in this fuller, less abstract sense, if we mean by it the real determinant of the habitual obedience of the people, we must look for its sources much more widely and deeply than the analytical jurists do; it can no longer be said to reside in a deter- minate person or persons, but in that impalpable congeries of the hopes and fears of a people bound together by common interest and sympathy, which we call the common will " (Green's Works, 2. 404). " Though it may be misleading to speak of the general will as anywhere, either actually or properly, sovereign . . . yet it is true that the institutions of political society are an expression of, and are maintained by, the general will " (2. 409). Sovereignty is used in a further sense when Plato and Aristotle speak of the sovereignty of the laws (Laws, 4. 715; Politics, 4. 4; 3. 15). Thus Plato remarks: " I see that the state in which the law is above the rulers, and the rulers are the inferiors of the law, has salvation." (See also Gierke, Genossenschaftsrecht, 3. 8.) Even in medieval writers, such as Bracton, is found the notion

that the king is subject to the laws: " Bracton knows of no sovereign in the Austinian sense, and distinctly denies to the royal authority the attribute of being incapable of legal limita- tion " (J. N. Figgis, The Divine Right of Kings, p. 13). We find the same expressed by many German jurists, i.e. the idea of a state which exists only in the law and for the law, and whose life is but by a legal order regulating public and private relationship (Gierke iii., x.).

Among the definitions of sovereignty may be quoted these: " That which decides in questions of war and peace, and of Definitions making or dissolving alliances, and about laws and ofSove- capital punishment, and exiles and fines, and audit reignty. Q £ acC qunts and examinations of administrators after their term of office " (Aristotle, Politics, 4. 4. 3). " Suprematum illi tribuo qui non tantum domi subditos manu militari regit, sed et qui exercitum extra fines ducere et armis, foederibus, legationibus, ac caeteris juris gentium functionibus aliquid momenti ad rerum Europae generalium summam conferre potest " (Leibnitz, Opera, 4. 333). " La souverainete est celle qui sert a exprimer l'independance d'un etat aussi bien a l'interieur qu'a l'exterieur " (F. de Martens, Traite du droit international, translated by A. Leo, 1883, i. 378). " L'independance complete qui peut se manifester a deux points de vue; Fun exterieur, Fautre interieur " (Frentz Despagnet, Droit international public, 1894, p. 80). " Sovereignty as applied to states imports the supreme, absolute, uncontrollable power by which any state is governed " (T. M. Cooley, Constitutional Limitations, p. 1). " Social control, manifesting itself in the authoritative organization of society as the state, and acting through the organs of government, is sovereignty " (Giddings, Elements of Sociology, p. 217). The sovereign is " Absolut unabhangig und nur durch sich selbst beschrankt und beschrankbar " (Zorn, Vblkerrccht, p. 4. See the collection of definitions in Der Souveranitdtsbegrif im, Bodin, &c, by Dr Adolf Dock (1897), p. 6, and in La Conception juridique de Vetat, by Combothecra, p. 90). Many of these definitions describe an ideal state of things rather than realities. Some of the definitions would apply to the authority of powerful religious bodies in certain periods of history, or of illegal associations, such as the Mafia, which have terrorized the community.

Territorial sovereignty is used in a variety of senses. Often the phrase is the equivalent of sovereignty. It may mean a state of things such as existed in the middle ages, in which ownership and sovereignty were not clearly separated: when he who was owner had sovereign rights incident thereto, or, as it was some- times phrased, when sovereignty inhered in the territory, when the king was the supreme landowner (Maine, Ancient Law, p. 106; Figgis, pp. n, 14) ; when all political power exhibited proprietary traits, and was incident to the ownership of land (Maitland, Township and Borough, p. 31). Territorial sovereignty is thus defined by Leibnitz: " Superioritatem

territorialem in summo subditos coercendi jure consistere " {Opera, 4. 358. See Laband, 1. c. 8).

Certain propositions are often stated with respect to sove- reignty. One of them, stated by Rousseau (Dm Contrat social, 2. c. 2), is that it is indivisible: a proposition true in Sovere/rai , i'. l ˆ e sense that i n regard to the same matters at the same time there cannot be two sovereigns, but not true in the sense in which it has often been employed, namely, that in the last analysis of society there are some persons or person who control all conduct and are habitually obeyed as to all matters. Rather we may say with Maine, " Sovereignty is divisible, but independence is not." To hold sovereignty not to be divisible is for juridical purposes not a working theory; states part, permanently or temporarily, with few or many of the rights and powers comprehended in sovereignty; to speak of it as undivided in the case of Crete, Egypt or Tibet is to do violence to facts.

A frequent deduction from the theory of the indivisibility of sovereignty is that there cannot be double allegiance; in other words, no one can be the subject of two states. This deduction is not in fact true. With the existing differences in the laws of

modern states as to nationality, persons may be, and are, subjects of two or more states. In the native states in India there may be said to be double allegiance. C. L. Tupper, in his Our Indian Protectorate, refers to " the double allegiance of the subjects of native states " in India; and he explains that the native rulers are themselves subject to the Indian government. " For all purposes of our relation with powers the subjects of Indian native states must be regarded as subjects of Her Majesty " {Our Indian Protectorate, 1893, p. 353). Such double allegiance is apt to exist in times of transition from one sovereignty to another; for example, in the 18th century, in the British possessions in India, the Mogul was said to exercise a personal sovereignty. As Sir William Scott remarked in the Indian Chief, 3 C. Rob. 22, it hardly existed otherwise than as a phantom : the actual authority to be obeyed was exercised by the East India Company. The natives of protected states owe not only allegiance to them, but also certain duties, ill defined, to the protecting state.

Another deduction from the same proposition is that any corporation or private body which appears to exercise sovereign powers together with the state does so only by delegation. This theory is thus stated by Burke {Works, 7. 289) with reference to the East India Company: " The East India Company itself acts under two very dissimilar sorts of power, derived from two sources very remote from each other. The first source of its power is under charters which the Crow T n of Great Britain was authorized by act of parliament to grant, the other is from several charters derived from

the emperor of the Moguls …. As to those of the first description, it is from the British charters that they derive a capacity by which they are considered as a public body, or at all capable of any public function. . . . This being the root and origin of their power, renders them responsible to the party from whom all their immediate or consequential powers are derived."

A further proposition often stated with respect to sovereignty is that it is unlimited: a proposition which is not true of the legal or political sovereign. In all states are limits, more or less definite, to such powers, according to the character of the subjects and the relations of the state to foreign powers. Even despotism is tempered by assassination and the liability of revolution (Dicey, Law of the Constitution, 6th ed., p. 75). A third proposition, often expressed with respect to sovereignty, is that it cannot be alienated: a proposition thus stated by Rousseau: " Je disque la souverainete, n'etant que l'exercisede la volonte generate, ne peut jamais s'aliener " {Du Contrat social, 2. 1 ; Figgis, p. 89).

According to one view, sovereignty is not the distinctive note of a state. Many communities usually regarded as true states do not possess it. There are sovereign and non-sovereign states; international law recognizing both. In the view of many writers sovereignty is not a necessary attribute of a state (Laband, Das Staalsrecht des deulschen Reiches, 1. 87; Jellinek, Die Lehre von den Staatenverbindungen, p. 37 ; Meyer, Lehrbuch des deutschen Staatsrechtes, p. 5; Ullmann, Volkerrecht, 29. See the contrary view presented by Professor Burgess, Political Science or Consti- tutional Law, i. 52; Political Science Quarterly, 3. 123; Georges Streit, Revue de droit international, 1900, p. 14). Any division or classification of states must be imperfect. The fact is that there may be an indefinite number of what Merignhac (i. 204) terms political " collectivites secondaires "; that the attributes summed up in sovereignty may be separated and divided in many ways; that there may be new forms of combinations, between states or parts of states; and that their morphology is subject to no hard and fast rules.

The phrase half sovereign states was invented by J. J. Moser to describe states possessing some of the attributes of sovereignty, Under this class are grouped very diverse communi- j/ a // ties. There are states which possess some attributes Sovereign of sovereignty, but no others; states possessing Siates – internal autonomy, but not externally independent ; states which are more or less under the influence of others. There are also states which have certain of the attributes of sovereignty, but are subject to servitudes or burthens imposed by treaty, usage,

or force. Feudalism had a phraseology to express the varieties of fiefs which existed under it; modern international law has no generally-accepted terminology for the still greater variety of states which now exist. These varieties tend to multiply, and it is difficult to reduce them all to a few types. The theory that states are equal, and possess all the attributes of sovereignty, was never true. It is still more at variance with the facts in these days when a few great states predominate, and when the contact of western states with African and Asiatic states or communities gives rise to relations of dependence falling short of conquest. The division into federations, confederations and alliances is not complete. Jellinek has suggested this classification (Die Lehre von den Staatenverbindungen, p. 58): (a) Unorganized associations, including — (1) treaties; (2) occupation of the territory of one state and administration by another, as in Bosnia and Cyprus; (3) alliances; (4) protectorates, guarantees, perpetual neutrality; (5) Der Staatenstaat, the feudal state, of which Jellinek gives the Turkish Empire and the old Holy Roman Empire as examples, (b) Organized associations, including — (1) international commissions (Internationale Verwaltungsvereine, such as international postal and telegraph unions, &c); (2) the Staatenbund or confederation of states; (3) real unions of states as distinguished from personal; (4) the Bundesstaat or federal state. 1 Most of the existing varieties may be conveniently ranged in the following classes: —

1. States which have complete independence, complete autonomy, external and internal, and which are recognized in international law as sovereign states.

2. States which have complete external independence, but are more or less subject permanently to other states as to their internal affairs. Of this class there are now few examples. Per- haps, however, such states as permit, permanently or normally, of interference by others on behalf of certain classes of subjects may.be so described. The general principle is that a treaty does not detract from sovereignty. As Jellinek expresses it. " Der Staatenvertrag bindet, aber er unterwirft nicht " (Gesetz und Verordnung, p. 205); or as Grotius (1. ch. 3, 22, 2) expresses it, " Nee regi aut populo jus demit summi imperii."

3. States which enjoy complete autonomy as to internal affairs, but which are more or less subject to other states as to foreign relations. Some writers would place in this category all states forming part of a true confederacy. It includes states which are united temporarily — cases of inorganic unity, to use Jellinek's expression. It includes also permanent alliances or organic unions. These are some examples: —

a. Protectorates and Suzerainties. — The status of certain states, such as Bulgaria and Rumania and the late South African Republic, were peculiar. Even before the independence of the two first- named states, they undoubtedly were for many purposes sovereign.

b. The unions between a superior and inferior state, e.g. the re- lations of the various states to the old Holy Roman Empire; the relations of the Ottoman Porte to its Christian provinces. In the middle ages the question was often mooted whether states subject to feudal superiors, or the states forming the empire, were sove- reign. According to one common definition they were not: a true sovereign state was universitas quae non superiorem recognoscit. " Celui est absolument souverain qui ne rien tient apres Dieu que del'espee. S'il tient d'autruiil n'est plus souverain." The prevalent opinion, however, was that sovereignty was compatible with rights such as were possessed by the Reich over the princes of Germany; that there might be fiefs held in full sovereignty; and that vassal states, when subject only to " nude vassalage," were sovereign. That was the view of Grotius (1. 1. ch. 3, 23. 2), who holds that the nexus feudalis is consistent with summum imperium.

4. States which have, by treaty or otherwise, parted with some portion of their sovereignty and formed new political units: what Herbert Spencer calls " compound political heads," or, to use Austin's expression, " composite states." The most important examples of this class consist of federal or composite states which by treaty or otherwise have surrendered certain of their powers, or which have created a new state (Staatenbund). For many years one of the burning questions in the politics of

*1 The distinction between the Staatenbund and the Bundesstaat is discussed in the articles Con*ederation andiFEDERAL Govern- ment.*

the United States was the question whether the individual states of the Union remained sovereign. According to the theory of J. C Calhoun, the states had entered into an agreement from which they might withdraw if its terms were broken, and they were sovereign. According to the theory expounded in the Federalist, the individual states did not, after the formation of the constitu- tion, remain completely sovereign: they were left in possession of certain attributes of sovereignty, while others were lodged in the Federal government; while there existed many states, there was but one sovereign. Even if the origin was a compact or contract, after the " United States " were formed by a " consti- tutional act " there no longer existed a mere contractual relation: there existed a state to which all were subject, and which all must obey (von Stengel, Staatenbund und Bundesstaat; Jahrbuch fiir Gesetzgebung, 1898, p. 754; Cooley, Principles of Constitutional Law, pp. 21, 102). According to Austin: " In the case of a

composite state or a supreme federal government, the several united governments of the several united societies together with a government common to these several societies, are jointly sovereign in each of these several societies and also in the larger society arising from the federal union, the several governments of the several united societies are jointly sovereign in each and all " (5th ed., vol. i. p. 258). In point of fact, there are fields of action in which A is sovereign, others in which B is sovereign, and certain others in which A and B are jointly or alternately sovereign. To take the American constitution, for example, the states are sovereign as to some matters, the Federal government as to others.

5. Another division includes anomalous cases, such as Cyprus or Bosnia, in which one government administers a country as to which another state retains certain powers, theoretically large.

6. The territories governed or administered by chartered companies form a class by themselves. Nominally such com- panies are the delegates of some states; in reality they act as if they were true sovereigns.

7. Two other classes may be mentioned: (a) cases of real union between states, e.g. that between Austria and Hungary; (b) personal unions, distinguished from the above-named forms — for example, the union of Great Britain and Hanover.

8. A small group consists of instances of condominium or arrangements similar thereto; for example, the arrangements as to the Samoa Islands from 1889 to 1899.

According to modern usage the appellation " sovereign state " belongs only to states of considerable size and population exer- cising without control the usual powers of a state, e.g. able to declare peace or war. Leibnitz, discussing this subject in his Tractatus de jure suprernatus (Opera, 4. 362), says: " Itaque valde etiam dubito, an possit Reipublicae illi Italiae, quam vocant Sancti Marini oppidum, concedi suprernatus, Slzeot tametsi jure liberam esse nemo negat," a remark State. which would apply also to the .republic of Andorra: " Illi tantum vocantur souverains ou potentats, qui territorium majus habent, exercitumque educere possunt; atque hoc demum illud est, quod ego voco suprematum, et Gallos quoque arbitror, cum de rebus ad jus gentium spectantibus, pace, bello, foederibus sermo est, et ipsi aliquos vocant souverains, eos non de urbibus liberis loqui, nee exiguorum territoriorum dominis, quae facile dives Mercator sibi emere potest, sed de majoribus illis potestatibus, quae bellum inferre, bellum sustinere, propria quodammodo vi stare, foedera pangere, rebus aliarum gentium cum auctoritate intervenire possunt " (4. 359).

With this view, may be compared that of a writer in the Law Magazine (1899) xxv. 30, who argues that the republic of San Marino is a state in the full sense.

It is sometimes suggested that self-governing colonies are to be regarded as true states. Undoubtedly some of them can no longer be regarded as colonies in the old sense. The Co/on ; es> self-governing colonies forming part of the " multi- cellular British state," as F. W. Maitland describes it (Political Theories of the Middle Ages, p. x.), have an essentially " state-like character." If Liberia is a state, the same may surely be

said of Canada. It is true the British colonies have not the power of declaring war or peace, or regulating the foreign policy of the empire; and the Crown may disallow a measure passed by the dominion parliament (J. G. Bourinot, Constitution of Canada, 188S, p. 75; A. H. F. Lefroy, Legislative Power in Canada, 244) . Colonial legislatures are said to have delegated powers. It is more accurate to say that as to certain matters the legislature of the Canadian Dominion is sovereign, and as to certain others that it is not (Lefroy, 244 ; Quick and Garran, Australian Common-wealth, 328; Dicey, 106); and as to some matters they are in fact, if not in form, universitates superiorem non recognoscentes (Quick and Garran, 319); or that they are states in process of making. Occasionally the expression " subject of a colony " is now used (Low v. Rouiledge, L.R. 1 Ch. 42; Lefroy, Legislative Power in Canada, 329). It has been decided by the judicial committee of the Privy Council that the colonial legislatures are not mere delegates of the Imperial parliament (A. B. Keith, Responsible Government in the Colonies, p. 81). At all events, the self-govern- ing colonies may be classed as " half sovereign states " or " quasi- sovereign."

Many attempts have been made to enumerate the attributes of sovereignty, i.e. the regalia, prerogatives, &c, as they were Attributes called. For example, Bodin gives a list of the of Sove- properties of majestas or sovereignty: (a) "Legem reigaty. universis, &c, singulis civibus dare posse; (b) bellum indicere aut pacem inire; (c) to appoint and change magistrates; (d) power of final appeal; (e) power of pardon; (/) raising revenue; (g) coining money " {De republica, vol. i. ch. 10). Leibnitz, with the middle ages in view, divides the attributes or faculties into two classes: regalia majora and regalia minora. Hobbes {Levia- than), analysing these attributes, enumerates twelve attributes. " These," he says, " are the marks which make the essence of sovereignty, and which are the marks whereby a man may dis- cover in what man, or assembly of men, the sovereign power

is placed or resideth." He also describes them as " inseparable rights." Bluntschli (Allgemeine Staatslehre, i. 575) enumerates these attributes: (a) right of recognition of majestas; (b) independence; (c) power to determine constitution; (d) right of legislation; (e) action through deposed organs; (/) irre- sponsibility. All of these enumerations are open to the objection that they merely describe the action of the state at a particular time, or indicate a theory of what an ideal state should be.

Authorities. — The literature of the subject is immense; every book on political science, from Republic of Plato and the Politics of Aristotle, has dealt with or touched sovereignty. A few of the chief modern works are: J. C. Bluntschli, Allgemeine Staatslehre (Munich, 1852); Otto Gierke. Das deutsche Genossenschaftsrecht (Berlin, 1863- 1881); J. Austin, Lectures on Jurisprudence (3rd ed., London, 1869); S ; r H. Maine, " Minute on the Kathiawar States" (1864; printed in Life and Speeches, p. 320) and Early History of Institu- tions (1875); P. Laband, Staatsrccht des deutschen Reiches (Freiburg- im-Breisgau and Tubingen, 1876); R. von Mohl, Encyclopadie der Staatswissenschaften (2nd ed., Tubingen, 1872); O. Gierke, Johannes Althusius (Breslau, 1880); G. Jellinek, Die Lehre von den Staatsver- bindungen (Vienna. 1882); G. Meyer, Lehrbuch des deutschen Staats- rechts (Leipzig, 1878); H. Rosin, Souveranitatstaat (1883); K. Gareis, Allgemeines Staatsreckt (1882); T. M. Cooley, Constitutional Limita- tions (6th ed., 1890); Jellinek, Ueber Staatsfragmente (1896); J. B. Westerkamp, Staatenbund und Bundesstaat (Leipzig, 1892); J. R. Green's Works (London, 1892); W. \V. Fowler, City State of the Greeks and Romans (London, 1893); Salomon, L'Occupation des territoires sans maltres (Paris, 1896); A. V. Dicey, Law of the Constitution (6th ed., 1902); X. Combothecra, La Conception juridique de Vital (1899); H. Rehm, Allgemeine Staatslehre 1899); Franklin H. Giddings, Principles of Sociology (3rd ed., New York, 1899); J. \V. Burgess, Political Science and Constitutional Law (Bos- ton, 1899) ; C. K. Merriam, History of the Theory of Sovereignty since Rousseau (New York, 1900) ; J. Bryce, Studies in History and Jurisprudence (2. Essay x. 1901); K. Bornhak. Einseitige Abhangigkeitsvcrhahnisse unter den modernen. Siaaten (1896); W. W. Willoughby, The Nature of the State {New York, 1896); Clauss, Die Lehre von den Staatsdiensibarkeiten (1894); Bosanquet, The Philosophical Theory of the State (1899); J. B. Moore, Digest of International Law (Washington, 1906), i. 18 seq.; " Notes on Sovereignty," American Journal of International Law 1907), i. 105; W. B. Keith, Responsible Government in the Colonies (1909) ; T. Baty, International Law (1909). (J. M.)

SOWAR (Hind, and Pers. suwar, a horseman), the name in Anglo-Indian usage for a horse-soldier belonging to the cavalry troops of the native armies of British India and the feudatory states. It is also used more

specifically of a mounted orderly, escort or guard.

SOWERBY, JAMES (1757-1822), English natural-history artist, was born in London on the 21st of March 1757. He became a student at the Royal Academy, and subsequently taught drawing, but soon applied his art to the illustration of botanical and conchological works, and became distinguished by the publication of his English Botany (36 vols., 1790-1814), and British Mineralogy (5 vols., 1804-1817). He likewise planned and carried out for a number of years the classic geological work intended to describe and illustrate the British fossils, and en- titled The Mineral Conchology of Great Britain (7 vols., 181 2- 1846). This was issued in parts, with the assistance first of his elder son, J. de C. Sowerby, and, after J. Sowerby's death (Oct. 25, 1822), of his second son, G. B. Sowerby, both the sons being themselves expert palaeontologists. The Sowerby col- lection, consisting of about 5000 fossils, was purchased by the British Museum in i860.

The elder son, James de Carle Sowerby (1787-1871), was in 1838 one of the founders of the Royal Botanic Society, and was its secretary for thirty years. He supplied the plates and part of the text to the Supplement to English Botany (4 vols., 1831-1849); but his most important work related to palaeon- tology, as he identified and in many cases described the invertebrate fossils fqr papers by Buckland, Sedgwick, Fitton, Murchison and others in the Transactions of the Geological Society of London.

The younger son, George Brettingham Sowerby (1788-1854) was author of The Genera of Recent and Fossil Shells (1820-1825), and one of the editors of the Zoological Journal (18 2 5-1826). His son, G. B. Sowerby (1812-1884), author of the Conchological Manual (1839; 4th ed., 1852), and grandson G. B. Sowerby (b. 1843), a distinguished student of the Mollusca, inherited the family talent for natural history.

SOWERBY BRIDGE, an urban district in the Sowerby parliamentary division of the West Riding of Yorkshire, England, 3 m. S.W. of Halifax by the Lancashire & Yorkshire railway. It is situated on both sides of the river Calder, at the termination of the Rochdale canal. Christ Church, dating from 1526, was rebuilt in 1819. The town is almost entirely a growth of the second half of the 19th century. It possesses worsted and cotton mills, iron works, dye works and chemical works. The separate urban district of Sowerby adjoins to the south-west. Pop. (1901), Sowerby Bridge, 11,477; Sowerby, 3653.

SOWING (from " to sow," O. Eng. sawan, cf. Du. zaaijen, Ger. sden, &c; the root is seen in Lat. serere, cf. "seed"), in agriculture, the planting of seed for the raising of crops. The scattering of seed by hand is the simplest

and oldest method of delivering seed to the earth, and is still preferred by some farmers and in certain circumstances. The sower carries the receptacle for the seed, a zinc " seed-lip," seed-sheet or basket, slung over his shoulder, and walking up and down the ridges of the field scatters handfuls of grain with a semicircular sweep of the arm across the body. The " casts " must not overlap too much, the seed must not fall more thickly at one point of the cast than at another, and the standard of seeding per acre must be rigidly adhered to; hence manual-sowing demands con- siderable skill and experience. It is still preferred in some districts for the sowing of corn crops; and in some cases the plough is followed by a furrow-presser, the seed falling into the hollows made by it, though under ordinary circumstances the face of the field as left in " seams " by the furrow-slices from the plough is in a suitable condition for broadcasting. So well, indeed, is the ploughing done in many countries that broadcasting gives perfectly good results, and broadcasting machines reaching up to 15 ft. wide are in common use in place of hand-sowing, as these get over the ground more quickly and deposit the seed more regularly than an ordinary work- man does by hand.

It was long recognized that the precision which is of the essence of good sowing could be better attained by mechanical means, and as early as 1662 a sowing-machine was invented by Joseph Locatelli in Carinthia. In England the early history of mechanical sowing is chiefly connected with the name of Jethro Tull, who about 1730 invented the corn-drill. 1 Cooke's drill brought out in 1783 was the definite precursor of the modern drill. The drill, besides depositing the seed at a uniform depth, sows it in parallel rows at equal distances from one another and thus makes possible the use of the horse hoe and facilitates the suppression of weeds amongst growing crops, the latter advan- tage being specially marked in the case of root crops. The "cup-feed" and the "force-feed" are the commonest and most generally useful types. The cup-drill consists of a long box carried upon wheels and divided diagonally into two sections by a partition. The forward section contains the seed which drops through apertures, the size of which can be regulated by slides, to the bottom section. A spindle geared to the ground- wheels by cogs passes longitudinally through the centre of this section and carries disks, round the rims of which are fitted small cups. As the horses pull the drill forward, the spindle and disks revolve and the cups scoop up the seed and pour it into the funnels; thence it proceeds down a series of tubes or " spouts " and drops into shallow furrows traced by small coulters travelling immediately in front of the streams of seed. The coulters can be raised or lowered by levers and are kept down to their work by

weights or pressers, which can be regulated according as deep or shallow sowing is required.

Fig. 1. — Rear view of Corn and Fertilizer Single Disk Drill.

In the force-feed type of drill the seed falls through apertures in the bottom of the seed-hopper into funnels, through which extends a shaft carrying bowl-shaped wheels, one for each (fig. 1). These

wheels are either spirally- grooved inside or else cogged and serve to feed the seed regularly into the tubes. Instead of coulters, the drill is often fitted with shoes or revolving disks, similar in action to those of the disk-harrow. The tooth and brush pinion, the per- forated disk and the chain feed drills, are other types differentiated according to the method by which the seed is " fed " from the

Fig. 2. — Disk Coulter.

hopper and the kind of crop being sown.

Liquid-manure drills distribute chemical manure mixed with water and are often fitted with a seed-box for root seeds, the manure and the seed being deposited through the same spout. Drills are also made in which dry fertilizers may be deposited with the seed in a similar manner.

The wheelbarrow seeder, a long box pierced with openings and carried transversely on a skeleton wheelbarrow, is used for sowing grass seed.

1 The machine devised by Josiah Worlidge about 1669 was ineffective in practice and differed totally in structure from that of Tull.

In the United States the maize or Indian-corn crop exceeds all others in value, and machines used in planting and handling this crop are of great importance. Corn (maize) is sometimes listed or planted in a continuous row like wheat, and for this purpose a machine known as a lister is employed.

In its general construction this machine is a sulky plough, having a double mould-board, which turns the furrow in both directions. Immediately behind the plough is a sub-soiler for deepening the furrow and penetrating to the moist soil below the surface. A seed- box is mounted on the plough beam, and is provided with a feed-plate operated by a shaft geared to one of the wheels. The seed is

Fig. 3. — Maize Lister.

delivered to the furrow in rear of the mould-boards and covered by two shovels fixed behind which turn the soil back into the furrow.

It is, however, more common to plant maize in hills, which are spaced equally from each other and form rows in both directions, so that a cultivator may be driven between them. This work is done by a machine called a check-row corn planter.

In using the corn planter, a wire, having buttons attached thereto, at intervals corresponding to the distance between the hills, is first stretched across the field and anchored at its ends. This wire is then placed upon the guide rollers at the side of the machine and passes between the jaws of a forked lever, which is connected at its other end with a rock-shaft passing across the machine and serving to oscillate a feed-plate in the bottom of each seed-hopper. As the buttons on the check-wire strike the forked lever, the latter is drawn to the rear and causes the feed-plate to drop the seed through the tubes into the open space between the plates of the furrowing shoe. A reel at the rear of the machine is used to take up the check-wire as the planter progresses.

In another corn planter the check-wire is dispensed with, and the machine is provided with a shaft carrying two reels, the blades of which are at a distance apart equal to the distance between the hills of corn, and thus measure the intervals at which the corn is to be dropped. A rod, extending from the side of the machine, and carrying a small wheel, marks the next row and serves as a guide to the driver.

See J. B. Davidson and L. W. Chase, Farm Machinery and Farm Motors, p. 132 (New York, 1908).

SOYER, ALEXIS BENOIT (1800-1858), French culinary artist, was born at Meaux-en-Brie, France, in October 1809. After five years' apprenticeship as a cook near Versailles, he was engaged by a well-known Paris restaurateur, and soon became chief cook. Leaving France at the revolution of 1830, he went to London and joined his brother in the kitchen of the duke of Cambridge. Subsequently he was cook in several noblemen's kitchens, and in 1837 was made chef to the Reform Club, London. In 1847, having written several letters to the press on the famine in Ireland, he was commissioned by the government to establish kitchens in Dublin. In 1850 he resigned his position at the Reform Club, and the following year opened Gore House, Kensington, as a restaurant, but this venture did not prove a success. In 1855 he offered, through the medium of The Times, to proceed at his own expense to the Crimea and advise on the cooking for the British army there. His services were accepted by the government. On returning from the front he lectured at the United Service

Institution on cooking for the services, and reformed the dietary of the military hospitals, and of the emigration commissioners, He

died in London on the 5th of August 1858. Soyer was the inventor of an army cooking wagon, and the author of a variety of cookery books. His wife, Elizabeth Emma Soyer, achieved considerable popularity as a painter, chiefly of portraits.

SOZOMEN, the name of a famous 5th-century church his- torian. Hermias Salamanes (Salaminius) Sozomenus (c. 400- 443) came of a wealthy family of Palestine, and it is exceedingly probable that he himself was born and brought up there — in Gaza or the neighbourhood. What he has to tell us of the history of South Palestine was derived from oral tradition. His grandfather, he tells us, lived at Bethel, near Gaza, and became a Christian, probably under Constantius, through the influence of Hilarion, who had miraculously healed an ac- quaintance of the grandfather, one Alaphion. Both men with their families became zealous Christians. The historian's grandfather became within his own circle a highly esteemed interpreter of Scripture, and held fast his profession even in the time of Julian. The descendants of the wealthy Alaphion founded churches and convents in the district, and were par- ticularly active in promoting monasticism. Sozomen himself had conversed with one of these, a very old man. He tells us that he was brought up under monkish influences and his history bears him out. As a man he retained the impressions of his youth, and his great work was to be also a monument of his reverence for the monks in general and for the disciples of Hilarion in particular. After studying law in Beirut he settled down as an advocate in Constantinople, where he wrote his EKK\r)

It is probable that Sozomen did not approve of Socrates's freer attitude towards Greek science, and that he wished to present a picture in which the clergy should be still further glorified and monasticism brought into still stronger pro- minence. In Sozomen everything is a shade more ecclesiastical — but only a shade — than in Socrates. Perhaps also he wrote for the monks in Palestine, and could be sure that the work of his predecessor would not be known.

Sozomen is an inferior Socrates. What in Socrates still betrays some vestiges of historical sense, his moderation, his reserve in ques- tions of dogma, his impartiality — all this is wanting in Sozomen. In many cases he has repeated the exact words of Socrates, but with him they have passed

almost into mere phrases. The chronological scrupulosity of the earlier writer has made no impression on his follower; he has either wholly omitted or inaccurately repeated the chronological data. He writes more wordily and diffusely. In his characterizations of persons, borrowed from Socrates, he is more dull and colourless. After Socrates he has indeed repeated the caution not to be too rash in discerning the finger of God; but his way of looking at things is throughout mean and rustic. Two

souls inhabit his book; one, the better, is borrowed from Socrates; another, the worse, is his own. Evidence of a boundless credulity with regard to all sorts of monkish fables is to be met with every- where. It must, however, be noted that for the period from Theo- dosius I. onward he has emancipated himself more fully from Socrates and has followed Olympiodorus in part, partly also oral tradition ; and here his statements possess greater value.

Sozomen also wrote an Epitome of History from the Ascension of Christ to the defeat of Licinius (323) which is not now extant (see his History, i. 1).

For bibliography see the article on the church historian, Socrates. Most of the editions and discussions named there cover Sozomen as well (the volume of Hussey's edition containing Sozomen appeared in i860). The latest English translation, revised by Hartranft, is published in the Nicene and Post-Nicene Fathers, 2nd series, vol. ii. In addition see Nolte in the Tubing. Quartalschr . (1861), p. 417 sqq. ; C. de Boor, " Zur Kenntniss der Handschriften der Griech. Kirchenhistoriker," in Zeitschrift fur Kirchengeschichie, vi. 478 sqq.; Sarrazin, " De Sozomeni historia num integra sit," in the Commentationes philologae jenenscs, i. 165 sqq.; Rosenstein, " Krit. Untersuchungen iiber d. Verhaltniss zwischen Olympiodor, Zosimus und Sozomen," in Forsch. z. deulschen Gesch., vol. i. ; Batiffol, " Sozomene et Sabinos," in Byzant. Zeitschr. vii. 265 sqq. (A. Ha. ; A. C. McG.)

SPA, a town, of Belgium, lying less than 20 m. S.E. of Liege and in the same province, famous for its mineral springs, which are reputed to be the oldest known in Europe, having been first discovered in 1326. They are supposed to have given the common name of " spa " to such resorts. The town is situated 850 ft. above sea-level and the heights above the valley reach noo ft. In the 18th century it was the most fashionable resort in Europe for the medicinal use of such waters, being visited by Peter the Great of Russia, Gustavus III. of Sweden, and Joseph II. of Austria. In 1807 much of the town was burned down, while the principal buildings, the Casino and the Pouhon, are quite modern. Spa has not held its own with its many French and German rivals, but it still attracts about 20,000 visitors annually. Pop. (1904), 7759.

SPACE AND TIME, in philosophy. The metaphysical problems connected with Space and Time are so similar and have been so closely conjoined in the history of thought that they may well be treated together. They are clearly distinguishable from the psychological, which relate to the modes whereby our spatial and temporal conceptions have been formed and to the analysis of the materials of which they are composed (see Psychology). In an exhaustive treatment of Space and Time by far the largest share of the work rests with the psychologist. The business of the metaphysician is to determine what reality outside our rninds corresponds to our temporal and spatial conceptions.

The first tendency of thought is to treat Space and Time as having objective existence in the same way as the ordinary things that compose our world, and this we may call the objective method. Simple as it appears to be, it discloses formidable difficulties, which may be illustrated by a consideration of Newton's famous account of " absolute, true and mathematical time " as something which " in itself and from its own nature flows equally " and with no liability to change. Now, if mathe- matical time as thus described is merely an abstraction used to facilitate mathematical calculations, no objection can be taken to it. But if Newton meant to assert that Time is a flowing stream no less actual than the Thames, his assertion is open to fatal objections. All admittedly real streams, such as the Thames, have a definite beginning and an ending. But where is the source of Time and where is its outlet? Every real stream has boundaries at its sides. What are the boun- daries of Time? Every real stream has certain definite quali- ties: water is rather heavy and translucent, and produces certain effects upon bodies plunged into it. What are the specific qualities of Time? How are things in time affected by their immersion in time so as to be different from things not in time? And if it be asserted that time has such specific qualities, by what senses do we perceive them? We may fairly assume that none of these questions can be answered intelligibly by one who holds the Newtonian position. And thus we are justified in the conclusion that time is not a real

stream at all, but something which is said to behave like a stream only in some metaphorical sense. Similar difficulties arise if we try to attribute a like objective reality to Space. We can imagine no boundaries to Space; it seems to have no active specific qualities and we have no sense-organ for per- ceiving it.

The thinkers of antiquity saw these difficulties without solving them. Their

whole treatment of philosophic problems was objec- tive; and, so long as Space and Time are treated objectively, not much can be done with them. Plato has great difficulty in explaining the relation between Space and his Ideas: Aris- totle contents himself with defining space as " the first unmoved limit of the containing body, " a definition which helps us very little: nor do we get more light from later Greek philosophy. As to Time, there was always a tendency in Greek thought to treat it as in some sense unreal. Time was seen to be intimately connected with change, and it was just their liability to change that made ordinary mundane things unreal, as contrasted with the unchanging steadfastness of the Platonic Ideas. And the pantheistic One-and-AU of Plotinus is plainly incompatible with the reality of Time. In all pantheistic systems Time belongs to mundane existence and Eternity to the transcendent Reality.

Modern philosophy is distinguished from ancient mainly by its greater subjectivity; and thus it was not long after the rise of modern philosophy that thinkers began to turn to the subjective method of explaining Space and Time, that is, to regard them as real only to our minds. Its use begins effectively with Berkeley, though prepared for to some extent by earlier writers such as Hobbes. Berkeley's treatment is most definitely clear in the case of Space; for his attack upon materialism made it necessary for him to affirm the ideality of Space as well as of Matter. But he takes a similar line of argument with Time, declaring it to be nothing but the succession of idea's. The merit of the subjective method was that it made men see the importance of psychology. If Space and Time exist only in the human mind we must analyse the human mind to explain them. The work of the English psychologists such as the Mills and Bain attaches itself to subjectivist principles. A distinct epoch in the history of the subject was made by the work of Kant, whose solution of the problems may be classed as transcendental. He argued that Space and Time are not given by experience, but are rather conditions of all our experience, being in his terminology a priori, that is, supplied by the mind from its own inward resources. They do not belong to things- in-themselves, but to things-as-we-know-them, or phenomena. Their validity consists in the fact that all men have them and that they are absolutely necessary conditions of human in- telligence. As he expresses it from his peculiar point of view, Space is the form of outer sense, Time of inner sense.

The prevalence of German philosophy in Great Britain during the last quarter of the igth century has given these Kantian principles a great currency, interrupting the more truly charac- teristic psychological tendency of British thought. That prevalence is now passing away. No one now holds the full Kantian position; which, in the case of Space, is refuted by the simple consideration that our spatial conceptions depend upon our sensuous perceptive powers; and that, consequently, the spatial conceptions

of the blind, for example, are quite different from those of ordinary men. If Kant is right, and Space is a pure form unaffected by all specific differences of content, it would follow that a man born with one sense only, say that of taste, would have the same space-conception as the rest of us; a conclusion too plainly absurd to need refutation. What an apriorist can still maintain is that in our conception of Space and Time there are elements which cannot be explained by the psychologist as having developed out of anything else, and must therefore be regarded as innate endowments of the mind. This is a position not unreasonable in itself, and one, at least, which does not interfere with the detailed work of the psychologist.

The way with these problems which commends itself to the

present writer and seems fully in harmony with the general tone of contemporary thinking may, if a distinctive catchword be desired, be termed the humanist method. By this is meant that the study of the human mind comes first; that we put no metaphysical questions till we have learnt what the psycholo- gist has to teach us; and that in our explanations of meta- physical realities we should be as anthropomorphic as possible. In the case of Space this leads to a result which is largely nega- tive. When we ask what objective reality corresponds to our conception of Space, the answer must be analogous to that which we give respecting the various sensible qualities of the external world. We cannot suppose that Colour, for example, exists objectively as we experience it; evidently it is altogether relative to the organs of vision which we happen to possess. But we must believe that the objective world has a quality in some way correspondent to the quality of Colour. So with Space. Space as we know it is altogether relative to our tactual, muscular and visual powers of perception. But the fact that our spatial perceptions and conceptions enable us to deal suc- cessfully with objects requires us to believe that the objective world has an arrangement of its own corresponding in some way to spatial arrangement, though we are unable to imagine what it can be. Space cannot be objectively real, because of the difficulties disclosed above in the criticism of the " objective " method, and we are unable to put anything definite in its place. With Time the case is somewhat different. Our conception of Time is based on our experience of Change, combined with memory and anticipation. Now Change is an experience which we feel directly in our personal consciousness: consciousness is not spatial, but it is mutable. This direct experience is a guarantee of the realness of Change, and justifies us in attri- buting it in some degree to ultimate objective reality.

See S. H. Hodgson, Space and Time; H. Bergson, Essai stir les donnies immediates de la conscience; J. E. MacTaggart, Studies in the Hegelian Dialectic. (H. St.)

SPADE, a tool for digging and loosening the soil; together with the fork it forms one of the chief implements wielded by the hand in agriculture and horticulture. Its typical shape is a broad flat blade of iron with a sharp lower edge, straight or curved, the upper edge on either side of the handle affording space for the foot of the digger, which drives it into the ground; the wooden handle terminates in a cross-piece, usually forming a kind of loop for the hand. The word in O.Eng. is spaedu, cognate forms being Du., Swed. and Dan. spade, Ger. Spaten; it is derived from the Gr. airadr], a broad blade of wood or metal, and so used of the blade of an oar or sword. This was latinized as spatha, and used of a broad paddle for stirring liquid, of a piece of wood used by weavers for driving home the woof, and particularly of a broad two-edged sword without a point. The Spanish playing cards had " swords " for the suit which we know as " spades," and the suit was called espada (see Cards, Playing).

SPAGNA, LO (d. -c. 1529), the usual designation (due to his Spanish origin) of the Italian painter Giovanni di Pietro, one of the chief followers of Perugino. The famous " Sposalizio " — marriage of Joseph and Mary — in the Caen museum, formerly attributed to Perugino (q.v.), is now credited to Lo Spagna. Nothing whatever is known of his early life, or how he became a member of the Perugian school. There is. a marked absence of individuality about his style, which seems like an imitation of the earliest manner of Raphael and that of Pinturicchio in a weaker and less virile form. The chief of his numerous panel paintings are the " Nativity," in the Vatican, and the " Adoration of the Magi," at Berlin. In 1510 Lo Spagna executed many frescoes at Todi, and in 151 2 several other mural paintings in and near Trevi. His most important works were frescoes at Assisi and Spoleto, of which some exist in good preservation. He received the freedom of the city of Spoleto in 1516, as a reward for his work there. Lo Spagna's frescoes reach a much higher standard of merit than his panel pictures. The museum of the Capitol in Rome now possesses a very beautiful series of life-sized fresco figures by him, representing Apollo and the

Nine Muses. Lo Spagna was alive in 1528, but he appears to have died before 1530, as in that year a pupil of his named Doni completed a fresco in S. Jacopo, near Spoleto, which Lo Spagna had begun.

SPAHIS (in Persian Sipari, meaning warriors, and synony- mous with Sepoy) originally the holders of fiefs in Central Asia who yielded personal military service to their superior chief. In time the term came to be applied

to the soldiery furnished in their own stead. A similar institution existed in Turkey, and the " Spahis " were the light irregular cavalry which from the time of Sultan Amurath I. (1326) down to the beginning of the 19th century formed the flower of the Turkish army; at one period they are estimated to have numbered 130,000. " Spahis " is the term now applied to certain native cavalry regiments in Algiers and Tunis, officered by Frenchmen.

SPAIN (Espana), a kingdom in the extreme south-west of Europe, comprising about eleven-thirteenths of the Iberian Peninsula, in addition to the Balearic Islands, the Canary Islands, and the fortified station of Ceuta, on the Moroccan coast opposite to Gibraltar. Each of the two island groups forms one of the forty-nine provinces of the kingdom, although only the first named belongs geographically to Spain. Ceuta is included in the province of Cadiz. In 1900 the kingdom (ex- clusive of its colonies) had a population of 18,607,674, and a total area of 194,700 sq. m. It is thus rather more than twice the size of Great Britain, nearly 50,000 sq. m. larger than Japan, and nearly 85,000 sq. m. larger than Italy and Sicily. Exclusive of the Canaries its area is 191,893 sq. m. On all sides except that of Portugal the boundaries of continental Spain are natural, the Peninsula being separated from France by the Pyrenees and on every other side being surrounded by the sea. On the side of Portugal a tract of inhospitable country ;led originally to the separation between the two kingdoms, inasmuch as it caused the reconquest of the comparatively populous maritime tracts from the Moors to be carried out independently of that of the eastern kingdoms, which were also well peopled. The absence of any such means of intercommunication as navig- able rivers afford has favoured the continuance of this isolation. The precise line of the western frontier is formed for a con- siderable length by portions of the chief rivers or by small tributaries, and on the north (between Portugal and Galicia) it is determined to a large extent by small mountain ranges. The British rock of Gibraltar, in the extreme south of the peninsula, is separated from Spain by a low isthmus known as the Neutral Ground.

By the relinquishment of Cuba and the cession of Porto Rico, the Philippine and Sulu Islands, and Guam, the largest of the Colonial Ladrones, to the United States, as a consequence Posses' of the war of 1898, and of the remaining Ladrone sions. or Marianne Islands, together with the Caroline and Pelew Islands, to Germany by a treaty of the 8th of February 1899, the colonial possessions of Spain were greatly reduced. Apart from Ceuta, Spain possesses on the Moroccan seaboard Melilla, Alhucemas, Pefion de la Gomera, Ifni, and the Chaffarinas islets. Besides these isolated posts Spain holds Rio de Oro, a stretch of the Saharan coast, and its hinterland lying between Morocco and French West Africa; the Muni River Settlements or Spanish Guinea, situated between French Congo and the German colony

of Cameroon; Fernando Po, Annobon, Corisco and other islands in the Gulf of Guinea. Spain has given to France the right of pre-emption over any of her West African colonies.

I. — General Survey or the Spanish Kingdom Physical Features. — The coast-line on the north and north- west is everywhere steep and rocky. On the north there are numerous small indentations, many of which form convenient harbours, although the current flowing along the coast from the west often leaves in the stiller water at their mouths

ˆ . ,, obstruction bars. The best harbours are to be found

Coast-lwes. , , 1#1 . , . . , ,, r , t. t

on the rias or fjord-like indentations in the W. and JN.

of Galicia, where high tides keep the inlets well scoured;

here occur the fine natural harbours of Pontevedra and Vigo, Corunna and Ferrol. Less varied in outline but more varied in character are the Spanish coasts on the south and east. The seaboard is generally flat from the frontier of Portugal to the Straits of Gibraltar. Between the mouth of the Rio Tinto and that of the Guadalquivir the shore is lined by a series of sand-dunes, known as the Arenas Gordas. Next follows a marshy tract at the mouth of the Guadalquivir known as Las Marismas, after which the coast-line becomes more varied, and includes the fine Bay of Cadiz. From the Straits of Gibraltar a bold and rocky coast continues almost to Cape Palos, a little beyond the fine natural harbour of Cartagena. North of Cape Palos a line of flat coast, beginning with the narrow strip which cuts off the lagoon called the Mar Menor from the Mediterranean, bounds half of the province of Alicante, but in its northern half this province, becoming mountainous, runs out to the lofty headland of Cape de la Nao. The whole coast of the Bay of Valencia is low and ill provided with harbours; and along the east of Catalonia stretches of steep and rocky coast alternate with others of an opposite character.

The surface of Spain is remarkable at once for its striking contrasts and its vast expanses of dreary uniformity. There are mountains rising with alpine grandeur above the snow-line, but often sheltering rich and magnificent valleys at their Surface. base. Naked walls of white limestone tower above dark woods of cork-oak and olive. In other parts, as in the Basque country, in Galicia, in the Serrania de Cuenca (between the headwaters of the Tagus and those of the Jucar), in the Sierra de Albarracin (between the headwaters of the Tagus and those of theGuadalaviar), there are extensive tracts of undulating forest-clad hill country, and almost contiguous to these

there are apparently boundless plains, or tracts of level table-land, some almost uninhabitable, and some streaked with irrigation canals and richly cultivated — like the Requena of Valencia. While, again, continuous mountain ranges and broad plains and table-lands give the prevailing character to the scenery, there are, on the one hand, loft} 7 isolated peaks, such as Monseny, Montserrat (q.v.) and Mont Sant in Catalonia, the Pefia Golosa in Valencia, Moncayo on the borders of Aragon and Old Castile, and, on the other hand, small secluded valleys, such as those of Vich and Olot among the Catalonian Pyrenees.

The greater part of the interior of Spain is composed of a table-land bounded by the Cantabrian Mountains in the north and the Sierra Morena in the south, and divided into two by a series central of mountain ranges stretching on the whole from east Table-land. to west. The northern half of the table-land, made up of the provinces of Leon and Old Castile, has an average elevation estimated at about 2700 ft., while the southern half, made up of Estremadura and New Castile, is slightly lower — about 2600 ft. On all sides the table-land as a whole is remarkably isolated, and hence the passes on its boundary and the river valleys that lead down from it to the surrounding plains are geographical features of peculiar importance. The isolation on the side of Portugal has already been mentioned. On the north-west the valley of the Sil and a series of valleys farther south, along both of which military roads have been carried from an early period, open up communication between Leon and the hill country of Galicia, which explains why this province was united to Leon even before the conquest of Portugal from the Moors. The passes across the Cantabrian Mountains in the north are toler- ably numerous, and several of them are crossed by railways. The two most remarkable are the Pass of Pajares, across which winds the railway from Leon to Oviedo and the seaport of Gijon, and that of Reinosa leading down to the deep valley of the Besaya, and crossed by the railway from Valladolid to Santander. In its eastern section the chain is crossed by the railways from Burgos to Bilbao and San Sebastian ; the last-named line winds through the wild and romantic gorge of Pancorbo (in the north-east of the province of Burgos) before it traverses the Cantabrian chain at Idiazabal.

On the north-east and east, where the edge of the table- land sweeps round in a wide curve, the surface sinks in broad terraces to the valley of the Ebro and the Bay of Valencia, and is crowned by more or less isolated mountains, some of which have been already men- tioned. On the north-east, by far the most important communica- tion with the Ebro valley is formed by the valley of the Jalon, which has thus always formed a military route of the highest consequence, and is now traversed by the railway from Madrid to Saragossa. Farther south the mountains clustered on the east of the table-land (Sierra de Albarracin, Serrania de Cuenca) long rendered

direct communication between Valencia and Madrid extremely difficult, and the principal communications with the east and south-east are effected where the southern table-land of La Mancha (q.v.) merges in the hill country which connects the interior of Spain with the Sierra Nevada.

In the south the descent from the table-land to the valley of the Guadalquivir is again comparatively gradual, but even here in the eastern half of the Sierra Morena the passes are few, the most

important being the Puerto de Despefiaperros, where the Rio Magana, a sub-tributary of the Guadalimar, has cut for itself a deep gorge through which the railway ascends from Andalusia to Madrid. Between Andalusia and Estremadura farther west the communica- tion is freer, the Sierra Morena being broken up into series of small chains.

Of the mountains belonging to the table-land the most continuous are those of the Cantabrian chain, which stretches for the most part „ from east to west, parallel to the Bay of Biscay, but

Mountains. u i t ; mate i y b enc ; s round towards the south between Leon and Galicia (see Cantabrian Mountains). A peculiar feature of this chain, and of the neighbouring parts of the table-land, is the number of the parameras or isolated plateaus, surrounded by steep rocky mountains, or even by walls of sheer cliff. The bleak districts of Sigiienza and Soria, round the headwaters of the Douro, separate the mountains of the so-called Iberian system on the north-east of the table-land from the eastern portion of the central mountain chains of the peninsula. Of these chains, to which Spanish geographers give the name Carpetano-Vetonica, the most easterly is the Sierra de Guadarrama, the general trend of which is from south-west to north- east. It is the Montes Carpetani of the ancients, and a portion of it (due north of Madrid) still bears the name of Carpetanos. Com- posed almost entirely of granite, it has an aspect when seen from a distance highly characteristic of the mountains of the Iberian Peninsula in general, presenting the appearance of a saw-like ridge (sierra) broken up into numerous sections. Its mean height is about 5250 ft., and near its centre it has three summits, the highest (named the Pico de Penalara) rising to a height of 6910 ft. The chief passes across the Sierra are those of Somosierra (4692 ft.) in the north-east, Navacerrada (5837 ft.), near Penalara, and Guadarrama (5010 ft.), a few miles farther south and west ; these are crossed by carriage roads. The railway from Madrid to Segovia

passes through a tunnel close to the Guadarrama Pass; and the railway from Madrid to Avila traverses the south-western portion of the range through a remark- able series of tunnels and cuttings.

A region with a highly irregular surface, filled with hills and parameras, separates the Sierra de Guadarrama from the Sierra de Gredos farther west. This is the loftiest and grandest sierra in the whole series. Its culminating point, the Plaza de Almanzor, attains the height of 8730 ft., not far short of that of the highest Cantabrian summits. Its general trend is east and west; towards the south it sinks precipitously, and on the north it descends with a somewhat more gentle slope towards the longitudinal valleys of the Tormes and Alberche which separate it from another rugged mountain range, forming the southern boundary of the paramera of Avila. On the west another rough and hilly tract, similar to that which divides it from the Sierra de Guadarrama in the east, separates it from the Sierra de Gata, the westernmost and the lowest of the Spanish sierras belonging to the series. These hilly intervals between the more continuous sierras greatly facilitate the communication between the northern and southern halves of the Spanish table-land. The Sierra de Gredos has a road across it connecting Avila with Talavera de la Reina by the Puerto del Pico; but for the most part there are only bridle-paths across the Gredos and Gata ranges, and no railway crosses either of them, although the line from Plasencia to Salamanca skirts the Sierra de Gredos on the west. The Serra da Estrella, in Portugal, is usually regarded as a fourth section in the Carpetano- Vetonica chain.

On the southern half of the table-land a shorter series of sierras, consisting of the Montes de Toledo in the east (highest elevation Tejadillas, 4567 ft.) and the sierras of San Pedro, Montanchez and Guadalupe in the west (highest elevation Cabeza del Moro, 5100 ft.), separates the basins of the Tagus and Guadiana. The southern system of mountains bounding the Iberian table-land — the Sierra Morena (q.v.) — is even less of a continuous chain than the two systems last described. As already intimated, its least continuous portion is in the west. In the east and middle portion it is composed of a countless number of irregularly-disposed undulating mountains all nearly equal in height.

Even more important than the mountains bounding or crossing the table-land are those which are connected with it only at their extremities; viz. the Pyrenees (q.v.) in the north-east, the Sierra Nevada (q.v.) and the coast ranges in the south. The transverse valleys of the Sierra Nevada open southwards into the mountainous longitudinal valleys of the Alpujarras (q.v.), into which open also on the other side the transverse valleys from the most easterly of the coast sierras, the Sierra Contraviesa and the Sierra de Almijara. These ranges are continued farther west by the Sierra de

Alhama and Sierra de Abdalajiz. Immediately to the west of the last-named sierra is the gorge of the Guadalhorce, which affords a passage for the railway from Malaga to Cordova; and beyond that gorge, to the west and south-west, the Serrania de Ronda, a mountain group difficult of access, stretches out its sierras in all directions. To Spanish geographers the coast ranges just mentioned are known collectively as the Sierra Penibetica. Although not comparable in altitude with the Pyrenees (highest summit Aneto, 11,168 ft.) or the Sierra Nevada (highest summit Mulhacen, 11,421 ft.), the coast ranges frequently attain an elevation of over 5000 ft., and in some cases of over 6000 ft. North-east of the Sierra Nevada two small

ranges, Alcaraz and La Sagra, rise with remarkable abruptness from the plateau of Murcia, where it merges in that of the interior.

The only two important lowland valleys of Spain are those of the Ebro and the Guadalquivir. The Ebro valley occupies the angle in the north-east between the Pyrenees and the central . Lowtan j table-land, and is divided by ranges of heights proceeding valleys. on the one side from the Pyrenees, on the other from the base of the Moncayo, into two portions. The uppermost of these, a plateau of between 1000 and 1300 ft. above sea-level, is only about one-fourth of the size of the remaining portion, which is chiefly low- land, but is cut off from the coast by a highland tract connecting the interior table-land with spurs from the Pyrenees. The Guadalquivir basin is likewise divided by the configuration of the ground into a small upper portion of considerable elevation and a much larger lower portion mainly lowland, the latter composed from Seville downwards of a perfectly level and to a large extent unhealthy alluvium (Las Marismas). The division between these two sections is indicated by the change in the course of the main stream from a due westerly to a more south-westerly direction.

The main water-parting of the Peninsula is everywhere near the edge of the table-land on the north, east and south, and hence de- scribes a semicircle with the convexity to the east. p/ vere ,„rf There are five great rivers in the Peninsula, the Tagus J"^., (Spanish Tajo, Portuguese Tejo), Douro (Spanish Duero), Ebro, Guadiana and Guadalquivir, all of which rise in Spain. The Ebro alone flows into the Mediterranean, and the Ebro and Guadalquivir alone belong wholly to Spain ; the lower courses of the Tagus and Douro are bounded by Portuguese territory; and the lower Guadiana flows partly through Portugal, partly along the frontier. The Tagus rises in the Montes Universales on the borders of Teruel, and flows in a westerly direction until it enters the Atlantic below Lisbon, after a total course of 565 m. The Douro (485 m.) and the Ebro (466 m.) flow respectively south-west to the Atlantic at Oporto, and south-east to the Mediterranean

at Cape Tortosa, from their sources in the great northern watershed. The Guadiana (510 m.) passes west and south through La Mancha and Andalusia to fall into Cadiz Bay at Ayamonte ; and the Guadalquivir (360 m.) takes a similar direction from its headwaters in Jaen to Sanlucar de Barrameda, where it also enters Cadiz Bay farther south. These five rivers, as also the smaller Jiicar and Segura, which enter the Mediterranean, are fully described in separate articles. With the exception of the Guadalquivir, none of them is of great service for inland navigation, so far as they lie within the Spanish frontier. On the other hand, those of the east and south are of great value for irrigation, and the Jiicar and Segura are employed in floating timber from the Serrania de Cuenca. The only considerable lakes in Spain are three coast lagoons — the Albufera (q.v.) de Valencia, the Mar Menor in Murcia and the Laguna de la Janda in Cadiz behind Cape Trafalgar (see Murcia and Cadiz). Small alpine and other lakes are numerous, and small salt lakes are to be found in every steppe region.

Geology. — Geologically the Spanish Peninsula consists of a great massif of ancient rock, bordered upon the north, east and south by zones of folding in which the Mesozoic and early Tertiary beds are involved. The massif is composed of Archean, Palaeozoic and eruptive rocks, partly concealed by a covering of Tertiary strata, but characterized by the absence, excepting on its margins, of any marine deposits of Mesozoic age. It stretches from Galicia and Asturias on the north to the valley of the Guadalquivir on the south, and includes the mountains of Castile, the Sierra de Toledo and the Sierra Morena. The rocks which form it are often strongly folded, but the folding is of ancient date and strikes obliquely across the massif and has had no influence in determining its outline. The massif is in fact merely a fragment of the great Hercynian mountain system which was formed across Europe at the close of the Carboni- ferous period. During the Mesozoic era this mountain chain was shattered and large portions of it sank beneath the sea and were covered by Mesozoic and Tertiary strata. But other fragments still rose above the waves, and of these the great rrassif of Portugal and western Spain was one. Around it the deposits of the Jurassic and Cretaceous seas were laid down: and during the Tertiary era they were crushed, together with the earlier Tertiary beds, against the ancient rocks, and thus formed the folded zones of the Cordillera Betica on the south, the hills of southern Aragon on the east and the Pyrenees on the north. The intervening plains and plateaus are now for the most part covered by Tertiary deposits, which also spread over much of the ancient massif.

Archean rocks are exposed in the north of the Peninsula, particu- larly along the great Pyrenean axis, in Galicia, Estremadura, the Sierra Morena, the Sierra Nevada and Serrania de Ronda. They consist of granites, gneisses and mica-schists, with talc-schists, amphibolites and crystalline limestones. The oldest Palaeo2oic strata are referred, from their included

fossils, to the Cambrian, Ordovician and Silurian systems. They range through a vast region of Andalusia, Estremadura, Castile, Salamanca, Leon and Asturias, and along the flanks of the Pyrenean and Cantabrian chain. They consist of slates, greywackes, quartzites and diabases. Grits, quartzites, shales and limestones referable to the Devonian system are found in a few scattered areas, the largest and most

fossiliferous of these occurring in Asturias. The Lower Carboni- ferous rocks of Spain consist partly of limestones, and partly of shales, sandstones and conglomerates like the culm of Devonshire. It is in the culm of the province of Huelva that the celebrated copper mines of Rio Tinto are worked. The Upper Carboniferous is formed to a large extent of sandstones and shales, with seams of coal ; but beds of massive limestones are often intercalated, and some of these contain Fusulina and other fossils like those of the Russian Fusulina limestone. The system is most extensively developed in the north, covering a considerable space in Asturias, whence it stretches more or less continuously through the provinces of Leon, Palencia and Santander. Another tract, about 500 sq. kilometres in extent, runs

I I Quaternary

I Tertiary 1 Cretaceous I Jurassic

Siluro-Cambrian Archaean and Metamorphic

Plutonic Rocks

Volcanic Rocks

from the province of Cordova into that of Badajoz. It is in this area that the important coal deposits of Penarroja are found. There are other smaller areas containing little or no coal, but showing by the included plant-remains that the strata undoubtedly belong to the Carboniferous system.

The Permian is probably represented by some of the red sand- stones, conglomerates and shales in the Pyrenees, in the Serrania de Cuenca, and in Andalusia. The Triassic system is well developed in the north of the peninsula along the Cantabrian chain and east- wards to the Mediterranean. It is composed of red and variegated sandstones, dolomites and marls, traversed in some places by ophitic rocks, and containing

deposits of gypsum, aragonite and rock- salt. It thus resembles the Trias of England and Germany. In the south-east, however, and at the mouth of the Ebro, limestones are found containing a fauna similar to that of the alpine Trias. These strata are overlain by members of the Jurassic series, which are especially conspicuous in the eastern part of the peninsula between Castile and Aragon, along the Mediterranean border, in Andalusia, and likewise along the flanks of the Pyrenees. The Jurassic of Andalusia belongs to the Mediterranean facies of the system ; the Jurassic of the rest of Spain is more nearly allied to that of north- western Europe. The Cretaceous system is distributed in four great districts: the largest of these extends through the kingdoms of Murcia and Valencia ; a second stretches between the two Castiles ; a third is found in the Basque Provinces and in Asturias; and a fourth spreads out along the southern slopes of the Pyrenees from Navarre to the Mediterranean. The lower members of the Creta- ceous series include an important fresh-water formation (sandstones and clays), which extends from the Cantabrian coast through the provinces of Santander, Burgos, Soria and Logrofio, and is supposed to represent the English Wealden series. The higher members comprise massive hippuriie limestones, and in the Pyrenean district representatives of the upper subdivisions of the system, including the Danian.

Deposits of Tertiary age cover rather more than a third of Spain. They are divisible into two great series, according to their mode of origin in the sea or in fresh-water. The marine Tertiary accumu- lations commence with those that are referable to the Eocene series, consisting of nummulitic limestones, marls and siliceous sand- stones. These strata are developed in the basin of the Ebro, and in a belt which extends from Valencia through Murcia and Andalusia to Cadiz. Marine Miocene deposits occupy some small tracts, especially on the coast of Valencia. But most of the sandy Tertiary rocks of that district are Pliocene. The Tertiary strata of Andalusia are specially noteworthy for containing the native silver of Herrerias, which is found in a Pliocene bed in the form of flukes, needles and

crystals. But the most extensive and interesting Tertiary accumu- lations are those of the great lakes which in Oligocene and Miocene time spread over so large an expanse of the table-land. These sheets of fresh-water covered the centre of the country, including the basins of the Ebrojucar, Guadalaviar, Guadalquivir and Tagus. They have left behind them thick deposits of clays, marls, gypsum and limestone, in which numerous remains of the land-animals of the time have been preserved.

Quaternary deposits spread over about a tenth of the area of the country. The largest tract of them is to be seen to the south of the Cantabrian chain; but another, of hardly inferior extent, flanks the Sierra de Guadarrama, and spreads out over the great plain from Madrid to Caceres. Some of these

alluvial accumula- tions indicate a former greater extension of the snowfields that are now so restricted in the Spanish sierras. Remains of the reindeer are found in caves in the Pyrenees.

Eruptive rocks of many different ages occur in different parts of Spain. The most important tract covered by them is that which stretches from Cape Ortegal to Coria in Estremadura and spreads over a large area of Portugal. They likewise appear in Castile, forming the sierras of Gredos and Guadarrama; farther south they rise in the mountains of Toledo, in the Sierra Morena, and across the provinces of Cordova, Seville, Huelva and Badajoz as far as Evora in Portugal. Among the minor areas occupied by them may be especially mentioned those which occur in the Trinssic districts. Of rocks included in the eruptive series the most abundant is granite. There occur also quartz-porphyry (Sierra Morena, Pyrenees, &c), diorite, porphyrite, diabase (well developed in the north of Andalusia, where it plays a great part in the structure of the Sierra Morena), ophite (Pyrenees, Cadiz), serpentine (forming an enormous mass in the Serrania de Ronda), trachyte, liparite, andesite, basalt. The last four rocks occur as a volcanic series distributed in three chief districts — that of Cape Gata, including the south-east of Andalusia and the south of Murcia, that of Catalonia, and that of La Mancha.

Climate. — In accordance with its southerly position and the variety in its superficial configuration, Spain presents within its borders examples of every kind of climate to be found on the northern hemisphere, with the sole exception of that of the torrid zone. As regards temperature, the heart of the table-land is characterized by extremes as great as are to be met in almost any part of central Europe. The northern and north-western maritime provinces, on the other hand, have a climate as equable, and as moist, as that of the west of England or Scotland.

Four zones of climate are distinguished. The first zone is that of the table-land, with the greater part of the Ebro basin. This is the zone of the greatest extremes of temperature. Even in summer the nights are often decidedly cold, and on the high parameras it is not a rare thing to see hoar-frost in the morning. In spring cold, wetting mists occasionally envelop the land for entire days, while in summer the sky is often perfectly clear for weeks together. At all seasons of the year sudden changes of temperature, to the extent of from 30 to 50 F., are not infrequent. The air is extremely dry, which is all the more keenly felt from the fact that it is almost constantly in motion. At Madrid (2150 ft. above sea-level) it freezes so hard in December and January that skating is carried on on the sheet of water in the Buen Retiro; and, as winter throughout Spain, except in the maritime provinces of the north and north-west, is the season of greatest atmospheric precipitation, snowfalls are frequent, though the snow seldom lies long

except at high elevations. The summers, on the other hand, are not only extremely warm but almost rainless, the sea-winds being deprived of their moisture on the edge of the plateau. In July and .August the plains of New Castile and Estre- madura are sunburnt wastes ; the roads are several inches deep with dust; the leaves of the few trees are withered and discoloured; the atmosphere is filled with a fine dust, producing a haze known as calina, which converts the blue of the sky into a dull grey. In the greater part of the Ebro basin the heat of summer is even more intense. The treeless mostly steppe-like valley with a bright- coloured soil acts like a concave mirror in reflecting the sun's rays and, moreover, the mountains and highlands by which the valley is enclosed prevent to a large extent the access of winds.

The second zone is that of the Mediterranean provinces, exclusive of those of the extreme south. In this zone the extremes of tem- perature are less, though the summers here also are warm, and the winters decidedly cool, especially in the north-east.

The southern zone, to which the name of African has been given, embraces the whole of Andalusia as far as the Sierra Morena, the southern half of Murcia and the province of Alicante. In this zone there prevails a genuine sub-tropical climate, with extremely warm and almost rainless summers and mild winters, the temperature hardly ever sinking below freezing-point. The hottest part of the region is not the most southerly district but the bright-coloured steppes of the coast of Granada, and the plains and hill terraces of the south-east coast from Almeria to Alicante. Snow and frost are here hardly known. It is said that at Malaga snow falls only about once in twenty-five years. The winter, in fact, is the season of the brightest vegetation : after the long drought of summer the surface gets covered once more in late autumn with a fresh green varied with bright-coloured flowers, and so it remains the

whole winter through. On the other hand, the eastern part of this zone is the part of Spain which is liable to be visited from time to time by the scorching leveche, the name given in Spain to the sirocco, as well as by the solano, a moist and less noxious east wind.

The fourth zone, that of the north and north-west maritime provinces, presents a marked contrast to all the others. The temperature is mild and equable; the rains are abundant all the year round, but fall chiefly in autumn, as in the west of Europe generally. Roses bloom in the gardens at Christmas as plentifully as in summer. The chief drawback of the climate is an excess of rain in some parts, especially in the west. Santiago de Compostela, for example, has one of the highest rainfalls on the mainland of Europe (see table below).

The figures given in the following tabic, 1 although based only on data of short periods (from 3! to 20 years), will help to illustrate the preceding general remarks. Greenwich is added for the sake of comparison.

Station.

Height ill feet.

Mean Temperature, F.

Rain- fall in inches.

Jan.

July.

Year.

Table-land zone j jˆid ; ;

c„ , <.u . \ San Fernando Southern zone | Ma[aga

Mediterranean (Murcia . zone (Mahon 1 Bilbao Northern mari- ■! Oviedo time zone (Santiago . Greenwich

260O

2I50

90

75 140

50 750

75o

37 41 52 54 49 52 46

43 45-5

39

73 76

75 79 79 77 70 66 66

63

53 56 63 70

63 64

58 54 55 50

19 15 30

14 27 46 36

66

25

Flora. — The vegetation of Spain exhibits a variety in keeping with the differences of climate just described. The number of endemic species is exceptionally large, the number of monotypic genera in the Peninsula greater than in any other part of the Mediter- ranean domain. The endemic species are naturally most numerous in the mountains, and above all in the loftiest ranges, the Pyrenees and the Sierra Nevada; but it is a peculiarity of the Spanish table- land, as compared with the plains and table-lands of central Europe, tha,t it also possesses a considerable number of endemic plants and plants of extremely restricted range. This fact, however, is also in harmony with the physical conditions above described, being explained by the local varieties, not only of climate, but also of soil. Altogether no other country in Europe of equal extent has so great a wealth of species as Spain. According to the Prodromus florae hispanicae of Willkomm and

Lange (completed in 1880), the number of species of vascular plants then ascertained to exist in the country was 5096.

Spain may be divided botanically into four provinces, correspond- ing to the four climatic zones.

In the table-land province (including the greater part of the Ebro valley) the flora is' composed chiefly of species characteristic of the Mediterranean region, and largely of species confined to the Peninsula. A peculiar character is imparted to the vegetation of this province by the growth over large tracts of evergreen shrubs and large herbaceous plants belonging to the Cistineae and Labiatae. Areas covered by the Cistineae are known to the Spaniards as jarales, and are particularly extensive in the Mancha Alta and on the slopes of the Sierr—. Morena, where the ladanum bush (Cistus ladaniferus) is specially abundant ; those covered by the Labiatae are known as tomillares (from tomillo, thyme), and occur chiefly in the south, south-west and east of the table-land of New Castile. In the central parts of the same table-land huge thistles (such as the Onopordum nervosum), centaureas, artemisiasand other Compositae are scattered in great piofusion. From the level parts of these table-lands trees are almost entirely absent. On the lofty parameras of Soria and other parts of Old Castile the vegetation has an almost alpine character. The southern or African province is distinguished chiefly by the abundance of plants which have their true home in North Africa (a fact explained by the geologically recent land connexion of Spain with that continent), but is also remarkable for the occurrence within it of numerous Eastern plants (natives of Syria and Asia Minor), and plants belonging to South Africa and the Canaries, as well as natives of tropical America which have become naturalized here (see Agriculture). In the maritime parts of Malaga and Granada the vegetation is of almost tropical richness and beauty, while in Murcia, Alicante and Almeria the aspect is truly African, fertile oases appearing in the midst of rocky deserts or barren steppes. A peculiar vegetation, consisting mainly of low shrubs with fleshy glaucous leaves {Inula crithmoiaes , &c), covers the swamps of the Guadalquivir and the salt-marshes of the south-west coast. Every- where on moist sandy ground are to be seen tall thickets of Arundo donax.

The Mediterranean province is that in which the vegetation agrees most closely with that of southern France and the lowlands

1 By conversion from Th. Fischer's Klima der Miltelmecrlander.

of the Mediterranean region generally. On the lower slopes of the mountains and on all the parts left uncultivated the prevailing form of vegetation consists of a dense growth of shrubs with thick leathery leaves,

such as are known to the French as maquis, to the Italians as macchie, and to the Spaniards as monte bajo, 2 shrubs which, how- ever much they resemble each other in external appearance, belong botanically to a great variety of families.

The northern maritime province, in accordance with its climate, has a vegetation resembling that of central Europe. Here only are to be found rich grassy meadows covered with flowers such as are seen in English fields, and here only do forests of oak, beech and chestnut cover a large proportion of the area. The extraordinary abundance of ferns (as in western France) is likewise characteristic.

The forest area of Spain is relatively small. The whole extent of forests is estimated at little more than 75 million acres, or less than 6% of the area of the kingdom. Evergreen oaks, chestnuts and conifers are the prevailing trees. The cork oaks of the southern provinces and of Catalonia are of immense value, but the groves have suffered greatly from the reckless way in which the produce is collected. Among other characteristic trees are the Spanish pine (Pinus hispanica), the Corsican pine {P. Lwcio), the Pinsapo fir (Abies Pinsapo), and the Quercus Tozza, the last belonging to the slopes of the Sierra Nevada. Besides the date-palm the dwarf-palm grows spontaneously in some parts of the south, but it nowhere makes up a large element of the vegetation.

The Spanish steppes deserve a special notice, since they are not confined to one of the four botanical provinces, but are found in all of them except the last. Six considerable steppe regions are counted : (1) that of Old Castile, situated to the south of Valladolid, and composed chiefly of hills of gypsum; (2) that of New Castile, in the south-east (including parts of La Mancha) ; (3) the Aragonese, occupying the upper part of the basin of the Ebro ; (4) the littoral, stretching along the south-east coast from Alicante to the neighbour- hood of Almeria ; (5) the Granadine, in the east of Upper Andalusia (the former kingdom of Granada); and (6) the Baetic, in Lower Andalusia, on both sides of the valley of the Jenil or Genii. All of these were originally salt-steppes, and, where the soil is still highly impregnated with salt, have only a sparse covering of shrubs, mostly members of the Salsolaceae, with thick, greyish green, often downy leaves. A different aspect is presented by the grass steppes of Murcia, La Mancha, the plateaus of Guadix and Huescar in the province of Granada, &c, all of which are covered chiefly with the valuable esparto grass (Macrochloa tenacissima).

Fauna. — The Iberian Peninsula belongs to the Mediterranean sub-region of the Palaearctic region of the animal kingdom. The forms that betray African affinities are naturally to be found chiefly in the south. Among the mammals that fall under this head are the common genet {Genetta

vulgaris), which extends, however, pretty far north, and is found also in the south of France, the fallow- deer, the porcupine (very rare), and a species of ichneumon (Herpestes Widdringtonii) , which is confined to the Peninsula, and is the only European species of this African genus. The magot or Barbary ape (Inuus ecaudatus), the sole species of monkey still found wild in Europe, is also a native of Spain, but only survives on the rock of Gibraltar [a. v.). Of the mammals in which Spain shows more affinity to the fauna of central and northern Europe, some of the most characteristic are the Spanish lynx {Lynx pardinus) , a species confined to the Peninsula, the Spanish hare (Lepus madritensis) , and the species mentioned in the article Pyrenees. The birds of Spain are very numerous, partly because the Peninsula lies in the route of those birds of passage which cross from Africa to Europe or Europe to Africa by way of the Straits of Gibraltar. Many species belonging to central Europe winter in Spain, especially on the south- eastern coasts and in the valley of the Guadalquivir. Innumerable snipe are killed in the Guadalquivir valley and brought to the market of Seville. Among the birds of prey may be mentioned, besides the cinereous and bearded vultures, the Spanish vulture(Gyps occidentalis) , the African or Egyptian vulture {Neophron percnop- terus), which is found among all the mountains of the Peninsula, the Spanish imperial eagle (Aquila Adalberti), the short-toed eagle {Circaetus gallicus), the southern eagle-owl {Bubo atheniensis) , and various kites and falcons. Among gallinaceous birds besides the red-legged partridge, which is met with everywhere on the steppes, there are found also the Pterocles alchita and P. arenarius ; and among the birds of other orders are the southern shrike (Lanius meridion- alis), the Spanish sparrow (Passer cyaneus), and. the blue magpie (Cyanopica cooki). The last is highly remarkable on account of its distribution, it being confined to Spain while the species most closely allied to it (Cyanopica cyanea) belongs to the east of Asia. The flamingo is found native in the Balearic Islands and on the southern coasts, and a 'stray specimen is occasionally seen on the table-land of New Castile. Other birds peculiar to the south are two species of quails, the Andalusian hemipode (Turnix sylvatica), confined to the plains of Andalusia, the southern shearwater (Puffinus cinereus), and other water-birds. Amphibians and reptiles are particularly numerous in the southern provinces, and among these the most remarkable are the large southern or eyed lizard (Lacerta

2 As distinguished from monte alto, the collective name for forest trees.

ocellata), which sometimes attains 3 ft. in length and is very abundant; the Platydactylus saccicularis, the grey amphisbaena {Blanus cinereus) , the European pond-tortoise (Emys europaea), and another species, Emys Siegrizii. Insect life is remarkably abundant and varied. More than 350 species of butterflies, many of them endemic, have been counted in the province of Madrid alone. Besides the ordinary European scorpion, which is general in southern Europe, there is another species, the sting of which is said to be still more severe, found chiefly in the basin of the Ebro. Trout abound in the moun- tain streams and lakes, barbel and many other species of Cyprinidae in the rivers of the plains. For the sea fauna, see under Fisheries below.

Territorial Divisions and Population. — For administrative purposes the kingdom of Spain has since 1833 been divided into forty-nine provinces, forty-seven of which belong to the mainland. Before 1833 the mainland was divided into thirteen provinces, also enume- rated below, which took their names from the ancient kingdoms and principalities out of which the modern kingdom was built up. All the continental provinces, ancient and modern, as also the Balearic Islands, Canary Islands, Annobon, Ceuta, Corisco, the Chaffarinas, Fernando Po, the Muni River Settlements and Rio de Oro are described in separate articles.

It is probable that the population of Spain attained its height during the early Roman Empire, when it has been estimated, though of course on imperfect data, to have numbered forty or fifty millions. The best evidence of a dense population in those days is that afforded by the specific estimates of ancient writers for some of the larger cities. The population of Tarraco (Tarragona) was estimated at 25 millions, and those of Nova Carthago (Carta- gena), Italica (Sevilla la Vieja), and other cities at several hundreds of thousands. Emerita Augusta (Merida) had a Roman garrison of 00,000 men, which also implies a large popu- lation.

The first Spanish census was made in 1594, but some of the provinces now included in the kingdom were not embraced in the enumera- tion, so that the total population assigned to Spain within its present limits for that date is obtained by adding the results of enumerations at different dates in the provinces then ex- cluded. The total thus arrived at is 8,206,791. No other census took place till 1787, when the total was found to be 10,268,150; and this census was followed by another in 1797, when the population was returned as 10,541,221. Various estimates were made within the next sixty years, but the census of 1857 proved that some of these estimates must have been greatly below the truth. The total population then ascertained to exist in Spain was 15,464,340, an increase of not much less than 50% since the census of 1797. Between 1857 and 1877 the population increased to 16,631,869; and by 1897 it had risen to 18,132,475. The

annual rate of increase during this period of forty years was less than -45%, or lower than that of any other European state, except France in the later years of the 19th century. The census of 1900, however, showed that the annual rate of increase had risen, between 1897 and 1900, to -89%, or nearly double its former amount. This fact may be explained partly by the growth of mining and certain other industries, partly, perhaps, by the recuperative power which the Spanish people has always exhibited after war — the most notable instance

of which is the above-mentioned net increase of nearly 50% between 1797 and 1857, despite the Napoleonic invasion and other disastrous wars. A similar though much smaller acceleration in the annual rate of increase after the Carlist Wars of 1874-76 is largely attributable to the prosperity caused by railway development between 1877 and 1887. It would be unjustifiable to assume from the inadequate data available that the Spanish people retains the vitality which characterized it from 1797 to 1857. It is, however, clear from the census returns that at the beginning of the 20th century;

A rea and Population of the Former and Present Provinces.

New Castile. Madrid _ . Guadalajara Toledo Cuenca Ciudad Real

Old Castile . Burgos Logrono . Santander Avila . . Segovia . Soria

Palencia . Valladolid

Asturias

Oviedo Leon .

Salamanca

Zamora .

Leon .

Estremadura Badajoz . Caceres .

Galicia .

Corunna (Corufia)

Lugo

Orense

Pontevedra

Andalusia (Andalusia) Almeria Granada . Malaga Cordova Jaen .

Cadiz (with Ceuta) Seville Huelva

Valencia

Castellon de la Plana Valencia . Alicante .

Murcia . Albacete . Murcia

Catalonia Lerida Gerona Barcelona Tarragona

Aragon . Huesca Saragossa – Teruel

Navarre (Navarra) Navarre .

Basque Provinces Biscay (Vizcaya) Guipuzcoa Alava

Balearic Islands

Canary Islands

Total

Area in sq. m.

27.935 3.084 4,676

5.919 6,636 7.620

25.372 5.480 1,946 2,108 3.042 2,635 3.983 3.256 2,922

4.205 4.205

14,862 4,829 4.097 5.936

16,118

8,451 7,667

“.254 3.051

3,8i4

2,694

1,695

33,777

3.36o

4,928 2,812

5,299 5,203 2,834 5,428 3,913 8,830

2,495 4,150 2,185

10,190 5,737 4,453

12,427 4,690 2,264 2,968 2,505

18,294 5,848 6,726 5,720

4,055 4,055

2,739 836 728 1. 175 1.935 2,807

Pop., 1857.

Pop., 18

194,700

1,477,915 475,785 199,088

328,755 229,959 244,328 1,609,948 333,356 173.812 214,441

164,039 146,839 147,468 185,970 244,023

524,529 524,529 861,434 263,516 249,162 348,756

707,115 404,981 302,134

1,776,879

55L989

424,186

37i,8i8

428,886

2,937.183 315.664 444.629 451,406 351.536 345.879 390,192 463,486 174,391

1,246,485 260,919 606,608 378,958 582,087 201,118 380,969

1,652,291 306,994 310,970 713.734 320,593 880,643

257.839 384,176 238,628

297,422 297.422

413.470 160,579 156,493 96,398 262,893 234,046

Pop., 1900.

1,778,155 683,484

205,040

356,398

246,091 287,142

1,744.301 342,988 183,430

249,116

195.321 155,927 157,008

189,349

271,162

615,844 615,844 984,711 320,588

274,890

389,233 808,685 476,273 332,412

1,967,239 635,327 438,076

415.237 478,599 3.393.681 345,929 482,787 523.915 413,883

428,152

423,261

535,687

240,067

1,461,453 292,952 730,916 437,685 720,843

231.073 489,770

1,836,139

296,609

311,153 879,771

348,606

922,554 260,585

415,152

246,817

307,994 307,994

510,194

234,880 181,149

94.165 313.480 301,963

15,464,340

Pop. per

sq. m.,

1900.

17,667,256

1,923.310

775.034 200,186 376,814 249,696 321,580

1,785,403 338,828 189.376 276,003 200,457

159.243 150,462

192,473 278,561

627,069 627,069

982,393 320,765

275,545 386,083

882,410 520,246 362,164

1,980,515 653,556 463,386 404,311 457,262

3,562,606

359,013 492,460

5",989 455,859 474,490 452,659 555,256 260,880

1,587,533 310,828 806,556 470,149

815,864 237,877 577,987 1,966,382 274,590 299,287

1,054,541 337,964 912,711 244,867 421,843

•246,001

307,669 307,669

603,596 311,361 195,850 96,385 3",649 358,564

6o-8

251-3 42-8 63-6 37-6 42-2

70-3

6i-8

97-3 130-9

65-9 60-4

37-7

59-i

95-3

149- 1

149- 1

66-i

66-4 67-2 65-0,

54-7

6i-6

47-2

175-8 214-2

122-0

I50-I

269-8

105-4 106-8

99-9

182-1 85-8 91-2

159-7

100-4

66-6

179-7 124-5 194-3 215-1

8o-o

4i-3

129-8

158-2

58-5 132-2

355-3 134-9

49-8 41-8 62-7 43-0

75-8 75-8

220-3

372-4 269-0

82-0

161-1 127-5

18,618,086

95-6

532

SPAIN

[GENERAL SURVEY

the nation was well able to make good the numerical losses involved by a serious war; that its numbers tend to increase steadily; and that the rate of increase has hitherto shown a marked acceleration in periods of commercial expansion.

The estimated area and population of the Spanish possessions in Africa, exclusive of Ceuta, are shown below: —

Area in sq. m.

Pop. '.

Rio de Oro

Muni River Settlements …. Fernando Po, Annobon, Corisco, &c. Melilla, Ifni, &c

Totals .

70,000

9,800

• 800

40

130,000

140,000

22,000

15,000

80,640

307,000

Its extraordinary lack of population differentiates Spain from every other country possessed of equal natural advantages and an historic civilization. Spain occupies an unsurpassed geographical position; its resources are rich, varied and to some extent un- exploited ; its inhabitants include the Basques and Catalans, noted for their commercial enterprise, and the Galicians, noted for their industry'. Nevertheless this country, which appears, more than 2000 years ago, to have supported a population nearly thrice as numerous as its present inhabitants and larger than that of the United Kingdom in 1901, is almost as thinly peopled as the most deserted province of Ireland (Connaught 94-5 inhabitants per sq. m.). The depopulation of Spain dates certainly from the Moorish con- quest, possibly from the earlier Visigothic invasion. The Moors decimated the native population; when they in turn were expelled, the country lost not only a numerically large section of its inhabitants, but the section best able to develop its natural wealth. The wars of the 16th, 17th and 18th centuries, and the vast potentialities of fortune which drew men to the Spanish colonies in America, caused a further serious drain upon the population.

As regards the distribution of population between town and country, Spain contrasts in a marked manner with Italy, Spain having but few large towns and a relatively large country population. Communications. — The communications in Spain were greatly improved during the 19th century. In 1808 there were little more than 500 m. of carriage roads; in 1908 the aggregate length of the state, provincial and municipal roads was about 40,000 m. But there are still many parts of the country where trade — and especially mining — is retarded by the want of good roads. In the mountainous districts, where there are only narrow paths, frequently rather steep, it is still not uncommon to meet long trains of pack-mules, which, with ox-carts for heavier goods, constitute the sole means of transport in such regions.

Railways have made great advance since the middle of the 19th century. The oldest line is that from Barcelona to Mataro, 17! m., which was opened on the 28th of October 1848. From 1850 onwards the rate of construction increased apace, and during the last decade of the 19th

century about 205 m. were opened to traffic every year. In January 1910, 9020 m. had been completed, and the whole kingdom was covered by a network of railways which linked together all the principal towns. The Spanish railway system at this time com- municated with the French at Irun and Portbou, west and east respectively of the Pyrenees; and with the Portuguese at or near Tuy on the northern frontier of Portugal, and near La Fregeneda, Ciudad Rodrigo, Valencia de Alcantara and Badajoz on the E. All the Spanish railways belong to private companies, most of which have received state subventions, and they will fall in to the govern- ment mostly at the end of 99 years. In granting a concession for a new railway the practice is to give it to the company that offers to construct it with the lowest subvention. For strategical reasons the Spanish gauge was made different from that of France; and military' considerations long postponed the _ construction of any railway across the Pyrenees. The roads which wind through the Pyrenees in northern Aragon, Navarre and Catalonia had long been the channels of an important traffic, although great inconvenience was caused by the snow which blocks the passes in winter. In 1882 the French and Spanish governments proposed to overcome this obstacle by constructing two railways: one from Huesca to Oloron, through the Canfranc Pass, and through an international tunnel which was to be built at Somport; the other from the Ariege railway system to the Spanish northern system in the province of Lerida. The first line was completed on the Spanish side as far as Jaca, the second was only surveyed; both were opposed by the ministries of war in the two countries concerned. The matter was taken up at the beginning of the 20th century by M. Delcasse, the French minister for foreign affairs, and on the 18th of August 1904 a convention was signed providing for the construction of (1) the Huesca-Oloron line, (2) a line from Ax les Thermes in the Ariege to Ripoll in Catalonia, (3) a line from St Girons in the Ariege to Sort, and thence to Lerida. The Spanish government agreed to finish the Lerida-Sort section by 1915, and the Noguera Pallaresa valley was chosen as the route from Sort to the frontier, where junction with the French railways would be effected through the Port de Salau. All three schemes were ratified in 1904 by the Cortes

and the French Chambers. Seventy per cent, of the railways of Spain, and an even larger proportion of the tramways and narrow-gauge railways, especially in mining districts, have been constructed and worked with foreign capital. The postal and telegraphic services have been placed on the same footing as in other civilized countries. In 1907 the number of letters and post-cards carried in the inland service was 133,201,000, in the international service 44,219,000. The length of state telegraph lines increased from 6665 m. in 1883 to 20,575 m. in 1903. In 1907 there were 84 urban telephone systems and 71 inter-urban circuits.

Agriculture. — Agriculture is by far the most important Spanish industry. In general it is in a backward condition, and is now much less productive than in the time of the Romans and again under the Moors. The expulsion of the latter people in many places inflicted upon agriculture a blow from which it has not recovered to this day. Aragon and Estremadura, the two most thinly peopled of all the old provinces, and the eastern half of Andalusia (above Seville), have all suffered particularly in this manner, later occupiers never having been able to rival the Moors in overcoming the sterility of nature, as in Aragon, or in taking advantage of its fertility, as in Andalusia and the Tierra de Barros. In some districts the imple- ments used are still of the rudest description. The plough is merely a pointed stick shod with iron, crossed by another stick which serves as a share, scratching the ground to the depth of a few inches. But the regular importation of agricultural implements betokens an improvement in this respect. In general there has been consider- able improvement in the condition of agriculture since the introduc- tion of railways, and in every province there is a royal commissioner entrusted with the duty of supervising and encouraging this branch of industry. Among other institutions for the promotion of agricul- ture the royal central school at Aranjuez, to which is attached a model farm, is of special importance. Of the soil of Spain 79-65 % is classed as productive; 33-8% being devoted to agriculture and gardens, 20-8 to fruit, 19-7 to grass, 3-7 to vineyards and 1-6 to olives. The land is subdivided among a very large number of proprietors; over 3,400,000 farms or estates were assessed for taxation in 1905.

The provinces in which agriculture is most advanced are those of Valencia and Catalonia, in both of which the river valleys are thickly seamed with irrigation canals and the hill-slopes carefully terraced for cultivation. In neither province is the soil naturally fertile, and nothing but the untiring industry of the inhabitants, favoured by the rivers which traverse the province from the table-land of New Castile and the numerous small streams (nacimientos) that issue from the base of the limestone mountains and by the numerous torrents from the Pyrenees, has converted them into two of the most productive regions in Spain. In the Basque Provinces and in Galicia the cultivable area is quite as fully utilized, but in these the difficulties are not so great. The least productive tracts, apart from Aragon and Estremadura, are situated in the south and east of New Castile, in Murcia, and in Lower Andalusia — the marshes or marismas of the lower Guadalquivir and the arenas gordas between that river and the Rio Tinto. By far the greater part of the table-land, however, is anything but fertile, the principal exceptions being the Tierra de Campos, said to be the chief corn-growing district in Spain, occupying the greater part of Palencia in the north-west of Old Castile, and the Tierra de Barros, in the portion of Badajoz lying to the south of the Guadiana in Estremadura.

Except in Leon and the provinces bordering on the Bay of Biscay and the Atlantic, irrigation is almost everywhere necessary for cultivation, at least in the case of certain crops. Almost all kinds of vegetables and garden-fruits, oranges, rice, hemp and other products are generally grown solely or mainly on irrigated land, whereas most kinds of grain, vines and olives are cultivated chiefly on dry soil. The water used for irrigation is sometimes derived from springs and rivers in mountain valleys, whence it is conveyed by long canals (acequias) along the mountain sides and sometimes by lofty aqueducts to the fields on which it is to be used. Sometimes the water of entire rivers or vast artificial reservoirs (pdntanos) is used in feeding a dense network of canals distributed over plains many square miles in extent. Such plains in Valencia and Murcia are known by the Spanish name of huertas (gardens), in Andalusia by the Arabic name of vegas, which has the same meaning. Many of the old irrigation works — such as those of the plain of Tarragona — date from the time of the Romans, and many others from the Moorish period, while new ones are still being laid out at the present day. Where no running water is available for irrigation, water is often obtained from wells by means of waterwheels (norias) of simple construction. In most cases such wheels merely have earthenware pitchers attached to their circumfer- ence by means of wisps of esparto, and are turned by a horse har- nessed to a long arm fitted to a revolving shaft. In recent years many artesian wells have been sunk for irrigation. In all, about 9 % of the entire surface of Spain is artificially watered, but in 1900 the government adopted plans for the construction of new canals and reservoirs on a vast scale. The system was designed to bring a greatly increased area of arid or semi-arid land under irrigation. The irrigated portions of the Ebro and Tagus valleys yield twelve times as large a crop per acre as the unirrigated.

Cereals constitute the principal object of cultivation, and among these wheat ranks first, the next in importance being barley, the

chief fodder of horses and mules. Both of these grains are cultivated in all parts, but chiefly on the more level districts of the two Castiles and Leon, and on the plains of 'the Guadalquivir Oram. basin. Oats and rye are cultivated only in the higher

parts of the mountains, the former as a substitute for barley in feeding horses and mules, the latter as a breadstuff. Maize also is cultivated in all

the provinces; nevertheless, its cultivation is limited, since, being a summer crop, it requires irrigation except in the Atlantic provinces, and other products generally yield a more profitable return where irrigation is pursued. Rice is cultivated on a large scale only in the swampy lowlands of Valencia. Among cereals of less importance are buckwheat (in the mountainous regions of the north), millets, including both the common millet (Panicum miliaceum) and the so-called Indian millet {Sorghum vulgare, the jodri of India, the dtirrah of Africa), and even (in La Mancha) guinea-corn {Penicillaria spicata).

Among the natural products of the soil of Spain, in regard to quantity, wines come next to cereals, but the only wines which have Wines. a world-wide reputation are those of the south, those

of Alicante, of Malaga, and more particularly those which take the name of " sherry," from the town of Jerez, in the neighbourhood of which they are grown (see Wine). From 1880 to 1890 when the French vineyards suffered so much from various plagues, and when Spain gave a great impetus to her foreign trade by numerous treaties of commerce, none of her products showed such an increase in exports as her wines. The vine-growing districts had formerly been mostly in the provinces of Cadiz, Malaga, Barce- lona, Aragon and Navarre. Then the vineyards spread all along the Ebro valley and in the Mediterranean seaboard provinces, as well as in New and Old Castile and Estremadura to such an extent that wine is now produced in all the 49 provinces of the kingdom. The average result of the vintage was estimated between 440 and 500 million gallons in 1880 to 1884, and it rose to more than double that amount towards 1890, and amounted in 1898 to 880 million gallons. In that year the total area under the vine was 3,546,375 acres, in 1908 it was 3,136,470 acres. In the hey-day of the cultiva- tion of the vine Spain sent the bulk of her wine exports to France. The imposition of high duties in France on foreign wines in 1 89 1 dealt a severe blow to the export trade in common Spanish wines. The export of wines of the south — Jerez, Malaga and other full- bodied wines styled generoso — did not suffer so much, and England and France continued to take much the same quantities of such wines. There is also a large export of grapes and raisins, especially from Malaga, Valencia, Almeria and Alicante. The Spanish vines have suffered, like those of France, from mildew and phylloxera. The latter has done most damage in the provinces of Malaga and Alicante, in Catalonia, and in some parts of the Ebro valley in Navarre and Aragon. The vines whose fruit is intended for table use as grapes or raisins are trained on espaliers or on trees, especially the nettle-tree (Celtis australis) .

Among fruit-trees the first place belongs to the olive. Its range in Spain embraces the whole of the southern half of the table-land, Fruit. tne g

reater P art of the Ebro valley, and a small strip

on the west coast of Galicia. Along the base of the Sierra Morena from Andujar to the vicinity of Cordova there run regular forests of olives, embracing hundreds of square miles. Cordova is the headquarters of the oil industry, Seville of the cultiva- tion of olives for table use. In 1908 the yield of oil amounted to 36,337,893 gallons. Oranges and lemons, excluded from the plateau by the severity of the winter cold, are grown in great quantities on the plains of Andalusia and all round the Mediterranean coast; the peel of the bigarade or bitter orange is exported to Holland for the manu- facture of curacao; and figs, almonds, pomegranates, carobs and other southern fruits are also grown abundantly in all the warmer parts, the first two even in central Spain and the more sheltered parts of the northern maritime provinces. In these last, however, the prevailing fruit-trees are those of central Europe, and above all the apple, which is very extensively cultivated in Asturias, the Basque Provinces and Navarre. In these provinces large quantities of cider are brewed. The date-palro is very general in the south- eastern half of the kingdom, but is cultivated for its fruit only in the province of Alicante, in which is the celebrated date-grove of Elche (q.v.). In the southern provinces flourish also various sub- tropical exotics, such as the banana, the West Indian cherimoya, and the prickly pear or Indian fig (Opuntia vulgaris), the last fre- quently grown as a hedge-plant, as in other Mediterranean countries, and extending even to the southern part of the table-land. It is specially abundant on the Balearic Islands. The agave or American aloe is cultivated in a similar manner throughout Andalusia.

Cotton is now cultivated only here and there in the south; but sugar-cane is, with sugar-beet, becoming more and more of a staple Sazar ‘ n tne provinces of Granada, Malaga and Almeria. Its

‘ cultivation was introduced by the Arabs in the 12th

century or later, and was of great importance in the kingdom of Granada at the time of the expulsion of the Moors (1489), but has since undergone great vicissitudes, first in consequence of the intro- duction of the cane into America, and afterwards because of the great development of beet-sugar in central Europe. The industry received a powerful stimulus from the loss of the Spanish colonies in 1898, which freed the Spanish growers from the rivalry of their

most successful competitors in the home market. In 1901 the official statistics showed 22 cane-sugar factories and 47 beet-sugar factories with an annual output of about 100,000 tons.

In the production of pod-fruits and kitchen vegetables Spain is ahead of many other countries. The chick-pea forms part of the daily food of all classes of the inhabitants; and among vegetables. other pod-fruits largely cultivated are various kinds of beans and peas, lentils (Ervum lens), Spanish lentils {Lathyrus sativus) and other species of Lathyrus, lupines, &c. The principal fodder-crops are lucerne (Medicago sativa) and esparcette (a variety of sainfoin). Clover, particularly crimson clover (Trifolium in- carnatum), is grown in the northern provinces. Among vegetables garlic and onions take the chief place, and form an indispensable part of the diet of all Spaniards ; besides these, tomatoes and Spanish pepper are the principal garden crops. Among the vegetable products not yet mentioned the most important are the mulberry, grown in almost all provinces, but principally in those bordering on the Mediterranean, and above all in Valencia, the chief seat of the Spanish silk production and manufacture; tobacco, which is also imported, hemp and flax, grown chiefly in Galicia and other northern provinces; among dye-plants, madder, saffron, woad (I satis tincloria), and wild woad or dyer's weed (Reseda luteola); ground-nuts (Arachis hypogaea), grown for their oil, for the pre- paration of which the nuts are exported in considerable quantity to France; liquorice, cummin, colocynth, &c. Esparto, chiefly from the arid lands of the south-east, is largely exported to Great Britain. Despite all the efforts of the breeders and of the government, a decline has gone on not only in horse-rearing, but also in other classes of livestock since 1865. Among the causes Livestock. assigned for this decay is the fact that horse, sheep, goat and swine rearing is becoming less remunerative. Heavy taxation, aggravated by unequal distribution of the burden, owing to insufficient survey of the assessable property, has also contributed to the decline of this and other branches of Spanish farming.

The only animals belonging to Spain still noted for their excellence are mules and asses, which are recognized as among the best to be found anywhere. Goats are mostly bred in the mountainous districts all along the Spanish side of the Pyrenees froth Biscay to Catalonia, and in Badajoz, Caceres, Ciudad Real, Granada and Leon ; swine in Badajoz, Lugo, Oviedo, Caceres and Corunna. The pork and hams of Estremadura are famous; goats' milk and cheese are important articles of diet. In some districts a single peasant often owns as many as 3000 head of goats. Besides the cattle reared for field-labour and (in the northern provinces) for regular dairy farming, bulls for bull-fighting are specially reared in many parts of the country, particularly in the forests of Navarre, the mountains separating the two Castiles, the Sierra Morena, and the Serrania de Ronda in Granada, and also in separate enclosures on the islands of the Guadalquivir. Spanish sheep, which once formed so important a part of the national wealth, are far from having the same importance at the present

day. The most famous breeds of Spanish sheep are the merinos or migrating sheep, which once brought immense revenues to the state as well as to the large proprietors to whom they mostly belonged (see Merino). These sheep are pastured in different districts in summer and winter. Their winter quarters are in the lower parts of Leon and Estremadura, La Mancha, and the lowlands of Andalusia, their summer quarters the more mountainous districts to the east and north (Plasencia in the province of Caceres, Avila, Segovia, Cuenca, Valencia), which are not so much affected by t-he summer droughts of. the Peninsula. The mode of the migration and the routes to be followed are pre- scribed by law. Each flock consists of about 10,000 sheep, under the command of a mayoral, and is divided into sections containing about 1000 each, each section under the charge of an overseer (capataz) , who is assisted by a number of shepherds (pastores) attended by dogs. The shepherds, rudely clad in a sleeveless sheepskin jacket, the wool outside, and leather breeches, and loosely wrapped in a woollen mantle or blanket, are among the most striking objects in a Spanish landscape, especially on the table-land. The migration to the summer quarters takes place at the beginning of April, the return at the end of September. At one time the owners of merino flocks enjoyed the right of pasturing their sheep during their migra- tions on a strip of ground about 100 yds. in breadth bordering the routes along which the migrations took place, but this right (the mesta, as it was called) was abolished in 1836 as prejudicial to cul- tivation. The numbers of the merinos have been greatly reduced, and they have been replaced by coarse-woolled breeds.

Fisheries. — The catching of tunnies, sardines, anchovies and salmon on the coasts employs large numbers of fishermen (about 67,000 in 1910), and the salting, smoking and packing of the first three give employment to many others. In 1910 there were about 400 sardine-curing establishments in the kingdom.

Minerals. — The mineral resources of Spain are as yet far from being adequately turned to account. No European country produces so great a variety of minerals in large amount, and in the production of copper ore, lead ore and mercury Spain heads the list. In the production of salt and silver it is excelled only by Austria-Hungary, and, as regards silver, not always even by it. Iron ore is chiefly obtained in Biscay and Murcia, the former yielding by far the greater quantity, but the latter yielding the better quality.

All except a small fraction of the copper ore is obtained from the province of Huelva, in which lie the well-known mines of Tharsis and Rio Tinto (g.i».). The lead ore is obtained chiefly in Murcia and Jaen . The famous mines of Linares belong to the latter province. Argentiferous lead is chiefly produced in Almeria, which also pro- duces most of the silver ore of other kinds except argentiferous copper ore, which is entirely obtained from Ciudad Real. The still more celebrated mercury mines of Almaden (?.».), the richest in the world till the discovery of the Californian mines of New Almaden, belong to Ciudad Real, and this province, together with that of Oviedo, furnishes the whole of the Spanish production of this mineral. Spanish salt is partly marine, partly derived from brine-springs and partly from rock-salt, of which last there is an entire mountain at Cardona {q.v.) in Barcelona. Coal is chiefly obtained in Oviedo, Palencia and Cordova. TITe production is quite insignificant compared with the extent of the coal-bearing beds, which are estimated to cover an area of about 3500 sq.' m., of which nearly a third belongs to Oviedo. Among the less important Spanish minerals are manganese (chiefly in Ciudad Real), antimony, gold, cobalt, sodic sulphate, sulphate of barium (barytes), phosphorite (found in Caceres), alum, sulphur, kaolin, lignite, asphalt, besides a variety of building and ornamental stones. In 1905 the workmen employed on mines in Spain numbered 105,000, and the total value of the output was estimated at £7,734,805. By the law of the 6th of July 1859, a large number of important mines, including all the salt-works and rock-salt mines, were reserved as state property, but financial necessities compelled the government to surrender one mine after another, so that at present the state possesses only the mercury mines and some salt-works. Many of the mines have been granted to foreign (principally British) companies.

Manufactures. — The maritime provinces, being those most favour- ably situated for the import of coal, and, where necessary, of raw material, are the chief seats of Spanish manufactures. The principal manufacture is that of cotton. The exports of Spanish cotton goods were, until the close of the 19th century, hardly worth mentioning outside the colonial markets, which took an average of two millions sterling in the decade 1 888-1 898. This outlet is now almost closed, as the new masters of Cuba, Porto Rico and the Philippines no longer protect Spanish imports against European and American com- petitors. But this loss has been to a great extent compensated by the expansion of the home market for cotton, and the Spanish manufacturers are unable to meet the wants of the population, large quantities of cotton goods being imported every year. The cotton industry was long principally centred in Catalonia, and mainly in the province and town of Barcelona, famed also for their manu- factures of lace, woollen and linen goods. The northern provinces, especially Guipiizcoa and Biscay, Navarre and Oviedo, have followed in the wake of

Catalonia for linen and cotton industries and for paper-mills. Flax-spinning is confined to Galicia. The silk industry, though inadequate to meet the home demands, is active in Valencia, Murcia and Seville. Metal industries, at first limited to the Basque Provinces, particularly around Bilbao, have spread to Asturias, Almeria, Galicia, near the great ore beds and in the vicinity of many coal mines. In the same Asturian districts the government has its foundries and factories for making arms at La Trubia and Oviedo, Toledo being only now famous for its blades and decorative work, while the foundries at Seville and Segovia are unimportant compared with those of Asturias. The manufacture of leather, another Spanish industry of old renown, is still extensively carried on in Catalonia and elsewhere, but the making of cordwain has long ceased to be a speciality of Cordova, from which it takes its name. Gloves are made in Seville and Madrid, shoes in the Balearic Isles, chiefly for Cuba and Porto Rico. The esparto is twisted into cords and ropes and the staple matting so common on the floors of Spanish houses of all classes, the estera. Soap, chocolate and cork manufactures are among the prosperous industries. The same may be said of charcoal, both for heating and mechanical purposes. The large furnaces for the distillation of mercury at Almaden were at one time heated solely with charcoal obtained from the Cistus ladaniferus. The making of porcelain is chiefly carried on at Seville. The war of tariffs between France and Spain after 1891 was an inducement for an extraordinary development in the making of brandy and liqueurs of every kind, of fruit preserves, potted meats, etc., in Navarre, the Basque Provinces, Catalonia, and even in Valladolid and Andalusia. Special mention must be made of the manufacture of tobacco, a royal monopoly, farmed out to a company, which increased the factories from seven to twelve and began by paying the treasury £3,400,000 annually.

The decade following the Spanish- American War (1898- 1908), which may be regarded as a period of industrial and commercial reconstruction, was marked by a very rapid increase in the use of electricity for lighting, traction and other purposes. Owing to the abundance of water-power to be obtained in the mountainous regions, these new undertakings proved very successful. Spain is, on the whole, a country whose production falls far short of her own requirements. With a protected home market, cheap power and cheap labour available, there is room for much industrial develop- ment. It is, however, noteworthy that Spanish capitalists are, as a class, though exclusive of the Catalans, unduly conservative. Hence the capital for the establishment of electrical industries was

almost exclusively subscribed in Germany, France, Belgium, Switzer- land and the United States, just as, in the 19th century, the railways and mining industries had been mainly financed by British investors, and the Valencian silk industry by French. Another feature of the period of reconstruction was

the formation of numerous trusts or combinations of producing companies designed to take advantage of the high tariff, and to restrict competition, lower expenses and raise prices. The paper, sugar, salt petroleum and metallurgical industries were subjected to this process, but in no case was it possible to secure a complete monopoly.

Commerce. — Possessing varied resources and being favourably situated for commerce, Spain might be expected to take a leading place among the trading communities of Europe. This it did at one time hold, when the treasure acquired by the discovery of America and the conquest of Mexico and Peru was squandered in the purchase of various commodities from England, the Nether- lands and other countries. This period of outward prosperity, however, was also that in which the seeds of decline were planted. The expulsion of the Moors from Granada was contemporaneous with the discovery of the New World. Hundreds of thousands of Moors were driven out from the country on subsequent occasions, and in the act Spain lost the best of her agriculturists and handi- craftsmen. The Spaniards ot that day, excited by the hope of rapidly acquired wealth and the love of adventure, embarked upon a career of discovery, and agriculture and manufacturing industry fell into contempt. The loss of all her possessions on the American mainland in the early part of the 19th century dealt a severe blow to the foreign commerce of Spain, from which it only recovered about 1 850, when imports and exports began to increase. After the re- storation of the Bourbons in 1875, the first cabinet of Alphonso XII. 's reign stopped the operation of the tariff law of the Revolution and reverted to protection. In 1882 a Liberal cabinet revived the system of a gradual reduction of import duties to a fixed maxi- mum, and made commercial treaties with France and several other nations, which were followed by a treaty with Great Britain in 1886. The foreign commerce of Spain rapidly developed in the decade 1882-1892, Great Britain, France and the United States figuring at the head of the imports, Great Britain and France at the head of the exports. The exports of Spanish wines to France alone amounted to £12,000,000 annually. When France and other European nations abandoned free trade for protection towards 1890, a strong movement set in in Spain in favour of protection. In 1890 the Conservative cabinet of Senor Canovas raised the duties on agricultural products, in 189 1 it denounced all the treaties of com- merce that included most-favoured-nation treatment clauses, and in 1 892 a new tariff law established considerably higher duties than those of 1882 — in fact, duties ranging from 40% to 300%. The subsequent revision of the tariff, completed in 1906, involved no serious departure from the economic policy adopted in 1890.

The following table shows the value of Spanish imports and exports for a number of representative years after 1848:—

Year.

Imports.

Exports.

£

£

1849

6,360,000

5,240,000

i860

14,833,000

10,982,000

1865

16,262,000

12,864,000

1870

20,876,000

15,982,000

1875

22,812,000

18,081,000

1880

28,482,000

25,999,000

1885

30,590,000

27,920,000

1890

37,646,000

37,510,000

1895

33,540,000

32,198,000

1900

34,496,000

28,955,000

1905

32,320,000

50,012,000

The principal exports include metals and other minerals; wine, sugar, fruit and other alimentary substances, cotton and its manu- factures; animals and their products, including wool and hair; timber and wrought wood. The principal imports include grain, dried fish and other food-stuffs; livestock and animal products; machinery, vehicles and ships; stone, minerals, glass and pottery; drugs and chemical products; textiles and raw cotton. Great Britain, France, the United States, Germany and Portugal, named in the order of their importance, are the chief consumers of Spanish exports. The chief exporters to Spain (in the same order) are Great Britain, France, Cuba, Germany and Portugal. The foreign trade of the country is of course carried on mainly by sea, and of the land commerce by far the largest proportion is with or through France. The smallness of the trade with Portugal is partly due to the similarity of the chief products of the two countries.

Shipping and Navigation. — Spain has 21 seaboard provinces, with more than 120 ports of some importance. The merchant navy of Spain, far from decaying through the loss of her colonies in 1898, seems to have been given fresh impetus. Many English and French steamers have been purchased

abroad and nationalized. In 1905 the mercantile marine comprised 449 steamships of 434,846 tons, and 541 sailing vessels of 85,583 tons. The sailing vessels are decreasing in numbers in the exterior trade, but not in the coasting

trade, which is decidedly developing and occupying more craft. It is carried on exclusively under the Spanish flag. The fishing fleet, chiefly sailing boats, is also important, and is manned by a hardy and active coast population. In 1905 19,722 ships of 16,595,267 tons entered, and 18,033 of 16,442,355 tons cleared.

Banking and Credit. — The Bank of Spain (Banco de Espana) has a charter which has been renewed and enlarged several times since its foundation after the Restoration, and its privileged note issue has had to be gradually and very largely increased by legislative authorizations, especially in 1891 and 1898, as its relations with the treasuries of Spain and of her colonies increased; since nothing in the sen-ices rendered by the bank to the public would ever have justified the growth of the note issue first to thirty millions sterling in 1 891 . then by quick strides to fifty and over sixty-one millions sterling in 1899 and 1900. At the close of the 19th century the remodelled bank charter, which is only to expire in 1921, authorized a maximum issue of £100,000,000, on condition that the bank keeps cash in hand, gold and silver in equal quantities, equal to a third of the notes in circulation up to £60,000,000, and equal to half the amount issued above that sum. Gold has practically disappeared from business of every kind since 1881, when the premium began to rise; it reached a maximum of 120% during the war with America. Afterwards it dropped to about 30 in 1900. Bank-notes and silver coin have been practically the currency for many years.

Currency, Weights and Measures. — The metric system of weights and measures was officially adopted in Spain in 1859 and the decimal monetary system in 1871. In the case of the weights and measures the French names were also adopted, with only the necessary linguistic changes. Certain older standards remain in common use, notably the quintal (of 101-4 lb avoirdupois), the libra (1-014 lb avoirdupois), the arroba (3} imperial gallons for wine, 2% imperial gallons for oil), the fane ga (ij imperial bushels). In the case of the currency the old Spanish name of peseta was retained for the unit (the franc, 9§d.). The peseta is divided

into 100 centesimos. According to its par value 25-225 pesetas are about equal to £1, but the actual value of the peseta is about 7jd. In law, there is a double standard of value, silver and gold, in the ratio of 15 1- to 1. But the only silver coin which is legal tender up to any amount is the 5-peseta piece, and the coinage of this is restricted. One- peseta pieres in silver, and 20-, 10- and 5-peseta pieces in gold are also current. Before the introduction of the decimal monetary system the peseta was the fifth part of a peso duro, which was equal to 20 reales de velion, or rather more than a 5-franc piece. The only paper money consists of the notes of the Bank of Spain.

Finance. — Spanish finance passed through many vicissitudes during the 19th century. In the reigns of Ferdinand VII. and Isabella II. the creditors of the state had to suffer several suspensions of payments of their dues, and reductions both of capital and interest. During the Revolution, from 1868 to 1874, matters culminated in bankruptcy. Payments of interest were only in part resumed after the Restoration in 1876, and in 1882 the government of King Alphonso XII. proposed arrangements to consolidate the floating and treasury debts of the Peninsula in the shape of £70,000,000 of 4°o stock, redeemable in 40 years, and to reduce and consolidate the old exterior and interior debts, then exceeding £480,000,000, in the form of £78,840,000 of exterior 4 % debt — exempt from taxation under an agreement to that effect with the council of foreign bond- holders in London on the 28th of June 1882 — and £77,840,000 of perpetual interior 4%. The colonial debts were not included in those plans. The debts of Spain were further increased in 1891 by a consolidation of £10,000,000 of floating debt turned into 4% redeemable stock similar to that of 1882; and this did not prevent a fresh growth of floating debts out of annual deficits averaging two to three millions sterling during the last quarter of the 19th century. The floating debt in 1900 had swollen to £24,243,300. The govern- ment of Spain having guaranteed the colonial debts of Cuba and of the Philippines, when those colonies were lost in 1898, Spain was further saddled with £46,210,000 of colonial consolidated debts, and with the expenses of ths wars amounting, besides, to £63,257,000. Consequently, the Spanish government had once more to attempt to make both ends meet by asking its creditors to assent to the suppression of all the amortization of imperial and colonial debts, and to a tax of 20% on the coupons of all the debts, whilst at the same time the Cortes were asked to authorize a consolidation and liquidation of the floating and war debts and an annual increase of £3,200,000 in already heavy taxation. Under these modifications the Spanish debt at the close of the 19th century, exclusive of £44,000,000 of treasury debt, consisted of £41,750,000 of exterior debt, still temporarily exempted from taxation on the condition of being held by foreigners, of £270,000,000 of 4% interior consols, and of £60,000,000

of new 5 % consols, replacing the war and floating debts. In January 1905 this total outstanding debt of £415,750,000 had been reduced to £381,833,000; the capital sum was thus approxi mately equal to £20 8s. per head of the population, and the annual charge amounted to about 17s. 6d. per head. Between 1885 and 1905 the revenue of Spain varied from £30,000,000 to £40,000,000, and the expenditure was approximated equal ; deficits were common towards the beginning of this period, surpluses towards the end. For an analysis of the budget the year 1008 may be taken as typical, inasmuch as trade had then resumed its normal condition, after*

the disturbing influence of tariff revision in 1906 and the failure of many crops in 1907. The estimates for 1908 showed that the revenue was derived as follows : Direct taxes on land, houses, mines, industry and commerce, livestock, registration acts, titles of nobility, mortgages and salaries paid by the state, £18,020,800; indirect taxes, including customs, excise, tolls and bridge and ferry dues, £14,748,000; tobacco monopoly, lottery, mint, national property, balance from public treasury, &c, £8,858,400; total £41,627,200. The_ principal items of expenditure were: Public debt, £16,199,300; ministry of war, £6,301,100; ministry of public works, &c, £3,679,540; pensions, £2,881,400. The total was £40,926,740.

Constitution and Government. — Spain is an hereditary monarchy the constitution of which was voted by the Cortes and became the fundamental law of the 30th of June 1876. This law fixes the order of succession as follows: should no legitimate descen- dant of Alphonso XII. survive, the succession devolves first upon his sisters, next upon his aunt and her legitimate descen- dants, and finally upon the legitimate descendants of the brothers of Ferdinand VII. " unless they have been excluded." Should all lines become extinct, the nation may elect its monarch. The sovereign becomes of age on completing his or her sixteenth year. He is inviolable, but his ministers are responsible tff the Cortes, and none of his decrees is valid unless countersigned by a minister. The sovereign is grand-master of the eight Spanish orders of knighthood, the principal of which is that of the Golden Fleece (Toison de Oro), founded in 1431 by Philip of Burgundy. The chain of this order surrounds the royal arms, in which are included, besides the arms of Castile, Leon, Granada, and the lilies of the royal house of Bourbon, the arms of Austria, Sicily, Savoy, Brabant and others. The national colours are red and yellow. The flag is divided into three horizontal stripes, two red stripes with a yellow one between bearing the royal arms. The legislative authority is exercised by the sovereign in conjunction with the Cortes, a body composed of two houses — a senate and a chamber of deputies. The senate is composed of members of three classes: (1) members by right of birth or office — princes, nobles who

possess an annual income of 60,000 pesetas (£2,400), and hold the rank of grandee (grande), a dignity conferred by the king either for life or as an hereditary honour, captains-general of the army, admirals of the navy, the patriarch of the Indies, archbishops, cardinals, the presi- dents of the council of state or of the Supreme Court, and other high officials, all of whom must have retained their appoint- ments for two years; (2) members nominated by the sovereign for life; and (3) members elected three each by the 49 provinces of the kingdom, and the remainder by academies, universities, dioceses and state corporations. The members belonging to the first two classes must not exceed 180 in number, and there may be the same number of members of the third class. The senatorial electors in the provinces are (1) delegates of the communes and (2) all the members of the provincial council, presided over by the governor. The lower house of the Cortes was elected by a very limited franchise from 1877 to 1890, when the Cortes passed a reform bill which became law on the 29th of June 1890. This law re-established universal male suffrage, which had existed during the Revolution, from 1869 to 1877. Under the law of the 29th of June 1890 every Spaniard who is not debarred from his civil and civic rights by any legal incapacity, and has resided consecutively two years in his parish, becomes an elector on completing his twenty-fifth year- Soldiers and sailors in active service cannot vote. All Spaniards aged 25 who are not clerks in holy orders can be elected. The same electoral law was extended to the municipal elections.

The executive administration is entrusted to a responsible ministry, in which the president generally holds no portfolio, though some prime ministers have also taken charge of one of the departments. The ministerial departments are: Foreign affairs, grace and justice, finance, interior, war, education and fine arts, marine, public works, and agriculture and commerce. Under the secretary of state for the interior the civil administration in each province is headed by a governor, who represents the central power in the provincial council (diputacion provincial) which is also elected by universal suffrage. The provincial councils meet yearly, and are permanently

represented by a committee (commission provincial), which is elected annually to safeguard their interests. Every commune or municipality has its own elected ayuntamiento {q.v.), which has complete control over municipal administration, with power to levy and collect taxes. Its members

are styled regidores or concejales, and half their number is elected every two years. They appoint an alcalde or mayor from among themselves to act as president, chief executive officer, and justice of the peace. In the larger towns the alcalde shares his reponsibilities with several permanent officials called lenientes alcaldes. The fundamental law of 1876 secures to ayuntamientos, and to the provincial councils, an autonomy which is complete within its own limits. Neither the executive nor the Cortes may inter- fere with provincial and communal administration, except when the local authorities exceed their legal power to the detriment of public interests. This provision of the constitution has not always been strictly observed by the government.

Law and Justice.-Spa.msh law is founded on Roman law, Gothic common law, and the national code proclaimed at the meeting of the ?|prtes at Toro in 1501 (the leyes de Toro).

The present civil code was put into force on the 1st of May 1889 for the whole kingdom. The penal code dates from 1870, and was modified in 1877. The commercial code was put into force on the 22nd of August 1885, the code of civil procedure on the 1st of April 1881, and the code of criminal procedure on the 22nd of June 1882. There is a court of first instance in each of the 495 partidos judiciales, or legal districts, into which the kingdom is divided. From this inferior jurisdiction the appeals go to the 15 audiencias lerritoriales, or courts of appeal. There is in Madrid a Supreme Court, which is modelled upon the French Cour de Cassation, to rule on points of law when appeals are made from the decisions of inferior courts, or when conflicts arise between civil and military jurisdiction. When the law of the 20th of April 1888 established trial by jury for most crimes and delicts, 49 audiencias criminates, one in each province, were created ; these are a sort of assize held four times a year. The administration of justice is public. The parties to a suit must be represented by counsel. The state is always represented in every court by abogados fiscales, public prosecutors, and counsel who are nominees of the Crown.

Religion. — Roman Catholicism is the established religion, and the Church and clergy are maintained by the state at an annual cost of about £1,600,000. The relations between Church and state, and the position of the religious orders, were defined by the concordat of 1851, remaining practically unchanged until 1910. There are ten archbishoprics (Toledo, Madrid, Burgos, Granada, Santiago, Saragossa, Seville, Tarragona, Valencia and Valladolid) and forty- five bishoprics. The archbishop of Toledo is primate. The number of monastic communities is about 3250, including some 600 convents for men and 2650 for women. Most of the religious orders carry on active educational or charitable work. The monks number about 10,000, the nuns 40,000. The immense majority of the

people are professed adherents of the Roman Catholic faith, so that, so far as numbers go, Spain is still the most " Catholic " country in the world, as it has long been styled. With liberty of conscience during the Revolution, from 1868 to 1877, the Church lost ground, and anti-clerical ideas prevailed for a while in the centres of repub- licanism in Catalonia and Andalusia; but a reaction set in with the Restoration. The governments of the Restoration showed the Church much favour, allowed the Jesuits and religious orders of both sexes to spread to an extent without precedent in the century, and to take hold of the education of more than half of the youth of both sexes in all classes of society. This revival of Church and monastic influence began during the reign of Alphonso XII., 1877-1885, and considerably increased afterwards under the regency of Queen Christina, during the long minority of Alphonso XIII., the godson of Pope Leo XIII. Spanish codes still contain severe penalties for delicts against the state religion, as writers frequently discover when they give offence to the ecclesiastical authorities. Blasphemy is punished by imprisonment. The bishops sit in the superior council of education, and exercise much influence on public instruc- tion. Since 1899 all boys have been obliged to attend lectures on theology and religion during six out of seven years of their curriculum to obtain the B.A. degree. Canon lav/ and Church doctrine form an obligatory part of the studies of men qualifying for the bar and magistracy. By the constitution of 1876 non-Catholics were only permitted to exercise their form of worship on condition that they did so in private, without any public demonstration or announcement of their services. The same rule applies to their schools, which are, however, numerously attended, in Madrid, Seville, Barcelona and other towns, by children of Protestant families and of many Roman Catholics also. A proposal to abolish these restrictions was made by the government in 1910 (see History, below).

Education. — A law of the 17th of July 1857 made primary educa- tion free for the poor, and compulsory on all children of school age,

originally fixed at six to nine years. It proved impossible to enforce this statute, and the majority of Spaniards are still illiterate, though in decreasing proportion at each census. The primary schools for both sexes are kept up by the municipalities, at an annual cost of about £1,000,000, to which the state contributes a small subvention. The secondary schools, of which there must be at least one in every province, are styled institutes and are mostly self-supporting, the fees paid by the pupils usually cover the expenses of such estab- lishments, which also receive subsidies from some of the provincial councils. Spain has nine universities : Madrid, the most numerously attended ; Salamanca, the most ancient ; Granada, Seville, Barcelona, Valencia, Santiago, Saragossa and Valladolid. There are also a faculty of medicine at Cadiz and a faculty of law at Oviedo. Most of the

universities are self-supporting from the fees of matriculations and of degrees. The state also maintains a variety of technical schools, for agriculture, engineering, architecture, painting, music, &c. The whole system of public instruction is controlled by the minister of education and an advisory council. A law passed on the 1st of July 1902 requires that all private schools must be authorized by the state, and arranges for their periodical inspection, for the enforce- ment of proper sanitation and discipline, and for the appointment of a suitable staff of teachers. Among the institutions affected by this law are numerous Jesuit and other ecclesiastical schools for boys, and a Jesuit university at Deusto, near Bilbao, whose pupils have to pass their final secondary examinations and to take all degrees in the state establishments as free scholars. The education of girls has been much developed not only in the state schools but even more so in the convents, which educate more than half the girls of the upper and middle classes. Many girls attend the provincial institutes, and some have successfully gone in for the B.A. degrees and even higher honours in the universities.

Defence. — The Spanish army is recruited by conscription. Liability to service begins with the first day of the calendar year in which the twentieth year is completed. Except in extraordinary circumstances, the war ministers have seldom called for more than forty to sixty thousand men annually, and of this contingent all who can afford to do so buy them- selves off from service at home by payment of £60, and if drafted for colonial service by payment of £80. The period of service for all arms is twelve years — three with the colours,, three in the first-class reserve, six in the second-class reserve, which contains the surplus of the annual contingent of recruits, and is liable to one month's training in every year. The war ministers can, and frequently do, send on unlimited furlough, or place in the first-class reserve, men who have not completed their first three years, and thus a considerable saving is made. Brothers can take each other's place in the service, and eldest sons of aged parents, or sons of widows, easily get exempted. Spain is divided into seven military regions or army corps. The strength of the regular army for many years varied between 85,000 and 100,000 in time of peace, and during the Carlist Wars, 1868 to 1876, Spain had 280,000 under arms, and nearly 350,000 during her more recent wars. For 1899-1900 the figures were only 80,000. The active army is divided into 56 regiments of the line with 2 battalions each, 20 battalions of rifles or cazadores, 2 Balearic Islands, 1 Melilla, 4 African battalions of light infantry, 2 battalions of rifles in the Canaries. The cavalry includes a squadron of royal horse guards, 28 regiments of the line, remount and depot establish- ments, 4 regional squadrons in Majorca, the Canaries, Ceuta, Melilia. The artillery comprises 12 regiments of field artillery, 1 of horse artillery, 3 regiments and an independent division of

mountain guns, and 7 battalions of garrison artillery. The royal engineers are 4 regiments of sappers and miners, 1 of pontooners, 1 battalion of telegraph engineers, 1 of railway engineers with cyclists, 1 balloon corps, and 4 colonial corps. Other permanent military forces are 1075 officers, 1604 mounted and 16,536. foot gendarmes, mostly old soldiers, and 14,156 carabineers, all of them old soldiers. The regular army, at the close of the wars in 1898, had 26,000 officers and about 400 generals, but a law was afterwards made to reduce their numbers by filling only one out of two death vacancies, with a view to reach a peace establishment of 2 marshals, 25 lieutenant-generals, 50 divisional- and 140 brigadier-generals, and 15,000 officers. The total strength of the field army may be estimated at 220,000 combatants. The military academies are Toledo for infantry, Segovia for artillery, Valladolid for cavalry, Avila for commissariat, Escorial for carabineers, Getafe

for civil guards, besides a staff college styled Escuela Superior de Guerra at Madrid. Numerous fortresses guard the Portu- guese frontier and the passes of the Pyrenees, but many of these are ill-armed and obsolete.

The navy is recruited by conscription in the coast or maritime districts, which are divided into three naval captaincies-general, those of Ferrol, Cadiz and Cartagena — at the head of each being a vice-admiral. No attempt was made, during the decade which followed the Spanish-American War, to replace the squadrons destroyed at Manila and Santiago de Cuba. When the reconstruc- tion of the navy was begun, in 1908, Spain possessed 1 battleship, 2 armoured cruisers, 6 protected cruisers, 5 destroyers and 6 torpedo-boats. All the larger vessels were old and of little value.

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History A. — Ancient to A.D. 406.

Primitive Inhabitants. — The origin and character of the early inhabitants of the Peninsula are unknown; recent conjectures on the subject, which have been many, are more bold than probable, and we must await the result of further excavations of prehistoric sites and further inquiries into the native inscrip- tions before we can hope for much certainty. The Romans, whose acquaintance with the country began in the 3rd century B.C., mention three races: Iberians (in the east, north and south), Celts (north-west) and Celtiberians (centre), but the classification does not help us far. The use to-day of the strange and ancient Basque tongue on the western slopes of the Pyrenees and in Vizcaya (Biscay) — a tongue which

is utterly unlike Celtic or Italian or any " Indo-Germanic " language — suggests that the Iberians may have been an older people than the Celts and alien from them in race, though the attempts hitherto made to connect Basque with ancient traces of strange tongues in the Basque lands have not yielded clear results. On the other hand, numerous place- names show that parts of the Peninsula were once held by Celtic-speaking peoples, and it is, of course, possible that Celts and Iberians may have formed a mixed race in certain regions. Of other ancient races little trace can be detected. The Phoenicians were here traders and not settlers; the Greeks, though they planted early colonies on the Gulf of Lyons, occupied hardly any site south of the Pyrenees, and the seeming likeness in name of Saguntum (q.v.) and the Greek island Zacynthus is mere coincidence. It is possible, however, that after the Roman conquest Italians drifted in, and it is fairly certain that after the Roman Empire fell German conquerors brought German settlers, though in what numbers no wise man will guess.

Earliest Historic Period. — Phoenician traders probably reached Spain long before our historical knowledge of the Peninsula begins, possibly as early as the nth century B.C. One of their earlier settlements, Gades (now ni^aa™' Cadiz), has been called the oldest town in the world (or in Europe) which has kept a continuity of life and name from its first origin. But the Phoenician exploitation of Spain dates principally from after the rise of Carthage {q.v.), the great Phoenician city of North Africa. Carthaginian " factories " were planted on many Spanish coasts: a Nova Carthago (New Carthage, mod. Cartagena) formed a Carthaginian fortress with the best harbour of south-eastern Spain. The expansion is attributed chiefly to the second half of the 3rd century B.C., and to the genius of the Carthaginian statesman, Hamilcar Barca, who, seeing his country deprived by Rome of her trading dominion in Sicily and Sardinia, used Spain, not only as a source of commercial wealth, but as an inexhaustible supply of warlike troops to serve in the Carthaginian armies. But Rome had already her eyes on the Spanish men and mines, and, in the second Punic War, drove Carthage finally and completely out of the Peninsula (201 B.C.).

Roman Spain. — The Romans divided Spain into two " spheres of administration" (provinciae) , Hither or Citerior, that is the northern districts which were nearer to Italy, and Republican Further or Ulterior, the south. To each " province " Period, was sent yearly a governor, often with the title 200-27B.C. proconsul. The commands were full of military activity. The south, indeed, and in particular the fertile valley of Anda-lusia, the region of the Guadalquivir (Baetis), then called Baetica, was from the first fairly peaceful. Settlements of Italian veterans or of Spanish soldiers who had served for Rome were made at Hispalis (Seville) and at Carteia near

Gibraltar, and a beginning was made of a Romanized provincial population, though in a somewhat half-hearted way. But in the north, on the high plateau and amidst the hills, there was incessant fighting throughout the greater part of the 2nd century B.C., and indeed in some quarters right down to the establish- ment of the empire. The Carthaginians had extended their influence no great distance from the eastern coast and their Roman successors had all the work to do. In the long struggle many Roman armies were defeated, many commanders dis- graced, many Spanish leaders won undying fame as patriot chiefs (see Numantia). Even where one Roman succeeded, the incapacity or the perfidy of his successor too often lost the fruits of success. But though its instruments were weak the Republic was still strong, and the struggle itself, a struggle quite as much for a peaceful frontier as for aggrandizement and annexation of fresh land, could not be given up without risk to the lands already won. So the war went on to its inevitable issue. Numantia, the centre of the fiercest resistance, fell in 133 B.C. before the science of Scipio Aemilianus (see Scipio), and even northern Spain began to accept Roman rule and Roman civilization. When in the decade 80-70 B.C. the Roman Sertorius (q.v.) attempted to make head in Spain against his political enemies in Rome, the Spaniards who supported him were already half Romanized. There remained only some disturbed and unconquered tribes in the northern hills and on the western coast. Some of these were dealt with by Julius Caesar, governor here in 61 B.C., who is said also to have made his way, by his lieutenant Crassus, to the tin mines of the north-west in Galicia. Others, especially the hill tribes of the Basque and Asturian mountains fringing the north coast, were still unquiet under Augustus, and we find a large Roman garrison maintained throughout the empire at Leon (Legio) to overawe these tribes. But behind all this long fighting, pacification and culture had spread steadily. The republican administration of Spain was wise. The Spanish subjects were allowed to collect themselves the taxes and tribute due to Rome, and, though the mineral wealth doubtless fell into the hands of Roman capitalists, the natives were free from the tithes and tithe system which caused such misery and revolt in the Roman province of Sicily. On the other hand, every facility was given them to Romanize themselves; there was no competing influence of Hellenic or Punic culture and the uncivilized Spaniards accepted Roman ways gladly. By the days of Cicero and Caesar (70-44 B.C.) the southern districts, at least, had become practically Roman: their speech, their literature, their gods were wholly or almost wholly Italian, as Cicero and Strabo and other writers of these and

the next few years unanimously testify. Gades, once Phoenician, gained, by Caesar's favour and the intercession of Balbus, a Roman municipal charter as municipium: that is, its citizens were regarded as sufficiently Romanized to be granted both the Roman personal franchise and the Roman city-rights. It was the first city outside of Italy which obtained such a municipal charter, without the usual implantation of Roman citizens (either poor men needing land or discharged veteran soldiers) from Italy.

Augustus (or Tiberius possibly) reorganized the administra- tion of Roman Spain. . Henceforward there were three pro- The Empire, vinces: (a) the north and north-west, the central 2TB.C- table-land and the east coast as far south as New A.D. 406. Carthage, that is, all the thinly-populated and un- quiet hill country, formed the province of Tarraconensis with a capital at Tarraco (Tarragona) under a legatus Augusti pro praetore with a legion (VII. Gemina) at Leon and some other troops at his disposal; (b) the fertile and peaceful west formed the province of Lusitania, very roughly the modern Portugal, also under a legatus Augusti pro praetore, but with very few troops; (c) the fertile and peaceful south formed the province of Baetica, called after its chief river, the Baetis, under a pro- consul nominated by the senate, with no troops. These divi- sions (it will be observed) exactly coincide with the geographical features of the Peninsula. Substantially, they remained till

the end of the empire, though Tarraconensis was broken up at different dates into smaller and more manageable areas. Augus- tus also accelerated the Romanization of the land by planting in it many municipalities (coloniae) of discharged soldiers, such for example as Augusta Emerita (mod. Merida), which declares by its name its connexion with time-expired veterans and still possesses extensive Roman ruins. Either now, too, or soon after, imperial finance agents (procuratores) were appointed to control the revenues and also to look after the mines, which now became Imperial property, while a special praefeclus administered the Balearic Islands. The two principal features of the whole country during the. imperial period are its great prosperity and its contributions to Roman literature. Shut off from foreign enemies (though occasionally vexed by pirates from Africa), secluded from the wars of the empire, it developed its natural resources to an extent unequalled before or since. Its iron and copper and silver and lead were well known: it was also (according to the elder Pliny) the chief source whence the Roman world obtained its tin and quite outdistanced in this period the more famous mines of Cornwall. But such com- mercial prosperity characterized many districts of the empire during the first two centuries of our era. Spain can boast that she supplied Rome with almost her whole literature in the silver age. The Augustan writers had been Italians. When they passed away there arose in their places such writers as the younger Seneca, the epic poet Lucan, the epigrammatist Martial, the

literary critic Quintilian, besides a host of lesser names. But the impulse of the opening empire died away and successful commerce drove out literary interests. With the 2nd century the great Roman-Spanish literature ceased: it was left to other regions which felt later than Spain the stimulus of Romaniza- tion to enter into the literary tradition. Of statesmen the Peninsula was less prolific. The emperor Trajan, indeed, and his relative and successor Hadrian, were born in Spain, but they were both of Roman stock and Roman training. The 3rd and 4th centuries saw a decline in the prosperity of Roman Spain. The confiscations of Septimus Seyerus and the ravages of barbarians in the middle of the 3rd century have both been adduced as causes for such a decline. But while we need not doubt that the decline occurred, we can hardly determine either its date or its intensity without careful examination of the Roman remains of Spain. Many of the best Roman ruins — such as the aqueduct of Segovia or the bridge of Alcantara — no doubt date from before a.d. 200. Others are probably later, and indicate that prosperity continued here, as it did on the other side of the Pyrenees in Gaul, till the later days of the 4th century — perhaps indeed not till the fatal winter's night in 406-7 when the barbarians burst the Rhine frontier and flooded Gaul and even Spain with a deluge from which there was no recovery. (F. J. H.)

B. — From A.D. 406 to the Mahommedan Conquest.

The Barbarian Invasion and the Visigothic Kingdom. — With the irruption of the Vandals, the Suebi and the Alans, the history of Spain enters on a long period of division and confusion which did not end even with the union of the chief kingdoms by the marriage of Isabella and Ferdinand at the close of the 15th century. The function of the barbarians everywhere was to cut the communications of commerce, and the nerves of the imperial administration, thereby throwing the invaded country back into a fragmentary condition from which a new order was to arise in the course of centuries.

This function was effectually discharged in Spain by the Vandals and their associates, who plundered far and wide, and then by the Visigoths, who appeared as the " foederati," or duly commissioned defenders of sˆ,/ 3 " the Romans. The first-comers cannot be said to have conquered the country in the sense that they established a rule of their own. They were not numerous enough for the execution of such a task, even if they had possessed the capacity. When in 428 Gaiseric, king of the Vandals (q.v.), accepted the invitation of Bonifacius, the count of Africa, and passed out*

of Spain to found the Vandal kingdom of Carthage, his whole horde numbered only 80,000 persons, including old men, women and children, and runaway slaves who had joined him. The Suebi, who remained, were certainly not more numerous. Such small bodies could not have occupied so extensive a terri- tory, even if they had scattered themselves in driblets all over its surface. What they did was to rove about in hordes, plunder- ing or levying blackmail. The cowed inhabitants had been trained out of all habit of acting for themselves by the imperial despotism, and could only flee or submit. There is probably some truth in the assertion of Salvian that many of the subjects of the empire preferred poverty among the barbarians to the tyranny of the imperial tax collectors. This would be pre- eminently the case with the smaller landowners who formed the " curiales," and who were in reality serfs of the fisc, for on them fell the main weight of taxation, and they were confined to their position by oppressive laws. The great landowners who formed the " ordo senatorius " had almost as much to fear from the agrarian insurgents known as bagaudae, who are indeed found acting with the Suebi, as from the barbarians. In time some of them took to " living barbarously " — that is to say, they fortified their villas, collected an armed following and fought for their lives, families and property. In some districts the inhabitants reverted to a state of tribal independence. This undoubtedly was the case in the north, where the Asturians and Basques, the least Romanized part of the population, appear from the beginning of the age of barbarization as acting for themselves. In the mountain country of Cuenca, Albacete, and the Sierra Nevada the natives known as the Orospedans were entirely independent in the middle of the 6th century. But if there lay in this revival of energy and character the germs of a vigorous national life, for the time being Spain was thrown back into the state of division from which it had been drawn by the Romans — with the vital difference that the race now possessed the tradition of the Roman law, the municipalities, and one great common organization in the Christian Church.

Xo help was to be expected from the empire. Unable to aid itself it had recourse to the Visigoths (see Goths). Ataulphus vii th' (?■"•) tne successor of Alaric, and the husband of Occupation. Placidia, daughter of the emperor Theodosius, whom he had married against the wish of her brother Honorius, entered Spain in 412, as the ally of the empire. He was murdered in 4 1 5, but after the speedily ensuing murder of his murderer

and successor Sigeric, Wallia (415-419), who was elected to the kingdom, continued his work. He destroyed the Alans, and drove the Vandals and Suebi into the north-west. Then he handed Spain back to the imperial officials, that is to say, to weakness and corruption, and marched with all his people into the Second Aquitaine, the south-west of modern France, which had been assigned to them by Honorius as a home and a reward. From this date till the very end of the reign of Amalaric (511- 5,31), the seat of the Visigothic kings was at Bordeaux, or Toulouse or Narbonne, and their main interests were in Gaul. They continued to intervene in Spain and to extend their influ- ence over it. But for an interval of more than twenty-five years they stood apart. Southern Spain was overrun and plundered by the Vandals before their departure for Africa. In 456 Theodoric II. (453-466) entered Spain as ally of Avitus, whom he had himself raised to the empire in Gaul. He defeated the Roman senators of the Tarraconensis and the Suebi, putting their king to death, and advanced as far as Merida. But he was recalled to Gaul, and his return was accompanied by outrages against the Roman cities. Majorian (457-461), the last capable emperor of the West, proposed to make Spain the basis of his attack on the Vandals at Carthage till his fleet was destroyed by them in the harbour of Carthagena. The fratricidal murderer and successor of Theodoric, Euric (466-485) followed his brother's policy in Spain. With the extinction of the Western Empire (476 or 479) the kings of the Visigoths became more and more the representatives of authority, which they exercised on Roman lines, and with an implied or formal deference to the distant emperor at Constantinople. But the continued existence of the

obscure Suevic kingdom in the north-west, the effective inde- pendence of several districts, and the rule of others by the Roman senators, proves that the regions actually under Visigothic rule were not extensive. After the defeat and death of Alaric II. (485-507) at Vouille the shattered Visigoth power was preserved from destruction at the hands of the Frankish king Clovis (q.v.) by Theodoric, the Gothic king of Italy. But on his death ;he advance of the Franks began again. Amalaric (507-531) fled from Narbonne, to meet the usual violent end of a Visigothic king at Barcelona.

The line of the Visigothic kings of Spain begins, strictly speak- ing, with his successor Theudis (531-548), an Ostrogoth appointed by Theodoric to act as guardian of Amalaric. Tie character of had acquired great possessions in the valley of the Visigothic Ebro by marriage with a Roman lady. It was a K'"xdom. government, and not a people, which was established in Spain with Theudis. The Visigoths had been much Romanized during their establishment in Gaul, and we hear of no exodus as having accompanied Amalaric. The example of Theudis is enough to show that the law of the Theodosian code which forbade the marriage of Romans and barbarians was not regarded by the Goths. It remained indeed unrepealed, as many

laws have done since, long after it had become a mere dead letter. The govern- ment which came with Theudis, and fell to ruin with Roderic, may be described as having been at once Roman and bad. In so far as it was affected by the Visigoths it was influenced for the worse. Their monarchy was elective. Until the death of Amalaric the choice was confined to one family, but he was the last of his line. The kings tried to make the crown here- ditary, and the nobles, Visigothic seniores, and Roman senatores seized every opportunity to keep it elective. Spain presented a forecast of the anarchy of Poland. Of the twenty-three kings between Theudis and Roderic five were certainly murdered, one was deposed, and three were tonsured by tricks or open force. Of the others some were passing phantoms, and the records of the later times of the kingdom are so obscure that we cannot be sure of knowing the names of all who perished by violence.

The administration which these kings of unstable authority had to direct was essentially the Roman system. The great owners, whether nominally Visigoth or nominally Roman — seniores or senatores — continued to enjoy all the privileges and exemptions of the ordo senatorius in the last days of the empire. They lived surrounded by multitudes of semi-servile coloni, or farmers, bound to the soil, of actual slaves, and of buccelarei, who were free swordsmen to whom they gave rations (buccelatum, soldiers' bread, or buccella, a portion). The curiales remained as before the victims of the fisc. How far the fact that Theudis and the four next sovereigns were Arians affected their govern- ment is not very clear. It prevented them from enjoying the active support of the Catholic clergy. But it is very doubtful whether Christianity had spread much beyond the cities. We hear of the conversion of pagans down to the last days of the Visigothic kingdom. The spread of Mahommedanism was so rapid in the first years after the conquest that it is impossible to believe that the country had been thoroughly christianized. Theudis, who made his headquarters at Seville, endeavoured to complete his mastery of the diocese of Spain by occupying Mauritania Tingitana, but he was defeated by the The imperial officers at Ceuta. He was in due course visigothic murdered at Seville by Theudigisel (548-549) who gs ' was himself promptly slain. The reigns of his two successors, Agila (549-554) and Athanagild (554-567), coincided with the reign of Justinian and the temporary revival of the Eastern Empire. Athanagild called on the imperial officers to help him against Agila, and paid for their assistance by the surrender of the province of Baetica. On his death there was an obscure interregnum of five months, which ended by the election of Liuva (567-572), the governor of Narbonne, the surviving remnant of the Visigoth power to the north of the Pyrenees. Liuva did not come to Spain, but associated his brother Leovigild (567-586) with him. The reigns of Leovigild and of his son Reccared are the greatest in the list

of the Visigoth kingdom in

Spain. The father was manifestly a man of great energy who cowed his unruly nobles by murder, forced the Orospedans to recognize his superiority, swept away the Suevic kingdom which had lingered in the north-west, and checked the raids of the Basques. To secure the succession in his family he associated his sons Hermenegild and Reccared with himself. He was the first Visigothic king who wore the crown, and it would appear that he threw off all pretence of allegiance to the empire. The series of the Visigothic gold coins begins with him, and it is to be noted that while the earliest are struck in the name of the emperor Justinian, the imperial superscription disappears in the later. Leovigild drove the imperial officers from Seville and Cordova, though they still retained control of the coast. His son Hermene- gild, to whom he entrusted the government of Baetica, was married to a Frankish princess. Intermarriages had not been uncommon between Frank and Visigoth, but they had rarely led to any other result than to subject the Arian ladies who were sent from Spain, or the Catholic ladies who came from France, to blows and murder by their husbands and their husbands' families. Ingunda the Frankish wife of Hermenegild, with the help of Leandro, archbishop of Seville, the brother and pre- decessor of the more famous Isidore (q.v.), persuaded her husband to renounce Arianism. He revolted against his father, was reduced to submission and executed in prison.

The reign of Reccared (586-601) is famous in Spanish history for the establishment of Catholicism as the religion of the state. Reccared must have seen from the example of the Franks that the support of the Church was a great element of strength for the Crown. He made the change at the Third Council of Toledo. If Reccared hoped to secure the perpetuance of his dynasty he was mistaken. His son Liuva the second (601-603) was murdered by an Arian reaction headed by Witteric (603-610). The Catholics regained power by his overthrow, but they could not give stability to the state. A succession of obscure " priests' kings," who are but names, followed: Gunthemar (610-612), Sisebut (612-620), Reccared II. (620-621), Swintella, associated with his son Reccimer (621-631), Sisinand (631-636), Chintila (636-640), Tulga (640-641), Chindaswinth(64i-6s2), Recceswinth (649-672). The growing weakness of the Merovingians saved them from serious attack, though not from occasional invasion on the north. The prostration of the empire in the East

by Avar and Persian invasions enabled them to drive the imperial officers from the coast towns. But the kingdom was growing internally weaker. The nobles were strong enough to prevent the monarchy from becoming hereditary. The Church seemed to exert great power, but it had itself become barbarized by contact with kings and nobles. Violent persecutions of heretics and of the numerous Jews brought in new elements of discord. Wamba (672-680) is credited with an attempt to reform the state, but he was tonsured while unconscious from illness or poison, and disappeared into a religious house. His successors again are but names, Euric (680-687) and Egica (687-701). Witiza (697-710) .has more substance. He was in aftertimes denounced as a monster of vice, whose sins accounted for the Mahommedan conquest. Contemporaries speak of him with respect, and he appears to have been a well-meaning man who endeavoured to check the corruption of the clergy and the persecution of the Jews, and who resisted the dictation of the pope. His reign ended in turmoil, and perhaps by murder. With Roderic, whose " tumultuous " election was the work of Witiza's enemies, the line of the Visigoth kings is considered to have ended.

The Visigoth kingdom presents an appearance of coherence which was very far from corresponding to the reality. At the Onaalza- nea d was the king, surrounded by his household of tioooofthe leudes, and aided by the palatines, great officers of visigoihk state imitated from the imperial model. At the head Kingdom. f t [j e provinces, eight in number, were dukes, and the cities were governed by counts. Both were, at least in theory, officers named by the king and removable by him. The king was advised by councils, made up by a combination of a senate of the great men, and of the ecclesiastical councils which had met under the Roman rule and that of the tolerant

Arian kings. The formation of the council was not complete until the establishment of Catholicism as the state religion. But from the reign of Reccared till the Arab invasion tiiey met sixteen times in all, generally at Toledo in the church of Santa Leocadia. Purely ecclesiastical matters were first discussed by the clergy alone. Then the great men, Visigoth and Roman, joined with the clergy, and the affairs of the kingdom were debated. The Leges Wisigothorum were elaborated in these councils (see Germanic Law). But there was more show than reality in this parade of government by free discussion and by law. There was no effective administration to enforce the law. The Mahommedan Conquest. — How utterly weak it was can be seen from the fact that it was shattered by the feeble Moslem invasion of 711. The danger from Africa had been Moslem patent for half a century. During the reign of Invasion, Witiza the Moslem masters of northern Africa had Jl1 ' pressed the town of Ceuta, the last remnant of the Byzantine possessions, very closely, and it had been relieved by supplies from Spain. Only the want of ships had prevented the Mahom-

medans from mastering the town, and crossing the straits, and now this deficiency was supplied by the Christians themselves. It seems to be certain that Julian, the imperial count or governor of Ceuta, acting in concert with the family and faction of Witiza, who sought his help against Roderic, provided vessels to trans- port the Berber Tarik (Tariq) across the straits. Tarik, the general of the caliph's governor in northern Africa, Musa b. Nosair, was invited as an ally by the conspirators, who hoped to make use of him and then send him back. He came with a small force, but with the certainty of finding allies, and on being joined by another detachment of Berbers marched inland. On the 19th of July 711 he met Roderic near the Lago de la Janda between Medina Sidonia and Vejer de la Frontera. He had perhaps already been joined by Spanish allies. It is at least certain that in the battle the enemies of Roderic passed over to the invader. The Visigoth king was routed and disappears from authentic history. There is some probability that he did not perish in the battle, but escaped to fall two years later, at Seguyjuela near Salamanca, in action with Merwan the son of Musa. A single blow delivered as much by Christian as by Moslem hands, sufficed to cut the bond which seemed to hold the kingdom together, and to scatter its fragments all over the soil of the Peninsula. Through these frag- The Ma- ments Tarik marched without a single check of im- hommedan portance. Before the end of 711 he had advanced as Conquest. far north as Alcala. Cordova fell to a detachment of his army. In 712 Musa joined his lieutenant, and the conquest of the south was completed. Merida was the only town which offered an honour- able resistance. During 713 and 714 the north was subdued to the foot of the mountains, and when Musa and Tarik were recalled to Damascus by the caliph the progress of the Moslems was not delayed. In 718 they crossed the Pyrenees, and con- tinued their invasions of Gaul till they met the solid power of the Austrasian Franks at Poitiers 732 (see Charles Martel and Caliphate, B. §§ 6, 10). The rush of the Mahommedan flood sent terror all over Europe, but the little opposition it encountered south of the Pyrenees is to be easily explained, and the victory, though genuine, was more specious than substantial. That the lieutenants of the caliph at Damascus should take the place of the Visigoth kings, their dukes and counts seemed to many no loss and to a still greater number a gain. The great landowners, to whom patriotism was unknown and whose religious faith was tepid, were as ready to pay tribute to the caliph as to render service to one of their own body who had become king by violence or intrigue. On the part of the Arabs, who, though a small minority of the invaders, were the ruling element, there was a marked absence of proselytizing zeal. They treated the occupa- tion of Spain as a financial speculation more than as a war for the faith. The Arab, though he produced Mahommedanism, was the least fanatical of the followers of the Prophet, and was not only willing but desirous to leave to all Arab ˆ ale ˆ men who would pay tribute the free exercise of their

religion. He cynically avowed a greater liking for the poll tax

paid by the Christian than for his conversion. The Spanish Roman and the Visigoth, so-called, of that epoch of poorness of spirit, accustomed as he was to compound with one master after another, saw nothing dishonourable in making' such an arrange- ment. That it was made is matter of record. In Murcia the duke whom the Arabs knew as Tadmir became a tributary prince, and his family retained the principality for generations. He no doubt contrived to induce the Arabs to recognize him as the owner of what had been public domain, and made an excellent bargain. The family of Witiza did obtain possession of an immense stretch of the land of the state in Andalusia on condition of paying tribute. One of them, by name Ardabast, was deprived of his holding at a later date on the ground that he held more land than could be safely left in the hands of a Christian. Every- where landowners made the bargain, and the monasteries and the cities followed their example. Nor was submission and pay- ment of tribute all that they were prepared to give. Many pro- fessed themselves converts to Mahommedanism. In the north one great Visigoth family not only accepted Islam, but founded a dynasty, with its capital at Saragossa, which played a stirring part in the 8th and 9th centuries, the Beni-Casi, or Beni-Lope. To the mass of the population the conquest was, for the present, a pure gain. The Jews, escaped from brutal persecution, were the eager allies of the Arabs. As the conquerors swept away the Roman fiscal system, which the Visigoths had retained, and re- placed it by a poll tax (which was not levied on old men, women, children, cripples or the very poor) and a land tax, the gain to the downtrodden serfs of the fisc was immense. They acquired personal freedom. Add to this that a slave who professed Islam could secure his freedom, at least from slavery to a Christian master, that Arianism had not been quite rooted out, that the country districts were still largely pagan, and it will not appear wonderful that within a generation Mahommedan Spain was full of renegades who formed in all probability a majority of its population and a most important social and political element. The Arabs at first were content to take a fifth of the land to constitute the public domain, or khoms, out of which fiefs held on military tenure were provided for the chiefs of the conquering army.

If this moderate policy had been or could have been steadily pursued, the invaders would in all probability have founded a lasting state. But it could not be pursued, since it required for its application a consistency, and a

power to act on a definite political principle, of which the Mahommedan conquerors were absolutely destitute. Nor had Spain been conquered by a single race. The invaders were a coalition of Arabs, Syrians and Berbers. The Arab was incurably anarchical, and was a noble who had no political idea except the tribal one. That their personal dignity must be asserted and recognized was the first article in the creed of these descendants of the heroes of the desert. They looked down on the Syrian, they thought the Berber a lout and a plebeian, they scorned the renegade, and called him a slave and son of a slave. They fought out the old tribal rivalries of Arabia on the banks of the Guadalquivir and on the Vega of Granada: They planted the Berber down on the bleak, ill- watered, and wind-swept central plateau. He revolted, and they strove to subdue him by the sword. He deserted his poor share of the conquered land, and in many cases returned to Africa. The conflict for the caliphate (

Cordova. It was an Oriental monarchy like another, strong when the amir was a strong man, weak when he was not, but exception- ally rich in able men. Its rulers had to fight the Arab nobles as much as the Christians, and the real basis of their power was their slave army of negroes, or of Christian slaves, largely Slavonians sold by their German captors to the Jew slave traders of Verdun, and by them brought to Spain. These janissaries at first gave them victory, and then destroyed them.

Such a kingdom as this needed only attack from a more solidly organized power to be shattered. The Christian enemies of the Mahommedans were for long weak and no less Christian anarchical than themselves, but they were never States of altogether wanting, and they had, what the Arab ibe North. and Berber had not, a tradition of law and a capacity for form- ing an organized polity and a state. They are to be sought for along the line of the mountains of the north. In the centre were the Basques, dwelling on both sides of the Pyrenees, who kept against the Mahommedan the independence they had vindicated against the Visigoth. On the east of the Basques, along the line of the Pyrenees, were others of kindred blood, who also kept a rude freedom on the slopes and in the valleys of the mountains. The Arab passed through them, going and returning to and from Gaul, but he never fully conquered them. The names of their leaders Garci Jeminez and Inigo Arista are altogether legendary. But here were the roots of the kingdom of Navarre, of Sobrarbe and Aragon. In the earliest times their most pressing foe was not the Arab or Berber so much as the Carolingian. It was at their hands that Charlemagne {q.v), while returning from his expedition to Saragossa, suffered that disaster to his rearguard at Roncesvalles which is more famous in poetry than important in history. With the aid of the Spanish Moslem Beni-Casi the Basques drove off the counts and wardens of the marches of the Carolingians. On the eastern extremity of the Pyrenees the Franks found no native free population. Here,

mainly under the leadership of Louis the Pious, they formed the Marca Hispanica, where Frankish counts and wardens of the marches gradually gained ground. By the reign of Charles the Fat a principality had been founded. Wilfred the Hairy — the Comes Vellosus, so called because his countship was poor and covered with scrub wood, and not because the palms of his hands were covered with hair as the legend has it— became the founder of the counts of Barcelona.

The greatest destiny was preserved for the Christian remnant which stood out to the west of the Basques, in the mountains of Asturias. Pelayo, whom they chose for king, and his victory of Covadonga, are well nigh as legendary, and are quite as obscure as Garci Jimenes and Inigo Arista. Yet it is certain that in this region were planted the seeds of the kingdom of Castile and Leon, the dominant power of the Spain of the future. The total silence of the contemporary chronicle, called by the name of Isidore of Beja, shows that in the south of Spain, where the writer lived, nothing was known of the resistance made in the north. The next Christian authorities belong to the latter part of the gth century. It is therefore with the warning that the dates can only be given as probably correct that the three first Christian kings can be said to have reigned from 718 to 757. Pelayo (718-737), his brother Favila (737-739) — of whom we only know that he is said to have been killed by a bear while hunting — and Alphonso I., the Catholic (739-757), stand as little more than names. While the invasion of Gaul was still going on Manuza, the chief of the Berbers settled in north-western Spain, had revolted against the caliph's lieutenants. In 740 came the great general revolt of the Berbers. In 7 50 plague, following on drought and famine, swept away thousands of conquered and conquerors alike. Amid the general desolation Alphonso I. duke of Canta- bria and son-in-law of Pelayo, constituted the king- dom which the Arabs called Gallicia. It answered a ^°" ° closely to the old Roman province of the same name- — extending from the Bay of Biscay to the line of the Duero, from the ocean to the foot of the mountains of Navarre. Internally it was divided into two belts. Along the shores of the bay, and in the valleys of the mountains to the north and west it was inhabited;

but a great belt of desolation separated it from the regions in which the Moslem were fighting out their own quarrels. Alphonso swept all through that region, already more than half depopu- lated, slaying the lingering remnants of the Berbers, and carrying back the surviving Christians to the

north. Behind that shield of waste the Christian kingdom developed; from the death of Alphonso I. to the reign of Ramiro II. (931-950) it was subject to no serious attack, though raids on the frontier never ceased. Norse pirates appeared on the coast in the 9th century, but made no permanent settlements. As the population grew, it pushed down to the plain of Leon and Castile. The advance is marked by the removals of the capital forward from Cangas de Ona to Oviedo, from Oviedo to Leon, and by the settlement of adven- turous frontier men in the ancient Bardulia, which from their " peels," and towers of strength, gained the name of Castilla — the castles. Burgos became its centre. The Montana (hill country) of Burgos, and in particular the district called the Alfoz of Lara, was the cradle of the heroes of the Castilian share in the reconquest — the count Porcellos, and the judge of the people, Lain Calvo, the infantes of Lara, the bastard Mudarra, and Ruy Diaz of Bivar, in whose lives legend and history are mingled beyond disentanglement, and of whom some are pure figures of romance. By a process which was going on elsewhere in Europe the frontier settled into a new political organism. As the Marca Hispanica on the east became the county of Barcelona, so the chiefs of Bardulia became the counts of Castile, then the count of Castile, the rival of the king at Leon, and in time the king of Castile, and head of Christian Spain.

There is much in the internal history of that kingdom which stands apart from the general development of western Europe, from which it was shut out. In all the long period from Pelayo to Ramiro II. only one event occurred which had much tendency to bring the Christians of the north-west into close relations with their neighbours of the same faith north of the Pyrenees. This was the discovery, or, in strict ecclesiastical language, the " invention " of the body of St James the Apostle in the reign of Alphonso II. the Chaste (789-842). The shrine at Santiago in Gallicia was accepted in an age when evidence and criticism were words of no meaning, and it attracted pilgrims, who brought trade. But, apart from this opening for foreign influence, the Christians were left to develop their order untouched by alien examples, and they developed from the Visigoth monarchy. The men who raised Pelayo on the shield believed themselves to be electing a successor to Roderic, and indeed they were. They continued for a time to call themselves Goths, and to claim Gothic descent, which had become for them very much what descent from the companions of the conqueror was to Englishmen of the 14th or 15th centuries and later — another name for nobility of blood. There was the same king possessing theoretically almost absolute power, both administrative and legislative; the same nobles who limited his effective power by rebellion, their constant effort to keep the crown elective, and his no less steady, and by the 10th century victorious, effort to make it hereditary; the same distinction between the few free, who are also the rich owners of land, and the many serfs, who are partial

bondsmen, or the slaves pure and simple. But the fact that every arm was needed for the raids on the frontier, and to provide settlers who should also be garrison for the regained lands, worked for freedom. The serf, who was also a soldier, revolted against bondage. The chief who had to " people " a new and exposed township had to tempt men by freedom and secure rights to follow his banner. The influences which by the r3th century had abolished serfdom in western Spain were all at work before the reign of Ramiro II. In spite of revolts and of fratricidal struggles a state was formed. To the east of it, the Navarrese, having rid themselves of the Carolingian counts and marchers, had made a kingdom in their mountains, and beyond them the little free territories of the central Pyrenees were advancing, in subordination to the Navarrese king at Pamplona. The Arab called them the Christians of Al Frank, and distinguished them from the Gallicians.

The 10th century and the first years of the nth saw a great

set-back of the Christian revival. Dissensions among them- selves coincided with an energetic rally of the Moslem power. From the foundation of the amirate by Abdur- jj, ejna . rahman I. (758-7ˆ0) to the beginning of the reign of hpmmedan Abdurrahman III. (912-961) Mahommedan Spain had Amirate. shared the usual fortunes of an Oriental monarchy. p " iod ° f A strong amir, such as Abdurrahman I. or his grandson Hakam I. (796-822), could enforce obedience by arms, or by murder, but it was the rule of the most pugnacious and the hardest hitter. Even with him it was often only apparent. On the upper frontier, which is now Aragon, the " Visigoth " Beni-Casi ruled, doing homage and paying tribute intermittently, supported by a loyal population of native Mahommedans, whose Christian or nominally Christian fathers had been their fol- lowers before the conquest. The " Moors," so called, who afterwards filled the kingdom of Aragon were of native blood. Toledo, relying on the immense military strength of its position, was more often in rebellion than in subordination. The mas- sacre which Hakam I. effected by a lavish use of fraud cowed it only for a time. Abdurrahman III. found it independent again when he came to the throne, and had to besiege it for two years before it yielded. The renegades grew in numbers, and in faith. Under the influence of orthodox Berber teachers their fanaticism was turned against the amir himself. Hakam, a winebibber much suspected of heterodoxy, had to expel thousands from his capital. Part went to people the town of Fez, newly founded in the Morocco, by the Idrisites. Part wandered eastward to found a Mahommedan state in Crete. Under the stimulus of Berber fanaticism the toleration first shown to the Christians was turned to persecution. A counter fanaticism was aroused in them, and for years the " Martyrs of Cordoba " continued to force the often reluctant cadis to behead them, by blaspheming the Prophet. The relations of the amir to the Christian bishops were very much those of the Ottoman sultan to the Greek patriarch. There were Spaniards who, like the

Greeks of the Phanar, were the servile instruments of their Moslem master. Under Abdurrahman II. (822-852), who spent his life listening to a favourite and highly accomplished , Persian tenor and in the company of dancing girls, and under Mahommed I. (852-886), the niggardly Mondhir (886-888), whose time was short, and Abdalla (888-912), who was feeble, the amirate was torn to fragments.

From this state of anarchy the amirate was saved by Abdur- rahman III. (912-961), the Akbar of his race. He came to the throne when half a century of war and murder had p ev iy a i produced exhaustion. The country was swarming under Ab- with brigands, and the communications were so durrahmaa dangerous that seven years had been known to pass ' during which no caravan travelled from Cordova to Saragossa. There was a disposition on all hands, save among the irrecon- cilable Christians of the Sierra de Ronda, to accept peace under a capable master. The Arabs were beaten down, and the renegades had gained most of what they fought for when the aristocracy was cowed. Abdurrahman III., an Oriental ruler of the great stamp, industrious, resolute, capable of justice, magnificent, and free handed without profusion, was eminently qualified to give all that his people wanted. The splendour of his reign is a commonplace. He restored order even in the Ronda, and then he took the field against the Christians. He obeyed the rule which has called upon all the intelligent governors of Spain to make sure of the African coast by occupying it. He saw the Christian princes of the north become his vassals and submit to his judgment in their quarrels. But within a period not so long as his own life his dynasty was extinct and his kingdom in fragments.

Hakam II. (961-976), Abdurrahman's son, ascended the throne in mature years, and continued his father's policy. A lover of books, he gave protection to writers and thinkers who were not strictly orthodox. From his Christian neighbours he had nothing to fear. The anarchy which broke out in the north- west, the kingdom now called Leon, on the death of Ramiro II. I — whose sons fought among themselves — and the endless

conflicts between Leon and Castile, rendered the only formidable Christian kingdom powerless. Even on Hakam's death the power of the caliphate was exercised for some thirty years with great vigour. In his old age, one of his wives Sobh (the Day- break), a Basque, bore him the first son born in his harem. To this son Hisham II. (976- ?) he left the crown. The rule went to

the sultana, and her trusted agent Ibn Abi 'Amir Mahommed ben Abdallah — an Arab of noble descent, who in his early life was a scribe, and who rose by making himself useful first to the ministers and to the favourite wife. By them he was promoted, and in time he brought their ruin. By her he was made hajib — lord chamberlain, prime minister, great domestic, alter ego, in short, of the puppet caliph — for Hisham II. in Admiais- all his long life was nothing else — and in due time tratioaot he reduced the sultana to insignificance. The Maasur. administration of Mahommed ben Abdallah, who took the royal name al-Mansur Billah (" the victorious through God ") and is generally known as Mansur (q.v.), is also counted among the glories of the caliphate of Cordova. It was the rule of a strong man who made, and kept under his own control, a janissary army of slaves from all nations, Christian mercenaries from the north, Berbers and negroes from Africa. With that host he made fifty invasions into the Christian territory. A more statesmanlike conqueror leading a people capable of real civilization would have made five, and his work would have lasted. Mansur made raids, and left his enemies in a position to regain all they had lost. It mattered little that he desolated the shrine of St James at Compostella, the monastery of Cardeiia in Castile, took Leon, Pamplona and Barcelona, if at the end he left the roots of the Christian states firm in the soil, and to his son and successor as hajib only a mercenary army without patriotism or loyalty. In later times Christian ecclesiastical writers, finding it difficult to justify the unbroken prosperity of the wicked to an age which believed in the judgment of God and trial by combat, invented a final defeat for Mansur at Calatafiaxor. He died in 1002 undefeated, but racked by anxiety for the permanence of the prosperity of his house. His son Mozaffar, kept the authority as hajib, always in the name of Hisham II., who was hidden away in a second palace suburb of Cordova, Zahira. But Mozaffar lasted for a short time, and then died, poisoned, as it was said, by his brother Abdurrahman, called Sanchol, the son of Mansur by one of the Christian ladies whom he extorted for his harem from the fears of the Christian princes. Abdurrahman Sanchol was vain and feather-headed. He extorted from the feeble caliph the Abdur- title of successor, thereby deeply offending the rahmaa princes of the Omayyad house and the populace Sanchol. of Cordova. He lost his hold on his slaves and mer-Eadotthe cenaries, whose chiefs had begun to think it would Empire of be more to their interest to divide the country among rahmaa in. themselves. A palace revolution, headed by Mahom- med, of the Omayyad family, who called himself Al Mahdi Billah (guided by God), and a street riot, upset the power of the hajib at Cordova while he was absent on a raid against Castile. His soldiers deserted him, and he was speedily slaughtered. Then in the twinkling of an eye the whole edifice went into ruin. The end of Hisham II. is unknown, and the other princes perished in a frantic scramble for the throne in which they were the puppets of military adventurers. A score of

shifting principalities, each ready to help the Christians to destroy the others, took the place of the caliphate. The fundamental difference between the Moslem, who know only the despot and the Koran, and a Christian people who have Development^^ Church, a bod) r of law and a Latin speech, was of the well seen in the contrast between the end of the

christian greatness of Mansur, and the end of the weakness ingdoma. Q £ ^jg Christian contemporaries. The first left no trace. The second attained, after much fratricidal strife, to the foundation of a kingdom and of institutions. The interval between the death of Ramiro II. in 950 and the establishment of the kingdom of Castile by Fernando I. in 1037 is on the sur- face as anarchical as the Mahommedan confusion of any time.

The personages are not anywise heroic, even when like

Alphonso V. (999-1027) they were loyal to their duty. Sancho

the Fat, and Bermudo II. the Gouty, with their shameless feuds

in the presence of the common enemy, and their appeals to the

caliph, were miserable enough. But the emancipation of the

serfs made progress. Charters began to be given to the towns,

and a class of burghers, endowed with rights and armed to

defend them, was formed; while the council of the magnates

was beginning to develop into a Cortes. The council over

which Alphonso V. of Leon and his wife Geloria {i.e. Elvira)

presided in 1020, conferred the great model charter of Leon,

and passed laws for the whole kingdom. The monarchy became

thoroughly hereditary, and one main source of anarchy was

closed. By the beginning of the nth century the leading place

among the Christian kings had been taken by sancho ihe

Sancho El Mayor (the Great) of Navarre. He was Great of

married to a sister of Garcia, the last count of Navarre –

Castile. Garcia was murdered by the sons of Count Vela of Alava whom he had despoiled, and Sancho took possession of Castile, giving the government of it to his son Fernando, (Ferdinand I.), with the title of king, and taking the name of " king of the Spains " for himself. It was the beginning of attempts, which continued to be made till far _ ., ., , \ ... r , Ferdinand!. into the 1 2th century, to obtain the unity of the ofCastiie, Christians by setting up an emperor, or king of "Emperor kings, to whom the lesser crowns should be subject. °f the „ Fernando was married to a daughter of Alphonso V. of Leon. Her brother Bermudo, the last of his line, could not live in peace with the new king, and lost his life in the battle of Tamaron, in a war which he had himself provoked. Fernando now united all the north-west of Spain into the kingdom of Castile and Leon with Gallicia. Navarre was left by Sancho to another son, Garcia, while the small Christian states of the central Pyrenees, Aragon and Sobrarbe with the Ribagorza went to his other sons, Ramiro Sanchez and Gonzalo. Fernando, as the elder, called himself emperor, and asserted a general superiority over his brothers. That he took his position of king of kings seriously would seem to be proved by the fact that when his brother Garcia attacked him in 1054, and was defeated and slain at Atapucrca, he did not annex Navarre, but left his nephew, Garcia's son, on the throne as vassal. The Council

of Coyanza, now Valencia de Don Juan (1050), at council of
which he confirmed the charters of Alphonso V., Coyanza,
is a leading date in the constitutional history of ,oso ‘
Spain. When he had united his kingdom, he took the
field against the Mahommedans; and the period of the great
reconquest began. So far the Christians had not gone much
beyond the limits of the territory left to them at the end of the
8th century. They had only developed and organized Beginning
within it. Under Fernando, they advanced to of the
the banks of theTagus in the south, and into Valencia Christian
on the south-east. They began to close round ecf ”””” jesi –
Toledo, the shield of Andalusia. The feeble Andalusian princes
were terrified into paying tribute, and Fernando advanced
to the very gates of Seville without finding an enemy to meet
him in the field. His death in 1065 brought about a pause for
a time. He left his three kingdoms to his three sons Sancho,
Alphonso and Garcia. Alphonso, to whom Leon had fallen as
his share, remained master after the murder of Sancho at Zamora,
which he was endeavouring to take from his sister, and the
imprisonment of Garcia of Gallicia. The reign, of Alphonso VI.,
which lasted till 1109, is one of the fullest in the Alphonso
annals of Spain. He took up the work of his v/.,
father, with less of the crusading spirit than was in 106S ‘ n09 –
Fernando, but with conspicuous ability. His marriage with

Constance, daughter of Robert, duke of Burgundy, brought

a powerful foreign influence into play in Castile. Constance

favoured the monks of Cluny, and obtained her husband's favour

for them. Under their leadership measures were taken

to reform the Church, from which hitherto little influence

had been expected save that it should be zealous and

martial. The adoption of the Roman instead of the Gothic

ritual of Saint Isidore has been lamented, but it marked the assumption by Castile of a place in the community of the western European kingdoms. The Frenchmen, both monks and knights, who accompanied Constance brought to bear on Spain the ecclesiastical, architectural, literary and military influence of France, then the intellectual centre of Europe, as fully as it ever was exercised in later times. Castile ceased to be an isolated kingdom, and became an advance guard of Europe in not the least vital part of the crusades. Alphonso, who during his exile owed some good services to the Mahom- medan king of Toledo, spared that city while his friend lived. Alphonso But he carried the war forward elsewhere. He overruns extorted tribute, and double and treble tribute Mahomme-f rom the princes of Andalusia. In 1082 he swept dan Spain. all through the valley of t he Guadalquivir to Tarifa, where he rode his horse into the sea and claimed possession of the " last land in Spain." In 1084, his friend being dead, he made himself master of Toledo. The fall of the city resounded throughout Islam, and shocked the Mahommedan princes of Andalusia into gravity and a sense of their position. Their peoples began to look to Africa, where Yusuf ben Techufin was ruling the newly founded empire of the Almoravides. The princes had cause to dread him; for Yusuf, the leader of a religious movement still in its first zeal, was known to have no friendly feeling for their religious indifference and elegant, dissipated habits. It was likely that, if he came as ally, he invasion of would remain as master. But the case was ex- theAUnori- cellently put by al-Motamid, amir of Seville, a vides. brilliant cavalier, an accomplished Arab poet, and

one of the most amiably spendthrift of princes. When the peril of appealing

to Yusuf was put before him at durbar by his son, he acknowledged the danger, but added that he did not wish to be cursed throughout Islam as the cause of the loss of Spain and that, if choose he must, he thought it better to lead camels in Africa than to tend pigs in Castile. Yusuf came, and in 1086 inflicted a terrible defeat on Alphonso VI. at Zalaca near Badajoz. The immediate results of the stricken field were, however, but small. Yusuf was called back to Africa, and in his absence the Christians resumed the advance. When he returned he was chiefly employed in suppressing the Mahommedan princes. Alphonso was compelled to withdraw a garrison he had placed in Murcia, and Valencia was, by his decision, given up by the widow of the Cid (q.v.). But he kept his hold on Toledo, and though his last days were darkened by the death of his only son in the lost battle of Ucles (1108), he died in 1 109 with the security that his work would last.

The Almoravides went round the fatal circle of Asiatic and African monarchy with exceptional rapidity. One generation of military efficiency and of comparative honesty theMahom- m administration was followed by sloth and cor- medan ruption as bad as that of the Arabs. To this the Power under Almoravides, who were Berbers and were largely Wrfes'" 10 ™" mm g le d witn P ure negroes, added a dull bigotry and a hatred of thought and knowledge from which the Arab, anarchical and politically incapable as he was, was free. In Aragon the successors of Ramiro Sanchez had begun to press close on Saragossa when the Almoravide invasion took place. The battle of Zalaca gave pause to the Aragonese, as it did for a short space to the Castilians. The interval of advance in the reconquest would have been shorter than it was but for the results of a most unfortunate attempt on the part of Alphonso VI. to unite the crowns of Aragon and

Castile by the marriage of Alphonso I. (1104-1134) of Aragon with his daughter Urraca. Urraca (the name is a form of Maria) was dissolute and Alphonso was arbitrary. There e'fAra'" IO n was nothing in the manners of the 12th century U04-U34.' to make a husband hesitate to beat his wife, and Urraca was beaten, and in the presence of witnesses. The marriage, too, was declared null by the pope, as the parties were within the prohibited degrees. Alphonso and Urraca came to open war, in which he claimed to be king of Castile by right of his marriage and his election by the nobles.

The confusion was increased by the fact that Alphonso, Urraca's son by her first marriage with Raymond of Burgundy, was recognized as king in Gallicia, was bred up there by the able bishop Diego Gelmirez, and took an active part in the feuds of his mother and step-father. The death of Urraca in n 26 allowed her son to reunite the dominions of his grandfather. In the meantime his quarrels with Urraca had not deterred Alphonso, who is surnamed the Battler in Aragonese history, from taking Saragossa in 11 18, and from defeating the Almora- vides at the decisive battle of Cutanda in n 20. In n 25 he carried out a great raid through Mahommedan Spain, camping in its midst for months, and returning with many thousands of the Christian rayahs, who, under the name of Mozarabes, had hitherto continued to live under Moslem rule. They now fled from the bigotry and negro brutality of the Almoravides. The failure of Alphonso's attempt to take Braga in 1134 was Speedily followed by his death. He left his kingdom by will to the Knights of the Temple and the Hospital, but the barons of Aragon paid no attention to his wish, and drew his brother Ramiro, a monk, from his cell to continue the royal line. Ramiro, having been first ex-claustrated by the pope, married Agnes of Aquitaine, and on the birth of his daughter Petronilla affianced her to Ramon Berenguer (Raymond Berenger), count of Barcelona, and then retired to his cell at Narbonne. 1 union of This marriage united Aragon and Catalonia for ever, Aragon and and marks a great step forward in the constitution CataIoBla – of a national unity in Spain. Navarre, indeed, which had been united with Aragon since the fratricidal murder of its king Sancho in 1076, preferred to remain independent under a new ruler of its choice. It was henceforth ^"y ar °™ ° a small state lying across the Pyrenees, dependent on France, and

doomed inevitably to be partitioned between its great neighbours to north and south.

Alphonso VII., the son of Urraca, was, during the twenty years between his mother's death and his own in n 57, the dominating sovereign of Spain. In 1135 he was Aj pnoaso crowned at Leon, in the presence of the new king vn., of Navarre, of the counts of Barcelona and Toulouse, "Emperor and of other princes, Christian and Mahommedan, laS P am -" " Emperor in Spain, and king of the men of the two religions." In his character of emperor and king of the men of the two religions Alphonso VII. seems to have aimed not at expelling, but at reducing the Moors to subjection as vassal communities. He took Cordova and conquered as far as Almeria, but left vassal Moslem princes in possession. His n Empire >> death was followed by another and, happily, a last division of Castile and Leon. Sancho, his eldest son, took the first and Fernando the second. The dream of the empire was speedily dissipated by the death of Sancho of Castile a year after his father; Portugal had already become a semi-independent state.

*The complicated story of the Christian kingdoms of Spain during the next two generations can be best made intelligible by taking the king of Castile as the centre of the Alfonso viil. turmoil. His boyhood was filled by all the miseries of Castile, which rarely failed to descend in the middle a,ges l,S8 ~ 1214 ' on the people whose king was a child. Alphonso VIIL married Leonora, daughter of Henry II. of England, who, as duke of Aquitaine, by right of his marriage with the duchess Eleanor, had a strong direct interest in Spanish politics. Castile, by its geo- graphical position as the centre of Spain from Cantabria to the Sierra Morena, was the forefront of the struggle with the Moors. In Andalusia the downfall of the Almoravides had war with opened the way to the Almohades, or followers of theAlmo- the Mahdi, an even more bigoted religious sect than * a<,es – the other. Alphonso had conquered Cuenca, in the hill country between Castile and Valencia, in 11 77, with the help of the king of Aragon, also an Alphonso, the son of Petronilla and of Ramon Berenguer of Barcelona. With eminent good sense he rewarded his ally by resigning all claim to feudal superiority over Aragon.*

1 Raymond du Puy, grand master of the Hospitallers, came to terms with Count Raymond in the matter of the bequest. (See Saint John of Jerusalem, Knights of.)

HISTORY]

SPAIN

At a later period the two kingdoms defined their respective spheres of influence by a treaty. Aragon was left free to Recognition conquer the Balearic Islands and Valencia, while of the lade- Murcia and Ardalusia were to fall to Castile. The pendence of Almohades took the field against Alphonso in force, Aragon. an(j as n j g f e rj ow Christian sovereigns failed him in the hour of need, he was defeated at Alarcos. But this wave of the ebbing Moslem tide had less force than the Almoravide, and fell back both sooner and farther than its predecessor. Alphonso

had leisure to punish his brother kings for deserting Organiza- ,. , , , . .. °
.,.,., °

Hon of the him, and to look to the organization of his kingdom.

Kingdom. It was a great epoch of the granting of charters, The Mm- an(j £ t jj e ac j varlce f the towns. To this age also r e ‘ belongs the formation of the great monastic military orders of Calatrava, Santiago and Alcantara. They supplied the Crown with a strong force of well-disciplined and well-appointed cavalry. To tighten the bond with Leon, Alphonso of Castile married his daughter Berengaria to its king Alphonso (1188-1230), the son of his uncle Fernando. The marriage was dissolved by the pope as being within the prohibited degrees, but the son born of it was recognized as legitimate. Berengaria, a woman of very noble character and eminent ability, deserved a better husband than her cousin of Leon, who was nicknamed El Baboso — the Slobberer — and who appears to have been epileptic. In 121 2 the king of Castile reaped the reward of long years of patience. The Almohades threatened an invasion in force, and he organized a crusade against them. Aragon was repre- sented by its king Peter II., Navarre by its king Sancho, and Portugal by a strong contingent of Templars and other knights. Overthrow At the Navas de Tolosa, just south of the Sierra of the Morena, the Almohades received the final overthrow

Almohades. whkh kid Mahommedan Spain at the feet of the Christians. Alphonso died in 12 14. His son Enrique (Henry) was. killed by the fall of a tile three years later; and Beren- garia, to whom the crown came, sent to Leon for her son Fernando, and abdicated in his favour.

Fernando (Ferdinand III.) who was in all ways worthy of his mother, took up the crusading duty of a king of Castile, and Ferdinand continued the advance into Andalusia. The Almo- ///., 1217- hades were in swifter decline than the Almoravides. 12S2. Q ne f them, al-Mamun, even sought Fernando’s

help to regain his throne in Morocco, and ceded a suburb of the city to his Christian allies. In 1230 the death of Alphonso of Leon opened the way to a final union of the crowns. The " Baboso " had, indeed, left his kingdom by will to his daughters by Teresa of Portugal, but Fernando was saved from the necessity of enforcing his rights by his mother. She persuaded Teresa and the infantas to resign their claims in Final Union return for pensions and lordships. Castile and of Castile Leon were united, never to be divided again. The and Leon. wor j. f the reconquest was now completed with swift steps. In 1236 Cordova was conquered, and Seville fell in 1248 with the help of a fleet from the Basque coast and of the Moorish king of Granada, who was Fernando's vassal, paying tribute and attending Cortes when summoned. Fernando died in May 1252. It will avoid repetition to note here that the Aragonese share of the reconquest was completed by James the Conqueror (1 2 1 3-1 2 76) , the son of that king Peter who fought in the Navas de Tolosa. He conquered the Balearic Islands in 1229 and Valencia in 1238. In 1265 he entered Murcia, which, Reconquest however, he agreed to occupy in the name of Castile. of Spain, Mahommedan Spain was reduced to Granada and except a u ne f p 0r ts round to Cadiz. The Christian a. p p U j a tion had disappeared in Granada and Moslem refugees had peopled it closely. Its king was a vassal, and of itself it was no longer a danger.

The close of the period of the great reconquest, five centuries of struggle, left Spain divided between two states of different Spain after character. On the west of the Iberian range and theRecon- south of the Guadarrama was the kingdom called, quest. £ or gjjort, Castile and Leon. In fact its sovereign

was also king of Gallicia, Asturjas, Estremadura, Jaen, Cordova xxv. 18

and Seville. This multiplicity of titles was more than a mere formula of the royal chancery. It was the official recogni- tion of a substantial political fact — namely, that the kingdom of Castile and Leon had been made up , • by the agglutination of separate political entities. The real bond between them lay in the common crown, the common creed. They were one only as subjects of the same lords and members of the same Church. But their territorial patriotism was local. The peoples were not Spaniards, save as a general term, but Gallicians, Asturians, Castilians, Andalusians. The great foreign question for them was the possibility, and from time to time the imminence, of renewed invasion from Africa. That peril did not cease till the defeat of the last for- midable African invader at the battle of the Rio Salado in 1340. It is characteristic of the loose construction of the kingdom that the Cortes of Leon and of Castile continued, after the final union, to meet apart on some occasions until

1301.

On the eastern slope of the Iberian hills and thˆ great central table-land was the kingdom called, again for short, Aragon. Its king was also a ruler of many titles — king in Arason Aragon, in Valencia, and the Balearic Isles (with one interval of separation), count of Barcelona, and in Provence. Marriage and inheritance had given him territorial rights in the south-east of France. Thus he came in contact with the crusaders of Simon de Montfort and the expansion of the French monarchy. Another marriage, that of Peter, the son and suc- cessor of James the Conqueror, with Costanza, the daughter of Manfred of Bcneventum, gave him claims on the Neapolitan and Sicilian inheritance of the Hohenstaufen. From the date of the Sicilian Vespers (1283) Aragon is found mixed in the politics of Italy. The commercial activity of Barcelona brought it into collision with Genoa and alliance with Venice. The curious double position of the king of Aragon is fully illustrated by the career of that king Peter who was the father of James the Conqueror. He fought as a crusader at the Navas de Tolosa, he went to Rome to be crowned, and did voluntary homage to the pope. Yet his interests as a prince of southern France compelled him to draw the sword in defence of the Albigenses, and, orthodox as he was in creed, he fell fighting for them at Muret in 1 2 13. If the fortunes of Aragon were to be followed in an outline of Spanish history, it would be necessary to wander as far as Athens and Constantinople.

The difference of the relations of these two states towards the comity of nations had corresponding internal distinctions. It has been already noted that eastern Spain was feudal. Therefore the distinction of classes was far sharper in Aragon than in non- feudal Castile and Leon. Predial slavery, which had disappeared in Castile and Leon in the 13th century, existed unmodified in Aragon, and in its worst form, down to the Bourbon dynasty. When we are told of the freedom of Aragon, it is well to remember that it was enjoyed only by the small minority who were per- sonally free and also privileged: by the citizens of the towns which had charters — called in Aragon the Universidades — the nobles, the gentry and the Churcli. The Catalans attained emancipation from feudal subjection by a succession of savage peasant revolts in the 15th and 16th centuries. In Valencia emancipation was finally brought by a measure which in itself was cruel — the expulsion of the Moriscoes in the 17th century. The landlords were compelled to replace them by free tenants. The prevalence of predial slavery in Aragon and Valencia can be largely explained by the number of Mudejares, that is Mahommedans living under Christian rule, and of Moriscoes — converted Mohammedans.

If now we look at the internal history of Spain from the conclusion of the period of the reconquest, which may be put in the middle of the 13th

century, down to the union of the crowns of Castile and of Aragon by the marriage of Ferdinand J-nrfeHan- and Isabel in 1469, it will be found to be occupied % ?„ a ˚ with two great processes. These two processes are firstly, the christianization of Spain, a very different thing from its reconquest from Moslem masters — and, secondly, not its unifica- tion, for that is hardly attained even now, but its progress towards unification.

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SPAIN

[HISTORY

When Fernando (Ferdinand III.), the conqueror of Andalusia, died in 1252, he was indeed the king of the two, or even the three, religions. The Jews and the Mahommedans formed a The Jeˆ verv large part of his subjects. We have no means of tta,IMa ”””“““estimating their numbers, but there is much probability medans. t j lat j- g et h er tne y formed not much less than a half of the population. The Jews, who had suffered cruelly from the brutal fanaticism of the Almohades, had done a great deal to forward the conquest of Andalusia. They were repaid by the confidence of the king, and the period which includes the reign of Fernando and lasts till the end of the 14th century was the golden age of their history in Spain. In 1391 the preaching of a priest of Seville, Fernando Martinez, led to the first general massacre of the Jews, who were envied for their prosperity and hated because they were the king's tax collectors. But the history of the persecution and expulsion of the Jews is the same every- where except in date. The story of the Mudejares and Moris- coes is peculiarly Spanish. In the Christian advance they were from the beginning first subjected and then incorporated. As far north as Astorga there is still a population known as the Maragatos, and familiar to all Spain as carters and muleteers. This marked type of the Leonese of modern times represents a Berber colony cut off among the Christians, and christianized at an early date, who went on using Arab and Berber names long after their conver- sion. They are only the most conspicuous example of a process which was common to all the Peninsula. As the Christians worked down to the south they found an existing Mahommedan population. To reduce them to pure slavery would, in the case of Castile at least, have been dangerous, and would also have been offensive to the Christians, who were themselves fighting for emancipation. To expel them would have been to have the soil untilled. Therefore the king, the nobles, the Church and the military orders combined to give them protection. For them, as for the Jews, the 13th and 14th centuries were a golden age. By the end of the 14th the persecutions

began. Forced conversion prepared the way for expulsion, which came in the reign of Philip III. (1598-1621). But Expulsion before the end was reached all had been persuaded or of (fie forced into Christianity, had ceased to be Mudejares,

Moriscoes. arK ˆ bad become Moriscoes. In the majority of cases the conversion had occurred so long ago that the memory of the time when they were Mahommedans was lost, and multitudes of the children of Mudejares remained. The Mozarabes again — the Christians who had always lived under The Mahommedan rule— were an element of importance

Moz&rabes. ‘ n me dieval Spain. They had learnt to write in ‘Arabic, and used Arabic letters even when writing Latin, or the corrupt dialect of Latin which they spoke. The conquest of Toledo by Alphonso Vi. first brought the Christians into contact with a large body of these Arabized Spaniards, and their influence was considerable. By Alphonso they were favoured. He stamped his name on his coins in Arabic letters. It is said with probability that one of the early kings of Aragon, Peter I., could write no other letters than the Arabic. The Mozarabes were treated under the kings of the reconquest as separate bodies with their own judges and law, which they had been allowed to keep by the Moslem rulers. That code was the forum judicum of the Visigoths, the fuero juzgo, as it was called in the ” romance ” of later times and in Castilian. The Mozarabes brought in the large Arabic element, which is one of the features of the Castilian language. A part of the work of christianizing the Spain of the 13th century, and not the least part, was done by the monks of Cluny introduced by the French wife of Alphonso VI. To them was due the impulse given to the reform of the church, and to education. The foundation of the studiitm generate of Palcncia in 1212 by Alphonso IX. was an outcome of the movement. It fell in the troubles following his death, but Fernando III. revived it by the foundation of the university of Salamanca, which dates from 1245. The church and the university were the great promoters of the effort to secure religious unity which began in the 14th and produced its full effects in the 17th century. How far the character, habits and morality ot the Christian Spaniards were affected by Oriental influences is not a question which it is easy to answer. To some extent they no doubt were coloured. Such a social institution as the form of marriage known by the name of barragania shows visible traces of Eastern influence. In so far as it was a mere agreement of a man and woman to live together as husband and wife, it had precedents both Roman and Teutonic. There was also Roman and Teutonic example for recognizing the children of such a union as having rights of inheritance. On the other hand the name is Arabic, and so is the term applied to the children, hijos de ganancia, sons of the strange woman. Moreover the Oriental character of this union, be its origin what it may, is

visible from the fact that it was poly- gamous. The only insuperable barrier to a barragania was the previous marriage " with the blessing," the full religious marriage, of the woman to another man. A married man might be united in barragania to a woman other than his lawful wife, and the children of that connexion, though not fully legitimate, were not bastards. The most signal example among many which could be quoted is that of Peter the Cruel (1350-1367), who, though married to Blanche of Bourbon, was abarraganado to Maria de Padilla. He left his

kingdom to the daughters she bore him, and their quasi legitimacy was recognized not only by the Cortes during King Peter's life, but abroad. John of Gaunt, duke of Lancaster, married the elder of the daughters of Maria de Padilla, and claimed the crown of Castile by right of his wife. The clergy, who were debarred from the religious marriage by the discipline of the church, were commonly abarraganado all through the middle ages. The sumptuary laws, which required the barraganas of priests to wear a red border to their dresses, recognized them as a known and tolerated class.

*The work of political unification was essentially more difficult than the christianization of Spain. The great common institution of the church, common enthusiasms, prejudices and -^ .. envies, were available for the second. The first had \T. el Ji. to contend with deeply rooted differences of national . . *\ ". ,ca ' character and of class. The Galician who spoke, and Soala still speaks, a language of his own, was profoundly separated from the Andalusian. The Basque, who till much later times practically included the Navarrese, was a man of another nationality and another speech from the Castilian. And what is true of Castile and Leon applies equally to Aragon. Aragonese, Catalans and Valencians ' werP National as different as Galicians, Basques, Castilians and aitfereEces. Andalusians. Aragon spoke a dialect of Castilian. Catalpnia and Valencia, together with the Balearic Islands, spoke, and speak, dialects of the southern French, the so-called Limose, though it was not the language of the Limousin. And the causes of division did not end here. The word " com- monwealth " had no meaning either east or west of the Iberian range. Every one of the kingdoms grouped round the two sovereigns who shared modern Spain was itself a loose con- glomeration of classes. Mention has already been made of the Jew and the Mudejar. These were more or less forcibly absorbed or brutally expelled. But the distinctions between class Dis- noble and not noble, between town and country, were n ac tioas. in the very fibre of all the Spanish peoples. Expulsion was impossible and combination only attainable by mutual agree- ment, and that was never secured. High mountain barriers and deep river courses had separated the Spaniards locally. They were more subtly and incurably separated by traditional and legal status. Speaking generally, and with the proviso that though names might differ from region to region, the facts did not; it may be said that Spain could be*

classified as follows: Under the crown of Castile all the territory was either abadengo, realingo, salariego, behetria, or it belonged to some town, big or little, which had its carta pueblo or town charter, its own fuero g ys f ems „/ (forum) or law. Abadengo was land of the church, jˆani realingo domain of the crown, salariego land of the Tenure. nobles. Behetria is less easy to translate. The word is the romance form of benefactoria. Behetrias, called " plebeian lordships," were districts and townships of peasants who were bound to have a lord, and to make him payments in money or in kind, but who had a varying freedom of choice in electing their lord. Some were described as " from sea to sea, and seven times a day," that is to say they could take him anywhere in the king's dominions from the Bey of Biscay to the Straits of Gibraltar, and change him as often as they pleased. Others were de linage, that is to say, bound to take their lord from certain lineages. Their origin must probably be sought in the action of communities of Mozarabes, Christians living under Moslem rule as rayahs, who put themselves under _.. _. Christian chiefs of the early days of the reconquest for e owns ' the benefice of their protection. They were mainly in old Castile. By the end of the middle ages they had disappeared. The chartered towns, in Spain east and west, were practically republics living under their own carta pueblo with their own fuero or law. All charters were not granted by the king. Many of them were given by nobles or ecclesiastics, but required the confirmation of the king. And in this country, where all was local law usage and privilege, where uniformity was unknown, all charters were not held by towns. In many cases the serfs in the course of their struggle for freedom extorted charters and fueros. The greater chartered towns had their surrounding comarcas, answer- ing to the " county " of an Italian city, over which they exercised jurisdiction. In time the villages dependent on a chartered city, as they grew to be towns themselves, fought for, and in many cases won, emancipation, which they then sought to have confirmed by the king and proceeded to symbolize by setting up their own gallows in the market-place. The church had won exemption from the payment of taxes by no general law, but by The clergy particular privilege to this or that chapter, bishopric aa(nh e or monastery. The nobles claimed, and were allowed, /,' /,/ es , exemption from taxation. Church and nobles alike were for ever extending their borders by purchase, or trying to do so by force. They conferred their exemptions on the land they acquired, thus throwing the burden of taxation on the towns and the non-nobles with increasing weight. But in this land, where nothing was consistent, there was in reality no sharp division except in the smaller and feudal portion — called Aragon for convenience — and save as between Christian and non-Christian, noble and non- noble. The necessities of the reconquest made it obligatory that all the dwellers

on the frontier should be garrison. Hence they were not only encouraged but required to possess arras. Those of them who could provide themselves with a charger, a mail rosdeF *ero Tt ‘ a s P ear an< ˆ sword were ranked as milites — " ' and the miles was a caballero. Alphonso VII. especially authorized all men who could arm themselves, mount themselves, and serve ” cavalierly ” to live as and count themselves ” cavaliers.” Hence the formation of the class of caballeros de fuero, non-nobles living ” nobly ” with a right to wear the sword. The privilege survived the epoch of the reconquest, and was often extended to gilds which the king wished to encourage. Hence came the practice which caused so much surprise and amusement to French and German travellers of the 16th and 17th centuries — the wearing of the gentlemanly sword by the artisans of towns.

No general law controlled these local usages and fueros. The fuero juzgo (jorum judicum) was accepted by the Mozarabes, and Local Laws na d authority everywhere in cases not provided for by the charters, or where no privilege had been granted by the king. But it was subject to innumerable exceptions, and particular jurisdictions. There was no common tribunal. Nor was any material change introduced after the epoch of the reconquest. Alphonso X., El Sabio or Learned, made a fuero real, which was formed by combining the best parts of existing charters. It was accepted by towns and districts not already chartered, but by them only. The famous siete partidas Partid (seven divisions), drawn up about 1260, is often

as ‘ spoken of as a code of laws. It was never so treated till it was promulgated at the Cortes of Alcala in 1338, in the reign of his great grandson, Alphonso XI. Even then it was subject to the restriction that it was not to prevail against any fuero, or the fuero real. The Cortes might have been expected to forward the work of unification. But without going into details on a subject which requires particular treatment, it may be noted that the Th c rt Cortes was no more coherent, or fixed in constitution or e ° es ‘ working, and was no more national, than any other of the institutions of the country. The crown of Castile and Leon had indeed a common Cortes afcer 1301. Aragon never advanced so far. It, Catalonia and Valencia had each their Cortes, which never united. When King Philip IV. (1621-1665) wished to secure grants of money from these parts of his dominions he had to summon three separate Cortes, which sat in different frontier towns, and he had to negotiate simultaneously with all three. Then the Spaniards, in their carelessness of form and regularity, never fixed any rule as to the constitution of a Cortes. The third estate secured representation in the Cortes of Leon (1188), and then in Castile and the

Common Cortes. In the kingdom of Aragon the right was secured about the same time. It was decided that no new tax could be imposed save with the consent of the commons, and that therefore they must be represented. But no rule was ever made as to whom the king was bound to summon, nor even that the presence of the clergy and the nobles was necessary to constitute a true Cortes. It was never claimed by the Cortes that its consent was necessary to the making of laws. The Roman maxim that what the " prince " wills has the force of law was not disputed — nor did the Spaniard doubt that the king acting by himself was " the prince." The check which the justiza, or chief justice, of Aragon imposed on the king was supported by the force of nobles and cities, but it was an excep- tion in Spain. The representatives of the commons were the personeros and procuradores, i.e. attorneys of the cities. There was no knight of the shire in any Spanish Cortes. The great cities in Castile and Leon succeeded finally in reducing the right of representa- tion to a privilege of eighteen among them, with the good will of the king, who found it easier to coerce or bribe the procurators of eighteen towns than the representatives of a hundred and fifty. The legislative work of such bodies was necessarily small. Their practical power might be great when the king was weak and necessitous, but only then.

It ought to have been easy for kings whose authority was confessedly so great to have made themselves effectively despotic

amid all this division and weakness. Nor would ˆCastile t ‘ le > ’ nave f a ˆ e d so t° do if the sovereigns of Castile

had not been either incapable or short-lived, and if there had not been an extraordinary succession of long minorities; while the kings of Aragon were tempted to neglect their Spanish possessions because they were in pursuit of their claims and ambitions in Italy. Alphonso X. of Castile (1252-1284) was an admirable writer, and a man of /«,™°/“ta intelligent interest in science and law. As

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a ruler he was at once weak, unstable and obstinate. He wasted much time and great sums of money in endeavouring to secure his election as emperor — not in Spain, but in the Holy Roman Empire. He did indeed add the town of Cadiz to his possessions with the help of his vassal, the Moorish king of Granada, but his reign is filled with quarrels between himself and his nobles. The nobles of Castile and Leon were not feudal

vassals, but great landowners claiming and exercising rights 01 jurisdiction on their estates. Their name of ricos hombres. which first appears in written documents of the 12th The Nobles, century, has been credited with a

Teutonic origin, Ricos but it was in all probability nothing but a "romance " omftres. or Castilian translation of the seniores and senatores, potentiores and possdssores of the Visigoth councils and code. They repre- sented a nobility of wealth and not of blood. In the earliei times their possessions were divided among their sons. It was only at the end of the 13th century and later that they began to form mayorazgos or entails, to preserve their name and family. It was then that segundones, or younger sons, began to be known in the social life of Spain. But whatever their position may have been legally, they were as grasping as any feudal nobility in Europe, and they were singularly destitute of any capacity for combined political action. In Aragon, indeed, the nobles did extort a promise from the king that they should not be put to death or deprived of their estates by his mere decision. In Castile they never went beyond begging or extorting grants of the crown lands, or pensions charged on the royal revenue. Alphonso X. ended his life in a civil war with his son Sancho, who claimed the succession in preference to the children of his elder brother, Fernando de la Cerda, and in virtue of a doctrine of which much was heard in the middle ages elsewhere than in Spain. He maintained that the younger son, being nearer to the father than the grandson, had a right to succeed in pre- ference to the children of an elder brother who had died before the succession was open. Alphonso, after first accepting Sancho's claim, repudiated it, and made a will by which he not only left the crown of Castile to the eldest son of Fernando de la Cerda, but cut vassal kingdoms out of the southern parts of Spain for Sancho's younger brothers. The reign of Sancho IV., surnamed El Bravo, or the Fierce (1284- 1284-1296.' 1296), was one constant struggle with the very nobles who had helped him against his father, with his youngei brothers, and with the sons of Fernando de la Cerda. Ferdinand Murder and massacre were his familiar methods. IV., 1296- He was succeeded by his infant son Fernando (Fer- dinand IV.), whose long minority was an anarchy, tempered by the courage and the tact of his mother, Maria de Molina. Fernando, ungrateful to his mother and incapable as a king, died in 1312, leaving a son of less than a year old, Alphonso XL (1312-1350). After another minority of confusion, Alphonso, surnamed "of the Rio Salado," from the great Alphonso victory he won over an invading host from Africa, XL, 1312- ruled with energy and real political capacity. He ' was indeed ferocious, but such actions as the murder of his great- uncle, Don Juan El Tuerto — the distorted in body and mind — did not seem to his subjects more than the exercise by " the prince " of that right to act for the good of the state legibus solutus which is inherent in sovereignty. But Alphonso did not use his freedom to act legibus solutus except against such hoary and incorrigible intriguers as Don Juan el Tuerto or the Caballero Diego Gil, whom he beheaded with seventeen of his men after promising them security for their lives. He did some- thing to found the judicial and administrative unity of the country. His death at the age of thirty-eight, during the great plague, and while he was besieging Gibraltar, was a misfortune to Spain. His successor, Peter, surnamed the Cruel (1350- 1368) was destined to show the Castilians exactly petetihe what the constant use by " the prince " of the Cruel, reserved rights of the sovereign authority could be W 5 made to mean, when they were exercised by a passionate man maddened by suspicion of all about him. Administering the civil side of his government through Jewish tax-gatherers and farmers of the taxes, and surrounded by the Mudejar guard, who were the executors of his justice, his path is marked by one long succession of murders. With all his appearance of energy, he shrank from action at the critical moment of his wars out of utter want of trust in all about him. His expulsion by his brother, Henry of Trastamara, the eldest son of Leonora de Guzman, his restoration by the Black Prince (q.v.), his treachery

to him, and his final defeat and murder at Montiel, are famous episodes.

Henry of Trastamara, the beginner of the " new Henry of kings" (1368-1379), reigned by election. The Trastamara, nobles and the cities to whom he owed his crown 1368-1379. na(j proportionate power. In his reign and those of his immediate successors the Cortes flourished, although it failed to establish checks on the absolute power of the king. Henry was on the whole a successful ruler. He forced his neighbours of Portugal to make peace, his fleet defeated an English squadron off Rochelle, and he restored internal order. The civic hermandades, or brotherhoods, enforced respect from the nobles. John I. (1379-1390), Henry's son and 1379-1390. successor, had to contend with John of Gaunt, son of Edward III. of England, who had married the eldest daughter of Peter the Cruel, and claimed the crown of Castile in her name. John averted the danger by arranging a marriage between his son Henry and Constance, the eldest daughter of John of Gaunt, an alliance which united the two equally illegitimate lines representing Alphonso XL, and so closed the dispute as to the succession. He was less fortunate in his efforts to vindicate the rights of his wife Beatrix to the throne of Portugal. The defeat of the Castilians at the battle of Aljubarrota (1385) compelled the king to renounce his pre-tensions. The minority of his son, Henry III. (1390-1406) was . long, and his effective reign short, but in the brief 1390-1406. s P ace allowed him the king, a weakly man surnamed El Doliente (the sufferer) did something to estab- lish order. He recovered all the immense grants of crown lands and rents, impounded by the nobles during his minority. The first years of the minority of his infant son, John II. (1406- 1454), were by a rare exception peaceful. The young 14061454 k' n g' s uncle Ferdinand (called " of Antequera " because he was besieging that town, which he took from the Moors, when he heard in 141 2 that he had been declared heir to the crown of Aragon by the Cortes of Caspe) acted as regent. Ferdinand was able and honest. His succession to the throne of Aragon is an event of capital importance in the history of the Peninsula.

The kings of Aragon from the death of James the Conqueror in 1276 to the death of Martin I. in 1410 were so largely con- cerned in the struggle with the Angevin party in Arasroaf 80 Napl es and Sicily, that their history belongs rather to Italy than to their Peninsular kingdom. They were six in number; Peter III. (1276-1285), Alphonso, III. (1285-1291), James II. (1291-1327), Alphonso IV. (1327- 1336), Peter IV. (1336-1387), John I. (1387-1305), and Martin I. (1395-1410). In so far as their influence was felt in the internal affairs of their Spanish kingdoms, they had a double task to perform. The first was to reunite the Balearic Islands and Roussillon, which James the Conqueror had left by will to a younger son, to the crown of Aragon. This was finally achieved, after a hideous story of fratricidal hatred and murder by poison, by Peter IV. Their second task was to reduce their turbulent barons, in Aragon, Catalonia and Valencia

alike, to the position of obedient subjects. In this task also it was Peter IV. who achieved success. The barons of Aragon and Valencia had extorted from his weak father the charter known Peter iv. as the Union, which not only recognized their just and the right not to be punished in life or property, except " Union." ky p rocess f i aw> but explicitly authorized them to elect the justiza or the chief justice, whose decisions were to be independent of royal confirmation, and to take up arms whenever they considered themselves aggrieved. Such an instrument was of course incompatible with the monarchical or any other form of government. The object of the life of Peter IV. was to force the barons to surrender their charter. After years of struggle and preliminary failures, Peter IV. defeated the " Union " utterly at the decisive battle of Epila (1348). He was a typical king of the 15th century, immeasurably false, and unspeakably ferocious, but he was not a mere blood- thirsty sultan like his enemy, Peter the Cruel of Castile. When he won he took indeed a brutal vengeance on individuals, and

he extorted the surrender of the charter and destroyed it with his dagger in the presence of the Cortes at Saragossa. He cut his hand in his eagerness, and declared that the blood of a king was well shed in securing the destruction of such an instrument — whence his popular nickname of Peter of the Dagger (del'Pune- jalet). But his use of the victory was statesmanlike. He fully confirmed the right of the nobles to trial by law and security against arbitrary punishment; he left the franchises of the city untouched, and respected the independence of the justiza. The result of his victory was to give Aragon and his other dominions a measure of internal peace unknown in Castile. The reigns of his sons and successors, John and Martin, were insignifi- cant and tranquil. The death of Martin without children in 1410 left the succession open. The two years of discussion which followed are interesting as a proof that Aragon had The Sac- reached a higher political level than Castile. The cession la Cortes was able to administer in peace, and the Aeagon. question of the succession was debated as if it had been in a suit between private persons. The judges finally decided in favour of Ferdinand, on the ground that his mother, Eleanor, was the daughter of Peter IV., and that though a woman could not reign as a " proprietary queen " in Aragon, she could convey the right to her husband or transmit it to her son. On their own principles they ought to have given the crown to John of Castile as the son of Ferdinand's elder brothei. But the countries were not ripe for union Nevertheless the choice of Ferdinand was a step forward towards union.

From 141 2 to 1479 the separation lasted with a growing ap- proximation of the two states whose interests touched one another so closely. In Castile John II. (1406-1454), a man Castile. of amiable but indolent character and of literary John //., tastes, was governed by his favourite, Alvaro de

**406-i4M. Luna, and harassed by his nobles. His reign is full of contentions which were not wars for a principle, but were scurries for the control of the spigot of taxation. At the end of his life he sacrificed his favourite at the instigation of his second wife, an act which, it is said, justly embittered his last days. Of his son, Henry IV. (1454-1474) it is enough to say that he was called " the Impotent, " and that there is every 1454ˆ1474. reason to believe that he deserved the description in all the senses of the word. His reign was an inferior copy of his father's. As the legitimacy of his alleged daughter Juana was disputed, his sister Isabella claimed the succession, and married her cousin, Ferdinand of Aragon, son of John I., in 1469 in defiance of her brother. In Aragon, Ferdinand I. " of Antequera " (1412-1416) was succeeded by Alphonso V. (1416- 1458) the Magnanimous, whose brilliant life belongs to Italy. In Aragon he was represented by his brother John, who administered as lieutenant-general, and who reigned in his own right (1458- 1479) when Alphonso V. died without legitimate heirs, leaving Naples by will to a bastard son. John I., a man of indomitable energy and consider- 1458-1479. able capacity, spent most of his life in endeavouring to enforce his claims to the kingdom of Navarre as the husband and heir of its queen Blanche. His conflict with his son by his first marriage, Charles, prince of Viana, was settled in his favour by the death of the prince. Then he had to contend with a national revolt in Catalonia, which endeavoured to make itself independent under three successive foreign princes. In the end the pertinacity of John triumphed. At the age of over eighty, blind and unconquerable, he transmitted his kingdom to Ferdi- nand, his son by his second marriage, with Juana Enriquez, of the family of the hereditary admirals of Castile. Navarre went to a daughter, and Roussillon was somewhat fraudulently retained by Louis XL as security for a debt. Ferdinand conquered the Spanish half of Navarre later, and recovered Roussillon from Charles VIII. , the successor of Louis XL*

With the death of John II. of Aragon in 1479 the history of Spain enters on an entirely new period. Hitherto it has been the story of a national development. The process did not cease, but, during the reign of Isabella the Catholic (1474-1504.) until the death of her husband Ferdinand in 1516, was carried,

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r.ot to completion, but to the stopping place at which it was destined to rest for two centuries. The voyage of Columbus Spanish in 1492, and the intervention of Ferdinand in the History great conflict of France, the empire and the papacy after 1479. f or predominance in Italy, had, simultaneously, the effect of opening to her the world of conquest and adventure in America, and of committing her to incessant wars in the Italian Peninsula. The death of John, the only son of Ferdinand and Isabella, the worst misfortune which ever happened to Spain, opened the succession to all the crowns and coronets worn by the Catholic sovereigns to Charles of Habsburg — the emperor Charles V. From that day Spain became a part — the leader, then the paymaster, then the dupe — of the international mon- archical confederation called " the illustrious House of Austria." The Spaniard became the swordsman and executioner of the counter-Reformation, because the power of the House of Austria depended on the imposition of religious unity in Europe. The decision of Charles V., king of Spain and emperor, to leave the Netherlands to his sen Philip II., committed the Spaniards to conflict on the sea with England, and to the insane attempt to secure a safe road for their armies across Europe from the shores of the Mediterranean to the North Sea. Thereby they threat- ened the very national existence of France. The arrangement was made possible only by the hopeless divisions of Germany, the blind pride of Spain, and the utter political incapacity of both. It forced every patriotic ruler of England to oppose Spain on the sea, and every statesmanlike master of France to ruin her power on the land. Meanwhile the Spaniards were endeav- ouring to check the advance of the Turks in the Mediterranean, and to exclude all Europe from the waters of the New World. In the intensity of their struggle with the Reformation they subjected education to a censorship which, in order to exclude all risk of heresy, stifled thought and reduced knowledge to the repetition of safe formulas. With their eyes on the ends of the earth, and a ring of enemies from Constantinople to the Antilles, the Spaniards fought, with steadily diminishing material resources, with a character and intellect which shrivelled by swift degrees. When nearly bled to death for the illustrious House of Austria, they were transferred to the House of Bourbon, which in its turn dragged them into conflict with Austria in Italy and England on the sea. At the beginning of the 19th century they had fallen into such a state of weak- ness that Napoleon could, with some considerable measure of excuse, look upon their country as a species of no-man's-land into which his troops had only to march on police duty to secure immediate obedience. The history of the 19th century is the liquidation of an enormous bankruptcy, and the com- pletion of the circle which confines the Spaniard once more to the soil of the Peninsula.

Ferdinand and Isabella were proclaimed king and queen of Castile together,

although the crown was hers alone, and although

she never consented to part with her sovereign and Isabella, authority. In the purely internal affairs of Castile

it was always she who decided on questions of administration. Some opposition was offered by a faction of the nobles who took up the claims of Henry's supposed daughter, commonly called Juana la Beltraneja, because her father was alleged to have been Don Beltran de la Cueva, who, however, fought for Isabella. Juana's party had the support of the king of Portugal, who arranged a marriage between her and his son. The defeat of the Portuguese at Toro made an early end of the war. The new sovereigns immediately began the work of establishing order and obedience in their dominions. The line of policy followed by the Catholic sovereigns 1 was to keep the old forms, but draw the substance of power to themselves. Thus, for instance, they organized a police to clear the country of brigands, and attached a special jurisdiction to it, but they gave it the old name of Hermandad and the very superficial appearance of a voluntary association of the cities and the gentry. It consisted of a force of well-appointed horsemen, in the pro-

1 The name was not formally given to them by the pope till later, but it isconvenient to use it at once.

portion of one to every hundred families. Its merits as a police have perhaps been exaggerated, and in the war with Granada its bands were employed as soldiers. But an end was at least put to the existence of peiias bravas in the dominions of the crown of Castile. And this was the uniform model of their policy. The masterships of the military orders of Calatrava, St Iago and Alcantara were one by one annexed to the Crown. Their commandaries were used to pay, or pension, the servants of the sovereigns. No attack was made on the charters of the towns, but in Castile and Aragon alike royal officers were appointed to adjudicate on disputes within the corporations themselves, or between corporation and corporation. By them the old councils were rapidly reduced to a state of atrophy. The same course was followed with the Cortes. It continued to be summoned by the Catholic sovereigns and their successors of the Habsburg line, but it was needed only to grant money. The nobles and the clergy, who as exempt from taxation had no vote, became purely ornamental parts of the Cortes. The representatives of the third estate were confined by the indiffer- ence of the Castilians to eighteen towns, whose procurators were named by the councils either from among themselves in rotation, or from particular families. Moreover, they received pay from the Crown while the Cortes sat. For the work of legis- lation the Cortes was not needed, and never had been. It was not even summoned during the whole of the war with

Granada. The Catholic sovereigns provided themselves with a revenue by the customary wholesale resumptions of grants aovernmeat made during the reigns of John II. and Henry IV., of the and by the suppression or reduction of the pensions "Catholic they had granted with profusion. The nobles, • Sove " ˆ having been brought to obedience by a frown, were left in possession of their estates, their social rank and the obli- gation to render military service. They were summoned to the royal council, but only as ornamental members, the real authority and the exclusive right to vote being confined to the letrados, or lawyers, chosen by the Crown from the class of the burghers. Encouragement of industry was not wanting; the state under- took to develop the herds of merino sheep, by issuing pro- hibitions against inclosures, which proved the ruin of agriculture, and gave premiums for large merchant ships, which ruined the owners of small vessels and reduced the merchant navy of Spain to a handful of galleons. Tasas, fixed prices, were placed on everything. The weaver, the fuller, the armourer, the potter, the shoemaker were told exactly how to do their own work. All this did not bear its full fruit during the reign of the Catholic sovereigns, but by the end of the 16th century it had reduced Spain to a state of Byzantine regulation in which every kind of work had to be done under the eye and subject to the interference of a vast swarm of government officials, all ill paid, and often not paid, all therefore necessitous and corrupt. When the New World was opened, commerce with it was limited to Seville in order that the supervision of the state might be more easily exercised. The great resource of the treasury was the alcabalas or excises — taxes (farmed by contractors) of 5 or 10% on an article every time it was sold-ˆ-on the ox when sold to the butcher, on the hide when sold to the tanner, on the dressed hide sold to the shoemaker and on his shoes. All this also did not bear its full fruit till later times, but by the 17th century it had made Spain one of the two " most beggarly nations in Europe " — the other being Portugal.

The policy of the Catholic sovereigns towards the Church was of essentially the same character as their treatment of the nobles or the cities. They aimed at using it as an instrument of government. One of the first measures adopted by them in Castile, before the union with Aragon, was to stop the nomina- tion of foreigners to Spanish benefices by the pope. But the most characteristic part of their ecclesiastical policy was the establishment of the Spanish Inquisition (q.v.). By the bull of Sixtus IV. of 1578 they obtained i nqu isitton. authority to appoint three inquisitors, whom they were empowered to remove or replace, and who were indepen- dent of, and superior to, the inquisitorial courts of the bishops.

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The Spanish Inquisition was a department of the royal govern- ment, employed to enforce religious unity and obedience, because they were held to be indispensable in order to obtain national unity and to enforce the authority of the Crown. The Inquisition was at first established (in 1480) in the dominions of Castile only,_ butit was extended in i486 to Catalonia and in 1487 to Aragon, in spite of strong protests. The first duties of the Inquisition were to deal with the converted Jews and M'ahommedans, respectively known as Marranos and Moriscoes, and with those who still professed their religions. The latter were dealt with by expulsion, which in the case of the Jews was enforced in 1492, and in the case of the subject Mahommedans or Mudejares in 1502. Both were industrious classes, and the loss of their services was disaster. to Spain — the first of a long series of similar measures which culminated in the final expulsion of the Moriscoes in 1610. The con- verted Jews and Mahommedans presented greater difficulties to the Inquisition. Many of the higher ecclesiastics and of the nobility were of Jewish, or partially Jewish, descent. The landlords who found the Moriscoes useful tenants, and the commercial authorities of towns like Barcelona, who knew the value of the converted Jews, endeavoured to moderate the zeal of the inquisitors. But they were supported by the Crown, and there can be no question that the Holy Office was popular with the mass of the nation. It produced a wholesale flight of the converted Jews to France.

In social life the religious zeal favoured by the Inquisition led to such things as those public processions of flagellants which went on in Spain till the end of the 18th century. It aimed at preserving orthodoxy and developing sainthood on the medieval model. Of ordinary immorality it took little notice, and the triumph of its cause in the 16th and 17th centuries, while producing such types of ecstatic piety as St Theresa (q.v.), the Sor Mariade Jesus (Maria Agreda), (q.v.) and the Venerable Virgin Luisa de Carvajal (q.v.), was accompanied by an extraordinary development of moral laxity. The Holy Office showed equal zeal in extending its jurisdic- tion, and by the end of the 17th century had provoked a strong reaction. The most honourable passage in its history is the part it took in forwarding the great, though temporary, reform of the monastic orders, which was a favourite object with Queen Isabella.

Between 1481 and 1492 the Catholic sovereigns completed the work of the reconquest by subjugating the one surviving Conquest of Mahommedan state of Granada. Their task was Granada, materially facilitated by dissensions among the U92 ' Moors, whose princes intrigued against one another,

and were to the last ready to aid the Christians in the hope of obtaining a small fragment of territory for themselves. The surrender of Granada on the 2nd of January 1492 was partly secured by promises of toleration, which were soon violated. A revolt had to be suppressed in 1501. Having secured the unity of their territory in the Peninsula, the Catholic sovereigns were free to begin the work of expansion. In 1492 Columbus

(q.v.) sailed on his first voyage to the west. In 1493 America" ° Ferdinand secured the restoration of Roussillon from

Charles VIII. of France by the fallacious treaty in which he undertook to remain neutral during the king's expedition to Italy. The voyage of Columbus had unforeseen consequences which led to diplomatic difficulties with Portugal, and the treaty of Tordesillas in 1494, which defined the respec- tive spheres of influence of the two powers in the New World and in Asia. In 1497 Ferdinand, with the support of his wife, Foreign entered on those wars of Italy in which the Spanish Policy of regular soldiers first gained their reputation, and Ferdinand which made Spain for a time the dominant power and Isabella. m ˆg Italian peninsula (see Cordoba, Gonzalo F. de). They endeavoured to strengthen themselves against France by marriages with the royal family of England (see Catherine of Aragon) and the Habsburgs. The marriage of Juana, called the Mad, with Philip of Habs- burg, son of the emperor Maximilian (q.v.) brought a new dynasty to Spain. On the death of the queen in 1504 her son-in-law claimed the regency, and was supported by the

Castilian nobles. His death in 1506 and the in- F°erdinaˆd° san ity °f his widow left the Castilians no choice

but to restore Ferdinand as regent. During the next ten years Ferdinand governed with the very able assistance of the archbishop of Toledo, Jimenes de Cisneros (q.v.). He annexed the southern part of Navarre, which was held by the representatives of his half-sister. The archbishop organized and directed the expedition which conquered Oran, Tripoli and other points on the African coast. Here beyond all doubt lay

the proper field for the expansion of Spain. She was drawn from it on the death of Ferdinand in 1516. He was succeeded by his grandson Charles of Habsburg, and when Charles was elected to the empire in 1519 Spain was dragged into the wars and politics of central Europe.

Only the smaller part of the reign of Charles was spent in Spain. He came to it from Flanders, where he had received his education, unable to speak the language and sur- Charles 1. of rounded by Flemish favourites. To him and them Spain, v. as the country was only a source of supply from which

Emperor. money was to be obtained in order to bribe the German electors. The disregard which both showed for the interests of Spain and its constitutional rights led to the outbreak of the revolt of the cities — the Comuneros — which plunged Castile into confusion in 1519 and 1520 after the departure Revolt of the of Charles for Flanders. The rising of the Comuneros, Comuneros has often been spoken of as a IS19 ~ 20 ‘ struggle for freedom. But it has a very dubious right to the name. In many places the movement was simply an excuse for a revival of private wars between wealthy noble families. In others it was a struggle to enforce the claims of particular towns. It hardly extended as a political movement beyond the two Castiles. If its leaders had acted together, in combination with the nobles, the Comuneros could have imposed their own terms, for there was no royal army to oppose them. But they drifted into hostility with the nobles, and were defeated by them at Villalar. The movement then rapidly collapsed. Charles had no part in the suppression of the revolt. Throughout his reign he respected the claim of the Cortes that no new taxation should be raised without its consent, but as he had to deal only with the representatives of eighteen cities, who could generally be bribed, he rarely failed to secure what he demanded. The outbreak of the Comuneros in Castile coincided with the social and agrarian revolt in Valencia known as the Germania or brotherhood, from the name of the directing committee appointed by the insurgents. It was in no sense a movement for political rights, but an attack by Rising of the the sailors, the workmen of the towns, and the Germania in Christian peasants on the landowners and their Valencia. Mudejar and Morisco serfs. It was accompanied by murder and massacre and by forced conversions of the Mudejares. After desolating Valencia for some three years it was put down by the help of troops from Castile. The conquest of Mexico by Hernan Cortes (q.v.) and of Peru by Francisco Spafa an j Pizarro (q.v.) belong to this reign, but were imrae- the Euro- diately due to the adventurers in America. These P eaa Policy conquests and the incessant wars into which Spain ° ares • was drawn by the Aragonese claims in Italy, and its connexion with the empire, gave to the nation a great European position and to the Spanish soldiers of the time many opportunities to win renown. The capture of the French king at Pavia and his imprisonment at Madrid gratified the pride of the Spaniards, and did much to reconcile them to the sacrifices which the policy of the emperor imposed on them. Except, however, in the case of the successful attack on Tunis in 153s, and the attempt to take Algiers in 1541, his actions were not inspired by any regard for the interests of his Spanish kingdoms. He treated them simply as instruments to promote the grandeur of his house. His indifference to their good, or his utter inability to see where it lay, was conspicuously shown when, on his abdication in 1556, he left his hereditary Flemish possessions to his son Philip, and not to his brother Ferdinand.

The reign of Philip II. (1 556-1 598) was a prolongation of the reign of his father, both in domestic and in foreign policy. In it the vices of this policy were displayed to the fullest extent. Philip's marriage with Mary Tudor is56-iS98. (q.v.) in 1554 having proved barren, and her death in 1558 having placed Elizabeth on the throne of England, he was left without the support against France which this union was meant to secure. At the same time his inheritance of the Netherlands brought him into collision with their inhabitants, who feared his absolutist tendencies, and with the Reformation.

The revolt in the Low Countries was inevitably favoured by both France and England. Philip was consequently drawn Spain and lnl0 intervention in the religious wars of France the Nether- (q.v.) and into war with England, which culminated lands, i n the great Armada (q.v.) of 1588. His relations France and w j t jj E n gi an d were further complicated by the exten- sion of English maritime enterprise to the New World (see Hawkins John; andDRAKE, Francis). In the Mediterranean he was equally forced by his position to take a part in resisting the Turks (see Malta: History; and Lepanto, Battle of). But the key to his whole policy must be sought in his relations to his Flemish subjects. With his absolutist tendencies he was bound to wish to govern them as he did Castile, and the prin- ciple of religious toleration, which was not understood by any prince in Europe with the exception of the prince of Orange, William the Silent {q.v.), was peculiarly impossible for him. His reign was therefore one long struggle with forces which he was unable to master.

The burden of the struggle fell with crushing effect on his Spanish dominions and peculiarly on Castile. Aragon, which was poor and tenacious of its rights, would give little; Catalonia and Valencia afforded small help. The Flemish revenue was destroyed by the revolt. The Italian states barely paid their expenses. Resources for the incessant wars of the reign had been sought in the taxation of Castile and the revenue from the mines of America. They were wholly inadequate, and the result of the attempt to dominate all western Europe was to Character of produce bankruptcy and exhaustion. In his internal Philip's government Philip was fully despotic. He made no aovera/nen(.p rel – ence f consulting the Cortes on legislation, and though he summoned them to vote new taxes he established the rule that the old were to be considered as granted for ever, and as constituting the fixed revenue of the Crown. The nobles were

excluded from all share in the administration, which was in the hands of boards (Juntas) of lawyers and men of the middle class. All business was conducted by corre- spondence, and with a final reference to the king, and the result was naturally endless delay.

The first years of the reign of Philip II. were occupied in concluding the last of his father's wars with France, to which Foreign was added a very unwelcome quarrel with the pope, Policy of arising out of his position as duke of Milan. He Philip. was unable to avoid sending an army under Alva against Paul IV., and was glad to avail himself of the services of Venice to patch up a peace. On the Flemish frontier, with the help of an English contingent and by the good generalship of Philibert of Savoy he defeated a French army at St Quentin on the 10th of August 1557, and again at Gravelines on the 13th of July 1558. But he did not follow up his successes, and the war was ended by the signing of the peace of Cateau Cambresis on the 2nd of April 1559. The exhaustion of his resources made peace necessary to him, and it was no less desirable to the French government. Philip's marriage with Elizabeth, the daughter of Henry II. and of Catherine de Medici, together with their common fear of the Reformation, bound him for a time to the French royal house. In August 1559 he returned t o Spain, which he never left for the rest of his life. The outcry of the Cortes, whether of Castile or of the other states, for relief from taxation was loud. In some cases the king went so far as to levy taxes in what he acknowledged was an illegal manner and excused under the plea of necessity. By 1567 the revolt in the Netherlands was flagrant, and the duke of Alva was sent with a picked arm}', and at the expense of Spain, to put it down. In the following year the tyranny of the Inquisition, encouraged by the king who desired to purge his kingdom of all taint of heterodoxy, led to the revolt of the Moriscoes, which desolated Granada from 1568 to 1570, and ruined the province completely. The Moriscoes had looked for help from the Turks, who were engaged in conquering Cyprus from Venice. The danger to Spain and to the Spanish possessions in Italy stimulated the king to join in the Holy League formed by the pope and Venice against the Turks; and Spanish ships and soldiers had a great

share in the splendid victory at Lepanto. But the penury of the treasury made it impossible to maintain a permanent naval force to protect the coast against the Barbary pirates (q.v.). Andalusia, Murcia, Valencia, Catalonia and the Balearic Islands were subject to their raids throughout the whole of the 16th and 17th centuries. In 1581 Philip annexed Portugal, as heir to King Henry, the aged successor of Dom Sebastian. Philip endeavoured to placate the Portuguese by the fullest recognition of their constitutional rights, and in particular by favouring the fidalgos or gentry. The duke of Braganza, whose claims were better than Philip's, was bought off by immense grants. Spain seemed now to have reached a com- manding height

of power. But she was internally exhausted.

Her real weakness, and the incompetence of her

i_ , , ... Exhaustion

government, were shown when open war began with ts P ain.

England in 1585. While a vast armament was being slowly collected for the invasion of England, Drake swept the West Indies, and in 1587 burnt a number of Spanish ships in their own harbour of Cadiz. The ruinous failure of the great Armada in 1588 demonstrated the incapacity of Spain to maintain her pretensions. In 1591 the support given by the Aragonese to Antonio Perez (q.v.) led to the invasion of their country by a Castilian army. The constitutional rights of Aragon were not entirely suppressed, but they were diminished, and the kingdom was reduced to a greater measure of submission. In his later years Philip added to all his other burdens a costly interven- tion in France to support the league and resist the succession of Henry IV. to the throne. He was compelled to acknowledge himself beaten in France before his death on the 13th of September 1598. He left the war with England and with the Netherlands as an inheritance to his son.

The period of one hundred and two years covered by the reigns of Philip III. (1598-1621), Philip IV. (1621-1665) and Charles II. (1665-1700), was one of decadence, end- ing in intellectual, moral and material degradation. 1598-1621'. The dynasty continued to make the maintenance of the rights and interests of the House of Austria its main object. Spain had the misfortune to be saved from timely defeat by the weakness of its neighbours. The policy of James I. of England (q.v.), the civil wars of Charles I. (q.v.), the assassination of Henry IV. of France, the troubles of the minority and reign of Louis XIII. (q.v.) and the Fronde (q.v.), preserved her from concerted and persistent foreign attack. After a futile attempt to injure England by giving support to the earl of Tyrone in Ireland (see Tyrone, Earls of) peace was made between the powers in 1604. In 1609 a twelve years' truce was made with the Dutch. But the temporary cessation of foreign wars brought no real peace to Spain. In 1610 fears of the help which the Moriscoes might give to a Mahommedan attack from Africa combined with religious bigotry to cause their expulsion. The measure was thoroughly popular with the nation, but it was industrially more injurious than a foreign invasion need have been. The king was idle and pleasure-loving. He resigned the control of his government to the duke of Lerma (q.v), one of the most worthless of all royal favourites. The expenses of the royal household increased fourfold, and most of the increase was absorbed by the favourite and his agents. The nobles, who had been kept at a

distance by Philip II., swarmed round the new king, and began to secure pensions in the old style. The pillage was so shameless that public opinion was stirred to revolt. Some of the lesser sinners were forced to restitution, and in 1618 Lerma fell from power, but only because he was supplanted by his son, the duke of Uceda, a man as worthless as himself. In that year was taken the step which was destined to consummate the ruin of Spain. The Thirty Years' War began in Germany, and Spain was called upon to support the House of Austria.

The death of Philip III. on the 21st of March 1621 brought no real change. His son, Philip IV., was an abler man, and even gave indications of a wish to qualify himself to discharge his duties as king. But he was young, pleasure-loving, and wanted the strength of will to make his good intentions effective.

For twenty years the administration was really directed by his favourite the count of Olivares (q.v.) and duke of San Lucar, known as the " Conde Duque," the count- 1621-1665. duke. Olivares was far more able and honest than Lerma. But he could only keep his place by supplying his master with the means of dissipation and by conforming to his dynastic sentiments. The truce concluded in i6og with Holland ended in 1621, and was not renewed. The commercial classes, particulatly in Portugal, complained that it subjected them to Dutch competition. War was renewed, and the Dutch invaded Brazil. As their fleets made it dangerous to send troops by sea to Flanders, Spain had to secure a safe road overland. Therefore she endeavoured to obtain full control of the Valtel- lina, the valley leading from Lombardy to Tirol, and from thence to the German ecclesiastical states, which allowed a free passage to the Spanish troops. War with France ensued. The failure of the treaty of marriage with England (see Charles I. and Buckingham, First Duke of) led to war, for the English court was offended by the Spanish refusal to aid in the restoration of the count palatine, son-in-law of James I., to his dominions. In Flanders the town of Breda was taken after a famous siege. The French conducted their campaign badly. The Dutch were expelled from Bahia in Brazil, which they had seized. An English attack on Cadiz in 1625 was repulsed. His flatterers called the king Philip the Great. A few years later it began to be a standing jest that he was great in the sense that a pit is great: the more that is taken from it the greater it grows. By 1640 the feebleness of the monarchy was so notorious that it began to fall to pieces. In that year

Portugal fell away without needing to strike a blow. Then followed the revolt of Naples (see Masaniello) and of the Catalans, who were bitterly angered by the excesses of the troops sent to operate against the French in Roussillon. They called in the French, and the Spanish government was compelled to neglect Portugal. Olivares, who was denounced by the nation as the cause of all its misfortunes, was dismissed, and the king made a brief effort to rule for himself. But he soon fell back under the control of less capable favourites than Olivares. In 1643 the prestige of the Spanish infantry was ruined by the battle of Rocroy. At the peace of Miinster, which ended the Thirty Years' War in 1648, Spain was cynically thrown over by the German Habsburgs for whom she had sacrificed so much. Aided by the disorders of the minority of Louis XIV., she struggled on till the peace of the Pyrenees in 1659, by which Roussillon was ceded to France. An attempt was now made to subdue Portugal, but the battle of Montesclaros in 1665 proved the futility of the effort. The news of the disaster was followed by the death of the king on the 17th of September 1665. Catalonia was saved by the reaction produced in it by the excesses of the French troops, and in Naples the revolt had collapsed. But Portugal was lost for ever, and the final judgment on the time may be passed in the words of Olivares, who complained that he could find " no men " in Spain. He meant no men fit for high command. The intellect and character of the nation had been rendered childish.

During the whole of the reign of Charles II. (1665- 1665-1700.' I 7 0O) > tne son °f the second marriage of Philip IV.

with his niece Mariana of Austria, the Spanish monarchy was an inert mass, which Louis XIV. treated as raw material to be cut into at his discretion, and was saved from dismemberment only by the intervention of England and Holland. The wars of 1667-68, ended by the peace of Aix-la-Chapelle, those of 1672-78, ended by the peace of Nijmwegen, those of 1683-84, ended by the peace of Ratisbon, and the war of the League of Augsburg, 1689-96, were some of them fought wholly, and all of them partly, because the French king wished to obtain one or another portion of the dominions of the Spanish Habsburgs. But Spain took a subordinate and often a merely passive part in these wars. The king was imbecile. During his minority the government was directed by his mother and her successive favourites, the German Jesuit Nithard and the Granadine adventurer Fernando de Valenzuela. In 1677 the king's bastard brother,

the younger Don John of Austria, defeated the queen's faction, which was entirely Austrian in sentiment, and obtained power for a short time. By him the king was married in 1679 to Marie Louise of Orleans, in the interest of France. When she died in 1689, he was married by the Austrian party to Mariana of Neu- burg. At last the French party, which hoped to save their

monarchy from partition by securing the support of France, persuaded the dying king to leave his kingdom by will to the duke of Anjou, the grandson of Louis XIV., and of Maria Teresa, daughter of Philip IV. by his first marriage. On the death of Charles II., on the 1st of November 1700, the duke of Anjou was proclaimed king.

The Bourbon Dynasty. — The decision of Louis XIV. to accept the inheritance left to his grandson by Charles II. led to a final struggle between him and the other powers of western war of Europe (see Spanish Succession, War of the), Spanish which was terminated in 17 13 by the peace of Succession, Utrecht. The part taken by Spain in the actual &00-I3. struggle was mainly a passive one, and it ended for her .with the loss of Gibraltar and the island of Minorca, which remained in the hands of England, and of all her dominions in Italy and Flanders. Another and a very serious consequence was that England secured the Asiento (q.v.), or contract, which gave her the monopoly of the slave trade with the Spanish colonies, as well as the right to establish " factories " — that is to say commercial agencies — in several Central and South American ports, and to send one cargo of manufactured goods yearly in a ship of 500 tons to New Carthagena. In internal affairs the years of the war were of capital importance in Spanish history. The general political and administrative uoo^l746. nullity of the Spaniards of this generation led to the assumption of all real power by the French or Italian servants and advisers of the king. Under their direction important financial and administrative reforms were begun. The opposition which these innovations produced encouraged the separatist tendencies of the eastern portion of the Peninsula. Philip V. was forced to reduce Aragon, Catalonia and Valencia by arms. Barcelona was only taken in 17 14, the year after the signing of the treaty of Utrecht. The local privileges of these once independent kingdoms, which had with rare exceptions been respected by the Austrian kings, were swept away. Their disappearance greatly promoted the work of national unification, and was a gain, since they had long ceased to serve any really useful purpose. The removal of internal custom-houses, and the opening of the trade with America, hitherto confined to Seville and to the dominions of the crown of Castile, to all Spaniards, were considerable boons. The main agents in introducing and promoting these changes were the French ambassadors, a very able French treasury official — Jean Orry, seigneur de Vignory (165 2-1 7 19) — and the lady known as the princess des Ursins {q.v.), the chief lady-in-waiting. Her maiden name was Anne Marie de la Tremoille, and she was the widow of Flavio Orsini, duke of Bracciano. Until 17 14 she was the power behind the throne in Spain. On the death of Philip V.'s first wife Maria Louisa Gabriella of Savoy, in 17 14, the king was married at once to Elizabeth Farnese of Parma, who expelled Mme des Ursins, obtained complete control Queen over her husband, and used her whole

influence to Elizabeth drag Spain into a series of adventures in order to Farnese ana obtain Italian dominions for her sons. Her first agent was the Italian priest Alberoni (q.v.), whose favour lasted from 1714 to 1719. Alberoni could not, and perhaps did not, sincerely wish to prevent the queen and king from plunging into an attempt to recover Sardinia and Sicily, which provoked the armed inter- vention of France and England and led to the destruction of the rising Spanish navy off Cape Passaro (see Torrington, George Byng, Viscount). In 1731 Elizabeth secured the succession of her eldest son, Charles, afterwards Charles III. of Spain, to the duchy of Parma, by arrangement with England and the Empire. Apart from the Italian intrigues, the most important foreign affairs of the reign were connected with the relations of Spain with England. A feeble attempt to regain

Gibraltar was made in 1733, and a serious war was only averted by the resolute peace policy of Sir Robert Walpole. But in 1739 trade difficulties, which had arisen out of the Asiento in America, led to a great war with England, which became merged in the War of the Austrian Succession (q.v.). The king, who had become almost entirely mad at the end of his life, died on the 9th of July 1746. His successor, Ferdinand VI., the second son of his first marriage, whose reign lasted till the 10th of August Ferdinand 1759, was a retiring and modest man, who adopted vi., 174b- a policy of peace with England. His ministers, of 1759. whom the most notable were Zenon de Somadevila,

marquis of Ensenada, and Richard Wall, an Irish Jacobite, carried on the work of financial and administrative reform. The advance of the country in material prosperity was consider- able. Foreign influences in thought and literature began to modify the opinions of Spaniards profoundly. The party known as the Rcgalistas, the lawyers who wished to vindicate the regalities, or rights of the Crown, against the encroachments of the pope and the Inquisition, gained the upper hand.

The new sovereign was one of the most sincere, and the most successful, of the " enlightened despots " of the 18th century. He had had a long apprenticeship in Naples, and was 1759-1788. ' a man °f forty-three when he came to Spain in 1759. Until his death on the 14th of December 1788 he was engaged in internal politics, in endeavouring to advance the material prosperity of Spain. His foreign policy was less wise. He had a

deep dislike of England, and a strong desire to recover Minorca and Gibraltar, which she held. He had also a strong family feeling, which induced him to enter into the "Family Com- pact " with his French cousins. He made war on England in 1 761, with disastrous results to Spain, which for the time lost both Havana and Manila. In 1770 he came to the verge of war with England over the Falkland Islands. In 1778 he joined France in supporting the insurgent English colonists in America. The most statesmanlike of his foreign enterprises, the attempt to take the piratical city of Algiers in 1775 (see Barbary Pirates) , was made with insufficient forces, was ill executed, and ended in defeat. Yet he was able to recover Minorca and Florida in the War of American Independence, and he finally extorted a treaty wit!i Algiers which put a stop to piratical raids on the Spanish coast. The worst result for Spain of his foreign policy was that the example set by the United States excited a desire for independence in the Spanish colonies, and was the direct incitement to the rebellions at the beginning of the 19th century. The king's domestic policy, on the contrary, was almost wholly fruitful of good. Under his direction many useful public works were carried out — roads, bridges and large schemes of drainage. The first reforms undertaken had provoked a disturbance in Madrid directed against the king's favourite minister, the Sicilian marquis of Squillacci. Charles, who believed that the Jesuits had promoted the outbreak, and also that they had organized a murder plot against him, allowed his minister Aranda {q.v.), the correspondent of Voltaire, to expel the order in 1766, and he exerted his whole influence to secure its entire suppression. The new spirit was otherwise shown by the restrictions imposed on the numbers of the religious orders and on the Inquisition, which was reduced to practical subjection to the lay courts of law. Many of the king's industrial enter- prises, such as the Bavarian colony, established by him on the southern slope of the Sierra Morena, passed away without leaving much trace. On the other hand the shipping and the industry of Spain increased greatly. The population made a considerable advance, and the dense cloud of sloth and ignorance which had settled on the country in the 17th century was lifted. In this work Charles III. was assisted, in addition to Squillacci and Aranda, by Campomanes {q.v.), who succeeded Aranda as minister of finance in 1787, and by Floridablanca (q.v.), who ruled the country in the spirit of enlightened bureaucracy.

Charles III. was succeeded in 1788 by his son Charles IV. The father, though " enlightened," had been a thorough despot; the son was sluggish and stupid to the verge of imbecility, but the despotism remained. The new king was much under the

influence of his wife, Maria Louisa of Parma, a coarse, passionate and narrow-minded woman; but he continued to repose confi- dence in his father's ministers. Floridablanca was, however, unable to continue his

earlier policy, iˆss-ilos ” in view of the contemporaneous outbreak of the Revolution in France. The revival of Spain depended on the restoration of her colonial and naval ascendancy at the expense of Great Britain, and for this the support of France was needed. But the ” Family Compact,” on which the French alliance depended, ceased to exist when Louis XVI. was deprived of power by his subjects. Of this conclusive evidence was given in 1791. Some English merchants had violated the shadowy claim of Spain to the whole west coast of America by founding a settlement at Nootka Sound. The Spanish government lodged a vigorous protest, but the French National Assembly refused to lend any assistance, and Florida- blanca was forced to conclude a humiliating treaty and give up all hope of opposing the progress of Great Britain. This failure was attributed by the minister to the Revolution, Spain and of which he became the uncompromising opponent, the French The reforms of Charles III.‘s reign were abandoned H evolutioa – and all liberal tendencies in Spain were suppressed. But Floridablanca was not content with suppressing liberalism in Spain; he was eager to avenge his disappointment by crushing the Revolution in France. He opened negotiations with the emigres, urged the European powers to a crusade on behalf of legitimacy, and paraded the devotion of Charles IV. to the head of his family. This bellicose policy, however, brought him into collision with the queen, who feared that the outbreak of war would diminish the revenues which she squandered in self- indulgence. She had already removed from the ministry Campo- manes and other supporters of Floridabianca, arid had compelled the latter to restrict himself to the single department of foreign affairs. Early in 1792 she completed her task by inducing Charles IV. to banish Floridablanca to Murcia, and his place was entrusted to the veteran Aranda, who speedily found that he held office only by favour of the queen, and that this had to be purchased by a disgraceful servility to her paramour, Emanuel Godoy. Spain withdrew from the projected coalition against France, and sought to maintain an attitude of neutrality, which alienated the other powers, while it failed to conciliate the Re- public. The repressive measures of Floridablanca were with- drawn ; society and the press regained their freedom ; and no opposition was offered to the propaganda of French ideas. Aranda’s policy might have been successful if it had been adopted earlier, but the time for temporizing was now past, and it was necessary to choose one side or the other. In November 1792 the queen felt herself strong enough to carry out the scheme which she had been long maturing. Aranda was dismissed, and the office of first minister was entrusted to Godoy, who had recently received the title of duke of Alcudia. Godoy, who was at once the queen’s lover and the personal favourite of the king, had no experience of the routine of office, and no settled policy. Fortunately for him, the course now to be pursued was decided for him. The execution of Louis XVI. (Jan. 2i, 1793) made a profound impression in a country where loyalty was a

superstition. Charles IV. was roused to demand vengeance for the insult to his family, and Spain became an enthusiastic member of the first coalition against France. The number of volunteers who offered their services rendered conscription unnecessary; and the southern provinces of France welcomed the Spaniards as deliverers. These advantages, however, were nullified by the shameful incom- petence and carelessness of the government. The troops were left without supplies; no plan of combined action was imposed upon the commanders; and the two campaigns of 1793 and 1794 were one long catalogue of failures. Instead of reducing the southern provinces of France, the Spaniards were driven from the strong fortresses that guarded the Pyrenees, and the French advanced almost to the Ebro; and at the same time the British were utilizing the war to extend their colonial power and were establishing more firmly that maritime

Oodoy.

supremacy which the Spanish government had been struggling for almost a century to overthrow. Under the circumstances the queen and Godoy hastened to follow the example set by Prussia, and concluded the treaty of Basel with France (1795)- The terms were unexpectedly favourable, and so great was the joy excited in Madrid that popular acclamation greeted the bestowal upon Godoy of the title of " Prince of the Peace." But the modera- tion of the treaty was only a flimsy disguise of the disgrace that it involved. Spain found herself tied hand and foot to the French republic. Godoy had to satisfy his allies by the encouragement of reforms which both he and his mistress loathed, and in 1796 the veil was removed by the conclusion of the treaty of San Ildefonso. This was a virtual renewal of the " Family Compact " of 1761, but with terms far more disadvantageous to Spain. Each power was pledged to assist the other in case of war with twenty-five ships, 18,000 infantry and 6000 cavalry. The real object of the treaty, which was to involve Spain in the war against Great Britain, was cynically avowed in the 18th article, by which, during the present war, the Spanish obligations were only to apply to the quarrel between Great Britain and France. A scheme was prepared for a joint attack on the English coast, but it was foiled by the battle of St Vincent (g.v.), in which Jervis and Nelson forced the Spanish fleet to retire to Cadiz. This defeat was the more disastrous because it deprived Spain of the revenues derived from her colonies. Great Britain seized the opportunity to punish Spain for its conduct in the American War by encouraging discontent in the Spanish colonies, and in the Peninsula itself both nobles and people were bitterly hostile to the queen and her favourite. It was in vain that Godoy sought to secure the friendship of the reforming party by giving office to two of its most prominent members, Jovellanos and Saavedra. Spanish pride and

bigotry were offended by the French occupation of Rome and the erection of a republic in the place of the papal government. The treat- ment of the duke of Parma by the Directory was keenly resented by the queen. Godoy found himself between two parties, the Liberals and the Ultramontanes, who agreed only in hatred of himself. At the same time the Directory, whose mistrust was excited by his attitude in the question of Parma, insisted upon his dismissal. Charles IV. could not venture to refuse; the queen was alienated by Godoy's notorious infidelities; and in March 1798 he was compelled to resign his office.

Godoy's office was entrusted to Saavedra, but the reformers did not obtain the advantages which they expected from the change. Jovellanos was compelled in August to retire on account of ill health — the result, it was rumoured — of attempts on the part of his opponents to poison him. His place was taken by Caballero, an ardent opponent of reform, who restored all the abuses of the old bureaucratic administration and pandered to the bigoted prejudices of the clergy and the court. The only advantage which Spain enjoyed at this period was comparative independence of France. The military plans of the Directory were unsuccessful during the absence of their greatest general in Egypt, and the second coalition gained successes in 1799 which had seemed impossible since 1793. But the return of Bonaparte, followed as it was by the fall of the Directory and the establishment of the Consulate, commenced a new epoch for Spain. As soon as the First Consul had time to turn his attention to the Peninsula, he determined to restore Godoy, who had already taTspain. regained the affection of the queen, and to make him the tool of his policy. Maria Louisa was easily gained over by playing on her devotion to the house of Parma, and on the 1st of October 1800 a secret treaty was concluded at San Ildefonso. Spain undertook to cede Louisiana and to aid France in all her wars, while Bonaparte promised to raise the duke of Parma to the rank of king and to increase his territories by the addition either of Tuscany or of the Roman legations. This was followed by Godoy's return to power, though he left the depart- ment of foreign affairs to a subordinate. Spain was now more servile to France than ever, and in 1801 was compelled to attack Portugal in the French interests. The Spanish invasion, commanded by Godoy in person, met with no resistance, and the

prince ventured to conclude a peace on his own authority by which Portugal promised to observe a strict neutrality on condi- tion that its territories were left undiminished. But Bonaparte resented this show of independence, and compelled Charles IV. to refuse his ratification of the treaty. Portugal had to submit to far harsher terms, and could only purchase peace by the cession of territory in Guiana, by a disadvantageous

treaty of commerce, and by payment of twenty-five million francs. In the pre- liminary treaty with Great Britain he ceded the Spanish colony of Trinidad without even consulting the court of Madrid, while he sold Louisiana to the United States in spite of his promise not to alienate it except to Spain.

Godoy, since his return, had abandoned all connexion with the reforming party. The Spanish Church was once more placed in strict subjection to the Roman see, from which for a short time it had been freed. As soon as Bonaparte saw himself involved in a new war with England, he turned to Spain for assistance and extorted a new treaty (Oct. 9, 1803), which was still more burdensome than that of 1796. Spain had to pay a monthly subsidy of six million francs, and to enforce strict neutrality upon Portugal, this involving war with England. The last remnants of its maritime power were shattered in the battles of Cape Finisterre and Trafalgar, and the English seized Buenos Aires. The popular hatred of Godoy was roused to passion by these disasters, and'Spain seemed to stand on the brink of revolution. At the head of the opposition was Ferdinand, the heir to the throne, as insignificant as his rival, but endowed with all good qualities by the credulous favour of the people. Napoleon was at this time eager to humble Great Britain by excluding it from all trade with Europe. The only country which had not accepted his " continental system " was Portugal, and he determined to reduce that kingdom by force. It was not difficult to bribe Godoy, who was conscious that his position could not be maintained after the death of Charles IV. In October 1807 Spain accepted the treaty of Fontainebleau. (See Portugal: History.) The treaty was hardly concluded when a French army under Junot marched through Spain to Portugal, and the royal family of that country fled to Brazil. Ferdinand, whose wife had died in 1806, determined to imitate his rival by bidding for French support. He entered into secret relations with Eugene Beauharnais, Napoleon's envoy at Madrid, and went so far as to demand the hand of a Bonaparte princess. Godoy, who discovered the intrigue, induced Charles IV. to order his son's arrest (Oct. 27, 1807), on the charge of plotting to dethrone his father and to murder his mother and Godoy. The prince indeed was soon released and solemnly pardoned; but, meanwhile, Napoleon had seized the opportunity afforded by the effect of this public scandal in lowering the prestige of the royal family to pour his troops into Spain, under pretext of reinforcing Junot's corps in Portugal. Even this excuse was soon dropped, and by January and February 1808 the French invasion had become clearly revealed as one of conquest. Charles IV. and his minister determined on flight. The news of this intention, how- ever, excited a popular rising at Aranjuez, whither the king and queen had gone from Madrid. A raging mob surrounded the palace, clamouring for Godoy's head; and the favourite's life was only saved by Charles IV. 's

announcement of his abdication in favour of Ferdinand (March 17). Murat, however, who commanded the French, refused to be turned aside by this change of circumstances. He obtained from Charles IV. a declaration that his abdication had been involuntary, and, occu- Napoleon pied Madrid (March 23, 1808). Meanwhile Napoleon attacks had advanced to Bayonne on the frontier, whither, at Spain. his orders, Murat despatched the old king and queen and their favourite Godoy. The emperor had already made up his mind to place one of his brothers on the Spanish throne; but in order to achieve this it was necessary to cajole the young king Ferdinand VII. and get him into his power. Ferdinand, instead of retiring to Andalusia and making himself the rallying point of national resistance, had gone to Madrid, where he was at the mercy of Murat's troops and whence he wrote grovelling letters to Napoleon. It was no difficult matter for the emperors

envoy, General Savary, to lure him by specious promises to the frontier, and across it to Bayonne, where he was confronted with his parents and Godoy in a scene of pitiful degradation. Struck and otherwise insulted, he was forced to restore the crown to his father, who laid it at the feet of Napoleon. The old king and queen, pensioned by the French government, retired to Rome; Abdication Ferdinand was kept for six years under strict military of Charles guard at Talleyrand's chateau of Valencay (see ,y ' Ferdinand VII., King of Spain). On the 13th of

May Murat announced to an improvised " junta of regency " at Madrid that Napoleon desired them to accept Joseph Bonaparte as their king.

But Spanish loyalty was too profound to be daunted even by the awe-inspiring power of the French emperor. For the first Joseph t' 1116 Napoleon found himself confronted, not by Bonaparte terrified and selfish rulers, but by an infuriated proclaimed people. The rising in Spain began the popular move- Klag ' ment which ultimately proved fatal to his power.

At first he treated the novel phenomenon with contempt, and thought it sufficient to send his less prominent generals against the rebels. Madrid was easily taken, but the Spaniards showed great capacity for the guerrilla warfare in the provinces. The French were repulsed from Valencia; and Dupont, who had advanced into the heart of Andalusia, was compelled to retreat and ultimately to capitulate with all his forces at Baylen (July 10).

The Spaniards now advanced upon Madrid and drove Joseph from the capital, which he had just entered. Unfortun- ately the insurgents displayed less political ability than military courage. Godoy's agents, the ministers, were swept aside by the popular revolt, .and their place was taken by local juntas, or committees, and then by a central junta formed from among them, which ruled despotically in the name of the captive king. In a country divided by sectional jealousies it was impossible to expect a committee of thirty-four members to impose unity of action even in a common cause; and the Spanish rising, the first fierceness of which had carried all before it, lacked the organizing force which alone would have given it permanent success. As it was, Napoleon's arrival in Spain was enough to restore victory to the French. In less than a week the Spanish army was broken through and scattered, and Napoleon restored his brother in Madrid. Sir John Moore, who had advanced with an English army to the relief of the capital, retired when he found he was too late, and an obstinate battle, in which the gallant general lost his life, had to be fought before the troops could secure their em- barcation at Corunna. Napoleon, thinking the work accom- plished, had quitted the Peninsula, and Soult and Victor were left to complete the reduction of the provinces. The capture of Seville resulted in the dissolution of the central junta, and the Peninsula was only saved from final submission by the obstinate resistance of Wellington in Portugal and by dissensions among the French. The marshals were jealous of each other, and Napoleon's plans were not approved by his brother. Joseph wished to restore peace and order among his subjects in the hope of ruling an independent nation, while Napoleon was determined to annex Spain to his own overgrown empire. So far did these disputes go that Joseph resigned his crown, and was with difficulty induced to resume it. Meanwhile, the dissolution of the central junta had given free play to the extremer reforming parties; on the 24th of September these met at Cadiz, which became the capital of what was left of independent Spain.

The Spanish Cortes had never been so entirely suspended as the states-general of France. Philip V., after suppressing the

local institutions of the crown of Aragon, had given Cortes of . .. . , ., ,•.••.,

1810 representation to some of the eastern cities in the

general Cortes of Spain. This body had been

summoned at the beginning of reigns to swear homage to

the new king and his heir, or to confirm regulations made

as to the succession. It sat in one house, and was composed

of the nobles and churchmen who formed the great majority

of procurators chosen by the town councils of a limited

though varying number of towns, and of representatives

of " kingdoms." The Cortes of 18 10 was constructed on

these lines, but with a very important difference in the pro- portion of its elements. The third estate of the commons secured 184 representatives, who were sufficient to swamp the nobles and the clergy. No intelligent scheme under which the representatives were to be elected had been fixed. In theory the members of the third estate had been chosen by a process of double election. In fact, however, since much of the country was held by the French, they were often returned by such natives of the regions so occupied as happened to be present in Cadiz at the time. The real power fell to those of the delegates who were influenced by the new ideas. Unhappily, they had no experience of affairs; and they were perfectly ready to make a constitution for Spain on Jacobin lines, without the slightest regard to the real beliefs and interests of Spaniards. Out of these materials nothing could be expected to come except such a democratic constitution as might have been made by a Jacobin club in Paris. In a country noted for its fanatical loyalty to the Crown and the Church, the kingship was to be deprived of all power and influence, and the clergy to be excluded as such irom Spanish all share in legislation. As though to deprive the Constitution constitution of any chance of being made effective, otl812 – the worst expedients dictated by the suspicious temper of the French convention of 1790 were adopted. Ministers were excluded from the chamber, thus rendering impossible any effective co-operation between the legislature and the executive; and, worst of all, a provision was introduced making members of the Cortes ineligible for re-election, an effective bar to the creation of a class of politicians possessing experience of affairs. The Spaniards were so broken to obedience, and the manlier part of them so intent on fighting the French, that the Cortes was not at the time resisted. The suppression of the Inquisition and the secularization of the church lands — measures which had already been taken by the government of the intruding French king Joseph at Madrid — passed together with much else. But even before the new constitution was published and sworn, on the 19th of March 1812, large numbers of Spaniards had made up their minds that after the invaders were driven out the Cortes must be suppressed.

The liberation of Spain could hardly have been accomplished without the assistance of Great Britain. The story of the struggle, from the military point of view, is told in the article Peninsular War. In 181 2 Wellington determined on a great effort. He secured his base of operations by the

capture of Ciudad Rodrigo and Badajoz, and at Salamanca he com- pletely routed the opposing army of Marmont. This victory enabled the English general to enter Madrid (Aug. 12), and Joseph retreated to Valencia. But further advance was pre- vented by the concentration of the French forces in the east, and Wellington found it advisable to retire for the third time to winter quarters on the Portuguese frontier. It was during this winter that Napoleon suffered his first and greatest reverse in the retreat from Moscow and the destruction of his grand army. This was the signal for the outbreak of the " war of liberation " in Germany, and French troops had to be withdrawn from Spain to central Europe. For the first time Wellington found himself opposed by fairly equal forces. In the spring of 18 1 3 he advanced from Ciudad Rodrigo and defeated Jourdan at Vittoria, the battle which finally decided the Peninsular War. Joseph retired altogether from his kingdom, and Welling- ton, eager to take his part in the great European contest, fought his way through the Pyrenees into France. Napoleon, who had suffered a crushing defeat at Leipzig, hastened to recognize the impossibility of retaining Spain by releasing Ferdinand VII., who returned to Madrid in March 1814.

Before entering Spain Ferdinand had undertaken to maintain the constitution of 181 2, and when on the 22nd of March 1814 he reached Figueras, he was met by a demand on Restoratton the part of the Cortes that he must accept all the of Ferdi-

terms of the constitution as a condition of his recog- naDd VII ->

1S14 nition as king. But Ferdinand had convincing

proof of the true temper of the nation. He now refused

to recognize the constitution, and was supported in his refusal

not only by the army and the Church, but by the masses. There can be no doubt that Ferdinand VII. could have ruled despotically if he had been able to govern well. But, although possessed of some sardonic humour and a large measure of cunning, he was base, and had no real capacity. He changed his ministers incessantly, and on mere caprice. Governed by a camarilla of low favourites, he was by nature cruel as well as cowardly. The government under him was thoroughly bad, and the persecution of the " Jacobins," that is of all those suspected of Liberal sentiment, ferocious.

Partial revolts took place, but were easily crushed. The revolt which overpowered him in 1820 was a military mutiny. During the war the American colonies had rebelled, and soldiers had been sent to suppress them. No progress had been made, the service was dreadfully costly in life, and it became intensely unpopular among the troops. Meanwhile the brutality of the king and his ministers had begun to produce a reaction. Not a few of the officers held Liberal opinions, and this was especially the case with those who had been prisoners in of 1820 France during the war and had been inoculated with foreign doctrines. These men, of whom the most conspicuous was Colonel Rafael Riego (q.v.), worked on the dis- content of the soldiers, and in January 1820 brought about a mutiny at Cadiz, which became a revolution. Until 1823 the king was a prisoner in the hands of a section of his subjects, who restored the constitution of 18 12 and had the support of the army. The history of these three miserable years cannot be told except at impossible length. It was a mere anarchy. The Liberals were divided into sub-sections, distinguished from one another by a rising scale of violence. Any sign of moder- ation on the part of the ministers chosen from one of them was enough to secure him the name of " Servile " from the others. The " Serviles " proper took up arms in the north. At last this state of affairs became intolerable to the French government of Louis XVIII. As early as 1820 the emperor Alexander I. of Russia had suggested a joint intervention of the powers of the Grand Alliance to restore order in the Peninsula, and had offered to place his own army at their disposal for the purpose. The Con- The project had come to nothing owing to the oppo- gress of sition of the British government and the strenuous Verona ""^objection of Prince Metternich to a course which would have involved the march of a powerful Russian force through the Austrian dominions. In 1822 the question was again raised as the main subject of discussion at the congress assembled at Verona (see Verona, Congress of). The French government now asked to be allowed to march into Spain, as Austria had marched into Naples, as the man- datory of the powers, for the purpose of putting a stop to a state of things perilous alike to herself and to all Europe. In spite of the vigorous protest of Great Britain, which saw in this demand only a pretext for reviving the traditional Bourbon ambitions in the Peninsula, the mandate was granted by the majority of the powers; and on the 7th of April 1823 the duke of French In- Angouleme, at the head of a powerful army, crossed tervention, the Bidassoa. The result was a startling proof of 1823. t j Te -g; mS y structure of Spanish Liberalism. What

the genius of Napoleon had failed to accomplish through years of titanic effort, Angouleme seemed to have achieved in a few weeks. But the difference of their task was fundamental. Napoleon had sought to impose upon Spain an alien dynasty; Angouleme came to restore the Spanish king " to his own." The power of Napoleon had been wrecked on the resistance

of the Spanish people; Angouleme had the active support of some Spaniards and the tacit co-operation of the majority. The Cortes, carrying the king with it, fled to Cadiz, and after a siege, surrendered with no conditions save that of an amnesty, to which Ferdinand solemnly swore before he was sent over into the French lines. As was to be expected, an oath taken " under compulsion " by such a man was little binding; and the French troops were compelled to witness, with helpless indignation, the orgy of cruel reaction which immediately began under the protection of their bayonets.

The events of the three years from 1820-1823 were the begin- ning of a series of convulsions which lasted till 1874. On the one hand were the Spaniards who desired to assimilate their country to western Europe, and on the other those of them who adhered to the old order. The first won because the general trend of the world was in their favour, and because their opponents were blind, contumacious, and divided among themselves.

*If anything could have recalled the distracted country to harmony and order, it would have been the object-lesson pre- sented by the loss of all its colonies on the continent of America. These had already become de facto colonies'! S independent during the death-struggle of the Spanish monarchy with Napoleon, and the recognition of their inde- pendence de jure was, for Great Britain at least, merely a. question of time. A lively trade had grown up between Great Britain and the revolted colonies; but since this commerce, under the colonial laws of Spain, was technically illegitimate, it was at the mercy of the pirates, who preyed upon it under the aegis of the Spanish flag, without there being any possibility of claiming redress from the Spanish government. The de- cision of the powers at the congress of Verona to give a free hand to France in the matter of intervention in Spain, gave the British government its opportunity. When the invasion of Spain was seen to be inevitable, Canning had informed the French government that Great Britain would not tolerate the subjugation of the Spanish colonies by foreign force. A dis- position of the powers of the Grand Alliance to come to the aid of Spain in this matter was countered by the famous message of President Monroe (Dec. 2, r823), laying the veto of the United States on any interference of concerted Europe in the affairs of the American continent. The empire of Brazil and the republics of Mexico and Colombia were recognized by Great Britain*in the following year; the recognition of the other states was only postponed until they should have given proof cf their stability. In announcing these facts to the House of Commons, George Canning, in a phrase that became famous, declared that he had " called a new world into existence to redress the balance of the old " and that " if France had Spain, it should at least be Spain without her colonies."*

In Spain itself, tutored by misfortune, the efforts of the king's ministers, in the latter part of his reign, were directed to re- storing order in the finances and reviving agriculture Reactionary and industry in the country. The king's chief Elements iu difficulties lay in the attitude of the extreme mon- s P ai "' archists (Apostolicos), who found leaders in the king's brother Don Carlos and his wife Maria Francisca of Braganza. Any tendency to listen to liberal counsels was denounced by them as weakness and met by demands for the restoration of the Inquisition and by the organization of absolutist demon- strations, and even revolts, such as that which broke out in Catalonia in 1828, organized by the " supreme junta " set up at Manresa, with the object of freeing the king from " the dis- guised Liberals who swayed him." Yet the absolute monarchy would probably have lasted for long if a dispute as to the suc- cession had not thrown one of the monarchical parties on the support of the Liberals. The king had no surviving Question ol children by his first three marriages. By his the Succes- fourth marriage, on the nth of December 1829, sion. The with Maria Christina of Naples he had two daughters. Pragmatic According to the ancient law of Castile and Leon women could rule in their own right, as is shown by the examples of Urraca, Berengaria, and Isabella the Catholic. In Aragon they could transmit the right to a husband or son. Philip V. had introduced the Salic Law, which confined the succession to males. But his law had been revoked in the Cortes summoned in 1789 by Charles IV. The revocation had not however been promulgated. Under the influence of Maria Christina Ferdinand VII. formally promulgated it Isabella 11., at the close of his life, after some hesitation, and Queen, amid many intrigues. When he died on the 29th of °^ September 1833, his daughter Isabella II. was proclaimed queen, with her mother Maria Christina as regent.

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The immediate result of the dead king's decision was to throw Spain back into a period of squalid anarchy. Maria Christina would have ruled despotically if she could, and began by an- nouncing that material changes would not be made in the method of government. But the Conservatives preferred to support the late king's brother Don Carlos, and they had the active aid of the Basques, who feared for their local franchises, and of the mountaineers of Navarre, Aragon, Catalonia and Valencia, who were either quite clerical, or who had become attached, during the French invasion and the troubles of the reign of Ferdinand, to a life of guerrilkro adventure. Maria Christina Christina. nac ^ tne su PP ort °f the army, and the control of the machinery of government; while the mass of the people

passively submitted to the powers that were, while as far as possible eluding their orders. The regent soon found that this was not enough to enable her to resist the active hostility of the Carlists and the intrigues of their clerical allies. She was eventually driven by the necessities of her position to submit to the establishment of parliamentary institutions. She advanced only when forced, first by the need for buying support, and then with the bayonet at her back. First the historic Cortes was summoned. Then in April 1834, under the influence of the minister Martinez de La Rosa, a charter (Estatudo Real) was issued establishing a Cortes in two Estamentos or Estates, one of senators (prdceres) and one of deputies, but with no rights save that of petition, and absolutely dependent on the Crown. This constitution was far from satisfying the advanced Liberals, and the supporters of Christina — known as Cristinos — broke into two sections, the Moderados, or Moderates, and Progrcssisias or Exaltados, the Progressists or Hot-heads. In August 1836 a military revolt at the palace of La Granja in the hills above Segovia drove the regent by sheer otiS37 violence to accept a.democratic constitution, based on that of 1812, which was issued in 1837. Mean- while' Cristinos and Carlistas, the successors of the " Liberates " and " Servilcs," were fighting out their quarrel. In 1835 a violent outbreak against the monastic orders took place. In some cities, notably in Barcelona, it was accompanied by cruel massacres. Though the measure was in itself repugnant to Maria Christina, the pressing needs of her government com- pelled her to consent when Juan Alvarez y Mendizabal (1790- 1853), a minister of Jewish descent, forced on her by Liberals, secularized the monastic lands and used them for a financial operation which brought some relief to the treasury.

The Carlist War lasted from the beginning of Isabella's reign till 1840. At first the Carlists were feeble, but they gathered strength during the disputes among the Cristinos. War ˆ S Their leaders, Tomas Zumalacarregui in Biscay and Navarre, and Ramon Cabrera in Valencia, were the ablest Spaniards of their time. The war was essentially a giterrilleros struggle in which the mountaineers held their ground among the hills against the insufficient, ill- appointed, and mostly very ill-led armies of the government, but were unable to take the fortresses, or to establish themselves in central Spain south of the Ebro; though they made raids as far as Andalusia. At last, in August 1839, exhaustion brought the Basques to recognize the government of Queen Isabella by the convention of Vergara in return for the confirmation of their privileges. The government was then able to expel Cabrera from Valencia and Catalonia. Great Britain and France gave some help to the young queen, and their intervention availed to bring a degree of humanity into the struggle.

Maria Christina, who detested the parliamentary institu- tions which she had been forced to accept, was always ready Revolt and to nullify them by

intrigue, and she was helped Regency of by the Moderados. In r84i the regen. and the Espartero. Moderados made a law which deprived the towns of the right of electing their councils. It was resented by the Liberals and provoked a military rising, headed by the most popular of the Cristino generals, Baldomero Espartero. The queen regent having been compelled to sign a decree illegally revoking the law, resigned and left for France. Espartero was*

declared regent. He held office till 1843, during an agitated period, in which the Carlists reappeared in the north, muti- nies were common, and a barbarous attempt was made to kidnap the young queen in her palace on the night of the 7th of October 1841. It was only defeated by the hard fighting of eighteen of the palace guards at the head of the main stair- case. In 1843 Espartero, a man of much personal courage and of fitful energy, but of no political capacity, was expelled by a military rising, promoted by a combination of discontented Liberals and the Moderates. The queen, though only thirteen years old, was declared of age.

The reign of Queen Isabella, from 1843 till her expulsion in 1868, was a prolongation of that of her mother's regency. It was a confused conflict between the constant attempt of the court to rule despotically, with a mere i sabeUa u pretence of a Cortes, and the growing wish of the Spaniards to possess a parliamentary government, or at least the honest and capable government which they hoped that a parliament would give them. In 1845 the Moderates having deceived their Liberal allies, revised the constitution of 1837 and limited the freedom it gave. Their chief leader, General Ramon Narvaez, had for his guiding principle that government must be conducted by the stick and by hard hitting. In 1846 Europe was scandalized by the ignominious intrigues connected with the young queen's marriage. Louis Philippe, king of the French, saw in the marriage of the The young queen a chance of reviving the family alliance "SpnnJsh which had, in the 18th century, bound Bourbon ■Marriages." Spain to Bourbon France. The court of Madrid was rent by the intrigues of the French and the English factions; the former planning an alliance with a son of the French king, the latter favouring a prince of the house of Coburg. The episode of the Spaiiish marriages forms an important incident in the history of Europe; for it broke the entente cordiale between the two western Liberal powers and accelerated the downfall of the July monarchy in France. There can be no doubt, in spite of the apology for his action published by Guizot in his memoirs, that Louis Philippe made a deliberate attempt to overreach the British government; and, if the attempt issued in disaster to himself, this was due, not to the failure of his statecraft so much as to his neglect of the obvious factor of human nature. Palmerston, on behalf of Great Britain, had agreed to the principle that the queen should be married to one of her Bourbon cousins of the Spanish line, and that the younger

sister should marry the duke of Montpensier, son of Louis Philippe, but not till the birth of an heir to the throne should have obviated the danger of a French prince wearing the crown of Spain. Louis Philippe, with the aid of the queen-mother, succeeded in forcing Isabella to accept the hand of Don Francisco d'Assisi, her cousin, who was notoriously incapable of having heirs; and on the same day the younger sister was married to the duke of Montpensier. The queen's marriage was miserable; and she consoled herself in a way which at once made her court the scandal of Europe, and upset the French king's plans by pro- viding the throne of Spain with healthy heirs of genuine Spanish blood. But incidentally the scandals of the palace had a large and unsavoury part in the political troubles of Spain. Narvaez brought Spain through the troubled revolutionary years 1848 and 1849 without serious disturbance, but his own unstable temper, the incessant intrigues of the palace, and the inability of the Spaniards to form lasting political parties made good government impossible. The leaders on all sides were of small capacity. In 1854 another series of outbreaks began which almost ended in a revolution. Liberals and discontented Moderates, supported as usual by troops led into mutiny by officers whose chief object was promotion, imposed some restraint on the queen. Another revision of the constitution was undertaken, though not carried out, and Espartero was brought from retirement to head a new govern- o'Donaeii. ment. But the coalition soon broke up. Espartero was overthrown by General Leopold O'Donnell, who in 1858 formed the Union-Liberal ministry which did at last give Spain

five years of fairly good government. A successful war in Morocco in 1859 nattered the pride of the Spaniards, and the country began to make real progress towards prosperity. In 1863 the old scene of confusion was renewed. O'Donnell was dismissed. For the next five years the political history of Spain was the story of a blind attempt on the part of the queen to rule despotically, by the help of reckless adventurers of mean capacity, and by brute violence. The Isabella opposition took the form of successive military outbreaks accompanied by murder, and suppressed by massacre. In 1868 the government of Queen Isabella collapsed by its own rottenness. She had even lost the mob popularity which she had once gained by her jovial manners. All men of political influence were either in open opposition or, when they belonged to the Conservative parties, were holding aloof in disgust at the predominance of the queen's favourites, Gonzales Brabo, a mere ruffian, and Marfori, her steward, whose position in the palace was

perfectly well known.

In September 1868 the squadron at Cadiz under the command of Admiral Topete mutinied, and its action was the signal for a Revolution general secession. One gallant fight was made for of 1868. the queen at the bridge of Alcolea in Andalusia by Deposition General Pavia, who was horribly wounded, but it of Isabella. was an exce pti oru Gonzales Brabo deserted her in a panic. She went into exile, and her reign ended. The Revolution of 1868 was the first openly and avowedly directed against the dynasty. It became a familiar saying that the " spurious race of Bourbon " had disappeared for ever, and the country was called upon to make a new and a better govern- ment. But the history of the six years from September 1868 to December 1874 proved that the political incapacity of the Spaniards had not been cu r ed. There was no definite idea any- where as to how a substitute was to be found. A Republican party had been formed led by a few professors and coffee-house politicians, with the mob of the towns for its support, and having as its mouthpiece Don Emilio Castelar, an honest man of Republican incredible fluency. The mass of the Spaniards, and however, were not prepared for a republic. Be-

*Monarvhical s i(j es them were the various monarchical parties: a s ' the Alfonsislus, who wished for the restoration of the queen's son with a regency, the partisans -of the widower king consort of Portugal; those of the duke of Montpensier; the Carlists; and a few purely fantastic dreamers who would have given the crown to the aged Espartero. The real power was in the hands of the military politicians, Francisco Serrano (q.v.) and Juan Prim (q. v.), who kept order by means of the army. A constituent Cortes was assembled in 1869, and decided in favour of a monarchy. Serrano was declared regent until a king , could be found, and it proved no easy task to find one. Ferdinand of Portugal declined. Montpensier was supposed to be unwelcome to Napoleon, and was opposed by Prim, who had also committed himself to the prophecy that the Bourbons would never return to Spain. Attempts to find a candidate in the Italian family failed at first. So did the first steps taken to find a king in the house of Hohenzollern-Sigmaringen. When the desired ruler was again sought in this family in 1870, the acceptance of the offer by Prince Leopold proved the immediate cause of the Franco-German War, in which Spain had a narrow Amadeo of escape of being entangled. At last, in August of Savoy 1870, Prince Amadeo of Savoy, second son of Victor accepts the Emmanuel II., consented to become candidate. He Crowa – W as elected on the 3rd of November. On the 27th *>f December 1870, on the very day on which the new king reached Carthagena, Prim was murdered by assassins who were never discovered.*

The nominal reign of Amadeo lasted till February 1873. It was a

scandalous episode. The Italian prince had put him- self into a thoroughly false position, in which the nearest approach to friends he could find were intriguing politicians who sought to use him as a tool, and where every man of honest principles, royalist or republican, looked upon him as an in-

Regency of Serrano.

truder. The Carlists began to collect in the mountains. Repub- lican agitations went on in the towns. At last a dispute in regard to the officering of the artillery gave the king an honourable excuse for resigning a throne J/J^^gn on which both he and his wife had been treated with the utmost insolence.

The Republicans entered the place he left vacant simply because there was nobody to oppose them. Until January of the following year the country was gi\ en up .

to anarchy. The Republicans had undertaken to /nter/u

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threw all his most eagerly avowed principles to ^n presidency. wind, raised a great conscription, and provided the means of reducing Carthagena and pushing the war against the Carlists with vigour. When the Cortes met again in January 1874, the extreme parties voted against Castelar on the 3rd of the month. Hereupon General Pavia, the governor of Madrid, turned the Cortes into the streets, to the relief of all sane men in the country. Serrano was appointed as head of the executive, and was mainly employed during the year in efforts to save Bilbao from falling into the hands of the Carlists. It had now become clear that the restoration of the Bourbons in the person of Don Alphonso, Isabella's son, was the only way of securing a final settlement. His civilian Alphonso agents would have preferred to see him brought in Xl '- King, by a Cortes. But on the 29th of December 1874 1874 ' General Martinez Campos caused him to be proclaimed king at Murviedro by a brigade of troops, and the example there set was followed everywhere. Don Alphonso XII. landed in Barcelona on the 10th of January 1875.

The Restored Monarchy, 1874-igoo. — The first act of Alphonso was a royal decree confirming the appointment of Canovas del Castillo as prime minister. A strong Conservative administra- tion was formed, to which Canovas admitted some men of the old parties of Queen Isabella's reign side by side with men who had played a part in the Revolution before they became his active auxiliaries in the Alphonsist propaganda in 1872 and 1873. This cabinet gave its chief attention for fifteen months to the

pacification of the Peninsula, adopting a Con- servative and Catholic policy which contributed quite as much as the great display of military resources to make the Pretender lose adherents and prestige from the moment that his cousin reached Madrid. The Church, the nobility and the middle classes soon pronounced for the new state of things. The Alphonsist armies, led by Marshals Campos and Jovellar, swept the Carlist bands from the right bank of the Ebro to the Pyrenees, and took their last strongholds in the eastern pro- vinces, Cantavieja and Seo de Urgel. Not a few of the Carlist leaders accepted bribes to go abroad, and others put their swords at the disposal of the government for employment against the Cuban rebels. Then all the forces of King Alphonso under Marshal Quesada gradually closed round the remainder

of the Carlist army in Navarre and in the Basque Provinces at the beginning of 1876. The young king himself was present at the close of the campaign, which sent his rival a fugitive across the French frontier, with the few thousand followers who had clung to his cause to the very end.

Directly the Carlist War was over, the government used part of the large army at its disposal to reinforce the troops which The Cuban had been fighting the Cuban insurgents since 1869. insurrec- Marshal Jovellar was sent out to Havana as governor- Won, general, with Marshal Martinez Campos as com- mander-in-chief of the forces. In about eighteen months they managed to drive the rebels into the eastern districts of the island, Puerto Principe and Santiago de Cuba, and induced all but a few irreconcilable chiefs to accept a con- vention that became famous under the name of the peace treaty of Zanjon. Marshal Campos, who very soon succeeded Jovellar as governor-general of Cuba, for the first time held out to the loyalists of the island the prospect of reforms, fairer treatment at the hands of the mother country, a more liberal tariff to promote their trade, and self-government as the crowning stage of the new policy. He also agreed to respect the freedom of the maroons who had fled from their masters to join the Cubans during the ten years' war, and this led to Spain's very soon granting gradual emancipation to the re- mainder of the slaves who had stood by their owners. Marshal Campos was not allowed to carry out his liberal and concili- atory policy, which the reactionary party in the colony, el partido espanol, resented as much as their allies in the Peninsula. Though much of his time and energies had been devoted to the re-establishment of peace at home and in the colonies from 1875 to 1880,

Sefior Canovas had displayed Chatties, considerable activity and resolution in the re- organization of the monarchy. Until he felt sure of the early termination of the' struggle with the pretender, he ruled in a dictatorial manner without the assistance of parlia- ment. Royal decrees simply set aside most of the legislation and reforms of the Spanish Revolution. Universal suffrage alone was respected for a while and used as the means to call into existence the first Cortes of the Restoration in 1876. The electors proved, as usual, so docile, and they were so well handled by the authorities, that Canovas obtained a parliament with great majorities in both houses which voted a limited franchise to take the place of universal suffrage. Immedi- ately afterwards they voted the constitution of 1876, which was virtually a sort of compromise between the constitution of 1845 in the reign of Isabella and the principles of the demo- cratic constitution of the Revolution in 1869. For instance, liberty of conscience, established for the first time in 1869, was reduced to a minimum of toleration for Protestant worship, schools and cemeteries, but with a strict prohibition of propa- ganda and outward signs of faith. Trial by jury was abolished, on the plea that it had not worked properly. Liberty of associations and all public meetings and demonstrations were kept within narrow limits and under very close surveillance of the authorities. The municipal and provincial councils were kept in leash by intricate laws and regulations, much resembling those of France under the Second Empire. The political as well as the administrative life of the country was absolutely in the hands of the wire-pullers in Madrid; and their local agents, the governors, the mayors and the electoral potentates styled los Caciques, were all creatures of the minister of the interior at the head of Castilian centralization. The constitution of 1876 had created a new senate, of which half the members were either nominees of the Crown or sat by right of office or birth, and the other half were elected by the provinces of the Peninsula and the colonies, the clergy, the universities and the learned societies and academies. The House of Deputies, composed of 456 members, was elected by the limited franchise system in Spain and by an even more restricted franchise in the colonies, five-sixths of the colonists being deprived of representation. From the beginning of the Restoration the great statesman, who was nicknamed at the

time the Richelieu of Aiphonso XII. 's reign, established a system of government which lasted for a quarter of a century. He encouraged the men of the Revolution who wanted to bow to accomplished facts and make the best of the restricted amount of liberty remaining, to start afresh in national politics as a Dynastic Liberal party. From the moment that such former revolutionists as Sagasta, Ulloa, Leon y Castillo, Camacho, Alcnzo Martinez and the marquis de la Vega de Armijo de- clared that they adhered to the Restoration, Canovas did not object to their saying in the

same breath that they would enter the Cortes to defend as much as possible what they had achieved during the Revolution, and to protest and agitate, legally and pacifically, until they succeeded in re-establishing some day all that the first cabinet of Aiphonso XII. had altered in the Constitution of 1869. The premier not only approved Sagasta's efforts to gather round him as many Liberals and Democrats as possible, but did not even oppose the return of Emilio Castelar and a few Republicans. He also counte- nanced the presence in the Cortes for the first time of 1 5 senators and 42 deputies to represent Cuba and Porto Rico, including a couple of home rulers. Thus Canovas meant to keep up the appearance of a constitutional and parliamentary govern- ment with what most Spaniards considered a fair proportional representation of existing parties, except the Carlists and the most advanced Republicans, who only crept into the House of Deputies in some later parliaments. Canovas ruled his own coalition of Conservatives and Catholics with an iron hand, managing the affairs of Spain for six years with only two short interruptions, when he stood aside for a few months, just long enough to convince the king that the Conservative party could not retain its cohesion, even under such men as Marshals Jovellar and Campos, if he did not choose to support them.

In the early years of the Restoration the king and Canovas acted in concert in two most delicate matters. Alphonsc XII. agreed with his chief counsellor as to the expediency of keeping military men away from active politics. Canovas boldly declared in the Cortes that the era of military pro- nunciamientos had been for ever closed by the Restoration, and the king reminded the generals more than once that he in- tended to be the head of the army. The king and his prime minister were equally agreed about the necessity of showing the Vatican and the Church sufficient favour to induce them to cease coquetting with the pretender Don Carlos, but not so much as to allow the pope and the clergy to expect that they would tolerate any excessive Ultramontane influence in the policy of the Restoration. In regard to foreign policy, the king and Canovas both inclined to assist national aspirations in Morocco, and jealously watched the relations of that empire with other European powers. This desire to exercise a preponderant influence in the affairs of Morocco culminated in the Madrid conference of 1880. Preponderant influence was not attained, but the conference led to a treaty which regulated the consular protection extended to the subjects of Morocco.

In 1878, in spite of the well-known hostility of his mother to the Montpensiers, and in spite of his ministers' preferences for an Austrian match, King Aiphonso insisted m arr j gge / upon marrying the third daughter of the duke of Aiphonso Montpensier, Dona Mercedes, who only survived xl1 – her marriage five months. Barely seventeen months after the death of his first wife, the king listened to the advice of Canovas and

married, in November 1879, the Austrian archduchess Maria Christina of Habsburg. In general matters the king allowed his ministers much liberty of action. From 1875 to 1 88 1, when not too much engrossed in more pressing affairs, his governments turned their attention to the re-organization of the finances, the resumption of payment of part of the debt coupon, and the consolidation of the colonial and imperial floating debts. They swerved from the mild free trade policy which was inaugurated by Sefior Figuerola and by Prim at the beginning of the Revolution, and to which was due the remarkable progress of the foreign trade. This

went on almost continuously as long as the regime of moderate tariffs and commercial treatises lasted, i.e. until i8go.

In 1 88 1 the Dynastic Liberals began to show impatience at being kept too long in the cold shade of opposition. Their Liberal chief, Sagasta, had found allies in several Con- Admtois- servative and Liberal generals — Campos, Jovellar, trations. L p ez Dominguez an d Serrano — who had taken offence at the idea that Canovas wanted to monopolize power for civil politicians. These allies were said to be the dynastic and monarchical ballast, and in some sort the dynastic guarantees of liberalism in the eyes of the court. Canovas came to the conclusion that it was expedient for the Restoration to give a fair trial to the quondam revolutionists who coalesced under Sagasta in such conditions. He arranged with the king to moot a series of financial projects the accept ance of which by His Majesty would have implied a long tenure of office for the Conservatives, and so Alphonso XII. found a pretext to dissent from the views of his premier, who resigned on the spot, recommending the king to send for Sagasta. The Liberal administration which that statesman formed lasted two years and some months. The policy of Sagasta in domestic affairs resembled that of Canovas. The Liberals had to act cautiously and slowly, because they perceived that any pre- mature move towards reform or democratic legislation would not be welcome at court, and might displease the generals. Sagasta and his colleagues therefore devoted their attention chiefly to the material interests of the country. They made several treaties of commerce with European and Spanish- American governments. They reformed the tariff in harmony with the treaties, and with a view to the reduction of the import duties by quinquennial stages to a fiscal maximum of 15% ad valorem. They undertook to carry out a general conversion of the consolidated external and internal debts by a considerable reduction of

capital and interest, to which the bondholders assented. They consolidated the floating debt proper in the shape of a 4% stock redeemable in 40 years, of which £70,000,000 was issued in 1882 by Seiior Camacho, the greatest Spanish financier of the century. Sagasta was not so fortunate in his dealings with the anti-dynastic parties, and the Republicans gave him much trouble in August 1883. The most irrecon- cilable Republicans knew that they could not expect much from popular risings in great towns or from the disaffected and anarchist peasantry in Andalusia, so they resorted to the old practice of barrack conspiracies, courting especially the non-commissioned officers and some ambitious subalterns. The chief of the exiles, Don Manuel Ruiz Zorilla, who had retired to Paris since the Restoration, organized a military conspiracy, which was sprung upon the Madrid government at Badajoz, at Seo de Urgel, and at Santo Domingo in the Ebro valley. This revolutionary outbreak was swiftly and severely repressed. It served, however, to weaken the prestige of Sagasta's administration just when a Dynastic Left was being formed by some discontented Liberals, headed by Marshal Serrano and his nephew, General Lopez-Dominguez. They were joined by many Democrats and Radicals, who seized this opportunity to break off all relations with Ruiz Zorilla and to adhere to the monarchy. After a while Sagasta resigned in order to let the king show the Dynastic Left that he had no objection to their attempting a mildly democratic policy, on condition that the Cortes should not be dissolved and that Sagasta and his Liberal majorities in both houses should grant their support to the cabinet presided over by Sefior Posada Herrera, a former Conservative, of which the principal members were General Lopez-Dominguez and Sefiores Moret, Montero Rios and Becerra. The support of – Sagasta did not last long, and he managed with skill to elbow the Dynastic Left out of office, and to convince all dissentients and free lances that there was neither room nor prospect for third parties in the state between the two great coalitions of Liberals and Conservatives under Sagasta and Canovas. When Posada Herrera resigned, the Liberals and Sagasta did not seem much displeased at the advent to power of Canovas in 1884, and soon

almost all the members of the Dynastic Left joined the Liberal party.

From 1881 to 1883, under the two Liberal administrations of Sagasta and Posada Herrera, the foreign policy of Spain was much like that of Canovas, who likewise had had to bow to the king's very evident inclination pJucy? for closer relations with Germany, Austria and Italy than with any other European powers. Alphonso XII. found a very willing minister for foreign affairs in the person of the marquis de la Vega de Armijo, who cordially detested France and cared as little for Great Britain. The Red-books revealed very plainly the aims of the king and his minister. Spanish diplomacy endeavoured to obtain the patronage of Italy and Germany with

a view to secure the admission of Spain into the European concert, and into international con- ferences whenever Mediterranean and North African questions should be mooted. It prepared the way for raising the rank of the representatives of Spain in Berlin, Vienna, Rome, St Petersburg and London to that of ambassadors. In Paris the country had been represented by ambassadors since 1760. The Madrid foreign office welcomed most readily a clever move of Prince Bismarck's to estrange Spain from France and to flatter the young king of Spain. Alphonso XII. was induced to pay a visit to the old emperor William in Germany, and during his stay there, in September 1883, he was made honorary colonel of a Uhlan regiment quartered at Strassburg. The French people resented the act, and the Madrid government was sorely embarrassed, as the king had announced his inten- tion of visiting Paris on his way back from Germany. Nothing daunted by the ominous attacks of the French people and press, King Alphonso went to Paris. He behaved with much coolness and self-possession w T hen he was met in the streets by a noisy and disgraceful demonstration. The president of the Republic and his ministers had to call in person on their guest to tender an apology, which was coldly received by Alphonso and his minister for foreign affairs. After the king's return, the German emperor sent his son the crown prince Frederick, with a brilliant suite, to the Spanish capital, where they were the guests of the king for several days. Until the end of his reign Alphonso XII. kept up his friendly relations with the German Imperial family and with the German government.

The close of the reign of Alphonso XII. was marked by much trouble in domestic politics, and by some great national calami- ties and foreign complications, while the declining health of the monarch himself cast a gloom over the court and govern- ing classes. The last Conservative cabinet of this reign was neither popular nor successful. When the cholera appeared in France, quarantine was so rigorously enforced in the Peninsula that the external trade and railway traffic were grievously affected. On Christmas night, r884, an earthquake caused- much damage and loss of life in the provinces of Granada and Malaga. Many villages in the mountains which separate those provinces were nearly destroyed. At Alhama, in Granada, more than 1000 persons were killed and injured, several churches and convents destroyed, and 30c houses laid in ruins. King Alphonso went down to visit the district, and distributed relief to the distressed inhabitants, despite his visib.'y failing health. He held on gallantly through the greater part of 1885 under great difficulties. In the Cortes the tension in tlve relations between the government and the opposition was growing daily more serious. Outside, the Republicans and Carlists were getting troublesome, and the tone of their press vied with that of the Liberals in their attacks on the Conservative cabinet. Then, to make

matters worse, an outbreak of cholera occurred in the eastern provinces of the kingdom. The epidemic spread rapidly over the Peninsula, causing great havoc in important cities like Granada, Saragossa and Valencia. The authorities confessed that 105,000 persons died of cholera in the summer and autumn of 1885, being on an average from 41 to 56% of those attacked.

In September a conflict arose between Spain and Germany which had an adverse effect upon his health. Prince Bismarck

looked upon the rights of Spain over the Caroline Islands in the Pacific as so shadowy that he sent some German war-ships to take possession of a port in the largest island of the group. The action of Germany caused great indignation in Spain, which led, in Madrid, to imposing demonstrations. The government got alarmed when the mob one night attacked the German embassy, tore the arms of the empire from the door of the consulate, and dragged the escutcheon to the Puerto del Sol, where it was burnt amid much uproar. The troops had to be called out to restore order. Alphonso alone remained cool, and would not listen to those who clamoured for a rupture with Germany. He elected to trust to diplomacy; and Spain made out such a good case for arbitration, on the ground of her ancient rights of discovery and early colonization, that the German emperor, who had no desire to imperil the dynasty and monarchy in Spain, agreed to submit the whole affair to the pope, who gave judgment in favour of Spain.

After his return to Madrid the king showed himself in public less than usual, but it was clear to all who came in contact Death of w 'th him that he was dying. Nevertheless, in Alphonso Madrid, Canovas would not allow the press to say •"• a word. Indeed, in the ten months before the*

death of Alphonso XII. the Conservative cabinet displayed unprecedented rigour against the newspapers of every shade. The Dynastic, Liberal and Independent press, the illustrated papers and the satirical weeklies fared no better than the Republicans, Socialists and Carlists, and in 60 days 1260 prosecutions were ordered against Madrid and provincial papers. At last, on the 24th of November 1885, the truth had to be admitted and on the morning of the 25th the end came.

It was no wonder that the death of a king who had shown so much capacity for rule, so much unselfish energy and courage, Regency of an d

so many amiable personal qualities, should Queen have made Spaniards and foreigners extremely

Christina, anxious about the prospects of the monarchy. Alphonso XII. left no male issue. He had two daughters, the princess of the Asturias, born in 18S0, and the Infanta Maria Theresa, born in 1882. At the time of his death it had not been officially intimated that the queen was enceinte. The Official Gazette did not announce that fact until three months after the demise of the sovereign. On the 17th of May 1886, six months after the death of Alphonso XII., his posthumous son, Alphonso XIII., was born at the palace of Madrid. Six months before this event definitely settled the question of the succession to the throne, the royal family and its councillors assembled to take very important decisions. There could be no doubt that under the constitution of 1876 the widowed queen was entitled to the regency. Dona Maria Christina calmly presided over this solemn council, listening to the advice of Marshal Campos, always consulted in every great crisis; of Captain-General Pavia, who answered for the loyalty of the capital and of its garrison; of the duke de Sexto, the chief of the household; of Marshal Blanco, the chief of the military household; and of all the members of the cabinet and the presidents of the Senate and Congress assembled in the presence of the queen, the ex-queen Isabella, and the Infanta Isabella. All looked chiefly to Marshal Campos and Canovas del Castillo for statesmanlike and disinterested advice. The question was whether it would be expedient to continue the policy of the late king and of his last cabinet. Canovas assured the queen- regent that he was ready to undertake the task of protecting the new state of things if it was thought wise to continue the Conservative policy of the late king, but in the circumstances created by his death, he must frankly say that he considered it advisable to send for Senor Sagasta and ask him to take the reins of government, with a view to inaugurate the regency under progressive and conciliatory policy.

Sagasta was summoned to El Pardo, and the result of his inter- view with the queen-regent, Canovas and the generals, was the understanding ever afterwards known as the pact of El Pardo, the corner-stone of the whole policy of the regency, and of the

two great statesmen who so long led the great dynastic parties and the governments of Dona Christina. It was agreed that during the first years of the regency, Canovas and Sagasta would assist each other in defending the institutions and the dynasty. Sagasta made no secret of the fact that it was his intention to alter the laws and the constitution of the monarchy so as to make them very much resemble the constitution of the Revolution of 1868, but he undertook to carry out his reform policy by stages, and without making too many concessions to radicalism and democracy, so that

Canovas and his Conservative and Catholic followers might bow to the necessities of modern times after a respectable show of criticism and resistance. The generals assured the queen-regent and the leaders of the dynastic parties that the army might be counted upon to stand by any govern- ment which was sincerely determined to uphold the Restoration against Republicans and Carlists. Sagasta left the palace to form the first of several cabinets over which he presided continuously for five years. He took for colleagues some of the strongest and most popular statesmen of the Liberal party, virtually representing the three important groups of men of the Revolution united under his leadership — veteran Liberals like Camacho and Venancio Gonzalez; Moderates like Alonzo Martinez, Gamazo and Marshal Jovellar; and Democrats like Moret, Montero Rios and Admiral Beranger. The new cabinet convoked the Cortes elected under the administration of Canovas in 1884, and the Conservative majorities of both houses, at the request of Canovas, behaved very loyally, voting supplies and other bills necessary to enable the government to be carried on until another parliament could be elected in the following year,

1886.

Pending the dissolution and general election, Sagasta and his colleagues paid most attention to public peace and foreign affairs. A sharp look-out was kept on the doings Republican of the Republicans, whose arch-agitator, Ruiz and Cariist Zorilla, in Paris displayed unusual activity in his intrigues. endeavours to persuade the Federals, the Intransigeants, and even the Opportunists of Democracy that the times were ripe for a venture. Ruiz Zorilla found no response from the Republican masses, who looked to Pi y Margall for their watchword, nor from the Republican middle classes, who shared the views of Salmeron, Azcarate and Pedregal as to the inex- pediency of revolutionary methods. Castelar, too, raised his eloquent protest against popular risings and barrack conspiracies. The Carlists showed equal activity in propaganda and intrigues. Sagasta derived much benefit from the divisions which made democracy powerless; and he was able to cope with Carlism chiefly because the efforts of the pretender himself abroad, and of his partisans in Spain, were first restrained and then decisively paralysed by the influence of foreign courts and governments, above all by the direct interference of the Vatican in favour of the Spanish regency and of the successor of Alphonso XII. The young and most impatient adherents of Carlism vainly pleaded that such an opportunity would not soon be found again, and threatened to take the law into their own hands and unfurl the flag of Dios, Patria, y Rey in northern and central Spain. Don Carlos once more showed his well- known lack of decision and dash, and the Cariist scare passed away. Pope Leo XIII. went even further in his patronage, for he consented to be the godfather of the posthumous son of Alphonso XII., and he never afterwards wavered in the

steady sympathy he showed to Alphonso XIII. He was too well acquainted with the domestic politics of the Peninsula to suppose that Carlism could ever do more than disturb for a while the tranquillity of Spain. He did not wish to stake the interests of the Church on a cause which could only revive against her the old animosities of Spanish liberalism and democracy, so roughly displayed in the years 1836 and 1868. Dona Christina, apart from the dictates of gratitude towards the head of her Church for the kindness shown to her son and government, was a zealous Catholic. She proved all through her regency that she not only relied upon the support of the Vatican and of the prelates, but that she was determined to favour the Church

and the religious foundations in every possible way. Her purse was always open to assist convents, monasteries, and religious works and societies of all kinds, as long as they were under the management of the Church. She became regent when Spain had felt the consequences of the expulsion of the Jesuits and other religious orders from France after the famous Jules Ferry laws, which aimed at placing these orders more under state control, to which they declined to submit. They selected Spain as an excellent field of enterprise; and it must be said that all the governments of the regency showed so much indulg- ence towards the Catholic revival thus started, that in less than a decade the kingdom .was studded with more convents, monas- teries, Jesuit colleges, Catholic schools, and foundations than had existed in the palmy days of the houses of Austria and Bourbon in the 17th and 18th centuries. A wave of Clericalism and ultra-Catholic influences swept over the land, affecting the middle classes, the universities and learned societies, and making itself very perceptible also among the governing classes and both dynastic parties, Liberals and Conservatives.

Next in importance to papal protection was the favour- able attitude of all the European governments towards the Europe queen-regent and, later, towards her son. The and the court and government of Germany vied with the Regency. Austrian and Italian royal families and govern- ments in showing sympathy to the widow of Alphonso XII. Republican France and the tsar made as cordial demon- strations as Queen Victoria and her government, and Switzerland, Belgium, Holland and others followed . suit. The Spanish foreign office received every assurance that friendly governments would watch the Carlists and Republicans, to pre- vent them from using their territories as a basis for conspiracies against the peace of

Spain. The statesmen of both dynastic parties, from the beginning of the regency, agreed to observe strict neutrality in European affairs, in order to avoid complica- tions fraught with evil consequences for the monarchy and the dynasty in the unsettled state of the country. This neutrality was maintained until the close of the 19th century.

Sagasta conducted the first general election in 1886 much after the usual precedents. The Long Parliament of the regency was composed of considerable Liberal majorities Sagasta. m D °th houses, though Sagasta had allowed a larger share than Canovas was wont to do to the minorities, so much so that on the opposition benches the Republicans of various shades were represented by their most eminent leaders, the Carlists had a respectable group, and the Conservatives a strong muster, flanked by a group of dis- sentients. The first Cortes of the regency in five sessions did really good and substantial work. A civil code was carefully drawn up by Senor Alonzo Martinez, in order to consolidate the very heterogeneous ancient legislation of the monarchy and the local laws of many provinces, especially Catalonia; Aragon, Valencia, Navarre, and the Basque territory. Trial by jury was re-established for most crimes and offences. The laws regulating the rights of association and public meeting, the liberty of the press, and other rights of the subject were reformed on liberal and more tolerant lines. Finance and trade received attention. Some commercial treaties and agreements were made, including one with Great Britain, which proved highly beneficial to home trade, and the tariff was altered, in spite of much resistance on the part of the Protectionists. In his progressive policy Sagasta was actively and usefully supported by the chief of the moderate Republicans, Emilio Castelar, who recommended his partisans to vote with the Liberal party, because he confessed that bitter experience had taught him that liberties and rights were better attained and made stable by pacific evolution than by revolution. He laid most stress upon this axiom when, in September 1886, Ruiz Zorilja suddenly sprang upon Sagasta a military and revolutionary movement in the streets and barracks of Madrid. The military authorities acted with promptitude, the rebels being pursued, dispersed and arrested. General Marina and several other officers were condemned to death by court martial, but Queen Christina

commuted the sentence into penal servitude, and the ministers of war and marine retired from the cabinet in consequence. Very shortly afterwards, another war minister, General Castillo, attempted to strike at the root of military insubordination, and simultaneously in every garrison of the kingdom the senior sergeants, more than 1000 in all, were given their discharge and ordered to start for their homes on the spot. The lesson produced a good result, as no trace of revolutionary work revealed itself among the non-commissioned officers after 1886, As time wore on, Sagasta found it difficult to maintain discipline in the ranks of the Liberal party. He

was obliged to reconstruct the cabinet several times in order to get rid of troublesome colleagues like General Cassola, who wanted to make himself a sort of military dictator, and Camacho, whose financial reforms and taxation schemes made him unpopular He had more often to reorganize the government in order to find seats in the cabinet for ambitious and impatient . worthies of the Liberal party— not always with success, as Senor Martos, president of the Congress, and the Democrats almost brought about a political crisis in 1889. Sagasta cleverly affected to resign and stand aside, so that Senor Alonzo Martinez might vainly attempt to form an intermediary cabinet. Canovas, who was consulted by the queen when Alonzo Martinez failed, faithfully carried out the pact, of El Pardo and advised Her Majesty to send for Sagasta again, as he alone could carry out what remained to be dome of the Liberal programme. Sagasta reconstructed his ministry for the last time, and announced his intention to make the re-establishment of universal suffrage the crowning act of the Liberal policy, knowing very well that he would thus rally round him all the Liberals, Democrats and Republicans in the last session of the Long Parliament. The Suffrage Bill was carried through the Senate and Congress in the spring of 1890 after protracted debates, in which the Conservatives and many military politicians who had previously been regarded as the allies of Sagasta did their best to obstruct the measure. Marshals Campos, Jovellar and Novaliches, and Generals Pavia, Primo de Rivera, Daban and others, were'angry with Sagasta and the Liberals not only because they deemed their policy too demo- cratic, but because they ventured to curb the insubordinate attitude of general officers, who shielded themselves behind the immunities of their senatorial position to write insolent letters to the war minister on purely professional questions. Spanish generals of pronunciamiento fame thought it perfectly logical and natural that sergeants and subalterns should be shot or sent to penal servitude for acts of indiscipline, but if an in- subordinate general was sent to a fortress under arrest for two months they publicly demonstrated their sympathy with the offender, made angry speeches against their hierarchical chief, the war minister, in the Senate, and dared to call upon the queen-regent to make representations, which unfortunately were listened to, according to the worst precedents of the Spanish monarchy. The increasing violence of the Conservative press and opposition, the divisions developing in the ranks of liberalism, and the restlessness of the agricultural protectionists led by Senor Gamazo, did not weigh so much in the balance at court against Sagasta as the aggressive attitude of the military politicians. Sagasta held on as long as was necessary to secure the promulgation of the universal suffrage law, but he noticed that the queen-regent, when he waited upon her for the despatch of public business, showed almost daily more impatience for a change of policy, until at last, in July 1890, she peremptorily told him that she considered the time had come for calling the

Conservatives and their military patrons to her councils. Sagasta loyally furnished the queen with a constitutional pretext for carrying out her desire, and tendered the resignation of the whole cabinet, so that Her Majesty might consult, as uSual, the party leaders and generals on the grave question of the expediency of entrusting to new ministers or to the Liberals the mission of testing the new electoral system. Queen Christina on this occasion acted exactly as she henceforth did in all ministerial crises. She slowly consulted the magnates of all i parties with apparent impartiality, and finally adopted the course

which it was an open secret she had decided upon in pectore beforehand.

Canovas gathered round him most 01 the prominent Conserva- tive and Catholic statesmen. The first step of the new cabinet A Protec- was calculated to satisfy the protectionist aspirations tioaist which had spread in the kingdom about the same Regime. t ; me jjjat mos t Continental countries were remodel- ling and raising their tariffs. The Madrid government used an authorization which Sagasta had allowed his Long Parlia- ment to vote, to please Senor Gamazo and the Liberal repre- sentatives of agricultural interests, empowering the government to revise and increase all tariff duties not covered by the then existing treaties of commerce. This was the case with most of the products of agriculture and with live stock, so Canovas and his finance minister made, by royal decree, an enormous increase in the duties on these classes of imports, and particu- larly on breadstuffs. Then, in 1891, they denounced all the treaties of commerce which contained clauses stipulating most- favoured-nation treatment, and they prepared and put in force in February 1892 a protectionist tariff which completely reversed the moderate free-trade policy which had been so beneficial to the foreign commerce of Spain from 1868 to 1892. Not a few nations retaliated with higher duties upon Spanish exports, and France raised her wine duties to such an extent that the exports of wines to that country dropped from £12,500,000 before 1892 to £2,400,000 in 1893 and the following years. The effects of a protectionist policy verging upon prohibition were soon sharply felt in Spain. Foreign exchanges rose, exports decreased, the railway traffic declined, and the commercial classes and consumers of foreign goods and products were loud in their protests. Industrial interests alone benefited, and imported more raw materials, chemicals, and coal and coke, which naturally influenced the exchanges adversely. Spain only attempted to

make new treaties of commerce with Hol- land, Norway, Sweden, Denmark and Switzerland. The Great Powers contented themselves with securing by agreements the same treatment for their commerce in Spain as that granted by those five treaties. The Protectionists in 1893 wrecked a treaty of commerce with Germany in the Senate; and Spain subsequently persevered in her protectionist policy. During his two and a half years' stay in office Canovas had not so much trouble with the opposition as with the divisions which sprang up in the Conservative ranks, though he fancied that he had managed the general election in 1891 so as to secure the customary docile majorities. The split in the Conservative camp originated in the rivalry between the two principal lieutenants of Canovas, Romero Robledo and Francisco Silvela. The latter and a strong and influential body of Conservatives, chiefly young politicians, dissented from the easy-going views of Romero Robledo and of Canovas on the expediency of reforms to correct the notorious and old-standing abuses and corruption of the municipalities, efpecially of Madrid. When Canovas found himself deserted on so delicate a matter by a numerous section of his party, he resigned, and advised the queen to send for Sagasta and the Liberals.

Sagasta took office very reluctantly, as he considered a change of policy premature. He conducted the general election with Difficulty much regard for the wishes of the opposition, and out of 456 seats in the Lower House allowed them to have more than 170, the Conservatives get- ting nearly 100 and the Republicans 30. He had to settle some knotty questions, foremost a conflict with Morocco, which was the consequence of the aggression of the unruly Riff tribes upon the Spanish outposts around Melilla. Reinforcements were tardily sent out; and in a second attack by the Arabs the Spanish forces lost heavily, and their commander, General Margallo, was killed. Public opinion was instantly fired, and the press called so loudly for revenge that the government sent to Melilla no less a personage than Marshal Campos, at the head of 29 generals and 25,000 men. The sultan of Morocco lost no time in censuring the behaviour of the Riff tribes, and in promising that he would chastise them. Marshal Campos was sent to

with Morocco.

Fez to make a treaty, in which he obtained ample redress and the promise of an indemnity of £800,000, which Morocco punctually paid.

Colonial affairs gave Sagasta much to do. He had given seats in his cabinet to Senor Antonio Maura as colonial secretary and to Senor Gamazo, his brother-in-law, as finance minister. These two moderate Liberals acted in Question. concert to grapple with colonial questions, which in 1894 had assumed a very serious aspect. Spain had received many ominous

warnings. Marshal Campos, on returning from Cuba in 1879, had advocated some concessions to satisfy the . legitimate aspirations of the majority of the colonists. In 1886, in the first parliament of the regency, Cuban autonomist depu- ties divided the house on a motion in favour of home rule and of an extension of the franchise in Cuba. This motion was negatived by all the Conservatives, by most of the Dynastic Liberals and by some of the Republicans. The majority of Span- iards were kept by the government and the press quite in the dark about the growth of disaffection in Cuba, so that they were loath to listen to the few men, soldiers and civilians, cour- ageous enough to raise the note of alarm during the ten years before the final catastrophe. For no other reason did the minister for the colonies, Senor Maura, in 1894 fail to convince the Cortes, and even the Liberal party, that his very moderate Cuban Home Rule Bill was an indispensable and wise, though tardy, attempt to avert a conflict which many plain symptoms showed to be imminent in the West Indies. Maura was warmly supported in Congress by the Cuban home rulers and by some far-sighted Liberals and Republicans. Nevertheless, his bill did not find favour with the Conservatives or the majority of the Liberals, and Sagasta, trimming according to his inveterate habit, found a pretext to get rid of Maura and Gamazo. In the place of Maura he found a more pliant minister for the colonies, Senor Abarzuza, who framed a Cuban Reform Bill so much short of what his predecessor had thought an irreducible minimum of concessions, that it was censured in Havana by all the colonial Liberals and home rulers, and by their representatives in Madrid. The latter at the last moment recorded their votes in favour of the Abarzuza Bill when they perceived that a strange sort of eleventh-hour presentiment was about to make all the Spanish parties vote this insufficient reform. Before it could be promulgated, the tidings came of a separatist rising in the old haunts of Creole disaffection near Santiago de Cuba. Sagasta sent about 12,000 men to reinforce the 15,000 soldiers in Cuba under General Callaga, and was preparing more when a characteristically Spanish ministerial crisis arose. The subal- terns of the Madrid garrison took offence at some articles pub- lished by Radical newspapers, and they attacked the editorial offices. Neither the war minister nor the commanders of the garrison chose to punish the offenders, and sooner than endorse such want of discipline, Sagasta and the Liberal party once more made way for Canovas. A very few days after he assumed office Canovas received information concerning the spread of the rising in Cuba which induced him to send out Marshal Campos with 30,000 men. He allowed Marshal Campos much liberty of action, but dissented from his views on the expediency of allowing him to offer the loyalists of Cuba as much home rule as would not clash with the supremacy of Spain. The prime minister declared that the Cubans must submit first, and then the mother country would be generous.

Before a year had passed, in view of the signal failure of Marshal Campos, the Madrid government decided to send out General Weyler, who had made himself famous in the Philippines and at Barcelona for his stern and cruel procedure against disaffection of every kind. He showed the same merciless spirit in dealing with the Cubans; and he certainly cleared two-thirds of the island of Creole bands, and stamped out disaffection by vigorous military operations and by obliging all the non- aeaeral combatants who sympathized with the rebels in Weyier's arms to elect between joining them in the bush, Cam P al «"- La Manigua, or residing within the Spanish lines. This system might probably have succeeded if the United States had not

countenanced the sending of supplies of every kind to the rebels, and if American diplomacy had not again and again made representations against Weyler's ruthless policy. Canovas so fully comprehended the necessity of averting American interven- tion that he listened to the pressing demands of secretary Olney and of the American minister in Madrid, Hannis Taylor, and laid before the Cortes a bill introducing home rule in Cuba on a more liberal scale than Maura, Abarzuza and Sagasta had dared to suggest two years before. Canovas did not live to see his scheme put into practice, as he was assassinated by an anarchist at the baths of Santa Agueda, in the Basque Provinces, on the 9th of August 1897. The queen-regent appointed General Azcarraga, the war minister, as successor to Canovas; and a few weeks later President McKinley sent General Woodford as representative of the United States at the court of Madrid. At the end of September 1897 the American minister placed on record, in a note handed hy him at San Sebastian to the minister for foreign affairs, the duke of Tetuan, a strongly -worded protest against the state of things in Cuba, and demanded in substance that a stop should be put to Weyler's proceedings, and some measures taken to pacify the island and prevent the prolongation of disturbances that grievously affected American interests. Less than a fortnight after this note had been delivered, the Conservative cabinet resigned, and the queen-regent asked Sagasta to form a new administration. The Liberal government recalled Weyler, and sent out, as governor-general of Cuba, Marshal Blanco, a conciliatory and prudent officer, who agreed to carry out the home-rule policy which was concerted by Senor Moret and by Sagasta, with a view to obtain the goodwill of the president of the United States. If things had not already gone too far in Cuba, and if public opinion in the United States had not exercised

irresistible pressure on both Congress and president, the Moret home-rule project would probably have sufficed to give the Cubans a fair amount of self-government. All through the winter of 1897-1898 the Madrid government took steps to propitiate the president and his government, even offering them a treaty of commerce which would have allowed American commerce to compete on equal terms with Spanish imports in the West Indies and defeat all European competition. But the blowing up of the American cruiser " Maine " in the port of Havana added fuel to the agitation in the United States against Spanish rule in Cuba. When Congress met in Washington the final crisis was hurried on. Spain appealed in vain to European mediation, to the pope, to courts and governments. All, with the exception of Great Britain, showed sympathy for the queen-regent and her government, but none were disposed to go beyond purely platonic representations in Washington.

At last, on the 20th of April 1898, when the Spanish govern- ment learned that the United States minister, General Woodford, War with had been instructed by telegraph to present an the United ultimatum demanding the cessation of hostilities states. j n Cuba, with a view to prepare for the evacuation

of the island by the Spanish forces, Sagasta decided to give General Woodford his passports and to break off official relations with the United States. It was an open secret that this grave decision was not taken at the cabinet council presided over by the queen without a solemn protest by Senor Moret and the ministers of war and marine that the resources of Spain were totally inadequate for a struggle with the United States. These protests were overruled by the majority of the ministers, who invoked dynastic and monarchical considerations in favour of a desperate stand, however hopeless, in defence of the last remnants of the colonial empire of Spain. Reckless as was the course adopted, it was in touch with the feelings of the majority of a nation which had been to the very end deceived by the government and by the press not only in regard to its own resources, but also in regard to those of the United States and of the colonists in arms in Cuba and in the Philippine Islands. The sequel is soon told. The Spanish fleet in the Far East was defeated in Manila Bay by Admiral Dewey. Admiral Cervera's squadron was destroyed outside the Bay of Santiago de Cuba by the American fleet under Admirals Sampson and

Schley. All communication between Spain and her colonies was thus cut off. An American expedition landed near Santiago, and the Spanish garrison surrendered after a fortnight's show of resistance. Very shortly afterwards, at the end of July, Spain sued for peace through the mediation of French diplomacy, which did not obtain much from President McKinley. It was agreed that hostilities should cease on sea and, land, but that Spain should evacuate Cuba and Porto Rico pending the negotia- tions for a peace treaty which were to begin in Paris at the end of September 1898. In the meantime Manila and its garrison had surrendered to the Americans. The agreement of the 9th of August, signed by M. Cambon, the French ambassador in Washington, in the name of Spain, clearly stipulated that her rule in the New World must be considered at an end, and that the fate of the Philippines would be settled at the Paris nego- tiations. Unfortunately, Spain indulged in the illusion that America would perhaps respect her rights of sovereignty in the Philippine Islands, or pay a considerable sum for their cession and recognize the debts of Cuba and of the Philippines. The American commission, presided over by secretary Day in Paris, absolutely refused to admit the Spanish contention that the United States or the new administration in Cuba and the Philippines should be saddled with several hundred million dollars of debts, contracted by the colonial treasuries, and guaranteed by Spain, almost entirely to maintain Spanish rule against the will of the Cubans and Filipinos. Spain could not help assenting to a treaty by which she renounced unconditionally all her rights of sovereignty over Cuba and Porto Rico and ceded the Philippine and Sulu Islands and the largest of the Marianne Islands in consideration of the payment of four millions sterling by America. Thus ended a struggle

which only left Spain the Carolines and a few other islands in the Pacific, which she sold to Germany in 1899 for £800,000, and a couple of islands which were left out in the delimitation made by the Paris peace treaty of the 12th of December 1898, and for which America paid £20,000 in 1900.

The consequences of the war and of the loss of the colonies were very serious for Spanish finance. The national debt, which consisted before the war of £234,866,500 of external j;/nanc/«/ and internal consols and redeemable debts, and and Political £24,250,000 of home floating debt, was increased ReorganUa- by £46,210,000 of Cuban and Philippine debts, which tion ' the Cortes had guaranteed, and by £60,000,000 of debts contracted at a high rate of interest, and with the national guarantee, to meet the expenses of the struggle with the colonies and of the war with the United States. These additional burdens rendered it necessary that taxation and the budget should be thoroughly reorganized. Sagasta and the Liberal party would gladly have undertaken the reorganization of Spain and her finances, but the issue of the war and the unavoidable peace treaty had so evidently damaged their popularity in the country and their credit at court, that the government seized the pretext of an adverse division in the Senate to resign. The Liberals left office after having done all that was morally and materially possible, considering the extremely difficult, indeed inextricable, situation in which they found the country in October 1897. The task of reorganization was confided by the queen-regent to Senor Silvela, who had been universally recognized as the leader of the Conservatives and Catholics after the death of Canovas del Castillo. Silvela endeavoured to unite in what he styled a Modern Conservative party the bulk of the followers of Canovas; the Ultramontanes, who were headed by General Polavieja and Senor Pidal; the Catalan Regionalists, whose leader, Duran y Bas, became a cabinet minister; and his own personal following, of whom the most prominent were the home secretary, Sefior Dato, and the talented and energetic finance minister, Senor Villaverde, upon whose shoulders rested the heaviest part of the task of the new cabinet. Silvela lacked the energy and decision which had been the characteristics of Canovas. He behaved constantly like a wary and cautious trimmer, avoiding all extreme measures, shaking off compromising allies like the Ultramontanes and the Regionalists, elbowing out of the cabinet

General Polavieja when he asked for too large credits for the army, taking

charge of the ministry of marine to carry out reforms that no admiral would have ventured to make for fear of his own comrades, and at last dispensing with the services of the ablest man in the cabinet, the finance minister, Senor Villaverde, when the sweeping reforms and measures of taxation which he introduced raised a troublesome agitation among the taxpayers of all classes. Villaverde. however, had succeeded in less than eighteen months in giving a decisive and vigorous impulse to the reorganization of the budget, of taxation and of the home and colonial debts. He resolutely reformed all existing taxation, as well as the system of assessment and collection, and before he left office he was able to place on record an increase of close upon three millions sterling in the ordinary sources of revenue. His reorganization of the national debt was very complete; in fact, he exacted even more sacrifices from the bond- holders than from other taxpayers. The amortization of the home and colonial debts was suppressed, and the redeemable debts of both classes were converted into 4 % internal consols. The interest on all colonial debts ceased to be paid in gold, and was paid only in pesetas, like the rest of the internal debts, and like the external debt held by Spaniards. Alone, the external debt held by foreigners continued to enjoy exemption from taxation, under the agreement made on the 28th of June 1882 between the Spanish government and the council of foreign bond- holders, and its coupons were paid in gold. The Cortes authorized the government to negotiate with the foreign bondholders with a view to cancelling that agreement. This, however, they declined to do, only assenting to a conversion of the 4 % external debt into a 3!% stock redeemable in sixty-one years. After parting with Villaverde, Silvela met with many difficulties, and had much trouble in maintaining discipline in the heterogeneous ranks of the Conservative party. He had to proclaim not only such important provinces as Barcelona, Valencia and Bilbao, but even the capital of Spain itself, in order to check a widespread agitation which had assumed formidable proportions under the direction of the chambers of commerce, industry, navigation and agriculture, combined with about 300 middle-class corporations and associations, and supported by the majority of the gilds and syndicates of tax- payers in Madrid and the large towns. The drastic measures taken by the government against the National Union of Tax- payers, and against the newspapers which assisted it in advocating resistance to taxation until sweeping and proper retrenchment had been effected in the national expenditure, checked this campaign in favour of reform and retrenchment for a while. Silvela's position in the country had been much damaged by the very fact of his policy having fallen so much short of what the nation expected in the shape of reform and retrenchment. At the eleventh hour he attempted to retrieve his mistake by vague promises of amendment, chiefly because all the opposition groups, above all Sagasta and the Liberals, announced their intention of adopting much the same pro-

gramme as the National Union. The attempt was unsuccessful, and on the 6th of March 1901 a Liberal government, under the veteran Sagasta, was once more in office. (A. E. H.)

Parties and Conflicts, igoo-igio. — The loss of nearly all that remained of her colonial empire, though in appearance a crowning disaster, in fact relieved Spain of a perennial source Tendencies. °f weakness and trouble, and left her free to set her own house in order. In this the task that faced the government at the outset of the 20th century was sufficiently formidable. Within the country the traditional antagonisms, regional, political, religious, still lived on, tending even to become more pronounced and to be complicated by the introduction of fresh elements of discord. The old separatist tendencies were increased by the widening gulf between the interests of the industrial north and those of the agricultural south. The growing disposition of the bourgeois and artisan classes, not in the large towns only, to imitate the " intellectuals " in desiring to live in closer touch with the rest of Europe as regards social, economic, scientific and political progress, embittered the

struggle between the forces of Liberalism and those of Catho- licism, powerfully entrenched in the affections of the women and the illiterate masses of the peasantry. To these causes of division were added others from without: the revolutionary forces of Socialism and Anarchism, here, as elsewhere, so far as the masses were concerned, less doctrines and ideals than rallying- cries of a proletariat in revolt against intolerable conditions. Finally, as though to render the task ' of patriotic Spaniards wellnigh hopeless, there was little evidence of any cessation of that purely factious spirit which in Spanish politics has ever rendered stable party government impossible. A sketch of the political history of a country is necessarily concerned with the externals of politics — the shifting balance of parties, changes of ministries, the elaboration of political programmes; and these have their importance. It must, however, not be forgotten that in a country in which, as in Spain, Politics. the constitutional consciousness of the mass of the people is very little developed, all these things reflect only very imperfectly the great underlying forces by which the life of the nation is being moulded and its destiny determined. For a century politics in Spain had been a game, played by profes- sionals, between the " ins " and " outs "; victory or defeat at the polls depended less on any intelligent popular judgment on the questions at issue than on the passing interests of the " wire-pullers " and " bosses " (Caciques) who worked the electoral machinery.

Silvela's Conservative cabinet was succeeded in March 1901 by a Liberal government under the veteran Sagasta, who remained in office — save for two short interludes— until the 3rd of December 1902. He was at once

faced with two problems, very opposite in their nature, which were destined to play a very conspicuous part in Spanish politics. The first was that presented by the growth of the religions orders and congregations, the second that arising out of the spread of Socialism and indus- trial unrest. Under the concordat of the 20th of March 1851, by which the relations of Spain and the Vatican are Question of still governed, the law under which since 1836 the the Reiigl- religious congregations had been banished from ous 0raers – Spain was so far relaxed as to permit the re-establish- ment of the orders of St Vincent de Paul, St Philip Neri and " one other among those approved by the Holy See," so that through- out the country the bishops " might have at their disposal a sufficient number of ministers and preachers for the purpose of missions in the villages of their dioceses, &c." In practice the phrase " one other " was interpreted by the bishops, not as one for the whole of Spain, but as one in each diocese, and at the request of the bishops congregations of all kinds established themselves in Spain, the number greatly increasing after the loss of the colonies and as a result of the measures of secularizа- tion in France. 1 The result was what is usual in such cases. The regular clergy were fashionable and attracted the money of the pious rich, until their wealth stood in scandalous contrast with the poverty of the secular clergy. They also all of them claimed, under the concordat, exemption from taxes; and, since many of them indulged in commercial and industrial pursuits, they competed unfairly with other traders and manu- facturers, and tended to depress the labour market. The Law of Associations of the 30th of June 1887 had attempted to modify the evil by compelling all congregations to register their members, and all, except the three already recognized under the concordat, to apply for authorization. This law the congregations, hot- beds of reactionary tendencies, had ignored; and on the 19th of July 1901, the queen-regent issued a decree, countersigned by Sagasta, for enforcing its provisions.

*Meanwhile, however, more pressing perils distracted the atten- tion of the government. The industrial unrest, fomented by Socialist agitation, culminated in January 1902 in ; n(j us < r / a / serious riots at Barcelona and Saragossa, and on Unrest and the 1 6th of February in the proclamation of a general Socialist strike in the former city. The government sent *^ a on ' General Weyler, of Cuban notoriety, to deal with the 1 See " Church-and State in Spain." The Times, July 15, 1910.*

situation; and order was restored. The methods by which this result had

been achieved were the subject of violent attacks on the government in the Cortes, and on the 13th of March Sagasta resigned, but only to resume office five days later. He now returned to the question of the religious orders, and on the 9th of April issued a decree proclaiming his intention of enforcing that of the 19th of July 1901. The attitude of the Church was practically one of defiance. The nuncio, indeed, announced that the papacy would be prepared to discuss the question of authorization, but only on condition that all demands for such authorization should be granted. To avoid a crisis at the time when the young king was about to come of age, the government yielded; and on the 10th of May Sagasta announced that a modus vivendi with the Vatican had been established.

King Alphonso XIII., whose enthronement took place with all the antique ceremonial on the 17th of May, was himself at Enthrone' the outset under clerical and reactionary influences, meat of and his contemptuous treatment of ministers — who xfii "1902 at tne ceremonial functions were placed wholly in ' the background — seemed to argue an intention of ruling personally under the advice of the court camarilla} This impression, due doubtless to the king's extreme youth and inexperience, was belied in the event; but it served to discredit the Liberal government still further at the time. Senor Antonio Resignation Maura y Montanes, who proved himself later a and Death statesman of exceptional character, seceded to the 0/ Sagasta. Conservatives. On the 7th of November Sagasta himself resigned, resumed office temporarily on the 14th, and handed in his final resignation on the 3rd of December. On the 6th of December a Conservative cabinet was formed under Senor Silvela, Senor Villaverde, pledged to a policy of retrenchment, taking the portfolio of finance.

The death of Sagasta, on the 5th of January 1903, temporarily broke up' the Liberal party, which could not agree on a leader; its counsels were directed for the time by a committee, consisting of Senors Montero Rios and Moret, the marquis de la Vega de Armijo, Senor Salvador and Count Romanones. The Re- publicans, under Salmeron, also had their troubles, Parties. due to tne growing influence of Socialism ; and, finally, the Conservatives were distracted by the rivalries between Silvela, Villaverde and Maura. In the country, meanwhile, the unrest continued. At Barcelona the university had to be closed to stop the revolutionary agitation of the students; in April there were serious riots at Salamanca, Barcelona and Madrid. The result of the new elections to the Cortes, declared on the 26th of April, revealed tendencies unfavourable to the government and even to the dynasty; the large towns returned 34 Republicans. A ministerial crisis followed; Maura resigned; and though the elections to the senate resulted in a large Conservative majority, and though in the lower house a vote of confidence was carried by 183 to 81, Silvela himself resigned shortly afterwards. Senor Villaverde was now called villaverde upon to form a

cabinet. His government, however, Ministry, accomplished little but the suppression of renewed 1904. troubles at Barcelona. His programme included

drastic proposals for financial reform, which necessarily precluded an adventurous policy abroad or any additional expenditure on armaments, principles which necessarily brought him into conflict with the military and naval interests. On the 3rd of December Villaverde was forced to resign, his successor being Senor Maura. Meanwhile, on the 24th of November, the Liberal party had been reconstructed, as the Democratic party, under Senor Montero Rios.

Senor Maura, as was to be proved by his second administra- tion, represented the spirit of compromise and of conservative First Maura reform. His position now was one of singular diffi- Mlnlstry, culty. Though a Catholic, he had to struggle against the clerical coterie that surrounded the king, and had not influence enough to prevent the appointment of Monsignor Nozaleda, formerly archbishop of Manila and a prelate of notoriously reactionary views, to the important 1 Ann. Register (1902), p. 347.

see of Valencia. His concessions to the demands of the ministers of war and marine for additional estimates for the army and navy exposed him to the attacks of Villaverde in the Cortes; and still fiercer criticism was provoked by the measure, laid by him before the Cortes on the 23rd of June, for the revision of the concordat with Rome, and more especially by the proposal to raise a loan at 4 % to indemnify the religious orders for their estates con- fiscated during the Revolution. Violent scenes greeted the attempt of the government to procure the suspension of the parliamentary immunities of 140 deputies, accused or suspected of more or less treasonable practices, and when, on the 4th of October, the Cortes reopened after the summer recess, Senor Romero Robledo, the president of the lower house, opened an attack on the ministry for their attempted breach of its privileges. Furious debates followed on this, and on the subject of Maura's financial proposals, which were attacked by the Conservative Villaverde and the Liberal Moret with impartial heat. On the 14th of December Ministry. Maura resigned an impossible task and King Alphonso made General Azcarraga head of a narrowly Clerical- Conservative cabinet.

The new ministry, confronted by a rapidly spreading revolu- tionary agitation and by a rising provoked by a crop failure and famine in Andalusia, survived scarcely a month, villaverde On the 26th of January 1905 Azcarraga resigned, Ministry, and two days later Senor Villaverde once more became prime minister. He was in no hurry to summon the Cortes, partly because the elections to the provincial councils were due in

March, and these had to be manipulated so as to ensure the return of a Senate of the right colour, partly because the convocation of the Cortes seemed at best a necessary evil. Already the discredit of parliamentary government was being evidenced in the increased personal power of the young king. Alphonso was now shaking himself loose from the deadening influence of the reactionary court, and was beginning to display a disconcerting interest in affairs, information about which he was apt to seek at first hand. The resignation of the see of Valencia by Archbishop Nozaleda was a symptom of the new spirit. This was none the less distasteful to the Republicans, who thundered against personal government, and to the Liberals, who clamoured for the Cortes and the budget. The Cortes met at last on the 14th of June, and the upshot justified Villaverde's reluctance to meet it. Attacked by Maura and Moret alike, the prime minister (June 20) accused his former colleague of acting through personal pique; on a motion of confidence, however, he was defeated by 204 votes to 54, and resigned. He died on the 15th of July following, within a few weeks of his former leader and colleague Silvela.

The Liberals now once more came into power under Sefior E. Montero Rios, Senor Moret having refused the premiership. The government programme, announced with a Montero view to influencing the impending elections, included Rios financial reform, reform of the customs, modifica-Miaistrj; tion of the octroi, and the question of the concordat with Rome. The result of the elections was a substantial Liberal majority in both houses. The government was none the less weak. Quarrels broke out in the cabinet between Senor Jose Echeray. the distinguished banker and famous dramatist, who as minister of finance was intent on retrenchment, and General Weyler, who as minister of war objected to any starving of the army. On the 27th of October, scarcely a fortnight after the opening of the session, the government resigned. At the instance of the king, who was going abroad, Sefior Montero Rios consented indeed to resume office; but his difficulties only increased. The price of corn rose, owing to the reimposition by the government, before the elections, of the import duties on corn and flour; and in November there was serious rioting in Seville, Granada, Oviedo, Bilbao and Valencia, while in Catalonia the Separatist movement gathered Ministry. such force that on the 29th martial law was proclaimed throughout the province. The same day the government finally resigned. Sefior Moret now accepted the

premiership; he took over Senor Echeray's budget, while General Weyler was replaced at the war office by General Luque.

The great constitutional parties had broken up into quarrelling groups just at the time when, as it seemed, the parties of reaction were concentrating their forces. Not the least ominous symptom was the attitude of the officers, who, irritated by newspaper attacks on their conduct in Catalonia more especially, demanded that all crimes against the army should be tried by the councils of war. The prolonged controversies to which this gave rise were settled on the 18th of March by a compromise passed by the Cortes; under this act all cases of press attacks on officers were to be tried by the courts martial, while those against the army generally and the national flag were still to be reserved for the civil courts. The singular weakness of the govern- ment revealed by this abdication of part of the essential functions of the civil power would have led to its speedy downfall, but for the truce cried during the festivities con- nected with the marriage of the king with Princess Victoria Eugenie Ena of Battenberg, which took place on the 31st of May.

The king's marriage was in many respects significant. In spite of the young queen's " conversion " and the singular distinction conferred on her by the papal gift of the golden rose, xiu° nS ° the " Protestant " alliance marked a further stage in Alphonso XIII. 's emancipation from the tutelage of the Clerical-Conservative court. He was, indeed, increasingly displaying a tendency to think and act for himself which, though never over-stepping the bounds of the constitution, was some- what disconcerting to all parties. His personal popularity, too, due partly to his youth and genial manners, was at this time greatly increased by the cool courage he had shown after the dastardly bomb attack made upon him and his young wife, during the wedding procession at Madrid, by the anarchist Matteo Morales. 1 Whatever his qualities, the growing entangle- ment of parliamentary affairs was soon to put them to the test. For the coronation was hardly over when Senor Moret resigned, Lopez- anc ' on tne 6th of July Captain-General Lopez- Domiaguez Dominguez became head of a cabinet with a frankly Ministry, anti-clerical programme, including complete liberty ' of worship, the secularization of education, and the

drastic regulation of the right of association. The signature by the king of an ordinance giving legal validity to the civil C i vn marriages of Catholics aroused a furious agitation

Marriage among the clergy, to which bounds were only set Question, by tjje threat of the government to prosecute the bishop of Tuy and the chapter of Cordova. In the session 1906- 1907 the most burning subject of debate was the new Associa- tions Law, drawn up by Senor Davila. Even in the Liberal

ranks the question aroused furious differences of opinion; Senor Montero Rios, the president of the senate, denounced the "infamous attacks on the church"; the government itself showed a wavering temper in entering on long and futile negotia- tions with the Vatican; while in January 1907 the cardinal archbishop of Toledo presented a united protest of the Spanish episcopate against the proposed law. This and other issues produced complete disunion in the Liberal party. Already, on the 27th of November, Lopez-Dominguez had resigned; his Vegade successor, Moret, had at once suffered defeat in the Armijo house and been succeeded in his turn, on the 4th of Ministry, December, by marquis de la Vega de Armijo. The ' question was now mooted in the cabinet of dropping the Associations Law; but on the 21st of January Senor Canalejas, president of the lower house, who was credited with having inspired the bill, publicly declared that in that event he would cease to support the government. By the 24th the cabinet had resigned, and a Conservative government was in office under Senor Maura as premier.

The administration of Senor Maura, which lasted till the 21st of October 1900. marks an important epoch in the history of

1 The king's reckless daring was destined later to impair his popularity, for in an enthusiastic motorist blind courage is a quality apt to be exercised at the expense of others.

modern Spain. The new premier was no mere party politician, but a statesman who saw the need of his country, on the one hand for effective government, on the other hand for second education, so as to enable it ultimately to govern Maura itself. Though a sincere Catholic, he was no Clerical, Administra- as was proved by his refusal to withdraw the ' °"" ordinance on civil marriage. The main objects that he set before himself were, firstly, the maintenance of order; secondly, the reform of local government, so as to destroy the power of the Caciques and educate the people in their privileges and responsibilities. The dissolution of the Cortes produced a cer- tain rearrangement of parties. The Liberal groups, as usual when in opposition, coalesced. The Republicans, on tlie other hand, split into sections; in Barcelona, Tarragona and Gerona they were Separatists, while a new party appeared under the name of Solidarists, consisting of Separatists, Carlists and Social- ists. The elections in April resulted in a sweeping Conservative victory— the government secured a majority in the lower house of 88 over all other groups combined. As for the " dynastic opposition," it was reduced to a rump of 66 members, a result so unsatisfactory from the point of view of the monarchy that the government offered to quash certain Conservative returns in order to provide it with more seats. The dynastic opposition, however, considered that it had been unfairly dealt with in the conduct of the elections; and though, out of

consideration for the dynasty (an heir to the throne having been born on the 10th of May), they attended the opening of the Cortes on the 13 th of May, the Liberals refused to take part in the session that followed, which lasted till the 29th of July. When, cocal however, the Cortes reopened on the 10th of October, Admialstra- the dynastic opposition was once more in its Mo" Reform. place. It was now that Senor Maura brought in his Local Administration Bill, a measure containing 429 clauses, the main features of which were that it largely increased the responsibility of the local elected bodies, made it compulsory for every elector to vote, and did away with official interference at the polls. The bill met with strenuous opposition, and on the 23rd of December 1907 the Cortes adjourned without its having been advanced.

At the close of the year an Anarchist outrage gave the excuse for the proclamation of martial law in Barcelona, and after the opening of the new session of the Cortes (January 23, 1908) a bill was introduced into the senate giving to the government the most drastic powers for the suppression of Anarchism. Its provisions practically amounted to a complete suspension of the guarantees for civil liberty, it met with the most strenuous opposition, and its final passing by the Senate (May 9) was fol- lowed by a serious crisis. Two months before (March 10-13) King Alphonso, with characteristic courage, had paid a surprise visit to Barcelona, and the general enthusiasm of his reception seemed to prove that the disaffection was less widespread or deep than had been supposed. In the circumstances, Sefior Maura dropped the Suppression Bill, and the king issued an ordinance re-establishing constitutional guarantees in Catalonia.

This good feeling was unfortunately not destined to be of long duration; and in the following year the struggle between the antagonistic forces in Spain once more produced a perilous crisis. The Local Administration Bill, after being debated for two sessions, passed the lower house on the 13th of February 1909, having at the last moment received the support of the Liberal Senor Moret, though the Radicals as a whole opposed it as gratifying to Sefior Cambo, the Regionalist leader, and there- fore as tending to disintegration. Though ruling in the spirit of an enlightened despotism rather than in that of a constitu- tional government, Senor Maura had succeeded in doing a notable work for Spain. It was inevitable that in doing so he should incur unpopularity in many quarters. His efforts to recon- struct the Spanish navy were attacked both by the apostles ol retrenchment and by those who saw in the shipbuilding con- tracts an undue favouring of the foreigner; the Marine Industries Protection Act was denounced as favouring the large ship^ owners and exporters at the expense of the smaller men; the

Compulsory Education Act as " a criminal assault on the rights of the family." His ecclesiastical policy also exposed him to the fate of those who take the middle way; the Liberals denounced the minister of education, Don F. Rodriguez San Pedro, for making concessions to the teaching orders, while the archbishops of Burgos and Santiago de Composfella fulminated against the government for daring to tax the congregations. In his reforming work Senor Maura had an active and efficient lieutenant in the minister of the interior, Senor La Cierva. Under his auspices laws were passed reforming and strengthening the police force, instituting industrial tribunals, regulating the work of women and children, introducing Sunday rest, early closing, and other reforms. In short, the government, whatever criticism might be levelled at its methods, had accomplished a notable work, and when on the 6th of June 1909 the Cortes adjourned, its position seemed to be assured.

Its downfall was ultimately due to the development of the crisis in Morocco. This is described elsewhere (see Morocco: Morocco History) ; here it is only proposed to outline the effects Crisis. of its reaction upon the internal affairs of Spain. The trouble, long brewing, broke out in July, with the attack by the Riff tribesmen upon the workmen engaged on the railway being built to connect Melilla with the mines in the hills, held by Spanish concessionaires. The necessity for strengthen- ing the Spanish forces in Africa had for some time been apparent; but Sefior Maura had not dared to face the Cortes with a demand for the necessary estimates, for which, now that the crisis had become acute, he had to rely on the authorization of the council of state. The spark was put to the powder by the action of the war minister, General Linares, in proposing to organize a new field force by calling out the Catalan reserves. This sum- moned up too vivid memories of the useless miseries of former over-sea expeditions. On the 26th of July a general strike was proclaimed at Barcelona, and a movement directed at first against the " conscription " rapidly developed into a revolu- tionary attack on the established order in church and state. Barcelona The city, a colluvies gentium, was seething with Rising of dangerous elements, its native proletariat being July 1909. reinforced by emigrants returned embittered from failure in South America and a cosmopolitan company of refu- gees from justice in other lands. The mob, directed by the revo- lutionary elements, attacked more especially the convents and churches. From the city the revolutionary movement spread to the whole province. In Barcelona the rising was suppressed after three days' street fighting (July 27-29). On the 28th martial law was proclaimed throughout Spain; and now began a military reign of terror, which lasted

until the end of September. In the fortress of Monjuich in Barcelona were collected, not only rioters caught red-handed, but many others— notably journalists — whose opinions were obnoxious. The greatest sensation was caused by the arrest, on the 31st of August, of Sefior Ferrer, a theoretical anarchist well known in many countries for his anti-clerical educational work and in Spain especially as the founder of the " lay schools." He was accused of being the chief instigator of the Barcelona rising, was tried by court martial (Oct. 11-13), and shot. This tragedy, which rightly or wrongly aroused the most wide- spread indignation throughout Europe, produced a ministerial crisis in Spain. The opening of the October session of the Cortes was signalized by a furious attack by Senor Moret on Senores Maura and La Cierva, who were accused of having Fallot sacrificed Ferrer to the resentment of their clerical Maura. task-masters. The government had been already weakened by the news of Marshal Marina's reverse in Morocco (Sept. 30); to this new attack it succumbed, Sefior Maura resigning on the 21st of October 1909.

On the 22nd the formation of a new cabinet under Sefior Moret was announced. It was from the first in a position of Moret singular weakness, without a homogeneous majority Ministry, in the Cortes, and depending for its very existence 1909-1910. on { ne uncer tain support of the extreme Left and the Republicans. For three months it existed without daring

to put forward a programme. It sent General Weyler to keep Barcelona in order, caused the release of most of the prisoners in Monjuich, reduced the forces in Morocco, reopened negotia- tions with Rome for a modification of the concordat, and on the 31st of December, the end of the financial year, was responsible for the issue of a royal decree stating that the budget would remain in force until the Cortes could pass a new one. But, meanwhile, the municipal elections, under the new Local Administration Law, had resulted in a triumph of the Liberals (Dec. 12). Senor Moret now considered the time ripe for a dissolution; the king, however, refused to consent, and on the 9th of February 1910 the ministry resigned. The new cabinet, with Senor Canalejas as president of the council, in- cluded members of the various Liberal and Radical canalejas groups: Garcia Prieto (foreign affairs), Count Ministry, Sagasta (interior), General Aznar (war), the Demo- 19W ' crat Arias Miranda (navy), Cobian, a strong Catholic though a Liberal (finance), Ruiz Valarino, a Democrat (justice), Calbeton (public works) and Count Romanones, who advocated a liberal settlement with the Church (education).

Though at once denounced by Senor Moret as " a democratic flag being used to cover reactionary merchandise," 1 the name of Canalejas was in itself a guarantee that the burn- Quarrel ing question of the relations of the state to Rome with the and the religious orders would at last be taken in

Vatican. hand, while the presence of so many moderate elements in his cabinet showed that it would be approached in a conciliatory spirit. A beginning was made with the issue of a circular by the minister of finance (March 18), ordering the collection of taxes from all religious bodies carrying on commercial and industrial enterprises. What more could be done would depend on the result of the elections necessitated by the dissolution of the Cortes on the 15th of April. Count Romanones, desiring to educate the electors, had been busy establishing schools; but the sweeping victory of the Liberals at the polls 2 was prob- ably far more due to the fact that this was the first election held under Senor Maura's Local Administration Act, and that the ignorant electors, indignant at being forced to vote under penalty of a fine, where they did not spoil their ballot papers, voted against the Conservatives as the authors of their grievance.

The government was thus in a position vigorously to pursue its religious policy. On the 31st of May the official Gacela published a decree setting forth the rules to which the religious associations would have to submit. It was pointed out that, in conformity with the decree of the 9th of April 1902, it had become necessary to coerce those congregations and associa- tions which had not fulfilled the formalities prescribed by the law of 1887, and also those engaged in commerce and industry which had not taken out patents with a view to their taxation. It further ordered that all foreign members of congregations were to register themselves at their respective consulates, in accordance with the decrees of 1901 and 1902. On the nth of June a further and still more significant step was taken. A royal ordinance was issued repealing that signed by Canovas del Castillo (Oct. 23, 1876), immediately after the promul- gation of the constitution of 1876, interpreting the nth article of the constitution, by which the free exercise of all cults was guaranteed in Spain. The article in question forbade " external signs or public manifestations of all religious con- fessions with the exception of that of the state," which was defined by Canovas del Castillo as meaning " any emblem, attribute or lettering which would appear on the exterior walls of dissident places of worship." s In the speech from the throne at the opening of the new Cortes (June 16) the king declared that his government would " strive to give expression to the

1 The Times (Feb. 18, 19 10).

2 The composition of the new parliament was as. follows — Senate: Ministerialists, 103; Conservatives, 42; Regionalists, 5; Republicans, 4; Carlists, 3; miscellaneous groups, 11. Lower House: Ministeri- alists, 227 ; Conservatives, 105 ; Republicans, 42 ; Carlists, 9 ; Catalans, 7 ; Integrists, 2 ; Independents, 9 ; unattached, 3.

3 The Times (June 13, 1910).

public aspirations for the reduction and control of the excessive number of orders and religious orders, without impairing their independence in spiritual matters," and in introducing a bill for the amendment of the law of 1887 Sefior Canalejas declared that the government, " inspired by the universal spirit of liberty of conscience," had given to article xi. of the constitution " the full sense of its text." 1

" Liberty of conscience," a principle condemned by the Syllabus of 1864 and sneered at in the encyclical Pascendi gregis of 1905, was hardly a phrase calculated to conciliate the Spanish clergy, still less the Vatican. A cry went up that to allow dissident churches to announce their presence was to insult and persecute the Catholic Church ; 2 at Rome the decree was attacked as unconstitutional, and a breach of diplomatic propriety all the more reprehensible as negotiations for a revision of the con- cordat were actually pending. A violent clerical agitation, encouraged by the Vatican, was started, 72 Spanish archbishops and bishops presenting a joint protest to the government. Fuel was added to the fire by the introduction of a bill — known as the Cadenas bill— forbidding the settlement of further congre- gations in Spain until the negotiations with the Vatican should have been completed. This was denounced at Rome as a uni- lateral assertion on the part of the Spanish government of an authority which, under the concordat, belonged to the Holy See as well. As a preliminary to negotiation, the government was required to rescind all the obnoxious measures. This demand broke the patience of the prime minister, and on the 30th of July Serior de Ojeda, Spanish ambassador at the Vatican, was instructed to hand in his papers. In Vatican circles dark hints began to be dropped of a possible rapproche- ment with Don Jaime, who had succeeded his father Don Carlos, on the 18th of July 1909, as the representative of Spanish legitimacy and Catholic orthodoxy. The pretender, indeed, disclaimed any intention of stirring up civil war in Spain ; his mission would be to restore order when the country should have wearied of the republican regime whose speedy advent he foresaw. The fulfilment of the first part of this prophecy seemed to some to be brought a step nearer by the overthrow of the monarchy in Portugal on the 5th of October 1910. For Spain its immediate effect was to threaten a great increase of the difficulties of the government, by the immi- gration of the whole mass of religious congregations expelled from Portugal by one of the first acts of the new regime.

(W. A. P.)

Chronological Tables of Christian Dynasties in Spain.

Kings of the Visigoths, having relations with Spain, but not established within it: —

569

Kings of the Visigoths established in Spain :-

Ataulf . . Sigcric . Wallia . .

Thcodoric I.

Thorismund Theodoric II Euric Alaric II. .

Gesalic . Amalaric

410-415

415 415-419

419-451

451-453 453-466 466-485 485-507

507-511 507-531

Entered the north-east of Spain, murdered at Barcelona.

His murderer, promptly mur- dered in turn.

Elected king, was the ally (foe- deratus) of the empire. De- feated the Vandals and Alans. Migrated to south-west of France with all his people.

Made inroads into Spain, as ally of the empire. Killed in the battle with Attila.

All these kings had the seat of their government north of the Pyrenees. They made inroads in Spain and had a stronghold on the north-east. Alaric was killed by the Frankish king, Clovis, at Vouill6, 507.

Bastard son of Alaric, was mur- dered.

Reigned in south and south-east of France under protection cf Theodoric, the Ostrogothic king in Italy. Fled before Franks to Barcelona at end of reign, and was murdered at Barcelona.

Theudis

Theudigisel . .

548-549

Agila . . .

549-554

Athanagild .

554-567

Liuva I.

567-572

Leovigild

567-586

Reccared

Liuva II. .

Witteric .

Gunthemar . Sisebut . Reccared II.

Swintella Reccimer

Sisinand

Chintila.

Tulga

Chindaswinth

Recceswinth

Wamba .

Erwic Egica Witiza Roderic .

531-548

586-601

601-603

603-610

610-612 612-620 620-62 1

621-631 ~|

621-631 J

631-636 636-640 640-641 641-652 649-672

672-680

680-687 687-701 697-710 710-711

An Ostrogoth, general of Theodo- ric. Murdered Amalaric, and was murdered in turn at Seville by Theudigesil.

Murdered by Agila.

Murdered at Merida.

Rebelled against Agila, evacuated Andalusia to secure aid of Imperial officers. Established the capital at Toledo.

Elected at Narbonne. Associated his brother Leovigild with him- self.

The first Visigoth king who as- sumed the diadem and purple, struck coins in his own name, and enforced recognition of his supremacy in all parts of Spain, except the south coast.

Son. Associated with his father. The first Visigoth king who was a Catholic.

Son. Soon murdered.

Leader of Arian reaction.

Obscure kings.

Associated his family with him on the throne. They were all de- posed by the nobles.

These kings were mainly sup- ported by the clergy, and were engaged in endeavouring to make the crown hereditary, by associating their kinsmen with themselves.

Unrelated to his predecessor and elected by the nobles — was de- posed

and tonsured.

The most obscure of the Visigoth kings. Egica and Witiza ap- pear to have continued the struggle with the nobles, by whom Roderic was tumultu- ously elected, in opposition to Witiza's son Actula.

Early kings of the Christian north-west of Spain, of uncertain chronology and relationship : —

Pelayo . . Favila . Alphonso I. . .

718-737 737-739 739-757

Elected as " king of the Goths." Brother of Pelayo. Son-in-law of Pelayo.

Froila

Aurelio . Silon Maurecat .

757-768

768-774 774-785 785-789

Son of Alphonso I. Murdered by

his brother. Brother or cousin. Brother-in-law of Aurelio. Bastard son of Alphonso I.

Bermudo

789-792

Called the Deacon, descendant of Alphonso I., reigned for a very short time, and retired to a religious house.

Alphonso II.

792-842

Called the Chaste, son of Froila. Was perhaps chosen in opposi- tion to Eermudo.

Ramiro I. . Ordono I. . Alphonso III. .

842-850 850-866 866-914

Son of Bermudo the Deacon. Son of Ramiro. Son of Ordono.

[HISTORY

Period of the small kingdoms, unions, separations and reunions ; the sons of Alphonso III. having rebelled, and forced a division of the kingdom near the close of the king's reign : —

Garcia

Ordono II. .

Fruela

Alphonso IV.

Ramiro II.

Ordono III.

Sancho I., " The Fat."

Ramiro III.

Bermudo II., " The Gouty "

Alphonso V.

Bermudo III.

!

Fernando I., or Ferdinand.

910-913 913-923

923-924

924-931

931-950

950-955 955-967

967-982

982-999

999-1027

1027-1037

1027-1065

Took Leon, which then included Bardulia, or Castile, as the eldest son.

Second son; became king in Gallicia which included north- ern Portugal and acquired Leon on the death of his brother Garcia.

Third brother; held Asturias, and was king of all north-west for a short time after death of Ordono.

Son of Ordono ; became a monk at Sahagun, and was succeeded by his brother Ramiro.

In his reign Castile broke away from Leon, under the count Fernan Gonzales.

Son of Ramiro.

Half brother of Ordono III. and son of Ramiro II. by his second marriage with a daughter of Sancho Abarca of Navarre. Was driven out by his nobles, in alliance with Fernan Gon- zales, count of Castile, and restored by the caliph. The rebels put Ordono, son of Alphonso IV., on the throne for a time.

Son of Sancho. Succeeded as a boy. His reign was a period of anarchy.

Son of Ordono III., was supported against his cousin Ramiro III. by the nobles, and was placed on the throne by the Hajib Mansur.

Son of Bermudo. Began the restoration of the kingdom after the period of anarchy, and subjection to the caliphate. Killed at siege of Viseu.

Son of Alphonso V. ; was killed in battle at Tamaron with his brother-in-law Ferdinand, count and then first king of Castile.

Son of Sancho el Mayor of Navarre, king of Castile by right of his mother, and of Leon and Gallicia by the sword.

Counts of Castile

The counts of Castile began, as a body, and not as a line of chiefs in the

reign of Alphonso the Chaste (789-842). They strove for independence from the first, and when one count had replaced several they achieved it.

Fernan Gonzales

923-968

Garcia Fernandez Sancho Garcia Garcia .

968-1006 1006-1028 1028

Made himself independent of Leon. One of his daughters married Ordono III. of Leon. By a second marriage with a daughter of Sancho Abarca of Navarre he had a son and successor.

Son.

Son.

Murdered. Castile then passed to Garcia's sister, trie wife of Sancho el Mayor of Navarre.

Early Kings of Navarre

The early history of Navarre has been overlaid with fable, and with pure falsification, largely the work of the Benedictines of San Juan de la Pefia near Huesca. Their object was to prove the foundation of their house by a king of Navarre, Aragon and Sobrarbe, in the 9th century. They were helped by the patriotism of the Aragonese, who wished to give their kingdom an antiquity equal to that of Leon. Hence much pure invention, bolstered up by forgery of charters, falsification of genuine ones, and construction of imaginary pedigrees!

Sancho Abarca, i.e. Brogues

Garcia Sanchez . Sancho Garcia Garcia Sanchez "TheTrembler"

Sancho el Mayor

Garcia III. Sancho IV.

906-926

926-966 966-993 993-1000

1000-1035

1035-1054 1054-1076

Made himself independent king at Pamplona. He fought with the Carolingian counts of the marches, and in alliance with the Spanish Mahommedan Beni Casi of Saragossa.

Very obscure. The most un- doubted personality of the time is Tota (Theuda), widow of Sancho Abarca, who gov- erned for her son and whose daughters were married to the kings of Leon and counts of Castile.

Son of "The Trembler." He married a daughter of Sancho Garcia, count of Castile. On the murder of Garcia, the last count, he took Castile by right of his wife. He inherited, or acquired, superiority over the central Pyrenean regions of Aragon and Sobrarbe. He di- vided his various dominions — Navarre to Garcia, Castile to Fernando, Sobrarbe to Gonzalo, and Aragon to Ramiro San- chez, a natural son.

Killed in battle with his brother Fernando of Castile and Leon at Atapuerca.

Son. Murdered by his natural brother Ramon at Pefialen. The Navarrese then chose Sancho Ramirez of Aragon as king. The kingdoms remained united till 1 134.

Historic kingdom of Aragon : —

Ramiro Sanchez

Sancho I.

Pedro I. . . .

Alphonso I."The Battler."

Ramiro II.

Petronilla

1035-1067

1067-1094

I 094- 1 102

1102-1134

II34-II37

1137-1164

Natural son of Sancho el Mayor of Navarre, who on the death of his legitimate brother Gon- zalo, annexed Sobrarbe. The kingdom of Sobrarbe lasted only during the life of Gonzalo.

Son of Ramiro. Was killed while besieging Huesca.

Son of Sancho.

Second son of Sancho. He took Saragossa from the Moors, and was married to Urraca, queen of Castile and Leon.

Third son of Sancho. A monk, who was exclaustrated alter the death of Alphonso, but re- turned to the cloister on the birth of his daughter Petronilla.

Married to Ramon Berenguer, count of Barcelona, who be- came king by right of his wife.

The Early Counts of Barcelona In the last years of the 8th and beginning of the 9th century, Charlemagne and Louis the Pius began conquering the north-east ot Spain, which the Arabs had occupied as early as 713. By 811 the Franks had conquered as far as Tortosa and Tarragona. The territory gained was called the Marca Hispanica, and was governed by counts of Roussillon, Ampurias, Besaltu, Barcelona, Cerdena, Pallars and Urgell. They became independent during the decadence of the Carolingians. The supremacy was acquired gradually by the

counts of Barcelona who became independent with Wilfred I. by 874. He and his immediate descendants gradually ˆubdued the other counts. They suffered much from the inroads of Mansur in the 10th century, but on the decline of the caliphate, they took part in the general advance.

Berenguer Ramon I.

Ramon Berenguer, “The Old.”

Ramon Berenguer II.

and Berenguer Ramon II.

Ramon Berenguer

Ramon Berenguer

101 8-1035

i035-i°7°

1076-1082 1076-1082

1082-1131

1131-1162

Held Barcelona, Vich and Manresa with land con- quered from the Moors to the south.

Son. His father had divided his possessions between his widow and all his sons, but Ramon Berenguer reunited them by force. He left his dominion to be held in common by his two sons.

Ramon Berenguer II. Cap d'estops (" Tow Pow ") was murdered by Berenguer Ramon II., whose end is unknown.

Son of Ramon Berenguer II. By his marriage with Aldonza or Douce of Pro- vence he acquired territory in south-eastern France. He inherited or subdued all the other countships of Catalonia, except Peralada

Son. Inherited the Spanish possessions of his father, the French going to a brother. Was betrothed to Petronilla of Aragon, and married her in 1150, becoming king of Aragon.

Second period of the union, disunion and reunion of Castile and Leon from Fernando I. to Fernando III. Fernando I. divided his dominions among his three sons: to Sancho, the eldest, Castile; to Alfonso, the second son, Leon; to Garcia, the third son, Gallicia.

Sancho II. . Alphonso VI. Urraca . Alphonso VII.

Sancho III. . Fernando II. Alphonso VIII. Alphonso IX.

Henry I. Berengaria

Fernando III.

1065-1072

I 065-1 109

1109-1126 1126-1157

1 157-1 1 58 1157-1188 1158-1214

U 88-1 230

1214-1217 1217-

1217-1252

He expelled Alphonso and Garcia, reuniting the three kingdoms. Murdered at Zamora.

Returned from exile, obtained all the three kingdoms, and im- prisoned Garcia for life.

Daughter of Alphonso VI., and widow of Raymond of Bur- gundy.

Son. Recognized as king in Gallicia during his mother's life. Divided his kingdoms between his sons; to the elder Sancho, Castile, to the younger, Fernando, Leon.

In Castile.

In Leon.

Castile. Son of Sancho III.

Leon. Son of Fernando II. Is numbered IX. because he was junior to the cousin Alphonso of Castile.

Castile. Son of Alphonso VIII.

Daughter of Alphonso VIII. Married to Alphonso IX. of Leon, but the marriage was declared uncanonical by the pope. The children were de- clared legitimate. Berengaria resigned the crown of Castile to her son Fernando by the uncanonical marriage with Alphonso IX. of Leon.

Inherited Leon on the death of his father Alphonso IX., and united the crowns for the last time, in 1230.

Castile and Leon till the Union With Aragon. Fernando III. was king of Castile and Leon from 1230 to 1252.

Alphonso X.

1252-1284

Eldest son of Fernando III.

Sancho IV. .

1 284-1 295

Second son of Alphonso. X. Was preferred to the sons of his elder brother Ferdinand de la Cerda, who died in Alphonso's lifetime.

Ferdinand IV. .

1295-1312

Son of Sancho.

Alphonso XI. .

1312-1350

Son of Ferdinand IV.

Peter "The Cruel"

1350-1369

Son of Alphonso XI.

Henry II.

1 369-1 379

Natural son of Alphonso IX. He deposed and murdered Peter, and founded the line of the new kings.

John I. . . .

1 379-1 390

Son of Henry II.

Henry III. . .

1 390-1 406

Son of John I.

John II. . .

1406-1454

Son of Henry III.

Henry IV. . . Isabella .

1454-1474 1 474-1 504

Son. The legitimacy of the daughter of his second marriage was not recognized, and the crown of Castile passed to his sister, who married Ferdinand of Aragon. The marriage united the crowns in 1479.

Aragon, from the union with the county of Barcelona, to the union with Castile: —

Alphonso II.

Peter II. . .

James I., " The

Conqueror."

Peter III. .

Alphonso III. James II.

Alphonso IV. Peter IV. .

John I. . . Martin . .

Ferdinand I.

Alphonso V. John II.

Ferdinand II.

1162-1196

1196-1213 1213-1276

1276-1285

1285-1291 1291-1327

i3 2 7-!336

1336-1387

1387-1395

1 395-I4IO

1412-1416

1416-1458 1 458-1 479

1479-1516

Son and successor of Petronilla and Ramon Berenguer IV. Recovered the Provencal pos- sessions of Ramon Berenguer II.

Son. Killed at Muret.

Son. Conquered the Balearic Islands and Valencia. Left the islands to his son James, from whom the title passed in succes- sion to Sancho (d. 1324), his eldest son, to Sancho's nephew James (d. 1349), and to another James, his son (d. 1375); but the actual possession was re- covered by the elder line before the extinction of the younger branch.

Eldest son. Conquered Sicily, claimed by right of his wife Constance, daughter of Man- fred of Beneventum.

Eldest son. Succeeded to Spanish possessions.

Second son of Peter III. He had succeeded to Sicily, but re- signed his rights, which were then assumed by his brother Frederick, who founded the Aragonese line of kings of Sicily.

Son of James II.

Finally reannexed the Balearic Islands.

Son by the marriage of Peter IV. with his cousin Eleanor of the Sicilian line.

Younger brother of John I. His son Martin was chosen king of Sicily ,_ but died in 1409. The male line of the kings of Aragon of the House of Barcelona ended with Martin.

Second son of Eleanor, sister of Martin, and wife of John I. of Castile. Succeeded by choice of the Cortes.

Son. Spent most of his life in Italy, where he was king of Naples and Sicily.

Brother of Alphonso V., whom he succeeded in the Spanish pos- sessions, and Sicily, but not in Naples.

Son. His marriage with Isabella united the crowns.

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Navarre till the conquest of Ferdinand the Catholic:

SPAIN

[HISTORY

Garcia IV.

Sancho VI . , called

” The Wise ” Sancho VII. Theobald I.

Theobald II. Henry I. Jeanne I.

Jeanne II. Charles II., called

” The Bad ” Charles III., “The

Noble ” John I. of Aragon

i i 34-1 i 50

1150-1194

1 194-1234 1 234-1 253

1253-1270 1270-1274 1274-1305

Francis Phoebus Catherine

1328-1349 1349-1387

1387-1425 ‘ 1425-1479

1479-1483 1483-1514

A descendant of Sancho el Mayor. Elected by theNavar- rese on the death of Alphonso of Aragon without issue.

Son. Father of Berengaria, wife

of Richard Cceur de Lion. Son. Died without issue. Husband of Blanche, daughter of Sancho " The Wise."

Son. Died without issue.

Brother.

Daughter, wife of Philip IV. of France. Navarre was now absorbed in France, and so remained till 1328, when on the death of Charles IV. of France, the last of the house of Hugh Capet, it passed to his niece Jeanne, daughter of Louis X., and wife of Philip, count of Evreux.

Son. These two kings were much concerned with France, and little with Spain.

King of Navarre by right of his wife Blanche, daughter of Charles III. On his death Navarre passed to his daugh- ter by Blanche, Eleanor, widow of Gaston IV., count of Foix. She died in the same year as her father, and Navarre passed to her grand- son, Francis Phoebus.

Died without issue, and was succeeded by his sister, the wife of Jean D'Albret. The Spanish part of Navarre was conquered by Ferdinand the Catholic in 1512.

Kings of United Spain

Joan, "The Mad'

Charles I. in Spain

Philip II. .

Philip III. .

Philip IV. .

Charles II. .

Philip V. .

Ferdinand VI. Charles III. . Charles IV. .

1 504-1 520

1516-1556

1 556-1 598

1598-1621 1621-1665 1 665-1 700 1 700-1 746

I746-I759

1 759-1 788 1 788-1 808

Daughter of Isabella, whom she succeeded in Castile, with her husband Philip I., of Habsburg. After his death, her father Ferdinand was guardian and regent.

Son of Joan. Was recognized as king with his mother; elected to the empire as Charles V.

Son. Succeeded on abdication of Charles V.

Son.

Son.

Son. Died without issue.

Succeeded by the will of Charles II., as grandson of Maria Tere- sa, daughter of Philip IV., and of Louis XIV., king of France. With him began the line of the Spanish Bourbons. He abdi- cated for a few months in 1724-1725 in favour of his son Louis, but resumed the crown when Louis died.

Son by Philip V.'s first marriage with Maria Louisa of Savoy. Died without issue.

Brother. Son of Philip V. by his second marriage with Elizabeth Farnese. Son. He abdicated under pres- i sure in 1808 in favour of his j son Ferdinand, and then re- signed his rights to Napoleon.

Kings of United Spain (continued)

Ferdinand VII.

Isabella II. .

Alphonso XII.

Alphonso XIII.

1808-1833

1 833-1 868

1875-1885

1886-

Was proclaimed king on the forced abdication of nis father. Remained a prisoner in France during the Peninsular War. He repealed the Salic Law estab- lished by Philip V.

Daughter. Her succession was resisted by her uncle Don Carlos, and the Carlist Wars ensued. Deposed.

Son. His mother abdicated in his favour and he was re- stored.

Born after his father's death.

(D. H.)

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(2) Works: The standard general history of Spain written by a Spaniard is that of Don Modesto Lafuente in 30 volumes (1850-1867; new ed., by Valera, 22 vols., Barcelona, 1888). It was written before the medieval period had been properly investigated, is wordy, and largely spoilt by displays of national vanity. A later ' and more critical writer of nearly the same name, Don Vicente de la Fuente, has published valuable Estudios criticos sobre la historia y el derecho de Aragon (1884-1886). No satisfactory general history of Spain has been written by a foreigner. The best is that of M. Romey, Histoire d'Espagne (1843). Don Rafael Altamira has pub- lished an Historia de Espana y de la civilizacion espanola (2 vols., Barcelona, 1900-1902), in which he sums up the results of later research. Among older writers Juan de Mariana, who ends with the Catholic sovereigns, professedly took Livy as a model, and wrote a fine example of a rhetorical history published in Latin (1592-1609), and then in Spanish translated and largely re-written by himself. It was continued to 1600 by Minana. An English translation, with supplements, was published by Captain J. Stephens in 1699. The Anales de Aragon of Geronimo Zurita (1610) are very far superior to the history of Mariana in criticism and

research. The great school of Spanish historians died out with the other glories of the nation in the 17th century. The later periods have been indifferently treated by them, but Don Antonio Canovas del Castillo published some valuable studies on the later Austrian dynasty under the title Estudios del reinado de Felipe IV. (1889). The reader may also consult — for the earlier period — Florian de Ocampo and Ambrosio de Morales, whose combined works are known as the Cronica general de Espana (fol. editions, 1543-1586, republished in 10 small volumes at Madrid, 1791-1792). This was continued by Prudencio de Sandoval, bishop of Tuy and afterwards of Pampeluna, under the title of Hist, de los reyes de Costilla y de Leon: Fernando I.-Alonso VII. Both ancient and later times are dealt with in the Historia general de Espana, escrita por individuos de la real academia de la historia (Madrid, 1892 sqq.) — a series of studies by different hands; that on the reign of Charles III., by Sefior Manuel Danvila, is very valuable for the later 1 8th century. An account of the troubled years of the 19th century has been written by Don Antonia Pirala, Historia contempordnea (1871-1879). The latest general history of Spain is Don Rafael Altamira y Crevea's Historia de Espana y de la civilizacion espanola, 3 vols(Barcelona 1902-1906). The standard authority for the Mahommedan side of Spanish history is the Histoire des Musulmans d'Espagne, 711-1110, by R. P. A. Dozy (4 vols., Leiden, 1861). It requires to be supplemented by Don Pascual de Gayongos's transla- tion of Al Makkari's History of the Mahommedan Dynasties in Spain (1840-1843) and by Sefior Francisco Codera's Decadencia y desapari- cion de los Almoravides en Espana (Saragossa, 1899) and Estudios criticos de hist, arabe espanola (ibid., 1903). See also Stanley Lane Poole, The Moors in Spain (" Story of the Nations " Series,' 1887) and S. P. Scott, Hist, of the Moorish Empire in Europe (3 vols., Philadelphia and London, 1904). Other English works, on general Spanish history, are Martin A. S. Hume's Spain, its Greatness and Decay, 1479-1788 (Cambridge, 1898) and Modern Spain, 1788- i8q8 ("Story of the Nations" Series, 1899), and Butler Clarke's Modern Spain, 1815-18Q8 (Cambridge, 1906). Excellent summaries of Spanish history year by year are published in the Annual Register.

LANGUAGE]

SPAIN

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The Spanish Language

The Iberian Peninsula is not a linguistic unit. Not to speak of the Basque, which still forms an island of some importance in the north-west, three

Romance languages share this extensive territory: (i) Portuguese-Galician, spoken in Portugal, Galicia, and a small portion of the province of Leon; (2) Castilian, covering about two-thirds of the Peninsula in the north, centre, and south; (3) Catalan, occupying a long strip of territory to the east and south-east.

These three varieties of the Romana ruslica are marked off from one another more distinctly than is the case with, say the Romance dialects of Italy; they do not interpenetrate one another, but where the one ends the other begins. It has only been possible to establish at the points of junction of two linguistic regions the existence of certain mixed jargons in which certain forms of each language are intermingled; but these jargons, called into existence for the necessities of social relations by bilinguists, have an essentially individualistic and artificial character. The special development of the vulgar Latin tongue in Spain, and the formation of the three linguistic types just enumerated, were promoted by political circumstances. From the 9th century onwards Spain was slowly recaptured from the Mahommedans, and the Latin spoken by the Christians who had taken refuge on the slopes of the Pyrenees was gradually carried back to the centre and ultimately to the south of the Peninsula, whence it had been driven by the Arab invasion. Medieval Spain divides itself into three conquistas — that of Castile (much the most considerable), that of Portugal, and that of Aragon. If a given province now speaks Catalan rather than Castilian, the explanation is to be sought simply and solely in the fact that it was conquered by a king of Aragon and peopled by his Catalan subjects.

1. Catalan. — This domain now embraces, on the mainland, the Spanish provinces of Gerona. Barcelona, Tarragona and Lerida (the old principality of Catalonia), and of Castellon de la Plana, Valencia and Alicante (the old kingdom of Valencia), and, in the Mediterranean, that of the Balearic Islands (the old kingdom of Majorca). Catalan, by its most characteristic features, belongs to the Romance of southern France and not to that of Spain; it is legitimate, therefore, to regard it as imported into Spain by those Hispani whom the Arab conquest had driven back beyond the mountains into Languedoc, and who in the 9th century regained the country of their origin; this conclusion is confirmed by the fact that the dialect is also that of two French provinces on the north of the Pyrenees— Roussillon and Cerdagne. From the 9th to the 12th century Catalan spread farther and farther within the limits of Catalonia, properly so called; in 1229 it was brought to Majorca by Jaime el Con- quistador, and in 1238 the same sovereign carried it to Valencia also. Even Murcia was peopled by Catalans in 1266, but this province really is part of the Castilian conquest, and accordingly the Castilian element took the upper hand and absorbed the dialect of the earlier colonists. The river Segura, which falls into the

Mediterranean in the neighbourhood of Orihuela, a little to the north of Murcia, is as nearly as possible the southern boundary of the Catalan domain; westward the boundary coin- cides pretty exactly with the political frontier, the provinces of New Castile and Aragon not being at all encroached on. Catalan, which by the reunion of Aragon and the countship of Barcelona in 1137 became the official language of the Aragonese monarchy — although the kingdom of Aragon, consist- ing of the present provinces of Saragossa, Huesca and Teruel, has always been Castilian in speech — established a footing in Italy also, in all parts where the domination of the kings of Aragon extended, viz. in Sicily, Naples, Corsica and Sardinia, but it has not maintained itself here except in a single district of the last-named island (ˆAlghero); everywhere else in Italy, where it was not spoken except by the conquerors, nor written except in the royal chancery, it has disappeared without leaving a trace.

In the 13th century the name given to the vulgar tongue of eastern Spain was Catalanesch (Caialaniscus) or Catald (Cata-

lanus) — the idiom of the Catalans. 1 By Catalanesch or Catala was understood, essentially, the spoken language and the lan- guage of prose, while that of poetry, with a large admixture of Provencal forms, was early called Lemosi, Limosi or language of Limousin — Catalan grammarians, and particularly the most celebrated of them, Ramon Vidal de Besalu, having adopted Lemosi as the generic name of the language of the troubadours. These grammarians carefully distinguish the vulgar speech, or pla Catald, from the refined trobar idiom, which originally is a modified form of Provencal. Afterwards, and especially in these parts of the Catalan domain outside of Catalonia which did not acknowledge that they derived their language from that province, Lemosi received a more extensive signification, so as to mean the literary language in general, whether of verse or of prose. To this hour, particularly in Valencia and the Balearics, Lemosi is employed to designate on the one hand the old Catalan and on the other the very artificial and somewhat archaizing idiom which is current in the jochs florals; while the spoken dialect is called, according to the localities, Valencid (in Valencia), Major qui and Menorqui (in Majorca and Minorca), or Catald (in Catalonia) ; the form Catalanesch is obsolete.

The principal features which connect Catalan with the Romance of France and separate it from that of Spain are the following: (1) To take first its treatment of the final vowels — Catalan, like French and Provencal, having only oxytones and paroxy- tones, does not admit more than one syllable after the tonic accent: thus anima gives arma, camera gives cambra. All the proparoxytones of modern Catalan are of recent introduction and due to Castilian influence. Further, the only post-tonic Latin vowel preserved “)y the Catalan is, as in Gallo-Roman, a : mare gives

mar, gratu (s) gives grat, but anima gives arma', and, when the word terminates in a group of consonants requir- ing a supporting vowel, that vowel is represented by an e : arb(o)rem, Cat. abre (Prov. and Fr. arbre, but Cast, drbol); pop(u)l(us) , Cat. poble (Prov. poble, Fr. peuple, but Cast, pueblo); sometimes, when it is inserted between the two consonants instead of being made to follow them, the supporting vowel is represented by an o : escdndol (scandalum), /j-cto/ (frivol us), circol (circulus). In some cases a post-tonic vowel other than a is preserved in Catalan, as, for example, when that vowel forms a diphthong with the tonic (Dew, Deus; £Ara,Hebreus); or, again, it sometimes happens, when the tonic is followed by an i in hiatus, that the i persists (diluvi, diluvium; servici, ser- vicium; labi, labium; ciri, cereus); but in many cases these ought to be regarded as learned forms, as is shown by the exist- ence of parallel ones, such as servey, where the atonic i has been attracted by the tonic and forms a diphthong with it (servici, servii, servey). What has just been said as to the treatment of the final vowels in Catalan must be understood as applying only to pure Catalan, unaltered by the predominance of the Castilian, for the actual language is no longer faithful to the principle we have laid down; it allows the. final atonic in a number of substantives and adjectives, and in the verb it now conjugates canto, temo, sento — a thing unknown in the ancient language. (2) As regards conjugation only two points need be noted here: (a) it employs the form known as the inchoative, that is to say, the lengthening of the radical of the present in verbs of the third conjugation by means of the syllable ex or ix, a proceeding common to Italian, Walachian, Provencal and French, but altogether unknown in Hispanic Romance; (b) the formation of a great number of past participles in which the termination is added, as in Provencal, not to the radical of the verb, but to that of the perfect: tingut from tinch, pogut from poch, conegut from conech, while in Castilian tenido (formerly also tenudo), podido, conocido, are participles formed from the infinitive.*

As for features common to Catalan and Hispanic (Castilian and Portuguese) Romance, on the other hand, and which are unknown to French Romance, only one is of importance; the conservation, namely, of the Latin u with its original sound, while the same vowel has assumed in French and Provencal, 1 The origin of the name Catalanus is unknown.

from a very early period — earlier doubtless than the oldest existing monuments of those languages — a labio-palatal pro- nunciation {ii). It is

not to be supposed that the separation of Catalan from the Gallo-Roman' family occurred before the transformation had taken place; there is good reason to believe that Catalan possessed the ii at one time, but afterwards lost it in its contact with the Spanish dialects.

Catalan being a variety of the langue d'oc, it will be con- venient to note the peculiarities of its phonetics and inflexion as compared with ordinary Provencal.

Tonic Vowels. — With regard to a, which is pronounced alike in open and close syllables {amar, a ma re; abre, arbor), there is nothing to remark. The Latin e, which is treated like i, gives e, sometimes close, sometimes open. On this point Catalan is more hesitating than Provencal; it does not distinguish so clearly the pronunciation of e according to its origin; while e {i) is capable of yielding an open e, the e is often pronounced close, and the poets have no difficulty in making words in e close and in e open rhyme together, which is not the case in Provencal. The Latin e never yields ie in Catalan as it does in French and occasionally in Pro- vencal; sedet becomes seu (where u represents the final d), p e d e m makes peu, and egoex; in some words where the tonic e is followed by a syllable in which an i occurs, it may become i {ir, h e r i; mig, m e d i u s; m-Us, melius); and the same holds good for e in a similar situation (ciri, cerius, cereus; fira, f e r i a), and for e in a close syllable before a nasal {eximpU, exemplum; tnintre for mentiri, gint for gent). I tonic long and short, when in hiatus with another vowel, produce * (amich, amicus; via, v 1 a). O tonic long and o short are represented by o close and o open {amor, a m o r e m ; poble, populus). short is never diphthong- ized into uo or we; such a treatment is as foreign to Catalan as the diphthongization of e into ie. Just as e before a syllable in which an i occurs is changed into i, so in the same circumstances o becomes u {full, folium; vull, v o i i o for v o 1 e o) and also when the ac- cented vowel precedes a group of consonants like cl, pi, and the like {nil, o c ' 1 u s; escull, scop'hs). Latin u persists with the Latin pronunciation, and, as already said, does not take the Franco- Provencal pronunciation ii. Latin au becomes o {cosa, causa; or, a u r u m) ; Old Catalan has kept the diphthong better, but possibly we sheuld attribute the examples of au which are met with in texts of the 13th and 14th centuries to the literary influence of Provence. Latin ua tends to become {cor, q u a r e).*

Atonic Vowels. — As for the Latin post-tonic vowels already spoken of, it remains to be noted that a is often represented in writ ; ng by «, especially before s; in old Catalan, the substantives, adjectives and participles readily form their singular in a and their plural in es : artna, armes (anima,animas); bona, bones (b o n a, b o n a s) ; amada, amades (a m a t a, am a t a s). This e is neither . open nor close, but a surd e the pronunciation of which comes very near a. In the same way the supporting

vowel, which is regularly an e in Cata- lan, is often written a, especially after r {abra, arborera; astra, a'strum; para, p a t r e tn) ; one may say that in the actual state of the language post-tonic e and a become indistinguishable in a surd sound intermediate between the French a and mute e. Before the tonic the same change between a and e constantly takes place; one finds in manuscripts enar, etnor for anar, amor (the same extends even to the case of the tonic syllable, ten and sent from t a n t u m and sanctum being far from rare), and, on the other hand, autre, arrar, for entre, errar. I atonic is often represented by e even when it is long (vehi, v i c i n u s). O atonic close, which in genuine Catalan exists only before the tonic, has become u; at the present day truvar, cuntradir is the real pronunciation of the words spelt trovar, contradir, and in the final syllables, verbal or other, where under Castilian influence an has come to be added to the normal Catalan form, this has the value of a u: trovo (genuine Catalan, trap) is pronounced trovu ; bravo (genuine Catalan, brau) is pronounced bravu. U atonic keeps its ground.

The only strong diphthongs of the spoken language are d i, au (rather rare), ei, eu, iu, bi, 6u, ui, uu. < Ai produced by a + i or by o + a palatal consonant has for the greater part of the time become an e in the modern language; factum has yielded fait, feit, and then fet, the last being the actual form ; arius has given er alongside of aire, ari, which are learned or semi-learned forms. Of the two weak diphthongs id and ud, the latter, as has been seen, tends to become o close in the atonic syllable, and is pronounced u: quaranta has become coranta, then curanta. After the tonic ua often becomes a in the Catalan of the mainland {ayga, aqua, llenga, lingua), while in Majorca it becomes o {aygo, llengo).

Consonants. — Final /readily disappears after n or I (tow, t a n t u m; aman, venin, partin, for amant,' venint, &c. ; mol, muitum; ocul, ocultum); the I reappears in composition before a vowel (fon, f o n t e m, but Font-alba). On the other hand, a / without etymo- logical origin is frequently added to words ending in r {cart for car, quare; mart for mar, mare; amart, ohirt, infinitive for amar, ohir), and even to some words terminating in a vowel {genii, i n g e n i u m ; premit, p r e m i u m), or the addition of the / has taken place by

assimilation to past participles in it. The phenomenon occurs also in Provengal (see Romania, vii. 107, viii. no). Median intervocal d, represented by 5 (z) in the first stage of the language:, has dis- appeared : f i d e Ii s gave fesel, then feel, and finally fel • v i d e t i s became vezets, then veets, vets and veu. Final d after a vowel has produced u {peu, pedem; niu, nidum; mou, m o d u m) ; but when the d, in consequence of the disappearance of the preceding vowel, rests upon a consonant, it remains and passes into the corresponding surd ; f r i g i d u s gives fred

(pronounced fret). The group oV, when produced by the disappearance of the intermediate vowel, becomes ur {creure, credere; oc'iure, o c c i d e r e ; veure, videre; seure, s e d e r e). Final n, if originally it stood between two vowels, drops away {bo, b o n u m ; ii, v i n u m), but not when it answers to mn (thus d o h u m makes do, but d o m n u m don ; s o n u m makes so, but s o m n u m son). Nd is reduced to n {de- manar, comanar for demandar, comandar). Assibilated c before e, i is treated like d ; within a word it disappears after having been repre- sented for a while byj(lucere gives llusir, lluhir ; r e c i p e r e gives reiebre, reebre, rebre); at the end of a word it is replaced by u {veu, v i c e m ; feu, feci t). The group c'r gives ur, just like d'r (jaure, j a c e r e; naure, nocere; plaure, p la cere; but facere, dicer e, ducere, make far {fer), dir, dur. Initial I has been preserved only in certain monosyllables (the article lo, los) ; every- where else it has been replaced by I mouillee (Prov. IK), which in the present orthography is written 11 as in Castilian, but formerly used to be .represented by ly or yl {lletra, 1 i t e r a llengua, lingua). P readily disappears after m, like t after n {cam, c a m p u m ; terns, tempils). B is replaced by the surd p at the end of a word {trobar in the infinitive, but trop in the present tense) ; so also in the interior of a word when it precedes a consonant {supvenir, s u b v e n i re, sopte, s u b ' t o). Median intervocalic / gives v {Esteve, S t e- p h a n u s) ; it has disappeared from profundus, which yielded the form preon, then pregon (g being introduced to obviate the hiatus). V, wherever it has been preserved, has the same pronunciation as b; at the end of a word and between vowels it becomes vocalized into u {suau, s u a v is; viure, v i v e r e). C guttural, written qu before e and i, keeps its ground as a central and as a final letter; in the latter position it is generally written ch {amich, a m i c u m ; joch, j o c u m). G guttural is replaced as a final letter by surd c {longa, but lone; trigar, but tnch). Tj after a consonant gives ss {cassar; captiare); between vowels, after having been represented by soft s, it has disappeared (r a t i o n e m gave razo, rayso. then raho) ; at the end of every word it behaves like ts, that is to say, changes into u {preu, pretium); instead of ts the second person plural of the verb— a t(i)s, e t(i)s, it(i)s — now has au,eu, iu after having had ats, etS its.- Dj gives & between vowels {verger, viridiarum), and c as a terminal (written either ig or tx : goig, g a u d i u m mig, mitx, m e d i u m). Si} and sc before e and i, as well as x and ps, yield the sound sh, represented in Catalan by x {angoxa, a n g u s t i a; coneixer, cognoscere; dix, dixit; mateix, met ipse). J almost everywhere has taken the sound of the French j {jutge, &c). Lj and // give / mouillee (// in the present orthography • fill, f i 1 i u m ; consell, consilium; null, nullum). In the larger portion of the Catalan domain this I mouillee has become y . almost everywhere fiy is pronounced for fill, consey for consell. Nj and nn give; n mouillee {ny in both old and modern spelling : senyor. seniorem; any, a n n u m). Sometimes the ny becomes reduced to y; one occasionally meets in manuscripts with seyor, ay, for senyor, any, but this*

*pronunciation has not become general, as has been the case with the y having it's origin in 11. • Lingual r at the end of a word has a tendency to disappear when preceded by a vowel : thus the infinitives a m a r e, t e m e r e, *1 e g i r e are pronounced amd, teme, llegi. It is never preserved except when protected by the non-etymological t already spoken of {llegirt or llegi, but never llegir) ; the r reappears, nevertheless, whenever the infinitive is followed by a pronoun {donarme, dirho). Rs is reduced to i {cos for cors, corpus). H is merely an orthographic sign ; it is used to indicate that two consecu- tive vowels do not form a diphthong {vehi raho), and, added to c, it denotes the pronunciation of the guttural c at the end of a word {amich).*

Inflexion.— -Catalan, unlike Old Provencal and Old French, has never had declensions. It is true that in certain texts (especially metrical, texts) certain traces of case-endings are to be met with, as, for example Deus and Deu, amors and amor, clars and clar, forts a.ndfor't, tuyt and tots, abduy and abdos, senyer and senyOr, emperaire and emperador ; but, since these forms are used convertibly, the nominative form when the word is in the objective, and the accusative form, when the word is the subject, we can only recognize in these cases a confused recollection of the Provencal rules known only to the literate but of which the transcribers of manuscripts took no account. Catalan, then, makes no distinctions save in the gender and the number of its nouns. As regards the formation of the plural only two observations are necessary. (1) Words which have their radical termination in n but which in the singular drop that n, resume it in the plural before s: homin-em makes ome in the singular and omens in the plural ; asin-um makes ase and asens. (2) Words termi- nating in s surd or sonant and in x anciently formed their plural by adding to the singular the syllable es {bras, brasses; pres, preses; mateix, mateixes), but subsequently, from about the 15th centurv,

the Castilian influence substituted os, so that one now hears brasses, presos, mateixos. The words in tx, sc, st have been assimilated to words in s (x) ; from bosch we originally had the plural bosches; but now boscos; from trist, tristes, but now tristos. For these last in st there exists a plural formation which is more in accordance with the genius of the language, and consists in the suppression of the 5 before the t; from aquest, for example, we have now side by side the two plurals aquestos, in the Castilian manner, and aquets. The article is lo, los (pronounced lu, lus in a

portion of the domain), fern, la, les (las). Some instances of li occur in the ancient tongue, applying indifferently to the nominative and the objective case ; el applying to the singular is also not wholly unknown. On the north-western border of Catalonia, and in the island of Majorca, the article is not a derivative from ille but from ipse (sing. masc. es or so, fern, sa; pi. masc. es, and also ets, which appears to come from istos—ets for ests, like aquets for aquests — fem. sas). Compare the corresponding Sardinian forms su. sa, pi. sos, sas. On the. pronouns it has only to be remarked that the modern language has borrowed from Castilian the composite forms nosaltres and vosaltres (pronounced also nosaltros and nosatrus), as also the form voste, vuste (Castilian usted for vuestra merced).

*Conjugation. — Catalan, and especially modern Catalan, has greatly narrowed the domain of the 2nd conjugation in e r e; a large number of verbs of this conjugation have been treated as if they belonged to the 3rd in e r e ; d e b e r e makes deure, v i d e r e, veure, and alongside of haber, which answers to h a b e r e, there is a form heure which points to h a b e r e. A curious fact, and one which has arisen since the 15th century, is the addition of a paragogic r to those infinitives which are accented on the radical; in a portion of the Catalan domain one hears creurer, veurer. Some verbs originally belonging to the conjugation in ere have, passed over into that in ir; for example tenere gives tenir alongside of tindre, r e m a- n e r e romanir and romandre. In the gerundive and in the present participle Catalan differs from Provengal in still distinguishing the conjugation in ir from that in er, re — saying, for example, sentint. As in Provencal, the past participle of a large number of verbs of the 2nd and 3rd conjugations is formed, not from the infinitive, but from the perfect (pogut, volgut, tingut suggest the perfects poch, volch, tinch, and not the infinitives poder, voter, tenir). In the present indicative and subjunctive many verbs in *> take the inchoative form already described, by lengthening the radical in the three persons of the singular and in the third person of the plural by means of the syllable esc (isc). agrakir has the present indicative agraesch, agraheixes, agraheix, agraheixen, the present subjunctive agraesca, -as, -a, -an (or more usually now agraesqui, -is, -i, -in). The old perfect of the conjugation in ar had e (also i) in the 1st pers. sing, and -a in the 3rd ; alongside of the -a, which is proper to Catalan exclusively, we also find, in the first period of the language, -el as in Provencal. Subsequently the perfect of the three conjugations has admitted forms in r (amdres, amdrem, amdreu, amdren), derived from the ancient pluperfect amara, &c, which has held its ground down to the present day, with the meaning of a Conditional in some verbs (one still hears fora, haguera). But the simple perfect is no longer employed in the spoken language, which has substituted for it a periphrastic perfect, composed of the infinitive of the verb and the present of the auxiliary anar: vaig pendre, for example, does not mean " I am going to take," but " I have*

taken." The earliest example of this periphrastic perfect carries us back to the 1 5th cen tury. The most usual form of the subj. pres. in spoken Catalan is that in -i for all the three conjugations {ami, -is, -i, -em, -eu -in; temi, -is, &c. ; senti, -is, &c); it appears to be an abbreviation from to, and in effect certain subjunctives, such as cdntia, temia, tinguia, vinguia (for cante, tema, tinga, vingia), evidently formed upon sia (subj. of esser), have been and still are used. The same i of the pre sent subjunctive, whatever may be its origin, is still found in the, imperfect : amis, -essis, -cs, -essium, &c.

Catalan Dialect of Alghero (Sardinia). — As compared with that of the mainland, the Catalan of Alghero, introduced into this portion of Sardinia by the Aragonese conquerors and colonists, does not present any very important differences; some of them, such as they are, are explicable by the influence of the indigenous dialects of Sassari and Logudoro. In phonetics one observes — (1) the change of Ij into y as an initial before i (yitx, yigis; lego, legis), a change which does not take place in the Catalan of the mainland except in the interior, or at the end of the word; (2) the frequent change of I between vowels and of / after c, g, f, p or b into r (taura tabula; candera, candela; sangrot, singultum; frama, flama). In conjugation there are some notable peculiarities. The 1st pers. sing, does not take the which continental Catalan has borrowed from Castilian (cant, not canto, &c.) ; the imp. ind. of verbs of the 2nd and 3rd conjugations has eva, iva instead of ia, a form which also occurs in the conditional (cantariva, drumiriva) ; the simple perfect, of which some types are still preserved in the actual language (e.g. anighe, agh.e), has likewise served for the formation not only of the past participle but also of the infinitive (agher, habere, can only be ex- plained by ach, 3rd person of the perfect) ; the infinitives with r paragogic (viurer, seurer, plourer) are not used (viure, seure, ploure instead) ; in the conjugation of the present of the verb essar or esser, the jnd pers. sing, ses formed upon the persons of the plural, while

continental Catalan says ets (anciently est), as also, in the plural, sem, seu, instead of som, sou, are to.be noted; tenere has passed over to the conjugation in re (trenda = tendre), but it is at the same time true that in ordinary Catalan also we have tindrer alongside of tenir the habitual form; dicere gives not dir but diure, which is more regular.

2. Castilian. — This name is the most convenient desig- nation to apply to the linguistic domain which comprises the whole of central Spain and the vast regions of America and Asia colonized from the 16th century onwards by the Spaniards. We might also indeed call it the Spanish domain, narrowing the essentially geographical meaning of the word Espaiiol (derived, like the other old form Espanon, from Hispania), and using it in a purely political sense. But the first expression is to be preferred, all the

more because it has been long in use, and even the inhabitants of the domain outside the two Castiles fully accept it and are indeed the first to call their idiom Castel- lano. It is agreed on all hands that Castilian is one of the two branches of the vulgar Latin of Spain, Portuguese-Galician being the other; both idioms, now separated by very marked differences, can be traced back directly to one common source — the Hispanic Romance. One and the same vulgar tongue, diversely modified in the lapse of time, has produced Castilian and Portuguese as two varieties, while Catalan, the third lan- guage of the Peninsula, connects itself, as has already been pointed out, with the Gallo-Roman.

Within the Castilian domain, thus embracing all in Spain that is neither Portuguese nor Catalan, there exist linguistic varieties which it would perhaps be an exaggeration to call dialects, considering the meaning ordinarily attached to that word, but which are none the less worthy of attention. Generally speaking, from various circumstances, and especially that of the recon- quest, by which the already-formed idiom of the Christian conquerors and colonists was gradually conveyed from north to south, Castilian has maintained a uniformity of which the Romance languages afford no other example. We shall pro- ceed in the first instance to examine the most salient features of the normal Castilian, spoken in the provinces more or less closely corresponding to the old limits of Old and New Castile, so as to be able afterwards to note the peculiarities of what, for want of a better expression, we must call the Castilian dialects.

In some respects Castilian is hardly further removed from classical Latin than is Italian; in others it has approximately reached the same stage as Provencal. As regards the tonic, accent and the treatment of the vowels which come after it, Castilian may be said to be essentially a paroxytonic language, though it does not altogether refuse proparoxytonic accentua- tion and it would be a mistake to regard vocables like Idmpara, Idgrima, rdpido, &c, as learned words. In this feature, and in its almost universal conservation of the final vowels e, i, u (0), Castilian comes very near Italian, while it separates from it and approaches the Gallo-Roman by its modification of the consonants.

Vowels. — Normal Castilian faithfully preserves the vowels e, t, 6, u; the comparatively infrequent instances in which e and are treated like e and must be attributed to the working of analogy. It diphthongizes e in ie, 6 in ue, which may be regarded as a weaken- ing of uo (see Romania, iv. 30). Sometimes ie and we in the modern language are changed into i and e : silla from sella (Old Cast. siella), vispera from vesper a (Old Cast, viespera), castillo from c a s t e 1 1 u m (Old Cast, castiello) , f rente from f r o n t e m (Old Cast. fruente), fleco from f loccus (Old Cast, flueco). The words in which e and have kept their ground are either learned words like

medico, mirito, or have been borrowed from dialects which do not suffer diphthongization. In many cases the old language is more rigorous; thus, while modern Castilian has given the preference to mente, como, modo, we find in old texts miente, cuemo, muedo. Lat. a u makes in all words of popular origin (cosa, oro, &c).

Consonants. — On the liquids /, m, n, r there is little to be remarked, except that the last-named letter has two pronunciations — oce soft (voiced), as in amor, burla, the other hard (voiceless), as hi rendir, tierra (Old Cast, in this case goes so far as to double the initial consonant : rrendir) — and that n is often inserted before 5 and d: ensayo, mensage, rendir (r e d d e r e). L mouillee (written li) represents not only the Latin I, 11, Ij, but also, at the beginning of words, the combinatio'is cl, gl, pi, bl, ft: llama (i 1 a m m a), Have

(clavis), llorar (plorare); the tendency of the modern language is, as in Catalan, to reduce // to y; thus one readily hears yeno (plenum). N mouillee (fl) corresponds to the Lat. nn, mn, nj, and sometimes to initial n : ano (a n n u m), dano (damnum), nudo (n o d u m). Passing to the dentals, except as an initial, t in words that are popularly current and belong to the old stock of the language, can only be derived Irom Lat. tt, pt, and sometimes ct, as in meter (mittere), calar (cap tare), punto (p u n c t u m) ; but it is to be observed that the habitual mode of representing ct in normal Castilian is by ch (pron. tch), as in derecho (directum), pecho (pectus), so that we may take those words in which I alone represents ct as secondary forms of learned words; thus we have bendito, otubre, santo as secondary forms of the learned words bendicto, octubre, sancto, alongside of the old popular forms bendicho, ochubre, sancho. D corresponds in Castilian to Latin / between vowels, or t before r : amado (a m a t u s), padre (p a t r e m). At the present day the d of the suffixes ado, ido is no longer pronounced throughout the whole extent of the domain, and the same holds good also of the final d : salu, pone, for salud, poned (from s a 1 u t e m, p o n i t e). Sometimes d takes the interdental sound of z (English th), or is changed into /; witness the two pronunciations of the name of the capital — Madriz and Madril (adj. Madrileno). The study of the spirants, c, z, s ; g, j is made a very delicate one by the circumstance that the interdental pronunciation of c, z on the one hand, and the guttural pronunciation of g, j on the other, are of comparatively recent date, and convey no notion of the value of these letters before the 17th century. It is

admitted, not without reason, that the spirants c, z, which at present represent but one interdental sound (a lisped s, or a sound between 5 and Eng. th in thing), had down till about the middle of the 16th century the voiceless sound ts and the voiced sound dz respectively, and that in like manner the palatal spirants g, j, x, before assuming the uniform pronunciation of the guttural spirant (= Germ. ch in Buck), had previously represented the voiced sound of & (Fr. j) and the voiceless sound of s (Fr. ch), which are still found in Portu- guese and in the Castilian dialects of the north-west. The substitu- tion of these interdental and guttural sounds for the surd and sonant spirants respectively did certainly not take place simultaneously, but the vacillations of the old orthography, and afterwards the decision of the Spanish Academy, which suppressed x (= £; x was retained for cs) and allows only c and g before e and i, 2 and j before a, 0, u, make it impossible for us to follow, with the help of the written texts, the course of the transformation. 5 now has the voiceless sound even between vowels: casa (pronounced cassa); final s readily falls away, especially before liquids: iodo los for todos los, vatnono for vamos nos. The principal sources of j (g) are — Lat. j and g before e and i [juego, jocura; genie, g e n t e m) ; Lat. initial 5 (jabon, s a p o n e m) ; Lat. x (cojo, c o x u m) ; Ij, cl (consejo, con- silium; ojo, o c'l u m). The sources of z © are Lat. ce, cj, tj, s (cielo, caelum; calza, c a 1 c e a ; razon, rationem; zampona, symphonia). As regards the spirants / and v, it is to be ob- served that at the beginning of a word / has in many instances been replaced by the aspirated h (afterwards silent), while in others no less current among the people the transformation has not taken place; thus we have hijo (f i 1 i u m) alongside of fiesta (f e s t a). In some cases the / has been preserved in order to avoid confusion that might arise from identity of sound : the/ in fiel (f i d e 1 i s) has been kept for the sake of distinction from hiel (f el). As for v, it has a marked tendency to become confounded, especially as an initial letter, with the sonant explosive b; Joseph Scaliger's pun — bibere est vivere — is applicable to the Castilians as well as to the Gascons. H is now nothing more than a graphic sign, except in Andalusia, where the aspirate sound represented by it comes very near j. Words beginning in hue, where the /;, not etymologically derived, marks the inseparable aspiration of the initial diphthong ue, are readily pronounced giie throughout almost the whole extent of the domain: giiele for huele (o 1 e t) ; giieso for hueso (o s). This giie extends also to words beginning with bue : gileno for bueno (bonum), Inflexion. — There is no trace of declension either in Castilian or in Portuguese. Some nominative forms — Dios (anciently Dios, and in the Castilian of the Jews Dio), Carlos, Marcos, saslre (sarto r) — have been adopted instead of forms derived from the accusative, but the vulgar Latin of the Peninsula in no instance presents two forms (subjective and objective case) of the same substantive. The article is derived from i 1 1 e, as it is almost everywhere throughout the

Romance regions : el, la, and a neuter lo ; los, las. The plural of the first and second personal pronoun has in the modern language taken a composite form — nosotros, vosotros — which has been imitated in Catalan. Quien, the interrogative pronoun which has taken the place of the old qui, seems to come from quern.

Conjugation. — The conjugation of Castilian (and Portuguese) derives a peculiar interest from thf archaic features which it retains. The vulgar Latin of Spain has kept the pluperfect indicative, still in current use as a secondary form of the conditional (cantdra, ven- diera, partiera), and, what is more remarkable still, as not occurring anywhere else, the future perfect (cantdre, vendiere, pcrtiere, formerly cantdro, vendiero, partiero). The Latin future has been replaced, as every ft-here, by the perirphasis (cantare habeo), but it is worth noticing that in certain old text; of the i.ttb century, and

in the popular songs of a comparatively ancient date which have been preserved in Asturias, the auxiliary can still precede the infinitive (habeo cantare), as with the Latin writers of the decadence : " Mucho de mayor precio a seer el tu manto Que non sera el nuestro " (Berceo, 5. Laur., str. 70), where a seer (h a b e t sederc) corre- sponds exactly to sera (s e d e r e habet). The vulgar Latin of the Peninsula, moreover, has preserved the 2nd pers. pi. of the impera- tive (cantad, vended, partid), which has disappeared from all the other Romance languages. Another special feature of Castilian- Portuguese is the complete absence of the form of conjugation known as inchoative (intercalation, in the present tense, of the syllable isc or esc between the radical and the inflexion), although in all the other tenses, except the present, Spanish shows a tendency to lay the accent upon the same syllable in all the six persons, which was the object aimed at by the inchoative form. Castilian displaces the accent on the 1st and 2nd pers. pi. of the imperfect (canldbamos, cantdbais), of the pluperfect indicative (cantdramos, cantdrais), and of the imperfect subjunctive (cantdsemos, cantdseis) ; possibly the impulse to this was given by the forms of future perfect cantdremos, cantdreis (cantarimus, cantaritis). The 2nd persons plural were formerly (except in the perfect) -odes, -edes, ides; it was only in the course of the 16th century that they got reduced, by the falling away of d, to ais, eis and ts. The verb e s s e r e has been mixed, not as in the other Romance languages with stare, but with s e d e r e, as is proved by older forms seer, siedes, sieden, seyendo, obviously derived from s e d e r e, and which have in the texts sometimes the meaning of " to be seated," sometimes that of " to be," and sometimes both. In old Latin charters also s e d e r e is frequently met with in the sense of esse: e.g. " sedeat istum meum donativum quietum et securum " (anno 1134), where sedeat = sit. The 2nd pers. sing, of the present of ser is eres, which is best explained as borrowed from the imperfect (eras), this tense being often used in Old

Spanish with the meaning of the present ; alongside of eres one finds (but only in old documents or in dialects) sos, formed like sois (2nd pers. pi.) upon somos. The accentuation in the inflexion of perfects in the conjugation called strong, like hubieron hizieron, which correspond to habuerunt, fecerunt (while in the other Romance languages the Latin type is erunt: Fr. eurent, firent) , may be regarded as truly etymological, or rather as a result of the assimila tion of these perfects to the perfects known as weak (amdron), for there are dialectic forms having the accent on the radical, such as dixon, hlzon. The past participle of verbs in er was formerly udo (u t u s) in most cases ; at present ido serves for all verbs in er and ir, except some ten or twelve in which the participle has retained the Latin form accented on the radical : dicho, hecho, visto, &c. It ought to be added that the past participle in normal Castilian derives its theme not from the perfect, but from the infinitive: habido, sabido, from haber, saber, not from hubo, supo.

Castilian Dialects. — To discover the features by which these are distinguished from normal Castilian we must turn to old charters and to certain modern compositions in which the provincial forms of speech have been reproduced more or less faithfully.

*Asturian. — The Asturian idiom, called by the natives bable, is differentiated from the Castilian by the following characters. le occurs, as in Old Castilian, in words formed with the suffix ellum (castiellu, portiellu), while modern Castilian has reduced ie to i. E, i, u, post-tonic for a, e, 0: penes (penas), grades (gracias), esti (este) , frenti (f rente) , llechi (leche) , nucchi (noche) , unu {una) , primeru (primero). There is no guttural spirant,/, but, according to circum- stances, y or x (s) ; thus Lat. cl, Ij gives y: veyu (*v e c 1 u s), espeyu (s p e c ‘ 1 u m), conseyu (consilium); and after an * this y is hardly perceptible, to judge by the forms fiu (f i 1 i u m), escoidos (Cast, escogidos), Castia {Castillo) ; Lat. g before e and i, Lat. initial j, and Lat. ss, x, give x (s) — xiente (g e n t e m), xudiu (J u d a e u s), baxu (b a s s u s), coxu (c o x u s), floxu (f 1 u x u s). Lat. initial / has kept its ground, at least in part of the province : fiu,fueya (Cast. hijo, hoja). A very marked feature is the habitual ” mouillure ” of / and n as initial letters: Heche, lleer, lluna, Hutu; non, nunca, nueve, nube. With respect to inflexion the following forms may be noted: personal pronouns: i (Mi), yos (illos) ; possessive pronouns: mio, pi. mios; to, los; so, sos for both masc. and fem. ; verbs: 3rd pers. pi. imp. of the 2nd and 3rd conjugations in in for ten (Cast, ian) ; train, tenin, facin (from facer), fiin (from fer), and even some instances of the 2nd pers. sing, (abis; Cast, habias) ; instances of pres. subj. in ia for a (sirvia, metia, sepia). The verb ser gives yes (sometimes yeres) in the 2nd pers. sing., ye in the 3rd. F a c e r e appears under two forms — facer and fer — and to the abridged form correspond feist fiendo, fiin, &c. Ire often appears under the*

form dir (antes de diros = antes de iros), which it is not necessary to explain by de-ir". (see H. Schuchardt, Ztschr. f. rom. Philol., v. 312).

*Navarrese-Aragonese. — In its treatment cf the post-tonic vowel J this dialect parts company with normal Castilian and comes nearetf Catalan, in so far as it drops the final e, especially after nt, rt (montf plazieni, muert, fuert, parents, gents); and, when the atonic e has dropped after a v, this v becomes a vowel — breu (brevero), grieu (*g r e v e m), nueu (n o v e m). Navarrese-Aragonese has the diphthongs ie, ue from tonic e and 0, and adheres more strictly to them than normal Castilian does — cuende (comitem), huey (hSdie), pueyo (podium), yes (est), yeran (grant), while*

Castilian says conde, hoy, poyo, es, eran. The initial combinations cl, pi, fl, have withstood the transformation into 11 better than in Castilian: piano, pleno, plega, clamado, flanta are current in old documents ; and at the present day, although the / has come to be " mouillee," the first consonant has not disappeared (plluma, pllord, pllano — pronounced pljuma, &c). Lat. ct gives it, not ch as in Castilian : nueyt (n o c t e m), destruito (destructum), proveito (provectum), dito for ditto (dictum). D between vowels kept its ground longer than in Castilian: documents of the 14th century supply such forms as vidieron, vido, hudio, provedir, redemir, prodeza, Benedit, vidiendo, &c. ; but afterwards y came to be substi- tuted for dor dj: veyere (vide r e) , seyer {s e. d e r e),seya (se d e a t), goyo (g a u d i u m), enueyo (i n o d i u m). Initial / does not change into h: fillo, feito. Navarrese-Aragonese does not possess the guttural spirant (j) of Castilian, which is here rendered according to circumstances either by g (Fr. j) or by // (/ mouillee), but never by the Asturian x. Certain forms of the conjugation of the verb differ from the Castilian: dar, estar, haver, saber, poner readily form their imperfects and imperfect subjunctives like the regular verbs in ar and er — havieron (Cast, hubieron), estaron (Cast, estubieron), sabio (Cast, supo), dasen (Cast, diesen), poniese (Cast, pusiese) ; on the other hand, past participles and gerundives formed from the perfect are to be met with — fisiendo for faciendo (perf. fiso), tuviendo and tuvido for teniendo, tenido (perf. tuvo). In the region bordering on Catalonia the simple perfect has given way before the periphrastic form proper to Catalan: voy cayer (I fell), vafe (he has done), vamos ir (we went), &c. ; the imperfects of verbs in er, ir, moreover, are found in eba, iba (comeba, subiba, for comia, subia), and some presents also occur where the Catalan influence makes itself felt: estigo (Cat. estich), vaigo

(Cat. vaig), veigo (Cat. veig). Navarrese-Aragonese makes use of the adverb en as a pronoun: no les en daren pas, no'n hi ha.

Andalusian. — The word "dialect" is still more appropriately applied to Andalusian than either to Asturian or Navarrese-Ara- gonese. Many peculiarities of pronunciation, however, are com- monly called Andalusian which are far from being confined to Andalusia proper, but are met with in the vulgar speech of many parts of the Castilian domain, both in Europe and in America. Of these but a few occur only there, or at least have not yet been observed elsewhere than in that great province of southern Spain. They are the following: L, n, r, d between vowels or at the end of a word disappear: sd {sal), so (sol), viee (viene), tiee (tiene), paa and pa (para), mia (mira), naa and na (nada), too and to (todo). D is dropped even from the beginning of a word: e (de), inero (dinero), on (don). Before an explosive, I, r, d are often represented by i: saiga (saiga), vaiga (valga), laigo (largo), maire (madre), paire (padre). Lat. / is more rigorously represented by h than in normal Castilian, and this h here preserves the aspirate sound which it has lost elsewhere; habld, horma (forma), hoder, are pronounced with a very strong aspiration, almost identical with that of j. The Anda- lusians also very readily write these words jabld, jorma, joder. This aspirate, expressed by j, often has no etymological origin ; for example, Jdndalo, a nickname applied to Andalusians, is simply the word Andaluz pronounced with the strong aspiration character- istic of the inhabitants of the province. C, z are seldom pronounced like 5 ; but a feature more peculiar to the Andalusians is the inverse process, the softened and interdental pronunciation of the s (the so-called ceceo) : zenor (senor) , &c. Before a consonant and at the end of a word s becomes a simple aspiration: mihmo (mismo), Dioh (Dios), do reales (dos reales). In the inflexion of the verb there is nothing special to note, except some instances of 2nd pers. sing, of the perfect in tes for te: estuvistes, estuvites, for estuviste — evidently a formation by analogy from the 2nd pers. of the other tenses, which all have s.

It is with the Andalusian dialect that we can most readily asso- ciate the varieties of Castilian which are spoken in South America. Here some of the most characteristic features of the language of the extreme south of Spain are reproduced — either because the Cas- tilian of America has spontaneously passed through the same phonetic transformations or because the Andalusian element, very strongly represented in colonization, succeeded in transporting its local habits of speech to the New World.

Leonese. — Proceeding on inadequate indications, the existence of a Leonese dialect has been imprudently admitted in some quarters; but the old kingdom of Leon cannot in any way be considered as constituting a linguistic domain with an individuality of its own. The fact that a poem of

the 13th century (the Alexandro), and certain redactions of the oldest Spanish code, the Fuero Juzgo, have a Leonese origin has been made too much of, and has led to a ten- dency to localize excessively certain features common to the whole western zone where the transition takes place from Castilian to Galician-Portuguese.

3. Portuguese. — Portuguese-Galician constitutes the second branch of the Latin of Spain. In it we must distinguish —

(1) Portuguese (Portuguez, perhaps a contraction from the old Port«ga/ez = Portugalensis), the language of the kingdom of Portugal and its colonies in Africa, Asia and America (Brazil) ;

(2) Galician (Gallego), or the language of the old kingdom of

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Galicia (the modern provinces of Pontevedra, La Corufia, Orense, and Lugo) and of a portion of the old kingdom of Leon (the territory of Vierzo in the province of Leon). Portuguese, like Castilian, is a literary language, which for ages has served as the vehicle of the literature of the Portuguese nation con- stituted in the beginning of the 12th century. Galician, on the other hand, which began a literary life early in the middle ages — for it was employed by Alfonso the Learned in his Canligas in honour of the Virgin — decayed in proportion as the monarchy of Castile and Leon, to which Galicia had been annexed, gathered force and unity in its southward conquest. At the present day Gallego, which is simply Portuguese variously modified and with a development in some respects arrested, is much less important than Catalan, not only because the Spaniards who speak it (1,800,000) are fewer than the Catalans (3,500,000), but also because, its literary culture having been early abandoned in favour of Castilian, it fell into the vegetative condition of a provincial patois. Speaking generally, Portuguese is further removed than Castilian from Latin; its development has gone further, and its actual forms are more worn out than those of the sister language, and hence it has, not without reason, been compared to French, with which it has some very notable analogies. But, on the other hand, Portuguese has remained more exclusively Latin in its vocabulary, and, particularly in its conjugation, it has managed to preserve several features which give it, as compared with Castilian, a highly archaic air. Old Portuguese, and more especially the poetic language of the 13th century, received from the language of the troubadours, in whose poetry the earlier Portuguese poets found much of their inspiration, certain words and certain turns of expression which have left upon it indelible traces.

Vowels. — Lat. c, with the accent have not been diphthongized into ie, no,

ue: pe (p e d e m), dez (d e c e m), bom (b o n u s), pode (p o t e t). On the other hand, Portuguese has a large number of strong diphthongs produced by the attraction of an i in hiatus or the resolution of an explosive into i: raiba (r a b i a), feira (f e r i a), feito (f a c t u m), seixo (s a x u m), oito (o c t o). A quite peculiar feature of the language occurs in the " nasal vowels," which are formed by the Latin accented vowels followed by m, n, or nt, nd: be (ben e), gra (g r a n d e m), bo (b o n u m). These nasal vowels enter into combination with a final atonic vowel : irmao (g e r m a- n u s) ; also amao (a m a n t), sermao (s e r m o n e m), where the is a degenerated representative of the Latin final vowel. In Old Portuguese the nasal vowel or diphthong was not as now marked by the til (~), but was expressed indifferently and without regard to the etymology by m or n: bem (bene), tan (tantum), disserom (d i x e r u n t), sermom (s e r m o n e m). The Latin diphthong au is rendered in Portuguese by ou (ouro, a u r u m; pouco, p a u c u m), also pronounced oi. With regard to the atonic vowels, there is a tendency to reduce a into a vowel resembling the Fr. e " muet," to pronounce as «, and to drop e after a group of consonants (dent for dente) .

*Consonants. — Here the most remarkable feature, and that which most distinctly marks the wear and Aar through which the language has passed, is the disappearance of the median consonants / and n: cor da (corona), lua (1 u n a), por formerly poer (ponere), conego (c a n o n i c u s), vir (venire), dor, formerly door (do lore m), paco (p a 1 a t i u m), saude (salute m), pego (p e 1 a g u s). Lat. b passes regularly into v : cavallo (caballus), fava (f a b a), arvore (a r b o re m) ; but, on the other hand, Lat. initial v readily tends to become 6: bexiga (vesica), bodo (votum). Lat. initial / never becomes h: fazer (f a c e r e), filo (f i 1 u m). Lat. c before e and i is represented either by the hard sibilant s or by the soft z. Lat. g between vowels is dropped before e and i : ley for leer (1 e- g e r e),dedv (d i g i t u m) ; the same is the case with d, of course, in similar circumstances: remir (re di mere), rir (ridere). Lat. j has assumed the sound of the French j. The Latin combinations cl, fl, pi at the beginning of words are transformed in two ways in words of popular origin. Either the initial consonant is retained while the / is changed into r : cravo (c 1 a v u m), prazer (p 1 a c e r e), fror({ 1 o re m) ; or the group is changed in ch (= Fr. ch, Catal. x) through the intermediate sounds kj, fj, pj : chamar (c 1 a m a r e) , chao (planus), chamma (f 1 a m m a). Within the word the same group and other groups also in which the second consonant is an / produce / mouillee (written Ih, just as n mouillee is written nh, as in Provencal) : ovelha (ovic'la), velho (*v eclus); and sometimes ch: facho (fac'lum), ancho (a m p 1 u m). Lat. ss or sc before e and i gives x (Fr. ch) : paixo (b a s s u s),faxa (fascia). The group ct is. reduced to it: leito (1 e c t u m), peito (pectus), noite (n o c- t e m) ; sometimes to ut : douto (d o c t*

u s). Such words as frulo, reto, dileto are modern derivatives from the learned forms fruclo.

recto, dilecto. Lat. cs becomes is: seis (sex); or isc, x (= Fr. ich, ch) : seixo (s a x u m), luxo (1 u x u m) ; or even ij: disse (d i x i).

Inflexion. — The Portuguese article, now reduced to the vocalic form o, a, os, as, was lo (exceptionally also el, which still survives in the expression El-Rei), la, los, las in the old language. Words ending in / in the singular lose the I in the plural (because it then becomes median, and so is dropped) :so/(so!em), but soes (soles); those having do in the sing, form the plural either in des or in des according to the etymology : thus cao (c a n e m) makes edes, but racao makes racoes. As regards the pronoun, mention must be made of the non-etymological forms of the personal mint and of the feminine possessive minha, where the second n has been brought in by the initial nasal. Portuguese conjugation has more that is interesting. In the personal suffixes the forms of the 2nd pers. pi. in ades, edes, ides lost the d in the 15th century, and have now become ais, eis, is, through the intermediate forms aes, ees, eis. The form in des has persisted only in those verbs where it was protected by the consonants n or r preceding it: pondes, tendes, vindes, amardes, and also no doubt in some forms of the present of the imperative, where the therne has been reduced to an extraordinary degree by the disappearance of a consonant and the contraction of vowels: ides, credes, ledes, &c. Portuguese is the only Romance language which possesses a personal or conjugated infinitive: amar, amar-es, amar, amar-mos, amar-des, amar-em; e.g. antes de sair-mos, " before we go out." Again, Portuguese alone has preserved the pluperfect in its original meaning, so that, for example, amara (a m a v e r a m) signifies not merely as elsewhere " I would love," but also " I had loved." The future perfect, retained as in Castilian, has lost its vowel of inflexion in the 1st and 3rd pers. sing, and consequently becomes liable to be confounded with the infinitive {amar, render, partir). Portuguese, though less frequently than Castilian, employs ter (t e n e r e) as an auxiliary, alongside of aver; and it also supple- ments the use of e s s e r e with s e d e r e, which furnished the subj. seja, the imperative se, sede, the gerundive sendo, the participle sido, and some other tenses in the old language. Among the peculiarities of Portuguese conjugation may be mentioned — (1) the

assimilation of the 3rd pers. sing, to the 1st in strong perfects (houve, pude, quiz, fez), while Castilian has hube and hubo; (2) the imperfects punha, tinha, vinha (from por, ter and vir), which are accented on the radical in order to avoid the loss of the n (ponia would have made poia), and which substitute u and i for o and e in order to distinguish from the present subjunctive (ponha, tenha, venha).

Galician. — Almost all the phonetic features which distinguish Portuguese from Castilian are possessed by Gallego also. Portu- guese and Galician even now are practically one language, and still more was this the case formerly : the identity of the two idioms would become still more obvious if the orthography employed by the Galicians were more strictly phonetic, and if certain transcrip- tions of sounds borrowed from the grammar of the official language (Castilian) did not veil the true pronunciation of the dialect. It is stated, for example, that Gallego does not possess nasal diphthongs; still it may be conceded once for all that such a word as p 1 a n u s, which in Galician is written sometimes chau and sometimes chan, cannot be very remote from the Portuguese nasal pronunciation chao. One of the most notable differences between normal Portu- guese and Galician is the substitution of the surd spirant in place of the sonant spirant for the Lat. j before all vowels and g before e and i : xuez (j u d i c e m), Port, juiz; xunto (ji'nctu m), Port, junto; xente (g e n t e m), Port, gente. In conjugation the peculiarities of Gallego are more marked ; some find their explanation within the dialect itself, others seem to be due to Castilian influence. The 2nd persons plural have stili their old form ades, edes, ides, so that in this instance it would seem as if Gaftego had been arrested in its progress while Portuguese had gone on progressing; but it is to be observed that with these full forms the grammarians admit contracted forms as well: as (Port, ais), es (Port, eis), is (Port. is). The 1st pers. sing. of the perfect of conjugations in er and ir has come to be complicated by a nasal resonance similar to that which we find in the Portuguese mim; we have vendin, partin, instead of vendi, parti, and by analogy this form in in has extended itself also to the perfect of the conjuga- tion in ar, and falin, gardin, for falei, gardei are found. The second persons of the same tense take the ending che, ches in the singular and chedes in the plural : falache or falaches (f a b u 1 a s t i), fala- chedes as well as faldstedes (fabulastis), bateche or batiche, pi. batestes or batechedes, &c. Ti (t i b i) having given che in Galician, we see that falasti has become falache by a phonetic process. The 3rd pers. sing, of strong perfect is not in e as in Portuguese (houve, pode), but in (houbo, puido, soubo, coubo, &c.) ; Castilian influence may be traceable here. If a contemporary grammarian, Saco Arce, is to be trusted, Gallego would form an absolute exception to the law of Spanish accentuation in the imperfect and pluperfect indica- tive: falabdmos, falabddes; bahdmos, baliddes; pididmos, pididdes; and

falardmos, falarddes; baterdmos, baterddes; pidirdmos, pidirddes. The future perfect indicative and the imperfect subjunctive, on the other hand, would seem to be accented regularly : faldremos, fald- semos. The important question is worth further study in detail.

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(A. M.-Fa.; J. F.-K.)

Spanish Literature

The name Spanish in connexion with literature is now generally restricted to works in the Castilian tongue. In the present article it is taken in the wider sense as embracing the literary productions of the whole Iberfem Peninsula, with the exceptions of Portugal and of Galicia, the latter of which, as regards language and literature, belongs to the Portuguese domain. Spanish literature thus considered falls into two divisions — Castilian and Catalan.

I. Castilian Literature. — Of the Castilian texts now extant none is of earlier date than the 1 2th century, and very probably none goes farther back than 11 50. The text generally accepted as the oldest — the Mystery of the Magian Kings, as it is rather inappropriately designated by most historians of literature — is a fragment of a short semi-liturgical play meant to be acted

Heroic Poetry,

in the church of Toledo on the feast of Epiphany. Manifestly an imitation of the Latin ludi represented in France during the early years of the 12 th century, the Spanish piece cannot have been composed much before n 50.

The national hero Rodrigo Diaz de Bivar (d. 1099), better known in history by the Arabic surname of the Cid, was cele- brated in the vulgar tongue in two poems, neither of which has come down to us in its entirety. The more ancient cantar, usually entitled Poema del Cid, since it was originally edited (1779) by Tomas Antonio Sanchez, relates in its first part the valiant deeds {gesta) of the Cid subsequent to his quarrel with Alphonso VI. ; in the second the capture of Valencia, the reconciliation of the hero with the king and the marriage of his daughters with the infantes of Carrion; and in the third the treason of the infantes, the ven- geance of the Cid, and the second marriage of his daughters with the infantes of Navarre and Aragon. The narrative of the last years of the Cid, which closes the epic, is much curtailed. Whilst in the Poema the Cid appears as the loyal vassal, de- ploring the necessity of separating from his king, the Cid of the second poem, Cronica rimada del Cid, is almost a rebel and at least a refractory vassal who dares treat his sovereign as an equal. The portion of the Cronica which has been preserved deals in the main with the youth of Rodrigo; it contains the primitive version of his quarrel with the Count Gomez de Gormaz and the marriage of the slayer with Ximena, the Count's daughter, and also a series of fabulous episodes, such as the Cid's journey to France to fight with the twelve peers of Charlemagne, &c. The Poema, which survives in a 14th-century manuscript, be- longs to about the middle of the 12th century; the form under which the Cronica text has reached us is at least two centuries later; but, on the other hand, several traditions collected by the author bear an incontestable stamp of antiquity. The versification of both poems is irregular. Normally this epic measure may be- divided into two hemistichs of seven or eight syllables each; but

here the lines sometimes fall short of this number and sometimes exceed it; the strophes follow the model of the laisses of the French chansons de geste — that is, they have a single assonance and vary greatly in extent.

A fragment of an epic poem on the infantes de Lara has been reconstituted from the Crdnica general by Ramon Menendez Pidal (1896); if similar poems existed on real personages like Roderick, or mythical heroes like Bernardo del Carpio, they have not survived. Still the frequent allusions in the chronicles to the narratives of the juglares suggest that Castilian heroic poetry was richer than the scarcity of the monuments now extant would lead us to believe. Fernan Gonzalez, first in- dependent count of Castile (10th century), has alone been celebrated in a poem composed (about 1250 or later) in single- rhyme quatrains.

With the heroic poetry which takes its themes from the national history and legends, there grew up in the 13th century a school Poems of of religious and didactic poetry, the most eminent nth Ceo- representative of which is Gonzalo de Berceo (1180?- tury ~ 1246?). This poet, born at Berceo (Logrono),

composed several lives of Spanish saints, and other devotional poems, such as the Miracles and the Praises of the Virgin. Berceo calls his poems prosa, decir, dictado, indicating thereby that he intended them to be read and recited, not sung like the cantares. They are written in single-rhyme quatrains and in verses of twelve to fourteen syllables, according as the ending of each hemistich is masculine or feminine. In the same metre were composed, also in the 13th century, two long poems — one on Alexander the Great, the other on Apollonius of Tyre- after Latin and French sources. The author of the first of these poems contrasts his system of versification, which he calls mester de clerecia, with the mester de joglaria used in heroic poetry, and intended to be sung; and he declares that this single-rhyme quatrain {cur so rimado por la quaderna via) consists of counted syllables. The composer of Apolonio calls this same versification nueva mestria. The single-rhyme quatrain, in- troduced in imitation of the French poetry of the 12th century,

became from the time of Berceo and the Alixandre and Apolonio the regular form in Castilian narrative and didactic poetry, and prevailed down to the close of the 14th century.

To the 13th century are assigned a Life of St Mary the Egyp- tian, translated from the French, perhaps through a Provencal version, and an Adoration of the Three Kings, in verses of eight or nine syllables rhyming in pairs (aa, bb, cc, &c), as well as a fragment of a Debate between Soul and Body, in verses of six or seven syllables, evidently an imitation of one of

the medieval Latin poems, entitled Rixa animi et corporis. The oldest lyric in Castilian, La Razdn feita d'amor, belongs to the same period and probably derives from a French source; it bears the name of Lope de Moros, who, however, seems to have been merely the copyist. Mention may here also be made of the cantigas (songs) of Alphonso the Learned in honour of the Virgin, although, being in the Galician dialect, these properly belong to the history of Portuguese literature.

The 14th century saw the birth of the most original medieval Spanish poet. Juan Ruiz, archpriest of Hita (near Guadala- jara), has left us a poem of irregular composition, poetryof in which, while reproducing apologues and dits Uth Ceo- from foreign sources, he frequently trusts to his ' n O r – own inspiration. Ruiz celebrates love and woman; his book is of buen amor, that is, he shows by his own experience and the example of those whom he follows how a man may become a successful lover. By way of precaution, the poet represents himself as one who has survived his illusions, and maintains that carnal love {loco amor) must finally give place to divine love; but this mask of devotion cannot disguise the real char- acter of the work. The Rimado de palacio of Pero Lopez de Ayala, chancellor of Castile at the end of the 14th century, does not refer exclusively to court life; the author satirizes with great severity the vices of all classes of laymen and church- men. Akin to this Rimado de palacio are the proverbios mor- ales of the Jew Sem Tob of Carrion, dedicated to Peter the Cruel (1350 to 1369). The Poema de Alfonso Onceno, by Rodrigo Yafiez, is a far-off echo of the epical poems, the laisses being superseded by octo-syllabic lines with alternate rhymes. The General Dance of Death and a new version of the Debate between Soul and Body, both in eight-line strophes of arte mayor (verses of twelve syllables), and both imitated from French originals, are usually referred to this period; they both belong, however, to the 15th century.

The word " romance " not only signifies in Spain, as in other Romanic countries, the vulgar tongue, but also bears the special meaning of a short epic narrative poem (historic ballad) or, at a later date, a short lyric poem. As regards the form, the " romance " (Spanish el romance, in con- trast to French, &c, la romance) is a composition in long verses ■ of sixteen syllables ending with one assonance; these verses are often wrongly divided into two short lines, the first of which, naturally, is rhymeless. This being the form of the romance verse, the Crdnica rimada del Cid, and even the Poema (though in this case the influence of the French alexandrines is per- ceptible), might be considered as a series of romances; and in fact several of the old romances of the Cid, which form each an independent whole and were printed as separate poems in the 1 6th century, are partly to be found in the Cronica. Other romances, notably those dealing with the heroes of the Carolin- gian epic, so popular in Spain, or with the legendary figures

which Spanish patriotism opposed to the French paladins — as, for example, Bernardo del Carpio, the rival and the conqueror of Roland in Castilian tradition — seem to be detached frag- ments of the cantares de gesta mentioned by Alphonso X. At the close of the 15th century, and especially during the 16th, the romances, which had previously passed from mouth to mouth, began to be written down, and afterwards to be printed, at first on broadsheets {pliegos sueltos) and subsequently in collections {romancer os); these are either general collections, in which romances of very different date, character and subject are gathered together, or are collections restricted to a single episode or personage (for example, the Romancer

del Cid). In such romancer os the epic verse is usually regarded as octosyllabic and is printed as such; occasionally certain editions divide the romance into strophes of four verses (cuartetas) .

King Alphonso X. (d. 1284), under whose patronage ware published the code entitled Las Siete partidas and several great Prose scientific compilations (such as the Libros de astro- Chroakles, nomia and the Lapidario), was also the founder of , ~ th ‘ ,6 J b Spanish historiography in the vulgar tongue. The Crdnica general, composed under his direction, consists of two distinct parts: the one treats of universal history from the creation of the world to the first centuries of the Christian era (La General e grant historia) ; the other deals exclusively with the national history (La Crdnica d Historia de Espaiia) down to tht death of Ferdinand III. (1252), father of Alphonso. The main sources of the Crdnica general are two Spanish ecclesiastical chroniclers of the 13th century — Lucas of Tuy and Rodrigo of Toledo; both wrote in Latin, but their works were early trans- lated into the vernacular. In the Historia de Espaiia, printed in its true form for the first time in 1906, are collected many legends and occasional references to the songs of the juglares (for the purpose, however, of refuting them), the narrative relating to the Cid being partly based on an Arabic text. This portion, as recast in the Crdnica de Caslilla compiled by order of Alphonso XL, was published apart by Juan de Velorado under the title of the Crdnica del Cid (1512), and has often been reprinted. Alphonso’s example bcre fruit In the 14th cen- tury we find another Crdnica general de Espaiia or de Castilla, constructed on the model of the first and embracing

the years 1030-1312; next, the Grant crdnica de Espaiia and the Grant Crdnica de los conqueridores, compiled by command of the grand master of the order of St John of Jerusalem, Juan Fernandez de Heredia (1310-1396), about 1390. Special chronicles of each king of Castile were soon written. Our information is defective regarding the authorship of the chronicles of Alphonso X., Sancho IV., Ferdinand IV. and Alphonso XL; but the four following reigns — those of Pedro I., Henry II., John I. and Henry III. — were dealt with by Pero Lopez de Ayala; here we recognize the man of literary culture who had acquired some knowledge of ancient history, for the form of the narrative becomes freer and more personal, and the style rises with the thought. Alvar Garcia de Santa Maria and other writers whose names are not recorded probably compiled the chronicle of John II.; the events of Henry IV. 's disastrous reign were related by Diego Enriquez del Castillo and Alfonso Fernandez de Palencia; the triumphs of the Catholic sovereigns Ferdinand and Isabella by Fernando del Pulgar and Andres Bern&ldez. With these royal chronicles should be mentioned some biographies of important persons. Thus in the 15th century the chronicle of Pedro Nino, count of Buelna (1375- Biographles. 1 446)) by Gutierre Diez de Games; that of Alvaro de Luna, constable of Castile (d. 1453); and a curious book of travels, the narrative of the embassy sent by Henry III. of Castile to Timur in 1403, written by the head of the mission, Ruy Gonzalez de Clavijo.

The other productions of Castilian prose in the 13th and 14th centuries are for the most part didactic and sententious _, compositions, which, however, contain illustrations Works of or tales of Eastern origin. The Spanish translation 13th and of Kalila and Dimna, made direct from an Arabic Uih text, dates from the middle of the 13th century,

and the romance of the Seven Sages (Sindibad), translated under the title of Libro de los enganos i asaya- mientos de las mugeres, is referred to 1253. From the second half of the 13th century the collections of aphorisms, dits, apologues and moral tales become very numerous: first of all, versions of the Secretum secretorum, attributed in the middle ages to Aristotle, one of which is entitled Poridat de las poridades, next the Proverbios buenos, the Bocados de oro or Libro de bonium, Rey de Persia and the Libro de los gatos, which is derived from the Narrationes of Odo of Cheriton. During the first half of the 14th century the nephew of Alphonso X., the

infante Juan Manuel, wrote the various works which place him in the first rank of medieval Spanish prose writers. The best known is the collection of tales, many of them borrowed from Oriental sources, entitled El Conde Lucanor; but, besides this contribution to literature, he wrote graver and still more didactic treatises. The knowledge of antiquity, previously so

vague, made remarkable progress in the 14th century. Curiosity was awakened concerning certain episodes of ancient history, such as the War of Troy, and Benoit de Sainte-More's poem and the Latin narrative of Guido delle Colonne were both translated. Lopez de Ayala translated, or caused to be translated, Pierre Bersuire's French version of Livy, Boetius and various writings of Isidore of Seville and Boccaccio.

While the Carolingian cycle is mainly represented in Spain by assonanced romances, of which the oldest seem to be frag- ments of lost poems by the juglares, the British cycle (Lancelot, Tristram, Merlin, &c.) is represented chivalry. almost exclusively by works in prose (see Romance). Those narratives are known only in 15th and 16th century editions, and these have been more or less modified to suit the taste of the time; but it is impossible not [to recognize that books such as El Baladro del sabio Merlin (1498) and La Demanda del sancto grial (1515) presuppose a considerable antecedent literature of which they are only the afterglow. The principal French romances of the Round Table were trans- lated and imitated in Spain and in Portugal as early as the first half of the 14th century at least; of that there is no doubt. And, even if there were not satisfactory testimony on this point, the prodigious development in Spanish literature of the cabal- lerias, or " books of chivalry," incontrovertibly derived from fictions of Breton origin, would be proof enough that at an early date the Spaniards were familiar with these romantic tales derived from France. The oldest work of the kind is El Cabal- lero Cifar, composed at the beginning of the 14th century, but the first book of real importance in the series of strictly Spanish caballerias is the Amadis de Gaula. Certain considera- tions lead one to seek for the unknown author of the first Amadis in Portugal, where the romances of the Round Table were more highly appreciated than in Spain, and where they have exer- cised a deeper influence on the national literature. To Garci Rodriguez de Montalvo, however, falls the honour of having preserved the book by printing it; he made the mistake of diluting the original text and of adding a continuation, Las Sergas de Esplandidn. Allied to Montalvo 's Amadis with its supplementary Esplandidn (1510) are the Don Florisando (1510) and the Lisuarte de Grecia (1514), the Amadis de Grecia (1514), the Don Florisel de Niquea (1532-1551), &c, which form what Cervantes called the " Amadis sect." Parallel with the Amadises are the Palmerines, the most celebrated of which are Palmerin de Oliva (1511), Primaleon (1512), and Palmerin de Inglaterre,v/hich was first written in Portuguese by Moraes Cabral. None of those caballerias inspired by the Amadis were printed or even written before the 16th century, and they bear the stamp of that period; but they cannot be separated from their medieval model, the spirit of which they have preserved. Among the caballerias we may also class some narratives derived from the Carolingian epic — the Historia del

emperador Carlomagno y de los doce pares, a very popular version still reprinted of the French romance of Fierabras, the Espejo de caballerias, into which has passed a large part of Boiardo's Orlando innamorato, the Historia de la reina Sibilla, &c.

The first half of the 15th century, or what comes almost to the same thing, the reign of John II. of Castile (1407-1454), is characterized as regards his literature (1) by the Poetry ol development of a court poetry, artificial and pre- iSih tentious; (2) by the influence of Italian literature Centur y> on Castilian prose and poetry, the imitation of Boccaccio and Dante, especially of the latter, which introduced into Spain a liking for allegory; and (3) by more assiduous intercourse with antiquity. After the example of the Pro- vencal troubadours whose literary doctrines had made their

way into Castile through Portugal and Catalonia, poetry was now styled the arte de trobar. The arte de trobar is strictly " court " poetry, which consists of short pieces in complicated measures — love plaints, debates, questions and repartees, motes with their glosas, burlesque and satirical songs — verse wholly " occasional " and deficient in charm when separated from its natural environment. In order to understand and appreciate these pieces they must be read in the collections made by the poets of the time, where each poem throws light on the others. The most celebrated cancionero of the i£th century is that compiled for the amusement of his sovereign by Juan Alfonso de Baena; it is, so to say, the official collection of the poetic court of John II., although it also contains pieces by poets of earlier dates. After Baena's collection may be mentioned the Cancionero de Siuhiga, which contains the Castilian poems of the trobadores who followed Alphonso V. of Aragon to Naples. These cancioneros, consisting of the productions of a special group, were succeeded by collections of a more miscellaneous char- acter in which versifiers of very different periods and localities are brought together, the pieces being classed simply according to their type. The earliest genuine Cancionero general (though it does not bear the title) is that compiled by Juan Fer- nandez de Constantina, which appears to have been issued from the Valencia press at the beginning of the 16th century; the second, much better known, was published for the first time at Valencia in 1511 by Hernando del Castillo. The other poetic school of the 15th century, which claims to be specially related to the Italians, had as its leaders Juan de Mena, author of the Coronacidn and the Laberinto de fortuna, and the

marquis of Santillana, Inigo Lopez de Mendoza, who in his sonnets was, perhaps, the first to imitate the structure of the Italian hendeca- syllabics. With those two chiefs, who may be designated poeias as distinguished from the decidores and the trobadores of the cancioneros, must be ranked Francisco Imperial, a Genoese by descent, who at a somewhat earlier date helped to acclimatize in Spain the forms of Italian poetry. The marquis of Santillana occupies a considerable place in the literature of the 15th century not only by reason of his poems, but through the sup- port he afforded to all the writers of his time, and the impulse he gave to the study of antiquity and to the labours of trans- lators. In the next generation the most prominent figures are Gomez Manrique and Jorge Manrique, the latter of whom has produced a short poem which is a masterpiece.

With the exception of the chronicles and some caballerias the prose of the 15th century contains little that is striking. Prose of The translation of Virgil by Enrique de Villena isth Cen- is ponderous and shows no advance on the versions iur y- of Latin authors made in the previous century.

A curious and amusing book, full of details about Spanish manners, is the Corbacho (1438) of the archpriest of Talavera, Alfonso Martinez de Toledo, chaplain to King John II.; the Corbacho belongs to the numerous family of satires against women, and this title, by which it is commonly known — borrowed from a work of Boccaccio's, with which it has otherwise nothing in common — indicates that he has not spared them.

The ancient liturgical Spanish theatre is known to us only by fragments of the play of the Magian Kings, already mentioned; but certain regulations given in the LUer'tan. ^^ te portidas (compiled between 1252 and 1257) prove that such a theatre existed, and that at the great festivals, such as Christmas, Epiphany and Easter, dramatic representations were given in church. These repre- sentations, originally a simple commentary on the liturgy, were gradually adulterated with buffoonery, which frequently brought down the censure of the clergy. Alphonso X. even thought it necessary to forbid the " clerks " playing juegos de escarnios, and permitted in the sanctuary only dramas destined to commemorate the principal episodes of the life of Christ. Of all the Church festivals, the most popular in Spain was that of Corpus Christi instituted by Urban IV. in 1264. At an early date the celebration of this festival was accompanied with

dramatic performances intended to explain to the faithful the eucharistic mystery. These dramas, called autos sacramentales, acquired more and more importance; in the 17th century, with Calderon, they become grand allegorical pieces, regular theo- logical dissertations in the form of dramas. To the auto sacra- mental corresponds the auto al nacimiento, or drama of the Nativity. In Spain, as elsewhere, the secular theatre is a product of the

religious theatre. Expelled from the Church, the juegos de tscarnios took possession of the public squares and there attained free development; ceasing to be a mere travesty of dogma, they developed into a drama whose movement is no longer determined by the liturgy, and whose actors are borrowed from real life in Spanish society. This new theatre begins towards the close of the 15th century, with the pastoral pieces of Juan del Encina, which, after Virgil's example, he calls eglogas. Genuine shepherds are the interlocutors of these bucolics, into which are also sometimes introduced students, and Lucas Fernandez, a contemporary and pupil of Encina's, introduces gentlemen and soldiers. A book which, strictly speaking, does not belong to the theatre, the Tragicomedia de Calixto y Melibea, much better known as La Celestina, caused the new theatre, still rudimentary in the attempts of the school of Encina, to make a step onwards. This astonishing novel taught the Spaniards the art of dialogue, and for the first time exhibited persons of all classes of society (particularly the lowest) speaking in harmony with their natural surroundings. The progress caused by the Celestina may be estimated by means of the Propaladia of Bartolome de Torres Naharro, a collection of pieces represented at Rome in presence of Leo X. Torres Naharro is thought to have borrowed from France the division of the play into " days " (jornadas); shortly after Naharro we find the comedy of manners in Lope de Rueda, whose dramatic work is composed of regular comedies constructed on the model of Italian authors of the beginning of the 16th century, and also of little pieces intended for performance in the intervals between the larger plays (entremeses and pasos) , some of which are models of sprightly wit. Some of Naharro's, and especially of Rueda's, pieces foreshadow the comedy of intrigue, which is emphatically the type of the classic stage. But to reach Lope de Vega, the Spanish stage had to be enlarged in relation to national history. A poet of Seville, Juan de la Cueva, first brought on the boards subjects such as the exploits of the Cid, Bernardo del Carpio, and others, which had previously been treated of only in the romances. To a poet called Berrio, of whose work nothing has been preserved, are attributed the comedias of Moors and Christians, in which were represented famous episodes of the ˆge-long struggle against the infidel. And it was at this period (1585) that Cervantes experimented in the drama; in his Tratos de Argel he gives us a picture of galley-life, recollections of his long captivity in Algiers. There is no need to linger over the attempts at tragedy of the ancient type by Jeronimo Ber- mudez, Cristobal de Virues, Lupercio Leonardo de Argensoia, &c, the only successful specimen of which is the Numancia of Cervantes; these works, mere exercises in style and versification, remained without influence on the development of the Spanish stage. The pre-classic period of this stage is, as regards dramatic form, one of indecision. Some write in prose, like Rueda; others, like Naharro, show a preference for the redondillas of popular poetry; and

there are those again who, to elevate the style of the stage, versify in hendecasyllabics. Hesitation is also evident as to the mode of dividing the drama. At first a division into five acts, after the manner of the ancients, is adopted, and this is followed by Cervantes in his early pieces; then Juan de la Cueva reduced the five acts to four, and in this he is imitated by most poets till the close of the 16th century (Lope de Vega himself in his youth composed pieces in four acts). Francisco de Avendaiio divided his Florisea into three acts as early as 1551, but his example was not followed till about forty years later, when this division was generally adopted in all dramatic works — with the exception of short pieces like the loa (prologue), the entrants, the paso, the baile (different kinds of entr'acte).

[LITERATURE

The golden age of Spanish literature belongs to the 16th and 17th centuries, extending approximately from 1550 to 1650. Classic Axe P rev ' ous t0 the reign of the Catholic sovereigns 16th and ' there exists, strictly speaking, only a Castilian nth Cea- literature, largely influenced by imitation first of fairies. France and then of Italy; the union of the two

crowns of Aragon and Castile, and afterwards the advent of the house of Austria and the king of Spain's election as emperor, achieved the political unity of Spain and the unity of Spanish literature. After the death of Philip IV. (1665) the light went out; the nation, exhausted by wars and bad administration, produced nothing; its literary genius sank in the general decline, and Spain was destined ere long to fall again under the influence of France, to which she had submitted during the first period of the middle ages. In the 16th and 17th centuries the literature was eminently national. Yet in certain kinds of literature the Spaniards continued to seek models abroad.

Lyric poetry, especially that of the more ambitious order, is always inspired by the Italian masters. An irresistible tendency leads the Spanish poets to rhyme in Poetry. hendecasyllabics —as the marquis of Santillana had formerly done, though his attempts had fallen into oblivion — and to group their verses in tercets, octaves, sonnets and cancioties (canzoni). Juan Boscan, Garcilaso de la Vega and Diego Hurtado de Mendoza are the recognized chiefs of the school al itdlico modo, and to them belongs the honour of having successfully transplanted to Spain these different forms of verse, and of having enriched the poetic language of their country. The defects of Boscan and Mendoza (such as certain faults of rhythmic

accentuation) were corrected by their disciples Gutierre de Cetina, Gregorio Silvestre, Hernando de Acufia, by the poets of the so-called school of Seville, headed by Fernando de Herrera and also by those of the rival school of Salamanca, rendered famous mainly by the inspired poetry of Luis Ponce de Leon. Against these innovators the poets, faithful to the old Castilian manner, the rhymers of redondillas and romances, held their own; under the direction of Cristobal de Castillejo, they carried on a fierce war against the " Petrarch- ists." But by the last third of the 16th century the triumph of the new Italian school was assured, and no one any longer thought of reproaching it for its exotic flavour. Still at this period there was a schism between the higher poetry and the other varieties: in the former only the hendecasyllabic and the heptasyllabic (quebrado) were employed, while the popular poets, or those who affected a more familiar tone, preserved the national metres. Almost all the poets, however, of the 16th and 17th centuries tried their powers in both kinds of versifica- tion, using them in turn according to the nature of their sub- jects. Thus Lope de Vega, first of all, who wrote La Dragontea (1598), La Hermosura de Angelica (1602), La Jerusalem con- quistada (1600), in Italian verses and in octaves, composed his long narrative poem on Isidore, the patron of Madrid (1590), in quintillas of octosyllabic verse, not to mention a great number of romances. As regards this last form, previously disdained by artistic poets, Lope de Vega gave it a prestige that brought it into favour at court. A host of poets were pleased to recast the old romances or to compose new ones. The 17th century, it may be said, is characterized by a superabundance of lyric poetry, to which the establishment of various literary academies contributed. Of this enormous mass of verses of all sorts little still survives; the names of most of the versifiers must be omitted, and in addition to those already cited it will be suffi- cient to mention G6ngora and Quevedo. G6ngora is especially famous as the founder of the " cultist " school, as the introducer into Castilian poetry of a periphrastic style, characterized by sonorous diction and artificial arrangements of phrase. The Spaniards have given the name of culto to this eccentric style, with its system of inversions based on Latin syntax; but Gongora, a poet of really great powers, had begun better, and as often as he is contented with romances he finds true poetic accents, ingenious ideas and felicitous expressions. Quevedo, much

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greater in prose than in verse, displays real power only in satire, epigram and parody. There is in some of his serious pieces the stuff of a Juvenal, and his satiric and burlesque romances, of which several are written in slang (germama), are in their way little masterpieces. Another commonplace of Spanish poetry at this period was epic poetry after the style of Tasso's Geru- salemme. These interminable and prosaic

compositions in octavos r coles do not approach their model; none of them can even be compared in style; elevation of thought and beauty of imagery, to Camoens's Lusiadas. They are in reality rhymed chronicles, and consequently, when the author happens to have taken part in the events he narrates, they have a genuine historical interest. Such is the case with Alonso de Ercilla's Araucana, of which it may be said that it was written less with a pen than with a pike. In burlesque poetry the Spaniards have been more successful: La Gatomaquia of Lope de Vega, and La Moschea of Villaviciosa (d. 1658) are agreeable examples of witty invention.

The departments of imaginative literature in which the genius of the new Spanish nation revealed itself with most vigour and originality are the novela and the drama. By novela must be understood the novel of manners, called picaresca (from plcaro, a rogue or " picaroon ") because of the social status of the heroes of those fictions; and this type of novel is a Spanish invention. The pastoral romance, on the other hand— the best-known examples of which are the Diana of Jorge de Montemayor, continued by Alonso Perez and Gaspar Gil Polo, the Galatea of Cervantes, and the Arcadia of Lope de Vega — as well as the novel of adventure begun by Cervantes in his Novelas exemplares, and cultivated after him by a host of writers, is directly derived from Italy. The Arcadia of Sannazaro is the source of the Diana and of all its imitations, just as the Italian novellieri are the masters of most Spanish novelistas of the 17 th century. The picaresque novel starts in the middle of the 16th century with the Vida de Lazarillo de Tormes, sus jortunas y adversidades; the impetus was given, and the success of Lazarillo was so great that imitators soon appeared. In 1599 Mateo Aleman published the first part of the adventures of another picaroon, Guzman de Alfarache; before he could issue the sequel (1604) he was anticipated (1602) by an unscrupulous rival, whose continuation was on a lower plane. Quite unlike that of the Lazarillo, the style of Mateo Aleman is eloquent, full, with long and learned periods, some- times diffuse. Nothing could be more extravagant and more obscure than the history of Justina the beggar woman (La Picara Justina) by Francisco Lopez de Ubeda (1605), which is generally (but perhaps wrongly) said to be a name assumed by the Dominican Andres Perez. A long series of similar tales continued to be published by writers of considerable merit (see Picaresque Novel).

By degrees the picaresque romance was combined with the novel of Italian origin and gave rise to a new type — half novel of manners, half romance of adventure — of which the character- istic example appears to be the Marcos de Obregdn (1618) of Vicente Martinez Espinel, one of the best written works of the 17th century. To the same class belong almost all the novels of Alonso Jeronimo de Salas Barbadillo, Luiz Velex de Guevara and Francisco Santos's popular pictures of life in Madrid, Dia y noche de

Madrid (1663), Periquillo, el de las gattineras, &c. On the other hand, the novels of Tirso de Molina (Los Cigarrales de Toledo, 1624), Perez de Montalban (Para todos, 1632), Maria de Zayas (Novelas, 1635-1647), are more in the manner of the Novelas exemplares of Cervantes, and consequently of the Italian type. Among the so-called historical romances one only deserves to be mentioned — the Guerras civiles de Granada (1 595-1604) by Gines Perez de Hita, which deals with the last years of the kingdom of Granada and the insurrection of the Moors of the Alpujarras in the time of Philip II. Don Quixote (1605-1615), the masterpiece of Cervantes, is too great a work to be treated with ethers; and, moreover, it does not fall strictly within the limits of any of the classes just mentioned. If it has to be defined, it may be described as the social romance of

16th and 17th century Spain. Cervantes undoubtedly owed much to his predecessors, notably to the few picaresque romancers who came before him, but he considerably enlarged the scope of the type and strengthened the framework of the story by a lofty moral idea. His main purpose was not so much to ridicule the books of chivalry, which were already out of fashion by his time, but to show by an example pushed to absurdity the danger of those prejudices of pure blood and nobler race with which three-fourths of the nation were imbued, and which, by the scorn of all useful labour which they involved, were destined to bring Spain to ruin. The lesson is all the more effective, as Cervantes's hidalgo, although ridiculous, was not put beyond the pale of the reader's sympathy, and the author condemns only the exaggeration of the chivalrous spirit, and not true courage and devotion when these virtues have a serious object. What happened to Guzman de Aljarache happened to Don Quixote. In 1614 a SDurious second part of the adventures of Don Quixote made its appearance; Cervantes was thus roused from inactivity, and the following year gave to the world the true second part, which instantly eclipsed Avellaneda's imitation. The stage in the 17 th century in some measure took the place of the romances of the previous age; it is, as it were, the Drama of medium of all the memories, all the passions, nth and ail the aspirations of the Spanish people. Its

Century, style, being that of the popular poetry, made it accessible to the most illiterate classes, and gave it an im- mense range of subject. The Bible, the lives of the martyrs, national traditions, the chronicles of Castile and Aragon, foreign histories and novels, even the daily incidents of con-

temporary Spanish life, the escapades and nightly brawls of students, the gallantries of the Calle Mayor and the Pradc of Madrid, balcony escalades, sword-thrusts and dagger-stabs, duels and murders, fathers befooled, jealous ladies, pilfering and cowardly valets, inquisitive and sprightly waiting-maids, sly and tricky peasants, fresh country girls — all are turned to dramatic account. The enormous mass of plays with which the literature of this period is inundated may be divided into two great classes — secular and religious; the latter may be sub- divided into (1) the liturgical play, i.e. the auto either sacra- mental or al nacimicnto, and (2) the comedia divina or the comedia de santos, which has no liturgical element, and differs from a secular play only in the fact that the subject is religious and frequently, as one of the names indicates, derived from the biography of a saint. In the secular drama, classification might be carried almost to any extent if the nature of the subject be taken as the criterion. It will be sufficient to distinguish the comedia (i.e. any tragic or comic piece in three acts) according to the social types brought on the stage, the equipment of the actors, and the artifices resorted to in the representation We have (1) the comedia de capa y espada, which represents everyday incident, the actors belonging to the middle class, simple cabal- leros, and consequently wearing the garb of ordinary town life, of which the chief items were the cloak and the sword; and (2) the comedia de tealro or de ruido, or again, de tramoya or de aparencias {i.e. the theatrical, spectacular or scenic play), which has kings and princes for its dramatis personae and makes a great display of mechanical devices and decorations. Besides the comedia, the classic stage has also a series of little pieces subsidiary to the play proper: the loa, or prologue; the entremes, a kind of inter- lude which afterwards developed into the sainete; the baile, or ballet accompanied with singing; and the zarzuela, a sort of operetta thus named after the royal residence of La Zarzuela, where the kings of Spain had a theatre. As to the dramatic poets of the golden age, even more numerous than the lyric poets and the romancers, it is difficult to group them. All are more or less pupils or imitators of the great chief of the new school, Lope Felix de Vega Carpio; everything has ultimately to be brought back to him whom the Spaniards call the " monster of Nature." Among Lope's contemporaries only a few poets of Valencia — Gaspar Honorat de Aguilar (1 561-1623), Francisco T&rrega, Guillen de Castro, the author of the Mocedades del Cid (from which Corneille derived his inspiration) — formed a small

school, as it were, somewhat less subject to the master than that of Madrid, which could only win the applause of the public by copying as exactly as possible the manner of the great initiator. Lope left his mark on all varieties of the comedia, but did not attain equal excellence in all. He was especially successful in the comedy of intrigue (enredo), of the capa y espada class, and in dramas whose subjects are derived from national history. His most

incontestable merit is to have given the Spanish stage a range and scope of which it had not been previously thought capable, and of having taught his contemporaries to invent dramatic situations and to carry on a plot. It is true he produced little that is perfect: his pro- digious fecundity and facility allowed him no time to mature his work; he wrote negligently, considered the stage an inferior department, good for the vulgo, and consequently did not judge it worthy of the same esteem as lyric or narrative poetry modelled on the Italians. Lope's first pupils exaggerated some of his defects, but, at the same time, each, according to his own taste, widened the scope of the comedia. Antonio Mira de Amescua and Luis Velez de Guevara were successful, especially in tragic histories and comedias divinas. Gabriel Tellez, better known under the pseudonym of Tirso de Molina, one of the most flexible, ingenious and inventive of the dramatists, displayed no less talent in the comedy of contemporary manners than in historical drama. El Burlador de Sevilla (Don Juan) is reckoned his masterpiece; but he showed himself a much greater poet in El Vergonzoso en palacio, Don Gil de las Colzas Verdes and Marta la Piadosa. Finally Juan Ruiz de Alarcon the most serious and most observant of Spanish dramatic poets, success- fully achieved the comedy of character in La Verdad sospechosa, closely followed by Corneille in his Menteur. Most of the remaining play-writers did little but increase the number of comedias; they added nothing to the real elements of the drama. The second epoch of the classical drama is represented mainly by Pedro Calderon de la Barca, the Spanish dramatist who has obtained most celebrity abroad, where his pieces have been much studied and admired (perhaps extravagantly). It is Calderon who first made honour, or more correctly the point of honour, an essential motive in the conduct of his personages (e.g. El Medico de su honra) ; it is he also who made the comedia de capa y espada uniform even to monotony, and gave the comic " part " of the gracioso (confidential valet of the caballero) a rigidity which it never previously possessed. There is depth and poetry in Calderon, but also vagueness and bad taste. His most philosophic drama, La Vida es sueno, is a bold and sublime idea, but indistinct and feebly worked out; his autos sacra- mentales give evidence of extensive theological knowledge and dexterity in dramatizing abstractions. Calderon was imitated, as Lope had been, by exaggerating his manner and perverting his excellences. Two contemporaries deserve to be cited along with him — Francisco de Rojas Zorilla, author of the fine historic play Del Rey abajo ninguno, and Augustin Moreto, author of some pleasant comedies. Among those who worked in a less ambitious vein, mention must be made of Luis Quinones de Benavente, a skilful writer of entreme'ses.

A new manner of writing appears with the revival of learning; the purely objective style of the old chroniclers, accumulating one fact after another, without showing the logical History connexion or expressing any opinion on

men or things, began to be thought puerile. An attempt was made to treat the history of Spain in the manner of Livy, Sallust, and Tacitus, whose methods of narration were directly adopted. The 16th century, however, still presents certain chroniclers of the medieval type, with more erudition, precision and the promise of a critical faculty. La Cronica general de Espana, by Ambrosio de Morales; the Compendio historial of Est6ban de Garibay; and the Historia general de las Indias occidentales, by Antonio de Herrera, are, so far as style is concerned, con- tinuations of the last chronicles of Castile. Jeronimo de Zurita is emphatically a scholar; no one in the 16th century knew as he did how to turn to account documents and records for the purpose of completing and correcting the narratives of the

ancient chronicles; his Andes de la corona de Aragdn is a book of great value, though written in a laboured style. With Juan de Mariana history ceases to be a mere compilation of facts or a work of pure erudition, and becomes a work of art. The Historia de Espaiia by the celebrated Jesuit, first written in Latin (1592) in the interest especially of foreigners, was after- wards rendered by its author into excellent Castilian; as a general survey of its history, well planned, well written and well thought out, Spain possesses nothing that can be compared with it. Various works of less extent — accounts of more or less important episodes in the history of Spain — may take their place beside Mariana's great monument: for example, the Guerra de Granada, by Diego Hurtado de Mendoza (a history of the revolt of the Moors of the Alpujarras under Philip II.), written about 1572, immediately after the events, but not published till 1627; the narrative of the expedition of the Catalans in the Morea in the 14th century, by Francisco de Moncada (d. 1635); that of the revolt of the same Catalans during the reign of Philip IV., by Francisco Manuel de Mello, a Portuguese by birth; and that of the conquest of Mexico by Antonio de Soils. Each of these writers was more or less inspired by some Latin author, one preferring Livy, another Sallust, &c. Most of these imitations are somewhat stilted, and their artificiality in the long run proves as fatiguing as the heaviness of the medieval chroniclers. On the other hand, the historians of the wars of Flanders, such as Carlos Coloma, Bernardino de Mendoza, Alonso Vazquez and Francisco Verdugo, are less refined, and for that very reason are more vivid and more capable of interesting us in the struggle of two races so foreign to each other and of such different genius. As for the accounts of the transatlantic discoveries and con- quests, they are of two kinds — either (1) memoirs of the actors or witnesses of those

great dramas, as, e.g. the Historia verdadera de la conquista de la nueva Espana, by Bernal Diaz del Castillo (1492-1581), one of the companions of Cortes, and the Historia de las Indias, by Bartolome de las Casas, the apostle of the Indians; or (2) works by professional writers, such as Francisco Lopez de Gomara, official historiographers who wrote in Spain on information sent to them from the newly-discovered lands. Letter writers, a rather numerous body in Spanish literature, are nearly related to the historians; in fact, letters written to be read by others than the persons addressed, or Writers. ' n an y case revised afterwards, are only a method of writing history in a familiar style. Fernando del Pulgar appended to his Claros varones a series of letters on the affairs of his time; and in the 16th century Antonio de Guevara (d. 1544) collected, under the title of Epistolas familiares, his correspondence with his contemporaries, which throws a great light on the early part of the reign of Charles V., although it must be used with caution because of the numerous recasts it has undergone. A celebrated victim of Philip II., Antonio Perez (d. 1611), revenged himself on his master by relating in innumerable letters, addressed during his exile to his friends and protectors, all the incidents of his disgrace, and by selling to the ministers of France and England the secrets of the Spanish policy in which he had a hand; some of these letters are perfect specimens of urbane gallantry.

Philosophy is rather poorly represented in the 16th and 17th centuries in the literature of the vernacular. The greater number of the Spanish thinkers of this epoch, ' whatever the school to which they belonged — scholastic, Platonic, Aristotelian or independent — wrote in Latin. Ascetic and mystical authors alone made use of the vulgar tongue for the readier diffusion of their doctrine among the illiterate, from whose ranks many of their disciples were recruited. Luis de Granada (1504-1588), Luis Ponce de Leon (1528-1598), Teresa de Jesus (151 5-1 582), Pedro Mal6n de Chaide and St John of the Cross are the brighter lights of this class of writers. Some of their books, like the Guia de pecadores of Luis de Granada, the autobiography of St Theresa, and Malonde Chaide 's Conversion of the Magdalen (1588), have obtained a lasting

Philosophy.

Mysticism.

Moralists.

success beyond the limits of the Peninsula, and have influenced the development of mysticism in France. The Spanish mystics are not only remarkable for the depth or subtlety of their thoughts and the intensity of the divine love with which they are inspired; many of them are masters of

style, and some, like St John of the Cross, have composed verses which rank with the most sublime in the language. A notable fact is that those who are regarded as illuminati profess the most practical ideas in the matter of morality. Nothing is more sensible, nothing less ecstatic, than the manual of domestic economy by Luis de Leon — La Perfecta casada. Lay moralists are numerous in the 16th and 17th centuries. Some write long and heavy treatises on the art of governing, the education of princes, the duties of subjects, &c. Pedro Fernandez de Navarrete's Conservacidn de monarquias, Diego de Saavedra Fajardo's Idea de un principe cristiano, Quevedo's La Politica de Dios y gobierno de Cristo, give a correct idea of the ability which the Spaniards have displayed in this kind of didactic literature — ability of no high order, for the Spaniard, when he means to expound a doctrine, loses himself in distinctions and easily becomes diffuse, pedantic and obscure. But there is a kind of morality in which he indubitably excels, namely, in social satire, which, under all its forms — dialogue and dream in the style of Lucian, epistle after the manner of Juvenal, or pamphlet — has produced several masterpieces and a host of ingenious, caustic and amusing compositions. Juan de Valdes (d. 1 541), the most celebrated of the Spanish Protes- tants, led the way with his Didlogo de Murcurio y Cardn, where the great political and religious questions of the first half of the 1 6th century are discussed with admirable vigour and freedom. The most eminent author in the department of social satire, as in those of literary and political satire, is Quevedo. Nothing escapes his scrutinizing spirit and pitiless irony. All the vices of contemporary society are remorselessly pilloried and cruelly dissected in his Suefios and other short works. While this great satirist, in philosophy a disciple of Seneca, imitates his master even in his diction, he is none the less one of the most vigorous and original writers of the 17th century. The only serious defect in his style is that it is too full, not of figures and epithets, but of thoughts. His phrases are of set purpose charged with a double meaning, and we are never sure on reading whether we have grasped all that the author meant to convey. Con- ceptism is the name that has been given to this refinement of thought, which was doomed in time to fall into ambiguity; it must not be confounded with the cultism of Gongora, the artifice of which lies solely in the choice and arrangement of words. This new school, of which Quevedo may be regarded as the founder, had its Boileau in the person of Baltasar Gracian, who published his Agudeza y arte de ingenio (1642), in which all the subtleties of conceptism are reduced to an exact code. Gracian, who had the gift of sententious moralizing rather than of satire, produced in his Criticdn animated pictures of the society of his own day, while he also displayed much ingenuity in collections of political and moral aphorisms which have won him a great reputation abroad.

Spanish thought as well as public spirit and all other forms of national activity began to decline towards the close of the 17th century. The advent of the house of Bourbon, and the increasing invasion of French influence in century. the domain of politics as well as in literature and science, frustrated the efforts of a few writers who had remained faithful to the pure Spanish tradition. In the hands of the second-rate imitators of Calder6n the stage sank lower and lower; lyric poetry, already compromised by the affected diction of G6ngora, was abandoned to rhymesters who tried to make up by extravagance of stylefor poverty of thought. The first symptoms, not of a revival, but of a certain resumption of intellectual production, appear in the department of linguistic study. In 1714 there was created, on the model of the French academies, La Real Academia Espaiiola, intended to maintain the purity of the language and to correct its abuses. This academy set itself at once to work, and in 1726 began the

publication of its dictionary in six folio volumes, the best title of this association to the gratitude of men of letters. The Gramdtica de la lengua castellana, drawn up by the academy, did not appear till 1771. For the new ideas which were intro- duced into Spain as the result of more intimate relations with France, and which were in many cases repugnant to a nation for two centuries accustomed to live a self-contained life, it was necessary that authoritative sanction should be found. Ignacio de Luzan, well read in the literatures of Italy and France, a disciple of Boileau and the French rhetoricians, yet not without seme originality of his own, undertook in his Poetica (1737) to expound to his fellow countrymen the rules of the new school, and, above all, the principle of the famous " unities " accepted by the French stage from Corneille's day onward. What Luzan had done for letters, Benito Feyjoo, a Benedictine of good sense and great learning, did for the sciences. His Teatro critico and Cartas eruditas y curiosas, collections of dissertations in almost every department of human knowledge, introduced the Spaniards to the leading scientific discoveries of foreign countries, and helped to deliver them from many superstitions and absurd prejudices. The study of the ancient classics and the department of learned research in the domain of national histories and literatures had an eminent representative in Gregorio Mayans y Siscar (1699-1781), who worthily carried on the great traditions of the Renaissance; besides publishing good editions of old Spanish authors, he gave to the world in 1757 a Retorica which is still worth consulting, and a number of learned

memoirs. What may be called the littirature d'agrtment did not recover much lost ground; it would seem as if the vein had been exhausted. Something of the old picaresque novel came to life again in the Fray Gerundio of the Jesuit Isla, a _ biographical romance which is also and above all —

to the detriment, it is true, of the interest of the narrative— a satire on the follies of the preachers of the day. The lyric poetry of this period is colourless when compared with its variegated splendour in the preceding century. Nevertheless one or two poets can be named who possessed oe refinement of taste, and whose collections of verse

at least show respect for the language. At the head of the new school is Menendez Valdes, and with him are associated Diego Gonzalez (1733-1794), Jose Iglesias de la Casa (1748-1791), known by his letrillas, Cienfuegos, and some others. Among the verse writers of the 18th century who produced odes and didactic poetry it is only necessary to mention Leandro Fernandez de Moratin and Quintana, but the latter belongs rather to the 19th century, during the early part of which he published his most important works. The poverty of the period in lyric poetry is even exceeded by that of the stage. No kind of comedy or tragical drama arose to take the place of the ancient comedia, whose platitudes and absurdities of thought and expression had ended by disgusting even the least exact- ing portion of the public. The attempt was indeed made to introduce the comedy and the tragedy of France, but the stiff and pedantic adaptations of such writers as the elder Moratin, Agustin de Montiano y Luyando (1697-1764), Tomas de Iriarte, Garcia de la Huerta and the well-known economist Caspar de Jovellanos failed to interest the great mass of playgoers. The only dramatist who was really successful in composing on the French pattern some pleasant comedies, which owe much of their charm to the great purity of the language in which they are written, is Leandro Fernandez de Moratin. It has to be added that the sainete was cultivated in the 18th century by one writer of genuine talent, Ramon de la Cruz; nothing helps us better to an acquaintance with the curious Spanish society of the reign of Charles IV. than the interludes of this genial and light- hearted author, who was succeeded by Juan Ignacio Gonzalez del Castillo.

The struggle of the War of Independence (1808-14), which was destined to have such important consequences in the 19th world of politics, exerted no immediate influence on

Century. tne literature of Spain. One might have expected as a consequence of the rising of the whole nation against

Napoleon that Spanish writers would no longer seek their inspiration from France, and would resume the national tradi- tions which had been broken at the end of the 17 th century. But nothing of the sort occurred. Not only the afrancesados (as those were called who had accepted the new regime), but also the most ardent partisans of the patriotic cause, continued in

literature to be the submissive disciples of France. Quintana, who in his odes preached to his compatriots the duty of resistance, has nothing of the innovator about him; by his education and by his literary doctrines he remains a man of the 18th century. The same may be said of Martinez de la Rosa, who, though less powerful and impressive, had a greater independence of spirit and a more highly trained and classical taste. And when roman- ticism begins to find its way into Spain and to enter into conflict with the spirit and habits of the 18th century, it is still to France that the poets and prose writers of the new school turn, much more than to England or to Germany. The first decidedly romantic poet of the generation which flourished about 1830 was the duke of Rivas; no one succeeded better in reconciling the genius of Spain and the tendencies of modern poetry; his poem El Moro expdsito and his drama of Don Alvaro 6 la fuerza del sino belong as much to the old romances and old theatre of Spain as to the romantic spirit of 1830. On the other hand, Espronceda, who has sometimes been called the Spanish Musset, savours much less of the soil than the duke of Rivas; he is a cosmopolitan romantic of the school of Byron and the French imitators of Byron; an exclusively lyric poet, he did not live long enough to give full proof of his genius, but what he has left is often exquisite. Zorilla has a more flexible and exuberant, but much more unequal, talent than Espronceda, and if the latter has written too little it cannot but be regretted that the former should have produced too much; nevertheless, among a multitude of hasty performances, brought out before they had been matured, his Don Juan Tenorio, a new and fantastic version of the legend treated by Tirso de Molina and Moliere, will remain as one of the most curious specimens of Spanish romanticism. In the dramatic literature of this period it is noticeable that the tragedy more than the comedy is modelled on the examples furnished by the French drama of the Restora- tion; thus, if we leave out of account the play by Garcia Gutierrez, entitled El Trovador, which inspired Verdi's well-known opera, and Los Amantes de T cruel, by Hartzenbusch, and a few others, all the dramatic work belonging to this date recalls more or less the manner of the professional playwrights of the boulevard theatres, while on the other hand the comedy of manners still preserves a certain originality and a genuine local colour. Breton de los Herreros, who wrote a hundred comedies or more, some of them of the first order in their kind, apart from the fact that their diction is of remarkable excellence, adheres with great fidelity to the tradition of the 17th century; he is the last of the dramatists who preserved the feeling of the ancient comedia. Mariano Jose de Larra, a prose writer of the highest talent, must be placed beside Espronceda, with whom he has several features in common. Caustic in temper, of a keenly observant spirit, remarkably sober and clear as a writer, he was specially successful in the political pamphlet, the article d'actualite, in which he ridicules without pity the vices and oddities of his contemporaries; his reputation is much more

largely due to these letters than either to his plays or his novel El Doncel de Don Enrique el Doliente. With Larra must be associated two other humoristic writers. The first of these is Mesonero Romanos, whose Escenas matrilenses, although of less literary value than Larra's articles, give pleasure by their good-natured gaiety and by the curious details they furnish with regard to the contemporary society of Madrid. The other is Estebanez Calderon, who in his Escenas atidaluzas sought to revive the manner of the satirical and picaresque writers of the 17th century; in a uselessly archaic language of his own, tesse- lated with fragments taken from Cervantes, Quevedo and others, he has delineated with a somewhat artificial grace various piquant scenes of Andalusian or Madrid life. The most promi- nent literary critics belonging to the first generation of the

century were Alberto Lista (1775-1848), whose critical doctrine may be described as a compromise between the ideas of French classicism and those of the romantic school, and Agustin Duran, who made it his special task to restore to honour the old literature of Castile, particularly its romances, which he had studied with ardour, and of which he published highly esteemed collections.

If the struggle between classicists and romanticists continued even after 1830, and continued to divide the literary world into two opposing camps, the new generation — that which occupied the scene from 1840 till about 1868 — had other pre- occupations. The triumph of the new ideas was assured; what was now being aimed at was the creation of a new literature which should be truly national and no longer a mere echo of that beyond the Pyrenees. To the question whether modern Spain has succeeded in calling into existence such a literature, we may well hesitate to give an affirmative answer. It is true that in every species of composition, the gravest as well as the lightest, it can show works of genuine talent; but many of them are strikingly deficient in originality; all of them either bear unmistakable traces of imitation of foieign models, or show (more or less happily) the imprint of the older literature of the 17th century, to which the historical criticism of Duran and the labours of various other scholars had given a flavour of novelty. Foreign influence is most clearly marked in the work of Ventura de la Vega (1807-1865), whose relationship to the younger Moratin, and therefore to Moliere, is unmistakable in El Hombre

de mundo (1845), a piece written after a long apprenticeship spent in translating French plays. Among those who endeavoured to revive the dramatic system established by Lope de Vega were Aureliano Fernandez-Guerra y Orbe (1816-1804) and Francisco Sanchez de Castro (d. 1878) ; the former in Alonso Cano, and the latter in Hermenegildo, produced examples of ingenious reconstruction, which testified to their scholarship but failed to interest the public permanently. A fusion of early and later methods is discernible in the plays of Adelardo Lopez de Ayala and Tamayo y Baus. Campoamor wrote dramas which, though curious as expressions of a subtle intelligence cast in the form of dialogue, do not lend themselves to presentation, and were probably not intended for the stage. Nunez de Arce in El Haz de lena produced an impressive drama, as well as several plays written in collaboration with Antonio de Hurtado, before he found his true vocation as a lyric poet. The successor of Tamayo y Baus in popular esteem must be sought in Jose Echegaray, whose earlier plays — such as La Esposa del vengador and En el puno de la espada — are in the romantic style; in his later works he attempts the solution of social problems or the symbolic drama. Such pieces as El Gran Galesto, El Hijo de Don Juan and El Loco dios indicate a careful study of the younger Dumas and Ibsen. Duing the last few years his popularity has shown signs of waning, and the copious dramatist has translated from the Catalan at least one play by Angel Guimera. (b. 1847). To Echegaray's school belong Eugenio Selles (b. 1844), author of El Nudo gordiano, El Cielo 6 el suelo and La Mujer de Loth, and Leopoldo Cano y Masas (b. 1844), whose best productions are La Mariposa, Gloria and La Pasion- aria, an admirable example of concise and pointed dialogue. Mention must also be made of Jose Feliu y Codina (1843-1897), a Catalan who wrote two vigorous plays entitled La Dolores and Moria del Carmen; Joaquin Dicenta (b. i860), whose Juan Jose showed daring talent; and especially Jacinto Benavente (b. 1866), a dramatist whose mordant vigour and knowledge of stage-effect is manifest in La Comida de las fieras and Rosas de otofio. In a lighter vein much success has attended the efforts of Miguel Echegaray (b. 1848), whose buoyant humour is in quaint contrast with his brother's sepulchral gloom, and Vital Aza (b. 1851) and Ricardo de la Vega (b. 1858) deserve the popularity which they have won, the first by El Seilor Cum and the second by Pepa la frescachona, excellent specimens of humorous contrivance. But the most promising writers for the Spanish stage at the present time are Serafin Alvarez Quintero -(b. 1871) and his brother Joaquin (b. 1873), to

whose collaboration are due El Ojito derecho and Abanicos y panderetes, scenes of brilliant fantasy which continue the tradition of witty observation begun by Lope de Rueda.

Rivas, Espronceda and Zorrilla owe more to foreign models than either

Campoamor or Nunez de Arce. It is true that Campoamor has been described, most frequently by foreign critics, as a disciple of Heine, and un- e ry ‘

doubtedly Campoamor suggests to cosmopolitan readers some- thing of Heine’s concentrated pathos; but he has nothing of Heine’s acrimony, and in fact continued in his own semi-philosophic fashion a national tradition of immemorial antiquity — the tradition of expressing lyrical emotion in four or eight lines which finds its most homely manifestation in the five volumes of Cantos populares espanoles edited by Francisco Rodriguez Marin. No less national a poet was Nunez de Arce, in whose verses, though the sentiment and reflection are often commonplace, the workmanship is of irreproachable finish. His best performance is Gritos del combate (1875), a series of impassioned exhortations to concord issued during the civil war which preceded the restoration of the Bourbon dynasty. An ineffectual politician, Nunee de Arce failed in oratory, but produced a permanent political impression with a small volume of songs. He wrote much in the ensuing years, and though he never failed to show himself a true poet he never succeeded in repeating his first great triumph— perhaps because it needed a great national crisis to call forth his powers. He found an accomplished follower in Emilio Perez Ferrari (b. 1853), whose Pedro Abelardo and Dos cetros y dos almas re- call the dignity but not the impeccability of his model. Another pupil in the same school was Jose Velarde (d. 1892), whose best work is collected in Voces del alma, some numbers of which are indications of a dainty and interesting, if not virile, talent, Absorbed by commerce, Vicente Wenceslao Querol (d. 1889) could not afford to improvise in the exuberant manner of his countrymen, and is represented by a single volume of poems as remarkable for their self-restraint as for a deep tenderness which finds expression in the Cartas d Maria and in the poignant stanzas A la muerte de mi hermana Adela. The temptation to sound the pathetic note so thrillingly audible in Querol’s subdued harmonies proved irresistible to Federico Balart (1831-1905)ˆ critic and humorist of repute who late in life astonished and moved the public with a volume of verse entitled Dolores, a sequence of elegiacs which bear a slight formal resemblance to In Memoriam; but the writer’s sincerity was doubtful, and in Horizontes the absence of genuine feeling degenerated into fluent fancy and agreeable prettiness. A more powerful and interesting personality was Joaquin Maria Bartrina (1850- 1880), who endeavoured to transplant the pessimistic spirit of Leconte de Lisle to Spanish soil. Bartrina’s crude materialism is antipathetic; he is wholly wanting in the stately impassability of his exemplar, and his form is defective; but he has force, sincerity and courage, and the best verses in Algo (1876) are not easily forgotten. The Andantes y allegros and Cromos y acuarelas of Manuel Reina (1856-1905) have a delightful Anda- lusian effusiveness

and metrical elegance, which compensate for some monotony and shallowness of thought. Manuel del Palacio (1832-1907) combined imagination and wit with a technical skill equal to that of the French Parnassians; but he frittered away his various gifts, so that but a few sonnets survive out of his innumerable poems. More akin to the English "Lake poets" was Amos de Escalante y Prieto (1831-1902), better known by his pseudonym of " Juan Garcia," whose faculty of poetic description, revealed only to the few who had read his verses in the edition privately circulated in 1890, is now generally recognized. The vein of religious sentiment which runs through Escalante's most characteristic lyrics was also worked by Luis Ramirez Martinez y Guertero (d. 1874), who, under the pseudonym of " Larmig," wrote verses impreg- nated with Christian devotion as well as with a sinister melan- choly which finally led him to commit suicide. The most interesting of the younger poets are provincials by sympathy I or residence, if not by birth. Salvador Rueda (b. 1857), in his

Aires espanoles, represents the vivid colouring and resonant emphasis of Andalusia; Ramon Domingo Peres (b. 1863), a Cuban by birth but domiciled at Barcelona, strikes a Catalan note in Musgo (1902), and substitutes restraint and simplicity for the Castilian sonority and pomp; Vicente Medina (b. 1866) in Aires murcianos and La Cancidn de la huerta reproduces with vivid intensity the atmosphere of the Murcian orchard-country; Juan Alcover and Miguel Costa, both natives of Majorca, cele- brate thei r island scenery with luminous picturesqueness of phrase. The roll of Spanish poets may close with the name of Jose Maria Gabriel y Galan (d. 1905), whose reputation depends chiefly on the verses entitled "El Ama" in Castellanas; Gabriel y Galan was extremely unequal, and his range of subjects was limited, but in El Ama he produced a poem which is unsurpassed in modern Spanish poetry. The facility with which verses of a kind can be written in Spanish has made Spain a nest of singing- birds; but the chief names have been already mentioned, and no others need be recorded here.

Since 1850 there has been a notable renaissance of the Spanish novel. Fernan Caballero is entitled to an honourable place in literary history as perhaps the first to revive thenative realism which was temporarily checked by the romantic movement. In all that concerns truth and art she is

superior to the once popular Manuel Fernandez y Gonzalez (d. 1888), of whom it has been said that Spain should erect a statue to him and should burn his novels at the foot of it. A Spanish Dumas, he equals the French author in fecundity, invention and resource, and some of his tales — such as El Cocinero de su majestad, Los Minfi.es de las Alpujarras and Martin Gil — are written with an irresistible brio; but he was the victim of his own facility, grew more and more reckless in his methods of composition, and at last sank to the level of his imitators. Antonio de Trueba followed Fernan Caballero in observing local customs and in poetizing them with a sentimental grace of his own, which attracted local patriots and uncritical readers generally. He had no gift of delineating character, and his plots arefeeble; buthewas not wanting in literary charm, and went his road of incorrigible optimism amid the applause of the crowd. His contemporary, Pedro Antonio de Alarcon, is remembered chiefly as the author of El Sombrero de Ires picos, a peculiarly Spanish tale of picaresque malice. Neither Trueba nor Alarcon could have developed into great artists; the first is too falsetto, the second is too rhetorical, and both are too haphazard in execution. Idealizing country life into a pale arcadian idyll, Trueba frowned upon one of his neighbours whose methods were eminently realistic. Jose Maria de Pereda is the founder of the modern school of realistic fiction in Spain, and the boldness of his experiment startled a generation of readers accustomed to Fernan Caballero's feminine reticence and Trueba's deliberate conventionality. Moreover, Pereda's reactionary political views — too frequently obtruded in his imaginative work — alienated from him the sympathies of the growing Liberal element in the country; but the power which stamps his Escenas montanesas was at once appreciated in the northern provinces, and by slow degrees he imposed himself upon the academic critics of Madrid. So long as Pereda deals with Country folk, sailors, fishermen, aspects of sea and land, he deserves the highest praise, for he under- stands the poor, hits upon the mean between conventional portraiture and caricature, and had the keenest appreciation of natural beauty. His hand was far less certain in describing townsmen; yet it is a mistake to class him as merely a successful landscape painter, for he created character, and continually revealed points of novelty in his descriptions of the common things of life. Pereda is realistic, and he is real. His rival, Juan Valera, is not, in the restricted sense of the word, realistic, but he is no less real in his own wider province; he has neither Pereda's energy nor austerity of purpose, but has a more in- fallible tact, a larger experience of men and women, and his sceptical raillery is as effective a moral commentary as Pereda's Christian pessimism. In Valera's Pepita Jiminez and Dona Luz, and in Pereda's Sotileza, we have a trio of Spanish heroines who deserve their fame: Pereda's is the more vigorous, full-

blooded talent, as Valera's is the more seductive and patrician; yet, much

as they differ, both are essentially native in the quality of their genius, system and phrasing. Benito Perez Galdos gave a new life to the historical novel in his huge series entitled Episodios nacionales, a name perhaps suggested by the Romans nationaux of Erckmann-Chatrian; but the subjects and senti- ment of these forty volumes are intensely local. The colouring of the Episodios nacionales is so brilliant, their incident is so varied and so full of interest, their spirit so stirring and patriotic, that the born Spaniard easily forgives their frequent prolixity, their insistence on minute details, their loose construction and their uneven style. Their appeal is irresistible; there is no such unanimous approbation of the politico-religious novels such as Dona Perfecta, Gloria and Leon Rock, each of which may be re- garded as a roman a these. The quick response of Perez Galdos to any external stimulus, his sensitiveness to every change in the literary atmosphere, made it inevitable that he should come under the influence of French naturalism, as he does in Lo Prohibido and in Realidad; but his conversion was temporary, and two forcible novels dealing with contemporary lite— Fortunata y Jacinta and Angel Guerra — mark the third place in the develop- ment of a susceptible talent. The true leader of the naturalistic school in Spain is Armando Palacio Valdes, whose faculty of artistic selection was first displayed in El Senorito Octavio. Two subsequent works — Marta y Maria and La Hermana San Sulpicio — raised hopes that Spain had, in Palacio Vald6s, a novelist of the first order to succeed Pereda and Valera; but in La Espnma and La Fe, two social studies which caused all the more sensation because they contained caricatures of well- known personages, the author followed the French current, ceased to be national and did not become cosmopolitan. His latest books are more original and interesting, though they scarcely fulfil his early promise. Another novelist who for a time divided honours with Palacio Valdes was the lady who publishes under her maiden name of Emilia Pardo Bazan. The powerful, repellent pictures of peasant life and the ethical daring of Los Pazos dc Ulloa and La Madre Naturaleza are set off by graphic passages of description; in later works the author chose less questionable subjects, and the local patriotism which inspires Insolacidn and De mi tierra is expressed in a style which secures Emilia Pardo Bazan a high place among her contemporaries. Leopoldo Alas (1851-1901), who used the pseudonym of " Clarin, " was better known as a ruthless critic than as a novelist; the interest of his shorter stories has evaporated, but his ambi- tious novel, La Regenta, lives as an original study of the relation between mysticism and passion. Jacinto Octavio Pic6n (b. 1852), who has deserted novel writing for criticism, displayed much insight in Lazaro, the story of a priest who finds himself forced to lay down his orders ; this work was naturally denounced by the clerical party, and orthodoxy declared equally against El Enemigo and Dulce y sabrosa; more impartial critics agree in admiring Pic6n's power of awakening sympathy and interest, his gift of minute

psychological analysis and his exquisite diction. No suspicion of heterodoxy attaches to Manuel Polo y Peyrolfin, the author of that charming story La Tia Levitico, nor to the Jesuit-Luis Coloma (b. 1851), who obtained a fleeting triumph with Pequencces, in which the writer satirized the fashionable society of which he had been an ornament before his conversion. Juan Ochoa (d. 1899) showed promise of the highest order in his two short stories, El Amado disclpulo and Un alma de Dios and Angel Ganivet (d. 1898) produced in Los Trabajos del in- fatigable creador Pio Cid, a singular philosophical romance, rich in ideas and felicitous in expression, though lacking in narrative interest. With him may be mentioned Ricardo Macias Picavea (d. 1899), author of La Tierra de campos, who died prematurely before his undoubted talent had reached maturity. Of the younger novelists the most notable in reputation and achieve- ment is Vicente Blasco Ibanez (b. 1866) who began with pictures of Valencian provincial life in Flor de mayo, made romance the vehicle of revolutionary propaganda in La Catedral and La Horda, and shows the influence of Zola in one of his latest books, La Maja desnuda. Blasco Ibanez lacks taste and

judgment, and occasional provincialisms disfigure his style; but his power is undeniable, and even his shorter tales are remarkable examples of truthful impressionism. Ram6n del Valle-Inclan (b. 1869) tends to preciosity in Corte de amor and Flor de santidad, but excels in finesse and patient observation; J. Martinez Ruiz (b. 1876) is wittier and weightier in Las Confes- iones de un pequeno filosofo and the other stories which he pub- lishes under the pseudonym of " Azorin," but he lacks much of Valle-Inclan's picturesque and perceptive faculty; Pio Baroja's restless and picaresque talent finds vigorous but incoherent expression in El Camino de perfection and Aurora roja, and Gregorio Martinez Sierra (b. 1882) has shown considerable mastery of the difficulties of the short story in Pascua florida and Sol de la tarde.

The tendency of Spanish historical students is rather to collect the raw material of history than to write history. Antonio Canovas del Castillo was absorbed by politics to Criticism" lne l° ss °f literature, for his Ensayo sobre la casa de Austria en Espana is ample in information and impartial in judgment; the composition is hasty and the style is often ponderous, but many passages denote a genuine literary faculty, which the author was prevented from developing. The Historia de los Visigodos, in which

Aureliano Fernandez-Guerra y Orbe collaborated with Eduardo de Hinojosa, illuminates an obscure but important period. Francisco Cardenas (1816- 1898) in his Historia de la propriedad territorial en Espana did for Spain much that Maine did for England. Eduardo Perez Pujol (b. 1830) in his Historia de las instiluciones de la Espana goda (1896) supplements the work of Fernandez-Guerra and Hinojosa, the latter of whom has published a standard treatise entitled Historia del derecho romano. Joaquin Costa's Estudios ibericos (1891) and Coleclivismo agrario en Espana (1898) have been praised by experts for their minute research and exact erudition; but his Poesta popular espanola y mitologia y liter a- tura celto-hispanas, in which a most ingenious attempt is made to reconstitute the literary history of a remote period, appeals to a wider circle of educated readers. The monographs of Francisco Codera y Zaidin (b. 1836), of Cesareo Fernandez Duro (1830-1907), of Francisco Fernandez y Gonzalez (b. 1833), of Gumersindo Azcarate (b. 1840), and of many others, such as the Jesuit epigraphist Fidel Fita y Calome, are valuable contribu- tions to the still unwritten history of Spain, but are addressed chiefly to specialists. Many of the results of these investigators are embodied by Rafael Altamira y Crevea (b. 1866) in his Historia de Espana y de la civilization espanola, now in progress. Literary criticism in Spain, even more than elsewhere, is too often infected by intolerant party spirit. It was difficult for Leopoldo Alas (" Clarin ") to recognize any merit in the work of a reactionary writer, but his prejudice was too manifest to mislead, and his intelligent insight frequently led him to do justice in spite of his prepossessions. In the opposite camp Antonio Valbuena, a humorist of the mordant type, has still more difficulty in doing justice to any writer who is an acade- mician, an American or a Liberal. Pascual de Gayangos y Arce and Manuel Mila y Fontanals escaped from the quarrels of contemporary schools by confining their studies to the past, and Marcelino Menendez y Pelayo has earned a European reputation in the same province of historical criticism. Among his followers who have attained distinction it must suffice to mention Ramon Menendez Pidal (b. 1869), author of La Leyenda de los infantes de Lara (1897), a brilliant piece of scientific, reconstructive criticism; Francisco Rodriguez Marin (b. 1855), wno has pub- lished valuable studies on 16th and 17th century authors, and adds to his gifts as an investigator the charm of an alembicated, archaic style; Emilio Cotarelo y Mori (b. 1858), who, besides interesting contributions to the history of the theatre, has written substantial monographs on Enrique de Villena, Villa- mediana, Tirso de Molina, Iriarte and Ramon de la Cruz; and Adolfo Bonilla y San Martin (b. 1875), whose elaborate bio- graphy of Juan Luis Vives, which is a capital chapter on the history of Spanish humanism, gives him a foremost place among the scholars of the younger generation.

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Romania, the Zeitschrift filr romanische Philologie and Romanische Forschungen, as also in Modern Language Notes (Baltimore) and the

Modern Language Review (Cambridge).

*2. Catalan Literature. — Although the Catalan language is simply a branch of the southern Gallo-Roman, the literature, Poetry of in its origin at least, should be considered as supple- Mlddie mentary to that of Provence. Indeed, until about 4**s. t ne second half of the 13th century there existed*

in the Catalan districts no other literature than the Provencal, and the poets of north-eastern Spain used no other language than that of the troubadours. Guillem de Bergadan, Uc de Mataplana, Ramon Vidal de Besalu, Guillem de Cervera, Serveri de Gerona and other verse writers of still more recent date were all genuine Provencal poets, in the same sense as are those of Limousin, Quercy or Auvergne, since they wrote in the langue d'oc and made use of all the forms of poetry cultivated by the troubadours north of the Pyrenees. Ramon Vidal (end of the 12th century and beginning of 13th) was a grammarian as well as a poet; his Rasos de trobar became the code for the Catalan poetry written in Provencal, which he called Lemosi, a name still kept up in Spain to designate, not the literary idiom of the troubadours only, but also the local idiom — Catalan — which the Spaniards chose to consider as derived from the former. The influence of R. Vidal and other grammarians of his school, as well as that of the troubadours we have named, was enduring; and even after Catalan prose — an exact reflection of the spoken language of the south-east of the Pyrenees — had given evidence of its vitality in some considerable works, Catalan poetry remained faithful to the Provencal tradition. From the combination of spoken Catalan with the literary language of the troubadours there arose a sort of composite idiom, which has some analogy with the Franco-Italian current in certain parts of Italy in the middle ages, although in the one case the elements of the mixture are more distinctly apparent than are the romance of France and the romance of Italy in the other. The poetical works of Raymond Lully or Ramon Lull are among the oldest examples of this Provencalised Catalan; one has only to read the fine piece entitled Lo Desconort (" Despair "), or some of his stanzas on religious subjects, to apprehend at once the eminently composite nature of that language. Muntaner in like manner, whose prose is exactly that spoken by his contemporaries, becomes a troubadour when he writes in verse; his Sermd on the conquest of Sardinia and Corsica (1323), introduced into his Chronicle of the kings of Aragon, exhibits linguistically the same mixed character as is found in Lully, or, we may venture to say, in all Catalan verse writers of the 14th century. These are not very numerous, nor are their works of any great merit. The majority of their compositions consist of what were called noves rimades, that is, stories in octosyllabic verse in rhymed couplets. There exist poems of this class by Pere March, by a certain Torrella, by Bernat Metge (an author more celebrated for his prose), and by others whose names we do not know; among the works

belonging to this last category special mention ought to be made of a version of the romance of the Seven Sages, a translation of a book on good breeding entitled Facetus, and certain tales where, by the choice of subjects, by various borrowings, and even occasionally by the wholesale introduction of pieces of French poetry, it is clearly evident that the writers of Catalonia under- stood and read the langue d'oui. Closely allied to the noves rimades is another analogous form of versification — that of the codolada, consisting of a series of verses of eight and four syllables, rhyming in pairs, still made use of in one portion of the Catalan domain (Majorca).

The 1 sth century is the golden age of Catalan poetry. At the instigation and under the auspices of John I. (1387-1395), Martin I- (1395-1410), and Ferdinand I. (1410-1416), kings of Century. Aragon, there was founded at Barcelona a consistory of the " Gay Saber," on the model of that of Toulouse, and this official protection accorded to poetry was the beginning of a new style much more emancipated from Provencal influence. It cannot be denied, indeed, that its forms are of foreign importa- tion, that the Catalan verse writers accept the prescriptions of

the Leys d'amor of Guillaume Molinier, and that the names which they gave to their cobles (stanzas) are all borrowed from the same art de trobar of the Toulouse school; but their language begins to rid itself more and more of Provenpalisms and tends to become the same as that of prose and of ordinary conversa- tion. With Pere and Jaume March, Jordi de Sant Jordi, Johan de Masdovelles, Francesch Ferrer, Pere Torroella, Pau de Bellviure, Antoni Vallmanya, and, above all, the Valencian Auzias March, there developed a new school, which flourished till the end of the 15th century, and which, as regards the form of its versification, is distinguished by its almost exclusive employment of eight-verse cobles of ten syllables, each with " crossed " or " chained " rhymes (cobla crohada or encadenada), each composition ending with a tornada of four verses, in the first of which the " device " {divis or senyal) of the poet is given out. Many of these poems are still unedited or have only recently been extracted from the canqoners, where they had been collected in the 15th century. Auzias March alone, the most inspired, the most profound, but also the most obscure of the whole group, was printed in the 16th century; his cants d'amor and cants de mort contain the finest verses ever written in Catalan, but the poet fails to keep up to his own high level, and by his studied obscurity occasionally becomes unintelligible to such a degree that one of his editors accuses him of having written in Basque. Of a wholly different class, and in quite another spirit, is the Libre de les dones of Jaume Roig (d. 1478), a Valencian also, like March; this long poem is a nova rimada, only comediada, that is to say, it is in quadrisyllabic instead of octosyllabic verse. A bitter and caustic satire upon women, it purports to be a true history- — the history of the poet himself and of his three unhappy

marriages in particular. Notwithstanding its author's allegations, how- ever, the Libre de les dones is mostly fiction; but it derives a very piquant interest from its really authentic element, its vivid picture of the Valencia of the 1 5th century and the details of contemporary manners. After this bright period of efflores- cence Catalan poetry rapidly faded, a decline due more to the force of circumstances than to any fault of the poets. The union of Aragon with Castile, and the resulting predominance of Castilian throughout Spain, inflicted a death-blow on Catalan literature, especially on its artistic poetry, a kind of composition more ready than any other to avail itself of the triumphant idiom which soon came to be regarded by men of letters as the only nbble one, and alone fit to be the vehicle of elevated or refined thoughts. The fact that a Catalan, Juan Boscan, inaugurates in the Castilian language a new kind of poetry, and that the Castilians themselves regard him as the head of a school, is important and characteristic; the date of the publica- tion of the works of Boscan (1543) marks the end of Catalan poetry.

The earliest prose works in Catalan are later than the poems of the oldest Catalan troubadours of the Provencal school; these prose writings date no further back than the Prose of close of the 13th century, but they have the advan- I3th-isth tage of being entirely original. Their language is Centuries. the very language of the soil which we see appearing in charters from about the time of the accession of James I. (1213). This is true especially of the chronicles, a little less so of the other writings, which, like the poetry, do not escape the influence of the more polished dialect of the country tc the north of the Pyrenees. Its chronicles are the best ornament of medieval Catalan prose. Four of them — that of James I., apparently reduced to writing a little after his death (1276) with the help of memoirs dictated by himself during his lifetime; that of Bernat Desclot, which deals chiefly with the reign of Pedro III. of Aragon (1 276-1286); that of Ramon Muntaner (first half of the 14th century), relating at length the expedition of the Catalan com- pany to the Morea and the conquest of Sardinia by James II.; finally that of Pedro IV., the Ceremonious (1335-1387), genuine commentaries of that astute monarch, arranged by certain officials of his court, notably by Bernat Descoll — these four works are distinguished alike by the artistic skill of their

narration and by the quality of their language; it would not be too much to liken these Catalan chroniclers, and Muntaner especially, to Villehardouin,

Joinville and Froissart. The Doctor Illumi- natus, Raymond Lully, whose acquaintance with Latin was very poor — his philosophical works were done into that language by his disciples — wrote in a somewhat Provencalized Catalan various moral and propagandist works — the romance Blanquerna in praise of the solitary life, the Libre de les maravelles, into which is introduced a " bestiary " taken by the author from Kalilah and Dimnah, and the Libre del orde de cavalleria, a manual of the perfect knight, besides a variety of other treatises and opuscula of minor importance. The majority of the writings of Lully exist in two versions — one in the vernacular, which is his own, the other in Latin, originating with his disciples, who desired to give currency throughout Christendom to their master's teachings. Lully — who was very popular in the lay world, although the clergy had a low opinion of him and in the 15th century even set themselves to obtain a condemnation of his works by the Inquisition — had a rival in the person of Francesch Ximenez or Eximeniz, a Franciscan, born at Gerona some time after 1350. His Crestid (printed in 1483) is a vast encyclopaedia of theology, morals and politics for the use of the laity, supplemented in various aspects by his three other works — Vida de Jcsucrist, Libre del angels, and Libre de les dones; the last named, which is at once a book of devotion and a manual of domestic economy, contains a number of curious details as to a Catalan woman's manner of life and the luxury of the period. Lully and Eximeniz are the only Catalan authors of the 14th century whose works written in a vulgar tongue had the honour of being translated into French shortly after their appearance.

We have chiefly translators and historians in the 15th century. Antoni Canals, a Dominican, who belongs also to the previous century, translates into Catalan Valerius Maximus and a treatise of St Bernard; Bernat Metge, himself well versed in Italian literature, presents some of its great masters to his countrymen by translating the Griselidis of Petrarch, and also by composing Lo Sompni (" The Dream "), in which the influence of Dante, of Boccaccio, and, generally speaking, of the Italy of the 13th and 14th centuries is very perceptible. The Feyts d'armes de Calalunya of Bernat Boades (d. 1444), a knightly chronicle brought to a close in 1420, reveals a spirit of research and a con- scientiousness in the selection of materials which are truly remarkable for the age in which it was written. On the other hand, Pere Tomich, in his Histories e conquestes del reyalme d'Aragd (1448), carries us back too much to the manner of the medieval chroniclers; his credulity knows no bounds, while his style has altogether lost the naive charm of that of Muntaner. To the list of authors who represent the leading tendencies of the literature of the 15th century we must add the name of Johanot Martorell, a Valencian author of three-fourths of the celebrated romance, Tirant lo blanch (finished in 1460 and

prin.ed in 1400), which the reader has nowadays some difficulty in regarding as that " treasury of content " which Cervantes will have it to be.

With the loss of political was bound to coincide that of literary independence in the Catalonian countries. Catalan fell to the rank of a patois and was written less and I6th-I8th j ess . i e tt ere(j persons ceased to cultivate it, and the upper classes, especially in Valencia, owing to the proximity of Castile, soon affected to make no further use of the local speech except in familiar conversation. The 16th century, in fact, furnishes literary history with hardly more than a single poet at all worthy of the name — Pere Serafi, some of whose pieces, in the style of Auzias March, but less obscure, are graceful enough and deserve to live; his poems were printed at Barcelona in 1565. Prose is somewhat better represented, but scholars alone persisted in writing in Catalan — antiquaries and historians like Miquel Carbonell (d. 1 31 7), compiler of the Chroniques de Espanya (printed in 1547), Francesch Tarafa, author of the Cronica de cavaliers Catalans, Anton Beuter and some others not so well known In the 17th and 18th centuries the decadence became

still more marked. A few scattered attempts- to restore tc Catalan, now more and more neglected by men of letters, some of its old life and brilliance failed miserably. Neither Hieronim Pujades, author of an unfinished Coronica universal del principal de Catalunya (Barcelona, 1609), nor even Vicent Garcia, rector of Vallfogona (1582-1623), a verse-writer by no means destitute of verve or humour, whose works were published in 1700 under the quaint title of La Armonia del Parnds, mes numerosa en las poesias varias del atlant del eel poetic lo Dr Yicent Garcia, and whose literary talent and originality have been greatly exaggerated by the Catalans of the present day, could induce his countrymen to cultivate the local idiom once more. Sermons, lives of saints, a few works of devotion, didactic treatises and the like are all that was written henceforth in Catalan till the beginning of the 19th century. Writers who were Catalan by birth had so completely unlearned their mother-tongue that it would have seemed to them quite inappropriate, and even ridiculous, to make use of it in serious works, so profoundly had Castilian struck its roots in the eastern provinces of Spain, and so thoroughly had the work of assimilation been carried out to the advantage of the official language of the court and of the government.

*In 1814 appeared the Gramdtica y apologia de la llengua Calhalana of Joseph Pau Ballot y Torres, which may be con- sidered as marking the origin of a genuine renaissance „ . . of the grammatical and literary study of Catalan. Catalan Although the author avows no object beyond the Language purely practical one of giving to strangers visiting *" d Barcelona for commercial purposes some knowledge of the language, the enthusiasm*

*with which he sings the praises of his mother-tongue, and his appended catalogue of works which have appeared in it since the time of James L, show that this was not his only aim. In point of fact the book, which is entitled to high consideration as being the first systematic Catalan grammar, written, too, in the despised idiom itself, had a great influence on the authors and literary men of -the principality. Under the influence of the new doctrines of romanticism twenty years had not passed before a number of attempts in the way of restoring the old language had made their appearance, in the shape of various poetical works of very unequal merit. The Oda & la patria (1833) of Buenaventura Carlos Aribau is among the earliest if not actually the very first of these, and it is also one of the best; the modern Catalan school has produced few poems more inspired or more correct. Following in the steps of Aribau, Joaquin Rubio y Ors {Lo Gayter del Llobregat), Antonio de Bofarull {Lo Coblejador de Moncada), and soon afterwards a number of other versifiers took up the lyre which it might have been feared was never to sound again since it fell into the hands of Auzias March. The movement spread from Catalonia into other provinces of the ancient kingdom of Aragon; the appeal of the Catalans of the principality was responded to at Valencia and in the Balearic Isles. La*er, the example of Provence, of the felibritge of the south of France, accelerated still further this renaissance movement, which received official recognition in 1859 by the creation of the jochs florals, in which prizes are given to the best competitors in poetry, of whom some succeed in obtaining the diploma of meslre en gay saber. It is of course impossible to foresee the future of this new Catalan literature— whether it is indeed destined for that brilliant career which the Catalans themselves anticipate. In spite of the unquestionable talent of poets like Mariano Aguilo (Majorca), Teodoro Llorente (b. 1836; Valencia), and more especially Jacinto Verdaguer (1845-1902), author of an epic poem Atldn- lida and of the very fascinating Cants mistichs, it is by no means certain that this renaissance of a provincial literature will be permanent now that the general tendency throughout Europe is towards unity and centralization in the matter of language. At all events it would be well if the language were some- what more fixed, and if its writers no longer hesitated between a pretentious archaism and the incorrectness of vulgar colloquialism. Some improvement in this respect is discernible in the poems of Joan Maragall (b. 186c), the lyrical verse r>f*

Apeles Mestre (b. 1854), the fiction of Narcis Oiler and Santiago Rusinol, as also in the dramas of Angel Guimera, and if the process be continued there may be a future, as well as a past, for Catalan literature.

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0. F.-K.; A. M.-Fa.)

SPALATIN, GEORGE, the name taken by George Burkhardt (1484-1545), an important figure in the history of the Reforma- tion, who was born on the 17 th of January 1484, at Spalt (whence he assumed the name Spalatinus), near Nuremberg, where his father was a tanner. He went to Nuremberg for his education when he was thirteen years of age, and soon afterwards to the university of Erfurt, where he took his bachelor's degree in 1499. There he attracted the notice of Nikolaus Marschalk, the most influential professor, who made Spalatin his amanuensis and took him to the new university of Wittenberg in 1502. In 1505 Spalatin returned to Erfurt to study jurisprudence, was recommended to Conrad Mutianus, and was welcomed by the little band of German humanists of whom Mutianus was chief. His friend got him a post as teacher in the monastery at Georgenthal, and in 1508 he was ordained priest by Bishop Johann von Laasphe, who had ordained Luther. In 1509 Mutianus recommended him to Frederick III. the Wise, the elector of Saxony, who employed him to act as tutor to his nephew, the future elector, John Frederick. Spalatin speedily gained the confidence of the elector, who sent him to Wittenberg in 1 51 1

to act as tutor to his nephews, and procured for him a canon's stall in Altenburg. In 1512 the elector made him his librarian. He was promoted to be court chaplain and secretary, and took charge of all the elector's private and public corre- spondence. His solid scholarship, and especially his unusual mastery of Greek, made him indispensable to the Saxon court.

Spalatin had never cared for theology, and, although a priest and a preacher, had been a mere humanist. How he first became acquainted with Luther it is impossible to say — pro- bably at Wittenberg; but the reformer from the first exercised a great power over him, and became his chief counsellor in all moral and religious matters. His letters to Luther have been lost, but Luther's answers remain, and are extremely interesting. There is scarcely any fact in the opening history of the Re- formation which is not connected in some way with Spalatin's name. He read Luther's writings to the elector, and translated for his benefit those in Latin into German. He accompanied Frederick to the Diet of Augsburg in 1518, and shared in the negotiations with the papal legates. Cardinal Cajetan and Karl von Miltitz. He was with the elector when Charles was chosen emperor and when he was crowned. He was with his master at the Diet of Worms. In short, he stood beside Frederick as his confidential adviser in all the troubled diplomacy of the earlier years of the Reformation. Spalatin would have dissuaded Luther again and again from publishing books or

engaging in overt acts against the Papacy, but when the thing was done none was so ready to translate the book or to justify the act.

On the death of Frederick the Wise in 1525 Spalatin no longer lived at the Saxon court. But he attended the imperial diets, and was the constant and valued adviser of the electors, John and John Frederick. He went into residence as canon at Altenburg, and incited the chapter to institute reforms somewhat unsuccess- fully. He married in the same year. During the later portion of his life, from 1526 onwards, he was chiefly engaged in the visitation of churches and schools in electoral Saxony, reporting on the confiscation and application of ecclesiastical revenues, and he was asked to undertake the same work for Albertine Saxony. He was also permanent visitor of Wittenberg Univer- sity. Shortly before his death he fell into a state of profound melancholy, and died on the 16th oi January 1545, at Altenburg.

Spalatin left behind him a large number of literary remains, both published and unpublished. His original writings are almost all historical. Perhaps the most important of them are: Annates reformations, edited by E. S. Cyprian (Leipzig, 1718); and " Das Leben und die Zeitgeschichte Friedrichs des Weisen," published in Georg Spalatins Historischer Nachlass und Brief e, edited by C. G. Neudecker and L. Preller (Jena, 1851). A list of them may

be found in A. Seelheim's George Spalatin als sdchs. Historiographer (1876). There is no good life of Spalatin? nor can there be until his letters have been collected and edited, a work still to be done. There is an excellent article on Spalatin, however, by T. Kolde, in Herzog- Hauck, Realencyklopddij, Bd. xviii. (1906).

SPALATO, or Spalatro (Serbo-Croatian Spljet or Split), an episcopal city, and the centre of an administrative district, in Dalmatia, Austria, and on the Adriatic Sea. Pop. (1900), of town and commune, 27,198; chiefly Serbo- Croatian, and almost exclusively Roman Catholic. Spalato is situated ' on the seaward side of a peninsula between the Gulf of Brazza and' the Gulf of Salona. Though not the capital, it is commercially the most important city in Dalmatia and carries on an extensive trade in wine and oil. It is a port of call for the Austrian Lloyd steamers, and communi- cates by rail with Sebenico, Knin and Sinj. Spalato has a striking sea-front, :'n which the leading feature is the ruined facade of the great palace of Diocletian, to which the city owes its origin. A large part of Spalato is actually within the limit of the palace; and many modern houses are built against its ancient walls and incorporate parts of them, not only on the inner but also on the outer side. This palace was erected between a.d. 290 and 310. In ground plan it is almost a square, with a quadrangular tower at each of the four corners. It covers 9ˆ acres. There were originally four principal gates, with four streets meeting in the middle of the quadrangle, after the style of a Roman camp. The eastern gate, or Porta Aenea, is destroyed, but, though the side towers are gone, the western gate, or Porta Ferrea, and the main entrance of the building, the beautiful Porta Aurea, in the north front, are still in fairly good preservation. The streets are lined with massive arcades. The vestibule now forms the Piazza del Duomo or cathedral square; to the north-east Of this lies the temple of Jupiter, or perhaps the mausoleum. This has long been the cathedral of St Doimo or Domnius, small and dark, but noteworthy for its finely carved choir stalls. To the south-east is the temple of Aesculapius, which served originally as a kind of court chapel, and has long been transformed into a bap- tistery. A beautiful Romanesque campanile was added to the baptistery in the 14th and 15th centuries. Architecturally the most important of the many striking features of the palace is the arrangement in the vestibule by which the supporting arches spring directly from the capitals of the large granite Corinthian columns. This, as far as the known remains of ancient art are concerned, is the first instance of such a method. The ruins of Salona or Salonae, lying about 4 m. north-east of the palace, were chiefly exhumed during a series of excavations undertaken after the visit of the emperor Francis I. in 1818. Research was carried on regularly from 1821 to 1827, and again from 1842 to 1850. It was afterwards resumed at intervals

until 1877, when the excavation committee was granted an annual subsidy by the Austrian government. Many discoveries were made, including the ruins of a theatre, amphitheatre, city walls and gates, baths, aqueducts, pagan and Christian cemeteries, basilicas and many fragments of houses and arches. Professor F. Bulid, who had charge of the work and of the museum at Spalato, reported in 1894 that the collection of minor objects comprised " 2034 inscriptions, 387 sculptures, 176 architectural pieces, 1548 fragments or objects of terra-cotta and vases, 1243 objects of glass, 3184 of metal, 929 of bone, 1229 gems, 128 objects from prehistoric times, and 15,000 coins" (Munro, p. 244). These are preserved in the museum. One vase, of Corinthian workmanship, dates from the 6th century B.C. ; and many of the early Christian relics are of unusual interest. The so-called " cyclopean " walls, mortarless, but constructed of neatly squared and fitted blocks, are probably of Roman work- manship. Jackson suggests that perhaps, like the long walls at Athens, they were intended to unite the city with its port.

Salona under the early Roman emperors was one of the chief ports of the Adriatic, on one of the most central sites in the Roman world. Made a Roman colony after its second capture by the Romans (78 B.C.), it appears as Colonia Martia Julia and Colonia Claudia Augusta Pia Veteranorum, and bears at different periods the titles of respublica, conventus, metropolis, praefectura and praetorium. Diocletian died in 313; and before long the city became an episcopal see, with St Doimo as its first bishop. The palace was transformed into an imperial cloth factory, and, as most of the workers were women, it became known as the gynaecium- Salona was several times taken and retaken by the Goths and Huns before 639, when it was sacked and nearly destroyed by the Avars. Its inhabitants fled to the Dalmatian islands, but returned shortly afterwards to found a new city within the walls of the palace. Salona itself was not entirely deserted until the close of the 12th century. In 650 the papal legate, John of Ravenna, was created bishop of Spalato, as the new city was named. " Spalato," or " Spalatro " (a very old spelling), was long regarded as a corruption of Salonae Palatium; but its true origin is doubtful. The most ancient form is Aspalathum, used in the 10th century by Constantine Porphyro- genitus. Spalathum, Spalathrum and Spalatrum are early variants. In a few years Spalato became an archbishopric, and its holders were metropolitans of all Dalmatia until 1033. In 1 105 Spalato became a vassal state of Hungary; in 1327 it revolted to Venice; in 1357 it returned to its allegiance. It was ruled by the Bosnian king, Tvrtko, from 1390 to 1391; and in 1402 the famous and powerful Bosnian prince, Hrvoje or Harvoye, received the dukedom of Spalato from Ladislaus of Naples, the claimant to the Hungarian throne. In 1413, after the overthrow of Ladislaus by the

emperor Sigismund, Hrvoje was banished; but a large octagonal tower, the Torre d'Harvoye, still bears his name. Spalato received a Venetian garrison in 1420, and ceased to have an independent history. The castle and city walls, erected by the Venetians between 1645 and 1670. were dismantled after 1807.

See T. G. Jackson, Dalmatia, the Quarnero and I stria (Oxford, 1887); and E. A. Freeman, Subject and Neighbour Lands of Venice (London, 188 1), for a general description of Spalato, its antiquities and history. A valuable account of the researches at Salona is given in R. Munro, Bosnia-Herzegovina and Dalmatia (London, 1900). There are two magnificently illustrated volumes which deal with Diocletian's palace: R. Adam, Ruins of the Palace of the Emperor Diocletian at Spalatro, in Dalmatia (London, 1764), engravings by Bartolozzi; and L. J. Cassas and J. Lavallee, Voyage pittoresque et historique de I'lstrie (Paris, 1802). The Dalmatian chronicles, reproduced by G. Lucio in his De regno Dalmatiae et Croatiae (Amsterdam, 1666), include several which deal specially with Salona and Spalato. The most important is the Historia salonitanorum pontijicum et spalatensium, by Thomas, archdeacon of Spalato (1200-1268).

SPALDING, WILLIAM (1809-1859), British author, was born in Aberdeen on the 22nd of May 1809. He was educated at the grammar school there and at Marischal College, and he went in 1830 to Edinburgh, where he was called to the bar in 1833. In that year he published a Letter ,,-n Shakespeare's

Authorship of the two Noble Kinsmen (reprinted for the New Shakspere Society in 1876), which attracted the notice of Jeffrey, who invited Spalding to contribute to the Edinburgh Review. He also spent some time in Italy, and in 1841 pub- lished Italy and the Italian Islands from the Earliest Ages to the Present Time. He occupied the chair of rhetoric in Edinburgh University from 1840 to 1845, when he was appointed professor of logic in the university of St Andrews, a post which he held till his death on the 16th of November 1859.

Besides contributions to the Edinburgh Review, Blackwood's Magazine and the eighth edition of the Encyclopaedia Britannica, he was the author of a concise History of English Literature (1853).

SPALDING, a market town in the Holland or Spalding parlia- mentary division of Lincolnshire, England, on the river Welland, and on the Great Northern and Great Eastern railways, 93 m. N. from London. Pop. of urban district (1901), 9385. Thetown is the centre of a rich agricultural district. The parish church of St Mary and St Nicholas was built in 1284 and is of peculiar con- struction, having four aisles to the nave. It is mainly

Decorated in style. The adjoining lady chapel (St Mary and St Thomas a. Becket) was built in 1315; in 1588 it was appropriated for the grammar school endowed in 1 568 by John Blanke and again in 1588 by John Gamlyn. A new grammar school was erected in 1881. There are several modern churches and chapels, a corn exchange, a Christian association and literary institute, and the Johnson hospital (1881, endowed). The existing high bridge over the Welland, constructed in 1838, took the place of a wooden erection dating from the end of the 17th century; this last was built on the site of a Roman bridge of two arches, the foundations of the centre pier of which were disclosed when the wooden bridge was constructed. Trade is principally agricul- tural, and there is considerable water-traffic on the Welland.

Although there are no traces of settlement at Spalding (Spaltnige) before late Saxon times there was probably a village here before Thorold the sheriff founded his cell of Crowland Abbey in 105 1. In Domesday Book the manor is said to belong to Ivo de Taillebois, who possessed a market there worth 40s., six fisheries and rent from salt-pans. The manor was afterwards granted to Angers, and later belonged to Spalding Priory, which retained it until at the suppression it passed to the Crown. Stephen made Spalding Priory free of toll, while John gave the monks forest rights. The town was governed by the prior's manorial court, and never became a parliamentary or municipal borough. The prior obtained the grant of the Friday market in 1242, and in the reign of Edward I. claimed from of old fairs on the feast of St Nicholas and fifteen days following, and on the vigil and octave of St Cross. In more modern times Spalding was well known for the club known as the " Gentleman's Society," founded in 17 10 by Maurice Johnson, which met once a week at a coffee-house in the town for the discussion of literary and antiquarian subjects, and numbered among its members Newton, Bentley, Addison, Pope and Gay.

SPALLANZANI, LAZARO (1729-1799), Italian man of science, was born at Scandiano in Modena on the 10th of January 1729, and was at first educated by his father, who was an advocate. At the age of fifteen he was sent to the Jesuit college at Reggio di Modena, and was pressed to enter that body. He went, how- ever, to the university of Bologna, where his famous kinswoman, Laura Bassi, was professor of physics, and it is to her influence that his scientific impulse has been usually attributed. With her he studied natural philosophy and mathematics, and gave also great attention to languages, both ancient and modern, but soon abandoned the study of law, and afterwards took orders. His reputation soon widened, and in 1754 he became professor of logic, metaphysics and Greek in the university of Reggio, and in 1760 was translated to Modena, where he continued to teach with great assiduity and success, but devoted his whole leisure to natural science. He declined many offers from other Italian universities and

from St Petersburg until 1768, when he accepted the invitation of Maria Theresa to the chair of natural history in the university of Pavia, which was then being reorgan- ized. He also became director of the museum, which he greatly

enriched by the collections of his many journeys along the shores of the Mediterranean. In 1785 he was invited to Padua, but to retain his services his sovereign doubled his salary and allowed him leave of absence for a visit to Turkey, where he remained nearly a year, and made many observations, among which may be noted those of a copper mine in Chalki and of an iron mine at Principi. His return home was almost a triumphal progress: at Vienna he was cordially received by Joseph II., and on reaching Pavia he was met with acclamations outside the city gates by the students of the university. During the following year his students exceeded five hundred. His integrity in the manage- ment of the museum was called in question, but a judicial investi- gation speedily cleared his honour, to the satisfaction even of his accusers. In 1788 he visited Vesuvius and the volcanoes of the Lipari Islands and Sicily, and embodied the results of his researches in a large work (Viaggi alle due Sicilie ed in alcune parti dell' Apennino), published four years later. He died from an apoplectic seizure on the 12th of February 1799, at Pavia.

His indefatigable exertions as a traveller, his skill and good fortune as a collector, his brilliance as a teacher and expositor, and his keenness as a controversialist no doubt aid largely in accounting for Spallanzani's exceptional fame among his contemporaries; yet greater qualities were by no means lacking. His life was one of incessant eager questioning of nature on all sides, and his many and varied works all bear the stamp of a fresh and original genius, capable of stating and solving problems in all departments of science — at one time finding the true explanation of " ducks and drakes " (formerly attributed to the elasticity of water) and at another helping to lay the foundations of our modern vulcanology and meteorology. His main discoveries, however, were in the field of physiology : he wrote valuable and suggestive papers on respira- tion, on the senses of bats, &c, while he made experiments (1768) to disprove the occurrence of spontaneous generation, showing in opposition to J. H. Needham (1713-1781) that animalcules did not develop in vegetable infusions which had been boiled and were kept in properly closed vessels. His great work, however, is the Dissertationi de fisica animate e vegetale (2 vols., 1780). Here he first interpreted the process of digestion, which he proved to be no mere mechanical process of trituration, but one of actual solution, taking

place primarily in the stomach, by the action of the gastric juice. He also carried out important researches on fertilization in animals (1780).

SPAN (from O. Eng. spannan, to bind, connect together; the word is of general occurrence in Teutonic languages, the ultimate origin being the root spa-, to extend, stretch out, cf. Gr. airdv, to draw out, Lat. spatium, space), a distance stretched, the space between terminal points. The word was formerly used as a measure of length= 10-368 in., taken from the stretch of the fully opened hand from thumb to little finger. The term is used in architecture for the width or opening of an arch or arched opening, and also the width of a roof between the wall plates. A " span roof " is a roof having two sides inclining to a centre or ridge, in contradistinction to a " shed roof " (see Shed).

SPANDAU, a town of Germany, in the Prussian province of Brandenburg, at the confluence of the Havel and Spree, 8 m. N.W. of Berlin, of which it is practically a suburb, on the main lines of railway to Hanover and Hamburg respectively. Pop. (1885), 31,463; (1895), 55,813; (1905), 70,295 (including a garri- son of about 5000). The town has of recent years made marked progress, its trade being enhanced by an excellent railway service with Berlin and improved navigation on the Havel. The fortifications, which were strengthened after the war, 1870-71, for the protection of the arsenal, have been razed on the northern and eastern sides, and of its former defences none remain except the citadel and a line of works along a ridge of hills to the south of the town. The Julius tower in the citadel, wdiich is surrounded by water, contains the Imperial war treasure (Reichskriegssckatz) , — a sum of £6,000,000 in gold, kept in readiness for any warlike emergency, and reserved from the indemnity paid by France after the war of 1870-71. Spandau contains four Protestant churches, a Roman Catholic church, a gymnasium and a school of musketry. Besides numerous barracks, there are various military establishments appropriate to an important garrison town; and its chief industries are connected with the prepara- tion of munitions of war. The government factories for the

manufacture of small arms, artillery, gunpowder, &c, cover upwards of 200 acres, and employ about 6000 workmen. The other industries are not very important; they comprise miscellaneous manufactures, fishing, boat-building, and some shipping on the Havel.

Spandau is one of the oldest places in the Altmark, and received civic rights in 1232. It afterwards became a favourite residence of the Hohenzollern electors of Brandenburg, and was fortified in 1577-1583. In 1635 it surrendered to the Swedes, and in 1806 to the French, A short investment in 18 13 restored it to Prussia.

See Zech and Gtinther, Geschichtliche Beschreibung der Stadt und Festung Spandau (Spandau, 1847), and Kuntzemiiller, Urkundliche Geschichte der Stadt und Festung Spandau (Spandau, 1881).

SPANDRIL, or Spandrel (formerly splaundrel, a word of unknown origin), in architecture, the space between any arch or curved brace and the level label, beams, &c, over the same. The spandrils over doorways in Perpendicular work are generally richly decorated. At Magdalen College, Oxford, is one which is perforated, and has a most beautiful effect. The spandril of doors is sometimes ornamented in the Decorated period) but seldom forms part of the composition of the doorway itself, being generally over the label.

SPANGENBERG, AUGUST GOTTLIEB (1704-1792), Count Zinzendorf's successor, and bishop of the Moravian Brethren, was born on the 15th of July 1704 at Klettenberg, on the south of the Harz Mountains, where his father, Georg Spangenberg, was court preacher and ecclesiastical inspector of the countship of Hohenstein. Left an orphan at the early age of thirteen, he was sent to the gymnasium at Ilefeld, and passed thence (1722), in poorest circumstances, to the university of Jena to study law. Professor Johann Franz Buddeus (1667-1729) received him into his family, and a " stipendium " was procured for him. He soon abandoned law for theology: took his degree in 1726, and began to give free lectures on theology. He also took an active part in a religious union of students, in the support of the free schools for poor children established by them in the suburbs of Jena, and in the training of teachers. In 1728 Count Zinzendorf visited Jena, and Spangenberg made his acquaintance; in 1730 he visited the Moravian colony at Herrnhut. A " collegium pastorale practicum " for the care of the sick and poor was in consequence founded by him at Jena, which the authorities at once broke up as a " Zinzendorfian institution." But Spangenberg's relations with the Moravians were confirmed by several visits to the colony, and the accident of an unfavourable appeal to the lot alone prevented his appointment as chief elder of the community, March 1733. Meanwhile his free lectures in Jena met with much acceptance, and led to an invitation from Gotthilf Francke to the post of assistant professor of theology and superintendent of schools connected with his orphanage at Halle. He accepted the invitation, and entered on his duties in September 1732. But differences between the Pietists of Halle and himself soon became apparent. He found their religious life too formal, external and worldly; and they could not sanction his comparative indifference to doctrinal correctness and his incurable tendency to separatism in church life. Spangenberg's participation in private observ- ances of the Lord's Supper and his intimate connexion witn Count Zinzendorf brought matters to a crisis. He was offered by the senate of the theological faculty of Halle the alternative of doing penance before God, submitting to his superiors,

and separating himself from Zinzendorf, or leaving the matter to the decision of the king, unless he preferred to " leave Halle qtrietly." The case came before the king, and, on the 8th of April 1733, Spangenberg was conducted by the military outside the gates of Halle. At first he went to Jena, but Zinzendorf at once sought to secure him as a fellow labourer, though the count wished to obtain from him a declaration which would remove from.the Pietists of Halle all blame with regard to the disruption. Spangenberg went to Heirnhut and found amongst the Moravians his life-work, having joined them at a moment when the stability of the society was threatened. He became its theologian, its

apologist, its statesman and corrector, through sixty long years of incessant labour.

For the first thirty years (i 733-1 762) his work was mainly devoted to the superintendence and organization of the extensive missionary enterprises of the body in Germany, England, Denmark, Holland, Surinam, Georgia and elsewhere. It was on an island off Savannah that Spangenberg startled John Wesley with his questions and profoundly influenced his future career. One special endeavour of Spangenberg in Pennsylvania was to bring over the scattered Schwenkfeldians to his faith. In 1741-1742 he was in England collecting for his mission and obtaining the sanction of the archbishop of Canterbury. During the second half of this missionary period of his life he super- intended as bishop the churches of Pennsylvania, defended the Moravian colonies against the Indians at the time of war between France and England, became the apologist of his body against the attacks of the Lutherans and the Pietists, and did much tt» moderate the mystical extravagances of Zinzendorf, with which his simple, practical and healthy nature was out of sympathy. The second thirty years of his work (1 762-1 792) were devoted to the consolidation of the German Moravian Church. Zinzen- dorf 's death (1760) had left room and need for his labours at home. At Herrnhut there were conflicting tendencies, doctrinal and practical extravagances, and the organization of the brethren was very defective. In 1777 Spangenberg was commissioned to draw up an idea fidei fratrum, or compendium of the Christian faith of the United Brethren, which became the accepted declaration of the Moravian belief. As compared with Zinzen- dorf's own writings, this book exhibits the finer balance and greater moderation of Spangenberg's nature, while those offen-sive descriptions of the relation of the sinner to Christ in which the Moravians at first indulged are almost absent from it. In his last years Spangenberg devoted special attention to the education of the young, in

which the Moravians have since been so success- ful. ‘ He died at Berthelsdorf, on the 18th of September 1792. In addition to the Idea fidei fratrum, Spangenberg wrote, besides other apologetic books, a Declaration iiber die seither gegen uns ausgegangenen Beschuldigungen sonderlich die Person unseres Ordinarius {Zinzendorf) betreffend (Leipzig, 1731), an Apdogeiische Schl’issschrift (1752), Leben des Grafen Zinzendorf (177 2- 177 5); and his hymns are well known beyond the Moravian circle.

In addition to his autobiography {Selbstbiographre) , see J. Risler, Leben Spangenbergs (Barby, 1794); K. F. Ledderhose, Das Leben Spangenbergs (Heidelberg, 1846) ; Otto Frick, Beitmge zur Lebens- geschichte A. G. Spangenbergs (Halie, 1884); Gerhard Reichel’s article in Herzog-Hauck’s Realencyklopadie (ed. 1906), s.v. ” Spangen- berg”; the article by Ledderhose, in the Allgemeine deutsche Biographie; also Moravian Brethren.

SPANISH-AMERICAN WAR OF 1898. For the causes leading up to the war see Cuba and United States: History. On the 15th of February 1898 the U.S. battleship “Maine,” which had been sent to Havana on the 25th of January, was destroyed in Havana harbour by an explosion, with a loss of 266 lives. An American board of inquiry, of which Captain W. T. Sampson was president, made an extensive examination of the wreck, and reported to the navy department on the 21st of March that the explosion was caused by an exterior mine, the principal reason for this decision being the upheaval of the ship’s bottom. 1 On the 20th of April President McKinley approved a resolution demanding the withdrawal of Spain from Cuba and setting noon of the 23rd of April as the latest date for a reply to the demand. Before this could be delivered by the American minister in Madrid, the Spanish government sent him his passports. On the 22nd the president declared a blockade of Cuban ports; on the 24th the Spanish government declared war; and on the

1 The Spanish authorities made an examination, but did not inspect the interior, the chief diver reporting that ” the bilge and keel of the vessel throughout its entire extent were buried in the mud, but did not appear to have suffered any damage.” It has been suggested that the explosion was the work of Cuban “sym- pathizers who thus planned to secure American assistance against Spain. It was not until iqio that Congress made an appropriation (and an inadequate one then) for raising the ” Maine.”

25th the United States Congress declared that war had existed since the 21st.

The American government had begun to prepare for war as early as January: ships on several foreign stations had been drawn nearer home,

and those in Chinese waters were collected at Hong-Kong; the North Atlantic squadron, the only powerful one, had been sent from Hampton Roads into the waters of Florida for manoeuvres; after the destruction of the " Maine " the chief part of the ships in the Atlantic were concentrated at Key West ; the battleship "Oregon" was ordered east from the Pacific; $50,000,000 was voted (March 9) " for the national defence "; steps were taken to purchase auxiliary cruisers, yachts and tugs, which were rapidly equipped; large supplies of ammunition were ordered, and Key West became an active base of preparation; Captain Sampson, senior officer of the North Atlantic squadron, was appointed its commander-in-chief with rank of acting rear- admiral; and a " flying squadron " composed of the armoured cruiser " Brooklyn " (flag), the battleships " Texas " and " Massachusetts," and the fast cruisers " Minneapolis " and " Columbia," with Commodore W. S. Schley in command, was stationed at Hampton Roads.

There was a great preponderance of large ships on the side of the United States; only in torpedo craft and small gunboats was Spain superior. The-American ships were highly efficient; in Spain everything was unready; Admiral Cervera felt that to send a Spanish squadron across the Atlantic was to send it to destruction, and when he had collected his squadron (including two cruisers from Havana) at the Cape Verde Islands in March, he renewed his expostulations, in which he was supported by a council of war. But on the 24th of April he was peremptorily ordered to leave for Porto Rico, without definite instructions or plan of campaign.

The American flying squadron was held at Hampton Roads, so great was the fear of attack by Spanish ships; and armed auxiliaries and fast cruisers were employed in patrolling the coast east of New York; these could have rendered good service else- where, but would have been of no use in repelling an attack by Cervera's squadron had it come that way.

The joint resolution of Congress of the 20th of April had declared that the relinquishment by Spain of authority in Cuba was the object of American action; the struggle thus naturally centred about the island. All operations were thus near at hand, Havana, the real objective in Cuba, being only about 100 m. from Key West. A political reason for confining action to the western Atlantic was that an immediate attack upon the coasts of Spain might have aroused the strongly pro-Spanish sympathy of continental Europe into greater activity. The regular United States army, the only available force until wax was declared and a volunteer force was authorized, had been assembled at lampa, Florida, New Orleans and Chickamauga, Georgia, but until the control of the sea was decided, the army could not prudently be moved across the Strait of Florida. Cervera's fleet was thus the real objective of the navy, and had to be settled with

before any military action could be undertaken.

Rear-Admiral Sampson left Key West early on the 22nd, and began the blockade of Havana and the north coast of Cuba as far as Cardenas, 80 m. east, and Bahia Honda, 50 m. west. His North Atlantic squadron of 28 vessels of all kinds, of which the armoured cruiser " New York " (flag), the battleships " Iowa " and " Indiana," and the monitors " Puritan," " Terror " and " Amphitrite," were the most important, and which included six torpedo-boats, was increased to 1 24 vessels by the 1st of July, chiefly by the addition of extemporized cruisers, converted yachts, &c.

In the Pacific, the American squadron — the protected cruisers " Olympia " (flagship of Commodore George Dewey), "Balti- more," "Raleigh" and "Boston," the small unprotected cruiser " Concord," the gunboat " Petrel," the armed revenue cutter " Hugh M'Culloen," with a purchased collier " Nanshan " and a purchased supply ship " Zafiro " — left Hong-Kong at the request of the governor and went to Mirs Bay, some miles east

On the Chinese coast. Ordered (April 25) to begin opera- tions, particularly against the Spanish fleet, which he was directed to capture or destroy, Dewey left Mirs Bay on the 27th, and arrived off Luzon, in the Philippines, on the 30th of April. The Spanish admiral Montojo anchored to the eastward of the spit on which are the village and arsenal of Cavite, in a general east and west line, keeping his broadside to the northward. His force consisted of the " Reina Cristina," the " Castilla " (an old wooden steamer which had to be towed) ; the " Isla de Cuba " and "Isla de Luzon" (protected cruisers of 1050 tons); the " Don Juan de Austria " and the " Don Antonio de Ulloa " (gunboats of about 1150 tons), and the " Marques del Duero " (of 500 tons). There were six guns (3 breech-loaders) in battery at or near Cavite.

Dewey stood on during the night, and passed into the Boca Grande (about 5 m. broad), paying no attention to rumours of torpedoes in a channel so broad and deep, and at MaaUa" midnight passed El Fraile (a large rock, if m. from the south side) ,' from which two shots were fired at him, and he was also fired at by the " Cavite " and one of the city batteries. When he sighted the Spanish squadron to the southward Le ordered his transports and the revenue cutter " Hugh M'Culloch " out into the hay, and stood down in column with the " Olympia," " Baltimore," " Raleigh," " Petrel," " Concord " and " Boston " at 400-yd. intervals. When within 5000 yds. he ported his helm, and at 5.41 a.m. opened fire. He stood westwards along

the Spanish line, using his port batteries, turned to starboard and stood back, gradually decreasing his distance to 2000 yds. At 7 o'clock the Spanish flagship attempted to come out and engage at short range, but was driven back by the American fire. The Spanish squadron was now in very bad plight, but the seriousness of its condition was not fully known to the American commander. At 7.35 Dewey withdrew, gave his men breakfast, and had a consultation of commanding officers. Before he re-engaged at 11. 16 the " Cristina " and " Castilla " had broken into flames, so that the remainder of the action consisted in silencing the Cavite batteries and completing the destruction and demoralization of the smaller Spanish ships, which the " Petrel " was ordered in to burn. The victory was complete. All the Spanish ships 1 were sunk or destroyed. The injury done the American ships was practically nil. The Spanish lost 167 killed and 214 wounded, out of a total of 1875. The Americans had 7 slightly wounded out of 1748 men in action. Dewey took possession of Cavite, paroled its garrison, and awaited the arrival of a land force to capture Manila.

The blockade of Havana had progressed without incident, beyond the capture of a number of Spanish steamers and sailing vessels, 2 and the shelling of some new earthworks Blockade. at Matanzas on the 27th of April; but on the nth of May a small action was fought at Cardenas, in which the Americans were repulsed and Ensign Worth Bagley, the first American officer to lose his life in the war, was killed. On the same day a partially successful attempt was made, under a heavy fire from the shore, to cut the cable between Cienfuegos and Havana.

Cervera had left the Cape Verde Islands on the 29th of April with four armoured cruisers, the " Almiiante Oquendo," " In- fanta Maria Theresa " and " Vizcaya " (sister ships of 7000 tons) and the " Cristobal Colon " (same size; differently equipped) and three torpedo-boat destroyers — a type not then represented in the American navy — " Furor," " Terror " and " Pluton." On hearing (May 1) of Cervera's departure, Sampson went east 1000 m. to San Juan, Porto Rico, with the armoured cruiser " New York," the battleships " Iowa " and " Indiana," the cruisers " Montgomery " and " Detroit," and one torpedo-boat. In going east he calculated on using a speed of 10 knots, on getting to San Juan on the 8th, about the time the Spaniards would reach

1 Three of the best were afterwards raised and repaired by American engineers.

'The " Buenaventura," the first prize of the war, was taken by the gunboat " Nashville " off Key West on the 23rd of Aprii.

its longitude, and if they were not there, on returning off Havana before

they could get to Havana harbour. He wished to prevent Cervera's refitting at San Juan, from which place the American coast would be within easy reach, New York being only about 1400 m. away. But the speed of the American squadron fell short of Sampson's expectation; he reached San Juan on the 12th, stood in to see if Cervera was in the harbour, and opened fire upon the fortifications. He did not press the attack since Cervera was not present, and at once started back for Havana without news of Cervera, who was then in fact off Martinique, with orders to go to San Juan. When he heard that Sampson was at San Juan, he steamed to Curasao, where he arrived on the 14th of May and where the authorities allowed him to coal. He reached Santiago de Cuba early on the 1 9th without being sighted en route by any of the American scouts, though several were in the vicinity. Sampson thought the Spanish squadron might have returned to Spain. 3 But he learned that the enemy had net turned back, on the night of the 15th, when a telegram from the navy department directed him to proceed with all despatch to Key West. He got there on the afternoon of the 18th, and found the flying The Search squadron ("Brooklyn" (flag), " Massachusetts," forCerrera's " Texas," and " Scorpion "), which left on the next Squadron. morning (19th) for Cienfuegos, then regarded by the navy department as the certain objective of the Spanish squadron. The battleship " Iowa," the gunboat " Castine," the torpedo- boat " Dupont " and the collier " Merrimac " sailed to join Schley on the 20th, and gave him a force sufficient to meet Cervera. Sampson was advised by the department (on the 20th) to " send by the ' Iowa ' to Schley to proceed off Santiago de Cuba with his whole command, leaving one small vessel off Cienfuegos," but he directed Schley in an order of the 21st if he was satisfied that Cervera was not at Cienfuegos, to proceed with all despatch to Santiago, and if the Spanish squadron was there, to blockade it.

Commodore Schley arrived off Cienfuegos on the 22nd, and held to the opinion that Cervera was there until the 24th, when Commodore M'Calla of the " Marblehead " communicated with the insurgents some miles westwards, and learned the truth. Schley sHrted that evening for Santiago, 300 m. distant, but on the afternoon of the 26th was 20 m. south of the port. Early on the 27th Schley received a despatch from the navy department suggesting that the Spanish squadron was in Santiago and bidding him see " that the enemy, if therein, does not leave without a decisive action." Schley replied "... cannot remain, off Santiago present state squadron coal account . . . much to be regretted cannot obey orders of department. . . forced to proceed for coal to Key West by way of Yucatan Passage "; in the controversy that arose out of these events Schley's critics insisted that the " Iowa " and the " Massachusetts " bad at this time enough coal to carry them three times the distance from Santiago to Key

West.

Sampson with the " New York " had arrived early on the 28th of May off Key West. When Schley's telegram, which had much disturbed the Washington officials, was forwarded to Sampson, he secured permission to go at once to Santiago with the " New York " and " Oregon " (which had arrived at Key West on the 26th of May in excellent condition after her voyage of nearly 16,000 m. from the Pacific) to turn back Schley's heavier ships. Before he started he received a telegram from Schley stating that he would remain off Santiago. It is now known from the documents published by Admiral Cervera that the Spanish squadron, in the interval preceding the 28th, when Schley arrived in sight of the port, was on the point of ieaving Santiago. On the morning of the 29th two Spanish cruisers were seen a short distance within the entrance, and on the 31st Schley, with the " Massachusetts," " Iowa " and " New Orleans," stood in and made an attack upon these and the batteries at long range (8500-11,000 yds.). On the 30th Sampson, leaving a squadron on the north side under Commodore Watson, stood for

3 A telegram (not received by Cervera) had been sent to Martinique on the 12th of May, authorizing the squadron's return.

Santiago at a speed of 13 knots. He arrived early on the 1st of June and work was at once begun on the preparations for sinking the collier " Merrimac " in the entrance channel, which was less than 200 ft. broad in parts available for ships. The preparations for a quick sinking were chiefly carried out by naval constructor Richmond P. Hobson, who went in, in the early morning of the 3rd of June, with a crew of seven men. The steering-gear was disabled by a shell, and the ship drifted too far with the tide and was sunk in a broad part of the channel where it did not block the egress of Cervera's squadron. Cervera sent word to Sampson that Hobson and his men, who had been captured, were unhurt. They were exchanged on the 7th of July.

On the 6th of June the batteries at the entrance were bom- barded and their weakness was ascertained. Sampson there- The United u P on placed, every evening, a battleship (relieved states Fleet every two and a half hours) close in, with a search- betore light turned on the channel, making it impossible, as

Santiago, Cervera. afterwards said, for the Spanish squadron to escape by

night. The port of Guantanamo, 40 m. east of Santiago, was occupied by the " Marblehead " and " Yankee " on the 7th, a battalion of marines from the transport " Panther" landed there on the 10th, and the port was used thereafter as a base and coaling station. On the 14th the Spanish land forces retired before an expedition of the American marines, who remained in occupation until the 5th of August.

A blockade of San Juan, Porto Rico, by one or two fast ships was kept up on account of the presence there of the destroyer " Terror," but this vessel, coming out (June 22) with a gun- boat to attack the auxiliary cruiser " St Paul," suffered so severely that she could hardly return to port, and was thereafter unserviceable.

When war was declared the total military forces of the United States consisted of 27,822 regulars and 114,602 militia. An act of the 22nd of April had authorized the president to call upon the states and Territories for men in proportion to their population, the regimental and company officers to be named by the governors of the states, the general and staff officers by the president. A first call was made for 125,000 men, and a month later a second call for 75,000. On the 26th of April large additions to the regular army were sanctioned for the war. The quotas were filled with extraordinary rapidity, and in May 124,776 had volunteered. The troops were concentrated chiefly at Chicka- mauga, Georgia, at Camp Alger, Virginia, and at Tampa, Florida, Preparations which was selected as the point for the embarcation tor a Land f the expeditionary force for Cuba, and where Campaign. Major-General W., R. Shafter was in command. With the exception of unimportant small expeditions, every-thing was delayed until control of the sea was assured, though some thirty large steamers were held in readiness near Tampa. After the arrival of Cervera at Santiago, the blockade of his squadron and the request (June 7) of Admiral Sampson to send a land force for co-operation, the troops embarked on the 7th and 8th of June, but a start was not made until the 14th, owing to a false report that Spanish war-ships were in Nicholas Channel. On the 29th the fleet of 32 transports, under convoy, arrived off Santiago. The whole force consisted of about 17,000 officers and men, 16 light field-guns, a train of heavier pieces, and some 200 vehicles. General Shafter selected Daiquiri, about 18 m. east of Santiago, for the point of landing, and the harbour entrance (preferred by Sampson) was disregarded. The fleet furnished all its available boats, and on the 2 2nd-2 5th the army was landed on a rough coast with scarcely any shelter from the sea; after the first day Siboney, 7 m. nearer Santiago, was used as well as Daiquiri. With the exception of three volunteer regiments (the 1st Volunteer Cavalry, known as the Rough Riders, of which Theodore Roosevelt was lieutenant-colonel; the 2nd Massachusetts and the 71st New York Volunteers), these troops were composed almost wholly of regulars,

most of whom had served on the plains against the Indians. Soon afterwards more voluuteers arrived.

No opposition was made to the landing and the small Spanish contingents at Daiquiri and Siboney were withdrawn without doing

any damage to the equipment of the railway which ran from Santiago to the iron mines at these points. The American troops (commanded by Major-General Joseph Wheeler until the 29th, when General Shafter landed) pushed forward, a soon as they landed, and found a small Spanish rearguard which was covering the concentration of outlying detachments on Santiago and which was entrenched 25 m. beyond Siboney, at Las Guasimas. Briga- dier-General S.B.M. Young with 964 dismounted cavalry engaged (June 24), and after a sharp action, in which he lost 16 killed and 52 wounded, drove back the enemy, of whom n were killed out of some 500 engaged. The advance was slow and a week elapsed before Shafter was ready to fight a battle in front of Santiago. Here the defenders, under General Arsenio Linares, held two positions, the hill of San Juan, barring the direct road to Santiago, and the village of El Caney, to the northward of the American position at El Pozo. The plan of attack on the 1st of July was Shaf ter's, but owing to the illness of Shafter the actual command was exercised by the subordinate generals, Joseph Wheeler, H. W. Lawton and J. F. Kent. General Lawton's division was to attack and capture El Caney, and thence move against the flank and rear of the defenders of San Juan, which would then be attacked in front by Kent and Wheeler from El Pozo. But Lawton for nine hours was checked by the garrison of El Caney, in spite of his great superiority in numbers (4500 to 520); at 3 p.m. the final assault on El Caney was successfully delivered by General A. R. Chaffee's brigade. Only about 100 of the Spanish garrison escaped to Santiago; about 320 were killed or wounded, including General Vara del Rey, who, with a brother and two sons, was killed. In the meantime Wheeler and Kent had an equally stubborn contest opposite San Juan hill, where, in the absence of the assistance of Lawton, the battle soon became a purely frontal-fire fight, and the rifles of the firing line had to prepare the attack unaided. The strong position of the Spaniards, gallantly defended by about 700 men, held out until 12.30, when the whole line of the assailants suddenly advanced, without orders from or direction by superior authority, and carried the crest of the Spanish position. A notable part in the attack was taken by the 1st Volunteer Cavalry or " Rough Riders," commanded by Colonel Leonard Wood and Lieut.Colonel Theodore Roosevelt. The Spaniards had no closed reserves, and their retreat was made under a devastating fire from the Ameri cans on the captured hills. On the American side over 1500 men out of 15,000 engaged, including several of the senior officers, were killed or wounded; and in one of Kent's brigades three successive commanders were killed or wounded. On the Spanish side,

out of the small numbers engaged, over 50% were out of action. Linares himself was severely wounded, and handed over the command to General Jose Toral. The Cubans on the American right failed to prevent General Escario from entering Santiago with reinforcements from the interior, and at the beginning of the investment General Toral's forces numbered about 10,000 men of the army and a naval contingent from the fleet.

Though victorious, the American army was in danger: after great fatigue under a tropical sun by day, the time spared at night from digging trenches was spent on a rain- investment soaked ground covered with thick vegetation; the of Santiago soldiers' blankets and heavy clothing had been cast on the Land aside in the attack; and there was insufficient food, s,de " because it was difficult to haul supplies over the one poor road from the base of supplies at Siboney. There was even discussion of retiring to a point nearer Siboney. Brisk firing was continued on the 2nd and 3rd of July, with a considerable number of casualties to the Americans. On the morning of the 3rd a demand was sent to the Spanish commander to surrender, with the alter- native of a bombardment of the city to begin on the 4th. This in effect had already begun on the 1st, when Admiral Sampson fired a number of 8-in. shells from a point 3 m. east of the harbour entrance over the hills into the city, using a range of about 4ˆ land miles. The result of this and the threat of General Shafter was an exodus of many thousands of civilians towards El Caney, where the American supplies were heavily taxed to support them.

On the morning of the 3rd of July Sampson, in his flagship the " New York," left the fleet to confer with General Shaffer at Naval Siboney with regard to combined operations at the

Battieof harbour entrance. 1 At 9.31, when he had gone about Santiago. ˆ m ˆ t jj e « Maria Teresa " was seen coming out. The ships in front of the port were the yacht " Gloucester," the battle- ships " Indiana," " Oregon," "Iowa," and" Texas," thearmoured cruiser " Brooklyn " and yacht " Vixen," in the order named from east to west, making a semicircle about 8 m. in length. The " Massachusetts " and " Suwanee " were coaling at Guan- tanamo. The " Iowa " hoisted the signal " Enemy coming out." All at once stood in toward the Spanish ships, which were standing westwards along shore, and began a heavy fire. The " Maria Teresa " (flagship) was followed at 800-yd. intervals by the " Vizcaya," " Colon " and " Oquendo." They were firing vigorously, but most of their projectiles went far beyond the American ships. The " Brooklyn " (flag of Commodore

Schley, the senior officer present) made a turn to starboard, which seems to have caused the " Texas " to stop and back, and to have given the " Colon " the opportunity of passing almost unscathed. The " Maria Teresa " and " Oquendo " had taken fire almost at once, and, as their water mains (outside the protec- tive deck) were cut, they were unable to extinguish the flames: they were run ashore at 10.15 an d 10.20 respectively, about 6| m. west of Santiago, burning fiercely. The " Vizcaya " and " Colon " were still standing westwards. Cervera's destroyers, the " Pluton " and " Furor," had come out last, some distance behind the " Oquendo," and were received with a heavy fire from the " Indiana " and from the unarmoured " Gloucester," which engaged them at close quarters. They attempted to close, but were cut to pieces. The " New York," Sampson's flagship, had passed, and stood on signalling the " Iowa " and " Indiana " to go back and watch the port, lest an attack be made on the American transports. The torpedo-boat " Erics- son " was ordered to rescue the men from the two Spanish ships ashore, and the flagship, with all the others, stood on in pursuit of the " Vizcaya " and " Colon." The " Vizcaya " hauled down her colours off Aserraderos, 15 nautical miles west of Santiago, and was there run ashore burning about 11.15 a – m – The " Iowa " was ordered to stop and rescue her men. and the " Oregon," " Brooklyn " and " Texas " (and behind them the flagship) settled down to the chase of the " Colon," some 6 m. ahead of the nearest American ship. She was, however, slacking her speed, and at 12.40 the " Oregon " opened with her 13-in. guns at a range of 9000 yds., as did also the " Brooklyn," with her 8-in. When the " Oregon " had fired five shells, the " Colon " hauled down her colours, and was beached at the mouth of the Rio Turquino, where in spite of endeavours to recover her, she became a total wreck. The whole Spanish fleet was destroyed; Admiral Cervera was taken prisoner; Captain Villamil, commanding the torpedo flotilla, went down with his ship: and Captain Lazaga of the " Oquendo " was drowned. Over 500 Spaniards were killed or wounded, and the survivors (except a few who escaped to Santiago) were prisoners. On the American side only one man was killed and ten were wounded, and no ship received serious injury.

After the naval victory combined operations were arranged for attacking the batteries of the harbour, but little more fighting occurred, and eventually a preliminary agreement was signed on the 15th, and the besiegers entered Santiago on the 17th. In accordance with the terms of the capitulation, all the Spanish forces in the division of Santiago de Cuba surrendered and were conveyed to Spain. The total number amounted to about 23,500, of whom some 10,500 were in the city of Santiago. The exposure of the campaign had begun to tell in the sickness of the Americans: yellow fever had broken out to some extent; and no less that 50% were attacked by the milder forms of

1 Shaffer had urged that the squadron should enter the harbour and take the city. Sampson (and the Navy department) was unwilling to risk losing a ship in the well-mined harbour and wanted the army to move on the forts and give the American squadron an opportunity to drag the harbour for mines.

malarial fever. The army, indeed, was so weakened by illness that the general officers united in urging its removal from Cuba. Major-General Nelson A. Miles, the general-in-chief, had arrived with reinforcements on the 12th of July, but the majority of these men were retained on board ship.

The fleet and the army gathered in Guantanamo Bay; and a new flying squadron, the " eastern squadron," was organized under Commodore John C. Watson, to proceed by way of the Mediterranean to the Philippines, threatening the Spanish coast, in order to meet a Spanish " reserve squadron," which had been formed towards the end of May, and which was to be sent on to the eastern coast of the United States, and thence to Cuba, but which was diverted toward the Philippines, and left Cadiz, on the 16th of June, for the East. This squadron turned back on the 8th of July after hearing the news of the Spanish defeat at Santiago.

On the 7th of May a telegram had been received from Dewey at Manila: " I control bay completely, and can take city at any time, but I have not sufficient men to hold." The cruiser " Charleston " and the steamer " Peking," with ammunition, supplies and troops, were sent to him at once. Major-General Wesley Merritt, to whom was assigned the command of the troops for the Philippines, first requested a force of 14,000, and afterwards asked for 20,000 men. On the 25th of May the first troops, 2491 in number, under Brigadier-General T. M.Anderson, sailed in three transports from San Francisco, touched at Hono- lulu, and were convoyed thence by the " Charleston." On the 20th of June possession was taken of the island of Guam, and on the 30th of June the ships arrived in Manila Bay. A second detachment of troops, 3586 in number, under Brigadier-General F. V. Greene arrived on the 17th of July; on the 25th of July General Merritt, who had been appointed governor-general, arrived; and on the 31st the five transports with which he had left San Francisco arrived with 4847 men, making nearly 11,000 men at Manila, with 5000 more on the way. General Merritt moved his forces from Cavite, and established an entrenched line within a thousand yards of the Spanish position at Manila, from which, on the night of the 31st of July, a heavy fire of musketry and artillery was opened, causing a loss to the Americans of 10 killed and 43 wounded, and for the next few days night-firing was frequent from the Spanish lines. On the 7th of August, a joint note from Dewey and Merritt, announcing that bombardment might begin at any time after .

forty-eight hours, and affording opportunity for the Manila," removal of non-combatants, was sent to the Spanish captain-general, Fermin Jaudenes, who replied that he was surrounded by the insurgents, 2 and that there was no place of refuge for the sick and for the women and children. A second joint note demanding surrender was declined by the Spanish commander, who offered to refer it to Madrid. This was refused, and preparations were made for an attack. There were 13,000 troops within the city fortifications, but with the strong fleet in front, and with the beleaguering force of Americans and insur- gents ashore, resistance was hopeless. When the combined assault of army and navy was made on the 13th there was no great resistance, and a white flag was hoisted at n o'clock, within one and a half hours after the fleet opened fire, a formal capitulation being signed the next day, the 14th of August. The total loss of the Americans during the whole campaign was 20 killed, 105 wounded.

Immediately after the surrender of Santiago (July 17), preparations were made for the invasion of Porto Rico with 3500 troops which had been sent as reinforcements operations to Santiago, but had not landed. They were largely in Porto reinforced and left Guantanamo, under General RIc0 ' Miles, on the 21st of July, convoyed by a strong squadron. 2 On the 19th of May, Emilio Aguinaldo, who had been at Hong- Kong, had landed from one of the American vessels at Cavite, and on the 1st of July, when the American troops landed, had proclaimed himself president of the Philippine Republic. The political attitude which he assumed was not sanctioned by the American autnoritiesi At the head of the insurgents he had instituted a close siege of Manila.

Fajardo, at the extreme north-eastern end of the island, was given out as the objective point of the expedition, but after sailing the plans were changed, and the towns on the south side were occupied, practically without resistance. The attitude of the population was exceedingly friendly, and opposition was not met until advance was begun northward. The troops were divided into four columns, advancing from Guanica around the western end of the island to Mayaguez: from Arroyo at the eastern end to meet the San Juan road at Cayey; from Ponce by the fine military road, 70 m., to San Juan; and the fourth column by way of Adjuntas and Utuado, midway of the island. The various movements involved several skirmishes, the chief op- position being met by the western column on the 10th of August, and by the column from Ponce on the 9th, when the Americans lost 1 killed and 22 wounded; the Spanish, 126 killed and wounded, and over 200 prisoners. A further advance on the San Juan highway would

probably have developed greater resistance, but news of the suspension of hostilities intervened. The total American loss had been 3 killed and 40 wounded. On the 1 2th of August operations were begun by the " Newark " and other vessels against Manzanillo. But during the night news arrived of the signing of the peace protocol on the 12th, and of an armistice, of which the Americans were informed by the Spanish commander under a flag of truce.

The total American loss was— in the navy, 1 officer, 1 7 men killed; in the army, 20 officers, 440 men. The health of the American fleet was kept remarkably. Its average Americans ° strength during the 1 14 days of hostilities was 26,102; the deaths from disease during this time were 56, or at the rate of 7 per 1000 per year. As nearly the whole of the service was in the tropics, and in the summer or wet season, this is a convincing proof of the efficiency in sani- tary administration. The army did not fare so ■ well, losing by disease during May, June, July and August, 67 officers and 1872 men out of an average total of 227,404. Its larger proportion of illness must of course be ascribed, in part, to its greater hardships. The war department was accused of gross maladministration; but the charges were not upheld by an investigating committee. The lack of proper preparation by the war department and the ignorance and thoughtlessness of the volunteers were the principal reasons for the high death-rate in the army.

For the terms of the peace and the results of the war see United States; Philippine Islands; Cuba; Porto Rico.

The literature of the Spanish-American War is voluminous: amongst the principal sources of information may be mentioned; The annual reports of various departments for 1898, especially the War Notes of the Office of Naval Intelligence, Washington, which include Spanish translations, and the appendix to the report of the Bureau of Navigation ; R. H. Titherington, A History of the Spanish-American War (New York, 1900) ; H. C. Lodge, Story of the Spanish War (New York, 1899); H. W. Wilson, The Downfall of Spain (London, 1900); W. A. M. Goode, With Sampson through the War (London, 1899) ; J. Wheeler, Santiago Campaign (Phila- delphia, 1899); Theodore Roosevelt, The Rough Riders (New York, 1899); C. D. Sigsbee, Personal Narratives of the Battleship Maine (New York, 1899); R. A. Alger, Spanish-American War (New York, 1900) ; Gomez Nunez, La Guerra hispano-americana (Madrid, 1900) ; H. Kunz, Taktische Beispiele aus den Kriegen der Neuesten Zeit II. (Berlin, 1901); Admiral Pluddemann, Der Krieg um Cuba i8q8 (Berlin); John D Long, The New American Navy (2 vols., New York, 1903); John R. Spears, Our Navy in the War with Spain (ibid., 1898); Bujac, Precii de quelques campagnes con- temporaines, IV. (Paris, 1899); and the Century and Scribner's magazines for 1898 and 1 899 passim.

SPANISH BROOM, a handsome shrub with long switch-like green few-leaved or leafless branches and large yellow sweet- scented papilionaceous flowers. It is a member of the Pea family (Leguminosae), and known botanically as Spartiwm junceum. It is a native of the Mediterranean region and the Canary Islands, and is often cultivated. The whole plant, but especially the flower shoots and seeds {herba el semen genistae hispanicae veljunceae), have a bitter taste and tonic and diuretic properties, and were formerly used medicinally. The fibres of the young stems were used in making nets, carpets, mats, baskets, &c.

SPANISH REFORMED CHURCH (Iglesia espanola refor- mada), a small community of Protestants in Spain organized on the model of the Anglican Church. This body of Spanish Episcopalians had its origin in a congregation which met for the first time, in June 187 1, in the secularized church of San Basilio at Seville, under the leadership of Francisco Palomares, a priest who had left the Roman communion. Before long it was joined by numbers of lay people and several clergymen, including Juan Cabrera, an ex-Roman priest, who had for some time been a Presbyterian minister. In July 1878 a memorial was presented to the Lambeth Conference by nine congregations in Spain and Portugal (see below) asking for the episcopate. The reply expressed the sympathy of the bishops, but only suggested that Dr Riley , recently consecrated by the Protestant Episcopal Church of the United States to minister to the reformed congregations in Mexico, should be invited to visit them and ordain and confirm for them. Archbishop Tait wrote a formal letter to Bishop Riley to this effect, and the request was complied with. A second petition for the episcopate was sent to the Irish bishops in 1879, and early in 1881, at their request, Lord Plunket paid his first visit to the Spanish Reformed Church, though nothing immedi- ately resulted from it. In 1880 the first " synod"' of the Church was held, under the presidency of Bishop Riley; the principles of the Church were laid down, Senor Cabrera was chosen bishop- elect, the preparation of a liturgy was begun, and the Thirty- nine Articles of Religion of the Church cf England, with certain modifications, were formally adopted as a standard of doctrine. Archbishop Plunket continued his efforts on their behalf; and at length the Irish bishops, having again received from them a petition for a bishop, brought the matter before the Lambeth Conference of 1888. The conference deprecated " any action that does not regard primitive and established principles of jurisdiction and the interests of the whole Anglican communion." The archbishop interpreted this as a modified consent; but the Irish bishops understood it otherwise, and again declined to consecrate a bishop for them. Meanwhile the movement prospered, being largely helped with money from friends in England. The foundation-stone of a new church was laid in Madrid in 1891, on the site of the Quemadero, where the autos de fi were formerly held ; and after considerable legal and other

difficulties, religious toleration in Spain being still imper- fect, it was dedicated and opened for service. At length, at the meeting of the Irish House of Bishops on the 21st of February 1894, a letter was read from the archbishop of Dublin and the bishops of Clogher (C. M. Stack) and Down (C. Welland), in which they declared their intention, unless a formal protest were made by the bishops, or by the general synod, to consecrate bishops for the Reformed churches in Spain and Portugal, subject to certain conditions being fulfilled by those churches. The bishops resolved, nemine contradicente, although the bishops of Derry (W. Alexander, subsequently primate of Armagh) and Cork did not vote, that they would not regard such action as " an indefensible exercise of the powers entrusted to the episco- pate"; and the general synod passed a resolution leaving the matter in the hands of the bishops. Accordingly, on the 23rd of September 1894, the three bishops laid hands on Senor Cabrera. The matter occasioned no little stir in the English Church, more especially as the Old Catholic bishops (see Old Catholics) had recently refused to take any part in the matter. It called forth a letter of protest and repudiation from Lord Halifax, as president of the English Church Union, to Cardinal Monescillo, archbishop of Toledo; and this in turn evoked a letter from Cardinal Vaughan, which was widely circulated in Spain.

The consecration of Bishop Cabrera certainly produced, from the point of view of Anglican churchmen, a somewhat anomalous state of things, and the action, or inaction, of the Irish bishops laid them open to criticism from many who were not unfriendly to such movements (see e.g. Bishop John Wordsworth, Ministry of Grace, pp. 176-177, London, 1901). Objection was made to the act as contrary to church order, and as unjustifiable in view of the nature of the Spanish Reformed Church itself. As regards the latter, it is true that the Prayer-book of the body (first

made in 1881 and published in a revised form ?n 1889) cannot really justify the claim made on its behalf as a " revised Mozarabic rite": it contains indeed many beautiful prayers from the Mozarabic and other offices, but its doctrinal teaching is more unambiguously " Protestant " than that of the English Prayer- book. The Church possessed in 1906 ten congregations with some dozen clergy.

Lusitanian Church. — A similar movement began in Lisbon in 1867, owing to the work of a Spanish priest there, SefiorMora; and at first its success was even greater than the movement in Spain, in spite of the fact that Portuguese priests who left the Roman communion had either to leave

Portugal or to become subjects of another power. In 1875 the adherents of this move- ment threw in their lot with their Spanish brethren, and when Bishop Riley visited them in 1878 the Portuguese members organized themselves as the " Lusitanian Church," and the Rev. T. Godfrey Pope, D.D. (d. 1902), the English chaplain at Lisbon, was subsequently chosen by them as president of the synod. A request made to the Irish bishops in 1897 for the consecration of Canon Pope as their bishop led to an examination of the Lusitanian Prayer-book, which was found to be even more defective from the Anglican point of view than that of the Spanish Reformed Church. Consequently no action was taken. In 1906 the Church had only some 500 adherents with five clergy.

Authorities.— H. E. Noyes, Church Reform in Spain and Portugal (London, 1897) ; F. D. How, Life of ArchbishopPlunket(hondon,i

SPANISH SUCCESSION, WAR OF THE, the name given to the general European war which began in 1701 and ended with the Treaties of Utrecht and Rastatt in 1713-14. The war in its ensemble is the typical " war with limited aim," carried out by professional armies in the interests of sovereigns and their cabinets and (except in the last stages of the war in northern France) enlisting no more than the platonic sympathies of the various peoples whose rulers were at war. Nevertheless, its monotonous round of marches and sieges is now and then quickened by the genius of three great soldiers, Marlborough, Eugene and Villars, and Peterborough and Galway, Catinat and Vendome, though less highly gifted, were men of unusual and conspicuous ability. As usual in these wars, manoeuvres, threats and feints played the principal part in field warfare. The soldiers of those days were too Costly to be squandered on indecisive battles, and few generals of the time either knew how to make a battle a means of definitively settling the quarrel or had the influence and force of character to extort from their sovereigns permission to play for high stakes. The tangible assets, at the conclusion of peace, were fortresses and provinces; and the effective seizure of fortresses and provinces, ■•" here a little, there a little," was in most cases the principal object with which kings and princes made war. Nevertheless, at the time of the Spanish Succession War the generals had not yet wholly reconciled themselves to their new position of superior chess-players. Moreover, the object of the war, at least in the case of England and Holland, was less to add a few cities and districts to their own domains than to cripple the power of Louis XIV. The ambition of the Grand Monarque had stepped beyond these narrow limits, and by placing on the throne of Spain his grandson Philip he had brought into politics the fear not merely of a disturbance but of an entire overthrow of the " balance of power." Thus the instrument of his ambition, his magnificent army, was (above all for England) an object in itself and not merely an obstacle to the attainment of other objects. Many of the allies,

however, had good reason to fear for their own possessions, and others entered the alliance with at least the hope of acquiring a few material gains at small expense. On the side of the allies therefore, throughout the war, there was a perpetual struggle between offensive activity and defensive passivity, and within the category of " activity "

two very different forms of offensive alternately prevailed, the decision of the main question b) r the sword and the seizure of a minor object by stratagem. Were it not for the existence of this struggle, indeed, the war would be devoid of interest. Later in the 18th century there was, as a rule, no such struggle, for the grander form of offensive died out completely, and the feebler form was easily reconciled with the requirements of passive defence. But in 1700 the true spirit of war— in a leader of the greatness of Marlborough at least— was not yet entirely smothered by chicane.

The action of Louis XIV. in the matter of the Spanish succes- sion was foreseen, and William III. of England had devoted his last years to providing against the emergency by the formation of a coalition to deal with it, and the production of a claimant for the Spanish throne, the archduke Charles. The coalition naturally grew out of the Grand Alliance (see Grand Alliance, War or the), and consisted of Austria, some of the German states, Great Britain, Holland, Denmark and Portugal. On the other side Louis XIV. was supported by Spain — where Philip, recognized as heir by the dying Charles II., had been promptly installed — Bavaria and Cologne. A doubtful ally was the duke of Savoy, whose policy was to secure and aggrandise himself by adhering at each moment to the stronger party. The alliance of Louis with the discontented prince of Hungary and Transyl- vania Rakocsy was rather an impediment to his enemy than a direct assistance to himself.

The war began, to all intents and purposes, with the handing over of the fortresses in the Spanish Netherlands to the French in March 1701. England and Holland at once began their preparations, but neither state was able to put an army in the field in the year — England because her peace-time army was absolutely insignificant, and Holland because she dared not act alone. In Italy, however, the emperor took the initiative, and an Austrian army under Prince Eugene, intended to overrun the Spanish possessions in the Peninsula, assembled in Tirol inˆthe early summer, while the opposing army (French, Spaniards and Piedmontese) , commanded by Marshal Catinat, was slowly drawing together between the Chiese and the Adige. But supply difficulties hampered Eugene, and the French were able to occupy the strong positions of the Rivoli defile above Verona. There Catinat thought himself secure, as all the country to the east was Venetian and neutral. But Eugene, while making ostentatious preparations to enter Italy by the Adige or Lake Garda or the Brescia road, secretly reconnoitred

passages over .the mountains between Roveredo and the Vicenza district. On the 27th of May, taking infinite precautions as to secrecy, and requesting the Venetian authorities to oSei (j r ˆ nM no opposition so long as his troops behaved well, Eugene began his march by paths that no army had used since Charles V.'s time, and on the 28th his army was on the plains. His first object was to cross tne Adige without fighting, and also by ravaging the duke of Mantua's private estates (sparing the possessions of the common people) to induce that prince to change sides. Catinat was completely surprised, for he had counted upon Venetian neutrality, and when in the search for a passage over the lower Adige, Eugene's army spread to Legnago and beyond, he made the mistake of supposing that the Austrians intended to invade the Spanish possessions south of the Po. His first dispositions had, of course, been for the defence of the Rivoli approaches, but he now thinned out his line until it reached to the Po, and after five weeks' cautious manoeuvring on both sides, Eugene found an unguarded spot. With the usual precautions of secrecy (deceiving even his own army), he crossed the lower Adige in the night of the 8th-9th of July, and overpowered the small cavalry corps that alone was encountered at Carpi (July 9). Catinat at once concentrated his scattered army backwards on the Mincio, while Eugene turned northward and regained touch with his old line of supply, Roveredo-Rivoli. For some time Eugene was in great difficulties for supplies, as the Venetians would not allow his barges to descend the Adige. At last, however, he made his preparations to cross the Mincio close to Peschiera and well beyond Catinat's left, with the intention

of finding a new supply area about Brescia. This was executed on the 28th of July, Catinat's cavalry, though coming within sight of Eugene's bridges, offering no opposition. It seems that the marshal was well content to find that his opponent had no intention of attacking the Spanish possessions in the Peninsula, at any rate Catinat fell back quietly to the Oglio. But his army resented his retreat before the much smaller force of the Austrians and, early in August, his rival Tesse reported this to Paris, where- upon Marshal Villeroy, a favourite of Louis, was sent to take com- mand. The new commander was perhaps the least competent of all the French senior officers, and ere long he attacked Eugene in a well entrenched position at Chiari (Sept. 1), and was thoroughly defeated, with a loss, it is said, of 3000 to the Austrians' 150. Both armies then stood fast until the exhaustion of supplies compelled them to move, when Villeroy retreated to the Adda. Both Villeroy and Catinat (who had remained with him as second- in-command), warned the king of the duplicity of the duke of Savoy, who, for all the reckless bravery that he had displayed in attempting

to storm his cousin's entrenchments, was in reality already intending to change sides.

As yet there was no declaration of war by either party. Preparations were made by both sides during the year, most vigorously of all by Louis, who set on foot no less than 450,000 regulars and embodied militia, and had always prided himself on being first in the field. But the debut was disheartening, and in the winter a fresh mishap befell the French. Eugene, who had taken up his winter quarters in such a way as to play upon Villeroy's fears of an invasion of Naples, surprised Cremona on the night of the 1st of February 1702, and, after a confused fight, drew off, taking with him Villeroy as a prisoner. The brave but incapable marshal was however little loss, and the French troops, many of them surprised in their beds, had yet managed to expel Eugene's men. The rest of the French army, instead of marching to the guns in the 19th-century manner, retreated in the 18th-century manner, while Eugene quietly resumed his winter quarters and his blockade of Mantua. ,

With the year 1702 the real struggle began. Villars and one or two others of Louis's best counsellors urged the king to concentrate his attention on the Rhine and the Danube, where, they pointed out, was the centre of gravity of the coalition. This advice was disregarded, and with political aims, which it is hard to imagine, the largest French army was employed on the side of the Meuse, whib the Rhine front was entrusted to smaller forces acting on the defensive. In Italy the balance of power remained unchanged, except that one of Louis's best generals, Vendome, was sent to replace the captured Villeroy. In the Low Countries, Ginckell, earl of Athlone, the interim commander of the allies (English, Dutch and minor German states), was at the outset outmanoeuvred by the French (Boufflers), and although, in fact, the material advantage was with the allies, who captured Kaiserswerth on the Rhine, the momentary threat of a French invasion had a lasting effect on the Dutch authorities, whose timidity thereafter repeatedly ruined the best-laid schemes of Marlborough, who was obliged to submit to their obstruction and their veto. This handicap, moreover, was not the only one M arl . under which Marlborough suffered. Unless it is

borough's realized and borne in mind that the great captain First was struggling against factiousness and intrigue in

Campaign. E n g] an(j an d f rom jealousies, faint-heartedness and disagreements amongst the states who lent their contingents to his miscellaneous army, the measure of his achievements in ten years seems small. But in fact it was marvellous. Under 18th- century conditions of warfare, and with an army so composed that probably no other man in Europe could have held it together at all, obstructed and thwarted at every

turn, he yet brought Louis XIV. and France to the very edge of ruin.

In this theatre of war the French, in concert with the garrisons of the Spanish Netherlands, had fortified a line of defence more than 70 m. long from Antwerp to Huy, as well as another line, longer but of only potential importance, from Antwerp along the Scheldt-Lys to Aire in France. Besides the " lines of Brabant " Boufflers held all the Meuse fortresses below Huv except Maas-

tricht. Marlborough concentrated 60,000 men (of whom 12,000 only were British) about Nijmegen in June, and early in July, having made his preparations, he advanced directly by Hamont on Diest. Boufflers, who had drawn together his field army in Gelderland for the relief of Kaiserswerth and the late attack on the earl of Athlone, hastily fell back, in order to regain touch with the Brabant lines. Marlborough, with the positive object of bringing his opponent to battle at a disadvantage, won the race and awaited the arrival of Boufflers' tired army to strike it a paralysing blow. But at the critical moment the Dutch deputies forbade the battle, content to see the army that had threatened Holland with invasion driven off to a safe distance without bloodshed (July 22). Ten days later Boufflers, thus easily let go, again advanced from Diest, was trapped by Marl- borough and released by the Dutch. This time it was a dis- obedient general, not the civilian commissioners at headquarters, who did the mischief, but after this second experience Marl- borough thought it prudent to pacify the Dutch by besieging the Meuse fortresses, several of which fell in rapid succession (Sep- tember-October). His return to the Meuse led Boufflers to suppose that the enemy had a Rhine campaign in view and he at once sent off a corps under Tallard towards Cologne, standing on the defensive himself at Tongres, where for the third time in the campaign he was outmanoeuvred by Marlborough and saved by the deputies at Marlborough's headquarters. Boufflers hurriedly fell back within the defended area of the lines of Brabant, and the campaign closed with the capture of Liege by the allies (Oct. 12). Marlborough was created a duke on his return to England in November. He had checked the main enterprise, or at least (for an enterprise commensurate with the force employed had scarcely been imagined) the main army, of the French. Every man in the army knew, moreover, that but for the Dutch deputies the enemy would have been destroyed.

On the Rhine the campaign was, except for two disconnected episodes, quite uneventful. The Imperialists under a methodical general, the margrave Louis of Baden, gathered in the Neckar country and crossed the Rhine above Spire. Catinat, now old and worn out, was sent to Strassburg to oppose the threatened invasion of Alsace, and, like MacMahon in 1870, he dared not- assemble his whole force either on the Lauter or on the 111.

*The margrave invested Landau (July 29) and with a covering army occupied the lines of the Lauter about Weissenburg, which Catinat did not attack. Hence Landau, valiantly defended by Melac, had to be surrendered on the 12th of September. But at the same time the elector of Bavaria took the side of France, surprised Ulm, and declared a local war on the house of Austria and the " circles " of Swabia and Franconia. The margrave then, in order to defend his own country, prevent the junction of Cati- nat's forces with the elector, and win back the latter to the Austrian side, recrossed the Rhine and hurried to Kehl with the greater part of his army, leaving a garrison in Landau and a corps of observation on the Lauter. To co-operate with the elector, Catinat had made up a corps out of every available battalion and squadron (keeping for himself not more than a personal escort) and placed it under Lieut. General Villars. This corps drew away into Upper Alsace and the margrave followed suit until the two armies faced one another on opposite sides of the Rhine near Huningen. But the corps that the elector on his part was to send to meet Villars * nge "' halted east of the Black Forest, and although, on the 14th of October 1702, after a series of skilful manoeuvres, Villars crossed the Rhine and won the first victory of his brilliant career at Friedlingen (opposite Huningen), it was profitless. Soon after wards Villars placed his army in winter quarters in Alsace, and Louis of Baden disposed his troops in two entrenched camps opposite Breisach and Strassburg respectively. In Italy Ven- ddme, superior in numbers but handicapped by instructions from Versailles and by the necessity of looking to the Italian interests of King Philip, gained a few minor successes over Eugene. A very hard-fought and indecisive battle took place at Luzzara on the Po on the 15'th of August.*

In the next two years Bavaria was the centre of gravity of the

French operations, and only campaigns of the methodical and non-committal kind were planned for Italy 1 and the Low Countries. Villeroy and Boufflers commanded the French in the Low Countries, Tallard in Lorraine, Villars in Alsace, and Vendome in Italy.

In the Netherlands the French field army was behind the lines of Brabant, the Spanish troops in the lines of Flanders { Antwerp-Ghent- Aire). Together the two considerably out- numbered Marlborough (90.000 against 50,000), but the duke managed to be first in the field. As early as February Rhein- berg had been taken, and in May he followed up this success by the capture of Bonn, returning to the Meuse before Villeroy had assembled his army at Diest. Marlborough's plan was to break the

immensely long line of defence of the French and Spaniards by the capture of Antwerp. One Dutch corps under Coehoorn was to assemble in the Sluys-Hulst region, and another under Opdam at Bergen-op-Zoom and Marlborough, after manoeuvring Villeroy's field army out of the way, was to join them before the fortress. Marlborough executed his own share of the movement with his usual skill, he pushed back Villeroy towards the Mehaigne and at the right moment, giving them the slip, marched for Antwerp via Hasselt. Villeroy, soon discover- ing this, hastened thither as fast as possible, and the Dutch generals enabled him to emerge from the manoeuvre with a handsome victory, for Coehoorn (in order to fill his own pockets, it has been suggested) had departed on a raid into West Flanders and Opdam was left alone at Eeckeren in front of Antwerp, where Boufflers and the Spanish general Bedmar surprised him (June 30) and put his corps to flight before Marlborough could come to his assistance. In disgust the great captain then resigned himself to a war of small sieges on the Meuse. The campaign closed with the capture of Huy (Aug. 25) and Limbourg (Sept. 27). On the Rhine great projects were entertained by the French, nothing less than the capture of Vienna by a combined Franco-Bavarian Hungarian army being intended. Villars hegan by capturing Kehl (March 10) under the very eyes of the margrave, who dared not risk a battle lest the Bavarians coming up in his rear should destroy his weakened army. The Bavarians had in fact no such intention. The elector, while carrying on a trifling war with a small imperial army under Count Styrum, insisted that Villars should cross the Black Forest and join him, which Villars was unwilling to do thus early in the year, as two-thirds of his officers were as usual on leave or detached on recruiting duties. Courtier though he was, the marshal would not stir even in spite of the king's orders until he was ready. At the end of April, leaving Tallard alone to defend Alsace and Lorraine against the margrave, Villars plunged into the defiles of the Black Forest and on the 8th of May joined the elector at Ebingen. All seemed favourable for the advance on Vienna, but at the last moment the elector half repented of his alliance with the enemies of Germany and proposed instead a junction with Vendome by way of Tirol. This proposal came to nothing, the Tirolese were soon roused to revolt by the mis-conduct of the ill-disciplined Bavarians, and Vendome, who, like Luxembourg, was a giant in battle and a sluggard in camp, would not stir. The active Villars meantime was reduced to impotence and faced Styrum in an entrenched camp at Dillingen on the Danube, neither side offering battle.

Villars had posted a protective force at Ulm to contain the margrave's army should it turn back upon him, and this, after an engagement at Munderkingen (July 31) induced the cautious Louis to return to the Rhine. Five weeks later, however, the margrave returned in full force, and moving

by the right bank of the Danube reached Augsburg on the 6th of September. The elector, returning from his futile Tirol expedition, had already rejoined Villars at Dillingen, and the marshal persuaded him to attack Styrum before the two imperial generals could join

1 In this year began the Camisard insurrection, in the Cevennes, which necessitated the detachment of a considerable body of troops from Vend6me's army in Italy. Similarly both in 1702 and 1703 the Hungarian insurrection compelled the Viennese government to keep back the reinforcements of which Eugene stood in need.

forces. The result was the battle of Hochstett 2 (Sept. 20) in which the elector and Villars won a great victory, at a loss of only 1000 men to Styrum's 11,000. Rarely indeed had an 18th- century general so great an opportunity of finishing a war at one blow. But even Villars saw no better use for the Hochstett, victory than the unimpeded junction of his own army ,703 – and Tallard's and winter quarters in Wurttemberg, and the elector on the other hand was principally anxious to evict the margrave's army from his dominions. The question was referred to Versailles, and another month passed away in inactivity. Tallard remained on the Rhine, and Villars in disgust applied to be recalled. The margrave, entrenched as usual, kept the field for another month and then rttired to the Lake of Constance, where, in a still unexhausted district, he spent the winter. Thf elector wintered in the Iller with the combined army. Tallard meanwhile invested Landau and defeated a detachment sent from Marlborough's distant army to relieve the place in the battle of Spire (Nov. 10), which was almost as costly to the allies as Hochstett. Landau surrendered on the 12th of November. Old Breisach, besieged by Vauban, capitulated on the 6th of September. Thus in Germany, though the grand advance on Vienna had come to nothing, the French had-won two important victories and established an army in Bavaria. More than this, under the prevailing conditions of warfare, it was impossible to expect. In Italy, on the other hand, Vendome, although no longer opposed by Eugene, achieved nothing. After a raid towards Trieste he was brought back hurriedly by the news that Victor Amadeus of Savoy had changed sides, and though he was victorious in a few skirmishes and re-established touch with France by capturing Asti, he failed to prevent the Imperial- ists, under Guido Starhemberg, from slipping past his position in Lombardy and joining the duke of Savoy in Piedmont.

The campaign of 1704, though in the Low Countries and in Italy practically nothing was done, is memorable for what was probably the greatest strategical operation in the 18th century, Marlborough's march to the Danube. At the outset the elector and Marsin (Villars' successor) were on the Iller, between Ulm and Memmingen, Tallard between Strassburg and

Landau, Villeroy as usual between the Brabant lines and the Meuse. Between Villeroy and Tallard there was a small force on the Moselle, intended to reinforce either. On the other side the Margrave Louis was in the Stockach-Engen region, with his own army and the relic of Styrum's, but being responsible for guarding the whole of the Middle Rhine as well as for opposing the elector he was weak everywhere, and his defence of the Rhine was practically limited to holding the " lines of Stollhofen," a defensive position near Buhl in Baden. With Breisach and Kehl in their own hands, the French were more or less closely in touch with their comrades in Bavaria, and Tallard convoyed a large body of recruits for Marsin's army through the Black Forest defiles. But in doing so he lost most of them by desertion, the margrave's army dogged his march, and in fact no o Wne aa # regular line of communication was established. Thus Danube the five armies (Marlborough's, Eugene's, Tallard's, Campaign Marsin's and the margrave's) engaged in this theatre of,7 ° 4 – of war, were moving and facing in all directions in turn in a most bewildering fashion. Marlborough's purpose at any rate was quite definite — to transfer a large corps from the Low Countries to Bavaria and there in concert with the allies in that quarter to crush the elector decisively. He took no one into his confi- dence. The timid Dutch were brought, not without difficulty, to assent to a Lower Rhine and Moselle campaign, of much the same sort as the Bonn expedition of 1703, but rather than be burdened with Dutch counsellors he forwent the assistance of the Dutch troops. These were left under Overkirk to defend the Meuse, and English and English-paid troops alone took part in the great venture. Meanwhile Tallard and Marsin, united at the moment of handing over the recruits, had promptly separated again. Tallard, Villeroy and the Versailles strategists,

2 Fought on the same battlefield as was Blenheim next year ; the latter is consequently called by some the " second battle of Hochstett."

well aware that Marlborough was ascending the Rhine, thought that a diversion on the Moselle was intended, and the feeble warnings of Marsin, who half suspected the real purpose, were disregarded. Villeroy remained in Brabant for fear that Overkirk would take a few towns in his absence.

Marlborough calculated that as he progressed up the Rhine the French would collect to prevent his crossing, instead of them- selves passing over to join the elector and Marsin. Thus the expedition would reach the Neckar mouth, without its true purpose being suspected, and once there Marlborough would vanish from the ken of the defenders of the Rhine, to

reappear on the Danube where he was least expected. On the 12th of May the army crossed the Meuse at Ruremond, on the 23rd it reached Bonn, on the 29th Mainz. On the 1st of June the puzzled French noted preparations for bridging the Rhine at Philipsburg. But two days later the English had turned to their left into the valley of the Neckar. On the 10th of June Prince Eugene and on the 13th the margrave appeared at the duke's headquarters to concert operations. It was arranged that the margrave was to join Marlborough and that Eugene should command the Stollhofen Marl- an d other forces on the Rhine, for Tallard, it seemed,

borough's was about to be joined by Villeroy l and Marlborough March to the knew that these marshals must be kept west of the Danube. Rhine for the six weeks he allowed himself for the

Bavarian enterprise. The margrave's army duly joined Marl- borough's on the 22nd of June at Ursprung, 12 m. north of Ulm, where the elector and Marsin were encamped. The endurance of Marlborough's corps, as displayed in the long march from Rure- mond, was not the least extraordinary feature of the operation. For 18th-century troops such performances were generally provo- cative of desertion, and involved the ruin of the army that at- tempted it. But Prince Eugene, we are told, was astonished at the fine condition of the army. On the French side meantime all was perplexity, and it was not until a week after the margrave and Marlborough had united that a decision was arrived at by Louis XIV., in whose eyes the feeble corps of Eugene sheltered in the lines of Stollhofen constituted a grave menace for Alsace and Lorraine. Villeroy's main body from the Meuse had after its first hesitations followed up Marlborough, in readiness for the supposed Rhine and Moselle campaign, and was now about Landau. Tallard with the smaller half of the united armies was to advance by Breisach and to " try to capture Villingen." Villeroy was to watch Eugene's corps, or rather the Stollhofen- Buhl position, and the small Moselle corps was to remain west of the Rhine. This meant conceding both the initiative and the superiority in numbers to Marlborough.

The duke had now manoeuvred himself with brilliant success from one theatre of war to another, and had secured every advantage to himself. His method of utilizing the advantage showed his mastery of the rules of the strict game that, with the instinct of a great captain, he had just set at nought. From before Ulm he sidled gradually along the north side of the Danube in the hope of finding an unguarded passage. He and the margrave exercised the general command on alternate days, and when on his own day he arrived opposite Donauworth, knowing Louis's caution, he thought that direct attack was better than another two days' extension to the east. Moreover he needed a walled town to serve as a magazine instead of Nordlingen, which he had used of late but which could not serve him for

*operations over the river. In the late afternoon of the 21st the army was flung, regardless of losses, against the entrenched hill of the Schellenberg at Donauworth, where the elector had posted a Campaign on strong detachment. The attack cost 6000 men, but the Danube, it was successful, and of the 12,000 Bavarians on "**• tjjg hm on iy 3000 returned to their main body, which*

had now moved from Ulm to Lauingen. Passing the river, the allies besjeged and took the small fortress of Rain, and thence moved to the neighbourhood of Augsburg, thoroughly and deliberately devastating the countryside so as to force the elector to make terms. The best that can be said of this barbarous

1 Even Villeroy it appears rose to the situation thus far, but the king only allowed him to send 25,000 men to Tallard.

device, more or less legitimate in the days when the quarrel was the people's as much as the prince's, is that Louis XIV. had several times practised it. Its most effective condem- nation is that military devastations, in these purely political contests, were entirely unprofitable. Louis had already found them so, and had given up the practice. In the present case the acts of the allies only confirmed the elector in his French sym- pathies, while at the same time Marlborough's own supplies ran short, his convoys were harassed and his reconnaissances impeded. The movements of the two armies were but trifling. Marlborough, though superior, was not decisively superior, and his opponents, well entrenched near Augsburg, waited for Tallard and (in vain) for Villeroy. Marlborough marked time until Eugene should join him.

There were now five armies in the field, two allied and three French. The centre of gravity was therefore in Villeroy's camp. If that marshal followed Tallard, even Eugene's junction with Marlborough would not give the latter enough force. If Tallard alone joined the elector and Eugene Marlborough, the game was in the hands of the allies. But none of the possible combinations of two armies against one were attempted by either side. Eugene did not venture to leave Villeroy's front to attack Tallard, who was marching by Kehl-Villingen-Ulm on Augsburg, but when he knew that Tallard was on the move he slipped away from Villeroy to join Marlborough. In turn, Tallard and the elector, aware of Eugene's march, could have left Marlborough to his sieges and combined against Eugene, but they were well content to join forces peaceably at Augsburg. Worst of all, Villeroy, in whose hands was the key of the situation, was the nearest to Versailles and the least capable of solving the knotty problem for himself. When the king bade him follow Tallard to Villingen he hesitated, and when he had made up his mind to try, Louis had changed his and ordered him to

detain Eugene (who was already far away) in the Stollhofen lines. The last stage of the campaign was brief. Marlborough and Eugene had in mind a battle, Tallard and Marsin a war of manoeuvre to occupy the few weeks now to be spun out before winter quarters were due. The two allied armies met in the Danube valley on the 6th of August. If the enemy remained on the south side Eugene was to cross, if they recrossed to the north bank Marlborough was to follow suit. The margrave Louis of Baden had been sent off to besiege Ingolstadt as soon as Eugene had come within a safe distance. The 18th-century general relied far more on himself than on the small surplus of force that his army, in the con- ditions of that time, could hope to have over its opponent. When therefore the French and Bavarians were reported opposite Eugene on the north side, Marlborough crossed at once, and without waiting for the margrave the two great soldiers went forward. On the 2nd of August (see Blenheim) they attacked and practically destroyed the armies of Tallard, Marsin and the elector.

The campaign of 1705 was uneventful and of little profit to either side. Marlborough's army had returned to the Low Countries, engaging en route in a small campaign in the Luxem- burg and Thionville region, which was defended with skill and success by Villars. Villeroy had also returned to Brabant and retaken Huy. With him was the now exiled elector of Bavaria. On the 1 8th of July, after a series of skilful manoeuvres, Marl- borough forced the lines of Brabant at Elissem near Tirlemont, but not even the glory of Blenheim could induce the Dutch deputies to give him a free hand or the Dutch generals to fall in with his schemes. King Louis was thus able to rein- force Villeroy betimes from Villars's Lorraine army, O f^os. and the campaign closed with no better work than the razing of the captured French entrenchments. On the Rhine Villars, with a force reduced to impotence by the losses of Blen- heim and the detachments sent to Villeroy, carried on a spiritless campaign about Hagenau and Weissenburg against the margrave Louis. In Italy alone was there any serious encounter. Here Veridome's army and a fresh corps from France were engaged in the attempt to subdue Victor Amadeus and his new Austrian allies (Starhemberg's, originally Eugene's army), and they were

so far successful' that the duke implored the emperor to send a j fresh army. Eugene commanded this army, opposed to which was a force under Vend6me's brother Philippe, called the Grand Prior. This man, a lazy dilettante, let himself be surprised by Eugene's fierce attack on the line of the Adda. The day was restored however, and the Austrians beaten off, thanks to Ven- dome's opportune arrival and dauntless courage (battle of

Cas- sano, August 16). Nevertheless, the subjugation of Piedmont was put off until next year, by Louis's orders.

1706 was a bad year for the French. At the very outset of the campaign in the Netherlands, Villeroy, hearing that some of the allied contingents that composed Marlborough's army had refused to join, went forward from his new defensive lines along the Dyle and offered battle. Marlborough would probably have fought in any case, but being joined in time by the belated allied contingents, he was able (May 1 2) not only to win but also to profit by the glorious victory of Ramillies (g.v.) on the 12th of May. This was one of the few cases of thoroughly efficient and successful pursuit in the military history of the 17th and 18th centuries. The whole of Flanders and Brabant, except a few minor fortresses, fell into his hands within two weeks. These too fell one after the other in August and September, and the British cavalry crossed the French frontier itself. But on the Rhine the inactivity of Louis of Baden had allowed Villars to transfer the bulk of his army to the Netherlands. Vendome, too, was sent to suc- ceed Villeroy, and Marlborough made no further advance. Louis's two most brilliant commanders devoted themselves to organizing the defence of the French frontier, and did not venture to interrupt Marlborough's sieges.

In Italy the campaign had, as before, two branches, the con- test for Piedmont and the contest between the French force-s- in Lombardy and the Austrian second army that sought to join Victor Amadeus and Starhemberg. The latter, repulsed by

Ramillies

1706.

Vend6me at Cassano, had retired to Brescia and Lake Garda, Vend6me following up and wintering about Castiglione and Mantua, and in April 1706, profiting by Eugene's temporary absence, Vend6me attacked the Imperialists' camp of Monte- chiaro-Calcinato. His intention was by a night march to surprise the post of Ponte San Marco on their extreme left, but when day came he noticed that he could give battle to the enemy's left wing at Calcinato before their right from calcinato. Montechiaro could intervene. His onset broke up the defence completely (battle of Calcinato, April 19), and he hustled the fragments of the Imperialist army back into the mountains, where Eugene had the greatest difficulty in rallying them. Until the middle of June Vendome completely baffled all attempts of Eugene to slip past him into Piedmont. He was then, however, recalled to supersede Villeroy in Belgium, and his feeble successors entirely failed to rise to the occasion. Philip of Orleans, with Marsin and the due de la Feuillade as his advisers, was besieging Turin, trying in vain to remedy the errors of the engineers and the constant repulse of small storming parties by a savage bombardment of the town itself. As soon as he knew of Vendome's departure Prince Eugene emerged afresh from the mountains, and, outmanceuvring the French in Lombardy without the least difficulty, hurried towards Turin. Victor Amadeus, leaving the defence to the Austrian and Pied- montese infantry, escaped through the besiegers' lines and joined his cousin with a large force of cavalry. On the 7 th of September they attacked the French lines Turin. round Turin. Owing to the disagreements of their generals, the various corps of the defenders, though superior in total numbers, were beaten in detail by the well-concerted attacks of Eugene, Victor Amadeus and the Turin garrison. Marsin was killed, many of the boldest officers in the army lost heart, and Philip retreated ignominiously to Pinerolo. Although in the same week Lieut. -General Medavy-Grancey inflicted a severe defeat on

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SPANISH SUCCESSION, WAR OF THE

the Austrians who were still left in Lombardy (Castiglione, Sept. 9) the battle of Turin practically ended the war in Italy.

Both in the north and in the south the tide had now receded to the frontiers of France itself. Louis could now hope to gain Changing the objects of the war only partially and by sheer Conditions enduraucе. But it is from this very point that the of the Wat. jr rencn operations cease (though only gradually it is true) to be the ill-defined and badly-joined patchwork of forays and cordons that they had hitherto been. In the place of Tallards, Marsins and Villeroys Louis made up his mind to put his Villars, Vendomes and Berwicks, and above all the approach of the allied armies roused in the French nation itself a spirit of national defence which bears at least a faint resemblance to the great uprisings of 1792 and 1870, and under the prevailing dynastic and professional conditions of warfare was indeed a startling phenomenon. For the gathering of this unexpected moral force 1 707 afforded a year of respite. The emperor, desiring to occupy Naples and Lombardy with the least possible trouble, agreed to permit Medavy-Grancey to bring off all the Italian garrisons, and with these and the militia battalions of the Midi Marshal Tesse formed a strong army for the defence of the Alpine frontier. In Spain the campaign opened with the brilliant success of Berwick at Almanza. In Germany Villars not only pricked the bubble reputation of the lines of Stollhofen, 1 but raided into Bavaria, penetrating as far as Blenheim battle- field before he gave up the attempt to rouse the Bavarians again. The Imperialists and Piedmontese in the south succeeded in turning the Alpine barrier, but they were brought to a complete standstill by Tesse's gallant defence of Toulon (August) and having, like their predecessors in 1692, roused the peasantry against them they retired over the mountains. In Belgium the elector of Bavaria, who was viceroy there for King Philip, and was seconded by Vendome, remained quiescent about Mons and Gsmbloux, while Marlborough, paralysed more completely than ever before by the Dutch, spent the summer inactive in camp on the Gheete.

The respite of 1707 had enabled Louis to 'gather his strength in Flanders. Henceforward operations on the Rhine and in Dauphine are of quite secondary importance, so much so that Eugene and the main Austrian army are always found in the Low Countries fighting side by side with the Anglo-allied army of Marlborough.

In" 1708 Eugene foresaw this shift of the centre of gravity and arranged with Marlborough to transfer the army which was Campaign ostensibly destined for the Rhine campaign to oii708. Brabant, repaying thus the debt of 1704. Indeed the main army of the French was markedly superior in numbers to Marlborough's and hardly inferior to Marlborough's and Eugene's combined. Placing the elector of Bavaria, with Ber- wick to advise

him, at the head of the small army of Alsace, he put his young grandson and heir, the duke of Burgundy, at the head of the great army which assembled at Valenciennes, and gave him Vendome as mentor. But the prince was pious, mild- mannered, unambitious of military glory and also obstinate, and to unite him with the fiery, loose-living and daring Venddme, was, as Saint-Simon says, " mixing fire and water." At the end of May operations began. Vendome advanced to engage Marlborough before Eugene, whose purpose had become known, should join him. As the French came on towards Brussels, Marlborough, who had concentrated at Hal,[fell back by a forced march to Louvain. Vendome having thus won the first move, there was a pause and then the French suddenly swung round to the west, and began to overrun Flanders, where their agents had already won over many of the officials who had been installed by the allies since 1706. Ghent and Bruges surrendered at once, and to regain for King Philip all the country west of the Scheldt it only remained to take Oudenarde. On the day of the sur- render of Ghent Marlborough was in pursuit, and one long forced

1 The Margrave Louis of Baden had died during the winter of 1706-1707. He was succeeded by the incompetent margrave of Bayreuth, who was soon displaced. This general's successor was the elector of Hanover, afterwards King George I. of England.

Oudenarde.

march brought his army almost within striking distance of the receding enemy. But though Eugene himself had joined him, Eugene's army was still far behind, and the duke was stopped by demands for protection from the officials of Brussels. Vend6me soon moved on Oudenarde. But scarcely had he begun this investment when Marlborough was upon him. The duke dis- cussed the situation with Eugene, who had placed himself under his friend's orders. Marlborough was half inclined — another general would have been resolved — to wait for Eugene's troops before giving battle, for he knew that Vend6me was no ordinary opponent, but Eugene counselled immediate action lest the French should escape, and relying on his own skill and on the well-known disunion in the French headquarters, Marlborough went forward. As he approached, the French gave up the siege of Oudenarde and took up a position at Gavre, 7 m. lower down the Scheldt, so as to be able to act towards either Ghent or Oudenarde. Marlborough's advanced guard, boldly handled by Cadogan, slipped in between Gavre and Oudenarde. At once the dissensions in the French headquarters became flagrant. Vendome began to place part of the army in position along the river while the duke of Burgundy was posting the rest much farther back as another line of defence. Cadogan was thus able to destroy the few isolated troops on the river. Thereupon Vendome proposed to the duke to advance and to destroy

Cadogan before the main body of the allies came up, but the young prince's hesitations allowed the chance to pass. He then proposed a retreat on Ghent. " It is too late," replied Vendome, and formed up the army for battle as best he could. The allied main body, marching with all speed, crossed the Scheldt at all hazards and joined Cadogan. In the encounter-battle which followed (see Oudenarde) Marlborough separated, cut off and destroyed the French right wing. The French re- treated in disorder on Ghent (July n) with a loss of 15,000 men. Nevertheless Oudenarde was in no way decisive, and for the rest of the campaign the two armies wandered to and fro in the usual way. Berwick, recalled from Alsace, manoeuvred about Douay, while Vendome remained near Ghent, and between siege ol them Marlborough's and Eugene's armies devoted LIIIe – themselves to the siege of Lille. In this town, one of Vauban's masterpieces of fortification, the old Marshal Boufflers had under- taken the defence, and it offered a long and unusually gallant resistance to Eugene's army. Marlborough covered the siege. Vendome manoeuvred gradually round and joined Berwick, but though 90,000 and later 1 20,000 strong, they did not attack him. Berwick was a new element of dissension in the distracted headquarters, and they limited their efforts first to attempting to intercept a hugh convoy of artillery and stores that the allies brought up from Brussels for the siege, 2 and secondly to destroy another convoy that was brought up from Ostend by the General Webb known to readers of Esmond. The futile attack upon the second convoy is known as the action of Wynendael (Sept. 28). The only other incident of the campaign in the open was an unsuccessful raid on Brussels by a small corps under the elector of Bavaria from the Moselle via Namur.

On the 8th of December the brave old marshal surrendered, Eugene complimenting him by allowing him to dictate the terms of capitulation. Ghent and Bruges were retaken by the allies without difficulty, and, to add to the disasters of Oudenarde and Lille, a terrible winter almost completed the ruin of France. In despair Louis negotiated for peace, but the coalition offered such humiliating terms that not only the king, but — what in the 18th century was a rare and memorable thing — his people also, resolved to fight to the end. The ruinous winter gave force to the spirit of defence, for fear of starvation, inducing something akin to the courage of despair, brought tens of thousands of recruits to the colours.

Of the three invasions of France attempted in this memorable year two were insignificant. On the Rhine the elector of

- An excellent illustration of 18th century views on war is afforded by the fact that the completely successful defence of this convoy was regarded by his contemporaries as Marlborough's greatest triumph.

Hanover (King George I.) was held in check by the due d'Harcourt on the Lauter and finally retired to the lines of Stoll-

hofen, while a smaller allied corps under the imperialist of 1709. general Count Mercy was defeated with heavy loss

by Harcourt's second in command, Du Bourg, at Rumersheim in Upper Alsace (Aug. 26). On the Alpine frontier Berwick, abandoning the fashionable method of " lines," pre- pared a remarkable system of mobile defence pivoted on Briancon, on which Victor Amadeus's feeble attacks made no impression. These affairs were little more than diversions. The main, indeed the only, attack was Marlborough's and Eugene's, and the Malplaquet campaign is one of the few episodes of 18th century warfare that retain a living and passionate interest.

Long before this Marlborough had proposed to dash straight forward into France, masking the fortresses, but this scheme was too bold even for Eugene, who preferred to reduce the strong places before going on. Lille having been successfully besieged, Tournai was the next objective, and — while Villars and his lieutenants Montesquiou and Albergotti lay inactive in their entrenchments at Bethune, Douai and Denam on the Scheldt, training their thousands of recruits and suffering severely from the famine that followed upon this bad winter — the allies sud- denly and secretly left their camps before Lille as if for an attack on the Douai lines (June 26-27). But before noon on the 27th they had invested Tournai. A few days afterwards their siege guns came up from Menin by water (down the Lys and up the Scheldt) and the siege was pressed with intense vigour. But it was the 3rd of September before the citadel capitulated. Then Marl- borough, free to move again, transferred his army secretly and by degrees to the river Haine, beyond Villars's right. East of St Ghislain Villars's long lirws of earthworks were but thinly held, and after a march of 50 m. in 56 hours through rain-sodden country, the allied advanced guard passed through them un- opposed (Sept. 6th). Mons, too, was weakly held, and Marl- borough hoped by the rapidity of his operations to take it before Villars could interrupt him. Based on Mons and Brussels, he could then, leaving the maze of fortresses in the Arras-Valen- ciennes region to his right, push on (as eighty years afterwards Coburg attempted to push on) straight to the heart of France. But Villars also moved quickly, and his eager army was roused to enthusiasm by the arrival of Marshal Boufflers, who, senior as he was to Villars, had come forward again at the moment of danger to serve as his second in command. Thinking that the allies were somewhat farther

to the east than they were in fact, the French marshal marched secretly, screened by the broken and wooded ground to the south of the fortress, and occupied the gap of Aulnois-Malplaquet (Sept. 9) , one of the two 1 practicable passages, where he set to work feverishly to entrench himself. Marlborough at once realized what had happened, and giving up the siege of Mons brought his army to the south-east of the place. Preparing, as at Oudenarde, to attack as rapidly as his brigades came on the scene, he cannon- aded the French working parties and drew the return fire of all Villars's guns. At this crisis the duke submitted the question of battle — unwillingly, as one may imagine— to a council of war, and Eugene himself was opposed to fighting an improvised battle when so much was at stake. Others thought the capture of the little fortress of St Ghislain was the best solution of the problem, and it was not until the nth that the allies delivered their attack Malplaquet. on t ' le now thoroughly entrenched position of the

French. The battle of Malplaquet {q.v.) was by far the most desperately contested of the war. In the end Boufflers, who took command when Villars was wounded, acknowledged defeat and drew off in good order, the left to Valenciennes, the right to Bavay and Le Quesnoy. Eugene was wounded, and Marlborough, after the most terrible experience in any soldier's lifetime, had only enough energy remaining to take Mons before he retired into winter quarters. The loss of the French is given variously as 7000 and 12,000. The allies sacrificed no less, probably more, than 20,000 men, and if the English and Austrian survivors could count themselves the bravest soldiers alive, one 'The other, scarcely less celebrated, is that of Jemappes.

considerable part of the allied army at least, the Dutch contin- gent, was ruined for ever. Even at Fontenoy, thirty-six years later, the memory of Malplaquet made them faint-hearted. From his bed the wounded Villars wrote triumphantly to Louis: " If God gives us another defeat like this, your majesty's enemies will be destroyed."

In 1 7 10 Villars lay entrenched behind a new series of lines, which he called Ne plus ultra and which extended from Valen- ciennes to the sea. Marlborough made no attempt to invade France from the side of Mons, for Villars at t"i7 P w g " the head of the army which had been through the ordeal of Malplaquet was too terrible an opponent to pass by with impunity. In England, too, the anti-Marlborough party was gaining the upper hand in the queen's council. So Marl- borough took no risks, and returning to the Lille side, captured Douai (June 26) and Bethune (Aug. 26). No attack was attempted upon the lines. In Dauphine, Berwick again repulsed the Austrians and Piedmontese.

171 1 was Marlborough's last campaign, and it was remarkable for the

capture of the Ne plus ultra lines by manoeuvres that must be recorded as being the ne plus ultra of the 18th-century way of making war by stratagem. In May the sudden death of the emperor completely altered the political outlook, for his successor Charles was the coalition's claimant to the throne of Spain, and those who were fighting for the " balance of power " could no more tolerate a new Charles V. than they could see Louis XIV. become a Charlemagne. Before the allies could agree upon any concerted action, Eugene's army had departed for Germany, and Marlborough alone was left to face Villars's great army. But in pursuance of the policy of passive endurance the marshal remained on the defensive behind the lines, and Marlborough determined to dislodge him. What force could not achieve, the duke trusted to obtain by ruse. The lines extended from the sea along the Canche, thence to Arras, and along the Sensee to Bouchain on the Scheldt. Marlborough held Lille, Tournai, Bethune and, in front of these places, Douai, while Villars's strong places, other than those in the lines, were Valenciennes, Cond6, Le Quesnoy, &c. As the western part of the lines, besides being strong, were worthless from the vs ˆ ra 2/ n "/. invaders' point of view because their capture could not lead to anything, Marlborough determined to pass the barrier between Arras and Bouchain. Here the front was difficult of access, because of the inundations and swamps of the Sensee valley, but two causeways crossed this valley at Arleux and Aubanchoeil-au-Bac respectively. On the 6th of July Marl- borough, who had encamped in the plain of Lens, sent a detach- ment to capture Arleux. He then marched away to the west as if to attack the lines between Arras and the headwaters of the Canche. Villars followed suit, but left a corps behind, as Marlborough had expected and desired, to retake Arleux. The commander of the garrison then sent urgent messages to say that he could not hold out, and Marlborough sent off Cadogan to relieve him. Cadogan, the only officer in the army in the duke's confidence, moved slowly, and the garrison had to surrender (July 22). Villars razed the defences of Arleux. The plot of the comedy now thickened. Marlborough lost his usual serenity, and behaved in so eccentric a manner that his own army thought him mad. He sent off one part of his forces to Bethune, another back to Douai, and ordered the small remainder to attack the lines between the Canche and Arras, where, as every one knew, Villars's whole army was massed. Marl- On the 24th of August he personally reconnoitred borough's the lines with a large staff, and calmly gave his Manoeuvre. generals instructions for the lines to be stormed. But Cadogan was hastening to give the duke's real orders to the corps at Bethune and Douai. In the night of the 4th-sth of August the main army set out for Aubanchoeil-au-Bac, at the highest possible speed. The Scarpe was crossed, the Bethune column came in punctually, 'and the word was passed down the ranks that Cadogan had crossed the lines at Arleux. Thereupon the pace was increased, though thousands of the infantry fell out and scores

died from exhaustion. Five hours ahead of the French

army and level in the race with Villars and the cavalry, the red- coats crossed the rivers at Arleux, while Marlborough and the horse hurried on to Aubanchoeil-au-Bac, crossed there and turned back along the Sensee to meet the French squadrons. The army reassembled between Aubanchoeil-au-Bac and Cambrai, and its leader, declining Villars's offer of a battle in front of Cam- brai, manoeuvred still farther to the east and invested Bouchain. The siege, covered by a strong " line of circumvallation " which Villars did not attempt to attack, ended with the surrender of the place on the 13th of September, and so terminated a series of manoeuvres which to the modern mind is so extraordinary as to be almost incredible. In December of this year, his party opponents in England being now triumphant, the man who was so consummate a master both of the 18th-century and the Ramillies-Oudenarde methods of making war was dismissed the service in disgrace. In June 1712 the British contingent, under the duke of Ormonde, withdrew from the Low Countries, the dis-content of the men at Marlborough's disgrace breaking out in open mutiny, and thus ignominiously ended the career of the army of Blenheim and Malplaquet. The coalition practically dissolved.

But Holland and Austria determined to make one last effort to impose their own terms on Louis. Eugene's army, which had been used in 1711 to influence the imperial election instead of to beat Villars, was brought back to the Low Countries. Reading the meaning of Marlborough's fall, he quietly made preparations to take over the various allied contingents into Imperial or Dutch pay. Thus when England seceded, Ormonde only marched away with some 1 2,000 sullen men, and over 100,000 remained with the prince.

Misfortunes at Versailles helped Eugene in his first operations, for three members of Louis's family died within a week and all was in confusion, not to speak of the terrible misery that prevailed in the country. But the old king's courage rose with the danger and- he told Villars that if the army were beaten he would himself join it and share in its fate. Villars, though suffering still from his Malplaquet wound, took command on the 20th of April, and spun out time on the defensive until the end of May, when Ormonde's contingent withdrew. Eugene, apparently with the intention of regaining the Mons line of operations, as the defec- tion of England had made further operations near the sea unprofitable, neglected to besiege, not only Arras, but Valen- ciennes and Conde as well, and, based temporarily

on Douai and Marchiennes and Bouchain he took Le Quesnoy (July 4) and moved thence on to Landrecies, which was closely invested. Then followed the last serious fight of the war, the battle of Denain, which saved the French monarch and completed the disintegration of the coalition.

In order to protect his camps around Landrecies, Prince Eugene constructed the usual lines of circumvallation with such speed that Villars, on coming up, found that they were too formidable to attack. Next, in order to guard the movements of his convoys between Marchiennes-on-Scarpe and the front against attacks from Cambrai or Valenciennes, he hedged in the route on both sides with continuous lines of breastworks, to the defence of which he assigned his Dutch corps. Villars anxiously looked out for an opportunity of breaking these modern " long walls." At Denain, the besiegers' route crossed the Scheldt. From this point to the front, streams and other obstacles reinforced the defence, but the marshal was told by a country priest that the lines were assailable north of Denain, and resolved to attack them there. The enterprise, like Marlborough's forcing of the Ne plus ultra lines, involved an extraordinary combination of resolution and skill — i.e. force and fraud— for the point of attack was far away and the opposing army almost within cannon-shot. Some days were spent by Villars in deceiving Eugene and his own army as well, as to his real intentions, and by various feints Eugene was induced to mass his main body about Landrecies and Le Quesnoy on the south side of the Scheldt. Then on the night of the 23rd of July the French army moved off silently, with its bridging train in the vanguard and cavalry posted everywhere along its

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right flank to conceal the march. By 9 a.m. on the 24th Villars's army had completely deployed on the north bank of the Scheldt. Eugene himself saw them and galloped away to bring up his army from Landrecies. But, long before it arrived, Villars's troops, without wasting precious moments in formal preparations, stormed the lines. The Dutch — spiritless since Malplaquet — were huddled into the narrow avenue between the two entrenchments and forced back on Denain. Their generals were taken. The broken mob of fugitives proved too heavy a load for the bridges at Denain, and many were drowned, while the rest, pinned against the bank of the now impassable river, tamely surrendered. Eugene arrived on the other bank with some brigades of the imperial infantry, but after losing heavily gave up the attempt to reopen the passage. Villars followed up his victory at once. Montesquiou captured Marchiennes and Albergotti St. Amand, and in these places all Eugene's reserve stores, pontoons and guns fell into the hands of the French. On the 2nd of August Eugene broke up the siege of Landrecies and retreated by a roundabout route to Mons, while Villars's lieutenants retook Douai and Bouchain (September-October). Before the

next campaign opened the treaty of Utrecht had been signed, and although the emperor continued the struggle alone for another year, the enfeebled combatants were content to accept Villars's captures of Landau (July 22, 1713) and Freiburg (Nov. 21) as decisive. The treaty of Rastatt, between Austria and France, was signed on the 7th of March 1 7 14, Eugene and Villars being the negotiators.

See J. W. Fortescue, 'Hist. British Army, vol. i. (London, r8o9) ; lives of Marlborough; the Austrian official Feldziige des Prinzen Eugen (Vienna, 1871-1892); Roder v. Diersburg's MarkgrafLudwig von Baden (Karlsruhe, 1850); Arneth's Prinz Eugen; Mimoires militaires relates d la succession d'Espagne (1835; ed. De Vault); detailed histories of the French army, and monographs in the French general staff's Revue d'histoire. (C. F. A.)

Naval Operations, and Military Operations in Spain , ;

The war of the Spanish succession affected all the nations of western, northern and central Europe in a greater or less degree, but that part of it which was fought out on the soil of Spain lay aside from the campaigns in Flanders, Germany and Italy. The purely Spanish campaigns had a close connexion with the movements of the fleets, and the two may be coriveniently taken together. The naval war was superficially somewhat wanting in interest. Louis XIV., having to support armies of unprece- dented size to contend with the forces of the Grand Alliance, and having also to meet the immense cost of the support of his court and the construction of palaces, was compelled to neglect his navy. Except therefore in 1704 he made no attempt to oppose the fleets of the allies with equal forces at sea. The honour of the French flag was chiefly maintained by the priva- teers who showed high courage and much skill. Some of their enterprises were undertaken with well-appointed squadrons, and attained to the dignity of regular operations of war.

When the Grand Alliance was formed on the 7th of September 1 701 a French naval force under M. de Chateaurenault was 1 in the West Indies. Its avowed purpose was to cover the arrival in Europe of the Spanish treasure ships. The secret intention of King Louis XIV. was that the treasure should be brought into a French port, and used by him for the general advantage of the house of Bourbon. On the 12th of September a British squadron of 10 ships commanded by Admiral Benbow was sent to the West Indies to intercept Chateaurenault, and carry out other attacks on the French and Spaniards. Benbow, who • was reinforced in the West Indies, did not intercept Chateaurenault, and his cruise was rendered of no effect by the gross misconduct of most of his captains, who refused to support him in an action with a French squadron under M. Du Casse near St Martha on the 20th of August 1702 and subsequent days, He was himself mortally

wounded, but lived long enough to bring his captains to court martial. Two of them were shot for cowardice. The treasure fleet sailed for Europe only to fall into the hands of the allies at Vigo. On the 1st of July 1702 a powerful combined fleet of 30 British sail-of-the-line under Sir George Rooke, and

so Dutch under Admiral Allemonde sailed from Spithead carrying 5000 troops. The general command was given to the duke of Ormonde. The purpose of this expedition was to occupy Cadiz and encourage a rising in Andalusia on behalf of the Habsburg candidate. It reached Cadiz on the 22nd of August, but the inhabitants and the garrison remained loyal. The leaders of the expedition quarrelled with one another and the soldiers aroused the bitter indignation of the inhabitants by plundering the small towns of Santa Maria and Rota. On the 30th of September the expedition sailed away. Information sent by the British minister at Lisbon that Chateaurenault had put into Vigo reached them at Lagos. The duke of Ormonde and his colleagues decided to attack the treasure fleet. On the 22nd of October they forced the boom laid by the enemy between the inner and outer harbours of Vigo, and the treasure fleet was destroyed, but the bullion had been landed.

During 1703 the "grand fleet " of the allies, i.e. their main force in European waters, entered the Mediterranean to carry help to the insurgent Protestants in the Cevennes, but effected nothing of importance. Portugal having now joined the Alliance, it was decided to make a serious effort in Spain. A combined fleet carrying 4000 Dutch and 8000 British troops, and conveying the archduke Charles, claimant of the Spanish throne, sailed from Spithead on the nth of February 1704. Portugal undertook to provide 30,000 troops to co-operate with the British and Dutch who were landed at Lisbon on the 8th of March. The operations on land were for the most part languid. The duke of Berwick who commanded the Bourbon forces on the Spanish frontier formed a vigorous plan for the invasion of Portugal. One Spanish force under Don Francisco Ronquillo was to threaten Beira Alta at Almeida. He himself entered Beira Baixa by the north bank of the Tagus. The prince of Tzerclaes was to have advanced from the south to meet Berwick at Villa Velha. But though Berwick achieved some success, and though both the Dutch general Fagel who operated on the north of the Tagus, and the British general, the duke of Schombergj who was stationed on the south, proved indolent and incapable, the invasion failed. Ronquillo and Tzerclaes failed to support Berwick, and the newly levied Spanish troops proved unsteady. Fagel was surprised and taken prisoner with 2000

men at Sobreira Fermosa, and some of the frontier posts remained in Berwick's hands when the heat from which the British and Dutch soldiers suffered severely suspended operations. At sea^ however, a material success was gained. Sir George Rooke went on from Lisbon accompanied by Prince George of Hesse-Darmstadt, to Barcelona. The prince who had been governor of Catalonia, believed that he could bring about a rising in the province in favour of the Habsburg cause. As the fleet carried no considerable body of troops, Rooke and Hesse-Darmstadt failed to persuade the Catalans to act. They were embarrassed by the knowledge that the count of Toulouse, a natural son of Louis XIV., the admiral of France, who had sailed from Brest on the 6th of May with 23 sail-of-the-line had entered the Mediterranean, and had reached Toulon in June. In expectation of an attack by the united fleets of Brest and Toulon, the allies fell back to the straits. Having obtained information that Gibraltar (9.0.) was not sufficiently garrisoned, they attacked and took it on the 3rd of August. On the 24th the count of Toulouse, came to the relief of the fortress with 50 sail-of-the-line, and 24 galleys. He engaged the allies, 62 British and Dutch line of battleships in all, off Malaga. The engagement was a cannonade accompanied with great loss of life, but without manoeuvring on either side. The French retired to Toulon, and the allies remained in possession of Gibraltar. An attempt of the Spaniards to retake it, made at the end of 1704 and beginning of 1705 was baffled by the resolute defence of the prince of Hesse- Darmstadt, and the relief afforded to the garrison by the squadron of Sir John Leake, who was left on the coast of Portugal, when Sir George Rooke returned to England.

The events of 1704 had persuaded the allies to make more serious efforts to push the war in Spain. The duke of Schom- beig was removed from the command of the troops in Portugal

and replaced by the earl of Galway, a French Huguenot exile. But the main attack was made, and the first successes were achieved on the east coast of Spain. On the 3rd of Juno 1705 Charles Mordaunt, earl of Peterborough, was sent with a com- mission to command both the fleet and the army, and to promote a rising in favour of the Habsburg, or Austrian party. He was joined by the archduke at Lisbon, and by the prince of Hesse- Darmstadt at Gibraltar. The truth in regard to the operations which followed has been very much obscured. Peterborough, a man of much erratic cleverness, but vain, spiteful and abso- lutely indifferent to truth, successfully represented himself as a species of hero of romance who won the most astonishing victories in spite of want of means, and of the ill will or incapacity of his colleagues. Critical investigation has destroyed much of the showy edifice of fiction he contrived to erect. The substantial facts are that after some operations on the coast of Valencia, which led to an insurrectionary movement in favour of the archduke, Barcelona was attacked and taken

between the 13th of September and the oth of October. The prince of Hesse- Darmstadt was killed during the siege.

All the east of Spain, the former kingdom of Aragon, which was at all times restive under the supremacy of Castile, now pronounced more or less openly for the Austrian party. The fall of Barcelona gave a severe shock to the Bourbon king. He came in person with Marshal Tesse who had replaced the duke of Berwick, and endeavoured to retake the town early in April 1 706. The brutality with which Tesse treated the people of Aragon and Catalonia raised the country against the Bourbon king. The British relieved Barcelona on the 9th of May, and Philip V. was compelled to retreat across the Pyrenees to Perpignan. In the meantime the withdrawal of troops from the Portuguese frontier for service in Catalonia, had opened the way for an invasion of Castile by the allies, British, Portuguese and Dutch. They occupied Madrid on the 25th of June 1706, and the queen who acted as regent in the absence of her husband retired to Burgos. But the success of the allies was merely apparent. The appearance in their midst of an invading army of Portuguese and heretics roused the national feeling of the Castilians. They rallied to the Bourbon cause. As in the later Peninsular War, guerrillero bands sprang up on all sides, and they found capable leaders in Vallejo and Bracamonte. The duke of Berwick, who was sent back to Spain, collected an army, and soon the allies, who were distressed by want of provisions and bad health, were forced to evacuate Madrid. They moved on Guadalajara to meet the archduke who was advancing from the east. Berwick outmanoeuvred them, and forced them to retreat on Valencia. In February 1707 they were reinforced by troops brought by the fleet and advanced in April. On the 2 5th of the month they were defeated by the French and Spanish troops at Almansa in the province of Alicante, with the loss of all their infantry.

From this date till 1710, the land war in Spain remained stationary. The Bourbon king was master of the greater part of Spain, including Aragon. His generals retook Lerida on the Catalan frontier, and on the Portuguese frontier at La Gudina near Badajoz, on the 7th of May 1709, a Spanish army under the Marques de Bay defeated an Anglo-Portuguese army under the earl of Galway. Yet the Austrian party held Catalonia and Valencia, and the financial distress of the Spanish government, aided by the disorganized state of the administration, rendered a vigorous off ensive impossible. By 1 7 10 the French king had been reduced to great distress, and was compelled to make at least a show of withdrawing his support from his grandson Philip V. The allies decided to advance from Catalonia, a course which was strongly urged by General Stanhope (afterwards Earl Stan- hope), who commanded the British troops. He had served in subordinate rank from the beginning of the war, and had gained some reputation by the capture of Port Mahon in 1708. Stan- hope's energy

overcame the reluctance of the Imperialist general Guido Starhemberg, who commanded the German troops of the archduke. The allies advanced and for a time seemed to carry all before them. The Spaniards were defeated at Almenara on the 27th of July 1710, and before Saragossa on the 20th of

August. On the 21st of September the archduke entered Madrid. But the invasion of 1710 was a repetition of the invasion of 1706. The 23,000 men of the allies, reduced by a loss of 2000 in the actions at Almenara and Saragossa, by casualties in constant skirmishes with the guerrilleros, and by disease, were absolutely incapable of occupying the two Castiles. The Portuguese gave no help. The Spaniards were reorganized by the duke of Ven- dome, who was lent to King Philip V. by his grandfather, and were joined by soldiers of the Irish brigade, and by some Frenchmen who were allowed, or secretly directed, to enter the Spanish service. The position of the allies at Madrid, which was deserted by all except the poorest of its inhabitants, became untenable. On the 9th of November they evacuated the town, and began their retreat to Catalonia. The archduke left the army with 2000 cavalry, and hurried back to Barcelona. The rest of the army marched in two detachments, the division being imposed on them by difficulty of finding food. General Starhemberg with the main body of 12,000 men, was a day's march ahead of the British troops, 5000 men, under Stanhope. Such a dis- position invited disaster in the presence of so capable a general as Vendome. On the 9th of December he fell upon General Stanhope at Brihuega, and after hard fighting forced him to surrender. Starhemberg, who received tardy information of the peril of his colleague, marched back to support him, and fought a drawn battle at Villa Viciosa, on the 1 ith. The fruits of victory fell to Vend6me, for the Imperialist general was compelled to continue his retreat, harassed at every step by the Spanish cavalry and irregulars. His army was reduced to 7000 men when he reached Barcelona.

The disastrous result of the campaign of 1710 proved to demonstration that it was impossible to force the archduke on the Castilians by any effort the allies were prepared to make. They remained quiescent at Barcelona till they evacuated the country altogether on the Peace of Utrecht. The Catalans, though deserted by their allies, continued to fight for their local franchises which had been declared forfeited by the victorious Bourbon king. Barcelona was only subdued on the 12th of September 1714, after a siege of great length and extraordinary ferocity, by the united exertions of the French and Spanish troops under the command of the duke of Berwick.

The naval operations, apart from the transport and support of the troops in Spain, were more numerous than memorable. The overwhelming superiority of the allies alone enabled them to maintain the war in the Peninsula, but as they met no serious opposition except in 1704, there is nothing to record save their successive cruises. In 1707 a British and Dutch fleet under Sir Cloudesley Shovel aided the Imperialists in the unsuccessful siege of Toulon. The action of the allied navy was in fact as decisive as the naval strength of Great Britain was to be in the later struggle with Napoleon. But it was less brilliant. The many expeditions sent to the West Indies rarely did more than plunder coast towns or plantations in the French islands. An exception was indeed provided by the British admiral Sir Charles Wager, who in May 1708 destroyed or captured a whole squadron of Spanish treasure ships near Cartagena in South America. The loss of the treasure was a heavy blow to the government of Philip V. and had much to do with his inability to follow up the victory of Almansa. On the whole however neither the British nor the Dutch achieved any material success against the French in America. One powerful British combined force, which was sent against Quebec in 1711, was compelled to return by the shipwreck of a number of the vessels composing it at the mouth of the St Lawrence on the 21st of August. The French found some consolation for the weakness of the royal navy in the daring and the frequent success of their privateers. They were indeed the finest operations of the kind recorded in naval warfare As the British and Dutch took measures to guard against capture of their merchant ships by sailing in well protected convoys, the French combined their privateers into squadrons and attacked the guard with great vigour. On the 20th of October 1708, a British squadron of 5 line of battleships, of which 2 were of 80 guns, conveying a number of store ships to Lisbon, was

attacked near the Lizard, and was almost wholly destroyed or captured by Duguay Trouin and Forbin with 12 smaller vessels. This was but one example of a number of operations of the same character by which the trade of Great Britain and Holland was hampered. The most signal single achievement of the privateers was the capture of Rio de Janeiro from the Portuguese in September 17 11 by a fleet of 6 sail-of-the-line and 6 frigates with corsairs. The royal ships were equipped as a speculation by Duguay Trouin and the shipowners of St Malo. The booty taken gave a profit of 92% on the capital invested.

Authorities. — For the war on land The History of the War of the Succession in Spain (London, 1832) by Lord Mahon (Stanhope) is still of value. Lord Mahon was, however, misled into placing too much confidence in Peterborough. Colonel Parnell, The War of Succession in Spain (London, 1888), goes perhaps into the opposite extreme, but his history is full and is supported by copious references to original authorities. The naval operations are told for Great Britain by Lediard Naval History (London,

1735); for Holland by De Jonghe, Geschiedenis van het nederlansche zeewezen (Haarlem, 1858); and for France by Tronde, Baiailles navales de la France (Paris 1867). (D. H.)

SPARASSODONTA, a zoological name applied to a group of primitive carnivorous mammals from the Santa Cruz beds of Patagonia, represented by the genera Borhyaena, Prothylacinus, Amphiproviverra, &c. By their first describer, Dr F. Ameghino, they were regarded as nearly related to the marsupials. They are, however, more probably members of the creodont Carnivora (see Creodonta).

SPARKS, JARED (1789-1866), American historian and educationalist, was born in Willington, Tolland county, Connecti- cut, on the 10th of May 1789. He studied in the common schools, worked for a time at the carpenter's trade, and then became a school-teacher. In 1809-1811 he attended Phillips Exeter Academy, where he met John G. Palfrey and George Bancroft, two schoolmates, who became his lifelong friends. He graduated at Harvard (A.B., in 1815 and A.M., in 1818); taught in a private school at Lancaster, Massachusetts, in 1815-1817; and studied theology and was college tutor in mathematics and natural philosophy at Harvard in 1817-1819. In 1817-1818 he was acting editor of the North American Review. He was pastor of the First Independent Church (Unitarian) of Baltimore, Maryland, in 1819-1823, Dr William Ellery Channing delivering at his ordination his famous discourse on " Unitarian Christi- anity." During this period Sparks founded the Unitarian Miscellany and Christian Monitor (1821), a monthly, and edited its first three volumes; he was chaplain of the national House of Representatives in 1821-1823; and he contributed to the National Intelligencer and other periodicals. In 1823 his health failed and he withdrew from the ministry. Removing to Boston, he bought and edited in 1824-1830 the North American Review, contributing to it about fifty articles. He founded and edited, in 1830 the American Almanac and Repository of Useful Know- ledge, which was continued by others and long remained a popular annual. After extensive researches at home and (1828-1829) in London and Paris, he published the Life and Writings of George Washington (12 vols., 1834-1837; redated 1842), his most im- portant work; and in 1839 he published separately the Life of George Washington (abridged, 2 vols., 1842). The work was for the most part favourably received, but Sparks was severely criticized by Lord Mahon (in the sixth volume of his History of England) and others for altering the text of some of Washington's writings. Sparks defended his methods in A Reply to the Stric- tures of Lord Mahon and Others (1852). The charges were not wholly justifiable, and later Lord Mahon (Stanhope) modified them. While continuing his studies abroad, in 1 840-1 841., in the history of the American War of Independence, Sparks dis- covered in the French archives the red-line map,

which, in 1842, came into international prominence in connexion with the dis- pute over the north-eastern boundary of the United States. In 1842 he delivered twelve lectures on American history before the Lowell Institute in Boston. In 1 839-1 849 he was McLean professor of ancient and modern history at Harvard. His appointment to this position, says his biographer, was "the first academic encouragement of American history, and of

original historical research in the American field." In 1849 Sparks succeeded Edward Everett as president of Harvard. He retired in 1853 on account of failing health, and devoted the rest of his life to his private studies. For several years he was a member of the Massachusetts board of education. He died on the 14th of March 1866, in Cambridge, Mass. His valuable collection of manuscripts and papers went to Harvard; and his private library and his maps were bought by Cornell University. He was a pioneer in collecting, on a large scale, documentary material on American history, and in this and in other ways rendered valuable services to historical scholarship in the United States. h.

Among Sparks's publications not already mentioned, are Memoirs of the Life and Travels of John Ledyard (1828); The Diplomatic Correspondence ■'. the American Revolution (12 vols., 1829-1830; redated 1854); Life uf Gouverneur Morris, with Selections from his Correspondence and Miscellaneous Papers (3 vols., 1832) ; A Collection of the Familiar Letters and Miscellaneous Papers of Benjamin Franklin (•833); The Works of Benjamin Franklin; with Notes and a Life of the Author (10 vols., 1836-1840; redated 1850), a work second in scope and importance to his Washington; Correspondence of the American Revolution; being Letters of Eminent Men to George Washington, from the Time of his taking Command of the Army to the End of his Presidency (4 vols., 1853). He also edited the Library of American Biography, in two series (10 and 15 vols, respectively, 1834-1838, 1844-1847), to which he contributed the lives of Ethan Allen, Benedict Arnold, Marquette, La Salle, Count Pulaski, John Ribault, Charles Lee and John Ledyard, the last a reprint of his earlier work. In addition, he aided Henry D. Gilpin in preparing an edition of the Papers of James Madison (1840), and brought out an American edition of William Smyth's Lectures on Modern History (2 vols., 1841), which did much to stimulate historical study in the United States. _

See Herbert B. Adams, The Life and Writings of Jared Sparks (2 vols., Boston, 1893) ; also Brantz Mayer, Memoir of Jared Sparks (1867), prepared for the Maryland Historical Society; and George E. Ellis, Memoir

of Jared Sparks (1869), reprinted from the Pro- ceedings of the Massachusetts Historical Society for May 1868.

1 v, (W. L. C.)*

SPARROW (O. Eng. spearwa; Icel. sporr; O.H.G. Sparo), a word perhaps (like the equivalent Latin passer) originally meaning almost any small bird, but gradually restricted in signification, and nowadays in common English applied to only four kinds, which are further differentiated as hedge-sparrow, house-sparrow, tree-sparrow and reed-sparrow — the last being a bunting (q.v.) — though when used without a prefix the second of these is usually intended.

1. The hedge-sparrow, called " dunnock " in many parts of Britain, Accentor modidaris of the sub-family Turdinae of the thrushes (q.v.), is the little brown-backed bird with an iron-grey head and neck that is to be seen in nearly every garden through- out the country, unobtrusively and yet tamely seeking its food, which consists almost wholly of insects, as it progresses over the ground in short jumps, each movement being accompanied by a slight jerk or shuffle of the wings. Though on the continent of Europe it regularly migrates, it is one of the few soft-billed birds that reside throughout the year with us, and is one of the earliest breeders — its well-known greenish-blue eggs, laid in a warmly built nest, being recognized by hundreds as among the surest signs of returning spring; but a second or even a third brood is produced later. The cock has a sweet but rather feeble song; and the species has long been accounted, though not with accuracy, to be the most common dupe of the cuckoo. Several other species are assigned to the genus Accentor; but all, except the Japanese A. rubidus, which is the counterpart of the British hedge-sparrow, inhabit more or less rocky situations, and one, A. collaris, or alpinus, is a denizen of the higher mountain- ranges of Europe, though it has several times strayed to England.

2. The house-sparrow, the Fringilla domestica of Linnaeus and Passer domesticus of modern authors, is far too well known to need any description of its appearance or habits, being found, whether in country or town, more attached to human dwellings than any other wild bird; nay, more than that, one may safely assert that it is not known to thrive anywhere far away from the habitations or works of men, extending its range in such countries as northern Scandinavia and many parts of the Russian Empire as new settlements are formed and land brought under

cultivation. Thus questions arise as to whether it should not be considered a

parasite throughout the greater portion of the area it now occupies, and as to what may have been its native country. Moreover, it has been introduced to several of the large towns of North America and to many of the British colonies, in nearly all of which, as had been foreseen by ornitho- logists, it has multiplied to excess and has become an intolerable nuisance, being unrestrained by the natural checks which partly restrict its increase in Europe and Asia. Whether indeed in the older seats of civilization the house-sparrow is not decidedly injurious to the agriculturist and horticulturist has long been a matter of discussion, and no definite result that a fair judge can accept has yet been reached. It is freely admitted that the damage done to growing crops is often enormous, but as yet the service frequently rendered by the destruction of insect-pests cannot be calculated. In the south of Europe the house-sparrow is in some measure replaced by two allied species, P. hispaniolensis and P. italiae, whose habits are essentially identical with its own; and it is doubtful whether the sparrow of India, P. indicus, is specifically distinct; but Africa has several members of the genus which are decidedly so.

3. The tree-sparrow, the Fringilla Montana of Linnaeus and Passer montanus of modern writers — both sexes of which much resemble the male house-sparrow, but are easily distin- guishable by the reddish-brown crown, the black patch on the sides of the neck, and doubly-barred wings — is a much more local species, in England generally frequenting the rows of pollard- willows that line so many rivers and canals, in the holes of which it breeds; but in some Eastern countries, and especially in China, it frequents houses, even in towns, and so fills the place of the house-sparrow. Its geographical distribution is extensive and marked by some curious characters, among which may be mentioned that, being a great wanderer, it has effected settle- ments even in such remote islands as the Faeroes and some of the Outer Hebrides.

The genus Passer belongs to the Passerine family Fringillidae. The American birds called " sparrows " have little in common with the members of the genus Passer, and belong to the family Emberizidae, which is closely allied to the Fringillidae. (A. N.)

SPARTA (Gr. 'Siraprrj or AaKe8ai/j.oiv) , an ancient city in Greece, the capital of Laconia and the most powerful state of the Peloponnese. The city lay at the northern end of the central Laconian plain, on the right bank of the river Eurotas, a little south of the point where it is joined by its largest tribu- tary, the Oenus (mod. Kelefina). The site is admirably fitted by nature to guard the only routes by which an army can penetrate Laconia from the land side, the Oenus and Eurotas valleys leading from Arcadia, its northern neighbour, and the Langada Pass over Mt Taygetus connecting Laconia and Messenia. At the same time its distance from the sea —

Sparta is 27 m. from its seaport, Gythium — made it invulnerable to a maritime attack.

I. — History Prehistoric Period. — Tradition relates that Sparta was founded by Lacedaemon, son of Zeus and Taygete, who called the city after the name of his wife, the daughter of Eurotas. But Amyclae and Therapne (Therapnae) seem to have been in early times of greater importance than Sparta, the former a Minyan foundation a few miles to the south of Sparta, the latter probably the Achaean capital of Laconia and the seat of Menelaus, Agamemnon's younger brother. Eighty years after the Trojan War, according to the traditional chrono- logy, the Dorian migration took place. A band of Dorians (q.v.) united with a body of Aetolians to cross the Corinthian Gulf and invade the Peloponnese from the north- west. The Aetolians settled in Elis, the Dorians iˆJˆ on pushed up to the headwaters of the Alpheus, where they divided into two forces, one of which under Cresphontes invaded and later subdued Messenia, while the other, led by Aristodemus or, according to another version, by his twin sons Eurysthenes and Procles, made its way down the Eurotas valley and gained Sparta, which became the Dorian capital

of Laconia. In reality this Dorian immigration probably con- sisted of a series of inroads and settlements rather than a single great expedition, as depicted by legend, and was aided by the Minyan elements in the population, owing to their dislike of the Achaean yoke. The newly founded state did not at once become powerful: it was weakened by internal dissension and lacked the stability of a united and well-organized community. The turning-point is marked by the legislation of Lycurgus (q.v.), who effected the unification of the state and instituted that training which was its distinguishing feature and the source of its greatness. Nowhere else in the Greek world was the pleasure of the individual so thoroughly subordinated to the interest of the state. The whole education of the Spartan was designed to make him an efficient soldier. Obedience, endur- ance, military success — these were the aims constantly kept in view, and beside these all other ends took a secondary place. Never, perhaps, in the world's history has a state so clearly set a definite ideal before itself or striven so consistently to reach it. But it was solely in this consistency and steadfastness that the greatness of Sparta lay. Her ideal was a narrow and unworthy one, and was pursued with a calculating selfishness and a total disregard for the rights of others, which robbed it of

the moral worth it might otherwise have possessed. Never- theless, it is not probable that without the training introduced by Lycurgus the Spartans would have been successful in secur- ing their supremacy in Laconia, much less in the Peloponnese, for they formed a small immigrant band face to face with a large and powerful Achaean and autochthonous population.

The Expansion of Sparta. — We cannot trace in detail the process by which Sparta subjugated the whole of Laconia, but apparently the first step, taken in the reign of Archelaus and Charillus, was to secure the upper Eurotas valley, con- quering the border territory of Aegys. Archelaus' son Teleclus is said to have taken Amyclae, Pharis and Geronthrae, thus mastering the central Laconian plain and the eastern plateau which lies between the Eurotas and Mt Parnon: his son, Alca- menes, by the subjugation of Helos brought the lower Eurotas plain under Spartan rule. About this time, probably, the Argives, whose territory included the whole east coast of the Peloponnese and the island of Cythera (Herod, i. 82), were driven back, and the whole of Laconia was thus incorporated in the Spartan state. It was not long before a further ex- tension took place. Under Alcamenes and Theopompus a war broke out between the Spartans and the Messenians, their neighbours on the west, which, after a struggle Wars. lasting for twenty years, ended in the capture of the stronghold of Ithome and the subjection of the Messenians, who were forced to pay half the produce of the soil as tribute to their Spartan overlords. An attempt to throw off the yoke resulted in a second war, conducted by the Messenian hero Aristomenes (q.v.); but Spartan tenacity broke down the resistance of the insurgents, and Messenia was made Spartan territory, just as Laconia had been, its inhabitants being re- duced to the status of helots, save those who, as perioeci, in- habited the towns on the sea-coast and a few settlements inland. This extension of Sparta's territory was viewed with appre- hension by her neighbours in the Peloponnese. Arcadia and Argos had vigorously aided the Messenians in their two struggles, and help was also sent by the Sicyonians, Pisatans and Triphy- lians: only the Corinthians appear to have supported the Spar- tans, doubtless on account of their jealousy of their powerful neighbours, the Argives. At the close of the second Messenian War, i.e. by the war 631 at latest, no power could hope to cope with that of Sparta save Arcadia and Argos. Early in the 6th century the Spartan kings Leon and Agasicles made a vigorous attack on Tegea, the most powerful of the Arcadian cities, but it was not until the reign of Anaxandridas and Ariston, about the middle of the century, that the attack was successful and Tegea was forced to acknowledge Spartan overlordship, though retaining its independence. The final struggle for Peloponnesian supremacy was with Argos, which had at an early period been the most powerful state of the peninsula, and even now,

though its territory had been curtailed, was a serious rival of Sparta. But

Argos was now no longer at the height of its power: its league had begun to break up early in the century, and it could not in the impending struggle wˆr™ count on the assistance of its old allies, Arcadia and Messenia, since the latter had been crushed and robbed of its independence and the former had acknowledged Spartan supremacy. A victory won about 546 B.C., when the Lydian Empire fell before Cyrus of Persia, made the Spartans masters of the Cynuria, the borderland between Laconia and Argolis, for which there had been an age-long struggle. The final blow was struck by King Cleomenes I. (q.v.), who maimed for many years to come the Argive power and left Sparta without a rival in the Peloponnese. In fact, by the middle of the 6th century, and increasingly down to the period of the Persian Wars, Sparta had come to be acknowledged as the leading state of Hellas and the champion of Hellenism. Croesus of Lydia had formed an alliance with her. Scythian envoys sought her aid to stem the invasion of Darius; to her the Greeks of Asia Minor appealed to withstand the Persian advance and to aid the Ionian revolt; Plataea asked for her protection; Megara acknowledged her supremacy; and at the time of the Persian invasion under Xerxes no state questioned her right to lead the Greek forces on land and sea. Of such a position Sparta proved herself wholly unworthy. As an ally she was ineffec- tive, nor could she ever rid herself of her narrowly Pelopon- nesian outlook sufficiently to throw herself heartily into the affairs of the greater Hellas that lay beyond the isthmus and across the sea. She was not a colonizing state, though the inhabitants of Tarentum, in southern Italy, arid of Lyttus, in Crete, claimed her as their mother-city. Moreover, she had no share in the expansion of Greek commerce and Greek culture; and, though she bore the reputation of hating tyrants and putting them down where possible, there can be little doubt that this was done in the interests of oligarchy rather than of liberty. Her military greatness and that of the states under her hegemony formed her sole claim to lead the Greek race: that she should truly represent it was impossible.

Constitution. — Of the internal development of Sparta down to this time but little is recorded. This want of information was attributed by most of the Greeks to the stability of the Spartan constitution, which had lasted unchanged from the days of Lycurgus. But it is, in fact, due also to the absence of an historical literature at Sparta, to the small part played by written laws, which were, according to tradition, expressly pro- hibited by an ordinance of Lycurgus, and to the secrecy which always characterizes an oligarchical rule. At the head of the state stood two hereditary kings, of the Agiad and Eurypontid families, equal in authority, so that one could not act against the veto of his colleague, though the Agiad king received greater honour in virtue of the seniority of his family (Herod, vi. 51). This dual kingship, a phenomenon unique in Greek .

history, was explained in Sparta by the tradition ags p ‘ that on Aristodemus’s death he had been succeeded by his twin sons, and that this joint rule had been perpetuated. Modern scholars have advanced various theories to account for the anomaly. Some suppose that it must be explained as an attempt to avoid absolutism, and is paralleled by the analogous instance of the consuls at Rome. Others think that it points to a com- promise arrived at to end the struggle between two families or communities, or that the two royal houses represent respec- tively the Spartan conquerors and their Achaean predecessors: those who hold this last view appeal to the words attributed by Herodotus (v. 72) to Cleomenes I.: “I am no Dorian, but an Achaean.” The duties of the kings were mainly religious, judicial and military. They were the chief priests of the state, and had to perform certain sacrifices and to maintain communication with the Delphian sanctuary, which always exercised great authority in Spartan politics. Their judicial functions had at the time when Herodotus wrote (about 430 B.C.) been restricted to cases dealing with heiresses, adoptions and the public roads: ci‘41 cases were decided by the ephors»

criminal jurisdiction had passed to the council of elders and the ephors. It was in the military sphere that the powers of the kings were most unrestricted. Aristotle describes the king- ship at Sparta as ” a kind of unlimited and perpetual general- ship ” (Pol. iii. 1285a), while Isocrates refers to the Spartans as ” subject to an oligarchy at home, to a kingship on cam- paign ” (iii. 24). Here also, however, the royal prerogatives were curtailed in course of time: from the period of the Per- sian wars the king lost the right of declaring war on whom he pleased, he was accompanied to the field by two ephors, and he was supplanted also by the ephors in the control of foreign policy. More and more, as time went on, the kings became mere figure-heads, except in their capacity as generals, and the real power was transferred to the ephors and to the gerousia (q.v.). The reason for this change lay partly in the fact that the ephors, chosen by popular election from the whole body of citizens, represented a democratic element in the constitution without violating those oligarchical methods which seemed necessary for its satisfactory administration; partly in the weak- ness of the kingship, the dual character of which inevitably gave rise to jealousy and discord between the two holders of the office, often resulting in a practical deadlock; partly in the loss of piestige suffered by the kingship, especially during the 5th century, owing to these quarrels, to the frequency with which kings ascended the throne as minors and a regency was necessary, and to the many cases in which a king was, rightly or wrongly, suspected of having accepted bribes from the enemies of the state

and was condemned and banished. In the powers exercised by the assembly of the citizens or apella (q.v.) we cannot trace any development, owing to the scantiness of our sources. The Spartan was essentially a soldier, trained to obedience and endurance: he became a politician only if chosen as ephor for a single year or elected a life member of the council after his sixtieth year had brought freedom from military service.

*Shortly after birth the child was brought before the elders of the tribe, who decided whether it was to be reared: if de- fective or weakly, it was exposed in the so-called Apotketae (ai 'AxotfeTcu, from diroˆeroj, hidden). Thus was secured, as far as could be, the main- tenance of a high standard of physical efficiency, and thus from the earliest days of the Spartan the absolute claim of the state to his life and service was indicated and enforced. Till their seventh year boys were educated at home: from that time their training was undertaken by the state and super- vised by the irtudovofios, an official appointed for that purpose. This training consisted for the most part in physical exer- cises, such as dancing, gymnastics, ball-games, &c, with music and literature occupying a subordinate position. From the twentieth year began the Spartan's liability to military service and his membership of one of the avdpeia or i8lna. (dining messes or clubs), composed of about fifteen members each, to one of which every citizen must belong. At thirty began the full citizen rights and duties. For the exercise of these three conditions were requisite: Spartiate birth, the training pre- scribed by law, and participation in and contribution to one of the dining-clubs. Those who fulfilled these conditions were the bijoioi (peers), citizens in the fullest sense of the word, while those who failed were called inroi*doves (lesser men), and retained only the civil rights of citizenship.*

Spartiates were absolutely debarred by law from trade or manufacture, which consequently rested in the hands of the perioeci (q.v.), and were forbidden to possess either gold or silver, the currency consisting of bars of iron: but there can be no doubt that this pro- hibition was evaded in various ways. Wealth was, in theory at least, derived entirely from landed property, and consisted in the annual return made by the helots (q.v.) who cultivated the plots of ground allotted to the Spartiates. But this attempt to equalize property proved a failure: from early times there were marked differences of wealth within the state, and these became even more serious after the law of Epitadeus, passed

Training of Citizens.

Social System.

at some time after the Peloponnesian War, removed the legal prohibition of

the gift or bequest of land. Later we find the soil coming more and more into the possession of large land- holders, and by the middle of the 3rd century B.C. nearly two- fifths of Laconia belonged to women. Hand in hand with this process went a serious diminution in the number of full citizens, who had numbered 8000 at the beginning of the 5th century, but had sunk by Aristotle's day to less than 1000, and had further decreased to 700 at the accession of Agis IV. in 244 B.C. The Spartans did what they could to remedy this by law: certain penalties were imposed upon those who remained unmarried or who married too late in life. But the decay was too deep- rooted to be eradicated by such means, and we shall see that at a late period in Sparta's history an attempt was made without success to deal with the evil by much more drastic measures.

The 5th Century B.C.— The beginning of the 5th century saw Sparta at the height of her power, though her prestige must have suffered in the fruitless attempts made to impose upon Athens an oligarchical regime after the fall of the Peisis- tratid tyranny in 510. But after the Persian Wars the Spartan supremacy could no longer remain unchallenged. Sparta had despatched an army in 490 to aid Athens in repelling the armament sent against it by Darius under the command of Datis and Artaphernes : but it arrived after the battle of Marathon had been fought and the issue of the conflict decided. In the second campaign, conducted ten years later by Xerxes in person, Sparta took a more active share and assumed the command of the combined Greek forces by sea and land. Yet, in spite of the heroic defence of Thermopylae by the Spartan king Leo- nidas (q.v.), the glory of the decisive victory at Salamis fell in great measure to the Athenians, and their patriotism, self-sacrifice and energy contrasted strongly with wars." the hesitation of the Spartans and the selfish policy which they advocated of defending the Peloponnese only. By the battle of Plataea (479 B.C.), won by a Spartan general, and decided chiefly by the steadfastness of Spartan troops, the state partially recovered its prestige, but only so far as land operations were concerned: the victory of Mycale, won in the same year, was achieved by the united Greek fleet, and the capture of Sestos, which followed, was due to the Athenians, the Peloponnesians having returned home before the siege was begun. Sparta felt that an effort was necessary to recover her position, and Pausanias, the victor of Plataea, was sent out as admiral of the Greek fleet. But though he won considerable successes, his overbearing and despotic behaviour and the suspicion that he was intriguing with the Persian king alienated the sympathies of those under his command : he was recalled by the ephors, and his successor, Dorcis, was a weak man who allowed the transference of the hegemony from Sparta to Athens to take place without striking a blow (see Delian League). By the withdrawal of Sparta and her Peloponnesian allies from the fleet the perils and the glories of the Persian War were left to Athens, who, though at the

outset merely the leading state in a confederacy of free allies, soon began to make herself the mistress of an empire. Sparta took no steps at first to prevent this. Her interests and those of Athens did not directly clash, for Athens included in her empire only the islands of the Aegean and the towns on its north and east coasts, which lay outside the Spartan political horizon: with the Peloponnese Athens did not meddle. Moreover, Sparta's attention was at this time fully occupied by troubles nearer home— the plots of Pausanias not only with the Persian king but with the Laconian helots; the revolt of Tegea \c. 473-71), rendered all the more formidable by the participation of Argos; the earthquake which in 464 devastated Sparta; and the rising of the Messenian helots, which immediately followed. But there was a growing estrangement from Athens, which ended at length in an open breach. The insulting dismissal of a large body of Athenian troops which had come, under Cimon, to aid the Spartans in the siege of the Messenian stronghold of Ithome, the /totems consummation of the Attic democracy under Ephi- ;

altes and Pericles, the conclusion of an alliance between Athens

and Argos, which also about this time became democratic, united with other causes to bring about a rupture between the Athenians and the Peloponnesian League. In this so-called first Peloponnesian War Sparta herself took but a small share beyond helping to inflict a defeat on the Athenians at Tanagra in 457 B.C. After this battle they concluded a truce, which gave the Athenians an opportunity of taking their revenge on the Boeotians at the battle of Oenophyla, of annexing to their empire Boeotia, Phocis and Locris, and of subjugating Aegina. In 449 the war was ended by a five years' truce, but after Athens had lost her mainland empire by the battle of Coronea and the revolt of Megara a thirty years' peace was concluded, probably in the winter 446-445 B.C. By this Athens was obliged to sur- render Troezen, Achaea and the two Megarian ports, Nisaea and Pegae, but otherwise the status quo was maintained. A fresh struggle, the great Peloponnesian War (q.v.), broke out in 431 B.C. This may be to a certain extent regarded as a contest between Ionian and Dorian; it may with greater truth be called a struggle bexween the democratic and oligarchic principles of government; but at bottom its cause aesiaaWar. was neither racial nor constitutional, but economic. The maritime supremacy of Athens was used for commercial purposes, and important members of the Pelopon- nesian confederacy, whose wealth depended largely on their commerce, notably Corinth, Megara, Sicyon and Epidaurus, were being slowly but relentlessly crushed. Materially Sparta must have remained

almost unaffected, but she was forced to take action by the pressure of her allies and by the necessities imposed by her position as head of the league. She did not, however, prosecute the war with any marked vigour: her operations were almost confined to an annual inroad into Attica, and when in 425 a body of Spartiates was captured by the Athenians at Pylos she was ready, and even anxious, to ter- minate the war on any reasonable conditions. That the terms of the Peace of Nicias, which in 421 concluded the first phase of the war, were rather in favour of Sparta than of Athens was due almost entirely to the energy and insight of an individual Spartan, Brasidas (q.v.), and the disastrous attempt of Athens to regain its lost land-empire. The final success of Sparta and the capture of Athens in 405 were brought about partly by the treachery of Alcibiades, who induced the state to send Gylippus to conduct the defence of Syracuse, to fortify Decelea in northern Attica, and to adopt a vigorous policy of aiding Athenian allies to revolt. The lack of funds which would have proved fatal to Spartan naval warfare was remedied by the intervention of Persia, which supplied large subsidies, and Spartan good fortune culminated in the possession at this time of an admiral of boundless vigour and considerable military ability, Lysander, to whom much of Sparta's success is attributable.

The 4th Century. — The fall of Athens left Sparta once again supreme in the Greek world and demonstrated clearly her, total unfitness for rule. Everywhere democracy was replaced by a philo-Laconian oligarchy, usually consisting of ten men under a harmost or governor pledged to Spartan Emp/re" interests, and even in Laconia itself the narrow and selfish character of the Spartan rule led to a serious conspiracy. For a short time, indeed, under the energetic rule of Agesilaus, it seemed as if Sparta would pursue a Hellenic policy and carry on the war against Persia. But troubles soon broke out in Greece, Agesilaus was recalled from Asia Minor, and his schemes and successes were rendered fruit- less. Further, the naval activity displayed by Sparta during the closing years of the Peloponnesian War abated when Persian subsidies were withdrawn, and the ambitious projects of Ly- sander led to his disgrace, which was followed by his death at Haliartus in 395. In the following year the Spartan navy under Peisander, Agesilaus' brother-in-law, was defeated off Cnidus by the Persian fleet under Conon and Pharnabazus, and for the future Sparta ceased to be a maritime power. In Greece itself meanwhile the opposition to Sparta was growing increas- ingly powerful, and, though at Coronea Agesilaus had slightly

the better of the Boeotians and at Corinth the Spartans main- tained their position, yet they felt it necessary to rid them- selves of Persian hostility and if possible use the Persian power to strengthen their own position^ at home: they therefore concluded with Artaxerxes II. the humiliating Peace of Antalcidas (387 B.C.), by which they surrendered to the Great King the

Greek cities of the Asia Minor coast and of Cyprus, and stipulated for the independence of all other Greek cities. This last clause led to a long and desultory war with Thebes, which refused to acknowledge the independence of the Boeotian towns under its hegemony: the Cadmeia, the citadel of Thebes, was treacherously seized by Phoebidas in 382 and held by the Spartans until 379. Still more momentous was the Spartan action in crushing the Olynthiac Confederation (see Olynthus), which might have been able to stay the growth of Macedonian power. In 371 a fresh peace congress was summoned at Sparta to ratify the Peace of Callias. Again the Thebans refused to renounce their Boeotian hegemony, and the Spartan attempt at coercion ended in the defeat of the Spartan army at the battle of Leuctra and the death of its leader, King Cleombrotus. The result of the battle was to transfer the Greek supremacy from Sparta to Thebes.

In the course of three expeditions to the Peloponnese con- ducted by Epaminondas, the greatest soldier and statesman Thebes ever produced, Sparta was weakened by the loss of Messenia, which was restored to an in-
sparta. dependent position with the newly built Messene as its capital, and by the foundation of Megalopolis as the capital of Arcadia. The invading army even made its way into Laconia and devastated the whole of its southern portion ; but the courage and coolness of Agesilaus saved Sparta itself from attack. On Epaminondas' fourth expedition Sparta was again within an ace of capture, but once more the danger was averted just in time; and though at Mantinea (362 B.C.) the Thebans, together with the Arcadians, Messenians and Argives, gained a victory over the combined Mantinean, Athenian and Spartan forces, yet the death of Epaminondas in the battle more than counterbalanced the Theban victory and led to the speedy break-up of their supremacy. But Sparta had neither the men nor the money to recover her lost position, and the continued existence on her borders of an independent Messenia and Arcadia kept her in constant fear for her own safety. She did, indeed, join with Athens and Achaea in 353 to prevent Philip of Macedon passing Thermopylae and entering Phocis, but beyond this she took no part in the struggle of Greece with the new power which had sprung up on Macedoa. her northern borders. No Spartiate fought on the field of Chaeronea. After the battle, however, she refused to submit voluntarily to Philip, and was forced to do so by the devastation of Laconia and the transference of certain border districts to the neighbouring states of Argos, Arcadia and Messenia. During the absence of Alexander the Great in the East Agis III. revolted, but the rising was crushed by Anti-
pater, and a similar attempt to throw off the Macedonian yoke made by Archidamus IV. in the troublous period which suc- ceeded Alexander's death was frustrated by Demetrius Polior- cetes in 294 B.C. Twenty-two years later the city was attacked by an immense force under Pyrrhus, but Spartan bravery had not died out and the formidable enemy was repulsed,

even the women taking part in the defence of the city. About 244 an Aetolian army overran Laconia, working irreparable harm and carrying off, it is said, 50,000 captives.

But the social evils within the state were even harder to combat than foes without. Avarice, luxury and the glaring inequality in the distribution of wealth, threatened to bring about the speedy fall of the state if no cure could be found. Agis IV. and Cleomenes III. (qq.v.) made an heroic and entirely disinterested attempt in the latter part of the 3rd century to improve the conditions by a redistribution of land, a widening of the citizen body, and a restoration of the old severe training and simple life. But the evil was too deep-seated to be remedied by these artificial means; Agis was assassinated, and the

Achaean League.

reforms of Cleomenes seem to have had no permanent effect. The reign of Cleomenes is marked also by a determined effort to cope with the rising power of the Achaean League (q.v.) and to recover for Sparta her long-lost supremacy in the Peloponnese, and even throughout Greece. The battle of Sellasia (222 B.C.), in which Cleomenes was defeated by the Achaeans and Antigonus Doson of Macedonia, and the death of the king, which occurred shortly afterwards in Egypt, put an end to these hopes. The same reign saw also an important constitutional change, the substitution of a board of patronomi for the ephors, whose power had become almost despotic, and the curtailment of the functions exercised by the gerousia; these measures were, however, cancelled by Antigonus. It was not long afterwards that the dual kingship ceased and Sparta fell under the sway of a series of cruel and rapacious tyrants — Lycurgus, Machani- das, who was killed by Philopoemen, and Nabis, who, if we may trust the accounts given by Polybius and Livy, was little better than a bandit chieftain, holding Sparta by means of extreme cruelty and oppression, and using mercenary troops to a large extent in his wars.

The Intervention of Rome. — We must admit, however, that a vigorous struggle was maintained with the Achaean League and with Macedon until the Romans, after the conclusion of their war with Philip V., sent an army into Laconia under T. Quinctius Flamininus. Nabis was forced to capitulate, evacu- ating all his possessions outside Laconia, surrendering the Laconian seaports and his navy, and paying an indemnity of 500 talents (Livy xxxiv. 33-43). On the departure of the Romans he succeeded

in recovering Gythium, in spite of an attempt to relieve it made by the Achaeans under Philopoemen, but in an encounter he suffered a crushing defeat at the hands of that general, who for thirty days ravaged Laconia unopposed. Nabis was assassinated in 192, and Sparta was forced by Philo- poemen to enrol itself as a member of the Achaean League (q.v.) under a phil-Achaean aristocracy. But this gave rise to chronic disorders and disputes, which led to armed intervention on the part of the Achaeans, who compelled the Spartans to submit to the overthrow of their city walls, the dismissal of their mercenary troops, the recall of all exiles, the abandonment of the old Lycurgan constitution and the adoption of the Achaean laws and institutions (188 B.C.). Again and again the relations between the Spartans and the Achaean League formed the occasion of discussions in the Roman senate or of the despatch of Roman embassies to Greece, but no decisive intervention took place until a fresh dispute about the position of Sparta in the league led to a de- cision of the Romans that Sparta, Corinth, Argos, Arcadian Orchomenus and Heraclea on Oeta should be severed from it. This resulted in an open breachJjetween the league and Rome, and eventually, in 146 B.C., after the sack of Corinth, in the dissolution of the league and the annexation of Greece to the Roman province of Macedonia. For Sparta the long era of war and intestine struggle had ceased and one of peace and a revived prosperity took its place, as is witnessed by the numerous extant inscriptions belonging to this period. As an allied city it was exempt from direct taxation, though compelled on occasions to make " voluntary " presents to Roman generals. Political ambition was restricted to the tenure of the municipal magistracies, culminating in the offices of nomophylax, ephor and patronomus. Augustus showed marked favour to the city, Hadrian twice visited it during his journeys in the East and accepted the title of eponymous patronomus. The old warlike spirit found an outlet chiefly in the vigorous but peaceful contests held in the gymnasium, the ball-place, and the arena before the temple of Artemis Orthia: sometimes too it found a vent in actual campaigning, as when Spartans were enrolled for service against the Parthians by the emperors Lucius Verus, Septimius Severus and Cara- calla. Laconia was subsequently overrun, like so much of the Roman Empire, by barbarian hordes.

Medieval Sparta. — In a.d. 396 Alaric destroyed the city and at a later period Laconia was invaded and settled by Slavonic

tribes, especially the Melings and Ezerits, who in turn had to give way before the advance of the Byzantine power, though pre- serving a partial independence in the mountainous regions. The Franks on their arrival in the Morea found a fortified city named Lacedaemonia occupying part of the site of ancient Sparta, and this continued to exist, though greatly depopulated, even after Guillaume de Villehardouin had in 1 248-1 249

founded the fortress and city of Misithra, or Mistra, on a spur of Tay- getus some 3 m. north-west of Sparta. This passed shortly afterwards into the hands of the Byzantines, who retained it until the Turks under Mahommed II. captured it in 1460. In 1687 it came into the possession of the Venetians, from whom it was wrested in 1715 by the Turks. Thus for nearly six centuries it was Mistra and not Sparta which formed the centre and focus of Laconian history.

The Modern City. — In 1834, after the War of Independence had resulted in the liberation of Greece, the modern town of Sparta was built on part of the ancient site from the designs of Baron Jochmus, and Mistra decayed until now it is in ruins and almost deserted. Sparta is the capital of the prefecture (vofws) of Lacedaemon and has a population, according to the census taken in 1907, of 4456: but with the exception of several silk factories there is but little industry, and the development of the city is hampered by the unhealthiness of its situation, its distance from the sea and the absence of railway communi- cation with the rest of Greece. As a result of popular clamour, however, a survey for a railway was begun in 1907, an event of great importance for the prosperity of Sparta and of the whole Eurotas Plain.

II. — Archaeology There is a well-known passage in Thucydides which runs thus: " Suppose the city of Sparta to be deserted, and nothing left but the temples and the ground-plan, distant ages would be very unwilling to believe that the power of the Lacedaemonians was at all equal to their fame. . . . Their city is not built continuously, and has no splendid temples or other edifices; it rather resembles a group of villages, like the ancient towns of Hellas, and would therefore make a poor show" (i. 10, trans. Jowett). And the first feeling of most travellers who visit modern Sparta is one of disappointment with the ancient remains: it is rather the loveliness and gran- deur of the situation and the fascination of Mistra, with its grass-grown streets, its decaying houses, its ruined fortress and its beautiful Byzantine churches, that remain as a lasting and cherished memory. Until 1905 the chief ancient buildings at Sparta were the theatre, of which, however, little shows above ground except portions of the retaining walls; the so- called Tomb of Leonidas, a quadrangular building, perhaps a temple, constructed of immense blocks of stone and containing two chambers; the foundation of an ancient bridge over the Eurotas; the ruins of a circular structure; some remains of late Roman fortifications; several brick buildings and mosaic pave- ments. To these must be added the inscriptions, sculptures and other objects collected in the local museum, founded by Stamatakis in 1872 and enlarged in 1907, or built into the walls of houses or churches. Though excavations were carried on near Sparta, on the site of the Amyclaeum in 1890 by Tsoun- tas, and in 1904 by Furtwangler, and at the shrine of Menelaus in Therapne by Ross in

1833 and 1841, and by Kastriotis in 1889 and 1900, yet no organized work was tried in Sparta itself save the partial excavation of the " round building " under- taken in 1892 and 1893 by the American School at Athens; the structure has been since found to be a semicircular retaining-wall of good Hellenic work, though partly restored in Roman times.

In 1904 the British School at Athens began a thorough ex- ploration of Laconia, and in the following year excavations were made at Thalamae, Geronthrae, and Angelona near Monemvasia, while several medieval fortresses were surveyed. In 1906 ex- cavations began in Sparta itself with results of great value, which have been published in the British School Annual, vol. xii. sqq.

A " small circus " described by Leake, but subsequently almost lost to view, proved to be a theatre-like building con- structed soon after a.d. 200 round the altar and in front of the temple of Artemis Orthia. Here musical and gymnastic con- tests took place as well as the famous flogging-ordeal (diamas- tigosis). The temple, which can be dated to the 2nd century B.C. rests on the foundation of an older temple of the 6th century, and close beside it were found the scanty remains of a yet earlier temple, dating from the 9th or even the 10th century. The votive offerings in clay, amber, bronze, ivory and lead found in great profusion within the precinct range from the 9th to the 4th century B.C. and supply invaluable evidence for early Spartan art; they prove that Sparta reached her artistic zenith in the 7 th century and that her decline had already begun in the 6th. In 1907 the sanctuary of Athena "of the Brazen House " (XaXidoiKos) was located on the Acropolis immediately above the theatre, and though the actual temple is almost completely destroyed, fragments of the capitals show that it was Doric in style, and the site has produced the longest extant archaic inscription of Laconia, numerous bronze nails and plates and a considerable number of votive offerings, some of them of great interest. The Greek city-wall, built in suc- cessive stages from the 4th to the 2nd century, was traced for a great part of its circuit, which measured 48 stades or nearly 6 m. (Polyb. ix. 21). The late Roman wall enclosing the Acro- polis, part of which probably dates from the years following the Gothic raid of a.d. 262, was also investigated. Besides the actual buildings discovered, a number of points were fixed which greatly facilitate, the study of Spartan topography, based upon the description left us by Pausanias. Excavations carried on in 1910 showed that the town of the " Mycenean " period which lay on the left bank of the Eurotas a little to the south-east of Sparta was roughly triangular in shape, with its apex towards the north: its area is

approximately equal to that of Sparta, but denudation and destruction have wrought havoc with its buildings and nothing is left save ruined foundations and broken potsherds.

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SPARTACUS, leader in the Slave or Gladiatorial War against Rome (73-71 B.C.), a Thracian by birth. He served in the Roman army, but seems to have deserted, for we are told that he was taken prisoner and sold as a slave. Destined for the arena, he, with a band of his fellow-gladiators, broke out of a training school at Capua and took refuge on Mt Vesuvius (73). Here he maintained himself as a captain of brigands, his lieutenants being two Celts named Crixusand Oenomaus, who like himself had been gladiators. A hastily collected force of 3000 men under C. Claudius Pulcher endeavoured to starve out the rebels, but the latter clambered down the precipices and put the Romans to flight. Swarms of hardy and desperate men now joined the rebels, and when the praetor Publius Varinius took the field against them he found thetai entrenched like a regular army on the plain. But they gave him the slip, and when he advanced to storm their lines he found them deserted. From Campania the rebels marched into Lucania, a country better suited Tor guerrilla warfare. Varinius followed, but was defeated in several engagements and narrowly escaped being taken prisoner. The insurgents reoccupied Campania, and by the defeat of C. Thoranius, the quaestor of Varinius, obtained possession of nearly the whole of southern Italy. Nola and Nuceria in Campania, Thurii and Metapontum in Lucania were sacked. The senate at last despatched both consuls against the rebels (72). The German slaves under Crixus were defeated at Mt Garganus in Apulia by the praetor Q. Arrius. But Spartacus overthrew both consuls, one after the other, and then pressed towards the Alps. Gaius Cassius, governor of Cisalpine Gaul, and the praetor Gnaeus Manlius, who attempted to stop him, were defeated at Mutina. Freedom was within sight, but with fatal infatuation the slaves refused to abandon Italy. Spartacus led them against Rome, but their hearts seem to have failed them; and instead of attacking the capital, he passed on again to Lucania. The conduct of the war was now entrusted to the praetor Marcus Licinius

Crassus. In the next battle Spartacus was worsted and retreated towards the straits of Messina, intending to cross into Sicily, where he would have been welcomed by fresh hordes of slaves; but the pirates who had agreed to transport his army proved faithless. Crassus endeavoured to shut in the rebels by carrying a ditch and rampart right across the peninsula, but Spartacus forced the lines, and once more Italy lay at his feet. Disunion, however, was at work in the rebel camp. The Gauls and Germans, who had withdrawn from the main body, were attacked and destroyed. Spartacus now took up a strong position in the mountainous country of Petelia (near Strongoli in Calabria) and inflicted a severe defeat on the vanguard of the pursuing army. But his men refused to retreat farther, and in a pitched battle which followed soon afterwards the rebel army was an- nihilated. Spartacus, who had stabbed his horse before the battle, fell sword in hand. A body of the rebels which had escaped from the field was met and cut to pieces at the foot of the Alps by Pompey (the Great), who was returning from Spain. Pompey claimed the credit of finishing the war, and received the honour of a triumph, while only a simple ovation was decreed to Crassus. Spartacus was a capable and energetic leader; he did his best to check the excesses of the lawless bands which he commanded, and treated his prisoners with humanity. His character has been misrepresented by Roman writers, whom his name inspired with terror down to the times of the empire.

The story has to be pieced together from the vague and some- what discrepant accounts of Plutarch (Crassus, 8-1 1 ; Pompey, 21), Appian (Bell. civ. i. 116-120), Florus, (ii. 8), Livy (Epit. 95-97), and the fragments of the Histories of Sailust, whose account seems to have been full and graphic.

SPARTANBURG, a dty and the county-seat of Spartanburg I House; he puts every question and declares the determination – . ~ i- TT c « •._,.. m«t .1 r-i. — u:„ thereon. As "mouth of the House" he communicates its*

county South Carolina, U.S.A., about 94 m. N.W. of Columbia Pop. (1890), 5544; (1900), 11,395, of whom 4269 were negroes; (1910 census), 17,517. Spartanburg is served by the South- ern, the Charleston & Western Carolina (controlled by the Atlantic Coast line), the Glenn Springs, the Carolina, Clinch- field & Ohio, and inter-urban (electric) railways. It is a thriv- ing city in a cotton-growing and cotton-manufacturing region, about 800 ft. above the sea and 25 m. S.E. of the Blue Ridge. Spartanburg is the seat of Wofford College (Methodist

Episcopal, South; founded in 1850 with a bequest of Benjamin Wofford, a local Methodist minister, and opened in 1854), which had, in 1908, 12 instructors and 286 students; also of Converse College (nonsectarian; for women), which was founded by D. E. Con- verse in 1889, opened in 1890, and in 1908 had 22 instructors and 355 students. An annual musical festival is held here under the auspices of the Converse College Choral Society. Four miles south of the city, at Cedar Spring, is the South Carolina Institution for the Education of the Deaf and Blind, founded as a private institution in 1849 and taken over by the state in 1857. There are gold-mines near the city; and Spartanburg county produces large crops of cotton. Cotton mills are the basis of the city's prosperity, and it has also a large wholesale trade, iron-working establishments, and various manufactures. The value of its factory product was $2,127,702 in 1905, or

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resolutions to others, conveys its thanks, and expresses its cen- sure, its reprimands or its admonitions. He issues warrants for executing the orders of the House, as the commitment of offenders, the issue of writs, the attendance of witnesses or prisoners in custody, &c. The symbol of his authority is the mace, which is borne before him by the serjeant-at-arms when he enters or leaves the House; it reposes on the table when he is in the chair, and it accompanies him on all state occasions. The Speaker takes precedence of all commoners in the kingdom both by ancient custom and by legislative declaration (1 Will. & Mary c. 21). His salary is £5000 a year. It is usual to create a retiring Speaker a peer of the realm, generally with the rank of viscount. The office is of great antiquity, and in the various conflicts between the Commons and the Crown was one of considerable difficulty, especially when, as mouthpiece of the House, he had to read petitions or addresses or deliver in the presence of the sovereign speeches on their behalf. The first to whom the title was definitely given was Sir Thomas Hungerford (d. 1398).

A list of Speakers, most of whom are separately noticed, from 1600 is appended. The date of election is given in brackets: —

more than in 1900. Spartanburg was founded in 1787,

and, although railway communication with Columbia and Charleston was opened in 1859, there was little growth until the establishment of the first cotton mill in the vicinity in 1880; it was chartered as a city in this year.

SPEAKER, a title of the presiding officer in the legislatures of various countries. In the English parliament the lord chan- cellor acts as Speaker of

the House of Lords, but should his office be in commission the Crown usually appoints a Speaker to supply his place, a case in point being that of Sir L. Shadwell, vice-chancellor, who in 1835 was appointed Speaker during the time the Great Seal was in commission. Unlike the House of Commons, the Speaker of the House of Lords need not neces- sarily be a member of the House; Brougham in 1830 sat on the woolsack as Speaker in his capacity of lord chancellor, being then plain Mr Brougham, his patent of nobility not having yet been made out. The House of Lords has also deputy Speakers who are appointed by commission. The duties of the Speaker of the House of Lords are defined by a standing order as follows: " The lord chancellor, when he speaks to the House, is always to speak uncovered, and is not to adjourn the House, or to do anything else as mouth of the House, without the consent of the Lords first had, except the ordinary thing about bills, which are of course, wherein the Lords may likewise over- rule; as for preferring one bill before another, and such-like; and in case of difference among the Lords, it is to be put to the question ; and if the lord chancellor will speak to anything par- ticularly he is to go to his own place as a peer." The Speaker of the House of Lords, as compared with the Speaker of the House of Commons, is an official without power; even his seat, the woolsack, is technically outside the House. Contrary to the practice in the Commons, he acts as a strong party man, making speeches on behalf of government measures from his place as a peer. Proposals have from time to time been made for augmenting the powers of the Speaker of the House of Lords, but it has been pointed out that, as he is a minister of the Crown, and not chosen by the House itself, and moreover is often the member of the least experience in the House, it would be inexpedient that he should exercise the same powers as the Speaker of the Commons.

The Speaker of the House of Commons is always a member of that House, and though chosen by the members themselves (subject to the approval of the sovereign) from one of the great political parties, he never either votes (except in the case of a tie) or speaks in his capacity as a member during the time he holds office. His duty is to enforce the observance of the rules laid down for preserving order in the proceedings of the

*J. Croke (1601). Sir E. Phelips (1604). Sir R. Crewe (1614). T. Richardson (1621). * l Sir T. Crewe (1624). Sir H. Finch (1626). SirJ. Finch (1628). J. Glanville (1640). * 2 W. Lenthall (1640). H. Pelham (1647). F. Rous (1653). Sir T. Widdrington (1656). C. Chute (1659). Sir L. Long (1659). T. Bampfylde (1659). W. Say (1660). Sir H. Grimston (1660). Sir E. Tumour (1661). Sir J. Charlton (1673). *E. Seymour (1673). Sir R. Sawyer (1678). Sir W. Gregory (1679). *W. Williams (1680). * 3 Sir J. Trevor (1685). H. Powle (1689). P. Foley (1695). Sir T. Littleton (1698). *R. Harley (1701)*

{Earl of Oxford). 4 J. Smith (1705). Sir R. Onslow (1708).

*Sir T. Hanmer (1714). *S. Compton (17 1 5)*

*{Earl of Wilmington). * 5 A. Onslow (1728). *Sir J. Cust (1761). *Sir Fletcher Norton (1770)*

*{Lord Granlly). *C. W. Cornwall (1780). W. W. Grenville (1789)*

*{Lord Grenville). * 6 H. Addington (1789) {Viscount Sidmouth). Sir J. Mitford (1801) {Lord Redesdale). *C. Abbott (1802)*

*{Lord Colchester). * 7 H. C. M. Sutton (1817)*

*{Viscount Canterbury). *J. Abercromby (1835)*

*{Lord Dunfermline). *C. Shaw Lefevre (1841) {Viscount Eversley). *J. E. Denison (1857)*

*{Viscount Ossington). *H. B. Brand (1872)*

*(Viscount Hampden). *A. W. Peel (1884)*

*{Viscount Peel). *W. C. Gully (1895)*

*{Viscount Selby). *J. W. Lowther (1905).*

W. Bromley (1710).

- *Speaker in more than one parliament.*

The title of Speaker is also applied to the presiding officer of the various legislative assemblies in the British colonies, that of president being applied to the presiding officer of the upper houses, legislative councils as they are usually called. In Canada, however, the presiding officer both of the Senate and the House of Commons is termed Speaker. In the United States the Speaker of the House of Representatives is an officer of con- siderable power (see United States: ConslitutionandGovernment).

Authorities. — Stubbs, Constitutional History; J. A. Manning, Lives of the Speakers (1850); E. Lummis, The Speaker's Chair

1 Brother of Sir R. Crewe.

2 Speaker of the Long Parliament.

3 Convicted of bribery and expelled, 1695.

4 First Speaker of the Commons of Great Britain.

6 Nephew of Sir R. Onslow, Speaker in 1708 and great-great- great-grandson of R. Onslow, Speaker in the second parliament of Elizabeth. Arthur Onslow was the second Speaker to be elected five times; the first Speaker to be so elected was Thomas Chaucer in the reign of Henry V. Onslow also held the Speakership for the longest period (1 727-1 761).

6 Afterwards prime minister. Was first Speaker of the Commons of the United Kingdom.

7 First to be Speaker six times and seven times.

(1900); for the United States, J. Bryce, American Common- wealth, M. P. Follett's The Speaker of the House of Representa- tives (New York, 1896); H. B. Fuller, Speakers of the House (Boston, 1909).

SPEAR (O. Eng. spere, O. H. Ger. sper, mod. Ger. speer, &c, cf. Lat. sparus; probably related to " spar, " a beam), a weapon of offence. Developed from a sharp-headed stake, the spear may be reckoned, with the club, as among the most ancient of weapons. All the prehistoric races handled the spear; all savage folk thrust with it or hurl it; civilized man still keeps it as the lance and the boar-spear; indeed, the bayonet is a spear-head with the rifle for a shaft.

The English before the Norman conquest were a spear-bearing race. The freeman's six-foot ashen spear was always near his hand; and its head is found beside the bones of every warrior. The casting javelin was commoner than the bow. Norman horsemen made the long lance, a dozen feet long, its pennon fluttering below the point, the knightly weapon. Throwing spears became rare, the Black Prince's English knights wonder- ing at the Spanish fashion of casting darts. In the 14th cen- tury the vamplate came into use as a guard for the lance hand above the grip. At this time also the coronel head was devised for the better safeguard of the jousters, many of whom, how- ever, preferred the blunted or " rebated " point. The next step in development gave the shaft a swell towards the hand on both sides of the grip, a swell exaggerated in the jousting lance of the 16th century, which, fluted and hollowed, is found weighing twenty pounds, with a girth of as much as 27J in. at its broadest part. Leather " burres " were added below the grip and, before the'end of the 14th century, the weight of the jousting lance called for the use of the lance-rest, a hook or catch screwed to the right breast of the harness.

The Scots, always weaker than the English in archery, favoured the long spear as the chief weapon of the infantry, and from Falkirk onwards held their own in their " schiltron " for- mation against all cavalry, until riddled and disarrayed by the arrow-flights. Their English enemy, when harquebusiers began to oust the archers, exchanged the old bills for those t8 and 20 ft. pikes which bristled from the squares pro- tecting the " shot." At the same time, the English horsemen began to leave the lance for sword, pistol and musketoon. During the civil wars in the 17th century every man on foot was either pikeman or musketeer. After 1675 the long pike gave way to the bayonet in its first shape of a dagger whose hilt could be struck into the muzzle of the musket, and, some four- teen years later, the bayonet with a ring-catch gave the infantry- man the last form of his pike. Sergeants, however, carried through the 18th century a " halbert " (q.v.) which, in its degen- erate form, became a short pike, and infantry officers were sometimes armed with the spontoon. In 18 16 certain dragoon regiments were given the lance which had been seen at work in the hands of Poles and Cossacks; and the weapon is still part of the service equipment although controversy is still hot over its value in action, its supporters urging the demoralizing effect of the lance against broken troops. Queen Victoria's navy gave up, in favour of the cutlass bayonet, the pikes which were once served out to repel attacks of boarders. At the present day the High Sheriff's party of javelin-men are the only Englishmen who march on foot with the ancient weapon. (See further Lance.)

SPECIES, a term, in its general and once familiar significance, applied indiscriminately to animate and inanimate objects and to abstract conceptions or ideas, as denoting a particular phase, or sort, in which anything might appear. In logic it came to be used as the translation of the Gr. dSos, and meant a number of individuals having common characters peculiar to them, and so forming a group which with other groups were included in a higher group. The application of the term was purely relative, for the higher group itself might be one of the " species, " or modes of a still higher group. In medicine it was used for the constituents of a prescription. In algebra it denoted the characters which represented quantities in an equation.

Early writers on natural history used the term in its vague logical sense without limiting it to a special category in the hierarchy of classification. To John Ray, the famous English naturalist, the credit is generally given of first making species a definite term in zoology and botany, but Ray owed much of his classification to Kaspar or Gaspard Bauhin (1550-1624), pro- fressor of Greek and of Anatomy and Botany at Basel, and much of his clear definition of terms to an unpublished MS. of Joachim Jung of Hamburg (1587-1657). Sir W. T. Thisleton Dyer (Edinburgh Review, 1902, p. 370) thinks that Ray's use of the word may be traced to the last-

mentioned authors. It is clear, however, that through Ray's work in the 17th century the common biological application of species became fixed much in its modern form, as denoting a group of animals or plants capable of interbreeding, and although not necessarily quite identical, with marked common characters. Working on these lines, and attaching special importance to common descent, naturalists applied the term with more and more precision, until Linnaeus, in his Philosophia botanica, gave the aphorism, " species tot sunt diversae, quot diversae formae ab initio sunt creatae "■ — " just so many species are to be reckoned as there were forms created at the beginning. " Linnaeus' invention of binomial nomenclature for designating species served systematic biology admirably, but at the same time, by attaching preponderating importance to a particular grade in classification, crystallized the doctrine of fixity. The lower grades in classification such as sub-species and varieties on the one hand, and the higher grades on the other, such as genera and families, were admitted to be human conceptions imposed on the living world, but species were concrete, objec- tive existences to be discovered and named. G. L. L. Buffon and J. P. B. Lamarck practically conceded the objective existence of species in arguing that they might be modified by external conditions, and G. L. Cuvier proclaimed their fixity without reserve. Charles Darwin found the conception of species so definite and fixed that he chose for the title of his great book (1859) the words On the Origin of Species by Means of Natural Selection, although his exposition of evolu- tion applied equally to every grade in classification. E. B. Poulton, in an admirable discussion of contemporary views regarding species (presidential address to the Entomological Society of London 1904), has shown that Darwin did not believe in the objective existence of species, not only because he was led to discard the hypothesis of special creation as the explanation of the polymorphism of life, but because in practice as a working systematist he could neither find for himself nor ascertain from other systematists any settled criteria by which a group of specimens could be elevated into a genus, accepted as a species, or regarded as a variety.

The vast advance in knowledge of the existing forms of living things that has been acquired and recorded since 1859 has accentuated the difficulty of finding any morphological criteria for species. A few writers have insisted that they are discon- tinuous, and that real gaps exist between them. Equally great gaps, however, may exist between males and females, between climatic phases or summer and winter forms. The attempt to find a physiological criterion has similarly failed; many forms that have been universally accepted as true species produce fertile hybrids (see Hybridism). In modern practice (see Zoological Nomenclature) systematists no longer regard species as more than as an artificial rank in classification, to be applied chiefly for reasons of convenience, so that the word is reverting to

its older logical significance. The word " species " now signifies a grade or rank in classification assigned by systematists to an assemblage of organic forms which they judge to be more closely interrelated by common descent than they are related to forms judged to be outside the species, and of which the known individuals, if they differ amongst them- selves, differ less markedly than they do from those outside the species, or, if differing markedly, are linked by intermediate forms. It is to be noted that the individuals may themselves be judged to fall into groups of minor rank, known as sub-species

or local varieties, but such subordinate assemblages are elevated to specific rank, if they appear not to intergrade so as to form a linked species, whilst on the other hand assemblages judged to be species are merged, or degraded to sub-species, if they are found to intergrade by discoveries of linking forms. A species, in short, is a subjective conception, and some writers, as for instance E. Ray Lankester, have urged that the word is so firmly asssociated with historical implications of fixity which are now incongruous with its application, that it ought to be discarded from scientific nomenclature.

In technical biology each species is designated by two words, one for the genus, printed with an initial capital, and one for the particular species, printed without an initial capital in Zoology, whilst in Botany the habit once common to both sub- jects is retained, and the specific name if derived from a proper name is printed with a capital. The two words are printed in italics, and may be followed by the name of the author who first described the species. Thus " Canis vulpes Linnaeus " is the specific designation of the common fox, Canis being the generic term common to dogs, wolves and so forth, and vulpes indicating the particular species, whilst the attached author's name indicates that Linnaeus first named the species in question. (P. C. M.)

SPECIFICATION (from Med. Lat. specificatio, specificare, to enumerate or mention in detail), any detailed statement, especially one on which an estimate or plan is based, as the specification of a builder or architect (see Building). In patent law a specification is a description of an invention. An application for a patent must be accompanied by a specifica- tion, either provisional or complete. If a complete specification does not accompany the application, it must be forwarded usually within six months of the date of application, otherwise the application is deemed to be abandoned. A provisional specification declares the nature of the invention in general

terms, while a complete specification describes the invention in detail, and shows the manner in which it is to be carried out (see further Patents).

In the civil law (see Accession) specification was the working up of a thing into a new product ; for example, the making of bread from grain. The effect of specification was that the original owner lost his title in favour of the creator of the new product, but had an action for the value of the materials.

SPECIFIC PERFORMANCE, an equitable doctrine under which a court of equity, in certain exceptional cases where the normal legal remedy, i.e. damages, would not be a sufficient compensation, orders from a defaulting party a specific or actual performance of the thing which he had contracted to do. The courts act on their own discretion in affording or refusing the relief of specific performance, and as a general rule will refuse that relief where the common law remedy is adequate, where the court would be unable to superintend or enforce the execu- tion of its judgment, where the plaintiff has himself acted inequitably, or where the enforcement of specific performance would be unreasonable. Specific performance is usually con- fined to executory agreements, such as a conveyance or a lease of land; it is not usually enforced in the cases of personal acts or in those of contracts for personal service. In the case of a contract for the sale of a chattel the courts will only order specific performance when the chattel is of peculiar value to the purchaser and cannot be obtained elsewhere. The courts are guided considerably by precedent, and it is only by reference to a standard textbook that details can be obtained of the conditions and restrictions which hedge the jurisdiction of the courts. In Scots law specific performance, or " implement," is part of the ordinary jurisdiction of the courts.

See Fry on Specific Performance; Ency. English Law , tit. " Specific Performance "; and Story, Equity Jurisprudence.

SPECTACLES, the name given to flat glasses, prisms, spherical or cylindrical lenses, mechanically adjusted to the human eyes, so as to correct defects of vision (q.v.). They are made usually of crown glass or rock crystal ("pebbles"), the latter being somewhat lighter and cooler to wear. They are mounted in

rigid steel wire or gold frames, with fastening-pieces over the ears; single or double eye-glasses, and hand-glasses, or lorgnettes, being varieties of form, according to the circumstances and the wearer's taste.

Preserves. — Preserves are used to conceal deformities or to protect the eyes in the many conditions where they cannot tolerate bright light, such as

ulceration and inflammation of the cornea, certain diseases of the iris, ciliary body, choroid, and retina. They are made of bluish, "smoked," or almost black coloured glass, and are of very various shapes, according to the amount of obscuration necessary.

Prisms. — Prisms are of great value in cases of double vision due to a slight tendency to squinting, caused by weakness or over-action of the muscular apparatus of the eyeball. Prisms deflect rays of light towards their bases. Hence, if a prism is placed in front of the eye with its base towards the nose, a ray of light falling upon it will be bent inwards, and seem to come from a point farther out from the axis of vision. Con- versely, if the base of the prism is turned towards the temple, the ray of light will seem to come from a point nearer the axis, and will induce the eye to turn inwards, to converge towards its fellow. In cases of myopia or short-sight owing to weakness of the internal recti muscles, the eyes in looking at a near object, instead of converging, tend to turn outwards, and so double vision results. If a suitable prism is placed in front of the eyes the double vision may be prevented. These prisms may be combined with concave lenses, which correct the myopia, or, since a concave lens may be considered as composed of two prisms united at their apices, the same effect may be obtained by making the distance between the centres of the concave lenses greater than that between the centres of the pupils. Again, to obviate the necessity for excessive convergence of the eyes so common in hypermetropia, the centre of the pupil should be placed outside the centre of the corrective convex lenses; these will then act as prisms with their bases inwards. Where, on the other hand, there is no tendency to squinting, care must be taken in selecting spectacles that the distances between the centres of the glasses and the centres of the pupils are quite equal, otherwise squinting, or at any rate great fatigue, of the eyes may be induced.

Spherical Lenses. — Biconcave, biconvex and concavo-convex (meniscus) lenses are employed in ophthalmic practice in the treatment of errors of refraction. Until recently these spherical lenses were numbered in terms of their focal length, the inch being used as the unit. Owing principally to differences in the length of the inch in various countries this method had great inconveniences, and now the unit is the refractive power of a lens whose focal length is one metre. This unit is called a " dioptric " (usually written " D"). A lens of twice its strength has a refractive power of 2 D, and a focal length of half a metre, and so on.

Concave Lenses are used in the treatment of myopia or short- sight. In this condition the eye is elongated from before back- wards, so that the retina lies behind the principal focus. All objects, therefore, which lie beyond a certain point (the conjugate focus of the dioptric system of the eye, the far

point) are indis- tinctly seen; rays from them have not the necessary divergence to be focused in the retina, but may obtain it by the interposition of suitable concave lenses. Concave lenses should never be used for work within the far point; but they may be used in all cases to improve distant vision, and in very short-sighted persons to remove the far point so as to enable fine work such as sewing or reading to be done at a convenient distance. The weakest pair of concave lenses with which one can read clearly test types at a distance of 18 ft. is the measure of the amount of myopia, and this fully correcting glass may be worn in the slighter forms of short-sight. In higher degrees, where full correction might increase the myopia by inducing a strain of the accommodation, somewhat weaker glasses should be used for near work. In the highest degrees the complete correction may be employed, but lorgnettes are generally preferred, as they can be removed when the eyes become fatigued. It must be remembered that

short-sight tends to increase during the early, especially the school, years of life, and that hygienic treatment, good light, good type, and avoidance of stooping are important for its prevention.

Convex Lenses. — In hypermetropia the retina is in front of the principal focus of the eye. Hence in its condition of repose such an eye cannot distinctly see parallel rays from a distance and, still less, divergent rays from a near object. The defect may be overcome more or less completely by the use of the accommodation. In the slighter forms no inconvenience may result; but in higher degrees prolonged work is apt to give rise to aching and watering of the eyes, headache, inability to read or sew for any length of time, and even to double vision and internal strabismus. Such cases should be treated with convex lenses, which should be theoretically of such a strength as to fully correct the hypermetropia. Practically it is found that a certain amount of hypermetropia remains latent, owing to spasm of the accommodation, which relaxes only gradually. At first glasses may be given of such a strength as to relieve the troublesome symptoms; and the strength may be gradually increased till the total hypermetropia is corrected. Young adults with slighter forms of hypermetropia need glasses only for near work; elderly people should have one pair of weak glasses for distant and another stronger pair for near vision. These may be conveniently combined, as in Franklin glasses, where the upper half of the spectacle frame contains a weak lens, and the lower half, through which the eye looks when reading, a stronger one.

Anisometropia. — It is difficult to lay down rules for the treatment of cases where the refraction of the two eyes is unequal. If only one eye is used, its anomaly should be alone corrected; where both are used and nearly of equal strength, correction of each often gives satisfactory results.

Presbyopia. — When distant vision remains unaltered, but, owing to gradual failure of the accommodative apparatus of the eye clear vision within 8 in. becomes impossible, convex lenses should be used for reading of such a strength as to enable the eye to see clearly about 8 in. distance. Presbyopia is arbitrarily said to commence at the age of forty, because it is then that the need of spectacles for reading is generally felt; but it appears later in myopia and earlier in hypermetropia. It advances with years, requiring from time to time spectacles of increasing strength.

Cylindrical Lenses. — In astigmatism, owing to differences in the refractive power of the various meridians of the eye, great defect of sight, frequently accompanied by severe headache, occurs. This condition may be cured completely, or greatly improved, by the use of lenses whose surfaces are segments of cylinders. They may be used either alone or in combination with spherical lenses. The correction of astigmatism is in many cases a matter of considerable difficulty, but the results to vision almost always reward the trouble.

Convex spectacles were invented (see Light) towards the end of the 13th century, perhaps by Roger Bacon. Concave glasses were introduced soon afterwards. Sir G. B. Airy, the astronomer, about 1827, corrected his own astigmatism by means of a cylindrical lens. Periscopic glasses were introduced by Dr W. H. Wollaston.

SPECTROHELIOGRAPH, an instrument for photographing the sun with monochromatic light. In its simplest form it consists of a direct-vision spectroscope, having an adjustable slit (called " camera slit "), instead of an eyepiece, in the focal plane of the observing telescope. This slit is set in such a posi- tion as to transmit a single line of the spectrum, e.g. the K line of calcium. Suppose a fixed image of the sun to be formed on the collimator slit of this spectroscope, and a photographic plate, with its plane parallel to the plane of the solar image, to be mounted almost in contact with the camera slit. The spectro- scope is then moved parallel to itself, admitting to the collimator slit light from all parts of the sun's disk. Thus a monochromatic image of the sun, formed of a great number of successive images of the spectral line employed, will be built up on the plate. As the only light permitted to reach the plate is that of the calcium

line, the resulting image will represent the distribution of calcium vapour in the sun's atmosphere. The calcium clouds or Jiocculi thus recorded are

invisible to the eye, and are not shown on direct solar photographs taken in the ordinary way.

The calcium flocculi, on account of the brilliant reversals of the H and K lines to which they give rise, and the protection to the plate afforded by the diffuse dark bands in which these bright lines occur, are easily photographed with a spectrohelio- graph of low dispersion. In the case of narrower lines, however, higher dispersion is required to prevent the light of the con- tinuous spectrum on either side of the dark line from blotting out the monochromatic image. A spectroheliograph which gives excellent results with the lines of calcium, hydrogen and iron is shown in the figure. This instrument, used since 1905 in conjunction with the Snow (horizontal) telescope of the Mount Wilson Solar Observatory, was constructed in the observatory instrument shop in Pasadena.

It consists of a heavy cast-iron platform (a) mounted on four steel balls (b) which run in V guides of hardened steel. Most of the weight of the instrument is floated on mercury contained in three troughs (c, c, c) which form part of the cast-iron base. The platform carries the two slits, the collimator and camera objectives and the prism-train. An image of the sun, about 6-7 in. in diameter, is formed by the Snow telescope on the collimator slit (

The rays, rendered parallel by the collimator objective, meet a plane mirror (f) of silvered glass, which reflects them to the prisms (g. g')- These are of dense flint-glass (Schott 0-102), and each has a refracting angle of 63 29'. Their width and height are sufficient to transmit (at the position of minimum deviation) the entire beam received from the collimator. After being deviated 180 from the original direction, the dispersed rays fall on the camera objective (h), which is exactly similar to the collimator objective. This forms an image of the solar spectrum in its focal plane on the camera slit (*). ■ *Beyond the camera slit, and almost in contact with it, the photographic plate-carrier (j) is mounted on a fixed support. In order to bring a spectral line upon the camera slit, the slit is widely opened and the plane mirror (/) rotated until the line is seen. A cross-hair, in the focal plane of an eyepiece, is then moved horizontally until it coincides with the line in question. The slit is narrowed down to the desired width, and moved as a whole by a micrometer screw, until it coincides with the cross-hair. The eyepiece is removed and the photographic plate (k) placed in position. An electric motor, belted to a screw (I or /') connected with the spectroheliograph, is then started. 1 The screw moves the spectro- heliograph at a perfectly uniform rate across the fixed solar image. Thus a monochromatic image of the sun is built up on the fixed photographic plate.*

The spectroheliograph, originally designed for photographing the solar prominences, disclosed in its first application at the Kenwood Observatory (Chicago, 1892) a new and unexplored region of the sun's atmosphere. Photographs of the solar disk, taken with the H or K line, show extensive luminous clouds (flocculi) of calcium vapour, vastly greater in area than the sun-spots. By setting the camera slit so as to admit to the photographic plate the light of the denser calcium vapour, which lies at low levels, or that of the rarer vapour at high levels, the phenomena of various superposed regions of the atmosphere can be recorded. The lower and denser vapour appears as bright clouds, but the cooler vapour, at higher levels, absorbs the light from below and thus gives rise to dark clouds.

The first photographs of the sun in hydrogen light were made with the spectroheliograph in 1903. These reveal dark hydrogen flocculi, which appear to lie at a level above that of the bright calcium flocculi. They also show less extensive bright flocculi, usually in the immediate neighbourhood of sunspots, and frequently eruptive in character. These rise

•Two screws, of different pitch, are provided, to give different speeds.

SPECTROHELIOGRAPH

Plate.

(By permission of Ike Carnegie Inslilulion of Waskin&m.)

THE SUN, 7TH OCTOBER 1908. Showing right and left-hand Sun-spot vortices.

from a low level, and sometimes reach considerable elevations in the form of eruptive prominences.

In such an exploration of the sun's atmosphere it might be anticipated that definite currents, or some evidences of atmo- spheric circulation analogous to those familiar in terrestrial meteorology, would be discovered. Neither the forms nor the motions of the calcium flocculi revealed the existence of such b

a

SPECTROSCOPY (from Lat. spectrum, an appearance, and Gr. GKoireZv, to see) , that branch of physical science which has for its province the

investigation of spectra, which may, for our present purpose, be regarded as the product of the resolution of composite luminous radiations into more homogeneous components. The instruments which effect such a resolution are called spectroscopes.

The Five-foot Spectroheliograph of the Mount Wilson Solar Observ- atory (camera lens, camera slit and plate carrier in section).

currents, but in the higher region shown by the hydrogen photographs the distribution of the dark flocculi suggested the operation of definite forces, though their nature remained obscure until the spring of 1908. At that time monochromatic photographs of the sun were first made on Mount Wilson with the red (Ha) line of hydrogen, previous hydrogen photographs having been taken with H/3, Hy or H5 in the blue or violet. On account of the relatively great strength of Ha at a consider- able distance from the photosphere, the new photographs recorded flocculi at high levels previously unexplored. The forms of these flocculi show that all sun-spots are vortical in nature, and are probably analogous to terrestrial cyclones or tornadoes. Most of the solar vortices indicate clockwise rotation in the southern hemisphere and counter-clockwise rotation in the northern, as in the case of terrestrial cyclones. But frequent exceptions have been observed in which the direction of rotation is reversed. The study of these vortices has led to the discovery of a magnetic field in sun-spots, apparently caused by electric convection in the vortices.

It is evident that by the use of a spectroheliograph of suffi- ciently high dispersion, photographs may be taken of vapours in the sun represented by lines narrower than those of calcium and hydrogen. Such work has been in progress both at Mount Wilson and at Meudon, and the erection of a spectroheliograph of 75 ft. focal length on Mount Wilson was at the end of 1908 contemplated for an early date.

Descriptions of spectroheliographs by Hale, Deslandres, Newall and others, may be found in various papers in Astronomy and Astrophysics, Aslrophysical Journal, Comptes rendus, Bulletin astronomique, and other periodicals. (G. E. H.)

1. Introductory. — The announcement of the first discoveries made through the application of spectroscopy, then called spectrum analysis, appealed to the imagination of the scientific world because it revealed a method of investigating the chemical nature of substances independently of their distances: a new science was thus created, inasmuch as chemical analysis could be applied to the sun and other stellar bodies. But the beautiful simplicity of the first experiments, pointing apparently to the conclusion that each element had its characteristic and invariable spectrum whether in

the free state or when combined with other bodies, was soon found to be affected by complications which all the subsequent years of study have not completely resolved. Compound bodies, we now know, have their own spectra, and only when dissociation occurs can the compound show the rays characteristic of the element: this perhaps was to be expected, but it came as a surprise and was not readily believed, that elements, as a rule, possess more than one spectrum according to the physical conditions under which they become luminous. Spectrum analysis thus passed quickly out of the stage in which its main purpose was " analysis " and became our most delicate and powerful method of investigating mole- cular properties; the old name being no longer appropriate, we now speak of the science of "Spectroscopy." 1 Within the limit of this article it is not possible to give a complete account of this most intricate branch of physics; the writer therefore confines himself to a summary of the problems which now engage scientific attention, referring the reader for details to H. Kayser's excellent and complete Handbuch der Spectroscopie.

2. Instrumental. — The spectroscope is an instrument which allows us to examine the vibrations sent out by a radiating source: it separates the component parts if they are homo- geneous, i.e. of definite periodicity, and then also gives us the distribution of intensity along the homogeneous constituents. This resolution into simple periodic waves is arbitrary in the same sense as is the decomposition of forces along assumed

1 The present writer believes that he was the first to introduce the word " Spectroscopy " in a lecture delivered at the Royal Institution in 1882 {Proceedings, vol. ix.).

axes; but, in the same way also the results are correct if the resolution is treated as an analytical device and in the final result account is taken of all the overlapping components. Spectroscopes generally consist of three parts: (i) the colli- mator; (2) the analysing appliance, (3) the telescope. The slit of the collimator confines the light to a nearly linear source, the beam diverging from each point of the source being subse- quently made parallel by means of a lens. The parallelism, which is required to avoid aberrations, otherwise introduced by the prism or grating, may often be omitted in instruments of small power. The lens may then be also dispensed with, and the whole collimator becomes unnecessary if the luminous source is narrow and at a great distance, as for instance in the case of the crescent of the sun near the second and third contact of a total solar eclipse. The telescope serves to examine the image of the slit and to measure the

angular separation of the different slit images; when photographic methods are employed the telescope is replaced by a camera.

The analysing appliance constitutes the main feature of a spectroscope. It may consist of one of the following: —

a. A prism or a train of prisms. These are employed in instruments of small power, especially when luminosity is a consideration ; but their advantage in this respect is to a great extent lost, when, in order to secure increased resolving power, the size of the prisms, or their number, is unduly increased.

b. A grating. Through H. A. Rowland's efforts the con- struction of gratings has been improved to such an extent that their use is becoming universal whenever great power or accuracy is required. By introducing the concave grating which (see Diffraction of Light, § 8) allows us to dispense with all lenses, Rowland produced a revolution in spectroscopic measure- ment. At present we have still to content ourselves with a much diminished intensity of light when working with gratings, but there is some hope that the efforts to concentrate the light into one spectrum will soon be successful.

c. An echelon grating. Imagine a horizontal section of a beam of light, and this section divided into a number of equal parts. Let somehow or other retardations be introduced so that the optical length of the successive parts increases by the same quantity wX, n being some number and X the wave-length. If on emergence the different portions he brought together at the focus it is obvious that the optical action must be in every respect similar to that of a grating when the «th order of spectrum is considered. A. Michelson produced the successive retarda- tions by inserting step-by-step plates of glass of equal thickness so that the different portions of the beam traversed thicknesses of glass equal to n\, 211K, 3«X, . . . NX. The optical effect as regards resolving power is the same as with a grating of N lines in the «th order, but, nearly all the light not absorbed by the glass may be concentrated in one or two orders. 1

d. Some other appliance in which interference with long difference of path is made use of, such as the interferometer of Fabry and Perot, or Lummer's plate (see Interference of Light) .

The echelon and interferometer serve only a limited purpose, but must be called into action when the detailed structure of lines is to be examined. For the study of Zeeman effects (see Magneto-Optics) the echelon seems specially adapted, while the great pliability of Fabry and Perot's methods, allowing a clear interpretation of results, is likely to secure them perma- nently an established place in measurements of precision. . The power of a

spectroscope to perform its main function, which is to separate vibrations of different but closely adjacent frequencies, is called its " resolving power." The limitation of power is introduced as in all optical instruments, by the finiteness of the length of a wave of light which causes the image of an indefinitely narrow slit to spread out over a finite width in the focal plane of the observing telescope. The so-called " diffraction " image of a homogeneously illuminated slit shows a central band limited on either side by a line along which the

•Michelson, Astrophys. Journ. (1898), 8, p. 36; A. Schuster, Theory of Optics, p. 115.

intensity is zero, and this band is accompanied by a number of fainter images corresponding to the diffraction of a star image in a telescope. Lord Rayleigh, to whom we owe the first general discussion of the theory of the spectroscope, found by observation that if two spectroscopic lines of frequencies «i and » 2 are observed in an instrument, they are just seen as two separate lines when the centre of the central diffraction band of one coincides with the first minimum intensity of the other. In that case the image of the double line shows a diminu- tion of intensity along the centre, just sufficient to give a clear impression that we are not dealing with a single line, and the intensity at the minimum is o-8i of that at the point of maximum illumination. We may say therefore that if the difference between the frequencies «i and « 2 of the two waves is such that in the combined image of the slit the intensity at the minimum between the two maxima falls to o-8i, the lines are just resolved and «i/(«i-» 2) may then be called the resolving power. There is something arbitrary in this definition, but as the practical importance of the question lies in the comparison between instruments of different types, the exact standard adopted is of minor importance, the chief consideration being simplicity of application. Lord Rayleigh's expression for the resolving power of different instruments is based on the assumption that the geometrical image of the slit is narrow compared with the width of the diffraction image. This condition is necessary if the full power of the instrument is to be called into action. Unfortunately considerations of luminosity compel the observer often to widen the slit much beyond the range within which the theoretical value of resolving power holds in practice. The extension of the investigation to wide slits was first made by the present writer in the article " Spectroscopy " in the oth edition of the Encyclopaedia Brilannica. Reconsideration of the subject led him afterwards to modify his views to some extent, and he has since more fully discussed the question. 2 Basing the investigation on the same criterion of resolution as in the case of narrow slits, we postulate for both narrow and wide slits that two lines are resolved when the intensity of the combined image falls to a value of o-8io in the centre between the lines, the intensity at the maxima being unity. We

must now however introduce a new criterion the " purity " and distinguish it from the resolving power: the purity is defined by »i/(»i— W2), where «i and n 2 arc the frequencies of two lines such that they would just be resolved with the width of slit used. With an indefinitely narrow slit the purity is equal to the resolving power. As purity and resolving power are essentially positive quantities, «i in the above expression must be the greater of the two frequencies. With wide slits the difference «i-«2 depends on their width. If we write P = p R where P denotes the purity and R the resolving power, we may call p the " purity- factor. " In the paper quoted the numerical values of p are given for different widths of slit, and a table shows to what extent the loss of purity due to a widening of the slit is accom- panied by a gain in luminosity. The general results may be summarized as follows: if the width of the slit is equal to /X/4D (where X is the wave-length concerned, D the diameter of the collimator lens, and / its focal length) practically full resolving power is obtained and a further narrowing of the slit would lead to loss of light without corresponding gain. We call a slit of this width a " normal slit. " With a slit width equal to twice the normal one we lose 6% of resolution, but obtain twice the intensity of light. With a slit equal in width to eight times the normal one the purity is reduced to o-45R, so that we lose rather more than half the resolving power and increase the light 3-7 times. If we widen the slit still further rapid loss of purity results, with very little gain in light, the maximum luminosity obtainable with an indefinitely wide slit being four times that obtained with the normal one. It follows that for observations in which light is a consideration spectroscopes should be used which give about twice the resolving power of that actually required; we may then use a slit having a width of nearly eight times that of the normal one.

! Astrophys. Journ. (1905), 21, p. 197.

Theoretical resolving power can only be obtained when the whole collimator is rilled with light and further (as pointed out by Lord Rayleigh in the course of discussion during a meeting of the " Optical Convention " in London, 1905) each portion of the collimator must be illuminated by each portion of the luminous source. These conditions may be generally satisfied by projecting the image of the source on the slit with a lens of sufficient aperture. When the slit is narrow light is lost through diffraction unless the angular aperture of this condensing lens, as viewed from the slit, is considerably greater than that of the collimator lens.

When spectroscopes are used for stellar purposes further considerations

have to be taken account of in their construction; and these are discussed in a paper by H. F. Newall. 1

3. Spectroscopic Measurements and Standards of Wave-Length. — All spectroscopic measurement should be reduced to wave- lengths or wave-frequencies, by a process of interpolation between lines the wave-lengths of which are known with sufficient accuracy. The most convenient unit is that adopted by the International Union of Solar Research and is called an Angstrom (A) ; and is equal to io" 8 cms. A. Perot and C. Fabry, employing their interferometer methods, have compared the wave-length of the red cadmium line with the standard metre in Paris and found it to be equal to 6438-4696 A, the observations being taken in dry air at 18° C and at a pressure of 76 cms. (g = 980-665). This number agrees singularly well with that determined in 1893 by Michelson, who found for the same line 6438-4700. Perot's number is now definitely adopted to define the Angstrom, and need never be altered, for should at some future time further researches reveal a minute error, it will be only necessary to change slightly the temperature or pressure of the air in which the wave-length is measured. A number of secondary standards separated by about 50 A, and tertiary standards at intervals of from 5 to 10 A have also been determined. By means of these, spectroscopists are enabled to measure by interpolation the wave-length of any line they may wish to determine. Interpolation is easy in the case of all observations taken with a grating. In the case of a prism some caution is necessary unless the standards used are very close together. The most convenient and accurate formula of interpolation seems to be that discovered by J. F. Hartmann. If D is the measured deviation of a ray, and Do, X , c and a are four constants, the equation

X = X ° + (D-D„)"» seems to represent the connexion between deviation and wave- length with considerable accuracy for prisms constructed with the ordinary media.

The constant a has the same value 1-2 for crown and flint glass, so that there are only three disposable constants left. In many cases it is sufficient to substitute unity for a and write

c

X = Xo + -

D-Do

which gives a convenient formula, which in this form was first used by A. Cornu. If within the range 5100-3700 A, the constants are determined

once for all, the formula seems capable of giving by interpolation results accurate to o- 2 A, but as a rule the range to which the formula is applied will be much less with a corresponding gain in the accuracy of the results.

Every observer should not only record the resolving power of the instrument he uses, but also the purity-factor as defined above. The resolving power in the case of gratings is simply mn, where m is the order of spectrum used, and n the total number of lines ruled on the grating. In the case of prisms the resolving power is— t (dfi/d\), where / is the effective thickness of the medium traversed by the ray. If h and U are thicknesses traversed by the extreme rays, t = h — t,, and if, as is usually the case, the prism is filled right up to its refraction cap, h = o, and t becomes equal to the greatest thickness of the medium which is made use of. When compound prisms are used in which, 1 Monthly Notices R.A.S. (1905), 65, p. 605.

for the purpose of obtaining smaller deviation, one part of the compound acts in opposition to the other, the resolving power of the opposing portion must be deducted in calculating the power of the whole. Opticians should supply sufficient informa- tion of the dispersive properties of their materials to allow dn/d\ to be calculated easily for different parts of the spectrum.

The determination of the purity-factor requires the measure- ment of the width of the slit. This is best obtained by optical means. The collimator of a spectroscope should be detached, or moved so as to admit of the introduction of an auxiliary slit at a distance from the collimator lens equal to its focal length. If a source of light be placed behind the auxiliary slit a parallel beam of light will pass within the collimator and fall on the slit the width of which is to be measured. With fairly homogeneous light the diffraction pattern may be observed at a distance, varying with the width of the slit from about the length of the collimator to one quarter of that length. From the measured distances of the diffraction bands the width of the slit may be easily deduced.

4. Methods of Observation and Range of Wave-Lengths. — Visual observation is limited to the range of frequencies to whieh our eyes are sensitive. Defining oscillation as 'is usual in spectro- scopic measurement by wave-length, the visible spectrum is found to extend from about 7700 to 3900 A. In importance next to visual observation, and in the opinion of some, surpassing it, is the photographic method. We are enabled by means of it to extend materially the range of our observation, especially if the ordinary kinds of glass, which strongly absorb ultra- violet light, are avoided, and, when necessary, replaced by quartz. It is in this manner easy to reach a wave-length of 3000 A, and, with certain precautions, 1800 A. At that point, however, quartz and even atmospheric air become strongly absorbent and the expensive fluorspar becomes the only medium that can

be used. Hydrogen still remains transparent. The beautiful researches of V. Schumann 2 have shown, however, that with the help of spectroscopes void of air and specially prepared photographic plates, spectra can be registered as far down as 1 200 A. Lyman more recently has been able to obtain photographs as far down as 1030 A with the help of a concave grating placed in vacuo. 3 Although the vibrations in the infra-red have a considerably greater intensity, they are more difficult to register than those in the ultra-violet. Photographic methods have been employed successfully by Sir W. Abney as far as 20,000 A, but long exposures are necessary. Bolo- metric methods may be used with facility and advantage in the investigation of the distribution of intensities in continuous or semi-continuous spectra but difficulties are met with in the case of line spectra. Good results in this respect have been obtained by B. W. Snow 4 and by E. P. Lewis, 5 lines as far as 11,500 having been measured by the latter. More recently F. Paschen 6 has further extended the method and added a number of infra-red lines to the spectra of helium, argon, oxygen and other elements. In the case of helium one line was found with a wave-length of 20,582 A. C. V. Boys' microradiometer has occasionally been made use of, and the extreme sensitiveness of the Crookes' radiometer has also given excellent results in the hands of H. Rubens and E. F. Nichols. In the opinion of the writer the latter instrument will ultimately replace the bolometer, its only disadvantage being that the radiations have to traverse the side of a vessel, and are therefore • subject to absorption. In order to record line spectra it is by no means necessary that the receiving instrument (bolometer or radio- meter) should be linear in shape, for the separation of adjacent lines may be obtained if the linear receiver be replaced by a narrow slit in a screen placed at the focus of the condensing lens. The sensitive vane or strip may then be placed behind the slit; its width will not affect the resolving power though there may be a diminution of sensitiveness. The longest waves

2 Wied. Annalen (1901), 5, p. 349.

3 Astrophys. Journ. (1906), 23, p. 181.

4 Wied. Annalen (1892), 47, p. 208. 6 Astrophys. Journ. (1895), 2, p. I.

6 Drude Annalen (1908), 27, p. 537 and (1909), 29.

observed up to the present are those recorded by H. Rubens and E. Aschkinass 1 (-0061 cms. or 610,000 A).

5. Methods of Rendering Gases Luminous. — The extreme flexi- bility of the phenomena shown by radiating gases renders it a matter of great importance to examine them under all possible conditions of luminosity. Gases, like atmospheric air, hydrogen or carbon dioxide do not become luminous if they are plated in tubes, even when heated up far beyond white heat as in the electric furnace. This need not necessarily be interpreted as indicating the impossibility of rendering gases luminous by temperature only, for the transparency of the gas for luminous radiations may be such that the emission is too weak to be detected. When there is appreciable absorption as in the case of the vapours of chlorine, bromine, iodine, sulphur, selenium and arsenic, luminosity begins at a red heat. Thus G. Salet 2 observed that iodine gives a spectrum of bright bands when in contact with a platinum spiral made white hot by an electric current, and J. Evershed 3 has shown that in this and other cases the temperature at which emission becomes appreciable is about 700 . It is only recently that owing to the introduction of carbon tubes heated electrically the excitement of the lumin- ous vibrations of molecules by temperature alone has become an effective method for the study of their spectra even in the case of metals. Hitbert© we were entirely and still are generally confined to electrical excitation or to chemical action as in the case of flames.

In the ordinary laboratory the Bunsen flame has become universal, and a number of substances, such as the salts of the alkalis and alkaline earths, show characteristic spectra when suitably placed in it. More information may- be gained with the help of the oxyhydrogen flame, which with its higher temperature has not been used as frequently as it might have been, but W. N. Hartley has employed it with great success, and in cyanite (a silicate of aluminium) has found a material which is infusible at the temperature of this flame, and is therefore suitable to hold the substance which it is desired to examine. An interesting and instructive manner of introducing salts into flames was discovered by A. Gouy, who forced the air before it entered the Bunsen burner, through a spray produce containing a salt in solution. By this method even such metals as iron and copper may be made to show some of their charac- teristic lines in the Bunsen burner. The spectra produced under these circumstances have been studied in detail by C. de Watteville. 4

Of more frequent use have been electric methods, owing to the greater intensity of the radiations which they yield. Especially when large gratings are employed do we find that the electric arc alone seems sufficient to give vibrations of the requisite power. The metals may be introduced into the arc in various ways, and in some cases where they can be obtained in sufficient quantity the metallic electrodes may be used in the place of carbon poles.

The usual method of obtaining spectra by the discharges from a Ruhmkorff coil or Wimshurst machine needs no descrip- tion. The effects may be varied by altering the capacity and self-induction of the circuit which contains the spark gap. The insertion of self-induction has the advantage of avoiding the lines due to the gas through which the spark is taken, but it introduces other changes in the nature of the spark, so that the results obtained with and without self-induction are not directly comparable. Count Gramont 5 has been able to obtain spectro- scopic evidence of the metalloids in a mineral by employing powerful condensers and heating the electrodes in an oxyhydro- gen flame when these (as is often the case) are not sufficiently conducting.

When the substance to be examined spectroscopically is in solution the spark may be taken from the solution, which must then be used as kathode of air. The condenser is in this case 1 Wied. Annalen (1898), 65, p. 241. 8 Ann. Chim. Phys. (1873), 28. 5 Phil. Mag. (1895), 39, p. 460. 4 Phil. Trans. (1904), 204, A. p. 139. ‘ Compies rendus, vols. 121, 122, 124.

not necessary, in fact better results are obtained without it. Lecoq de Boisbaudran has applied this method with considerable success, and it is to be recommended whenever only small electric power is at the disposal of the observer. To diminish the resistance the current should pass through as small a layer of liquid as possible. It is convenient to place the liquid in a short tube, a platinum wire sealed in at the bottom to convey the current reaching to the level of the open end. If a thick- walled capillary tube is passed over the platinum tube and its length so adjusted that the liquid rises in it by capillary action just above the level of the tube, the spectrum may be examined directly, and the loss of light due to the passage through the partially wetted surface of the walls of the tube is avoided.

For the investigation of the spectra of gases at reduced pressures the so-called Plucker tubes (more generally but incorrectly called Geissler tubes) are in common use. When the pressure becomes very low, inconvenience arises owing to the difficulty of establishing the discharge. In that case the method introduced by J. J. Thomson might with advantage be more frequently employed. Thomson 3 places spherical bulbs inside thick spiral conductors through which the oscillating discharge of a powerful battery is led. The rapid variation in the intensity of the magnetic field causes a brilliant electrodeless discharge which is seen in the form of a ring passing near the inner walls of the bulb when the pressure is properly adjusted. A variety of methods to render gases luminous should be at the com- mand of the investigator, for nearly all show some distinctive peculiarity and any new modification generally results in fresh facts being brought to light. Thus E. Goldstein 7 was able to show that an increase in the current density is capable of destroying the well-known spectra of the alkali metals,

replacing them by quite a new set of lines.

6. Theory of Radiation. — The general recognition of spectrum analysis as a method of physical and chemical research occurred simultaneously with the theoretical foundation of the connexion between radiation and absorption. Though the experimental and theoretical developments were not necessarily dependent on each other, and by far the larger proportion of the subject which we now term " Spectroscopy " could stand irrespective of Gustav Kirchhoff's thermodynamical investigations, there is no doubt that the latter was, historically speaking, the immediate cause of the feeling of confidence with which the new branch of science was received, for nothing impresses the scientific world more strongly than just that little touch of mystery which attaches to a mathematical investigation which can only be understood by the few, and is taken on trust by the many, provided that the author is a man who commands general confidence. While Balfour Stewart's work on the theory of exchanges was too easily understood and therefore too easily ignored, the weak points in Kirchhoff's developments are only now beginning to be perceived. The investigations both of Balfour Stewart and of Kirchhoff are based on the idea of an enclosure at uniform temperature and the general results of the reasoning centre in the conclusion that the introduction of any body at the same temperature as the enclosure can make no difference to the streams of radiant energy which we imagine to traverse the enclosure. This result, which, accepting the possibility of having an absolutely opaque enclosure of uniform temperature, was clearly proved by Balfour Stewart for the total radiation, was further extended by Kirchhoff, who applied it (though not with mathematical rigidity as is sometimes supposed) to the separate wave-lengths. All Kirchhoff's further conclu- sions are based on the assumption that the radiation transmitted through a partially transparent body can be expressed in terms of two independent factors' (1) an absorption of the incident radiation, and (2) the radiation of the absorbing medium, which takes place equally in all directions. It is assumed further that the absorption is proportional to the incident radiation and (at any rate approximately) independent of the temperature, while the radiation is assumed to be a function of the temperature

6 Phil. Mag. 32, pp. 321, 445.

7 Vertr. d. phys. Ges. (1904), 9, p. 321.-

only and independent of the temperature of the enclosure. This division into

absorption and radiation is to some extent artificial and will have to be revised when the ohenomena of radiation are placed on a mechanical basis. For our present purpose it is only necessary to point out the difficulty involved in the assumption that the radiation of a body is independent of the temperature of the enclosure. The present writer drew attention to this difficulty as far back as 1881, 1 when he pointed out that the different intensities of different spectral lines need not involve the consequence that in an enclosure of uniform temperature the energy is unequally partitioned between the corresponding degrees of freedom. When the molecule is losing energy the intensity of each kind of radiation depends principally on the rapidity with which it can be renewed by molecular impacts. The unequal intensities observed indicate a difference in the effectiveness of the channels through which energy is lost, and this need not be connected with the ultimate state of equilibrium when the body is kept at a uniform temperature. For our immediate purpose these considerations are of importance inasmuch as they bear on the question how far the spectra emitted by gases are thermal effects only. We generally observe spectra under conditions in which dissipation of energy takes place, and it is not obvious that we possess a definition of tem- perature which is strictly applicable to these cases. When, for instance, we observe the relation of the gas contained in a Pliicker tube through which an electric discharge is passing, there can be little doubt that the partition of energy is very different from what it would be in thermal equilibrium. In consequence the question as to the connexion of the spectrum with the temperature of the gas seems to the present writer to lose some of its force. We might define temperature in the case of a flame or vacuum tube by the temperature which a small totally reflecting body would tend to take up if placed at the spot, but this definition would fail in the case of a spark discharge. Adopting the definition we should have no difficulty in proving that in a vacuum tube gases may be luminous at very low temperatures, but we are doubtful whether such a conclusion is very helpful towards the elucidation of our problem. Radia- tion is a molecular process, and we can speak of the radiation of a molecule but not of its temperature. When we are trying to bring radiation into connexion with temperature, we must therefore take a sufficiently large group of molecules and compare their average energies with the average radiation. The question arises whether in a vacuum discharge, in which only a compara- tively small proportion of the molecules are affected, we are to take the average radiation of the affected portion or include the whole lot of molecules, which at any moment are not concerned in the discharge at all. i"he two processes would lead to entirely different results. The problem, which, in the opinion of the present writer, is the one of interest and has more or less definitely been in the minds of those who have discussed the subject, is whether the type of wave sent out by a molecule only depends on the internal energy of that molecule, or on

other considera- tions such as the mode of excitement. The average energy of a medium containing a mixture of dissimilar elements possesses in this respect only a very secondary interest.

We must now inquire a little more closely into the mechanical conception of radiation. According to present ideas, the wave originates in a disturbance of electrons within the molecules. The electrons responsible for the radiation are probably few and not directly involved in the structure of the atom, which according to the view at present in favour, is itself made up of electrons. As there is undoubtedly a connexion between thermal motion and radiation, the energy of these electrons within the atom must be supposed to increase with tempera- ture. But we know also. that in the complete radiation of a white body the radiative energy increases with the fourth power of the absolute temperature. Hence a part of what must be included in thermal energy is not simply proportional to temperature as is commonly assumed. The energy of radiation resides in the medium and not in the molecule. Even at the 1 Phil. Mag. (1881), 12, p. 261.

highest temperatures at our command it is small compared with the energy of translatory motion, but as the temperature increases, it must ultimately gain the upper hand, and if there is anywhere such a temperature as that of several million degrees, the greater part of the total energy of a body will: be outside the atom and molecular motion ultimately becomes negligible compared with it. But these speculations, interesting and important as they are, lead us away from our main subject.

Considering the great variety of spectra, which one and the same body may possess, the idea lies near that free electrons may temporarily attach themselves to a molecule or detach themselves from it, thereby altering the constitution of the vibrating system. This is most likely to occur in a discharge through a vacuum tube and it is just there that the greatest variety of spectra is observed.

It has been denied by some that pure thermal motion can ever give rise to line spectra, but that either chemical action or impact of electrons is necessary to excite the regular oscillations which give rise to line spectra. There is no doubt that the impact of electrons is likely to be effective in this respect, but it must be remembered that all bodies raised to a sufficient temperature are found to eject electrons, so that the presence of the free electrons is itself a consequence of temperature. The view that visible radiation must be excited by the impact of such an electron is therefore quite consistent with the view that there is no essential difference between the excitement due to chemical or electrical action and that resulting from a sufficient increase of temperature.

Chemical action has frequently been suggested as being a necessary factor in the luminosity of flame, not only in the sense that it causes a sufficient rise of temperature but as furnishing some special and peculiar though undefined stimulus. An important experiment by C. Giinther 2 seems however to show that the radiation of metallic salts in a flame has an intensity equal to that belonging to it in virtue of its temperature. • If a short length of platinum wire be inserted vertically into a lighted Bunsen burner the luminous line may be used as a slit and viewed directly through a prism. When now a small bead of a salt of sodium or lithium is placed in the flame the spectrum of the white hot platinum is traversed by the dark absorption of the D lines. This is consistent with Kirchhoff 's law and shows that the sodium in a flame possesses the same relative radiation and absorption as sodium vapour heated thermally to the temperature of the flames. According to independent experi- ments by Paschen the radiation of the D line sent out by the sodium flame of sufficient density is nearly equal to that of a black body at the same temperature. 3 Other more recent experiments confirm the idea that the radiation of flames is mainly determined by their temperature.

The definition of temperature given above, though difficult in the case of a flame and perhaps still admissible in the case of an electric arc, becomes precarious when applied to the disruptive phenomena of a spark discharge. The only sense in which we might be justified in using the word temperature here is by taking account of the energy set free in each discharge and distributing it between the amount of matter to which the energy is supplied. With a guess at the specific heat we might then calculate the maximum temperature to which the substance might be raised, if there were no loss by radiation or otherwise. But the molecules affected by a spark discharge are not in any sense in equilibrium as regards their partition of energy and the word " temperature " cannot therefore be applied to them in the ordinary sense. We might probably with advantage find some definition of what may be called " radiation temperature " based on the relation between radiation and absorption in Kirchhoff's sense, but further information based on experimental investigation is required.

7. Limits of Homogeneity and Structure of Lines.— As a first approximation we may say that gases send out homogeneous

2 Wied. Ann. (1877), 2. p. 477.

3 Ibid. (1894), 51. P- 4°-

radiations. A homogeneous oscillation is one which for all time is described by a circular function such as sin(«/ + a), t being the time and n and a constants. The qualification that the circular function must apply to all time is important, and unless it is recognized as a necessary condition of homo- geneity, confusion in the more intricate problems or radiation becomes inevitable. Thus if a molecule were set into vibra- tion at a specified time and oscillated according to the above equation during a finite period, it would not send out homo- geneous vibrations. In interpreting the phenomena observed in a spectroscope, it is necessary to remember that the instru- ment, as pointed out by Lord Rayleigh, is itself a producer of homogeneity within the limits defined by its resolving power. A spectroscope may be compared to a mechanical harmonic analyser which when fed with an irregular function of one variable represented by a curve supplies us with the sine curves into which the original function may be resolved. This analogy is useful because the application of Fourier's analysis to the optical theory of spectroscopes has been doubted, and it may be urged in answer to the objections raised that the instrument acts in all respects like a mechanical analyser, 1 the applica- bility of which has never been called into question.

*A limit to homogeneity of radiation is ultimately set by the so-called Doppler effect, which is the change of wave-length due to the translatory motion of the vibrating molecule from or towards the observer. If N be the frequency of a homogeneous vibration sent out by a molecule at rest, the apparent frequency will be N (i=fcr/7), where V is the velocity of light and v is the velocity of the line of sight, taken as positive if the distance from the observer increases. If all molecules moved with the velocity of mean square, the line would be drawn out into a band having on the frequency scale a width 2NV/V, where v is now the velocity of mean square. According to Maxwell's law, however, the number of molecules having a velocity in the line of sight lying between v and v + dv is proportional to e-& m dv, where /3 is equal to 3/2M 2 ; for » = «, we have therefore the ratio in the number of molecules having velocity u to those having no velocity in the line of sight e~&i&=e-% = 22. We may therefore still take 2Nu/V to be the width of the band if we define its edge to be the frequency at which its intensity has fallen to 22% of the central intensity. In the case of hydrogen rendered luminous in a vacuum tube we may put approximately u equal to 2000 metres per second, if the trans latory motion of the luminous molecules is about the same as that at the ordinary temperature. In that case \u/V or the half width of the band measured in wave lengths would be |-io _ *X,or, for the red line, the half width would be 0-044 A. Michelson, who has compared the theoretical widening with that found experimentally by means of his interferometer, had to use a somewhat more complicated expression for the comparison, as*

his visibility curve does not directly give intensities for particular frequencies but an integral depending on a range of frequency. 2 He finds a remarkable agreement between the theoretical and experimental values, which it would be important to confirm with the more suitable instruments which are now at our disposal, as we might in this way get an estimate of the energy of translatory motion of the luminous molecules. If the motion were that of a body at white heat, or say a temperature of 1000 , the velocity of mean square would be 3900 metres per second and the apparent width of the band would be doubled. Michelson's experiments therefore argue in favour of the view that the luminescence in a vacuum tube is similar to that pro- duced by phosphorescence where the translatory energy does not correspond to the oscillatory energy — but further experi- ments are desirable. The experimental verification of the change of wave-length due to a source moving in the line of sight has been realized in the laboratory by A. Belopolsky and Prince Galitzin, who substituted for the source an image formed of a stationary object in a rapidly moving mirror.

1 Phil. Mag. (1894), 37, p. 509.

s Cf. Rayleigh, Phil. Mag. (1899), 27, p. 298; Michelson, Phil. Mag. (1892), 34, p. 280.

The homogeneity of vibration may also be diminished by molecular impacts, but the number of shocks in a given time depends on pressure and we may therefore expect to diminish the width of a line by diminishing the pressure. It is not, however, obvious that the sudden change of direction in the translatory motion, which is commonly called a molecular shock, necessarily also affects the phase of vibration. Experiments which will be discussed in § 10 seem to show that there is a difference in this respect between the impacts of similar and those of dis- similar molecules. When the lines are obtained under circum- stances which tend towards sharpness and homogeneity they are often found to possess complicated structures, single lines breaking up into two or more components of varying intensities. One of the most interesting examples is that furnished by the green mercury line, which when examined by a powerful echelon spectroscope splits up into a number of constituents which have been examined by several investigators. Six companions to the main lines are found with comparative ease and certainty and these have been carefully measured by Prince Galitzin, 3 H. Stansfield 4 and L. Janicki. 6 According to Stansfield there are three companion lines on either side of a central line, which consists of two lines of unequal brightness.

8. Distribution of Frequencies in Line Spectra. — It is natural to consider the frequencies of vibrations of radiating molecules as analogous to the different notes sent out by an acoustical vibrator. The efforts which were

consequently made in the early days of spectroscopy to discover some numerical relation- ship between the different wave lengths of the lines belonging to the same spectrum rather disregard the fact that even in acoustics the relationship of integer numbers holds only in special and very simple cases. Some corroboration of the simple law was apparently found by Johnstone Stoney, who first noted that the frequencies of three out of the four visible hydrogen lines are in the ratios 20 : 27 : 32. In other spectra such " harmonic " ratios were also discovered, but their search was abandoned when it was found that their number did not exceed that calculated by the laws of probability on the supposi- tion of a chance distribution. 6 The next great step was made by J. J. Balmer, who showed that the four hydrogen lines in the visible part of the spectrum may be represented by the equation

» = A(i-4/ 2), where n is the reciprocal of the wave-length and therefore proportional to the wave frequency, and s successively takes the values 3, 4, 5, 6. Balmer's formula received a striking confirma- tion when it was found to include the ultra-violet lines which were discovered by Sir William Huggins 7 in the photographic spectra of stars. The most complete^ hydrogen spectrum is that measured by Evershed 8 in the flash spectrum observed during a total solar eclipse, and contains thirty-one lines, all of which agree with considerable accuracy with the formula, if the frequency number n is calculated correctly by reducing the wave-length to vacuo. 9*

It is a characteristic of Balmer's formula that the frequency approaches a definite limit as 5 is increased, and it was soon discovered that in several other spectra besides hydrogen, series of lines could be found, which gradually come nearer and nearer to each other as they become fainter, and approach a definite limit. Such series ought all to be capable of being represented by a formula resembling that of Balmer, but so far the exact form of the series has not been established with certainty. The more important of the different forms suggested are as follow:

R C

(1) n = A + -5 + j t (H. Kayser and C. Runge).

(2) n=A-

N

- *a*

(J. R. Rydberg).

3 Bulletin Akad. St Petersburg (1907), p. 159.

4 Phil. Mag. (September, 1909), 18, p. 371. 6 Ann. d. Phys. (1909), 29, p. 1833.

6 A. Schuster, Proc. Roy. Soc. (1881), 21, p. 337.

7 Phil. Trans. (1880), 171, p. 619.

8 Ibid (1891), 197, p. 381.

9 The table so corrected will be found in C. Baly's Spectroscopy, p. 472.

N

(E. C. Pickering, generalized by T. N.

(3) ■»=A- (i+M)S+a Thiele)

(4) "A (r+a +^/ f y (Ritz).

(5) »° A – (,+,. + a/s)' (Hicks) –

In all cases s represents the succession of integer numbers. In the last case we must put for r either s or, s+% according to the nature of the series, as will be explained further on. The first of the forms which contains three disposable constants did good service in the hands of their authors, but breaks down in important cases when odd powers of s have to be introduced in addition to the even powers. The second form contains two or three constants according as N is taken to have the same value for all elements or not. Rydberg favours the former view, but he does not attempt to obtain any very close approxi- mation between the observed and calculated values of the fre- quencies. Equation (3), which E. C. Pickering 1 used in a special ;ase, presently to be referred to, was put into a more general form by Thiele, 2 who, however, assumes N to have the same value for all spectra, and not obtaining sufficient agreement, rejects the formula. J. Halm 3 subsequently showed that if N may differ in different cases, the equation is a considerable improvement on Rydberg's. It then possesses four adjustable constants, and more can therefore be expected from it. All these forms are put into the shade by that which was introduced by Ritz, led thereto apparently by theoretical considerations. As he takes N to be strictly the same for all elements the equation has only three disposable constants A, a and b. It is found to be very markedly superior to the other equations. Its chief advantage appears, however, when the relationship

between different series of the same element is taken into account. We therefore turn our attention to this relationship.

In the case of those elements in which we can represent the spectrum most completely by a number of series, it is generally found that they occur in groups of three which are closely related to each other. They were called by H. Kayser and F. Paschen " Haupt serie," " 1st Nebenserie," " 2nd Nebenserie," which is commonly translated " Principal series," "First subordinate series," " Second subordinate series." These names become inconvenient when, as is generally the case, each of the series splits into groups of two or three, and we have to speak of the second or third number of the first or second subordinate series. Moreover, a false impression is conveyed by the nomen- clature, as the second subordinate series is much more closely related to the principal series than the first subordinate series. The present writer, therefore, in his Theory of Optics, adopted different names, and called the series respectively the " Trunk," the " Main Branch " and the " Side Branch," the main branch being identical with the second subordinate series; the limit of frequency for high values of 5 is called the " root " of the series, and it is found in all cases that the two branches have a common root at some point in the trunk. According to an important law discovered by Rydberg and shortly afterwards indepen- dently by the writer, the frequency of the common root of the two branches is obtained by subtracting the frequency of the root of the trunk from that of its least refrangible and strongest member. In the spectra of the alkali metals each line of the trunk is a doublet, and we may speak of a twin trunk springing out of the same root. In the same spectra the lines belonging to the two branches are also doublets. According to the above law the least refrangible member of the trunk being double, there must be two roots for the branches, and this is found to be the case. In fact the lines of each branch are also doublets, with common difference of frequency. There are, therefore, two main branches and two side branches, but these are not twins springing out of the same root, but parallel branches springing out of different though closely adjacent roots. It will also be noticed that the least refrangible of tire doublets of the

1 Astrophys. Jovrn. (1896), 4, p. 369.

- Ibid. (1897), 6, p. 65.

- *Trans. Ast. Soc. Edinburgh (1905), 41, p. 551.*

branches must according to the above law correspond to the most refrangible of the doublets of the trunk, and if the com- ponents of the doublets have different intensities the stronger components must lie on different sides in the trunk and branch series. This is confirmed by

observation. Rydberg discovered a second relationship, which, however, involving the assumed equation connecting the different lines, cannot be tested directly as long as these equations are only approximate. On the other hand the law, once shown to hold approximately, may be used to test the sufficiency of a particular form of equation. These forms all "agree in making the frequency negative when s falls below a certain value sp. Rydberg's second law states that if the main branch series is taken, the numerical value of np_ t corresponding to sp_ x is equal to the frequency of the least refrangible member of the trunk series.

The two laws are best understood by putting the equations in the form given them by Rydberg. For the trunk series write

M s I I

N-(i+a) 2 (i-fV) and for the main branch series

n 1 , 1 1

N-(i-t-m) 2 (-K) 2 ' Here n, a and N are constants, while 5 as before is an integer number.*

The difference between the frequencies of the roots (s = 00) is given by

«« "^ = N [(iT7?(rT^] = w '-

This is the first law.

If further in the two equations we put s = l, we obtain : »i = —tii 1 . This is the second law.

As has already been mentioned, the law is only verified very roughly, if Rydberg's form of equation is taken as correctly re- presenting the series. The fact that the addition of the term intro- duced by Ritz not only gives a more satisfactory representation of each series, but verifies the above relationship with a much closer degree of approximation, proves that Ritz's equation forms a marked step in the right direction. According to him, the follow- ing equations represent the connexion between the lines of the three related series.

Trunk series: ±- ? | = [i . +ai+fc/ ^- [l . 5+ol+fc , /(l . 5)2 p-

Main Branch Series: ±-^- = r — , rrrxra – T — i — , , t, / .n 1

N [2-t-cn-r-o/2 2] 2 [r--a l +b 1 jr 2 f

ft It J J

Side Branch Series: — -Tcr = r—-i , ..„.!, — 7 — i — , j, .,, –

Here s stands for an integer number beginning with 2 for the trunk and 3 for the main branch, and r represents the succession of numbers 1-5, 2-5, 3-5, &c. As Ritz points 6ut, the first two equations appear only to be particular cases of the form

n 1 1

N'

in which s and r have the form given above. In the trunk series s has the particular value 1-5, and in the main branch series s has the particular value 2, but we should expect a weaker set of lines to exist corresponding to the trunk series with r = 2-5 or corresponding to the main branch series with s = $, and in fact a whole succession of such series. Taking the Trunk and Main Branch Series, we find they depend altogether on the four constants : 01, b, a 1 , ft 1 , while N is a universal constant identical with that deduced from the hydrogen series. As an example of the accuracy obtained we give in the following Table the figures for potassium. The lines of the trunk series are double but for the sake of shortness the least refrangible component is here omitted.

Spectrum of Potassium.

Trunk Series.

Main Branch.

Side Branch.

S

«

A

r

n

A

s

n

A

2

13036-8

—0-24

i-5

12980-7

o-oo

5

I7I99-5

0-00

3

24719-4

-t-o-oo

2-5

—

—

6

18709-5

o-oo

4

29006-7

: 4-0-12

3-5

I4465-3

0-00

7

19611-5

+0-I6

5

31073-5

-0-05

4-5

17288-3

+0-20

8

20188-0

+0-70

6

32226-5

+0-40

5-5

18779-2

+0-22

7

*3*939-4*

-0-05

6-5

19662-3

-f-O-22

8

33408 -7

-0-08

7-5

20224-7

+ I-IO

9

33736-2

— 0-07

10

33971-4

-023

626

SPECTROSCOPY

W. M. Hicks 1 has modified Rydberg's equation in a way similar to that of Ritz as shown by (5) above. This form has the advantage that the constants of the equation when applied to the spectra of the alkali metals show marked regularities. The most extensive series which has yet been observed is that of the trunk series of sodium when it is observed as an absorption spectrum; R. W. Wood has in that case measured as many as 50 lines belonging to this series.

The different series have certain characteristics which they seem to maintain wherever they have been obtained. Thus the trunk series consists of lines which are easily reversed while those of the side branch are nebulous. The lines of the trunk seem to appear at lower temperatures, which may account for the fact that it can be observed as absorption lines.

If we compare together the spectra of the alkali metals, we find that the doublets of the branch series separate more and more as the wave-length increases. Roughly speaking the difference in frequency is proportional to the square of the atomic weight. Taking sodium and lithium we find in this way that the lithium lines ought to be double and sepa- rated by '7 A. They have not, however, so far as we know, been resolved. The roots of the three series have frequencies which diminish as the atomic weight increases, but not according to any simple law.

In the case of other metallic groups similar series have also been found, but while in the case of the alkali group nearly the whole spectrum is represented by the combined set of three series, such is not the case with other metals. The spectra of magnesium, calcium, zinc, cadmium and mercury, give the two branch series, and each series is repeated three times with constant difference of frequency. In these elements the doublets of the alkali series are therefore replaced by triplets. Strontium also gives triplets, but only the side branch series has been observed. In the spectrum of barium no series has yet been recognized. The spectrum of helium has been very carefully studied by Runge and Paschen. All its lines arrange themselves in two families of series, in other words, the spectrum looks like that of the superposition of two spectra similar to those presented by the alkali metals. Each family consists of the trunk, main branch and side branch. The conclusion which was originally drawn from this fact that helium is a mixture of two gases has not been confirmed, as one of the spectra of oxygen is similarly constituted.

We must refer to Kayser and Runge's Handbuch for further details, as well as for information on other spectra such as those of silver, thallium, indium and manganese, in which series lines have been found.

Before leaving the subject, we return for a moment to the spectrum of hydrogen. In 1896, Professor E. C. Pickering discovered in the structure of the star £ Puppis a series of lines which showed a remarkable similarity to that of hydrogen having the same root. Kayser on examining the spectrum recognized the fact that the two series were related to each other like the two branch series, and this was subsequently confirmed. If we compare Balmer's formula with the general equation of Ritz, we find that the two can be made to agree if the ordinary hydrogen spectrum is that of the side branch series and the constants a 1 , b, c and d are all put equal to zero. In that case the main branch is found to represent the new series if a 1 and b l are also put equal to zero, so that

N 4 r 2 ' where r takes successively the values 1-5, 2-5, 3-5. A knowledge of the constants now determines the trunk series, which should be

- = l-l 1)

N U1.5) 2 sV

(i-5) 2 _ The least refrangible of the lines of this series should have a wave-length 4687‘88, and a strong line of this wave-length has indeed been found in the spectra of stars which are made up of bright lines, as also in the spectra of some nebulae. It seems remarkable, however, that we should not have succeeded yet in reproducing in the laboratory the trunk and main branch of the hydrogen spectrum, if the spectra in question really belong to hydrogen.

Considering the complexity of the subject it is not surprising that the efforts to connect theoretically the possible periods of the atom considered as a vibrating system have met with no considerable success. Two methods of investigation are avail- able. The one endeavours to determine the conditions, which are consistent with our knowledge of atomic constitution derived from other sources, and lead to systems of vibration similar to those of the actual atom. We might then hope to particularize or modify these conditions so as to put them into more complete agreement. An attempt in that direction has, been made with partial success by J. H. Jeans, 2 who showed that a shell-like constitution of the atom, the shells being electrically charged,

1 Proc. Roy. Soc. (1909), 83, p. 226 (abstract).

2 Phil. Mag. (1901), 2, p. 421.

would lead to systems of periods not unlike those of a series of lines such as is given by observation. The other method starts from the observed values of the periods, and establishes a differ- ential equation from which these periods may be derived. This is done in the hope that some theoretical foundation may then be found for the equation. The pioneer in this direction is E. Riecke, 8 who deduced a differential equation of the 10th order. Ritz in the paper already mentioned follows in the footsteps of Riecke and elaborates the argument. On the whole it seems probable that the System of moving electrons, which according to a modern theory constitute the atom, is not directly con- cerned in thermal radiation which would rather be due to a few more loosely connected electrons hanging on to the atom. The difficulty that a number of spectroscopic lines seem to involve at least an equal number of electrons may be got over by imagining that the atom may present several positions of equilibrium to the electron, which it may occupy in turn. A collision may be able to throw the electrons from one of these positions to another. According to this view the different lines are given out by different molecules, and we should have to take

averages over a number of molecules to obtain the complete spectrum just as we now take averages of energy to obtain the temperature. 4 If it should be confirmed that the period called N in the above investigation is the same for all elements, it must be intimately connected with the structure of the electron. At present the quantity of electricity it carries, and also its mass, may be determined, and we can therefore derive units of length and of mass from our electrical measurements. The quantity N may serve to fix the third fundamental unit. One further point deserves notice. Lord Rayleigh, 5 who has also in- vestigated vibrating systems giving series of lines approaching a definite limit of" root," remarks that by dynamical reasoning we are always led to equations giving the square of the period and not the period, while in the equation representing spectral series the simplest results are obtained for the first power of the period. Now it follows from Rydberg's second law put on a more accurate basis by Ritz that in one case at any rate a nega- tive period has reality and must be interpreted just as if it Were positive. This looks indeed as if the square of the period were the determining quantity.

9. Distribution of Frequencies in Band Spectra. — In many cases the spectra of molecules consist of lines so closely ruled together in groups as to give the appearance of continuous bands unless high resolving powers are employed. Such spectra seem to be characteristic of complex molecular structure, as they appear when compounds are raised to incandescence without decom- position, or when we examine the absorption spectra of vapours such as iodine and bromine and other cases where we know that the molecule consists of more than one atom. The bands often appear in groups, and such spectra containing groups of bands when viewed through small spectroscopes sometimes give the appearance of the flutings of columns. Hence the name " fluted spectra," which is sometimes applied. Each band, as has been stated, is made up of lines indicating highly homo- geneous vibrations. A systematic study of the distribution of frequencies in these bands was first made by H. Deslandres, 6 who found that the successive differences in the frequencies formed an arithmetical progression.

If s represents the series of integer numbers the distribution of frequency may be represented by

» = C+Bs 2 , where C and B are constants. The brightest line, for which s = p, is called the "head" of the band; and as .s increases the lines diminish in intensity. The band fades towards the red or violet according as A is positive or negative, and the appearance is some- times complicated by the fact that several sets of lines start from identical or closely adjoining heads. The equation which expressed " Deslandres' law " was only given by its author as an approximate one. The careful measurements of Kayser and

Runge of the carbon bands show that u the successive differences in the frequencies do

3 Drude's Annalen (1900), 1, p. 399.

4 Nature (1895), 51, p. 293, 6 Phil. Mag. (1897), 44, p. 356. • Comptes rendus (1885), 100, p. 1256.

not quite keep up with the mathematical expression but tend to become more equal The distances between the two first lines it A, and is small compared with the frequency itself, which is B. If this is the case it is obvious that an equation of the form

n = A-

N i 2 +a

does, for small values of s, becomes identical with Deslandres' equation, a representing a constant which is large compared with unity. If we wish to be more general, while still adhering to Deslandres' law as a correct representation of the frequencies when s is small, we may write

„- A N

where n is an additional constant.

We have now reduced the law for the bands to a. form which we have found applicable to a series of lines, but with this important difference that while o in the case of line spectra is a small corrective term, it now forms the constant on which an essential factor in the appearance of the band depends. Halm, 1 to whom we owe a careful comparison of the above equation with the observed fre- quencies in a great number of spectra, attached perhaps too much weight to the fact that it is capable of representing both line and band spectra. It is no doubt important to recognize that the two types of spectra seem to represent two extreme cases of one formula, the significant difference being that in the line spectrum the distance between lines diminishes as we recede from the head, while in the case of the band it increases, at any rate to begin with. But, on the other hand, no one pretends to have found the rigorous expression for the law, and the appropriate approximation may take quite different forms when constants which are large in one case are small in the other. It would not therefore be correct to push this agree- ment against Ritz's expression which

is not applicable to bands.

A discussion of band spectra on a very broad basis was given by Thiele, 1 who recommends a formula

w _ go + gi(+ g) +*

+ q r (s + c)'

P0 + Pl(s + C) + ... + Pr(s + C}

where s as before represents the integer numbers and the other quantities involved are constants. If r = i, we obtain Pickering's equation, which is the one advocated by Halm. Equations of this form have received a striking observational verification in so far as they predict a tail or root towards which the lines ultimately tend when s is increased indefinitely. This fact bridges over the distinction between the band and line spectra. The distance between the lines measured on the frequency scale does not, accord- ing to the equation, increase indefinitely from the head downwards, but has a maximum which, in Pickering's form as written above, is reached when (j + /i) 2 = $a. This gives a real value for i only when a is positive. If a is negative the frequency passes through infinity and the maximum distance between the lines occurs there. If we only assign positive values to n and a, the band fades away from the head, the lines at first increasing in distance. It appears from the observations of A. S. King,' that in the case of the so-called spectrum of cyanogen these tails- can be observed. If a negative value of the frequency is admitted, more complicated effects may be predicted. A band might in that case fade away towards zero frequencies, and as s increases, return again from infinity with diminishing distances, the head and the tail pointing in the same direction; or with a different value of constants a band might fade away towards infinite frequencies, then return through the whole range of the spectrum to zero frequencies, and once more return with its tail near its head. The same band may therefore cross its own head on the return journey. If we adopt Thlele's view that each band is accompanied by a second branch for which s has negative values the complication is still further increased, but there does not seem to be sufficient reason to adopt this view.

10. Effects of Varying Physical Conditions.— The same spectrum may show differences according to the physical conditions under which the body emitting the spectrum is placed. The main effects we have to discuss are (1) a symmetrical widening,

(2) a shift of wave-length, which when it accompanies expansion in both directions may appear as an unsymmetrical widening,

(3) a change in the relative intensities of the lipes.

As typical examples illustrating the facts to be explained, the following may be mentioned, (a) "When a sodium salt is placed in a Bunsen burner in sufficient quantity, the yellow lines are widened. When the amount of luminous matter is small the lines remain narrow. (6) If a spark be sent through a Pliicker tube containing hydrogen the lines are widened when the pressure

1 Trans. Roy. Soc. Edin (1905), 41, p. 551.

8 Astrophys. Journ. (1897), 6, p. 65; (1898), 8, p. I.

- *Ibid. (1901), 14. p. 323.*

is increased, (c) Under moderate pressures the lines of hydrogen may be widened by powerful sparks taken from ' a condenser. (d) If a spark be taken from an electric condenser through air, both the lines of oxygen and nitrogen are Wide compared with what they would be at low pressures. But a mixture of nitrogen and oxygen containing only little nitrogen will show the nitrogen lines narrow and similarly narrow oxygen lines may be obtained if the quantity of oxygen is reduced, (e) If a spark be taken from a solution of a salt, e.g. lithium, the relative intensities of the lines are different according as the solution is concentrated or dilute. (/) The relative intensity of lines in the spark taken from metallic poles may be altered by the insertion of greater or smaller capacities, similarly the relative intensities are different in arc and spark spectra, (g) Increased pressure nearly always diminishes the frequency of vibration, but this effect is generally of a smaller order of magnitude than the widening which takes place in the other cases. In investigating the effects of mixture on the widening of lines in absorption spectrum, R. W. Wood discovered some interesting effects. The cadmium line having a wave-length of 2288 A broadens by pressure equally in both directions, but if mercury be added the broadening is more marked on the less refrangible side.

The discussion as to the causes of this widening has turned a good deal on the question whether it is primarily due to changes of density, pressure or temperature, but some confusion has been caused by the want of proper definition of terms. For the cause of this the writer of the present article is jointly with others at any rate partly responsibtej and clearness of ideas can only be re-established by investigating the mechanical causes of the effect rather than by applying terms which refer to a different order of physical conceptions.

The facts, as quoted, point to the closeness of the packing of molecules as

the factor which always accompanies and perhaps causes the widening of lines. But is this alone sufficient to justify us in assigning the widening to increased density? Increased density at the same temperature means in the first place a reduction of the average distance between the mole- cules, but it means also a reduction in the mean free path and an increase in the number of impacts. The question is: which of these three factors is significant in the explanation of the widening? If it is the average distance irrespective of length of path and of number of impacts we should be justified in as- cribing the effect to density, but if it is the number of impacts it would.be more reasonable to ascribe it to pressure. The question could not be settled by experiments made at the same temperature, and if the temperature is altered the question is complicated by the distinction which would probably have to be drawn between the number of collisions and their intensity. Experimentally we should be confined to a strict investigation of absorption spectra, because in the electric discharge tempera- ture has no definite meaning, and variations of pressure and density are not easily measured.

Assuming for a moment the change to be one of density and leaving out of account the pressure shift, the cases (e) and (/) point to the fact that it is the closeness of packing of similar molecules which is effective, e.g. the number of oxygen molecules per cubic centimetre determines the width of the oxygen lines, though nitrogen molecules may be mixed with them without materially affecting the appearance. Experiment © is, however, generally taken to mean that this closeness of packing cannot be the sole determining cause, for it is argued that if a closed vacuum tube can show both wide and narrow lines according to the mode of discharge, density alone cannot account for the change. But this argument is not conclusive, for though the total number of hydrogen molecules is fixed when the gas is enclosed, yet the number of luminous molecules may vary with the condition. Those that are not luminous may, if they do not contain the same vibrating system, behave like inert molecules. When an electric current from a battery is sent through a tube containing hydrogen, increase of current simply means increase in the number of ions which take part

in the discharge, except within the region of the kathode glow. Each molecule need not radiate with increased energy, but the more brilliant emission of light may be due to the greater number of particles forming similar vibrating systems.

When we compare together electric discharges the intensity of which is

altered by varying the capacity, we are unable to form an opinion as to whether the effects observed are due to changes in the density of the luminous material or changes of temperature, but the experiments of Sir William and Lady Huggins 1 with the spectrum of calcium are significant in suggesting that it is really the density which is also the deter- mining factor in cases where different concentrations and different spark discharges produce a change in the relative intensities of different lines.

The widening of lines does not lend itself easily to accurate measurements; more precise numerical data are obtainable by the study of the displacements consequent on increased density which were discovered and studied by W. J. Humphreys and J. F. Mohler. In the original experiments 2 the pressures could only be increased to 15 atmospheres, but in a more recent work Humphreys, 3 and independently Duffield, were able to use pressures up to 100 atmospheres. The change of frequency (dn) for a series of lines which behave similarly is approximately proportional to the frequency (n) so that we can take the fraction dn/n as a measure of the shift. It is found that the lines of the same element do not all show the same shift, thus the calcium line at 4223 is displaced by 0-4 A by 100 atmospheres pressure, while the H and K lines are only displaced through about half that amount. Duffield finds that the iron lines divide themselves into three groups with pressure shifts which are approximately in the ratio 1:2:4. Curiously enough this is also approximately the ratio of the displacements found by Humphreys in the trunk series, the side branch and main branch in the order named, in cases where these displacements have been measured. It was believed that band spectra did not show any pressure shift, until A. Dufour 4 discovered that the lines into which the band spectra of the fluorides of the alkaline earths may be resolved widen towards the red under increased pressure.

Let us now consider the causes which may affect the homo- geneity of radiation. We have first the Doppler effect, which, according to Michelson's experiment, is the chief cause of the limit at very low pressures, but it is too small to account for the widening which is now under discussion. We have further to consider the possibility of sudden changes of phrase during an encounter between two molecules, and we can easily form an estimate of the amount of apparent widening due to this cause. It is found to be appreciable but smaller than the observed effects.

Shortly after the discovery of pressure shifts A. Schuster 6 suggested that the proximity of molecules vibrating in the same period might be the cause of the diminished frequency, and suggested that according to this view the shifts would be similar if the increase of density were produced by the presence of molecules of a different kind from those whose lines are being examined. Though there is no absolutely conclusive evidence, no

experiments hitherto have given any indication that the nature of the gas producing the pressure has any effect on the amount of shift. G. F. Fitzgerald' suggested as an alternative explana- tion the change of inductive capacity of the medium due to increased density. J. Larmor 7 developed the same idea, and arrived by a very simple method at an approximation estimate of the shift to be expected.

If the medium which contains the vibration is divided into a sphere equal to k times the molecular vibration outside of which the effects of these molecules may be averaged up, so that its

1 Proc. Roy. Soc. (1897), 61, p. 433.

2 Astrophys. Journ. (1876), 3, p. 114.

3 Ibid. (1907), 26, p. 18.

4 Comptes rendus (1908), 146, pp. 118, 229.

5 Astrophys. Journ. (1896), 3, p. 292. • Ibid. (1897), 5, p. 210.

7 Ibid. (1907), 26, p. 120.

inductive capacity may be considered uniform and equal to K, the frequency of the vibration is increased in the ratio of the square root of I — k~ 2 " + (l — K~ l) to 1. Here n represents an integer which is 3 if the vibration is a simple doublet, but may have a higher integer value. If K has a value nearly equal to unity, the pressure shift is 5fe _2n + 3 (K _1 — 1) and it is significant that for different values of n, the shifts should be in geometric ratio, because as stated above, the ratio occurring in the amounts observed with different lines of the same element are as 1:2: 4. The question is complicated by the fact that in the cases which have been observed, the greater portion of the metallic vapour vibrates in an atmosphere of similar molecules, and the static energy of the field is determined by the value of K applicable to the particular frequency. It would therefore seem to be more appropriate to replace 1 — K _1 by {n 1 — i)// 2 , where fi is the refractive index; but this expression involves the wave propagation for periods coinciding with free periods of the molecules. Close to and on either side of the absorptive band y? has large positive and negative values, and if the above expression remains correct the change of frequency would, close to the Centre of absorption, be \k~ th + a , which for » — 3 and k = 10 ' is 1/2000, or 500 times greater than the observed shifts, but this represents now the maximum displacement and not the displacement of the most intense portion of the radia- tion. There is a region within the band where ji = o, ' and this would give an infinite shift in the opposite

direction. We there- fore should expect a band in place of the line, which is the case, but our calculation is not able to give the displacement of the most intense portion, which is what we require for comparison with experiment.

The effects of resonance have been studied theoretically by Prince Galitzin s and later by V. W. Ekman. 9 The latter obtains results indicating no displacement but a widening. He concludes an interesting and important investigation by giving reasons for believing that the centre of a widened line radiates with smaller energy than the adjacent parts. Hence the apparent reversals so frequently observed in the centre of a widened line may not be reversals at all but due to a reduction in luminosity. Ekman quotes in support an observation due to C. A. Young, according to which the dark line observed in the centre of each component of the sodium doublet in a Bunsen burner is transparent to a radiation placed behind. It should not be difficult to decide whether the reversals are real or fictitious.

Leaving the consideration of radical changes of a vibrating system out of account for the present, the minor differences which have been observed in the appearances of spectra under different sparking conditions are probably to a large extent due to differences in the quantities of material examined, though temperature must alter the violence of the impact and there is a possible effect due to a difference in the impact according as the vibrating system collides with an electron or with a body of atomic dimensions.

A. Schuster and G. A. Hemsalech have observed that the insertion of a self-induction in a condenser discharge almost entirely obliterates the air lines, and the same effect is produced by diminishing the spark gap sufficiently. The explanation of these facts presents no difficulty, inasmuch as during the sudden discharge which takes place in the absence of a self-induction, the metallic molecules have not sufficient time to diffuse through the spark gap; hence the discharge is carried by the gas in which it takes place. When, however, the time of discharge is lengthened, the conditions of the arc are more nearly approached. When the spark gap is small, the sudden evaporation of the metal has a better chance of filling the interval between the poles, even without the introduction of a self-induction.

Enhanced lines are lines which appear chiefly near the pole when strong spark discharges are used. Their presence indicates the characteristic difference between the spark and the arc. The name is due to Sir Norman Lockyer, who has studied these lines and drawn the attention of astronomers to their impor- tance in interpreting stellar spectra. These lines in the case of the spark cannot be due entirely to the increased mass of vapour near the poles, but indicate a real change of spectrum probably connected with a higher temperature.

8 Wied. Ann, (1895), 56, p. 78.

9 Ann. d. Phys. (1907), 24, \>. 580.

11. Molecular Velocities. — A. Schuster and G. A. Hemsalech 1 have measured the velocity with which the luminous molecules are projected from metallic poles when a strong spark is passed through the air interval which separates the poles. The method adopted consisted in photographing the spectrum on a film which was kept in rapid motion by being attached to the front of a rotating disk. The velocities ranged from about 400 to 1900 metres, the metals of small atomic weight giving as a rule the higher velocities. In the case of some metals, notably bismuth, the velocity measured was different for different lines, which seems intelligible only on the supposition that the metal vapour consists of different vibrating systems which can differ with different velocities. C. C. Schenck 2 subsequently conducted similar experiments, using a rotating mirror, and though he put a different interpretation on the effects, the main con- clusions of Schuster and Hemsalech were not affected. These have further been confirmed and extended by the experiments of J. T. Royds made with the same rotating disk, but with im- proved optical appliances. The photographs taken by Royds show the separate oscillations of each spark discharge even when the circuit only contained the unavoidable capacity of the leads. It was found that during the successive electrical oscillations the metallic lines can be observed to stretch farther and farther away from the poles, thus giving a measure of the gradual diffu- sion of the metal. The subject wants further investigation, especially with a view to deciding the connexion between the molecular rush and the discharge. While some of the phenomena seem to indicate that the projection of metallic vapours into the centre of the spark is a process of molecular diffusion independent of the mechanism of the discharge, the different velocities obtained with bismuth, and the probability that the vibrating systems are not electrically neutral, seem to indicate that the projected metallic particles are electrified and play some part in the discharge.

li. The Zeeman Effect. — The change of frequency of oscilla- tion of radiating molecules placed in a magnetic field, which was discovered by P. Zeeman, and the observed polarization of the components, are all beautifully explained by the theory of H. A. Lorentz, and leave no manner of doubt that the radiating centres are negative electrons. The fact that in certain simple cases where a line when looked at equatorially splits into a triplet, the ratio of the charge to the mass is found by Lorentz's theory to be

equal to that observed in the carrier of the kathode ray, shows that in these cases the electron moves as an independent body and is not linked in its motion to other electrons. On the other hand, most of the lines show a more complicated structure in the magnetic field, suggesting a system of electrons rather than a single free corpuscle. The question has been fully discussed by C. Runge in the second volume of Kayser's Handbuch (see also Magneto-Optics), and we may therefore content ourselves with the mention of the law discovered by Th. Preston that all the lines of the same series show identical effects when measured on the frequency scale, and the fact recently announced by Runge 3 that even in the more compli- cated cases mentioned some simple relation between the distances of the components exists. If a is the distance shown by the normal triplets the type of separation observed in the line D; shows distances from the central line equal to a/3, 311/3, 51/'.?, while the type of D! gives 211/3, 4«/3- In all observed cases the distances are multiples of some number which itself is a sub-mutiple of a. The component lines of a band spec- trum do not as a rule give the Zeeman effect, and this seems to be connected with their freedom from pressure shifts, for when Dufour had shown that the bands of the fluoride of calcium were sensitive to the magnetic field, R. Rossi 4 could show that they were also sensitive to pressure.

13. Identification of Spectra. — The interpretation of spectro- scopic observation seemed very simple when Kirchfaoff and

r Phil. Trans. (1899), 190, p. 189.

2 Astrophys. Journ. (1901), 14, p. 116.

3 Phys. Zeitschrift, 8, p. 225.

4 Proc. Roy. Soc. (1909), 82, p. 518.

Bunsen first announced their discovery, for according to their view every combination of an element showed the characteristic spectrum of its constituent atoms; it did not matter according to this view whether f a salt, e.g. sodium chloride, introduced into a flame, was dissociated or not, as in either case the spec- trum observed would be that of sodium. It was soon found, however, that compounds possess their own characteristic spectra, and that an element may give under special conditions of luminosity several different spectra. When we now speak of the identification of spectra we like to include, wherever possible, the identification of the particular compound which is luminous and even — though we have only begun to make any progress in that direction — the differentiation between the molecular or electronic states which yield the different spectra of the same element.

One preliminary question must first be disposed of. The fact that the gases with which we are most familiar are not rendered luminous by being heated in a tube to a temperature well above a white heat has often been a stumbling block and raised the not unreasonable doubt whether approximately homogeneous oscillations could ever be obtained by a mere thermal process. The experiment proves only the transparency of the gases experimented upon, and this is confirmed by the fact that bodies like bromine and iodine give on heating an emission spectrum corresponding to the absorption spectrum seen at ordinary temperatures. The subject, however, re- quired further experimental investigation, which was supplied by Paschen. Paschen proved that the emission spectra of water vapour as observed in an oxyhydrogen flame and of carbon dioxide as observed in a hydrocarbon flame may be obtained by heating aqueous vapour and carbon dioxide respectively to a few hundred degrees above the freezing point. The same author proved that a sufficient thickness of layer raised the radiation to that of a black body in agreement with Kirch- hoff's law. The spectra experimented on by Paschen were band spectra, but as these split up into fine lines the possibility of homogeneous radiation in pure thermal oscillation may be con- sidered as established. Paschen's observations originated in the desire to decide the question raised by E. Pringsheim, who, by a series of experiments of undoubted merit, tried to establish that the emission of the line spectra of the alkali metals was invari- ably associated with a reduction of the metallic oxide. Pring- sheim seems, however, to have modified his view in so far as he now seems to consider that the spectra in question might be obtained also in other ways, and to attach importance to the process of reduction only in so far as it forms an effective inciter of the particular spectra. In spite of the fact that C. Freden- hagen has recently attempted to revive Pringsheim's original views in a modified form — substituting oxidation for reduction — we may consider it as generally admitted that the origin of spectra lies with vibrating systems which are definite and not dependent on the method of incitement. These systems may only be semi-stable, but they must last a sufficient length of time to give a train of waves having a length corresponding to the observed homogeneity of the line.

In many cases there is a considerable difficulty in deciding whether a particular spectrum belongs to a compound body or to one of the elements composing the compound. Thus one of the most common spectra is that seen at the base of every candle and in every Bunsen burner. Everybody agrees that carbon is necessary for its appearance, but some believe it to be due to a hydrocarbon, others to carbon monoxide, and others to volatilized carbon. There is a vast amount of literature on the subject, but in spite of the difficulty of conceiving a luminous carbon vapour at the temperature of an ordinary carbon flame, the evidence seems to show that no other

element is necessary for its production as it is found in the spectrum of pure carbon tetrachloride and certainly in cases where chlorine is excluded. Another much disputed spectrum is that giving the bands which appear in the electric arc; it is most frequently ascribed to cyanogen, but occasionally also to carbon vapour.

Compounds generally show spectra of resolvable bands, and

if an elementary body shows a spectrum of the same type we are probably justified in assuming it to be due to a complex mole- cule. But that it may be given by the ordinary diatomic molecule is exemplified by oxygen, which gives in thick layers by absorption one of the typical sets of Bands which were used by Deslandres and others to investigate the laws of distribution of frequencies. These bands appear in the solar spectrum as we observe it, but are due to absorption by the oxygen contained in the atmosphere.

If oxygen is rendered luminous by the electric discharge, a series of spectra may be made to appear. Under different conditions we obtain (a) a continuous spectrum most intense in the yellow and green,(6) the spectrum dividing itself into two families of series, (c) a spectrum of lines which appears when a strong spark passes through oxygen at atmospheric pressure, (d) a spectrum of bands seen in the kathode glow. We have therefore five distinct spectra of oxygen apart from the absorp- tion spectra of ozone. To explain this great variability of spectroscopic effects we may either adopt the view that mole- cular aggregates of semi-stable nature may be found in vacuum tubes, or that a molecule may gain or lose one or more additional electrons and thus form new vibrating systems. It seemed that an important guide to clear our notions in this direction could be obtained through the discovery of J. Stark, who examined the spectra of the so-called " canal-rays " (Canalestrahlen). These rays are apparently the trajectories of positively charged particles having masses of the order of magnitude of the gaseous molecules. Stark discovered that in the case of the series spectrum of hydrogen and of other similar spectra the lines were displaced indicating high velocities; in other cases no displace- ments could be observed. The conclusion seemed natural that the spectra which showed the Doppler effect were due to vibra- tory systems which had an excess of positive chasge. More detailed examinations of the " canal-rays " by J. J. Thomson and others have shown however that they contain both neutral and charged molecules in a relative proportion which adjusts itself continuously, so that even neutral molecules may partake of the translatory motion which they gained while carrying a charge. No conclusion can

therefore be drawn, as Stark 1 has more recently pointed out, respecting the charge of the mole- cule which emits the observed spectrum. Nevertheless, the subject is well worth further investigation.

Previous to Stark's investigation P. Lenard 2 had concluded that the carriers of certain of the lines of the flame spectra of the alkali metals are positively charged. He draws a distinction between the lines of the trunk series to which he assigns neutral, and the lines of carriers the two branch series of which are electrically charged. The numerical relations existing between the trunk series and the branch series make it somewhat difficult to believe that they belong to different vibrating systems. But while we should undoubtedly hesitate on this ground to adopt Fredenhagen's 3 view that the two branch series belong to the element itself and the trunk series to a process of oxidation, we cannot press the argument against the view of Lenard, because the addition or subtraction of an electron introduces two vibrating systems which are still connected with each other and some numerical relationship is probable. Whatever ideas we may form on this point, the observations of Stark and Siegl 4 have shown that there is a Doppler effect, and therefore a positive charge, for one of the lines of the trunk series of potassium, and E. Dorn 5 has found the Doppler effect with a number of lines of helium, which contain representatives of the trunk series as well as of the two branch series. These facts do not countenance the view that there is an essential electric difference between the vibrating system of the three members of a family of series.

It is probable, however, that the above observations may

1 Phys. Zeitschrift (1910), IX, p. 171.

2 Ann. d. Phys. (1905), 17, p. 197.

1 Phys. Zeitschrift (I904), &, p. 735.

- *Ann. d. Phys. (1906), 21, p. 457.*
- *Phys. Zeitschrift (1907k 8, p. 5%.*

help to clear up some difficulties in the phenomena presented by flames. While we have seen that the radiation of sodium vapour has an intensity corresponding to that of the pure ther- mal radiation at the temperature of the flame, other flames not containing oxygen (e.g. the flames of chlorine in hydrogen) do not apparently emit the usual sodium radiation when a sodium salt is placed in them. In the light of our present knowledge we should look for the different behaviour in the peculiarity of the oxygen flame to ionize the metallic vapour. '

14. Fluorescence and Phosphorescence. — When a simple peri- odic force acts on a system capable of oscillatory motion the ultimate forced vibration has a period equal to that of the impressed force, but the ultimate state is only reached theoreti- cally after an infinite time, and if meanwhile the vibrating system suffers any perturbations its free periods will at once assert themselves. Applying the reasoning to the case of a homo- geneous radiation traversing an absorbing medium, we realize that the mutual disturbances of the molecules by collision or otherwise must bring in the free period of the molecule whatever the incident radiation may be. It is just in this degradation of the original period that (according to the present writer) the main phenomenon of absorption consists. 6 With most bodies the degradation goes on rapidly and the body mainly radiates accord- ing to its temperature, but there are cases in which these inter- mediate stages can be observed and the body seems then to be luminous under the influence of the incident radiation. Such bodies are said to be fluorescent, the degradation of motion towards that determined by its temperature gives rise to the law of Stokes, the fluorescent light being in nearly all cases of lower fre- quency than the incident light. With absorbing gases we should expect the degradation to proceed more slowly than with liquids, and hence the discovery of E. Wiedemann and Schmidt 7 that the vapours of sodium and potassium are fluorescent, important as it was from an experimental point of view, caused no surprise. It is not possible here to enter into a detailed description of the phenomena of fluorescence (q.v.), though their importance from a spectroscopic point of view has been materially increased through the recent researches of Wood 8 on the fluorescence of sodium vapour. After Wood and Moore had confirmed and extended the observations of Wiedemann and Schmidt and showed that the vibrating system of the fluorescent light seems identical with that observed by absorption in the fluted band spectrum, Wood excited the fluorescence by homogeneous radiation and discovered some remarkable facts. The fluores- cent bands in this case appear to shift rapidly when the period of the incident vibration is altered, though the change may be small. The author, no doubt correctly, remarks that the shift does not indicate a change of frequency but a change of relative intensity, consisting of a great number of fine lines; when the maximum intensity of the distribution of light is altered, the appearance is that of a shift. It would probably not be difficult to imagine a mechanical system having a number of free periods which when set into motion by a forced vibration shows a corre- sponding effect. If the forced vibration is suddenly stopped, the free periods will appear but not necessarily with the same intensity when the period of the original forced vibration js altered. There cannot, however, be a question that, as R, W. Wood remarks, the careful investigation of these phenomena is likely to give us an insight into the mechanism of radiation.

Phosphorescence (q.v.) can only be here alluded to in order to draw attention to the phenomena studied by Sir William Crookes and others in vacuum tubes. When kathode rays strike certain substances, they emit a phosphorescent light, the spectroscopic investigation of which shows interesting effects which are important especially as indicating the influence of slight admixtures of impurities on the luminescence. It should be mentioned that the infra-red rays have a remarkable damping effect on the phenomena of phosphorescence, a fact which has

8 Schuster, Theory of Optics, p. 254.

7 Wied. Ann. (1896), 57, p. 447.

8 R. W. Wood and Moore, Astrophys. Journ. (1903), 18, p. 95; R. W. Wood and Moore, Phil. Mag. (1905), 10, p. 513.

been made use of by Becquerel in his investigations of infra-red radiations.

15. Relationship between the Spectrum of an Element and that of Us Compounds. — In the present state of our knowledge we cannot trace any definite relationship between the spectrum of a com- pound body and that of its elements, and it does not even seem certain that such a relationship exists, but there is often a similarity between different compounds of the same element. The spectra, for instance, of the oxides and haloid salts of the alkaline earths show great resemblance to each other, the bands being similar and similarly placed. As the atomic weight of the haloid increases the spectrum is displaced towards the red.

It is in the case of the absorption spectra of liquids that we can most often discover some connexion between vibrations of a complex system and that of the simpler systems which form the complex. The most typical case in this respect is the effect of a solvent on the absorption spectrum of a solution. A. Kundt, 1 who initiated this line of investigation, came to the conclusion that the absorption spectra of certain organic substances like cyanin and fuchsin were displaced towards the red by the solvent, and that the displacement was the greater the greater the disper- sive power of the solvent. This law cannot be maintained in its generality, but nevertheless highly dispersive substances like carbon bisulphide are always found to produce a greater shift than liquids of smaller dispersion like water and alcohol. In these cases the solvent seems to act like an addition to the mass of the vibrating system, the quasi-elastic forces remaining the same.

Dr J. H. Gladstone, 2 at an early period of spectroscopy, examined the absorption spectra of the solution of salts, each constituent cf which was coloured. He concluded that generally but not invariably the following law held good: " When an acid and a base combine, each of which has a different influence on the rays cf light, a solution of the resulting salt will transmit only those rays which are not absorbed by either, or, in other words, which are transmitted by both." He mentioned as an important exception the case of ferric ferrocyanide, which, when dissolved in oxalic acid, transmits the rays in great abun- dance, though the same rays be absorbed both by ferrocyanides and by ferric salts. Soret has confirmed, for the ultra-violet rays, Dr Gladstone's conclusions with regard to the identity of the absorption spectra of different chromates. The chromates of sodium, potassium and ammonium, as well as the bichromates of potassium and ammonium, were found to give the same absorption spectrum. Nor is the effect of these chromates con- fined to the blocking out simply of one end of the spectrum, as in the visible part, but two distinct absorption bands are seen, which seem unchanged in position if one of the above-mentioned chromates is replaced by another. . Chromic acid itself showed the bands, but less distinctly, and Soret does not consider the purity of the acid sufficiently proved to allow him to draw any certain conclusions from this observation.

In many of these cases the observed facts might perhaps be explained by" dissociation, the undissociated compound pro- ducing no marked effect on the spectra. In 1872 W. N. Hartley and A. K. Huntingdon examined by photographic methods the absorption spectra of a great number of organic compounds. The normal alcohols were found to be transparent to the ultra-violet rays, the normal fatty acids less so. In both cases an increased number of carbon atoms increases the absorption at the most refrangible end. The fact that benzene and its deriva- tives are remarkable for their powerful absorption of the most refrangible rays, and for some characteristic absorption bands appearing on dilution, led Hartley to a more extended examina- tion of some of the more complicated organic substances. He determined that definite absorption bands are only produced by substances in which three pairs of carbon atoms are doubly linked together, as in the benzene ring. Subsequently 3 he subjected the ultra-violet absorption of the alkaloids to a careful

1 Wied. Ann. (1878), 4, p. 34.

2 Phil. Mag. (1857), 14, p. 418.

3 Phil. Trans. (1885), pt. ii.

investigation, and arrived at the conclusion that the spectra are sufficiently

characteristic to " offer a ready and valuable means of ascertaining the purity of the alkaloids and particularly of establishing their identity."

We can only briefly refer to an important investigation of Sir William Abney and Colonel E. R. Festing, who examined the infra-red absorption of a number of substances. We may quote one of the principal conclusions at which they arrived: —

" An inspection of our maps will show that the radical of a body is represented by certain well-marked bands, some differing in position according as it is bonded with hydrogen, or a halogen, or with carbon, oxygen or nitrogen. There seem to be characteristic bands, however, of any one series of radicals between 1000 and about 1 100, which would indicate what may be called the central hydrocarbon group, to which other radicals may be bonded. The clue to the composition of a body, however, would seem to lie between 700 and 1000. Certain radicals have a distinctive absorp- tion about 700 together with others about goo, and if the first be visible it almost follows that the distinctive mark of the radical with which it is connected will be found. Thus in the ethyl series we find an absorption at 740, and a characteristic band, one edge of which is at 892 and the other at 920. If we find a body contain- ing the 740 absorption and a band with the most refrangible edge commencing at 892, or with the least refrangible edge terminating at 920, we may be pretty sure that we have an ethyl radical present. So with any of the aromatic group; the crucial line is at 867. If that line be connected with a band we may feel certain that some derivative of benzene is present. The benzyl group shows this remarkably well, since we see that phenyl is present, as is also methyl. It will be advantageous if the spectra of ammonia, benzene, aniline and dimethyl aniline be compared, when the re- markable coincidences will at once become apparent, as also the different weighting of the molecule. The spectrum of nitrobenzene is also worth comparing with benzene and nitric acid. In our own minds there lingers no doubt as to the easy detection of any radical which we have examined, . . . and it seems highly probable by this delicate mode of analysis that the hypothetical position of any hydrogen which is replaced may be identified, a point which is of prime importance in organic chemistry. The detection of the pres- ence of chlorine or bromine or iodine in a compound is at present undecided, and it may be well that we may have to look for its effects in a different part of the spectrum. . The only trace we can find at present is in ethyl bromide, in which the radical band about 900 is curtailed in one wing. The difference between amyl iodide and amyl bromide is not sufficiently marked to be of any value."

The absorption spectra of cobalt and didymium salts also offer many striking examples of minor changes produced in spectra by combination

and solution. (A. S.)*

Apparatus. — Spectroscopes may be divided into two classes: prism spectroscopes, with angular or direct vision, and grating spectroscopes; the former acting by refraction {q.v.), the latter by diffraction or interference. Angular prism spectroscopes are the commonest. Such an instrument consists of a triangular prism set with its refracting edge vertical on a rigid platform attached to a massive stand. The prism may be made of a dense flint glass or of quartz if the ultra-violet is to be explored, or it may be hollow and filled with carbon bisulphide, a-bromnaph- thalene or other suitable liquid. Liquid prisms, however, suffer from the fact that any change of temperature involves a change in the refractive index of the prism. The stand carries three tubes: the collimator, observing telescope and scale telescope. The colli- mator has a vertical slit at its outer end, the width of which may be regulated by a micrometer screw; in some instruments one half of the slit is covered by a small total reflection prism which permits the examination of two spectra simultaneously. At the other end of the collimator there is a condensing lens for bringing the rays into parallelism. The observing telescope is of the ordinary terrestrial form. The scale telescope contains a graduated scale which is illuminated by a small burner; the scale is viewed by reflection from the prism face opposite the first refracting face. The power may be increased, but with a diminution of intensity, by using a train of prisms. Steinheil made an instrument of four prisms, each of which had, however, to be set in the position of minimum deviation by trial. In Browning's form the setting is automatic. The dispersion may be further increased by causing the rays to pass more than once through the prism or prisms. Thus, by means of a system of reflecting prisms, Hilger passed the dispersed rays six times through one prism, and, by similar means, Browning passed the rays first through the upper part of a train and then back through the lower part. Compound prisms are also employed. Rutherfurd devised one made of flint glass with two crown glass compensating prisms; whilst Thallon employed a hollow prism containing carbon bi- sulphide also compensated by flint glass prisms. In direct vision spectroscopes the refracting prisms and slit are m. the observing

telescope. The prisms are necessarily compound, and usually consist of flint glass with compensating prisms of crown. In all cases where compound prisms are used, the angles must be accur- ately calculated. Amici in i860 devised such an instrument; an improved form by Jannsen was made up of two flint and three crown prisms, and in Browning's form there are three flint and four crown. Sorby and, later, Abbe, designed instruments on the

same principle to be used in connexion with the microscope. By suitably replacing the ocular of the observing telescope in an angular vision spectroscope by a photographic camera, it is possible to photograph spectra; such instruments are termed spectrographs. In grating spectroscopes both plane and concave gratings are employed in connexion with a collimator and observing telescope.

Authorities. — The standard work is H. Kayser, Handbuch der Spectroscopic (1900-1910, vol. v.). See also J. Landauer, Spectrum Analysis (Eng. trans, by J. B. Tingle, 1898); E. C. C. Baly, Spectroscopy (1905). For spectra see A. Hagerbach and H. Konin, Atlas of Emission Spectra (Eng. trans, by A. S. King, 1905); F. Exner and E. Haschek, Wellenldngen-Tabellen (1902-1904); W. M. Watts, Index of Spectra; also reports of B.A. Special Committee.

SPECULATION, a round game of cards at which any reasonable number can play. Each player contributes a stake to the pool, the dealer staking double. Three cards are dealt face down- wards to each player; the top card of those left is turned up for trumps. Each player, beginning with the player on the dealer's left, turns up a card; if it is not a trump, or is a lower trump than the trump-card, the next player turns up one of his cards, and so on till a higher trump than the trump-card appears, the values being reckoned as at whist. The holder may sell this card to the highest bidder, or retain it. The turning-up proceeds till a still higher trump is found, but the holder of the original highest does not turn up till his card is beaten. The new card may then be sold. The dealer may not turn up till the trump-card has been beaten. The holder of the highest trump when all the hands have been exposed takes the pool. If the ace of trumps is the trump-card, the dealer takes the pool ; if it is turned up during play, the hand is, of course, at an end. Variations of the game allow the purchase of unseen cards or hands, or of the trump-card, even before it is turned up. The cards used in one deal are not dealt again till the whole pack has been gradually dealt out; they are col- lected and shuffled by the " pone " — the player on the dealer's right — to be used when the pack is exhausted.

SPECULUM, the Latin word for a mirror, employed more particularly for a metallic mirror used in a reflecting telescope. In early instruments metallic mirrors, made from an alloy of copper and tin, with the addition of a little arsenic or other metals to increase the whiteness, were customarily employed, but they have now been displaced by the more convenient silver-on-glass mirror (see Telescope). Various forms of specula are used in surgery for examining internal organs.

SPEDDING, JAMES (1808-1881), English author, editor of the works of Bacon, was born on the 26th of June 1808, in Cumber- land, the younger

son of a country squire. He was educated at Bury St Edmunds and Trinity College, Cambridge, where he took a second class in the classical tripos, and was junior optime in mathematics in 183 1. In 1835 he entered the colonial office, but he resigned this post in 1841. In 1842 he was secretary to Lord Ashburton on his American mission, and in 1855 he became secretary to the Civil Service Commission; but from 1841 on- wards he was constantly occupied in his researches into Bacon's life and philosophy. On the 1st of March 1881 he was knocked down by a cab in London, and on the 9th he died of erysipelas. His great edition of Bacon was begun in 1847 in collaboration with R. E. Ellis and D. D. Heath. In 1833 Ellis had to leave the work to Spedding, with the occasional assistance of Heath, who edited most of the legal writings. The Works were pub- lished in 1857-1859 in seven volumes, followed by the Life and Letters (1861-1874). Taken together these works contain practically all the material which exists in connexion with the subject, collected and weighed with the utmost care and im- partiality. Spedding humorously emphasized his devotion to Bacon in the title of one of his non-Baconian works, Reviews and Discussions, Literary, Political and Historical, not relating to Bacon (1879); and his literary remains outside that one field are no longer of interest. But as a Baconian scholar he is not likely soon to be superseded.

SPEED, JOHN (1552-1629), English historian and carto- grapher, was born, according to Fuller, at Farringdon, Cheshire. He was the son of a London tailor, and followed his father's trade, being admitted member of the Merchant Taylors Company in 1 580. He settled in Moorfields, where he built himself a house. He was enabled to give up his trade and to devote himself to antiquarian pursuits through the kindness of Sir Fulke Greville, whom Speed calls the " procurer of my present estate," and through his patron's interest he also received a " waiter's room in the custom-house." The results of the leisure thus secured to him appeared in 161 1 in his Theatre of the Empire of Great Britaine, a series of fifty-four maps of different parts of England, which had already appeared separately, and in which he was helped by Christopher Saxton, John Norden and William White. To each map descriptive matter was attached. In 161 1 also he published his History of Great Britaine under the Conquests of the Romans . . . to . . . King James. Speed acknowledges his obligations to the chief antiquaries and historians of his day. Sir Robert Cotton lent him manuscripts and coins, and is said to have revised the proofs for him; in heraldry he acknowledges the help of William Smith (1550?- 1618); and he had valuable help from John Barkham (1572?- 1642) and Sir Henry Spelman. Speed brought some historical skill to bear on the arrangement of his work, and although he repeated many of the errors of older chroniclers he added valuable material for the history of his country. He died in London on the 28th of July 1629.

Other maps of his, beside those in the Theatre, are in the British Museum. Another edition of the Theatre is Theatrum Magnae Britanniae latine, redditum a P. Holland (London, folio, 1616). He wrote Genealogies Recorded in Sobered Scriptures (161 1), and a similar work, A Cloud of Witnesses (1616). These passed through numerous editions, and were frequently prefixed to copies of the Bible. An account of Speed's descendants is to be found in Rev. J. S. Davies's History of Southampton (1883), which was founded on MS. material left by John Speed (1703-1781).

SPEETON BEDS, in English geology, a series of clays well exposed at Speeton, near Filey on the Yorkshire coast. Peculiar interest attaches to these beds for they are the principal repre- sentatives in Britain of the marine phase of the Lower Creta- ceous system. The Speeton Clays pass downwards without break into the underlying Kimeridgian; they are capped by the Red Chalk, which may be regarded as the equivalent of the Upper Gault of southern England. These beds thus form a passage series between marine Jurassic strata and those belong- ing undoubtedly to the Cretaceous system; in this way they correspond with the Purbeck-Wealden rocks, which form a connecting link between estuarine Jurassic and Cretaceous strata.

Above the dark, bituminous, nodular shales with Kinieridge fossils at the base of the Speeton Clay comes the zone of Belem- nites lateralis (34 ft.), withOlcostephanus gravesiformis, O. rotula, and species of Hoplites and Oxynoticeras; this is followed by the zone of Belemnites jaculum, with B. crislatus, Olcostephanus (Astieria) astieri, O. {Simbirskites) inversus and 0. (S.) Speetonen sis in ascending order; Echinospatagus cordiformis, a species found' in the typical Neocomian area, also occurs in this zone. The next higher zone is that of Belemnites brunsvicensis (= semi-canaliculatus) (100 ft.), with B. Speetonensis, Hoplites des- hayesii, and Amaltheus bicurvatus. The topmost zone is charac- terized by Belemnites minimus with Inoceramus concentricus and /. sulcatus; it consists of a few feet of mottled clays. It appears, therefore, that while the lower portions of the Speeton Clay are the equivalents of the Wealden and perhaps of the Pur- beck beds, the higher portions are the equivalents of the Lower Greensand and part of the Gault. In Lincolnshire the upper Speeton beds are represented by the Carstone and Tealby Lime- stone and Clay, and the lower Speeton by the Claxby Ironstone, Spilsby Sandstone and lower part of the Tealby clay. A similar faunal horizon is recognized in Heligoland and Russia.

See Cretaceous; Neocomian; Kimeridgian; also G. W. Lamp- lugh, Q.J.G.S. (1889), xlv. (1896), Hi.; Rep. Brit. Assoc. (1890); A. Pavlow and G. W. Lamplugh, Bull. soc. imp. nat. Moscow (1891), and Q.J,G,S, (1897), liii.

SPEKE, HUGH (1656-c. 1724), English writer and agitator, was a son of George Speke (d. 1690) of White Lackington, Somerset. The older Speke was a member of the Green Ribbon Club, the great Whig organization which was founded in 1675, and was a supporter of the duke of Monmouth, voting for the Exclusion Bill in 1681. Educated at St John's College, Oxford, Hugh Speke joined the Green Ribbon Club, and in 1683 he was put in prison for asserting that Arthur Capell, earl of Essex, another of Monmouth's supporters, had been murdered by the friends of the duke of York. He was tried and sentenced to pay a fine, but he refused to find the money, and remained in prison for three years, being in captivity during Monmouth's rebellion, in consequence of which his brother Charles was hanged at Ilminster. In prison Speke kept a printing-press, and from this he issued the Address to all the English Protestants in the Present Army, a manifesto written by the Whig divine Samuel Johnson (1649-1703), urging the soldiers to mutiny. In 1687 he was released, and in 1688 he served James II. as a spy in the camp of William of Orange. In December of this year a document, apparently official, was found by a London bookseller. This called upon the Protestants to disarm their Roman Catholic neighbours; it was freely circulated, and much damage was done to property in London before it was found that it was a forgery. It appears to have been the work of Speke, although this was not known until 1709, when he asserted his authorship in his Memoirs of the Most Remarkable Passages and Transactions of the Revolution. He afterwards issued these memoirs with modifications as The Secret History of the Happy Revolution in 1688 (17 15). After imploring both Anne and George I. to reward his past services, Speke died in obscurity before 1725.

SPEKE, JOHN BANNING (1827-1864), English explorer, discoverer of the source of the Nile, was born on the 4th of May 1827 at Jordans near Ilminster, Somersetshire. On his father's side he descended from the ancient Yorkshire family of Espec, a branch of which migrated to Somerset in the 15th century. His mother was a Miss Georgina Hanning, of Dillington Park, Somerset. Through his mother's influence with the duke of Wellington he obtained a commission in the Indian Army, which he entered in 1844. He served in Sir Colin Campbell's division in the Punjab campaigns, and acquired considerable repute both as a soldier and as a sportsman and naturalist. When on furlough Captain Speke had explored portions of the Himalayas, had crossed the frontier into Tibet and mapped part of its south-western districts; but his attention was at an early date turned to the great problems of African geography, and in 1854 he began his brief and brilliant African career by joining Captain (afterwards Sir) Richard Burton

in an expedition into the interior of Somaliland, the incidents of which are narrated in What led to the Discovery of the Source of the Nile (London, 1864). In April 1854″ the expedition was attacked by Somalis near Berbera, one officer being killed, Burton slightly, and Speke severely wounded. Invalided home, Speke shortly afterwards volunteered for the Crimea and served during the war with a regiment of Turks. In 1856 he accepted an invitation from Burton to join an expedition to verify the reports as to the existence of great lakes in east central Africa, and especially to try and find Lake Nyassa. The route to Nyassa was closed by the Arabs, and the travellers left Zanzibar in June 1857 by a more northerly route, which brought them by November to a place called Kaze in Unyamwezi. Here they learnt from an Arab trader that further inland were three great lakes — and Speke leapt to the conclusion that the most northerly of the three would prove to be the source of the Nile. Continuing westward in January 1858 the travellers reached Lake Tanganyika, of which they made a partial explora- tion, Speke marking on his map the mountains which close in the lake to the north, " Mountains of the Moon." By June they were back at Kaze, and here Speke induced his chief, who was ill, to allow him to attempt to reach the northern lake. Marching north for twenty-five days, on the 30th of July Speke reached a creek, along which he travelled till, on the 3rd of August, he saw it open up into the waters of a lake extending northward to the

horizon. He no longer doubted that this lake — the Victoria Nyanza — was the source of the Nile. Returning to Kaze (August 25) he made known his discovery to Burton, who did not believe Speke's theories. The explorers reached Zanzibar early in 1859, Speke hastened back to England in advance of his comrade, and at once made public his discoveries and con- clusions. Despite the scepticism of his fellow traveller and many geographers, he secured the support of Sir Roderick Murchison, president of the Royal Geographical Society, under whose direction a new expedition, expressly intended to solve the Nile problem, was fitted out. Of this expedition Speke had the command, his only European companion being Captain (after- wards Colonel) J. A. Grant (q.v.). The expedition, over 200 men all told, started from Zanzibar in October i860 and reached Kaze on the 24th of January 1861. Despite illness and the hostility and extortions of the natives the Victoria Nyanza was again reached, at its south-west corner, in October 1861. Following the western shores of the lake Speke crossed the Kagera on the 16th of January 1862, and arrived at the capital of Uganda on the 19th of February following. Here he was de- tained by the king, Mtesa, for some months, but at last prevailed on the chief to furnish him with guides, and on the 28th of July Speke stood at the spot where the Nile issued from the lake. The great discovery was made, the problem which had baffled all previous efforts — extending over 2000

years — was solved. The troubles of the travellers were, however, by no means over; with difficulty they obtained permission to enter Unyoro, and with difficulty were allowed to leave, without being permitted to visit another large lake (the Albert Nyanza) of whose existence and connexion with the Nile they learned. As far as possible Speke and Grant followed the course of the Nile, and on the 3rd of December came in touch with the outside world once more, striking in 3 10′ 37″ N. an outpost established at the request of John Petherick, British consul at Khartum, who had been charged with a mission for the relief of the explorers. On the 15th of February 1863 they arrived at Gondokoro, the Egyptian post on the Nile marking the limit of navigability from the north. At Gondokoro they met Sir Samuel (then Mr) Baker, generously giving him the information which enabled him to discover the Albert Nyanza. From Khartum Speke telegraphed to London the great news that the Nile had been traced to its source, and on his return to England he Was received with much enthusiasm. In the same year (1863) he published his Journal of the Discovery of the Source of the Nile, a work full of geographical, ethnological and zoological information, and written in a frank, attractive style. The accuracy of his observations and the correctness of his main deductions have been since abundantly justified. But as Speke had not been able to follow the Nile the whole way from the Victoria Nyanza to Gondokoro, and as the part played in the Nile regime by the Albert Nyanza was then unknown, Burton and others remained unconvinced, and Speke's conclusions were criticized in The Nile Basin (1864), a joint pro- duction of Burton and James McQueen ; it being argued in this work that Tanganyika was the true Nile source. It was arranged that Speke should meet Burton at the meeting of the geographi- cal section of the British Association at Bath on the 16th of September and publicly debate the question of the Nile source. On the previous afternoon Speke was out partridge shooting at Box, near Bath. In getting over a low stone wall he laid down his gun at half cock. Drawing the weapon towards him by the muzzle one barrel exploded and entered his chest, inflicting a wound from which Speke died in a few minutes. A granite obelisk to his memory was erected by public subscription in Kensington Gardens.

See, besides the works mentioned, Sir R. F. Burton, The Lake Regions of Central Africa (London, i860); J. A. Grant, A Walk across Africa (London, 1864); T. D. Murray and A. S. White, Sir Samuel Baker: a Memoir (London, 1895); The Times (Sept. 17 and 19, 1864) ; Sir H. H. Johnston, The Nile Quest (London, n. d. [1903]).

SPELLING BEE, a match in which two sides contest in accuracy of spelling. The custom, an old one, was revived in the schools of the United States about the year 1873, and rapidly spread

throughout the country and to Great Britain, enjoying for a few years an extraordinary vogue, not only in schools, but in all classes and ages of society. In the United States inter-city and inter-state matches were not unknown. According to the generally recognized rules a competitor who misspelled a word retired, and the match was won by the side having the greatest number of survivors at the close. The use of the word " bee " as an assemblage of persons for the purpose of joint work or play originated in America in colonial times, and was taken from the labour of the bees of a hive. Familiar examples of it are husking- bee and quilting-bee, assemblages of villagers for the purpose of helping a neighbour with the husking of the corn or his wife with her quilt-making.

SPELLO (anc. Hispellum, q.v.), a town of Umbria, in the province of Perugia, from which it is 22 m. S.E. by rail, 1030 ft. above sea-level. Pop. (1901), 5571. It is picturesquely situated on the slope of a mountain. The Cappella Baglioni in the church of S. Maria Maggiore contains some of Pinturicchio's finest frescoes (1501), " The Annunciation," " The Adoration " and " Christ in the Temple." The rich background with gold decoration in relief is characteristic. There is also a late altar- piece by Perugino (1521) and a fine early Renaissance canopy by Rocco da Vicenza (15 15). In the sacristy is a crucifix in silver by Paolo Vanni of Perugia (1398). The holy- water basin is formed of a sepulchral cippus of the Roman period. S. Andrea contains a large altarpiece by Pinturicchio (1508), upon which a letter from G. Baglioni to the artist is painted.

See G. Urbini, in L'Arte (1897), ii. 367 sqq., (1898), iii. 16 sqq.
SPELMAN, SIR HENRY (c. 1564-164^, English antiquary, wag the eldest son of Henry Spelman, of Congham, Norfolk, and the grandson of Sir John Spelman (c. 1495-1544), judge of the king's bench, Born probably in 1 564, he was educated at Walsingham School, and proceeded in 1580 to Trinity College, Cambridge, where he took his degree in 1583. His father had died in 1581, and on Spelman devolved the management of the family estates. He became a member of Lincoln's Inn, but in 1590 he returned to Norfolk, where he married Eleanor 1'Estrange. He became guardian to his brother-in-law, Sir Hamon 1'Estrange, on whose property at Hunstanton he resided for some time. He occupied himself with the history and antiquities of his native county, writing an account of Norfolk for John Speeds's Theatre of Great Brilaine. He belonged to the Society of Antiquaries, of which Sir Robert Cotton and William Camden were also members. The society gradually declined, and Spelman's efforts to revive it in 1614 were frustrated by James I. Having bought in 1594 the remainder of the two

leases of two abbeys of which the Crown was the lessor, he became involved in prolonged litigation over them, and a judgment given against him by Bacon makes it interesting to find Spelman subsequently among the petitioners who alleged corruption against the lord chancellor. His experience in this process no doubt combined with a scandal connected with a church and parsonage in the possession of his uncle Francis Sanders to occasion his pamphlet De non temer- andis ecclesiis (1613-1616), which induced many lay owners of ecclesiastical spoils to make restitution, and Spelman himself acted accordingly. This tract led up to his History and Fate of Sacrilege, 1 which was in the hands of the printer when the Great Fire broke out. The book was supposed to have perished, but Bishop Gibson discovered part of it in the Bodleian Library. It was printed, not, however, under his editorship, in 1698, with the statement on the title-page that it was " wrote in 1632." Spelman had conceived the idea of a work on the foundations of English law, based on early charters and records, but finding that there were no adequate means of determining the exact meaning of the Anglo-Saxon and Latin law terms employed in the documents, he began to compile a glossary, the first volume of which, Archaeologus in modum glossarii, was published at his own expense in 1626. He continued to work at the subject until 1638. A second volume, Glossarium archaiologicum (1664), appeared after his death. His Codex legum veterum staiutorum 1 This was re-edited as late as 1895, with an appendix bringing the subject up to date, by C. F. S. Warren.

regni Angliae, quae ab ingressu Gulielmi I usque ad annum nonum Henry III. edita sunt was published by David Wilkins in his Leges anglo-saxonicae (1721). Spelman's most important work, Concilia, decreta, leges, constitutiones in re ecclesiarum orbis britannici, is an attempt to place English church history on a basis of genuine documents. The first volume, which occupied him seven years, came down to 1066 and was published in 1636. A second volume was edited by Sir William Dugdale in 1664. Spelman entered parliament as member for Castle Rising in 1597, and in 1604 was high sheriff of his county. In 161 2 he settled in London near his friend Sir Robert Cotton. In 16 1 7 he served on a commission to inquire into disputed Irish estates, and later took part in three legal inquiries into the exactions levied on behalf of the Crown in the civil and ecclesias- tical courts. He was member of parliament for Worcester in 1625. In 1627 he became treasurer of the Guiana Company, and he was also an energetic member of the council for New England. His general services to the state were recognized in 1636 by a gift of money, and two years later by the offer of the mastership of Sutton's Hospital, Charterhouse. He died in London in October 1641, and was buried in Westminster Abbey. His later years had been spent in the house of his son-in-law, Sir Ralph Whitfield.

His son, Sir John Spelman (1 594-1643), also gained a reputa- tion as a

scholar and antiquary. He was knighted in 1641 and served the king actively at the beginning of the Civil War. He edited from MSS. in his father's library Psalterium Davidis latino- saxonicum velus (1640), and wrote a Life of Alfred the Great which was translated into Latin and published in 1678.

Edmund Gibson, bishop of London, published in 1723 The English Works of Sir Henry Spelman, Kt., PublisJied in his Lifetime; together with his Posthumous works relating to the Laws and Antiquities of England. The first section contained De non Temerandis Ecclesiis, already mentioned; The Larger Treatise concerning Tythes, first published in 1646; De sepultura; and Villare anglicum, or a View, of the Towns of England; while the second included The Original, Growth, Propagation and Condition of Feuds and Tenures by Knight- service in England, written in 1639; Two Discourses: i. Of the Ancient Government of England, ii. Of Parliaments; The Original of the Four Terms of the Year, written in 1614 and first printed in 1684; Icenia: a Latin description of Norfolk, and some other treatises. This was a revised edition of an earlier collection (1698), and contained a life of the author, based chiefly on the autobiographical matter prefixed to the Glossary of 1626, and two additional papers, Of the Admiral Jurisdiction, and the Officers thereof, and Of Antient Deeds and Charters. Wilkins's edition of his Concilia was edited by A. W. Haddan and W. Stubbs in 1869-1873.

SPENCE, THOMAS (1750-1814), inventor of a system of land nationalization, was born at Newcastle-on-Tyne on the 21st of June 1750, the son of a Scottish netmaker and shoemaker. A dispute in connexion with common land rights at Newcastle impelled him to the study of the land question. His scheme was not for land nationalization proper, but for the establish- ment of self-contained parochial communities, in which rent paid to the corporation, in which the absolute ownership of the land was vested, should be the only tax of any kind. His pamphlet, The Meridian Sun of Liberty, which was first hawked in Newcastle, appeared in London in 1793; it was reissued by Mr H. M. Hyndman under the title of The Nationalization of the Land in 1775 and 1882. Spence presently left Newcastle for London, where he kept a bookstall in High Holborn. In 1784 he spent six months in Newgate gaol for the publication of a pamphlet distasteful to the authorities, and in 1801 he was sentenced to twelve months' imprisonment for seditious libel in connexion with his pamphlet entitled The Restorer of Society to its Natural State. He died in London on the 8th of September 1814. His admirers formed a " Society of Spencean Philan- thropists," of which some account is given in Harriet Martineau's England During the Thirty Years' Peace.

See also Davenport, Life, Writings and Principles of Thomas Spence

(London, 1836).

SPENCER, HERBERT (1820-1903), English philosopher, • was born at Derby on the 27th of April 1820. His father, William George Spencer, was a schoolmaster, and his parents' religious convictions familiarized him with the doctrines of the

Methodists and Quakers. He declined an offer from his uncle, the Rev. Thomas Spencer, to send him to Cambridge, and so was practically self-taught. During 1837-1846 he was employed as an engineer on the London & Birmingham railway; 1848-18 53 as sub-editor of the Economist. From about this time to i860 he contributed a large number of articles to the Westminster Review, which contain the first sketches of his philosophic doctrines. He also published two larger works, Social Statics in 1850, and Principles of Psychology in 1855. In i860 he sent out the syllabus of his Synthetic Philosophy in ten volumes, and in spite of frequent ill health had the satisfaction of com- pleting it in 1896 with the third volume of the Principles of Sociology. He died on the 8th of December 1003.

Herbert Spencer's significance in the history of English thought depends on his position as the philosopher of the great scientific movement of the second half of the 19th century, and on the friendship and admiration with which he was regarded by men like Darwin, G. H. Lewes and Huxley. Spencer tries to express in a sweeping general formula the belief in progress which pervaded his age, and to erect it into the supreme law of the universe as a whole. His labours coincided in time with the great development of biology under the stimulus of the Darwinian theory, and the sympathizers with the new views, feeling the need of a comprehensive survey of the world as a whole, very widely accepted Spencer's philosophy at its own valuation, both in England and, still more, in America. In spite of this, however, his heroic attempt at a synthesis of all scientific knowledge could not but fall short of its aim. Living at the commencement of an epoch of unparalleled scientific activity, Spencer could not possibly sum up and estimate its total production. To the specialists in sciences which were advancing rapidly and in divergent directions to results which often reacted on and transformed their initial assumptions, Spencer has often appeared too much of a philosopher and defec- tive in specialist knowledge. To the technical philosophers, who strictly confine themselves to the logical collation and criticism of scientific methods, he has, contrariwise, not seemed philosophic enough. Hence his doctrines were open to damaging attacks from both sides, the more so as he always stood aloof from the academic spirit and its

representatives. It seems unlikely, therefore, that as a system the Synthetic Philosophy will prove long-lived; but this hardly detracts from its fruitfulness as a source of suggestion, or from the historic influence of many of its conceptions on the culture of the age.

This estimate of Spencerian philosophy may be substantiated by a brief survey of its origin and leading characteristics. Spencer claims, with some reason, that he was always an evolu- tionist. But his notions of what " evolution " is developed quite gradually. At first he seems to have meant by the word only the belief that progress is real, and that the existing order of nature is the result of a gradual process and not of a " special creation." In Social Statics (1850) he still regards the process teleologically, and argues after the fashion of Paley that " the greatest happiness is the purpose of creation" (ch. iii. § 1), and that to " gag the moral sentiment " is " to balk creative design" (ch. xxxii. § 7). But this phraseology soon dis- appears, without his considering how, in default of some sort of teleology, it is legitimate to treat the world's history as a process. In The Development Hypothesis (1852) he objects strongly to the incredibility of the special creation of the myriad forms of life, without, however, suggesting how development has been effected. In Progress, its Law and Cause (1857) he adopted Von Baer's law, that the development of the individual proceeds from the homogeneous to the heterogeneous. This is at once connected with the nebular hypothesis, and subsequently " deduced " from the ultimate law of the " persistence of force," and finally supplemented by a counter-process of dissolution, all of which appears to Spencer only as " the addition of Von Baer's law to a number of ideas that were in harmony with it." It is clear, however, that Spencer's ideas as to the nature of evolution were already pretty definite when Darwin's Origin of Species (1859) revolutionized the subject of organic evolution

by adding natural selection to the direct adaptation by use and disuse, and so suggesting an intelligible method of producing modifications in the forms of life. Spencer welcomed the Darwinian theory, and enriched it with the phrase " survival of the fittest "; but he did not give up the (Lamarckian) belief in the hereditary transmission of the modifications of organisms by the exercise of function. Shortly afterwards (i860) he sent out the prospectus of a systematic exposition of his Synthetic Philosophy, of which the first volume, First Principles, appeared in 1862. This work is divided into two parts; the first intended to show that while ultimate metaphysical questions are insoluble they compel to a recognition of an inscrutable Power behind phenomena which is called the Unknowable; the second devoted to the formulation and illustration of the Law of Evolution. In the first part Spencer's argument rests on Mansel's Limits of Religious Thought and Hamilton's " philosophy of the con- ditioned " (and so ultimately on Kant), and tries to show that alike in scientific and religious thought the

ultimate terms are " incanceivable " (not by him distinguished from" unimagin- able "). In science, the more we know the more extensive " the contact with surrounding nescience." In religion the really vital and constant element is the sense of mystery. This is illustrated by the difficulties inherent in the conception of Cause, Space, Time, Matter, Motion, the Infinite, and the Absolute, and by the " relativity of knowledge," which precludes know- ledge of the Unknowable, since " all thinking is relationing." Yet the Unknowable may exist, and we may even have an " indefinite knowledge " of it, positive, though vague and extralogical. Hence both science and religion must come to recognize as the " most certain of all facts that the Power which the Universe manifests to us is utterly inscrutable." Thus to be buried side by side in the Unknowable constitutes their final reconciliation, as it is the refutation of irreiigion which consists of "a lurking doubt whether the Incomprehensible is really incomprehensible."

Such are the foundations of Spencer's metaphysic of the Unknowable, to which he resorts in all the fundamental difficul- ties which he subsequently encounters. Whatever its affinities with that version of " faith " which regards it as antagonistic to knowledge, it can hardly be deemed philosophically satis- factory. A failure to solve the problems of metaphysics must always remain a failure, in spite of all protestations that it was inevitable; and it in no wise justifies an advance to so self-contradictory an asylum ignorantiae as the Unknowable. In the edition of his First Principles, published in 1900, Spencer adds a " postscript " which shows some consciousness of the contradiction involved in his knowledge of the Unknowable, and finally contends that his account of the Knowable in part ii. will stand even if part i. be rejected. Even this, however, understates the case, seeing that a really inscrutable Unknow- able would destroy all confidence in the order of nature and render all knowledge entirely precarious.

In part ii. Spencer recognizes successively likenesses and unlikenesses among phenomena (the effects of the Unknowable) , which are segregated into manifestations, vivid (object, non- ego) or faint (subject, ego), and then into space and time, matter and motion and force, of which the last is symbolized for us by the experience of resistance, and is that out of which our ideas of matter and motion are built. Hence the Persistence of Force is the ultimate basis of knowledge. From it Spencer proceeds to deduce the indestructibility of matter and energy, the equiva- lence and transformation of forces, the necessity of a rhythm, of Evolution {i.e. integration of matter with concomitant dissipation of motion) and Dissolution, and finally reaches the statement of the Law of Evolution as " an integration of matter and concomitant dissipation of motion, during which the matter passes from an indefinite incoherent homogeneity to a definite coherent

heterogeneity, and during which the retained motion undergoes a parallel transformation." This process of evolution is due to " the instability of the homogeneous," the " multiplication of effects " and their " segregation," con- tinuing until it ceases in complete " equilibration." Sooner

or later, however, the reverse process of Dissolution, with its absorption of motion and disintegration of matter, which indeed has always been going on to some extent, must prevail, and these oscillations of the cosmic process will continue with- out end.

It appears, therefore, that Spencer ultimately describes the Knowable in terms of the mechanical conceptions of matter and motion, and that this must give a materialistic colouring to his philosophy. There are, however, other flaws also in his procedure. The presence of Force, i.e. his version of the methodo- logical assumption of constancy in the quantitative aspects of phenomena, seems a very unsuitable basis for a philosophy of progress. To such a philosophy a consideration of the conditions, if any, under which progress can be conceived as ultimately real, seems a necessary preliminary, which Spencer omits. He also assumes that " Evolution " is a real, nay, an ultimate law of nature, but his evidence only goes to show that it is a result, in some cases, of the complex interaction of laws, which, like Rhythm, Segregation, &c, are in their turn only tendencies, and may be, and often are, counteracted. By the afterthought of a " dissolution " process (2nd ed. of First Principles) Spencer in a way admits this, but introduces fresh difficulties as to its relation to " Evolution." If the two pro- cesses go on together both are tendencies, and whether there is on the whole progress or not will depend on their relative strength; neither can be universal, nor the "law" of cosmic existence, unless its coexisting rival is regarded as essentially secondary. But if so it ceases to be available as evidence of a coming reversal of the dominant process. If, on the other hand, the processes are strictly alternative, a world which ex hypothesi exemplifies the one can never justify us in inferring the other. Spencer appeals alternately to the " instability of the homogeneous " and the impossibility of complete equilibra- tion to keep up the cosmic see-saw, but he can do so only by confining himself to a part of the universe. A world wholly homogeneous or equilibrated could no longer change, while so long as a part only is in process, the process cannot be repre- sented as universal. Again, an infinite world cannot be wholly engaged either in evolution or in dissolution, so that it is really unmeaning to discuss the universality of the cosmic process until it is settled that we have a universe at all, capable of being con- sidered as a whole. In the last resort, therefore,

Spencer fails to deduce philosophically not only the necessity of progress, but also its compatibility with the evolution-dissolution oscilla- tion, and even the general possibility of conceiving the world as a process. In other words, in spite of his intentions he does not succeed in giving a metaphysic of evolutionism.

In the Principles of Biology the most notable points are the definition of life as the continuous adjustment of internal to external relations, and the consequent emphasis on the need of adapting the organism to its environment. This exaggerates the passivity of life, and does not sufficiently recognize that the higher organisms largely adjust external to internal relations and adapt their environment to their needs. His universal process of Evolution seems to give Spencer a criterion of " higher " and " lower " " progression " and " degeneration," independent of the accidents of actual history, and unattainable by strictly Darwinian methods. The higher (at least in times of " evolution ") is the more complex and differentiated, whether it invariably survives or not. On the other hand, he advances too easily from the maxim that function is prior to, and makes, structure to the conclusion that the results of use and disuse are therefore immediately incarnated in structural adaptations capable of hereditary transmission. This inference has involved him in much controversy with the ultra-Darwinians of Weis- mann's school, who deny the possibility of the inheritance of acquired characteristics altogether. And though Spencer's general position — that it is absurd to suppose that organisms after being modified by their life should give birth to offspring showing no traces of such modifications — seems the more philo- sophic, yet it does not dispose of the facts which e r o to show that most of the evidence for the direct transmission of adaptations

is illusory, and that beings are organised to minimize the effects of life on the reproductive tissues, so that the transmission of the effects of use and disuse, if it occurs, must be both difficult and rare — far more so than is convenient for Spencer's psychology.

In his Principles of Psychology Spencer advocates the genetic explanation of the phenomena of the adult human mind by reference to its infant and animal ancestry. On the funda- mental question, however, of the psychophysical connexion and the derivation of mind from matter, his utterances are neither clear nor consistent. On the one hand, his whole formu- lation of Evolution in mechanical terms urges him in the direc- tion of materialism, and he attempts to compose the mind out of homogeneous units of consciousness (or " feeling ") " similar in nature to those which we know as nervous shocks; each of which is the correlative of a rhythmical motion of a material unit or group Of such units " (§ 62). On the other hand, when pressed by his disciple, Fiske (Outlines of Cosmic Philosophy ii.

p. 444), he is ready to amend nervous into psychical shocks, which is no doubt what he ought to have meant but could not say without ruining the illusory bridge between the psychical and the physiological which is suggested in the phrase " nervous shock." And he admits (§ 63) that if we were compelled to choose between translating mental phenomena into physical and its converse, the latter would be preferable, seeing that the ideas of matter and motion, merely symbolic of unknowable realities, are complex states of consciousness built out of units of feeling. But easiest of all is it to leave the relation of the unknowable " substance of Mind " to the unknowable " substance of Matter " (substance he throughout conceives as the unknowable substrate of phenomena) to the Unknowable, as he finally does. To the theory of knowledge Spencer con- tributes a " transfigured realism," to mediate between realism and idealism, and the doctrine that " necessary truths," acquired in experience and congenitally transmitted, are a priori to the individual, though a posteriori to the race, to mediate between empiricism and apriorism. It has already been explained, however, that the biological foundations of the latter doctrine are questionable.

In the Principles of Sociology Spencer's most influential ideas have been that of the social organism, of the origination of religion out of the worship of ancestral ghosts, of the natural antagonism between nutrition and reproduction, industrialism and warfare. Politically, Spencer is an individualist of an extreme laissez faire type, and it is in his political attitude that the consequences of his pre-Darwinian conception of Evolution are most manifest. But for this he would hardly have estab- lished so absolute an antithesis between industrial and military competition, and have shown himself readier to recognize that the law of the struggle for existence, just because it is universal and equally (though differently) operative in every form of society, cannot be appealed to for guidance in deciding between the respective merits of an industrial or military and of an individualist or socialist organization of society.

In the Principles of Ethics Spencer, though relying mainly on the objective order of nature and the intrinsic consequences of actions for the guidance of conduct, conceives the ethical end in a manner intermediate between the hedonist and the evolu- tionist. The transition from the evolutionist criterion of sur- vival — which in itself it is difficult to regard as anything but non-moral — to the criterion of happiness is effected by means of the psychological argument that pleasure promotes function and that living beings must, upon pain of extinction, sooner or later take pleasure in actions which are conducive to their survival. Hence pleasure is, on the whole, good, and asceticism reprehensible, although in man's case there has arisen (owing to the rapidity of evolution) a certain derangement and diver- gence between the pleasant and the salutary (§ 39). Never- theless pleasure forms an " inexpugnable element " of the moral aim (§ 16).

Conduct being the adjustment of acts to einds, and good conduct that which is conducive to the preservation of a pleasurable, life in a society so adjusted that each attains his happiness without impeding that of others, life can be

considered valuable only if it conduces to happiness. On the other hand, life must in the long run so conduce, whatever its present value may appear to be, because a constant process of adjustment is going on which is bound sooner or later to lead to a complete adjustment which will be perfect happiness. This is the refutation of pessimism, which ultimately agrees with optimism in making pleasure the standard of value. In this reasoning Spencer appears to have overlooked the possibility of an expansion of the ethical environment. If this is as rapid as (or more rapid than) the xate of adaptation, there will be no actual growth of adaptation and so no moral progress. Complete adaptation to an infinitely receding ideal is impossible, and relative adaptation depends on the distance between the actual and the ideal. Spencer, however, considers that he can not only anticipate such a state of complete adjustment, but even lay down the rules obtaining in it, which will constitute the code of " Absolute Ethics " and the standard for discerning the " least wrong " actions of relative ethics. He conceives it as a state of social harmony so complete that in it even the antagonism between altruism and egoism will have been over- come. Both of these are original and indispensable, but egoism has the priority, since there must be egoistic pleasure somewhere before there can be altruistic sympathy with it. And so in the ideal state everyone will derive egoistic pleasure from doing such altruistic acts as may still be needed. In it, too, the sense of duty will have become otiose and have disappeared, being essentially a relic of the history of the moral consciousness. Originally the socially salutary action was in the main that which was enjoined on the individual by his political and religious superiors and by social sentiment; it was also in the main that to which his higher, more complex and re-representa- tive feelings prompted. Hence the fear with which the political, religious and social controls were regarded came to be associated also with the specifically moral control of lower by higher feelings, and engendered the coercive element in the feeling of obligation. Its authoritativeness depends on the intrinsic salutariness of self-control, and must cease to be felt as the resistance of the lower feelings relaxes. Hence SpenCer con- cludes that the sense of duty is transitory and must diminish as moralization increases. In the preface to the last part of his Ethics (1893) Spencer regrets that " the Doctrine of Evolution has not furnished guidance to the extent he had hoped," but his contributions to ethics are not unlikely to be the most permanently valuable part of his

philosophy.

After completing his system (1896) Spencer continued to revise it, and brought out new editions qf the Biology (1898,1899) and First Principles (1900). The dates of his chief works are as follows: 1842, Letters to the Nonconformist, "■ The Proper Sphere of Govern ment." 1850, Social Statics. 1852, The Theory of Population (cf. part vi. of Biology); "The Development Hypothesis" (in Essays, vol. i.) 1853. The Universal Postulate (cf. Psychology, part vii.). 1854, "the Genesis of Science" (in Essays, vol. ii.). 1855, Principles of Psychology (1 vol.). 1857, Progress, its Law and Cause {Essays, vol. i.). 1858, Essays (containing most of his con- tributions to the Westminster Review; 1863, vol. ii. ; 1885, vol. iii.), 1 861, Education: Intellectual, Moral, Physical. 1862, First Prin- ciples (2nd ed., 1867; 6th, 1900). 1864-1867, Principles of Biology (2 vols.). 1872, Principles of Psychology (2nd ed., in 2 vols.). 1873, The Study of Sociology. 1876, vol. i., The Principles of Sociology; vol. ii., Ceremonial Institutions, 1879, Political Institutions, 1882; vol. iii., Ecclesiastical Institutions, 1885, completed 1896. 1879, The Data of Ethics (part i. of Principles of Ethics in 2 vols. ; part iv., Justice, 1891 ; parts ii. and iii., Inductions of Ethics and Ethics of Individual Life, 1892 ; parts v. and vi., Negative and Positive Beneficence, 1893). 1884, Man versus the State, 1886, Factors of Organic Evolution. 1893, Inadequacy of Natural Selection. 1894, A Rejoinder to Professor Weismann and Weismannism once more. 1897, Fragments. 1902, Facts and Comments. An Autobiography in 2 vols, appeared posthumously in 1904. For a full bibliography ot his works see W. H. Hudson's Introduction to the Philosophy of Herbert Spencer (up to 1895); and for a useful summary of his chief doctrines by Spencer himself, his preface to ColHns's Epitome of the Synthetic Philosophy. He also supervised the Compilation of a comprehensive series of volumes by various writers on Descriptive Sociology, of which by 1 88 1 eight parts on different racial areas had been published (at a loss to him of £3250) as the result of fourteen years of labour. He then suspended this undertaking, but resolved that at his death it should be continued at the cost of his estate.

In his will he appointed trustees, who were to entrust the supervision to Mr. H. R. Tedder, librarian of the Athenaeum Club; and the Work was resumed accordingly after his death, five more parts being arranged for, one of which was published in 1910.

(F. C.S. S.)

SPENCER, JOHN CHARLES SPENCER, 3 rd Earl (1782- 1845), English statesman, better known by the courtesy title of Lord Althorp, which he bore during his father's lifetime, was the son of George John, 2nd Earl

(1758-1834), grandson of John (1734-1783), created 1st Earl Spencer in 1765, and great-grandson of Charles Spencer, 3rd Earl of Sunderland. His father served in the ministries of Pitt, Fox and Grenville, and was first lord of the admiralty from 1 794-1 801; and his interest in literature was shown in his attention to the Althorp library, inherited from the 3rd Earl of Sunder- land, which he developed into the finest private library in Europe; his wife, the eldest daughter of the 1st Earl Lucan, was conspicuous in London society for her gaiety and brightness. Their eldest son, John Charles, was born at Spencer House, London, on the 30th of May 1782. In 1800 he took up his residence at Trinity College, Cambridge, and for some time applied himself energetically to mathematical studies; but he spent most of his time in hunting and racing. Almost im- mediately after taking his degree in 1802, he set out on a conti- nental tour, which was cut short, after he had passed some months in the chief cities in Italy, by the renewal of war. Through the influence of Pitt's government he was returned to parliament for the borough of Okehampton in Devonshire in April 1804, and, although he vacated his seat in February 1806, to contest the university of Cambridge against Lord Henry Petty and Lord Palmerston (when he was hopelessly beaten), he was elected in the same month for St Albans, and appointed a lord of the treasury. At the general election in November 1806, he was elected for Northamptonshire, and he continued to sit for the cqunty until he succeeded to the peerage. His tastes were then, as ever, for country life, but his indignation at the duke of York's conduct at the Horse Guards led him to move a resolu- tion of the House of Commons in 1809 for the duke's removal from his post. For the next few years after this speech Lord Althorp occasionally spoke in debate and always on the side of Liberalism, but from 1813 to 1818 he was only rarely in the House of Commons. His absence was partly due to a feeling that it was hopeless to struggle against the will of the Tory ministry, but more particularly to his marriage on the 14th of April 1 8 14, to Esther, only daughter of Richard Acklom of Wiseton Hall, Northamptonshire, who died in childbirth 1818. In 1819, on his return to political life after her death, and for many years after that date he pressed upon the attention of the house the necessity of establishing a more efficient bankruptcy court, and of expediting the recovery of small debts; and he saw both these reforms accomplished before 1825. During the greater part of the reign of George IV. the Whigs lost their legitimate influence in the state from their want of cohesion, but this defect was soon remedied in 1830 when Lord Althorp was chosen their leader in the lower house, and his capacity for the position was proved by experience. When Lord Grey's administration was formed at the close of the year the chan- cellorship of the exchequer combined with the leadership of the House of Commons was entrusted to Lord Althorp, and to him more than to any other man, with the exception of the prime minister and the lord chancellor, may be attributed the success of the government measures.

The budget, it is true, was a failure, but this misfortune was soon forgotten in the struggles over the Reform Bill. The consideration of the preliminaries of this measure was assigned to four ministers, two in the cabinet and two outside that body; but their proposals were, after careful examination, approved or rejected by Lord Grey and Lord Althorp before they were brought under the notice of the cabinet. When the Bill was ready for introduction to the House of Commons its principles were expounded by Lord John Russell; but from the commencement of the protracted discussion over its details he had the assistance of Lord Althorp, and after some

weeks of incessant toil, which the physique of Lord John Russell could not sustain any longer, the whole resppnsibility was cast on Lord Althorp. To combat the objections of three such pertinacious opponents as Croker, Sugden and Wetherell required both skill and courage, and in Lord Althorp these qualities were found. On one evening' he made as marly AS twenty Speeches. The Reform Bill was carried at last, and popular instinct was right in assigning to the leader of the house a credit only second to that earned by Lord John Russell. After the dissolution of 1833 the Whigs returned to; power with augmented numbers; but differences soon showed themselves among both leaders and followers, and their majority crumbled away. Their position was strengthened for a time by triumphantly carrying a new poor law bill; and even their keenest critics would not allow that, had the Whig propositions on tithes and church rates been carried into effect, many years of passionate controversy would have been spared. The ministry of Lord Grey was shattered to pieces by difficulties over an Irish coercion bill. Although Lord Melbourne became premier (July 14, 1834), the fortunes©! the ministry rested on Lord Althorp's presence in the House of Commons.*

The death of the 2nd Earl Spencer in November 1834, called his son to the upper house, and William IV. took advantage of this event to summon a Tory cabinet to his side. The new Lord Spencer abandoned the cares of office . and returned to country life with unalloyed delight. Henceforth agriculture, not politics, was his principal interest. He was the first president of the Royal Agricultural Society (founded 1838),, and a notable cattle-breeder. Often as he was urged by his political friends to come to their assistance, he rarely quitted the peaceful pleasures which he loved. He died at Wiseton on the 1st of October 1845, being succeeded as 4th Earl, in default of issue, by his brother Frederick (d. 1857). He had held, as a statesman, a remarkable position. The Whigs required, to carry the Reform

Bill, a leader of unstained character, one to whom party spirit could not attach the suspicion of greed of office, and against Lord Althorp malevolence was powerless. No stronger proof of his pre-eminence could be given than the oft-quoted saying of Lord Hardinge that one of Croker's ablest speeches was demolished by the simple statement of Lord Althorp that he had collected some figures which entirely refuted it, but had lost them. The trust which the house put in him then was never wanting.

SPENCER, JOHN POYNTZ SPENCER, 5th Earl (1835-1010), English statesman, was the son of the 4th Earl and his first wife, a daughter of William Stephen Poyntz, of Cowdray Park, Sussex. Born on the 27th of October 1835, and educated a t Harrow and Trinity College, Cambridge, he was a member of parliament for a few months before he succeeded to the earl- dom in December 1857. His long career as a Liberal politician dates from his acceptance of the office of lord-lieutenant of Ireland under Gladstone in 1868, a post which he retained until 1874. When the Liberals returned to power in 1880 he was appointed lord president of the council, but in 1882 he eittered upon a second term of office as lord-lieutenant of Ireland. The three years during which Earl Spencer now filled this position was a period of exceptional disorder in Ireland, marked by a long series of outrages and conspiracies associated with the " Invincibles," but the courage and firmness which he. then displayed won the admiration of all, and made his adoption of the policy of Home Rule in 1885 an event of considerable interest. In the short Liberal administration of 1886 he was lord-president of the council, and from 1892 to 1895 he was a very capable first lord of the admiralty; it ! is on record that Gladstone, on retiring in 1904, would have recommended the Queen, if she had consulted him, to summon Lord Spencer to.the premiership. From 1002 to 1905 he was the Liberal leader in the House of Lords, and early in 1905, when a change of government was seen to be probable, it was thought in some quarters that he would be the most suitable Liberal prime minister. But his health broke down just at this time, and he took no further part in political life, although he survived until the 13th of

August 1910, when he died at Althorp. For forty-five years the earl was a Knight of the Garter; he was lord-lieutenant of Northamptonshire for upwards of thirty years, and he had a reputation as a keen and daring rider to hounds. The fine library, collected at Althorp by the 2nd earl, was sold by him for £250,000 to Mrs Rylands, the widow of a Manchester merchant, and was by her presented to the city of Manchester.

Earl Spencer had no children, and his successor was his half- brother, . Charles Robert Spencer (b. 1857), who became the 6th earl. As the Hon. Charles R. Spencer he was one of the parlia- mentary representatives for Northamptonshire from 1880 to 1895 and again from 1900 to 1905, and

was vice-chamberlain of the royal household from 1892 to 1895. In 1905 he was ap- pointed lord chamberlain, and in the same year he was raised to the peerage as Viscount Althorp.

*SPENCER, WILLIAM ROBERT (1769-1834), English poet and wit, was the son of Lord Charles Spencer, second son of Charles Spencer, 3rd duke of Marlborough and 5th earl of Sunderland. He was educated at Harrow and Christ Church, Oxford, but left the university without taking a degree. Spencer's wit made him a popular member of society, but he took no part in public life although he numbered among his friends leading statesmen like Pitt, Fox and Sheridan. He was an accomplished writer of " occasional ■" verse, which was warmly praised by Scott, by Christopher North and by Byron, who placed him in the same rank as Moore, Rogers and Campbell. In 1796 he published an English version of Burger's Leonore, and in 1802 he burlesqued German romance in his Urania, which was produced on the stage at Drury Lane. Among his best-known pieces, which were published in a collection of his poems in 1811, were " Beth Gelert "and " Too Late I Stayed." He died in poverty in Paris in 1834. In 1791 he married Susan, daughter of Count Jenison- Walworth, chamberlain to the elector palatine, by whom he had five sons and two daughters. One son, Aubrey George Spencer (1795-1872), became first bishop of Newfoundland in 1839, being afterwards translated to the See of Jamaica. Another son, George Trevor Spencer (1799*1866), was mi 83 7 consecrated second bishop of Madras. He published several books relating to missionary work in India; on his return to England in 1849 he was appointed assistant to the bishop of Bath and Wells, and in i860 became chancellor of St Paul's Cathedral. He married, in 1823, Harriet, daughter of Sir Benjamin Hobhouse and sister of Lord Brought on.*

See W. R. Spencer, Poems (London, 1835), containing. a bio- graphical memoir; The Annual Register (1834); Alumni Oxonienses 1715-ˆ1886., annotated by J. Foster (4 vols., Oxford, 1891).

SPENCER, a township of Worcester county, Massachusetts, U.S.A., about 11 m. W. of Worcester. Popˆ (1890), 8747,; (1900), 7ˆ27, of whom 1614 were foreign-born; (1910, U.S. census), 6740. Area, about 34-1 sq. m. The township is served by the Boston & Albany railway and by inter-urban electric lines. The Richard Sugden Public Library, founded in 1889, had 12,000 volumes in 1908. Bemis Memorial Park arid the Samuel Bemis Monument were dedicated in 1901 in honour of the first settler of Spencer. There are three other public parks. Among the township's manufactures are boots and shoes, woollens, muslin underwear, wire, and wooden and paper boxes. Spencer was a part of the Leicester grant; was first settled in 1721; was the "West Parish of Leicester " in 1744-1753; and in 1753 was incorporated as a township, under its present name. In one house in

Spencer were born Elias Howe, jun., the inventor of the sewing-machine, and his uncles, William Howe, inventor of the "Howe truss" bridge (see Bridges), and Tyler Howe (1800-1880), inventor (in 1855) of the spring bed; in 1009 a memorial was dedicated to these three inventors.

See Henry M. Tower, Historical Sketches Relating to Spencer, Mass. (4 vols., Spencer, 1901-1909).

SPENER, PHILIPP JAKOB (1635-1705), German theologian, was born on the 13th of January 1635, at Rappoltsweiler in Upper Alsace. After a brief stay in the grammar school of Colmar he went to Strassiburg in 165 1, where he devoted himself

to the study of philology, history and philosophy, and won his degree of master (1653) by a disputation against the philosophy of Hobbes. He then became private tutor to the princes Christian and Charles of the Palatinate, and lectured in the university on philology and history. From 1659 to 1662 he visited the universities of Basel, Tubingen and Geneva, and commenced the study of heraldry, which he pursued throughout his lif e. In Geneva especially his religious views and tendencies were turned in the direction of mysticism. He returned to Strassburg in 1663, Where he was appointed preacher without pastoral duties, with the right of holding lectures. Three years afterwards he was invited to become the chief pastor in the Lutheran Church at Frankfort-on-Main. Here he published his two chief works, Pia desideria (1675) and Allgemeine Gottes- gekhrtheit (1680), and began that form of pastoral work which resulted in the movement called Pietism. In 1686 he accepted the invitation to the first court chaplaincy at Dresden. But the elector John George III., at whose personal desire the post had been offered to him, was soon offended at the fearless con- scientiousness with which his chaplain sought to discharge his pastoral duties. Spener refused to resign his post, and the Saxon government hesitated to dismiss him. But in 1691 the Saxon representative at Berlin induced the court of Brandenburg to offer him the rectorship of St Nicholas in Berlin with the title of " Konsistorialrat." In Berlin Spener was held in high honour, though the tendencies of the court and the government officials were rather rationalistic than pietistic. The university of Halle was founded under his influence in 1694. All his life long Spener had been exposed to the attacks and abuse of the orthodox Lutheran theologians; with his years his opponents multiplied, and the movement which he had inaugurated presented increasingly matter for hostile criticism. In 1695 the theological faculty of Wittenberg formally laid to his charge 264 errors, and only his

death on the 5th of February, 1705, released him from these fierce conflicts. His last important work was Theologische Bedenken (4 vols., 1700-1702), to which was added after his death Letzte theologische Bedenken, with a biography of Spener by C. H. von Canstein (17 n).

Though Spener has been justly called " the father of Pietism," hardly any of the errors and none of the extravagances of the movement can be ascribed to him personally. So far was he from sharing them that A. Ritschl (Ceschichte des Pietismus, ii. 163) maintains that " he was himself not a Pietist," as he did not advocate the quietistic, legalistic and semi-separatist practices of Pietism, though they were more or less involved in the positions he assumed or the practices which he encouraged or connived at. The only two points on which he departed from the orthodox Lutheran faith of his day were the requirement of regeneration as the sine qua Hon of the true theologian, and the expectation of the con- version of the Jews and the fall of Papacy as the prelude of the triumph of the church. He did not, like the later Pietists, insist on the necessity of a conscious crisis of conversion, nor did he en- courage a complete breach between the Christian and the secular life.

Spener was a voluminous writer. The list of his published works comprises 7 vols, folio, 63 quarto, 7 octavo, 46 duodecimo ; a new edition of his chief writings was published by P. Grunberg in r889- See W. Hossbach, Philipp Jakob Spener und seine Zeit (1828, 3rd ed., 1861) ; A. Ritschl, Geschichte des Pietismus, ii. (1884) ; E. Sachsse, Ursprung und Wesen des Pietismus (1884) ; P. Grunberg, P. J. Spener (3 vols., 1893-1906).

SPENNYMOOR, a market town in the Bishop Auckland parlia- mentary division of Durham, England, 6 m. S. of the city of Durham, on a branch of the North Eastern railway. Pop of urban district, which includes several neighbouring parishes (1901), 16,665. It is in the midst of a populous coal-mining district, and its growth is modern.

SPENS, THOMAS DE (c. 141 5-1480), Scottish statesman and prelate, received his education at Edinburgh, and by his excep- tional abilities attracted the notice of the advisers of the Scottish king, James II., who sent him on errands to England and to France. About 1450 he became bishop of Galloway; soon after- wards he was made keeper of the privy seal, and in 1459 he was chosen bishop of Aberdeen. Much of his time, however, was passed in journeys to France and to England, and in 1464 he

and Alexander Stewart, duke of Albany, a son of James II. , were captured at sea by some English sailors. Edward IV., to whom the bishop had previously revealed an assassination plot, set him at liberty, and he was partly responsible for the treaty of peace made about this time between the

English king and James III. He also helped to bring about the meeting between Edward IV. and Louis XL of France at Picquicny, and another treaty of peace between England and Scotland in 1474. Spens was a frequent attender at the Scottish parlia- ments, and contributed very generously to the decoration of his cathedral at Aberdeen. He died in Edinburgh on the 14th of April 1480.

SPENSER, EDMUND (c. 1552-1599), English poet, author of the Faery Queen, was born in London about the year 1552. The received date of his birth rests on a passage in sonnet Ix. of the Amoretti. He speaks there of having lived forty-one years; the Amoretti was published in 1595, and described on the title- page as " written not long since "; this would make the year of his birth 1552 or 1553. We know from the Prothalamion that London was his birthplace. This at least seems the most natural interpretation of the words —

" Merry London, my most kindly nurse, That to me gave this life's first native source."

In the same poem he speaks of himself as taking his name from " an house of ancient fame." Several of his pieces are addressed to the daughters of Sir John Spencer, head of the Althorp family; and in Colin Clout's Come Home Again he describes three of the ladies as —

" The honour of the noble family Of which I meanest boast myself to be."

Mr R. B. Knowles, however, is of the opinion (see the Spending of the Money oj Robert Nowell, privately printed, 1877) that the poet's kinsmen must be sought among the humbler Spencers of north-east Lancashire. Robert Nowell, a London citizen, left a sum of money to be distributed in various charities, and in the account-books of his executors among the names of other beneficiaries has been discovered that of " Edmund Spensore, scholar of the Merchant Taylor School, at his going to Pembroke Hall in Cambridge." The date of this benefaction is the 28th of April 1 569. As the poet is known to have been a sizar of Pembroke, the identification is beyond dispute. Till this discovery it was not known where Spenser received his school education. The speculations as to the poet's parentage, started by the Nowell MS., are naturally more uncertain. Mr Knowles found three Spensers in the books of the Merchant Taylors, and concluded that the poorest of them, John Spenser, a " free journeyman" in the "art or mystery of clothmaking," might have been the poet's father, but he afterwards abandoned this theory. Dr Grosart, however, adhered to it, and it is now pretty generally accepted. The connexion of Spenser with Lancashire is also supported by the Nowell MS. — rseyeral Spensers of that county appear among the " poor kinsfolk " who profited by Nowell's

bounty. The name of the poet's mother was Elisabeth, and he notes as a happy coincidence that it was borne by the three women of most consequence to him — wife, queen and mother {Amoretti, Ixxiv.).

It is natural that a poet so steeped in poetry as Spenser should show his faculty at a very early age; and there is strong reason to believe that verses from his pen were published just as he left school at the age of sixteen or seventeen. Certain pieces, translations from Du Bellay and Petrarch, afterwards included in a volume of poems by Spenser published in 1591, are found in a miscellany, Theatre for Worldings, issued by a Flemish Protestant refugee, John van der Noodt, on the 25th of May 1569. The translations from Du Bellay appear in blank verse in the miscellany, and are rhymed in sonnet form in the later publication, but the diction is substantially the same; the translations from Petrarch are republished with slight variations. Poets were so careless of their rights in those days and pub- lishers took such liberties that we cannot draw for certain the conclusion that would be inevitable if the facts were of more

modern date; but the probabilities are that these passages in Van der Noodt's Theatre, although the editor makes no acknowledgment, were contributed by the schoolboy Spenser. 1 As the exercises of a schoolboy writing before our poetic diction was enriched by the great Elizabethans, they are remarkable for a sustained command of expression which many schoolboys might exhibit in translation now, but which was a rarer and more significant accomplishment when Surrey and Sackville were the highest models in post-Chaucerian English.

Little is known of Spenser's Cambridge career, except that he was a sizar of Pembroke Hall, took his bachelor's degree in 1572, his master's in 1576, and left Cambridge without having obtained a fellowship. Dr Grosart's inquiries have elicited the fact that his health was not good— college allowances while he was in residence being often paid " Spenser aegrotanti." One of the fellows of Pembroke strongly influenced his destiny. This was Gabriel Harvey, a prominent figure in the university life of the time, an enthusiastic educationist, vigorous, versatile, not a little vain of his own culture and literary powers, which had gained him a certain standing in London society. The revival and advancement of English literature was a passion of the time, and Harvey was fully possessed by it. His fancy for reforming English verse by discarding rhyme and substituting unrhymed classical metres, and the tone of his controversy with Thomas Nash, have caused him to be regarded as merely an obstreperous and pragmatic

pedant; but it is clear that Spenser, who had sense enough not to be led astray by his eccentricities, received active and generous help from him and probably not a little literary stimulus. Harvey's letters to Spenser 2 throw a very kindly light on his character. During his residence at the university the poet acquired a knowledge of Greek, and at a later period offered to impart that language to a friend in Ireland (see Ludowick Bryskett, Discourse of Civil Life, London, 1606 — written twenty years previously). Spenser's affinity with Plato is most marked, and he probably read him in the original.

Three years after leaving Cambridge, in 1579, Spenser issued his first volume of poetry, the Shepherd's Calendar. Where and how he spent the interval have formed subjects for elaborate speculation. That most of it was spent in the study of his art we may take for granted. That he lived for a time in the " north parts " of England; that there or elsewhere he fell in love with a lady whom he celebrates under the anagram of " Rosalind," and who was most likely Rose, a daughter of a yeoman named Dyneley, near Clitheroe; that his friend Harvey urged him to return south, and introduced him to Sir Philip Sidney; that Sidney took to him, discussed poetry with him, introduced him at court, put him in the way of preferment — are ascertained facts in his personal history. Dr Grosart con- jectures with considerable plausibility that he was in Ireland in 1577. The words " for long time far estranged " in E.K.'s preface to the Shepherd's Calendar point that way. Spenser undoubtedly entered the service of the earl of Leicester either in 1578 or a year earlier (Carew Papers).

The interest of the Shepherd's Calendar is mainly personal to Spenser. Its twelve poems continue to be read chiefly because they were the first published essays of the author of the Faery Queen, the poems in which he tried and disciplined his powers. They mark no stage in the history of pastoral poetry. The title, borrowed from a French almanack of the year 1496, which was translated into English in 1503, and frequently reprinted, is at- tractive but hardly tallies with the subject. It may have been an afterthought. Spenser had too strong a genius not to make his own individuality felt in any form that he attempted, and his buoyant dexterity in handling various schemes of verse must always afford delight to the connoisseur in such things. But a reader not already interested in Spenser, or not already familiar with the artificial eclogue, would find little to attract him in the Shepherd's Calendar. The poems need a special education; given this, they

1 The first versions of the Visions of Petrarch and Du Bellay are reproduced by Dr Grosart in his Complete Works of Spenser, vol. iv. (London, 1882). The translations of Petrarch are imitated from Marot. Koeppel (Englische Studien, vol. xv.), questions whether they are by

Spenser (see also J. B. Fletcher, Modern Language Notes, vol. xxii.).

2 Letter- Book of Gabriel Harvey (Camden Society).

are felt to be full of charm and power, a fresh and vivid spring to the splendid summer of the Faery Queen. The diction is a studi- ously archaic artificial compound, partly Chaucerian, partly North Anglian, partly factitious; and the pastoral scenery is such as may be found in any country where there are sheep, hills! trees, shrubs, toadstools and running streams. That Spenser, having been, in the north of England, should have introduced here and there a touch of north country colour is natural enough! but it is not suffi- cient to give a character to the poems as pastoral poems. As Such they follow continuously arid do not violently, break away from Latin, Italian and French predecessors, and Professor George Saintsbury is undoubtedly right in indicating Marot as the most immediate model. At the same time one can quite understand on historical grounds why the Shepherd's Calendar was hailed with enthusiasm as the advent of a " new poet." Not only was it a complete work in a form, then new to English literature, but the execution showed the hand of, a master. There had been nothing so finished, so sustained, so masterful in grasp, so brilliant in metre and phrase, since Chaucer, ft was felt at once that the poet for whom the age had been waiting had come. The little coterie of friends whose admiration the young poet had won in private were evidently concerned lest the wider public should be bewildered and repelled by the unfamiliar pastoral form and rustic diction. To put the public at the right point of view the poems were pub- lished' with a commentary by " E.K." — supposed to be one Edward Kirke, who was an undergraduate with Spenser at Pembroke;. This so-called " glosse " explained the archaic words, revealed the poet's intentions, and boasted that, as in the case of Virgil, the pastoral poetry of the " new poet " was but " a proving of the wings for higher and wider flights." The " new poet's " name was with- held; and the identification of the various " shepherds "—of Cuddie and B-off y and Diggon Davie, and the beauteous golden-haired " widow's daughter of the glen " — was fortunately reserved to yield delight to the ingenious curiosity of a later age.' On the subject of Spenser's obligations the " glosse " is very misleading. An eclogue drawn almost entirely from Virgil is represented as jointly inspired by Virgil and Theocritus and chiefly by the latter. Marot is belittled and his claim to be a poet called in question. As regards the twelfth eclogue suggested by and in part translated from his poetry, his influence is ignored. The stanzas Professor Hales cites as autobiographical are actually taken from Marot's eclogue, Au Roi sous les noms de Pan el Robin. Dr Grosart falls into the same error.

The Shepherd's Calendar was published at Gabriel Harvey's instance, and was dedicated to Sir Philip Sidney. It was one out of many poetical

schemes on which the young poet was busy in the flush of conscious power and high hopes excited by the admiration of the literary authorities whose approval was then most to > "be coveted. His ; letters to Harvey and Harvey's letters to him furnish hints for a very engaging fancy picture of Spenser at this stage of his life — looking at the world through rose-coloured spectacles, high in favour with Sidney and Leicester, dating his letters from Leicester House, gaily and energetically discussing the technicalities of his art, with some provision from his powerful friends— certain, but the form of it delightfully uncertain; — going to court in the train of Leicester, growing pointed beard and mustachios of fashionable shape, and frightening his ever-vigilant friend and mentor Harvey by the light courtier-like tone of his references to women. The studious pastoral poet from " north parts " had blossomed with surprising rapidity in the image of the gay fortune-seeking adventurers who crowded the court of the virgin queen in those stirring times. Some of the poems which he mentions to Harvey as then completed or on the anvil— his Dreams, his Nine Comedies, his Dying Pelican and his Stemmata dudleiana (singing the praises of the noble family, which was befriending him) — have not been preserved, at least in any form that can be certainly identified. Among the lost works was his English Poet — a contribution to literary criticism. He had sent Harvey a portion of the Faery Queen, which he was eager to continue; but Harvey did not think much of it — a judgment for which Harvey is often ridiculed as a dull pedant, as if we knew for certain that what was submitted to him was identical with what was published ten years later.,

Spenser was appointed secretary to the lord-deputy of Ireland in 1 580. and was one of the band of adventurers who, with mixed motives of love of excitement, patriotism, piety and hopes of forfeited estates, accompanied Lord Arthur Grey of Wilton to Ireland to aid in the suppression of Desmond's rebellion. Regret is sometimes expressed that the author of ■■ the Faery Queen, who ought to have been dreamy, meditative, gentle and refined, should have been found in such company, and should have taken part in the violent and bloody scenes of Lord Grey's two years' attempt at " pacification." But such things must be judged with reference to the circumstances and the spirit of the time, and it must be remembered that England was then 3 See Dr Grosart's Complete Works of Spenser, vol. i.

engaged in a fierce struggle for existence against the Catholic powers of the Continent. Of Lord Grey's character his secretary was an enthusiastic admirer, exhibiting him in the Faery Queen as Arthegal, the personification of justice; and we know exactly what were his own views of Irish policy,

and how strongly he deplored that Lord Grey was not permitted to carry them out. Spenser's View of the State of Ireland drawn up after fourteen years' experience, but first printed in 1633 by Sir James Ware, who complains of Spenser's harshness and inadequate know- ledge (History of Ireland, appendix), is not the work of a gentle dreamer, but of an energetic and shrewd public official.

The View is not a descriptive work; there is nothing in the style to indicate that it was written by a poet; it js an elaborate state paper, the exposition in the form of a dialogue of a minutely con- sidered plan for the pacification of Ireland, written out of zeal for the public service for the eyes of the government of the day. A very thoroughgoing plan it is. After passing in review the history and character of the Irish, their laws, customs, religion, habits of life, armour, dress, social institutions and finding " evil usages " in every department, he propounds his plan of " reformation." Reformation can be effected only by the sword, by the strong hand. The interlocutor in the dialogue holds up his hands in horror. Does he propose extermination? By no means; but he would give the Irish a choice between submission and extermination. The government had vacillated too long, and, fearing the cost of a thorough operation, had spent twice as much without in any way mending matters. Let them send into Ireland 10,000 foot and 1000 horse, disperse them in garrisons— a complete scheme of localities is submitted — give the Irish twenty days to come in; if they did not come in then, give no quarter afterwards, but hunt them down like wild beasts in the winter time when the covert is thin; " if they be well followed one winter, ye shall have little work to do with them the next summer "; famine would complete the work of the sword; and in eighteen months' time peace would be restored and the ground cleared for plantation by English colonists. There must be no flinching in the execution of this plan — " no remorse or drawing back for the sight of any such rueful object as must thereupon follow, nor for compassion of their calamities, seeing that by no other means it is possible to recover them, and that these are not of will but of very urgent necessity." The government had out of foolish compassion drawn back before when Lord Grey had brought the recalcitrant Irish to the necessary extremity of famine; the gentle poet warns them earnestly against a repetition of the blunder.

Such was Spenser's plan for the pacification of Ireland, pro- pounded not on his own authority, but as having support in " the consultations and actions of very wise governors and counsellors whom he had sometimes heard treat thereof." He knew that it was " bloody and cruel "; but he contended passion- ately that it was necessary for the maintenance of English power and the Protestant religion. The method was repugnant to the kindly nature of average Englishmen; from the time of Lord Grey no English authority had the heart to go through with it till another

remorseless zealot appeared in the person of Cromwell. That Cromwell knew the treatise of " the sage-and serious Spenser," perhaps through Milton, is probable from the fact that the poet's Irish estates were secured to his grandson by the Protector's intervention in 1657. These estates had been granted to Spenser as his share in the redistribution of Munster — 3000 acres of land and Kilcolman Castle, an ancient seat of the Desmonds, in the north of the county of Cork. The elaborate and business-like character of the View shows that the poet was no sinecurist, but received his reward for substantial political services. He ceased to be secretary to the lord-deputy when Lord Grey was recalled in 1582; but he continued in the public service, and in 1 586 was promoted to the onerous position of clerk to the council of Munster.

Amidst all the distractions of his public life in Ireland Spenser kept up his interest in literature, and among proper subjects for reforn included Irish poetry, of which he could judge only through the medium of translations. He allows it some merit — "sweet wit," "good invention," " some pretty flowers" — but laments that it is " abused to the gracing of wickedness and vice." Meanwhile he seems to have proceeded steadily with the composition of the Faery Queen, translating his varied ex- perience of men and affairs into the picturesque forms of his allegory, and expressing through them his conception of the immutable principles' that ought to regulate human conduct, xxv. 21

He had, as we have seen, conceived a work of the kind and made a beginning before he left England. The conception must have been very much deepened and widened and in every way enriched by his intimate daily contact with the actual struggle of conflicting individuals and interests and policies in a great crisis. Some four or five years later, being asked in a mixed company ot English officials in Ireland (as recorded in Lodowick Bryskett's Discourse of Civil Life) to give off-hand a short sketch of " the ethical part of moral philosophy " and the practical uses of the study, Spenser explained to these simple- minded men that the subject was too intricate for an impromptu exposition, but that he had in hand a work called the Faery Queen in which an ethical system would be exhibited in action. The respect paid by his official brethren to Spenser as a man, " not only perfect in the Greek tongue, but also very well read in philosophy, both moral and natural," is an interesting item in his biography. Some years later still, when Spenser was settled at Kilcolman Castle, Sir Walter Raleigh found him with three books of the Faery Queen completed, and urged him to come with them to London. London accordingly he revisited in 1 589, after nine years' absence. There is a very pretty record of this visit in Colin Clout's Come Home Again, published in 1595, but written in 1591, immediately after his return to Kilcolman. The incidents of the visit, by that time matters of wistful memory, are imaged as a shepherd's

excursion from his quiet pastoral life into the great world. Colin Clout calls round him once again the masked figures of the Shepherd's Calendar, and describes to them what he saw, how he fared, and whom he met at the court of Cynthia, and how, through the influence of " the Shepherd of the Ocean," he was admitted at timely hours to play on his oaten pipe in the great queen's presence.

How much is pure fiction and how much veiled fact in this picture cannot now be distinguished, but it is undoubted that Spenser, though his chief patrons Leicester and Sidney were now dead, was very graciously received by the great world on his return to London. Not only did the queen grant him an audi- ence, but many ladies of the court, several of whom he afterwards honoured with dedications, honoured him with their patronage. The first three books of the Faery Queen, which were entered at Stationers' Hall on the 1st of December 1589, were published in 1590, and he was proclaimed at once with remarkable unanimity by all the writers of the time as the first of living poets.

From the first week of its publication the literary world has continued unanimous about the Faery Queen, except on minor points. When romanticism was at its lowest ebb Pope read Spenser in his old age with as much delight as in his boyhood. Spenser speaks: himself of having had his detractors, of having suffered from the venomous tooth of the Blatant Eeast, and he seems to have had in more than ordinary share the poet's sensitiveness to criticism; but the detraction or indifference have generally been found among men who, like the lord high treasurer Burghley, have no liking for poetry of any kind. The secret of Spenser s enduring popularity with poets and lovers of poetry lies specially in this, that he excels in the poet's peculiar gift, the instinct for verbal music. Shakespeare, or the author of the sonnet usually assigned to him, felt and expressed this when he drew the parallel between " music and sweet poetry " —

" Thou lovest to hear the sweet melodious sound That Phoebus' lute, the queen of music, makes; And I in deep delight am chiefly drowned Whenas himself to singing he betakes." This is an early word in criticism of Spenser, and it is the last word about his prime and unquestionable excellence — a word in which all critics must agree. Whether he had imagination in the highest degree or only luxuriant fancy, and whether he could tell a story in the highest epic manner or only put together a richly varied series of picturesque incidents, are disputable points; but about the enchantment of his verse there can be no difference of opinion. It matters not in the least that he gains his melody often by archaic affectations and licences of diction; there, however purchased, the marvellously rich music is. In judging of the struc- ture of the Faery Queen we must always remember that, long and diffuse as it is, what we have is but a fragment of the poet's

design, and that the narrative is regulated by an allegorical purpose; but, however intricate, however confused, the reader may feel the succession of incidents to be, when he studies the succession of incidents, it is only at the call of duty that he is likely to occupy himself with such a study in reading Spenser.

II

The ethical value of the allegory hag been very variously esti- mated. The world would probably never have divined that there was any allegory if he had not himself drawn attention to it in a prose dedication and in doggerel headings to. the cantos. It was apparently at his friend Raleigh's suggestion that the poet con- descended to explain his ethical purpose in A Letter of the Author's addressed to Sir Walter and dated the 23rd of January 1589-1590; otherwise it would have been as problematical as the similar intention in the case of the Idylls of the King before that intention was expressly declared. It is almost to be regretted, as far as the allegory is concerned, that the friendly •" E. K." was not employed to furnish a " glosse " to the Faery Queen as he had done to the Shepherd's Calendar. Undoubtedly the peculiar " poetic luxury " of the Faery Queen can be enjoyed without any reference to the allegory; even Professor Dowden, the most eloquent champion of Spenser's claims as a "teacher," admits that it is a mistake to look for minute correspondence between outward , symbol and underlying sense, and that the poet is least enjoyable where he is most ingenious. Still the allegory governs the structure of the poem, arid Spenser himself attached great importance to it as determining his position among poets. The ethical purpose is distinctive of the poem as a whole; it was foremost in Spenser's mind when he conceived, the scheme of the poem, and present with him as he built up and articu- lated the skeleton; it was in this respect that he claimed to have " overpassed " his avowed models Ariosto and Tasso. If we wish to get an idea of Spenser's imaginative force and abundance, or to see his creations as he saw them, we must not neglect the allegory. It is obvious from all that he says of his own work that in his eyes the ethical meaning not only heightened the interest of the marvel- lously rich pageant of heroes and heroines, enchanters and monsters, but was the one thing that redeemed it from romantic common- place. For the right appreciation of many of the characters and incidents a knowledge of the allegory is indispensable. For example, the slaughter of Error by the Red Cross knight would be merely disgusting but for its symbolic character; the iron Talus and his iron flail is a revolting and brutally cruel monster if he is not regarded as an image of the executioner of righteous law; the

Blatant Beast, a purely grotesque and ridiculous monster to out- ward view, acquires a serious interest when he is known to be an impersonation of malignant detraction.

Notwithstanding its immense range, the Faery Queen is pro- foundly national and Elizabethan, containing many more or less cryptic allusions to contemporary persons and interests: It has never been popular abroad, as is proved by the fact that there is no complete translation of it in any of the Continental languages. This is doubtless oil account of a certain monotony in the subject-matter, which is only partially relieved by subtle variations. The same objection applies to the famous "Spen- serian stanza " (see below) with its concluding Alexandrine. It was by no means a happy invention, but its infelicity is- dis- guised by its author's marvellous skill in rhythm, and thus recommended it was adopted by Byron and Keats. In his own day Spenser was criticized by Sidney, Ben Jonson, Daniel and others for the artificiality of his language, his " aged accents and untimely words," but Ben Jonson went further — " Spenser's stanza pleased him not, nor his matter." Milton, on the other hand, duly appreciated " our sage and serious poet," and he has been followed by a long line of distinguished judges. It was Charles Lamb who named Spenser " the poet's poet."

*After the publication of the Faery Queen Spenser seems to have remained in London for more than a year, to enjoy his triumph. It might be supposed, from what he makes the Shep- herd of the Ocean say in urging Colin Clout to quit his banish- ment in Ireland, that Raleigh had encouraged him to expect some permanent provision in London. If he had any such hopes, they were disappointed. The thrifty queen granted him a pension of £50, which was paid in February 1591, but nothing further was done for him. Colin Clout's explanation that the selfish scrambling and intriguing of court life were not suited to a lowly shepherd swain, and that he returned to country life with relief, may be pastoral convention, or it may have been an expression of the poet's real feelings on his return to Kilcolman, although as a matter of fact there seems to have been as much scrambling for good things in Munster as in London. Certain *.t is that he did return to Kilcolman in the course of the year 1 59 1, having probably first arranged for the publication of Daphnaida and Complaints. Daphnaida is a pastoral elegy on the death of the niece of the mistress of the robes. The fact implied in the dedication that he was not personally known to*

the lady has more than once provoked the solemn remark that the poet's grief was assumed. Of course it was assumed; and it is hardly less obvious that sincerity of personal emotion, so far from being a merit in the artificial forms of pastoral poetry, the essence of which lies in its dreamy remoteness from real life, would be a blemish and a discord. Any suggestion of the

poet's real personality breaks the charm; once raise the question of the poet's personal sincerity, and the pastoral poem may at once be thrown aside. The remark applies to all Spenser's minor poetry, including his love-sonnets; the reader who raises the question whether Spenser really loved his mistress may have a talent for disputation, but none for the full enjoyment of hyperbolical poetry. Complaints, also published in 1591, is a miscellaneous collection of poem3 written at different periods. The volume contained The Ruins of Time; The Tears of the Muses, Virgil's Gnat; Mother Hubbard's Tale; The Ruins of Rome; Muiopotmos; Visions of the World's Vanity; Bellay's Visions; Petrarch's Visions. Some of these pieces are translations already alluded to and interesting only as the exercises of one of our greatest masters of melodious verse; but two of them, The Tears of the Muses and Mother Hubbard's Tales, have greater intrinsic interest. The first is the complaint of the decay of learning alluded to in Midsummer Night's Dream, v. i. 52 —

" The thrice three Muses mourning for the death Of Learning late deceased in beggary."

The lament, at a time when the Elizabethan drama was " mew- ing its mighty youth," was not so happy as some of Spenser's political prophecies in his View of Ireland; but it is idle work to try to trace the undercurrents and personal allusions in such an occasional pamphlet. Mother Hubbard's Tale, a fable in Chaucerian couplets, shows a keenness of satiric force not to be paralleled in any other of Spenser's writings, and suggests that he left the court in a mood very different from Colin Clout's.

Spenser returned to London probably in 1595. He had married in the interval a lady whose Christian name was Elizabeth — Dr Grosart says Elizabeth Boyle. The marriage, celebrated on the nth of June 1594, was followed by a rapid succession of publications. The first was a volume (entered at Stationers' Hall, on the 19th of November 1594; published 1595) containing the Amoretti, a series of exquisite sonnets com-memorative of the moods and incidents of his courtship, and the magnificent Epithalamion, incomparably the finest of his minor poems. As in the case of the Complaints, the publisher for obvious reasons issued this volume nominally without his authority. Colin Clout's Come Home Again Was published in the same year, with a dedication to Sir Walter Raleigh, dated 1591. Early in 1596 the second three books of the Faery Queen were entered in the register of Stationers' Hall, and in the course of the same year were published his Four Hymns, his Prothalamion, and his Astrophel, a pastoral lament for Sir Philip Sidney, which he dedicated to the countess of Essex.

That Spenser wrote more of the Faery Queen during the last two years of

his life, and that the MS. perished in the sack of Kilcolman Castle by the rebels, may plausibly be conjectured, but cannot be ascertained. During those years he would seem to have been largely occupied with political and personal careS; He describes himself in the Prothalamion as a disappointed suitor at court. He drew up his View of Ireland in 1596 when he was in London, and from various circumstances it is evident that he had hopes- of some kind from the favour of Essex. The View, with its urgent entreaty that Essex should be sent to Ireland, was entered at Stationers' Hall in April 1 598, • but he did not obtain leave to publish it. Burghley, who had long stood in his way, died in August of that year, and next month Spenser, who seems to have returned to Ireland in 1597, was appointed sheriff of Cork. In October Tyrone's rebellion broke out, and Spenser's house was sacked and burned. The poet himself escaped, and in December was sent to London with despatches. Again he ventured to urge upon the queen hu plan for the thorough " reformation " of Ireland. But his own

end was near. On the 16th of January 1599 he died at West- minster, ruined in fortune, if not heart-broken, and was buried in Westminster Abbey, near his master Chaucer. Ben Jonson asserted that he perished for lack of bread, and that when the earl of Essex, hearing of his distress, sent him " 20 pieces," the poet declined, saying that he had no time to spend them.' This report of his end is mentioned also' by the author of The Return from Parnassus, but, having regard to Spenser's position in the world, it is inherently improbable. Still there is an ugly possibility of its truth. The poet left three sons and a daughter. A pedigree of the family appeared in the Gentleman's Magazine for August 1842.

Editions by Todd (8 vols., 1805) and by A. B. Grosart (9 vols., 1 882-1 884;; the Aldine edition, with Life by Collier, and the Globe edition, with Life byJ.W. Hales; Dean Church's Spenser, in "English Men of Letters " series; Craik's Spenser and his Poetry (1845) ; Mrs C. M. Kirkland's Spenser and the Faery Queen (New York, 1847); J. S. Hart's Essay on the Life and Writings of Edmund Spenser (New York, 1847); Kitchin and Mayhew's Spenser's Faery Queen, bks. i.ii., and Herford's Spenser's Shepherd s Calendar (Oxford, Clarendon Press) ; Roden Noel's preface to the Spenser volume in the Canterbury Poets; and F. I. Carpenter's Guide to the Study of Spenser (Chicago, 1894). (W. M.; F.J.S.)

SPENSER, JOHN (1 559-1614), president of Corpus Christi College, Oxford, was educated at Merchant Taylors' school, London, and Oxford. After graduating he became Greek reader in Corpus Christi College, and

held that office for ten years, resigning in 1588. He then left Oxford and held successively the livings of Alveley, Essex (1 580-1 592), Ardleigh, Essex (1592- 1594), Faversham, Kent (1 594-1 599), and St Sepulchre's London (1599-1614). He was also presented to the living of Broxbourne, Hertfordshire, in 1592. In 1607 he was appointed president of Corpus Christi College. After the death of his friend Richard Hooker he edited the first five books of Hooker's Ecclesiastical Politie (London, 1604). The introduction to that work and A Sermon at P aide's Crosse on Esay V., 2, j (London, 161 5) are his only published writings. He was, however, one of the translators of the authorized version of the Bible, serving on the New Testament committee.

SPENSERIAN STANZA, a form of verse which derives its name from the fact that it was invented by the poet Edmund Spenser, and first used in his Faery Queene in 1 590. The origin of this stanza has been matter for disagreement among critics of prosody. Schipper has argued that it was adapted from the oid French ballade-stanza (see Ballade). But it is much more probable that it was of Italian origin, and that Spenser, who was familiar with otlava rima as it had long been employed in Italy, and was at that very time being used by the school of Tasso, added a line between the Italian fourth and fifth, modified slightly the arrangements of rhyme, and added a foot to the last line, which became an Alexandrine. The form of the pure Spenserian stanza can best be observed by the study of a specimen from the Faery Queene: —

Into the inmost temple thus I came,

Which fuming all with frankincense I found, And odours rising from the altar's flame.

Upon a hundred marble pillars round

The roof up high was reared from the ground, AH decked with crowns and chains and garlands gay,

And thousand precious gifts worth many a pound, The which sad lovers for their vows did pay,

And all the ground was strow'd with flowers as fresh as May."

It is necessary to preserve in all respects the characteristics of this example, and the number, regular sequences and identity of rhymes must be followed. It is a curious fact that, in spite of the very great beauty of this stanza and the popularity of Spenser, it was hardly used during the course of the 17 th century, although Giles and Phineas Fletcher made for themselves adap- tations of it, the former by omitting the eighth line, the

latter by omitting the sixth and eighth. In the middle of the 18th century the study of Spenser led poets to revive the stanza which bears his name. The initiators of this reform were Akenside, in The Virtuoso (1737); Shenstone, in The Schoolmistress (1742); and 1 See Conversations with Drummond, Shakespeare Society, pp. 7, 12.

Thomson, in The Castle of Indolence (1748). Mrs Tighe (1772- 1810) used it for her once-famous epic of Psyche. It was a favourite form at the time of the romantic revival, when it was employed by Campbell, for his Gertrude of Wyoming (1809); by Keats, in The Eve of St Agnes (1820) ; by Shelley, in The Revolt of Islam (Laon and Cythna) (1818) ; by Mrs Hemans; by Reginald Heber; but pre-eminently by Byron, in Childe Harold (1812- 181 7). Thomas Cooper, the Chartist, wrote his Purgatory of Suicides (1845) in Spenserian stanza, and Tennyson part of his Lotus Eaters. By later poets it has been neglected, but Worsley and Conington's translation of the Iliad (1865-1868) should be mentioned. The Spenserian stanza is an exclusively English form.

SPERANSKI, COUNT MIKHAIL MIKHAILOVICH (1772- 1839), Russian statesman, the son of a village priest, spent his early days at the ecclesiastical seminary in St Petersburg, where he rose to be professor of mathematics and physics. His brilliant intellectual qualities attracted the attention of the government, and he became secretary to Prince Kurakin. He soon became known as the most competent of the imperial officials. The most important phase of his career opened in 1806, when the emperor Alexander I. took him with him to the conference of Erfurt and put him into direct communication with Napoleon, who described him as " the only clear head in Russia " and at the instance of Alexander had many conversations with him on the question' of Russian administrative reform. The result of these interviews was a series of projects of reform, including a consti- tutional system based on a series of dumas, the cantonal assembly (volost) electing the duma of the district, the dumas of the districts electing that of the province or government, and these electing the Duma of the empire. As mediating power between the autocrat and the Duma there was to be a nominated council of state. This plan, worked out by Speranski in 1809, was for the most part stillborn, only the council of the empire coming into existence in January 1810; but it none the less, to quote M. Chesle, 1 dominated the constitutional history of Russia in the 19th century and the early years of the 20th. The Duma of the empire created in 1905 bears the name suggested by Speranski, and the institution of local self-government (the zemslvos) in 1864 was one of the reforms proposed by him. Speranski's labours also bore fruit in the constitutions granted by Alexander to Finland and Poland.

From 1809 to 181 2 Speranski was all-powerful in Russia, so far as any

minister of a sovereign so suspicious and so unstable as Alexander could be so described. He replaced the earlier favourites, members of the " unofficial committee," in the tsar's confidence, becoming practically sole minister, all questions being laid by him alone before the emperor and usually settled at once by the two between them. Even the once all-powerful war-minister Arakcheyev was thrust into the background. Speranski used his immense influence for no personal ends. He was an idealist ; but in this very fact lay the seeds of his failure. Alexander was also an idealist, but his ideals were apt to centre in himself; his dislike and distrust of talents that overshadowed his own 'iwere disarmed for a while by the singular charm of Speranski's personality, but sooner or later he. was bound to discover that he himself was regarded as but the most potent instrument for the attainment of that ideal end, a regenerated Russia, which was his minister's sole preoccupation. In 1810 and the first half of 181 1 .Speranski was still in high favour, and was the confidant of the emperor in that secret diplomacy which preceded the breach of Russia with Napoleon. 2 He had, however, committed one serious mistake. An ardent freemason himself, he conceived in 1809 the idea of reorganizing the order in Russia, with the special object of using it to educate and elevate the Orthodox clergy. The emperor agreed to the first steps being taken, namely the suppression of the existing lodges; but he was naturally suspicious of secret societies, even when ostensibly admitted to their secrets, and Speranski's abortive plan only resulted in adding the clergy to the number of his enemies.

1 Le Parlement russe (Paris, 1910), p. 21 ! Schiemann, Gesch. Russlands, i. 77.

On the eve of the struggle with Napoleon, Alexander, conscious of his unpopularity, conceived the idea of making Speranski his scape-goat, and so conciliating that Old Russian sentiment which would be the strongest support of the autocratic tsar against revolutionary France. Speranski's own indiscretions gave the final impulse. He was surrounded with spies who reported, none too accurately, the minister's somewhat sharp criticisms of the emperor's acts; he had even had the supreme presumption to advise Alexander not to take the chief command in the coming campaign. A number of persons in the entourage of the emperor, including the grand-duchess Catherine, Karam- zin, Rostopchin and the Swedish general Baron. Armfield, intrigued to involve him in a charge of treason. 1 Alexander did not credit the charge, but he made Speranski responsible for the unpopularity incurred by himself in consequence of the hated reforms and the still more hated French policy, and on the i7th-2oth of March

1812 dismissed him from office. Reinstated in the public service in 1816, he was appointed governor-general of Siberia, for which he drew up a new scheme of government, and in 182 1 entered the council of state. Under Nicholas I., he was engaged in the codification of the Russian law (published in 1830 in 45 vols.), on which he also wrote some important commentaries.

See the biography (in Russian) by M. Korff (St Petersburg, 1 861). On his public life and constitutional reforms see Theodor Schiemann, Geschichte Russlands unlet Kaiser Nikolaus I., Bd. ». Kaiser Alexander I. p. 75 seq. (Berlin, 1904) ; Pierre Chasles, Le Parlement russe p. 19 seq. (Paris, 1910), and the works of V. Vagin (St Petersburg, 1872 and Moscow, 1905). Count Nesselrode's letters to Speranski and many references are published in vol. iii. of the Letires et papiers du comte de Nesselrode.

SPERMACETI (from Lat. sperma, seed, and celus, a whale), a wax found in the head cavities and blubber of the sperm-whale (Physeler macrocephalus), where it is dissolved in the sperm oil while the creature is living; it also occurs in other Cetacea (see Whale Oils). At a temperature of about 6° C. the solid matter separates in a crystalline condition, and when purified by pressure and treatment with weak solution of caustic alkali it forms brilliant white crystalline scales or plates, hard, but unctuous to the touch, and destitute of taste or smell. It is quite in- soluble in water, very slightly affected by boiling alcohol, but easily dissolved in ether, chloroform, and carbon bisulphide. Spermaceti consists principally of cetin or cetyl palmitate, C 16 H3iC0 2 Ci6H33. The substance is used in making candles of standard photometric value, in the dressing of fabrics, and in medicine and surgery, especially in cerates, bougies, ointments, and in cosmetic preparations.

SPERM-WHALE, or Cachalot (Physeler macrocephalus), the largest representative of the toothed whales, its length and bulk being about equal to, or somewhat exceeding those of the Arctic right-whale, from which, however, it is very different

The Sperm- Whale (Physeler macrocephalus).

in appearance and structure. The head is about one-third of the length of the body, very massive, high and truncated in front; and owing its size and form mainly to the accumulation of a peculiarly modified form of fatty tissue in the large hollow on the upper surface of the skull. The oil contained in cells in this cavity, when refined, yields spermaceti, and the thick cover- ing of blubber, which everywhere envelopes the body, produces the valuable sperm-oil of commerce. The single blowhole is a longitudinal slit, placed at the upper and anterior extremity of the head to the left side

Of the middle line. The opening of the mouth is on the under side of the head, considerably behind the end of the snout. The lower jaw is extremely narrow, and 1 See Schiemann, op. cit., 1. 81.

has on each side from twenty to twenty-five stout conical teeth, which furnish ivory of good quality, though not in sufficient bulk for most of the purposes for which that article is required. The upper teeth are rudimentary and buried in the gum. The nipper is short, broad, and truncated, and the dorsal fin a mere low protuberance. The general colour of the surface is black above and grey below, the colours gradually shading into each other. The sperm-whale is one of the most widely distributed of animals, being met with, usually in herds or " schools," in almost all tropical and subtropical seas, and occasionally visiting the northern seas, a number having been killed around the Shetlands a few years ago. The food of sperm-whales consists mainly of squid and cuttlefish, but also comprises fish of consider- able size. The substance called " ambergris," formerly used in medicine and now in perfumery, is a concretion formed in the intestine of this whale, and found floating on the surface of the sea. Its genuineness is proved by the presence of the horny beaks of the cuttles on which the whale feeds. The one represen- tative of the genus Cogia is called the lesser or pigmy sperm- whale, being only from 9 ft. to 13 ft. long.

SPES, in Roman mythology, the personification of Hope. Originally a nature goddess (like Venus the garden goddess, with whom she was sometimes identified), she represented at first the hope of fruitful gardens and fields, then of abundant offspring, and lastly of prosperity to come and good fortune in general, being hence invoked on birthdays and at weddings. Of her numerous temples at Rome, the most ancient was appro- priately in the forum olitorium (vegetable market), built during the first Punic war, and since that time twice burnt down and restored. Th« day of its dedication (August 1) cor- responded with the birthday of Claudius, which explains the frequent occurrence of Spes on the coins of that emperor. Spes is represented as a beautiful maiden in a long light robe, lifting up her skirt with her left hand, and carrying in her right a bud already closed or about to open. Sometimes she wears a garland of flowers on her head, ears of corn and poppy-heads in her hand, symbolical of a prosperous harvest. Like Fortune, with whom she is often coupled in inscriptions on Roman tombstones, she was also represented with the cornu copiae (horn of plenty).

See G. Wissowa, Religion und Kultus der Romer (1902), according to whom Spes was originally not a garden goddess, but simply the divinity to whom one prayed for the fulfilment of one's desires.

SPESSART, a highland forest country of Germany, belonging mainly to the

Bavarian province of Lower Franconia, but in the north to the Prussian province of Hesse Cassel, and it is bounded on the S. and W. by the Main, on the E. by the Sinn and on the N. by the Kinzig and Joss. The main ridge of the formation, consisting of gneiss, granite and red sandstone, runs from a point opposite Miltenberg, in a north-westerly direction to the source of the Kinzig near Schliichtern — a distance of 45 m. — and attains its highest elevation in the Geiersberg (1919 ft.), which lies north of the Rohrbrunn pass, through which runs the main road from Aschaffenburg to Wiirzburg. The forest, with which it is densely covered, consists of oak, beech, ash and fir, and the scenery, especially on the main side, between Gemiinden and Lohr, is impressive. The climate is inclement in winter and oppressively hot in midsummer. The inhabitants are engaged chiefly in woodcutting, raft- making and quarrying, and most of the timber is floated down to Holland. Cobalt, silver, lead and copper are also worked, and the southern and western slopes yield wine of good quality. This beautiful tract of country until recent years was compara tively little known to the tourist, but a club (Spessart Klub) through the establishment of finger-posts and the issue of maps, has indicated the more interesting tours to be foll'owed.*

See Bucking, Der nordwes'liche Spessart, geologisch aufgenommen (Berlin, 1893); Schober, Fuhrer durch den Spessart (Aschaffenburg, 1904); Wolff, Der Spessart, sein Wirtschaftsleben (ibid., 1905).

SPEUSIPPUS (4th century B.C.), Greek philosopher, son of Eurymedon and Potone, sister of Plato, is supposed to have been born about 407 B.C. He was bred in the school of Isocrates;

but, when Plato returned to Athens about 387, yielded to his influence and became a member of the Academy. In 361, when Plato undertook his third and last journey to Sicily, Speusippus accompanied him. In 347 the dying philosopher nominated his nephew to succeed him as scholarch, and the choice was ratified by the school. Speusippus held the office for eight years, and died in 330 after a paralytic seizure. According to some authorities he committed suicide. There is a story that his youth was riotous, until Plato's example led him to reform his ways. In later life he was conspicuously temperate and amiable. He was succeeded by Xenocrates.

Of Speusippus 's many philosophical writings nothing survives except a fragment of a treatise On Pythagorean Numbers. Nor have secondary authorities preserved to us any general state- ment or conspectus of his

system. Incidentally, however, we learn the following details, (a) In regard to his theory of being:

(1) whereas Plato postulated as the basis of his system a cause which should be at once Unity, Good, and Mind, Speusippus distinguished Unity, the origin of things, from Good, their: end, and both Unity and Good from controlling Mind or Reason;

(2) whereas Plato recognized three kinds of numbers— firstly, ideal numbers, i.e. the" determinants " or ideas; secondly, mathe- matical numbers, the abstractions of mathematics; and thirdly sensible numbers, numbers embodied in things — Speusippus rejected the ideal numbers, and consequently the ideas; (3) Speusippus traced number, magnitude and soul each to a distinct principle of its own. (b) In regard to his theory of knowledge : (4) he held that a thing cannot be known apart from the know- ledge of all things besides; for, that we may know what a thing is, we must know how it differs from other things, which other things must therefore be known; (5) accordingly, in the ten books of a work called "O/ uoia, he attempted a classification of plants and animals; (6) the results thus obtained he distinguished at once from " knowledge" (exurnjyitTj) and from " sensation" (aicrˆfftj), holding that " scientific observation" ieKLUT-qtiovKi] atadricns) , though it cannot attain to truth, may, nevertheless, in virtue of a certain acquired tact, frame "definitions" (X6701), (c) In regard to his theory of ethics: (7) he denied that pleasure was a good, but seemingly was not prepared to account it an evil.

In default of direct evidence, it remains for us to compare these scattered notices of Speusippus's teaching with what we know of its original, the teaching of Plato, in the hope of obtain- ing at least a general notion, firstly, of Speusippus's system, and, secondly, of its relations to the systems of Plato, of contemporary Platonists, such as Aristotle, and of the later Academy.

It has been suggested elsewhere (see Socrates) that the crude and unqualified " realism " of Plato's early manhood gave place in his later years to a theory of natural kinds founded upon a " thoroughgoing idealism," and that in this way he was led to recognize and to value the classificatory sciences of zoology and botany. More exactly, it may be said that the Platonism of Plato's maturity included the following principal doctrines: (i.) the supreme cause of all existence is the One, the Good, Mind, which evolves itself as the universe under certain eternal immu- table forms called " ideas" ; (ii.) the ideas are apprehended by finite minds as particulars in space and time, and are then called " things" ; (hi.) consequently the particulars which have in a given idea at once their origin, their being, and their perfection may be regarded, for the purposes of

scientific study, as members of a natural kind; (iv.) the finite mind, though it cannot directly apprehend the idea, may, by the study of the particulars in which the idea is revealed, attain to an approximate notion of it.

Now when Speusippus (1) discriminated the One, the Good, and Mind, (2) denied the ideas, and (3) abandoned the attempt to unify the plurality of things, he explicitly rejected the theory of being expressed in (i.) and (ii.) ; and the rejection of the theory of being, i.e. of the conception of the One evolving itself as a plurality of ideas, entailed consequential modifications in the theory of knowledge conveyed in (iii.) and (iv.). For, if the members of a natural kind had no common idea to unite them,

scientific research, having nothing objective in view, could at best afford a \670s or definition of the appropriate particulars; and, as the discrimination of the One and the Good implied the progression of particulars towards perfection, such a "Soyos or definition could have only a temporary value. Hence, though, like Plato, Speusippus (4) studied the differences of natural products (5) with a view to classification, he did not agree with Plato in his conception of the significance of the results thus obtained; that is to say, while to Plato the definition derived from the study of the particulars included in a natural kind was an approximate definition of the idea in which the natural kind originated, to Speusippus the definition was a definition of the particulars studied, and, strictly speaking, of nothing else. Thus while Plato hoped to ascend through classificatory science to the knowledge of eternal and immutable laws of thought and being, Speusippus, abandoning ontological speculation, was content to regard classificatory science not as a means but as an end, and (6) to rest in the results of scientific observation. In a word, Speusippus turned from philosophy to science.

It may seem strange that, differing thus widely from his master, Speusippus should have regarded himself and should have been regarded by others as a Platonist, and still more strange that Plato should have chosen him to be his successor. It is to be observed, however, firstly, that the scientific element occupied a larger place in Plato's later system than is generally supposed, 1 and, secondly, that other Academics who came into competition with Speusippus agreed with him in his rejection of the theory of ideas. Hence Plato, finding in the school no capable representative of his ontological theory, might well choose to succeed him a favourite pupil whose scientific enthu- siasm and attainment were beyond question; and Speusippus's rivals, having themselves abandoned the theory of ideas, would not be in a position to tax him with his philosophical apostasy.

In abandoning the theory of ideas — that is to say, the theory of figures and numbers, the possessions of universal mind, eternally existent out of

space and time, which figures and numbers when they pass into space and time as the heritage of finite minds are regarded as things — Speusippus had the approval, as of the Platonists generally, so also of Aristotle. But, whereas the new scholarch, confining himself to the detailed examination, of natural kinds, attempted no comprehensive explanation of the universe, Aristotle held that a theory of its origin, its motions, and its order was a necessary adjunct to the classificatory sciences; and in nearly all his references to Speusippus he insists upon this fundamental difference of procedure. Conceiving that the motions of the universe and its parts are due to the desire which it and they feel towards the supreme external mind and its several thoughts, so that the cosmical order planned by the diyine mind is realized in the phenomenal universe, Aristotle thus secures the requisite unification, not indeed of mind and matter, for mind and matter are distinct, but of the governing mind, the prime unmoved movent, since it and its thoughts are one. Contrari- wise, when Speusippus distinguishes One, Good, and Mind, so that Mind, not as yet endowed with an orderly scheme, adapts the initial One to particular Goods or ends, his theory of nature appears to his rival " episodical," i.e. to consist of a series of tableaux wanting in dramatic unity, so that it reminds him of Homer's line — oiik ayaOov ToKvKOipavir] ' eh Kolpavos eorco.

Speusippus and his contemporaries in the school exercised an important and far-reaching influence upon Academic doctrine. When they, the immediate successors of Plato, rejected their master's ontology and proposed to themselves as ends mere classificatory sciences which with him had been means, they bartered their hope of philosophic certainty for the tentative and provisional results of scientific experience. Xenocrates indeed, identifying ideal, and mathematical numbers, sought to

1 That Plato did not neglect, but rather encouraged, classificatory science is shown, not only by a well-known fragment of the comic poet Epicrates, which describes a party of Academics engaged in investigating, under the eye of Plato, the affinities of the common pumpkin, but also by the Timaeus, which, while it carefully dis- criminates science from ontology, plainly recognizes the importance of the study of natural kinds.

shelter himself under the authority of Plato; but, as the Xeno- cratean numbers, though professedly ideal as well as mathe- matical, were in fact mathematical only, this return to the Platonic terminology was no more than an empty form. It would seem, then, that Academic scepticism began with those who had been reared by Plato himself, having its origin in their

acceptance of the scientific element of his teaching apart from the ontology which had been its basis. In this way, and, so far as the present writer can see, in this way only, it is possible to understand the extraordinary revolution which converted Platonism, philo- sophical and dogmatic, into Academicism, scientific and sceptical. It is as the official representative of this scientific and sceptical departure that Speusippus is entitled to a place in the history of philosophy.

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SPEY, a river in the Highlands of Scotland. It rises in Mt Clach-a-Cheannaiche in the north of Lochaber, in Inverness- shire, at a height of 1407 ft. above the sea. A mile from its source it forms the small Loch Spey, and 31 m. lower down it expands into the larger Loch Inch. After crossing the boundary of Elginshire, below Grantown, it pursues an extremely serpen- tine course, as far as Craigellachie, where it begins to flow due northwards, becoming wholly a Moray stream as it approaches Fochabers, and falling by several mouths into the Moray Firth at Kingston. Its total length is about 1 10 m. It is the most rapid river in Scotland and is nowhere properly navigable, though at Speymouth in its lowest reaches some ship-building has been intermittently carried on. The strength of its current is due partly to its lofty origin, and partly to the volume of water con- tributed by numberless affluents from the mountainous regions of its birth. The more important tributaries are, on the left, the Markie, Calder, Dulnain, Tulchan, Ballintomb and Rothes and, on the right, the Mashie, Truim, Tromie, Feshie, Nethy, Avon, Fiddich and Mulben. Its area of drainage is 1300 sq. m. At certain points the stream attains a considerable width, as at Alvie, where it is 1 50 ft. wide, and at Kingussie, where its width is from 80 to 100 ft. From below Craigellachie, and especially on the low-lying coast land, pools or stretches of fair size become frequent. For beauty of scenery Strathspey holds its own with any of the great valleys of Scotland. As a salmon river the Spey yields only to the Tay and Tweed. It passes many interest ing spots in its long career, such as Laggan; Cluny Castle, the seat of Cluny Macpherson; Craig Dhu, the " black rock," and Kingussie. It flows past the pine forests of Rothiemurchus; Granton, the capital of Strathspey; Cromdale, where the clans- men suffered defeat at the hands of William III.'s troops in 1690; Ballindalloch, with a splendid Scottish baronial castle, the seat of the Macpherson-Grants; and Charlestown of Aberlour and its fine cataract.

SPEZIA, a city of Liguria, Italy, in the province of Genoa, 56 m. S.E. of

that town by rail, 49 ft. above sea-level. Pop. (1906), 41,773 (town); 75,756 (commune); in 1861 only 11,556. It is the chief naval harbour of Italy, having been adopted as such in 1861. The Bay of Spezia is sheltered from all except southerly winds, and on its western shore are numerous openings, which afford perfectly safe anchorage in all weathers. The entrance is protected by forts, while a submarine embankment, 2 m. long, renders it secure. The arsenal consists of three depart- ments, the principal of which is 3937 ft. long, with an average width of 2460 ft. The chief basin is 23 acres in extent, and the second — connected with the first by a canal 91 ft. wide — 36 acres. Both basins have an average depth of between 33 and 35 ft. The second basin gives access to the docks, of which there are six; two 390 ft. long, two 420 ft. long, one 500 ft. long, and one 650 ft. long. The establishment of San Vito is devoted entirely to the production of artillery; that of San Bartolomeo is exclusively used for electrical works and the manufacture of submarine weapons, especially torpedoes. The arsenal was

constructed by General Chiodo (d. 1870), whose statue rises at the entrance, and near it are the naval barracks and hospital. Though the town itself, with the barracks and military hospital as its principal buildings, presents little to attract the foreign visitor, the beauty of the gulf and of the neighbouring country has brought Spezia into some repute as a winter resort, and it is also visited in summer for sea-bathing. The walls and gates of the old city are for the most part destroyed. The opening of a railway across the Apennines (there is a branch leaving the coast line at Vezzano, and joining the line from Sarzana at S. Stefano di Magra), placed Spezia in communication with Parma and the most fertile regions of the Po valley, and so stimulated commerce that a new commercial port to the east of the city was built. This harbour consists of a broad quay with 657 ft. of wharfage, and of a mole 1639 ft. long with 984 ft. of wharfage. The basin of the harbour is about 26 ft. deep. A branch railway connects the wharves directly with the main line. Since the opening of the new port the traffic has considerably increased, and it exports oil, pig-lead; silver, flour, wine, marble and sandstone for paving' purposes, while it imports quantities of coal, iron, cereals, phosphates, timber, pitch, petroleum, and mineral oils. The import of coal in 1906 was 439,494 tons, being nearly double the average for 1901-1905. The tonnage of vessels entered was over 600,000, an increase of about 25% on that of 1905. Several important industrial establishments lie along the bay, including large lead and silver works at Pertusola (see Lerici), submarine cable works, a shipyard at Muggiano for the construction of mercantile vessels up to 10,000 tons, a branch of the Vickers Terni works for armour plate, several motorboat works, brick and tile works, &c.

The origin of Spezia is doubtful; but it probably rose after the destruction of

Luna. Sold by one of the Fieschi in 1276 to Genoa, the town was fortified by its new possessors and made the seat of a governor of some importance. It became a city in the 1 6th century. The idea of making the Gulf of Spezia a great naval centre was first broached by Napoleon I.

SPHAERISTERIUM (Gr. o-

SPHENE, a mineral consisting of calcium titano-silicate, CaTiSiOs, crystallizing in the monoclinic system. The crystals vary considerably in habit, but are generally thin and wedge- shaped; hence the name sphene, from the Greek (rtp^v (a wedge), given by R. J. Haiiy in 1801. The earlier name titanite, given by M. H. Klaproth in 1795, is also in common use. Twinning on the ortho-pinacoid is not uncommon. The colour is green, yellow, brown or black, and the lustre resinous to adamantine; crystals are transparent to opaque. The hardness is 55, and the specific gravity 3-5. The refractive indices and the optic axial angle vary considerably with the colour of the light: the dispersion of the optic axes is inclined, and the interference figure seen in convergent light between crossed nicols is very characteristic of the mineral. Sphene is sometimes cut as a gem-stone, though it is rather too soft to stand much wear; owing to its high dispersive power it gives brilliant flashes of prismatic colours. As crystals, sphene has a wide distribution constituent of many kinds of igneous rocks (granite, syenite, trachyte, phonolite, &c), and also of gneiss, schist and crystalline limestone. Sharply-developed, transparent, pale green crystals are frequently associated with adularia, asbestos and quartz in the crystal-lined crevices of the schists of the Swiss and Tyrolese Alps. Large, rough and dark-coloured crystals are found at Arendal and Kragero in Norway, and in granular limestone at Diana in New York and Eganville in Ontario. A greyish, compact and impure variety of sphene, known as

small

embedded accessory

SPHENODON^SPHERE

" leucoxene," frequently occurs in basic igneous rocks as an alteration product of ilmenite and rutile. (L. J. S.)

SPHENODON, or Tuatara. Sphenodon s. Hatteria (called by Gray after Hatter), with one species, S. punctatum, is the sole surviving member of the whole group of Rhynchocephalia (q.v. under Reptiles, Fossil). It is one of the few reptiles inhabiting New Zealand; formerly common on the main islands, now restricted to some of the small, uninhabited islands in the Bay of Plenty, where these last " living fossils " enjoy the protection of the government. The Maoris call it ruatara, tuatete or tuatara, the latter meaning " having spines." This creature represents an almost jdeally generalized type of reptile. The total length of large males is more than two feet, but mature females are scarcely half this size. In general appearance they much resemble the Agamidae, especially Uromastix, or Physignathus, with the massive head, the chisel-shaped front teeth, short legs and erectile crest of cutaneous spines on the head and along the mid-line of the trunk and tail, whilst the rest of the dark olive-green skin is granular, with yellowish specks. But the Agamoid resem- blance is only skin-deep, and only the tyro can confound them with any group of Lacertilia. At the same time it is probable that Sphenodon stands near the ancestral root of the Lacertilia, before these divided into geckos, chameleons, and lizards proper, ˆhe development of this animal has been first studied by G". B. Howes, who quotes the literature bearing upon the whole subject. A good account of the habits of the tuatara has been given by Newman. They live upon animals, but these are only taken when alive and moving about, e.g. fish, worms, insects. Sluggish in their habits, they sleep during the greater part of the day in their self-dug burrows, and are very fond of lying in the water, and they remain below for hours without breathing. Each individual excavates its own hole, a tunnel leading into a roomy chamber, lined with grass and leaves; part of the habitation is shared socially by a family of petrels, which is said to occupy usually the left side, whilst the tuatara itself lives a solitary life. The male croaks or grunts much during the pairing season; the hard-shelled, long-oval eggs, about 28 mm. long, are laid in holes in the sand, about ten in one nest, from November to January or February. They contain nearly ripe embryos in the following August, but they are not hatched until about thirteen months old; in the meantime they seem to undergo a kind of hibernation, their nasal chambers becoming blocked with proliferating epithelium, which is resolved shortly before hatching during the southern summer. In spite of their imposing, rather noble appearance, when, with their heads erect, they calmly look about with their large quiet eyes, they are dull creatures, but they bite furiously.

For life history see A. K. Newman, Trans. New Zealand Inst. (1878), x. 222; Von Haast, ibid. (1881), xiv. 276; Reischek, ibid, xiv. 274; A. Dendy, ibid. (1899), xxxi. 245; Nature, 59, 340. For development; G. 6. Howes and H. H. Swinnerton, Trans. Zool. Soc. (1900), xv. 1-86, six plates; A. Dendy, Quart. Journ. Mic. Sci. (1899), 42, pp. 1-87, ten plates and ibid. pp. m-153 (parietal eye); H. Schauinsland, Arch. mikr. Anat. (1900), 56, pp. 747-867, plates. For anatomy. A. Giinther, Phil. Trans. (1867), 157, pp. 595-629, plates; A. K. Newman, quoted above; F. J. Knox, Trans. New Zealand Inst. (1869) ii. 17-20; G. Osawa, Arch. mikr. Anat. (1898), 51, pp. 481-690, and ibid. 52, pp. 268-366. (H. F. G.)

SPHERE (Gr. caipa, a ball or globe), in geometry, the solid or surface traced out by the revolution of a semicircle about its diameter; this is essentially Euclid's definition; 1 in the modern geometry of surfaces it is defined as the quadric surface passing through the circle at infinity. Every point is equidistant from a fixed point within the surface; this point is the " centre," the constant distance the " radius," and any line through the centre and intersecting the sphere is a " diameter." All sections of the

1 The surfaces formed by revolving a circle about any chord also received attention at the hands of the Greeks. According to Heron and Geminus they were discussed under the name spire by Perseus (c. 200-100 B.C.), their sections were termed spiral sections, and are probably the same as the hippopede of Eudoxus. The surface and solid traced by the revolution of the lesser segment of a circle is termed a " spindle." An " anchor ring " or " tore " results when a circle revolves about an axis in its plane.

sphere are necessarily circles; if the cutting plane contains the centre, the section is said to be " meridional," the curve of inter- section is a " great circle," and the solid cut off a " hemisphere." If the plane does not contain the centre, the curve of intersection is a " small circle," and the solid cut off is a " segment." " Great " circles may also be defined as circles on a sphere which pass through the extremities of a diameter; they are familiar as the . meridians or lines of longitude of geographers; lines of latitude are " small circles." The shortest distance between two points on a sphere is the arc of the great circle containing the points. This proposition is the basis of the "great circle sailing " of navigators, and the arc of the great circle is called the " rhumb line " or " loxodromic curve." The determination of the shortest distance between two small circles on a sphere is given in the article Variations, Calculus of. The extremities of the diameter perpendicular to a small circle are called the " poles " of that circle, and the distance from the pole to the circle, measured by the arc of the great circle through the pole, is the " polar distance " of the small circle. The solid enclosed by a small circle and the radii vectores from the centre of the sphere is a " spherical sector " ; and the solid contained between two

spherical sectors standing on copolar small circles is a " spherical cone." A " spherical sector " and " spherical cone " may be also regarded as the solids of revolution of a circular sector about one of its bounding radii, and about any other line through the Vertex respectively. The solid intercepted between two parallel planes is a " zone."

The geometry of the sphere was studied by the Greeks; Euclid, in book xii. of his Elements, discusses various properties of the sphere, and in book xiii. he shows how to inscribe the five regular polyhedra within it. But with the sole exception of proving that the volumes of spheres are in the triplicate ratio of their diameters, a theorem probably due to Eudoxus, no mention is made of its mensuration. This subject was investigated by Archimedes, who, by his " method of exhaustions," derived the principal results. He showed that the surface of a segment is equal to the area of the circle whose radius equals the distance from the vertex to the base of the segment; that the surface of the entire sphere is equal tp the curved surface of the circumscribing cylinder, and to four times the area of a great circle of the sphere; and that the volume is two- thirds that of the circumscribing cylinder. To Zeriodorus (c. 200ˆ 100 B.C.) is due the important problem in maxima and minima that for a given surface the sphere is the solid of maximum volume. Calling the radius r, and denoting by jr the ratio of the circumfer- ence to the diameter of a circle, the volume is fur 3 , and the surface 4irr 2 . _ _ •

Archimedes gave his results in the treatise Xlepl rijs aaipat xal toD Kv \iv5pov. he left unfinished the problem of dividing a sphere into segments whose volumes are in a given ratio. A solution by means of the parabola and hyperbola was given by Dionysodorus of Amisus (c. 1st century B.c), and a similar problem — to construct a segment equal in volume to a given segment, and in surface to another segment — was solved by the Arabian mathematician and astronomer, Al Kuhi.

In analytical geometry, the equation to the sphere takes the forms x i --y i --z t = a i , and r = a, the first applying to rectangular Cartesian co-ordinates, the second to polar, the origin being in both cases at the centre of the sphere. If the centre be (a, /3, y), the Cartesian equation becomes (x — a) 2 + (y — /3) 2 + (2 — y) 2 = a 2 ; consequently the general equation is aˆ+ji 8 + z 2 f 2A# + 2By+2Cz+D=o, and it is readily shown that the co-ordinates of the centre are (-A, -B, -C), and the radius A 2 +B 2 +C 2 D. A sphere can therefore be described so as to satisfy four given conditions. Systems of spheres have characters analogous to those of systems of circles. If r, n be the radii of two spheres, d the distance between the centres, and the angle at which they inter sect, then d 2 = r 2 + T 2 + 2fi cos ; hence irri cos <£ = d 2 — r 2 — rf. This function is named the " power " of the two spheres, and it is important in the investigation of

systems of spheres. If the sphere r\ degenerate to a point, the function irr\ cos $ has the limit o 2 ~r 2 ; this is the square of the tangent to the sphere from the point, and is named the " power of the sphere at the point," or the " power of the point with respect to the sphere." Two spheres intersect in a plane, and the equation to a system of spheres which intersect in a common circle is x 2 + y + z 2 +2A# + D = o, in which A varies from sphere to sphere, and D is constant for all the spheres, the plane yz being the plane of intersection, and the axis of a: the line of centres. Corresponding to the radical centre of three circles, it may be shown that four spheres have a radical centre, i.e. that there exists a point such that the tangents from this point to the four spheres are equal, and that with this point as centre, and the length of the tangent as' radius, a sphere may be described which*

Definitions.

cuts the four spheres at right angles; this "orthotomic " sphere corresponds to the orthogonal circle of a system of circles.

The investigation of triangles and other figures drawn upon the surface of a sphere is all-important in the sciences of astronomy, geodesy and geography. In astronomy, we are principally com cerned with the orientation of points on a sphere — the so-called celestial sphere — with regard to certain planes and points within the sphere ; this subject is treated in the article Astronomy (Spheri- • cal). In " geodesy," and the cognate subject " figure of the earth," the matter of greatest moment with regard to the sphere is the determination of the area of triangles drawn on the surface of a sphere — the so-called "spherical triangles"; this is a branch of trigonometry, and is studied under the name of spherical trigono- metry. In mathematical geography the problem of representing the surface of a sphere on a plane is of fundamental importance ; this subject is treated in the article Map.

SPHERES, MUSIC OF THE, in Pythagorean philosophy, the harmony produced by the heavenly bodies in their orbits, inaudible to human ears. Pythagoras (cf. Arist. de .Caelo, ii. 9) held that the movements of stars were governed by fixed laws which could be expressed in numbers according to the numbers which give the harmony of sounds (see Pythagoras, ad fin.). It is this theory to which Shakespeare alludes in The Merchant of Venice (Act. v. i. seq.: " such harmony is in immortal souls, but ... we cannot hear it "). According to Gomperz (Greek Thinkers, i. 118, Eng. trans.) " there was nothing fanciful in the Pythagorean doctrine except only the belief that the differences of velocity in the movements of the stars were capable of producing a harmonious orchestration and not

merely sounds of varying pitch."

SPHERES OF INFLUENCE. "Spheres of influence," " spheres of action," " spheres of interest," " zones of influence," field of operations," " Machtsphare," " Interes c en- ' sphare,'' are phrases in international law which have come into use to describe regions as to which nations have agreed that one or more of them shall have exclusive liberty of action. These phrases became common after 1882, when the " scramble for Africa " began, to describe diplomatic arrangements with respect to it. Some definitions may be quoted — when secretary of state for the colonies, Lord Knutsford, replying to a deputation in 1890, said: " 'Sphere of action ' is a term I do not wish to define now; but it amounts to this: we should not allow the Portuguese, Germans, or any ' foreign nation or republic to settle down and annex the territory '; (quoted in Keane's Compendium of Geography, i. 21). " The term ' sphere of influence ' implies an engagement between two states that one of them will abstain from interfering or exercising influences within certain territories which, as between the contracting parties, are reserved for the operation of the other " (Ilbert, Government of India, 2nd ed., p. 370). " IJnter ' Inter- essensphare ' oder ' Machtsphare ' versteht man namlich das auf Grund von Vereinbarungen unter den betheiligfen Kolonial- staaten abgegrenzte Gebiet, innerhalb dessen ein Staat ausschliesslich berechtigt ist, seine koloniale Herrschaft durch Besitzergreifung oder Abschluss von Protectoratsvertragen zu begriinden, oder doch einen fur die in diesem Gebiete vorhandenen Volkerschaften massgebenden politischen Einfluss auszuiiben " (Stengel, Die deutschen Schutzgebiete, p. 18). "The term ' sphere of influence or sphere of interest ' has been given an extended meaning by recent developments. Formerly it was used to signify a region wherein a nation, through its citizens, had acquired commercial or industrial interests without having asserted any political protectorate or suzerainty. To-day, as used in China and elsewhere, the term applies rather to a region pre-empted for further exploitation and possibly for political control " (Dr Reinisch's Politics, pp. 60, 61). "A portion of a non-Christian or uncivilized country which is the subject of diplomatic arrangements between European states, but has not yet developed into a protectorate " (Jenkyn's British Rule and Jurisdiction beyond the Seas. See also Hall, 6th ed., 129.

The reasons for making these arrangements are to be explained partly by reference to the history of international law as to occupation. The Roman jurists recognized certain " natural modes " of acquiring property, in particular traditio and occupatio. The doctrines which the Roman jurists had worked

out as to acquisition of private property by occupation were applied to the appropriation by states or their subjects of vacant lands (res nullius),

including lands in the possession Rights of of barbarous tribes. " Quod enim nullius est> id Discoverer ratipne naturali occupanti conceditur " (Institutes, ana ii. 1-12). The Roman law required the animus " pa "" domini — there must be seizure for and on behalf of the owner. There roust be " apprehensio. Apiscimur possessionem corpore et animo, neque per se animo aut per se corpore " (Dig. xli. 2-3). Professing to act on these doctrines, and relying . also on an assumed right on the part of Christian nations to subdue obdu- rate non-Christian communities, the navigators and explorers of the 15th and 16th centuries made exorbitant claims. Having occupied Certain points on the coast-line, they claimed to have occupied a whole island or continent (De Martens i. 462). They made vast claims under Papal bulls; for example, under the bull of Nicholas V. of 1454, and the bull of Alexander VI. of 1494, which assigned to the Portuguese the empire of Guinea just discovered. It was: one of Grotius's services to diffuse sounder ideas, and to point out that Roman law gave no support to these pretensions: " In venire non illud est oculis usurpare, sed apprehendere " (Mare liberum, c. 2). He insisted that " occu- patUfcautem publica eodem modo fit quo privata territoria sunt ex decupationibus populorum ut privata dominia ex occupa- tionibus singulorum." In recent times the old doctrine that discovery without occupation confers an independent right to the land so discovered of any extent is discredited. The ten- dency is to insist on actual occupation as a condition of legiti- mate possession or sovereignty (see correspondence between Great Britain and Portugal, State Papers 79, p. 1062), and to treat the discoverer's right as merely inchoate. Thus, in opening the conference at Berlin in 1884, Prince Bismarck said: " Pour qu'une occupation soit consideree comme effective, il est, de plus, a. d6sirer que Pacquereur manifeste, dans delai raisonnable, par des institutions positives, la volonte et le pouvoir d'y exercer ses droits et de remplir les devoirs qui en resultent." This doctrine is recognized in articles 34 and 35 of the General Act of Berlin, the former of which states that " any Power which henceforth takes possession of a tract of land on the coast of the African continent outside its posses- sions, or which being hitherto without such possessions shall acquire them, as well as the Power which assumes a protectorate, shall accompany the respective act with a notification thereof, addressed to the other Signatory Powers of the present act, in order to enable them, if need be, to make good any claim of their own." To a similar effect wrote Lord Salisbury in 1887 with reference to the claims of Portugal in East Africa. " Great Britain considers that it has been admitted in principle by all the parties to the act of Berlin that a claim of sovereignty in Africa can only be maintained by real occupation of the territory claimed; and that the doctrine has been practically applied in the recent Zambezi delimitation (State Papers 79, p. 1063). No paper annexation of territory can pretend to validity as a bar to the enterprise of otheT nations." At its session at Lausanne, in 1889, the Institut de Droit

International adopted the following principles:—

" Article 1. — L'occupation d'un territoire a. titre de souverainetˆ ne pourra 6tre reconnue comme effective que si elle reunit les conditions suivantes: 1° La prise de possession d'un territoire enferm6 dans certaines limites, faite au nom du gouvernement. 2 ? La notification officielle de la prise de possession. La prise de possession s'accomplit par l'etablissement d'un pouvoir local re- sponsable, pourvu de moyens suffisants pour maintenir l'prdre et pour assurer l'exercice regulier de son autorite dans les limites du territoire Occupy. Ces moyens pourront 6tre empruntfis a des institutions existantes dans le pays occupe. La notification de la prise de possession de fait, soit pour la publication dans la forme qui, dans chaque etat, est en usage pour la notification des actes officiels, ' soit par la voie diplomatique. Elle contiendra la determination approximative des limites du territoire occupˆ " (Annuaire x. 201).

This development of international law naturally led to arrange- ments as to " spheres of influence." Nations which had hot yet settled or occupied, or established protectorates, in regions con- tiguous to their existing possessions, were desirous to retain a

hold over the former, and proceeded to enter into treaties defining the spheres of influence.

The following are some of the chief treaties by which such spheres are defined: —

Great Britain and Portugal as to Africa, August 20, 1890, November 14, 1890 and June 11, 1891. Great Britain and France as to Upper Niger, January 20, 1891; November 15, 1893, as to Lake Chad. Great Britain and France as to Siam, January 15, 1896. The two governments engage to one another " that neither of them will, without the consent of the other in any case or under any pretext, advance their armed forces into the regions, &c." They also engage not to acquire within this region any special privilege or advantage which shall not be enjoyed in common, or equally open to Great Britain and France or their nationals and dependants. Great Britain and Italy as to Africa, April 15, 1891; May 5, 1894, as to region of the Gulf of Aden. Congo and Portugal, May 25, 1891, as to " spheres de souverainet6 et d'influ- ence " in the region of Lunda. Great Britain, Belgium and Congo, May 12, 1894, as to the sphere of influence of the independent Congo State. Great Britain and Germany, July I, 1890 and

November 15, 1893, as to East and Central Africa. Great Britain and Russia as to the spheres of influence to the east of Lake Victoria in the region of the Pamirs, March II, 1895.

As an example of the promises or engagements in such treaties may be quoted that between Great Britain and Portugal of the 20th of August 1890. Portugal engages that the territory of which the limits are defined in article 3 shaE not, without the consent of Great Britain, be transferred to any other power. In the treaty between the same powers of the 14th of November 1890 it is stipulated that neither power will make, tender, accept pro- tectorates, or exercise any act of sovereignty, &c. Sometimes a treaty defining spheres of influence declares that such and such territory shall be neutral.

In the treaty of delimitation between France and Germany of the 15th of March 1894, the line of demarcation of the zones of influence of the two states in the region of Lake Chad is drawn, and they agree to exercise no political influence in such spheres. Each of the states agrees (art. 2) to acquire no territory, to conclude no treaties, to accept no rights of sovereignty, or pro- tectorate, and not " gener ou de contester l'infiuence de l'autre Puissance dans la zone qui lui est reservee."

Being the result of treaties, arrangements as to spheres of influence bind only the parties thereto. As Mr Olney, in his correspondence with Lord Salisbury in regard to Venezuela, remarked: " Arrangements as to spheres of influence are new departures, which certain great European Powers have found necessary and convenient in the course of their division among themselves of great tracts of the continent of Africa, and which find their sanction solely in their reciprocal obligations" (United States No. 2, 1896, p. 27).

Some treaties expressly declare that the arrangement shall not affect the rights of other powers (Stoerck, Recueil, xvi. p. 932). No doubt, however, the tendency is for spheres of influence to become protectorates. It may be mentioned that Germany and Holland have concluded a treaty (Dec. 21, 1897) by which the latter agrees to extradite German criminals in spheres of influence. By an agreement of the 12th of May 1894 between Great Britain and the Congo State, the former granted to the latter a lease of territories comprised within the sphere of influence laid down in the Anglo-German agreement of the 1st of July 1890 (19 Hertslet, p. 179).

Somewhat akin to the rights of a state in a sphere of influence are those possessed by Germany in the zone surrounding the protectorate of Kiaochow under the treaty of the 6th of March 1898, and the rights obtained under treaties with China that certain provinces shall not be

alienated.

Somewhat similar arrangements as to ports of the sea are not unknown. Grotius in his Mare liberum says: " IUud interim fatemur, potuisse inter gentes aliquas convenire, ut capti in maris hac vel ilia parte, hujus aut illius reipublicae judicium subirent, atque ita ad commoditatem distinguendae jurisdictions in mari fines describi, quod ipsos quidem earn sibi legem ferentes obligat, at alios populos non item; neque locum cujus proprium facit, sed in personas.copfrahentium jus constituit " (c. 5).

. Hinterland,

The best known example of a claim to a sphere of influence, which is not the result of any treaty, is the Monroe doctrine, first broached by President Monroe in 1823. The Romans had their equivalent to the Monroe doctrine; they forbade any Asiatic king entering Europe and conquering any part of it; the breach of this rule was their chief grievance against Mithradates (Montesquieu, De la Grandeur et de la decadence des romains, (c. 6).

Claims somewhat similar to those relating to spheres of influ- ence have been put forward as against the whole world, in virtue of the right of continuity or the doctrine of the hinterland. Sometimes it is called the " doctrine of contiguity," or " droit de vicinite, de priorite, de preemption ou d'enclave." He who occupies a part of a well-defined close or fundus, a parcel of land with artificial or natural boundaries, which enables him to control the whole area, may be said to occupy it. He need not be present everywhere, or enter on every part of it: " Sufficit quamlibet partem ejus fundi introire, dum mente et cogitatione hac sit, uti totum fundum usque ad terminum velit possidere " {Dig. xli. 2,3). In virtue of a supposed analogy to such occupation, it has been said that the occupation of the mouth of a river is constructive occupation of all its basin and tributaries, and that the occupation of part of a territory extends to all the country of which it forms physically a part. A state, having actually occupied the coast, may claim to reserve to itself the right of occupying from time to time territory lying inland (hinterland). In the discussions as to the western boun- dary of Louisiana between the commissions of the United States and Spain, as to Oregon, as to the claims of the Portuguese in East Africa, and as to the boundaries of Venezuela, the question of the extent of the rights of the discoverer and occupier came up. Portugal actually claimed all territory lying between her African possessions. It has been urged that the subsequent settlement within a reasonable time of the mouth of a river, " particularly if none of its branches had been explored prior to such discovery, gave the right of occupation, and ultimately of sovereignty, to the whole country drained by such river and its several branches." Another form of the same doctrine is, that the occupier of a part of the sea-coast

thereby acquires rights " extending into the interior of the country to the sources of the rivers emptying within that coast, to all their branches, and the country they cover " (Twiss, Laws of Nations in Time of Peace, p., 170; Twiss, Oregon Question, p. 245; Bluntschli, s. 282; Phillimore, Commentaries, p. 236; Westlake, International Law, pt. i. p. 128). Lord Salisbury referred to " the modern doctrine of hinterland with its inevitable contradictions " (United States, No. 2, 1896, p. 12). Certainly it is inconsistent with the doctrine, more and more received in recent times, that effective possession is necessary to found a title to sovereignty or control. It is akin to the extravagant claims of the early Portuguese and Spanish navigators to territory on which they had never set foot or eyes. The doctrine of the hinterland is likely to become less important, now that Africa has been parcelled out.

Authorities. — Twiss, Laws of Nations in Time of Peace (1855); Phillimore, Commentaries on International Law, s. 236; Salomon, L 'Occupation des territoires sans maitre (1889); Correspondence as to Delagoa Bay (Portugal, No. I, 1875, p. 191); British Counter Case, Venezuela, No. 2- (1899), p. 135; Annuaire de I'institut de droit international, ix. 243; x. 173; Revue de droit international, xvii. 113; xviii. 433; xix, 371; Venezuelan Papers, No. 4 (1896); J. B. Moore, Digest of International Law (1906), i. 268. (J. M.)

SPHERICAL HARMONICS, in mathematics, certain functions of fundamental importance in the mathematical theories of gravitation, electricity, hydrodynamics, and in other branches of physics. The term " spherical harmonic " is due to Lord Kelvin, and is primarily employed to denote either a rational integral homogeneous function of three variables x, y, z, which satisfies the differential equation

rtv-d'V , d 2 V , <5 2 V n

^^aF + ay+l^ ' known as Laplace's equation, or a function which satisfies the differential equation, and becomes a rational integral homo- geneous function when multiplied by a power of (x 2 +y i --z i)-*

Of all particular integrals of Laplace's equation, these are of the greatest importance in respect of their applications, and were the only ones considered by the earlier investigators; the solu- tions of potential problems in which the bounding surfaces are exactly or approximately spherical are usually expressed as series in which the terms are these spherical

harmonics. In the wider sense of the term, a spherical harmonic is any homogeneous function of the variables which satisfies Laplace's equation, the degree of the function being not necessarily integral or real, and the functions are not necessarily rational in x, y, z, or single- valued; when the term spherical harmonic is used in the narrower sense, the functions may, when necessary, be termed ordinary spherical harmonics. For the treatment of potential problems which relate to spaces bounded by special kinds of surfaces, solutions of Laplace's equation are required which are adapted to the particular boundaries, and various classes of such solutions have thus been introduced into analysis. Such functions are usually of a more complicated structure than ordinary spherical harmonics, although they possess analogous properties. As examples we may cite Bessel's functions in connexion with circular cylinders, Lame's functions in connexion with ellipsoids, and toroidal functions for anchor rings. The theory of such functions may be regarded as embraced under the general term harmonic analysis. The present article contains an account of the principal properties of ordinary spherical harmonics, and some indications of the nature and properties of the more important of the other classes of functions which occur in harmonic analysis. Spherical and other harmonic functions are of additional impor- tance in view of the fact that they are largely employed in the treatment of the partial differential equations of physics, other than Laplace's equation; as examples of this, we may refer to the

du .

equation ˆf = W'u, which is fundamental in the theory of con-

duction of heat and electricity, also to the equation-gˆ = kV'u,

which occurs in the theory of the propagation of aerial and electro-magnetic waves. The integration under given condi- tions of more complicated equations which occur in the theories of hydro-dynamics and elasticity, can in certain cases be effected by the use of the functions employed in harmonic analysis.

1 . Relation between Spherical Harmonics of Positive, and Negative Degrees. — A function which is homogeneous in x, y, z, of degree n in those variables, and which satisfies Laplace's equation

d l V , 3»V , W

*ˆ+ |y+-ˆ3 =0, or V*V=o,*

dz 2 '

(1)

is termed a solid spherical harmonic, or simply a spherical harmonic of degree n. The degree n may be fractional or imaginary, but we are at present mainly concerned with the case in which n is a positive or negative integer. If x, y, z be replaced by their values r sin 9 cos cf>, r sin 6 sin 4>, r cos 8 in polar co-ordinates, a solid spherical harmonic takes the form f/„(0,); the factor /»(0,) is called a surface harmonic of degree n. If V denote a spherical harmonic of degree n, it may be shown by differentiation that vKˆVn) = rn{2n + m + 1 Jr"" -2 V., and thus as a particular case that y2(r -in-LV ii) _ . TC have thus the fundamental theorem that from any spherical harmonic V„ of degree n, another of degree — n — 1 may be derived by dividing V„ by r 2n+l . All spherical harmonics of negative integral degree are obtainable in this way from those of positive integral degree. This theorem is a par- ticular case of the more general inversion theorem that if F {x, y, z) is any function which satisfies the equation (1), the function*

r l \7 r" ?/*

also satisfies the equation.

The ordinary spherical harmonics of positive integral degree n are those which are rational integral functions of ***, y, z. The most general rational integral function of degree n in three letters contains J(n + i)(»+2) coefficients; if the expression be substituted in (1), we have on equating the coefficients separately to zero ±n(n — 1) relations to be satisfied; the most general spherical harmonic of the prescribed type therefore contains J (n /)(» 2) — \n{n — i), or 2M + I independent constants. There exist, there- fore, 2m + i independent ordinary harmonics of degree n; and corresponding to each of these there is a negative harmonic of degree— n — 1 obtained by dividing by r"*** *+1 . The three inde- pendent harmonics of degree 1 are x, y, z\ the five of degree 2 are y 2 — 2 s , z ! — x i , yz, zx, xy. Every harmonic of degree n is a linear function of 2»-)-i independent harmonics of the degree; we pro- ceed, therefore, to find the latter.*

2. Determination of Harmonics of given Degree. — It is clear that a function f{ax+by--cz) satisfies the equation (l), if a, b, c are constants which satisfy the condition a 2 +& 2 +e 2 = o; in particular the equation is satisfied by (2+tr cos et+iy sin a) n . Taking n to be a positive integer, we proceed to expand this expression in a series of cosines and sines of multiples of o; each term will then satisfy (1) separately. . Denoting e' a by k, and y+ix by /, we have

*(z+ t * cos a-by sin «)-= (z+Ifc+ˆL-ˆ "*

which may be written as (2kt)~ n {(z+ ktf — r 2))". On expansion by Taylor's theorem this becomes

(2JM)-

2 fen' <£_ S\ 02'

(z 2 r 2),

the differentiation applying to 2 only as it occurs explicitly; the terms involving cos ma, sin ma in this expansion are

*3= cos ma \ fr+mjld^-') + (»+»)! *=^-^*

where m = 1, 2, . . . n; and the term independent of a is

2"n! dz» yz r >- On writing (y+Lx) m = i m r m {cos m4> — 1 sin m)2 sin m B, (y+tx)~ m =

i~ m r~ m (cos m+i sin m) sin~ m and observing that in the expansion of (z--ix cos a--iy sin a) m the expressions cos ma, sin ma can only occur in the combination cos mQ> — a), we see that the relation

■ r (n+m)! cte—"^ r > J {n-m)\ dz«~° > (z r >

must hold identically, and thus that the terms in the expansion reduce to

■7 — i — rr —z-;r m cos ma cos m

(H + m y. v^S" sin ma sin m t> sin ^e^a^-^-

We thus see that the spherical harmonics of degree n are of the form

„ /7n+m

f£m* sin •VjjjsraW-i)"

where /1 denotes cos 6; by giving m the values o, 1,2. ...» we thus have the 2n + l functions required. On carrying out the differentiations we see that the required functions are of the form

A[(+»y)-(z-iy)-J : j 2"" (!j?3*~ ^f-^ixt+f+s') \ | (n-m)(n-m-i)(n-m-2)(n-m-T,) /em> x , + y +J2 ^; (2)

where m=o, 1, 2, 3, . . . n.

3. Zonal, Tesseral and Sectorial Harmonics. — Of the system of 2n--i

harmonics of degree n, only one is symmetrical about the 1: axis; this is

T ff n

T 2»»! 3ˆ ‘ ‘ writing

p-wˆSˆ 2 – 1)”’

we observe that ‘Pn(in) has n zeros all lying between’ i, consequently the locus of points on a sphere r—a, for which P„G) vanishes is w circles all parallel to the meridian plane : these circles divide the sphere into zones, thus P„(m) is called the zonal surface harmonic of degree n, and r»P„(/u), r _n_1 P„(M) are the solid zonal harmonics of degrees n and —n — i. The locus of points on a

sphere for which

*sTn *+•«” me d7ˆ*

(/it 2 — 1)” vanishes consists of

n—m circles parallel to the meridian plane, and m great circles through the poles; these circles divide the spherical surface into quadrilaterals or riairtpa, except when »»m, in which case the surface is divided into sectors, and the harmonics are therefore called tesseral, except those for which m = n, which are called*

JmJwip (u)

sectorial. Denoting (1 -m T ˆ by P”(/i), the tesseral surface harmonics are ˆ m .Pˆ”(cos 9), where »«i, 2,...»-l, and the sectorial harmonics are ˆ kˆ.Pˆcos 6). The functions PnO),,PTM denote the expressions*

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*r * w 2”»!n!< M 2.2n-i M T 2.4.2W-1 .2n~3 M i w*

p”(„) = (|!1; — ˆ(1 u’)i m \ u”

» w 2 v n!(n-w)! v M ;i (ˆ

(n-w)(w-OT-i) _ ,) . v

2.2n-i M r ■ • j v

Every ordinary harmonic of degree n is expressible as a linear function of the system of 2» + i zonal, tesseral and sectorial harmonics of degree «; thus the general form of the surface harmonic is

« OoP„ (m) + 2 (on cos m<£ +6 m sin m$) P„ 00 • (5)

m = i In the present notation we have

P.U)+22i™-££-j-ˆP lt (Ai)cos»»(-a) I*

if we put = 0, we thus have

n

(cos 0+i sin cos <>)" = P„(cos 0) +22 t '"' / i„\| P„(cos 0) cos »»#,*

1 ■

m

from this we obtain expressions for P„(cos 0), P n (cos 0) as definite integrals

P„(cos 0) =- y (cos + i sin cos) n d j

*iP., (cos 0) =- i" (cos + i sin cos #)"cos nt(t>d. *

by Differentiation, — The

(6)

*1 W+ *n*

4. Derivation of Spherical Harmonics linear character of Laplace's equation shows that.lrom any solution, Others may be derived by differentiation with respect to the variables x, y, z; or, more generally, if

f(ˆˆ)

J \dx dy dz]

denote any rational integral operator,

J \dx' W dz) v

is a solution of the equation, if V satisfies it. This principle has been applied by Thomson and Tait to the derivation of the system of any integral degree, by operating upon i/r, which satisfies Laplace's equation. The operations may be conveniently carried out by means of the following differentiation theorem. (See papers by Hobson, in the Messenger of Mathematics, xxiii. 115, and Proc. Lond. Math. Soc. vol. xxiv.)

L I J -._! _2n+l

' n \dx' dy' dz) r '

+ :

2"nl r" r 4 V 4

!■

;...(/.<

2 ..2n — l 2n — 3 which is a particular case of the more general theorem

*f (A, A, A) F® = \ 2»-^£ +HT. 2 f ~'F 7 * + }n \dx dy dz) t (r >-} 2 d(r*)" + TT Jp)^ 1 + ■ ■*

y,z)

(7)

V-

d"-'F

ry+—. \fn(x,y,z)

(7 1),

of the singular point. Let a singular point of degree zero, and strength e , be on an axis hi, at a distance ao from the origin, and also suppose that the origin is a singular point of strength — e ; let eo be indefinitely increased, and 00 indefinitely diminished, but so that the product «o< >o is finite and equal to eo ! the origin is then said to be a singular point of the first degree, of strength e u the axis being hi. Such a singular point is frequently called a doublet. In a similar manner, by placing two singular points of degree, unity and strength, e u —ei, at a distance 01 along an axis h 2 , and at the

origin respectively, when «i is indefinitely increased, and 01 diminished so that dai is finite and = e 2 , we obtain a singular point of degree 2, strength e% at the origin, the axes being hi, hi. Proceeding in this manner we arrive at the conception of a singular point of any degree n, of strength e„ at the origin, the singular point having any n given axes hi, }h,. . .h„. If e n -i 4 > n-i (x, y, 2) is the potential due to a singular point at the origin, of degree n — 1, and strength e„_i, with axes hi, h,—h*-i, the potential of a singular point of degree n, the new axis of which is h n , is the limit of*

s\ d(r 2)»"

where /„(, y, z) is a rational integral homogeneous function of degree n. The harmonic of positive degree n corresponding to that of degree — n — I in the expression (7) is*

} 2.2»-I T 24.2(l-1.2«-3) J X ' •" '

It can be verified that even when n is unrestricted, this expression satisfies Laplace's equation, the sole restriction being that of the convergence of the series.

5. Maxwell's Theory of Poles.— Before proceeding to obtain by means of (7), the expressions for the zonal, tesseral and sectorial harmonics, it is convenient to introduce the conception, due to Maxwell (see Electricity and Magnetism, vol. i. ch. ix.), of the poles of a spherical harmonic. Suppose a sphere of any radius drawn with its centre at the origin ; any line whose direction-cosines are /, m, n drawn from the origin, is called an axis, and the point where this axis cuts the sphere is called the pole of the axis. Differ- ent axes will be denoted by suffixes attached to the direction-cosines ; the cosine (l,x--m,y + niz)jr of the angle between the radius vector r to a point (x, y, z) and the axis (h, m,, ni), will be denoted by Xi; the cosine of the angle between two axes is Uy + m,m y --nMy, which will be denoted by n,y. The operation

when

this limit is

a

dx dy dz

I'-zz + m^ + nr

e„_i <£n-i (— J»a, y— m n a, z—n„a) — e„_! 4>„_i (x, y, z) ; Lo = o, Le n _i = o>, Laen_i = e n ;*

„ /; 5> <£»-l_L«, d0„_i 1 „ 1

d«-i 1 „ d-i \ -. ,*

dy +nn ^r)' 0T _e "a

-n-l-

dx dy ' "" dz J"" – n dhJ

Since e = i/r, we see that the potential V, due to a singular point at the origin of strength e,„ and axes hi, hi, . . .h n is given by

= n ^hidZ..dh j (8)

6. Expression for a Harmonic with given Poles. — The result of performing the operations in (8) is that V» is of the form

where Y„ is a surface harmonic of degree n, and will appear as a function of the angles which r makes with the n axes, and of the angles these axes make with one another. The poles of the n axes are defined to be the poles of the surface harmonics, and are also frequently spoken of as the poles of the solid harmonics Y„r", Ynr – " -1 . Any spherical harmonic is completely specified by means of its poles.

In order to express Y„ in terms of the positions of its poles, we apply the theorem (7) to the evaluation of V„ in (8). On putting r=n f n {x, y, z) —Xl(l,x+mry+n r z), we have t =1 (2n!) I /. rV , r 4 V 4

performed upon any function of x, y, z, is spoken of as differentiation with respect to the axis (L, m>, «i), and is denoted by d/dh,. The potential function Vo = ft>/r is defined to be the potential due to a singular point of degree zero at the origin ; eo is called the strength

V _ (2"0 1 /. fV I " 2"»[image] r n \ 2.2n~i

2 ..2n — 1 .in

=i-)

X

n (l,x +m r y+n,z).

1

By ZGi'X" -25) we shall denote the sum of the products of 5 of the quantities p, and n — 2s of the quantities X; in any term each suffix is to occur once, and once only, every possible order being taken. We find

Mlx+my+nz) =2(X")r\ A 2 n(te +my+nz) =22(1 u 1 X' , – 2)r"- 2 , and generally

A 2m n(lx+my+nz) =2 m m ! 2(^" , X"- 2 "')r n – :!m ;

thus we obtain the following expression for Y n , the surface harmonic which has given poles hi, hi, . . ,h„;

d" ±

r

Yn = r n+lL-Lt

n\ dhidhi. . .dh„

(-1)"

, (2«— 2m)! 2"~'"n\ (n—m)

,2(X»

*V") *

(9)

m =

where S denotes a summation with respect to m from m = o to m = \n, or \(n — 1), according as n is even or odd. This is Maxwell's general expression (loc. cit.) for a surface harmonic with given poles.

If the poles on a sphere of radius r are denoted by A, B, C. . ., we obtain from (9) the following expressions for the harmonics of the first four degrees: —

~ Yi = cos PA, Y s = J(3 cos PA cos PB-cos AB),

Y« = 4(J5 cos PA cos PB cos PC -cos PA cos BC-cos PB cos CA

—cos PC cos AB), Y 4 = K35 cos PA cos PB cos PC cos PD -52 cos PA cos PB cos CD

+ 2 cos AB cos CD), 7. Poles of Zonal, Tesseral and Sectorial Harmonics. — Let the n axes of the harmonic coincide with the axis of z, we have then by (8) the harmonic

(— i)"r» +1 d» I. n ! dz' r '

applying the theorem (7) to evaluate this expression, we have

(-i)y +1

n\ dz n r 2"n\n\r n \ 2 . 211 — i + 2 . 4.2m — I , 2« — 3).*

~2»»!«!(M 2.2»-I M ^ ■ ■ ••$■•

the expression on the right side is P"(m) > the zonal surface harr monic ; we have therefore

p 1 . (-i)"r" +1 a^ 1 r,l W – 7i ! dz n r'

The zonal harmonic has therefore all its poles coincident with the z axis. Next, suppose n — m axes coincide with, the z axis, and that the remaining m axes are distributed symmetrically in the plane of x, y at intervals v/m, the direction cosines of one of them being cos a sin a, o. We have

'JL \dx~

dy,

Let i=x+iy, i) = x — iy, the above product becomes

which is equal to

«<»- l >"n j ^..(1) "_«-«•« (-J)" J ; when a=o, ^,

this becomes

— 'fJ(l)'"(,f(l) M {and

From (7), we find <3s"

/a a-“i..(2n)! 1 r

*\dx l dy) r 2”«! r”> + > |_*

rW

■+■

. \z n ~ m {x

= ,y)«

*: (- i)”^T ^Th(cos m0±i sin *N>) sin m e j cos»-“0*

_ (n-m)(n-m-i) j

2 . 2re — 1) ‘

hence

d”-” / d d\ m i . .„(»-m)!, ,, . ..«.,

*di^ \di ‘ayj r = (~ ‘) f +1 (cos OT * ‘ Sln w) P ” (cos (*

as we see on referring to (4) ; we thus obtain the formulae

*i^’ 1 W ~ w I ? = (~ l) ******* m • P » (cos*

(10)

0:

d.

It is thus seen that the tesseral harmonics of degree n and order m are those which have n — m axes coincident with the z axis, and the other m axis distributed in the equatorial plane, at angular intervals ir/ra. The sectorial harmonics have all their axes in the equatorial plane. 8. Determination of the Poles of a given Harmonic. — It has been shown that a spherical harmonic Y„(, y, z) can be generated by means of an operator*

f”\Tx>a? aijactmgupon-, the function /„ being so chosen that

Y,.U, y , z) = (- i)“gr j 1 -dlb+ • ■ • JM. y< z) :*

this relation shows that if an expression of the form

(x»+/+ !)/„_ ! (,y, z)*

is added to /»(, y, z), the harmonic Y n (,x, y, z) is unaltered; thus if Yn be regarded as given, f n (x, y, z) = 0, is not uniquely determined, but has an indefinite number of values differing by multiples of x i +y--z i . In order to determine the poles of a given harmonic, / „ must be so chosen that it is resolvable into linear f actoi s ; it will be shown that this can be done in one, and only one, way, so that the poles are all real.

If x, y, z are such as to satisfy the two equations Y„(i, y, z) =0, x t +y t +z t =0, the equation fn(x, y, z) is also satisfied; the problem of determining the poles is therefore equivalent to the algebraical one of reducing Y„ to the product of linear factors by means of the relation a^+y-f-z =0, between the variables. Suppose*

m Y n (x,y, z)=An(^+w.y+n,z)+(x 2 +y 2 +z 2)V„- 2 (x, y , s),

we see that the plane l s x+m,y+n& = passes through two of the 2» generating lines of the imaginary cone # J t;y 2 +z =0,> in which that cone is intersected by the cone Y„(#, y, z) =0. Thus a pole (/„ w», »«) is the pole with respect to the cone x 2 +y 2 +z i = 0, of a plane passing through two of the generating lines; the number of systems of poles is therefore n{2n — 1), the number of ways of taking the 2» generating lines in pairs. Of these systems of poles, however, only one is real, viz. that in which the lines in each pair correspond to conjugate complex roots of the equations Y„=0, x' 1 \-f--z i = Q. Suppose

x y _ z

ai+'&~ a 2 +tffi a 3 + i/S 3 gives one generating line, then the conjugate one is given by

x y g

ai — ift a 2 — 102 a-i—iPi and the corresponding factor lx--my--nz is x y z

ai+ift a 2 +i/? 2 a 3 -r-i/3 3 ai~ ift o 2 — ift

xx' -Vyy 1 +zz' \ rr')

or P»(cos9cos0'f sin 9 sin 9' cos 0— ')\ this is expressible as a linear

function of the system of zonal, tesseral, and sectorial har- monics already found. It will be observed that it is symmetrical with respect to (x, y, z) and (x', y', z'), and must thus be capable of being expressed in the form

floP»(cos0)P»(cos0')+2a»P"'(cos0)P£(cosfl')cosw(0-'). I and it only remains to determine the co-efficients ao, Oi, ...o»,...o„. To find this expression, we transform (x'x--y'y+z'z) n , where x, y, z satisfy the condition x 2 +y+z 2 = 0; writing $ = x+iy, 7j = x — iy, i'=x'--iy', r' =x' — ty', we have*

(xx'+yy'+zz'rˆiWt + Wv+zz')" which equals

*n . ' r .a ,b a b .b .a Jr a *

' a\bl(n-a-b)\ (2 »+ 6) .

the summation being taken for all values of a and b, such that a +iSre, a>b; the values o = 0,' 6 = corresponding to the term (zz')". Using the relation £))= — s 2 , this becomes*

(— 1)» «!

r" r"

-„ is P,

•(=

(xx'+yy'+zz')" = (zz') " +S2ˆ-ˆ-

»!6!(n-a-6)!

ˆ3m(W"-*

putting a — b = m, the coefficient of |™s n

', on the right side is

2

(-D

,' • (t'„'\b'm 9 'n-m-ib

m ™ b\(m+b)\(n-m-2by> i v > n J

2 m+ 20 bl(m+b)U.n-m

from i = to b = \(n— m), or \(n— m — 1), is even or odd. This coefficient is equal to

j{x'i.y') m \ z'"

according as n — m

-0.

2.2m+2

2 (» ,2 -fy 2)

2 m m\(n — m)\ K

(n~m)(n-m-i)(n-m-2)(,n-m-i,) ,„_,»_,,, „ . „ ,) . ˆ 2.4.2m+2.2m+3 z C .-t-y) j.

in order to evaluate this coefficient, put z = l, x' = t coso, y' = i sin a, then this coefficient is that of (i cos a+sjn a) m , or of ˆer""- 11 in the expansion of (z'+ix' cos a+iy' sin 0)" in powers of e~ la and e' a , this has been already found, thus the coefficient is

*rˆr-T,«" lM *'P» (cos e') .r'n.*

(n+m)'. nV '

Similarly the coefficient of 7) m 2 n-m is

(n+m)'

e+ "»'Pˆ (cos 0')r'»;*

hence we have

1

*ˆ(*x'+y/+zz') n =z»P„(cos O +»!2PT(cos »0(cos m4>'i£ m +n m)*

+1 sin M 0'(,»-j»)f 5 gJL fI .

In this result, change x, y, z into

Ox' My' dz>

and let each side operate on i/r, then in virtue of (io), we have (rr')"P» (xx '+yy' i + zz ' \ = P„(c os 9 cos 0'+sin sin 0' cos – <)>') = P„(cose)P„(cose')+2S^^|p™(cos9)P^(cos9')cosm(0-«') (n)

which is known as the addition theorem for the function P». It has incidentally been proved that

p:(cos e) =^± ^sin»e j cos—«e

_{n-m)(n-m-i) ^ ^^) _ (, 2)

2.2OT+2)

which is an expression for P™ (cos 0) alternative to (4).

10. Legendre's Coefficients. — The reciprocal of the distance of a point (r, 0, $) from a point on the z axis distant r' from the origin is

(r 2 -2rr' M +r'T i which satisfies Laplace's equation, n denoting cos 0. Writing this expression in the forms

it is seen that when r < r' , the expression can be expanded in a convergent series of powers of r/r', and when r' < r in a convergent series of powers of r'/r. We have, when /j 2 (2/i — h) 2 < I

(l-2hn+Vy ! = l+h(2n-h)+±lh?{2n-hy+ . . .

I _ .3. 5 ..,2tt-I fr, (_ h) n + _ _ ~ 2.4. . .2n v ^ ' ' and since the series is absolutely convergent, it may be rearranged as a series of powers of h, the coefficient of h" is then found to be I.3-S..-2B-I J – «(*-!) ._ , w(w-0(«-2)(»-3) „-< [

I.2.3. ..» < 2.2»-I M 2.4.2n— I.2B— 3)

this is the expression we have already denoted by PnCu) I thus

(1 -2&m &')"* = PoM*PiG') + ...+^Pn(M) + .. •• (I3)

the function P„(ji) may thus be defined as the coefficient of h n in this expansion, and from this point of view is called the Legendre's coefficient or Legendre's function of degree n, and is identical with the zonal harmonic. It-may be shown that the expansion is valid for all real and complex values of h and m, such t hat mo d, h is less

than the smaller of the two numbers mod. (m V/* 2 — i)- We now see that*

{r- — 2rr' ju-|-r' 2)~<

is expressible in the form

From the identity

(1 -2h cos e+h 2)-i = (1 fce' 9)(i he} it can be shown that*

i.n

2.4.6. . .2

Pn(cos 0) = I -, 3 – J 5 ft- 2 " w I j cos n0+

■cos (n — 2)6 cos (« — 4)8 +

(14)

when r < r', or

CO

2^ p – w

when r' < r; it follows that the two expressions r n P„0i), r~" 'P„Im) are solutions of Laplace's equation.

The values of the first few Legendre's coefficients are

Po(m) = i. PiW=M, P(m) =5(3^-1), Ps(p)=|(5/^-3m)*

P,W=§(35m 4 -30m 2 +3). P5(M)=g(63M 5 -70/x 3 + J5^)

P»(A>)=^(23iM«-3i3M + i05/i ! -5), P7(m)=^(429m 7 -693m !*

We find also

P„(l) = l,Pn(-i) = (i)» n

*+3 1 5m 3 – 35*0 •*

P»(0)=0, or (i)"^ 1 ^*

2.4. . .»

*according as n is odd or even; these values may be at once obtained from the expansion (13), by putting p = *i, o, — 1.*

11. Additional Expressions for Legendre's Coefficients. — The expression (3) for P„(>i) may be written in the form

P.O.) =_&£!. F (-2, 1 =«, I-». 4) " w 2"n ! » r V 2 2 2 (j 2 /

with the usual notation for hypergeometric series. On writing this series in the reverse order

l.2« — I

■ i.3-n(n-i) " r i.2.(2n — l)(2« — 3)

By (13), or by the formula

which is known as Rodrigue's formula, we may prove that P»(cos9) = l- K ^ sin 2 -+' – ^,v Jy 'sm 4 -...

=f(« + i, -n, I, sin 2 ?). (15)

Also that P„(cos«) = cos 2 "|j x-Jtan^+ ^^tan^-... |

= cos 2 »^F l-n, -n, 1, -tan 2 |) . (16)

By means of the identity

(l-2ft M +fr)-»»(l-/0- 1 | I + ^ I -7ff j~*.*

it may be shown that

tw „.. „„ («(»— 1). „„ 1 »(» — 1)(» — 2)(n — 3). „„) P„(cos0) = cos"0 j 1 ~ 5 — 'tan 2 0+ — iTT2 ^ tan 4 — ... >

= cos n flF(-in, i-in, I, -tan 2 0). (17)

Laplace's definite integral expression (6) may be transformed into the expression

1 C d4 >*

tJ (p. — V M 2 — 1 cos ^) n+l ' by means of the relation

(m+Vju 2 -i cos 0)0— Vm 2 -i cos^) = i.*

Two definite integral expressions for ?(/«) given by Dirichlet have been put by Mehler into the forms*

P„(ccs0) =2 r» cos(n + j)» ˆ 2 p sin(n + j)» ˆ

y T./ 0V2 COS0 — 2COS9 Tˆ 9V2COSS — 2COS0

When re is large, and 9 is not nearly equal to o or to ir, an approximate value of P„(cos0) is |2/nx sin 8\i sin {(n--\)6--\i!.

12. Relations between successive Legendre's Coefficients and their Derivatives. — If (1 — 2hii--h' i)~'h be denoted by u, we find

(i-2Am+A 2)||+(A-m)« = 0;

on substituting SA"P„ for u, and equating to zero the coefficient of h", we obtain the relation

«P„-(2»-l)/iP»_i + (n-i)P n _j = 0.

From Laplace's definite integral, or otherwise, we find

(m'-i)ˆ =»G»P»-P-0 = -(« + i)(mP"P" +1) We may also show that

dPn d?ˆ „

"■ST"" 5T =mP "

(„ +l)P „ = _ M g. + ˆ (2M + I)P„ = -

*C, 1 ,N ˆP» I I Pn-1 1 rfPn+1 (2n + l)M _ =(„ + l)_-+ *-*

(2» + i)0 u 2 -i)ˆ = n(„ + i)(P„ +1 -P n _ 1)

P-(m)=(-

2- (ˆJ '.(-»)!

(_I) 2 2->«-l ,n-iˆ F (~T- i + 1 ' 2 "V

2 2

according as n is even or odd.

dP n

dp

(2«-l)Pˆl + (2»~5)P»-J + (2»-9)P-«+- ■ •

the last term being 3P! or P according as n is even or odd.

*13. Integral]*ropfrties of Legendre's Coefficients.— \t may be shown that if P»(?i) be multiplied by any one of the numbers I , /x. M 2 , • • .-ju" -1 and the product be integrated between the limits I,— I with respect to n, the result is zero, thus*

rVP»fj)ˆ=0, a = 0, I, 2, . . .n-l. (18)*

To prove this theorem we have

on integrating the expression k times by parts, and remembering | hence that (m 2 — i) n and its first » — I derivatives all vanish when n= ±i, the theorem is established. This theorem derives additional importance from the fact that it may be shown that AP„(m) is the only rational integral function of degree n. which has this property ; from this arises the importance of the functions P„ in the theory of quadratures.

The theorem which lies at the root of the applicability of the functions P„ to potential problems is that if n and n' are unequal integers

f 1

P„„Gu)PnM < ˆ-0,

(19)

to

which may be stated by saying that the integral of the product of two Legendre's coefficients of different degree taken over the whole of a spherical surface with its centre at the origin is zero; this is the fundamental harmonic property of the functions. It is immediately deducible from (18), for if n'

When n' =n, the integral in (19) becomes I {P„Gz)) ! <2m

evaluate this we write it in the form

on integrating n times by parts, this becomes

fel£f > – O-jgiO- 0*M. or SD 1 -"»"". which on putting*

u = -(i—p, becomes 2 \ '\ t u n (l— u)"du,

aence

/:

jP.00Nm =

2n+r

(20)

14. Expansion of Functions in Series of Legendre's Coefficients. — If it be assumed that a function /(/») given arbitrarily in the interval / i=— I to +1, can be represented by a series of Legendre's co-efficients oo+OiPi(m)+12P2(m)+-•-+a n P n (n)+. . .and it be assumed that the series converges in general uniformly within the interval, the coefficient a can be determined by using (19) and (20) ; we see that the theorem (19) plays the same part as the property

(n + n') does in the theory of the expansion of

On multiplying the series

Vo=2™2ˆP„(m)Jˆ/U')P«UVm'

/:

COS COS '

unctions in series of circular functions, by P-. (ju), we have

hence

t fj PnOx) fdp = f^b) P.O.)ˆ

a»=-

2n +

hence the series by which /(/») is in general represented in the interval is

P.to/ˆ/GOP.O'W

(21)

The proof of the possibility of this representation, including the investigation of sufficient conditions as to the nature of the function f(ji), that the series may in general converge to the value of the function requires an investigation, for which we have not space, similar in character to the corresponding investigations for series of circular functions (see Fourier's Series). A complete investi- gation of this matter is given by Hobson, Proc. Land. Math. Soc, 2nd series, vol. 6, p. 388, and vol. 7, p. 24. See also Dini's Serie di Fourier.

The expansion may be applied to the determination at an external and an internal point of the potential due to a distribution of matter of surface density /(ˆi) placed on a spherical surface r = a. If

v. = .z\j£iP.OO, Vo = sA n ˆjP„G,),

we see that Vt, V have the characteristic properties of potential functions for the spaces internal to, and external to, the spherical surface respectively ; moreover, the condition that Vi is continuous with Vo at the surface r = a, is satisfied. The density of a surface distribution which produces these potentials is in accordance with a known theorem in the potential theory, given by

I /dVi dV a \ °ˆd7~dr) r = a >

hence

*: have A„ = 2*0ˆ/0*') P.OOV.*

are the required expressions for the internal and external potentials due to the distribution of surface density /(m).

15. Integral Properties of Spherical Harmonics. — The fundamental harmonic property of spherical harmonics, of which property (19) is a particular case, is that if Y»(x, y, z), Z n >(x, y, z) be two (ordinary) spherical harmonics, then,

//

*Y n (x, y, z)Z n ,{x, y, *) < 2S = 0,*

(22)

when n and n' are unequal, the integration being taken for every element < 2S of a spherical surface, of which the origin is the centre. Since v 2 Y» = 0, v 2 Z»/ = 0, we have

JJJdKˆdz = 0,

the integration being taken through the volume of the sphere of radius r ; this volume integral may be written

jJJ I Tx V Y ""aF – ln '$_{dx}$) + dy V'ly- ~ Zn '$_{dy}$)

+ s (Y 'H9F _z "4r) t dxdydz = 0:

by a well-known theorem in the integral calculus, the volume integral may be replaced by a surface integral over the spherical surface; we thus obtain

+?(Y.%-z.f) !«-«;

on using Euler's theorem for homogeneous functions, this becomes

n ^/)Y^dS = 0,

whence the theorem (22), which is due to Laplace, is proved.

The integral over a spherical surface of tfee product of a spherical harmonic of degree n, and a zonal surface harmonic P„ of the same degree, the pole of which is at (x', y', z') is given by

JjY„(*, y, z)P n dS=^~a^Y n (x', y', z~) ■ (23)

thus the value of the integral depends on the value of the spherical harmonic at the pole of the zonal harmonic. This theorem may also be written

I (T I i Vn(– 9, *)P»(C0S e cos 0'+sin 9 sin 0' cos — <(> ')dij.d

To prove the theorem, we observe that V„ is of the form n OoPnU) +2(o m cos m+b m sin m

p.rjO-i.PrGO-0;

hence Oo is equal to the value V„(0) of V„ (8,) at the pole = of Pn(ju). Multiply by P„(m) and integrate over the surface of the sphere of radius unity, we then have

4?r = ^ZL

7^0

:V„(0),

2M+I ° 2n+i

if instead of taking y. = I as the pole of P»(ju) we take any other point (m', ') we obtain the theorem (23).

If f{x, y, z) is a function which is finite and continuous through- out the interior of a sphere of radius R, it may be shown that

ffY n{ x, y, z)f(x, y, z)dS = R T 0^, \ i +J ^

+;

R'V 4

+3

:+..

Y '(h'£? B fix ' y>s)

2-4- 2 "+3-2»+5 where x, y, z are put equal to zero after the operations have been performed, the integral being taken over the surface of the sphere of radius R (see Hobson, " On the Evaluation of a certain Surface Integral," Proc. Land. Math. Soc. vol. xxv.).

The following case of this theorem should be remarked: If fn(x, y, z) is homogeneous and of degree n

//¥.(, y, z) M x, y, s)d sˆRˆ0ˆY.(§- x . |. |)/.(,y,i)*

if f n (x, y, z) is a spherical harmonic, we dbtain from this a theorem, due to Maxwell (Electricity, vol. i. ch. ix.),

//

*Y.(. y, «)/„(, y, *)«*S— sj+r – x Midht ,, dh Mx, y, z)*

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where hifh...h> are the axes of Yn. Two harmonics of the same degree are said to be conjugate, when the surface integral of their product vanishes; if Y„, Z» are two such harmonics, the addition of conjugacy is

*Mi?) 2 /b>** –*

Lord Kelvin has shown how to express the conditions that 2« + l harmonics of degree n form a conjugate system (see B. A. Report,

1871).

16. Expansion of a Function in a Series of Spherical Harmonics. — It can be shown that under certain restrictions as to the nature of a function F(m,) given arbitrarily over the surface of a sphere, the function can be represented by a series of spherical harmonics which converges in general uniformly. On this assumption we see that the terms of the series can be found by the use of the theorems (22),

(23). Let F(/u,

*_ VoUˆ+ViU) + ... +V.&, *) + ...; change n, into n', <£' and multiply by*

we have then

P„(cos 9 cos 0'+sin 9 sin 9′ cos —'),

J " J F(ji', tfOPnCcos 9 cos 0'+sin 9 sin 9′ cos — ')dii'd'

= j « (V»0i', ■>')?,, (cos e cos 0'+sin 9 sin 9′ cos — ')dti'd'*

*= -4=-V„(», *), 2n + i '*

hence the series which represents F(/n, tj>) is

CO

*i*ˆ (2n + i) f"Jlf(l*', ')Pn(cos COS B'*

+sin 9 sin 0′ cos — 4>')dii'd'. (24) A rational integral function of sin 9 cos , cos 9 of degree n may be expressed as the sum of a series of spherical har- monics, by assuming

/„(, y, z) = Y„+r»Y_+r*

*Since V , (> a *Y»_j,) =2s{2n — 2s + i)r 1 '~ i Y n -u, we have*

V 2 /» = 2(2n-i)Yˆ 2 +4(2»- 3)r 1 Yˆ+6(2n-5)ˆY n ,+ . . . vy» = 2.4(2n-3)(2»-5)Y,-|-4.6(2»-5)(2n-7)r 2 Yˆ,l. . . the last equation being

Vfn = n(n + i)(n — 2)(» — 1). . .Y , if n is even, or

V"_1 /» = (m — i)(»+2)(n— 3)n. . .Yi, if » is odd from the last equation Yo or Yi is determined, then from the pre- ceding one Y 2 or Y3, and so on. This method is due to Gauss (see Collected Works, v. 630).

As an example of the use of spherical harmonics in the potential theory, suppose it required to calculate at an external point, the potential of a nearly spherical body bounded by r = a{l--tu), the body being made of homogeneous material of density unity, and u being a given function of 9, , the quantity e being so small that its square may be neglected. The potential is given by

jrA/oˆV+r' 2 ˆ' cos Tl'rfr'W,

where y is the angle between r and r' \ now let u' be expanded in a series

*Y (m', *')+Y,(m', *') + ... +Y„(/, «') + •■• of surface harmonics; we may write the expression for the potential*

J0J-J0 |-+pPi(cos T) + ...

+ 0i?n{cos y) + ... J r'Hr'du'd'*

which is,

/;-/■.

u

1 o'

\f r (i+Mu')+~y 2 d+W)P l +...

+ˆ3 ˆ(i+«+3««')P»(cos t) I

on substituting for u' the series of harmonics, and using (22), (23), this becomes

4JTIJ'

L3 f (3'

*yiYiU+J+ˆOi, *) + ...*

+ (2n ; n ;; rn – 1 Y n (M,ˆ)+...i]

) / h, dV\ d 1 h 2 gy\ a / h 3 ay\ _ n , .

which is the required potential at the external point (r, 9,).

17. The Normal Solutions of Laplace's Equation in Polars.- — If hi, hi, h 3 be the parameters of three orthogonal sets of surfaces, the length of an elementary arc ds may be expressed by an equation of

the form ds 2 — rrˆdh 2 + rndh\ + rndh\, where Hi, H 2 , H s are

= 0.

functions of hi, h\, h s , which depend on the form of these

parameters; it is known that Laplace's equation when expressed with hi, hi, h as independent variables, takes the form

*d_*

dhj

In case the orthogonal surfaces are concentric spheres, co-axial, circular cones, and planes through the axes of the cones, the parameters are the usual polar co-ordinates r, 9, 4>, and in this case

Hi = i, H 2 =-, H 3 = — , — – thus Laplace's equation becomes

*r r sin 9 * ^*

&_ 1 2 sv\ i 9 (. dv\ , i_ m

dr V dr) + sin d9\ Sm 69 J + sin 2 d^ Assume that V = Re is a solution, R being a function of r only, 9 of 9 only, * of only ; we then have*

1 d (2 dK\ , 1 d I ■ A_ n Rdr\ r dr) esm9d9 \ smv de) + sin 2 . d*

This can only be satisfied if -tt-j- (f-r-) is a constant, say «(n + l), X-JT5 is a constant, say— m 2 , and satisfies the equation

if we write u for 9, and ft for sin 0, this equation becomes

From the equations which determine R, 9, u, it appears that Laplace's equation is satisfied by

*r n cos . _ *, • nob . u m r^ 1 l sin T »*

where u is any solution of (26) ; this product we may speak of as

the normal solution of Laplace's equation in polar co-ordinates;

it will be observed that the constants n, m may have any real or

complex values.

18. Legendre's Equation. — If in the above normal solution we

consider the case m = 0, we see that

r n

»-n~lWn

(27)

is the normal form, where «n satisfies the equation

i! (i - 2) S+ M(M+i)M=0 ‘ •*

known as Legendre’s equation; we shall here consider the special case in which n is a positive integer. One solution of (27) will be the Legendre’s coefficient Pn(/u), and to find the complete primitive we must find another particular integral ; in considering the forms of solution, we shall consider /a to be not necessarily real and between ±1. If we assume

U =—n m + aiti m – 2 + a i n m ~ i + ■ . . as a solution, and substitute in the equation (27), we find that m =«, or— n — I, and thus we have as solutions, on determining the ratios of the coefficients in the two cases, 1

1 L»_J1(!LZI) M »«4....[C 2 . 2n—i ‘)*

and

(1 . (w + i)(n+2) 1 , (n+i)(»+2)(»+3)(»+4) 1 , J

P I ˆn+lT 2 2 n+3 ˆ” +3 ” r 2 . 4 . 2»+3 . 2W+5 |i”+ 5 ˆ ‘ ” ‘ J

the first of these series is (« integral) finite, and represents P«(m), the second is an infinite series which is convergent when mod n > 1.

If we choose the constant /3 to be

1 ■ 2 ■ 3 ■

the second

3.5... 2» re solution may be denoted by Q»(m), and is called the Legendre’s function of the second kind, thus

Q.G0

1-2. 3

3-5-

. .n { 1 ;n + i I /i n+

+

(n+l)(n+2) 1

*ˆ+5+--- *

„n+l I 2.2W-(-3 y.

1.2.3 . . .n _ 1 r- f n+i n+2 2n+3

P (n+i n+2 2n+3 i\ , „

3.5...2W+I m" +1 \ 2 ‘ 2 2 ‘/»/• k °>*

This function Q»(m), thus defined for mod n > I, is of considerable importance in the potential theory. When mod ju < I, we may in a similar manner obtain two series in ascending powers of n, one of which represents PnOu), and a certain linear function of the two series represents the analytical continuation of Q..(m), as defined above. The complete primitive of Legendre's equation is

MˆAP.OO+BQnGO.

By the usual rule for obtaining the complete primitive of an ordinary differential equation of the second order when a particular integral is known, it can be shown that (27) is satisfied by

P.W1 2 ‘

the lower limit being arbitrary.

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From this form it can be shown that I

Q.G0 =i P.(m) log K±|- WˆCm),

where W»_i(/x) is a rational integral function of degree n — I in m; it can be shown that this form is in agreement with the definition of Qnto by series, for the case mod />i. In case mod /n*

3P»(m)1°siˆ;-W._iG0,

which is real when p. is real and between ±1, the function Q„(m) in this case is not the analytical continuation of the function Qt.(m) for mod m> x . but differs from it by an imaginary multiple of P„(m). It will be observed that Q n (i), Q n (— i) are infinite, and Qn(x) =o.

The function Wn-i(ju) has been expressed by Christoffel in the form

2 “-?P„_ lW + – 2 “-

•w+|ˆp — w+-

I . n ˆ’ . ‘ 3 . n — I

and it can also be expressed in the form

~P (p.)Pˆ 1 (p.)+~P l (p)?ˆ. 2 (p.) + . . . +P„-,(m)Po(m).

It can easily be shown that the formula (28) is equivalent to

which is analogous to Rodrigue’s expression for PnM- Another expression of a similar character is

It can be shown that under the condition mod \u — V (u- — 1)\ >mod \ti — V (v?— 1)|, the function il(n — u) can be expanded in the form 2(2»-|-i)P«(tt)Q„(tt) ; this expansion is connected with the definite integral formula for Q n (v) which was used by F. Neumann as a definition of the function Q»(p.), this is

which holds for all values of \i which are not real and between ± I. From Neumann’s integral can be deduced the formula

d4>

••00 Qn(M) = J ,

iM+vcˆ-o.coshˆr’

which holds for all values of p. which are not real and between =”= 1 , provided the sign of V (/ 2 — 1) is properly chosen ; when p is real and greater than 1, V (p 2 — 1) has its positive value. By means of the substitution.*

Jm + V(m 2 — i).cosh \fr\ii — V(m 2 — l).cosh x! = i,

the above integral becomes

*Q„0) = J *V~V (m 2 – 1) cosh xNx. where xa = ˆog c j~. ‘*

This formula gives a simple means of calculating Q„(p) for small values of n; thus

**w-/>—>*e±j.*

If, in Legendre's equation, we differentiate m times, we find

*. . n d m **u , . . d M+1 u , , ., , , .d m u*

• c 11 1 d m u , m , , ,v m d m u

it follows that u = 'hence «„ = 0 2 i) – a*

2m'"

The complete solution of (26) is therefore

when m is real and lies between ± 1 , the two functions

U-M –) 4u'" ' U_M –) C^" 1 are called Legendre's associated functions of degree

Qi(p) =/»X«-V (m 2 – I) sinh Xo = M^oSj~ I.

Neumann's integral affords a means of establishing a relation between successive Q functions, thus

»Q»-(2rt-i)/«Q»-i + (n-l)(?»_2

"1 «P,(tt) + (n- i)P„- 2 (h.) – (2w- p — u

pP n -i{u)du

-ITJ

= |J _,(2» l)P»-l(") =0.

Again, it may similarly be proved that

19. Legendre Associated Functions. — Returning to the equation (26) satisfied by «™ the factor in the normal forms „_, ™ mtfr.u™,

we shall consider the case in which n, m are positive integers, and

n^m. Let « = (m 2 — i) m v, then it will be found that v satisfies the equation*

(m 2 -0

dp'" '

(V-i)

*U d m Q*W*

dp m ‘

in either case the functions may be denoted by P n (m), Qn (m). It can be shown that, when p is real and between ± 1

p:m =5ˆ11 (S3 im ˆio.-i)”ˆo.+i)-i

2»(n-m)l\l+p) dp” 1 ˆ V ” +l ‘ <• In the same case, we find

Pr +2 (cos 8)-2(m + i) cot $ P™ +1 (cos 0)

+ (n — m)(n+m + l)P™(cos 8)=o, (ra-«+2)Pr +2 (cos 0) – (2n +3) M Pr + i(cos 0)

+ (»+m + l)Pr(cos0)=o.

20. Bessel’s Functions.— -If we take for three orthogonal systems of surfaces a system of parallel planes, a system of co-axial circular cylinders perpendicular to the planes, and a system of planes through the axis of the cylinders, the parameters are a, p, $, the cylindrical co-ordinates; in that case Hi = i, Hi = i, H 3 = i/p, and the equation (25) becomes

d”v yy 1 av 1 a-v d~ 2 + 2 ~ ‘

*To find the normal functions which satisfy this equation, we put V = ZR, when Z is a function of z only, R of p only, and * of , the equation then becomes*

I ˆ?j_ ± /ˆP:j_I E\ j.1 I 4!?_ Z dz- + K Up 2 + p dp/ V d~°-*

1

tt yj conetant, say = — m-, and R, for which we write u, must satisfy the differential equation d 2 u , I dti

dp’

. 1 du /,„ pi-

it follows that the normal forms arc e ˆ z ‘-m

“,7/ T n ii t n”

(29)

*d 2 u , I du , / n7 ! *

d?+pd7 + { l -7) u=0 –

This is known as Bessel's equation of order m\ the particular case

d"-u , I du

d9 + pT P + u=0 '

(30)

corresponding to m = o. is known as Bessel's equation.

If we solve the equation (29) in series, we find by the usual process that it is satisfied by the series

+0

2.2OT+2 r 2.4.2/W-(2.2W|-4

the expression

P" \, P 2 ,

*2"*II(m) (2.2m+2 2.4.2m+2.2m+4*

...| s

or

(— i)V +2n

/ |) 2"' +2 "n(m+»)n(w' l

is denoted by J m (p). """"i When m=o, the solution

i _pJ + A...

2 2 ' 2 2 . 4 2

of the equation (30) is denoted by Jo(p) or by J(p).

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The function J m (p) is called Bessel-'s function of order m, and Jo(p) simply Bessel's function; the series are convergent for all finite values of p.

The equation (29) is unaltered by changing m into— m, it follows that J-m(p) is a second solution of (20). thus in general

« = AJ m (p)+BJ_ m (p)

is the complete primitive of (29). However, in the most important case, that in which m is an integer, the solutions J_ m (p), J m (p) are not distinct, for J~ m (p) may be written in the form

6 5?

m— 1

M-V (-!)■ /aV V2/ ^^n(»-m)n(») W

n-0

i_VsV

now n(« — m) is infinite when m is an integer, and n < m ; thus the first part of the expression vanishes, and the second part is (-i)'"Jm(p), hence when m is an integer J_ ra (p) = (— i) m] m (p), and the second solution remains to be found.

Bessel's Functions of the Second Kind. — When m is not a real integer, we have seen that any linear function of] m (p), F-m(p) satisfies the equation of order m. The Bessel's function of the second kind of order m is defined as the particular linear function

Tf m., J-™(p) -cos rax . T m (P) t sin 2mir –

and may be denoted by Y„(p). This definition has the advantage of giving a meaning to Y„(p) in the case in which m is an integer, for it may be evaluated as a limiting form 0/0, and the limit will satisfy the equation (29). The only failing case is when m is half an odd integer; in that case we take cos mv Y„(p) as a second finite solution of the differential equation. When m is an integer, we have

on earning out the differentiations, and proceeding to the limit we find cc

n_0

+i(T2- nJ =sr i (r

—0

where t(») denotes ll'(n)/n(n).

When m = o wc have the second solution of (30) given by

*21. Relations between Bessel's Functions of Different Orders.— Since * sin m< t>' u "> {p) satisfies Laplace's equation, it follows that sin m< t>"m(p) satisfies the differential equation*

d-u d-u

ˆ, + ˆ—„ + u=o.

dx 1 dy-

(30

The linear character of this equation shows that if u is any solution

is also one, / denoting a rational integral function of the operators. Let i, tj denote x+iy, x-iy, then since pr"4™«m(V£';) satisfies the differential equation, so also does

thus we have

d(p—)ˆ

Mm+p = Cp m+ "-

n »>t.(p)l,

d" [«„,(p)

d{?)»\ p,

where C is a constant. If u m (p)=] m (p), we have u m+p = J m p(p), and by comparing the coefficients of p" l ", wc find C = (— 2) v , hence

Jm+p(p) = (-2)"p m+ " :

and changing m into —m, we find

d(p !)" ['

"Jm(p)(,

d" ',

J,_ m (p) = (-2) V -ˆ[p«J_ m (p)j.

In a similar manner it can be proved that

} m „(p) = 2 »pˆ 5 ˆp|p»‘J m (p)j.

From the definition of Y„,(p), and applying the above analysis, wi, prove that

and

ˆ +1 ,(p) = (2)»p— ˆ{p

‘Y,(p)J

Y m _ J) (p)=2’>p>’

d”

, d d{p>)*

,Yo(p)

ˆpfp m Y m (p)!.

As particular cases of the above formulae, we find

*L,(p) = (-2p)*ˆ|Lj (p), Y p (p) = (-2p)*

J I (p) = _%W,Y I (p) = -ˆ Y «(£). cp dp

22. Bessel’s Functions as Coefficients in an Expansion. — It is clear that eip° <« = ei* or ew> si » * = g>» satisfy the differential equation (31), hence if these exponentials be expanded in series of cosines and sines of multiples of 0, the coefficients must be Bessel’s functions, which it is easy to see are of the first kind. To expand e’psin _ put <■< = /, we have then to expand eM’-‘ -1) in powers of t. Multiplying together the two absolutely convergent series*

we obtain for the coefficient of t m in the product P’” S . P 2 p 4

(5)

hence

I-

elt>(.’-

2 .2m+i~*' 1 .4 ,2m + 2 .2m+4.~

■')_

Jo(p)-HTi(p) + ...+ˆj T m (p) + „ ˆJi(p) + ■.+(- 1)™*-™ »™J m (p)

ˆor J m (p),

J»(p) 5

(32)

the Bessel's functions were defined by Schlomilch as the coefficients of the powers of I in the expansion of eip('\ and many of the properties of the functions can be deduced from this expansion. By differentiating both sides of (32) with respect to t, and equating the coefficients of /'" ' on both sides, we find the relation

Jm-i(p) +Jm+i(p) =-j-J m (p),

which connects three consecutive functions. Again, by differentiating both sides of (32) with respect to p, and equating the coefficients of corresponding terms, we find

„ djm(p) dp

=]m 1 (/>),— Jm+lM.

In (32), let l = e"t>, and equate the real and imaginary parts, we ;have then

cos (p sin 0)=Jo(p)+2.J 2 (p) cos 20+2j 3 (p) cos 30+. . .

sin (p sm 0) =2ji(p) sin 0+2j 3 (p) sin 30+ ... we obtain expansions of cos (p cos 0), sin (p cos 0), by changing into 2-0. On comparing these expansions with Fourier's series, we find expressions for J,„(p) as definite integrals, thus

Jn(p) = ~J cos (psin0)<20, J,„(p) = I jˆcos(p sin 0) cos m{m even)

]m(p) = „. J () sin (p sin 0) sin m0i0 (m odd).

It can easily be deduced that when m is any positive integer

jm(p) = _ I cos ("'0 — P s >" .

23. Bessel's Functions as Limits of Legmdrc's Functions. — The

system of orthogonal surfaces whose parameters are cylindrical co-ordinates may be obtained as a limiting case of those whose parameters are polar co-ordinates, when the centre of the spheres moves off to an indefinite distance from the portion of space which is contemplated. It would therefore be expected that the normal forms

e _,t2 Jm(Xp)si' n s m0 would be derivable as limits of -"(cos 6)ˆnt..

and we shall show that this is actually the case. If O be the centre of the spheres, take as new origin a point C on the axis of 2, such that OC=a; let P be a point whose polar co-ordinates are r, 0, referred to O as origin, and cylindrical co-ordinates p, z, referred to C as origin; we have

P = r sin 0, z = r cos 8 – a, hence (£) n P„(cose) = sec"0 (1 +-) "P„(cos 6) .

Now let move off to an infinite distance from C, so that a becomes

infinite, and at the same time let n become infinite in such a way that n/a has a finite value X. Then

Lsec»0 = L(sec!) X " = i > L(i+!) n = /"

and it remains to find the limiting value of P n (cos 8). From the series (15), it may be at once proved that

P„ (cos9) = I _(!l±i)2(sin f) 2 + ...

' l 2 .2 2 .m 2 \ 2/

where 5 is some number numerically less than unity and m is a fixed finite quantity sufficiently large; on proceeding to the limit, we have

T „ / Xp\ XV' , XV 4 , / , ms X 2 V"

L P„(cosM=Jo(X P). n- CO \ n I

where 81 is less than unity Hence

Again, since we have

P"(cosp) = sin"fl'

*L *- mp »K) = L !*

= (-2)“p’

hence

.(fPnCcosa)

d(cos B) m ‘

<•■•(»«■£)*

‘(-£)”

AJo(p)

«(p»)-*

has been introduced for them. We denote the two solutions of the

equation

(Pit , 1 du

-f-jH — j — w = o

by I ®, K ® when

1 /”»■ = – I cosh (r cos)<2

K ® = Yo(ir) +-nrJo(tr) = I Q e~r cos A

The particular integral KoM is so chosen that it vanishes when r is real and infinite; it is also represented by

and

and by

/:

rdv.

/”<° e~ ru ,

J 1 7I^T) & ‘

The solutions of the equation

du 2 , 1 du I , m'\ dˆ+-rTr-{ l +ˆ) u =

are denoted by l m ®, K m ®, where

T m (

+

;+;

2.2W + 2 ‘ 2.4.2m + 2.2W+4

(2′ ,) m j(pysIo(’’),

+

...J

B L ”””” P » (cos£) =J„(P).

It may be shown that Yo (p) is obtainable as the limit of Q„ (cos –) the zonal harmonic of the second kind ; and that

Y m (p)=Ln-»Q:(cosQ.

24. Definite Integral Solutions of Bessel’s Equation.ˆ-BeaseYs equation of order m, where m is unrestricted, is satisfied by the

r m~i

expression p™ I ev’ (P—l) dt, where the path of integration is either

a curve which is closed on the Riemann’s surface on which the integrand is represented, or is taken between limits, at each of which ew>’(< 2 — i) m+ i is zero. The equation is also satisfied by the expres- sion I e 2P ˆ — 'r m ~ 1 dt where the integral is taken along a closed

path as before, or between limits at eacii of which e p ˆ)/->»-i*

vanishes.

The following definite integral expressions for Bessel’s functions are derivable from these fundamental forms.

*J-to ° n(-i)n(«-a (2) 7V ros * sin im ˆ*

where the real part of m--\ if positive. Y m (p) + ˆ7n.e”” r ‘sec mir.]

„(p)

where the real parts of m--\, are positive; if p is purely imaginary and positive the upper limit may be replaced by 00 .

Y m (p) — Jiri.e”””” sec tmr.] m (p)

under the same restrictions as in the last case; if p is a negative

imaginary number, we may put » for the upper limit.

If p is real and positive

2 f °° Jo(p) =-J sin (p cosh

/CD cos (p cosh)d

25. Bessel’s Functions with Imaginary Argument. — The functions with purely imaginary argument are of such importance in connexion with certain differential equations of physics that a special notation

when m is an integer, and

K»M = (aO-jˆICM =e~ im ” 1 j Y m W) +|«rj m (,r) { . We find also

I-(0-

K m ® =

I.3.5. ..(2W

(-l)“V

■pr – I cosh (r cos) sin 2 ™

“ˆTTJo

e-r cosh cj> s j[n h 2m

1.3.5. ..(2m-

-(-0-3.5… ssmr-/;ˆˆˆ.. .

26. JTje Asymptotic Series for Bessel’s Functions. — It may be shown, by means of definite integral expressions for the Bessel’s functions, that

J-Cp)-\^!p «-(= = + J-p)+Q-(^4J-p) |

Y„(p) = « sec «, j P sin (+J-p) -Q cos (^+J-p) \ where P and Q denote the series

n_. (4m-i')Um*-3')*

*1. 2.(8,0**

■ (4 m 2 – 1 2) (4m 2 – 3 2) (4 m 8 – 5 2) (4 m – 7') ^ i.2.3-4(8p) 4 ! " '*

4 W 2 -I 2 (4OT 2-l»)(4w i- 3 «)(4OT 2_.;»)

v i.8p i.2.3.(8p)» i "-"

These series for P, Q are divergent unless m is half an odd integer, but it can be shown that they may be used for calculating the values of the functions, as they have the property that if in the calculation we stop at any term, the error in the value of the function is less than the next term ; thus in using the series for calculation, we must stop at a term which is small. In such series the remainder after n terms has a minimum for some value of », and for greater values of n increases beyond all limits ; such series are called semi- convergent or asymptotic.

We have as particular cases of such series : —

"V™"" (4-') irg-,'It(Jri-+—i

when m is an integer,

27. The Bessel's functions of degree half an odd integer are of special

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importance in connexion with the differential equations of physics. The two equations

are reducible by means of the substitutions u = e~ k 'v, u = e lk 'v to the form v»+»=o. If we suppose v to be a function of r only, this last differential equation takes the form*

0,

so that v has the values

sin r/r, cos rjr; in order to obtain more general solutions of the equation v»+d=o, we may operate on*

sin rjr, cos rjr with the operator

Y f±. ± -±) In Va' dy' dzj '*

where Y„ (x, y, z) is any spherical solid harmonic of degree n. The result of the operation may be at once obtained by taking Y„ {x, y, z) for /„(, y, z) in the theorem (7'), we thus find as solutions, of V*v +f = o, the expressions*

Y.(x, y. z)jˆ By recurring to the definition of the function J m ®, we see that

sin r v , s d" cosy

-7—, '»ft y< z ->

*j*wV£i'-*

r 2 r

2.3 2-3-

4-5

-■M

2 sin r

thus

r-ijlˆ

, /2 sin r

Using the relation between Bessel's functions whose orders differ by an integer, we have

Mr).(2)ˆ,ˆ(-.)VV' d " Sinr

It may be shown at once that

that the function K„(z) has no real zeros unless «=2fe + l where k is

an integer, when it has one real negative zero; and that K n (z) has no purely imaginary zeros, and no zero whose real part is positive, other than those at infinity. When l>re>0, K„(z) has no zeros other than those at infinity, when 2>n>l,it has one zero whose real part is negative, and when m+i>-n>m where m is ah integer, there are to zeros whose real parts are negative. When n is an integer, K„(z) has n zeros with negative real parts.

29. Spheroidal Harmonics. — For potential problems in which the boundary is an ellipsoid of revolution, the co-ordinates to be used are r, 0, where in the case of a prolate spheroid

- *= c \V 2 — I sin cos , y = c-Jr* — l sin sin*

the surfaces r = r , 0=0o, 4>= from o to 2ir, every point in space has then unique co-ordinates r, 8, .

For oblate spheroids, the corresponding co-ordinates are r, given by

8, 4,

»+i

d n cos r

d{r)» r*

a second solution of 4>) denotes a surface

x = c^r z + i sin 8cos, y = c\V 2 + l sin 8 sin , z = cr cos 8,

where

0< r < w , o < < ff, o < tfr < 2jt ;

these may be obtained from those for the prolate spheroid by changing c into — ic, and r into ir.

Taking the case of the prolate spheroid, Laplace's equation becomes

3V\ , r 2 -cos'0 a 2 v

d { ,„ ,aV) . 1 a / . „av\ .

m.

dr S ' sin 8 08 V" " 68/ " r (^-i)sin»9 dtf and it will be found that*

the normal solutions are

p»)p;T(cos0);

Q:(r))Q:(cos8)

For the space inside a bounding spheroid the appropriate normal

m are positive integers, and for the external space

*forms are P”(r)V™ (cos 8)ˆ?*m, where n,*

*is a second solution of Bessel’s equation of order n-f-j; thus the differential equation y*v+v = o is satisfied by the expression*

y.(. y, 3) J -ˆtV*

and by the corresponding expression with Bessel’s equation instead of Jˆ+i ® ; if S„(/j, harmonic of degree n, the expression

*S.O., *)ˆ w l®*

is a solution of the equation v 2 ti-{-v = o.

The Bessel’s functions of degree half an odd integer are the only ones which are expressible in a closed form involving no trans- cendental functions other than circular functions. It will be observed that in this case the semi-convergent series for J m becomes a finite one as the expressions P, Q then break off after a finite number of terms.

28. The Zeros of Bessel’s Functions. — The determination of the position of the zeros of the Bessel’s functions, and the values of the argument at which they occur, have been investigated by Hurwitz {Math. Ann. vol. xxxiii.j, and more completely by H. M. Macdonald (Proc. Lond. Math. Soc. vols. xxix.,xxx.). It has been shown that the zeros of J»(z)/z are all real and associated with the singular point at infinity when n is real and > — 1 , and that all the real zeros of J»(z)/z” when n is real and <— I, and not an integer, are associated with the essential singularity at infinity. When n is. a negative integer — to, Jr.(z)/z" has, in addition,, 2w real zeros co- incident at the origin. When n — — m— v, m being a positive integer, and i>f>o, LCzWz” has a finite number 2tn of zeros which are not associated with the essential singularity. If n is real, and starts with any positive value, the zeros nearest the origin approach it as n diminishes, two of them reaching it when n= i,i, and t\vo more reach it whenever n passes through a negative integral value; these*

zeros then become complex for values of n not integral. The zeros of J„(z)/z" are separated by those of J»+i(z)/z n , one zero of the latter, and one only, lies between two consecutive zeros of Jn(z),/z". When n is real and >— I, all the zeros of Jn(z)/z" are givenby a formula due to Stokes; the m th positive zero in order of magnitude is given by

*q:wp„-(cos0)^> *.*

5£r

For the case of an oblate spheroid, P"('f), Q7("')i take the place

of K®, QT®.

30. Toroidal Functions. — For potential problems connected with the anchor-ring, the following co-ordinates are appropriate: If A, B are points at the extremities of a diameter of a fixed circle, and P is any point in the plane PAB which is perpendicular to the plane of the fixed circle, let P = log(AP/BP), 0=/_APB, and let be the angle the plane APB makes with a fixed plane through the axis of the circle. Let be restricted to lie between — ir and ir, a discontinuity in its value arising as we pass through the circle, so that within the circumference is ir on the upper side of the circle, and — ir on the lower side ; 8 is zero in the plane of the circle outside the circumference; p may have any value between —00 and co . and any value between o and 2ir. The position of a point is then uniquely represented by the co-ordinates p, 8, , which ate the parameters of a system of tores with the fixed circle as limiting circle, a system of bowls with the fixed circle as common rim, and a system of planes through the axis of the tores. If x, y r z are the co-ordinates of a point referred to axes, two of which x, y are in the plane of the circle and the third along its axis, we find that

a sinh p . , _ ,0. sin

,sin

cosh p— cos 8

4n»— 1 4(4^— i)(28w 8 — 31)

— &C.,

I

sinh p dtf " can be shown

that this

*a sinh p x ~ cosh p – cos COS *' y = cosh p – cos C*

where a is the radius of the fixed circle. ' Laplace's equation reduces to

_a (sinhp aV) _a \ sinhp 3V dp\ P 2 dp) + d9\ P 2 d8)

when P denotes V(cosh p— cos 0). It equation is satisfied by

1 1 u . P»_i(cosh p) cos „ cos ,

*V (cosh p-cos ˆQ-ˆcosh p) sin "" sin m *'*

the functions P"_ } (cosh p), Qr_|(cosh p) required for the potential

problems, are associated Legendre's functions of degree n — |, half an odd integer, of integral order «, and of argument real and greater than unity; these are known as toroidal functions. For the space

external to a boundary tore the function Q™_ i (cosh p) must be

where (i = iir(2»+4»»-i). It has been, shown by Macdonald | used > al » d for the internal space P'ˆcosh p).

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The following expressions may be given for the toroidal functions: —

Pˆj(coshp)

ir H(»— m— j)J a (cosh p + sinh p cos .

cos m(j >

JTPˆ

I n(re+m — J) f , i , -i ,n„_i ,j,

= — jtH r~- (coshp -f sinhp cos 0)" 5 cos m$d.

w ii\n~i) Jo

P^.(coshp) = 2J^_

cosh n

= d.

0V2 cosh p — 2 cosh <£

Q^j(coshp) = (-1)" n („_|) j .. ■ (cosh P

■ — sinh p cosh w)"~3 cosh mwdw

^(-^TUm-mi-i) -nh " P f; (2 cosh ;°_ S f cos0) ^^.

The relations between functions for three consecutive values of the degree or the order are

2»t cosh pP ? ,(cosh p) — (« — m + 1) P™ , (cosh p) — (n--m — l)P_i (cosh p) = o. P^?(cosh p) + 2(m + 1) coth pP^Hcosh p) — (n.— »»;— j)(» + »»4-5)P^_, (cosh p) = 0,

with relations identical in form for the functions Q^, (cosh p). The function Q„_;(cosh p) is expansible in the form

3^g2^W + npF(i, M + h -n + .i, «-«p),

which is useful for calculation of the function when p is not small. P»_i(cosh p) can also be expressed in terms of tr by a somewhat complicated, formula.*

31. Ellipsoidal Harmonics. — In order to treat potential problems in which the boundary surface is an ellipsoid, Lame took as co-ordinates the parameters p, p, v of systems of confocal ellipsoids, hyperboloids of one sheet, and of two sheets; these co-ordinates are three roots of the equation

- +

pTp-h^P-U

+ «

j = l, (k > h);

we thence find that

_ppv Vp'-^VM^-gVtf-.- 2 _Vp 2 -£ 2 Vfe 2 -p. 2 V'& 2 -y 2

where 00 >p 2 >h 2 , W- < p. 2 < h- , and £ 2 >f 2 >o.

*We find from these values of *, y, z*

(p 2 -^)(m 2 -, 2)

and on applying the general transformation of Laplace's equation that equation becomes

(M 2 -^)-g|2 +(p'-^)y^ -Hp 2 / 2)^ =0, where £, if, f are defined by the formulae*

t ff d» r)=C d »*

**-A*

^

of the parameters £, jj, f in terms of p, p, 1/, ^e find that the equation satisfied by E(p) becomes

(p 2 -^)(p 2 - 2)^+p(V-ft 2 -* 2)^*

+\(h 2 +k 2)p-n(n + l)p 2 }E(p) =0,

and E(p.), E(i>) satisfy equations in p, v respectively of identically the same form ; this equation is known as Lamp's equation.

If n be taken to be a positive integer, it can be shown that it is possible in 2« + i ways so to determine p that the equation in E(p) is satisfied by an algebraical function of degree n, rational in p, V (p 2 — h 2), V(p 2 — k 2). The functions so determined are called Lamp's functions, and the 2» + I functions of degree n are of one of the four forms. –

K(p) = flo p" + a ip"^ + ■ • ■> L(p) = Vp 2 A 2 (oo' p"" 1 + o'lp"" 3 + ...), M(p) = V 7^F (o o"p" 1 + a"i p»- 3 +...), N(p) = yl7^k\^7^¥{<"p n ^+a["p"- i + . . .).

These are the four classes of Lame's functions qf degree, n ; of the functions K there are l+|», or i(n--l), according as n is even or odd ; of each of the functions L, M, there are in, or i(n — 1), and of the functions N, there are -|», or i(n + i).

The normal forms of. solution of Laplace's equation, applicable to the space inside the ellipsoid, are the 2m + i products E (p) Kip.)

E(v). It can be shown that the 2ra + i values of p a,re real and unequal.

It can be shown that, subject to certain restrictions, a function of p and v, arbitrarily given over the surface of the' ellipsoid p = pi, can be expressed as the sum of products of Lame's functions of p and c, in the form

00 2M+I

2 2 C jEjl(p.)E;(x); i s-i

the potential function for the space inside the ellipsoid, which has the arbitrarily given value over the surface of the ellipsoid, is consequently

22

, e^(p)e;(m)e„w EJKpO

Wtf-vVF-?'

which are equivalent to

p^kdn{k£, ki),p~=kdn(K~kr), ki), v-ksn(k(, hi), where ki 2 , k\ n denote the quantities i—h 2 jk', VjV and K denotes the complete elliptic integral

Vi-fe ! sinV

It can now be shown that Laplace's equation is satisfied by the product E(p)E(p,)E(>'), where E(o) satisfies the differential equation

^^-M«+l)p 2 -(ft 2 + fe 2)£!E(p)=o ;

and E(jj), E(v) satisfy the equations

|+[»(n4 i) M t-.0(A»+tf)]EGi)«O,_

,|~ [n{n+ iy -p{W+V)]E{S) =0, where n and p are arbitrary constants. 'On substituting the values

It can be shown that a second solution of Lame's equation it, F„(p) Where

F„(P) = (2B+I

)En{ P)j' i

dp

plE„(p)l 2 Vp 2 -^-Vp 2 -fe 2 '

this function F„(p) vanishes'at infinity as p~" -1 , and is therefore adapted tq the space outside the bounding ellipsoid. The external potential which has at the surface p = pi, the value

*22^ E *) E »« is S2 c "*

'F« P i)

El(p)El(v).

32. History and Literature. — The first investigator in the subject was Legendre, who introduced the functions known by his name, and at present also called zonal surface harmonics; he applied them to the determination bf the attractions Of solids of revolution. Legendre's investigations are contained in a memoir Of the Paris Academy, Sur V attraction des spheroides, published in 1785, and in a memoir published by the Academy in 1787, Recherches sur la figure des planktes; his investigations are collected in his Exercices, and in his Traite des functions elliptiques. The potential function was introduced by Laplace, who also first obtained the equation' which tears his name; he applied spherical surface harmonics to the

j determination of the potential of a nearly spherical solid, in his memoir, ThSorie des attractions des spheroides el de la figure des planUes, published by the Paris Academy in ^785. Laplace was the first to consider the functions of two angles, which Junctions have consequently been known as Laplace's functions; his investi-

' gationson these functions are given in the Mecanique celeste, tome ii.

j livre iii., tome v. livre xi., and in the supplement to vol. v. The notation P'") was introduced by Dirichlet (see Crelle's Journal, vol. xvii., " sur les series dont le terme general depend de deux angles " &c. ; see also his memoir, " Ueber einen neuen Ausdruck zur Bestimmung der Dichtigkeit einer uhendlich diinnen Kugelschale," in the Abhandlungen of the Berlin Academy, 1850). The name " Kugelfunctionen " was introduced by Gauss (see Collected Works, yi. 648). A direct investigation of the expression for the reciprocal of the distance between two points in spherical surface harmonics was

given by Jacobi (Crelle's journal, vol. xxvi., see also vol. xxxii.). The functions of the second kind were first introduced by Heine (see his " Theorie der Anziehung eines Ellipsoides," Cretle's Journal, vol. xlii., 1851). The above-mentioned investigators employed almost entirely polar co-ordinates ; the use of Cartesian co-ordinates for the expression of spherical harmonics was introduced by Kelvin iri' his. theory of the equilibrium of an elastic •spherical shell (see

Phil. Trans. Roy. Soc, 1862), and also independently by Clebsch (see his paper, " Ueber die Reflexion an einer Kugelflache," Crelle's Journal, vol. lxi.,.1863). The general theory of spherical harmonics of unrestricted degree, order and argument has been treated by Hobson (Phil. Trans., 1896) ; see also a paper by Barnes in the Quar. Journ. Math. 39, p. 97. The functions which bear the name of Bessel were first introduced by Fourier in his investigations on the conduction of heat (see his Theorie analytique de la chaleur, 1822) ; they were employed by Bessel in the theory of planetary motion (see the Abhandlungen of the Berlin Academy, 1824). The functions which are now known as Bessel's functions of degree half an odd integer were employed by Poisson in the theory of the conduction of heat in a solid spherical body (see the Journ. de I'icole polyt., 1823, cah. 19). The toroidal functions were introduced by C. Neumann (Theorie der Elektricitdts- und Warmevertheilung in einem Ringe, Halle, 1864), and independently by Hicks (Phil. Trans. Roy. Soc, 1881). The ellipsoidal harmonics were first investigated by Lame in con- nection with the stationary motion of heat in an ellipsoidal body (see Liouville's Journal, 1839, pt. iv. The external ellipsoidal harmonics were introduced by Liouville and Heine (see Liouville's Journal, vol. x., and Crelle's Journal, vol. xxix.). The ellipsoidal har- monics have been considered as expressed in Cartesian co-ordinates by Green (see Collected Works), by Ferrers (see his treatise), and by W. D. Niven (Phil. Trans. Roy. Soc, 1892). A method of representing ellipsoidal harmonics in a form adapted for actual use in certain physi- cal problems has been developed by G. H. Darwin (Phil. Trans., vol. 197).

The following treatises may be consulted: Heine, Theorie der Kugelfunctionen (2nd ed., 1878, vol. i.; 1881, vol. ii.); this treatise gives much information as to the history and literature of the subject; Ferrers, Spherical Harmonics (Cambridge, 1881); Tod- hunter, The Functions of Laplace, Lame and Bessel (Cambridge, 1875); Thomson

and Tait, Natural Philosophy (1879), App. Br Haentzschel, Reduction der Potentialgleichung auf gewohnliche Differ- entialgleichungen (Berlin, 1893); F. Neumann, Beitrdge zur Theorie der Kugelfunctionen (Leipzig, 1878) ; C. Neumann, Theorie der Bessel'- schen Functionen (Leipzig, 1867); Ueber die na'ch Kreis-,Kugel- und Cylinder-functionen fortschreitenden Entwickelungen (Leipzig, 1881); Lommel, Studien iiber die Bessel' schen Functionen (Leipzig, 1868); Mathieu, Cours de physique mathe'matique (Paris, 1873); Pockels, Ueber die partielle Differentialgleichung A«4-£ 2 tt=o (Berlin, 1891); Bocher, Ueber die Reihenentwickelungen der Potentialtheorie (Leipzig, 1894]; Gray and Mathews, Treatise on Bessel's Functions; Dini, Serie di Fourier e altre rappresentazione . . . (Pisa, 1880) ; Graf and Gubler, Einleitung in die Theorie der Bessel' schen Functionen (Berne, 1898) ; Nielsen, Handbuch der Theorie der Cylinderfunktionen (Leipzig, 1904) ; WhittakerM Course of Modern Analysis (Cambridge, 1902); H. Weber, Die partiellen Differenlialgleichungen der, Physik (Bremen, 1900) ; VV. E. Byerly, Fourier's Series and Spherical, Cylin- drical and Ellipsoidal Harmonics (Boston, 1893). (E. W. H.)

SPHEROID (Gr. aaipa-tiS-r]s, like a sphere), a solid resem- bling, but not identical with, a sphere in shape. In geometry; the word is confined to the figures generated by an ellipse revolving about a diameter. If the axis of revolution be the major axis of the ellipse, the spheroid is " prolate "; if the minor axis, "oblate"; if any other, "universal."

If the generating ellipse has for its equation x 1 la 1 +y 1 /b i = i, and revolves about the major axis, i.e. the axis of x, the volume of the solid generated is fxai 2 , and its surface is 2ir{b' i \(ab[e) sin- tej, where e denotes the eccentricity. If the curve revolve about the minor axis, the volume is f«i 2 6, and the surface is 7rj2a 2 + (6 2 / e) log (1 +e)/(l —e) } . The figure of the earth is frequently referred to as an oblate spheroid; this, however, is hardly correct, for the geoid has three unequal axes. The Cartesian equation to a spheroid assumes the forms x 2 /a 2 ((y 2 -l-z 2)/h 2 = i, for the prolate, and (x 2 -|-z 2)/tt 2 + > , V& 2 = l, for the oblate, the origin being the centre and the co-ordinate axes the axes of the original ellipse, x 2 /a 2 +y 2 /6 2 = i, and the line perpendicular to the plane containing them. ˆ In physics, the terra " spheroidal state " is given to the following phenomenon. If drops of a liquid be placed on a highly heated surface, for example, the top of a stove, the liquid forms a number of tremulous globules which continually circulate internally. There is no visible boiling, although the globule diminishes slowly in size. The theory of the experiment is that the liquid is

surrounded by an elastic envelope of its vapour which acts, as it were, as a cushion preventing actual contact of the drop with the plate. On the formation of a similar protective cushion of vapour depends the immunity of such experiments as plunging a hand into a bath of molten metal.

SPHEROMETER (Gr. aipa , a sphere, fikrpov, a measure), an instrument for the precise measurement of the radius of a sphere or the thickness of a thin plate. The usual form consists of a fine screw moving in a nut carried on the centre of a small three-legged table; the feet forming the vertices of an equilateral triangle (see figure).

The lower end of the screw and those of the table legs are finely tapered and terminate in hemispheres, so that each rests on a point. If the screw has two turns of the thread to the millimetre the head is usually divided into 500 equal parts, so that differences of o-ooi millimetre may be measured without using a vernier. A lens, however, may be fitted, in order to magnify the scale divisions. A vertical scale fastened to the table indicates the number of whole turns of the screw and serves as an index for reading the divisions on the head. In order to measure the thickness of a plate the instrument is placed on a perfectly level plane surface and the screw turned until the point just touches; the exact instant when it does so is defined by a sudden diminution of resistance succeeded by a considerable increase. The divided head and scale are read ; the screw is raised ; the thin plate slipped under it ; and the process is repeated. The difference between the two readings gives the required thickness. A contact- lever, delicate level or electric contact arrangement may be attached to the spherometer in order to indicate the moment of touching more precisely than is possible by the sense of touch. To measure the radius of a sphere — e.g. the curvature of a lens — the spherometer is levelled and read, then placed on the sphere, adjusted until the four points exert equal pressure, and read again. The difference gives the thickness of that portion of the sphere cut off by a plane passing through the three feet. Calling this distance ft, and the distance between the feet a, the radius R is given bv the formula R = (a 2 +3ft 2)/6/j.

SPHERULITES (Gr. cQaipa, sphere, \Wo$, stone), in petrology small rounded bodies which commonly occur in vitreous igneous rocks. They are often visible in specimens of obsidian, pitch- stone and rhyolite as globules about the size of millet seed or rice grain, with a duller lustre than the surrounding glassy base of the rock, and when they are examined with a lens they prove to have a radiate fibrous structure. Under the microscope the spherulites are of circular

outline and are composed of thin divergent fibres, which are crystalline and react on polarized light. Between crossed nicols a black cross appears in the spheru- lite; its axes are usually perpendicular to one another and parallel to the crossed wires; as the stage is rotated the cross remains steady; between the black arms there are four bright sectors. This shows. that the spherulite consists of radiate, doubly refracting fibres which have a straight extinction; the arms of the black cross correspond to those fibres which are extinguished. The aggregate is too fine grained for us to determine directly of what minerals it is composed.

Spherulites are commonest in acid glassy rocks like those above mentioned, but they occur also in basic glasses such as tachylyte. Sometimes they compose the whole mass; more usually they are surrounded by a glassy or felsitic base. When obsidians are devitrified the spherulites are often traceable, though they may be more or less completely recrystallized or silicified. In the centre of a spherulite there may be a crystal (e.g. quartz or felspar) or sometimes a cavity. Occasionally spherulites have zones of different colours, and while most frequently spherical they may be polygonal, or irregular in outline. In some New Zealand rhyolites the spherulites send branching " cervicorn " processes (like stags' horns) outwards through the surrounding glass of the rock. The name axiolites is given to long, elliptical or band-like spherulites.

Occasionally spherulites are met with which are half an inch or more in diameter. If the rock be pounded up fragments of these can be picked out by hand and subjected to analysis, and it is found that from their composition they may be regarded as a mixture of quartz and acid felspar. Direct microscopic evidence as to the presence of these minerals is rarely obtainable. Some authors describe spherulites as consisting of felsit or microfelsite, which also is supposed to be a cryptocrystalline quartzofelspathic , substance.*

Very large and cavernous spherulites have been called litho- physae; they are found in obsidians at Lipari, the Yellowstone Park, &c. The characteristic radiate fibrous structure is usually conspicuous, but the fibres are interrupted by cavities which are often arranged as to give the spherulite a resemblance to a rose- bud with folded petals separated by arching interspaces. Some of these lithophysae are an inch or more in diameter. In the crystallization of a glass there must

be contraction, and it is supposed that thus the concentric cavities arise. The steam and other vapours in the magma would fill these empty spaces and exert a powerful mineralizing action on the warm rock. The presence of garnet, tridymite, fayalite and other minerals, very abnormal in rhyolites in these cavities, in the lithophysae is accounted for in this way. The fibres of these coarse spherulites are often broad and seem to belong to alkali felspar (sanidine or anorthoclase) embedded in tridymite and glass; by analogy it is often inferred that the extremely tenuous fibres of ordinary spherulites have the same composition.

Artificial glass which has not the right composition, or is retained for too long a time in a furnace, sometimes crystallizes, and contains spherulites which may be as large as a marble. As the glass "has little similarity in chemical composition to volcanic obsidians these spherulites when analysed throw little light on the mineral nature of spherulites in rocks. They show, however that in viscous semi-solid glasses near their fusion point crystallization tends to originate at certain centres and to spread outwards, producing spherulitic structures. Many salts and organic substances exhibit the same tendency, yielding beautiful spherulite crystallizations when melted arid cooled rapidly on a microscopic slide.

There are many structures in rocks which are allied to spherulites and usually grouped with them, though probably they are not exactly of the same nature. Some are more vitreous, while others are more perfectly crystalline than the true spherulites. Of the former we mention the doubly refracting glassy spheroids common in rhyolites and obsidians. They differ in no respect from the surrounding hyaline base in ordinary light, but between crossed nicols appear as rounded bodies faintly lighted, with a black cross like that of the spherulites. They are portions of the glass which are in a state of compression or strain and hence no longer isotropic. In gelatin, celluloid and artificial glasses similar appearances are Occasionally seen. Opal, especially the variety known as hyalite, exhibits the same phenomenon.

In the group of porphyries known as gfanophyres crystals of quartz and felspar occur surrounded by a ground-mass which has a radiate fibrous or spherulitic structure. The fibres consist of quartz and felspar, usually in graphic intergrowth over considerable areas, and often sufficiently coarse to be easily distinguishable by means of the microscope. Often the quartz or the felspar of the spherulite extinguishes simultaneously with a crystal of either of these minerals lying in the centre of the aggregate. Exactly what the relationships of

the spherulites are to those of the obsidians has never been cleared up; they are probably analogous growths but not identical. The name granospheres has been given to these bodies. Another group of radiate fibrous growths resembling spherulites in many respects consists of minute feathery crystals spreading outwards through a fine grained or glassy rock. In the variolites there are straight or feathery felspar crystals (usually oligoclase) forming pale coloured spherulites, a quarter to half an inch in diameter. The same rocks often contain similar aggregates of plumose skeleton crystals of augite. Many volcanic rocks have small lath-shaped crystals of felspar or augite diverging from a common centre. To distinguish these radiate crystal groups from the cryptocrystalline spherulites they have been called sphaerocrystals. They are com- monest in those rocks which contain a fine ground-mass and have been rapidly consolidated. Stellate groupings are frequent also in secondary minerals, being very characteristic of natrolite, chlorite and chalcedony; often the component prisms are very narrow and regularly arranged so that in microscopic sections they give a black cross exactly like that of the spherulites. (J. S, F.)

SPHINX (Gr. ff0i77«J', to draw tight, squeeze), the Greek name for a compound creature with lion's body and human head. The Greek sphinx had wings and female bust, and the male sphinx of Egypt (wingless) is distinguished as " andro- sphinx " by Herodotus. The type perhaps originated in Egypt, where figures of gods with human bodies and animal heads, and compound animal forms like the gryphon were numerous from very «arly times. The sphinx, however, is a perfectly clear and well-defined type there, and is usually recumbent. The most

celebrated example is the Great Sphinx of Giza, 189 ft. long, a rock carved into this shape, and from its situation likely to be a work of the IVth Dynasty. The pattern of the wig-lappets has been quoted to prove that it dates from the XUth Dynasty, but it is said that the peculiar disposition of the uraeus on its forehead agrees with that in the earliest sculptures. The face looks out due eastward from the pyramid field over the Nile valley, and, according to the inscriptions of the XVIIIth Dynasty in the shrine between the paws, it represented the sun- god Harmachis. Sphinxes of granite, &c, occur of the XII th Dynasty and later. A pair from Tanis are attributed by Flinders Petrie to Pepi I. of the Vlth Dynasty. The heads of the sphinxes are royal portraits, and apparently they are intended to represent the power of the reigning Pharaoh. The king as a sphinx, in certain religious scenes, makes offerings to deities; and elsewhere he tears his enemies in pieces. In the Saite period accordingly the figure of the

sphinx was used as a hieroglyph for neb, " master," " lord." Recumbent sphinxes were especially used in pairs to guard the approach to a temple, and it may be conjectured that the Great Sphinx was sculptured at Giza to guard the entrance of the Nile Valley. The name of the sphinx in Egyptian was Hu.

The great temple avenues at Thebes are lined with recumbent rams, true sphinxes (a few late instances), and with the so-called criosphinxes or ram-sphinxes, having lion bodies and heads of the sacred animal of Ammon. A falcon-headed sphinx was aedicated to Harmachis in the temple of Abu Simbel, and is occasionally found in sculptures representing the king as Horus, or Mont, the war-god. It is distinguishable from the gryphon only by the absence of wings.

W. M. F. Petrie, History of Egypt from the Earliest Times to the XVIth Dynasty, p. 51, &c. ; L. Borchardt, " Das Alter der grossen Sphinx," in Sitzungsberichte of the Berlin Academy (1897), p. 752. Baedeker's Egypt; Prisse d'Avennes, Histoire de I' art igyptien (Paris, 1878), vol. u. pi. 26, 35, text, pp. 405, 410. (F. Ll. G.)

From Egypt the figure of the sphinx passed to Assyria, where it appears with a bearded male head on cylinders; the female sphinx, lying down and furnished with wings, is first found in the palace of Esar-haddon (7 th cent. B.C.). Sphinxes have been found in Phoenicia, one at least being winged and another bearded. They are copies of the Egyptian, both in form and posture, wearing the pshent and the uraeus, but distinguished by having the Assyrian wings. The sphinx is common on Persian gems, and the representations are finely executed. On a Persian intaglio are two sphinxes face to face, each wearing a tiara and guarding a sacred plant which is seen between them; but the sphinx, whether of the Egyptian or the Assyrian type, is not found in Persian sculptures (Perrot and Chipiez, History of Art in Persia, Eng. trans., London, 1892). In Asia Minor the oldest examples are the " Hittite " sphinxes of Euyuk. They are Egyptian sphinxes treated in the Assyrian style. They are not recumbent, and the hair falling from the head is curled, not straight, as in the true Egyptian sphinx. An ancient female sphinx, but wingless, stands on the sacred road near Miletus. Sphinxes of the usual Greek type are represented seated on each side of two doorways in an ancient frieze found by Sir Charles Fellowes at Xanthus in Lycia, and now in the British Museum. The same type appears on the early sculptures of the half-Greek, half-Oriental temple at Assus. In the early art of Cyprus — the half-way house between Asia and Greece— sphinxes of this type are not uncommon. On the other hand, on a gem of Phoenician style found at Curium in

Cyprus there appear two male (bearded) sphinxes, with the tree of life between them. With regard to Greece proper, in the third tomb on the acropolis of Mycenae were found six small golden sphinxes; they are beardless, but the sex is doubtful. The bust is not that of a woman, though the head and face are distinctly feminine. A shallow cap covers the head, and from the middle of it there is always a sort of tail or plume, blown back by the wind. It is curious that, though the sphinx (as also the gryphon) were thus common in the Mycenaean period, the words Lyl- and ypix^ do not occur in Homer. Helbig suggested that the word kvwv (dog), which is

connected with the sphinx in the tragedians, was used by Homer for the sphinx, but this theory has not met with general accep- tance. In the ancient tomb discovered in 1877 at Spata near Athens (which represents a kindred but somewhat later art than the tombs at Mycenae) were found female winged sphinxes carved in ivory or bone. Sphinxes on glass plates have been found in graves at Camirus in Rhodes and on gold plates in Crimean graves. Sphinxes were represented on the throne of Apollo at Amyclae and on the metopes at Selinus; in the best period of Greek art a sphinx was sculptured on the helmet of the statue of Athena in the Parthenon at Athens; and sphinxes carrying off children were sculptured on the front feet of the throne of Zeus at Olympia. There is also an Athenian vase from Capua in the form of a sphinx «painted white. It is winged, and the face is smooth and delicate in contour. Though Greek sphinxes are in general winged, there have been found in Boeotia terra-cotta figures of wingless sphinxes. Roman sphinxes of a late period have sometimes a man's, sometimes a woman's head with an asp on the forehead. An indefinable mansion inata sinha) represents the fourth avatar of the Indian Vishnu, and is found also among the Tibetans.

In Greek mythology the most famous sphinx was that of Thebes in Boeotia, first mentioned by Hesiod (Theog, 326), who calls her the daughter of Orthus and Chimaera. According to Apollonius (iii. 5, 8), she was the daughter of Typhon and Echidna, and had the face of a woman, the feet and tail of a lion and the wings of a bird. She dwelt at the south-east corner of Lake Copais on a bald rocky mountain called Phicium (mod. Fagas), which was derived from <£ ££, the Aeolic form of v&yt-. The Muses taught her a riddle and the Thebans had to guess it. Whenever they failed she carried one of them off and devoured him. The riddle was this: " What is that which

is four-footed, three-footed, and two-footed?" At last Oedipus guessed correctly that it was man; for the child crawls on hands and feet, the adult walks upright, and the old man supports his steps with a stick. Then the sphinx threw herself down from the mountain.

The story of the sphinx's riddle first occurs in the Greek tragedians. Milchhofer believes that the story was a mere invention of Greek fancy, an attempt to interpret the mysterious figure which Greek art had borrowed from the East. On the other hand, he holds that the destroying nature of the sphinx was much older, and he refers to instances in both Egyptian and Greek art where a sphinx is seen seizing and standing upon a man. And, whereas the Theban legend is but sparingly illustrated in Greek art, the figure of the sphinx appears more commonly on tombs, sculptured either in the round or in relief. From this Milchhofer seems to infer that the sphinx was a symbol of death.

Among the remains of the Mayan culture in Yucatan are found examples of sphinxes, male and female, which are not unlike those of Egypt and Asia Minor.

Milchhofer, in Mitih. d. deulsch. archdol. Instit. in Athen (1879), p. 46 seq.; J. Ilberg, Die Sphinx in der griechischen Sage und Kunst (1895); Sir R. C. Jebb's edition of Sophocles, Oed. Tyrann., app., note 12. (J. M. M.)

SPIDER-MONKEY, the English title of a group of tropical American monkeys known to the natives of Brazil by the name coaita, and to zoologists as Aleles, in allusion to the imperfectly- developed thumb. They take their English name from the slimness of the body, the elongated limbs, and the long tail, the under surface of the prehensile extremity of which is naked. The thumb is either rudimentary or wanting, so that the hands act merely as hooks in climbing. The absence of woolly under- fur, the less compressed nails, and the broader partition between the nostrils distinguishes them from the woolly spider-monkeys (Brachyteles.) The species are numerous, and the most active and thoroughly arboreal of all American monkeys. The prehen- sile tail is employed not only as a means of suspension, but also to convey food to the mouth. These monkeys generally go about in small parties, high up in the trees; and, like the other members of the group, are comparatively silent. Their food consists chiefly of fruits and leaves. (See Primates.)

SPIDERS, the common English name of Arachnida (q.v.) of the order Araneae, resembling the Pedipalpi in many structural points, but

differing from them as well as from all other Arachnida in retaining short abdominal appendages known from their silk-manipulating function as spinnerets or spinning mamillae, with which are associated silk glands. It is probably owing to the possession of such glands and the varied purposes for which the, silk is used that spiders as a group far surpass the other orders of Arachnida, with the possible exception of the Acari (mites and ticks), in diversity of form and of size, in numbers of genera and species, in extent of geographical distribution, and in adaptation to varied habitats. Except in the extreme north and south, and on the tops of the highest mountains, where there is no insect life as food supply, spiders are found all over the world, even in isolated oceanic islands. They occur up mountain slopes as far as vegetation extends, in tropical valleys and forests, in open grassy plains, in sandy deserts, and even in fresh-water ponds and between tide-marks on the seashore. Some are nocturnal, some diurnal; some catch their prey by speed of foot, some by cunningly lying hid, some by means of silken nets. The phenomena known as " protective resemblance," or similarity to inanimate objects or vegetation, and the kindred phenomenon of " mimicry," or beneficial likeness to certain protected species of animals, are common in the group. In these particulars, considered in their entirety, spiders show a marked contrast to other Arachnida, such as the scorpions, pedipalps, book-scorpions and so-called harvest spiders, which by comparison are remark- ably uniform, within the limits of the orders, in structure, habits and other respects. Spiders, in short, must be regarded as the most highly organized and the most successful members of the class Arachnida.

Their success in the struggle for existence, as already indicated, must be assigned in a great measure to the possession of silk glands and to their power of manipulating the silk for a variety of purposes. Several facts point to the conclusion that the primary use of this secretion was the formation of egg-cases or cocoons by the female, for this is the only constant use for which the silk is employed, without exception, by all species. The second step in the evolution of spinning instincts was probably the making of a silken chamber for the reception of the cocoon itself and for the protection of the mother while guarding it and her newly-hatched young. If an aperture for ingress and egress, for purposes of feeding, were left in the wall of such a chamber, there would arise in a rudimentary form what is known as the tubular nest or web; and the next important step was possibly the adoption of such a nest as a permanent abode for the spider. Some spiders, like the Drassidae and Sallicidae, have not advanced beyond this.stage in architectural industry; but next to the

cocoon this simple tubular retreat — whether spun in a crevice or burrow or simply attached to the lower side of a stone — is the most constant feature to be observed in the spinning habits of spiders. From this starting-point the evolution of web-making seems to have proceeded along two main divergent lines. Along one line there was a gradual elaboration of the tube until it culminated, so far as structural complexity is concerned, in the so-called trap- door nests or burrows of various families; along the other line the tubular retreat either retains its primitive simplicity in association with a new structure, the snare or net, or is entirely superseded by the latter.

Trap-door nests are made by spiders belonging to two widely different groups, namely the Lycosidae or wolf-spiders, to which the true tarantula (q.v.) belongs, and the Mygalomorphae, containing the species which construct the best -known types of this style of burrow. Although there is no direct genetic affinity between the spiders of these two groups, an interesting parallelism in their habits may be traced. In both there, axe species which form no nest or burrow, others which construct a simple silk-lined tunnel in the soil, and others which close the aperture of the burrow With a hinged door; while both sjiare the habit of lining the burrow with silk to prevent the infallof loose sand or mould; and the species which make an open burrow close the aperture with a sheet of silk in the winter during

hibernation and open it again in the spring. Possibly from this habit was developed the instinct to build a door with a movable hinge. In the trap-door species of Lycosidae, like, for instance, Lycosa opifex of the Russian steppes, the hinge is weak and the lid of the burrow is kept normally shut by being very much thicker and heavier at its free margin opposite the hinge so that it readily falls by its own weight. In the burrows made by the Mygalomorphae, on the contrary, the hinge is strong and highly elastic, its component silken threads being laid .on in such a way that the door shuts with a snap when the occupant has passed in or out. The lid is sometimes thin and wafer-like as in the burrow of the species of Nemesia, sometimes thick and cord-like as in that of the species of Cleniza or Pachylomerus. Its upper side is always covered by the spider with pieces of the vegetation growing hard by, so that, when the door is closed, the position of the burrow is completely concealed. If an attempt be made by any enemy to lift

the lid, the spider seizes its inner side with his fangs and striking his claws into the walls of the burrow offers the greatest possible resistance to the efforts of the intruder. When on the watch for prey the spider slightly raises the lid and, peeping through the chink, darts like a flash upon any beetle or fly that unwittingly passes within reach. Quite commonly the burrow has a second passage running obliquely upwards from the main passage to the surface of the soil, and this sub- sidiary track may itself be shut off from the main branch by an inner door, so that when an enemy has forced an entrance through the main door, the spider retreats behind the second, leaving the intruder to explore the seemingly empty burrow.

There is no doubt that the primary influence that has guided the evolution of the architecture of the burrowing spiders has been that great necessity for the preservation of life, avoidance of enemies and protection from adverse physical conditions like rain, cold or drought. And when we turn to the other line along which the web-building instinct has been developed we find that the primary guiding influence has been that second great vital necessity, namely the necessity of getting food. Reference has already been made to the silken tube or tent, of simple structure, with an orifice at one or both ends, as the possible origin of all snares, however complex they may be. Perhaps the most rudimentary form of snare arose • from the spinning of threads round the mouth of the tube to hold it in place. Be that as it may, the snare in many instances, as in that of the Agalenidae (Tegenaria, A galena), a family closely allied to the Lycosidae, is a horizontal sheet of webbing, upon which the spider runs, continuous with the lower half of the aperture of the tube, of which it is simply an extension. A very similar sheet is spun by a species of Linyphia, one of the Argyopidae, but in this case there is no tube connected with the web and the spider hangs suspended beneath the horizontal netting. Snares of another type consisting of a tangled mass of threads amongst which the spiders pick their way with ease, but which are impassable to insects, are spun by members of the Theridiidae and Pholcidae; but by common consent the so-called orbicular web, so character- istic of the Argyopidae but by no means confined to them, is regarded as manifesting the greatest perfection of instinct in snare-spinning. These webs, which are typically subcircular in form, consist of a system of threads radiating from a common centre and crossed at intervals, and approximately at right angles, by a series of concentric lines, the whole being suspended in a triangular, quadrangular or polygonal framework formed of so-called foundation lines, attached to the branches or leaves of trees or other firm objects in the neighbourhood. Passing

back from the centre of the web to the underside of an adjoining leaf or some other sheltered spot runs a single thread, the trap line affording passage to the spider to and from the sheltered spot and the snare itself. At whatever spot an insect becomes entangled in the frame, the vibration set up by its struggles is transmitted along the nearest radiating thread to the centre and thence up the trap line to the shelter where the occupant lurks awaiting the signal. No sooner is the vibration perceived than the spider descends with all speed to the centre, and by feeling the ends of the radiating lines learns which is ashake

and rapidly, without the possibility of mistake, makes its way to the entangled insect. The probable reason for the wall-lines being concentric is that lines passing over the radii as nearly as possible at right angles are the shortest that can be laid on; they therefore use up a smaller quantity of silk and take a shorter time to spin than threads crossing the radii in any other direction; and at the same time they afford them the greatest possible support compatible with delicacy and strength of construction. On account of its delicacy no web is more difficult to see than one of the orbicular type above described. Its whereabouts is thus, to a great extent, concealed both from enemies searching for spiders and from insects suitable for food; and its open meshwork of strong threads makes it much less liable to be beaten down by rain or torn to shreds by winds than if it were a flat sheet of closely woven silk. In constructing, therefore, a snare of radiating and concentric lines, it seems that a spider economizes both time and silk and in addition renders the web as strong and as serviceable and yet as delicate and invisible as possible.

Perfect orbicular webs are made by many genera of Argyopidae (Zitta, Meta, Gasteracantha), the best-known example being that of the common garden spider of England, Aranea or Epeira diademata; but these webs are not associated with any tubular retreat except such as are made under an adjoining leaf or in some nook hard by. Some tropical members of the family belonging to the genus Nephela, however, spin a web which is intermediate in structure between that of Aranea and the com- plete sheet-like web of A galena. It covers an area of about one- third of a circle and its radiating threads diverge from the mouth of a funnel-shaped tube resembling in every respect the tube of the last-mentioned genus. Again some species of Dictyna, belonging to the AmaurobiMae, also have a tubular retreat opening on to the surface of a snare in which a crude attempt at a radial and concentric arrangement of the threads is per- ceptible. The interest of these two types of web lies in the fact that they bridge over*

the structural gap between the simple sheet-web of Agalcna and the perfected orb-web of Aranea.

Dictyna may be cited as an example of a group of spiders, sometimes called the Cribellata, which have certain spinning glands and appliances not possessed by others. These glands are represented externally by a special plate, the cribellum, which lies in front of the ordinary spinning mamillae, and by a comb of short bristles, the calamistrum, placed in the penultimate segment of the left of the last pair. By means of the calamistrum the silk secreted by the cribellum is teased into a fine thread which is twisted round the main threads of the web, giving it a very characteristic woolly or flocculent appearance.

There are many other uses to which silk is put, besides those mentioned above. By trailing a thread behind them spiders are able to drop from any height to the ground and to retrace their steps with certainty to a particular spot. The possession of silk-glands has also profoundly influenced the geographical distribution of spiders and has enabled them to cross arms of the sea and establish themselves on isolated oceanic islands which most of the orders of Arachnida are unable to reach. This is effected by the so-called habit of " ballooning " practised by very young spiders, which float through the air, often at great altitudes, in the direction of the prevalent winds. It was formerly supposed that this custom was peculiar to a single species, which was called the "gossamer " spider from the fact that the floating webs, when brought to the earth by rain or intercepted by bushes and trees, coat the foliage or grass with a sheeting of gossamer-like silk; but the habit is now known to be practised by the newly-hatched young of a great variety of species belonging to several distinct families.

As a commercial product spider-silk has been found to be equal, if not superior, to the best silk spun by lepidopterous larvae; but the cannibalistic propensities of spiders, making it impossible to keep more than one in a single receptacle, coupled with the difficulty of getting them to spin freely in a confined space, have hitherto prevented the silk being used on any extensive scale for textile fabrics.

The methods of catching prey adopted by spiders are extremely

varied. The nets or snares are highly efficient for this purpose. Amongst the threads, which entangle the wings and legs of intercepted prey, the spiders are perfectly at home and can pounce on the struggling victim at once if it be small and harmless or keep at a respectful distance, checking all efforts at escape, if it be poisonous or strong. If in the latter cage the spider be afraid to come to close quarters, various devices for securing it are resorted to. The Theridiidae eject on to the insect from their spinning mamillae drops of liquid adhesive silk; the Argyopidae, steadying it with the tips of their long front legs, sweep additional strands of silk over it with the legs of the hinder pair; the Agalcnidae, attaching a long thread to a point hard by, run round and round the victim in circles, gradually winding it up beyond all hope of breaking loose. Two genera of Argyopidae {Hyptiotes and Tlieridiosoma) construct springrnets out of their incomplete webs of the orbicular type. To the web is attached a trap-line which when drawn taut holds the snare stretched and tight, and when relaxed loosens the whole structure so that the threads fall together. When an insect strikes the web the spider loosens his hold of the trap-line, thus enveloping the victim in a tangle of threads which would otherwise not come into contact with it. Spiders which spin no snare are dependent for capturing prey for the most part upon their quickness or powers of lying concealed. Many Thomisidae lurk amongst the stamens and petals of flowers, which they closely match in colour, waiting to seize the insects which visit the blossoms for nectar. Examples of Selenops (Clubionidae) lie flat and absolutely still on the bark of trees, to which their coloration assimilates, and spring like a flash of light upon any insect that touches their legs; the Lycosidae dart swiftly upon their prey; and the Salticidae, which compared with other spiders have keen powers of vision, stealthily stalk it to within leaping distance, then, gathering their legs together, cover the intervening space with a spring and with unerring aim seize it and bury their fangs in its body. One genus of Thomisidae (Phognarachne) , which inhabits the Oriental region, adopts the clever device of spinning on the surface of a leaf a sheet of web resembling the fluid portions of a splash of bird's dung, the more solid central portions being represented by the spider itself, which waits in the middle of the patch to seize the butterflies or other insects that habitually feed on birds' excrement and are attracted to the patch mistaking it for their natural food.

The sexes of spiders are distinct. Except in the case of the water-spider {Argyroneta) the males are smaller, sometimes very much smaller, than the females, but have proportionately longer legs and smaller bodies. When adult the males may always be distinguished

from the females by the presence of a pair of horny intromittent organs, one of which is lodged in the terminal seg- ment of each palpus or appendage of the second pair. In its simplest form this is a hollow flask-shaped horny piece, con- sisting of a dilated basal portion and a terminal spiniform portion with an orifice at the apex; but its structure is frequently com- plicated by accessory processes and outgrowths which aid copula- tion and serve to protect the delicate point from injury. In the breeding season the male deposits drops of sperm on a sheet of webbing, picks it up in these flasks by means of capillary attrac- tion and carries it about until he falls in with a female. During pairing he thrusts the tip of these organs into the seminal vesicles of the female and the eggs are fertilized as they pass out of the oviduct. Cases of parthenogenetic reproduction, or reproduction without the intervention of the male, have been recorded in the case of two genera (Filistata and Tegenaria) , and may be commoner than is usually supposed. All spiders are oviparous. The number of eggs produced at a time varies enormously accord- ing to the species, from about half a dozen, more or less, in some ant-mimicking Attidae or jumping spiders to many hundreds in the larger orbicular- webbed spiders of the family Argyopidae. The first act of the female after oviposition is to wrap her eggs in a casing of silk commonly called the cocoon. The cocoon varies greatly in size, shape and consistency according to the nature of the spider that makes it. Sometimes, as in Pholcus, it is

merely a thin network of silk just sufficient to hold the eggs together. More often it consists of a thick felting of silk, either spun in one continuous piece into a globular form, as in the Avicularidae, or composed of two plate-like pieces, an upper and a lower, united at the edges and lenticular in shape, as in some of the Lycosidae. Sometimes it is woolly and flocculent, sometimes smooth like parchment, and its shape depends in a large measure upon the habits of the female towards her offspring. As a rule terrestrial spiders guard the cocoon in the permanent burrow, as in the trap-door spiders, or in the silken retreat which acts as a temporary nursery, as in the Salticidae. Other species of wandering habits carry the cocoon about with them, sometimes attached to the spinnerets, as in the Lycosidae, sometimes tucked under the thorax, as in the large tropical house-spider, Heteropoda regia, one of the Clubionidae. The females of some snare-spinning species, like the Pholcidae, carry it in their jaws; but in the case of the Argyopidae the females usually leave the cocoon to its fate as soon as: it is constructed, sometimes rolling it in a leaf, sometimes attaching it by a stalk to a branch. It is. in this and related families that the greatest diversity in the colour

and form of the cocoon is found. In these spiders, too, the newly-hatched young shift for themselves as soon as they emerge from the cocoon; in others that guard the cocoon the young stay for a longer or shorter time under their mother's protection, those of the wandering Lycosidae climbing on her back to be carried about with her wherever she goes. There is no metamorphosis during growth such as occurs in some insects, the young being hatched with its full complement of appendages and only differing from its parents in characters of comparatively minor importance. Growth is accompanied by a succession of moults, the spider emerging from its old skins by means of a fracture which extends along the front and sides of the cephalp- thorax just beneath the edge of the carapace. It is only at the final moult that the sexual organs are mature, the two sexes being alike in the earlier stages of growth. Until maturity is reached the spider has the power to repair lost or damaged limbs. If a limb be lost at an early stage it may be re-grown in perfection; but at later stages it is only , imperfectly reproduced and js shorter and thinner than the other limbs. Rapidity of growth and longevity vary greatly according to circumstances and to the species. In northern and temperate latitudes where insects disappear in the winter, species of Argyopidae like Aranea diade- mata, live only for a single season. The young emerge from the cocoon in the early spring, grow through the summer, and reach maturity in the early autumn. The sexes then pair and perish soon after the female has constructed her cocoon. Species of other families {Lycosidae, Clubionidae) may live for a few seasons, hibernating in the soil or amongst dead leaves; and examples of the larger spiders {Avicularidae) have been kept alive in captivity for several years.

Owing to the smaller size of the male and the greater voracity of the female, the male makes his advances to his mate at the risk of his life and is not infrequently killed and eaten by her either before or after pairing has been effected. Fully aware of the danger, he pays his addresses with extreme caution, frequently waiting for hours in her vicinity before venturing to come to close quarters. Males of .the Argyopidae hang on the outskirts of the webs of the females and signal their presence to her by jerking the radial threads in a peculiar manner. Other web- spinning spiders {Tegenaria) have somewhat similar habits; and the male of the park-web spider {Atypus), one of the Mygalo- morphae, taps the walls of the tubular web of the female before daring to bite a hole in it and descend into her burrow. Most curious of all is the courtship of the males of some species of Salticidae, or jumping spiders, which are decorated with plumes or coloured stripes or iridescent patches. These they display before her,

*posing and performing extraordinary antics in her presence exactly as cock birds behave towards their hens. Lastly, the males of some species of spiders differ from the females in possessing stridulating organs * consisting of horny ridges and spikes and lodged either between the mandible and palpus as in some species allied to Linyphia, one of the Argyopidae, or between*

the cephakv-thbrax and abdomen as in Steatoda t one of the Theridiidae and Cambridgea, one of the Agalenidae. It is believed that the males of these species signal to their females by means of the sound these organs emit. The greatest disparity in size between the sexes is met with in the tropical genus Nephila, the females of which are gigantic representatives of the Argyopi- dae. The male, however, is a veritable pigmy beside the female, and during copulation presents the appearance of a parasite attached to her abdomen. It has been suggested that the diminutive size of the male' is of great advantage to him during courtship, because he is enabled to move easily thereby to escape from her clutches should she turn upon him with hostile intent.

All spiders possess a pair of poison-glands, one in each of the chelicerae or mandibles and opening by means of a duct at the tip of the fang. The primary function of this poison is to kill the prey upon which they feed, its action being very rapid upon insects. In a great majority of cases, however, it is comparatively innocuous to human beings, despite legends to the contrary that have arisen in connexion with certain species like the tarantula. The bite, however, of any spider, strong enough to pierce the skin, may give rise to a certain amount of local inflam- mation and pain depending principally upon the amount of poison injected. The bite, for example, of large species of the family Avicularriidae, sometimes called Mygales, and sometimes, but erroneously, known as tarantulas, species which have fangs half an inch long and as sharp as needles and a considerable quantity of poison, may be very painful, though seldom serious provided the health of the patient be good. There is one possible exception, however, to the innocuous nature of the poison and this is supplied by the species of the genus Lathrodectus, one of the Theridiidae. There is no actual proof that this spider is more poisonous than others, but it is a significant fact that its species, inhabiting countries as widely separated as Chile, Madagascar, Australia, New Zealand and South Europe are held in great fear by

the indigenous population, and many stories are current of serious or fatal results following their bites. Many of the species of these spiders, moreover, are very conspicu- ously coloured, being either wholly black or black relieved by fiery red spots, forcibly suggesting that they are warningly coloured. Some of the species of Avicularriidae also appear to be warningly coloured with black or black and red, and their colora^ tion is associated with the urticating nature of their bristles, which makes them highly unpalatable to vertebrate foes. So far as is known, however, only the large spiders belonging to this group possess this special means of defence, and in many other species this is accompanied by highly-developed stridu- lating organs resembling those of rattlesnakes and scorpions in function. Others again, like Gasteracantha and Acrosoma, belonging to the A rgyopidae, are armed with sharp and strong abdominal spines, and these spiders are hard-shelled like beetles and are spotted with black on a reddish or yellow ground, their spines shining with steel-blue lustre. The majority of spiders, however, are soft-skinned and succulent, and are tasty morsels for insectivorous reptiles, birds and mammals. Hence as a very general rule the coloration makes for concealment under natural conditions of existence, and the instincts which lead to conceal- ment are very highly developed. As instances of procryptic or celative coloration may be mentioned that of the species of the genus Dolomedes, one of the Lycosidae, which lives amongst reeds and is marked with a pair of longitudinal yellow lines which harmonize with the upright stalks of the vegetation, and Lycosa picta, which lives on the sand, can scarcely be seen on account of its mottled pattern: Sparassus smargduliis and the species of Pecucetia, which are found amongst grass or low green herbage, are mostly green in colour, and Salticus scenicus is banded with white and black to match the grey tint of the rocks and stone walls on which it hunts its prey. Similar instances of protective colora- tion could be cited without end. Sometimes the shape of the spider combines with the colour to produce the same effect, as in the species of Uloborus, which as they hang in thin shabby-looking webs exactly resemble fragments of wind-blown rubbish. The success of procryptic coloration depends, however, very largely

upon stillness, and the instinct to keep stationary without moving a limb is a marked characteristic of all spiders unless engaged in hunting or fleeing from imminent danger. The instinct reaches its highest development in the phenomenon miscalled "death feigning." Spiders of various families will, when alarmed, lie absolutely still with legs tucked up and allow themselves 1 to be pushed and rolled, and handled in various ways without betraying that they are alive by

the slightest movement. But it would be absurd to suppose that they are in reality pretending to be dead, because there is no reason to think they can have any knowledge of death. They are merely practising the inherited instinct to lie motionless, movement being the only indication of the presence of living prey known to many insectivorous animals. When concealment is no longer possible terrestrial species, like the Lycosidae, dart swiftly to the nearest shelter afforded by crevices in the soil, stones, fallen leaves or logs of wood, while those that live in bushes, like the Argyopidae, drop straight to the ground and lie hidden in the earth or in the fallen vegetation beneath.

The extent to which procryptic coloration and instincts favouring concealment are developed indicates that generation after generation spiders have been subjected to persecution from enemies. No doubt large numbers are devoured by insectivorous birds, mammals and reptiles, but the mortality due to them and other foes sinks into insignificance beside that caused by the persecution of hymenopterous insects of the families Ichneumonidae and Pompilidae, especially of the latter, many species of which systematically ransack the country for spiders wherewith to feed their young in the breeding season. It is no exaggeration to say that countless thousands of spiders of all families are annually destroyed by these insects, and there is no reason to doubt that destruction on at least as great a scale has been g6ing on for centuries, too many even to guess at. Hence it is probable that no factor has had a greater influence than these wasps in moulding the protective instincts and habits of spiders. One interesting phenomenon in spider-life seems to be directly and certainly traceable to this influence, and that is mimicry of ants. In several families of spiders, but principally in those like the Clubionidae and Salticidae, which are terrestrial in habits, there are species which not only live amongst ants, but so closely resemble them in their shape, size, colour and actions that it requires a practised eye to distinguish the Arachnid from the insect. Now the Pompilidae or mason wasps provision their cells with insects of many different kinds, as well as with spiders; but, of the hundreds of species of these wasps that have been described from different parts of the world, only one is known to use ants for this purpose; and this species is not one that preys upon spiders. On the other hand it has been specially recorded of two of the species of spider-destroyers that they have great dislike and apparent fear of these little poisonous Hymeno- ptera. So, too, does it appear that ants are entirely immune to the attacks of Ichneumonidae, which destroy hosts of other insects and of spiders by laying their eggs upon their

bodies. But since ants are not persecuted by these two families of Hymeno- ptera, the greatest enemies spiders have to contend with, it is evident that mimicry of ants is of supreme advantage to spiders. Ants, however, are not the only animals mimicked by spiders. Some members of the Argyopidae (Cyclosa) are exactly like small snails; others (Cyrtarachne) resemble Coccinellidae in shape dnd colour. Now, Coccinellidae (ladybirds) are known to be highly distasteful to most insectivorous mammals and birds, and snails would be quite unfit food for the Porhpilid or Ichneumonid larvae, so that the reason for the mimicry in these cases is also perfectly clear. The exact extent, however, to which each particular class of enemy has affected the protective habits and attributes of spiders is by no means always evident; and it is impossible to discuss the question in detail withiri the limits of a short a/tide. But two instances of extreme deviation from the ordinary mode of life due, apparently, like ant-mimicry, solely, if not wholly, to the persecution of Hymenoptera, may be cited as illustrations of the profound effect upon habit brought about by long-continued persecution from enemies of this kind.

This deviation is the adoption of an aquatic mode of life by the European fresh-water spider (Argyroneta) and by the marine spider Desis, which is found on the shores of the Indian and Pacific Oceans from Cape Colony to eastern Australia. Desis lives invariably between tide-marks upon the rocks and coral reefs, and may be found at low tide either crawling about upon them or swimming in tidal pools and feeding upon small fish or crusta- ceans. As the tide rises the spiders take refuge in crevices and spin over their retreat a sheet of silk, impervious to water, beneath which they lie in safety with a supply of air until the ebb exposes the site again to the sun. The fresh-water spider {Argyroneta) lives amongst the weeds of lakes and ponds and, like Desis, is quite at home beneath the water either swimming from spot to spot or crawling amongst the stems of aquatic plants. As a permanent home the spider makes beneath the surface a thimble-shaped web, with inverted mouth, anchoring it to the weeds. He then ascends to the surface, carries down a bubble of air and releases it inside the mouth of the silk-thimble, thus replacing a certain amount of water. This action is repeated until the domicile is filled with air, when the spider takes possession of it. The spider owes its name Argyroneta or the silver swimmer to its silvery appearance as it swims about under water enveloped in air, and its power to

retain an envelope of air on its sternum and abdomen depends upon the circumstance that these areas are beset with hairs which prevent the water reaching the integument; but the air retained by these hairs can be released when the spider wishes to fill its subaqueous home with that element. Argyroneta feeds principally upon flies or gnats, which it seizes from below as they light upon the surface of the water. In the breeding season the male spins a bell or thimble near that of the female and joins the two by means of a silken passage. The female attaches her eggs to the inner wall of her own home, and the young when large enough to shift for themselves have the bell-making instinct fully developed. Since the adoption of an aquatic mode of life by Desis and Argyroneta involves no increased facilities in getting food, and merely substitutes for ordinary terrestrial enemies fishes and crustaceans in the former case, and fishes, amphibians, and insectivorous water-insects in the latter, the supposition is justified that the change in environment is due to the unre- mitting persecution of Pompilidae and Ichneumonidae, which would not venture to pursue their prey beneath the water's surface. The habits of certain other spiders suggest the origin of the perfect adaptation to aquatic conditions exhibited by Desis and Argyroneta. The nature of the integument and its hairy clothing in all spiders enables them to be plunged under water and withdrawn perfectly dry, and many species, even as large as the common English house-spider (Tegenaria), are so lightly built that they can run with speed over the surface of standing water, and this faculty has been perfected in genera like Pirata, Dolomedes and Triclaria, which are always found in the vicinity of lakes or on the edges of rivers and streams, readily taking to the water or running down the stems of water plants beneath its surface when pursued. Some species of Dolomedes, indeed, habitually construct a raft by spinning dead leaves together and float over the water upon it watching for an opportunity to dash upon any insect that alights upon its surface.

Geologically, spiders date from the Carboniferous Period, Arthro-lycosa and others from the coal beds of Europe and North America being closely allied to the existing genus Liphistius. Remains of spiders from the Baltic amber beds of Oligocene age and from nearly coeval fluviatile or lacustrine deposits of North America belong to forms identical with or closely related to existing genera, thus proving the great antiquity of our present spider fauna. (R. I. P.)

SPIELHAGEN, FRIEDRICH VON (1820-), German novelist, was born at Magdeburg on the 24th of February 1829. He was brought up at Stralsund, where his father was in 1835 appointed government architect; he attended the gymnasium there, and studied law, and

subsequently literature and philo- sophy, at the universities of Berlin, Bonn and Greifswald. On leaving the university he became a master in a gymnasium at Ieipzig, but upon his father's death in 1854 devoted himself

entirely to writing. After publishing Klara Vere (1857) and Auf der D-iine (1858), he obtained a striking success with Proble- matische Naturen (1860-ˆ1861), one of the best novels of its time; it was followed by Die von Hohenstein (1863), In Reih' undGlied (1866), Hammer und Amboss (1869), Deutsche Pioniere (1870), A llzeit voran I (1 8 7 2) , Sturmflut (1876), Plattland (1878), Quisisana (1880), Angeia(i88i), Uhlenhans (1884), Einneuer Pharao (1889), Faustulus (1897) and Freigeboren (11900). Spielhagen's best work was produced between the years i860 and 1876; he wrote nothing after Sturmflut which can be compared with that power- ful romance. His novels combine two elements of especial power, the masculine assertion of liberty which renders him the favourite of the intelligent and progressive citizen, and the ruth- less war he wages against the self-indulgence of the age. His love of the sea, derived from an early residence at Stralsund, introduces an element of poetry into his novels which is some- what rare in German fiction. Spielhagen's dramatic productions, Hans und Crete (1868) and Liebe filr Liebe (1875), and others, cannot compare with his novels. From 1878-1884 he was editor of Westermann's Monatshefte.

Spielhagen's Samtliche Werke were published in 1 871. in sixteen volumes, in 1878 in fourteen volumes; his Samtliche Romane in 1898 (22 vols.), and these were followed by a new series in 1002. See his autobiography, Finder und Kr finder (2 vols., 1890); also G. Karpeles, F. Spielhagen (1889), and H. and J. Hart, Kritische Waffengdnge (1886).

SPIESS, CHRISTIAN HEINRICH (1755-1799), German writer of romances, was born at Freiberg in Saxony on the 4th of April 1755. For a time an actor, he was appointed in 1788 controller on the estate of a certain Count Kiinigl at Betzdikau in Bohemia, where he died, almost insane, the result of his weird fancies, on the 17 th of August 1799.

Spiess, in his Ritter-, Rduber- und Geister- Romane, as they are called — stories of knights, robbers and ghosts of the " dark " ages — the idea of which he borrowed from Goethe's Golti von Berlichingen and Schiller's Rduber and Geisterseher, was the founder of the German Schauerroman (shocker) , a style of writ- ing Continued, though in a finer vein, by Karl Gottlob Cramer (1758ˆ1817) and by

Goethe's brother-in-law, Christian August Vulpius. These stories, though appealing largely to the vulgar taste, made Spiess one of the most widely read authors of his day. The most popular was a ghost story of the 13th century, Das Pelerm'dnnchen (1793); among others were Der alte tfberall und Nirgends (1792); Die Lowenrilter (1794), and Hans Heiting, vierter und letster Regent der Erd- Luft- Feuer- und Wasser- Geister (1798). Beside numerous comedies, Spiess wrote, antici- pating Schiller, a tragedy Maria Stuart (1784), which was in the same year performed at the court theatre in Vienna.

See Karl Goedeke, Grundriss, v. 506 sqq. ; Muller-Fraureuth, Die Ritter- und Rduberromane (Halle, 1894).

SPIKENARD, or Nard (0. Fr. spiquenard, Lat. spica nardi, from spica, ear of corn, and Gr. va.pb'os, Pers. nard, Skt. nalada, Indian spikenard, from Skt, nal, to smell), a celebrated per- fume which seems to have formed one of the most durable aromatic ingredients in the costly unguents used by the Romans and Eastern nations. The ointment prepared from it (" oint- ment of pistic nard" 1) is mentioned in the New Testament (Mark xiv. 3-5; John xii. 3-5) as being " very costly," a pound of it being valued at more than 300 denarii (over £10). This appears to represent the prices then current for the best quality of nard, since Pliny (H.N. xii. 26) mentions that nard spikes reached as much as 100 denarii per lb, and, although he does not mention the price of nard ointment, he states (xiii. 2) that the "unguentum cinnamominum," a similar preparation, ranged from 25 to 300 denarii according to its quality. Nard ointment also varied considerably in price from its liability to sophistication (Ibid. xii. 26, 27; xiii. 2). The genuine ointment 2

1 The meaning of the word " pistic " is uncertain, some rendering it " genuine," others " liquid," and others taking it for a local name

2 The use of alabaster vessels for preserving these fragrant unguents was customary at a very early period. Theophrastus (c. 314 B.C.) states that vessels of lead and alabaster were best for the purpose, on account of their density and coolness, and their power

(unguentum nardinum sive foliatum) contained costus (the root of Saussurea lappa), amomum (the fruits of Amomum carda- momum), bairn (the oleoresin of Balsamodendron opobahamum) and myrrh,

with Indian nard (Ibid. xiii. 2).

The exact botanical source of the true or Indian nard was long a matter of uncertainty, the descriptions given by ancient authors being somewhat vague, but it is now identified as Nardostachys jatamansi, > a. plant of the valerian order, the fibrous root-stocks or " spikes " of which are still collected in the mountains of Bhotan and Nepal. The name " spike " is applied apparently from its resemblance in shape to a spike or ear of bearded corn; The root is crowned by the bases of several stems, each about 2 in. or more in length and as thick as the finger. To these the fibrous tissue of former leaves adheres and gives them a peculiar bristly appearance. It is this portion that is chiefly collected.

Other and inferior varieties of nard are mentioned by Dioscorides and subsequent writers. Celtic nard, obtained from the Ligurian Alps and Istria, consisted of the roots of plants also belonging to the valerian order (Valeriana celtica and V. saxatilis). This was exported to the East and thence to Egypt, and was used in the preparation of baths. Mountain nard was collected in Cilicia and Syria, and is supposed to have consisted of the root of Valeriana luberosa. The false nard of Dauphinˆ, used in later times, and still employed as a charm in Switzerland, is the root-stock of Allium victorialis. It presents a singular resemblance to the spikes of Indian nard, but is devoid of fragrance. It is remarkable that all the nards belong to the natural order Valerianaceae, the odour of valerian being considered disagreeable at the present day; that of Nardostachys jatamansi is intermediate between valerian and patchouli, although more agreeable than either.

The name " spikenard " has also been applied in later times to several plants. The spikenard of the United States is Aralia racemosa, and another species of the same genus, A. nudicaulis, or wild sarsaparilla, is known as " wild spikenard." In the West Indies Hyptis suaveolens is called " spikenard," and in Great Britain the name " ploughman's spikenard " is given to Inula conuza.

SPILLIKINS (M.D., spelleken, little pin), or Jackstraws (origi- nally " jerk-straws"), a game of some antiquity played with a set of slender sticks of wood, bone or ivory, from 3 to 6 in. long, generally carved to represent weapons and utensils of various kinds, which are thrown in a heap haphazard upon the table. The players then endeavour in turn to extricate from the heap, one at a time, as many straws as possible, without moving any except the one angled for. The player obtaining the most straws wins. The game is called in French

jonchcts and in German Federspiel.

SPINA (Lat. for a thorn, or prickle, also backbone, whence spine), in architecture, the term given to the low podium wall which divided the circus of the Romans and round which the chariots ran; at each end of it was the meta or goal. On coins, gems and bas-reliefs it is shown with numerous other features on it, such as obelisks (of which those from the spina of the Circus Maximus are now in the piazzas of the Lat£ran and del Popolo), small aedicula or pairs of, columns carrying an entablature, altars, statues, trophies, &c.

SPINACH (Spinacia olcracea), an annual plant, a member, of the natural order Chenopodiaceae, which has been long culti- vated for the sake of its succulent leaves. It is probably of Persian origin, being introduced into Europe about the 15th century. It should be grown on good ground, well worked and well manured; and for the summer crops abundant water- ing will be necessary.

The first sowing of winter spinach should be made early in August, and another, towards the end of that month, in some sheltered but not shaded situation, in rows 18 in. apart — the plants, as they advance, being thinned, and the ground hoed. By the beginning of winter the outer leaves will have become fit for use, and if the weather is mild successive gatherings may be obtained up to the beginning of May. The prickly-seeded and the Flanders are the best for winter; and these should be thinned out early in the autumn to about 2 in. apart, and later

of resisting the penetration of the ointment into their substance. Pliny also recommends alabaster for ointment vases. For small quantities onyx vessels seem to have been used (Horace. Cartn. iv. 12, lines 10, 17).

on to 6 in. The lettuce-leaved is a good succulent winter sort, but not quite so hardy. To afford a succession of summer spinach, the seeds should be sown about the middle of February, and again in March; after this period small quantities should be sown once a fortnight, as summer spinach lasts but a very short time. They are generally sown in shallow drills, between the lines of peas. If a plot of ground has to be wholly occu- pied, the rows should be about 1 ft. apart. The round-seeded is the best sort for summer use.

, The Orach or Mountain Spinach (A triplex hortensis), a member of the same order, is a tall-growing hardy annual, whose leaves, though coarsely flavoured, are used as a substitute for spinach, and to

correct the acidity of sorrel. The white and the green are the most desirable varieties. The plant should be grown quickly in rich soil. It may be sown in rows 2 ft. apart, and about the same distance in the row, about March, and for succession again in June. If needful, water must be freely given, so as to maintain a rapid growth.

The New Zealand Spinach (Tetragonia expansar), natural order Ficoideae, is a half-hardy annual, native of New Zealand, sometimes used as a substitute for spinach during the summer months, but in every way inferior to it. The seeds should be sown in March, on a gentle hot-bed, having been previously steeped in water for several hours. The seedlings should be potted, and placed under a frame till the end of May, and should then be planted out in light rich soil. The young leaves are those which are gathered for use, a succession being produced during summer and autumn.

SPINAL CORD, in anatomy, that part of the central nervous system in man which lies in the spinal canal formed by the ver- tebrae, and reaches from the foramen magnum to the lower margin of the first lumbar vertebra. It is about 18 in. , long, and only occupies j the upper two-thirds of the spinal canal. The cord is protected by the same three membranes which surround the brain. Outside is the dura mater, which differs from that of the brain in Fig. i.— Transverse Section of the not forming a periosteum Spinal Cord and its Membranes, to the bones, in sending no processes inward, and in having no blood sinuses enclosed within its walls. In other words the spinal dura mater is the continuation of only the inner or cere- bral layer of the dura mater of the skull. Inside the dura mater is the arachnoid, which is delicate and transparent, while between the two lies the sub-dural space, which reaches down to the second or third sacral vertebra. The pia mater is the innermost cover- ing, and is closely applied to the surface cf the cord into the substance of which it sends processes. Between it and the arachnoid is the sub-arachnoid space, which is much larger than the sub-dural and contains the cerebro-spinal fluid. Across this space, on each side of the cord, run a series of processes of the pia mater arranged like the teeth of a saw; by their apices they are attached to the dura mater, while their bases are continuous with the pia mater surrounding the cord. These ligaments, each consisting of twenty-one teeth, are the liga- menta denliculata, and by them the spinal cord is moored in the middle of the cerebro-spinal fluid.*

The spinal cord itself is a cylinder slightly flattened from before backward. In the cervical region it is enlarged where the nerves forming the brachial plexus come off, while opposite the lower

thoracic vertebrae the lumbar enlargement marks the region whence the lumbo-sacral nerves are derived. (See fig. 2.) Opposite the second lumbar vertebra the cylindrical cord becomes pointed and forms the conus medullaris, from the apex of which a glistening membranous thread runs down among the nerves which form the Cauda equina, and, after blending with the termination of the dural sheath, is attached to the back of the coccyx.

In a transverse section of the cord two median fissures are seen; the antero-median (see fig. 3, A) is wide, and reaches about a third of the way along the antero-posterior diameter of the cord ; it is lined by the pia mater, which, at its orifice, is thickened to form a

Lis. Dcmtiou- latum

*P'« Mate**

(From Gray's Anatomy, Descriptive and Surgical.)

Postero-median fissure"

Cervical swelling – Posterior para- median fissure –

Fostero-latera! fissure"

glistening band, known as the tinea splendens; in front of this lies

the single anterior spinal artery.

The postero-median fissure (fig. 3, P.) is much deeper and narrower,

and has no reflection of the pia mater into it. Where the posterior

nerve roots emerge (fig. 3, P.R.) is a depression which is called the postero- lateral fissure, while between this and the postero-median a slight groove is seen in the cervical region, the para- median fissure (fig. 3, P.M j see also fig. 2) . On looking at fig. 3 it will be seen that the anterior nerve roots' (A.R.) do not emerge from a definite fissure. The spinal cord, like the brain, consists of grey and white matter, but, as there is here no representa- tive of the cortical grey matter of the brain, the white matter entirely surrounds the grey. In section the grey matter has the form of an H, the cross bar forming the grey commissure. In the middle pf this the central canal can just be made

Out by the naked eye (see fig. 4). The anterior limbs of the H form the anterior comua, while the posteriori which in the greater part of the cord are longer and thinner, are the pos- terior comua. At the tips of these is a lighter-coloured cap (fig. 3, S.G.) which is known as the substantia gelatinosa Rolandi. On each side of the H is a slighter projection, the lateral cornu, which is best marked in the thoracic region (see fig. 4).

On referring to fig. 4 it will be seen that the grey matter has different and characteristic appearances in different regions of the cord, and it will be noticed that in the cervical and lumbar enlargements, where the nerve to the limbs comes off, the anterior horns are broadened.

**CVi*

-CVv

-DVn

Lumbar swelling.-

ˆDVxn

„LVn

(From D.J. Cunningham, in Cunning- ham's Text-Book oj Anatomy.)

Fig. 2. — Diagram of the Spinal Cord as seen from behind.

CVi shows the level of the 1 st cervical vertebra ; CVv of the 5th cervical vertebra; DVn of the 2nd dorsal vertebra; DVx of the 10th dorsal vertebra; DVxn of the 1 2th dorsal vertebra; LVn of the 2nd lumbar vertebra.

DPT A.K.

Fig. 3. — Diagram to show the Tracts in the Spinal Cord.

A. Antero-median fissure.

P. Postero-median fissure.

A.R. Anterior nerve roots. P.R. Posterior nerve roots. P.M. Paramedian fissure. S.G; Substantia gelatinosa. G.T. Tract of Goll. B.T. Tract of Burdach. C.T. Comma tract. O.A. Oval area. L.T. Lissauer's tract. D.C.T. Direct cerebellar tract. T.G. Gowers' tract. C,P.T. Crossed pyramidal tract. L.B.B. Lateral basis bundle. A.B.B.

Anterior basis bundle

Fig. 4. — Sections of Spinal Cord, twice scale of nature.

1. Cervical enlargement.

2. Thoracic region.

3. Lumbar enlargement.

4. Sacral region.

D.P.T. Direct pyramidal tract.

Histologically the grey matter is made up of neuroglia, medul- lated and non-medullated nerve fibres, and nerve cells (for details see Nervous System). The nerve cells are arranged in three main columns, ventral, intermedio-lateral and posterior vesicular. The ventral cell column has the longest cells, and these are again sub-divided into antero-mesial, antero lateral, postero-lateral and central groups. The intermedin lateral cell column is found in the lateral horn of the thoracic region.

The posterior vesicular or Clarke's column is also largely confined to the thoracic region, and lies in the mesial part of the posterior cornu. It is the place to %

*which the sensory fibres of * ~ "~ ~ J*

the sympathetic system (vis- ceral afferents) run. The white matter, as has been shown, Surrounds the grey and passes across the middle line to form the white com- missure, which lies in front of the grey. It is composed of neuroglia and medullated nerve fibres, which are ar-ranged in definite tracts, although in a section of a healthy cord these' tracts cannot be distinguished even with the microscope. They have been and are still being gradually mapped out by pathologists, physiologists and embryologists.

On tracing a sensory nerve into the cord (fig. 3, P.R.) through the posterior nerve root it will be seen to lie quite close to the mesial side of the posterior horn of grey matter, where most of it runs upward. The next root higher up takes the same position and pushes the former one toward the middle line, so that the lower nerve fibres occupy an area close to the postero-median fissure known as the tract of Goll (fig. 3, G.T.), while the higher lie more externally in the tract of Burdach, (B.T.). The greater part of each nerve sooner or

later enters the grey matter and comes into closerelation with the cells of Clarke's column, but some fibres run right up to the nucleus gracilis and cuneatus in the medulla (see Brain), while a few turn down and form a descending tract, which, in the upper part of the cord, is situated in the inner part of the tract of Burdach and is known as the comma tract (fig. 3, C.T.), but lower down gradually shifts quite close to the. postero-median fissure and forms the oval area of Flechsig (fig. 3, O.A,). It will be obvious that both these tracts could not be seen in the same section, and that fig. 3 is only a diagrammatic outline of their position.

A few fibres of each sensory nerve ascend in a small area known as Lissauer's tract (fig. 3, L.T.) on the outer side of the posterior nerve roots, and eventually enter the substantia gelatinosa.

To the outer side of Lissauer's tract and lying close to the lateral surface of the cord is the direct cerebellar tract (fig. 3, D.C.T.), the fibres of which ascend from the cells of Clarke's column to the cerebellum. As Clarke's column is only well developed in the thoracic region this tract obviously cannot go much lower.

In front of the last and also close to the lateral surface of the cord is another ascending tract, the tract of Gowers (fig. 3, T.G.), or, as it is sometimes called, the lateral sensory fasciculus. It probably begins in the cells of the posterior horn.and runs up to join the fillet and also to reach the cerebellum through the superior cerebellar peduncle. The crossed pyramidal tract (fig. 3, C.P.T.) lies internal to the direct cerebellar tract, between it and the posterior cornu. It is the great motor tract , by which the fibres coming from the Rolandic area of the cerebral cortex are brought into touch with the motor cells in the anterior cornu of the opposite side. This tract extends right down to the fourth sacral nerve.

In front of the crossed pyramidal tract is the lateral basis bundle (fig. 3, L.B.B), which probably consists of association fibres linking up different segments of the cord.

The anterior basis bundle (fig. 3, A.B.B.) lies in front and on the mesial side of the anterior cornu, and through it pass the anterior nerve roots. Like the lateral bundle it consists chiefly of association fibres, but it is continued up into the medulla as the posterior longitudinal bundle to the optic nuclei.

The direct pyramidal tract (fig. 3, D.P.T.) is a small bundle of the motor fibres frOm the Rolandic area, which, instead of crossing to the other side at the decussation of the pyramids in the medulla, runs down by the side of the antero-median fissure. Its fibres, however, keep on gradually crossing to the opposite side through the anterior white commissure of the cord, and by the time the mid- thoracic region is reached it has usually disappeared.

The roots of the spinal nerves in the vpper part of the canal rise from the cord nearly opposite the points at which they emerge between the vertebrae, but the farther one passes down the higher the origin of each root becomes above its point of emergence. Con- sequently the lumbar and sacral nerves run a long way down from the lumbar enlargement to their spinal foramina and are enclosed in the dural and arachnoid sheaths to form a mass like a horse's tail, which is therefore known as the Cauda equina. The relation between the origin of each nerve and the spinous processes of the vertebrae has been worked out by R. W. Reid {Journ. Anat. and Phys., xxiii.

34i)-

Embryology.— The early development of the neural tube from the ectoderm is outlined in the article on the Brain. When the neural groove becomes a tube it is oval in section with a very large laterally

compressed central canal (see fig. 5). The original ectodermal cells elongate and, radiating outward from the canal, are now known as spongioblasts, while the inner ends of some of them bear cilia and so the canal becomes ciliated. A number of round cells, known as germinal cells, now appear close to the central canal, except at the thin -mid-dorsal arid _mid-ventral laminae (roof-plate and floor-plate). From the division of these the primitive nerve cells or neuroblasts are formed and these later on migrate from the region

MVELO-

.SPONSIUM

Early

MID-VENTRAL LAMINA (From D. J. Cunningham in Cunningham's Text-Book of Anatomy.) Fio. 5. — Schema of a Transverse Section through the

Neural Tube (Young). The left side of the section shows an earlier stage than the right side.

of the canal and shoot out long processes — the axons. The permanent central canal of the cord was formerly said only to represent the ventral end of the large embryonic canal, the dorsal part being converted into a slit by the gradual closing in of its lateral walls, thus forming the postero-median fissure. A, Robinson, however, does not believe that the posterior fissure is any remnant of the central canal, and there are many points which bear out his contention (Studies in Anatomy, Owens College, 1891). The most modern view (1908) is that the fissure is formed partly by an infolding and partly from the original central canal. The antero-median fissure is caused by the ventral part of the cord growing on each side, but not in the mid-line where no germinal cells are.

The anterior nerve roots are formed by the axons of the neuro- blasts in the developing anterior cornua, but the posterior grow into the cord from the posterior root ganglia (see Nerve -.Spinal), and, as they grow, form the columns of Goll and Burdach. That part of the grey matter from which the ventra.1, anterior or motor nerve roots rise is known as the basal lamina of the cord, while the more dorsal part into which the posterior nerve roots enter is the alar lamina. These parts are important in comparing the morphology of the spinal cord with that of the brain.

In the embryo up to the fifth month there is little difference in the appearance of the grey and white matter of the cord, but at that time the fibres in the columns of Burdach acquire their medullary sheaths or white substance of Schwann, the fatty matter of which is probably abstracted from the blood. Very soon after these the basis bundles myelenate and then, in the sixth month, tne columns of Goll. Next follow the direct cerebellar tracts and, in the lacter half of the eignch month the tracts of Gowers, while the fibres of the pyramidal and Lissauer's tracts do not gain their medullary sheaths ., until just

before or after birth. At first the spinal cord exends as far as the last mesodermal somite, but neuroblasts are only formed as far as the first coccygeal somite, so that behind that the cord is non-nervous and degenerates later into the filum terminate. After the fourth month the nervous portion grows more slowly than the rest of the body and so the long cauda equina and filum terminate are produced. At birth the lower limit of the cord is opposite the third lumbar vertebra, but in post-natal development it recedes still farther to the lower level of the first.

For further details see Quain's Anatomy, vol. i. (London, 1908); J. P. McMurrich, Development of the Human Body (1906). Most modern descriptions are founded on the writings of W. His, references to which and to other literature will be found on p. 463 of McMurrich's book.

Comparative Anatomy— In the Amphioxus there is little difference between the spinal cord and the brain ; the former reaches the whole length of the, body and is of uniform calibre. It encloses a central canal from which' a dorsal fissure extends to the surface of the cord and it ;is composed of nerve fibres and nerve cells ; most of the latter being grouped round the central canal or neurocoele, as they are in the human embryo. Some very large multipolar ganglion cells are present, and there are also large fibres known as giant fibres, the function of which is not clear.*

When the reptiles are reached the cord shows slight enlargements in the regions of the limbs and these become more marked in birds and mammals.

In the lumbar region of birds the dorsal columns diverge and open HP the central cainal, converting it into a diamond-shaped space which is only roofed over by the membranes of the cord, and is known as the sinus rhomboidalis.

In all these lower vertebrates except the Anura (frogs and toads), the cord fills the whole length of the spinal canal, but in the higher mammals (Primates, Chiroptera and Insectivora) it grows less rapidly, and so the posterior part ot the canal contains the cauda equina within its sheath of dura mater. In mammals below the anthropoid apes there are no direct pyramidal tracts in the cord, since the decussation of the pyramids in the medulla is complete. Moreover, the crossed tracts vary very much in their proportional size to the rest of the cord in different animals. In man, for example, they form n-87% of the total cross area of the cord, in the cat

7-76%, "J the rabbit 5-3 %, in the guinea-pig 3 %, and in the mouse I ■ 14 /o. In the frog no pyramidal tract is found. It is obvious, there- fore, that in the lower vertebrates the motor fibres of the cord are not so completely gathered into definite tracts as they are in man.

A good deal of interest has lately been taken in a nerve bundle which in the lower vertebrates runs through the centre of the central canal of the cord, and takes its origin in the optic reflex cells in close relation to the posterior commissure of the brain. I More posteriorly (caudad) it probably acquires a connexion with the motor cells of the cord and is looked upon as a means by which the muscles can be made to actively respond to the stimulus of light. It is known as litis sner's fibre, and its morphology and physiology have been studied most carefully in cyclostomes and fishes. It is said to be present in the mouse, hut hitherto no trace of it has been found in man. It was discovered in i860, but for forty years has been looked upon as an artifact.

See P. E. Sargent, " Optic Reflex Apparatus of Vertebrates," Bull. Mus. Comp.Zool. Harvard, vol. xlv. No. 3 (July, 1904); also for general details R, Wiedersneim, Comparative Anatomy of Vertebrates (London, 1907) ; Lenhossek, Bau des Nervensystemt (1895). (F. G. P.)

Surgery op the Spine and Spinal Cord

Fracture of the spine may occur from indirect violence, as when a man falls from a height upon his head, or in a sitting position; or it may result from direct violence, as when he is hanged, or as when he is run over by a loaded van, or in a fall from a height across a beam. The vertebrae above the fracture being displaced from those below it, the spinal cord is generally torn across, and the parts of the trunk, or the limbs, which are supplied by the spinal nerves passing out from the cord below the seat of injury are of necessity cut off from their connexion with the brain, and at once deprived of sensation and of the power of voluntary movement. In some cases of fracture of the spine there is at the time marvellously little constitutional disturbance. The higher up the column that the fracture occurs the more quickly does death ensue. If the fracture is in the middle of'the back the patient may linger for several weeks, but even if he is lying upon a water-bed, and even if every care is taken of him, inflammation of the bladder and intractable bed-sores are apt to make their appearance, and his existence becomes truly miserable. Operative surgery is unable to effect much in these cases on account

of the spinal cord being generally torn across or hopelessly crushed.

Curvature of the spine may be due to deformity of the bodies of the vertebrae caused by irregular pressure, or ' to the dis- integration of their anterior parts by tuberculous ulceration, known as Pott's disease or spinal caries. Thus the causes of spinal curvature are very different, and it is necessary that the actual condition be clearly recognized or treatment may prove harmful. Briefly, the curvature which is due to tuberculous disease requires absolute and continuous rest; the other calls for well-regulated exercises.

Lateral or rotatory curvature of the spine is a deformity which comes on during the developing period of life, before the bodies of the vertebrae are solidly formed. In young people who are

growing rapidly, and whose muscular system is weak, the bad habit of standing, and throwing the weight of the body constantly on one leg, gives rise to a serious tilting of the trunk; or, if, when writing at a desk, they sit habitually in a twisted position, a lateral curvature of the spine is apt to take place. By con- stant indulgence in these bad habits the spinal column gets permanently set in a faulty position. Sometimes the tilting of the base of the trunk is due to a congenital or acquired differ- ence in the length of the legs. In the concavity of the curve there is increased pressure, and, necessarily, diminished growth; in the convexity of the curve there is diminished pressure with increased growth. The patient's friends probably notice that one shoulder is higher than the other, or that " the hip is growing out," and unless means are taken to alter the abnormal distri- bution of pressure, the condition becomes worse, until complete ossification checks the further progress of the deformity. The growth of the subject being completed, the deformity ceases to increase. And when the growth is completed and the bones are solid and misshapen the condition is quite iritapable of improvement. The usual curvature is one in which there is a convexity of the spine in the chest-region towards the right, with the right shoulder higher than the left. Compensatory curves in the opposite direction form in the ; loins and neck. Along with the lateral bending of the spine a rotation of the bodies of the vertebrae towards the convexity of the curve takes place, the spinous processes turning towards the con- cavity of the curve. Since the line of the spinous processes of the vertebrae can be easily traced through the skin, their deviation may

mislead the superficial observer as to the actual amount of the curvature.

To counteract this deformity in the earliest stages (and it is in the early stage that treatment effects most); the patient (generally a girl) should be encouraged to walk perfectly erect. Systematic exercises, to strengthen the muscles of the back, ought to be strictly and persistently carried out under the direction of a surgeon with the assistance of a skilled instructor of gymnastics. During the intervals of rest the child should lie upon her back on a firm board, and should avoid taking exercise which gives rise to weariness of the muscles; for when- ever the muscles become wearied she will attempt to take up a position which throws the strain on to her : ligamentous and bony structures. One of the best exercises is to lay the patient on her face, fix her feet, and encourage her to raise herself by using the muscles of the back. Whilst she hangs from a trapeze the weight of the lower limbs and pelvis will help to straighten the spine as a whole, necessarily diminishing the increased pressure upon the cartilaginous bodies of the vertebrae towards the concavity, and increasing the pressure between the sides' of the bodies towards the convexity. It is often a good thing to remove a girl with commencing lateral curvature from the sedentary life of school or town and to let her run wild in the country, exercising her muscles to the full.

If the deformity is due to inequality in the length of the legs, a high boot on the short leg may correct it. In sortie cases of lateral curvature a tilted seat is useful. Mechanical "spinal supports " are as expensive as they are inefficient. As a rule, indeed, they are positively harmful, in that they add to the weight of the trunk' and hinder needful muscular development.

By kyphosis is meant an exaggerated degree of roundness of the shoulders. It can be effaced only by constant drillings and exercises whilst the spinal column is still plastic. When once the bones are solid no great improvement is possible. The deformity is sometimes due to short sight. It is well, therefore, to have the child's vision duly tested.

Lordosis is an exaggeration of the normal concavity of the loin-region of the spine. It is most often met with in those cases in which' from congenital displacement of the head of the thigh bone, or from old disease of the hip-joint, the subject has acquired the habit of throwing the shoulders back in order to preserve the balance.

Tuberculous disease of the spine (Pott's disease), is the result of a

deposit of tubercle-germs in the body of the vertebra.

Inflammation having thus been set up, ulceration (caries) of the vertebra, or of several vertebrae, occurs, and if the case runs on unchecked extensive abscesses may form in the thigh, Join or groin. The trouble is often begun by a blow or by a sprain of the spine, which, by lowering the power of resistance of the delicate bone, prepares it for the bacillary invasion. The earliest symptoms are likely to be a dull aching in the back with stiffness of the spine. The child complains of being tired, and is anxious to lie down and be left quiet whilst his little cbmpan'ions are running about. If the disease is in the middle part pf the spine, pains are complained of in the front of the chest or at the pit of the stomach. Unfortunately such pains are often ascribed to indigestion. If the disease is in the upper part of the spine the pains may be in the head, the shoulders or ; the arms. If in the loin-region of the spine they are in the lower part of the trunk, the thighs or the legs. (These obscure peripheral pains are often misunderstood and are apt to be attributed to rheumatism). The back is stiff so that the child cannot stoop. In trying to pick up anything from the floor he keeps his back straight and bends his knees. If the disease is in the neck-region he cannot easily look upwards, and, instead df turning his head to look sideways, he wheels round his whole body. In some cases, though the disease is far advanced, there have been no complaints of pain in the back. As the bodies of the vertebrae crumble away, the spine bends for- wards under the influence of the weight of the head and of the upper part of the trunk, and a projection may appear in the middle line of the back. In the neck, and in the loin- region, the projection is rarely well marked, but in the chest-region a conspicuous boss may make its appearance— the "hump-back." -The projection is often spoken of as an angular curvature — a contradiction in terms, for a thing which is angular is not curved. When the deformity is great there may be pressure upon the spinal cord with more or less paralysis in the parts below.

The treatment of tuberculous disease of the spine demands absolute and uninterrupted rest. The best thing is to put the patient fiat on his back for as many months as may be found necessary, but not in a close bedroom. If he is compelled to lie in a bedroom the windows should be open night and day. If the patient is a child, he should be laid flat in a box-splint, or upon a thin horsehair mattress, and should be carried out of doors every day — but always lying flat- When the pressure-symptoms, such as the pains in the legs, thighs or arms, the " belly-ache," or the pains in the chest or neak have passed away, a firm leather splint may be moulded on to keep the parts

quiet until consolidation has taken place, or a cuirass of poroplastic felt or of plaster of Paris may be applied. The danger in these cases is of leaving off treatment too soon: they must not be hurried, or the trouble will be likely' to come back again with, perhaps, increased deformity. If the disease is in the upper part of the dorsal spine, or in the neck-region, a cervical collar of leather, or a double Thomas's hip-splint may be found useful.

In cases of advanced tuberculous disease of the spine, in which the spinal cord is compressed within its bony canal either by the posterior parts of the vertebral bodies or by inflammatory products, or in which, after severe, injury, the cord is pressed upon by a displaced piece of bone, the surgeon may think it expedient to open the spinal canal from behind, removing in the procedure the posterior arches (laminae) of the vertebrae. The operation is called by the hybrid word laminectomy. Sometimes in the case of tuberculous disease, where the propriety of resorting to the operation is being discussed, the symptoms of the compression begin to clear off and the child makes a complete recovery without being operated on; the moral is that we should wait patiently and give Nature a full chance of doing her work in her own way. The operative treatment of these, cases is not highly satisfactory. Still, there are a certain small number of cases in which it may be given a trial.

The treatment of spinal abscess has been greatly influenced by the Listerian method. The collection of broken-down tuberculous material or fluid is not an abscess in the usual sense, for it does not contain " pus " or " matter," being, as a rule, destitute of septic micro-organisms. A spinal abscess is therefore no longer drained: it is incised, scraped, washed out, and swabbed dry, the opening being carefully and permanently sewn up. In this way septic germs are effectually excluded from the cavity, and the patient is spared the depressing and tedious discharging of the cavity which so often followed the old methods of treatment. It must be clearly understood, however, that every spinal abscess does not undergo cure after being subjected to the evacuation and closure treatment mentioned

above, but that the surgeon is sometimes compelled to use irrigation and drainage.

In 1897 Dr Calbt of Berk-sur-Mer reintroduced the method of

straightening out the hump of the back, so often left after disease of the spine, by stretching the child on a fiat table and dealing with the hump, under chloroform, with what is commonly known as " brute force." A considerable number of hump-backed children on the Continent as well as in England and America were thus dealt with, but it is doubtful whether the records of those cases, could they all' be collected and published, would be found to justify the enthusiasm and publicity with which the method was inaugurated and its details were spread abroad. It is scarcely necessary to say that the forcible straightening of a spine which has developed a hump because tuberculous disease has wrecked the front of the vertebral segments is in no sense a curative operation. Diminishing the size of the projection does not cure the tuberculous ulceration of the bones ; indeed, it may increase the ulcerative process or determine a scattering of the germs of tubercle throughout the body. The operation has not been accepted by British and American surgeons. In' the practice-of the foreign surgeon death ensued in three cases out of thirteen that were operated on, and an. English surgeon reported fourteen cases " in all of which the deformity had recurred although the spines had been fixed in plaster 61 Paris after the straightening."

Being deeply placed in thS mass of the muscles of the back, and, moreover, being jealously locked within the bony canal of; the verte j bral column, the spinal marrow or spinal cord was, until the last few years, generally considered to be beyond the reach even of the most enterprising surgeon. Still, like other tissues, it was liable to diseases and injuries. The exact situation of a tumour pressing upon the spinal cord can now be located with great precision by noting the areas of pain and numbness, and the height in the limbs or trunk to which loss of power of voluntary movement ascends, and hy noting also whether these effects are symmetrical upon the two sides or appear more upon one side than on the other. By cutting away the posterior parts of certain segments of the vertebral column, tumours; of various sorts have been successfully removed from the interior of the canal. Displaced fragments of bone in tuberculous affection of the spine, abscess-contents and inflammatory tissue have alsp been similarly dealt with. Sir William Macewen of Glasgow and Sir Victor Horsley of London have been pioneers in this development of surgery. In cases of fracture of the spine, with displacement of the vertebrae and compression of the spinal cord, surgeons have also been trying what relief can be afforded by the adoption of bold operative measures, but as in most of these cases of fracture-dislocation the spinal cord is torn right across or crushed beyond hope of repair, active measures cannot be undertaken with much prospect of success.

” Concussion of the Spine.” — -Occasionally one hears persona, whose professional education should have taught them better, speaking or writing of concussion of the spine as if that were in itself a disease. It is an expression which is not infrequently used in an equally comprehensive and incorrect way when the ill-informed person is speaking of the injuries, real or imaginary, of which an individual makes complaint after having met with a severe shake when travelling on a railway. One might as well speak of concussion of the skull as of concussion of the spine, for the spine is but the bony envelope of the spinal cord, as the skull is of the brain. The violent Shaking of the spinal cord and the spinal nerves in a serious accident may, however, be followed by some functional disturbance, which may be associated with pains in the back, by numbness and tingling in the limbs, or with muscular weakness. In some cases the disturbance is due to slight haemorrhages into the nerve sheaths, which may clear up with rest and quiet. But when the presence of these obscure symptoms, after a railway accident for instance, becomes the subject of an action-at-law, there is a great chance that they will not pass off until the case is settled in one way or the other. Not, perhaps, that the individual concerned is dishonest in his estimation of them, but because the anxiety of the overhanging lawsuit has so grievously disturbed his mind and altered his perspective that his sense of proportion is for a time in abeyance. After the actidn-at-law the symp- toms may clear up with a rapidity which to some people appears surprising. (E. ■©.)*

Physiology of the Spinal Cord The name spinal cord, given by early morphologists to the! nervous mass lying in the tubular chamber enclosed by , thje vertebral column, was doubtless given under the supposition that the organ so named could be treated as an entity. • Scien- tifically, however, it cannot be so treated, either as regards its

structure or its function. It is merely a part of that great nervous structure which throughput the length of the body forms the central meeting-place of the nerve-paths arriving from and issuing to all regions with which nerve fibres are in touch. ; To separate from the rest of this system the part which lies within the spine is an artificial and in many ways mis- leading provision. This artificial treatment is the outcome of crudg. ideas drawn from the study of merely the gross form of the bodily parts. But crude • as the distinction is, its historic priority has influenced the study of the vertebrate nervous system, not only in regard to morphological description but also in regard to exposition of the functional reactions of the nervous system and even up to the present day. Hence it is still customary arbitrarily, to detach certain of the reactions of the nervous system into a separate

group and describe that group by itself, simply because they occur in nervous arcs whose central courses in the great central nervous organ lie within that part of it extending along the spine. An additional inconvenience attaching to the mode of description of the nervous system customary in works on human anatomy, is that in such works the parts of the nervous arcs outside the central organ are described apart from it under the term peripheral nerves. This severs artificially structures which are functionally in dissolubly united. The study and description of the working of the nervous system is hampered by this unphilosophic sub- division of its structural parts.

To gain a broader and truer point of view as starting-point for understanding the- working of the spinal cord one must prepare the exposition by a short reference to the general function of the nervous system in the bodily economy.

Relation to General Nervous System. — An animal of micro- scopic size may continue throughout its life to be constituted entirely by one single cell. Animals of . larger bulk, although each begins its existence as a single cell, attain their develop- ment by the multiplication of the original single cell, so that, from it there comes to be formed a coherent mass of cells very many millions, in number. In these multicellular animals each of the constituent cells is a minute self-centred organism, in- dividually born, leading its own life and destined for individual death. The corporate power of the complex animal is the sum of the powers of those manifold individual existences, its cells. In the complex; animal the several organs, even the most homo- geneous, such as muscles or glands, are each composed of many thousands of cells similarly specialized but living each per se. The solidarity of action which a complex animal thus built up exhibits is the result of the binding together of the units which compose the complex ˆorganism. Of the agencies which integrate the complex animal, one of the most potent is nervous action. , A certain number of the unit cells composing the animal are specially differentiated from the rest to bind the whole together by nervous action. These specially differentiated cells are called " neurones." They constitute living threads along which wayes of physico-chemical disturbance are transmitted to. act as releasing forces for the energy in distant cells, where they finally impinge.

It is characteristic of this nervous system, the system of neurones, that, although ramifying far and wide through the body, it is a continuum from end to end. The peripheral nerves are formed of bundles of neurones lying side by side, but these, although packed

close together, are strictly isolated one from another as conductors and remain isolated throughout the. whole length of the nerve. The points of functional nexus, of the neurones one with another are confined to one region only of the whole system. All their conductive connexions one with another take place solely in the central nervous mass which constitutes the so-called central nervous system, a nervous organ extending axially along the length of the body midway between , the body's lateral halves. Thither the neurones converge in vast numbers, those of each body segment converging to that fraction of the central organ which belongs, to their body segment. The central nervous organ thus receiving these neurones is, where it lies in the head, called

the brain, the rest of it is called in vertebrates the " spinal cord," in vermes and arthropods the " nerve-cord." The central organ not only receives neurones which converge to it from outside, but many of its own neurones thrust out their conductive arms from it as nerve fibres carrying nervous influence outwards to regulate the activity of glands and muscles. In the vertebrata the ingoing neurones for each segment and similarly the out-going neurone fibres are collected into a seg- mental nerve. To the spinal cord these are each attached by two roots, one dorsal, consisting of the afferent fibres, the other ventral, consisting of the efferent fibres.

The Reflex. — Analysis of function of this nervous system leads to what is termed " the reflex " as the unit of its action. The simplest complete reaction of the system is a reflex. There are many reflexes which are extremely complex, being built up of a number of simpler reflexes combined together. A reflex is a reaction started by the environment acting as a stimulus upon some nerve which communicates the excitement thus started in itself to other nerves by means of its connexions with these in the central nervous organ. The excitement so generated and transmitted finally travels outward from the central organ by one or more of the efferent nerves and through these reaches muscles or glands producing in them its final effect. The muscles and glands are from this point of view termed effector organs. The reaction is therefore " reflected " fiom the Central organ. The nerve structures along which it runs in its tra- jectory are spoken of as a nervous arc. The whole purpose of the central nervous organ is therefore to bring afferent neurones into touch with efferent neurones. The whole purpose of reflex arcs is to

bind one part of the organism to another part in such a way that what the environment is doing to the organism at one place may appropriately call forth or restrain movement or secretion in the muscles or glands possessed by the organism. Receptor Cells. — There is one condition for the due perform- ance of these reactions which is not provided by the nervous system itself. The afferent neurones are not in most cases so constituted as to be excitable themselves directly by the environment — for instance, they cannot be stimulated by light. Their amenability to the environment, their sensitization to environmental agencies, is effected by special cells adjunct to their peripheral ends. These cells from organs are called receptors. They are delicately adapted to be stimulated by this or that particular agent and are classifiable into various species, so that each species is easily excited by a particular agent which is " adequate " for it, and is quite inexcitable or only excitable with difficulty by agencies of other kinds. Thus in the skin some receptors are adapted for mechanical stimuli (touch) and not for thermal stimuli, while others (cold spots, warm spots) are adapted for thermal stimuli and not for mechanical. As far as it is known each afferent neurone is connected with receptors of one species only. The receptors thus confer upon the reflex arcs selective excitability. Each arc is thus tuned to respond to certain stimuli, while other arcs not having that kind of receptor do not respond. The receptors, therefore, while increasing the responsiveness of the organism to the environment, prevent confusion of reactions (inco-ordination) by limiting to particular stimuli a particular reaction.

Proprioceptors. — The system of neurones is thus made acces- sible to the play of the external world acting on the body, And in addition to those receptors which are stimulated directly by the external world, are others lying within the mass of the organism itself, which are excitable by actions occurring in the organism itself. These are called proprioceptors. They are distributed preponderantly in the muscles and structures functionally adjunct to muscle, such as joints, ligaments, fasciae, &c. The reactions induced in such motor structures reflexly in response to environmental stimuli tend therefore secondarily to be followed and accompanied by reflex reactions initiated from proprioceptors.

Conduction. — The process by which the excitement generated in the afferont neurone travels along the reflex arc is known as conduction. Conduction along afferent and efferent nerves XXV. 22

differs in some important respects from that obtaining in the nerve centre, i.e. in the piece of the central nervous system connecting the

afferent nerve with the efferent nerve. In a nerve- trunk the excited state set up in it by a stimulus travels along its fibres as wave-like disturbance at a speed of about thirty- three metres per second, and does not alter in intensity or speed in its travel. A nerve-trunk when excited (artificially) at some point along its length transmits the " impulse," i.e. the wave- like excited state in both directions, i.e. both up and down each fibre, from the point stimulated. This is true whether the fibre is afferent or efferent. The speed of travel of the nervous impulse along the nerve-trunk is practically the same whether the state of excitement, i.e. nervous impulse, is weak or intense. The nerve-trunk shows practically no delay in its response to an effective even though weak stimulus and its response ceases practically at once on cessation of the exciting stimulus. When excited by repeated brief stimuli the rhythm of the response corresponds closely with that of the stimuli, even when the frequency of the latter is as high as 100 per second. With momentary stimuli a response even so brief as its can be given by the nerve-trunk. Finally, nerve-trunk conduction is singu- larly resistant to fatigue, to impoverished blood supply, and to many drugs which powerfully affect reflex actions.

In conduction through the central nervous organ the travel of the nervous impulse exhibits departure from these features. Its intensity is liable to be altered in transit. Its time of transit, especially if it be weak, is much longer than for a similar length of nerve-trunk. Its direction of transmission becomes polarized, that is, confined to one direction along the nervous path. The state of excitement engendered does not subside immediately on cessation of the stimulus, and may outlast the stimulus by many seconds. The rhythm of response to a rhythmic stimulus does not change in correspondence with change in the stimulus-rhythm. A response, however brief the stimulus, is probably never shorter than 50 in duration.

These are striking differences, and morphological study of the structural features of the central organ does not at present suggest how they for the most part arise. It seems certain, however, that in the central organ it is that part which consists of so-called grey matter which form's the place of their occurrence. There the spread of the impulse from one nerve-fibre to others seems clearly due to the fact that each afferent fibre breaks up into branching threadlets which ramify in various directions and terminate in close apposition with other neurones. There has been much dispute as to whether the termination is one of contiguity with the next neurone or of actual continuity with it. The result of recent investigation seems to show that in the vast majority of cases contiguity and not actual homo-

geneous continuity is the rule in the spinal cord. The point of nexus of one neurone with another is termed the synapse. If synapsis occurs by contiguity and not homogeneous continuity, it is fair to suppose that at it the transmission of nervous impulses must be different from that observable in the homo- geneous conducting threads of nerve fibres. The conduction must traverse something of the nature of a membrane. To the properties of synaptic membranes many of the features peculiar to conduction in the grey matter may be due, for instance, the feature of irreversible direction of conduction.

Reflex Reactions.— When the spinal cord is severed at any point the reflex arcs of the portion of the body behind the transection are quite cut off from the rest of the nervous system in front, including the brain. The reflex reactions elicited from the thus isolated region cannot therefore be modified by the action of the higher nervous centres. It is important to see what character these reflexes possess. The higher centres in the brain exercise powers over the motor machinery of the body and in doing so make use of the simpler nervous centres that belong to the segments severally, that is the local nervous centres existing for and in each body segment itself. In the head the local centres are overlaid by higher centres which cannot by any simple severance be separated from them By studying, therefore, the powers of the cord behind a complete

spinal transection we can obtain in a comparatively simple way information as to the powers of the purely local or segmental reflex mechanisms.

The so-called " flexion-reflex " of the limb is one of the most accessible of the local reflex reactions which can thus be studied with an isolated portion of the spinal cord as its centre.

Let it be supposed that the limb observed is the hind limb. The three main joints of the limb are the hip, the knee and the ankle. Each of. these joints is provided with muscles which flex or bend it, and others which extend or straighten it. It is found that the reflex throws into contraction the flexor muscles of each of these joints. It matters little which of all the various afferent nerves of the limb is stimulated, whichever of these the afferent nerve may be, the centrifuged

discharge from the cord goes to practically the same muscles, namely, always to the flexors of the joints.

The centrifuged discharge does not go to the extensor muscles of the limb. However strong the stimulus and however powerful the afferent nerve chosen the spinal centre does not dis- charge impulses into the extensor muscles, though these muscles receive motor nerves issuing from the very same region of the cord as that supplying motor nerves to the flexor muscles. Not only does the reflex action not discharge motor impulses into the nerves of the extensor muscles, but if the spinal cord happens to be discharging impulses into these nerves when the reflex is evoked this discharge is suppressed or diminished (inhibited). The result is that when the reflex occurs not only are the flexor muscles made to contract, but their antagonists, the extensors, are, if in contraction at the same time, thrown out of contraction, that is, relaxed. In this way the latter muscles are prevented from impeding the action of the contracting flexors. This inhibition occurs at the beginning of the 'reflex action which excites the muscles and continues so long as the flexion-reflex itself continues. It thus prevents other reflexes from upsetting for the time being the due action of the flexion- reflex, for it renders the muscles opposing that reflex less accessible to motor discharge through the spinal cord whatever the quarter whence incitation to that discharge may come.

A feature of this reflex is its graded intensity. A weak stimulus evokes in the flexor muscles a contraction which is weak and in the extensor muscles a relaxation which is slight. Not only is the contraction weak in the individual flexor muscles, but it is limited to fewer of them, and in large muscles seems to involve only limited portions of them.

The duration of the reflex similarly varies directly with the duration of the exciting stimulus applied to the afferent nerve. The time relations of electrical stimuli can be controlled by the experimenter with much precision. In the single induction shock he has at command a stimulus of extreme brevity, lasting only a few millionths of a second. With such stimulus a lower limit is soon found to the brevity of the reflex effect as ex- pressed by muscles. It is found difficult to evoke with brief stimuli reflex contractions so brief as those evoked from the muscle by similar stimuli applied direct to the motor nerve of the muscle. There is reason to think that such stimuli applied to a nerve may evoke one single nerve-impulse. A single nerve impulse generated in a motor nerve causes in the muscle a brief contraction which is called a twitch, and lasts-a tenth of a second. A single nerve impulse generated in an afferent nerve sometimes fails

on arriving at the spinal centre to evoke any observable reflex effect at all, but if it is effective the muscle contraction tends to be longer than a " twitch," often much longer. It is therefore questioned whether the spinal centre when excited even most briefly ever discharges one single centrifugal im- pulse only; it seems usually to discharge a short series of such impulses.

Allied to this character is the tendency which even simple spinal reflexes exhibit to continue discharging for a certain time after their exciting stimulus has ceased to be applied. This after-discharge succeeding a strong stimulus may persist even for several seconds.

Refractory Phase. — Besides characters common to all or many

spinal reflexes certain spinal reflexes have features peculiar to themselves or exhibited by them in degrees not obvious in other reflexes. One of these features is refractory phase. The scratch-reflex exemplifies this. In the dog, cat, and many other ani- mals the hind limb often performs a rapid scratching movement, the foot being applied to the skin of the shoulder or neck as if to groom the hairy coat in that region. This movement is in the intact animal under control of the brain, and can be executed or desisted from at will. When certain of the higher centres in the brain have been destroyed, this scratching action occurs very readily and in, as it were, an uncontrolled way. When the spinal cord has been severed in the neck this scratch- ing movement of the hind limb can be elicited with regularity as a spinal reflex by merely rubbing the skin of the side of the neck or shoulder, applying there a weak electric current to the skin. In this reflex the stimulus excites afferent nerves con- nected with the hairs in the skin and these convey impulses to the spinal centres in the neck or shoulder segments, and these in turn discharge impulses into nerve fibres entirely intraspinal passing backward along the cord to reach motor centres in the hind limb region. These motor centres in turn discharge centrifugal impulses into the muscles of the hind limb of the same side of the body as the shoulder which is the seat of irritation. The motor discharge is peculiar in that it causes the muscles of the hind limb to contract rhythmically at a rate of about four contractions per second, and the discharge is peculiar further in that it excites the flexor and extensor muscles of the joints alternately so that at the hip for instance the limb is alternately flexed and extended, each single phase of the movement lasting about an eighth of a second. Now this rhythmic discharge remains the same in rate whether the exciting stimulus applied to the skin be continuous or one of many various rates of repetition. Evidently at some point in the reflex arc there is a mechanism which after

reacting to the impulses reaching it remains for a certain brief part of a second unresponsive, and then becomes once more for a brief period responsive, and so on. And this phasic alternation of excitability and inex- citability repeats itself through the continuance of the reflex even when that endures for minutes. The phase of inexcit- ability is termed the refractory phase. It is important as an essential element in the co-ordination; without it the scratching movement would obviously not be obtained for alternation of flexion and extension is essential to the act. A similar element almost certainly forms part of the co-ordinating mechanism for many other cyclic reflexes, including those of the stepping of the limbs, the movement of the jaw in mastication, the action of the eyelids in blinking, and perhaps the respiratory move ments of the chest and larynx. '

Fatigue. — Nerve trunks do not easily tire out under stimu- lation even most prolonged. Reflex actions on the other hand relatively soon tire. Some are more resistant, however, than are others. The flexion-reflex may be continued for ten minutes at a time and the scratch-reflex can be maintained so long. As a reflex tires, the muscular contraction which it causes tends to become less intense and less steady. The relatively rapid onset of fatigue in reflexes is counterbalanced by speedy recovery in repose. A long flexion-reflex, when from fatigue it has become weak, tremulous and irregular, will recommence after 30 seconds' repose with almost the same vigour and steadiness as if it had not recently been tired out.

This character of reflexes is in accordance with their executing movements which for the most part are not under natural circumstances required to last long. Such movements are the taking of a step by a limb, the movement of the jaw in masti- cation, the descent of the diaphragm in breathing, the withdrawal of the foot or the pinion from a noxious stimulus or the move- ment of the eyelids to wash off a particle touching the cornea, in all these no very prolonged reflex discharge is required. These natural movements to which the artificially provoked reflexes seem to correspond do not demand prolonged motor activity, or when they do, demand it in rhythmic repetition with intervening pauses which allow repose.

Reflex Postures.— But there are certain reflexes which do persist for long periods at a stretch. These are reflex postures. The hind limbs of

the " spinal " frog assume an attitude which is reflex, for it ceases on severance of the afferent spinal roots. This attitude is one of flexion at hip, knee and ankle, resembling the well-known natural posture of the frog as it squats when quiet in the tank. Similarly in the " spinal " dog or cat certain muscles exhibit a slight but persistent contraction. This is seen well in the extensor muscles of the knee. These tonic reflexes are related to attitudes. In the dog and cat they are exhibited by those muscles whose action antagonizes gravity in postures which are usual in the animal, thus the extensors of the knee and hip and shoulder and elbow are in tonic con- traction during standing. The reflex arcs concerned in reflex maintenance of this tonic contraction of muscles have been shown in several cases to arise within those muscles, and in those very muscles which themselves exhibit the tonic contraction It is not, however, certain that all muscles exhibit a reflex tonus: for instance, it is not certain that in the dog the tail muscles exhibit such a tonus. And in those muscles which do exhibit the spinal reflex tonus attempts to obtain a similar untiring slight steady reflex contraction by artificial stimuli applied to receptive organs or nerves have failed.

The Spinal Reflex Arcs of the Hind Limb. — When the skin of the limb is stimulated the flexion-reflex already described is evoked. The reflex is excited by nocuous stimuli such as a prick or squeeze applied to the skin anywhere in the limb, but most easily when applied to the foot. Electrical stimuli wherever applied evoke the same reflex. Similarly electrical stimuli applied to any afferent nerve of the limb evoke this reflex, whether the afferent nerve be from skin or from the muscles. Since the reflex always provokes excitation of the flexor muscles and inhibition of the extensor muscles, the result is that central stimulation of the afferent nerve of a flexor muscle excites its own muscle and inhibits its antagonist (reciprocal innerv- ation), while similar stimulation of the afferent nerve of an extensor muscle inhibits its own muscle and excites its anta- gonist (reciprocal innervation). The reflex flexion of the ipse- lateral hind limb is commonly accompanied by reflex extension of the opposite hind limb. If the reflex spreads to the fore limb, it produces extension of the same side fore limb with flexion of the crossed fore limb sometimes, but sometimes extension of both fore limbs.

In the dog and cat extension of the ipselateral hind limb can, however, be excited by stimulation of the skin in three limited regions. One of these is the sole of the foot; smooth pressure between the pads excites a strong brief extension. This is called the extensor thrust. It is accompanied by a similar sudden brief extension of all three other limbs. This reflex may be related to the action of

galloping, and the pres- sure which excites resembles that which the weight of the body bears on the pads against the ground.

The two other regions are the skin of the front of the groin supplied by the crural branch of the genito-crural nerve, and the skin just below and mesial to the buttock. These always excite the extensor muscles, not the flexors. They may be concerned with sexual acts.

Reflexes of the Fore Limb.— These resemble those obtainable from the hind limb. The ipselateral reflex is flexion at shoulder, elbow and wrist. The contra lateral fore limb at the same time is extended at shoulder, elbow and wrist. When the reflex spreads to the hind limbs the hind limb of the same side is extended at hip, knee and ankle, that of the crossed side is sometimes flexed at hip, knee and ankle, but sometimes is instead extended at hip, knee and ankle. The reflex sometimes spreads to the neck, causing the head to be turned toward the fore limb, which is the seat of the stimulation.

The Scratch Reflex. — This has already been partly described above. The area from which it can be excited by appropriate stimulation is a large one, namely, a field of skin which is some- what saddle-shaped having its greatest width transversely across the shoulders. It extends from dose behind the pinna

back to the loin. The stimuli which are effective are rubbing the skin or lightly pricking it, or lightly pulling on the hairs: also faradisation by a needle electrode whose point is only just inserted among the hairs but not deeper than their roots. If the stimulus be applied to the right hand of the mid-line the right hind limb is flexed at hip and performs the rapid scratch- ing movement described above, and the left hind limb is thrown into steady extension. And conversely, when the stimulus is to the left side of the mid-line. .,

Each of these reflexes is a co-ordinate reaction. It is seen, therefore, that through the medium of the spinal cord the body behind the head has at command a certain number of reflexes and that each of these manages the skeletal musculature in a co-ordinate way. It will also be clear from the facts mentioned above about these separate reflexes that the fields of muscles worked by these several reflexes is to a large extent common to them all. Thus the reflex excited from the skin of the right hind limb acts on the muscles of that limb and also on those of the three other limbs. So similarly the reflex excited from the left hind limb, and from each fore limb. Study of the inter-relation- ship between these reflexes shows that by means of the spinal cord not only is co-ordinate action of the muscles ensured for

each reflex, but that also the separate reflexes are co-ordinated one with another.

When we examine the relationship holding between individual reflexes we find that some resemble one another in regard to their action upon a particular muscle or group of muscles. On the other hand, some act in opposite ways upon a particular muscle or muscle group. In order to follow the co-ordination effected by the spinal cord in corresponding reflexes together we have to turn to a certain feature in the scheme of construction of the nervous system. This feature is. embodied in what is termed the principle of the common path.

Interaction between Reflexes. — At the commencement of every reflex-arc is a receptive neurone extending from the receptive surface to the central nervous organ. This neurone forms the sole avenue which impulses generated at its receptive point can use whithersoever be their destination. This neurone is therefore a path exclusive to the impulses generated at its own receptive point, and other receptive points than it,s own cannot employ it. A single receptive point may play reflexly upon quite a number of different effector organs. It may be connected through its reflex path with many muscles and glands in many different regions. Yet all its reflex arcs spring from the one single shank or stem, i.e. from the one afferent neurone which conducts from the receptive point at the periphery into the central nervous organ.

But at the termination of every reflex ; arc we find a final neurone, the ultimate conductive link to an effector organ, (muscle or gland). This last link in the chain, e.g. the motor neurone, differs obviously in one important respect from the first link of the chain. It does not subserve exclusively impulses generated at one single receptive source, but receives impulses from many receptive sources situate in many and various regions of the body. It, is the sole path which all impulses, no matter whence they come, must travel if they are to act on the muscle fibres to which it leads.

Therefore, while the receptive neurone forms a private path exclusively serving impulses of one source only, the final or efferent neurone is, so to say, a public path, common to impulses arising at any of many sources of reception. A receptive field, e.g. an area of skin, is analysable into receptive points. One and the same effector organ stands in reflex connexion not only with many individual points, but even with many various receptive fields. Reflexes generated in manifold sense-organs can pour their influence into one

and the same muscle. Thus a limb muscle is the terminus ad quern of many reflex arcs arising in many various parts of the body. Its motor nerve is a path common to all the reflex arcs which reach that muscle.

Reflex arcs show, therefore, the general features that the initial neurone of each is a private path exclusively belonging to a single receptive point (or small group of points) ; and that

finally the arcs embouch into a path leading to an effector organ ; and that their final path is common to all receptive points where-soever they may lie in the body, so long as they have connexion with the effector organ in question. Before finally converging upon the motor neurone the arcs converge to some degree. Their private paths embouch upon inlernuncial paths common in various degree to groups of private paths. The terminal path may, to distinguish it from internuncial common paths, be called the final common path. The motor nerve to a muscle is a collection of final common paths.

Certain consequences result from this arrangement. One of these is the preclusion of essential qualitative difference between nerve-impulses arising in different afferent nerves. If two conductors have a tract in common there can hardly be essential qualitative difference between their modes of conduction; and the final common paths must be capable of responding with different rhythms which different conductors impress upon it. It must be to a certain degree aperiodic. If its discharge be a rhythmic process, as from many considera- tions it appears to be, the frequency of its own rhythm must be capable of being at least as high as that of the highest frequency of any of the afferent arcs that play upon it; and it must be able also to reproduce the characters of the slowest.

A second consequence is that each receptor being dependent for final communication with its effector organ upon a path not exclusively its own but common to it with certain other receptors, such nexus necessitates successive and not simultaneous use of the common path by various receptors using it to different or opposed effect. When two receptors are stimulated simul- taneously, each of the receptors tending to evoke reflex action that for its end-effect employs the same final common path but employs it in a different way from the other, one reflex appears without the other. The result is this reflex

or that reflex, but not the two together.

In the simultaneous correlation of reflexes some reflexes com- bine harmoniously, being reactions that mutually reinforce. These may be termed allied reflexes, and the neural arcs which they employ allied arcs. On the other hand, some reflexes, as mentioned above, are antagonistic one to another and incom- patible. These do not mutually reinforce, but stand to each other in inhibitory relation. One of them inhibits the other, or a whole group of others. These reflexes may in regard to one another be termed antagonistic; and the reflex or group of reflexes which succeeds' in inhibiting its opponents may be termed " prepotent " for the time being.

*Allied Reflexes. — The action of the principle of the final com- mon path may be instanced in regard to " allied arcs " in the scratch-reflex as follows. * If, while the scratch-reflex is being elicited from a skin point at the shoulder, a second point distant 10 mm. from the other point but also in the receptive field of skin, be stimulated, the stimulation at this second point favours the reaction from the first point. This is well seen when the stimulus at each point is of subminimal intensity. The two stimuli, though each unable separately to invoke the reflex, yet do so when applied both at the same time. This is not due to overlapping spread of the feeble currents about the stigmatic poles of the two circuits used. Weak cocainization of either of the two skin poles annuls it. Moreover, it occurs when localized mechanical stimuli are used. It therefore seems that the arcs from the two points, e.g. Ra and R have such mutual relation that reaction of one of them reinforces reaction of the other, as judged by the effect on the final common path.*

This reinforcement is really an instance of summation in the final common path. So also is the effect to which Exner has given the name of " bahnung " a phenomenon of frequent occurrence in reflex reactions. Suppose a stimulus (A) be applied which is too weak to elicit the reflex which were it stronger it could evoke. It is found that a second stimulus (B) also of itself too weak to evoke the reflex, will evoke the reflex if applied at a short interval after the application of (A). The two stimuli sum in their effect upon the final common path. The " receptive field " of a reflex is really the common area of

commencement of a number of allied arcs. And reflexes whose arcs commence in receptive fields even widely apart may also have " allied " relation. In the bulbo-spinal dog stimulation of the outer digit of the hind foot will evoke reflex flexion of the leg, and stimulation of each of the other digits evokes prac- tically the same reflex; and if

stimulation of several of these points be simultaneously combined the same reflex as a result is obtained more readily than if one only of these points is stimulated. And to these stimulations may be added simul- taneously stimulation of points in the crossed fore foot; stimulation there yields by itself flexion of the hind leg; and under the simultaneous stimulation of fore and hind foot the flexion of the leg goes on as before, though perhaps more readily; that is, the several individual reflexes harmonize in their effect on the hind limb. Further, to these may be added simultaneous stimulation of the tail and of the crossed pinna; and the reflexes of these stimulations all coalesce in the same way in flexion of the hind limb. Exner has shown that, in exciting different points of the central nervous system itself, points widely apart exert "bahnung" for one another's reactions and for various reflex reactions induced from the skin. Thus reflexes originated at different distant points, and passing through paths widely separate in the brain, converge to the same motor mechanism (final common path) and act har- moniously upon it. Reflex arcs from widely different parts con- join and pour their influence harmoniously into the same muscle. The motor neurones of a muscle of the knee are the terminus ad quern of reflex arcs arising in receptors not only of its own foot, but from the crossed fore foot and pinna and tail, also undoubtedly from the otic labyrinth, olfactory organs and eyes. Thus, if we take as a standpoint any motor nerve to a muscle it consists of a number of motor neurones which are more or less bound into a unit mechanism among the reflex actions of the organism a number can all be brought together as a group, because they all in their course converge together upon this motor mechanism, this final common path, activate it, and are in harmonious mutual relation with regard to it. They are in regard to it what were termed above " allied " reflexes.

Antagonistic Reflexes. — But not all reflexes connected to one and the same common final path stand to one another in the rela- tion of " allied reflexes." Suppose during the scratch-reflex a stimulus be applied to the foot not of the scratching side, but of the opposite side. The left leg, which is executing the scratch- reflex in response to stimulation of the left shoulder skin is cut short in its movement by the stimulation of the right foot, although the stimulus at the shoulder to provoke the scratch movement is maintained unaltered all the time. The stimulus to the right foot will temporarily interrupt a scratch-reflex, or will cut it short or will delay its onset; which it does of these depends on the time-relations of the stimuli. The inhibition of the scratch-reflex occurs sometimes when the contraction of the muscles innervated by the reflex conflicting with it

is very slight. There is interference between the two reflexes and the one is inhibited by the other. The final common path used by the left scratch -reflex is also common to the reflex elicitable from the right footi This latter reflex evokes at the opposite (left) knee extension; in doing this it causes steady excitation of extensor neurones of that knee and steadily inhibits the flexor neurones. But the scratch-reflex causes rhythmic excitation of the flexor neurones. Therefore these flexor neurones in this conflict lie as a final common path under the influence of two antagonistic reflexes, one of which would excite them to rhythmical discharge four times a second, while the other would continually repress all discharge in them. There is here an antagonistic relation between reflexes embouching on one and the same final common path:

In all these forms of interference there is a competition, as it were, between the excitatory stimulus used for the one reflex and the excitatory stimulus for the other. Both stimuli are in progress together, and the one in taking effect precludes the other's taking effect as far as the final common path is concerned; and the precise form in which that occurs depends greatly on

the time-relations of application of the two stimuli competing against each other.

Again, if, while stimulation of the skin of the shoulder is evoking the scratch-reflex, the skin of the hind foot of the same side is stimulated, the scratching may be arrested. Stimulation of the skin of the hind foot by any of various stimuli that have the character of threatening the part with damage causes the leg to be flexed, drawing the foot up by steady maintained contraction of the flexors of the ankle, knee and hip. In this reaction the reflex arc is (under schematic provisions similar to those mentioned in regard to the scratch reflex schema)

Antagonistic Reflexes.

(i.) the receptive neurone, noci-ceptive, from the foot to the spinal segment, (ii.) the motor neurone to the flexor muscle, e.g. of hip (a short intra-spinal neurone); a Schalt-zelle (v. Monakow) is probably existent between (i.) and (ii.) but omitted for simplicity. Here, therefore, there is an arc which embouches into the same final

common path, FC. The motor neurone FC is a path common to it and to the scratch-reflex arc; both these arcs employ the same effector organ, namely, the knee-flexor, and employ it by the common medium of the final path FC. But though the channels for both reflexes embouch upon the same final common path, the excitatory flexor effect specific to each differs strikingly in the two cases. In the scratch-reflex the flexor effect is an intermittent effect; in the noci-ceptive flexion- reflex the flexor effect is steady and maintained. The accom- panying tracing shows the result of conflict between the two reflexes. The one reflex displaces the other at the common path. Compromise is not evident. The scratch-reflex is set aside by that of the noci-ceptive arc from the homonymous foot. The stimulation which previously sufficed to provoke the scratch- reflex is no longer effective, though it is continued all the time. But when the stimulation of the foot is discontinued the scratch- reflex returns. In that respect, although there is no enforced inactivity, there is an interference which is tantamount to, if not the same thing as, inhibition. Though there is no cessation of activity in the motor neurone, one form of activity that was being impressed upon it is cut short and another takes its place. A stimulation of the foot too weak to cause more than a minimal

reflex will often suffice to completely interrupt, or cut short, or prevent onset of, the scratch-reflex.

The kernel of the interference between the homonymous flexion-reflex and the scratch-reflex is that both employ the same final common path FC to different effect — just as in the inter- ference between the crossed extension-reflex and the scratch- reflex. Evidently, the homonymous flexion-reflex and the crossed extension-reflex both use the same final common path FC. And they use it to different effect. The motor neurone to the flexor of the knee being taken as a representative of the final common path, the homonymous flexion-reflex inhibits it from discharging. Hence if, while the direct flexion-reflex is in progress, the crossed foot is stimulated, the reflex of the knee-flexor is inhibited. The crossed extension-reflex therefore inhibits not only the scratch-reflex, but also the homonymous flexion-reflex.

Further, in all these interferences between reflexes the direction taken by the inhibition is reversible. Thus, the scratch-reflex is not only liable to be inhibited by, but is itself able to inhibit either the homonymous flexion-reflex or the crossed extension- reflex; the homonymous flexion-reflex is not only capable of being inhibited by the crossed extension-reflex, but conversely in its turn can inhibit the

crossed extension-reflex. These inter- ferences are therefore reversible in direction. Certain conditions determine which reflex among two or more competing ones shall obtain mastery over the final common path and thus obtain expression.

Therefore, in regard to the final common pathFC, the reflexes that express themselves in it can be grouped into sets, namely, those which excite it in one way, those which excite it in another way, and those which inhibit it. The reflexes com- posing each of these sets stand in such relation to reflexes of the same set that they are with them "allied reflexes." But a reflex belonging to any one of these sets stands in [such relation to a reflex belonging to one of the other sets I that it is in regard to the latter an " antagonistic " reflex. This correlation of reflexes about the flexor neurone in the leg, so that some reflexes are mutually allied and some are mutually antagonistic in regard to that neurone, may serve as a paradigm of the correlation of reflexes about every final common path, e.g. about every motor nerve to skeletal muscle.

As to the intimate nature of the mechanism which thus, by summation or by interference, gives co-ordination where neu- rones converge upon a common path, it is difficult to surmise. In the central nervous system of vertebrates, afferent neurones A and B in their convergence toward and impingement upon another neurone Z, towards which they conduct, do not make any lateral connexion directly one with the others— at least, there seems no clear evidence that they do. It seems, then, that the only structural link between A and B is neurone Z itself. Z itself should therefore be the field of coalition of A and B if they transmit " allied "■ reflexes.*

It was argued, from the morphology of the perikaryon, that it must form, in numerous cases, a nodal point in the conductive lines provided by the neurone. The work of Ram6n-y-Caja], van Gehuchten, v. Lenhossek and others, with the methods of Golgi and Ehrlich, establishes as a concept of the neurone in general that it is a conductive unit wherein a number of branches (dendrites) converge towards, meet and coalesce in a single out-going stem (axone). Through -this tree-shaped structure the nervous impulses flow, like the water in a tree, from roots to stem. The conduction does not normally run in the reverse direction. The place of junction of the dendrites with one another and with the axone is commonly the perikaryon. This last is therefore a nodal point in the conductive system. But it is a nodal point of particular quality. It is not a nodal point where lines meet to cross one another, nor one where one line splits into many. It is a nodal point where conductive lines run

together into one which is the continuation of them all. It is a reduction point in the system of lines. The perikaryon with its convergent dendrites is therefore just such a structure as spatial summation and immediate induction would demand.

*The neurone Z may well, therefore, be the field of coalition, *nd the organ where the summational and inductive processes occur. And the morphology of the neurone as a whole is •een to be just such as we should expect, arguing from the principle of the common path.*

With the phenomenon of " interference " the question is more difficult. There it is not clear that the field of antagonism is within the neurone Z itself. The field may be synaptic. We have the demonstration by Verworn that the interference produced by A at Z for impulses from B is not accompanied by any obvious change in excitability of the axone of Z. Z, if itself the seat of inhibition, might have been expected to exhibit that inhibition throughout its extent. This, as tested by its axone, it does not. There exist, it is true, older experiments by Uspensky, Belmondo and Oddi, &c," according to which the threshold of direct excitability of the motor root is lowered by stimulation of the afferent root. This points to an extension of the facilitation effect through the whole motor neurone, conversely to Verworn's demonstration for central inhibition. Verworn's experiment and its result is very clear. It leads us to search for some other mechanism common to A and B to which might be attributable their mutual influence on each other's reactions. But if we admit the conception, argued above,, that at the nexus between A and Z, i.e. at synapse A Z, and similarly between B and Z, i.e. at synapse B Z, there exists a surface of separation, a membrane in the physical sense, a further consequence seems inferable. Suppose a number of different neurones A. B, C, &c, each conducting through its own synapse upon a neurone Z. The synapses A Z, B Z, C Z, &c. are all surfaces or membranes into which Z enters as a factor common to them all. A change of state induced in neurone Z might be expected to affect the surface condition or membrane at all of the synapses, since the condition of Z is a factor common to all those membranes. Therefore a change of state (excitatory or inhibitory) induced in Z by any of the neurones A, B, C, &c, playing upon it would enter as a condition into the nervous transmission at the other synapses from the other collateral neurones. In harmony with this is the spread of refractory state in the neurones as mentioned above. A change in

neurone Z induced by neurone A playing upon it, in that case seems to effect its point of nexus with the other neurones B, C, &c, also. It is conceivable that the phenomena of interference may be based in part at least on such a condition. The neurone threshold of Z for stimulation through B will be to some extent a function of events at synapses A Z.

Factors Determining the Sequence. — The formation of a common path from tributary converging afferent arcs is important because it gives a co-ordinating mechanism. There the domi- nant action of one afferent arc, or set of allied arcs in con- dominium, is subject to supercession by another afferent arc, or set of allied arcs, and the supercession normally occurs without intercurrent confusion. Whatever be the nature of the physio- logical process occurring between the competing reflexes for dominance over the common path, the issue of their competition namely, the determination of which one of the competing arcs shall for the time being reign over the common path, is largely conditioned by four factors. These are spinal induction, relative fatigue, relative intensity of stimulus, and the func- tional species of the reflex.

*i . The first of these occurs in two forms, one of which has already been considered, namely, immediate induction. It „ . . is a form of ” bahnung.” The stimulus which induction. e *cites a reflex tends by central spread to facilitate and lower the threshold for reflexes allied to that which it particularly excites. A constellation of reflexes thus tends to be formed which reinforce each other, so that the reflex is supported by allied accessory reflexes, or if the prepotent stimulus shifts, allied arcs are by the induction particularly prepared to be responsive to it or to a similar stimulus.*

Immediate induction only occurs between allied reflexes. Its tendency in the competition between afferent arcs is to fortify the reflex just established, or, if transition ocour, to favour

transition to an allied reflex. Immediate induction seems to obtain with highest intensity at the outset of a reflex, or at least near its commencement. It does not appear to persist long.

The other form of spinal induction is what may be termed successive induction. It is in several ways the reverse of the preceding.

In peripheral inhibition, exemplified by the vagus action on the heart, the inhibitory effect is followed by a rebound after- effect opposite to the inhibitory (Gaskell). The same thing is obvious in

various instances of the reciprocal inhibition of the spinal centres. Thus, if the crossed-extension reflex of the limb of the " spinal " dog be elicited at regular intervals, say once a minute, by a carefully adjusted electrical stimulus of defined duration and intensity, the resulting reflex movements are repeated each time with much constancy of character, amplitude and duration. If in one of the intervals a strong prolonged (e.g. 30") flexion-reflex is induced from the limb yielding the extensor- reflex movement, the latter reflex is found intensified after the intercurrent flexion-reflex. The intercalated flexion-reflex lowers the threshold for the aftercoming extension-reflexes, and especially increases their after-discharge. This effect may endure, progressively diminishing, through four or five minutes, as tested by the extensor reflexes at successive intervals. Now, as we have seen, during the flexion-reflex the extensor arcs were inhibited: after the flexion-reflex these arcs are in this case evidently in a phase of exalted excitability. The phenomenon presents obvious analogy to visual contrast. If visual bright- ness be regarded as analogous to the activity of spinal discharge, and visual darkness analogous to absence of spinal discharge, this reciprocal spinal action in the example mentioned has a close counterpart in the well-known experiment where a white disk used as a prolonged stimulus leaves as visual after-effect a grey image surrounded by a bright ring (Hering's "Lichthof ")■ This bright ring has for its spinal equivalent the discharge from the adjacent reciprocally correlated spinal centre. The exalta- tion after-effect may ensue with such intensity that simple dis- continuance of the stimulus maintaining one reflex is immediately followed by " spontaneous " appearance of the antagonistic reflex. Thus the flexion-reflex, if intense and prolonged, may, directly its own exciting stimulus is discontinued, be suc- ceeded by a " spontaneous " reflex of extension, and this even when the animal is lying on its side and the limb horizontal— a pose that does not favour the tonus of the extensor muscles. Such a " spontaneous " reflex is the spinal counterpart of the visual "Lichthof." To this spinal induction, as it may be termed, seems attributable a phenomenon commonly met in a flexion-reflex of high intensity when maintained by very pro- longed excitation. The reflex flexion is then frequently broken at irregular intervals by sudden extension movements. It would seem, therefore, that some process in the flexion-reflex leads to exaltation of the activity of the arcs of the opposed extension-reflex. An electrical stimulation of the proximal end of the severed nerve of the extensor muscles of the knee (cat), though it does not, in the present writer's experience, directly excite contraction of the extensors of the knee is on cessation often immediately followed by contraction of them.

As examples of the rebound exaltation following on inhibition the following may also serve. The so-called " mark-time " reflex of the " spinal " dog is an alternating stepping movement of the hind limbs which occurs on holding the animal up so that its limbs hang pendent. It can be inhibited by stimulating the skin of the tail. On cessation of that stimulus the stepping movement sets in more vigorously and at quicker rate than before. The increase is chiefly in the amplitude of the move- ment, but the writer has also seen the rhythm quickened even by 30% of the frequence.

This after-increase might be explicable in either of two ways. It might be due to the mere repose of the reflex centre, the repose so recruiting the centre as to strengthen its subsequent action. But a similar period of repose obtained by simply supporting one limb — which causes cessation of the reflex in both limbs, the

stimulus being stretch of the hip-flexors under gravity — is not followed by after-increase of the reflex.

Or the after-increase might result from the inhibition being followed by a rebound to superactivity. This latter seems to be the case. The after-increase occurs even when both hind limbs are passively lifted from below during the whole duration of the inhibitory stimulus applied to the tail. It is the depression of inhibition, and not the mere freedom from an exciting stimulus, that induces a later superactivity. And the reflex inhibition of the knee-extensor by stimulation of the central end of its own nerve is especially followed by marked rebound to superactivity of the extensor itself.

Again, the knee jerk, after being inhibited by stimulation of the hamstring nerve, returns, and is then more brisk than before the inhibition.

By virtue of this spinal contrast, therefore, the extension- reflex predisposes to and may actually induce a flexion-reflex, and conversely the flexion-reflex predisposes to and may actually induce an extension-reflex. This process is qualified to play a part in linking reflexes together in a co-ordinate sequence of successive combination. If a reflex arc A during its own activity temporarily checks that of an opposed reflex arc B , but as a subsequent result induces in arc B a phase of greater excitability and capacity for

discharge, it predisposes the spinal organ for a second reflex opposite in character to its own in immediate succession to itself. The writer has elsewhere pointed out the peculiar prominence of " alternating reflexes " in pro- longed spinal reactions. It is significant that they are usually cut short with ease by mere passive mechanical interruption of the alternating movement in progress. It seems that each step of the reflex movement tends to excite by spinal induction the step next succeeding itself.

Much of the reflex action of the limb that can be studied in the " spinal " dog bears the character of adaptation to locomotion. This has been shown recently with particular clearness by the observations of Phillipson. In describing the extensor thrust of the limb the writer drew attention at the time to its signifi- cance for locomotion. Spinal induction obviously tends to connect to this extensor-thrust flexion of the limb as an after- effect. In the stepping of the limb the flexion that raises the foot and carries it clear, of the ground prepares the antagonistic arcs of extension, and, so to say, sensitizes them to respond later in their turn by the supporting and propulsive extension of the limb necessary for progression. In such reflex sequences an antecedent reflex would thus not only be the means of bring- ing about an ensuing stimulus for the next reflex, but would pre- dispose the arc of the next reflex to react to the stimulus when it arrives, or even induce the reflex without external stimulus. The reflex " stepping " of the " spinal " dog does go on even without an external skin stimulus: it will continue when the dog is held in the air. The cat walks well when anaesthetic in the soles of all four feet.

Each reflex movement must of itself generate stimuli to afferent apparatus in many parts and organs — muscles, joints, tendons &c. This probably reinforces the reflex in progress. The reflex obtainable by stimulation of the afferent nerve of the flexor muscles of the knee excites those muscles to contraction and inhibits their antagonistics: the reflex obtainable from the afferent nerve of the extensor muscles of the knee excites the flexors and inhibits their antagonistics.

Where a reflex by spinal induction tends to eventually bring about the opposed reflex, the process of spinal induction is therefore probably reinforced by the operation of any reflex generated in the movement. This would help to explain how it is that a reflex reaction, when once excited in a " spinal " animal, ceases on cessation of the stimulus as quickly as it generally does. Such a reaction must generate in its progress a number of further stimuli and throw up a shower of centripetal impulses from the moving muscles and joints into the spinal cord. Squeezing of muscles and

stimulation of their afferent nerves and those of joints, &c, elicit reflexes. The primary reflex movement might be expected, therefore, of itself to initiate further reflex

movement, and that secondarily to initiate further still, and so on. Yet on cessation of the external stimulus to the foot in the flexion-reflex the whole reflex comes, usually at once to an end. The scratch-reflex, even when violently pro- voked, ceases usually within two seconds of the discontinuance of the external stimulus that provoked it.

We have as yet no satisfactory explanation of this. But we remember that such reflexes are intercurrent reactions breaking in on a condition of neural equilibrium itself reflex. The suc- cessive induction will tend to induce a compensatory reflex, which brings the moving parts back again to the original position of equilibrium.

2. Another condition influencing the issue of competition between reflexes of different source for possession of one and the same final common path is fatigue. A spinal reflex Fallnte under continuous excitation or frequent repetition becomes weaker, and may cease altogether. This decline is progressive, and takes place earlier in some kinds of reflexes than it does in others. In the " spinal " dog the scratch-reflex under ordinary circumstances tires much more rapidly than does the flexion-reflex.

A reflex as it tires shows other changes besides decline in amplitude of contraction. Thus in the flexion-reflex, the original steadiness of the contraction decreases; it becomes tremulous, and the tremor becomes progressively more marked and more irregular. The rhythm of the tremor in the writer's observations has often been about ro per second. Then phases of greater tremor tend to alternate with phases of improved con- traction as indicated by some regain of original extent of flexion of limb and diminished tremor. Apart from these partial evan- escent recoveries the decline is progressive. Later, the stimula- tion being maintained all the time, brief periods of something like complete intermission of the reflex appear, and even of a replacement of flexion by extension. These lapses are- recovered from, but tend to recur more and more. Finally, an irregular phasic tremor of the muscles is all that remains. It is not thfe flexor muscles themselves which tire out, for these, when under fatigue of the flexion-reflex they contract no longer for that reflex, contract in response to the scratch-reflex which also employs them.

Similar results are furnished by the scratch-reflex, with certain

differences in accord with the peculiar character of its individual charge. One of these latter is the feature that the individual beats of the scratch-reflex usually become slower and follow each other at slower frequency. Also the beats, instead of remaining fairly regular in amplitude and frequency, tend to succeed in somewhat regular groups. The beats may disappear altogether for a short time, and then for a short time reappear, the stimulus continuing all the while. Here, again, the phenomena are not referable to the muscle, for when excited through other reflex channels, or through its motor nerve directly, the muscle shows its contraction well. Part of the decline of these reflexes under electrical stimulation in the " spinal ' ' dog may be due to reduction of the intensity of the stimulus itself by physical polarization. That does not account in the main for the above described effects. The graphic record of fatigue of the flexion of the scratch-reflex obtained by continued mechanical stimulation does not appreciably differ from that yielded under electrical stimulation. The different speed of the decline due to fatigue proceeds characteristically in different kinds of reflex, and in the same kind of reflex under different physiological conditions, e.g. "spinal shock": this indicates its determination by other factors than electrical polarization. Polarization has in a num- ber of cases been deferred as far as possible by using equalized alternate shocks applied in opposite directions through the same gilt needle; this precaution has not yielded; results differing appreciably from those given by ordinary double shocks or by series of make or break shocks of the same direction. The slow- ing of the beat in fatigue is also against the explanation by polarization, since merely weakening the stimulus does not lead to a slower beat.

When the scratch-reflex elicited from a spot of skin is fatigued.,

the fatigue holds for that spot, but does not implicate the reflex as obtained from the surrounding skin. The reflex is, when tired out to stimuli at that spot, easily obtainable by stimulation two or more centimetres away. This is seen with either mechanical or electrical stimuli. When the spot stimulated second is close to the one tired out, the reflex shows some degree of fatigue, but not that degree obtaining for the original spot. This fatigue may be a local fatigue of the nerve-endings in the spot of skin stimulated, to which in experiments making use of electric stimuli some polarization may be added. Yet its local character does not at all necessarily imply its reference to

the skin. It may be the expression of a spatial arrangement in the central organ by which reflex arcs arising in adjacent receptors are partially confluent in their approach toward the final common path, and are the more confluent the closer together lie their points of origin in the receptive field. The resemblance between the distribution of the incidence of this fatigue and that of the spatial summation previously described argues that the seat of the fatigue is intraspinal and central more than peripheral and cutaneous; and that it affects the afferent part of the arc inside the spinal cord, probably at the first synapse. Thus, its inci- dence at the synapse Ro — Pa and at R — P would explain its restrictions, as far as we know them, in the scratch-reflex.

The local fatigue of a spinal reflex seems to be recovered from with remarkable speed, to judge by observations on the reflexes of the limbs of the " spinal " dog. A few seconds' remission of the stimulus suffices for marked though incomplete restoration of the reaction. In a few instances there may be seen return of a reflex even during the stimulation under which the waning and disappearance of the reflex occurred. The exciting stimulus has usually in such cases been of rather weak intensity. In the writer's experience these spinal reflexes fade out sooner under a weak stimulus than under a strong one. This seeming paradox indicates that under even feeble intensities of stimulation the threshold of the reaction gradually rises, and that it rises above the threshold value of the weaker stimulus before it reaches that of a stronger stimulus. The scratch-reflex which has ceased to be elicited by a weak stimulus is immediately evoked — often without any sign of fatigue in its motor response — by increasing the intensity of the stimulus applied at the same electrode. The occurrence of fatigue earlier under the weaker stimulus than under the stronger also shows that the fatigue consequent under the weaker stimulus may often be, relatively to the production of the natural discharge, greater than when a stronger stimulus is employed. This, which has been of frequent occur- rence in the writer's observations on the leg of the "spinal" dog, if obtaining widely in reflex actions, has evident practical importance.

It is easy to avoid in some degree the local fatigue associated with excitation of the scratch-reflex from one single spot in the skin by taking advantage of the spatial summation of stimuli applied at different points in the receptive field. When this was done, a curious result met the writer. The provocation of the reflex has been made through ten separate points in the receptive field, the distance between each member of the series of points and the point next to it being about four centimetres. Each point is stimulated by a double-

induction shock delivered twice a second. When this is done a series of scratch movements is elicited, and continues longer than when the stimuli are applied at the same interval, not to succeeding series of skin points but to one point. Thus three or four hundred beats can be elicited in unbroken series. But the series tends somewhat abruptly to cease. If, then, in spite of the cessation of the response, the stimulation be continued without alteration during three or four minutes or more, the scratching movement breaks out again from time to time and gives another series of beats, perhaps longer than the first. These experiments indicate that physical polarization at the stigmatic electrode is not answerable for the fading out of the scratch-reflex. It shows also the complexity of the central mechanisms involved in the reflex. The phenome- non recalls Lombard's phases of briskness and fatigue in series of records obtained with the ergograph.

It is interesting to note certain differences between the cessa- tion of a reflex under fatigue and under inhibition. The reflex ceasing under inhibition is seen to fade off without obvious change in the frequency of repetition of the beats, or in the duration of the individual beats. The reflex ceasing under fatigue is seen to show a slower rhythm and a sluggish course for the latter beats, especially for the terminal ones.

Among the signs of fatigue of a reflex action are several sug- gesting that in it the command over the final common path exercised for the time being by the receptors and afferent path in action becomes less strong, less steady and less accurately adjusted. Under prolonged excitation their hold upon the final common path becomes loosened. This view is supported by the fact that' its connexion with the final common path is then more easily cut short and ruptured by other rival arcs competing with it for the final common path in question. The scratch- reflex interrupts the flexion-reflex more readily when the latter is tired out than when it is fresh.

In the hind limb of the " spinal " dog the extensor-thrust is inelicitable during the flexion-reflex. That is to say, when the flexion-reflex is evoked with fair or high intensity the writer has never succeeded in evoking the extensor-thrust, though the flexed posture of the limb is itself a favouring circumstance for the production of the thrust if the flexion be a passive one. But when the flexion-reflex is kept up by appropriate stimulation of a single point over a prolonged time, so that it shows fatigue, the extensor-thrust becomes again elicitable. Its elicitability is, then, not regular nor facile, but it does become obtainable, usually in quite feeble degree at first, later more powerfully. In other words, it can dispossess the

rival reflex from a common path when that rival is fatigued, though it cannot do so when the rival action is fresh and powerful.

Again, the crossed extension-reflex cannot inhibit the reflexion of the flexor-reflex under ordinary circumstances if the intensity of the stimulation of the competing arcs be approximately equal; but it can do so when the flexion-reflex is tired.

The waning of a reflex under long-maintained excitation is one of the many phenomena that pass in physiology under the name of fatigue. It may be that in this case the so-called fatigue is really nothing but a negative induction. Its place of incidence may lie at the synapse. It seems a process elabo- rated and preserved in the selective evolution of the neural machinery. One obvious use attaching to it is the prevention of the too prolonged continuous use of a common path by any one receptor. It precludes one receptor from occupying for long periods an effector organ to the exclusion of all other receptors. It prevents long continuous possession of a common path by any one reflex of considerable intensity. It favours the receptors taking turn about. It helps to ensure serial variety of reaction. The organism, to be successful in a million-sided environment, must in its reaction be many sided. Were it not for such so-called fatigue, an organism might, in regard to its receptivity, develop an eye, or an ear, or a mouth, or a hand or leg, but it would hardly develop the marvellous congeries of all those various sense-organs which it is actually found to possess. The loosening of the hold upon the common path by so-called fatigue occurs also in paths other than those leading to muscle and effector organs. If instead of motor effects sensual are examined, analogous phenomena are observed. A visual image is more readily inhibited by a competing image in the same visual field when it has acted for some time than when it is first perceived (W. Macdougall).

One point, on a priori grounds, is a natural corollary from the " principle of the common path," as indicated by the experimental findings relative to the incidence of fatigue. The reflex arcs, each a chain of neurones, converge in their course so as to impinge upon and conjoin in links (neurones) common to whole varied groups — in other words, they conjoin to common paths. This arrangement culminates in the convergence of many separately arising arcs in the final efferent-root neurone. This neurone thus forms the instrument for many different reflex arcs and acts. It is responsive to them in various rhythm and in

various grades of intensity. In accordance with this, it seems from experimental evidence to be relatively indefatigable. It thus satisfies a demand that the principle of the common path must make regarding it.

3. In the transition from one reflex to another a final common path changes hands and passes from one master to another. A fresh set of afferent arcs becomes dominant on the ' supersession of one reflex by the next. Of all the conditions determining which one of competing reflexes shall for the time being reign over a final common path, the intensity of reaction of the afferent arc itself relatively to that of its rivals is probably the most powerful. An afferent arc that strongly stimulates is caeteris paribus more likely to capture the common path than is one excited feebly. A stimulus can only establish its reflex and inhibit an opposed one if it have intensity. This explains why, in order to produce examples of spinal inhibition, recourse has so frequently been made in past times to strong stimuli. A strong stimulus will inhibit a reflex in progress, although a weak one will fail. Thus in Goltz's inhibition of micturition in the " spinal " dog a forcible squeeze of the tail will do it, but not, in the present writer's experience, a weak squeeze. So, likewise, any condition which raises the excitability and responsiveness of a nervous arc will give it power to inhibit other reflexes, just as it would if it were excited by a strong stimulus. This is much as in the heart of the Tunicate. There the prepotent spot whence starts the systole lies from time to time at one end and from time to time at the other. The pre- potent region at one end which usually dominates the common path is from time to time displaced by local increase of excitability at the other under local distension of the blood sinuses there.

In judging of intensity of stimulus the situation of the stimulus in the receptive field of the reflex has to be remembered. One and the same physical stimulus will be weak if applied near the edge of the field, though strong if applied to the focus of the field.

Crossed reflexes are usually less easy to provoke, less reliable of obtainment, and less intense than are direct reflexes. Con- sequently we find crossed reflexes usually more easily inhibited and replaced by direct reflexes than are these latter by those former. Thus the crossed stepping-reflex is easily replaced by the scratch-reflex, though its stimulus be continued all the time, and though the scratch-reflex itself is not a very potent reflex. But the reverse can occur with suitably adjusted intensity of stimuli.

Again, the flexion-reflex of the dog's leg is, when fully developed, accompanied by extension in the opposite leg. This crossed extensor movement, though often very vigorous, may be considered as an accessory and weaker part of the whole reflex, of which the prominent part is flexion of the homonymous limb. When the flexion-reflex is elicitable poorly, as, for instance, in spinal shock or under fatigue or weak excitation, the crossed ex- tension does not accompany the homonymous flexion and does not appear. But, where the flexion-reflex is well developed, if not merely one but both feet be stimulated simultaneously with stimuli of fairly equal intensity, steady flexion at knee, hip and ankle results in both limbs, and extension occurs in neither limb. The contralateral part of each reflex is inhibited by the homolateral flexion of each reflex. In other words, the more intense part of each reflex obtains possession of the final common paths at the expense of the less intense portion of the reflex. But if the intensity of the stimuli applied to the right and left feet be not closely enough balanced, the crossed exten- sion of the reflex excited by the stronger stimulus is found to exclude even the homonymous flexion that the weaker stimulus should and would otherwise evoke from the leg to which it is applied.

It was pointed out above that in a number of cases the transference of control of the final common path FC from one afferent arc to another is reversible. The direction of the trans- ference can caeteris paribus be easily governed by making the stimulation of this receptor or that receptor the more intense.

A factor largely determining whether a reflex succeed another or not is therefore intensity of stimulus.

4. A fourth main determinant for the issue of the conflict between rival reflexes seems the functional species of the reflexes. Reflexes initiated from a species of receptor appa- species of ratus that may be termed noci-ceptive appear to Reflex. particularly dominate the majority of the final common paths issuing from the spinal cord. In the simpler sensations we experience from various kinds of stimuli applied to our skin there can be distinguished those of touch, of cold, of warmth and of pain. The adequate stimuli for the first-mentioned three of these are certainly different; mechanical stimuli, applied above a certain speed, which deform beyond a certain degree the resting contour of the skin surface, seem to constitute adequate stimuli for touch. Similarly the cooling or raising of the local temperature, whether by thermal conduction, radia- tion, &c, are adequate for the cold and warmth sensations. The organs for these three sensations have by stigmatic stimuli been traced to separate

and discrete tiny spots in the skin. In regard to skin-pain it is held by competent observers, notably by V. Frey and Kiesow, that skin-pain likewise is referable to certain specific nerve-endings. In evidence of this it is urged that mechanical stimuli applied at certain places excite sensations which from their very threshold upward possess unpleasantness, and as the intensity of the stimulus is increased, culminate in " physical pain." The sensation excited by a mechanical stimulus applied to a touch-spot does not evoke pain, however intensely applied, so long as the stimulation is confined to the touch-spot. The threshold value of mechanical stimuli for touch- spots is in general lower than it is for pain-spots; and conversely the threshold value of electrical stimuli for touch-spots is in general higher than it is for the spots yielding pain. Similarly it is said that stimulation of a cold spot or of a warm spot does not, however intense, evoke, so long as confined to them, sensa- tions of painful quality. But pain can be excited not only by strong mechanical stimuli and by electrical stimuli, but by cold and by warmth, though the threshold value of these latter stimuli is higher for pain than for cold and warm spots. If these observations prove correct there exist, therefore, numerous specific cutaneous nerve-fibres evoking pain.

A difficulty here is that sensory nerve-endings are usually provided with sense organs which lower their threshold for stimuli of one particular kind while raising it for stimuli of all other kinds; but these pain-endings in the skin seem almost equally excited by stimuli of such different modes as mechanical, thermal conductive, thermal radiant, chemical and electrical. That is, they appear anelective receptors. But it is to be re- marked that these agents, regarded as excitants of skin-pain, have all a certain character in common, namely this, that they become adequate as excitants of pain when they are of such intensity as threatens damage to the skin. And we may note about these excitants that they are all able to excite nerve when applied to naked nerve directly. Now there are certain skin surfaces from which, according to most observers, pain is the only species of sensation that can be evoked. This is alleged, for instance, of the surface of the cornea — a modified piece of skin. The histology of the cornea reveals in its epithelium nerve-endings of but one morphological kind; that is, the ending by naked nerve-fibrils that pass up among the epithelial cells. Similar nerve-endings exist also in the epidermis generally. It may therefore be that the nerve-endings subserving skin- pain are free naked nerve-endings, and the absence of any highly evolved specialized end-organ in connexion with them may explain their fairly equal amenability to an unusually wide range of different kinds of stimuli. Instead of but one kind of

stimulus being their adequate excitant, they may be regarded as adapted to a whole group of excitants, a group of excitants which has in relation to the organism one feature common to all its components, namely, a nocuous character.

With its liability to various kinds of mechanical and other

damage, in a world beset with dangers amid which the individual

I and species have to win their way in the struggle for existence,

we may regard nocuous stimuli as part of a normal state of affairs. It does not seem improbable, therefore, that there should under selective adaptation attach to the skin a so-to-say specific sense of its own injuries. As psychical adjunct to the reactions of that apparatus we find a strong displeasurable effective quality in the sensations they evoke. This may perhaps be a means for branding upon memory, of however rudimentary kind, a feeling from past events that have been perilously critical for the existence of the individuals of the species. In other words, if we admit that damage to such an exposed sentient organ as the skin must in the evolutionary history of animal life have been sufficiently frequent in relation to its importance, then the existence of a specific set of nerves for skin-pain seems to offer no genetic difficulty, any more than does the clotting of blood or innate immunity to certain diseases. That these nerve-eridings constitute a distinct species is argued by their all evoking not only the same species of sensation, but the same species of reflex movement as regards " purpose," intensity, resistance to "shock," &c. And their evolution may well have been unaccompanied by evolution of any specialized end-organ, since the naked free nerve-endings would better suit the wide and peculiar range of stimuli, reaction to which is in this case required. A low threshold was not required because the stimuli were all intense, intensity constituting their harmfulness; but response to a wide range of stimuli of different kinds was required, because harm might come in various forms. That responsive range is supplied by naked nerve itself, and would be cramped by the specialization of an end-organ. Hence these nerve-endings remained free.

It is those areas, stimulation of which, as judged by analogy, can excite pain most intensely, and it is those stimuli which, as judged by

analogy, are most fitted to excite pain which, as a general rule, excite in the " spinal " animal- — where pain is .of course non-existent — the prepotent reflexes. If these are reactions to specific pain-nerves, this may be expressed by saying that the nervous arcs of pain-nerves, broadly speaking, dominate the spinal centres in peculiar degree. Physical pain is thus the psychical adjunct of an imperative protective reflex. It is preferable, however, since into the merely spinal and reflex aspect of the reaction of these nerves no sensation of any kind can be shown to enter, to avoid the term " pain-nerves." Re- membering that the feature common to all this group of stimuli is that they threaten or actually commit damage to the tissue to which they are applied, a convenient term for application to them is nocuous. In that case what from the point of view of sense are cutaneous pain-nerves are from the point of view of reflex-action conveniently termed noci-ceptive nerves.

In the competition between reflexes the noci-ceptive as a rule dominate with peculiar certainty and facility. This explains why such stimuli have been so much used to evoke reflexes in the spinal frog, and why, judging from them, such " fatality " belongs to spinal reflexes.

One and the same skin surface will in the hind limb of the spinal dog evoke one or other of two diametrically different reflexes according as the mechanical stimulus applied be of noxious quality or not, a harmful insult or a harmless touch. A needle-prick to the planta causes invariably the drawing up of the limb— the flexion-reflex. A harmless smooth contact, on the other hand, causes extension — the extensor-thrust above described. This flexion is therefore a noci-ceptive reflex. But the scratch-reflex— which is so readily evoked by simple light irritation of the skin of the shoulder — is relatively mildly noci-ceptive. When the scratch-reflex and the flexion-reflex are in competition for the final neurone common to them, the flexion-reflex more easily dispossesses the scratch-reflex from the final neurone than does the scratch-reflex the flexion- reflex. If both reflexes are fresh, and the stimuli used are such as, when employed separately, evoke their reflexes respec- tively with some in tensity j in my experience it is the flexion- reflex that is usually prepotent. Yet if, while the flexion-reflex fa being moderately evoked by an appropriate stimulus of weak intensity, a strong stimulus suitable for producing the scratch-

reflex is applied, the steady flexion due to the flexion-reflex ; te replaced by the rhythmic scratching movement of the scratch- reflex, and this occurs though the stimulus for the flexion-reflex is

maintained unaltered. When the stimulus producing the scratch is discontinued the flexion-reflex reappears as before. The flexion-reflex seems moTe easily to dispossess the scratch- reflex from the final common paths than can the scratch-reflex dispossess the flexion-reflex. Yet the relation is reversible — by heightening the intensity of the stimulus for the scratch-reflex or lowering that of the stimulus for the flexion-reflex.

In decerebrate rigidity, where a tonic reflex is ' maintaining contraction in the extensor muscles of the knee, stimulation of the noci-ceptive arcs of the limb easily breaks down that reflex. The noci-ceptive reflex dominates the motor neurdne previously held in activity by the postural reflex. And noci-ceptive reflexes are relatively little depressed by " spinal shock."

Noci-ceptive arcs are, however, not the only spinal arcs' which in the intact animal, considered from the point of view of sensation, evoke reactions rich in affective quality. Beside those receptors attuned to react to direct noxa, the skin has others, concerned likewise with functions of vital importance to the species and colligate with sensations similarly of intense affective quality; for instance, those concerned with sexual functions. In the male frog the sexual clasp is a spinal reflex: The cord may be divided both in front and behind the brachial region without interrupting the reflex. Experiment shows that from the spinal male at the breeding season, and also at other times, this reflex is elicited by any object that stimulates the skin of the sternal and adjacent region. Ill the intact animal, on the contrary, other objects than the female are', when applied to that region, at once rejected, even though they be wrapped in the fresh skin of the female frog and in other ways made to resemble the female. The development of the reflex is not prevented by removal of the testes, but removal of the seminal reservoirs is said to depress it, and their distension, even by indifferent fluids, to exalt it. If the skin of the sternal region and arms is removed the reflex does not occur. Severe mutilation of the limbs and internal organs does not inhibit the reflex, neither does stimulation of the sciatic nerve central to its section. The reflex is, however, depressed or extinguished by strong chemical and pathic stimuli to the sternal skin, at least in many cases. The tortoise exhibits a similar sexual reflex of great spinal potency.

It would seem a general rule that reflexes arising in species of receptors which considered as sense-organs provoke strongly affective sensation caeteris paribus prevail over reflexes of other species when in competition with them for the use of the "final

common path." Such reflexes override and set aside with peculiar facility reflexes belonging to touch organs, muscular sense-organs, &c. As the sensations evoked ' by these arcs, e.g. " pains," exclude and dominate concurrent sensations, so do the reflexes of these arcs prevail in the competition for possession of the common paths. They seem capable of pre- eminent intensity of action.

Of all reflexes it is the tonic reflexes, e.g. of ordinary posture, that are in the writer's experience the most easily interrupted by other reflexes. Even a weak stimulation of the noci-ceptive arcs arising in the foot often suffices to lower or abolish the knee-jerk or the reflex extensor tonus of the elbow or knee. If various species of reflex are arranged, therefore, in their order of potency in regard to power to interrupt one another, the reflexes initiated in receptors which considered as sense- organs excite sensations of strong affective quality lie at the upper end of the scaley and the reflexes that are answerable for the postural tonus of skeletal muscles lie at the lower end of the scale. One great function of the tonic reflexes is to maintain habitual attitudes and postures. They form, therefore, a nervous background of active equilibrium. It is of obvious advantage that this equilibrium should be easily upset, so that the animal rnay respond agilely to the passing events that break upon it as intercurrent stimuli.

Results. —Intensity of stimulation, fatigue ahd freshness,

spinal induction, functional species of reflex, are all, therefore, physiological factors influencing the result of the interaction of reflex-arcs at a common path. It is noticeable that they all resolve themselves ultimately into intensity of reaction. Thus, intensity of stimulus means as a rule intensity of reaction. Those species of reflex which are habitually prepotent in inter- action with others are those which are habitually intense; those specially impotent in competition are those habitually feeble in intensity, e.g. skeletal muscular tone. The tonic reflexes of attitude are of habitually low intensity, easily inter- fered with and temporarily suppressed by intercurrent reflexes, these latter having higher intensity. But these latter suffer fatigue relatively early, whereas the tonic reflexes of posture can persist hour after hour with little or no signs of fatigue. Fatigue, therefore, in the long run advantageously redresses the balance of an otherwise 1 unequal conflict. We can recognize in it another agency working

toward that plastic alternation of activities which is characteristic of animal life and increases in it with ascent of the animal scale.

*The high variability of reflex reactions from experiment to experiment, and from observation to observation, is admittedly one of the difficulties that has retarded knowledge of them. Their variability, though often attributed to general conditions of nutrition, or to local blood-supply, &c, seems far more often due to changes produced in the central nervous organ by its own functional conductive activity apart from fatigue. This functional activity itself causes from moment to moment the temporary opening; of some connexions and the closure of others. The chains of neurones, the conductive lines, have been, especially in recent years, by the methods of Golgi, Ehrlich, Apathy, Cajal and others, richly revealed to the microscope. Anatomical tracing * of these may be likened, though more difficult to accomplish, to tracing the distribution of blood vessels after Harvey's discovery had given them meaning, but before the vasomotor mechanism was discovered. The blood vessels of an organ may be turgid at one time, con- stricted almost to obliteration at another. With the conductive network of the nervous system the temporal variations are even greater, for they extend to absolute withdrawal of nervous influence. Under reflex inhibition a skeletal muscle may relax to its post-mortem length, i.e. there may then be no longer evidence of even a tonic influence on it by its motor neurone. The direction of the stream of liberation of energy along the pattern of the nervous web varies from minute to minute. The final common path is handed from some group of a plus class of afferent arcs to some group of a minus class, or of a rhythmic class, and then back to one of the previous groups again, and so on. The conductive web changes its functional pattern with certain limits to and fro. It changes its pattern at the entrances to common paths. The changes in its pattern occur there in virtue of interaction between rival reflexes, " interference." As a tap to a kaleidoscope, so a new stimulus that strikes the receptive surfaces causes in the central organ a shift of functional pattern at various synapses. The central organ is a vast network whose lines of conduction follow a certain scheme of pattern, but within that pattern the details of connexion are, at the entrance to each common path, mutable. The grey matter may be compared with a telephone exchange, where, from moment to moment, though the end-points of the system are fixed, the connexions between starting-points and terminal points are changed to suit passing requirements, as the functional points are shifted at a great railway junction. In order to realize the exchange at work, one must add to its purely spatial plan the temporal datum that within*

certain limits the connexions of the lines shift to and fro from minute to minute. An example is the " reciprocal innervation " of antagonistic muscles — when one muscle of the antagonistic couple is thrown into action the other is thrown out of action. This is only a widely spread case of the general rule that antagon- istic reflexes interfere where they embouch upon the same final common paths. And that general rule is part of the general principle of the mutual interaction of reflexes that impinge

upon the same common path. Unlike reflexes have successive but not simultaneous use of the common path; like reflexes mutually reinforce each other on their common path. Expressed Ideo- logically, the common path, although economically subservient for many and various purposes, is adapted to serve but one purpost at a time. Hence it is a co-ordinating mechanism and prevents confusion by restricting the use of the organ, its minister, to but one action at a time.

In the case of simple antagonistic muscles, and in the instances of simple spinal reflexes, the shifts of conductive pattern due to interaction at the mouths of common paths are of but small extent. The co-ordination covers, for instance, one limb or a pair of limbs. But the same principle extended to the reaction of the great arcs arising in the projicient receptor organs of the head, e.g. the eye, which deal with wide tracts of musculature as a whole, operates with more multiplex shift of the conductive pattern. Releasing forces acting on the brain from moment to moment shut out from activity whole regions of the nervcus system, as they conversely call vast other regions into play. The resultant singleness of action from moment to moment is a keystone in the construction of the individual whose unity it is the specific office of the nervous system to perfect. The interference of unlike reflexes and the alliance of like reflexes in their action upon their common paths seem to lie at the very root of the great psychical process of " attention."

The spinal cord is not only the seat of reflexes whose "centres" lie wholly within the cord itself; it supplies also conducting paths for nervous reactions initiated by impulses derived from afferent spinal nerve, but involving mechanisms situate alto- gether headward of the cord, that is to say, in the brain. Many of these reactions affect consciousness, occasioning sensations of various kinds. In regard to the part played by spinal con- duction in subserving these sensual reactions a question of practical rather than theoretical importance has been as yet the chief aim of inquiry. The inquiry has been in fact whether the impulses concerned in evoking the various species of

sensations follow in their headward course along the cord certain discrete paths occupying separable fractions of the cross-area of the cord, and if they are thus confined to discrete paths in what parts of the cross-area of the cord do these parts lie. • This "localiza- tion " problem has as yet been almost the sole problem attacked, and therefore, despite its limited scope and interest, the results attained in it may be briefly mentioned here. ■ Localization. — The sensations usually grouped under the name of touch may with advantage, as shown by Head, be dis- tinguished from the point of view of their practical elicitation into superficial and deep. The former of these are referable to stimulation of afferent nerve-fibres distributed actually to the skin, the latter to stimulation of deeper afferents subjacent to the skin. The touch-fibres belonging to the skin proper are further subdivisible, as Head has shown, into two kinds. One kind, the protopathic, yield sensations so suffused with disagree- able affective tone (skin-pain) that they may for the present purpose be considered pain-nerves, and the description of their spinal connexions be relegated to the paragraph dealing with the spinal path for pain. The other kind, the epicritic, are those which react to tangible stimuli lightly applied, such as stroking the skin with a loose pledget of cotton wool or the light touching of the skin with a pin's head or a blunt pencil point. Deep touch, on the other hand, involves afferent nerve fibres supplied by nerve-trunks not classed as cutaneous, but probably largely muscular in the sense that they run to muscles and contain side by side the afferent fibres in question and the efferent nerve- fibres causing muscular contraction. Head has brought forward clear evidence that though the afferent fibres subserving the epicritic tactual sense of the skin and deep touch of subcutaneous origin run so separate a course in the peripheral nerves, the spinal fibres constituting the intraspinal headward-running paths from these two kinds of peripheral touch-fibres, the epicritic and the deep, to the brain, lie together and are impli- cated together by injuries of the spinal cord. In this sense there is, therefore, in the cord a tactual path. The question

is, therefore, what course does this path follow in the cord ? In the first place it must be noted that the path contains a synapse for the peripheral neurone whether belonging to the epicritic tactual group or to the deep tactual group ends in the cord, probably not far, i.e. not more than four or five segments^ from its place of entrance. The rest of the headward path must therefore run through one secondary

*neurone at least, it may be through a series of such arranged as a headward running line of relays. It is, however, more probable that one long secondary neurone reaching the bulb covers the whole of the remaining spinal part of the trajectory. The part of the headward-running path formed by the intraspinal part of the peripheral neurone (primary afferent neurone) lies certainly in the dorsal column of the cord of the same lateral half as the side from which the neurone entered, i.e. in the right dorsal column if the neurone entered by a spinal root of the right side. The secondary neurone continuing the path lies, however, *in the ventral column of the crossed half of the cord. The junction or synapse between the primary and secondary neurone lies, of course, in the grey matter of the spinal cord.*

The spinal path of impulses which when they reach the brain occasion pain has been determined chiefly in regard to pain referred to the skin. The primary afferent neurones bringing these impulses to the cord are the protopathic of Head mentioned above. These, there is much evidence to show, terminate in the grey matter of the cord not far from their point of entrance into the cord, that is, they terminate intraspin- ally nearer their point of entrance than do the corresponding primary afferent neurones for touch. From the local spinal grey matter the pain-path is continued headward in the lateral white columns of the cord by secondary afferent neurones. These secondary afferent neurones run chiefly in the lateral column of the opposite half of the cord from that which the primary afferent neurones entered; but some run up the lateral column of the same side as that by which the primary neurones entered. The synapse between the primary afferent neurone and the secondary afferent neurone of this path lies probably in the grey matter called substantia gelatinosa of the dorsal horn.

The spinal path taken by the impulses concerned with sensa- tions of heat and cold seems to agree closely with that taken by the impulses subserving skin pain. The position of the nerve- fibres belonging to the secondary afferent neurones of the pain and temperature path has been fairly successfully identified with that of the spinal tract called Gowers' tract. The uncrossed portion of the temperature path appears, however, to be relatively smaller as compared with its crossed portion than is that of pain.

There is much evidence that impulses contributory to " mus- cular sense " pass headward along the spinal cord and in their course remain for the most part uncrossed. This course would in so far agree with the course taken by the intraspinal continua- tions of the

primary afferent neurones which form the long fibres of the dorsal columns. These are known to run to the bulb without transgressing the median plane at all. In addition to this uncrossed tract there is another, namely, that offered by the dorsal cerebellar tract, a tract of secondary neurones connected through the grey matter of the vesicular column of Clarke with primary afferent neurones of the ipselateral side. Either or both of these uncrossed tracts may be the path taken by the impulses subserving muscular sense, and there is experi- mental evidence in favour of such a possibility, but the question cannot be considered as definitely answered at present.

Besides the paths followed by headward-running impulses the spinal cord contains paths for impulses passing along it backwards from the brain. These paths lie almost entirely in the ventrolateral columns of the Cord. The fibres of which they are composed cross but little in the cord. Their sources are various, some come from the hind brain and some from the mid brain, and in the higher mammalia, especially in man and in the anthropoid apes, a large tract of fibres in the lateral column (the crossed pyramidal tract) comes from the cortex of the neopallium of the fore brain. This last tract is

the main medium by which impulses initiated by electrical stimulation of the motor cortex reach the moto-neurones of the cord and through them influence the activity of the skeletal muscles. Of the function of the other tracts descending from the brain into the cord little is known except that mediately or immediately they excite or inhibit the spinal moto-neurones by various levels. How they harmonize one with another in their action or what their purpose in normal life may be is at present little more than conjecture. Such terms, therefore, as " paths for volition," &c, are at present too schematic in their basis to warrant their discussion here. (C. S. S.)

SPINEL, a name now given to a group of minerals, of which the typical member is a magnesium aluminate, sometimes used as a gem-stone, to which the term " spinel " was originally restricted. The name comes from the French spindle (diminutive of Lat. spina), perhaps suggested by the sharp angles of the crystals. AH spinels crystallize in the cubic system, usually in octahedra, and often twinned as in the accompanying figure, which is a form so characteristic as to be called the " spinel twin." The hard- ness of spinel is about that of topaz (8) and its specific gravity near that of diamond. Professor A. H. Church gives the range in variously coloured spinels as 3-582 to 3-715. Pure spinel is colourless, but most varieties are coloured, no doubt in many cases with iron and probably in some with chro- mium. The deep red spinel is known

as " spinel-ruby," or " ruby-spinel," and has often been taken for true ruby, from which it is distinguished, however, by being singly refracting and therefore not 'dichroic, as well as by its inferior hardness and density. The " balas ruby " is a rose-red spinel, said to derive its name from Balkh, the capital of Badakshan (Balaxia), where it occurs with rubies, and was formerly worked, chiefly in the Shighnan valley, in the upper Oxus basin. Rubicelle is a spinel in which the red colour tends to orange, whilst in almandine-spinel it passes into violet. Stones of the colour of vinegar are called vinegar-spinel. When the colour is blue the mineral is known as sapphire-spinel, and when green as chloro-spinel.

The spinels used in jewelry are found mostly in gem-gravels, where, however, the octahedral form is often well preserved. The chief localities are Ceylon, Siam and Upper Burma. In all these localities the spinels accompany the coloured corun- dums, and their close association with true rubies led Tavernier to Gall spinel " the mother of ruby." Formerly there was much confusion between the two minerals, and probably many stones described as monster rubies have been spinels. The great historic " ruby" set in the Maltese cross in front of the Imperial state crown of England is really a spinel. This fine stone was given to Edward the Black Prince by Pedro the Cruel, king of Castile, on the victory of Najera in 1367, and it was afterwards worn by Henry V. at the battle of Agincourt, when it narrowly escaped destruction. V. Ball described, in 1894, a spinel weighing 133ˆ carats, engraved with a Persian inscription, then in the possession of Lady Carew.

All the isomorphous minerals known as the group of spinellids, of which spinel is the type, crystallize in regular octahedra and have a composition conforming to the general formula R"R 2 "'0« (= R"0-R2′ Oj). Ordinary spinel is MgAUOi. A black opaque spinel in which Fe partly replaces Mg is known as pleonaste (irXeovaoros, abundant, from the number of faces on certain crystals) or ceylonite, from the island of Ceylon, but sometimes written ceylanite. It occurs in gneiss, often with cordierite, and is found also in the ejected blocks of Monte Somma, Vesuvius. Large crystals come from Warwick and Amity, Orange county, New York, U.S.A. The black spinels are generally green or brown when viewed in thin sections by transmitted light. In some cases spinel is evidently a result of contact metamorphism, whilst in others it has crystallized out of a molten magma, as illustrated by the experiments of J. Moro- zewicz. A chrome-spinel with the formula (Mg.Fe) (Al,Fe,Cr) 2 C>4 is named picotite, after Picot de la Peyrouse, who described it. Picotite occurs in the form of black grains and crystals in certain olivine rocks and in serpentine. A

black iron-spinel (FeAlaO«),

found in the granulites of Saxony and Bohemia, is known as hercynite from the Hercynian Forest. A zinc-spinel (Zn AI3O4) , occurring in talcose slate near Falun in Sweden, is named gahnite, after its discoverer J. G. Gahn; whilst it has also been termed automolite from Gr. Xos, a deserter, in allusion to the occurrence of zinc in a mineral where it was unexpected. The group of spinellids includes, as its extreme members, magnetite (Fe"Fe 2 '"04) and chromite (FeCr 2 4) (q.v.). (F. W. R.)*

SPINELLO ARETINO (c. 1330-c. 1410), Italian painter, the son of a Florentine named Luca, who had taken refuge in Arezzo in 1,310 when exiled with the rest of the Ghibelline party, was born at Arezzo about 1330. Spinello was a pupil of Jacopo di Casentino, a follower of Giotto, and his own style was a sort of link between the school of Giotto and that of Siena. In the early part of his life he worked in Florence as an assistant to his master Jacopo while painting frescoes in the church of the Carmine and in Sta Maria Novella. Between 1360 and 1384 he was occupied in painting many frescoes in and near Arezzo, almost all of which have now perished. After the sack of Arezzo in 1384 Spinello returned to Florence, and in 1387-1388 with some assistants covered the walls and vault of the sacristy of S. Miniato near Florence with a series of frescoes, the chief of which represent scenes from the life of St Benedict. These still exist, though in a sadly restored condition; they are very Giotto-like in composition, but have some of the Siena decorative brilliance of colour. In 1301-1392 Spinello was painting six frescoes, which still remain on the south wall of the Pisan Campo Santo, representing miracles of St Potitus and St Ephesus. For these he received 270 gold florins. Among his later works the chief are the very fine series of frescoes painted in 1407-1408 on the walls and vault of a chapel in the municipal buildings of Siena; these also have suffered much from repainting, but still are the finest of Spinello's existing frescoes. Sixteen of these represent the war of Frederick Barbarossa against the republic of Venice. Spinello died at Arezzo about 1410.

Spinello's frescoes are all strong and highly decorative works, drawn with much spirit, and are very superior in style to his panel pictures, many of which appear to be mere bottega productions. The academy of Florence possesses a panel of the " Madonna and Saints," which is

chiefly interesting for its signature — " Hoc opus pinxit Spinellus Luce Aritio D.I.A.(i3Qi)." The easel pictures which are to be found in the various galleries of Europe give little or no notion of Spinello's power as a painter.

SPINET, or Spinnet (Fr. espinette or (pinette; Ger. Spineit; Ital. spinetla), names given in England to all small keyboard instruments irrespective of shape, having one string to a note, plucked by means of a quill or plectrum of leather. The earliest name recorded for this instrument is clavicymbalum, which occurs in the rules of the Minnesingers (1404), and also in the Wunderbuch (1440), a MS. preserved in the grand-ducal library at Weimar. This is enriched with pen and ink sketches, amongst which is a series of musical instruments comprising a clavi- cymbalum, not represented as the rectangular instrument figured by Virdung and Luscinius, but harp- or wing-shaped like the larger and more perfect instrument afterwards known as harpsi- chord in England (clavecin, clavicymbel).

In Italy the usual early model of spinet was pentagonal or heptagonal, and was generally enclosed in an outer case, from which it was taken for performance. Some of the oldest rect- angular specimens merely contain a pentagonal spinet, the corners not being filled in. In the 16th century the rectangular spinets were modelled in Italy on the cassone or wedding coffers, and the keyboard, until the middle of that century, stood out from the case, Rosso of Milan being the first to recess it. Both forms were in use in England until the Restoration, when the transverse or wing form became popular in England, Haward, Stephen Keene and Thomas Hitchcock being the most cele- brated English makers l at the end of the 1 7th and beginning of the 18th century.

The mechanism of all spinets, virginals and harpsichords is the same in principle, the principal variation being in the number of strings to each note and the manner in which they

1 See A. J. Hipkins, The History of the Pianoforte, pp. 71-73 (London, 1896).

are disposed over the soundboard. In the spinets they run parallel or at an obtuse angle to the keyboard. The jack rests on the back of the key-lever, and works through a rectangular hole cut through the soundboard as the key is depressed. The quill or plectrum is embedded in a pivoted tongue near the top of the jack in such a manner that when the tongue is at rest the quill protrudes at right

*angles just under the string. As the jack rises the quill catches the string and twangs it, causing the tongue, kept in place by a bristle spring, to fall back and thus avoid the string on the return of the jack. A little piece of cloth acting as a damper and attached to the jack rests on the string whenever the key returns to its normal position. For the history of the spinet, see Pianoforte. *■ ‘ ”’*

SPINNING (from O. Eng. spinnan, to spin, cf. Ger. spinnen, &c, the Teut. root is spen, to draw out, cf. span, spider), the forming of threads by drawing out and twisting various fibres. There is ample evidence of the great antiquity and wide diffusion of the art of spinning, for spinning necessarily precedes weaving {q.v.) whenever short fibrous materials have to be made into threads, and weaving is one of the primal and most univer- sal employments of mankind. Either remains of implements employed in spinning, or spun threads, are found wherever traces of prehistoric man make their appearance. The simple spinning apparatus which was used in the earliest ages continued to be used by civilized communities till comparatively recent times, and it may therefore be said that no art which has been so long and widely practised remained so unprogressive as that of spinning. On the other hand, since about the middle of the 1 8th century, when human ingenuity bent itself in earnest to improve the art, there have not been developed in the whole range of mechanical industries machines of greater variety, delicacy of action, and manifold productive capacity than those now in use for spinning.

The primitive thread-making implement consisted of a wooden spindle, from 9 to 15 in. long, which was rounded and tapered at both extremities, as in the accompanying figure. Near the

Primitive Spindle.

top there was usually a notch in which the yarn was caught while undergoing the operation of twisting, and lower down a whorl, or wharve, composed of a’ perforated disk of clay, stone, wood, or other material was secured to give momentum and steadiness to a rotating spindle. Long fibres were commonly attached to a distaff of wood, which was held under the left arm of the operator, but short fibres were spun from carded rolls. After attaching some twisted fibres to the spindle, a rotatory motion was given to the latter either by rolling it by hand against one thigh, or by twirling it between the fingers and thumb of the right hand, after which the fibres were drawn out in a uniform strand by both hands and converted into yarn. When the thread was of sufficient strength, the spindle was suspended by it until a full stretch had been drawn and twisted, after

which that portion was wound upon the body of the spindle, and the operation continued until the spindle was filled. The quantity thus rolled up gives the name to a now definite measure of linen yarn, namely " the spindle, " or 14,400 yards. Simple as was this primitive apparatus, a dexterous spinner could produce yarn of an evenness, strength and delicacy such as has scarcely been exceeded by elaborate modern appliances. The yarns for the gossamer-like Dacca muslins of India were so fine that 1 lb weight of cotton was spun into a thread nearly 253 m. long. This was accomplished with the aid of a bamboo spindle not much bigger than a darning needle, and which was lightly weighted with a pellet of clay. Since such a tender thread could not support even the weight of so slight a spindle, the apparatus was rotated upon a piece of hollow shell. The spindle as here described was, so far as is

known, the sole apparatus with which yarn was spun until comparatively recent times.

The changes in modern spinning have had for their object: (i) the providing of mechanical means to rotate the spindle, (2) an automatic method of drawing out the fibres, and (3) devices for working a large group of spindles together, at speeds before unattainable.

The first improvement consisted in cutting a ring groove in the wharve, mounting the spindle horizontally in a frame, and passing a band from a large wheel round the wharve. A rotatory motion was then given to the spindle by turning the wheel with the left hand. After attaching the filaments to the spindle they were attenuated with the right hand, and when fully twisted the thread was moved to form a right angle with the spindle and coiled upon it. Such a wheel has' long been known in India, and from a drawing in a 14th-century manuscript in the British Museum it is obvious that it was not unknown, although far from being in general use, in Europe at that early date. It came ultimately to be known in England as the " bobbing wheel," and was in constant use down to the beginning of the 19th century for spinning coarse and fine yarnsl But fine yarns received two spinnings; the first consisted in drawing out and slightly twisting the fibres into what is still known as a roving, and by the second spinning the roving was fully attenuated and twisted. In 1533, a citizen of Brunswick is said to have cranked the axis of the

large wheel and added a treadle, by which the spinner was enabled to rotate her spindle with one foot and have both hands free to manipulate the fibres.

It is not possible accurately to fix the dates at which all improvements in spinning appliances were made; it is certain that many were known and used long before they were generally adopted. Thus the flyer, which twists yarn before winding it upon a bobbin, is shown in a drawing by Leonardo da Vinci, together with a device for moving the bobbin up and down the spindle so as to effect an even distribution of the yarn. During the 1 6th century a machine of the foregoing type was widely used, and came to be known as the Saxony wheel. It changed spinning from an intermittent to a continuous operation. The spindle had affixed upon its outer end a wooden flyer, whose forked legs were far enough apart to enclose a double-flanged spool, and at short intervals bent wires, known as the heck, were inserted in each leg for the purpose of guiding the thread evenly upon the spool. This spool was loosely threaded upon the spindle and one of its flanges was grooved to take a driving band from the large wheel, hence the spindle and the spool were separately driven, but the former at a higher speed than the latter. The twisted filaments were drawn through an eye in the flyer, led- along one of its legs, and made fast to the spool. By operating the treadle the flyer twisted all the fibres about a common axis once for each revolution, and the spool wound up the length thus spun: the thread being slipped from tooth to tooth of the heck at regular intervals to direct it evenly across the spool. During the 17th century a second and similar spindle and flyer were added, and these left the spinner free to manipulate one thread with her right, and another with her left hand. It was in this condition that the most advanced form of yam-making was carried on until a great series of inventions revolutionized spinning, and laid the foundations of the factory system which now prevails.

The remaining part of the problem which lay before inventors was to dTaw out masses of parallel fibrous material, and twist them into uniform strands by mechanical means. The first stage in the evolution of mechanical spinning was effected by the invention of Lewis Paul, of Birmingham, who obtained a patent in r738, and who was assisted by John Wyatt. The essential features of this invention consisted in passing carded slivers between pairs of parallel rollers, each succeeding pair of which moved faster than the preceding pair, to attenuate the sliver to the required extent. From Paul's specification it would appear that he attempted to turn the rollers about their horizontal and vertical axes simultaneously, in order to

draw out the fibres and twist them at one operation. But he

also mentions a plan for which he procured a patent twenty years later, namely, the use of only one pair of rollers working in conjunction with a bobbin which drew off the thread faster than the rollers delivered the sliver, and coiled the thread about itself. The bobbin, therefore, attenuated, twisted and wound the material. Neither plan proved a commercial success. Thomas Highs, of Leigh, and others, laboured upon the problem, but it was left to Richard Arkwright, a barber, of Preston and Bolton, to achieve what his predecessors vainly struggled for. He obtained patents, in 1769 and 177s, for a machine which was subsequently known as the water-twist frame by reason of water-power being applied to drive it. Arkwright's first machine did not contain any really new feature, for it consisted of Paul's drawing rollers, and the spindle, flyer and spool from the Saxony wheel, but the spindles and rollers were grouped in sets of four. Later the water-twist frame was changed into the "throstle" frame, which in turn has almost ceased to be used. L11829C. Danforth (1797-1876), an American spinner, invented a dead spindle, on the top of which he placed a hollow cap to serve as the winding point, and inside the cap he rotated a spool: a plan still used by worsted spinners. In 1828 Mr Thorpe, also an American, invented the ring spinning frame, whose principal feature consisted in the substitution;: for the flyer of a flanged annular ring, and a light C-shaped traveller. By means of the traveller a thread was held in the best position for winding upon a spool, as well as put under the necessary tension. Later inventors have so altered the construction of the ring, traveller and spindle that a speed of upwards of 11,000 revolutions per minute can now be attained. This represents the highest development of continuous spinning.*

Whilst endeavours were being made to perfect continuous spinning, attention was also directed to perfecting the inter- mittent process as represented by the bobbing wheel. Between the years 1764 and 1767, James Hargreaves, of Standhill, invented the spinning jenny, by the aid of which sixteen, or more, threads could be spun simultaneously by one person. All the spindles were placed vertically and rotated from a drum, but the rovings were mounted in a movable carriage and passed between a clamp that opened and shut like a parallel ruler. After securely clamping the rovings and attaching them to the spindles, the carriage was drawn out slowly by one hand and the spindles revolved by the other. The rovings were thus stretched to the proper degree of tenuity, and sufficiently twisted. This was followed by the inward run of the carriage, when the stretch of spun threads was wound upon the spindles, and the operation repeated.

Hargreaves therefore returned to the first principles of spinning, namely, simultaneous drawing and twisting. But although the jenny gave a greatly increased output, it was ill adapted for fine spinning. During the years 1774 to 1779, Samuel Crompton, of Bolton, combined, in the mule, the drawing rollers of Paul with the stretching of Hargreaves. But his rollers did not fully attenuate the rovings before twisting them, as is the case with continuous spinning, neither was stretching alone relied upon. From its introduction this machine was able to spin finer and more elastic threads than any of its rivals, but for a time the preparation of suitable rovings was a source of great trouble. The immediate conse- quence of the decision of the court of King's Bench, in 1785, to throw open to the public Arkwright's preparatory machinery, was to enormously increase the usefulness of the mule. Since Crompton's time a host of inventors have laboured to render all parts of the mule thoroughly automatic ; this has led to many changes and additions, but none of its essential features have been discarded. The inventions of Paul, Arkwright, Hargreaves and Crompton are at the foundations of all modern systems of spinning; details regarding them are given in the article on Cotton-spinning Machinery. (T. W. F.)

SPINOLA, AMBROSE, Marquis de los Balbases (1560-1630), Spanish general, was born in Genoa in 1569. He was the eldest son of Philip Spinola, marquis of Sesto and Benafro, and his wife Policena, daughter of the prince of Salerno. . The family of Spinola was of great antiquity, wealth and power in Genoa.

In the 1 6th century the republic was practically a protected state under the power of Spain, the Genoese being the bankers of the monarchy and having entire control of its finances. Several of the younger brothers of Ambrose Spinola sought their fortune in Spain, and one of them, Frederick, distinguished himself greatly as a soldier in Flanders. The eldest brother remained at home to marry and continue the family. In 1592 he was married to Joanna Bacciadonna, daughter of the count of Galerrata. The houses of Spinola and Doria were rivals for authority within the republic. Ambrose Spinola continued the rivalry with the count of Tursi, then the chief of the Dorias. He was not successful, and having lost a lawsuit into which he had entered to enforce a right of pre-emption of a palace belonging to the Salerno family which the Dorias wished to purchase, he decided to withdraw from the city and advance the

fortunes of his house by serving the Spanish monarchy in Flanders. In 1602 he and his brother Frederick entered into a contract with the Spanish government — a " condotta " on the old Italian model. It was a speculation on which Spinola risked the whole of the great fortune of his house. Ambrose Spinola undertook to raise 9000 men for land service, and Frederick to form a squad- ron of galleys for service on the coast. Several of Frederick's galleys were destroyed by English war-ships on his way up channel. He himself was slain in an action with the Dutch on the 24th of May 1603. Ambrose Spinola marched overland to Flanders in 1602 with the men he had raised at his own expense. During the first months of his stay in Flanders the Spanish government played with schemes for employing him on an invasion of England, which came to nothing. At the close of the year he returned to Italy for more men. His actual experi- ence as a soldier did not begin till as general, and at the age of thirty-four, he undertook to continue the siege of Ostend on the 29th of September 1603. The ruinous remains of the place fell into his hands on the 22nd of September 1604. The archduke Albert and the infanta Clara Eugenia, daughter of Philip II., who then governed Flanders and had set their hearts on taking Ostend, were delighted at his success, and it won him a high reputation among the soldiers of the time. On the close of the campaign he went to Spain to arrange with the court, which was then at Valladolid, for the continuance of the war. At Valladolid he insisted on being appointed commander-in- chief in Flanders. By the 9th of April he was back at Brussels, and entered on his first campaign. The wars of the Low Countries consisted at that time almost wholly of sieges, and Spinola made himself famous by the number of places he took in spite of the efforts of Maurice of Nassau to save them. In 1606 he again went to Spain. He was received with much outward honour, and entrusted with a very secret mission to secure the government of Flanders in case of the death of the arch- duke or his wife, but he could not obtain the grandeeship which he desired, and was compelled to pledge the whole of his fortune as security for the expenses of the war before the bankers would advance funds to the Spanish government. As he was never repaid, he was in the end utterly ruined. The Spanish govern- ment began now to have recourse to devices for keeping him away from Spain. Until the signing of the twelve years' truce in 1609 he continued to command in the field with general success. After it was signed he retained his post, and had among other duties to conduct the negotiations with France when the prince of Conde fled to Flanders with his wife in order to put her beyond the reach of the senile admiration of Henry IV. of France. By 161 1 Spinola's financial ruin was complete, but he obtained the desired "

grandeza." In 1614 he had some share in the operations connected with the settlement of Cleves and Juliers, On the outbreak of the Thirty Years' War he made a vigorous campaign in the lower Palatinate and was rewarded by the grade of captain-general. After the renewal of the war with Holland in 162 1 he gained the most renowned victory of his career — the capture of Breda after a long siege (Aug. 28, 1624- June 5, 1625) and in spite of the most strenuous efforts of the prince of Orange (Frederick Henry) to save it. The surrender of Breda is the subject of the great

picture by Velasquez, known as " Las Lanzas "; the portrait of Spinola is from memory.

The taking of Breda was the culmination of Spinola's career. Utter want of money paralysed the Spanish government, and the new favourite, Olivares, was jealous of the general. Spinola could not prevent Frederick Henry of Nassau from taking Groll, a good set-off for Breda. In January 1628 he left for Spain, resolved not to resume the command in Flanders unless security was given him for the support of his army. At Madrid he had to endure much insolence from Olivares, who endeavoured to make him responsible for the loss of Groll. Spinola was resolute not to return to Flanders. Meanwhile the Spanish government added a war over the succession to the duchy of Mantua to its other burdens. Spinola was appointed as pleni- potentiary and general. He landed at Genoa on the 19th of September 1629. In Italy he was pursued by the enmity of Olivares, who caused him to be deprived of his powers as pleni- potentiary. Spinola's health broke down, and, having been robbed of his money, grudged the compensation he asked for his children and disgraced in the presence of the enemy, he died on the 25th of September 1630 at the siege of Casale, muttering the words "honour" and "reputation." The title of marquis of Los Balbases, still borne by his representa- tives in Spain, was all that his family received for the vast fortune they spent in the service of Philip III. and IV.

Don A. Rodriguez Villa has published a biography well supplied with original documents — Ambrosia Spinola, primer marques de los Balbases (Madrid, 1905). (D. H.)

SPINOLA, CRISTOVAL ROJAS DE (d. 1695), Spanish ecclesi- astic, was general of the Franciscan order in Madrid. He went to Vienna as confessor to the Spanish wife of Leopold I., and became bishop of Wienerisch-Neustadt in 1685. He endea- voured to reconcile the Protestant churches with the Roman Catholic, and at a conference at Hanover in 1683 presented his Regulae circa Christianorum,

omnium ecclesiasticum reunionem. The Helmstadt theologians, represented by Gerhard Molanus (1633-1722), at the same time put forward their MethoduS reducendae unionis. The discussions were approved by the pope and the emperor, but had no popular feeling behind them, and though the negotiations were continued for ten years, especially between Molanus on the one side and Bossuet on the other, no agreement was reached, for the Protestants could not accept the Council of Trent as authoritative or surrender the matter of communion under both species. Spinola died on the 12th of March 1695.

SPINOZA, BARUCH (1632-1677), or, as he afterwards signed himself, Benedict de Spinoza, Dutch philosopher, was born at Amsterdam on the 24th of November 1632:. His parents belonged to the community of Jewish emigrants from Portugal and Spain who, fleeing from Catholic persecution in the Penin- sula, had sought refuge in the nearly emancipated Netherlands. The name, variously written Espinoza, De Spinoza, D 'Espinoza and Despinoza, probably points to the province of Leon as the previous home of the family; there are no fewer than five town- ships so called in the neighbourhood of Burgos. The philo- sopher's grandfather appears to have been the recognized head of the Jewish community in Amsterdam in 1628, and his father, Michael Espinoza, was repeatedly warden: of the synagogue between 1630 and 1650. The father was a merchant in fair circumstances. He was thrice married and had six children- all of whom predeceased him save a daughter Rebekah, born of the first marriage, and Baruch, the son of his second wife. Spinoza's mother died in 1638 when the boy was barely six years old, and his father in 1654 when he was in his twenty-second year. Spinoza received his first training under the senior rabbi, Saul Levi Morteira, and Manasseh ben Israeli a theological writer of some eminence whose works show con- siderable knowledge of philosophical authors. Under these teachers he became familiar with the Talmud and, what was probably more important for his own development,' with the philosophical writings of Ibn Ezra and Maimonides, Levi ben Gerson, Hasdai Crescas, and other representatives of Jewish

medieval thought, who aim at combining the traditional theology with ideas got from Aristotle and his Neoplatonic commentators. Latin, still the universal language of learning, formed no part of

Jewish education; and Spinoza, after learning the elements from a German master, resorted for further in- struction to a physician named Franz van den Ende, who eked out an income by taking pupils. Van den Ende appears to have been distinctly a man of parts, though of a somewhat indiscreet and erratic character. He was eventually hanged in Paris as a conspirator in 1674. His enthusiasm for the natural sciences may have been the only ground for the reputa- tion he had acquired of instilling atheistic nations into the minds of his pupils along with the Latin which he taught them. But it is quite possible that his scientific studies had bred in him, as in many others at that time, a materialistic, or at least a naturalistic, turn of mind; indeed, we should expect as much in a man of Van den Ende's somewhat rebellious temperament. We do not know whether his influence was brought to bear in this sense upon Spinoza; but it has been suggested that the writings of Bruno, whose spirit of enthusiastic naturalism and fervid revolt against the Church would be especially dear to a man of Van den Ende's leanings, may have been put into the pupil's hand by the master. Latin, at all events, Spinoza learned to use with correctness, freedom and force, though his language does not, of course, conform to classical canons.

A romance has woven itself round Spinoza's connexion with Van den Ende's household. The physician had an only daughter, Clara Maria by name, who, besides being proficient in music, understood Latin, it is said, so perfectly that she was able to teach her father's pupils in his absence. Spinoza, the story goes, fell in love with his fair instructress; but a fellow-student, called Kerkering, supplanted him in his mistress's affections by the help of a valuable necklace of pearls which he presented to the young lady. Chronology unfortunately forbids us to accept this little episode as true. Recent investigation has proved that, while the marriage with Kerkering, or rather Kerckkrink, is a fact, it did not take place till 1671, in which year the bride, as appears by the register, was twenty-seven years of age. She cannot, therefore, have been more than eleven, or twelve in 1656, the year in which Spinoza left Amsterˆ dam ; and as Kerckkrink was seven years younger than Spinoza, they cannot well have been simultaneous pupils of Van den Ende's and simultaneous suitors for his daughter's hand. But, though the details of the story thus fall to pieces, it is still pos- sible that in the five years which followed his retirement from Amsterdam Spinoza, who was living within easy distance and paid visits to the city from time to time, may have kept up his connexion with Van den Ende, and that the attachment may have dated from this later period. This would at least be some explanation for the existence of the story; for Colerus

expressly says that Spinoza " often confessed that he meant to marry her." But there is no mention of the Van den Endes in Spinoza's correspondence; and in the whole tenor of his life and character there is nothing on which to fasten the probability of a romantic attachment.

The mastery of Latin which he acquired from Van den Ende opened up to Spinoza the whole world of modern philosophy and science, both represented at that time by the writings of Descartes. He read him greedily, says Colerus, and afterwards often declared that he had all his philosophical knowledge from him. The impulse towards natural science which he had received from Van den Ende would be strengthened by the reading of Descartes; he gave over divinity, we are told, to devote himself entirely to these new studies. His inward break with Jewish orthodoxy dated, no doubt, further back — from his acquaintance with the philosophical theologians and commentators of the middle ages; but these new interests combined to estrange him still further from the traditions of the synagogue. He was seldomer seen at its services — soon not at all. The jealousy of the heads of the synagogue was easily roused. An attempt seems to have been made to draw from him his real opinions on certain prominent points of divinity. Two so-called friends

endeavoured, on the plea of doubts of their own, to lead him into a theological discussion; and, some of Spinoza's expressions being repeated to the Jewish authorities, he was summoned to give an account of himself. Anxious to retain so promising an adherent, and probably desirous at the same time to avoid public scandal, the chiefs of the community offered him a yearly pension of 1000 florins if he would outwardly conform and appear now and then in the synagogue. But such deliberate hypocrisy was abhorrent to Spinoza's nature. Threats were equally unavailing, and accordingly on the 27th of July 1656 Spinoza was solemnly cut off from the commonwealth of Israel. The curses pronounced against him may be read in most of the biographies. While negotiations were still pending, he had been set upon one evening by a fanatical ruffian, who thought to expedite matters with the dagger. Warned by this that Amsterdam was hardly a safe place of residence for him any longer, Spinoza had already left the city before the sentence of excommunication was pronounced. He did not go far, but took up his abode with a friend who lived some miles out on the Old Church road. His host belonged to the Collegiants or Rhijnsburgers, a religious society which had sprung up among the proscribed Arminians of Holland. The pure morality and simple-minded piety of this community seem early to have attracted Spinoza, and to have

won his unfeigned respect. Several of his friends were Collegiants, or belonged to the similarly minded community of the Mennonites, in which the Collegiants were afterwards merged. In this quiet retreat Spinoza spent nearly five years. He drew up a protest against the decree of excommunication, but otherwise it left him unmoved. From this time forward he disused his Hebrew name of Baruch, adopting instead the Latin equivalent, Benedictus. Like every Jew, Spinoza had learned a handicraft; he was a grinder of lenses for optical instruments, and was thus enabled to earn an income sufficient for his modest wants. His skill, indeed, was such that lenses of his making were much sought after, and those found in his cabinet after his death fetched a high price. It was as an optician that he was first brought into connexion with Huygens and Leibnitz; and an optical Treatise on the Rainbow, written by him and long supposed to be lost, was discovered and reprinted by Dr Van Vloten in 1862. He was also fond of drawing as an amusement in his leisure hours; and Colerus had seen a sketch-book full of such drawings repre- senting persons of Spinoza's acquaintance, one of them being a likeness of himself in the character of Masaniello.

The five years which followed the excommunication must have been devoted to concentrated thought and study. Before their conclusion Spinoza had parted company from Descartes, and the leading positions of his own system were already clearly determined in his mind. A number of the younger men in Amsterdam — many of them students of medicine or medical practitioners — had also come to regard him as their intellectual leader. A kind of philosophical club had been formed, including among its members Simon de Vries, John Bresser, Louis Meyer, and others who appear in Spinoza's correspondence. Originally meeting in all probability for more thoroughgoing study of the Cartesian philosophy, they looked naturally to Spinoza for guidance, and by and by we find him communicating systematic drafts of his own views to the little band of friends and students. The manuscript was read aloud and discussed at their meetings, and any points remaining obscure were referred to Spinoza for further explanation. Ah interesting specimen of such difficulties propounded by Simon de Vries and resolved by Spinoza in accor dance with his own principles, is preserved for us in Spinoza's correspondence. This Simon de Vries was a youth of generous impulses and of much promise. Being in good circumstances, he was anxious to show his gratitude to Spinoza by a gift of 2000 florins, which the philosopher half -jestingly excused himself from accepting. De Vries died young, and would fain have left his fortune to Spinoza; but the latter refused to stand in the way

of his brother, the natural heir, to whom the property was accordingly left, with the condition that he should pay to Spinoza an annuity sufficient for his maintenance. The heir

offered to 'fix the amount at 500 florins, but Spinoza accepted only 300, a sum which was regularly paid till his death. The written communications of his own doctrine referred to above belong to a period after Spinoza had removed from the neigh- bourhood of Amsterdam; but it has been conjectured that the Short Treatise on God, on Man, and his Wellbeing, which represents his thoughts in their earliest systematic form, was left by him as a parting legacy to this group of friends. It is at least certain, from a reference in Spinoza's first letter to Oldenburg, that such a systematic exposition was in existence before Septem- ber 1661. 1 There are two dialogues somewhat loosely incorpor- ated with the work which probably belong to a still earlier period. The short appendix, in which the attempt is made to present the chief points of the argument in geometrical form, is a fore- runner of the Ethics, and was probably written somewhat later than the rest of the book. The term " Nature " is put more into the foreground in the Treatise, a point which might be urged as evidence of Bruno's influence — the dialogues, moreover, being specially concerned to establish the unity, infinity and self-containedness of Nature 2 ; but the two opposed Cartesian attributes, thought and extension, and the absolutely infinite substance whose attributes they are — substance constituted by infinite attributes — appear here as in the Ethics. The latter notion — of substance — is said to correspond exactly to " the essence of the only glorious and blessed God." The earlier differs from the later exposition in allowing an objective causal relation between thought and extension, for which there is substituted in the Ethics the idea of a thoroughgoing parallelism. The Short Treatise is of much interest to the student of Spinoza's philosophical development, for it represents, as Martineau says, " the first landing-place of his mind in its independent advance." Although the systematic framework of the thought and the terminology used are both derived from the Cartesian philosophy, the intellectual milieu of the time, the early work enables us, better than the Ethics to realize that the inspiration and starting-point of his thinking is to be found in the religious speculations of his Jewish predecessors. The histories of philo- sophy may quite correctly describe his theory as the logical development of Descartes's doctrines of the one Infinite and the two finite substances, but

Spinoza himself was never a Cartesian. He brought his pantheism and his determinism with him to the study of Descartes from the mystical theologians of his race.

Early in 1661 Spinoza's host removed to Rhijnsburg near Leiden, the headquarters of the Collegiant brotherhood, and Spinoza removed with him. The house where they lived at Rhijnsburg is still standing, and the road bears the name of Spinoza Lane. Very soon after his settlement in his new quar- ters he was sought out by Henry Oldenburg, the first secretary of the Royal Society. 3 Oldenburg became Spinoza's most

1 Various manuscript copies were apparently made of the treatise in question, hut it was not printed, and dropped entirely out of knowledge till 1852, when Edward Bohmer of Halle lighted upon an abstract of it attached to a copy of Colerus's Life, and shortly afterwards upon a Dutch MS. purporting to be a translation of the treatise from the Latin original. This was published in 1862 by Van Vloten with a retranslation into Latin. Since then a superior Dutch translation has been discovered, which has been edited by Professor Schaarschmidt and translated into German. Another German version with introduction and notes has been published by Sigwart based on a comparison of the two Dutch MSS. A scholarly English translation similarly equipped was published by A. Wolf in

1910.

2 The fact that Spinoza nowhere mentions Bruno would not imply, according to the literary habits of those days, that he was not acquainted with his speculations and even indebted to them. There is no mention, for example, of Hobbes throughout Spinoza's political writing, and only one casual reference to him in a letter, although the obligation of the Dutch to the English thinker lies on the surface. Accordingly, full weight must be allowed to the internal evidence brought forward by Sigwart, Avernarius and others to prove Spinoza's acquaintance with Bruno's writings. But the point remains quite doubtful and is in any case of little importance.

3 Heinrich Oldenburg (c. 1626-1678) was a nttive of Bremen, but had settled in England in the time of the commonwealth. Though hardly a scientific man himself, he had a genuine interest in science, and must have possessed social gifts. He was the friend of

regular correspondent — a third of the letters preserved to us are to or from him; and it appears from his first letter that their talk on this

occasion was " on God, on infinite extension and thought, on the difference and the agreement of these attri- butes, on the nature of the union of the human soul with the body, as well as concerning the principles of the Cartesian and Baconian philosophies." Spinoza must, therefore, have unbosomed himself pretty freely to his visitor on the main points of his system. Oldenburg, however, was a man of no speculative capacity, and, to judge from his subsequent corre- spondence, must have quite failed to grasp the real import and scope of the thoughts communicated to him. From one of Oldenburg's early letters we learn that the treatise De intellectus emendatione was probably Spinoza's first occupation at Rhijnsburg. The nature of the work also bears out the supposition that it was first undertaken. It is, in a manner, Spinoza's " organon " — the doctrine of method which he would substitute for the corresponding doctrines of Bacon and Descartes as alone consonant with the thoughts which were shaping themselves or had shaped themselves in his mind. It is a theory of philosophical truth and error, involving an account of the course of philosophical inquiry and of the supreme object of knowledge. It was apparently intended by the author as an analytical introduction to the constructive exposition of his system, which he presently essayed in the Ethics. But he must have found as he proceeded that the two treatises would cover to a large extent the same ground, the account of the true method merging almost inevitably in a statement of the truth reached by its means. The Improvement of the Understanding was therefore put aside unfinished, and was first published in the Opera posthuma. Spinoza meanwhile concentrated his attention upon the Ethics, and we learn from the correspondence with his Amsterdam friends that a consider- able part of book i. had been communicated to the philosophical club there before February 1663. It formed his main occupation for two or three years after this date. Though thus giving his friends freely of his best, Spinoza did not cast his thoughts broadcast upon any soil. He had a pupil living with him at Rhijnsburg whose character seemed to him lacking in solidity and discretion. This pupil (probably Albert Burgh, who after- wards joined the Church of Rome and penned a foolishly insolent epistle to his former teacher) was the occasion of Spinoza's first publication — the only publication indeed to which his name was attached. Not deeming it prudent to initiate the young man into his own system, he took for a textbook the second and third parts of Descartes's Principles, which deal in the main with natural philosophy. As he proceeded he put Descartes's matter in his own language and cast the whole argument into a geometric form. At the request of his friends he devoted a fortnight to applying the same method to the first or metaphysical part of Descartes's philosophy, and the sketch was

published in 1663, with an appendix entitled Cogitata metaphysica, still written from a Cartesian standpoint (defending, for example, the freedom of the will), but containing hints of his own doctrine. The book was revised by Dr Meyer for publication and furnished by him, at Spinoza's request, with a preface in which it is expressly stated that the author speaks throughout not in his own person but simply as the exponent of Descartes. A Dutch translation appeared in the following year. 4

In 1663 Spinoza removed from Rhijnsburg to Voorburg, a suburban village about 2 m. from the Hague. His reputa- tion had continued to spread. From Rhijnsburg he had paid frequent visits to the Hague, and it was probably the desire

Boyle, and acquainted with most of the leaders of science in England as well as with many on the Continent. He delighted to keep him- self in this way au courant with the latest developments, and lost no opportunity of establishing relations with men of scientific reputa- tion. It was probably at the suggestion of Huygens that he bent his steps towards Spinoza's lodging.

4 The tjtle of the Latin original ran — Renati des Cartes princi- pioruin philosophiae pars i. et ii. more geoinetrico demonstratae per Benedictum de Spinoza Amstelodamensem. Accesserunt ejusdem cogitata metaphysica.

to be within reach of some of the friends he had made in these visits — among others the De Witts — that prompted his changed residence. He had works in hand, moreover, which he wished in due time to publish ; and in that connexion the friendly patron- age of the De Witts might be of essential service to him. The first years at Voorburg continued to be occupied by the com- position of the Ethics, which was probably finished, however, by the summer of 1665. A journey made to Amsterdam in that year is conjectured to have had reference to its publication. But, finding that it would be impossible to keep the authorship secret, owing to the numerous hands through which parts of the book had already passed, Spinoza determined to keep his manu- script in his desk for the present. In September 1665 we find Oldenburg twitting him with having turned from philosophy to theology and busying himself with angels, prophecy and miracles. This is the first reference to the Tractatus theologico- politicus, which

formed his chief occupation for the next four years. The aim of this treatise may be best understood from the full title with which it was furnished — Tractatus theologico- politicus, continens dissertationes aliquot, quibus ostenditur libertatem philosophandi non tantum salva pielate et reipublicae pace posse concedi sed eandem nisi cum pace reipublicae ipsaque pielate tolli non posse. It is, in fact, an eloquently reasoned defence of liberty of thought and speech in speculative matters. The external side of religion — its rites and observances — must of necessity be subject to a certain control on the part of the state, whose business it is to see to the preservation of decency and order. But, with such obvious exceptions, Spinoza claims com- plete freedom of expression for thought and belief; and he claims it in the interests alike of true piety and of the state itself. The thesis is less interesting to a modern reader — because now gener- ally acknowledged — than the argument by which it is supported. Spinoza's position is based upon the thoroughgoing distinction drawn in the book between philosophy, which has to do with knowledge and opinion, and theology, or, as we should now say, religion, which has to do exclusively with obedience and conduct. The aegis of religion, therefore, cannot be employed to cover with its authority any speculative doctrine; nor, on the other hand, can any speculative or scientific investigation be regarded as putting religion in jeopardy. Spinoza undertakes to prove his case by the instance of the Hebrew Scriptures. Scripture deals, he maintains, in none but the simplest precepts, nor does it aim at anything beyond the obedient mind; it tells nought of the divine nature but what men may profitably apply to their lives. The greater part of the treatise is devoted to working out this line of thought; and in so doing Spinoza consistently applies to the interpretation of the' Old Testament those canons of historical exegesis which are often regarded as of compara- tively recent growth. The treatise thus constitutes the first document in the modern science of Biblical criticism. It was published in 1670, anonymously, printer and place of publication being likewise disguised (Hamburgi apud Heinricum Kiinraht). The storm of opposition which it encountered showed that these precautions were not out of place. It was synodically condemned along with Hobbes's Leviathan and other books as early as April 1671, and was consequently interdicted by the states-general of Holland in 1674; before long it was also placed on the Index by the Catholic authorities. But that it was widely read appears from its frequent reissue with false title-pages, representing it now as an historical work and again as a medical treatise. Controversialists also crowded into the lists against it. A translation into Dutch appears to have been proposed; but Spinoza, who foresaw that such a

step would only increase the commotion which was so distasteful to him, steadily set his face against it. No Dutch translation appeared till 1693.

The same year in which the Tractatus was published Spinoza removed from his suburban lodging at Voorburg into the Hague itself. He took rooms first on the Veerkay with the widow Van de Velde, who in her youth had assisted Grotius to escape from his captivity at Loewenstein. This was the house afterwards occupied by Colerus, the worthy Lutheran minister who became Spinoza's biographer. But the widow

insisted on boarding her lodger, and Spinoza presently found the expense too great for his slender purse. He accordingly removed to a house on the Pavelioen Gracht near at hand, occupied by a painter called Van der Spijck. Here he spent the remaining years of his life in the frugal independence which he prized. Colerus gives particulars which enable us to realize the almost incredible simplicity and economy of his mode of life. He would say sometimes to the people of the house that he was like the serpent which forms a circle with its tail in its mouth, meaning thereby that he had nothing left at the year's end. His friends came to visit him in his lodgings, as well as others attracted by his reputation — Leibnitz among the rest — ■ and were courteously entertained, but Spinoza preferred not to accept their offers of hospitality. He spent the greater part of his time quietly in his own chamber, often having his meals brought there and sometimes not leaving it for two or three days together when absorbed in his studies. On one occasion he did not leave the house for three months. " When he happened to be tired by having applied himself too much to his philosophical meditations, he would go downstairs to refresh himself, and discoursed with the Van der Spijcks about anything that might afford matter for an ordinary conversation, and even about trifles. He also took pleasure in smoking a pipe of tobacco; or, when he had a mind to divert himself somewhat longer, he looked for some spiders and made them fight together, or he threw some flies into the cobweb, and was so well pleased with the result of that battle that he would sometimes break into laughter" (Colerus). He also conversed at times on more serious topics with the simple people with whom he lodged, often, for example, talking over the sermon with them when they came from church. He occasionally went himself to hear the Lutheran pastor preach — the pre- decessor of Colerus — and would advise the Van der Spijcks not to miss any sermon of so excellent a preacher. The children, too, he put in mind of going often to church, and taught them to be obedient and dutiful to their parents. One day his land-

lady, who may have heard strange stories of her solitary lodger, came to him in some trouble to ask him whether he believed she could be saved in the religion she professed. " Your religion is a good one," said Spinoza; " you need not look for another, nor doubt that you will be saved in it, provided that, while you apply yourself to piety, you live at the same time a peaceable and quiet life." Only once, it is recorded, did Spinoza's admir- able self-control give way, and that was when he received the news of the murder of the De Witts by a frantic mob in the streets of the Hague. It was in the year r672, when the sudden invasion of the Low Countries by Louis XIV. raised an irresis- tible clamour for a military leader and overthrew the republican constitution for which the De Witts had struggled. John De Witt had been Spinoza's friend, and had bestowed a small pension upon him; he had Spinoza's full sympathy in his political aims. On receiving the news of the brutal murder of the two brothers, Spinoza burst into tears, and his indignation was so roused that he was bent upon publicly denouncing the crime upon the spot where it had been committed. But the timely caution of his host prevented his issuing forth to almost certain death. Not long after Spinoza was himself in danger from the mob, in consequence of a visit which he paid to the French camp. He had been in correspondence with one Colonel Stoupe, a Swiss theologian and soldier, then serving with the prince of Conde, the commander of the French army at Utrecht. From him Spinoza received a communication enclosing a passport from the French commander, who wished to make his acquaintance and promised him a pension from the French king at the easy price of a dedication to his majesty. Spinoza went to Utrecht, but returned without seeing Conde, who had in the meantime been called elsewhere; the pension he civilly declined. There may have been nothing more in the visit than is contained in this narrative; but on his return Spinoza found that the popu- lace of the Hague regarded him as no better than a spy. The town was full of angry murmurs, and the landlord feai'ed that the mob would storm his house and drag Spinoza out. Spinoza

quieted his fears as well as he could, assuring him that as soon as the crowd made any threatening movement he would go out to meet them, 1C though they should serve me as they did the poor De Witts. I am a good republican and have never had any aim but the honour and welfare of the state." Happily the danger passed off without calling for such an ordeal.

In 1673 Spinoza received an invitation from the elector palatine to quit his retirement and become professor of philo- sophy in the university of Heidelberg. The offer was couched in flattering terms, and conveyed an express assurance of " the largest freedom of speech in philosophy, which the prince is confident that you will not misuse to disturb the established religion." But Spinoza's experience of theological sensitiveness led him to doubt the possibility of keeping on friendly terms with the established religion, if he were placed in a public capa- city. Moreover, he was not strong; he had had no experience of public teaching; and he foresaw that the duties of a chair would put an end to private research. For all these reasons he courteously declined the offer made to him. There is little more to tell of his life of solitary meditation. In 1675 we learn from his correspondence that he entertained the idea of publishing the Ethics, and made a journey to Amsterdam to arrange matters with the printer. " But, whilst I was busy with this," he writes, " the report was spread everywhere that a certain book of mine was in the press, wherein I endeavoured to show that there was no God; and this report found credence with many. Whereupon certain theologians (themselves perhaps the authors of it) took occasion to complain of me to the prince and the magistrates; moreover, the stupid Cartesians, because they are commonly supposed to side with me, desiring to free them- selves from that suspicion, were diligent without ceasing in their execrations of my doctrines and writings, and are as diligent still." As the commotion seemed to grow worse instead of subsiding, Spinoza consigned the manuscript once more to his desk, from which it was not to issue till after his death. His last literary work was the unfinished Tractatus politicus and the preparation of notes for a new edition of the Tractatus theologico-politkus, in which he hoped to remove some of the misunder- standings which the book had met with. The Tractatus politicus develops his philosophy of law and government on the lines indicated in his other works, and connects itself closely with the theory enunciated by Hobbes a generation before. Consump- tion had been making its insidious inroads upon Spinoza for many years, and early in 1677 he must have been conscious that he was seriously ill. On Saturday, the 20th of February, he sent to Amsterdam for his friend Dr Meyer. On the following day, the Van der Spijcks, having no thought of immediate danger, went to the afternoon service. When they came back Spinoza was no more; he had died about three in the afternoon with Meyer as the only witness of his last moments. Spinoza was buried on the 25th of February "in the new church upon the Spuy, being attended," Colerus tells us, " by many illustrious persons and followed by six coaches." He was little more than forty-

four years of age.

Spinoza's effects were few and realized little more than was required for the payment of charges and outstanding debts. " One need only cast one's eyes upon the account," says his biographer, " to perceive that it was the inventory of a true philosopher. It contains only some small books, some engravings, a few lenses and the instruments to polish them." His desk, containing his letters and his unpublished works, Spinoza had previously charged his landlord to convey to Jan Rieuwertz, a publisher in Amsterdam. This was done, and the Opera posthuma appeared in the same year, without the author's name, but with his initials upon the title- page. They were furnished with a preface written in Dutch by Jarig Jellis, a Mennonite friend of Spinoza's, and translated into Latin by Dr Meyer. Next year the book was proscribed in a violently worded edict by the states of Holland and West Friesland. The obloquy which thus gathered round Spinoza in the later years of his life remained settled upon his memory for a full hundred years after his death. Hume's casual allusion to " this famous atheist " and his " hideous hypothesis " is a fair specimen of the tone in which he is usually referred to; people talked about Spinoza, Lessing said, " as if he Were a dead dog." The change of opinion in this respect may be dated from Lessing's famous conversation with Jacobi in 1780. Lessing, Goethe, Herder, Novalis and

Schleiermacher, not to mention philosophers like Schelling and Hegel, united in recognizing the unique strength and sincerity of Spinoza's thought, and in setting him in his rightful place among the specula- tive leaders of mankind. Transfused into their writings, his spirit has had a large share in moulding the philosophic thought. of the 19th century, and it has also been widely influential beyond the schools. Instead of his atheism Hegel speaks of his acosmism, and Novalis dubs him a God-intoxicated man. Schleiermacher's fine apostrophe is well known, in which he calls upon us to " offer a lock of hair to the manes of the holy and excommunicated Spinoza."

Spinoza's personal appearance is described by Colerus from the accounts given him by many people at the Hague who knew him familiarly. " He was of a middle size, and had good features in his face, the skin somewhat dark, black curled hair, and the long eyebrows of the same colour, so that one might easily know from his looks that he was descended from the Portuguese Jews." Leib- nitz also gives a similar description: " The celebrated Jew Spinoza had an olive complexion and something Spanish in his face." These characteristics are preserved in a portrait in oil in the Wolfenbiittel

library, which was probably the original of the (in that case unsuccessfully rendered) engraving prefixed to the Opera posthuma of 1677. This portrait was photographed for Dr Martineau's Study of Spinoza. In 1880 a statue was erected to Spinoza at the Hague by international subscription among his admirers, and more recently the cottage in which he lived at Rhijnsburg has been restored and furnished with all the discoverable Spinoza relics.

Spinoza's philosophy is a thoroughgoing pantheism, which has both a naturalistic and a mystical side. The foundation of the system is the doctrine of one infinite substance, of which all finite existences are modes or limitations (modes of thought or modes of extension). God is thus the immanent cause of the universe; but of creation or will there can be no question in Spinoza's system. God is used throughout as equivalent to Nature (Deus sive natura). The philosophical standpoint comprehends the necessity of all that is — a necessity that is none other than the necessity of the divine nature itself. To view things thus is to view them, according to Spinoza's favourite phrase, sub specie aeternitatis. Spinoza's philo- sophy is fully considered in the article Cartesianism.

Literature. — The contents of the Opera posthuma included the Ethics, the Tractatus politicus and the De intellectus emendatione (the last two unfinished), a selection from Spinoza's correspondence, and a Compendium of Hebrew Grammar. The Treatise on the Rainbow, supposed to be lost, was published anonymously in Dutch in 1687. The first collected edition of Spinoza's works was made by Paulus in 1802; there is another by Gfrorer (1830), and a third by Bruder (1843-1846) in three volumes. Van Vloten's volume, published in 1862, Ad Benedicti de Spinoza opera quae supersunt omnia supplementum, is uniform with Bruder's edition, and contains the early treatise De deo el homine, the Treatise on the Rainbow, and several fresh letters. A complete edition undertaken by Dr Van Vloten and Professor J. P. N. Land for the Spinoza Memorial Committee formed in Holland to celebrate the bicentenary of the philosopher's death appeared in 1882 and was reissued in three volumes in 1895. An English translation of The Chief Works of Spinoza, by R. H. M. Elwes, appeared in 1883, and translations of the Ethics and the De intellectus emendatione were published in 1883 and 1895 by W. Hale White; A. Wolf's translation of the Short Treatise appeared in 1910; previous translations were unscholarly in execution.

The main authority for Spinoza's life is the sketch published in 1705, in Dutch, with a controversial sermon against Spinozism, by Johannes Colerus. The French version of this Life (1706) has been

several times reprinted as well as translated into English and German. The English version, also dating from 1706, was reprinted by Sir Frederick Pollock at the end of his Spinoza, his Life and Philosophy (1880). This book, Dr Martineau's Study of Spinoza (1882) and Dr John Caird's Spinoza (1888), are all admirable pieces of work, and, as regards the philosophical estimate, complement one another. H. H. Joachim's Study of the Ethics of Spinoza (1901) and R. A. Duff's Spinoza's Political and Ethical Philosophy (1903) are important contributions of more recent date. Careful research by Professor Freudenthal, Dr W. Meyer and Dr K. O. Meinsma has recently brought to light a number of fresh details connected with Spinoza's life and increased our knowledge of his Jewish and Dutch environment. The earliest lives and all the available documents have been edited by Freudenthal in a single volume, Die Lebens- geschichte Spinozas (1899), on the basis of which he has since rewritten the Life, Spinozas Leben ttnd Lehre, vol. i., Das Leben (1904). Meinsma's Spinoza und en zijn Kring (1896) appeared in a German translation in 1909. The new material has been judicially used by A. Wolf in the " Life " prefixed to his translation of the Short Treatise (1910), and the greater part of it also in the second edition of Sir Frederick Pollock's Spinoza (1899). (A. S. P.-P.)

SPINY SQUIRREL, a book-name for a group of African ground squirrels, characterized by the spiny nature of the fur of the more typical forms. They form the genus Xerus, which is split up into a number of subgenera; Xerus rutilus of Abyssinia and East Africa belonging to the typical group, while the striped

North African X. getulus represents the sub-genus Atlanlo- xerus. The more typical species are characterized by the coarse spiny hair, the small size, or even absence of the ears, and the long, nearly straight, claws. The skull is narrower and longer than in typical squirrels, and there are distinctive features in the cheek-teeth; but the more aberrant types come much closer to squirrels. Typical spiny squirrels differ from true squirrels in being completely terrestrial in their habits, and live either in clefts or holes of rocks, or in burrows which they dig themselves. (See Rodentia.)

SPION KOP, a mountain in Natal on the north side of the Tugela River, and 24 m. W.S.W. of Ladysmith. It is celebrated as the scene

of a battle (Jan. 24, 1900) in the Transvaal War, in which the British forces under Sir Redvers Bullcr were defeated by the Boers (see Transvaal and Ladysmith). The Spion Kop incident led to much controversy; for an admirable elucidation of the facts see The Times History of the War in South Africa. The name itself (Dutch for " Look-out Hill ") is fairly common as a place-name in South Africa.

SPIRAL, in mathematics, the locus of the extremity of a line (01 radius vector) which varies in length as it revolves about a fixed point (or origin). Here we consider some of the more important plane spirals. Obviously such curves are con- veniently expressed by polar equations, i.e. equations which directly state a relation existing between the radius vector and the vector angle; another form is the " p, r " equation, wherein r is the radius vector of a point, and p the length of the perpendicular from the origin to the tangent at that point.

The equiangular or logarithmic spiral (fig. 1) is such that as the vectoF angle increases arithmetically, the radius vector increases

*flG3. "**

geometrically; this definition leads to an equation of the form r — Aeˆ, where e is the base of natural logarithms and A, B are constants. Another definition is that the tangent makes a constant angle (a, say) with the radius vector; this leads to p — r sin o. This curve has the property that its positive pedals, inverse, polar reciprocal and evolutes are all equal equiangular spirals. A group of spirals are included in the " parabolic spirals " given by the equation r = aO"; the more important are the Archimedean spiral, r — a6 (fig. 2) ; the hyperbolic or reciprocal spiral, r = a(?~i (fig. 3) ; and the lituus, r = ad~i (fig. 4). The first-named was discovered by Conon, whose studies were completed by Archimedes. Its " p, r " equation is p = r 2 /V (a 2 +r 2), and the angle between the radius vector and the tangent equals the vector angle. The second, called hyperbolic on account of the analogy of its equation (polar) to that (Cartesian) of a hyperbola between the asymptotes, is the inverse of the Archime- dean. Its p, r equation is p~ 2 =r~i--a~, and it has an asymptote at the distance a above the initial line. The lituus has the initial line as asymptote. Another group of spirals — termed Cotes's spirals — appear as the path of a particle moving under the influence of a central force varying as the inverse cube of the distance (see Mechanics). Their general equation is p~? = Ar~' + B,in which A and B can have any values. If B =0, we have p = rˆ A, and the locus is the equiangular spiral. If A = i we have p~2=r~z--*

B, which leads to the polar equation r0 = i/VB, i.e. the reciprocal spiral. The more general investigation is as follows: Writing u = r~i we have p~ 2 =Au 2 + B, and since p- 2 = u 2 + (du/d8) 2 (see Infinitesimal Calculus), then Au 2 + B=u 2 + (du/d0) 2 , i.e. (du/de) 2 = (A-i)u 2 + B. The right-hand side may be written as C 2 (u 2 + D r), C 2 (zt 2 — D 2), C 2 (D 2 — m 2) according as A — I and B are both positive, A — I positive and B negative, and as A — 1 negative and B positive. On integration these three forms yield the polar equations u = C sin hDO, w = C cos hDe, and k = C sin D6. Of interest is the spiral r = a0 2 /(8 2 — i), which has the circle r = a as an asymptote in addition to a linear asvmptote

SPIRE (O. Eng. spir, a blade of grass, and so anything tapering to a point), the architectural term (Fr. fleche, Ital. guglia, Ger.

spitze) given to the lofty roofs in stone or wood covered with lead or slate, which crown the towers of cathedrals, churches, &c. In their origin, as in the church of Thaon in Normandy, they were four-sided roofs of slight elevation, but soon began to be features of great importance, becoming lofty pyramids generally of octagonal form, and equal in height sometimes to the towers themselves. The junction, however, of an octa- gonal spire and a square tower involved a distinct architectural problem, and its solutions in English, French and German spires are of infinite variety. One of the earliest treatments is that of the south-west tower of Chartres Cathedral, where, on the four projecting angles are lofty spire lights which, with others on the four faces and the octagonal spire itself, form a fine composition; at the abbey of St Denis the spire light at each angle was carried on three columns which filled better the three- cornered space at the angles and gave greater lightness to the structure; long vertical slits in the spire lights and the spire increased this effect, leading eventually to the introduction of tracery throughout the spire; the ultimate results of this we see in the lace-work spires of Strassburg, Antwerp, St Stephen's at Vienna, Freiberg, Ulm and other examples, which in some cases must be looked upon as the tours de force of the masons employed. In England the spires were far less pre- tentious but of greater variety of form. The spire of the cathe- dral at Oxford (1220) is perhaps the earliest example; it is of comparatively low elevation, of octagonal form with marked entasis, and is decorated with spire lights on each face and pinnacled turrets at the angles. Those which are peculiar to England are the broach-spires, in which the four angles of the tower are covered with a stone roof which penetrates the central, octagonal spire. In the best examples the spire comes down on the tower with dripping eaves, and is carried on a corbel table, of which the finest solution is St Mary's

at Stamford. The angles of the octagonal spire have a projecting moulding which is stopped by a head just above the corbel table, and at the top of the broach is a small niche with a figure in it; the spire lights are in three stages alternately in the front and dia- gonal faces. At St Mary, Kelton, and St Nicholas, Walcot, are similar designs. Seen, however, on the diagonal, the void space at the angles of these broach-spires is noticeable, so that an octagonal pinnacle was erected, of which the earliest example is that of the cathedral at Oxford, where the broach was of very low pitch. Of later date St Mary's, Wollaston, All Saints, Leighton Buzzard, and St Mary's, Witney, are good examples. As a rule the broach penetrates the octagonal spire about one- sixth or one-seventh up its height, but there is one instance in St Nicholas, Cotsmere, in Rutlandshire, where it rises nearly half the way up the octagonal spire. W T hen the parapet or battle- ment (the latter being purely decorative) took the place of the dripping eaves, the broach disappeared, and octagonal turrets occupy the corners, as in St Peter's at Kettering and Oundle, Northamptonshire, and in All Saints, Stamford, Lincolnshire. The next combination perhaps followed from this; in order to connect the angle tower or pinnacle with the spire, a flying buttress was thrown across, thus filling the gap between them; of this St James's, at Louth, in Lincolnshire, may be taken as a fine type; it belongs to the Perpendicular period and is further enriched with crockets up each angle of the spire; the same is found in St Mary's, Whittlesea, Cambridgeshire. At St Michael's, Coventry, the lower part of the octagonal spire is made vertical with a battlemented cresting round it. In St Patrick's, Partington, Yorkshire, the lower part of the spire, which otherwise is plain, is enclosed with an open gallery like the cresting of a crown. Sometimes the upper storey of the tower is made octagonal, and is set back so as to allow of a passage round with parapet or battlement, as at St Mary's, Bloxham, St Peter and St Paul, Seton, and St Mary, Castlegate, York. The most important groupings are those which surmount the towers of the English cathedrals; at Lichfield square turrets of large size with richly crocketed pinnacles; at Peterborough, a peculiar but not happy arrangement where a lofty spire covers over the buttress between angle turret and spire; and at

Salisbury an octagonal pinnacle at the angle and a triangular spire light against the spire. The happiest combination of all, however, is perhaps the spire of St Mary's, Oxford, with three ranges of angle

niche-groups set one behind the other, forming with the centre spire a magnificent cluster of spires; the niche gables and pinnacles are all enriched with crockets and the ball flower in the arch mouldings.

Reference has already been made to two of the French spires, at Chartres and St Denis; there is nothing like the diversity of design in France, however, when compared with those in England, and there are but few on the crossing of nave and transept; the towers were built to receive them, as at Amiens, Reims and Beauvais, but for some reason not carried above the roof, possibly from some doubt as to the expediency of raising stone lanterns and spires of great weight on the four piers of the crossing; on the other hand their places were taken by constructions in timber covered with lead, of immense height and fine design. There was a 13th-century fleche on the crossing of Notre-Dame, Paris, taken down soon after the beginning of the 19th century, of which the existing example by Viollet-le- Duc is a copy. The same fate befell that over the Sainte Chapelle, Paris, being reconstructed about 1850 by Lassus. The fleche at Amiens, though of late date (c. 1500), is still in good preservation and is a remarkable work; above the ridges of the roofs of nave and transept, and octagonal in plan, are two stages, the upper one set back to allow of a passage round, and, above the cresting of the latter, a lofty octagonal spire with spire lights at the base on each side, crockets up the angles, and other decorations in the lead work with which it is covered. Including the vane, from the ridge of roof the height is 182 ft. Of timber fleches covered with slates there are many examples in the north of France, those at Orbais (Marne) and the abbey at Eu (Seine Inferieure) being the best known. Returning to stone spires, those on the west front of St Stephen's, Caen (Abbaye-aux-Hommes), are good examples with lofty octagonal turrets and pinnacles at west angle and spire light between, and among others are those of St Pierre at Caen, Senlis, Cou- tances, Bayeux, and many others in Calvados, and at Soissons, Noyon and Laon in Picardy. One of the most beautiful spires in France, though of late date, is that of the north-west tower to Chartres Cathedral. In the south of France, in the Charente and Perigord, the stone spire takes quite another form, being of much less height, of convex form, and studded with small scales, giving somewhat the appearance of a pine cone, with small pinnacles also with scales, and carried on a group of shafts at the angles of the tower. The west tower of Angouleme Cathe- dral, the central towers of Saintes Le Palud, and Plassac in the Charente, and the tower of St Front, Perigueux, and Brantome in Perigord, have all spires of this kind, of which a small example crowns the Lanterne des Morts at Cellefrouin. The German towers

are generally covered with roofs only, of varied form, but at Ulm, Strassburg, Freiburg and Cologne is a remarkable series of traceried spires in stone, of great elaboration and show- ing great masonic ability, but wanting in repose and solidarity, and the same applies to the spire at Antwerp. In Spain there are not many examples of note, the spire at Burgos suggesting in its outline and want of height the influence of the Perigordian spires, and that at Salamanca the influence of those in the north of France.

Looking upon the spire as the crowning feature of a tower, those of the Renaissance period must be included here, though as a compromise they are often termed " steeples." Of these the finest and most varied are those by Wren in London, among which that of Bow Church and St Bride's, Fleet Street, are the best known, the former with two stages of lanterns with de- tached columns round, and the latter octagonal on plan with five stages, set one behind the other, with arches in centre of each face and pilasters at the angles. St Antholin, now de- stroyed, was the only example based on a Gothic prototype; it consisted of an octagonal spire with Renaissance spire lights and angle finials resting on the upper octagonal storeys of the tower. St Margaret Pattens somewhat resembles it, but the

tower has a balustrade round and the angle pinnacles are in the form of obelisks, a favourite Renaissance interpretation of the Gothic finial, which is found in other churches, as in those of St Martins-in-the-Fields by Gibbs and St Giles-in-the-Fields by Flitcroft. Hawksmoor apparently based his spire of St George's, Bloomsbury, which consists of a series of lofty steps, and is crowned with a statue of George I., on that of the mausoleum at Halicarnassus. In France, Italy and Spain, lanterns usually terminate the towers. The spire of the Seo at Saragossa in design somewhat resembles those of Wren, being one of the few examples worth noting. (R. P. S.)

SPIRE LIGHT (Fr. lucarne), the term given to the windows in a spire which are found in all periods of English Gothic architecture, and in French spires form a very important feature in the composition. There is an early example in the spire of the cathedral at Oxford; they are not glazed, and have occasion- ally, if of large size, transoms to strengthen the mullions.

SPIRES (Ger. Speyer or Speier), a town and episcopal see of Germany, capital of the Bavarian palatinate, situated on the left bank of the Rhine, at the mouth of the Speyerbach, 16 m. S. of Mannheim by rail. Pop. (1905), 21,823. The principal streets are broad but irregular, and the general appearance of the town little

corresponds to its high antiquity, owing to the fact that it was burned by the French in 1689. The only impor- tant ancient building that survived the flames is the cathedral, a very large and imposing basilica of red sandstone, and one of the noblest examples of Romanesque architecture now extant. Beyond the general interest attaching to it as one of the old Romanesque churches of the Rhineland, Spires Cathedral has a peculiar importance in the history of architecture as probably the earliest Romanesque basilica in which the nave as well as the side arcades was vaulted from the first (see Architecture: Romanesque in Germany). Built in 1030-1061 by Conrad II. and his successor, this church has had a chequered history, its disasters culminating in 1689, when the soldiers of Louis XIV. burned it to the bare walls, and scattered the ashes of the eight German emperors who had been interred in the king's choir. Restored in 1772-1784 and provided with a vestibule and facade, it was again desecrated by the French in 1794; but in 1846-1853 it was once more thoroughly restored and adorned in the interior with gorgeous frescoes at the expense of the king of Bavaria. The large cathedral bowl (Domnapf) in front of the west facade formerly marked the boundary between the episcopal and municipal territories. Each new bishop on his election had to fill the bowl with wine, while the burghers emptied it to his health. The heathen tower to the east of the church, on founda- tions supposed to be Roman, was probably part of the town-wall built in 1080 by Bishop Rudger. Of the Retscher, or imperial palace, so called because built after the model of the Hradschin at Prague, only a mouldering fragment of wall remains. It was in this palace that the famous Diet of Spires met in 1529, at which the Reformers first received the name of Protestants. The Altportel {alia porta), a fine old gateway of 1246, is a relic of the free imperial city. Among the modern buildings are several churches and schools, a museum and picture gallery, &c. Spires, although rebuilt in 1697, has never recovered from the injuries inflicted by the French in 1689. Its trade is in- significant, although it still has a free harbour on the Rhine. Its manufactures include cloth, paper, tobacco and cigars, sugar, sugar of lead, vinegar, beer and leather. Vines and tobacco are grown in the neighbourhood.

Spires, known to the Romans as Augusta Nemetum or Nemetae, and to the Gauls as Noviomagus, is one of the oldest towns on the Rhine. The modern name appears first under the form of Spira, about the 7th century. Captured by Julius Caesar in 47 B.C., it was repeatedly destroyed by the barbarian hordes in the first few centuries of the Christian era. The town had become an episcopal seat in the 4th century; but heathenism supervened, and the present bishopric dates

from 610. In 830 Spira became part of the Frankish Empire, the emperors having a " palatium " here; and it was especially favoured by the Salie imperial house. The contentions between the bishops and the

citizens were as obstinate and severe as in any other city of Germany. The situation of the town opposite the mouths of several roads through the Rhine valley early fostered its trade; in 1294 it rose to be a free imperial city, although it owned no territory beyond its walls and had a population of less than 30,000. It enjoyed great renown as the seat of the imperial supreme court from 1527 till 1689; it was fifth among the free cities of the Rhine, and had a vote in the Upper Rhenish Diet. Numerous imperial diets assembled here. From 1801 till 1814 it was the capital of a department of France; but it was restored to Bavaria in the latter year. By the Peace of Spires in 1544 the Habsburgs renounced their claims to the crown of Sardinia. SPIRITS. 1 The original meaning of the word spirit (Lat. spiritus, from spirare) was wind in motion, breath, the soul, and hence it came to denote that which gives life or vigour to the human body and other objects, and it is, therefore, synonymous with everything eminently pure, ethereal, refined or distilled. In popular chemical nomenclature the term " spirit " in its former sense is still occasionally encountered, for instance, " spirits of salts " for hydrochloric acid. The spirits of the British Phar- macopoeia {e.g. sp. aetheris nilrosi; sp. chlorojormi; sp. cam- phorae) are solutions of various substances obtained either by distilling these with, or dissolving them in, the rectified spirit of the Pharmacopoeia, which latter is pure alcohol with 16% by weight of water.

In the modern sense, spirits may be broadly defined as the pro- ducts resulting from the distillation of saccharine liquids which have undergone alcoholic fermentation. Spirits of wine means rectified spirit of a strength of 43 degrees over proof and upwards. By rectified spirit is meant spirit rectified at a licensed rectifier's premises. Proof spirit, which is the standard spirit of the United Kingdom, is legally defined (58 Geo. III. c. 28) as a spirit which at 51° F. weighs exactly twelve-thirteenths of the weight of an equal volume of distilled water. The strength of proof spirit at 6o° F. — the temperature now generally employed for official calculations — is now officially regarded as being equal to a spirit containing 57-06% by volume, or 49-24% by weight, of absolute alcohol. Spirit which

possesses a greater or smaller alcoholic strength than proof is described as being so many degrees over or under proof, as the case may be. The strength is legally estimated by Sykes's hydrometer, which was legalized in 1816 by 56 Geo. III. c. 40. The degrees " over " or " under " proof as ascertained by Sykes's hydrometer are arbitrary percentages by volume of a standard spirit contained in the spirit under examination. This standard spirit is proof spirit. For example, by a spirit of strength 75-25 degrees over proof (absolute alcohol) is meant a spirit of such a strength that 100 volumes of the same contain an amount of spirit equal to 175-25 volumes of the standard (proof) spirit. A spirit of 25 degrees under proof is one of which 100 volumes contain only as much alcohol as do 75 {i.e. 100 —25) volumes of proof spirit. According to Nettleton, " proof spirit " would appear to be the outcome of an attempt to pro- duce a mixture of pure alcohol and water, containing equal weights of the constituents. The term " proof " probably originated from a rough test for spirituous strength formerly employed, which consisted in moistening gunpowder with the spirit and applying a light. If the gunpowder did not ignite, but the spirit merely burned away, the spirit was regarded as being under proof, i.e. it contained so much water that the gunpowder became moist and refused to deflagrate. The basis of the standard of other countries is almost invariably the unit volume of absolute alcohol, the hydrometers, orjather" alcoholo- meters " — such as those of Gay-Lussac and of J. G. Tralles — employed indicating the exact quantity of alcohol in a mixture at a standard temperature, in percentages by volume. In the United States the term " proof " is also employed, American proof spirit being a spirit which contains 50% of alcohol by volume at 6o° F. American " proof " spirit is, therefore, considerably weaker than British " proof." Allowing for this difference and also for the fact that the American standard 1 For the sense of disembodied persons, see Spiritualism.

gallon (which is really the old English wine-gallon) is equal to 0-833 of an imperial gallon, the American " proof " gallon roughly equals 0-73 of a British proof gallon.

Historical. — The art of distillation, more particularly the preparation of distilled alcoholic fluids for beverage and medi- cinal purposes, is of very ancient origin. It is probable that the art of making spirits was well known many centuries before

Fig. I. — Ancient form of Still, Fig. 2. — Ancient form of Still, used in China. used in Central India.

the advent of the Christian era. According to T. Fairley, the Chinese distilled liquor " sautchoo " was known long before the Christian era, and " arrack " was made in India at a date as remote as 800 B.C. Aristotle in his Meteorology (lib. ii. ch. ii.) says " Sea- water can be rendered potable by distillation: wine and other liquids can be sub- mitted to the same process. After they have been converted into humid vapours they return to liquids. " There is, on the whole, little doubt that spirits were manufactured in Egypt, India, China, and the Far East generally, as far back as 2000 B.C. Figs. 1-4 (from More- wood's Inebriating Liquors,

Fig. 3. — Ancient form of Still, used in Tibet.

published in 1838) show very ancient forms of stills in use in China, India, Tibet and Tahiti.

As far as can be ascertained the oldest reference to the pre- paration of a distilled spirituous liquor in the British Isles is contained in the " Mead Song " written by the Welsh bard, Taliesin, in the 6th cen- tury. He said " Mead distilled I praise, its eulogy is everywhere," &c. (Fairley, The Ana- lyst, 1905, p. 300). The same authority points out that the knowledge of distillation in the British Isles was inde- pendent of the art of distillation from wine, seeing that distilla- tion from grain was known in Ireland before the art of making wine came to Europe. An Irish legend states that St Patrick first taught the Irish the art of distillation; but, however that may be, it is certain that at the time of the first English invasion of Ireland (1170-72) the manufacture of a spirit distilled from grain {i.e. whisky) was known to the inhabitants of that country. It is probable that grain spirit was first prepared in the Far East, inasmuch as a spirit distilled from rice and other grains was made in India before the Christian era. The establishment of regular distilleries in England appears to date back to the reign of Henry VIII., and they are said to have been founded by Irish settlers who came over at that time. It is difficult to obtain exact data

Fig. 4. — Ancient form of Still, used in Tahiti.

regarding the origin of the distilling industry in Scotland, but, as Fairley says, it is probable that distilling was carried on there almost as early as in Ireland. At the time of the Tudors Scotch whisky was

held in great repute in England. The production of a spirit from wine (i.e. brandy) appears to have been known in the 9th century; but, according to Morewood, the first attempt at the distillation of wine in France is attributed to Arnaldus de Villa Nova, in the 13th century. As a manufacturing industry the distillation of brandy in France began in the 14th century. The history of the spirit industry in the United Kingdom is, as Nettleton has well pointed out, inseparably connected with questions of taxation. According to one writer, it was not until 1660 that an excise duty was first imposed on the consumption of spirit (" aqua vitae ") in the United Kingdom, but it appears probable that the industry generally was taxed in one form or another in the reign of Elizabeth, when it first began to assume considerable importance. No record, however, of the quantity of spirit on which duty was charged was kept until 1684. In that year duty was paid on 527,492 gallons. At the end of the century the consumption reached 1,000,000 gallons, and in 1745 it had risen to a quantity equivalent to about 5,000,000 gallons at proof. Cromwell imposed a tax of 8d. per gallon, but this was soon lowered to 2d. In 1751 a tax equivalent to is. per proof gallon was imposed, and in 1766 this was further increased to 2s. After this various changes and complex methods of assess- ing the duty were introduced (see Nettleton, The Manufacture of Spirit, Marcus Ward, 1893) until, in more modern times, a more rational and uniform system was introduced.

Conditions of Manufacture. — The principal act now governing and regulating the manufacture of spirits and the working of distilleries in Great Britain is the Spirits Act of 1880. The provisions of this and of the other acts bearing on the subject are exceedingly numerous and complicated, and, therefore, only a few of the chief points can be set forth here, so that an adequate appreciation may be gained of the arduous and rigid conditions under which the spirit manufacturer is, in order to ensure the safeguarding of the revenue, constrained to carry out his opera- tions. A distillery must not, without permission, be carried on at a greater distance than half a mile from a market town, nor may it be situated within a quarter of a mile from a rectifying establishment. A distiller must give notice of the erection of new plant or apparatus, of the time of brewing, of the removing of sugar from store or of yeast from wort or wash, of the making of " bub," of the locking of the spirit receiver supply pipe, &c. He may use any material he pleases, provided that the gravity of the wort can be ascertained by the saccharometer, but he may not brew beer nor make cider, wine nor sweet wines. When the worts are collected in the wash-back (fermenting vessel) a declaration must be made at

once, specifying the original gravity and the number of dry inches remaining in the back. At the end of every distilling period a return must be delivered showing (a) the quantity of brewing materials used, (i) the quantity of wort or wash attenuated and distilled,

out of store, the number and size of vessels, the locking of the latter, and the painting of the pipes carrying various liquids in certain colours. The methods of assessing the duty are three- fold, and whichever of these methods gives the highest return is the one adopted. The first is the " attenuation charge." This consists of levying the charge due on one gallon of proof spirit for every hundred gallons of worts collected and for every five degrees of attenuation observed, the latter being calculated by taking the difference between the highest specific gravity of the worts and the lowest gravity of the wash after complete fermentation. Secondly, there is the " low-wines charge," calculated upon the bulk-quantity at proof-strength of the low wines produced by the distillation of the wash; and lastly, the " feints and spirits charge." This is the method usually adopted, as it generally gives the highest results; it is assessed on the number of bulk gallons at proof of the feints and spirits produced by the final distilling operations. The duty, which was fixed at 10s. per proof gallon in i860, remained at that rate until 1890, when an addition of 6d. was made, but a further increase to the like amount made in 1894 was remitted in the next year owing to the unsatisfactory results obtained. The rate remained at 10s. 6d. until 1900 when it was raised to us., a further increase being made in 1909-1910.

Legally, the word " spirit " implies spirit of any description, and all liquors, mixtures and compounds made with the same. In the same way plain spirit is any British spirit which has not been artificially flavoured, and to which no ingredient has been added subsequent to distillation.

The extremely severe and inelastic provisions of the acts governing the manufacture of spirit in the United Kingdom have proved to be a very serious impediment to the develop- ment of the spirit industry on modern lines, and have placed the British manufacturer at a considerable disadvantage as compared with his foreign competitors. There is little doubt that the enormous revenue derived from the spirit industry could be adequately safeguarded in a manner more consistent with the development of the industry on sound commercial and technological lines than it is at present.

Production and Consumption. — The production of spirit in the

United Kingdom amounted in 1907 to roughly 50,000,000 proof gallons, the consumption to a gallon per head of population. In the decade 1880-1890 the quantity of spirits distilled remained practically stationary at about 40,000,000 gallons, but during the ten years 1890-1900 there was a rapid increase, the maximum being attained in 1898, when nearly 64,000,000 gallons were produced. A point had then been reached at which the production had considerably outstripped the consumption, due in part to the desire of the spirit trade to meet the increased demand for " matured " spirits, and in part to the fact that an excessive amount of capital had, owing to the increased popularity of Scotch whisky, been attracted to the distilling industry. This over-production led to a vast increase in the quantity of spirit remaining in warehouse. In 1906 production and consumption were about equal, and the quantity of spirit in warehouse represented roughly a five years' supply.

The following figures regarding production, consumption, duty, &c, need no explanation: —

1.

United Kingdom Statistics regarding Home-made Spirits.

Year.

Total quantity

distilled (proof gallon).

Total consump- tion of pot- able spirit (proof gallon).

Consumption of potable spirit per

head of popula- tion (proof gallon).

Exports (proof gallon).

Retained for

methylation

(proof gallon).

Remaining in

warehouse (proof gallon).

Duty paid

(Excise).

£

1 895-1 896 1898-1899 1900-1901 1 903- 1 904 1905-1906 1 906- 1 907

49,324.875 63,437,884 57,020,847 51,816,600 49,214,165 50,317,908

31,088,448 34.334,084 36,703,728 34.103,111 32,486,958

32,5",3l6

o-79

0-85 0-89

o-8o

o-75

074

4,254.883 5,090,290 5.773.718 6,334.971 7,049,798

7.341.077

3,838,082 4,781,369 5,070,713 5,054,586 5,663,429 6,055,285

114,110,701

151,732,539 161,502,829

167,155,504 163,519.957 161,648,409

16,380,134

17,967,142 20,124,003 18,667,818 17,765,352 17,745,125

(c) the quantity of spirits produced at proof -strength, and (d) the quantity of " feints " remaining. Regulations also exist with regard to the amount of " bub " (see below) that may be added to the worts, or the quantity of yeast that may be removed from the wash, concerning the time permissible for drawing over spirit at the various stages, as to placing in and taking spirit

The importation of foreign potable spirits into the United King- dom has fallen off materially since 1870-1875, during which period it stood at 16,000,000 to 17,000,000 gallons. This is chiefly due to the decreased consumption of brandy, and, to a smaller extent, to the diminishing importance of rum and other foreign spirits. The most remarkable change in this connexion is in the case of foreign methyl- ated spirit. At onetime (1891) the quantity of this article imported

2. Statistics regarding Imported Spirits.

Consumption

Year.

Total imports

per head of

Nature of spirits

Retained for

(proof gallon).

population

(proof gallon).

methylation.

(proof gallon).

rRum . . 6,217,469 ■i Brandy. . 2,668,616 I- Other sorts. 1,935,433.

i 895- i 896

10,821,518

0-20

91,990

rRum . . 6,719,452 i Brandy. . 3,081,525 L Other sorts. 2,617,090

1902-1903

13,130,182

0-20

1,212,001

rRum . . 4,879,958 ■i Brandy. . 2,456,773 L Other sorts. 891,704

1905-1906

8,228,-435

016

nil.

rRum. . . 5>no,345 ■1 Brandy. . 1,942,415 L Other sorts. 1,076,743

1906-1907

8,129,503

0-17

nil.

■

was almost equal to the amount manufactured in the United Kingdom, the figures being 1,995,782 gallons for the home produce and 1,456,108 for the foreign. For various reasons — chiefly owing to the surtax of 4d. per gallon on all foreign spirit — the quantity imported has gradually dwindled away, and at the present time is practically negligible. The principal spirit-producing countries are Russia and Germany, the United States coming next, and then France, Austria and the United Kingdom in succession, followed by Hungary, Holland and Belgium. The following are the figures for 1905 :—

Proof gallons. Russian Empire 161,366,000 (1904)

146,014,000 125,042,000 160,584,000

55,682,000

48,520,000

40,216,000

13.552,000

11,924,000

(which make roughly

Germany

United States

France

Austria

United Kingdom

Hungary

Holland

Belgium If we except Canada and the Cape 6,000,000 and 1,500,000 gallons respectively), the production of the British Empire, apart from the United Kingdom, is very small. British Guiana exports 3,000,000 to 4,000,000 and Jamaica about 1,500,000 gallons of rum.

With regard to the consumption in gallons per head, Denmark stands first with 2-4, then follows the Austro-Hungarian Empire, with 1-98, Germany with 1-43, Holland with the same figure, France with 1-37, Sweden with 1-36, the United States with 1-26, Belgium with I 10, and last the United Kingdom with 0.91. The consump tion in Russia is about equal to that of the United Kingdom. The figures given are for the year 1905. In the British colonies Western Australia comes first with a consumption per head of 1-33 gallons; and then jn order Queensland 1-32 gallons; Canada 0-94 gallon; New South Wales 0-77 gallon; New Zealand 0-73 gallon; Victoria 0-64 gallon; the Cape 0-68 gallon, and South Australia 0-47 gallon. Of the spirits

distilled in the United Kingdom, Scotland produces roughly one half, England and Ireland about one quarter each. Although the number of distilleries in England and Ireland has varied but little of recent years, the number in Scotland increased from 120 in 1880 to 161 in 1899. In 1906 the actual numbers were — Scotland 150; Ireland 28; England 8. The apparent anomaly between the number of distilleries and the quantity of spirit produced in different parts of the kingdom is explained by the fact that the great majority of the distilleries in Scotland and Ireland are small, pot-still distilleries, whereas the English works are all of considerable capacity. It is difficult to arrive at any satisfactory figure with regard to the amount of capital invested in British and Irish distil- leries, but it probably exceeds twenty millions.

Illicit distillation has almost ceased to exist in Great Britain, but in Ireland the number of annual seizures under this heading is still considerable. In 1906-1907, out of a total of 974 detections and seizures, 968 were in Ireland.

The spirit produced in the United Kingdom is made almost exclusively from malt, unmalted grain (chiefly maize, rye, barley, wheat and oats) and molasses. The relative proportion of malt to unmalted grain has shown a slight tendency to increase during the past twenty years, but the quantity of molasses employed has increased very largely in the same period, owing mainly to the fact that home-made spirit has largely displaced the foreign article for several industrial purposes and particularly for methylation. The estimated quantities of the various materials employed in 1883 and 1906 respectively were as under: —

Year.

Malt (quarters).

Unmalted grain (quarters).

Molasses and ! sugar (cwt.).

1883 1906

859.363 1. 151. 199

1,054,081 1,090,286

165,529 985,808

With regard to the materials employed in the manufacture of spirits in France, roughly 80-90% now consist of maize (and other starchy substances), beetroot and molasses, whereas in 1840 nine- tenths of the alcohol produced was derived from the grape and other fruits. This change is due in part to the ravages of the oi'dium disease (1850-1857) and the phylloxera (1876-1890), which destroyed an immense number of vines, but chiefly to the increased demand for commercial spirit in the arts and manu- factures, and also to the improved methods for obtaining a high-class spirit from prac- tically any starchy or saccharine material. In 1905 the number of alcohol units (the unit = 1000 hectorlitres of pure alcohol) distilled from maize and other starchy materials was 589, from molasses 516, from beetroot 1002, from wine, cider, lees and fruits 499. In Germany roughly 75% of the spirit manufactured is derived from potatoes. In 1905 the total spirit distilled amounted to 3786 units (of 1000 hectolitres of pure alcohol), of which 2877 units were obtained from potatoes, 765 units from grain and 1 44 units from molasses and other material. In Russia spirits are distilled chiefly from potatoes and rye, in the United States from maize.

Manufacture. — The manufacture of spirits consists broadly in converting starchy or saccharine matter into alcohol, the latter product being subsequently separated, concentrated and rectified. When spirits are made from a purely saccharine material the process of conversion into alcohol is a relatively simple one, but where farinaceous raw products are employed it is primarily necessary to transform the starch contained in them into sugar. The main varieties of spirits manufactured from sugar, or from sugar-containing materials, are: —

Sugar-derived Spirits Raw Material. Product.

Wine. • Brandy.

Sugar-cane and cane molasses. Rum. Beetroot; beet molasses. Industrial alcohol.

Occasionally wine, cider, perry and cane molasses are also employed for making either plain potable spirit or industrial alcohol, and at times cane molasses (chiefly obtained from Cuba and the West Indies) are used somewhat extensively in England for the manufacture of plain spirit. Occasionally, also, plain potable spirit is derived from beets, but rarely from beet molasses, the spirit derived from the latter being somewhat difficult of rectification.

The chief spirits derived from starchy materials, and their corresponding raw materials, are as follows : — Starch-derived Spirits Raw Material. Product.

rWhisky, "corn brandy," " vod- Cereal grains: chiefly barley, rye, J. ka," plain spirit; industrial

oats, wheat and maize . L alcohol. Potatoes Industrial alcohol.

A. Spirits Derived from Saccharine Materials. — The manu- facture of the finer brandies, such as those of Cognac, is, as far as the processes involved are concerned, by no means a complex matter. The excellence of this class of spirit is due mainly to the character of the wine employed and to the great experience of the distillers in selecting and blending the raw materials and finished products. The character of the wine is, of course, chiefly due to the peculiar soil and climatic conditions, and in some degree to the methods of cultivation. The latter, it may be added, have since the reconstitution of the Charente vineyards subsequent to their partial destruction by the phylloxera (see Brandy) been much improved. In the pre-phylloxera days the vineyards were planted and cultivated in a very rough and ready fashion, without any attempt at regularity of planting. The result was that the vines spread practically unrestrained in every and any direction. In consequence there was a great irregularity of growth, feeble and hardy plants being found side by side, and the yield was poor. In vineyards constructed in the modern style the vines are planted in regular rows, and the bushes are, with a view to obtaining regular and rapid

ripening, methodically supported by wire. The wines pro- duced by the Charente vineyards are of a light(white) character and possess no marked " bouquet," but they nevertheless produce a spirit of a peculiarly fine and delicate character. It is remarkable that the fuller and more aromatic wines of the Gironde and of Burgundy, for instance, are not so suitable for the manufacture of brandy as the relatively poor growths of the Charente. The apparatus employed for the distillation of the fine Cognac brandies is generally of a very simple pot- still type. Fig. 5 depicts the still-room of a Charente distillery

Fig. 5.— Old Cognac Pot-still.

of former times, and fig. 6 shows one of Messrs MartelPs distilleries in Cognac, equipped on modern lines. It will be seen that, in principle, there is very little difference between

Rum.

Fig. 6.— Modern Cognac Pot-still. (Martell & Co.)

*the two sets of plant, the reason being that experience has shown that for wines producing the finest brandies, the simplest form of still is also the best. For the distillation of wines not of the highest quality (from the brandy distillers' point of view) more complicated apparatus is employed, as the spirit from these wines must be more highly rectified than is the case with the finest brandies. Broadly speaking, it may be said that the type of still is suited to the production in the most economical manner of the best spirit to be obtained from the wine of a particular district. In Cognac, brandy is generally, but not universally, made by the " brouillis et repasse " system, this being a double distillation in a simple pot-still. The stills are (compared with whisky pot-stills) very small, holding roughly one hundred gallons, and the distillation is conducted very slowly and carefully, lasting about eight hours. Sometimes the whole of the spirit is collected in one receiver (corresponding to the low wines of Scotch whisky), but frequently the " brouillis," as the results of the first distillation are termed, are divided into several fractions. The " brouillis " which contain about *5 to 35% of alcohol are redistilled, this second distillation*

being called the " bonne chauffe " or " repasse." The first runnings — which vary in quality according to the quality of the wine, the manner of heating, &c. — are termed " produit de tete " or " tetes," and are separately collected and mixed with the " brouillis " of the following operation. The spirit which next comes over (starting at a strength of about 80% and running down to about 55%) is the " cceur," and as a whole, marks roughly 66 to 70% of absolute alcohol by volume. The residue in the still is then run down to water, and the spirit so obtained, which shows 20 to 25%, is called " seconde," and is either mixed with a fresh charge of wine cr rectified separately, the stronger portion being mixed with the " brouillis," the weaker with a charge of wine (see Brandy).

There are two main kinds of rum, namely, Jamaica rum and rum of the type prepared principally in Demerara and Trinidad (see Rum).

There are two varieties of Jamaica rum (a) the common clear rum, and (b) flavoured, or " German " rum. (a) " Common clear " rum is prepared from a mixture of sugar-cane molasses, " skimmings " (the scum from the boiling cane juice) and " dunder," this last name being given to the spent lees from previous distillations. Previous to use the " skimmings " are subjected to acid fermen- tation either alone or in conjunction with " trash " (crushed cane). The wort, which on the average contains about 10 to 15% of sugar, ferments very slowly, owing to the fact that very little yeast— the latter being derived from the cane rind — is present. Roughly five to ten days are occupied by this operation. At first the fermentation is mainly alcoholic, but it rapidly assumes an acid character, owing to the presence of a great number of acidifying bacteria derived from the " dunder " and " skimmings." The, distillation of the fer- mented wort is carried out in pot stills heated by fire or steam, either of a simple type or provided with rectifiers. In the former case two distillations are necessary, the first resulting in the production of a weak alcoholic liquid termed " low wines," the second, which consists in a rectification of the low wines, producing " high wines " or strong rum. The other type of still is provided with two rectifiers, which are interposed between the still and the condensing worm. These are charged with low and high wines respectively. The first runnings of the still (25 to 40 o.p.) constitute the rum proper, the next fraction the high wines, and the final distillate the low wines. (b) Flavoured or " German " rum is prepared from the same materials as the " common clear " variety, with the addition of " acid " and " flavour." " Acid " is obtained by acidifying fermented cane juice by means of cane " trash " and refuse from the wash backs. " Flavour " is prepared in much the same way as " acid," except that " dunder " sediment is also added. The fermentation, which is to a very great extent bacterial, results in the formation of large quantities of acid, including much butyric acid and compound esters. The distillation of " flavoured " rum is carried out in much the same manner as that of the " common clear." The manufacture of " Demerara rum " is differentiated from that of the Jamaica varieties mainly by the fact that the fermentation in the former case is practically purely saccharomycetic (i.e. yeast), whereas the latter is largely schizomycetic (i.e. bacterial). For the distillation of the Demerara rums, which are much lighter in flavour than the Jamaica varieties, stills of the " patent " (see below) or rectifying type are frequently employed (see Rtjm and Arrack).

For the manufacture of industrial spirit from saccharine materials see below, under Industrial Alcohol.

B. Spirits Derived from Starchy Materials. — The manufac- ture of spirit from saccharine materials is, as we have seen, a relatively simple operation, the sugar being transformed into alcohol by fermentation, and the latter then distilled off. To convert starchy matter into alcohol is a much more compli- cated matter. To the operations necessary for the transforma- tion of sugar into spirit, must, in the case of starchy materials, be added that of converting the starch into sugar. This is accomplished either by the action of a diastatic ferment, such

as that present in malted grain (see Brewing) or secreted by certain living organisms, or by an acid such as sulphuric acid. The latter process is little employed at the present time. The materials employed by the distiller, and the methods of pre- paration and treatment to which they are subjected before and after entering the distillery, are in some respects similar, in others materially different, from those employed by the brewer. The materials most frequently employed are maize, rye, barley malt, raw barley, oats, wheat and potatoes. Com- paring the main operations (apart from the actual process of distillation) of the brewer with those of the distiller, it is true that these are identical in the sense that they consist in the conversion of starch into sugar and of the latter into alcohol; but whereas the object of the brewer is to produce beer, of which alcohol forms only a relatively small proportion, the distiller, broadly speaking, desires to produce alcohol, and it is this fact which is responsible for the differences alluded to above.

Distillery Malting. — Where malt is employed as the main raw material, as, for instance, in the case of Scotch pot-still whiskies, and also, but to a minor degree, in Irish pot-still whiskies and patent-still whiskies, the process of preparation does not, except in some specific particulars, differ very widely from that used in making brewer's malt (see Malt). With regard to the barley employed for this purpose, certain qualities which are of the greatest importance to the brewer, such as the nature of the husk, colour, and friability of the starch, are of little interest to the distiller, and providing that the grain is sound and that it contains a high percentage of starch and malts as well, it will pass muster as an average distillery material. It is usual to give barley intended for patent-still work a rather longer period in the steep and on the floors than in brewery malting, and it is well to treat the steep-water with some anti- septic, preferably

lime, as the distiller has not the opportunity of lessening the dangers of bacterial infection at subsequent stages which is afforded to the brewer by the boiling and hopping of the wort. In distilleries where barley malt is not used as the main raw material, but mainly or chiefly as a diastatic agent (for instance, in potato and maize distilleries on the continent of Europe), the so-called "long" malt process is widely em- ployed. This consists essentially in subjecting the grain first to a somewhat lengthy steep (until the increase in weight due to the absorbed water is about 40 to 45%), and secondly to a very prolonged " flooring " at a moderate temperature, great attention being paid to the conditions of ventilation and humidity. It was formerly believed that the germinating barley grain attains its maximum of diastatic power after a very short period, and that when the acrospire is three-quarters " up " and the rootlets say one and a half times the length of the grain, the malt is ready for removal from the floor. M. Delbruck, Hayduck and others have, however, shown that this is not the case, and the practical results obtained by adopting the twenty days' " floor- ing " period (and its attendant conditions) have amply confirmed the scientific researches on this subject.

Hayduck has shown that the relative diastatic strengths of " short " (seven to ten days) and " long " (twenty days) malt are, (1) for heavy barleys as 100: 128-5 (average), (2) for light barleys as 100: 160-5 (average). In contradistinction to the brewer (who can only use it on exceptional occasions and for special purposes), the distiller prefers, whenever this is feasible, to use green malt rather than kilned malt. One of the principal objects of kilning brewing malt is to restrict the diastatic power; but this is the very factor which the distiller desires to preserve, as the green malt possesses roughly twice the diastatic activity of high kilned malt. It is obvious that the distiller, who regards his malt merely as a starch-converting agent, will, ceteris paribus, use as little kilned malt as possible. The malt whisky distiller cannot, however, use green malt, as he relies to a great extent on the kilning process for the development of the peculiar flavour characteristic of the article he produces. Moreover, it is frequently difficult during hot weather to obtain a satis- factory green malt supply, especially as the latter will not bear

carriage for any distance, and distillers who make pressed yeast (commonly called " German " yeast) find that a proportion of kilned malt is necessary for the satisfactory manufacture of this article. When the distiller is unable to use green malt he will, by preference, use a malt which has been kilned at as low a temperature as possible. Under these conditions the kilning is little more than a drying

operation, and the temperature is rarely raised above 130 F.

Although green or low-dried barley malt is the saccharifying agent usually employed both in the United Kingdom and on the continent of Europe, malts prepared from other cereals are not infrequently employed for this purpose. According to Glaser and Moransky the relative starch-transforming capacities of the various malted grains, taking barley as the 'unit, are as follows : —

Barley malt i-oo

Rye malt 0-93

Wheat malt 1-08

Oat malt 0-30

Maize malt 0-28

Oat malt, notwithstanding its low transforming power, possesses certain advantages, inasmuch as it is easily and rapidly prepared, it acts very quickly in the mash tun, and its diastatic power is well maintained during fermentation. Rye is best malted in conjunction with a little barley or oats, as it otherwise tends to superheat and to grow together in a tangled mass.

Distillery Mashing. — Distillery mashing, although outwardly very similar to the process employed in brewing, differs very widely in some important particulars. In brewing all the necessary fermentable matter is formed from the starch by the mashing operation. The wort so obtained is then hopped and sterilized. This method of working, however, cannot be adopted by the distiller. The brewer must have . a certain proportion of dextrinous, non-fermentable carbohydrate matter in his wort; the distiller, on the contrary, desires to convert the starch as completely as possible into fermentable, that is, alcohol-yielding, material. This result is obtained in two ways: first, by mashing at low temperatures, thus restricting the action of the diastase less than is the case in the brewer's mash; and, secondly, by permitting the diastatic action to continue during the fermentation period. Low temperature mashing alone will not have the desired effect, for part of the dextrinous bodies resulting from diastatic starch-transformation are not further degraded by diastase alone, but are rendered completely fer- mentable by the combined action of diastase and yeast. Hence the distiller is unable to boil, that is, to sterilize his wort, as he would thereby destroy the diastase entirely. In this he is at a serious disadvantage compared with the brewer, as

an unsterilized wort is very liable to bacterial infection. The latter danger prevents the distiller from taking full advantage of the benefits of low-temperature mashing, and he is obliged to heat his mash to a temperature which will, at any rate, be a partial safeguard against the bacterial evil. The method employed varies according to the nature of the mash and the quality of the spirit that it is desired to obtain, but in principle it consists, or should consist, in bringing the mash as rapidly as possible to the temperature of maximum saccharification, keeping the whole at this point for some little time, then heating to the temperature of maximum liquefaction, and subsequently to as high a temperature as is consistent with the thickness of the mash and the preservation of sufficient . diastase for the fermenting period.

The Fermenting Operations. — The conditions and methods of distillery fermentation vary considerably, and in some respects radically, from those employed in the brewery. In order to obtain the maximum alcohol yield the distiller is obliged to work with unsterilized wort, and at relatively high temperatures. The necessity for the former condition has already been ex- plained, but the latter is due to the fact that the optimum working capacity of distillery yeast is reached at a temperature markedly above that most favourable to brewing types. Apart from this, if the distiller worked at brewing temperatures the

brewing yeasts would predominate, and these produce less alcohol than the distillery types. Thus at 75° F. (and above) distillery yeasts tend to predominate. The conditions of fer- mentation which are more or less forced upon the distiller are unfortunately also very favourable to the development of bacteria, and if special methods are not adopted to check their development, the result would seriously affect not only the quantity but also the quality of alcohol produced. The micro- organisms chiefly to be feared are those belonging to the class of fission fungi (schizomycetes), such as the butyric, the lactic, the mannitic, and mucic ferments.

Souring. — It has long been known to practical distillers that in order to avoid irregular (bacterial) fermentations it is necessary either to let the wort " sour " naturally, or to add a small quan- tity of acid (formerly sulphuric acid was frequently employed) to it before pitching with yeast. The reason for this necessity was until

recent times by no means clear. It has, however, now been demonstrated that a slightly acid wort is a favourable medium for the free development of the desirable types of distillery yeasts, but that the growth of brewery yeasts, and especially of bacteria, is very much restricted, if not entirely suppressed, in a " soured " liquid. The acid which is the result of a properly conducted souring is lactic acid, formed by the decomposition of the sugar in the wort, by bacterial action, and according to the equation C 6 H,20 6 = 2C 3 H 6 3 .

For various reasons (one being that in order to restrict the lactic fermentation when sufficient acid has formed it is neces- sary to heat the soured liquid to a higher temperature than is desirable in the case of the main wort) it is inexpedient to allow the souring process to take place in the main wort. It is usual to make a small mash, prepared on special lines, for the produc- tion of the " bub " (German Hefegut), as the soured wort is termed. This is allowed either to " sour " spontaneously, or, better, is inoculated with a pure culture of B, acidificans longis- simus, which for this purpose is undoubtedly the best variety of the lactic acid bacteria. The optimum developing temperature of this organism is about 104° F., but it is better to keep the wort at 122 F., for at the latter temperature practically no other bacteria are capable of development. When the lactification is completed the wort is raised to 165° F. in order to cripple the lactifying bacteria — otherwise souring would go on in the main fermentation — and after cooling to the proper point it is pitched with yeast. When a good crop of the latter is formed the whole is added to the main wort. The beneficial effects of souring are not due to any specific action of the lactifying bacteria, but purely to the lactic acid formed. It has been found that excellent — and in some respects better — results can be obtained by the use of lactic acid as such in place of the old souring process. Some success has also attended the introduction of hydrofluoric acid and its salts as a substitute for lactic acid. Hydrofluoric acid is poisonous to bacteria in doses which do not affect distillery yeasts, and the latter can be cultivated in such a manner as to render them capable of withstanding as much as 0-2% of this acid. Bacteria, apparently, cannot be " acclimatized " in this fashion. Worts treated with hydrofluoric acid produce practically no side fermentation, and it seems a fact that this substance stimulates diastatic action, and thus permits of the use of relatively low mashing temperatures. The yeast employed in British and Irish pot-still and in some patent-still distilleries is still generally obtained from breweries, but it is now generally recognized that — at any rate for the production of

industrial alcohol and for " plain " spirit — a special type of yeast such as the so-called " German " yeast, a good deal of which comes from Holland, but which is now also produced in the United Kingdom on a considerable scale, is desirable in the distillery. This variety of yeast, although closely allied botanically to that used in brewing (belonging as it does to the same class, namely Saccharomyces cerevisiae), is capable of effecting a far more rapid and far more complete fermentation than the latter. Probably the most widely known and best "pure-culture" distillery yeast is the one called " Species II," first produced in the laboratories of the

Berlin Distillers' Association. The optimum working tempera- ture of distillery yeast is at about 81-5° F.; but it would be inexpedient to start the main fermentation at this temperature, as the subsequent rise may be as much as 36°. It is, therefore, usual to pitch at about 8o° F., and then, by means of the attem- perator, to cool down very slowly until the temperature reaches 6o° F. The temperature subsequently rises as fermentation goes on, but should not exceed 85° F. Pot-still malt whisky distillers frequently work at somewhat higher temperatures. Fermentation is carried on until practically all the saccharine matter is converted into alcohol; and when this is the case, the gravity of the mash is about equal to, or even a little below, that of water. In malt whisky distilleries the original gravity of the wort is usually from 1-050 to 1-060, occasionally lower, but in grain and potato distilleries the worts are often made up to a higher gravity. In Germany gravities as high as i-n are em- ployed; but in that country " thick " mashes, owing to the method employed to raise the duty, are a matter of necessity rather than of choice.

It will be seen from the above that the employment of malt for the purpose of rendering starch soluble and fermentable leaves a good deal to be desired in regard to both the mashing and fermenting operations in the production of spirit. The use of acid for this purpose is also attended by serious drawbacks inas- much as a considerable proportion of the starch is converted into " reversion " products which are practically unfermentable and thus considerable caramelization is brought about by the action of the acid. In the case of the production of potable spirits such as whisky, where the alcohol yield is not the only object, and the conservation of a specific flavour is desired, it is doubtful whether any material improvement can be made in this connexion, as it seems probable that part of the flavour may be due to some of the circumstances which from the point of view of alcoholic yield alone are most undesirable. For the production of industrial alcohol, however, and for the preparation of spirit intended to be used in compound potable spirits and liqueurs,

these difficulties have now been surmounted. The older methods at the disposal of the distiller have of late years been enriched by the discovery that certain micro-organisms (or rather the enzymes contained in them) possess the power of converting starch into sugar, and also of splitting up saccharine materials into the ordinary products of alcoholic fermentation. It is possible to inoculate a sterilized wort with a pure culture of a micro-organism of this description and subsequently with a pure culture of yeast, and so to avoid all undesirable features of the older processes.

Details concerning the practical application of this discovery will be found below under Industrial Alcohol.

Distillation. — The primary object of the distillation of all fermented liquids is that of separating, as far as possible, alcohol from the non-volatile constituents of the wash. In the second place the object of the distiller is to rectify and concentrate the dilute alcoholic liquid obtained by simple distillation. The degree and manner of rectification and concentration vary in accordance with the type of spirit to be produced, and it will be better therefore to discuss methods of distillation under the headings of the different types of spirit concerned.

1. Scotch Pot-still Whisky. — The raw material employed in the manufacture of Scotch pot-still whisky is practically without exception malted barley only. The malt is prepared in much the same way as brewery malt, except that it is generally cured (dried) with a peat, or mixed peat and coke, fire. It is to this peat drying that the so-called smoky flavour of most Scotch pot-still whisky is due. The malt is mashed in a mash-tun on lines similar to those obtaining in the brewery, except that the mashing heats are somewhat different. They should be so regulated as to obtain the maximum yield consistent with the preservation of the proper flavour. In order to obtain as high a yield as possible four separate mashes are as a rule made with the same lot of grist, the temperature of each successive mash being somewhat higher than that preceding it. The worts obtained from the first three mashes are united prior to

fermentation. The liquor from the last mash is used as mashing

liquor for the next lot of malt. The general scheme of opera- tions subsequent to mashing is illustrated by fig. 7, which depicts the process at one of Messrs Buchanan's distilleries.

After the wort has been drawn off it is run through a refrigerator, and then passes to the wash backs. The latter are large wooden vessels corresponding to ihe fermenting backs of the brewer. Here the wort is pitched with yeast, the fermentation starting as a rule

in the low wines still is termed " spent lees." Both these liquors are run to waste, or where local circumstances make it necessary are destroyed, or modified by means of a purification process. In some cases the solid matter contained is converted into manure. The mixed feints and foreshots contained in the feints receiver are worked up in the subsequent operation, being mixed with the next lot of low wines in the proportion of roughly one third mixed feints and fore- shots, and two-thirds low wines. The object of the double distilla- tion as described is in the first place to concentrate th« alcohol

Fig. 7. — Diagram of Malt-whisky Pot-still Plant. (Messrs J. Buchanan's Glentaucher's Distillery, Speyside, N.B.)

at something over 70 F. The maximum temperature attained at some distilleries frequently exceeds 90 ° F., but in the opinion of the author this is excessive. Fermentation proceeds until the whole of the saccharine matter is converted into alcohol, and when this is the case the gravity of the fermented wort — now termed wash — • should be equal to, or a little lower than that of water. The wash from the various wash backs is now collected in the wash charger, which is an intei mediary vessel serving for the mixing of the contents of the different wash backs, and also for the purpose of enabling the revenue officer to ascertain the total volume and strength of the wash. In this way he obtains a check on the quantity and gravity of the wort as taken prior to fermentation. From the wash charger the wash passes to the wash still, which is a copper vessel varying in size in Scotland from about 3000 to 8000 gallons. The usual size is about 5000 to 6000 gallons. This still is heated either by direct fire (as shown in the illustration), or frequently by means of a steam jacket or steam coil. The wash still is provided with rakes or chains actuated from outside for the purpose of preventing the solid contents of the wash from being charred. The whole of the spirit is drawn off in one fraction from this still, and is condensed by means of a copper coil cooled by running water. The distillate so obtained is termed " low wines," and the strength is generally about 50 u.p. The next stage in the process is the redistillation of the low wines. This

takes place in the low wines still, which is a vessel similar to the wash still, except that it is rather smaller. The distillate from the low wines still is collected in three separate fractions termed respectively and in the order of their collection, (a) foreshots, (b) clean spirit or whisky, (c) feints. The quantity of each of these three fractions collected will vary somewhat according to the nature of the spirit being made, the quality of the material employed, and to other circumstances into which it is not necessary to enter. As a rule the foreshots will be run from the starting of the still down to 25 to 30 o.p. Whisky will be collected from about 25 to 30 o.p. to proof, the remainder, namely the residual fraction, from proof down to water, being feints. In collecting the various fractions the distiller is mainly guided by the alcoholic strength of the spirit coming over, by its flavour, and by its behaviour on mixing with water. It is the object of the distiller to obtain a clean spirit or whisky which gives as little " blueing," that is opalescence, when mixed with water as possible. The foreshots and feints are run into the feints receiver, the whisky to the spirit receiver. The dis- tiller is able to divert the spirit coming over into either of these receivers at will by means of a movable arm contained in the spirit safe. The spirit safe is a closed vessel containing two or more broad funnels each of which is connected with a pipe leading to a feints or spirit receiver as the case may be. The movable arm fixed on to the pipe leading from the condensing coil can be actuated from without by the distiller. In this way the distiller is able to regulate the distillation at will without having access to the spirit. The quality of the spirit coming over is judged by means of the apparatus contained in the sampling safe. This is another closed vessel containing hydrometer jars fitted with hydrometers, and with a water supply. A small part of the spirit coming from the coil passes through this box into the hydrometer jars, where its strength is taken by means of the hydrometers and its behaviour towards water ascertained by mixing with a known volume of the_ same. The strength of the whisky collected varies at different distilleries, but it is generally from 25 to 30 o.p. The quantity and strength of the spirit are gauged in the spirit receiver by the revenue officer, and the spirit is then run into casks and placed in store. The residue jn the wash still is termed " pot ale " or " spent wash," the residue

contained in the wash, and secondly to rectify it. Part of the volatile by-products pass out in the spent wash and spent lees; another part is eliminated by the modification which some of these products undergo during storage in the feints receiver.

2. Irish Pot-still Whisky. — Both as regards the raw material

employed and the manner of manufacture, Irish pot-still whisky differs very appreciably from the Scotch variety. There are a few distillers who work with malted barley only, but the great majority employ a mixture of from (generally) 25 to 50% of malted barley and 50 to 75% of a mixed grist of " raw " {i.e. unmalted) rye, wheat, barley and oats. The malt is not peat cured. The distillation is carried out in a type of still radically different from the Scotch pot-still. The stills (of which there are generally three as against two in the Scotch process) are very large, ranging up to 20,000 gallons. A characteristic feature of the Irish pot-still is the great length and height of the " lyne- arm," i.e. the pipe connecting the still with the condensing coil. This lyne-arm generally runs up vertically from the still for a distance of 10 to 20 ft., then horizontally for another 30 or 40 ft., again vertically for 10 to 20 ft., and is then connected to the condenser. The horizontal portion of the lyne-arm lies in a shallow trough fitted with a water supply, and the temperature of the spirit vapours prior to their passing to the condenser may thus be regulated at will. According to the length and height of the lyne-arm and the temperature of the water jacket, more or less of the vapours condense and are carried back to the still by means of a pipe running back from the horizontal portion

Fig. 8. — Diagram of single type of Irish Pot-still Plant. (Messrs John Jameson's Distillery, Dublin.)

of the lyne-arm to the still. The return pipe is fitted with a cock, which enables the distiller to regulate the return flow. Occasionally there is a further return pipe for the condensing coil, but this is not usual. The result of this form of plant is that it is possible to work up far greater quantities of wash and

to obtain a much higher rectification in a single operation than is possible in the case of the Scotch pot-still.

A single type of Irish pot-still plant as employed at Messrs J. Jameson's, Dublin, is shown in fig. 8. It will be noticed that in this case there is no return pipe from the lyne-arm. The method of collection and of working the Irish pot-stills is a great deal more complicated than that described under the Scotch variety. Three stills are employed and strong low wines and weak low wines, strong feints and weak feints are collected, and mixed in varying proportions

according to the discretion of the distiller.

3. American Pot-still Whisky. — There are two main varieties of American pot-still whisky, namely, rye whisky, in which rye is the predominant raw material, and Bourbon whisky, in which maize or Indian corn is the chief substance employed. There are different varieties of these whiskies.

" Sour mash " whisky is made by scalding the raw material with pot ale (i.e. the residue left in the stills from the previous operation), then cooling down to mashing temperature and saccharifying by means of malt. The distillation is sometimes carried out with naked fire, but more generally by means of steam which is passed into the wash (termed " beer " in America), either in a free state or by means of a coil, and then collecting the spirit, after condensing and subsequently rectifying by means of a second distillation (termed " doubling "). " Sweet mash " whisky is made by mashing the raw material in the ordinary way by means of malt. The stills generally employed for making whisky by this procees contain three compartments situated above one another and connected by means of a curve pipe. Live steam blown into the lower compartment causes the wash to boil. The vapours go up through the curved pipe into the next compartment and so cause the contents of the latter to boil. The vapour from the second compartment then passes up to the third in the same manner. The vapour from the third compartment passes into a vessel charged with low wines, and the vapours so obtained are finally condensed, forming whisky, or " high wines."

4. Patent-still Whisky. — Scotch and Irish patent-still or " grain " whiskies are manufactured usually with a mixed grist of raw and malted grain, and by means of an apparatus usually termed the " patent," but more properly called Coffey's still. For the manufacture of patent-still whisky a grist containing generally 25% or more of malted barley is employed. The balance consists of maize together with malted and unmalted rye, oats and wheat, and the mixture of grains employed varies at different distilleries. The mashing takes place as a general rule in an ordinary mash-tun, and calls for no special mention. The fermentation is conducted in much the same way as at pot- still distilleries, except that at some patent-still distilleries where bakers' yeast is made it is conducted on somewhat different lines, the conditions being adjusted so as to suit the propagation of a healthy type of yeast of a particular type. For fermentation of this description it is well recognized that the use of selected or pure yeast is necessary. The fermenting vessels, wash chargers, &c, are much the same as in the pot-still distillery except

that they are of much larger size. The " patent " still was invented by Aeneas Coffey in the early part of the 19th century with a view of accomplishing in one operation that which necessitates several operations in the pot-still, of economiz- ing time, fuel, and material, and also of obtaining at will a spirit of a higher purity than that which can be got by the pot-still. It is sometimes stated that the patent still does not produce whisky, but merely plain spirit or alcohol, but as a matter of fact this is not the case. It can be so worked by selecting the proper materials and by running the still in a particular way as to produce an article which is most distinctly a potable spirit of the character of whisky. It can also be employed by altering the proportion of the materials and by running the still differently to produce a spirit which may be used for purposes of methy- lation, or which may pass through the hands of the rectifier and emerge as plain spirit or alcohol pure and simple. It is, however, quite impossible to obtain from the Coffey still a really plain or silent spirit such as that produced by some of the stills on the continent of Europe; in order to obtain this type of spirit.

the product of the patent still is treated by the rectifier in a special rectifying still with charcoal and potash. In certain details the Coffey still has been modified since it was devised by the inventor, but in principle it has been very little altered. Although it does not in some respects compare with some of the modern continental rectifying stills, it must be remembered that it is not made for the purpose of obtaining pure alcohol, and from this point of view it is a remarkable tribute to the ingenuity of Coffey that he should at so early a date have designed so perfect an apparatus.

The still shown in fig. 9 is one of the type designed by Messrs Robert Willison of Alloa for Scotch grain whisky distilleries. The Coffey still is a double still consisting of two adjacent columns, termed respectively the rectifier and analyser. Both columns are subdivided into a number of chambers by perforated copper plates. The main structure is of wood firmly braced with iron. Each com- partment communicates with the next by means of a drop pipe standing slightly above the level of the plate and passing downwards into a cup, which forms a water seal or joint. Each compartment is also fitted with a safety valve in case of the plates choking or of the pressure rising unduly. At the beginning of the operation both columns are filled with steam at a pressure of about 5 lb. The steam at the base of the analyser passes upwards through it, and then to the bottom of the rectifier by means of the pipe B (termed the low- wines vapour pipe), and then up through the rectifier. When both columns are filled with steam the wash is pumped up from the wash charger

through the copper pipe A to near the top of the rectifier, which it enters at the point A'. The pipe A runs from the top to the bottom of the rectifier forming a double bend in each compartment, and the wash (contained in the pipe) travels down in a zigzag course until it reaches the base of the rectifier at the point C. From here (still remaining in pipe A) it is pumped to the top of the analyser, where it emerges from the pipe and covers the plate of the top compartment. As there is an upward pressure of steam the wash is not able to pass through the perforations of the copper plate forming the base of the compartment, but collects until its level reaches the top of the first drop pipe. Through this it passes into the cup on the plate below and so out on to the next plate. The drop pipes being trapped by the cups the steam cannot pass upwards through the former. In this way the wash passes through compartment to compartment of the analyser until it reaches the bottom, and then passes out by means of the spent wash siphon. The steam on its passage up through the analyser carried with it the alcoholic vapours and other volatile matters contained in the wash. The alcoholic vapours pass from the top of the analyser to the bottom of the rectifier, and then upwards through the latter from compartment to compartment. In so doing they are gradually cooled by the wash flowing down through the pipe A. This gradual cooling causes the less volatile constituents to condense and so to flow downwards through the column until they reach the base of the rectifier. At a certain point in the upper part of the rectifier (marked S in the illustration) the bottom of the compartment in question is formed not of a perforated plate, but of a stout copper sheet, pierced by a fairly wide pipe, which stands up about two inches above the level of the former. This is termed the spirit plate. It is so placed that the alcoholic vapours condense either on or immediately above it. The alcohol passes out from the spirit plate chamber from one of the two pipes shown in the illustration (either to the spirits or to the feints receiver as the case may be), and is then further cooled, in order to complete the condensation, by means of coils immersed in flowing water, as shown in the illustration. In order to render the condensation still more perfect the upper chambers of the rectifier are fitted with coils through which cold water is passed. The vapours condensed by this fall upon the spirit plate. The vapours which have an appreciably lower boiling-point than ethylic alcohol, such as the aldehydes, together with a large volume of carbonic acid gas derived from the wash, pass out of the top of the rectifier by means of the " incondensible gas " pipe E, and thence to a separate condensing coil. The spirit obtained is of high strength, generally about 64 o.p. The less volatile constituents of the wash, generally termed " fusel oil," which pass out of the base of the recti-

fier, are cooled and then passed to the oil vessel. After the apparatus has been worked for some time the fusel oil which floats in a layer on the top of the contents of the oil vessel is skimmed off. The watery layer from the oil vessel, which still contains a little alcohol, is again passed through the apparatus to remove the last trace of the latter. By employing the cold wash to cool the alcoholic vapours much condensing water is saved as compared with the ordinary pot-still apparatus. Conversely, as the hot alcohol vapours heat the cold wash to boiling-point, there is a great economy of coal as compared with the older process.

The distillation is controlled by an operator standing on the platform P. The operator is able by means of the sampling appa- ratus X to determine the quality and strength of the spirit and of the wash. He is able, by regulating the quantity of steam admitted to the apparatus, by modifying the rate of pumping, and by running

the spirit either to the spirit or to the feints receiver, as the case may be, to control the strength and quality of the product in much the same manner as does the pot-still distiller. Analyser

Rectifier E

Fig. 9.— Diagram of a Coffey Still. (Messrs R. Willison & Co., Alloa.)

Industrial Alcohol. — By industrial alcohol is understood spirit which is employed for other than potable purposes. Alcohol is largely employed in the industries and arts, and for domestic purposes. It is chiefly used for the manufacture of varnish, fine chemicals and dye-stuffs, for pharmaceutical purposes, and in the form of ordinary methylated spirit for lighting and heating. Ordinary methylated spirit for domestic purposes is prepared in the United Kingdom by adding 10 parts of wood naphtha and a small quantity of mineral naphtha to 90 parts of strong spirit. This spirit may be employed duty free for any purpose, except that it may not be purified in such a manner as to produce pure alcohol or a potable spirit. Up to the year 1906 British manufacturers were forced either to use this spirit or to pay the full duty if they wished to use any other variety. As a result of the recommendations of the industrial alcohol committee of 1 904-1 905 the Revenue Act of 1906 contained provisions modifying this

undesirable state of affairs. Manufacturers may now use a special " industrial methylated spirit," which consists

of alcohol 95 parts and wood naphtha 5 parts, and they may also, under certain conditions and restrictions, employ pure alcohol. It is generally considered that the most satisfactory way of methylating or " denaturing " spirit intended for technical purposes is that which consists in adding one of the ingredients which would ordinarily be used in the course of manufacture, or some other ingredient which does not interfere with the manufacture of the specific article in question. In the year 1906 the total quantity of " industrial methylated spirit " em- ployed in the United Kingdom was 2 > °4i,373 proof gallons. The quantity of pure alcohol employed in the same year was 435,915 gallons; for the same period the total quantity of ordinary methylated spirit produced was 6,055,285 gallons. On the con- tinent of Europe and in America alcohol is used in the industries to a greater extent than is the case in the United Kingdom.

The raw materials generally em- ployed in making industrial alcohol are the sugar beet, and beet or cane molasses, potatoes, maize, rice and similar starchy materials. The manu- facture of spirit for industrial pur- poses in many respects resembles the process for manufacturing potable spirit, but, broadly speaking, it may be said that the raw materials em- ployed need not be of so high a class, and that the main object of the dis- tiller in this case is to produce as high a yield of alcohol as possible. Taste and flavour are secondary con- siderations, although in the case of industrial alcohol employed for some purposes — for instance, for pharma- ceutical preparations — a very fine spirit is required. When beets or molasses are employed for making alcohol, the process is a comparatively simple one. If beets are used the sugar is extracted from them in much the same way as is the case in the manufacture of sugar itself (see Sugar), although in recent years a process for steaming the beets under pressure in much the same way as in the preparation of potato mashes has been employed. The sugar present in the beet and in molasses is not directly fer- mentable. It is generally rendered so by the addition of a small quantity of mineral acid. The saccharine solution is then pitched with yeast and fermented in the ordinary way. Potatoes, maize, rice and other starchy materials are generally treated under pressure with steam in a close vessel termed a converter. This method entirely disrupts the starch cells, and so renders the starch very readily convertible. When the pressure " cooking " is completed the mash is run out of the converter into the mash tun proper, where it is treated with a minimum quantity of

malt at the most suitable temperature. The wort obtained is, after (as a rule) removing a part of the husks and skins by means of special machinery, pitched with yeast and fermented. '

We have seen above in the paragraphs dealing with the general features of distillery operations that the method of converting starch into sugar by means of malt possesses very serious

drawbacks. Of late years a process has been discovered whereby these disadvantages, as far as industrial spirit is concerned, are entirely overcome. It has been known for some time that certain micro-organisms (or rather the enzymes contained in them) possess the power of converting the starch directly into ferment- able sugar, and further of splitting up the latter into the usual products of alcoholic fermentation. Among the organisms of this description first known may be mentioned the moulds, Aspergillus Oryzae and Eurotium Oryzae. Later A. L. C. Calmette dis- covered a mould to which he gave the name Amylomyces Rouxii, which was employed by A. Collette and A. Boidin for producing alcohol on an industrial scale. Since then Boidin has discovered another mould to which he gave the name of Mucor (3, which possesses advantages over the other micro-organisms named inasmuch as it works more rapidly and in a more concentrated wort. The amylo process, as this method of producing alcohol is termed, is now worked on a very large scale in many countries. The process consists in inoculating a sterile (mostly maize or rice) mash in a closed vessel with a very small quantity of the spores of the mould, passing filtered air through the liquid for a certain time, thus causing the material to develop very rapidly, and subsequently inducing fermentation by the addition of a pure yeast culture. The mould is of itself capable of fermenting the sugar produced, but it is found that the yeast acts more quickly, and will stand a greater percentage of alcohol, than the former. The whole process occupies about five days. The advantages accruing from operating, as is the case in the amylo process, with sterile worts are enormous, inasmuch as undesirable bacterial and side fermentations are impossible. The quality and yield of the alcohol is, owing to this fact, considerably improved. The fact that no malt is employed leads to a further very considerable economy. The general course of operations in the amylo process may be gathered from fig. 10. The maize or other raw

Fig. 10. — Diagram of the Amylo Process.

material is steeped in the vessels AA with a sufficient quantity of dilute acid to convert the secondary into primary phosphates. When the steeping operations are complete the material passes into the converters BB. After conversion is completed the disintegrated material passes into the vessel C, and thence by means of the pipe D to the fermenting vessels EEE. After fermentation is completed the wash passes to the still F.

It is impossible at present to employ the amylo process in its most satisfactory form in the United Kingdom owing to the fact that it is necessary in order to take full advantage of the process to employ a thick wort, i.e. one from which the husks have not been removed. The gravity of a wort of this descrip- tion cannot be taken by the saccharimeter prescribed by the spirit Acts, but no doubt this difficulty will in time be over- come. The average yield by the amylo process is from one to one and a half gallons a cwt. of raw material more than is the case with the processes orclinarily employed in the United Kingdom.

Distillation of Industrial Alcohol. — A still intended for the distillation of industrial alcohol should be so devised as to yield a spirit of the greatest strength and purity in the most economical manner. Stills are now constructed which yield in one opera- lion a spirit containing up to 98% of absolute alcohol, and free from all but the merest traces of aldehyde, fusel oil, &c. (fore- shots and tailings). An excellent still of this kind is that of R. Uges. He takes advantage of the fact that if a liquid containing 15% of alcohol is boiled, the quantity of fusel oil in the vapour is equal to the amount in the remanent fluid, and that if the percentage of alcohol is less than 15% the amount of fusel oil in the vapour is greater than that in the liquid. It is therefore

possible, by working on proper lines, to remove the whole of the fusel from the mash by a single operation. By subjecting the vapours so obtained to a carefully regulated dephlegmation, the fusel oil condenses, together with the steam and a certain proportion of alcohol — in practice 15%. By further cooling the liquid so obtained the fusel separates out, and, being specific- ally lighter, rises to the surface of the watery spirit, and is then easily removed. This form of still is so arranged that any change from the correct temperature necessary for the adequate separa- tion of the concentrated " feints " into two layers is automatically corrected by the admission of more or less cooling liquor to the refrigerating pipe coiled round the

dephlegmating column. The " foreshots " (aldehyde, &c.) are removed by submitting the alcoholic vapour passing through the main dephlegmator to further purification. The Ilges apparatus yields three con- tinuous streams of fine spirit, fusel oil, and foreshots respectively. By-products of Fermentation and Distillation. — The main con- stituent of spirits is, of course, ethyl alcohol — spirit of wine — but all spirits contain small but varying quantities of by-products and it is by these that the character of a spirit is determined. The by-products are mainly formed during fermentation, but are also to a certain extent pre-existent in the raw materials, or may be formed during the operations preceding and succeeding fermentation. The nature of the by-products is complex, and varies sensibly according to the raw materials employed and the methods of malting, mashing, fermentation and distillation.

The by-products may be classified as follows: (a) higher alcohols — usually going under the name of fusel oil; lb) esters; (c) fatty acids; (d) fatty aldehydes and acetals; (e) furfuryl aldehyde; (/) terpene, terpene hydrate and ethereal oils; and (g) volatile bases. The higher alcohols consist of mixtures of fatty alcohols (C n H2„-)-iOH), containing three or more atoms of carbon in which, as a rule, amyl alcohol (C 5 H n OH) predomi- nates. The fusel oil of British pot-still spirits is chiefly composed of amyl and butyl alcohols, whereas in patent spirits propyl alcohol preponderates, that is, in the finished or fine spirit, since the fusel oil separated from patent spirit in the course of distil- lation consists mainly of amyl and butyl alcohols. Broadly speaking, the higher alcohols present in pot are of higher mole- cular weight than those in patent spirits. Potato fusel contains a high proportion of isobutyl alcohol, grain fusel of n-butyl alcohol. The acid present in spirits is chiefly acetic acid, but small quantities of other acids are also found. The esters, formed by the interaction of alcohols and acids chiefly during the fermenting and distilling operations, consist almost entirely of fatty acid radicles in combination with ethyl and, to a minor extent, amyl alcohol. Ethyl acetate (acetic ester) is the main constituent of the esters, the others being mainly ethyl valerate, butyrate and propionate. Oenanthic ether (ethyl pelargonate) is one of the characteristic esters of brandy. Furfuryl aldehyde (furfurol) is a characteristic product in pot-still spirits, although 'it occurs to a greater or less extent in patent spirits according to the degree of rectification. It is probable that the furfural is formed by the splitting up of a part of the pentoses contained in the wort. It was formerly thought that its occurrence in relatively large quantities in pot-still spirits was due to the char- ring effect of the action of the fire gases on the carbonaceous matter

adhering to the bottom and sides of the still, but the author has shown that this is not the case, inasmuch as he has found that spirits distilled by means of a steam jacket instead of direct fire contain quite as much furfurol as those distilled in the old way. Terpene and terpene hydrate are characteristic constituents of grain fusel. Although the ethereal oils appear to play an important part in determining the character of a spirit, too little is at present known of these substances to warrant any closer description.

Effect of Maturing on the By-products. — That potable spirits (excepting, of course, pure alcohol) and wine are greatly improved by age is an undeniable fact, and one that has been recognized for many hundreds, and even thousands, of years. Thus in the gospel of St Luke we have the statement " that no man having drunk old wine, straightway desireth new: for he saitn,

The old is better." And again in the Apocrypha, " New friends are like new wine: when it is old, thou shalt drink it with pleasure." There is little doubt that the beneficial effect of age on the character of spirits is due to the changes effected in the character and quantity of the by-products, but the exact nature of these changes is by no means clear. Such improvement as takes place is apparently connected in some way with the free access of air to, or rather the satisfactory ventilation of, the containing vessel ; for spirits preserved entirely in glass undergo relatively little change, either in taste or in chemical composition, whereas cask storage materially affects both these factors.

Concerning the changes which take place during maturation, it was formerly believed that the higher alcohols decreased with age, and that the main reason of the improvement noticeable in mature spirits was due to this fact. The author has, however, shown conclusively that this is not the case, but that on the con- trary the higher alcohols generally increase during maturation. This decrease is not absolute, but only relative, and may be due to the fact that the higher alcohols are less volatile than ethyl alcohol. There is a decided increase during maturation of both the volatile and non-volatile acids. On the whole also the esters and aldehydes generally tend to increase, but not to so great an extent as was formerly believed to be the case. There is, however, a marked decrease in regard to furfurol. The type of cask exercises a marked influence on the course of maturation;

and, as regards whisky, spirit stored in a sherry cask undoubtedly matures more quickly than that contained in a plain wood cask. The relative humidity of the cellar in which spirit is stored has a very great effect on the course of maturation. In a very damp cellar the spirit will lose alcohol very rapidly and as a resiilt all those changes which are favoured by these conditions will take place with relative rapidity. On the other hand, in a very dry cellar the loss of alcohol is relatively smaller than that of water (cf. Schidrowitz and Kaye, Joum. Soc. Chem. Ind., June 1905).

Physiological Effects of Spirit By-products. — The nature of the physiological effects produced by the ingestion of spirits varies considerably, not only according to the class of spirit (i.e. whether whisky, brandy, rum, &c.) consumed, but also with its condition (i.e. whether new or old, and so on) ; and there is no doubt that the causation of these phenomena is intimately connected with the nature and quantity of the by-products, to which, as has been already said, the character of the spirit is due. Commenting on a statement in Bailey's Book of Sports to the effect that wine and brandy had a tendency to make a man fall on his side, whisky to make him fall forward, and cider and perry to make him fall on his back, Sir T. Lauder Brunton (Evidence, Spirits Committee, 1891) suggests that these state- ments — if correct — might indicate definite injury to various parts of the cerebellum. Thus, if the anterior part of the middle lobe of the cerebellum is injured, the animal tends to fall forward; when the posterior part is affected, the head is drawn backwards, &c. Brunton is inclined to believe that the varying action of different spirits may be due to the specific action of specific products on the separate nerve centres. Thus the cause of the epileptic convulsions produced by the injection of absinthe has been traced to the specific action of the chief flavouring agent of this liqueur.

In view of the doubt which modern research has thrown on the older theories, to the effect that the improved character of a mature, as compared with a new, spirit is due to the decrease in the quantity of the higher alcohols (i.e. the fusel oil), a discussion of the specific action and relative toxicity of these bodies may seem superfluous, more especially as they occur in quantities which are apparently incapable of producing serious effects. As, however, there is considerable reason for believing that the higher alcohols do influence, at any rate, the flavour of the spirit a brief reference to their physiological action seems to the author not out of place. Broadly speaking, the toxicity of the fatty alcohols increases with their molecular weight. Dujar-din- Beaumetz and Audige found that

the lethal dose for dogs was 5-6 grammes per kilo-body-weight for ethyl (ordinary) alcohol; 3′ 75 grammes for propyl alcohol; i-8 grammes for butyl; and

1-5 grammes for n-amyl alcohol. It is interesting to note that the experiments of these investigators were conducted chiefly with the pig, as the digestive organs of the latter animal are very similar to those of man, and also because the pig is apparently the only animal which willingly takes alcohol with its food. With regard to the action of spirits generally, the investigators named above found that the digestive organs of pigs fed for thirty months with pure alcohol alone were not affected, whereas the animals treated with similar quantities of imperfectly purified spirit (whether derived from the beet, the potato or from grain) suffered considerably.

Of late years the attention of pharmacologists has been directed to furfurol especially, and the aldehydes generally, as being, at any rate in part, the cause of the unpleasant after or by-effects of certain spirits. Curci and others showed that furfurol in certain doses is poisonous to animals. Brunton and F. W. Tunnicliffe demonstrated a poisonous action of this sub- stance upon man, and, comparing the after-effects upon animals of spirits containing, and freed from, aldehydes, found certain important physiological differences between them. I. Guareschi and A. Mosso first drew attention to the fact that numerous samples of reputedly pure spirits contained small quantities of certain volatile bases of an alkaloidal nature. They apparently belong to the pyridine series, and have effects similar to those of strychnine. E. Bamberger and Einhorn discovered the presence of pyridine, dimethylpyridine and other bodies belonging to the same series, in commercial fusel oil. It is possible that the existence of these volatile bases in spirit may have given rise to the — on the face of it absurd — suggestion that tar bases have been used as adulterants of whisky. It appears likely that the formation of the bases in question is connected with the use of inferior or decaying grain or maize. Thus the spirit produced in Sweden in 1879 was particularly bad and had very curious effects, and it was found, on investigation by M. Husz, that it had actually been largely prepared from decomposing grain. More- over, C. Lombroso discovered an alkaloidal body in decayed maize, the action ol which was not unlike that of strychnine. The quantities of these bases which have been found in spirits are very small, but it must be remembered that substances are known — such as abrine, for instance — which have marked effects in practically unweighable quantities. It is possible that these volatile bases may be responsible for some of the effects — very similar to alkaloidal poisoning — produced by crude spirits such

as Cape " smoke " and the cheap Portuguese liqueurs.

Having described the nature and effects of spirit by-products, and the changes occurring in them during storage, the question that arises is: How is the knowledge gained by scientific research in this direction applied in practice? It may be said that the old adage " prevention is better than cure " holds good in the spirit industry as elsewhere, and the distiller, therefore, tries as far as possible to avoid the formation of those by-products which are objectionable, or at any rate to remove them during the course of manufacture. These methods for obtaining a satis- factory potable spirit are so far, however, only successful up to a certain point, and the distiller is therefore bound to have recourse to prolonged storage or to one of the many artificial processes of purification and maturing, the majority of which have been devised — with varying success — during recent years. Referring, in the first place, to what may be called the natural or " preventive " methods for the production of a well-flavoured spirit, it is necessary (a) that the water supply (for steeping, mashing, &c.) be a good one; (b) that no mouldy or inferior material be used; (c) that mashing heats be kept within reason- able limits; (d) that refrigerators be constructed so as to avoid bacterial infection; (e) that the " souring " of the wort be con- ducted on proper lines; (/) that a favourable and vigorous type of yeast be used; and (g) that stills, &c, be kept perfectly clean. Coming next to the methods ordinarily or frequently employed by distillers for eliminating the undesirable by-products, which, despite all care, are formed in the course of manufacture, the most important undoubtedly is purification by rational fractional distillation. By properly regulating the distilling heats, by

using a well-devised still, both in the first instance and also for rectifying, a product very free from fusel oil, and especially from fatty aldehydes and volatile ethers, may be obtained. The removal of acids — objectionable chiefly on account of the unpleasant decomposition products which they form in still — is carried out by neutralizing the still contents with an alkaline medium. The alkali so used also decomposes undesirable esters, and retains some of the aldehydes. For the elimination of fusel oil, treatment with charcoal is the most common method. Luck has suggested for this purpose the passing of the alcoholic vapours through petroleum, which is said to absorb the higher alcohols much more easily than it does ordinary

spirit; and some distillers have successfully tried the method of V. Traube, which consists in treating the spirit with a saturated aqueous solution of various inorganic salts. This causes the formation of a super- natant layer, which is said to contain practically all the fusel oil as well as the greater part of the foreshot by-products, i.e. fatty aldehydes, &C. 1

Finally, there remain for consideration the artificial maturing processes. These are exceedingly numerous, but it may be said at once that the great majority of them are hardly to be taken seriously. Thus one inventor, acting on the alleged fact that spirits are improved by lengthy journeys, suggests that a miniature railway, with numerous obstacles to augment the roll- ing and shaking action, be laid down in the distiller's ware- house. Of the methods worthy of consideration may be men- tioned, first, those depending solely on the action of currents of air, oxygen and ozone. They exist in numerous modifications, but the principle involved, broadly speaking, is to pass a current of hot or cold air or oxygen, or alternate currents of hot and cold air, or a current of ozonized air, through the liquid, with or with- out pressure, as the case may be. According to the patents of E. Mills and J. Barr, new whisky rapidly acquires the character of the mature sherry-cask stored spirit if the action of alternate hot and cold air currents be assisted by the addition of a little sherry and a minute trace of sulphuric acid, the latter being subsequently neutralized by lime. Secondly, there are the pro- cesses which make direct or indirect use of the electric current. Of the indirect methods in this class may be mentioned that of Hermite, which consists essentially in adding an electrolysed solution of common salt to the spirit, and subsequently redistill- ing. Thirdly, the processes which rely on accelerating natural cask action by artificially reproducing the conditions attendant on the latter in a purposely exaggerated or heightened form. One method strives to obtain this object by heating the spirit under pressure in an atmosphere of oxygen in a vessel containing a quantity of oak shavings. This process certainly seems calcu- lated to remove a portion of the by-products, for the " grog " obtained in A. H. Allen's experiments by steaming the staves of an old whisky cask contained appreciably more fusel oil and esters than commercial whisky. Fourthly, we have the methods chiefly dependent on the action of cold. R. P. Pictet, by cooling a new brandy to -8o° C, is said to have obtained a liquid which had apparently acquired the properties of a twelve-year-old spirit. R. C. Scott's process consists in energetically treating spirit which has been cooled down to 0° C. with dry filtered air, and the operations are so conducted, it is said, that there is no

loss of alcohol or of the important aromatic esters. According to the published data, the quantity of the fusel oil is materially reduced by this method, and the quality of the spirit much improved. None of the above processes has apparently (although in practice they may give satisfactory results) been devised with a view to effecting the direct removal of those specific substances (furfurol, other aldehydes and volatile bases) which later research has shown to be present to a greater extent in new or inferior spirits than in the matured or superior article, and to some of which, at any rate, owing to their acknowledged toxicity in very small quantities, it is more than reasonable (as Lauder 1 The above chiefly applies to industrial spirit, in the manufacture of which a product which is practically pure alcohol is desired. These methods can only be used to a limited extent by whisky and brandy distillers, for a complete removal of by-products also entails destruction of the spirit's character.

Brunton and Tunnicliue have pointed out) to suppose that at least a part of the evil effects by drinking new or inferior spirit may be ascribed. In this connexion a patent taken out by J . T. Hewitt is of interest, inasmuch as it deals with the problem of spirit purification on seemingly rational scientific lines. This patent takes advantage of the fact that furfurol and similai aldehydes can be removed from spirits by distillation with phenyl- hydrazine-sulphonate of soda, which salt forms non-volatile products with the substance in question. (P. S.)

SPIRITUALISM, a term used by philosophical writers to denote the opposite of materialism, and also used in a narrower sense to describe the belief that the spiritual world manifests itself by producing in the physical world effects inexplicable by the known iaws of nature. It is in the latter sense that it is here discussed. The belief in such occasional manifestations has probably existed as long as the belief in the existence of spirits apart from human bodies (see Animism; Magic, &c), and a complete examination into it would involve a discussion of the religions of all ages and nations. In 1848, however, a peculiar form of it, believed to be based on abundant experi- mental evidence, arose in America and spread there with great rapidity, and thence over the civilized world. To this movement, which has been called " modern spiritualism," the present article is confined.

The movement began in a single family. In 1 848 a Mr and Mrs J. D. Fox and their two daughters, at Hydesville (Wayne county), New

York, were much disturbed by unexplained knockings. At length Kate Fox (b. 1839) discovered that the cause of the sounds was intelligent and would make raps as requested, and, communi- cation being established, the rapper professed to be the spirit of a murdered pedlar. An investigation into the matter was thought to show that none of the Fox family was concerned in producing the rappings; but the evidence that they were not concerned is insufficient, although similar noises had been noticed occasionally in the house before they lived there. It was, how- ever, at Rochester, where Kate and her sister Margaret (1836- 1893) went to live with a married sister (Mrs Fish) that modern spiritualism assumed its present form, and that communication was, as it was believed, established with lost relatives and deceased eminent men. The presence of certain " mediums " was required to form the link between the worlds of the living and of the dead, and Kate Fox and her sister were the first mediums. Spiritualists do not as yet claim to know what special qualities in mediums enable spirits thus to make use of them. The earliest communications were carried on by means of " raps," or, as Sir William Crookes calls them, " percussive sounds." It was agreed that one rap should mean " no " and three " yes," while more complicated messages were — and are — obtained in other ways, such as calling over or pointing to letters of the alphabet, when raps occur at the required letters.

The idea of communicating with the departed was naturally attractive even to the merely curious, still more to those who were mourning for lost friends, and most of all to those who believed that this was the commencement of a new revelation. The first two causes have attracted many inquirers; but it is the last that has chiefly given to modern spiritualism its religious aspect. Many came to witness the new wonder, and the excite- ment and interest spread rapidly. It should be noted that expec- tations favourable to the new idea had already been created by the interest in mesmerism and the phenomena of hypnotic trance (see Hypnotism), widely diffused at this time both in America and Europe. It was believed that information about other worlds and from higher intelligences could be obtained from persons in the sleep-waking state. Andrew Jackson Davis (q.v .) was in America the most prominent example of such persons; his work, The Principles of Nature, Her Divine Revelations (New- York, 1847), was alleged to have been dictated in " clairvoyant " trance, and before 1848 his followers were expecting a new religious revelation. Many reputed "clairvoyants" developed into mediums (q.v.). The " spiritualistic " movement spread like an epidemic. " Spirit circles " were soon formed in many families. There

is very little evidence to show that mediumship

arose anywhere spontaneously, 1 but those who sat with the Foxes were often found to become mediums themselves and then in their turn developed mediumship in others. The mere reading of accounts of seances developed the peculiar susceptibility in some persons, while others, who became mediums ultimately, did so only after prolonged and patient waiting.

There seems to have been little practical interest in spiritual- ism in England till 1852, when its first development took the form of a mania for table-turning (q.v.). This seems to have prevailed all over Europe in 1853. In England it was greatly stimulated by the visit of Mrs Hayden, a professional medium from Boston, in the winter of 1852-1853. Daniel Dunglas Home, the next medium of importance who appeared in London, came over from America in 1855; and for many years almost all the chief mediums for physical phenomena known in England came from the United States. It was at Keighley in Yorkshire — where also the first English periodical, the Yorkshire Spiritual Telegraph, was published in 1855 and onwards — that spiritual- ism as a religious movement first made any mark in England; but this movement, though it spread rather widely, cannot be said to have attained at any time very vigorous proportions. It had taken more hold in its original home in the United States of America, and thence it has spread in some degree to most Christian countries. Nowhere, however, has there been much religious organization in connexion with it, and the force of the movement seems to have declined rather than increased.

In the present article it is impossible to give an exhaustive catalogue of the phenomena and modes of communication of modern spiritualism. 2 The greater part of the phenomena may be divided into two classes. To the first belong what may be called the physical phenomena {q.v.) of spiritualism — those, namely, which, if correctly observed and due neither to conscious or unconscious trickery nor to hallucination or illusion on the part of the observers, exhibit a force acting in the physical world hitherto unknown to science. The earliest of these phenomena were the raps already spoken of and other sounds occurring without apparent physical cause, and the similarly mysterious movements of furniture and other objects; and these were shortly followed by the ringing of bells

and playing of musical instru- ments. Later followed the appearance of lights; quasi-human voices; musical sounds, produced, it is said, without instruments; the " materialization " or presence in material form of what seemed to be human hands and faces, and ultimately of complete figures, alleged to be not those of any person present, and some- times claimed by witnesses as deceased relatives; " psycho- graphy," or " direct writing and drawing," asserted to be done without human intervention; " spirit-photography," or the appearance on photographic plates of human and other forms when no counterpart was visible before the camera to any but specially endowed seers; 3 unfastening of cords and bonds; elongation of the medium's body; handling of red-hot coals; and the apparent passage of solids through solids without disintegration.

The second class of phenomena, which we may call the automatic, consists in table-tilting and turning with contact; writing, drawing, &c, through the medium's hand; convulsive movements and involuntary dancing; entrancement, trance- speaking, and personation by the medium of deceased persons attributed to temporary " possession " (q.v.); seeing spirits and visions and hearing phantom voices. This class bears affinity to some of the phenomena of hypnotism and of certain nervous

1 It is possible that the family of Dr Phelps we'c unaware of the " Rochester knockings " when the disturbances began in his house at Stratford, Connecticut, in 1850 (see Capron's Modern Spiritualism, its Facts, &c.) ; but these disturbances, as recorded, have no closer resemblance to the ordinary occurrences at a spiritualistic seance than those which took place at Tedworth in 1661 (see Glanvill's Sadducismus Triumphatus) and at Slawensik in 1806 (see Kerner's Sekerin von Prevorst), and others too numerous to mention.

2 See the articles on Psychical Research; Magic; Conjuring; Automatism; Divination; Crystal Gazing; Hypnotism; Appari- tions; Hallucinations; Hauntings, &c.

3 There have been several professional photographers (all detected in fraud sooner or later) who made it their business to take photo-

complaints, to certain epidemics of the middles ages, 4 and to phenomena that have occurred at some religious revivals.

In a third class must be placed the cure of disease by healing mediums. This belongs to medical psychology, and cannot well be studied apart from hypnotic treatment of disease, from the now well-

recognized power of suggestion (q.v.), from "faith cures," " mind cures," " Christian Science " and cures connected with other forms of religious belief (see Faith-Healing).

Phenomena falling into the automatic class are much the most common. The investigation of Carpenter on unconscious cerebration and of Faraday on unconscious muscular action 6 showed early in the movement that it was not necessary to look outside the medium's own personality for the explanation of even intelligent communications unconsciously conveyed through table-tilting, automatic writing and trance-speaking — provided the matter communicated was not beyond the range of the medium's own knowledge or powers. And the whole subject of the action of the subconscious personality — the " subliminal self " — has since been more fully worked out by psychologists and notably by F. W. H. Myers. 6 No one conversant with the facts now doubts that what looks like possession or inspiration by an external intelligence may generally be accounted for by subconscious mentation, so that in all cases where no material effects are produced except such as can be attributed to the muscular action of the medium, the evidence for a supernormal interpretation must depend on the content of the communication. Spiritualists maintain that true information is received, which is provably unknown to the medium or other persons present, or which at least is expressed in a manner obviously beyond their powers; and they attribute this to extra-corporeal intelligences. Others, while not going so far as this, admit that the content of the communications does occasionally exceed the medium's knowledge and affords evidence of telepathic communication (see Telepathy) between living persons. Probably most per- sons who have studied the subject would now be inclined to go this length; and there is some evidence, notably in connexion with the trances of an American medium, Mrs Piper, 7 which has convinced some good observers that the hypothesis of occasional communication from deceased persons must be seriously enter- tained. 8 Recently the Society of Psychical Research has obtained from various persons automatic script affording important new material for investigation and which prima facie supports the spiritualistic hypothesis. Whether or not further study of the scripts of these writers confirms this hypothesis, it cannot fail to throw light on the nature of the intelligence in- volved. The scripts contain some matter unknown to the writers and in particular show interconnexions with each other not to be accounted for by knowledge normally possessed by the writers. 9

At no period of the spiritualistic movement has the class of physical phenomena been accepted altogether without criticism. Most

spiritualists know that much fraud in connexion with them has been discovered — frequently by spiritualists themselves— and that the conditions favourable to obtaining them are often such as favour fraud. It is with a full knowledge of these difficul- ties in the way of investigation that they maintain that un- mistakably genuine phenomena are of constant occurrence. Many volumes containing accounts of such phenomena have been printed, and appeal is often made to the mass of evidence so accumulated. " No physical science can array a tithe of the mass of evidence by which psychism " (i.e. what is usually called spiritualism) " is supported," says Serjeant Cox. 10 But the

graphs which should contain, besides the normal sitter, representa- tions of deceased friends. For an account of these see Proceedings of the Society for Psychical Research, vii. 268.

4 See Hecker, Epidemics of the Middle Ages (1859).

5 Athenaeum (July 2, 1853); see also on this subject Chevreul, De la baguette divinatoire, &c. (1854).

6 Human Personality and its Survival of Bodily Death (2 vols., 1903).

7 See Proceedings of the Society for Psychical Research, vi. 436; viii. 1 ; xiii. 284; xxiv. 351.

8 See F. W. H. Myers, op. cit.

9 See Proceedings of the Society for Psychical Research, xx., xxi. 166; xxii. 19; xxiv. 2-328.

10 Mechanism of Man: What am I? (1879), ii. 313.

majority of these accounts have scarcely any scientific value. Spiritualists have, as a rule, sought to convince not by testimony but by ocular demonstration. Yet, if there is not a mass of scientific evidence, there are a number of witnesses — among them distinguished men of science and others of undoubted intelligence — who have convinced themselves by observation that phe- nomena occur which cannot be explained by known causes; and this fact must carry weight, even without careful records, when the witnesses

are otherwise known to be competent and trustworthy observers.

Among proposed normal explanations of these phenomena that of hallucination (q.v.), including illusion as to what is seen almost amounting to hallucination, deserves careful considera- tion. Sensory hallucination of several persons together who are not in a hypnotic state is, however, a rare phenomena outside the seance room and must not therefore be lightly assumed within it; nor is it in most cases a plausible explanation where there is general agreement not only of all the witnesses but of more than one sense as to what is perceived, as distinguished from what is inferred. Nevertheless something of the kind seems occasionally to have happened, especially at some of the seances with Home. 1

What may broadly be called " conjuring " is a much more probable explanation of most of the recorded phenomena; and in the vast majority of cases the witnesses do not seem to have duly appreciated the possibilities of conjuring, and have con- sequently neither taken sufficient precautions to exclude it nor allowed for the accidental circumstances which may on any particular occasion favour special tricks or illusions. The ex- periments of S. J. Davey and R. Hodgson should be studied in this connexion. 2 At a spiritualistic seance the medium has the privilege of failing whenever he pleases and there is seldom any settled programme — circumstances very favourable to deception. As it was put by Mr Stainton Moses, a leading spiritualist and himself a medium, who wrote under the nom de plume' of " M.A. (Oxen.)": "In 99 out of every 100 cases people do not get what they want or expect. Test after test, cunningly devised, on which the investigator has set his mind, is put aside, and another substituted." 3 In other words, the evidence is rarely strictly experimental, and this not only gives facilities for fraud, but makes it necessary to allow a large margin for accidents, mistakes and mal-observation. It may be urged that if none of the phenomena is genuine we have to assume a large amount of apparently aimless trickery in non-professional mediums. But it must be borne in mind that the most excellent moral character in the medium is no guaranteee against trickery, unless it can be proved that he was in no abnormal mental condition when the phenomena occurred; and extraordinary deceptions are known to have been carried on by hysterical patients and others with no apparent motive.

One of the possibilities to be allowed for is that of exceptional muscular endowment or anatomical peculiarity in the medium. For instance, it is not very uncommon to find persons who can make loud sounds by partially dislocating and restoring the toe, knee, or other

joints, and some experiments made with the Fox girls in 1851 supported the view that they made raps by this method.

Besides the general arguments for supposing that the physical phenomena of spiritualism may be due to conjuring, there are two special reasons which gain in force as time goes on. (1) Almost every medium who has been prominently before the public has at some time or other been detected in fraud, or what cannot be distinguished from fraud except on some violently improbable hypothesis; and (2) although it is easy to devise experiments of various kinds which, by eliminating the neces- sity for continuous observation on the part of the investigator, would place certain phenomena above the suspicion of conjur-

1 See, e.g., Report on Spiritualism of the Committee of the London Dialectical Society (1871), pp. 207, 367-369. See also Guldenstubbe, De la realite des esprits (1857), p. 66; also Maxwell, Les Phe.nomenes psychiques (1903).

1 See Proceedings of the Society for Psychical Research, iv. 371 ; viii. 253.

3 Human Nature, for 1876, p. 267.

ing, there is no good evidence that such experiments have ever succeeded.

Nevertheless there does exist evidence for the genuineness of the physical phenomena which deserves consideration. Count Agenor de Gasparin, in his Tables tournantes (Paris, 1854), gives an account of what seem to have been careful experiments, though they are hardly described in sufficient detail to enable. us to form an independent judgment. They convinced him that by some unknown force tables could be got to move without contact. The experiments were conducted with his own family and friends without professional mediums, and in some of them he was assisted by M. Thury, professor of physics at Geneva, who was also convinced of the operation of an unknown force. 4 The minutes of the sub-committee No. 1 of the committee of the Dialectical Society (op. cit., pp. 373-391) report that tables moved without contact, whilst all the persons present knelt on chairs (the backs of which were turned to the table) with their hands on the backs. The report, however, would be of greater value if the names of the medium and of the working members of the committee were given — we only know that of Serjeant Cox — and if they had written independent accounts of

what they witnessed. Sir William Crookes has published accounts of striking experiments and observations with D. D. Home, which have left him convinced of the genuineness of the wide range of physical phenomena which occurred through Home's medium- ship. 5 Of considerable interest again are the experiences of Mr Stainton Moses between 1870 and 1880, of which the best account has been compiled from contemporary records by F. W. H. Myers in two papers published in the Proceedings of the Society for Psychical Rzsearch.fi More recently several men of science, including Sir Oliver Lodge in England, Professor Charles Richet in France, and Professors Schiaparelli and Morselli in Italy, have convinced themselves of the supernormal character (though not of any spiritualistic explanation) of certain physical phenomena that have occurred in the presence of a Neapolitan medium, Eusapia Palladino, though it is known that she fre- quently practises deception. 7 M. Joseph Maxwell, of Bordeaux, has published accounts 8 of raps and movements of objects without contact, witnessed with private and other mediums, which he appears to have observed with care, though he does not describe the conditions sufficiently for others to form any independent judgment about them.

The interest in spiritualism, apart from scientific curiosity and mere love of the marvellous, is partly due to the belief that trustworthy information and advice about mundane matters can be obtained through mediums— to the same impulse in fact which has in all ages attracted inquirers to fortune-tellers. The more thoughtful spiritualists, however, are chiefly interested in the assurance of life and progress after death, and the moral and religious teaching, which they obtain through automatic writing and trance-speaking. It was discovered very early in the movement that the accuracy of these communications could not always be relied on; but it is maintained by spiritualists that by the intelligent exercise of the reason it is possible to judge whether the communicating intelligence is trustworthy, especially after prolonged acquaintance with particular intelli- gences, or where proofs are given of identity with persons known to have been trustworthy on earth. Such intelligences are nut supposed to be infallible, but to have the knowledge of spirit life superadded to their earthly experience. Still the agreement between communications so received has not been sufficiently

4 See Thury, Les Tables tournantes considere.es au point du vue de la question de physique genSrale qui s'y rattache (Geneva, 1855).

6 Quart. Journ. of Science (July and Oct. 1871; republished with other papers by Crookes, under the title of Researches on the Pheno-

mena of Spiritualism (1 874-1 876) . See also his ‘ ‘ Notes of Seances with D.D.Home,” Proceedings of the Society for Psychical Research, vi. 98.

6 Proceedings of the Society for Psychical Research, ix. 245 ; xi. 24.

7 See E. Morselli, Psicologia e spiritismo (Turin, 1908); cf. also Bulletin de I’institut general psychologique (Nov.-Dee., 1908), and Proceedings of the Society for Psychical Research, xxiii. 306.

8 Maxwell, Les Phenomenes psychiques (ist ed., Paris, 1903). There is also an English translation entitled Metapsychical Phenomena (London, 1905).

great for anything like a universal spiritualistic creed to have been arrived at. In France the doctrine of successive reincarnations with intervals of spirit life promulgated by Allan Kardec (L. H. D. Rivail) forms a prominent element of spiritualistic belief. This view has, however, made but little way in England and America, where the opinions of the great majority of spiritu- alists vary from orthodox Christianity to Unitarianism of an extreme kind. Probably it would be impossible to unite spiritualists in any creed, which,, besides the generally ac- cepted belief in God and immortality, should postulate more than the progress of the spirit after death, and the power of some of the dead to communicate with the living by means of mediums.

Spiritualism has been accused of a tendency to produce in- sanity, but spiritualistic sittings carried on by private persons do not appear to be harmful provided those who find in them- selves ” mediumistic ” powers do not lose their self-control and exercise these powers when they do not desire to do so, or against their better judgment. Public sittings are apt to be means of obtaining money by false pretences, and the great scandal of spiritualism is undoubtedly the encouragement it gives to the immoral trade of fraudulent mediumship.

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Capron, Modern Spiritualism, its Facts, &c. (Boston, 1855), fortheearly history of the movement in America; T. W. Edmonds and G. T. Dexter, Spiritualism (New York, 1853-1855); R. Hare, Experimental Investi- gations of the Spirit Manifestations (New York, 1856) ; Allan Kardec, Litre dcs esprits (1st ed., 1853); Mrs De Morgan, From Matter to Spirit (London, 1863), with preface by Professor De Morgan; Alfred Russel Wallace, Miracles and Modern Spiritualism (1876); W. Stainton Moses [M.A. (Oxon.)], Spirit Identity and Spirit Teaching; Zollner, Wissenschaftliche Abhandlungen (the part relating to spiritu- alism has been translated into English under the title Transcendental Physics by C. C. Massey) ; Report of the Seybert Commission on Spiritualism (Philadelphia, 1887); Professor Th. Flournoy, Des Indes a. la Planete Mars (Geneva, 1900; there is an English translation published in London) ; Proceedings of the Society for Psychical Research, passim. A succinct account of typical frauds of spiritu- alism is contained in D. D. Home's Lights and Shadows of Spiritu- alism (2nd ed., 1877-1878), and also in Hereward Carrington's The Physical Phenomena of Spiritualism, Fraudulent and Genuine (Boston 1907). (E. M. S.)

SPIT, a rotating bar for roasting meat, game or poultry. A spit usually has one or more prongs to which the meat is fixed; in the case of a basket-spit it is enclosed in an oblong basket of iron wire. The old form of spit was fixed on hooks or upon rachets on the fire-dogs; at one end of the bar is a grooved wheel for a chain connected with a smoke-jack in the chimney, or some similar contrivance for turning the spit so that every surface of the meat is exposed to the fire in turn. The jack was sometimes turned by a boy or a small dog trained for the pur- pose, the boy and the dog were equally known as turn-spits. The spits, when not in use, were placed in a spit-rack over the fireplace. These primitive arrangements eventually gave place to a combined spit and mechanical roasting-jack, which was fixed to a small crane projecting from the mantelpiece. The jack, which was largely of brass, rotated when wound up, and the meat was hung below it immediately in front of the fire, and the gravy and dripping were caught in a large shallow metal pan with a high screen to prevent the diffusion of heat. The almost universal employment in England of closed kitcheners has thrown all forms of spits and jacks into disuse, but in old-fashioned kitchens they are still sometimes seen. The more ancient forms of roasting apparatus are now much sought after by collectors.

SPITALFIELDS, a district of London, England, in the western part of the metropolitan borough of Stepney. The name is derived from the fact that the land belonged to a priory of St Mary Spital, founded in

1197. Excavations have revealed a Roman burial-place here. The name is well known in connexion with the silk industry established here by French refugees after the revocation of the Edict of Nantes, in 1685.

SPITHEAD, a strait of the English Channel, between the mainland (the coast of Hampshire, England) and the north- eastern coast of the Isle of Wight, forming the eastern entrance to Southampton Water, the Solent being the western. Its length is about 12 m., and its general breadth about 4 m., though the distance between Ryde and Gilkicker Point is almost exactly 3 m. The Spit Sand, extending south-east from this promontory, gives name to the strait. On the north side opens the narrow entry to Portsmouth Harbour, with the towns of Portsmouth and Gosport east and west of it. On the south the coast of Wight rises sharply though to no great elevation; it is well wooded, and studded with country residences. Here is also the favourite watering-place of Ryde. Spithead, which as an anchorage is exposed only to the south-east, shares in the fortifications of Portsmouth Harbour, the principal station of the British navy. In this connexion the strait has been the scene of many splendid naval pageants, such as those attendant upon the jubilee in 1897, and the funeral in 1901 of Queen Victoria, and that which celebrated the coronation of King Edward VII. on the 16th of August 1902.

SPITI, an extensive minor division of Kangra district in the Punjab, India. Area, 2155 sq. m., the population (1901) being only 3231, all Buddhists. It consists of an outlying Tibetan valley among the external ranges of the Himalayas, which has a mean elevation of 12,981 ft. and contains on its borders many peaks over 20,000 ft. and one in the outer Himalayas of 23,064 ft. in altitude. Spiti originally formed part of the kingdom of Ladakh, and came into the hands of the British in 1846. The river Spiti rises at the converging angle of the Kamzam and outer Himalayan ranges at a height of 20,073 ft-, drains the whole valley of Spiti, and falls into the Sutlej after a course of 120 m.

SPITSBERGEN (the name being Dutch is incorrectly, though commonly, spelled Spitzbergen), an Arctic archipelago, almost midway between Greenland and Novaya Zemlya, in 76 26′ to 80° 50′ N. and io° 20′ to 32° 40′ E., comprising the five large islands of West Spitsbergen or New Friesland, North-East Land, Edge Island, Barents Island and Prince Charles Fore- land, the Wiche Islands, and many small islands divided by straits from the main group. The chief island, West Spits- bergen, shaped like a wedge pointed towards the south and deeply indented on the west and north by long branching

fjords, has an area of about 15,200 sq. m. At the north-west angle of the island is a region of bold peaks and large glaciers, in the midst of which is the fine Magdalena Bay. Farther south come the series of glaciers called by the whalers " The Seven Icebergs," which drain a high snowfield reaching east almost to Wood Bay and south to the head of Cross Bay. On the south-east it is drained by glaciers towards or into Dickson and Ekman bays. South of this snowfield comes the mountainous King James Land, consisting of an intricate network of craggy ridges with glaciers between. A deep north-and-south de- pression is occupied by Wijde and Dickson bays, the one opening on the north coast, the other a head-branch of the great Ice Fjord of the west coast, bordered on the west by a range of fine mountains, a spur of which separates the two bays. East of this depression there is a plateau region. Its edge is eaten away into deep valleys, down which the ice-sheet of New Fries- land sends glacier tongues into Wijde Bay. East of Dickson Bay the marginal valleys are larger, and no glaciers come far down them. The plateau between Dickson and Klaas Billen bays is cut up by deep valleys such as the Rendal, Skansdal and Mimesdal (all well known to geologists); it contains no large glaciers. Farther east is found a glaciated area called Garwood Land by Sir Martin Conway. The neck of West Spits- bergen is bounded on the north by a line from near the head of Klaas Billen Bay to Wiche Bay, and on the south by the Sassendal and the depression leading to Agardh Bay. It is a complicated area of fine craggy ridges with beautiful glaciers between. Adventure Land lies south of the neck, and is bounded on the south by a line from the head of Van Keulen Bay to Whales Bay. It is an area of boggy valleys, rounded hills, and small glaciers,

and may be described as the temperate and fertile belt, and is the only part of the island where reindeer still linger in any number. Near the west coast it contains some fine peaks and large glaciers. It is penetrated by the longest green valleys in Spitsbergen, e.g. from Coles Bay, Advent Bay and Low Sound (the valley of the Shallow river). The southern division of the island is very icy. There is a high snowfield alcng its east side, and ranges of peaks farther west. Two parallel ranges form the backbone of the-island south of Horn Sound, the higher of them containing the famous Horn Sund Tind (4560 ft.). The long narrow island, Prince Charles Foreland, with lofty peaks, runs parallel to part of the west coast of West Spits- bergen, from which it is separated by a narrow strait. Its range of mountains is

interrupted towards the southern end of the island by a flat plain of 50 sq. m. raised only a few feet above sea-level. There is a narrower depression a few miles farther north. The broad Stor (Great) Fjord, of Wybe Jans Water, separates the main island from two others to the east — Edge Island (2500 sq. m.) and Barents Land (580 sq. m.). Formerly these were considered as one, until the narrow Freeman Strait which parts them was discovered. Neither Barents Land nor Edge Island carries ice-sheets, and both are practi- cally devoid of glaciers down their western coasts, but have large glaciers reaching the sea on the east. To the north-east of West Spitsbergen, separated from it by Hinlopen Strait (7 to 60 m. in breadth) lies North-East Land, with an area of about 6,200 sq. m. Its western and northern coasts are indented by several bays and fjords. It is covered with a true ice-sheet, while the neighbouring Wiche Islands to the south-east bear no large glaciers at all. East by north from Cape Leigh Smith, the easternmost promontory of North-East Land, rises White Island, covered with snow and ice, and rising to about 700 ft. It was discovered by Cornelis Giles or Gillis in 1707, and is alterna- tively named Giles Land. Numerous small islands lie around the larger: Danes and other islands off the north-west coast of West Spitsbergen, the Seven Islands, Outger Reps, Broch, and Charles XII. Island on the north of North-East Land; Hinlopen Strait contains numerous islets, and the Ryk Yse Archipelago, Hope or Walrus Island, and the Thousand Islands (about a hundred small rocks) lie to the east and south of Edge Island.

The nomenclature is in a state of hopeless confusion, the names given by the old explorers having been carelessly trans- ferred from point to point, or capriciously set aside. The true names, English and Dutch, of the principal misnamed sites are here indicated in brackets after the current names: South Cape (Point Look-out), Torrel's Glacier (Slaadberg), Recherche Bay (Joseph's Bay, Schoonhoven), Van Keulen Bay (Lord Ellesmere Sound, Sardammer Rivier), Van Mayen Bay (Low Sound, Klok Rivier), Coal Bay (Coles Bay), Advent Bay (Adventure Bay), St John's Bay (Osborn's Inlet), English Bay (Cove Comfortlesse) , Foreland Sound (Sir Thomas Smith Bay, Keerwyk), Cross Bay (Close Cove), the bay called Smeerenburg (Fair Haven, Dutch Bay), Flat Hook (Fox Point), Biscayers' Hook (Point Welcome), Redbeach (Broad Bay), Leifde Bay (Wiche Sound), Grey Hook (Castlin's Point), Wijde Bay (Sir Thomas Smith Inlet), Verlegen Hook (Point Desire), Treuren- berg Bay (Bear Bay), Agardh Bay (Foul Sound), Stor Fjord

(Wybe Jans Water), North-East Land (Sir Thomas Smith Island), North Cape (Point Purchas). Stans Foreland is not, as often appears,

an alternative name of Edge Island, but the

lame of its south-eastern cape only.

Geology. — The backbone of the main island consists of an ancient mass of pre- Devonian granites, gneisses and schists forming a mountain chain in the western region. Resting upon these ancient crystalline rocks, the precise age of which has not been definitely determined, there is a succession of sedimentary rocks representing nearly every one of the prominent periods of geological time. For the eastern part of the group these strata lie nearly horizontal ; here and there they are pierced by intrusive igneous rocks. The oldest sediments yet found are the Ordˆvician beds which occur at Hekla Hook, dolomites, limestones, slates and quartzites; Silurian rocks may possibly exist in the north-west; and Devonian grits with Pleraspis have been recorded in Liefde Bay. The Carboniferous period is represented by Culm-like rocks (classed by O. Heer as

Ursien — Upper Devonian) ; upon these come limestones with Spirifer Mosquensis (Hinlopen Straits) and above these again are limestones with Cyathophyllum and Fusulina: (Eisfjord, Bell Sound, Horn Sound, &c). Permo-Carboniferous limestones and dolomites occur on the west on the mainland and on Prince Charles Foreland and in King James Land. Black slaty shales with large ammonites in the Calcareous nodules and beds of black, bituminous limestone represent the Trias at Cape Thorodsen ; and Rhaetic fossils are found in Research Bay, Bell Sound. Jurassic rocks are widely spread and include Bajocian, Bathonian, Callovian, Oxfordian and Portlandian (Cape Starashchin and Advent Bay) ; the older stages being in the west. Some of these rocks are coal-bearing. Wealden strata with coal seams and marine beds (Volgian) occur in the south, and in King Charles Land are Neocomian rocks with interbedded basalts. Plant-bearing lower Cretaceous strata have been recorded, and lower Eocene beds are found in Ice Fjord, Bell Sound containing large magnolia leaves and others; beds of London Clay age occur in Kolbay. Miocene Sandstones and clay with lignite beds, some 2800 ft. thick, occupy the west coast about Ice Fjord, Bell Sound, Advent Bay, &c. In this period these islands were probably all united and covered a much greater area and were covered with extensive peat bogs, on the edges of which the marsh cypress flowered, dropping its leaves and blossoms into the marshes. Sequoia, poplars, birches, planes and large oaks also grew there, while ivy and thick underwood freely developed under their shadow, and thousands of insects swarmed in the thicket. Subsidence followed in late Tertiary times, to be succeeded by a period of rapid elevation giving origin to

the raised beaches such as those seen on Prince Charles Foreland, and possibly resubmergence may be again in progress. In comparatively recent geological times this, the main island, was over most of its area a high plateau covered with an ice-sheet, which has gradually been withdrawn from the west towards the east, the western region being thus cut up into deep valleys and more or less rugged moun- tains. Farther east the mountains are' more rounded, but still farther east the plateau character of the land remains.

Climate. — The sea around Spitsbergen is shallow, and the ice readily accumulates round the shores. Although the glaciers of Spitsbergen do not give origin to icebergs so huge as those of Green- land, the smaller bergs and the pack-ice are thick enough to prevent access to the shores except for a few months in the year. However, the warm drift from the Atlantic sends a branch to the western shores of Spitsbergen, moderating its climate, and leaving an open passage which permits vessels to approach the western coast even under the most unfavourable conditions of ice in the arctic regions. Drift-wood from lower latitudes, glass floats of the Norwegian fishermen and other objects have been found at the northern extremity of Spitsbergen. On the other hand a cold current charged with ice descends from higher latitudes along the eastern coasts, rendering approach extremely difficult. On this account these shores long remained practically unknown.

Owing to the warm drift the climate of Spitsbergen is less severe than in the corresponding latitudes of Greenland and Smith Sound. Bear Island, notwithstanding its more southerly position, has a lower temperature. The isotherm of 23 ° F., which crosses the middle of Eastern Siberia, touches its southern extremity, and only the north- east coasts of Spitsbergen have an average yearly temperature so low as 14 to 10-5°. At Mussel Bay (79° 53') the average yearly temperature is 16 (January 14-1°, July 39-3°). Even in the coldest months of the winter a thaw may set in for a few days; but, on the other hand, snow sometimes falls in July and August. Spring comes in June; the snow becomes saturated with water and disappears in places, and scurvy grass and the polar willow open their buds. By the end of June the thermometer has ceased to sink below the freezing- point at night; July, August and September are the best months. In September, however, autumn sets in on shore, and by the end of the month the pack-ice rapidly freezes into one solid mass. In Trcurenberg Bay an annual precipitation of 64 in. has been observed.

Fauna and Flora. — The Greenland whale has completely disap-

peared in consequence of the great havoc made by the early whalers. According to Scoresby, no less than 57,590 whales were killed between 1669 and 1775. A great diminution, in the same way, is to be observed in the numbers of other creatures which were the object of hunters. A reckless extermination of seals was carried on. Walruses are now only occasionally seen in the waters of West Spitsbergen. Birds, also, have rapidly diminished in numbers. The fulmar petrel meets ships approaching Spitsbergen far away from the coasts. It makes colonies on the cliffs, as also do the glaucous gull and the " burgomaster." Rotches, black guillemots, ivory gulls, auks and kittiwake gulls breed on the cliffs, while geese, looms and snipe frequent the lagoons and small fresh-water ponds. The eider duck breeds on the islands, but its numbers have become noticeably reduced, while the lumme and the tern confine themselves to separate cliffs. These birds, however, are only guests in Spits- bergen, the snow-bunting being the only species which stays perma- nently; some twenty-three species breed regularly on Spitsbergen, and four others (the falcon, snowy owl, swan and skua) come occasionally. Of land mammals, besides the polar bear, the reindeer and arctic fox have been greatly reduced; the reindeer, in fact, are approaching extinction, whereas for several years consecutively

before 1868 from 1500 to 2000 were killed by hunters in a few weeks of summer.

There are twenty-three species of fishes, but no reptiles. Insects are few. Arachnids, and especially Pantopods, on the other hand, are very common. Molluscs are also numerous. At some places the mussels and univalves reach a large size and appear in great abundance. Of Crustaceans fully 100 species have been recognized in the waters of the archipelago.

The flora is, of course, poor. The only tree is the polar willow, which does not exceed 2 in. in height and bears a few leaves not larger than a man's finger-nail; and the only bushes are the crow- berry and cloudberry. But at the foot ol the warmer cliffs some loam has been formed notwithstanding the slowness of putrefaction, and there, in contrast with the brownish lichens that cover the hills, grows a carpet of mosses of the brightest green, variegated with the golden-yellow flowers of the ranunculus, the large-leaved scurvy grass, several saxifrages, fox-tail grass, &c. , with a few large flowers, Polygona

and Andromedae; while on the driest spots yellow poppies, whitlow grasses, &c, are found. Even on the higher slopes, 1500 ft. above the sea, the poppy is occasionally met with. In all over 130 species of flowering plants have been found. Mosses, mostly European acquaintances, cover all places where peat has accumulated. The slopes of the crags and the blocks of stone on the beach are sometimes entirely covered with a luxuriant moss and lichen vegetation, among the last being the so-called " famine bread " (Umbilicaria arctica), which has maintained the life of many arctic travellers. Although limited in number, the flora is suggestive in its distribution. The vegetation of the south has a decidedly Lappish or European alpine character, while that of the north coast is decidedly American, and recalls that of Melville Island. Many flowering plants which are common in north-west Spitsbergen are absent from the east coast, where the cold climate is inimical to both flora and fauna; but, on the other hand, one moss {Pottia hyperborea) and one lichen (Usnea melaxantha) are found there which are of American origin and grow both in North America and on the Cordilleras. Algae are most numerous, many, like the brown Laminaria and Nostoc communis, which fill all pools and are the chief food of many birds, being familiar in Europe. Protococcus nivalis covers the snow with its reddish powder.

History. — Spitsbergen has never been permanently inhabited, although there are several instances of hunters wintering on the island under stress of circumstances, and several scientific expeditions have done so. A Russian trapper named Starash- chin is said in various accounts to have spent 32 or 39 winters, and 15 consecutive years, in the archipelago; he died there in 1826. Spitsbergen was discovered on the 17th of June 1596, during the expedition under William Barents and Jacob Heem- skerk, which ended with the death of Barents. Barents saw parts of the west and north coasts, and to these he gave the name of Spitsbergen. In 1607 Henry Hudson, after visiting the coast of Greenland, reached Spitsbergen in June. Bear Island, the ice-bound island midway between Spitsbergen and the North Cape, situated on the same submarine platform as the former, had been discovered by Barents, and became important as a hunting-ground (for walrus, Sic.) before Spitsbergen began to be visited for this purpose. In 1609 Thomas Marmaduke of the " Heartsease," proceeding north from Bear Island, reached Spitsbergen, and in the following year the first hunting expedition was despatched thither by the Muscovy Company on board the " Amitie " of London, Jonas Poole, master, on whose report of the abundance of whales on the coast the Spitsbergen

whaling industry, which was to grow to such im- portance, was established in 161 1. Very shortly the Dutch began to take a share in this, and there were frequent collisions between the whalers of the two nationalities, while in 1615 the Danes attempted to claim this part of " Greenland," as Spits- bergen was for a long time considered. England attempted to annex the archipelago, but at length the Dutch became pre- dominant in the whaling industry, and in 1623 founded the summer settlement of Smeerenburg. This became a busy and important centre, but began to decline in about twenty years, as the whales were gradually driven from the bays and must be followed, at first northward along the coast, and later into the open sea. Independently of the English and Dutch, Russians from the White Sea district came to Spitsbergen to hunt walruses, seals, bears, foxes, &c. At what early period they first did so cannot be known, but the industry seems to have gained a certain importance before 1740. The Russians had their own nomenclature for various parts of the archipelago, the

whole of which they also called Grumant, a corruption of Green- land. A similar hunting industry was established by Nor- wegians early in the 18th century, but Spitsbergen declined in importance as a hunting-ground owing to the indiscriminate slaughter of game.

Many expeditions have made Spitsbergen their base for polar exploration. The Russian admiral Chichagov visited it twice, in 1765 and 1766, and reached 8o° 28′ N. The expedition sent from England in 1773 at the instigation of Daines Barrington under the command of Constantine John Phipps, was the first having a purely geographical purpose. It consisted of two vessels, the " Racehorse " and the " Carcass," on the first of which Horatio Nelson was a midshipman. Phipps mapped the north of Spitsbergen, and reached 8o° 48′ north. In 18 18 David Buchan and John Franklin reached 8o ° 34′ to the north of the archipelago. Captain D. C. Clavering and Sir Edward Sabine in 1823 explored the islands, and Sabine made his remarkable magnetic observations, while Clavering reached 80° 20′ N. Sir William Parry, shortly after his return from his third voyage, went to Spitsbergen and reached 82 40′ north on sledges, while other members of the expedition were occupied with scientific work in the archipelago. In the same year the Norwegian geologist Balthasar Mathias Keilhau visited the group and related his experiences in a remarkable book, Resa i Ost og West Finmarken (Christiania, 1831). The Swedish pro- fessor Sven Loven was the first to undertake, in 1837, dredging and geological explorations in Spitsbergen and its vicinity. Next year a body of French, Swedish, Danish, and Norwegian naturalists, among whom was Charles Martins, visited the

western coast. In 1858, at the suggestion of Loven, Otto Torell, accompanied by A. E. Nordenskiold and A. Quenncrstadt made many important observations and brought home rich geological collections. In 1861 a larger expedition led by Torell, Nordenskiold, A. J. Malmgren, and Karl Chydenius, set out with the object of finding how far it was possible to obtain a measurement of an arc of meridian of sufficient extent. This aim was only partly accomplished, but the expedition returned with an invaluable store of various observations. The work of the measurement of the arc was completed in 1864 by another expedition conducted by Nordenskiold, assisted by Malmgren and N. Duner. This expedition was followed in 1868 by that of the " Sofia," under Nordenskiold, which, in the words of Oswald Heer, " achieved more and gave a wider extension to the horizon of our knowledge than if it had returned merely with the information that the ' Sofia ' had hoisted her flag on the North Pole." In the same year the German arctic ex- pedition under Karl Koldewey circumnavigated West Spits- bergen. In 1870 two young Swedish savants, Drs Nathorst and Wilander, visited Spitsbergen in order to examine the phosphoric deposits, and two years later a colony was formed in Ice Fjord, and a small tramway constructed to work the beds. The attempt, however, did not prove successful. Leigh Smith and the Norwegian Captain Ulve visited and mapped parts of East Spitsbergen in 187 1, returning with valuable information. They reached 81° 24′ north. In the same year the first tourist steamer visited the archipelago. In 1872 a great polar expedition under Nordenskiold set out to winter on Spitsbergen with the intention of attempting in the spring to advance towards the pole on sledges drawn by reindeer. But the expedition encountered a series of misfortunes. The ships were beset in the ice very early in Mussel Bay, and, six Nor- wegian fishing vessels having been likewise overtaken and shut in, the expedition had to feed the crews on its provisions and thus to reduce the rations of its own men. The reindeer all made their escape during a snow-storm; and when the sledge party reached the Seven Islands they 'found the ice so packed that all idea of going north had to be abandoned. Instead of this, Nordenskiold explored North-East Land and crossed the vast ice-sheet which covers it. The expedition returned in 1873 with a fresh store of important scientific observations, especially in physics and submarine zoology. In 1873 R. von Drasche- Wartinberg, the geologist, paid a short visit to Spitsbergen,

In 1882 the Swedish geologists, A. G. Nathorst and G. de Geer made a journey which furnished interesting data about the geology and flora of the islands. In the same year a Swedish meteorological station was established at Cape Thordsen for carrying on the observations desired by the international polar committee. During the last decade of the 19th century Spits- bergen attracted not only a number of scientists but also sports- men and tourists. Such expeditions as those of Gustaf Norden- skiold in 1890 and the important circumnavigation by Nathorst in 1898, during which the Wiche Islands and White Islands were carefully explored, confined their attentions almost en- tirely to the coasts. In 1892 M. C. Rabot made the first serious attempt to penetrate the interior from the head of Ice Fjord, exploring a part of the Sassendal; and in 1896 Sir Martin Conway led an expedition which crossed the island for the first time, and surveyed the region between Ice Fjord and Bell Sound on the east coast. In 1897 Conway and Mr E. J. Garwood surveyed the glaciated area north of Ice Fjord to about 78 10′ N., and climbed Horn Sund Tind. In the same year Herr Andre made his fatal balloon ascent from Danes Island with the intention of floating over the Pole. In 1896 a weekly service of Norwegian tourist steamers was established in summer, and a small inn was built at Advent Bay in Ice Fjord, and though this was afterwards closed, the west coast continued to be fre- quently visited by tourist steamers during the height of summer. In 1898, 1899 and 1906 the prince of Monaco made scientific investigations in the Archipelago, and in 1898-1902 Swedish and Russian expeditions undertook the measurement of an arc of the meridian, the results of which were accompanied by valuable physiographical, meteorological, botanical and other obser- vations. Dr W. S. Bruce made a complete survey and scien- tific investigations of Prince Charles Foreland. In 1900 coal began to be worked on Advent Bay, a seam 10 ft. thick being found below 40 ft. of fossil ice and 20 ft. of rock. This develop- ment and other considerations led to some discussion between the powers interested as to the territorial sovereignty over the archipelago, a question which though approached before (as in 1870) had never been brought to a settlement.

Bibliography. — On a land visited by so many scientific observers the literature is naturally voluminous. The chief source of scientific papers is the publications of the Swedish Vetenskaps Akademie. Sir W Martin Conway narrates his expedition in the First Crossing of Spitsbergen (London, 1897); and in No Man's Land (Cambridge, 1906) he details the history of the Archipelago down to 1840, tabulates the principal voyages and incidents thereafter until 1900,

and furnishes a very full bibliography for the history and geography of Spitsbergen from the earliest time down to 1902. The various observations of the Swedish expedition for the measure- ment of an arc of the meridian were brought together (in French) in Missions scientifiques pour la mesure d'un arc de meridien au Spitzberg . . . (Stockholm, 1903-1906), and those of the Russian expedition under the same title in 1904, seq. (St. Petersburg).

SPITTA, FRIEDRICH (1852-), German Protestant theologian, was born at Wittingen on the 10th of January 1852. His father, Karl Johann Philipp (1801-1859), well known as a hymn- writer (see Lyra domestica, 1st series, London, i860; 2nd series, 1864), was superintendent at Burgdorf near Hanover. Friedrich studied at Gottingen and Erlangen, and in course of time became (1887) professor ordinarius and univer- sity preacher at Strassburg. In 1896 he became joint-editor with J. Smend of the Monatschrift fiir Gottesdicnst und kirch- liche Kunst, and he is widely known as the author of a work on the Acts of the Apostles (Die Apostelgeschichte, ihre Quellen und deren geschichtlicher Wert (1891).

His other works include : Der Knabe Jesus, eine biblische Geschichte und ihre apokryphischen Entstellungen (1883), Die Offenbarung des Johannes (1889), Zur Reform des evang. Kultus (1891), and Zur Geschichte und Litteratur des Urchristentums (3 vols., 1893-1901).

1 SPLEEN (Gr. cn\i)v), a vascular organ situated on the left side of the abdomen (see Ductless Glands). It was supposed in olden times to be the seat of ill-humour and melancholy, whence such phrases as " to have the spleen," to be out of temper, sulky, morose, " splenetic."

SPLUGEN PASS, one of the passes across the main chain of the Alps from Switzerland to Italy (from 1512 to 1797, however,

Chiavenna belonged to the Grisons). The route quits that of the Albula Pass (q.v.) at Thusis, passes first through the celebrated gorge of the Via Mala, then through the Schams basin and past Andeer, beyond which the Rofna gorge gives access to the village of Spliigen (from which the pass takes its name) in the upper reach of the main or Hinter branch of the Rhine (q.v.). Leaving to the west the road over the San Bernardino Pass, 6769 ft. (by which the St Gotthard railway line is joined at Biasca, the route lying entirely through Swiss territory) the Spliigen road (constructed in 1823) mounts south to the pass (6946 ft.), which forms the political frontier. On the other side the road avoids the old path through the dreaded Car- dinello gorge (here passed Macdonald's army in December, 1800) in

order to descend by zigzags to Pianazzo. Thence past Campo Dolcino and Gallivaggio the descent is made to the ancient town of Chiavenna at the junction of the read from the upper Engadine over the Maloja Pass, and 17 m. by rail above Colico, at the northern end of the lake of Como. The distance by road from Spliigen village (16 m. above Andeer) to Chia- venna is 25 m. The diligences take 5I hours from Spliigen vil- lage (4 hours above Thusis) to Chiavenna. But by the proposal to pierce a railway tunnel of about 16 m. in length from Andeer to Gallivaggio, it was calculated that the Spliigen line would become the shortest route from southern Germany to Milan, while at Chiavenna it would receive the traffic from the upper Engadine. (W. A. B.C.)

SPODUMENE, a lithium-aluminium silicate belonging to the pyroxene group (see Pyroxene). It was named by B. J. d'Andrada e Sylva, in 1800, from Gr. o-ir6Sios (ash-coloured), in allusion to its grey colour. Soon afterwards J. R. Haiiy termed it triphane, because it exhibited certain characteristics equally in three directions (rpKpavrjs, appearing three-fold). Spodumene crystallizes in the monoclinic system, the crystals having generally a prismatic habit and being often striated longitudinally. It has perfect prismatic cleavage, and imper- fect cleavage parallel to the clinopinacoid, whilst a lamellar structure may be developed by parting along the orthopinacoid. The hardness is 6-5 to 7, and the specific gravity about 3-16. Though generally a dull mineral, some varieties of spodumene are so brightly coloured and transparent as to be valued as gem-stones. Such is the emerald-green hiddenite (q.v.) and the lilac-coloured kunzite (q.v.), whilst a yellow or yellowish- green spodumene found as pebbles in the state of Minas Geraes, in Brazil, resembles, when cut, some kinds of chrysoberyl. Common spodumene is used as a source of lithium in chemical preparations. Spodumene occurs in granite and crystalline schists. The original specimens came from the isle of Uto in Sodermanland, Sweden, but the finest examples are found in the United States, especially in Massachusetts, where Goshen, Sterling and Chester- field are well-known localities. Very fine specimens have been obtained from the Black Hills of S. Dakota. Some remarkable deposits containing spodumene were discovered many years ago at Branchville, Fairfield county, Connecticut, and the minerals which they yielded were exhaustively studied by Professor G. J. Brush and E. S. Dana. The spodumene occurred in large quantity, in a vein of albite-granite, associated with apatite, garnet, columbite, pitchblende and other uranium minerals, together with several species of manganese phosphates, termed eosphorite, triploidite, dickinsonite, lithiophilite, natrophilite,

reddingite, fairfieldite and fillowite. The spodumene, which has normally the formula LiAl (Si03)2, becomes altered at Branch- ville to what has been called |3-spodumene, which consists really of the mineral eucryptite (LiAlSi0 4) and albite. Eucryp- tite was named by Brush and Dana from ev (well) and Kpvirros (concealed). Further alteration results in the formation of cymatolite, a mineral described by C. U. Shepard in 1867, but shown to be an intimate mechanical mixture of muscovite and albite. The final products of alteration of the spodumene may be muscovite, albite and microcline. The mineral dis- covered in 1817 in the granite of Killiney Hill, near Dublin, and described by T. Thomson as killinite, appears to be an altered spodumene. (F. W. R.)*

SPOHR, LUDWIG (1784-1859), German composer and violin- ist, was born at Brunswick on the 25th of April 1784. He spent his childhood at Seesen, where in 1789 he began to study the violin, and at six years old was able to take part in chamber- music. He had a few lessons in composition, but, as he himself tells us, he learnt more from studying the scores of Mozart. After playing a concerto of his own at a school concert with marked success, he was placed under Maucourt, the leader of the duke's band; and in 1798 he started on an artistic tour. This proved a failure; but on his return to Brunswick the duke gave him an appointment in his band, and provided for his future education under Franz Eck, with whom he visited St Petersburg and other European capitals. His first violin concerto was printed in 1803. In that year Spohr returned to Brunswick and resumed his place in the duke's band. A visit to Paris was prevented by the loss of his favourite violin — a magnificent Guarnerius, presented to him in Russia. After a series of concerts in Berlin, Leipzig, Dresden, and other German towns, his reputation gained for him in 1805 the appoint- ment of leading violinist to the duke of Gotha. Soon after this he married his first wife, Dorette Scheidler, a celebrated harpist. At Gotha he composed his first opera, Die Priljung, but did not succeed in producing it. Alruna was equally unfortunate, though Goethe approved of it at a trial rehearsal at Weimar in 1808. In this year Spohr, hearing that Talma was performing at Erfurt before Napoleon's Congress of Princes, and failing to obtain admission to the theatre, bribed a horn- player to send him as his deputy; and, though he had never touched a horn in his life, he learned in a single day to play it well enough to pass muster in the evening and so to get a good view of Napoleon and the

princes in a pocket mirror on his desk. Spohr's third opera, Der Zweikampf mil der Geliebten, written in 1809, was successfully performed at Hamburg next year. In 181 1 he produced his (first) Symphony in E flat, and in 181 2 composed his first oratorio, Das jiingste Gericht. 1 In writing this work he felt hampered by lack of skill in counter- point.; so with characteristic diligence he mastered the contents of Marpurg's Abhandlung von der Fuge.

In 181 2 Spohr visited Vienna, and was induced to accept the leadership of the orchestra at the Theater an der Wien. He then began his dramatic masterpiece, Faust, which he completed in 1813, though it was not performed until five years later. His strength and inventiveness as a composer were now fully developed, and enabled him to produce large works with astonish- ing rapidity. He resigned his appointment at Vienna in 181 5, and soon afterwards made a tour in Italy, where he' per- formed his eighth and finest violin concerto, the Scena canlanie, nello stilo drammatico. The leading Italian critics called him " the finest singer on the violin that had ever been heard." On Spohr's return to Germany in 181 7 he was appointed con- ductor of the opera at Frankfort; and there in 1818 he first produced his Faust. It was followed by Zemire und Azor, which, though by no means as fine as Faust, soon attained a much greater popularity. Faust suffered from its libretto, which is on quite a different plot from Goethe's poem.

Spohr first visited England in 1820, and on the 6th of March played his Scena cantante with great success in London at the first Philharmonic concert. At the third he produced a new symphony (No. 2 in D minor) and, instead of having it led by the first violinist and a maestro al cembalo, conducted it himself with a baton; a great innovation in London at the time. Spohr had a triumphant success both as composer and as virtuoso; and he on his side was delighted with the Philharmonic orchestra. At his farewell concert in London Mme Spohr played on the harp for the last time. The constrained attitudes of harp- oiaying were bad for her health; so in later concerts she played the pianoforte in duets with violin which her husband produced with his usual prompt facility. After a transitory visit to Paris, Spohr returned to Germany and settled for a time in Dresden, where German and Italian opera were flourishing side by side under the direction of Weber and Morlacchi. Spohr could 1 Not to be confused with The Last Judgment.

not appreciate Weber's genius ; nevertheless Weber recommended him strongly to the elector of Hesse Cassel as Kapellmeister. Spohr entered upon his duties at Cassel on the 1st of January 1822, and

soon afterwards began his sixth opera, Jessonda, which he produced in 1823. This work — which he himself re- garded as one of his best — marks an important epoch in his operatic career. It was his first opera on Gluck's lines, i.e. with accompanied recitative throughout in place of secco-recitative or spoken dialogue; and it was produced in the same year as Weber's Euryanthe, a work marked by the same departure from German custom.

Spohr's resources at Cassel enabled him to produce his new works on a grander scale and with more perfect detail than he could have attained in a less well-endowed post; and he never failed to use these privileges to the advantage of other meri- torious composers, though as a critic he was very difficult to please. Soon after his instalment Mendelssohn, then a boy of thirteen, visited Cassel; notwithstanding the disparity of their years, a firm friendship sprang up between the two, which ceased only with Mendelssohn's death in 1847. Spohr's next three operas, Der Berggeist (1825), Pietro von Abano (1827) and Der Alchymist (1830), attained only fair temporary success. But at the Rhenish musical festival held at Dusseldorf in 1826, his oratorio Die lelzten Dinge met with so enthusiastic a reception that it was repeated a few days later in aid of the Greek Insur- gents, and became the most famous of his sacred compositions. It is known in English as The Last Judgment. In 183 1 Spohr summed up another aspect of his career by publishing his Violin School, an admirable book for advanced students, which stands to the violin much as the combination of Cramer's Studies with Clementi's Gradus stands to the pianoforte. The year 1834 was saddened by the death of Spohr's wife. In 1836 he married again. During 1833 he had been working at an oratorio — Des Heilands letzte Stunden, known in English as Calvary or The Crucifixion — which was performed at Cassel on Good Friday 1835, and sung in English at the Norwich Festival of 1839 under Spohr's own direction, with an effect which he afterwards always spoke of as the greatest triumph of his life. For the Norwich Festival of 1842 he composed The Fall of Babylon, which also was a perfect success, though the elector of Hesse- Cassel, unmoved by a petition from England almost amounting to a diplomatic representation, refused Spohr leave of absence to conduct it. His last opera, Die Kreuzfahrer, was produced at Cassel in 1845. Of his nine symphonies the finest, Die Weihe der Tone, was produced in 1832. His compositions for the violin include concertos, quartetts, duets, and other con- certed pieces and solos, and among these a high place is taken by four double quartetts, {i.e. octets for two antiphonal string- quartet groups), an art-form of his own invention. He was, indeed, keenly interested in experiments, notwithstanding

his attachment to classical form; and the care with which he produced Wagner's Fliegender Hollander and Tannhauser at Cassel in 1842 and 1853, in spite of the elector's opposition, shows that his failure to understand Beethoven lay deeper than pedantry. Spohr retained his appointment until 1857, when, very much against his wish, he was pensioned off. In the same year he broke his arm, but he was able to conduct Jessonda at Prague in 1858. This, however, was his last effort. He died at Cassel on the 16th of October 1859.

Spohr's Selbslbio graphic is a delightful document, revealing a character the generosity of which was conspicuous through all its complacent intellectual foibles. He was a born taste-maker, for he mastered the technique of his art safely and then applied his mastery to the expression of exactly those modes of thought which surprise no one who believes that each art-problem has one answer and that the critics know it. But he had a very genuine melodic invention, and his sense of beauty was such as even the all-pervading mannerisms of his otiose chromatic style could not quite destroy. He tried every experiment the copy-book optimism of his age could suggest; the subjects of his operas are all that is romantic and necromantic; he wrote almost as much " programme-music " as Berlioz; he invented

" double quartets," he wrote an Historical Symphony tracing the progress of music from Bach to his own day; and, lastly, his gift for orchestration was quite exceptional. Yet not one of his experiments shows any essential connexion between the new form and the old material which he has so skilfully packed into it. Nor is his treatment of his beloved classical forms any nearer to organic life. In conversation with Joachim he once in his last years expressed the ambition to write a set of string quartets " in the strict form with all the passages ending properly with shakes." This shows that all his work as a composer had failed to wean him from the conventions of virtuoso players, and it well illustrates the way in which " strict forms " desert their convenient functions to pose as classical ideas; for the " passage ending in a shake " is merely the easiest known way of finishing a section in concerto style, and is so far from being an essential feature in chamber-music that in the ten. mature quartets of Mozart which Spohr undoubtedly regarded as his models it cannot be traced in more than twelve of the thirty one movements in which it ought to occur.

The steady level of Spohr's mastery prevents any of his work from either rising to the height of Mendelssohn's master- pieces, or sinking to the weakness of Mendelssohn's failures. But where the true conditions of an art-form suit Spohr's training and temperament he is, at times, very nearly a great composer; and in the severely restricted medium of duets for two violins his work is an artistic tour de force, the neglect of which would be unfortunate in a wider field than that of mere violin-technique. His best work is not so great that we are obliged to Live with it; but its merits demand that we should let it live. (D. F. T.)

SPOIL-FIVE, an old game of cards, probably imported from Ireland, where it is still very popular, though the original name, according to The Compleat Gamester, was " Five-cards." It may probably be identified with " Maw," a game of which James I. of England was very fond. A full pack of cards is used: about five players is the best number, each receiving five cards, dealt in pairs and triplets, the card that is left at the top of the pack being turned up for trumps. If the turn-up is an ace, the dealer must " rob," i.e. put out, face downwards, any card from his hand and take in the ace. The trump suit re- mains unaltered. " Robbing " must take place before the first player, the player on the dealer's left, leads. Similarly a player who holds the ace of trumps must rob, putting out any card and taking in the turn-up, but need not disclose the fact till it is his turn to play. A player who fails to rob cannot go out that hand. The card put out may not be seen. The player on the dealer's left leads. The highest card of the suit led — the value of the cards will be explained — or the highest trump, wins the trick. Players must follow suit to a lead of trumps, except in certain cases which will be mentioned. To a plain suit no one need follow except a player who holds no trumps; others may follow or trump as they please. If a player takes three tricks he wins the game. If no one succeeds there is a " spoil," and a fresh stake, smaller than the original one as a rule, is put into the pool for the next round. The order of the cards in plain suits may be remembered by " after the knave the highest in red and the lowest in black." In red suits the order is king, queen, knave, ten, &c, down to the ace, which is lowest: in black suits king, queen, knave, ace, &c, up to ten, which is lowest. But the ace of hearts, which is always a trump, is not reckoned in its own suit. In trumps the order is " below the queen highest in red, lowest in black." The order in red suits is five, knave, ace, of hearts, ace of trumps, king, queen, ten, &c. : in black suits five, knave, ace of hearts, ace of trumps, king, queen, two, three, &c, up to ten, which is the lowest. When trumps are led, the five and the knave of trumps and the ace of hearts need not be

played. This is called " reneging," colloquially " renigging." The five may always renege: if it is led, no card can renege. The knave may renege if the five is played, not led. Only the five can renege to the knave led. The ace of hearts can renege to any inferior card. If hearts are not trumps and the ace of hearts is led, a trump must be

played if possible: if not, it is not necessary to play a heart. " Twenty-five " and " Forty-five " are varieties of " Spoil-five ": the game is played for either of these numbers; each trick counts five to the maker, and there is no " spoil," but the trick made by the highest trump out scores ten; if a player gets out before that trump is played, he wins the game all the same. The winning of all five tricks is called a " jink "; at " Spoil- five " a player who jinks, if jinking is agreed upon, receives an extra stake all round; but if, after winning three tricks, he elects to " jink " and fails, he cannot score during that hand. SPOKANE, a city and the county-seat of Spokane county, Washington, U.S.A., on both banks of the Spokane river, near the eastern boundary of the state, and about 242 m. E. of Seattle. Pop. , 19,922; (1900), 36,848, of whom 7833 were foreign born, including 1683 English Canadians, 1326 Germans, and 1168 Swedes; (1910 census: 104,402. Spokane is served by the Great Northern, the Oregon Railway & Navigation Co. (Union Pacific system), the Northern Pacific, the Idaho & Washington Northern, the Spokane, Portland & Seattle, and the Spokane & International railways, and by the Spokane & Inland Empire (electric) line connecting with the Cceur d'Alene mining region, Idaho, and with Colfax, Washington and Moscow, Idaho. Among the principal buildings of the c ; ty are the Federal building, the county court-house, the city- hall, the post office, the Paulsen building, the Columbia and Auditorium theatres, the Spokane club, the masonic temple, the Spokesman-Review building, and a large Roman Catholic church. Spokane is the see of a Protestant Episcopal bishop. The city has a Carnegie library, and ten public parks aggre- gating 320 acres; the more important are Liberty Park (25 acres), Manito Park (85 acres), and Corbin Park (13 acres). Fort George Wright (established in 1895) is 3 m. west of Spokane on a tract of 1022 acres given to the United States Govern- ment by the city, for that purpose, in 1894-1895. Spokane is the seat of Gonzaga College (Roman Catholic) for boys, founded in 1887 and incorporated in 1904; of Spokane College (1907; Lutheran); of Brunot Hall (Protestant Episcopal), for girls; the Academy of the Holy Names (Roman Catholic), for girls; and of other schools and academies. Among the city's charit- able institutions are a home for the friendless (1890), the St Joseph orphanage (1890), St Luke's (1900) and the Marie Beard Deaconess (1896) hospitals, each

having a training school for nurses, a Florence Crittenden home, and a House of the Good Shepherd. The Spokane river is a rapidly flowing stream with two falls (the upper of 60 and the lower of 70 ft.), within the city limits, providing an estimated energy of about 35,000 horse-power at low water. Of this energy, in 1908, about 17,000 horse-power was being utilized, chiefly for generating electricity (the motive power most used in the city's indus- tries), as well as for lighting and transit purposes, while about 9000 horse-power in electrical power was transmitted to the Cceur d'Alene mines. At Post Falls, Idaho, 22 m. east of Spokane, about 12,000 horse-power is developed, and at Nine Mile Briage near Spokane, about 20,000 horse-power. Spokane's manufacturing interests have developed with remarkable rapidity. In 1900 there were 84 factories capitalized at $2,211,304, and their product was valued at $3,756,119. In 1905 there were 188 factories capitalized at $5,407,313 (144-5% increase), and the value of their products was $8,830,852 (135-1 % increase). The city's principal manufactures in- 1905 were: lumber and planing nr'll products ($2,040,059); flour and grist- mill products ($1,089,396); malt liquors ($679,274); foundry and machine-shop products ($479,954); and lumber and timber products ($418,019). Spokane is an important jobbing centre, is a natural supply point for the gold, silver and lead mining regions of northern and central Idaho, eastern Washington, and Oregon, and is a distributing point for the rich agricultural districts in this region.

The first permanent settlement on the site of Spokane was made in 1874 by James N. Glover, who bought from two trappers a tract of land here. The settlement was named Spokane Falls, in memory of the Spokan Indians, a tribe of

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SPOLETO— SPON

Salishan stock, which formerly occupied the Spokane Valley; the word Spokan is said to mean " children of the sun." Spo- kane was incorporated as a town in 1881 and in the same year received its first city charter (amended in 1891). The city became the county-seat in 1882. The present name was adopted in 1890. The city was reached by the Northern Pacific rail- way in 1883, by the Union Pacific in 1889, and by the Great Northern in 1892. On the 4~6th of August 1889, thirty squares of the city (nearly all of its business section) were destroyed by fire, with a loss estimated at $5,000,000. Rebuilding was at once begun, and in about two years the city had

been almost entirely reconstructed and greatly improved. In 1910 Spokane adopted a commission form of government.

SPOLETO (anc. Spoletium), a town and archiepiscopal see of the province of Perugia, Italy, 18 m. N.N.E. of Terni, and 88 m. N. by E. of Rome by rail. Pop. (1901), 9631 (town); 24,648 (commune). It is situated on a hill, so that the lowest part is about 1000, the highest 1485, ft. above sea-level, at the south end of the open valley of the Topino, a tributary of the Tiber, which it joins near Assisi. The principal industries are the collection and preparation of truffles and preserved foods, also tanning and the manufacture of earthenware. Spoleto is also the centre of an agricultural district, and contains a government experimental olive oil factory. There are few towns of Italy which possess so many Roman remains in good preservation under the medieval buildings, and few medieval towns with so picturesque an appearance. There are con- siderable remains of perhaps pre-Roman polygonal walls — in one place a piece of this walling has masonry of rectangular blocks superposed, with an inscription of two of the Roman municipal magistrates {quattuorviri) . There are also a few traces of an inner enceinte of the Roman period. There are remains of a Roman theatre, over 370 ft. in diameter, and an amphitheatre 390 by 205 ft. A Roman bridge of three arches, 80 ft. 'long and 26 ft. high, exists at the lower (north) entrance to the town, under the modern road to Foligno, in the former bed of a torrent • which has now changed its course. A Mith- raeum was found outside this gate in 1878. The rock above the town was included within the polygonal walls: but Totila fortified, not this rock, but the amphitheatre, which remained the citadel until 1364, when Cardinal Albornoz destroyed it and erected the present Rocca, which was enlarged by Pope Nicholas V.; it is now a prison. The Porta della Fuga (the name alludes to the repulse of Hannibal) occupies the site of a Roman gate, but is itself medieval : while the medieval enceinte encloses a somewhat wider area than the ancient. The Piazza del Mercato represents the Roman forum; close by is a triumphal arch of Drusus and Germanicus, and a temple (?) into which is built the church of S. Ansano. A Roman house in the upper part of the town, with mosaic pavements, probably belonged to Vespasia Polla, the mother of the emperor Vespasian. The Palazzo Municipale, close by, contains the archives and picture gallery. The cathedral of S. Maria Assunta, much modernized in 1644, occupies the site of a church of the Lombard dukes erected about 602. The present church was consecrated in 1198; the facade belongs to the middle of the 12 th century. Over the main entrance is a large mosaic of Christ enthroned, with the Virgin and St John, by the artist

Solsernus (1207). The Early Renaissance vestibule (after 1491) is fine. In the choir and on the half dome of the apse, are the finest frescoes of Fra Filippo Lippi (scenes from the life of the Virgin) completed after his death by Fra Diamante: his tomb, erected by Lorenzo de' Medici, with the epitaph by Politian, is on the left of the choir. The fine stalls and panelling in the winter choir date from 1 548-1 554. In and near the Piazza del Duomo are the unfinished Palazzo della Signoria, of the early 14th century, which contains the archaeological museum, the small Renais- sance church of the Manna d'Oro (1527), the facade of the Roman- esque basilica of S. Eufemia (in the archbishop's palace) and the fine Early Renaissance Palazzo Arroni with its graffito frieze. The church of S. Pietro, outside the town on the road to Rome (wrongly supposed to have been the cathedral before 1067), was

founded in a.d. 419 by Bishop Achilles. Its facade is re- markable for its richly sculptured decorations of grotesque figures and beasts, which are of two different dates, about 1000 and about 1 200. S. Domenico is a fine example of. later Italian Gothic with bands of different coloured stones. Both the church and its crypt contain 14th-century frescoes. The triple- apsed crypt of S. Gregorio probably dates from the 9th century: the upper church was consecrated in 1196 and the Romanesque work covered with stucco in the restoration of 1597. S. Nicolo is a beautiful example of Pointed Gothic. The basilica of S. Salvatore (il Crocefisso) at the cemetery belongs to the 4th century a.d. The fine sculptures of the facade, with its beauti- ful windows, as also the octagonal dome, all belong to this period; Meliorantius, the sculptor of the portal of the cathedral (after n 55), took his inspiration hence. S. Ponziano, not far off, belongs to the 13th century, but its interior has been re- stored: the crypt contains frescoes of the 15th century. The city is still supplied with water by an aqueduct, to which be- longs the huge bridge called the Ponte delle Torri, crossing the ravine which divides the town from the Monte Luco (2723 ft.). The bridge is 253 ft. high and 755 ft. long and has ten arches: the ground plan is Roman; the stone piers are in the main later (the work is often attributed to Theodelapius, the third Lombard duke, in 604), while the pointed brick arches belong to a restoration of the 14th (?) century. The Monte Luco, which commands a splendid view, has several hermitages upon it.

The first mention of Spoletium in history is the notice of the foundation of a colony there in 241 B.C. (Liv. Epit. xx.; Veil. Pat. i. 14), and it was still according to Cicero {Pro Balb. 21) — " colonia latina in primis firma et illustris " — a Latin colony in 95 B.C. After the battle of Trasimenus (217 B.C.) Spoletium was attacked by

Hannibal, who was repulsed by the inhabitants (Liv. xxii. 9). During the Second Punic War the city was a useful ally to Rome. It suffered greatly during the civil wars of Marius and Sulla. The latter, after his victory over Crassus, confiscated the territory of Spoletium (82 B.C.). From this time forth it was a municipium. Under the empire it again became a flourishing town, but is not often mentioned in history. It was situated on a branch of the Via Flaminia, which left the main road at Narnia and rejoined it at Forum Flaminii. An ancient road also ran hence to Nursia. Martial speaks of its wine. Aemilianus, who had been proclaimed emperor by his soldiers in Moesia, was slain by them here on his way to Rome (a.d. 253), after a reign of three or four months. Rescripts of Constantine (326) and Julian (362) are dated from Spoleto. The foundation of the episcopal see dates from the 4th century. Owing to its elevated position it was an im- portant stronghold during the Vandal and Gothic wars; its walls were dismantled by Totila (Procop. Bell. got. iii. 12). Under the Lombards Spoleto became the capital of an in- dependent duchy (from 570), and its dukes ruled a considerable part of central Italy. Together with other fiefs, it was be- queathed to Pope Gregory VII. by the empress Matilda, but for some time struggled to maintain its independence. In 1155 it was destroyed by Frederick Barbarossa. In 1213 it was definitely occupied by Gregory IX. During the absence of the papal court in Avignon it was a prey to the struggles between Guelphs and Ghibellines, until in 1354 Cardinal Albornoz brought it once more under the authority of the Church. In 1809 it became capital of the French department of Trasimene. In i860 it was taken by the Italian troops after a gallant defence. Giovanni Pontano, founder of the Accademia Pontaniana of Naples, was born here.

See A. Sansi, Degli Edifizi e dei frammenti slorici dell' antichitd. di Spoleto (Foligno, 1869), and other works; G. Angelini Rota, Spoleto e Dintomi (Spoleto, 1905) ; and various articles by G. Sordini, in Nolizie degli Scavi. (T. As.)

SPON, JACQUES (1647-1685), French doctor and archaeo- logist, was born at Lyons and died at Vevey. He is famous as a pioneer in the exploration of the monuments of Greece, travel- ling there in 1675-1676 with the Englishman (Sir) George Wheler

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(1650-1723), whose collection of antiquities was afterwards bequeathed to Oxford University. Spon brought back many valuable

treasures, coins, inscriptions and manuscripts, and in later years published various important works on archaeology, notably his Voyage d'ltalie, de Dalmatie, de Grece et du Levant (1678), and a Histoire de la republique de Geneve (1680).

SPONGES. The Sponges or Porifera form a somewhat isolated phylum (or principal subdivision) of the animal king- dom. This phylum includes an immense number of marine and fresh-water organisms, all of which agree amongst them- selves in possessing a combination of important structural characters which is not found in any other animals. Though the phylum is a very large one yet almost the only examples with which the name " sponge " is popularly associated are the common bath sponges (species of the genera Euspongia and Hippospongia), which are amongst the most highly organized and least typical members of the group.

The history of the group begins with Aristotle, who recognized several different kinds of sponge, some of which were used by the Greek warriors for padding their helmets. Owing, however, to the permanently fixed character, irregular growth and feeble power of movement in the adult organism, it was not until the advent of microscopical research that it was definitely proved that the sponges are animals and not plants. Indeed our scientific knowledge of the group can scarcely be said to begin much before the middle of the 19th century, when the classical researches of R. E. Grant, J. E. Gray, H. J. Carter and J. S. Bowerbank laid the foundations of modern spongology. It very soon became evident that the group is one which illustrates with remarkable clearness and beauty those laws of organic evolution which were beginning to attract so much attention from zoologists, a fact which found abundant recognition in Ernst Haeckel's epoch-making work on the Calcareous Sponges published in 1872. This was followed by a series of remark- able researches by F. E. Schulze on the minute anatomy, histology and embryology of the group, which have served as a pattern to all subsequent investigators. In more recent years our knowledge of the sponges has advanced very rapidly, especially as the result of the great series of scientific exploring expeditions inaugurated by the voyage of H.M.S. " Challenger. – ' The large collection made by the " Challenger " expedition alone, necessitated a complete reorganization of our systematic knowledge of the phylum, and afforded the foundation upon which our present system of classification has been built up. There is perhaps no great group of the animal kingdom in the study of which greater advance has been made in the last twenty years. It is impossible in the space at our disposal to do justice to the numerous valuable memoirs which have

appeared during this period, but reference to the more important works of recent investigators will be found in the bibliography at the end of this article, while for a comprehensive account of the whole subject the reader should refer especially to Professor E. A. Minchin's article in Sir E. Ray Lankester's Treatise on Zoology. General Characters of the Phylum. — The sponges are all aquatic organisms, and for the most part marine. They vary in size from minute solitary individuals, scarcely visible to the naked eye, up to great compound masses several feet in circumference, and in form from almost complete shapelessness to the most exquisite and perfect symmetry. The indefiniteness of shape and size which characterizes the vast majority of the group is due to the power of budding, which is almost universal amongst them, whereby extremely complex colonies are built up in which it is usually impossible to determine the limits of the individual zooids or persons, while very frequently, by a process of integration, individuals of a higher order are produced which again form colonies by budding (fig. 2).

The entire body of the sponge is penetrated by a more or less complicated canal-system, beginning with numerous in- halant pores, scattered over the general surface or collected in special pore-areas, and ending in one or several larger apertures, the vents or oscula, situated usually on the uppermost portions of the sponge (fig. 8). If the living animal be kept under

observation it will be seen that a stream of water is ejected with considerable force from the vents, carrying with it minute particles in suspension. At the same time numerous smaller streams enter the canal system through the inhalant pores, bringing with them the minute particles of organic matter upon which the sponge feeds and the oxygen which it requires for respiration. This stream of water may be temporarily inter- rupted by the closure of the pores and vents, to be resumed apparently at will. It is maintained by the activity of certain cells, known as collared cells or choanocytes (fig. 35, g, fig. 36), which line the walls of the canal system either throughout their entire extent or in certain regions only. These cells bear an extraordinarily close resemblance to the choanoflagellate Protozoa or collared Monads. Each is provided with a filmy protoplasmic collar and a long whip-like flagellum, and the movements of the latter drive the water out of the canal-system through the vents and thus keep up the circulation. In all but the simplest sponges the collared cells are confined to certain portions cf the canal system known as flagellated chambers (fig. 9), the size, form and arrangement of which vary greatly in different types. That part of the canal-system which is not lined by collared cells is

covered with a flattened pavement- epithelium (fig. 34, 1), and so also is the outer surface of the sponge. The space between the various branches of the canal- system is occupied by a gelatinous ground-substance (meso- gloea) in which amoeboid and connective-tissue cells are em- bedded (fig. 34, 3, 4, 5; fig. 35, a), and in which in most cases a well-developed skeleton is secreted by special cells known as scleroblasts. This skeleton (figs. 24-32, &c.) supports the extremely soft tissues of which the body is composed, and con- sists either of mineral spicules (carbonate of lime or silica) or of horny fibres (spongin) , or of a combination of siliceous spicules with spongin. In many cases the proper skeleton is more or less completely replaced by sand.

The question as to how far the cell-layers of the sponge body correspond to the " germinal layers " usually recognizable in other multicellular animals is an extremely difficult one and not yet by any means settled. It has until recently been generally sup- posed that the flattened epithelium which covers the outer surface of the sponge, together with part of that which lines the canal- system, is ectodermal, while the collared cells and the remainder of the flattened epithelium lining the canal-system are endodermal, and the term mesoderm has been frequently applied to the middle gelatinous layer. Recent embryological research, however, makes it extremely doubtful whether this view is justifiable, and whether indeed the germ-layers of typical Metazoa can be identified at all in the Porifera. Embryological research, moreover, tends to show that the primitive gastral epithelium (of collared cells) is in most sponges completely replaced, except in the flagellated chambers, by an invasion of the dermal epithelium (composed of flat pavement- cells).

Sexual reproduction, by means of ova and spermatozoa, is probably universal throughout the group. The segmentation of the ovum gives rise to the free-swimming ciliated larva (figs. 38, e, 39) in the form of a hollow " amphiblastula " or of a solid " parenchymula." This larva becomes attached and, by means of a more or less complex metamorphosis, gives rise to the young sponge. During the metamorphosis the outer, ciliated or flagellated cells of the larva take up their position in the interior of the body and give rise to the collared cells of the adult; while the inner cells (of the parenchymula) migrate outwards and form the superficial epithelium, so that the position of the so-called " ectoderm " and " endoderm " is completely reversed in the adult as compared with the larva.

A sexual reproduction is effected by budding, and the buds may

either remain attached to the parent and form colonies or become detached and form entirely separate individuals.

Types of Structure. — We may illustrate our account of the general characters of the group by a brief description of the anatomy of three widely divergent types, selected as being fairly representative of the entire group, viz. Leucosolenia, Plakina and Euspongia.

Leucosolenia. — The genus Leucosolenia includes a number of calcareous sponges of very simple structure, and thus forms_ a suitable starting-point for our studies. Imagine a minute, thin- walled sac (fig. i), attached at the lower end to some rock or seaweed, and enclosing a spacious cavity in its interior. This cavity is the gastral or digestive cavity, and it opens to the exterior

through a wide vent or osculum at the upper extremity of the sponge. The thin wail is also pierced by numerous small inhalant pores or prosopyles. The inhalant pores, the gastral cavity and the vent constitute the canal-system, through which a stream of water can be kept flowing by the activity of the collared cells which line practically the whole of the gastral cavity. Each collared cell consists of an oval nucleated body surmounted by a filmy proto- plasmic collar, in the middle of which the whip- like flagellum projects into the water. They are placed close together, side by side, and thus form a continuous layer, extending almost up to the vent and interrupted only by the inhalant pores. The outer surface of the sponge is covered by a single layer of flattened pavemeit-epitheliuin or epidermis. Some of these cells, distinguished as porocytes, become perforated by the inhalant pores, around which they form contractile diaphragms capable of opening and closing, and thus regulating the supply of water. Between the outer protective, dermal epithelium, and the inner gastral epi- thelium of collared cells, lies the mesogloea, a layer of gelatinous material containing cells of at least two kinds, amoebocytes and sclero- blasts. The former closely resemble the amoe- boid white blood corpuscles, or leucocytes, of higher animals, and have the power of wan- dering about from place to place in the sponge- wall. They probably serve to distribute food material and carry away waste products, and some of them undoubtedly give rise to the ova and spermatozoa. The scleroblasts are derived from cells of the dermal epith- elium which migrate inwards into the gela- tinous ground-substance and there secrete the spicules of which the

skeleton is composed. These spicules are composed of transparent crystalline carbonate of lime (calcite), and may be of three fundamental forms: triradiatc, qyadriradiate and monaxon. It has been shown by E. A. Minchin, however, that the triradiate and quadriradiate types are not simple spicules but spicule-systems, each formed of three or four primary spicules, originating from as many mother-cells and only secondarily united. In fig. I only triradiate spicules are represented, but very often all three kinds are present in the same sponge (cf. fig. 24). The triradiates lie in the mesogloea with their three rays extended in a plane parallel to the surfaces of the sponge-wall, and form a kind of loose scaffolding upon which the soft tissues are supported. The quadriradiates resemble the triradiates in form and position, but a fourth ray is developed which projects through the layer of collared cells into the gastral cavity, where it serves as a defence against internal parasites. The monaxon spicules have one end embedded in the mesogloea while the other projects outwards and upwards and serves as a defence against external foes.

Although all species of the genus Leucosolenia agree essentially in structure, yet they exhibit very great diversity in external form. This is due to the habit of budding and colony formation. All start life after the metamorphosis of the larva in the simple sac-shaped condition which we have just described, and to which the name " Olynthus-type " is sometimes applied. This is indeed the simplest type of sponge organization known to us and we must look upon the Olynthus as representing a primary sponge- individual or " person." By a simple process of budding, in which

(After Haeckel) Fig. 1. — Leucoso- lenia primordialis (Olynthus form).

contr.osc.

A

the buds all remain united together by their bases, we get a branched colony in which the persons or zooids are still easily recognizable, each with its own vent or osculum. Very frequently, however, the zooids become elongated into slender cylindrical tubes which branch in an extremely complex manner and anastomose with one another in many places to form networks, in which it is no longer possible to recognize the component individuals (fig. 2). This is known as the " Clathrina " type of structure, and we may look upon a Clathrina colony as an individual of a higher order, which may assume a

definite external form and even acquire a secondary internal cavity (pseudogaster), opening to the exterior through a secondary vent (pseudosculum), while the outer tubes of the colony may give rise to a protective skin (pseudoderm), perforated by secondary inhalant pores (pseudopores) which are obviously quite distinct in nature from the primary inhalant pores or prosopyles of the Olynthus.

Other types of colony-formation in the genus Leucosolenia will be discussed when we come to deal with the canal-system in general.

Plakina.- —The genus Plakina includes some of the simplest of the siliceous sponges. Just as in the Calcarea the most primitive " person " or individual is represented by the Olynthus type, so in the non-calcareous sponges we may recognize a primitive or

(After Miachin, from Lankester's Treatise nn Zoology.)

Fig. 2. — Leucosolenia {Clathrina) clathrus, natural size; showing reticulate form of colony, expanded and with open oscula on the left, contracted and with closed oscula on the right.

osc, Osculum. ph, Sphincter of osculum.

cl. osc, Closed osculum. dii, Diverticula.

contr. osc, Closed oscula in con- osc. div, Diverticula from which

tracted part of colony. new oscula arise.

(After Keller.)

Fig. 3. — Vertical section of a Rhagon, diagrammatic. 0, Osculum; p, Gastral cavity, fundamental form of individual to which the name " Rhagon " has been applied. This is the first stage reached after the meta- morphosis of the larva in certain species, and the little sponge consists of a cujhion-shaped sac, attached below by a broad flattened base and terminating above in a single vent or osculum (fig. 3). There is a large gastral cavity lined by pavement-epithelium and surrounded by a number of more or less spherical " flagellated chambers," lined by collared cells. These chambers open into the gastral cavity by wide mouths (apopyles) and communicate with the exterior by smaller inhalant pores. The entire outer surface of the sponge is covered with pavement-epithelium and there is a well-developed mesogloea which may contain spicules. This Rhagon may be compared to an Olynthus which has become flattened out from above downwards and from which a number of small buds (the

flagellated chambers) have been given off all round, except from the attached basal portion; so that the whole forms a small colony, in which the collared cells have become restricted to the buds. We may, therefore, perhaps, look upon the Rhagon as an individual or person of a higher order than the Olynthus. Like the Olynthus the Rhagon occurs as a transient stage in the development of certain sponges, but we do not know any non- calcareous sponge which remains in such a simple condition through- out life. In Plakina monolopha, for example, the entire wall of the Rhagon becomes thrown into folds (fig. 4) so that a system of inhalant and exhalant canals is formed between the folds, through which the water has to pass on its way to and from the chambers. The inhalant canals lead down between the folds from the outer surface of the =ponge. In P. monolopha they are wide and ill defined. In another species, Plakina dilopha, they become con- stricted to form perfectly definite, narrow canals, by the develop- ment of a thick layer of mesogloea (and pavement-epithelium) which covers the outer surface of the sponge in such a manner that the folded character is no longer visible externally. The external openings of the inhalant canals now form definite dermal pores. In such a sponge as this the folded chamber-kayer of the sponge- wall is sometimes called the choanosome, while the external layer of mesogloea and pavement-epithelium is called the ectosome. In a third species, Plakina trilopha, further folding of the " choano- somal lamella " takes place and we thus get a still more complex canal-system.

In Plakina the spicules are composed of colloidal silica. The fundamental spicule form is the primitive tetract or calthrops, consisting of four sharp-pointed rays diverging at equal angles from a common centre (fig. 5, a-e). Modifications of this form occur in two directions: in the first place some of the tetˆacts, by branching of one ray, give rise to " candelabra," while others, by suppression of rays, give rise to forms with three or even two rays only, triacts and diacts, the latter sometimes termed oxeate (fig. 5, /-/). The arrangement of the spicules is very irregular; the candelabra alone are definitely arranged (at the surface of the sponge), the other forms are thickly scattered without any sort of order throughout the mesogloea.

Euspongia. — The genus Euspongia, to which belong all the finer bath sponges, is a typical example of the true " horny " sponges or Euceratosa, characterized especially by the fact that the skeleton is not composed of spicules but of so called horny fibres. A living

6ath sponge appears as a dark-coloured, irregular or sometimes cup-shaped mass attached by the under surface to the sea-bottom. The outer surface is covered by a skin or dermal membrane, elevated in innumerable minute conuli by the growing apices of the primary

speak of under the name " sponge." It consists of a very close network of spongin fibres (closely resembling silk in chemical composition), some of which, known as primaries, run towards the surface at fairly regular intervals, while others, known as secondary

mm*

§&&£&

(After F. E. Schulze.)

Fig. 4. — Plakina monclopha.

a, Ciliated embryo (the central

part should be shaded).

b, Part of section of ciliated

embryo. col, Inner cell-mass. ec, External, columnar cells. fl, Flagella.

c, Attached embryo, viewed

from above, with the gas- tral cavity appearing in the interior.

d, Vertical section oi attached

embryo.

e, Rhagon stage, viewed as a transparent object, show- ing the inhalant pores on the surface and the flagel- lated chambers in the interior; the osculum is not shown.

/, Part of vertical section through adult sponge, showing the folded choano- somal lamella or spongo- phare.

ov, Ova. bl, Embryo.

skeleton fibres. This skin is pierced by a vast number of inhalant

dermal pores of microscopic size, and by a much smaller number of comparatively large vents or oscula. When the sponge is removed from the water the soft tissues rapidly decay and leave behind only the elastic " horny " skeleton, which is what we usually

(After F. E. Schulze. From a plat3 in Zeitschriftfiir Wissen. Zoologie, by permission of Wilhelm Engelmann.)

Fig. 5.— Plakina monolopha. Spicules, a-e, tetracts or calthrops; f-k, triacts or triradiates; M, diacts, showing how the monaxon form (1) may be derived from the primitive tetract la) by suppression of actines.

~i.c.

(After F

E. Schulze.

From a coloured plate in Zcits. fur Wissen. Zoologie. by permission of Wilhelm Engelmann.)

Fig. 6. — Euspongia officinalis (bath sponge). Part of vertical section

showing general arrangement of skeleton and canal-system.

p.f, Primary fibre of skeleton. i.c, Inhalant canals.

s.f, Secondary fibres. ex, Exhalant canals.

d.p, Dermal pores (inhalant). f.c, Flagellated chambers, fibres, connect the primaries in all directions and themselves branch and anastomose freely. The primary fibres contain particles of sand or foreign spicules which are taken in by their growing

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(After F. E. Schulze. From Lankester's Treatise on Zoology.)

Fig. 7. — Euspongia officinalis (bath sponge). Skeleton. Fibre

surrounded by spongoblasts.

sp.f, Spongin fibre; sp.bl, Spongoblasts. Coll, Collencytes.

apices at the surface of the sponge, and the presence of which may

greatly injure the quality of the sponge. The connecting fibres

are only about 0-035 mm. in diameter, or even less, and the primaries

are a little thicker, while the meshes between the fibres are so narrow

as to permit of the soaking up of water by capillary attraction,

(After F. E. Schulze.)

Fig. 8. — Euspongia officinalis (bath sponge). Diagram of the arrangement of the canal-system as seen in vertical sections of two young individuals.

d.p, Dermal pores; 0, Oscula; r, Rock to which the sponges are

attached.

the property upon which the economic value of the bath sponge depends. In the living sponge the fibres are embedded in the mesogloea, where they are secreted by special cells known as spongo-blasts, which are often found thickly clustering around them (fig. 7) The canal-system (figs. 6, 8) is very complex and shows but little indication of its origin from a folded rhagon. The in- halant pores lead each into a short, narrow, inhalant canal; these unite in roomy subdermal cavities lying in the ectosome, and from these in turn the main inhalant canals come off. The latter divide

and subdivide, and thus ramify through the deeper parts of the sponge amongst the flagellated chambers, to each of which a small number of slender canaliculi are ultimately given off (fig. 9). The chambers themselves, lined by the usual collared cells, are small and approximately spherical, and each one discharges its water through a short and narrow exhalant canali- culus (fig. 9). The openings of the inhalant canaliculi into the chambers, of which there are several, correspond to the prosopyles of an Olynthus, while the single exhalant ..,—.•-.. vk^-^.··. 5, opening, or apopyle, may possibly

*(After F. E. Schulze. From a plate correspond to an Olynthus osculum. mZeits.jur Wissen. Zoologie, by per- * ” e exhalant canaliculi unite to- mission of Wilhelm Engelmaun.) gether to form*

larger and larger Fig. 9. — Euspongia offici- canals which finally lead the stream nalis (bath sponge). Part of of water to the vents on the surface a section such as is shown ˚f tne sponge (fig. 8). The various in fig. 6, more highly magni- parts of the canal-system, other fied, showing three flagellated than the chambers themselves, are chambers, with inhalant cana- lined by a flat pavement-epithelium, liculi on the left and exhalant an d the mesogloea, occupying all canaliculi on the right. the spaces between the different „ , ... , parts of the canal-system, contains cells ot various kinds, embedded in a very granular matrix.

*Comparative Anatomy. External Characters.— Amongst the simpler calcareous sponges which are all of comparatively small size, the external form is usually symmetrical and is evidently a kind of outward expression —■' s **«ˆ- of the arrangement of the canal-system.*

This is well seen in the simplest form of all,, the sac-shaped Olynthus, and also in its simpler Syconoid and Leuconoid derivatives (described later on), which may be regarded either as individuals of a higher order or as colonies of Olynthus persons grouped around a central indi- vidual whose large gastral cavity opens to the exterior through the single oscu- lum. In the more complex Leuconoids, however, the process of colony formation becomes very irregular and may give rise to great compound masses, with many vents. In these masses we may perhaps recognize the presence of individuals of three orders: (1) the primitive Olynthus persons, represented by the individual flagellated chambers; (2) the Leuconoid persons, indicated each by its osculum; and (3) the entire colony formed by the union of many such Leuconoid persons in an irregular manner. It is, however, very doubtful how far the flagellated chambers in such forms as this can be regarded as morphologically equivalent to Olynthus persons.

In the non-calcareous sponges we are always dealing with individuals of a high order, which usually form complex aggre- gates (colonies) of large size and very various shape. As a general rule the form of those non-calcareous sponges which grow in shallow water is extremely irregular and variable while at great ocean depths the shape is usually defi- nite, constant and often exquisitely symmetrical, a fact which may perhaps be accounted for in part by the absence of disturbing influences such as are met with in shallow water. Perhaps the most extraordinary external form yet discovered is that of Esperiopsis challen- e.en. discovered by the " Challenger " expedition in deep water off the Philip-

(After Ridley and TVndy. From a plate in " Challenger " Reports, xx. . by permission of the Controller of H.M. Stationery Office.)

Fig. 10. — Esperiopsis challengeri : a deep-water Monaxonellid Sponge.

pine Islands (fig. 10), a form which reminds one strikingly of a number of flowers arranged in a raceme, except that the largest and oldest member of the compound colony is at the top of the stalk and the smallest at the bottom. In other deep- water species the external form may frequently be explained

(After Ridley and Dendy. From " Challenger " Reports, xx., by permission of the Controller of H. M. Stationery Office.) Fig. 11.— Cladorhiza longipinna: a deep-water Monaxonellid Sponge, showing the Crinorhiza " form, adapted for support on soft ooze.

as an adaptation to the special exigencies of the environment.

u"u Y?J exam P le > man y species are provided with long stalks which lift up the body of the sponge out of the soft ooze m which it would otherwise be smothered, while the bottom of the stalk is frequently extended in root-like processes which serve to attach it to some solid object {e.g. Stylocordyla). In other cases the sponge supports itself on the surface of the ooze by long stiff processes, formed of bundles of spicules which radiate from the central, cap-shaped body; this is known as the " Crinorhiza form," and is met with in several distinct genera (fig. 11). Amongst the Hex-actinellida, which are essentially a deep-water group, many very beauti- ful external forms are met with, the best known, perhaps, being the so-called Venus's flower basket {Euplectella, fig. 12).

Flabellate (or fan-shaped) and cup- shaped forms are frequently met with even amongst shallow-water sponges, and in widely separated genera, such as Poterion (the great ffl Neptune's cup sponge) and Reniera Sˆxm? testudinaria. In Phyllospongia the Bq&Bt'S flabellate and cup-shaped forms pass ™" K!!h insensibly into one another, the cup being apparently merely a folded lamella. Slender branching forms are also not uncommon in shallow water, as seen in the common Chalina oculata of the British coast. Spherical forms, such as Tethya, likewise occur. By far the greater number of shallow-water sponges, however, are quite irregular in shape and either form crusts of varying thickness on the surface of rocks and sea- weed, or large and massive aggre- gates which may rise to a consider- able height above the substratum. In the boring sponges (Family m ..

Lhallenger „ Reporls< ˆ bv

Lllomaae; the sponge occupies an permission of tbe Controller of H.M.

elaborate system of chambers and Stationery Office.)

passages which it excavates for Fig. 12.— Euplectella asper-

ltself in the shells of Mollusca and gillum, ” Venus’s Flower

other calcareous organisms. The Basket”: a Hexactinellid

common British Cliona celata begins Sponge.

(After F. E. Schulze. From a plate in “Challenger ” Reports, xxi., by

direction perhaps

life in this way, but soon outgrows the housing capacity of its host, whose shell then serves merely as a base of attachment for the large independent sponge-colony.

One of the most striking features of living sponges is their colour, which is often very brilliant. Yellow, red, orange, purple, brown, black, green and blue are all met with, in varying degrees of purity and intensity, amongst the commoner Non-calcarea ; whilst the calcareous sponges are usually white. It appears probable that the colour is more or less constant for each species, and may therefore afford a useful guide to specific identification. As a rule the colour is lost in spirit-preserved or dry specimens, but a noteworthy exception is found in the brilliant purple Suberites wilsoni of Port Phillip, in which the colour, though soluble in water, is permanent in dry specimens and in alcohol. The colouring matter is some- times lodged in special pigment cells belonging to the sponge itself, and sometimes in symbiotic algae, with which the mesogloea is frequently filled.

Canal-system. — Whether we start with the primitive Olynthus form of the Calcarea or with the more advanced Rhagon of many Non-calcarea, it is evident that further advance in the complication of the canal-system is arrived at either by budding or folding, or by a combination of these processes. As, however, the canal- systems of the calcareous and of the main types of non-calcareous sponges have been evolved along perfectly independent lines it will be well to consider them separately.

In the genus Leucosolenia (Calcarea Homocoela) the primitive Olynthus form may, as we have already seen, give rise, by branching and anastomosing, to complex reticulate colonies of the Clathrina type, in which a pseudoderm, pierced by inhalant pores, may cover over a system of inhalant canals which are simply the inter- spaces between the branching tubes of which the colony is made up, while at the same time a centrally placed pseudogaster, which is simply a space enclosed by upgrowth of the colony around it, may form the main exhalant canal and open to the exterior through a well-defined vent or pseudosculum. In this the most remarkable modification arrived at is that of Leucosolenia cavata, in which the Clathrina tubes, lined by collared cells, widen out into large irregular spaces, while the inhalant interspaces become con- stricted into narrow canals lined by collared cells on the outside. We have here a kind of inversion of the ordinary Clathrina canal- system, but a perfectly gradual transition from the ordinary to the inverted condition is seen as we pass from the older to the younger parts of the colony.

In Leucosolenia (Dendya) tri- podifera (fig. 13) we find a totally different type of colony formation, which is of great importance as indicating in its canal-system the possible starting-point of a line of

evolution which culminates in the highest Calcarea. Here a large central individual, whose spacious gastral cavity is lined by collared' cells, gives off radial buds from all sides, which branch slightly and terminate in blind ends in contact with one another, so that the entire colony has an approximately even surface. The inhalant canals are represented by the interspaces between the radial tubes, between the blind extremi- ties of which the water finds its way in from the outside. There is only a single vent, situate at the extremity of the central cavity. This cavity must be regarded as the original gastral cavity of a parent Olynthus, from which the radial tubes have been produced by budding. (After Dendy. Simplified from a coloured We have next, amongst the

feLLUTot JV">- " • Calcar f a Heterocoela, the Sycon

,, T , ■ , •. .■ type 01 canal-system which diners

Via. it, Leucosolenia trtpodi f £ h foregoing in that the fera with part of the sponge- col|ared „ f the s central astra i wall cut away to show the . „ re , d , payment- arrangement of the radial out- epithelium . The radial tubes now growths. form de fj n i te ffogellated chambers,

pierced as before by numerous prosopyles through which the water enters from the spaces between the chambers, while the original gastral cavity forms a central exhalant canal terminating in the single vent, a true osculum, corresponding to the osculum of an

Olynthus. In the simplest Syconoid forms (Sycetta) the radial chambers remain perfectly straight and unbranched. They do not touch one another at all and

there is no trace of an ectosome jpros.

or dermal cortex, and hence there are no true inhalant canals, and the water circulates without interruption between the chambers. In the genus Sycon (fig. 14) the walls of adjacent chambers come into contact with one another and fuse together and thus give rise to more or less well-defined inhalant " inter-canals." The chambers themselves may branch, and in some species of Sycon a thin, pore-bearing dermal membrane connects to- gether their distal extremities

g.coi

to the inhalant canals. The canal-system now exhibits all the different parts found the most

~ (From Dendy, in Quart. Journ. Micro, Sciˆ

and covers over the entrances new series, xxxv., by permission of J, and • ■ – ‘ A.Churchill.)

Fig. 14. — Sycon carteri, part of a transverse (horizontal) section, highly -organized showing three radial chambers, the sponges: viz. dermal pores, middle one cut open, inhalant canals, flagellated fl x ˆ Flagellated chamber, chambers, exhalant canal and ex.op, Its exhalant opening or osculum. In the genus Grantia apopyle.

and its allies (e.g. Ute, fig. 15) p r0Sy Prosopyle. the thin dermal membrane C-g . C) Central gastral cavity, of Sycon is converted into a ;. C] Inhalant canal, well-developed cortex, ˆ cover- g , CO r, Gastral cortex. ˆ ‘”” g-2.

s.g.s,

nig the extremities of both the inhalant canals and the radial chambers, and some- times containing a system of special cortical inhalant canals. We may now dis- tinguish between an ectosome t,ox, (the dermal cortex), which ‘ contains no flagellate cham- bers, and a choanosome in which

Gastral quadriradiate spi- cule.

Subgastral sagittal trira- diate spicules, forming the first joint of the articulate tubar skeleton.

Tufts of monaxon spicules at the ends of the chambers.

chambers are present.

The

next stage has probably been arrived at by a kind of fold- ing of the choanosome, for we find the chambers arranged

(After Polejaeff.)

Fig. 15. — Ute argentea, part of transverse section, showing the Syconoid canal-system, and thick dermal cortex containing huge longitudinally placed monaxon spicules whose cross-sections are represented by concentric circles.

radially, not around the central gastral cavity but around diverticula of the latter which form special exhalant canals. This condition,

sometimes called the " sylleibid " type, is not characteristic of any particular genus 'or family, but occurs in a few isolated species, such as Leucilla connexiva (fig. 16). A somewhat similar condition may be arrived at by branching of the radial flagellated chambers, as in Heteropegma (fig. 17). The next stage is marked by great reduction in the size of the chambers, which may become almost spherical, and by further folding of the choanosome, so that in a section of the sponge-wall we see the small chambers scattered irregularly in the mesogloea between the numer- ous branches of complicated inhalant and exhalant canals. Each

chamber still has several prosopyles, through which it receives water from the ultimate branches of the inhalant canals, while it opens into a relatively large exhalant canal by a wide apopyle. This is the highest type of canal-system met with amongst the Calcarea. It is sometimes known as the Leucon type and is seen in most species of the genus Leucandra, as well as in many others.

(After Polejaeff.)

Fig. 16. — Leucilla connexiva, part of transverse section, showing " sylleibid " type of canal system with folded chamber layer and exhaiant canals (E) into which the chambers open.

It is almost identical with one of the types commonly found in non-calcareous sponges (e.g. Plakina, fig. 4), but has of course been evolved independently. The various types of canal-system met with in the Calcarea are connected together by numerous intermediate forms, thus forming a very interesting evolutionary series, while both the Sylleibid and Leuconoid types appear to have been in- dependently evolved several times, thus affording excellent examples of the phenomenon of convergence, a phenomenon which is very frequently mei with amongst sponges.

(After Polejaeff.)

Fig. 17. — Heteropegma nodus- gordii, part of transverse section, showing branching flagellated chambers and huge subdermal quadriradiate spicules, with greatly reduced tubar skeleton.

In describing the anatomy of Plakina as a type of non-calcareous sponge, we have traced the development of a fairly complex canal-

system from the so-called Rhagon form. We can, however, hardly regard the Rhagon as representing a fundamental type of canal-system common to all the Ncn-calcarea, for in some of the Myxo-spongida, which are the most primitive of all, and again in the Hexactinellida, we find a type characterized by the presence of elongated sac-shaped flagellated chambers resembling those of the Syron type amongst the Calcarea, and these chambers are arranged radially around the exhalant canals {Halisarca, Hexactinellida). The first recognizable stage in the evolution of the canal-system of the Non-calcarea would thus appear to be a condition not unlike that of Sycon, with a number of elongated chambers arranged radially around a central gastral cavity and having their blind outer extremities covered over by a dermal membrane. This stage is very nearly reproduced in the young form of a Hexactinellid sponge, Lanuginella pupa. From some such form the Rhagon type may perhaps be derived by flattening out of the lower end of the sponge into a broad base of attachment, and by reduction in the size of the flagellated chambers, accompanied by a more irregular arrangement.

Starting from the primitive Myxosponge ancestor, with large sac-shaped chambers, radially arranged, the Non-calcarea have apparently developed along four main lines, giving rise to the exist-ing Myxospongida, the Hexactinellida (Triaxonida), the Tetraxonida

■*d'm.*

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(After F. E. Schulze. From Lankester's Treatise on Zoology.')

Fig. 18. — Lanuginella pupa. O.S., Vertical section of a young specimen (spicules omitted). d.m, Dermal membrane. g.m, Gastral membrane.

sd.tr, Subdermal trabecular layer. G.C, Gastral cavity. fl.c, Flagellated chamber. osc, Region of future osculum.

sg.tr, Subgastral trabecular layer.

and the Euceratosa. The Myxospongida have retained the large size of the chambers in certain forms {Halisarca, Bajalus), but have lost this primitive character in the more advanced members of the group (Oscarella). The Hexactinellida have retained the large size and radial arrangement of the flagellated chambers throughout their

entire series. The chamber layer, however, tends to become more or less folded (fig. 19), and always lies between two layers of

9.*

(After Schulze. From Lankester's Treatise on Zoology.)

Fig. 19. — Section of the Body-wall of Bathydorus fimbriates, F.E.S. (spicules omitted). ex.c , Exhalant canals. sg.tr, Subgastral trabecular layer.

d.m, Dermal membrane. g.m, Gastral membrane.

sd.tr, Subdermal trabecular layer. G.C, Gastral cavity. fix, Flagellated chambers.

loose trabecular tissue in which the canals are represented by irregular spaces. The Tetraxonida appear to have suffered reduction in the size of the flagellated chambers at a very early date, and it is of this group especially that the Rhagon type is characteristic (e.g. Plakina, fig. 4). The Euceratosa exhibit a beautiful series,

beginning with forms {Aplysillidae) having large sac-shaped chambers like those of Hexactinellids and ending with forms {Spongiidae, Euspongia, figs. 6, 8, 9) having small spherical chambers.

Along all four lines of descent it is probable that folding of the choanosome, or chamber-bearing layer of the sponge-wall, has played a very important part in the evolution of the canal-system. This folding is very clearly seen in the Hexactinellida and in such forms as Oscarella (Myxospongida) and Plakina (Tetraxonida). By this process inhalant and exhalant canal-systems have been formed, and then the ends of the inhalant canals have in most cases been closed in by development of an ectoscme, as in Plakina trilopha and Slelletta phrissens (fig. 20). In the majority of cases (e.g.

(After Sollas.) Fig. 20. — Young specimen of Slelletta phrissens (Sollas). Vertical section through the osculum (0), showing the choanosome folded within the ectosome.

Euspongia) the folding has become so complex that it is no longer

recognizable as such, and the origin of the now well-defined inhalant and exhalant canals is completely disguised. In many cases the principal exhalant canals may be surrounded by a layer of tissue of considerable thickness in which there are no flagellated chambers at all, known as the endosome, so that the folded choanosome may be sandwiched in between ectosome' on the outside and endosome on the inside.

The manner in which the flagellated chambers communicate with their respective branches of the inhalant and exhalant canal-

J.—.

(After Sollas.)

Fig. 21. — Transverse section across an exhalant canal and surrounding choanosome of Cydonium eosastsr (Sollas), showing the aphodal flagellated chambers.

system varies considerably in different forms, and the following types are recognizable, though by no means sharply distinguished from one another. In the more primitive forms (e.g. Hexactinellida, Aplysillidae, Spongeliidae) each chamber is provided with several prosopyles and receives its water supply direct from relatively large inhalant canals or even lacunae, discharging it again through a wide mouth (apopyle) into a relatively large exhalant canal or lacuna which also receives water directly from other chambers.

To this type (fig. 4, /) the name " eurypylous " has been given, and we may include in it cases where there is only a single prosopyle, and perhaps even a short, narrow inhalant canal. In more ad- vanced forms the water is dis- charged from each chamber through a narrow exhalant canaliculus (aphodus) peculiar to itself, and thence into wider canals. This is known as the " aphodal " type (e.g. Cydo- nium, fig. 21). In the " dip- lodal " type there is a special inhalant canaliculus (prosodus) as well as a special aphodus to each chamber, with usually, at any rate, oniy a single prosopyle (e.g. Corticium, fig. 22). The progress from the curypylous to the diplodal condition is accompanied by a corresponding increase in the development of the mesogloea, whereby the canals are greatly

restricted in diameter, and at .... T , „ c 1. , % .. .■ .1 , (After I . E. SchulzeO

the same time the mesogloea

tends to lose its transparent Fig. 22. — Part of a section of gelatinous character and to Corticium candelabrum, O.S., show- become compact and granular, ing diplodal type of canal-system. With the growth of the ectc- The canal shown on the left is some we necessarily get a inhalant and that on the right (e) corresponding development of exhalant. the proximal portion of the

inhalant canal-system. At first the ectosome is merely a thin mem- brane, the dermal membrane, pierced by the inhalant pores, which are usually arranged in groups. Beneath the groups of pores (pore- areas) lie spacious sub- dermal cavities which form the commencement of the inhalant canal-system in the choanosome. In more advanced types the ectosome becomes greatly thick- ened and may be specially strengthened in a variety of ways to form a cortex. The inhalant pores now no longer lead directly into the subdermal cavities, but first into a scries of cavities lying in the cortex and known as chones, which may be separated from the underlying subdermal cavities (sub-cortical crypts) by definite sphincters (Cydonium, fig. 23).

The arrangement of the oscula and pores on the surface of the sponge varies greatly in different types, and sometimes gives rise to very striking modifications of the external form. The oscula or vents are usually relatively large openings situated on the more prominent parts of the

sponge, often on special eleva- lome' i~Cvdoniumeosa7ter (Sollas), tions. Occasionally they are showing a pore-sieve and under- replaced by sieve-hke oscular i ymg c h ne in the cortex. The areas (e.g. Geodta perarmata), a c hone communicates below with modincation which doubtless a subcortical crypt, from which serves to prevent foreign bodies the inhalant canals originate. The from entering the wide exhalant CO rtex contains numerous sterras- canals. The inhalant pores ters> connected with one another may be irregularly scattered by fibrous bands, over the surface of the sponge

or collected in more or less well-defined pore-areas. In cup-shaped sponges the pores are usually confined to the outer and the oscula to the inner surface. In flabellate sponges we find pores on one side and oscula on the other. In Tedania actiniiformis, a deep- sea form, the pores are restricted to a narrow band surrounding the columnar body of the sponge just beneath the flattened top, which bears the vents; thus they are kept from being choked up by the soft ooze on which the sponge lies. In Xenospongia, a flattened discoid form, they are confined to narrow grooves on the upper surface, the chief of which

run round the margin of the disk. In Esperella murrayi the pores are also confined to special grooves on the surface of the sponge, and in both these cases the grooves can apparently be opened and closed by special bands of muscle- fibres, and the supply of water thus regulated. In some species of Latrunculia we find the surface of the sponge covered with

(After Sollas.) Fig. 23. — Section through the cortex and part of the choano-

conspicuous projections of two kinds, some conical and bearing each a single vent, others truncated at the top and bearing the inhalant pores.

Skeleton. — The original ancestral form (Prololynthus) from which all the Porifera are supposed to be descended, probably possessed no proper skeleton at all, and this condition has been retained in the existing Myxospongida, although these sponges have made considerable progress in the evolution of their canal- system. There appears to be little doubt that the Myxo- spongida are primitively devoid of skeleton, and in this respect they must becarefullydistinguishedfromthegenusC/jOKrfroij'a, in which the skeleton has been secondarily suppressed, as well as from numerous and divers species in which the proper skeleton has been more or less completely replaced by grains of sand or other foreign bodies. The Calcarea, Triaxonida, Tetraxonida and Euceratosa, except in cases of extreme degeneration, all possess a well-developed proper skeleton. As this skeleton has been independently evolved in each of these great groups it is necessary to deal with it separately in each case.

Calcarea. — The skeleton in this group is composed of spicules of crystalline carbonate of lime (usually calcite), developed within special mother-cells or scleroblasts. Each spicule is enclosed in a delicate membranous spicule-sheath and contains an axial thread of organic matter. Three main types of calcareous spicule are met with, triradiate, quadri- radiate and monaxon (fig. 24). The triradiates and quadri- radiates, however, are not simple spicules, but spicule-systems formed of three or four rays each originating independently from its own scleroblapt (actinoblast) and all uniting together secondarily. There is reason to believe that this may also sometimes

be the case with the monaxon or oxeate spicules. In the most primitive triradiate spicules all three rays lie in the

quadriradiate spicules. These may be sagittal, in which case the oral rays are turned towards the osculum while the basal ray is directed downwards. If there is an apical ray it projects into the gastral cavity. The walls of the radial chambers are supported by a special " tubar " skeleton (cf. fig. 14), consisting exclusively of

(After E. A. Minchin. From Lankester's Treatise on Zoology.) Fig. 24. — Spicules of Calcareous Sponges.

same plane. Three chief varieties may be distinguished: (1) Regular (fig. 24, b), with all the rays and all the angles equal; (2) Sagittal (fig. 24, c, d, I, &c), with two of the rays or two of the angles forming a pair, differentiated in some respect from the re- maining ray or angle, the paired rays being termed " oral " and the odd ray " basal "; (3) Irregular (fig. 24, p), when conforming to neither of the above types. It has been proposed to draw a very sharp distinction between " equi-angular " triradiates and " alate " forms (in which the angle between the oral rays differs from the paired angles), but it may be doubted whether such a distinction has any great value. The quadriradiate (fig. 24, e, f, k, m) is formed by the addition of an " apical " or " gastral " ray to the three " facial " rays of the triradiate; this ray lies in a plant at right angles to that of the facial rays. The monaxon spicules (fig. 24, h, i, q, r, s) are straight or curved and the two ends are usually more or less sharply differentiated from one another. In all these spicules the form and arrangement of the rays is usually clearly correlated with their position in the sponge in such a manner that they are specially adapted for the work which they have to do. The arrangement of the spicules in the case of the genus Leucoso- lenia has been dealt with above, and we must pass on at once to the Calcarea Heterocoela. In this group the skeleton exhibits an evolutionary series no less remarkable than that of the canal-system. We may take as a convenient starting-point the genus Sycetta, a typical Syconoid form, with . the flagellated chambers radiating independently from the central gastral cavity. The wall of the gastral cavity is supported by a gastral skeleton of triradiate or

(After J. J. Lister.)

Fig. 25. — Astrosclera willeyana (Lister).

A, Entire sponge (x 3) : p.s., upper surface with openings of canal-

system ; b, base of attachment.

B, Section of skeleton: sph, spherules of arragonite; c, canals.

triradiates with their basal rays directed towards the distal end of each chamber. The oral rays are spread out at right angles to the length of the chamber, and as several spicules generally lie at the same level the tubar skeleton forms a series of more or less definite joints and is said to be " articulate." This type of skeleton is almost invariably associated with the Syconoid type of canal- system. In the genus Sycon itself we find the distal ends of the chambers specially protected by tufts of monaxon spicules (fig. 14), but the next great advance in the evolution of the skeleton is brought about by the development of a dermal cortex, in which a special dermal skeleton is developed. This is well seen in the genus Ute (fig- !5)- After this the skeleton of the chamber layer in the sponge- wall begins to undergo modifications, some of which are obviously correlated with the gradual change of the canal-system from the Syconoid to the Leuconoid condition (cf. figs. 16 and 17). Finally all trace of the articulate tubar skeleton is lost, and we get a " paren- chymal " skeleton of scattered radiate spicules in the chamber layer. The skeleton of the chamber layer, no matter what the type of canal-system, may be supplemented by large subdermal sagittal triradiates or subdermal quadriradiates (fig. 17), whose basal or apical rays project inwards from the dermal cortex (Heteropidae and Amphoriscidae). Very generally a special " oscular" skeleton is developed in the form of a fringe of long monaxon spicules around the vent.

Various aberrant types of skeleton are met with in the group. In the genus Lelapia we find a partly fibrous skeleton, in wˆiich the fibres are composed of bundles of triradiates shaped like tuning- forks (fig. 24, 0), and in Petrostoma the main skeleton is formed of calcareous spicules actually fused together. In Astrosclera (fig. 25) a very anomalous type of calcareous skeleton is found, consisting of spherical masses of arragonite, each originating in a special sclero-blast and having a radiate structure, recalling that of a siliceous

a

(After W. J. Sollas.)

Fig. 26. — Typical Siliceous Megascleres.

Diactinal monaxon (oxeate).

Style.

Triact.

Primitive tetraxon (calthrops).

Hexact.

Polyaxon desma.

Sterraster (often regarded as a microsclere).

Part of section of sterraster, showing two rays united by intervening silica.

sterraster. These bodies become closely packed together over large areas, and give the sponge a stony hardness.

Hexactinellida. — In this group the skeleton is composed of spicules of colloidal silica deposited in concentric lamellae around slender axes of an organic substance which in life occupies the " axial canal " of the spicule. Although varying greatly in detail and often exhibiting great complication or, it may be, reduction in structure, these spicules are all referable to the same fundamental triaxonid and hexactinellid type, characterized by the possession of three axes intersecting each other at right angles and each thereby divided into two rays or actines (fig. 26, e). According as one, two, three, four or five of these actines are suppressed we distinguish between pentact, tetract, triact, diact and monact spicules, and these may be further subdivided according to special modifications of the rays due to secondary branching, ornamentation by spines,

(After F. E. Schulze.) Fig. 27. — Derivatives of the Hexact type of Spicule, found in Hexactinellida. a, Dagger. ' d, Amphidisc. /, Tetract (staurus).

b.,c, Pinuli. e, Pentact. g, Diact (rhabdus).

knobs, &c, or curvature, or to excessive development of certain rays as compared with the remainder. Some of the most character- istic of these special types are represented in figs. 27 and 28. Two of them require special notice on account of their importance in the

classification of the group. These are the hexaster and the

find some of the spicules enlarged to form megascleres and others reduced to form microscleres. The megascleres play the principal part in building up the skeleton while the microscleres are usually scattered through the mesogloea.

Triaene Series of Megascleres. — When three rays (cladi) of the tetract resemble one another, while the fourth (shaft) differs in some respect the spicule is termed a triaene. The simplest form is the [iotriaene (fig. 29, 2), with three short simple cladi and an elon-

(After F. E. Schulze.)

Fig. 28. — Derivatives of the Hexact type of Spicule, found in

Hexactinellida.

a, Uncinaria; b, Clavula; c, Scopula.

amphidisc. A hexaster (= rosette) is a perfectly symmetrical hexact whose actines branch out into secondary or terminal rays, in a star-like manner (fig. 30, /). Various sub-types are distinguished according to the character of the rays (floricome, plumicome, &c). An amphidisc (fig. 27, d) is a diact spicule consisting of two opposite rays each of which terminates in a disk-like or spherical expansion surrounded by marginal teeth.

In some cases the spicules all remain disconnected from one another (Lyssacine condition), in others some of them may be united by siliceous cement into a continuous framework (Dictyonine condition), and the distinction between these two types of arrange-ment was for a long time regarded as indicating a primary sub-division of the Hexactinellida into Lyssacina and Dictyonina, but this subdivision has now been abandoned. The term prostalia is applied to spicules which project freely from the surface of the sponge, and these ar° further distinguished as basalia, pleuralia and marginalia, according to their position at the base of the sponge, on the sides, or round the margin of the osculum. The basalia frequently form a root-tuft for attaching the sponge to the sub- stratum (Hyalonema, Euplectella) and commonly have anchor- like dista' extremities. They may be extremely long, as in the well- known " glass-rope " of Hyalonema. In the remarkable genus Monorhaphis we find a single gigantic diact spicule, which may attain a length of two or three feet and the thickness of a lead pencil, transfixing the body of the sponge like a skewer from above down- wards. A special dermal skeleton is

usually formed by a number of spicules distinguished as dermalia, and a gastral skeleton may be similarly formed by special gastralia surrounding the central gastral cavity. Between the dermal and gastral skeletons another set of spicules, known as parenchymalia, form the most important part of the skeleton, supporting the chamber-layer and adjacent tissues. The distinction into large megascleres and small microscleres is perhaps less well marked in this group than in the Tetraxonida.

Tetraxonida. — Here, again, the spicules are composed of colloidal silica deposited around organic axial threads. The starting-point in the evolution of the very complex series of tetraxonid spicules is the primitive tetract or calthrops, characteristic of the most primitive members of the group (e.g. Plakina). This fundamental ground-form (fig. 26, d) consists of four rays or actines of equal length, which all meet one another at equal angles in the centre of the spicule, while their apices would occupy the four angles of a regular pyramid whose sides are four equilateral triangles. It is thus both tetraxonid (with four axes) and letractinellid (with four rays). In Plakina the spicules are all of about the same size, neither very large nor very small, but in higher forms we usually

FIG. 29. — The Tetraxon type of Spicule and its derivatives, found in Tetraxonida. iˆa,inb, Pseudasters. 25, Chiaster. 26, Oxyaster.

tri-

1, Primitive tetract

2, Plagiotriaene.

Dchotriaene.

Discotriaene.

Anatriaene.

Protriaene.

8, Reduced

aenes, becoming monaxon. 9, Tetracrepid desma,

10, Primitive diact.

11, Oxeate.

12, Style.

13, Tylostyle.

14, Acanthotylostyle

Aster ˆ with branching rays.

Rhaphis or tri- chite.

Trichodragma.

30, Sigmata.

31, Isochela.

32, Anisochela.

33, Diancistron.

34, Toxon.

35, Labis (forcipi-

form).

27

29

15, Cladotylote.

16, Acanthoxeate. 1 6a, Pseudaster (am- phidisc).

17, Strongyle.

18, Tylote.

19, Cladostrongyle.

20, Rhabdocrepid (monocrepid) desma.

21, Aster.

22, Spheraster.

23, Sterraster.

24, Spiraster. gated shaft, the angles all remaining approximately equal. If the angles between the cladi and shaft become approximately right angles we have an ortholriaene. If the cladi point forward, we have a protriaene (fig. 29, 6). If the cladi are turned backwards towards the shaft we have an anatriaene (fig. 29, 5). If the cladi branch each into two we have a dichotriaene (fig. 29, 3). If the cladi are expanded laterally and fused together to form a plate, while the shaft is reduced, we have a discotriaene (fig. 29, 4). The cladi may be reduced in size or even suppressed (fig. 29, 7, 8), leaving only the shaft, which may be either sharp at each end (oxeate) or sharp at the apex and rounded at the base (stylote). The spicule has now become monaxonid or monaxonellid (i.e. with a single axis) and monactinellid (with only a single ray) ; but this condition may also be arrived at in a different way, as we shall see directly.

The tetracrepid desma (fig. 29, 9), characteristic of many Lithistids, has been derived from the primitive tetract by ramification of the ends of all the rays.

Monaxonid Series of Megascleres. — We have already seen, in Plakina, how a diactinellid spicule may arise by suppression of two rays of the tetract (fig. 5). At first the two remaining axes

are distinctly indicated by the presence of an angle in the middle of the spicule (fig. 29, 10) ; by straightening out of this angle we reach a monaxonid but diactinellid condition — the diactinellid oxeate, with the organic centre of the spicule in the middle (fig. 29, 11). By rounding off of both ends this form passes into the strongylole. (fig. 29, 17), then if both ends become enlarged into knobs it is said to be tylole (fig. 29, 18). If one end only is rounded off, which apparently usually takes place by suppression of one ray, while the other remains sharp, the spicule is termed slylote (fig. 29, 12). It is now monactinellid as well as monaxonid. If the blunt end of the style enlarges to form a knob we have the tylostyle (fig. 29, 13). Acanthoxeales (fig. 29, 16), acanthostyles and acanthotylostyles (fig. 29, 14) are formed by the development of spines on the surface of the spicule. The development cf large recurved spines at the apex of a tylostyle gives us the cladotylote or grapnel spicule (fig. 29, 15), which simulates an anatriaene. By enlargement of the spiny base of an acanthotylostyle and suppression of the shaft we get forms which

simulate astrose microscleres and may be called pseudasters (fig. 29, 14a, 14S). Pseudasters may also be developed by shortening up of acanthoxeates, accompanied by enlargement of the spines (e.g. Spongillinae, fig. 29, 16a). The exotyle appears to have been formed by enlargement of the outer end of a radially placed oxeate at the surface of the sponge. By ramification of both ends of a diactinal megasclere we get the monocrepid desma (fig. 29, 20), characteristic of certain Lithistids and closely simu- lating the tetracrepid desma. By ramification of one end of a strongylote spicule we may get a cladostrongyle (fig. 29, 19).

Diactinal Series of Microscleres. — The starting-point of this series is the primitive angulate, diactinal oxeate (fig. 29, 10). This has given rise to long hair-like forms or rhaphides (fig. 29, 28), short hair-like forms associated in bundles and called trichodragmata (fig. 29, 29), bow-shaped forms or toxa (fig. 29, 34), and C- and S-shaped forms or sigmata (fig. 29, 30). From the sigmata may be

>(C AU

(After Sollas.)

Fig. 30. — Typical Microscleres. a, b, Sigmata (sigmaspires). /, Modified isochela of Melonan-

c, Toxon.

d, Spiraster.

e, Sanidaster. /, Amphiaster. g, Sigma.

h, k, Isochelae.

j, End of a chela, showing the teeth.

chora. m, Spheraster. n, 0, p, Oxyasters. q, r, Reduced asters. s, Microxeate. /, Hexaster (rosette).

derived the diancistra (fig. 29, 33), shaped like pocket-knives with a blade half open at each end, and the wonderful series of chelae (fig. 29, 31, 32), in which each end branches into a number of sharply recurved teeth. These chelae are characteristic of the family Destnacidonidae, and exhibit great variations in detail, while each particular form is remarkably constant in the species in which it occurs. The most curious and aberrant are those of Melonanchora (fig. 30, /) and Guitarra. In isochelae the two ends of the spicule are

equal, in anisochelae they are unequal.

Astrose or Polyactinal Series of Microscleres. — For the beginning of this series we must go back to the primitive tetract. Reduction in size, sometimes accompanied by increase in the number of rays, has given rise to the oxyaster (fig. 29, 26), with sharp rays and no conspicuous centrum. The development of a distinct centrum from which numerous rays come off gives us the spheraster (fig. 29, 22). In the sterraster (fig. 26, g, h), characteristic of the family Geodiidae, numerous slender rays become fused together side by side to form a solid ball. In the spiraster (fig. 29, 24) the centrum appears to have become elongated and twisted into a spiral. The rays of the aster may terminate in knobs as in the chiaster (fig. 29, 25), or they may become branched (fig. 29, 27).

Arrangement of the Skeleton in the Tetraxonida, — The most primitive type of skeleton arrangement in this group was probably very similar to that which we still find in Plakina or Dercitopsis, but

without any special dermal spicules, the skeleton consisting exclusively of small isolated tetracts irregularly scattered through the mesogloea between the chambers. We may call this the scattered or diffuse type of skeleton. With the development of an ectosome — whether thin dermal membrane or thick cortex — a special dermal skeleton arose. Sometimes this consists of small specially differentiated dermal spicules — candelabra in Plakina, oxeates in Dercitopsis — but a much more important series of modifications was

(After W. J. Sollas.) Fig. 31. — Section of a young Stellettid Sponge, showing radial arrangement of skeleton.

initiated by the development of the triaenes. The cladi of these spicules are commonly extended in or beneath the ectosome and form a very efficient dermal skeleton, while the shafts are directed centripetally through the choanosome. In the genus Discodermia the discotriaenes form a continuous dermal armour of siliceous plates. When anatriaenes and protriaenes are developed their cladi commonly project beyond the surface of the sponge and render it more or less strongly hispid, thus forming a protection from the attacks of enemies. The shafts of the triaenes, though greatly reduced in Discodermia, usually become very much hypertrophied and may be grouped together in bundles, often associated with oxeate spicules. These spicules, or bundles of spicules, now form the principal part of the skeleton, and inasmuch as they radiate from the interior towards the surface of the sponge we distinguish this as the radiate type of

skeleton. The skeleton of the vast majority of Tetraxonida is either actually radiate in structure or derived from the radiate type by further modification. In many Stellettidae, for example (fig. 31), we have a typical radiate skeleton in which a large number of the spicules retain the primitive tetrac- tinellid form, though associated with oxeates, while in Tethya the skeleton is arranged in a similar manner but only monaxonid spicules are present. From the radiate we pass to the reticulate type of

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(After Minchin and Bendy. A, B, C from Lankester's Treatise on Zoology, D from Trans, oj Zool Soc. of London, vol. xii.)

Fig. 32. — Evolution of the Pseud oceratose Reticulate type of Skeleton, as seen in A, Reniera; B, Pachychalina; C, Chalina; D, Spinosella plicifera.

sp, Spicules; spg., Spongin; m.f., Primary fibres; c.f., Secondary (connecting) fibres.

skeleton which characterizes the majority of the so-called Monax-onellida. This is derived from the former by the establishment of secondary spicule-bundles connecting the primary or radial bundles together, and the transit'on is usually accompanied by loss of the cladi of the triaenes and by the development of a massive irregular form on the part of the entire sponge. An intermediate condition is found in some of the massive species of Tetilla (e.g. T. limicola), in which the spicule-bundles are very well defined and form distinct primary " fibres " in the interior of the sponge, but no distinct secondary or connecting fibres are yet developed.

(After Lendenfcld. Modified from Lendenfeld's Horny Sponges, by permission of the Royal Society of London.)

FlG. 33- — Dendritic, Euceratose Skeleton of Dendrilla rosea.

In the Sigmatomonaxonellida, derived from the Tetillidae, the reticulate type of skeleton is almost universal, and in this group an entirely new element is introduced into the skeleton with the development of a " horny " cementing material (spongin) which unites the spicules together in the fibres. At first small in quantity

(Renicra, fig. 32, A), the spongin cement gradually increases in proportion to the spicules until in many Chalininae (fig. 32, B, C) and Desmacidonidae the spicules become completely embedded in it, and the fibres may be formed chiefly of spongin, with only a core of spicules. The complete enclosure of the spicules by spongin at a very early stage cuts off their food supply and causes arrest of development. Finally, in some Chalininae (fig. 32, D) and Desmacidonidae the spicules entirely disappear from the interior of the fibre, and if at the same time they happen to be absent from the intervening mesogloea we get a skeleton composed exclusively of horny matter or spongin, to which the term pseudoceratose may be applied. In the sub-family Ectyoninae the skeleton be- comes modified in an interesting manner by the development of " echinating " spicules, usually acanthostyles or acanthotylostyles, whose bases are cemented on to "the fibre by spongin while their apices project into the surrounding soft tissues. These doubtless serve as a defence against internal parasites. In Agelas these echinating spicules may persist after the spicules have entirely disappeared from the interior of the strongly developed horny fibre. In the Axinellidae all the spicules in the fibres are typically more or less echinating in character and the fibres become plume- like.

Very frequently a special dermal skeleton is developed in the ectosome altogether distinct from that formed by the cladi of the triaenes (when these are present). Thus in the Geodiidae (ng. 23) the thick cortex is almost filled with densely packed sterrasters. In many forms there is a dense layer of small radially arranged monaxons at the surface of the sponge, whose projecting arics form an efficient protection. In the reticulate forms the ectosomˆ is usually a thin dermal membrane supported by a reticulate dermal skeleton of slightly different structure from the " main " skeleton. In cases where a special stalk or a root-tuft is developed we also find a special and appropriate skeleton in connexion there- with.

In the so-called Lithistida alone amongst the Tetraxonida do we find the spicules (desmas) united together by silica to form a coherent skeleton, sometimes of stony hardness, very different from the elastic, flexible skeleton resulting from the development of spongin, and analogous to the condition met with in the Dictyo- nine Hexactinellids.

The microscleres usually play quite a subordinate part in the formation of the skeleton, being scattered irregularly throughout the mesogloea, though sometimes (Geodia, Tethya) the asters may form a definite cortical layer.

Euceratosa. — In the true horny sponges, if we neglect for the moment the presence of foreign bodies, we may say that the skeleton consists from the first exclusively of spongin, secreted (by special

spongoblasts) in concentric layers to form very well defined fibres. In the most primitive forms (Aplysillidae) this horny skeleton is dendritic in arrangement (fig 33), composed of fibres which rise vertically upwards from the base of the sponge (where they may be expanded to form a horny basal cuticle which serves for. attachment) and ramify towards the surface, where their apices push against the dermal membrane and cause it to project in the form of "conuli." No reticulation is formed in the simplest cases (Aplysilla, Dendrilla), but in Megalopastas secondary connecting fibres are established (in relation, doubtless, to the increase in size and massive form of the sponge), and the skeleton thus simulates the pseudoceratose reticulate type of the Sigmatomonaxonellida. In Darwinella we have, in addition to the dendritic skeleton, isolated " spicules " of spongin scattered irregularly through the mesogloea. The presence of these spicules, which are sometimes, though by no means always, hexactinellid in form, has given rise to much speculation as to the possible relationship of the Aplysillidae to the siliceous Hexactinellida. Until we know more about their origin, however, we may perhaps best regard them simply as detached portions of the general skeleton secreted by isolated groups of spongoblasts. The genus Megalopastas forms a natural transition to the Spongeliidae, in which the reticulation of the horny skeleton is an almost constant feature, and in which the tendency to supple- ment or replace the spongin by foreign bodies (sand, broken spicules) is very strongly marked. In extreme cases the skeleton is composed almost exclusively of sand (e.g. Psammopemma), and the whole sponge looks like a mass of sand stuck together by a minimum of soft tissues and spongin cement. Such " arenaceous " sponges also occur in other groups (e.g. Desmacidonidae). The culminating point in the development of the true horny skeleton is found in the Spongiidae (e.g. Euspongia), but even in the bath sponge (fig. 6) we commonly find sand grains or other foreign matter in the in- terior of the primary fibres. The value of the sponge for domestic purposes depends upon the softness and elasticity of the fibre, the closeness of the meshes, and the relative absence of sand.

Histology. There are two primary tissue-forms in sponges, the flat pavement epithelium and the epithelium composed of choanocytes or collared cells. The former covers the whole of the external surface of the sponge and, except in the simpler Calcarea Homocoela, it also lines a considerable portion of the canal-system. The latter lines

practically the whole of the primitive gastral cavity in the Calcarea Homocoela, but in all higher types becomes restricted to well-defined " flagellated chambers." A gelatinous "mesogloea;" which must be regarded primarily as an intercellular substance, appears between the primitive outer and inner layers of the sponge-wall. This contains primitive amoeboid wandering cells (archaeocy tes) ,

6,

(After Dendy. From Quart. Journ. Micro. Science, new series, vol. xxxv., by permission of J. and A. Churchill.)

Fig. 34. — Histology'.

Pavement epithelium from the upper surface of an oscular

diaphragm of Vosmaercpsis wilsoni. Chamber diaphragm of Vermaeropsis macera; mus.c. Myocytes;

ex.op, Exhalant aperture of flagellated chamber. 4, 5, Amoebocytes of Leucandra phillipensis (the one shown

in 5 appears to be feeding by means of pseudopodia upon the

collared cells (c.c.) of a flagellated chamber). Section across an inhalant canal (i.e.) of Ute syconoides, showing

an ovum (ov.) suspended from the wall, apparently awaiting

fertilization; sp, spicules.

which give rise to the ova and spermatozoa, and also various other cells which are now generally believed to migrate into it from the primitive pavement epithelium (dermal epithelium) of the outer surface, such as scleroblasts, various connective tissue elements and contractile fibres.

Pavement Epithelium (fig. 34., l). — This always consists of a single layer of polygonal cells, which are usually flat and very rarely (Oscarella) provided with cilia or flagella. They may be glandular and may secrete a definite cuticle (as in many Euceratosa). They may also be highly contractile.

Porocytes. — In certain Calcareous sponges (Leucosolenia) it has been shown (by E. A. Minchin) that the primitive inhalant pores (prosopyles) are formed as perforations in certain of the pavement epithelium cells, which acquire a tubular form and extend through the mesogloea from the dermal to the gastral surface. The outer portion of each porocyte forms a contractile diaphragm which doubtless regulates the admission of water to the gastral cavity. The porocytes are sometimes conspicuous on account of their highly granular character.

Scleroblasts. — We may distinguish three kinds of scleroblasts, according to the chemical character of the skeletal material which they secrete; these are calcoblasts, silicoblasts and spongoblasts. The calcoblasts and silicoblasts (fig. 35, h-n) form their respective spicules, at any rate in the first instance, as intra-cellular (perhaps sometimes intra-syncytial) secretions, though we must suppose

(After Scbulze and Sollas.)

Fig. 35. — Histology.

a, Collencytes from Thenea muricata.

b, Chondrenchyme (with spicules) from Corticium candelabrum.

c, Cystenchyme, from Pachymatisma johnstoni.

d, Desmacyte, from Dragmastra normani.

e, Myocytes and collencytes, from Cinachyra barbata.

f, Thesocyte, from Thenea muricata.

g, Collared cell (choanocyte), from Sycon raphanus.

h—n, Silicoblasts or mother-cells, in which different forms of siliceous spicules are being secreted.

that in the case of large spicules the later stages in growth are acconv- plished by the activity of several or many scleroblasts in co-operation. The spongoblasts (fig. 7) appear to co-operate with one another in the formation of the spongin fibre from the beginning. They are found only around the young, growing fibres, where they occur in large numbers, forming a kind of sheath of somewhat flask-shaped cells, each placed at right angles to the surface of the fibre and with the nucleus in its broad distal end. The spongin is secreted

in concentric lamellae and is obviously intercellular in origin, and probably of the same nature as the cuticle which often occurs on the surface of the sponge.

Connective-tissue Elements. — The following are the chief forms assumed by the mesogloea according to the nature of its connective-tissue cells and intercellular substance, (a) Collenchyme, consisting of a clear gelatinous matrix with branching stellate collencytes (fig. 35, a) embedded in it; (b) Sarcenchyme, in which the quantity of intercellular matrix is greatly reduced and the connective-tissue cells are closely packed together; (c) Cystenchyme (fig. 7, Coll , fig. 35, c), consisting of close-packed, oval, vesicular cells with fluid contents and strands of protoplasm radiating from the nucleus to the periphery; (d) Chondrenchyme (fig. 35, b), somewhat resembling cartilage in texture and with a very large amount of intercellular matrix.

The name desmacytes has been given to certain slender connective-tissue fibres (fig. 35, d) often united in dense bundles or layers, which occur especially in the ectosome of many Tetraxonida, giving rise to a fibrous cortex of leathery consistence.

Contractile Fibres. — Muscular fibres or myocytes (fig. 35, e) are of common occurrence, especially in relation to various parts of the canal-system, the diameter of which appears to be regulated by their agency. They may form definite sphincters around the vents or in other places (fig. 34, 2), or they may form transverse bands lying in the floor of pore-bearing grooves, by the contraction of which the lips of the groove are doubtless approximated and the in- current stieam of water shut off {Esperella murrayi, Xenospongia patelliformis).

Endothelial Cells. — In many sponges the developing embryos are enclosed in definite capsules composed of flattened polygonal cells, the whole being embedded in the mesogloea. The origin of the endothelial cells forming the capsules is doubtful. They sometimes aid in the nutrition of the developing embryo {e.g. in Stelospongus flabelliformis).

No nervous elements, nor sensory cells of any kind, have as yet been recognized with any degree of certainty in sponges, in spite of various heroic attempts to demonstrate their existence.

Collared Cells or Choanocytes (fig. 35, g). — These are quite the most characteristic histological elements met with in sponges. Although exhibiting various minor differences in structure, and still

more as regards size, they always show the same essential features. Each consists usually of an oval or rounded body (frequently appearing polygonal from the pressure of its fellows) surmounted by a more or less cylindrical or funnel-shaped collar, which surrounds a single long, whip-like flagellum projecting from the apex of the cell. The collar is a filmy, transparent ex- tension of the cytoplasm (cell – protoplasm) , which can be completely with- drawn. The flagellum may also be withdrawn, and in preserved specimens nei- ther collar nor flagellum is usually visible. The cell is usually broadest at the base and narrowed to form a neck or " collum," be- neath the collar. The nucleus may be situated either at the base or at tl.ˆ the apex of the cell-body or between the two. The collar itself is often a more , complicated structure than (After F. E. Schulze.)

appears at first sight. It FlG . 3 6._ Collared Cells of Schaudinnia may be provided with one arctica

or two transverse_ hoops, n Nucleus; fl, Flagellum; c, Collar, presumably serving to

stiffen it (Ascandra falcata). In many cases the collars of adjacent choanocytes have been observed to be connected by a definite membrane which stretches from one to the other at the level of their margins. This is known as Sollas's membrane, but it is apparently not a permanent structure, and the circumstances under which it appears require elucidation. In the Hexa'-.tinellida the form of the collared cells appears to be somewhat unusual (fig. 36).

Archaeocytes. — The term " archaeocytes " has been applied to certain undifferentiated amoeboid cells which make their appearance at an extremely early stage in the ontogeny, and some of which persist throughout life, with little, if any, modification, as the amoe- bocyles of the adult sponge, while others become germ-cells, differ entiated into ova and spermatozoa.

Amoebocytes. — These are amoeboid cells closely resembling the leucocytes or white blood corpuscles of higher animals. They commonly have blunt, lobose pseudopodia and the cytoplasm is generally more or less densely charged with refractive granules. They have the power of wandering from place to place through the mesogloea (fig. 34, 3-5)-

(After Polejaeff and Schulze.)

Fig. 37. — Spermatozoa.

a-h, Development of Spermatozoa in Sycon raphanus; k, Mature Spermatozoa; j, Sperm-ball in Mesogloea of Oscaretta lobularis; k, Mature Spermatozoon.

Germ-Cells. — The ova (fig. 34, 6) are formed from amoebo- cytes, which grow to a large size and finally withdraw their pseudopodia and acquire a rounded form. They have large nuclei with a very distinct nuclear membrane and commonly a conspicuous nucleolus. The spermatozoa (fig. 37) closely resemble those of higher animals, consisting each of a small " head," composed chiefly of chromatin material, and a slender vibratile " tail " composed of cytoplasm. In this case the amoebocyte gives rise to a single sperm mother-cell (spermato- cyte) sometimes enclosed in one or two covering cells. The nucleus of the spermatocyte undergoes repeated mitosis and a " sperm-bail " is produced which is either enclosed in the covering cell or in a special endothelium similar to that which surrounds the segmenting ovum. The germ-cells occur scat- tered through the mesogloea and are not aggregated in gonads, so that we cannot speak of " ovaries " and " testes " as in higher types.

Reproduction.

Reproduction in sponges may be effected in one of three ways: (1) The first is by vegetative budding, followed by separation of the buds and thus differing from the ordinary budding which leads merely to increase in the size of the sponge-colony. This process has been observed in many cases (e.g. Leucosolenia, Oscarella, Lophocalyx, Aplysilla). (2) The second way is by the formation of specialized repro- ductive bodies known as gemmules. This process is best known in the fresh-water sponges (Spongillinae), where it has been developed as a special means of tiding over unfavourable periods during which the parent sponge is liable to be destroyed by cold or drought. Each gemmule consists of an aggregation of amoeboid cells f'statocytes) densely charged with nutrient granules and enclosed in a protective horny envelope which may be strengthened by a layer of special spicules. The ripe gemmule is very resistant to adverse conditions and is capable of remaining dormant for a lengthened period, and of develop- ing into a new sponge on the return of favourable conditions. In temperate climates the gemmules remain dormant through- out the winter and develop in the spring, the development being very similar to that of an ordinary fertilized ovum

except that it begins at the " morula " stage, with the numerous statocytes representing the blastomeres. (3) The third way is by the union of ova and spermatozoa to form zygotes, which undergo segmentation and develop into the adult through a more or less complex series of ontogenetic stages. Previous to fertilization the ovum undergoes a process of maturation accompanied by the extrusion of two polar bodies, as in higher animals. Very little is known about the

actual process of fertilization, but it appears probable that ˆ Blastosohere '(MastulaT this is effected in the inhalant canals of the parent sponge, e ' L arva at time of escape from

the form of a free-swimming ciliated larva, which, after fixing itself to some object, undergoes a metamorphosis and then grows into the adult form. The details of development appear to differ widely in different species and various interpretations have been placed upon somewhat limited and discrepant observations.

One of the best-known cases is that of the calcareous genus Sycon (fig. 38). The fertilized ova develop into ciliated larvae within the parent sponge, embedded in the walls of the radial chambers, in their endothelial capsules. Each divides first into two, then into four, and then into eight equal and similar blastomeres by successive vertical clefts. The eight-celled stage (fig. 38, b, c,) has the form of a somewhat flattened cushion, with an axial cavity which is the beginning of the blastocoel or segmentation cavity. A horizontal cleft now divides each blastomere into a somewhat smaller upper and a somewhat larger lower portion, and the sixteen blastomeres arrange themselves in the form of a hollow sphere surrounding the blastocoel. The smaller cells multiply rapidly and become columnar, while still remaining as a single layer. Each one presently acquires a flagellum (" cilium ") at its outer end. The larger cells multiply more slowly and are characterized by their coarsely granular appear- ance. They are destined to give rise to the dermal layer and its derivatives (including archaeocytes ?) and never become flagellated. 1 The blastosphere or blastula (fig. 38, d, e,) is now complete, the blastocoel being completely surrounded by a single layer of cells differentiated, however, into two groups, gastral and dermal. The large granula (dermal) cells now become invaginated, but this

(After F.E. Schulze.)

Fig. 38.

a, Ovum.

b, c, Embryo with 8 blastomeres (b, top view, c, side view).

where the ova have been observed suspended from the epithe- lial lining of the canal (e.g. in Ute, fig. 34, 6). After fertiliza- tion they appear, usually at any rate, to migrate back into the mesogloea, where they become surrounded by endothelial cap- sules and undergo segmentation. In Stelospongus flabelliformis the cells of the capsule are of gigantic size and are attached to the superficial blastomeres of the developing embryo by protoplasmic processes, through which, no doubt, nutriment is passed from the parent to the embryo.

Embryology. The segmentation of the ovum appears to be in all cases complete or holoblastic, and the young sponge usually leaves the parent in

parent.

Development 01 Sycon raphanus.

f, Invagination of flagellated cells.

g, Gastrula attached by oral face. h, Young sponge (Olynthus

stage). J, Top view of young sponge.

is only a temporary condition, probably to be explained as the mechanical result of the pressure of the spicules of the parent sponge. The so-called ” pseudogastrula ” thus formed escapes by rupture

1 According to E. A. Minchin, the first-formed granular cells are ” archaeocytes,” which migrate into the interior of the larva while their place is taken by granular cells formed by modification of the neighbouring flagellated cells. The later-formed granular cells are destined to give rise to the dermal layer of the adult, while the remaining flagellated cells form the gastral layer.

of the parent tissues into a radial flagellated chamber and passes to the exterior with the outgoing stream of water. The invaginated dermal cells are pushed out again and the ” amphiblastula ” swims away (hg. 38, e). (Possibly the granular dermal cells, by prolifera-

tion, may form a solid mass blocking up the blastocoel completely, so that we have a solid embryo.) The larva now fixes itself by the anterior flagellated pole (which, according to Schulze, becomes permanently invaginated, thus giving rise to a true gastrula, fig. 38, /, g), and the dermal cells spread themselves out over the gastral cells, which they completely cover. The fixed larva (" pupa ") consists of a solid mass of gastral cells enclosed in a single layer of now flattened dermal cells. Presently the gastral cavity appears (or reappears) in the middle, around which the gastral cells arrange themselves in a single layer. The young sponge elongates upwards, some of the dermal cells form porocytes which become perforated by prosopyles, others migrate into the gelatinous mesogloea and form scleroblasts, from which spicules are developed. The cells of the gastral layer acquire collars in addition to their flagella, an osculum is formed by perforation at the apex, and the young sponge begins to feed. It is now in the Olynthus condition (fig. 38, h) and is exactly comparable to a simple Leucosolenia individual. As it grows older radial flagellated chambers are budded out around the central gastral cavity and the collared cells lining the latter are replaced by pavement-epithelium derived from the dermal layer.

An interesting account of the development of Leucosolenia (Clathrina) blanca has been given by E. A. Minchin. Segmentation is regular and complete, resulting in the formation of a hollow, ciliated, oval blastula (fig. 39, A), with a large blastocoel and a wall composed of a single layer of columnar flagellated cells and a pair of very large granular cells at the posterior pole. The latter are primitive archaeocytes and are destined to give rise to the amoebocytes and germ-cells of the adult. The flagellated cells will give rise to all the other cells of the adult, both dermal and gastral. The larva becomes free-swimming in this condition. Here and there individual flagellated cells (destined to form the cells of the dermal layer) lose their flagella and, becoming amoeboid, migrate into the blastocoel, which presently becomes completely filled with such cells. The larva is thus converted into a solid " parenchymula," in which the archaeocytes remain unchanged in their original position at the posterior extremity. It now fixes itself and flattens out upon the substratum in the pupal condition. During the metamorphosis Which now ensues the majority of the cells of the inner mass (dermal cells) pass out to the exterior again between the flagellated cells

(After E. A. Minchin.)

Fig. 39. — Types of Sponge Larvae (semi-diagrammatic). The ciliated (gastralj cells are left blank; the dermal cells are shaded, and

the archaeocytes are granulated.

A, Larva of Leucosolenia {Clathrina) blanca.

(gastral cells), over which they spread themselves in the form of a dermal layer of flattened epithelium. Some of the dermal cells, however, remain in the inner mass as porocytes; the primitive archaeocytes have divided up into amoebocytes; and porocytes, amoebocytes and the cells of the gastral layer are all crowded together in the interior of the pupa. The pupa now elongates vertically. A gastral cavity appears in the interior. The cells of the gastral layer arrange themselves around this cavity and develop their collars and flagella. At first, however, the gastral cavity is lined by the porocytes, which presently separate and migrate out- wards. 1 Scleroblasts migrate inwards from the dermal layer and secrete spicules. An osculum and prosopyles are formed as in Sycon and the Olynthus stage is reached.

The development of sponges in general appears to be characterized by a remarkable want of uniformity in the arrangement of the different kinds of cells of which the larva is composed. Two, or possibly three, primary groups of cells are universally present; the flagellated cells, which will give rise to the collared cells of the adult, the non-flagellated (granular) cells, which will give rise to the dermal layer and its derivatives, and possibly the primitive archaeocytes (perhaps to be regarded as undifferentiated blastomeres) . It may be considered as doubtful, however, whether the primitive archaeo-cytes can in all cases be distinguished from the primitive dermal cells. The latter are in some cases (amphiblastula type) grouped at the posterior pole of the larva (Sycon), while in other cases (parenchymula type) they may pass inwards and completely fill the interior, blocking up the blastocoel and perhaps also freely projecting at the hinder end (fig. 39, F). At the time of the metamorphosis the dermal cells pass to the outside and come to completely enclose the gastral cells, so that the two layers acquire their proper relative positions. The sponge larva in many respects closely resembles the Coelenterate " planula," with its ectoderm and endoderm, but it is very doubtful how far this comparison is valid, and in the presenft state of our knowledge it is perhaps better to avoid the use of the terms ectoderm and endoderm in dealing with the sponges altogether. The idea naturally suggests itself that the two primary layers ol the Sponge correspond to those of the Coelenterate, but in a reversed position, the inner layer of the one being the outer layer of the other, and vice versa, and this idea has found expression in the name Enantiozoa which has been proposed for the group by Yves Delage,

but which has not met with general acceptance.

Physiology. Comparatively little is known of the physiology of sponges. The most obvious expression of the vital activity of the organism is the stream of water which flows in through the dermal pores or ostia and out through the vents or oscula. That this stream is maintained by the undulatory movements of the flagella of the collared cells there can be no doubt, but the fact that the movements of the flagella of different cells are not co-ordinated, so that they do not act in unison, indicates that the mechanical problem involved is not so simple as is usually supposed. There can be no doubt that the incoming stream brings with it minute food-particles, consisting of fragments of organic matter, alive or dead, and also the oxygen required for purposes of respiration ; while the outgoing stream removes faecal products and waste matter (excreta). The rate of flow appears to be regulated by the opening and closing of the pores and vents, or of intermediate apertures such as the apopyles or exhalent openings of the flagellate chambers. This opening and closing may be effected by the activity of definite muscular sphincters (fig. 34, 2) or, in the case of some prosopyles, by the contractility of the porocytes themselves.

The ingestion of the food particles is no doubt effected in large measure by the collared cells, which seem to feed much in the same manner as independent collared monads (Choanoflagellata). It seems not improbable thatSollas's membrane may be a temporary structure which assists in arresting food particles as they pass through the flagellate chambers. There is reason to believe also that amoebocytes (in this case therefore phagocytes) may capture minute organisms on their way through the canal system, and even porocytes are sometimes credited with this power. Digestion, no doubt, is, at any rate chiefly, intracellular. The amoebocytes probably serve not only to ingest food themselves but also to receive surplus food from the collared cells and distribute it through the sponge (fig. 34, 5).

Nothing definite is known as to the function of excretion, but here, as in the case of nutrition, it seems likely that collared cells and amoebocytes are both concerned.

B, Of Leucosolenia (Clathrina) reticulum.

C, Young larva of Leucosolenia (or pseudogastrula stage of Sycon).

D, Late larva of Leucosolenia (or newly hatched larva of Sycon).

E, Larv.-i of Oscarella.

F, Parenchymula larva of a siliceous Monaxonellid (Myxilla).

1 The position of the porocytes inside the collared cells appears at first sight very anomalous, but Minchin has shown that this condition is actually repeated in the adult sponge every time the gastral cavity is obliterated by contraction.

Sponges, as we have already seen possess no special nervous system and no special sense organs, and the power of response to stimuli appears to be very limited. Many sponges probably have the power of contracting as a whole, which may in some cases be due, in part at any rate, to the presence of bands of muscular fibres, and Sollas observes that in Pachymatisma irritation of the oscular margin is invariably followed after a short interval by a slow closure of the sphincter. The power of movement in adult sponges is, however, chiefly confined to individual cells acting independently. The young larvae, on the other hand, swim vigorously about by means of their cilia or flagella, whose movements must obviously be co-ordinated in order to ensure the progress of the entire organism in definite directions.

The rate of growth of sponges appears to be very rapid. A British species of Hymeniacidon is said to form a crust measuring a foot in diameter in so short a period as five months. With this rapidity of growth must be associated the fact that many sponges, marine as well as fresh-water, appear to be annual.

Distribution. The vast majority of sponges are marine, only a single sub-family, the Spongillinae, having acquired the habit of living in fresh water. The Spongillinae are, however, very widely distributed, being found in lakes and rivers in all parts of the world. Marine sponges occur everywhere, from low-water mark to the greatest depths, but certain localities, such as the Gulf of Manaar, Port Phillip and Port Jackson, appear to be much richer than others both in individuals and species. The Hexactinellida are essentially a deep-water group and are there- fore much more rarely met with than other forms. The Tetraxonida and Euceratosa abound in shallow and in moderately deep water, and a comparatively small number of species of Tetraxonida occur at great depths. Both are dominant

groups at the present day, represented by very large numbers of species and individuals. The Myxospongida are comparatively rare and represented by very few species. The Calcarea are common, in the littoral region, especially in sheltered situations amongst rocks and seaweed.

Most families and even genera of sponges enjoy a very wide geographical range, very many being cosmopolitan. Species are usually much more restricted in distribution, but even here there are some noteworthy exceptions, and future researches will probably show that many species from different localities which are at present regarded as distinct are connected by intermediate forms living in intermediate situations.

There appears to be a well-marked relation between temperature and the power of spongin-secretion, and as a result we find that sponges with a really well-developed horny skeleton (whether Euceratosa or Pseudoceratosa) are usually only met with in com- paratively warm waters. This fact brings about a striking contrast between the sponge-faunas of different latitudes. Classification. The classification of the Phylum Porifera, the characters of which have already been given, is as follows: —

Sub-phylum and Class Calcarea. — Sponges with a skeleton composed of carbonate of lime, commonly in the form of isolated spicules whose most usual shape is triradiate.

Order 1. Homocoela, — Calcarea in which the gastral cavity and its outgrowths are lined throughout by collared cells. This order is sometimes divided into two families, Clathrinidae and Leucosoleniidae, but it is doubtful if this distinction can be maintained , and by some writers only a single genus \Lexicosolenia) is recognized. Order 2. Heterocoela. — Calcarea in which the original lining of the gastral cavity is partly replaced by pavement epithelium, so that the collared cells are confined to separate flagellated chambers. This order includes the living families Leucascidae, Sycettidae, Grantidae, Heteropidae, Amphoriscidae and Pharetronidae (with only two living representatives but numerous fossil forms). The relationships of the anomalous Astrosclera (fig. 25), for which the family Astroscleridae has been proposed by J. J. Lister, must still be regarded as problematical.

Sub-phylum Non-Calcarea. — Sponges without any calcareous skeleton.

Class and Order Myxospongida. — Sponges with no skeleton ; with simple canal system and usually large flagellate chambers. (The absence of skeleton is primitive and not due to degeneration.) This class is sometimes divided into two families — Halisarcidae, with elongated, sac-shaped chambers, and Oscarellidae, with more or less spherical chambers.

Class Triaxonida (= Hexactinellida). — Sponges with a skeleton composed of siliceous spicules, either isolated or cemented together by silica, and either triaxonid and hexactinellid in form or derivable from the triaxonid and hexactinellid type. The canal system is simple and the flagellated chambers are large and sac- shaped, and more or less radially arranged in a network of trabecular tissue. Spongin is never formed.

Order I. Amphidiscophora. — Triaxonida with characteristic amphidisc spicules, but no hexasters, and with a root-tuft of anchoring spicules. The family Hyalonematidae, including the well-known glass-rope cponges of the genus Hyalonema, is the only family recognized in this order.

Order 2. Hexasterophora. — Triaxonida whose most characteristic spicules are hexasters. To this order belong the living families Euplectellidae, Asconematidae, Rossellklae, Euretidae, Melittionidae, Coscinoporidae, Tretodictyidae and Macandrospongidae, and a number of extinct families such as the Ventriculitidae so commonly met with in the Jurassic and Cretaceous rocks.

Class Tetraxonida. — Sponges with a skeleton composed of siliceous spicules, either isolated or cemented together (by silica or by spongin), and either tetraxonid and tetractinellid in form or derivable from the tetraxonid and tetractinellid type. The canal system is usually complex, with small, more or less spherical flagellated chambers.

Grade Tetractinellida. — Tetraxonida in which some, at any rate, of the megasclerqs retain the primitive tetractinellid form. No desmas are developed.

Order 1. Homosclerophora. — Tetractinellida in which microscleres and megascleres are not yet sharply differentiated from one another and no triaenes are developed. The canal system is comparatively simple. This order includes the family Plakinidae (see Plakina, ante) which forms the starting-point of the evolution of the class.

Order 2. Astrophora. — Tetractinellida with triaenes and with astrose microscleres, without sigmata. This order includes the families Pachastrellidae, Theneidae, Stellettidae, Ceodiidae.

Order 3. Sigmatophora. — Tetractinellida with triaenes, with sigmata for microscleres (when present), without asters. This order includes the families Tetillidae and Samidae.

Grade (? order) Litiiistida. — Tetraxonida in which the mega- scleres form desmas, typically united with each other by siliceous cement to form a continuous skeleton, often of stony hardness. This group inc'udes both tetractinellid and monaxonellid forms and may possibly be of polyphyletic origin. The Lithistida bear the same relation to the other Tetraxonida that the dictyonine Hexac- tinellids bear to the lyssacine forms, but in the present state of bur knowledge it is hardly possible to trace the natural affinities of the numerous members of the group, many of which are only known in the fossil state. The following are the principal families: Tetra- ladidae, Desmanthidae, Corallistidae, Pleromidae, Neopeltidae, Scleritodermidae, Cladopeltidae, Azoricidae, Anomocladidae.

Grade Monaxonellida. — Tetraxonida in which the primitive tetraxonid and tetractinellid condition of the megascleres has been entirely lost through suppression of some of the spicule rays, so that none but monaxonellid megascleres remain. No desmas are developed. Owing to the extreme reduction or modification of the skeleton, leading in many cases to convergence, the classification of this group is extraordinarily difficult and the group is obviously not monophyletic.

Order 1. Aslromonaxonettida. — Monaxonellida in which the microsclere, when present, is some form of aster. The members of this order are to be regarded as descended from aster-bearing tetractinellid ancestors.

Families. — Epipolasidae, Tethyidae, Spirastrellidae (including Placospongiidae), Clionidae (the boring sponges), Suberitidae, Chondrosiidae. (In Chondrosia the skeleton is entirely suppressed, so that it simulates the Myxospongida.)

Order 2. Sigmatomonaxonellida — Monaxonellida in which tht typical microscleres are sigmata, or other diactinal forms. Normal astrose microscleres are absent (though secondary pseudasters are occasionally present). The members of this order are to be regarded as descended from sigma-bearing tetractinellid ancestors.

Families. — Haploscleridae (chief sub-families: Gelliinae, Renierina Chalininae, Spongillinae), Desmacidonidae (chief sub-families: Esperellinae, Ectyoninae), Axinellidae.

Class and Order Euceratosa. — Non-calcareous sponges without siliceous spicules, but with a skeleton composed of horny fibres developed independently, i.e. not in relation to any pre-existing spicular skeleton. The skeleton is often supplemented, or even largely replaced, by foreign bodies. This group includes the bath- sponges and their very numerous relations.

Families. — Aplysillidae, Spongeliidae, Spongiidae.

There are two groups of palaeozoic fossil siliceous sponges which apparently do not fit into the above system, viz. the Octactinellida _£

and Heteractinellida of G. J. Hinde. The former, represented by the genus Aslraeospongia, have oc- tactinal megascleres. The latter, represented by the genera Tholiastcrella and Asteraclinella, have poly- axon megascleres with an indefinite number of rays. These may indicate the former existence of two distinct classes of siliceous sponger

(After G. J. Hinde.)

Fig. 40. — A, octactine and B, hexac- tine spicules of Aslraeospongia.

which are, so far as we know, totally unrepresented at the present day.

A £

(After G. J. Hinde.)

Fig. 41. — Spicules of Heteractinellida. A, Typical polyactine. B, Rosette-like form. C, D, E, Nail-like forms.

Phytogeny. The most recent views as to the evolution and inter-relationships of the principal groups of sponges above enumerated may be conveni- ently expressed by the accompanying phylogenetic tree (fig. 42). Starting with the hypothetical Protolynthus as the

ancestral form of the entire group, we see how two divergent lines of descent are very early estab- lished according to whether or not a calcareous skeleton is developed. The Calcarea are at first simple Olynthus forms, Homocoela, differ- ing only from the Protolynthus in the presence of the calcareous spicules. From these are derived, by the pro- cess of budding, on the one hand reticulate forms {Clathrina) and on the other radiate forms {e.g. Leuco- solenia tripodifera) , and some of the latter (now probably extinct) form the starting point for the evolution of the Calcarea Heterocoela, begin- ning with simple Syconoid forms and ending with complex Leuconoids, in which the original process of simple budding has been followed up by elaborate modifications of both skeleton and canal system.

Turning to the other main line of ships of the principal groups descent we find at once a conspicuous of sponges to one another. gap between the Protolynthus and

the simplest known non-calcareous sponge; though the analogy of the Calcarea makes it easy to understand how the almost Syconoid canal system of the simplest Hexactinellids, or the primitive Rhagon type of other groups, may have been derived from the Protolynthus ancestor in the first instance by simple budding. This line of descent may be regarded as continued straight on into the existing Myxospongida, with increase in the complexity of the canal system, due to folding of the chamber- bearing layer and the accompanying development of inhalent and exhalent canal systems, but without the development of any skeleton. The Triaxonida and Euceratosa would seem to have branched off independently at a very early stage from the Myxo- sponge line, before the flagellated chambers had suffered that reduc- tion in size which occurs in some existing Myxospong-da and in all Tetraxonida. In the Triaxonid line of descent the evolution of the siliceous skeleton of primitively hexactinellid spicules is the leading feature, the canal system preserving remarkable uniformity through- out the group. In the Tetraxonida also the skeleton has played the principal part in the evolution of existing species, but the canal system too has undergone great modifications. The primitive tetrax- onid, tetractinellid siliceous spicules must have arisen quite indepen- dently, their fundamental form being totally different from that of the triaxonid hexactinellid type. The appearance of differentiated microscleres in this group introduced new possibilities of variation, of which full advantage has been taken, and we are confronted with most interesting evolutionary series, terminating in many very

Fig. 42. — Phylogenetic Tree, showing the supposed relation-

remarkable and at present inexplicable spicule forms (fig. 29). In many of the more advanced Tetraxonida, especially in the Chalininae, the development of spongin cement also appears as a new factor in the process of evolution. At first serving merely to glue the mega- scleres together into a continuous framework, it ultimately, in some extreme cases, completely replaces the siliceous skeleton and gives rise to a purely " horny " skeleton in which all traces of spicules have been lost by degeneration. Thus we arrive at a " Pseudo- ceratose " condition (fig. 32, D) which must be carefully distinguished from the condition of the Euceratosa, which have apparently branched off quite independently from Myxosponge ancestors. Here we have another typical example of that phenomenon of " convergence " which has rendered the classification of sponges so very difficult. In the Euceratose line of descent we start with forms (Aplysilla) with large sac-shaped chambers and altogether primitive canal system, accompanied by an arborescent horny skeleton (fig. 33) of an entirely different type from that of the pseudoceratose Tetraxonida. From this we can tr?ce the evolution gradually through the Spongeliidae to the Spongiidae, the skeleton becoming reticulate and the canal system gradually more complex with accompanying reduction in size of the chambers. The bath, sponge perhaps represents the culminating point in this direction. Thus it appears that both the horny type of skeleton and the siliceous spicular type have been twice independently produced in the evolution of the Non-calcarea. An analogous case of convergence is seen in the union of originally separate spicules into a coherent skeleton by means of cement of the same chemical composition as themselves. This has taken place independently in the Calcarea {Petrostoma), the Dictyonine Hexactinellida and the Lithistid Tetraxonida.

Affinities of the Porifera. Three main views have been put forward with regard to the position of the Sponges in the animal kingdom: (1) that they are colonies of Protozoa; (2) that they form a subdivision of the Coelenterata; (3) that they are not Protozoa but have originated from 'Protozoon ancestors quite independently from other Metazoa (Enterozoa). The first of these views, associated especially with the names of James Clark and Saville Kent, is supported by the relative independence of the constituent cells in the sponge-body and by the extraordinary resemblance of the collared cells to the choanoflagellate or collared Monads. It is also supported by the existence of a remarkable colonial fcrm uf Choanoflagcllata {Proterospongia) in which the collared Monads are partially embedded in the surface of a gelatinous matrix, in the interior of which amoeboid cells are found. E. A. Minchin has shown that even

in the adult Leucosolenia {Clathrina) the collared cells and porocytes have the power of changing their relative positions, while migration of dermal and gastral cells and consequent inversion of the layers appears to be a common feature of the sponge larva at the time of metamorphosis. These facts are certainly suggestive of Protozoon colonics rather than of Metazoa. On the other hand it must not be forgotten that migratory amoebocytes {leucocytes) occur in probably all groups of Metazoa, while the degree of integration and the amount of histological differentiation in Sponges are far greater than in any other Protozoon colonies known to us. It has been argued that the process of sexual reproduction by means of ova and spermatozoa is fatal to the Protozoon-colony theory, but this argument is completely disposed of by the discovery of spermatozoa and ova in the unicellular Sporozoa. On the other hand the occurrence of collared cells has been held to distinguish the Sponges from all other Metazoa, and this argument has also been answered by the discovery of collared cells in the larva of Echinocyamus (an Echinoderm) by H. Thcel. It would, in short, t be difficult to frame a definition of the Protozoa which should absolutely exclude the Sponges, while at the same time our con- ception of the nature of Protozoa will have to be profoundly modified if we are to admit the Sponges within the limits of that group.

The second view, that the Sponges constitute a subdivision of the Coelenterata, is maintained by some very eminent con- tinental authors such as Ernst Haeckcl and F. E. Schulze. This view is supported by the structure of the Olynthus type, which, as we have seen, forms the starting-point of Sponge evolution. The dermal layer of the Olynthus is regarded as ectoderm, the gastral layer as endoderm and the mesogloea I with its contained cells as mesoderm, more highly developed

than in most Coelenterates. It Is also supported by a consider- able amount of agreement in the early stages of development, up to the formation of the ciliated larva. According to this view the Olynthus, or at any rate the imaginary ” Protolynthus ” is only a slightly modified gastrula, and the Sponges are there- fore Enterozoa without any coelom, or in other words Coelen- terata. The extraordinary histological differences between the Sponges and other Coelenterates (Cnidaria), combined with the highly characteristic canal system and the absence of tentacles, are, however, alone sufficient to throw

grave doubts upon the. probability of a close relationship between the two groups, and these doubts are greatly strengthened by recent embryological researches, which tend to show that the so-called ectoderm and endoderm are not homologous in the two cases.

There remains the third view, in accordance with which the Sponges are multicellular animals which have originated quite independently from Choanoflagellate Protozoon ancestors, and this is the view which at present seems to have most in its favour. It is especially associated with the name of W. J. Sollas, who invented the term " Parazoa " for the group. In support of this view it may be pointed out that the tendency to form hollow, spherical colonies, resembling the blastosphere stage in the development of Enterozoa, is met with in very distinct groups of Protozoa (e.g. Volvox, Sphaerozoum). This form of colony is obviously polyphyletic in origin. The fact that the segmentation of the ovum leads to such a form in both Sponges and Enterozoa is therefore by no means conclusive evidence that Sponges and Enterozoa have originated from the same Protozoon group. While, as has been repeatedly pointed out, the universal and characteristic collared cells of sponges point emphatically to a Choanoflagellate ancestry, it is impos- sible, in the present state of our knowledge, to indicate the par- ticular Protozoon group which has given origin to the Enterozoa. We may then consider the Metazoa, or many-celled animals, as a polyphyletic, or at any rate diphyletic group, including two perfectly distinct lines of descent from the ancestral Protozoa, the Sponge-line on the one hand, which leads to nothing higher than Sponges, which retain in many respects the characters of Protozoa, and the Enterozoon line on the other, which leads through the Coelenterata to the Coelomata and so on to the highest divisions of the animal kingdom.

Economics.

All the bath sponges belong to the two genera Euspongia, Bronn, and Hippospongia, Schulze, subdivisions of the old genus Spongia, auctorum, distinguished from one another by the fact that in Hippospongia the body of the sponge is traversed by wide ramifying canals or vestibules, in addition to the proper canal system of the sponge. Species of these two genera occur in many parts of the world, probably wherever the temperature of the sea-water is sufficiently high and the depth and bottom suitable. It is only in a few localities, however, that they occur in sufficient numbers and of sufficiently good quality to render a sponge fishery practicable. The sponges of commerce are obtained chiefly from the Mediterranean, the coast of Florida and the Bahama Islands. From the Mediterranean three dis-

tinct species are obtained — (1) Euspongia officinalis, which includes the " fine sponges," with two chief varieties, mollissima (the Levantine sponges, very soft and often cup-shaped), and adriatica; (2) Euspongia zimocca, including the "hard" or Zimocca sponges; (3) Hippospongia equina, the " common " or " horse " sponge.

Of the Florida sponges five principal kinds are recognized by the dealers — (1) the sheep's wool sponge {Hippospongia gossypina) — this appears to be by far the most abundant in the market and also the most valuable; (2) the yellow sponge (Euspongia agaricina), resembling the Zimocca sponge of the Mediterranean; (3) the grass sponges (including both Hippo- spongia graminea and H. cerebriformis) ; (4) the velvet sponge Hippospongia maeandriniformis), which is not so common as the others; (5) the glove sponge {Euspongia tubulifera) , which is the least valuable. In the year 1900 the Florida sponge

fisheries yielded 418,125 lb of sponges, valued at $567,685. The Bahama sponges appear to be very similar to those of Florida.

Bath sponges occur in comparatively shallow water and are obtained by diving, by dredging, or by means of a trident or long-handled fork. The preparation of the sponges for the market is extremely simple. The slimy soft tissues very soon begin to decay and run off when they are removed from the water; after this has gone on for some time the sponges are washed and beaten until the skeleton is clean, they are then threaded on string and dried. They are frequently " loaded " with foreign matter by the dealers in order to increase their weight; rock-salt, glucose, molasses, lead, gravel, sand and stones being used for the purpose. They are also often bleached by means of chemicals to give them a better colour, but though their appearance is thereby greatly improved, their durability is said to be impaired.

In spite of the undoubted rapidity with which sponges grow, as shown by the fact that on the coast of Florida marketable sponges are found commonly in places that had been stripped of saleable specimens in the preceding year, there appears to be considerable danger of injury to the sponge industry by over- fishing and by the reckless destruction of young specimens, and it has been found necessary to introduce special legislation in America to counteract these evil tendencies. The question of the artificial propagation and cultivation of sponges has also been much discussed, but although some very interesting experiments have been made, they have not as yet led to any great practical results. As far back as 1862 Oscar Schmidt

showed that " cuttings " of sponges will attach themselves and grow. This idea was followed out in the experiments of G. Buccich on the Island of Lesina, from 1863-187 2, but these ex- periments were brought to a close by the hostility of the native fishermen. Sifnilar experiments have since been made on the Florida sponge-grounds. The possibility of rearing sponges in this way from cuttings has thus been fully demonstrated, but whether it can be done profitably is another question. Accord- ing to the experience of G. Buccich it appeared that it would take seven years for the cuttings to attain marketable size in the Mediterranean. The Florida experiments, on the other hand, indicate a much more rapid rate of growth, and it has been stated that under favourable conditions the cuttings will attain marketable size in as short a time as one year. It has been doubted, however, whether the total weight of sponges produced by cuttings would be greater than the weight of the sponges from which the cuttings were taken if these sponges were allowed to continue their growth undisturbed. H. V. Wilson has suggested that sponges may be artificially reared from the eggs, in the same way that fishes or oysters are reared. The eggs of the bath sponge, like those of other sponges, develop into free-swimming ciliated larvae, and these might be made to attach themselves, like oyster-spat, to suitable objects, on which the young sponges could be cultivated under appropriate conditions. Detailed experiments are required to demonstrate the feasibility or otherwise of this interesting suggestion.

For further information on the economic aspect of the subject the student should consult the annual Bulletin and special papers of the United States Bureau of Fisheries and also the work of Seurat referred to in the bibliography.

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SPONSOR (from Lat. spondcre, to promise), one who stands surety for another, especially in the rite of Christian baptism, a godfather or godmother. The practice originated not in infant baptism, but in the custom of requiring an adult pagan who offered himself for the rite to be accompanied by a Christian known to the bishop, who could vouch for the applicant and undertake his supervision, thus

fulfilling the function performed in the Eleusinian mysteries by the mystagogus. The Greek word for the person undertaking this function is avaoaxps, to which the Latin susceptor is equivalent. The word " sponsor " in this ecclesiastical sense occurs for the first time, but incidentally only, and as if it were already long familiar, in Tertullian's treatise De baptismo (ch. 18), where, arguing that in certain circumstances baptism may conveniently bepostponed, especially in the case of little children, he asks, " For why is it necessary that the sponsors likewise should be thrust into danger, who both themselves by reason of mortality may fail to fulfil their promises, and may also be disappointed by the development of an evil disposition [in those for whom they become sponsors] ? " The sponsors here alluded to may have been in many cases the actual parents, and even in the 5th century it was not felt to be inappropriate that they should be so; Augustine, indeed, in one passage appears to speak of it as a matter of course that parents should bring their children and answer for them " tanquam fidejussores " (Epist. . . . ad Bonif. 98), and the oldest Egyptian ritual bears similar testimony. Elsewhere Augustine contem- plates the bringing of the children of slaves by their masters, and of course orphans and foundlings were brought by other benevolent persons. The comparatively early appearance, however, of such names as compatrcs, commatres, propatres, promatres, patrini, matrinae, is of itself sufficient evidence, not only that the sponsorial relationship had come to be regarded as a very close one, but also that it was not usually assumed by the natural parents. How very close it was held to be is shown by the Justinian prohibition of marriage between godparents and godchildren. On the other hand, the anciently allowable practice of parents becoming sponsors for their own children, though gradually becoming obsolete, seems to have lingered until the 9th century, when it was at last formally prohibited by the council of Mainz (813). For a long time there was no fixed rule as to the necessary or allowable number of sponsors and sometimes the number actually assumed was large. By the council of Trent, however, it was decided that one only, or at most two, these not being of the same sex, should be permitted. The rubric of the Church of England according to which " there shall be for every male child to be baptized two godfathers and one godmother, and for every female one godfather and two godmothers," is not older than 1661; the sponsors are charged

with the duty of instructing the child, and in due time presenting it for confirmation, and in the Catechism the child is taught to say that he received his name from his " godfathers and god- mothers." At the

Reformation the Lutheran churches retained godfathers and godmothers, but the Reformed churches reverted to what they believed to be the more primitive rule, that in ordinary circumstances this function should be undertaken by a child's proper parents. Most churches demand of sponsors that they be in full communion. In the Roman Catholic Church, priests, monks and nuns are disqualified from being sponsors, either " because it might involve their entanglement in worldly affairs," or more probably because every relationship of father- hood or motherhood is felt to be in their case inappropriate. The spiritual relationship established between the sponsor and the baptized, and the sponsors and the parents of the baptized, constitutes an impediment to marriage (see Marriage: Canon Law).

SPONTINI, GASPARO LUIGI PACIFICO ˆ774-1851), Italian musical composer, was born on the 14th of November 1774 at Majolati (Ancona) in Italy. He was the son of a poor cobbler and was intended for the priesthood. His musical propensities however were not to be restrained, and he obtained lessons from Kapellmeister Quintiliani. In 1791 he went to the Conserva- torio de' Turchini at Naples, where he was trained to write operatic music under Paisiello, Cimarosa and Fiorivanti. His first opera, L'Eroismo ridicolo, was successfully produced in 1796, and by 1799 he had already written and produced eight operas. After becoming court composer to King Ferdinand of Naples in this year an intrigue with a princess of the court compelled Spontini to leave Naples in 1800. For the next few years he wrote operas in Rome and Venice until 1803 when he settled in Paris, where his reception was anything but flattering. His comic opera Julie proved a failure; a successor, La Petite maison, was hissed. Undaunted by these misfortunes, he abandoned the light and somewhat frivolous style of his earlier works, and in Milton, a one-act opera produced in 1804, achieved a real success. Spontini henceforth aimed at a very high ideal, and during the remainder of his life strove so earnestly to reach it that he frequently remodelled his passages five or six times before permitting them to be performed in public, and wearied his singers by introducing new improvements at every rehearsal. His first masterpiece was La Vestale, completed in 1805, but kept from the stage through the opposition of a jealous clique until the 15th of December 7807, when it was produced at the Academic, and at once took rank with the finest works of its class. Spontini had abandoned the parlando of Italian opera for an accompanied recitative; he had increased the strength of the orchestra and introduced the big chorus freely. His opera, Ferdinand Cortez, was received with equal enthusiasm in 1809; but another,

Olympia, was much less warmly welcomed in 1819. Napoleon, whose approval of any work of art was at once a compliment to the artist and a serious imputation on the value of the work, professed immense admiration for Spontini's music.

Spontini had been appointed director of the Italian opera in 1810; but his quarrelsome and grasping disposition led to his summary dismissal two years later, and, though reinstated in 1814, he voluntarily resigned his post soon afterwards. He was in fact very ill fitted to act as director; yet on the 28th of May 1820, five months after the failure of Olympia, he settled in Berlin by invitation of Frederick William III., commissioned to super- intend all music performed at the Prussian court and compose two new grand operas, or three smaller ones, every three years. But he began by at once embroiling himself with the intendant, Count Bruhl. Spontini's life at Berlin may be best described as a ceaseless struggle for precedence under circumstances which rendered its attainment impossible. Yet he did good work. Die Vestalin, Ferdinand Cortez and Olympia — the last two entirely remodelled — were produced with great success in 1821. A new opera, Nourmahal, founded on Moore's Lalla Rookh, was performed in 1822, and another, entitled Alcidor, in 1825; and in 1826 Spontini began the composition of Agnes von Hohen- staufen, a work planned on a grander scale than any of bis

former efforts. The first act was performed in 1827, and the complete work in three acts graced the marriage of Prince William in 1829. Though the German critics abused it bitterly, Agnes von Hohenstaufen is undoubtedly Spontini's greatest work. In breadth of conception and grandeur of style it exceeds both Die Veslalin and Ferdinand Cortez, and its details are worked out with untiring conscientiousness. Spontini himself, however, was utterly dissatisfied with it, and at once set to work upon an entire revision, so that on its re-presentation in 1837 many parts were scarcely recognizable by those who had heard the opera in its original form.

This was his last great work. He several times began to rewrite his early opera, Milton, and contemplated the treatment of many new subjects, such as Sappho, La Colere d'Achille, and other classical myths, but with no definite result. He had never been popular in Berlin; and he has been accused of endea- vouring to prevent the performance of Euryanthe, Oberon, Die Hochzcit des Camacho,

Jessonda, Robert the Devil, and other works of genius, through sheer envy of the laurels won by their composers. But the critics and reviewers of the period were so closely leagued against him that it is difficult to know what to believe. After the death of Frederick William III. in 1840 Spontini's conduct became so violent and imperious that he was sentenced to nine months' imprisonment for lese- majeste. The sentence was remitted by Frederick William IV., but on the 2nd of April 1841, when he appeared at the con- ductor's desk to direct a performance of Don Juan, he was greeted with hisses and groans, and his orders to raise the curtain were ignored, so that he was compelled to leave the desk. The king dismissed him on the 25th of August, with power to retain his titles and live wherever he pleased in the enjoyment of his full salary. He elected to settle once more in Paris, after a short visit to Italy; but beyond conducting occasional perform- ances of some of his own works he made but few attempts to keep his name before the public. In 1847 he- revisited Berlin and was invited by the king to conduct some performances during the winter. In 1848 he became deaf. In 1850 he retired to his birthplace, Majolati, and died there on the 14th of January 1851, bequeathing all he possessed to the poor of his native town.

SPONTOON (Fr. esponton, Ital. spontone, from Lat. punctum, point, pungcre, to prick), a weapon carried by infantry officers in the 17th and early 18th centuries. It was a type of the partisan or halberd (q.v.), a shafted weapon with a special form of spear head.

SPOON (O. Eng. spon, a chip or splinter of wood, cf. Du. spaan, Ger. Spahn, in same sense, probably related to Gr. a<$>r\v, wedge), a table implement, bowl-shaped at the end, with a handle vary- ing in length and size. From the derivation of the word the earliest northern European spoon would seem to have been a chip or splinter of wood; the Greek KoxAiaptov (Lat. cochleare) points to the early and natural use of shells, such as are still used by primitive peoples. Examples are preserved of the various forms of spoons used by the ancient Egyptians of ivory, flint, slate and wood, many of them carved with the symbols of their religion. The spoons of the Greeks and Romans were chiefly made of bronze and silver, and the handle usually takes the form of a spike or pointed stem. There are many examples in the British Museum from which the form of the various types can be ascertained, the chief points of difference being found in the junction of the bowl with the handle. Medieval spoons for domestic use were commonly made of horn or wood, but brass, pewter and " latten " spoons appear to have been common about the 15th century. The full descriptions and entries re- lating to silver spoons in the inventories of the royal and other households point to

their special value and rarity. The earliest English reference appears to be in a will of 1259. In the ward- robe accounts of Edward I. for the year 1300 some gold and silver spoons marked with the fleur-de-lis, the Paris mark, are mentioned. One of the most interesting medieval spoons is the coronation spoon used in the anointing of the sovereign, an illustration of which is given under Regalia. The sets of

spoons popular as christening presents in Tudor times, the handles of which terminate in heads or busts of the apostles, are a special form to which antiquarian interest attaches (see Apostle Spoons). The earlier English spoon-handles ter- minate in an acorn, plain knob or a diamond; at the end of the 1 6th century the baluster and seal ending becomes common, the bowl being " fig-shaped." At the Restoration the handle becomes broad and fiat, the bowl is broad and oval and the termination is cut into the shape known as the pied de biche, or hind's foot. In the first quarter of the 18th century the bowl becomes narrow and elliptical, with a tongue or " rat's tail " down the back, and the handle is turned up at the end. The modern form, with the tip of the bowl narrower than the base and the rounded end of the handle turned down, came into use about 1760.

See C. J. Jackson, " The Spoon and its History," in Archaeologia (1892), vol. liii. ; also Cripps, Old English Plate.

SPOONBILL. The bird now so called was formerly known in England as the Shovelard or Shovelar, while that which used to bear the name of Spoonbill, often amplified into Spoon-billed Duck, is the Shoveler (q.v.) of modern days — the exchange of names having been effected as already stated (loc. cit.) about 200 years ago, when the subject of the present notice — the Platalea leucorodia of Linnaeus as. well as of recent writers — was doubtless far better known than now, since it evidently was, from ancient documents, the constant concomitant of Herons, and with them the law attempted to protect it. 1 J. E. Harting (Zoologist, 1886, pp. 81 seq.) has cited a case from the " Year- Book " of 14 Hen. VIII. (1523), wherein the then bishop of London (Cuthbert Tunstall) maintained an action of trespass against the tenant of a close at Fulham for taking Herons and " Shovelars " that made their nests on the trees therein growing, and has also printed (Zoologist, 1877, pp. 425 seq.) an old document showing that " Shovelars " bred in certain woods in west Sussex in 1570. Nearly one hundred years later (c. 1662) Sir Thomas Browne, in his " Account of Birds found in Norfolk " (Works, ed. Wilkin, iv. 315, 316), stated of the " Platea or Shouelard " that it formerly " built in the Hernerie at Claxton and Reedham, now at Trimley in Suffolk." Thislast isthelatest known proof of the breeding of the species in

England; but more recent evidence to that effect may be hoped for from other sources. That the Spoonbill was in the fullest sense of the word a " native " of England is thus incontestably shown; but for many years past it has only been a more or less regular visitant, though not seldom in considerable numbers, which would doubt- less, if allowed, once more make their home there; but its conspicuous appearance renders it an easy mark for the greedy gunner and the contemptible collector. What may have been the case formerly is not known, except that, according to P. Belon, it nested in his time (1555) in the borders of Brittany and Poitou; but as regards north-western Europe it seems of late years to have bred only in Holland, and there it has been deprived by drainage of its favourite resorts, one after the other, so that it must shortly become merely a stranger, except in Spain or the basin of the Danube and other parts of south-eastern Europe.

The Spoonbill ranges over the greater part of middle and southern Asia, 2 and breeds abundantly in India, as well as on some of the islands in the Red Sea, and seems to be resident throughout Northern Africa. In Southern Africa its place is taken by an allied species with red legs, P. crislata or tenuiroslris,

1 Nothing shows better the futility of the old statutes for the protection of birds than the fact that in 1534 the taking of the eggs of Herons, Spoonbills (Shovelars), Cranes, Bitterns and Bustards was visited by a heavy penalty, while there was none for destroying the parent birds in the breeding season. All of the species just named, except the Heron, have passed away, while there is strong reason to think that some at least might have survived had the principle of the Levitical law (Deut. xxii. 6) been followed.

2 Ornithologists have been in doubt as to the recognition of two species from Japan described by Temminck and Schlegel under the names of P. major and P. min n r. It has been suggested that the former is only the young of P. leucorodia, and the latter the young of the Australian P. regia.

which also goes to Madagascar. Australia has two other species, P. regia or melanorhynchus, with black bill and feet, and P. flavipes, in which those parts are yellow. The very beautiful and wholly different P. ajaja is the Roseate Spoonbill of America, and is the only one

found on that continent, the tropical or juxta-tropical parts of which it inhabits. The rich pink, deepening in some parts into crimson, of nearly all its plumage, together with the yellowish green of its bare head and its lake-coloured legs, sufficiently marks this bird; but all the other species are almost wholly clothed in pure white, though the English has, when adult, a fine buff pectoral band, and the spoon-shaped expanse of its bill is yellow, contrasting with the black of the compressed and basal portion. Its legs are also black. In the breeding season, a pendent tuft of white plumes further ornaments the head of both sexes, but is longest in the male. The young of the year have the primary quills dark-coloured.

The Spoonbills form a natural group, Plataleinae, allied to the Ibididae, and somewhat more distantly to the Storks (see Stork). They breed in societies, not only of their own kind, but in company with Herons, either on trees or in reed-beds, making large nests in which are commonly laid four eggs — white, speckled, streaked or blotched, but never very closely, with light red. Such breeding stations have been several times described, as for instance by P. L. Sclater and W. A. Forbes {Ibis, 1877, p. 412), and H. Seebohm (Zoologist, 1880, p. 457), while a view of another has been given by H. Schlegel (Vog. Nederland, taf. xvii.). (A. N.)

SPORADES (Gr. 'SiropaSes, from airelpuv, to sow), the islands scattered about the Greek Archipelago, as distinguished from the Cyclades, which are grouped round Delos, and from the islands attached, as it were, to the mainlands of Europe and Asia. Ancient and modern writers differ as to the list of the Sporades (see Bursian, Griechenland, ii. 348 seq.). The Doric Sporades — Melos, Pholegandros, Sikinos, Thera, Anaphe, Astropalia and Cos — were by some considered a southern cluster of the Cyclades. In modern times the name Sporades is more especially applied to two groups — the northern Sporades, which lie north-east of Negropont (Euboea), Skiathos, Skopelos and Ikos being included in the department of Magnesia and Scyros in that of Euboea; and the southern Sporades, lying off the south-west of Asia Minor, being included in the Turkish vilayet of the " Islands of the White Sea." The northern, which have altogether an area of 180 sq. m. and a population of 12, 2 50 (1896), comprise Skiathos (pop. 2790), Ikos (pop. 653), Skopelos (pop. 5295), Pelagonisi, Giura, Pipari and Scyros (pop. 3512), with the adjacent islets. Skiathos is a beautifully wooded and picturesque island; the town stands on a declivity surrounding an excellent harbour. The larger island of Skopelos is also well wooded. Almost every householder in both islands is the owner, joint owner or skipper of a sailing ship. The southern Sporades are as follows:

Icaria, Patmos, Leros, Calymnus, Astropalia (Astypalaea or Stampalia), Cos (Stanko), Nisyros, Tilos or Episcopi, Syme, Khalki, Rhodes, Crete and many smaller isles. Icaria (pop. about 8000) derives its name from the legend of Icarus. The forests which it once possessed have been destroyed by the inhabitants for the manufacture of charcoal. Leros (pop. about 3000) was in ancient times a seat of the worship of Artemis. Calymnus (pop. about 7000) was once covered by forests — (Ovid, A. A. ii. 81, " silvis umbrosa Calymne"), which have disappeared. Nisyros (pop. about 2500) possesses hot sulphur springs.

SPCROZOA, a large and most important section of the Proto- zoa, all the members of which are exclusively parasitic in habitat. They are of extremely widespread occurrence; there is hardly one of the chief classes of animals which does not furnish hosts for these parasites, scarcely one of the common tissues or organs of the Metazoan body which may not be liable to infection. Sporozoa differ greatly as regards the effects which they produce upon their hosts. In many, perhaps in most, cases the general health of the infected animal seems to be unimpaired, even though the parasites may be fairly abundant. Some, however,

give rise to dangerous or fatal diseases, while others may cause ravaging epidemics; instances of these are given under the various orders.

Correlated with the mode of life are the two features character- istic of all Sporozoa: (a) They absorb only fluid nutriment, osmotically, and so lack any organs for ingesting and digesting solid food; and (b) they reproduce by sporulation, i.e. the for- mation of minute germs, which are in most instances very numerous and are often enclosed in firm protective envelopes or cases, each case with its contents forming a spore. In addition, the great majority have also another method of reproduction, for increasing the number of the parasites in any individual host ; this is distinguished as multiplicative or endogenous repro- duction, from the propagative or exogenous method (by means of the resistant spores), which serves for the infection of fresh hosts and secures the dissemination and survival of the species. Further, most if not all forms of Sporozoa undergo sexual conjugation at some period or other of the life-cycle.

Beyond this, however, it is impossible to generalize. In response to the exceeding diversity of habitat and of the con- ditions of life, the parasites exhibit manifold and widely-different types of form, organization and life-history. The recognition of this fact is

expressed, at the present day, by the division of the Sporozoa into several well-defined orders, which are grouped in two main divisions, each containing more or less closely related forms. One of these groups consists of the Gregarines, Coccidia and Haemosporidia (qq.v.). The other comprises the Myxosporidia, Actinomyxidia, Sarcosporidia and Haplosporidia, the parasites included in the last named order being of compara- tively simple structure, and probably near the base of this section. There are, in addition, various other forms (Sero- and Exo-sporidia), also primitive in character, but which are as yet too insufficiently known for it to be certain whether they are of distinct ordinal rank, or should be placed with the Haplosporidia.

The nomenclature assigned to these two principal divisions of the Sporozoa by different writers has varied according to the particular character on which they have primarily based the arrangement. Of late years, the terms Telosporidia and Neosporidia, proposed by F. Schaudinn (1900), have been most in favour. In the Telosporidia (comprising the Gregarines, Coccidia and Haemosporidia), sporulation does not begin until the close of the vegetative or trophic period, i.e. until growth has ceased; in the Neosporidia (including the remaining orders) growth and sporulation go on coincidently. Recently, however, considerable doubt has been thrown upon the general occurrence of this latter condition in certain Myxosporidia (Microsporidia) ; and the present writer adopts as preferable, therefore, the terms Ectospora and Endospora (qq.v.), invented by E. Metschnikoff and made use of by F. Mesnil (1899), which indicate a universal distinction between the two groups in their manner of sporula- tion. This distinction is probably the most fundamental one, and itself supports a conclusion which is, on other grounds, becoming more and more likely, namely, that these two divisions are not related phylogenetically; but have, on the contrary, a radically different origin. In other words, under the heading Sporozoa, as at present used, are included two entirely inde- pendent series of Protozoan parasites; the general resemblances which these exhibit are due to convergence brought about by their specialized mode of life.

The most recent and comprehensive account of the group is that by E. A. Minchin (in Lankester's Treatise on Zoology, pt. i., London, 1903). to which the present writer is much indebted; another useful treatise is that of F. Doflein, Die Protozoen als Parasiten u. Krank- heitserreger (G. Fischer, Jena, 1901). Earlier accounts are those, of M. Liihe, Ergebnisse der neuren Sporozoenforschung (Jena, 1900); Wasielewski, Sporozoenkunde (Jena, 1896); Y. Delage and E.

Herouard in Traite de zoologie concrete, pt. i., Paris, 1896); E. R. Lankester, art. " Protozoa " in Ency. Brit. 9th ed. (1886), and O. Biitschli in Bronn's Klassen u. Ordnungen des Thierreichs, I. i. (1882). There is a systematic enumeration of the group by A. Labbe in Das Thierreich, 5. (Berlin, 1899); and the classification and phylogeny are considered by E. Mesnil (Soc. Biol., vol. jub. p. 258, Paris, 1899), and by H. Crawley in Amer. Nat. (1905), xxxix. 607.

(H. M. Wo.)

SPORRAN (Gaelic sporan, purse, pouch), a pouch which is worn, in Highland costume, hanging from the belt over the front of the kilt. The older sporrans were quite modest objects and ordinarily of leather; in modern Highland costume and in the uniform of Highland kilted regiments it has become a highly- ornamental adjunct, with silver or metal rims, and a heavy long backing of horsehair or fur.

SPORT (a contracted or shortened form of "disport," to amuse, divert oneself, 0. Fr. se disporter or deporter, to leave off work, hence to play, Lat. dis-, away, and portare, to carry; the origin of the meaning lies in the notion of turning away from serious occupations, cf. " diversion "), play, amusement, enter- tainment or recreation. The term was applied in early times to all forms of pastime. It was, however, particularly used of out-of-door or manly recreations, such as shooting with the bow, hunting and the like. Modern usage has given several meanings to " sport " and " sports. " Generally speaking " sport " includes the out-of-door recreations, the " field-sports," such as fishing, shooting, fox-hunting, &c, connected with the killing or hunting of animals as opposed to organized " games, " which are contests of skill or strength played according to rules. It also includes the special class of horse-racing, the votaries of which, and also of the prize-ring, have arrogated to themselves sometimes the name of " sportsman, " applying that word even to those who follow racing simply as an occasion for betting. On the other hand, the plural " sports " is generally confined to athletic contests such as running, jumping, &c. (see Athletic Sports and subsidiary articles).

In zoology and botany the word has a specific meaning of a sudden or singular variation from type, a " diversion " in a more etymological sense of the term.

SPORTS, THE BOOK OF, or more properly the Declaration of Sports, an order issued by James I. in 1617 on the recom- mendation of Thomas Morton, bishop of Chester, for use in Lancashire, where the king on his return from Scotland found a conflict on the subject of Sunday amusements between the Puritans and the gentry, many of whom were Roman Catholics. Permission was given for dancing, archery, leaping, vaulting and other harmless recreations, and of " having of May games, Whitsun ales and morris dances, and the setting up of May-poles and other sports therewith used, so as the same may be had in due and convenient time without impediment or neglect of divine service, and that women shall have leave to carry rushes to church for the decorating of it." On the other hand, " bear and bull-baiting, interludes, and (at all times in the meane sort of

people by law prohibited) bowling " were not to be permitted on Sunday (Wilkins, Concilia, iv. 483). In 1618 James transmitted orders to the clergy of the whole of England to read the declara- tion from the pulpit; but so strong was the opposition that he prudently withdrew his command (Wilson, in Kennet, ii. 709; Fuller, Church History, v. 452). In 1633 Charles I. not only directed the republication of his father's declaration (Rushworth, ii. 103) but insisted upon the reading of it by the clergy. Many of the clergy were punished for refusing to obey the injunction. With the fall of Laud all attempts to enforce it necessarily came to an end.

SPOTSWOOD (Spottswood or Spottiswood), ALEXANDER (1676-1740), American colonial governor, was born, of an old Scotch family, in Tangier, Africa, in 1676. He served under Marlborough in the War of the Spanish Succession, and was wounded at Blenheim. He became lieutenant governor of Virginia in June 1710, when he was received with some enthusiasm, because he brought to the colony the privilege of habeas corpus; his term as governor closed in September 1722 — probably because he meddled in ecclesiastical matters; but he remained in Virginia, living near his ironworks in Germanna, a settlement of Germans, on the Rapidan in Spottsylvania county (named in his honour) and he was deputy postmaster-general of the colonies from T730 to 1739. He was the first representative of the British government in America who fully appreciated the value of the western territory. As governor he recommended the establishment of a Virginia company to carry on trade with the

Indians, he urged upon the provincial government and also upon the British authorities the wisdom of constructing forts along the frontier, and he personally organized and conducted an exploring expedition (Aug. 17 to Sept. 20, 17 16) into the Shenandoah Valley reaching the water-parting between the Atlantic and the Ohio river. 1 These ambitious and expensive schemes, coupled with his haughty and overbearing conduct, involved him in a controversy with the rather niggardly House of Burgesses. He developed the iron industry of Virginia, promoted the religious education of the Indians and tried to advance the interests of education, and especially of the College of William and Mary. In 1740 he was commissioned major- general to conduct the expedition against Cartagena, but died while attending to the embarcation, at Annapolis, Maryland, on the 7th of June 1740. His library he left to the College of William and Mary.

See R. A. Brock (ed.), " The Official Letters of Alexander Spots- wood " (with a memoir), in The Collections of the Virginia Historical

Society (2 vols., Richmond, 1882-1885).

SPOTTISWOODE (Spottiswood, spotiswood or Spotswood), JOHN (1565-1639), archbishop of St Andrews and historian of Scotland, eldest son of John Spottiswood, minister of Calder and " superintendent " of Lothian, was born in 1565. He was educated at Glasgow University (M.A. 1581), and succeeded his father in the parish of Calder in 1583. In 1601 he attended Ludowick, duke of Lennox, as his chaplain, in an embassy to the court of France, returning in 1603. He followed James to Eng- land on his accession, but was the same year nominated to the see of Glasgow, his consecration in London, however, not taking place until October 1610. Spottiswoode had originally become prominent as an ardent supporter of the strict Presby- terian party, but gradually came to see the inconveniences of " parity in the Church," attributed little importance to the existing matters of dispute, and thought that the interests of both church and state were best secured by keeping on good terms with the king. He was therefore ready to co-operate with James in curtailing the powers of the Kiik which encroached on the royal authority, and in assimilating the church of Scotland to that of England. On the 30th of May 1605 he became a member of the Scottish privy council. In 1610 he presided as moderator over the assembly in which presbytery was abolished, in 161 s he was made archbishop of St Andrews and primate of Scotland, and in 1618 procured the sanction of the privy council to the Five Articles of Perth with their ratification by parliament in 1621. In 1633 he crowned Charles I. at Holyrood. In 1635 he was appointed lord chancellor of Scotland, an office which he retained till 1638. He was opposed to the new liturgy as inexpedient, but when he could not prevent its introduction he took part in enforcing it. He was a spectator of the riot of St Giles's, Edinburgh, on the 23rd of July 1637, endeavoured in vain to avoid disaster by concessions, and on the taking of the Covenant perceived that " now all that we have been doing these thirty years past is thrown down at once." He escaped to Newcastle, was deposed by the assembly on the 4th of Decembei on a variety of ridiculous charges, and died in London on the 26th of November 1639, receiving burial in Westminster Abbey. Spottiswoode published in 1620 Rcfutatio libelli de regimint ecclesiae scoticanae, an answer to a tract of Calderwood, who replied in the Vindiciae subjoined to his Altar e damascenum, (1623). The only other writing published during his lifetime was the sermon he preached at the Perth assembly. His most considerable work was The History of the Church and State of Scotland (London, 1655, seq.). It displays considerable research and sagacity, and even

when dealing with contemporary events gives a favourable impression, upon the whole, of the author's candour and truth. The opposite side can be studied in Calderwood's History.

Spottiswoode married Rachel, daughter of David Lindsay, bishop of Ross, and besides a daughter left two sons, Sir John Spottiswoode of Dairsie in Fife, and Sir Robert, president of

1 To each of his comrades in this journey Spotswood presented a small golden horseshoe, lettered " Sic juvat transcendere montes."

the Court of Session, who was captured at the battle of Philip- haugh in 1645 an(i executed in 1646.

See the accounts prefixed to the first edition of Spottiswoode's History of Scotland and to that published by the Spottiswoode Society in 1851 ; also David Calder wood's His/, of the Kirk of Scotland

(1842-1849).

SPOTTISWOODE, WILLIAM (1825-1883), English mathema- tician and physicist, was born in London on the nth of January 1825. His father, Andrew Spottiswoode, who was descended from an ancient Scottish family, represented Colchester in parlia- ment for some years, and in 183 1 became junior partner in the firm of Eyre & Spottiswoode, printers. William was educated at Laleham, Eton, Harrow and Balliol College, Oxford. His bent for science showed itself while he was still a schoolboy, and indeed his removal from Eton to Harrow is said to have been occasioned by an accident? 1 explosion which occurred whilst he was performing an experiment for his own amusement. At Harrow he obtained in 1842 a Lyon scholarship, and at Oxford in 1845 a first-class in mathematics, in 1846 the junior and in 1847 the senior university mathematical scholarship. In 1846 he left Oxford to take his father's place in the business, in which he was engaged until his death. In 1847 he issued five pamphlets entitled Meditationes analyticae. This was his first publication of original mathematical work; and from this time scarcely a year passed in which he did not give to the world further mathe- matical researches. In 1856 Spottiswoode travelled in eastern Russia, and in i860 in Croatia and Hungary; of the former expedition he has left an interesting record entitled A Taran- tasse

Journey through Eastern Russia in the Autumn of 1856 (London, 1857). In 1870 he was elected president of the London Mathematical Society. In 1871 he began to turn his attention to experimental physics, his earlier researches bearing upon the polarization of light and his later work upon the electrical discharge in rarefied gases. He wrote a popular treatise upon the former subject for the "Nature" Series (1874). In 1878 he was elected president of the British Association, and in the same year president of the Royal Society, of which he had been a fellow since 1853. He died in London of typhoid fever on the 27th of June 1883, and was buried in Westminster Abbey.

As a mathematician he occupied himself with many branches of his favourite science, more especially with higher algebra, includ- ing the theory of determinants, with the general calculus of symbols, and with the application of analysis to geometry and mechanics. The following brief review of his mathematical work is quoted from the obituary notice which appeared in the Proceedings of the Royal Society (xxxviii. 34) : " The interesting series of com- munications on the contact of curves and surfaces which are contained in the Philosophical Transactions of 1862 and subsequent years would alone account for the high rank he obtained as a mathematician. . . . The mastery which he had obtained over the mathematical symbols was so complete that he never shrank from the use of expressions, however complicated — nay, the more com- plicated they were the more he seemed to revel in them — provided they did not sin against the ruling spirit of all his work — symmetry. To a mind imbued with the love of mathematical symmetry the study of determinants had naturally every attraction. In 1851 Mr Spottiswoode published in the form of a pamphlet an account of some elementary theorems on the subject. This having fallen out of print, permission was sought by the editor of Crelle to reproduce it in the pages of that journal. Mr Spottiswoode granted the request and undertook to revise his work. The subject had, however, been so extensively developed in the interim that it proved necessary not merely to revise it but entirely to rewrite the work, which became a memoir of 1 16 pages. To this, the first elementary treatise on determinants, much of the rapid development of the subject is due. The effect of the study on Mr Spottiswoode's own methods was most pronounced; there is scarcely a page of his mathematical writings that does not bristle with determinants." His papers, numbering over 100, were published principally in the Philosophical Transactions, Proceedings of the Royal Society, Quarterly Journal of Mathematics, Proceedings of the London Mathematical Society and Crelle, and one or two in the

Comptes rendus of the Paris Academy; a list of_ them, arranged according to the several journals in which they originally appeared, with short notes upon the less familiar memoirs, is given in Nature, xxvii. 599.

SPOTTSYLVANIA, a county of Virginia, U.S.A., so called after Alexander Spotswood (q.v.), lieutenant governor of Virginia in 17 10-1722, who owned extensive estates and mines therein. It is

bounded on the N. by the Rapidan and Rappahannock rivers and on the S. by the North Anna. It is celebrated as containing several of the most famous battlefields of the Civil War — Fredericksburg, Chancellorsville, the Wilderness, and particularly that of Spottsylvania Court House, where the armies of Grant and Lee contended for nearly two weeks (May 8-21, 1864). The battles of Chancellorsville, Wilderness and Spottsylvania are described in the article Wilderness.

SPOUSE, (O. Fr. espous, mod. epoux, espouse, Spouse, Lat. sponsus, sponsa, a betrothed or promised man or woman, from s ponder e, to promise), a husband or wife, properly one promised or betrothed to another in marriage.

SPRAT, THOMAS (1635-1713)', English divine, was born at Beaminster, Dorsetshire, and educated at Wadham College, Oxford, where he held a fellowship (1657-1670). Having taken orders he became a prebendary of Lincoln in 1660. In the pre- ceding year he had gained a reputation by his poem To the Happie Memory of the most Renowned Prince Oliver, Lord Protector (London, 1659), and he was afterwards well known as a wit, preacher and man of letters. His chief prose works are the Observations upon Monsieur de Sorbier's Voyage into England (London, 1665), a satirical reply to the strictures on Englishmen in Samuel de Sorbiere ; s book of that name, and a History of the Royal Society of London (London, 1667), which Sprat had helped to found. In 1669 he became canon of Westminster, and in 1670 rector of Uffington, Lincolnshire. He was chaplain to Charles II. in 1676, curate and lecturer at St Margaret's, West- minster, in 1679, canon of Windsor in 1681, dean of Westminster in 1683 and bishop of Rochester in 1684. He was a member of James II. 's ecclesiastical commission, and in 1688 he read the Declaration of Indulgence to empty benches in Westminster Abbey. Although he opposed the motion of 1689 declaring the throne vacant, he assisted at the coronation of William and Mary. As dean of Westminster he directed Wren's restoration of the abbey. He died on the 20th of May 1713.

SPRAT, a marine fish (Clupea sprattus), named " garvie " in Scotland, one of the smallest species of the genus Clupea or herrings, rarely exceeds 5 in. in length, and occurs in large shoals on the Atlantic coasts of Europe. Sprats are very often con- founded with young herrings, which they much resemble, but can always be distinguished by the following characters: they do not possess any teeth on the palate (vomer), like herrings; their gill-covers are smooth, without the radiating striae which are found in the shad and the pilchard; the anal fin consists of' from seventeen to twenty rays, and the lateral line of forty-seven or forty-eight scales. The ventral fins are slightly anterior to the origin of the dorsal fin ; and the spine consists of from forty- seven to forty-nine vertebrae. The sprat spawns in the open sea from February to May and is only occasionally captured in the ripe condition. Its eggs are buoyant and pelagic and easily recognized. The sprat is one of the more important food- fishes on account of the immense numbers which are caught when thd shoals approach the coasts. They are somewhat capricious, however, as regards the place and time of their appearance, the latter falling chiefly in the first half of winter. They are caught with the seine or with the bag-net in the tideway. Large quantities are consumed fresh, but many are pickled or smoked and others prepared like anchovies. Frequently the captures are so large that the fish can be used as manure only.

SPRATT, THOMAS ABEL BRIMAGE (1811-1888), English vice-admiral, hydrographer and geologist, was born at East Teignmouth on the nth of May 181 1. He was the eldest son of Commander James Spratt, R.N., and entered the navy in 1827. He was attached to the surveying branch, and was engaged almost continuously until 1863 in surveying the Mediterranean. As commander of the " Spitfire " he rendered distinguished service in the Black Sea during the Crimean War, and was appointed C.B. in 1855. At an earlier date he was associated with Edward Forbes, then naturalist to the " Beacon," and during the years 1841-1843 they made observations on the bathymetrical distribution of marine life. To Forbes he was specially indebted for his interest in natural history and geology,

*and together they published Travels in Lycia, &*c. (1847). Spratt investigated the caves at Malta and obtained remains of the pigmy elephant (Elephas melitensis), which was described by Dr H. Falconer. He investigated the geology of several Greek islands, also*

the shores of Asia Minor, and made detailed observa- tions on the Delta of the Nile. He was especially distinguished for his Travels and Researches in Crete (2 vols., 1865), in which he ably described the physical geography, geology, archaeo- logy and natural history of the island. He was commissioner – of fisheries from 1866 to 1873; and acting conservator of the Mersey from 1879 until the close of his life. He died at Tunbridge Wells on the 10th of March 1888.

SPRECKELS, CLAUS (1828-1908), American capitalist, was born in Lanstedt, Hanover, in 1828. In 1846, to escape army service, he emigrated to the United States and became a grocer. In 1856 he removed from New York City to San Francisco, where he set up as a grocer, then a brewer, and later a sugar refiner. He gradually obtained control of most of the sugar refineries on the Pacific coast; he was able to undersell his competitors because he bought his raw sugar in Hawaii, where he purchased large plantations and contracted for the produce of others. He built a large refinery in Hawaii, and his influence with the Hawaiian government was for a time paramount. By financing the Pacific Steamship Company he was able to reduce the freight charges on his sugar, and he also introduced various improvements in the methods of manufacture. It was he who built the railway from Salinas to San Francisco, by buying which the Atchison, Topeka & Santa Fe first made a through line into San Francisco. Spreckels died in San Francisco on the 26th of December 1908. His eldest son, John Diedrich Spreckels (b. 1S53), became proprietor of the San Francisco Morning Call and succeeded to his father's steamship interests; and another son, Rudolph Spreckels (1873-), became president of the First National Bank of San Francisco.

SPREE, a river of Prussia, Germany, rising in the district of Upper Lusatia, in the kingdom of Saxony, close to the Bohemian frontier, and flowing nearly due north past Bautzen, Spremberg and Cottbus, dividing between the first two towns for a time into two arms. Below Cottbus the river splits into a network of channels, and swings round in a big curve to the west forming the peculiar marshy region (30 m. long and 3 to 6 m. wide) known as the Spreewald. Having returned to its predominant direction, it turns W.N.W., and passing Furstenwalde and Kopenick threads Berlin in several arms, and joins the Havel at Spandau. Its length is 227 m. of which 112 are navigable; the area of its drainage basin is 3660 sq. m. It is connected with the Oder by the Friedrich Wilhelm or Miillrose Canal made in 1862-1868, which is 17 m. long, and by the Oder-Spree Canal, made in 1887-1888, and with the Havel by the Berlin-Spandau Navigation Canal, 5! m. long, and by the Teltow Canal

completed in 1905.

SPREEWALD, a district of Germany, in the Prussian province of Brandenburg, a marshy depression of the middle Spree valley, extending to some 106 sq. m., its length being 27 m. and its width varying from 1 to 7 m. It owes its marshy character to the river Spree, which above Liibben splits into a network of over two hundred arms, and in seasons of flood generally overflows considerable portions of the region. In the parts which are especially liable to inundation, as, for example, the villages of Lehde, Leipe and Burg, many of the homesteads are built each on a little self-contained island, approachable in summer only by boat, and in winter over the ice. In spite of its marshy character the Spreewald is in part cultivated, in part converted into pasturage, and almost everywhere, but more especially in the lower districts, wooded like a park, the predominant trees being willows. Fishing, cattle-breeding and the growing of vegetables, more particularly small pickling cucumbers, are the chief occupations of the people, about 30,000 in all. In great part they are of Wendish blood, and though the majority have been Germanized, there is a small residue who have faithfully preserved their national speech, customs, and their own peculiar styles of dress. The attractive xxv. 24

blending of wood and water makes the Spreewald in summer a resort of the people of the Prussian capital, but also in winter the district is largely visited by people bent on skating, sleighing and other winter pastimes. The chief town is Liibben, 45 m. south from Berlin on the railway to Gorlitz.

See W. von Schulenburg, Wendische Volkssagen und Gebrduche aus dem Spreewald (Leipzig, 1880) ; Kiihn, Der Spreewald und seine Bewohner (Cottbus, 1889); and Braunsdorf, Spreewaldfahrten (Liibbenau, 1901).

SPREMBERG, a town of Germany, in the Prussian province of Brandenburg, situated partly on an island in the river Spree and partly on the west bank, 76 m. S.E. of Berlin by the railway 'to Gorlitz. Pop. (1905) 11,188. There are a Roman Catholic and two Evangelical churches, a pilgrimage chapel, dating from 1 100, a ducal chateau, built by a son of the elector John George about the end of the 16th century (now utilized as government offices), classical, technical and commercial schools and a hospital. It carries on considerable manufactures of woollen cloth.

SPRENGEL, KURT (1766-1833), German botanist and physi' cian,

was born on the 3rd of August 1766 at Bodelkow in Pome- rania. His uncle, Christian Konrad Sprengel (1750-1816), is remembered for his studies in the fertilization of flowers by insects — a subject in which he reached conclusions many years ahead of his time. His father, a clergyman, provided him with a thorough education of wide scope; and the boy at an early age distinguished himself as a linguist, not only in Latin and Greek, but also in Arabic. He appeared as an author at the age of fourteen, publishing a small work called Anleitung zur Botanik fiir Frauenzimmer in 1780. In 1784 he began to study theology and medicine at the university of Halle, but soon relinquished the former. He graduated in medicine in 1787. In 1789 he was appointed extraordinary professor of medicine in his alma mater, and in 1795 was promoted to be ordinary professor. He devoted much of his time to medical work and to investigations into the history of medicine; and he held a foremost rank as an original investigator both in medicine and botany. Among the more important of his many services to the latter science was the part he took in awakening and stimu- lating microscopic investigation into the anatomy of the tissues of the higher plants, though defective microscopic appliances rendered the conclusions arrived at by himself untrustworthy. He also made many improvements in the details of both the Linnaean and the " natural " systems of classification. He died of an apoplectic seizure at Halle on the 15th of March

1833-

Sprengel's more important works were: Beitrage zur Geschichte des Pulses (1787); Galens Fieberlehre (1788); Apologie des Hippokrates (1789); Versuch einer pragmatischen Geschichte der Arzneikunde (1792-1799); Handbuch der Pathologic (1795-1797); Institutions medicae (6 vols., 1809-1816); Geschichte der Medicin (completed in 1820); Antiquitatum botanicarum specimen (1798); Historia rei herbariae (1807—1808); Anleitung zur Kenntniss der Gewachse (1802-1804; and again 1817-1818); Geschichte der Botanik (1817-1818); Von dem Ban und der Natur der Gewachse (1812); Flora halensis (1806-1815; and in 1832); Species umbelliferarum minus cognitae (1818); Neue Entdeckung im ganzen Umfang der Pfianzen-kunde (1820-1822). He edited an edition of Linnaeus's Systema vegetabilium in- 1824 and of the Genera plantarum in 1830. A list of his botanical papers from 1798 onwards will be found in the Royal Society's Catalogue of Scientific Papers.

SPRENGER, JAKOB (fl. 1500), the Dominican inquisitor of Cologne, who with Heinrich Kramer (institor) published Malleus maleficarum

or Hexenhammer, the standard textbook on witchcraft, especially in Germany. The book gives (1) evidences of witchcraft; (2) rules for discovering it; (3) proceedings for punishment.

SPRENGTPORTEN, GORAN MAGNUS, Count (1740-1819), Swedish and Russian politician, younger brother of Jakob Magnus Sprengtporten, entered the army and rose to the rank of captain during the Seven Years' War. He assisted his brother in the revolution of 1772, and in 1775 was made a colonel and brigadier in east Finland. Here he distinguished himself greatly as an organizer and administrator. The military school which he founded at Brahelinnd subsequently became a state

institution. Irritable and suspicious like his brother he also came to the conclusion that his services had not been adequately appreciated, and the flattering way in which he was welcomed by the Russian court during a visit to St Petersburg in 1779 still further incensed him against the purely imaginary ingrati- tude of his own sovereign. For the next two years he was in the French service, returning to Finland in 1781. It was now that he first conceived the plan of separating the grand duchy from Sweden and erecting it into an independent state under the protection of Russia. During the riksdag of 1786 he openly opposed Gustavus III., at the same time engaging in a secret and treasonable correspondence with the Russian ministers with the view of inducing them to assist the Finns by force of arms. In the following year, at the invitation of Catherine II., he formally entered the Russian service. When the Russo- Swedish War of 1788-90 began, Sprengtporten received the command of a Russian army corps directed against Finland. He took no direct part in the Anjala conspiracy (see Sweden: History), but urged Catherine to support it more energetically. His own negotiations with his fellow countrymen, especially after Gustavus III. had brought the Finlanders back to their allegiance, failed utterly. Nor was he able to serve Russia very effectively in the field for he was seriously wounded at the battle of Parosalmi (1790). At the end of the war, indeed, his position was somewhat precarious, as the High Court of Finland condemned him as a traitor, while Catherine regarded him as an incompetent impostor who could not perform his promises. For the next five years, therefore (1793-1798), he thought it expedient

to quit Russia and live at Tdplitz in Bohemia. He was re-employed by the emperor Paul who, in 1800, sent him to negotiate with Napoleon concerning the Maltese Order and the interchange of prisoners. After Paul's death Sprengtporten was again in disgrace for seven years, but was consulted in 1808 on the eve of the outbreak of hos- tilities with France. On the 1st of December 1808 he was appointed the first Russian governor-general of Finland with the title of count, but was so unpopular that he had to resign his post the following year. The last ten years of his life were lived in retirement.

See Finska Tidskrift (Helsingfors, 1 877-1 889); and Svenska Letteratursallskapets i Finland fbrhandlingar (Helsingfors, 1887).

(R. N. B.)

SPRENGTPORTEN, JAKOB MAGNUS (1727-1786), Swedish soldier and politician. In his twelfth year he chose the pro- fession of arms, and served his country with distinction. The few and miserable triumphs of Sweden during the Seven Years' War were due almost entirely to young Sprengtporten, and he emerged from it with a lieutenant-colonelcy, a pension of £20, and the reputation of being the smartest officer in the service. Sprengtporten, above all things a man of action, had too hearty a contempt for " Hats " and " Caps " to belong to either. He regarded the monstrous system of misrule for which they were primarily responsible with indignation, made no secret of his sentiments, and soon gathered round him a band of young officers of strong royalist proclivities, whom he formed into a club, the so-called Svenska Botten (Sweden's groundwork). The club was suppressed by the dominant " Caps," who also sought to ruin Sprengtporten financially by inciting his tenants in Finland to bring actions against him for alleged extortion, not in the ordinary courts but in the riksdag itself, where Sprengt- porten's political adversaries would be his judges. The enraged Finnish colonel thereupon approached Gustavus III. with the project of a revolution against their common enemies, the " Caps." It was to begin in Finland where Sprengtporten's regiment, the Nyland dragoons, was stationed. He undertook to seize the impregnable fortress of Sveaborg by a coup de main. The submission of the whole grand duchy would be the natural consequence of such a success, and, Finland once secured, Sprengtporten proposed at the head of his Finns to embark for Sweden, meet the king and his friends near Stockholm, and surprise the capital by a night attack. This plan, subsequently enlarged by a suggestion of a fellow plotter, J. K. Toll (q.v.),

was warmly approved of by the king. On the 22nd of July 1772

Sprengtporten left Stockholm. On the 9th of August he reached Helsingfors. On the 16th he persuaded the fortress of Sveaborg to submit to him. Helsingfors followed the example of Sveaborg. A week later all Finland lay at the feet of the intrepid colonel of the Borga, dragoons. By the 23rd of August Sprengtporten was ready to re-embark for Stockholm with 780 men, but contrary winds kept him back, and in the meantime Gustavus III. himself had carried out his revolution unaided. On his return to Sweden, however, Sprengtporten was received with the greatest distinction and made a lieutenant-general and colonel of the guards. He was also appointed the president of a commission for strengthening the defences of Finland. But Sprengtporten was still dissatisfied. He could never forgive Gustavus for having forestalled the revolution, and his morbidly irritable and suspicious temper saw slights and insults in the most innocent conjunctures. His first quarrel with Gustavus happened in 1774 when he refused to accept the post of com- mander-in-chief in Finland on the eve of threatened war with Russia. The king good-naturedly overlooked his outrageous insolence on this occasion, but the inevitable rupture was only postponed. A most trumpery affair brought matters to a head. Sprengtporten had insulted the guards by giving precedence over them at a court-martial to some officers of his own dragoons. The guards complained to the king, who, after consulting with the senate, mildly remonstrated with Sprengtporten by letter. Sprengtporten thereupon tendered his resignation as colonel of the guard, and at a personal interview with Gustavus was so violent and insolent that anything like agreement between them became impossible. Sprengtporten was haunted by the fixed idea that the jeunesse doree of the court was in league with his old enemies to traduce and supplant him, and not all the for- bearance of the king could open his eyes. He received a pension of £2400 a year on his retirement and was allowed the extraordinary privilege of a guard of honour as long as he lived. Nevertheless, to the end of his career, he continued to harass and annoy his long-suffering benefactor with fresh impertinences.

See R. N. Bain, Gustavus III. and his Contemporaries, vol. i. (London, iSgˆ); C. Julin, Gustavus III. och J. M. Sprengtporten, sv. Hist. Tid. (Stockholm, 1903). (R. N. B.)

SPRING (from " to spring," " to leap or jump up," " burst out," O. Eng., springan, a common Teut. word, cf. Ger. springen, possibly allied to Gr.

SPRINGBUCK, or Springbok (Antidorcas euchore), an aberrant South African gazelle inhabiting the country south of the Zambezi,

but ranging north-westwards to Mossamedes. In the more settled parts of Cape Colony, the Transvaal and the Orange Free State it now only exists within the enclosures of the large farms, and can hardly be said to be any longer truly wild. Both sexes carry lyrate horns; the shoulder-height of an adult male is about 30 in., and an average pair of horns measures 14 in. along the curve; in the female the horns are more slender. The general colour above is reddish fawn, separated from the white of the under-parts by a dark band on the flanks. Along the middle of the hinder half of the back is a line of long erectile white hairs, forming the " fan," continued down over the rump; in repose this is concealed by the surrounding hair, but is conspicuously displayed when the animal takes the great leaps from which it derives its popular name. The periodical migra- tions of springbuck are well known, and though the treks are

small compared with those of about 1850, they still include very large herds. In 1896 there was a great trek, and about then in the north of Cape Colony a herd was seen which was estimated at 500,000 head.

SPRINGER, ANTON HEINRICH (1825-1891), German writer, was born at Prague on the 13th of July 1825 and was educated at the university of his native city. Taking an interest in art, he visited Munich, Dresden and Berlin, and spent some months in Italy; afterwards he settled at Tubingen and in 1848 he returned to Prague and began to lecture at his own university on the history of the revolutionary epoch. The liberal tone of these lectures brought him into disfavour with the ruling authorities, and in 1849 he left Bohemia and passed some time in England, France and the Netherlands. In 1852 he settled at Bonn, where he lectured on art and became a professor in 1850; in 1872 he went to the university of Strassburg and in 1873 to. Leipzig. As a journalist and a publicist Springer advocated the federal union of the states ruled by the Austrian emperor, and asserted the right of Prussia to the headship of Germany; during the Crimean War he favoured the emancipation of the small states in the south-east of Europe from Turkish supremacy. After many years of feeble health, he died at Leipzig on the 31st of May 1S91.

Springer is known as a writer both on history and on art. In the former connexion his most important work is his Geschichte Oester-

reichs seit dem wiener Frieden (Leipzig, 1863-1865), which has been translated into Czech (Prague, 1867). His other historical works are: Geschichte des Revolulionszeitallers (Prague, 1849); Oesterreich nach dcr Revolution (Prague, 1850); Oesterreich, Preussen und Deutschland (Prague, 1851) ; Paris imxiii. Jahrhundert (Leipzig, 1 856) ; and Protokolle des Verfassungs-Ausschusses im oesterreichischen Reichstage 184S-1S4Q (Leipzig, 1885). His principal works on art are : Baukunst des christlichen Mittelalters (Bonn, 1854) ; the valuable Handbuch der Kunstgeschichte (7th ed., Leipzig, 1906), a revised edition of his Grundzilge der Kunstgeschichte (Leipzig, 1887— 1888); Geschichte der hildenden Kiinste im xix. Jahrhundert (Leipzig, 1858); Bilder aus der neueren Kunstgeschichte (Bonn 1867, and again 1886) ; Raffael und Michelangelo (Leipzig, 1877 and 1885); and Die Kunst des xix. Jahrhunderts (Leipzig 1880-1881). Springer wrote two bio- graphies: Friedrich Christoph Dahlmann (Leipzig, 1870— 1872), and Albrecht Dvrer (Berlin, 1892); and was responsible for the German edition of Crowe and Cavalcasehe's Lives of the Early Flemish Painters, which was published at Leipzig in 1875. His book of reminiscences, Aus meinem Leben (Berlin, 1892), containing contributions by G. Freytag and H. Janitschek, was edited by his son Jaro Springer (b. 1856), who is also known as a writer on art.

SPRINGER (Fr. rein), the term given in architecture to the stone from which an arch springs (see Arch) ; in some cases this is the stone resting on the impost or capital, the upper surface of which is a plane directed to the centre of the arch. In vaulting, however, where the lower stone of the arch or rib is laid in horizontal courses, so as to bond it well into the wall, constituting a system of construction known in France as the tas-de-charge, the springer may be considerably higher. The term is Sometimes applied to the lowest stone of a gable.

SPRINGFIELD, the capital of Illinois, U.S.A., and the county- seat of Sangamon county, on the Sangamon river, in the central part of the state. Pop. (1890), 24,963; (1900), 34,159, of whom 4654 were foreign-born (1940 Germans, 1106 Irish and 499 English) and 2227 negroes; (1910 census) 51,678. Land area (1906), 7-07 sq. m., of which 3-37 sq. m. had been annexed since 1890. It is served by the Baltimore & Ohio South- Western, the Chicago & Alton, the Chicago, Peoria & St Louis, the Illinois Central, the Wabash, and the Cincinnati, Hamilton & Dayton railways, and by inter-urban electric lines. The city has a park and a boulevard system; the principal parks are Washington, Lincoln, Reservoir and Mildred. The chief public building is the state capitol (built in 1868-1888 at a cost of

about $4, 500,000), in the form of a Greek cross, with porticoes of granite and a dome 361 ft. high. It is the fifth state capitol of Illinois and the second erected in Springfield. Other prominent build- ings are the Supreme Court building, the county court house (the old state capitol, finished in 1853), the city-hall, the state arsenal, the high school and the public library. In Oak Ridge cemetery, adjacent to the city, is the Lincoln monument, erected over Abraham Lincoln's grave with funds raised throughout

the country by a Lincoln Monument Association. It was de- signed by Larkin G. Mead, and consists of a granite obelisk 121 ft. above the centre of a mausoleum, which is 119J ft. long and 72 I ft. wide, and in which there are six crypts for the burial of members of Lincoln's family, and a memorial hall, a museum of Lincolniana. Around the foot of the obelisk (besides an heroic statue of Lincoln) are four groups of figures in bronze, symbolizing the army and navy of the United States. The monument was completed and dedicated in 1S74, was transferred to the state in 1895, and restored and in large part rebuilt in 1899-1901. Lincoln's home (erected in 1839 and bought by Lincoln in 1844) in Springfield is well preserved by the state. In the city are the state library (1842), the state law library (1839), the Illinois historical library (1889), of which the State Historical Society (1903) is a department, and the Illinois Supreme Court library; several educational institutions, including Concordia-Seminar (Evangelical Lutheran), the Ursuline Academy (Roman Catholic), and the Academy of the Sacred Heart (Roman Catholic) ; the Springfield hospital (1897; Lutheran), and the St John's hospital (1875; under the Sisters of St Francis), two orphanages, two homes for aged women, and a sanatorium; the permanent grounds of the State Fair (157 acres), and a state rifle range and militia camp-ground (160 acres). Springfield is a trading and shipping centre for a prosperous agricultural region, and ships large quantities of bituminous coal from the immediate vicinity. The Wabash and the Chicago, Peoria & St Louis railways have large repair shops here. Among the manufactures are agricultural imple- ments, watches and watch material — the Illinois Watch Company has a large factory here — lumber, flour, foundry and machine-shop products, automobiles, shoes and boilers. The total value of the factory product in 1905 was $5,976,637 (67-2 % more than in 1900). The first settlement was made in 1818. In 1821 the place was chosen to be the county-seat of the newly created Sangamon county and was named Spring- field. In 1823 it was platted, and was named Calhoun in honour of John C. Calhoun, but this name was not popular and the former name was soon restored. Springfield was incorporated as

a town in 1832 and chartered as a city in 1840. In 1837 the state legislature passed a bill making Springfield the capital, and in December 1839 the legislature first met here.

SPRINGFIELD, a city and the county-seat of Hampden county, Massachusetts, U.S.A., about 99 m. W. by S. of Boston and 26 m. N. of Hartford, Connecticut, on the east bank of the Connecticut river. Pop. (1800), 2312; (1850), 11,766; (1890), 44,179; (1900), 62,059, of whom 14,381 were foreign-born (5462 Irish, 2474 French Canadians, 1144 English-Canadians, 1321 English), 33,710 were of foreign parentage (either parent foreign- born), and 1021 were negroes; (1910, census), 88,926. Spring- field is served by the Springfield division of the New York & New England, the Hartford division of the New York, New Haven & Hartford, the Connecticut River division of the Boston & Maine, and the Athol division and the main line of the Boston & Albany railways, and by inter-urban electric railway lines. The river is crossed here by four large bridges. The area of the city, which until 1852 was a township, is 38-53 sq. m. In its extreme eastern part is the small village of Sixteen Acres; north-west of the main part of the city on the Connecticut river is another village, Brightwood (on the Boston & Maine railway) and on the Chicopee river, north-east of the business part of the city, is the village of Indian Orchard, served by the Athol division of the Boston & Albany railway.

The city contains many public and private buildings of architectural importance. Among these are some of the earlier works of H. H. Richardson, such as the Court House, the Union railway station (1889), the Church of the Unity on State Street, and the North Congregational Church. Among other buildings are: Christ Church (Protestant Episcopal) St Michael's Cathe- dral (Roman Catholic), the South Congregational Church, the Memorial Church, and the Church of the Sacred Heart; the Art Museum (1894-1896), which contains the George Walter Vincent Smith art collection and an art library; the Horace

Smith Hall of Sculpture; the Museum of Natural History (1898), organized in 1859; a group of municipal buildings, with a tower 270 ft. high and a large auditorium; a government building (1891) containing the post office and custom house, the Hampden County Hall of Records, the City Library with 175,000 volumes, and two

branch libraries given by Andrew Carnegie; a state armoury, and the business buildings of the Springfield Fire & Marine Insurance Company, the Union Trust Company, and the Institution for Savings. The Public Library, the Art Museum, and the Museum of Natural History are controlled by the City Library Association, organized in 1857. In the city are a government arsenal and armoury. The arsenal was established by the Continental Congress during the War of Independence and began to be used as a repository for arms and ammunition about 1777. The armoury, in the midst of a park on Armory Hill immediately east of the railway station, was established in 1794. Here the famous Springfield muskets used by the Federal forces during the Civil War were manufac- tured (800,000 having been made during that struggle) and it is still the principal manufactory of small arms for the United States army. Springfield has a good system of parks (under a board of park commissioners) with a total acreage of 550 acres. Forest Park (464 acres), in the southern part of the city, is the largest and most attractive; it contains a good zoological collection, and in its ponds is one of the finest collec- tions in America of lotus plants and Oriental aquatic flora; at its southern entrance is a monument to President McKinley by Philip Martiny. In Merrick Park, adjoining the City Library, there is St Gaudens's famous statue of " The Puritan," commemorative of Deacon Samuel Chapin, one of the early settlers of the city. In Court Square are a statue of Miles Morgan (1616-1699), an early settler, by J. S. Hartley, and a monument in memory of the soldiers and sailors of the Civil War. In Carew Triangle in the northern part of the city is a monument in honour of soldiers of the Spanish-American War. In the suburbs of the city is Hampden Park, once a famous race track. There are two large cemeteries, in one of which are buried many of Springfield's famous men, including Samuel Bowles and J. G. Holland, whose grave is marked by a medallion by St Gaudens. Among the hospitals are the Mercy Hospital (1896, under the Sisters of Divine Providence), the Wesson Memorial (formerly Hampden Homeopathic) Hospital (1900), the Wesson Maternity Hospital (1906), and the Springfield Hospital (1883). The Springfield public school system is excellent, and in addition to the regular high school there are a technical high school, a vocational school, and a kinder- garten training school. Other schools in Springfield are: the training .school of the International Young Men's Christian Association (1885); the American International College, estab- lished in Lowell (1885) as the French-American College for the education of French-Canadians, and now working among various immigrant races; and the MacDuffie school (1890) and the Elms (1866), both schools for girls.

Springfield is noted for the diversity of its industries. In 1905 the capital invested in manufacturing establishments was $24,081,099, and in the value of its factory products ($25,860,250, not including those of the U.S. Arsenal; 42-4% more than in 1900) Springfield ranked ninth among the cities of Massachusetts. The largest single item in point of value was the product ($3,053,008) of the slaughtering and meat-packing establishments. Other important products were foundry and machine-shop products ($1,749,054); paper goods ($1,481,427, not including envelopes, which had an additional value of almost $700,000); cars, automobiles, firearms (besides the Federal arsenal there is the Smith & Wesson revolver factory); and printing and publishing ($1,165,544).

The principal newspapers are the Springfield Republican (Independent; weekly, 1824; morning, 1844), one of the most able and influential journals in New England, which since its establishment by Samuel Bowles (q.v.) has been the property of the Bowles family; the Union (Republican; morning, evening, and weekly; 1864); the Daily News (Democratic; 1880); and

the Springfield Homestead (tri-weekly; 1878). The New England Homestead (weekly; published by the Orange Judd Company), Farm and Home, a semi-monthly, and Good Housekeeping, a monthly (published by the Phelps Publishing Company), and the Kindergarten Review (monthly, published by the Milton- Bradley Company, who publish other educational matter) are important periodicals.

The city is governed by a mayor, a board of aldermen (one from each of eight wards) and a common council of eighteen members (two or three from each ward, according to population), elected in December every other year. The city owns and operates the waterworks.

Springfield was founded in. 1636 by a company of settlers from Roxbury led by William Pynchon (1590-1662). Pynchon, who had been one of the original patentees of the Massachusetts Bay Colony, was dissatisfied with the government of Roxbury, of which he had been a founder. On a trip to the Connecticut Valley he selected a spot for a new colony which should have a limited membership and in which his ideas as to government might be put into execution. Accompanied by a dozen families he removed thither early in 1636. The settlers found there a settlement of Agawam Indians (probably allied with the Pacomtuc), and the settlement was at first known as Agawam. For some time the political affiliation was with the Connecticut river towns in Connecticut, but later the authority of the

Massa- chusetts General Court was recognized. In 1640 the name was changed to Springfield, after the native place of William Pynchon in Essex, England. For several years Pynchon was the dominating influence in the colony, ruling it with the power of an autocrat. In 1650 he published a tract {The Meritorious Price of Our Redemption) in which he attacked the Calvinistic doctrine of the atonement, and which was burned on Boston Common by order of the General Court. He was removed from the magistracy and. returned to England in 1652. In King Philip's War Springfield was a centre of hostilities. In October 1675 a force of hostile Indians, joined by the hitherto friendly Aga- wams, surprised the settlers, killed some of them, drove the others into the three fortified houses, and burned the remaining buildings. They were preparing to storm the fortified houses when they were in turn attacked and driven off by a force of militia. Springfield was somewhat out of the track of operations of the warfare between the French and English in America, as it was later in the War of Independence; but men from Spring- field served in all these conflicts. In 1777 the armoury was established and the place became an important military supply depot for the Continental forces. In July of that year representa- tives of the New England States and New York met here in convention to consider plans of co-operation for meeting Bur- goyne's invasion. During Shays's rebellion there was a riot here in September 1786, and on the 25th of January 1787 the insurgent forces under Daniel Shays attacked the arsenal, but were dispersed by the militia under Brigadier-General William Shepard (1737-1817). Springfield remained little more than a large country market town until the completion of the Boston & Albany railway in 1839. From that time its growth as a railway and manufacturing centre was marked. Springfield was a strong abolition centre before the Civil War, and from here active plans were put in operation for sending material aid in the form of men and arms to the " free state " party in Kansas. The city was chartered in 1852.

See H. M. Burt, First Century of the History of Springfield (2 vols., Springfield, 1898-1899); J. E. Tower (ed.), Springfield, Present and Prospective (ibid., 1905); M. A. Green, Springfield, 1636-1886 (ibid., 1888); Moses King, Handbook of Springfield (ibid., 1884).

SPRINGFIELD, a city and the county-seat of Greene county, Missouri, U.S.A., in the S.W. part of the state, about 238 m. from St Louis. Pop. (1890), 21,850; (1900), 23,267, of whom 2268 were negroes and 1057 foreign-born; (1910, census), 35,201. It is served by the St Louis & San Francisco, the Missouri Pacific, and the Kansas City, Clinton & Springfield railways. The city is pleasantly

situated on the Ozark Dome, about 1300 ft. above sea-level, is regularly laid out on an undulating site, and has

attractive residential districts. The principal building is that of the Federal government (1894), which is built of Indiana cut stone. Springfield is the seat of Loretto Academy, of a state normal school, and of Drury College (co-educational; founded in 1873 by Congregationalists, but now undenominational), which comprises, besides the college proper, an academy, a conserva- tory of music and a summer school, and which in 1908-1900 had 500 students. Near the city is the Academy of the Visitation under the Sisters of St Chantal. The municipal water-supply is drawn from springs 3 m. north of the centre of the city. There are four large private parks (340 acres) on the outskirts, and two municipal cemeteries — a Confederate cemetery, maintained by associations, the only distinctively Confederate burial ground in Missouri; and a National cemetery, maintained by the United States government. Springfield is one of the two chief commercial centres of this region, which has large mining, fruit, grain, lumber and livestock interests. The jobbing trade is important. Springfield ranks fourth among the manufac- turing cities of the state; in 1905 the value of its factory pro- ducts was $5,293,315 (28-2% more than in 1900). Flour and grist mill products constituted in 1905 a third of the total; and carriages and wagons ranked next. The St Louis & San Francisco railway has large shops here.

Springfield was settled in the years following 1829, and was laid out in 1833, though the public lands did not pass from the United States for sale until 1837. In 1838 and again in 1846 Springfield was incorporated as a town, and in 1847 was chartered as a city; though government lapsed during much of the time up to 1865, when prosperous conditions became settled. At the opening of the Civil War, Springfield was one of the most important strategic points west of the Mississippi river. In 1861-62 it was occupied or controlled a half dozen times in succession by the Confederate and the Union forces, the latter retaining control of it after the spring of 1862. In the battle of Wilson's Creek (August 10, 1861), fought about 10 m. south of the city, and one of the bloodiest battles of the war, relatively to numhers engaged, a force of about 5500 Union soldiers under General Nathaniel Lyon was defeated by about 10,000 Con- federates under Generals Benjamin McCulloch (1811-1862) and

Sterling Price. The other occupations and abandonments were unattended by serious conflicts in the immediate vicinity. In January 1863, after Springfield had been made an important Union supply post, it was attacked without success by a Confederate force of about 2000 men under General J. S. Marmaduke. The year 1870 was marked by the arrival of the first railway. In the same year North Springfield was laid out, and was incorporated as a town in 1870 and 1871. In 1881 Springfield was chartered as a city of a higher class, and in 1887 it absorbed North Springfield. After 1902 the city's growth in population and in industries was very rapid.

SPRINGFIELD, a city and the county-seat of Clark county, Ohio, U.S.A., at the confluence of Mad river and Lagonda Creek, about 45 m. W.S.W. of Columbus. Pop. (1890), 31,895; (1900), 38,253, of whom 3311 were foreign-born (including 1337 German, 1097 Irish and 308 English) and 4253 were negroes; (1910, census), 46,921. Springfield is served by the Cleveland, Cincinnati, Chicago & St Louis; the Pittsburg, Cincinnati, Chicago & St Louis; the Erie, and the Detroit, Toledo & Ironton railways, and by an extensive inter-urban electric system. The older portion of the city is in the narrow valley of Lagonda Creek, but from here the city has spread over the higher and more undulating surface farther back until it occupies an area of about 85 sq. m. Among the public buildings are the United States government building, the Clark county court house, the City building (the first floor of which is occupied by the city market), the Warder public library (established 1872), which in 1908 contained 25,000 volumes, the city hospital, and the city prison and work- house. On hills near the city border are the Ohio state homes for the Masons, the Independent Order of Oddfellows, and the Knights of Pythias. The city park contains more than 250

acres, and in 1908 the city adopted plans for an extensive park system. Ferncliff cemetery is a picturesque burial-ground. On a hill on the north side of the city is Wittenberg College (Lutheran; 1845), which in 1909 had 35 instructors and 710 students. Springfield is in a productive farming region, and water power is provided by Lagonda Creek, so that manufac- tures closely related to agriculture have always been prominent. The value of the factory product in 1905 was $13,654,423, of which $4,051,167 was the value of agricultural imple- ments, $2,914,493 of foundry and machine-shop products, and $1,025,244 of flour and grist-mill products. The municipality owns and operates the waterworks. Natural gas is piped from Fairfield county.

In 1799 Simon Kenton and a small party from Kentucky built a fort

and fourteen cabins near Mad river 3 or 4 m. beyond the present western limits of the city. Later in the same year James Demint built a cabin on a hill-side over- looking Lagonda Creek. In 1801 he engaged a surveyor to plat a town here and soon after this the site of the Kenton settlement was abandoned. The new town was near the border- line that had been fixed between the Whites and the Indians, and the latter threatened trouble until 1807, when in a council held on a large hill in the vicinity, at which Tecumseh was the principal speaker for the Indians, peace was more firmly estab- lished. In 18 18, when Clark county was erected, Springfield was made the county-seat. It was incorporated as a town in 1827, and in 1850 it was chartered as a city.

See E. S. Todd, A Sociological Study of Clark County, Ohio (Spring-field, 1904).

SPRING-GUN, a device formerly in use against poachers and trespassers. Wires were attached to the trigger of a gun in such a manner that any one stumbling over or treading on them would discharge it and wound himself. Since 1827 spring-guns and all man-traps are illegal in England, except within a house between sunset and sunrise as a protection against burglars. Spring-guns are sometimes used to trap wild animals.

SPRINGTAIL, the common name of a group of small insects, so named from the presence of a pair of tail-like appendages at the end of the abdomen, which acts as a spring. When the insect is undisturbed these appendages are turned forwards and held in position by a catch beneath the abdomen; but in case of alarm they are kicked forcibly downwards and back- wards, jerking the body into the air. This action may be rapidly repeated until a place of safety is reached. These insects usually live under fallen leaves, stones or the bark of trees, and sometimes occur in such quantities as to resemble patches of powder or dust. One species (Podura aquatica) may be seen floating in this way in masses upon the surface of standing water. Another (Achorutes socialis) may sometimes be found in abundance in the snow. Zoologically the springtails belong to the sub-order Collembola of the order Aptera (q.v.).

SPRING VALLEY, a city of Bureau county, Illinois, U.S.A., on the north bank of the Illinois River, in the northern part of the state, about 104 m. S.W. of Chicago. Pop. (1890), 3837; (1900), 6214 (2845 foreign-born); (1910) 7035. It is served by the Chicago, Burlington & Quincy, the Chicago, Rock Island & Pacific, the

Chicago & North Western, and the Chicago, Ottawa & Peoria (electric) railways. Spring Valley is a shipping and distributing point for a large number of bituminous coal- mines in its vicinity. It was chartered as a city in 1886.

SPRUCE, i.e. spruce-fir, a coniferous tree belonging to the genus Picea, of which there are several species, such as the Norway spruce, Picea excelsa; the black spruce, Picea nigra, &c. (see Fir). The name has a curious origin, which explains also the particular meaning of the adjective " spruce," neatly dressed, smart in appearance, fine. From a number of early quotations given by Skeat (Etym.Dict.) it is clear that " spruce " a variant of "pruce," simply stood for Prussian; the form " spruce," rather than " pruce," being established partly by the German Sprossen, sprouts or young shoots (seen in Sprossen-bier, spruce beer, made of the sprouts of this fir).

SPRUE, a tropical disease, prevalent in India, China, Java, and the West Indies. It is described by Sir Patrick Manson as characterized by a peculiar, inflamed, superficially ulcerated, exceedingly sensitive condition of the mucous membrane of the tongue and mouth; great wasting and anaemia; and more or less diarrhoea, with pale and frothy fermenting stools. It is an obscure disorder, and the treatment recommended is rest and milk diet.

SPULLER, EUGENE (1835-1896), French politician and writer, was born at Seurre (Cote d'Or) on the 8th of December 1835, his father being a German who had married and settled in France. After studying law at Dijon he went to Paris, where he was called to the bar, and entered into close relations with Gambetta, collaborating with him in 1868 in the foundation of the Revue politique. He had helped Emile Ollivier in his electoral campaign in Paris in 1863, but when in 1869 Ollivier was preparing to " rally " to the empire he supported the republican candidate. During the siege of Paris he escaped from the city with Gambetta, to act as his energetic lieutenant in the provinces. After the peace he edited his chief's Parisian organ, the Republique francaisc, until in 1876 he entered the Chamber of Deputies for the department of the Seine. He was minister of foreign affairs during part of the brief Gambetta administration, and subsequently one of the vice-presidents of the chamber, serving also on the budget commission and on a special industrial and agricultural inquiry. His Parisian con- stituents

thought his policy too moderate on the clerical question, and he had to seek election in 1885 in the Cote d'Or, which in later years he represented in the Senate. He was minister of education, religion and the fine arts in the Rouvier cabinet of 1887, minister of foreign affairs under Tirard (1889-ˆ890), and minister of education in 1894 in the Casimir-Perier cabinet. He died on the 28th of July 1896. His published works include some volumes of speeches and well-known studies of Ignatius Loyola (1876) and of Michelet (1876).

SPUR (A.S. spura, spora, related to spornan, spurnan, to kick, spurn; cf. M.H.G. sporn, mod. Ger. Spom), an instrument attached to the heel of a rider's boot for the purpose of goading the horse. The earliest form of the horseman's spur armed the heel with a single prick. In England the rowel spur is shown upon the first seal of Henry III., but it does not come into general use until the 14th century. In the 15th century spurs appear with very long shanks, to reach the horse's flank below the outstanding bards. After this time, and until the beginning of the modern period of costume at the Restoration, they take many decorative forms, some of which remain in the great spurs worr by Mexican cavaliers. Gilded spurs were reckoned the badge of knighthood, and in the rare cases of cere- monious degradation they were hacked from the knight's heels by the cook's chopper. After the battle of Courtrai, in 1302, the victors hung up bushels of gilt spurs in the churches of Courtrai and Maestricht as trophies of what is still remembered by the Flemings as the Goudensporendag. For another reason the English named the French rout beside Therouanne as the Battle of Spurs.*

In architecture, a spur (Fr. griff e, Ger. Knoll), is the ornament carved on the angles of the base of early columns; it consists of a projecting claw, which, emerging from the lower torus of the base, rests on the projecting angle of the square plinth. It is possibly to these that Pliny refers {Hist. Nat. xxvi. 42) when speaking of the lizard and frog carved on the bases (spirae) of the columns of the temples of Jupiter and Juno in the Portico of Octavius; the earliest known example is that of Diocletian's palace at Spalato. In Romanesque work the oldest examples are those found on the bases in crypts, where they assumed various conventional forms; being, however, close to the eye, the spur soon developed into an elaborate leaf ornament, which in French 13th-century work and in the early English period is of great beauty; sometimes the spur takes the form of a fabulous animal, such as a griffin.

SPURGEON, CHARLES HADDON (1834-1892), English Nonconformist divine, was born at Kelvedon, Essex, on the 19th of

June 1834. He was the grandson of an Essex pastor, and son of John Spurgeon, Independent minister at Upper Street, Islington. He went to school at Colchester and Maidstone, and in 1849 he became usher at a school in Newmarket. He joined the Baptist communion in 1851, and his work at once attested his " conversion." He began distributing tracts and visiting the poor, joined the lay preachers' association, and gave his first sermon at Teversham, near Cambridge. In 1852 he became pastor of Waterbeach. He was strongly urged to enter Stepney (now Regent's Park) College to prepare more fully for the ministry, but an appointment with Dr Joseph Angus, the tutor, having accidently fallen through, Spurgeon interpreted the contretemps as a divine warning against a college career. The lack of early systematic theological training certainly had a momentous effect upon his development. Broad in every other respect, he retained to the last the narrow Calvinism of the early 19th century. His powers as a boy preacher became widely known, and at the close of 1853 he was " called " to New Park Street Chapel, Southwark. In a very few months' time the chapel was full to overflowing. Exeter Hall was used while a new chapel was being erected, but Exeter Hall could not contain Spurgeon's hearers. The enlarged chapel at once proved too small for the crowds, and a huge tabernacle was projected in Newington Causeway. The preacher had recourse to the Surrey Gardens music hall, where his congregation numbered from seven to ten thousand. At twenty-two he was the most popular preacher of his day. In 1857, on the day of national humiliation for the Indian Mutiny, he preached at the Crystal Palace to 24,000 people. The Metropolitan Tabernacle, with a platform for the preacher and accommodation for 6000 persons, was opened for service on the 25th of March 1861. The cost was over £30,000, and the debt was entirely paid off at the close of the opening services, which lasted over a month. Spurgeon preached habitually at the Tabernacle on Sundays and Thursdays. He frequently spoke for nearly an . hour, and invariably from heads and subheads jotted down upon half a sheet of letter paper. His Sunday sermons were taken down in shorthand, corrected by him on Monday, and sold by his publishers, Messrs Passmore & Alabaster, literally by tons. They have been extensively translated. Clear and forcible in style and arrangement, they are models of Puritan exposition and of appeal through the emotions to the individual conscience, illuminated by frequent flashes of spontaneous and often highly unconventional humour. In his method of employing illustration he is suggestive of Thomas Adams, Thomas Fuller, Richard Baxter, Thomas Manton and John Bunyan. Like them, too, he excelled in his vigorous command of the vernacular. Among more recent preachers he had

most affinity with George White- field, Richard Cecil and Joseph Irons. Collected as The Taber- nacle Pulpit, the sermons form some fifty volumes. Spurgeon's lectures, aphorisms, talks, and " Saplings for Sermons " were similarly stenographed, corrected and circulated. He also edited a monthly magazine, The Sword and Trowel; an elaborate exposition of the Psalms, in seven volumes, called The Treasury of David (1870-1885); and a book of sayings called John Ploughman's Talks; or; Plain Advice for Plain People (1869), a kind of religious Poor Richard. In the summer of 1864 a sermon which he preached and printed on Baptismal Regeneration (a doctrine which he strenuously repudiated, maintaining that immersion was only an outward and visible sign of the inward conversion) led to a difference with the bulk of the Evangelical party, both Nonconformist and Anglican. Spurgeon maintained his ground, but in 1865 he withdrew from the Evangelical Alliance. Subsequently in 1887 his distrust of modern biblical criticism led to his withdrawing from the Baptist Union. His powers of organization were strongly exhibited in the Pastors' College, the Orphanage (at Stockwell), the Tabernacle Almshouses, the Colportage Association for selling religious books, and the gratuitous book fund which grew up under his care. He received large money testimonials

(£6000 on his silver-wedding day and £5000 on his fiftieth birthday), which he handed over to these institutions. He died at Mentone on the ,31st of January 1892, leaving a widow with twin sons (b. 1856). One of them, Rev. Thomas Spurgeon, after some years of pastorate in New Zealand, succeeded his father as minister of the Tabernacle, but resigned in 1908 and became president of the Pastors' College.

An Autobiography was compiled by his widow and his private secretary from his diary, sermons, records and letters (1897-1900).

SPURN HEAD, or Spurn Point, a foreland of the North Sea coast of England, in Yorkshire, projecting across the mouth of the Humber. Its length is nearly 4 m. from the village of Kilnsea, but its breadth seldom exceeds 300 yds., and it rises only a few feet above sea-level. It is formed of sand and shingle, the debris of the soft coast of Holderness to the north, from which it is estimated that six million tons of material are annually removed by southerly currents along the shore. Deep water is found close off the seaward side of Spurn

Head, the formation of which appears to have taken place within historic times, even since about the close of the 1 6th century. There are two light- houses and a lifeboat station on the head.

SPURZHEIM, JOHANN CHRISTOPH [Kaspar] (1776-1832), German phrenologist, was born near Treves on the 31st of December 1776. He made the acquaintance of F. J. Gall while studying medicine in Vienna, and for some years assisted him in spreading his phrenological doctrines, but in 1813 the two separated. Spurzheim lectured with considerable success in England and France, and was extending his propaganda to the United States when he died at Boston, Massachusetts, on the 10th of November 1832. His works include: Anatomic tt physiologie du systeme nerveux (1810-1820); Observations sur la phrenologie (1810); The Physiognomical Systems of Drs Gall and Spurzheim (1815), and Essai philosophique sur la nature dc I'hamme (1820). (See Phrenology.)

SPY, a commune near Namur, Belgium. Here in 1886, in Betche aux Roches cavern, Maximin Lohest and Marcel de Puydt found two nearly perfect skeletons (man and woman) at the depth of 16 ft., with numerous implements of the Mousterian type. All the human remains are now in the Lohest Collec- tion, Liege. The skulls were characterized by enormous brows, retreating forehead, massive jaw-bones, rudimentary chin and large posterior molars. The skeletons were further marked by a divergent curvature of the bones of the fore-arm; the tibia were shorter than in any other known race, and stouter than in most; the tibia and femur, being so articulated that to maintain equilibrium the head and body must have been thrown forward, as in the gait of the larger apes. These characteristics justify placing " the man of Spy in the lowest category . . . the dentition is inferior to that of the neolithic man in France . . . approximates near to the apes, although there is still, to use the language of Fraipont and Lohest, an abyss between the man of Spy and the highest ape" (E. D. Cope, " The Genealogy of Man " in The American Naturalist, April 1893, p. 334). With the skeletons were found bones of extinct mammals, the woolly rhinoceros {Rhinoceros lichorhinus) , mammoth (Elephas primi- genius), and the cave-bear (Ursus spelaeus).

See also L'Homme contemporain du mammouth b\ Spy (Namur, 1887); G. de Mortillet, Le Prehistorique (1900).

SPY (from " to spy " or " espy"; 0. Fr. espie, espier, to spy, watch; cf. Ger. spdhen, Lat. specere, to look; the Fr. term "espionage "is of course from the same source), in war — a person who, disguised or

without bearing the distinguishing marks of belligerent forces, mixes with the enemy for the purpose of obtaining information useful to the army he is serving. As by the law of war a spy is liable, if caught, to the penalty of death, the Hague " Regulations respecting the Laws and Customs of War on Land " are very precise on the subject. A soldier not wearing a disguise is not a spy, though he may be found within the zone of the hostile army and though his object may be to obtain information; nor are soldiers or civilians spies who cross

enemy lines openly carrying messages. This applies even to persons sent in balloons for the purpose of carrying despatches. In short, it is essential to the character of a spy that he should act clandestinely or on false pretences, that he should be caught within the zone of operations of the hostile belligerent forces, and that his object should be to obtain information for use against them (art. 29). The regulations also provide that he cannot be " punished " without previous trial (art. 30). Nor can he be treated as a spy if he is captured after he has rejoined his army. He must then be treated as an ordinary prisoner of war (art. 31). (T. Ba.)

The term " spy " is applied also to those who in time of peace secretly endeavour to obtain information concerning the forces, armaments, fortifications or defences of a country for the purpose of supplying it to another country. Every country has always endeavoured to guard jealously its military and naval secrets, and with this object denies admittance to fortified places or arsenals to those who cannot produce the proper credentials. Notwithstanding the utmost precautions, it is impossible to prevent some amount of leakage to countries which are prepared to pay for information otherwise unobtainable. Consequently, most countries have legislation dealing with " spying " in time of peace. In the United Kingdom, the Official Secrets Act 1889 makes it a misdemeanour wrongfully to obtain information as to any fortress, dockyard, office, &c, of his majesty, or, having such information or any information relating to the naval or military affairs of his majesty, to communicate the same to any person to whom it ought not in the interest of the state to be communicated at the time. If the information is communicated, or intended or attempted to be communicated, to any foreign state, the offence becomes a felony. In Germany an imperial law of 1893 deals similarly with such an offence.

SQUADRON, a military and naval term for a body of mounted troops or a detachment of war vessels. The word is derived from squadra, a square, as a military term, according to Florio, applied to a " certain part of a company of souldiers of 20 o: 25 whose chief e

was a corporal," and so called no doubt as being formed on parade or in battle array in squares. Squadra, square, is derived from the Low Latin cxquadrare, an intensive form of quadrare {quadrus, four-cornered, qualtiior, four). In military usage the term "squadron" is applied to the principal units into which a cavalry regiment is divided, corresponding to the company in an infantry battalion. The normal modern division of a cavalry regiment is into four squadrons of two to four troops each, this squadron numbering 120 to 200 men (see Cavalry). In naval usage a squadron is a group of vessels either as forming one of the divisions of a fleet or as a separate detachment under a flag officer despatched on special service. In military use, "squad" (a shortened form of " squadron ") is used of any small detachment of men detailed for drill, fatigue or other duty.

SQUAILS (from skail or kail, aninepin), an old English game in which disks are snapped or struck with the palm from the edge of a table or board at a mark at its centre. Its early prototype was shove-groat, called also slyp-groat or slide-thrift, which in the 18th century went under the name of jervis or jarvis. This last variation was played on a table marked with chalk into alleys divided into squares numbered from 1 to 9 or 10, the object being to send a halfpenny into a high-num- bered space. If it went beyond nothing was scored. The highest aggregate of a certain number of plays won. The most scientific development of this class of games is the modern Shuffle-board (q.v.).

SQUALL, the name given to any sudden increase of wind to gale force. Generally speaking a squall is understood to be of short duration, but the word " gust " would be used to indicate an increase of wind force of more transient character than a squall. Gusts may succeed one another several times within the compass of a minute. A squall may comprise a succession of gusts, with intervening partial lulls, and would last with varying intensity for some minutes at least. The distinct"«n

between gusts and squalls is best illustrated by the traces of a Dines pressure-tube anemograph. The trace reproduced in fig. i for an ordinary steady wind shows that the force of the wind is constantly oscillating. The general appearance of the trace is a ribbon which has a breadth proportional to the mean wind velocity. The breadth of the

ribbon is also dependent upon the nature of the reference; the better the exposure the narrower the ribbon; for an anemograph at a coast station the ribbon is wider for a shore wind than for a sea wind.

From the records obtained at Scilly and Holyhead, Dr G. C. Simpson concluded that a wind of mean hourly velocity v was composed of alternations of gusts and lulls ranging on the average between limits 5 +.isv and —5+761; with occasional recurrences to extreme velocities of 1-5 + 1-32; and — i-o+-65i>. In other words, the average range of the ribbon is -5 + -451; for the two

stations during the hour when the mean velocity is v, and the extreme range within the same period is 2 0+ -68"j.

The differences of gust velocity at stations with different exposures may be illustrated by quoting the breadth of the ribbon for a 30 m. wind at the following stations : —

Southport (Marshside) 10 m.

Scilly i§

Shoeburyness 20

Holyhead 15

Pendennis Castle (Falmouth) ... 8

.... 16

Aberdeen 30

Alnwick Castle 25

(from W.) (fromE.N.E.)

(from S.) (from W.) (from N.W.)

Kew

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5p.m. 6

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Fig. 2 represents a succession of squalls occurring in an ordinary gusty wind; the squalls succeed one another with fair regularity about every twenty minutes and last in full force for a few minutes A

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Midi. 1a.m. 2 Fig. 2.

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(Redrawn by permission from the British- Association Report, 1908. J

succession of squalls of this kind is a common experience with • westerly wind at Scilly, and the onset of squalls is generally associated with the veering of the wind to the north-west. Changes in wind velocity, either in the form of gusts or squalls, are generally associated

with some change in direction ot' the wind, but the relation between the changes in gusts have not yet been studied.

A characteristic of squalls is the suddenness with which the increase of wind velocity occurs. At sea the ruffling of the surface can be seen travelling over the water, and the wind producing it and travel- ling with it strikes a sudden blow when it reaches a ship. If squalls are of sufficient violence to do damage to trees or buildings their progress can be traced in a like manner over the land.

These phenomena are exhibited in their most striking form in " line squalls." The characteristic feature of a line squall is that a number of places arranged, roughly speaking, in a straight or slightly curved line across the country experience a similar sequence of events at the same time, and the line of action sweeps across the country as a front advancing nearly uniformly throughout its length. This march of a linear front gives the impression of a wave or bore with an advancing front _ ,. . . e ,, hundreds of miles long, sweeping

o^^SETi? a"^ °™ the country with a velocity Squall. that can be

identified from the

time of occurrence of the various changes at different places. The associated events are very well marked by those recorded for the line of squall of the 2nd of August 1906 (fig. 3). They comprise a sudden increase of wind with a veer of direction of 45° to 90 , a sudden rise of pressure known in France as the crochet d'orage, and in Germany as the Gewitter Nase, a pronounced and permanent fall of temperature, and a shower of rain, hail or snow. While these various phenomena are indicated all along the advancing line their intensity may be very different at different points along it. The squall often exhibits greater violence in the middle portion, and it becomes more intense as the whole line advances. In the most fully developed portions the weather phenomena take the form of thunderstorms with violent wind and rain. The course of events in a typical line squall has been most care- fully worked out by R. G. K. Lempfert in a paper on the " Line Squall " of the 8th of February 1906 (Quart. Journ. Roy. Met. Soc. vol. xxxii.). Fig. 4 (reproduced from the papers) shows the successive positions of the line of the front from which its rate of travel can be estimated. The line of advance of a line squall is generally from some point between south and north on the western side, the change of wind being from a warm southerly or westerly wind to a colder westerly or northerly one. So far as is known to the writer there is no case of a line squall exhibiting a backing wind. The date and direction of advance appear to be, generally speaking, those of the final wind, but in cases where the thunderstorms are developed there

Endeavours have been made to explain the phenomena of line squalls as due to vortex motion of particular character. The violent wind blowing out in front of the storm is part of the circulation of a vortex with horizontal axis. It supplies the air for the rainfall of the stations in front. Its place is taken by descending air at the back, which becomes in its turn the surface supply for stations farther in. But such an explanation

seems in many ways incomplete. Although perhaps if the wind velocities in a vertical plane were plotted there might be some evidence of circulation in the mathematical sense by integrating round a closed curve, yet the idea of circulation in a vertical plane as suggesting the primary constitution of the phenomena is very inadequate. The change of air which takes place during the passage of the line squall is altogether different from that which we would get by passing the surface air through a complete vertical cycle and condensing a large quantity of water vapour on the way. If vertical

circulation were complete the air would

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Fig. 4. — Times of occurrence of sudden meteorological changes, and isochronous lines showing the advance of the squall. The hours are numbered consecutively from I to 18, starting at I a.m. (Feb. 8), and the minutes are expressed as decimal fractions of an hour. Hail and thunder storms occurred in the region to the east of the dotted line.

return to the surface warmed and dried. A few revolutions would produce a very considerable elevation of temperature. The air which remains after the passage of a line squall is, how- ever, distinctly colder, of an entirely different kind from that which it replaces and, in those cases which have been investigated, can be traced back to a different point of the compass. More- over, the smallness of vertical dimensions in the atmosphere as compared with the horizontal dimensions makes it difficult to allow that there is really room for an effective vortex with a horizontal axis. To carry air up 5 m. and bring it back again would practically deprive it of all its moisture and raise its temperature 72° F. Yet 5 m. would be a very small allowance for the horizontal spread of the phenomena of the squall.

The sudden replacement of warm air by cold with a change of wind seems much more likely to be associated with the flooding of the country by an advancing sweep of cold air. The pressure changes are continuous in the old layer and in the new layer, but discontinuous with varying degrees of discontinuity along the line of junction, where instability of the upper air may be set up. Fig. 5 •shows the discontinuity of pressure in the example discussed by Mr Lempfert. It is clear that as the discontinuity of pressure becomes accentuated there arise

(Redrawn by permission from the Quart. Journ. Roy. Met. Soc.)

Fig. 5. — Distribution of Pressure (Feb. 8, 1906). Isobars are shown for each 01 in.

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Shepherds Bush

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(Redrawn by permission from the British Association Report,

1908.)

Fig. 6. — Records of wind velocity on June I,

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in the localities on the line of advance very steep pressure gradients for which there are corresponding winds. The violent winds may therefore be attri- buted to the breakdown of the dynami- cal system under the stress of these local differences of pressure.

From this point of view the pheno- mena of the line squall are to be regarded as a development of the ordinary phenomena of the V-shaped depression. A sudden change of wind and a line of rain that pass over the country with the velocity of the same order as that of the following wind are quite common features of the S.W. quadrant of a cyclonic depression, and they, too, seem to point to the juxta-position of currents of different tem- perature coming from different regions but forming adjacent components of supply for the depression.

Examples of all degrees between the comparatively unimportant rain line and the most violent tornado-like squall could be put side by side with cases in which the typical pressure, temperature and weather changes are accompanied by a sudden lull in the wind, as in the

example quoted in the Life History of Surface Air Currents (M. O. publication, No. 174, 1906). An example of a line squall in its most

violent and destructive form is shown in the records for the 1st of June 1908. In the record for Kew the squall of wind which destroyed a number of the trees of Bushey Avenue is shown as lasting for a very long period (fig. 6).

A line squall of historic interest is that which capsized H.M.S. " Eurydice " off the Isle of Wight on the 24th of March 1878. The occurrence is discussed by the Hon. Ralph Abercromby in 1884 (Quart. Journ. Roy. Met. Soc. x. 172) and previously by the Rev. Mr Clementhey (Symon's Met. Mag., April 1878). The shift of wind in this case appears to have been from west to north, and the change in the wind was accompanied by the transitions from fine blue sky to snow. The records at the seven obser- vatories belonging to the Meteorological Council are repro- duced in the Quarterly Weather Report, from which fig. 7 is taken.

Whatever explanation may be given of the cause and origin of the phenomena of line squalls, it must take account of the fact that a first squall is often succeeded by others of a similar character but often of less intensity than the first. After the sudden shift of wind, with accompanying weather changes, the conditions seem to revert more or less to the original state. The warm southerly wind reasserts itself, but is driven out again by another attack, and ultimately the cold wind holds the field. It is easy to suggest, but at present not easy to verify, the course of replacement of the warm wind. Upper air observa- tions in such circumstances with kites or manned balloons are dangerous, both for the apparatus and the observer; but it may be possible to trace the actual course of events by the records of rounding balloons supplemented by observations of the motive balloon by means of theodolites.

Little has been said about the actual force of the wind in gusts or squalls, and in the present state of anemometry it is difficult to

(By permission of the Controller of His Majesty's Stationery Office.)

Fig. 7. — " Eurydice " Squall, from the Quarterly Weather Report.

regard the figures hitherto obtained as final ; moreover, the large

wind force in squalls is probably subject to large local variations, the difference between the record of the squall of the 1st of June 1908 at Kew and Shepherd's Bush suggests that it may have been much stronger at Bushey, where the damage was done. The highest velocity in a gust hitherto recorded upon instruments belonging to the office is 106 5 m. per hour at Pendennis Castle on the 14th of March 1905. Gale force is defined for the purposes of the meteoro- logical office as that of a wind which has an average velocity during an hour of 38 m. per hour. According to Simpson's results at Scilly or Holyhead, where the exposure is good, a wind that just got within the reckoning of gales would reach 44 m. per hour in the ordinary gusts, with occasional records of 51 m. per hour. Squalls with velocities reaching 55 m. per hour are not uncommon, and the range of wind velocity which constitutes a squall may be anything between 40 m. an hour and upwards of 100 m. an hour. (W. N. S.)

SQUAW, the anglicized word for woman among the North American Indians; the Massachusetts Indian form is squa or schqua, the Narraganset squdwo, the Cree eskwuo, Delaware ochqueu, khqueu, &c. It is also used in composition with names of animals to denote the female.

SQUIB, supposed to be derived from the German word schieben, to push or shove forward with a sliding movement, the name for a projected kind of firework that is flung out of a groove and breaks with a flash and a clatter. Hence, in the literary sense, a squib is a slight satirical composition put forth on an occasion; and it is intended that it should make a noise by its explosion, not by the possession of any permanent importance. Steele says, in the Taller, that " squibs are those who in the common phrase of the world are call'd libellers, lampooners and pam- phleteers," showing that, at the beginning of the 18th century, the man who composed the satire, as well as the satire itself, was called a squib Swift speaks of the rapidity with which these little literary fireworks flew about from place to place, and he himself was a proficient in the making of noisy squibs. Perhaps the best type of a squib in English literature is Gray's Candidate, which was written and circulated among the electors in 1764, when Lord Sandwich was canvassing for the office of high-steward of the university of Cambridge. The object of this poem was, by ridicule and defamation, to injure Lord Sandwich's prospects of success. When once the election was over the verses served no further purpose, and they have sur- vived simply in consequence of their fluent wit and of the reputation of the great poet who composed them. (See also Lampoon.)

SQUILL, the name under which the bulbous root of Urginea Scilla is used in medicine. It belongs to the natural order Liliaceae. The name of " squill " is also applied by gardeners to the various species of Scilla. The medicinal squill is a native of the countries bordering the Mediterranean, and grows from the sea-level up to an elevation of 3000 ft. The bulbs are globular and of large size, often weighing more than 4 lb. Two varieties are met with, the one having white and the other pink scales. They are collected in August, when they are leafless, the membranous outer scales being removed and the fleshy portion cut transversely into slices and dried in the sun. These are then packed in casks for exportation. They are chiefly imported into the United Kingdom from Malta. When reduced to powder and exposed to the air the drug rapidly absorbs moisture and cakes together into a hard mass.

Squill has been used in medicine from a very early period. The ancient Greek physicians prescribed it with vinegar and honey almost in the same manner as it is used at present. The composition of the drug, first efficiently studied by Merck in 1878, is very com- plex. The chief constituent is scillitoxin, a bitter and intensely irritant principle. A somewhat similar substance, scillipiain, is also physiologically active. The bitter glucoside scillin, or scillain, is unimportant. The bulb also contains mucilage, and a considerable quantity of an irritant resin. It has been shown that a definite action on the heart is not obtainable unless so large a dose of squill is given that some gastro-intestinal irritation or even inflammation is set up by this resin. The dose of squill is from 1 to 3 grains. Of the numerous pharmacopoeial preparations only three are of any importance: the syrup of squill, composed of one part of squill, eight of dilute acetic acid and four of sugar; the Piiula Ipecacuanhae cum Scilla, in which ipecacuanha and opium are the chief constituents; and the tincture of squill, which is still widely used, made by macerating one part of squill

with five of alcohol. The action of the drug is that of a cardiac stimulant, with three important further properties all dependent on its irritant constituents. Even in small doses, such as will not affect the heart, it is a gastro-intestinal, a bronchial and a renal irritant. The two latter properties constitute it a powerful expectorant and a fairly active diuretic. The drug must not be given alone, owing to its irritant action. It is very frequently given as a diuretic in cardiac cases in the form ot a pill containing one grain each of mercury, digitalis and squill. Combined with a sedative, such as opium, it may be given in chronic bronchitis. It must not be given in acute bronchitis, which it only aggravates; nor in phthisis, which is

invariably accompanied by a hypersensitive state of the alimentary tract. For similar reasons squill should not be given in any form of Bright's disease. The textbook pro- hibition against its use in acute Bright's disease should certainly be extended to chronic nephritis in all its forms. The use of this irritating drug, while still extensive, is yearly diminishing. It does not accomplish anything that may not otherwise be achieved at less cost to the secreting surfaces of the patient.

An allied species, Urginea indica, is used in India in the same manner as the European species. The true squills are represented in Great Britain by two species, Scilla autumnalis and S. verna. The former has a racemose inflorescence and leaves appearing in autumn after the flowers; the latter has the flowers arranged in a corymbose manner, leaves appearing in spring, and is confined to the sea-coast. Several species are cultivated in gardens, 5. bifolia and S. sibirica being remarkable for their beautiful blue flowers, which are produced in early spring; Chinese squill is S. chinensis, a half-hardy species; Roman squill is a popular name for species of Bellevalia, a genus now generally included in Hyacinthus; striped squill is Puschkinia scilloidcs, a liliaceous plant resembling the squill in habit.

SQUINCH, possibly a corruption of sconce (French equiva- lents are pendentive, trompe), the term in architecture applied to a corbelling out by means of arched rings in stone thrown across the angles of a square tower, to carry an octagonal spire or a dome. The earliest examples are found in the palaces of Serbittan and Firuzabad constructed by the Sassanian dynasty (a.d. 350-450), and in the mosque at Damascus, where it takes the form of a niche. In early French Romanesque work a small niche with additional rings above is employed; a greater impor- tance is sometimes given by small shafts at the sides, of which there are examples in the Coptic churches of Egypt, and in France in the cathedral at Le Puy and the church of St Martin at Dijon. (See Pendentive.)

SQUINT (possibly connected with Swed. svinka, to flinch; O. Eng. swiccan, avoid), properly an adjective meaning looking different ways, hence oblique, indirect vision, particularly a strabismus, an affection of the eyes consisting in non-coincidence of the optic axes (see Eye, § Diseases; and Vision). In architec- ture "squint" is used of a slit or opening usually on one or both sides of the chancel arch, giving a view of the altar from the transepts or aisles; it is also styled " hagioscope " (q.v.).

SQUIRE, an abbreviated form of "esquire" (q.v.), originally with the same meaning of an attendant on a knight. In this form, however, the word has developed certain special connota- tions. Thus in England it is used partly as a courtesy title, partly as a description of the chief landed proprietor, usually the lord of the manor, in a parish the lesser proprietors being " gentlemen " or yeomen. In some parts also it is not uncom- mon for the title of " squire " to be given to small freeholders of the yeoman class, known in Ireland half contemptuously as " squireens." In the United States the title has also survived as applied to justices of the peace, local judges and other digni- taries in country districts and towns. In another sense " squire " has survived in its sense of " attendant," " to squire " being used so early as Chaucer's day as synonymous with " to wait upon." A " squire of dames " is thus a man very attentive to women and much in their company. Footpads and high- waymen were termed sometimes " squires of the pad " as well as " gentlemen of the road."

SQUIRREL (Fr. ecureuil), properly the name of the well- known red, bushy-tailed British arboreal mammal, Sciurus vulgaris, typifying the genus Sciurus and the family Sciuridae, but in a wider sense embracing all the rodents included in this

and a few nearly allied genera. For the characteristics of the family Sciuridae and the different squirrel-like genera by which it is represented, see Rodentia.

What may be called typical, that is to say arboreal, squirrels are found throughout the greater part of the tropical and temper- ate regions of both hemispheres, although they are absent both from Madagascar and Australasia. The species are both largest and most numerous in the tropics, and reach their greatest development in the Malay countries. Squirrels vary in size from animals no larger than a mouse, such as Nannosciurus soricinus of Borneo, or N. minutus of West Africa, to others as large as a cat, such as the black and yellow Ratufa bicolor of Burma and the Malay area. The larger species, as might be expected from their heavier build, are somewhat less strictly arboreal in their habits than the smaller ones. The common squirrel, whose habits are too well known to need special descrip- tion, ranges over the whole of Europe and Northern Asia, from Ireland to Japan, and from Lapland to North Italy; but speci- mens from different parts of this wide range differ so much in colour as to constitute distinct

races. Thus, while the squirrels of north and west Europe are of the bright red colour of the British animal, those of the mountainous regions of southern Europe are of a deep blackish grey; while those from Siberia are a clear pale grey colour, with scarcely a tinge of rufous. There is also a great seasonal change in appearance and colour in this squirrel, owing to the ears losing their tufts of hair and to the bleaching of the tail. The pairing time of the squirrel is from February to April; and after a period of gestation of about thirty days the female brings forth from three to nine young. In addition to all sorts of vegetables and fruits, the squirrel is exceedingly fond of animal food, greedily devouring mice, small birds and eggs. The squirrels of the typical genus Sciurus are unknown in Africa south of the Sahara, but otherwise have a distribution co-extensive with the rest of the family.

Although the English squirrel is a beautiful little animal, it is surpassed by many of the tropical members of the group, and especially by those of the Malay countries, where nearly all the species are brilliantly marked, and many are ornamented

The Burmese Red-bellied Squirrel (Sciurus pygerythrus).

with variously coloured longitudinal stripes along their bodies. Every one who has visited India is familiar with the pretty little striped palm-squirrel, which is to a considerable extent a partially domesticated animal, or, rather, an animal which has

taken to quarter itself in the immediate neighbourhood of human habitations. It has been generally supposed that there is only one palm-squirrel throughout India, but there are really two distinct types, each with local modifications. The first or typical palm-squirrel, Funambulus palmarum, inhabits Madras, has but three light stripes on the back, and shows a rufous band on the under-side of the base of the tail. In Pennant's palm- squirrel, F. pennanti, on the other hand, there is a pair of faint additional lateral white stripes, making five in all, and the under-surface of the tail is uniformly whitish olive. As this species has been obtained in Surat and the Punjab, it is believed to be the northern type. One Oriental species {Sciurus caniceps) presents almost the only known instance among mammals of the assumption during the breeding season of a distinctly ornamental coat, corresponding to the breeding plumage of birds. For the greater part of the year the animal is of a uniform grey colour, but about December its back becomes a brilliant orange-yellow, which lasts until about March, when it is again replaced by grey. The squirrel shown in the illustration is a native of Burma and

Tenasserim, and is closely allied to S. caniceps, but goes through no seasonal change of colour. Another Burmese squirrel, 5. haringtoni, differs as regards colour in a remarkable manner from all other known members of the group. It is a medium-sized species of a pale creamy buff colour above, lighter beneath, and with a whitish tail, while it is further characterized by the absence of the first upper premolar, which shows that it is not an albino or pale variety. Two examples were obtained by Captain H. H. Harington, of one of the Punjabi regiments, on the Upper Chindwin river. It may be added that generic subdivisions of the squirrels are based mainly on the characters of the skull and teeth. That they are essential is evident from the circumstance that the African spiny squirrels Xerus (see Spiny Squirrel) come between Sciurus and some of the other African genera. (R. L.)*

SQUIRREL MONKEY, the English name of a small golden- haired South American monkey, commonly known as Chryso- thrix sciurea, and also applied to the two other members of the same genus, whose collective range extends from Costa Rica to Bolivia and Brazil. It has, however, been proposed to transfer the name Chrysothrix to the marmosets of the genus Hapale, to which it is stated to have been originally applied, and to replace it by Saimiris. The squirrel-monkeys were formerly classed with the douroucoulis (see Douroucouli), but, on account of their brain-structure, they have been transferred to the Cebinae (see Capuchin-Monkey), from the other members of which they differ by their practically non-prehensile tails and smaller size, while they are further distinguished by their com- paratively large eyes and the backward prolongation 01 the hinder part of the head. They are exceedingly pretty little monkeys. (See Primates.) (R. L.)*

SRINAGAR, capital of the state of Kashmir, in Northern India, 5250 ft. above sea-level, on both banks of the river Jhelum, which winds through the city with an average width of 80 yds. and is crossed by seven wooden bridges. The houses occupy a length'of about 3 m. and a breadth of about i| m. on either side of the river; but the greater part of the city lies on the right bank. No two buildings are alike. The curious grouping of the houses, the frail tenements of the poor, the substantial mansions of the wealthier, the curious carving of some, the balconies of others, the irregular embankment and the mountains in the background, form a quaint and picturesque spectacle. Area, 3795 acres. Pop. (1901), 122,618. The city is exposed to both fire and flood. In 1893 six of the seven bridges were swept away, and great damage was again caused in 1903. A regular water-supply has been provided. The artisans of Srinagar enjoy a high reputation.

Unfortunately, the historic industry of shawl-weaving is now practically extinct. The loss of the French market after the war of 1870 was followed by the famine of 1877-1879, which drove many of the weavers into the Punjab, and the survivors have taken to the manufac- ture of carpets. Other industries are paper, leather, papier

mache, silver and copper ware, wood-carving and boat-making. The three chief routes of communication with India are: (i) along the Jhelum valley to Murree and Rawalpindi, which has been opened throughout for wheeled traffic (195 m.); (2) over the Banihal pass (9200 ft. above the sea) to Jammu (163 m.); (3) over the Pir Panjal pass (11,400 ft.) to Gujrat (180 m.).

See Sir Walter R. Lawrence, The Valley of Kashmir (1895); M. A. Stein, Chronicle of the Kings of Kashmir (1900).

SRIRANGAM, or Seringham, a town of British India, in Trichinopoly district, Madras presidency, 2 m. N. of Trichinopoly city. Pop. (1901), 23,039. It stands on an island of the same name, formed by the bifurcation of the river Cauvery and by the channel of the Coleroon. The town is celebrated for its great temple, dedicated to Vishnu, composed of seven square enclosures, one within another, and 350 ft. distant from each other. Each enclosure has four gates with high towers, placed one in the centre of each side opposite to the four' cardinal points. The successively widening enclosures and the greater elaboration of the outer as compared with the inner buildings mark the progress of the shrine in fame and wealth. The outer wall of the temple is not less than 4 m. in circumference. Not far distant is the smaller but more beautiful Jambukeswaram, a temple dedicated to Siva. From 1751 to 1755 the island and its pagodas were the object of frequent contests between the French and the English.

STAAL, MARGUERITE JEANNE CORDIER DELAUNAY, Baroxne de (1684-1750), French author, was born in Paris on the 30th of August 1684. Her father was a painter named Cordier. He seems to have deserted her mother, who then resumed her maiden name, Delaunay, which was also adopted by her daughter. She was educated at a convent at Evreux, of which Mme de la Rochefoucauld, sister of the author of the Maximes, was superior. Here she became attached to Mme de Grieu, who, being appointed abbess of the convent of St Louis at Rouen, took her friend with her.

Mile Delaunay lived there until 1 7 10 in the enjoyment of the utmost consideration. There she held a little court of her own, which included Brunei, the friend of Fontenelle, the sieur de la Rey and the abbe Vertot. She describes her own first passion for the marquis de Silly, the brother of a friend with whom she was visiting. Her affection was not returned, but she entered on a correspondence with him in which she plays the part of director. After the death of her patron, Mme de Grieu, poverty compelled her to enter the household of the duchesse du Maine at Sceaux in the capacity of femme de chambre. Her literary talent soon manifested itself in the literary court of the duchess, and secured for her, among other friendships, the somewhat undesirable admiration of the abbe Chaulieu. The duchess is said, but chiefly on the waiting lady's own authority, to have been not a little jealous of her attendant. Enough, however, is known of the duchess's imperious and capricious temper to make it improb able that her service was agreeable. Mile Delaunay, however, enjoyed a large share of her confidence and had a considerable share in drawing up the Memoire des princes legitimes which demanded the meeting of the states-general. She was implicated •in the affair of the Cellamare conspiracy, and was sent in 17 18 to the Bastille, where she remained for two years. Even here, however, she made conquests, though she was far from beautiful. Her own account of her love for her fellow prisoner, the chevalier de Menil, and of the passion of the chevalier de Maisonrouge, her gaoler, for her, is justly famous. She returned on her liberation to the service of the duchess, who showed no gratitude for the devotion, approaching the heroic, that Mile Delaunay had shown in her cause. She received no promotion and still had to fulfil the wearisome duties of a waiting-maid. She refused, it is said, Andre Dacier, the widower of a wife more famous than himself, and in 1735, being then more than fifty, married the Baron de Staal. Her dissatisfaction with her position had be- come so evident that the duchess, afraid of losing her services, arranged the marriage to give Mile Delaunay rank sufficient to allow of her promotion to be on an equality with the ladies of the court. On this footing she remained a member of the

household. It was at this time that she became the friend and correspondent of Mme du Deffand. She died at Gennevilliers on the 15th of June 1750. Her Memoires appeared about five years later, and have often been reprinted, both separately and in collections of the memoirs of the 17th and 18th centuries, to both of which the author belonged both in style and character. She has much of the frankness and seductive verve of Mme de SeVigne and her contemporaries, but more than a little alloyed with the sensibilite of

a later time. It may be doubted whether she does not somewhat exaggerate the discomforts . of her position and her sense of them. In her lack of illusions she was a child of the 18th century. Sainte-Beuve says that the most fit time for the reading of the Mimoires is the late autumn, under the trees of November. But her book is an extremely amusing one to read, as well as not a little instructive. The humours of the " court of Sceaux " are depicted as hardly any other society of the kind has ever been. " Dans cet art enjoue de raconter," says Sainte-Beuve, " Madame de Staal est classique." Besides her Memoires Mme de Staal left two excellent short comedies, performed at the court of Sceaux, and some letters, the answers to which are in some cases extant, and show, as well as the references of contemporaries, that the writer did not exaggerate her own charm. Her Memoires were translated by S. Bathurst (1877) and by C. H. Bell (1892). See the edition (1877) of her Memoires by M. de Lescure.

STABIAE, an ancient town of Campania, Italy, on the coast at the east extremity of the Gulf of Naples (mod. Castellam- mare di Stabia). It was dependent upon Nuceria Alfaterna (q.v.) until it joined the revolt against Rome in the Social War (90 B.C.). In 89 it was taken and destroyed by Sulla, and its territory given to Nuceria as a reward for fidelity to Rome. The place, however, continued to be visited for its natural beauties, its mineral springs and its pure milk. Remains of fine villas have been found about half a mile to the east of the modern town, and also the remains of a temple to the genius of Stabiae, which no doubt occupied the same site as it had done in Oscan times. None of these remains is now visible. The town was destroyed by the eruption of a.d. 79 (in which the elder Pliny met his death), but was soon rebuilt on the site now occupied by the modern Castellammare. Above the town on the east is the Mons Lactarius (from lac, milk) . Here took place the battle between Narses and Teias in a.d. 553, which put an end to the Gothic domination in Italy.

See M. Ruggiero, Scavi di Stabia del 1749 al 1782 (Naples, 1881); J. Beloch, Campanien, 2nd ed. p. 248 sqq. (Breslau, 1890). (T.As.)

STABLE, a building in which horses are kept, including the stall in which they stand, furnished with manger and rack, the room in which the harness is kept and attended to, the loft in which the hay and corn are stored, and other accessory rooms, &c. (See Horse.) This is the current usage, but the word was formerly applied, as was the Latin stabulum, i.e. standing- place (from stare, to stand), to a stall or enclosure for all kinds of domestic animals, cows, sheep, &c.

The adjective " stable," meaning firmly established, comes directly from Latin stabilis, also from stare, to stand.

STADE, BERNHARD (1848-1906), German Protestant theo- logian, was born on the nth of May 1848, at Arnstadt, in Thuringia. He studied at Leipzig and Berlin, and in course of time became (1875) professor ordinarius at Giessen. Once a member of Franz Delitzsch's class, he became a convinced adherent of the newest critical school. In 1881 he founded the Zeitschrift fiir alttestamenlliche Wissenschaft, which he continued to edit; and his critical history of Israel {Geschichte des Volks Israel, 2 vols., 1887-1888; vol. ii. in conjunction with Oscar Holtzmann) has made him very widely known. With C. Siegfried he has revised and edited the Hebrew lexicon, Hebr. Wiirterbuch zum Alten Testament (1892-1893). Stade's other works include Tiber die alttestamentlichen Vorstellungen vom Zustand nach dem Tode (1877), Lehrbuch der hebr. Grammalik (vol. i., 1879), Ausgewdhlte akademische Reden und Abhandlungen (1899), and Biblische Theologie des Alten Testaments (190s, &c). He died on the 6th of December 1906.

See O. Pfleiderer, Development of Theology (1890).

STADE, a town of Germany in the Prussian province of Hanover, situated on the navigable Schwinge, 35 m. above its confluence with the Elbe, 20 m. N.W. of Hamburg on the railway to Cuxhaven. Pop. (1905), 10,837. It carries on a number of small manufactures and has some shipping trade, chiefly with Hamburg, but the rise of Harburg has deposed it from its former position as the chief port of Hanover. In the neighbourhood are deposits of gypsum and salt. The fortifications, erected in 1755 and strengthened in 1816, were demolished in 1882.

According to the legend, Stade was the oldest town of the Saxons and was built in 321 B.C. Historically it cannot be traced farther back than the 10th century, when it was the capital of a line of counts. In the 13th century it passed to the arch- bishopric of Bremen. Subsequently entering the Hanseatic League, it rose to some commercial importance. 1 In 1648 Stade became the capital of the principality of Bremen under the Swedes; and in 1719 it was ceded to Hanover, the fate of which it has since shared. The Prussians occupied it without resistance in 1866.

See Jobelmann and VVittpennig, Geschichte der Stadt Stade (Stade, 1898).

STADION, JOHANN PHILIPP KARL JOSEPH (1763-1824), Austrian statesman, entered the diplomatic service and rose early to a high position. In 1 790-1 793 he was ambassador in London. After some years of retirement he was entrusted (1800) with a mission to the Prussian court, where he endea- voured in vain to effect an alliance with Austria. He had greater success as envoy at St Petersburg, where he played a large part in the formation of the third coalition against Napoleon (1805). Notwithstanding the failure of this alliance he was made foreign minister, and in conjunction with the archduke Charles pursued a policy of quiet preparation for a fresh trial of strength with France. In 1808 he abandoned the policy of procrastination, and with the help of Metternich hastened the outbreak of a new war. The unfortunate results of the campaign of 1809 compelled his resignation, but in 1813 he was commissioned to negotiate the convention which finally overthrew Napoleon. 'The last ten years of his life were spent in a strenuous and partly successful attempt to reorganize the disordered finances of his country.

See A. Beer, Zehn Jahre osterreichischer Politik, 1801-1810 (Leipzig, 1877); Die Finanzen Oesterreichs im 19 Jahrhundert (Prague, 1877); Krones, Zur Geschichte Oesterreichs, 1792-1816 (Gotha, 1886).

STADIUM, the Latin form of this Greek name for a standard of length, a stade = ioo bpyvial (about 6 ft., or 1 fathom) = 6 irXedpa (100 Gr. about 101 Eng. ft.), equivalent to about 606 Eng. ft. ; as being about one-eighth of the Roman mile, it is often translated by " furlong." The course for the foot-race at Olympia (q.v.) was exactly a stade in length, and hence the name was given to the Greek foot-race and to the amphitheatre in which the races took place (see Games, Classical).

STADTHOLDER (Du. stadhouder, a delegate or representa- tive), the title of the chief magistrate of the seven states which formed the United Netherlands by the union of Utrecht in 1579. Though the word stad means a town, it has also the force of the kindred English " stead." A stadhouder was not the governor of a " stad " or " stead " in the sense of a place or town. He was in the place, or stead, of the sovereign. The word is translated into Latin by legatus, gubernalor and praefectus. The office of stadtholder is a proconsulatus, and the High German equivalent is Statthalter, a delegate. When the

northern Netherlands revolted from Philip II. of Spain, who had inherited his sovereign rights from the house of Burgundy (see Netherlands: History), the stad-

1 The Stade Elbe-dues (Stader Elbezoll) were an ancient impost upon all goods carried up the Elbe, and were levied at the village of Brunshausen, at the mouth of the Schwinge. The tax was abolished in 1267 by the Hanseatic League, but it was revived by the Swedes in 1688, and confirmed by Hanover. The dues were fostered by the growing trade of Hamburg, and in 1 861, when they were redeemed (for £427,600) by the nations trading in the Elbe, the exchequer of Hanover was in the yearly receipt of about £45,000 from this source. Hamburg and Great Britain each paid more than a third of the redemption money.

houder passed from being the representative of an absent sove- reign prince and became the chief magistrate of the states in whom the sovereignty resided. Six of the seven states forming the confederation of the United Netherlands took as their stadtholder William of Orange-Nassau, called " the Silent," and his descendants during three generations. The seventh, Friesland, had for stadtholder William's brother, John " the Old," and his descendants. The younger line became stadt- holders of the other states after the extinction of the elder, and were the ancestors of the present royal family of the Netherlands. Though the stadtholders of the house of Orange-Nassau were of princely rank and intermarried with the royal families of Europe, they were not sovereign princes. They exercised large admini- strative powers, and commanded the land and sea forces, but it was with delegated authority given them by each state in domestic affairs, and by the states-general of the confederation in all common and foreign affairs. The states-general and some of the individual states not only claimed but exercised the right of suspending the stadtholdership, as for instance after the death of William II., 1650, and of William III., 1702.

STAEL, MADAME DE. Anne Louise Germaine Necker, Baronne de Stael-Holstein (1766-1817), French novelist and miscellaneous writer, was born at Paris on the 22nd of April 1766. Her father was the famous financier Necker, her mother Suzanne Curchod, almost equally famous as the early love of Gibbon, as the wife of Necker himself, and as the mistress of one of the most popular salons of Paris. Between mother and daughter there was, however, little sympathy. Mme Necker, despite her talents, her beauty and her fondness for philosophe society, was strictly decorous, somewhat reserved, and disposed to carry out in her daughter's case the

rigorous discipline of her own childhood. The future Mme de Stael was from her earliest years a romp, a coquette, and passionately desirous of prominence and attention. There seems moreover to have been a sort of rivalry between mother and daughter for the chief place in Necker's affections, and it is not probable that the daughter's love for her mother was increased by the conscious- ness of her own inferiority in personal charms. Mme Necker was of a most refined though somewhat lackadaisical style of beauty, while her daughter was a plain child and a plainer woman, whose sole attractions were large and striking eyes and a buxom figure. She was, however, a child of unusual intellectual power, and she began very early to write though not to publish. She is said to have written her father a letter on his famous Compte-Rendu and other matters when she was not fifteen, and to have injured her health by excessive study and intellectual excitement. But in reading all the accounts of Mme de Stael's life which come from herself or her intimate friends, it must be carefully remembered that she was the most distinguished and characteristic product of the period of sensibilite — the singular fashion of ultraˆsentimest which required that both men and women, but especially women, should be always palpitating with excitement, steeped in melancholy, or dissolved in tears. Still, there is no doubt that her father's dismissal from the ministry, which followed the presentation of the Compte, and the conse- quent removal of the family from the busy life of Paris, were bene- ficial to her. During part of the next few years they resided at Coppet, her father's estate on the Lake of Geneva, which she herself made famous. But other parts were spent in travelling about, chiefly in the south of France. They returned to Paris, or at least to its neighbourhood, in 1785, and Mile Necker resumed literary work of a miscellaneous kind, including a novel, Sophie, printed in 1786, and a tragedy, Jeanne Grey, published in 1790. It became, however, a question of marrying her. Her want of beauty was compensated by her fortune. But her parents are said to have objected to her marrying a Roman Catholic, which, in France, considerably limited her choice. There is a legend that William Pitt the younger thought of her; the somewhat notorious lover of Mile de Lespinasse, Guibert, a cold-hearted coxcomb of some talent, certainly paid her addresses. But she finally married Eric Magnus, Baron of Stael-Holstein, who was first an attache of the Swedish

legation, and then minister. For a great heiress and a very ambitious

girl the marriage scarcely seemed brilliant, for Stael had no fortune and no very great personal distinction. A singular series of negotiations, however, secured from the king of Sweden a promise of the ambassadorship for twelve years and a pension in case of its withdrawal, and the marriage took place on the 14th of January 1786. The husband was thirty-seven, the wife twenty. Mme de Stael was accused of extravagance, and latterly an amicable separation of goods had to be effected between the pair. But this was a mere legal formality, and on the whole the marriage seems to have met the views of both parties, neither of whom had any affection for the other. They had three children; there was no scandal between them; the baron obtained money and the lady obtained, as a guaranteed ambassadress of a foreign power of consideration, a much higher position at court and in society than she could have secured by marrying almost any Frenchman, without the inconveniences which might have been expected had she married a Frenchman superior to herself in rank. Mme de Stael was not a persona grata at court, but she seems to have played the part of ambassadress, as she played most parts, in a rather noisy and exaggerated manner, but not ill. Then in 1788 she appeared as an author under her own name {Sophie had been already published, but anonymously) with some Lettres sur J . J. Rousseau, a fervid panegyric showing a good deal of talent but no power of criticism. She was at this time, and indeed generally, enthusiastic for a mixture of Rousseauism and constitutionalism in politics. She exulted in the meeting of the states-general, and most of all when her father, after being driven to Brussels by a state intrigue, was once more recalled and triumphantly escorted into Paris. Every one knows what followed. Her first child, a boy, was born the week before Necker finally left France in unpopularity and disgrace; and the increasing disturbances of the Revolution made her privileges as ambassadress very important safeguards. She visited Coppet once or twice, but for the most part in the early days of the revolutionary period she was in Paris taking an interest and, as she thought, a part in the councils and efforts of the Moderates. At last, the day before the September massacres, she fled, befriended by Manuel and Tallien. Her own account of her escape is, as usual, so florid that it provokes the question whether she was really in any danger. Directly it does not seem that she was; but she had generously strained the privileges of the embassy to protect some threatened friends, and this was a serious matter.

She betook herself to Coppet, and there gathered round her a considerable number of friends and fellow-refugees, the beginning of

the quasi-court which at intervals during the next five-and- twenty years made the place so famous. In 1793, however, she made a visit of some length to England, and established herself at Mickleham in Surrey as the centre of the Moderate Liberal emigrants — Talleyrand, Narbonne, Jaucourt and others. There was not a little scandal about her relations with Narbonne; and this Mickleham sojourn (the details of which are known from, among other sources, the letters of Fanny Burney) has never been altogether satisfactorily accounted for. In the summer she returned to Coppet and wrotr? a pamphlet {Reflexions sur le proces de la reine) on the queen's execution. The next year her mother died, and the fall of Robespierre opened the way back to Paris. M de Stael (whose mission had been in abeyance and himself in Holland for three years) was accredited to the French republic by the regent of Sweden; his wife reopened her salon and for a time was conspicuous in the motley and eccentric society of the Directory. She also published several small works, the chief being an essay Dc I'lnfluence des passions (1796), and another De la Litterature consideree dans ses rapports avcc les institutions sociales (1800). It was during these years that Mme de Stael was of chief political importance. Nar- bonne's place had been supplied by Benjamin Constant, whom she first met at Coppet in 1 794, and who had a very great influence over her, as in return she had over him. Both personal and political reasons threw her into opposition to Bonaparte. Her own preference for a moderate republic or a constitutional

monarchy was quite sincere, and, even if it had not been so, her own character and Napoleon's were too much alike in some points to admit of their getting on together. For some years, however, she was able to alternate between Coppet and Paris without difficulty, though not without knowing that the First Consul disliked her. In 1797 she, as above mentioned, separated formally from her husband. . In 1799 he was recalled by the king of Sweden, and in 1802 he died, duly attended by her. Besides the eldest son Auguste Louis, they had two other children — a son Albert, and a daughter Albertine, who afterwards became the duchesse de Broglie.

The exact date of the beginning of what Mme de StaeTs admirers call her duel with Napoleon is not easy to determine. Judging from the title of her book Dix annees d'exil, it should be put at 1804; judging from the time at which it became pretty clear that the first man in France and she who wished to be the first woman in France were not likely to get on together, it might be put several years earlier. The whole question of this duel, however, requires consideration from the point of view of common sense. It displeased Napoleon no doubt that

Mme de Stael should show herself recalcitrant to his influence. But it probably pleased Mme de Stael to quite an equal degree that Napoleon should apparently put forth his power to crush her and fail. Both personages had a curious touch of charlatanerie. If Mme de Stael had really desired to take up her parable against Napoleon seriously, she need only have established herself in England at the peace of Amiens. But she lingered on at Coppet, constantly hankering after Paris, and acknowledging the hankering quite honestly. In 1802 she published the first of her really noteworthy books, the novel of Delphine, in which the " femme incomprise " was in a manner introduced to French literature, and in which she herself and not a few of her intimates appeared in transparent disguise. In the autumn of 1803 she returned to Paris. Whether, if she had not displayed such extraordinary anxiety not to be exiled, Napoleon would have exiled her remains a question; but, as she began at (5nce appealing to all sorts of persons to protect her, he seems to have thought it better that she should not be protected. She was directed not to reside within forty leagues of Paris, and after considerable delay she determined to go to Germany. She journeyed, in company with Constant, by Metz and Frankfort to Weimar, and arrived there in December. There she stayed during the winter and then went to Berlin, where she made the acquaintance of August Wilhelm Schlegel, who afterwards became one of her intimates at Coppet. Thence she travelled to Vienna, where, in April, the news of her father's dangerous illness and shortly of his death (April 8) reached her. She returned to Coppet, and found herself its wealthy and independent mistress, but her sorrow for her father was deep and certainly sincere. She spent the summer at the chateau with a brilliant company; in the autumn she journeyed to Italy accompanied by Schlegel and Sismondi, and there gathered the materials of her most famous work, Corinne. She returned in the summer of 1805, and spent nearly a year in writing Corinne; in 1806 she broke the decree of exile and lived for a time undisturbed near Paris. In 1807 Corinne, the first aesthetic romance not written in German, appeared. It is in fact, what it was described as being at the time of its appearance, " a picturesque tour couched in the form of a novel." The publication was taken as a reminder of her existence, and the police of the empire sent her back to Coppet, She stayed there as usual for the summer, and then set out once more for Germany, visiting Mainz, Frankfort, Berlin and Vienna. She was again at Coppet in the summer of 1808 (in which year Constant broke with her, subsequently marrying a German lady) and set to work at her book, De V Allemagiie. It took her nearly the whole of the next two years, during which she did not travel much or far from her own

house. She had bought property in America and thought of moving thither, but chance or fatality made her determine to publish De V Allemagne in Paris. The submission to censorship which this entailed was sufficiently inconsistent and she wrote to the emperor one of the unfortunate letters, at once undignified and provoking, of which she had the

secret. A man less tyrannical or less mean-spirited than Napo- leon would of course have let her alone, but Napoleon was Napoleon, and she perfectly well knew him. The reply to her letter was the condemnation of the whole edition of her book (ten thousand copies) as " not French," and her own exile, not as before to a certain distance from Paris, but from France altogether. The act was unquestionably one of odious tyranny, but it is impossible not to ask why she had put herself within reach of it when her fortune enabled her to reside anywhere and to publish what she pleased. She retired once more to Coppet, where she was not at first interfered with, and she found con- solation in a young officer of Swiss origin named Rocca, twenty- three years her junior, whom she married privately in 181 1. The intimacy of their relations could escape no one at Coppet, but the fact of the marriage (which seems to have been happy enough) was not certainly known till after her death.

The operations of the imperial police in regard to Mme de Stael are rather obscure. She was at first left undisturbed, but by degrees the chateau itself became taboo, and her visitors found themselves punished heavily. Mathieu de Montmorency and Mme Recamier were exiled for the crime of seeing her; and she at last began to tnink of doing what she ought to have done years before and withdrawing herself entirely from Napo- leon's sphere. In the complete subjection of the Continent which preceded the Russian War this was not so easy as it would have been earlier, and she remained at home during the winter of 181 1, writing and planning. On the 23rd of May she left Coppet almost secretly, and journeyed by Bern, Innsbruck and Salz- burg to Vienna . There she obtained an Austrian passport to the frontier, and after some fears and trouble, receiving a Russian passport in Galicia, she at last escaped from the dungeon of Napoleonic Europe.

She journeyed slowly through Russia and Finland to Sweden, making some stay at St Petersburg, spent the winter in Stock- holm, and then

set out for England. Here she received a brilliant reception and was much lionized during the season o"f 1813. She published De VAllemagne in the autumn, was saddened by the death of her second son Albert, who had entered the Swedish army and fell in a duel brought on by gambling, under- took her Considerations sur la revolution francaise, and when Louis XVIII. had been restored returned to Paris. She was in Paris when the news of Napoleon's landing arrived and at once fled to Coppet, but a singular story, much discussed, is current of her having approved Napoleon's return. There is no direct evidence of it, but the conduct of her close ally Constant may be quoted in its support, and it is certain that she had no affection for the Bourbons. In October, after Waterloo, she set out for Italy, not only for the advantage of her own health but for that of her second' husband, Rocca, who was dying of consumption. Her daughter married Duke Victor de Broglie on the 20th of February 1816, at Pisa, and became the wife and mother of French statesmen of distinction. The whole family returned to Coppet in June, and Byron now frequently visited Mme de Stael there. Despite her increasing ill-health she returned to Paris for the winter of 1816-1817, and her salon was much frequented. But she had already become confined to her room, if not to her bed. She died on the 14th of July, and Rocca survived her little more than six months.

Mme de Stael occupies a singular position in French literature. The men of her own time exalted her to the skies, and the most extravagant estimates of her (as " the greatest woman in literary history," as the " foundress of the romantic movement," as representing " ideas," while her contemporary Chateaubriand only represented words, colours, and images, and so forth) are to be found in minor histories of literature. On the other hand, it is acknowledged that she was soon very little read. No other writer of such eminence is so rarely quoted; none is so entirely destitute of the tribute of new and splendid editions. The abundant documents in the hands of her descendants, the families of Broglie and Haussonville, have indeed furnished material for books and papers, but these are almost wholly on the social aspect of Mme de Stael, not on her

literary merit. Nor, when the life and works are examined is the neglect without excuse. Her books are seen to be in large part merely clever reflections of other people's views or views current at the time. The sentimentality of her sentiment and the florid magniloquence of her style equally disgust the reader. But to state this alone would be in the highest degree unfair. Mme de Stael's faults are great; her style is of an age, not for all time; her ideas are mostly second-hand and frequently superficial. But nothing save a very great talent could

have shown itself so receptive. Take away her assiduous frequentation of society, from the later philosophe coteries to the age of Byron — take away the influence of Constant and Schlegel and her other literary friends — and probably little of her will remain. But to have caught from all sides in this manner the floating notions of society and of individuals, to reflect them with such vigour and clearness, is not anybody's task. Her two best books, Corinne and De I'Allemagne, are in all probability almost wholly unoriginal, a little sentiment in the first and a little constitutionalism in the second being all that she can claim. But Corinne is still a very remarkable exposition of a certain kind of aestheticism, while De I'Allemagne is still perhaps the most remarkable account of one country, by a native and inhabitant of another, which exists in literature.

Baron Auguste de Stael (d. 1827) edited the complete works of his mother in seventeen volumes (Paris, 1820-182 1), with a notice by Mme Necker de Saussure, and the edition was after- wards republished in a compacter form, and, supplemented by some (Euvres inedites, is still obtainable in three volumes, large 8vo (Didot). The Considerations and the Dix annees d'exil had been published after Mme de Stael's death. Some Lettres inedites to H. Meister were published in 1903. There is no recent reissue of the whole, and the minor works have not been reprinted, but Corinne, Delphine and De V AUemagne are easily accessible in cheap and sepa- rate forms. Of separate works on Mme de Stael, or rather on Coppet and its society, besides those of MM Caro and Othenin d'Haussonville, may be mentioned the capital work of A. Sorel in the Grands ecrivains Jranqais. In English there are biographies by A. Stevens (London, 1880), and Lady Blennerhasset (1889). (G. Sa.)

STAFF (O. Eng. staef, cf. Du. staf, Ger. Stab, &c; Icel. stafr meant also a written letter, and O. Eng. stafas, the letters of the alphabet; " stave," one of the thin pieces of wood of which a cask is made, is a doublet), a long stick or pole, used either as an aid in walking, as a weapon as in the old quarter-staff (q.v.) or as a symbol of dignity and office, e.g. the pastoral staff (q.v.). Further the word is applied to the pole on which a flag is hoisted and to various measuring surveying instruments. Probably from the early use of the word for the letters of the alphabet, " staff " and its doublet " stave " came to be used of a line, verse or stanza, and in musical notation (q.v.) of the horizontal lines on which notes are placed to indicate the pitch. A par- ticular use, perhaps derived from the sense of an aid or help, is that of a body of assistants, particularly military.

The military staff organization of to-day, with its subdivision and

specialization, is a modern product. Although generals have always provided themselves with aides-de-camp and order- lies, the only official corresponding to a modern staff officer in a 16th or 17th century army was the " sergeant-major-general " or " major-general," in whom was vested the responsibility of forming the army in battle array and also the command of the foot. In those days armies, large and small, were arrayed in deep formations and, occupying but a narrow front both in camp and in battle, were easily manageable by one man and his messengers. A little later, however, we find a "quarter- master-general " and his assistants charged with the duties of selecting camps, reconnoitring the country and collecting infor- mation generally. The quartermaster-general himself was some- times used, as Marlborough used Cadogan (q.v.), not only as chief-of-staff and as quartermaster-general in the strict sense, but also as the general's authorized representative with detach- ments, advanced guards, &c. But there was no subdivision of functions in the modern sense. A staff was a group of officers attached temporarily to headquarters and available for any mission which the commander thought fit to give them, and in the highly centralized armies of those days these missions

(as regards junior officers) were practically limited to orderly work and reconnaissance, especially topographical reconnais- sance. Subordinate generals had aides-de-camp only. Apart, then, from the "adjutants" or personal staff s (amongst whom must be reckoned the commander-in-chief's secretary, generally a civilian), the staff in the field in Frederick the Great's day was the quartermaster-general's staff, and it was chiefly con- cerned, both in peace and war, with military engineering duties. In the Seven Years' War Frederick's Q.M.G. staff 1 comprised two to six officers, usually engineers, and by 1806 the quarter- master-general had practically monopolized engineering and scientific appointments at headquarters. Summer the staff officers devoted to surveying and topographical reconnais- sance; winter to the codification of the information obtained. None of them were employed or trained with troops, although Frederick the Great sometimes made the quartermaster-general's officers at Berlin do duty with the guards.

With the French Revolution, however, the organization of the staff gradually modified itself to suit the new conditions of warfare. The size of armies necessitated subdivision and separate staffs for the

subordinate leaders, their mobility re- duced the importance of minute tqpographical reconnaissance, and the necessity of communicating between the several groups of an army produced an increased demand for orderly officers. But naturally a fully developed staff system did not spring to life immediately. Only by degrees were generals evolved who could handle large and mobile armies, and the highly gifted army leaders who in time appeared, Napoleon of course above all, scarcely needed a general staff. Napoleon had a chief of staff, Marshal Berthier, who bore the old title of "major- general," but Berthier was practically a chief clerk, a man of extraordinary aptitude for business. Berthier's staff was distinctly a mobile war office, and the great captain who needed not advice, but obedience, was wont to despatch his orders by a crowd of subalterns. The principal contribution, there- fore, made by Napoleon to the development of staff organiza- tion was the thorough establishment of the principle of corps and divisional autonomy. Corps and divisions to be self- contained required, and they were furnished with, their own staffs. The old type of " quartermaster," whose " castra- metation " and engineering science had been essential in the days of rigid indivisible armies, disappeared and gave way to a type of staff officer whose duty was to translate his chief's general instructions (other than those delivered in the field by the gallopers of the personal staff) into orders for the various subordinate commanders. The general staff officer's functions as strategical assistant to his chief were non-existent. This system worked satisfactorily in the main while Berthier was at the head of the central office, somewhat less satisfactorily in the Waterloo campaign when Marshal Soult occupied his place, and worst of all it worked in various wars of the 19th century in which the self-contained great general was not forthcoming. The general staff became a mere bureau, divorced from the army. Thus on the French side in 1870 Marshal Bazaine so far distrusted his general staff that he forbade it to appear on the battlefield, and worked the army almost wholly by means of his personal staff. Thus the latter, the mere mouthpiece of the marshal, issued sketchy strategical orders for movements, and so reduced the rate of marching of the army to five or six miles a day; while the former, kept in the dark by the commander-in-chief, issued either no orders at all or orders that had no reference to the real condition of affairs and the marshal's intentions. The army at large distrusted both staffs equally.

The Prussian general staff was as different from this staff of bureaucrats and amateurs as day from night. Even before 1806 Massenbach (g.v.) had added the preparation of strategical plans to

the work of the quartermaster-general's staff, obtaining thus at the expense of the adjutant-general's side the powers of a general staff in the modern sense. That he was incapable of using these powers is shown by the mournful history of Jena. But another quartermaster-general in the war of 1806, 1 The " general staff " was simply the list of general officers.

Scharnhorst (q.v.), took up his work and in a very different spirit. In Scharnhorst's first instructions of 1808 it was laid down that an accurate knowledge of troops and a general know- ledge of country were essential to a staff officer who was to be practised in exercises with troops and also in surveying. Scharn- horst, moreover, distributed general staff officers in peace to the provincial commands. The business-like habits which he instilled into his pupils, and their close touch with com- manders and troops, began a tradition of efficient and accurate staff work in the field, work in which the previous Prussian staff (and indeed all contemporary staffs except Napoleon's) had failed. Thus it was that although the battle of Gravelotte- Saint-Privat was fought on the German side by over 200,000 men and in' two or three distinct phases with little central direction, and, moreover, was not finished until after dark, Moltke had in his hands at dawn next morning a complete account of the events of the battle, and of the losses and con- dition of the troops of each corps. This was the fruit not only of methodical training in the theory of staff duties but of 'constant practice with troops in field manoeuvres.

Another very important feature of the Scharnhorst system was the periodical return of all general staff officers to regimental duty. This indeed has often been considered the keynote of efficiency. It did not at first meet with universal approval, but, like so many other military institutions in Prussia, finan- cial considerations helped to ensure its retention until its in- trinsic merits were proved in war. Just as the army was kept at a low peace effective and augmented on mobilization from a numerous reserve, so the staffs were small in peace, but as many officers as possible were passed through them so as to form a staff reserve within the regimental strength of the army.

But above all, the circulation of staff officers made it possible to educate the regimental officer in the approved doctrines of strategy and tactics. " Unity of doctrine " meant that instead of the complicated instructions hitherto issued for any operation, a brief note or even a hint was sufficient. In an army with a " doctrine " all ranks from general to subaltern speak the same language and use the same term in the same sense. There must always be shades of

interpretation, varying with the individual officer, as was notably the case in all that Prince Frederick Charles and Blumenthal did in execution of Moltke's " directives " in 1866 and 1870. But the general lines of action in such an army are thoroughly fixed.

A further consequence of the new conception of staff work was an enormous increase in the " discretionary " powers of all officers. If there is to be one and only one doctrine, that doctrine must be comprehensive and elastic, and education in it must consist chiefly in applying the general principle to the specific case. Thence it was not a long step to the notion that an officer could disregard a superior's orders if the situation on which they were based was wrongly conceived or had changed in the meantime. For the test of such independent action is that the " inferior should be conscientiously satisfied that the superior, in his place, would act as he himself proposes to do," and this, of course, is the very purpose of unity of doctrine. The exercise of initiative was peculiarly useful and necessary in the case of the staff officer. He could not only disobey superior orders, but give orders in the name of superior authority. He was better able than any other person to say, not only what action the Field Service Regulations laid down generally for such problems as that in hand, but also what solution his own general, possessing better information than the regimental officers, would adopt if present. The latitude in this respect accorded to German staff officers as well as to German commanders, is a most striking phenomenon of the war of 1870 (e.g. Colonel von Caprivi before Vionville and Colonel von der Esch at Worth) .

The result of unity of doctrine, then, was that a properly qualified officer could act as a substitute for his superior, and that the orders which he gave in that capacity were obeyed even by officers higher in rank than the originator of the order. This principle, owing to the peculiar circumstances of the

German army, was carried to an extreme in the case of the chiefs of staff. Moltke himself was a chief of staff, the king, although more experienced than any officer in his army, deli- berately accepting Moltke's guidance and assuming the respon- sibility for the orders that Moltke issued in his name. On several occasions the kin<$ indeed formed a different conclusion from Moltke's and gave his orders accordingly, but these were exceptions. The effect of this,

however, is not to deprive or to relieve the actual commander from the responsibility for the results of his action, whether that action was suggested by his own brain or by his staff officer's. Such an arrangement depends moreover on mutual confidence. The self-sufficing great commander does not need a Moltke, an average general is wholly ruled by his mentor; and between these two extremes the influence of the chief of staff varies according to circum- stances and the character of the general. In the German armies of 1870, for example, the chief staff officer was in one case the reflector of his chief's views, in another he was the real army commander, in a third the characters of the two men were opposed in an almost paralysing equilibrium, while in a- fourth the staff officer's business was to soothe and encourage an angry and disheartened commander and at the same time to " keep him straight."

This delicate adjustment is a necessary result of the absorp- tion — inevitable under modern conditions of war — of strategical and even tactical functions by the general staff. The serious risks of disunion within the headquarters — and 1870 proves that even ” unity of doctrine ” does not altogether eliminate this disunion — has to be faced, and is best insured against by the selection of officers appropriate to each other. The imagina- tion and technique of Hess supplemented the vigorous common- sense of Radetzky; Blucher, with the single supreme military quality of character, could leave all the brain-work to his Gneis- enau. But usually, unless other than purely military considera- tions determine the selection of the general-in-chief (in which case he can make the best soldier in the army — irrespective of seniority — his adviser), smooth and efficient working is best secured when the general and his chief of staff possess the same military qualities in different balance, each compen- sating the other’s weaknesses and deriving strength from the other’s good qualities. In the Prussian account of the war of 1859 Moltke writes: —

” Great captains have no need of counsel. They study the ques- tions which arise, and decide them, and their entourage has only to execute their decisions. But such generals are stars of the first magnitude, who scarcely appear once in a century. In the great majority of cases the leader of the army cannot do without advice. This advice may be the outcome of the deliberations of a small number of qualified men. But within this small number one and only one opinion must prevail. The organization of the military hierarchy must ensure subordination even in thought, and give the right and duty of presenting a single opinion for the examination of the general-in-chief to one man, and one only. He will be appointed, not

by seniority, but by reason of the confidence he inspires. The general-in-chief will always have, as compared with his adviser, the infinitely weightier merit of having assumed the responsibility of executing what he advises."

Thus the chief of the general staff is defined in the British Field Service Regulations as the general's " responsible adviser on all matters affecting military operations, through whom he exercises his functions of command and by whom all orders issued by him will be signed."

Staff Duties in the Field. — The manifold duties essential and incidental to commanding and administering an army, which the general performs, as above defined, through his staff, are in the British service classified broadly into three headings — general staff work, adjutant-general's work and quartermaster-general's work. The immediate head of the general staff, and (if the general delegates the duty) the supervising authority over the other staffs, is the chief of the general staff. The link between the army and the inspector-general or controller of its lines of communication is the quarter-master-general. All details required for insertion in general staff (i.e. " operation ") orders that come within the adjutant-general's or the quartermaster-general's branch are drafted by those branches in accordance with the general lines laid down by the general staff, and inserted in the orders issued by the general staff. " Routine " orders are drafted and issued by the other staffs themselves-

a. General Staff Duties {Operations). — The study of proposed opera- tions; the framing, issue and despatch of the operation orders; plans for movements to the points of concentration and for strategic deployment; general allotment of areas for quarters; measures of security; intercommunication; reconnaissance; acquisition, collation and distribution of information as to the enemy and the country ; flags of truce and correspondence with the enemy ; censor- ship; provision, distribution and revision of maps; reports and despatches relating to operations ; furnishing of the adjutant-general's and quartermaster-general's staffs with information as to the situa- tion and probable requirements of the troops, and receiving from these branches such information as affects the operations in prospect. 6. Adjutant-General's Staff (Personnel). — Discipline; application of military law, martial law and international law, both to the army and to the civil population of occupied areas; questions of promotion, appointments of officers, pay, rewards, enlistments; chaplain's services; casualties and invaliding; medical and sanitary services; organization of new corps and drafts; prisoners of war;

police ; routine and interior economy ; ceremonial.

c. Quartermaster-General's Staff (Materiel). — Distribution of camps and quarters within allotted areas; supplies, equipment and clothing (except medical stores) ; transport by land and sea ; railway administration ; remounts ; veterinary service ; postal service.

The work of the lower staffs — divisions and brigades — is similarly subdivided as far as necessary. There are, moreover, the small personal staffs (aides-de-camp) of the army and divisional commanders. The work of the latter is not of course as important as it was under the old system, and is partly of a social character, partly orderly work. The headquarters staff of an army of six infantry and one cavalry divisions consists of: Personal Staff, 5 officers; General Staff, chief and 10 other officers; Adjutant-General's Staff, adjutant-general and 4 officers; Quartermaster-General's Staff, quartermaster-general and 3 officers; attached in various capacities, 28 officers. 232 non-commissioned officers and men are employed in the work of headquarters as clerks, printers, cooks, servants, &c. The staff of a division consists of : Personal, 2 aides-de-camp ; General, 3 or 4 officers; Adjutant-General's, 1 officer; Quartermaster-General's, I officer; attached, 8 officers; rank and file attached, 64-80 men. A brigade staff consists of one general staff officer for opera- tions, a brigade major for administration, and one aide-de-camp: attached, 1 officer; rank and file, 33-45.

Staff Duties in Peace. — In modern conditions peace is normal and war exceptional ; moreover, as between European nations, the need of a swift decision of a quarrel is so urgent that immediately after mobilization and concentration, if not indeed during these preliminaries, the decisive action of the war may be begun. Success in such a war is the consequence of national spirit in the first place and of the peace training of all ranks in the second. The direction and supervision of the latter is the principal duty of a staff in time of peace, and therefore the specialization of staff functions, referred to above, in the three branches of operations, personnel and materiel, is as well marked in peace as in war. The two latter branches, which are concerned with the maintenance rather than the use of an army, are necessarily quite as fully occupied in peace as in war, for the life of the army is uninterrupted. But the " general staff " branch would not have enough work to justify a separate existence, were it not for the fact that on the battlefield nothing can be reaped that has not been sown. Nowadays, as the decisive battle immedi- ately follows the concentration of the armies, the crop that is expected to be reaped must be sown in peace time. To this end the modern general

staff in peace not only has an existence apart from the routine and supply staffs, but, as in war, occupies the first place in importance. In Great Britain, perhaps more than in any other state, the functions of training and administration are very sharply differentiated. Each commander-in-chief of a large group of garri- sons has under him not only a brigadier-general at the head of the general staff, but a major-general " in charge of administration," who in all questions of administration is the alter ego of the com- mander-in-chief. The latter is thus free to devote himself to the training of his troops, which he carries out through the medium of his general staff officers. Only those administrative questions that involve important decisions come before him, the whole of the routine work being carried out by the general in charge of adminis- tration in ,his own office and on his own responsibility.

In the War Office, the general staff work, under the Chief of the Imperial General Staff, is classified into three main heads, for each of which there is a general officer as " director." These are: (a) Military Operations, in which all strategical matters connected with imperial defence and operations overseas are studied, (b) Staff Duties, which organizes and co-ordinates the whole of the general staff work, and also deals with questions of war organization, (c) Military Training, which supervises the Staff College and other educational institutions and also the Officers' Training Corps, anc controls and in some cases conducts the professional examinations of officers and candidates for commissions. Under this branch is placed the section which arranges questions of home defence.

The administrative work is divided between the three depart- ments of the Adjutant-General (peace organization, mobilization arrangements, record offices and routine orders, medals, regimental

distinctions, titles, &c. ; certain artillery and engineer services ; and the large and exceedingly important service of personnel, discipline, recruiting, casualties, drafts and reliefs) ; the Quartermaster-General (movements and quartering, barracks, railway administration, mobilization arrangements for rail and sea transportation; remounts and registration of horses for service in war; Army Service Corps work, including horse and mechanical transport, vehicles, &c. ; training of administrative personnel; veterinary duties; provision and maintenance of supplies, clothing and stores) ; the Master- General

of the Ordnance (armaments and weapons of all kinds, ammunition and explosive stores, military engineering and fortifica- tions, barrack and building construction). Besides these three departments there are the civil departments of the Civil Member of the Army Council, under whom, on account of its citizen character, has been placed the administration of the Territorial Force, and who has further all duties connected with war department lands, roads, &c. ; and of the Finance Minister, which works out the annual estimates, examines financial proposals such as contracts, administers the Army Pay Department, and deals with accounts and audits.

Directly under the Army Council is the department of the Inspector-General of the Forces, whose duties are to review and report upon the training and efficiency of all troops under the home government, the state of stores, remounts, &c, with regard to war requirements, and the condition of fortifications.

See Bronsart von Schellendorf, Duties of the General Staff (Eng. trans., 1904); Spenser Wilkinson, The Brain of an Army; British official Field Seroice Regulations (1909); pt. ii.; King's Regulations, and Field Service Pocket Book; v. Janson, Generalstabsdienst im Frieden (1901) ; French official Aide-MSmoire de Vofficier d'ilat-major.

STAFFA (Norse for staff, column, or pillar island), an island of the Inner Hebrides, Argyllshire, Scotland, 54 m. W. of Oban by steamer, about 7 m. from the nearest point of Mull, and 6 m. N. by E. of Iona. It lies almost due north and south, is f m. long by about 3 m. wide, is 15 m. in circumference, has an area of 71 acres, and its highest point is 135 ft. above sea-level. In the north- east it shelves to a shore, but otherwise the coast is rugged and much indented, numerous caves having been carved out by rain, stream and ocean. There is enough grass on the surface to feed a few cattle, and the island contains a spring, but it is unin- habited. During the tourist season it is visited every week-day by steamer from Oban. The island is of volcanic origin, a fragment of an ancient stream of lava. In section the isle is seen to possess a threefold character: there is first a basement of tufa, from which rise, secondly, colonnades of basalt in pillars forming the faces and walls of the principal caves, and these in turn are overlaid, thirdly, by a mass of amorphous basalt. . Only the chief caves have been named. On the south-east coast is the Clam-shell or Scallop Cave. It is 30 ft. high, about 18 ft. wide at the entrance, and some 130 ft. long, and on one side of it the ridges of basalt stand out like the ribs of a ship. Near this cave is the rock of Buachaille (" The Herdsman," from a supposed likeness to a shepherd's cap), a pile of columns, fully seen only at low water. On the south-west shore are the Boat Cave and Mackinnon's or the Cormorants' Cave. Fingal's Cave is, how- ever, the most famous of all. It was discovered in 1772 by Sir Joseph Banks, who visited Staffa on his expedition to Iceland. The grotto, situated in the southern face of the isle, is 227 ft. long, 42 ft. wide, 66 ft. high and 25 ft. deep at ebb. On its western side the pillars are 36 ft. high, on its east 18 ft. high. From its mouth to its extremity a pavement of broken pillars runs up one side. The cave is the haunt of seals and sea birds. In suitable atmospheric conditions its beauty is unique. The play of colour is exquisite, the basalt combining every tint of warm red, brown and rich maroon; sea-weeds and lichens paint the cave green and gold; while the lime that has filtered through has crusted the pillars here and there a pure snow-white. From the sombre roof of smooth rock or broken pillars hang yellow, crimson and white stalactites. The floor of the cave is the green sea, out of

which the columns rise on either side with a regularity so perfect as to suggest the hand of man rather than the work of Nature. The murmur of the sea won for the cave a Gaelic name meaning " the Cave of Music." At times of storm the compressed air, as it rushes out, produces a sound as of thunder. When the sea is very smooth visitors may be rowed directly into the cave, but the more usual landing-place is near the Clam- shell Cave, where the columns have been worn down until they form a kind of terrace running all the way to Fingal's Cave. The

Wishing Chair is formed out of a column that has broken short. From the Causeway a ladder affords access to the summit of Staffa.

STAFFORD (Family). This famous English house was founded in England by Robert, a younger brother of Ralf de Tosny (Toeni), of a noble Norman house, who was standard- bearer of the duchy. Robert received, like his elder brother, at the Conquest a great fief which extended into seven counties and became known as Robert de Stafford from his residence at Stafford Castle. The military service due from the fief was no less than sixty knights, as is proved by his grandson Robert's return in 1166. With this Robert's son the male line became extinct, and his sister's husband, Hervey Bagot, one of his knightly tenants, succeeded to the fief in her right (1194): their descendant Edmund de Stafford (that surname having been assumed) was summoned as a baron in 1299. His son, Ralph, a warrior like his father, attained fame in the French wars. He conducted the brilliant defence of Aiguillon against the host of France, fought at Crecy and in the siege of Calais. Chosen a Knight of the Garter at the foundation of the order, he was further created earl of Stafford in 1351.

His son Hugh, who succeeded as 2nd earl in 1372, served in the French wars. From 1376 he became prominent in politics, probably through his marriage to a daughter of the earl of Warwick, being one of the four lords on the committee in the Good Parliament, and also serving on the committee that controlled Richard II., 1378-1380. He was friendly, however, with that king, and was with him on his Scottish ex- pedition in 1385. He died next year on pilgrimage at Rhodes. The marriage of his son, Thomas, the 3rd earl, in 1392 to the daughter and eventual heiress of Thomas, duke of Buckingham (son of Edward III.), by a coheiress of the great house of Bohun, proved a decisive turning-point in the history of the Staffords; for, although he died childless, this great lady, styled " countess of Stafford, Buckingham, Hereford and Northampton " in her will, married in 1398 his brother Edmund, the 5th earl, who obtained, in

addition to her great possessions, her ancestors' office of lord high constable in 1403, but was slain the same year at Shrewsbury, commanding the van of the king's host. Their son, Humphrey (1402-1460), the first Stafford duke of Bucking- ham, was placed by his descent and his possessions in the front rank of the English nobility.

The Staffords fell from their pinnacle of greatness, which had aroused the jealousy of the Crown, by the attainder of Henry the 2nd duke in 1483, but were completely restored for the time, on the triumph of Henry VII. in i486, when Edward, the 3rd duke (1478-1521), regained the title and estates. Under Henry VIII. his great position, fortified by his relationship to the Percys, Howards and Nevilles, made him a natural leader of the old nobility, while his recovery of the ancestral office of lord high constable in 1509 increased his prestige. He had not sufficient force of character to take an active part in politics, but the king's easily roused suspicions were excited by private accusations in 1 521, and, after a nominal trial by his peers, he was beheaded on the 17th of May 1521, a subsequent act (1523) confirming his attainder. His fate, even under such a king, made a great sensation, exciting sympathy at home, and moving the emperor Charles V. to say that a butcher's dog (Wolsey) had pulled down the noblest buck in England. It is noteworthy that the 2nd and 3rd dukes were both beheaded, while the 1st duke fell in the Wars of the Roses.

Henry (1 501-1563), the son of the last duke, was granted by the Crown some of his father's manors for his support, and, espousing the Protestant cause (though married to a daughter of Margaret, countess of Salisbury and sister of Cardinal Pole), was restored in blood on Edward VI. 's accession and declared Lord Stafford, as a new creation, by act of parliament. His second surviving son, Thomas, eventually assumed the royal arms, on the ground of his lofty descent, sailed from Dieppe with two ships in April 1557, landed at Scarborough, seized the castle, and proclaimed himself protector. He was captured and executed for high treason. His father's new barony, in 1637, passed to a cadet in humble circumstances, who was called on, as

a pauper, to surrender it to the king, which he did (illegally, it is now held) in 1639. The king thereupon bestowed it on Mary Stafford (the

heir general of the line) and her husband, William Howard, in whose descendants it is now vested. Roger, who had surrendered the title, died in 1640, the last heir male, apparently, of the main line of this historic house.

Of the junior lines the most important was that known as Stafford of Hooke (Co. Dorset), which had branched off from the parent stem at a very early date. Sir John Stafford of this line married his kinswoman, a daughter of the 1st earl of Stafford. From their younger son, Ralf, descended the Staffords of Grafton and other families; the elder, who fought in the French wars, was grandfather of John (Stafford), archbishop of Canter- bury. This prelate 1 came to the front under Henry VI., becoming treasurer (1422), bishop of Bath and Wells (1425), and lord chan- cellor (1432-1450). Archbishop from 1443 to his death in 1452, he steered an even course between parties as a moderate man and useful official. His elder brother obtained Hooke by marriage, and left two sons, of whom the younger was grandfather of Humphrey Stafford, who succeeded to Hooke, fought for Edward IV. at Towton, and was summoned as Lord Stafford of South wick in July 1461, and was advanced to the earldom of Devon on the 7th of May 1469, after the execution of the Courtenay earl, which he is said to have intrigued for. Failing to support the earl of Pembroke against the rebels a few months later, he was responsible for their victory, for which he was arrested, and beheaded (Aug. 17). With him ended the Staffords of Hooke.

Sir Humphrey Stafford of Grafton (of their cadet line) was an active supporter of Richard III., and was executed for high treason by Henry VII. in 1485. From him descended Sir Edward Stafford (whose mother was a daughter of Henry, Lord Stafford), an Elizabethan diplomatist, who was appointed resident ambassador to France in 1583, a post which he held with success to 1 590, sitting afterwards in parliament for Stafford, and dying in 1605. His brother William (1554-1612) was concerned in some obscure plots under Elizabeth.

Another offshoot from the main line was that of the Staffords of Clifton (Co. Stafford), founded by Sir Richard, younger brother of the 1st earl of Stafford, who was closely associated with him in French warfare and negotiation, fought, like him, at Crecy, and acted as seneschal of Gascony (1361-1362). Clifton came to him in marriage with a Camville heiress, and he was summoned as a baron in 1371. His eldest surviving son, Edmund (1344- 1419), a churchman, became bishop of Exeter in 1395, and was lord chancellor from 1396 to 1399. He lost the office on Henry IV. 's

accession, but held it again from 1401 to 1403. He then devoted himself to his diocese till his death in 1419. His patronage of learning is commemorated by Exeter College, Oxford. The male line of the Staffords of Clifton ended about 1445.

Of younger sons of the main line who attained peerage rank Sir Hugh Stafford, K.G., a son of the 2nd earl, was summoned as a baron from 141 1 to 1413 (probably in right of his wife, a Bourchier heiress), but died childless in 1420. John, a son of the 1st duke of Buckingham, received the garter and an earldom of Wiltshire (1470), which became extinct with his son in 1499, but was revived in 1510 for Henry Stafford, K. G., a son of the 2nd duke, who, however, died childless in 1523.

The Staffords made illustrious marriages from the day of the 1st earl; a son of the 1st duke married the mother of Henry VII. The badge of the family was " the Stafford knot," at one time as famous as " the ragged staff" of the earls of Warwick.

See Dugdale, Baronage (1675), vol. i.; G. E. C(okayne), Complete Peerage; Wrottesley, History of the Family of Bagot (1908) and Crecy and Calais (1898). The important Stafford MSS. in Lord Bagot's possession are calendared in the 4th Report on Historical MSS., and the Salt Arch. Soc.'s collections for the history of Staffordshire are valuable for early records. Harcourt's His Grace the Steward and the Trial of Peers (1907) should also be consulted. The bishop of Exeter's Register was edited by Hingeston-Randolph in 1886. Papers relating to the two Baronies of Stafford (1807), and Campbell's The Stafford Peerage (1818) are useful for the pedigree, and there are collections for a history of the family in Add. MSS. (Brit. Mus.) 14,409; 19,150. (J. H. R.)

STAFFORD, EARLS AND MARQUESSES OF. The earldom of Stafford, created in 1351, was held at first by the family of Stafford (see above). In 152 1 it became extinct, and in Sep- tember 1640 Sir William Howard (1614-1680), a son of Thomas Howard, earl of Arundel and Surrey, having three years previously married Mary (d. 1694), sister and heiress of Henry Stafford, 5th Baron Stafford, was created Baron Stafford and two months later viscount of Stafford. Accused by Titus Oates of partici- pating in the popish plots, he was found guilty, and was beheaded on the 29th of December 1680, his titles being forfeited.

His son, Henry Stafford Howard (1658-1719), who, but for his father's attainder, would have inherited the barony and the

viscounty, was created earl of Stafford in 1688, his mother being created countess of Stafford at the same time; he was succeeded by his nephew William (c. 1 690-1 734). When John Paul, the 4th earl (1700-1762), died, the earldom became extinct, but the title to the barony, which was under attainder, fell into abeyance.

The 4th earl's sister Mary (d. 1765) married Francis Plowden (d. 1712), and in 1824 their descendant, Sir George William Jerningham, Bart. (1771-1851), of Costessy Park, Norfolk, obtained a reversal of his ancestor's attainder and was recognized as Baron Stafford. The barony is still held by the Jerninghams.

In 1758 Granville Leveson-Gower (1721-1803) was created marquess of Stafford. He was the son of John Leveson-Gower (d. 1754), who was created Viscount Trentham and Earl Gower in 1746. The public positions held by him included that of lord privy seal, which he filled from 1755 to 1757, and again from 1784 to 1794; of master of the horse; of lord chamberlain of the royal household; and of lord president of the council, which he held from 1767 to 1769 and in 1783-1784. This wealthy and influential nobleman, who was the last survivor of the associates of the duke of Bedford, the " Bloomsbury gang," died at Trentham Hall, in Staffordshire, on the 26th of October 1803. His son and successor, George Granville Leveson-Gower, was created duke of Sutherland in 1833. A younger son was Granville Leveson-Gower, who was created Earl Granville in 1833. The title of marquess of Stafford is now borne by the eldest son of the duke of Sutherland.

STAFFORD, a market town, municipal and parliamentary borough, and the county town of Staffordshire, England, on the river Sow, a western tributary of the Trent. Pop. (1901), 20,895. It is an important junction on the main line of the London & North-Western railway, by which it is 1335 m. N.W. from London. Branches of this company diverge to Wolver- hampton and Birmingham, and to Walsall; a joint line of the North-Western and Great Western companies to Shrewsbury and Welshpool; the Great Northern serves the town from the eastern counties, and the North Staffordshire runs north through the Potteries district. The town, while largely modernized, contains a number of picturesque half-timbered houses. The church of St Mary, a fine cruciform building having a transitional Norman nave, and Early English and Decorated in other parts, was formerly collegiate, its canons having mention in Domesday, though the complete foundation is attributed to King John. It contains a memorial to the famous angler, Izaak Walton, born at Stafford in 1593. The older church of St Chad contains good

Norman details, but is chiefly a reconstruction. It formerly provided sanctuary. There are county council buildings, a shire hall and a borough hall. The grammar school is an ancient foundation enlarged in 1 5 50 by Edward VI. The county technical institution is in Stafford. A museum, consisting principally of the collections of Clement Wragge, and called by his name, contains a specially fine series of fossils. The William Salt library, presented to the borough in 1872 after the death of the collector, has a large collection of books and MSS., deeds and pictures relating to the county. Charitable institutions include a general infirmary, county asylum, and the Coton Hill intitution for the insane. The burgesses of Stafford had formerly common rights over a considerable tract known as Coton Field and Stone Flat; the first is now divided into allotments and the second is a recreation ground.- The staple trade is the manufacture of

boots and shoes ; there are ironworks, and salt is prepared from brine wells in the neighbourhood. These also supply baths. The parliamentary borough was extended in 1885, when the representation was reduced from two members to one. The town is governed by a mayor, 8 aldermen and 24 councillors. Area, 1084 acres.

In the beautiful well-wooded neighbourhood an interesting site is that of Stafford Castle, on a hill commanding a wide prospect. The existing ruin is that of an unfinished mansion dating from 1810, which replaced an old stronghold. Beyond it is an early encampment, Bury Ring.

Stafford (Stadford, Stajfort, Stajforde) is said to have originally been called Betheney from Berthelin, a hermit who lived here. The first authentic mention of it is in the Anglo-Saxon Chronicle, where it is stated that Aethelflead, lady of the Mercians, in 913 built a fort at Stafford. It was a place of considerable importance in later Anglo-Saxon times, and the evidence of coins shows that a mint then existed here. Stafford is described as a borough in Domesday Book, and at the time of the survey it tvas the chief place in the county though many of the houses were " wasted." The king received all the dues, two-thirds coming to him as king, the other third as earl of Stafford. From the Domesday Survey it appears that the Conqueror took certain land out of the manor of Chelsea in order to erect a

castle at Stafford; this was destroyed in the wars of the 17th century. A charter from John in 1206 constituted Stafford a free borough. In 1399 the government was by bailiffs. In 1501 it was ordered that two bailiffs should be elected annually out of a council of twenty-five burgesses. Charters were granted by Edward VI. in 1551 and by James I. in 1605, the latter incorporating it under the title of the mayor and burgesses of the borough of Stafford: owing to irregularities in elections, another almost similar charter was given by George IV., under which the town was governed until 1835. In Elizabeth's reign Stafford was in a depressed condition owing partly to the decay of the cap manu- facture which formerly had been considerable. Speed (d. 1629) states that Lichfield is "more large" than Stafford: in the middle of the 1 8th century the town had " greatly encreased of late by their manufacture of cloth: " about the same time the shoe trade began. Two fairs, to be held on St Matthew's day and on the 4th of December, were granted in 1261 and 1685 respectively, and are still kept up. There are now eight annual fairs in all.

STAFFORDSHIRE, a midland county of England, bounded N.E. by Derbyshire, E. by that county and Leicestershire, S.E. by Warwickshire, S. by Worcestershire, S.W. by Shropshire and N.W. by Cheshire. The area is 1171-2 sq. m. The county includes the valley of the Trent from its source to the point at which it becomes navigable, Burton-upon-Trent. It rises in the extreme north of the county, and follows a southerly course, turning eastward and finally north-eastward through the centre of the county. Its tributaries on the left bank follow a course roughly parallel with it; the chief are the Blythe and the Dove, which receives the Churnet from the west, and forms the county boundary with Derbyshire. The country between Trent, Churnet and Dove is undulating and beautiful; the hills rise to some 1800 ft. on the Derbyshire border in Axe Edge near Buxton, and continue by Mow Cop or Congleton Edge along the Cheshire border to the coal-bearing hills above the Potteries district. Dovedale, the name applied to a portion of the upper valley of the Dove (q.v.) t attracts many visitors on account of its beauty, and is in favour with anglers for its tn N ut-fishing. South of the Trent, about the middle of the county, an elevated area is known as Cannock Chase, formerly a royal preserve, now a wealthy coalfield, and the high ground, generally exceeding 500 ft., continues south to surround the great manufacturing district of south Staffordshire (the Black Country), and to merge into the Clent and Lickey Hills of Worcestershire. A small area in the north-west drains to the Weaver, and so to the Mersey, and from the west and south-west the Severn receives some

small feeders and itself touches the county in the extreme south-west. The only considerable sheet of water is Aqualate Mere, in the grounds of the mansion of that name near Newport in Shropshire.

Geology. — The Pennine folding gently plicates the northern of two Carboniferous tracts interrupting the Midland Triassic plateau in Staffordshire, but affects the unconformable Trias less. It isolates the Pottery and smaller coalfields mainly in synclines, but elevates the western margin of the former anticlinally. A prolongation arches the South Staffordshire Coal Measures, with minor saddles disclosing Silurian inliers, intermediate formations being absent there. Faults depressing the Trias bound the southern coalfield on both sides, the northern Carboniferous westward. At Walsall Upper Llandovery Sandstone with Stricklandinia lens and Barr (Woolhope) Limestone (Illaenus barriensis) underlie Wenlock Shales, succeeded, as at Wren's Nest and Dudley, by Wenlock Limestone in two beds, honeycombed with old lime-workings and famous for trilobites. At Sedgley there follow Lower Ludlow Shales, Sedgley (Aymestry) Limestone {Pentamerus knighti) and some Upper Ludlow Shale. Carboniferous Limestone, with gently- sloping hills and deep valleys, enters the northern region on the east. It contains brachiopods and corals of the Dibunophyllum zone, with lead and copper, once worked at Ecton. Marine Pendleside (Ybredale) Shales, with thin limestones and higher sandstones, ascend around a central syncline and the northern margins of the coalfields into the Millstone Grit, whose four grits in massive escarpments, only the " First " and " Third " persisting westward, alternate with shales. The Pottery Coalfield, the centre of pottery manufacture, though local clays now furnish only coarse ware and the " saggars " in which pottery is baked, includes 8000 ft. of Coal Measures, chiefly shales, clays and sandstones, diminishing south- ward. The Lower and Middle Measures (5000 ft.) contain the princi- pal coals, about forty, with comparatively barren strata (1000 ft.) preceding the Winpenny, Bullhurst, Cockshead, Bambury, Ten-foot, and higher coals associated with " clayband " ironstones. The neighbouring Cheadle Coalfield comprises the lower 2000 ft., with the Crabtree, Woodhead and Dilhorne coals; two other little coal- fields comprise only the lowest strata. The South Staffordshire coalfield has 500-1000 ft. of equivalent measures, with the Bottom, Fireclay, New Mine, Heathen, the composite Tenyard and other coals, besides ironstones to which the Black Country originally owed its hardware industry. Plants (Lepidodendron, Neuropteris heterophylla) , fresh-water shells (Carbonicola acuta, C. robusta) and fishes are characteristic fossils; but the roof of the North Stafford- shire Crabtree Coal (Lower

Measures) and several higher bands yield marine goniatites, &c. Shales, pottery-clays and " black- band " ironstones with thin Spirorbis-limestones, Entomostraca and Anthracomya phillipsi (Blackband Series), succeed in the Pottery Coalfield. Then follow red brick-clays with ashy grits (Etruria Marls) ; white sandstones with Pecopteris arborescens (Newcastle- under-Lyme Series) ; red sandstones and clays with Spirorbis-Yime- stones (Keele Series); paralleled in South Staffordshire respectively by Red Coal Measure Clays, Halesowen Sandstone, and beds like the Keele Series. Around this the Triassic sequence ascends out- wards through Bunter (Pebble-Beds between Mottled Sandstones), Keuper Sandstone and Waterstones into Keuper Marl, which, containing gypsum and brine-springs, covers the central plateau, the sandstones emerging marginally and axially. The Pebble-Beds rise in Cannock Chase, and fringe the northern coalfields. Rhaetic outliers on Need wood Forest contain Axinus cloacinus. The Rowley and other doleritic sills and dikes invade the southern, one dike the Pottery Coalfield and the Trias.

Glacial drift partly conceals the rocks. Irish Sea ice, entering on the west, left boulder-clay with stratified sands, and mingled with local material, Lake District and Scotch erratics, and shells swept from the sea-bed. It threw down a gravelly moraine before the marginal hills of the Pottery Coalfield, and concentrated countless boulders between Rugeley and Enville. Barred northward by this ice, the Arenig glacier carried Welsh erratics across South Stafford- shire to Birmingham. North Sea ice with Cretaceous and Jurassic debris reached east Staffordshire.

Agriculture. — Nearly four-fifths of the total area of the county is under cultivation, and of this more than two-thirds is in permanent pasture, cattle being largely kept, and especially cows for the supply of milk to the towns. Like most of the midland counties, Stafford-shire is well wooded. The acreage under corn crops is steadily diminishing, and wheat, which formerly was the principal corn crop, is now superseded in this respect by oats, which occupies over one-half of the corn acreage, little more being under wheat than under barley. Turnips are grown on about half the acreage under green crops.

Manufactures. — The manufactures of Staffordshire are varied and important. Out of the three great coalfields in the north, south and centre (Cannock Chase), the two first have wholly distinct dependent industries. The southern industrial district is commonly known as the Black Country (q.v.) ; it is the principal seat in Eng- land of iron and

steel manufacture in all its branches. It covers an area, between Birmingham and Wolverhampton, resembling one great town, and includes such famous centres as Walsall, Wednesbury, Dudley (in Staffordshire) and West Bromwich. The northern industrial district is called the Potteries (q.v.). Cheadle, east of the Potteries, is the centre of a smaller coalfield. Burton- upon-Trent is famous for its breweries. Chemical works are found in the Black Country, brick and tile works in the Black Country

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and at Tunstall, glassworks at Tutbury ; there are also a considerable textile industry, as at Newcastle-under-Lyme, paper-mills in that town and at Tamworth, and manufactures of boots and shoes at Stafford and Stone.

Communications. — The main line of the London & North-Western railway runs from south-east to north-west by Tamworth, Lichfield (Trent Valley), Rugeley and Stafford. This company and the Great Western serve the towns of the Black Country by many branches from Birmingham, and jointly work the Stafford-Shrewsbury line. The London & North-Western has branches from Trent Valley to Burton-upon-Trent, and from Rugeley through the Cannock Chase coalfields. The North Staffordshire railway runs from Stafford and from Burton-upon-Trent northward through the Potteries, with a line from Uttoxeter through Leek to Macclesfield. The Manifold Valley light railway serves part of the Dovedale district. The west-and-north line of the Midland railway (Bristol-Derby) crosses the south-eastern part of the county from Birmingham by Tam- worth and Burton, with a branch to Wolverhampton. The Great Northern, with a branch from its main line at Grantham, serves Uttoxeter, Burton and Stafford. A considerable amount of coal- transport takes place along canals, the Black Country especially being served by numerous branches. The principal canals are — the Grand Trunk, which follows the Trent over the greater part of

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its course within the county, the Coventry, Birmingham and Fazeley,

Daw End and Essington canals, connecting the Grand Trunk with Warwickshire, the Black Country and Cannock Chase ; the Liverpool and Birmingham junction; the Staffordshire and Worcestershire, running from the Severn at Stourport by Wolverhampton and Penkridge to the Grand Junction near Stafford, and the Caldon canal running eastward from the Potteries into the Churnet Valley.

Population and Administration. — The area of the ancient county is 749,602 acres, with a population in 1891 of 1,083,424; and in 1901 of 1,234,506. The area of the administrative county is 744,984 acres. Staffordshire contains five hundreds, each having two divisions. The municipal boroughs are: in the southern industrial district, Smethwick (pop. 54,539), Walsall (86,430), Wednesbury (26,554), West Bromwich (°5i T 7S), Wolverhampton (94,187); in the northern indus- trial district, Newcastle-under-Lyme (19,914), and the several formerly separate boroughs amalgamated under the " Potteries Federation " Scheme (1908) under the name of Stoke- on-Trent {q.v.); elsewhere, Burton-upon-Trent (50,386), Lich- field (7902), Stafford (20,895), Tamworth (7271). Burton, Hanley, Smethwick, Walsall, West Bromwich and Wolver-

hampton are county boroughs; Lichfield is a city, and Stafford is the county town. The urban districts are — in the southern industrial district, Amblecote (3218), Bilston (24,034), Brierley Hill (12,042), Coseley (22,219), Darlaston (15,395), Handsworth (52,921), Heath Town or Wednesfield Heath (9441), Perry Bar (2348), Quarry Bank (6912), Rowley Regis (34,670), Sedgley (15,951), Short Heath (3531), Tettenhall (5337), Tipton (30,543), Wednesfield (4883), Willenhall (18,515); in the northern industrial district, Audley (13,683), Biddulph (6247), Fenton (22,742), Kidsgrove (4552), Smallthorne (6263), Tunstall (19,492), Wolstanton (24,975); elsewhere, Brownhills (15,252), Cannock (23,974), Leek (15,484), Rugeley (4447), Stone (5680), Uttoxeter (5133). Among other towns may be mentioned Abbots Bromley (1318), Brewood (2535), Cheadle (5186) and Eccleshall (3799). The county is in the Oxford circuit, and assizes are held at Stafford. It has one court of quarter sessions, and is divided into 23 petty sessional divisions. The boroughs of Hanley, Lichfield, Newcastle-under-Lyme, Walsall, West Bromwich and Wolverhampton have separate commissions of the peace and courts of quarter sessions, and those of Burslem, Burton, Longton, Stafford, Stoke-upon-Trent, Smethwick, Tamworth and Wednesbury have separate commissions of the peace only. The total number of civil parishes is 277. The county is almost wholly in the diocese of Lichfield, but has small parts in those of Worcester, Hereford, Southwell and Chester; it contains 348 ecclesiastical

parishes or districts, wholly or in part. Staffordshire is divided into seven parliamentary divisions each returning one member — Burton, Hands- worth, Kingswinford, Leek, Lichfield, North- West and West. The parliamentary borough of Wolverhampton returns a member for each of three divisions, and the boroughs of Hanley, Newcastle-under-Lyme, Stafford, Stoke-upon- Trent, Walsall, Wednesbury and West Bromwich each return one member.

History. — The district which is now Stafford- shire was invaded in the 6th century by a tribe of Angles who settled about Tamworth, after- wards famous as a residence of the Mercian kings, and later made their way beyond Can- nock Chase, through the passages afforded by the Sow valley in the north and Watling Street in the south. The district was frequently overrun by the Danes, who in 910 were defeated at Tettenhall, and again at Wednesfield, and it was after Edward the Elder had finally expelled the Northmen from Mercia that the land of the south Mercians was formed into a shire around the fortified burgh which he had made in 914 The county is first mentioned by name in the

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at Stafford.

Anglo-Saxon Chronicle in ioi6when it was harried by Canute. The resistance which Staffordshire opposed to the Conqueror was punished by ruthless harrying and confiscation, and the Domesday Survey supplies evidence of the depopulated and impoverished condition of the county, which at this period contained but 64 mills, whereas Dorset, a smaller county, contained 272. No Englishman was allowed to retain estates of any importance after the Conquest, and the chief lay pro- prietors at the time of the survey were Earl Roger of Mont- gomery; Earl Hugh of Chester; Henry de Ferrers, who held Burton and Tutbury castles; Robert de Stafford; William Fitz-Ansculf, afterwards created first Baron Dudley; Richard Forester; Rainald Bailgiol; Ralph Fitz Hubert and Nigel de Stafford. The Ferrers and Staffords long continued to play a leading part in Staffordshire history, and Turstin, who held Drayton under William Fitz Ansculf, was the ancestor of the Bassets of Drayton. At the time of the survey Burton was the only monastery in Staffordshire, but foundations of canons existed at Stafford, Wolverhampton, Tettenhall, Lichfield,

Penkridge and Tamworth, while others at Hanbury, Stone, Strensall and Trentham had been either destroyed or absorbed before the Conquest. The five hundreds of Staffordshire have existed since the Domesday Survey, and the boundaries have remained practically unchanged. Edingale, however, was then included under Derbyshire, and Tirley under Shropshire, while Cheswardine, Chipnall and part of Bobbington, now in Shropshire, were assessed under Staffordshire. The hundreds of OfHow and Totmonslow had their names from sepulchral monu- ments of Saxon commanders. The shire court for Staffordshire was held at Stafford, and the assizes at Wolverhampton, Stafford and Lichfield, until by act of parliament of 1558 the assizes and sessions were fixed at Stafford, where they are still held.

In the 13 th century Staffordshire formed the archdeaconry of Stafford, including the deaneries of Stafford, Newcastle, Alton and Leek, Tamworth and Tutbury, Lapley and Creigull. In 1535 the deanery of Newcastle was combined with that of Stone, the deaneries remaining otherwise unaltered until 1866, when they were increased to twenty. The archdeaconry of Stoke-on-Trent was formed in 1878, and in 1896 the deaneries were brought to their present number; the archdeaconry of Stafford comprising Handsworth, Himley, Lichfield, Penkridge, Rugeley, Stafford, Tamworth, Trysull, Tutbury, Walsall, Wednesbury, West Bromwich and Wolverhampton; the arch- deaconry of Stoke-on-Trent comprising Alstonfield, Cheadle, Eccleshall, Hanley, Leek, Newcastle-under-Lyme, Stoke-on- Trent, Trentham and Uttoxeter.

In the wars of the reign of Henry III. most of the great families of Staffordshire, including the Bassets and the Ferrers, supported Simon de Montfort, and in 1263 Prince Edward ravaged all the lands of Earl Robert Ferrers in this county and destroyed Tutbury Castle. During the Wars of the Roses, Eccleshall was for a time the headquarters of Queen Margaret, and in 1459 the Lancastrians were defeated at Blore Heath. In the Civil War of the 17th century Staffordshire supported the parliamentary cause and was placed under Lord Brooke. Tamworth, Lichfield and Stafford, however, were garrisoned for Charles, and Lichfield Cathedral withstood a siege in 1643, in which year the Royalists were victorious at Hopton Heath, but lost their leader, the earl of Northampton. In 1745 the Young Pretender advanced as far as Leek in this county.

A large proportion of Staffordshire in Norman times was waste and

uncultivated ground, but the moorlands of the north afforded excellent pasturage for sheep, and in the 14th century Wolverhampton was a staple town for wool. In the 13th century mines of coal and iron are mentioned at Walsall, and ironstone was procured at Sedgley and Eccleshall. In the 15th century both coal and iron were extensively worked. Thus in the 17 th century the north of the county yielded coal, lead, copper, marble and millstones, while the rich meadows maintained great dairies; the woodlands of the south supplied timber, salt, black marble and alabaster; the clothing trade flourished about Tamworth, Burton, and Newcastle-under-Lyme; and hemp and flax were grown all over the county. The potteries are of remote origin, but were improved in the 17th century by two brothers, the Elers, from Amsterdam, who introduced the method of salt glazing, and in the 18th century they were rendered famous by the achievements of Josiah Wedgwood.

Staffordshire was represented by two members in the parlia- ment of 1290, and in 1295 the borough of Stafford also returned two members. Lichfield was represented by two members in 1304, and Newcastle-under-Lyme in 1335. Tamworth returned two members in 1562. Under the Reform Act of 1832 the county returned four members in four divisions, and the boroughs of Stoke-on-Trent and Wolverhampton were represented by two members each, and Walsall by one member. Under the act of 1868 the county returned six members in three divisions and Wednesbury returned one member.

Antiquities. — Early British remains exist in various parts of the county; and a large number of barrows have been opened in which human bones, urns, fibulae, stone hammers, armlets,

pins, pottery and other articles have been found. In the neighbourhood of Wetton, near Dovedale, on the site called Borough Holes, no fewer than twenty-three barrows were opened, and British ornaments have been found in Needwood Forest, the district between the lower Dove and the angle of the Trent to the south. Several Roman camps also remain, as at Knave's Castle on Watling Street, near Brownhills. The most noteworthy churches in the county are found in the large towns, and are described under their respective headings. Such are the beautiful cathedral of Lichfield, and the churches of Eccleshall, Leek, Penkridge St Mary's at Stafford, Tamworth, Tutbury, and St Peter's at Wolverhampton. Checkley, 4 m. south of Cheadle, shows good Norman and Early English details, and there are carved stones of pre- Norman date in the church- yard. Armitage, south-east of Rugeley, has a church showing good Norman work. Brewood church, 4 m. south-west of Penkridge, is Early

English. This village gives name to an ancient forest. Audley church, north-west of Newcastle- under-Lyme, is a good example of Early Decorated work. Remains of ecclesiastical foundations are generally slight, but those of the Cistercian abbey of Croxden, north-west of Uttoxeter, are fine Early English, and at Ran ton, west of Stafford, the Perpendicular tower and other portions of an Augustinian foundation remain. Among medieval domestic remains may be mentioned the castles of Stafford, Tamworth and Tutbury, with that of Chartley, north-east of Stafford, which dates from the 13th century. Here is also a timbered hall, in the park of which a breed of wild cattle is maintained. Beaudesert, south of Rugeley, is a fine Elizabethan mansion in a beautiful undulating demesne. In the south-west, near Stour- bridge, are Enville, a Tudor mansion with grounds laid out by the poet Shenstone, and Stourton Castle, embodying por- tions of the 15th century, where Reginald, Cardinal Pole, was born in 1500. Among numerous modern seats may be named Ingestre, Ham Hall, Alton Towers, Shugborough, Patteshull, Keele Hall, and Trentham.

See Robert Plot, Natural History of Staffordshire (Oxford, 1686) ; S. Erdeswick, Survey of Staffordshire (London, 1717 ; 4th ed., by T. Harwood, London, 1844); Stebbing Shaw, History and Antiquities of Staffordshire, &c, vol. i., ii., pt. i. (London, 1798-1801); William Pitt, Topographical History of Staffordshire (Newcastle-under-Lyme, 1817); Simeon Shaw, History of the Staffordshire Potteries (Hanley, 1829); Robert Garner, Natural History of the County of Stafford (London, 1844-1860); William Salt, Archaeological Society, Collec- tions for a History of Staffordshire (1880), vol. i. ; Victoria County History; Staffordshire.

STAG (0. Eng. stagga, a Norse word, cf. Icel. steggr, steggi, a male animal, cf. Steggander, a drake; it is usually referred to sligan, to climb, to mount, but this is doubtful), the common name of the male of many species of the deer tribe, but usually confined to the male of the red deer (Cervus elaphus), " buck " being used in other cases, as of the fallow-deer (see Deer and Pecora). In Stock Exchange slang the term is used of an operator who applies for a portion of a new security being issued, not with a view to holding it, but with the intention of immediate realization, at a profit if possible.

STAGE (Fr. etage; from Lat. stare, to stand), in architecture, an elevated floor, particularly the various storeys of a bell-tower, &c. The term is also applied to the plain parts of buttresses between cap and cap where they set back, or where they are divided by horizontal strings and panelling. It is used, too, by William of Worcester to

describe the compartments of windows between transom and transom, in contradistinction to the word bay, which signifies a division between mullion and mullion (see Storey). From the sense of the floor or platform on which plays were acted the term came to signify both the theatre (q.v.) and the drama (q.v.). And from its etymological meaning of a station comes the sense of a place for rest on a journey, the distance between such places, &c.

STAHL, FRIEDRICH JULIUS (1802-1861), German ecclesi- astical lawyer and politician, was born at Munich on the 16th of January 1802, of Jewish parentage. Although brought up strictly in the Jewish religion, he was allowed to attend the

gymnasium, and, as a result of its influence, was at the age of nineteen baptized into the Lutheran Church. To this faith he clung with earnest devotion and persistence until his death. Having studied law at Wiirzburg, Heidelberg and Erlangen, Stahl, on taking the degree of doctor juris, established himself as privatdozent in Munich, was appointed (1832) ordinary pro- fessor of law at Wiirzburg, and in 1840 received the chair of ecclesiastical law and polity at Berlin. Here he immediately made his mark as an ecclesiastical lawyer, and was appointed a member of the first chamber of the synod. Elected in 1850 a member of the short-lived Erfurt parliament, he bitterly opposed the idea of German federation. Stahl early fell under the influence of Schelling, and at the latter's insistence, began in 1827 his great work: Die Philosophic des Rechls nach geschichtlicher Ansicht (an historical view of the philosophy of law), in which he bases all law and political science upon Christian revelation, denies rationalistic doctrines, and, as a deduction from this principle, maintains that a state church must be strictly confessional. This position he further eluci- dated in his Der christliche Staat und sein Verhdltniss zum Deismus und Judenthum (The Christian State and its relation to Deism and Judaism; 1874). As Oberkirchenrath (synodal councillor) Stahl used all his influence to weaken the Evan- gelical Union {i.e. that compromise between the Calvinist and Lutheran doctrines which is the essence of the Prussian Evan- gelical Church) and to strengthen the influence of the Lutheran Church (cf. Die Lutherische Kirche und die Union, 1859). The Prussian minister von Bunsen attacked, while King Frederick William IV. supported, Stahl in his ecclesiastical policy, and the Prussian Evangelical Church would probably have been dissolved had not the regency of*

Prince William (afterwards the emperor William I.) supervened in 1858. Stahl's influence fell under the new regime, and, resigning his seat on the synod, he retired into private life and died at Briickenau on the 10th of August 1 86 1.

See " Biographie von Stahl," in Unsere Zeit, vi. 419-447 (anonymous, but probably by Gneist) ; Pernice, Savigny, Stahl (anonymous ; Berlin, 1862).

STAHL, GEORG ERNST (1660-1734), German chemist and physician, was born on the 21st of October 1660 at Anspach. Having graduated in medicine at Jena in 1683, he became court physician to the duke of Weimar in 1687. From 1694 to 1 7 16 he held the chair of medicine at Halle, and was then ap- pointed physician to the king of Prussia in Berlin, where he died on the 14th of May 1734. In chemistry he is chiefly known in connexion with his doctrine of phlogiston, the essentials of which, however, he owed to J. J. Becher; and he also propounded a view of fermentation which in some respects resembles that supported by Liebig a century and half later. In medicine he professed an animistic system, in opposition to the material- ism of Hermann Boerhaave and Friedrich Hoffmann.

The most important of his numerous writings are Zymotechnia fundamentals sive fermentationis theoria generalis (1697), which contains the phlogistic hypothesis; Specimen Becherianum (1702); Experimenta, observationes, animadver stones . . . chymicae et physicae (1731); Theoria medica vera (1707); Ars sanandi cum expectatione (173°)-

STAINER, SIR JOHN (1840-1901), English composer and organist, was born at Southwark on the 6th of June 1840. He was the second son of the schoolmaster of the parish school of St Thomas's, Southwark, who was enough of a musician to teach his son the organ and the art of reading music, in which he was already proficient when, in 1847, he entered the choir of St Paul's Cathedral. He remained there till 1856, and often took the organ in emergencies; he held the post of organist of St Benet's and St Paul's, Upper Thames Street, during the last year of his choristership; and in 1856 was given the ap- pointment of organist to St Michael's College, Tenbury, where his musical and general education benefited greatly from the intercourse with Sir Frederick Gore Ouseley. He was appointed to Magdalen College, Oxford, in i860, and became university organist in the following year. While at Oxford he did much to bring the choir of Magdalen to a remarkable state of excellence;

he took a keen interest in the foundation of various musical societies; and as a sign of his appreciation of the value of general culture, it is worth recording that he took the degree of B.A. in 1864, that of Mus. D. in 1865, and procured M.A. in 1867, being appointed a university examiner in music in the same year. In 1868 he was engaged frequently as solo organist at the Crystal Palace; and in 1872 was appointed organist of St Paul's, where he raised the standard of choral music to something very like perfection. He was professor of the organ in the National Training School of Music from 1876, and in 1881 succeeded his lifelong friend Sullivan as principal. In 1878 he was a juror at the Paris Exhibition, and was created Chevalier of the Legion d'Honneur. In 1882 he became inspector of music in training colleges. In 1888 he retired from the organistship of St Paul's owing to failing eyesight, and was knighted. In 1889 he succeeded Ouseley as professor of music in the univer- sity of Oxford, holding the post till 1899. Besides these official distinctions he received a great number of honorary degrees: he was vice-president of the Royal College of Organists, and president of the Plain-song and Medieval Music Society, the London Gregorian Association, and the Musical Association. His compositions include four oratorios: Gideon (1865), The Daughter of Jairus (Worcester, 1878), St Mary Magdalen (Gloucester, 1887), Crucifixion (London, 1887); forty-two anthems, some of them very elaborate; many hymn-tunes, organ pieces, madrigals, &c. His professorial lectures were of great value, and he made many contributions to the literature of music. He was a man of wide influence, with a remarkable faculty of organization, and his work in regard to the conditions of the musical profession was of considerable importance. His own music has many of the defects of his qualities, for his breadth of artistic views led him to admire and adopt many styles that are not always compatible with each other. He died while on a holiday at Verona on the 31st of March 1901.

STAINES, a market town in the Uxbridge parliamentary division of Middlesex, England, on the river Thames at the junction of the Colne, 19 m. W.S.W. of London on the London & South Western and Great Western railways. Pop. of urban district (1901), 6688. Breweries and mustard mills employ many hands. A rifle range for the Metropolitan Volun- teers and others was opened in 1892. A British village was situated here at the crossing of the Thames on the main road from London to south-western Britain, and the crossing was certainly one of the earliest bridged. A grant of oaks from Windsor forest for the repair of the bridge is recorded in 1262. The existing bridge, from the designs of George Rennie, was opened in

1831, after three bridges had failed in the previous forty years. The name of Staines appears in the Domesday Survey, and it has been supposed that the town is so called from a stone which marks the limit of the former jurisdiction of the City of London over the lower Thames. This is still considered to be the boundary between the upper and lower Thames. In the immediate neighbourhood, though included in the parish of Egham, Surrey, is Runnimede Island, where King John signed the Magna Carta.

STAIR, JAMES DALRYMPLE, ist Viscount (1619-1695), Scottish lawyer and statesman, was born in May 1619, at Drummurchie in Ayrshire. He was descended from a family for several generations inclined to the principles of the Reforma- tion, and had ancestors both on the father's and the mother's side amongst the Lollards of Kyle. His father, James Dalrymple, laird of the small estate of Stair in Kyle, died when he was an infant; his mother, Janet Kennedy of Knockdaw, is described as " a woman of excellent spirit," who took care to have him well educated. From the grammar school at Mauchline he went, in 1633, to the university of Glasgow, where he graduated in arts on the 26th of July, 1637. Next year he went to Edinburgh, probably with the intention of studying law, but the troubles of the times, then approaching a crisis, led him to change his course, and we next find him serving in the earl of Glencairn's regiment in the War of the Covenant. What part he took in it is not certainly known, but he was in command of

a troop when recalled in 1641 to compete for a regency (as a tutorship or professorship was then called) in the university of Glasgow. , He was elected in March. Mathematics, logic, ethics and politics were the chief subjects of his lectures, and a notebook on logic by one of his students has been pre- served. His activity and skill in matters of college business were praised by his colleagues, who numbered amongst them some of the leading Covenanting divines, and his zeal in teaching was gratefully acknowledged by his students. After nearly seven years' service he resigned his regency, and removed to Edinburgh, where he was admitted to the bar on the 17th of February 1648. This step had probably been rendered easier by his marriage, four years before, to Margaret Ross, co-heiress of Balneil in Wigtown. Stair's practice at the bar does not appear to have been large; his talents lay rather in the direction of learning and business than of oratory or advocacy. His reputation and the

confidence reposed in him were shown by his appointment in 1649 as secretary to the commission sent to the Hague to treat with Charles II. by the parliament of Scot- land. The negotiation having been broken off through the unwillingness of the young king to accept the terms of the Covenanters, Stair was again sent in the following year to Breda, where the failure of Montrose's expedition forced Charles to change his attitude and to return to Scotland as the covenanted king. Stair had preceded him, and met him on his landing in Aberdeenshire, probably carrying with him the news of the execution of Montrose, which he had witnessed.

During the Commonwealth Stair continued to practise at the bar; but like most of his brethren he refused in 1654 to take the oath of allegiance to the Commonwealth. Three years later, on the death of Lord Balcomie, Stair was appointed one of the commissioners for the administration of justice in Scotland, on the recommendation of Monk. His appointment to the bench on the ist of July 1657, by Monk, was confirmed by Cromwell on the 26th. Stair's association with the English judges at this time must have enlarged his acquaintance with English law, as his travels had extended his knowledge of the civil law and the modern European systems which followed it. He thus acquired a singular advantage when he came to write on law, regarding it from a cosmopolitan, or international, rather than a merely local or national point of view. His actual discharge of judicial duty at this time was short, for after the death of Cromwell the courts in Scotland were shut — a new commission issued in 1660 not having taken effect, it being uncertain in whose name the commission ought to run. It was during this period that Stair became intimate with Monk, who is said to have been advised by him when he left Scotland to call a full and free parliament. Soon after the Restora- tion Stair went to London, where he was received with favour by Charles, knighted, and included in the new nomination of judges in the court of session on the 13th of February 1661. He was also put on various important commissions, busied himself with local arid agricultural affairs, and, like most of the Scottish judges of this and the following century, acted with zest and credit the part of a good country gentleman.

In 1662 he was one of the judges who refused to take the declaration that the national covenant and the solemn league and covenant were unlawful oaths, and, forestalling the deposi- tion which had been threatened as the penalty of continued non-compliance, he placed his resignation in the king's hands. The king, however, summoned him to London, and allowed him to take the declaration under an implied reservation. The next five years of Stair's life were comparatively

uneventful, but in 1669 a family calamity, the exact facts of which will probably never be ascertained, overtook him. His daughter Janet, who had been betrothed to Lord Rutherfurd, was married to Dunbar of Baldoon, and some tragic incident occurred on the wedding night, from the effects of which she never recovered. As the traditions vary on the central fact, whether it was the bride who stabbed her husband, or the husband who stabbed the bride, no credence can be given to the mass of superstitions

and spiteful slander which surrounded it, principally levelled at Lady Stair. 1 In 1670 Stair served as one of the Scottish commissioners who went to London to treat of the Union; but the project, not seriously pressed by Charles and his ministers, broke down through a claim on the part of the Scots to what was deemed an excessive representation in the British parliar ment. In January 1671 Stair was appointed president of the court of session. In the following year, and again in 1673, he was returned to parliament for Wigtownshire, and took part in the important legislation of those years in the department of private law. During the bad time of Lauderdale's government Stair used his influence in the privy council and with Lauder- dale to mitigate the severity of the orders passed against ecclesi- astical offenders, but for the most part he abstained from attending a board whose policy he could not approve. In 1679 he went to London to defend the court against charges of partiality and injustice which had been made against it, and was thanked by his brethren for his success. When, in the following year, the duke of York came to Scotland Stair dis- tinguished himself by a bold speech, in which he congratulated the duke on his coming amongst a nation which was entirely Protestant. This speech can have been little relished, and the duke was henceforth his implacable enemy. His influence prevented Stair from being made chancellor in 1681, on the death of the duke of Rothes.

The parliament of this year, in which Stair again sat, was memorable for two statutes, one in private and the other in public law. The former, relating to the testing of deeds, was drawn by Stair, and is sometimes called by his name. The other was the infamous Test Act, probably the worst of the many measures devised at this period with the object of fettering the conscience by oaths. Stair also had a minor share in the form which this law finally took, but it was confined to the insertion of a definition of " the Protestant religion "; by this he hoped to make the test harmless, but his expectation was disappointed. Yet, self-contradictory and absurd as it was, the Test Act was at once rigidly enforced. Argyll, who de- clared he took it only in so far as it was consistent with itself and the Protestant

religion, was tried and condemned for treason and narrowly saved his life by escaping from Edinburgh Castle the day before that fixed for his execution. Stair, dreading a similar fate, went to London to seek a personal interview with the king, who had more than once befriended him, perhaps remembering his services in Holland; but the duke of York intercepted his access to the royal ear, and when he returned to Scotland he found a new commission of judges issued, from which his name was omitted. He retired to his wife's estate in Galloway, and occupied himself with preparing for the press his great work, The Institutions of the Law of Scotland, which he published in the autumn of 1681, with a dedication to the king.

He was not, however, allowed to pursue his legal studies in peaceful retirement. His wife was charged with attending conventicles, his factor and tenants severely fined, and he was himself not safe from prosecution at any moment. A fierce dispute arose between Claverhouse and Stair's son, John, master of Stair, relative to the regality of Glenluce; and, both having appealed to the privy council, Claverhouse, as might have been expected, was absolved from all the charges brought against him and the master was deprived of the regality. Stair had still powerful friends, but his opponents were more powerful, and he received advice to quit the country. He repaired to Holland in October 1684, and took up his residence, along with his wife and some of his younger children, at Leiden. While there he published the Decisions of the Court of Session between 1666 and 1671, of which he had kept a daily record, and a small treatise on natural philosophy, entitled Physiologia nova experimentalis.

In his absence a prosecution for treason was raised against

1 Sir Walter Scott took the plot of his Bride of Lammermoor _ from this incident, but he disclaimed any intention of making Sir William Ashton a portrait of Lord Stair.

him and others of the exiles by Sir G. Mackenzie, the lord advocate. He was charged with accession to the rebellion of 1679, the Rye House plot, and the expedition of Argyll. With the first two he had no connexion; with Argyll's unfortunate attempt he had no doubt sympathized, but the only proof of his complicity was slight, and was obtained by torture. The proceedings against him were never brought

to an issue, having been continued by successive adjournments until 1687, when they were dropped. The cause of their abandonment was the appointment of his son, the master of Stair, who had made his peace with James II., as lord advocate in room of Mac- kenzie, who was dismissed from office for refusing to relax the penal laws against the Roman Catholics. The master only held office as lord advocate for a year, when he was " degraded to be justice clerk " — the king and his advisers finding him not a fit tool for their purpose. Stair remained in Holland till the following year, when he returned under happier auspices in the suite of William of Orange. William, who had made his ac- quaintance through the pensionary Fagel, was ever afterwards the firm friend of Stair and his family. The master was made lord advocate; and, on the murder of Lockhart of Carnwath in the following year, Stair was again placed at the head of the court of session. An unscrupulous opposition, headed by Montgomery of Skelmorlie; who coveted the office of secretary for Scotland, and Lord Ross, who aimed at the presidency of the court, sprang up in the Scottish parliament; and an anony- mous pamphleteer, perhaps Montgomery himself or Ferguson the Plotter, attacked Stair in a pamphlet entitled The Late Proceedings of the Parliament of Scotland Stated and Vindicated. He defended himself by publishing an Apology, which, in the opinion of impartial judges, was a complete vindication.

Shortly after its issue he was created Viscount. Stair (1690). He had now reached the summit of his prosperity, and the few years which remained of his old age were saddened by private and public cares. In 1692 he lost his wife, the faithful partner of his good and evil fortune for nearly fifty years. The massacre of the Macdonalds of Glencoe (Feb. 13, 1692), which has marked his son, the master of Stair, with a stain which his great services to the state cannot efface — for he was undoubtedly the principal adviser of William in that treacherous and cruel deed, as a signal way of repressing rebellion in the Highlands — was used as an opportunity by his adversaries of renewing their attack on the old president. His own share in the crime was remote; it was alleged that he had as a privy councillor declined to receive Glencoe's oath of allegiance, though tendered, on the technical ground that it was emitted after the day fixed, but even this was not clearly proved. But some share of the odium which attached to his son was naturally reflected on him. Other grounds of complaint were not difficult to make up, which found willing supporters in the opposition members of parlia- ment. A disappointed suitor brought in a bill in 1693 com- plaining of his partiality. He was also accused of domineering over the other judges and of

favouring the clients of his sons. Two bills were introduced without naming him but really aimed at him — one to disqualify peers from being judges and the other to confer on the Crown a power to appoint temporary presidents of the court. The complaint against him was remitted to a committee, which, after full inquiry, completely exculpated him; and the two bills, whose incompetency he demonstrated in an able paper addressed to the commission and parliament, were allowed to drop. He was also one of a parliamentary commission which prepared a report on the regulation of the judicatures, afterwards made the basis of a statute in 1695 supplementary to that of 1672, and forming the foundation of the judicial procedure in the Scottish courts for many years. On the 29th of November 1695 Stair, who had been for some time in failing health, died in Edinburgh, and was buried in the church of St Giles.

In 1695 there was published in London a small volume with the title A Vindication of the Divine Perfections, Illustrating the Glory of God in them by Reason and Revelation, methodically digested — By a Person of Honour. It was edited by the two Nonconformist divines, William Bates and John Howe, who had been in exile in

Holland along with Stair, and is undoubtedly his work. Perhaps it had been a sketch of the " Inquiry Concerning Natural Theology " which he had contemplated writing in 168 1. It is of no value as a theological work, for Stair was no more a theologian than he was a man of science, but it is of interest as showing the serious bent of his thoughts and the genuine piety of his character.

Stair's great legal work, The Institutions of the Law of Scotland deduced from its Originals, and collated with the Civil, Canon and Feudal Laws and with the Customs of Neighbouring Nations, affords evidence of the advantage he had enjoyed from his philosophical training, his foreign travels and his intercourse with Continental jurists as well as English lawyers. Unfortunately for its permanent fame and use, much of the law elucidated in it has now become anti-quated through the decay of the feudal part of Scottish law and the large introduction of English law, especially in the departments of commercial law and equity.

The Physiologia was favourably noticed by Boyle, and is inter- esting as showing the activity of mind of the exiled judge, who returned to the studies of his youth with fresh zest when physical science was approaching its new birth. But he was not able to emancipate himself from formulae which had cramped the education of his generation, and had not caught the light which Newton spread at this very time

by the communication of his Principia to the Royal Society of London.

Stair was fortunate in his descendants. " The family of Dalrymple," observes Sir Walter Scott, " produced within two centuries as many men of talent, civil and military, of literary, political and professional eminence, as any house in Scotland." His five sons were all remarkable in their professions. John, master of Stair (1648-1707), who was created 1st earl of Stair in 1703, an able lawyer and politician, who is, however, principally remembered for his part in the massacre of Glencoe, is dealt with above. Sir James Dalrymple of Borthwick, created a baronet in 1698, was one of the principal clerks of session, and a very thorough and accurate historical anti- quary. Sir Hew Dalrymple of North Berwick (1652-1737) succeeded his father as president, and was reckoned one of the best lawyers and speakers of his time; he, too, was created a baronet in 1698. Thomas Dalrymple became physician to Queen Anne. Sir David Dalrymple of Hailes (d. 1721), who was created a baronet in 1700, was lord advocate under Anne and George I. ; and his grandson was the famous judge and historian, Lord Hailes (q.v.).

Stair's grandson, John, 2nd earl (1673-1747), who rose to be a field-marshal, gained equal credit in war and diplomacy. He was ambassador in Paris (1715-1720), and, besides seeing service under Marlborough, was commander-in-chief of the British forces on the Continent in 1742, showing great gallantry at the battle of Dettingen. He had no son, and in 1 707 had selected his nephew John (1720-1789). as heir to the title; but through a decision of the House of Lords in 1748 he only became 5th earl, after his cousin James and James's son had suc- ceeded as 3rd and 4th earls. John's son, the 6th earl, died without issue, and a cousin again succeeded as 7th earl, his two sons becoming 8th and 9th earls. The 8th earl (1771-1853) was a general in the army, and keeper of the great seal of Scotland. The 9th earl's son and grandson succeeded as 10th and nth earls.

For a fuller account of the life of Stair, see J. Murray Graham, Annals of the Viscount and First and Second Earls of Stair (1875); A. J. G. Mackay, Memoir of Sir James Dalrymple, First Viscount Stair (1875); and Sir R. Douglas, Peerage of Scotland, new ed., by Sir J. B. Paul.

STAIR (O. Eng. staeger, step, from stigan, to climb, cf. Ger. steigen; the root is also seen in " stile " and " stirrup "), in architecture, the term (Fr. escalier) given to a series of steps rising one above the

other, either in one straight line or with returns, or round a newel, or open well-hole, either square, rectangular, circular or elliptical. A series of continuous steps is called a " flight." The ordinary staircase of two flights with landing between is known as a "pair"; "two pair back" therefore would be the room at the back on the second floor; in houses where the space occupied by the staircase is very limited there is no landing, but the stairs wind round the corner post or newel, and are known as " winders."

The steps of a stair consist of " tread " and "riser," the

respective dimensions of which vary according to the impor- tance of the staircase and the space which has been given to it; in external flights or stairs, such as those at Persepolis, the tread is so wide and the riser so small in height as to allow of a horse ascending, and generally in garden terraces there is the same slight rise. For the stairs of a palace or municipal build- ing, 14 in. tread and 5 in. riser would be required, but as a rule 1 2 in. tread and 6 in. riser is adopted. In the stone staircase in the palace at Cnossus in Crete, the treads were 18 in. and the risers 55 in. In ordinary houses 9 in. or 10 in. is generally given for the tread, and 65 in. to 7 in. for the riser. In the stairs leading to lofts, and in yachts or steamers, the ascent is much steeper, having sometimes 10 in. rise and 5 in. tread. The series of stairs provided to ascend from one floor to another when enclosed with walls is known as a staircase (q.v.). Unenclosed flights of steps placed in front of a building are known by the French term perron (q.v.), usually applied to a structure like the horseshoe staircase of the palace at Fontainebleau, the stairs of which are carried on a support independent of the main wall of the palace. From this point of view the great return flight of steps at Persepolis might be looked upon as a staircase, because on one side the steps are all embedded in the main wall of the platform.

Belonging to the same type are the great flights of steps which led to the successive stages of the Ziggurats or Assyrian stage towers; those in front of the Propylaea, leading to the Acropolis at Athens; the stairs leading to the Propylaea (150 ft. in width) at Baalbek; others in Palmyra; and generally all the Roman temples. In medieval times should be included the great flights of steps which stood in front of the cathedrals of Europe, some of which, as those at Le Puy in France, Ste Gudule at Brussels, the cathedral at Erfurt in Germany,

S. Miniato at Florence in Italy, and others, still exist, not having yet been buried by the gradual raising of the ground-level in great towns; also the immense flights of steps in Rome, leading up to the Trinita del Monte and the Capitol, and those found in all towns built on hills, when an architectural composition has guided their plan.

In Egyptian architecture inclined planes took the place of stairs, as in the sloping corridors of the Great Pyramid, the descent leading to the temple of the Sphinx, and the approaches to the two temples of Deir el-Bahri, one of them the oldest temple found. Inclined planes were also provided in front of some of the Greek temples, where the steps of the stylobate were of great height; similar contrivances were adopted by the Mahommedans in Egypt to ascend the minaret of Ibn Tulun and el Hakim; in the great circular tower at Amboise, and in the fallen campanile of St Mark's, Venice. (R. P. S.)

STAIRCASE, the term usually applied (Fr. cage d'escalier, Ger. Treppenhaus) to the stairs leading to the upper floors in a building, including the enclosure walls. In the ordinary house a single staircase only is provided; in larger ones a second or service staircase; in those of more importance, especially where the principal reception rooms are on the first floor, a grand staircase leading to the latter, and other subsidiary stairs or staircases.

Architecture. — Among the earliest examples are those found in Egypt, generally built in the thickness of the walls, as in the pylons and temples; a remarkable example was found by Dr Arthur Evans in Cnossus, in Crete, consisting of a staircase in stone, 6 ft. wide, with return flights of stairs, rising through two floors; the staircase in the temple of Zeus at Olympia leading to the gallery, is supposed to have been in wood, but in some of the Greek temples have been found stairs in stone with return, flights. In the Tabularium at Rome there is a long flight of 67 steps leading up from the Forum to a hall at the back, but otherwise there are few examples of ancient Roman staircases, and none of any importance have been found in Pompeii. Of medieval staircases the principal examples are those in stone built round a circular newel, to provide means of ascent to the various stages of the church towers. One of these, at St Gilles in Provence, is covered with a semicircular

rising vault, which is known as Vis St Gilles; some of these circular staircases are 12 ft. in diameter, others, like those in the campanile of Pisa, are built in the thickness of a circular hall with well-hole in centre. In the 15th century some cf the stone staircases leading to the rood loft, with open tracery round the edge, are of great elaboration

and beauty, as at St Maclou, Rouen. In the 16th century in France, in the chateaux of the Loire, are many examples, among which the circular staircases at Blois, two of them in square towers, the third octagonal in plan and on one side open at intervals to the court, has a great circular newel enriched with arabesque carving, and a rising elliptical barrel vault with ribs and bosses. In the chateau of Chambord the great staircase in the middle, which is built round a circular well-hole, had two separate flights, one over the other, so that, starting from opposite sides on the ground floor, two persons could ascend without seeing one another. At Azay le Rideau, Loire, and in the chateau of St Germain-en-Laye, the staircases in return flights are built between walls, and the same is found in the ducal palace at Venice and most of the palaces of Rome. At Venice, in the Palazzo Minelli, the staircase is in a circular tower with open arcades and balustrades. The most famous staircase in Spain is that in the north transept of Burgos Cathedral, remarkable for the magnificent iron- work of its balustrade; and in England the staircase leading to the hall of Christ Church, Oxford, with a magnificent fan vault, is a fine example. In the 16th and 17th centuries in England the grand staircases of the great mansions were usually in wood, the finest examples being those at Hatfield, Knole, Audley End, &c. They would seem also to have been regarded as part of the great entrance halls, but in France and Italy they assumed greater importance, being always in stone or marble, with colonnades or arcades round the staircase on the first floor. Of these there were three types. The first is the straight staircase with two or more landings, of which examples existed in Paris in the Tuileries and the old Hdtel de Ville, having been reproduced in the new H6tel de Ville, and the staircase in the Vatican. The second is the staircase with return flights right and left, at the top of a first flight, sometimes built in long rectangular halls, but un- satisfactory owing to the want of concentration and to the difficulty of deciding whether to turn to the right or left at the top of the first flight; examples are in the Herrenchiemsee Palace, Bavaria, the Palazzo Reale at Naples, the Madama Palace at Turin, and the government offices in London. In the new opera house in Paris, J. L. Gamier (q.v.) solved the problem better by placing his staircase in a square hall, which, seen from the first floor surrounded with open balconies, forms one of the finest staircase halls known. The third alternative is that of the staircase in three flights, built round a square well-hole, of which the staircase in Holford House is the best example. The vestibule staircases in Genoa which lead to a raised ground-storey, such as those in the Palazzo Durazzo, or in the university, are extremely fine in effect and are executed all in white marble. As the vestibules are open to the

narrow streets, it is possible that the title of the ” marble palaces of Genoa ” refers to those marble staircase halls, because the external walls of the palaces are either in ordinary stone or in brick covered with stucco. (R. P. S.)

Construction. — The primary object of stairs, in house-building, is to afford a safe and easy communication between floors at different levels. To make the communication easy the ” rise ” and width (or ” tread “) of the steps should be regular and suitably proportioned to each other with convenient landings; there should be no winding steps, and the rail which is fixed to render the use of the staircase safe should be strongly fixed with its top at a convenient height for the hand.

The first person that attempted to fix the relation between the height and width of a step upon correct principles was, we believe, Blondel, in his Cours d ‘architecture. His formula is applicable to very large buildings but not to ordinary dwellings. Ashpitel.who investigated the subject at length (in Handrails and Staircases), gives the following rules for different proportions of treads and I risers: —

Width of tread

Height of rise

in inches.

in inches.

12

5f

ui

5f

11

6

10 J

6i

10

*6**

9i

61

9

7. .

These dimensions give angles of ascent varying from 24° to 37°. The projection of the nosings is not reckoned in the width of the treads and must be added to determine the full width of the treads. It will be seen upon examination that these proportions may be expressed in the following simple formula : 23 = twice the rise in inches + the tread in inches. An American rule is to make the sum of the rise and tread equal to 17 or 175 in.

The forms of staircases are various, ihe simplest being a straight flight, which type should only be used to a low storey. In towns, where space cannot be allowed for convenient forms, they are often made angular, circular or elliptical, with winding steps, or are constructed of composite form partly straight and partly circular. In large buildings, where convenience and beauty are the chief objects of attention, winding steps are seldom introduced when it is possible to avoid them. Well-designed stairs should be planned as simply as possible to afford easy and convenient access to the higher level. The staircase must be placed in a position easy of approach, and convenient for both the lower and upper apartments. It must be well ventilated and lighted — the absence of sufficient light may prove the cause of serious accidents. At no part should the head room (that is, the height between the level of a tread and that portion of the structure immediately above it) be less than 7 ft. Straight flights should be composed of not less than four and not more than twelve steps. If it is desired to continue more than this number of steps in a straight line, a landing equal in length at least to the width of the stairs should be provided before starting up the next flight. Winders should be avoided if possible, but should they be found necessary it is advisable to put them at the bottom of a flight rather than at the top, the reason being that should they be the cause of an accident the unfortunate individual will not have far to fall.

Besides the straight flight of stairs, stairs may be designed in almost numberless different ways to suit the position which they are to' occupy or with a view to architectural effect, but whatever position or form they are made to take their chief purpose of provid- ing convenient and easy access to a higher level must be steadily borne in mind. Some of the most ordinary forms from which staircases of a more ambitious character are elaborated are the dog-legged or newel stair, open newel stair, geometrical stair, circular newel stairs (see fig. 1).

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Fig. i.

The newel or dog-legged stair is so termed from its supposed resemblance to a dog's hind leg. In this form the staircase is divided in width into two equal parts and the outer string of the upper return

of the stairs rises in a vertical plane immediately above that of the lower flight. There is therefore no well-hole in this form of construction (see fig. 4, plan and section).

Open newel stairs, as in the previous example, have newels placed at the angles, but are so arranged as to enclose a well. This is more convenient for the distribution of light than the dog-legged stairs, especially when the lighting is effected by means of a lantern sky-light placed at the top of the staircase.

Geometrical flairs usually enclose a well, which may vary very much in size and shape from merely a narrow slit between the flights to a square opening admitting of ample ventilation and lighting. This form has continuous strings and handrail, and may be rectangu- lar, circular or elliptical in plan, although it is especially adapted for the curved forms and most satisfactory when so treated. Such stairs are more difficult to construct than the newel stairs already mentioned and lack their strength, as in the absence of the strong framed newel posts the handrail depends for support entirely upon the balusters, which must therefore be very securely fastened to the treads. When wood balusters for the most part are used bars of iron are often introduced at intervals to afford additional stiffness. Circular geometrical stairs are built on a circular plan around a well. Each step is necessarily a winder radiating from the outer string to the wall string. If in wood they must be very carefully framed, especially if the well-hole is small, owing to the difficulty of intro- ducing proper carriages for support, and the number of pieces of which the work must be built up on account of its curvature. This type of stairs is more suitable for building in stone, and in this case support is obtained by pinning the end of the stone step well into the wall and supporting each step upon the one below. The balusters and handrail also, in the case of stone, are much more firmly fixed by the former, which are usually of iron, being let into mortices in the tread or end of the step and run in with molten lead and caulked to secure a firm fixing.

Solid newel or spiral stairs are circular or polygonal on plan and built around a central pillar or newel, which may be square, poly- gonal or circular in section. This also is a form of stair-building especially suitable for erection in stone, the central newel being formed on the step itself, and the other end well pinned into the masonry of the wall. Each succeeding step should be dowelled at the newel to the one below and should lap for a matter of two or three inches at least for its entire length over the one below and in this way obtain extra support.

The newel stair was at its best in Elizabethan and later Renais- sance times. The older form of staircase with circular newel and narrow winding steps was found ill adapted to the altered conditions when convenience and elegance were becoming more sought after. The designers of this period found in the open newel stair a construc- tion capable of being developed into a dignified and beautiful feature of domestic architecture, and they certainly brought out its possibilities in a remarkable manner. This is evidenced by the many fine examples, handed down to us by the architects of the Tudor period, to be found in the great mansions which date back to the time of the early Renaissance. Steps were arranged in broad short flights with wide treads and easy rise. Landings were freely used, and in many cases were large enough to be used as galleries for the display of pictures. The work was generally solidly executed in oak, and carved and moulded decoration was lavished upon every detail. The newels, much enriched, were frequently carried up to the ceiling and formed a portion of the arcading which was often a prominent feature around the well. In the period of the later Renaissance the newel principle of construction was still retained and the main features were the same, but they were planned with longer flights and the manner of decoration partook of a more severely classic nature. One of the first examples is that of the Chateau de Blois, and of modern treatment that of the Grand Opera House, Paris. In the period of the Georgian era the geometrical staircase was much "favoured and very generally used in domestic buildings. Although more difficult to build it must be admitted that this type of stair is not so satisfactory in a number of ways as the newel form. With its continuous curving strings and handrail it has a certain elegance of its own, but in principle of construction it is not so good, nor can it compete with the open newel stair in regard to the ease with which the latter lends itself to schemes of artistic decoration. As before remarked, however, it is well adapted for stairs circular and elliptical in plan.

Experience has proved concrete to have fire-resisting properties of the most effective character, and it does not possess the propensi- ties for splitting and flying under the action of heat that belong to stone. Steel or iron is often employed as an additional support for stone and concrete stairs. In the case of concrete work iron bars are fre- quently embedded in the steps for their full length, and are in this way hidden from sight while at the same time serving the pur- poses of support. When a more ornate appearance Fig. 2. is desired than is obtained

by the use of plain concrete the steps may be encased in other material to secure a richer effect. Marbles, tiles and mosaic are the

principal materials used for this

Concrete and Stone Stairs.

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STAIRCASE

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purpose. Stairs of fine concrete to which is given the name of artificial stone ” have largely superseded those constructed of genuine stone. It is very strong and capable of being further forti- fied by the introduction of steel core bars without detriment to its appearance; it is consistent in quality and special shapes are readily moulded ; it is very hard-wearing, especially when the aggregate” consists of a hard nature such as granite chippings. The stairs are built by pinning each step in the wall either at one or at both ends. In the first case they are termed cantilever or hanging steps, and it is advisable to use steel reinforcement and pin

the end of the step at least 9 in. lfiMm& into the wall. When fixed at H both ends the pinning need not be so deep, and unless the stairs are very wide the steel core may be omitted. The steps are either ™. rectangular or spandrel-shaped

I ?jjfl ln sec tion (figs. 2 and 3); the

‘rtj — I former are stronger and easier

— L 1 to fix than the latter, which,

however, give a better appear- ance and can be finished with a plain

smooth soffitt. Iron balus- ters are generally used for stone and concrete staircases, and are fitted with lug terminations which are let into dovetailed mortices formed in the top or side of the stair tread and held fast by molten lead, neat Portland cement, or a mixture of sulphur and sand.

The construction of wood staircases forms a special branch of

the joinery craft, and many books have been written on the subject.

Numerous methods of setting out the handrails have

Htf S h been put forward by different authors, among them

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Fig. 3.

being the tangent system, which gives excellent results

and Hand-

ra ° s ‘ at perhaps the smallest cost compatible with good work. It is noteworthy that the common practice in England with regard to wood stairs is to frame and form the finished work in the workshop and fix it bodily in the position it has to occupy. In America, especially in the eastern states, the finished staircase is built up piece by piece upon a rough framework which has been used by the workmen during the erection of the carcase of the building. In many instances the strings consist of easings and panellings nailed upon .the rough skeleton work.

Stairs are built in many kinds of materials, such as wood, stone, concrete, iron and brick. Often two or more kinds of materials are used in the same staircase, as when constructions of concrete or stone are reinforced with iron or steel. It is common also to fit to a staircase handrails, balusters and newels of a different nature from the steps themselves. The spandrel or triangular-shaped 6pace between a flight of stairs and the floor is frequently enclosed with wood-panelled framing and fitted with a door so that it may be made use of for cupboard accommodation.

There are a number of technical terms connected with staircases which require some explanation to enable the drawings to be easily

understood: —

Staircase. — This comprises the whole of the stair construction and is the name given to the space or enclosure which contains the stairs.

Well-hole, the open space enclosed by the stairs. Flight, a continuous series of steps between two landings. Landing, a platform forming a kind of halting-place between two flights of stairs. A quarter-space landing forms a space, usually a rectangle, equal in width and length to the breadth of the two flights which it separates. A half-space landing extends the total width of the staircase.

Flier. — Fliers are steps that have the nosings of the treads parallel one to another.

Winder. — This is an angular-shaped step. A winder fitted into a wall angle is often termed a kite winder, from the fact that it resembles a kite. In planning stairs the width of the winder tread at a distance of 18 or 20 in. from the handrail should equal the width of a flier.

Curtail Step. — This may be either a flier or a winder. One or both ends of the step are projected to form a base for the newel and are shaped to a scroll which often follows the line of the curve terminating the handrail. It is usually the step or steps at the base of a staircase that are formed in this way.

Bidl-ncsed step, one having a blunt rounded end. It may be shaped to a quarter or half circle.

Dancing Stairs. — The introduction of winders in geometrical staircases brings about awkward complications in the curve of the handrail and strings, for the width of the winding steps at the handrail being much less than that of the fliers, while at the same time the rise is necessarily equal, causes an unsightly knee in the handrail and in the strings. To obviate this the whole of the steps are made to dance, that is, they are all shaped as winders in order to divide the going equally between them and thus obtain a regular slope for the strings and handrail. Often the first and last three or four steps of a flight are made ordinary fliers. In a polygonal or elliptical staircase the whole of the flight is constructed in this way so as to

obtain a regular sweep up from the bottom to the top step. Each step may be divided into several different parts such as the tread, the riser and the nosing. The tread is the horizontal upper surface of the step which supports the foot when ascending or descending the stairs.

The riser is the upright member of a step which supports the tread. It fills in the vertical space between the nosing of one tread and the back edge of the one below. The edge of the tread usually projects some little distance beyond the face of the riser and is formed into a rounded or moulded nosing. Stone stairs and those of concrete usually have each step formed separately in a solid piece of stone of square or triangular section, and these are fixed in position by being pinned into the wall at one or both ends with each step resting upon the back edge of the one below. Stairs of costly marble are frequently built up in a manner somewhat similar to that adopted for wood construction.

Rise, the vertical distance between the surface of one tread and that of the next.

Going, the horizontal measurement between two adjacent risers. In America this is termed the run.

Newels, strong posts occurring at intervals in a newel staircase. They are placed at the ends of flights where junction is made to landings, at turnings, and at the top and bottom of the staircase. They should be strongly framed in the stair construction, and have the string and handrail housed into them. Newels are sometimes of iron, and in large stone staircases of stone. They are sometimes of elaborate form and often designed as a pedestal carrying a lamp or statuette, or they may be carried up to form part of some orna- mental framing around the staircase. In America the newel is the main post where the stairs begin, and the remainder of the posts used in the framing are termed angle posts.

Handrail. — This is a rail commonly of hard wood which runs up at the same slope as the stairs at a height above the nosing line of about 2 ft. 8 in. (that is 3 ft. minus half a rise) to the upper surface of the rail. On the level, such as on landings, it is usually fixed 3 ft. above the surface. These are the heights at which a handrail is found to give most assistance to persons going up or down stairs. Handrails are made in other materials such as iron and bronze. A handrail is generally upheld by balusters, which are vertical bars or posts filling in the space between the handrail and the string or the treads. They are made in many shapes and in many different materials such as wood, iron, bronze, stone and marble. Sometimes in the place of balusters the space usually occupied by them is filled in with scrollwork of wrought or cast iron or bronze, or with panels of wood perforated, perhaps, and richly carved.

Core-rail. — An iron band is frequently used in geometrical stairs to give extra strength and stiffness to the handrail. It is generally about i in. thick, being screwed into a groove formed in the under- side of the handrail. It is especially necessary for the curved portions of the handrail, where the grain of the wood is often cut across.

String. — Strings are the members that carry the treads and risers which in wood stairs are housed into them or else fitted into notches cut in the strings to receive them. In the former case the supporting member is termed a close string, but if notched out for the steps it is known as a cut string (see details, fig. 4). A cut and mitred string is similar to this last, but has the vertical cut of each notch splayed and the riser is mitred to it so as not to show the joint. Strings are either wall strings or outer strings ; the former are fixed against the wall, the latter run up from newel to newel or in geometrical stairs ramp and curve according to the nosing line. Rough strings or rough carriages are placed between the inner and outer strings to afford additional support to the treads and risers, and rough brackets about I in. thick are fitted into the steps and spiked to the carriages.

Ramp. — This is a concave curve formed in one plane when changing the direction of the handrail or string. In America it is known as an easing.

Knee. — This is a convex curve in one direction. When used in conjunction with a ramp it forms a swan-neck, which is a combination of ramp and knee.

Wreathe— This is a curve formed both horizontally and vertically in the handrail or string. It is often necessary in geometrical stairs where a change of direction takes place.

Although more in the nature of a mechanical lift or elevator than a stair, moving stairways may perhaps find a place in this article owing to their resemblance and to the fact that their object is to convey the passenger quickly and easily moving to a higher level without the necessity of a tedious aes ‘

climb up stairs, or of a wait such as is often entailed with a vertical lift. The contrivance consists of an endless inclined platform formed of links bolted together, which allow it to travel round wheels fixed at the top and bottom of the stairway and hidden within its framing. This is kept in continual motion by mechanical means, usually by an electric motor, which causes it to travel at the rate of about 100 ft. a minute. The handrail also moves at the same rate, so that a

passenger merely steps on to the lower portion of the stair, places his hand upon the handrail, and is carried swiftly and safely up to the next floor, where he is deposited without any effort on his part. The process of stepping on and getting off the stairway is amazingly simple and without any element of danger

to the passenger. For high buildings, underground railways and similar positions, a spiral form is used which winds round in a circular shaft to the highest level and returns in the opposite direction in a similar manner, taking up and setting down passengers as it revolves. Although this type of elevator is probably not so rapid as the vertical lift working in a straight line to the point it is desired to reach, its great advantage is that it does away with the waiting which often causes so much annoyance with ordinary lifts.

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Fig. 4.

The by-laws of the London County Council contain many stipulations regulating the construction of staircases, and these are summar- , ized below. In every public or other building of more than

w ‘ 125,000 cub. ft. constructed to be used as a dwelling for

separate families the floors of lobbies, corridors, passages, landings, and also the flights of stairs, shall be of fire-resisting materials. The principal staircase of every dwelling-house shall be ventilated by means of a window or skylight opening directly into the external air. In buildings occupied in separate tenements by more than two families the common staircase shall be ventilated upon each storey above the ground storey by windows or skylights, or otherwise adequately ventilated. Staircases in churches, chapels, public halls, lecture rooms, exhibition rooms and buildings for similar purposes are subject to the following conditions: Stairs shall be supported and enclosed by brick walls at least 9 in. thick. The treads of each flight shall be of uniform width, and stairs, corridors or passages shall be 4 ft. 6 in. wide unless the building is for the accommodation of less than two hundred persons, when it may be 3 ft. 6 in. wide. If for more than four hundred persons the width must increase by 6 in. for each additional hundred persons up to a maximum of 9 ft. Staircases 6 ft. wide and upwards shall be divided by a hand- rail. Two staircases may be substituted for one large one, each to be two-thirds the width required for the single stair, but not less than 3 ft. 6 in. Accommodation upon different levels must be pro- vided with separate stairs leading directly to the street or open. Exit doors must open outwards. Under the theatre regulations dated 1892 the same widths hold good, but the minimum width is increased to 4 ft. 6 in. Every staircase for the use of the audience shall have solid square section steps of approved stone or concrete with treads of uniform width not less than 11 in. wide or rise greater than 6 in. Winders are prohibited, and the flights must have not more than twelve steps nor less than three steps each. Both ends of each step shall be pinned into the wall. The several flights shall be supported and enclosed on all sides by brick walls not less than 9 in. thick carried down to the level of the footings. Not more than two flights of twelve steps each shall be constructed without a turn. Landings to be 6 in. thick, square on plan and supported under the middle by 9 in. brick arches. A

continuous handrail supported on strong metal brackets to be fixed on both sides of steps and land-

ings, and if possible chased into the wall to avoid projection. The roof over the staircase shall be of fire-resisting materials. Separate exits are required for different parts of the theatre or hall.

The Factory and Workshop Act 1901 contains somewhat similar conditions, but in this case the staircases communicate with each floor and the roof. The minimum width of tread shall be 10 in. and the maximum rise 75 in. Steps of spandrel section may be used having a thickness of 3 in. at the smallest part for staircases 3 ft. 6 in. wide, and not less than 4J in. thick for staircases 4 ft. 6 in. wide. External fire escape stairs must be constructed with dead bearings and without cantilever work. They must comply with the requirements for enclosed staircases as regards width, going, width of treads, height of risers, doors, handrails, &c. They must deliver at the ground-level into a public way or some large space. Where in general use the treads must be of non-slippery material as distinguished from perforated iron or chequered iron plates.

The second schedule of the London Building Act 1894 sets forth the materials that are deemed fire-resist- ing under the act, and specific in the case of staircases " oak or teak or other hard timber with treads and risers not less than 2 in. thick."

The law regulating the construction of buildings in the city of New York provides that " stairways serving for the exit of fifty people must, if straight, be at least 4 ft. wide between railings or between walls, and if curved or winding 5 ft. wide, and for every additional fifty people to be accommodated 6 in. must be added to their width. In no case shall the risers of any stairs exceed 7 J in. in height, nor shall the treads exclusive of nosings be less than ioj in. wide in straight stairs. In circular or winding stairs the width of the tread at the narrowest end shall not be less than 7 in."

Authorities. — The principal works of reference on this subject are J. Riddell, Carpenter, Joiner, Stair- builder and Handrailer; W. H. Wood, Stair Building and Handrailing; J. H. Monckton, Stair Building in its Various Forms; J. Newland, Carpenter and Joiner's Assistant; G. L. Sutcliffe, Modern Carpenter, Joiner and Cabinetmaker; W. Mowat, Handrailing and Stair Building; W. R. Purchase, Practical Masonry; F. E. Kidder, Building Construction and Superintendence, pt.ii. (J- Bt.)

STALACTITES (Gr. o-rdXaKTos, from craXacceiv, to drip), pendent masses formed where water con- taining mineral solutions drops very slowly from an elevation. They are seen, for example, beneath bridges, arches and old buildings as water per- colating through the joints of the masonry has dissolved very small quantities of the lime present in the cement and mortar between the stones. On exposure to the air part of the water evaporates and the solution of carbonate of lime becomes supersaturated; a deposit of this substance ensues and as the drop continues to fall from the same spot a small column of white calcite very slowly grows downwards in a vertical direc- tion from the roof of the arch. In a very similar manner stalactites of ice are produced in frosty weather as the water dropping from eaves of buildings, beams, branches of trees, &c, very gradually freezes. Other minerals than ice and calcite often occur in stalactitic growths. Thus we find in mines and in the cavities of mineral veins stalactites of limonite, fluorspar, opal, chalcedony and gibbsite. These stalactites are never of great size, usually not more than 2 or 3 in. in length, and probably the method of origin is exactly the same as that of the larger and more common stalactites of ice and of calcite.

The conditions essential to the perfect development of stalac- tites appear to be (1) a very slow trickle of water from a fissure; (2) regular evaporation; (3) absence of disturbance, such as currents of air. If the discharge of water is fast, irregular encrustations may be produced, or the precipitate of solid matter may be entirely washed away by the mechanical force of the currents. Changes of temperature will interfere with evapora- tion, sometimes accelerating and sometimes retarding it, and the stalactites tend under such circumstances to stop growth or to develop irregularities and excrescences. Currents of wind produce the same effect. For these reasons ice stalactites form most readily on calm cold nights, and stalactites of ice or calcite are seen in greatest perfection in the interior of caves,

where the sun's light does not penetrate, the temperature is steady, and there are no strong currents of air.

In all limestone caves stalactites form in great abundance as glimmering white columns covered with a thin film of water. The great caves, such as those of Adelsberg (in Styria), Jenolan (Australia), the Mammoth Cave (Kentucky), the Causses district in

France, and the grottos of Belgium, are divided into chambers which are richly festooned with stalactites, and fanciful names are given to various groups according to their similarity to different objects, natural or artificial. Ice caves of considerable size occur in the Arctic and Antarctic regions, and are draped with ice stalactites often wonderfully like those of limestone caves.

Where the water drops upon the floor of one of these caves evaporation still goes on and an encrustation forms which may cover the whole surface as an irregular sheet. If the air be perfectly still, however, the drop which falls from a stalactite on the roof will always land on the same place and a pillar of deposit will rise vertically, till in course of time it meets and joins with the stalactite above. In this way a column is pro- duced, which sometimes has a graceful form with a long straight shaft expanding somewhat at its upper and lower extremities. As the stalactites thicken by deposit of layer upon layer of carbonate of lime, they rarely continue to be cylindrical but assume tapering forms with irregular surfaces. They seldom branch, but sometimes they give off excrescences which may curve upwards or downwards and occasionally long thin stalac- tites take their rise from these and grow downwards parallel to the main stalactite. Large stalactites may be three or four feet thick, but in that case they have usually formed by the coalescence of adjacent ones which enlarged fill they met and were then covered with a continuous layer of deposit. Single stalactites 2 ft. in diameter are not rare. It is known that they are of very slow growth, and much speculation has gone on regarding the length of time required for the formation of some of the largest stalactites. From data obtained by measurement of the rate of growth at the present day it has been estimated that as much as two hundred thousand years may have elapsed since certain thick stalactites began to grow. We know that many caves are of great antiquity from the fossil remains they contain, but these estimates are probably ill- founded, seeing that there is no certainty that the conditions have remained the same during the whole period of growth. Sir Archibald Geikie records that stalactites 15 in. in diameter had formed beneath a bridge in Edinburgh which was a hundred years old; in caves, however, the rate of formation is rarely so great as this. Inscriptions on stalactites in the Adelsberg cave after thirty years had been covered with a scarcely perceptible film of new deposit. In one of the Moravian caves a stalactite, about as thick as a goose quill, was broken across in 1880 and in 1891 it had grown three or four centimetres; from careful observations it has been calculated that one of these stalactites, 7 ft. long, may have been formed in 4000 years. The

stalagmitic crust on the floor of caves is usually mixed with blocks which have fallen from the roof, sand, mud and gravel carried in by floods, and the bones of animals and men which have inhabited the cave if it had an accessible entrance. Its formation must have been interrupted by many changes in the physical conditions of the district, and consequently it often occurs in layers which alternate with beds of a different character.

Some particulars regarding the internal structure and growth of stalactites have been ascertained by Professor W. Rinz of Brussels. The first stage of every stalactite is a low circular ring of deposit on the roof of the cave. The diameter of this ring corresponds to the breadth of a drop of water which is so large that it is on the point of falling. At the outer surface of the drop evaporation goes on and supersaturation results in the deposit of a thin ring-shaped band. At the centre of the drop no deposition takes place, and as this goes on after some time a short tube is produced ; the width of this tube is about 5 millimetres and is fairly constant. The tube very slowly lengthens as deposit gathers at its lower end: water is constantly dropping from it and its interior is always full. Very little material is deposited except at the orifice — hence in many caves long straight

tubular stalactites can be seen not much more than a quarter of an inch wide, and with delicate thin walls. A little water, however, makes its way from the interior to the outside of the tube and is exposed to evaporation there, consequently the tube walls gradually grow thicker. The end of a simple tubular stalactite of this type has small sharp teeth or points which are the corners of crystals. These have the rhombohedral faces of calcite, and are usually of a simple description: their corresponding faces are parallel, and an examination of the material of the tube proves that the whole mass has the same crystalline structure. We may, in fact, describe these stalactites as rounded, tubular crystals continuously growing but provided with crystalline facets only at their lower ends. Small lateral passages sometimes allow the water to escape from the interior of the tube and their apertures become surrounded with lime deposits. In this way horns, twigs and branches arise, often curving upwards or downwards; they are always provided with a central tubule which may be a mere capillary. The substance of these offshoots is in crystalline continuity with that of the main stalactite, and the whole mass has a uniform optical orientation. In the majority of cases the long axis of the stalactite corresponds to the optic axis of the calcite crystal, but in one group of stalactites these two make an angle of 15 with one another. An interruption in the supply of water or an accidental fracture of the stalactite induce

abnormal growth. The end of the tube becomes obstructed or completely closed, and nodular or tuberculate growths are often the result. If the outer surface dries the next layer which is laid down may often be readily detached, as it is not firmly united with the underlying material. In any case a second stage of growth ultimately arrives, when the central tube is no longer the chief conduit but a general drip of water from the roof bathes the whole outer surface of the stalactite. Then small, flat crystals of calcite appear with their basal planes directed outwards. These increase in number till they cover the whole mass, and as they grow outwards they develop into prisms whose axes are directed radially. In very old spherulites the initial tube is covered with a great thickness of radiating calcite crystals deposited from the mineral solutions which trickle down along the external surface. When they are cut across they show concentric rings, some of which are due to stains of iron or manganese oxides or insoluble materials brought down by the water; others are lines of cavities produced by interrupted or irregular crystallization. They resemble the rings of the wood of trees, but probably do not depend on seasonal changes but on purely accidental factors, so that they afford no clue to the rate of growth.

Stalactites also occur in the interior of lava caves in the Sandwich Isles, Samoa, &c. Often the upper surface of a lava flow has cooled to form a crust, while the interior is still perfectly fluid, and it sometimes happens that the liquid basalt has made its escape, leaving great cavities below the hollow roof of the lava. The interior of these caves is covered with a black shining film of glassy basalt, and black stalactites of lava hang down- wards. Their surface is sometimes changed to brown or red by the oxidizing action of the acid vapours which occupied the cave after the lava retired. These stalactites are tubular, with bluntly rounded ends, and probably their mode of growth is somewhat analogous to that of ice-stalactites. In microscopic section they prove to be glassy with small crystals of olivine and augite; in this they differ from the ice and calcite stalactites which are crystalline throughout.

STALL (O. Eng. steall, stael, cf. Du. stal, Ger. and Swed. Stall, a common Teutonic word for a place, station, place for standing in; the root is the Indo-European sta-, to stand, seen also in Latin stabulum, Greek cradfios, and in stallion, an entire horse, properly one kept in a stall and not worked), a word which means literally a place where one may stand, and so is applied to a separate division in a stable, shed, &c, in which a single horse, cow or other domestic animal may be kept, to a separate booth, bench or table in a market or other building, or in the street, on which goods are exposed for

sale by the person owning or licensed to use the same, and in England to the higher-priced seats on the ground floor of a theatre. The word is more particularly applied to a special form of seat in an ecclesiastical building. In cathedrals, monastic churches and the larger parish churches the stalls are fixed seats enclosed at the back and separated at the sides by high project- ing arms, and placed in one or more rows on the north and south sides of the choir or chancel, running from the sanctuary to the screen or chancel arch. These separate enclosed seats are properly reserved for the clergy, and more usually the choir are seated in open benches in front of the stalls. In a cathedral the canons and prebendaries have each a stall assigned to them.

In the chapels of the various knightly orders the stalls are assigned to the members of the order, thus, in St. George's Chapel, Windsor, are the stalls of the Knights of the Garter, in Henry VII. 's Chapel in Westminster Abbey are those of the Knights of the Bath, adorned with the stall plates emblazoned with the arms of the knight occupying the stall, above which is suspended his banner.

Architecturally and artistically considered, the stalls of a cathedral or church are a marked feature of the interior adorn- ment. They are richly carved, and are frequently surmounted by canopies of tabernacle work. The seats generally can be folded back so as to allow the occupant to stand upright or kneel; beneath the seat, especially in monastic churches, is fixed a small bracket, a miserere (q.v.), which affords a slight rest for the person while standing. Among beautiful specimens of carved stalls may be mentioned the Early Decorated stalls in Winchester Cathedral, the Early Perpendicular ones in Lincoln Minster, and the early 1 5th-century canopies in Norwich Cathedral. The stalls, especially the towering corner-stalls with their ornate carving filled with figures, in Amiens Cathedral are very fine; they date from 1508-1520.

STALLBAUM, JOHANN GOTTFRIED (1793-1861), German classical scholar, was born at Zaasch, near Delitzsch in Saxony, on the 25th of September 1793. From 1820 until his death on the 24th of January 1861 Stallbaum was connected with the Thomasschule at Leipzig, from 1835 as rector. In 1840 he was also appointed extraordinary professor in the university. His reputation rests upon his work on Plato, of which he published two complete editions: the

one (182 1- 182 5) a revised text with critical apparatus, the other (1827-1860) containing exhaustive prolegomena and commentary written in excellent Latin, a fundamental contribution to Platonic exegesis. A separate edition of the Parmenides (1839), with the commentary of Proclus, deserves mention. Stallbaum also edited the com- mentaries of Eustathius on the Iliad and Odyssey, and the Grammaticae latinae institutiones of Thomas Ruddiman.

See C. H. Lipsius in the Osterprogramm of the Thomasschule (1861) ; R. Hoche in Allgemeine deutsche Biographie, vol. xxxv.

STALYBRIDGE, a municipal and parliamentary borough of Cheshire, England; the parliamentary borough extending into Lancashire. Pop. (1901), 27,673. It lies on the river Tame, in a hilly district, 6 m. E. of Manchester, and is served by the London & North-Western, Great Central, and Lancashire & Yorkshire railways. Immediately to the west lie the towns of Dukinfield, and across the river in Lancashire, Ashton-under- Lyne; while 2 m. south of Stalybridge is the town of Hyde. The whole district is thus very densely populated. ' Stalybridge is one of the oldest seats of the cotton manufacture in this locality, the first cotton mill having been erected in 1776, and the first steam engine in 1795. There are also machine works, nail works, paper mills, and iron and brass foundries. The development of the town is modern, as it was created a market town in 1828, incorporated in 1857, and created a parliamentary borough, returning one member, in 1867. It is under a mayor, 7 aldermen and 22 councillors. Area, 3130 acres.

STAMBOLOV, STEFAN (1854-1895), Bulgarian statesman, was born on the 31st of January 1854 at Trnovo, the ancient Bulgarian capital, where his father kept a small inii. Under Turkish rule it was impossible to obtain a liberal education in Bulgaria, and young Stambolov, after attending the communal school in his native town, was apprenticed to a tailor. During the politico-religious agitation which preceded the establish- ment of the Bulgarian exarchate in 1870, a number of Bulgarian youths were sent to Russia to be educated at the expense of the Imperial government; among them was Stambolov, who was entered at the seminary of Odessa in order to prepare for the priesthood. His wayward and independent nature, however, rebelled against the discipline of school life; he was expelled from the seminary on the ground of his association with Nihilists, and, making his way to Rumania, he entered into close relations with the Bulgarian revolutionary committees at Bucharest, Giurgevo and Galatz. In 1875, though only twenty years of

age, he led an insurrectionary movement at Nova Zagora in Bulgaria, and in the following year organized another rising at Orekhovitza. In the autumn of 1876 he took part as a volunteer in the Servian campaign against Turkey, and subsequently joined the Bulgarian irregular contingent with the Russian army in the war of 1877-78. After the signature of the Berlin Treaty in 1878 Stambolov settled at Trnovo, where he set up as a lawyer, and was soon elected deputy for his native town in the Sobranye. His force of character, his undoubted patriotism, his brilliant eloquence, and his disinclination to accept office — a rare charac- teristic in a Bulgarian politician — combined to render him one of the most influential men in Bulgaria. The overthrow of the Zankoff ministry in 1884 was largely due to his influence, and in that year he was nominated to the presidency of the Sobranye. He held this important office for the next two years, a critical period in the national history. The revolution of Philippopolis, which brought about the union of Bulgaria with eastern Rumelia, took place on the 18th of September 1885, and it was largely owing to Stambolov's advice that Prince Alexander decided to identify himself with the movement. The war with Servia followed, and Stambolov, notwithstanding his official position, served as an ordinary soldier in the Bulgarian army. After the abduction of Prince Alexander by a band of military con- spirators (Aug. 21, 1886) Stambolov, who was then at Trnovo, acted with characteristic promptitude and courage. In his capacity as president of the Sobranye he established a loyal government at Trnovo, issued a manifesto to the nation, nomi- nated his brother-in-law, General Mutkurov, commander-in- chief of the army, and invited the prince to return to Bulgaria. The consequence of these measures was the downfall of the provisional government set up by the Russophil party at Sofia. On the abdication of Prince Alexander (Sept. 8) Stambolov became head of a council of regency, with Mutkurov and Karavelov as his colleagues; the latter, however, soon made way for Jivkov, a friend and fellow townsman of the first regent. Invested with supreme power at this perilous juncture, Stambolov displayed all the qualities of an able diplomatist and an energetic ruler. He succeeded: in frustrating the mission of General Kaulbars, whom the Tsar despatched as special commissioner to Bulgaria; in suppressing a rising organized by Nabokov, a Russian officer, at Burgas; in quelling military revolts at Silistra and Rustchuk; in holding elections for the Grand Sobranye, despite the interdict of Russia, and in securing eventually the election of Prince Ferdinand of Coburg to the vacant throne (July 7> 1887). Under the newly-elected ruler he became prime minister and minister of the interior, and continued in office for nearly seven years (see

*Bulgaria). The aim of his foreign policy was to obtain the recognition of Prince Ferdinand, and to win the support of the Triple Alliance and Great Britain against Russian interference in Bulgaria. In his dealings with Turkey, the suzerain power, he displayed considerable acuteness; he gained the confidence of the Sultan, whom he flattered and occasionally menaced; and aided by the ambassadors of the friendly powers, he succeeded in obtaining on two occasions important concessions for the Bulgarian episcopate in Macedonia (see Macedonia), while securing the tacit sanction of the Porte for the technically illegal situation in the principality. With the assistance of Austria-Hungary and Great Britain he negotiated large foreign loans which enabled him to develop the military strength of Bulgaria. Under Prince Ferdinand he pursued the same despotic methods of government which had characterized his administration during the regency; Major Panitza, who had organized a revolutionary conspiracy, was tried by court-martial and shot at Sofia in 1890; four of his political opponents were hanged at Sofia in the following year, and Karavelov was sen- tenced to five years' imprisonment. His tyrannical disposition was increased by the assassination of his colleague, Beltchev, in 1891, and of Dr Vlkovitch, the Bulgarian representative at Constantinople, in 1892, and eventually proved intolerable to Prince Ferdinand, who compelled him to resign in May 1894. He was now exposed to the vengeance of his enemies, and sub- jected *o. various indignities lid persecutions; he was refused*

permission to leave the country, and his property was confiscated. On the 15th of July 1895 he was attacked and barbarously muti- lated by a band of Macedonian assassins in the streets of Sofia, and succumbed to his injuries three days later. His funeral, which was attended by the representatives of the powers at Sofia, was interrupted by disgraceful riots, and an effort was made to perpetrate an outrage on his remains. No attempt was made to arrest his murderers; two persons were, however, arraigned for the crime in 1806, and subjected to almost nominal penalties.

(J. D. B.)

STAMFORD, HENRY GREY, ist Earl of (c. 1599-1673), eldest son of Sir John Grey, succeeded his grandfather, Henry Grey as Baron Grey of Groby in July 1614. He married Anne, daughter of William Cecil,

2nd earl of Exeter, the heiress of the borough and manor of Stamford, and in March 1628 was created earl of Stamford. Just before the outbreak of the Civil War he ranged himself definitely among the king's opponents, and was made lord-lieutenant of Leicestershire. After some operations around Leicester he occupied Hereford, and, when compelled to abandon the city, marched into Cornwall. At Stratton, in May 1643, his troops were beaten by the Royalists; driven into Exeter, Stamford was forced to surrender this city after a siege of three months. The earl, who was certainly no general, was charged with cowardice, and took no further part in the military operations of the war, although once or twice he was employed on other business. The ravages of the Royalists had reduced him to poverty, and, distrusted by the House of Commons, he had great difficulty in getting any compensation from parliament. After a period of retirement Stamford declared for Charles II. during a rising in August 1659, and was arrested, but was soon released. He died on the 21st of August 1673. One of his sons was Anchitell Grey (d. 1702), the compiler of the Debates of the House of Commons, 1667-1694 (10 vols. 1769). His eldest son, Thomas, Lord Grey of Groby (c. 1623-1657), was member of parliament for Leicester during the Long Parliament, and an active member of the parliamentary party. In January 1643 he was appointed commander-in-chief of the forces of the parliament in the midland counties and governor of Leicester. In 1648 he won some credit for his share in the pursuit and capture of the duke of Hamilton; he assisted Colonel Pride to " purge " the House of Commons later in the same year; and he was a member of the court which tried the king, whose death- warrant he signed. A member of the council of state under the Commonwealth, Grey fought against the Scots in 1651, and in February 1655 he was arrested on suspicion of conspiring against Cromwell. He was, however, soon released, but he predeceased his father in April or May 1657.

Thomas (c. 1654-1720), only son of the last named, succeeded his grandfather as 2nd earl of Stamford. He took some part in resisting the arbitrary actions of Charles II., and was arrested in July 1685; then after his release he took up arms on behalf of William of Orange, after whose accession to the throne he was made a privy councillor and lord-lieutenant of Devonshire. In 1697 he became chancellor of the duchy of Lancaster, and in 1699 president of the board of trade, being dismissed from his office on the accession of Anne in 1702. From 1707 to 1711, however, he was again president of the board of trade. On his death without children on the 31st of January 1720 his titles passed to his cousin Henry (d. 1739), a

grandson of the first earl, from whom the later earls were descended.

STAMFORD, a city of Fairfield county, Connecticut, U.S.A., in a township of the same name, in the south-western part of the state, on Long Island Sound, 335 m. (by rail) N.E. of New York City. Pop. of the city (1900), 15,997, of whom 4078 were foreign-born; (1910, census) 25,138; of the township, including the city (1900), 18,839; i 1 ˆ): 28,836. The city is served by the New York, New Haven & Hartford railway (which has other stations in the township at Glenbrook, Springdale and Talmadge Hill), by electric railway to Darien, Greenwich, &c, and by two lines of steamboats to New York City and ports on the Sound. The city is pleasantly situated with the Rippowam river flowing through it, the Mianus river on the west and the

Noroton on the east. It is the place of residence of many New York business men. Among its institutions are the Ferguson Library (1882; with 16,000 volumes in 1909), several private schools, a Y.M.C.A., the Stamford Hospital (private, 1893), two private sanatoria, the Convent of our Lady of Lourdes, St John's Church House, a day nursery (1902), with dispensary and kindergarten, and the Stamford Children's Home (1895). The Stamford and the Corinthian Yacht Clubs have club-houses here. Shippan Point, on the Sound, i£ m. south of the city, is a summer resort, near which the city bought land for a public park in 1906. Stamford's factory product in 1905 was valued at $5,890,416, 50-3% more than in 1900. The principal manu- factures are builders' hardware, locks and keys (the works of the Yale & Towne Manufacturing Company are here), woollen goods, dye stuffs, &c. The township of Stamford, known until 1642 by the Indian name of Rippowam, was settled in 1641 by twenty-nine persons who for religious reasons seceded from the Wethersfield church and joined the colony of New Haven. Dis- content with the religious policy of New Haven, however, caused a number of the Stamford citizens to withdraw and to found Hempstead, Long Island, and for the same reason many of the people of Stamford approved of the union of the New Haven colony and Connecticut by the charter of 1662; and in Octo- ber 1662 Stamford submitted to Connecticut. Stamford was chartered as a borough in 1830 and as a city in 1894.

See E. B. Huntington, History of Stamford (Stamford, 1868) ; and C. B. Gillespie. Picturesque Stamford (Stamford, 1893).

STAMFORD, a market town and municipal borough, chiefly in the South Kesteven or Stamford parliamentary division of Lin- colnshire, but partly in Northamptonshire, on the river Welland, at the

landward edge of the fen country. Pop. (1901), 8229. The town stands picturesquely on the steep banks of the river, and is of the highest antiquarian interest. It formerly possessed fourteen parish churches, but now has only six, viz. St Mary's, erected at the end of the 13th century, possessing an Early English tower, with Decorated spire, the principal other parts of the building being Perpendicular; All Saints', also of the 13th century, the steeple being built at the expense of John Browne, merchant of the staple at Calais, in the beginning of the 15th century; St Michael's, rebuilt in 1836 on the site of the one erected in 1269; St George's, Early English, Decorated, and Perpendicular, for the most part rebuilt in 1450 at the expense of William Bruges, first garter king-at-arms; St John Baptist's, Perpendicular, erected about 1452; and St Martin's, Perpendicu- lar, in which Lord Treasurer Burghley is buried. Formerly there were several religious houses: the Benedictine monastery of St Leonard's, founded in the 7th century, of, which there are some Norman and later remains; the Carmelite monastery (1291), of which the west gate still stands; and houses for Grey Friars (time of Henry III.), Dominicans (1240), Gilbertines (1291), and Augustinians (13 16). The principal secular build- ings are the town hall (rebuilt 1776), the corn exchange (1859), and the literary and scientific institute (1842), with a library of 6000 volumes. There are a large number of charitable institu- tions, including the Stamford and Rutland infirmary (1828), Browne's hospital, founded in the time of Richard III., with its picturesque Late Perpendicular building, Snowden's alms- houses (1604), Truesdale's almshouses (1700), and Burghley hospital, founded by Lord Treasurer Burghley (1597). The modern grammar school building incorporates remains of the church of St Paul. To the south of Stamford, in Northampton- shire, is Burghley House, the seat of the marquis of Exeter, a fine quadrangular mansion dating from 1587, containing a note- worthy art collection. It stands in a well-wooded park. The prosperity of the town depends chiefly on its connexion with agriculture. It possesses iron foundries, agricultural implement works, wagon factories and breweries. There is also some trade in coal, timber, stone and slates. The town is governed by a mayor, 6 aldermen and 18 councillors. Area, 1918 acres.

Apart from the tradition preserved by Henry of Huntingdon that the Saxons here defeated the Picts and Scots in 449, Stam- ford (Staunford) is a place of great antiquity. The Danes built

a fort here on the north bank of the Welland, round which a town existed when in 922 King Edward fortified the opposite side of the stream. It passed again into Danish hands and was one of the five boroughs recaptured by Edmund .lEtheling in 941. The priory of St Leonard was a cell of Durham, and a charter of Edgar dated 972 mentions a market and a mint. In the reign of Edward the Confessor Stamford was a royal borough governed by twelve lawmen, reduced in 1086 to nine, and divided into six wards. The Norman castle, built before 1086, was thrice besieged by Henry II. while Duke of Normandy, but only yielded in n 53. Two years later he granted it and the manor to Richard Humet; forfeited by his son it was given to John, earl of Warenne, in 1206. In 1337 it passed to William de Bohun, earl of Northampton, and thence to Edmund Langley, afterwards duke of York, finally reverting to the Crown on the death of Cicely, duchess of York. Elizabeth granted it to the first Lord Burghley. The barons met here in 1215 on their march to London, and in 1309 a parliament was held at Stam- ford. In 1256 Henry III. gave the burgesses freedom from tolls, the right of receiving tolls and immunity of their goods from arrest, privileges confirmed and enlarged in the following year. William, earl of Warenne, in 1275 permitted the burgesses to choose their chief officer or alderman, who was still sworn in at the manor court as late as 1615 and was first called " mayor " in 1663. Edward IV. incorporated Stamford by the name of the alderman and burgesses in 1461 and granted the town immunity from all external jurisdiction and gave it a common seal. The charters have been frequently confirmed. As early as 1292 Stamford was well known for its monastic schools, and in 1333 was chosen as the headquarters of the students who seceded from Oxford, and an Early Decorated gateway remains of Brasenose Hall. The attempt to establish a regular univer- sity was prohibited by royal authority. The defeat of the Yorkists here was followed by the decay of the castle in the reign of Richard III., and the history of the place henceforth centred chiefly round the family of Cecil, whose ancestor, David Seyceld, settled here about 1566. Stamford occasionally re- turned two members to parliament from 1295 until 1832. The representation was reduced to one by the act of 1867, and was abolished in 1885. The fairs are of ancient origin, and are mentioned in 1245 and the reign of Edward I. These are the May fair, town fair, and spring fair, and fairs on various dates representing Candlemas, mid-Lent, the feasts of Corpus Christi, St James and SS. Simon and Jude. A market is still held every Friday. In 1182 there were dyers, weavers and fullers here, but these were only the usual home industries. In 1822 silk throwsting was .successfully carried on, but this has long ceased.

See E. C. Mackenzie-Walcott, Memorials of Stamford, past and present (Stamford, 1867); John Drakard, The History of Stamford in the County of Lincoln, comprising its ancient progressive and modern state (Stamford, 1822); Charles Nevinson, History of Stamford (Stamford, 1879); Victoria County History : Lincoln.

STAMMERING, or Stuttering, a spasmodic affection of the organs of speech in which the articulation of words is suddenly checked and a pause ensues, often followed by a repetition in rapid sequence of the particular sound at which the stoppage occurred. Of this distressing affection there are many grades, from a slight inability to pronounce with ease certain letters or syllables, or a tendency to hesitate and to interject unmeaning sounds in a spoken sentence, to the more severe condition in which there is a paroxysm of spasms of the muscles, not only of the tongue and throat and face, but even of those of respiration and of the body generally. To understand in some degree the explanation of stammering it is necessary to consider shortly the physiological mechanism of articulate speech. Speech is the result of various muscular movements affecting the current of air as it passes in expiration from the larynx through the mouth. If the vocal cords are called into action, and the sounds thus pro- duced are modified by the muscular movements of the tongue, cheek and lips, we have vocal speech; but if the glottis is widely open and the vocal cords relaxed the current of air may still be moulded by the muscular apparatus so as to produce speech without voice, or whispering (see Voice). In both cases, how-

ever, the mechanism is very complicated, requiring a series of nervous and muscular actions, all of which must be executed with precision and in accordance. In vocal speech, for example, it is necessary that the respiratory movements, more especially those of expiration, occur regularly and with nice adjustment to the kind of articulate expression required; that the vocal cords be approximated and tightened by the muscles of the larynx acting with delicate precision, so as to produce the sound of the pitch desired; that the rima glottidis (or aperture of the larynx) be opened so as to produce prolonged sounds, or suddenly closed so as to cut off the current of air; that the move- ments of the muscles of the tongue, of the soft palate, of the jaws, of the cheeks and of the lips occur precisely at the right time and to the requisite extent; and finally that all of these muscular adjustments take place with rapidity and smoothness, gliding into each other without effort and without loss of time. Exquisite co-ordination of muscular movement is therefore necessary, involving also complicated nervous actions. Hence is it that speech is acquired by long and laborious effort. A child

possesses voice from the beginning; it is born with the capacity for speech; but articulate expression is the result of education. In infancy, not only is knowledge acquired of external objects, and signs attached in the form of words to the ideas thus awakened, but the nervous and muscular mechanisms by which these signs or words receive vocal expression are trained by long practice to work harmoniously.

It is not surprising, therefore, that in certain cases, owing to some obscure congenital defect, the co-ordination is not effected with sufficient precision, and that stammering is the result. Even in severe cases no appreciable lesion can be detected either in the nervous or muscular mechanisms, and the condition is similar to what may affect all varieties of finely co-ordinated movements. The mechanism does not work smoothly, but the pathologist is unable to show any organic defect. Thus the co-ordinated movements necessary in writing are disturbed in scrivener's palsy, and the skilful performer on the piano or on any instrument requiring minute manipulation may find that he is losing the power of delicate adjustment. Stammering is occasionally hereditary. It rarely shows itself before the age of four or five years, and as a rule it is developed between this age and puberty. Men stammer in a much larger proportion than women. It may occur during the course of nervous affections, such as hysteria, epilepsy or locomotor ataxia; some- times it follows febrile disorders; often it develops in a child in a feeble state of health, without any special disease. In some cases a child may imitate a stammerer and thus acquire the habit. Any general enfeeblement of the health, and especially nervous excitement, aggravates the condition of a confirmed stammerer.

Stammerers, as a rule, find the explosive consonants b, p, d, t, k and hard g the most difficult to articulate, but many also are unable easily to deal with the more continuous consonants, such as v, f, th, s, z, sh, m, n, y, and in severe cases even the vowels may cause a certain amount of spasm. Usually the defect is not observed in whispering or singing; but there are exceptions to this statement. In pronouncing the explosive sounds the part of the oral apparatus that ought suddenly to open or close remains spasmodically closed, and the stammerer remains for a moment voiceless or strives pitifully to overcome the obstruc- tion, uttering a few successive puffs or sounds like the beginning of the sound he wishes to utter. The lips thus remain closed at the attempted utterance of b and p; the tip of the tongue is pressed against the hard palate or the back of the upper front teeth in d and t; and the back of the tongue presses against the posterior part of the palate in pronouncing g hard and k. In

attempting the continuous consonants, in which naturally the passage is not completely obstructed, the stammerer does not close the passage spasmodically, but the parts become fixed in the half-opened condition, or there are intermittent attempts to open or close them, causing either a drawling sound or coming to a full stop. In severe cases, where even vowels cannot be freely uttered, the spasm appears to be at the rima glottidis

(opening of the larynx). Again, in some cases, the spasm may affect the respiratory muscles, giving rise to a curious barking articulation, in consequence of spasm of the expiratory muscles, and in such cases the patient utters the first part of the sentence slowly, gradually accelerates the speed, and makes a rush towards the close. In the great majority of cases the spasm affects the muscles of articulation proper, that is, those of the pharynx, tongue, cheeks and lips.

A condition named aphthongia is particularly distressing. It totally prevents speech, and may, at intervals, come on when the person attempts to speak; but fortunately it is only of temporary duration, and is usually caused by exceptional nervous excitement. It is characterized by spasm of the muscles supplied by the hypoglossal nerve, including the sterno- hyoid, sterno-thyroid and thyro-hyoid muscles. In almost all cases of stuttering it is noticed that the defect is most apparent when the person is obliged to make a sudden transition from one class of sounds to another, and the patient soon discovers this for himself and chooses his words so as to avoid dangerous muscular combinations. When one considers the delicate nature of the adjustments necessary in articulate speech, this is what may be expected. It is well known that a quickly diffusible stimulant, such as alcohol, temporarily removes the difficulty in speech.

Stuttering may be successfully overcome in some cases by a careful process of education under a competent tutor. Not a few able public speakers were at first stutterers, but a prolonged course of vocal gymnastics has remedied the defect. The patient should be encouraged to read and speak slowly and deliberately, carefully pronouncing each syllable, and when he feels the tendency to stammer, he should be advised to pause for a short time, and then by a strong voluntary effort to attempt to pronounce the word. He should also be taught how to regulate respiration during speech, so that he may not fail from want of breath. In some cases aid may be

obtained by raising the voice towards the close of the sentence. Sounds or combinations of sounds that present special difficulties should be made the subject of careful study, and the defect may be largely overcome by a series of graduated exercises in reading. The practice of intoning is useful in many cases; and many per- sons who habitually stutter in conversation show no sign of the defect when they come to sing. In ordinary conversation it is often important to have some one present who may by a look put the stammerer on his guard when he is observed to be talking too quickly or indistinctly. Thus by patience and determination many stammerers have so far overcome the defect that it can scarcely be noticed in conversation; but even in such cases mental excitement or slovenly inattention to the rules of speech suitable for the condition may cause a relapse. In very severe cases, where the spasmodic seizures affect other muscles than those of articulation, special medical treatment is necessary, as such are on the borderland of serious nervous disturbance. All measures tending to improve the general health, the removal of any affection of the mouth or gums that may aggravate habitual stammering, the avoidance of great emotional excite- ment, a steady determination to overcome the defect by volun- tary control, and a system of education such as has been sketched will do much in the great majority of cases to remedy stam- mering.

STAMP (from " to stamp," to strike or tread heavily, hence to impress, O. Eng. slempen, Du. stampen, Ger. stamp/en, whence, O. Fr. estamper, mod. Hamper), an instrument for crushing or pounding or for making impressions or marks on other bodies; thus, in mining, the stamp is that part of the machinery of a mill which crushes the ore to the fineness necessary for the separation of the valuable portions; in coining, &c, it is an engraved block or die by which the mark is impressed, hence in the most general sense of the word an impression or mark made with a " stamp," and particularly such a mark impressed on a document for purposes of certification, validity and the like, or as showing that certain duties or charges have been paid. For the first class, viz., stamps for purposes of taxation, see Stamp

Duties below; For the second class, of which the most familiar are the small adhesive pieces of paper used as the sign that postal charges have been duly paid on letters, parcels, &c, transmitted by the postal service of a country, see Post and Postal Service and Philately.

Stamp Duties, — The stamp duty is a tax imposed upon a great variety of legal and other documents, and forms a branch of the national revenue. The stamp is a cheap and convenient mode of

certifying that the revenue regulations have been com- plied with. Stamp duties appear to have been invented by the Dutch in 1624. They were first imposed in England by an act of 1694 as a temporary means of raising funds for carrying on the war with France. Stamp duties in the United Kingdom form part of the inland revenue, and are placed under the con- trol of the commissioner of inland revenue. The principal acts in force on the subject are the Stamp Act 1891 and the Stamp Duties Management Act 1891'. Amendments of the law are also included in the Customs and Inland Revenue Act 1893, the Finance Acts of subsequent years, and the Revenue Act 1898. The death duties, the corporation duty, the duties on patent medicines and playing cards, and postage duties, are also technically "stamp duties"; but in ordinary use the expression is limited to those imposed on the various classes of legal instruments, such as conveyances, leases, transfers, mortgages, bonds, &c, on bills of exchange, pro- missory notes, contract notes, bank notes and bankers' drafts, receipts, insurance policies, bills of lading, and a few other documents. Stamps are either adhesive or impressed. The adhesive stamps, which can only be used for certain documents, can be obtained at inland revenue offices through- out the United Kingdom, and at all post offices which are money order offices. Stamps can only be impressed at the inland revenue offices in certain of the larger towns. For duties not exceeding 2s. 6d. the adhesive inland revenue or postage stamps may (in most cases) be used indiscriminately. This arrangement was first introduced in 1881, when it was applied to the penny stamp, and it has since been extended to other denominations. The commissioners of inland revenue are authorized to make allowance under certain conditions for stamps which have been inadvertently spoiled or rendered useless for their intended purposes. In order to obtain such allowance the parties must present the stamps within two years from the time when they became useless. The commissioners may be required by any person to express their opinion as to the amount of duty, if any, which is chargeable on any instrument; and such person, if dissatisfied with the assessment made, may appeal to the courts.

The stamp duty on the transfer of certain kinds of securities can be commuted by the payment of a lump sum or (in some cases) an annual composition, and the transfers then become exempt from duty.

Stamp duties are either fixed, such as the duty of one penny on every cheque irrespective of its amount, or ad valorem, as the duty on a conveyance, which varies according to the amount of the purchase money. The duty is denoted generally by an impressed, less

frequently by an adhesive, stamp, sometimes by either at the option of the person stamping. Thus an inland bill of exchange (unless payable on demand) must have an impressed stamp, a foreign bill of exchange an adhesive stamp, while an agreement or receipt stamp may be of either kind. It should be noticed that certain documents falling within a class which as a rule is subject to stamp duty are for reasons of public policy or encouragement of trade exempted from the duty by special legislation. Examples of such documents are Bank of England notes, agreements within § 17 (but not those within § 4) of the Statute of Frauds (see Fraud), agreements between a master of a ship and his crew, transfers of ships or shares in ships, indentures of apprenticeship for the sea service, petitions forwarded by post to the Crown or a House of Parliament and most instruments relating to the business of building and friendly societies.

As a general rule a document must be stamped at the time of execution, or a penalty (remissible by the commissioners of inland revenue) is incurred. The penalty is in most cases £10, sometimes much more; in the case of policies of marine insurance it is £100. Some instruments cannot be stamped at all after execution, even with payment of the penalty. Such are bills of exchange and promissory notes (where an impressed stamp is necessary), bills of lading,

proxies for voting at meetings of proprietors of joint-stock companies and receipts after a month from date. An unstamped instrument cannot be pleaded or given in evidence except in criminal proceedings or for a collateral purpose. If an instrument chargeable with duty be produced as evidence in a court, the officer whose duty it is to read the instrument is to call the attention of the judge to any omission or insufficiency of the stamp, and if the instrument is one which may legally be stamped after execution, it may, on payment of the amount of the unpaid duty and the penalty payable by law, and a further sum of £i, be received in evidence, saving all just exceptions on other grounds. The rules of the supreme court, 1883 (Ord. xxxix. r. 8, re-enacting a provision of the Common Law Pro- cedure Act), provide that a new trial is not to be granted by reason of the ruling of a judge that the stamp upon any document is sufficient or that the document does not require a stamp. The stamp upon a document subject to the stamp laws of a foreign state is usually admissible in evidence in a court of the United Kingdom if it conform in other

respects to the rules governing the admissibility of such documents, even though it be improperly stamped according to the law of the foreign country. The admissibility of documents belongs to the ordinatoria litis rather than the decisoria litis, and is governed by the lex fori rather than the lex loci contractus, unless indeed that law makes a stamp necessary to the validity of the instrument. Certain offences, such as forging a die or stamp, selling or using a forged stamp, &c, are made felonies punishable with penal servitude for life as a maximum.

United States. — The subject of stamp duties is of unusual historical interest, as the passing of Grenville's Stamp Act of 1765 (see United States: History) directly led to the American War of Independ- ence. The act was, indeed, repealed the next year as a matter of expediency, but an act of the same year dealing with the dependency of American colonies declared the right of the British legislature to bind the colonies by its acts. The actual yield of the stamp duties under the act of 1765 was, owing to the opposition in the American colonies, only £4000 — less than the expenses of putting the act into force. The stamp duties of the United States are now under the superintendence of the commissioner of internal revenue.

STANCHION (Fr. ttancon, a wooden post), an architectural term applied to the upright iron bars in windows which pass through the eyes of the saddle bars or horizontal irons to steady the lead lights. The French call the latter traverses, the stan- chions montants, and the whole arrangement armature. Stan- chions frequently finish with ornamental heads forged out of the iron.

STANDARD, a. term with three main meanings: (1) an ensign or flag; (2) a fixed weight, measure, value or quality established by law or customarily recognized as a unit of comparison by which the correctness of others can be determined; (3) an upright or standing object, such as a large candelabrum, or, particularly, a fruit-tree which stands without support. With regard to the derivation, the word which appears in most European languages, e.g. Du. standaard, Ger. Standarte, O. Fr. estandart, estendard, mod. itendard, Ital. stendale, stendardo, &c, is to be referred to the Teut. standan, to stand, and refers to the fixed pole to which an object or a pole was attached. The " standard " as a military ensign was properly stationary and served as the signal of the position of its owner on the ordered field of battle. The O. Fr. form estendard points to the influence of Lat. extendere, to spread out, extend, of the flag when hung upon the pole (see further Flag for the various meanings of the word and its history). The use of the term for a recognized unit of

comparison is due probably to the fact that it is something fixed or set up, stable, and not to any fanciful reference to the ensign or flag as the object to which one turns as a rallying-point. For the standard weights and measures see Weights and Measures and Standards Department below. There are many other standards, such as electrical standards (see Electricity), standard solutions in chemistry (q.v.) for the purpose of volumetric analysis, &c. In engineering, the component parts of machines or other structures are " standardized " in accordance with agreed measurements. For " standard time " see Time, Standard.

STANDARD, BATTLE OF THE, a name given to the battle of the 22nd of August 1138 near Northallerton, in which the Scottish army under King David was defeated by the English levies of Yorkshire and the north Midlands, who arrayed them- selves round a chariot carrying the consecrated banners of St Peter of York, St John of Beverley, St Wilfrid of Ripon and St Cuthbert of Durham.

See C. Oman, Art of War: Middle Ages, pp. 389 sqq "

STANDARDS DEPARTMENT, a department of the English Board of Trade, having the custody of the imperial standards of weights and measures. As far back as can be traced, the standard weights and measures, the primary instruments for determining the justness of all other weights and measures used in the United Kingdom, were kept at the exchequer, and the duties relating to these standards were imposed upon the chamberlains of the exchequer. The office of chamberlains was abolished in 1826, under the operation of 23 Geo. III. c. 82, passed in 1783, but the custody of the standards and any duties connected therewith remained attached to an officer in the exchequer (q.v.) until that department was abolished in 1866. Meanwhile, in pursuance of recommendations of Standard Commissions of 1841 and 1854 and a House of Commons Committee of 1862, the Standards of Weights, Measures and Coinage Act 1866 was passed. This act created a special department of the Board of Trade, called the " Standard Weights and Measures Department," and a head of that department styled the " Warden of the Standards." His duty was to conduct comparisons, verifications and operations with reference to the standards in aid of scientific research and otherwise. The first— indeed, the only real holder — of the office was Henry Williams Chisholm (1 809-1901), previously chief clerk of the old exchequer, 1 under whose direction the department was organized; and before his retirement in 1877 it embraced not merely the re- verification of the imperial standards, but the making of local standards for local authorities, the re-

verification of standards and instruments for all parts of the United Kingdom and colonies, for foreign countries which did not possess standardizing departments, the verification of manufacturers' standards and instruments, gas- measuring standards, apparatus for determining the flash-point of petroleum, &c. The Weights and Measures Act of 1878 left out all reference to the title and office of warden of the standards, and this opportunity was taken, in the words of the then per- manent secretary of the Board of Trade, T. H. (afterwards Lord) Farrer, to make the office " more strictly a department of the Board of Trade." It was put in charge of an officer (Mr H. J. Chaney) termed " Superintendent of Weights and Measures," but on his death in 1906 an attempt was made partially to restore dignity and importance to the office by the appointment of Major P. A. MacMahon, F.R.S., with the title of " Deputy Warden of the Standards." 1

There are Standards departments under the charge- of experi- enced scientists in Berlin, St Petersburg, Paris, Vienna, Rome; Madrid, Lisbon, Brussels, Bucharest and Constantinople and at Ottawa, Melbourne and Sidney. The United States Bureau of Standards is in the department of Commerce and Labor. It was established in 1901 and is under the charge of a director. Its work follows that of the English department and embraces also research in the domain of physics, extending from chemistry on the one side to engineering on the other. It also tests and , investigates standards and methods of constructing measuring- instruments for scientific societies, educational institutions, manufacturers and others.

STANDERTON, a town of the Transvaal, 114 m. S.E. of Johannesburg, on the railway from that city, via Newcastle to Durban, distant 369 m. Pop. (1904), 4589, of whom 2136 were white. Standerton is 5025 ft. above the sea and is built on the north bank of the Vaal, here spanned by two fine bridges. It is the chief town of a district of the same name and the centre of an important agricultural and pastoral region. A government stud farm is maintained here. In the neighbourhood are coal- fields. The name of the town is derived from that of the former owner of the site, an Adrian Stander, who fought against the British at Boomplaats in 1848. The town was laid out in 1870. Since 1903 it has been governed by a municipality.

STANDISH, MILES, or Myles (c. 1584-1656), American colonist, was born about 1584 in Lancashire, probably of the

1 The act of 1878, which repealed the act of 1866, merely declared

that the Board of Trade should have all powers and perform all duties

relative to the standards vested in or imposed upon the warden of

the standards by the act of 1866 or otherwise, and the title ” deputy

I warden of the standards ” is therefore a departmental creation.

Duxbury Hall branch of the family. Nothing definite is known of him before 1620, when with his wife, Rose (d. 1621), he emi- grated to New England in the ” Mayflower.” He became the military leader of the Plymouth colony; was sent to London in 1625 on an unsuccessful mission to secure the intervention of the Council for New England in the affairs of the colony; and in 1628 was one of the eight members of the colony who pledged themselves to pay £1800 and thus buy out the merchant adven- turers. In 163 1 with William Brewster and others he settled at Duxbury, where he died on the 3rd of October 1656, and where on ” Captain’s Hill, ” near the site of his home, there is a monument to him, consisting of a stone shaft, no ft. high, and a bronze statue of him. Longfellow’s Courtship of Miles Standish apparently has no basis in fact; Standish’s second wife, Barbara, a sister of Rose, must have been summoned to Ply- mouth a year before the marriage of John Alden to Priscilla Mullins. Lowell’s Interview with Miles Standish misrepresents him : he was not a typical Puritan.

See William Bradford’s History of Plimouth Plantation. Tudor Jenks’s Captain Myles Standish (New York, 1905) and Henry Johnson’s Exploits of Myles Standish (New York, 1897) are popular sketches.

STANFIELD, WILLIAM CLARKSON (1 794-1 867), English marine painter, was born of Irish parentage at Sunderland in 1794. As a youth he was a sailor, and during many long voyages he acquired that intimate acquaintance with the sea and ship- ping which was admirably displayed in his subsequent Works. In his spare time he diligently occupied himself in sketching marine subjects, and so much skill did he acquire that, after having been incapacitated by an accident from active service, he received an engagement, about 1818, to paint scenery for the ” Old Royalty, ” a sailor’s theatre in Wellclose Square, London. Along with David Roberts he was afterwards employed at the Cobourg theatre, Lambeth; and in 1826

he became scene-painter to Drury Lane theatre, where he executed some admirable work, especially distinguishing himself by the production of a drop- scene, and by decorations for the Christmas pieces for which the house was celebrated. Meanwhile he had been at work upon some easel pictures of small dimensions, and was elected a member of the Society of British Artists. Encouraged by his success at the British Institution, where in 1827 he exhibited his first important picture — " Wreckers off Fort Rouge " — and in 1828 gained a premium of 50 guineas, he before 1830 abandoned scene-painting, and in that year made an extended tour on the Continent. He now produced his " Mount St Michael, " which ranks as one of his finest works; in 1832 he exhibited his " Opening of New London Bridge " and " Portsmouth Harbour " — commis- sions from William IV. — in the Royal Academy, of which he was elected an associate in 1832 and an academician in 1835; and until his death on the 18th of May 1867 he contributed to its exhibitions a long series of powerful and highly popular works, dealing mainly with marine subjects, but occasionally with scenes of a more purely landscape character. Among these may be named: the " Battle of Trafalgar " (1836), executed for the United Service Club; the " Castle of Ischia " (1841), "Isola Bella " (1841), among the results of a visit to Italy in 1839; "French troops Fording the Margra " (1847), "The 'Victory' Bearing the Body of Nelson Towed into Gibraltar" (1853), "The Abandoned "(1856). He also executed two notable series of Venetian subjects, one for the banqueting-hall at Bowood, the other for Trentham. He was much employed on the illustrations for The Picturesque Annual, and published a collection of lithographic views on the Rhine, Moselle and Meuse; and forty of his works were engraved in line under the title of " Stanfield's Coast Scenery. " The whole course of Stanfield's art was powerfully influenced by his early practice as a scene-painter. But, though there is always a touch of the spectacular and the scenic in bis works, and though their colour is apt to be rather dry and hard, they are large and effective in handling, powerful in their treatment of broad atmospheric effects and telling in composition, and they evince the most complete knowledge of the artistic materials with which their painter deals.

STANFORD, SIR CHARLES VILLIERS (1852-), Irish musical composer, was born in Dublin on the 30th of September 1852, being the only son of Mr John Stanford, examiner in the court of chancery (Dublin) and clerk of the Crown, Co. Meath. Both parents of the composer were accomplished amateur musicians, the father being the possessor of a splendid bass voice, and the mother a very clever pianist. Under R. M. Levey (violin), Miss Meeke, Mrs Joseph

Robinson, Miss Flynn and Michael Quarry (piano), young Stanford's musical powers were trained in the early days; and Sir Robert Stewart taught him composition and organ. Various feats of precocity are recorded in an article in the Musical Times for December 1898. He came to London as a pupil of Arthur O'Leary and Ernst Pauer in 1862, and in 1870 won a scholarship at Queen's College, Cambridge, whence he migrated to Trinity College in 1873, and succeeded J. L. Hopkins as college organist, a post he held till 1892. His appointment as conductor of the Cambridge Univer- sity Musical Society gave him great opportunities, and the fame which the society soon obtained was in the main due to Stan- ford's energies. Before his time ladies were not admitted into the chorus, but during his tenure of the office of conductor many most interesting performances and revivals took place. In the years 1874 to 1877 he was given leave of absence for a portion of each year in order to complete his studies in Germany, where he learnt from Reinecke and Kiel. He took the B.A. degree in 1874 and M.A. in 1878, and was given the honorary degree of Mus. D., at Oxford in 1883, and at Cambridge in 1888. He first came prominently before the public as a composer with his incidental music to Tennyson's Queen Mary (Lyceum, 1876); and in 1881 his first opera, The Veiled Prophet, was given at Hanover (revived at Covent Garden, 1893); this was succeeded by Savonarola (Hamburg, April, and Covent Garden, July 1884), and The Canterbury Pilgrims (Drury Lane, 1884). A long inter- val separates these from his later operas, Shamus O'Brien, a delightful piece of Irish dramatic writing (Opera Comique, 1896) and Much Ado About Nothing (Covent Garden, 1901). For the main provincial festivals, works by Stanford were commissioned as follows; ".Orchestral serenade" (Birmingham, 1882); "Elegiac Ode" (Norwich, 1884); The Three Holy Children (Birming- ham, 1885); The Revenge (Leeds, 1886); The Voyage of Maeldune (Leeds, 1889); The Battle of the Baltic (Hereford, 1891); Eden (Birmingham, 1891); The Bard (Cardiff, 1895); Phaudrig Crohoore (Norwich, 1896); Requiem (Birmingham, 1897); Te Deum (Leeds, 1898); TheLastPost (Hereford, 1900); StabatMater (Leeds, 1907). Besides these, his music includes a few choral works of importance, such as The Resurrection (Cambridge, 1875) ; Psalm XL VI. (Cam- bridge, 1877); Carmen Saeculare (Jubilee Ode, 1887); " Installa- tion Ode " (Cambridge, 1892) ; East to West (London, 1893) ; Psalm CL. (Manchester, 1887); Mass in G (Brompton Oratory, 1893). He was appointed professor of composition at the Royal College of Music, 1883; conductor of the Bach choir in 1885; professor of music in the university of Cambridge, succeeding Sir G. A. Macfarren, 1887; conductor of the Leeds Philharmonic Society,

1897, and of the Leeds Festival from 1901 onwards. He was knighted in 1902. His instrumental works include six symphonies, many chamber compositions, among them two string quartets; besides many songs, part-songs, madrigals, &c, and incidental music to the Eumenides and Oedipus Rex (as performed at Cambridge), as well as to Tennyson's Beckel. His church music holds an honoured place among modern Anglican compositions; and his editions of Irish and other traditional songs are well known. In 1908 he published an interesting volume of Studies and Memories, a collection of contributions to reviews, &c, in past years.

STANHOPE, EARLS. James Stanhope, 1st Earl Stanhope (c. 1673-1721), English statesman and soldier, was the eldest son of Alexander Stanhope (d. 1707), a son of Philip Stanhope, 1st earl of Chesterfield. Educated at Eton and at Trinity College, Oxford, he accompanied his father, then British minister at Madrid, to Spain in 1690, and obtained some knowledge of that country which was very v.seful to him in later life. A little later, however, he went to Italy where, as afterwards in Flanders,

he served as a volunteer against France, and in 1695 he secured a commission in the British army. In 1701 Stanhope entered the House of Commons, but he continued his career as a soldier and was in Spain and Portugal during the earlier stages of the War of the Spanish Succession. In 1705 he served in Spain under Charles Mordaunt, earl of Peterborough, and in 1706 he was appointed British minister in Spain, but his duties were still military as well as diplomatic, and in 1708, after some differences with Peterborough, who favoured defensive measures only, he was made commander-in-chief of the British forces in that country. Taking the offensive he captured Port Mahon, Minorca, and after a visit to England, where he took part in the impeachment of Sacheverell, he returned to Spain and in 17 10 helped to win the battles of Almenara and of Saragossa, his perseverance enabling the archduke Charles to enter Madrid in September. However, at Brihuega he was overwhelmed by the French and was forced to capitulate on the 9th of Decemter 1 7 10. He remained a prisoner in Spain for over a year and returned to England in August 171 2. 'He now definitely aban- doned the army for politics, and became one of the leaders of the Whig opposition in the House of Commons. He had his share in establishing the house of Hanover on the throne, and in September 17 14 he was appointed

secretary of state for the southern department, sharing with Walpole the leadership of the House of Commons. He was mainly responsible for the measures which were instrumental in crushing the Jacobite rebellion of 1 71 5, and he forwarded the passing of the Septennial Act. He acted as George I.'s foreign minister, and only just failed to conclude a treaty of alliance with France in 1716. In 1717, consequent on changes in the ministry, Stanhope was made first lord of the treasury, but a year later he returned to his former office of secretary for the southern department. In 1717 he was created Viscount Stanhope of Mahon and in 17 18 Earl Stanhope. His activity was now shown in the conclusion of the quadruple alliance between England, France, Austria and Holland in 17 18, and in obtaining peace for Sweden, when threatened by Russia and Denmark, while at home he promoted the bill to limit the membership of the House of Lords. Just after the collapse of the South Sea Scheme, for which he was partly responsible but from which he did not profit, the earl died in London on the 5th of February 1721. Stanhope married Lucy, daughter of Thomas Pitt, governor of Madras, and he was succeeded by his eldest son Philip (1717-1786), a distin- guished mathematician and a fellow of the Royal Society.

Charles Stanhope, 3rd Earl Stanhope (1753-1816), states- man and man of science, son of the 2nd earl, was born on the 3rd of August, 1753, and educated under the opposing influences of Eton and Geneva, devoting himself whilst resident in the Swiss city to the study of mathematics, and acquiring from the associations connected with Switzerland an intense love of liberty. In politics he took the democratic side. As Lord Mahon he contested the city of Westminster without success in 1774, when only just of age; but from the general election of 1780 until his accession to the peerage on the 7th of March 1786 he represented through the influence of Lord Shelburne the Buck- inghamshire borough of High Wycombe, and during the sessions of 1783 and 1784 he gave his support to the administration of William Pitt, whose sister, Lady Hester Pitt, he married on the 19th of December 1774. When Pitt ceased to be inspired by the Liberal principles of his early days, his brother-in-law severed their political connexion and opposed with all the im- petuosity of his fiery heart the arbitrary measures which the ministry favoured. Lord Stanhope's character was without any taint of meanness, and his conduct was marked by a lofty consistency never influenced by any petty motives; but his speeches, able as they were, had no weight on the minds of his compeers in the upper chamber, and, from a disregard of their prejudices, too often drove them into the opposite lobby. He was the chairman of the " Revolution Society, " founded in

honour of the Revolution of 1688, the members of which in 1790 expressed their sympathy with the aims of the French republicans. He brought forward in 1794 the case of Muir, one

of the Edinburgh politicians who were transported to Botany Bay; and in 1795 he introduced into the Lords a motion depreca- ting any interference with the internal affairs of France. In all these points he was hopelessly beaten, and in the last of them he was in a " minority of one " — a sobriquet which stuck to him throughout life — whereupon he seceded from parliamentary life for five years. He was elected a fellow of the Royal Society so early as November 1772, and devoted a large part of his income to experiments in science and philosophy. He invented a method of securing buildings from fire (which, however, proved impracticable), the printing press and the lens which bear his name and a monochord for tuning musical instruments, sug- gested improvements in canal locks, made experiments in steam navigation in 1795-1797 and contriyed two calculating machines. When he acquired an extensive property in Devon- shire, he projected a canal through that county from the Bristol to the English Channel and took the levels himself. Electricity was another of the subjects which he studied, and the volume of Principles of Electricity which he issued in 1779 contained the rudiments of his theory on the " return stroke " resulting from the contact with the earth of the electric current of lightning, which were afterwards amplified in a contribution to the Philo- sophical Transactions for 1787. His principal labours in litera- ture consisted of a reply to Burke's Reflections on the French Revolution (1790) and an Essay on the rights of juries (1792), and he long meditated the compilation of a digest of the statutes. The lean and awkward figure of Lord Stanhope figured in a host of the caricatures of Sayers and Gillray, reflecting on his political opinions and his personal relations with his children. His first wife died in 1780, and he married in 1781 Louisa, daughter and sole heiress of the Hon. Henry Grenville (governor of Barbadoes in 1746 and ambassador to the Porte in 1762), a younger brother of the 1st Earl Temple and George Grenville; who survived him and died in March 1829. By his first wife he had three daughters, one of whom was Lady Hester Stanhope (q.v.). His youngest daughter, Lady Lucy Rachael Stanhope, eloped with Thomas Taylor of Sevenoaks, the family apothe- cary, and her father refused to be reconciled to her; but Pitt made Taylor controller-general of the customs, and his son was one of Lord Chatham's executors. His second wife was the mother of three sons. Lord Stanhope died at the family seat of Chevening, Kent, on the 15th of December 1816, being succeeded as 4th earl by his son Philip

Henry (1781-1855), who inherited many of his scientific tastes, but is best known, perhaps for his association with Kaspar Hauser (q.v.).

Philip Henry Stanhope, 5th Earl Stanhope (1805-187 5) English historian, better known as Lord Mahon, son of the 4th earl and his wife, the daughter of the 1st Baron Carrington, was born on the 30th of January 1805. He took his degree at Christ Church, Oxford, in 1827, and entered parliament in 1830. He was under secretary for foreign affairs for the early months of 1835, and secretary to the India Board in 1845, but though he remained in the House of Commons till 1852, he made no special mark in politics. He was chiefly interested in literature and antiquities, and in 1842 took a prominent part in passing the Copyright Act. He was a trustee of the British Museum, and in 1856 he proposed the foundation of a National Portrait Gallery; its subsequent creation was due to his executors. It was mainly due to him that in 1869 the Historical Manuscripts Commission was started. As president of the Society of Anti- quaries (from 1846 onwards), it was he who called attention in England to the need of supporting the excavations at Troy. And in 1855 he founded the Stanhope essay prize at Oxford. Of his own works the most important are his Life of Belisarius (1829); History of the War of Succession in Spain (1832), largely based on the first earl's papers; History of England from the Peace of Utrecht to the Peace of Versailles (1836-1853); Life of William Pitt (1 861-186 2); and History of England, comprising the reign of Queen Anne until the Peace of Utrecht (1870). A new edition of this last work was published in 1908. The two histories and the Life of Pitt are of great importance on account of Stanhope's unique access to manuscript authorities, and they remain

standard works; and though here and there he has been found to give credit for too much to Lord Chatham, his industry, clear though not brilliant style, and general impartiality in criticism, have been deservedly praised. His position as an historian was already established when he succeeded to the earldom in 1855, and in 1872 he was made an honorary associate of the Institute of France. He was president of the Literary Fund from 1863 until his death. He died on the 24th of December 1875, being succeeded as 6th earl by his son Arthur Philip (1838-1905), father of the 7th earl. His second son, Edward Stanhope (1840-1803), was a well-known Conservative politician, who filled various important offices, and was finally

secretary of state for war

(1886-1802).

STANHOPE, LADY HESTER LUCY (1776-1830), the eldest child of the 3rd Earl Stanhope by his first wife Lady Hester Pitt, was born on the 12th of March 1776, and dwelt at her father's seat of Chevening in Kent until early in 1800, when his excitable and wayward disposition drove her to her grandmother's house at Burton Pynsent. A year or two later she travelled abroad, but her cravings after distinction were not satisfied until she became the chief of the household of her uncle, William Pitt, in August 1803. She sat at the head of his table and assisted in welcoming his guests, gracing the board with her stately beauty and enlivening the company by her quickness and keenness of conversation. Although her brightness of style cheered the declining days of Pitt and amused most of his political friends, her satirical remarks sometimes created enemies when more consideration for the feelings of her associates would have converted them into friends. Lady Hester Stanhope possessed great business talents, and when Pitt was out of office she acted as his private secretary. She was with him in his dying illness, and some of his last thoughts were concerned with her future, but any anxiety which might have arisen in her mind on this point was dispelled through the grant by a nation grateful for her uncle's qualities of a pension of £1200 a year, dating from the 30th of January 1806, which Lady Hester Stanhope enjoyed for the rest of her days. On Pitt's death she lived in Montagu Square, London, but life in London without the interest caused by associating with the principal politicians of the Tory party proved irksome to her, and she sought relief from lassitude in the fastnesses of Wales. Whilst she remained on English soil happiness found no place in her heart, and her native land was finally abandoned in February 1810. After many wanderings she settled among the Druses on Mt Lebanon, and from this solitary position she wielded an almost absolute authority over the surrounding districts. Her control over the natives was sufficiently commanding to induce Ibrahim Pasha, when about to invade Syria in 1832, to solicit her neutrality, and this supremacy was maintained by her commanding character and by the belief that she possessed the gift of divination. Her cherished companion, Miss Williams, and her trusted medical attendant, Dr Charles Lewis Meryon (1783-187 7), dwelt with her for some time; but the former died in 1828, and Meryon left Mt Lebanon in 1831, only returning for a final visit from July 1837 to August 1838. In this lonely residence, the villa of Djoun, 8 m. from Sidon, in a house " hemmed in by arid mountains, " and with- the troubles of a household of

some thirty servants, only waiting for her death to plunder the house, Lady Hester Stanhope's strength slowly wasted away, and at last she died on the 23rd of June 1839. The dissappointments of her life, and the necessity of overawing her servants as well as the chiefs who surrounded Djoun, had intensified a temper naturally imperious. In appearance as in voice she resembled her grandfather, the first Lord Chatham, and like him she domineered over the circle, large or small, in which she was placed.

Some years after her death there appeared three volumes of Memoirs of the Lady Hester Stanhope as related by herself in Con- versations with her Physician (Dr Meryon, 1845), and these were followed in the succeeding year by three volumes of Travels of Lady Hester Stanhope, forming the Completion of her Memoirs narrated by her Physician. They presented a lively picture of this strange woman's life and character, and contained many anecdotes of Pitt

and his colleagues in political life for a quarter of a century before his death. See also Mrs Charles Roundell, Lady Hester Stanhope

(1910).

STANIMAKA, a town of Bulgaria in Eastern Rumelia; on the Derin Dere, an affluent of the Maritza, 12 m. S.S.E. of Philippopolis. Pop. (1906), 14,120. It is an important seat of the wine trade and also possesses a distillery. Sericulture is carried on under British auspices. To the south of the town are the ruins of the medieval citadel. Under its Greek name Stenimachos, the town is frequently mentioned in connexion with the Bulgarian wars from the nth century onwards.

STANISLAU (Polish, Stanislawow) , a town in Galicia, Austria, 87 m. S.E. of Lemberg by rail. Pop. (1900), 30,410, about half Jews. It possesses a beautiful parish church, which contains the tombs of the Potocki family. The principal industries include tanning, dyeing, tile-making, milling, the production of yeast and there is a large establishment for the manufacture of railway stock. Stanislau is an important railway junction, and has a considerable trade, principally in agricultural produce. Stanislau was founded by Stanislav Potocki (d. 1683), and has been newly rebuilt since it was devastated by a great fire in 1868.

STANISLAUS I. [Leszczynski] (1677-1766), king of Poland, born at Lemberg in 1677, was the son of Rafael Leszczynski, palatine of Posen, and Anne Catherine Jablonowska. He married Catherine Opalinska by whom he had one daughter. In 1697, as cupbearer of

Poland, he signed the confirmation of the articles of election of Augustus II. In 1703 he joined the Lithuanian Confederacy, which the Sapiehas with the aid of Swedish gold had formed against Augustus, and in the following year was selected by Charles XII. to supersede Augustus. Leszczynski was a young man of blameless antecedents, respect- able talents, and ancient family, but certainly without sufficient force of character or political influence to sustain himself on so unstable a throne. Nevertheless, with the assistance of a bribing fund and an army corps the Swedes succeeded in procuring his election by a scratch assembly of half a dozen castellans and a few score of gentlemen (July 2, 1704). A few months later Stanislaus was forced by a sudden inroad of Augustus to seek refuge in the Swedish camp, but finally on the 24th of September 1705 he was crowned king with great splendour, Charles himself supplying his nominee with a new crown and sceptre in lieu of the ancient regalia which had been carried off to Saxony by Augustus. The first act of the new king was to conclude an alliance with Charles XII. whereby Poland engaged to assist Sweden against the tsar. Stanislaus did what he could to assist his patron. Thus he induced Mazeppa the Cossack hetman to desert Peter at the most critical period of the war, and placed a small army corps at the disposal of the Swedes. But he depended so entirely upon the success of Charles's arms that after Poltava (1709) his authority vanished as a dream at the first touch of reality. The vast majority of the Poles hastened to re- pudiate him and make their peace with Augustus, and Leszczyn- ski, henceforth a mere pensioner of Charles XII., accompanied Krassau's army corps in its retreat to Swedish Pomerania. On the restoration of Augustus, Stanislaus resigned the Polish Crown (though he retained the royal title) in exchange for the little principality of Zweibriicken. In 1716 he was saved from assassination at the hands of a Saxon officer, Lacroix, by Stanislaus Poniatowski, the father of the future king. He now resided at Weissenburg in Lorraine, and in 1725 had the satisfac- tion of seeing his daughter Mary become the consort of Louis XV. and queen of France. His son-in-law supported his claims to the Polish throne after the death of Augustus II. in 1733, which led to the war of the Polish Succession. On the 9th of September 1733 Stanislaus himself arrived at Warsaw, having travelled night and day through central Europe disguised as a coachman, and on the following day, despite many protests, was duly elected king of Poland for the second time. But Russia, opposed to any nominee of France and Sweden, at once protested against his election; declared in favour of the new elector of Saxony, as being the candidate of her Austrian ally; and on the 30th of June

1734 a Russian army of 20,000 under Peter Lacey, after proclaiming Augustus III. at Warsaw, proceeded to besiege Stanislaus in Danzig where he had intrenched himself with his partisans (including the primate and the French and Swedish ministers) to await the promised succour from France. The siege began in October 1734. On the 17th of March 1735 Marshal Munnich superseded Lacey, and on the 20th of May the long expected French fleet appeared in the roads and disembarked 2400 men. A week after its arrival this little army gallantly attempted to force the Russian intrenchments, but was beaten off and finally compelled to surrender. This, by the way, was the first time France and Russia met as foes in the field. On the 30th of June

1735 Danzig capitulated unconditionally, after sustaining a siege of 135 days which cost the Russians 8000 men. Stanislaus, disguised as a peasant, had contrived to escape two days before. He was first heard of again at Konigsberg, whence he issued a manifesto to his partisans which resulted in the formation of a confederation on his behalf, and the despatch of a Polish envoy to Paris to urge France to invade Saxony with at least 40,000 men. In the Ukraine too, Count Nicholas Potocki kept on foot to support Stanislaus a motley host of 50,000 men, which was ultimately scattered by the Russians. In 1736 Stanislaus again abdicated the throne, but received by way of compensation the dukedom of Lorraine and Bar, which was to revert to France on his death. He settled at Luneville, founded there the Accidentia Stanislai, and devoted himself for the rest of his life to science and philanthropy. He died in 1766 at the age of 89. Among his works may be mentioned: CEuvres du philosophe bienfaisant (Paris, 1763; 1866).

See Robert Nisbet Bain, Charles XII. (London, 1895) ; ibid., Pupils of Peter the Great, cap. vi. (London, 1897); Czarnowski (Jan Nepomucen), Stanislaw Leszczynski in Poland (Pol:; Warsaw, 1858) ; Louis Lacroix, Les Opuscules inedites de S. L. (Nancy, 1866); Lettres inedites de S. L., ed. P. Boy<; (Paris, 1901) ; Marchioness Des Reaulx, Le Roi Stanislas et Marie Leszczynski (Paris, 1895). (R. N. B.)

STANISLAUS II. AUGUSTUS [Poniatowski] (1732-1798), king of Poland, the son of Stanislaw Poniatowski, palatine of Cracow, the friend and companion of Charles XII. of Sweden. Born in 1732 he

owed his advance in life to the influence of his uncles the powerful Czartoryscy, who sent him to St Petersburg in the suite of the English ambassador Hanbury Williams. Subsequently, through the influence of the Russian chancellor, Bestuzhev-Ryumin, he was accredited to the Russian court as the ambassador of Saxony. Through Williams he was introduced to the grand duchess Catherine, who was irresistibly attracted to the handsome and brilliant young nobleman, for whom she abandoned all her other lovers. Poniatowski was concerned in the mysterious and disreputable conspiracy which sought to set aside the succession of the grand duke Peter and his son Paul in favour of Catherine, a conspiracy frustrated by the unexpected recovery of the empress Elizabeth and the conse- quent arrest of the conspirators. Stanislaus returned to Warsaw much discredited, but nevertheless was (Sept. 7, 1764) elected king of Poland through the overwhelming influence of Catherine (she had promised him the crown as early as October 1763), and was crowned on the 25th of November, to the disgust of his uncles, who would have preferred another nephew, Prince Adam Casimir Czartoryscy, as king, but were obliged to submit to the dictation of the Russian court. The best that can be said for Stanislaus as king of Poland is that with all his romantic ideas and excellent intentions he remained from first to last the creature of circumstances. He had climbed to the throne by very slippery ways, he was dependent for a considerable part of his enormous income on the woman who had compensated him with a crown for the loss of her affections, he was detested by the nobility, who regarded him as a base-born upstart and yet had to put up with him. Thus in every way his position was most difficult; yet he tried to do his duty. Irr the beginning of his reign he broke away from the leading-strings of his uncles and inaugurated some useful economical reforms. After the first partition (as a result of which, by the way, his debts amounting to 7,000,000 guldens were paid by the Diet and his civil list

was raised to 216,000 guldens per annum) he entered enthusiasti- cally into the attempts of the patriots to restore the power and prosperity of their country, while the eloquent oration which he delivered before the Diet on taking the oath to defend the constitution of the 3rd of May 1791, moved the susceptible deputies to' tears. But when the confederation of Targowica, with the secret support of Russia, was formed against the consti- tution, he was one of the first to accede to it, thus completely paralysing the action of the army which, under his younger brother Prince Joseph and Thaddeus Kosciuszko, was performing prodigies. In fact, by the end of his life, Stanislaus had become an expert in the art of " acceding "

and " hedging. " Of resolute and independent action he was quite incapable; in fact, his whole career is little more than a record of humiliations. Thus in 1782 when he waited upon Catherine at Kaniow during her triumphal progress to the Crimea, she kept her ancient, grey- haired lover waiting for weeks, and while half contemptuously promising to respect the integrity of Poland, she curtly declined to be present at a supper which he had prepared for her at great cost. A few years later he was forcibly abducted by the Confede- rates of Bar, who did not know what to do with their captive, and allowed him to return to his court in a confused, bedraggled condition. On the outbreak of the insurrection of 1794 he was obliged to sue for his very life to Kosciuszko, and suffered the indignity of seeing his effigy expunged from the coinage a year before he was obliged to abdicate his throne. The last years of his life were employed in his sumptuous prison at St Petersburg (where he died in 1798) in writing his memoirs. Of his innumer- able mistresses the most notable was Mme Lullie, the widow of an upholsterer, on whom he lavished a fortune. He also contracted a secret marriage with the countess Grabowska. Yet he was capable of the most romantic friendships, as witness his correspondence with Mme Geoffrin, whom he invited to Warsaw, where on her arrival she found rooms provided for her exactly like those she had left at Paris — the same size, the same kind of carpets, the same furniture, down even to the very book which she had been reading the evening before her departure, placed exactly as she had left it with a marker at the very place where she had left off. Stanislaus had indeed a generous heart, frequently paid the debts of his friends or of deserving scholars whose cases were brought to his notice, arid was exceedingly good to the poor. He also encouraged the arts and sciences, and his Wednesday literary suppers were for some time the most brilliant social functions of the Polish capital. The best descrip tion of Stanislaus is by the Swedish minister Engestrom, who was presented to him early in 1788. " The king of Poland, " he says, " has the finest head I ever saw, but an expression of deep melancholy detracts from the beauty of his countenance. . . . He is broad-shouldered, deep-chested, and of such lofty stature that his legs seem disproportionately short. ... He has all the dazzling qualities necessary to sustain his dignity in public. He speaks the Polish, Latin, German, Italian, French and English tongues perfectly . . . and his conversation fills strangers with admira- tion. ... As a grand-master of the ceremonies he would have : done the honours most brilliantly. . . . Moral courage he alto- gether lacks and allows himself to be completely led by his entourage, which for the most part consists of women. "*

See Lars von Engestrom, Minnen och Anteckningar , vol. i. (Stockholm, 1876); Correspondance inedite de Stanislas Poniatowski avec Madame Geoffrin (Paris, 1875); Jan Kibinski, Recollections of the Times of Stanislaw Augustus (Pol. Cracow, 1899) ; Memoires secrets et inedits de Stanislas Auguste (Leipzig, 1862) ; Stanislaw and Prince Joseph Poniatowski in the Light of their Private Correspondence, in French, edited in Polish by Bronislaw Dembinski (Lemberg, 1904), Stanislaus's diaries and letters, which were for many years in the Russian foreign office, have been published in the Vestnik Evfopy for January 1908. See also R. N. Bain's, The Last King of Poland and his Contemporaries (1909). (R. N. B.)

STANLEY (Family). This ancient and historic English family derived its name from Stanley in Leek (in the Staffordshire " moorlands ")■ Its first known ancestor is Adam de Stanley, brother of Liulf de Audley, ancestor of the lords Audley, who lived in the time of King Stephen. His descendant William de

Stanley acquired the forestership of Wirral, with an heiress, in 1284, and was ancestor of two brothers, Sir William and Sir John Stanley. The former married the heiress of Hooton in Wirral and was ancestor of the Stanleys of Hooton, whose baronetcy, created in 1661, became extinct in 1893. The younger brother was lieutenant of Ireland under Richard II. and Henry IV., obtained from the latter the Isle of Man in fee, built a fortified house at Liverpool, and became K.G. He married the heiress of the Lathoms, a native family who had held Lathom in thanage from the Conquest at least and Knowsley by knight-service from the 12th century. His grandson Thomas was father of the first earl of Derby (see Derby, Earls or) and of Sir William Stanley of Holt, whose great wealth led to his execution for treason in 1495, and also of Sir John Stanley, ancestor of the Stanleys of Alderley, who obtained a baronetcy in 1660 and a barony in 1839.

Of the second earl's younger brothers, Sir Edward was raised to the peerage as Lord Monteagle in 15 14 for his services at Flodden, but the dignity passed with an heiress to the Parkers in 1581; and Sir James was ancestor of the Stanleys of Bicker- staffe, who obtained a baronetcy in 1628 and succeeded to the earldom in 1 736. Their father had married the heiress of Lord Strange of Knockyn, and was summoned in that peerage from 1482 to 1497, but did not live to

inherit the earldom. His wife was a first cousin of Henry VII. 's queen.

The 4th earl 'was summoned as Lord Strange, in his father's lifetime, as was the 5th earl, but the barony fell into abeyance between his three daughters, who contested possession of the family estates with his brother, the 6th earl. He bought out their rights in the Isle of Man, and, by his marriage with a sister and co-heir of the 18th earl of Oxford, acquired a claim to the great chamberlainship, which he advanced in 1626 and which was renewed by their descendants. His son was summoned as Lord Strange in 1628 in the erroneous belief that the family retained the dignity, and a fresh barony of Strange was thus created. But on the death of the 10th earl (1736) this barony, with the lordship of Man and other great estates, passed to the 2nd duke of Atholl, whose heir, the present duke, holds the title. The earldom with large estates in Lancashire, passed to the heir male (see above).

Although the present wealth of the Stanleys is largely derived from the great industrial development of Lancashire, they were already a power to be reckoned with in that county and in Cheshire at the time of the Wars of the Roses, and have held a leading position ever since among English nobles. .For three centuries they were in succession lords-lieutenant of Lancashire and occasionally of Cheshire as well, and they have always lived in considerable state. Lathom House, their ancient seat, in the hundred of West Derby (whence possibly the style of their earldom) , was wrecked in the Civil War, and, though rebuilt by the ninth earl, was sold by his daughters. But Knowsley, with its great park, is still theirs, lying to the east of Liverpool, in which their feudal tower still stood in 1821.

See Young's Hundred of Wirral (Liverpool, 1909) ; Round's Peerage and Pedigree (London, 1910); County Histories of Lancashire and Cheshire, and works on the peerage passim. (J. H. R.)

The barony of Stanley of Alderley was created in 1839 for Sir John Thomas Stanley, Bart. (1 766-1850), of Alderley Park, Cheshire, a brother of Edward Stanley (1779-1849), bishop of Norwich and father of Arthur Penrhyn Stanley. A member of parliament and a-fellow of the Royal Society, he married Maria Josepha (d. 1863), daughter of John Holroyd, 1st earl of Sheffield. Their eldest son, Edward John Stanley, 2nd baron (1802-1869), entered the House of Commons in 183 1 and became under- secretary to the home department in 1841, patronage secretary to the treasury from 1835 to 1841, paymaster-general in 1841, and under-secretary for foreign

affairs from 1846 to 1852. In 1848, two years before he succeeded to the barony of Stanley, he was created Baron Eddisbury of Winnington. He was president of the board of trade from 1853 to 1858, and postmaster-general from i860 to 1866. His wife, Henrietta Maria (1807-1895), a daughter of Henry Augustus Dillon-Lee, 13th Viscount Dillon,

was a remarkable woman. Before her marriage in 1826 she had lived in Florence, and had attended the receptions of the countess of Albany, the widow of Charles Edward, the Young Pretender; and in London she had great influence in social and political circles. When he was patronage secretary her husband was described by Lord Palmerston as " joint-whip with Mrs Stanley." Later in life Lady Stanley of Alderley helped to found the Women's Liberal Unionist Association, and she was a strenuous worker for the higher education of women, helping to establish Girton College, Cambridge,the Girls' Public Day School Company, and the Medical College for Women. She died on the 16th of February 1895. Her younger son, Edward Lyulph Stanley (b. 1839), who in 1903 succeeded his brother Henry Edward John (1827-1903) as 4th baron, had previously had an active career as an educationist and a Liberal politician. He was a fellow of Balliol College, Oxford, and was M.P. for Oldham from 1880 to 1885. He was for many years a member of the London School Board. In 1909 on the death of the 3rd earl of Sheffield, he inherited the barony of Sheffield, and that of Stanley of Alderley now became merged in it.

STANLEY, ARTHUR PENRHYN (1815-1881), English divine, dean of Westminster, was born on the 13th of December 181 5, at Alderley in Cheshire, where his father, afterwards bishop of Norwich, was then rector. He was educated at Rugby under Arnold, and in 1834 went up to Balliol College, Oxford , After obtaining the Ireland scholarship and Newdigate prize for an English poem (The Gypsies), he was in 1839 elected fellow of University College, and in the same year took orders. In 1840 he travelled in Greece and Italy, and on his return settled at Oxford, where for ten years he was tutor of his college and an influential element in university life. His personal relations with his pupils were of a > singularly close and affectionate nature, and the charm of his social gifts and genial character won him friends on all sides. His literary reputation was early established by his Life of Arnold, published in 1844. In 1845 he was appointed select preacher, and published in 1847 a volume of Sermons and Essays on the Apostolic Age, which not only laid the foundation of his fame as a preacher, but also marked his future position as a theologian. In university politics, which at that time

wore mainly the form of theological controversy, he was a strong advocate of comprehension and toleration. As an undergraduate he had entirely sympathized with Arnold in resenting the agitation led by, but not confined to, the High Church party in 1836 against the appointment of R. D. Hampden to the regius professorship of divinity. During the long agitation which followed the publication ini84i of Tract No. XC. and which ended in the withdrawal of J. H. Newman from the Anglican Church, he used all his influence to protect from formal condemnation the leaders and tenets of the "Tractarian" party. In 1847 he resisted the movement set on foot at Oxford against Hampden's appointment to the bishopric of Hereford. Finally, in 1850, in an article published in the Edinburgh Review in defence of the " Gorham judgment " he asserted two principles which he maintained to the end of his life — first, "that the so-called supremacy of the Crown in religious matters was in reality nothing else than the supremacy of law," and, secondly, "that the Church of England, by the very condition of its being, was not High or Low, but Broad, and had always included and been meant to include, opposite and contradictory opinions on points even more important than those at present under discussion."

It was not only in theoretical but in academical matters that his sympathies were on the liberal side. He was greatly inter- ested in university reform and acted as secretary to the royal commission appointed in 1850. Of the important changes in administration and education which were ultimately carried out, Stanley, who took the principal share in drafting the report printed in 1852, was a strenuous advocate. These changes included the transference of the initiative in university legislation from the sole authority of the heads of houses to an elected and representative body, the opening of college fellowships and scholarships to competition by the removal of local and other

restrictions the non-enforcement at matriculation of subscription to the Thirty-nine Articles, and various steps for increasing the usefulness and influence of the professoriate. Before the report was issued, Stanley was appointed to a canonry in Canterbury Cathedral. During his residence there he published his Memoir of his father (1851), and completed his Commentary on the Epistles to the Corinthians (1855). In the winter and spring of 1852-1853 he made a tour in Egypt and the Holy Land, the result of which was his well-

known volume on Sinai and Palestine (1856). In 1857 he travelled in Russia, and collected much of the materials for his Lectures on the Eastern Church (1861). His Memorials of Canterbury (1855), displayed the full maturity of his power of dealing with the events and characters of past history. He was also examining chaplain to Bishop A. C. Tait, his former tutor. At the close of 1856 Stanley was appointed regius professor of ecclesiastical history at Oxford, a post which, with the attached canonry at Christ Church, he held till 1863. He began his treatment of the subject with " the first dawn of the history of the church," the call of Abraham; and published the first two volumes of his History of the Jewish Church in 1863 and 1865. From 1 860 to 1 864 academical and clerical circles were agitated by the storm which followed the publication of Essays and Reviews, a volume to which two of his most valued friends, Benjamin Jowett and Frederick Temple, had been contributors. Stanley's part in this controversy may be studied in the second and third of his Essays on Church and State (1870) . The result of his action was to alienate the leaders of the High Church party, who had endeavoured to procure the formal condemnation of the views advanced in Essays and Reviews. In 1836 he published a Letter to the Bishop of London, advocating a relaxation of the terms of clerical subscription to the Thirty-nine Articles and the Prayer-book. An act amending the Act of Uniformity, and carrying out in some degree Stanley's proposals, was passed in the year 1865. In 1862, Stanley, at Queen Victoria's wish, accompanied the prince of Wales on a tour in Egypt and Palestine.

Towards the close of 1863 he was appointed by the Crown to the deanery of Westminster. In December he married Lady Augusta Bruce, sister of Lord Elgin, then governor-general of India. His tenure of the deanery of Westminster was memorable in many ways. He recognized from the first two important disqualifications — his indifference to music and his slight knowledge of architecture. On both these subjects he availed himself largely of the aid of others, and threw himself with charac- teristic energy and entire success into the task of rescuing from neglect and preserving from decay the treasure of historic monu- ments in which the abbey is so rich. In 1865 he published his Memorials of Westminster Abbey, a work which, despite occasional inaccuracies, is a mine of information. He was a constant preacher, and gave a great impulse to Trench's practice of inviting distinguished preachers to the abbey pulpit, especially to the evening services in the nave. His personal influ- ence, already unique, was much increased by his removal to London. His circle of friends included men of every denomina- tion, every class and almost of every nation. He was untiring in literary work,

and, though this consisted very largely of occasional papers, lectures, articles in reviews, addresses, and sermons, it included a third volume of his History of the Jewish Church, a volume on the Church of Scotland, another of Addresses and Sermons preached in America, and another on Christian Institutions (1881). He was continually engaged in theological controversy, and, by his advocacy of all efforts to promote the social, moral, and religious amelioration of the poorer classes and his chivalrous courage in defending those whom he held to be unjustly denounced, undoubtedly incurred much and grow- ing odium in influential circles. Among the causes of offence might be enumerated not only his vigorous defence of one from whom he greatly differed, Bishop Colenso, but his invitation to the Holy Communion of all the revisers of the translation of the Bible, including a Unitarian among other Nonconformists. Still stronger was the feeling caused by his efforts to make the recital of the Athanasian Creed optional instead of imperative in the

Anglican Church. In 1874 he spent part of the winter in Russia, whither he went to take part in the marriage of the duke of Edin- burgh and the grand duchess Marie. He lost his wife in the spring of 1876, a blow from which he never entirely recovered. But in 1878 he was deeply interested by a tour in America, and in the following autumn visited for the last time northern Italy and Venice. In the spring of 1881 he preached funeral sermons in the abbey on Thomas Carlyle and Lord Beaconsfield, concluding with the latter a series of sermons preached on public occasions. In the summer he was preparing a paper on the Westminster Confession, and preaching in the abbey a course of Saturday Lectures on the Beatitudes. He died on the 18th of July, and was buried in Henry VII. 's chapel, in the same grave as his wife. His pall-bearers comprised representatives of literature, of science, of both Houses of Parliament, of theology, Anglican and Nonconformist, and of the universities of Oxford and Cambridge. The recumbent monument placed upon the spot, and the windows in the chapter-house of the abbey, one of them a gift from Queen Victoria, were a tribute to his memory from friends of every class in England and America.

Stanley was undoubtedly the leading liberal theologian of his time in England. Throughout his writings we see the impress, not only of his distinctive genius and of his extraordinary gifts, but also of his special views, aims and aspirations. He looked on the age in which he lived as a period of transicion, to be followed either by an " eclipse of faith " or by a " revival of Christianity in a wider aspect," a " catholic, comprehensive, all-embracing Christi- anity " that " might yet overcome the world. " He was never tired of asserting his

belief " that the Christian Church had not yet presented its final or its most perfect aspect to the world "; that " the belief of each successive age of Christendom had as a matter of fact varied enormously from the belief of its predecessor " ; that " all confessions and similar documents are, if taken as final expressions of absolute truth, misleading "; and that " there still remained, behind all the controversies of the past, a higher Christianity which neither assail- ants nor defenders had fully exhausted." " The first duty of a modern theologian " he held to be " to study the Bible, not for the sake of making or defending systems out of it, but for the sake of discovering what it actually contains." To this study he looked for the best hope of such a progressive development of Christian theology as should avert the danger arising from " the apparently increasing divergence between the intelligence and the faith of our time." He enforced the duty " of placing in the background whatever was accidental, temporary or secondary, and of bringing into due prominence what was primary and essential." In the former group Stanley would, without doubt or hesitation, have placed all questions connected with Episcopal or Presbyterian orders, or that deal only with the outward forms or ceremonies of religion, or with the authorship or age of the books of the Old Testament. Even to the question of miraculous and external evidence he would have been inclined to assign a secondary place.

The foremost and highest place, that of the " essential and super-natural " elements of religion, he would have reserved for its moral and spiritual truths, "its chief evidence and chief essence," "the truths to be drawn from the teaching and from the life of Christ," in whose character he did not hesitate, to recognize " the greatest of all miracles."

With such views it was not to be wondered at that, from first to last, as has already been indicated, he never lost an opportunity of supporting a policy of width, toleration and comprehension in the Church of England. So again he was always eager to insist on the essential points of union between various denominations of Christians. He was throughout his life an unflinching advocate of the connexion between Church and State. By this he under- stood: (1) " the recognition and support on the part of the state of the religious expression of the faith of the community," and (2) " that this religious expression of the faith of the community on the most sacred and most vital of all its interests should be con- trolled and guided by the whole community through the supremacy of law." At the same time he was in favour of. making the creed of the Church as wide as possible — " not narrower than that which is even now the test of its

membership, the Apostles' Creed " — and of throwing down all barriers which could be wisely dispensed with to admission to its ministry. As an immediate step he even advo- cated the admission under due restrictions of English Nonconformists and Scottish Presbyterians, to preach in Anglican pulpits.

Apart from the great impulse which he gave to the study alike of the Bible and Church history, his influence may be said in a very true sense to colour the writings of many of those who most differ from him. The subjects to which he looked as the most essential of all — the universality of the divine love, the supreme importance of the moral and spiritual elements of religion, the supremacy of conscience, the sense of the central citadel of Christianity as being contained in the character, the history, the spirit of its divine

Founder — have impressed themselves more and more on the teaching and the preaching of every class of clergy in the Church.

See G. G. Bradley, Recollections of A. P. Stanley (1883); R. E. Prothero and G. G. Bradley, Life and Correspondence of Dean Stanley (2 vols., 1893).

STANLEY, EDWARD (1770-1849), bishop of Norwich, the younger brother of the 1st Baron Stanley of Alderley, was born in London and educated at St John's College, Cambridge (16th wrangler, 1802). He was ordained in 1802 and became rector of Alderley, Cheshire, three years later. Here he took a great interest in education, and encouraged especially the teaching of secular subjects at his school. In 1837 he was consecrated bishop of Norwich. The diocese at this time was conspicuous for laxity and want of discipline, and this he proceeded to remedy, although at first he met with much opposition. Ordina- tions and confirmations were held more regularly and frequently, the schools were properly inspected, the Plurality Act was enforced and undesirable clergy were removed. He was tolerant towards Dissenters and supported all missionary undertakings without regarding their sectarian associations. In politics he was a Liberal and devoted himself especially to educational questions. Dean Stanley (see above) was his third son.

Stanley's letters, Before and after Waterloo (edited by J. H. Adeane and M. Grenfell, 1907), are full of interest to students of Napoleonic

history.

STANLEY, SIR HENRY MORTON (1 840-1 904), British explorer of Africa, discoverer of the course of the Congo, was born at Denbigh, Wales, on the 10th of June 1840. 1 His parents were named Rowlands or Rollant, and his father, who died in 1843, was the son of a small farmer. John Rowlands, by which name Stanley was baptized, was brought up first by his maternal grandfather, and after his death was boarded out by his mother's brothers at half a crown a week. In 1847 he was taken to the St Asaph Union workhouse, where he was noted for his activity and intelligence. The schoolmaster at the workhouse, James Francis (who eventually died in a madhouse), was a tyrant of the Squeers type, and in May 1856, Rowlands, after giving Francis a thrashing, ran away from school. He sought out his paternal grandfather — a well-to-do farmer — who refused to help him. A cousin, however, who was master of a national school at Brynford, took him in as a pupil teacher. But within a year he was sent to Liverpool, where he lived with an uncle who was in straitened circumstances. The lad, after working at a haberdasher's and then at a butcher's shop, engaged himself as a cabin boy on a sailing ship bound for New Orleans, in which city he landed early in 1859. There he obtained a situation through the good offices of a merchant named Henry Morton Stanley, who subsequently adopted the lad as his son, designing for him a mercantile career. To this end young Stanley (as he was henceforth known) was sent to a country store in Arkansas. The merchant shortly afterwards died, without having made further provision for his protege. When the Civil War broke out in 1861 Stanley enlisted in the Confederate army; he was taken prisoner at the battle of Shiloh (April 1862), and after two months' experience of the hardships of Camp Douglas, Chicago (where the prisoners of war were confined), he obtained release by enrolling in the Federal artillery. In less than a month he was discharged as unfit. In November 1862 he returned to Liverpool " very poor, in bad health and in shabby clothes," and made his way to Denbigh, but was turned away from his mother's door. This incident deeply affected him. Naturally of a sensitive, affectionate nature, henceforth he prac- tised strong self-suppression and reserve. For a livelihood he took to the sea — was wrecked off Barcelona — and in August 1864 enlisted in the United States navy. According to an apparently authentic story 2 he obtained promotion for swimming

500 yds. and tying a rope to a captured steamer, while exposed to the shot and shell of a battery of ten guns. After the war he crossed the plains to Salt Lake City, Denver, and other parts,

acquiring a reputation as a vivid descriptive writer for the press.

Thus began a series of adventures in search of " copy." In the autumn of 1866 we hear of him travelling in Asia Minor "en route for Tiflis and Tibet," and as being attacked, with his twc companions, by brigands, robbed apd imprisoned, the Porte subsequently paying through the American minister an indemnity for the outrage. In December of the same year Stanley revisited Denbigh and St Asaph, returning thence to America. In 1867 he joined General Hancock's expedition against the Red Indians, acting as correspondent for the Missouri Democrat and other papers. His reports induced the New York Herald to send him to accompany the British expedition of 1867-68 against the emperor Theodore of Abyssinia. Succeeding in sending through the first news of the fall of Magdala, Stanley attracted the special attention of the proprietor of the Herald, James Gordon Bennett, and received from him a roving commission. He went to Crete, then in rebellion, in the latter part of 1868, and thence to Spain, where he arrived in time to witness the scenes following the flight of Queen Isabella from Madrid. He chronicled the events of the Republican rising in 1869 and was at Madrid in October of that year, when he received a telegram from Mr Gordon Bennett, jun., summoning him to Paris.

Arrived in Paris Stanley was informed that he was to go and find Livingstone. 3 Stanley then shared the common opinion that Livingstone had died somewhere in Central Africa, but Bennett was sure he was alive and Stanley was to find and help him to the best of his ability. The journey, which was to be kept secret to avoid suspicion, was to begin next day. Strangely enough, though so urgent in the matter, Bennett cumbered Stanley with a large number of commissions to fulfil before the quest for Livingstone could be begun. In accordance with these instructions, Stanley went to Egypt to witness the opening of the Suez Canal in November, thence to Philae, and in January 1870 he arrived in Jerusalem, where he met Captain (afterwards Sir) Charles Warren. Next, by way of Constantinople, he visited the battlefields of the Crimea, and, passing through the Caucasus from Baku, he made an adventurous journey across Persia to Bushire, whence he sailed to Bombay. From Bombay he sailed for Africa, reaching Zanzibar on the 6th of January 1871.

The journey to the interior was begun on the 21st of March; on the 10th of November, having overcome innumerable difficul- ties, Stanley arrived at Ujiji, where Livingstone then was; the young traveller greeting the famous veteran with the words, " Dr Livingstone, I presume ? " With Livingstone Stanley navigated the

northern shores of Tanganyika and settled the question as to whether the Rusizi was an effluent or an affluent — a point then much debated in connexion with the hydrography of the Nile basin. Leaving Tanganyika on the 9th of January 1872 Stanley regained Zanzibar on the 7th of May. He had accomplished his mission, and by it he established his reputation as a leader of men and an explorer of great promise. His story, made public in a picturesque narrative, How I Found Livingstone (1872), was at first received in London with some incredulity, owing in part to his connexion with American journalism of a type then unfamiliar and distasteful; but the journals of Living- stone, which he brought home, silenced the critics, and from Queen Victoria Stanley received a gold snuff-box set with brilliants and her thanks for the services he had rendered. Nevertheless Stanley records that all the actions of his life, and all his thoughts, since 1872, were strongly coloured by the storm of abuse and the wholly unjustifiable reports circulated about him then.

A series of public lectures in England and America followed. In 1873, as war correspondent of the Herald, he accompanied Wolseley's expedition to Ashanti, which he described, together with his Abyssinian experiences, in a volume entitled Coomassie and Magdala: Two British Campaigns (London, 1874). On reaching the island of St Vincent from Ashanti in 1874 he first heard that Livingstone was dead, and that the body was on its way to England. After the funeral of Livingstone some time was spent in negotiations for sending Stanley again to Africa,

1 This is the usually accepted date, but from Stanley's Auto- biography it would appear that the year of his birth was 1842. 1 See C. Rowlands, Henry M. Stanley, p. 102.

3 Previously, in November 1868, Stanley had been sent to Egypt

by the Herald " to meet Livingstone," at the time reported to be

I on his way home. Stanley got as far as Aden when he was recalled.

there to determine geographical problems left unsolved by the deaths of Livingstone and Speke, and the discovery by Sir Samuel Baker of Albert Nyanza, a lake then reputed to extend inimitably in a southerly direction. Finally, Sir Edward Lawson (afterwards Lord Burnham), the editor and proprietor of the Daily Telegraph, to whom Stanley had communicated his desires, and Sir Edwin Arnold of that journal, induced Mr Gordon Bennett to join them in raising a fund for an Anglo- American expedition under Stanley's command. This expedi- tion lasted from October 1874 to August 1877 and accomplished more than any other single exploring expedition in Africa. Politically, also, the journey had momentous consequences; it led directly to the foundation of the Congo State and to the partition of the hitherto unappropriated regions of Africa between the states of western Europe. Stanley started from the east coast and reached the ocean again at the mouth of the Congo, having demonstrated the identity of that river with Livingstone's Luaiaba by navigating its course from Nyangwe — the point at which both Livingstone and Lovett Cameron had turned aside. This wonderful achievement was accomplished in the face of difficulties so great that they could have been overcome only by such a man as Stanley proved himself to be — a man of inflexible will, who having conceived a vast design carried it to its conclu- sion regardless of any obstacles, sparing neither himself nor his associates and, if opposed, prepared to shed blood to attain his object. Of the three white men who accompanied him all died during the journey; Stanley himself was prematurely aged. The discovery of the course of the Congo, though the greatest, was but one of many geographical problems solved during this memorable expedition. The part played by the Kagera in the Nile system, the unity and approximate area of Victoria Nyanza, the true length and area of Tanganyika and the whereabouts of its outlet, and the discovery of a new lake, Dweru, which at the time Stanley believed to be a branch of Albert Nyanza, are some of the other discoveries made by Stanley at this time. The story of the expedition was given at length in Through the Dark Continent (London, 1878). Stanley's

letters from Uganda and his call for missionaries to go to the court of Mtesa met with an immediate response and proved the first step in bringing the region of the Nile sources under the protection of Great Britain. Important as was this result of his journey it was eclipsed by the events which followed his revelation of the Congo as a magnificent waterway piercing the very heart of Africa. Of the commercial possibilities of the region he had made known Stanley was well aware. The one other man who at once grasped the situation was Leopold II., king of the Belgians, who sent commissioners to intercept Stanley at Marseilles, when he was on his way back to England, with proposals to return to the Congo, proposals which Stanley, much needing rest, put aside for the time. Ap- proached again in the summer of 1878 Stanley lent a more favour- able ear to Leopold's suggestions. Efforts made by the explorer in the autumn to arouse British merchants to the importance of the Congo basin were unavailing, and in November Stanley went to Brussels and committed himself to the schemes of the king of the Belgians. A Comite d'Uudes du Haul Congo was formed and Stanley was entrusted with the leadership of the new expedition, which was, in his own words, " to prove that the Congo natives were susceptible of civilization and that the Congo basin was rich enough to repay exploitation." Stanley reached the Congo in August 1879, and the work he accomplished there in the ensuing five years enabled the Comite, which had meantime changed its name to that of Association intemationale du Congo, to obtain the recognition of America and Europe to its transformation into an independent state (" The Congo Free State ") under the sovereignty of King Leopold. Stanley described his labours in The Congo and the Founding of its Free State (London, 1885), a book which throws valuable light on the manner in which the promoters of that enterprise set to work, and the object at which, from the beginning, they aimed. For the political aspects of this question see Africa (§ 5) and Congo Free State. Here it is only necessary to indicate what Stanley actually accomplished on the Congo. At the outset the area of his activities was

restricted by the enterprise of the French traveller de Brazza, who, reaching Stanley Pool by a more northern route, placed — September and October 1880 — the neighbouring districts on the north bank of the Congo under French protection. De Brazza's journey was directly inspired by Stanley's discoveries, and thus early had those discoveries led to international rivalries. Not- withstanding this check Stanley, without much trouble with the natives, founded stations for his association along the banks of the river as high up as Stanley Falls. A more difficult task was the making of a road through

the cataract region and the carry- ing over it in sections of four small steamers, all of which were launched on the middle river. This road-making exploit earned for Stanley from the natives the name of Bula Malari, the rock-breaker, the all-powerful — a fit description of the man who allowed no obstacles to turn him from the achievement of his purpose.

Stanley returned to Europe in the middle of 1884 and attended the Berlin Conference of 1884-1885, which dealt with African affairs, acting as technical adviser of the American plenipoten- tiaries. While in Germany he lectured in various cities on the benefits which would result from the opening up of Central Africa, and found the Germans more alive than the British to the great interests at stake. The revelation of what the Association intemationale had done intensified the struggle among the powers for the possession of African territory. Stanley did not return to the Congo on the recognition of the Free State but took up his residence in London. With James F. Hatton, a leading Manchester merchant, he promoted the Royal Congo Railway Company to connect Stanley Pool with the lower river, but the scheme at the time came to nought, partly owing to the indiffe- rence of English capitalists and partly in consequence of a clause inimical to British interests in the charter which King Leopold proposed to grant the company.

Though still an American citizen Stanley's interests and ambi- tions were becoming distinctly British, his sympathies in that direction being joined to a personal loyalty to the king of the Belgians. 1 A desire to serve both parties was one of the leading motives in his next African adventure. Stanley had become deeply interested in the schemes of Mr (afterwards Sir) William Mackinnon, chairman of the British India Steam Navigation Com- pany, for establishing a British protectorate in East Equatorial Africa, and it was believed that this object could be furthered at the same time that relief was afforded to Emin Pasha (

1 Of the later policy pursued in the Congo State Stanley wrote, in 1896, that it was" erring and ignorant." To go back to the Congo " would be to disturb a moral malaria injurious to the reorganizer " (Autobiography, p. 537).

Nothing but miles and miles, endless miles of forest." Starva- tion,

fever, the hostility of the tribes, were daily incidents of this terrible march, during which Stanley lost nearly 50% of his men. On the 13th of December Albert Nyanza was reached, and after some delay communication was opened with Emin, who came down the lake from the Nile in a steamer, the two chiefs meeting on the 29th of April 1888. Disquieted by the non-arrival of his rearguard, Stanley retraced his steps, and on the 17th of August, a short distance above Yambuya, found that Tippoo Tib had broken faith, that Barttelot had been murdered, that Jameson (who soon afterwards died of fever) was absent at Stanley Falls, and that only one European, William Bonny, was left in the camp. Collecting those who survived of the rearguard Stanley for the third time traversed the primeval forest, and in January 1889 all that was left of the expedition was assembled at Albert Nyanza. Of 646 men with whom he entered the Congo, but 246 remained. In April the return journey to Zanzibar by way of Uganda was begun, Emin reluctantly accompanying Stanley. On this homeward journey Stanley discovered Ruwenzori (the Mountains of the Moon), traced the course of the Semliki River, discovered Albert Edward Nyanza and the great south- western gulf of Victoria Nyanza. During his stay in the Congo forests he had also obtained much information concerning the pygmy tribes. As to the political results of the expedition, Stanley's proposals to Emin to hold the Equatorial Province for the Congo State or to move nearer Victoria Nyanza and enter the service of Mackinnon's British East Africa Company had not been accepted, but he concluded agreements with various chiefs in the lake regions in favour of Great Britain, agreements which were handed over to the East Africa Company. Zanzibar was reached on the 6th of December 1889 and the expedition was at an end. Stanley's account of it, In Darkest Africa, was published (in six languages) in 1890.

Returning to England, Stanley was received with much honour, among the many distinctions conferred upon him "being the degrees of D.C.L. from Oxford and of LL.D. from Cambridge and from Edinburgh. On the 12th of July 1890 he married a lady whose graceful work as an artist was well known, Miss Dorothy Tennant, second daughter of Mr Charles Tennant, sometime M.P. for St Albans. Later in the year he visited the United States, where he made a pilgrimage to the places where his youth had been spent, and in 1891-1892 went to Australia and New Zealand on lecturing tours. On his return he was renaturalized as a British subject, and — at the solicitation of his wife — he stood at the general election in the summer of 1892 as candidate for North Lambeth in the Liberal Unionist interest, being defeated by a small majority. In 1895 he

again stood for the same constituency and was elected, but he had no liking for parliamentary life, and (being also in ill-health) he did not seek re-election in 1900. In 1895 Stanley published My Early Travels and Adventures in America and Asia, in which he retold the story of his experiences with the Red Indians and of his eastern journey of 1869-1870. In 1897 Stanley paid his last visit to Africa. He went to the Cape as the guest of the British South Africa Company, spoke at the opening of the railway from the Cape to Bulawayo, visited the Victoria Falls of the Zambezi and had an interview with President Kruger, of whom he gives a characteristic pen- picture. One result of this journey was Through South Africa (1898), the last of his published works. In 1899 in recognition of his services in Africa he was made a Knight Grand Cross of the Bath. The last few years of his life were spent mainly in retirement on a small estate he had purchased, Furze Hill, near Pirbright. He died at his London residence in Richmond Terrace, Whitehall, on the 10th of May 1904. After a service in West- minster Abbey he was buried at Pirbright on the 17th of May. His widow, Lady Stanley, afterwards married, in 1907, Mr Henry Curtis, F.R.C.S. By Sir Henry Stanley she had a son, Denzil, born 1896.

In geographical discoveries Stanley accomplished more than any other explorer of Africa, with which continent his name is indissolubly connected. Notwithstanding his frequent conflicts with Arabs and negroes, he possessed in extraordinary degree

the power of managing native races; he was absolutely fearless and ever ready to sacrifice either himself or others to achieve his object. His books differ widely from the ordinary books of travel. Stanley had a gift of dramatic narrative, and his power of portraiture was remarkable. Curiously, the least successful of his works was the only one which he cast in the form of fiction, My Kalulu, Prince, King and Slave. Another volume from his pen, My Dark Companions and their Strange Stories (1893), is a valuable contribution to folklore.

The Autobiography of Sir Henry Morton Stanley, ed. by his wife, Dorothy Stanley, appeared in 1909. Henry M. Stanley, the Story of his Life . . . (London, n.d. [1872]), by C. Rowlands, contains, notwithstanding many inaccuracies, valuable information concern- ing his family and early career. The following books may also be consulted: Mrs J. S. Jameson, Story of the Rear Column of the Emin Pasha Relief Expedition (1890) ; W. G. Barttelot, The Life of Edmund Musgrave Barttelot . . . (1890); H. Brode, Tippoo Tib, the Story of his Career in Central Africa (1907). (F. R. C.)

STANLEY, THOMAS (1625-1678), English poet and philo- sopher, son of Sir Thomas Stanley of Cumberlow, in Herts, was born in 1625. His mother, Mary Hammond, was the cousin of Richard Lovelace, and Stanley was educated in company with the son of Edward Fairfax, the translator of Tasso. He pro- ceeded to Cambridge in 1637, in his thirteenth year, as a gentle- man commoner of Pembroke Hall. In 1641 he took his M.A. degree, but seems by that time to have proceeded to Oxford. He was wealthy, married early, and travelled much on the Continent. He was the friend and companion, and at need the helper, of many poets, and was himself both a writer and a translator of verse. His Poems appeared in 1647 ; his Europa, Cupid Crucified, Venus Vigils, in 1649; his Aurora and the Prince, from the Spanish of J. Perez de Montalvan, in 1647; Oronla, the Cyprian Virgin, from the Italian of G. Preti (1650); and Anacreon; Bion; Moschus; Kisses by Secundus … a volume of translations, in 1651. Stanley's most serious work in life, however, was his History of Philosophy, which appeared in three successive volumes between 1655 and 1661. A fourth volume (1662), bearing the title of History of Chaldaick Philosophy, was trans- lated into Latin by J. Le Clerc (Amsterdam, 1690). The three earlier volumes were published in an enlarged Latin version by Godfrey Olearius (Leipzig, 1711). In 1664 Stanley published in folio a monumental edition of the text of Aeschylus. He died at his lodgings in Suffolk Street, Strand, on the 12th of April 1678, and was buried in the church of St Martin-in-the-Fields. His portrait was painted by Sir Peter Lely; his wife was Dorothy, daughter and coheir of Sir James Emyon, of Flower, in North- amptonshire. Stanley is a very interesting transitional figure in English literature. Born into a later generation than that of Waller and Denham, he rejected their reforms, and was the last to cling obstinately to the old prosody and the conventional forms of fancy. He is the frankest of all English poets in his preference of decadent and Alexandrine schools of imagination; among the ancients he admired Moschus, Ausonius, and the Pervigilium Veneris; among the moderns, Joannes Secundus, Gongora and Marino. The English metaphysical school closes in Stanley, in whom it finds its most delicate and autumnal exponent, who went on weaving his fantastic conceits in elabor- ately artificial measures far into the days of Dryden and Butler. When Stanley turned to prose, however, his taste became trans- formed. He abandoned his decadents for the gravest masters of Hellenic thought. As an elegant scholar of the illuminative order, he secured a very high place indeed throughout the second half of the 17th century. His History of Philosophy was long the principal authority on the progress of thought in ancient Greece. It took the form of a series of

critical biographies of the philosophers, beginning with Thales; what Stanley aimed at was the providing of necessary information concerning all " those on whom the attribute of Wise was conferred." He is par- ticularly full on the great Attic masters, and introduces, " not as a comical divertisement for the reader, but as a necessary supplement to the life of Socrates," a blank verse translation of the Clouds of Aristophanes. Bentley is said to have had a very high appreciation of his scholarship, and to have made use of the

poet's copious notes, still in manuscript (in the British Museum), on Callimachus.

Stanley's original poems, which had been collected in 1651, were imperfectly reprinted in Sir S. Egerton Brydges's edition of 150 copies in 1814, but never since; his " Anacreon " was issued, with the Greek text, by Mr Bullen in 1892. His prose works have not been collected. (E. G.)

STANLEY, SIR WILLIAM (1548-1630), English soldier and traitor, was the eldest son of Sir Rowland Stanley (d. 1612) of Hooton, Cheshire, a member of the famous family of that name. As a volunteer under the duke of Alva he gained his earliest military experiences in the service of Spain; then about 1570 he joined the English forces in Ireland, where he remained for fifteen years, being knighted by Sir William Drury in ,1579. He was very prominent in the guerrilla warfare against the Irish rebels; he was made sheriff of Cork, and he acted as deputy for Sir John Norris, the president of Munster, where by 300 executions he terrified the inhabitants " that a man now may travel the whole country and none to molest him." Having, says William Camden, " singulari fide et fortitudine in Hibernico bello moruerat," he returned to England in October 1585, undoubtedly annoyed that his services had not been more generously rewarded. In December of this year, however, he crossed to the Netherlands with the English forces, but almost as soon as he reached his destination he was sent to Ireland to collect recruits, of whom he ;enlisted about 1400. Although a strong Roman Catholic, Stanley had hitherto served Elizabeth loyally, but lingering in London on his return from his Irish errand, he seems to have entered into the schemes of the Jesuits against the queen, and he was probably aware of Anthony Babington's plot. But the time for more active and personal treachery had not yet arrived, and with his Irish

levies he reached Holland in August 1 586, fought gallantly at Zutphen and helped Sir William Pelham to seize Deventer. In spite of some remonstrances, Stanley was made governor of this town, being given extended powers by Leicester, and his opportunity had now come. In January 1587 he surrendered Deventer to the Spaniards, and while most of his men entered the Spanish service, he travelled to Madrid to discuss the projected invasion of England, his idea being to make Ireland the base for this undertaking. These and subsequent plans were ruined by the defeat of the Armada, but he made several journeys to Spain, and did not abandon the hope that England might be invaded. In the intervals between his travels he fought under the Spanish flag in the Netherlands and in France. Later he became governor of Mechlin, and he died at Ghent on the 3rd of March 1630. His descendant, William Stanley, was created a baronet in 1661, the male line of the family becoming extinct when Sir John Stanley-Errington, the 12th baronet, died in 1893.

See R. Bagwell, Ireland under the Tudors (1890), vol. iii. ; and J. L. Motley, The United Netherlands (1904), vol. ii.

STANNARD, JOSEPH (1796-1830), British painter, was born in Norwich. He there received some training in art from Robert Ladbrooke, the brother-in-law of Crome, and he also visited Holland and studied the pictures of the Dutch masters. His short life — he died when he was thirty-four — was spent in his native town, and he contributed to the exhibitions of the Norwich Society, of which he was a member, and also occasionally showed his work in London. Most of his pictures represent coast subjects or river scenes, but he had some reputation as a portrait-painter also, and in this branch of practice he achieved locally a fair measure of success. In his large picture, " The Annual Water Frolic at Thorpe," he com- bined landscape with portraiture. He attained no little skill as an etcher and published several plates which have a considerable degree of merit.

STANNARIES (Lat. stannum, Cornish, stean, tin), tin mines. Stannary courts exercised a jurisdiction peculiar to Cornwall and Devon. So far as regards Cornwall the jurisdiction is an immemorial one. By ancient charters, the tinners of Corn- wall were exempt from all other jurisdiction than that of the stannary courts, except in cases affecting land, life and limb.

The tin-mining industry of Cornwall, dating, as it does, from the very earliest times, was always prosecuted in accordance with a particular code of customs; the earliest charter which embodies them

is that of Edmund, earl of Cornwall, but the freedom then assured was rather confirmed than given for the first time, and it is impossible to say how far these customs of the stannaries courts go back. Twenty-four stannators were returned for the whole of Cornwall. Their meeting was termed a parliament, and when they assembled they chose a speaker. In earlier times, the combined tinners of Devon and Cornwall assembled on Hingston Down, a tract of highland on the Cornish side of the Tamar. After the charter of Earl Edmund, the Cornish stan- nators met (apparently) at Truro; those of Devonshire at Crockern Tor on Dartmoor. An officer was appointed by the duke of Cornwall or the Crown, who was lord warden of the stannaries, and the parliaments were assembled by him from time to time, in order to revise old or to enact new laws. The last Cornish stannary parliament was held at Truro in 1752. For a long series of years little or no business was transacted in the stannary courts; but the necessity for a court of peculiar jurisdiction, embracing mines and mining transactions of every description within the county of Cornwall having become more and more apparent, a committee was appointed to report on the subject, and an act of parliament was afterwards (1836) passed, suppressing the law courts of the stewards of the differ- ent stannaries, and giving to the vice-warden their jurisdiction, besides confirming and enlarging the ancient equity juris- diction of that office. By the Stannaries Act 1855 the respec- tive parliaments or stannaries courts of Cornwall and Devon were consolidated. From the judgments of the vice-warden an appeal lay to the lord warden, and from him to the Supreme Court. By the Stannaries Courts Abolition Act 1896 the jurisdiction of the courts was transferred to the county courts. The most important customs may be briefly stated: (a) " free tinners " had the right to work upon rendering the " toll-tin," usually one-fifteenth of the produce, to the owner or lord of the soil; (b) the right of " tin-bounding," that is, the right of bounding any unappropriated waste lands, or any several or enclosed lands which had once been waste land, subject to the custom and to the delivery of tin-toll. The bound was marked by turf or stone, and was about an acre in extent. The estate of a bounder in Devonshire is real property, but in Cornwall is personal property.

For many centuries a tax on the tin, after smelting, was paid to the earls and dukes of Cornwall. The smelted blocks were carried to certain towns (Liskeard, Lostwithiel, Penzance, Truro) to be coined, that is, a corner of the block was cut off, and the block was then stamped with the duchy seal as a guar- antee of the quality. By an act of 1838 the dues payable on the coinage of tin were abolished,

and a compensation was awarded to the duchy instead of them.

See T. Pearce, Laws and Customs of the Stannaries in the Counties of Cornwall and Devon (1725) ; Bainbridge, Law of Mines and Minerals ; G. R. Lewis, The Stanneries: a Study of the English Tin Mines (" Harvard Economic Studies," 1908).

STANNITE, a rare mineral consisting of tin, copper and iron sulphide (a sulpho-stannate, Cu 2 FeSnS4), containing, when pure < tin 27-5, copper 29-5%. It has a metallic lustre, and, when pure, is iron-black in colour: more often, however, it is bronze- yellow, owing to tarnish or to the presence of intimately ad- mixed chalcopyrite: for this reason it is known to miners as " bell-metal-ore " or as " tin pyrites." The hardness is 35 and the specific gravity 4-45. It usually occurs as granular to compact masses, rarely as crystals. Minute crystals from Bolivia have been shown to be tetragonal and hemihedral, like chalcopyrite; and to be invariably twinned, giving rise to pseudocubic forms. The mineral has been found in a number of Cornish tin mines, and was formerly worked to a limited extent as an ore. At Zinnwald in Bohemia it occurs with blende and galena, and in Bolivia with silver ores. (L. J. S.)

STANS, the capital of the eastern half (or Nidwalden) of the Swiss canton of Unterwalden. It stands amid orchards at a

height of 1493 ft. above the sea-level on a plain at the north foot of the conical Stanserhom (6238 ft). It is, by electric railway, about 2 m. from Stansstad, its port on the south shore of the lake of Lucerne, and 12 m. from Engelberg (with its great Benedictine monastery, founded about n 20), now a much- frequented summer resort, while there is also an electric rail- way from Stans up the Stanserhorn. In 1900 Stans had a population of 2798, all German-speaking and Romanists. Stans was the home of the Winkelried family (q.v.) and has a modern monument to the memory of Arnold von Winkelried, the legendary, hero of the battle of Sempach (1386). In 148 1 the holy Nicholas von der Flue composed at Stans by his advice the strife between the Confederates, while in 1798 many persons were massacred here by the French. (W. A. B. C.)

STANSFELD, SIR JAMES (1820-1898), English politician, was born at Moorlands, Halifax, on the 5th of October 1820, the son of James

Stansfeld, a county-court judge. Educated at University College, London, he was called to the bar in 1849. In 1847 he was introduced through his father-in-law, W. H. Ashurst, to Mazzini, with whom he formed a close friendship. In 1859 he was returned to parliament as Radical member for Halifax, which town he continued to represent for over thirty- six years. He voted consistently on the Radical side, but his chief energies were devoted to promoting the cause of Italian unity. He was selected by Garibaldi as his adviser when the Italian patriot visited England in 1862. In 1863 he moved in the House of Commons a resolution of sympathy with the Poles, and two months later was made a junior lord of the admiralty. In 1864, as the result of charges made against him by the French authorities, in connexion with Greco's conspiracy against Napoleon III., Disraeli, in the House of Commons, accused him of being " in correspondence with the assassins of Europe." Stansfeld was vigorously defended by Bright and Forster, and his explanation was accepted as quite satis- factory by Palmerston. Nevertheless he only escaped a vote of censure by ten votes, and accordingly resigned office. In 1865 he was re-elected for Halifax, and in 1866 became under- secretary of state for India. In the first Gladstone admin- istration he held a variety of public offices, finally becoming, in 187 1, the first president of the local government board. The remainder of his life was mainly spent in endeavouring to secure the repeal of the Contagious Diseases Acts, and in 1886 this object was attained. In the same year Stansfeld again became president of the local government board. He died on the 17th of February 1898.

STANTON, EDWIN M'MASTERS (1814-1869), American statesman, was born at Steubenville, Ohio, on the 19th of December 1814. He attended Kenyon College at Gambier, Ohio, from 1831 to 1833, was admitted to the bar in 1836, was prosecuting attorney of Harrison county in 1837-1839, and practised in Cadiz, O., until 1839, when he returned to Steu- benville. In 1847 he removed to Pittsburg, Pennsylvania, where he took a leading place at the bar. One of his most famous cases was that of The State of Pennsylvania v. The Wheeling and Belmont Bridge Company (1849-1856), in which, as counsel for the state, he invoked successfully the aid of the Federal government in preventing the construction of a bridge over the Ohio river at Wheeling, Virginia (now West Virginia) — on the ground that the structure would interfere with the navi- gation of that stream by citizens of Pennsylvania. His large practice before the United States Supreme Court caused him to remove to Washington in 1856. In 1858 he was sent to California by the United States attorney-general as special Federal agent for the settlement of land claims,

and he succeeded in breaking up a conspiracy by which the government would have been defrauded of vast tracts of land of almost inestimable value. Before the Civil War Stanton was a Democrat, opposed to slavery, but a firm defender of the constitutional rights of the slaveholders, and was a bitter opponent of Lincoln, whose party he then hated and distrusted. In the reorganization of President Buchanan's cabinet in i860 Stanton became attorney-general, and he did what he could to strengthen the

weak policy of the president in the last months of his admin- istration. Although he had often violently denounced President Lincoln, the latter thought he saw in Stanton a good war minister, and in January 1862 invited him into his cabinet. In his administration of the war office Stanton was vigorous, rigid, and often harsh, and his peremp- tory manner, in speech and correspondence, was the cause of considerable friction between the war department and the generals, one of the last and most conspicuous instances being his controversy with General Sherman over the terms of surrender granted to J. E. Johnston's army. But he removed a horde of fraudulent contractors, kept the armies in the field well equipped, and infused energy into procrastinating generals. Not the least of his achievements was the peaceable disband- ment of 800,000 soldiers at the end of the war. Remaining in the cabinet of President Andrew Johnson, Stanton exerted all his energies toward thwarting the policies of that executive, especially those related to the reconstruction of the Southern states. He expressed disapproval of the Tenure of Office Act, making the consent of the Senate necessary for the removal of civil officers, and drafted the supplementary act on Recon- struction, passed over the president's veto on the 19th of July 1867. Stanton was finally asked to resign, and on his refusal to do so the president suspended him (Aug. 12) from office and appointed General Grant (who had disapproved of the secretary's removal) secretary ad interim. When the Senate, however, under the terms of the Tenure of Office Act, refused (Jan. 13, 1868) to concur in the suspension, Grant left the office and Stanton returned to his duties. On the 2 1 st of February 1868 Johnson appointed General Lorenzo Thomas secretary of war ad interim, and ordered Stanton to vacate, but on the same day the Senate upheld Stanton, and by way of reply the secretary made oath to a complaint against Thomas for violating the Tenure of Office Act, and invoked military protection from General Grant, who placed General E. A. Carr in charge of the war department building, while Congress came to Stanton's rescue by impeaching the presi- dent, the principal article of impeachment being that based on the removal of

Stanton (see Johnson, Andrew). When the impeachment proceedings failed (May 26) Stanton resigned and returned to the practice of law. In 1869 President Grant appointed him a justice of the United States Supreme Court, but he died on the 24th of December, four days after his appoint- ment. Stanton had a violent temper and a sharp tongue, but he was courageous, energetic, thoroughly honest and a genuine patriot.

See George C. Gorham, Life and Public Services of Edwin M. Stanton (2 vols., Boston, 1899), and Frank A. Flower, Edwin McMasters Stanton: The Autocrat of Rebellion, Emancipation, and Reconstruction (New York, 1905).

STANTON, ELIZABETH CADY (1815-1902), American reformer, was born in Johnstown, New York, on the 1 2th of November 1815, the daughter of Daniel Cady (1773-1859), a Federalist member of the National House of Representatives in 1815-1817 and a justice of the supreme court of New York state in 1847-1855. She was educated at the Johnstown Academy and at the Troy Female Seminary (now the Emma Willard School), where she graduated in 1832. In 1840 she married Henry Brewster Stanton (1805-1887), a lawyer and journalist, who had been a prominent abolitionist since his student days (1832-1834) in Lane Theological Seminary, and who took her on a wedding journey to London, where he was a delegate to the World's Anti-Slavery Convention. He was a member of the New York Senate in 1850-1851, was one of the founders of the Republican party in New York, and from 1868 until his death was on the staff of the New York Sun. Mrs Stanton, who had become intimately acquainted in London with Mrs Lucretia Mott, one of the women delegates barred from the anti-slavery convention, devoted herself to the cause of women's rights. She did much by the circulation of petitions to secure the passage in New York in 1848 of a law giving a married woman property rights; and in the same year on the 19th and 20th of

June in Seneca Fills (q.v.), whither the Stantons had removed in 1847 from Boston, was held, chiefly under the leadership of Mrs Mott and Mrs Stanton, the first Woman's Rights Con- vention. She spoke before the New York legislature on the rights of married women in 1854 and on drunkenness as a ground for divorce in i860, and for twenty-five years she annually addressed a committee of

Congress urging an amendment to the Federal constitution giving certain privileges to women. With Parker Pillsbury (1809-1898) she edited in 1867-1870 The Revolution, a radical newspaper, which in 1870 was con- solidated with the Christian Enquirer. To the Woman's Tribune she made important contributions, publishing in it serially parts of the Woman's Bible (1895), which she and others pre- pared, and her personal reminiscences, published in 1898 as Eighty Years and More. With Susan B. Anthony and Mathilda Joslyn Gage she wrote The History of Woman Suf- frage (3 vols., 1880-1886). She was president of the National Woman Suffrage Association in 1865-1890. Her daughter, Harriot Stanton Blatch (1856-), also became prominent as a worker for woman's suffrage.

STANYHURST, RICHARD (1347-1618), English translator of Virgil, was born in Dublin in 1547. His father was recorder of the city, and Speaker of the Irish House of Commons in 1557; I 56° and 1568. Richard was sent in 1563 to University College, Oxford, and took his degree five years later. At Oxford he became intimate with Edmund Campian. After leaving the university he studied law at Furnival's Inn and Lincoln's Inn. He contributed in 1557 to Holinshed's Chroni- cles "a playne and perfecte description " of Ireland, and a history of the country during the reign of Henry VIII., which were severely criticized in Barnabe Rich's New Description of Ireland (1610) as a misrepresentation of Irish affairs written from the English standpoint. After the death of his wife, Janet Barnewall, in 1579, Stanyhurst went to the Netherlands. After his second marriage, which took place before 1585, with Helen Copley, he became active in the Catholic cause. He spent some time in Spain, ostensibly practising as a physician, but his real business seems to have been to keep Philip II. informed of the state of Catholic interest in England. After his wife's death in 1602 he took holy orders, and became chaplain to the arch- duke Albert in the Netherlands. He never returned to England, and died at Brussels, according to Wood, in 1618. He trans- lated into English The First Foare Bookes of Virgil his Aeneis (Leiden, 1582), to give practical proof of the feasibility of Gabriel Harvey's theory that classical rules of prosody could be successfully applied to English poetry. The translation is an unconscious burlesque of the original in a jargon arranged in what the writer called hexameters. Thomas Nashe in his preface to Greene's Menaphon ridiculed this performance as his " heroicall poetrie, infired . . . with an hexameter furie ... a patterne whereof I will propounde to your judge- ments. . . . Then did he make heaven's vault to rebounde, with rounce robble

hobble Of ruffe raffe roaring, with thwick thwack thurlery

bouncing."

This is a parody, but not a very extravagant one, of Stanyhurst's vocabulary and metrical methods.

His son, William Stanyhurst (1602-1663), was a voluminous writer of Latin religious works, one of which, Dei immorlalis in corpore mortali patientis historia, was widely popular, and was translated into many languages.

Only two copies of the orginal Leiden edition of Stanyhurst's translation of Virgil are known to be in existence. In this edition his orthographical cranks are preserved. A reprint in 1583 by Henry Bynneman forms the basis of J. Maidment's edition (Edinburgh, 1836), and of Professor E. Arber's reprint (1880), which contains an excellent introduction. Stanyhurst's Latin works include De rebus in Hibernia gestis (Antwerp, 1584) and a life of St Patrick

(1587).

STANZA (Low Lat. stantia, Ital. stantia or stanza), properly an apartment or storey in a house, the term being hence adopted for literary purposes to denote a complete section, of recurrent form, in a poem. A stanza is a strophe of two or more lines,

usually rhyming, but always recurring, the idea of fixed re- petition of form being essential to it. At the close of the 1 6th century the word stanza began to be used with an ad- jective to designate a particular species, as the " Spenserian stanza," because Spenser had invented that nine-lined form for his Faerie Queen; or " Ariosto's stanza " as Drayton de- scribed what is now known as ottava rima, because Ariosto had written prominently in it. By " stanzaic law " is meant the law which regulates the form and succession of stanzas. The stanza is a modern development of the strophe of the ancients, modified by the requirements of rhyme. (See Verse; Strophe; Spenserian Stanza.)

STAPLE, a word which has had a curious and interesting development of meaning. The O. Eng. stapul meant a prop or support, and is to be referred to the root seen in step, stamp, &c. ; the meaning is also seen in the cognate Du. stapel, stocks, pile, Ger. Staffel, step of a ladder, &c. The application, in current usage, of the word to a loop of wire or metal with two sharpened points used to fix a pin or bolt, or to fasten wire, &c, to wood, preserves the original sense. A special development in Low German of stapel gave the

meaning of an orderly arranged heap of goods or stores, hence a store-house in which goods were arranged in a settled order, the idea of firmness or stability being that which runs through the changes of meaning to which the word has been subjected. This Low German word and sense was adapted in Old French as estaple, mod. itape, and applied to an' established market or town, particularly to one which was the centre of the trade in some Specific commodity. Thence the word has in modern -usage been transferred to a principal or chief commodity or article of consumption.

In English economic history the term " staple " was applied to those towns which were appointed by the king as the centres for the trade of the company of the merchants of the staple. These merchants had a monopoly in the purchase and export of the staple commodities of England, viz. wool, woolfels, leather, tin and lead. The merchants of the staple were the origin of all English trading companies. The trade of the staple towns was under the management of a mayor and constables, sometimes appointed by the merchants themselves, sometimes by the mayor of the town and sometimes by the king himself. W. Stubbs (Const. Hist. vol. ii.) dates the growth of the system from the reign of Edward I. The monopolies of the staple were from time to time abolished and restored, but they were consolidated by a statute o.f 1353, the number and place of the staples being fixed, the custom declared, and the rights and privileges of the merchants confirmed. (See C. Gross, Gild Merchants; W. Cunningham, Growth of English Industry and Commerce.)

STAPLEDON, WALTER DE (1261-1326), English bishop, was born at Annery in North Devon on the 1st of February 1261. He became professor of canon law at Oxford and chaplain to Pope Clement V. and in 1307 was chosen bishop of Exeter. He went on errands to France for both Edward I and Edward II., and attended the councils and parliaments of his time. As lord high treasurer of England, an office to which he was appointed in 1320, the bishop was associated in the popular mind with the misdeeds of Edward II., and consequently, after the king fled before the advancing troops of Queen Isabella, he was murdered in London by the mob on the 1 5th of October 1326. Stapledon is famous as the founder of Exeter College, Oxford, which originated in Stapledon Hall, established in 1314 by the bishop and his elder brother, Sir Richard Stapledon, a judge of the king's bench. He also contributed very liberally to the rebuilding of his cathedral at Exeter.

STAR, the general term for the luminous bodies seen in the heavens; used also by analogy for star-shaped ornaments (see Medal; Orders

and Decorations) or other objects, and figura- tively for persons of conspicuous brilliance. The word is common to many branches of languages: in Teutonic two forms appear, slarre or sterre (cf. Du. ster), and sterne, or stem (cf. Ger. Stem, and the Scand. stjarna, stjerna, Sec). From Lat. Stella, are derived Span, and Port, estrella, and Fr. Uoile.

STAR

7.85

The Greek is i.arfip, and the Sanskrit tar a, for star a. The ultimate root is unknown, but may be connected with that meaning " to strew," and the word would thus mean the points of light scattered over the heavens. The study of the stars is coeval with the birth of astronomy (see Astronomy: History); and among the earliest civilizations bene- ficent or malevolent influences were as- signed to them (see Astrology). With the development of observational astro- nomy the sidereal universe was arbitrarily divided into areas characterized by special assemblages of stars; these assemblages were named asterisms or constellations, and each received a name suggested by mythological or other figures. The heavenly bodies fall into two classes: (1) the fixed stars, or stars proper, which retain the same relative position with respect to one another; and (2) the planets, which have motions of a distinctly individual character, and appear to wander among the stars proper.

Numerous counts of the number of stars visible to the naked eye have been made; it is doubtful whether more than 2000 can be seen at one time from any position on the earth. When a telescope is employed this number is enormously in- creased, and still more so with the introduction of photographic methods; with modern appliances more than a hundred million of these objects may be rendered perceptible.*

The recognition of star's is primarily dependent on their brightness or "magnitude"; and it is clear that stars admit of classification on this basis. This was attempted S Mˆ nHud° d by Ptolem y. wh ° termed the brightest stars "of the of the stars. first magnitude," and the progressively fainter stars of progressively greater magnitude. Ptolemy's classification has been adopted as the basis of the more exactly quantitative modern system. In this system one star is defined to be unit magnitude higher than another if its light is less in the ratio 1:2-512. This ratio is adopted so that a difference of five magnitudes may correspond to a light-ratio of 1 : 100. This subject is treated in the article Photometry, Celestial. The faintest stars visible

to the naked eye on clear nights are of about the sixth magnitude; exceptionally keen, well-trained eyes and clear moonless nights are necessary for the perception of stars of the seventh magnitude. According to E. Heis the numbers and magnitudes of stars between the north pole and a circle 35 south of the equator are: —

noticed that they fall into two fairly well-marked classes. The following table, based on S. C. Chandler's " Third Catalogue " (Astronomical Journal, vol. xvi.), supplemented by A. W. Roberts's list of southern variables (ibid. vol. xxi.), classifies the lengths of the periods of 330 stars. ,

Period

in

days

to

50

50

to

100

100

to

150

150

to

200

200

to

250

250

to

300

300

to

350

350

to

400

400

to

450

450

to

500

500

to

550

550

to 6pp.

600

to

650

Stars

73

8

12

22

41

45

49

So

20

6

1

2

1

1st mag.

2nd mag.

3rd mag.

4th mag.

5th mag.

6th mag.

14

48

152

313

854

2010

From the value of the light-ratio we can construct a table showing the number of stars of each magnitude which would together give as much light as a first magnitude star, viz.: —

1st mag.

2nd mag.

3rd mag.

4th mag.

5th mag.

6th mag.

1

2|

6

16

40

100

Comparing these figures with the numbers of stars of each magnitude we notice that the total light emitted by all the stars of a given magnitude is fairly constant. '

Variable Stars. — Although the majority of the stars are unchanging in magnitude, there are many exceptions. Stars whose brightness fluctuates are called variable stars. The number of known objects of this class is being added to rapidly, and now amounts to over 4000. The systematic search made at Harvard Observatory is responsible for a large proportion of the recent discoveries. Many of these stars seem to vary quite irregularly; the changes of magnitude do not recur in any orderly way. Others, however, are periodic, that is to say, the sequence of changes is repeated at regular intervals, and it is thus possible to predict when the maximum and minimum brightness will occur. Of the periodic variable stars, the lengths of the periods range from 3 hours 12 minutes, which is the shortest yet determined, to 610 days, the longest. When statistics of the lengths 6f the periods are collected, it is at once

It will be noticed that there are very few periods between 50 and 150 days, that a considerable number are less than 50 days (actually a large majority of these are less than 10 days), and that from 150 days upwards the number of periods increases to a maximum at about 350 days and then diminishes. We thus recognize two classes of variables, of which (1) the long-period variables have periods ranging in general from 150 to 450 days, though a few are outside these limits, and (2) the short-period variables have periods less than 50 days (in the majority pf cases less than 10 days). There is some over-lapping of these two classes as regards length of period, and it is doubtful in which class some stars, whose periods are between 10 days and 150 days, should be placed; but the two classes are quite distinct physically, and the variability depends on entirely different causes.

Long-period Variables. — The best known and typical star of this class is Mira or o Ceti. This was the first variable star to be discovered, having been noticed in 1596 by David Fabricius, who thought it was a new star (a Nova). The varying brightness, ranging from the ninth to the second magnitude, was recognized in 1639 by John Phocylides Holwarda, and in 1667 Ismael Boulliau (1605-1694) established a periodicity of 333 days. Although the periodic outbursts of light have taken place without intermission during the two and a half centuries that the star has been Under observation, they are somewhat irregular. The different maxima differ considerably in brightness; thus in 1906 (the brightest maximum since 1779) the second magnitude was reached) but in other years (as in 1868) it has failed to reach the fifth magnitude. The minima likewise are variable, but only slightly so. Also, the period varies somewhat ; the maxima occur sometimes early and sometimes late as compared with the mean period, but the difference is never more than forty days. No general law has been discovered governing these irregularities. The change of magnitude takes place gradually, but the rise to maximum brilliance is rather more rapid than the decline. Spectroscopic observation shows that' the increased light accompanies an actual physical change or conflagration in the star. The spectrum is of the third type with bright hydrogen emission lines (see below, Spectra of Stars). Stars having this type of spectrum are always variable, and a large proportion of the more recently discovered long-period variables have been detected through their characteristic spectrum.

X Cygni is another star of this class, remarkable for its range of magnitude. In its period of 406 days it fluctuates between the thirteenth and the fourth magnitudes; thus at maximum it emits

4000 times as much light as at minimum. The mean range of 75 long-period variables observed at Harvard {Harvard Annals, vol. lvii.) was five magnitudes. Another variable, R Normae 1 is of interest as having a pronounced double maximum in each period.

It is natural to compare the periodic outbursts occurring in these stars with the outbursts of activity on the sun, which have a period of about eleven years. In both cases no extraneous cause can be assigned; the period seems to be inherent in the star itself and not to be determined by the revolution of a satellite (no variability of the line-of-sight motion of Mira has been found, so that it is probably not accompanied by any large companion). In both cases the rise to a maximum is more rapid than the decline to a minimum, and in fact some of the minor peculiarities of the sunspot curve are closely imitated by the light-curves of variable stars. H. H. Turner has analysed harmonically the light-curves of a number of long-period variables, and has shown that when they are arranged in a natural series the sun takes its place in the series near, but not actually at, one end. It is necessary to suppose, if the analogy is to hold, that the sun is brightest when sunspots and faculae are most numerous; this is by no means unlikely. On the other hand, the variations in the light of the sun must be very small compared with the enormous fluctuations in the light of variable stars. Moreover, the solar period (n years) is far outside the limits of the periods of

'Variable stars (except those sufficiently bright to have received special names) are denoted by the capital letters R to Z followed by the name of the constellation. The first nine variables recognized in each constellation are denoted by single letters, after which combinations RR, RS, &c, are used.

variables. It is therefore perhaps misleading actually to class the sun with them; but it seems highly probable that whatever cause produces the periodic outbursts of spots and faculae on our sun differs only in degree from that which, in stars under a different physical condition of pressure and temperature, results in the gigantic conflagrations which we have been considering.

Short-period Variables. — Besides the shortness of the period these variables possess other characteristics which differentiate them from the long-period variables. The range of variation is much smaller, the

difference between maximum and minimum rarely exceeding two magnitudes. Also the variations recur with perfect regularity. There is reason to believe that all the stars of this class are binary systems, and that the variations of brightness are deter- mined by the different aspects presented by the two component stars during the period of revolution. There are several well- marked varieties of short-period variables; the most important are typified by the stars Algol, /S Lyrae, J Geminorum and 5 Cephei.

In the Algol variables one of the component stars is dark (that is to say, dark in comparison with the other), and once in each revolu- tion, passing between us and the bright component, partially hides it. This class of variables is accordingly characterized by the fact that for the greater part of the period the star shines steadily with its maximum brilliancy, but fades away for a short time during each period. The variability of Algol (/9 Persei) was discovered in 1783 by John Goodricke (1764-1786), but, judging from its name, which signifies " the demon," it seems possible that its peculiarity may have been known to the ancient astronomers. Algol is ordinarily of magnitude 23, but once in a period of 2 d – 20 h – 49 m – it suffers partial eclipse and fades to magnitude 3-5. The duration of each eclipse is 9 \ hours. Ever since the variability of Algol was observed it was suspected to be due to a partial eclipse of the star by a dark body nearly as large as itself revolving round it; but the explanation remained merely a surmise until K. H. Vogel of Potsdam, by repeated measurements of the motion of Algol in the line of sight, showed that the star is always receding from us before the loss of light and approaching us afterwards. This leaves no room for doubt that an invisible companion passes between us and Algol about the time the diminution of light takes place, and so proves the correct- ness of the explanation. The dimensions of the Algol system have been calculated, with the result that Algol appears to haveja diameter of 1,000,000 m. and its companion a diameter of 830,000 m. ; the distance between their centres cannot be deduced without making certain doubtful assumptions, but may be about 3,000,000 m. When this distance is compared with those prevailing in the solar system, it seems an extraordinarily small separation between two such large bodies; we shall, however, presently come across systems in which the two components revolve almost or actually in contact. About 56 Algol variables were known in 1907 ; the variables of this class are the most difficult to detect, for the short period of obscuration may easily escape notice unless the star is watched continuously.

The variable star /3 Lyrae, which is typical of another class, was also discovered by Goodricke in 1784. It differs from the Algol type

in having two unequal minima separated by two equal maxima. Thus in a period of I2 d – 22 h – from a maximum of magnitude 3-4 it falls to 3-9, rises again to 3-4, then falls to 4-5 and returns to magnitude 3-4. The changes take place continuously, so that there is no period of steady luminosity. The hypothesis of G. W. Myers {Astrophysical Journal, vol. vii.) affords at least a partial explanation of the phenomena. Two stars are supposed to revolve about one another nearly or actually in contact. In such a system the tidal forces must be very great, and under their influence the stars will not be spherical, but will be elongated in the direction of the line joining their centres. When the line of centres is at right angles to our line of sight, the stars present to us their greatest apparent surface, and therefore send us the maximum light. This happens twice in a revolution. As the line of centres becomes more oblique, the surface is seen more and more foreshortened and the brilliancy diminishes continuously. Supposing that the two stars are of unequal surface brilliancy, the magnitude at minimum will depend on which of the two stars is the nearer to us, accordingly there are two unequal minima in each revolution. When the two stars are of equal brilliancy the minima are equal; this is the case in variables of the f Geminorum type. When the orbits are eccentric, the tidal disturbance varying with the distance between the two components will probably cause changes in their absolute brilliancy; the variation due to change in the aspect of the system presented to us may thus be supplemented by a real intrinsic varia- tion, both, however, being regulated by the orbital motion. A large eccentricity also produces an unsymmetrical light variation, the minimum occurring at a time not midway between two maxima; stars of this character are called Cepheid variables, after the typical star S Cephei. All the best-known short-period variables have been proved to be binary systems spectroscopically, and to have periods corresponding with the period of light variation, so that to this extent the hypothesis we have described is well founded; but it is doubtful if it is the whole explanation. S. Albrecht has shown that, of the 10 members of the S Cephei class for which both the orbits and the light-variations are thoroughly known, the maximum light always occurs approximately at the time when the brighter

component is approaching us most rapidly ; this relation, which seems to be well established, is a most perplexing one.

No hard and fast physical distinction can be drawn between the various classes of short-period variables; as the distance between the components diminishes the Algol variable merges insensibly into the /3 Lyrae type. The latter, on the other hand, is perhaps connected by

insensible gradations with the ordinary simple star. Sir G. H. Darwin and H. Poincare have investigated the forms taken up by rotating masses of fluid. When the angular momentum is too great for the usual spheroidal form to persist, this gives place to an ellipsoid with three unequal axes ; this is succeeded by a pear-shaped form. The subsequent sequence of events cannot be traced with certainty, but it seems likely that the pear-shaped form is succeeded by an hour-glass-shaped form, which finally separates at the neck into two masses of fluid. Ellipsoidal, pear-shaped or hour-glass- shaped stars would all give rise to the phenomena of a short-period variable, and doubtless examples of these intermediate forms exist. Certain clusters contain a remarkable number of short-period variables. Thus the cluster Messier 5 was found at Harvard to contain 185 variables-out of 900 stars examined. Solon I. Bailey, on examining 63 of them, found that with one exception their periods lay between I0 h – 48 m – and I4 h – 59 m , and the range of varia tion between 0-7 and 1-4 magnitudes. Moreover, the light-curves were all of a uniform type, a distinctive feature of " cluster variables " being the rapid rise to a maximum and slow decline.

Temporary Stars or Novas. — From time to time a star, hitherto too faint to be noticeable, blazes out and becomes a prominent object, and then slowly fades into obscurity. According to Miss Agnes Clerke there are records of ten such stars appearing between 134 B.C. and A.D. 1500. Since that time nine novas have appeared, which have attained naked-eye visibility; and in recent years a number of very faint objects of the same class have been detected. The brightest star of all these was the famous " Tycho's star " in Cassiopeia. It was first observed on the 6th of November 1572 by Wolfgang Schuler. In five days its light had reached the first magnitude, and a little later it even equalled Venus in brilliancy and was observed in full daylight. After three weeks it began to decline, but the star did not finally disappear until March 1574. " Kepler's " nova in Ophiuchus broke out in 1604 and attained a brightness greater than that of Jupiter; it likewise gradually waned, and disappeared after about fifteen months. For nearly three centuries after these two remarkable stars no nova attained a brilliancy greater than that of the ordinary stars, until in 1901 Nova Persei appeared. This star was discovered by T. D. Anderson on the 2ist-22nd of February, its magnitude at that time being 2-7. In the next two days it reached zero magnitude, thus becoming the brightest star in the northern heavens, but after that it rapidly decreased. On the 15th of March it was of the fourth magnitude; during the next three months it oscillated many times between magnitudes 4 and 6, and by the end of the year it had faded

to the seventh magnitude. In July 1903 it was of the twelfth magnitude, and its light has remained constant since then. In the case of this star there is evidence that the outburst must have been extremely rapid, for the region where Nova Persei appeared had been photographed repeatedly at Harvard during February, and in particular no trace of the star was found on a plate taken on the 19th of February, which showed eleventh magnitude stars. Thus a rise of at least eight magnitudes in two days must have occurred.

On the 2 1 st of August, six months after the discovery of Nova Persei, C. Flammarion and E. M. Antoniadi discovered that a nebula surrounded it. ' Subsequent photographs showed that this nebula, which consisted mainly of two incomplete rings of nebulosity, was expanding outwards at the rate of from 2″ to 3″ per day. This expansion continued at the same rate until the following year. Spectroscopic examination had already suggested prodigious velocities of the order of 1000 m. per second in the gases of the atmosphere of the nova ; but the velocity implied by this expansion of the nebula was unprecedented and comparable only with the velocity of light. The suggestion was made, and seems to be the true explanation, that what was actually witnessed was the wave of light due to the outburst of the nova, spreading outwards with its velocity of 186,000 m. per second, and rendering luminous as it reached them the particles of a pre-existing nebula, whose own light had been too faint to be visible.

Two possible explanations of the phenomena of temporary stars have been held. The collision theory supposes that the outburst is the result of a collision between two stars or between a star and a swarm of meteoric or nebulous matter. The explosion theory regards the outburst as similar to the outbreak of activity of a long- period variable. Probably the latter hypothesis is the one more generally accepted now. There is one unique star, which is of special interest as occupying rather an intermediate position between a nova and a long-period variable. This is the southern star 17 Argus (sometimes called ij Carinae). From 1750 until about 1832 it seems to have varied irregularly between the second and the fourth magnitudes. For the next ten years it slowly increased (though with slight check), and in 1843 was nearly as bright as Sirius; since then it has slowly faded, but it was not till 1 869 that it ceased to be visible to the naked eye. It is now about magnitude 7-5. The slowness both of the rise and decline is in great contrast with the

STAR

progress of a nova, ij Argus is surrounded by a nebula, the famous " Keyhole nebula " ; in this respect it resembles Nova Persei.

System of Stars. — On examining the stars telescopically, many which appear single to the unaided eye are found to be composed of two or more stars very close together. In some Stare" cases t ' ie P rox i m ity is on ly apparent; one star may be really at a vast distance behind the other, but, being in the same line of vision, they appear close together. In many cases, however, two or more stars are really connected, and their distance from one another is (from the astronomical standpoint) small. The evidence of this connexion is of two kinds. In a number of cases measures of the relative positions of the two stars, continued for many years, have shown that they are revolving about a common centre; when this is so there can be no doubt that they form a binary system, and that the two components move in elliptic orbits about the common centre of mass, controlled by their mutual gravitation. But these cases form a very small proportion of the total number of double stars. In many other double stars the two com- ponents have very nearly the same proper motion. Unless this is a mere coincidence, it implies that the two stars are nearly at the same distance from us. For otherwise, if they had from some unknown cause the same actual motion, the apparent motion in arc would be different. We can therefore infer that the two stars are really comparatively close together, and, moreover, since they have the same proper motion, that they remain close together. They may thus be fairly regarded as constituting a binary system, though the gravitational attraction between some of the wider pairs must be very weak.

Several double stars were observed during the 17th century, f Ursae Majoris being the first on record. In 1784 Christian Mayer published a catalogue of all the double stars then known, which contained 89 pairs. Between 1825 and 1827 F. G. W. Struve at Dorpat examined 120,000 stars, and found 31 12 double stars whose distance apart did not exceed 32". W. S. Bumham' s General Catalogue of Double Stars (1907) contains 13,655 pairs north of declination -31 °. Undoubtedly a large number of these are only optical pairs, but mere considerations of probability show that the majority must be physically connected. For only 88 of them has it been possible as yet to deduce a period, and at least half even of these periods are very doubtful. The rates of motion are so slow that many centuries' observations are needed to determine the orbit.

The most rapid visual binary (leaving aside Capella for the moment) is 5 Equulei, which completes a levolution in 5-7 years. Next to it come 13 Ceti, period 7-4 years, and k Pegasi, period 11-4 years. From a list of systems with determined periods given by Aitken (Lick Observatory Bulletin, No. 84) there are 20 with periods less than 50 years, and 16 between 50 and 100 years. S Equulei, 13 Ceti and k Pegasi are all extremely close pairs, and can only be resolved with the most powerful instruments. Capella, whose period is only 104 days, was discovered to be double by means of the spectroscope, but has since been measured frequently as a visual binary at Greenwich. With the best instruments a star can be distinguished as double when the separation of the two components is a little less than o-i. From the very few orbits that have as yet been determined one interesting result has been arrived at. Most of the orbits are remarkably eccentric ellipses, the average eccentricity being about 0-5. There is a very striking relation between the eccentricity and the period of a system ; in general the binaries of longest period have the greatest eccentricities. The relation applies not only to the visual but to the spectroscopic binaries; these, having shorter periods than the visual binaries, have generally quite small eccentricities. Another interesting feature is that, where the two components differ in brightness, the fainter component is often the one possessing the greater mass.*

Far within the limit to which telescopic vision can extend binary systems are now being found by the spectroscope. These systems

Spectra-

appear as a connecting link between short-period variable stars on the one hand and telescopic double binaries stars on the other. Stars of the class to which the Algol

type of variables belongs will appear to us to vary only in the exceptional case when the plane of the orbit passes so near our sun that one body appears to pass over the other and so causes an eclipse. Except when the line of sight is perpendicular to the plane of the orbit, the revolution of the two bodies will result in a periodic variation of the motion 'n the. line of sight. Such a variation can be detected by the spectroscope. If both the bodies are luminous, especially if they do not differ much in brilliancy, the motion of revolution is shown by a periodic doubling of the lines of the spectrum; when one body is moving towards us and the other away their spectral lines are displaced (according to Doppler's principle) in opposite directions, so that all the lines strong enough to appear in

both spectra appear double ; when the two bodies are in

conjunction, and therefore moving transversely, their spectra are merged into one and show nothing unusual. More usually, however, only one component is sufficiently luminous for its spectrum to appear; its orbital motion is then detected by a periodic change in the absolute displacement of its spectral lines. Up to 1905, 14P spectroscopic binaries had been discovered ; a list of these is given in the Lick Observatory Bulletin, no. 79. Details of the calculated orbits of 63 spectroscopic binaries are given in Publications of the Allegheny Observatory, vol. i. No. 21. According to W. W. Campbell one star in every seven examined is binary.

A continuous gradation can be traced from the most widely separated visual binaries, whose periods are many thousand years, to spectroscopic binaries, Algol and /S Lyrae variables, whose periods are a few hours and whose components may even be in contact, and from these to dumb-bell shaped stars and finally to ordinary single stars. It is a legitimate speculation to suppose that these in the reverse order are the stages in the evolution of a double star. As the simple star radiates heat and contracts, it retains its angular momentum ; when this is too great for the spheroidal form to per- sist, the star may ultimatelv separate into two components, which are driven farther and farther apart by their mutual tides. Tidal action also accounts for the progressively increasing eccentricities of the orbits, already referred to. This theory of the genesis of double-stars by fission is not, however, universally accepted; in particular objections have been urged by T. C. Chamberlin and F. R. Moulton. It is true that rotational instability alone is not com- petent to explain the separation into two components; but the exist- ence of gravitational instability, pointed out by J. H. Jeans, enables the principal difficulties of the theory to be surmounted. Whilst there is thus no well-defined lower limit to the dimensions of systems of two stars, on the other hand we cannot set any superior limit either to the number of stars which shall form a system or to the dimensions of that system. No star is altogether removed from the attractions of its neighbours, and there are cases where some sort of connexion seems to relate stars which are widely separated in space. A curious case of this sort is that of the five stars jS, 7, S, e and f of Ursa Major. These have proper motions which are almost identical in amount and in direction. The agreement is too close to be dis- missed as a mere coincidence, and it is confirmed by a corresponding agreement of. their radial motions determined by the spectroscope; and yet, seeing that /3 and f Ursae Majoris are 19 apart, these two stars must be distant from each other at least one-

third of the dis- tance of each from the sun; thus the members of this singular group are separated by the ordinary stellar distances, and probably each has neighbours, not belonging to the system, which are closer to it than the other four stars of the group. Further, E. Hertzsprung has shown that Sirius also belongs to this same system and shares its motion, notwithstanding that it is in a nearly opposite part of the sky. It is difficult to understand what may be the connexion between stars so Widely separated ; from the equality of their motions they must have been widely separated for a very long period. ‘ Of multiple stars the most famous is 6 Orionis, situated near the densest part of the great Orion nebula. It consists of four principal stars and two faint companions. From the more complex s . systems of this kind, we pass to the consideration of star- clusters clusters, which are systems of stars in which the compo- nents are very numerous. When examined with a telescope of power insufficient to separate the individual stars, a cluster appears like a nebula. The ” beehive cluster ” Praesepe in Cancer is an example of an easily resolved cluster composed of fairly bright stars. The great cluster in Hercules (Messier 13), on the other hand, requires the highest telescopic power for its complete resolution into stars. Doubtless with improved telescopes many more apparent nebulae would be shown to be clusters, but there are certainly many nebulae which are otherwise constituted. Many of the clusters are ‘of very irregular forms, either showing no well-marked centre of condensa- tion, or else condensed in streams along certain lines. There is, however, a well-marked type to which many of the richest clusters belong; these are the globular clusters. They have a symmetrical circular shape, the condensation increasing rapidly towards the centre. The Hercules cluster is of this form ; another example is o > Centauri, in which over 6000 stars have been counted, comprised within a circle of about 40′ diameter. These clusters present many unsolved problems. Thus Perrine, from an examination of ten globular clusters (including Messier 13 and w Centauri), has found in each case that the stars can be separated into two classes of magnitudes. About one-third of the stars are between magnitudes II and 13, and the remaining two-thirds are between magnitudes 15-5 and 16-5. Stars of magnitudes intermediate between these two groups are almost entirely absent. Thus each cluster seems to consist of two kinds of stars, which we may distinguish as bright and faint; the bright stars are all approximately of one standard size, and the faint stars of another standard size and brightness.

The question of the stability of these clusters is one of much interest. The mutual gravitation of a large number of stars crowded in a

comparatively small space must be considerable, and the indivi- dual stars must move in irregular orbits under their mutual attrac- tions. It does not seem probable, however, that they can escape the fate of ultimately condensing into one confused mass. If this sur- mise be correct, we are witnessing in clusters a counter-process of

evolution to that which is taking place in double stars ; the latter appear to be separating from a single original mass and the former condensing into one.

Colours and Spectra of Stars. — The brighter stars show a marked variety of colour in their light, and with the aid of a telescope a still greater diversity is noticeable. It is, however, only the red stars that form a clearly marked class by themselves. For purposes of precise scientific investiga- tion the study of spectra is generally more suitable than the vague and unsatisfactory estimates of colour, which differ with different observers. Of the first magnitude red stars Antares is the most deeply coloured, Betelgeux, Aldebaran and Arcturus being successively less conspicuously red. Systematic study of red stars dates from the publication in 1866 of Schjellerup's Catalogue, containing a list of 280 of them.

The two components of double stars often exhibit complementary colours. As a rule contrasted colours are shown by pairs having a bright and a faint component which are relatively wide apart; brilliant white stars frequently have a blue attendant — this is instanced in the case of Regulus and Rigel. That the effect is due to a real difference in the character of the light from the two compo- nents has been shown by spectrum analysis, but it is probably exaggerated by contrast.

The occurrence of change, either periodic or irregular, in the colour of individual stars, has been suspected by many observers; but such a colour-variability is necessarily very difficult to establish. A possible change of colour in the case of Sirius is noteworthy. In modern times Sirius has always been a typical white or bluish-white star, but a number of classical writers refer to it as red or fiery. There is perhaps room for doubt as to the precise significance of the words used ; but the fact that Ptolemy classes Sirius with Antares, Alde-

baran, Arcturus, Betelgeux and Procyon as " fiery red " ({nrdnipjioi) as compared with all the other bright stars which are " yellow " (tavdoi.) seems almost conclusive that Sirius was then a redstar.

*When examined with the spectroscope the light of the stars is found to resemble generally that of the sun. The spectrum consists _ . , of a continuous band of light crossed by a greater or c? 6 * ° l ess number of dark absorption lines or bands. As in ars ' the case of the sun, this indicates an incandescent body*

which might be solid, liquid, or a not too rare gas, surrounded by and seen through an atmosphere of somewhat cooler gases and vapours; it is this cooler envelope whose nature the spectroscope reveals to us, . and in it the presence of many terrestrial elements has been detected by identifying in the spectrum their characteristic absorption lines. Stellar spectroscopy dates from 1862, when Sir William Huggins (with a small slit-spectroscope attached to an 8-in. telescope) measured the positions of the chief lines in the spectra of about forty stars. In 1876 he successfully applied photography to the study of the ultra-violet region of stellar spectra. Various schemes of classification of spectra have been used. The earliest is that due to A. Secchi (1863-1867) who distinguished four " types " ; subsequent research, whilst slightly modifying, has in the main confirmed this classification. Secchi's Type I. or " Sirian " type includes most of the bright white stars, such as Sirius, Vega, Rigel, &c. ; it is characterized by strong broad hydrogen lines, which are often the only absorption lines visible. Type II. includes the "Solar" stars, as Capella, Arcturus, Procyon, Aldebaran, their spectra are similar to that of the sun, being crossed by very numerous fine lines, mostly due to vapours of metals. The great majority of the visible stars belong to these first two types. Type III. or " Antarian " stars are of a reddish colour, such as Antares, Betelgeux, Mira, and many of the long-period variables. The spectrum, which closely resembles that of a sunspot, is marked by nutings or bands of lines sharply bounded on the violet side and fading off towards the red. It has been shown by A. Fowler that these flutings are due to titanium oxide; this probably indicates a relatively low temperature, for at a high temperature all compounds would be dissociated. Type IV. also consists of red stars with banded spectra, but the bands differ in arrangement and appearance from those in the third type, and are sharply bounded on the red side. These stars are also believed to have a comparatively low, surface temperature, and the bands are attributed to the presence of compounds of carbon. About 250 Type IV. stars are known, but none conspicuous ; 19 Piscium, the brightest, is of magnitude 5 5. Other classifications which are extensively used are

those respectively of K. H. Vogel, J. N. Lockyer and the Draper Catalogue. The divergences depend mainly on the different views taken by their authors as to the order of stellar evolu tion. Apart from these considerations, the chief modification in the classification introduced by more recent investigators has been to separate Secchi's Type I. into two divisions, called helium and hydrogen stars respectively. The former are often called " Orion " stars, as all the brighter stars in that constellation, with the exception of Betelgeux belong to the helium type. Helium stars are generally considered to be the hottest and most luminous (in proportion to size) of all the stars. Type II. is now subdivided into " Procyon," " Sola/ " and " Arcturian stars, The " Procyon "

or calcium stars form a transition between Type I. and Type II. proper, and show the lines of calcium besides those of hydrogen. An important variety of Type III. spectra has been recognized, in which, as well as the usual absorption bands, bright emission lines of hydrogen appear ; stars having this particular spectrum are always variable. Finally, a fifth type has been added, the Wolf- Rayet stars; these show a spectrum crossed by the usual dark lines and bands, but showing also bright emission bands of blue and yellow light. About 100 Wolf-Rayet stars are known, of which 7 Velorum is the brightest ; they are confined to the region of the Milky Way and the Magellanic Clouds. (See Planet.)

Evolution of Stars. — The absence of the distinctive lines of an element in the spectrum does not by any means signify that that element is wanting or scarce in the star. The spectroscope only yields information about the thin outer envelope of the star; and even here elements may be present which do not reveal themselves, for the spectrum shown depends very greatly on the temperature and pressure. Stars of the different types are therefore not neces- sarily of different chemical constitution, but rather are in different physical conditions, and it is generally believed that every star in the course of its existence passes through stages corresponding to all (or most of) the different types. The stars are known to be continually losing enormous quantities of energy by radiating their heat into space. Ordinary solid or liquid masses would cool very rapidly from this cause and would soon cease to shine. But a globe of gaseous matter under similar conditions will continually contract in volume, and in so doing transforms potential energy into heat. It was shown by Homer Lane that a mass of gas held in equilibrium by the mutual gravitation of its parts actually groWs hotter through radiating heat; the heat gained by the resulting contraction more than counterbalances that lost by radiation. Thus in the first stage of a

star's history we find it gradually condensing from a highly diffused gaseous state, and growing hotter as it does so. But this cannot continue indefinitely; when the density is too great the matter ceases to behave as a true gas, and the contraction is insufficient to maintain the heat. Thus in the second stage the star is still contracting, but its temperature is decreasing. The greatest temperature attained is not the same for all stars, but depends on the mass of the star. It is, however, important to bear in mind that Lane's theory is concerned with the temperature of the body of the star; the temperature of the photosphere and absorbing layers, with which we are chiefly concerned, does not necessarily follow the same law. It depends on the rapidity with which convection currents can supply heat from the interior to replace that radiated, and on a number of other nicely balanced circumstances which cannot well be calculated.

Conflicting opinions are held as to the various steps in the process of evolution and the order in which the various types succeed one another, but the following perhaps represents in the main the most generally accepted view. Starting from a widely diffused nebula, more or less uniform, we find that, in consequence of gravitational instability, it will tend to condense about a number of nuclei. Jeans has even estimated theoretically the average distances apart of these nuclei, and has shown that it agrees in order of magnitude with the observed distances of the stars from one another {Astro- physical Journal, vol. xxii.). As the first condensation takes place, the resulting development of heat causes the hydrogen, helium and light gases to be expelled. This may explain the existence of gaseous nebulae, which are often found intimately associated with star-clusters, a good example being the nebulosity surrounding the Pleiades. As the nuclei grow by the attraction of matter they begin to be capable of retaining the lighter gases, and atmospheres of hydro-gen and helium are formed. The temperature of the photosphere at this stage has reached a maximum, and the star is now of the helium type. Then follows a gradual absorption of first the helium and then the hydrogen, the photosphere grows continually cooler, and the star passes successively through the stages exemplified by Sirius, Procyon, the Sun, Arcturus and Antares. Some authori- ties, however, consider the Antarian (Type III.) stars to be in a very early stage of development and to precede the helium stars in the order of evolution; in that case they are in the stage when the temperature is still rising. Type IV. (carbon) stars are placed last in the series by all authorities ; they seem, however, to follow : more directly the solar stars than the Antarian. If the latter are considered to be in an early

state this presents no difficulty; but if both Antarian and carbon stars are held to be evolved from solar stars, we may consider them to be, not successive, but parallel stages of development, the chemical constitution of the star deciding whether it shall pass into the third or fourth type. The Wolf- Rayet stars must probably be assigned to the earliest period of evolution; they are perhaps semi-nebulous. In this connexion it may be noted that the spectrum of Nova Persei, after passing through a stage in which it resembled that of a planetary nebula, has now become of the Wolf-Rayet type.

Density of Stars. — Interesting light is thrown on the question of the physical state of the stars by some evidence which we possess as to their densities. The mean density of the sun is about if times"

that of water; but many of the stars, especially the brighter ones,

have much lower densities and must be in a very diffused state.

We have necessarily to turn to binary systems for our data. When,.

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f he orbit and periodic time is known, and also the parallax, the masses of the stars can be found. (If only the relative orbit is known, the sum of the masses can be determined; but if absolute positions of one component have been observed, both masses can be determined separately.) But even when, as in most cases, the parallax is unknown or uncertain, the ratio of the brightness to the mass can be accurately found. Thus it is found that Procyon gives about three times as much light as the sun in proportion to its mass, Sirius about sixteen times, and f Orionis more than ten thousand times. In these cases evidently either the star has a greater intrinsic brilliancy per square mile of surface than the sun, or is less dense. Probably both causes contribute. The phenomena of long-period variables show that the surface brilliancy may vary very greatly, even in the same star. The Orion stars have the highest temperature of all and have admittedly the greatest surface- luminosity, but the extreme brilliancy of f Orionis in proportion to its mass must be mainly due to a small density. For the Algol variables it is possible to form even more direct calculations of the density, for from the duration of the eclipse an approximate estimate of the size of the star may be made. A. W. Roberts concluded in this way that the average density of the Algol variables and their eclipsing companions is about one-eighth

that of the sun. For Lyrae G. W. Myers found a density a little less than that of air; the density is certainly small, but J. H. Jeans has shown that for this type of star the argument is open to theoretical objection, so that Myers's result cannot be accepted.

There are many stars, however, of which the brightness is less than that of the sun in proportion to the mass. Thus the faint companion of Sirius is of nearly the same mass as the sun, but gives ° n 'y iAn of its light. In this case the companion, being about half the mass of Sirius itself, has probably cooled more rapidly, and on that account emits much less light. T. Lewis, however, has shown that the fainter component of the binary system is often the more massive. It may be that these fainter components are stiil in the stage when the temperature is rising, and the luminosity is as yet comparatively small; but it is not impossible that the massive stars (owing to their greater gravitation) pass through the earlier stages of evolution more rapidly than the smaller stars.

Distances and Parallaxes of the Stars. — As the earth traverses annually its path around the sun, and passes from one part of its orbit to another the direction in which a fixed star is seen changes. In fact the relative positions are the same as if the earth remained fixed and the star described an orbit equal to that of the earth, but with the displacement always exactly reversed. The star thus appears to describe a small ellipse in the sky, and the nearer the star, the larger will this ellipse appear. The greatest displacement of the star from its mean position (the semi-axis major of the ellipse) is called its parallax. If t be the parallax, and R the radius of the earth's orbit, the distance of the star is R/sin tt. The determination of stellar parallaxes is a matter of great difficulty on account of the minuteness of the angle to be measured, for in no case does the parallax amount to 1"; moreover, there is always an added difficulty in determining an annual change of position, for seasonal instrumental changes are liable to give rise to a spurious effect which will also have an annual period. Very special precautions are required to eliminate instrumental error before we can compare observations, say, of a star on the meridian in winter at 6 p.m. with observations of the same star in summer on the meridian at 6 a.m. The first determination of a stellar parallax was made by F. W. Bessel in the years 1837-1840, using a helio- meter. He chose for his purpose the binary star 61 Cygni, which was the star with the most rapid apparent motion then known and therefore likely to be fairly near us, although only of the sixth magnitude. He found for it a parallax of 0-35" a value which agrees well with more modern determinations. T. Henderson at the Cape of Good Hope measured

the parallax of a Centauri, but his resulting value 1″ was considerably too high. More accurate determinations have shown that this star, which is the third brightest star in the heavens, has a parallax of 0-75”, this indicates that its distance is 25,000,000,000,000 m. So far as is known a Centauri is our nearest neighbour.

Formerly attempts were made to determine parallaxes by mea- suring changes in the absolute right ascensions and declinations of the stars from observations with the meridian circle. The results were, however, always untrustworthy owing to annual and diurnal changes in the instrument. Nowadays the determination is more usually made by measuring the displacement of the star relatively to the stare surrounding it. Hitherto the heliometer has been most extensively used for this purpose, D. Gill, W. L. Elkin, B. E. A. Peter and others have made their important determinations with

it. The photographie method; however, now appears to yield results oi equal precision, and is/ likely to be used very largely in the future. The quantity determined by these methods is the relative parallax between the star measured and the stars with which it is compared. To obtain the true parallax, the mean parallax of the comparison stars must be added -to this relative parallax. It is, however, fair to assume that the comparison stars will rarely have a parallax as great as o-oi ” ; for it must be remembered that it is quite the exception for a star taken at random to- have ab appreciable parallax; particularly if a star has an ordinarily sfilail proper motion, it is likely to be very distant. Still exceptional cases will occur where a comparison star is even nearer than the principal star; it is one of the advantages of the’ photographic method that it involves the use of a considerable number of compari- son stars, whereas in the heliometric method usually only two stars,’ chosen symmetrically one on each side of the principal star, are used. In the table are collected the parallaxes and other data of all stars for which the most probable value of the parallax exceeds 0-20”. Although much work has been done recently in measuring parallaxes, the number of stars included in such a list has not been increased, but rather has been considerably diminished; many large parallaxes, which were formerly provisionally accepted, have been reduced on revision. It cannot be too strongly emphasized that many of these determinations are subject to a large probable error, or even altogether uncertain. For one or two of the more famous stars such as o Centauri the probable error is less than = < = o-oi"; but for others in the list it ranges up to ±0-05". To convert parallaxes into distance we may remember that a parallax of 1″ denotes a distance of l8| billion miles, or 206,000 times the

distance of the sun from the earth. , A parallax of o-oi" denotes a distance a hundred times as great, and so on, the distance and parallax being inversely proportional. A unit of length, which is often used in measuring stellar distances, is the light year or distance that light travels in a year; it is rather less than six billion miles.

Stars with Lar

ge Parallax

Position R.A. Dec.

Annual

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Authority

Star.

Mag.

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Parallax

h. m. sec.

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Gr. 34 . .

13 +43

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•27

R, Sc, C

t Ceti

1 39 -16

3-7

19

•31

S

C.'Z.5h243.

5 8 -45

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s

Sirius

6 41 -17

-1-4

i-3

■38

G, E

Procyon .

7 34 + 5

o-5

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•30

A, E

LI. 21185 .

10 58 +37

7-6

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•37

R, C

LI. 21258

11 +44

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A, k, K, R

LI. 25372 _ .

13 4° +15

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•20

R, E

a Centauri .

14 33 6c

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G, E

O.A. 1 741 5-6

17 37 +68

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Sc, R

19 32 +70

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G, E

Krueger 60 .

22 24 +57

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B, Sc, R

1 Lac. 9352 •

22 59 -36

7+

7-0

•28

G

Authorities. — -A — A. Auwers; B — E. E. Barnard; C — F. L. Chase; E— W. L. Elkin ; G— Sir David Gill ; K— J. C. Kapteyn ; k— K. N. A. Kriiger; P— B. Peter; R— H. N. Russell and A.R. Minks; 5— W. de Sitter ; s — M . F. Smith ; Sc — F. Schlesinger.

The stars selected to be examined for parallax are usually either the brightest stars or those with an especially large proper motion. Neither criterion is a guarantee that the star shall have a measurable parallax. Brightness is particularly deceptive; thus Canopus, the second brightest star in the heavens, has probably a parallax of less than o-oi", and so also has Rigel. These two stars must have an intrinsic brilliancy enormously greater than that of the sun for if the sun were removed to such a distance (parallax o-oi") it would appear to be of about the tenth magnitude.

Although the parallaxes hitherto measured have added greatly to our general knowledge of stellar distances and absolute luminosities of stars, a collection of results derived by various observers choosing specially selected stars is not suitable for statistical discussion. For this reason a series of determinations of parallax of 163 stars on a uni- form plan by F. L. Chase, M. F. Smith and W. L. Elkih (Yale Trans- actions, vol, ii., 1906) constitutes a very important addition to the available data. The stars chosen were those with centennial proper motions greater than 40", observable at Yale, and not hitherto attacked. It is noteworthy that no parallaxes exceeding 0-20″ were found ; the mean was about 0-05". It is greatly to be desired that a general survey of the heavens, or of typical regions of the heavens, should be made with a view to determining all the stars which have an appreciable parallax. This is now made possible by photography. If three plates (or three sets of exposures on one plate) are taken at intervals of six months, when the stars in the region have their maximum parallactic displacements, the first and third plates serve

to eliminate the proper motion of the star, and the detection of a parallax is easy. Some progress with this scheme has been made. But even such an attempt to systematically plumb the universe can only make us acquainted with the merest inside shell. We should learn perhaps the distribution and luminosities of the stars within a sphere of radius sixty light years (corresponding to a parallax of about 0-05"), but of the structure of the million-fold greater system of

stars, lying beyond this limit, yet visible in our telescopes, we should learn nothing except by analogy. Fortunately the study of proper motions teaches us with some degree of certainty some- thing of the general mean distances and distribution of these more distant stars, though it cannot tell us the distances of individual stars. There is another method of determining stellar distances, which is applicable to a few double stars. By means of the spectroscope it is possible to determine the relative orbital velocity of the two components, and this when compared with the period fixes the absolute dimensions of the orbit; the apparent dimensions of the orbit being known from visual observations the distance can then be found. The method is of very limited application, for in general the orbital velocity of a visual binary is far too small to be found in this way; one of its first applications has been made to a Centauri, with the result that the parallax found in the ordinary way is completely confirmed.

Proper Motions of Stars. — The work of cataloguing the stars and determining their exact positions, which is being pursued on so large a scale, naturally leads to the determination of their proper motions. The problem is greatly complicated by the fact that the equator and equinox, to which fhe observed posi- tions of the stars must be referred, are not stationary in space, and in fact the movements of these planes of reference can only be determined by a discussion of the observations of stars. Halley was the first to suspect from observation the proper motions of the stars. From comparisons between the observed places of Arcturus, Aldebaran and Sirius and the places assigned to them by Alexandrian astronomers, he was led to the opinion that all three are moving towards the south {Phil. Trans. 17 18). Jacques Cassini also proved that Arcturus had even since the time of Tycho Brahe shifted five minutes in latitude; for rj Bootis, which would have shared in the change, if it had been due to a motion of the ecliptic, had not moved appreciably. It was early realized that the proper motions of the stars were changes of position relative to the sun, and that, if the sun had any motion, of its own as compared with the surrounding stars as a whole, this would be shown by a general tendency of the apparent motions of the stars to be directed away from the point to which the sun was moving.

To determine proper motions it is necessary to have observations separated by as long a period of time as possible. Old catalogues of precision are accordingly of great importance. By far the most valuable of these is Bradley's catalogue of 3240 stars observed at Greenwich about 1 750-1 763, which has been re-reduced according to modern methods by A. Auwers. These stars include most of the brighter ones visible in the latitude of Greenwich, ranging down to

about the seventh magnitude. An early catalogue which includes large numbers of stars of magnitude as low as 8-5 is that of S. Groom- bridge, containing 4200 stars within 52 ° of the north pole observed between 1806 and 1816. This has been re-reduced by F. W. Dyson and W. G. Thackeray, and proper motions derived by comparison with modern Greenwich observations. A very extensive determina- tion of proper motions from a comparison of all the principal catalogues has been made by Lewis Boss. The results are given in his Preliminary General Catalogue (1910), which comprises the motions of 6188 stars fairly uniformly distributed over the sky, including all the stars visible to the naked eye. Of rather a different nature are J. G. Porter's catalogue {Publications of the Cincinnati Observatory, No. 12) and J. F. Bossert's catalogue {Paris Observa- tions, 1890), which consist of lists of stars of large proper motion determined from a variety of sources. Recently the proper motions of faint stars have been determined by comparing photographs of the same region of the sky, taken with an interval of a number of years. At present the available intervals are too small for this method to have met with marked success. Large proper motions can however be found in this way. Their detection is especially simple when the stereo-comparator is used ; this instrument enables the two eyes to combine the images of each star on two plates into one image (as in the stereoscope) ; when the star has moved consider- ably in the interval between the taking of the two plates, it appears to stand out from the rest in relief and is at once noticed.

The star with the greatest proper motion yet known was found by J-C. Kapteyn on the plates of the Cape Photographic Durch- tnuslerung. Its motion of 8-7" per year would carry it over a portion of the sky equal to the diameter of the full moon in about two

centuries. In the table is given a list of the stars now known to have an annual proper motion of more than 3". The faintness of the majority of the stars appearing in this list is noteworthy.

Stars with Large Proper

Motion.

Name.

R.A.

1900.

Dec.

1900.

Annual Proper Motion.

Mag.

C.Z.5 h 243 • •

h. m.

5 8

-45-0

870

8-5

Gr. 1830 . .

n 47

+38-4

7-04

6-9

Lac. 9352 . .

22 59

-36-4

6-94

7-5

Cor.32416 .

-37-8

6-07

8-5

61 1 Cygni

21 2

+38-3

5-20

5-5

LI. 21 185 . .

10 58

+36-6

476

7-3

e Indi

21 56

-57-2

4-61

5-2

LI. 21258 . .

11

+44-0

4-41

87

o 2 Eridani .

4 11

- 7-8

4-o5

4-6

n Cassiop

1 2

+54-4

3-73

5-6

O.A. 14318

15 5

— 16-0

3-68

9-1

O.A. 14320

15 5

-15-9

3-68

9-1

Centauri .

14 33

—60-4

3-60

0-2

Lac. 8760 .

21 11

-39.2

3-53

7-3

e Eridani

3 16

-43-4

3-12

4.4

O.A. 1 1677

11 15

+66-4

3-02

9-0

The majority of the stars have far smaller proper motions than these. Only 24% of the stars of Auwers-Bradley have proper motions exceeding 10″ per century, and 51% exceeding 5″ per century. With catalogues containing fainter stars the proportion of large proper motions is somewhat smaller, thus the corresponding percentages for the Groombridge stars are 12 and 31 respectively.

When the parallax of a star is known, we are able to infer from its proper motion its actual linear speed in miles per hour, in so far as the motion is transverse to the line of sight. The velocity in the line of sight can be determined by spectroscopic observation, so that in a few cases the motion of the star is completely known. Several stars appear to have speeds exceeding 100 m. per second, but of these the only one reliably determined is Groombridge 1830, whose speed is found to be about 150 m. per second. Probably the velocity of Arcturus is also over 100 m. per second; there is, however, no real evidence for the velocity of 250 m. per second which has sometimes been credited to it. The above are velocities transverse to the line of sight. The greatest radial velocities that have yet been found are about 60 m. per second; several stars (Groombridge 1830 among them) have radial speeds of this amount. The stars of the Helium type of spectrum are remarkable for the smallness of their velocities; from spectroscopic observations of over 60 stars of this class, J. C. Kapteyn and E. B. Frost have deduced that the average speed is only 8 m. per second. Accord- ing to W. W. Campbell the average velocity in space of a star is 21-2 m. per second.

When the proper motions of a considerable number of stars are collected and examined, a general systematic tendency is noticed. The stars as a whole are found to be moving Tlle Solar towards a point somewhere in or near the constellation Motion Canis Major. The motions of individual stars, it is true, vary widely, but if the mean motion of a number of stars is considered this tendency is always to be found. Now it is necessary to bear in mind that all

observed motions are relative; and, especially in dealing with stellar motions, it is arbitrary what shall be considered at rest, and used as a standard to which to refer their movements. Accordingly this mean motion of the stars relative to the sun has been more generally regarded from another point of view as a motion (in the opposite direction — towards the constellation Lyra) of the sun relatively to the stars. In what follows we shall speak of this relative motion as a motion of the sun or of the stars indifferently, for there is no real distinction between the two conceptions. One of the problems, which has engaged a large share of the attention of astronomers in the last century, has been the determination of the direction of this " solar motion."

The first attempt to determine the solar apex (as the point towards which the solar motion is directed is termed) was made in 1783 by Sir William Herschel. Although his data were the proper motions of only seven stars, he indicated a point near A Herculis not very far from that found by modern researches. Again in 1805 from Maskelyne's catalogue of the proper motions of 36 stars (published in 1790), he found the position, R.A. 245 ° 52′ and Dec. 49° 38′ N. The systematic tendency of the proper motions is so marked that the motions of a very few stars are quite sufficient to fix roughly the position of the solar apex; but attempts to fix its position to within a few degrees have failed, notwithstanding the many thousands of determined proper motions now available. The difficulties of the determination are twofold. There is a close interdependence between the constant of procession and the solar motion; the two determinations must generally be made simul- taneously, and both depend very considerably on the systematic

corrections required by the catalogues compared. But further, if these practical difficulties could be considered overcome in the best determinations, there is a vagueness in the very definition of the solar motion. The motion of the sun relative to the stars depends on what stars are selected as representative. There is no a priori reason to expect the same result from the different classes of stars, such as the brighter or fainter, northern or southern, nearer or more distant, Solar type or Sirian stars. There is for example some evidence that the declination of the solar apex is really increased when the motion is referred to fainter stars. For these reasons a really close agreement between the results of different investigators is not to be expected.

Of the various modern determinations of the apex, we give first those

which depend, wholly or mainly, on the Auwers-Bradley proper motions. Setting A for the right ascension, D for the declination of the apex, these are : —

L. Boss A = I7 h 48™ D = + 42°-8

L. Struve A = i8 h 20 m D= -j-23°-5

S. NewcombA = i8 h io m D = +3i°-3

J. C. Kapteyn A= i8 h 14™ D= +29°-5.

The large differences between these results, derived from the same material, depend mainly on the different systematic corrections applied by each astronomer to the declinations of Bradley. From the data of his Preliminary General Catalogue (1910), L. Boss found A = i8 h 2 m , D= +34°-3. Having regard to the special precautions taken to eliminate systematic error, and to the fact that the stars used were distributed nearly equally over both hemispheres, it is fair to conclude that this is the most accurate determination yet made. From the Groombridge proper motions Dyson and Thackeray found A = i8 h 20 m , D= +37°. Other determinations have been made by O. Stumpe (Ast. Nach. No. 3000) and J. G. Porter (Ast. Journ. xii. 91), using mainly stars of large proper motions derived from various sources; their results are of the same general character. Most of the above investigators, besides giving a general result, have determined the apex separately for bright and faint stars, for stars of greater or less proper motion, and in some cases for stars of Sirian and Solar spectra. Considerable divergences in the resulting position of the apex are found.

It will be seen that the proper motion of any star may be regarded as made up of two components. The part of the star's apparent Speed of displacement, which is due to the solar motion, is gener- ate Solar a "y called the parallactic motion ; the rest of its motion Motion. (l – e – its motion relative to the mean of all the stars, is

called its peculiar motion {motus peculiaris). Regarded as a linear velocity, the parallactic motion is the same for all stars, being exactly equal and opposite to the solar motion ; but its amount, as measured by the corresponding angular displacement of the star, is inversely proportional to the distance of the star from the earth, and foreshortening causes it to vary as the sine of the angular dis- tance from the apex. To arrive at some estimate of the speed of the solar motion, we may consider the motions of those stars whose parallaxes

have been measured, and whose actual linear speed is accordingly known (disregarding motion in the line of sight). If a sufficient number of stars are considered, their peculiar motions will mutually cancel and the parallactic or solar motion can then be derived. But not much reliance can be placed on this kind of determination. A very weighty objection is that the stars whose parallaxes are determined are mainly those of large proper motion and therefore not fairly representative of the bulk of the stars; in fact their peculiar motions will not neutralize one another in the mean. A better method is to derive the speed from the radial motions observed with the spectroscope. In this way W. W. Campbell from the radial motions of 280 stars found the velocity to be 20 kilometres per second with a probable error of ij km. per second (Astrophysical Journal, 1901, vol. xiii). This result depends on the northern stars only. By the addition of the data for southern stars, so as to obtain a distribution fairly symmetrical over the whole sphere, S. S. Hough and J. Halm deduced a velocity of 20-8 km. per second towards the apex A = i8 h 5 m , D = +26°. The speed is very nearly four radii of the earth's orbit per year; thus the annual parallactic motion is equal to four times the parallax, for a star lying in a direction 90 from the solar apex; for stars nearer the apex or antapex it is foreshortened. Thfs result, while it does not afford any means of determining the parallaxes of individual stars, enables us to determine the mean parallax of a group of stars, if we may assume their peculiar motions practically to cancel one another.

In researches on the solar motion the assumption is almost always made that the motions of the stars relatively to one another —the peculiar motions — are at random. The correctness cf this hypothesis has long been under suspicion, but it has generally been accepted as the best simple approximation to the actual distribution of the motions that could be made. Naturally exceptional regions mu ? t be recognized; for example, a connected system such as the Pleiades, whose stars have the same proper motion, must constitute an exception. There can occasionally be traced a certain commu- nity of motion over a much larger area. Thus R. A. Proctor found that between Aldebaran and the Pleiades most of the stars have a motion positive in right ascension and negative in declination, a

phenomenon which he designated "star-drift." A more precise investigation by L. Boss has shown that there is in this region a "moving cluster " of globular form. The stars composing this all have equal and parallel motions; about 40 stars brighter than the seventh

magnitude are known to belong to it. The group consisting of five stars of Ursa Major together with Sirius has already been alluded to; another very marked group of 16 stars in Perseus, all of the Helium type of spectrum, form a similar association. Spectroscopic evidence has indicated that most of the stars of Orion are associated, and share nearly the same motion (or rather, in this case, absence of motion).

But, whilst recognizing the existence of local drifts and systems, and admitting the possibility of relative motion between the nearer and more distant, or other classes of stars, it is^only recently that astronomers have seriously doubted the correctness of the hypothesis of random distribution of stellar motions as at least a rough representation of the truth. The hypothesis was put to the test by J. C. Kapteyn, with the result that it appears to be not even approximately accordant with the facts. His researches indicate that, instead of being haphazard, the proper motions of the star show decided preference for two " favoured " directions, apparently implying that the stars surrounding us do T be Tw9 not constitute a simple system but a dual one. The f tar motion of the stars in the mean towards Canis Major s ' re «ns« is thus a resultant motion, which, when examined more minutely, is found to be due to the intermingling of two great streams of stars moving in very different directions. These two streams or drifts prevail in every part of the sky examined, and contain nearly equal numbers of stars; that is to say, in whatever part of the sky we look about half the stars are found to belong to one and half to the other of the two great drifts. This hypothesis of two star-drifts does not imply that all the stars move in one or other of two directions. The stars have on this theory random peculiar motions in addition to the motion of the drift to which they belong, just as on the older theory the stars have peculiar motions in addition to the solar or parallactic motion shared by all of them. But the two theories lead to a very different statistical distribution of the stellar motions The older one — which may be called the " one-drift " hypothesis, since according to it the stars appear to form a single drift moving away from the solar apex — requires that the apparent directions of motion should be so distributed that fewest stars are moving directly towards the solar apex, and most stars along the great circle away from the solar apex, the number decreasing symmetrically, for directions inclined on either side of this great circle, according to a _Iaw which can be calculated. This is found not to agree with the facts at all. The deviation is unmistakable; in general the direction from the solar apex is not the one in which most stars are moving; and, what is even more striking, the directions, in

which most and fewest stars respectively move, are not by any means opposite to one another. It seems difficult to account for the very remarkable and unsymmetrical distribution of the motions, unless we suppose that the stars form two more or less separate systems superposed ; and it has been found possible by assuming two drifts with suitably assigned velocities to account very satisfactorily for the observed motions.

The phenomenon of two drifts was discovered by an examination of the Bradley proper motions {Brit. Assoc. Rep., 1905, p. 257), and has subsequently been confirmed by a discussion of the Groombridge proper motions (Mon. Not. R.A.S., 1906, 67, p. 34; 1910,71, p. 4). By an examination of the stars of very large proper motion F. W Dyson has traced the presence of the two drifts in all parts of the sky! I hey have been shown to prevail among fainter stars down to magnitude 9-5, by an examination of the Greenwich-Carrington proper motions; these, however, only cover a region within 9 of the north pole. Of the behaviour of stars fainter than magnitude 9-5 there is at present no direct evidence. About 10,000 stars altogether were dealt with in the above-mentioned investigations I he general results indicate that one of the drifts is moving (rela- tively to the sun) directly away from a point near a Ophiuchi % i Ut o A f27°°- Dec – +12°), and the other from a point in Lynx (K.A. 83 , Dec. +60°). These two points may be called the apices of the two drifts, for they are analogues of the solar apex on the one-drift theory; they are about no° apart. The velocities of the drifts differ considerably, the one whose apex is in Ophiuchus having about 1 5 times the speed of the other. We may conveniently distinguish the two drifts as the slow-moving and fast-moving drifts respectively ; but it should be remembered that, since these motions are measured relatively to the sun, this distinction is not physically significant. The stars appear to be nearly equally divided between the two drifts. The magnitudes of the stars are distributed in the same way in each drift. There is also clear evidence that the mean distances of both drifts from us are very approximately the same. 1 hus we are led to regard the two systems as completely intermingled, a fact which adds considerably to the difficulty of explaining the phenomena otherwise than as produced by two great systems— uni verses they have been called— which have come together, perhaps, by their mutual attraction, and are passing through one another. 1 he chances of individual stars of the two systems colliding are infinitesimal. Until the hypothesis has been thoroughly tested by an

examination of the line-of-sight velocities of stars from the same point of view, this physical interpretation must be received with some degree of caution; but there can be no doubt of the reality of the anomalies in the statistical distribution of proper motions of the stars, and of these it offers a simple and adequate explanation.

Having determined the motions of the two drifts, and knowing also that the ; stars are nearly equally divided between them, it is evidently possible to determine the mean motion of the drifts combined. This is of course that relative motion of the sun and stars which we have previously called the solar motion. The position of the solar apex calculated in this way agrees satisfactorily with that found by the usual methods. It is naturally fairly close to the apex of the faster drift, but is displaced from it in the direction of the apex of the other drift. In this connexion it may be noticed that, when the smaller and larger proper motions are discussed separately, the latter category will include an unduly great proportion of stars belonging to the fast-moving drift, and the resulting determination will lead to a solar apex too near the apex of that drift, i.e. with too low a declination. This appears to be the explanation of Stumpe's and Porter's results; they both divided their proper motions into groups according to theif numerical amount, and found that the declination of the solar apex progressively increased as the size of the motions used diminished. Another anomalous determination of the apex, due to H. A. Kobold (Astro. Nach., 3163, 3451, and 3491) is also explained when the two drifts are recognized. Kobold, using a peculiar and ingenious method, found for it a declination -3 , which disagrees very badly with all other determinations; but it is a peculiarity of Kobold's method that it gives the line of symmetry of motion, which joins the apex and antapex, without indicating which end is the apex. Now the position of this line, as found by Kobpld, actually is a (properly weighted) mean between the corresponding lines of symmetry of the two drifts, but naturally it lies in the acute angle between them, whereas the line of the solar motion is also a weighted mean between the two lines of drift, but lies in the obtuse angle between them.

The Structure of the Universe.— -We now arrive at the greatest of all the problems of sidereal astronomy, the structure and nature of the universe as a whole. It can by no means be taken for granted that the universe has anything that may properly be called a structure. If it is merely the aggregate of the stars, eac.h star or small group of stars may be a practically independent unit, its birth and development

taking place without any rela tion to the evolution of the whole. But it is becoming more

only enables us to see stars more remote than before, but also reveals very many smaller stars within the limits previously penetrated. But notwithstanding the great variety of intrinsic brightness of the stars, the ratio of the number of stars of one magnitude to the number of the magnitude next lower (the " star-ratio ") is a guide to the uniformity of their distribution. If the uniform distribution extends indefinitely, or as far as the telescope can penetrate, the star-ratio should have the theoretical value 3-98, 1 any decrease in density or limit to the distribution of the stars will be indicated by a continual falling off in the star-ratio for the higher magnitudes. H. H. Seeliger, who investigated this ratio for the stars of the Bonn Durchmusterung and Southern Durchmusterung, came to the Conclusion (as summarized by Simon Newcomb) that for these stars the ratio ranges from 3-85 to 3-28, the former value being found for regions near the Milky Way and the latter for regions near the galactic poles. There is here evidence that even among stars of the Durchmusterung (9-5 magnitude), a limit of the universe has been reached, at least in the direction normal to the plane of the Milky Way. For the higher magnitudes J. C. Kapteyn has shown that the star-ratio diminishes still further.

In all investigations into the distribution of the stars in space one fact stands out pre-eminently, viz. the existence of a certain plane fundamental to the structure of the heavens. This'is the galactic plane, well known from the fact that it is marked in the sky by the broad irregular belt of milky light called the Galaxy or Milky Way. But it is necessary to make a careful distinction between the galactic plane and the Galaxy itself ; the totter, though it is neces- sarily one of the most remarkable features of the universe, is not the only peculiarity associated with the galactic plane: Its par- ticular importance consists in the fact that the stars, bright as well as faint, crowd towards this plane. This apparent relation of the lucid stars to the Galaxy was first pointed out by Sir W. Herschel. For the stars visible to the naked eye a very thorough investigation by G. V. Schiaparelli has shown the relation in a striking manner. He indicated on planispheres the varying density of distribution of the stars over the sky. On these the belt of greatest density can be easily traced, and it follows very closely the course of the Milky Way; but, whereas the latter is a belt having rather sharply defined boundaries, the star-density decreases gradually and con- tinuously from the galactic equator to the galactic poles. The same result for the great mass of fainter stars has been shown by Seeliger. The following table

shows the density with which stars brighter than the ninth magnitude are distributed in each of nine zones into which Seeliger divided the heavens : —

The

Galactic

Plane.

Galactic latitude

Number of stars per square degree .

N. Pole

to 70 N.

2-78

70° N.

to

50° N.

3-03

5o° N.

to

30° N.

3-54

30 N.

to

io° N.

5-32

io° N.

to io° S.

8.17

io° S.

to

30°S.

6-07

30° S.

to

50° S.

3-71

50° S.

to 70° S.

3-21

70 S.

to

S. Pole

3-H

Limits ol the Universe.

and more generally recognized that the stars are not unrelated; they are parts of a greater system, and we have to deal with, not merely the history of a number of independent units, but with a far vaster conception, the evolution and development of an ordered universe.

Our first inquiry is whether the universe extends indefinitely in all directions, or whether there are limits beyond which the stars are not distributed. It is not difficult to obtain at least a partial answer to this question ; anything approaching a uniform distribution of the stars cannot extend indefinitely. It can be shown that, if the density of distribution of the stars through infinite space is nowhere less than a certain limit (which may be as small as we please), the total amount of light received from them (assuming that there is no

absorption of light in space) would be infinitely great, so that the background of the sky would shine with a. dazzling brilliancy. We therefore conclude that beyond a certain distance there is a thinning out in the distribution of the stars ; the stars visible in our telescopes form a universe having a more or less defined boundary; and, if there are other systems of stars unknown to us in the space beyond, they are, as it were, isolated from the universe in which we are. It is necessary however to emphasize that the foregoing argument assumes that there is no appreciable absorption of light in interstellar space. Recently, however, the trend of astronomical opinion has been rather in favour of the belief that diffused matter may exist through space in sufficient quantity to cause appreciable absorption; so that the argument has no longer the weight formerly attached to it. Another line of reasoning indicates that the boundary of the universe is not immeasurably distant, and that the thinning out of the stars is quite perceptible with our telescopes. This depends on the law of progression in the number of stars as the brightness dimin- ishes. If the stars were all of the same intrinsic brightness it is evident that the comparison of the number of stars of successive magnitudes would show directly where the decreased density of distributibn began. Actually we know that the intrinsic brightness varies very' greatly, so that each increase of telescopic power not

The table, which is based on over 130,000 stars, shows that along the galactic circle the stars are scattered nearly three times more thickly than at the north and south poles of the Galaxy. What, however, is of particular importance is that the increase is gradual. No doubt many of the lucid stars which appear to lie in the Milky Way actually belong to it, and the presence of this unique cluster helps to swell the numbers along the galactic equator; but, for example, the increased density between latitudes 30 to 50° (both north' and south) as Compared with the density at the poles cannot be attributed to the Galaxy itself, for the Galaxy passes nowhere near these zones. The star-gauges of the Herschels exhibit a similar result; the Herschels counted the number of stars visible with their powerful telescopes in different regions of the sky, and thus formed comparative estimates of the density of the stars extending to a very high magnitude. According to their results the star-density increases continuously from 109 per square degree at the poles to 2019 along the galactic equator. In general, the fainter the stars included in the discussion the more marked is their crowding towards the galactic plane. Various considerations tend to show that this apparent crowding does not imply a really greater density or clustering of the stars in space, but is due to the fact that in these directions we look

through a greater depth of stars before coming to the boundary of the stellar system. Sir William Herschel and afterwards F. G. W. Struve developed the view that the stars are contained in a comparatively thin stratum bounded by two parallel planes. The shape of the universe may thus be

compared to that of a grind- A p. n p

stone or lens, the . sun being 1 ~pˆ

situated about midway be- ! . <•'"

tween the two surfaces. Thus the figure, represents a section

of the (ideally simplified) uniˆ ‘ ,, r —

*verse cut perpendicular to ˆ ” ***

the planes AB and CD between .which the stars are contained,

1 This number is the 3/2th power of the ratio of the brightness of stars differing by a unit magnitude.

I?”

!S

STARAYA RUS3A

793

S being the sun. Imagine this stratum to be uniformly filled with stars (of course in the actual universe instead of sharply defined boundaries AB and CU, we shall have a gradual thinning out of the stars) it follows that in the two directions SP and SP’ the fewest stars will be seeni ‘liese then are the directions of the galactic poles. As we consfi. S” a direction such as SQ farther and farther from the pole the boundary of the universe in that direction becomes more and more remote so that more stars are seen, and finally in the directions SR and SR’ in the galactic plane, the boundary is perhaps beyond the limits of our telescopes. That the universe must have a boundary in the directions SR and SR’, we can hardly doubt, but nothing is known of its shape or distance except that in all directions it must be far greater than SP or SP’; in particular it is not known whether the sun is near the centre or otherwise. That the sun is nearly midway between the two boundary planes can be tested by comparing the

star-densities of the northern and southern galactic hemispheres. These are zone for zone very nearly equal ; the slight excess of stars in the southern hemisphere perhaps implies that the sun is a little north of the central position. This is confirmed by the fact that the Milky Way is not quite a great circle of the celestial sphere, but has a mean south galactic latitude of about 1-7°.

If, instead of considering the whole mass of stars, attention is directed to those of large proper motion, which are therefore in the mean relatively near us, the crowding to the galactic plane is much less noticeable, if not indeed entirely absent Thus Kapteyn found that the Bradley stars having proper motions greater than 5″ per century were evenly distributed over the sky, Dyson and Thackeray's tables show the same result for the Groombridge stars down to magnitude 6-5; but the fainter stars (with centennial proper motions greater than 5") show a marked tendency to draw towards the galactic circle. The result is precisely what should be expected from the theory of the shape of the universe which has been set forth. If in the fig. we describe a sphere about S with radius SP so as just to touch the boundaries of the stratum of stars, then, provided a class of stars is considered wholly or mainly included within this sphere, no concentration of stars in the galactic plane is to be expected, for the shape of the universe does not enter into the question. It is only when some of the stars considered are more remote and lie outside this sphere (but of course between the two planes) that there is a galactic crowding. We infer that nearly all the stars down to magnitude 6-5, whose proper motions exceed 5", are at a distance from the sun less than SP, whilst of the fainter stars with equally great proper motions a large proportion are at a distance greater than SP. This result enables us to form some sort of idea of the distance SP.

On considering the distribution of the stars according to their spectra, it appears that the Type II. (solar) stars show no tendency to congregate in the galactic plane. The result of course only applies to the brighter stars, for we have very little knowledge of the spectra of stars fainter than about magnitude 7-5. The explanation indicated in the last paragraph applies to this case also Type II. stars are in general much less intrinsically luminous than Type I., so that the stars known to be of this type must be comparatively near us, for otherwise they would appear too faint to have their spectra determined. They are accordingly within the sphere of radius SP (fig.), and consequently are equally numerous in every direction. The Type I. stars, being intrinsically brighter, are not so limited. According to F. McClean, of the stars brighter than magnitude 3-5, only the helium and not the hydrogen stars of Type I. show a

condensation towards the galactic plane. Thus we see that the effect of limiting the magnitude to 3-5 is that the hydrogen stars are now practically all within the sphere SP, and it is only the helium stars, whose absolute luminosity is still greater, that are more widely distributed. Of the rarer types of spectra, stars of Type III. agree with those of Type II. in being evenly distributed over the sky; Types IV. and V. however,' congregate towards the galactic plane. The most remarkable are the Type V. (Wolf- Rayet) stars ; in their case the condensation into the galactic regions is complete, for of the Qi known stars of this type, 70 are actually in the Milky Way and the remaining 21 are in the Magellanic Clouds (two large clusters in the southern hemisphere, which re- semble the Milky Way in several respects). Excluding the latter, the 70 Wolf-Rayet stars have a mean distance from the central galactic circle of only 2-6°. There can be little doubt that these stars belong to the Milky Way cluster, so that their presence is a property of the cluster rather than of the galactic plane in general. Spiral nebulae have the remarkable characteristic of avoiding the galactic plane, and it has been suggested that the space outside the limits of the stellar universe is filled with them. It does not, however, seem probable that their apparent anti-galactic tendency has such a significance; in the Magellanic Clouds spiral nebulae are very abundant, a fact which shows that there is no essential antipathy between the stars and the spiral nebulae.

As might be expected, the relative motion of the two great star-drifts is parallel to the galactic plane.

A glance at the Milky Way, with its sharply defined irregular boundaries, its clefts and diverging spur, is almost sufficient to assure us that it is a real cluster of stars, and does not merely

indicate the directions in which the universe extends farthest. Barnard's photographs of its structure leave little doubt on the matter; the numerous rifts and dark openings show that . M „ t

its thickness cannot be very great. To complete our Tr e " I " k y representation of the universe, it is therefore necessary Wa y~ to add to the fairly uniform distribution of stars between two

E lanes a gigantic cluster of an annular or spiral form, also lying etween the planes and completely surrounding the sun. The Milky Way is not of uniform brightness, so that we are perhaps nearer to some parts of it than to others, but it is everywhere very distant from the sun. Estimates of this distance vary, but it may probably be put at more than three thousand light years (parallax less than o-ooi").

Nevertheless the Milky Way contains a fair prqportion of lucid stars, for these are considerably more numerous in the bright patches of the Milky Way than in the rifts and dark spaces.*

It has been seen that the parallaxes afford little information as to the distribution of the main bulk of the stars and that the chief evidence on this point must be obtained indirectly from their proper motions. Our principal knowledge D,sMb ”’. of this subject is due to Kapteyn (Gronirigen Publications, , ” f-j No. 8 and 11), and though much of his work is pro Lu .’”’”’”^ visional, and perhaps liable to considerable revision % * e when more extensive d_ata are obtainable, it probably s ‘ gives an idea of the construction of the universe sufficiently accurate in all essential respects. As has been explained the, mean distance of a group of stars can be readily determined from the parallactic motion, which, when not foreshortened, is approximately four times the parallax; but to obtain a complete knowledge of the distribution of stars it is necessary to know, not merely the mean parallax of the group, but also the frequency law, i.e. what proportion of stars have, a quarter, half, twice or three tinies, &c, the meaft parallax. One result of Kapteyn’s investigations may be given here. Taking a sphere whose radius is 560 light years (a distance about equal to that of the average ninth magnitude star), it will contain:— 1 star giving from 100,000 to 10,000 times the light of the sun 26 stars „ 10,000 ,, 1,000 „ ,, ,,*

i>3QO ,, ,, 1,000 „ 100 ,, ,. .,

22,000 ,, ,,, 100 ,, 10 ,, ,, „

140,000 „ ,, 10 „ 1 „

430,000 „ „ 1 ,, o-i ,, „ „

650,006 ,, ,, o-i ,, o-oi ,, „ „

Whether there is an increasing number of still less luminous stars is a disputed question.

The comparative nearness of the stars, of the solar type, which we have had occasion to allude to, is confirmed by the fact, that their proper motions are on the average much larger than those of the Sirian stars. Kapteyn finds that magnitude for magnitude, the absolute brightness of the solar stars is only one-fifth ofthat of the Sirian stars, so that in the mean they must be at less than half the distance. As the numbers of known stars of the two types are nearly equal, it is clear that, at all events in our immediate neigh-

bourho6d, the solar stars must greatly outnumber the Sirian.

References. — Of modern semi-popular works entirely devoted to and covering the subjects treated of in this article the principal is Simon Newcomb's The- Stars, a Study of the Universe; mention must also be made of Miss A. M. Clerke's The System of the Stars (2nd ed., 1905), which contains full references to original papers; Problems in Astrophysics, by the same author, may also be consulted. The following works of reference and catalogues deal with special branches of the subject; for variable stars, Chandler's "Third Catalogue," Astronomical Journ. (1896), vol. xvi., is now very incomplete; Harvard Annals, vol. lv., pt. 1, and vol. lx., No. 4, together constitute a catalogue of 3734 variable stars ; ephemerides of over 800 variables are given in the Vierteljahrsschrift of the Astronomische Gesellschaft. For double stars see Burnham!s General Catalogue (1907), and Lewis, Memoirs of the R.A.S., vol. lvi! ; the orbits of the principal binaries are discussed in T. J. J. See, Evolution of Stellar Systems, and another list will be found in Lick Observatory Bulletin, No. 84. A list of spectroscopic binaries dis- covered up to 1905 is given in Lick Observatory Bulletin, No. 79. For the spectrum analysis of stars, Scheiner's Astronomical Spectro- scopy (trans, by Frost) may be consulted. The "Draper Catalogue," Harvard Annals, vol. xxvii., gives the classification' according ito spectrum of over 10,000 stars; for the brighter stars Harvard Annals, vol. 1. forms a more complete catalogue. Of the numerous memoirs discussing stellar spectra in relation to evolution, A. Schuster, "The Evolution of Solar Stars," Astrophysical Journ. (1903), vol. xvii., may be mentioned as giving a concise survey of the subject. (A. S. E.)

STARAYA RUSSA, a town of Russia, in the government of Novgorod, 58 m. S. of the city of Novgorod, on the river Polista, by means of which and Lake Umen it is brought in tb steamer communication with St Petersburg. Pop., 1 5ˆ234. Brine springs on the east of the town were used as a source for the supply of salt as late as 1865; at present they are used only as mineral waters (temperature 51-54° F.), having a great

resemblance to those of Kreuznach in Germany. Some thousands of visitors resort to them every summer, and owing to this circumstance Staraya Russa is better built and better kept than any other town in the government of Novgorod. The inhabitants are supported chiefly

by the summer visitors. There is a trade in rye, oats and flax shipped to St Petersburg. The name of Staraya Russa occurs in Russian annals as far back as 1 167. It belonged to the republic of Novgorod, and suffered continually in the wars between Russia, Lithuania and Livonia. It was afterwards annexed to Moscow.

STARA ZAGORA (Turk. Eski-Zagra), the capital of a depart- ment of Bulgaria, in Eastern Rumelia, on the southern slope of the Karaja Dagh, 70 m. N.W. of Adrianople, with which it is connected by railway. Pop. (1906), 20,647. It is surrounded by Vineyards, and has also cloth and carpet manufactures, copper foundries and tanneries. The production of silk and attar of roses is carried on in the district, which contains nume- rous mineral springs. The town having been almost wholly destroyed during the Russo-Turkish War of 1877-78, was rebuilt on a regular plan, with wide and broad streets radiating from a fine central square, where are situated the principal public buildings. During the rebuilding, important Thracian, Roman, Byzantine and Turkish antiquities were discovered.

Stara Zagora, founded probably by the Macedonians, was known to the Romans as Augusta Traiana, but afterwards, to distinguish it from a Macedonian town of this name, it was named Beroe or Berrhoea. By the Turks the name was changed in the 17th century to Eski-Zagra or Eski-Zaara, but after 1878 the Bulgarian name of Stara Zagora came into general use.

STARBOARD and LARBOARD, nautical terms for the right and left sides respectively of a ship, looking towards the bows. The final part of these is Old English bord, board, the side of a ship, now used for a plank of wood. In starboard (O. Eng. steorbord) the first part certainly means " steer," and " steering side " therefore refers to the time when vessels were steered by a paddle or sweep worked from the right side. In Old English the left side of a ship was known as baecbord, back board, the side of the vessel to the back of the steersman. This is paralleled in all other Teutonic languages, cf. German backbord, and has been adopted in Romanic languages, cf. French bdbord. Baecbord did not survive in Middle English, in which its place was taken by laddeborde or lalheborde. In the 16th century the word takes the forms lerbord, leerebord or larbord, probably by assimilation to ster-, steere-, and slar-bord. There is much doubt as to the origin of the term and the curious change from laddebord to larboard. Skeat {Etym. Diet.) suggests that these may be two distinct words. The earlier form is usually con- nected with " lade," to put cargo on board a vessel, the left side being that on which this was

usually done, for the ship when in port would lie with her left side against the quay wall, her head pointing to the entrance. If the later form is not due to mere assimilation to starboard, it may contain a word meaning empty (O. Eng. geldr, Ger. leer), and refer to that side of the vessel where the steersman does not stand. Owing to the similarity in sound between starboard and larboard, the word port is now used for the left side. The substitution of this for the older term was officially ordered in the British navy by an admiralty order of 1844, and in the United States of America by a navy department notice in 1896. The use of port in this sense is much older; it occurs in Manwaring's Seaman's Dictionary (1625-1644). In this usage port may either mean ," harbour " (Lat. porlus), the ship lying with its left side against the port or quay for unloading, or " opening," " entrance " (Lat. porta, gate), for the cargo to be taken on board; cf. " porthole."

STARCH, an organized product of the vegetable kingdom, forming one of the most important and characteristic elements of plant life. It originates within the living vegetable cell through the formative activity of chlorophyll under the in- fluence of light, and is consequently an unfailing characteristic of all plants containing that body. Starch found within leaves and other green parts of plants is assimilated and transformed

with great rapidity; accumulations of it are carried as starch-formers, and redeposited as starch in special reservoirs or portions of plants as the period of maturity approaches. In this way the body is found to gorge the stems of certain palms — the sago, &c. — just before these plants begin to form their fruit; it is the principal constituent of the underground organs of biennial and perennial plants, tap-roots, root-stocks, corms, bulbs and tubers; and it is abundantly stored in many fruits and seeds, as in the cereals and pulses, in bananas, bread-fruit, &c. It occurs in minute granules varying in diameter from -002 to 185 milli metres; and the granules from different sources have each a distinct microscopic character. Under the microscope these granules are seen to consist of a nucleus or hilum surrounded by layers arranged concentrically or excentrically, and the relations of hilum and layers are the most distinctive features of individual starches (see H. Gait, Microscopy of the Starches, 1900). Starch consists of a white or yellowish white glistening powder. It is only slightly acted on by cold water, but under the influence of heat in water it swells up, forming according to the proportions of starch and water a clouded opalescent paste. The soluble portion is called granulose, and the insoluble starch cellulose; from the aqueous solution alcohol precipitates soluble

starch. Iodine acts on it in water, producing a brilliant blue coloration, this reaction forming a very delicate and character- istic test. The colour disappears on heating, but is recovered when the mixture is cold. Diastase and dilute boiling sulphuric acid convert starch into a form soluble in hot water, whence it passes into a series of easily soluble dextrins, and finally into the condition of the sugars, dextrose and maltose. Chemically, starch is a carbohydrate with the formula (C 6 Hio06) n , where n is four or more.

As an economic product starch in its separate condition is a most important alimentary substance, the chief pure food starches being arrowroot, sago, tapioca and cornflour. In its combined condition, in cereals, &c, starch is a useful nutritive element. In its other industrial relations starch is used: (1) directly, as a thickening material in calico printing, for the dressing and finishing of many textiles, for laundry purposes, adhesive paste, and powder; and (2) indirectly, for the pre- paration of dextrin and British gum and starch sugar. Indian corn, wheat and rice starch are principally employed for the direct applications; and for the dextrin and starch-sugar manufacture potato starch is almost exclusively selected.

In the preparation of starch the object of the manufacturer is to burst the vegetable cell walls, to liberate the starch granules, and to free them from the other cell contents with which they are associated. When, as in the case of the potato, the associated cell contents, &c, are readily separated by solution and levigation the manufacture is exceedingly simple. Potato starch is prepared principally by carefully washing the potatoes and in a kind of rasping machine reducing them to a fine pulp, which is deposited in water as raw starch. The impurities of this starch— cellulose, albuminoids, fragments of potato, &c. — are separated by washing it in fine sieves, through the meshes of which the pure starch alone passes. The sieves are-variously formed, some revolving, others moving horizontally or in such manner as to keep the material in agitation. The starch is then received in tanks, in which it settles, and so separates from the soluble albuminoids and salts of the potatoes. (The waste pulp which passes over the sieve is pressed, dried quickly, and sold as a low-grade cattle food.) The settling of the starch is much retarded by the dissolved albuminoids, and to hasten the separation small quantities of alum or sulphuric acid are employed. Alum coagulates the albumen and to that extent contaminates the starch, while the acid acts on the starch itself and is difficult of neutralization. After the starch has settled, the brown- coloured supernatant liquor is drawn off and the starch again washed either in tanks or in a centrifugal machine. Finally it is dried by spreading it in layers over porous

bricks (a process not required in the case of starch washed in a centrifugal machine) and by exposure to the air, after which it still retains a large proportion of water, but is in a condition for making dextrin or starch-sugar. For further drying it is ground to a rough powder, and dried thoroughly in a hot chamber, then reduced to. a powder and sifted. Potato starch is also made by a " rotting " process, in which potatoes are reduced to a pulp by slicing and are then heaped up till fermentation takes place; 100 lb of potatoes yield 15-16 lb of dry starch.

In dealing with the starches of the cereals, there is greater

difficulty, owing to the presence of gluten, which with water forms a tough elastic body difficult of solution and removal. The diffi- culty is experienced in greatest measure in dealing with wheat, which contains a large proportion of gluten. Wheat starch is separated in two different ways: (i) the fermentation method, which is the original process, and (2) by mechanical means without preliminary fermentation. In the fermentation process whole wheat or wheaten meal is softened and swollen by soaking in water. Wheat grains are, in this condition, ground, and the pulp, mixed to a thickish fluid with water, is placed in tanks, where it ferments, developing acids which dissolve the gummy constituents of the wheat, with part of the gluten, and render the whole less tenacious. After full fermentation, the period of which varies with the weather and the process employed, the starch is separated in a washing drum. It is subsequently washed with water, which dissolves out the gluten, the starch settling in two layers — one comparatively pure, the other mixed with gluten and some branny particles. These layers are separated, the second undergoing further washing to remove the gluten, &c, and the remaining operations are analogous to those employed in the preparation of potato-starch. By the mechanical process wheaten flour is kneaded into a stiff paste, which, after resting for an hour or two, is washed over a fine sieve so long as the water passing off continues milky, whereby the starch is liberated and the greater part of the gluten retained as a gluey elastic mass in the sieve. The starch is sub- sequently purified by fermentation, washing and treatment in centri- fugal machines. The gluten thus preserved is a useful food for diabetic patients, and is made with flour into artificial macaroni and pastes, besides being valuable for other industrial purposes. The fermentation process gives about 59 lb of starch and 11 of bran from

100 lb of wheat, whilst the mechanical process gives about 55 lb of starch and 12 of gluten.

Maize (Indian corn) starch is obtained by analogous processes, but, the proportion of gluten in the grain being smaller and less ten- acious in its nature, the operations, whether chemical or mechanical, present fewer difficulties. Under one method the separation of maize starch is facilitated by steeping, swelling and softening the grain in a weak solution of caustic soda, and favourable results are also obtained by a process in which the pulp from the crushing mill is treated with water acidulated with sulphurous acid.

In the preparation of rice-starch a weak solution of caustic soda is also employed for softening and swelling the grain. It is then washed with pure water, dried, ground and sifted, and again treated with alkaline water, by which the whole of the nitrogenous constituents are taken up in soluble form. ,An acid process for obtaining rice- starch is also employed, under which the grain, swollen and ground, is treated repeatedly with a solution of hydro- chloric acid, which also dissolves away the non-starchy constituents of the grain. The yield is about 85 lb per 100 of rice. Laundry starches are principally made from rice and from pulse.

See O. Saare, Die Fabrikation der Kartoffelstdrke (1897).

STAR CHAMBER, the name given in the 15th, 16th and 17th centuries to an English court of justice. The name is probably derived from the stars with which the roof of the chamber was painted; it was the camera stellata. But it has also been derived from a Hebrew word shetar or sh'tar, a bond, on the supposition that the chamber of meeting was the room in which the legal documents connected with the Jews were kept prior to their expulsion from England by Edward I.

The origin and early history of the court are somewhat obscure. The curia regis of the 1 2th century, combining judicial, delibera- tive and administrative functions, had thrown off several offshoots in the court of king's bench and other courts, but the Crown never parted with its supreme jurisdiction. When in the 13th century the king's council became a regular and permanent body, practically distinct from parliament, this supreme juris- diction continued to be exercised by the king in council. As the ordinary courts of law became more important and more systematic, the indefinite character of the council's jurisdiction gave rise to frequent complaints, and efforts, for the most part fruitless, were made by the

parliaments of the 14th century to check it. The equitable jurisdiction of the chancellor, which grew up during the reign of Edward III. like the courts of law under Henry II., was derived from this supreme judicial power, which was yet unexhausted.

It is in the reign of Edward III., after an act of 1341, that we first hear of the chancellor, treasurer, justices and other members of the king's council exercising jurisdiction in the old chamber, or chambre de esloiles, at Westminster. In Henry VI. 's reign one Danvers was acquitted of a certain charge by the council in the camera stellata. Hitherto such acts of parliament as had

recognized this jurisdiction had done so only by way of limita- tion or prohibition, but in 1453, about the time when the distinction between the ordinary and the privy council first became apparent, an act was passed empowering the chancellor to enforce the attendance of all persons summoned by the privy seal before the king and his council in all cases not determinable by common law. At this time, then, the jurisdiction of the council was recognized as supplementary to that of the ordinary courts of law. But the anarchy of the Wars of the Roses and the decay of local justice, owing to the influence of the great barons and the turbulence of all classes, obliged parliament to entrust wider powers to the council. This was the object of the famous act of 1487, which was incorrectly quoted by the lawyers of the long parliament as creating the court of star chamber, which was in reality of earlier origin.

The act of 1487 (3 Hen. VII.) created a court composed of seven persons, the chancellor, the treasurer, the keeper of the privy seal, or any two of them, with a bishop, a temporal lord and the two chief justices, or in their absence two other justices. It was to deal with cases of " unlawful maintainance, giving of licences, signs and tokens, great riots, unlawful assemblies "; in short with all offences against the law which were too serious to be dealt with by the ordinary courts. The jurisdiction thus entrusted to this committee of the council was not supplemen- tary, therefore, like that granted in 1453, but it superseded the ordinary courts of law in cases where these were too weak to act. The act simply supplied machinery for the exercise, under special circumstances, of that extraordinary penal jurisdiction which the council had never ceased to possess. By an act of 1529 an eighth member, the president of the council, was added to the star chamber, the jurisdiction of which was at the same time confirmed. At this time the court performed a very necessary and valuable work in punishing powerful offenders who could not be reached by the ordinary courts of law. It was found very useful by

Cardinal Wolsey, and a little later Sir Thomas Smith says its object was "to bridle such stout noblemen or gentlemen who would offer wrong by force to any manner of men, and cannot be content to demand or defend the right by order of the law."

It is popularly supposed that the star chamber, after an exis- tence of about fifty years, disappeared towards the end of the reign of Henry VIII., the powers obtained by the act of 1487 being not lost, but reverting to the council as a whole. This may have been so, but it is more probable that the star chamber continued to exist side by side with the council, and the two bodies were certainly separate during the latter 'part of Eliza- beth's reign. The act of 1540, which gave the king's pro- clamation the force of law, enacted that offenders against them were to be punished by the usual officers of the council, together with some bishops and judges " in the star chamber or else- where." It is difficult, if not impossible, to draw a clear distinction between the duties of the privy council and the duties of the star chamber at this time, although before the abolition of the latter there was a distinction " as to their com- position and as to the matters dealt with by the two courts." During the reign of Elizabeth Sir Thomas Smith remarks that juries misbehaving "were many times commanded to appear in the star chamber, or before the privy council for the matter." The uncertain composition of the court is well shown by Sir Edward Coke, who says that the star chamber is or may be compounded of three several councils: (1) the lords and others of the privy council; (2) the judges of either bench and the barons of the exchequer; (3) the lords of parliament, who are not, however, standing judges of the court. William Hudson (d. 1635), on the other hand, considers that all peers had the right of sitting in the court, but if so they had certainly given up the privilege in the 17th century.

The jurisdiction of the star chamber was as vague as its constitution. Hudson says it is impossible to define it without offending the supporters of the prerogative by a limitation of its powers, or the lawyers by attributing to it an excessive latitude. In practice its jurisdiction was almost unlimited.

It took notice of riots, murder, forgery, felony, perjury, fraud, libel and slander, duels and acts tending to treason, as well as of some civil matters, such as disputes about land between great men. and

corporations, disputes between English and foreign merchants, and testamentary cases; in fact, as Hudson says, " all offences may be here examined and punished if the king will." Its procedure was not according to the common law. It dispensed with the encumbrance of a jury; it could proceed on rumour alone; it could apply torture; it could inflict any penalty but death. It was thus admirably calculated to be the support of order against anarchy, or of despotism against individual and national liberty. During the Tudor period it appeared in the former light, under the Stuarts in the latter. Under the Tudors, as S. R. Gardiner says, it was "a tribunal constantly resorted to as a resource against the ignorance or prejudices of a country jury," and adds that "in such inves- tigations it showed itself intelligent and impartial." Under James I. and Charles I. all this was changed; the star chamber became the great engine of the royal tyranny. Hateful and excessive punishments were inflicted on those brought before the court, notable 'among whom were Prynne, Bastwick and Burton, and the odium which it gathered around it was one of the causes which led to the popular discontent against Charles I. As it became more unpopular its jurisdiction was occasionally ques- tioned. An example of this kind occurred in 1620, but the barons of the exchequer who heard the ca,se declared that the star chamber was created many years before the statute of Henry VII. and that it was " one of the most high and honour- able courts of justice." It was abolished by an act of parlia- ment of July 1641. In 1661 a committee of the House of Lords reported " that it was fit for the good of the nation that there be a court of like nature to the star chamber "; but nothing further was done in the matter.

For the history of the star chamber see Sir Thomas Smith, Commonwealth of England (1633) ; Lord Bacon, History of Henry VII., edited by J. R. Lumby (Cambridge, 1881); William Hudson, " Treatise of the Court of Star Chamber," in vol. ii. of Collectanea Juridical H. Hallam, Constitutional History of England (1876); W. S. Holdsworth, History of English Law (fol. 1902) ; G. W. Prothero, Statutes and Constitutional Documents 1550-162$ (1894) ; W. Busch, England under the Tudors (1895) ; S. R. Gardiner, History of England 1603-1642 (1883-1884); D. J. Medley, English Con- stitutional History (1907); and A. V. Dicey, The Privy Council. The pleadings in the star chamber are in the Record Office, London ; the decrees appear to have been lost.

STARFISH, a popular term under which are included a large number of sea-animals, belonging all to the great group of Echinor

derms, but to three dis- tinct divisions of that group: the Asterids, the

Ophiurids and the Crinoids (see Echino- derma). The Asterids or starfish proper in- clude the cross-fish, the sun-star (see Echino-derma, fig. 17), the cushion-star, the butt- horn, and many with- out a popular name. The common cross-fish or five-finger, Asterias rubens, of British seas, -An Asterid, A sterias rubens, mav be taken as typical

a, Madreporit U e PPer ”””^ £”■ .* and \»* *e*

a, The same magnified. description will apply

b, Anus. : also to the American This starfish may be 9-12 in. across. species A. forbesi and

A. vulgaris. The animal consists of a central body or disk, produced into five arms or rays. The upper surface is covered with a’ leathery skin, strengthened by a rafter-work of little bones or plates, made of crystalline carbonate of lime, many of them bearing prickles of the same substance and small piacer-like bodies — the pedicellariae (see Sea-Urchin). In the

middle of the body is a small anal opening, and near the angle between two rays is a furrowed plate pierced by many minute pores and called the madreporite. The under surface of the body has the mouth in the centre, and from it deep grooves radiate to the ends of the arms. At the bottom of each groove is a water-vessel, which gives off branches to the podia or sucking- feet on each side of it. A section across this groove is given in the article Echjnoderma, fig. 12 B. The arrange- ment and working of this ?}?■ 2.— Asterias rubens, under surface, hydraulic system is a > ^““podk “ “* g ”*

essentially the same as 0i End of a podium, magnified, in the sea-urchin, except

for the presence of plates at the bottom of the groove beneath the radial water-vessel, and the absence of any plates covering the groove. At the end of each ray is, as in the urchin, a single tentacle surrounded by pigment and connected with a definite plate called ” terminal.” Thus the terminals of a starfish cor- respond to the oculars of a sea-urchin (see Echinoderma, fig. 3). The stomach is not a long coil, but a simple sac with branched blind tubes extending into each ray. A generative gland also passes down the side of each ray, and emits the milt or eggs when ripe through a pore near the body. Spawning takes place in spring or early summer. A starfish can crawl in any direction by means of its sucking-feet, whether the surface be

hard or rough Or polished, or the softest silt, whilst its supple body can squeeze through incredibly narrow crevices. The rate of progress is about six inches a minute.

The starfish are the scavengers of the sea, but unfortunately do not confine their attentions to decaying matter; they eat oysters, clams, mussels, barnacles, sea-snails, worms, Crustacea and even smaller starfish. There is constant war between oyster-fishers and starfish ; no less than 42 ,000 bushels of starfish were removed from the oyster-beds of Connecticut in a single year, but not till they had worked damage to the amount of $631,500. The simplest way in which a starfish eats is by taking small bits of food into the stomach, and ejecting the refuse again through the mouth. But since the mouth is quite small and the food often large, the starfish finds it more convenient to turn its stomach inside out and to wrap it around the animal to be eaten, which is then digested quietly and the stomach withdrawn again. In the case of oysters and similar bivalves, the starfish first has to open them; and this it does by fixing the suckers of one or two rays to one valve and those of the opposite rays to the other valve, while it may get a purchase by also holding on to some neighbouring object. It then begins to straighten out its rays. The oyster can withstand a very strong pull, but it cannot hold out against a long pull, and the starfish does not hurry. At last the oyster gives way, and the starfish has its reward; but its companions often join in, and you may see a whole ball of them interlaced round half-digested molluscs and rolling about. Starfish begin to eat voraciously when quite young; one less than fth in. across has been observed to eat over fifty young clams of half that length in six days. The more a starfish has to eat the quicker it grows, and it may become sexually mature in less than a year, then producing many thousands of young. Fortunately the increase is kept in check by many causes. The young, while still in the stage of free-swimming larvae, are swallowed in millions by various fish. When they settle down on seaweed their bright colours attract eels and many small fishes. Later in life they are attacked by parasites, while those which stray into shallow water are eaten by gulls and crows. Freshets and cold currents are also destructive.

Probably the best way in which man can keep down the numbers of starfish is by dredging the seaweed in the latter half of July when it is covered with young; a single cartload thrown on shore would capture many millions. At a later stage tangles of hemp or cotton waste may, be dragged over the oyster-beds, when the starfish will cling to them by their pedicellariae. They make excellent manure, but are of ho further service to man. Fishermen who catch them in their

nets or on their lines often tear them in half and throw them back into the sea. Some of these mutilated

animals may, however, grow fresh rays, and thus one may find a starfish consisting of one large ray and four quite small ones, the whole shaped like a comet.

The Ophiurids (the name means " snake-tails ") include the brittle-stais, sand-stars, and basket-fish or medusa-heads.

Fig. 3.-

-An Ophiurid, the Daisy Brittle-star (Ophiopholis aculeata) ; upper surface.

The two former, which may often be found hiding under the rocks, or in the seaweed, or in pools at low tide, resemble the ordinary starfish in having five distinct arms. These, however, as shown in fig. 3, are long and serpent-like, and are attached to a relatively small body or disk. The digestive and generative systems do not extend to the rays but are confined to the body. The arms are cylindrical and have no groove on the under side such as exists in starfish; but the water-vessel traverses the solid bones that form the axis of the arm, and the podia pass but through special openings (see Echinoderma, fig. 18).

In Ophiurids it is the arms that are used for locomotion and not the podia, so that the latter have no terminal suckers. The axial ossicles, which correspond to the plates flooring the arm-groove in a starfish, resemble vertebrae connected by pairs of straight muscular bundles, and articulated by tenon-and-mortise joints, according to whose degree of development the arms vary in their power of coil- ing. These vertebrae are encased in the tough outer skin of the arm, in which are developed plates. Spines borne by these plates aid the animal in locomotion. The skin of the disk also bears small plates, which are often covered with prickles. The mouth is on the under surface of the disk, and round it are a number of short, flat processes, the mouth-papillae, which serve as strainers. Inside the mouth are seen the five tooth-plates, borne on a strong frame of complicated structure. In the sand-stars the rays are com- paratively short, with their spines closely pressed to their sides, so that they look like lizards' tails ; in the brittle-stars the rays are much longer and more flexible, with the spines standing out, so that they look like

wriggling centipedes attached round a little sea-urchin. The brittle-stars are more active than the sand-stars, and can go more than two yards in a minute; some of them, if seized, break off their arms, which continue breaking into smaller pieces; but the body can soon grow new ones. Sand-stars and brittle-stars are found in all seas, usually occurring in quantities, but are most abundant in the rock-pools of the tropics. By con- stantly sweeping their arms over the sea bottom, they gather food consisting of minute animals. They eat the bait of fishermen, and their fish as well if they find any already dead, but they are themselves a favourite food with many fish, notably the cod.

The basket-fish or medusa-heads are Ophiurids whose arms branch several times, their ends often curling and interlacing. They live in deeper water and are often brought up clinging to fishermen's lines.

The feather-stars (fig. 4) have a central body and five arms, each forking at least once and fringed with small branches (pinnules) which give the feathery appearance. The mouth is in the middle of the body, and from it grooves pass along the arms and all their branches. The animal lives with the mouth upwards, and although it can crawl and even swim by movement of its arms, it generally fixes itself to a' stone or seaweed or some zoophyte, by means of a bunch of small jointed and hooked processes (cirri) growing from the back or under side of the body. It gets its food in this way: the arm-grooves (Echinoderma, fig. 12, C) are lined with minute hairs (cilia) always waving in the direction of the mouth, towards which they drive a stream of water; this stream, containing minute

organisms, constantly flows through the coiled gut, which extracts nourishment from it. The feather-stars were formerly placed with the starfish, but they really belong to another class of Echinoderms — the Crinoidea.

1. *Fig. 4. — The Rosy Feather-star, Antedon bifida, attached by its cirri to a small stone, from which it is moving in the direction of the spectator by pushing with the branches of one arm and pulling with three branches of two arms. (Natural size.)*

In 1823 J. V. Thompson, of Cork, discovered that the feather- star when quite young was fixed by a stalk, just as are nearly all crinoids (see Echinoderma, figs. 1 and 2). The stalked crinoids are not so numerous as they once were, but feather-stars belonging to about half a dozen genera (Antedon, Actinometra, &c.) are found in all

seas at all depths, often in enormous numbers.

(F. A. B.)

STARGARD, a town of Germany, in the Prussian province of Pomerania, situated on the left bank of the navigable Ihna, 20 m. E. of Stettin on the railway to Danzig and at the junction of lines to Posen, Schneidemuhl and Ciistrin. Pop. (1905), 26,908. Formerly a member of the Hanseatic League, the town retains memorials of its early importance in the large church of St Mary, built in the 14th century, the 16th-century town- hall, and some gateways and towers dating from the 14th century. The walls which formerly surrounded it have been mostly converted into promenades. Extensive new law-courts and three large barracks are among the modern buildings. Stargard has a considerable market for cattle and horses, and carries on trade in grain, spirits and raw produce. Its manufactures include cigars, tobacco, wadding and stockings; and there are also iron-foundries, and linen and woollen factories in the town.

Stargard, mentioned as having been destroyed by the Poles in 1 1 20, received civic rights in 1229, and became the capital of eastern Pomerania. As a Hanseatic town it enjoyed consider- able commercial prosperity, but it had also to undergo siege and capture in the middle ages and during the Thirty Years' War. In 1807 it was taken by Schill. The name Stargard (from the Slavonic Starogad or Starigrod, meaning " old town ") is common to several other towns in the north of Germany, of which the chief are Preussisch-Stargard, near Danzig, and Stargard an der Linde in Mecklenburg-Strelitz.

See Zuck, Fuhrer durch Stargard (Stargard, 1900).

STARK, JAMES (1794-1859), British painter, was born in Norwich, and as he showed strong artistic inclinations early in life was, at the age of seventeen, articled to John Crome for three years. He was elected in 181 2 a member of the Norwich Society, to the exhibitions of which he had already contributed; but in 18 1 7 he migrated to London and entered the Royal Academy Schools. He soon returned to Norwich and did not finally settle in the metropolis until 1830, though he was meanwhile a regular contributor to the British Institution and Suffolk Street Galleries. In 1840 he moved to Windsor, but after an interval of some years went back to London, where he died in 1859. Between 1831 and 1859 most of his pictures were shown at the Royal Academy, though he still continued to exhibit occasionally in other galleries. He undertook in 1827 the publication of a work on The Scenery of the Rivers of Norfolk, which

was completed seven years later; the illustrations he

prepared for it have much topographical and artistic interest I and show well the better qualities of his work. In his pictures the influence of Crome is plainly perceptible, and there is evi- dence also of his study of the Dutch landscape-painters; but he had little of Crome's largeness and power and his works charm rather by their gentle truth and quietness of manner than by their robustness of view or by their decisiveness of execution. There is one picture by him, " The Valley of the Yare," in the National Gallery of British Art.

STARK, JOHN (1728-1822), American soldier, was born at Nutfield, now Londonderry, New Hampshire, on the 28th of August 1728. In 1752 he was taken prisoner by the Indians but was ransomed by Massachusetts. During the Seven Years' War he served under Robert Rogers, first as a lieutenant and later as a captain, taking part in the battle of Lake George in 1755, the disastrous attack upon Ticonderoga in 1758, and the Ticonderoga-Crown Point campaign in 1759. At the beginning of the War of Independence he raised a regiment and as colonel did good service in the Battle of Bunker Hill, in the Canadian expedition, and in Washington's New Jersey campaign in the winter of 1776-77. In March 1777 he resigned his commission because other officers had been promoted over himi Later in the year, however, he was placed in, command (by New Hampshire), with the rank of brigadier-general of militia, of a force of militiamen, with whom, on the 16th of August, near Bennington (q.v.), Vermont, he defeated two detachments of Burgoyne's army under Colonel Friedrich Baum and Colonel Breyman. For this victory, which did much to bring about the capitulation of General Burgoyne, Stark received the thanks of Congress and a commission as brigadier-general in the Continental Army (Oct. 4, 1777). He took part in the opera- tions about Saratoga, and for a short time in 1778 and again in 1 781 he was commander of the northern department. In September 1783 he was breveted major-general. He died at Manchester, New Hampshire, on the 8th of May 1822. John Stark's brother, William (1724-1776), served in the Seven Years' War and afterwards on the frontier; and at the outbreak of the War of Independence, piqued because he was not put in command of a regiment, he entered the British service.

See Memoir and Official Correspondence of General John Stark

(Concord, N.H., i860) by his grandson Caleb Stark (1804-1864), who wrote in 1831 Reminiscences of the French War containing, Rogers's Expeditions with the New England Rangers and an Account . . . of John Stark.

STARLEY, JAMES (1830-1881), British inventor, the son of a farmer, was baptized at Albourne, Sussex, on the 13th of , June 1830. At eighteen he ran away from home and started on foot for London, but on the way obtained work as a gardener at Lewisham, Kent, where he lived for a number of. years. He had always been an ingenious mechanic, inventing trifling novelties and repairing watches and clocks in the neighbourhood, and when sewing machines began to be much used they attracted his practical attention, and aroused his inventive genius. Leaving his garden he went up to London and became working mechanic for a firm of sewing-machine makers. Here he was in his element, and in several particulars improved his principal's machines, and invented a new one with an arm attachment that permitted circular as well, as straightforward work. With a fellow workman he moved in 1857 to Coventry, and started the manufacture of the " European " and other sewing machines from his patents. This was the beginning of the Coventry Machinists' Company, the pioneer of all the great bicycle and tricycle works which afterwards made that city the centre of the industry. Former acquaintances of Starley at Lewisham and elsewhere migrated to Coventry to become skilled mechanics for this company. In 1868 they began the manufacture, after a Paris model and at first for French use, of bicycles, several of the earliest suggested improvements being Starley's. A number of firms were soon devoting themselves exclusively to the manufacture of bicycles, and for one of these Starley — whose financial successes were always for others — designed the Coventry tricycle. As it was harder to propel than the bicycle he invented the balance gear, and applied it in the Salvo, which

is the type of the present tricycle (q.v.). Starley died on the 17th of June 1881, and a public monument has been erected to his memory in Coventry. His nephew, J. K. Starley, patented the tangent wh'.el in 1874.

STARLING (O. Eng. staer steam, and slerlyng; Lat. sturnus; Fr. etoumeau), a well-known bird about the size of a thrush; though at a distance it appears to be black, when near at hand its plumage is seen to be brightly shot with purple, green and steel-blue, most of the feathers when freshly grown being tipped with buff. These markings wear off in the course of the winter, and in the breeding season the

bird is almost spotless. It is the Sturnus vulgaris of ornithologists.

A full description of the habits of the starling x is unnecessary in this place. A more engaging bird scarcely exists, for its familiarity during some months of the year gives opportunities for observing its ways that few others afford, while its varied song, its sprightly gestures, its glossy plumage, and, above all, its character as an insecticide — which last makes it the friend of the agriculturist and the grazier — render it an almost universal favourite. The worst that can be said of it is that it occasionally pilfers fruit, and, as it flocks to roost in autumn and winter among reed-beds, does considerable damage by breaking down the stems. 2 The congregations of starlings are indeed very marvellous, and no less than the aerial evolutions of the flocks, chiefly before settling for the night, have attracted attention from early times, being mentioned by Pliny {Hist, naturalis, x. 24) in the 1st century. The extraordinary precision with which the crowd, often numbering several hundreds, not to say thousands, of birds, wheels, closes, opens out, rises and descends, as if the whole body were a single living thing — all these move- ments being executed without a note or cry being uttered — ■ must be seen to be appreciated, and may be seen repeatedly with pleasure. For a resident the starling is rather a late breeder. The nest is commonly placed in the hole of a tree or of a building, and its preparation is the work of some little time. The eggs, from 4 to 7 in number, are of a very pale blue, often tinged with green. As the young grow they become very noisy, and their parents, in their assiduous attendance, hardly less so, thus occasionally making themselves disagreeable in a quiet neighbourhood. The starling has a Wide range over Europe and Asia, reaching India; but examples from Kashmir, Persia and Armenia have been considered worthy of specific distinction, and the resident starling of the countries bordering the Mediterranean is generally regarded as a good species, and called 5. unicolor from its unspotted plumage.

Of the many forms allied to the genus Sturnus, some of which have perhaps been needlessly separated therefrom, those known as Grackles (q.v.), are separately dealt with, and here we shall only notice one other, Pastor, containing a beautiful species P. roseus, the Rose-coloured Starling, which is not an unfrequent visitor to the British Islands. It is a bird of most irregular and erratic habits — a vast horde suddenly arriving at some place to which it may have hitherto been a stranger, and at once making a settlement there, leaving it wholly deserted as soon as the young are reared. This happened in the summer of 1875 at Villafranca, in the province of Verona, the castle of which was occupied in a single day by some

12,000 or r4,ooo birds of this species, as has been graphically told by Sig. de Betta (Atti del r. ist. venelo, 5th series, vol. ii.); 3 but similar instances have been before recorded — as in Bulgaria in 1867, near Smyrna in 1856, and near Odessa in 1844, to mention only some of which particulars have been published. 4

1 They are dwelt on at some length in Yarrell's British Birds, ed. 4, vol. ii. pp. 229-241.

2 A most ridiculous and unfounded charge has been, however, more than once brought against it — that of destroying the eggs of skylarks. There is little real evidence of its sucking eggs, and much of its not doing so; while, to render the allegation still more absurd, it has been brought by a class of farmers who generally complain that skylarks themselves are highly injurious.

3 A partial translation of this paper is given in the Zoologist for 1878, pp. 18-22.

4 It is remarkable that on almost all of these occasions the locality pitched upon has been, either at the time or soon after, ravaged

STARNBERG, a village and climatic health resort of Germany, in the kingdom of Bavaria, on the Starnberger See, 16 m. by rail S. from Munich. Pop. (1905), 3257. It has an evangelical and a Roman Catholic church, an old castle (now government offices) and a bathing establishment. The Starnberger See (or Wurmsee) is a lake with a length of 12 m., a breadth of 3 m., and covering 23 sq. m. Its greatest depth is about 400 ft. The lake is girdled by hills, studded with attractive villa residences, commanding beautiful and extensive views of the Alps. On the Roseninsel, an island in the lake, remains of lacustrine dwellings have been discovered. The waters abound in fish. In the summer steamboats ply, touching at all the villages lying on the shores.

See Ule, Ver Wurmsee in Oberbayern (Leipzig, 1901). STAR-NOSED MOLE (Condylura cristata), a North American species, the single representative of its genus. In burrowing habits it resembles the European mole, but is distinguished from all other members of the family Talpidae by the presence of a ring of tentacles round the nostrils, probably serving as organs of touch.

STARODUB, a town of Russia, in the government of Chernigov, 98 m. N.E. of the city of Chernigov. It is regularly built, with broad straight streets, and the houses are surrounded by large gardens. Pop. 12,451; Little Russians with about 5000 Jews. Tanning and the manufacture of copper wares are carried on, and there is a trade in corn and hemp exported to Riga and St Petersburg. As early as the nth and 12th centuries Starodub was a bone of contention between different Russian princes, who appreciated its strategic position. The Mongols seem to have destroyed it in the middle of the 13th century, and its name does not reappear until the following century. During the 15th and 1 6th centuries the Russians and Lithuanians were continually disputing the possession of its fortress, and at the beginning of the 17th century it became a stronghold of Poland.

STARVATION, the state of being deprived of the essentials of nutrition, particularly of food, the suffering of the extremities of hunger and also of cold (see Hunger and Thirst) . The word is an invented hybrid, attributed, according to the accepted story, to Henry Dundas, 1st Viscount Melville, who used it in a parliamentary debate on American matters in 1775 and gained thereby the nickname of " Starvation Dundas " (see H. Walpole's Letters, ed. Cunningham, viii. 30; and Notes and Queries no. 225). The English word " to starve " meant originally " to die," as in O. Eng. steorfan, Du. sterven, Ger. sterben, but was particularly applied to death from hunger or cold.

STAS, JEAN SERVAIS (1813-1891), Belgian chemist, was born at Lou vain on the 21st of August 1813. He studied for a medical career and took his doctor's degree, but soon turned to chemistry. In 1835 after much trouble he gained admission to J. B. A. Dumas's laboratory in Paris in order to continue a research on phloridzin which he had begun in an attic in his father's house, and he was associated with that chemist in several researches, including his redetermination of the atomic weight of carbon. In 1840 he left Paris on his appointment to the chair of chemistry at the Ecole Royale Militaire in Brussels. There he remained for more than a quarter of a century, but before he had served the thirty years necessary to secure a pension he was obliged to resign through a malady which affected his speech. He was then appointed to a post in con- nexion with the Mint, but gave it up in 1872, and spent the rest of his life in retirement in Brussels, where he died on the 13th of December 1891. Stas's name is best known for his determina- tion of the atomic weights of a number of the more important elements. His work in this field was marked by extreme care, and he adopted the most minute precautions to avoid error, with such success that the greatest

variation between his numerous

by locusts, which the birds greedily devour. Another fact worthy of attention is that they are often observed to affect trees or shrubs bearing rose-coloured flowers, as Nerium oleander and Robinia viscosa, among the blossoms of which they themselves may easily escape notice, for their plumage is rose-pink and black shot with blue.

individual determinations for each element was represented by from 0-005 t° o-oi. Though he started with a predilection in favour of Prout's hypothesis he was later led by the results he obtained and by his failure to find any evidence of dissociation in the elements to regard it as a pure illusion and to look upon the unity of matter as merely an attractive speculation unsup- ported by proof. Nevertheless, a few years before his death, a. propos of the close approximation to integers presented by a number of the atomic weights of the elements when hydrogen is taken as unity, he remarked, " II faut croire qu'il y a quelque chose la-dessous." In connexion with the poisoning of Count Hippolyte de Bocarme with nicotine in 1850 Stas worked out a method for the detection of the vegetable alkaloids, which, modified by Friedrich Julius Otto (1809-1870), professor of chemistry at Brunswick, has been widely used by toxicologists as the Stas-Otto process.-

STASINUS, of Cyprus, according to some ancient authorities the author of the Cypria (in 1 1 books) , one of the poems belonging to the epic cycle. Others ascribed it to Hegesias (or Hegesinus) of Salamis or even to Homer himself, who was said to have written it on the occasion of his daughter's marriage to Stasinus. The Cypria, presupposing an acquaintance with the events of the Homeric poem, confined itself to what preceded, and thus formed a kind of introduction to the Iliad. It contained an account of the judgment of Paris, the rape of Helen, the abandonment of Philoctetes on the island of Lemnos, the landing of the Achaeans on the coast of Asia, and the first engagement before Troy. It is probable that the list of the Trojans and their allies {Iliad, ii. 816-876), which formed an appendix to the catalogue of the Greek ships, is abridged from that in the Cypria, which was known to contain a list of the Trojan allies. Proclus, in his Chrestomathia, gave an outline of the poem (preserved in Photius, cod. 239).

See F. G. Welcker, Ver epische Cyclus (1862); D. B. Monro, Appendix to his edition of Odyssey, xiii.-xxiv. (1901); T. W. Allen, " The Epic Cycle," in Classical Quarterly (Jan. 1908, sqq.) ; and

Cycle.

STASSFURT, a town of Germany, in the Prussian province of Saxony, and one of the chief seats of the German salt-pro- ducing industry, situated on both sides of the Bode, 20 m. S.W. of Magdeburg by the railway to Aschersleben. Pop. (1905), 18,310. It is still surrounded in part by the ruins of its ancient walls, but, with the exception of the parish church of St John (15th century), there are no buildings worthy of special notice; Although saline springs are mentioned here as early as the 13th century, the first attempt to bore for salt was not made until 1839, while the systematic exploitation of the salt-beds, to which the town is indebted for its prosperity, dates only from' 1856. The shafts reached deposits of salt at a depth of 850 ft.; but the finer and purer layers lie more than 1100 ft. below the surface. Besides the rock-salt, which is excavated by blasting^ the saline deposits of Stassfurt yield a considerable quantity of deliquescent salts and other saline products, which have encouraged the foundation of numerous chemical factories in the town and in the neighbouring village of Leopoldshall, which lies in Anhalt territory. The rock-salt works are mainly govern- ment property, while the chemical factories are in private hands.

See Precht, Salzindustrie von Stassfurt und Umgebung (Stassfurt, 1 891) ; and Westphal, Geschichte des kbniglichen Salzwerks zu Stassfurt (Berlin, 1901).

STATE. As currently employed in that department of political science which concerns itself, not with the relations of separate political entities, but with the political /) efln /y OD- composition of society as a whole, the word state expresses the abstract idea of government in general, or the governing authority as opposed to the governed, and is thus used by Herbert Spencer in all his discussions of government and society. Louis XIV. 's " l'etat, c'est moi," Rousseau's theory of the "contrat social," Bastiat's "donne a l'etat le strict necessaire et garde le reste pour toi," all imply this opposi- tion. Hobbes regards the state, or, as he calls it, the common- wealth, as " one person for whose acts a great multitude by

mutual covenants, one with another, have made themselves every one the author, to the end he may use the means and strength of them all as he shall think expedient for their peace and common

defence."

The term is also used to distinguish the civil from the ecclesi- astical authority in countries where they are or have been in conflict.

A large number of definitions and classifications, according to political structure, international status, national homogeneity, &c, have been attempted, but it is beyond the scope of a short article to do more than mention these different senses of a word so variously employed.

In international law the term has a more precise meaning, according to which the state is the external personality or Attributes outward agency of an independent community. in later- In its fullest form its attributes are: (a) possession national f sovereign power to pledge the community in its

aw ' relations with other similarly sovereign communities,

(b) independence of all external control, and © dominion over a determinate territory. In practice, however, there are still incomplete forms of states which join in the international life of states, paramount states whose relations to subordinate parts of their empire are in a condition of uncertainty, and there is, at any rate, one body carrying on international state intercourse without dominion over any territory at all. Thus, Great Britain, has diplomatic relations, purely formal though they may be, with several of the subordinate states forming the German Empire. Egypt, while legally under the suzerainty of the Porte, is practically a British protectorate. Great Britain treats Cyprus as a dependency, though she is in mere occupation of the island for the purpose of carrying out certain reforms for the protection of Christians. Austria-Hungary considered herself in the same position, though she occupied Bosnia and Herzegovina " without affecting the rights of sovereignty of his majesty the Sultan on those provinces." Though Bulgaria, by the Treaty of Berlin, was an " autonomous and tributary principality under the suzerainty of his imperial majesty the Sultan," Turkey did not consider her suzerainty to involve her in the war of 1885 between her vassal and Servia. The Roman Catholic Church has permanent diplomatic relations as an independent state, though it has no independent territory against which international rights can be enforced. We saw in the Boer War the army of an annexed community wandering from place to place recognized as a belligerent with whom Great Britain negotiated as an independent state.

A new and somewhat shadowy form of suzerainty is growing up in the " paramountcy " first enunciated (with the concurrence of Great Britain) by the President of the United States in 1823 (see Monroe Doctrine), asserted with a certain measure of success against Great Britain in 1896 (see Venezuela, also Arbitration), and proclaimed formally by the United States at the Hague peace conference in 1899 as a condition of her signature of the Peace Convention. While the Spanish republics of Central and South America are recognized in international law as sovereign states, they can only be said to fulfil the condi- tions of absolute independence subject to the limitations which the Monroe Doctrine has placed upon their treaty-making powers with Europe. 1

1 Great Britain, in acceding to the arbitration imposed by Presi- dent Cleveland, has, in the opinion of a number of American and Continental publicists, recognized the Monroe Doctrine. See Chretien, Principes; De Beaumarchais, La Doctrine de Monroe; De Bustamente, Le Canal de , Panama el le droit international; De Pressense, " La Doctrine de Monroe et le conflit anglo- americain," Revue des deux mondes (1B96); also the writings of Ridgway, W. L. Scruggs, Sibley and G. F. Tucker, and the Annates de jurisprudence (Colombia), June 1897 and following numbers. M Pradier-Foder6, Professor of International Law at Lyons University, and formerly professor of the University of Lima, observes that " En declarant que la grande republique americaine considererait comme dangereuse pour sa tranquillite et sa security toute tentative de la part des puissances europeennes d'etendre leur systeme politique a une partie quelconque du continent americain, il (le president) s'est m616 indirectement des affaires int6rieures des republiques du Nouveau Monde, autres que les Stats Unis; il a fait

" In constitutional law, the state," says a leading English authority, " is the power by which rights are created and maintained, by which the acts and forbearances necessary for their maintenance are habitually andCon- enforced " (Anson, Law and Custom of the Conslitu- tinentai Hon, pt. i. p. 2). In France, where the state embraces c °"" a hierarchy of bodies and authorities culminating in cep the president of the republic, whose acts are the final form of a series of incomplete acts of the members of the hierarchy, it comes nearer to the theoretical meaning of the word. In Great Britain the sovereign power of the state is diffused among a number of authorities which have rights against each other and stand in independent relation towards the individual citizens. Actions can be brought by private citizens in the ordinary law courts against individual authorities, and there is no system of hierarchical

responsibility which prevents a state official from being personally accountable for his administrative conduct. In A. V. Dicey's admirable Introduction to the Study of the, Law of the Constitution, this distinction between the French, or, as we should rather call it, continental system of entire subordi- nation of the organs to the state as a whole, and the less logical British system is dwelt upon. "Few things," he observes, " are more instructive than the examination of, the actions which have been brought in Great Britain against officers for retaining ships about to proceed to sea. Under the Merchant Shipping Act 1876 the board are open to .detain any ship which, from its unsafe and unsea worthy condition, is a serious danger to human life." " Most persons would suppose that the officials of the board of trade, so long as they — bona fide and without malice or corrupt motive — endeavour to carry out the provisions of the statute, would be safe from action at the hands of a shipowner. This, however, is not so. The board and its officers have more than once been sued with success. They have never been accused of either malice or negligence, but the mere fact that the board acts in an administrative capacity is not a protection to the board; nor is mere obedience to the orders of the board an answer to an action against its servants " (P- 324)-

In England, we may say, the notion of state, from the constitu- tional point of view, is still inchoate, but the play of international intercourse seems to be gradually leading to a clearer conception of the fact that an increasing national responsibility requires a corresponding increase in the power of . co-ordinate state control. An instance of its absence is shown by the loose way in which the British Crown has granted governing powers to chartered companies (see Raid), This uncertainty applies as much to the United States as to Great Britain. In the Louisiana lynching riots, of which some Italian citizens were the victims, it was contended that the United States government was not responsible, and that the responsibility fell upon the government of Louisiana alone. This contention could not be pressed, and compensation was of course paid to Italy. Sirnilar difficulties arose in connexion with the Japanese school question in Cali- fornia. The subject is well known to have raised apprehension as to the adequacy of the United States system to meet its centralized state responsibilities. ,

Another, and, in some respects, more dangerous feature of an inchoate conception of state responsibility is the growing apart, so to speak, of certain British dependencies. The British state, for international purposes, is the British Empire, for domestic purposes it is the United Kingdom. Any limb of the former's huge body can have

interests different from those of the United Kingdom, and involve its responsibility. A signifi- cant step towards concentration of liability and control was taken by the Australian colonies in the federation brought about by the Commonwealth Act of 1900. Under this act, by the way, an element of confusion has been created by the application of the term " state " to the federating colonies. Section 6 of the act provides " the states " shall mean such of the colonies of New

de l'intervention par anticipation et au profit de l'Union; car, c'est d'intervenir que d'interdire aux autres gouvernements d'intervenir."

South Wales, New Zealand, Queensland, Tasmania, Victoria, West Australia and South Australia as for the time being are parts of the Commonwealth, and such colonies or territories as may be admitted into or established by the Commonwealth as states; and each of such parts of the Commonwealth shall be called " a state." " Original states " shall mean " such states as are parts of the Commonwealth at its establishment." Fol- lowing out this distinction between the Commonwealth and the states, articles 106 to 124 of the Commonwealth constitution deal with the respective positions of the Commonwealth, the original states, and the new states. Article 109 in particular provides that " when a law of a state is inconsistent with the law of the Commonwealth, the latter shall prevail, and the former shall, to the extent of the inconsistency, be invalid," thus paving the way for the ultimate consolidation of the federal power.

Much has been written on the " science " of the state, or, as we prefer, in Anglo-Saxon lands, to call it, " political science." In Germany the subject is dealt with as an independent branch of university education. Several of her universities have a staatswissenschaftliche Facultat, granting a special degree in the subject. In consequence of the great attention paid to the subject in Germany, her state polity has been largely the work of her political writers. The result has not unnaturally tended ■ to a system bearing some resemblance to that of the American Union, with this very important difference, however, that whereas in the United States the federal power is derived from the democratic forces of the individual states, in Germany it is derived from their aristocratic and absolutist forces. German political thinkers, in fact, have worked out

Staatsrecht as a comparative study, in which arguments in favour of absolute government have received as much careful consideration as those in favour of democratic institutions, and the German state has developed upon lines based on the best theoretical arguments of these thinkers. There is, therefore, no anomaly in its practically absolutist government working out the most democratic reforms as yet put into legislative form. It follows, however, that German theories are of little use in the consideration of the state problems with which British and American political thinkers nave to deal. Anglo-Saxon institutions are following their independent development, and if the influence of foreign institu- tions is felt at all, it is probably that of the clear logical detail and cohesion of French institutions.

Authorities. — Rehm, Geschichte der Staatsrechtswissenschaj '2(1896), Allgemeine Staatslehre (1899) ; R. von Mohl, Geschichte und Litteralur der Staatswissenschaflen (1855-1858) ; Hildebrand, Geschichte und System der Rechts- und Staatsphilosophie (1866); Gierke, Das deutsche Genossenschaftsrecht (1881); I. F. Stahl, Die Staatslehre und die Principien des Staatsrechts (1870); Bluntschli, Geschichte des allgemeinen Staatsrechts und der Politik (1867); Lehre vom modernen- Staate (1884-1885), i., ii.; Politik (1876); Seydel, Grttndsuge der allgemeinen Staatslehre (1873); Lingg, Empirische Untersuchungen zur allgemeinen Staatslehre (1890); Bornhak, Allgemeine Staatslehre (1896); Jellinek, Recht des modernen Staates (1900); R. Schmidt, Allgemeine Staatslehre (1901); von Treitschke, Politik (1898); Laband, Staatsrecht des deutschen Reiches, 2 Bde. (1895); Haenel, Deutsches Staatsrecht (1892); Janet, Hisloire de la science politique (1887); Boutmy, Etudes de droit constitutionnel (1899); Combothecra, La Conception juridique de I'etat (1899); Esmein, Elements de droit constitutionnel francais et etranger (1899); Hauriou, Precis de droit administratif et de droit public general (1900); Le Fur, £tat federal et confederation d'etats (1896); Henry Michel, L'Idee de I'etat (1896): Michaud, " De la Responsabilit6 de I'etat a raison des fautes de ses agents," Revue du droit public et de la science politique (1895); Pillet, Recherches sur les droits fonda- mentaux des etats dans I'ordre des rapports internationaux (1899); Fabreguettes, Societe, etat, patrie (1898); Dalloz, Repertoire du droit francais, t. 21, p. 37; Amos, Science of Politics (1883); Green, Lectures on the Principles of Political Obligation (1895); Pollock, Introduction to the History of the Science of Politics (1890; 3rd ed., 1900); Anson, Law and Custom of the Constitution (3rd ed., pt. i., 1897); Holland, Jurisprudence (10th ed., 1906); Dicey, Introduction to the study of the Law of Constitution (5th ed., 1897); Ilbert, Legis- lative Methods and Forms

(1901); Kovalevsky, Russian Political Institutions (Chicago, 1902). (T. Ba.)

STATE, GREAT OFFICERS OF, a designation popularly applied to all the principal ministers of the British Crown, but xxv. 26

strictly applicable only to the: lord high steward, the lord high chancellor, the lord high treasurer, the lord-president of the (privy) council, the lord (keeper of the) privy seal, the lord great chamberlain, the lord high constable, the earl marshal, and the lord high admiral. Of these, three — the lord chancellor, the lord-president of the council, and the lord privy seal — the first and second are always, and the third almost always, cabinet ministers. The offices of two more — those of the lord treasurer and the high admiral — are now executed by commission, the chief of the lords commissioners, known severally as the first lord of the treasury and the first lord of the admiralty, being likewise members of the cabinet, while the first lord of the treasury is usually at the head of the government. But, although it has become the rule for the treasury and the admiralty to be put in commission, there is nothing except usage of longer or shorter duration to prevent the Crown from making a personal appointment to either of them, and the functions which formerly appertained to the lord treasurer and the high admiral are still regularly performed in the established course of the national administration. The four offices of the high steward, the great chamberlain, the high constable, and the earl marshal stand on a different footing, and can be regarded at the present day as little else than survivals from an earlier condition of society. They have practically ceased to have any relation to the ordinary routine of business in the country or of ceremonial in the palace, and the duties associated with them have either passed entirely into abeyance or are restricted within extremely narrow limits, save on certain occasions of exceptional pomp and solemnity. All of them were once hereditary, and, taking the three kingdoms together, they or their counterparts and equivalents continue to be held by right of inheritance in one or other of them even now. These and the more important foreign great offices of state are all dealt with under their proper headings, and other information will be found in the articles Cabinet, Ministry, Privy Council, Treasury, and Household, Royal.

On the subject of the great offices of state generally, see Stubbs, Constitutional History, ch. xi.; Freeman, Norman Conquest, ch. xxiv. ; Gneist, Constitution of England, ch. xvi., xxv. and liv. ;also Gibbon, Decline and Fall, ch. liii., and Bryce, Holy Roman Empire, ch. xiv.

STATEN ISLAND, an island constituting the borough of Richmond, New York City, and Richmond county, the southern- most of the counties of the state of New York. It is separated from Long Island on E. by the Narrows which connect Upper and Lower New York Bay; from New Jersey on the N. by the narrow channel of Kill van Kull which connects New York Bay with Newark Bay; and from New Jersey on the W. by the narrow channel of Staten Island Sound or Arthur Kill; and on its S.E. coast are Lower New York, Raritan and Prince's Bays, Great Kills, and the Atlantic Ocean. Pop. (1890), 51,693; (1900), 67,021; (1905), 72,845; (1910), 85,969. Staten Island 'ii connected by ferry with the borough of Manhattan, 5 m. distant, and with Perth Amboy, New Jersey. The Staten Island Rapid Transit railway extends along the north shore and the south-east side, and there are several electric lines and pleasant drives. The island is triangular in shape, is 13! m. long from north-east to south-west, has a maximum width of nearly 8 m. at its north end, and has an area of about 70 sq. m. The north-east quarter is broken by two ranges of hills having a precipitous east slope and rising to a maximum height of about 400 ft., 1 m. inland from the Narrows; but on the west and south the hills fall gently to the Coastal Plain, which, occupying the greater part of the island, is broken only by low morainal ridges and terminates in salt marshes along much of the west coast. There are many species of forest trees and more than 1300 species of flowering plants and ferns. The climate is subject to sudden changes,' but the temperature rarely rises above 90 F. or falls below zero. The island is chiefly a residential district, and in the picturesque hill section are many fine residences. Forts Wadsworth and Tompkins commanding the passage of the Narrows constitute one of the strongest defences of New York Harbor. The principal villages are New Brighton, West New Brighton, Port Richmond, Stapleton, and Tompkinsville on the north coast,

and Tottenville (or Bentley Manor) on the south-west coast. Richmond, the county-seat since 1727, is a small village near the centre of the island. South Beach, below the Narrows, is a popular seaside resort. At West New Brighton is a large dyeing establishment, there are also ship-building yards, oyster fisheries, and truck farms, and among the maufactures are linoleum, paper, white lead, linseed oil, brick, and fire-clay products.

When discovered by Europeans Staten Island was occupied by the Aquehonga Indians, a branch of the Raritans, and several Indian burying-grounds, places where wampum was manufactured, and many Indian relics, including a stone head with human features, have been found here. In 1630 the Dutch West India Company granted the island to Michael Pauw as a part of his patroonship of Pavonia, and it was bought at this time from the Indians for " some duffels, kettles, axes, hoes, wampum, drilling awls, Jew's harps, and divers other small wares "; but before Pauw had established a settlement upon it he sold his title back to the company. A portion of it was regranted to David Pietersen de Vries in 1636 and in 1642 the remainder was erected into a patroonship and granted to Cornelis Melyn. In 1641 de Vries established a settlement at Oude Dorp (Old Town), near Arrochar Park, near South Beach. It was destroyed by the Indians in the same year, was immediately rebuilt, was again destroyed in 1642 and was again rebuilt, but was abandoned after its destruction for the third time in 1655. A company of Waldenses founded a second settlement in 1658, at Stony Brook, about 2 m. west of the ruins of Oude Dorp; this was the principal village for many years and from 1683, when the island was erected into a county, until 1727 it was the county-seat. Melyn surrendered his rights as a patroon in 1661 and during the remainder of the Dutch regime many small grants of land were made to French, Dutch, and English settlers. In 1664 the duke of York became pro- prietor of the newly erected province of New York and by his grant in the same year to Berkeley and Carteret of all that portion which lay west of the Hudson river, Staten Island became properly a part of New Jersey, but in 1668 the duke decided that all islands within New York Bay which could be circumnavigated in twenty-four hours should be adjudged to New York. Captain Christopher Billopp made the trip within the time limit and was rewarded with a grant of n 63 acres at the south end of the island. He erected this into the Manor of Bentley and the manor house, built about this time, still stands in the village of Tottenville. It was in this house that Lord Howe on the nth of September 1776 held a peace conference with Benjamin Franklin, John Adams, and Edward Rutledge representing the Continental Congress. The British army under Sir William Howe landed at the Narrows on the 3rd of July 1777 and until the close of the war Staten Island was held by the British and Loyalists. From it the British made frequent predatory raids into New Jersey and the Americans made several retaliatory raids into the island. Under the direction of General Hugh Mercer some American troops reached Rich- mond on the morning of the 16th of October 1776, and in an engagement which immediately followed they were victorious; but, as

they were retreating with their prisoners, British rein- forcements arrived and in a second engagement at Fresh Kill (now Green Ridge) they were routed with considerable loss. A second raid was made against Richmond early in August 1777; and on the 22 nd of the same month American troops under General John Sullivan fought the British at several places, inflicted a loss of about 200 killed, wounded and prisoners and destroyed considerable quantities of stores. In the War of 181 2 Fort Richmond was built at the Narrows and Fort Tompkins in the rear of it. The Federal government bought the site in 1847 and after destroying the old forts began the erection of the present works. In 1808 Staten Island became the borough of Richmond in Greater New York.

See I. K. Morris, Memorial History of Staten Island (2 vols., New York, 1808-1900); R. M. Bayles, History of Richmond County (New York, 1887); and J. J. Clute, Annals of Staten Island (New York, 1877).

STATE RIGHTS, a term used generally in political science to denote those governmental rights which belong to the indi- vidual states of a federal union, there being a certain sphere of authority in which these individual states may act without interference from the central government. Thus in the United States there were certain rights reserved to themselves by the states when forming the union under the constitution of 1787. These rights the central government is by fundamental law bound to respect, and they can be reduced only by amendment to the constitution. For a thousand years the various German states were so jealous of any curtailment of their individual rights as to prevent the formation of an efficient federal government; in Austria-Hungary the larger states still jealously guard their liberties. In federal unions, such as Mexico and Brazil where a central authority existed first and created the states, the belief in state rights is much weaker than it is in unions composed of originally independent states. The rights of a state are said to be delegated when, as in Mexico, Brazil and Colombia, the constitution is created by a central national authority which also makes the states; state rights are residuary when independent states unite to delegate by a constitution certain powers to a central government, as in the case of the German Empire, Austria-Hungary, the United States, Switzerland, and until 1905, Sweden-Norway. History shows that states forming unions of the second class are certain in after time to deny or assert that the sovereignty of the state is one of the rights reserved, according as the state belongs to a stronger or weaker section or faction; state sovereignty being the defence of the weaker state or faction, and being denied by the stronger group of

states which controls the government and which asserts that a new sovereign state was created by a union of the former independent ones. This dispute is usually ended by civil war and the destruction of state sovereignty. The evolu- tion of state rights as shown in the history of the United States is typical. Thirteen independent states formed a union in 1787 under a constitution reserving certain rights to the states. The sphere of the state authority embraced most of the powers of government, except, for instance, those relating to foreign affairs, army and navy, inter-state commerce, coinage and the tariff; the powers of the central government were specified in the fundamental law. Most of the states claimed at one time or another that sovereignty was one of the reserved rights of the states and on this theory the Southern states acted in the secession in 1861. The war that resulted destroyed all claims of state sovereignty. The other rights of the states consisted of those not delegated to the central government or forbidden to the states by the constitution. In case of doubt the presump- tion was in favour of the state. Since the beginning, however, the central government has gained strength at the expense of the states, seldom by direct usurpation (except during the Civil War and Reconstruction, 1861-76), but indirectly through use and custom, as the country and people developed and new conditions of government arose. The field of state rights had not increased, while centralization has slowly but surely taken place. This centralization is shown not only by the increased power and activity of the Federal government as compared with the state governments, but in the change in popular opinion indicated by the use of the terms National, Union, &c, where formerly Confederate, Federal, &c, were used, and in the use of singular verbs after the words Congress and the United States, where formerly they were followed by plural verbs.

The central authority in the United States, formerly almost unheard of by the average citizen, now touches him in many of the activities of life and sometimes intrudes even into the domain of local self-government. The history of the decay of state rights makes it seem doubtful if the federal form of government is a permanent one, or is only a transient form between independent state governments or loose confederacies

and a centralized national government.

See J. W. Burgess, Political Science and Comparative Constitutional Law (New York, 1895) ; Woodrow Wilson, The State (new ed;,

STATES-GENERAL

New York, 1903) ; A. H. Stephens, Constitutional View of the War Between the States (Philadelphia, 1868-1870); and A. L. Lowell, Governments and Parties in Continental Europe (Boston, 1896).

_ STATES-GENERAL, the English translation of (1) the Etats-Generaux of France before the Revolution, (2) the Stalen- Generaal of the Dutch Netherlands. The name in both cases signifies, whatever the ultimate divergence in character of the two bodies, the assembly of the representatives of the various estates of the realm, called together for purposes of legislation or deliberation.

The French States-General. — In France the States-General owed their origin to the same causes which produced the Parlia- ment of England, the Cortes of Spain, the Diet of the Holy Roman Empire and the Diets (Landtage) of the states of Ger- many, and they resembled these assemblies in their constitution. In these countries the royal or ducal power, when it began to extend its scope, found itself limited by the feudal system and had to turn to the forces of feudalism to obtain from them aid and counsel, i.e. pecuniary assistance and moral support. Instead of treating severally with the local representatives of these forces the ruler found it useful and convenient to enter into contact with them as a whole, treating with them through their principal representatives.

In France these conditions led in 1302 to a general assembly consisting of the chief lords, both lay and ecclesiastical, and the representatives of the principal privileged towns, which were like distinct lordships. There had, of course, been certain pre- cedents before 1302 which had, as it were, paved the way for this institution; the representatives of the principal towns had several times been convoked by the king, and under Philip III. there had been assemblies of nobles and ecclesiastics in which the two orders had deliberated separately. It was the dis- pute between Philip IV. the Fair and Boniface VIII. which led to the States-General of 1302; the king of France desired that, in addition to the officers of the Crown, the principal authorities of the country should come and testify solemnly that they were at one with the king in this serious crisis. The letters summoning the assembly of 1302 are published by M. Georges Picot in his collection of Documents inedits pour servir a I'histoire de France. In 1302 the States-General had been called upon only to give counsel to the king; but during the same reign they were several times assembled to give him aid, i.e. to grant him subsidies, and in course of time this came to be the most frequent motive of their*

convocation.

In one sense the composition and powers of the States- General have always been the same. They have always in- cluded representatives of the clergy, nobility and third estate, and they have always been summoned either to grant subsidies or to advise the Crown, to give aid and counsel. Their composi- tion, however, as well as their effective powers, have varied greatly at different times.

In their primitive form, i.e. in the 14th and the first half of the 15th centuries, the States-General had only a limited elective element. The lay lords who appeared therein were not elected, but directly chosen and summoned by the king, and the same was the case with the prelates, bishops and clergy, who were summoned qud ecclesiastical lords. In the order of the clergy, however, since certain ecclesiastical bodies, e.g. abbeys and chapters of cathedrals, were also, summoned to the assembly, and as these bodies, being persons in the moral but not in the physical sense, could not appear in person, their representative had to be chosen by the monks of the convent or the canons of the chapter. It was only the representation of the third estate which was furnished by election. Originally, moreover, the latter was not called upon as a whole to seek representation in the estates. It was only the bonnes villes, the privileged towns, which were called upon. They were represented by elected procureurs, who were frequently the municipal officials of the town, but deputies were often elected for the purpose. The country districts, the plat pays, were not represented.

It was during the last thirty years of the 16th century that the States-General became an entirely elective body and really

representative of the whole nation as divided into three parts. This was brought about by various causes. On the one hand, the nobles and prelates who were summoned were not always inclined to attend the estates, so had themselves represented by an envoy, a procureur, as they had the right to do, and fre- quently the lords or prelates of the same district chose the same procureur to represent them. On the other hand, the Crown seems at that time to have felt the need of having the con- sent of representatives really expressing the will and feelings of all the orders, and especially of the third estate as a whole. The letters of summons to the States-General of 1484 invited the ecclesiastics, nobles and third estate in general, to meet at the chief town of their bailliage or senechaussee and elect deputies. An intermediate form had been employed in 1468 when the prelates and lords had still been summoned personally, but the towns had each

elected three deputies, an ecclesiastic, a noble and a burgess.

At the estates of 1484 there seems to have been universal and direct suffrage for all the three orders. But the roturiers of the country districts could not in practice avail themselves of this power; so the country communities and small towns spontaneously elected delegates to represent them at the elec- toral assembly. Thus a system of indirect election arose for the third estate which became confirmed and subsequently con- tinued to be used. To a certain extent there were sometimes more than two degrees in the suffrage; the delegates nominated by the country communities would gather together with the electors chosen by the neighbouring little town, and appoint with them new delegates to represent them at the electoral assembly of the bailliage. This ultimately became the system. For the clergy and nobles the suffrage remained direct; but as a rule only such ecclesiastics were admitted to the assembly of the bailliage as possessed a benefice, and only such lords as had a fief.

The effective powers of the States-General likewise varied in the course of time. In the 14th century they were actually great. The king could not, in theory, levy general taxation. Even in the provinces attached to the domain of the Crown, he could only levy it where he had retained the haute justice over the inhabitants, but not on the subjects of lords having the haute justice. The privileged towns had generally the right of taxing themselves. In order to obtain general taxes, the king had to obtain the consent of the lay and ecclesiastical lords and of the towns; this amounted to obtaining the authorization of the States-General, which only granted these subsidies temporarily for a fairly short period. The result was that they were summoned fairly frequently and that their power over the Crown might be considerable.

But in the second half of the 14th century certain royal taxes levied throughout the whole of the domain of the Crown, tended to become permanent, and independent of the vote of the estates. This sprang from many causes, but from one in particular; the Crown endeavoured by transforming and changing the nature of the " feudal aid " to levy a general tax by right, on its own authority, in such cases as those in which a lord could demand feudal aid from his vassals. For instance, it was in this way that the necessary taxes were raised for twenty years to pay the ransom of King John without a vote of the States^ General, although they met several times during this period. Custom confined this tendency. Thus during the second half of the 15th century the chief taxes, the taille, aids and gabelle became definitely permanent for the benefit of the Crown, sometimes

by the formal consent of the States-General, as in 1437 in the case of the aids. The critical periods of the Hundred Years' War had been favourable to the States-General, though at the price of great sacrifices. Under the reign of King John they had had for a few years, from 1355 to 1358, not only the voting, but through their commissaries, the administration of and jurisdiction over the taxes. In the first half of the reign of Charles VII. they had been summoned almost every year and had patriotically voted subsidies. And when the struggle was over they renounced, through weariness

and a longing for peace, their most precious right, the power of the purse.

At the estates of 1484, however, after the death of Louis XI., there was a kind of awakening. The deputies of the three orders united their efforts in perfect harmony in the hope of regaining the right of periodically sanctioning taxation. They voted the taille for two years only, at the same time reducing it to the amount which it had reached at the end of the reign of Charles VII. They even demanded, and obtained, the promise of the Crown that they should be summoned again before the expiry of the two years. But the promise was not kept, and we do not find the States-General summoned again till 1560. There was then a first interruption of 76 years in the working of the institution, while the absolute monarchy was establishing itself. But there was a revival of its activity in the second half of the 16th century caused by the scarcity of money and the quarrels and wars of religion. The estates of Orleans in 1560, followed by those of Pontoise in 1561, and those of Blois in 1576 and 1588 were most remarkable for the wisdom, courage and efforts of the deputies, but on the whole were lacking in effect. Those of 1 588 were ended on a regular coup d'Slat effected by Henry III., and the States summoned by the League, which sat in Paris in 1 593 and whose chief object was to elect a Catholic king, were not a success. The States-General again met in Paris in 1614, on the occasion of the disturbances which followed the death of Henry IV.; but though their minutes bear witness to their sentiments of exalted patriotism, the dissensions between the three orders rendered them weak and they were dissolved before having completed their work, not to be summoned again till 1789.

As to the question whether the States-General formed one or three

chambers for the purposes of their working, from the constitutional point of view the point was never decided. What the king required was to have the consent, the resolution of the three estates of the realm; it was in reality of little import- ance to him whether their resolutions expressed themselves in common or separately. At the States-General of 1484 the elections were made in common for the three orders, and the deputies also arrived at their resolutions in common. But after 1560 the rule was that each order should deliberate separately; the royal declaration of the 23rd of June 1789 even stated that they formed three distinct chambers. But Necker's report to the conseil du roi according to which the convocation of 1789 was decided, said (as did the declaration of the 23rd of June), that on matters of common interest the deputies of the three orders could deliberate together, if each of the others decided by a separate vote in favour of this, and if the king consented.

The working of the States-General led to an almost exclusive system of deliberation by committee, as we should say nowa- days. There were, it is true, solemn general sessions, called stances royales, because the king presided; but at these there was no discussion. At the first, the king or his chancellor announced the object of the convocation, and set forth the demands or questions put to them by the Crown; at the other royal sessions each order made known its answers or observations by the mouth of an orateur elected for the purpose. But almost all useful work was done in the sections, among which the depu- ties of each order were divided. At the estates of 1484 they were divided into six nations or sections, corresponding to the six gineralites then existing. Subsequently the deputies belong- ing to the same gouvernement formed a group or bureau for deliberating and voting purposes. Certain questions, however, were discussed and decided in full assembly; sometimes, too, the estates nominated commissaries in equal numbers for each order. But in the ancient States-General there was never any personal vote. The unit represented for each of the three orders was the bailliage or senechaussee and each bailliage had one vote, the majority of the deputies of the bailliage deciding in what way this vote should be given. At the estates of the 16th century voting was by gouvernements, each gouvernement having one vote, but the majority of the baittiages composing the gouvernement decided how it should be given.

The States-General, when they, gave counsel, had in theory only a consultative faculty. They had the power of granting subsidies, which was the chief and ordinary cause of their convocation. But it had come to be a consent with which the king could dispense. We have

seen how permanent taxation became established. In the 16th century, however, the estates again claimed that their consent was necessary for the establish- ment of new taxation, and, on the whole, the facts seem to be in favour of this view at the time. But in the course of the 17th century the principle gained recognition that the king could tax on his own sole authority. Thus were established in the second half of the 17th century, and in the 18th, the direct taxes of the capitation and of the dixieme or vinglieme, and many indirect taxes. It was sufficient for the law creating them to be registered by the cours des aides and the parlements. It was only in 1787 that the parlement of Paris declared that it could not register the new taxes, the land-tax and stamp- duty (subvention territoriale and impdt du timbre), as they did not know whether they would be submitted to by the country, and that the consent of the representatives of the tax-payers must be asked.

The States-General had legally no share in the legislative power, which belonged to the king alone. The States of Blois demanded, it is true in 1576, that he should be bound to turn into law any proposition voted in identical terms by each of the three orders; but the king would not grant this demand, which would not even have left him a right of veto. In practice, however, the States-General contributed largely to legislation. Those who sat in them had at all times the right of presenting complaints (doleances), requests and petitions to the king; in this, indeed, consisted their sole initiative. They were usually answered by an ordonnance, and it is chiefly through these that we are acquainted with the activity of the estates of the 14th and 15th centuries. In the latest form, and from the estates of 1484 onwards, this was done by a new and special pro-cedure. The States had become an entirely elective assembly, and at the elections (at each step of the election if there were several) the electors drew up a cahier des doleances (statement of grievances) which they requested the deputies to present; this even appeared to be the most important feature of an election. The deputies of each order in every bailliage also brought with them a cahier des doleances, which was arrived at, for the third estate, by a combination of the statements drawn up by the primary or secondary electors. On the assembly of the estates the cahiers of the bailliages were incorporated into a cahier for each gouvernement, and these again into a cahier general or general statement, which was presented to the king, and which he answered in his council. When the three orders deliberated in common, as in 1484, there was only one cahier general; when they deliberated separately, there were three, one for each order. The drawing up of the cahier general was

looked upon as the main business (le grand muvre) of the session.

By this means the States-General furnished the material for numerous ordonnances, though the king did not always adopt the propositions contained in the cahiers, and often modified them in forming them into an ordonnance. These latter were the ordonnances de reforme (reforming ordinances), treating of the most varied subjects, according to the demands of the cahiers. They were not, however, for the most part very well observed. The last of the type was the grande ordonnance of 1629 (Code Michau) drawn up in accordance with the cahiers of i6r4 and with the observations of various assemblies of notables which followed them.

The States-General had, however, peculiar power which wa recognized, but was of a kind that could not often be exer- cised; it was what might be called a constituent power. The ancient public law of France contained a number of rules called " the fundamental laws of the realm (lots fondamenlales du royaume), though most of them were purely customary; chief among them were the rules of determining the succession to the Crown and those forbidding the alienation of the domain of I the Crown. The king, supreme though his power might be,*

could not abrogate, modify or infringe them. But it was admitted that he might do so by the consent of the States- General. The States could give the king a dispensation from a fundamental law in a given instance; they could even, in agree- ment with the king, make new fundamental laws. The States of Blois of 1576 and 1588 offer entirely convincing precedents in this respect. It was universally recognized that in the event of the line of Hugh Capet becoming extinct, it would be the func- tion of the States-General to elect a new king.

The States-General of 1614 had been the last. A new con- vocation had indeed been announced to take place on the majority of Louis XIV., and letters were even issued in view of the elections, but this ended in nothing. Absolute monarchy was becoming definitely established, and was incompatible with the institution of the States-General. Liberal minds, however, in the entourage of the duke of Burgundy, who were preparing a new plan of government in view of his accession to the throne, thought of reviving the institution. It

figures in the projects of St Simon and Fenelon, though the latter would have preferred to begin with an assembly of non- elected notables. But though St Simon was high in the favour of the regent Orleans, the States were not summoned at the death of Louis XIV.

In 1789 they were summoned. They were preceded, as Fenelon had wished in former days, by an assembly of notables in 1787, which already displayed great independence. It was the refusal of the parlement of Paris to register the fiscal edicts submitted to the Notables which led to the convocation of the States-General. The Notables, who had sat in 1787, were again summoned in 1788 to inquire into and fix the rules for the elec- tions and the procedure of the States. Necker, in the Memoire which he submitted to the conseil du roi in December 1788, granted for these States the doublement du tiers, i.e. that the third estate should have a number of deputies equal to that of the deputies of the other two orders combined, this is what had happened previously in the few provincial assemblies created by Necker during his first administration and in those created by an edict of 1787 for all the pays d'elections. But Necker's report, as to the subject of deliberating separately {par ordre) or in common, simply referred to the ancient prin- ciples; and he seems also to have proposed to maintain the system of voting by bailliages. Now the doubling of the tiers could yield it no real advantage unless the deliberation was in common and the voting by individuals, and it was this question which from the 6th of May 1789 onwards was the subject of the separate deliberations and negotiations between the three orders. On the 13th of June the third estate had arrived at a resolution to examine and settle in common the powers of the three orders, and invited to this common work those of the clergy and nobles. Certain of the latter and the majority of the clergy joined the tiers, and on the 17th of June it arrived at the celebrated decision by which it affirmed the principle of the national supremacy residing in the mass of the nation; the deputies, without any distinction of order, constituted a national assembly, which assembly was called upon to regenerate France by giving her a constitution, while the royal power (which in reality became provisional) could not negative its decisions. The king tried to resist. In the seance royale of the 23rd of June 1789, where he took the attitude of granting a charte octroy ee (a constitution granted of the royal favour) , he affirmed, subject to the traditional limitations, the right of separate deliberation for the three orders, which constitutionally formed three chambers. We know how this move failed; soon that part of the deputies of the nobles who still stood apart joined the National Assembly at the request of the king. The States-General had ceased to exist, having

become the National Constituent Assembly, though it consisted of the deputies elected by the order.

See G. Picot, Histoire des etats-generaux (2nd ed., Paris, 1888).

(J. P- E.) The. Dutch States-General. — In the Netherlands the convoca- tion of the States-General, consisting of delegates from the provincial estates, dates from about the middle of the 15th

century, under the rule of the dukes of Burgundy The name was transferred, after the separation of the northern Nether- lands from the Spanish dominions, to the representatives elected by the seven sovereign provincial estates for the general government of the United Provinces. The States-General, in which the voting was by provinces — each province having one vote — was established from 1593 at the Hague. The States- General came to an end after the revolution in 179S) with the convocation of the National Assembly (March 1, 1796), See Holland (History). The title of Staten-Generaal is, however, still borne by the Dutch parliament. (W. A. P)

STATES OF THE CHURCH, or Papal States (Ital. Stato delta Chiesa, Stato Pontifico, Stato Romano, Stato Ecclesiastico; Fr. Etats de I'Eglise, Pontifical Souverain de Rome, &c. ; Ger. Kirchenstaal; in ecclesiastical Latin often Patrimonium Sancti Petri), that portion of central Italy which, previous to the unifica- tion of the kingdom, was under the direct government of the see of Rome. The territory stood in 1859 as in the annexed table.

With the exception of Benevento, surrounded by the Neaˆ politan province of Principato Ulteriore, and the small state of Pontecorvo, enclosed within the Terra di Lavoro, the States of the Church formed a Compact territory, bounded on the N.W. by the Lombardo-Venetian kingdom, on the N.E. by the Adriatic, on the S.E. by the kingdom of Naples, on the S.W. by the Mediterranean, and on the W. by the grand-duchy of Tuscany and the duchy of Modena. On the Adriatic the coast extended 140 m. from the mouth of the Tronto (Truentus) to the southern mouth of the Po, and on the Tyrrhenian Sea 130 m. from 41 20′ to 42 22′ N. lat.

Comarca of Rome . . r Bologna c Ferrara •SjForll . . . .

Ravenna

Urbino, with Pesaro LVelletri . . ■ .

Ancona

Macerata .

Camerino . . .

Fermo

Ascoli Perugia .

Spoleto

Rieti

Viterbo

Orvieto

Civita Vecchia

Frosinone, with Pontecorvo

Benevento ....

Area in English sq. m.

1752-8 1359-2 1094-0

718-8

701-5 1414-6

571-3

441-8

895-0

320-0

335-7

476-3

1555-5

1 175-9

531-7

1158-9

316-6

380-0

739-9

61-3

16,000-8

Population in 1853.

326,509 375,631 244,524 218,433 175,994 257,751 62,013

176,519 243,104

42,991 110,321

91,916 234,533 135,029

73,683 128,324.

29,047

20,701

154,559 23,176

3,124,758

The divisions shown above were adopted on the 21st of December 1827, the legations being ruled by a cardinal and the delegations by a prelate. Previously the several districts formally recognized were Latium, the Marittima (or sea-board) and Campagna, the patrimony of Saint Peter, the duchy of Castro, the Orvietano, the Sabhia, Umbria, the Perugino, the March of Ancona, Romagna, the Bolognese, the Ferrarese, and the duchies of Benevento and of Pontecorvo. The former papal territories are now comprised within the Italian provinces of Bologna, Ferrara, Forli, Ravenna, Pesaro and Urbino, Ancona, Macerata, Ascoli-Piceno, Perugia, Rome and Benevento.

The question of the origin of the territorial jurisdiction of the pope is treated under Papacy. With the moral and ecclesiastical decay of the papacy in the 9th and 10th centuries much of its territorial authority

slipped from its grasp; and by the middle of the nth century its rule was not recognized beyond Rome and the immediate vicinity. By the treaty of Sutri (February nil) Paschal II. was compelled by the emperor Henry V. to surrender all the possessions and royalties of the Church ; but this treaty was soon afterwards repudiated, and by the will of Matilda, countess of Tuscany, the papal see was enabled to lay claim to new territories

of great value. By the capitulation of Neuss (1201) the emperor Otto !y- recognized the papal authority over the whole tract from Radicofam in Tuscany to the pass of Ceperano on the Neapolitan frontier — the exarchate of Ravenna, the Pentapolis, the March of Ancona, the bishopric of Spoleto, Matilda's personal estates, and the countship of Bnttenoro; but a good deal of the territory thus described remained for centuries an object of ambition only on the part of the popes. The actual annexation of Ravenna, Ancona, Bologna, Ferrara, &c, dates from the 16th century. The States of the Church were of course submerged for a time by the ground- swell of the French Revolution, but they appeared again in 1 814. In 1849 they received a constitution. On the formation of the king- dom of Italy in i860 they were reduced to the Comarca of Rome, the legation of Velletri, and the three delegations of Viterbo, Civita Vecchia and Frosmone; and in 1870 they disappeared from the political map of Europe. See Italy : History.

STATE TRIALS, in English law, a name which primarily denotes all trials relating to offences against the state, but in practice is often used of cases illustrative of the law relating to state officers or of international or constitutional law. The first collection of accounts of state trials was published in 17 19 in four volumes. Although without an editor's name, it appears that Thomas Salmon (1670-1767), an historical and geographical writer, was responsible for the collection. A second edition, increased to six volumes, under the editorship of Sollom Emlyn (1697-1754), appeared in 1730. This edition contained a lengthy preface critically surveying the condition of English law at the time. A third edition appeared in 1742, in eight volumes, the seventh and eighth volumes having been added in 18.35. Ninth and tenth volumes were added in 1766, and a fourth edition, comprising ten volumes, with the trials arranged chronologically, was published the same year. A fifth edition, originated by William Cobbett, but edited by Thomas Bayly Howell

(1768-1815) and known as Cobbett's Complete Collection of Stale Trials, was published between 1809 and 1826. This edition is in thirty-three volumes; twenty-one of them, giving the more important state trials down to 1781, were edited by T. B. Howell, and the remaining volumes, bringing the trials down to 1820, by his son Thomas Jones Howell (d. 1858). A new series, under the direction of a parliamentary committee, was projected in 1885, with the object of bringing the trials down to a later date. Eight volumes were published in 1888- 1898, bringing the work down to 1858. The first three of these were edited by Sir J. Macdonell, the remaining five by J. E. P. Wallis. Selections have also been edited by H. L. Stephen and others. The trials are invaluable not only for their reports of criminal cases, in which the whole course of criminal procedure and evidence may be traced, but for their historical information.

STATICS (from Gr. root txra-, stand, or cause to stand), the branch of mechanics which discusses the conditions of rest or equilibrium of forces (see Mechanics).

STATIONERY, a term embracing all the various articles sold by " stationers," who were originally booksellers having " stations " or stands in markets, near churches or other build- ings for the sale of their goods (see Bookselling for the further history of the word). The stationers were formed into a gild in 1403, the Livery Company not being incorporated till 1556. At the hall of the company in London, " Stationers' Hall," is kept a book for the registration of copyrights (see Copyright). The " Stationery Office " is a British government department which supplies stationery to parliament and the government offices and generally controls the printing required by them.

Under the name of stationery are now included all writing materials and implements, together with the numerous appli- ances of the desk and of mercantile and commercial offices.

The principal articles and operations of the stationery trade are dealt with under such headings as Bookbinding; Copying Machines; Ink; Lithography; Paper; Pen; and Pencil.

STATIONS OF THE CROSS, a series of 14 pictures or images representing the closing scenes in the Passion of Christ, viz. (1) the condemnation by Pilate, (2) the reception of the cross, (3) Christ's first fall, (4) the meeting with His mother, (5) Simon of Cyrene carrying the cross, (6) Veronica wiping the face of Jesus, (7) the second fall, (8) the exhortation to the women of

Jerusalem, (9) the third fall, (10) the stripping of the clothes, (n) the crucifixion, (12) the death, (13) the descent from the cross, (14) the burial. Sometimes a 15th— the finding of the cross by Helena— is added; on the other hand in the diocese of Vienna, the stations were at the end of the 18th century reduced to eleven. . They form a very popular item in Roman Catholic devotion. The representations are usually ranged round the church; sometimes they are found in the open air, especially on the ascent to some elevated church or shrine.

The devotion began among the Franciscans, who, as the guardians of the holy places in Jerusalem, sought by this means to enable Christians to make a pilgrimage at least in spirit. Pope Innocent XII. in 1694 declared that the indulgences granted for visiting Palestine might be gained by members of the order who, simply visiting the stations of the cross wherever represented, exercised a devout meditation as they passed from station to station. These indulgences were extended by Bene- dict XIII. in 1726 to all the faithful, and Clement XII. five years later granted the privilege to churches other than Francis- can, provided the stations were erected by a Franciscan. In 1857 the Roman Catholic bishops in England received faculties, renewed quinquenially, permitting them to erect the stations wkh the accompanying indulgences, and they often delegate this faculty to priests.

STATISTICS. The word "statistic" is derived from the Latin status, which, in the middle ages, had come to mean a " state " in the political sense. " Statistic," therefore, originally denoted inquiries into the condition of a state. Since the 1 8th century the denotation of the word has been extended, while at the same time its scope has become more definite, and may now be said, for all practical purposes, to be fixed. History.— The origin of what is now known as " statistics " (Ger. die Statistik; Fr. la statistique; Ital. statistica) can only be 'referred to briefly here. As human societies became more and more highly organized, there can be no doubt that a very considerable body of official statistics must have come into existence, and been constantly used by statesmen, solely with a view to administration. The Romans were careful to obtain accurate

information, regarding the resources of the state, and they appear to have taken the census with a regularity which has hardly been surpassed in modern times.

Statistics, or rather the material for statistics, therefore existed at a very early period, but it was not until within the last_ three centuries that systematic use of the information available began to be made for purposes of investigation and not of mere administration. A volume compiled by Francesco Sansovino, entitled Del Governo et amministrazione di diversi regni et republicke, was printed in Venice and bears the date 1583. Other works of a similar kind were published towards, the end of_ the 16th century in Italy and France. Works on state administration and finance continued to be published during the first half of the 17th century, and the tendency to employ figures, which were hardly used at all by Sansovino, became more marked, especially in England, where the facts connected with "bills of mortality" had begun to attract attention.

G. Achenwall is usually credited with being the first to use the word " statistics," but statistics, in the modern sense of the word, did not really come into existence until the publication (1761) by J. _ P. Sussmilch, a Prussian clergyman, of a work entitled Die gottliche Ordnung in den Verdnderungen des menschlichen Geschleckts aus der Geburt, dem Tode, und der Fortpflanzung desselben erwiesen. In this book a systematic attempt was made to make use of a class of facts which up to that time had been regarded as belonging to " political arithmetic," under which description some of the most important problems of what modern writers term " vital statistics " had been studied, especially in England. Sussmilch had arrived at a perception of the advan tage of studying what Quetelet subsequently termed the " laws of large numbers." He combined the method of " descriptive statistics " with that of the "political arithmeticians," who had confined themselves to investigations into the facts regarding

mortality and a few other similar subjects, without much attempt at generalizing from them.

Political arithmetic had come into existence in England in the middle of the 17 th century. The earliest example of this class of investigation is the work of Captain John Graunt of London, entitled

Natural and Political Annota- tions made upon the Bills of Mortality, which was first published in 1666. This remarkable work, which dealt with mortality in London only, ran through many editions, and the line- of inquiry it suggested was followed up by various other writers, of whom the most distinguished was Sir William Petty, who published in 1683 his Five Essays in Political Arithmetick. Other writers, of whom Halley, the celebrated mathematician and astronomer, was one, entered on similar investigations, and during the greater part of the 18th century the number of persons who devoted themselves to " arithmetical " inquiries into problems of the class now known as statistical was steadily increasing. Much attention was given to the construction of tables of mortality. Attempts were also made to deal with figures as the basis of political and fiscal discussion by Arthur Young, Hume and other historical writers, as well as by the two Mirabeaus.

It is now necessary to return to Slissmilch, who, as already mentioned, endeavoured to form a general theory of society, based on what were then termed " arithmetical " premises. In modern language, he made use of quantitative aggregate- observation as an instrument of social inquiry. It is true he did not enter on hi» investigation with an " open mind." He desired to support a foregone conclusion, as the title of his work shows. But nevertheless his work was a most valuable one, since it pointed out a road which others who had no desire to procure evidence in favour of a particular system of thought were not slow to follow. Although for many years after the appear- ance of Siissmilch's book there was a good deal of resistance to the introduction of " arithmetic " as the coadjutor of moral and political investigations, yet, practically there was a tacit admission of the usefulness of figures, even by the chiefs of the so- called " descriptive " school. On the other hand, Siissmilch's suc- cess was the origin of a '•mathematical" school of statisticians, some of whom carried their enthusiasm for figures so far that they refused to allow any place for mere " descriptions " at all. These two schools have now coalesced, each admitting the importance of the point of view urged by the other. They were, however, still perceptibly distinct even as late as 1850, and the ignorant hostility with which many people even among the cultivated classes still regard statistical inquiries into the nature of human society may be regarded as a survival of the much stronger feeling which showed itself among "orthodox " pro- fessors of law and economics on the publication of Siissmilch's treatise.*

To the impulse given by the great Belgian, Quetelet, must be attributed the foundation in 1834 of the Statistical Society of

London, a body which, though it has contributed little to the theory of statistics, has had a considerable influence on the practical work of carrying out statistical investigations in the United Kingdom and elsewhere. Quetelet was above all things an exponent of the " laws of large numbers." He was especially fascinated with the tendency to relative con- stancy of magnitude displayed by the figures of moral statistics, especially those of crime, which inspired him with a certain degree of pessimism. His conception of an average man {V homme moyen) and his disquisition on the " curve of possibility " were most important contributions to the technical development of the statistical method.

The influence exercised by Quetelet on the development of statistics is clearly seen from the fact that, though there is still considerable controversy among statisticians, the old controversy between the " descriptive " and arithmetical schools has disappeared, or perhaps we should say has been transformed into a discussion of another kind, the question now at issue being whether there is a science of statistics as well as

a statistical method. It is true that a few books were published between 1830 and 1850 in which the politico-geographical description of a country is spoken of as " statistics," which is thus distinguished from " political arithmetic." The title of Knies's great work, Die Statistik als selbstdndige Wissenschaft (Cassel, 1850), is especially noteworthy as showing that the nature of the controversy was changing. Knies claimed that the really " scientific " portion of statistics consisted of the figures employed. As Haushofer says, " his starting point is political arithmetic."

Some eminent statisticians of the latter half of the 19th century accepted the view of Knies, but the majority of modern writers on the theory of statistics, especially in Germany, have adopted a slightly different standpoint according to which statistics is at once a science relating to the social life of man and a method of investigation applicable to all sciences. This view was ably maintained by von Mayr, Haushofer, Gabaglio and Block, whose views, published fifteen to twenty years before the close of last century, still substantially represent the opinions held by the majority of statisticians in Germany, and probably on the European continent. In France, however, several writers of importance have recently published works on the subject in which, in spite of the influence of M. Block, the claim of statistics to be considered as an independent sociological science has been rejected. There has been little systematic exposition of the subject in the United Kingdom. Isolated

dicta have been furnished by authorities on the practice of statistics, such as the late Dr W. A. Guy, Professor J. K. Ingram, Sir Rawson W. Rawson, Sir Robert Giffen and others, Professor Foxwell has lectured on statistics at University College, London. The most important English work dealing with the matter is that of Mr A. L. Bowley. His volume, Elements of Statistics (first published in 1001), is intended as a practical handbook for teaching the principles on which statistics should be handled. The nature of Mr Bowley's book is, indeed, an indication of the fact that in the United Kingdom the study of statistics has been, in the main, of a practical character, the in- vestigation of the theoretical basis of the statistical method attracting little interest. On the other hand, numerous mono- graphs have been published by English writers on particular points connected with the technique of statistical investigation, as was natural considering the excellence of the practical use made of statistics in the United Kingdom.

With regard to the few earlier invasions of the domain of theory attempted by English writers, it may be observed that the authorities above mentioned were not unanimous. Dr Guy as well as Sir Rawson W. Rawson both claim that statistics is to be regarded as an independent science, apart from sociology, while Professor Ingram maintained that statistics cannot occupy a position co-ordinate with that of sociology, and that they " constitute only one of the aids or adminicula of science." Sir Robert Giffen has also expressed himself adversely to the continental doctrine that there is an in- dependent science of statistics, and this opinion appears to be the correct one, but, as Dr Guy and Sir Rawson W. Rawson had the support of the great body of systematic teaching emana- ting from distinguished continental statisticians in support of their view, while their opponents have so far only the obiter dicta of a few eminent men to rely upon, it appears needful to examine closely the views held by the continental authorities, and the grounds on which they are based.

The clearest and shortest definition of the science of statistics as thus conceived is that of M. Block, who describes it as " la science de l'homme vivant en societe en tant qu'elle peut &tre exprimee par les chiffres." He proposes to give a new name to the branch of study thus defined, namely " demography." Von Mayr's definition is longer. He defines the statistical science as " die systematische Darlegung und Erorterung der thatsachlichen Vorgange und der aus diesen sich ergebenden Gesetze des gesellschaf tlichen menschlichen Lebens auf Grundlage quantitativer Massenbeobachtungen " (the systematic statement

and explanation of actual events, and of the laws of man's social life that may be deduced from these, on the basis of the quantitative observation of aggregates). Gabaglio's view is practically identical with those adopted by von Mayr and Block, though it is differently expressed. He says " statistics may be interpreted in an extended and in a restricted sense. In the former sense it is a method, in the latter a science. As a science it studies the actual social-political order by means of mathematical induction." Most German writers on the subject have endorsed the views of Block and von Mayr. Among them may be mentioned Professors J. Conrad, Lexis and Westergaard, but Dr Augst Meitzen of Berlin, a second edition of whose Geschichte, Theorie und Technik der Statistik was published in 1903, makes a much less wide claim. In France opinions are divided, Professors Andre Liesse and Fernand Faure and others accepting the view that statistics is essentially a method.

This discussion regarding the nature of statistics is to a large extent a discussion about names. There is really no difference of opinion among statistical experts as to the subject-matter of statistics, the only question being — Shall statistics be termed a science as well as a method ? That there are some investigations in which statistical procedure is employed which certainly do nof belong to the domain of the supposed statistical science is generally admitted. But, as already shown, an attempt has been made to claim that the phenomena of human society, or some part of those phenomena, constitute the subject-matter of an independent statistical science. It is not easy to see why this claim should be admitted. There is no reason either of convenience or logic why the use of a certain scientific method should be held to have created a science in one department of inquiry, while in others the said method is regarded merely as an aid in investigation carried on under the superintendence of a science already in existence. It is impossible to get over the fact that in meteorology, medicine, and other physical sciences statistical inquiries are plainly and obviously examples of the employment of a method, like microscopy, spectrum analysis, or the use of the telescope. Why should the fact of their employment in sociology be considered as authorizing the classification of the phenomena thus dealt with to form a new science ?

The most effective argument put forward by the advocates of this view is the assertion that statistics are merely a conve- nient aid to

investigation in the majority of sciences, but are the sole method of inquiry in the case of sociology. When, indeed, it is tested by reference to the important class of social facts which are named economic, it becomes obvious that the argu- ment breaks down. Economics is a branch — the only scientific- ally organized branch — of sociology, and statistics are largely used in it, but no one, so far as we are aware, has proposed to call economics a department of statistical science.

Although, however, the above considerations forbid the acceptance of the continental opinion that the study of man in the social state is identical with statistics, it must be admitted that without statistics the nature of human society could never become known. For society is an aggregate, or rather a congeries of aggregates. Not only that, but the individuals composing these aggregates are not in juxtaposition, and what is, from the sociological point of view, the same aggregate or organ of the " body politic " is not always composed of the same individuals. Constancy of social form is maintained concurrently with the most extensive changes in the collocation and identity of the particles composing the form. A " nation " is really changed, so far as the individuals composing it are concerned, every moment of time by the operation of the laws of population. But the nation, considered sociologically, remains the same in spite of this slow change in the particles composing it, just as a human being is considered to be the same person year by year, although year by year the particles forming his cr her body are constantly being destroyed and fresh particles substi- tuted. Of. course the analogy between the life of a human being and the life of a human community must not be pressed too far. Indeed, in several respects human communities more nearly

resemble some of the lower forms of animal life than the more highly organized forms of animal existence. There are organ- isms which are fissiparous, and when cut in two form two fresh independent organisms, so diffused is the vitality of the original organism; and the same phenomenon may be observed in regard to human communities.

Now the only means whereby the grouping of the individuals forming a social organism can be ascertained, and the changes in the groups year by year observed, is the statistical method. Accordingly the correct view seems to be that it is the function of this method to make perceptible facts regarding the consti- tution of society on which sociology is to base its conclusions. It is not claimed, or ought not to be claimed, that statistical inves- tigation can supply the whole of the

facts a knowledge of which will enable sociologists to form a correct theory of the social life of man. The statistical method is essentially a mathematical procedure, attempting to give a quantitative expression to certain facts; and the resolution of differences of quality into differences of quantity has not yet been effected, even in chemical science. In sociological science the importance of differences of quality is enormous, and the effect of these differences on the conclusions to be drawn from figures is sometimes neglected, or insufficiently recognized, even by men of unquestionable ability and good faith. The majority of politicians, social "reformers " and amateur handlers of statistics generally are in the habit of drawing the conclusions that seem good to them from such figures as they may obtain, merely by treating as homogeneous quantities which are heterogeneous, and as com- parable quantities which are not comparable. Even to the conscientious and intelligent inquirer the difficulty of avoiding mistakes in using statistics prepared by other persons is very great. There are usually " pit-falls " even in the simplest statistical statement, the position and nature of which are known only to the persons who have actually handled what may be called the " raw-material " of the statistics in question; and in regard to complex statistical statements the " outsider " cannot be too careful to ascertain from those who compiled them as far as possible what are the points requiring elucidation.

The Statistical Method. — This method is a scientific procedure (1) whereby certain phenomena of aggregation not perceptible to the senses are rendered perceptible to the intellect, and (2) furnishing rules for the correct performance of the quantitative observation of these phenomena. The class of phenomena of aggregation referred to includes only such phenomena as are too large to be perceptible to the senses. It does not, e.g. include such phenomena as are the subject-matter of micro- scopy. Things which are very large are often quite as difficult to perceive as those which are very small. A familiar example of this is the difficulty which is sometimes experienced in finding the large names, as of countries or provinces, on a map. Of course, the terms " large," " too large," " small " and u too small "must be used with great caution, and with a clear com- prehension on the part of the person using them of the standard of measurement implied by the terms in each particular caste. A careful study of the first few pages of De Morgan's Differential and Integral Calculus will materially assist the student of statis- tics in attaining a grasp of the principles on which standards of measurement should be formed. It is not necessary that he should become acquainted with the calculus itself, or even possess anything more than an elementary

knowledge of mathe- matical science, but it is essential that he should be fully con- scious of the fact that " large " and " small " quantities can only be so designated with propriety by reference to a common standard. It is also necessary that he should be acquainted with the theory of probability as applied to statistical investi- gations, the need of which is well set forth by Mr A. L. Bowley in Part II. of his work, already referred to, and by other writers. Valuable instruction on this technical subject can be obtained from monographs by Professor F. Y. Edgeworth, Professor Karl Pearson, Dr John Venn, Mr Udney Yule and many othei contributors to the Transactions of the Royal Society, the Journal of the Royal Statistical Society, the Economic Journal,

the Quarterly Journal of Economics and similar publications in different countries.

Sources whence Statistics are Derived^ — The term " statistics " in the concrete sense means systematic arrangements of figures representing " primary statistical quantities." A primary statis- tical quantity is a number obtained from numbers representing phenomena, with a view to enable an observer to perceive a certain other phenomenon related to the former as whole to parts. They represent either a phenomenon of existence at a given point of time or a phenomenon of accretion during a given period. As examples may be mentioned the number of deaths in a given district during a given time, the number of pounds sterling received by the London & North Western railway during a given time, and the number of " inches of rain " that fell at Greenwich during a given time. Other examples are the number of tons of pig-iron lying in a par- ticular store at a given date, the number of persons residing (the term " residing " to be specially defined) in a given territory at a given date, and the number of pounds sterling representing the "private deposits " of the Bank of England at a given date.

Primary statistical quantities are the result of labours carried on either (A) by governments or (B) by individuals or public or private corporations.

A Government Statistics. — 1. A vast mass of statistical material of more or less value comes into existence automatically in modern states in consequence of the ordinary administrative routine of

departments. To this class belong the highly important statistical information published in England by the registrar-general, the returns of pauperism issued by the local government board, the reports of inspectors of prisons, factories, schools, and those of sanitary inspectors, as well as the reports of the commissioners of the customs, and the annual statements of trade and navigation prepared by the same officials. There are also the various returns compiled and issued by the board of trade, which is the body most nearly resembling the statistical bureaus with which most foreign governments are furnished. Most of the government departments publish some statistics for which they are solely responsible as regards both matter and form, and they are very jealous of their right to do so, a fact which is to some extent detrimental to that uniformity as to dates and periods which should be the ideal of a well-organized system of statistics. Finally may be mentioned the very important set of statistical quantities known as the budget, and the statistics prepared and published by the commissioners of inland revenue, by the post office, and by the national debt com- missioners. All these sets of primary statistical quantities arise out of the ordinary work of departments of the public service. Many of them have been in existence, in some form or other, ever since a settled government existed in the country. There are records of customs receipts at London and other ports of the time of Edward III., covering a period of many years, which leave nothing to be desired in point of precision and uniformity. It may be added that many of these sets of figures are obtained in much the same form by all civilized governments, and that it is often possible to compare the figures relating to different countries and thus obtain evidence as to the sociological phenomena of each, but in regard to others there are differences which make comparison difficult.

2. Besides being responsible for the issue of what may be called administration statistics, all governments are in the habit of ordering from time to time special inquiries into special subjects of interest, either to obtain additional information needful for administrative purposes, or, in countries possessed of representative institutions, to supply statistics asked for by parliaments or con- gresses. It is not necessary to refer particularly to this class of statistical information, except in the case of the census. This is an inquiry of such great importance that it may be regarded as one of the regular administrative duties of governments, though as the census is only taken once in a series of years it must be mentioned under the head of occasional or special inquiries undertaken by governments. In the United Kingdom the work is done by the registrars-general who are

in office when the period for taking the census comes round. On the Continent the work is carried out by the statistical bureaus of each country — -except France, where it is under the supervision of the minister of the interior. The new regulations as to income-tax assessment and the new land taxes will furnish the government with much fresh information as to incomes; and the census of production ordered in the session of 1907 and already carried out as regards a number of trades will also be useful.

B. The primary statistical quantities for which individuals or corporations are responsible may be divided into three categories:

1. Among those which are compiled in obedience to the law of the land are the accounts furnished by municipal corporations, by the Bank of England, by railway, gas, water, banking, insurance and other public companies making returns to the board of trade, by trades unions, and by other bodies which are obliged to make returns to the registrar of friendly societies. The information thus obtained is published in full by the departments receiving it, and is also furnished by the companies themselves to their pro- prietors or members.

2. An enormous mass of statistical information is furnished

voluntarily by public companies in the reports and accounts which, in accordance with their articles of association, are pre- sented to their proprietors at stated intervals. With these statistics may be classed the figures furnished by the various trade associa- tions, some of them of great importance, such as Lloyd's, the London Stock Exchange, the British Iron Trade Association, the London Corn Exchange, the Institute of Bankers, the Institute of Actuaries, and other such bodies too numerous to mention.

3. There are cases in which individuals have devoted themselves with more or less success to obtaining original statistics on special points. The great work done by Messrs Behm and Wagner in arriving at an approximate estimate of the population of the earth does not belong to this category, though its results are really primary statistical quantities. Many of these results have not been arrived at by a direct process of enumeration at all, but by ingenious processes of inference. It need hardly be said that it is not easy for individuals to obtain the materials for any primary statistical quantity of importance, but it has been done in some cases with success. The investigations of Mr Charles Booth into labour and wages questions, carried out with care over many years, are a remarkable example of

this.

Operations Performed on Primary Statistical Quantities. — Only' a brief description of matters connected with the technique of the statistical method can be given in this article. In order to form statistics properly so called the primary statistical quantities must be formed into tables, and in the formation of these tables lies the art of the statistician. It is not a very difficult art when the principles relating to it have been properly grasped, but those who are unfamiliar with the subject are apt to underrate the difficulty of correctly practising it.

Simple Tables. — The first thing to be done in the construction of a table is to form a clear idea of what the table is to show, and to express that idea in accurate language. This is a matter which is often neglected, and it is a source of much waste of time and occasionally of misapprehension to those who have to study the figures thus presented. No table ought to be considered complete without a " heading " accurately describing its contents, and it is frequently necessary that such headings should be rather long. It' has been said that " you can prove anything by statistics." This statement is, of course, absurd, taken absolutely, but, like most assertions which are widely believed, it has a grain of truth in it. If this popular saying ran " you can prove anything by tables with slovenly and ambiguous headings," it might be assented to without hesitation. The false " statistical " facts which obtain a hold of the public mind may often be traced to some widely circulated table, to which, either from stupidity or carelessness, an erroneous or inaccurate " heading " has been affixed.

A statistical table in its simplest form consists of " primaries " representing phenomena of the same class, but existing at different points of time, or coming into existence during different portions of time. This is all that is essential to a table, though other things are usually added to it as an aid to its comprehension. A table stating the number of persons residing in each county of England on a given day of a given year, and also, in another column, the corresponding numbers for the same counties On the corresponding day of the tenth year subsequently, would be a simple tabular statement of the general facts regarding the total population of those counties supplied by two successive censuses. Various figures might, however, be added to it which would greatly add to its clearness. There might be columns showing the increase or decrease for each county and for the whole kingdom during the ten years, and another column showing what proportion, expressed in percentages, these increases

or decreases bore to the figures for the earlier of the two years. Then there might be two columns showing what proportions, also expressed as percentages,ˆ the figures for each county bore in each year to the figures for the whole kingdom. The nine-column table thus resulting would still be simple, all the figures being merely explicit assertions of facts which are contained implicitly in the original " primaries."

Complex Tables. — Suppose now we have another table precisely similar in form to the first, and also relating to the counties of England, but giving the number of houses existing in each of them at the same two dates. A combination of the two would form a complex table, and an application of the processes of arithmetic would make evident a number of fresh facts, all of which would be implied in the table, but would not be obvious to most people until explicitly stated.

The technical work of the statistician consists largely in operations of which the processes just referred to are types.

Proportions. — The most usual and the best mode of expressing the proportion borne by one statistical quantity to another is to state it as a percentage. In some cases another method is adopted, viz. that of stating the proportion in the form " one in so many." This method is generally a bad one, and its use should be dis- couraged as much as possible, the chief reason being that the changing portion of this kind of proportional figure becomes greater or less inversely, and not directly, as the phenomenon it represents increases or diminishes.

Averages. — Averages or means are for statistical purposes divided into two classes, the arithmetical and weighted. An

arithmetical mean is the sum of all the members forming the series of figures under consideration divided by their number, without reference to their weight or relative importance among themselves. A weighted mean is the sum of such figures divided by their number, with due allowance made for their weight. An example will make this clear, and the simplest example is taken from a class of statistical quantities of a peculiar kind, viz. prices. The price of a given article is the approximate mathematical expression of the rates, in terms of money, at which exchanges of the article for money were actually made at or about a given hour on a given day. A quotation of price

such as appears in a daily price list is, if there has been much fluctuation, only a very rough guide to the actual rates of exchange that have been the basis of the successive bargains making up the day's business. But let us suppose that the closing price each day may be accepted as a fair representative of the day's transactions, and let us further suppose that we desire to obtain the average price for thirty days. Now, the sum of the prices in question divided by thirty would be the arithmetical mean, and its weak point would be that it made no allowance for the fact that the business done on some days is much larger than that done on others; in other words, it treats them as being all of equal weight. Now if, as is actually the case in some markets, we have a daily account of the total quantities sold we can weight the members accurately, and can then obtain their weighted mean. There are cases in which the careless use of arithmetical means misleads the student of the social organism seriously. It is often comparatively easy to obtain arithmetical means, but difficult to obtain weighted means. Inferences based on the former class of average should be subjected to the most rigid investigation.

There are many methods of weighting averages; for descriptions of these statistical processes the reader must be referred to the works on the technique of statistics. In chapter v. of Mr Bowley's volume, the subject is dealt with in a manner suitable for students. Before closing this short survey of the very important subject of averages or means, it is needful to discuss briefly the nature of the phenomena which they may safely be regarded as indicating, when they have been properly obtained. Given a weighted mean of a series of numbers referring to no matter what phenomenon, it is obvious that the value of the mean as a type of the whole series will depend entirely on the extent of divergence from it of the members of the series as a body. If we are told that there are in a certain district iooo men, and that their average height is 5 ft. 8 in., and are told nothing further about them, we can make various hypotheses as to the structure of this body from the point of view of height. It is possible that they may consist of a rather large number of men about 6 ft. high, and a great many about 5 ft. 5 in. Or the proportions of relatively tall and short men may be reversed, that is, there may be a rather large number of men about 5 ft. 4 in., and a moderate number of men about 5 ft. n in. It is also possible that there may be very few men whose height is exactly 5 ft. 8 in., and that the bulk of the whole body consists of two large groups — one of giants and the other of dwarfs. Lastly, it is possible that 5 ft. 8 in. may really give a fair idea of the height of the majority of the men, which it would do if (say) 660 of them were

within an inch of that height, either by excess or deficiency, while of the re-, mainder one half were all above 5 ft. 9 in. and the other half all below 5 ft. 7 in. This latter supposition would most likely be found to be approximately correct if the men belonged to a race whose average height was 5 ft. 8 in., and if they had been collected by chance. The extent of the divergence of the items composing an average from the average itself may be accurately measured and expressed in percentages of the average, the algebraic signs + and — being employed to indicate the direction of the variation from the mean. An average may, therefore, advantageously be supplemented: (1) by a figure showing what proportion of the members from which it is derived differs from the average by a relatively small quantity, and (2) by figures showing the maximum and minimum deviations from the average. The meaning of the term " relatively small " must be considered independently in each investigation. Fuller remarks on averages will be found in the works mentioned at the conclusion of this article.

Prices. — Reference has already been made to the peculiar class of statistical quantities known as prices. Prices in their widest sense include all figures expressing ratios of exchange. In modern society the terms of exchange are always expressed in money, and the things for which money is exchanged are: (1) concrete entities with physical attributes, such as iron or wheat; (2) immediate rights, such as those given by interest-bearing securities of all kinds, by bills of exchange, by railway or steamship contracts to carry either passengers or goods, and by bargains relative to the foreign exchanges; (3) contingent rights, such as those implied in policies of insurance. All these rates of exchange belong to the same category, whether they are fixed within certain limits by law, as in the case of railway charges, or are left to be determined by the " higgling of the market." All these cases of price may con- ceivably come within the operation of the statistical method, but the only matter connected with price which it is necessary to refer to here is the theory of the index number.

Index Numbers. — The need for these became conspicuous during the investigations of Tooke, Newmarch and others into the general

cyclical movements of the prices of commodities; and to construct a good system of these may be said to be one of the highest technical aims of the statistical method. In comparing the prices of different years it was soon observed that, though whole groups of articles moved upwards or downwards simultaneously, they did not all move in the same proportion, and that there were nearly always cases in

which isolated articles or groups of articles moved in the opposite direction to the majority of articles. The problem pre- sented to statisticians therefore was, and is, to devise a statistical expression of the general movement of prices, in which all prices should be adequately represented. The first rough approximation to the desired result was attained by setting down the percentages representing the movements, with their proper algebraic signs before them, and adding them together algebraically. The total with its proper sign was then divided by the number of articles, and the quotient represented the movement in the prices of the whole body of articles during the period under consideration. It was soon seen, however, that this procedure was fatally defective, inasmuch as it treated all prices as of equal weight. Cotton weighed no more than pimento, and iron no more than umbrellas. Accord- ingly an improvement was made in the procedure, first by giving the prices of several different articles into which cotton, iron and other important commodities entered, and only one price each in the case of the minor articles, and secondly by fixing on the price of some one article representing iron or cotton, and multiplying it by some number selected with the view of assigning to these articles their proper weights relatively to each other and to the rest. The objection to both these plans is the same — that the numbers attached to the various articles or groups of .articles are purely arbitrary; and attempts have been made to obtain what may be called natural index numbers, the most successful so far being that of Sir Robert Giffen, whose index numbers were obtained from the declared values of the imports or exports into or from the United Kingdom of the articles whose prices are dealt with. In the case of both imports and exports Sir Robert worked out the proportion borne by the value of each article to the total value for a series of years. Deducting the " unenumerated " articles, a series of numbers was thus obtained which could be used as the means of weighting the prices of the articles in an investiga- tion of a movement of prices. This procedure is no doubt sus- ceptible of further improvement, like its predecessors. The index numbers prepared and published every month by the Economist, and by Mr Augustus Sauerbeck, which are weighted, are of great value; owing to the frequency of their appearance they make it possible to watch the tendency of prices closely.

The Desirability of Increased Uniformity in Statistics. — One of the most serious difficulties in connexion with statistical investigations is the variety of the modes in which primaries of the same order are obtained, as regards dates and periods. This is a matter of which all persons who have occasion to use statistics are made painfully aware

from time to time. Some attempts have lately been made to introduce more harmony into the official statistics of the United Kingdom, and many years ago a committee of the treasury sat to inquire into the matter. The committee received a good deal of evidence, and presented a report, from which, how- ever, certain members of the committee dissented, preferring to express their views separately. The evidence will be found very interesting by a-U who wish to obtain an insight into the genesis of the official statistics of the country.

The International Institute of Statistics. — The absence of uniformity in statistics which is felt in England is not so marked in foreign countries, where the principle of centralization in arrangements of a political character is more powerful. In several continental countries and in the United States there are statistical bureaus with definite duties to perform. In the United Kingdom, as already remarked, the nearest approach to a central statistical office is the commercial and statistical department of the board of trade, on which the work of furnishing such statistics as are not definitely recognized as within the province of some other state department usually falls. Various attempts have been made to introduce more uniformity into the statistics of all countries. It was with this object that statistical congresses have met from time to time since 1853. An endeavour was made at the congress held in 1876 at Budapest to arrange for the publication of a system of international statistics, each statistical bureau undertaking a special branch of the subject. The experiment was, however, foredoomed to be only a very partial success, first because all countries were not then and are not yet furnished with central statistical Offices, and secondly because the work which fell on the offices in existence could only be performed slowly, as the ordinary business of the offices necessarily left them little leisure for extra work. In 1885, at the jubilee of the London Statistical Society, a number of eminent statistical officials from all parts of the world except Germany were present, and the opportunity was taken to organize an International Institute of Statistics with a view, to remedying the defects already ascertained to exist in the arrangements made by the congresses. The only obstacle to secur- ing a proper representation of all countries was the absence of any_ German delegates, none of the official heads of the German statistical office being allowed to attend — apparently on political*

grounds. Since then assurances of a satisfactory kind have been given to the German government that their servants would be in no way committed to any course disapproved by that government if they gave their assistance to the Institute, from the formation of which it is hoped that much advantage may result. For in- formation as to the constitution and objects of the Institute refe- rence may be made to a paper by the late Dr F. X. von Neumann- Spallart in vol. i. (1886) of the Bulletin de I'institut international de statistique (Rome, 1886). Meetings of the Institute have been held annually ever since its formation in various cities of the world. Literature. — E. Blaschke, Vorlesungen iiber mathematische Statistik (die Lehre von den statistischen Masszahlen) (Leipzig and Berlin, 1906) ; Maurice Block, Traite theorique et pratique de statistique (Paris, 1878); Luigi Bodio, Delia Statistica nei suoi rapporti coll' economia politica, &c. (Milan, 1869); Arthur L. Bowley, Elements of Statistics (London, 1901); J. Conrad, " Statistik," Grundriss zum Studieren der- politischen Oekonomie, vierter Teil; (2nd ed., Jena, 1902) (vierter Teil); Elderton (W. Palin and Ethel M.), Primer of Statistics (London, 1910) ; F. Faure, Elements de statistique (Paris, 1906); A. Gabaglio, Storia e teoria della statistica (Milan, 1880); Max Haushofer, Lehr-und Handbuch der Statistik (2nd ed., Vienna, 1883); K. Knies, Die Statistik als selbstdndige Wissenschaft (Cassel, 1850); A. Liesse, La Statistique (Paris, 1905) ; R. Mayo-Smith, Science of Statistics (1895); G. von Mayr, Die Gesetzmdssigkeit im Gesellschaflsleben (Munich, 1877), abridged translation in Journ. Roy. Stat. Soc. (Sept. 1883) ; idem, Statistik und Gesellschaftslehre, pts. i. and ii. (Freiburg, 1897); A. Meitzen, Geschichte, Theorie und Technik der Statistik (2nd ed., Stuttgart and Berlin, 1903); A. Quetelet, various works, but especially that entitled Sur I'homme et le developpement de ses facultes, ou Essai de physique sociale (Paris, 1837); and Letters on the Theory of Probability; idem, Lettres & s.a.r. le due regnant de Saxe-Coburg et Gotha sur la theorie des probability (Brussels, 1846); A. C. F. Schaffle, Bau und Leben des socialen Kbrpers (Tubingen, 1881), especially pt. ii. pp. 463 seq., and pt. iv. pp. 493 sqq. ; Herbert Spencer, Principles of Sociology (London, 1877), especially pt. ii. p. 465 seq.; A. Wagner, article "Statistik," in Buntschli-Brater's Staatsworlerbuch, vol. x. ; H. Westergaard, Die Grundziige der Theorie der Statistik (Jena, 1890).

(W. Ho.) .

STATIUS, PUBLIUS PAPINIUS (c. a.d. 45-96), Latin poet, was born at Naples. He was, to a great extent, devoted by birth and training to the profession of a poet. The Statii were of Graeco-Campanian origin, and were of gentle extraction, though impoverished, and the

family records were not without political distinctions. The poet's father taught with marked success at Naples and Rome, and from boyhood to age he proved himself a champion in the poetic tournaments which formed an important part of the amusements of the early empire. The younger Statius declares that his father was in his time equal to any literary task, whether in prose or verse. Probably the poet inherited a modest competence and was not under the necessity of begging his bread from wealthy patrons. He certainly wrote poems to order (as Silvae, i. 1, 2, ii. 7, and iii. 4), but there is no indication that the material return for them was important to him, in spite of an allusion in Juvenal's seventh satire. Of events in the life of Statius we know little. From his boyhood he was victorious in poetic contests — many times at his native city Naples, thrice at Alba, where he received the golden crown from the hand of the emperor Domitian. But at the great Capitoline competition (probably on its third cele- bration in 94 a.d.) Statius failed to win the coveted chaplet of oak leaves. No doubt the extraordinary popularity of his Thebais had led him to regard himself as the supreme poet of the age, and when he could not sustain this reputation in the face of rivals from all parts of the empire he accepted the judges' verdict as a sign that his day was past, and retired to Naples, the home of his ancestors and of his own young years. We still possess the poem he addressed to his wife on this occasion (Silv. iii. 5). There are hints in this poem which naturally lead to the surmise that Statius was suffering from a loss of the emperor's favour; he may have felt that a word from Domitian would have won for him the envied garland, and that the word ought to have been given. In the preface to book iv. of the Silvae there is mention of detractors who hated our poet's style, and these may have succeeded in inducing a new fashion in poetry at court. Such an eclipse, if it happened, must have cut Statius to the heart. He appears to have relished thoroughly the role of court-poet. The statement sometimes made that the elder Statius had been the emperor's teacher, and had received many

favours from him, so that the son inherited a debt of gratitude, seems to have no solid foundation. Statius lauds the emperor, not to discharge a debt, but rather to create an obligation. His flattery is as far removed from the gentle propitiatory tone of Quintilian as it is from the coarse and crawling humiliation of Martial. It is in the large extravagant style of a nature in itself healthy and generous, which has accepted the theme and left scruples behind. In one of his prefatory epistles Statius declares that he never allowed any work of his to go forth without invoking the godhead of the divine emperor.

Statius had taken the full measure of Domitian's gross taste, and, presenting him with the rodomontade which he loved, puts conscience and sincerity out of view, lest some uneasy twinge should mar his master's enjoyment. But in one poem, that in which the poet pays his due for an invitation to the Imperial table, we have sincerity enough. Statius clearly feels all the raptures he expresses. He longs for the power of him who told the tale of Dido's banquet, and for the voice of him who sang the feast of Alcinous, that he may give forth utterance worthy of the lofty theme. The poet seemed, he says, to dine with great Jove himself and to receive nectar from Ganymede the cup- bearer (an odious reference to the imperial favourite Earinus). All his life hitherto has been barren and profitless. Now only has he begun to live in truth. The palace struck on the poet's fancy like the very hall of heaven; nay, Jove himself marvels at its beauty, but is glad that the emperor should possess such an earthly habitation; he will thus feel less desire to seek his destined abode among the immortals in the skies. Yet even so gorgeous a palace is all too mean for his greatness and too small for his vast presence. " But it is himself, himself, that my eager eye has alone time to scan. He is like a resting Mars or Bacchus or Alcides." Martial too swore that, were Jove and Domitian both to invite him to dinner for the same day, he would prefer to dine with the greater potentate on the earth. Martial and Statius were no doubt supreme among the imperial flatterers. Each was the other's only serious rival. It is therefore not surprising that neither should breathe the other's name. Even if we could by any stretch excuse the bearing of Statius towards Domitian, he could never be forgiven the poem entitled " The Hair of Flavius Earinus," Domitian's Ganymede (Silv. iii. 4), a poem than which it would be hard to find a more repulsive example of real poetical talent defiled for personal ends. Every- thing points to the conclusion that Statius did not survive his emperor — that he died, in fact, a short time after leaving Rome to settle in Naples. Apart from the emperor and his minions, the friendships of Statius with men of high station seem to have been maintained on fairly equal terms. He was clearly the poet of society in his day as well as the poet of the court.

As poet, Statius unquestionably shines in many respects when compared with most other post-Augustans. He was born with exceptional talent, and his poetic expression is, with all its faults, richer on the whole and less forced, more buoyant and more felicit- ous, than is to be found generally in the Silver Age of Latin poetry. Statius is at his best in his occasional verses, the Silvae, which have a character of their own, and in their best parts a charm of their own. The title was proper to verses of rapid workmanship, on

everyday themes. Statius prided himself on his powers of improvisation, and he seems to nave been quite equal to the feat, which Horace describes, of dictating two hundred lines in an hour while standing on one leg. The improvisatore was in high honour among the later Greeks, as Cicero's speech for the poet Archias indicates; and the poetic contests common in the early empire did much to stimulate ability of the kind. It is to their velocity that the poems owe their comparative freshness and freedom, along with their loose texture and their inequality. There are thirty-two poems, divided into five books, each with a dedicatory epistle. Of nearly four thousand lines which the books contain, more than five-sixths are hexameters. Four of the pieces (containing about 450 lines) are written in the hendecasyllabic metre, the " tiny metre of Catullus," and there is one Alcaic and one Sapphic ode. The subjects of the Silvae are very various. Five poems are devoted to flattery of the emperor and his favourites; but of these enough has already been said. Six are lamentations for deaths, or consolations to survivors. Statius seems to have felt a special pride in this class of his productions; and certainly, notwithstand- ing the excessive and conventional employment of pretty mytho- logical pictures, with other affectations, he sounds notes of pathos

such as only come from the true poet. There are oftentimes traits of an almost modern domesticity in these verses, and Statius, the child- less, has here and there touched on the charm of childhood in lines for a parallel to which, among the ancients, we must go, strange to say, to his rival Martial. One of the epicedia, that on Priscilla the wife of Abascantus, Domitian's freedman {Silv. v. i), is full of interest for the picture it presents of the official activity of a high officer of state. Another group of the Silvae give picturesque descriptions of the villas and gardens of the poec s friends. In these we have a more vivid representation than elsewhere of the surroundings amid which the grandees of the early empire lived when they took up their abode in the country. It was of these pieces that Niebuhr thought when he said that the poems of Statius are charming to read in Italy. They exhibit, better even than Pliny's well-known letters, the passion of the rich Roman for so constructing his country house that light, air, sun and leafage should subserve his luxury to the utmost, while scope was left for displaying all the resources of art which his wealth enabled him to command. As to the rest of the Silvae, the congratu- latory addresses to friends are graceful but

commonplace, nor do the jocose pieces call for special mention here. In the ”’ Kalendae decembres ” we have a striking description of the gifts and amuse- ments provided by the emperor for the Roman population on the occasion of the Saturnalia. In his attempt at an epithalamium (Silt. i. 2) Statius is forced and unhappy. But his birthday ode in Lucan’s honour (Silv. ii. 7) has, along with the accustomed exaggeration, many powerful lines, and shows high appreciation of preceding Latin poets. Some phrases, such as “the untaught muse of high-souled Ennius ” and ” the lofty passion of sage Lucretius, ” are familiar words with all scholars. The ode ends with a great picture of Lucan’s spirit rising after death on wings of fame to regions whither only powerful souls can ascend, scornfully surveying earth and smiling at the tomb, or reclining in Elysium and singing a noble strain to the Pompeys and the Catos and all the ” Pharsalian host, ” or with proud tread exploring Tartarus and listening to the waitings of the guilty, and gazing at Nero, pale with agony as his mother’s avenging torch glitters before his eyes. It is singular to observe how thoroughly Nero had been struck out of the imperial succession as recognized at court, so that the ” bald Nero ” took no umbrage when his flatterer-in-chief profanely dealt with his predecessor’s name.

The epic poems of Statius are less interesting because cast in a conrmoner mould, but they deserve study in many respects. They are the product of long elaboration. The Thebais, which the poet says took twelve years to compose, is in twelve books,_ and has for its theme the old ” tale” of Thebes ” — the deadly strife of the Theban brothers. There is also preserved a fragment of an Achilleis, consisting of one book and part of another. In the weary length of these epics there are many flowers of pathos and many little finished gem-pictures, but the trammels of tradition, the fashionable taste and the narrow bars of education check continually the poet’s flight. Not merely were the materials for his epics prescribed to him by rigid custom, but also to a great extent the method by which they were to be treated. All he could do was to sound the old notes with a distinctive timbre of his own. The gods must needs wage their wonted epic strife, and the men, their puppets, must dance at their nod; there must needs be heavenly messengers, portents, dreams, miracles, single combats, similes, Homeric and Virgilian echoes, and all the other paraphernalia. of the conventional epic. But Statius treats his subjects with a boldness and freedom which contrast pleasingly with the timid traditionalism of Silius Italicus and the stiff scholasticism of Valerius Flaccus. The voca- bulary’ of Statius is conspicuously rich, and he shows audacity, often successful, in the use of words

and metaphors. At the same time he carried certain literary tricks to an aggravating pitch, in

f>articular the excessive use of alliteration, and the misuse of mytho- ogical allusion. The most well-known persons and places are described by epithets or periphrases derived from some very remote connexion with mythology, so that many passages are as dark as Heraclitus. The Tfiebais is badly constructed. The action of the epic is hindered and stopped by enormous episodes, one of which fills one-sixth of the poem. Nor had Statius a firm grasp or_ clear imagination of character. So trying are the late ancient epics to a modern reader that he who has read any one of the three— Statius, Silius and Valerius Flaccus (Lucan stands apart) — will with difficulty be persuaded to enter on. the other two. Yet,, if he honestly reads them all, he can hardly fail to rank Statius the highest of the three by a whole sphere.

The editio princeps of the epics is dated 1470, of the Silvae 1472. Notable editions since have been those of Bernartius (Antwerp, 1595), Gronovius (1653) and Barth (1664). Recent texts are the Teubner (the Achilleis and Thebais by Kohlmann, the Silvae by Baehrens) and that contained in the new edition of the Corpus poetarum latinorum; and of the Silvae only, texts by Klotz (1899), and Vollmer (1898), the last with an explanatory commentary. Among editions of portions of Statius's works, that of the Silvae by Jeremiah Markland, fellow of Peterhouse in Cambridge (1728), deserves special attention. A translation of the Silvae with intro- duction and notes was published by D. A. Slater in 1908 (Oxford

Library of Translations). A critical edition of the Thebais and Achilleis was begun by O. Miiller (1870) but not completed. The condition of the text of the Silvae is one of the most curious facts in the history of ancient literature. Poggio discovered a MS. at St Gallen and brought it into Italy. This MS. has disappeared, but from it are derived all our existing MSS., except one of the birth- day ode to Lucan, now at Florence, and of the 10th century. Politian collated Poggio's MS. with the editio princeps, and the collation has come down to us, and is the principal basis of the text. The MSS. of the epics are numerous, as was to be expected from their great popularity in the middle ages, to which Dante is witness (see Purg. xxi., where an interview with the shade of Statius is described at some length). (J. S. R.)

STATUTE, a law made by the " sovereign power " in the state (see Act as. Parliament). It forms a part of the lex scripta, or written law,

which by English legal authorities is used solely for statutory law, a sense much narrower than it bore in Roman law. To make a statute the concurrence of the Crown and the three estates of the realm is necessary. Thus a so-called statute of 5 Ric. II. c. s, directed against the Lollards, was afterwards repudiated by the Commons as passed without their assent. The validity of a statute was indeed at times claimed for ordi- nances such 'as that just mentioned, not framed in accordance with constitutional rule, and was actually given to royal pro- clamations by 31 Hen. VIII. c. 8 (1539)- But this act was repealed by 1 Edw. VI. c. 12, and since that time nothing but a statute has possessed the force of a statute, unless indeed cer- tain rules or orders depending ultimately for their sanction upon a statute may be said to have such force. Examples of what may be called indirect legislation of this kind are orders in council (see Privy Council), by-laws made under the powers of the Public Health Acts, Municipal Corporation Acts and other Acts, and rules of court such as those made under the powers of the Judicature Acts and Acts of Sederunt of the Court of Session.

The list of English statutes as at present existing begins with the Statute of Merton, 123s. 1 Many of the earlier statutes are known by the names of the places at which they were passed, e.g. the Statutes of Merton, Marlbridge, Gloucester, Westminster, or by their initial words, e.g. Quia Emptores, Circumspecte Agatis. The earliest existing statute rpll is 6 Edw. I. (the Statute of Glou- cester), After 4 Hen. VII. the statute roll ceased to be made up, and enrolments in chancery (first made in 1485) take its place. Some of the acts prior to the Statute of Gloucester are of questionable authority, but have gained recognition by a kind of prescription.

All statutes were originally public, irrespective of their subject-matter. The division into public and private dates from the reign of Richard III. At present statutes are of four kinds, public general acts, public local and personal acts, private acts printed by the king's printers and private acts not so printed. The division into public general and public local and personal rests upon a resolution of both Houses of Parliament in 1798. In 1815 a resolution was passed in accordance with which private acts are printed, with the exception of name, estate, naturalization and divorce acts. The last two are now practically superseded by the provisions of the Divorce Act 1857 (except as to Ireland and India), and the Naturalization Act 1870. Since 1815 it has been usual to refer to public general acts by Arabic numerals, e.g. 3 Edw. VII. c. 21, public local and personal acts by small Roman numerals, e.g. 3 Edw. VII. c. xxi. Each act is strictly but a chapter of the legislation of the session, which is regarded as

composing a single act divided into chapters for convenience, the chapters themselves being also called acts. The citation of previous acts is provided for by 13 and 14 Vict. c. 21, § 3. It is now usual for each chapter or act to contain a short title by which it may be cited, e.g. the Elementary Education Act 1870. The Short Titles Act 1892 created short titles for numerous single acts and groups of acts, and since then it has been usual to cite acts and groups by their short titles — where possible — 1 Ruffhead's edition of the statutes begins with the Magna Carta of 1225. But in the Revised Statutes that form of Magna Carta which is now law appears as a statute of the year 1297. It is often known as Confirmatio cartarum, and is a recital and confirmation by Edward I. of the chief provisions of John's charter.

rather than by the year of the reign. 8 & o Vict. c. 113, s. 3, makes evidence the king's printers' copies of private and local and personal acts. A private act not printed by the king's printers is proved by an examined copy of the parliament roll.

A public act binds all subjects of the realm, and need not be pleaded (except where the law from motives of policy specially provides for pleading certain acts, as in the defences of not guilty by statute, the Statute of Frauds and the Statute of Limitations). A private act must generally be pleaded, and does not as a rule bind strangers to its provisions. Formerly an act took effect from the first day of the session in which it was passed. The hardship caused by this technical rule has been obviated by 33 Geo. III. c. 13, by which an act takes effect from the day on which it receives the royal assent, where no other date is named. This has been held to mean the beginning of the day, so as to govern all matters occurring on that day. An act cannot in the strict theory of English law become obsolete by disuse. Nothing short of repeal can limit its operation. The law has, however, been interpreted in many cases with somewhat less rigour. In the case of a prosecution for blasphemy in 1883 (R. v. Ramsay) Lord Coleridge said, " though the principles of law remain unchanged, yet (and it is one of the advantages of the common law) their application is to be changed with the changing circumstances of the times." l This would be applic- able as much to the interpretation of statutes as to other parts of the common law. The title, preamble and marginal notes are strictly no part of a statute, though they may at times aid its interpretation.

Besides the fourfold division above mentioned, statutes are often classed according to their subject-matter, as perpetual and temporary, penal and beneficial, imperative and directory, enabling and disabling. Temporary acts are those which expire at a date fixed in the act itself. Thus the Army Act is passed annually and continues for a year; the Ballot Act 1872 expired at the end of 1880, and the Regulation of Railways Act 1873 at the end of five years. By means of these temporary acts experimental legislation is rendered possible in many cases where the success of a new departure in legislation is doubtful. In every session an Expiring Laws Continuance Act is passed for the purpose of continuing (generally for a year) a consider- able number of these temporary acts. By 48 Geo. III. c. 106 a continuing act is to take effect from the date of the expiration of a temporary act, where a bill for continuing the temporary act is in parliament, even though it be not actually passed before the date of the expiration. Penal acts are those which impose a new disability; beneficial, those which confer a new favour. An imperative statute (often negative or prohibitory in its terms) makes a certain act or omission absolutely necessary, and subjects a contravention of its provisions to a penalty. A directory statute (generally affirmative in its terms) recom- mends a certain act or omission, but imposes no penalty on non- observance of its provisions. To determine whether an act is imperative or directory the act itself must be looked at, and many nice questions have arisen on the application of the rule of law to a particular case. Enabling statutes are those which enlarge the common law, while disabling statutes restrict it. This division is to some extent coincident with that into bene- ficial and penal. Declaratory statutes, or those simply in affirmance of the common law, were at one period not uncommon, but they are now practically unknown. The Treason Act 1351 is an example of such a Statute. Statutes are sometimes passed in order to overrule specific decisions of the courts. Examples are the Factors Act 1877, the Territorial Waters Jurisdiction Act 1878, the Married Women's Property Act 1893, the Trade Disputes Act 1906.

The construction or interpretation of statutes depends partly on the common law, partly on statute. The main rules of the •common law, as gathered from the best authorities, are these:

1 This opinion carries out to a certain extent the view of Locke, who in article 79 of his Carolina Code recommended the determina- tion of acts of the legislature by effluxion of time after a hundred years from their enactment.

(1) Statutes are to be construed, not according to their mere letter,

but according to the intent and object with which they were made.

(2) The relation of the statute to the common law is to be considered. In the words of the resolution of the Court of Exchequer in Heydon's case, 3 Coke's Rep. 7, the points for consideration are: " (a) What was the common law before the making of the act ? (b) What was the mischief and defect against which the common law did not provide? (c) What remedy the parliament hath resolved and appointed to cure the disease of the Commonwealth? (

1894.

The earlier acts are generally simple in character and language, and comparatively few in number. At present the number passed every session is enormous; in the session of 1906 it was 58 general and 212 local and personal acts, the former being under the average. Without going as far as to concede with an eminent legal authority that of such legislation three-fourths is unnecessary and the other fourth mischievous, it may be admitted that the immense library of the statutes would be but a trackless desert without trustworthy guides. Revision of the statutes was evidently regarded by the legislature as desirable as early as 1563 (see the preamble to 5 Eliz. c. 4). It was demanded by a petition of the Commons in 1610. Both Coke and Bacon were employed for some time on a commission for revision. In 1861 was passed the first of a long series of Statute Law Revision Acts. The most important action, however, was the nomination of a revision committee by Lord Chancellor Cairns in 1868, the practical result of which has been the issue of an edition of the Revised Statutes in eighteen volumes, bringing the revision of statute law down to 1886. This edition is of course subject to the disadvantage that it becomes less accurate every year as new legislation appears. A Chronological Table and Index of the Statutes which are still law is published from time to time by the council of law reporting.

The chief editions of the British statutes are the Statutes of the Realm printed by the king's printers, Ruffhead's and the fine folio edition issued from 18 10 to 1824 in pursuance of an address from the House of Commons to George III.

Authorities. — The safest authority is of course the Revised Statutes. Chitty's collection of Statutes of Practical Utility is a useful compilation. Among the earlier works on statute law may be mentioned the readings and commentaries on statutes by great lawyers, such as the second volume of Coke's Institutes, Bacon's

Reading on the Statute of Uses, Barrington's Observations on the more ancient Statutes from Magna Carta to the 21 Jac. I. c. 27 (5th ed., 1796), and the Introduction to Blackstone's Commentaries. Among the later works are the treatises of Dwarris (2nd ed., 1848) and Sir P. B. Maxwell (3rd ed., 1905) and Hardcastle (3rd ed., 1901). On the interpretation of statutes, see Lord Farnborough, The Machinery of Parliamentary Legislation (1881); Sir C. P. Ilbert, Legislative Methods and Forms (1 901); Sir H. Thring, Practical Legislation, or the Composition and Language of Acts of Parliament (1902).

Scotland. The statutes of the Scottish parliament before the union differed from the English statutes in two important respects: they were passed by the estates of the kingdom sitting together and not in separate houses, and from 1367 to 1690 they were discussed only after preliminary consideration by the lords of the articles. 2 An act

2 The Scottish parliament from an early date discharged its functions by the aid of two committees known as the legislative and judicial committees. The legislative committee were termed lords of the articles and existed until 1688. The judicial committee were called lords auditors.

of the Scottish parliament may in certain cases cease to be binding by desuetude. " To bring an act of parliament like those we are dealing with " (i.e. the Sabbath Profanation Acts) " into what is called in Scots law the condition of desuetude, it must be shown that the offence prohibited is not only practised without being checked but is no longer considered or dealt with in this country as an offence against law " (Lord Justice General Inglis in Bute's case, I Couper's Rep., 495). Acts of the imperial parliament passed since the union extend in general to Scotland, unless that country be excluded from their operation by express terms or necessary implication. Scottish acts are cited thus, 1678, c. 10. The best edition is that issued by order of the Treasury, 1844-1875. An edition of the revised statutes has been facilitated by the repeal of obsolete statutes by the Statute Law Revision (Scotland) Act 1906.

Ireland. Originally the lord deputy appears to have held parliaments at his option, and their acts were the only statutory law which applied to Ireland, except as far as judicial decisions had from

motives of policy extended to that country the obligation of English statutes. In 1495 the act of the Irish parliament known as Poynings' Law or the Statute of Drogheda enacted that all statutes lately made in England be deemed good and effectual in Ireland. This was construed to mean that all statutes made in England prior to the 18 Hen. VII. were valid in Ireland, but none of later date were to have any operation unless Ireland were specially named therein or unless adopted by the Irish parliament (as was done, for instance, by Yelverton's Act, 21 & 22 Geo. III. c. 48 (I.). Another article of Poynings' Law secured an initiative of legislation to the English privy council, the Irish parliament having simply a power of accep- tance or rejection of proposed legislation. The power of the parlia- ment of Great Britain to make laws to bind the people of Ireland was declared by 6 Geo. I. c. 5. This act and the article of Poynings' Law were repealed in 1782, and the short-lived independence of the parliament of Ireland was recognized by 23 Geo. III. c. 28. The application of acts passed since the union is the same as in the case of Scotland. Divorce acts are still passed for Ireland (see Divorce). Irish acts are cited thus, 26 Geo. III. c. 15 (I.) or (Ir.). The best edition is that issued in twenty volumes pursuant to an order of the earl of Halifax, lord-lieutenant in 1762. A volume of revised statutes was published in 1885. The earliest that is still law is one of 1459.

British Colonies and Dependencies. Acts of the imperial parliament do not extend to the Isle of Man, the Channel Islands or the colonies, unless they are specially named therein. By the Colonial Laws Validity Act 1865 (" the charter of colonial legislative independence ") any colonial law repugnant to the provisions of any act of parliament extending to the colony is void to the extent of such repugnancy, and no colonial law is to be void by repugnancy to the law of England unless it be repugnant to such an act of parliament. For colonies without representative legislatures the Crown usually legislates, subject to the consent of parliament in particular cases. Examples of imperial legislation for the colonies in general are the Colonial Stock Act 1877, and the Colonial Courts of Admiralty Act 1890. For imperial acts dealing with particular colonies may be cited the British North America Act 1867, and the Commonwealth of Australia Constitution Act 1900. A colony is defined for the purposes of imperial legislation by the Interpretation Act 1889, s. 18. In many of the colonies, as in Canada, the constitutionality of an act of the colonial legislature is, as in the United States, a matter for the determination of the local court or of the judicial committee of the privy council on appeal.

United Slates. By the constitutions of many states English statute

law, as it existed at the time of the separation from England, and as far as it is applicable, has been adopted as part of the law of the states. The United States and the state are not bound by an act of Congress or a state law unless specially named. The states legislate for themselves within the limits of their own constitution and that of the United States. Here appears the striking difference between the binding force of a statute of the United Kingdom and an act passed by Congress or a state legislature. In the United Kingdom parliament is supreme; in the United States an act is only of authority if it is in accor- dance with the constitution. The courts may declare an act void if it contravene the constitution of the United States or of a state, so that practically the Supreme Court of the United States is the ultimate legislative authority. The restrictions upon Federal legislation in the constitution of the United States provide against the suspension of the writ of habeas corpus except in case of rebellion or invasion, the passing of a bill of attainder or ex post facto law, the imposition of capitation or

other direct tax, unless in proportion to the several states, or of a tax or duty on exports, the preference of the ports of one state over those of another, the drawing of money from the treasury except by appropriations made by law, and the grant of a title of nobility. Constitutional amend- ments contain further limitations, e.g. the taking of private property for public use without just compensation, and the abridging of the right of citizens on account of race, colour or previous condition of servitude. State legislation is limited by s. 10: " No state shall . . . make anything but gold and silver coin a tender in payment of debts, pass any bill of attain- der, ex post facto law, or law impairing the obligation of contracts, or grant any title of nobility. " The section further forbids imposition of duties on imports or exports or any duty of tonnage without consent of Congress. State constitutions often contain further restrictions; among the more usual are pro- visions against laws with a retrospective operation, or impairing the obligation of contracts, or dealing with more than one subject to be expressed in the title. The time when a statute is to take effect after its passing is often fixed by state constitu- tions. The statutes of the United States were revised under the powers of an act of Congress passed in 1874 (sess. i. c. 333), and the volume of Revised Statutes was issued in 1875. There was a second edition in 1878 and several supplements have appeared since that date. Many of the states have also issued revised editions of their statutes. The rules of construction are in general agreement with those adopted in England. In some states the referendum has been introduced in certain cases. Continental European Countries. In

most European countries there is a code, the existence of which makes the system of legislation hardly comparable to ours. The assent of two chambers and of the monarch, or president, is generally necessary. Greece is an exception; it is the only state in Europe with one chamber.

International Law. The term " statute " is used by international jurists and civilians mostly on the continent of Europe to denote the whole body of the municipal law of the state. In this sense statutes are either real, personal or mixed. A real statute is that part of the law which deals directly with property, whether movable or immovable. A personal statute has for its object a person, and deals with questions of status, such as marriage, legitimacy or infancy. A mixed statute affects both property and person, or, according to some authorities, it deals with acts and obligations. Personal statutes are of universal validity; real statutes have no extra-territorial authority. The determination of the class under which a particular law ought to fall is one of great difficulty, and one in which there is often a conflict of legal opinion. On the whole the division appears to have created more difficulties than it has solved, and it is rejected by Savigny as unsatisfactory.

See Story, Conflict of Laws, §§ 12-16; Phillimore, International Law, vol. iv. ch. xvi. ; Pillet, Principes de droit international prive, chs. xi. and xii. (J. W.)

STATUTE MERCHANT and STATUTE STAPLE, two old

forms of security, long obsolete in English practice, though references to them still occur in some modern statutes. The former security was first created by the Statute of Acton Burnell (1283) and amplified by the Statute of Merchants (1285) — whence its name — and the latter by an act of 1353, which provided that in every staple (i.e. public mart) the seal of the staple should be sufficient validity for a bond of record acknowledged and witnessed before the mayor of the staple. They were originally permitted only among traders, for the benefit of commerce, but afterwards extended by an act of Henry VIII. (1532) to all subjects, whether traders or not. The creditor under either form of security was allowed to seize the goods and hold the lands of a defaulting . debtor until satisfaction of his debt. While he held the lands he was termed tenant by statute merchant or by statute staple. In addition to the loss of his goods and lands the debtor was liable to be imprisoned. Statute merchant, owing to the summary method of enforcing payment, was some- times known as " pocket judgment." Both were repealed by the Statute Law Revision

Act 1863.

STAUNTON, SIR GEORGE THOMAS, Bart. (1781-1859), English traveller and Orientalist, was born near Salisbury on the 26th of May 1 78 1. He was the son of Sir George Leonard

Staunton (1737-1801), first baronet, diplomatist and Orientalist, and in 1792 accompanied his father, who had been appointed secretary to Lord Macartney's mission to China, to the Far East. He acquired a good knowledge of Chinese, and in 1798 was appointed a writer in the East India Company's factory at Canton, and subsequently its chief. In 1805 he translated a work of Dr George Pearson into Chinese, thereby introducing vaccination into China. In 1816 he proceeded as second com- missioner on a special mission to Pekin with Lord Amherst and Sir Henry Ellis. Between 1818 and 1852 he was M.P. for several English constituencies, finally for Portsmouth. He was a member of the East India Committee, and in 1823, in con- junction with Henry Thomas Colebroke founded the Royal Asiatic Society. He died on the 10th of August 1859.

His publications include translations of Ta Tsing leu lee, being the Fundamental Laws of China (1810), the first Chinese book trans- lated into English, and of the Narrative of the Chinese Embassy to the Khan of the Tourgouth Tartars (1821); Miscellaneous Notices Relating to China and our Commercial Intercourse with that Country (1822); Notes of Proceedings and Occurrences during the British Embassy to Peking (1824); Observations on our Chinese Commerce (1850). For the Hakluyt Society he edited Gonzalez de Mendoza's History of the Great and Mighty Kingdom of China.

STAUNTON, HOWARD (1810-1874), English Shakespearian scholar and writer on chess, supposed to have been a natural son of Frederic Howard, fifth earl of Carlisle, was born in 1 8 10. He is said to have studied at Oxford, but if so, he never matriculated. Settling in London he soon spent the small fortune left him under his father's will and began to make his living by journalism. He gave much of his attention to the study of the English dramatists of the Elizabethan age. As a Shakespearian commentator he showed the qualities of acute- ness and caution which made him excel in chess. He possessed, moreover, a thorough mastery of the literature of the period, shown in his papers in the Athenaeum on " Unsuspected Cor-

ruptions of Shakespeare's text," begun in October 1872.' These formed part of the materials which he intended to utilize in a proposed edition of Shakespeare which never became an accomplished fact. In 1864 he published a facsimile of the Shakespeare folio of 1623, and a facsimile edition of Much Ado about Nothing, photolithographed from the quarto of 1600. He died in Lon- don on the 22nd of June 1874. Staunton's services to chess literature were very great, and the game in England owes much of its later popularity to him, while for thirty years he was the best player in England, perhaps in the world. For his important works on the subject see Chess.

STAUNTON, an independent city and the county-seat of Augusta county, Virginia, U.S.A., about 135 m. N.W. of Rich- mond. Pop. Cr89o) 6975; (1900) 7289, including 1828 negroes and 149 foreign-born; (1910) 10,604. Staunton is served by the Chesapeake & Ohio and the Baltimore & Ohio railways. It lies between the Alleghany Mountains and the Blue Ridge, on a plateau about 1380 ft. above sea-level, in a fertile farming country with good pasture on the hillsides. In Staunton are a county court-house, the Western State hospital for the insane (1828), the Virginia school for the deaf and the blind (1839), the King's Daughters' hospital (1895), Dunsmore business college, Staunton military academy, the Mary Baldwin sem- inary, formerly Augusta female seminary (founded in 1842) and Stuart Hall (for girls), which was founded in 1843, was incorporated in 1845, an d w &s reincorporated in 1907 under its present name in honour of Mrs J. E. B. Stuart, wife of the Confederate cavalry leader, who was its principal in 1879-1898. One mile east of Staunton is a U.S. national military cemetery with graves of 753 Union soldiers killed at Port Republic, Cross Keys and Piedmont; and west of the city is a Confederate cemetery with a memorial monument. The municipality owns the waterworks, the electric-lighting plant and the opera house An interesting feature of the city government is the employment of a business manager (elected annually by the city council), whose duties are in general similar to those of the business manager of a large corporation — e.g. he buys the city's supplies and has general supervision over the city improvements.

The first settlement in this vicinity was on Lewis Creek, about 2 m. east of the city, in 1 73 1 . A county court-house was built here in 1745, and the name Staunton, in honour of the wife of Sir William Gooch (then lieutenant-governor), whose maiden name was Staunton, was used in 1 748-1 749, but Staunton was not incorporated as a town until 1761. It was chartered as a city in

1870, and then became a municipality independent of the county. The corporate limits of the city were extended in 1965 and, as its population thus became more than 10,000, Staunton was made a city of the first class.

STAUROLITE, a mineral consisting of basic aluminium and ferrous iron silicate with the formula HFeAl 5 Si 2 0i 3 . The material is, however, usually very impure, the crystals enclosing sometimes as much as 30 or 40% of quartz and other minerals as well as carbonaceous matter. Crystals are orthorhombic and have the form of six-sided prisms. Interpenetrating cruci- form twinned crystals are very common and characteristic; they were early known as pierres de croix or lapis crucifer, and the name staurolite, given by J. C. Delametherie in 1792, has the same meaning (Greek, aravpos, a cross, and Xi0os, a stone). In fig. 1 the twin-plane is (032) and the two prisms intercross

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Fig. 1. 'Fig. 2.

Twinned Crystals of Staurolite.

at an angle of 91 22'; in fig. 2 the twin-plane is (232) and the prisms intercross at nearly 6o°. The mineral is translucent to opaque and dark reddish-brown in colour; it thus has a certain resemblance to garnet, and on this account has been called grenatite. Waterworn pebbles of material sufficiently trans- parent for cutting as gem-stones are occasionally found in the diamantiferous sands of Brazil. The hardness is 7ˆ and the specific gravity 3-75. Staurolite is a characteristic mineral of crystalline schists, and it is also a product of contact-meta- morphism. Large twinned crystals with rough surfaces a.re found in mica-schist in Brittany and at several places in the United States, e.g. in Fannin county, Georgia. Untwinned crystals, translucent and of a rich brown colour (grenatite), are abundant in the silvery white paragonite-schist of Monte Campione, St Gothard. (L. J. S.)

STAVANGER, a seaport of Norway, capital of Stavanger amt (county), on the west coast in 59° N. (that of the Orkney Islands and northern Labrador). Pop. (1900), 30,541. It lies on the south side of the Bukken Fjord, and has a picturesque harbour well sheltered by islands. The town is one of the oldest in Norway, founded in the 8th or 9th century, but the present town is modern, though narrow, winding streets and wooden houses give it an antique appearance. It became the seat of a bishopric in the 13th century. Though the bishop's see was removed to Christiansand in 1685, the Romanesque cathedral church of St Swithun, founded by the English bishop Reinald in the end of the nth century, and rebuilt after being burned down in 1272, remains, and, next to the cathedral of Trondhjem, is the most interesting stone church in Norway. There is an ornate painted pulpit of carved wood (1658). The old episcopal palace of Kongsgaard is now a Latin school. There are a theatre, an interesting museum of antiquities, natural history and art; and a picturesque park (Bjergsted). The industries of the town and its environs (Sandnaes, &c.) are prosperous, including factories for preserved foods, woollens and linens, lime, iodine from seaweed, and domestic commodities. The

fisheries are important — for herring, mackerel, sprats, cod, salmon, lobsters and anchovies. On Rennes Island in the fjord, over against the town, there is a Cheviot sheep-breeding farm under government auspices. The imports consist prin- cipally of coal, salt, grain and flour, groceries, textiles, wood, and mineral oils. The most important export is fish, other items being seaweed, marble, preserved foods, butter and margarine and infusorial earth.

Stavanger is the first port of call for northward-bound pas- senger steamers from Hull and Newcastle, and has regular services from all the Norwegian coast towns, from Hamburg, &c. A rail- way runs south along the wild and desolate coast of Jaederen, one of the few low and unprotected shores in Norway, the scene of many wrecks. Stavanger commands a considerable tourist traffic. It is the starting-point of a favourite tour, embracing the fine valley of the Sand River, the great Lake Suldal and the Bratlandsdal. The Lyse Fjord, a branch of the Bukken Fjord, is a fine narrow inlet enclosed by precipitous mountains. Stavanger is the birthplace of Kjelland the novelist (1849).

STAVELEY, a town in the north-western parliamentary division of Derbyshire, England, 12 m. S.E. of Sheffield, on the Midland and the Great Central railways. Pop. (1901), 11,420. It lies in the valley of the Rother, in a populous industrial district, devoted chiefly to the working of coal and iron; while there are manufactures of iron goods and brushes in the town. The church of St John the Baptist is Early English, with much Perpendicular and modern alteration; it contains a number of interesting early monuments.

STAVELOT, an ancient town of Belgium, in the south-east of the province of Liege. Pop. (1904), 5037. Here Charles Martel gained a signal victory over Neustria in 719. A monas- tery had been established there half a century earlier by St Remade, bishop of Tongres. The prince-abbot of Stavelot exercised secular authority over many towns in the Ambleve and Warche valleys, including Malmedy (now in Prussia), and had a seat in the old German Diet. In 1815 the treaty of Vienna broke up the Stavelot principality, giving half to Prussia and half to the Netherlands. Only the tower of the old Benedic- tine abbey remains, and the shrine of St Remade is preserved in the parish church.

STAVROPOL, a government of northern Caucasia, Russia, having an area of 26,492 sq. m. and bounded by the govern- ment of Astrakhan and the territory of the Don Cossacks on the N., by Kuban on the W. and by Terek on the S. and E. It occupies the eastern part

of the broad steppes which stretch away north from the foot of the main chain of the Caucasus. The western part of the government is diversified by a broad undulating swelling, 1500 to 2000 ft. above sea-level; in the southern part of this swelling, and principally in Terek, there is a group of sixteen mountains, the Beshtau, 2800 to 4600 ft. in height, which are considered by H. Abich to be a porphyritic upheaval at the point of intersection of the two predominant orographical lines in the Caucasus (south-west to north-east and south-east to north-west). Northward and eastward of these heights are extensive steppes, 200 to 400 ft. above the sea, having gentle slopes both to the north (to the depression of the Manych) and to the east (towards the low, arid shores of the Caspian littoral).

Stavropol is chiefly drained by the Kuma and its tributaries (Karamyk and Buivola), its basin being the most fertile part of the government, but the evaporation is so great that the Kuma never reaches the Caspian except in spring. The Manych is not so much a river as a series of lakes, occupying a depression which formerly was a connecting channel between the Black Sea and the Caspian. This channel has two slopes, the eastern sometimes discharging its scanty water-supply into the Kuma, while on the western slope the elongated lakes which fill up the depression drain into the Don, reaching it however only during spring. Two Yegorlyks (Great and Middle), the Kalaus, and the Chogra (temporary tributaries of the Manych), drain the western part of Stavropol. On the whole, irrigation is restricted, and in the eastern steppes water is supplied only by cisterns. Besides the lakes of the Manych depression, there are many smaller salt lakes along the Caspian. Timber is scarce, <~ven in the hilly tracts.

The climate is marked by rapid changes of temperature. The

dry east winds are sometimes very violent in the spring and early summer, blowing the seeds out of the fields, and even destroying in a few days all existing vegetation. In July and August they continue for several weeks in succession, and choke the air with dust. The average temperatures at the town of Stavropol (altitude 2030 ft.) are much lower than one might expect in that latitude; that for the year is 47 Fahr., that for January 24°, and that for August 68°. The rainfall at the same place is 28 2 in., but other parts of the govern- ment are much worse off in this respect, the yearly rainfall being only II to 21J in.

There is a great lack of forests, which are found only near the town of Stavropol and alongside of the main rivers. In the prairies the only arboreal vegetation is tamarisks and the dwarf almond tree.

Altogether, except in the hilly parts of the government, the flora and fauna differ to a great extent from the flora and fauna of other parts of the Caucasus. Both resemble, on the one hand, those of Central Asia in such features as the presence, among mammals and birds, of the antelope Saiga tatarica, L., the steppe fox Vulpes corsac, Pallas, and the lark Melanocorypha tatarica, Pallas, and among plants of, firstly Tamarix Pallasii, Statice caspia and Stipa lessingiana (all characteristic of the arid prairies beyond the Urals), and secondly of species of Salsola, Salicornia, Sueda, Artemisia, Kochia and Camphorosma, all characteristic of the salt steppes of Asia; on the other hand, both flora and fauna have many features in common with the prairies of south Russia.

As regards geology, the whole of the government is covered with Tertiary and post-Tertiary deposits. Lower Miocene, Middle-Mediterranean deposits, and Sarmatian clays, limestones and sandstones crop out over nearly one-half of the surface of the government, namely, in its higher portion, while the remainder is buried under loess and fluviatile and lacustrine deposits. A narrow zone, now a low plain almost devoid of vegetation, is overlain with the so-called Caspian deposits.

The population is rapidly increasing, particularly from natural causes, and partly in consequence of immigration. In 1886 it was 702,635; in 1897, 879,758; and in 1906 was estimated at 1,023,700. The average density of the population is only 44 per sq. m., but in some districts it rises to 87. Russians form 90% of the population, the other races being Kalmucks, Turkomans, Nogai Tatars, Armenians, Georgians, Germans, Poles, &c. More than four-fifths of the population (81 %) are Russian peasants. The nomad popula- tion occupies, however, more than one-third of the territory. There are four ordinary districts, the centres of administration in which are Stavropol, Alexandrovsk, Medvyezhinsk and Praskoveya, the chief town of the district of Novo-grigoryevsk ; besides these the territory occupied by the nomads is divided into three districts, Bolshe-Derbetovskiy, Turkoman and Achikulak.

Agriculture is the most important occupation of the settled popula- tion, and so large is the harvest that no less than 16,000 labourers come annually from European Russia to assist in gathering in the crops. The peasants own some 48 % of the total area, private persons 7 %, the imperial government 2 % and the Crown less than 2 %. Agriculture is most successful on the wide prairie lands, where over 3,250,000 acres are annually under cereals. The principal crops are rye, wheat, oats, barley and potatoes. Melons, water- melons, flax

and sunflowers are widely cultivated. Modern agri- cultural implements are in general use. Vineyards stretch for close upon 100 m. along the Kuma, and nearly 800,000 gallons of wine of an inferior quality are obtained annually. The factories are limited to flour-mills, oil-mills, distilleries, tanneries and candle works, and a few domestic industries are carried on in the villages. Considerable quantities of grain, flax, wool and hides are exported, and the fairs are very animated. Large amounts of corn are exported both to the mountainous districts of Caucasia and to Russia (Rostov- on-the-Don). Livestock breeding is engaged in very largely, not only by the Kalmucks, Turkomans and Nogai Tatars, but also by the Russians.

The northern slopes of the Caucasus began to be colonized by the Russians at a very early period, and as early as the nth century part of the territory now occupied by Stavropol was known to Russian annalists as the Tmutarakan principality, which had Russian princes. A new attempt to colonize North Caucasia was made in the 1 6th century, under Ivan the Terrible, who married a Kabardian princess. This was again unsuccessful, and it was not till 171 1 that Russia began regularly to colonize the territory by Cossack settle- ments. Kizlyar was founded in 1736, Stavropol in 1776 or 1777. Vast tracts of lands were given by Catherine II. to her courtiers, who began to people them with serfs from Russia.

(P. A. K.; J. T. Be.)

STAVROPOL, a town of southern Russia, capital of the govern- ment of the same name, situated on a plateau 2030 ft. above the sea, on the northern slope of the Caucasus, 200 m. N.W. of Vladikavkaz. It is connected by rail (247 m.) with Rostov- on-the-Don. Although founded only in 1776, it has grown rapidly, and had in 1885 a population of 35,561, and of 46,965 in 1900. Stavropol is an episcopal see of the Orthodox Greek Church, and one of the best-built provincial towns of the

Russian Empire, having wide streets, and houses mostly of stone, with large gardens surrounding the houses. There are public libraries, a people's palace and several scientific societies. Stavropol has flour-mills and various small fac- tories. Large numbers of cattle are sent to Moscow and St Petersburg, while cereals, tallow and sheepskins are exported to Russia, and manufactured wares imported.

Armenian, Georgian and Persian merchants carry on a lively trade in local wares.

STAWELL, SIR WILLIAM FOSTER (1815-1880), British colonial statesman, was the son of Jonas Stawell, of Old Court, in the county of Cork, and of Anna, daughter of the Right Rev. William Foster, bishop of Clogher. He was born on the 27th of June 181 5, was educated at Trinity College, Dublin, studied law at King's Inn, Dublin, and Lincoln's Inn, and was called to the Irish bar in 1839. He practised in Ireland until 1842, and then, making his home in Australia, was admitted to the Melbourne bar in 1843. He engaged extensively in pastoral pursuits, and had sheep stations at Natte Yallock, on the banks of the river Avoca, and in the neighbourhood of Lake Wallace, near the South Australian border. For many years he enjoyed the leading practice at the local bar, and when the Port Phillip district of New South Wales was separated from the parent colony, and entered upon an independent existence as the colony of Victoria, Mr Stawell accepted the position of attorney- general and became a member of the executive and legislative councils. A few weeks after his appointment gold was dis- covered, and to Mr Stawell fell the arduous duties of creating a system of government which could cope adequately with the difficulties of the position. He had to establish a police force, frame regulations for the government of the goldfields, appoint magistrates and officials of every grade, and protect life and property against the attacks of the hordes of adventurers, many of desperate character, who landed in Victoria, first from the neighbouring colonies, and later from Europe and America. It was very much owing to the firm administration of Mr Stawell that, at a time when the government was weak and a large section of the newcomers impatient of control, lynch law was never resorted to. He had very little assistance for some time from any of his colleagues, and until the executive council was strengthened by the admission of Captain (afterwards Sir Andrew) Clarke and Mr H. C. E. Childers Mr Stawell was the brains as well as the body of the administration. The success of his policy was upon the whole remarkable. In the legislature he was sometimes opposed, and at other times assisted, by Mr (after- wards Sir John) O'Shanassy, who was the leader of the popular party, and between them they managed to pass a number of statutes which added greatly to the prosperity of the colony. Mr Stawell was indefatigable in the discharge of his duties, and extraordinary stories are told of the long journeys on horseback to visit distant outposts which he would take after being all day long in the law courts or in the council chamber. Mr Stawell bore an active part in drafting the Constitution Act which gave to

Victoria representative institutions and a re- sponsible ministry, instead of an executive appointed and removable by the governor and a legislature in which one-third of the members were chosen by the Crown. At the first general election after the new constitution in 1856 Mr Stawell was returned as one of the members for Melbourne, and became the attorney -general of the first responsible ministry. In 1857, on the resignation of the chief justice, Sir William A'Beckett, he succeeded to the vacant post, and was created a knight-bachelor. He administered the government of Victoria in 1873, 1875-1876, and 1884. Sir William never left Australia from his arrival in 1843 till 1872, when he paid short visits to the neighbouring colonies and New Zealand, and 1873, when he returned to Europe on two years' leave of absence. He took a very deep interest in the proceedings of the Church of England, and was a member of the synod. On his retirement from the bench in 1886 he was created K.C.M.G. He died at Naples in 1889. In 1856 he had married Mary Frances Elizabeth, only daughter of W. P. Greene, R.N. (G. C. L.)

STAWELL, a municipality of Borung county, Victoria, Australia, 179 m. by rail W.N.W. of Melbourne. Pop. (1901), 5296. The quartz reefs of the Pleasant Creek goldfields near the town are worked at very deep levels and there axe several extensive cyanide plants on the reef. In the adjacent Grampians, which are connected by rail with Stawell, there are numerous freestone quarries. Wheat is extensively grown in the vicinity and also large numbers of vines, for which the soil is particularly adapted. Stawell is the changing station on the line from Melbourne to Adelaide, and has large engine-houses and repairing shops.

STAY BARS, in architecture, saddle bars passing through the mullions in one length across the whole window, and secured to the jambs on each side (see Saddle).

STEAD, WILLIAM THOMAS (1849-), English journalist, was born at Embleton, Northumberland, on the 5th of July 1849, the son of a Congregational minister. He went to school at Wakefield, but was early apprenticed in a merchant's office at Newcastle-on-Tyne; he soon gravitated however, into journal- ism, and in 1871 became editor of the Darlington Northern Echo. In 1880 he went to London to be assistant editor of the Pall Mall Gazette under John Morley, and when the latter retired he became editor (1883-1889). Up to 1885 he had distinguished himself for his vigorous handling of public affairs, and his brilliant modernity in the presentation of news. He introduced the " interview," made a feature of the Pall Mall " extras " (see also Newspapers: London), and his enterprise and originality

exercised a potent influence on contemporary journalism and politics. His enthusiasm, however, carried him too far when in 1885 he entered upon a crusade against vice by pub- lishing a series of articles on the " Maiden Tribute of Modern Babylon." Though his action undoubtedly furthered the passing of the Criminal Law Amendment Act, it made his position on the paper impossible; and his imprisonment at Holloway for three months on a charge arising out of his crusade made his connexion with the whole subject a source of considerable prejudice. On leaving the Pall Mall he founded the monthly Review of Reviews (1890), and his abundant energy and facile pen found scope in many other directions in journalism of an advanced humanitarian type. He started cheap reprints (Penny Poets and Prose Classics, &c), conducted a spiritualistic organ, called Borderland (1893-1897), in which he gave full play to his interest in psychical research; and became an enthusiastic supporter of the peace movement, and of many other movements, popular and unpopular, in which he impressed the public gener- ally as an extreme visionary, though his practical energy was recognized by a considerable circle of admirers and pupils. At the time of the Boer War of 1899 he threw himself into the Boer cause and attacked the government with characteristic violence. Yet amid all his unpopularity, and all the suspicion and opposi- tion engendered by his methods, his personality remained a forceful one both in public and private life. He was an early imperialist dreamer, whose influence on Cecil Rhodes in South Africa remained of primary importance; and many politicians and statesmen, who on most subjects were completely at variance with his ideas, nevertheless owed something to them. Mr Rhodes made him bis confidant, and was inspired in his will by his suggestions; and Mr Stead was intended to be one of Mr Rhodes's executors, though his name was struck out after the Boer War (see his Last Will and Testament of C. J. Rhodes, 1902). The number of his publications gradually became very large, as he wrote with facility and sensational fervour on all sorts of subjects, from The Truth about Russia (1888) to // Christ came to Chicago (1893), and from Mrs Booth (1900) to The Americanization of the World (1902). In private life his keen sense of merit and kindly interest influenced many aspirants to journalism and literature.

STEAK, a thick slice or piece of meat cut for frying, broiling or stewing. The word is apparently derived from Icel. steik, used in the same sense, which meant properly roasted meat, from steikja, to roast, that is, placed on a stick or peg of wood before the fire, stika, stick, cf. Swed. stek; Dan. steg, roast meat. A

steak may be cut from any meat or fish, but the best-known is a " beef-steak," cut properly from the rump a " rump-steak," or part of the loin a " tenderloin." A " porter-house " steak is a choice cut of steak from the loin, so named apparently first in New York from a well-known " porter-house," an eating- house where chops, steaks, &c, and porter or stout were served, at which these steaks were a speciality. A steak grilled between two other steaks, which are not served after the cooking is finished, is also sometimes called a " porter-house" steak.

STEAM (O. Eng. steam, vapour, smoke, cf. Du. stoom; the origin is unknown), water-vapour. Dry steam is steam free from mechanically mixed water particles; wet steam, on the other hand, contains water particles in suspension. Saturated steam is steam in contact with liquid water at a temperature which is the boiling point of the water and condensing point of the steam ; superheated steam is steam out of contact with water heated above this temperature. For theoretical considerations see Vaporization, and for the most important application see Steam Engine; also Water.

STEAM ENGINE, i. A steam engine is a machine for the conversion of heat into mechanical work, in which the working substance is water and water vapour. The working substance may be regarded from two points of view. Thermodynamically it is the vehicle by which heat is conveyed to and through the engine from the hot source (the furnace and boiler). Part of this heat suffers a transformation into work as it passes through, and the remainder is rejected, still in the form of heat. Mechani- cally the working substance is a medium capable of exerting pressure, which effects this transformation in doing work by means of the changes of volume which it undergoes in the operation of the machine. Regarded as a thermodynamic device, the function of the engine is to get as much work as possible from a given quantity of heat or, to go a step further back, from the combustion of a given quantity of fuel. Accord- ingly, a question of primary importance is what is called the efficiency of the engine, which is the ratio of the work done to the heat supplied. Before, however, proceeding to discuss the steam engine in this aspect, or treating of the mechanics of its modern forms, it may Tse useful to give a brief historical sketch of its early development as an industrial appliance. In any such sketch the chief share of attention must necessarily be given to the work of James Watt. But a process of

evolution had been going on before the time of Watt which prepared the steam engine for the immense improvements it received at his hands. His labours stand in natural sequence to those of Thomas Newcomen, and Newcomen's to those of Denis Papin and Thomas Savery. Savery's engine in its turn was the reduc- tion to practical form of a contrivance which had long before been known as a scientific toy. The most modern type of all, the steam turbine of C. A. Parsons, is a new departure which has but little to connect it directly with the past; but even the steam turbine not only profits by the inventions of Watt, but

in its characteristic feature finds crude prototypes in apparatus which employed the kinetic energy of jets of steam.

2. One of these, indeed, is mentioned amongst the ear- Hero, 130 liest notices we B,ft have of any heat

engine. In the Pneumatica of Hero of Alexandria (c. 130 B.C.) there is described the aeolipile, which is a primitive steam reaction tur- bine, consisting of a spherical vessel pivoted on a central axis and supplied with steam through one of the pivots. The steam escapes by bent pipes facing tangentially in opposite directions, at opposite ends of a diameter perpendicular to the axis. The globe revolves by

Fig. i. — Hero's Apparatus, 130 B.C.

reaction from the escaping steam just as a Barker's mill is driven by escaping water. Another apparatus described by Hero (fig. i) 1 is interesting as the prototype of a class of engines which long afterwards became practically important. A hollow altar containing air is heated by a fire kindled on it; the air in expanding drives some of the water contained in a spherical vessel beneath the altar into a bucket, which descends and opens the temple doors above by pulling round a pair of vertical posts to which the doors are fixed. When the fire is extinguished the air cools, the water leaves the bucket,. and the doors close. In another device a jet of water driven out by expanding air is turned to account as a fountain.

*3. From the time of Hero to the 17th century there is no progress to record, though here and there we find evidence that appliances like those described by Hero were used for trivial purposes, such as organ-blowing and the 160 f ° *' turning of spits. The next distinct step was the publication in 1 601 of a treatise on pneumatics by Giovanni Battista della Porta, in which he shows an apparatus similar to Herb's fountain, but with steam instead of air as the dis-*

placing fluid. Steam generated in a separate vessel passes into a closed chamber containing water, from which a pipe (open under the water) leads out. He also points out that the con- densation of steam in the closed chamber may be used to pro- duce a vacuum and suck up water from a lower level. In fact, his suggestions anticipate very fully the engine which a century later became in the hands of Savery the earliest commercially successful steam engine. In 161 5 Solomon de Caus gives a plan of forcing up water by a steam fountain which differs from Della Porta's only in having one vessel serve both as boiler and as displacement-chamber, the hot water being itself raised.

4. Another line of invention was taken by Giovanni Branca (1629), who designed an engine shaped like a water-wheel, to be driven by the impact of a jet of steam on its vanes, and in its turn to drive other mechanism for various useful purposes. But Branca's suggestion was for the time unproductive, and we find the course of invention reverting to the line followed by Della Porta and De Caus.

5. The next contributor is one whose place is not easily assigned. To Edward Somerset, second marquis of Worcester, appears to be due the credit of proposing, if not marquts of making, the first useful steam engine. Its object Worcester, was to raise water, and it worked probably like 1663 – Della Porta's model, but with a pair of displacement-chambers, from each of which alternately water was forced by steam from an independent boiler, or perhaps by applying heat to the chamber itself, while the other vessel was allowed to refill. Lord Worcester's description of the engine in art. 68 of his Century of Inventions (1663) is obscure, and no drawings are extant. It is, therefore, difficult to say whether there were any distinctly novel features except the double action; in particular, it is. not clear whether the suction of a vacuum was used to raise water as well as the direct pressure of steam.

6. The steam engine first became commercially successful in the hands of Thomas Savery, 2 who, in 1698, obtained a patent for a water-raising engine, shown in fig. 2. Steam is admitted to one of the oval vessels A, displacing ffo»°'' water, which it drives up through the check-valve

B. When the vessel A is emptied of water the supply of steam is stopped, and the steam already there is condensed by allowing a jet of cold water from a cistern above to stream over the outer surface of the vessel. This produces a vacuum and causes water to be sucked up through the pipe C and the valve D. Meanwhile steam has been

displacing water

1 From Greenwood's translation of Hero's Pneumatica.

- *Savery was borri probably in 1650 and died in 1715. See Sir E. Durning Lawrence's presidential address to the Royal Institution of Cornwall {Journ. of the Roy. Inst, of Cornwall, No. li.), repub- lished with a reprint of Savery's Miner's Friend of 1702, in which he discusses the originality of Savery's invention and dismisses. the claims put forward for Lord Worcester.*

Fig. 2.— Savery's Pump- ing Engine, 1698.

from the other vessel, and is ready to be condensed there. The valves B and D open only upwards. The supplementary

boiler and furnace E are for feeding water to the main boiler; E is filled while cold and a fire is lighted under it; it then acts like the vessel of De Gaus in forcing a supply of feed- water into the main boiler F. The gauge cocks G, G are an inter- esting feature in detail. Another form of Savery's engine had only one dis- placement-chamber and worked intermittently. In the use of artificial means to condense the steam, and in the appli- cation of the vacuum so formed to raise water by suction from a level lower than that of the engine, Savery's engine was probably an improvement on Worcester's; in any case it found what Worcester's engine had failed to find — considerable employment in pumping mines and in raising water to supply houses and towns, and even to drive water-wheels. A serious difficulty which prevented its general use in mines was the fact that the height through which it would lift water was limited by the pressure the boiler and vessels could bear. Pressures as high as 8 or 10 atmospheres were employed — and that, too, without a safety-valve — but Savery found it no easy matter to deal with high-pressure steam; he complains that it melted his common solder, an& forced him, as Desaguliers tells us, " to be at the pains and charge to have all his joints soldered with spelter." Apart from this drawback, the waste of fuel was enormous, from the condensation of steam which took place on the surface of the water and on the sides of the displacement-chamber at each stroke; the consumption of coal was, in proportion to the work done, some twenty times greater than in a

good modern steam engine. In a tract called The Miner's Friend Savery alludes thus to the alternate heating and cooling of the water-vessel: " On the outside of the vessel you may see how the water goes out as well as if the vessel were transparent, for so far as the steam continues within the vessel so far is the vessel dry without and so very hot as scarce to endure the least touch of the hand. But as far as the water is, the said vessel will be cold and wet where any water has fallen on it; which cold and moisture vanishes as fast as the steam in its descent takes the place of the water." Before Savery's engine was entirely displaced by its successor, Newcomen's, it was improved by J. T. Desagu- liers, who applied to it the safety valve (invented by Papin), and substituted condensation by a jet of cold water within the vessel for the surface condensation used by Savery. To Savery is ascribed the first use of the term " horse power " as a measure of the performance of an engine.

7. So early as 1678 the use of a piston and cylinder (long before known as applied to pumps) in a heat-engine had been Cylinder suggested by Jean de Hautefeuille, who proposed and to use the explosion of gun-powder either to raise a

Piston piston or to force up water, or to produce, by the sub- Bngiae. se q Uen t cooling of the gases, a partial vacuum into which water might be sucked up. Two years later Christian Huygens described an engine in which the explosion of gun- powder in a cylinder expelled part of the gaseous contents, after which the cooling of the remainder caused a piston to descend under atmospheric pressure, and the piston in descending did work by raising a weight

the safety-valve as an adjunct to his " digester," suggested that the condensation of steam should be employed to make a vacuum under a piston previously raised by the expansion p ap i tt . of the steam. Papin 's was the earliest cylinder and piston steam engine, and his plan of using steam was that which afterwards took practical shape in the atmo- spheric engine of Newcomen. But his scheme was made unworkable by the fact that he proposed to use but one vessel as both boiler and cylinder. A small quantity of water was placed at the bottom of a cylinder and heat was applied. When the piston had risen the fire was removed, the steam was allowed to cool, and the piston did work in its down-stroke under the pressure of the atmosphere. After hearing of Savery's engine in 1705 Papin turned his attention to improving it, and devised a modified form, shown in fig. 3, in which the displacement-

Fig. 3. — Papin, 1705. chamber A was a cylinder, with a floating

diaphragm or piston on the top of the water to keep the water and steam from direct contact with one another. The water was delivered into a closed air-vessel B, from which it issued in a continuous stream, against the vanes of a water-wheel. After the steam had done its work in the displacement-chamber it was allowed to escape by the stop-cock C instead of being condensed. Papin's engine was, in fact, a non-condensing single-acting steam pump, with steam cylinder and pump cylinder in one. A curious feature of it was the heater D, a hot mass of metal placed in the dia- phragm for the purpose of keeping the steam dry. Among the many inventions of Papin was a boiler with an internal fire-box — the earliest example of a construction that is now almost universal. 1

9. While Papin was thus going back from his first notion of a piston engine to Savery's cruder type, a new inventor had appeared who made the piston engine a practical n ewc omen's success by separating the boiler from the cylinder Atmospheric and by using (as Savery had done) artificial means Engine, to condense the steam. This was Thomas New- comen, who in 1705, with his assistant, John Cawley, gave the steam engine the form shown in fig. 4. Steam admitted from the boiler to the cylin- der allowed the piston to be raised by a heavy counterpoise on the other side of the beam. Then the steam valve was shut and a jet of cold water entered the cylin- der and condensed the steam. The piston was consequently forced down by the pressure of the atmosphere and did work on the pump. The next entry of steam expelled the condensed water from the cylinder

Fig. 4. — Newcomen's Atmospheric Engine, 1705.

1 For an account of Papin's inventions see his Life and Corre- 8. In 1690 Denis Papin, who ten years before had irivented I spondence, by Dr E. Gerland (Berlin, 1881).

through an escape valve. The piston was kept tight by a layer of water on its upper surface. Condensation was at first effected by cooling the outside of the cylinder, but the accidental leakage of the packing water past the piston showed the advan- tage of condensing by a jet of injection water, and this plan took the place of surface condensation. The engine used steam whose pressure was little if at all greater than that of the atmo- sphere; sometimes, indeed, it was

worked with the manhole lid off the boiler.

10. About 171 1 Newcomen's engine began to be introduced for pumping mines. It is doubtful whether the action was originally automatic, or depended on the periodical ValvVgeS. turning of taps by an attendant. The common story is that in 17 13 a boy named Humphrey Potter, whose duty it was to open and shut the valves of an engine he attended, made the engine self-acting by causing the beam itself to open and close the valves by suitable cords and catches. This device was simplified in 1718 by Henry Beighton, who suspended from the beam a rod called the plug- tree, which worked the valves by means of tappets. By 1725 the engine was in common use in collieries, and it held its place without material change for about three-quarters of a century in all. Near the close of its career the atmospheric engine was much improved in its mechanical details by John Smeaton, who built many large engines of this type about the year 1770, just after the great step which was to make Newcomen's engine obsolete had been taken by James Watt.

Compared with Savery's engine, Newcomen's had (as a pumping engine) the great advantage that the intensity of pressure in the pumps was not in any way limited by the pressure of the steam. It shared with Savery's, in a scarcely less degree, the defect already pointed out, that steam was wasted by the alternate heating and cooling of the vessel into which it was led. Though obviously capable of more extended uses, it was in fact almost exclusively employed to raise water — in some instances for the purpose of turning water-wheels to drive other machinery. Even contemporary writers complain of its vast " consumption of fuel," which appears to have been scarcely smaller than that of the engine of Savery.

11. In 1763 James Watt, an instrument maker in Glasgow, while engaged by the university in repairing a model of New- comen's engine, was struck with the waste of steam to which the alternate chilling and heating of the cylinder gave rise. He saw that the remedy, in his own words, would lie in keeping the cylinder as hot as the steam that entered it. With this view he added to the engine a new organ — an empty vessel separate from the cylinder, into which the steam should be allowed to escape from the cylinder, to be condensed there by the application of cold water either outside or as a jet. To preserve the vacuum in his condenser he added a pump called the air-pump, whose function was to pump from it the condensed steam and water of con- densation, as well as the air which would otherwise accumulate by leak- age or by being brought in with the steam or with the injection 'water. Then, as the cylinder

was no longer used as a condenser, he was able to keep it hot by clothing it with non- conducting bodies, and in particular by the use of a steam jacket, or layer of hot steam between the cylinder and an external casing. Further, and still with the same object, he covered in the top of the cylinder, taking the piston- rod out through a steam-tight stuffing-box, and allowed steam instead of air to press upon the piston's upper surface. The idea of using a separate condenser had no sooner occurred to Watt than he put it to the test by constructing the apparatus shown in fig. 5. There A is the cylinder, B a surface condenser, and C the air-pump. The cylinder was filled with steam above

watt,

1763.

Fir.. 5. — Watt's Experi- mental Apparatus.

the piston, and a vacuum was formed in the surface condenser B.

On opening the stop-cock D the steam rushed over from the cylinder and was condensed, while the piston rose and lifted a weight. After several trials Watt patented his improvements in 1769; they are described in his specification in the following words, which, apart from their immense historical interest, deserve careful study as a statement of principles which to this day guide the scientific development of the steam engine: —

" My method of lessening the consumption of steam, and conse- quently fuel, in fire-engines, consists of the following principles : —

" First, That vessel in which the powers of steam are to be em- ployed to work the engine, which is called the cylinder in common fire-engines, and which I call the steam-vessel, must, during the whole time the engine is at work, be kept as hot as the steam that enters it; first by enclosing it in a case of wood, or any other materials that transmit heat slowly; secondly, by surrounding it with steam or other heated bodies ; and, thirdly, by suffering neither water nor any other substance colder than the steam to enter ortouch it during that time.

" Secondly, In engines that are to be worked wholly or partially by condensation of steam, the steam is to be condensed in vessels distinct from the steam-vessels or cylinders, although occasionally communicating with them; these vessels I call condensers; and, whilst the engines are working, these condensers ought at least to be kept as cold as the air in the neighbourhood of the engines, by application of

water or other cold bodies.

" Thirdly, Whatever air or other elastic vapour is not condensed by the cold of the condenser, and may impede the working of the engine, is to be drawn out of the steam-vessels or condensers by means of pumps, wrought by the engines themselves, or other- wise.

" Fourthly, I intend in many cases to employ the expansive force of steam to press on the pistons, or whatever may be used instead of them, in the same manner in which the pressure of the atmosphere is now employed in common fire-engines. In cases where cold water cannot be had in plenty, the engines may be wrought by this force of steam only, by discharging the steam into the air after it has done its office. ...

" Sixthly, I intend in some cases to apply a degree of cold not capable of reducing the steam to water, but of contracting it considerably, so that the engines shall be worked by the alternate expansion and contraction of the steam.

" Lastly, Instead of using water to render the pistons and other parts of the engine air and steam tight, I employ oils, wax, resinous bodies, fat of animals, quicksilver and other metals in their fluid state."

The fifth claim was for a rotary engine, and need not be quoted here.

The " common fire engine " alluded to was the steam engine, or, as it was more generally called, the " atmospheric " engine of Newcomen. Enormously important as Watt's first patent was, it resulted for a time in the production of nothing more than a greatly improved engine of the Newcomen type, much less wasteful of fuel, able to make faster strokes, but still only suitable for pumping, still single-acting, with steam admitted during the whole stroke, the piston, as before, pulling the beam by a chain working on a circular arc. The condenser was generally worked by injection, but Watt has left a model of a surface condenser made up of small tubes, in every essential respect like the condensers now used in marine engines. 1

*12. Fig. 6 is an example of the Watt pumping engine of this period. It should be noticed that, although the top of the cylinder is closed and steam has access to the upper side of the „, , piston, this is done only to keep the cylinder and piston _ * f warm. The engine is still single-acting; the steam in EBiint the upper side merely plays the part which was played 17*9. ' in Newcomen's engine by the atmosphere; and it is*

the lower end of the cylinder alone that is ever put in communication with the condenser. There are three valves: the " steam " valve a, the " equilibrium " valve b, and the " exhaust " valve c. At the beginning of the down-stroke c is opened to produce a vacuum below the piston and a is opened to admit steam above it. At the end of the down-stroke a and c are shut and 6 is opened. This puts the two sides in equilibrium and allows the piston to be pulled up by the pump-rod P, which is heavy enough to serve as a counterpoise. C is the condenser, and A the air-pump, which discharges into the hot well H, whence the supply of the feed-pump F is drawn.

13. In a second patent (1781) Watt describes the " sun-and- planet" wheels and other methods of making the engine give

1 An interesting detailed narrative of the steps leading to his invention was written by Watt as a note to the article " Steam Engine " in Robison's System of Mechanical Philosophy (1S22). See Ewing, The Steam Engine and other Heat Engines, pp. 15-19.

continuous revolving motion to a shaft provided with a flywheel. He had invented the crank and connecting-rod for

this purpose, but it had meanwhile been patented Engine' b v one Picked, and Watt, rather than make terms

with Pickard, whom he regarded as a plagiarist of his own ideas, made use of his sun-and-planet motion until the patent on the crank expired. The reciprocating motion of earlier forms had served only for pumping; by this invention Watt opened up for the steam engine a thousand other channels of

Fig. 6. — Watt's Single- Acting Engine, 1769. usefulness. The engine was still single-acting; the connecting- rod was attached to the far end of the beam, and that carried a counterpoise which served to raise the piston when steam was admitted below it.

14. In 1782 Watt patented two further improvements of the first importance, both of which he had invented some years Other before. One was the use of double action, that is inventions to say, the application of steam and vacuum to of Watt, each side of the piston alternately. The other (invented as early as 1769) was the use of steam expan- sively, in other words the plan (now used in all engines

that aim at economy of fuel) of stopping the admission of steam

when the piston had made only a part of its stroke, and allowing the rest of the stroke to be performed by the expansion of the steam already in the cylinder. To let the piston push as well as pull the end of the beam Watt devised his so-called parallel motion, an arrangement of links connecting the piston- rod head with the beam in such a way as to guide the rod to move in a very nearly straight line. He further added the throttle valve, for regulating the rate of admission of steam, and the centrifugal governor, a double conical pendu- lum, which controlled the speed by acting on

Fig. 7. — Watt's Double-Acting Engine, 1782.

the throttle-valve. The stage of development reached at this time is illustrated by the engine of fig. 7 (from Stuart's History of the Steam Engine), which shows the parallel motion pp, the governor g, the throttle-valve t, and a pair of steam and exhaust valves at each end of the cylinder. Among other inventions of Watt were the " indicator," by which diagrams showing the relation of the steam pressure in the cylinder to the movement of the piston are automatically drawn; a steam tilt-hammer; and also a steam locomotive for ordinary roads — but this invention was not prosecuted.

In partnership with Matthew Boulton, Watt carried on in Birmingham the manufacture and sale of his engines with the utmost success, and held the field against all rivals in spite of severe assaults on the validity of his patents. Notwithstanding his accurate knowledge of the advantage to be gained by using steam expansively, he continued to employ only low pressures — seldom more than 7 ib per sq. in. over that of the atmo- sphere. His boilers were fed, as Newcomen's had been, through an open pipe which rose high enough to let the column of water in it balance the pressure of the steam. He gave a definite numerical significance to the term " horse-power" (q.v.) as a mode of rating engines, defining it as the rate at which work is done when 33,000 lb are raised one foot in one minute.

15. In the fourth claim in Watt's first patent the second sentence describes a non-condensing engine, which would have required steam of a higher pressure. This, how- Noa . ever, was a line of invention which Watt did not condensing follow up, perhaps because so early as 1725 a Engine. non-condensing engine had been described by Jacob Leupold in his Theatrum machinarum. Leupold's proposed engine is shown in fig. 8, which makes its action sufficiently clear.

Watt's aversion to high – pressure steam was strong, and its influence on steam engine practice long survived the expiry of his patents. So much indeed was this the case that the terms " high-pressure " and " non-condensing " were for many years synonymous in contradistinction to the " low-pressure " or condens- ing engines of Watt. This nomenclature no longer holds; in modern practice many condensing engines use as high pressures as non-con- densing engines, and by doing so are able to take advantage of Watt's great invention of expansive working to a degree which was impossible in his own practice.

16. The introduction of the non-condensing and, at that time, relatively high-pressure engine was effected in England by Richard Trevithick and in ■ America by Oliver Hlgh . Evans about 1800. Both Evans and Trevithick pressure applied their engines to propel carriages on roads, Steam. and both used for boiler a cylindrical vessel with a cylindrical flue inside — the construction now known as the Cornish boiler. In partnership with William Bull, Trevithick had previously made direct acting pumping-engines, with an inverted cylinder set over and in line with the pump-rod, thus dis- pensing with the beam that had been a feature in all earlier forms. But in these " Bull " engines, as they were called, a condenser was used, or, rather, the steam was condensed by a jet of cold water in the exhaust-pipe, and Boulton and Watt successfully opposed them as infringing Watt's patents. To Trevithick belongs the distinguished honour of being the first to use a steam carriage on a railway; in 1804 he built a locomotive in the modern sense, to run on what had formerly been a horse-tramway, in Wales, and it is noteworthy that tht.'

Fig. 8. — Leupold's Non-Condensing Engine, 1725.

exhaust steam was discharged into the funnel to force the furnace draugftt, a device which, twenty-five years later, in the hands of George Stephenson, went far to make the locomotive what it is to-day. In this connexion it may be added that as early as 1 769 a steam carriage for roads had been built in France by Nicolas Joseph Cugnot, who used a pair of single-acting high- pressure cylinders to turn a driving axle step by step by means of pawls and ratchet-wheels. To the initiative of Evans may be ascribed the early general use of high-pressure steam in the United States, a feature which for

many years distinguished American from English practice.

17. Amongst the contemporaries of Watt one name deserves special mention. In 1781 Jonathan Carter Hornblower con- structed and patented what would now be called Borine." 11 a compound engine, with two cylinders of different sizes. Steam was first admitted into the smaller cylinder, and then passed over into the larger, doing work against a piston in each. In Hornblower's engine the two cylinders were placed side by side, and both pistons worked on the same end of a beam overhead. This Was an instance of the use of steam expansively, and as such was earlier than the patent, though not earlier than the invention, of expansive working by Watt. Hornblower was crushed by the Birmingham firm for infringing their patent in the use of a separate condenser and air-pump. The compound engine was revived in 1804 by Arthur Woolf, with whose name it is often associated. Using steam of fairly high pressure, and cutting off the supply before the end of the stroke in the small cylinder, Woolf expanded the steam to several times its original volume. Mechanically the double-cylinder compound engine has this advantage over an engine in which the same amount of expan- sion is performed in a single cylinder, that the sum of the forces exerted by the two pistons in the compound engine Varies less throughout the action than the force exerted by the piston of the single-cylinder engine. This advantage may have been clear to Hornblower and Woolf and to other early users of compound expansion. But another and probably a more important merit of the system lies in a fact of which neither they nor for many years their followers in the use of compound engines were aware — the fact that by dividing the whole range of expansion into two parts the cylinders in which these are separately performed are subject to a reduced range of fluctuation in their tempera- ture. This, as will be seen later, limits to a great extent a source of waste which is present in all steam engines, the waste which results from the heating and cooling of the metal by its alternate contact with hot and cooler steam. The system of compound expansion is now used in nearly all large engines that pretend to economy. Its introduction forms the most outstanding improvement which steam engines of the piston and cylinder type have undergone since the time of Watt; and we are able to recognize it as a very important step in the direction set forth in his " first principle " that the cylinder should be kept as hot as the steam that enters it.

18. Woolf introduced the compound engine somewhat widely about 1814 as a pumping engine in the mines of Cornwall. But here it met a -strong competitor in the higrN Earfae. pressure single-cylinder

engine of Trevithick, which had the advantage of greater simplicity in construc- tion. Woolf's engine fell into comparative disuse, and the single-cylinder type took a form which, under the name of the Cornish pumping engine, was for many years famous for its great economy of fuel. In this engine the cylinder was set under one end of a beam, from the other end of which hung a heavy rod which operated a pump at the foot of the shaft. Steam was admitted above the piston for a short portion of the stroke, thereby raising the pump-rod, and was allowed to expand for the remainder. Then an equilibrium valve, connecting the space above and below the piston, as in fig. 6, was opened, and the pump-rod descended, doing work in the pump and raising the engine piston. The large mass which had to be started and stopped at each stroke served by its inertia to counter-balance the unequal pressure of the steam, for the ascending

rods stored up energy of motion in the early part of the stroke when the steam pressure was greatest, and gave out energy in the later part, when expansion had greatly lowered the pressure. The frequency of the stroke was controlled by a device called a cataract, consisting of a small plunger pump, in which the plunger, raised at each stroke by the engine, was allowed to descend more or less slowly by theescape of fluid below it through an adjustable orifice, and in its descent liberated catches which held the steam and exhaust valves from opening. A similar device controlled the equilibrium valve, and could be set to give a pause at the end of the piston's down-stroke, so that the pump- cylinder might have time to become completely filled. The Cornish engine is interesting as the earliest form which achieved an efficiency comparable with that of good modern engines. For many years monthly reports were published of the " duty " of these engines, the " duty " being the number of foot-pounds of work done per bushel or (in some cases) per cwt. of coal. The average duty of engines in the Cornwall district rose from about 18 millions of foot-pounds per cwt. of coal in 1813 to 68 millions in 1844; after which less effort seems to have been made to maintain a high efficiency (Proc. Inst. C.E., 1863, vol. 23). In individual cases much higher results were reported, as in the Fowey Consols engine, which in 1835 was stated to have a duty of 125 millions. This (to use a more modern mode of reckon- ing) is equivalent to the consumption of only a little more than if lb of coal per horse-power per hour — a result surpassed by very few engines in even the best recent practice. It is difficult to credit figures which, even in exceptional instances, place the Cornish engine of that period on a level with the most efficient modern engines — in which compound expansion and higher pressure combine to make a much more perfect*

thermodynamic machine; and apart from this there is room to question the accuracy of the Cornish reports. They played, however, a useful part in the process of steam engine development by directing attention to the question of efficiency, and by demonstrating the advantage to be gained by high pressure and expansive working, at a time when the theory of the steam engine had not yet taken shape.

19. The final revival of the compound engine did not occur until about the middle of the 19th century, and then several agencies combined to effect it. In 1845 M'Naught introduced a plan of improving beam engines of the Z" 1 original Watt type, by adding a high-pressure cylinder whose piston acted on the beam between the centre and the flywheel end. Steam of higher pressure than had formerly been used, after doing work in the new cylinder, passed into the old or low-pressure cylinder, where it was further expanded. Many engines whose power was proving insufficient for the extended machinery they had to drive were " M'Naughted " in this way, and after conversion were found not only to yield more power but to show a marked economy of fuel. , The compound form was selected by William Pole for the pumping engines of Lambeth and other waterworks about 1850; in 1854 John Elder began to use it in marine engines; in 1857 E. A. Cowper added a steam-jacketed intermediate reservoir for steam between the high and low pressure Cylinders, which made it unnecessary for the low-pressure piston to be just beginning when the other piston was. just ending its stroke. As facilities increased for the use of high-pressure steam, compound expansion came into more, general use, its advantage becoming more conspicuous withievery increase in boiler pressure —until now there are few large land engines and scarcely any marine engines that do not employ it. In marine practice, where economy of fuel is a much more important' factor in determining the design than it is on land, the principle of compound expansion has been greatly extended by the intro- duction of triple and even quadruple expansiofi engines, in which the steam is made to expand successively in three or in four cylinders. In locomotive engines, where other considerations are of more moment than the saving of coal, compound expansion has found some application, but its use there is comparatively rare.

to. The adaptation of the steam engine to railways, begun by Trevithick, became a success in the hands of George Stephen- Applicatloa son, whose engine, the " Rocket," when tried along to

Loco- with others, in 1829, not only distanced its com- mottves. petitors but settled once and for all the question whether horse traction or steam traction was to be used on railways. The principal features of the " Rocket " were an improved steam-blast for urging the combustion of coal and a boiler (suggested by Booth) in which a large heating surface was given by the use of many small tubes through which the hot gases passed. Further, the cylinders, instead of being vertical as in earlier locomotives, were set in at a slope, which was afterwards altered to a position more nearly horizontal. To these features there was added later the "link motion," a contrivance which enabled the engine to be easily reversed and the amount of expansion to be readily varied. In the hands of George Stephenson and his son Robert the locomotive took a form which has been in all essentials maintained by the far heavier locomotives of to-day.

21. The first practical steamboat was the tug " Charlotte Dundas," built by William Symington, and tried in the Forth Application and Clyde Canal in 1802. A Watt double-acting to steam- condensing engine, placed horizontally, acted directly boats. j,y a connecting-rod on the crank of a shaft at the stern, which carried a revolving paddle-wheel. The trial was successful, but steam towing Was abandoned for fear of injuring the banks of the canal. Ten years later Henry Bell built the " Comet," with side paddle-wheels, which ran as a passenger steamer on the Clyde; but an earlier inventor to follow up Symington's success was the American, Robert Fulton, who, after unsuccessful experiments on the Seine, fitted a steamer on the Hudson in 1807 with engines made to his designs by Boulton and Watt, and brought steam naviga- tion for the first time to commercial success.

*22. With improvements in the details of design and construc- tion it gradually became practicable to use higheT steam pressures Rise In anc ˆ higher piston speeds, and consequently to Steam obtain not only greater efficiency, but also a greater pressure amount of power from engines of given bulk. In *"< "" 1872 Sir F. J. Bramwell, describing the typical Spe°a. marine practice of that time, gave a list of engines,*

all compound, in which the boiler pressure ranged from 45 to 60 lb, the mean piston speed was 350 ft. per minute, and the consumption of coal 2 to i\ ft per hour per indicated horse-power. In 1881 F. C. Marshall gave a similar list, in which the boiler pressure was 77 ft, the speed 460 ft. per minute, and the consumption a trifle under 2 ft. These were compound engines with expansion in two stages. The triple expansion engine, introduced by Dr A. C. Kirk Triple ana in

1874, did not come into general use until after Quadruple 188 1. It became the normal type of marine engine, Expansion. w ; t ˆ pressures ranging, as a rule, from 150 to 200 lb, piston speeds generally of 500 or 600 ft. per minute, but sometimes as high as 900 or 1000, and coal consumption of about 1 \ lb per hour per indicated horse-power. In some instances quadruple expansion has been preferred, with some- what higher pressures, but it can scarcely be said to be established that the advantage of adding a fourth stage clearly compensates for the extra complication. Some particulars of the dimensions reached in modem practice will be given later. Several of the vessels engaged in the Transatlantic passenger service, and also a few armoured cruisers, have engines in which the twin sets together have an indicated horse-power exceeding 30,000. But even these figures are eclipsed in ships which are driven by turbine engines. The cruisers of the " Invincible " class have turbine engines of 41,000 horse-power, and the turbines of the great Cunarders " Lusitania " and " Mauretania " (1907) develop about 70,060 h.p. in propelling these ships at a speed of 25 knots. It may be questioned whether such gigantic concentrations of power for the propulsion of a ship would have been practicable had' it not

been for the new possibilities which the introduction of the steam turbine has opened up.

23. The invention of the steam turbine has in fact revolu- tionized marine engine practice, so far as fast vessels are con- cerned, and has supplied a formidable rival to the /_<_. reciprocating engine for use on land. The steam doctlon turbine has been brought to a degree of efficiency ofthe which places it, in respect of economy in steam ˆ tea ˆ and coal consumption, on a somewhat higher level

than the best engines of the older type in cases where a large amount of power is to be generated. Its greater simplicity, compactness and freedom from vibration are merits which have already gone far to secure for it a preference, notwith- standing the short time that has passed since it became known as a practicable engine. The largest demands for power occur in fast passenger vessels, in war-ships and in stations from which electric energy is distributed for traction or other uses; in all these cases the steam turbine is now taking the leading place. It is to the inventive genius of the Hon. C. A. ■Parsons that we owe not only the main idea of the modern steam turbine, but also the working out of many novel mechanical details which have been essential to success, as well as the adaptation of the turbine to marine propulsion.

24. In the steam turbine, as in the water turbine (for which see Hydraulics), the force directly operative to do useful work is derived from the kinetic energy of the operative fluid, either by the impulse of a jet or jets sliding over movable blades, or by the reaction of orifices or guides from which the jets issue. The pressure, instead of being exerted on a piston, is employed in the- first instance to set the fluid itself in motion. There is a conversion of pressure-energy into velocity-energy as a pre- liminary step towards obtaining the effective work of the machine. But in a steam turbine this implies velocities which are immensely greater than those with which water turbines have to deal, in consequence of the much smaller density of steam as the moving fluid. Attempts to design a steam turbine were made by numerous inventors, but fell short of practical success mainly because of the difficulty of arranging for a sufficiently high velocity in the working parts to utilize a reasonably large fraction of the kinetic energy of the steam, the principle involved being that for good efficiency the velocity of the blades should approximate to half the velocity of the jets which strike them. There is a further difficulty in getting the energy of the steam into a suitable kinetic form, namely, to get the stream of issuing particles to take a single direction, without undue dispersion, when steam is allowed to expand through an orifice from a chamber at high pressure into a space where the pressure is greatly less.

In 1889 Dr Gustaf de Laval introduced a form of steam turbine in which both of these difficulties were to a great extent over- come, partly by the special form of the nozzle used to produce the steam jet and partly by features of design which allowed an exceptionally high speed to be reached in the wheel carrying the vanes against which the steam impinged. This simple type of turbine, which will be described in a later section of this article, has met with considerable success, especially in compara- tively small sizes, as an engine for driving electric generators. Its efficiency is fairly good, but it is not well adapted for work on a large scale, and it has not been applied to the propulsion of ships.

Parsons attacked the problem at an earlier date, in an entirely different way in the invention of his " compound " turbine. By dividing the whole expansion of the steam into a great number of successive and separate steps he limited the velocity acquired at each step to such an extent as to make it compara- tively easy to extract the greater part of the kinetic energy, as work done upon the moving blades, without making the velocity of these blades inconveniently high. Moreover, in Parsons's compound turbine the range of pressure through which the steam expands in each separate step is too small

to give rise to any difficulty in the formation of the jets. The guide blades, which form the jets, are distributed round the whole

circumference of the revolving wheel, and all the revolving blades are consequently in action at once. The steam streams from end to end through an annular space between a revolving drum and the casing which surrounds it. Parallel rings of fixed guide blades project inwards from the casing at suitable distances, and between these are rings of moving blades which project out- wards from the drum and revolve with it. At each step in the expansion the steam streams through a ring of fixed guide blades, and the streams so formed impinge on the next ring of moving blades, and so on. The construction, which is of great simpli- city, will be described later; it lends itself well to the generation of power on a large scale, especially in cases where a fairly high speed of rotation is wanted. The more powerful the turbine the less important do various inevitable sources of loss become; and hence, though the small turbines which were first built were less economical than reciprocating engines, the advantage is the other way where large powers are concerned.

25. Parsons introduced his compound steam turbine in 1884. For some years it was made in small sizes only, and the steam was discharged to the atmosphere without condensation. So long, however, as this was done the steam turbine was sacrificing one of its most important advantages, namely, its exceptional capacity for utilizing the energy of low-pressure steam down to the lowest vacuum obtainable in a condenser. In 1891 it was first fitted with a condenser, and it then began to be used in electric supply stations. Its efficiency at that date was found, in tests made by the present writer, to be com- parable with that of good reciprocating compound engines, but the figures then obtained were much improved on later in turbines of larger size and modified design. The first applica- tion to marine propulsion was in the " Turbinia," in 1897. The success of this little experimental vessel of 100 tons, which with its horse-power of 2100 made a record in speed for a ship of any size, was soon followed by the application of the turbine to various war-ships and other steamers. In war-ships the use of steam turbines has a special advantage in enabling the machinery to be kept at a low level, beneath the protective deck, in addition to the general advantages of reduced bulk, reduced vibration, reduced liability to break-down,

and reduced consumption of coal and of oil which are common to vessels of all classes. The successful trials of the cruiser " Amethyst " in 1904 demonstrated these advantages so conclusively that all new war-ships for the British navy, from battleships to torpedo- boats are being fitted with steam turbines. It is also used in many cross-channel packets, as well as in the largest ocean-going passenger vessels. The turbine-driven steamers " Lusitania " and " Mauretania " (1907) are the most powerful and the fastest ocean-going vessels afloat. The rapid development of the marine steam turbine makes it probable that it will displace the reciprocating engine in all large and fast ships. For slow-going cargo-boats it is at a disadvantage, unless gearing is resorted to, on account of the difficulty of securing a sufficiently high peripheral velocity in the turbine drums without making the turbines unduly bulky, and the leakage losses (due to steam passing through the clearance spaces over the tips of the blades) unduly large. Experiments by Parsons {Trans. Inst. Nav. Arch., 1910) on a ship in which a slow-running propeller is driven through reducing-gear from a high- speed turbine, have given highly promising results.

Enough has been said to show that the invention of the steam turbine is the most important step in steam engineering since the time of Watt. It is the first solution of the problem of using steam efficiently in an engine without reciprocating parts. The object in most steam engines is to deliver power to revolving machinery, and much ingenuity has been expended in attempts to devise engines which will produce rotation directly, instead of by conversion of reciprocating motion. No rotary engine, however, was permanently successful until the steam turbine took a practical form.

26. In the early development of the steam engine inventors had little in the way of theory to guide them. Watt had the advantage, which he acknowledges, of a knowledge of Joseph

Black's doctrine of latent heat; but there was no philosophy of the relation of work to heat until long after the inventions of Watt were complete. The theory of the steam Theory ot engine as a heat engine dates from 1824, when steam N. L. Sadi Carnot published his Reflexions sur E" 1 "" la puissance tnotrice du feu, and showed that heat does work only by being let down from a higher to a lower tempera- ture. But Carnot had no idea that any of the heat disappears in the process, and it was not until the doctrine of the conserva- tion of energy was established in 1843 by the experiments of J. P. Joule that the theory of heat engines began a vigorous growth. From 1849 onwards the science of thermodynamics was*

developed with extraordinary rapidity by R. J. M. Clausius, W. J. Macquorn Rankine and William Thomson (Lord Kelvin) and was applied, especially by Rankine, to practical problems in the use of steam. The publication in 1859 of Rankine's Manual of the Steam Engine formed an epoch in the history of the subject by giving inventors a new basis, outside of mere em- piricism, from which they could push on the development of the steam engine. Unfortunately, however, it was assumed that the cylinder and piston might be treated as behaving to the steam like non-conducting bodies — that the transfer of heat between the steam and the metal was negligibly small. Rankine's cal- culations of steam consumption, work and thermodynamic efficiency involve this assumption, except in the case of steam- jacketed cylinders, where he estimates that the steam in its passage through the cylinder takes just enough heat from the jacket to prevent a small amount of condensation which would otherwise occur as the process of expansion goes on. If the transfer of heat from steam to metal could be overlooked, the steam which enters the cylinder would remain during admission as dry as it was before it entered, and the volume of steam consumed per stroke would correspond with the volume of the cylinder up to the point of cut-off. It is here that the actual behaviour of steam in the cylinder diverges most widely from the behaviour which the theory assumes. When steam enters the cylinder it finds the metal chilled by the previous exhaust, and a portion of it is at once condensed. This has the effect of increasing, often very largely, the volume of boiler steam required per stroke. As expansion goes on the water that was condensed during admission begins to be re-evaporated from the sides of the cylinder, and this action is often prolonged into the exhaust. It is now recognized that any theory which fails to take account of these exchanges of heat between the steam and its metal envelope fails also to yield even compara- tively correct results in calculating the relative efficiency of various steam pressures or various ranges of expansion. But the exchanges of heat are so complex that there seems little prospect of submitting them to any comprehensive theoretical treatment, and information is rather to be sought from the scientific analysis of experiments with actual machines.

27. Formation of Steam under Constant Pressure. — In attempting a brief sketch of steam engine theory it is necessary to begin by giving some account of the properties of steam, so far as they are relevant. The properties of steam are most conveniently stated by referring in the first instance to what happens when steam is formed under constant pressure. This is substantially the process which occurs in the boiler of a steam engine when the engine is at work. To fix the

ideas we may suppose that the vessel in which steam is to be formed is a long upright cylinder fitted with a piston which may be loaded so that it exerts a constant pressure on the fluid below. Let there be, to begin with, at the foot of the cylinder a quantity of water (which for convenience of numerical statement we shall take as I lb), at any temperature h; and let the piston press on the surface of the water with a force of p H) per square foot. Let heat now be applied to the bottom of the cylinder. As it enters the water it will produce the following effects in three stages : —

1. The temperature of the water rises until a certain temperature t is reached, at which steam begins to be formed. The value of t depends on the particular pressure p which the piston exerts. Until the temperature / is reached there is nothing but water below the piston.

2. Steam is formed, more heat being taken in. The piston (which is supposed to exert a constant pressure) rises. No further increase of temperature occurs during this stage, which continues until all the water is converted into steam. During this stage the steam

which is formed is said to be saturated. The volume which the piston encloses at the end of this stage — the volume, namely, of 1 lb of saturated steam at pressure p (and temperature /) — will be denoted by v in cubic feet.

3. If after all the water is converted into steam more heat be allowed to enter, the volume will increase and the temperature will rise. The steam is then said to be superheated.

The difference between saturated and superheated steam may be expressed by saying that if water (at the temperature of the steam) be mixed with steam some of the water will be evaporated if the steam is superheated, but none if the steam is saturated. Any vapour in contact with its liquid and in thermal equilibrium is necessarily saturated. When saturated its properties differ con- siderably, as a rule, from those ot a perfect gas, especially at high pressures, but when superheated they approach those of a perfect gas more and more closely the further the process of superheating is carried, that is to say, the more the temperature is raised above /, the temperature of saturation corresponding to the given pressure p.

28. Relation of Pressure and Temperature in Saturated Steam. —

The temperature / at which steam is formed depends on the value of p. Their relation was determined with great care by Regnault (Mem. Inst. France, vol. xxi.). The pressure of saturated steam rises with the temperature at a rate which increases rapidly in the upper regions of the scale. This will be apparent from the first and second columns of the following table. The first column gives the temperature on the Centigrade scale; the second gives the corresponding pressure in pounds per square inch.

29. Relation of Volume and Temperature. — The same table shows the volume v in cubic feet occupied by 1 lb of saturated steam at each temperature. This is based on the investigations of H. L. Callendar who has shown (see Thermodynamics and Vaporization) that an equation of the form

is applicable to water vapour, whether saturated or superheated, within the limits of experimental error throughout the range of pressure that is important in engineering practice. In this equation t is the absolute temperature, R and 6 are constants and c is a term varying inversely as a certain power of the temperature. By aid of this equation, in conjunction with the results of various experiments on the latent heat and other properties of steam, Callendar has shown that it is possible to frame expressions from which numerical values of all the important properties of steam may be derived throughout a range of saturation temperatures extending from o° C. to 200 ° C. or so. The values so obtained are thermo- dynamically consistent with one another, and are in good agree- ment with the most authoritative experimental results. They are accordingly to be accepted in lieu of those given in earlier steam tables which depended on measurements by Regnault, and are now known to be in some particulars erroneous. R. Mollier has applied Callendar's method with great completeness to the calculation of steam tables, and the figures given here are adapted from his results. 1 In addition to the relation of temperature, pressure and volume, the table shows other properties of steam which will be explained as we proceed.

30. Supply of Heat in Formation of Steam under Constant Pressure. — We -have next to consider the supply of heat in the imaginary experiment of § 27. During the first stage, until the temperature rises from its initial value t to t, the temperature at which steam begins to form under the given pressure, heat is required only to warm the water. Since the specific heat of water is nearly constant, the amount of heat taken in during the first stage is approximately t — ta thermal units, or J (/ — to) foot-pounds, J being Joule's equiva- lent, and this expression for it will generally serve with sufficient

accuracy in practical calculations. More exactly, however, the heat taken in is somewhat greater than this at high temperatures, for Regnault's experiments show that the specific heat of water increases slightly as the temperature rises. In stating the amount of heat required for this first stage, to must be taken as a known temperature; for convenience in numerical statement the temperature 0° C. is usually chosen as an arbitrary starting-point from which the reception of heat is to be reckoned. We shall employ the symbol h to designate the heat required to raise 1 lb of water from 0° C. to the temperature / at which steam begins to form. During the first stage, sensibly all the heat supplied goes to increase the stock of internal energy which the fluid possesses, the amount of external work which is done by the expansion of the fluid being negligible.

The heat taken in during the second stage is what is called the latent heat of steam, and is denoted by L. Of it a part is spent in doing external work, namely, p multiplied by the excess of the volume ol the steam v over the volume of the water tv, and the remainder is the difference of internal energy between 1 lb of steam at-/ and 1 lb of water at t.

31. Total Heat of .Steam.— Adding together the heat taken in during the first and second stages, we have a quantity designated

1 R. Mollier, Neue Tabellen und Diagramme fiir Wasserdampf (Berlin, 1906). See also Ewing's Steam Engine (3rd ed., 1910).

by H whiclTmay be called the heat of formation of I lb of saturated steam : —

H = /t+L. The heat of formation of 1 lb of steam, when formed under constant pressure from water at any temperature to, is H— ho, where ho corresponds to fo.

It has been pointed out by Mollier that for the purpose of calculations in technical thermodynamics it is convenient to add to the heat of formation the quantity pwj], which represents the thermal equivalent of the work spent in introducing the water under the piston, against the constant pressure p, before the operation of heating imagined in § 27 begins, w being the volume of the water. We thus obtain a quantity which in its numerical values differs only very slightly from H, namely

I=H-Hw/J. We shall call this the total heat of saturated steam. Values of I are stated in the table. Since the volume of 1 lb of water

is only

Properties of Saturated Steam.

Tempera- ture. Centigrade.

Pressure lb per sq. in.

Volume cub. ft. per lb.

Total Heat. 1

Entropy.

Of Water.

Of Steam.

Of Water.

Of Steam.

0089

3283

O

5947

O

2-178

5

OI27

2354-

5

597-1

OOl8

2148

10

OI78

1708-

100

599 4

OO36

2119

15

0246

1253-

150

6018

O054

2-091

20

O336

931-

20

604- 1

071

2-064

25

0-455

699 5

25

606 5

088

2-039

30

0610

530-7

300

608 -8

OIO4

2-015

35

0809

406-8

35

6111

0-I2I

1 991

40

1 062

3H-8

401

6135

0137

1 969

45

1-381

245-8

45 1

6158

OI53

1-947

50

178

1937

501

618

O169

1-927

55

2 27

153 9

55 -i

620-3

OI84

1 907

60

2-88

123-3

601

622-6

OI99

1-888

65

3 61

99 5

65 -2

624-8

O-2I4

1-870

70

451

809

70 2

627-0

0-229

1852

75

5 58

66 24

75 3

629-2

0-244

1-835

80

6-86

54-60

80 3

631-3

0258

1-819

85

838

45 29

85-3

°33-5

0272

1-803

90

1016

3779

904

635-6

0286

1788

95

12 -26

3.1 71

95 5

6376

0300

1773

100

I47O

2675

1005

6397

o-3H

1759

105

17 52

22-69

105-6

641-7

0327

1745

no

2079

19 34

1107

6436

0340

1 732

115

24-55

16-56

1 15 8

645 5

o-354

1 719

120

2883

1425

1209

647-4

0367

1706

125

33-72

12 30

1260

6492

0379

1-694

130

39 26

10-67

131-1

651-0

0392

1682

135

45-51

929

136-2

652-8

0405

1-671

140

52-56

812

i4 J -3

6.54 5

0417

1 -66o

145

60-42

7-13

1464

656 1

0430

1-649

150.

6924

6274

151-6

657-8

0442

1638

155

7904

5 542

1567

659 3

0-454

1-628

160

89 93

4910

161-9

660-8

0466

1 618

165

101 98

4 363

167-1

662-3

0-478

1608

170

11527

3-891

172-2

6637

0489

1 599

175

1299

3 478

177-4

6650

0501

I-589

180

145-9

3-n6

182-6

6663

0512

i-58o

185

1634

2800

1879

667-6

0524

1 -571

190

182 -6

2-523

I93-I

668-8

o-535

1 563

195

2034

2-279

1983

670-0

0546

1-554

200

226-0

2063

203 -6

671-1

0-557

1 546

205

2505

1-874

208-9

672-2

0568

1-538

210

277-2

1703

214-1

673-2

o-579

1 530

215

3068

i-54 6

2194

674-1

0590

1 522

0016 cub. ft. the term pwj] is numerically insignificant except at the highest pressures. Similarly, in reckoning the total heat of water I„ we add pw/J to h, and this quantity is also given in the table. The latent heat L is to be found from the table by sub- tracting l w , the total heat of water, from the total heat of steam. We shall use the centigrade scale of temperature throughout this article, and accordingly the total heats are expressed in terms of a unit involving the centigrade degree, namely, the quantity of heat required to raise the temperature of unit mass of water through i° C. at 15° C. With this unit of heat the mechanical equivalent J is 1400 foot-pounds when the unit of mass is the lb, and ia 427 kilogram-metres when the unit of mass is the kilogramme.

32. Internal Energy. — Of the heat of steam the part pvj] is spent in doing external work. The remainder has gone to increase the stock of internal energy which the substance possesses.

In dealing with the heat required to produce steam we adopted the state of water at o°C. as an arbitrary starting-point from which to reckon the reception of heat. In the same way it is convenient

to use this arbitrary starting-point in reckoning what may be called the internal energy of the substance, which is the excess of the heat taken in over the external work done by the substance during its reception of heat. Thus the internal energy E of i lb of saturated steam at pressure p is equal to the total heat I, less that part of the total heat which is spent in doing external work, or

E = I-p»/J. The notion of internal energy is useful in calculating the heat taken in or rejected by steam during any stage of its expansion or com- pression in an engine., When a working substance passes from one condition to another its gain or loss of heat is determined by the equation

Heat taken in = increase of internal energy -f-external work. Any of the terms of this equation may be negative ; the last term is negative when work is done, not by but upon the substance.

33. Wet Steam. — In calculations which relate to the action of steam in engines we have often to deal, not with dry saturated steam, but with wet steam, or steam which either carries in suspension, or is otherwise mixed with, a greater or less proportion of water. In any such mixture, assuming it to be in equilibrium, the steam and water have the same temperature, and the steam is saturated. The dryness of wet steam is measured by the proportion g of dry steam in each pound of the mixed substance. When that is known it is easy to determine the other physical constants: thus —

Latent heat of 1 lb of wet steam = gL ; Total heat of 1 lb of wet steam = I,„-r-gL; Volume of 1 lb of wet steam = gu-Kl — q) w

= qv very nearly, unless the steam is so wet as to consist mainly of water.

34. Superheated Steam. — Steam is superheated when its tempera- ture is raised, in any manner, above the temperature corresponding to saturation at the actual pressure. When considerably super- heated, steam approximates in behaviour to a perfect gas.

The specific heat during superheating is nearly constant at low pressures, its value being approximately 0-48 ; at high pressures it is higher, especially when the amount of superheating is slight.' Calendar's equations enable it to be calculated for any assigned conditions of temperature and pressure. They also allow a direct determination to be made of the total heat of superheated steam of given temperature and pressure, and from this, by comparison with the total heat of saturated steam at the same pressure, the mean specific heat over any stated range of superheating, may be found. Calling I, the total heat of steam in the saturated condition, when the temperature is t, k the mean specific heat in superheating at constant pressure to a higher temperature t' and I' the total heat in the superheated state, we have

I' = 1, +K{t'~t).

The following are values of k: —

Temperature of Superheat t' in °C.

Temperature

of Saturation / in

°C.

8o°

120°

160°

180

200°

IOO°

049

1 50

0-49

0-51

200

0-49

051

o-54

o-57

250

0-48

0-50

o-53

0-56

o-59

300

0-48

0-50

0-52

o-54

o-57

35o:

0-48

0-49

o-5i

o-53

0-56

400

0-48

0-49

0-51

0-52

0-55

45o°

0-48

0-49

0-51

0-52

o-54

35. Isothermal Expansion of Steam.— The expansion of volume which occurs during the conversion of water into steam under constant pressure is isothermal. From what has been already said it is obvious that steam, or any other saturated vapour, can be expanded or compressed isothermally only when wet, and that evaporation (in the one case) or condensation (in the other) must accompany the process. Isothermal lines for a working substance which consists of a liquid and its vapour are straight lines of uniform pressure.

36. Adiabatic Expansion of Steam. — If steam initially dry be allowed to expand adiabatically (namely, without taking in or giving out any heat) it becomes wet. A part of the steam is condensed by the process of adiabatic expansion, at first in the form of minute particles suspended throughout the mass. The temperature and pressure fall; and, as that part of the substance which remains uncondensed is saturated, the relation of pressure to temperature throughout the expansion is that which holds for saturated steam. Before expansion let the initial dryness of the steam be gi and its absolute temperature t. Then, if it expand adiabatically until its temperature falls to t, its dryness after expansion may be shown to be

L, and L are the latent heats (in thermal units) of 1 & of steam before and after expansion respectively. When the steam is dry to begin with, g t = 1.

This formula is easily applied to the construction of the adiabatic curve when the initial pressure and the pressure after expansion are given, the corresponding values r and L being found from the table.

37. Ideal Action of Heat Engine. — According to the principles of thermodynamics (g .!<.), the action of a heat engine depends on its receiving heat at a temperature higher than that at which it is capable of rejecting heat to surrounding objects. The working substance in the engine must necessarily pass from an upper temperature, at which it takes in heat, to a lower temperature, at which it rejects heat, the difference, between the heat taken in and the heat rejected being the thermal equivalent of the work done. It may

readily be shown that when the conditions are such as to make this difference as great as possible — in other words, to make the efficiency reach its ideal limit — the ratio of the heat taken in to the heat rejected depends only on the temperature at which reception and rejection of heat occur. Calling n and t 2 the absolute temperatures at which heat is taken in and rejected respectively, and Qi and Q 2 the quantities of heat taken in and rejected, the limit of efficiency is reached when Q1/Q2 = ti/t 2 . The efficiency then has the value

■(Qi-&>/Qi = (ti-t 2)/ti and W, the work done, is Qi(n — t- 2)/ ti.

In the ideal engine imagined by Carnot the action is of this simple character. The working substance is brought by adiabatic compression from the lower to the upper extreme of temperature. It then takes in heat, without chariging in temperature. Next, it expands adiabatically until its temperature falls to the lower extreme and finally at that temperature it rejects enough heat to restore it to its initial state, thereby completing a cycle of operations.

38. Carnot' s Cycle with Steam for Working Substance.— We are now in a position to study the action of a heat engine employing steam as the working substance. To simplify the first consideration as far as possible, let it be supposed that we have a long cylinder composed of non-conducting material except at the base, and fitted with a- non-conducting piston; also a source of heat A at some temperature ti ; a receiver of heat, or, as we may now call it, a condenser C, at a lower temperature t 2 ; and a non-conducting cover B. Then We can perform as follows the ideal reversible cycle of operations first described by Carnot, which gives the highest possible efficiency attainable in any heat engine. To fix the ideas, suppose that there is 1 lb of water in the cylinder to begin with, at the temperature n : —

1. Apply A, and allow the piston to rise. The water will take in heat and be converted into steam, expanding isothermally at constant pressure^. This part of the operation is shown by the line ah in fig. 9.

2. Remove A and apply

B. Allow the expansion to continue adiabatically (be), with falling pressure, until the temperature falls to t 2 . The pressure will then be pi,. namely, the pressure given in the table corresponding

to T 2 .

3. Remove B, apply C, and compress. Steam is con- densed by rejecting heat to

C. The action is isothermal, and the pressure remains pi. Let this be continued until a certain point d is reached, after which adiabatic compression will complete the cycle.

4. Remove C and apply B. Continue the compression, which is now adiabatic. If the point d has been rightly chosen, this will complete the cycle by restoring ,the working fluid to the state of water at temperature n.

The " indicator diagram " or diagram exhibiting the relation of pressure to volume for such a cycle is given in fig. 9. Since the process is reversible, and since heat is taken in only at n and rejected only at T2, the ideal conditions for perfect efficiency are satisfied, and accordingly the efficiency is (n — t 2 /ti. The heat taken in per lb of the fluid is Li, and the work done is Li(ti — t 2)/ti, a result which may be used to check the calculation of the diagram.

39. Efficiency of a Perfect Steam Engine: Limits of Temperature. — If the action here described could be realized in practice, we should have a thermodynamically perfect steam engine using saturated steam. The fraction of the heat supplied to it which such an engine would convert into work would depend simply on the temperature, and therefore on the pressure, at which the steam was produced and condensed. The t em P er ature of. condensation is limited by the consideration that there must be an abundant supply of some substance to absorb the rejected heat; water is actually used for this purpose, so that t 2 has for its lower limit the temperature of the available water-supply.

To' the higher temperature -n a practical limit is set by the mechanical difficulties, with regard to strength and to lubrication, which attend the use of high-pressure steam. In engines of ordinary construction the pressure is rarely so much as 250 lb per sq. in.

torn

tMM\X*

l

3

■ *V*

i

>

v 1

*l^flTHC#M*t-*

N

m ■' '

Fig. 9.— Carnot's Cycle with water and steam for working substance.

STEAM ENGINE

It must not be supposed that the efficiency On — rj)/^ is actually attained, or is even attainable. Many causes conspire to prevent steam engines from being thermodynamically perfect, and some of the causes of imperfection cannot be removed.

40. Engine with Separate Organs. — In the ideal engine represented in fig. 10 the functions of boiler, cylinder and condenser are combined in a single vessel; but, provided the working substance passes through the same cycle of operations, it is indifferent whether these are performed in several vessels or in one. To approach a little more closely the conditions that hold in practice, we may think of

the engine as consisting of a boiler A (fig. 10) kept at tj, a non-conducting cylinder and piston B, a surface con- denser C kept at t 2 , and a feed-pump D which restores the condensed water to the boiler. When the several organs of the engine are separated in this way we can still carry out the first three stages of the cyclic process described in § 38. The first stage of that cycle

Flo. xo.-Organs of a Steam Engine. STSSSff^tfifSSS into the cylinder. Then the point known as the point of cut-off is reached, at which admission ceases, and the steam already in the cylinder is allowed to expand, exerting a diminishing pres- sure on the piston. This is the second stage, or the stage of expansion. The process of expansion may be carried on until the pressure falls to that of the condenser, in which case the expansion is said to be complete. .At the end of the expansion release takes place, that is to say, communication is opened with the con- denser. Then the return stroke begins, and a

period termed the exhaust occurs, that is to say, steam passes out of the cylinder, into the condenser, where it is condensed at the pressure in the condenser, which is felt as a back pressure opposing the return of the piston. So far, all has been essentially reversible and identical with the corresponding parts of Carnot's cycle.

But we cannot complete the cycle as Carnot's cycle was completed. The existence of a separate condenser makes the fourth stage, that of adiabatic compression, impracticable, and the best we can do is to continue the exhaust until condensation is complete, and then return the condensed water to the boiler.

41. Rankine Cycle. — It follows that the ideal cycle of Garnot is not an appropriate standard with which to compare the action of a real steam engine. Instead of it we have, in the engine with separated organs, a cycle which is commonly called the Rankine cycle, which differs from the Carnot cycle only in this, that the stage of adiabatic compression, is wanting and its place is taken by a direct return of the condensed water to the boiler, a process which makes the water receive heat at various temperatures, ranging from the temperature of the condenser up to that of the boiler. The chief part of the heat which the working substance receives is still taken in at the upper limit of temperature, during the process of changing from water to steam. But a small part is taken in at lower tempera- tures, namely, in the heating of the feed water in its transfer to the boiler. Any heat so taken in has less availability ior conversion into work than if it were taken in at the top of the range, and conse- quently the ideal efficiency of the cycle falls somewhat short of this ideal reached in the cycle of Carnot.

But the principle still applies that with respect to each portion of the heat that is taken in, the fraction convertible into work under ideally favourable conditions is measured by (t — ti)/t, where t is the absolute temperature at which that portion of heat is received, and t 2 is the temperature at which heat is rejected. Accordingly, we may investigate as follows the ideal performance of an engine following the Rankine cycle. Let &Q represent that portion of the whole heat which is taken in at any temperature t. Then the greatest amount of work obtainable from that portion of heat is ?Q(r— t 2)/t, and the whole amount of work ideally obtainable in the complete process is found by calculating, 25Q(t — t2)/t where the summation includes all the heat that is taken in. In a steam engine using saturated steam the principal item in this sum is the latent heat Li, which is taken in at constant temperature n, during the change of state from water to steam. But there is, in addition, the heat taken in by the feed-water

before it reaches the temperature at which steam is formed, and this may be represented as the sum of a series of elements ahr taken in at varying temperatures t, where a is the specific heat of water. Thus if W represents the thermal equivalent of the work theoretically obtainable per ft of steam, under ideally favourable conditions

determined by Regnault, between the limits of ri and tj. basis

W= t r(r 1 T. 2) J T2logˆ+ Ll(T '~ T2) –

T 2 Ti

It is usual to take a as practically equal to 1 , which makes W =

827

On this

= (r

\ Tl/ T 2

This expresses the greatest amount of work which each pound of steam can yield when the temperature ti at which it reaches the engine and the temperature t 2 at which it leaves the engine are assigned. It consequently serves as a standard with which the actual per- formance may usefully be compared. The actual yield per lb of steam is always considerably less, chiefly because the ideal condition of adiabatic expansion from the higher to the lower extreme of temperature is never satisfied.

A more simple expression for the work theoretically obtainable per lb of steam when expanded adiabatically under the conditions of the Rankine cycle, is

I1-I2, where Ii is the total heat of the working substance in the initial state, before the adiabatic expansion, and I 2 is its total heat after that expansion. For it may readily be proved that, in an adiabatic process,

y,r_ ; , q-»T(T— T;) J Llfri— T 2) T Ti

The experiments of Regnault show that a, within the limits of temperature that obtain in boilers, is a nearly constant quantity, and no serious error will be introduced in this integration by treating it as a constant, with a value equal to the mean value, as

l'-I. = j/£«fc.

and this integral is the area of the indicator diagram when the substance is taken in at pi, expanded to pi and discharged at pi.

This expression applies whether the steam is initially superheated or not. I 2 will in general be the total heat of a wet mixture, and to calculate it we must know the condition as to wetness which results from the expansion. This is most easily found, especially when there has been initial superheat, by making use of the entropy- temperature diagram to be presently described, or by other graphic methods, for an account of which the reader should refer to the paper by Mollier already cited, or to J. A. Ewing's The Steam Engine and other Heat Engines (3rd ed.).

42. Entropy. — The study of steam-engine problems is greatly assisted by introducing the idea of entropy and making use of diagrams in which the two co-ordinates are entropy and temperature. Entropy is a condition of the working substance defined by the statement that when any quantity of heat SQ is received by, or generated in, or rejected by the substance, when its absolute temperature is t, the substance gains or loses entropy by the amount SQ/t. Thus 2SQ/r measures the whole change of entropy in a process which involves the taking in or rejection of heat at more than one temperature. We shall denote entropy by tf>, and consider it as reckoned per unit of mass of the substance. Since by definition of entropy SQ—SQ/t, t5<£ = oQ, and hence if a curve be drawn with t and for ordinates to exhibit the action of a working substance, the area under the curve, or jrd, being equal to S5Q, measures the heat which the substance has received or rejected during the operation which the curve represents.

In a reversible cycle of operations Carnot's principle shows that S5Q/t = o, and it is obvious in such a case that the entropy returns at the end of the cycle to its primitive value. The same result may be extended to a cycle which includes any non-reversible step, by taking account of the heat generated within the substance by such a step, as if it were heat communicated from outside, in the reckoning of entropy. Thus, for example, if at one stage in the cycle the substance passes through a throttle-valve, which lowers its pressure without letting it do work, the action is equivalent in effect to an adiabatic expansion, together with the communication to the substance, as heat, of the work which is lost in consequence of the irreversible expansion through the throttle-valve taking the place of adiabatic expansion against a piston. If this heat be included in the

reckoning 25Q/r = o for the complete cycle.

The entropy-temperature diagram for any complete cyclic process is a closed curve, and the area it encloses, being the excess of the heat received over the heat rejected, measures the work done. The entropy-temperature diagram shares this useful characteristic with the pressure-volume diagram, and in addition it shows directly the heat received and the heat rejected by the areas under the forward and backward limbs of the curve. To draw the entropy-tempera- ture diagram for the ideal steam engine (namely, the engine following the Rankine cycle), we have to reckon first the entropy which water acquires in being heated, and next the entropy Li/n which is acquired when the conversion into steam has taken place. Reckoning from any standard temperature t,,, in the heating of the feed-water up to any temperature r, the entropy acquired is

*. (~t adr < *V = J T o — ' and taking a as sensibly constant,*

4>,,, = ff(logeT — logero)-

During evaporation at n a quantity of heat Li is taken in at temperature n, and hence the entropy of the steam

*, = *«, +L1/T1 = O- (lOgeTj – log«T) +Li/ti>*

£ S\ˆXX.\ˆ\XXXXXxVV-v,X..-.X.xˆ

**

Entrnptj

Values of the entropy of water and steam are given in the table. The entropy-temperature diagram for a Rankine cycle is illustrated

in fig. ii, where ab, a logarithmic curve, repre- sents the process of heat- ing the feed-water, and be the passage from the state of water into that of steam. The diagram / is drawn to scale for a case in which steam is formed at a pressure of 180 lb per sq. in., and condensed at a pressure of I lb per sq. in. After the formation of the steam, the next step in the ideal process is adiabatic expansion from the higher to the lower limit of temperature, which is represented by

p IG the vertical straight line

.... .'„.'„, C< 1< an adiabatic process

being also lsentropic. Finally, the cycle is completed by da, which represents the condensation of the steam after its temperature has been reduced by adiabatic expansion to the lower limit of temperature. The area abed represents the work done, and its value per lb of steam is identical with W as reckoned above. The area mabcp is the whole heat taken in, and the area madp is the heat rejected.

Let a curve cf be drawn to show the values of the entropy of steam for various temperatures of saturation: then if ad be pro- duced to meet the curve in /, the ratio fd/fa represents the fraction of the steam which was condensed during adiabatic expansion. For the point / represents the state of I lb of saturated steam, and in the condensation of I lb of saturated steam the heat given out would be the area under fa, whereas the heat actually given out in the condensation from d was the area under da. Thus the state at d is that of a wet mixture in which da/fa represents the fraction present as steam, and fd/fa the fraction present as water. It obviously follows that by drawing horizontal lines at intermediate tempera- tures the development of wetness in the expanding steam can be readily traced. Again, if the steam is not dry when'expansion begins, its state may be represented by making the expansion line begin at a point in the line be, such that the segments into which the line is divided are proportional to the constituents of the wet mixture. In this way the ideal process may be exhibited for steam with any assumed degree of initial wetness. Further, the entropy-temperature diagram admits of ready application to the case of incomplete expansion. Suppose, for example, that after adiabatic expansion from c to c' (fig. 12) the steam is directly cooled to the lower-limit

Fig. 12. temperature by the application of cooling water instead of by con- tinued expansion. This process is represented by the line e'ed, which is a curve of constant volume. Its form is determined by the consideration that at any point e the proportion of steam still uncondensed, or le/lk, is such that the mixture fills the same volume as was filled at c'.

43. Entropy-Temperature Diagrams extended to the Case of Super- heated Steam. — In the diagrams which have been sketched, it has

been assumed that the steam is supplied to the engine in a saturated state. To extend the same treat- ment to the case of super- heated

steam, we have to take account of the supple- mentary supply of heat which the steam receives after the point c is reached, and before expansion be- gins. When superheating is resorted to, as is now often the case in practice, the superheat is given at constant pressure. If K represent as before the mean specific heat of steam at constant pressure, the addition of entropy during

■*i*

1

/ ‘

‘t

\ \ \ \

d

♦ *]’*

u

the process of superheating from n to t’ is k(t’— n). The value of k may be treated as approximately constant, and the addition to the entropy may then be written as K (log r’-log n). This gives a line such as er on the entropy diagram (fig. 13), and increases the value of W by the amount

‘ ” (t-t 2)

/:

Fig. 13.

which is represented on the diagram by the area dcrs. During adiabatic expansion from r the steam remains superheated until it reaches the state /, when it is just saturated, and further expansion results in the condition of wetness indicated by j The extra work dcrs is done at the expense of the extra supply of heat pcru, and an inspection of the diagram suffices to show that the efficiency of the ideal cycle is only very slightly increased by even a large amount of superheating. In practice, however, superheating does much to promote efficiency, because it materially reduces the amount by which the actual performance of an engine falls short ot the ideal performance by keeping the steam comparatively dry in its passage

through the engine, and thereby reducing exchanges ot heat between the steam and the metal.

44. Entropy of Wet Steam— The entropy of wet steam is readily calculated by considering that the change of entropy in the conversion from water to steam will be gL/r if the steam is wet, q being the dryness Accordingly the entropy of wet steam at any tempera- ture t is

= logtT — logero+gL/r. We may apply this expression to trace the development of wetness in steam when it expands adiabatically. In adiabatic expansion 0=constant. Using the suffix 1 to distinguish the initial state, we therefore have at any stage in the expansion

log e T-logrro+gL/7- = log e Ti-log'T +giLi/T 1 , from which the dryness at that stage is found, namely,

ˆu(t I + 1 ˆ)-

The expression is not applicable to steam which is initially superheated In either case the graphic method of tracing the change ot condition during adiabatic expansion is available.

45. Actual Performance.— Trials of engines using saturated steam show that in the most favourable cases from 60 to 65 % of the ideallv possible amount of work is realized as " indicated " work One of the causes of loss is that the expansion is incomplete. In practice the steam is allowed to escape to the condenser, while its pressure is still considerably higher than the pressure at which condensation is to take place. When the pressure of steam in the cylinder has been so far reduced by expansion that it can only overcome the friction of the piston, there is no advantage in going on further; the indicated work due to any additional expansion would add nothing to the output of the engine, when allowance is made for the work spent on friction within the mechanism itself. Considera- tions of bulk often lead to an even earlier release of the expanding steam; and another consideration which points the same way is that when expansion is carried very far, the losses due to exchange of heat between the cylinder and the steam, referred to below, tend to increase. Again, since experience shows that the most efficient engines are those in which the process of expansion is divided into two, three or more stages by the use of compounded cylinders, a certain amount of loss is to be ascribed to the drops in pressure which are liable to occur through unresisted expansion in the transfer ot steam from one vessel to another. But the chief cause of loss is to be found in the exchanges

of heat which take place between the steam and the metal. In each cylinder there is a process of alternate condensation and re-evaporation— condensation during the period of admission, when the steam finds itself brought intS contact with metal which has been. chilled by evaporation during the preceding exhaust stroke, and then evaporation, when the pressure has fallen sufficiently, during the later stage of expansion, as well as during exhaust. The consequence is that the steam

though supplied in a dry

state, may contain some 20

or 30 % of moisture when

admission to the cylinder is

complete, and the entropy

diagram for the real process

of expansion takes a form

such as is indicated by the

line e'e" in fig. 14. The heat a,

supplied is still measured by

*the area under abc. The * IG * *4-*

condensation from c to c' occurs by contact with the walls of the

cylinder; and though part of the heat thus abstracted is restored

before release occurs at c" , the general result is to make a large

reduction in the area of the diagram.

46. Exchanges of Heat between the Steam and the Metal.— The. exchanges of heat between steam and metal in the engine cylinder have been made the subject of an elaborate experimental examination

by Professors Callendar and Nicolson (Proc. Inst. C.E. cxxxi. 147), who studied the cyclic variations of temperature throughout the metal by means of thermo-electric junctions set at various depths. They found that the range of temperature through which the surface of the metal fluctuates is much less than the range of temperature passed through by the steam; the processes of condensation and re-evaporation are slow, and the time is too short to bring the surface of the metal into anything like equilibrium with the steam. The amount of condensation up to the point of cut-off, as inferred from the heat which the metal takes up, may be much less than the " missing quantity " or difference between the steam supplied per stroke and the dry steam then present. According to their experiments, this discrepancy is accounted for by leakage of steam past the valve, direct from the steam chest to the exhaust, and they suggest that this source of error may have been present in many estimates of initial condensation based on determinations of the missing quantity. This may explain cases in which the initial condensation has apparently been excessive, but large amounts of initial condensation certainly do occur, and constitute the most potent factor in making the real performance of the engine fall short of the ideal standard. 1

In the alternate condensation and re-evaporation of steam in the cylinder more heat is given to the metal by each pound of steam that is condensed than is taken from the metal by each pound of steam that is re-evaporated, the temperature of condensation being higher than that of re-evaporation. The quantity Hi — H 2 , namely, the difference in the heat of formation at the two temperatures, represents this excess of heat. Unless this is in some way abstracted from the metal, the process cannot occur. Hence the action of the cylinder walls in causing alternate condensation and re-evaporation to occur may be limited by imposing conditions which prevent or reduce the abstraction of heat. By the use of a steam jacket the metal may be prevented from losing heat externally, and may even be made to take up heat. Under these conditions the action depends on the fact that more water is re-evaporated than is con- densed. To some extent this is a necessary result of the work done during expansion, which (in an adiabatic process) would make the steam become wetter as expansion proceeds, and would therefore leave more water to be evaporated than is initially condensed by the action of the cylinder walls. But it is important to notice that any water which is introduced into the cylinder along with the steam will be an important factor in supplying the means by which this thermal balance is maintained. With steam that is perfectly dry before admission the action of the walls takes its limit from the

condensation which expansion brings about; with steam that is wet before admission no such limit applies. Hence the importance of having steam that is initially dry. To secure this, no method is so certain as to give some initial superheat to the steam, and hence arises the practical advantage which even a small amount of superheating is found to bring about.

47. Influence of the Slide-Valve. — To a considerable extent the slide-valve itself promotes initial condensation, for it requires that the hot steam shall enter the cylinder through a passage which, immediately before, was chilled by being used for the escape of exhaust steam. The use of entirely distinct admission and exhaust ports and valves tends towards economy of steam, partly for this reason and partly because it allows the clearance spaces to be reduced. Accordingly, we find that many of the best recorded results of tests relate to engines in which each cylinder has four separate valves of the Corliss or of the drop type. By using hori- zontal cylinders with admission valves on the top and exhaust valves below, the further advantage of drainage through the exhaust valves is secured. Water which is present at release has then the chance of escaping without being re-evaporated, a circumstance which contributes largely to reduce the exchange of heat between the working substance and the metal. Thus a horizontal triple- expansion engine with drop valves, by Messrs Sulzer, using saturated steam at an absolute pressure of 160 lb per sq. in., and indicat- ing not much more than 200 h.p., is reported, in a test by Professor Stodola, to have used only 11-52 lb of steam per indicated horse-power-hour (see Engineer, July I, 1898; also summary of trials by B. Donkin, ibid., Oct. 13, 1899). The performance in this test is equivalent to nearly 69 % of the ideal, an exceptionally high figure. In one or two trials of larger engines even this performance has been surpassed, 1 1 -2 and 11-3 lb per horse-power-hour having been recorded. In other particularly favourable records of trials the consumption of steam with triple-expansion engines has been found to lie between 12 and 13 lb per horse-power-hour. Some of the best results relate to slow-running pumping engines fitted with steam jackets on the barrels and on the covers of the cylinders, and may be taken as showing how influential, in a long-period engine, the jacket may prove in reducing the evils of initial condensation. In the mean of several apparently authoritative trials by different observers on different engines the consumption of steam was 12-2 lb per horse-power-hour, at an absolute pressure of about 140 lb per sq. in., which corresponds to 66% of the ideal performance.

1 See also " Report of Steam Engine Research Committee," Inst.

Mech. Eng. (1905).

It should be added that these figures are exceptional. A consumption of 13 or 14 lb of steam per horse-power-hour is much more usual even in large and well-designed triple-expansion engines; and with two-cylinder compound engines, using steam with an absolute pressure of 100 or 120 lb per sq. in., anything from 14 to 15 lb may be reckoned a good performance.

48. Superheated Steam. — The advantage of superheated steam, which arises mainly from its influence in reducing the exchange of heat between the steam and cylinder walls, was demonstrated by the experiments of Hirn, and as early as i860 it was not unusual to supply superheaters with marine engines. But the practice of superheating was soon abandoned, chiefly on account of difficulties in regard to lubrication. By the introduction of heavy mineral oils this objection has been removed, and a revival in the use of superheating has taken place, with striking effect on the thermodynamic economy of engines. Experiments made in 1892 by the Alsatian Society of Steam Users on a large number of engines showed that superheating effected an average saving in coal to the extent of about 20%, when the superheater was simply placed in the boiler flue, so that it utilized what would otherwise be waste heat, and about 12 % when the superheater was separately fired. In those cases the steam was superheated only about 30° to 45° C. above the temperature of saturation, but in more recent practice much greater amounts of superheat have been successfully applied. Professor Schroter has tested a factory engine of 1000 h.p., using steam super- heated by some 50 C, and has shown that this amount of super- heat is not sufficient to prevent some of the steam from becoming condensed on the walls during admission to the cylinder {Zeitschrift des Vereins deutscher Ingenieure, vol. xl., 1896). It follows that still larger amounts of superheat will be thermodynamically advantageous. That this is the case has been demonstrated by the remarkable results which have been obtained with highly superheated steam by W. Schmidt in stationary engines and locomotives. Using a somewhat special design, Schmidt has shown that it is perfectly practicable to employ steam superheated to a temperature of 400 C, and that an efficiency not attainable from steam in any other way is thereby reached. In several authentic trials of Schmidt engines the consumption of steam has been considerably less than 10 lb per indicated horse-power-hour — a figure which, after allowance is made for the heat taken up during the process of superheating, represents a better performance than that of the best engines using saturated or slightly superheated steam. It has been found that the consumption of coal,

in the boiler and superheater together, need not exceed if lb per indicated horse-power even with engines of small power. To attain this remarkable result it is of course necessary that, after the hot gases from the furnace have passed the superheater, a further extraction of heat from them should take place. This is done by an economizer or feed-water heater of peculiar form, consisting of a long coil of small pipes which maintain a circulation of hot distilled water through a closed system containing an external coil, which forms the heater of a tank through which the feed-water passes on its way to the boiler. Some of the Schmidt engines adopt the principle of single action, to escape the necessity of having a piston-rod and gland on the side which is exposed to contact with high-temperature steam ; but it is found that this precaution is not essential, and that with glands of suitable design a double-acting piston may be used without inconvenience, and without risk of undue wear. In some instances Schmidt transfers to the partially expanded steam in the interme- diate receiver a portion of the heat which is conveyed to the engine by the highly superheated steam; and when this is done, the steam may properly receive a still higher degree of initial superheat. Accordingly, though the initial temperature of the steam may be 400 C. or more, this is reduced to about 320 by transfer to steam in the superheater before the high-pressure steam is admitted to the cylinder. In tests by the present writer of a Schmidt plant indica- ting 180 h.p., in which this device was employed, the steam was superheated to 397 C. and 10-4 lb were used per horse-power- hour. In this trial the temperature of the chimney gases was reduced, by the use of Schmidt's feed- water heater, to 175 C, and the consumption of coal was 1-31 lb per indicated horse-power-hour. In another trial, of a larger engine with steam superheated to 425° C, the consumption of steam per horse-power-hour was only 9-0 lb.

49. The Indicator. — The actual behaviour of steam in the cylinder of a steam engine is studied by means of the indicator, which serves not only to measure the work done but to examine the operation of the valves and generally to give much useful information regarding the action of the engine. The indicator, which was invented by Watt, and improved by Richards, is a device for automatically drawing a diagram showing the pressure at all points of the piston's stroke. In its most usual form it consists of a small steam cylinder fitted with a piston which slides easily within it and is pressed down by a spiral spring of steel wire. The cylinder of the indicator is connected by a pipe below this piston to one or other end of the cylinder of the engine, so that the piston of the indicator rises and falls in response to the fluctuations of pressure which occur in the engine cylinder.

The indicator piston actuates a pencil, which rises and falls with it and traces the diagram on a sheet of paper fixed to a drum that is caused to rotate back and forth through a certain arc, in unison with the motion of the engine piston. In

M'Naught's indicator the pencil is directly attached to the indicator piston, in Richards's the pencil is moved by means of a system of links so that it copies the motion of the piston on a magnified scale. This has the advantage that an equally large diagram is drawn with much less movement of the piston, and errors which are caused by the piston's inertia are consequently reduced. In high-speed engines especially it is important to minimize the inertia of the indicator piston and the parts connected with it. In Richards's indicator the linkage employed to multiply the piston's motion is an arrangement similar to the parallel motion introduced by Watt as a means of guiding the piston-rod in beam engines. In several recent forms of indicator lighter linkages are adopted, and other changes have been made with the object of fitting the instrument better for high-speed work. One of these modified forms of Richards's indicator (the Crosby) is shown in fig. 15. The pressure

Fig. 15. — Crosby Indicator.

of steam in the engine cylinder raises the piston P, compressing the spring S and causing the pencil Q to rise in a nearly straight line through a distance proportional, on a magnified scale, to the compression of the spring and therefore to the pressure of the steam. At the same time the drum D, which carries the paper, receives motion through the cord C from the crosshead of the engine. Inside this drum there is a spiral spring which becomes wound up when the cord is pulled, and serves to turn the drum in the reverse direc- tion during the back stroke. The cap of the indicator cylinder has holes in it which admit air freely to the top of this piston, and the piston has room to descend, extending the spring S, when the pressure of the steam is less than that of the atmosphere. The spring is easily taken out and replaced by a more or less stiff one when higher or lower pressures have to be dealt with.

50. Errors in Indicator Diagrams. — To register correctly, an indicator must satisfy two conditions: (1) the motion of the piston must be proportional to the change of steam pressure in the engine

cylinder: and (2) the motion of the drum must be proportional to that of the engine piston.

The first of these requires that the pipe which connects the indicator with the cylinder should be short and of sufficient bore, and that it should open in the cylinder at a place where the pressure in it will not be affected by the kinetic action of the inrushing steam. Frequently pipes are led from both ends of the cylinder to a central position where the indicator is set, so that diagrams may be taken From either end without shifting the instrument; better results are obtained, especially when the cylinder is long, by using a pair of indicators, each fixed with the shortest possible connecting pipe. The general effect of an insufficiently free connexion between the indicator and the engine cylinder is to make the diagram too small. The first condition is also invalidated to some extent by the friction of the indicator piston, of the joints in the linkage, and of the pencil on the paper. The piston must slide very freely ; nothing of the nature ot packing is permissible, and any steam that leaks past it must have a free exit through the cover. The pencil pressure must not exceed the minimum which is necessary for clear _ marking. Another source of disturbance is the inertia of the moving parts, which tends to set them into oscillation whenever the indicator piston suffers a comparatively sudden displacement. These oscilla- tions, superposed upon the legitimate motions of the piston, give a wavy outline to parts of the diagram, especially when the speed is great. When they appear on the diagram a continuous curve should be drawn midway between the crests and hollows of the undulations. To keep them within reasonable compass in high- speed work a stiff spring must be used and an indicator with light parts should be selected. Care must be taken that the spring is

graduated to suit the temperature (about 100 C.) to which it is exposed when in use ;. its stiffness at this temperature is about 3 % less than when cold.*

51. Measurement of Horse-Power.— To determine the indicated horse-power, the mean effective pressure is found by dividing the area of the diagram by the length of its base. This gives a mean height, which, interpreted on the scale of pressures, is the mean effective pressure in pounds per square inch., This has to be multi- plied by the effective area of the piston in square inches and by the length of the piston stroke in feet to find the work done per stroke in foot-pounds on that side of the piston to which the diagram refersˆ Let Ai be the area of the piston on one side and A2 on the other ; pi and pi the mean effective pressures on the two sides respectively; L

the length of the stroke in feet ; and n the number of complete double strokes or revolutions per minute. Then the indicated horse-power

j H p _ nL(piA 1 +p i A 2)

33000

In finding the mean pressure the area of the diagram may be conveniently measured by a planimeter. A less accurate plan, frequently followed, is to divide the diagram by lines drawn at the middle of strips of equal width and to take the mean pressure as the average height of these lines.

52. Tests of Efficiency. — In testing the actual efficiency of an engine the work done as determined by the indicator is compared with the supply of heat, which is calculated from the amount of steam passing through the engine. We may find the amount of steam passing through either by measuring the feed-water or, when a surface condenser is used, by collecting the condensed water from the air-pump discharge and measuring that, adding the water drained from jackets if any are used. In some trials both of these measurements have been made, and it has been found that in general the amount of feed-water exceeds the amount of steam discharged from air-pump and jackets by something like 3 or 4 %, a discrepancy due to leakages in the boiler and the engine. The results of tests are generally stated by giving the number of pounds of steam used per horse-power-hour, or by giving the work done by each pound of steam, a quantity which is directly comparable with the amount of work ideally obtainable, if the engine followed the perfect Rankine cycle already discussed. To make a complete engine trial the engine is caused to work not only at full power, but at various fractions of its greatest load. The results are very conveniently represented (in a manner due to P. W. Willans) by drawing a curve, the co-ordinates of which are the horsepower and the total consumption of steam per hour. This " Willans Line," as it is called, is irt most cases straight or nearly straight. Another useful curve is drawn by plotting the steam used per horse-poWer-hour in relation to the horse-power.

53. Determination of the "Missing Quantity." — When the amount of steam passing through the engine is known, the indicator diagram enables the degree of wetness of the steam to be estimated at various stages in the expansion from cut-off to release, provided there is no direct passage from steam-chest to exhaust, such as has been referred to above in connexion with Messrs Callendar and Nicolson's

researches. For this purpose we must first calculate the quantity of the working substance present in the cylinder. It is made up of two parts, namely, the amount supplied per stroke, plus the amount retained by being shut up in the clearance space. If we assume, as may generally be done without serious error, that at the beginning of compression the steam present in the cylinder is dry, it is an easy matter to deduce from the diagram, knowing the pressure and the volume, how much steam is shut up in the clearance. Adding that to the supply per stroke, we get the whole quantity that is present from cut-off to release. The volume which this would occupy at each pressure, if saturated, is found from the steam table The volume actually occupied at each pressure is found from the diagram, and by comparing the two it is easy to infer how much of the substance exists as water and how much as steam. The ratio of the two volumes measures with sufficient accuracy the dryness of the steam. Any direct leakage from the steam side to the exhaust side of the valve will invalidate this calculation, which proceeds..On the basis that all the steam passing through the engine passes through the cylinder.*

54. Compound Engines. — In the original form of compound engine, invented by Hornblower and revived by Woplf , steam passed directly from the first to the second cylinder; the exhaust from the first and admission to the second went on together throughout the whole of the back stroke. This arrangement is possible only when the high and low pressure pistons begin and end their strokes together, as in engines of the "tandem " type, whose high and low pressure cylinders are in one line, with one piston-rod common to both pistons. Engines in which the high and low pressure cylinders are placed side by side, and act either on the same crank -or on cranks set at 180° apart, may also discharge steam directly from one to the other cylinder; the same remark applies to beam engines, whether of the class in which both pistons act on one end of the beam, or of the class introduced by M'Naught, in which the high and low pressure cylinders stand on opposite sides of the centre. By ja

convenient usage which is now pretty general the name " Woolf engine " is restricted to those compound engines which discharge steam directly from the high to the low pressure cylinders without the use of an intermediate receiver.

55. Receiver Engine. — An intermediate receiver becomes necessary

when the phases of the pistons in a compound engine do not agree With two cranks at right angles, for example, a portion of the discharge from the high-pressure cylinder occurs at a time when the low-pressure cylinder cannot properly receive steam. The receiver is in some cases an entirely independent vessel connected to the cylinders by pipes; very often, however, a sufficient amount of receiver volume is afforded by the valve casings and the steam pipe which connects the cylinders. The receiver, when it is a distinct vessel, is frequently jacketed.

A receiver is frequently applied with advantage to beam and tandem compound engines Communication need not then be maintained between the high and low pressure cylinders during the whole of the stroke , admission to the low-pressure cylinder is stopped before the stroke is completed ; the steam already admitted is allowed to expand independently ; and the remainder of the discharge from the high-pressure cylinder is compressed into the intermediate receiver. Each cylinder has then a definite point of cut-off, and by varying these points the distribution of work between the two cylinders may be adjusted at will. In general it is desirable to make both cylinders of a compound engine contribute equal quantities of work. If they act on separate cranks this has the effect of giving the same value to the mean twisting moment of both cranks.

56. Compound Diagrams .—Wherever a receiver is used, care should be taken that there should not be a wasteful amount of unresisted expansion into it; in other words, the pressure in the receiver should be not greatly less than that in the high-pressure cylinder at the moment of release. If the receiver pressure is less there will be what is termed ” drop ” in the steam pressure between the high-pressure cylinder and the receiver, which will show itself in an indicator diagram by a sudden fall at the end of the high- pressure expansion. This ” drop ” is, from the thermodynamic point of view, irreversible, and therefore wasteful. It can be avoided by selecting a proper point of cut-off in the low-pressure cylinder. When there is no ” drop ” the expansion that occurs in a compound engine has precisely the same effect in doing work as the same amount of expansion in a simple engine would have, provided the law of expansion be the same in both and the waste of energy which occurs by the friction of ports and passages in the transfer of steam from one to the other cylinder be negligible. The work done in either case depends merely on the relation of pressure to volume throughout the process; and so long as that relation is unchanged it is a matter of indifference” whether the expansion be performed in one vessel or in more than one. In general a compound engine has a thermo- dynamic advantage over a simple

engine using the same pressure and the same expansion, inasmuch as it reduces the exchange of heat between the working substance and the cylinder walls and so makes the process of expansion more nearly adiabatic. The com- pound engine has also a mechanical advantage which will be pre- sently described. The ultimate ratio of expansion in any compound engine is the ratio of the volume of the low-pressure cylinder to the

volume of steam admitted to the high-pressure cylinder. Fig. 16 illustrates the com- bined action of the two cylin- V. \^ ders in a hypothetical com-

"] ^ — _- ' ■ ^ — ^« pound engine of the Woolf ' I ■ type, in which for simplicity*

the effect of clearance is ne- glected and also the loss of pressure which the steam undergoes in transfer from one to the other cylinder. ABCD is the indicator diagram of the high-pressure cylinder. The exhaust line CD shows a falling pressure in consequence of the increase of volume which the steam is then undergoing through the advance of the low-pressure piston. EFGH is the diagram of the low-pressure cylinder drawn alongside of the other for convenience in the construc- tion which follows. It has no point of cut-off; its admission line is the continuous curve of expansion EF, which is the same as the high-pressure exhaust line CD, but drawn to a different scale of volumes. At any point K, the actual volume of the steam is KL + MN. By drawing OP equal to KL + MN, so that OP represents the whole volume, and repeating the same construction

at other points of the diagram, we may set out the curve QPR, the upper part of which is identical with BC, and so complete a single diagram which exhibits the equivalent expan- sion in a single cylinder.

In a tandem compound engine of the

receiver type the diagrams resemble

those shown in fig. 17. During CD

», „ , r^. (which corresponds to FG) expansion

Fig. 17.— compound Dia- ia taki la £ into the j ^ r tew .

grams: Receiver type. pressure 8 c ^ U nder. D and G mark

the point of cut-off in the large cylinder, after which GH shows tha

Fig. 16. — Compound Diagrams: Woolf type.

independent expansion of the steam now shut within the large cylinder, and DE shows the compression of steam by continued discharge from the small cylinder into the receiver. At the end of the stroke the receiver pressure is OE, and if there is to be no " drop " this must be the same as the pressure at C. Diagrams of a similar kind may be sketched without difficujty for the case of a receiver engine with any assigned phase relation between the pistons.

57. Adjustment of Work and " Drop." — By making the cut-off take place earlier in the large cylinder we increase the mean pressure in the receiver ; the work done in the small cylinder is consequently diminished. The work done in the large cylinder is correspondingly increased, for the total work (depending as it does on the initial pressure and the total ratio of expansion) is unaffected by the change. The same adjustment serves, in case there is " drop," to lessen it.' By selecting a suitable ratio of cylinder volumes to one another and to the volume of the receiver, and also by choosing a proper point for the low-pressure cut-off, it is possible to divide the work suitably between the cylinders and at the same time prevent the amount of drop from being greater than is practically convenient.

58. Uniformity of Effort in a Compound Engine. — An important mechanical advantage belongs to the compound engine in the fact that it avoids the extreme thrust and pull which would have to be borne by the piston-rod of a single-cylinder engine working at the same power with the same initial pressure and the same ratio of expansion. If all the expansion took place in the low-pressure cylinder, the piston at the beginning of the stroke would be exposed to a thrust much greater than the sum of the thrusts on the two pistons of a compound engine in which a fair proportion of the expansion is performed in the small cylinder. The mean thrust throughout the stroke in a tandem engine is of course not affected by compounding ; only the range of variation in the thrust is reduced. The effort on the crank-pin is consequently made more uniform, the strength of the parts may be reduced, and the friction at slides and journals is lessened. The advantage in this respect is obviously much greater when the cylinders are placed side by side, instead of tandem, and work on cranks at right angles. As a set-off to its advantage in giving a more uniform effort, the compound engine has the drawback of requiring more working parts than a simple engine with one cylinder. But in many instances— as in marine engines —*

two or more Cranks are almost indispensable- to give a tolerably uniform effort' and to get over the dead points; and the comparison should then be made between a pair of simple cylinders and a pair of compounded cylinders. Another point in favour of the compound engine is that, although the whole ratio of expahsion is great, there need not be a very early cut-off in either cylinder; hence the common slide-valve, which is unsuited to give an early cut-off, may be used in place of a more complex arrangement. The mechanical advantage of the compound engine has long been recognized, and had much to do with its adoption in the early days of high-pressure steam. Its subsequent development has been due in part to this, and in part to the thermodynamic advantage which has been discussed above.

59. Ratio of Cylinder Volumes. — In a two-cylinder compound engine, using steam at 80 to 100 lb pressure, the large cylinder has 3 or 4 times the volume of the small cylinder. In triple engines the pressure is rarely less than 1 50 lb ; the low-pressure cylinder has generally 6 or 7 times, and the intermediate cylinder 2 5 to 2 J times the volume of the high-pressure cylinder. In naval practice the ratios are about 1 : 2\ : 5 for a pressure of 160 lb and 1 : 2-6 : 7 for a pressure of 250 lb. In the mercantile marine the engines are normally working at full power, whereas in the navy most of the working is at greatly reduced powers, the cruising speed requiring very much less than the full output. Consequently, for the same boiler pressure, the cylinder ratio is made less in war-ships to adapt the engines for economical working under cruising conditions.

60. The Distribution of Steam. — In early steam engines the distribution of steam was effected by means of conical valves, worked by tappets from a rod which hung from the beam. The slide-valve, the invention of which in the form now known as the long D-slide

Fig. 18. — Horizontal Section through Cylinder and Valve-chest: showing Slide-valve.

is credited to Murdock, an assistant of Watt, came into general use with the introduction of locomotives, and is now employed, in one or other of many forms, in the great majority of engines.

The common slide-valve is illustrated in fig. 18, which also shows

the cylinder and the ports and passages leading to its ends. The seat,

or surface on which the valve slides, is a plane surface formed on or fixed to the side of the cylinder, with three ports or openings which extend across the greater part of the cylinder's width. The central opening is the exhaust port through which the steam escapes ; the others, or steam ports, which are narrower, lead to the two ends of the cylinder respectively. The valve is a box-shaped cover which slides over the seat, and the whole is enclosed in a chamber called the valve-chest, to which steam from the boiler is admitted. When the valve moves a sufficient distance to either fide of the central position, steam enters one end of the cylinder from the valve-chest and escapes from the other end of the cylinder through the cavity of the valve into the exhaust port. The valve is generally moved by an eccentric on the engine shaft, which is mechanically equivalent to a crank whose radius is equal to the eccentricity, or distance from the centre of the shaft to the centre of the eccentric sheave. The eccentric rod is generally so long that the motion of the valve is sensibly the same as that which it would receive were the rod infinitely long. Thus if a circle (fig. 19) be drawn to represent the path of the eccentric centre during a revolution of the engine, and a perpendicular PM be drawn from any point P on a diameter AB, the distance CM is the displacement of the valve from its middle position at the time when the eccentric centre is at P. AB is the whole travel of the valve.

61. Lap and Lead. — If the valve when in its middle position did not overlap the steam ports (fig. 20), any movement to the right or the left would admit steam, and the admission would continue until the valve hacj returned to its middle position, or, in other words, for half a revolution of the engine. Such a valve would not serve for expansive working, and as regards the relative position of the crank and eccentric it would have to be set so that its middle position coincided with the extreme position of the piston; in other words,

Fig. 19.

Fig. 20. — Slide- Valve without Lap.

Fig.

21. — Slide- Valve with Lap.

the eccentric radius would make a right angle with the crank. Expansive working, however, becomes possible when we give the valve what is called " lap," by making it project over the edges of the steam ports, as in fig. 21, where is the " outside lap " and i is the " inside lap." Admission of steam (to either side) then begins only

when the displacement of the valve from its middle position exceeds the amount of the outside lap, and continues only until the vaPve has returned to the same distance from its middle position. Further, exhaust begins only when the valve has moved past the middle by a distance equal to i, and continues until the valve has again returned to a distance i from its middle position. Thus on the diagram of the eccentric's travel (fig. 22) we find, by setting off and i on the two sides of the centre, the posi- tions a, b, c and d of the eccentric radius at which the four events of admission, cut-off, release and compression occur for one side of the piston. As to the other side of the piston, it is only neces- sary to set off to the right and i to the left of the centre, but for the sake of clearness we may confine our attention to one of the two sides. Of the whole revolution, the part from a to b is the arc of steam admission, from b to c is the arc of expansion, from c to d the arc of exhaust, and from d to a the arc of compression. The relation of these, however, to the piston's motion is still undefined. If the eccentric were set in advance of the crank by an angle equal to ACff, the opening of the valve would be coincident with the beginning of the piston's stroke. It is, however, desirable, in order to allow the steam free entry, that the valve be already some way open when the piston stroke begins, and thus the eccentric may be set to have a position Co' at the begin- ning of the stroke. In that case the valve is open at the beginning of the stroke to the extent mm', which is called the " lead." The amount by which the angle between Ca' (the eccentric) and CA (the crank) exceeds a right angle is called the angular advance, this being the angle by which the eccentric is set in advance of the position it would occupy if the primitive arrangement without lap were adopted. The quantities lap, lead and angular advance (0) are connected by the equation

outside lap-Head = half travel X cos 9. An effect of lead is to cause preadmission, that is to say, admis-

kdnvstiof'

FlG. 22.

sion before the end of the back stroke, which, together with the compression of steam left in the cylinder when the exhaust port closes, produces the mechanical effect of " cushioning," to which reference has already been made. To examine the distribution of steam throughout the piston's stroke, we may now draw a circle to represent the path of the crank pin (fig. 23, where the dotted lines

Fig. 23.

*have been added to show the assumed configuration of piston, connecting-rod and crank) and transfer to it from the former diagram the angular positions o, b, c and d at which the four events occur. To facilitate this transfer the diagrams of eccentric path and of crank-pin path may by a suitable choice of scales be drawn of the same actual size. Then by projecting these points on a diameter which represents the piston's path, by circular arcs drawn with a radius equal to the length of the connecting-rod, we find p, the position of the piston at which admis- sion occurs during the back stroke, \, also 3 and r, the position at cut-off and release, during the stroke which takes place in the direction of the arrow, and s, the point at which compression begins. It is obviously «< **"" unnecessary to draw the two circles of figs. 22 and 23 separately; the single diagram (fig. 24) contains the solution of the steam distribution with Pig. 24. a slide-valve whose laps, travel and*

angular advance are known, the same circle serving, on two scales, to show the motion of the crank and of the eccentric.

Zeuner's Diagram. — The graphic construction most usually employed in slide-valve investigations is the ingenious diagram published by Dr G. Zeuner in the Civilingenieur in 1856. 1 On the line AB (fig. 25), which represents the travel of the valve, let a pair of circles (called valve- circles) be drawn, each with diameter equal to the half travel. A radius vector CP, drawn in the direction of the eccentric at any instant, is cut by one of the circles at Q, so that CQ re- presents the corresponding displacement of the valve from its middle position. That this is so will be seen by drawing PM (as in fig. 19) and FlG. 25.

joining QB, when it is obvious that CQ = CM, which is the displacement of the valve. The line AB with the circle on it may now be turned back through an angle of 9O° + 0 (0 being the angular advance), so that the valve-circles take the position shown

Fig. 26.— Zeuner's Slide- Valve Diagram.

to a larger scale in fig. 26. This makes the direction of CQ (the eccentric) coincide on the paper with the simultaneous direction of

1 Zeuner, Treatise on Valve Gears, trans, by M. Mtiller (1868).

Fig. 27.

the crank, and hence to find the displacement of the valve at any position of the crank we have only to draw CQ in fig. 26 parallel to the crank, when CQ represents the displacement of the valve to the scale on which the diameter of each valve circle represents the half-travel of the valve. CQo is the valve displacement at the beginning of the stroke shown by the arrow. Draw circular arcs ab and cd with C as centre and with radii equal to the outside lap and the inside lap i respectively. Ca is the position of the crank at which pre- admission occurs. The lead is a Qo. The greatest steam opening is ajB. The cut-off occurs when the crank has , . . a , . , , the direction Cb. Cc is the position

of the crank at release, and Cd marks the end of the exhaust

03. In this diagram radii drawn from C mark the angular positions of the crank and their intercepts by the valve circles determine the corresponding displacement of the valve. It remains to find the corresponding displacement of the piston. For this Zeuner employs a supplementary graphic construction, shown in fig. 27. Here ab or a b represents the connecting rod, and be or b'c the crank. With centre c and radius ac a circle ap is drawn, and with centre b and radius ab another circle aq. Then for any position of the crank, as cb , the intercept pq between the circles is easily seen to be equal to aa , and is therefore the distance by which the piston has moved lrom its extreme position at the beginning of the stroke. In practice this diagram is combined with that of fig. 26, by drawing both about the same centre and using different scales for valve and piston travel A radius vector drawn from the centre parallel to the crank in any position then shows the valve's displacement from the valve's middle position by the intercept CQ of fig. 26, and the piston's displacement from the beginning of the piston's motion by the intercept pq of fig. 27.

64. In the figures which have been sketched the events refer to the front end of the cylinder, that is, the end nearest to the crank (see hg. 23) 10 determine the events of steam distribution at the back end, the lap circles shown by dotted lines in fig. 26 must also be drawn, Ca' being the outside lap for the back end, and Cc' the inside lap. These laps are not necessarily equal to those at the other end of the valve. From the diagrams it will be seen that, especially with a short connecting-rod, the cut-off and release occur earlier and the compression later at the front than at the back end it the laps are equal, and a more symmetrical steam distribution can be produced by making the inside lap greater and the outside lap less on the side which leads to the front end of the cylinder On the other hand, an

unsymmetrical distribution may be desirable as in a vertical engine, where the weight of the piston assists the steam during the down-stroke and resists it during the up-stroke and this may be secured by a suitable inequality in the laps

65. By varying the ratio of the laps and i to the travel of the valve, we produce effects on the steam distribution which are readily traced by means of the diagram. Reduction of travel (which is equivalent to increase of both and i) gives later pre- admission, earlier cut-off, later release and earlier compression- the ratios of expansion and of compression are both increased. Increase of angular advance accelerates all the events and causes a slight increase in the ratio of expansion.

_ 66. In designing a slide-valve the breadth of the steam ports in the direction of the valve's motion- is determined with reference to the volume of the exhaust steam to be discharged in a given time the area of the ports being generally such that the mean velocity ot the steam during discharge is less than 100 ft. per second The travel is made great enough to keep the cylinder port fully open during the greater part of the exhaust; for this purpose it is 2\ or 3 times the breadth of the steam port. To facilitate the exit of steam the inside lap is always small, and is often wanting or even negative. During admission the steam port is rarely quite un- covered, especially if the outside lap is large and the travel moderate. Large travel has the advantage of giving freer ingress and egress of steam, with more sharply-defined cut-off, compression and release but this advantage is secured at the cost of more work spent in moving the valve and more wear of the faces. To lessen the neces- sary travel without reducing the area of steam ports, double-ported valves are often used. An example is shown below in fig. 39

67 Reversal of Motion with Slide- Valve. —The eccentric must stand in advance of the crank by the angle 90° + 0, as in fig. 28, where CK is the crank, and CE the corresponding position of the eccentric when the engine is running in the direction of the arrow a. To set the engine in gear to run in the opposite direction (b) it is only necessary to shift the eccentric into the position CK when it wil still be 90 +6 in advance of the u„ «■-> -i Cr 5" ln – the ? lder e "g in es this reversal was effected

by temporarily disengaging the eccentric-rod from the valve-rod

rr »nfJ L Va w by J£?, d u H tn the crank turned back through an angle equal to ECE', the eccentric meanwhile remaining

Fig. 28.

at rest, and then re-engaging the gear. The eccentric sheave, instead of being keyed to the shaft, was driven by a stop fixed to the shaft, which abutted on one or other of two shoulders projecting from the sheave. In some modern forms of reversing gear means are provided for turning the eccentric round on the shaft, but the arrangement known as the link-motion is now the most usual gear in locomotive, marine, winding and other engines which require to be often and easily reversed.

68. Link-Motion.— In the link-motion two eccentrics are used and the ends of their rods are connected by a link. In Stephenson's link-motion— the earliest and still the most usual form— the link is a slotted bar or pair of bars curved to the same radius as the eccentric rods (fig. 29), and capable of being shifted up or down bv a suspension rod. The valve-rod ends in a block which slides within the link, and when the link is placed so that this block is nearly in line with the forward eccentric rod (R. fig. 29) the valve moves in

Fig. 29. — Stephenson's Link-Motion.

nearly the same way as if it were driven directly by a single eccentric Ihisjs the position of " full forward gear." In " full backward gear, on the other hand, the link is pulled up until the block is in nearly a line with the backward eccentric rod R'. The link-motion thus gives a ready means of reversing the engine— but it does more than this. By setting the link in an intermediate position the valve receives a motion nearly the same as that which would be given by an eccentric of shorter radius and of greater angular advance and the effect is to give a distribution of steam in which the cut-off is earlier than in full gear, and the expansion and compression are greater. In mid gear the steam distribution is such that scarcely any work is done in the cylinder. The movement of the link is effected by a hand-lever, or by a screw, or (in large .engines') bv an auxiliary steam engine. A usual arrangement of hand-lever sketched in fig. 29, has given rise to the phrase " notching up "

Fig. 30.— Gooch's Link-Motion. to describe the setting of the link to give a greater degree of expan-

In Gooch's link-motion (fig. 30) the link is not moved up in

Fig. 31.— Allan's Link-Motion.

shifting from forward to backward gear, but a radius rod between the valve-rod and the link (which is curved to suit this radius rod) is raised or lowered— a plan which has the advantage that the lead is the same in all gears. In Allan's motion (fig. 31) the change of gear is effected partly by shifting the link and partly by shifting a radius rod, and the link is straight.

69. Graphic Solution of Link-Motion.— -The movement of a valve driven by a link-motion may be very fully and exactly analysed by drawing with the aid of a template the positions of the centre line

the link corresponding to a number of successive positions of the crank. Thus, in fig. 32, two circular arcs passing through e and e' are drawn with E and E' as centres and the eccentric rods are radii, lhese are loci of two known points of the link, and a third locus is the circle a in which the point of suspension must tie. By placing on the paper a template of the link, with these three points marked

on it, the position of the link is readily found, and by repeating the process for other positions of the eccentrics a diagram of positions (fig. 32) is drawn for the assigned state of the gear. A line AB drawn across this diagram in the path of the valve's travel deter- mines the displacements of the valve, and enables the oval diagram to be drawn, which is shown to a larger scale in another part of fig. 32. The example refers to Stephenson's link-motion in nearly full forward gear; with obvious modification the same method may be used in the analysis of Gooch's or Allan's motion. The same

Fig. 32.

diagram determines the amount of slotting or sliding motion of the block in the link. In a well-designed gear this sliding is reduced to a minimum for that position of the gear in which the engine runs most usually. In marine engines the suspension-rod is generally connected to the link at the end of the link next the forward eccen- tric, to reduce this sliding when the engine is in forward gear.

70. — Radial Gears. — Many forms of gear for reversing and for Varying expansion have been devised with the object of escaping the use of two eccentrics, and in some both eccentrics are dispensed

with. Hackworth's gear, the parent of several others, to which the general

name of radial gears is applied, has a single eccen- tric E (fig. 33) opposite the crank, with an eccentric-rod EQ, whose mean position is perpendicular to the travel of the valve. The rod ends in a block Q, which slides on a fixed inclined guide-bar or link, and the valve-rod re- ceives its motion through a connecting rod from an inter- mediate point P of the eccen- tric-rod, the locus of which is an ellipse. To reverse the gear the guide-bar is tilted over to the position shown by the dotted lines, and intermediate inclinations give various degrees of expansion without altering the lead. The steam distribution is quite satisfactory, but an objection to the gear is the In Bremme's or Marshall's

Fig.

33. — Hackworth's Valve-Gear.

wear of the sliding-block and guide.

form this objection is obviated with some loss of symmetry in the valve's motion by constraining the motion of the point Q, not by a sliding-guide, but a suspension-link, which makes the path of Q a circular arc instead of a straight line; to reverse the gear the centre of suspension R of this link is thrown over to the position R' (fig. 34). I n the example sketched P is beyond Q, but P may be between Q and the crank (as in fig. 33), in which case the eccentric is set at 180 from the crank. This gear has been applied in a number of marine engines. In Joy's gear, which is extensively used in locomotives, no eccentric is required; and the rod corresponding to the eccentric rod in Hackworth's gear receives its motion from a point in the connecting rod by the linkage shown in fig. 35, and is either suspended, as in Marshall's form, by a rod whose suspension centre R is thrown over to reverse the motion, or constrained, as in Hackworth's, by a slot-guide whose inclination is reversed. Fig. 36 shows Joy's gear as applied to a locomotive. A slot-guide E is used, and it is curved to allow for the obliquity of the valve connect- ing-rod AE. C is the crank-pin, B the piston path and D a fixed centre.

A form of radial gear very largely used in locomotives, especially on the continent of Europe, is the Walschaert or Heusinger- Waldegg gear, in which the valve receives its motion in part from the piston cross-head through a reducing lever, and in |»rt from a single eccentric set at right angles to the crank, which actuates a rocking

link. Reversing is effected by shifting

a sliding block along this rocking link from one side to the other of the centre on which it rocks. , ■

Fig. 34. — Bremme's or Marshall's Valve-Gear.

71. Separate Expansion-Valves. — When the distribution of steam is effected by the slide-valve alone the arc of the crank's motion during which compression occurs is equal to the arc during which expansion occurs, and for this reason the slide-valve would give an

. AbcAoˆ.

r-

foto Path*

Fig. 35.— Diagram of Joy's Valve-Gear.

excessive amount of compression if it were made to cut off the supply of steam earlier than about half-stroke. Hence, where an early cut-off is wanted it is necessary either to use an entirely different means of regulating the distribution of steam, or to supplement the

o Fig. 36. — Joy's Gear as applied to a Locomotive.

slide-valve by another valve — called an expansion-valve, usually driven by a separate eccentric — whose function is to effect the cut-off, the other events being determined as usual by the slide-valve. Such expansion-valves belong generally to one or other of two types. In one the expansion-valve cuts off the supply of steam to the chest In which the main valve works.

Fig. 37. — Expansion- Valve on back of Main Slide- Valve.

In the other the expansion-valve slides on the back of the main slide-valve, which is provided with through ports which the expan- sion-valve opens and closes Fig. 37 shows one form of this type. Here the resultant relative motion of the expansion-valve and main-valve has to be considered. If r a and r (fig. 38) are the eccentrics working the main and expansion valves respectively, then CR drawn equal and parallel to ME is the resultant eccentric which determines the motion of the expansion-valve relatively to the main-valve. Cut-off occurs at Q, when the shaft has turned through an

Fig. 38.

piston

angle , which brings the resultant eccentric into the direction CQ and makes the relative displacement of the two valves equal to the distance I.

Expansion-valves furnish a convenient means of varying the expansion, which may be done by altering their lap, travel or angular advance. Alteration of lap, or rather of the distance / in the figures, is often effected by having the expansion-valve in two parts (as in %• 37) and holding them on one rod by right- and left-handed screws respectively ; by turning the valve-rod the parts are made to approach or recede from each other. In large valves the adjustment is more conveniently made by varying the travel of the valve, which is done by connecting it to its eccentric through a link which serves as a lever of variable length.

72. Relief Rings. — To relieve the pressure of the valve on the seat, large slide-valves are generally fitted with a steam-tight ring, which excludes steam from the greater part of the back of the valve. The ring fits steam-tight into a recess in the cover of the steam-chest, and is pressed by springs against the back of the valve, which is planed smooth to slide under the ring. Fig. 39 shows a relief ring of this kind fitted on the back of a large double- ported slide-valve for a marine engine. Another plan is to fit the ring into a recess on the back of the valve, and let it slide on the inside of the steam- chest cover. Steam is thus excluded from the space within the ring, any steam that leaks in being allowed to escape to the condenser (or to the intermediate receiver when the arrangement is fitted to the high- pressure cylinder of a compound engine). A flexible diaphragm has also been used, instead of a recess, to hold the ring.

73. Piston Slide-Valve. — The pressure of valves on cylinder faces is still more completely obviated by making the back of the valve similar to its face, and causing the back to slide in contact with the valve- chest cover, which has recesses corresponding to the cylinder ports. This arrangement is most perfectly carried out in the slide-valves now very largely used in the high-pressure cylinders of marine engines. The piston slide-valve may be described as a slide- valve in

which the valve face is curved to form a complete cylinder, round whose whole circumference the ports extend. The pistons are packed like ordinary cylinder pistons by metallic rings, and the ports are crossed here and there by diagonal bars to keep the rings from springing out as the valve moves over them. Fig. 40 shows a form of piston valve for the supply of high-pressure steam to a large marine engine. P, P are the cylinder ports.

74. Balance Piston. — Fig. 39 illustrates an arrangement common in all heavy slide-valves whose travel is vertical — the balance piston, which Is pressed up by steam on its lower side and so equili- brates the weight of the valve, valve-rod and connected parts of the mechanism.

The valve sometimes takes the form of a rocking cylinder. This last kind of sliding motion is very usual in stationary engines fitted with Corliss gear, in which case fo.ur distinct rocking slides are com- monly employed to effect the steam distribution, one giving admission and one giving exhaust at each end of the cylinder.

75. Double-Beat Valve. — In many stationary engines, especially on the con- tinent of Europe, lift or mushroom valves are used, worked by tappets, cams or

He. 40.— Piston eccentrics. Lift- valves are generally of

Slide- Valve. the Cornish or double-beat type (fig. 41),

in which equilibrium is secured by the use of two conical faces which open or close together. In Cornish pumping engines, which retain the single action of Watt's early engine, three double-beat valves are used, as steam-valve, equilibrium-valve and exhaust- valve respectively. These are closed by tappets on a rod moving with the beam, but are opened by means of a device called a cataract, which acts as follows: The cataract is a small pump with a weighted plunger, discharging fluid through a stop-cock which can be adjusted by hand when it is desired to alter the speed of the engine. The weighted plunger is raised by a rod from the beam, but is free in its descent, so that it comes down at a rate depending on the extent to which the stop-cock is opened. When it comes down a certain way it opens the steam and exhaust valves, by liberating catches which hold them closed; the "out-door" stroke then begins and admission continues until the steam-valve is closed : this is done directly by the motion of the beam, which

Fig. 41.-

-Double-Beat Lift

Valve.

also, at a later point in the stroke, closes the exhaust. Then the equilibrium-valve is opened, and the " in-door " stroke takes place, during which the plunger of the cata- ract is raised. When it is completed, the piston pauses until the cataract causes the steam-valve to open and the next " out-door " stroke begins. By applying a cataract to the equil- ibrium-valve also, a pause is intro- duced at the end of the " out-door " stroke. Pauses have the advantage of giving the pump time to fill and of allowing the pump-valves to settle I in their seats without shock.

76. Methods of Regulating. — To make an engine run steadily an almost continuous process of adjust- ment must go on, by which the amount of work done by the steam in the cylinder is adapted to the amount of external work demanded of the engine. Even in cases where the demand for work is sensibly uniform, fluctuations in boiler-pressure still make regulation necessary. Generally the process of government aims at regularity of speed; occasionally, however, it is some other condition of running that is maintained constant, as when an engine driving a dynamo-electric machine is governed by an electric regulator to give a constant difference of potential between the brushes.

The ordinary methods of regulating are either (a) to alter the pressure at which steam is admitted by opening ot closing more or less a throttle- valve between the boiler and the engine, or (6) to alter the volume of steam admitted to the cylinder by varying the point of cut-off. The former plan, was introduced by Watt and is still common, especially in small engines. The second plan of regulating is generally preferred, especially when the engine is sub- 1 ject to large variations of load. Within certain limits regulation by either plan can be effected by hand, but for the finer adjustment of speed some form of automatic governor is necessary. Speed governors are commonly of the centrifugal type: a pair of masses revolving about a spindle which is driven by the engine are kept from flying out by a certain controlling force. When an increase of speed occurs this controlling force is no longer able to keep the masses revolving in their former path; they move out until the con- trolling force is sufficiently increased, and in moving out they act on the regulator of the engine, which may be a throttle- valve or some form of automatic expan-

sion gear. In the conical pendulum governor of Watt (fig. 42) the revolving masses are balls attached to a vertical spindle by links, and the controlling force is furnished by the weight of the balls, which, in receding from the spindle, are obliged to rise. When the speed exceeds or falls short of its normal value they move out or in, and so raise or lower a collar c which is in connexion by a lever with the throttle-valve.

77. Loaded Governor. — In a modified form, known as the loaded governor, a supplementary controlling force is given by placing a weight on the sliding collar (fig. 43). This is equivalent to in- creasing the 'weight of the balls without altering their mass. In other governors the controlling force is wholly or partly produced by springs. The use of springs to provide controlling force allows the axis of rotation to be horizontal, and governors of this class are frequently attached directly to the hori- zontal shaft in high-speed engines.

78. Equilibrium of Governor. — In whatever way the revolving masses are controlled, the controlling force may be treated as a force F acting on each ball in the direction of the radius towards the axis of revolution. Then, if M be the mass of the ball, n the number of revolutions per second and r the radius of the ball's path, the governor will revolve in equilibrium when F = 4ir 2 nVM (in absolute Units), or

Fig. 42.— Watt's Governor.

Fig. 43.— Loaded Governor.

2jr\Mr

In order that the configuration of the governor should be stable, F must increase more rapidly than r, as the balls move outwards. It is obvious that no stable governor maintains a strictly constant speed in the engine which it controls. If the boiler pressure or the demand for work is changed, a certain amount of permanent displace- ment of the balls is necessary to alter the steam-supply, and the balls can retain their displaced position only by virtue of a permanent change in the speed. The maximum range of speed depends on that amount of change of n which suffices to alter the configuration

of the governor from the position which gives no steam-supply to the position which gives full steam-supply , and the governor is said to be sensitive if this range is a small fraction of n.

To find the configuration which the governor will assume at any particular speed, or the speed corresponding to a particular configura- tion, it is only necessary to determine the whole controlling force F per ball acting along the radius towards the axis for various values of r. Let a curve ab (fig. 44) be drawn showing the relation of F to r. At any assigned value of r set up an ordinate QC = Air 2 n 2 rM. Join OC. The point c, in which OC cuts the curve, determines the value of r at which the balls will revolve at the assigned Fir aa speed n. Or, if that is given, and the value of n

‘ ”” is to be found, the line Oc- produced will determine

C, and then n 2 = QC/4XVM. The sensibility of the governor is determined by taking points a and b corresponding to full steam and no steam respectively, and drawing lines through them to determine the corresponding values of QA and QB. When the frictional resistance / is known, an additional pair of curves drawn above and below ab, with ordinates F + / and F / respect ively, serve to show the additional variations in speed which are caused by friction. The governor is stable throughout its whole ‘ range when the curve ab has a steeper gradient than any line drawn from O to meet it.

79. Isochronism. — If, when the balls are displaced, the controlling force F changes proportionally to the radius r, the speed is constant. In other words, the equilibrium of the governor is then neutral; it can revolve in equilibrium at one, and only at one, speed. At this speed it assumes, indifferently, any one of its possible configurations.

opportunity is passed if the cut-off has already occurred, and the control only begins with the next stroke.

When the demand for power suddenly falls, the speed rises so much as to force the governor into a position of over-control, such that the supply of steam is no longer adequate to meet even the reduced demand for power. Then the speed slackens, and the same kind of excessive regulation is repeated in the opposite direction. A state of forced oscillation is consequently set up. The effect is aggravated by the momentum which the governor balls acquire in being displaced. Hunting is to be avoided by giving the governor a fair degree of stability, by reducing as far as possible the static frictional resistances, and by introducing a viscous resistance to the

displacement of the governor, which prevents the displace- ment from occurring too suddenly, without affecting the ultimate position of equilibrium. For this purpose many governors are furnished with a dash-pot, which is a hydraulic or pneumatic brake, consisting of a piston connected to the governor, working loosely in a cylinder which is filled with oil or with air.

80. Regulation by the Governor of the Steam-Supply: Throttle- Valve. —The throttle- valve, as introduced by Watt, was originally a disk turning on a transverse axis across the centre of the steam- pipe. It is now usually a double-beat valve or a piston-valve. When regulation is effected by varying the cut-off, and an expansion- valve of the slide-valve type is used, the governor generally acts by changing the travel of the valve. In other forms of automatic expansion-gear the lap of the valve is altered ; in others the governor acts by shifting the expansion-valve eccentric round on its shaft, and so changing its angular advance.

81. Trip-Gear. — In large stationary engines the most usual plan of automatically regulating the expansion is to employ some form of

Fig. 45. — Corliss Engine, with Spencer Inglis Trip-Gear.

The slightest variation of speed drives it to the extremity of its range; hence its sensibility is indefinitely great. Such a governor is called isochronous. Where springs furnish the controlling force, an approach to isochronism can be secured by adjusting the initial tension of the springs, and this forms a convenient means of regulating the sensibility.

But in practice no governor can be absolutely isochronous. It is indispensable to leave a small margin of stability for the sake of preventing violent change in the supply of steam, especially when there is much frictional resistance to be overcome by the governor, or where the influence of the governor takes much time to be felt by the engine. An over-sensitive governor is liable to fall into a state of oscillation called hunting. When an alteration of speed begins to be felt, however readily the governor alters its form, the engine's response is more or less delayed. If the governor acts by closing a throttle-valve, the engine has still a capacious valve-chest on which to draw for steam. If it acts by changing the cut-off, its

trip-gear, the earliest type of which was introduced in 1849 by G. H. Corliss (1817-1888), of Providence, U.S.A. In the Corliss system the valves which admit steam are distinct from the exhaust-valves. The

latter are opened and closed by a reciprocating piece which takes its motion from an eccentric. The former are opened by a reciprocating piece, but are closed by springing back when released by a trip- or trigger-action. The trip occurs earlier or later in the piston's stroke according to the position of the governor. The admission-valve is opened by the reciprocating piece with equal rapidity whether the cut-off is going to be early or late. It remains wide open during the admission, and then, when the trip-action comes into play, it closes suddenly. The indicator diagram of a Corliss engine consequently has a nearly horizontal admission-line and a sharply defined cut-off. Generally the valves of Corliss engines are cylindrical plates turning in hollow cylindrical seats which extend across the width of the cylinder. Often, however, the admission-valves in trip^gear engines are of the disk or double-beat type, and spring into their seats when

the trip-gear acts. Messrs Sulzer have developed, this type with much success. Many forms of trip-gear have been invented by Corliss himself and by others. One of these, the Spencer Inghs trip-gear, by Messrs Hick, Hargreaves & Co., is shown in figs. 45 and 46. A wrist-plate A, which turns on a pin on the outside of the cylinder, receives a motion of oscillation from an eccentric. It opens the cylindrical rocking-valve B by pulling the link C, which consists of two parts, connected to each other by a pair of spring clips o, a. Between the clips there is a rocking-cam b, and as the link is pulled down this cam places itself more and more athwart the link, until at a certain point it forces the clips open. Then the upper part of the link springs back and allows the valve B to close by the action of a spring in the dash-pot D. When the wrist-plate makes its return stroke the clips re-engage the upper portion of the link C, and things are ready for the next stroke. The rocking-cam b has its position controlled by the governor through the link E in

Fig. 46. — Corliss Valve-Gear, Spencer Inglis form.

such a way that when the speed of the engine increases it stands more athwart the link C, and therefore causes the clips to be released at an earlier point in the stroke. A precisely similar arrangement governs the admission of steam to the other end of the cylinder. The exhaust-valves are situated at the bottom of the cylinder, and receive an oscillating motion from a separate wrist-plate, behind A,

82. Use of Flywheel. — Besides those variations of speed which occur from stroke to stroke, which it is the business of the governor to check, there are variations within each single stroke due to the varying rate at which work is done on the crank-shaft during its revolution. To limit these is the function of the flywheel, which acts by forming a reservoir of energy to be drawn upon during those parts of the revolution in which the work done on the shaft is less than the work done by the shaft, and to take up the surplus in those parts of the revolution in which the work done on the shaft is greater than the work done by it. This alternate storing and restoring of energy is accomplished by slight fluctuations of speed, whose range depends on the ratio which the alternate excess and defect of energy bears to the whole stock the flywheel holds in virtue of its motion. The effect of the flywheel may be studied by drawing a diagram of crank-effort, which shows the work done on the crank in the same way that the indicator diagram shows the work done on the piston. The same diagram serves another useful purpose in determining the twisting and bending stress in the crank.

The diagram of crank-effort is drawn by representing, in rect- angular co-ordinates, the relation between the moment which the con- necting-rod exerts to turn the crank and the angle turned through by the crank. The moment exerted to turn the crank is readily found when the direction and magnitude of the thrust exerted by the connecting-rod on the crank-pin is known for successive points in the revolution.

83. Influence of the Inertia of the Reciprocating Masses. — This thrust depends not only, on the resultant pressure of the steam on the piston but also on the inertia of the reciprocating masses. The mass of the piston, piston-rod, cross-head, and to some extent that of the connecting-rod also, has to be started and stopped in each half revolution, and in high-speed engines the forces concerned in this action are so large as to affect most materially not only the distribu- tion of crank-effort but also the stresses which the various parts have to be proportioned to bear. The calculation of the stresses due to inertia in high-speed engines consequently forms an essential part of engine design. Taking M to represent the whole reciprocat- ing mass, and a its acceleration at any instant in the direction of the piston's motion, the force required to produce this acceleration is Ma/g, and this quantity has to be deducted from the resultant pressure of the steam in finding the effective thrust. The effect is to reduce the effective thrust at the beginning of the stroke and to increase it at the end. The greatest acceleration a occurs in the extreme position of the piston, most distant from the crank-shaft centre, and its value there

*is 4ir ! »V(i + r/l) where r is the radius of the crank, I the length of the connecting-rod and n the number of turns per second. When the piston is in the other extreme position, nearest to the shaft, the value of o is 4**»V(i – rjl). The exact calculation of inertia effects for the connecting-rod is com-*

plicated, but its influence on the thrust is approximately found by treating the mass of the rod as divided into two parts, one of which moves with the cross-head and is therefore an addition to the recipro- cating system, while the other moves with the crank-pin and is therefore an addition to the revolving system. The mass may be divided for this purpose into parts which are inversely proportional to the distances of the centre of gravity from the cross-head and crank-pin respectively. By com- bining diagrams of the steam thrust and of the forces due to inertia a diagram is obtained showing the true thrust through- out the stroke. Fig. 47 gives an example: there the line ab is drawn to show the inertia forces for an engine in which the con- necting-rod has 3 J times the length of the crank. The straight p IG ._

line cd shows what the inertia .

force would be if the connecting-rod were treated as being so long that the deviation from simple-harmonic motion might be neglected. The inertia of the reciprocating parts imposes a limit on the light- ness of engines of the piston and cylinder type. The proportion of weight to power is reduced by increasing mean piston speeds, but this process cannot be carried beyond a point at which the forces due to inertia become so great as to produce unsafely high alternating stresses in the piston-rods and other parts. In some torpedo-boat destroyers, where the reduction of weight has been carried as far as is practicable, the mean piston speed approaches 1200 ft. per minute with nearly 400 revolutions per minute and an 18-in. stroke. These engines develop 6000 h.p., and the weight of engines and boiler together is only 50 lb per indicated h.p. Such a figure is,

however, to be regarded as exceptional; weights of 150 to 200 lb per h.p. are more usual even in conditions like those of high-speed cruisers where saving of weight is specially desirable.

84. Balancing. — Another aspect in which the inertia of the reciprocating parts is important is in regard to the balancing of the engine as a whole. Any forces required to accelerate the piston and its attached parts produce reaction on the frame and bed-plate of the engine, which will set up vibrational disturbances in the foundations

and ground or the supporting structure. The object of balancing is to group the masses in such a manner that their inertia effects more or less neutralize one another. This is especially important in marine engines, where massive foundations are absent and where it may happen that the periodic impulses due to want of balance find some portion of the hull free to respond synchronously with vibrations so violent as to be inconvenient and even dangerous. Even in land engines a want of balance causes enough vibration to constitute a serious nuisance in the neighbourhood.

,85. In considering the question of balance, the system of eccentrically revolving masses and the system of reciprocating masses have to be considered separately. A reciprocating mass such as a piston cannot be balanced by the use of revolving masses, for the forces which are due to the inertia of the piston necessarily act along the line of its stroke, while those due to revolving masses are continually changing their direction. The inertia of each connecting-rod may be approximately treated by resolving its mass into two constituents, one of which moves with the crank-pin, and is therefore an addition to the revolving system, while the other moves with the cross-head, and is therefore an addition to the reciprocating system. The mass of the rod may be divided for this purpose into parts which are inversely proportional to the distances of its centre of gravity from the crank-pin and the cross-head respectively. LetMi, M2, M», &c, represent the various revolving masses n, r 2 , r 3 , &c, their effective radii of rotation, and a lt a 2 , a 3 , &c, their distances from any assumed plane of reference taken perpendicular to the shaft. Then the conditions necessary for balance amongst them are that the vector sum of M r shall vanish, and also that the vector sum ofMor shall vanish, this latter quantity being the resultant of the moments of the centrifugal forces with respect to the plane of reference. In a four-crank engine there is no serious difficulty in arranging the revolving masses in such a manner that these conditions shall be satisfied, so far as those masses are concerned. The problem, as Professor W. E. Dalby has shown, lends itself readily to graphical treatment (see his treatise on Balancing, of Engines). With respect to the reciprocating masses, a first approximation towards balance is attained by satisfying the conditions which would secure balance if the motions were simply harmonic. These conditions are identical with those which have just been stated for the revolving masses, when r is interpreted as the semi-amplitude of the harmonic motion. When the conditions in question are satisfied, the only remaining source of disturbance is that which comes from the fact that the reciprocating masses are connected to the cranks by rods of finite length; in other

words, that the motions are not simply harmonic. For this reason the force required to accelerate each piston is greater when the piston is at the end of the stroke farthest from the shaft than when it is at the other end, and consequently the balance, which would be perfect if the connecting-rods were

indefinitely long, is disturbed by the presence of forces which vary j periodically with a frequency twice that of the rotation. When three cranks, 120 apart, are employed, it will be found that the effect of the shortness of the. connecting-rods in causing forces to act in the line of the stroke is reduced to a couple tending to tilt the engine in a fore and aft direction, which may in its turn be balanced by using a second set of three cranks on the same shaft, the second set being so arranged that the couple to which it gives rise neutralizes the couple due to the first set. A six-crank engine may be arranged in this 'way to secure an extremely close approximation to per feet balance, and the same state of balance can be secured when the number of cranks is reduced to five.*

86. The most usual arrangement adopted in marine engines, when questions of balance are taken into account, is to have four cranks, and consequently four sets of reciprocating masses. In the " Yarrow-Schlick-Tweedy " system of balancing engines four cranks are employed, and by adjusting the relative weights of the four pistons, as well as their distances apart, and by selecting suitable angles for the relative positions of the cranks (differing somewhat from 90), a close approximation to complete balance is obtained. In triple expansion this arrangement is readily applied when two low-pressure cylinders are used instead of one, the steam from the intermediate cylinder being divided between them, and it is also of course applicable to quadruple expansion engines.

87. In this connexion mention may be made of a type of engine which has been used in various electric power stations, especially in America, in which a revolving mass might be employed to balance completely the inertia effects of two pistons. This is a compound engine in which the cylinders stand at right angles to one another, one being horizontal and the other vertical. If the piston masses were made equal it is clear that the inertia effect of a revolving mass could be resolved into two components which would balance both. It does not appear, however, that advantage has been taken of this property

in the design of actual engines of this type. In the London County Council power station at Greenwich, where the engines are of this class, the unbalanced effects of inertia are so considerable as to affect the instruments at the Observatory half a mile away. One of the conspicuous merits of the steam turbine is that it avoids the use of reciprocating parts and so escapes the inconveniences and limitations to which the inertia of reciprocating parts gives rise.

88. Types of Engine. — In classifying engines with regard to their general arrangement of parts and mode of working, account has to be taken of a considerable number of independent charac- teristics. We have first a general division into condensing and non-condensing engines, with a subdivision of the condensing class into those which act by surface condensation and those which use injection. Next there is the division into compound and non-compound, with a further classification of the former as double-, triple- or quadruple-expansion engines. Again,

engines may be classed as single or double-acting, according as the steam acts on one or alternately on both sides of the piston. Again, a few engines— -such as steam hammers and certain kinds of steam pumps — are non-rotative, that is to say, the reciprocating motion of the piston does work simply on a reciprocating piece; but generally an engine does work on a continuously revolving shaft, and is termed rotative. In most cases the crank-pin of the revolving shaft is connected directly with the piston-rod by a connecting-rod, and the engine is then said to be direct- acting; in other cases, of which the ordinary beam engine is the most important example, a lever is interposed between the piston and the connecting-rod. The same distinction applies to non-rotative pumping engines, in some of which the piston acts directly on the pump-rod, while in others it acts through a beam. The position of the cylinder is another element of classification, giving horizontal, vertical and inclined cylinder engines. Many vertical engines are further distinguished as belonging to the inverted cylinder class; that is to say, the cylinder is above the con- necting-rod and crank. In oscillating cylinder engines the connecting-rod is dispensed with; the piston-rod works on the crank-pin, and the cylinder oscillates on trunnions to allow the piston-rod to follow the crank-pin round its circular path. In trunk engines the piston rod is dispensed with; the connecting- rod extends as far as the piston, to which it is jointed, and a trunk or tubular extension of the piston, through the cylinder cover, gives room for the rod to oscillate. In rotary engines there is no piston in the ordinary sense; the steam does work on a revolving piece, and the necessity is thus avoided of afterwards converting reciprocating into rotary , motion. Steam

turbines may, in one sense, be regarded as an extreme

development of the rotary type; but they are distinct from all other steam engines in this that their action depends on the kinetic energy of the steam.

89 . Beam Engines. — In the single-acting atmospheric engine of Newcomen the beam was a necessary feature; the use of water-packing for the piston required that the piston should move down in the working stroke, and a beam was needed to let the counterpoise pull the piston up. Watt's improvements made the beam no longer necessary; and in one of the forms he designed it was discarded — namely, in the form of pumping engine known as the Bull engine, in which a vertical inverted cylinder stands over and acts directly on the pump-rod. But the beam type was generally retained by Watt, and for many years it remained a favourite with builders of engines of the larger class. The beam formed a convenient driver for pump-rods and valve- rods; and the parallel motion (q.v.) invented by Watt as a means of guiding the piston-rod, which could easily be applied to a beam engine, was, in the «arly days of engine-building, an easier thing to construct than the plane surfaces which are the natural guides of the piston-rod in a' direct-acting engine. In modern practice the direct-acting type has to a very great extent dis- placed the beam type. For mill-driving and the general purposes of a rotative engine the beam type is now rarely chosen. In pumping engines it is somewhat more common, but even there the direct-acting forms are generally preferred.

90. Direct-Acting Engines. — Of direct-acting engines the horizontal type has in general the advantage of greater accessibility, but the vertical economizes floor space. In small forms the engine is generally self-contained, that is to say, a single frame or bedplate carries all the parts including the main bearings in which the crank-shaft with its flywheel turns. The frame often takes what is called a girder shape, which brings a portion of it into a favourable position for taking the thrust between the cylinder and the crank-shaft bearings and allows two surfaces to be formed on the frame to serve as guides for the cross-head. When a condenser is used with a horizontal engine it is usually placed behind the cylinder, and the air-pump, which is within the condenser, has a horizontal plunger or piston on a "tail- rod " or continuation of the main piston-rod through the back cover of the cylinder. In large horizontal engines the condenser generally stands in a well below, and its pump, which is vertical, is driven by means of a bell-crank lever attached by a link to the engine cross-head.

91. Coupled Engines. — When uniformity of driving effort or the absence of dead points is important, two independent cylinders often work on the same shaft by cranks at right angles to each other. Such engines, which are called " coupled," can start readily from any position; the ordinary locomotive engine is an example. Winding engines for mines and collieries, in which ease of starting, stopping and reversing is essential, are very generally made by coupling a pair of cylinders on opposite sides of the winding drum with link motions as the means of operating the valves.

92. Compound Engines, Coupled or Tandem. — Large direct- acting engines are usually compounded either by having a high- and a low-pressure cylinder side by side, with cranks at right angles, or by putting one cylinder behind the other with the axes of both in the same line. The latter is called the tandem arrangement. In a tandem engine, since the pistons agree in phase, the steam may expand directly from the small into the large cylinder. But the connecting-pipe and steam chest form a receiver of considerable size, and to avoid loss by " drop " the supply of steam to the large cylinder is cut off long before the end of the stroke. For mill engines the com- pound tandem and compound coupled types of engine are the most usual. The high-pressure cylinder is very generally fitted with Corliss or other trip-gear.

93. Jet and Surface Condensation.— -In land engines using condensation the jet form of condenser is common, but surface condensation is resorted to when the available water-supply is unsuited for boiler feed. When there is no large supply of condensing water a very fair vacuum can be obtained by using

an evaporative condenser , consisting of a stack of pipes into which the exhaust steam is admitted and over which a small amount of cooling water is allowed to drip. This water is evaporated by the heat which is extracted in condensing the steam within. Such a condenser is placed in the open, generally on a roof where the air has free access. The amount of water it uses need not exceed the amount of steam that is condensed, and is there- fore a very small fraction of the amount required in a jet or surface condenser.

94. High-Speed Direct- Acting Engines. — Prior to the advent of the steam turbine the demand for engines suitable for driving electric

generators without the intervention of a belt led to the introduction of various forms of direct-acting engine adapted to run at a high speed. Some of these were single acting, steam being admitted to one side of the piston only, generally the back, with the result that the rods could be kept in a state of thrust throughout the revolution, and alternations of stress in them and at the joints thereby avoided, together with the knocking and wear of the bearing brasses which it is apt to cause. To secure, however, that the connecting-rod should always push and never pull against the crank-pin there had to be much cushioning during the out stroke on account of the fact that from about the middle of that stroke to the end the reciprocat- ing mass was being retarded. In engines designed by P. W. Willans, which were highly successful examples of this class, the cushioning was provided by means of a supplementary piston which compressed air during the out stroke; the energy which the reciprocating masses had to part with in losing their motion during the second half of the out stroke was stored in this air and was restored in the succeeding down stroke.

Willans obtained compound or triple expansion by mounting two or three cylinders in tandem in a vertical line, with the air-compressing piston below them in the form of a trunk which served also as a guide for the cross-head. The piston-rod was hollow and within it there was a valve rod carrying piston valves for the admission and release of the steam. The valve rod was worked by an eccentric on the crank-pin which gave it the proper relative motion with respect to the hollow piston within which it works. The engine was entirely enclosed in a casing the bottom of which formed an oil bath in which the cranks splashed to ensure ample lubrication. These engines for a time had much vogue and gave good results. Many of them are in use in electric light stations and elsewhere, but the tendency now is to use turbines for this class of work, and even in cases where reciprocating engines are preferred they are now more usually of the double-acting type, which has the advantage of giving a greater output of power for the same weight.

95. Double-Aciing High-Speed Engines. — Of double-acting high-speed engines an interesting form is that of Messrs Belliss and Morcom, the chief distinctive feature of which is the use of forced lubrication at the pin joints and shaft bearings. In a double-acting engine, where the thrust acts alternately on one and the other side of the crank-pins and cross-head pins, high frequency of stroke tends to produce much knocking and wear unless the brasses are very closely adjusted, and in that case the pins are liable to get hot, and to " seize" by expanding sufficiently to fill the small clearance. This

difficulty, which exists when lubrication is carried out in the ordinary way, is overcome in the Belliss engine by feeding the bearings with a continuous supply of oil, which is pumped in under a pressure of about 15 lb per sq. in. The presence of a film of oil is thereby continuously secured, and knocking is prevented although the brasses are not set very close. Notable examples in which double action is combined with a relatively high frequency of stroke are found in naval engineering practice, especially in the engines of high-speed cruisers and torpedo- boat destroyers. As a rule these engines employ triple expansion with four cranks and four cylinders, the third stage of the expan- sion being performed in two cylinders, which divide the steam between them. But in this field also the steam turbine is rapidly displacing the reciprocating type.

06. Pumping Engines. — In engines for pumping or for

*blowing air it is not essential to drive a revolving shaft, and. in many forms the reciprocating motion of the steam piston is applied directly or through a beam to produce the reciprocating motion of the pump-piston or plunger. * On the other hand, pumping engines are frequently made rotative for the sake of adding a flywheel.*

Fig. 48 shows a compound inverted vertical pumping engine of the non-rotative class by Messrs Hathorn, Davey & Co. Steam is distributed through lift valves, and the distribution

Fig. 48. — Vertical Non- Rotative Pumping Engine.

of steam is controlled by means of a cataract, which makes the pistons pause at the end of each stroke. The pistons are in line with two pump-rods, and are coupled by an inverted beam which gives guidance to the cross-heads by means of an approxi- mate straight-line motion. Engines of this kind, like the old Cornish pump, are able to work expansively against a uniform resistance without a flywheel in consequence of the great inertia of the reciprocating pieces which include long massive pump-rods. Notwithstanding the low frequency of the strokes, enough energy is stored in the moving rods to counterbalance the inequalities of steam thrust, and the rate of acceleration of the system adjusts itself to give, at the plunger end, the nearly uniform effort which the pump requires. In other words, the motion, instead of being almost simple harmonic as it is in rotative engines, is such that the form of the inertia curve when drawn as in fig. 47 is nearly the same as that of the steam curve, with the result that the distance between the two, which re- presents the net effort on the pump-plunger, is nearly con- stant. The massive

pump-rods act in such a way as to form a reciprocating equivalent of a flywheel.

97. It is, however, only to deep well pumping that this applies, and a very numerous class of direct-acting steam pumps have too little mass in their reciprocating parts to allow such an adjustment to take place. A familiar example is the small donkey pump used for feeding boilers, in which the steam- piston and pump-plunger are on one and the same rod. In some of these pumps a rotative element is introduced, partly to secure steadiness of working and partly for convenience in working the valves. But many pumps of this class are entirely non-rotative, and in such cases the steam is generally admitted throughout the stroke without expansion. In some of them the valve is worked by tappets from the piston-rod. In the Blake steam pump a tappet worked by the piston as it reaches each end of its stroke throws over an auxiliary steam-valve, which admits steam to one or other side of an auxiliary piston carrying the main slide-valve.

98. Worthington Engines. — In the Worthington pumping engine two steam cylinders are placed side by side, each work- ing its own pump-piston. The piston-rod of each is connected by a short link to a swinging bar, which actuates the slide-valve of the other steam cylinder. In this way one piston begins its stroke when the motion of the other is about to cease, and a

.smooth and continuous action is secured. These engines have been extensively applied, on a large scale, to raise water for the supply of towns and to force oil through " pipe-lines" in the United States. In the larger sizes they are made compound, each high-pressure cylinder having a low-pressure cylinder tandem with it on the same rod. To allow of expansive working a device is added which compensates for the inequality of effort

resulting from an early cut-off. A cross-head A (fig. 40) fixed to each of the piston-rods is connected to the piston-rods of a pair of oscillat- ing cylinders B, B, which contain water and communicate with a reservoir full of air compressed to a pressure of about 300 lb per square inch. When the stroke (which takes place in the direction of the arrow) begins the pistons are at first forced in, and work is at first done the main piston-rod, through the compensating cylinders B,

on the compressed air in the reservoir. This continues until the cross-head has advanced so that the cylinders stand at right angles to the line of stroke. Then for the remainder of the stroke the compensating cylinders assist in driving the main piston, and the compressed air gives out the energy which it stored in the earlier portion. The volume of the air reservoir is so much greater than the volume of the cylinders, B, B, that the air pressure remains nearly constant throughout the stroke. Any leakage from the cylinder or reservoir is made good by a small pump which the engine drives. 99. Pulsometer. — Hall's "pulsometer"

Fig. 49.

by B,

Fig. 50.-

is a peculiar pump- ing engine without cylinder or piston, which may be regarded as the modern representative of the engine of Savery. The sectional view, fig. 50, shows its principal parts. There are two chambers A, A', narrowing towards the top, where the steam-pipe B enters. A ball-valve C allows steam to pass into one of the chambers and closes the other. Steam entering (say) the right-hand chamber forces water out of it past the clack-valve V into a delivery passage D, which is connected with an air-vessel. When the water level in A sinks so far that steam begins to blow through the delivery passage, the water and steam are disturbed and so brought into intimate contact, the steam in A Pulsometer. is condensed, and a partial vacuum is formed. This causes the ball-valve C to rock over and close the top of A, while water rises from the suction-pipe E to fill that chamber. At the same time steam begins to enter the other chamber A', discharging water from it, and the same series of actions is repeated in either chamber alternately. While the water is being driven out there is comparatively little condensation of steam, partly because the shape of the vessel does not promote the formation of eddies, and partly because there is a cushion of air between the steam and the water. Near the top of each chamber is a small air-valve opening inwards, which allows a little air to enter each time a vacuum is formed. When any steam is condensed, the air mixed with it remains on the cold surface and forms a non-conducting layer. The pulsometer is, of course, far from efficient as a thermodynamic engine, but its suitability for situations where other steam-pumps cannot be used, and the extreme simplicity of its working parts, make it valuable in certain cases.

100. Rotary Engines. — From the earliest days of the rota- tive engine attempts have been made to avoid the intermittent reciprocating motion which an ordinary piston engine first produces and then converts into motion of rotation. Murdoch, the contemporary of Watt, proposed an engine consisting of a

pair of spur-wheels gearing with one another in a chamber through which steam passed by being carried round the outer sides of the wheels in the spaces between successive teeth.

In Dudgeon's wheel engine the steam was admitted by ports in side-plates into the clearance space behind teeth in gear with one another, just after they had passed the line of centres. From that point to the end of the arc of contact the clearance space increased in volume; and it was therefore possible, by stopping the admission of steam at an intermediate point, to work expansively. The difficulty of maintaining steam-tight connexion between the teeth and the side-plates on which the faces of the wheels slide is obvious; and the same difficulty has prevented the success of many other forms of rotary engine. These have been devised in immense variety, in many cases, it would seem, with the idea that a distinct mechanical advantage was to be secured by avoiding the reciprocating motion of a piston. In point of fact, however, very few forms entirely escape having pieces with reciprocating motion. In all rotary engines, with the exception of steam turbines — where work is done not by pressure but by the kinetic impulse of steam — there are steam chambers which alternately expand and con- tract in volume, and this action usually takes place through a more or less veiled reciprocation of working parts. So long as engines work at a moderate speed there is little advantage in avoiding reciprocation; the alternate starting and stopping of piston and piston-rod does not affect materially the frictional efficiency, throws no deleterious strain on the joints, and need not disturb the equilibrium of the machine as a whole. The case is different when very high speeds are concerned; it is then desirable as far as possible to limit the amount of reciprocating motion and to reduce the masses that partake in it.

101. Types of Marine Engines. — The early steamers were fitted with paddle-wheels, and the engines used to drive them were for the most part modified beam engines. Bell's " Comet" was driven by a species of inverted beam engine, and another form of inverted beam, known as the side-lever engine, was for long a favourite with marine engineers. In the side-lever engine the cylinder was vertical, and the piston-rod projected through the top. From a crosshead on the rod a pair of links, one on each side of the cylinder, led down to the ends

of a pair of horizontal beams or levers below, which oscillated about a fixed gudgeon at or near the middle of their length. The two levers were joined at their other ends by a cross-tail, from \yhich a connecting-rod was taken to the crank above. The side- lever engine is now obsolete. In American practice, engines of the beam type, with a braced-beam supported on A frames above the deck, are still common in river-steamers and coasters. An old form of direct-acting paddle-engine was the steeple engine, in which the cylinder was set vertically below the crank. Two piston-rods projected through the top of the cylinder, one on each side of the shaft and of the crank. They were united by a crosshead sliding in vertical guides, and from this a return- cortnecting-fod led to the crank. Modern paddle-wheel engines are usually of one of the following types. (1) In oscillating cylinder engines the cylinders are set under the crank-shaft, and the piston-rods are directly connected to the cranks. The cylinders are supported on trunnions which give them the neces- sary freedom of oscillation to follow the movement of the crank. Steam is admitted through the trunnions to slide-valves on the sides of the cylinders. In some instances the mean position of the cylinders is inclined instead of vertical; and oscillating engines have been arranged with one cylinder before arid another behind the shaft, both pistons working on one crank. The oscillating cylinder type is best adapted for what would now be considered comparatively low pressures of steam. (2) Diagonal engines are direct-acting engines of the ordinary connecting-rod type, with the cylinders fixed on an inclined bed and the guides sloping up towards the shaft.

When the scfew-propeller began to take the place of paddle- wheels in ocean steamers, the increased speed which it required was at first supplied by using spur-wheel gearing in conjunction with one of the forms of engines then usual in paddle steamers.

After a time types of engine better suited to the screw were introduced, and were driven fast enough to be connected directly to the screw-shaft. The smallness of the horizontal space on either side of the shaft formed an obstacle to the use of horizontal engines,: but this difficulty was overcome in several ways. In Penn's trunk engine, now obsolete, the engine was shortened by attaching the connecting-rod directly to the piston, and using a hollow piston-rod, called a trunk, large enough to allow the connecting-rod to oscillate inside it. The return-connecting-rod engine was another horizontal form at

one time used in the British navy. It was a steeple engine placed horizontally, with two, and in some cases four, piston- rods in each cylinder. The piston-rdds passed clear of the shaft and the crank, and were joined beyond it in a guided crosshead, from which a connecting-rod returned.

102. Inverted Vertical Engines. — Both in the navy and in merchant ocean steamers one general type of engine is universal, where the reciprocating engine has not yet been displaced by the steam turbine. This is the inverted vertical direct-acting engine, with two or more cylinders placed side by side directly over the shaft. Two, three and four cranks are employed, the arrangement with four cranks being specially suitable, as has already been pointed out, when the balance of the engine at high speeds has to be secured. As a rule naval engines are triple compound, and those of merchant vessels either triple or quadruple. In vessels of high speed and power the engines are arranged in twin sets, on two shafts with twin screw propellers.

The marine engine is always furnished with a surface con- denser, consisting of a multitude of brass tubes about $ in. in diameter cooled by sea-water which is caused to circulate through the condenser by means of a circulating pump. This pump and also the air pump are often driven independently of the main engine.

103. It is in marine practice that the largest examples of engines are to be found. The triple expansion engines of the " Campania " and " Lucania," which develop 30,000 h.p., consist of twin sets, on two shafts, each set having three cranks and five cylinders, two of 37 in., one of 70 in. and two of 98 in. diameter, with a stroke of 69 in. In the " Kaiser Wilhelm der Grosse " engines of the same power are arranged in twin sets, each set consisting of four cylinders, one of 52 in. diameter, one of 89 and two of 96-4, the four giving triple expansion and working on four cranks. The " Deutschland " develops 36,000 h.p. with twin sets, each of which comprises two 36-6-in. cylinders, one 73-6-in., one 103-9-ˆ1. and two io6-3-in. with a stroke of 72-8 in. In the " Kaiser Wilhelm II." each of the twin shafts is driven by two 3-crank 4-cylinder quadruple expan- sion engines, the diameters being 37-4, 49-2, 74-8 and 112-2 in. and a stroke of 70-9 in. With a working pressure of 225 lb per square inch these engines develop in all 40,000 h.p. These are examples of the most powerful reciprocating engines used in the propulsion of ships, but the successful application of the Parsons turbine to marine use has enabled even these powers to be greatly surpassed.

104. Locomotive Engines. — The ordinary locomotive consists of a

pair of direct-acting horizontal or nearly horizontal engines, fixed in a rigid frame under the front end of the boiler, and coupled to the same shaft by cranks at right angles, each with a single slide-valve worked by a link-motion, or by a form of radial gear. The engine is non-condensing, except in a very few special cases, and the exhaust steam, delivered at the base of the funnel through a blast-pipe, serves to produce a draught of air through the furnace. In some instances a portion of the exhaust steam, amounting to about one-fifth of "the whole, is diverted to heat the feed-water. In tank engines the feed-water is carried in tanks on the engine itself; in other engines it is carried behind in a tender.

On the shaft are a pair of driving-wheels, whose frictional adhesion to the rails furnishes the necessary tractive force. In some engines a single pair of driving-wheels are used; in many more a greater tractive force is secured by having two equal

driving-wheels on each side, connected by a coupling-rod be- tween pins on the outside of the wheels. In some engines a still greater proportion of the whole weight is utilized to give tractive force by coupling three or more wheels on each side.

It is now general to have under the front of the engine two or four smaller wheels which do not form part of the driving system. These are carried in a bogie, that is, a small truck upon which the front end of the boiler rests by a swivel-pin or plate which allows the bogie to turn, so as to adapt itself to curves in the line, and thus obviate the grinding of tyres and danger of derailment which would be caused by using a long rigid wheel base. The bogie appears to have been of English origin; 1 it was brought into general use in America, and is now common in English as well as in American practice. Instead of a four-wheeled bogie, a single pair of leading wheels are also used, carried by a Bissel pony truck, which has a swing-bolster pivoted by a radius bar about a point some distance behind the axis of the wheels. This has the advantage of combining lateral with radial movement of the wheels, both being required if the wheel base is to be properly accommodated to the curve. Another method of getiing lateral and radial freedom is the plan used by F. W. Webb of carrying the leading axle in a box curved to the arc of a circle, and free to slide laterally for a short distance, under the control of springs, in curved guides. 2

In inside-cylinder engines the cylinders are placed side by side within the frame of the engine, and their connecting-rods work on cranks in the driving shaft. In outside-cylinder engines the cylinders are spread

apart far enough to lie outside the frame of the engine, and to work on crank-pins on the outsides of the driving wheels. This dispenses with the cranked axle, which is the weakest part of a locomotive engine. Owing to the frequent alternation of strain to which it is subject, a locomotive crank axle is peculiarly liable to rupture, and has to be removed after a certain amount of use.

The outside-cylinder type is adopted by several British makers; in America it is almost universal. There the cylinders are in castings which are bolted together to form a saddle on which the bottom of the smoke-box sits. The slide-valves are on the tops of the cylinders, and are worked through rock- ing levers from an ordinary link-motion. Fig. 51, which is a half section through one cylinder of an American locomotive, by the Baldwin Company of Philadelphia, shows the position of the cylinders and valves.,

In inside-cylinder engines the slide- valves are frequently placed back to back in a single valve-chest between the cylinders. The width of the engine within the frame leaves little room for them there, and they are reduced to the flattest possible form, in some cases with split ports, half above and half below a partition in a central horizontal plane. In some engines the valves are below the cylinders: in many others the valves work on horizontal planes above the cylinders; this position is specially suitable when some form of radial gear is used instead of the link-motion. Radial valve-gears have the advantage, which is of considerable moment in inside-cylinder engines, that a part of the shaft's length which would otherwise be needed for eccentrics is available to increase the width of main bearings and crank-pins, and to strengthen the crank-cheeks.

The principle of compounding has often been applied to locomotive engines, but without much advantage. On this subject the reader should refer to the article Railway: § Locomotive Power. A more important modern departure is the use of highly superheated steam, which in many locomotives has been attended with conspicuous success.

1 Proc. Inst. Civ. Eng., liii. 3, p. 50.

2 Proc. Inst. Mech. Eng. (1883).

Fig. 51. — American Outside-Cylinder Loco- motive.

105. Steam Turbines. — Steam turbines are distinguished from all other types of steam engine by the fact that their action involves a double transformation of energy. The heat energy present in the steam is first employed to set the steam itself in motion, giving it kinetic energy, and this in turn is employed to do work on the turbine blades. A brief account of the main principles involved will make the action of the various types of steam turbine more intelligible.

106. Theory of the Steam-jet. — Consider an element of steam, of unit mass, acquiring kinetic energy in the expansion of the steam through a nozzle or other channel, from a region of pressure pi to a region of lower pressure p 2 . Its volume changes from Vi to Vi in the process. The work done upon it by steam from behind is piVi. The work which it does on the steam in front is p 2 Vi. The net amount of work done upon it is therefore p\ih —piVi. Its velocity changes from Vi to V 2 ; the kinetic energy which it gains is therefore (VY — Vi 2)/2g. The internal energy changes from Ei to E2. Hence by the conservation of energy

(VY – V, 2)/2g = J(Ei -E„) +P1V1 -P>t*

which may be written

(v 2 =-vy)/2 £ =j(i 1 -i 2),

where I is the total heat (§ 31), which is equal to E+£»/J. It is assumed here that the action is adiabatic in the sense that no heat is received by the steam or given up by it to other bodies as the process goes on.

It is usual to speak of the change of I as the " heat drop " which the steam undergoes in acquiring velocity. When the neat drop is known the gain in velocity is readily found, as above. In determin- ing the best drop account must, of course, be taken of the wetness of the steam, or of its superheat if it has any. Thus, for superheated steam I = I, +ic(<'— where I s is the total heat of saturated steam at the same pressure and k(1′ — I) represents the heat taken up in the process of superheating to the actual temperature f from the temperature of saturation t. And for wet steam I = I OT +gL where I„ is the total heat of water, L the latent heat, and q is the dryness fraction.

During this process of expansion, which we assume to be adiabatic, the steam becomes wet, and the value of q accordingly falls. As has been shown in § 36, the dryness may be found at any stage in

adiabatic expansion from the formula —

or it may be determined by measurement from the entropy-tempera-‘ ture diagram. A still more convenient diagram in which the heat drop can be directly measured is one introduced by Mollier, in which the co-ordinates are the entropy and the total heat (see Mollier, loc. at., or Ewing’s Steam Engine).

The pressure-volume diagram gives a very useful alternative

means of finding the heat drop or energy available for trans-formation. Consider steam or any other gas supplied at pressure pi and expanding to pressure pi, at which pressure it is discharged. The work which it does is measured by the area ABCD of the pressure-volume diagram (fig. 52), namely,

ffrP-

upon this s equal to

*W-Vt)l2g=f*iOp.*

If this work is wholly done upon this steam in giving it velocity, the kinetic energy acquired is equal to it, that is

We have already seen (§ 41) that in adiabatic expansion this integral measures the heat drop, being equal to Ii — 12.

If the mode of expansion is such as to make pv n = constant, n being any index, then

/:

pfdPˆnˆlˆ 1 ~ ˆ

D”

j Pi«u

where D is the ratio in which the pressure falls, namely pi/pi-

Now the adiabatic expansion of steam, starting from an initially dry saturated state, is very approximately represented by the formula £j,i-»5-_ constant Hence the area of the pressure- volume diagram, which under these conditions measures the work theoretically obtainable, is equal to 8-41(1 — D°” u ‘)/>iDi, a quantity which will be found on evaluation to agree closely with the value of Ii — la.

107. Form of the Jet in Adiabatic Expansion. — As expansion pro-

ceeds the volume of the steam, per pound, at any stage is found by multiplying the volume of 1 lb of saturated steam, at the pressure then reached, by the dryness fraction q. On comparing the velocity acquired at any intermediate stage of expansion- — as calculated from the heat drop down to that stage — with the increase in volume, it will be found that in the earliest stages the gain in velocity is relatively great, but as expansion proceeds the increase in volume outstrips the increase in velocity. Hence the proper form for a nozzle to give adiabatic expansion is orfe in which the area of section at first contracts and afterwards becomes enlarged. The area of section to be provided for the discharge is found by dividing the volume v at each stage of the velocity V acquired up to that stage, and the ratio r/V at first diminishes and afterwards increases as the expansion proceeds. Take, for instance, as a numerical example, a Case in which dry saturated steam is admitted to a nozzle at an absolute pressure of 213 lb per sq. in., and expands adiabatically, giving itself velocity, until the, pressure falls to 1-7 per sq. in. It will be found on working out numerical values that until the pressure falls to about 123 H) per sq. in. the steam is gaining velocity so rapidly that though its volume is expanding the stream-lines are convergent. Below that pressure, however, the augmentation of volume is relatively so great that a larger and larger area of section has to be provided for the flow. Thus, when the pressure is 123 lb per sq. in. the dryness q is 0-96, the volume per pound is 3-51 cub. ft., the heat drop is 25J thermal units, giving a velocity of 1510 ft. per second. Consequently, the area of the stream is 0-00233 sq. ft. per pound of flow, and this is the minimum value. When the pressure falls to 1-7 lb per sq. in. the dryness q is 0-784, the volume per pound is 157-8 cub. ft., the heat drop is 175-7 thermal units, giving a velocity of 3980 ft. per second, and consequently the area of the stream is 0-0396 sq. ft. per pound of flow.

*108. De Laval's Divergent Nozzle. — It is on this basis that De Laval's divergent nozzle is designed. The "throat" or smallest section is approached by a more or less rounded entrance, allowing the stream-lines to converge, and from the throat outwards the nozzle expands in any gradual manner, generally in fact as a simple cone (fig. 53). In the example just given the final area of section m*s*?I would be seventeen times that of the throat to provide for adiabatic expansion down to a pressure of 1-7 lb per sq. in. With any final area less than this the pressure at exit would be higher than 1-7 lb; it would in fact adjust itself to give*

the area, and the remainder of the pressure drop would be wasted. For expansion to atmospheric pressure (14-7 per sq. in.) the area at exit would be 3-14 times that of the throat.

The equation of velocity

may be applied to calculate generally the discharge per square foot of stream section, and hence to find at what point in the fall of pressure this discharge becomes a maximum — in other words, to determine the pressure at the throat. Since pv n = piVi"

d = Di/D» where D = p/pi. The discharge per square foot when the volume is v is

I Q will be a maximum when dQfdD is zero, which occurs when

n

\n + ij

This result is general for any gas. With saturated steam, w being I -135. Q is a maximum when D = 0-577, that is to say, the pressure at the throat is 57-7 % of the initial pressure, a result which agrees with the figures quoted above for a particular case.

The maximum value of Q, namely the discharge in pounds per square foot at the throat, is

3'6V (piM,

and the velocity there is 5-85V (£i»i)- In these expressions pi is the initial pressure in pounds per square foot.

109. , From these considerations it follows that, provided the final pressure is less than 0-577 times the initial pressure, the total discharge depends simply on the least area of section of the nozzle and on the initial pressure, and is independent of the final pressure. By continuing the expansion in a divergent nozzle, after the throat is passed, the amount of discharge is not increased, but the steam is Caused to acquire a greater velocity of exit, namely the velocity corresponding to the augmented pressure range.

no. When the pressure drop is small (pi greater than 0-577 Pi) the full velocity due to the drop is obtained without the use of a

Fig. 53. a value of "»/V corresponding to

divergent nozzle. This is the case, for instance, in the Parsons turbine, where the whole expansion is divided into many stages each of which involves only a small drop in pressure.

in. Influence of Friction. — We have dealt so far with the ideal case of no friction, and have taken the whole work of expansion as going to produce kinetic energy in the jet. But under real condi- tions there is a progressive dissipation of energy through friction ; as expansion proceeds the steam loses part of its kinetic energy which is restored to it as heat. Thus, at every stage in the process the velocity acquired is less than it would be in f rictionless adiabatic ex- pansion, but the steam is drier and its volume is greater in consequence of the restored heat. Referring to the entropy-temperature diagram (fig. 54) the process of expansion under conditions involving friction is represented not by the adiabatic line cd but by some such line as eg lying between the adiabatic line and the saturation line cf. The final condition of dryness is ag/af instead of adjaf. During this expansion the effect of friction, as regards the entropy, is equivalent to the communication to the substance of a quantity of heat repre- sented by the area pegr. Hence that

x f~f -area represents the work converted by

friction into heat. The whole work done Fig. 54. during expansion is the area abeg, which

is more than before by the area dcg. The difference, namely abeg minus pegr, represents what may be called the net heat drop when friction is allowed for: it represents what is effectively available for giving kinetic energy to the jet. This net area may also be expressed as equal to abed minus pdgr. Compared with frictionless adiabatic expansion the net loss resulting from friction is the area pdgr. The volume is increased in the ratio of ag to ad, and this has to be taken account of in determining the proper dimensions of the divergent nozzle.

112. Turning now to the question of utilizing the kinetic energy of steam in a steam turbine, it will be clear from the figures that have been given that if the whole heat drop is allowed to give kinetic energy to the steam in one operation, as in the De Laval nozzle, a velocity of about 4000 ft. per second has to be dealt with. To take

advantage of a jet in the most efficient manner in a turbine consisting of a single wheel the velocity of the buckets against which the steam impinges should be nearly one half the velocity of the stream. But a peripheral velocity approaching 2000 ft. per second is impracticable. Apart from the difficulties which it would involve as regards gearing down to such a speed as would serve for the driving of other machines, which are to employ the power, there are no materials of con- struction fitted to withstand the forces caused by rotation at such a speed.

Hence it is advantageous to divide the process into stages. This may be done by using more than one wheel to absorb the kinetic energy of the jet, as is done in the Curtis turbine, or by dividing the heat drop into many steps, making each of these so small that the steam never acquires an inconveniently great velocity, as is done in the Parsons turbine. Turbines which employ one or other of these two methods, or a combination of both, achieve a greater economy of steam than is practicable with a single wheel.

113. De Laval Turbine. — Thanks, however, to the inventions of De Laval, the single expansion single wheel type of turbine, with buckets in the rim, has been brought to a degree of effici- ency which, while considerably less than is reached in com- pound turbines, is still remarkably good. This has been done by the use of the divergent nozzle and with the help of mechani- cal devices which enable the peripheral speed to be very high, though even with the help of these devices the speed of the buckets falls considerably short of that which would be suitable to the velocity of the jet. In De Laval's turbine the steam expands at one step from the full pressure of the supply to the pressure of the exhaust by discharge in the form of a jet from a divergent nozzle. It then acts on a ring of buckets or blades in much the same way as the jet of water acts on the buckets of a Pelton wheel or other form of pure impulse turbine. To utilize a fair fraction of the kinetic energy of the jet the blades have to run at an enormous velocity, and the speed of the shaft which carries them is so great that gearing down is resorted to before the motion is applied to useful purposes. The general arrange-

ment of the steam nozzle and turbine blades is illustrated in fig. 55. The blades project from the circumference of a disk-shaped wheel and form a complete ring round it, only a few of the blades being shown in the sketch. The increasing section of the nozzle is calculated ....

with reference to the final ˆv

pressure, according to the F JG – 55-

principles already explained. The jet impinges at one side of the wheel and escapes at the other after having had its direction of motion nearly reversed. The expansion in the nozzle is carried to atmospheric pressure, or near it, if the turbine is to be used without a condenser; but in many cases an ejector condenser is employed, and when that is done the nozzle is of a form which adapts it to expand the steam to a correspond- ingly lower pressure. It is only in the smaller sizes of these turbines that a single nozzle is used; in the larger steam turbines, as in large Pelton wheels r several nozzles are applied at intervals along the circumference of the disk. The peripheral velocity of the blades ranges from about 500 ft. per second in the smallest sizes (5 h.p.) up to nearly 1400 ft. per second in turbines of 300 h.p. In a 50 h.p. De Laval turbine the shaft which carries the turbine disk makes 16,000 revolutions per minute; in the 5 h.p. size it makes as many as 30,000 revolutions per minute. A turbine developing 300 h.p. uses a wheel 30 in. in diameter, running at over 10,000 revolutions per minute, with a peri- pheral speed of nearly 1400 ft. per second. These enormous speeds are made possible by the ingenious device of using a flexible shaft, which protects the bearings and foundations from the vibration which any want of balance would otherwise produce. The elasticity of the shaft is such that its period of transverse vibration is much longer than the time taken to complete a revolution. The high-speed shaft which carries the turbine disk is geared, by means of double helical wheels with teeth of specially fine pitch, to a second-motion shaft, which runs at one-tenth of the speed of the first; and from this the motion is taken, by direct coupling or otherwise, to the machine which the turbine is to drive. The wheel carrying the buckets is much thickened towards the axis to adapt it to withstand the high stresses arising from its rotation. Turbines of this class in sizes up to 300 or 400 h.p. are now in extensive use for driving dynamos, fans and centrifugal pumps. Com- pared with the Parsons turbine, De Laval's lends itself well to work where small amounts of power are wanted, and there it achieves a higher efficiency, but in large siz§s the Parsons turbine is much the more efficient of the two. Trials of a De Laval turbine used with a condenser, and developing about 63 h.p., have shown an average steam consumption at the rate of about 20 lb per brake-horse-power- hour, and even better results are reported in turbines of a larger size.

114. Action of the Jet in De Laval's Turbine. — In entering the turbine the jet is inclined at an angle a to the plane of the wheel. Calling its initial velocity Vi and the velocity of the buckets u we

have, as in fig. 56, Vj forthe velocity of the steam relatively to the wheel on admis- sion. A line AB parallel to V2 therefore determines the proper angle of the blade or bucket on the entrance side if the steam is'to enter without shock. As the steam passes through the blade channel the magnitude of this relative velocity does not change, except that it is a little reduced on account of friction. The action is one of pure impulse; there is no change of pressure during the passage, and consequently no acceleration of the steam through drop in pressure after once it has left the nozzle. Hence V 3 , the relative velocity at exit may (neg- p ,

lecting friction) be taken as equal to \ t . 5 •

The direction of V 3 or BC is tangent to the exit side of the bucket.

*Compounding V 3 with u we find V4, which is the absolute velocity of the steam after exit, and this should be no greater than is required to get the steam clear of the wheel. The most favourable condition of running would be when the bucket velocity u is such that V4 is perpendicular to the plane of the wheel, for V4 would then have its least possible value. Assuming the angle of discharge /3′ to be equal to /S, we should in that event have tt = 5V*iCos a, which approximates more and more closely to §Vi the smaller a is made. The ideal efficiency would be CV l 1 — ⁄4 ,)/V 1 1 or 1— sinV in a turbine in which the jet enters the buckets Without shock and travels over them without friction. In practice a is about 20 . Owing to the impossibility of making the bucket speed so high as the above condition implies the steam enters the buckets of a De Lava! turbine with some shock and leaves them with a velocity inclined to the plane of the wheel, with a backward component, and the turbine loses something in efficiency through this exit velocity being greater than the ideal minimum.*

Taking a test of a De Laval turbine of 300 h.p. in which the steam consumed was 15-6 lb per horse-power-hour, Stodola estimates that the losses in the nozzle amount to about 15 % of the available energy or total heat drop, the losses in the buckets (due to friction and to eddy currents set up by shock) to 21 % and the losses due to the velocity retained by the steam at exit to nearly 5 . The losses due to friction in the mechanism consume about 5 more, leaving a net return of about 54 % of the available energy.

115. Curtis Turbine. — The Curtis turbine, like that of De Laval, is a pure impulse turbine, but the velocity of the jet is extracted not by one ring of buckets but by a series of rings, each of which extracts a certain part. Between the first and second rings of buckets there are fixed guide blades which serve to turn the remaining motion of the steam into a direction proper for its action on the second ring, and so on. The jet, having acquired its velocity in a nozzle in the first place, often acts on three successive rings of moving buckets, with two sets of fixed guide blades between, the three co-operating to extract its kinetic energy. But the Curtis turbine is generally compound in the further sense that the total drop from admission to con- denser pressure is itself divided into two, three or more stages, the steam acquiring velocity anew at each stage and then giving up that velocity in passing through a series of impulse turbine rings generally either two or three in number before undergoing the next drop in pressure.

116. Action of the Steam in the Curtis Turbine. — In this division of the heat drop or pressure drop into stages Curtis follows Parsons. The distinctive feature in Curtis is the multi- impulse action which occurs at each pressure stage. This is illustrated in the diagram (fig. 57), which shows the nozzle and

Steam Chest

Nottlt

Mooing Bladet Stationary Blade Mooing Blades Stationary Bladet Moving Blade**

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B'ades i

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Blades

*K^^^mu^om^*

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FlG. 57. — Diagram of Steam Nozzles and Blades, Curtis Steam Turbine.

blades of a two-stage Curtis turbine, with three rings of moving blades or buckets in each stage, arranged, of course, round the periphery of a wheel. The velocity acquired in the nozzles is extracted as the steam pursues its sinuous course between moving and fixed blades, and it leaves the third ring in each case with only 'a small residual velocity, the direction of which is approxi-

mately parallel to the axis of the wheel. The changes of velo- city are illustrated in fig. 58, which, for the sake of Simpli- fication, is drawn for the ideal case of no friction. There u is the velocity of the buckets, V, the initial velocity of the jet, and Wthe initial relative velocity on entrance to the first moving ring. V3 is the absolute velocity on entering the second moving ring, and V 4 the relative velocity. V 5 is the absolute velocity on entering the third moving ring and Ve the relative velocity. Finally, V? is the absolute velocity on leaving the third moving

A u

P fixed

I Mooing

)

I Moving

)

Q Fixed

Fig. 58. ring, and this in the example here drawn is parallel to the axis of the turbine. The first moving blades have sides parallel to OB, BP; the first fixed blades have sides parallel to CP, PD. The second moving blades have sides parallel to PE, EQ; the second fixed blades to FQ, QG, and the third moving blades to QH, HR.

The steam then passes on to a second set of divergent nozzles in which it undergoes a second drop in pressure, acquiring velocity afresh, which it loses as before in passing through a set of three rings of moving buckets. In some Curtis turbines this is followed by a third and often a fourth similar process before the condenser is reached. In a four-stage Curtis turbine the speed of the buckets is usually about 400 ft. per second; the steam issues from each set of nozzles with a velocity of about 2000 ft. per second, and each set of moving rings reduces this by something like 400 ft. per second. The losses due to steam friction are somewhat serious, although the blade speed in each set is sufficient to let the steam enter without shock; on the other hand, the Curtis turbine escapes to a great extent losses due to leakage which are present in the Parsons type. The velocity diagram shown in fig. 58 may readily be modified to allow for effects of friction. Owing to the progressive reduction of velocity in passing from ring to ring a larger and larger area of blade opening is required, and this is provided for by making the height of the blades increase in the successive rings of each series.

*117. Performance of Curtis Turbines— Curtis turbines have been successfully applied in large sizes, especially in America, to drive electric generators, with outputs of as much as 0000 kilowatts, and in a few instances they have been adapted to marine propulsion. In large sizes, and using moderately super- heated steam, the Curtis turbine has achieved a high degree of efficiency. The advantage of superheating, in any type of turbine, is to reduce the wetness which the steam develops as it expands during work. The prejudicial effect of wetness is chiefly that it increases friction, especially in the later stages of the expansion. Tests of Curtis turbines show that they maintain a very uniform efficiency throughout a wide range of loads, and are capable of being much overloaded withov**

material increase in the ratio of steam consumption to output. In tests of a 9000 kilowatt Curtis turbine using steam of about 200 lb pressure and 8o° C. superheat, with a vacuum of 295 in. the consumption of steam is reported to have been only 13 lb per kilowatt-hour, and this figure remained almost constant for loads ranging from 8000 to 12,000 kilowatts. In a 5000 kilowatt turbine under very similar conditions the consumption is reported to have been 135 lb per kilowatt-hour. In the usual arrangement of the Curtis turbine the shaft is vertical and the wheels lie in horizontal planes, the weight of the re- volving parts being taken by a footstep bearing with forced lubrication, and the electric generator is mounted on the top. There are usually in the large sizes four stages of expansion, each stage being separated from the one above it by a diaphragm plate containing the nozzles in which the next step in velocity is acquired. The expansion has been divided into as many as seven stages in a Curtis turbine for marine use, the shaft being then horizontal, and in all except the first stage in that example the pressure drop is so comparatively small as not to require divergent nozzles.

118. Parsons Turbines. — In the turbines of De Laval and Curtis the action on the moving blades or buckets is entirely one of impulse. No drop of pressure occurs while the steam is passing the moving blades, and its velocity relative to the blade surface undergoes no change except such as is brought about by friction. In the Parsons turbine, on the other hand, there is a

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vvvvvvw.w acquires relative velocity

ttoaing Blades }))))))))))) -—•and loses pressure as it ..... passes each ring of moving

fixed Blades V\\V\\ blades: in this respect

Hosing Blades)))))))))) » the action in the moving

_ ~ j vf, . ~ . blades is like the action in

rlG. 59. — Fixed and Moving Blades .. ,. , ,, , ,, ,

of Parsons Turbine the . fi f £ b , lades – Each*

pair of fixed and moving rings makes up what is called a ” stage ” and may be said to constitute a separate turbine: the whole is a series

of many such stages. In each stage the drop in pressure and in heat is divided equally between the fixed and moving element, the exit and entrance angles and the form of the blades generally being alike in both. The number of stages depends on what peripheral speed it is convenient to use. Where

comparatively high blade speeds are practicable, as in tur- bines for driving electric generators, the steam is allowed to acquire a fairly high velocity at each ring of blades, and in such cases so few as 45 stages may be suitable. In large marine turbines, on the other hand, where the number of revolutions per minute has to be kept low in the interests of propeller efficiency, the blade speeds cannot be kept high without making the diameters unduly great, and consequently more stages are required: in such turbines the number of stages may be from 100 to 200. The general relation of fixed to moving blades and the characteristic form of both will be seen from fig. 59.

Fig. 60 shows a complete Parsons turbine of 1000 kilowatts capacity in longitudinal section through the casing. The fixed blades are caulked with separating distance-pieces into grooves turned on the inner surface of the case and project in- wards: the moving blades are similarly secured in grooves which are turned .on the surface of the rotating drum. Between drum and case there is an annular space fitted in this way with successive rings of fixed and moving blades. There is con- siderable longitudinal clearance from ring to ring, but over the tips of the blades the clearance is reduced to the smallest pos- sible amount consistent with safety against contact (generally from 15 to 30 thousandths of an inch in turbines of moderate size). Steam enters at A, expands through all the rings of blades in turn and escapes to the condenser at B. To provide for the increase in its volume the size of the blade passages enlarges progressively from the high to the low pressure end. In the ex- ample shown this is done partly by lengthening the blades and partly by increasing the circumference of the drum, which has the further effect of increasing the blade velocity, so that the expanded steam not only has a larger area of passage open to it but is also allowed to move faster, and consequently each unit of the area is more effective in giving it vent. Instead of attempt- ing to make the change in passage area continuous from ring to ring, as the ideal turbine would require, it is done in a limited number of steps and the several rings in each step are kept of the same size. Thus in the example shown in the figure the first step consists of seven pairs of rings or stages, the next two also of seven each, the next three of four each, the next of two and so on. This is convenient for constructive reasons and gives a sufficiently good approximation to the ideal conditions as regards

the relation of steam volume to blade-passage-area and velocity.

Fig. 60. — Parsons Turbine.

119. Balance of longitudinal Forces: Dummies. — Since the pressure of the steam falls progressively from left to right there is a resultant longitudinal thrust on the drum forcing it to the right, which is balanced by means of " dummy " rings C' C" C". These correspond in diameter with the several portions of the bladed drum and are connected with them by steam passages which secure that each dummy shall have the jame pressure forcing it to the left as tends on the corresponding part of the drum to force it to the right. No steam-tight fit is practicable at the dummies, but leakage of the steam past them is minimized by the device of furnishing the circumference of each dummy with a series of rings which revolve between a corresponding series of fixed rings projecting inwards from the case. The dummy rings do not touch but the clearance spaces are made as fine as possible and the whole forms a labyrinth which offers great resistance to the escape of steam. Sub- stantially the same device is employed to guard against leakage in the glands DD where the shaft leaves the turbine case. There is a " thrust block " E at one end of the shaft which maintains the exact longitudinal position of the revolving part and allows the fine clearances between fixed and moving dummy rings to be adjusted.

120. Lubrication. — The main bearings LL are supplied with oil under pressure kept in circulation by a rotary pump F which draws the oil from the tank G. The pump shaft H, which also carries a spring governor to control the speed of the turbine, is driven by a worm on the main shaft. The same oil is cir- culated over and over again and very little of it is consumed. No oil mixes with the steam, and in this point the turbine has a marked advantage over piston and cylinder engines, which is especially important in marine use. In small fast-running turbines each bearing consists of a bush on which three con- centric sleeves are slipped, fitting loosely over one another with a film of oil between. The whole acts as a cushion which damps out any vibration due to want of balance or alignment. In large turbines this device is dispensed with and a solid brass bearing lined with white metal is employed.

121. Blades.— The blades are generally of drawn brass, but copper

is used for the first few rows in turbines intended for use with superheated steam. In the most usual method of construction they are put one by one Into the grooves, along with distance pieces which hold them at the proper angle and proper distance apart, and the distance pieces are caulked to fix them. The length of the blades ranges from a fraction of an inch upwards. In the longest blades of the largest marine steam turbines it is as much as 22 in. When over an inch or so long they are strengthened by a ring of stout wire let into a notch near the tip and extending round the whole circumference. Each blade is " laced " to this by a fine copper binding wire, and the lacing is brazed. For long blades two and even three such rings of supporting wire are introduced at various distances between root and tip. The tips are fined down nearly to a knife-edge so that in the event of contact taking place at the tips between the " rotor " or revolving part, and the " stator " or case, they may grind without being stripped off. The possible causes of such contact are wear of bearings and unequal expansion in heating up. With a proper circulation of oil the former should not take place, and the clearances are made large enough to provide for the latter. Various plans have been devised to facilitate the placing and fixing of the blades. In one method they are slung on a wire which passes through holes in the roots and in the distance pieces and are assembled before- hand in a curved chuck so as to form a sector of the required ring, and are brazed together along with the supporting wires before the segment is put in place. In another method the roots are fixed in a brass rod in which cuts have been machined to receive them; in another the rod in which the roots are secured has holes of the right shape formed in it to receive the blades by being cast round a series of steel cores of the same shape as the blades: the cores are then removed and the blades fixed in the holes,

122. Drums— In small turbines the drums carrying the re- volving blades are solid forgings; in large turbines they are jlso of forged steel but in the form of hollow cylinders turned true inside as well as out. These are supported on the shafts by means of wheel-shaped steel castings near the ends, over which they are shrunk and to which they are fastened by screws the heads of which are riveted over. The case is of cast iron with a longitudinal joint which allows the upper half to be lifted off.

123. Governing. — The governor regulates the turbine by causing the steam to be admitted in a series of blasts, the dura- tion of which is automatically adjusted to suit the demand for power. When working at full power the admission is practically continuous; at lower powers the steam valve is opened and closed at rapidly recurring

intervals. Each revolution of the governor shaft causes a cam, attached to the governor, to open and close a relay valve which admits steam to a cylinder controlling the position of the main steam valve, which accordingly opens and closes in unison with the relay. The position of the governor determines how long the relay will admit steam to the con- trolling cylinder, and consequently how long the main valve will be held open in each period. In turbines driving electric generators the control of the relay-valve is sometimes made to depend on variations of the electric pressure produced instead of variations in the speed. In either case the arrangement secures control in a manner remarkably free from frictional inter- ference, and therefore secures a high degree of uniformity in speed or in electric pressure, as the case may be.

To admit of overloading, that is, of working at powers con- siderably in excess of the full power for whicft the turbine is designed, provision is often made to allow steam to enter at the full admission pressure beyond the first set of rows of blades: this increases the quantity admitted, aftd, though .the action is somewhat less efficient, more power is developed. An orifice will be seen in fig. 60 a little to the right of the main steam admission orifice, the purpose of which is to allow steam to enter direct to the second set of blades, missing the first seven stages, so that the turbine may cope with overloads.

124. Absence of Wear. — Owing to its low steam velocities the Parsons turbine enjoys complete immunity from wear of the blades by the action of the steam. A jet of steam, especially when wet, impinging at very high velocity against a metal surface, has considerable cutting effect, but this is absent at velocities such as are found in these turbines, and it is found that even after prolonged use the blades show no signs of wear and the efficiency of the turbine is unimpaired.

125. Blade Velocity.— ˆExperience has shown that the most economical results are obtained when the velocity of the steam through the blades is about twice the velocity of the blades them- selves, and the Parsons turbine is accordingly designed with, as far as possible, a constant velocity ratio of about this value. As already explained, it is convenient in practice to divide the expansion into a comparatively small number of steps (about twelve steps isa usual number), giving a constant area of steam passage to the first few rows, a larger area to the next few, and so on. An effect of this is that the velocity ratio varies slightly above and, below the value of two to one, but if the steps are not too great this variation is not

sufficient materially to affect the efficiency.

If the spindle or drum carrying the moving blades were of the same diameter throughout, the blades at the exhaust end would have to be exceedingly long in order to give passage to Jthe rarefied steam. By increasing the diameter towards the exhaust end the peripheral velocity is increased, and hence the proper velocity for the steam is also increased. The amount of heat drop per ring is consequently greater towards the lowrpressure end : in other words, the number of rings for a given drop is reduced. Taking the turbine as a whole, the number of rings will depend on the blade velocity at each step, the relation being such that 2rcVj> 2 = constant for a given total drop from admission to exhaust, n being the number of rings whose blade velocity is V&. It appears that a usual value of this constant is about 1,500,000′ for the whole range from an admission pressure which may be nearly 200 ft per sq. in. down to condenser pressure.

1 Speakman, " The Determination of the Principal Dimensions of the Steam Turbine with special reference to Marine Work," Proc. Inst. Engineers &" Shipbuilders in Scotland (October 1905). On this subject see also Reed, " The Design of Marine Steam Turbines," Proc. Inst. Civ. Eng. (February 1909).

The increased diameter at the low-pressure end not only allows the steam velocity to be increased but by enlarging the annulus enables a sufficient area of passage to be provided without unduly lengthening the blades. In the very last stages of the expansion, however, the volume becomes so great that it is not practicable to provide sufficient area by lengthening the blades, and the blades there are accordingly shaped so as to face in a more nearly axial direction and are spaced more widely apart.

The area of the steam passage depends on the angle of the blade. If the blades were indefinitely thin it would be equal to the area of the annulus multiplied by the sine of the angle of discharge, and in practice this is subject to a deduction for the thickness of the blade on the discharge side, as well as to a correction for leakage over the tips. Generally the angle of discharge is about 22§°; and the effective area for the passage of steam is about one-third of the area of the annulus.

Fig. 61 A shows a representative pair of fixed and moving blades of a Parsons turbine, and fig. 61 B the corresponding

Fig. 61.

velocity diagram for the steam, neglecting effects of friction. Vi is the exit velocity from the fixed blades, the delivery edges of which are tangent to tiie direction of Vi. The blade velocity is u which is jVi- V2 is consequently the relative velocity with which the steam enters the moving blades. Approxi- mately, the back surface of these blades is parallel to V 2 , but the blades are so thick near the entrance side that their front faces have a considerably different slope and there is therefore some shock at entrance. In passing through the moving blades the relative velocity of the steam over the blades changes from V to V3. Allow- ing for the velocity u of the blades themselves, this corresponds to an absolute velocity V4, with which the steam enters the next set of fixed blades. In these blades it is again accelerated to Vi and so on. 126. Calculation of Velocity at each Stage. — The acceleration of the steam in each row of blades results from a definite heat drop. Or, if we look at the matter from the point of view of the pressure- volume diagram, the acceleration results from the work done on the steam by itself during a drop &p in its pressure. The amount of this work per pound is vbp where v is the actual volume per pound. It is convenient in practice to write this in the form (pv)bp/p, for the product pv changes only slowly as expansion proceeds. In designing a turbine a table of the values of pv throughout the range of pressures from admission to exhaust is prepared, and from these numbers it is easy to calculate the work done at each stage in the expansion, the pressure p and drop in pressure hp being known. In the ideal case with no losses we should have*

(V, J -V 4 »)/2g = ()S/>/

*or V l ? = 2g{pv)5pjp + V i **

A. Cylinder

B. Rotor

C. Balance Piston

D. Bearing

E. Adjusting Block

F. Steam Packed Gla,

L

where V4 is the velocity before the acceleration due to the drop bp and Vi is the velocity after.

But under actual conditions the gain of velocity is less than this, owing to blade friction, shock and other sources of loss. The actual velocity depends on the efficiency and on the shape and angles of the blades. It appears that under the conditions which hold in practice in Parsons turbines it is very nearly such that V 1 2 = 2g(pv)Sp/p.*

In this formula, which serves as a means of estimating approximately the velocity for purposes of design, it is to be understood that in calculating the product pv the volume to be taken is that which is actually reached during expansion. The actual volume is affected both by friction and by leakage and is intermediate in value between the volume in adiabatic expansion and the volume corresponding to saturation. In the case of a turbine of 70 % efficiency the actual wetness of the steam is, according to Mr Parsons's experience, about 55 % of that due to adiabatic expansion in the early stages and 60% in the latest stages. In preparing the table of values of pv figures are accordingly to be taken intermediate between those for saturated steam and for steam expanded adia- batically, and from these is found as above the velocity for any given drop in pressure, and also the volume per pound, for which at each stage in the expansion provision has to be made in designing the effective areas of passage.

The blade speeds used in Parsons turbines rarely exceed 350 ft. per second and are generally a good deal less. In marine forms, where the number of revolutions per minute is limited by considera- tions of efficiency in the action of the screw propeller, the blade speeds generally range from about 120 to 150 ft. per second, though speeds as low as 80 ft. per second have been used.

127. Parsons Marine Turbines. — Marine turbines are divided into distinct high and low pressure parts through which the steam passes in series, each in a separate casing and each driving a separate propeller shaft. The most usual arrangement is to have three propeller shafts; the middle is driven by the high pressure portion of the turbine, and the steam which has done duty in this is then equally divided between two precisely similar low pressure turbines, each on one of two wing shafts. The rotor drum of each turbine has a uniform diameter through- out its length, but the casing is stepped to

allow the lengths of the blades to increase as the pressure falls.

The casing which contains each of the two low pressure turbines contains also a turbine for running astern, so that either or both of the two wing shafts may be reversed. Steam is admitted to the reversing turbine direct from the boiler, the centre shaft being then idle. Each astern-driven turbine consists of a comparatively short series of rings of blades, set for running in the reversed direction, developing enough power for this purpose but making no pretensions to high efficiency. The astern turbine, being connected to the condenser, runs in vacuo when the ahead turbine is in use and consequently wastes little or no power.

Figs. 62 and 63 are sections of the high pressure and low pressure portions of a typical Parsons marine steam turbine, as designed for the three-shaft arrangement in which the low pressure portion is duplicated- In each figure A is the fixed casing and B is the revolving drum. Steam enters the high pressure turbine (fig. 62) through J and passes out through H. There are 4 " expansions" or steps, with 9 stages or double rows of blades in the first, 9 in the

G. Worm for Actuating Governor H. Exhaust to low Pressure 7urhU» J. Steam Inlet K. Turbine Drain L. Oil Inlet HI. Oil!*

Fig. 62. — Parsons Marine Turbine : High Pressure Part. Upper half : sectional elevation. Lower half : external view.

5 s J i

9 .? -S « f ■

! O^'

-; X J S Z 6

*— * 1 S | 3 I 5*

second, 8 in the third and 8 in the fourth, or 34 stages in all. The low pressure turbine (fig. 63) comprises 28 more stages stepped as shown in the figure. The reversing turbine which is seen on the left- hand side in fig. 63, at the place where the rotor is reduced in diameter,

has 26 stages in 4 steps. These turbines have a total normal horse power of 12,500, and run at 450 revolutions per minute.

128. Longitudinal Forces in Marine Turbines. — In a marine steam turbine the size of the dummy is reduced so that instead of balancing the whole steam thrust it leaves a resultant force which nearly balances the propeller thrust. Consequently only a small thrust block has to be provided to take any difference there may be between these forces. This thrust block is shown on the extreme right in each figure, beyond the gland and bearing. The dummy (at D in the figures) is made up of some 22 rings of brass fixed in the case in close proximity to the faces of projecting rings on the rotor (fig. 64) with a longitudinal clearance of 0-015 in. This form of dummy is suitable for the end near the thrust block, where exact longitudinal adjustment is possible, but the astern turbine in fig. 63

Fig. 64. Fig. 65.

requires a different form because some longitudinal play is necessarily brought about there by differences in expansion of the rotor and stator. Accordingly, the astern dummy is of the " radial " form shown in fig. 65 where the fine clearance is round the circumference of the brass rings set in the rotor and stator alternately. The whole dummy includes about sixteen of these rings.

129. Shaft Arrangement of Marine Turbines. — Fig. 66 shows the usual three-shaft arrangement, with two low pressure turbines in parallel on the wing shafts, and one high pressure turbine, with which they are jointly in series, on the middle shaft. In very large vessels four shafts are used, and the turbines form two independent sets one on each side of the ship. The outer shaft on each side carries a high pressure turbine, and the inner shaft car- ries the corresponding low pressure turbine and also a turbine for revers- ing. This arrangement " Mauretania "

E.P «,

_HP^.

Fig. 66.

followed in the " Lusitania " and where the low pressure turbines have drums 188 in. in diameter, are about 175 ft. in diameter over all and 50 ft. long, and weigh 300 tons. Each turbine has 8 steps with about 16 stages in each step in the high pressure turbine and 8 in the low. They run at 180 revolutions per minute.

130. Cruising Turbines in War-Ships. — In turbines for the propulsion of war-ships it is necessary to secure a fairly high economy at speeds greatly short of those for which the turbines are designed when working at full power, for the normal cruising speed of such vessels is usually from half to two-thirds of the speed at full power. To counterbalance the reduced blade velocity, when running under these conditions, the number of rows of blades has in some cases

Fig. 67. been augmented by adding what are called cruising turbines, which are connected in series with the main turbines when the ship is to run at cruising speed. In the three-shaft arrangement the cruising turbines are fitted on the wing propeller shafts, which carry also the low pressure and astern turbines. They form a high and intermediate pressure pair through which the steam may pass in series

before going on to the main turbines. This arrangement is shown in fig. 67, where C.H.P. and C.I. P. are the two cruising turbines. In cruising at low speeds the whole group of turbines is used in series : when the speed is increased a larger amount of power is got by admitting steam direct to the second cruiser turbine; and finally at the highest speed both cruiser turbines are cut out. The arrange- ment shown in fig. 67 has been used in some torpedo-boat destroyers and small cruisers. In some large cruisers and battleships a four- shaft system is employed and a longitudinal bulkhead divides the whole group into two independent sets. On each of the outer shafts there is a high-pressure ahead and also a separate high-pressure astern turbine. On each of the inner shafts there is a combined low-pressure ahead and astern turbine and also a cruising turbine. All four shafts can be reversed.

131. Application of Parsons Turbine. — The Parsons was the earliest steam turbine to be made commercially successful, and it has found a wider range of application than any other. Its chief employment is as an electric generator and as a marine engine, but it has been put to a considerable number of other uses. One of these is to drive fans and blowers for exhausting air, or for delivering it under pressure. The turbine-driven fans and blowers designed by Mr Parsons are themselves com- pound turbines driven reversed in such a manner as to pro- duce a cumulative difference in the pressure of the air that is to be impelled.

An interesting field for the application of steam turbines is to economize the use of steam in non-condensing engines of the older type, by turning their exhaust to the supply of a turbine provided with an efficient condenser. It is a characteristic of the turbine that it is able to make effective use of low pressure steam. No condensing piston and cylinder can compete with it in this respect ; for the turbine continues to extract heat energy usefully when the pressure has fallen so low that frictional losses and the inconveniences attaching to excessive volume make it impracticable to continue expansion to any good purpose under a piston.

132. Parsons Vacuum Augmenter. — For the same reason it is especially important in the turbine to secure a good vacuum: any increase in condenser pressure during a turbine test at once shows its influence in making a marked reduction of steam economy. In the region of usual condenser pressures a differ- ence of 1 in. changes the steam consumption by about 5%. With this in mind Mr Parsons has invented a device called a vacuum augmenter, shown in fig. 68. The condensed water

Fig. 68. — Parsons Vacuum Augmenter.

passes to the air-pump through a pipe bent to form a water- seal. The air from the condenser is extracted by means of a small steam jet pump which delivers it into an " augmenter condenser " in which the steam of this jet is condensed. The vacuum in the augmenter condenser is directly produced by the action of the air-pump. The effect of this device is to maintain in the main condenser a higher vacuum than that in the augmenter condenser, and consequently a higher vacuum than the air-pump by itself is competent to produce. This i£ done with a small expenditure of steam in the jet, but the effect of the augmented vacuum on the efficiency of the turbine is so beneficial that a considerable net gain results. ■ 133. Rateau and Zolly Turbines. — Professor Rateau has designed a form of steam turbine which combines some of the

features of the Parsons turbine with those of the De Laval. He divides the whole drop into some twelve or twenty-four stages and at each stage employs an impulse wheel substantially of the De Laval type, the steam passing from one stage to the next through a diaphragm with nozzles. This form can scarcely be called an independent type. It has been applied as an exhaust steam turbine in conjunction with a regenerative thermal accumulator which enables steam to be delivered steadily to the turbine although supplied from an intermittent source. The Zolly turbine, which has found considerable

application on a large scale, acts in a precisely similar manner to that of Rateau: it differs only in mechanical details.

134. Combined Reciprocating and Turbine Engines.— The combination of a reciprocating engine with a turbine is sug- gested by Parsons for the propulsion of cargo or other low-speed steamers where the speed of the screw shafts cannot be made high enough to admit of a sufficient blade velocity for the efficient treatment in the turbine of high-pressure steam. With a small speed of revolution blade velocity can be got only by increasing the diameter of the spindle, and a point is soon reached when this not only involves an unduly large size and weight of turbine, but also makes the blades become so short (by augmenting the circumference of the annulus) that the leakage loss over the tips becomes excessive. This consideration confines the practical application of turbines to vessels whose speed is over say 1 5 knots. But by restricting the turbine to the lower part of the pressure range and using a piston and cylinder engine for the upper part a higher economy is possible than could be reached by the use of either form of engine alone, the turbine being specially well adapted to make the most of the final stages of expansion, whereas the ordinary reciprocating engine in such vessels makes little or no use of pressure below about 7 lb per sq. in.

135. Consumption of Steam in the Parsons Turbine. — In large sizes the Parsons turbine requires less steam per horse-power-hour than any form of reciprocating engine using steam under similar conditions. Trials made in April 1900, by the present writer, of a 2000 h.p. turbine coupled to an electric generator showed a con- sumption of l8j lb per kilowatt hour, with steam at 1ˆ5 lb per sq. in. superheated 84° F. Since 1 kilowatt is 1-34 h.p. this consumption is equal to 13-6 lb per electrical horse-power-hour. The best piston engines when driving dynamos convert about 84 % of their indicated power into electric power. Hence the above result is as good, in the relation of electric power to steam consumption, as would be got from a piston engine using only 11-4 lb of steam per indicated horse- power-hour. An important characteristic of the steam turbine is that it retains a high efficiency under comparatively light loads. The figures below illustrate this by giving the results of a series of trials of the same machine under various loads.

Load in kilowatts . Steam used per kilo-) watt-hour in pounds)

H50

18-1

1250 1000 18-5 19-2

750 20-3

500 1 250

22-6 34 -o

Still better results have been obtained in more recent examples, in turbines of greater power. A Parsons turbine, rated as of 3500 but working up to over 5000 kilowatts tested in 1907 at the Carville power station of the Newcastle-on-Tyne Electric Supply Company, showed a consumption of only 13-19 lb of steam per kilowatt-hour, with steam of 200 lb pressure by gauge and 67 ° C. superheat (temperature 264-7° C.), the vacuum being 29-04 in. (barometer 30 in.). It is interesting to compare this performance with the ideal amount of work obtainable per pound of steam, or in other words with the ideal " heat drop." At the temperature and pressure of supply the total heat Ii is 709. After expansion to the pressure correspond- ing to the stated vacuum (0-96 in.) the total heat of the wet mixture would be 486, the dryness being then 0-792, if the expansion took place under ideal adiabatic conditions. Hence the heat drop Ii — 1 2 is 223 units, and this represents the work ideally obtainable under the actual conditions as to temperature and pressure of supply and exhaust. Since 1 kilowatt-hour is 1896 thermal units (lb — degree C), each pound of steam was generating an amount of electrical

energy equivalent to — — or 143-7 thermal units, and the electric

output consequently corresponds to 64!% of the ideal work. If we allow for the loss in the electric generator by taking the electrical output as 92 % of the mechanical power, this implies that 70 % of the ideal work in the steam was mechanically utilized.

136. Torsion Meters for Power. — No measurement correspond- ing to the " indicating " of a piston engine is possible with a

steam turbine. In the tests that have been quoted the useful output was determined by electrical means. Direct measure- ments of the useful mechanical power (the " brake " power) may, however, be obtained by applying a torsion dynamometer to the shaft. Devices are accordingly used in marine turbines for determining the horse-power

from observations of the elastic twist in a portion of the propeller shaft as it revolves. In Denny & Johnson's torsion meter two light gun-metal wheels are fixed on the shaft as far apart as is practicable, generally 15 or 20 ft., and their relative angular displacement is found by comparing the inductive effects produced on fixed coils by magnets which are carried on the wheels. In Hopkinson & Thring's torsion meter a short length of shaft— a foot or so — suffices. A small mirror is carried by a collar fixed to the shaft, and a second collar fixed a little way along is geared to the mirror in such a way as to deflect the mirror to an extent pro portional to the twist: the deflexion is read by means of a lamp and scale fixed alongside. As the shaft revolves the light re- flected from the mirror is momentarily seen at each revolution and its position along the scale is easily read. (J. A. E.)

STEAMSHIP LINES. The shipping company is the outcome of the development of the steamship. In former days, when the packet ship was the mode of conveyance, there were com- binations, such as the well-known Dramatic and Black Ball lines, but the ships which were run in them were not necessarily owned by those who organized the services. The advent of the steamship changed all that. It was in the year 18 15 that the first steamship began to ply between the British ports of Liverpool and Glasgow. In 1826 the " United Kingdom," a " leviathan steamship," as she was considered at the time of her construction, was built for the London and Edinburgh trade, steamship facilities in the coasting trade being naturally of much greater relative importance in the days before railways. In the year 1823 the City of Dublin Steam Packet Company was inaugurated, though it was not incorporated till ten years later. The year 1824 saw the incorporation of the General Steam Navigation Company, which was intended not only to provide services in British waters, but also to develop trade with the continent. The St George Steam Navigation Company and the British & Irish Steam Packet Company soon followed. The former of these was crushed in the keen competition which ensued, but it did a great work in the development of ocean travelling. Isolated voyages by vessels fitted with steam engines had been made by the " Savannah " from the United States in 1819, and by the first " Royal William " from Canada in 1833, and the desirability of seriously attacking the problem of ocean navigation was apparent to the minds of shipping men in the three great British ports of London, Liverpool and Bristol, Three companies were almost simultaneously organized: the British & American Steam Navigation Company, which made the Thames its headquarters; the Atlantic Steamship Company of Liverpool; and the Great Western

Steamship Company of Bristol. Each company set to work to build a wooden paddle steamer in its own port. The first to be launched was the " Great Western," which took the water in the Avon on the 19th of July 1837. On the 14th of October following the " Liverpool " was launched by Messrs Humble, Milcrest & Co., in the port from which she was named, and in May 1838 the Thames- built " British Queen " was successfully floated. The "Great Western " was the first to be made ready for sea.

But the rival ports were determined not to be deterred by delays in getting delivery of their specially built ships. The London company chartered the " Sirius," a 700-ton steamship, from the St George Steam Packet Company, and despatched her from London on the 28th of March 1838. She was thus the first to put to sea. She eventually left Cork on the 4th of April, and reached New York on the 22nd, after a passage of 17 days. The " Great Western " did not leave Bristol till the 8th of April, but under the command of James Hosken, R.N. (1 708-1885) she reached New York only a few hours after the " Sirius." The Liverpool people, fired by the action of the other two ports, chartered the " Royal William " from the City of Dublin Steam

Packet Company, and despatched her on the first steam voyage from the Mersey to Sandy Hook on the 5th of July in the same year. The " Liverpool " made her maiden voyage in the follow- ing October. But the " British Queen " did not make her initial attempt till the 1st of July 1839. Trouble overtook all three of these early Atlantic lines, and they soon ceased to exist.

Perhaps the most serious factor against them was the success of Mr Samuel Cunard in obtaining the government contract for the conveyance of the mails from Liverpool to Halifax and Boston, with a very large subsidy. The Cunard Line was enabled, and indeed, by the terms of its contract, obliged, to run a regular service with a fleet of four steamships identical in size, power and accommodation. It thus offered conveyance at well- ascertained times and by vessels of known speed. The other companies, with their small fleets of isolated ships and their irregular departures, could not continue the competition. The Atlantic Steamship Company of Liverpool found that the port could not then maintain two steamship lines, and the steamship " Liverpool," with another somewhat similar vessel which they had built, fell into the hands of the P. & O. Company. The Great Western Steamship Company proceeded to build the " Great Britain," an iron screw steamship, which in every way was before her time, and were swamped by financial difficulties, their " Great Western "

being sold to the West India Royal Mail Company, to whom she became a very useful servant. The " Great Britain " (which was stranded in Dundrum Bay in September 1846, owing to her captain, Hosken, being misled by a faulty chart and mistaking the lights) eventually drifted into the Australian trade. The London company put a second ship, the " President," on their station. She was lost with all hands, no authentic information as to her end ever being obtained. Her mysterious fate settled the fortunes of her owners, and the "British Queen " was transferred to the Belgian flag. Steam navigation across the Atlantic was now an accom- plished fact. But all the three pioneers had been borne down by the difficulties which attend the carrying out of new departures, even when the general principles are sound.

Constant improvement has been the watchword of the ship- owner and the ship-builder, and every decade has seen the ships of its predecessor become obsolete. The mixed paddle and screw leviathan, the " Great Eastern," built in the late 'fifties, was so obviously before her time by some fifty years, and was so under-powered for her size, that she may be left out of our reckoning. Thus, to speak roughly, the 'fifties saw the iron screw replacing the wooden paddle steamer; the later 'sixties brought the compound engine, which effected so great an economy in fuel that the steamship, previously the conveyance of mails and passengers, began to compete with the sailing vessel in the carriage of cargo for long voyages; the 'seventies brought better accommodation for the passenger, with the midship saloon, improved state-rooms, and covered access to smoke- rooms and ladies' cabins; the early 'eighties saw steel replacing iron as the material for ship-building, and before the close of that decade the introduction of the twin-screw rendered break- downs at sea more remote than they had previously been, at the same time giving increased safety in another direction, from the fact that the duplication of machinery facilitated further subdivision of hulls. Now the masts of the huge liners in vogue were no longer useful for their primary purposes, and degenerated first into derrick props and finally into mere signal poles, while the introduction . of boat decks gave more shelter to the pro- menades of the passengers and removed the navigators from the distractions of the social side. The provision of train-to- boat facilities at Liverpool and Southampton in the, 'nineties did away with the inconveniences of the tender and the cab. The introduction of the turbine engine at the beginning of the 20th century gave further subdivision of machinery and increase of economy, whereby greater speed became possible and comfort was increased by the reduction of vibration. At the same time the introduction of

submarine bell signalling tends to diminish the risk of stranding and collision, whilst wireless telegraphy not only destroys the isolation of the sea but tends

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to safety, as was seen by the way in which assistance was called out of the fog when the White Star liner " Republic " was sinking as the result of a collision off Martha's Vineyard (1909). In the following pages some of the ships which first embodied these improvements are mentioned, a brief history of the prin- cipal lines is attempted, and reference is made to some of the milestones on the road of improvement.

Allan Line. — The story of the Allan Line is that of the enterprise of one family. Captain Alexander Allan, at the time of the Penin- sular War, conveyed stores and cattle to Lisbon for Wellington's army. After 1815 he began to run his vessel between the Clyde and Canada, and as years went on he employed several vessels in the service. Till 1837 the ships ran from Greenock to Montreal, but in that year, after the Clyde was deepened, the ships went to Glasgow, as they have continued to do ever since. Captain Allan and his five sons devoted all their energies to the development of the Canadian trade, and for about forty years the line ran sailing ships only, which were greatly 'in request for the emigrant traffic. In 1852 the Canadian government requested tenders for a weekly mail service between Great Britain and Canada. That of Sir Hugh Allan of Montreal, one of Captain Allan's sons, was accepted, and the Canadian mail line of steamships came into existence. It may be noted that the Allan Line inaugurated steamers of the " spar-deck " type, i.e. with a clear promenade deck above the main deck. This measure of safety was taken as a lesson from the disastrous foundering of the Australian steamship "London" in the Bay of Biscay in the year 1866. The company may claim, too, that their steamship " Buenos Ayrean," built for them in the year 1879 by Messrs Denny of Dumbarton, was the first Atlantic steamship to be constructed of steel. As time went on the company's services were extended to various ports on the eastern shores of North America and in the river Plate; and London, as well as the two strongholds of Glasgow and Liverpool, was taken as a port of departure. In the course of its career it has absorbed the fleet of the old State Line of Glasgow and a great part of the fleet of the Royal Exchange Shipping Company and of the Hill Line. Included in the latter fleet were the first twin-screw steamers constructed for a

British North Atlantic line. The " Virginian " and the " Victorian," built for the Allan Line in 1 905, were the first transatlantic liners propelled by turbines. The principal ports served by the Allan Line are (in the United Kingdom) Glasgow, Londonderry, Belfast, Liverpool and London ; from these their vessels ply to many places in North and South America, including Quebec, Montreal, St Johns (Newfoundland), Halifax, St John (New Brunswick), Portland, Boston, New York, Philadelphia, Baltimore, Montevideo, Buenos Aires and Rosario.

American Line. — Though the American Line, as now constituted, is of comparatively modern origin, it is the successor of several much older organizations. Of these the oldest is the Inman Line, last acquired by it. On the 16th of April 1850 an iron screw steam- ship of 1609 tons gross register left Glasgow on her maiden trip to New York. This was the beginning of the Inman Line. After a few voyages this ship was sold to Messrs Richardson, Spence & Co. of Liverpool, in which William Inman (1825-1881) was a partner, and the sailings of the steamships were thenceforth for some years between Liverpool and Philadelphia. But in 1857 New York took the place of Philadelphia as a regular terminus. In 1859 the regular call at Queenstown was commenced by this line, which may be said to have been responsible for two other innova- tions in transatlantic traffic. Before 1850 practically all the steam- ships crossing the ocean, with the famous exception of the " Great Britain," were paddle-boats. After the advent of the Inman liners the screw began to be everywhere substituted for the paddle. In the second place, the Inman steamers were the first which regularly undertook the conveyance of third-class passengers, to the extinc- tion of the old clipper vessels which had hitherto carried on the traffic. In 1867 the Inman liner " City of Paris " (the first bearing the name) held the westward record with 8 days 4 hours, and in 1869 the " City of Brussels " came home in 7 days 22 hours 3 minutes. Till 1872 these records held good. The " City of Brussels " also had the distinction of being the first Atlantic mail steamer to be fitted with steam steering-gear. About 1875 Mr William Inman turned the concern into a limited company, and in 1886 the business was amalgamated with the International Company, and the vessels, though still flying the red ensign, became the property of a group of United States capitalists, who also acquired the old American Line which had been started in 1873 with four Philadelphia-built steamers. This company had been conducted under the auspices of the Pennsylvania Railroad. It plied between Liverpool and Philadelphia. A third constituent in the Inman and International Steamship Company was the Red Star Line, as the

Soci6t6 Anonyme Belge-Americaine was familiarly called. Its service was from Antwerp to New York. The whole was placed under the manage- ment of Messrs Richardson, Spence & Co., who thus after thirty- two years reassumed the direction of the old companv. In 1887 the two ships " City of New York " and " City of Paris " were built on the Clyde for the company. At the time of their construction they were the largest vessels ever built, always excepting the

" Great Eastern." The " City of Paris " was the first vessel (1889) to cross the Atlantic in less than six days. The year 1893 was an important one in the history of the company, and indeed of the United States. The two vessels above mentioned were admitted to American registry by Congress, a stipulation being made that two new ships of at least equal tonnage and speed to the pair should be ordered by the company from American firms, and that they should, be capable of being employed by the United States government as auxiliary cruisers in case of war. The American flag was hoisted over the " New York " in 1893 by President Harrison, and in the same year the British headquarters of the company were transferred from Liverpool to Southampton. In 1894 the first American-built ocean liner of the new fleet was launched, and was named the "St Louis." In 1898 the American Line had the distinction of supply- ing the navy of its country with cruisers for use in war. The " St Paul," the only vessel of the tour under contract in American waters at the time, was put under the command of Captain Sigsbee, whose own battleship, the " Maine," had been blown up in Havana harbour on the 15th of February. The other three ships were also put into commission, the " Paris " being temporarily renamed the " Yale " and the " New York " the " Harvard." In 1902 with their twin-screw liner " Kensington " the American Line made the first experiments towards fitting Atlantic passenger steamers with appliances for the use of liquid fuel. The express fleet of- the line consists of the four vessels, " St Louis " and " St Paul," each of 11,600 tons and a length of 554 ft. ; and the "New York " and " Philadelphia," each of 10,800 tons and 560 ft. length. Several still larger but less speedy steamships have been constructed . for the intermediate services of the company In addition to the weekly express service between Southampton and New York, the American Line runs steamers between New York and Antwerp, Philadelphia, Queenstown and Liverpool, and Philadelphia and Antwerp.

Austrian Lloyd Steam Navigation Company. — This company was started in 1837 at Trieste, where its headquarters are still situated. It commenced operations with seven small wooden paddle-boats for the voyage to Constantinople and the Levant. By 1910 they had

increased to a fleet of sixty-two iron and steel steamships, with a gross tonnage of about a quarter of a million tons. The whole eastern coast of the Adriatic and the Levant is visited by them with frequent services. There is a line to the west as far as Brazil, and a monthly mail service between Trieste, Brindisi and Bombay. There is also a monthly ordinary service between Trieste, Bombay, China and Japan, and a monthly branch in connexion with it between Colombo, Madras and Calcutta.

Bibby Line.— The name of Bibby has long been known and respected in the shipping world. The first undertaking of the family was the institution of a service from Liverpool to Mediterranean ports about the middle of last century. When Mr (subsequently Sir Edward) Harland took over the shipbuilding works at Belfast, which he afterwards made famous, Mr Bibby was one of his earliest customers. It was he who gave him practically carte blanche in the way of proportion for the new ships built for his service, and it was from the experience acquired and the success achieved with them that the " long ships," with which the White Star Line made its name, were first brought into the region of the practical. In this connexion it may be stated that Sir Edward Harland was born at Scarborough in 1831, his father being a medical practitioner. He learnt the science of ship-building in the yards of Messrs R. Stephenson & Co. of Newcastle, and became first a draughts- man with Messrs J. & G. Thomson, and then manager in a New- castle yard. In 1854 he went to Belfast, first as manager to Messrs Robert Hickson & Co. Then in 1858 he took over their yard. In 1859 he launched the "Venetian "for Mr Bibby, and in i860 he took Mr G. W. Wolff into partnership. After a time Mr Bibby retired from the active pursuit of his business, and the, line passed into the hands of one of his confidential managers — Mr Leyland (see Leyland Line). But the Bibby family, though large shareholders in the White Star Line, could not remain without some active interest in seafaring matters. Hence a new Bibby Line was started. Its first vessel was the " Lancashire," a single-screw steatner of 4ˆ44 tons gross register, built— as have been all this fleet — by Messrs Harland & Wolff. She came out in 1889. Her sister was a similar vessel. Subsequent additions to the fleet were all of the twin-screw type; thus the Bibby Line can boast that it was the first to maintain its service, which is now fortnightly, exclusively with twin-screw vessels. In the trade between Liverpool and Rangoon they soon made a name.

The Booth Line is essentially a Liverpool company. It was- founded in the year 1866 by Messrs Alfred Booth & Co., who in that year instituted a service to north Brazil. Three years later from the same

port was started the Red Cross Line of Messrs R. Singlehurst & Co. to carry on a similar service. In 1901 the two lines were amalgamated under the title of the Booth Steamship Company Limited. Since the year 1883 there has been a connexion by the Booth steamers between north Brazil and New York. Para, Manaos, Maranham, Paranahyba and Ceara are the chief Brazilian ports served by the company, whilst the steamers make calls on the eastern side of the Atlantic at Cardiff and Havre as well as at Spanish and Portuguese ports. The company carries the British mails to Para

and Manaos, whilst it also takes the United States mails between New York and north Brazil. In addition to its transatlantic passenger traffic the Booth Line is largely developing a tourist trade to Vigo, Oporto and Lisbon in the Peninsula as well as to Madeira. The Yquitos Steamship Company, which is under its management, carries its trade a couple of thousand miles up the River Amazon; a further development will extend to River Plate ports.

British India Steam Navigation Company. — This line maintains, perhaps, a larger network of communications and serves a greater number of ports difficult of access than any in the world. The Persian Gulf, Burma, the Straits of Malacca, and the entire littoral of the East Indies, to say nothing of the east coast of Africa, are among the scenes of its enterprise. Though its ramifications now extend to the ports of northern Australia, the company had its origin in the Indian coasting trade. Its present designation is of comparatively recent origin, but its first operations date from 1855. A project for a mail service between Calcutta and Burma was then first set on foot by the East India Company. Early in the following year a company was formed, under the title of the Calcutta and Burma Steam Navigation Company. Two small steamers of 600 tons each were brought and despatched to India round the Cape in 1857, for a service between Calcutta, Akyab, Rangoon and Moulmein, under a contract with the government of India. At the outbreak of the Mutiny in 1857 the company rendered important service by bringing up from Ceylon to Calcutta the first detachment of European troops which came to the assistance of India from outside. In 1862 an agreement was made between the company and the government, by which the former agreed to convey troops and stores and to perform other services. Under this arrangement steamers were to be despatched regularly from Calcutta to Ran- goon, Moulmein,

Akyab and Singapore, and from Rangoon to the Andaman Islands. A service was also set on foot to the Persian Gulf, between Bombay and Karachi and Madras and Rangoon. This gave a great impulse to the business of the company. During the Abyssinian campaign of 1 867 it proved of the greatest assistance to the government. The opening of the Suez Canal in 1869 produced an entire revolution in the shipping trade of India, and led to a great development of the company's fleet. The s.s. " India " with cargo was waiting at Suez when the canal was opened to traffic, and was the first steamer to arrive in London through the canal with an Indian cargo. In 1872 the company extended its operations to the east coast of Africa, and by an arrange- ment with the British government began to run a service every four weeks between Aden and Zanzibar. Upwards of one hundred .ports are visited by the company's steamers. In all there are twenty-one lines with additional services. They may be classed roughly as those running to ports in (i.) India, Burma and Straits Settlements; (ii.) Straits Settlements and Philippines; (iii.) East Coast of Africa; (iv.) Persian Gulf; (v.) Dutch East Indies and Queensland.

The Canadian Pacific Railway is now one of the big shipping companies of the world, owning, as it does, just under 200,000 tons of steam shipping. Its services divide themselves into several sections. There are those in home waters, such as the Great Lakes, where it employs a fleet of vessels of quite considerable tonnage. Under this head, too, come the local services on the coasts and rivers of the Pacific. Then there are the ocean lines on the Pacific and the Atlantic. The first of these is run from Vancouver via Yokohama and other Japanese ports to Hong-Kong. Sailings are made at about three-weekly intervals. This service is maintained by the three Empresses, the " Empress of India," the " Empress of China " and the Empress of Japan," sister ships of about 6000 tons and 10,000 i.h.p., specially built with a view to serve as auxiliary cruisers to the British navy in time of war. The great develop- ment of the Canadian Pacific, as far as regards ship-owning, took place in 1903, when it took over from Messrs Elder, Dempster & Co. their transatlantic services to Canada. The " deal " affected four twin-screw passenger and cargo steamers, and some ten vessels of a purely cargo type. These steamers ranged in size from the " Monmouth," of just over 4000 tons gross register, to the " Lake Manitoba " of not far short of 10,000 tons. Since their entry into the Atlantic trade the company has added two important mail steamers — the " Empress of Britain " and " Empress of Ireland " — to that side of its fleet.

Castle Line (see also Union Line and Union-Castle Line). — The Castle Line began its career in 1872 with the " Iceland " and the "

Gothland," both vessels of about 1400 tons. At that time the charge for carrying letters to the Cape was about is. per half oz., and the contract time between England and the Cape thirty-seven days. The mail contracts were then in the hands of the Union Line exclusively, but in 1873 the House of Commons refused to ratify the extension of the contract signed with them by the chancellor of the exchequer, and their rights thus expired in 1876. Up to 1876 the Cape parliament made an allowance to the Castle Line for the conveyance of letters, and when the postal contract was renewed in that year it was divided between the Union and the Castle lines, an arrange- ment which was adhered to down to the time when the two lines united their fortunes. The scope of the company's energies has now been extended to all parts of South Africa. The line did great national service in carrying troops and stores to South Africa during the 1 899-1902 and previous campaigns. By a resolution passed

at a meeting of shareholders held on the 13th of February 1900 this company was amalgamated with the Union Line. The fleet had grown from two ships in 1876 to twenty ships in 1900, and from a total tonnage of 2800 to one of about 110,000 gross register.

City of Dublin Steam Packet Company. — Among the steamship services in the narrow seas round Great Britain a special interest attaches to this company, which vies with the General Steam Navigation Company in the claim for seniority. The General Steam was undoubtedly the first to receive incorporation in the year 1824, but the undertakings from which the City of Dublin Company sprang were at work in the years immediately prior to these dates. As far as appears, the firm of Bourne & Co. — who fulfilled in Ireland functions for which the Messageries Imperiales in France were first formed — were large shareholders in two undertakings which made history in regard to the development of steam navigation. One of these companies was the Dublin & London Steam Packet Company, from which Messrs Wilcox & Anderson, the first managers of the P. & O., chartered the " Royal Tar," the first steamer they despatched to the Peninsula, and the other was the City of Dublin Company, which originally occupied itself in the maintenance of a service of steamships between Dublin ,and Liverpool. It was this company's ' ' Royal William ' ' which had the distinction of opening the Liverpool service to New York. By absorption, too, this company represents the old St George Company, whose " Sirius " was the first steamer to sail from London towards New York. In the year 1838 the admiralty, which in those days had the management of many of the mail services and continued for a time to keep the Irish day mails in its own hands, gave the City of Dublin Company the con- tract for the

night Irish mails, which were thus despatched via Liverpool. The name of Laird is to this day closely associated with the fortunes of the company, and even at that time a Mr Laird, grandfather of the present partners in the ship-building firm, was a director of the City of Dublin Company. In the year 1848 the government with four steamers endeavoured to run the day and night mails itself via Holyhead. But this arrangement did not work well, and two of its mail steamers were bought by the City of Dublin Company, while the two others were acquired by the Chester & Holyhead railway. It is needless to follow the vicissi- tudes of the mail service, wavering as it did from the admiralty to the Chester & Holyhead railway, and then to the City of Dublin Company. Suffice it to say that in 1859 an arrangement was entered into whereby the City of Dublin Company undertook the conveyance of both day and night mails via Holyhead, and built four ships, called after the four Irish provinces, for the service. The performances of these four paddle-ships, three of which were built by Messrs Laird, were remarkable indeed. The " Connaught " was the first vessel to do her 18 knots. The " Ulster " made the best passage of them all — doing the journey from Holyhead and Kingston in 3 hours 18 minutes. But the " Leinster" was only two minutes behind her, and the " Munster " only six minutes worse than the " Leinster." Taking the performances of the whole four vessels over the first fourteen years of their existence, and considering the mean of 20,440 passages made as well in winter as in summer, the average time of passage was only 3 hours 56-1 minutes. The contract was renewed from time to time, that coming into operation on the 1st of October 1883 being for an accelerated service. To enable this to be adequately performed, the last paddle-ship of the fleet, the " Ire- land, " was built by Messrs Laird, who also overhauled and improved the machinery of the older vessels, giving them new boilers adapted for the use of forced draught. In 1895 it was felt that the mode of carrying these important mails again needed revision, and in that year the House of Commons approved of a new contract, under which four new twin-screw vessels were to be built for the service. The work of design and construction was again undertaken by Messrs Laird, and in 1897 the new fleet assumed the duties, and indeed the names, of the vessels which had done such remarkable service during a period of about thirty-eight years. The contract time was now decreased by half an hour, and this meant naturally a very great increase in the speed of the vessels employed. The present ships, capable of a speed of about 24 knots, maintain however with regularity and ease the 20 to 21 knots which are required. Besides the night and day services with the mails the company also maintains its old line between Liverpool and Dublin.

Compagnie Generate Transatlantique. — A French undertaking known as the Compagnie Generate Maritime was founded in 1855. It owed its inception to the brothers Emile and Isaac Pereire. Services were first organized from Rouen to Algeria, between Havre and Hamburg, and between Marseilles and Antwerp, with calls at Spanish and Portuguese ports. In 1861 the company was allowed to change its title to the more comprehensive one under which it is now known, and it then undertook its first contracts for the carriage of the French mails to the United States, the Antilles and Mexico. Some of the earlier vessels employed in the New York service were very fine specimens of the naval architecture of their day. Among them may be instanced the great iron paddle-steamer " Napo- leon III.," built in the year 1864 by Messrs Scott & Co. of Greenock, who at that time constructed most of the more important vessels for this service. This vessel with her imperially titled sisters suffered a change of name in the early 'seventies, when several of them were lengthened and altered to screws. In the year 1881 , again, there was

a great movement towards the acceleration and improvement of the New York service, and a new fleet was begun with the single- screw steamship " La Normandie," launched at Barrow-in-Furness in 1883. Four larger vessels of much the same class followed, three of them being constructed in the owners' own yard at Penhoet. In 1890 the first twin-screw steamer of the line appeared in " La Touraine," and proving a success, the British-built " L'Aquitaine " was pur- chased. A new postal contract was arranged in 1898, and under its terms it became necessary for the company to build still larger and faster vessels. Eventually four such ships were to be pro- vided. These vessels are of 22 knots speed on trial, and are among the fastest on the Atlantic. The company maintains a weekly service to New York, as well as the lines to the Antilles and Mexico in the Atlantic. There are also communications with British and Algerian ports.

Cunard Line. — This company derives its name from Samuel Cunard of Halifax, Nova Scotia, an owner of sailing vessels trading from Boston and Newfoundland to Bermuda. He first conceived the idea of a regular despatch of royal mail steamships across the Atlantic, to take the place of the government brigs, which often took six or seven weeks in the transport of mails. This idea he realized with the help of Mr George Burns of Glasgow and Mr David Maclver of Liverpool. On the 4th of July 1840 the first Cunarder, the " Britannia," started on

her voyage across the Atlantic with sixty-three passengers, landing them at Boston in a fortnight. The experiment of using the screw for the Atlantic service was made with several cargo steamers in the early 'fifties, and the first Cunard screw steamer for the mail line made her d£but in 1862. This was the " China," the gross tonnage of which was 2 539> her i.h.p. 2250, and her average speed 13-9 knots. In 1870 the Cunard Company first fitted compound engines to their steamship " Batavia," and in 1881 the " Servia," the first steel vessel in the service, was the pioneer of the larger type which constitutes the present express fleet. Since 1840 the Cunard Company has been under contract with the British government for a mail service. At the present time the contract is for a weekly mail to the United States, via Liverpool and New York. The British post office, however, only pays its contractors for the weight of mails actually carried, and reserves the right to send specially addressed letters by foreign ships. The company's services also include a passenger line to Boston, and frequent despatches to Mediterranean and Levant ports as well as a weekly steamer to Havre, and a passenger service from the Mediterranean to New York. In October 1902, as a result of the formation of the Morgan Shipping Trust, the British government made a new arrangement with the Cunard Line, involving the loan at i\ % of the capital for building two new fast steamers, besides a yearly subsidy of £150,000 for twenty years. The company showed its confidence in the turbine system — then in its infancy — by adopting this principle for these two vessels, the largest and fastest at that time contem- plated. The advance in size and power of Atlantic steamships is evidenced by the following comparison : —

Speed.

Tonnage.

H.P.

1884

" Umbria " and

" Etruria "

19

8,127

14,500

1893

“Campania” and

” Lucania ”

22

12,952

30,000

1907

“Lusitania” and

” Mauritania ”

25

30.830

68,000

Elder, Dempster & Co. — The remarkable progress of this com- pany, and of the undertakings connected with it, was largely due to the activity of the late Sir Alfred Jones. The oldest business under its management is the African Steamship Company, which was incorporated by royal charter in the year 1852 for the purpose of trading with West African ports. It received a subvention of £30,000 per annum for a monthly mail to the Gold Coast, and began its work with an unambitious little fleet of four 700-ton vessels. These were at first, however, equal to all the traffic which the trade could offer them. As time went on the number and size of the vessels employed was increased. In 1869 such progress had been made that it appeared worth while to start an opposition line under the name of the British and African Steam Navigation Company. This was at first a Glasgow venture, much in the same way as the old concern had made its headquarters in London. But Liverpool has long been the centre of the West African trade, and both com- panies practically transferred their business thither. In the year 1883 the British & African Company, which was the first of the two to fall under the management of Messrs Elder, Dempster & Company, became a limited company, and not long afterwards the two rivals arrived at a working arrangement whereby their sailings— at that time about three times a fortnight — were worked into one another. The Canary

Islands, where the West African steamers called on their voyages, were then becoming known as a resort for tourists and invalids, and the issue of tickets available by either line was commenced for their convenience. The develop- ment of the cultivation of the banana for the English market was also begun to be encouraged by the two steamship companies.

But it was in the month of August 1891 that the great movement by the Elder- Dempster Company was made public. It was then announced that the firm had assumed the management of the African Company. The two concerns were, and are, continued as distinct organizations, but they naturally work very closely together. The African Company soon began to break fresh ground, building jiot only superior vessels for the improving West African service, but also constructing large cargo vessels for the general Atlantic trade. These were soon engaged in the trade between the Mersey and the St Lawrence on the one hand, and between Liverpool and the southern ports of the United States on the other. Mean- while the development of the possibilities of West Africa and of the Canary Islands was not neglected. Various undertakings, not usually considered part of a shipowner's work, were inau- gurated. These included a bank, founded in 1894, for the accommo- dation of West African traders, oil-mills in Liverpool, where the palm kernels so largely consigned from the coast might be dealt with, and a hotel at Grand Canary for the convenience of the tourist; while, to ensure the disposal of the bananas which their companies brought to England, a fruit brokerage business was opened in Covent Garden. Having already, as has been seen, a footing in the Canadian trade, they began the restoration of the Atlantic trade to Bristol, by giving it a service of steamships to the St Lawrence, employing for the purpose vessels of as great size as their docks could accom- modate. At the beginning of 1899 they further strengthened their connexion with the nearest British colony by the purchase, from the liquidator of the insolvent Canada Snipping Company, of the name, house-flag and remains of the old Beaver Line. A new fleet for this service was at once put in hand, a fair representative of the ships being the twin-screw " Lake Erie," a vessel of 7550 tons gross register, built in 1900 by Messrs Barclay, Curie & Co. of Glasgow, which did good work — with many other Elder- Dempster steamers — in the transport service during the Boer War. The Canadian steamers were however in 1903 transferred to the Canadian Pacific railway. At the beginning of the 20th century the firm began trading with the West Indies. By arrangement with the colonial office, for an annu?' subsidy of £40,000, the " Direct " service of fortnightly steamships was started with the sailing from

Avonmouth of the then newly built " Port Morant " in February 1901. The steamships of the new line have good passenger accommodation and hotels were acquired in Jamaica to provide accommodation for those who wished to visit the West Indies under the new management. This provision for tourists was a novel feature. The increase, at once absolute and comparative, in the tonnage of the Elder- Dempster fleet has been very remarkable. On the death of Sir Alfred Jones a limited company was established under the direction of Lord Pirrie, of the great ship-building firm of Harland & Wolff, and of Sir Owen Philipps, chairman of the Royal Mail Steam Packet Company, to carry on the Elder-Dempster Company and take over the various interests concerned. The vessels of the West African lines ply as well from Hamburg and other North Sea continental ports as from Liverpool, while closely connected with the firm, though sailing its vessels under the Belgian flag, is the Compagnie Beige Maritime du Congo, which runs a service from Antwerp to West African ports.

Ellerman Line. — " Lloyd's Register of Shipping " in its issue for 1901-1902 contains no reference to the Ellerman Line. For unlike most other shipping companies it sprang into being in a moment. It was started when Mr (afterwards Sir) John Ellerman, chairman of the Leyland Line, severed his connexion with that company and went his own way, taking with him some nineteen vessels of the fleet, and the Peninsula and Mediterranean connexions of the old company. Forthwith he added to the tale of his ships by taking over the management of the seven steamers of the Papay- anni Line— which has also long maintained a service to Mediter- ranean ports. Nine steamers previously managed by Messrs Westcott & Laurence also came into the fold. But this was not all ; the direction of two old-established lines to Indian ports was also acquired. These were the fleet of the City Line, which at that time comprised some fifteen vessels, many of them fitted for the passenger trade. This line had been founded by Messrs George Smith & Sons of Glasgow in the first half of the 19th century and had grown up out of a fleet of sailing vessels. The other was the Hall Line of Liverpool, previously managed by Messrs Robert Alexander & Co. It consisted of some eleven steamships of about 4000 tons gross apiece. The various sailings of these different companies have all been maintained and extended, and in 1910, in conjunction with the Harrison and Clan lines, a new development up the East Coast of Africa towards Zanzibar and Mombasa was organized.

The Leyland Line may be said to date from the year 1851, when the first Mr Bibby founded his steamship line with the small vessels " Arno " and " Tiber " for service to the Mediterranean (see Bibby Line

above). The company extended its business to the North Atlantic and in the early 'seventies changed its name, Mr F. R. Leyland, one of its managers, assuming the control. On his death in 1892 the concern became a limited company. In 1900 it pur- chased the fleet and connexions of the West India & Pacific Steam- ship Company — a business which had been founded nearly forty years previously in Liverpool and which served, beside many West

India Islands, the cotton ports of Galveston and New Orleans, having also a connexion to Colon for places on the western coast of America. This company at the date of its absorption had a fleet of twenty-two steamships totalling over 1 1 1 ,000 tons gross register. This amalgamation was the first step towards the great American combine. Mr Ellerman, however, who was chairman of the old Leytand Company, separated himself from it at this juncture, and founded his own line. The Ley land Company had a number of transatlantic services.

General Steam Navigation Company. — This is the oldest existing line. Its first prospectus was issued in 1824, and in 1831 it re- ceived its charter of incorporation. It commenced with the passenger trade from London to Margate, and its operations gradually extended to the British coastwise ports and the home trade ports on the Conti- nent. In time the company introduced a regular steam service between Edinburgh and other east coast ports and London, Ham- burg, Rotterdam, Antwerp and Havre in the north of Europe. It gradually obtained a strong hold upon the passenger and fine goods trade to the Continent, holding the mail contracts between London and Hamburg, and London and Rotterdam. In the early 'seventies the pressure of foreign competition made itself severely felt, and in 1876 the increase of the American cattle trade told on the profits of the company; but the difficulty was met by obtaining parliamen- tary leave for an increase of capital, and the company had displayed new enterprise, especially in regard to its passenger facilities. It may claim to have been the pioneer in the promotion of steamship traffic between British home ports and the nearer ones of the Continent. The steamship " Giraffe," built in 1836, brought over the first cargo of live cattle from Rotterdam to Blackwall in 1846. The company runs steamers from London to Edinburgh, Hull and Yarmouth, and from London to Antwerp, Amsterdam, Bordeaux, Havre, Hamburg, Oporto, Ostend, Rotterdam, Charente and the Mediterranean port"

Vessels are also run to some of the ports above-named from Hull and Southampton. There is also a pas- senger service between Harwich and Hamburg, and excursion services in summer to the watering-places at the mouth of the Thames and on the Kentish coast.

Hamburg-American Line. — The extraordinary progress of Hamburg as a seaport during the last thirty years of the 19th century may be held due in no small measure to the enterprise of this line, which now carries passengers not only to the two American con- tinents, but also to the east of Asia and Africa. It was founded in May 1847. At that time, owing to the political disturbances throughout Germany, there was an enormous exodus of emigrants to the new world ; of this the founders took advantage, and they started a regular service of sailing ships between Hamburg and New York. The first ship they owned was the " Deutschland," of 700 tons, built on the Elbe. It is interesting to note that the present " Deutschland " is of 16,502 tons gross register, and is of twenty-three times the capacity of her predecessor. The first sailing took place in October 1848. In 1851 the company's fleet consisted of six vessels, with an aggregate of 4000 tons. In 1856 the first screw steamer in the company's service left Hamburg; this was the " Borussia," a vessel constructed, as were her sisters for many years, on the Clyde. From this time, when the company abandoned sailing ships and took to steam, its prosperity may be said to have dated. It is strange to note that the two first steamships owned by it were chartered by the British and French governments to convey troops to the Crimea. By 1867 the company had ceased to own any sailing ships. The enormous increase of the traffic is indicated by the fact that whilst in 1856 the sailings to New York took place every fortnight, in 1881 there were two a week, and later on three. The company had also by this time considerably extended its operations from the original passage between Hamburg and New York. After the war between France and Germany it started a line to the West Indies, and later to Baltimore, Boston, Montreal and other ports in North America. In 1875 it absorbed the old Eagle Company of Hamburg, which had previously been its rival, and then began to run steamers to Central and South America, and later to China, Japan and the Straits Settlements. To-day the Hamburg- American Line may claim to be the largest steamship company in the world. For its services to New York run by twin- screw steamers it has the " Deutschland," built at Stettin by the Vulcan Company. Her engines develop about 33,000 horse-power, and she was the first Atlantic liner to exceed a speed of 23 knots at sea. Other large steamers built for its Hamburg-Southampton- New York service are the " Kaiserin Augusta Victoria " and the "

Amerika," which, though larger, has not the " Deutschland's" speed. A service from Hamburg to New York direct for third- class passengers only is also maintained. The Hamburg Company has extended its influence and enlarged its fleet by purchases from and absorptions of other fleets. Thus it has acquired vessels from the Carr Line and the Hansa Line of Hamburg, the Rickmers Line of Bremen, as well as from the Hamburg South America and the Hamburg-Calcutta companies. In conjunction with the Lloyd Line it took over the fleet of the Kinsing Line. In 1901, with a view to the feeding of its main lines, it acquired the Atlas Line of Liverpool — a company which had developed the tra3e between New York and the West Indies. Starting from Hamburg, its vessels ru» to New York, Portland, Baltimore, Boston, Philadelphia,

Galveston and New Orleans, and to Canadian ports. In Central and Southern America, there are lines to Mexico, Venezuela, Brazil, Uruguay and Argentina. Amongst the West Indian Islands Cuba receives special attention from this line. There is a service to Eastern Asia, China and Japan. From Stettin its steamers run to New York, and from New York to the Mediterranean, Brazil and Eastern Asia. From Genoa they run to La Plata direct. ,

Japan Mail Steamship Company, Limited (Nippon Yusen Kaisha). — From an early period their insular frontiers made the Japanese a seafaring folk, but imperial policy for a long period shut them away from all intercourse with the rest of the world. It was not until about the year i860 that the life of the West really touched Japan: In 1868 steamship communication was opened between Toky<3 and Osaka; in 1871 the Yubin Kisen Kaisha Steamship Company came into existence under the control of the Imperial Bureau of Com- munication; and in the same year a private company, called the Mitsubishi Kaisha, was founded. This may be said to have been the beginning of all modern maritime enterprises in Japan. In 1876 the government company gave up the contest, and its fleet passed into the hands of the private company. In 1873 the capacities of this company had been tested in the military expedition to Formosa, when its organization had been found excellent, but its fleet insufficient. The treasury now invited the company to buy up the Yokohama-Shanghai service of the Pacific Mail Steam- ship Company. In 1876 the company had a fleet of forty-two vessels, including sailing ships. In 1882 the government set on foot another rival line, the Kyodo Unyu Kaisha, but it did not answer, and in 1885 the two were amalgamated into the present " Nippon Yusen Kaisha," or " Japan Mail Steamship Company." In the nine years which passed between this union and the outbreak of the war with

China in 1894, the services between Japan and neighbouring countries were extended, and the development of the cotton trade induced the government to inaugurate a service between Japan and Bombay. During the war the vessels of the line were used for the transport of troops, and many additional ships had to be acquired. The result of the war gave an enormous impulse to trade and navigation. The company determined to run vessels to America, Europe and Australia. The capital was greatly increased, and orders were given for the construction of twelve twin-screw steamers of over 6000 tons each for the European line, and three of 3800 tons each for the Australian line. In 1899 the Japanese Diet resolved to grant subsidies to the company's European and American lines. All its lines therefore now, with few exceptions, run under the mail contract of the Japanese government. There is a regular fortnightly service of twin-screw vessels between Yokohama, London and Antwerp; a monthly service between Yokohama and Melbourne; also between Yokohama and Victoria (British Columbia). There are lines to Bombay, Shanghai, Vladi- vostok, Newchang, Tientsin, and many local lines, touching at all the ports of the islands of Japan.

Royal Mail Steam Packet Company. — Soon after British-owned steamships began to run to America a company was formed by leading business men interested in the West Indies, to carry the mails from England to that part of the world. The charter of this company, to be known as the Royal Mail Steam Packet Company, was granted in 1839. The government believed that the institution of a line carrying the mails regularly to British possessions in the West Indies was likely to prove of benefit to the empire, and granted it a large subsidy. The first contract with the government was entered into in March 184 1. No less than fourteen large paddle-steamers capable of carrying the largest guns then used by the Royal Navy were at once ordered, and the service was opened with the Thames " on the 3rd of January 1842, followed by other vessels in fortnightly succession. These steamers started from Falmouth and returned to Southampton, which was the company's headquarters, though it had no dock accommodation in those days. In 1846 the company began to carry the, mails for places on the western coast of South America, the Pacific Steam Navigation Company receiving them at Panama. In January 1851, the com- pany by contract with the government inaugurated a monthly service to Brazil and the river Plate, and new steamers were built which greatly increased the rapidity of transit. This company was therefore the first to institute direct mail communication by steamer between Europe and the countries of South America, as it had also been with the West Indies. The

company's vessels were employed continuously during the Crimean War in the transport of troops. It is interesting to note that it was from one of the com- pany's ships, the " Trent," that Slidell and Mason, the commissioners of the Confederate states, were taken on their way to Europe by a United States man-of-war. In 1872 the service to Brazil and the River Plate was doubled. At the beginning of the 20th century the company seemed to be on the downward grade. But a change came over its fortunes. \ new chairman, Sir Owen Philipps, took over the reins and new enterprises were started in several directions. The interest of the Pacific Steam Navigation Company in the Orient-Pacific Line to Australia was purchased in January 1906, and steamers despatched once a month from London to Australia through the Suez Canal. This enterprise, however, was discontinued when the new mail contract came into force in May

1909. New twin-screw steamships of much greater tonnage than any they had hithertofore owned were constructed for the mail service to South America, and an extension was made into the tourist and cargo trade to Morocco, Madeira and the Canary Islands by the purchase of the old-established Forwood Line. Part of the fleet of the Shire Line to the Far East was also acquired. But the great development took place at the beginning of 1910, when the directors made the startling announcement that they had purchased the whole of the share capital of the Pacific Steam Navigation Company — a business established in Liverpool only a year after the grant of their own royal charter. This absorption brought some forty ships — many of them modern twin-screw steamships of a high class — into the fleet, which was then placed amongst the big lines of the world. Another move was made when Sir Owen Philipps joined Lord Pirrie in organizing a company to take over the numerous enterprises of Sir Alfred Jones. The West India Line steamers leave Southampton for the West Indies every fort- night, and after calling at Cherbourg proceed direct to Barbadoes, thence to Jamaica and Colon, whence they proceed to Savanilla and other local ports. From Barbadoes, Trinidad, La Guaira, branch lines run to Demerara and the islands. The Brazil and River Plate Line comprises a fortnightly service of mail steamers to Pernambuco, Bahia, Rio, Montevideo and Buenos Aires. The Shire Line steamers sail to the Far East every fortnight, as do those of the Islands service, whilst the Pacific Line despatches twin-screw passenger steamers and large cargo vessels alternate weeks from Liverpool to South American ports, besides maintaining

local services up the West Coast. There are also cargo services to the West Indies and Mexico, and to the River Plate and intermediate ports.

Messageries Maritimes de France. — Originally known as the Messageries Imperiales, this company sprang from a land-transit undertaking. It received its first contract for the conveyance of oversea mails from the French government in 1851. It then extended its services to Italian, Greek, Egyptian and Syrian ports. In the following year it included Salonica in its itinerary. The occurrence of the Crimean War gave an increase to its fleet and a stimulus to its operations. For it was not only given the task of maintaining mail communication with the French forces in the Black Sea, but was largely entrusted by the government with the duty of transporting troops and stores to the seat of war. At that time it was a considerable purchaser of British tonnage. In 1857 it had the French mail contract to Algiers, as well as to the Danube and Black Sea ports, whilst in the same year a new mail contract for a service between Bordeaux and Brazil and the river Plate was granted to it. By this time it had, either afloat or under construction, a fleet of no less than fifty-four steamships of 80,875 tons. In 1 861 further employment was found for its vessels in the conveyance of the mail to India and China. By the year 1875 its fleet embraced 175,000 tons of shipping, and also employed a large number of chartered sailing vessels. It was at that time the largest steam shipping company in the world. It had already ceased to employ British shipbuilders and now constructed its own tonnage in its own yards. The extension of its services to Japan followed, and eventually it put forth branches which served Madagascar, Mauritius and Zanzibar, as well as Australian ports and the French colony of New Caledonia. Some of the steamers employed in the mail services to the Far East and South are of a very fine character. In 1909 its fleet traversed 1,019,046 marine leagues and carried 197,320 passengers and over a million tons of cargo.

Morgan Combination. — Under the head of the American Line it has been shown how a group of American capitalists acquired the Red Star, Inman and American lines, thus forming a body of shipping which embraced in the year 1901 about 167,000 tons of shipping tonnage, partly under the British and partly under the Belgian and American flags. Another company which drew its capital chiefly from the United States, though its vessels fly the red ensign, is the Atlantic Transport Company, registered under the British Limited Liability Acts in 1889. Its main service is between London and New York, and it is carried on by large and modern twin-screw

steamships, several of which have been con- structed by Messrs Harland & Wolff of Belfast. These vessels range up to about 14,000 tons gross register, and though they carry large quantities of cargo and of cattle on the eastward voyage, also accommodate a number of passengers in their saloons. Through the connexion of this undertaking with Messrs Harland & Wolff as builders of their vessels, those American capitalists who were interested in the extension of United States interests on the North Atlantic and who purchased the share capital of the Leyland Line were brought into connexion with Lord Pirrie, the managing director of this ship-building firm, and through him approach was made to the managers ot the White Star Line in the year 1901. An offer for the purchase of this famous British line was put forward by the American syndicate, headed by Mr J. Pierpont Morgan. The managers of the White Star Company had not merely to consider what many experts believed to be a liberal offer. There was another factor in the situation present to their mind. The New York syndicate, besides having the control of the vessels of the American lines on the Atlantic, had, it was said, secured the management of the trunk lines of railway between the great producing districts of the Western states of America and the eastern seaboard. They

were thus in a position to give to shippers from the United States the convenience of . transit by a through bill of lading to embrace both the railway journey and the ocean voyage, and there was ground for the belief that if competition were allowed to ensue the British steamship companies— which from the nature of things could receive no corresponding support from the railways of the United Kingdom — might suffer very severely. The White Star Line accordingly threw in its lot with the American and Atlantic Transport Companies, and with the White Star Line went the Dominion Company — a line whose fine passenger vessels were constructed by Messrs Harland & Wolff, and whose management is largely influenced by the partners in that firm. The Dominion Line has services from Liverpool to Boston, Portland (Maine), and St Lawrence ports. The Norddeut- scher Lloyd and the Hamburg-American companies were approached by Mr Morgan with a view to their entering into the scheme; but though a working agreement was arranged, the German lines decided to preserve their separate existence. The Morgan com- bination was eventually incorporated at the end of September 1902 in New Jersey as " The International Mercantile Marine Company," with a capital of $120,000,000; and an agreement was come to with the British government, by which the British character of the British ships in it would be preserved. The combine controls about a million tons of

steamships.

Navigazione Generate Italiana. — The union of the Florio and Rubattino lines in the year 1882 was the origin of this company. The Rubattino Line finally made Genoa its headquarters, while the Florio Line centred its business at Palermo, and had itself been largely strengthened by the absorption of the Trinacria Company of its own port. The coasting trade of Italy and Sicily, with services to various ports of the Mediterranean and Black Seas, occupies the great part of the company's fleet. But it also runs monthly lines from Genoa through the Suez Canal to Red Sea ports, and so to India and Hong-Kong. Towards the western ocean it has a service maintained in conjunction with that of another Italian company, La Veloce, to Brazil and the River Plate, whereby weekly departures are made from Genoa. In February 1901 a new line was opened by the sailing of the Italian Generate Company's steam- ship " Liguria " — a new Italian-built vessel of upwards of 5000 tons register — for New York. The object of this line, which is maintained by steamers of the Generate Company, aided by a similar number from the fleet of La Veloce, sailing once a week from Genoa via Naples, is to attempt to retain in Italian hands some of the large traffic which is carried on from these ports in the steamers of the Norddeutscher Lloyd, the Hamburg-American Line, the Cunard and White Star lines.

New Zealand Shipping Company.— -This company was established in 1872 for the purpose of maintaining a passenger and cargo service between London and New Zealand. This was before the days when steam vessels could be used with commercial success in the long sea trade. At first it depended on chartered vessels, but gradually it acquired a fleet of fast clipper iron sailing-ships which reduced the voyage to 90 days. These vessels took out a large number of government emigrants between 1874 and 1882. In 1881 one of these ships inaugurated the frozen meat trade from New Zealand, thus opening up a business which has since grown to colossal proportions. The trade increased so rapidly that it was found impossible to conduct it by means of sailing ships, and in January 1 883 the company despatched from London the chartered steamship " British King," of 3559 tons. This vessel accomplished the voyage in 50 days, but it was found necessary to diminish the passage to 45 days out and 42 home. Five steamers were therefore built to fulfil the requirements of the trade. The first of these, the " Tongariro," of 4163 tons, left England in October 1883. The com- pany about this time received the contract of the New Zealand government for a monthly mail service, with a guaranteed time .of 45 days. The managers gradually eliminated all the sailing vessels from the fleet,

and more recently replaced the original single-screw mail steamers with large modern twin-screws. In addition to passenger vessels the company owns several cargo boats, some of which are among the largest afloat. In the " Otaki " triple-screw vessel, added to the fleet in 1907, the company initiated a com- bination of reciprocating engines for using the high-pressure steam and turbines to make use of it subsequently. The company's ships sail from London, calling at Plymouth, Teneriffe, Cape Town, Hobart, on the way out, and sometimes at Montevideo or Rio and Teneriffe on the return voyage. Communication with the different ports of New Zealand, as well as to Australian ports, is carried out by the vessels of the Union Steamship Company of New Zealand.

Norddeutscher Lloyd. — To the enterprise of certain citizens in the city of Bremen this large business owes its existence. The originator was Herr H. H. Meier, who brought into line the various shipping interests of Bremen, and induced them to amal- gamate into one company. The associations thus brought together were the Weser Haute Steamship Company, the Unter Weser and Ober Weser Steam Tug Companies and the Ober Weser Uni- versal Shipping Insurance Association. The statutes of the new company were approved by the senate of Bremen on the 18th of February 1857. The original capital was 4,000,000 thalers, but soon after the formation of the new company great depression set in, owing to the commercial crisis in North America. More

than 2500 shareholders in the Lloyd forfeited their shares, but the directors were not dismayed, and had the loyal support of their fellow citizens. Four big ocean steamers were constructed for the American line and three for the English, and large docks for repairs were established at Bremerhaven. The first voyage was made in June 1858, when the " Bremen " started for New York, carry- ing many steerage passengers, but only one in the saloon. The second ship, the " Hudson," was shortly afterwards burned while lying in harbour. At the end of the first year both lines showed a loss. At the end of the second year matters improved, the English cattle trade especially showing great progress. But the company still commanded little confidence, for the Darmstadt Bank parted with 1,000,000 thalers' worth of shares at a loss of 75 . These the directors themselves took over. But the American Civil War now came, to deal another severe blow at the Lloyd, just when its prospects were growing brighter,and

till 1864 no dividend greater than 2j was paid to the shareholders.. After the termina- tion of the war the trade with the United States grew enormously, and the English traffic also revived in a most unexpected way. One result was the foundation of rival lines, which, however, were unable to maintain effective competition, and succumbed. In 1868 a new line was opened. Bremen's staple of commerce is tobacco, and the directors determined to bring their port into direct communication with the tobacco-producing areas in the States; so in that year they inaugurated their line to Baltimore. In the following year a line was started to New Orleans, another great centre of the tobacco and cotton trade. It was necessary to con- struct three special liners for that service, as the ordinary ships could not pass the bar of the Mississippi. In 1869 a line to Central America and the West Indies was set on foot, and new steamers were ordered to run on it. With the outbreak of the war of 1870 the company naturally had anxious times, as the French fleet blockaded the German coasts ; but its vessels often ran the blockade with success. Soon after the war the West Indian service, proving unprofitable, was given up. In 1875 a new line of steamers to Brazil and Argentina was started. This was separated into two distinct services in 1878. In 1880 the approach of the great struggle for supremacy on the Atlantic made itself felt, and the company began to prepare for the contest, and ordered the con- struction of the " Elbe," the first of its express line of steamers. She commenced running in 1881, and was quickly followed by others. Between 1 88 1 and 1 888 an entirely new fleet was placed on the New York line. In 1886 the Australian and East Asian Lines were founded in accordance with a contract with the imperial government. This included a monthly service to China, with a branch service to Japan, and a monthly service to Australia, with a branch line to the Samoan and Tonga Islands. From that time onwards the story of the Norddeutscher Lloyd has been one of increased prosperity. The company's fleet includes four large and fast steamships of about 23 to 235 knots speed for its weekly express service to New York, whilst it has also large vessels — one, the "George Washington," being of 27,000 tons — for its intermediate service to the same port, built by the Vulcan Company at Stettin. The company runs many lines from its headquarters at Bremen; among them are those to New York — a line of express steamers and a line of ordinary mail steamers, all calling at Southampton or Cherbourg; to Balti- more direct ; to Galveston direct — there are no first-class passengers by this line; to Brazil; to the River Plate, calling at principal ports on the way. There are also lines of imperial mail steamers between Bremen and Hamburg and eastern Asia, and Bremen and Australia, and a freight line to east

Asia, which runs in connexion with the Hamburg-American Line. In pursuance of the German policy of securing the feeders to maintain traffic, the Norddeutscher Lloyd purchased the ships and business of the Kinsing Line and of the Scottish Oriental Company, when it began seriously to develop its Eastern trade. Feeling in common with all large steamship companies the difficulty of providing efficient personnel for its constantly expanding fleet, and believing in the necessity for sea- men of experience in masted ships, the Lloyd has provided itself with a sea-going training-ship. Such success attended this ex- periment that a second vessel has been added and the idea has since commended itself to certain British steamship companies.

Ocean Steamship Company. — The Ocean Steamship Company is the successor of older steamship enterprises, mainly under the same management and ownership. These began in 1852 with the coast ing trade, and extended in following years to French ports, and in 1 85.S to the West Indies. The last-named line attained some moderate importance, comprising seven vessels; it was sold in 1863, and eventually became the West India & Pacific Steamship Company, which in its turn was absorbed by the Leyland Line in 1900. The managers thereupon, seeking other trades, decided on attempting that to China, and the company under its present title was registered as unlimited in 1875. Up to this date low- pressure jet-condensing engines were alone used, burning perhaps 5 to 5i lb of coal per indicated horse-power per hour. This rate of consumption would have been fatal to the scheme, since vessels could not have carried any cargo in addition to the coal necessary for so long a voyage as that via the Cape, the Suez Canal not being opened till 1870. A small vessel, the " Cleator," of which the exact speed and consumption with the old type of engine was well known,

was therefore experimentally fitted with new machinery of the compound high-pressure (70 lb), surface-condensing type. The result of the experiment was that her consumption was reduced to about 3 or 3$ lb per i.h.p. per hour, and this warranted the con- struction of the " Agamemnon," " Ajax "and " Achilles," all 309 ft. long, 38 ft. 6 in. broad, 28 ft. 6 in. deep, fully rigged as barques, with screws outside their rudders. These rigs were subsequently altered to that of barquentines, but the relative positions of the screws and rudders were retained till they were disposed of in 1899. In these vessels the consumption was further reduced to about 25 lb, which allowed margin for a reasonable cargo. The " Agamemnon " sailed from Liverpool in 1866; the itinerary being Mauritius, Penang, Singapore, Hong-Kong and Shanghai, and, with similar calls, back to London. The cargoes in those days were mainly manufactured goods outwards

and tea homewards. The average speed was perhaps 9! knots, and the consumption about 21ˆ tons of Welsh coal per day. These and succeeding steamers were at that date the only vessels carrying high-pressure steam on long voyages, and they traded regularly round the Cape, being the only line that did so. When the Suez Canal was opened in 1870 they changed the route. The trade from the United King- dom to China has since steadily grown, and increasingly large cargoes are also procurable homewards from the Far East, in spite of the successful competition of Indian and Ceylon teas. In 1891 a service was begun from Amsterdam and Liverpool to Java, and this is maintained about once a fortnight, finding employment for about ten of the smaller ships. The vessels in this trade, which is princi- pally between Holland and her eastern possessions, fly the Dutch flag. A limited number of passengers were formerly carried be- tween England and the East, but these ships now take cargo only to and from Europe, though Mahommedan pilgrims are conveyed in considerable numbers to and from Jeddah, the port for Mecca. The ships generally commence loading at Glasgow, and occasionally at other West Coast ports. They usually carry the greater part of the cargo from Liverpool, the most important element being fine goods (manufactured cottons, &c.) from Lancashire and Yorkshire. Abroad the regular service has been extended to the principal Japan ports — Nagasaki, Kobe and Yokohama, and, as opportunity arises, additional ports of call in China and Korea have been added to its itinerary. The following local services have their headquarters at Singapore: (1) Singapore to West Australian ports, including Fremantle. These steamers carry passengers, and bring large quantities of wool and pearl shell from Australia to Singapore for transshipment to the main line steamers bound for London. (2) Singapore to Deli (Sumatra). Three small steamers bring tobacco from Deli for transshipment to Europe. (3) Singapore and Penang to China. The great emigra- tion of Chinese coolies to the British colony of the Straits Settle- ments keep several steamers regularly employed. The company is colloquially known in the shipping world as the " Blue Funnel ' Line, and is also often referred to by the name of Mr Alfred Holt, who has been closely identified with it throughout its history. In 1902 the Ocean Company absorbed its younger rival, the China Mutual Steam Navigation Company, with a fleet of thirteen vessels of 106,870 tons, and shortly afterwards re-registered itself under the Limited Liability Acts. The company's most recent develop- ment is in its connexion with Australia. For its direct service thither several 10,000-ton ships fitted with refrigerating apparatus and accommodation for some 300 passengers each are provided.

Orient Line. — The Orient Line of steamers between London and Australia took up the work of the Orient Line of clipper packets, which in the days of sailing-ships used to ply between London and Adelaide. In April 1877 it was announced that " the Orient Line would sail the under-mentioned steamships of the Pacific Steam Navigation Company to Australia." That connexion between the two organizations was continued and strengthened till in 1901 the name of Orient Line was changed to that of Orient- Pacific. In June of 1877 the " Lusitania " was despatched from London to Adelaide, Melbourne and Sydney, via the Cape of Good Hope. Other sailings followed at about two-monthly intervals. In the following year the Orient-Pacific Line came into existence. It was formed by the joint efforts of Messrs Anderson, Anderson & Co. and F. Green & Co., who are the managers of the line. When the service was begun it was intended to be run monthly, but the in- crease of traffic soon demonstrated that fortnightly sailings would be successful. This extension was determined on in 1880, the year following that in which the " Orient," the first ship specially built for the company's trade, commenced work. Since 1888 the Orient Company has carried the mails to Australia by contract with the English post office, once a fortnight. These despatches, alternat- ing with those of the P. & O., give Australia a weekly mail. Several twin-screw steamers have been built for this service by both the Orient and the Pacific Companies. The latter company subsequently retired from the partnership, the Royal Mail Company taking its place and purchasing the vessels which it employed. In 1910, however, a new mail contract came into operation, and this was undertaken by the Orient Company alone. The Royal Mail withdrawing its ships, the Orient Company replaced them with a new fleet of 12,000-ton steamers, of which the first five are twin- screws and the sixth is to have three propellers driven by a

combination of reciprocating and turbine engines. It was the Orient liner " Ophir " which took the place of a royal yacht for the imperial tour of the Prince and Princess of Wales in 1901. The steamers of the Orient Line call regularly at Plymouth, Gibraltar, Marseilles, Naples, Port Said, Suez, Colombo, Fremantle, Adelaide, Melbourne and Sydney.

Pacific Steam Navigation Company. — This was the pioneer of the steam-trade along the western coast of South America; sub- sequently its operations were extended to Europe, and finally, in

conjunction with the Orient Steam Navigation Company, it established the Orient Line to Australia, from which it withdrew in 1906. It obtained a charter early in 1840, and soon sent out from England two steam vessels, the " Chili " and " Peru." These were paddle-boats of 710 tons and 198 ft. in length. They ran along the coast from Valparaiso to Panama. The early struggles of this company are noteworthy as showing how difficulties, apparently insuperable, may be overcome, and even turned to essential ad- vantage. The great obstacle to the success of these steamers was the difficulty of ootaining supplies of fuel, and in the first five years of its existence no less than £72,000 was lost, the whole capital of the company being but £94,000. But the difficulties were over- come, and all that remained in the mind of the managers was a strong feeling of the importance of economy in coal consumption. Accordingly, in conjunction with the Fairfield firm of Randolph, Elder & Co., they turned their attention in this direction, and were sending out vessels fitted with compound engines some ten or a dozen years before the Atlantic companies adopted them. In 1867, under pressure from the Chilean government, the company sought and obtained powers to extend its operations, and in the same year the " Pacific," of 1630 tons, was constructed. She left Valparaiso for Liverpool in May 1868, the first of the new mail line. In 1870 the voyage was extended, Callao, 11,000 miles from Liverpool, being made the terminal port, and the sailings were increased from one to three a month. In 1873 a weekly service between Liverpool and Callao was instituted, and by 1874 there was a fleet of fifty-four steamers, with an aggregate of 120,000 tons, in commission. Owing, however, to a great decrease in the South American trade the service was reduced to a fortnightly one. The opening of the Transandine railway was expected to have a great effect on the fortunes of shipping companies in South American waters and consolidation of interests seemed desirable. In 1910 the whole of the company's ordinary capital was purchased by the Royal Mail Company, and the line was thus absorbed. In January 1893 the company inaugurated a monthly cargo service to the Brazils, River Plate and the West Coast. This service has been extended to Glasgow. Many ports are served. The principal are La Pallice, La Rochelle, Corunna, Carril, Vigo, Lisbon, St Vincent, Pernambuco, Bahia, Rio de Janeiro, Monte- video, Buenos Aires, Punta Arenas, and the ports of the western coast of South America, Valparaiso and Callao.

Peninsular & Oriental. — The story of the P. & O. Company may be divided into two eras — the first reaching from its foundation to the opening of the Suez Canal; the second from that date to the present

day. During almost the whole of its career the company has acted as the agent of the British government in the conveyance of its mails, first to Mediterranean ports, and afterwards to Egypt, India and the Far East. From time to time the government has made efforts to procure some other means for transmitting its mails, but on every occasion it has found it advisable to return to the P. & O. In 1835 Messrs Willcox & Anderson, a firm of London merchants, began to run steamers to the principal ports of the Peninsula. Their vessels observed greater regularity than the sailing-ships then employed to carry the mails, and the first mail contract was entered into on the 22nd of August 1837. This was awarded to them after another company, which was unable to fulfil its obligations, had been engaged for the work. Messrs Willcox & Anderson had shortly before, in concert with Captain Bourne, R.N., founded the Peninsular Company. This contract arranged for a monthly service between Falmouth and Vigo, Oporto, Lisbon and Gibraltar. About two years later another step was taken. Hitherto the mails to Egypt and India had been conveyed by the Peninsular Company to Gibraltar, by an admiralty packet from Gibraltar to Malta, by another admiralty vessel from Malta to Alexandria, and from Egypt to Bombay by one of the East India Company's steamers. It was resolved to substitute for this unsatisfactory mode of conveyance a direct system of carriage by one line of steamers from London to Alexandria. The Peninsular Company again secured the contract, which was put up to public competition, and built two steamers of 1600 tons for the purpose this being a large tonnage for those days. The annual subsidy was fixed at £34,000, by which the government saved £10,000 of the amount formerly expended on their own inefficient means of transport. The company then, by a charter of incorporation, dated December 1840, assumed the name by which it has ever since been known — The Peninsular & Oriental Company. The charter was granted only on the onerous condition that steam communication with India should be established within two years. The first steamer, the " Hindostan," was despatched to India via the Cape of Good Hope on the 26th of September 1842. She was one

of a small fleet destined to ply between Calcutta, Madras, Ceylon, Aden and Suez. It was an adventurous undertaking, for the East India Company promised no definite subsidy, only a small premium on a certain number of voyages.

The obvious advantages of a direct conveyance of mails between Suez and Bombay by a regular sufficient service were becoming evident, and the P. & O. Company offered to effect this at a great saving on the existing system; but, for some reason or other, the East

India Company showed the greatest reluctance to allow the control of this route to pass out of their hands, in which, in fact, it remained until 1854. Fortunately for the P. & O. Company the government decided to establish regular monthly steam com- munication between England and Ceylon, Madras and Calcutta, and also from Ceylon, eastward to Singapore and Hong-Kong. Only the P. & O. could at that time have comtemplated under- taking such a service. In 1844 the contract was signed, and by it the company was to receive a subvention of £160,000. The Indian portion of the service opened on the 1st of January 1845, and during that year the extension to China was effected, and nine new steamers were put on the stocks. The organization of the overland route was due to the P. & O. Company, which brought it into regular working in order to convey its passengers from Alexandria to Suez. It was a picturesque but uncomfortable passage by canal-boat and steamer to Cairo, then by a two- wheeled omnibus for ninety miles across the desert to Suez. Even the coal for the boats at Suez had to be transported in this fashion, which was cheaper than sending it by sailing vessel round the Cape. The construction of a railway across the isthmus in 1859 greatly simplified the transit. It may be noted that the company had to establish coaling stations between Suez and the Far East, and also dep6ts of provisions, a business of no less magnitude than that of the steam service itself. In 1852 the first mail service to Australia was undertaken by the company, and the same contract included an arrangement for a fortnightly service to India and China, though a service running once every two months via Singapore and Sydney was thought sufficient for the requirements of Australia. The year 1854 saw the abolition of the East India Company's service to Bombay, the P. & O. taking its place. This arrangement saved the country £80,000 per annum. The Crimean War made large demands on the company's resources for the conveyance of troops, and the Australian service was for a time interrupted. By 1859 the com- pany was in possession of all the lines of steam communication between England and the East. In 1864 the service to Australia was increased to one sailing a month, and in 1868 the Bombay mail left weekly. About the same time the fourth India and China contract was entered into, and at the end of 1869 the opening of the Suez Canal led to a serious crisis in the company's affairs; and also, after these difficulties had been surmounted, to a complete revolution in its methods. The opening of the canal led to a pro- longed controversy with the post-office, which, with true official perversity, would not allow the company to use the canal for the conveyance of its mails. A serious falling-off of the company's revenue was the result, as the competition of the canal steamers was killing its trade.

At length in 1874 a new arrangement was made by which the mails were to be carried through the canal, the subsidy granted to the company being at the same time reduced. Under these conditions, however, it was now able to construct vessels capable of competing successfully with its rivals. A pro- longed dispute between Victoria and New South Wales for a long time prevented the Australian service from being as efficient as it might have been. Sydney insisted on the Pacific route being adopted. In consequence of this controversy the Australian headquarters of the company were for some time fixed at Melbourne, and it was not till 1888 that a general contract was entered into with the oost- master-general, acting at last for all the Australian colonies as well as for the Imperial government. This stipulated for an accelerated service — the India, China and Australian mails being all worked from Aden in connexion with the steamer which con- veyed them from Brindisi. There was for long a service between Venice, Brindisi and Egypt, and a mail contract with the Italian government; but this came to an end in March 1900.

The company's first ship, the " William Fawcett," built in 1829, had a gross tonnage of 206 and 60 h.p. Down to 1851 the vessels of the fleet were all constructed with paddles ; after that date the screw took their place, though for the Marseilles to Malta express service certain famous fast paddle-steamers were sub- sequently constructed. A later interesting development was the abandonment of Brindisi as a port of call for the ocean mail steamers, which reverted to Marseilles, whence they run across to Port Said direct. The mails leaving London every Friday night are des- patched from Brindisi in specially designed twin-screw vessels, which land them at Port Said little more than 96 hours after their despatch from London. On this service the " Osiris " and " Isis " are employed, and they have the distinction of being the only ves- sels in the mercantile marine which cross the seas with mails and passengers only. The company is under contract with the British

fovernment for the conveyance of mails to India, China and Australia. ts services are as follows — India : Brindisi to Bombay, weekly. China; Brindisi to Shanghai, fortnightly. Australia: Brindisi to

Sydney, fortnightly. Apart from the mail services, the company runs

independent lines to Malta, Colombo and Calcutta; also be- tween Bombay, Colombo, Singapore, Hong-Kong and Shanghai; and between Hong-Kong, Nagasaki, Hiogo and Yokohama. There is likewise a direct fortnightly service of through steamers to China and Japan at special rates. The mails are despatched weekly to Bombay, going one week by direct mail steamer and the next by the fortnightly Australian liner as far as Aden. A fast twin- screw vessel — -the " Salsette " — built after the idea of the " Isis " but of thrice her tonnage — takes the Bombay mails from Aden on the weeks when there is no steamer. For the Indian and Australian mail services a new type of steamer known as the " M " class has been provided. There are already no less than ten such vessels, all twin-screws of similar design, commencing with the "Moldavia," built 1903, of 9500 tons and 14,000 i.h.p. and running up to 12,500 tons and 15,000 i.h.p. in the " Maloja " and " Medina." In 1910 a new service was acquired, the Blue Anchor fleet of Mr Wilhelm Lund being purchased. This gave the company an entry into the South African trade, the Blue Anchor steamers calling at Cape Town and Durban on their way to Australia, and new and larger vessels are being provided for this branch also of the company's activities.

Shaw, Savill & Albion Company. — The amalgamation of the business of Messrs Shaw, Savill & Co. of London and of the Albion Shipping Company of Glasgow brought this company into its present form at the close of the year 1882. At that time the amalgamating firms owned a large fleet of sailing-ships, and traded chiefly between England and New Zealand. Soon, after the amalgamation the company began to acquire steamships, which gradually supplanted their sailing vessels. The Shaw, Savill & Albion Company were among the first in the frozen meat trade, and their vessels are fitted to carry large numbers of carcases. With this company the White Star Line of Liverpool became asso- ciated in the year 1884, and five of their ships now run in the fleet of the Shaw, Savill & Albion Company. In June 1910 an offer was made by Sir John Ellerman to take over the fleet, which at that time consisted of six twin-screw and five single-screw steamships with a total of 51,300 tons gross register, a twelfth vessel being under construction. The route to New Zealand is by the Cape of Good Hope on the outward voyage, returning by Cape Horn, thus going completely round the globe every voyage. After leaving London the steamers call at Plymouth, Teneriffe, Cape Town, Hobart and Wellington ; returning from New Zealand, the ports touched are Rio (sometimes Montevideo), Teneriffe, Plymouth, London. The " Arawa," which came out in 1884, made the outward voyage in 38 days, and the run home in 35

days 4 hours steaming time; she thus made the circuit of the world in 73 days 4 hours net time.

Union Steamship Company (see Castle Line). — This company first came into existence in 1853 under the name of the Union Steam Collier Company, with a capital of £60,000. At its commence- ment it possessed a fleet of five small steamers with an aggregate of only 2337 tons. But by the time these vessels were built the Crimean War was being actively carried on, and it was thought advisable to employ them for other purposes than those for which they were originally intended. They ran for a time between Southamp- ton, Constantinople and Smyrna; but the transport service proved more remunerative, and they were used for the conveyance of troops. At the close of the war the company was registered under the Limited Liability Act by its present name. It was then deter- mined to run the vessels between Southampton and Brazil with cargo, but this did not prove profitable, and in 1857 a notable change took place in the status of the company, for in that year it took its place among the great ocean mail companies of England. In that year a contract was completed with the government for a monthly mail service for five years to the Cape of Good Hope at an annual subsidy of £30,000. The " Dane " was the first steamer to leave Southampton with the mails on the 15th of September. In 1858 the subsidy was increased in order that the company's ships might call at St Helena and Ascension for mails on the homeward voyage. When the first contract expired the company secured another for five years. A service between the Cape and Natal, under a temporary arrangement, was inaugurated in 1862, and a seven years' mail service contract with the Natal government was concluded in 1865. In 1873 the House of Commons refused to ratify a contract which the government had entered into with the company for an extended mail service; the company, however, carried out its intention to extend its service to Zanzibar. But in October 1876 a new mail contract with the Cape of Good Hope

fovernment was entered into for a fortnightly service between 'lymouth and Table Bay, the length of voyage not to exceed twenty-six days. During the Zulu War this company rendered considerable services to Great Britain. In 1878 three ships were employed, and after Isandula they conveyed reinforcements, the " Pretoria " being the only mail steamer to carry an entire regiment, the 91st Highlanders. It was on this company's s.s. " Danube " that the prince imperial sailed, whilst the old s.s. " German " took out the Empress Eugenie when she went to visit the scene of his death. The direct service with the Cape, Natal and Zanzibar was in 1 88 1

discontinued, and in February of that year operations were extended to the Continent, a service from Hamburg was commenced, running

every twenty-eight days, which for a time proved highly successful; A branch service to Antwerp, begun in 1882, was discontinued for a time, but subsequently resumed. At the time of the Panjdeh scare in 1885, when hostilities were threatening with Russia, two of this company's steamships, the " Moor " and the " Mexican "were selected to act as armed cruisers for the defence of South Africa. The former was the only merchant vessel on which the pennant was actually hoisted. In 1889 the company's continental traffic increased so that it not only resumed the despatch of through steamers from Hamburg, but made calls at Rotterdam. This service afterwards became fortnightly, calls being made at Rotter- dam, Antwerp and Hamburg. New contracts with the colonial governments were made in 1888, and in the same year Southampton took the place of Plymouth as the outward mail port, while in 1889 the homeward mails were landed at Southampton in place of Plymouth. In 1889, by the construction of the " Scot," the company acquired a much larger vessel than any they had hitherto employed; in 1895 Messrs Harland & Wolff successfully accomplished the task of lengthening this ship by cutting her in two amidships and adding 54 ft. to her length and 1000 tons to her tonnage. She subsequently was altered to adapt her for public yachting purposes and transferred to the German flag under the name of " Oceana." In 1893 the company entered upon its new policy of building a large number of practically sister ships for its intermediate trade. All were built by Messrs Harland & Wolff, and fitted with twin- screws. The series included ten vessels, commencing with the ' ' Gaul ' ' of 4745 tons, and ending with the " Galician " of 6757 tons launched in 1900. Meanwhile from the same yard the mail steamers " Norman," " Briton " and " Saxon " were added to the fleet. The last-named, which came out in 1899, is a vessel of 12,385 tons, with a length of 570 ft. By a resolution passed at a meeting of shareholders held on the 13th of February 1900, this company was amalgamated with the Castle Line (see below). At its absorption its fleet consisted of twenty-three vessels, of which nine were over 6000 tons.

Union-Castle Line. — This company was formed by the amalga- mation of the Union and Castle lines. Previously, though practi- cally all the vessels made their final departure from Southampton, the Union Line only made its headquarters at that port, the Castle liners coming round from London. After amalgamation, the mail steamers — to which cargo is not of so much importance — did not come to the Thames at all, the increase in their size and the neglect of the

improvement of the river and of the docks by the authorities making it undesirable that they should do so. The cargo (intermediate) liners, on the other hand, all load in London, and many of them, before their final departure from the Thames, visit Hamburg, Antwerp and Rotterdam, for the purpose of picking up cargo. On these North Sea trips passengers are carried, and facilities are given for their accommodation on board during the calls at the various ports. The new company carries out the contracts of its two constituents and thus despatches every Saturday a mail steamer from Southampton via Madeira to the Cape and Natal. An hour or so before the sailing of the mail boat an intermediate steamer departs from the same port. Her places of call are Teneriffe or Las Palmas for certain, and possibly also Ascension and St Helena. These vessels serve the east coast ports of Algoa Bay and East London as well as Natal. Some of them also go to Delagoa Bay, to Beira on the mainland, and to the island of Mauritius. In 1910 a further extension was made, a monthly service being instituted to East Africa through the Canal. Besides the two weekly vessels, however, there are despatches of extra mid-weekly intermediate steamers, and these extra sailings have recently tended to become more fre- quent. The company's attention has for some time been directed to the trade between the United States and South Africa, and within two years after amalgamation eight new steamships were constructed with a view to the development of the trade between Cape ports and New York. Nor did the union of the two com- panies stop the improvement of the general fleet. The 10,000-ton twin-screw mail steamers " Kinfauns Castle " and " Kildonan Castle " were delivered to the Castle Company from the Fairfield yard prior to the amalgamation. Messrs Harland & Wolff had the " Saxon," 2000 tons larger than these ships, well in hand at the time. But the " Walmer Castle," a larger and still later addition to the fleet, embodied as far as possible the practice which from experience commended itself to both the old companies. Subse- quent additions to the mail fleet have been the sisters " Armadale Castle "and "Kenil worth Castle, "followed in 19 10 by the "Edinburgh Castle " and the "Balmoral Castle "of 13,300 tons each. Provision is now made for the carriage of the mails exclusively in twin-screw vessels. Meanwhile the intermediate fleet has received several vessels of large dimensions and of comfortable accommodation, though of speed inferior of course to the mail steamers. The company proved its capacity in the South African War, when it carried vast bodies of military and civilian passengers by its regular steamers at a time when many of its vessels were chartered by the government as troopers and storeships. In spite of the strain put on the resources of the company by the heavy work

entailed by the South African War, both on the vessels employed in their regular service and on those especially taken up for government transport duty, it was found possible already to discard two of their older vessels.

STEAMSHIP LINES

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White Star Line. — Though perhaps chiefly known in the New York trade, the White Star flag was first hoisted in the middle of last century over a fleet of clippers which sailed to Australia. In 1867 Mr Thomas Henry Ismay took it over, and two years later the great revolution in the constitution of the company took place. It was in 1869 that Mr Ismay formed the Oceanic Steam Navigation Company to run a line of steamers between Liverpool and New York. Immediately on its formation the company entered into arrangements with Messrs Harland & Wolff of Belfast for the construction of a fleet of high-class passenger ships, and it is worthy of notice that the terms upon which Messrs Harland & Wolff built the White Star ships were peculiar. No definite price was

agreed upon, but the actual cost plus a percentage for builders' profit was charged. The first " Oceanic," pioneer steamship of the line, was launched on the 27th of August 1870, and sailed for New York on the 2nd of March 1871. Her advent opened a new era in Atlantic travel. She introduced the midship saloon, which ex- tended the whole width of the ship, thus giving increased light and improved ventilation, and reducing to a minimum the sensation of the vessel's motion. The arrangement thus introduced is now almost universally adopted in the construction of ocean liners. The " Oceanic " was also narrower in proportion to her length than the vessels previously designed for the transatlantic mail service. In 1877 the " Britannic " reduced the passage to 7 days 10 hours and

Fleets of Various Important Steamship Companies in i8gi, igoi and 1910. 1

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No. of

Vessels.

Gross Tonnage.

International Mercantile Marine

Co- White Star Line .... Leyland Line 2 . . . American Line and Red 3 Star

Line

Atlantic Transport Co. Dominion and British & North

Atlantic Co. . Vessels owned jointly with

Shaw, Savill & Albion . .

National S.S. Co

Training Ship

Hamburg- American Line

Norddeutscher Lloyd

P. & O. Company

British India S.N. Co.

Royal Mail S.P. Co. .

Pacific Steam Navigation Co. .

Alfred Holt & Co.— Ocean S.S. Co

China Mutual Steam Naviga- tion Co.

Furness, Withy & Co.

Elder, Dempster & Co. 4 .

Union-Castle Co. 6 . . . .

Messageries Maritimes .

Nippon Yusen Kaisha

Ellerman Lines

Lamport & Holt

Nav. Gen. Italiana 6 . . . .

Hansa Line

Compagnie Generale Trans- atlantique

Harrison Line of Liverpool .

Austrian Lloyd

Cunard Line

Han Line

Canadian Pacific Railway

Hamburg South American Line

Wilson Line

Kosmos Line

Allan Line

Ropner's

Maclay & Macintyre

Chargeurs Reunis . . . .

Booth Line ……

Holland-American Line .

Prince Line

31

42

16

14

13

7 2 1

372,045 253.803

164,213 107,650

86,655

51,053

16,005

1,814

126

45 40

39

18

1,053,238

194,663 183,234

234,808 105,751

Bucknall Line Anchor Line .... Westoll Line .... Volunteer Fleet . Johnston Line of Liverpool Compania Transatlantica

British British

Mixed British

British

British British British

German

German

British

British

British

British

British

British

British

British

French

Japanese

British

British

Italian

German

French

British

Austrian

British

British

British

German

British

German

British

British

British

French

British

Dutch

British

British

British

British

Russian

British

Spanish

9 10 11 12 13 14

i5

16

17 18

19 20 21 22 23 24 25 26

27 28

29 30 31 32 33 34 35 36 37 38

10

7

15 26

27

25 55

25 17

13

212,403 242,781

167,105 123,593

105,430

17 23

32 29

16 23

18,464

1-053,238 979,217

752,037 458,037 423,063

377,897

340,559 57

340,537 331,533 295,360 293,669 289,787 283,234 281,412 274,952 247,691

245,353 217,085 216,414 209,231 202,463 198,310

197,703 190,278

177,704 160,570

155,440 144,500 144,441 128,200 124,136 123,909 122,388 110,588

90,174 84,500 81,000 79,767

I

202

2

in

5

58

4

120

32

28

22

42

16

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18 13

21 14 25 17

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28

22

30

41

12 120

41 62

47 102

57

59

3i

68 26 46 12 32 89 29 36 36

5i

26

27 9 33 23

4i

38 16

24 23

541,085 454,936 313,343 378,770 88,205

138,754 165,143

9 4 3 1

19 15

40,994 382,560 222,613 246,277 218,361

149,712 205,104 157,037

183,343 146,625 169,436 126,332 164,487 38,089

125,597 189,818 110,251

152,367

100,426

126,917

81,149

64,456

55,413

79,ooi

83,207

132,540 88,306 80,424

100,460 88,453

25

2 28

12

6

26

5 22 10 16 18

13 21

30 20

33 8 27

3i

24

H

42

7o

49

100

25 36

44

20

48

63 52

54

106

26

66

27 76 22

29

7

26

73 15

3i

34 19 30 10 11 32

44

3i

8 22 36

84,902 60,511

18,111 28,696

53,522

126,795 198,723 199,911 234-654 73,384 97-793

109,000

44,528

55j_256

202,801 42,058

106,648

164,052

50,413

174,600 61,643

124-435 85,104 76,300

24,373 56,938

132,8- 32,963

106,346 62,717 26,928

7o,i73

13-951 37.891 59,221

127,065 48,298

23,845

58,621

101,214

'This table is based on that contained in a paper on " Shipping Subsidies," by B. W. Ginsburg, published in the Journal of the Royal Statistical Society (September 1901).

2 The Leyland Line was formerly the Leyland Line and West India & Pacific Steam Navigation Company.

- *In 1891 the old American Line had 3 steamers of 10,166 tons; the Inman Line 6 steamers of 41,276 tons; the International Lin 4 steamers of 12,112 tons; and the Red Star Line 9 steamers of 39,609 tons.*

4 Messrs Elder, Dempster & Co. now control the fleets of the African, British & African, and Imperial Direct Steamship companies.

6 Formerly the Union Line and the Castle Line. In 1 89 1 the Union Line had 23 steamers of 55,576 tons, and the Castle Line I steamers of 57,934 tons. 6 Formerly known as the FIorio-Rubattino Line.

50 minutes, excelling by three hours the best previous Atlantic passage. After the year 1888 the company ceased to build single-screw steamers, all later vessels having been constructed on the twin-screw system, of which the superiority had been clearly demonstrated. About this time also the owners of the line became responsible for an important advance in steamship construction which was afterwards imitated by merchant ships of all the great maritime powers. The " Teutonic " and " Majestic," introduced in 1889 and 1890, were the first merchant ships constructed with a view to their use as possible auxiliaries to the Royal Navy. The former was present, armed with eight quick-firing guns, at the naval in- spection by the German emperor in 1889. With the launch of the second " Oceanic " in January 1899 the company's record was still further enhanced. The White Star Line was from 1877 regularly employed under contract with the British government to carry the

American mails from Liverpool and Queenstown to New York. Besides this weekly mail and passenger service, a fleet of twin- screw cargo vessels maintained a subsidiary service between Liver- pool and New York. These vessels were especially designed for the conveyance of cattle and horses. After 1883 several steamships of the line were employed in the Shaw, Savill & Albion service between London and New Zealand. Three of the company's ships ran in the line of the Occidental & Oriental Company between San Francisco and Yokohama and Hong-Kong. The company inaugurated a service to Australia from Liverpool in 1899. Five ships ran in it (calling at Cape Town) to Albany, Adelaide, Melbourne and Sydney. The ports visited by their vessels in New Zealand will be found detailed under Shaw, Savill & Albion Company. In 1902 the absorption of the White Star fleet and management in the Morgan shipping combine was arranged. Since that time several alterations have taken place. The mail steamers of the line left Liverpool for Southampton in June 1907 and new call at Cherbourg on their way to and from New York. Two services are still maintained between Liverpool and New York — one the old cargo service, and the other a weekly despatch of large passenger and cargo vessels. In addition to these there are two other Atlantic services from Liverpool — one to Boston and the other maintained in conjunction with the Dominion Line to Canadian ports. There is also a line of White Star steamers between New York and the Mediterranean. Several important vessels from other limbs of the combine have been brought under the White Star flag, whilst the company has also practically absorbed the old Aberdeen Line.

Wilson Line. — Thomas Wilson, Sons & Co. is at the present time the largest private ship-owning company in the world. This line traces its origin as far back as 1835. It was founded by Mr Thomas Wilson in conjunction with Messrs Hudson and Becking- ton, and on the retirement of the two last-named gentlemen it acquired its present title. Early in the 'forties the firm was running three steamships to Gothenburg, and was engaged largely in the iron trade, importing large quantities of Swedish and Russian iron, and running a regular line of sailing boats to Swedish ports. It also despatched a regular service to Dunkirk. Steamships gradually superseded the sailing vessels, and new steamers year by year were placed on the Scandinavian service. About this time the firm secured the mail contract between England and Sweden, which it still holds. After the Crimean War it started the St Petersburg, Stettin and Riga trade. During the Franco- German War the trade to Stettin had to be suspended; and as a set-off the service to Trieste was inaugurated, which has developed into an independent Adriatic and Sicilian

service. The Norwegian trade was then improved by the despatch of steamships to Bergen, Stavanger and Trondhjem, and subsequently a service of large steamers began running to Constantinople and the Black Sea. After the opening of the Suez Canal the trade to India, which has since assumed such considerable proportions, was inaugurated. In 1875 the firm launched out into a more hardy enterprise, by commencing to run steamers to America. Its vessels in 1902 ran to New York regularly from Hull and the Tyne ports. The original Calcutta trade was discontinued when the New York line was started, but in 1883 a service was established between Hull and Bombay. In 1 891 the firm became a private limited company and in 1894 took over the coasting trade between Hull and New- castle. The company employs a number of large and swift ships in the Norwegian passenger traffic, which in the summer season now reaches very considerable proportions. It has frequent ser- vices of passenger and cargo vessels to the ports of northern Europe, carrying passengers in the season as far north as the North Cape. Of course the winter season necessitates considerable variation of summer services to Baltic ports. In 1903 the fleet of the old- established Hull firm of Messrs Bailey & Leetham was absorbed, and in 1908 that of the North-Eastern Railway Company. There are also steamers leaving Grimsby, Manchester and Liverpool regularly for Scandinavian and Baltic ports; weekly services to Ghent, Liverpool and Newcastle; and services to Mediterranean and Black Sea ports. Besides the New York line there are ocean services to Boston, to New Orleans and the river Plate. There is also a weekly service to and from London and Boston in con- junction with the Furness-Leyland Line.

Conclusion. — The scope of this article will riot allow of any de- tailed reference to many of the important foreign lines which in a complete history should be mentioned. The Hansa Company of Bremen ; the Chargeurs Reunis of Havre ; the Holland-American Line, which has of recent years added to the fleet several fine twin- screw liners, built at the Belfast yard ; the Compania Transatlantica of Barcelona, which performed so great a feat in the transport of troops from Barcelona toCuba in the latter days of Spain's dominion over that island; the Pacific Mail Company of the United States; and many others might be noticed. A whole article might be de- voted to the work of the lines on the North American inland waters, while there are several other English companies which might well claim attention, both from the magnitude of their operations and the extent to which they have developed types of ships suitable for the peculiarities of the trades in which their vessels are engaged. The Clan Line, for example, has largely adopted the turret- decked ship,

which is the design of Messrs W. Doxford & Co. of Sunderland. This type of ship is intended to carry large cargoes on a small registered tonnage and a light draught, without paying for it by a sacrifice of weatherly qualities. The same object is aimed at by the design of the trunk steamers built by Messrs Ropner of Stockton. The Isherwood system of construction and the cantilever type of cargo steamer are other devices for attaining the same object. Then there are the tank steamers constructed for the carriage of oil in bulk. Many of these ships are adapted not only for the carriage of oil. but also for its consumption in their furnaces in place of coal. We have already referred to some of the vessels fitted with refrigerating apparatus for the carriage of dead meat, and to the cargo steamers of the Atlantic companies, which are supplied with conveniences for carrying valuable racehorses and cattle. The experience of many years has enabled the owners of some of these lines to exhibit a wonderfully low record of loss, the percentage of deaths at sea to numbers carried being small beyond the dreams of, say, the 'seventies. A tenth of I % over a somewhat extended period is not an unprecedented average.

The table shows something of the recent growths of companies, and at the same time records some of the amalgamations which have been so frequent. It should be explained that the table does not pretend to be exhaustive. The fleets embraced in it are not necessarily all those whose tonnage reaches above the lower limit shown. There are now a number of lines whose total exceeds 100,000 tons which are not shown in the list. Amongst them may be cited the Hamburg- Pacific Line, the German line to Australia, the Union Company of New Zealand — which contains many small vessels, the Forende Company of Copenhagen and the Anglo-American Oil Company. The table shows how whilst the principal lines are largely increasing their fleets, one or two companies are falling back in their gross amount of tonnage. The figures, moreover, are sub- ject to certain reservations. The count was not necessarily taken by the various companies at the same period of each year. Some of the figures given may include numbers and tonnages of tugs and tenders, while others may exclude them. Again, some of the companies may have returned in their fleets the vessels which they had under construction, whilst others may not have counted them. But none of these considerations can much affect the general significance of the figures shown. The growth in the average size of individual ships is as marked as that of the aggregate tonnage of the companies.

Authorities. — The following books throw much light on the history of the leading steamship lines: History of Merchant Shipping, by W.

S. Lindsay (London, Sampson Low & Co.) ; La Navig. comm. au XIX. sihcle (Paris, 1901); A. J. Maginnis, The Atlantic Ferry (3rd ed., London, Whittaker & Co.); E. R. Jones, The Shipping World Year-Book ; Lloyd's Register of British and Foreign Shipping (published annually). Also see a comprehensive article on this subject in the Quarterly Review for January' 1 900. Perhaps, the fullest information is, as a rule, to be obtained from the handbooks issued by the companies themselves. (B. W. G.)

STEARIC ACID, n-Octodecylic acid CH 3 (CH 2) 16 C0 2 H, an organic acid found as its glyceride stearin, mixed with palrnitin and olein, in most tallows (hence its name, from Gr. cr'tap, tallow). The so-called " stearin " of candles is a mixture of stearic and palmitic acids (see Candle).

STEATOPYGIA (Gr. crrtap, fat, irxryi) rump), an unusual accumulation of fat in and around the buttocks. The deposit of fat is not confined to the gluteal regions, but extends to the outside and front of the thighs, forming a thick layer reaching sometimes to the knee. This curious development constitutes a racial characteristic of the Bushmen (q.v.). It is specially a feature of the women, but it occurs in a less degree in the males. It is also common among the Hottentots, and has been noted among the pygmies of Central Africa. In women it is regarded among them as a beauty: it begins in infancy and is fully developed on the first pregnancy. It is often accompanied by

the pecuUar formation known as " the Hottentot-apron," hyper-trophy of the nymphae (Tablier). No satisfactory explanation of these malformations has been offered. Steatopygia would seem to have been a characteristic of a race which once extended from the Gulf of Aden to the Cape of Good Hope, of which stock Bushmen and pygmies are remnants. The discovery in the caves of the soulh of France of figures in ivory presenting a remarkable development of the thighs, and even the peculiar prolongation of the nymphae, has been used to support the theory that a steatopygous race once existed in Europe. What seems certain is that steatopygia in both sexes was fairly wide- spread among the early races of man. While the Bushmen and Hottentots afford the most noticeable examples of its develop- ment, it is by no means rare in other parts of Africa, and occurs even more frequently among Bastaards of the male sex than

among Hottentot women.

STEDMAN, EDMUND CLARENCE (1833-1908), American poet and critic, was born at Hartford, Connecticut, on the 8th of October 1833. He studied two years at Yale; became a journalist in New York, especially on the staffs of the Tribune and World, which latter paper he served as field correspondent during the first years of the Civil War; and was a banker in Wall Street from 1869 to 1900. His first book, Poems, Lyrical and Idyllic, appeared in i860, followed by successive volumes of similar character, and by collected editions of his verse in 1873, 1884 and 1897. His longer poems are Alice of Monmouth: an Idyl of the Great War (1864); The Blameless Prince (1869), an allegory of good deeds, supposed to have been remotely suggested by the life of Prince Albert; and an elaborate commemorative ode on Hawthorne, read before the Harvard Phi Beta Kappa Society in 187 7. An idyllic atmosphere is the prevalent character- istic of his longer pieces, while the lyric tone is never absent from his songs, ballads and poems of reflection or fancy. As an editor he put forth a volume of Cameos from Landor (with T. B. Aldrich, 1874); a large Library of (selections from) American Literature (with Ellen M. Hutchinson, n vols., 1888-1890); a Victorian Anthology (1895); and an American Anthology, 1787-1899 (1900); the two last-named volumes being ancillary to a detailed and comprehensive critical study in prose of the whole body of English poetry from 1837, and of American poetry of the 19th century. This study appeared in separate chapters in Scribner's Monthly now the Century Magazine, and was reissued, with enlargements, in the volumes entitled Victorian Poets (1875; continued to the Jubilee year in the edition of 1887) and Poets of America (1885), the two works forming the most symmetrical body of literary criticism yet published in the United States. Their value is increased by the treatise on The Nature and Elements of Poetry (Boston, 1892) — a work of great critical insight as well as technical knowledge. He died in New York on the 18th of January 1908.

See Laura Stedman and G. M. Gould, The Life and Letters of Edmund Clarence Stedman (2 vols., N. Y., 1910).

STEEL, FLORA ANNIE (1847-), English writer, was born on the 2nd of April 1847, the daughter of George Webster. In 1867 she married an Indian civilian, and for the next twenty- two years lived in India, chiefly in the Punjab, with which most of her books are connected; her interest in the education of women, as an inspectress of schools, gave her a special insight into native life and character. Some of her best work is con- tained in two collections of short stories: From the

Five Rivers (1893) and Tales from the Punjab (1894); while her most ambitious effort was her novel, On the face of the Waters (1896), describing incidents of the Indian Mutiny. She also wrote a popular history of India. Later works are In the Permanent Way (1897), Voices in the Night (1900), The Hosts of the Lord (1900), In the Guardianship of God (1903), A Sovereign Remedy (1906).

STEEL CONSTRUCTION. The use of steel construction in the erection of large buildings is the natural consequence of the conditions imposed upon owners of property lying within sections of large cities, and the result of the introduction of new materials and devices. Apart from the aesthetic considerations to which has been due the construction of spires, towers,

domes, high roofs, &c, the form and height of buildings have always been largely controlled by a practical consideration of their value for personal use or rental. The cost of buildings of the same class and finish is in direct proportion to their cubic contents, and each cubic foot constructed is commercially unprofitable which does not do its part in paying interest on the capital invested. Until the latter half of the 19th century, these considerations practically limited the height of buildings on city streets to five or six storeys. The manufacture of the wrought-iron " I " beam in 1855 made cheaper fire-proof construction possible, and, with the introduction of passenger lifts (see Elevators; Lifts or Hoists) about ten years later, led to the erection of buildings to be used as hotels, flats, offices, factories, and for other commercial purposes, containing many more storeys than had formerly been found profitable. The practical limit of height was reached when the sectional area of the masonry of the piers of the exterior walls in the lower storey had to be made so great, in order to support safely the weight of the dead load of the walls and floors and the accidental load imposed upon the latter in use, as to affect seriously the value of the lower storeys on account of the loss of light and floor space. This limit was found to be about ten storeys. Various devices were successively made to reduce the size of the exterior piers. In 1881 the walls of a very large courtyard were constructed by building a braced cage of iron and filling the panels with masonry, a system of construction which had been used in the early part of the century for a tall shot-tower erected in the city of New York. Subsequently several buildings were erected in which the entire weight of the floors and roofs was carried by a system of metal columns placed against the inner surface of the exterior walls. The walls thus supported no load but their own weight, and were tied to the inner cage formed by the wall columns, interior columns, girders, and floors by anchors arranged to provide for the shrinkage of

masonry in drying out which always occurs to a greater or less extent. By the use of this form of construction buildings were carried to the height of eighteen or nineteen storeys.

Iron or steel as a substitute for wood for constructive purposes was long thought to be fire-proof or fire-resisting because it is incombustible, and for this reason it has not only replaced wood in many features of building construction but is also used as a substitute for masonry. In time, however, it was realized that iron by itself is not fire-proof, but requires to be protected by means of fire-resisting coverings; but as soon as satisfactory forms of these were invented their development progressed hand in hand with that of iron and steel forms and combinations.

Buildings in steel are either of " skeleton " or " cage " con- struction. These terms may be defined as follows: In " skeleton " construction the columns and girders are built without proper or adequate inter-connexion and would not be able to carry the required weights without the support afforded by the walls; or, as in more recent construction, the walls are self-supporting and the other portions of the building are carried on by the skeleton steelwork. " Cage " construction consists of a com- plete and well-connected framework of iron or steel capable of carrying not only the floors but the walls, roof, and every other part of the building, and efficiently constructed with wind bracing to secure its independent safety under all conditions of loading and exposure, all loads being transmitted to the ground through columns at predetermined points. In America under this system the walls can be built independently from any level (see fig. 4), but in England the requirements of the building acts as to the thickness of walls prevents the general use of this form of construction.

Skeleton construction is defined by the Chicago building ordinance as follows: —

" The term ' skeleton construction ' shall apply to all buildings wherein all external and internal loads and strains are transmitted from the top of the building to the foundations by a skeleton or framework of metal. In such metal framework the beams and girders shall be riveted to each other at their respective junction points. If pillars made of rolled iron or steel are used, their different parts shall be riveted to each other and the beams and girders

resting upon them shall have riveted or bolted connexions to unite them with the pillar. It cast-iron pillars are used, each successive pillar shall be bolted to the one below it by at least four bolts not less than three-fourths of an irich in diameter, and the beams and girders shall be bolted to the pillars. At each line of floor- or roof- beams, lateral connexion between the ends of the beams and girders shall be made by passing wrought-iron or steel straps across or through the cast-iron column, in such a manner as to rigidly connect the beams and girders with each other on the direction of their length. These straps shall be made of wrought-iron or steel, and shall be riveted or bolted to the flanges or to the webs of the beams or girders.

" If buildings are made fire-proof entirely, and have skeleton construction so designed that their enclosing walls do not carry the weight of the floors or roof, then their walls shall be not less than twelve inches in thickness ; and provided, also, that such walls shall be thoroughly anchored to the iron skeleton, and pro- vided, also, that, whether the weight of such walls rests upon beams or pillars, such beams or pillars must be made strong enough in each storey to carry the weight of wall resting upon them without reliance upon the walls below them. All partitions must be of incombustible material."

With the introduction of cheap structural steel, steel Cage construction came rapidly into use. The dimensions of the exterior piers ceased to control the height of the *" e ' c ** e building, which was limited alone by the possibility tioa. °f secu ring adequate foundations, and by a considera-

tion of the amount of floor space which could be devoted without too great loss to a system of passenger lifts of sufficient capacity to afford speedy access to all parts of the building. The advantages that led to the very rapid intro- duction of this system were not only the power of greatly reducing the size of the piers, but the enormous facility afforded for quick construction, the small amount of materials relatively used and the proportionately small load upon the foundations, and the fact that as the walls are supported at each storey directly from the cage, the masonry can be begun at any storey indepen- dently of the masonry below it. It is a disadvantage of the system that defects of proportion, material, or workmanship, which would be of less moment in an old-fashioned construction, may become an element of danger in building with the steel cage, while the possibility of securing a permanent protection of all parts of the cage from corrosion is a most serious consideration. The safety

of the structure depends upon the preservation Of the absolute integrity of the cage. It must not only be strong enough to sustain all possible vertical loads, but it must be sufficiently rigid to resist without deformation or weakening all lateral disturbing forces, the principal of which are the pres sure of wind, the possible sway of moving crowds or moving machinery, and the vibration of the earth from the passage of loaded vans and trolleys, and slight earthquakes which at times visit almost all localities. In buildings wide in proportion to their height it is the ordinary practice to make the floors suf- ficiently rigid to transfer the lateral strains to the walls, and to brace the wall framings to resist them. In buildings of small width in proportion to their height this method of securing rigidity is generally found to be inadequate, and the frame is also braced at right angles to the outer walls to take up the strains directly. In each case all strains are carefully computed. The bracing is accomplished by the introduction at the angles of the columns and girders or beams of gusset plates or knee braces, or by diagonal straps or rods properly attached by rivet or pin connexions. All portions of the frame are united by hot rivets of mild steel or wrought iron, care being taken that the sum of the sectional areas of rivets affords in each case a sufficient amount of metal for the safe transfer of the stresses. The greatest care should be taken to see that all rivet holes are accurately punched, and if necessary that they are rhymed so that each rivet will have its full value.

For the proper and successful erection of the frame much depends upon an accurate alinement of the column bases. These should be properly tested as to position and level. The bases are either grouted with cement, or bolted to the founda- tions, but where cast column bases rest on masonry piers or footings any considerable grouting is not advisable. The only grouting that should be permitted in tall buildings would be in

levelling up the tops of the concrete footings to receive the masonry courses, or in a very thin layer between the column pedestal and the masonry bed. The cap stones should always be brought to the most accurate bed possible, with grouting uaed as a thin cement and not as a backer. Accurate redressing of the cap stones after setting is much to be preferred.

All riveting and punching of the steel members is done at the shop, where also they receive the usual coat of oil or paint. This leaves the assembling and field riveting to be done on the ground, together with the adjustment of the lateral or wind-bracing, the placing of tie rods and the field painting.

After erection the steelwork should receive one or two coats of paint; two coats are to be recommended, in which case they should be of different colours. Red lead is best for the priming coat and oxide paint for the. y otect,oa finishing coat. In German specifications it is cormstoa. required that the steelwork should first receive a coat of boiled linseed oil, in order that the red lead coating should be more coherent with the steel.

Steelwork that has to come in contact with brickwork or concrete should not be painted, but should receive a wash of cement as the brickwork or concrete-work proceeds. The steelwork which is exposed to the weather should be painted about every three years, but when it is under cover an interval of five years may elapse.

To secure painting of permanent value a clean scaleless and rustless surface is first necessary. Steel plates and shapes, when delivered from the rolls which form them to the cooling beds, are largely covered with scales, which, adhering only partially to the surface, offer the intervening cracks or joints as vulnerable points for rust. After being rolled, structural steel is stored or handled out of doors for a varying period both at the mill and then again at the shop before the building is started. This period of open-air exposure allows the process of rust to start under the scales. If the rust so covered up has not begun to pit the iron the chances are that it will do no harm; but, if it is already well developed and of some thickness, it will have enough oxidizing agents in its pores to develop more oxide, and to swell up and crack the paint. The first requirement, therefore, for efficient painting is the careful removal of all mill-scale, rust, grease, or foreign substance, before even the priming coat is applied. It is agreed that the first step in the preservation of metal-work against deterioration or corrosion is the obtaining of absolute cleanness of metal before the application of paint or oil.

The following are the requirements of the New York building law in regard to the protection of iron or steelwork against corrosion, &c.: —

" All structural metal-work shall be cleaned of all scale, dirt and rust, and be thoroughly coated with one coat of paint. Cast-iron columns shall not be painted until after inspection by the Department of Buildings. Where surfaces in riveted work come in con- tact they shall be painted before assembling. After erectipn all work shall be painted with at least one additional coat. All iron or steel used under water shall be enclosed with concrete."

The Chicago ordinance makes no mention of paint or coating to prevent rust in metal framework. The London Building Acts do not set out any special requirements, but suggestions have been made at the Royal Institution of British Architects for the regulation of skeleton buildings and they are drawn up upon a more scientific basis than the bulk of the existing acts.

In transferring the loads from the column bases to the bottom of the footings the greatest care must be taken in all systems of construction that the stresses throughout at no ˆpoint exceed the safe limits of stress for the various materials used. Steel is generally used for columns in preference to cast iron, because it affords greater facility for securing satisfactory connexions, because its defects of quality or work- manship are more surely detected by careful test and inspection, and because, on account of its superior elasticity and ductility, its fibre is less liable to fracture from slight deformations. It is used in preference to wrought iron on account of its lesser cost.

Columns are generally built of riveted work of zedbars, channels, angles, plates, or lattice, of such form as will make the simplest and most easily constructed framing in the particular position in which the column is placed. The columns are sometimes run through two or more storeys and arranged to break joints at the different floors. In buildings to be used as offices, hotels, apartments, &c, it is usual in establishing the loads for the purpose of computation to assume that the columns carrying the roof and the upper storey will be called upon to sustain the full dead load due to material and the maximum computed variable load, but it is customary to reduce the variable loads at the rate of about 5 % storey by storey towards the base, until a minimum of about 20% of the entire variable load is reachedˆ for it is evidently impossible that the building can be loaded by a densely-packed moving crowd in all of its storeys simultaneously. In the case of factories and buildings' used for storage purposes the maximum variable load which can be imposed. for any serious length of time on each floor must be used without reduc- tion in computing the loads of the lower column, and proper allowances must be made for vibrating loads. In the case of very tall exposed buildings of small depth, the vertical load on the columns due to wind pressure in the opposite side of the building must be computed and allowed for, and in case the lower columns are without lateral support their bending moment must be sufficient to resist the lateral*

pressure due to wind and eccentricity of loading. In computing the column sections a proper allowance must be made for any eccentricity of loading. It is usual to limit the height of sections of columns without lateral support to 30 diameters, and to limit the maximum fibre stress to 12,000 lb per sq. in. The sectional areas are com- puted \>y the use of the ordinary formulae for columns and struts. The standard sections in use are numerous and varied, and from time to time a steel user has occasion to design a new steel shape because no existing section is suitable. The experi- ments given by Professor Burr indicate that a closed column is stronger than an open one, but practice does not always sup- port theory, and many other questions besides mere form arise in connexion with the choice of a section; special considerations in the use of columns in buildings sometimes call for a form very different from the circular section, and such include the transfer of loads to the centre of the section, the maximum efficiency under loading, and the requirements for pipe space around or included in the column form. Lattice bars, fillers, brackets, $.c, add just so much more weight without increasing the section, and must be allowed for; the method of riveting the sections together must also be taken into account.

*For girders of small spans " I " beams or channels are generally used, but for greater spans girders are built of riveted work aird rs * n tne f ° rm °f boxes with top and bottom plates, side plates, and angles with proper stiffening bars on the side plates, or " I's," or lattice, or other forms of truss work. In girders and beams the maximum fibre stress is usually limited to 16,000 lb. In very short girders the shear must be computed, and in long girders the deflexion, particularly the flexure from the variable load, since a flexure of more than s fo of the length is liable to crack the plastering of the ceilings carried by the girders. The same necessity for ■ computing shear .and flexure applies to the floor beams. The floors between the girders are constructed of " I" beams, spaced generally about 5 ft. between centres; their ends are usually framed to fit the form of the girders, and rest either upon their lower flanges, or upon seats formed of angles riveted to their webs, being secured to them by a pair of angles at each end of the beam riveted to its web and to the web of the girder. Some- times the beams rest upon the girders, and are riveted through the flanges to it; in this case the abutting ends of beams are spliced by scarf plates placed on each side of the webs and secured by rivets. A similar construction is followed for flat roofs, the grades being generally formed in the girder and beam construction, and a flat ceiling secured by hanging from them, with steel straps, a light tier of ceiling beams. The floor beams are tied laterally by rods in*

continuous lines placed at or above

their neutral axis. It is usual in both girders and beams to provide not only for the safe support of the greatest possible distributed load, but for the greatest weight, such as that of a safe or other heavy piece of furniture which may be moved over the floor at its weakest points, the centres of the girders and beams. It must always be borne in mind that the formulae for the ultimate strength of the "I" beams only hold good when the upper chord or flange is supported laterally.

Considerable improvement has been made in the design of rolled steel shapes; for example the rolling of a 16-in. joist was formerly deemed a remarkable achievement, though now there are several works producing 24-in. joists with flanges 7 and 7 J in. wide. The Broad Flange Differdange Beams are claimed by the manufacturers to be stronger and to minimize weight for use as girders; they are made in twenty-one different sizes with flanges from 8f to 12 in. wide.

The introduction of steel construction has simplified many details of architectural treatment, such as projections for cornices, bay windows and galleries. These may be supported by bracket-angles attached to the columns with a system of anchors to tie them back; the material must be carried in such a manner as to make it independent of the general structure, and must be constructed as light as possible. If the supporting member is a floor beam or girder the girder should be rigidly connected to the floor system to prevent any twisting due to the weight of the projection.

The arrangement of the building and floor framings is in a great measure governed by the architectural effect sought and by the arrangement and proper planning of the _. _ interior according tq the intended uses; the positions of columns, girders and floor beams are usually the result of particular requirements, and unless complicated and expensive framing is to be expected the distance between columns must be kept within the limits of simple girder construction. The position of the columns having been determined, the girders must next be located; these serve to support the floor beams which transfer the loads direct to the columns, and also to brace the columns during erection. The spacing, or distance from centre to centre of the floor beams, will depend upon the type of fire-proof flooring employed; it also depends to a considerable extent upon the amount and character of the floor load and the length of span. If the loads to be carried are largely stationary, and if the span is small, the floor joists can be readily propor- tioned by means of tables given in the handbooks issued by many steel companies. The distance between

joists should be limited to 5 or $ ft.; horizontal bracing by means of diagonal rods is sometimes used, but should be avoided. The following are the usual assumptions made in good practice for super-imposed loads:: —

Floors of dwellings and offices ... 70 lb per sq. ft.

,, ,, churches, theatres and ball-rooms 125 ,, ,, ,, „

,, „ warehouses . . . . 200 to 250 ,, ,, ,, „

,, ,, for heavy machinery . . 25010400 „ „ „ ˆ

The relation between the velocity of wind and the pressure exerted upon surfaces must be considered in steel construction, and designers differ in regard to the forces to be Wtarf resisted and the material to be used. Every building bracing. offers its own peculiar condition; the height, width, shape and situation of the structure, and ” character of the enclosing walls, will determine the amount of wind pressure to be provided against, and the internal appearance and the plan- ning of the various floors will largely influence the manner in which the bracing is to be treated. There are many and varied forms of bracing, each designer adopting methods peculiar to his own ideas. One form consists of adjustable diagonals, rods or bars, properly fastened to the columns in the building; these diagonals may run through one floor and be attached to the columns at the floor above. Another form is known as portal bracing; this is usually braced between adjacent columns in halls or passage-ways and extends from the foundations up from floor to floor to such a height that the stability of the

building itself is sufficient to resist the assumed wind pressure. In general, if the building is square or nearly so wind-bracing should be placed close to the corners. In case neither of the above methods can be applied, brackets should be used at each floor level or a continuous deep beam or girder carried all around the building. Some architects depend solely upon partitions, and a building with a well-constructed iron frame should be safe if provided with brick partitions or if the exterior of the iron framework is covered with well-built masonry of sufficient thickness.

Truss rods, portals, or lattice or plate girders constitute the more

definite types of wind -bracing ordinarily employed; the bracing must reach to some solid connexion at the ground. The greatest wind pressure to which a building is subjected is that from a horizontal wind. The maximum pressure is not uniform from the ground level to the roof but is greatest at the centre; it is diminished near the ground level by the fractional resistance of the ground, and at the eaves by the eddies formed by the air escaping over the roof. The change in direction of the air when striking a flat surface such as the side of a building will form a cushion to diminish the effects of impulses and shocks from local gusts.

The building laws of the city of New York require the following provisions as regards wind forces : —

" All structures exposed to wind shall be designed to resist a horizontal wind pressure of thirty pounds for every square foot . of surface thus exposed, from the ground to the top of the same, including roof, in any direction. In no case shall the overturning moment due to wind pressure exceed seventy-five per centum of the moment of stability of the structure. In all structures exposed to wind, if the resisting moments of the ordinary materials of construction, such as masonry, partitions, floors and connexions, are not sufficient to resist the moment of distortion due to wind pressure, taken in any direction on any part of the structure, ad- ditional bracing shall be introduced sufficient to make up the differ- ence in the moments. In calculations for wind pressures, the working stresses set forth in the code may be increased by fifty per centum. In buildings under one hundred feet in height, pro- vided the height does not exceed four times the average width of the base, the wind pressure may be disregarded."

The steel used throughout the entire structure should be subjected to the most thorough chemical and mechanical tests and inspection, first at the mill and subsequently at Uued. tne fabricating shops and the building, to ensure that

it shall not contain more than o-o8% of phosphorus or o-o6% of sulphur, that it shall have an ultimate strength of between 60,000 and 70,000 lb per sq. in., with an elastic limit of not less than 35,000 lb per sq. in., and an elongation before fracture of not less than 25% in 8 in. of length, and that a piece of the material may be bent cold 180 over a mandril equal to the thickness of the piece tested without fracture of the fibres on the outside of the bend. At least two pieces are taken from each melt or blow at the mill, and are stamped or marked, and all the various sections rolled from the melt

or blow are required to bear a similar stamp or mark for identification. All finished material is carefully examined to see that it possesses a smooth surface, and that it is free from cracks, seams and other defects, and that it is true to section throughout. Rivets are either of wrought iron or of extra soft steel, with an ultimate tensile strength of 55,000 lb per sq. in. The material must be sufficiently tough to bend cold 180 flat on itself without sign of fracture. The greatest care is taken that no steel is left in a brittle condition by heating and cooling without proper annealing. All abutting joints in riveted work are faced to exact lengths and absolutely at right angles to the axis of the piece, and are spliced by scarf plates of proper dimensions adequately secured by rivets. The work should be so accurate that no packing pieces are necessary. If the conditions are such that a packing or filling piece must be used, the end of one piece is cut to a new and true surface, and the filling piece is planed to fill the space accurately. Where cast iron is used it must be of tough grey iron free from defects. In testing it pieces 14 in. long and 1 in. square are cast from each heat and supported on blunt knife edges spaced 12 in. apart;

under a load in the centre of the piece of 2500 lb ihe deflexion must not exceed ˆ in.

The filling between the girders and floor beams consists of segmental arches of brick, segmental or flat arches of porous (sawdust) terra-cotta, or hard-burned hollow terra- Boor-filling cotta voussoirs, or various patented forms of con- and crete floors containing ties or supports of steel or Partl Uons. iron. In all cases it is customary to fill on top of the arches with a strong Portland cement concrete to a uniform level, generally the top of the deepest beam; the floor filling is constructed and carried to this level immediately upon the completion of each tier of beams, for the purpose not only of stiffening the frame laterally, and of adding to its stability by the imposition of a static load, but also to afford constantly safe and strong working platforms at regular and convenient intervals for use throughout the entire period of the construction. In cases in which the lateral rigidity of the floors is depended upon to transfer the horizontal strains to the exterior walls which are framed to resist them, no form of floor construction should be used which is not laterally strong and rigid. With very rapid building, no method of construction of floors furrings, or partitions should be adopted which will not dry out with great speed. In flat forms of masonry floor construction the level of its bottom is placed somewhat below the bottom of the " I " beams and girders, so that when it is plastered a continuous surface of at least an inch of mortar will form a fire-

proof protection for the lower flanges of the beams and girders. Where the width of the flange is considerable it is first covered with metal lath secured to the under side of the floor masonry. Girders projecting below the floor are usually encased in from 1 to 2 in. of fire- proof material, 2 or 4 in. of which is also put on all columns. Such fire-proof coverings, and also interior partitions, are composed of hollow, hard-burned terra-cotta blocks, of porous (sawdust) terra cotta, or various plastic compositions applied to metallic lath, many of which are patented both as to material and method of application. The most simple test for the value of a system of fire-proof coverings, and of partitions and furrings, is to erect a large sample of the work and to subject it alternately to the continued action of an intensely hot flame which is allowed to impinge upon it, and to a stream of cold water directed upon it from the ordinary service nozzle of a steam fire engine. It is important in all fire-proofing of columns and girders, and in all floor construction, furring and partitions, that there shall be no continuous voids, either vertical or horizontal, which may possibly serve as flues for the spread of heat or flame in case of fire. All furrings and partitions must be started on the solid masonry of the floors to prevent the possible passage of fire from the room in which it may occur. The failure to make this provision has been the cause of very serious losses in buildings which were supposed to be fire-proof. Steel construction possesses great advantages in time required for erection. When once the site is cleared and the founda- tions prepared and set, work can be pushed on the Time and walls at different storeys at one and the same time, Cost of and often main cornices and filling-in work are Ereci,on – fixed before special details and ornamentation. In the Commercial Cable Building, New York, seven complete tiers aggregating 7000 tons were erected in nine weeks. In the Unity Building, Chicago, of seventeen storeys, the metal frame- work from basement columns to finished roof was accomplished in nine weeks. In the Fisher Building, Chicago, the entire steel skeleton above the first floor, nineteen storeys and attic, was erected in twenty-six days.

Owing to the low price of steel it is possible to make a steel column of equivalent strength cheaper than one in cast iron. The question of cost is purely a commercial one, but the cost of the raw material will practically never determine the relative cost between various forms, as the expense of manufacture and the detail and duplication of members will all influence the ultimate cost to a much greater extent than the simple cost of the plain materials. The steelwork for a building of any considerable size is almost invariably rolled to order.

STEEL CONSTRUCTION

Plate I.

Mewes & Davis, Architects.

Fig. i.-THE MORNING POST BUILDING, LONDON.

Waring White Building Co. Ltd., Contractors.

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Fig. 2.— THE FLATIRON BUILDING, NEW YORK CITY. D. H. Burnham & Co., Architects. Geo. A. Fuller & Co., Contractors.

Steel construction and the rapid development of engineering practice has affected not only the erection of tall buildings, but has also produced improvement in the erection Buiidtazs °^ f actorv an< i workshop premises. Modern work- shops consist of wider buildings of greater height with plenty of roof-light, efficient ventilation, and artificial heating, and as the heavy loads can be carried by the reinforcing material, heavy walls become unnecessary. Gradually, therefore, the modern steel-framed factory has been evolved, capable of supporting all the loads, the outer walls being required only for protection against weather. Light steel roof trusses have replaced the timber trusses, and with the columns form a rigid framework to resist the structural and wind loads as well as those from the cranes and shafting.

In Germany skeleton steel-framed factory buildings may be erected with half brick (12 cm.), with a restriction that when such buildings are abutting or are in the immediate neighbour- hood, i.e. within 20 ft. of a neighbouring building, the outside walls on the sides affected shall be full brick (25 cm.).

The permissible height to which a building may be erected on the continent of Europe depends largely on the breadth of the road on

which such buildings are situated. As a rule it is not permissible to erect a building wider than the road, measured from building line to building line.

In American practice the use of steel in buildings of ten or more storeys, or in manufacturing plant where the floor loads are heavy and frequently " live " in the sense of causing vibration, has led to more careful specifications as to the quality of mate- rials and character of workmanship, and it is the custom of the leading architects to have the structural frame inspected and tested during manufacture at the foundries, rolling-mills and shops by a firm of engineers making a speciality of such inspections.

The illustrations (see Plates I. and II.) will give a good idea of the general construction as now carried out in England and America.

Authorities. — See Birkmire, The Planning and Construction of High Office Buildings ; Farnsworth, Constructional Steel Work ; J. K. Frietag, Architectural Engineering; Kitchin, Steel Mill Build- ings; Carnegie Steel Company's Pocket Companion; Pencoyd Iron Works Handbook. (J. Bt.)

STEELE, ANNE (171 7-1 778), English hymn writer, was born at Broughton, Hampshire, in 17 17. The drowning of her betrothed a few hours before the time fixed for her marriage deeply affected an otherwise quiet life, and her hymns rather emphasize the less optimistic phases of Christian experience. In 1760 she published Poems on Subjects Chiefly Devotional under the name " Theodosia," and her complete works (144 hymns, 34 metrical psalms and 50 moral poems) appeared in one volume in London (1863). She was a Baptist, and her hymns are much used by members of that communion, though some of them, e.g. " Father of mercies, in Thy word," have found their way into the collections of other Churches. She has been called the Frances Ridley Havergal of the 18th century.

STEELE, SIR RICHARD (167 2-1 7 29), English man of letters in the reign of Queen Anne, is inseparably associated in the history of literature with his personal friend Addison. He cannot be said to have lost in reputation by the partnership, because he was inferior to Addison in purely literary gift, and it is Addison's literary genius that has floated their joint work above merely journalistic celebrity; but the advantage was not all on Steele's side, inasmuch as his more brilliant coadjutor has usurped not a little of the merit rightly due to him. Steele's often-quoted generous acknowledgment of Addison's services in the Taller has proved true in a somewhat different sense

from that intended by the writer: " I fared like a distressed prince who calls in a powerful neighbour to his aid; I was undone by my auxiliary; when I had once called him in I could not subsist without dependence on him." The truth is that in this happy alliance the one was the complement of the other; and the balance of mutual advantage was much more nearly even than Steele claimed or posterity has generally allowed.

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The famous literary pair were born in the same year. Steele, the senior by less than two months, was baptized on the 12th of March 1672 in Dublin. His father, also Richard Steele, was an attorney. He died before his son had reached his sixth year, but the boy found a protector in his maternal uncle, Henry Gascoigne, secretary and confidential agent to two successive dukes of Grmond. Through his influence he was nominated to the Charterhouse in 1684, and there first met with Addison. Five years afterwards he proceeded to Christ Church, Oxford, and was a postmaster at Merton when Addison was a demy at Magdalen. Their schoolboy friendship was continued at the university, and probably helped to give a more serious turn to Steele's mind than his natural temperament would have taken under different companionship. Addison's father also took an interest in the warm-hearted young Irishman ; but their combined influence did not steady him sufficiently to keep his impulses within the lines of a regular career; without waiting for a degree he volunteered into the army, and served for some time as a cadet " under the command of the unfortunate duke of Ormond " (i.e. the first duke's grandson, who was attainted in 1715). This escapade was made without his uncle's consent, and cost him, according to his own account, " the succession to a very good estate in the county of Wexford in Ireland." Still, he did not lack advancement in the profession he had chosen. A poem on the funeral of Queen Mary (1695), dedicated to Lord Cutts, colonel of the Coldstream Guards, brought him under the notice of that nobleman, who took the gentleman trooper into his household as a secretary, made him an officer in his own regiment, and ultimately procured for him a captaincy in Lord Lucas's regiment of foot. His name was noted for promotion by King William, but the king's death took place before anything had been done for Captain Steele. A duel which he fought with Captain Kelly in Hyde Park in 1 700, and in which he wounded his antagonist dangerously, inspired him with the dislike of the practice that he showed to the end of his life. Steele probably owed the king's favour to a timely reference to his majesty in The Christian Hero, his first prose treatise, published in April 1701. The "reformation of

manners" was a cherished purpose with King William and his consort, which they tried to effect by proclamation and act of parliament; and a sensible well-written treatise, deploring the irregularity of the military character, and seeking to prove by examples — the king himself among the number — " that no principles but those of religion are sufficient to make a great man," was sure of attention. Steele complained that the reception of The Christian Hero by his comrades was not so respectful; they persisted in trying him by his own standard, and would not pass " the least levity in his words and actions " without protest. His uneasiness under the ridicule of his irreverent comrades had a curious result: it moved him to write a comedy. "It was now incumbent upon him," he says " to enliven his char- acter, for which reason he writ the comedy called The Funeral." Although, however, it was Steele's express purpose to free his character from the reproach of solemn dullness, and prove that he could write as smartly as another, he showed greater respect for decency than had for some time been the fashion on the stage. The purpose, afterwards more fully effected in his famous periodicals, of reconciling wit, good humour and good breeding with virtuous conduct was already deliberately in Steele's mind when he wrote his first comedy. It was produced and published in 1701, and received on the stage with favour. In his next comedy, The Lying Lover; or, the Ladies' Friendship, based on Corneille's Menteur, produced two years afterwards, in December 1703, Steele's moral purpose was directly avowed, and the play, according to his own statement, was " damned for its piety." The Tender Husband, an imitation of Moliere's Sicilien, produced eighteen months later (in April 1705), though not less pure in tone, was more successful; in this play he gave unmistakable evidence of his happy genius for conceiving and embodying humorous types of character, putting on the stage the parents or grandparents of Squire Western, Tony Lumpkin and Lydia Languish. It was seventeen years before Steele

again tried his fortune on the stage with The Conscious Levers, the best and most successful of his comedies, produced in December 1722.

Meanwhile the gallant captain had turned aside to another kind of literary work, in which, with the assistance of his friend Addison, he

obtained a more enduring reputation. There never was a time when literary talent was so much sought after and rewarded by statesmen. Addison had already been waited on in " his humble lodgings in the Haymarket," and advanced to office, when his friend the successful dramatist was appointed to the office of gazetteer. This was in April or May 1707. It was Steele's first connexion with journalism. The periodical was at that time taking the place of the pamphlet as an instru- ment for working on public opinion. The Gazette gave little opening for the play of Steele's lively pen, his main duty, as he says, having been to " keep the paper very innocent and very insipid "; but the position made him familiar with the new field of enterprise in which his inventive mind soon discerned materials for a project of his own. The Taller made its first appearance on the 1 2th of April 1709. It was partly a newspaper, a journal of politics and society, published three times a week. Steele's position as gazetteer furnished him with special advan- tages for political news, and as a popular frequenter of coffee- houses he was at no loss for social gossip. But Steele not only retailed and commented on social news, a function in which he had been anticipated by Defoe and others; he also gradually introduced into the Tatler as a special feature essays on general questions of manners and morality. It is not strictly true that Steele was the inventor of the English " essay "—there were essayists before the 1 8th century, notably Cowley and Temple; but he was the first to use the essay for periodical purposes, and he and Addison together developed a distinct species, to which they gave a permanent character, and; in which • they had many imitators. As a humbler motive for this fortunate venture Steele had the pinch of impecuniosity, due rather to excess of expenditure than to smallness of income. He had £300 a year from his gazetteership (paying a tax of £45), £100 as gentleman waiter to Prince George, £850 from the Barbadoes estates of his first wife, a widow named. Margaret Stretch, and some fortune by his second wife— Mrs Mary Scurlock, the " dear Prue " of his charming letters.. But Steele lived in con- siderable state after his second marriage, and before he started the Tatler was reduced to the necessity of borrowing. The assumed name of the editor was Isaac Bickerstaff , but Addison discovered the real author in the sixth number, and began to contribute in the eighteenth. It is only fair to Steele to state that the success of the Tatler was established before Addison joined him, and that Addison contributed to only forty-two of the two hundred and seventy-one numbers that had appeared when the paper was stopped, obscurely, in January 171 1. Some papers satirizing Harley appeared in the Tatler, and Steele lost or resigned the post of gazetteer. It is possible that this political recklessness may have had something to do with

the sudden end of the venture.

Only two months elapsed between the stoppage of the Taller and the appearance of the Spectator, which was the organ of the two friends from the 1st of March 1711 till the 6th of December 1712. Addison was the chief contributor to the new venture, and the history of it belongs more to his life. Nevertheless, it is to be remarked as characteristic of the two writers that in this as in the Tatler Addison generally follows Steele's lead in the choice of subjects. The first suggestion of Sir Roger de Coverley was Steele's although it was Addison that filled in the outline of a good-natured country gentleman with the numerous little whimsicalities that convert Sir Roger into an amiable and exquisitely ridiculous provincial oddity. Steele had neither the fineness of touch nor the humorous malice that gives life and distinction to Addison's picture; the Sir Roger of his original hasty sketch has good sense as well as good nature, and the treatment is comparatively commonplace from a literary point of view, though unfortunately not commonplace in its charity. Steele's suggestive

vivacity gave many another hint for the elaborating skill of his friend.

The Spectator was followed by the Guardian, the first number of which appeared on the 12th of March 1713. It had a much shorter career, extending to only a hundred and seventy-six numbers, of which Steele wrote eighty-two. This was the last of his numerous periodicals in which he had the material assist- ance of Addison. But he continued for several years to project journals, under various titles, some of them political, some social in their objects, most of them very short-lived. Steele was a warm partisan of the principles of the Revolution, as earnest in his political as in his other convictions. The English- man was started in October 1733, immediately after the stoppage of the Guardian, to assail the policy of the Tory ministry. The Lover, started in February 17 14, was more general in its aims; but it gave place in a month or two to the Reader, a direct counterblast to the; Tory Examiner. The Englishman was resuscitated for another volume in 1715; and he subsequently projected in rapid succession three unsuccessful ventures — Town Talk, the Tea Table and Chit Chat. Three years later he started his most famous political paper the Plebeian, rendered memorable ; by the fact that it embroiled him with his old ally Addison. The subject of controversy between the two lifelong friends was Sunderland's Peerage Bill. Steele's last venture in journalism was the Theatre, 1720, the immediate occasion of which was the revocation of his patent for

Drury Lane. Besides these journals he wrote also several pamphlets on passing ques- tions—on the disgrace of Marlborough in 171 1, on the fortifica- tions of Dunkirk in 1713, on the " crisis " in 1714, An Apology for Himself and his. Writings (important biographically) in the same year, and on the South Sea mania in 1 7 20.

The fortunes of Steele as a zealous Whig varied with the fortunes of his party. Over the Dunkirk question he waxed so hot that he threw up a pension and a commissionership of stamps, and went into parliament as member for Stockbridge to attack the ministry with voice and vote as well as with pen. But he had not sat many weeks when he was expelled from the house for the language of his pamphlet on the Crisis, which was stigmatised as seditious. The Apology already mentioned was his vindication of himself on this occasion. With the accession of the House of Hanover his fortunes changed. Honours and substantial rewards were showered upon him. He was made a justice of the peace, deputy-lieutenant of Middlesex, surveyor of the royal stables, governor, of the royal company of comedians — the' last,a lucrative post— and was also knighted (1715). After the suppression of the Jacobite rebellion he was appointed one of the commissioners of forfeited estates, and spent some two years, in Scotland in that capacity. In 17 18 he obtained a patent for a plan for bringing salmon alive from Ireland. Differing from his friends in power on the question of the Peerage Bill he was deprived of some of his offices, but when Walpole became chancellor of the exchequer in 1721 he was reinstated. With all. his emoluments however the imprudent, impulsive, ostentatious and generous Steele could never get clear of financial difficulties, and he was obliged to retire from London in 1724 and live in the country. He spent his last years on his wife's estate of Llangunnor in Wales, and, his health broken down by a paralytic seizure, died at Carmarthen on the 1st of September 1729.

A selection from Steele's essays, with a prefatory memoir, has been edited by Mr Austin Dobson (1885 ; revised 1896). Mr Dobson contributed a fuller biography to Mr Andrew Lang's series of English Worthies, in 1886. In 1889 another and more exhaustive life was published by Mr G. A. Aitken, who has also edited Steele's plays (1898) and the Tatler (1898). (W. M.; A. D.)

STEELE, THOMAS (1788-1848), Irish politician and writer, a member of a Somerset family which settled in Ireland during the 17th century, was born on the 3rd of November 1788. He was educated at Trinity College, Dublin, and at Magdalene College, Cambridge, and succeeded to a large estate in Co. Clare. As a

volunteer he fought against the Bourbons in Spain in 1823, and, returning to Ireland, he became an enthusiastic worker for Roman Catholic emancipation, helping greatly to

return Daniel O'Connell to parliament for Go. Glare at the famous election of 1828. It is interesting to note that Steele himself was a Protestant. Having ruined his fortune by con- tributing liberally to the causes in which he was interested, he died in London on the 15th of June 1848. He wrote Notes of the War in Spain (1824) and some essays on Irish questions.

STEELE, WILLIAM (d. 1680), lord chancellor of Ireland, was a son of Richard Steele of Sandbach, Cheshire, and was educated at Caius College, Cambridge. In 1648 he was chosen recorder of London, and he was one of the four counsel appointed to conduct the case against Charles I. in January 1649, but illness prevented him from discharging this duty. However, a few days later he took part in the prosecution of the duke of Hamilton and other Royalists. Steele was M.P. for the City of London; in 1654, was chief baron of the exchequer in 1655, and was made lord chancellor of Ireland in 1656. After the fall of Richard Cromwell he was one of the five commissioners appointed in 1659 to govern Ireland. At the end of this year he returned to England, but he refused to sit on the committee of safety to which he had been named. At the Restoration he obtained the full benefits of the Act of Indemnity, but he thought it advisable to reside for a time in HolUind. However, he had returned to England before his death towards the. end of 1680.

See O. J. Burke, History of the Lord Chancellors of Ireland (Dublin', 1879). '. • . ■■ : ■•

STEELE, a town of Germany, in the Prussian Rhine Province on the navigable Ruhr, 4 m. by rail E. of Essen, at the junction of the lines Duisburg-Dortrnund and Vohwinkel-Hagen. Pop. (1905), 12,988. It contains a Gothic parish church (Roman Catholic), a high school and a Roman Catholic hospital. It;Has coal-mines, iron and steel works, and makes fireproof bricks. A Diet of the empire was held here in the year 938 by the emperor Otto I.

STEELTON, a borough of Dauphin county, Pennsylvania, U.S.A., on the Susquehanna river, 3 m. S.E. of Harrisburg. Pop. (1890), 9250;

(1900), 12,086, of whom 2300 were foreign- born and 1508 were negroes; (1910 census), 14,246. Steelton is served by the Pennsylvania and the Philadelphia & Reading railways, and is connected with Hanisburg by electric line. The city has a public library. Steelton is in an agricultural district, but its industrial importance is due primarily to the vast steel works of the Pennsylvania Steel Company. Other manufactures are flour and grist mill products, bricks, planing-: mill products, &c. In 1905 the total value of the borough's factory products was $15,745,628; the capital invested in manu- facturing increased from $6,266,068 in 1900 to $i8,642 l) 8s3- in 1905, or 197-5%. There is a large limestone quarry within the borough limits. The municipality owns its waterworks and filtration plant. The place was laid out in 1866 under the name of Baldwin, but when it was incorporated as a borough, in 1880, the present name was adopted.

STEELYARD, MERCHANTS OF THE, Hanse merchants who settled in London in 1250 at the steelyard on the riveir-side, near Cosin Lane, now Ironbridge Wharf. Henry III. in 1259, at the request of his brother Richard of Cornwall, king of the Romans, conferred on them important privileges, which were confirmed by Edward I. It was chiefly through their enterprise that the early trade of London was developed, and they continued to flourish till, on the complaint of the Merchant Adventurers in the reign of Edward VI., they were deprived of their privileges. Though Hamburg and Liibeck sent ambassadors to intercede for them, they were not reinstated in their monopolies, but they succeeded in maintaining a footing in London till expelled by Elizabeth in 1597. Their beautiful guildhall in Thames Street, adorned with allegorical pictures by Holbein, and de- scribed by Stow, was made a naval storehouse; The land and buildings still remained the property of the Hanseatic League, and were subsequently let to merchants for business purposes. Destroyed in the Great Fire of 1666 they were rebuilt as ware- houses, and were finally sold to the South-Eastem Railway Company in 1852 by the Hanseatic towns, Liibeck, Bremen and

Hamburg. The site is now occupied by Cannon Street railway station.

See Lappenburg, Urkuniliche Geschichte des hansischen Stahlhofes zu London (Hamburg, 1851); Stow, Survey of London (1598);, Pauli, Pictures , of Old. London (1851); Ehrenberg, Hamburg und England im Zeitalter der Kbnigin Elizabeth (Jena, 1896).

STEEN, JAN HA VICKSZ (1626-1-679), Dutch subject-painter, was born at Leiden in 1626, the son of a brewer of the place. He studied

at Utrecht under Nicolas Knupfer, a German historical painter. Dr Bode suggests that, before entering Knupfer's studio, Jan Steen took drawing lessons from Jacob de Wet in Haarlem. He bases his theory on the internal evidence of such early pictures as the " Market, at Leiden" (Staedel Institute, Frankfort), the " Kermesse " (A. von-Goldschmidt-Rothschild, Berlin), " Calling for the Bride " (Six Collection, Amsterdam), and " St John's Sermon " (Dessau Castle). About the year 1644 Steen went to Haarlem, where he worked under Adrian van Ostade and under Jan van Goyen, whose daughter he married in 1649. In the previous year h< had joined the painters' gild of the city. In 1667 he is said ta have been a brewer at Delft; in 1669 a small debt of ten florins owing to an apothecary led to the seizure and sale of his pictures, and in 1673 he received municipal authority to open a tavern. In 1673 he took a second wife, Maria van Egmont, the widow of a bookseller in Leiden. The accounts of his life, however, are very confusing and conflicting. Some biographers have asserted that he was a drunkard and of dissolute life, but the number ot his works— Van Westrheene, in his Jan Steen, itude sur I'art en Holland, has catalogued nearly five hundred and Hofstede de Groot about double that number — seems sufficient in itself to disprove the charge. ., His later pictures bear marks of haste and, are less carefully finished than those of his earlier period. He died at Leiden in 1679.

The works. of Jan Steen are distinguished by correctness of drawing, admirable freedom and spirit of touch, and clearness and transparency of colouring. But their true greatness is, due to their intellectual qualities. In the. wide range of his subjects, and their dramatic character, he surpasses all the Dutch figure painters, with the single exception of Rembrandt. His pro- ductions range from the stately interiors of grave and wealthy citizens to tavern scenes of jollity and debauch. He painted chemists in their laboratories, doctors at the bedside of their patients, cd.rd-parties, marriage feasts, and the festivals of St Nicholas and Twelfth Night — even religious subjects, though in these he was least successful. His rendering of children is especially delightful, • Dealing often with the coarser side of things, his work is full 'of humour; he depicts the comedy of human life in a spirit of very genial toleration, but now and again there appear keenly telling touches of satire which recall a pictorial moralist such as Hpgarth. Portraits from his brush are comparatively rare. The best known is the portrait of himself at the Rijksmuseum in Amsterdam.

The National Gallery contains three pictures by Jan Steen, of which the " Music Master " is the most important, and other excellent

examples of his art in England are preserved in the Royal, the Bute, and the Northbrook collections, at Apsley House and Bridgewater House, and in the galleries of the Hague, Amsterdairi, and the Hermitage, St Petersburg. A remarkably fine example of his work, which appeared at the Royal Academy Winter Exhi- bition in 1907, is the " Grace Before Meat."

STEENKIRK (Steenkerke), a village in the Belgian province of Hainaut, on the river Senne, famous for the battle of Steen- kirk (Steinkirk, Estinkerke) fought on July 23rd/August 3rd 1692 between the Allies (see Grand Alliance, War or the) under WiHiam III. of England and the French commanded by the duke of Luxemburg. Previous to the battle the French, army lay facing north-west, with its right on the Senne at Steenkirk and its left towards Enghien, while the army q$' William III. was encamped a>bout Hal. In accordance with the strategical methods of the time, the French, not .wishing to fight after having achieved the immediate object, the capture of Namur, took up a strong position, supposing the enemy would not dare to attack it, while the Allies, who would otherwise

in all probability have done as the French marshal desired, were by the fortune of war afforded the opportunity of surprising a part of the enemy's forces. For in the 17th century, when the objects of a war were as far as possible secured without the loss of valuable lives, and general decisive battles were in every way considered undesirable, a brilliant victory over a part, not the whole, of the enemy's forces was the tactical idea of the best generals, and accordingly William, having completely misled the enemy by forcing a detected spy to give Luxemburg false news, set his army in motion before dawn on July 23rd/ August 3rd to surprise the French right about Steenkirk. The advanced guard of infantry and pioneers, under the duke of Wiirttemberg, deployed close to the French camps ere Luxemburg became aware of the impending blow; at this moment the main body of the army farther back was forming up after the passage of' some woods. When the fight opened, Luxemburg was completely surprised, and he could do no more than hurry the nearest foot and dragoons into action as each regiment came on the scene. But the march of the Allies' main body had been mismanaged; while Wiirttemberg methodically cannonaded the enemy, wait- ing for support and for the order to advance, and the French worked with feverish energy to form a strong and well-covered line of battle at the

threatened point, the Allies' main body, which had marched in the usual order, one wing of cavalry leading, the infantry following, and the other wing of cavalry at the tail of the column, was being hastily sorted out into infantry and cavalry, for the ground was only suitable for the former. A few battalions only had come up to support the advanced guard when the real attack opened (12.30). The advanced guard had already been under arms for nine hours, and the march had been over bad ground, but its attack swept the first French line before it. The English and Danes stub- bornly advanced, the second and third lines of the French in- fantry giving ground before them, but Luxemburg was rapidly massing his whole force to crush them, and meanwhile the con- fusion in the allied main body had reached its height. Count Solms, who commanded it, ordered the cavalry forward, but the mounted men, scarcely able to move over the bad roads and heavy ground, only blocked the way for the infantry. Some of the English foot, with curses upon Solms and the Dutch generals, broke out to the front, and Solms, angry and excited, thereupon refused to listen to all appeals for aid from the front. No attempt was made to engage and hold the centre and left of the French army, which hurried, regiment after regiment, to take part in the fighting at Steenkirk. William's counter-order that the infantry was to go forward, the cavalry to halt, only made matters worse, and by now the advanced guard had at last been brought to a standstill. At the crisis Luxemburg had not hesitated to throw the whole of the French and Swiss guards, led by the princes of the royal house, into the fight, and as, during and after this supreme effort, more and more French troops appeared from the side of Enghien, the Allies were driven back, contesting every step by weight of numbers. Those troops of the main body, foot and dragoons, which suc- ceeded in reaching the front, served only to cover and to steady the retreat of Wiirttemberg's force, and, the coup having mani- festly failed, William ordered the retreat. The Allies retired as they had come, their rear-guard showing too stubborn a front for the French to attack. The latter were indeed in no state to pursue. Over eight thousand men out of only about fifteen thousand engaged on the side of the Allies were killed and wounded, and the losses of the French out of a much larger force were at least equal. Contemporary soldiers affirmed that Steen- kirk was the hardest battle ever fought by infantry, and the battle served not only to illustrate the splendid discipline of the old professional armies, but also to give point to the reluctance of the generals of those days to fight battles in which, once the fighting spirit was unchained, the armies shot each other to pieces before either would give way.

STEEPLE (akin to “steep”), a general architectural name (Fr. clocher, Ital. campanile, Ger. Glockenturm) for the whole arrangement of tower, belfry, spire, &c.

STEEPLECHASE, a variety of horse-racing not run on the flat, but either across country or on a made course with artificial fences, water-jumps, &c. (see Horse-racing). The origin of the sport and the name is due to matches run by owners of hunters, the goal being some prominent landmark, such as a neighbouring church steeple. There is an early record of such a match in 1732 in Ireland, when the course was 4§ m., ” from the Church of Buttevaut to the spire of St Leger Church.” The name is sometimes used of cross-country running or of a race on a made course over hurdles and other obstacles. It is also given to an English variation of the old French game of Goose (q.v.). It is played with two dice on a board, on which is depicted a race-course with hurdles, water-jumps and other obstacles. The course is marked in 60 compartments by means of radii, and the game is won by the player whose horse makes the circuit in the fewest throws. Each player is provided with a marker, usually in the form of a jockey on horseback, which is moved forward after each throw to the space to which the number thrown entitles it.

STEER, PAUL WILSON (i860-), English painter, was born at Birkenhead. He was trained first at the Gloucester school of art and afterwards in Paris at the Academie Julian, and in the £cole des Beaux Arts under Cabanel. After 1886, before which date he had shown three pictures at the Royal Academy, practically the whole of his work was seen in the exhibitions of the New English Art Club, of which he is a pro- minent member. His figure subjects and landscapes show great originality and technical skill (see Painting: Recent British). His portrait of himself is included in the collection in the Uffizi Gallery, Florence.

STEEVENS, GEORGE (1736-1800), English Shakespearian commentator, was born at Poplar on the 10th of May 1736, the son of an East India captain, afterwards a director of the company. He was educated at Eton and at King’s College, Cambridge, where he resided from 1753 to 1756. Leaving the university without a degree, he settled in chambers in the Temple, removing later to a house on Hampstead Heath, where he collected a valuable library, rich in Elizabethan literature. He also accumulated a large collection of Hogarth prints, and his notes on the subject were incorporated in John Nichols’s Genuine Works of Hogarth. He walked from Hampstead to London every morning before seven o’clock, discussed

Shake- spearian questions with his friend, Isaac Reed, and, after making his daily round of the booksellers' shops, returned to Hampstead. He began his labours as a Shakespearian editor with reprints of the quarto editions of Shakespeare's plays, entitled Twenty of the Plays of Shakespeare ... (1766). Dr Johnson was impressed by the value of this work, and suggested that Steevens should prepare a complete edition of Shakespeare. The result, known as Johnson's and Steevens's edition, was The Works of Shakespeare with the Corrections and Illustrations of Various Commentators (10 vols., 1773), Johnson's contributions to which were very slight. This early attempt at a variorum edition was revised and reprinted in 1778, and further edited in 1785 by Isaac Reed; but in 1793 Steevens, who had asserted that he was now a " dowager-editor," was persuaded by his jealousy of Edmund Malone to resume his labours. The definitive result of his researches was embodied in an edition of fifteen volumes. He made changes in the text sometimes apparently with the sole object of showing how much abler he was as an emendator than Malone, but his wide knowledge of Elizabethan literature stood him in good stead, and subsequent editors have gone to his pages for parallel passages from contemporary authors. His deficiencies from the point of view of purely literary criticism are apparent from the fact that he excluded Shakespeare's sonnets and poems because, he wrote, " the strong- est act of parliament that could be framed would fail to compel readers into their service." In the twenty years between 1773 and 1 793 he was less harmlessly engaged in criticizing his fellows and playing malicious practical jokes on them. Dr Johnson:., who was one of his stanchest friends, said he had come to live the life of an outlaw, but he was generous and to a small circle

of friends civil and kind. He was one of the foremost in expos- ing the Chatterton-Rowley and the Ireland forgeries. He wrote an entirely fictitious account of the Java upas tree, derived from an imaginary Dutch traveller, which imposed on Erasmus Darwin, and he hoaxed the Society of Antiquaries with the tombstone of Hardicanute, supposed to have been dug up in Kennington, but really engraved with an Anglo-Saxon inscrip- tion of his own invention. He died at Hampstead on the 22nd of January 1800. A monument to his memory by Flaxman, with an inscription commemorating his Shakespearian labours, was erected in Poplar Chapel. The sale catalogue of his valuable library is in the British Museum.

Steevens's Shakespeare was re-issued by Isaac Reed in 1803, in 21 volumes, with additional notes left by Steevens. This, which is known as the " first variorum " edition, was reprinted in 1813. Steevens's notes are also incorporated in the edition of 182 1, begun by Edmund Malone and completed by James BosWell the younger.

STEEVENS, GEORGE WARRINGTON (1860-1900), English journalist, was born at Sydenham, near London, on the 10th of December 1869, and was educated at the City of London School and Balliol College, Oxford, of which he was a scholar. He first began to write in undergraduate periodicals. In 1893 he was elected a fellow of Pembroke College, Oxford, and in the same year spent some time at Cambridge, editing a weekly periodical, the Cambridge Observer, and becoming a contributor to the National Observer, then edited by Mr W. E. Henley. He then married and went to London, and joined the staff of the Pall Mall Gazette, contributing also to the New Review and Blackwood's Magazine. Some of his articles were reprinted in Monologues of the Dead. In 1896 he joined the staff of the London Daily Mail, then just started, and went on various special missions for that paper, which resulted in more than one series of articles, afterwards turned into books. In this way he published The Land of the Dollar (1897), With the Conquering Turk (1897), Egypt in i8q8, and With Kitchener to Khartoum (1899). In September 1899 he went to South Africa and joined Sir George White's force in Natal as war-correspondent, being subsequently besieged in Ladysmith. He died during the siege, of enteric fever, on the 15th of January 1900. The articles he had sent home from South Africa were published post- humously in a volume called From Capetown to Ladysmith. Steevens had a remarkable gift of seizing the salient facts and principal characteristics in anything he wished to describe, and putting them in a vivid and readable way. His early death removed an interesting personality in English journalism.

STEFANIE, Basso Naebor, or Chuwaha, a lake of East Africa, lying in 37 E., between 4°25′ and 5 N., and measuring some 40 m. by 15. It is the southernmost and lowest (1880 ft.) of a series of lakes which lie in what appears to be a north-easterly continuation of the great East African rift valley, although this loses its clearly marked character in about 3 N. There is, how- ever, a well defined watershed extending from the hills east of Stefanie to the Harrar range. The character of the lake, which has no outlet, varies greatly according to the amount of water brought down by its principal feeder, the Dulei, which enters at its north end, being there a fairly rapid stream 50 yds. wide and 3 1 ft. deep. At low water the western part of the lake is dry. The Dulei, which rises north of 6° N., is joined in about

36 55′ E., 5° 8′ N. by the Galana Sagan or Galana Amara. The Sagan in times of flood receives the overflow of the next lake in the series, Chambo or Ganjule, which lies, at a height of 3460 ft., 70 m. north-north-east of Stefanie. Chambo in turn receives the waters of a larger lake — Abai, Abaya, Pagade or Regina Margherita — through the river Walo, across a plain only 2 m. wide. Abai lies 4200 ft. above the sea, is 45 m. long and 18 m. across at its greatest width. It is cut by 38 E. There are a number of islands on the lake. All the lakes of the series are shut in by high mountains, those surrounding Lake Abai, to- gether with the islands with which its surface is broken, being clothed with luxuriant vegetation. The chief feeder of Abai, the Bilate, rises in about 8° N. North-east of Abai are several smaller lakes unconnected with the more southerly system.

Lake Stefanie was discovered by Count Samuel Teleki in 1881, and has since, with others of the series, been explored by Donaldson Smith, V. Bottego, M. S. Welby, Oscar Neumann and others. J. J. Harrison in 1899 found the lake quite dried up, and two years later Count Wickenburg found water only in the northern part. An agreement of 1907 with Great Britain recognized the lake as within the Abyssinian Empire.

See Geographical Journal (Sept. 1896, Sept. and Dec. 1900, Sept. 1901, Oct. 1902). L. von Hohnel, Discovery of Lakes Rudolf and Stefanie (London, 1894); L. Vannutelli and C. Citerni, L'Omo (Milan, 1899) ; British War Office map, Africa, sheet 79.

STEFFANI, AGOSTINO (1653-1728), Italian ecclesiastic, diplomatist and musical composer, was born at Castelfranco on the 25th of July 1653. At a very early age he was admitted as a chorister at St Mark's, Venice. In 1667 the beauty of his voice attracted the attention of Count Tattenbach, by whom he was taken to Munich, where his education was completed at the expense of Ferdinand Maria, elector of Bavaria, who appointed him " Churfiirstlicher Kammer- und Hofmusikus " and granted him a liberal salary. After receiving instruction from Johann Kaspar Kerl, in whose charge he lived, he was sent in 1673 to study in Rome, where Ercole Bernabei was his master, and among other works he composed six motets, the original manuscripts of which are now in the Fitzwilliam Museum at Cambridge. On his return to Munich in 1674 he published his first work, Psalmodia vespertina, a part of which was reprinted in Martini's Saggio di contrappunto in 1674. In 1675 he was appointed court organist. The date when he was ordained priest, with the title of Abbate of Lepsing, is not precisely known. His ecclesiastical status did not prevent him from turning his

atten- tion to the stage, for which, at different periods of his life, he composed work which undoubtedly exercised a potent influence upon the dramatic music of the period. Of his first opera, Marco Aurelio, written for the carnival and produced at Munich in 1681, the only copy known to exist is a manuscript score preserved in the royal library at Buckingham Palace. It was followed by Solone in 1685, by Audacia e rispetto, prerogative d'amore and Servio Tullio in 1686, by Alarico in 1687, and by Niobe in 1688; but of these works no trace can now be discovered. Not- withstanding the favour shown to him by the elector Maximilian Emanuel, he accepted in 1688 the appointment of Kapellmeister at the court of Hanover, where he speedily improved an acquaint- ance dating from 1681 with Ernest Augustus, duke of Bruns- wick-Luneburg (afterwards elector of Hanover), winning also a pleasant footing with the duchess Sophia Charlotte (afterwards electress of Brandenburg), the philosopher Leibnitz, the Abbate Ortensio Mauro, and many men of letters and intelligence, and where, in 17 10, he showed great kindness to Handel, who was then just entering upon his glorious career. He inaugurated a long series of triumphs in Hanover by composing, for the opening of the new opera house in 1689, an opera called Enrico il Leone, which was produced with extraordinary splendour and achieved an immense reputation. For the same theatre he composed La Lotta d' Ercole con Achilleo in 1689, La Superbia d' Alessandro in 1690, Orlando generoso in 1691, Le Rivali con- cordi in 1692, La Liberia contenta in 1693, / Trionfi del fato and / Baccanali in 1695, and Briseide in 1696. The libretto of Briseide is by Palmieri. Those of most if not all the others are by the Abbate Mauro. The scores are preserved at Buck- ingham Palace, where, in company with five volumes of songs and three of duets, they form part of the collection brought to England by the elector of Hanover in 17 14. But it was not only as a musician that Steffani distinguished himself in his new home. The elevation of Ernest Augustus to the electorate in 1692 led tc difficulties, for the arrangement of which it was necessary that an ambassador should visit the various German courts, armed with a considerable amount of diplomatic power. The accomplished abbate was sent on this delicate mission in 1696, with the title of envoy extraordinary, and he fulfilled his difficult task so well that Pope Innocent XL, in recognition of certain privileges he had secured for the Hanoverian Catholics, consecrated him bishop of Spiga in the Spanish West Indies.

In 1698 he was sent as ambassador to Brussels, and after the death of Ernest Augustus in the same year he entered the service of the elector palatine, John William, at Diisseldorf, where he held the offices of privy councillor and protonotary of the holy, see. Invested with these high honours, Steffani could scarcely continue to produce dramatic compositions in public without grievous breach of etiquette. But his genius was too importun- ate to submit to repression; and in 1709 he ingeniously avoided the difficulty by producing two new operas — Etiea at Hanover and Tassilone at Diisseldorf — in the name of his secretary and amanuensis Gregorio Piva, whose signature is attached to the scores preserved at Buckingham Palace. Another score— ˆ-that of Arminio — in the "same collection, dated Diisseldorf, 1707, and evidently the work of Steffani, bears no composer's name.

Steffani did not accompany the elector George to England; but in 1724 the Academy of Antient Musick in London elected him its honorary president for life; and in return for the com- pliment he sent the association a magnificent Stabat Mater, for six voices and orchestra, and three fine madrigals. The manu- scripts of these are still in existence, and the British Museum possesses a very fine Confitebor, for three voices and orchestra, of about the same period. All these compositions are very much in advance of the age in which they were written; and in his operas Steffani shows an appreciation of the demands of the stage very remarkable indeed at a period at which the musical drama was gradually approaching the character of a merely formal concert, with scenery and dresses. But for the manuscripts at Buckingham Palace these operas would be utterly unknown; but Steffani will never cease to be remembered by his beautiful chamber-duets," which, like those of his contemporary Carlo Maria Clari (1669-1745), are chiefly written in the form of cantatas for two voices, accompanied by a figured bass The British Museum (Add. MSS. 5055 seq.) possesses more than a hundred of these charming compositions, some of which were published at Munich in 1679. Steffani visited Italy for the last time in 1727, in which year Handel, who always gratefully remembered the kindness he had received from him at Hanover, once more met him at the palace of Cardinal Ottoboni in Rome. This was the last time the two composers were destined to meet. Steffani returned soon afterwards to Hanover, and died on the 1 2th of February 1728 while engaged in the transaction of some diplomatic business at Frankfort.

Steffani stands somewhat apart from contemporary Italian composers {e.g. Alessandro Scarlatti) in his mastery of instru- mental forms. His opera overtures, &c, show a remarkable

combination of Italian suavity with a logical conciseness of construction which is due to French influence. In vocal music he is certainly inferior to Scarlatti, and none of his famous duets, despite their charm, can compare for seriousness of intention with the Sicilian's master's chamber-cantatas. His instru- mental music, however, is historically important as a factor in the artistic development of Handel.

STEFFENS, HENRIK (1773-1845), German philosopher, scientist and poet, of Norwegian extraction, was born on the 2nd of May 1773 at Stavanger, and died in Berlin on the 13th of February 1845. At the age of fourteen he went with his parents to Copenhagen, where he studied theology and natural science. In 1796 he lectured at Kiel, and a year later went to Jena to study the natural philosophy of Schelling. He went to Freiberg in 1800, and there came under the influence of Werner. After two years he returned to Copenhagen, but his lectures excited so much disapproval that he took a professor-ship at Halle in 1804. During the War of Liberation he served as a volunteer in the cause of freedom, and was present at the capture of Paris. From 181 1 he was professor of physics at Breslau until 1832, when he accepted an invitation to Berlin. Steffens was one of the so-called Philosophers of Nature, a friend and adherent of Schelling and Schleiermacher. More than either of these two thinkers he was acquainted with the discoveries of modern science, and was thus enabled to correct or modify the highly imaginative speculations of Schelling. He held that, throughout the' scheme of nature and intellectual life, the main

principle is Individualization. As organisms rise higher in the scale of development, the sharper and more distinct become their outlines, the more definite their individualities. This principle he endeavoured to deduce from his knowledge of geology, in contrast to Lorenz Oken, who developed the same theory on biological grounds. The influence of his views was con- siderable. Not only did Schelling and Schleiermacher modify their theories in deference to his scientific deductions, but the intellectual life of his contemporaries was considerably affected. His lectures in Copenhagen in 1802 were attended by many leading Danish thinkers, such as Oehlenschlager and Grundtvig. Schleiermacher was so much struck by their excellence that he endeavoured, unsuccessfully, to obtain for Steffens a chair in the new Berlin University in 1804, in order that his own ethical teachings should be supported in the scientific department.

His chief scientific and philosophical works are : Beitrdge zur innern

Naturgeschichte der Erde (1801); Grundziige der phil'os. Naturwissenschaft (1806); Anthropologie (1824). He wrote also Ueber die Idee der Universitdten (1835), and Ueber geheime Verbindungen auf Universitdten (1835); works on religious subjects, Karikaturen des Heiligsten (1819-1821); Wie ich wieder Lutheraner wurde undwas mir das Luthertum ist (1831) ; Von der falschen Theo- hgie tind dem wahren Glauben (new ed., 1831); poetical works, Die Familien Walseth und Leith (1827); Die vier Norweger (1828) ; Malcolm (1831), collected in 1837 under the title of Novellen. During the last five years of his life he wrote an autobiography, Was ich erlebte, and after his death was published Nachgelassene Schriften (1846). See Tietzen, Zur Brinnerung an Steffens; Petersen, Henrik Steffens (Ger. trans., 1884); Dilthey, Leben Schleiermacher s.

STEIBELT, DANIEL (c. 1764-1823), German pianist and composer, was born at the earliest in 1764 or 1765 in Berlin. He was indebted to the crown prince Frederick William for his musical education. Very little is known of his artistic life before 1790, when he settled in Paris and attained great popu- larity as a virtuoso by means of a pianoforte sonata called La: Coquette, which he composed for Queen Marie Antoinette; his dramatic opera entitled Rotnio et Juliette, produced at the Th6atre Feydeau in 1793, was equally successful. In 1796 Steibelt removed to London, where his pianoforte-playing attracted great attention. In 1798 he produced his concerto (No. 3, in E flat) containing the famous " Storm Rondo •"• — a Work that ensured his popularity. In the following year Steibelt started on a professional tour in Germany; and, after playing with some success in Hamburg. Dresden, Prague and Berlin, he arrived in May 1800 at Vienna, where he challenged Beethoven to a trial of skill. His discomfiture was complete and he retired to Paris. During the next eight years he lived alternately in that city and in London. In 1808 he was invited by the emperor Alexander to St Petersburg, succeeding Boiel- dieu as director of the royal opera in 181 1. Here he resided in the enjoyment of a lucrative appointment until his death on the 20th of September 1823.

Besides his dramatic music, Steibelt left behind him an enor- mous number of compositions for the pianoforte. His playing, though brilliant, was wanting in the 'higher qualities which characterized that of his contemporaries, John Cramer and Muzio Clementi; but he was gifted with talents of a high order; and the reputation he enjoyed was fully deserved.

STEIN, CHARLOTTE VON (1742-1827), the friend of Goethe, was

born at Weimar on the 25th of December 1742, the eldest daughter of the Hofmarschall (master of the ceremonies) von Schardt. She became in her sixteenth year lady-in-waiting to the duchess Anna Amalia, the accomplished mother of Duke Kali August of Saxe-Weimar. In 1764 she married Freiherr Fried- rich von Stein, master of the horse to the duke, and seven chil- dren were the issue of the union. Goethe, who arrived in Weimar in 1775, was soon captivated by the charm of this lady, his senior by seven years, and the Seelenbund (union of souls) they formed exercised a furthering and ennobling influence upon Goethe's life and work. For more than ten years Charlotte von Stein was his constant companion, and by her bright and genial nature and friendship she stimulated his efforts and assuaged his cares. On Goethe's return from Italy in 1788 the previous intimate

relations between them were relaxed, and the poet's connexion with Christiane Vulpius still further estranged them. Char- lotte's jealousy and indignation at first knew no bounds, and it was only by slow-degrees that friendship was restored. Charlotte von Stein was also intimate with Schiller and his wife, and numerous interesting letters from her are to be found in Charlotte von Schiller und ihre Fretcnde (vol. ii., 1862). She became a widow in 1793, but continued to live at Weimar until her death there on the 6th of January 1827.

Goethe's letters to Frau von Stein form one of the most interest- ing volumes of the poet's correspondence.: Her own letters addressed to him were returned to her at her request and destroyed shortly before her death. A prose tragedy, Dido, written by her in 1792 (published 1867), is of little poetical value.

Goethe's Briefe an Frau von Stein aus den Jahren 1776-1820 were edited by A. Scholl (3 vols., 1848-1851 ; 2nd ed. by W. Fielitz, 1883-1885; 3rd ed., by J. Wahle, 1900). See H. Diintzer, Charlotte von Stein (2 vols., 1874) ; id., Charlotte von Stein und Corona Schroler (1876); G. H. Calvert, Charlotte von Stein (Boston and New York, 1877); and A. Sauer, Frauenbilder aus der Bliitezeit der deutschen Literatur (1885); W. Bode, Charlotte von Stein (1910).

STEIN, HEINRICH FRIEDRICH KARL, Baron vom und zum (17 57-1831), German statesman, was born at the family estate near Nassau, on the 26th of October 1757. He was the ninth child of Karl

Philipp, Freiherr vom Stein; the maiden name of his mother was von Simmern. His father was a man of stern and irritable temperament, which his far more famous son inherited, with the addition of intellectual gifts which the father entirely lacked. The family belonged to the order of imperial knights of the Holy Roman Empire, who occupied a middle position between sovereign princes and subjects of the empire. They owned their own domains and owed allegiance only to the emperor, but had no votes for the diet. In his old age he ex- pressed his gratitude to his parents for " the influence of their religious and truly German and knightly example." He added, " My view of the world and of human affairs I gathered as a boy and youth, in the solitude of a country life, from ancient and modern history, and in particular I was attracted by the incidents of the eventful history of England." The influence of English ideas, which was so potent a factor in the lives of Vol- taire, Rousseau, Talleyrand and many others in the 18th century, was therefore potently operative in the early career of Stein. He does not seem to have gone to any school; but in 1773 he went with a private tutor to the university of Gottingen in Hanover, where he studied jurisprudence, but also found time to pursue his studies in English history and politics, whereby, as he wrote, " my predilection for that nation was confirmed." In 1777 he left Gottingen and proceeded to Wetzlar, the legal centre of the Holy Roman Empire, in order to see the working of its institutions and thereby prepare himself for the career of the law. Next, after a stay at each of the chief South German capitals, he settled at Regensburg (Ratisbon) in order to observe the methods of the Imperial diet. In 1779 he went to Vienna, gave himself up to the gay life of that capital, and .then pro- ceeded to Berlin early in 1780.

There his admiration for Frederick the Great, together with his distaste for the pettiness of the legal procedure at Wetzlar, impelled him to take service under the Prussian monarch. He was fortunate in gaining an appointment in the department of mines and manufactures, for at the head of this office was an able and intelligent administrator, Heinitz, who helped him to master the principles of economics and civil government. In June 1785 he was sent for a time as Prussian ambassador to the courts of Mainz, Zweibriicken and Darmstadt, but he soon felt a distaste for diplomacy, and in 1786—1787 he was able to indulge his taste for travel by a tour in England, where he pursued his researches into commercial and mining affairs. In November 1787 he became Kammerdirektor, i.e. director of the board of war and domains for the king's possessions west of the river Weser; and in 1796 he was*

appointed supreme president of all the Westphalian chambers dealing with the Commerce and mines of those Prussian lands. Among the benefits which he conferred on these districts, one of the chief was the canalization of the river Ruhr, which thenceforth became an important outlet for

the coal of that region. He also improved the navigation of the Weser, and kept up well the main roads committed to his care. On the 8th of June, 1793 he married the countess Wilhelmine, daughter of Field Marshal Count Johann Ludwig yon Wallmoden-Gimborn, a natural son of King George II. of Great Britain.

Stein's early training, together with the sternly practical bent of his own nature, made him completely impervious to the enthusiasm which the French Revolution had aroused in many minds in Germany. He disliked its methods as an interruption to the orderly development of . peoples. Nevertheless he care- fully noted the new sources of national strength which its reforms called forth in France.

Meanwhile Prussia, after being at war with France during the years 1792-95, came to terms with it at Basel in April 1795, and remained at peace until 1806, though Austria and South Ger- many continued the struggle with France for most of that interval. Prussia, however, lost rather than gained strength at this time; for Frederick William III., who succeeded the weak and sensual Frederick William II. in November 1797, was lacking in fore- sight, judgment and strength of character. He too often allowed public affairs to be warped by the advice of secret and irrespon- sible counsellors, and persisted in the policy of subservience to France inaugurated by the treaty of Basel. It was under these untoward circumstances that Stein in 1804 took office at Berlin as minister of state for trade. He soon felt constrained to protest against the effects of the Gallophil policy of the chief minister, Haugwitz, and the evil influences which clogged the administration. Little, however, came of Stein's protests, though they were urged with his usual incisiveness and energy. Prussian policy continued to progress on the path which led to the disaster at Jena (Oct. 14, 1806).

The king then offered to Stein the portfolio for foreign affairs, which the minister declined to accept on the ground of his incompetence to manage that department unless there was a complete change in the system of government. The real motive for his refusal was that he desired to see Hardenberg take that office and effect, with his own help, the necessary administrative changes. The king refused to accept Hardenberg, and, greatly irritated by Stein's unusually

outspoken letters, dismissed him altogether, adding that he was " a refractory, insolent, obstinate and disobedient official." Stein now spent in retirement the months during which Napoleon completed the ruin of Prussia; but he saw Hardenberg called to office in April 1 807 and important reforms effected in the cabinet system. During the negotiations at Tilsit, Napoleon refused to iact with Hardenberg, who there- upon retired. Strange to say, the French emperor at that time suggested Stein as a possible successor. No other strong man was at hand who could save the ship of state; and on the 4th of October 1807 Frederick William, utterly depressed by the terrible terms of the treaty of Tilsit, called Stein to office and entrusted him with very wide powers.

Stein was now for a time virtually dictator of the reduced and nearly bankrupt Prussian state. The circumstances of the time and his own convictions, gained from study and experience, led him to press on drastic reforms in a way which could not otherwise have been followed. First came the Edict of Emanci- pation, issued at Memel on the 9th of October 1807, which abolished the institution oi serfdom throughout Prussia from the; 8th of October 1810. All distinctions affecting the tenure of land (noble land, peasants' land, &c.) were also swept away, and the principle of free trade in land was established forthwith. The same famous edict also abrogated all class distinctions respecting occupations and callings of any and every kind, thus Striking another blow at the caste system which had been so rigorous in Prussia. Stein's next step was to strengthen the cabinet by wise changes, too complicated to be enumerated here. He also furthered the progress of the military reforms which are connected more especially with the name of Scharn- horst (q.v.); they refashioned the Prussian army on modern lines, with a reserve system. Stein's efforts were directed more towards civil affairs; and in this sphere he was able to

issue a measure of municipal reform (Nov. ig> 1808) which granted local self-government on enlightened yet practical lines to all Prussian towns, and even to all villages possessing more than 800 inhabitants.

Shortly afterwards the reformer had to flee from Prussia. In August 1808 the French agents, who swarmed throughout the land, had seized one of his letters, in which he spoke of his hope that Germany

would soon be ready for a national rising like that of Spain. On the 10th of September Napoleon gave orders that Stein's property in the new kingdom of Westphalia should be confiscated, and he likewise put pressure on Frederick William to dismiss him. The king evaded compliance; but the French emperor, on entering Madrid in triumph, declared (December 16) le nomm£ Stein to be an enemy of France and the Confederation of the Rhine; and ordered the confisca- tion of all his property in the Confederation. Stein saw that his life was in danger and fled from Berlin (Jan. 5, 1809). Thanks to the help of his former colleague, Count Friedrich Wilhelm von Reden, who gave him an asylum in his castle in the Riesengebirge, he succeeded in crossing the frontier into Bohemia.

For three years he lived in the Austrian Empire, generally at Briinn; but in May 1812 he received an invitation from the emperor Alexander I. to visit St Petersburg, seeing that Austria was certain to range herself on the side of France in the forth- coming Franco-Russian War. At the crisis of that struggle Stein may have been one of the influences which kept the tsar determined never to treat with Napoleon. When the miserable remains of the Grand Army reeled back into Prussia at the close of the year, Stein urged the Russian emperor to go on and free Europe from the French domination.

Events now brought Stein rapidly to the front. On the 30th of December 1812 the Prussian general Yorck signed at Tauroggen a convention with the Russian general Diebich for neutralization of the Prussian corps at and near Tilsit, and for the free passage of the Russians through that part of the king's dominions. The Russian emperor thereupon requested Stein to act as provisional administrator of the provinces of East and West Prussia. In that capacity he convened an assembly of representatives of the local estates, which on the 5th of February 1813 ordered the establishment of a militia {Landwehr) , a militia reserve and a final levy (Landsturm). The energy which Stein infused into all around him contributed not a little to this impor- tant decision, which pushed on the king's government to more decided action than at that time seemed possible. Stein now went to Breslau, whither the king of Prussia had proceeded; but the annoyance which Frederick William felt at his irregular action lessened his influence. The treaty of Kalisch between Russia and Prussia cannot be claimed as due to his actions, which were reprehended in court circles as those of a fanatic. At that time the great patriot fell ill of a fever and complained of total neglect by the king and court. He recovered, however, in time to take part in the drafting of a Russo-Prussian con- vention (March 19, 1813) respecting the administration of the

districts which should be delivered from French occupation. During the varying phases of the campaign of 1813 Stein con- tinued to urge the need of war d outrance against Napoleon. The Allies, after the entry of England and Austria into the coali- tion, conferred on Stein the important duties of superintending the administration of the liberated territories. After the great battle of Leipzig (Oct. 16-19, 1813) Stein entered that city the day after its occupation by the Allies and thus expressed his feelings on the fall of Napoleon's domination: "There it lies, then, the monstrous fabric cemented by the blood and tears of so many millions and reared by an insane and accursed tyranny. From one end of Germany to the other we may venture to say aloud that Napoleon is a villain and the enemy of the human race."

He now desired to see Germany reconstituted as a nation, in a union which should be at once strong for purposes of defence and founded on constitutional principles. His statesmanlike projects were foiled,' partly by the short-sightedness of German

rulers and statesmen, but also by the craft whereby the Austrian statesman Metternich (q.v.) gained the alliance of the rulers of south and central Germany for his empire, on the under- standing that they were to retain their old governing power unimpaired. Thus it was in vain that Stein, during the congress of Vienna, pressed for an effective union of the German people. Austria and the secondary German states resisted all proposals in this direction; and Stein blamed the Prussian chancellor Hardenberg for betraying an indefiniteness of purpose which probably resulted from the same unfortunate defect in Frederick William of Prussia. Stein shared in the desire of all Prussian statesmen at that time to have Saxony wholly absorbed in their kingdom. In that, as in other matters, he was doomed to disappointment. On the 24th of May 1815 he sent to his patron, the emperor Alexander, a detailed criticism of the federal arrange- ments proposed for Germany, showing that they fulfilled not one of the requirements for real union and constitutional govern- ment which had been so loudly demanded by the German people during the struggle of 1813.

The remainder of Stein's career must be briefly dismissed. He passed into retirement after the congress of Vienna, and saw with pain and disgust the postponement of the representative system of government which Frederick William had promised to Prussia in May 1815. He refused to act as Prussian repre- sentative at the Frankfort diet, which he regarded as a mere travesty of the central federal institution which he had hoped to see. By indirect means he did what

he could to check the violence of political reaction, but he was conscious of his weakness, and that fact embittered the later days of a man who was intensely proud and self-assertive. His chief interest was in the study of history, and in 1818-1820 he worked hard to establish the society for the encouragement of historical research and the publication of the Monumenta Germaniae historica, of which his future biographer, Pertz, became the director. Stein died on the 29th of June 1831. He left three daughters.

In some respects there has been a tendency to magnify the achievements of Stein. As usually happens with men of great force of character, the work of less noteworthy individuals is ascribed to the one commanding personality. This was so even during the fourteen months of phenomenal activity, October 1807 to December 1808. More painstaking research has shown that the credit for originating many of the far-reaching reforms then promulgated must be shared with Heinrich Theodor von Schon and many others. 1 It is now recognized that the king himself at that time rendered unsuspectedly large services to the cause of reform. A popular legend named him as the founder of the Tugendbund, an institution which he always distrusted. But when this is granted, it still remains true that Stein's enlightenment, insight into the needs of the time, and almost superhuman energy, imparted to the reform movement a momentum which ensured its triumph at the most critical period which Prussia or any great European state passed through in the 19th century. All his contemporaries were impressed, or even awed by the determination and intellectual power of this remark- able man. His conversation had the effect of calling out all the powers of his interlocutors. " A conversation with him (wrote Varnhagen vonEnse) was a continual contest, a. continual danger." This mental pugnacity sometimes degenerated into rudeness; and on several occasions his impetuosity led him to take false steps. Still, when we take into consideration the magnitude of his achievements; when we recollect that in 1808 he intended his municipal reform to serve as the foundation for free institutions for the Prussian provinces, and thereafter for the whole kingdom; when we realize the grandeur of his schemes in 1813-1815 for the union of the German people in a federal

1 Thus Schon's memorandum on the abolition of serfdom was the basis of the law of emancipation; and Stein's Politisches Testament was also based on a draft by Schon. Schon was born in 1773, entered the Prussian civil service in 1 793, and subsequently held various high ministerial appointments. He was made castellan (Burggraf) of Marienburg on his retirement in 1842, and died in

1856. The share claimed by him in Stein's reforms has been the subject of some controversy.

system which would combine strength with political liberty — we shall find it difficult to overrate the importance of his contri- bution to the solution of the most complex political problem of modern times.

The chief authority on Stein is the biography by G. H. Pertz (6 vols., 1849-1855), but few English readers will find the need of going beyond the admirable Life of Stein, by Sir John Seeley (3 vols., Cambridge, 1878), which contains a full bibliography. These works are corrected at a few points by Max Lehmann's Leben Steins (Leipzig, 1902-1903). For side-lights on his career an.d character, see H. F. K., Baron vom Stein, Lebenserinnerungen (Hagen, 1901); C. T. Perthes, Politische Zustande und Personen in Deutschland zur Zeit der franzosischen Herrsckaft (2 vols., Gotha, 1862); Denkwurdigkeiten des Staatskanzlers Fiirsten von Hardenberg, ed. by L. von Ranke (5 vols., Leipzig, 1877); Varnhagen von Ense, Denkwurdigkeiten (6 vols., Mannheim, 1837-1842; English ed., London, 1847); A. Stern, Abhandlungen und Aktenstiicke aus der preussischen Reformzeit 1807-1815 (Leipzig, 1885) ; M. Philippson, Geschichte des preussischen Staatswesens 1786-18 13 (2 vols., Leipzig, 1880); M. Lehmann, Knesebeck und Schon (Leipzig, 1875); J. P. Hassel, Geschichte der preussischen Politik, 1807-1815 (Leipzig, 1881); the Vicomte Jean d'Ussel, ILtudes sur I'annee 1813; la defec- tion de la Prusse (Paris, 1907). (J. Hl. R.)

STEINER, JAKOB (1 796-1863), Swiss mathematician, was born on the 18th of March 1796 at the village of Utzendorf (canton Bern). At eighteen he became a pupil of Heinrich Pestalozzi, and afterwards studied at Heidelberg. Thence he went to Berlin, earning a livelihood there, as in Heidelberg, by giving private lessons. Here he became acquainted with A. L. Crelle, who, encouraged by his ability and by that of N. H. Abel, then also staying at Berlin, founded his famous Journal (1826). After Steiner's publication (1832) of his Systematische Entwickehingen he received, through Jacobi's exertions, who was then professor at Konigsberg, an honorary degree of that university; and through the influence of G. J. Jacobi and of the brothers Alexander and Wilhelm von Humboldt a new chair of geometry was founded for him at Berlin (1834). This he occupied till

his death, which took place in Bern on the 1st of April 1863.

Steiner's mathematical work was confined to geometry. This he treated synthetically, to the total exclusion of analysis, which he hated, and he is said to have considered it a disgrace to synthetical geometry if equal or higher results were obtained by analytical methods. In his own field he surpassed all his contemporaries. His investigations are distinguished by their great generality, by the fertility of his resources, and by such a rigour in his proofs that he has been considered the greatest geometrical genius since the time of Apollonius.

In his Systematische Entwickelung der Abhangigkeit geometrischer Gestalten von einander he laid the foundation of modern synthetic geometry. He introduces what are now called the geometrical forms (the row, flat pencil, &c), and establishes between their elements a one-one correspondence, or, as he calls it, makes them projective. He next gives by aid of these projective rows and pencils a new generation of conies and ruled quadric surfaces, " which leads quicker and more directly than former methods into the inner nature of conies and reveals to us the organic connexion of their innumerable properties and mysteries." In this work also, of which unfortunately only one volume appeared instead of the projected five, we see for the first time the principle of duality introduced from the very beginning as an immediate outflow of the most fundamental properties of the plane, the line and the point. In a second little volume, Die geometrischen Conslruclionen ausgefiihrt mittelst der geraden Linie und eines festen Kreises (1833), republished in 1895 by Ottingen, he shows, what had been already suggested by J. V. Poncelet, how all problems of the second order can be solved by aid of the straight-edge alone without the use of compasses, as soon as one circle is given on the drawing-paper. He also wrote Vorlesungen iiber synthetische Geometrie, published posthumously at Leipzig by C. F. Geiser and H. Schroeter in 1867; a third edition by R. Sturm was published in 1887-1898.

The rest of Steiner's writings are found in numerous papers mostly ublished in Crelle's Journal, the first volume of which contains is first four papers. The most important are those relating to algebraical curves and surfaces, especially the short paper Allgemeine Eigenschaften algebraischer Curven. This contains only results, and there is no indication of the method by which they were obtained, so that, according to L. O. Hesse, " they are, like P. Fermat's theorems, riddles to the present and future generations." Eminent analysts succeeded in proving some of the theorems, but it

was reserved to L. Cremona to prove them all, and that by a

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uniform synthetic method, in his book on algebraical curves Other important investigations relate to maxima and minima. Starting from simple elementary propositions, Steiner advances to the solution of problems which analytically require the calculus of variation, but which at the time altogether surpassed the powers of that calculus. Connected with this is the paper Vom Krummungsschwerpuncte ebener Curven, which contains numerous properties of pedals and roulettes, especially of their areas.

Steiner's papers were collected and published in two volumes {Gesammelte Werke, 1 881-1882) by the Berlin Academy.

See C. F. Geiser's pamphlet Zur Erinnerung an J. Steiner (Zurich, 1874).

STEINMETZ, KARL FRIEDRICH VON (1796-1877), Prussian general field-marshal, was born at Eisenach on the 27th of December 1796 and educated at the cadet school of Stolp in Pomerania from 1807 to 181 1, in the midst of the misery and poverty caused by the French occupation. At the outbreak of the War of Liberation he and his elder brother made their way through the French posts to Breslau, where, in spite of their poverty, they were at once appointed to the army, the elder as ensign on probation, the younger to the substantive rank of second lieutenant. After a vain attempt to obtain a transfer to the Bliicher Hussars, for which regiment he had conceived an intense boyish admiration when it was quartered at Stolp, he was ordered to report himself to York, who treated him and the other officers sent from Breslau with coldness, until young Steinmetz asked " when he was to return to the king who had sent him?" The brothers took part in the hardest fighting of the campaign of 18 13, the elder being killed at Leipzig and the younger being more than once wounded. The short halt on the Rhine he utilized in improving his military and general education. In the battles in France he won the second class of the Iron Cross. After the peace he entered Paris but once, fearing to infringe upon the ten ducats that he saved monthly from his pay to send to his mother. For the same reason he held aloof from the pleasures of his more fortunate comrades. His avoidance of youthful excesses enabled him to overcome his earlier bad health and to acquire a physical vigour which he kept to the end of his long career as a soldier. His character as well as his physique was strengthened by his Spartan way of life, but his temper was naturally embittered

by the circumstances which imposed this self-restraint. His poverty and want of influence were the more obvious as he was, shortly after the wars, assigned to the 2nd Foot Guards, stationed in Berlin. He rigorously devoted himself to study and to the routine duties of his profession. From 1820 to 1824 he studied with distinction at the General War Academy, and was at the end of the course appointed to the topographical section of the general staff. General von Muffling reported of him that he was arrogant and that he resented " encouragement" — which he probably regarded as patronage — but that his ability would enable him to out- distance his comrades. Steinmetz was too poor to mount himself on the small allowance granted to general staff officers, and had to remain with his regiment in consequence. But shortly after this his marriage to his cousin Julie, the daughter of Lieutenant-General K. F. F. von Steinmetz (1768-1837), not only tempered his fierce and resentful state of mind, but in a measure improved his material prospects, for his father-in-law was generous to the young couple, and his appointment as captain at the Guard Landwehr depot at Potsdam, near where the general lived, brought them into daily contact. His brigade commander too, General von Roder, was an excellent soldier, and Steinmetz often spoke in later days of the thorough training he received at his hands. After this from about 1830 his regimental work and his promotion went on without incident for several years, in various garrisons, until in 1839 he became major and battalion commander. In this position he had many official differences with his immediate superiors, for he urged a strenuous war train- ing for the troops, in season and out of season, too vigorously for his more conservative comrades, but off parade his relations with all, thanks chiefly to the social gifts of his wife, were of the most pleasant character. In 1848 he was in command of a guard battalion during the disturbances in Berlin, but was not engaged, and soon found more active employment in the Danish

War. At Schleswig he so distinguished himself that Wrangel, the commander-in-chief, told him that he had " decided the battle." He distinguished himself again at Diippel, and Prince William himself decorated him with the order pour le mirite on parade. For his campaign journals and letters see supplement to MilitSr Wochenblatt for 1878. On returning he was entrusted with the difficult command of the troops at Brandenburg during the sitting of a democratic popular convention at that place, and after this with the control of

some troops that were known to be affected by the prevalent spirit of revolution. At the time of the Olmiitz- Bronnzell incident of 1850 he was employed as military governor of Cassel, and in 1851, becoming colonel commandant of the cadet school of Berlin, he at once set about the reformation of the prevailing system of instruction, the defects of which he had openly condemned as early as 1820. Though more than fifty years of age, he now learned Latin and English in order to be a more competent instructor. In 1854, after forty-one years of active service, he was promoted major-general. At Magdeburg, as at Berlin, his reforming zeal made him many enemies, and in October of this year he sustained a loss which almost unhinged his mind in the death of his youngest and only sur- viving child, a girl of twenty-six. From Magdeburg he was removed to the command of a guard brigade at Berlin (1857), and thence almost immediately to a divisional command in the I. Corps. Early in 1858 he was promoted lieutenant-general, and for the five years that he held this command he devoted himself particularly to acquiring knowledge of the cavalry arm. About 1863, learning that von Bonin, his senior by date, but his junior in age and length of service, was about to be appointed to command the I. Corps, he meditated retirement, but the authori- ties at the same time as they appointed Bonin made Steinmetz commander of the II. Corps, and shortly afterwards, when the crown prince of Prussia took over this post, commander of the V. Corps at Posen. Shortly after this his wife died. He was promoted general of infantry in 1864, and led the V. Corps to the war against Austria in 1866. This was the chance of his lifetime. His skilful and resolute leadership was displayed in his three battles, won on three successive days, of Nachod, Skalitz and Schweinschadel (see Seven Weeks' War), and opened the way through the mountains in spite of the defeat of Steinmetz's rival Bonin at Trautenau. In 1867, in his loneli- ness, the " Lion of Nachod," as he was popularly called, contracted a second marriage with Elise von Krosigk (who after his death married Count Briihl). He was now, for the first time in his life, a fairly wealthy man, having been awarded a money grant for his brilliant services in 1866. About this time he was elected a member of the North German Confederation parliament.

At the outbreak of the war of 1870 Steinmetz was appointed to command one of the three armies assembled on the Rhine, the others being led by Prince Frederick Charles and the crown prince. It was not long before serious differences arose between Steinmetz and Prince Frederick Charles. The former, em- bittered by a lifelong struggle against the influences of wealth and position, and perhaps somewhat grist by his successes in 1866, considered an order to clear

the roads for the prince's army as an attempt to crowd a humbler comrade out of the fighting line, and various incidents added day by day to his growing resentment until at last on the field of Gravelotte (see MeTZ and Franco-German War for an account of these quarrels) he lost his temper and wasted his troops. After this there was no alternative but to relieve him of the command of the I. Army and to send him home as governor-general of the V. and VI. Army Corps districts. In April 1871 he was retired at his own request, but his great services were not forgotten when victory had softened animosites, and he was promoted general field- marshal, given a pension of 200c thalers and made a member of the upper chamber. In the spirit of loyalty which had guided his whole career as a soldier he made no attempt to justify his conduct in 1870 either against the criticisms of the general staff history or against unofficial attacks. His life in retirement was quiet and Happy, and he retained his bodily health" to the

last. He died at Bad Landeck on the 2nd of August 1877. The 37 th Fusiliers of the German army bear his name as part of their regimental title.

See supplement of Militdr Wochenblatt (1877 and 1878).

STEINSCHNEIDER, MORITZ (1816-1907), Jewish biblio- grapher, was born in Moravia in 18 16. He was the most accom- plished bibliographer in the realm of Hebrew literature. His greatest work was his Catalogue of the Hebrew Collection of the Bodleian Library, Oxford ,(1852-1860). In this masterly work he settled many questions as to the locality, date and author- ship of early printed books, and provided a vast mass of bio- graphical materials. His Jewish Literature (published in German in Ersch and Gruber in 1850, in English in 1857, and in Hebrew in 1899) is a complete survey of its subject. Steinschneider prepared many other catalogues (Leiden, Munich, Hamburg and Berlin). He wrote much on Arabic literature, and was the author of bibliographies on a great variety of subjects. Among them may be named bibliographies of Jewish mathematicians and travellers. His most extensive work after his Bodleian Catalogue was his treatise on Hebrew translations in the middle ages {Die hebrdischen Ubersetzungen des Mittelalters, 2 vols., 1893). Much of his work appeared in his periodical Bebraische Bibliographie (1859-1882). He died in Berlin in 1907. (I. A.)

STEINTHAL, HEYMANN (1823-1899), German philosopher and philologist, was born at Grobzig in Anhalt on the 16th of May 1823. He read philosophy and philology at the univer- sity of Berlin, where

he graduated in 1850. From 1852 to 1855 he studied Chinese (language and literature) in Paris, and in 1863 became extraordinary professor of philology at Berlin. In his philosophic theories he sympathized with Moritz Lazarus, in conjunction with whom he founded in 1859 the Zeitschrift fiir V olkerpsychologie und Sprachwissenschaft. Like Lazarus and the Herbartian school in general, he attached supreme value to psychology, and especially to the psychology of society, the study of which, combined with comparative philology, alone could give trustworthy results. In philology he was an admirer and disciple of Wilhelm von Humboldt, on whose methods he wrote several books.

His principal works are Der Ursprung der Sprache im Zusatnmenhang mit den letzten Fragen alles Wissens (1851 ; 4th ed., 1888); Klassification der Sprachen (1850); Charakteristik der hauptsachlichen Typen des Sprachbaues (i860); Die Entwickelung der Schrift (1852); Grammatik, Logik, Psychologie, ihre Prinzipien, &c. (1885); Geschichte der Sprachwissenschaft bei den Griechen und Romern (1863; 2nd ed., 1889-1891); Die Mande-Negersprachen, psychqlogisch und phonetisch betrachtet (1867); Abriss der Sprachwissenschaft, (2nd ed., 1881); Allgemeine Ethik (1880); Zu Bibel und Religionsphilosophie (1890 and 1895). His books on von Humboldt appeared in 1848, 1864 and 1867, and in 1884 he published an edition of his works.

STELE, the Greek name (otˆXt;) for a pillar or vertical slab of stone or marble, sometimes decorated with bas-reliefs and bearing inscriptions, and generally terminated with a cresting (£7ri0?)jua) enriched with the anthemion plant. In later times the stele was crowned with a small pediment. The Way of the Tombs at Athens was lined with stelae, some of them in memory of prominent citizens.

STELLENBOSCH, a town of the Cape province, South Africa, 31 m. by rail E. of Cape Town. Pop. (1904), 7573, of whom 2497 were whites. It lies 360 ft. above the sea in a pleasant upland valley on the Atlantic slope of the coast range, and is, next to the capital, the oldest settlement in the province, having been founded by order of Commandant Simon van der Stell in 1681 and named after him and his wife, whose maiden name was Bosch. The streets are lined with magnificent oaks, while many of the houses with heavy, thatched gables date from the 17th century. Stellenbosch is the headquarters of the Cape branch of the Dutch Reformed Church, and is also an, important educational centre. The chief buildings, besides the churches, are the Dutch theological seminary, Victoria College, Bloemhof girls' school, agricultural college and school of mines,

laboratory and school of science and the S.A. conservatorium of music. The surrounding district is largely devoted to viticulture and

STEM

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fruit-growing. The vineyards have been replanted with Ameri- can stocks. The Stellenbosch valley is closed in by ranges of hills beyond which, eastward, lies Frenchhoek valley, with a village of the same name. This district was the headquarters' of the Huguenot refugees who settled in South Africa at the close of the 17 th century.

In the early days of the Boer War (1899-1902) Stellenbosch was one of the British military bases, and was used as a " remount " camp; and in consequence of officers who had not distinguished themselves at the front being sent back to it, the expression " to be Stellenbosched " came into use; so much so, that in similar cases officers were spoken of as " Stellenbosched " even if they were sent to some other place. The remount dep&t is maintained ; horses and mules thrive here.

STEM (0. Eng. staefn, stemn, cf. Du. slam, Ger. Stamm, &c, probably related to " staff "), in popular language the stalk of a plant, the trunk of a tree (for the technical use of the term in botany see below). There are many transferred uses of the word, such as for the slender structure which joins the foot or base of a vase or goblet to the bowl, a stock or branch of a family, or, in philology, a derivative from a root, the unchanged part in a series of inflected forms. The stem of a ship is the prow, properly a curved piece of timber or metal to which the two sides are attached at its foremost end. This was a Scandinavian use early adopted in English; the word meant simply post, and custom alone restricted it to the bows rather than to the stern; in Danish the distinction is made between {ram slam and bak slam and also in German, V order-steven Hinler-steven.

In botany a stem may be denned as an axis bearing leaves. The stem with its leaves is known as the shoot. Structurally it differs from a root in having no development of cells forming a cap over the growing-point. Under the term caulome (stem structure) are included all those parts of a plant morphologically equivalent in bearing leaves. The stem generally ascends, seeking air and light, and has therefore been termed the ascend- ing axis. Stems have usually considerable firmness and solidity, but sometimes they are weak, and either lie prostrate on the ground, thus becoming*

procumbent, or climb on plants and rocks by means of rootlets, like the ivy, being then called scandent, or twist round other plants in a spiral manner like woodbine, when they are twining. Twining plants turn either from right to left, as the French bean, convolvulus, dodder and gourd; or from left to right, as honeysuckle, twining polygonum, hop and black bryony (Tamus). In other cases climbing plants are supported by tendrils, as in vine, bryony, passion-flower, or by the tendril-like leaf-stalks, as in clematis and Tropaeolum. In warm climates twining plants (lianas) often form thick woody stems, while in temperate regions they are generally herbaceous. Some stems are developed more in diameter than in height, and present a peculiar shortened and thickened aspect, as Testudinaria or tortoise-plant, cyclamen, Melocactus, Echino- cactus and other Cactaceae; while in many orchids (fig. 1) the stem assumes an oval or rounded form, and is called a pseudobulb.

Names are given to plants according to the nature and dura- tion of their stems. Herbs, or herbaceous plants, have stems which die down annually. In some of them the whole plant perishes after flowering; in others, the lower part of the stem forming the crown of the root remains, bearing buds from which the stem arises next season. In biennial herbs the whole plant perishes after two years, while in perennial herbs the crown is capable of producing stems for many years, or new annual products are repeatedly added many times, if not indefinitely, to the old stems. The short permanent stem of herbaceous plants is covered partially or completely by the soil, so as to protect the buds. Plants producing permanent woody stems are called trees and shrubs. The latter produce branches from or near the ground; while the former have conspicuous trunks. Shrubby

Fit;. 1. — Orchid with pseudobulbs, p.

plants of small stature are called under-shrubs or bushes. The limits between these different kinds of stem are hot' always well defined; and there are some plants occupying an inter- mediate position between shrubs and trees, to which the name of arborescent shrubs is occasionally given.

The stem is not always conspicuous. Plants with a distinct stem are caulescent; those in which it is inconspicuous are acaulescent, as the primrose, cowslip and dandelion. A similar term is given in ordinary language to plants whose stems are buried in the soil, such as cyclamen or sowbread. Some plants are truly stemless, and consist only of expansions of cellular tissue representing stem and leaf,, called a thdllus, and hence are denominated Thallogens, or

Thallophytes.

The first rudiment of the young shoot of the embryo appears from the seed after the radicle (young root) has protruded. It is termed the plumule (fig. 2), and differs from the radicle in the absence of a root-cap and in its tendency to ascend. The apical growing portion constitutes the terminal bud of the plant, and by its development the stem increases in height ; projections appear at regular intervals, which are the rudimentary leaves, and in addi- FlG 2 ._The Embryo of the Pea tion there is a provision for i a ;(j open

the production of lateral buds, c< Cj The two fl esny cot le . which deve op into lateral shoots dons? or geed-iobes, which remain more cr less resembling the underground when the plant parent stem, and by these s p rou t s

the branching of the plant is r< T ' he you root r radicle, determined (fig. 3). These buds «, The axis bearing the young are found in, the axil of pre- shoot or p i umu i ei g> wh ; c h lies viously-formed leaves;, or, in in a depression of the cotyle- other woyds, in the angle dons t formed between the stftm and ■ '•'

leaf. They are hence called axillary. They are produced like the leaves from the outer portion of the stem (exogenous), and at first consist entirely of cellular tissue, but in the progress of growth vascu- lar bundles are formed in- them continuous- with those of the stem, and ultimately branchesare prbduced.whkh in every respect resemble the axis whence the buds first sprang. In the Lyco- pods branching takes place by forking of the growing- point, the main axis being thus replaced by two equiva- lent axes (fig. 4); in most cases the new axes develop unequally, the weaker be- coming, pushed aside and appearing later as a lateral branch of the stronger. The place of origin of the leaf is called a node ; the intervals between nodes are called in- ternodes. The stem, although it has a tendency to rise up- wards when first developed,

(From Strasburger's Lekrbnck dcr Botanik, permission of Gustav Fischer.)

in many instances becomes FlG 3 _ Ap ex of a shoot of a phanero-

prostrate, and either lies gamie plant.

along the ground partially Extreme apex, so-called vegetative

covered by the soil, or runs r cone

completely, underneath its , Lea f rudiment.

surface, giving off roots from g Rudiment of an axillary bud.

one side and buds from the ….,,’._.;.

other. Some stems are therefore subterranean, and are distinguished

from roots by the provision made for regular leaf-buds. ,

Growth in length of the stem is due to elongation of the internodes ; the zone of most rapid growth is at some distance below the apex; below this the rate of growth gradually diminishes until the portion is reached where growth in length no longer takes place. _ In some cases, as in the stems of grasses, growth in lengtk persists for a longer time in a small region at the base of the internodes; this is known as intercalary growth. In the dwarf or short shoots, such as those of the larch, the internodes do not elongate and the leaves remain close together. Lateral buds give rise to branches, from which others, called branchlets or twigs, arise. The terminal bud, after producing leaves, sometimes dies at the end of one season, and the whole plant, as in annuals, perishes; or part of the axis is persistent, and remains for two or more years, each of the leaves before its decay producing a bud in its axil. This bud

continues the growth in spring. In ordinary trees, in which there is provision made for the formation of numerous lateral buds, any

*injury done to a few branches is easily repaired ; but in palms, which only form terminal buds, and have no provision for a lateral formation of them, an injury inflicted on the terminal bud is more likely to have a prejudicial effect on the future plant. In the trees of temperate and cold climates the buds which are developed during one season lie dormant during the winter, ready to burst out under the genial warmth of spring. They are generally protected by ex- ternal modified leaves in the form of scales, which frequently exhibit a firmer and coarser texture than the leaves themselves. They serve a (r? .-ˆburger’s .Ltkrbuck der temporary purpose, and usually fall Bolamh, by permission of Gustav a f *. ”””/ “”*

Fischer.) off sooner or later, after the leaves

Fig. 4.— Longitudinal sec- fre expanded. The bud is often pro-

tion of a bifurcating shoot tect J: d h ? . a , coa . tln S ° f reslnou J s

(P) of Lycopodium alpinum, Jitter, as in the horse-chestnut and

showing equal development balsam P°P lar ‘ ° r b y. a thick downy

of the rudimentary shoots, co ˆ e ˆ ln f’ as . “\ th ? .J”” ™- , Llnnae ” s p’ p” called leaf-buds hibernacula, or the*

‘b, ‘Leaf rudiments; c, f inter

Cortex; /, Vascular strands. i n . som 1 e P . lan f’ as , m the , P lan f’ ˆ e

buds destined to live through the

winter are so completely surrounded

by the base of the petiole as not to be visible until the leaf has fallen

off. These are said to be intrapetiolar.

In the bud of a common tree, as the sycamore (fig. 5), there is seen

the cicatrix or scar left by the leaf of the previous year c, then the

Fig. 5. — Leaf-bud of Sycamore Fig. 6. — Transverse section of (Acer Pseudo-platanus) covered the same leaf -bud. with scales.

scales e, e, arranged in alternate pairs and overlying each other in what is called an imbricated manner. On making a transverse section of the bud (fig. 6), the overlying scales e, e, e, e, are distinctly seen surrounding the leaves /, which are plaited or folded round the axis or growing-point. In plants of warm climates the buds are often formed by the ordinary leaves without any protecting append- ages; such buds are called naked. A bud may be removed in a young state from one plant and grafted upon another by the process of budding, so as to continue to form its different parts; and it may even be made to grow in the soil, in some instances, immediately after removal. In some trees of warm climates, as papawtree, palms and tree-ferns, growth by terminal buds is well seen. In these plants the elongation of thestem is generally regular and uniform, so that the age of the plant may be estimated by its height; as there is no great increase in the leaf area owing to absence of branching, there is no need for a great increase in the diameter of the stem.

Although provision is made for the regular formation of buds, there are often great irregularities in consequence of many being abortive or remaining in a dormant state. Such buds are called latent, and are capable of being developed in cases where the terminal bud, or any of the branches, have been injured or destroyed. In some instances, as in firs, the latent buds follow a regular system of alternation; and in plants with opposite leaves it frequently happens that the bud in the axil of one of the leaves only is developed , and the different buds so produced are situated alternately on opposite sides of the stem. Occasionally, after a partial develop- ment as branches, buds are arrested and form knots or nodules. The so-called embryo buds or woody nodules in the bark of the beech, elm, olive and other trees are of this nature. They are partially developed buds, in which the woody matter is pressed upon by the surrounding tissue, and thus acquires a very hard and firm texture. When a section is made, they present woody circles arranged around a central pith, and traversed by medullary rays. The nodules sometimes form knots on the surface of the stem, at

other times they appear as large excrescences, and in some cases twigs and leaves are produced by them.

When the terminal bud is injured or arrested in its growth the elongation of the main axis stops, and the lateral branches often 'acquire increased activity. By continually cutting off the terminal buds a woody plant is made to assume a bushy appearance, and thus pollard trees are produced. Pruning has the effect of checking the growth of terminal shoots, and of causing lateral ones to push forth. The peculiar bird-nest appearance often presented by the branches of the common birch depends on an arrestment in the terminal buds, a shortening of the internodes, and a consequent clustering or fasciculation of the twigs. In some plants there is a natural arrestment of the main axis after a certain time, giving rise to peculiar shortened stems. Thus the crown of the root is a stem of this nature, forming buds and roots. Such is also the case in the stem of cyclamen, Testudinaria, and in the tuber of the potato. The production of lateral in place of terminal buds sometimes gives the stem a remarkable zigzag aspect.

The mode in which branches come off from the stems gives rise to various forms of trees, as pyramidal, spreading or weeping — the angles being more or less acute or obtuse. In the Italian poplar and cypress the branches are erect, forming acute angles with the upper part of the stem; in the oak and cedar they are spreading or patent, forming nearly a right angle; in the weeping ash and elm they come off at an obtuse angle; while in the weeping willow and birch they are pendulous from their flexibility. The comparative length of the upper and under branches also gives rise to differences in the contour of trees, as seen in the conical form of spruce, and the umbrella-like form of the Italian or Stone pine (Pinus Pinea). The branching of some trees is peculiar. In the Amazon district many Myristicaceae and Monimiaceae have whorled branches coming off in fives. This is also seen in the Chili pine.

Branches are sometimes long and slender, and run along the ground, producing buds with roots and leaves at their extremity. This is seen in the runner (flagellum) of the strawberry. In the house- leek (Sempervivum) there is a similar prostrate branch of a shorter and thicker nature, known as an offset, producing a bud at its extremity capable of independent existence. In many instances the branch decays, and the young plant assumes a separate existence. Gardeners propagate plants by the process of layering, which consists in bending a twig, fixing the central part of it into the ground, and,

after the production of roots, cutting off its connexion with the parent. A stolon differs from these in being a branch which curves towards the ground, and, on reaching a moist spot, takes root and forms an upright stem, and ultimately a separate plant. This is a sort of natural layering, and the plant producing such branches is called stoloniferous. In the rose and mint a subterranean branch arises from the stem, which runs horizontally to a certain extent, and ultimately sends up an aerial stem, which becomes an inde- pendent plant. Such branches are denominated suckers, and the gardener divides the connexion between the sucker and the parent stem, in order to propagate these plants. In the case of asparagus and other plants which have a perennial stem below ground, subterranean buds are annually produced which appear above ground as shoots or branches covered with scales at first, and ultimately with true leaves. These branches are herbaceous and perish annually, while the true stem remains below ground ready to send up fresh shoots next season. In ' bananas and plantains the apparent aerial stem is a shoot sent up by an underground stem, and perishes after ripening fruit. Branches are sometimes arrested in their develop- ment, and, in place of forming leaves, become transformed into spines or thorns, as in the hawthorn. Plants which have spines in a wild state, as the apple and pear, often lose them when cultivated, in consequence of their being changed into branches; in some cases, as in the sloe (Prunus spinosa) (fig. 7), a branch bears leaves at its lower portion, and terminates in a spine. In some climbing plants some of the shoots are transformed into tendrils, which help the plant to climb by twining about a support, as in passion-flower and vine; or, as in Ampelopsis Veitchii, by forming ad- hesive disks at the tips of their branchlets which enable them to cling to flat supports. In some cases branches become flat and leaf-like, taking the place in the plant economy of the leaves, which are reduced to small scales or spines, as in butcher's broom ; branches showing this modification are termed cladodes or phylloclades (fig. 8). In Cactaceae (e.g. Opuntia, prickly pear, fig. 9) and fleshy euphorbias, where the leaves are reduced to spines, the fleshy stems become green and perform the functions of leaves; they also serve as water reservoirs for the plants, which are natives of very dry countries.

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Fig. 7. — Branch of the Sloe (Prunus spinosa) producing spines or thorns, which are abortive branches, as shown by their bearing leaves.

Buds sometimes become extra-axillary in consequence of the non-appearance or abortion of one or more leaves, or on account of the

Fig. 8. — Twig of Butcher's Broom (Ruscus aculeatusY slightly enlarged, showing cladodes' c.

adhesion of the young branch to the parent stem. In place of one bud there are occasionally several accessory ones produced in the axil, ' ' giving origin to numerous branches!

By the union of several such buds branches are produced having a thickened or flattened appearance, as is seen in the fir, ash and other trees. In some cases, however, these fasciated branches are owing to the abnormal development of a single bud.

The typical form of stems is rounded. They are sometimes compressed or flattened laterally (fig. 9), while at other times they are angular. Various terms are applied to the forms of stems, as cylindrical or terete, quadrangular or square, jointed or articulated, &c. The following are some of the more important modifications of stems: The crown of the root is a shortened stem, often partially underground, which remains in some plants after the leaves, branches and flower- stalks have withered. In this case the internodes are very short, and the nodes are crowded together, so (From Strasburger's Lckrbuch der Bola- that the plant appears to be stem- mi, by permission of Gustav Fischer.) i_- t,. ;„ „__ •„ „„ • , .

Fig. 9 .Opunlia monacan T*' ,** ' s se ? n ˆ• p ,f re j? nla ! P lants –

thia, showing "flower and fruit. f£ tZfnA n dl \ do ™ t0

The leaves are reduced to ˆ rn f f °Z h ffi "£ 1* £ '***""? tnorns or root-stock (fig. 10) is a horizontal

stem usually sending out numerous

roots and leaf-buds from its upper surface. It occurs in ferns, iris,

Hedychium, Acorus or sweet flag, ginger, waterlily, many species of

Fig. 10. — Rhizome of Polygonalum multiflorum (Solomon's Seal),

forming buds and adventitious roots.

a, bud which will form the aerial shoot next season; b, c, d, e, scars

of successive aerial shoots ; w, root.

Carex, rushes, anemone, &c. The leaves are reduced to scales and by their presence, and the absence of a root-cap, a rhizome can be

distinguished from a root. A rhizome such as occurs in Solomon's seal (fig. 10) is not a single stem, i.e. the product of a single bud, but is composed of portions of successive axes, the aerial parts of which have died off, leaving their scars (fig. 10, 6, c, d, e). Rhizomes are well seen in British ferns. A rhizome sometimes assumes an erect form, as in Scabwsa succisa, in which the so-called praemorse root is in reality a rhizome, with the lower end decaying. The erect rhizome of Ctcuta virosa (water-hemlock) shows hollow internodes separated by partitions. In the coral-root orchid Corallorhiza which grows in soil rich in humus, no roots are developed, the coral-like branching rhizome acting as theabsorbingorgan (fig. ii,).Apseudobulb (ng I) is an enlarged bulbous-like aerial stem, common in epiphytic orchids -it is covered with a thick epidermis and acts as a water-store tor the plant, which from its growth on branches of trees and in similar positions is often unable to get sufficient water for its immediate needs. A sobole is a creeping underground stem, sending roots from one part and leaf-buds from another, as in couch-grass Carex arenana, and Scirpus lacustris. It is often called a creeping root but is really a rhizome with narrow elongated internodes. A tuber is a thickened stem or branch produced by the approximation of the nodes and the swelling of the internodes, as in the potato. The eyes of the potato are leaf-buds. Tubers are sometimes aerial, occupying the place of branches. The ordinary herbaceous stem of the potato, when cut into slips and planted, sends off branches from its base, which assume the form of tubers. Tubers fre- quently store up a quantity of starch, as in Maranta arundina- cea, whence arrowroot is derived. Another form of thickened un- derground stem is the corm, as seen in the autumn crocus (Col- chicum, fig. 11), gladiolus, &c. Structurally it is composed of a solid more or less rounded axis covered by a layer of thin mem- branous scales (fig. 12, h, h). A corm is only of one year's dura- tion, giving off buds annually in

(After Sachs.)

Fig. 12.— Corms of Colchicum autumnale in autumn when the plant is in flower.

k,

h, h,

w,

st,

k',

Fig. 11. — Corm of Meadow Saffron or Autumn Crocus {Colchicum autumnale).

a. Old corm shrivelling.

b, Young corm produced later- ally from the old one.

s,s' V, I b,b' k".

Oldest corm.

Brown scales covering it.

Its roots.

Its withered flowering

stem. Younger corm produced

from k. Roots from k', which

grows at expense of k. s", Sheathing leaves. Foliage leaves. Flowers. Young corm produced

from k' in autumn,

which in succeeding

autumn will produce

flowers.

the form of young corms. In autumn the young corm gives origin to leaves, the lower of which (s, s', s") form sheaths round the corm and flower stalk, the upper (/', /") remaining very small ; and in the axil of the uppermost leaves the flowering-stem develops and bears the flowers (b, b'). Meanwhile in the axil of one of the middle leaves on the corm, a bud — the rudiment of a new corm — appears (“). The flowering-stem dies down, and the young corm k' from which it

arose enlarges greatly during the winter at the expense of its parent corm (k) , which thus becomes shrivelled. In spring the leaves produced on it (/', /), which were merely rudiments in autumn, appear above ground as conspicuous large leaves. At the end of spring these leaves die down, the bases of the lower ones

alone remaining, and , constituting thin brown scales around the corm (as at h). Meanwhile, the young bud-corm (") in the axil of the middle leaf grows rapidly at the expense . of its parent corm (&'), but it does not attain . a great size. In autumn it produces new leaves, which remain small, but from the axil of the two upper the flowering stem 1 rises up and bears flowers; whilst in the axil of one of its middle leaves a new bud-corm appears, which will the following ; autumn pro- duce- young leaves; ; flowering stem, and' a new bud-corm, arid thus the cycle goes on. The buds or hew corms formed from the old corms may be produced either laterally, as in Cokhicum autum- nale, or terminally, as in crocus and gladiolus. The bulb, is another form of underground stem or bud. The. axis in this case is much shortened, and the internodes are hardly developed. The bases of the leaves rising from the stem are quite close together, and become succulent and enclose the axis. In the lily the thick and narrow scales are arranged separately in rows, and the bulb is called scaly; while in the leek,*

i-c. „ c, u J>J 7 l i l onion, squill and tulip the scales are (Prom Stiasburgeifs Lphthvch 1 j j 1 – X. ˆ.

*ier Boianik by permission " of broad, and enclose each other in a con- Gustav Fischer.) ■'[. : centric manner, the outer ones being thin Fig. 13. — Rhizome of anc * membranous, and the bulb is luni- Corallorhiza innata, (Nat. cate d- In the axils of these fleshy scales size.) • new lateral shoots arise, forming new*

a, Floral shoot. ' . bulbs. The lateral buds or cloves, some-

*b, Rudiments of ni*ir\ times remain attached to the axis, and*

*rhizome branches. * produce flowering stems, so that appar- ently the same bulb continues to flower for many years, as hi the. hyacinth and tulip; at: other times the young bulbs are detached, and form separate plants. In the axil of the leaves of Lilium bulbiferum, Dentaria bulbifera, and some other plants, small comical or rounded*

bodies are produced, callea bulbils or bulblets (fig. 14, 0). They resemble bulbs in their aspect, and, consist of a small number of; thickened, scales enclosing a growing-point. These scales are frequently united closely together, so as to form a solid mass. Bulbils are therefore fc /w 1///// transformed leaf-buds, which' are easily detached, and are capable 'jpf •producing young plants when, pfecfcd it . favourable circumstances. The spitesˆn bulbsyary in number. In Gageattievfr is- only onft scale ; w ? f in the tulip and F.riiillaria imperialif they*

*r, ,,"?; I4 ' T-i m /T-i- TOT Irom two to ■ five 1 while m Kites and Bulbiferous Lily (Lilt- hyacinths there are ia great number of urn bulbifemm), show- ^^ In the ˆ a , b H d is formed in ing bulbils b produced the axil of an outer's^, a*a\this gives in the axils 01 tne j.;ˆ to a new fl ower j n gr axis, andVa new leaves. bulb, at the side of which the* former*

bulb is attached in a withered state. . "if, ;-,.. ;•'

Adventitious shoots are those which arise elsewhere- tns|(i)} the normal predetermined place, as from old stems,, or footsi Such

*shoots are f requfent on the roots of elmˆ poplar, plum and other fruit- trees. Occasionally ad- ventitious buds are produced" on ihi edges of leav*s, as ■ in Bryo- pkyllufn- calycinum (fig. 15), Malaxis paludosa, and various species of Asplenium, and on the surface of leaves, as Fig. 15-Leaf of BryophyUum caCyci- inˆnithogˆthyrˆ num, producing buds along the margin taeum – lnese ar<*

at the extremities of the primary veins.

are capable of forming in- dependent plants. Simi- lar buds are also made to appear on the leaves of Begonia, Gesnera, Gloxinia and Achimenes, by wounding various parts of them, and placing them in moist soil; this is the method often pursued by gardeners in their propagation. The ipecacuanha plant has been propagated by means of leaves inserted in the soil. In this case the lower end of the leaf becomes thickened like a corm, and from it roots are produced, and ultimately a bud and young plant.

STENBOCK, MAGNUS GUSTAFSSON, Count (1664-1717), Swedish soldier, was educated at Upsala and at Paris, chose the military profession, and spent some years in the service of

the IMited Provinces. Returning to Sweden he entered the army, arid in 1688 became major. He served with the Swedes in the Low

Countries and on the Rhine, distinguishing him- self for skill and courage at Fleurus. During the War of the Grand Alliance he was employed not only in the field but also as a confidential agent in diplomatic missions. Soon after- wards as colonel of the Dalecarlian regiment he led it in the astonishing victory of Narva. He distinguished himself still more at Diinamunde, Klissow and Cracow. In 1703 he fought the successful battle of Fultusk, and three years later, having reached the rank of general of infantry, was made governor- general of the province of Scania, which he delivered from the Danish invaders by the decisive victory of Helsingborg. He was a great favourite with Charles XII. in the earlier campaigns, but later the two drifted somewhat apart. It is recorded that the king, before whom General Lagercrona accused Stenbock of drunkenness, replied that " Stenbock drunk was more capable of giving orders than Lagercrona sober." His activities were not confined to war and diplomacy; the university of Lund was under his care for some years, and he had no mean skill as a painter and a poet. He became councillor in 17 10, and Charles gave him his field marshal's baton in 171 2. In the same year he invaded Mecklenburg (with but 9000 men) in order to cover Stralsund. He won the brilliant action of Gadebusch, but numbers prevailed against him in the end. Cut off in Tonning he was forced to surrender after a gallant resistance, and passed into captivity. Five years of harsh treatment in Copenhagen brought his life to a close in 1 71 7.

See Loenbom, Magni.Stenbocks lefverne (1 757—1 765); Lilljestrale, Magnus Stenbock (Helsingborg, 1890).

STENCIL, a thin plate or sheet of metal, leather, »§ber or other material cut or pierced with a pattern or design; this is laid upon a surface and colour or ink is brushed or rubbed over it, thus leaving the ground colour of the surface imprinted with the design or pattern cut out. In ceramics the stencil is pro- duced by coating the biscuit with a preparation which prevents the transfer-paper or enamelling from adhering to the surface at those parts where the original colour of the biscuit is 'to be preserved. According to Skeat (Etym. Diet,, 1010) the word stands for an earlier stinsel, and is to be derived from Old French estinceller, to sparkle, to powder with stars, an old term in heraldry, from Latin .scintilla, a spark. The same French word has given the English "tinsel," strips, disks or pieces of thin glittering metallic substances used for the decoration of fabrics, hence any gaudy, showy and pretentious material or substance.

STENDAL, a town of Germany, in the province of Prussian Saxony, picturesquely situated on the Uchte, 70 m. W. of Berlin on the main

*line of railway to Hanover'and at the junction of lines to Bremen, Magdeburg and Wittenberge. Pop/(ioos), 23,281. Among the relics of its former importance are the cathedral, built in 1420-1424 (though originally founded in 11 88), restored in 1893 and now housing the archaeological collection of the Altmark, the Gothic church of St Mary, founded in 1447; a "Roland column " of 1535, and two fortified gateways, dating from the 13th century. The last form the chief remains of the ancient fortifications, the site of which is now mostly occupied by promenades. A monument to the archaeologist Johann Joachim Wincketmann (1717-1768) commemorates his birth in the town. Stendal is the seat of a large railway workshop, and carries on various branches" of textile industry, besides the manufacture of tobacco, machinery, stoves, gold-leaf, &c. The earliest printing-press in the Altmark was erected here, and published in edition of the Sachsenspiegel in 1488 as its first book. * *

Stendal was founded in 1151 by Albert the Bear, on the site of a Wendish settlement, and soon afterwards acquired a muni- cipal charter. Becoming capital of the Altmark and a frequent imperial residence, it rose to a considerable degree of prosperity, in part recently restored to it by its railway connexions. When the mark was divided in 1258, Stendal became the seat of the elder or Stendal branch of the house of Ascania, which, however, became extinct in 1320. The original Wends were gradually*

fused with the later Saxons, although the Platea Slavonica, mentioned in 1475, was still distinguished as the Wenden Stfasse in 1567. The population still exhibits a marked Slavonic element.

See Gotze, Urkundliche Geschichte der Stadt SUndal (Stendal,

1873).

STENO, NICOLAUS (1631-1686), Danish naturalist, was born at Copenhagen in 1631, and studied medicine and anatomy in that city and in Paris. After a period of travel he settled in Italy (1666) at first as professor of anatomy at Padua, and then in Florence as house-physician to the grand-duke 'Ferdinand II. of Tuscany. He returned to his native city in 1672 to become professor of anatomy, but, having become a Roman Catholic, he found it expedient to

return to Florence, and was ultimately made apostolic vicar of Lower Saxony. He died at Schwerin in Mecklenburg, on the 25th of November 1686. His fame rests on De solido intra solidum naturaliter conlento, published at Florence in 1669. In this notable work Steno described various gems, minerals and petrifactions (fossils) enclosed within solid rocks. He compared the fossil with the living organisms, and distinguished marine and fluviatile formations. He argued also in favour of the original horizontality of sedimentary deposits.

See Di Nicola Stenone e dei suoi studii geologici in Italia, by G. Capellini (1870) ; K. A. von Zittel's History of Geology and Palaeontology (Eng. ed., 1901) ; and W. J. Sollas, in Science Progress for Jan.

1898.

STEHOGRAPHY (from Gr. crevos, close, narrow, and ypacpHv, to write), the system or art of writing by signs re- presenting single sounds or groups of sounds, single words or groups of words, sometimes also styled " brachygraphy " (Gr. /3paxw, short); it is a general term including all the various systems of shorthand writing (see Shorthand).

STENTOR, one of the Greeks before Troy (Iliad, v. 783), whose voice was as loud as that of fifty men. It is said that he came by his death as the result of challenging Hermes, the crier of the gods, to a contest. Possibly, like Hermes himself, Stentor is a personification of the wind. The name is used in modern times of any one possessing a particularly loud voice (stentorian).

STENTOR, a genus of heterotrichous ciliate Infusoria (<7.>.), so named by R. Oken. It possesses a large moniliform meganu- cleus, accompanied by numerous micronuclei, and has a trumpet shape, when at rest, anchored by pseudopodial outgrowths from the narrow end. It is relatively large, and is much utilized to demonstrate myonemes, and had been also the object of interesting studies on regeneration, any piece, containing with a fragment of the meganucleus at least one micronucleus, regenerating the whole animal (see Regeneration). S. poly- morphs often inhabits a gelatinous sheath and may be green with zoochlorella; it attains a length of -fo in. 5V caeruleus and igneus are coloured blue and scarlet respectively by pigment granules in the ectosarc: E. R. Lankester made a study of the pigment of the former (blue stentorin).*

STEPHAN, HEINRICH VON (1831-1897), German statesman, was born at Stolp, in Pomerania, on the 7th of January 183 1. From his earliest years he showed that talent for languages to which he owed so much of his success in life,' and before he went to school had acquired a considerable knowledge of Italian, Spanish and English. He was educated at the grammar school of his native town, and at the age of sixteen entered the service of the Prussian post office. His promotion was rapid; he was transferred to East Prussia, and thence to Cologne. Here he added to his salary by writing dramatic criticism, and here he obtained his first acquaintance with the system, or rather lack of system, which with its complication of charges made all international postal correspondence so expensive and uncertain — a system which he was in later years to revolutionize. After passing the examinations which ' ad- mitted him to the higher branches of the service he was trans ferred to Frankfort-on-the-Oder, and in 1856 to Berlin. Many different stories are told of the manner in which his exceptional*

knowledge of Eiiropean languages was brought to the know- ledge of the postmaster-general, who at once saw that capacity and attainments of the kind could best be used at headquarters. During the next few years he was entrusted with very important duties; he was chosen as Prussian representative when a postal treaty was arranged with Spain and Portugal. In 1864 he was given the task of reorganizing the postal service in the conquered duchies of Schleswig and Holstein, and in 1866 it fell to his lot to extend the Prussian system to the newly annexed provinces; he had to take over and replace the system by which for three hundred years the family of Thurn and Taxis had conducted the postal service of central Germany. He also found time to write works on the history of postal matters, viz. & History of the Prussian Post Office (1859), and articles on the means of communication in ancient and medieval times, which appeared in Raumer's Historisches Taschenbuch (1868). He was one of the invited guests at the opening of the Suez Canal, and in 1872 published a work on modern Egypt.

In 1870, at the early age of thirty-nine, Stephan was made postmaster-general of the North German confederation, and in the next year of the newly founded empire; in 1878, at the general reorganization of the imperial administration (see article Germany) the post office was made a separate depart- ment, and his title was altered to that of secretary of state. His great powers of organization were at once shown in the arrange- ment of the admirable Feld Post, which during the war with France maintained communication with the army in the field. In eight months 89,000,000 letters, 2,500,000

post-cards, and £10,000,000 in money passed through the department, and it was his boast that letters were delivered to and collected from the soldiers with almost unfailing regularity, sometimes even on the field : of battle. In this way he began what was the great work of his life, that of making the post office in the truest sense of the word popular, and henceforth he was unremittingly occupied in devising and adopting new contrivances for the convenience and use of the people. The introduction of post-cards was his first innovation. In this he had been anticipated by Austria, but the idea was his own, and had been adopted by the Austrians in consequence of a suggestion made by him at a postal conference in 1865. The development of the parcel post and of the system of money orders was his next work, and in this he was so successful that in 1883 the German post office dealt with 79,000,000 parcels, while in all the other countries of the world together only 52,000,000 went through the post. While in this and other ways he extended the use of the post office at home, he gained a wider celebrity in being the chief promoter of the International Postal Union. He presided at the first conference, which met at Bern in 1874.

The alacrity of Stephan's intelligence and his enthusiasm for the institution over which he presided were shown by the readiness with which he applied or took over all new inventions which might be of public service, such as .telegraphs, telephones and pneumatic tubes. His pride in the post office showed itself in the immediate interest which he took in the design and plan of the new offices which were erected in all parts of Germany; it was always his ambition that the post office in each town should be the most conspicuous and the handsomest of public buildings; even at the sacrifice of economy. He warmly sup- ported Bismarck in his policy of extending and promoting national industry and foreign trade, and arranged the subsidies by which a direct postal service was established between Germany and China and Australia. His national feeling also- showed itself in the support which he gave to the movement for purifying the German language of foreign words— but he did not always succeed in avoiding the exaggeration verging on the ridiculous into which this movement so easily degenerates. While he stood aloof from ordinary party politicsˆ he was a frequent speaker in the Reichstag on the affairs of his own department, and was a' member of the Bundesrat. Though never on terms of intimate friendship with Bismarck, his mastery in his own department won for him the appreciation of the chancellor, and he was allowed more independence than moat

of the officials. By the power of working out broad and general principles in detail and idealizing the routine work of administration he may fairly be placed among the great administrators by whom (far more than by statesmen and politicians) the Prus- sian state has been built up, and he was singularly fortunate in that his life fell at a time when by perfecting the administration of the newly founded imperial post he took no small part in strengthening the national idea and binding together the German nation. In 1897 blood-poisoning, arising from a wound in the foot, made amputation of the leg necessary, and he died from the effects of the operation, on the 8th of April 1897.

See E. Knickeberg, H. v. Stephan (Berlin, 1897). (J. W. He.)
STEPHANITE, a mineral consisting of silver sulphantimonite, AgsSbS 4 ; containing 68-5 % of silver, and sometimes of im- portance as an ore of this metal. Under the name Schwarzerz it was mentioned by G. Agricola in 1546, and it has been variously known as ” black silver ore ” (Ger. SchivarzguU tigerz), brittle silver-ore (Sprodglanzerz), &c. The name stephanite was proposed by W. Haidinger in 1845 in honour of the archduke Stephan of Austria; French authors use F. S. Beudant’s name psaturose (from the Greek fadvpfc, fragile). It frequently occurs as well-formed crystals, which are ortho- rhombic and occasionally show indications of hemimorphism : they have the form of six-sided prisms or flat tables terminated by large basal planes and often modified at the edges by numerous pyramid-planes. Twinning on the prism-planes is of frequent occurrence, giving rise to pseudo-hexagonal groups like those of aragonite. The colour is iron-black, and the lustre metallic and brilliant; on exposure to light, however, the crystals soon become dull. The mineral has a hardness of 25 and is very brittle; the specific gravity is 6-3. Stephanite occurs with other ores of silver in metalliferous veins. Localities which have yielded good crystallized specimens are Freiberg and Gersdorf near Rosswein in Saxony, Chafiarcillo in Chile, and exceptionally Cornwall. In the Comstock lode in Nevada massive stephanite and argentite are important ores of silver.

(L.J.S.) STEPHANUS BYZANTINUS (Stephen of Byzantium), the author of a geographical dictionary entitled ‘JZdviKa, of which, apart from some fragments, we possess only the meagre epitome of one Hermolaus. This work was first edited under the title Iltpi yroktuv (Aldus, Venice, 1502); the best modern editions are by W. Dindorf and others (4 vols., Leipzig, 1825), A. Wester- mann (Leipzig, 1839), and A. Meineke (vol. i., Berlin, 1849). Hermolaus

dedicates his epitome to Justinian; whether the first or second emperor of that name is meant is disputed, but it seems probable that Stephanus flourished in the earlier part of the 6th century, under Justinian I. The chief fragments re- maining of the original work (which certainly contained lengthy quotations from classical authors and many interesting topo- graphical and historical details) are preserved by Constantine Porphyrogennetos, De adminislrando imperio, ch. 23 (the article 'Ifi-qpiai 8vo) and De thematibus, ii. 10 (an account of Sicily) ; the latter includes a passage from the comic poet Alexis on the Seven Largest Islands. Another respectable fragment, from the article Abm to the end of A, exists in a MS. of the Seguerian library.

See the editions of Westermann, Dindorf and Meineke, above noticed; the article "Stephanus Byzant.," in Smith's Dictionary of Ancient Biography, vol. iii.; E. H. Bunbury, History of Ancient Geography, i. 102, 135, 169; ii. 669-671 (London, 1883); Riese, De Stephani 'Byzant. auctoribus (Kiel, 1873) ; J. Geffcken, De Stephano Byzantio (Gottingen, 1886); Spuridon Kontogones, Au>p8i

STEPHEN, the " proto-martyr " (as he is called in certain MSS. of Acts xxii. 20), in some senses the greatest figure in primitive Christianity prior to Paul's conversion, was one of " the Seven" (xxi. 8, nowhere called " deacons") set over the " daily ministration " towards the needy members of the Jerusalem community. But, like Philip and perhaps others of his colleagues (vi. 3), he had higher gifts than his office would suggest. We read that he was " full of faith and of the holy

Spirit"; and as his spiritual power seems to have shown itself in mighty deeds as well as words (vi. 5, 8), he became a marked man in Jerusalem. Himself a Jew of Greek culture, he naturally tried to win over his fellow Hellenists (vi. 9).

It is here that Stephen's advance upon the Apostolic teaching becomes apparent. His special " wisdom " lay in greater insight into the merely relative nature and value of the externals of Israel's religion, and particularly those connected with the Temple. His fellow Hellenists were as a body eager to dis- prove the feeling of the native " Hebrews" that they were only half Jews; accordingly teaching which minimized the value of the sacred " customs which Moses had delivered" (vi. 14) — • by making salvation turn immediately upon faith in Jesus as Messiah — would cause deep resentment in such circles, in spite of their more liberal attitude to things non-Jewish. They may have met Stephen's appeal for faith in

Jesus as Messiah by saying that full fellowship with God was theirs by observance of the Mosaic customs, centring in the Temple, which in Jerusalem overshadowed men's thoughts touching the Divine presence. To this he would reply by warning them in Jesus' own words, supported by those of the prophets, that the heart is the true seat of the Shekinah; and that if they refused God manifest in His Messiah, the final embodiment of Divine righteousness, no holy " customs" — no, not the Temple itself — could save them from the displeasure of the living God. Nay, God might have to make good Messiah's words as to His person being more essential to fellowship with God than the Temple itself (cf. Matt. xii. 6), which might even be destroyed, as it had been in the past, without loss to true religion. In all this he was but reasserting the prophetic rather than the scribal view of the Mosaic Law and its institutions, viz. that the inner spirit, that which could be written on the heart, was the only thing really essential. But they could not rise to this conception and treated his words as " blasphemous against Moses and against God," and roused " the people and the elders and the scribes " against him. He was seized and brought before the Sanhedrin on the charge of speaking "against the Temple and the Law" (vi. n-14). His defence against this twofold charge took the form of a survey of Israel's religious past, with a view to show: (1) that " the God of Glory" had covenant relations with their fore- fathers before they had either Holy Place (Land or Temple) or Law (vii. 1-17); (2) that the first form of visible meeting place between God and His people was far other than that for which absolute sanctity was now claimed. Nay, the form of " the tabernacle of testimony in the wilderness" (no Holy Land) had more divine sanction 1 than any later Temple (44-47) ; (3) that, after all, the presence of "the Most High" was in no way bound up with any structure of human hands, as Isaiah witnessed (48-50). The moral of all this was plain: Israel's forms of fellowship with the Most High had all along been relative and subject to change. Particularly was this so with the external forms of cultus then represented by the Temple. Hence there was no " blasphemy" in suggesting that in the Messianic age yet another change might come about, and that observance of Temple services could prove little as to acceptance with God. But there is another and more actual line of pleading. This is found in the elaborate section dealing with the person and work of Moses, the great lawgiver (17-38) — a section full of extra-biblical touches — followed by one on Israel's hardness of heart towards him and the " living oracles" he mediated, together with its result, the Exile (39-43). Pure and original Mosaism, embodied in Moses and his ministry to Israel, is represented as something which in its full spiritual intention had been frustrated by Israel's stiff neckedness

(39, 42 seq.). The figure of Moses is made to stand forth in ideal outlines, the thinly-veiled Christian application shining through. ” This is that Moses who said unto the children of Israel, ‘A prophet

1 The solemn language in v. 44 suggests that to Stephen, as to the writer to the Hebrews (and perhaps Hellenists generally), the Biblical Sanctuary, as corresponding to the heavenly archetype, was more sacred than the Temple of Herod, which owed what sanctity it had to the older features it still preserved.

shall God raise up unto you . . . like unto me.’ This is he that was in the Church in the wilderness with the angel which spake to him in the Mount Sinai, and with our fathers; who received living oracles to give unto us: to whom our fathers would not be obedient, but thrust him from them, and turned back in their hearts. . .” (38 seq.). Here we have the very situation as between Stephen and his hearers; and it is made unmistakable by the speaker’s closing words (51-53). They will have nothing to say to the greater Mediator of the Divine oracles in Messianic clearness and power. But if so, the reason is not their fidelity to the Mosaic Law, but their infidelity to its spiritual substance. Had they kept the Law dutifully they would have believed on Him in whom true Mosaism was fulfilled and transcended.

In all this there are points both of contact and divergence between Stephen and Paul. Alike they are champions of the “spirit” against the “letter”; and alike they tax unbelieving Judaism with failure to keep the Law in its real sense. But here difference begins. Quite apart from the externalism of Temple worship, to which Paul never alludes, they start from different conceptions of the Law. Stephen, the Hellenist, views it idealistically and with the spiritual freedom of the prophets and of Jesus Himself. But Paul took it more strictly (see Paul). Thus in spite of general kinship of spirit, Stephen is not really Paul’s forerunner. He has no sense of antithesis between law and grace; and he makes no reference to the Gentiles. It is rather the author of the Epistle to Hebrews (q.v.) who recalls Stephen. Both deal largely with the Temple and its worship; both expose the externalism of the legal rites of Judaism, as tending to spiritual unreality; and both view the Gospel as the sublimation of the Law on ideal lines. Only, the later thinker contrasts even pure Mosaism with the Gospel of Christ, as old with new, as the Covenant of shadow with that of reality.

As to the authenticity of Stephen's speech, it is generally admitted to be accurate in substance, if not in the words that he uttered. We may suppose it lived in the memory of some associate in such discussions, who would often repeat its tenor in his work as one of the preachers scattered (viii. 4, xi. 19) by the persecution which Stephen's preaching brought on the Jerusalem community, particularly on its Hellenistic section as most identified with the revolutionary aspect which faith in Jesus the Nazarene now for a time assumed in public esti- mation (contrast ii. 47). It would finally be committed to writing, largely because it was so representative of the Hel- lenistic view of the relations of Judaism and Christianity. As such it was given prominence in the book of Acts — a work which shows the greatness of the contributions to the Apostolic age not only of Paul, but also of the Hellenists, those mediators between Jews and Gentiles. Possibly also Paul had spoken in Luke's hearing of Stephen's martyrdom and his own close relations to it (vii. 58, 60, cf. vi. 9).

Stephen's actual martyrdom is described as tumultuary in character, though the legal forms of stoning for blasphemy were observed (58). This is quite consistent with a trial before the Sanhedrin; nor is it inconceivable that an act exceeding the rights of that body under the Romans should have taken place at the impulse of religious fanaticism. Our knowledge of Jewish history is not full enough to warrant denial of the historicity of this feature of the narrative simply on the score of its illegality. Neither is there good reason to assume that the hearing before the Sanhedrin is a touch added by the author of Acts to the source on which he has drawn in the main.

Literature. — All requisite materials will be found in articles in the Ency. Bib. vol. iv., and Hauck's Realencykl. f. protestant. Theol. u. Kirche, vol. xix. The former in particular examines the Midrashic elements (adding to or diverging from the O. T. data) in Stephen's speech, the linguistic features of Acts vi. 1, viii. 3, and various theories as to the source or sources used therein. It also refers to the worthless legends touching Stephen's death and the finding of his relics, collected in Tillemont, Memoires (Eng. ed., 1735). PP- 353-359- (J- V. B.)

STEPHEN (ro97?-ri54), king of England, was the third son of Stephen Henry, count of Blois and Chartres, and, through

his mother Adela, a grandson of William the Conqueror. Born some time before 1101, he was still a boy when he was taken into favour by his uncle, Henry I. of England. From Henry he received the

honour of knighthood and the county of Mor- tain. In n 18 he severed his connexion with Blois and Chartres, renouncing his hereditary claims in favour of his elder brother Theobald. But he acquired the county of Boulogne by marry- ing Matilda (e. 1103-1152), the heiress of Count Eustace III. and a niece of Henry's first wife. The old king arranged this match after the untimely loss of his son, William Atheling, in the tragedy of the White Ship; until n 25 Stephen was regarded as the probable heir to the English throne. But the return of the widowed empress Matilda (q.v.) to her father's court changed the situation. Henry compelled Stephen and the rest of his barons to acknowledge the empress as their future ruler (n 26). Seven years later these oaths were renewed; and in addition the ultimate claims of Matilda's infant son, Henry of Anjou, were recognized (1133). But the death of Henry I. found the empress absent from England. Stephen seized the opportunity. He hurried across the Channel and began to canvass for supporters, arguing that his oaths to Matilda were taken under coercion, and that she, as the daughter of a professed nun, was illegitimate. He was raised to the throne by the Londoners, the official baronage and the clergy; his most influential supporters were the old justiciar, Robert, bishop of Salisbury, and his own brother Henry, bishop of Winchester. Innocent II. was in- duced by Bishop Henry to ratify the election, and Stephen thus cleared himself from the stain of perjury. Two charters of liberties, issued in rapid succession, confirmed the King's alliance with the Church and earned the good will of the nation. But his supporters traded upon his notorious facility and the unstable nature of his power. Extortionate concessions were demanded by the great barons, and particularly by Earl Robert of Gloucester, the half-brother of the empress. The clergy insisted that neither their goods nor their persons should be subject to secular jurisdiction. Stephen endeavoured to free himself from the control of such interested supporters by creating a mercenary army and a royalist party. This led at once to a rupture between himself and Earl Robert (1138), which was the signal for sporadic rebellions. Soon afterwards the king attacked the bishops of Salisbury, Ely and Lincoln — a powerful family clique who stood at the head of the official baronage — and, not content with seizing their castles, sub- jected them to personal outrage and detention. The result was that the clergy, headed by his brother, the bishop of Win- chester, declared against him (1139). In the midst of these difficulties he had left the western marches at the mercy of the Welsh, and the defence of the northern shires against David of Scotland had devolved upon the barons of Yorkshire. Stephen was thoroughly discredited when the empress at length appeared in England (Sept. 30, 1T39). Through a mis- placed sense*

of chivalry he declined to take an opportunity of seizing her person. She was therefore able to join her half- brother at Gloucester, to obtain recognition in the western and south-western shires, and to contest the royal title for eight years. Stephen's initial errors were aggravated by bad general- ship. He showed remarkable energy in hurrying from one centre of rebellion to another; but he never ventured to attack the headquarters of the empress. In it4i he was surprised and captured while besieging Lincoln Castle. The empress in consequence reigned for six months as "Lady (Domino) of the English"; save for her faults of temper the cause of Stephen would never have been retrieved. But, later in the year, his supporters were able to procure his release in exchange for the earl of Gloucester. After an obstinate siege he expelled Matilda from Oxford (Dec. 1142) and compelled her to fall back upon the west. The next five years witnessed anarchy such as England had never before experienced. England north of the Ribble and the Tyne had passed into the hands if David of Scotland and his son, Prince Henry; Ranulf earl of Chester was constructing an independent principality; on the west the raids of the Angevin party, in the east and midlands the

excesses of such rebels as Geoffrey de Mandeville, earl of Essex, turned considerable districts into wildernesses. Meanwhile Geoffrey of Anjou, the husband of the empress, completed the conquest of Normandy (1144). In 1147 the situation improved for Stephen; Robert of Gloucester, the ablest of the Angevin partisans, died, and the empress left England in despair. But her son soon appeared in England to renew the struggle (1140) and conciliate new supporters. Soon after his return to Nor- mandy Henry was invested by his father with the duchy (1150). He succeeded to Anjou in 1151; next year he acquired the duchy of Aquitaine by marriage. Stephen struggled hard to secure the succession for Eustace, his elder son. But he had quarrelled with Rome respecting a vacancy in the see of York; the pope forbade the English bishops to consecrate Eustace (n5i);andthere was a general unwillingness to prolong the civil war. Worn out by incessant conflicts, the king bowed to the inevitable when Henry next appeared in England (11 53). Negotiations were opened; and Stephen's last hesitations dis- appeared when Eustace was carried off by a sudden illness. Late in n 53 the king acknowledged Henry as his heir, only stipulating that the earldom of Surrey and his private estates should be guaranteed to his surviving

son, William. The king and the duke agreed to co-operate for the repression of anarchy; but Stephen died before this work was more than begun (Oct. 1154). On his great seal Stephen is represented as tall and robust, bearded, and of an open countenance. He was frank and generous; his occasional acts of duplicity were planned reluctantly and never carried to their logical conclusion. High spirited and proud of his dignity, he lived to repent, without being able to undo, the ruinous concessions by which he had con- ciliated supporters. In warfare he showed courage, but little generalship; as a statesman he failed in his dealings with the Church, which he alternately humoured and thwarted. He was a generous patron of religious foundations; and some pleasing anecdotes suggest that his personal character deserves more commendation than his record as a king.

See the Gesta Stephani, Richard of Hexham, ˆElred of Rievaux' Relatio de Standardo, and the chronicle of Robert de Torigni, all in R. Howlett's Chronicles of the Reigns of Stephen, &c. (4 vols., London, 1884-1889); Ordenc Vitalis s Historia ecclesiastica, ed. Le Prevost (5 vols., Paris, 1838-1855); William of Malmesbury's Historia novella, ed. W. Stubbs (London, 1889); John of Worcester's Continuation of Florence, ed. J. H. Weaver (Oxford, 1908); the Peterborough Chronicle, ed. C. Plummer (1892-1899). Of modern works see Miss K. Norgate's England under the Angevin Kings, vol. i. (London, 1887); O. Rossler's Kaiserin Mathilde (Berlin, 1897); J. H. Round's Geoffrey de Mandeville (London, 1892); H. W. C. Davis's "The Anarchy of Stephen's Reign" in Eng. Hist. Review for 1903. (H. W. C. D.)

STEPHEN, the name of nine popes.

Stephen I., bishop of Rome from about 254 to 257, followed Lucius I. He withdrew from church fellowship with Cyprian and certain Asiatic bishops on account of their views as to the necessity of rebaptizing heretics (Euseb. H. E. vii. 5; Cypr. EpP- 75)- He is also mentioned as having insisted on the restoration of the bishops of Merida and Astorga, who had been deposed for unfaithfulness during persecution but after- wards had repented. He is commemorated on August 2. His successor was Sixtus II.

Stephen II., pope from March 752 to April 757, was in deacon's orders when chosen to the vacant see within twelve days after the death of Zacharias. 1 The main difficulty of his pontificate was in connexion with the aggressive attitude of Aistulf, king of the Lombards. After unsuccessful embassies to Aistulf himself and

appeals to the emperor Constantine, he, though in feeble health, set out to seek the aid of Pippin, by whom he was received in the neighbourhood of Vitry le Brule in the beginning of 754. He spent the winter at St Denis. The result of his negotiations was the Frankish invasion of Aistulf's territory and the famous " donation " of Pippin. The death of Stephen took place not long after that of Aistulf. He was succeeded by Paul I.

1 A priest named Stephen, elected before him, died three days after, without having received the episcopal consecration.

Stephen III., pope from the 7th of August 768 to the 3rd of February 772, was a native of Sicily, and, having come to Rome during the pontificate of Gregory III., gradually rose to high office in the service of successive popes. On the deposition of Constantine II. Stephen was chosen to succeed him. Frag- mentary records are preserved of the council (April 769) at which the degradation of Constantine was completed, certain new arrangements for papal elections made, and the practice of image-worship confirmed. Stephen inclined to the Lombard rather than to the Frankish alliance. He was succeeded by Adrian I.

Stephen IV., pope from June 816 to January 817, suc- ceeded Leo III. He did not continue Leo's policy, which was more favourable to the clergy than to the lay aristocracy. Immediately after his consecration he ordered the Roman people to swear fidelity to Louis the Pious, to whom he found it prudent to betake himself personally in the following August. After the coronation of Louis at Reims in October he returned to Rome, where he died in the beginning of the following year. His successor was Paschal I.

Stephen V., pope from 885 to 891, succeeded Adrian III., and was in turn succeeded by Formosus. In his dealings with Constantinople in the matter of Photius, as also in his relations with the young Slavonic Church, he pursued the policy of Nicholas I. His Italian policy wavered between his desire for the protection of the German king Arnulf against Guy of Spoleto, king of Italy, and fear of offending Guy. Guy was crowned emperor in 891.

Stephen VI., pope from May 896 to July- August 897, succeeded Boniface VI., and was in turn followed by Romanus. His conduct towards the remains of Formosus, his last pre- decessor but one (see Formosus) excited a tumult, which ended in his imprisonment and death by strangling.

Stephen VII. (January 929 to February 931) and Stephen VIII. (July 939 to October 949) were virtually nonentities, who held the pontificate while the real direction of the pontifical state was in the hands of Marozia and, afterwards, of her son Alberic, senator of the Romans.

Stephen IX., pope from August 1057 to March 1058, suc- ceeded Victor II. (Gebhard of Eichstadt). His baptismal name was Frederick, and he was a younger brother of Godfrey, duke of Upper Lorraine, marquis of Tuscany (by his marriage with Beatrice, widow of Boniface, marquis of Tuscany). Frederick, who had been raised to the cardinalate by Leo IX., acted for some time as papal legate at Constantinople, and was with Leo in his unlucky expedition against the Normans. He shared his brother's fortunes, and at one time had to take refuge from Henry III. in Monte Cassino. Five days after the death of Victor II. (who had made him cardinal-priest and abbot of Monte Cassino) he was chosen to succeed him. He showed great zeal in enforcing the Hildebrandine policy as to clerical celibacy, and was planning the expulsion of the Normans from Italy and the elevation of his brother to the imperial throne when he was seized by a severe illness. He died at Florence on the 29th of March 1038. N

STEPHEN I. [St Stephen] (977-1038), king of Hungary, was the son of Geza, duke of Hungary, and of Sarolta, one of the few Magyar Christian ladies, who obtained the best teachers for her infant son. These preceptors included the German priest Bruno, the Czech priest Radla, and an Italian knight, Theodate of San Severino, who taught him arms and letters (a holograph epistle by Stephen existed in the Vatican Library as late as 1513). In 996 Stephen married Gisela, the daughter of Duke Henry II. of Bavaria, and in the following year his father died and the young prince was suddenly confronted by a formidable pagan reaction under Kupa in the districts between the Drave and Lake Balaton. Stephen hastened against the rebels, bearing before him the banner of St Martin of Tours, whom he now chose to be his patron saint, and routed the rebels at Veszprem (998), a victory from which the foundation of the Hungarian monarchy must be dated, for Stephen assumed the royal title immediately afterwards. In 1001 his envoy Asztrik

obtained Pope Silvester II. 's confirmation of this act of sove- reignty. Silvester at the same time sent Stephen a consecrated crown, and

approved of the erection of an independent Hun- garian church, divided into the two provinces of Esztergom and Bacs. But the power of pagan Hungary could not be broken in a day. The focus of the movement was the Maros region, where the rebel Ajtony built the fortress of Marosvar. The struggle proceeded for more than twenty-five years, the diffi- culties of Stephen being materially increased by the assistance rendered to the rebels by the Greek emperors, his neighbours since their reconquest of Bulgaria. As early as 1015 Stephen had appointed the Italian priest Gellert bishop of Maros, but he was unable to establish the missionary in his see till 1030. The necessity of christianizing his heathen kingdom by force of arms engrossed all the energies of Stephen and compelled him to adopt a pacific policy towards the emperors of the East and West. When the emperor Conrad, with the deliberate intention of subjugating Hungary, invaded it in 1030, Stephen not only drove him out, but captured Vienna (now mentioned for the first time 1 and compelled the emperor to cede a large portion of the Ostmark (103 1). Of the five sons borne to him by Gisela, only Emerich reached manhood, and this well- educated prince was killed by a wild boar in 1031. ■ *Stephen thereupon appointed as his successor his wife's nephew Peter Orseolo, who settled in Hungary, where his intrigues and foreign ways made him extremely unpopular. Stephen died at his palace at Esztergom in 1038 and was canonized in 1083. For an account of his epoch-making reforms see Hungary: History. See Gyula Pauler, History of the Hungarian Nation, vol. i. (Hung.; Pest, 1893); Lajos Balics, History of the Roman Catholic Church in Hungary, vol. i. (Hung.; Pest, 1885); Antal Por, Life of St Stephen (Hung.; Pest, 1871); Janos Karacsonyi, Documents issued by Stephen I. (Hung. ;Pest, 1892), idem, Life of St Gellert '(Hung. ; Pest, 1887); E. Horn, St Etienne, roi aposlolique de Hongrie (Paris, 1899); W. J. Winkler de K£trszynski, Vita sancti Stephani (Cracow, 1897). (R. N. B.)*

STEPHEN V. (1239-127 2), king of Hungary, was the eldest son of Bela IV., whom he succeeded in 1270. As crown prince he had exhibited considerable ability, but also a disquieting restlessness and violence. In 1262 he compelled his father, whom he had assisted in the Bohemian War, to surrender twenty- nine counties to him, so that Hungary was virtually divided into two kingdoms. Not content with this he subsequently seized the southern banate of Macso, which led to a fresh war between father and son in which the latter triumphed. In 1268 he undertook an expedition against the Bulgarians, con-quering the land as far as Tirnova and styling himself hence- forth king of Bulgaria. Stephen was a keen and circumspect politician, and for his future security contracted, during his father's lifetime, a

double 1 matrimonial alliance with the Nea- politan princes of the House of Anjou, the chief partisans of the pope. He certainly needed exterior support; for on his accession to the Hungarian throne, as he himself declared, every one was his enemy. This hostility was due to the almost universal opinion of western Europe that Stephen was a semi-pagan. His father had married him while still a youth (c. 1255) to Elizabeth, daughter of the Rumanian chieftain Roteny, with a view to binding the Rumanians (who could put in the field 16,000 men; see Hungary: History) more closely to the dynasty in the then by no means improbable contingency of a second Tatar invasion. The lady was duly baptized and remained a Christian; but the adversaries of Stephen, especially Ottakar II. of Bohemia, affected to believe that Stephen was too great a friend of the Rumanians to be a true Catholic. Ottakar endeavoured, with the aid of the Magyar malcontents, to conquer the western provinces of Hungary, but after some suc- cesses was utterly routed by Stephen in 1271 near Mosony, and by the peace of Pressburg, the same year, relinquished all his conquests. Stephen died suddenly on the 6th of August

1 Charles, the son of Charles of Anjou, was to marry Stephen's daughter Maria, while Stephen's infant son Ladislaus was to marry Charles's daughter Elizabeth. Another of his daughters, Anna, married the Greek emperor Andronicus Palaeologus.

1272, just as he was raising an army to recover his kidnapped infant son Ladislaus from the hands of his rebellious vassals.

See Ignacz Acsady, History of the Hungarian Realm, vol. i. (Hung.; Budapest, 1903). (R. N. B.)

STEPHEN, SIR JAMES (1789-1859), English historian, was the son of James Stephen, master in chancery, author of The Slavery of the West India Colonies and other works, and was born in London On the 3rd of January 1789. He was educated at Trinity Hall, Cambridge, graduating B.A. in 181 2, after which he studied for the bar and was called at Lincoln's Inn. He obtained an extensive practice as a chancery barrister, being ultimately counsel to the colonial department and counsel to the board of trade. In 1834 he became assistant under- secretary for the colonies, and shortly afterwards permanent under-secretary. On his retirement in 1847 h e was made a knight commander of the Bath. In 1849 he was appointed regius professor of modern history in the university of Cam- "bridge, having already distinguished himself by his brilliant studies in ecclesiastical biography contributed to the Edinburgh Review, which were published that year under the title Essays in

Ecclesiastical Biography and Other Subjects; a 4th edition, with a short memoir, appeared in i860. He was also the author of Lectures on the History of France (2 vols., 1851; 3rd ed., 1857), and Desultory and Systematic Reading, a lecture (1853). He died at Coblentz on the 15th of September 1859.

STEPHEN, SIR JAMES FITZJAMES, Bart. (1829-1894), English lawyer, judge and publicist, was born in London on the 3rd of March 1829, the third child and second son of Sir James Stephen (q.v.). Fitzjames Stephen was for three years (1842- 1845) at Eton, and for two years at Ring's College, London. In October 1847 he entered at Trinity College, Cambridge. Notwithstanding exceptional vigour in mind and body, he did not attain any of the usual scholastic or athletic distinctions. The only studies then seriously prosecuted in the university course were mathematics and classics. Neither of these attracted him in their academical forms, nor did he care for competitive sport. But his Cambridge time was fruitful in other ways. He was already acquainted with Sir Henry Maine (q.v.), six years his senior, and then newly appointed to the chair of civil law. This acquaintance now ripened into a perfect friend- ship, which ended only with Maine's death in 1888. No two men's intellectual tempers ever presented a stronger contrast. As Stephen himself said, it took them a long time to know when they really agreed. Maine was subtle, swift and far- reaching; Stephen was massive, downright, indefatigable and sincere even to unnecessary frankness. Their qualities were an almost exact complement of one another, but neither of them would take opinions on trust, or acquiesce in common- place methods of avoiding difficulties; and it might have been said of either of them without exaggeration that, if all his technical and professional requirements could be taken away, a born man of letters would be left. By Maine's introduction, Stephen became a member of the Cambridge society known as the Apostles, in form not very different from many other essay societies, in substance a body with an unformulated but most individual tradition of open-mindedness and absolute mutual tolerance in all matters of opinion. Perhaps the golden age of the society was a few years before Stephen's election, but it still contained a remarkable group of men who afterwards became eminent in such different ways as, for instance, James Clerk Maxwell and Sir William Harcourt. Stephen formed friendships with some of its members, which were as permanent, though in few cases so little subject to external interruption, as his intimacy with Maine. Probably the Apostles did much to correct the formalism inevitably incident to the evangelical traditions of the first Sir James Stephen's household.

After leaving Cambridge, Fitzjames Stephen, having practi- cally to choose between the Church and the bar, decided for the bar. He was called in 1854, after the usual haphazard prepara- tion which was then (and still practically is) considered in England alone, and even in England for one kind of learning

alone, a sufficient introduction to the duties of a learned pro- fession. His own estimate of his strictly professional success, written down in later years, was that in spite of such training as he could get, rather than because of it, he became a moderately successful advocate and a rather distinguished judge. As to the former branch of the statement, it is correct but ambiguous io those who do not know the facts. Stephen's work was always distinguished in quality, though his amount of business was never great in quantity. After his return from India and before he became a judge he had what is called a good practice, but still not a large one. In his earlier years at the bar he was attracted by the stop-gap of journalism. It was no common journalism, however, that enlisted Stephen as a contributor to the Saturday Review when it was founded in 1855. He was in company with Maine, Sir William Harcourt, G. S. Venables (a writer of first-rate quality who never set his name to any- thing), C. S. C. Bowen, E.A. Freeman, Goldwin Smith and others whose names have since become well known. Strangely enough, the first and the last books published by Stephen were selections from his papers in the Saturday Review (Essays by a Barrister, 1862, anonymous; Horae sabbalicae, 1892). These volumes embodied the results of his studies among publicists and theologians, chiefly English, from the 17th century onwards. They never professed to be more than the occasional products of an amateur's leisure, but they were of greater value when they were first published than is easily recognized at this day by a generation familiar with the resources of later criticism.

For exactly three years (1858-1861) Stephen served as secretary to a royal commission on popular education, which was more fortunate than most commissions in having prompt effect given to its conclusions. In 1859 he was appointed recorder of Newark. In 1863 he published his General View of the Criminal Law of England (not altogether superseded by the second edition of 1890, which was practically a new book). This was really the first attempt that had been made since Blackstone to explain the principles of English law and justice in a literary form, and it had a thoroughly deserved

success. All this time Stephen kept up a great deal of miscellaneous writing, and the foundation of the Pall Mall Gazette in 1865 gave him a new opening. He was one of the principal contributors for some years, and an occasional one till he became a judge. So far he was a literary lawyer, also possibly with chances (diminished by his vehement dislike for party politics) of regular professional advancement, possibly not free from the temptation to turn wholly to literature. The decisive point of his career was in the summer of 1869, when he accepted the post of legal member of council in India. Fitzjames Stephen's friend Maine was his immediate predecessor in this office. Guided by Maine's comprehensive genius, the government of India had entered" on a period of systematic legislation which was to last about twenty years. The materials for considerable parts of this plan had been left by Maine in a more or less forward condition. Stephen had the task of work- ing them into their definite shape and conducting the bills through the Legislative Council. This he did with wonderful energy, with efficiency and workmanship adequate to the purpose, if sometimes rough according to English notions, and so as to leave his own individual mark in many places. The Native Marriages Act of 1872 was the result of deep consideration on both Maine's and Stephen's part. The Contract Act had been framed in England by a learned commission (apparently not having much special Indian information, or not much regarding that which it had), and the draft was materially altered in Stephen's hands before, also in 1872, it became law. The Evidence Act of the same year was entirely Stephen's own. It not only consolidated the rules of judicial proof, but en- deavoured to connect them by legislative authority with a logical theory of probability set forth in the act itself. This part of the act has been criticized both as to the principle (which, indeed, seems open to much doubt) and as to the success of the draftsman in applying it. At any rate it is characteristic of Stephen's anxiety never to shirk a difficulty. To some extent

the Contract Act may be charged with similar over-ambition; but ils more practical defects are evidently due to the acceptance by the original framers of unsatisfactory statements which, coming to India with a show of authority, naturally escaped minute criticism amid the varied business of the legislative department. If the success of the later Anglo-Indian Codes has not been quite so complete as that of the Penal Code, they have, on the whole, done excellent service, and they are at least as good as any European codification prior to the very recent achievements of scientific lawyers in Italy and Germany. Besides the special work of legislation, Stephen had to attend to the current administrative business of his department, often heavy

enough to occupy the whole of an ordinary able man's attention, and he took his full share in the general delib- erations of the viceroy's council. His last official act was the publication of a minute on the administration of justice which pointed the way to reforms not yet fully realized, and is still most valuable for every one who wishes to understand the judicial system of British India. Stephen, mainly for family reasons, came home in the spring of 1872. During the voyage he made a pastime of meditating and writing a series of articles which took the form of his book entitled Liberty, Equality, Fraternity (1873-1874) — a protest against J. S. Mill's neo- utilitarianism which was really in the nature of an appeal from the new to the old utilitarians, if any such were left, or per- haps rather to Hobbes. It was, however, too individual to be systematic, and made no serious attempt at reconstruction.

Indian experience had supplied Stephen with the motive for his next line of activity, which future historians of the common law may well regard as his most eminent title to remembrance. The government of India had been driven by the conditions of the Indian judicial system to recast a considerable part of the English law which had been informally imported. Criminal law procedure, and a good deal of commercial law, had been or were being put in a shape intelligible to civilian magistrates, and fairly within the comprehension of any intelligent man who would give a moderate amount of pains to mastering the text of the new codes. The rational substance of the law had been preserved, while the disorder and the excessive technicalities were removed. Why should not the same procedure be as practicable and profitable in England? It was Bentharn's ideal of codification, to be put in practice with the knowledge of actual business and legal habits, and the lack of which hed made Bentharn's plans unworkable. For the next half-dozen years Fitzjames Stephen was an ardent missionary in this cause. The mission failed for the time as to the specific under- takings in which Stephen made his experiments, but it had a large indirect success which has not yet been adequately recognized. Stephen published, by way of private exposition, digests in code form of the law of evidence and the criminal law. There were transient hopes of an evidence act being brought before parliament, and in 1878 the digest of criminal law became a ministerial bill. This was referred to a very strong judicial commission, with the addition of Stephen himself: the revised bill was introduced in 1879 and 1880. It dealt with procedure as well as substantive law, and provided for a court of criminal appeal (after several years of judicial experience Stephen changed his mind as to the wisdom of this). However, no substantial progress was made. In

1883 the part relating to procedure was brought in separately, and went to the grand committee on law, who found there was not time to deal with it satisfactorily in the course of the session. Criminal appeal has since (1907) been dealt with; otherwise nothing has been done with either part of the draft code since. The historical material. which Stephen had long been collecting took permanent shape the same year (1883) in the History of the Criminal Law of England, which, though not free from inequalities and traces of haste, must long remain the standard work on the subject. A projected digest of the law of contract (which would have been much fuller than the Indian Code) fell through for want of time. Thus, none of Stephen's own plans of English codification took effect. Nevertheless they bore fruit indirectly. Younger

men dealt with other chapters of the law in the systematic form of the Anglo-Indian codes; and a digest of the law of partner- ship by Sir Frederick Pollock, and one of the law of negotiable instruments by Sir M. D. Chalmers, who some time afterwards filled the post of legal member of council in India, became the foundation of the Bills of Exchange Act of 1882 and the Partner- ship Act of 1890. Lord Herschell passed a Sale of Goods Act on similar lines, also drafted by Chalmers, in 1893; and a Marine Insurance Act, prepared in like manner in 1894, finally became law in 1906. Nothing really stands in the way of a practically complete code of maritime and commercial law for the United Kingdom but the difficulty of finding time in the House of Commons for non-contentious legislation; and whenever this is achieved, the result will in substance be largely due to Sir James Stephen's efforts. Meanwhile, in addition to his other occupations, Stephen was an active member of the Metaphysical Society (see Knowles), and he carried on an intimate corre- spondence with Lord Lytton, then viceroy of India, during the critical period of the second Afghan War. In connexion with the Metaphysical Society, and otherwise, Fitzjames Stephen took an active interest in many topics of current controversy. This led him to produce a great number of occasional articles, of which a list may be found at the end of Sir Leslie Stephen's Life. The matters dealt with covered a wide field, from modern history and politics, with a predilection for India, to philosophy, but the prevailing mood was theologico-political. All these writings were forcible expositions of serious and thoroughly definite views, and therefore effective at the time and valuable even to those who least agreed with them. As to

the philosophical part of them, the grounds of discussion were shifting then, and have continued to shift rapidly. Much of Stephen's vigorous polemic has already incurred the natural fate of becoming as obsolete as the arguments against which it was directed. Pure metaphysical speculation, as an intellectual exercise, had little attraction for him; and, though he was fully capable of impartial historical criticism, he seldom applied it outside the history of law.

In 1877 Stephen was made a Knight Commander of the Star of India, and in 1878 he received the honorary degree of D.C.L. at Oxford. Early in 1879 he was appointed judge of the queen's bench division. He held that office a little more than eleven years. The combination of mature intellectual patience and critical subtlety which marked the great masters of the common law was not his, and it cannot be said that he made any con- siderable addition to the substance of legal ideas. His mind was framed for legislation rather than for systematic interpreta- tion and development. Therefore he can hardly be called a great judge; but he was a thoroughly just and efficient one; and if none of his judgments became landmarks of the law, very few of them were wrong. Especially in criminal jurisdiction, he was invariably anxious that moral as well as legal justice should be done. He found time, in 1885, to produce a book on the trial of Nuncomar, for the purpose of rehabilitating Sir Elijah Impey's memory against the attack made on him in Macaulay's essay on Warren Hastings, which for most English readers is the first and last source of information on the whole matter. Mr G. W. Forrest's later research in the archives of the government of India had tended to confirm the judicial protest, at any rate as regards Macaulay's grosser charges.

The one thing of which Stephen was least capable— among other things possible to a good man and a good citizen — was sparing himself. He had one or two warnings which a less energetic man would have taken more seriously. In the spring of 1891 his health broke down, the chief symptom being sudden lapses of memory of which he was himself quite unconscious. In obedience to medical advice he resigned his judgeship in April, and was created a baronet. He lived in retirement till his death on the 1 ith of March 1894, having filled a not very long life with a surprising amount of work, of which a large proportion was of permanent value. Perhaps the most individual part of Stephen's character was his absolute sincerity. He would not allow himself even innocent dissimulation; and this gave to those who knew him but slightly an impression of hardness

which was entirely contrary to his real nature. Sir James Stephen married Mary Richenda Cunningham in 1855. On his death his

eldest son, Herbert, succeeded to the baronetcy. A second son of brilliant literary promise, Tames Kenneth Stephen (1859-1892), died in his father's lifetime: his principal literary achievements consisted in two small volumes of verse — Lapsus calami and Quo Musa tendis, the former of which went through five editions in a very short time. The third son, Mr H. L. Stephen, was appointed in 1901 judge of the High Court of Calcutta.

See Sir Leslie Stephen, Life of Sir James Fitzjames Stephen (London, 1895), with bibliographical appendix, a model Biography; same author's article in the Diet. Nat. Biog. ; Letters with biographical Notes, by his daughter, Caroline Emelia Stephen (1907). See also Sir C. P. Ilbert, " Sir James Stephen as a Legislator," Law Quart. Rev. x. 222. (F. Po.)

STEPHEN, SIR LESLIE (1832-1904), English biographer and literary critic, grandson of James Stephen (1758-1832), master in chancery, a friend of Wilberforce, and author of a book called Slavery Delineated, and son of Sir James Stephen (1 789-1 859), colonial under-secretary for many years, and author of Essays on Ecclesiastical Biography, was born at Ken- sington Gore on the 28th of November 1832. At his father's house he saw a good deal of the Abolitionists and other members of the Clapham sect, and the Macaulays, James Spedding, Sir Henry Taylor and Nassau Senior were intimate friends of his family. After education at Eton, King's College, London, and Trinity Hall, Cambridge, where he graduated B.A. (20th wrangler) 1854, M.A. 1857, Stephen remained for several years a fellow and tutor of his college. He has recounted the experi- ences of a resident fellow at that period in a delightful chapter in his Life of Fawcett as well as in some less formal Sketches from Cambridge: By a Don (1865). These sketches were reprinted from the Pall Mall Gazette, to the proprietor of which, George Smith, he had been introduced by his brother (Sir) James Fitzjames Stephen. It was at Smith's house at Hampstead that Stephen met his first wife, Harriet Marion (d. 1875), daughter of W. M. Thackeray; after her death he married Julia Prinsep, widow of Herbert Duckworth. While still a fellow he had taken holy orders, which he relinquished in March 1875 upon the passing of the Clerical Disabilities Act. In the meantime (after a visit to America, where he formed lasting friendships with Lowell and Eliot Norton) he settled in London, and wrote largely, not only for the Pall Mall Gazette and the Saturday Review, but also for Fraser, Macmillan, the Fortnightly and other periodicals. He was already known as an ardent moun- taineer, as a contributor to Peaks, Passes and Glaciers (1862), and as one of the earliest presidents of the Alpine Club, when in 1 87 1, as a

vindication in some sort of the mountaineering mania, and as a commemoration of his own first ascents of the Schreck- horn and Rothhorn, he published his fascinating Playground of Europe (republished with additions, 1894). In the same year he was appointed editor of the Cornhill Magazine, the reputation of which he maintained by enlisting R. L. Stevenson, Thomas Hardy, W. E. Norris, Henry James and James Payn among his contributors. During the eleven years of his editorship, in addition to three sharp and penetrating volumes of critical studies, reprinted mainly from the Cornhill under the title of Hours in a Library (1874,1876 and 1879), and some Essays on Freethinking and Plain Speaking (1873 and 1897, with intro- ductory essays by J. Bryce and H. Paul), which included the very striking " A Bad Five Minutes in the Alps " (reprinted from Fraser and the Fortnightly in 1873), he made two valuable contributions to philosophical history and theory, The History of English Thought in the Eighteenth Century (1876 and 1881) and The Science of Ethics (1882); the second of these was extensively adopted as a textbook on the subject. The first was generally recognized as an important addition to philosophical literature, and led immediately to Stephen's election at the Athenaeum Club in 1877. In 1879 he set on foot a Sunday Walking Club, which contained well-known names, among them Sir F. Pollock, F. W. Maitland, Croom Robertson and Cotter Morison.

In the autumn of 1882 he abandoned the direction of the Cornhill to James Payn, having accepted the more responsible duty of the editor of the Dictionary of National Biography, for the first planning and conception of which he was largely responsible. The first volume of the Dictionary was published in January 1885, and twenty quarterly volumes followed under Stephen's «ole editorship. Five volumes were then published under the joint editorship of Leslie Stephen and of Mr Sidney Lee, whom he had appointed as his assistant in March 1883. Early in 1891, after eight and a half years' service, Stephen, whose health had been impaired by the labour inseparable from the direction of such an undertaking, resigned the responsi- bility to his coadjutor. Not a trained historian, he often found it difficult to curb his impatience with Carlyle's old enemy Dryas- dust. Fortunately for the success of the work, re-established health enabled him to remain a contributor to the Dictionary. Among his lives are those of Addison, Bolingbroke, Burns, Charlotte Bronte, Byron, Carlyle, Marlborough, Coleridge, Defoe, Dickens, Dryden, Fielding, George

Eliot, Gibbon, Gold- smith, Hobbes, Hume, Johnson, Landor, Locke, Macaulay, the two Mills, Milton, Pope, Scott, Swift, Adam Smith, Thackeray, Warburton, Wordsworth and Young. Many of these are salted with irony, and most of them are characterized by felicitous phrases, by frequent flashes of insight (especially of the sardonic order), and by the good fortune which attends a consummate artist in his special craft. His particular style of treatment is more appropriate, perhaps, to the self-complacent worthies of the 18th century than to quietists such as Law and Words- worth; but where space demands that a character should be inscribed upon a cherry-stone, Stephen seldom if ever failed to rise to the occasion. For the " English Men of Letters " he wrote lives of Swift, Pope and Johnson- — the last well described as " the peerless model of short biographies " — and subsequently George Eliot and Hobbes (1904). During his tenure of the editorship of the Dictionary he was appointed first Clark lecturer at Cambridge (1883), and lectured upon his favourite period- Berkeley, Mandeville, Warburton and Hume; a few years later, upon one of several visits to his intimate friends and old correspondents, Norton and Lowell, he received (1890) a doctor's degree from Harvard University. After Lowell's death in 1891 Stephen was mainly instrumental in having a memorial window placed in Westminster Abbey.

In 1885 he brought out his standard Life of Favicett, in 1893 his Agnostic's Apology and other Essays, and in 1895 the Life of his brother, Sir James Fitzjames Stephen, which, less essayistic in manner than the Life of Fawcett, contains his most finished biographical work. In the same year, in succession to Lord Tennyson, Stephen was elected president of the London Library, and shortly afterwards appointed a trustee of the National Portrait Gallery. Some of his experiences as an editor were embodied in Studies of a Biographer, issued in 1898, while in 1900 appeared an important work which he had long had in preparation in continuation of his English Thought in the Eighteenth Century, entitled The English Utilitarians, being full- length studies of Bentham and the two Mills. As a thinker Leslie Stephen showed himself consistently a follower of Hume, Bentham, the Mills and G. H. Lewes, but he accepted the older utilitarianism only as modified by the application of Darwinian principles, upon lines to some extent indicated by Herbert Spencer (see Ethics). The negative character of his teaching, his anti-sacerdotal bias, 'his continual attitude of irony, and even the very subtlety of his thought, have co- operated to retard the recognition of his value as rivalled only by Bagehot among critics of the incisive school. For blowing the froth off the flagon of extravagant or inflated

eulogy he certainly met no equal in his generation. Voluminous as his work is, it is never dull. While making self-depreciation a fine art, and perpetually laughing in his sleeve at the literary bias and the literary foible, he fulfilled with exceptional conscience the literary duty of never writing below his best. Brought up in a rigid and precise school which scorned all pretence and dis- couraged enthusiasm as the sign of an ill-regulated mind, he

produced no magnum opus, but he enriched English literature with a fine gallery of literary portraits, not all of them perhaps wholly accurate, but restrained, concise and always significant. Besides being a member of the Metaphysical Society, he was for some years president of the Ethical Society (many of his addresses to which were published as Social Rights and Duties in 1896). In addition to his separate works, he superintended a large number of editions, among them Clifford's Essays (1879), Fielding (1882), Richardson (1883), Payn's Backwater of Life (1899), and J. R. Green's Letters (1901). In 1896 he wrote a memoir of his friend James Dykes Campbell for the second edition of Campbell's Coleridge, and in 1897 he contributed a preface to the English translation of The Early Life of Wordsworth, by M. Legouis.

His name was included in the Coronation honours list of June 1902, when he was made K.C.B. In December of this year he had to undergo an operation, after which his health began to wane rapidly. In 1903 his Ford lectures, one last luminous talk about the 18th century, were delivered by his nephew, H. L. Fisher. He told a nurse that his enjoyment of books had begun and would end with Boswell's Johnson. Like Johnson, under a brusque exterior and a coltish temper, he concealed a sympathetic and humorous soul. In spite of " natural sorrows "• — the loss of two much loved wives, he pronounced his life to have been a happy one. He died at his house, 22 Hyde Park Gate, on the 22nd of February 1904, and his remains were buried at Golders Green. A Leslie Stephen memorial lectureship was founded at Cambridge in 1905. Under an austere form and visage Stephen was in reality the soul of susceptibility and of an almost freakish fun. This is shown very clearly in the fantastic marginal drawings with which he delighted to illustrate his life for the amusement of young people.

See Life and Letters, by F.W.Maitland(i9o6) ;and Dictionary of National Biography, postscript to Statistical Account in the 1908-1909 reissue. (T. Se.)

STEPHEN BAR SUDHAILE, a Syrian mystical writer, who flourished

about the end of the 5th century a.d. The earlier part of his career was passed at Edessa, of which he may have been a native. 1 He afterwards removed to Jerusalem, where he lived as a monk, and endeavoured to make converts to his peculiar doctrines, both by teaching among the community there and by letters to his former friends at Edessa. He was the author of commentaries on the Bible and other theological works. Two of his eminent contemporaries, the Monophysites Jacob of Serugh (451-521) and Philoxenus of Mabbogh (d. 523), wrote letters in condemnation of his teaching. His two main theses which they attacked were (1) the limited dura'tion of the future punishment of sinners, (2) the pantheistic doctrine that " all nature is consubstantial with the Divine essence " — that the whole universe has emanated from God, and will in the end return to and be absorbed in him.

The fame of Stephen as a writer rests on his identification with the author of a treatise which survives in a single Syriac MS. (Brit. Mus. Add. MSS. 7189, written mainly in the 13th century), "The book of Hierotheus on the hidden mysteries of the house of God." The work claims to have been composed in the 1st century a.d. by a certain Hierotheus who was the disciple of St Paul and the teacher of Dionysius the Areopagite. But, like the works which pass under the name of Dionysius, it is undoubtedly pseudonymous, and most Syriac writers who mention it attribute it to Stephen. An interesting discussion and summary of the book have been given by A. L. Frothingham (Stephen bar Sudhaili, Leiden, 1886), but the text is still (1910) unpublished. From Frothingham's analysis we learn that the work consists of five books; after briefly describing the_ origin of the world by emanation from the Supreme Good it is mainly occupied with the description of the stages by which the mind returns to union with God, who finally becomes " all in all." " To describe the contents in a few words: at the beginning we find the statement regarding absolute existence, and the emanation from primordial essence of the spiritual and material universes: then comes, what occupies almost the entire work, the experience of

1 He is described as " Stephen the Edessene " in the 8th-century MS. which contains the letter of Philoxenus to Abraham and Orestes.

the mind in search of perfection during this life. Finally comes the description of the various phases of existence as the mind rises into

complete union with, and ultimate absorption into, the primitive essence. The keynote to the experience of the mind is its absolute identification with Christ; but the son finally resigns the kingdom unto the Father, and all distinct existence comes to an end, being lost in the chaos of the Good " (Frothingham, p. 92). One of the most curious features of the work is the misguided skill with which the language of the Bible is pressed into the service of pantheistic speculation. In this and other respects the book harmonizes well with the picture of Stephen's teaching afforded by the letter of Philoxenus to the Edessene priests Abraham and Orestes (Frothing- ham, pp. 28-48). The Book of Hieroiheus is probably an original Syriac work, and not translated from Greek. Its relation to the Pseudo-Dionysian literature is a difficult question; probably Frothingham (p. 83) goes too far in suggesting that it was prior to all the pseudo-Dionysian writings (cf. Ryssel in Zeitschrift fur Kirchengeschichtc).

The unique MS. in which the book of Hierotheus survives furnishes along with its text the commentary made upon it by Theodosius, patriarch of Antioch (887-896), who appears to have sympathized with its teaching. A rearrangement and abridgment of the work was made by the great Monophysite author Barhebraeus (1226- 1286), who expunged or garbled much of its unorthodox teaching. It is interesting to note that the identical copy which he used is the MS. which now survives in the British Museum. (N. M.)

STEPHEN (ISTVAN) BATHORY (1533-1586), king of Poland and prince of Transylvania, the most famous member of the Somlyo branch of the ancient Bathory family, now extinct, but originally almost coeval with the Hungarian monarchy. Istvan Bathory spent his early years at the court of the emperor Ferdinand, subsequently attached himself to Janos Zapolya, and won equal renown as a valiant lord-marcher, and as a skilful diplomatist at the imperial court. Zapolya rewarded him with the voivodeship of Transylvania, and as the loyal defender of the rights of his patron's son, John Sigismund, he incurred the animosity of the emperor Maximilian, who kept him in prison for two years. On the 25th of May 1571, on the death of John Sigismund, Bathory was elected prince of Transylvania by the Hungarian estates, in spite of the opposi- tion of the court of Vienna and contrary to the wishes of the late prince, who had appointed Gaspar Bekesy his successor. Bekesy insisting on his claims, a civil war ensued in which Bathory ultimately drove his rival out of Transylvania (1572). On the flight of Henry of Valois from Poland in 1574, the Polish nobility, chiefly at the instigation of the great chancellor, Jan Zamoyski, elected Bathory king of Poland (1575) in opposition to the emperor Maximilian, the candidate of

the senate. On hearing of his altogether unexpected elevation, BSthory sum- moned the Transylvanian estates together at Medgyes and persuaded them to elect his brother Christopher prince in his stead; then hastening to Cracow, he accepted the onerous conditions laid upon him by the Polish Diet, espoused the princess Anne, the elderly sister of the last Jagiello, Sigismund II., and on the 1st of May was crowned with unprecedented magnificence. At first his position was extremely difficult; but the sudden death of the emperor Maximilian at the very moment when that potentate, in league with the Muscovite, was about to invade Poland, completely changed the face of things, and though Stephen's distrust of the Habsburgs re- mained invincible, he consented at last to enter into a defensive alliance with the empire which was carried through by the papal nuncio on his return to Rome in 1578. The leading events of Stephen Bathory's glorious reign can here only be briefly indicated. All armed opposition collapsed with the surrender of Danzig. " The Pearl of Poland," encouraged by her immense wealth, and almost impregnable fortifications, as well as by the secret support of Denmark and the emperor, had shut her gates against the new monarch, and was only reduced (Dec. 16, 1577) after a six months' siege, beginning with a pitched battle beneath her walls in which she lost 5000 of her mercenaries. Danzig was compelled to pay a fine of 200,000 guldens, but her civil and religious liberties were wisely confirmed. Stephen was now able to devote himself to foreign affairs. The difficul- ties with the sultan were temporarily adjusted by a truce signed on the 5th of November 1577; and the Diet of Warsaw was

persuaded to grant Stephen subsidies for the inevitable war against Muscovy. Two campaigns of wearing marches, and still more exhausting sieges ensued, in which Bathory, although repeatedly hampered by the parsimony of the Diet, was uniformly successful, his skilful diplomacy at the same time allaying the suspicions of the Porte and the emperor. In 1581 Stephen penetrated to the very heart of Muscovy, and, on the 22nd of August, sat down before the ancient city of Pskov, whose vast size and imposing fortifications filled the little Polish army with dismay. But the king, despite the murmurs of his own officers, and the protestations of the papal nuncio, Possevino, whom the curia, deluded by the mirage of a union of the churches, had sent expressly from Rome to mediate between the tsaT and the king of Poland, closely besieged the city throughout a winter of arctic severity, till, on the 13th of December 1581, Ivan the Terrible, alarmed for the safety of the third city in his empire, concluded peace at Zapoli (Jan. 15, 1582), thereby ceding Polotsk and the whole of Livonia. The chief domestic event of Stephen's reign

was the establishment in Poland of the Jesuits, who alone had the intelligence to understand and promote his designs of uniting Poland, Muscovy and Tran- sylvania into one great state with the object of ultimately expelling the Turks from Europe. The project was dissipated by his sudden death, of apoplexy, on the 12th of December 1586. See I. Polkowski, The Martial Exploits of Stephen Bdthory (Pol.; Cracow, 1887); Paul Pierling, Un Arbitrage pontifical au xvi"" siicle (Brussels, 1890) ; Lajos Szadeczky, Stephen Bathory's election to the Crown of Poland (Hung.; Budapest, 1887). (R N. B.)

STEPHENS, ALEXANDER HAMILTON (1812-1883), Ameri- can statesman, vice-president of the Confederate States during the Civil War, was born in Wilkes (now Taliaferro) county, Georgia, on the nth of February 1812. He was a weak and sickly child of poor parents, and from his sixth to his fifteenth year, when he was left an orphan, he worked on a farm. After his father's death he went to live with an uncle in Warren county. The superintendent of the local Sunday school sent him to an academy at Washington, Wilkes county, for one year and in the following year (1828) he was sent by the Georgia Educational Society to Franklin College (university of Georgia), where he graduated in 1832. Deciding not to enter the ministry, he paid back the money advanced by the society. He was a schoolmaster for about two years, and then, after studying law for less than four months, was admitted to the bar in 1834. Although delicate in health, his success at the bar was immediate and remarkable. In 1836 he was elected to the Georgia House of Representatives after a campaign in which he was vigorously opposed because he had attacked the doctrine of nullification, and because he had opposed all extra-legal steps against the abolitionists. He was annually re-elected until 1841; in 1842 he was elected to the state Senate, and in the following year, on the Whig ticket, to the National House of Representatives. In this last body he urged the annexation of Texas, chiefly as a means of achieving more power for the South in Congress. He was denounced as a traitor to his party because of his support of annexation, but he later became the leader of the Whig opposition to the war with Mexico. He vigorously supported the Compromise Measures in 1850, and continued to act with the Whigs of the North until they, in 1852, nominated General Winfield Scott for the presidency without Scott's endorsement of the Compromise. Stephens and other Whigs of the South then chose Daniel Webster, but a little later they joined the Democrats. In 1854 Stephens helped to secure the passage of the Kansas-Nebraska Bill. Before the Georgia legislature in November i860, and again in that state's secession con- vention in January 1861, he strongly opposed

secession, but when Georgia seceded he " followed his state," assisted in form- ing the new government, and was elected vice-president of the Confederate States. He greatly weakened the position of the Confederacy by a speech delivered at Savannah (March 21, 1 861) in which he declared that slavery was its corner-stone. Throughout the war, too, he was so intensely concerned about states' rights and civil liberty that he opposed the exercise of

extra-constitutional war powers by President Jefferson Davis lest the freedom for which the South was fighting should be destroyed. His policy was to preserve constitutional govern- ment in the South and strengthen the anti-war party in the North by convincing it that the Lincoln administration had abandoned such government; to the same end he urged, in 1864, the unconditional discharge of Federal prisoners in the South. Stephens headed the Confederate commission to the peace conference at Hampton Roads in February 1865. In the following May, after the fall of the Confederacy, he was arrested at his home and taken to Fort Warren, in Boston harbour, where he was confined until the 12th of October. He accepted the result of the war as a practical settlement of the question of secession, exercised a beneficent influence on the negroes of his section, and promoted reconciliation between the North and the South. In 1866 he was elected to the United States Senate, but was not permitted to take his seat. He was a representative in Congress, however, from 1873 to 1882, und was governor of Georgia in 188 2-1 883, dying in office, at Atlanta, on the 4th of March 1883. He was remarkable for both his moral and physical courage, and in politics was notable for his independence of party. From 1871 to 1873 he edited the Atlanta Daily Sun, and he published A Constitutional View of the Late War between the States (2 vols., 1868-1870), perhaps the best statement of the southern position with reference to state sovereignty and secession; The Reviewers Reviewed (1872), a supplement to the preceding work; and A Compendium of the History of the United Stales (1875; new e d-, 1883).

See Louis Pendleton, Alexander H. Stephens (Philadelphia, 1908) ; R. M. Johnston and W. H. Browne, Life of Alexander H. Stephens (Philadelphia, 1878 ; new ed., 1883) ; and Henry Cleveland, Alexander H. Stephens in Public and Private, with Letters and Speeches (Phila- delphia, 1866).

• *STEPHENS, JOHN LLOYD (1803-1852), American traveller, was born on the 28th of November 1805, at Shrewsbury, New Jersey. Having been admitted to the bar, he practised for about eight years in New York City. In 1834, the state of his health rendering it advisable that he should travel, he visited Europe, and for two years made a tour through many countries of that Continent, extending his travels to Egypt and Syria. On his return to New York he published in 1837 (under the name of " George " Stephens) Incidents of Travel in Egypt, Arabia Petraea, and the Holy Land. This work was followed next year by the publication of Incidents of Travel in Greece, Turkey, Russia and Poland. In 1839 Stephens arranged with Frederick Catherwood of London, who had accompanied him on some of his travels, and illustrated the above-mentioned publications, to make an exploration in Central America, with a view to discovering and examining the antiquities said to exist there. Stephens, meantime, was appointed to a mission to Central America. The joint travels of Stephens and Catherwood occupied some eight months in 1839 and 1840. As the result of these researches Stephens published in 1841 Incidents of Travels in Central America, Chiapas and Yucatan. In the autumn of 1841 the two travellers made a second exploration of Yucatan, and a work followed in 1843 — Incidents of Travel in Yucatan. This work describes the most extensive travels executed till that date by a stranger in the peninsula, and, as the author claims, " contains account of visits to forty-four ruined cities or places in which remains or vestiges of ancient populations were found." It enjoyed a wide popularity, and Stephens was urged to prose- cute his researches of American antiquities in Peru, but was disinclined to so distant an expedition. He became a director of the newly-formed American Ocean Steam Navigation Company, which established the first American line of transatlantic steamships. He visited Panama to reconnoitre the ground with a view to the construction of a railway across the isthmus, and, first as vice-president and then as president of the Panama Railway Company, spent the greater part of two years in superintending the project. His health was, however, under- mined by exposure to the climate of Central America, and he died at New York on the 10th of October 1852.*

STEPHENSON, GEORGE (1781-1848), English engineer, was the second, son of Robert Stephenson, fireman of a colliery engine at Wylam, near Newcastle, where he was born on the 9th of June 1781. In boyhood he was employed as a cowherd, and afterwards he drove the ginhorse at a colliery. In his fourteenth year he became assistant fireman to his father at a shilling a day, and in his seventeenth year he was appointed plugman, his duty being to attend to the pumping

engine. As yet he was unable to read, but, stimulated by the desire to obtain fuller information regarding the inventions of Boulton and Watt, he began in his eighteenth year to attend a night school and made remarkably rapid progress. In 1801 he obtained a situa- tion as a brakesman, in 1802 he became an engineman at Willing- ton Quay, where he took up watch and clock cleaning, and in 1804 he moved to Killingworth, where in 181 2 he was appointed engine- wright at the High Pit at a salary of £100 a year. It was at Killingworth that he devised his miner's safety lamp, first put to practical tests in the autumn of 181 5, at the same time that Sir Humphry Davy was producing his lamp. There was considerable controversy as to which of the two men was entitled to the honour of having first made an invention which was probably worked out independently, though simultaneously, by both, and when the admirers of Davy in 1817 presented him with a service of plate, those of Stephenson countered with an address and £1000 early in 1818. In 1813 his interest in the experiments with steam traction that were being carried on at Wylam led him to propose an experiment of the same kind to the pro- prietors of the Killingworth colliery, and he was authorized to incur the outlay for constructing a " travelling engine " for the tramroads between the colliery and the shipping port 9 m. distant. The engine, which he named " My Lord," ran a successful trial on the 25th of July 1814. In 1822 he succeeded in impressing the advantages of steam traction on the projectors of the Stockton & Darlington railway, who had contemplated using horses for their wagons, and was appointed engineer of the railway, with liberty to carry out his own plans, the result being the opening, on the 27th of September 1825, of the first railway over which passengers and goods were carried by a locomotive. His connexion with the Stockton & Darlington railway led to his employment in the construction of the Liverpool & Manchester railway, which, notwithstanding prognostica- tions of failure by the most eminent engineers of the day, he carried successfully through Chat Moss. When the line was nearing completion he persuaded the directors, who were rather in favour of haulage by fixed engines, to give the locomotive a trial. In consequence they offered a prize of £500 f° r a suitable machine, and in the competition held at Rainhill in October 1829 his engine " The Rocket " met with approval. On the r5th of September in the following year the railway was formally opened, the eight engines employed having been made at the works started by Stephenson with his cousin Thomas Richardson (1771-1853) and Edward Pease (1767-1858) at Newcastle in 1823. Subsequently Stephenson was engineer of, among others, the Grand Junction, the London &

Birmingham (with his son Robert), Manchester to Leeds, Derby to Leeds, Derby to Birmingham, and Normanton to York; but he strongly dis- approved of the railway mania which ensued in 1844. He was also consulted in regard to the construction of railways in Belgium and Spain. The last year or two of his life was spent in retirement at Tapton House, Chesterfield, in the pur- suit of farming and horticulture, and there he . died on the 1 2th of August 1848. Stephenson was thrice married, his only son Robert being the child of Fanny Henderson, his first wife, who died in 1806. A nephew, George Robert Stephenson, who was born at Newcastle in 1819 and died near Cheltenham in 1905, was placed by him on the engineering staff of the Manchester & Leeds line in 1837, and subse- quently constructed many railways in England, New Zealand and Denmark. He was president of the Institution of Civil Engineers in 1876-1877.

See Story of the Life of George Stephenson, by Samuel Smiles (1857, new ed., 1873) i an d Smiles's Lines of British Engineers, vol. iii.

STEPHENSON, ROBERT (1803-1859), English engineer, only son of George Stephenson {q.v.), was borr at Willington Quay on the 16th of October 1803. His father, remembering his own early difficulties, bestowed special care on his son's education, and sent him in his twelfth year to Mr Bruce's school in Percy Street, Newcastle, where he remained about four years. In 1819 he was apprenticed to Nicholas Wood, a coal- viewer at Killingworth, after which he was sent in 1822 to attend the science classes at the university of Edinburgh. On his return he assisted his father in surveying the Stockton & Darlington and Liverpool & Manchester lines, but in 1824 he accepted an engagement in South America to take charge of the engineer- ing operations of the Colombian Mining Association of London. On account of the difficulties of the situation he resigned it in 1827, and returned to England via New York in company with Richard Trevithick, whom he had met in a penniless condition at Cartagena. He then undertook the management of his father's factory in Newcastle, and greatly aided him in the im- provement of the locomotives. His practice was not confined to his own country, but extended also to Sweden, Denmark, Belgium, Switzerland, Piedmont and Egypt. In this connexion his most remarkable achievements were his railway bridges, especially those of the tubular girder type. Among his more notable examples are the Royal Border bridge at Berwick-on- Tweed, the High Level bridge at

Newcastle-on-Tyne, the Britannia tubular bridge over the Menai Straits, the Conway tubular bridge, and the Victoria tubular bridge over the St Lawrence at Montreal. In 1847 he entered the House of Commons as member for Whitby, retaining the seat till the end of his life. In 1855 he was elected president of the Institu- tion of Civil Engineers, of which he became a member in 1830. He died in London on the 12th of October 1859, and was buried in Westminster Abbey.

See The Story of the Life of George Stephenson, including a Memoir of his Son Robert Stephenson, by Samuel Smiles (1857 ; new ed., 1873) ; Jeaffreson, Life of Robert Stephenson (2 vols., 1864); and Smiles's Lives of British Engineers, vol. iii.

STEPNEY, GEORGE (1663-1707), English poet and diploma- tist, son of George Stepney, groom of the chamber to Charles II., was born at Westminster in 1663. He was admitted on the foundation of Westminster School in 1676, and in 1682 became a scholar of Trinity College, Cambridge, becoming a fellow of his college in 1687. Through his friend Charles Montagu, after- wards earl of Halifax, he entered the diplomatic service, and in 1692 was sent as envoy to Brandenburg. He represented William III. at various other German courts, and in 1702 was sent to Vienna, where he had already acted as envoy in 1693. In 1705 Prince Eugene desired his withdrawal on the ground of his alleged partiality to the Hungarian insurgents, but the demand was taken back at the request of Marlborough, who had great confidence in Stepney. He was, nevertheless, removed in 1706 to the Hague. In the next year he returned to England in the hope of recovering from a severe illness, but died in Chelsea, London, on the 15th of September 1707, and was buried in Westminster Abbey. Stepney had a very full and accurate knowledge of German affairs, and was an excellent letter- writer. Among his correspondents was Baron Leibnitz, with whom he was on the friendliest terms. Much of his official and other correspondence is preserved in the letters and papers of Sir John Ellis (Brit. Mus. Add. MSS. 28875-28947), purchased from the earl of Macclesfield in 1872, and others are available in the record office. He contributed a version of the eighth satire of Juvenal to the translation (1693) of the satires ' by Mr Dryden and several other eminent hands." Dr Johnson, who included him in his Lives of the Poets, called him a "very licentious translator," and remarked that he did not " recom- pense his neglect of the author by beauties of his own."

His poems appear in Chalmers's English Poets, vol. viii., and other collections of the kind. Some of his correspondence is printed by J. M. Kemble in State Papers and Correspondence . . . from the

Revolution to the Accession of the House of Hanover (1857). A list of the Macclesfield letters is to be found in the Report of the

Hist. MSS. Commission, No. i., app. pp. 34-40. For an account of Stepney's family and circumstances, see R. Harrison, Some Notices of the Stepney Family (1870), pp. 22-28.

STEPNEY, an eastern metropolitan borough of London, England, bounded N. by Bethnal Green, E. by Poplar, S. by the river Thames, and W. by the City of London and Shoreditch. Pop. (1901), 298,600. It forms part of the "East End" of London; the parish, indeed, formerly covered practically the whole area so termed. Here are squalid streets and mean houses typical of the poorest class of inhabitants. The thoroughfares of Mile End Road and Whitechapel Road and that of Commercial Road East traverse the borough from the east and converge near the City boundary, where stood the ancient Aldgate. In the north Stepney includes the districts of Spitalfields, Whitechapel and Mile End; and in the south Wapping, Shadwell, Ratcliff and Limehouse. The southern districts are occupied by sailors and labourers in the St Katherine and London Docks and the wharves and factories lining the river-bank. The parish church of St Dunstan, Stepney, is a perpendicular building, much restored, containing many monuments and curious inscriptions. The church of St Anne, Limehouse (1730) is by Nicholas Hawks- moor. The district of Spitalfields has an old association with the silk- weaving industry; a trade in singing birds is also char- acteristic of this district; and in Ratcliff the well-known natural- ist's firm of Jamrach is situated. In the extreme west the borough includes within its bounds the historic Tower of London, the Royal Mint and the fine Tower Bridge over the Thames. There is no bridge below this, but the construction of the Rotherhithe Tunnel was authorized in 1900. The Thames Tunnel is used by the East London railway. Among institutions the principal is the People's Palace, Mile End Road, opened by Queen Victoria in 1887 as a place of intellectual and physical recreation and education. The Drapers' Company contributed largely to the cost of erection. Toynbee Hall, Commercial Street, was founded in 1884 under the trusteeship of the Universities Settlements Association and named after Arnold Toynbee (d. 1883), a philanthropist who devoted himself to work in this part of London. Other institutions are the London Hospital, Whitechapel, the East London children's hospital, the head- quarters of Dr Barnardo's Homes, Stepney Causeway, and Her Majesty's Hospital for waifs connected therewith; the Stepney training college of the Society for Promoting Christian Know- ledge, and the Spitalfields trade and technical school. There is a fish market in

Shadwell, and a vegetable market in Spital- fields. Stepney is a suffragan bishopric in the diocese of London. The municipal borough comprises the Stepney, Whitechapel, Mile End, Limehouse and St George divisions of the Tower Hamlets parliamentary borough, each division returning one member. The borough council consists of a mayor, 10 aldermen, and 60 councillors. Area, 1765-6 acres.

The name appears in Domesday and later as Stevenhethe. The suffix is thus the common form hythe, a haven; but for the prefix no certain derivation is offered. At Mile End, so called from its distance from the City (Aldgate), the rebels from Essex under the leadership of Wat Tyler assembled (1381), and here Richard II. first met them in parley. Pepys records the village as a favourite place of resort.

STEPNIAK, SERGIUS (1852-1895), Russian revolutionist, whose real name was Sergius Michaelovitch Kravchinski, was born in South Russia, of parents who belonged to a noble family. He received a liberal education, and, when he left- school, became an officer in the artillery; but his sympathy with the peasants, among whom he had lived during his boyhood in the country, developed in him at first democratic and, later, revolutionary opinions. Together with a few other men of birth and education, he began secretly to sow the sentiments of democracy among the peasants. His teaching did not long remain a secret, and in 1874 he was arrested. He succeeded in making his escape— possibly he was permitted to escape on account of his youth— and immediately began a more vigorous campaign against autocracy. His sympathetic nature was influenced by indignation against the brutal methods adopted

towards prisoners, especially political prisoners, and by the stern measures which the government of the tsar felt compelled to adopt in order to repress the revolutionary movement. His indignation carried him into accord for a time with those who advocated the terrorist policy. In consequence he exposed himself to danger by remaining in Russia, and in 1880 he was obliged to leave the country. He settled for a short time in Switzerland, then a favourite resort of revolutionary leaders, and after a few years came to London. He was already known in England by bis book, Underground Russia, which had been published in London in 1882. He followed it up with a number of other works on the condition of the Russian peasantry, on Nihilism, and on the conditions of life in Russia. His mind gradually

turned from belief in the efficacy of violent measures to the acceptance of constitutional methods; and in his last book, King Stork and King Log, he spoke with approval of the efforts of politicians on the Liberal side to effect, by argument and peaceful agitation, a change in the attitude of the Russian government towards various reforms. Stepniak constantly wrote and lectured, both in Great Britain and the United States, in support of his views, and his energy, added to the interest of his personality, won him many friends. He was chiefly identified with the Socialists in England and the Social Demo- cratic parties on the Continent; but he was regarded by men of all opinions as an agitator whose motives had always been pure and disinterested. Stepniak was killed by a railway engine at a level crossing at Bedford Park, Chiswick, where he resided, on the 23rd of December 1895. He was cremated at Woking on the 28th of December. (H. H. F.)

STEPPE (from the Russ. stepi, a waste), the name given to the level treeless plains in certain parts of the Russian Empire, and thence sometimes, though not commonly, extended, in physical geography, to signify similar plains elsewhere. The name is most commonly applied specifically to the plains in the south and south-east of European Russia and in the south- west of Asiatic Russia, and in this connexion the term sometimes connotes semi-desert conditions. Otherwise the Russian steppes may be considered as kindred to and connected with the Heiden (heaths) of northern Germany.

STEPPES, GENERAL-GOVERNORSHIP OF, a portion of Russian Central Asia which includes both what was formerly known as the Kirghiz Steppe, and the region around Omsk, which was formerly part of Western Siberia. It consists of four provinces: Akmolinsk, Semipalatinsk, Turgai and Uralsk, having a total area of 711,000 sq. m. and a total population of 2,472,931 in 1897. Details are given under the names of the provinces respectively. Omsk is the capital.

STEREOBATE (Gr. oreptos, solid, and |3d

STEREOCHEMISTRY (Gr. crrtptos, solid, and chemistry), a branch of chemistry which considers the spatial arrangement of the atoms composing a molecule (see Stereo-isomerism).

STEREOISOMERISM, or Stereomerism, a term introduced by Victor Meyer (by way of his denomination stereo-chemistry for " chemistry in space ") to denote those cases of isomerism, i.e. the difference of properties accompanying identity of mole- cular formulae, where we

are forced to admit the same atomic linking and can only ascribe the existing difference to the different relative position of atoms in the molecule.

Historical. — Considerations concerning the relative position of atoms have been traced back as far as Swedenborg (17 21); in more recent times the first proposal in this direction seems due to E. Paterno (1869), followed by Auguste Rosenstiehl and by Alexis Gaudin (1873). The step made by J. A. Le Bel and J. H. van't Hoff (1874) brought considerations of this kind in the reach of experimental test, and so led to " stereo- chemistry." The work of Louis Pasteur on molecular asymmetry in tartaric acid (i860) touched stereo-chemistry so nearly that, had structural chemistry been sufficiently developed then, stereo-chemistry might have originated fourteen years earlier; it happened, however, that Wislicenus's investigation of lactic

acids (1869) immediately stimulated Van't Hoff's views. The fundamental conceptions, of Le Bel and Van't Hoff differ in that the former are based on Pasteur's notions of molecular asymmetry, the latter on structural chemistry, especially as developed by August Kekule for quadrivalent carbon. Both seem to lead to the same conclusions as to stereo-isomerism, but the latter has the advantage of allowing a more detailed insight, whereas the former, which is free from hypothetical conceptions, is of absolute reliability.

As our knowledge of stereo-isomerism originated in the chemistry of carbon compounds and found the largest develop- ment there, this part will be treated first.

Stereo-isomerism in Carbon Compounds.

1. The Asymmetric Carbon Atom. — Though stereo-chemistry is based on the notion of atoms, there is not the least danger that it may break down when newer notions about those atoms are intro- duced. Even admitting that they are of a compound nature, i.e. built up from smaller electrical particles or anything else and able to split up under given conditions, their average lapse of existencs is long enough to consider them as reliable building-stones of the molecule, though these building-stones may give way now and then, as our best ordinary ones by the action of an earthquake. Another thing which stereo-chemistry abstracts beforehand is the movement of atoms, which is generally accepted to exist, but becoming less as the temperature sinks and disappearing at absolute zero. And so the following symbols, representing atoms in a fixed position, may

correspond to these last circumstances, whereas at ordinary temperatures atoms may vibrate, for instance, with these fixed positions as centres.

The first development from structural to stereo-chemistry was to consider the relative position of atoms in methane, CH 4 . Structural chemistry had proved that the four atoms of hydrogen were linked

/ H to carbon and not to each other, thus Cˆ

H—H-C

- H

ˆtt and not, for example

ˆH

but how the four were grouped remained to decide.

The decision is derived as follows : —

If the four hydrogen atoms are supposed to be in a plane on one side of the carbon atom as above, two methylchlorides CH 3 C1 should be possible, viz. : —

/CI /H

C -H and C ˆH”

X H X H

Such isomeric compounds have never been found, but they appear as soon asthe four atoms (or groups of atoms) to which carbon is combined are different, for example in CHFClBr, fiuorchlorbrom-methane. Then and only then two isomeric compounds have been regularly observed, and the sole notion about relative position of atoms in methane which explains this fact is that the four groups combined with carbon are placed at the summits of a tetrahedron whose centre is formed by carbon. The two possibilities are then represented by : —

Fig. 1.

Fig. 2.

These groupings have the character of enantiomorphism, i.e. they are

non-identical mirror images. If any of the two differences in the summits is given up, for example, F substituted by CI with the formation of CHCUBr, the enantiomorphism disappears.

The isomerism corresponding to this difference in relative position is the simplest case of stereo-isomerism. The carbon atom in the special condition described, linked to four different atoms or groups, is denominated " asymmetric carbon," and will be denoted in the following formulae as C. Stereo-isomerism exists in tartaric acid, H0 2 C-CH(OH)CH(OH)-C0 2 H (studied by Pasteur), in the lactic acid, CH 3 -CH-OH-C0 2 H (studied by Wislicenus), while the simplest case at present known is the chlorobromofluoracetic acid, C-CbBr-F-COoH, obtained by Schwartz. This stereo-isomerism, due to the presence of asymmetric carbon, is of a characteristic kind, which is in perfect accordance with the theory of its origin, being the most complete identity combined with the difference that exists between the left and right hand. All the properties which

cannot differ in this last sense are identical, viz. : melting and boiling point, specific gravity, &c. But the crystalline form, which may show enantiomorphism, indeed shows this difference in the isomers in question; and especially the behaviour (in the amorphous state) towards polarized light differs in the sense that the plane of polarization is turned to the left by the one isomer, and exactly as much to the right by the other, so that they may be termed " optical antipodes." All these differences disappear with the asymmetric carbon, and the succinic acid, H0 2 C-CH 2 -CH 2 -C0 2 H, from tartaric acid is optically inactive and shows no stereo-isomerism.

2. Compounds with more than one Asymmetric Carbon Atom. — Stereo-isomerism and the space relation of atoms in compounds with higher asymmetry can best be developed by aid of graphic representa- tions, founded on the notion of space relations in ethane, H3OCH3. \ consequence of the tetrahedral grouping in methane is the con- figuration given in fig. 3, where the six hydrogen atoms are substituted by six atoms or groups Rj, . . . R6. The second (above) carbon atom is sup- posed to be at the top of the lower tetrahedron, and vice versa. Each other position, obtained by turning RiRjRs around the C — C axis, is also possible, but since no isomerism due to this difference of relative posi- tion, which might already show itself in ethane, has been observed, we may admit that one of the

positions ob- tained by the above rotation is the stable one, and fig. 3 may represent it. For simplicity's sake this figure may be projected on a plane by mov- ing R 3 and Re respectively upward and downward, with R1R2 and R.1R5 as axes, which leads to the first of the four configurations representing the stereo-isomers possible in the above case. They differ in the two possible spatial arrangements of RiR 2 R 3 and RjRsRe: —

Fig. 3.

Ra

I

R,— C— R,

R.

-C— Rs

i

Re

R» R2 — C — Ri

1

R 4 — C— R 6

I Re

Rs

I Ri — C — R2

R 5 — C— R 4

R.

As one asymmetric carbon introduces two stereo-isomers and two introduce four, n asymmetric carbon atoms will lead to 2" isomers. They are grouped in pairs presenting enantiomorphic figures in space, as do the first and the last of the above symbols, which correspond to the character of optical antipodes, whereas the first and second correspond to greater differences in melting points, &c. A well- studied example is offered by the dibromides of cinnamic acid,

CeH 5 -CHBr-CHBrC0 2 H. They have been obtained by Liebermann in two antipodes melting at 92 , and two other antipodes, differing in optical rotation from the first, and melting at 195 .

A simplification is introduced when the structural formula shows symmetry, as is the case in RiR2R 3 C-CR 3 R 2 Ri. The four above-mentioned symbols then are reduced to three : —

R3 R^— R 2

R 2 — C— Ri

I R 3

R»

I

Ri — C — R2

R.-

-C— R 2

I Rs

R3 R 2 — C — Ri Ri — C — R2

1

Rs

of which the first and last show the enantiomorphism corresponding to the character of optical antipodes, while the second shows symmetrv and corresponds to an inactive type. A well-studied example is offered here by tartaric acid: the two antipodes, often denoted as d and I, have been found, viz. in the ordinary dextrogyre form and the laevogyre form, prepared by Pasteur from racemic acid, while the third corresponds to mesotartaric acid; such internally compensated compounds are generally termed ” meso.”

3. Cyclic Compounds. —Three or more carbon atoms may link together so as to produce ring systems such as

R,CR 2

R3R4C CReRe.

It is in these cases that the principle of the asymmetric carbon, which in the above case leads to 2 3 = 8 stereo-isomers, is easily applied by means of graphical representations in a plane, derived from the space relation shown in fig. 4. The six groups, Ri . . . R 6 , are either under

or above the plane in which the carbon ring is supposed to be situated, and this may be indicated by the following symbol: —

where the carbon atoms are supposed half-way between Ri and R 2 , R 3 and R 4> R 6 and R„.

One of the most simple examples is offered by the trimethylene-dicarboxylic acids CH 2

eo,ii

H0 2 C-HC CH-C0 2 H

for which three formulae can be deduced : —

CO3H

CO»H

CO3H

CO«H

COjW

the first, where the carboxyl groups -C0 2 H lie on the same side of the carbon ring, called, as Von Baeyer proposed, the cis-form, the others /raws-forms. The trans-forms show enantiomorphism and correspond to optical antipodes, whereas the first symbol may be considered as corresponding to mesotartaric acid, symmetrical in configuration and inactive; this third stereo-isomer has also been met with.

Special attention has been given to those ring systems of the general form :— Riv /R 3 — R

>C< >C/ •

R 2 / \R«— R/ \Ri This trans-form corresponds to a cis-form, where both R 2 and Ri are on the same side of the plane containing the ring, These latter are enantiomorphic in the ordinary sense of the

word, but the particular feature is that the trans-form, though offering nc plane of symmetry, is yet identical with its mirror image, and thus not enantiomorphic and not corresponding to optical antipodes but to the meso-form.

There correspondences have been realized by Emil Fischer in derivatives of alanine, H3OCH-C0 2 H, which exists in two antipodes d and /. Two of these molecules can be combined to alanyl-alanine:H3C-CH-NH(COC-H-NH 2 -CH3)-C0 2 H,which,ascontaining two asymmetric carbons, may be had in four stereo- isomers dd, II, dl and Id. In their anhydrides

H x .CO— NH V .CH3 >C< \C<

H 3 C/ \NH— CO/ \H we meet the above type, and find that dd and 11 formed the predicted antipodes, while the anhydride of dl and Id is one and the same substance, without any optical activity. Such cases are often termed " pseudo-asymmetric."

4. Isolation of Optical Antipodes. — The optical antipodes are often found as natural products, as is the case with the Ordinary or (/-tartaric acid ; generally only one of the two forms appears, the second form (and, more generally both forms) being obtained synthetically. This is a problem of particular difficulty, since the artificial production of a compound with asymmetric carbon, from another which has no asymmetric carbon, always produces the two antipodes in equal quantity, and these antipodes, by their identity in most properties, e.g. melting and boiling point, solubility, and also on account of their analogous chemical behaviour, cannot be separated by customary methods, the application of which is rendered still more difficult by the formation of a so-called racemic compound.

The method called " spontaneous separation " was first observed by Pasteur with racemic acid, which in its double sodium and ammonium salt crystallized from its aqueous solution in two enantiomorphic forms, which could be separated on examination. One of the two proved to be the ordinary sodium-ammonium-tartrate, the other its laevogyre antipode; thus /-tartaric acid wasdiscovered, and racemic acid proved to be a combination of d- and /-tartaric acid. The further examination of this particular transformation showed that it had a definite temperature limit. Only below 27° is Pasteur's observation corroborated, while above 27° a racemate appears; these changes are due to a chemical action taking place at the given temperature between the solid salts : —

2C40eHiNaNH4-4H 2 tˆ (C40,H 1 NaNH 4)2-2H 2 0+6H 2 0, one molecule of the d- and one of the /-tartrate forming above 27°, the racemate with loss of water, while under 27° the opposite change occurs. This temperature limit, generally called transition-point, was discovered by Van't Hoff and Van Deventer. It is the limit where the possibility of spontaneous separation begins, and is relatively rare, so that this way of separation is an exceptional one, most antipodes forming a racemic compound stable at all tempera- tures that come into question.

The use of optically active compounds in separating antipodes

is of the greatest value. The general principle is that the compounds which the d- and /-form give with a different active compound, for instance d producing dd and Id, are by no means antipodes and so exhibit the ordinary differences, e.g. in solubility, which allow separation. It was in this way that Pasteur split up racemic acid by cinchonine. This method has since been applied to the most various acids; bases may be split in an analogous wa> ; artificial conine was separated by Ladenburg by means of (/-tartaric acid, and one of these antipodes proved to be identical with natural conine. Aldehydes and ketones on the other hand may be spljt up by their combinations with an active hydrazine, &c, and so this method is by far the most fruitful.

The formation of a racemic compound built up from dd and Id has also been observed in the so-called partial racemate. An example is the racemate of strychnine. It is in this case also that the transi- tion-point forms the limit of possible separation, determined by Ladenburg and G. Doctor to be 30°. Such partial racemic com- bination however occurs only in exceptional cases, else it would have invalidated this method, as it did spontaneous separation.

A different way of using active compounds in producing antipodes consists in the so-called asymmetric synthesis. The method consists in the introduct'on of an active complex before that of the asym- metric carbon ; both stereo-isomers need not then form in the same quantity. W. Marckwald and A. McKenzie, who chiefly worked out this method, found, for example, that the salt of methylethyl-malonic acid, C(CH 3) (C2H5) (C0 2 H) 2 , with the active brucine forms on heating the corresponding salt of d- and /-methylethylacetic

acid C(CH 3) (C 2 H 5)H(C0 2 H), with the /-antipode in slight excess.

5. Configuration of Stereo-isomers. — The conception of asymmetric carbon not only opens the possibility of determining when and how many stereo-isomers are to be expected, but also allows a deeper insight into the relative position of atoms in each of them. The chief indication here lies in the configuration of the meso-type, already given for mesotartaric acid ; the corresponding alcohol, the natural sugar erythrite, which produces this acid by oxidation, consequently corresponds to CH 2 OH

H— C— OH

H— C— OH

CH 2 OH. In the glutaric acids, H0 2 C- (CH-OH) 3 -CO.H, the structural symmetry again leads to meso-forms

OHOHOH OH H OH

HO,C-

U<

C— C0 2 H and H0 2 C

H H H

cUU

H OH H

-C0 2 H.

They are respectively obtained by the oxidation of ribose and natural xylose, stereo-isomers of the formula COH 3 CH 2 OH ; the latter produces active tartaric acid and so decides that the second formula is that of the corresponding trioxyglutaric acid, the first remaining for that obtained from ribose.

In such and analogous ways the configuration of meso-types may be fixed with absolute certainty. The decision is more difficult in the case of antipodes. For tartaric acid it is certain that the d- and /- forms correspond to

CO2H HCOH HOCH C0 2 H

C0 2 H

and

HOCH HCOH

A

2 H,

but which of the two represents the ordinary acid is unknown. Emil Fischer proposed to decide provisionally in an arbitrary way and admit for the d the first formula. Then we may conclude that the natural malic acid, which may be obtained by the reduction of /-tartaric acid, is C0 2 H

HO

:h 2

OH

o 2 h,

while the natural xylose, which produces /-tartaric acid by the substitution of C0 2 H for CHO-CHOH, corresponds to

CHO

HCOH

HOCH

HCOH

The results obtained in these and analogous ways have proved to be of value in the study of enzymes, e.g. such complex organic substances as zymase in yeast, which is able to produce in small quantity an unproportioned large amount of chemical change, in this case the transformation of the sugar glucose, C6Hi 2 06, into alcohol and carbonic acid

C6H 12 06 = 2C 2 H 6 0-r-2C0 2 .

These enzymes have an extremely specific action, producing, for instance, the change in ordinary natural glucose, but not at all in its artificial antipode, and so they are often valuable means of isolat-

ing an antipode from the inactive mixtures or racemic compounds; this method has indeed been used for the isolation of the glucose-antipode from the artificial racemic form. The fundamental fact here is due once more to Pasteur, but Emil Fischer added that sugars are acted upon by zymase in an analogous way if their configuration shows a certain amount of identity. For example yeast acts on

d-Glucose HCO

HCOH

HOCH

HCOH

HCOH

H 2 COH

ˆMannose HCO

HOCH

HOCH HCOH HCOH H 2 COH

(/-Fructose H 2 COH

Ao

HOCH HCOH HCOH H 2 COH,

t

H 2 OH.

and we observe that the three formulae agree indeed in the lower four-carbon chain. This particular behaviour led Fischer to the expression that the enzyme-action on given substances needs a corresponding feature as " lock and key." There are indications that in the synthesis by enzymes, of which examples have been realized in fats, sugars, glucosides and albuminoids, an analogous behaviour prevails.

6. Mutual Transformation of Antipodes.' — Thus far we have supposed the molecule to be stable with atoms in fixed places, as may be the case at absolute zero ; in reality, at ordinary temperatures, atoms probably are endowed with movement, and this may be

supposed to take place along the fixed places just mentioned as centres, which movement can go so far as to lead to total trans- formation, the one stereo-isomer changing over into the other. These cases may be considered now.

As a general rule the liquid, gaseous or dissolved antipode is it itself unstable, tending to be transformed into inactive complexes. Temperature may accelerate this, and, as a rule, sufficient heat wil. produce the loss of optical activity, half of the original compount having changed over into its optical antipode. This transformation has been often used for preparing the latter, as was first done by Le Bel with the optically active amyl alcohol, HC(CH 3)(C 2 H 6)(CH 2 OH), rendering it inactive by sufficient heating, and separating from the obtained complex the stereo-isomer. Walden found that in some cases analogous transformations take place at ordinary temperature, as for instance with d-phenylbromacetic acid, which within three years totally lost its considerable rotative power; this transformation has been termed " autoracemization." It explains that till now the most simple compounds with asymmetric carbon have not yet been obtained in antipodes; active CHClBrF might be obtained by treating chlorobromonuoracetic acid with potash, but autoracemiza- tion, which especially shows itself when halogens are linked to the asymmetric carbon, might, without special precautions, lead to an inactive mixture of antipodes.

When two asymmetric carbons are present, four stereo-isomers are possible, which may be represented by : —

*(1) A+B, (2) -(A+B), (3) A-B, (4) -(A-B), (1) and (2), as well as (3) and (4), being antipodes. The stable form will be in this case also the inactive mixture, corresponding in the solid state either to (1), (2) or (3), (4). In the last case, suppose the primitive compound is (1), the first step towards stability may be the production of (3), so that practically one stereo-isomer changes over into another ,J*4*

of a different type. Such has, for instance, ˆ

been proved by Bechmann for /-menthol, H— C— C 3 H T

H 2 C CH 2

H 2 C CO

\y

H— C— CH 3> which on heating produces a form rotating in

opposite sense, though not the antipode. Probably H and CH 3 in the lower asymmetric carbon have changed places. A further treatment at high temperature might prob- ably produce the inactive mixture of this menthol and its antipode. Fig. 5.

7. Doubly-Linked Carbon Atoms. — When carbon atoms are doubly linked, as in derivatives of ethylene, H 2 C :CH 2 , the two tetrahedra representing the four groups around each carbon may be supposed to have two summits combined, as was supposed with one in simple linking. Fig. 5 represents this supposition, from which follows that the six atoms in question are situated in a plane and may be represented by a plane figure : —

Ri-C-Rj

II Ra'C-Ri.

The chief consequence is that as soon as the two atoms or groups attached to each carbon are different, two stereo-isomers may be looked for: —

Rj-C-R, R r CR 2

I! II

RrC-Rj R2CR1.

Such has been found to be the case, fumaric and maleic acids, H-C-COjH H-C-COsH

HOjC-C-H H-C-C0 2 H,

forming the oldest and one of the most simple examples ; the simplest is o-chlorpropylene (H 3 C)HC :CC1H.

The nature of this stereo-isomerism is quite different from that in antipodes. There is no enantiomorphism in the supposed con- figurations, and so no. rotatory power, &c, in the corresponding compounds, which, on the other hand, show differences far deeper than antipodes do, having different melting points, solubility, heat of formation, chemical properties, &c, behaving in these as ordinary isomers. These isomers, having some relation to those in cyclic

compounds, may be also denoted as cw-(maleic) and trans-(fumaric) forms, a close analogy existing indeed in those ring systems of which the simplest type is; —

H.

1/Kr i\iA

.!

this has been realized in the I, 3-tetramethy!ene dicarboxylic acids, which exist in a trans- and cis-1'orm : —

CO3H 1

C0 2

CO2H

H 3 C H

C<

When two double carbon Unkings are present, as in H 2 C:C:CH 2 , the four hydrogen atoms form the summits of a tetrahedron accord- ing to the development in fig. 4 ; and consequently the introduction of different groups may bring enantiomorphism and optical antipodes. This has been realized in the compound i-methyl-cyc/o-hexylidene-^ acetic acid (formula I.), first prepared by W. H. Perkin and W. J. Pope in 1908, and resolved into its components by fractional crystal- lization of its brucine salt by Perkin, Pope and Wallach. The substance resolved by W. Marckwald and R. Meth in 1906, which was regarded as this acid, was really the isomeric i-methyl-A3- cw/o-hexene-4-acetic acid (formula II.), which contains asymmetric carbon atoms (see Jonrn. Chem. Soc, 1909, 95, p. 1791; cf. ibid., 1910, 97, p. 486).

/CHrCftv /H H 3 C

>C:C<

nzh 2 -ch/ \co 2 h, h

1.

8. Numerical Value of Optical Rotation. — To express the value of optical rotation either specific or molecular rotation may be chosen, the first being the deviation caused by a layer of 1 decimetre in length when the substance in question is supposed to be present with specific gravity 1, the latter is this value multiplied by one-hundredth of the molecular weight. Specific rotation is indicated by [a] ! D , where the suffix indicates the wave-length of the light in question, D being that of the sodium line, and t the temperature; [M]j-, is the corre- sponding value of molecular rotation. Both values vary with the solvent used, and probably are most adapted to solve problems touching relations of rotatory power and configuration, when they apply to extreme dilution in the same liquid.

One of the most general rules, relating to rotatory power, is that for electrolytes, i.e. salts in aqueous solution, viz. the limiting rota- tion in dilute solution only depends on the active radicle. Oudemans found that for such active bases as quinine in its salts with hydro-

\ >C-CH 2 -C0 2 H CH 2 CH/ II.

chloric, nitric, chloric, acetic, formic, sulphuric, oxalic, phosphoric, perchloric acids the specific rotation (calculated for the base) only varies from -272° to — 288 ; H. H. Landolt found the same thing for active acids, the mono lithium, sodium, potassium and ammonium tartrates varying only between 27-5° and 28-5° (calculated for the acid). A corresponding rule may be expected where both base and acid have rotatory power; the molecular rotation will be the sum of those for base and acid in salts with inactive radicles. Each of these rules finds sufficient explanation in Arrhenius's view of electrolytic dissociation, which admits that diluted electrolytes are split up in their ions, and so the salts of quinine (Q) owe their

rotatory power to the ion QH, those of acid tartrates to the ion

C4H5O6, and quinine-tartrate to both.

With non-electrolytes relations are less evident. One general obser- vation is that non-saturation, especially cyclic structure, augments rotatory power. The saturated compounds, hydrocarbons, alcohols, ethers, amines and acids rarely show specific rotations higher than 10°, and some of them, as mannite, CH 2 OH(CHOH) 4 CH 2 OH, for instance, show such small values that only a more thorough investigation, due to the theoretical probability of rotatory powers in asymmetric natural products, has detected the optical activity.

Unsaturated compounds generally show larger rotative powers; amyl alcohol with — 5° produces an aldehyde with 15 ; succinic (diamyl) ether with 9° produces fumaric ether with 15°, &c. Cyclic configuration especially leads to the highest values known: the lactic acid with 3 leads to a lactone with —86°, HsC-CH-COO

I I

OOC-HC-CH 3 ;

mannosaccharic acid, H0 2 C(CHOH)4CO 2 H, to a dilactone (with two rings, formed by the loss of two molecules of water) with 202°, whereas the original acid only shows a small rotation.

A second Conception, which connects rotation with configuration in non-electrolytes, is due to Alexander Crum Brown and P. : A. Guye. It starts from the simple assumption that, as rotatory power is due to the difference of the four groups around the asymmetric carbon, so its amount may correspond to the amount in this. So, generally speaking, take some property, denoted by Ki, . . . K t respectively, a function : —

(Ki-KO (Ki-K.) (Id-KO (K.-K.) (K 2 -K 4) (K.-KO

would express what is wanted. It becomes zero when two groups are equal ; it changes its sign, retaining its value, when Ki is inter-changed with K 2 , &c. The chief difficulty in application is to point out that property which is here dominating. It has been supposed to be weight, and then the above expression divided by (K1 + K2-I-K3 + K4) 6 might be proportional 'to specific rotation. This explains, for instance, that in the homologous series of glyceric

HO\ x:h 2 oh

ethers yC\ , augmenting the heaviest group, -C0 2 R, first

h/ x:o 2 r

augments the specific rotation, which then passes through a minimum (the theoretical limit being zero) : —

Ether of methyl, ethyl, propyl, butyl, hexyl, octyl, [a] D =-4-8°, -9-2°, -12-9°, -i3-2°,-ii-3°,-io-2 . But the serious objection is met that groups of equal weight and different structure often allow considerable rotatory power as in methyl acetylamygdalate, with — 146 , though in the formula C 6 H 5 HC(OC 2 H 3 0) (C0 2 CH 3)

the third and fourth groups are of equal weight. It is in this way especially that other properties might be tested, such as volume or density, and perhaps qualities related to light, such as refractive power and the dielectric constant. At- tempts to connect the rotatory power of a compound with more asymmetric carbons to the action of each of these separately, i.e. by the so-called optical superposition have not been very successful. In the four stereo-isorceric acids C0 2 H(CHOH) 3 CH 2 OH of the following configurations

C0 2 H

HCOH HOCH HOCH

H 2 COH

i-arabonic acid,

C0 2 H

I HCOH

C0 2 H HOCH HCOH

CO2H HOCH HOCH

HCOH

H 2 COH

d-lyxonic

acid,

HOCH

H 2 COH

(i-xylonic

acid.

HCOH

HCOH

I HjCOH

d-ribonic acid,

We might suppose the upper asymmetric carbon to produce a rotation f A or — A, the other ± B and ± C. The rotations then were A-B-C, A + B+C, -A-B + Cand -A + B-Cor zero in total. This supposition is in so far related to that of Crum Brown and Guye that it admits that the smallest conceivable change, i.e. stereo-isomeric change, in one group does not influence the rotation caused by the asymmetric carbon attached to it. It has not been tested in this case, but substances as propyl- and isopropyl-glycerate only differ in specific rotation from — 12-9° to

— 1 1 -8°, and might prove identical in the same solvent ; the sharpest test might be afforded by propylisopropylacetic acid.

9. Steric Hindrance. — The difference in the relative positions of atoms not only explains the different behaviour of optical antipodes, as has been indicated, but also gives some indication where no optical activity is concerned.

In the stereo-isomerism of ethylene compounds, taking maleic and fumaric acid as examples, space relations chiefly indicate that in one of the two the carboxyl groups CO2H are nearer. Such seems indeed to characterize maleic acid. It easily gives an an-

HC-CO hydride of the cyclic formula || \0 and, inversely, when cyclic

HC-CO compounds such as benzene are broken down by oxidizing agents, it is maleic and not fumaric acid that appears. On the other hand the presence of the two negative carboxyls makes maleic acid the stronger acid but less stable, with a pronounced tendency to change over into fumaric acid; this goes hand in hand, according to a general rule, with smaller heat of formation, "lower melting point and increased solubility.

In the cyclic compounds analogous phenomena occur. The formation of lactones, i.e. cyclic anhydrides derived from oxy-acids by interaction of hydroxyl and carboxyl, presents one of them. In the oxy-acids of the fatty series a particular feature is that from the isomers, denoted as o, and y, &c. H0 2 C-CHOH„CH 3 , H0 2 C-CH 2 -CHOH-fCH 2)„. 1 CH 3 ,H0 2 0(CH«) 2 -CHOH n – 2 CH s ,&c. > the 7-compounds most easily form a lactone, though in the o-series

carboxyl and hydroxyl run nearer. The tetrahedral arrangement, how- ever, as shown in fig. 6, explains that A, one of the groups attached to the carbon atom Ci, is fairly near C&, one of the groups attached to the carbon atom C 4 (the angle A being 35) ; A would correspond to the hydroxyl forming part of carboxyl around Ci; Cs to the hydroxyl linked with the carbon atom in the -y-position.

A third consideration on analogous ground is that of " steric hindrance." It was introduced by Victor Meyer's discovery that derivatives of benzoic acid, having two substituents (X and Y) in the immediate neighbourhood of carboxyl : —

COjH

are unable to form ethers in the ordinary way, by treating with methyl alcohol and hydrochloric acid, whereas the isomers having only one of the substituents Y in 4 (X in 6) readily do ; it was suggested that the presence of X and Y near C0 2 H prevented the access to the latter. This argument has not been completely established, but a large amount of quantitative corroboration has been brought to- gether by N. A. Menschutkin, who has found that in alcohols the more the hydroxyl group is surrounded by substituents (for instance CH 8) the slower esterification (with acetic anhydride in acetone at 100) take's place, the ratio of rates being

Methyl alcohol H 3 COH ... 100

Ethyl alcohol H 3 C-CH 2 -OH . . 48

Dimethyl carbinol (H 3 C) 2 CH-OH . 14

Trimethyl carbinol (H 3 C) 3 OOH . . o-8

Stereo-isomerism in Other Elements.

Phenomena analogous to those observed in carbon compounds might also exist in derivatives of other quadrivalent elements ; and only the relative stability of carbon-compounds makes every form of isomer, which often is unstable, more easily obtainable in organic chemistry. Nevertheless it has been possible to obtain stereo- isomers with different elements, but, as expected from the above, especially in derivatives containing carbon. Some of them have the character of optical antipodes and are more easily considered from a theoretical point of view ; others have not.

1. Optically Active Stereo-isomers. — Most closely related to the

phenomena with carbon are those with sulphur, selenium, tin and silicon, when these elements behave as quadrivalent. S. Smiles {Journ. Chem. Soc, 1900, 77, pp. 1072, 1174; 1905, 87, p. 450) split up such derivatives of methylethyl-thetine as C 2 H 6V XHrCO-CeH,,

X,

CH

ˆBr

obtained by condensing methylethyl sulphide with oi-bromaceto-phenone, by means of the salt with d-bromocamphosulphonic acid, into optical antipodes.

W. J. Pope and A. Neville (Journ. Chem. Soc, 1902, 18, p. 198) succeeded in the same way with a selenium compound CaHsv /CH 2 C0 2 H >Se< ;

H 3 (X ˆBr W. J. Pope and S. J. Peachey (Journ. Chem. Soc, 1900, 16, pp. 42, 116) with a compound of tin (tin methylethylpropyl iodide) C 2 H S \ /C3H7

>Sn< H 3 (X M ; Kipping (Journ. Chem. Soc, 1904, 20, p. 15; 1907, 23, p. 9) with one of silicon (benzylethylpropyl silicol)

(~ 2 Hfiv /C3H7

CeHj-CH/ X>H.

These facts may be explained in the same way as with carbon, by admitting tetrahedral grouping. A special feature, however, wanting with carbon, is that compounds with one atom only of the element in question have been obtained as antipodes. A second observation of some interest is that the compounds in question are electrolytes and that, as in solutions, where they are split up into ions, activity must be due to the last, the ionic complex, for in- stance, RiR 2 R s S, must cause optical rotation.

Optical antipodes have also been obtained with quinquevalent nitrogen in compounds of the type: R;R 2 R 3 RiNR 6 . Le Bel observed these in methylethylpropyl-isobutylammonium chloride; since then Pope and Peachey and Wedekind studied the same question more thoroughly, and as a general result it is now stated that ammonium compounds with four different radicals behave as

asymmetric carbon compounds. The explanation may be that the four radicals arrange themselves in the two possible tetrahedral configurations, and that the fifth element or group, e.g. chlorine or hydroxyl, more loosely linked, finds its fittest place, as shown in figs. 7 and 8.

Fig. 7.

Fig. 8.

2. Stereo-isomersˆ Without Optical Activity. — The chief cases here belong to the derivatives of nitrogen with double linking and the metallic compounds which have been chiefly studied by Werner.

The nitrogen compounds showing stereo-isomerism belong to two classes, according to the structural formulae, containing C :N or N :N ; in their general behaviour they seem related to the ethylene derivatives.

The first group was detected by Victor Meyer and Goldschmidt in C 6 H 6 'C:NOH benzildioxime : I

C 6 H 6 -C:NOH. Later investigations, especially by Hantzsch, showed that a grouping Ri-C-R 2 R,CR 2

X

&

NX

gives rise to stereo-isomerism, the supposed difference being that X is either more close to Ri or to R 2 . This peculiarity is observed in the aldoximes and ketoximes, derived from aldehydes and ketones on treatment with hydroxylamine, and the two simplest examples are ethyl-aldoxime H 3 C-CH:NOH, and phenyl-benzyl-ketoxime, (C 6 H 6) (C6H 4 CH 2) C:NOH. As the behaviour of these stereo-isomers much resembles that of ethylene-compounds, they are often indicated as cis- and trans-forms.

The second stereo-isomerism in nitrogen-compounds was detected by Schraube in potassium benzenediazotate, and may perhaps be reproduced by the following symbols : —

C 6 H 6 -N and C 6 H 6 N

KON NOK.

The last group of stereo-isomers, in which insight is most difficult yet, is that of Werner's complex metallic compounds, observed with cobalt, platinum and chromium. No enantiomorphous character throws light here, and there is no relation to ethylene derivatives.

With cobalt the fact is that in the hexammonic cobalt salts, e.g. Co(NH 3) 6 Cl 3 , when NH 3 C1 is substituted by N0 2 isomerism appears as soon as the number of substituents is two ; Jorgensen's flavo-salts Co(NHs)4(N0 2) 2 Cl, and Gibbs's isomeric croceo-salts offer examples. Werner puts forward that a grouping of (NH S) 6 at the summits of a regular octahedron around Co may explain this.

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Platinum compounds such as (H 3 N) 2 PtCU have been obtained in two forms, Werner admitting here the following plane configurations : —

CI

j/

CI

\nh 3

ind

CI

X

NH3

H.N' \NH 3 H 3 lN T/ X C1

Chromium shows a behaviour analogous to that of cobalt, and analogous space-formulae may be used here. But, in a general way, at present it is extremely difficult to decide upon their value.

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STEREOSCOPE (Gr. orepeos, solid, (TKorelv, to see). 1 The fundamental property of stereoscopic vision, or simultaneous vision with both eyes, is the direct perception of the relative distances of near objects. Of course, ideas of the different distances of objects also occur in vision with a single eye, but these are the result of other experiences and considerations. These representations are also not always unequivocal (see fig. 1). For instance they may arise from the former know- ledge of the shape and size of a distant object, from the partial covering of one object by Fig. 1. another; and they very often occur where stereoscopic observation fails; this latter is involuntary, i.e. the observer is unconscious of it. We will now investigate the conditions necessary for the perception of depth.

If the head is held still only one portion of space can be observed stereoscopically. The single eye, when moved, sur- veys, including indirect vision, a field which measures 180° in a horizontal direction, and 135 in a vertical direction. The two fields overlap and a smaller conical space is formed, with the nose as vertex (B V S in fig. 2), in which both eyes can see simultaneously; and outside this

space stereoscopic vision is impossible. The shape and size of this space are very differ- ent in men and animals. According to Armin Tschermak the horizontal extent of the space surveyed with both eyes is only 34 in a rabbit as compared with 90 in man, 15° in a fowl and about 5 in a carp (measured in water). There is a further difference between the eyes of men and animals. The optic axis of the eye is the line joining the centres of the curves, but the direction in which the eye can see most clearly does not always coincide with this, being determined by the spot on the retina which is most susceptible to light, the so-called yellow spot (Fovea, F in fig. 2). In man this spot is still near the axis, although not always exactly on it. It is not perfectly known how it is situated in animals, but in many the axes of the eyes diverge (especially strongly in geese), and the portions of the retina utilized in stereoscopic vision lie far distant from the axis, as in many animals the eyes are only slightly movable. Every' time that the eyes are directed on one spot (P in

1 The subject of stereoscopy has been extensively developed by the author of this article, who, curiously enough, having lost the sight of one eye through an accident, could no more enjoy the beauties of stereoscopic sight. — Ed.

fig. 2) this point is seen simply, together with a number of other points which together form the so-called " horopter." According to Joh. Miiller, Helmholtz, Hering, Volkmann and others, these are those points of the object-space (e.g. Q and R in fig. 2), whose images fall on identical or corresponding spots on the retina, by which are meant those points on the retina whose nerve filaments are united and which are equidistant in the same direction from the centre of the yellow spot (see Eye; Vision). The horopter varies according to the position of the fixed spot in the object-space; for example, it is the ground

itself for a man standing erect and looking straight ahead. All object-points situated outside the horopter fall on points of the retina which are not identical, but the two images are only seen as real double images in exceptional cases. As a rule the effect is that these points are also seen simply, but at other dis- tances than that of the fixed point P. The differences of the images arise in the moving of the image-points in the direction of the connecting line of the two eyes. For this reason the eyes cannot recognize the space between parallel shining telegraph wires if the connecting line of the two eyes be parallel to the wires, whilst the perception of the depth occurs involuntarily if the connecting line of the eyes is more or less perpendicular to the wires. These differences of images which have

been men- tioned are therefore necessary and are sufficient for the perception of depth. The explanation that the perception of depth was due to a difference between the two retinal images was first given by Ch. Wheatstone in 1833; but it was contradicted by E. Briicke (1841), Sir David Brewster (1843) al >d others, who stated that when observing an object the angle of convergence of the axes of the eyes continually changed, and through this and also by the exertion of the muscles and the accommodation of the eye there was a simultaneous touching of the object, which gave rise to the perception of its depth. This latter theory, however, was contradicted by H. W. Dove, who showed that a stereoscopic viewing was also possible with momentary i illumination of the object; and still less does it agree with the

fact, to which Wheatstone first called attention, that facsimiles also have a stereoscopic influence, in spite of the fact that the images retain their position on the retina unchanged. Numerous experiments show the same result, and it follows that even a change of the angle of convergence is not always observed as a change of depth.

There are two kinds of stereoscopic vision, direct and in- direct, according to whether the point seen indirectly, e.g. H in fig. 3, is compared with the fixed point P, or with another point seen indirectly, e.g. J in fig. 3. In both kinds of stereo- scopic vision the exactness of the observation of the depth is greater as the point J approaches H, and the point H approaches P. As a matter of fact a man's eyes are naturally never perfectly still. They move in their sockets, and the point P, where the axes intersect, is continually changing. Direct stereoscopic vision arises from indirect stereoscopic vision and vice versa, and the accuracy of the discernment of the depth increases and decreases. As in this the eye does not revolve round its lens but round the centre of the sphere situated 10 mm.

J

Fig. 3.

behind it, the entrance-pupil of the eye moves slightly to and fro and up and down, and many experiments have been made to produce a perception of depth for a single eye from the relative movements of the images consequent on this motion. As these movements of the

images only occur in indirect vision, it can be understood they are not seen by most people. This, however, cannot be regarded as an actual perception of depth, because these viewings necessitate a consideration for each individual interpretation, which is quite foreign to stereoscopic vision.

Indirect stereoscopic vision is of great importance. It makes it possible to recognize any sudden danger or obstacle outside the direction in which one is looking. Even with the stereo- telemeter (see below) the position of the range through which, for example, a bird flies, could not always be accurately given, if one were solely dependent upon direct stereoscopic vision. If the attention and eyes are directed upon a certain object, as, for instance, in manual labour and in measuring the image- space with the so-called " travelling mark " on the stereo- comparator, then direct stereoscopic vision only is concerned.

Stereoscopic vision is in many ways similar to the monocular observation of a preparation under the microscope, and yet

there is a great difference. In an unchanged focused micro- scope it cannot be distinguished which of the indistinct objects are above and which are below the plane focused for. In stereoscopic vision, however, this can be seen directly. How does this happen? Why does the point H in fig. 3 appear behind and the point V in front of the point P when both eyes are fixed on the point P?

As is shown in fig. 3 the image-points on both sides lie further apart for H or nearer together for V than the image-points for P, and for all the points on the horopter (Q, R, S, T &c), whether the points H and V are situated inside or outside the horopter. In other words, if the point H be formed in the object-space by the moving of the related points Q (or R) towards H, then a movement of the image-point takes place in the right eye (or the left), in both eyes in the direction of the nose, so long as the point H is outside the horopter. On the contrary an external movement of the image- point, i.e. towards the temples, takes place when the points S and T are substituted by the point V situated inside the horopter. This differentiation of the retinal images of the points H and V respectively inside and outside the horopter must suffice, and the question as to how the idea of space is conveyed to the brain is a physiological and psychological subject.

If the images of the line PH in both eyes (or of the line PV) ar& very different in length, the double images of the point H (or V) are seen

without great attention. But the stereoscopic effects are in these cases always the same as before. There is, however, an exception in which the observer sees only two images and in which stereoscopic observation is completely excluded. This exception is important because it occurs in the space in the immediate proximity of P. If for example the second point (H' in fig. 3) is situated behind or in front of the point P, so that it falls between the two optic axes, or on one of them, then only double images can be seen, either of P or of H', according to whether the optic axis cuts at P or H', or double images of both points if the optic axes intersect at any other point of the line PH', but the representation of the difference of depth of the two points P and H' is never obtained.

This fact can be easily realized if a stick, e.g. a lead pencil, be held before the eyes of an observer with good stereoscopic sight so that its lengthwise axis falls exactly on a point between the eyes or in the middle of one of the two eyes. The double images can be seen still more clearly if two small balls on thin threads are suspended behind one another so that their connecting line retains the position mentioned above. In this experiment it can be seen directly how inconvenient these double images are to the observer. He involuntarily tries to evade them by moving the head. The reason for this is that, when P (or H') is fixed, the images of H' (or P) are always separated from one another by the centre of the yellow spot. The distances of the two images from the yellow spot have consequently opposite signs, whilst for all other objects (e.g. H) which lie outside the two axes the distances have the same signs. The difference of the sign is, however, not alone decisive, for if the connecting line PH' is moved a little higher or lower out of the plane FPF the signs remain different, but the stereoscopic effect is immediately regained. Therefore in all cases in which the connecting line PH' is seen with one eye as a point and with the other as a line, or with both eyes as a line, but from two diametrically opposite sides, there is no stereoscopic effect, but double images are seen; and that for stereoscopic observation it is essential to see the connecting line PH' ■with both eyes simultaneously from one and the same side, from above or below, from the left or the right. This condition is provided for in the stcreotelemeter by the arrangement of a zigzag measuring scale, so that the connecting-line of the marks slightly ascends. Care must be taken when using this instrument (as also when using any stereoscopic measuring instrument) that the index hangs close to or above the object to be measured, so that the latter is only touched and in no way covered by the mark.

The power of perception of depth in man is most accurate. This has

been ascertained by the approximately equal keenness of vision of all normal-sighted people and by the interpupillary distance. The angle which serves as a measure for the keen- ness of vision is that under which appear two neighbouring points of the object-space which are still seen by the single eye as a double point; according to the older experiments of Helm- holt z, this angle is about 1'. When measured on the retina the keenness of vision is determined by the diameter of the nerve filaments situated in straight rows close to one another in the fovea (fig. 4). The diameter of these filaments amounts to roughly 0-005 mm., or in angular measure 1'. More recent experiments for keenness of vision and power of perception of depth have given considerably higher values (Wiilfing, Pulfrich, Heine and others); thus Pulfrich in 1899, when first introducing

stereoscopic instruments for measuring distance, proved that as a rule persons with normal eyes have a power of perception of depth of 10" and still less in unrestricted vision. This is explained as follows (Hering, Heine): —

It is unimportant for perception where the filament mentioned above is illuminated. In order to see two objects lying close to one another it is not essential that the two image-points should be separated from one another by the distance of the two nerve fila- ments of the eyes. This happens whenever the line separating two objects passes through the two points (see fig. 4). It is natural that the perception of depth has no fixed limits, for the position of the images shown in fig. 4 changes with the movement ol the eyeball, and the closer the two points are to one another, the more

Fig. 4. rarely it occurs. If the angle of convergence of the optic axes = A, the (average) distance between the eyes B = 65 mm., 5 = §' relatively = 1 7000 (the perception of depth easily attained by normal sight) and E = the normal distance of the point P from B in fig. 2, then from E = B/A, the change of depth dE gives: — ■

$$dE/E = 5/A \text{ or } dE/E = E/R.$$

The limits of stereoscopic vision defined above can be extended and under the name of " stereoscope " every binocular in- strument is included which serves this end. Those instruments should first be mentioned which have restored the more or less lost power of

stereoscopic vision. It is necessary for those with normal sight to wear spectacles when the eyes cease to accommodate themselves to objects near at hand. Spectacles which only cover the lower half of the eye and leave the upper

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A >

A,

a:

Fig. 5.

a;

half free to look out into space are the best. For those who have been operated on for cataract, and for excessively short- sighted persons, the " telescope-spectacles " devised by M. v. Rohr (of Zeiss, Jena) are a great assistance. There are two

XXV. 20,

methods of extending the limits of stereoscopic vision and of increasing the accuracy of the perception of depth. (1) by augmenting the keenness of sight by the aid of a telescope or microscope, and (2) by increasing the interpupillary distance by several reflections after the plan shown by Helmholtz in his mirror stereoscope (1857) (see fig 5). When binocular tele- scopes and microscopes are used, erect images are formed when the two instruments are contiguous. If this is not the case, the order of depth is reversed and the same false or pseudo- images are formed as when the pictures in a stereoscopic view are interchanged or a correctly combined stereoscopic picture is observed in a so-called pseudo-stereoscope. If, however, in this case the axes of both instruments intersect in front of the eyes, then reversed pictures are obtained, but the correct order of depth is recovered.

Telescope magnification {m times) and base magnification (» times) bring the radius R of the stereoscopic field to m or n times respectively the value above given, and if both are simultaneously active to mn times. The errors for a certain distance E are accord- ingly reduced to l/mn. Of course these expedients do not increase the capability of the observer, but the values of the convergence angle A and 5 in the object-space are different. It is therefore quite natural

that the three-dimensional images, which appear in the binocular vision-space of the observer, vary with reference to their dimensions and the distance of the separate parts from each other. In this respect the action of the base magnification is funda- mentally different from that of the telescope magnification. Both bring the objects m or n times respectively nearer to the observer, but in the first case the areal dimensions are diminished in the same proportion as the distances are lessened, whilst in the other case the real dimensions remain unchanged. In the first case the three- dimensional image is a model proportionately diminished in all its dimensions and brought nearer to the observer: in the other case the objects appear pushed together to the front like the wings of a theatre. The remark made in Helmholtz's Physiological Optics that when m = n the three-dimensional image would look like the object seen without any instrument at a distance of l/n is conse- quently not correct. What is remarkable is that this observation, to which as a so-called " Helmholtz rule " great importance was for a long while attached, and to a certain extent still is, does not correctly express the views of Helmholtz, which he states very clearly in his earlier essay on the tele-stereoscope, and which agree with the explanation here given.

Spectacles and binocular telescopes were the first binocular instruments (see Binocular Instruments). The latter with chromatic lenses had already been constructed in the 17th and 1 8th centuries. The Dutch double-telescope (opera glasses), which were almost exclusively used up to the 'nineties of the 19th century, were introduced in the 'thirties by Fr. Voigt- lander. The binocular microscope appeared in the early 'fifties. The introduction of the Porro prism (four reflections with reversion of the picture and lateral transposition of the rays) by Abbe in 1893 was of great importance for the binocular telescope and micro- scope. It led to the construction of the prism field-glasses and other telescopes which, in comparison with the Galileo binocular telescopes till then in use, not only had a considerably increased per- ception of depth but also a substantially larger field of vision. Similarly by inserting the Porro inverting system between the eyepiece and the objective, the binocular microscope constructed by H. S. Greenough and S. Czapski was produced. Recently binocular glasses (after Fritsch and Zeiss) have come into use for slight magnifications, in which, following the example given by Wenham (1853), the interpupillary distance and the angle of convergence are diminished by four reflections (the course of the rays reversed as in fig. 5) .

All of the instruments mentioned above are used exclusively for the observation of three-dimensional objects with two eyes. Wheatstone

(1838) first showed that the same spatial impression could be produced by two views of the object taken

**i*

p, h,

L

Ft

Fig. 6.

'8 9 8

STEREOSCOPE

Fig. 7.

from two different points and he called the instrument a stereo-scope. Let us imagine in fig. 6 a plane F/ F 2 ' between the two eyes Ai and A2 and the points P, H and V in the object-space, and on this plane the perspective projections of P, H and V produced towards Ai and A 2 — as, for example, by photographing on the plates Fi and F 2 with objectives Oi and €)» at Ai and A 2 — then the object can be taken away and we obtain from the projections the same spatial effect as when observing the object itself. The change of accommodation of the eye which, however, has no influence on the power of perception of depth, is excluded, and a further difference (according to I. I. Oppel, 1854) is that in unrestricted vision the image-points not situated on the yellow spot undergo slight displacement in consequence of the difference of the position of the pupil and of the centre of rotation of the eye, which is taken as the centre of projection. This can in no way be imitated in the pictures. In order to obtain a stereoscopic effort from such pictures apparatus is not always necessary. When the pictures L and R in fig. 6 are at a distance equal to that of distinct vision, the stereoscopic effect can be obtained by observing them when the optic axes of the eyes are parallel, and if the pictures are interchanged, when the axes intersect. The second of these methods, which were discovered by Wheatstone, was later widely used for the stereoscopic observation of large wall pictures.

The 1852 model of the Wheatstone stereoscope is shown diagrammatically in fig. 7. This differs from the original model in that the pictures L and R can be placed at different inclina- tions to

the mirrors Si and si and at different distances from them in order to observe the pictures under exactly the same inclination of the image and the same angle of con- vergence as when the picture was taken. Photographs with a large base line and converging axes were then often taken (in Germany first by L. Moser). This mirror stereo- scope had no practical result worth mentioning on account of its awk- ward shape and of the difficulty in obtaining equal illumination of both pictures. It was also inconvenient that the pictures had to be placed separately and reversed in the apparatus. These difficulties are for the greater part avoided in the L. Pigeon fi (Nancy, 1905) new mirror-stereoscope for

large pictures, which can be purchased in book form. Fig. 8 shows diagram- matically the arrangement by which one picture is seen direct and the other in a mirror (H. W. Dove, Sir David Brewster and W. Rollmann). The disadvantage attached to this, that the picture observed in the mirror must be reversed, can according to Pulfrich 1 be obviated by rotating the correct picture through 180 in its own plane and placing it in the position of the picture L and by using a so- called roof-prism in the place of the mirror.

Incorrect stereoscopic effects easily arise when using pictures. If for instance the distance of a picture from the centre of projection is different at the time of observation from what it was when the photograph was taken (see fig. 9), objects appear to be either too much in relief or too flat even in monocular vision, just as when looking first through the objective of a telescope and then through the eyepiece. An excellent example is provided by the stereoscopic observation of the moon, first performed by Warren de la Rue (7858) to show that the three-dimensional image is modified by altering the angle of convergence and by placing the pictures obliquely. If the pictures obtained with converging axes are placed further apart on the same plane, the stereoscopic image of the moon has the shape of an egg; this, however, immediately disappears and changes into an approximate sphere, if the picture be broken in the middle and both sides bent back. If the pictures are observed, as by Warren de la Rue, in a Wheatstone stereoscope under exactly the same conditions as when the photographs were taken, the im- pression of a sphere is obtained.

M. von Rohr (Die binocularen Instrumente, 1907) drew atten- tion to che optics of the older stereoscopists and in particular to the works of Wheatstone, and it is to be regretted that so 1 This fact is published here for the first time.*

Fig.

little notice was taken of these older works during the recent development of most binocular instruments. It would, however, be erroneous to demand that the above-mentioned conditions for the observation of three-dimensional images should always be considered. This is impossible, for example, in the stereo-comparator in which the three-dimensional image is only seen in portions, and never all at once. Neither does it concern stereoscopic measuring instruments, and it is a curious coin- cidence that the stereo-planigraph (see fig. 15) constructed after Wheatstone's stereoscope, and correct as to the so-called ortho- morphy of the three-dimensional image, was of no use as a measuring instrument.

A lens-stereoscope invented in 1849 by Sir David Brewster and constructed by J. Duboscq is very largely used. The causes of its success were its convenient form and the fact that a series of adjusted stereoscopic pictures (landscapes, machines,

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^A

d = f

*"ToT^*

plane of the picture

Fig. 9.

&c.) could be observed in rapid succession. The Brewster stereoscope, by making an easy observation of stereoscopic pictures possible when the distance between identical points on both pictures was considerably greater than that between the observer's eyes, supported to a certain extent the in- clination of photographers not to detract from the pictures. If the lenses shown in fig. 10, on

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the focal plane of which the stereoscopic image is formed, are large enough, and the distance between the image-points hi and h 2 is not greater than the distance between the cen- tres of the two lenses (avoiding the divergence of the axes of the eyes), then the distance between the eyes is secondary and the observer sees the distant points with the axes of the eyes parallel. These apparent advan- tages, however, are counteracted by the defect that the picture seen through the lenses is eccentric, and consequently an incorrect impression of the picture is obtained, and an alteration in the three- dimensional image occurs.

Wheatstone showed later in his controversy with Brewster that this disadvantage in the lens-stereoscope could be avoided by

Fig. 10.

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R

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h 2 p 2 v 2

> J

H ‘ ‘

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r ,

v . ...

v P2 h«*

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v, p, hj

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hi Pi v,

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*hj P**

c

Fig.” 1 1.

adjusting the lenses and distant points to the distance between the observer’s eyes. This same condition was fulfilled in the ” double-verant ” constructed by v. Rohr and A. Kohler (1905),

in which the lenses, in accordance with A. Gullstrand's rule, are so arranged that the centre of rotation of the eye always coincides with the nodal point of the lenses. If every one had the same inter-pupillary distance there would be nothing more perfect than this stereoscope.

If in fig. 6 the two pictures L and R are interchanged in both pictures (a or b in fig. 11), then the image-points for H are closer together than those for V; thus in stereoscopic vision H appears in front of P, and V behind it. No change is made to the relief by turning the picture upside down (c and d in fig. 11). In fig. lid, the pictures are in the same positions as when the photographs are taken (Fi, F 2 in fig. 6). Obviously transparent pictures can be easily reversed ; in other cases it must be effected by mirrors (Wheat- stone, Dove and others) or by an erecting reflection prism. The original unbroken plate (fig. lid) can be seen in the pseudo-stereoscope shown in fig. 12, and the correct relief is obtained if it is rotated about the connecting line of the two pictures before placing in the stereoscope. If a symmetrical body be observed in the pseudo-stereo- scope, for example a pyramid, the relief is still reversed. But if a prism be dispensed with the object appears flat, and a plane drawing appears in relief.

These pseudo-stereoscopic phenomena are of the

greatest importance for the study of the principles

of stereoscopy, for they demonstrate that the per-

A t Aj ception of depth can be aided by a direct presenta-

Fig 12 t ' on anc ˆ hindered by a reverse presentation. If

a plate of the dolomites, for example, with a large

base line, arranged as in 11a and lib is taken, and the apparatus and

the eyes are directed upwards, then the pseudomorphic image in

space looks like the roof of a stalactite cave. On the other hand,

when arranged as 1 ic and 1 id the image appears correctly

represented,

but it is a little more difficult to see the horizon in the foreground of

the pseudomorphic image. Reference can only be made here to

the physiologically interesting phenomena of colour-tones, which

are a result of the chromatism of the eye and occur in monocular

and binocular vision (Dove and, more recently, A. Briickper).

A comparatively simple solution to the problem of putting pic- tures seen in a stereoscope in motion is provided in the muto- scope for a single observer. The other problem — to make one stereoscopic picture visible to several people simultaneously — can be met in various ways, most simply (according to Roll- mann [1853] and D'Almeida [1858]) by portraying the two stereoscopic pictures in different colours one over the other, and giving each observer spectacles of different coloured glass for each eye, with which it is only possible to see one picture with each eye. Another method suggested by I. Anderton (1891), in which polarization and a Nicol prism must be used to separate the pictures, has met with little success, and F. E. Ives's novel proposal (1903) to separate the pictures when being taken and also observed by a ruled grating placed immediately in front of the photographic plate is not practicable. A method devised by D'Almeida, which depended upon the alternate visibility of the two pictures, demands a mechanism for each observer, exactly synchronous with the intermittent illumina- tion. This principle was successfully adopted by J. Mackenzie Davidson and H. Boas (1900) for a direct stereoscopic observa- tion of Rontgen radiographs. Immediately after the discovery of the Rontgen rays in 1895, E. Mach made stereoscopic investigations of these radiographs.

The development of stereoscopy has in no way been uni- form; on the contrary, a. long period, during which practi- cally no interest was taken in stereoscopy or stereoscopic phenomena, was preceded during the middle part of the 19th century by a period of universal interest. The reason for this was not so much the realization of the defects of the stereo- scopes in themselves, and the trivial manner in which they were put on the market, as, for example, a closing stereoscope con- taining confectionery, as the fact that the public did not know how to make use of the pictures seen in the stereoscope. This state of affairs was altered when Zeiss, of Jena, as a result of

the investigations of E. Abbe and C. Pulfrich, succeeded in constructing apparatus which made it possible to measure the three-dimensional images.

The stereotelemeter, constructed after H. de”~ Grousilliers’ idea, appeared in 1899. This is a double telescope with the distance between the objectives increased, and a number of rows of marks placed in the plane of the image which appear as

Minco 1

real objects floating at fixed distances above the landscape, from which the distances of the objects in the view can be easily read. In 1905 Pulfrich devised a method of stereoscopic measurement which is specially interesting from a physiological point of view, but which can only be employed for isolated objects, such as beacons, signals, &c. This method has the peculiarity that no marks are necessary for the measurement. The binocular tele- scope is so arranged that it always produces two three-dimen- sional images of the object which is to be measured close to one another, which as a rule are seen as though they were at different distances and of different sizes. The measurement is made by causing the difference of relief of q- the two images to disappear either by bringing the instrument nearer to the object or by readjusting the apparatus. The equal size of the two three-dimensional images can be regarded as a criterion of their equal distances; and it is of further advantage to the method that the images to be compared are equal as to definition and?” colour.

A consequence of these instru- ments, which are chiefly important for military surveying, was the Pulfrich stereocomparator devised inigoi. The stereoscopic measuring machine invented by H. G. Fourcade of Capetown (1902) is similar to this in ‘many points. These instru- ments inaugurated the successful measurement of the distances of distant objects and the uses of stereoscopy were consequently increased. Measurement is not made of the objects themselves, but on photographic plates which are taken with special instruments — – field- and stand-phototheodolites — at the extremities of a base- line which is always selected according to the distance of the object

Jtereo- Comparator

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Fig. 14.

and the exactitude of measurement needed. For measuring the pictures a binocular microscope, adjusted to the dimensions and the distance between the two plates, is used, and a fixed mark is placed in each image plane which combine in binocular view to a virtual mark in the three-dimensional image. If the plates are correctly

given proofs of its uses and M

adjusted, by moving the plates perpendicular to one another and by altering the distance of the plates from one another, this so-called " travelling mark " can be placed on any point of the landscape, and then used for the measurement of solidity of the objects, or the production of plans and models, just as formerly, for example, the measuring staff was used for geodetic observations, with the difference that in the stereocomparator the mark is regu- lated by the observer only and is not hindered in its movements by any undulations, &c, of the land.

*Fig. 13 shows how the lateral movement of the mark mˆ is trans- formed in a movement towards and away from the observer in the three-dimensional image M. Fig. 14 shows the theory of measuring a stereophotograph. The axes are horizontal when the photograph is taken, and the plates are in one plane. It shows the method of calculating the position of the point P in the object-space from the co-ordinates Xi and yi of image-point on the left plate and the so- called parallel axis a = »i — * 2 ; the last is constant for all points in the vertical plane GG through P at right angles to M1O1. The two microscopes in fig. 14 really produce erect pictures, and the two plates are so placed in the stereocomparator as to be seen from P/ and P 2 '.*

The use of the stereocomparator is unlimited for the measure- ment of relief. It is extended similarly to all objects and phenomena, large and small, distant and near, in motion or stationary, to those which retain their shape for a long period or which are constantly changing, or to those which are only visible for a short time. For a large number of experi- ments of this sort — mountain photography (Von Hubl, &c.), coastal measurements, photographing a battle from

a ship, geodesy, study of the waves (Kohlschutter, Laas), the trajectory of a shot (Neuffer, Krupp, Neesen), the use in building railways or on voyages of discovery, &c. — the stereocomparator has

new fields are being constantly opened up for it. A further advance has been made in the stereophotogrammetric method by providing the stereocomparator with a drawing apparatus (F. V. Thomson, E. v. Orel and Carl Zeiss), with which contours can be automatically drawn from the stereophotogrammetric photo- graphs. E. Deville's (1903) stereo- planigraph (fig. 15), designed for the same purpose, is only used as The mirrors are transparent for the observation of a source of light, &c, which is moved in the object-space.

The stereometer may be regarded as a modification of the stereo-comparator, and is constructed for the measurement of men and animals, and also for sculpture, and for the observation of complete stereoscopic photographs. The motion of the mark is effected by a lateral movement of one of the two objectives forming the picture. Pulfrich has recently provided the Greenough binocular microscope with a point or a circular mark situated exactly in the centre of the field of view for the purpose of the direct gauging of small prepara-tions which cannot be directly brought into contact with a mark. This contact with the preparation is effected by displacing either the preparation or the microscope, and the separate distances are read with a vernier.

The earlier suggestions for making the stereoscope a measuring instrument were not realized though decisive improvements were made. Brewster was unconsciously near the solution of the problem when he prepared ghosts or vistas by placing one transparent picture over another. More important than these trivial pictures are the superposed pictures (of conic sections, machines, anatomical preparations, &c.) contrived by E. Mach (1866) in which sections of the same solid object are successively photographed on one plate so that in a stereoscope one can see, as it were, through the opaque surface of the solid into the interior. To A. Rollet (1861) is due the merit of constructing the first stereoscopic measuring scale. It was a sort of ladder, whose rungs gave the distances of objects. Shortly after Mach sug- gested using the mirror image of a wire model observed in a transparent mirror for the measurement of the dimensions of a body placed behind the glass plate.

The works of I. Harmer (1881) and F. Stolze (1884 and 1892) are of importance for the history of the development of stereo- scopic measurement. Harmer used a scale of depth consisting of a series of

squares arranged one behind the other in order to measure in the stereoscope a picture of the clouds taken with a large base-line (about 15 metres). Stolze placed gratings in front of the two semi-pictures of a mirror stereoscope, one of

Fig. 15. a demonstration apparatus.

which could be moved by a micrometer, and he thus discovered the device called the " travelling mark." Apparently inde- pendent of all earlier experimenters T. Marie and H. Ribaut had the idea of the " travelling mark " in 1899 and 1900 and used it for measuring the Rontgefi radiographs.

Of the applications of stereoscopy we may notice the utilization of spatial effects and troubles in stereoscopic vision (agitation and lustrous appearances) in the discovery of differences and alterations in pictures. The method was first used by Brewster to recognize irregularities in carpet patterns, and later by Dove and others for distinguishing the original from a copy, for testing coins, cheques, &c. Moreover, with the develop- ment of celestial photography, the stereoscope came to be applied to the discovery of planets, comets, variable stars, errors in plates, the proper motions and parallaxes of the fixed stars (Harmer, Kummel, Wolf and Lenard, Forster and others) .

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Fig. 16.

The stereocomparator has also been employed in astrometry, and a planetoid discovered by its aid was named Stereoscopia in recognition of this application. Since 1904 binocular observation of stellar plates to determine differences in the images of the objects reproduced has been gradually discarded for the method devised by Pulfrich, which consists in the monocular observation of the two plates in the stereocomparator with the assistance of the so-called "

blink " microscope (fig. 16). In this microscope the two pictures are seen simultaneously, or individually by alternately opening the screens Bi and B 2 . In the second case all differences of the two images are immediately distinguished by a sudden oscillation of the image-point or by a sudden appearance and disappear- ance of single points like flash lights at sea or the modern illuminated sky lights in towns, and there is now no merit in discovering new planets, comets and variable stars by this method.

The blink microscope is far more useful than the stereomicro- scope for such purposes, for there is not one special direction in which differences can be best distinguished. It is better there- fore for the stereo method to be restricted to the work for which it is specially suitable, and for which it will never be replaced, and for such experiments as we have just discussed to be solely performed with the aid of the blink microscope. (C. P.)*

STERLING, ANTOINETTE (d. 1904), Anglo-American vocalist, was born at Sterlingville, New York state. She studied with Mme Marchesi, with Mme Viardot Garcia and with Manuel Garcia, and after singing for two years in America came in 1873 to England, where she made her first appearance at Covent Garden under Sir Julius Benedict and rapidly became a popular favourite among the contraltos of the day. She gained her greatest successes as a ballad-singer, especially in such songs as " Caller Herrin'," " The Three Fishers " and " The Lost Chord." She was a woman of deep religious feeling and many enthusiasms, and her name was constantly associated with philanthropic enterprise. She died on the 10th of January 1904. In 1875 she had married Mr John Mackinlay, and her life was written by her son, Mr Sterling Mackinlay, in 1906.

STERLING, J.~ STERNE, LAURENCE

STERLING, JOHN (1806-1844), British author, was born at Kames Castle in Bute on the 20th of July 1806. He belonged to a family of Scottish origin which had settled in Ireland during the Cromwellian period. His father, Edward Sterling (1773- 1847), had been called to the Irish bar, but, having fought as a militia captain at Vinegar Hill, afterwards volunteered with his company into the line. On the breaking up of his regiment he went to Scotland and took to farming at Kames Castle. In 1804 he married Hester Coningham. In 1810 the family removed to Llanblethian, Glamorganshire, and during his residence there Edward Sterling, under the signature of " Vetus," contributed a number of letters to The Times, which were reprinted in 181 2, and a second series in 1814. In the latter year he removed

to Paris, but on the escape of Napoleon from Elba in 181 5 took up his residence in London, obtaining a position on the staff of The Times newspaper; and during the late years of Thomas Barnes's administration he was practically editor. His fiery, emphatic and oracular mode of writing conferred those char- acteristics on The Times which were recognized in the sobriquet of the " Thunderer." John Sterling was his second son, the elder being Colonel Sir Anthony Coningham Sterling (1805-1871), who besides serving in the Crimea and as military secretary to Lord Clyde during the Indian Mutiny, was the author of The Highland Brigade in the Crimea and other books. After studying for one year at the university of Glasgow, John Sterling in 1824 entered Trinity College, Cambridge, where he had for tutor Julius Charles Hare. At Cambridge he took a distinguished part in the debates of the union, and became a member of the " Apostles' " Club, forming friendships with Frederick Denison Maurice and Richard Trench. He removed to Trinity Hall with the intention of graduating in law, but left the university without taking a degree. During the next four years he resided chiefly in London, employing himself actively in literature and making a number of literary friends. With Maurice he purchased the Athenaeum in 1828 from J. Silk Buckingham, but the enterprise was not a pecuniary success. He also formed an intimacy with the Spanish revolutionist General Torrijos, in whose unfortunate expedition he took an active interest. But he did not accompany it, as he was kept in England by his marriage to Susannah, daughter of Lieut. General Barton. Shortly after his marriage in 1830 symptoms of pulmonary disease induced him to take up his residence in the island of St Vincent, where he had inherited some property, and he remained there fifteen months before returning to England. After spending some time on the Continent in June 1834 he was ordained and became curate at Hurstmonceaux, where his old tutor Julius Hare was vicar. Acting on the advice of his physician he resigned his clerical duties in the following February, but, according to Carlyle, the primary cause was a divergence from the opinions of the Church. There remained to him the . " re source of the pen," but, having to " live all the rest of his days as in continual flight for his very existence," his literary achieve- ments were necessarily fragmentary. He published in 1833 Arthur Coningsby, a novel, which attracted little attention, and his Poems (1839), the Election, a Poem (1841), and Strafford, a tragedy (1843), were not more successful. He had, however, established a connexion in 1837 with Blackwood's Magazine, to which he contributed a variety of papers and several tales of extraordinary promise not fulfilled in his more considerable undertakings. Among these papers were " The Onyx Ring " and " The Palace of Morgana."

He died at Ventnor on the 18th of September 1844, his wife having died in the preceding year.

His son, Major-General John B. Sterling (b. 1840), after entering the navy, went into the army, and had a distinguished career (wounded at Tel-el-Kebir in 1882), both as a soldier and as a writer on military subjects.

John Sterling's papers were entrusted to the joint care of Thomas Carlyle and Archdeacon Hare. Essays and Tales, by John Sterling, collected and edited, with a memoir of his life, by Julius Charles Hare, appeared in 1848 in two volumes. So dissatisfied was Carlyle with the memoir that he resolved to give his own " testimony "

about his friend, and his vivid Life (1851) has perpetuated the memory of Sterling more than any of the latter's own writings.

STERLING, a city of Whiteside county, Illinois, U.S.A., on the north bank of Rock river, 109 m. by rail W. of Chicago. Pop. (1900), 6309, of whom 815 were foreign-born and 23 were negroes; (1910), 7467. Sterling is served by the Chicago & North- western and the Chicago, Burlington & Quincy railways, and by inter-urban electric railway to Dixon, 12 m. N.N.W. Across the river is Rock Falls (pop. in 1910, 2657), practically a suburb of Sterling, with foundries and machine-shops and manufactories of agricultural implements, barbed wire and bolts and rivets. Three bridges cross the river. The river is tapped here by the feeder of the Illinois & Michigan Canal, so that there is direct water communication with Chicago and St Louis. Two great dams on the river (one built by the Federal government) provide good water power. The public library (1878) had 12,000 volumes in 1910. In the city are large ironworks, and numerous other manufactures. Sterling was formed in 1839 by the consolidation of two towns, Harrisburg and Chatham, founded here in 1836 and 1837 respectively; it was chartered as a city in 1857.

STERLING, a term used to denote money of standard weight or quality, especially applied to the English gold sovereign, and hence with the general meaning of recognized worth or authority, genuine, of approved excellence. The word has been generally derived from the name of " Easterlings " given to the North German merchants who came to England in the reign of Edward I. and formed a hansa or gild in London, modelled on the earlier one of the merchants of Cologne. Their coins were of uniform weight and excellence (cf.

Matthew Paris, ann. 1247, moneta esterlingorum, propter sui materiem desiderabilem, &c), and thus it is supposed gave the name of the moneyers to a coinage of recognized fineness. This theory is based on the statement of Walter de Pinchbeck, a monk of the time of Edward I., " sed moneta Angliae fertur dicta fuissc a nominibus opificum, ut Floreni a nominibus Florentiorum, ita Sterlingi a nominibus Esterlingorum nomina sua contraxerunt, qui hujusmodi monetam in Anglia primitus cornponebant " (quoted in W'edgwood, Diet, of Eng. Etym.). The word, however, occurs much earlier. The Roman de Rou (1180) has "Pour ses estellins recevoir, ' and " in Anglia unus Sterlingus per solvetur " occurs in an ordinance of Philip of France and Henry II. of England of 1184, both quoted in Du Cange (Gloss, s.v. Esterlingus). The " ster- ling " was a coin, the silver penny, 240 of which went to the " pound sterling " of silver of 5760 grains, 925 fine, and described in a statute of Edward I., quoted in Du Cange, as " Denarius Angliae qui vocatur Sterlingus." The word was borrowed by all European languages and applied to the English coin and to coins in general of a standard quality; thus we find not only O. Fr. estorlin or estellin but M. H. G. sterlinc or staerlinc, l'tal. slerlino, &c. It would seem therefore that the term was applied to a coin of recognized quality before the North German mer- chants were established in London and that its origin should be found in a native English word. Two suggestions have been made; one that it represents an O. Eng. steorling, i.e. little star, from a device on an early coin, such as is found on some of William II., or O. Eng. staerling, starling, from the birds, which however may be doves, on the coins of Edward the Confessor. (See Du Cange, Gloss, s.v. Esterlingus; and Skeat, Etym. Diet. 1910, s.v. Sterling.)

STERNBERG, a town of Austria, in Moravia, 73 m. N.E. of Briinn by rail. Pop. (1900), 15,195, almost exclusively German. It is the chief seat of the Moravian cotton industry, and it also carries on the manufacture of linen, stockings, liqueurs, sugar and bricks. Fruit, especially cherries, and tobacco are grown in the neighbourhood. Sternberg is said to have grown up under the shelter of a castle founded by Yaroslav of Sternberg on the site of his victory over the Mongols in 1241.

STERNE, LAURENCE (1713-1768), English humorist, was the son of Roger Sterne, an English officer, and great-grandson of an archbishop of York. Nearly all our information about the first forty-six years of his life before he became famous as the author of Tristram Shandy is derived from a short memoir

jotted down by himself for the use of his daughter. It gives aothing but the barest facts, excepting three anecdotes about his infancy, his school days and his marriage. He was born at Clonmel, Ireland, on the 24th of November 1713, a few days after the arrival of his father's regiment from Dunkirk. The regiment was then disbanded, but very soon after re-established, and for ten years the boy and his mother moved from place to place after the regiment, from England to Ireland, and from one part of Ireland to another. The familiarity thus acquired with military life and character stood Sterne in good stead when he drew the portraits of Uncle Toby and Corporal Trim. After ten years of wandering, he was fixed for eight or nine years at a school at Halifax in Yorkshire. His father died when he was in his eighteenth year, and he was indebted for his university education to one of the members of his father's family. His great-grandfather the archbishop had been master of Jesus College, Cambridge, and to Jesus College he was sent. He was admitted to a sizarship in July 1733, took his B.A. degree in 1736 and proceeded M.A. in 1740. One of his uncles was pre- centor and canon of York. Young Sterne took orders, and through this uncle's influence obtained in 1738 the living of Sutton-in-the-Forest, some 8 m. north of York. Two years after his marriage in 1741 to a lady named Elizabeth Lumley he was presented to the neighbouring living of Stillington, and did duty at both places. He was also a prebendary of York Cathedral.

Sutton was Sterne's residence for twenty uneventful years. He kept up an intimacy which had begun at Cambridge with John Hall-Stevenson (1718-1785), a witty and accomplished epicurean, owner of Skelton Hall (" Crazy Castle ") in the Cleveland district of Yorkshire. Skelton Hall is nearly 40 m. from Sutton, but Sterne, in spite of his double duties, seems to have been a frequent visitor there, and to have found in his not too strait-laced friend a highly congenial companion. Sterne is said to have never formally become a member of the circle of gay squires and clerics at Skelton known as the " Demoni- acks"; but no doubt he shared their festivities. Stevenson's various occasional sallies in verse and prose — his Fables for Grown Gentlemen (1761-1770), his Crazy Tales (1762), and his numerous skits at the political opponents of Wilkes, among whose " macaronies" he numbered himself — were collected after his death, and it is impossible to read them without being struck with their close family resemblance in spirit and turn of thought to Sterne's work, inferior as they are in literary genius. Without Stevenson, Sterne would probably have been a more decorous parish priest, but he would probably never have written Tristram Shandy or

left any other memorial of his singular genius. In 1747 Sterne published a sermon preached in York under the title of The Case of Elijah. This was followed in 1750 by The Abuses of Conscience, afterwards inserted in vol. ii. of Tristram Shandy. In 1759 he wrote a skit on a quarrel between Dean Fountayne and Dr Topham, a York lawyer, over the bestowal of an office in the gift of the archbishop. This sketch, in which Topham figures as Trim the sexton, and the author as Lorry Slim, gives an earnest of Sterne's powers as a humorist. It was not published until after his death, when it appeared in 1769 under the title of A Political Romance, and afterwards the History of a Warm Watch-Coat. The first two volumes of Tristram Shandy were issued at York in 1759 and advertised in London on the 1st of January 1760, and at once made a sensation. York was scandalized at its clergyman's indecency, and indignant at his caricature as " Slop " of a local physician (Dr John Burton); London was charmed with his audacity, wit and graphic uncon- ventional power. He went to London early in the year to enjoy his triumph, and found himself at once a personage in society — ■ was called upon and invited out by lion-hunters, was taken to Windsor by Lord Rockingham, and had the honour of supping with the duke of York.

For the last eight years of his life after this sudden leap out of obscurity we have a faithful record of Sterne's feelings and movements in letters to various persons, published in 1775 by his sole child and daughter, Lydia Sterne de Medalle, and in the

Letters from Yorick to Eliza (1766-1767), also published in 1775. At the end of the sermon in Tristram he had intimated that, if this sample of Yorick's pulpit eloquence was liked, " there are now in the possession of the Shandy family as many as will make a handsome volume, at the world's service, and much good may they do it." Accordingly, when a second edition of the first instalment of Tristram was called for in three months, two volumes of Sermons by Yorick were announced. Although they had little or none of the eccentricity of the history, they proved almost as popular. Sterne's clerical character was far from being universally injured by his indecorous freaks as a humorist: Lord Fauconberg presented the author of Tristram Shandy with the perpetual curacy of Coxwold. To this new residence he went in high spirits with his success, " fully deter- mined to write as hard as could be," seeing no reason why he should not give the public two volumes of Shandyism every year and why this should not go on for forty years. By the beginning of August 1760 he had another volume written, and was so " delighted with Uncle Toby's imaginary character that he was become an enthusiast." The author's delight in this wonderful creation was not

misleading; it has been fully shared by every generation of readers since. For two years in succession Sterne kept his bargain with himself to provide two volumes a year. Vols. iii. and iv. appeared in 1761; vols. v. and vi. in January 1762. But his sanguine hopes of continuing at this rate were frustrated by ill-health. He was ordered to the south of France; it was two years and a half before he returned; and he came back with very little accession of strength. His reception by literary circles in France was very flattering. He was overjoyed with it. " 'Tis comme d Londres," he wrote to Garrick from Paris; " I have just now a fortnight's dinners and suppers upon my hands." Through all his pleasant experiences of French society, and through the fits of dangerous illness by which they were diversified, he continued to build up his history of the Shandy family, but the work did not progress as rapidly as it had done. Not till January 1765 was he ready with the fourth instalment of two volumes; and one of them, vol. vii., leaving the Shandy family for a time, gave a lively sketch of the writer's own travels to the south of France in search of health. This was a digression of a new kind, if any- thing can be called a digression in a work the plan of which is to fly off at a tangent whenever and wherever the writer's whim tempts him. In the first volume, anticipating an obvious com- plaint, he had protested against digressions that left the main work to stand still, and had boasted — not without justice in a Shandean sense — that he had reconciled digressive motion with progressive. But in vol. vii. the work is allowed to stand still while the writer is being transported from Shandy Hall to Languedoc. The only progress we make is in the illustration of the buoyant and joyous temper of Tristram himself, who, after all, is a member of the Shandy family, and was due a volume for the elucidation of his character. Vol. viii. begins the long-promised story of Uncle Toby's amours with the Widow Wadman. After seeing to the publication of this instalment of Tristram and of another set of sermons — more pronouncedly Shandean in their eccentricity — he quitted England again in the summer of 1765, and tavelled in Italy as far as Naples. The ninth and last and shortest volume of Tristram, concluding the episode of Toby Shandy's amours, appeared in 1767. This despatched, Sterne turned to a new project, which had probably been sug- gested by the ease and freedom with which he had moved through the travelling volume in Tristram. The Sentimental Journey through France and Italy was intended to be a long work: the plan admitted of any length that the author chose, but, after seeing the first two volumes through the press in the early months of 1768, Sterne's strength failed him, and he died in his lodgings at 41 Old Bond Street on the 18th of March, three weeks after the publication. The loneliness of his end has often

been com- mented on; it was probably due to its unexpectedness. He had pulled through so many sharp attacks of his "vile influenza" and other lung disorders that he began to be seriously alarmed only three days before his death.

Sterne's character defies analysis in brief space. It is too subtle and individual to be conveyed in general terms. For comments upon him from points of view more or less diverse the reader may be referred to Thackeray's Humourists, Professor Masson's British Novelists (1859), and H. D. Traill's sketch in the " English Men of Letters " Series. The fullest biography is Mr Percy Fitzgerald's (1864). But the reader who cares to have an opinion about Sterne should hesitate till he has read and re-read in various moods considerable portions of Sterne's own writing. This writing is so singularly frank and uncon- ventional that its drift is not at once apparent to the literary student. The indefensible indecency and overstrained senti- mentality are on the surface; but after a time every repellent defect is forgotten in the enjoyment of the exquisite literary art. In the delineation of character by graphically significant speech and action, introduced at unexpected turns, left with happy audacity to point their own meaning, and pointing it with a force that the dullest cannot but understand, he takes rank with the very greatest masters. In Toby Shandy he has drawn a character universally lovable and admirable; but Walter Shandy is almost greater as an artistic triumph, considering the difficulty of the achievement. Dr Ferriar, in his Illustrations of Sterne (published in 1798), pointed out several unacknowledged plagiarisms from Rabelais, Burton and others; but it is only fair to the critic to say that he was fully aware that they were only plagiarisms of material, and do not detract in the slightest from Sterne's reputation as one of the greatest of literary artists.

A revised edition of Mr Percy Fitzgerald's Life of Sterne, containing much new information, appeared in 1896. There is also a valuable study of Sterne by M. Paul Stapfer (1870, 2nd ed., 1882) ; and many fresh particulars as to Sterne's relations with his wife and daughter, and also with the lady known as " Eliza " (Mrs Elizabeth Draper), are collected in Mr Sidney Lee's article in the Diet. Nat. Biog. Sterne's original journal to Mrs Draper ("The Bramine's Journal "), after she had gone back to India, and extend- ing from the 13th of April to the 4th of August 1767, is now in the department of MSS., British Museum (addit. MS. 34,527). A con- venient edition

of Sterne's works, edited by Professor George Saintsbury, was issued in six volumes in 1894. See also Wilbur L. Cross. The Life and Times of Laurence Sterne (New York, 1909) ; and Walter Sichel, Sterne: a Study (1910). (W. M.; A. D.)

STERNE, RICHARD (c. 1500-1683), English divine, arch- bishop of York, was born at Mansfield, Nottinghamshire, and was educated at the free-school in that town and at Trinity College, Cambridge. He was elected fellow of Corpus Christi College in 1620; in 1633 he became chaplain to Archbishop Laud and in 1634 master of Jesus College, Cambridge, and rector of Yclverton, Somerset. For his zeal in helping the royalist cause with college plate he suffered imprisonment at the order of parliament and lost his appointments. He attended Laud at his execution, and during the Commonwealth kept a school at Stevenage, Hertfordshire. At the Restoration he was rein- stated as master of Jesus College and soon after was made bishop of Carlisle. With George Griffith, bishop of St Asaph, and Brian Walton, bishop of Chester, he was appointed by Convocation to revise the Prayer Book. In 1664 he was raised to the arch-bishopric of York. He had impoverished Carlisle, and in his new see, according to Burnet (who calls him " a sour ill-tempered man ".), " minded chiefly the enriching of his family." For his regard to the duke of York's interests he was suspected of leaning towards Roman Catholicism. He died on the 20th of June 1683. He helped Brian Walton with the Polyglot Bible and wrote a book on logic, Summa logicae (London, 1685).

He has also been credited with The Whole Duty of Man, which must, however, be assigned to the royalist divine Richard Allestree (1619-1681), provost of Eton College, whose original was consider-ably altered by his literary executor, John Fell (1625-1686), bishop of Oxford.

STESICHORUS (c. 640-555 B.C.), Greek lyric poet, a native of Himera in Sicily, or of Mataurus a Locrian colony in the south of Italy. According to Sui'das, his name was originally Tisias, but was changed to Stesichorus (" organizer of choruses "). His future eminence as a poet was foretold when a nightingale perched upon his lips and sang (Pliny, Nat. Hist.,x. 43). We are told that he warned his fellow-citizens against Phalaris,

whom they had chosen as their general, by relating to them the well-known fable of the horse, which, in its eagerness to punish the stag for intruding upon its pastures, became the slave of man (Aristotle, Rhetoric, ii. 20). But his warnings had no effect; he himself was

obliged to flee to Catana, where he died and was buried before the gate called after him the Stesichorean. The story that he was struck blind for slandering Helen in a poem and afterwards recovered his sight when, in consequence of a dream, he had composed a palinode or recantation (in which he declared that only Helen's phantom had been carried off to Troy), is told by Plato {Phaedrus 243 A.), Pausanias (iii. 19, 13), and others. We possess about thirty fragments of his poems, none of them longer than six lines. They are written in the Doric dialect, with epic licences; the metre is dactylico-trochaic. Brief as they are, they show us what Longinus meant by calling Stesichorus " most like Homer "; they are full of epic grandeur, and have a stately sublimity that reminds us of Pindar. Stesi- chorus indeed made a new departure by using lyric poetry to celebrate gods and heroes rather than human feelings and pas- sions; this is what Quintilian (Instil, x. 1, 62) means by saying that he " sustained the burden of epic poetry with the lyre." Several of his poems sung of the adventures of Heracles; one dealt with the siege of Thebes, another with the sack of Troy. 1 The last is interesting as being the first poem containing that form of the story of Aeneas's flight to which Virgil afterwards Cave currency in his Aeneid. The popular legends of Sicily also inspired his muse; he was the first to introduce the shepherd Daphnis who came to a miserable end after he had proved faith- less to the nymph who loved him. Stesichorus completed the form of the choral ode by adding the epode to the strophe and antistrophe; and " you do not even know Stesichorus's three " passed into a proverbial expression for unpardonable ignorance (unless the words simply mean, " you do not even know three lines, or poems, of Stesichorus"). He was famed in antiquity for the richness and splendour of his imagination and his style, although Quintilian censures his redundancy and Hermogenes remarks on the excessive sweetness that results from his abundant use of epithets.

Fragments in T. Bergk, Poetae lyrici graeci, iii.; see also S. Bernage, De Stesichoro lyrico (1880); O. Crusius, "Stesichorus und die epodische Composition in der griechischen Lyrik," in Commentationes Philologicae, dedicated to O. Ribbeck (1888).

STETHOSCOPE (Gr. o"ri;0os, chest, and aKoitelv, to look, examine), a medical instrument used in auscultation (q.v.). The single stethoscope is a straight wooden or metal tube with a flattened bell, the surface of which is usually covered with ivory or bone at the end which is placed against the body of the patient, and a small cup at the other to fit- the ear of the observer. In the " binaural " stethoscope, which has the advantage of flexibility, the tube is

divided above the bell into two flexible tubes which lead to both ears.

STETTIN, a seaport of Germany, capital of the Prussian province of Pomerania, on the Oder, 17 m. above its entrance into the Stettiner Haff, 30 m. from the Baltic, 84 m. N.E. of Berlin by rail, and at the junction of lines to Stargard-Danzig and Kustrin-Brcslau. Pop. (1885), 99,475; (1890), 116,228; (1900) — including the incorporated suburbs — 210,680; (1905) 224,078. The main part of the town occupies a hilly site on the left bank of the river, and is connected by four bridges, including a massive railway swing-bridge, with the suburbs of Lastadie (" lading place " from lastadium, " burden,") and Silberwiese, on an island formed by the Parnitz and the Dunzig, which here diverge from the Oder to the Dammsche-See. Until 1874 Stettin was closely girdled by very extensive and strong forti- fications, which prevented the expansion of the town, but the steady growth of its commerce and manufactures encouraged the foundation of numerous industrial suburbs beyond the

1 The tabula Iliaca, a stucco bas-relief found in the ruins of an ancient temple on the site of the ancient Bovillae and so called because it represents the chief events of the Trojan War, is a sort of commentary upon this (see O. Jahn and A. Michaelis, Griechische Bilderchroniken, 1873; and M. F. Paulcke, De tabula iliaca quaesti- ones Stesichoreae, 1897, an exhaustive treatise).

line of defence and these now combine with Stettin to form one industrial and commercial centre. Since the removal of the fortifications their site has been built upon. Apart from its commerce Stettin is comparatively an uninteresting city, although its appearance, owing to its numerous promenades and open spaces, is very pleasant. Among its nine Evangelical churches that of St Peter, founded in 1124 and restored in 1816- 181 7, has the distinction of being the oldest Christian church in Pomerania. Both this and the church of St James, dating from the 14th century, are remarkable for their size. Three of the Evangelical churches are fine new buildings, and there are also churches belonging to the Roman Catholics and other religious bodies. The old palace, now used as public offices, is a large but unattractive edifice, scarcely justifying the boast of an old writer that it did not yield in magnificence even to the palaces of Italy. Among the modern buildings are the theatre, the barracks, the bourse, a large hospital, the new town-hall, super- seding a building

of the 13th century, and the new govern- ment buildings. Statues of Frederick the Great, of Frederick William III. and of the emperor William I. adorn two of the fine squares, the Konigsplatz and the Kaiser Wilhelmsplatz. Other squares are the Paradeplatz, and the Rathausplatz with a beautiful fountain. Two gateways, the Konigstor and the Berliner Tor, remains of the old fortifications, are still standing. As a prosperous commerical town Stettin has numerous scientific, educational and benevolent institutions.

Stettin, regarded as the port of Berlin, is one of the principal ship-building centres of Germany and a place of much com- mercial and industrial activity. The foremost place in its chief industry, ship-building, is taken by the Vulcan yard, situated in the suburb of Bredow, which builds warships for the German navy. The business was begun in 1851 and now employs about 8000 hands, the works extending over 70 acres and the covered workshops over 650,000 sq. ft. In 1897 a floating dock was fitted up capable of holding vessels of 1 2,000 tons. Locomotives, boilers and machinery of all kinds are made in other great establishments. Other industries are the manufacture of clothing, cement, bricks, motor-cars, soap, paper, beer, sugar, spirits and cycles. Most of the mills and factories are situated in the suburbs, Grabow, Bredow and others. The sea-borne commerce of Stettin is of scarcely less importance than her industry and a larger number of vessels enter and clear here than at any other German port, except Hamburg and Bremer- haven. Swinemiinde serves as its outer port. Its principal exports are grain, wood, chemicals, spirits, sugar, herrings and coal, and its imports are iron goods, chemicals, grain, petroleum and coal. A great impulse to its trade was given in 1898 by the opening of a free harbour adjoining the suburb of Lastadie on the east bank of the Oder; this embraces a total area of 150 acres and quays with a length of 14,270 ft. It has two basins, with the necessary accompaniment of cranes, storehouses, &c, and the deepening of the Oder from Stettin to the Haff to 24 ft. was practically completed by 1903. With the view of still further increasing the commercial importance of Stettin, it is proposed to construct a ship canal giving the town direct communication with Berlin. A feature in the mercantile life of Stettin is the large number of insurance companies which have their headquarters in the town.

The forest and river scenery of the neighbourhood of Stettin is picturesque, but the low level and swampy nature of the soil render the climate bleak and unhealthy.

Stettin is said to have existed as a Wendish settlement in the gth

century, but its first authentic appearance in history was in the 12th century, when it was known as Stedyn. From the beginning of the 12th century to 1637 it was the residence of the dukes of Pomerania, one of whom, Duke Barnim I., gave it municipal rights in 1243. Already a leading centre of trade it entered the Hanseatic League in 1360. The Pomeranian dynasty became extinct in 1637, when the country was suffering from the ravages of the Thirty Years' War, and by the settle- ment of 1648 Stettin, the fortifications of which had been improved by Gustavus Adolphus, was ceded to Sweden. In

1678 it was taken from Sweden by Frederick William, elector of Brandenburg, but it was restored in 1679, only, however, to be ceded to Prussia in 1720 by the peace of Stockholm. It was fortified more strongly by Frederick the Great, but in 1806 it yielded to France without any resistance and was held by the French until 1813. Stettin was the birthplace of the empress Catherine II. of Russia.

See Berghaus, Geschichte der Stadt Stettin (Wtlrzen, 1 875-1 876)'; W. H. Meyer, Stettin in alter und neuer Zeil (Stettin, 1887); T. Schmidt, Zur Geschichte des Handels und der Schijfahrt Stettins 1786- 1846 (Stettin, 1875); and C. F. Meyer, Stettin zur Schwedenseit (Stettin, 1886).

STEUART, SIR JAMES DENHAM, Bart. (1712-1780), English economist, was the only son of Sir James Steuart, solicitor-general for Scotland under Queen Anne and George I., and was born at Edinburgh on the 21st of October 17 12. After passing through the university of Edinburgh he was admitted to the Scottish bar at the age of twenty-four. He then spent some years on the Continent, and while in Rome entered into relations with the Pretender. He was in Edinburgh in 1745, and so compromised himself that, after the battle of Culloden, he found it necessary to return to the Continent where he remained until 1763. It was not indeed until 1771 he was fully pardoned for any complicity he may have had in the rebellion. He died at his family seat, Coltness, in Lanarkshire, on the 26th of November 1780. In 1767 was published Steuart's Inquiry into the Principles of Political Economy. It was the most com- plete and systematic survey of the science from the point of view of moderate mercantilism which had appeared in England. But the time for the mercantile doctrines was past. Nine years later the Wealth of Nations was given to the world. Adam Smith never quotes or mentions Steuart's book; being acquainted with Steuart, whose conversation he said was better than his book, he probably wished to keep clear of controversy with him. German economists have examined Steuart's treatise more carefully than English writers; and

they have recognized its high merits, especially in relation to the theory of value and the subject of population. They have also pointed out that, in the spirit of the best modern research, he has dwelt on the special characters which distinguish the economies proper to different nations and different grades in social progress.

The Works, Political, Metaphysical and Chronological, of the late Sir James Steuart of Coltness, Bart., now first collected, with Anecdotes of the Author, by his Son, General Sir James Denham Steuart, were published in 6 vols. 8vo in 1805. Besides the Inquiry they include — A Dissertation upon the Doctrine and Principles of Money applied to the German Coin (1758), Apologie du sentiment de M. le Chevalier Newton sur V ancienne chronologie des Grecs (4to, Frankfort-on-the-Main, 1757), The Principles of Money applied to the Present State cf Bengal, published at the request of the East India Company (4to, 1772), A Dissertation on the Policy of Grain (1783), Plan for Introducing Uniformity in Weights and Measures within the Limits of the British Empire (1790), Observations on Beattie's Essay on Truth, A Dissertation concerning the Motive of Obedience to the Law of God, and other treatises.

STEUBEN, FREDERICK WILLIAM AUGUSTUS HENRY FERDINAND, Baron von (1730-1794), German soldier, was born at Magdeburg, Prussia, on the 15th of November 1730, the son of William Augustine Steuben (1699-1783), also a soldier. At fourteen he served as a volunteer in a campaign of the Austrian Succession War. He became a lieutenant in 1753, fought in the Seven Years' War, was made adjutant -general of the free corps in 1 7 54 but re-entered the regular army in 1 761 , and became an aide to Frederick the Great in 1762. Leaving the army after the war, he was made canon of the cathedral of Havelberg, and subsequently was grand-marshal to the prince of Hohenzollern- Hechingen. In 1777 his friend, the count St Germain, then the French minister of war, persuaded him to go to the assistance of the American colonists, who needed discipline and instruction in military tactics. Steuben arrived at Portsmouth, New Hampshire, on the 1st of December 1777, and offered his services to Congress as a volunteer. In March 1778 he began drilling the inexperienced soldiers at Valley Forge; and by May, when he was made inspector-general, with the rank of major-general, he had established a thorough system of discipline and economy.

STEUBENVILLE— STEVENS, A.

Results of his work were shown in the next campaign, particu- larly at Monmouth, where he rallied the disordered, retreating troops of General Charles Lee. His Regulations for the Order and Discipline of the Troops of the United States (1779) was of great value to the army. He was a member of the court-martial which tried Major John Andre in 1780, and after General Horatio Gates's defeat at Camden was placed in command of the district of Virginia, with special instructions " to collect, organize, discipline and expedite the recruits for the Southern army." In April 1781 he was superseded in command of Virginia by La Fayette and later took part in the siege of Yorktown. Retiring from the service after the war, he passed the last years of his life at Steubcnville, New York, where he died on the 28th of November 1794. New York, Virginia, Pennsylvania and New Jersey gave him grants of land for his services, and Congress passed a vote of thanks and gave him a gold-hilted sword in 1784 and later granted him a pension of $2400.

See Frederick Kapp, The Life of Frederick William von Steuben (New York, 1859); and George W. Greene, The German Element in the War of American Independence (Cambridge, Massachusetts, 1876).

STEUBENVILLE, a city and the county-seat of Jefferson county, Ohio, U.S.A., on the west bank of the Ohio river, about 40 m. W. of Pittsburg. Pop. (1880), 12,093; (1890), 13,394; (1900), 14,349, of whom 1815 were foreign-born and 736 were negroes; (1910 U.S. census) 22,391. It is served by the Wheeling & Lake Erie (Wabash system), the Pittsburg, Cin- cinnati, Chicago & St Louis (Pennsylvania system), and the Pennsylvania railways, and by inter-urban electric railways. A suspension bridge crosses the Ohio river here. Steubenville is on a high plain (the second terrace of the river), surrounded by hills 300-500 ft. high, in a good farming country, rich in bituminous coal, natural gas, building-stone, petroleum and clay. The city has a Carnegie library, Gill hospital, a Y.M.C.A. building and Stanton and Altamont parks. The value of its factory products increased from $4,547,049 in 1900 to $12,369,677 in 1905, or 172 % — the greatest increase during this period for any city, with a population of 8000 or over in 1900, in the state; during the same period the capital invested in manufacturing industries increased from $2,302,563 to $12,627,048 or 448-4 %. Among manufactures are iron and steel, tin and terne plate, glass, paper and wood pulp, and pottery. Near the city limits are building-stone quarries and coal-mines. The municipality owns and operates the waterworks. Steubenville was platted as a town in 1797, immediately after the erection of Jefferson county, and was built on the site of Fort Steuben, erected in 1 786-1787, and named in honour of Baron

Frederick William von Steuben; it received a city charter in 1851, and its city limits were much enlarged in 187 1.

See W. H. Hunter, " The Pathfinders of Jefferson County," and " The Centennial of Jefferson County," in Ohio Archaeological and Historical Review, vol. vi. Xos. 2, 3 (Columbus, 1898).

STEUCO [in Latin Steuchus or Eugubinus], AGOSTINO (1406-1549), Italian scholar and divine, was born at Gubbio in Umbria. In 15 13 he entered the congregation of the canons of St Saviour, and for some years earned his living by teaching Oriental languages, theology and antiquities. In 1525 he became librarian of the convent of Sant' Antonio at Venice, returning later to Gubbio as prior of his congregation. In 1538 he was made bishop of Chisamo in Crete, but returned after a year or two to Rome, where in 1542 he succeeded Alessandro as prefect of the Vatican Library. He wrote many works on sacred antiquities and Bible exegesis.

See Hoefer, Xouvelle biographie genirale (Paris, 1857-1870).

STEVEDORE, a person who is engaged in the stowage of cargo on board a ship, one who loads and unloads vessels in port. The word is an adaptation of the Spanish eslivador, literally a packer, rstivar, to press or pack closely, Latin si! pare, to press. The Spanish word was particularly applied to the packers of wool, when Spain was a great wool-expqrting country, and thus came into general mercantile use.

STEVENAGE, an urban district in the Hitchin parliamentary division of Hertfordshire, England, 28J m. N. of London by the

Great Northern railway. Pop. (1901), 3957. The church of St Nicholas, with a graceful tower and spire, is mainly Early English, but has Norman and later portions. There is a grammar school, founded in 1558. By the North Road, south of the town, is a row of six large barrows, considered to be of Danish construction.

STEVENS, ALFRED (1818-1875), British sculptor, was born at Blandford in Dorset on the 28th of January 1818. He was the son of a house painter, and in the early part of his career he painted pictures in his leisure hours. In 1833, through the kindness of the rector of his parish, he was enabled to go to Italy, where he spent nine years in study', at Naples, Rome, Florence, Milan and Venice. He had never been at an English school. In 1841 Thorwaldsen employed him for a year in Rome. After this he left Italy for England, and in 1845 he obtained a tutorial position in the School of Design,

London. This post he occupied until 1847. In 1850 he became chief artist to a Sheffield firm of workers in bronze and metal. In 1852 he returned to London. To this period belongs his design for the vases On the railings in front of the British Museum, and also the lions on the dwarf posts which were subsequently transferred to the inside of the museum. In 1856 occurred the competition for the Wellington monument, originally intended to be set up under one of the great arches of St Paul's Cathedral, though it was only consigned to that position in 1892. Stevens agreed to carry out the monument for £20,000 — a quite inadequate sum, as it afterwards turned out. The greater part of his life as a sculptor Stevens devoted to this grand monument, constantly harassed and finally worn out by the interference of government, . want of money and other difficulties. Stevens did not live to see the monument set up — perhaps fortunately for him, as it was for many years placed in a small side chapel, where the effect of the whole was utterly destroyed and its magnificent bronze groups hidden from view. Stevens was aware of the position finally decided on for the work, and he suppressed the equestrian group intended for the summit and left the model for the latter feature in a rough state. On the removal of the ■monument from the chapel to the intercolumnar space on the north side of the nave for which it was originally designed, the model of horse and man was placed in the hands of an able young sculptor, trained mainly in another school, to be worked upon and cast in bronze. The incongruity of the idea did not strike those responsible for the proceeding. Its completion was still not carried into effect in 19 10, after years of work and polemics, and it was feared that it would have a disastrous result on the masterpiece as a whole. Indeed the president of the Royal Institute of British Architects declared that the structure would not bear the weight of the addition. The monument itself consists of a sarcophagus supporting a recumbent bronze effigy of the duke, over which is an arched marble canopy of late Renaissance style on delicately enriched shafts. At each end of the upper part of the canopy is a large bronze group, one representing Truth tearing the tongue out of the mouth of False- hood, and the other Valour trampling Cowardice underfoot. The two virtues are represented by very stately female figures modelled with wonderful beauty and vigour; the vices are two nude male figures treated in a very massive way. The vigorous strength of these groups recalls the style of Michelangelo, but Stevens's work throughout is original and has a very distinct character of its own. Owing to the many years he spent on this one work Stevens did not produce much other sculpture.. In Dorchester House, Park Lane, there is some of his work, especially a very noble mantelpiece supported by nude female

caryatids in a crouching attitude, modelled with great largeness of style. He also designed mosaics to fill the spandrels under the dome of St Paul's. Stevens died in London on the 1st of May 1875.

See Sculpture: British; Sir William Armstrong, Alfred Stevens (London, 1881) ; II. Stannus, Alfred Stevens (London, 1891).

STEVENS, ALFRED (1828-1906), Belgian painter, was born in Brussels on the 1 ith of May 1828. His father, an old officer in the service of William I., king of the Netherlands, was passion- ately fond of pictures, and readily allowed his son to draw in the

studio of Francois Navez, director of the Brussels Academy. In 1844 Stevens went to Paris and worked under the instruction of Camille Roqueplan, a friend of his father's; he also attended the classes at the ficole des Beaux Arts, where Ingres was then professor. In 1849 he painted at Brussels his first picture, " A Soldier in Trouble," and in the same year went back to Paris, where he definitely settled, and exhibited in the Salons. He then painted " Ash- Wednesday Morning," " Burghers and Country People finding at Daybreak the Body of a Murdered Gentleman," " An Artist in Despair," and " The Love of Gold." In 1855 he exhibited at the Antwerp Salon a little picture called " At Home," which showed the painter's bent towards depicting ladies of fashion. At the Great Exhibition in Paris, 1855, his contributions were remarkable, but in 13.57 he returned to graceful female subjects, and his path thenceforth was clear before him. At the Great Exhibition of 1867 he was seen in a brilliant variety of works in the manner he had made his own, sending eighteen exquisite paintings; among them were the " Lady in Pink " (in the Brussels Gallery), " Consola- tion," " Every Good Fortune," " Miss Fauvette," " Ophelia," and " India in Paris." At the Paris International Exhibitions of 1878 and 1889, and at the Historical Exhibition of Belgian Art, Brussels, 1880, he exhibited " The Four Seasons " (in the Palace at Brussels), "The Parisian Sphinx," "The Japanese Mask," " The Japanese Robe," and " The Lady-bird " (Brus- sels Gallery). He died on the 24th of August 1906. " Alfred Stevens is one of the race of great painters," wrote Camille Lemonnier, " and like them he takes immense pains with the . execution of his work." The example of his finished technique was salutary, not merely to his brethren in Belgium, but to many foreign painters who received encouragement from the study of his method.

The brother of Alfred Stevens, Joseph Stevens, was a great painter of dogs and dog life.

See J. du Jardin, L'Ari flamand; Camille Lemonnier, Histoire des beaux arts en Belgique.

STEVENS, HENRY (1819-1886), American bibliographer, was born in Barnet, Vermont, on the 24th of August 1819. He studied at Middlebury College, Vermont, in 1838-1839, graduated at Yale in 1843 and studied at the Cambridge (Massachusetts) Law School in 1843-1844. 'In 1845 he went to London, where he was employed during most of the remainder of his life as a collector of Americana for the British Museum and for various public and private American libraries. He was engaged by Sir Anthony Panizzi, librarian of the British Museum, to collect historical books, documents, journals, &c, concerning North and South America; and he was purchas- ing agent for the Smithsonian Institution and for the library of Congress, as well as for James Lenox, of New York, for whom he secured much of the valuable Americana in the Lenox library in that city, and for the John Carter Brown library, at Providence, Rhode Island. He became a member of the Society of Antiquaries in 1852, and in 1877 was a member of the committee which organized the Caxton Exhibition, for which he catalogued the collection of Bibles. He died at South Hampstead, England, on the 28th of February 1886.

His principal compilations and publications were: an Analytical Index to the Colonial Documents of New Jersey in the State Paper Office in England (1858), constituting vol. v. of the New Jersey Historical Society's. Collections; Collection of Historical Papers relating to Rhode Island . . . 1640-1775 (6 vols.), for the John Carter Brown library; historical indexes of the colonial documents relating to Maryland (10 vols.), now in the library of the Maryland Historical Society; and a collection of papers relating to Virginia for the period 1585-1775, incomplete, deposited in the Virginia state library in 1858; a valuable Catalogue of American Maps in the Library of the British Museum (1856); catalogues of American , of Mexican and other Spanish-American and of Canadian and other British North American books in the library of the British Museum ; Historical and Geographical Notes on the Earliest Discoveries in America, 1453-153°, with Comments on the Earliest Maps and Charts, &c. (1869), Sebastian Cabot – John Cabot — o (1870); The Bibles in the Caxton Exhibition, 1877 (1878) ; and Recollections of Mr James Lenox, of New York, and the Formation of his Library (1886).

His brother, Benjamin Franklin Stevens (1833-1902), also a bibliographer, was born at Barnet, Vermont, on the

19th of February 1833, was educated at the university of Vermont, and in i860 became associated with his brother in London. For about thirty years he was engaged in preparing a chronological list and alphabetical index of American state papers in English, French, Dutch and Spanish archives, covering the period from 1763 to 1784, and he prepared more than 2000 facsimiles of important American historical manuscripts found in European archives and relating to the period between 1773 and 1783. He also acted as purchasing agent for various American libraries, and for about thirty years before his death was United States despatch agent at London and had charge of the mail intended for the vessels of the United States navy serving in Atlantic or European stations. He died at Surbiton, Surrey, England, on the 5th of March 1902.

His principal publications include Campaign in Virginia, 1781: an Exact Reprint of Six Rare Pamphlets on the Clinton-Cornwallis Controversy, with . . . Manuscript Notes by Sir Henry Clinton; with a Supplement containing Extracts from the Journals of the House of Lords (1888); Facsimiles of Manuscripts in European Archives Relating to Atnerica, 1773-1783, with Descriptions, References and Translations (25 vols., 1 889-1 898); General Sir William Howe's Orderly Book at Charlestown, Boston and Halifax (1890); and Columbus: His Own Book of Privileges, 150s (1893).

STEVENS, .THADDEUS (1792-1868), American political leader, was born in Danville, Vermont, on the 4th of April 1792. He graduated at Dartmouth College in 1814, removed to York, Pennsylvania, was admitted to the bar (in Maryland), and for fifteen years practised at Gettysburg, Pennsylvania. He was a leader of the Anti-Masons in Pennsylvania, and was prominent in the national Anti-Masonic Convention at Baltimore in 1831. He served in the Pennsylvania House of Representatives, first as an Anti-Mason and later as a Whig, in 1833-1835, 1838-1839 and 1841-1842. On the nth of April 1835 he made an eloquent speech in defence of free public education. A partner's venture in the iron business having involved him in a debt of $217,000, he retired from public life in 1842 and practised law in Lancaster, Pennsylvania, with such success as within six years to reduce this debt to $30,000. He frequently appeared in behalf of fugitive slaves before the Pennsylvania courts, and previously, in the state constitutional convention of 1837, he had refused to sign the constitution limiting the suffrage to white freemen. In 1840 he did much in Pennsylvania

to bring about the election of W. H. Harrison, and in the campaign of 1844 Stevens again rendered marked services to the Whig ticket. He was a Whig representative in Congress in 1849-1853, and was leader of the radical Whigs and Free-Soilers, strongly opposing the Compromise Measures of 1850, and being especially bitter in his denuncia- tions of the Fugitive Slave Law. In 1855 he took a prominent part in organizing the Republican party in Pennsylvania, and in 1856 was a delegate to the Republican National Convention, in which he opposed the nomination of John C. Fremont. He returned to the National House of Representatives in 1859 and bitterly criticized the vacillation of Buchanan's administration. He became chairman of the ways and means committee on the 4th of July 1861, and until his death was, as James G. Blaine said, " the natural leader who assumed his place by common consent." During the Civil War he was instrumental in having necessary revenue measures passed in behalf of the administration. He was not, however, • in perfect harmony with Lincoln, who was far more conservative as well as broader minded and more magnanimous than he; besides this Stevens felt it an injustice that Lincoln in choosing a member of his cabinet from Pennsylvania had preferred Cameron to himself. During the war Stevens urged emancipation of the slave, and earnestly advocated the raising of negro regiments. He not only opposed the president's " ten percent, plan" in Louisiana and Arkansas (i.e. the plan which provided that these states might be reorganized by as many as 10% of the number of voters in i860 who should ask for pardon and take the oath of allegiance to the United States), but he also refused to accept the Wade-Davis Bill as being far too moderate in character. On the motion of Stevens (Dec. 4, 1865), the two houses appointed a joint committee on reconstruction, and Stevens

was made chairman of the House committee. In his speech of the 1 8th of December 1865 he asserted that rebellion had ipso facto blotted out of being all states in the South, that that section was then a " conquered province," and that its govern- ment was in the hands of Congress, which could do with it as it wished. He introduced from the joint committee what became, with changed clause as to the basis of representation, the Four- teenth Amendment, and also the Reconstruction Act of the 6th of February 1867. He also advocated the Freedmen's Bureau bills and the Tenure of Office Act, and went beyond Congress in favouring the confiscation of the property of the Confederate States and "of the real estate of 70,000 rebels who own

above 200 acres each, together with the lands of their several states," for the benefit of the freedmen and loyal whites and to reimburse, it was said, the sufferers from Lee's invasion of Pennsylvania, during which Stevens's own ironworks at Chambersburg had been destroyed. He led Congress in the struggle with the president, and after the president's removal of Secretary of War Stanton he reported the impeachment resolution to the house and was chairman of the committee appointed to draft the articles of impeachment. He was one of the managers appointed to conduct the case for the House of Representatives before the Senate, but owing to ill-health he took little part in the trial itself. He died at Washington, D.C., on the nth of August 1868, and was buried at Lancaster. Pennsylvania. 1

Stevens was an extreme partisan in politics; and his opponents and critics have always charged him with being vindictive and revengeful toward the South. Instead of obtaining political and social equality for the negro, his policy intensified racial antagonism, forced practically all of the white people of the South into the Democratic party, and increased the difficulties in the way of a solution of the race problem; the policy, however, was the result of the passions and political exigencies of the time, and Stevens cannot be held responsible except as the leader of the dominant faction in Congress. He was an able, terse, forcible speaker, master of bitter sarcasm, irony, stinging ridicule, and, less often used, good-humoured wit.

See S. W. McCall's Thaddeus Stevens (Boston and New York, 1899), in the American Statesmen Series, a sympathetic, but judicious biography; also J. F. Rhodes, History of the United States from the Compromise of 1850, especially vol. v. (New York, 1904).

STEVENSON, ADLAI EWING (1835-), American political leader, was born in Christian county, Kentucky, on the 23rd of October 1835. He removed with his family to Bloomington, Illinois, in 1852; was educated at the Illinois Wesleyan Univer- sity at Bloomington and at Centre College, Danville, Kentucky; and was admitted to the Illinois bar in 1857. He was master in chancery for Woodford county, Illinois, in 1860-1864, and district-attorney for the twenty-third judicial district of that state from 1865 to 1869, when he removed to Bloomington. He was a Democratic representative in Congress from Illinois in 1875-1877 and again in 1879-1881; was first assistant post- master-general in 1885-1889, and was severely criticized for his wholesale removal of Republican postmasters. He was a delegate to the national Democratic conventions in 1884 and 1892, and in the latter year was elected vice-president of the United

States on the ticket with Cleveland, serving from 1893 to 1897. In 1897 he was a member of the commission (Senator Edward O. Wolcott and General Charles J. Paine being the other members) appointed by President McKinley to confer with the governments of Great Britain, France and Germany with a view to the establishment of international bimetallism. He

1 In accordance with his own wish he was buried in a small grave-yard rather than in one of the regular city cemeteries, and on his tombstone is the following epitaph written by himself: " I repose in this quiet and secluded spot, not from any natural preference for solitude, but, rinding other cemeteries limited as to race by charter rules, I have chosen this, that I might illustrate in my death the principles I advocated through a long life — Equality of man before his Creator." He bequeathed a part of his estate to found a home for white and negro orphans — the present Thaddeus Stevens industrial school — at Lancaster.

was again Democratic nominee for vice-president in 1900, but was defeated. He published Something of Men I have Known; With Some Papers of a General Nature, Political, Historical and Retrospective (1909).

STEVENSON, ROBERT (1772-1850), Scottish engineer, was the only son of Alan Stevenson, partner in a West Indian house in Glasgow, and was born in that city on the 8th of June 1772. He was educated at Anderson's College, Glasgow, and Edinburgh University. In his youth he assisted his stepfather, Thomas Smith, in his lighthouse schemes, and at the age of nineteen was sent to superintend the erection of a lighthouse on the island of Little Cumbrae. Subsequently he succeeded Smith, whose daughter he married in 1799, as engineer to the Commissioners of Northern Lighthouses, and during his period of office, from 1797 to 1843, he designed and executed a large number of lighthouses, the most important being that on the Bell Rock, begun in 1807. For its illumination he introduced an improved apparatus, and he was also the author of various valuable inventions in connexion with lighting, including the intermittent and flashing lights, and the mast lantern for lightships. As a civil engineer he improved the approaches to Edinburgh, including that by the Calton Hill, constructed harbours, docks and breakwaters, improved river and canal navigation, and constructed several important bridges. In consequence of observations made by him George Stephenson advocated the use of malleable- instead of cast-iron rails for railways, and he was the inventor of the movable jib and balance cranes. Chiefly through his interposition an

admiralty survey was established, from which the admiralty sailing directions for the coasts of Great Britain and Ireland have been prepared. Stevenson published an Account of the Bell Rock Lighthouse in 1824, and, besides contributing important articles on engineering subjects to Brewster's Edinburgh Encyclopaedia and the Encyclopaedia Britannica, was the author of various papers read before learned societies. He died at Edinburgh on the 12th of July 1850.

Of his family, three sons, Alan, David and Thomas, attained distinction as lighthouse engineers. The eldest, Alan (1807- 1865), eventually became a partner with his father, whom he succeeded as engineer to the Commissioners of Northern Light- houses in 1843. The most noteworthy lighthouse designed by him is Skerryvore on the west coast of Scotland, an isolated tower of which the first stone was laid in 1840 and which first showed its light in 1843. He published an Account of the Skerryvore Lighthouse in 1848, and a Rudimentary Treatise on the History, Construction and Illumination of Lighthouses in 1850, and he wrote the article on lighthouses in the 8th edition of the Encyclo- paedia Britannica. The third son, David (181 5-1886), was at first engaged on land and marine surveys and in railway work. In 1837 he made a tour in North America, which gave rise to his Sketch of the Civil Engineering of North America (1838), and on his return became a partner in his father's business. In 1853 he and his youngest brother Thomas were appointed joint engineers to the Commissioners of Northern Lighthouses in succession to their brother Alan, and he designed many light- houses not only in Scotland but also in New Zealand, India and Japan. His books include Marine Surveying (1842), Canal and River Engineering (1858), Reclamation and Protection of Agricul- tural Land (1874), and Life of Robert Stevenson (1878), and he was also a contributor to the 8th and 9th editions of the Encyclo- paedia Britannica. The youngest son, Thomas (1818-1887), joined his father's business in 1846, and as joint engineer to the Commissioners of Northern Lighthouses from 1853 to 1885 introduced various improvements in lighthouse illumination,, which were described in the article on lighthouses he wrote for the 9th edition of the Encyclopaedia Britannica. He was also deeply interested in meteorology, and in 1864 designed the Stevenson screen widely used for the sheltering of thermometers. He was the father of Robert Louis Stevenson.

STEVENSON, ROBERT LEWIS BALFOUR (1850-1894), British essayist, novelist and poet, was the only child of Thomas Stevenson, civil engineer, and his wife, Margaret Isabella Balfour. He was born

at 8 Howard Place, Edinburgh, on the 13th of

November 1850. He suffered from infancy from great fragility of health, and nearly died in 1858 of gastric fever, which left much constitutional weakness behind it. From the age of six he showed a disposition to write. He went to school, mainly in Edinburgh, from 1858 to 1867, but his ill-health prevented his learning much, and his teachers, as his mother afterwards said, " liked talking to him better than teaching him." He often accompanied his father on his official visits to the light- houses of the Scottish coast and on longer journeys, thus early accustoming himself to travel. As his health improved it was hoped that he would be able to adopt the family profession of civil engineering, and in 1868 he went to Anstruther and then to Wick as a pupil engineer. In 187 1 he had so far advanced as to receive the silver medal of the Edinburgh Society of Arts for a paper suggesting improvements in lighthouse apparatus. But long before this he had started as an author. His earliest publication, the anonymous pamphlet of The Pentland Rising, had appeared in 1866, and The Charity Bazaar, a trifle in which his future manner is happily displayed, in 1868. From about the age of eighteen he dropped his baptismal names of Lewis Balfour and called himself Robert Louis, but was mostly known to his relatives and intimate friends as " Louis." Although he greatly enjoyed the outdoor business of the engineer's life it strained his physical endurance too much, and in 1871 was reluctantly exchanged for study at the Edinburgh bar, to which he was called in 1875. In 1873 he first met Mr Sidney Colvin, who was to prove the closest of his friends and at last the loyal and admirable editor of his works and his correspondence; and to this time are attributed several of the most valuable friendships of Stevenson's life.

He was now labouring, with extreme assiduity, to ground himself in the forms and habits of literary style. In 1875 appeared, anonymously, his Appeal to the Clergy of the Church of Scotland, and in that year he made the first of many visits to the forest of Fontainebleau. Meanwhile at Mentone in the winter of 1873-1874 he had grown in mind under the shadow of extreme physical weakness, and in the following spring began to contribute essays of high originality to one or two periodicals, of which the Cornhill, then edited by Sir Leslie Stephen, was at first the most important. Stevenson made no attempt to practice at the bar, and the next years

were spent in wanderings in France, Germany and Scotland. Records of these journeys, and of the innocent adventures which they encouraged, were given to the world as An Inland Voyage in 1878, and as Travels with a Donkey in the Cevennes in 1879. During these four years Stevenson's health, which was always bettered by life out of doors, gave him little trouble. It was now recognized that he was to be an author, and he contributed many essays, tales and fantasies to various journals and magazines. At Fontaine- bleau in 1S76 Stevenson had met Mrs Osbourne, the lady who afterwards became his wife; she returned to her home in Cali- fornia in 1878, and in August of the following year, alarmed at news of her health, Stevenson hurriedly crossed the Atlantic. He travelled, from lack of means, as a steerage passenger and then as an emigrant, and in December, after hardships which seriously affected his health, he arrived in San Francisco. In May 1880 he married, and moved to the desolate mining-camp which he has described in The Silverado Squatters. As Mr Colvin has well said, these months in the west of America were spent " under a heavy combined strain of personal anxiety and literary effort." Some of his most poignant and most enchanting letters were written during this romantic period of his life. In the autumn of 1880 he returned to Scotland, with his wife and step- son, who were received at once into the Edinburgh household of his parents. But the condition of his health continued to be very alarming, and they went almost immediately to Davos, where he remained until the spring of 188 1. In this year was published Virginibus puerisque, the earliest collection of Stevenson's essays. He spent the summer months in Scotland, writing articles, poems, and above all his first romance, The Sea-Cook, afterwards known as Treasure Island; but he was driven back to Davos in October. In 1882 appeared Familiar Studies of

Men and Books and New Arabian Nights. His two winters at Davos had done him some good, but his summers in Scotland invariably undid the benefit. He therefore determined to reside wholly in the south of Europe, and in the autumn of 1882 he settled near Marseilles. This did not suit him, but from March 1883 to July 1884 he was at home at a charming house called La Solitude, above Hyeres; this was in many ways to be the happiest station in the painful and hurrying pilgrimage of Stevenson's life. The Silverado Squatters was published in 1883, and also the more important Treasure Island, which made Stevenson for the first time a popular writer. He planned a vast amount of work, but his schemes were all frustrated in January 1884 by the most serious illness from which he had yet suffered. He was just pulled through, but the attack was

followed by long prostration and incapacity for work, and by continued relapses. In July he was brought back to England, and from this time until August 1887 Stevenson's home was at Bournemouth. In 1885 he published, after long indecision, his volume of poems, A Child's Garden of Verses, an inferior story, The Body Snatcher, and that admirable romance, Prince Otto, in which the peculiar quality of Stevenson's style was displayed at its highest. He also collaborated with W. E. Henley in some plays, Beau Austin, Admiral Guinea and Robert. Macaire. Early in 1886 he struck the public taste with precision in his wild symbolic tale of The Strange Case of Br Jekyll and Mr Hyde. In the summer of the same year he published Kidnapped, which had been written at Bournemouth.

This, however, was a period of great physical prostration, so that 1886 and 1887 were perforce among the least productive years of Stevenson's life. In the early months of 1887 Stevenson was particularly ill, and he was further prostrated by being summoned in May to the deathbed of his father, who had just returned to Edinburgh from the south. He printed privately as a pamphlet, in June 1887, a brief and touching sketch of his father. In July he published his volume of lyrical poems called Underwoods. The ties which bound him to England were now severed, and his health was broken to such a discouraging degree that he determined to remove to another hemisphere. Accord- ingly, having disposed of Skerryvore, his house at Bournemouth, he sailed from London, with his wife, mother and stepson, for New York on the 17th of August 1887. He never set foot in Europe again. His memoir of his friend Professor Fleeming Jenkin was published soon after his departure. After resting . at Newport, he went for the winter to be under the care of a . physician at Saranac Lake in the Adirondacks for the winter. Here he was very quiet, and steadily active with his pen, writing both the greater part of the Master of Ballantrae and many of his finest later essays. He had undertaken, for a regular payment greatly in excess of anything which he had hitherto received, to contribute a monthly essay to Scribner's Magazine, and these essays, twelve in number, were published continuously through- out the year 1888. Early in that year was begun The Wrong Box, a farcical romance in which Mr Lloyd Osbourne participated; Stevenson also began a romance about the Indian Mutiny, which he abandoned. His attitude about this time to life and experi- ence is reflected in Pulvis et umbra, one of the noblest of all his essays. In April 1888 he was at the coast of New Jersey for some weeks, and in June started for San Francisco, where he had ordered a schooner, the " Casco," to be ready to receive him. On the 28th of the month, he started, as Mr Colvin has said, " on

what was only intended to be a pleasure excursion . . . but turned into a voluntary exile prolonged until the hour of his death ": he never again left the waters of the Pacific. The " Casco " proceeded first to the Marquesas, and south and east to Tahiti, passing before Christmas northwards to Honolulu, where Stevenson spent six months and finished The Master of Ballantrae and The Wrong Box. It was during this time that he paid his famous visit to the leper settlement at Molokai. In 1889, " on a certain bright June day," the Stevensons sailed for the Gilbert Islands, and after six months' cruising found themselves at Samoa, where he landed for the first time about Christmas Day 1889. On this occasion, however, though

strongly drawn to the beautiful island, he stayed not longer than six weeks, and proceeded to Sydney, where, early in 1890, he published, in a blaze of righteous anger, his Father Damien: an Open Letter to the Rev. Dr Hyde of Honolulu, in vindication of the memory of Father Damien and his work among the lepers of the Pacific. At Sydney he was very ill again: it was now obvious that his only chance of health lay within the tropics. For nearly the whole of the year 1890 the Stevensons were cruising through unfamiliar archipelagos ion board a little trading steamer, the " Janet Nicholl." Meanwhile his volume of Ballads was published in London.

The last four years of his unquiet life were spent at Samoa, in circumstances of such health and vigour as he had never previously enjoyed, and in surroundings singularly picturesque. It was in November 1890 that he made his abode at Vailima, where he took a small barrack of a wooden box 500 ft. above the sea, and began to build himself a large house close by. The natives gave him the name of Tusitala. His character developed unanticipated strength on the practical side; he became a vigorous employer of labour, an active planter, above all a powerful and benignant island chieftain. He gathered by degrees around him. " a kind of feudal clan of servants and retainers," and he plunged, with more generous ardour than coolness of judgment, into the troubled politics of the country. He took up the cause of the deposed king Mataafa with extreme ardour, and he wrote a book, A Footnote to History: Eight Years of Trouble in Samoa (1892), in the endeavour to win over British sympathy to his native friends. In the autumn of this year he received a visit at Vailima from the countess of Jersey, in company with whom and some others he wrote the burlesque extravagance in prose and verse,

called An Object of Pity, privately printed in 1893 at Sydney. Whenever the cultivation of his estate and the vigorous championship of his Samoan retainers gave him the leisure, Stevenson was during these years almost wholly occupied in writing romances of Scottish life. The Wrecker, an adventurous tale of American life, which mainly belonged to an earlier time, was written in collaboration with Mr Lloyd Osbourne and finally published in 1892; and towards the close of that very eventful and busy year he began The Justice Clerk, afterwards Weir of Hermiston. A portion of the old record of emigrant experiences in 1879, long suppressed for private reasons, also appeared in book form in 1892. In 1893 Stevenson published the important Scottish romance of Catriona, written as a sequel to Kidnapped, and the three tales illustrative of Pacific Ocean character, Island Nights' Entertain- ments. But in 1 893 the uniform good fortune which had attended the Stevensons since their settlement in Samoa began to be disturbed. The whole family at Vailima became ill, and the final subjugation of his protege Mataafa, and the destruction of his party in Samoan politics, deeply distressed and discouraged Stevenson. In a series of letters to The Times he exposed the policy of the chief justice, Mr Cedercrantz, and the president of the council, Baron Senfft. He so influenced public opinion that both were removed from office. In the autumn of that year he went for a change of scene to the Sandwich Islands, but was taken ill there, and was only too glad to return to Samoa. In 1894 he was greatly cheered by the plan, suggested by friends in England and carried out by them with the greatest energy, of the noble collection of his works in twenty-eight volumes, since known as the Edinburgh editions. In September 1894 was published The Ebb Tide, the latest of his books which he saw through the press. Of Stevenson's daily avocations, and of the temper of his mind through these years of romantic exile, a clear idea may be obtained by the posthumous Vailima Letters, edited by Mr Sidney Colvin in 1895. Through 1894 he was engaged in composing two romances, neither of which he lived to complete. He was dictating Weir of Hermiston, apparently in his usual health, on the day he died. This was the 3rd of December 1 894 ; he was gaily talking on the verandah of his house at Vailima when he had a stroke of apoplexy, from which he never recovered consciousness, and passed away painlessly in the course of the evening. His body was carried next day by sixty sturdy

Samoans, who acknowledged Stevenson as their chief, to the summit of the precipitous peak of Vaea, where he had wished to be buried, and where they left him to rest for ever with the Pacific Ocean at his feet.

The charm of the personal character of Stevenson and the romantic vicissitudes of his life are so predominant in the minds of all who knew him, or lived within earshot of his legend, that they made the ultimate position which he will take in the history of English literature somewhat difficult to decide. That he was the most attractive figure of a man of letters in his generation is admitted; and the acknowledged fascination of his character was deepened, and was extended over an extremely wide circle of readers, by the publication in 1899 of his Letters, which have subdued even those who were rebellious to the entertainment of his books. It is therefore from the point of view of its " charm " that the genius of Stevenson must be approached, and in this respect there was between himself and his books, his manners and his style, his practice and his theory, a very unusual harmony. Very few authors of so high a class have been so consistent, or have made their conduct so close a reflec- tion of their philosophy. This unity of the man in his work makes it difficult, for one who knew him, to be sure that one rightly gauges the purely literary significance of the latter. There are some living who still hear in every page of Stevenson the voice of the man himself, and see in every turn of his language his flashing smile. So far, however, as it is possible to dis- engage one's self from this captivation, it may be said that the mingling of distinct and original vision with a singularly conscientious handling of the English language, in the sincere and wholesome self-consciousness of the strenuous artist, seems to be the central feature of Stevenson as a writer by profession. He was always assiduously graceful, always desiring to present his idea, his image, his rhapsody, in as persuasive a light as possible, and, particularly, with as much harmony as possible. He had mastered his manner and, as one may say, learned his trade, in the exercise of criticism and the reflective parts of literature, before he surrendered himself to that powerful creative impulse which had long been tempting him, so that when, in mature life, he essayed the portraiture of invented character he came to it unhampered by any imperfection of language. This distinguished mastery of style, and love of it for its own sake within the bounds of good sense and literary decorum, gave him a pre-eminence among the story-tellers of his time. No doubt it is still by his romances that Stevenson keeps the wider circle of his readers. But many hold that his letters and essays are finer contributions to pure literature, and that on these exquisite mixtures of wisdom, pathos, melody and humour his fame is likely to be ultimately based. In verse he had a touch far less sure than in prose. Here we find less evi- dence of sedulous workmanship, yet not infrequently a piercing sweetness, a depth of emotion, a sincere and spontaneous lovableness, which are

irresistibly touching and inspiring.

The personal appearance of Stevenson has often been described: he was tall, extremely thin, dark-haired, restless, compelling attention with the lustre of his wonderful brown eyes. In the existing portraits of him those who never saw him are apt to discover a strangeness which seems to them sinister or even affected. This is a consequence of the false stability of portraiture^ since in life the unceasing movement of light in the eyes, the mobility of the mouth, and the sympathy and sweetness which radiated from all the features, precluded the faintest notion of want of sincerity. Whatever may be the ultimate order of reputation among his various books, or whatever posterity may ultimately see fit to ordain as regards the popularity of any of them, it is difficult to believe that the time will ever come in which Stevenson will not be remembered as the most beloved of the writers of that age which he did so much to cheer and stimulate by his example.

His cousin R. A. M. Stevenson (1847-1900) was an accom- plished art-critic, who in 1889 became professor of fine arts at University College, Liverpool; he published several works on art (Rubens, 1898; Velasquez, 1895; Raeburn, 1900).

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STEVENS POINT— STEVIN US

R. L. Stevenson's other works include: Memories and Portraits

(1887); The Merry Men and other Tales and Fables (1887) ; The Black Arrow (1888); Edinburgh: Picturesque Notes (1889); Across the Plains, with other Memories and Essays (1892), and the posthumous works, Songs of Travel and other Verses (1896), St Ives (1899), com- pleted by Sir A. T. Quilier Couch; A Stevenson Medley (1899); In the South Seas: experiences . . . on the " Casco " {1888) and the Equator {i88q) (1900). See the Letters of Stevenson to his Family (1899), with the critical and biographical preface by Mr Sidney Colvin; Vailima Letters, to Sidney Colvin (1895), an d the Life of Robert Louis Stevenson by Graham Balfour (1901). See also Professor Walter Raleigh, R. L. Stevenson (1895), and Memories of Vailima (!9°3)i by Isobel Strong and Lloyd Osbourne. A complete edition of Stevenson's works was issued at Edinburgh in 1 894-1 898. A Bibliography of the works of R. L. Stevenson by Colonel W. F. Prideaux appeared in 1903. (E. G.)

STEVENS POINT, a city and the county-seat of Portage county, Wisconsin, U.S.A., on both banks of the Wisconsin river, about no m. N. of Madison. Pup. (1890), 7896; (1900), 9524, of whom 2205 were foreign-born; (1910 U.S. census), 8692. Stevens Point is served by the Green Bay & Western and the Minneapolis, St Paul & Sault Ste Marie railways. It is attractively situated, has a fine public school system, including a high school, a manual training school, a domestic science department, and kindergarten and day schools for the deaf. It is the seat of one of the state normal schools (1894), of St Joseph's Academy (Polish), and of the Stevens Point Commercial College, and has a Carnegie library (1904), the Portage county court-house, a city hospital, and a tuberculosis sanatorium. The city is situated in the borders of the pine timber region, and the lumber industry predominates. There are railway repair shops here, and various manufactures. The city has a considerable wholesale jobbing trade, and is an important point of shipment for the products of the agricultural country in the vicinity. Stevens Point was first settled by George Stevens in 1839, was incorporated as a village in 1847, and was first chartered as a city in 1858.

STEVENSTON, a manufacturing town of Ayrshire, Scotland. Pop. (1901), 6554. It is situated about 1 m. from Saltcoats on the coast of the Firth of Clyde, 29 m. S.W. of Glasgow by the Glasgow & South-Western railway. There are coal- mines, several ironworks — one is among the largest in Scotland — and, on the sandhills along the shore, the works of Nobel's Explosives Company, which cover an area of a mile, the separate- hut principle being adopted to minimize the risks attendant upon so dangerous an occupation.

STEVINUS, SIMON (1548-1620), Dutch mathematician, was born in 1548 at Bruges (where the Place Simon Stevin contains his statue by Eugen Simonis) and died in 1620 at the. Hague or in Leiden. Of the circumstances of his life very little is recorded; the exact day of his birth and the day and place of his death are alike uncertain. It is known that he left a widow with two children; and one or two hints scattered throughout his works inform us that he began life as a merchant's clerk in Antwerp, that he travelled in Poland, Denmark and other parts of northern Europe, and that he was intimate with Prince Maurice of Orange, who asked his advice on many occasions, and made him a public officer — at first director of the so-called " waterstaet," and afterwards quartermaster-general. The question whether Stevinus, like most of the rest of the prince's followers, belonged to the Protestant creed hardly admits of a categorical answer. A Roman Catholic would perhaps not have been so ready as Stevinus to deny the value of all authority. A Roman Catholic could

not well have boasted, as Stevinus in a political pamphlet did, that he had always been in harmony with the executive power. But against these considerations it might be urged that a Protestant had no occasion to boast of a harmony most natural to him, while his further remark to the effect that a state church is indispensable, and that those who cannot belong to it on conscientious grounds ought to leave the country rather than show any opposition to its rites, seems rather to indicate the crypto-Catholic. The same conclusion is supported by the fact that Stevinus, a year before his death, bequeathed a pious legacy to the church of Westkerke in Flanders out of the revenues of which masses were to be said.

His claims to fame are varied. His contemporaries were most struck by his invention of a carriage with sails, a little model of which was preserved at Scheveningen till 1802. The carriage itself had been lost long before; but we know that about the year 1600 Stevinus, with Prince Maurice of Orange and twenty-six others, made use of it on the seashore between Scheveningen and Petten, that it was propelled , solely by the force of the wind, and that it acquired a speed which exceeded that of horses. Another idea of Stevinus, for which even Hugo Grotius gave him great credit, was his notion of a bygone age of wisdom. The goal to be aimed at is the bringing about of a second age of wisdom, in which mankind shall have recovered all its early knowledge. The fellow-countrymen of Stevinus were proud that he wrote in their own dialect, which he thought fitted for a universal language, as no other abounded like Dutch in monosyllabic radical words.

Stevinus was the first to show how to model regular and semiregular polyhedra by delineating their frames in a plane. Stevinus also distinguished stable from unstable equilibrium. He proved the law of the equilibrium on an inclined plane. He demonstrated before Pierre Varignon the resolution of forces, which, simple consequence of the law of their composition though it is, had not been previously remarked. He discovered the hydrostatic paradox that the downward pressure of a liquid is independent of the shape of the vessel, and depends only on its height and base. He also gave the measure of the pressure on any given portion of the side of a vessel. He had the idea of explaining the tides by the attraction of the moon. Stevinus seems to be the first who made it an axiom that strongholds are only to be defended by artillery, the defence before his time having relied mostly on small firearms. He was the inventor of defence by a system of sluices, which proved of the highest importance for the Netherlands. His plea for the teaching of the science of fortification in universities, and the existence of such lectures in Leiden, have led to the impression that he himself filled this chair; but the belief is erroneous, as Stevinus, though living at Leiden, never had direct relations with its university.

Book-keeping by double entry may have been known to Stevinus as clerk at Antwerp either practically or through the medium of the works of Italian authors like Lucas Paccioli and Girolamo Cardan. He, however, was the first to recommend the use of impersonal accounts in the national household. He practised it for Prince Maurice, and recommended it to Sully, the French statesman.

His greatest success, however, was a small pamphlet, first published in Dutch in 1586, and not exceeding seven pages in the French translation. This translation is entitled La Disme enseignant facilement exp&dier par N ombres Entiers sans rompuz tous Comples se rencontrans aux Affaires des Hommes. Decimal fractions had been employed for the extraction of square roots some five centuries before his time, but nobody before Stevinus established their daily use; and so well aware was he of the importance of his innovation that he declared the universal introduction of decimal coinage, measures and weights to be only a question of time. His notation is rather unwieldy. The point separating the integers from the decimal fractions seems to be the invention of Bartholomaeus Pitiscus, in whose trigono- metrical tables (161 2) it occurs and it was accepted by John Napier in his logarithmic papers (1614 and 1619). Stevinus printed little circles round the exponents of the different powers of one-tenth. For instance, 2$j^\% was printed 237 © 5 © 7 © 8 @; and the fact that Stevinus meant those encircled numerals to denote mere exponents is evident from his employ- ing the very same sign for powers of algebraic quantities, e.g. 9 ©-14(3) +6©- s to denote 9a; 4 – i4« 3 + 6x- 5. He does not even avoid fractional exponents (" Racine cubique de © serait § en circle "), and is ignorant only of negative exponents.

Stevinus wrote on other scientific subjects — optics, geography, astronomy, &c. — and a number of his writings were translated into Latin by W. Snellius. There are two complete editions in French of his works, both printed at Leiden, one in 1608, the other in 1634

by Albert Girard. See Steichen, Vie el travaux de Simon Stevin (Brussels, 1846) ; M. Cantor, Geschichte der Mathematik. (M. Ca.)

STEWART, Stuart or Steuart, the surname of a family which inherited the Scottish and ultimately the English crown. Their descent is traced to a Breton immigrant, Alan the son of Flaald, which Flaald was a brother of Alan, steward (or sene- schal) of Dol in Brittany. This elder Alan, whose name occurs in Breton documents before 1080, went on crusade in 1097, and was apparently succeeded by his brother Flaald, whose son, the younger Alan, enjoyed the favour of Henry I., who bestowed on him Mileham and its barony in Norfolk, where he founded Sporle Priory. By the daughter of Ernulf de Hesdin (in Picardy), a Domesday baron, he

was father of at least three sons: Jordan, who succeeded to the family office of steward of Dol; William, who inherited Mileham and other estates in Eng- land, and who founded the great baronial house of Fitz Alan (afterwards earls of Arundel); and Walter, who was made by David I. steward (dapifer) or seneschal of Scotland. The Scottish king conferred on Walter various lands in Renfrewshire, including Paisley, where he founded the abbey in 1163. Walter, his grandson, third steward, was appointed by Alexander II. justiciary of Scotland, and, dying in 1246, left four sons and three daughters. The third son, Walter, obtained by marriage the earldom of Menteith, which ultimately came by marriage to Robert, duke of Albany, son of Robert II. Alexander, fourth steward, the eldest son of Walter, third steward, inherited by his marriage with Jean, granddaughter of Somerled, the islands of Bute and Arran, and on the 2nd of October 1263 led the Scots against Haakon IV., king of Norway, at Largs. He had two sons, James and John. The latter, who commanded the men of Bute at the battle of Falkirk in 1298, had seven sons: (1) Sir Alexander, whose grandson George became in 1389 earl of Angus, the title afterwards passing in the female line to the Douglases, and in 1761 to the duke of Hamilton; (2) Sir Alan of Dreghorn, ancestor of the earls and dukes of Lennox, from whom Lord Darnley, husband of Queen Mary, and also Lady Arabella Stuart, were descended; (3) Sir Walter, who obtained the barony of Garlies, Wigtownshire, from his uncle John Randolph, earl of Moray, and was the ancestor of the earls of Galloway, younger branches of the family being the Stewarts of Tonderghie, Wig- townshire, and also those of Physgill and Glenturk in the same county; (4) Sir James, who fell at Dupplin in 1332, ancestor of the lords of Lorn, on whose descendants were conferred at differ- ent periods the earldoms of Athole, Buchan and Traquair, and who were also the progenitors of the Stewarts of Appin, Argyll- shire, and of Grandtully, Perthshire; (5) Sir John, killed at Halidon Hill in 1333; (6) Sir Hugh, who fought under Edward Bruce in Ireland; and (7) Sir Robert of Daldowie, ancestor of the Stewarts of Allanton and of Coltness. James Stewart, the elder son of Alexander, fourth steward, succeeded his father in 1283, and, after distinguishing himself in the wars of Wallace and of Bruce, died in 1309. His son Walter, sixth steward, who had joint command with Sir James Douglas of the left wing at the battle of Bannockburn, married Marjory, daughter of Robert the Bruce, and during the latter's absence in Ireland was entrusted with the government of the kingdom. He died in 1326, leaving an only son, who as Robert II. ascended the throne of Scotland in 1371. Sir Alexander Stewart, earl of Buchan, fourth son of Robert II., who earned by his ferocity the title of the " Wolf of Badenoch," inherited by his wife the earldom of

Ross, but died without legitimate issue, although from his illegitimate offspring were descended the Stewarts of Belladrum, of Athole, of Garth, of Urrard and of St Fort. On the death of the " Wolf of Badenoch" the earldom of Buchan passed to his brother Robert, duke of Albany, also earl of Fife and earl of Menteith, but these earldoms were forfeited on the execution of his son Murdoch in 1425, the earldom of Buchan again, however, coming to the house of Stewart in the person of James, second son of Sir James Stewart, the black knight of Lorn, by Joan or Joanna, widow of 'King James I. From Murdoch, duke of Albany, were descended the Stewarts of Ard-voirlich and other families of the name in Perthshire, and also

the Stuarts of- Inchbreck and Laithers, Aberdeenshire. From a natural son of Robert II. were descended the Steuarts of Dalguise, Perthshire, and from a natural son of Robert III. the Shaw Stewarts of Blackhall and Greenock. The direct male line of the royal family terminated with the death of James V. in 1542, whose daughter Mary was the first to adopt the spelling " Stuart." Mary was succeeded in her lifetime in 1567 by her only son James VI., who through his father Lord Darnley was also head of the second branch, there being no surviving male issue of the family from progenitors later than Robert II. In James V., son of James IV. by Margaret, daughter of Henry VII., the claims of Margaret's descendants became merged in the Scottish line, and on the death of Queen Elizabeth of England, the last surviving descendant of Henry VIII. , James VI. of Scotland, lineally the nearest heir, was proclaimed king of England, in accordance with the arrangements made by Lord Burghley and Elizabeth's other advisers. The accession of James, was, however, contrary to the will of Henry VIII., which favoured the heirs of his younger sister Mary, wife of Charles Brandon, duke of Suffolk, whose succession would probably have marvel- lously altered the complexion of both Scottish and English history. As it was, the only result of that will was a tragedy initiated by Elizabeth and consummated by James. In the Scottish line the nearest heir after James VI., both to the Scottish and English crowns, was Arabella Stuart, only child of Charles, earl of Lennox, younger brother of Lord Darnley — Lady Margaret Douglas, the mother of Darnley and his brother, having been the daughter of Archibald, sixth earl of Angus, by Margaret of England, queen dowager of James IV. James VI. (I. of England) was thus nearest heir by a double descent, Arabella Stuart being next heir by a single descent. On account of the descent from Henry VII., the jealousy of Elizabeth had already caused her to imprison Arabella's mother Elizabeth, daughter of Sir William Cavendish, on learning that she had presumed to marry

Lennox. The daughter's marriage she was determined by every possible means to prevent. She objected when King James proposed to marry her to Lord Esme Stuart, whom he had created duke of Lennox, but when the appalling news reached her that Arabella had actually found a lover in Edward Seymour, grandson of Catherine Grey, heiress of the Suffolks, she was so deeply alarmed and indignant that' she immediately ordered her imprisonment. This happened imme- diately before Elizabeth's death, after which she obtained her release. Soon after the accession of James a conspiracy, of which she was altogether ignorant, was entered into to advance her to the throne, but this caused no alteration in her treatment by James, who allowed her a maintenance of £800 a year. In February 16 10 it was discovered that she was engaged to Seymour, and, although she then promised never to marry him without the king's consent, the marriage took place secretly in July following. In consequence of this her husband was sent to the Tower and she was placed in private confinement. Though separated, both succeeded in escaping simultaneously on the 3rd of June 161 1 ; but, less fortunate than her husband, who got safe to the Continent, she was captured in the straits of Dover and shut up in the Tower of London. Her hopeless captivity deprived her of her reason before her sorrows were ended by death, on the 27th of September 1615.

By the usurpation of Cromwell the Stuarts were excluded from the throne from the defeat of Charles I. at Naseby in 1645 until the restoration of his son Charles II. in 1660. Carlyle refers to the opinion of genealogists that Cromwell " was indubit- ably either the ninth or the tenth or some other fractional part of half a cousin of Charles Stuart," but this has been com- pletely exploded by Walter Rye in the Genealogist (" The Steward Genealogy and Cromwell's Royal Descent," new series, vol. ii. pp. 34-42). On the death of Charles II. without issue in 1685, his brother James, duke of York, ascended the throne as James II. but he so alienated the sympathies of the nation by his unconstitutional efforts to further the Roman Catholic religion that an invitation was sent to the prince of Orange to come " to the rescue of the laws and religion of England."

Next to the son of James II., still an infant under his father's control, Mary, princess of Oraage, elder daughter of James II., had the strongest claim to the crown; but the claims of the prince of Orange also, even apart from his marriage, were not very remote, since he

was the son of Mary, eldest daughter of Charles I. The marriage had strengthened the claimsof both, and they were proclaimed joint sovereigns of England on the 12th of February 1689, Scotland following the example of England on the nth of April. They left no issue, and the Act of Settle- ment passed in 1701, excluding Roman Catholics from the throne, secured the succession to Anne, second daughter of James II., and on her death without issue to the Protestant house of Hanover, descended from the princess Elizabeth, daughter of James I., wife of Frederick V., count palatine of the Rhine. On the death of Anne in 17 14, George, elector of Hanover, eldest son of Sophia (youngest child of the princess Elizabeth), and Ernest, elector of Brunswick-Luneburg, or Hanover, consequently became sovereign of Great Britain and Ireland, and, notwithstanding somewhat formidable attempts in behalf of the elder Stuart line in 1715 and 1745, the Hanoverian suc- cession has remained uninterrupted and has ultimately won universal assent. The female issue of James II. ended with the death of his daughter, Queen Anne. James, called James III. by the Jacobites and the Old Pretender by the Hanoverians, had two sons — Charles Edward, the Young Pretender, who died without legitimate issue in 1780, and Henry Stuart, titular duke of York, commonly called Cardinal York, on whose death in 1807 the male line of James II. came to an end. Henry was also the last descendant in the lineal male line of any of the crowned heads of the race, so far as either England or Scot- land was concerned. In the female line, however, there are among the descendants of James I. representatives of the royal Stuarts who are senior to the house of Hanover, for Philip, duke of Orleans (brother of Louis XIV.), married, as his first wife, Henrietta daughter of Charles I., and, as his second, Charlotte, granddaughter and heiress of the princess Elizabeth (daughter of James I.). By the former, through their daughter, the queen of Sardinia, he was ancestor, among others, of the princess Maria Theresa of Bavaria, who in iqio was " heir of line " of the house of Stuart, her eldest son, Prince Rupert, being heir to the throne of Bavaria; and from his second marriage descends the house of Orleans. In addition to those descended from these two marriages there are also the descendants of Edward, a brother of the electress Sophia. The male repre- sentation of the family, being extinct in the royal lines, is claimed by the earls of Galloway and also by the Stewarts of Castlemilk' but the claims of both are more than doubtful.

See Sir George Mackenzie, Defence of the Royal Line of Scotland (1685), and Antiquity of the Royal Line of Scotland (1686) ; Crawfurd, Genealogical History of the Royal and Illustrious Family

of the Stuarts (1710); Duncan Stewart, Genealogical Account of the Surname of Stewart (1739); Andrew Stuart, Genealogical History of the Stuarts (1798); Stodart, House of Stuart (privately printed, 1855); An Abstract of the Evidence to Prove that Sir William Stewart of Jedworth, the Paternal Ancestor of the Present Earl of Galloway, was the Second Son of Sir Alexander Stewart of Darnley (1801) ; Riddell, Stewartiana (1843); W. Townend, Descendants of the Stuarts (1858); R. W. Eyton, History of Shropshire (1858), vol. vii.; Bailey, The Succession to the English Crown (1879); Skelton, The Royal House of Stuart (1890) ; J. H Round, Studies in Peerage and Family History (1901); and S. Cowan, The Royal House of Stuart (1908). The best chart pedigree of the house is that which was prepared for the Stuart Exhibition by W. A. Lindsay.

STEWART, ALEXANDER TURNEY (1803-1876), American merchant, was born, of Scotch descent, at Lisburn, near Bel- fast, Ireland, on the 12th of October 1803. He studied for the ministry for about two years at Trinity College, Dublin, emi- grated to New York in 1823, and in 1825 opened a small dry goods store In 1848 he built at the corner of Chambers Street and Broadway a store which became the wholesale department upon the completion in 1862 of the large store on Broadway between Ninth and Tenth Streets. The business grew to enor- mous proportions for those days, with foreign branches in Manchester, Belfast, Glasgow, Berlin, Paris and Lyons. Stewart

was chairman of the commission sent by the United States to the Paris Exposition of 1867. In 1869 he was appointed secretary of the treasury by President U. S. Grant, but the Senate refused to confirm the appointment because of an old law excluding from the office any one interested in the importation of merchandise. Grant asked Congress to repeal the law, and Stewart offered to transfer his business to trustees and to give its proceeds while he held office to charitable institutions, but the nomination was never confirmed. Stewart sent to Ireland a shipload of provisions during the famine of 1846; he manufac- tured and sold to the government, at less than the prevailing rates, great quantities of cotton cloth for the use of the army during the Civil War; he took an active part in the prosecution of the "Tweed Ring" in New York; he sent a shipload of flour to the French sufferers from the Franco-German War, and he gave $50,000 to the sufferers from the Chicago fire of 1871. In 1869 he bought some 7000 acres on the Hempstead Plain, Long Island, New York, and established Garden City for working men. The cathedral of the Incarnation (Protestant Episcopal) dedicated in 1885, was erected in Garden City by Stewart's widow as a memorial to him. He died in

New York on the 10th of April 1876, 1 leaving the bulk of his great fortune to his widow, Mrs Cornelia (Clinch) Stewart (1802-1886) 2 . His large art collection was sold by auction in New York in 1887.

See William O. Stoddard, " Alexander Turney Stewart," in Men of Business (New York, 1893) ; " A Merchant Prince," in Chambers's Journal (1876), vol. liii. ; Edward Crapsey, " A Monument of Trade," in The Galaxy (1882), vol. ix.; " Stewart's," -in The Nation (1882), vol. xxxiv.; "The Story of a Millionaire's Grave," in Chambers's Journal (1888), vol. lxv.; and George W. Walling, Recollections of a New York Chief of Police (New York, 1887).

STEWART, BALFOUR (1828-18S7), Scottish physicist, was born in Edinburgh on the 1st of November 1828, and was educated at the university of that city. The son of a tea merchant, he was for some time engaged in business in Leith and in Australia, but, returning to his studies of physics at Edin- burgh, he became assistant to J. D. Forbes in 1856. Forbes was especially interested in questions of heat, meteorology, and terrestrial magnetism, and it was to these that Stewart also mainly devoted himself. Radiant heat first claimed his atten- tion, and by 1858 he had completed his first investigations into the subject. These yielded a remarkable extension of Pierre Prevost's " Law of Exchanges," and enabled him to establish the fact that radiation is not a surface phenomenon, but takes place throughout the interior of the radiating body, and that the radiative and absorptive powers of a substance must be equal, not only for the radiation as a whole, but also for every con- stituent of it. In recognition of this work he received in 1868 the Rumford medal of the Royal Society, into which he had been elected six years before, Of other papers in which he dealt with this and kindred branches of physics may be men- tioned " Observations with a Rigid Spectroscope," " Heating of a Disc" by Rapid Motion in Vacuo," " Thermal Equilibrium in an Enclosure Containing Matter in Visible Motion," and " Internal Radiation in Uniaxal Crystals." In 1859 he was appointed director of Kew Observatory, and there naturally became interested in problems of meteorology and terrestrial magnetism. In 1870, the year in which he was very seriously injured in a railway accident, he was elected professor of physics at Owens

1 On the 6th of November 1878 his body was stolen from St Mark's churchyard in New York, but recovered in 1881 upon the payment of $20,000, and buried in the crypt of the cathedral in Garden City.

2 Upon her death she left a small part of her estate to her other relatives and her servants, about $4,631,000 to Charles J. Clinch, a

kinsman, and about $9,262,000 to Judge Henry Hilton (1824-1899), a business associate of Stewart, who had received a legacy of $1,000,000 from Stewart, and who managed Mrs Stewart's business affairs after her husband's death. Clinch and Hilton were executors, and it was understood that Hilton should complete the cathedral at Garden City and endow schools there. A nephew of Mrs Stewart in 1887 sued to break the will on the ground that Hilton had unduly influenced her; the case was compromised out of court in 1890 and Mrs Stewart's relatives received more of her estate than they would have got under the terms of the testament.

College, Manchester, and retained that chair until his death, which happened near Drogheda, in Ireland, on the 19th of December 1887. He was the author of several successful textbooks of science, and also of the article on " Terrestrial Magnetism " in the ninth edition of this Encyclopaedia. In conjunction with Professor P. G. Tait he wrote The Unseen Universe, at first published anonymously, which was intended to combat the common notion of the incompatibility of science and religion.

STEWART, CHARLES (1778-1869), American naval officer, was born at Philadelphia, Pennsylvania, on the 28th of July 1778, of poor Irish parents. At the age of thirteen he shipped as cabin boy on a merchant vessel, and soon commanded a ship in the India trade. He entered the United States navy in March 1798 as lieutenant on the frigate " United States," and in 1800, when in command of the " Experiment," took the French privateers " Deux Amis " and " Diane." In 1802-4 he served against Tripoli, first as executive officer of the " Constel- lation " and then as commander of the " Siren." In 1806 he became a captain. From 1808 to 181 2 he was in the merchant service, but on the outbreak of hostilities against Great Britain returned to the navy, and with Commander William Bainbridge is said to have persuaded President Madison to send the navy to sea instead of using it only for harbour defence. Placed in the command of the " Constellation," he was closely blockaded at Norfolk. Virginia. In 1813 he was placed in command of the " Constitution," and in February 1815 captured the " Cyane " and the " Levant," though the " Levant " was retaken. Later he commanded the Mediterranean squadron, the Pacific squadron, the home squadron and the Philadelphia navy yard. He was retired in 1855, and became rear-admiral on the retired list in 1862. He died in

Bordentown, New Jersey, on the 6th of November 1869. His daughter, Delia Tudor, married, in 1834, John Henry Parnell, and became the mother of the Irish leader. Charles Stewart Parnell.

STEWART, SIR DONALD MARTIN (1824-1900), British field marshal, son of Robert Stewart of Forres, Elginshire, was born at Mount Pleasant, near Forres, on the 1st of March 1824. Educated at schools at Findhorn, Dufftown and Elgin, and at Aberdeen University, he entered the Bengal army in 1840, and served in 1854 and 1855 in the frontier expeditions against the Mohmands, and Afridis Aka and Bari Khel (medal and clasp). In the Indian Mutiny in 1857 Stewart, after a famous ride from Agra to Delhi with despatches, served on the staff at the siege and capture of Delhi and of Lucknow, and afterwards through the campaign in Rohilkhand (medal and two clasps, and brevet- major and lieutenant-colonel). For nine years he was assistant and deputy-adjutant-general of the Bengal army, commanded the Bengal brigade in the Abyssinian expedition in 1867 (medal and C.B.), and became a major-general in 1868. He reorganized the penal settlement of the Andaman Islands, where he was commandant when Lord Mayo was assassinated, and, after holding the Lahore command, was promoted lieutenant-general in 1877, and commanded the Kandahar field force in the Afghan War in 1878 (K.C.B. and thanks of parliament). In 1880 he made a difficult march from Kandahar to Kabul, fighting on the' way the battles of Ahmed Khel and Urzu, and held supreme military and civil command in northern Afghanistan. On hearing of the Maiwand disaster, he despatched Sir Frederick Roberts with a division on his celebrated march from Kabul to Kandahar, and himself led the rest of the army back to India by the Khybcr Pass (medal with clasp, G.C.B., CLE., baronetcy, and thanks of parliament). Promoted general in 1881, he was for five years commander-in-chief in India, and afterwards member of the council of the secretary of state for India until his death. He was made G. C.S.I, in 1885, promoted to be field marshal in 1894, and appointed governor of Chelsea Hospital in 189-5. H e died al Algiers on the 26th of March 1900. See G. R. Elsmie, Sir Donald Stewart (1903).

STEWART, DUGALD (1753-1828), Scottish philosopher, was born in Edinburgh on the 22nd of November 1753. His father, Matthew Stewart (17 15-1785), was professor of mathematics in the university of Edinburgh (1747-1772). Dugald Stewart was

educated in Edinburgh at the high school and the university, where he read mathematics and moral philosophy under Adam Ferguson. In 1771, in the hope of gaining a Snell exhibition and proceeding to

Oxford to study for the English Church, he went to Glasgow, where he attended the classes of Thomas Reid. While he owed to Reid all his theory of morality, he repaid the debt by giving to Reid's views the advantage of his admirable style and academic eloquence. In Glasgow Stewart boarded in the same house with Archibald Alison, author of the Essay on Taste, and a lasting friendship sprang up between them. After a single session in Glasgow, Dugald Stewart, at the age of nineteen, was summoned by his father, whose health was beginning to fail, to conduct the mathematical classes in the university of Edinburgh. After acting three years as his father's substitute he was elected professor of mathematics in conjunction with him in 1775. Three years later Adam Ferguson was appointed secretary to the commissioners sent out to the American colonies, and at his urgent request Stewart lectured as his substitute. Thus during the session 1778-1779, in addition to his mathematical work, he delivered an original course of lectures on morals. In 1783 he married Helen Bannatyne, who died in 1787, leaving an only son, Colonel Matthew Stewart. In 1785 he succeeded Ferguson in the chair of moral philosophy, which he filled for a quarter of a century and made a centre of intellectual and moral influence. Young men were attracted by his reputation from England, and even from the Continent and America. Among his pupils were Sir Walter Scott, Jeffrey, Cockburn, Francis Horner, Sydney Smith, Lord Brougham, Dr Thomas Brown, James Mill, Sir James Mackintosh and Sir Archibald Alison. The course on moral philosophy embraced, besides ethics proper, lectures on political philosophy or the theory of government, and from 1800 onwards a separate course of lectures was delivered on political economy, then almost unknown as a science to the general public. Stewart's enlightened political teaching was sufficient, in the times of reaction succeeding the French Revolution, to draw upon him the undeserved suspicion of disaffection to the constitution. The summers of 1788 and 1789 he spent in France, where he met Suard, Degerando, Raynal, and learned to sympathize with the revolutionary movement.

In 1790 Stewart married a second time. Miss Cranstoun, who became his wife, was a lady of birth and accomplishments, and he was in the habit of submitting to her criticism whatever he wrote. A son and a daughter were the issue of this marriage. The death of the former in 1809 was a severe blow to his father, and was the immediate cause of his retirement from the active duties of his chair. Before that, however, Stewart had not been idle as an author. As a student in Glasgow he wrote an essay on Dreaming. In 1792 he published the first volume of the Elements of the Philosophy of the

Human Mind; the second volume appeared in 1814, and the third not till 1827. In 1793 he printed a textbook, Outlines of Moral Philosophy, which went through many editions; and in the same year he read before the Royal Society of Edinburgh his account of the Life and Writings of Adam Smith. Similar memoirs of Robertson the historian and of Reid were afterwards read before the same body and appear in his published works. In 1805 Stewart published pamphlets defending Mr (afterwards Sir John) Leslie against the charges of unorthodoxy made by the presbytery of Edin- burgh. In 1806 he received in lieu of a pension the nominal office of the writership of the Edinburgh Gazette, with a salary of £300. When the shock of his son's death incapacitated him from lecturing during the session of 1809-1810, his place was taken, at his own request, by Dr Thomas Brown, who in 1810 was appointed conjoint professor. On the death of Brown in 1820 Stewart retired altogether from the professorship, which was conferred upon John Wilson, better known as " Christopher North." From 1809 onwards Stewart lived mainly at Kinneil House, Linlithgowshire, which was placed at his disposal by the duke of Hamilton. In 1810 appeared the Philosophical Essays, in 1814 the second volume of the Elements, in 1815 the first part and in 1821 the second part of the " Disserta- tion " written for the Encyclopaedia Britannica " Supplement,"

entitled " A General View of the Progress of Metaphysical, Ethical, and Political Philosophy since the Revival of Letters." In 1822 he was struck with paralysis, but recovered a fair degree of health, sufficient to enable him to resume his studies. In 1827 he published the third volume of the Elements, and in 1828, a few weeks before his death, The Philosophy of the Active and Moral Powers. He died in Edinburgh on the nth of June 1828. A monument to his memory was erected on Calton Hill.

Stewart's philosophical views are mainly the reproduction of his master Reid (for his ethical views see Ethics). He upheld Reid's psychological method and expounded the " common-sense " doctrine, which was attacked by the two Mills. Unconsciously, however, he fell away from the pure Scottish tradition and made concessions both to moderate empiricism and to the French ideologists (Laromiguiere, Cabanis and Destutt de Tracy). It is important to notice the energy of his declaration against the argument of ontology, and also against Condillac's sensationalism. Kant, he confessed, he could not

understand. Perhaps his most valuable and original work is his theory of taste in the Philosophical Essays. But his reputation rests rather on his inspiring eloquence and the beauty of his style than on original work.

Stewart's works were edited in n vols. (1 854-1 858) by Sir William Hamilton and completed with a memoir by John Veitch. Matthew Stewart (his eldest son) wrote a life in Annual Biography and Obituary (1829), republished privately in 1838. For his philosophy see McCosh, Scottish Philosophy (1875), PP- 162-173; A. Bain, Mental Science, pp. 2O8, 313 and app. 29, 65, 88, 89; Moral Science, pp. 639 seq. ; Sir L. Stephen, English Thought in the XVIIIth Century.

STEWART, SIR HERBERT (1843-1885), British soldier, eldest son of the Rev. Edward Stewart, was born on the 30th of June 1843 at Sparsholt, Hampshire. He was educated at Winchester and entered the army in 1863. After serving in India with his regiment (37th Foot) he returned to England in 1873, having exchanged into the 3rd Dragoon Guards. In

1877 he entered the staff college and also the Inner Temple. In

1878 he was sent out to South Africa, served in the Zulu War and against Sikukuni. As chief staff officer under Sir G. Pomeroy Colley he was present at Majuba (Feb. 27, 1881), where he was made prisoner by a Boer patrol and detained until the end of March. In August 1882 he was placed on the staff of the cavalry division in Egypt. After Tel-el-Kebir (Sept. 13, 1882) he headed a brilliant advance upon Cairo, and took possession of the town and citadel. He was three times mentioned in despatches, and made a brevet-colonel, C.B., and aide-de-camp to the queen. In January 1884 he was sent to Suakin in command of the cavalry under Sir Gerald Graham, and took part as brigadier in the actions from El Teb to the advance on Tamaneb. His services were recognized by the honour of K.C.B., and he was assistant adjutant and Q.M.G. in the south- eastern district in England from April to September 1884. He then joined the expedition for the relief of Khartum, and in December, when news from Gordon decided Lord Wolseley to send a column across the desert of Metemma, Stewart was entrusted with the command. On the 16th of January 1885, he found the enemy in force near the wells of Abu Klea, and brilliantly repulsed their fierce charge on the following morning. Leaving the wounded under guard, the column moved forward on the 1 8th through bushy country towards Metemma, 23 m. off. Meanwhile the enemy continued their attacks,

and on the morn- ing of the 19th Stewart was wounded and obliged to hand over the command to Sir Charles Wilson. He lingered for nearly a month, living long enough to hear of his promotion to the rank of major-general " for distinguished service in the field." He died on the way back from Khartum to Korti on the 16th of February, and was buried near the wells of Jakdul. In the telegram reporting his death Lord Wolseley summed up his character and career in the words: " No braver soldier or more brilliant leader of men ever wore the Queen's uniform."

STEWART, J. (?JAMES), of Baldynneis (fl. 1590), Scottish verse writer, is known as the translator of Ariosto's Orlando Furioso. The work is an abridgment in twelve cantos and has

the historical interest of having preceded Sir John Harington's translation (1591). The volume containing this version and other poems (of indifferent quality) is preserved in the Advo- cates' Library, Edinburgh. It bears the title Ane Abbregement of Roland Fvriovs, translait ovt of Aroist: togither vith sym Rapsodies of the Avthor's yovlhfvll braine, and last ane Schersing ovt of treiv Felicitie; composil in Scotis meiter be J. Stewart of Baldynneis. . This MS. appears to be the original which was once in the possession of James VI. Extracts are printed in Irving's History of Scotish Poetry (1861).

STEWART, JOHN (1749-1822), British traveller, was born in London of humble parentage. After an unruly career at school he entered the service of the East India Company at Madras in 1763, but he threw up his position about two years later and became interpreter to Hyder Ali, afterwards serving as a general in his army; subsequently he seryed the nabob of Arcot, whose chief minister he became. Having enriched himself in this capacity, he began a series of travels through India, Persia, Ethiopia and Abyssinia, which earned him the nickname of "Walking Stewart." About 1783 he returned to Europe, where he cut a curious figure by wearing Armenian dress. He crossed over to America in 1791 and had various adventures, but soon came back to Europe, and made the acquaintance of Wordsworth in Paris and later of De Quincey in Bath. Be- coming short of money, he again went to America, where he supported himself by lecturing. Having returned to Europe, Stewart's fortunes began to mend. In 1813 a claim he had made against the nabob of Arcot was settled by the East India Com- pany for £10,000, and he took rooms in London and settled down to enjoy life, airing his opinions on literature and art. He died on the 20th of February 1822. De Quincey (see Collected Writings, 1890, vol. iii.) gives various particulars of him.

STEWART, JULIUS L. (1855-), American artist, was born at Philadelphia on the 6th of September 1855. His father, William Hood Stewart, was a distinguished collector of the fine arts, an early patron of Fortuny and the Barbizon artists, and lived in Paris during the latter part of his life. The son was a pupil of J. L. Gerome, at the Ecole des Beaux Arts, and of Raymondo de Madrazo. Among his principal paintings are " The Hunt Ball," Essex Club, Newark, New Jersey; " Full Speed," in James Gordon Bennett's collection; " Five o'clock Tea," and " Court in Cairo."

STEWART, WILLIAM (c. 1480-c. 1550), Scottish poet and translator, descendant of one of the illegitimate sons of Alexander Stewart, earl of Buchan, the " Wolf of Badenoch," was a member of the university of St Andrews. He was in orders, and a hanger-on at the court of James V. The last entry of the pay- ment of a pension of £40 appears in the accounts of 1541. He was known as a poet in his own day: Lyndsay and Rolland refer to him. Portions of his minor verse are preserved in the Bannatyne and Maitland Folio MSS. His chief work is a metrical translation of Hector Boece's History, in obedience to the command of James V., who entrusted Bellenden with its translation into Scots prose.

Stewart's version remained in MS. till 1858, when it was edited by W. Turnbull for the " Rolls Series " (3 vols.). The MS. is now in the library of the university of Cambridge.

STEWART, SIR WILLIAM (c. 1540-c. 1605), Scottish politician, began life as a soldier in the Netherlands, where he became a colonel and entered into communications with Lord Burghley on the progress of affairs. In the year 1582 he was in Scotland, where James VI. made him captain of his guard. Having visited the English court in the king's interest in 1583, Stewart helped to free James from William Ruthven, earl of Gowrie, and to restore James Stewart, earl of Arran, to power; he was made a privy councillor and for a time assisted Arran to govern Scotland. In 1584 he captured Gowrie at Dundee. In 1585 he and Arran lost their power, and Stewart went to Denmark and France on secret errands for the king. He commanded the ships which conveyed James and his I bride Anne from Denmark in 1 590, and the same year was sent

on an embassy to the German princes. Twice he went on missions to

the Netherlands, and in 1594 he was knighted and was given lands at Houston. He died before 1606. His only son, Frederick (c. 1500-1625), who was created a peer as Lord Pittenweem in 1609, died childless in December 1625.

Sir William Stewart of Houston is often confused with Sir William Stewart of Monkton (d. 1588), a brother of James Stewart, earl of Arran, who was killed in a fight in Edinburgh in July 1588, and also with Sir William Stewart of Caverstoun.

STEWARTON, a municipal and police burgh, in the Cunning- ham district of Ayrshire, Scotland. Pop. (1901), 2858. It is situated on Annick Water, 19 m. S.W. of Glasgow by the Glasgow & South-Western railway. The town lies in a fine agricultural district, famed for its dairy produce. Two cattle and two horse fairs are held yearly; at the 'October cattle fair there is the largest show of Ayrshire dairy stock in Scotland. About 2 m. north by west is Dunlop (pop. 473), which gave its name to a cheese that at one time commanded a large market.

STEYN, MARTINUS THEUNIS (1857-), last president of the Orange Free State, was born at Winburg in that state on the 2nd of October 1857. He was a student in Holland and later in England at the Inner Temple, and was called to the English bar in November 1882. After his return to South Africa he practised as a barrister at Bloemfontein, and in 1889 was appointed state attorney of the Free State. A few months afterwards he became second puisne judge, and in 1893 first puisne judge of the high court. His decisions won him a reputation for ability and sound judgment. In 1895, upon the resignation of President F. W. Reitz, Steyn was the candidate of the pan-Dutch party for the vacant post. The election resulted (February 1896) in a decisive victory for Steyn. As president he linked the fortunes of his state with those of the Transvaal, a policy which led to the extinction of the republic. After the occupation of Bloemfontein by Lord Roberts Steyn wandered about South Africa, carrying on a semblance of government, and on occasion taking charge of military operations. More than once he narrowly escaped capture. Regarded as one of the most irreconcilable of the Boer leaders, he took part, however, in the preliminary peace negotiations at Klerksdorp in April 1902, but was prevented by illness from signing the instrument of surrender at Pretoria on the 31st of May. At that date he was suffering from locomotor ataxy, brought on by his constant exertions; and in the July following he sailed for Europe, where he remained until the autumn of 1904. He then took the oath of allegiance to the British crown, and returning to South

Africa partially restored to health resumed an active participation in politics. In 1908-1909 he was vice-president of the Closer Union Convention, where he was distinguished for his statesmanlike and conciliatory attitude, while maintaining the rights of the Dutch community.

STEYNING, a small market town in the mid parliamentary division of Sussex, England, io| m. W.N.W. of Brighton by the London, Brighton & South Coast railway. Pop. (1901), 1705. The church of St Andrew retains a very fine series of Norman pier-arches in the nave. Some picturesque old houses remain in the town. Brewing and the manufacture of parchment are carried on.

The Anglo-Saxon church of Steyning (Stoeningas, Stoeningum, Staninges, Stenyges, Stenyng) mentioned in Domesday is attri- buted to St Cuthman, who is said to have settled here before the qth century, and whose shrine became a resort for pilgrims. The later prosperity Df the town was due to its harbour. Alfred bequeathed Steyning to his nephew, but it evidently reverted to the Crown, as it was granted by Edward the Confessor to the abbot and convent of Fecamp, with whom it remained until the 15th century. By 1086 Steyning was a thriving port. It had a market, a mint and two churches, and the borough contained 1 23 burga ges. The decay of the town began in the 14th century owing to the recession of the sea, and it received another blow in the suppression of its priory by Henry IV. It was afterwards granted to fhe abbey of Sion, which held it until the dissolution. From the reign of Edward IV. to that of Richard III. there is

evidence that the town was governed by a bailiff elected annually in the borough-court. Steyning returned two representatives to parliament from 1298 until it was disfranchised in 1832. In the 14th century the abbot of Fecamp held weekly markets in the borough on Wednesdays and Saturdays, and fairs at the Nativity of the Virgin and the Feast of St Michael, by prescriptive right. The present market day is Wednesday, for stock, and a cattle fair is held on the nth of October.

STEYR, or Steier, a town in Upper Austria, 28 m. S.E. of Linz by rail. Pop. (1900), 17,592. It is situated at the confluence of the Steyr with the Enns, and on an eminence rises the castle of the princes of Lamberg, dating from the 10th century. The parish church is in Gothic style and was built in 1443-1522. Steyr is the chief centre of the steel and iron industry of Upper Austria. The rifle factory, founded in 1830 by Josef Werndl, is the largest in Austria,

and since 1882 it has added the manu- facture of bicycles and electrical plant. It is the birthplace of the poet Alois Blumauer (1755-1798). Steyr was founded at the end of the 10th century and was the capital of a countship, first belonging to Styria, but annexed to Austria in 1192.

STIBNITE, a mineral consisting of antimpny sulphide, SbzSs, occurring as bladed or acicular orthorhombic crystals; an important ore of antimony. It was mentioned by Dioscorides and Pliny under the names stimmi, stibi and platyophthalmon (Tka,Tv64>da\nov) ; the last name refers to the use which the ancients made of the powdered mineral for darkening the eye- brows to increase the apparent size of the eyes. Antimonite is a name in common use for this species. The crystals are prismatic in habit, deeply furrowed longitudinally, and usually terminated by acute pyramidal planes. There is a perfect cleavage (010) parallel to the length of the crystals, and the basal plane (001) is a plane of gliding; the latter gives rise to very characteristic transverse striations or nicks on the cleavage surfaces of crystals which have been bent. The colour is leadˆ grey, and the lustre metallic and brilliant :• crystals become dull on prolonged exposure to light. Cleavage flakes of extreme thinness transmit a small amount of red light, but are more transparent for heat rays. The mineral is quite soft (H. = 2), and has a specific gravity of 4-6. Stibnite occurs with quartz in beds and veins in gneisses and schists, or with blende, galena, &c, in metalliferous veins. Magnificent groups of brilliant crystals, up to 20 in. in length, are abundant in the extensive anti- mony mine of Ichinokawa, province of Iyo, Japan. Large, but dull, crystals have also been found at Lubilhac in Haute-Loire, France. Prismatic and acicular crystals often penetrating tabular crystals of barytes, are common at Felsobanya near Magy-Banya and Kremnitz in Hungary. (L. J. S.)

STICHOMETRY, a term applied properly to the measurement (utTpov) of ancient texts by arixoi (lit. " rows ") or verses of a fixed standard length. It was the custom of the Greeks and Romans to estimate the length of their literary works by measured lines. In poetical works the number of metrical verses was computed; in prose works a standard line had to be taken, for no two scribes would naturally write lines of the same length. On the authority of Galen (de Placit. Hipp, et Plat. viii. 1) we learn that the unit of measurement among the Greeks was the average Homeric line, consisting of about 36 letters, or 16 syllables. The lines so measured were called arixoi. oramj. The practice of thus computing the length of a work can be traced back to the 4th century B.C. in the boast of

Theopompus that he had written more hrrj than any other writer. The number of such arixoi or ewr; contained in a papyrus roll was recorded at the end of the work; and at the end of a large work extending to several rolls the grand total was given. The object of such stichometrical calculations was a commercial one, viz. to assess the pay of the scribe and the market value of the MS. Calli- machus, when he drew up his catalogue of the Alexandrian libraries in the 3rd century B.C., registered the total of the arixoi. in each work. Although he is generally lauded for thus carefully recording the numbers and setting an example to all who should follow him, it has been suggested that this very act was the cause of their general disappearance from MSS.; for that, when his

vivaicei were published, scribes evidently thought it was needless to repeat what could be found there; and thus it is that so few MSS. have descended to us which are marked in this way. A more natural reason for the scarcity of such details is that scribes and booksellers suppressed them in order to impose upon their customers.

The application of the system to Latin MSS. was fully recog- nized. The unit of measurement was the average Virgilian line. This is recorded in an interesting memorandum written in the 4th century, found in a MS. in the Phillipps Library at Cheltenham, containing a computation of the arixoi in the books of the Bible and the works of Cyprian. The writer states that in the city of Rome it had become the practice not to record the number of verses in the MSS., and that elsewhere also, for greed of gain, the numbers were suppressed. Therefore he has made a calculation of the contents of the text under his hand and has appended to the several books the number of Virgilian hexameters which would represent its length. The rate of pay of the scribes in Diocletian's reign was fixed by his edict de pretiis rerum venalium at 25 denarii for 100 arixoi in writing of the first quality, and at 20 denarii for the second quality; what the difference was between the two qualities does not appear.

The system of measurement described above has been called " total stichometry," in distinction from " partial stichometry," which was the calculation and marking off in the margins of the arixoi from point to point, just as we mark off the lines in a poem at convenient intervals and number the verses of the chapters of the Bible. This method was for convenience of literary reference. Instances of such "

partial stichometry " are not very numerous among existing MSS., but they are sufficient to show that the system was in vogue. In the Bankes Homer in the British Museum the verses are numbered in the margin by hundreds, and the same practice was followed in other Homeric papyri. In the Ambrosian Pentateuch of the 5th century at Milan the book of Deuteronomy is likewise numbered at every hundredth

There was also in use in biblical texts and in rhetorical works a stichometrical system different from that described above, in which the arixoi, as we have seen, were lines of measurement or space-lines. This other system, which is more correctly entitled colometry (see Manuscript), consisted in the division or breaking up of the text into short sentences or lines according to the sense, with a view to a better understanding of the meaning and a better delivery in public reading. The Psalms, Proverbs and other poetical books were anciently thus written, and hence received the title of /3(/3\oi orixhptis, or arixnpo-i', and it was on the same plan that St Jerome wrote, first the books of the prophets, and subsequently all the Bible of his version, per cola el commata " quod in Demosthene et Tullio solet fieri." In the Greek Testament also Euthalius, in the 5th century, introduced the method of writing arixt&ov, as he termed it, into the Pauline and Catholic epistles and the Acts. The sur- viving MSS. which contain the text written in short sentences show bv the diversity of the latter that the rhythmical sentences or lines of sense were differently calculated by different writers; but the original arrangement of St Jerome is thought to be represented in the Codex Amiatinus at Florence, and that of Euthalius in the Codex Claromontanus at Paris. With regard to St Jerome's reference to the division per cola et commata of the rhetorical works of Demos- thenes and Cicero, it should be noticed that there are still in exis- tence MSS. of works of the latter in which the text is thus written, one of them being a volume of the Tusculans and the De senectuie in the Bibliotheque Nationale at Paris. The same arrangement of the text of the orations of Demosthenes is also mentioned by the rhetoricians of the 5th and subsequent centuries.

Authorities. — C. Graux in Revue de philologie (1878), ii. 97; T. Mommsen in Hermes, xxi. 142; W. Sanday in Studia biblica (1891), iii. 217; J. Rendel Harris, Stichometry (1893). (E. M. T.)

STICKfi, a game played in an enclosed court, taking its name from " sphairistike," the parent of lawn-tennis. The implements are an ordinary lawn-tennis racket and lawn-tennis balls not covered with flannel. The walls of the court may be made of wood, cement or

brick to the height of 9 or 10 ft., with netting above — unless the court is roofed — to prevent the balls from going out: the floor may be of wood, cement or asphalt, perfect accuracy not being essential. The dimensions of the court are 78 ft. by 27 ft.; it is bisected longitudinally by a painted line, laterally by a net 3 ft. 6 in. high, above which is stretched a tape 8 ft. from the ground. In each of the corners a 9-ft. square (the

" service " court) is painted, and 18 ft. from each back wall lines ("service" lines) are drawn across the breadth of the court. The rules are similar to those of lawn-tennis, except that a ball can only be " out of court " if it is struck over the walls.

STICK-INSECT, the name given to certain orthopterous insects of the family Phasmidae, of extremely variable form and size, and deriving their name from a resemblance to the branches and twigs of the trees in which they live and feed. The resem- blance is produced by the great length and slenderness of the body and legs. Protection is afforded to some species, like Heteropteryx grayi from Borneo, by sharp thornlike spines. The anterior wings, when present, are always small; but the posterior wings are sometimes of large size and very beautifully coloured. The colouring, however, is only visible when the wings are expanded and in use. Many species are wingless at all ages. As in the leaf-insects, to which the stick-insects are closely allied, the egg-cases are very similar to seeds. Stick-insects ˆre intolerant of cold, and attain their largest size and greatest pro- fusion of species in the tropics, one West African species, Palophus centaurus, reaching a length of 9 in. Species of small size are found in southern Europe, one belonging to the genus Bacillus advancing as far north as the middle of France.

STICKLEBACK, the name applied to a group of small fishes (Gastrosteus) which inhabit the fresh and brackish waters as well as the coasts of the temperate zone of the northern hemi- sphere. As far as the European kinds are concerned, all may be met with in the brackish water of certain littoral districts. The majority have a compressed well-proportioned body, which in the marine species is of a more elongate form, leading to the allied group of flute-mouths (Fistulariidae) , which are, in fact, gigantic marine sticklebacks. Their mouth is of moderate width, oblique, and armed with small but firmly set teeth. The head is almost entirely protected by hard bone; even the cheeks are cuirassed by the dilated infraorbital bones. There are no scales developed on any part of the body, but a series of hard and large scutes protects a greater or lesser portion of the sides. The first dorsal fin and the ventrals are transformed into pointed

formidable spines, and joined to firm bony plates of the endo-skeleton. With regard to the degree in which this armature is developed, not only do the species differ from each other, but almost every species shows an extraordinary amount of varia- tion. About ten kinds may be taken to be specifically distinct. So far as is known at present, all sticklebacks construct a nest for the reception of the spawn, which is jealously guarded by the male until the young are hatched, which event takes place in from ten to eighteen days after oviposition. He also protects them for the first few days of their existence.

Sticklebacks are short-lived animals; they are said to reach an age of only three or four years; yet their short life, at least chat of the males, is full of excitement. During the first year of their existence, before the breeding season begins, they live in small companies in still pools or gently flowing brooks. But with the return of the warmer season each male selects a territory, which he fiercely defends against all comers, especially against intruders of his own species and sex, and to which he invites all females, until the nest is filled with ova. At this period he also assumes a bridal dress, painted with blue and red tints. The eggs are of comparatively large size, one female depositing from 50 to 100.

Gastrosteus aculeatus, var. noveboracensis, Three-Spined Stickleback.

Of the species known not one has so wide a geographical range,

and has so well been studied, as the common British three-

spined stickleback (Gastrosteus aculeatus). It is found every-

I where in northern and central Europe, northern Asia, and North

America. The development of its scutes and spines varies exceedingly, and specimens may be found without any lateral scutes and with short spines, others with only a few scutes and moderately sized spines, and again others which possess a com- plete row of scutes from the head to the caudal fin, and in which the fin-spines are twice as long and strong as in other varieties. On the whole, the smooth varieties are more numerous in southern than in northern localities. This species swarms in some years in prodigious numbers;

in Pennant's time amazing shoals appeared in the fens of Lincolnshire every seven or eight years. No instance of a similar increase of this fish has been observed in our time, and this possibly may be due to the diminished number of suitable breeding-places in consequence of the introduction of artificial drainage. This species usually constructs its nest on the bottom, excavating a hollow in which a bed of grass, rootlets or fibres is prepared; walls are then raised, and the whole is roofed over with the like material. The nest is an inch and more in diameter, with a small aperture for an entrance.

The ten-spined stickleback (Gastrosteus pungitius) is so called from the number of spines usually composing its first dorsal fin, which, however, may be sometimes reduced to eight or nine or increased to eleven. It is smaller than the three-spined species, rarely exceeding 2 in. in length. Its geographical range nearly coincides with that of the other species, but it is more locally distributed, and its range in northern Asia is not known. Its nest is generally placed among weeds above the bottom of the water. Breeding males are readily recognized at a distance by the intensely black colour of the lower parts of their body.

Both these species are extremely voracious. A small stickle- back kept in an aquarium devoured, in five hours' time, 74 newly-hatched dace, which were about a quarter of an inch long. Two days after it swallowed 62 and would probably have eaten as many every day could they have been procured. The sea-stickleback {Gastrosteus spinachia or Spinachia vul- garis) attains to a length of 7 in., and is armed with fifteen short spines on the back. It is extremely common round the British coasts, but never congregates in large shoals. At suitable localities of the coast which are sheltered from the waves and overgrown with seaweed, especially in rock-pools, one or two males establish themselves with their harems, and may be observed without difficulty, being quite as fearless as their fresh- water cousins. Harbours and shallows covered with Zostera are likewise favourite haunts of this species, although the water may be brackish. The nest is always firmly attached to sea- weed, and sometimes suspended from an over-hanging frond. The materials are bound together by a tough white thread which is formed by a secretion of the kidneys of the male. This species inhabits only the northern coasts of Europe.

STIER, RUDOLF EWALD (1800-1862), German Protestant divine and mystic, was born at Fraustadt in Posen on the 17th of March 1800. He studied at Halle and Berlin, first law and afterwards

theology; and he continued his theological studies later at the pastoral seminary of Wittenberg. In 1824 he was made professor in the Missionary Institute at Basel. Afterwards he held pastorates at Frankleben near Merseburg (1829) and at Wichlinghausen in the Wupperthal (1838). In 1850 he was appointed superintendent at Schkeuditz, and in 1859 at Eisleben. He published a new edition of Luther's Catechism and a trans- lation of the Bible based on that of Luther; but he is noted chiefly for his thoughtful, devotional and mystical commentary on the v/ords of the Lord {Reden des Herrn, 3 vols., 1843 ; 3rd ed., 7 vols., 1870-1874; Eng. trans., 8 vols., 1855-1858; 3 vols., 1869). He died at Eisleben on the 16th of December 1862.

His other works, besides commentaries on the Psalms, Second Isaiah, Proverbs, Ephesians, Hebrews, Epistles of James and Jude, include : Die Reden der Apostel (2 vols., 1824-1830; Eng. trans., 1869) and Die Reden der Engel in der heiligen Schrift (1862). Cf. J. P. Lacroix, The Life of R. Stier (New York, 1874).

STIFTER, ADALBERT (1805-1868), Austrian author, was born at Oberplan in Bohemia on the 23rd of October 1805, the son of a linen weaver. Having studied at the university of Vienna, he became tutor to Richard, eldest son of Prince Metter- nich, and obtained in 1849 the appointment as school inspector

with the title of Schulrat in Linz, where he lived until his death on the 28th of January 1868. As early as 1840 Stifter had made his name known by his Feldblumen, a collection of charming little sketches, but his fame chiefly rests upon his Sttidien (1844- 1851) in which he gathered together his early writings. These sketches of scenery and rural life are among the best and purest examples of German prose. Among other of his works may be cited Bunte Steine (1853), Nachsommer (1857), Witiko (1864- 1867), and Brieje, which appeared posthumously in 1869.

Stifter's Sdmtliche Werke were published in 17 vols, in 1870. There are also editions of selected works in 4 vols. (1887) and in 6 vols. (1899). A critical edition by A. Sauer is in preparation. Stifter's letters were published by J. Aprent in 3 vols. (1869). See E. Kuh, Zivei Dichler Osterreichs (1872); K. Proll, A. Stifter, der Dichter des Bohmerwaldes (Vortrag, 1891); J. K. Markus, A. Stifter (2nd ed., 1879); A. R. Hein, A. Stifter (1904); T. Klaiber, A. Stifter (1905) ; W. Kosch, A. Stifter und die Romantik (1905).

STIGAND (d. 1072), archbishop of Canterbury, is first men- tioned

in 1020. He was then chaplain to Canute and afterwards to his son, Harold Harefoot, and after the death of the former king appears to have acted as the chief adviser of his widow, Emma. In 1043 he was consecrated bishop of Elmham and in 1047 was translated to Winchester; he supported Earl Godwine in his quarrel with Edward the Confessor, and in 1052 arranged the peace between the earl and the king. In this year the arch- bishop of Canterbury, Robert of Jumieges, having been outlawed and driven from England, Stigand was appointed to the arch- bishopric; but, regarding Robert as the rightful archbishop, Pope Leo IX. and his- two successors refused to recognize him. In 1058, however, Benedict X. gave him the pall, but this pope was deposed in the following year. Stigand is said by Norman writers to have crowned Harold in January 1066; but it is now probable that this ceremony was performed by Aldred, arch- bishop of York. Stigand submitted to William, and assisted at his coronation. But the Conqueror was anxious to get rid of him, although he took him in his train to Normandy in 1067. In 1070 he was deposed by the papal legates and was imprisoned at Winchester, where he died, probably on the 22nd of February 1072. Stigand was an avaricious man and a great pluralist, holding the bishopric of Winchester after he became archbishop of Canterbury, in addition to several abbeys.

See E. A. Freeman, The Norman Conquest (1870-1876), vols. ii. f iii. and iv. ; and J. R. Green, The Conquest of England (1899), vol. ii.

STIGMATIZATION, the infliction of stigmata, i.e. marks tattooed or branded on the person, the term being used with specific reference to the supposed supernatural infliction of wounds like those of Christ.

An ancient and widespread method of showing tribal con- nexion, or relation to tribal deities, was by marks set upon the person; thus Herodotus, in describing a temple of Hercules in Egypt (ii. 113), says that it is not lawful to capture runaway slaves who take refuge therein if they receive certain marks on their bodies, devoting them to the deity. The practice is alluded to by Paul (Gal. vi. 17) in the words, " from henceforth let no man trouble me, for I bear branded on my body the stigmata of Jesus "; and some writers have understood the passage as referring to stigmatization in the modern sense (Molanus, De historia ss. imaginum et picturarum, ed. Paquot, iii. 43, p. 365). Branding, as indicative of servitude, was forbidden by Constantine.

In the period of persecution Christian martyrs were sometimes branded with the name of Christ on their foreheads (Pontius, " De

vit. S. Cypriani," Biblioth. veterum patrum, vol. iii. p. 472, § vii.). Wounds of this sort were sometimes self-inflicted as a disfigurement by nuns for their protection, as in the case of St Ebba abbess of Coldingham (see Baronius, Annales, xv. 215, ann. 870, also Tert. De vel. virg.). Some Christians likewise marked themselves on the hands or arms with a cross or the name of Christ (Procopius, In Esaiam, ed. Curterius, p. 496), and other voluntary mutilations for Christ's sake are mentioned (Matt. xix. 12; Fortunatus, Life of St Rhadegund, ed. Migne,

I col. 508; Palladius, Lausiac History, cxii.; Jerome's Letter to

I St Eustochium, &c).

In St Francis of Assisi we have the first example of the alleged miraculous infliction of stigmata. (For an earlier instance pronounced by the Church to be an imposture see Fleury, Hist. Eccl. lxxviii. § 56, arm. 1222.) While meditating on the sufferings of our Lord, in his cell on Mount Alverno in 1224, we are told by his biographers, Thomas of Celano and Bonaventura, that the Lord appeared to Francis as a seraph and produced upon his body the five wounds of Christ ; of these we are told that the side wound bled occasionally, though Bonaventura calls it a scar, and the wounds in the feet had the appearance and colour of nails thrust through. After his death St Clare endeavoured, but in vain, to extract one of these. Pope Alexander IV. and other witnesses declared that they had seen these marks both before and after his death (Raynaldus, ad ann. 1255, p. 27). The divinely attested sanctity of their founder gave to the newly established order of Franciscans a powerful impulse, so that they soon equalled and threatened to overshadow in influence the previously founded order of St Dominic.

The reputation of the latter order was, however, similarly raised in the next century by the occurrence of the same wonder in the case of a sister of the third rule of St Dominic, Catherine Benincasa — better known as St Catherine of Siena. From her biographer's account, we gather that she was subject to hystero- epileptic attacks, in one of which, when she was twenty-three years old, she received the first stigma (see v. 230). In spite of her great reputation, and the number of attesting witnesses, this occurrence was not universally believed in. Pope Sixtus IV. published a bull in 1475 ordering, on pain of

anathema, the erasure of stigmata from pictures of St Catherine, and pro- hibiting all expressions of belief in the occurrence. Pope Innocent VIII. similarly legislated " ne de caetero S. Catherina cum stigmatibus depingatur; neve de ejus stigmatibus fiat verbum, aut sermo, vel praedicatio ad tollendam omnem scandali occasionem " (see references in Raynaud, De Stigma- tisme, cap. xi. 1665). In the years which followed cases of stigmatization occurred thick and fast- — now a Franciscan, now a Dominican, very rarely a religieuse of another order, showing the marks. Altogether about ninety instances are on record, of which eighteen were males and seventy-two females. (There are about thirty other cases sometimes included in the catalogue, of which there are no particulars recorded.) Most of them occurred among residents in religious houses, after the austerities of Lent, usually on Good Friday, when the mind was intently fixed on our Lord's Passion; and the possibility of the reception of the marks was constantly before the eyes and thoughts of the members of the two orders to which St Francis and St Catherine belonged. The order of infliction in the majority of cases was that of the crucifixion, the first token being a bloody sweat, followed by the coronation with thorns; afterwards the hand and foot wounds appear, that of the side being the last. The grade of the infliction varied in individual cases, and they may be grouped in the following series: —

I. As regards full stigmatization, with the visible production of the five wounds, and generally with the mark of the crown as well, the oldest case, after St Francis, is that of Ida of Louvain (1300), in whom the marks appeared as coloured circles; in Gertrude von Oosten of Delft (1344) they were coloured scars, and, as in the case of St Catherine, disappeared in answer to prayer as they also did on Dominica de Paradis; in Sister Pierona, a Franciscan, they were blackish grey. They were true wounds in Margaret Ebnerin of Nuremberg (d. 1351; see her Life, Augsburg, 1717), in Brigitta, a Dominican tertiary (1390), and also in Lidwina. An intermission is described in the marks on Johanna della Croce of Madrid (1524), in whom the wound in the side was large, and the others were rose-coloured circular patches. The marks appeared on each Friday and vanished on Sunday. These emitted an odour of violets; but in Sister Apollonia of Volaterra they were fetid while she lived. Angela della Pace (1634) was fully stigmatized at nine years of age, being even marked with the sponge and hyssop on the mouth; while Joanna de Jesu-Maria at Burgos (1613), a widow, who had entered the convent of Poor Clares, was marked in her sixtieth year. To her in vision two crowns were offered — one of flowers and one of thorns ; she chose

the latter and immediately was seized with violent pain and her confessor heard a sound as of her skull breaking. This case was investigated by the officers of the Inquisition. The stigmatiza-

tion of Veronica Giuliani (1696) was also the subject of inquiry, and in this case the nun drew on a paper a representation of the images which she said were engraved on her heart. On a post-mortem examination being made in 1727 by Professor Gentili and Dr Bordiga, the image of the cross, the scourge, &c, were said to have been impressed on the right side of the organ (Vita della Veronica Giuliana, by Salvatori, Rome, 1803). The case of Christina Stumbelen, a Dominican at Cologne, is noteworthy, as on her skull there was found a raised ridge or crown which was at first green, with red dots. In Lucia di Narni (1546) the marks were variable, as they also were on Sister Maria di S. Dominico. On the body of St Margaret of Hungary the stigmata were found fresh and clear when her body was exhumed some time after her death for transportation to Presburg. Other stigmatized persons were Elizabeth von Spalbeck, a Cister- cian ; Sister Coleta, a Poor Clare ; Matilda von Stanz ; Margaret Bruch of Endringen (1503) ; Maria Razzi of Chios (1582) ; Catharina Janu- ensis; Elizabeth Reith of Allgau; Stieva zu fiamm in Westphalia; Sister Mary of the Incarnation at Pontoise ; Archangela Tardera in Sicily (1608) ; Catharina Ricci in Florence (1590) ; and Joanna Maria della Croce, a Poor Clare at Roveredo (d. 1673), upon whom the markings of the thorn crown and spear wound were especially deep.

2. In some cases, although the pains of stigmatization were felt, there were no marks apparent. This occurred to Helen Brumsen (1285); Helena of Hungary (1270); Osanna of Mantua (1476); Columba Rocasani; Magdalena de Pazzis; Anna of Vargas; Hiero- nyma Carvaglio; Maria of Lisbon, a Dominican; Joanna di Vercelli; Stephania Soncinas, a Franciscan; Sister Christina, a Carthusian; and Joanna Rodriguez, a Poor Clare. In the case of Ursula Aguir de Valenza, a tertiary of St Dominic (1608), and Catharine Cialina (d. 1619) the pain was chiefly that of the crown of thorns, as it was also in Amelia Bicchieri of Vercelli, an Augustinian.

3. In a third series some of the marks were visible on the body, while others were absent or only subjectively indicated by severe pains. The crown of thorns only was marked on the head of Vin- centia Ferreria at Valencia (d. 1515) and Philippa de Santo Tomaso of Montemor (1670), while according to Torellus the Augustinian Ritta von Cassia (d. 1430) had a single thorn wound on the forehead. The crown was marked on Catharina of Raconizio (b. i486), who also

suffered a severe bloody sweat. In the case of Stephano Quinzani, in Soncino (1457), there was a profuse bloody- sweat and the wounds were intermitting, appearing on Friday and Saturday, vanishing on Sunday. Blanche Gazinan, daughter of Count Arias de Sagavedra (1564), was marked only on the right foot, as also was Catherine, a Cistercian nun. The heart wound was visible in Christina Mirabilis (1232). Gabrielda de Piezolo (d. 1473) died from the bleeding of such a wound, and similar wounds were described in Maria de Acosrin in Toledo ; Eustochia, a tertiary of St Francis; Clara de Bugny, a Dominican (1514); Cecilia Nobili, a Poor Clare of Nuceria (d. 1655). In the last instance the heart wound was found after death — a three-cornered puncture. A similar wound was seen in the heart of Martina de Arilla (d. 1644). Maria Villana, a Poor Clare, daughter of the margrave of La Pella, was marked with the crown and the spear thrust, and after her death the impresses of the spear, sponge and reed were found on her heart (d. 1670). The wound was usually on the left side, as in Sister Masrona of Grenoble, a tertiary of St Francis (1627) ; it was on the right in Margareta Columna, also a Clare. In Maria de Sarmiento it was said to have been inflicted by a seraph in a vision.

4. In a fourth set of cases the imprints were said to have been found on the heart, even though there was no surface marking. Thus the Dominican Paula de St Thomas was said to have had the stigmata on her heart. The heart of Clare of Montfaucon (1308) was said to have been as large as a child's head and impressed with the cross, the scourge and the nails. Similar appearances were found in Margaret of Citta di Capello and Johanna of Yepes (I59I)- •

The instances of masculine stigmatization are few. Benedict di Rhegio, a Capuchin at Bologna, had the marks of the crown (1602); Carolus Sazia, an ignorant lay brother, had the wound in his side. Dodo, a Praemonstratensian lay brother, was fully stigmatized, as also was Philip de Aqueria. The marks after death were found on the heart of Angelos del Pas, a minorite of Perpignan, as also on Matheo Carery in Mantua, Melchior of Arazel in Valentia, Cherubin de Aviliana (an Augustinian), and Agolini of Milan. Walter of Strassburg, a preaching friar (1 264) , had the heart-pain but no mark, and the same was the case with a Franciscan, Robert de Malatestis (1430), and James Stephanus. On Nicholas of Ravenna the wounds were seen after death, while John Gray, a Scotsman, a Franciscan martyr, had one wound on his foot.

Several later instances have been recorded. Anna Katherina Emmerich, a peasant girl born at Minister in 1774, afterwards an

Augustinian nun at Agnetenberg, was even more famous for her visions and revelations than for the stigmata. Biographies,

with records of her visions, have been published by Brentano at Munich in 1852 and the Abbe Cazales at Paris (1870). Colombe Schanolt of Bamberg (1787) was fully stigmatized, as also was Rose Serra, a Capuchin of Ozieri in Sardinia (1801), and Madeleine Lorger (1806). Two well-known cases occurred in Tirol — one " L'Ecstatica " Maria von MSrl of Caidaro, a girl of noble family, stigmatized in 1839, the other " L'Addolorata " Maria Dominica Lazzafi, a miller's daughter at Capriana, stigmatized in 1835 (see Bore, Les Stigmatisees du Tyrol, Paris, 1846). A case of the second class is that of Elizabeth Eppinger of Niederbrunn in Bavaria (1814), reported on by Kuhn. An interesting example of stigmatic trance also occurred in the case of a Protestant young woman in Saxony in 1820, who appeared as if dead on Good Friday and Saturday, and revived on Easter Sunday.

The last case recorded is that of Louise Lateau, a peasant girl, at Bois de Haine, Hainault, upon whom the stigmata appeared on the 24th of April 1868. This case was investigated by Professor Lefebvre of Louvain, who for fifteen years was physi- cian to two lunatic asylums. In her there was a periodic bleeding of the stigmata every Friday, and a frequent recur- rence of the hystero-cataleptic condition. Her biography has been written by Lefebvre and published at Louvain (1870).

On surveying these ninety cases we may discount a certain number, including all those of the second class, as examples of subjective sensations suggested by the contemplation of the pains of crucifixion. A second set, of which the famous case of Jetzer (Wirz, Helvetische Kirchengeschichte, 1810, iii. 389) is a type, must be also set aside as obvious and intentional frauds produced on victims by designing persons. A third series, and how large a group we have not sufficient evidence to decide, we must regard as due to the irresponsible self-infliction of injuries by persons in the hystero-epileptic condition, those perverted states of nervous action which Charcot has done so much to elucidate. To any experienced in this form of disease, many of the phenomena described in the records of these examples are easily recognizable as characteristic of the hystero-epileptic state.

There are, however, some instances not easily explained, where the self-infliction hypothesis is not quite satisfactory. Parallel cases of physical effects due to mental suggestion are well authenticated. Beaunis vouches for rubefaction and vesica- tion as produced by suggestion in the hypnotic state, andBourru and Burot describe a case of bloody sweat, and red letters marked on the arm by simple tracing with the finger. See Congres scientifiquc de Grenoble, progres m&dicale (Aug. 29, 1885), and Berjon's La Grande hysterie chez Vhomme (Paris, 1886). VVeknow so little of the trophic action of the highernerve centres that we cannot say how far tissue nutrition can be controlled in spots. That the nerve centres have a direct influence on local nutrition is, in some cases, capable of experimental demonstra- tion, and, in another sphere, a few of the recorded instances of connexion between maternal impression and congenital deformity seem to indicate that this trophic influence may have wider limits and a more specific capacity of localization than at first sight seems possible.

Literature. — See references to each name in Acta sanctorum or Hueber, Menologium franciscanorum (1698) ; Henriquez, Menologium cistersiense; Marchese, Sagro diario; Steill, Ephemerides dominicano sacrae (Dillingen, 1692); Petrus de Alva y Astorga, Prodigium naturae porteniium gratiae (Strassburg, 1664) ; Thiepolus, De passione Christi, tract, xii. ; Meyer, Blatter fur hohere Wahrheit, vii. 5; Hurter, Tableau des institutions et des mceurs de I'eglise au moyen age (Paris, 1842) ; Gorres, Die ckristliche Mystik, ii. 410 sqq. (Ratisbon) ; Franciscus Quaresmius, De vulneribus domini, i. 4 (Venice, 1652); Raynaud, Opera, vol. xiii. (Lyons, 1665); Dublin Review (1871), p. 170; Maury, Magie et astrologie; Beaunis, Recherches exp. sur I'activite cerebrate (Paris, 1886); Bourbeyre, Les Stigmatisi.es (Paris, 1886); Ennemoser, Der Magnelismus im Verhdltniss zur Religion, § 92 (Stuttgart, 1853); Tholuck's Vermischte Schriften, p. 97 (Hamburg, 1839); Schmieder, in Evang. Kirchenzeitung, pp. 180, 345 (Berlin, 1875); Comptes rendus de la societe de biologie (July 12, 1885); Barthelemy, &iide sur le dermographisme ou dermo- neurose toxi-vaso-motrice (Paris, 1898); Imbert-Goarbeyre, Les Stigmatisees (1873). (A. Ma.)

STILBITE, a mineral of the zeolite group consisting of hydrated calcium aluminium silicate, $CaAl_2(SiO_3)_6 + 6H_2O$. Usually a small proportion of the calcium is replaced by sodium. Crystals are monoclinic, and are invariably twinned, giving rise to complex groups and characteristic sheaf-lide aggregates. The colour is usually white, sometimes red, and on the perfect cleavage (parallel to the plane of symmetry) the lustre is markedly pearly; hence the name

stilbite given by R. J. Haiiy in 1796, from Gr. oriX/Sew, to shine. After the separa- tion of heulandite from this species in 18 18, the najne desmine (from Sko-ixt], a bundle) was proposed, and this name is now employed in Germany. The hardness is 3! and the specific gravity 2-2. Stilbite is a mineral of secondary origin, and occurs with other zeolites in the amygdaloidal cavities of basic volcanic rocks; it is sometimes found in granite and gneiss, and exceptionally in metalliferous veins. It is abundant in the volcanic rocks of Iceland, Faeroe Islands, Island of Skye, Bay of Fundy, in Nova Scotia and elsewhere. . Beautiful, salmon-pink crystals occur with pale green apophyllite in the Deccan traps near Bombay and Poona; white sheaf-like groups encrust the calcite (Iceland-spar) of Berufjord near Djupivogr in Iceland; and crystals of a brick-red colour are found at Old Kilpatrick in Dumbartonshire. (L. J. S.)

STILE, a series of steps of stone or wood, or a combination of bars and steps used for passing over a fence or wall without the necessity of a permanent open passage or of opening or shutting a gate. The Old English, stigel is formed from stigan, to climb, ascend; stair (O. Eng. staeger) and stirrup are from the same root. Stile (Lat. stilus, a pointed instrument) is really the correct spelling of style {q.v.).

STILES, EZRA (1727-1795), American clergyman and educa- tionalist, seventh president of Yale College, was born on the 29th of November 1727 in North Haven, Connecticut, where his father, Isaac Stiles (d. 1760), was minister of the Congrega- tional Church. He graduated at Yale in 1746; studied there for the three years following; was licensed to preach in 1749 and was a tutor at Yale in 1749-1755. He preached in 1750 to the Indians at Stockbridge, later studied law, was admitted to the bar in 1753, and practised in New Haven for two years. He was pastor of the Second Congregational Church of Newport, Rhode Island, from 1755 to 1777; in 1 776-1777 he preached occasionally in Dighton, Massachusetts, whither he had removed his family after the British occupation of Newport; and in April 1777 he became pastor of the North Church of Portsmouth, New Hampshire. In 1778 he became president of Yale College and professor of ecclesiastical history there, having insisted that no theological statement be required of him except assent to the Saybrook platform of 1708; in 1780-1782 he was professor of divinity, and he lectured besides on astronomy and philo- sophy. He died in New Haven on the 12th of May 1795. His wise administration as president made possible the speedy recovery of Yale College after the War of Independence, and his intellectual and theological breadth helped to secularize and strengthen the college. As an undergraduate he became deeply interested in astronomy; he

observed the comet of 1759 and the transit of Venus of June 1769, and left a quarto volume of astronomical notes. He experimented successfully with the electrical apparatus presented to Yale by Benjamin Franklin, whose intimate friend he became. He carefully kept thermo- metric and meteorological statistics; he imported silkworms and books on silk culture; he corresponded with many litterati — notably with Dr Nathaniel Lardner and with Sir William Jones, of whom he besought information of all kinds, but especially any that would lead to the discovery of the whereabouts of the ten lost tribes; and he undertook the study of Hebrew at the age of forty and became an able scholar. On Franklin's recommendation he was made a doctor of divinity by the university of Edinburgh in 1765: he had received a master's degree at Harvard in i754 r and was made doctor of divinity in 1780 by Dartmouth and in 1784 by the college of New Jersey (now Princeton University) .

Dr Stiles published several sermons, notably, a Discourse on the Christian Union (1761), which has remarkable ecclesiastical breadth of view ; an Account of the Settlement of Bristol, Rhode Island (1 785) ; and a History of Three of the Judges of King Charles I.: Major- General Whalley, Major-General Goffe and Colonel Dixwell (1794). He began in 1768 but never finished an Ecclesiastical History of New England and British America. His Literary Diary was published in New York in 3 vols, in 1901, being edited by F. B. Dexter, who quotes largely from Dr Stiles's Itineraries, a daily account of his travels; the Diary gives a valuable picture of the life of New England in 1769-1795 and many interesting estimates of Stiles's contempo- raries. See the Life of Ezra Stiles (Boston, 1798), by his daughter's husband, Abiel Holmes, the father of Oliver Wendell Holmes.

STILETTO (an Italian diminutive of stilo, dagger, Lat. stilus, a pointed instrument), a short stabbing dagger, the blade of which is either triangular or square in form. The term is also applied to a pointed bodkin of ivory, bone or metal used for making eyelet holes, &c.

STILICHO, FLAVIUS (?4o8), Roman general and states man, was the son of a Vandal who had served as an officer in the army of the emperor Valens (364-378). He himself entered the imperial army at an early age and speedily attained high pro- motion. He had already

become master of the horse when in 383 he was sent by Theodosius (379-395) at the head of an embassy to the Persian king, Sapor III. His mission was very successful, and soon after his return he was made count of the domestics and received in marriage Serena, the emperor's niece and adopted daughter. In 385 he was appointed master of the soldiery {magister militum) in Thrace, and shortly afterwards directed energetic campaigns in Britain against Picts, Scots and Saxons, and along the Rhine against other barbarians. Stilicho and Serena were named guardians of the youthful Honorius when the latter was created joint emperor in 394 with special juris- diction over Italy, Gaul, Britain, Spain and Africa, and Stilicho was even more closely allied to the imperial family in the follow- ing year by betrothing his daughter Maria to his ward and by receiving the dying injunctions of Theodosius to care for his children. Rivalry had already existed between Stilicho and Rufinus, the praetorian praefect of the East, who had exercised considerable influence over the emperor and who now was in- vested with the guardianship of Arcadius. Consequently in 395, after a successful campaign against the Germans on the Rhine, Stilicho marched to the east, nominally to expel the Goths and Huns from Thrace, but really with the design of displacing Rufinus, and by connivance with these same bar- barians he procured the assassination of Rufinus at the close of the year, and thereby became virtual master of the empire. In 396 he fought in Greece against the Visigoths, but an arrangement was effected whereby their chieftain Alaric was appointed master of the soldiery in Illyricum (397). In 398 he quelled Gildo's revolt in Africa and married his daughter Maria to Honorius. Two years later he was consul. He thwarted the efforts of Alaric to seize lands in Jtaly by his victories at Pollentia and Verona in 402-3 and forced him to return to Illyricum, but was criticized for having withdrawn the imperial forces from Britain and Gaul to employ against the Goths. He manoeuvred so skilfully in the campaign against Radagaisus, who led a large force of various Germanic peoples into Italy in 405, that he surrounded the barbarian chieftain on the rocks of Fiesole near Florence and starved him into surrender. Early in 408 he married his second daughter Thermantia to Honorius. It was rumoured about this time that Stilicho was plotting with Alaric and with Germans in Gaul and taking other treasonable steps in order to make his own son Eucherius emperor. There are conflicting accounts of the plots and counterplots and of the court intrigues, the relative truth of which will probably never be known. It is certain, however, that he was suspected by Honorius and abandoned by his own troops, and that he fled to Ravenna, and, having been induced by false promises to quit the church in which he had taken sanctuary, was assassin- ated on

the 23rd of August 408.

The principal sources for the life of Stilicho are the histories of Zosimus and of Orosius and the flattering verses of Claudian. See T. Hodgkin, Italy and her Invaders, vols. i. and ii. (Oxford, 1880);

E. Gibbon, Decline and Fall of the Roman Empire, edited by J. B. Bury, vol. iii. (London, 1902) ; P. Villari, The Barbarian Invasions of Italy, translated by L. Villari, vol. i. (New York, 1902) ; S. Dill, Roman Society in the last century of the Western Empire (London, 1899)- (C H. Ha.)

STILL. (1) (0. Eng. stille, a word appearing in many Teutonic languages, all derived from the root, meaning to set in position or rest, seen in " stall," Ger. stellen, &c), motionless, noiseless, or when used of wines or mineral waters, having little or no effervescence. As an adverb, " still" has preserved the original sense of " that which preserves its position," and thus means continually, permanently, now as before. (2) From the shortened form of " distil," Lat. distillare, to drip, trickle down, stilla, a drop, dim. of stiria. The older word for a " still " in English was stillatory, Medieval Latin slillatorium, an ap- paratus for heating substances and condensing the vapours (see Distillation and Spirits).

STILL, JOHN (c. 1 543-1608), bishop of Bath and Wells, formerly reputed to be the author of Gammer Gur ton's Needle, was born about 1543 at Grantham, Lincolnshire. He became a student of Christ's College, Cambridge, where he graduated B.A. in 1562, M.A. in 1565, and D.D. in 1575. In 1561 he became a fellow of his college and took holy orders. He was appointed in 1570 Lady Margaret professor of divinity, sub- sequently held livings in Suffolk and Yorkshire, and was master successively of St John's College (1574) and of Trinity College (i577)- Still was vice-chancellor of his university in 1575— 1576 and again in 1592-1593, and was raised to the bishopric of Bath and Wells in 1593. He died on the 26th of February 1608, leaving a large fortune from lead mines discovered in the Mendip Hills.

Gammer Gurton's Needle is the second extant English comedy, properly so called. Still, whose reputation as a serious church- man cannot be easily reconciled with the buffoonery of A Ryght Pithy, Pleasaunt and merie Comedie: Intytuled Gammer Gurtons Nedle, was first credited with its authorship by Isaac Reed in his edition (1782) of Baker's Biographia dramalica. The title-page of the piece, which was printed by Thomas Col well in 1575, states that it was played

not long ago at Christ's College, Cambridge, and was " made by Mr S. Mr of Art." A play was acted at Christmas 1567, and Still was chosen as being the only M.A. on the register at that time whose name began with S. There are reasons to suppose however that the play had been in Colwell's hands some time before it was printed, and it may well be identical with the Dyccon of Bedlam for which he took out a licence in 1562-1563, " Diccon the Bedlem " being the first of the dramatis personae of Gammer Gurton. In the accounts of Christ's College for 1 559-1 560 is the entry, " Spent at Mr Stevenson's plaie, 5s." William Stevenson was born at Hunwick, Durham, matriculated in 1546, took his M.A. degree in 1553, and became B.D.in 1560. Stevenson was a fellow of Christ's College from 1559 to 1561, and is perhaps to be identified with a William Stevenson who was a fellow from 1551 to 1554. If such is the case, there is reason to think that the composition of Gammer Gurton's Needle should be referred to the earlier period. He was made prebendary of Durham in 1 560-1 561, and died in 1575. Contemporary Puritan writers in the Marprelate tracts allude to Dr John Bridges, dean of Salisbury, author of A Defence of the Government of the Church of England, as the reputed author of Gammer Gurton's Needle, but he obviously could not be properly described as " Mr S." Dr Bridges took his M.A. degree at Pembroke College, Cambridge, in 1560, and the witty and sometimes coarse character of his acknowledged work makes it reasonable to suppose that he may have been a coadjutor of the author.

For the argument on behalf of William Stevenson's authorship, see Henry Bradley's essay prefixed to his edition of the play in Representative English Comedies (1903). The piece is also reprinted in Dodsley's Old Plays (vol. i., 1744; vo '- n -> l 7&°); in Ancient British Drama (1810), vol. i.; and in J. M. Manly 's Specimens of the Pre-Shakspearean Drama (Boston, U.S.A., 1897).

STILLICIDIUM, a dripping of water from the eaves (stilla, drop, cadere, to fall), the term in architecture given by Vitruvius (iv. 7) to the dripping eaves of the roof of the Etruscan temple.

Similar dripping eaves existed in most of the Greek Doric temples in contradistinction to the Ionic temples, where the water of the roof was collected in the cymatium or gutter and thrown out through the mouths of lions, whose heads were carved on the cymatium.

STILLINGFLEET, EDWARD (1635-1690), English divine, was born at Cranborne, Dorset, on the 17th of April 1635. There and at Ringwood he received his early education, and at the age of thirteen was entered at St John's College, Cambridge. He took his B.A. in 1652, and in the following year was elected to a fellow- ship. After residing as tutor first in the family of Sir Roger Burgoyne in Warwickshire and then with the Hon. Francis Pierrepoint at Nottingham, he was in 1657 presented by the former to the living of Sutton in Bedfordshire. Here he pub- lished (1659) his Irenicum, in which he sought to give expression to the prevailing weariness of the faction between Episcopacy and Presbyterianism, and to find some compromise in which all could conscientiously unite. He looks upon the form of church government as non-essential, but condemns Nonconformity. In 1662 (the year of the Act of Uniformity) he reprinted the Irenicum with an appendix, in which he sought to prove that '" the church is a distinct society from the state, and has divers rights and privileges of its own." Stillingfleet's actions were as liberal as his opinions, and he aided more than one ejected minister. In later years he was not so liberal. But, though in 1680 he published his Unreasonableness of Separation, his willingness to serve on the ecclesiastical commission of 1689, and the interpretation he then proposed of the damnatory clauses of the Athanasian creed, are proof that to the end he leaned towards toleration. His rapid promotion dates from 1662, when he published Origines sacrae, or a Rational Account of the Christian Faith as to the Truth and Divine Authority of the Scriptures and the Matters therein contained. Humphrey Hench- man, bishop of London, employed him to write a vindication of Laud's answer to John Fisher, the Jesuit. In 1665 the earl of Southampton presented him to St Andrew's, Holborn, two years later he became prebendary of St Paul's, in 1668 chaplain to Charles II., in 1670 canon residentiary, and in 1678 dean of St Paul's. He was also preacher at the Rolls Chapel and reader at the Temple. Finally he was consecrated bishop of Worcester on the 13th of October 1689. During these years he was cease- lessly engaged in controversy with Nonconformists, Romanists, Deists and Socinians. His unrivalled and various learning, his dialectical expertness, and his massive judgment, rendered him a formidable antagonist; but the respect entertained for him by his opponents was chiefly aroused by his recognized love of truth and superiority to personal considerations. He was one of the seven bishops who resisted the proposed Declaration of Indul- gence (1688). The range of his learning is most clearly seen in his Bishop's Right to Vote in Parliament in Cases Capital. His Origines Britannicae, or Antiquities of the British Church (1685), is a strange mixture of critical and

uncritical research. He was so handsome in person as to have earned the sobriquet of " the beauty of holiness." In his closing years he had some contro- versy with John Locke, whom he considered to have impugned the doctrine of the Trinity. He died at Westminster on the 28th of March 1699, and was buried at Worcester. His manuscripts were bought by Robert Harley (afterwards earl of Oxford), his books by Narcissus Marsh, archbishop of Armagh.

A collected edition of his works, with life by Richard Bentley, was published in London (1710) ; and a useful edition of The Doctrines and Practices of the Church of Rome Truly Represented was published in 1845 by William Cunningham.

STILLMAN, WILLIAM JAMES (1828-1901), American painter and journalist, was born at Schenectady, New York, on the 1st of June 1828. His parents were Seventh-Day Baptists, and his early religious training influenced him all though his life. He was sent to school in New York by his mother, who made great sacrifices that he might get an education, and he graduated at Union College, Schenectady, in 1848. He studied art under Frederick E. Church and early in 1850 went to England, where he made the acquaintance of Ruskin, whose Modem Painters he

had devoured, was introduced to Turner, for whose works he had unbounded admiration, and fell so much under the influence of Rossetti and Miliars that on his return home in the same year he speedily became known as the " American Pre-Raphaelite. " In 1852 Kossuth sent him on a fool's errand to Hungary to dig up crown jewels, which had been buried secretly during the insurrec- tion of 1848-1849. While he was awaiting a projected rising in Milan, Stillman studied art under Yvon in Paris, and then, as the rising did not take place, he returned to the United States and devoted himself to landscape painting on Upper Saranac Lake in the Adirondacks and in New York City, where he started the Crayon. It numbered Lowell, Aldrich and Charles Eliot Norton among its contributors, and when it failed for want of funds, Stillman removed to Cambridge, Massachusetts. There he passed several years, but a fit of restlessness started him off once more to England. He renewed his friendship with Ruskin, and went with him to Switzerland to paint and draw in the Alps, where he worked so assiduously that his eye- sight was affected. He then lived in Faris and was in Normandy in 1861 when the American Civil War broke out. He made more than one attempt to serve in the Northern ranks, but his health was too weak ; in the same year he was appointed United States consul in Rome. In 1865 a dispute with his government led to his resignation, but immediately

afterwards he was appointed to Crete, where, as an avowed champion of the Christians in the island and of Cretan independence, he was regarded with hostility both by the Mussulman population and by the Turkish authorities, and in September 1868 he resigned and went to Athens, where his first wife (a daughter of David Mack of Cambridge) , worn out by the excitement of life in Crete, committed suicide. He was an editor of Scribner's Magazine for a short time and then went to London, where he lived with D. G. Rossetti. In 1871 he married a daughter of Michael Spartali, the Greek consul-general. When the insurrec- tion of 1875 broke out in Herzegovina he went there as a corre- spondent of The Times, and his letters from the Balkans aroused so much interest that the British government was induced to lend its countenance to Montenegrin aspirations. In 1877-1883 he served as the correspondent of The Times at Athens; in 1886- 1898 at Rome. He was a severe critic of Italian statesmen, and embroiled himself at various times with various politicians, from Crispi downwards. After his retirement he lived in Surrey, where he died on the 6th of July 1901. He wrote The Cretan Insurrection of 1866-1868 (1874). On the Track of Ulysses (1888), Billy and Hans (1897) and Francesco Crispi (1899). See his Autobiography of a Journalist (2 vols., Boston, 1901).

STILLWATER, a city and the county-seat of Washington county, Minnesota, U.S.A., at the head of Lake St Croix, on the west bank of the St Croix river, 20 m. above its mouth, and about 20 m. N.E. of St Paul. Pop. (1890) 11,260; (1900)12,318; (1905 state census) 12,435, 3586 being foreign-born (1189 Swedes, 849 Germans, 828 Canadians); (1910 U.S. census) 10,198. It is served by the Northern Pacific, the Chicago, St Paul, Minneapolis & Omaha, and the Chicago, Milwaukee & St Paul railways, and is connected by electric line with St Paul and Minneapolis. The city is picturesquely situated on bluffs rising from the St Croix and commanding fine views. Among the public buildings are a handsome public library, the city hall, the county court-house, the Federal building, an audi- torium, and the city hospital, and the city is the seat of the Stillwater business college, and of the Minnesota .state prison, established in 185 1, in which a system of parole and of graded diminution of sentences is in force, and in connexion with which is maintained a school and a library Commercially Stillwater is important as a centre of the lumber trade and as a shipping point for cereal products. The valuable water-power is utilized by its varied manufactories. In 1905 the value of the factory products was $2,784,113 an increase of 54-6% since 1900. Stillwater, the first town platted in Minnesota, was permanently settled in 1843, and was laid out in 1848 by

Joseph Renshaw Brown (1805-1870), a pioneer editor and soldier. Here met in 1848 the " Stillwater Convention," famous in Minnesota history

as the first step in the erection of Minnesota Territory. Still- water was chartered as a city in 1854. The first electric railway in the state was completed here in 1889, but failed later.

STILO PRAECONINUS, LUCIUS AELIUS, (c. 154-74 B.C.), of Lanuvium, the earliest Roman philologist, was a man of distinguished family and belonged to the equestrian order. He was called Stilo (stilus, pen), because he wrote speeches for others, and Praeconinus from his father's profession (praeco, public crier). His aristocratic sympathies were so strong that he voluntarily accompanied Q. Caecilius Metellus Numi- dicus into exile. At Rome he divided his time between teaching (although not as a professional schoolmaster) and literary work. His most famous pupils were Varro and Cicero, and amongst his friends were Coelius Antipater, the historian, and Lucilius, the satirist, who dedicated their works to him. According to Cicero, who expresses a poor opinion of his powers as an orator, Stilo was a follower of the Stoic school. Only a few fragments of his works remain. He wrote commentaries on the hymns of the Salii, and (probably) on the Twelve Tables; and invest- igated the genuineness of the Plautine comedies, of which he recognized 25, four more than were allowed by Varro. It is probable that he was the author of a general glossographical work, dealing with literary, historical and antiquarian questions. The rhetorical treatise Ad H erennium has been attributed to him by some modern scholars.

See Cicero, Brutus, 205-207, De legibus, ii. 23, 59; Suetonius, De grammaticis, 2; Geilius iii. 3, 1. 12; Quintilian, Inst. orat. x. I, 99; monographs by J. van Heusde (1839) and F. Mentz (if "'

Mommsen, Hist, of Rome, bk. iv. ch. 12, 13; J. E. Sandys, History of Classical Scholarship (2nd ed., I906) ; M. Schanz, Geschichle der romischen Literatur (1898), vol. i. ; Teuffel, Hist, of Roman Literature (Eng. trans., 1900), p. 148.

STILPO [Stilpon], Greek philosopher of the Megarian school (q.v.), was a contemporary of Theophrastus and Crates. Intel- lectually in

agreement with the Megarian dialectic, he followed the practical ethics of the Cynics both in theory and in practice. He extolled the Cynic airadda (loosely, self-control) as the principal virtue. Cicero (De fato, 5) describes him as a man of the highest character. Suidas attributes twenty dialogues to him, but of these no fragments remain. Among his followers were Menedemus and Asclepiades, the leaders of the Eretrian school of philosophy. Seneca (Epistle 9) shows how closely allied Stilpo was to the Stoics (q.v.).

STILT, or Long-legged Plover, a bird so-called (see Stilts) for reasons obvious to anyone who has seen it, 'since, though not very much bigger than a snipe, the length of its legs (their bare part measuring 8 in.), in proportion to the size of its body exceeds that of any other bird's. The first name (a trans- lation of the French Schasse, given in 1760 by M J. Brisson) seems to have been bestowed by J. Rennie only in 183 1; but, recommended by its definiteness and brevity, it has wholly supplanted the second and older one. The bird is the Ckaradrius himantopus^ of Linnaeus, the Himantopus candidus or melan- opterus of modern writers, and belongs to the group Limicolae, having been usually placed in the family Scolopacidae, though it might be quite as reasonably referred to the Charadriidae, and, with its allies to be immediately mentioned, would seem to be not very distant from Haematopus, notwithstanding the wonderful development of its legs and the slenderness of its bill.

The stilt obtains its food by wading in shallow water and seizing the insects that fly over or float upon its surface or the small crustaceans that swim beneath, for which purpose its slender extremities are, as might be expected, admirably adapted. Widely spread over Asia, North Africa, and Southern Europe, it has many times visited Britain — though always as a straggler, for it is not known to breed to the northward of the Danube valley— and its occurrence in Scotland (near Dumfries)

1 The possible confusion by Pliny's transcribers of this word with Haematopus is referred to under Oystercatcher. Himantopus, with its equivalent Loripes, " by an awkward metaphor," as re- marked by Gilbert White, " implies that the legs are as slender and pliant as if cut out of a thong of leather."

was noticed by Sibbald so long ago as 1684. It chiefly resorts to pools or lakes with a margin of mud, on which it constructs a slight nest, banked round or just raised above the level so as to keep its eggs dry (Ibis, 1859, p. 360); but sometimes they are laid in a tuft of grass. They are four in number, and, except in size, closely resemble

those of the oystercatcher (q.v.). The bird has the head, neck, and lower parts white, the back and wings glossy black, the irides red, and the bare part of the legs pink. In America the genus has two representatives, one 2

(After Gosse.)

Fig. 1. — Black-necked American Stilt.

(fig. 1) closely resembling that just described, but rather smaller and with a black crown and nape. This is H. nigricollis or mexicanus, and occurs from New England to the middle of South America, beyond which it is replaced by H. brasiliensis, which has the crown white. The stilt inhabiting India is now recognized to be H. candidus, but Australia possesses a distinct species, H. novae-hollandiae, which also occurs in New Zealand, though that country has in addition a species peculiar to it, H. novae- zelandiae, differing from all the rest by assuming in the breeding- season an altogether black plumage. Australia, however, presents another form, which is the type of the genus Clado- rhynchus, and differs from Himantopus both in its style of plumage (the male having a broad bay pectoral belt), in its shorter tarsi, and in having the toes (though, as in the stilt's feet, three in number on each foot) webbed.

Allied in many ways to the stilts, but differing in many undeniably generic characters, are the birds known as Avocets, 3 forming the genus Recurvirostra of Linnaeus. Their bill, which is perhaps the most slender to be seen in the whole class, curves upward towards the end, and has given the oldest known species two names which it formerly bore in England, — " cobbler's-awl," from its likeness to the tool so called, and " scooper," because it resembled the scoop with which mariners threw water on their sails. The legs, though long, are not extraordinarily so, and the feet, which are webbed, bear a small hind toe.

This species (fig. 2), the R. avocetta of ornithology, was of old time plentiful in England, though doubtless always restricted to certain localities. Charleton in 1668 says that when a boy he had shot not a few on the Severn, and Plot mentions it so as to lead one to suppose that in his time (1686) it bred in Staffordshire, while F. Willughby (1676) knew of it as being in winter on the eastern coast, and T. Pennant in 1769 found it in great numbers opposite to Fossdyke Wash in Lincolnshire, and described the birds as hovering over the sportsman's head like lapwings. In this district they were called " Yelpers " from their cry; 4 but whether that name was

2 This species was made known to Ray by Sloane, who met with it in Jamaica, where in his day it was called " long-legs."

3 This word is from the Bolognese Avosetta, which is considered to be derived from the Latin avis — the termination expressing a diminu- tive of a graceful or delicate kind, as donnetta from donna (Professor Salvadori in epist.).

4 Cf. " yarwhelp " (see Godwit) and " yaup " or " whaup " (see Curlew). " Barker " and " clinker " seem to have been names used in Norfolk.

elsewhere applied is uncertain. At the end of the last century they frequented Romney Marsh in Kent, and in the first quarter of the present century they bred in various suitable spots in Suffolk and Norfolk — the last place known to have been inhabited by them being Salthouse, where the people made puddings of their eggs, while the birds were killed for the sake of their feathers, which were used in making artificial flies for fishing. The extirpation of this settlement took place between 1822 and 1825 (cf. Stevenson, Birds of Norfolk, ii. 240, 241). The avocet's mode of nesting is much like that of the stilt, and the eggs are hardly to be distinguished from those of the latter but by their larger size, the bird being about as big as a lapwing (g.r.), white, with the exception of its crown, the back of the neck, the inner scapulars, some of the wing-coverts and

(After Naumann.)

Fig. 2. — Avocet. the primaries, which are black, while the legs are of a fine light blue. It seems to get its food by working its bill from side to side in shallow pools, and catching the small crustaceans or larvae of insects that may be swimming therein, but not, as has been stated, by sweeping the surface of the mud or sand — a process that would speedily destroy the delicate bill by friction. Two species of avocet, R. americana and R. andina, are found in the New World ; the former, which ranges so far to the northward as the Saskatchewan, is distinguished by its light cinnamon-coloured head, neck and breast, and the latter, confined so far as known to the mountain lakes of Chile, has no white in the upper parts except the head and neck. Australia produces a fourth species, R. novae-hollandiae or rubricollis, with a chestnut head and neck; but the

European R. avocetta extends over nearly the whole of middle and southern Asia as well as Africa. (A. N.)

STILTED, a term in architecture, given to anything raised above its usual level; it is usually applied to the arch, which is said to be stilted when its centre is raised above the capital or impost. In Byzantine architecture this was frequently done in order to give more importance to the twin arches of the windows, and less to the shaft which divided them. In Romanesque and Gothic work the stilted arch was often employed in the semi- circular apses, where in consequence of the closer juxtaposition of the columns round the apse the arches were much narrower than those of the choir; in order, however, that the apex of all the arches should be of the same height, the apse arches were stilted.

STILTS, poles provided at a certain distance above the ground with steps or stirrups for the feet, for the purpose of walking on them. As a means of amusement stilts have been used by all peoples in all ages, as well as by the inhabitants of marshy or flooded districts. The city of Namur in Belgium, which formerly suffered from the overflowing of the rivers Sambre and Meuse, has been celebrated for its stilt-walkers for many centuries. Not only the towns-people but also the soldiers used stilts, and stilt-fights were indulged in, in which parties of a hundred or more attacked each other, the object being to overset as many of the enemy as possible. The governor of Namur having promised the archduke Albert (about 1600) a company of soldiers that should neither ride nor walk, sent a detachment on stilts, which so pleased the archduke that he conferred upon the city perpetual exemption from the beer-tax, no small privilege at that time.

The home of stilt-walking at the present day is the department of Landes in Gascony, where, owing to the impermeability of the subsoil, all low-lying districts are converted into marshes, compelling the shepherds, farmers and marketmen to spend the greater part of their lives on stilts. These are strapped to the leg below the knee, the foot resting in a stirrup about five feet from the ground. Their wearers, who are called tchangues (long-legs) in the Gascon dialect, also carry long staves, which are often provided with a narrow piece of board, used as a seat in case of fatigue. In the last quarter of the 19th century stilt- races, for women as well as men, became very popular in: the Landes district, and still form an important feature of every provincial festivity. One winner of the annual championship races accomplished 490 kilometres (more than 304 m.) in 103 hours, 36 minutes. Silvain Dornon, a baker of the Landes, walked on

stilts from Paris to Moscow in 58 days in the spring of 1 89 1. The rapids of the Niagara have been waded on stilts. In many of the Pacific islands, particularly the Marquesas, stilts are used during the rainy season. Stilts used by children are very long, the upper half being held under the arms; they are not strapped to the leg. Stilts play an important part in the Italian masquerades, and are used for mounting the gigantic figures in the grotesque processions of Lisle, Dunkirk, Louvain and other cities.

STINDE, JULIUS (1841-1905), German author, was born at Kirchnuchel near Eutin on the 28th of August 1841, the son of a clergyman. Having attended the gymnasium at Eutin, he was apprenticed in 1858 to a chemist in Liibeck. He soon tired of the shop, and went to study chemistry at Kiel and Giessen where he proceeded to the degree of doctor of philosophy. In 1863 Stinde received an appointment as consulting chemist to a large industrial undertaking in Hamburg; but, becoming editor of the Hamburger Gewerbeblatt, he gradually transferred his energies to journalism. His earliest works were little comedies, dealing with Hamburg life, though he continued to make scientific contributions to various journals. In 1876 Stinde settled in Berlin and began the series of stories of the Buchholz family, vivid and humorous studies of Berlin middle-class life by which he is most widely known. He died at Olsberg near Kassel on the 7th of August 1905.

The first of the series Buchholzens in Italien (translated by H. F.. Powell, 1887) appeared in 1883 and achieved an immense success. It was followed by Die Familie Buchholz in 1884 (translated by L. D. Schmitz, 1885); Frau Buchholz im Orient in 1888; Frau Wilhelmine {Der Familie Buchholz letzter Teil; translated by H. F. Powell, 1887) in 1886; Wilhelmine Buchholz' Memoir en, in 1894; and Hotel Buch-holz; Ausstellungserlebnisse der Frau Wilhelmine Buchholz, in 1896. Under the pseudonyms of Alfred de Valmy, Wilhelmine Buchholz and Richard E. Ward, he also published various other works of more or less merit, among which his Naturphilosophie (1898) deserves special mention; his Waldnovellen (1881) have been translated into English.

STINK-WOOD, in botany, a South African tree, known botani- cally as Ocotea bullata, and a member of the family Laurineae. Other names for it are Cape Walnut, Stinkhout, Cape Laurel and Laurel wood. It derives its name from having a strong and unpleasant smell when fresh felled. It is used for building in South Africa and is described by Stone (Timbers of Commerce, p. 174) as " the most beautiful dark-coloured wood that I have yet met with." It is said to

be a substitute for teak and equally durable. The wood is dark walnut or reddish brown to black with a yellow sap-wood, and the grain extremely fine, close, dense and smooth.

STIPEND, a fixed periodical payment or salary for services rendered. The word is particularly used of the income from an ecclesiastical benefice or of the salary paid to any minister of religion. In the United Kingdom a paid magistrate or justice of the peace, appointed by the Crown on the advice of the home secretary for certain boroughs are termed " stipendiaries " or " stipendiary magistrates " (see Justice of the Peace). The Latin stipendium (for stipipendium) is derived from slips, a gift, contribution (originally a heap of coins, stipare, to press; mass together) and pendere, to weigh out, pay. This was applied first to the pay of the army, and hence was used in the sense of

military service, in such phrases as stipendia facere, and of a campaign, e.g. vicena stipendia meritis (Tac. Ann. i. 17). It also meant a tax or impost, payable in money.

STIRLING, MARY ANNE [Fanny] (1815-1895), English actress, was born in London, the daughter of a Captain Kehl. After some experience at outlying theatres, she appeared in London in 1836. Having been successful as Celia in As You Like It and Sophia in The Road to Ruin, Macready gave her an opportunity to play Cordelia to his Lear, and Madeline Weir to his James V. in the Rev. James White's King of the Commons. In 1852 she created Peg Woffington in Reade and Taylor's Masks and Faces. Meanwhile she had married Edward Stirling (d. 1894), an actor, manager and dramatic author. In later years Mrs Stirling gained a new popularity as the nurse in Irving's presentation (1882) of Romeo and Juliet, and again (1884) with Mary Anderson; and she was the Martha in Irving's production of Faust (1885). She died on the 30th of December 1895, having in the previous year married Sir Charles Hutton Gregory (1817-

1898).

STIRLING, JAMES (1692-1770), Scottish mathematician, third son of Archibald Stirling of Garden, and grandson of Sir Archibald Stirling of Keir (Lord Garden, a lord of session), was born at Garden, Stirlingshire, in 1692. At eighteen years of age he went to

Oxford, where, chiefly through the influence of the earl of Mar, he was nominated (1711) one of Bishop Warner's exhibitioners at Balliol. In 1715 he was expelled on account of his correspondence with members of the Keir and Garden families, who were noted Jacobites, and had been accessory to the " Gathering of the Brig o' Turk " in 1708. From Oxford he made his way to Venice, where he occupied himself as a pro- fessor of mathematics. In 17 17 appeared his Lineae tertii ordinis Newtonianae, sive . . . (8vo, Oxford). While in Venice, also, he communicated, through Sir Isaac Newton, to the Royal Society a paper entitled " Methodus differentialis Newtoniana illustrata " (Phil. Trans., 1718). Fearing assassination on account of having discovered a trade secret of the glass-makers of Venice, he returned with Newton's help to London about the year 1725. In London he remained for ten years, being most part of the time connected with an academy in Tower Street, and devoting his leisure to mathematics and correspondence with eminent mathematicians. In 1730 his most important work was published, the Methodus differentialis, sive tractatus de summa- lione el inter polatione serierum infinilarum (4to, London), which, it must be noted, is something more than an expansion of the paper of 1718. In 1735 he communicated to the Royal Society a paper " On the Figure of the Earth, and on the Varia- tion of the Force of Gravity at its Surface." In the same year he was appointed manager for the Scots Mining Company at Leadhills. We are thus prepared to find that his next paper to the Royal Society was concerned, not with pure, but with applied science — " Description of a Machine to blow Fire by the Fall of Water " (Phil. Trans. 1745). His name is also connected with another practical undertaking, since grown to vast dimensions. The accounts of the city of Glasgow for 1752 show that the very first instalment of ten millions sterling spent in making Glasgow a seaport, viz. a sum of £28, 4s. 4d., was for a silver tea-kettle to be presented to "James Stirling, mathematician, for his service, pains, and trouble in surveying the river towards deepening it by locks." Stirling died in Edinburgh on the 5th of December

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See W. Fraser, The Stirlings of Keir, and their Family Papers, (Edinburgh, 1858); " Modern History of Leadhills," in Gentleman's Magazine (June, 1853); Brewster, Memoirs of Sir Isaac Newton, ii. 300,307, 411, 516; J. Nicol, Vital Statistics of Glasgow (1881-1885), p. 70; Glasgow Herald (Aug. 5, 1886).

Another edition of the Lineae tertii ordinis was published in Paris in 1797; another edition of the Methodus differentialis in London in

1764; and a translation of the latter into English by Halliday in London in 1749. A considerable collection of literary remains, consisting of papers, letters and two manuscript volumes of a treatise on weights and measures, are still preserved at Garden.

STIRLING, JAMES HUTCHISON (1820-1909), Scottish philosopher, was born at Glasgow on the 22nd of June 1820. He was educated at Glasgow University, where he studied medicine

and philosophy. For a short time he practised as a doctor in Wales, but gave up his profession in order to continue his philo- sophical studies in Germany and France. From 1888 to 1890 he was Gifford lecturer at the university of Edinburgh and published his lectures in 1890 (Philosophy and Theology). He was an LL.D. of Edinburgh University, and foreign member of the Philosophical Society of Berlin. He died in March 1909. His principal works are: The Secret of Hegel (1865; new ed. 1893); Sir William Hamilton: The Philosophy of Percep- tion; a translation of Schwegler's Gcschichte der Philosophic (1867; 12th ed., 1893); Jerrold, Tennyson and Macaulay, &c. (1868); On Materialism (186S); As Regards Protoplasm (1869; 2nd ed., 1872) ; Lectures on the Philosophy of Law (1873) ; Bums in Drama (1878); Text-Book to Kant (1881); Philosophy in the Poets; Darwinianism; Workmen and Work (1894); What is Thought ? Or the Problem of Philosophy; By Way of a Conclusion So Far (1900); The Categories (1903). Of these the most important is The Secret of Hegel, which is admitted, both in England and in Germany, to be among the most scholarly and valuable contributions to Hegelian doctrine and to modern philosophy in general. In the preface to the new edition he explains that he was first drawn to the study of Hegel by seeing the name in a review, and subsequently heard it mentioned with awe and reverence by two German students. He set himself at once to grapple with the difficulties and to unfold the principles of the Hegelian dialectic, and by his efforts he introduced an entirely new spirit into English philosophy. Closely connected with the Secret is the Text-Book to Kant, which comprises a trans- lation of the Critique with notes and a biography. In these two works Dr Stirling endeavoured to establish an intimate con- nexion between Kant and Hegel, and even went so far as to maintain that Hegel's doctrine is merely the elucidation and crystallization of the Kantian system. " The secret of Hegel," he says in the preliminary notice to his great work, " may be indicated at shortest thus: Hegel made explicit the concrete universal that was implicit in Kant."

The sixth part of the Secret contains valuable criticisms on the

Hegelian writings of Schwegler, Rosenkranz and Haym, and explains by contrast much that has been definitely stated in the preceding pages. Of Dr Stirling's other works the most important is the volume of Gifford Lectures, in which he developed a theory of natural theology in relation to philosophy as a whole. As Regards Protoplasm contains an attempted refutation of the Essay on the Physical Basis of Life by Huxley.

STIRLING, WILLIAM ALEXANDER, Earl of (c. 1567- 1640), most generally known as Sir William Alexander, Scottish poet and statesman, son of Alexander Alexander of Menstrie (Clackmannanshire), was born at Menstrie House, near Stirling, about 1567. The family was old and claimed to be descended from Somerled, lord of the Isles, through John, lord of the Isles, who married Margaret, daughter of Robert II. William Alexander was probably educated at Stirling grammar school. There is a tradition that he was at Glasgow University; and, according to Drummond of Hawthornden, he was a student at the university of Leiden. He accompanied Archibald, 7th earl of Argyll, his neighbour at Castle Campbell, on his travels in France, Spain and Italy. He married, before 1604, Janet, daughter of Sir William Erskine, one of the Balgonie family. Introduced by Argyll at court, Alexander speedily gained the favour of James VI., whom he followed to England, where he became one of the gentlemen-extraordinary of prince Henry's chamber. For the prince he wrote his Paraenesis to the Prince . . . (1604), a poem in eight-lined stanzas on the familiar theme of princely duty. He was knighted in 1609. On the death of Henry in 161 2, when he wrote an elegy on his young patron, he was appointed to the household of prince Charles. In 1613 he (in conjunction with Thomas Foulis and Paulo Pinto, a Portuguese) received from the king a grant of a silver-mine at Hilderston near Linlithgow, from which, however, neither the Crown nor the undertakers made any profit. In 1613 he began a correspondence with the poet Drummond of Hawthornden, which ripened into a lifelong intimacy after their meeting (March 1614) at Menstrie House, where Alexander was on one of his

short annual visits. In 1614 Alexander was appointed to the English office of master of requests, and in July of the following year to a seat on the Scottish privy council. In 1621 he received from James I. enormous grants of land in America embracing the districts of Nova

Scotia, New Brunswick, and the Gaspe Peninsula, accompanied by a charter appointing him hereditary lieutenant of the new colony. This territory was afterwards increased on paper, so as to include a great part of Canada. Alexander proceeded to recruit emigrants for his " New Scot- land," but the terms he offered were so meagre that he failed to attract any except the lowest class. These were despatched in two vessels chartered for the purpose, and in 1625 he published an Encouragement to Colonies in which he vainly painted in glowing colours the natural advantages of the new territory. The enterprise was further discredited by the institution of an order of baronets of Nova Scotia, who were to receive grants of land, each 6 sq. m. in extent, in the colony for a considera- tion of £150. An attempt made by the French to make good their footing in the colony was frustrated (1627) by Captain Kertch, and Alexander's son and namesake made two expeditions to Nova Scotia. But Alexander found the colony a constant drain on his resources, and was unable to obtain from the treasury, in spite of royal support, £6000 which he demanded as compensation for his losses. He received, however, a grant of 1000 acres in Armagh. He was the king's secretary for Scot- land from 1626 till his death, and in 1630 was created Viscount Stirling and Lord Alexander of Tullibody. In the same year he was appointed master of requests for Scotland, and in 1631 an extraordinary judge of the Court of Session. Meanwhile French influence had gained ground in America. In 1631 Charles sent instructions to Alexander to abandon Port Royale, and in the following year, by a treaty signed at St Germain-en-Laye, the whole of the territory of Nova Scotia was ceded to the French. Alexander continued to receive substantial marks of the royal favour. In 163 1 he obtained a patent granting him the privilege of printing a translation of the Psalms, of which James I. was declared to be the author. There is reason to believe that in this unfortunate collection, which the Scottish and English churches refused to encourage, Alexander included some of his own work. He had been commanded by James to submit translations, when James was carrying out his long entertained wish to supplant the popular version of Sternhold and Hopkins; but these the royal critic had not preferred to his own. It has been assumed from the scanty evidence that when Alexander was entrusted with the editing and publishing of the Psalms by Charles I. he had introduced some of his own work. In 1633 he was advanced to the rank of earl, with the additional title of Viscount Canada, and in 1639 he became earl of Dovan. His affairs were still embarrassed and he had begun to build Argyll House at Stirling. In 1623 he received the right of a royalty on the copper coinage of Scotland, but this proved unproductive. He therefore secured for his fourth son the office of general of the Mint,

and proceeded to issue small copper coins, known as " turners," which were put into circulation as equivalent to two farthings, although they were of the same weight as the old farthings. These coins were unpopular, and were reduced to their real value by the privy council in 1639. Alexander died in debt on the 12th of February 1640, at his London house in Covent Garden.

He was succeeded in the title by his grandson William, who died a few months later, and then by his son Henry (d. 1644), who became the 3rd carl. When Henry's grandson Henry, the 5th earl (1664-1739), died, the earldom became dormant, and in 1759 it was claimed by William Alexander (see below). In 1S25 the earldom was claimed by Alexander Humphreys- Alexander, who asserted that his mother was a daughter of the fust earl. The charter of 1639, however, on which his title rested, was declared in 1S39 to be a forgery. See W. Turnbull, Stirling Peerage Claim (1839).

All Alexander's literary work was produced after 1603 and before his serious absorption in politics about 1614. The verse may be classed in three groups, (a) poetical miscellanies and minor verse,

(b) dramas, (c) the heroic fragment on Jonatltan arid the long poem on Doomesday.

a. His earliest effort was Aurora, containing the first fancies of the author's youth (London, 1604), a miscellany of sonnets, songs and elegies, showing considerable formal felicity, if little originality, in the favourite themes of the Elizabethan sonneteers. To this may be added the Paraenesis to Prince Henry (u.s.), An Elegie on the Death of Prince Henrie (u.s.), and shorter pieces, including a sonnet to Michael Drayton, who had called Alexander " a man of men/' and lines on the Report of the Death of Drummond of Hawthorndeh.

b. He wrote four tragedies, Darius (1603), Croesus (1604), The Alexandraean (1605), and Julius Caesar (1607). The first and second were published together in 1604 as the Monarchicke Tragedies, a title which was afterwards given by Alexander to a print of the four works in the editions of 1607 and 1616. They are didactic poems rather than plays, a sequence of reflections of the type of the Falls of Princes, the Mirror for Magistrates, or Lyndsay's Dialog between Experience and a Courteour (known also as the " Monarche "). It is very probable that the last suggested both motif and title. The pieces are dialogues rather than dramas: the choruses are of the " Moralitas " type of Renaissance verse rather than classical; and the varied versification is unsuitable for representation. Yet they contain not a few fine passages in the soliloquies, notably one in Darius (IV., iii.) on the vanishing of " Those golden palaces, those gorgeous halls " as " vapours in the air," which recall Shakespeare's later lines in the Tempest.

c. Of Jonathan, an Heroicke Poeme intended, only the first book (105 eight-lined stanzas) was written. Doomesday, or The Great Day of the Lord's Judgement (1614) is a dreary production in twelve books or " hours," extending to nearly 12,000 lines. It is written in eight-lined stanzas.

In addition to the pamphlet on Colonization, he wrote (1614) a continuation or " completion " to the third part of Sidney's Arcadia, which appears in the fourth and later editions of the Romance; and a short critical tract entitled Anacrisis, a " censure " of poets, ancient or modern.

A collected edition of his works appeared in his lifetime (1637) with the title Recreations with the Muses (folio). Aurora and the Elegie were not included. A complete modern reprint The Poetical Works . . . now first collected and edited (but without the editor's name on the title-page) was published in 3 vols. 8vo. in 1870 (Glasgow: Maurice Ogle & Co.).

His Encouragement to Colonies was edited for the Bannatyne Club by David Laing (1867), and by Edmund F. Slafter, in Sir W. Alexander and Amer. Colonization (Prince Society, Boston, Massa- chusetts, 1865). See also E. F. Slafter, The Copper Coinage of the Earl of Stirling, 1632 (1874); The Earl of Stirling's Register of Royal Letters relative to the Affairs of Scotland and Nova Scotia from 1615-1635 (ed. C. Rogers, with biographical introduction (1884-1885) ; C. Rogers, Memorials of the Earl of Stirling (1877) ; the introduction to the Works (1870) referred to above; the Register of the Privy Council of Scotland, passim; and the bibliography for William Drummond (q.v.) of Hawthornden. (A. B. G. ; G. G. S.)

STIRLING, WILLIAM ALEXANDER, (titular) Earl of (1726-1783), American soldier, was born in New York City. He was the son of James Alexander (1690-1756), at one time surveyor-general of New York and New Jersey, a noted colonial lawyer who was disbarred for a year for his conduct of the defence in the famous trial of John Peter Zenger. William served first as commissary and then as aide-de-camp to Governor William Shirley at the beginning of the French and Indian War, and in 1756 he accompanied Shirley to England, where he was persuaded to claim the earldom of Stirling (see above). In 1759 an Edinburgh jury declared him to be the nearest heir to the last earl of Stirling, and in 1761 he returned to America and assumed the title, although the House of Lords in 1762 forbade him to use it until he had proved his legal right. Soon after his return to America he settled at Basking Ridge, New Jersey, and became a member of the New Jersey Provincial Council and surveyor-general of the colony. Warmly espousing the colonial cause at the outbreak of the War of Independence, he was appointed in November 1775 colonel of the first regiment of continental troops raised in New Jersey, and in the following January distinguished himself by the capture of an armed British transport in New York Bay. In March he became brigadier-general, and for some time was in command at New York and supervised the fortification of the city and harbour. At the battle of Long Island he was taken prisoner, but was soon afterward exchanged, and in February 1777 became a major-general. He participated in the battles of Trenton, Princeton, Brandywine and Germantown, and especially

distinguished himself at Monmouth. He took an active part in exposing the Conway Cabal, presided over the court-martial of General Charles Lee, and enjoyed the confidence of Washing- ton to an unusual degree. In October 1781 he took command of the northern department at Albany to check an expected invasion from Canada. He died at Albany on the 15th of January 1783. He was a member of the board of governors of King's College (now Columbia University) and was himself devoted to the study of mathematics and astronomy.

See W. A. Duer, '* Life of William Alexander, Earl of Stirling," in vol. ii. of the Collections of the New Jersey Historical Society (New York, 1847).

STIRLING, a royal, municipal and police burgh, river port and county town of Stirlingshire, Scotland. Pop. (1901), 18,697. It is finely situated on the right bank of the Forth, 39! m. N.W. of Edinburgh and 295 m. N.E. of Glasgow, being served by the North British and the Caledonian railways. The old town occupies the slopes of a basaltic hill (420 ft. above the sea) terminating on the north and west in a sheer precipice. The modern quarters have been laid out on the level ground at the base, especially towards the south. Originally the town was protected on its vulnerable sides by a wall, of which remains still exist at the south end of the Black Walk. Formerly there were two main entrances — the South Port, 100 yds. to the west of the present line of Port Street, and the " auld brig " over the Forth to the north, a quaint high-pitched structure of four arches, now closed to traffic. It dates from the end of the 14th century and was once literally "the key to the Highlands." It still retains the gateway towers at both ends. Just below it is the new bridge erected in 1829 from designs by Robert Stevenson, and below this again the railway viaduct. According to local tradition, a bridge stood at Kildean, 1 m. up the river, not far from the field of the battle of Stirling Bridge (1297). The castle crowning the eminence is of unknown age, but from the time that Alexander I. died within its walls in n 24 till the union of the crowns in 1603 it was intimately associated with the fortunes of the Scottish monarchs. It is one of the for- tresses appointed by the Act of Union to be kept in a state of repair, and is approached from the esplanade, on which stands the colossal statue of Robert Bruce, erected in 1877. The main gateway, built by James III., gives access to the lower and then to the upper

square, on the south side of which stands the palace, begun by James V. (1540) and completed by Mary of Guise. The east side of the quadrangle is occupied by the parliament house, a Gothic building of the time of James III., now used as a barrack-room and stores. On the north side of the square is the chapel royal, founded by Alexander I., rebuilt in the 15th century and again in 1594 by James VI. (who was christened in it), and afterwards converted into an armoury and finally a store-room. Beyond the upper square is the small castle garden, partly destroyed by fire in 1856 but' restored, in which William, 8th earl of Douglas, was murdered by James II. (1452). Just below the castle on the north-east is the path of Ballangeich, which is said to have given private access to the fortress, and from which James V. took his title of "Guidman of Ballangeich " when he roved incognito. Below it is Gowan Hill, and beyond this the Mote or Heading Hill, on which Mur- doch Stuart, 2nd duke of Albany, his two sons, and his,father- i'n-law the earl of Lennox, were beheaded in 1425. In the plain c'o the south-west were the King's Gardens, now under grass, with an octagonal turf-covered mound called the King's Knot in the centre. Farther south lies the King's Park, chiefly devoted to golf, cricket, football and curling, and containing also a race-course. On a hill of lower elevation than the castle and separated from the esplanade by a depression styled the Valley — the tilting-ground of former times — a cemetery has been laid out. Among its chief features are the Virgin Martyrs' Memorial, representing in white marble a guardian angel and the figures of Margaret M'Lauchlan and Margaret Wilson, who were drowned by the rising tide in Wigtown Bay for their fidelity to the Covenant (1685); the large pyramid to the

memory of the Covenanters, and the Ladies' Rock, from which

ladies viewed the jousts in the Valley. Adjoining the cemetery on the south is Greyfriars, the parish church, also called, since the Reformation (1656), when it was divided into two places of worship, the East and West churches. David I. is believed to have founded (about 1 130) an earlier church on their site dedicated to the Holy Rood, or Cross, which was burned in 1406. The church was rebuilt soon afterwards and possibly some portions of the preceding structure were incorporated in the nave. The choir (the East church) was added in 1494 by James IV., and the apse a few years later by James Beaton, archbishop of St Andrews, or his nephew, Cardinal David Beaton. At the west stands the stately battlemented square tower, 90 ft. high. The nave (the West church), divided from the aisles by a double row of massive round pillars, is a transition between Romanesque and Gothic, with pointed windows. The crow-

stepped Gothic gable of the south transept affords the main entrance to both churches. The choir is in the Decorated and Perpendicular styles and is higher than the nave. The parish church is 200 ft. long, 55 ft. broad and 50 ft. high. Within its walls Mary Queen of Scots was crowned in 1543, when nine months old, and in the same year the earl of Arran, regent of Scotland, abjured Protestantism; in 1544 an assembly of nobles appointed Mary of Guise queen-regent; on the 29th of July 1567 James VI. was crowned, John Knox preaching the sermon, and in August 1571 and June 1578 the general assembly of the Church of Scotland met. James Guthrie (1612-1661), the martyr, and Ebenezer Erskine (1680-1794), founder of the Scottish Secession Church, were two of the most distinguished ministers. To the south-west of the church is Cowane's Hos- pital, founded in 1639 by John Cowane, dean of gild, for twelve poor members of the gildry; but the deposition of the charity has been modified and the hall serves the purpose of a gildhall. Adjoining it is the military prison. Near the principal entrance to the esplanade stands Argyll's Lodging, erected about 1630 by the 1st earl of Stirling. On his death in 1640 it passed to the 1st marquess of Argyll and is now a military hospital. Broad Street contains the ruins of Mar's Work, the palace built by John Erskine, 1st (or 6th) earl of Mar, about 157°, according to tradition, out of the stones of Cambuskenneth Abbey; the old town house, erected in 1701 instead of that in which John Hamil- ton, the last Roman Catholic archbishop of St Andrews, was hanged for alleged complicity in the murders of Darnley and the regent Moray; the town cross, restored in 1891, and the house which was, as a mural tablet says, the " nursery of James VI. and his son Prince Henry." The important buildings include: the high school; the trades hall, founded by Robert Spittal, James IV. 's tailor, in the Back Walk; the burgh buildings, with a statue of Sir William Wallace over the porch; the National Bank, occupying the site of the Dominican monastery, founded in 1223 by Alexander II. and demolished at the Reformation; the Smith Institute, founded in 1873 by Thomas Stewart Smith, an artist, containing a picture-gallery, museum and reading- room; the public halls; the Royal Infirmary and various charitable institutions. Woollen manufactures (carpets, tartans, shawls) are the staple industry, and tanning, iron-founding, carriage-building and agricultural implement-making are also carried on, in addition to furniture factories, cooperage and rubber works. The harbour being accessible only at high water, and then merely to vessels of small tonnage, the shipping trade is inconsiderable.

Stirling is under the jurisdiction of a council with provost and

bailies, and, along with Culross, Dunfermline, Inverkeithing and Queensferry (the Stirling burghs) returns a member to Parliament. The Abbey Craig, an outlying spur of the Ochils, 1ˆ m. north-east of Stirling, is a thickly-wooded bill (362 ft. high), on the top of which stands the Wallace monument (1869), a baronial tower, 220 ft. high, surmounted with an open-work crown. The Valhalla, or Hall of Heroes, contains busts of eminent Scotsmen. Cambuskenneth Abbey is situated on the left bank of the Forth, about 1 m. east-north-east of Stirling by ferry across the river. The name is derived from the Gaelic and means "the Crook of Kenneth," or Cairenachus. a friend

of St Columba and patron of Kilkenny in Ireland. The abbey, which was in the Early Pointed style, was founded by David I. in 1 147 for monks of the order of St Augustine. Several Scots parliaments met within its walls, notably that of 1326, the first attended by burgesses from the towns. At the Reformation Mary Queen of Scots bestowed it on the 1st earl of Mar (1562), who is said to have used the stones for his palace in Stirling. In 1 709 the town council of Stirling purchased the land and ruins. All that remains of the abbey is the massive, four-storeyed tower — which is 70 ft. high, and 35 ft. square, and was painted and repaired in 1864 — the graceful west doorway and the foundations of some of the walls. The bones of James III. and his queen, Margaret of Denmark, who were buried within the precincts, were discovered in 1864 and re-interred next year under a tomb erected by Queen Victoria at the high altar.

Earlier forms of the name of Stirling are Strivilen, Estriuelen, Striviling and Sterling, besides the Gaelic Struithla. It was known also as Snowdoun, which became the official title of the Scots heralds. The Romans had a station here (Benobara). In 1 1 19 it was a royal burgh and under Alexander I. was one of the Court of Four Burghs (superseded under James III. by the Convention of Royal Burghs). In 1 174 it was handed over to the English in security for the treaty of Falaise, being restored to the Scots by Richard I. The earliest known charter was that granted in 1226 by Alexander II., who made the castle a royal residence. The fortress was repeatedly besieged during the wars of the Scottish Independence. In 1304 it fell with the town to Edward I. The English held it for ten years, and it was in order to raise the Scottish siege in 13 14 that Edward II. risked the battle at Bannockburn. Edward Baliol surrendered it in 1334 in terms of his compact with Edward III., but the Scots

regained it in 1339. From this time till the collapse of Queen Mary's fortunes in 1568, Stirling almost shared with Edinburgh the rank and privileges of capital of the kingdom. It was the birthplace of James II. in 1430 and probably of James III. and James IV. In 1571 an attempt was made to surprise the castle by Mary's adherents, the regent Lennox being slain in the fray, and seven years later it was captured by James Douglas, 4th earl of Morton, after which a reconciliation took place between the Protestants and Roman Catholics. It was occupied in 1584 by the earls of Angus and Mar, the Protestant leaders, who, however, fled to England on the approach of the king. Next year they returned with a strong force and compelled James VI, to open the gates, his personal safety having been' guaranteed. In 1 504 Prince Henry was baptized in the chapel royal, which had been rebuilt on a larger scale. After the union of the crowns (1603) Stirling ceased to play a prominent part on the national stage. The privy council and court of session met in the town in 1637 on account of the disturbed state of Edinburgh. In 1641 Charles I. gave it its last governing charter, and four years afterwards parliament was held in Stirling on account of the plague in the capital, but the outbreak of the pest in Stirling caused the legislators to remove to Perth. During the Civil War the Covenanters held the town, to which the committees of church and state adjourned after Cromwell's victory at Dunbar (1650), but in August next year the castle was taken by General Monk. In 1715 the 3rd duke of Argyll held it to prevent the passage of the Forth by the Jacobites, and in 1746 it was ineffectually besieged by Prince Charles Edward. In 1773, in consequence of an intrigue on the part of three members of the council to retain themselves in office, the town was deprived of its corporate privileges, which were not restored until 1781.

See History of the Chapel Royal, Stirling (Grampian Club, 1882); Charters of Stirling (1884); John Jamieson, Bell the Cat (Stirling, 1902); The Battle of Stirling Bridge — the Kildean Myth (Stirling Natural History and Archaeological Society, 1905).

STIRLING-MAXWELL, SIR WILLIAM, Bart. (1818-1878), Scottish man of letters and virtuoso, the only son of Archibald Stirling of Keir, Perthshire, and of Elizabeth, third daughter of Sir John Maxwell, seventh baronet of Pollok, Renfrewshire, was born at Kenmure, near Glasgow, on the 8th of March,

1818. William Stirling was educated privately and at Trinity College, Cambridge, where he graduated in 1839. On leaving Cambridge he spent some years abroad, chiefly in Spain and Syria. Having

succeeded his father as proprietor of Keir in 1847, when he was made vice-lieutenant of Perthshire, he in 1852 entered parliament as member for that county; and he was several times re-elected. On the death of his uncle in 1865 he succeeded to the baronetcy and estates of Pollok, assuming the additional name of Maxwell. In the same year he became deputy-lieutenant of Lanarkshire, and a like office was con- ferred on him in Renfrewshire in 1870. He married in 1865 Anna Maria, daughter of the 10th earl of Leven and Melville. She died in 1874, andin 1876 Sir William married Caroline Norton. In 1862 he was chosen lord rector of St Andrews, in 1872 the same honour was. conferred by Edinburgh, and in 1876 he became chancellor of Glasgow. He was a trustee of the British Museum, of the National Gallery, and member of the senate of London University. In 1876 he was created a Knight of the Thistle, being the only commoner of the order. He died at Venice on the 15th of January 1878.

Sir W. Stirling-Maxwell's works, which are invariably charac- terized by thorough workmanship and excellent taste, were in some cases issued for private circulation only, and almost all of them are now exceedingly rare. They include an early volume of verse (Songs of the Holy Land, 1848), and several volumes containing costly reproductions of old engravings, along with valuable explana- tory matter. His best-known publications are Annals of the Artists of Spain (1848), The Cloister Life of Charles V. (1852). Part of the Annals was revised and published as Velasquez and his Works (1855). The Cloister Life was at once recognized as a valuable contribution to history, but its importance was lessened by the appearance a year or two later of Mignet's Charles-Quint and L. P. Gachard's Retraite et mort de Charles-Quint. A life of Don John of Austria, from his posthumous papers, edited by Sir G. W. Cox, appeared in 1883. A collected edition of his works, with a short memoir, appeared in 1891.

STIRLINGSHIRE, a midknd county of Scotland, bounded N. by Perthshire, N.E. by Clackmannanshire and the Firth of Forth, S.E. by Linlithgowshire, S. by Lanarkshire and the detached part of Dumbartonshire and S.W. and W. by Dum- bartonshire; area 288,842 acres, or 451-3 sq. m. In the north- west a spur of the Grampians culminates in Ben Lomond (3192 ft.), and the centre is occupied by a group known as the Lennox Hills, consisting of Gargunnock Hills (1 591), Fintry Hills (1676), Kilsyth Hills (1870), and Campsie Fells (1894). The chief river is the Forth, the windings of which constitute most of the northern boundary. The other important streams are the Carron, which rises in Campsie Fells and

flows mainly east for 25 m. to the Forth of Grangemouth; the Endrick, which, rising in Fintry Hills, first flows east, then south and finally bends round to the west, a direction which it maintains for most of its course of 31 m. till it empties itself into Loch Lomond; the Kelvin, which, from its source in Kilsyth Hills, flows south- west to the Clyde at Glasgow after a run of 22 m., and the Avon, rising in the detached portion of Dumbartonshire, and flowing for 21 m. east and then north to the Forth. The principal lochs include the greater part of the eastern waters of Loch Lomond, from Endrick mouth to a point 2 m. north of Inversnaid; a small portion of the upper end of Loch Katrine, from a point in the centre of the lake opposite to Stronachlachar to Glengyle at the head; Loch Arklet, in the north-west area, 1 m. long by \ m. wide, forming part of the water supply of Glasgow; the small Loch Coulter, in the parish of St Niriians, and Black Loch, partly in Lanarkshire. The Forth and Clyde Canal crosses the south-eastern corner of the county from Grangemouth to Castlecary.

Geology. — The oldest rocks in the county are the Dalradian schists which occupy the north-west beyond a great fault which runs across from near the bottom end of Loch Lomond in a north- easterly direction passing not far from Aberfoyle. These schists are less altered and micaceous near the fault and there is some evidence for believing them to be of Ordovician age. On the south- eastern side of the fault are the conglomerates and sandstones of Lower Old Red Sandstone age, which are more highly inclined and coarser nearer the fault. Resting uniformly on the lower series is

the Upper Old Red series of sandstones; but the junction between the two is faulted between Balfron and Kippen; the fault runs E.N.E.-W.S.W. Then follows the Carboniferous system which occupies the rest of the county. The lowest member, the Calciferous Sand- stone group, consisting of clays and marls with cement nodules, may be seen on both sides of the Campsie Fells; it is well exposed near Strathblane in Ballagan Burn. These beds are succeeded by alternating beds of contemporaneous tuffs and sandstones and then by great sheets of diabase-porphyrite which attain a considerable thick- ness and form well-marked ridges on the southern side of the Campsie Hills; they are best developed north of Kilsyth and east of Fintry. Meikle Bin and Dungoil mark the sites of the vents from which some of these volcanic rocks were erupted. The Carboniferous

Limestone series is the next in order and the lower beds may be found resting upon the volcanic rocks except where the junction is faulted and this series is let down, as it is between Strathblane and the Carron Water. As in the neighbouring counties, this series consists of a lower limestone group — with the Index, Calmy and Castle Cary limestones — a middle group with coals and clay ironstones and an upper limestone group with the Hosie and Hurlet limestones ; below the latter is a bed of alum shale. These rocks are considerably folded about Kilsyth and in the directions of Banton and Cairnbeg; the " Riggin " near Kilsyth is a noteworthy example of an anticlinal fold. The next series is the Millstone Grit — sandstones with some coal-seams and fireclays— which occurs towards the eastern boundary. The true Coal-measures are well developed between Grangemouth and Stenhousemuir and about Falkirk. The more important seams are the Virtuewell (the highest), the Splint, Craw and Coxhead coals. Intrusive sheets of basalt have penetrated the Carboniferous rocks and are now quarried for road metal ; Abbey Craig and Stirling Castle hill are formed of one of the more important of these intrusions. Later basalt dikes of Tertiary age are not uncommon. A good deal of boulder clay covers the older rocks and an interesting blue marine clay is found beneath it in the Endrick valley. The Carse of Stirling is overlaid by the muds and sands of the 50 ft. raised beach; and traces of the 100 ft. beach are also to be found.

Climate and Agriculture. — The rainfall for the year varies from 35 in. in the far east to 55 in. in the Highland region in the extreme north-west. The mean annual temperature is 47-5° F. ; for January 38 F., for July 59 F. The arable soils are of two kinds, locally distinguished as " carse " and " dryfield," the rest of the land being composed of pasture, moor and peat. The " carse " extends along the valley from Buchlyvie to the eastern boundary, a distance of 32 m. (by the river), with a breadth of I to 4 m. The soil consists of the finest clays, without stones, but interspersed with strata of marine shells. It has been largely stripped of the overlying peat, and by draining, subsoil ploughing and the use of lime has been converted into a rich soil, especially adapted for wheat and beans. The " dryfield," mostly reclaimed since the beginning of the 18th century, occupies the valleys and the higher ground bordering the carse. It is fertile and well suited for potatoes and turnips. In the order of their importance the grain crops are oats, barley and wheat. Beans are also extensively grown. Livestock is raised in increasing numbers. The sheep are chiefly black-faced, the cattle Irish, short- horns and cross-breeds. Ayrshires are the principal breed on the " dryfield "

farms, where butter-making is largely carried on. Horses are kept only for farming operations or for stock, and a considerable number of pigs are reared. The average size of the holdings is from 70 to 80 acres. The area under wood is small. Birches grow naturally on the lower slopes of the mountains in Buchanan and Drymen, and oaks freely on the banks of Loch Lomond. Larch and Scots fir are the leading trees in modern plantations.

Other Industries. — The coalfield of the south-east supplies the staple industry. Iron ore, fireclay and oil-shale are also obtained, while limestone is extensively wrought in the Campsie district, and sandstone is quarried in many parts. The ironworks at Carron and Falkirk are important. Woollens are manufactured at Stirling and Bannockburn; calico-printing and bleaching are established in the south-west, especially at Lennoxtown, Strathblane and Milton. There are chemical works at Falkirk, Stirling, Denny and Lennox- town. Throughout the county there are several breweries and distilleries, and at Grangemouth, the principal port, shipbuilding is carried on.. The southern and south-eastern districts are served by the North British railway from Edinburgh to Glasgow (via Falkirk) and the Caledonian railway from Glasgow to Stirling (via Larbert), while branches connect Grangemouth, Denny and other places with the through-lines. The Forth & Clyde railway crosses the shire, mostly in the north, from Stirling to Balloch, and the North British also runs from Glasgow to Aberfoyle. In the tourist season there is a steamer service from Leith to Stirling (37 m.).

Population and Administration. — In 1891 the population numbered 118,021, and in 1901 it was 142,291, or 315 persons to the square mile, an increase for the decade exceeded only by the shires of Linlithgow and Lanark. In 1901 there were ten persons who spoke Gaelic only and 2014 Gaelic and English.

The principal towns are Falkirk (pop. 29,380), Stirling (18,697), Grangemouth (8386), Kilsyth (7292), Stenhousemuir (5184), Denny and Dunipace (5158), Bridge of Allan (3240), and Bonny- bridge (3009). The shire returns a member to parliament, and Stirling and Falkirk respectively belong to the Stirling and Falkirk district groups of parliamentary burghs. The police burghs include Falkirk, Grangemouth, Kilsyth, Denny and Dunipace and Bridge of Allan. The shire forms a sheriff- dom with the counties of Dumbarton and Clackmannan, but there is a resident sheriff-substitute at Stirling and another at Falkirk. The shire is under schoolboard jursidiction, and there are secondary as well as science and art schools at Stirling and Falkirk. The town councils of Stirling and Kilsyth subsidize classes in

science and art, besides manual instruction, and Denny and Dunipace maintains a mining instruction class.

History and Antiquities. — The wall of Antonius, built by Lollius Urbicus, in a.d. 142, connecting the Forth and Clyde, passed through the south-east of the county, in which it is locally known as Graham's Dyke. At Castlecary and Camelon, which were both stations of consequence on the line of the wall, many interesting relics have been found. The Camelon cause- way, a Roman road, ran eastwards from Castlecary, crossed the rampart at Camelon, whence it proceeded northwards to Stirling and the Forth, where there was a station near the present bridge of Drip. Thence it crossed the river to Keir and Dunblane in Perthshire. To the north-east of the Car- ron foundry there stood, till its demolition in 1743, a fine circular Roman building called Arthur's Oon (oven), or Julius's Hof, but the two mounds in Dunipace parish supposed to have been raised as monuments of peace between the Romans and Caledonians are probably of natural origin. After the with- drawal of the Romans the county once more fell into the hands of the Picts, the original inhabitants, who, however, gradually retired before the advance of the Saxons and Scots. By the time of Malcolm Canmore (d. 1093) the lowland area had be- come settled, but the highland tract remained a disturbed and disturbing region until the pacification following the Jacobite rising of 1745-46. The county played a conspicuous part in the struggle for Scottish independence, being particularly associated with many of the exploits of Sir William Wallace and Robert Bruce. The three great battles of the independence were fought in the shire — Stirling Bridge (1297), Falkirk (1298), Bannockburn (1314). James III. was stabbed to death in a cottage in the village of Milton after the battle of Sauchieburn (1488), but apart from the disastrous defeat of the Covenanters at Kilsyth (1645) an< l the transitory triumph which Prince Charles Edward won at Falkirk (1746), the history of the shire

practically centres in that of the county town.

t Bibliography. — Sir Robert Sibbald, Description of Stirlingshire (1710); Nimmo, History of Stirlingshire (1777, 1880); Registrum Monasterii S. Marie de Cambuskenneth (Edinburgh, 1872); W. Rowand Anderson, Stirling Castle (1893); J. S. Fleming, Old Lodgings of Stirling (Stirling, 1897), Old Nook of Stirling (Stirling, 1898) ; J. W. Small, Old Stirling (1897).

STIRRUP (O. Eng. stirap, sligrap, M. Eng. stirop,styrope,&.c.,i.e. a

mounting or climbing-rope; O. Eng. stigan, to mount, climb, and rap, rope, cf. Du. stijbeugel, literally mounting bow or loop, Ger. Steigbiigel) , a loop usually of metal, suspended by an adjustable strap from the saddle and used as a support for the foot of a rider of a horse when seated in the saddle and as an aid in mount- ing. The earliest use of stirrups seems to have been in the East, for they are mentioned in early Chinese literature and examples which must be earlier than the 7th century a.d. have been found in Japan. The Greeks and Romans did not use them but mounted by vaulting or from a mounting block (see Saddlery and Harness) . The earliest evidence of their use in Europe is in the Art of War of the emperor Maurice (a.d. 582-602). They were probably brought into use by the nomad horsemen of Asia. The stirrup of the early middle ages seems to have been light and semicircular or triangular in shape. By the 14th century the footplate became broader and the sides heavier and orna- mented. By the 16th century this ornamentation increases

and open metal-work is used. The Arab stirrup is very large, affording a rest for the entire sole of the foot ; sometimes the heel part projects and terminates in a sharp point used as a spur.

See the plates in F. Hotteuroth, Trachten, Haus- Feld- und Kriegs-gerdthschaften, &c. (1901); and R. Zschille, Die Steigbilgel in ihrer Formen-Entwicklung (1896).

STJERNHJELM, GEORG (1598-1672), Swedish poet and scholar, whose original name was Goran Lilja, was born at Wika in Dalecarlia on the 7th of August 1598. He took his degree at Greifswald, and spent some years in travelling over every quarter of Europe. On his return in 1626 he maintained a correspondence with Salmasius, Heinsius, and other scholars. He taught at Vesteras, and then at Stockholm, attracting the notice of Gustavus Adolphus, who gave him a responsible post at Dorpat in 1630, and raised him next year to the nobility. After the king's death, Christina attached him, as a kind of poet laureate, to her court in Stockholm. His property lay in Livonia, and when the Russians plundered that province in 1656 the poet, who was in temporary disgrace at court, was reduced to extreme poverty for two or three years. He subse- quently became judge at Trondhjem, member of the council of war (1661), and president (1667) of the College of Antiquities at Stockholm. He died at Stockholm on the 22nd of April 1672. His greatest poem Hercules, is a didactic allegory in hexameters, written in very musical verse, and with almost Oriental splendour of phrase and imagery. The

Hercules, which deals with the familiar story of the dispute for the hero between Duty and Pleasure, was first printed at Upsala in 1653 but was finished some years earlier. Brollops-Besvars Ihugkommelse, a sort of serio-comic epithalamium in the same measure, is another very brilliant work. His masques, Then fdngne Cupido (Cupid Caught) (1649), Freds-afl (The Birth of Peace) (1649), an(l Parnassus triumphans (1651), were written for the entertain- ment of Queen Christina. He can scarcely be said to have been successful in his attempt, in the first two of these, to introduce unrhymed song-measures.

Stjernhjelm was an active philologist, and left a great number of works on language, of which only a few have been printed. He also wrote on history, mathematics, philosophy and natural science, producing original and valuable work on every subject he attempted. Among his numerous works are Letter A of the Lexicon vocabulorum antiquorum gothicorum (1643, &c), Archimedes reformatus (1644), Runa suetica (Liibeck, 1700), and an edition of Wast Gbtha Lagbok (1663). His works were partially edited by P. Hanselli (Samla.de vitterhets arbeten af Svenska Forfattare, vol. i., 1871), by L. Hammar- skold (Stockholm, 1818), by F. Tamm (Upsala, 1891). See also C.J. Lenstrom, Litterdrt Portrdttgalleri (Upsala, 1838) ; there is a full list of his writings in the Svenskt biographiskt Lexikon, vol. xv. (Upsala, 1848).

STOA, the term in Greek architecture (Lat. porticus) given to a building, the roof of which is supported by one or more rows of columns, the stoai at Elis described by Pausanias being important examples.

STOBAEUS, JOANNES, so called from his native place Stobi in Macedonia, the compiler of a valuable series of extracts from Greek authors. Of his life nothing is known, but he probably belongs to the latter half of the 5th century a.d. From his silence in regard to Christian authors, it is inferred that he was not a Christian.

The extracts were intended by Stobaeus for his son Septimius, and were preceded by a letter briefly explaining the purpose of the work and giving a summary of the contents. From this summary (preserved in Photius's Bibliotheca) we learn that Stobaeus divided his work into four books and two volumes. In most of our MSS. the work is divided into three books, of which the first and second are generally called 'Eiikoyai (pvaiKal kciX ridLKai (Physical and Moral Extracts), and the third 'Avdo- \6yiov (Florilegium or Sermones). As each of the four books is sometimes called 'Av0o\6yu>v, it is

probable that this name originally belonged to the entire work; the full title, as we know from Photius, was "EnXoyciv airo4 > dey ixaroiv virodriKwv /3(.0Xia TtTTapa (Four Books of Extracts, Sayings and Precepts). The modern arrangement is somewhat arbitrary and there are several marked discrepancies between it and the account given xxv., 20

by Photius. The introduction to the whole work, treating of the value of philosophy and of philosophical sects, is lost, with the exception of the concluding portion; the second book is little more than a fragment, and the third and fourth have been amalgamated by altering the original sections. From these and other indications it seems probable that what we have is only an epitome of the original work, made by an anonymous Byzantine writer of much later date. The didactic aim of Stobaeus's work is apparent throughout. The first book teaches physics — in the wide sense which the Greeks assigned to this term — by means of extracts. It is often untrustworthy: Stobaeus betrays a tendency to confound the dogmas of the early Ionic philosophers, and he occasionally mixes up Platonism with Pythagoreanism. For part of this book and much of book ii. he depended on the works of Aetius, a peripatetic philosopher, and Didymus. The third and fourth books, like the larger part of the second, treat of ethics; the third, of virtues and vices, in pairs; the fourth, of more general ethical and political subjects, frequently citing extracts to illustrate the pros and cons of a question in two successive chapters. In all, Stobaeus quotes more than five hundred writers, generally beginning with the poets, and then proceeding to the historians, orators, philosophers and physi- cians. It is to him that we owe many of our most important fragments of the dramatists, particularly of Euripides.

Editio princeps (1609) ; Eclogae, ed. T. Gaisford (1822), A. Meineke, (1860-1864) ; Florilegium, ed. T. Gaisford (1850) ; A. Meineke (1855- 1857), C. Wachsmuth and O. Hense (1884-1894, and 1909).'

STOCKBRIDGE, a township of Berkshire county, in western Massachusetts, U.S.A. Pop. (1900), 2081; (1910, U.S. census) 1933. It comprises an area of 24 sq. m. Lake Mahkeenac, or Stockbridge Bowl, is about 2 m. north of Stockbridge village. Immediately south of the village, in a cleft in the north-western part of Bear Mountain, is Ice Glen, with caverns ice-lined even in midsummer. In the southern part of the township, on the boundary of

Great Barrington, is Monument Mountain (1710 ft.). Stockbridge village is on the Housatonic river, about 13 m. south by east of Pittsfield, and is served by the New York, New Haven & Hartford railway, and by an interurban electric line. It is well known as a summer resort, with a casino and golf links, a war monument, a bell tower erected by David Dudley Field to commemorate the Indian mission, a monument in the old burial ground of the Stockbridge Indians, a public library, and the Stockbridge Academy. Jonathan Edwards (com- memorated by a monument, 1871) was the pastor (1750-1758), and wrote his Freedom of tfic Will here; the Sedgwick mansion, the home of Theodore Sedgwick (1746-1813), is at Stockbridee; his daughter, the author, Catherine M. Sedgwick, was born (ahd buried) here; and Stockbridge was the birthplace of Mark Hopkins and of Cyrus W. Field, who presented a park to the village. The " village improvement society " movement seems to have originated at Stockbridge in 1853. The Stockbridge (or Muh-he-kan-ne-ok) Indians, survivors of the Mohican tribe, removed to the Housatonic Valley from the west bank of the Hudson river soon after the first white settlements were made in New York; and in 1734 a mission was established among them in what is now the township of Great Barrington by John Sergeant (17 10-1749), who translated part of the Bible into their language. In 1736 a town 6 m. square (including the present Stockbridge) was laid out for them. Lands were held in severalty, the Indians were guaranteed the civil rights of whites; they had a church (under the charge of Jonathan Edwards in 1750-1758), and a school. In 1739 their township was incorporated under the name of Stockbridge, possibly adopted because of a resem-blance to the country about Stockbridge, England. Many of the Indians fought on the American side in the War of Indepen- dence. In 1783-1788 nearly all of them removed to the Brother- ton settlement (established 1775), 14 m. south of what is now Utica, New York; there they built New Stockbridge. By 1829 nearly all had left New York for Wisconsin, settling near what is now South Kaukauna. By 1859 they had removed to

the reservation in Shawano county, Wisconsin, where they now live.

See E. F. Jones, Stockbridge Past and Present (Springfield, 1854); and J. N. Davidson, Muhhekaneok: a History of the Stockbridge Indians (Milwaukee, 1863).

STOCK EXCHANGE, a market for the purchase and sale of all descriptions of negotiable securities (see Market). In the immense majority of cases the securities so dealt in are what are known as "stocks, bonds and shares," on which interest, or dividend, is payable when earned; but bills issued by govern- ments and municipal corporations are also occasionally dealt in. Many years ago, when the British government was in the ha hit of issuing exchequer bills, a now obsolete form of security, cnese bills were quoted in the official list of the London Stock Exchange; this was possible because though nominally bills, they were really bonds with a variable rate of interest fixed half- yearly in advance by the treasury. The inconvenience of this arrangement led to their being abandoned as a portion of the system of British government finance. Markets for dealing in securities have existed for some hundreds of years. Their organization was loose, there was no specific body of persons forming the market, and there were no special rules governing their procedure until within the last hundred and fifty years.

London. — Previous to 1773 the London stockbrokers con- ducted their business in and about the Royal Exchange, but in that year, having formed themselves into an association under the designation of the Stock Exchange, they, after temporarily locating their headquarters in Sweeting Ally, Threadneedle Street, removed to Capel Court, Bartholomew Lane. The growth of business necessitating improved accommodation, a capital of £20,000 in four hundred shares of £50 each was raised in 1 801 for the purpose of erecting a new building in Capel Court, which was finished and occupied in the following year, the members at that date numbering about five hundred. With the occupation of the new building new rules came into force; all future members were admitted by ballot, while both members and their authorized clerks were required to pay a subscription of ten guineas each. As only the wealthier members of the association had provided the capital for the new building, the Stock Exchange henceforth consisted of two distinct bodies — proprietors and subscribers. In 1854 the membership having increased to about one thousand persons, an extension of the premises in Capel Court was effected at a cost of £16,000. A very extensive increase in the accommodation was made in 1885, when what was for many years afterwards known as the " new house " was erected. It occupies by far the greater portion of the triangular area of which Throgmorton Street, Bartholo- mew Lane, part of Threadneedle Street and part of Old Broad Street form the sides. Sections of the external parts of this area are in the hands of banks,

insurance companies and other places of business, but most of the south side of Throgmorton Street and most of the north side of that portion of Old Broad Street which lies between Throgmorton Street and Thread- needle Street are Stock Exchange premises. Since 1885 various alterations in the use of the space available have been made, but there has been no considerable extension to the building. A portion of the share and loan department occupies premises in Austin Friars.

The Stock Exchange site and buildings are the property of the holders of the share capital in the company called the Stock

_,. „ Exchange (Limited), which is under the control of The Man- . ,, , ,, , . . ,

agtrs, the nme trustees and managers, who are appointed

Members by the shareholders. There are now 20,000 shares of

and Com- un ij m jt e d amount on which £12 has been paid up;

no one person may hold more than 200 shares, and

only members of the Stock Exchange can hold shares,

except in the case of the representatives of proprietors who

acquired their shares before the 31st of December 1875. When

a proprietor dies his shares must be sold to a member within

twelve months of his decease. As the dividends are handsome,

there is rarely any difficulty in finding a buyer for such

shares. The income of the company is derived from the annual

subscriptions of members and their clerks, from entrance fees paid by new members, and from rents and investments.

The business and discipline of the Stock Exchange is under the control of the "committee for general purposes," shortly known as " the committee. " This body is composed of thirty persons, and is elected annually. It is entirely distinct from the " managers. " The committee, when called upon, settles disputes between members and sometimes between members and their clients. It does not move in any matter until this is brought to its notice, and even then it

frequently declines to act. It does part of its work through sub-committees, but all ques- tions are finally settled in full meeting. Its powers are very wide, ranging from the granting or refusing of a quotation to a new stock, to the expulsion of a member, and the suspension of a " special settlement, " as well as such trifles as reprimanding young members overburdened with animal spirits, and the closing of the "house" for holidays other than those provided for by the rules. The committee has an enormous amount of routine work to do or superintend; the " official list " of prices and the marking of " business done, " for which the share and loan department is responsible, is supervised by it; the " official assignees, " who are appointed to deal with the assets of defaulting members, act under the orders of the committee.

Membership of the Stock Exchange is for twelve months only; everyone without exception who wishes to remain a mem- ber must be re-elected annually; the year ends on the 25th of March. New members may be elected, (a) by the nomination of a member who retires in favour of the new member, or of a former member, or of the legal personal representative of a deceased member. The candidate must be recommended by three members, who also become sureties for him during the first four years from the date of his admission for £500 each. (b) A certain number of admissions are made each year, with- out nomination, of candidates with two sureties; under this arrangement clerks who have completed four years' service are admitted.

Since the 23rd of November 1904, every member has been obliged to become the owner of at least one share in the Stock Exchange (Limited). This arrangement is the outcome of the long-standing controversy respecting the " dual management " of the Stock Exchange, the managers and the committee being, as already explained, independent authorities. The arrange- ment is, no doubt, anomalous, but it has worked efficiently. Its principal drawback is the fact that, as the managers are proprietors and represent the body of proprietors who were, and still are, a minority of the members, they may be uncon- sciously biased in favour of increasing the number of members, since the dividends on the Stock Exchange shares are derived from this source. In 1904 the number of members had become, temporarily, at any rate, too great, relatively to the business to be done by them, and it was decided to introduce the principle of limitation, not directly, but by the methods briefly described above. It is hoped that, if the shares are all gradually dis- tributed among the members, the slight difference between the interests of the managers and the rest of the Stock Exchange will

disappear. The plan adopted involves of course the diffi- culty that it may not be easy at all times for a candidate to obtain his qualifying shares except at a high price. The new system, however, appears to work well.

The London Stock Exchange is remarkable for having developed spontaneously a special mode of doing business, namely the differentiation of members into jobbers and brokers. A jobber is a member of the Stock Brokers. Exchange who, according to the rules of that body, does business only with other members, as opposed to a broker who does business with the public as well as with his fellow members. Any member may at any time make known his intention to act as either jobber or broker, but he must not act as both simultaneously. The business of a jobber (who is sometimes called a dealer) is to be prepared to " make prices " and deal in certain classes of securities selected by himself, in which he causes it to be known that he is a jobber. He thus

becomes a jobber in " the American market, " or in the " South African market, " or in the " Consols market "; or in any other market which he chooses. At the beginning of his career he usually has to rely for business on such friends as he has made in the house, while serving his time as a clerk to a broker; but if he shows ability for the work he soon becomes known to a wider circle and may eventually make for himself a position of considerable importance in the house. A jobber's method of doing business is simple in appearance. All he has to do is to remain in or near that portion of the Stock Exchange where other jobbers in the class of stocks he is concerned with congre- gate, during the greater part of the day, and wait for brokers to propose transactions to him. If he is in the Home Railways market and a broker tells him that he wants to deal in, say 1000 " Easterns, " meaning Great Eastern ordinary, he replies that they are 80 to 8o|, or whatever the price is at the moment; this means that he will sell at the higher and buy at the lower of these prices the amount of shares mentioned, not knowing " which way " the broker wishes to operate. On the latter saying that he will sell, or buy, as the case may be, the bargain is made, and is noted by both parties in memorandum books for completion at the next " settlement. " The broker is understood to be, and usually is, acting for a client outside the house, and is paid for his trouble by a brokerage fixed by rules and paid by the client. The jobber's profit

consists in the " turn, " that is, the difference between the two prices quoted. But it is obvious that the realization of this profit by the jobber depends on his being able to effect a counter-sale, or purchase, with some other broker in 1000 " Easterns, " and it is in so fixing the prices he quotes that, on the average of the day's or fortnight's trans- actions, his book shows a balance on the right side that his ability is displayed. If he has sold the stock and has not got it on his books already, he must procure it by the next settle- ment in order to deliver it; if he cannot procure it he must borrow it (backwardation). If he has bought it he must pay for it by the next settlement, and should it have gone down in the interval he will evidently have made nothing on the transaction, so far as that settlement is concerned; he will have the stock " on his book " and will have to carry it over (con- tango) and wait till someone wants to buy it of him in order to " undo " the bargain. If he is possessed of capital he may pay for and hold the stock until its price has risen considerably, but as a rule a jobber tries to make quick profits. A jobber is not obliged to make a price, and in times of serious trouble the weaker ones among them refuse to do so, or merely stay away. A jobber has another defence against the risk of making a bar- gain which he thinks he will not be able to " undo " promptly; he can quote a " wide " price, that is, he could quote for jooo " Easterns " " 79J-805, " a price no broker would be likely to deal at. The extent of a jobber's business depends on the reputation he has acquired. Good brokers, in their own as well as their client's interest, always " pick their man, " especially in times of danger and difficulty. A broker may be acquainted with several men in a particular market any one of whom he considers quite safe to deal with in ordinary times, but he will be very careful whom he chooses to execute an order with, when, owing to money being dear, or for some other reason, markets are " bad. " The usefulness of the jobber has from time to time been denied by critics, who have pointed out that in other stock exchanges no differentiation of members into brokers and jobbers has taken place. It has also been alleged that his " turn " is too easily earned, which is not true, and that it is often too large; as to the latter statement, it may safely be said that no jobber who habitually quoted prices which were too " wide " would get much business.

Since 1900 a controversy has arisen as to the propriety of jobbers dealing direct with members of country stock exchanges, Dealings and of brokers dealing direct with financial houses with known to have certain shares to sell. The difficulty

••Outside" as regards the latter chiefly affected the mining Parties. s hare market. It may be argued that both parties are wrong according

to the letter of Stock Exchange law,

but their action can be defended. The broker who goes for a particular share direct to a financial house (colloquially called " the shop ") may get better terms for his client, and though he also gets a second commission for himself, provided he makes known this latter fact to the client, the transaction is an innocent one. The jobber's actk n in regard to provincial stock exchanges, known in Stock Exchange slang as " shunting " business, may be regarded as a rough compensatory operation for loss of busi- ness he may incur through the broker's desertion of him for the financial houses. The quarrel would not have arisen but for the great increase in the members of the Stock Exchange and the fact that business during and for some years after the South African War was insufficient to give a living to so many competitors for it.

The hours of business on the Stoik Exchange have varied little since the early days of the institution. They now begin at 11 a.m. and end at 3.30 p.m. on ordinary days except Saturday, but the house remains open procedure. until 4 p.m. On Saturdays the closing hour is 1.30. During the settlement (see Account) the house is kept open till 4.30 p.m. Bargains are " marked, " that is, the prices at which they are " done " are recorded in the official list, between 11 a.m. and 3.30 p.m. on ordinary days, and 11 a.m. and 1 p.m. on Saturdays; the marking of a bargain is effected at the request of the broker who made it; whenever investment purchases are made a large proportion of them are usually marked, as brokers like to be able to show that they did the business at the price stated in the " contract note " sent to the client. The amount of trouble a broker takes for a client is not always realized. An investment order gives much more trouble to a broker than a speculative order. In the former case the broker after arrang- ing the purchase or sale has to perform various operations before ths whole transaction is complete. He has to procure transfer forms, get them properly signed and witnessed, obtain the certificates, if the security dealt in is registered stock or shares, or the bonds if the security is " to bearer. " There may be delay in the delivery of securities bought for which he is not responsible, but for which he may be blamed by an inconsiderate client. In cases of serious and unreasonable delay a broker has the drastic remedy open to him of calling upon the officials of the "buying- in and selling-out department " to buy the stock at whatever price may be necessary, the other party, that is, the jobber with whom he dealt, paying any difference between the agreed price and the price at which the security was " bought-in. " Inscribed stock may be bought in on the day following the day specified for delivery of it.

Bearer securities not punctually delivered may, in some cases, be bought in on the day they were due for delivery. Similar rules apply to unreasonable delay in payment for securities sold, which may be ended by a demand that the Stock shall be " sold out." These rules are intended for use in extreme cases, and are not often resorted to.

Every bargain which a broker executes for a client is under- stood to be " for the account, " unless otherwise specified; that is, the completion of the bargain is understood as intended to take place on the next "settling day." settlement. There are two settlements in securities generally, and one in consols and British government securities, India stock, &c, each month (see Account). The interval between two settlements varies from 12 days to 19 days, but the normal interval is 14 days, and the settlement is usually spoken of as " the fortnightly settlement " or " account." In most securities it would not be easy to deal " for money, " that is, to obtain cash or stock on the day of the transaction; but this can always be done in consols and other British government securities; "money" bargains in these are sometimes very numerous. Of late the practice of dealing in consols for next ordinary (not consols) account has become fairly common, and is now recognized officially.

All bargains for sale or purchase of stock are supposed prima facie to be investments, that is, the form of contract is the same in .all cases. But if a client has bought or sold speculatively he will when the settlement arrives either " close

the account " by effecting a sale, or purchase, of the stock he has operated in, or he may request his broker to " carry over " the bargain or " continue " it until the next Bargains account. This operation may be repeated as often as the client chooses, provided the broker is ready to give the required facilities. But the broke- is under no obligation to carry over, and in times of difficul y, when money is dear, or politics threatening, he would very likely decline to do so. Since about 1890 an increasing number of speculative trans- actions have been effected in a manner which disguises their real character; the security is, to all appearance, bought and paid for in the Stock Exchange, but the client has, as a matter of fact, obtained the money by "pawning" the security with a bank. For many years the relations between the Stock Exchange and the money market l 1 its wider sense (see Market) have been becoming closer; banks now*

lend more freely than they used to, and on a wider range of securities; but they also lend more often direct to the holder of the securities borrowed on, and not through a member of the Stock Exchange. Formerly the usual practice of those banks which had considerable business with the Stock Exchange was to lend large sums on high-class stocks to wealthy brokers, who employed the money inside the house in carrying over the accounts of their clients, or to other brokers whom they trusted. This class of business is still very large, but clients are not now always satisfied to borrow through their brokers; they not infrequently go direct to banks and borrow from them. This practice has its inconveniences: formerly it was possible for the jobbers in all important markets on the Stock Exchange to form a good idea, by comparing notes at each settlement, of what the condition of the speculative account really was, but it is less easy to do so now, because so much stock is " pawned " with banks that the conclusions arrived at by the jobbers from examining only what they are carrying over themselves are liable to be falsified through their finding (a) that the account is either lighter than they expected, stock having been taken off the market temporarily by means of loans obtained from banks; or (b) that it is much heavier than they were pre- pared for, the banks having suddenly refused to lend any longer on a mass of stock they had hitherto been carrying. Banks are apt to be more capricious in their action as regards this class of business than the big " money brokers "; they cannot so well feel the pulse of the market, and are therefore liable to sudden fits of alarm, and also to hurried changes of policy on the part of their boards, which may be, and usually are, based on sound principles, but are not infrequently carried out without sufficient regard to the circumstances existing at the moment chosen for putting them in practice.

Speculative dealings sometimes take the form of " options. " An option is a right to buy or sell a specified quantity of a speci- fied security at a certain price, within a specified period; for this right a sum of cash is paid which is usually quoted as a percentage on the face value of the security. Having paid this sum the purchaser of the option watches the market during the period fixed; if a rise or fall sufficient to show a profit occurs he sells or buys an amount of the security equal to that bargained for in the option contract and informs the broker with whom he " did the option " that he " calls " the security from, or " puts " it on him. If no move- ment, or an insufficient movement, occurs in the price during the specified period, the " option " is " abandoned." This form of transaction is often a useful one for a business man, but attempts have been made

to represent it as a " safe " way of making money on the ground that " risk is limited," and, as such, it has been recommended to inexperienced persons who are foolish enough to wish to speculate without comprehending the nature of speculation. Option dealings are neither more nor less " safe " than other speculative operations. Brokers who quote prices for an option always fix them at a level which will, on the average, make their own positions safe, and their clients, unless they are unusually acute and well informed, are not more likely to make exceptional, or any, profits than by the more usual speculative methods. /

Options.

During recent years the volume of transactions in interest- bearing securities has grown enormously in all the great cities of the world. In London the membership of the The Growth Stock Exchange, the number of securities quoted of stock in the official list, and the number of securities Markets. dealt in, have expanded greatly, and the markets in New York and Paris, especially the former, have acquired enhanced importance. The Berlin Bourse, the business of which was steadily growing during the 'eighties and early 'nineties, was checked in its expansion after 1896 by drastic legislation passed in July of that year against bargains for future delivery, and much of the business of German speculators has been done since then in other exchanges, especially London, Amsterdam and Brussels, but it has grown nevertheless, and if the existing restrictions are removed will grow more. Com- munication between the various great cities of the world is much closer than it was before the telephone came into use; what is known as arbitrage business having attained very large propor- tions. This class of business consists in watching closely the fluctuations in certain securities which are dealt in in two big markets, and simultaneously selling in one and buying in the other. Previous to 1884 and 1885 it was chiefly confined to operations between London and Paris, the difference in the times of London and New York having up till then prevented the growth of a similar business between those cities, as New York morning prices do not reach London till about 3-15 p.m., and the London Stock Exchange is shut at 4 p.m. But in London, about the middle of the 'eighties, the practice of staying in " the street," after the Stock Exchange was shut, to deal in " Americans," began to become common, though many old-fashioned brokers set their faces against it. It is worth noting that in most of the foreign cities there has always been a disposition to stay later than in London, where it was formerly the rule to cease business definitely at a more or less fixed hour. Since 1885 there has been more laxity in this respect, but it is not even yet

the practice to do business in the evening. In Paris, dealing ” on the boulevard ” goes on intermittently in summer as late as 9 p.m. when trade is active.

The market for mining shares had, up to about 1888, held a very small place in the business of the Stock Exchange, but the discovery of an extensive goldfield on the Witwaters- rand in the Transvaal produced a great change. At Market. “ first, although the transactions in the new group of securities were very large, and enormous sums of money were won and lost in them, the ” Kaffir circus,” as it was called, was regarded with contempt by the older habitues of the Stock Exchange, and it was not until the winter of 1 894-1 895, when the number of brokers engaged in the new market had become greater than those in any other, that special recognition was given to the mining department by a rule that the arrangements for carrying over bargains in mining shares should begin the day before the regular settlement \commenced (see Account). Even with these new facilities the Stock Exchange clearing house found it difficult to cope with the huge mass of work thrown on it in 1895, and once or twice it broke down temporarily. Much of the trouble to all concerned arose from the fact that mining shares, like nearly all securities dealt in in London, were ” registered ” and not ” to bearer.” The offices of the companies were naturally not equipped with the staffs that would have enabled them to furnish certificates promptly in the enormous quantities unexpectedly required: it must be remembered that the preparation of a certificate for 50 or 100 shares of £1 each is just as troublesome as the preparation of one for 500 or 1000. The new feature, which upset all calculations, was the extra- ordinary number of small speculative investors who bought and paid for their shares, very often to their subsequent regret. If the shares had been ” to bearer, ” the work could have been done with comparative ease.*

Another remarkable feature of the ” boom,” to use the slang which came into general use during the great speculative mania for South African shares in 1895, was the fact that of the 200 or 300 shares dealt in, less than a dozen were officially quoted

As a rule no quotation was asked for, though a ” special settle- ment ” was obtained. Most of the companies concerned had Mining been registered under the laws of the then existing Shares not South

African Republic. After the Jameson raid nrtfcftf business in the South African market slackened y ‘ somewhat, and there were few new ” Kaffir ” com- panies introduced; but the volume of mining transactions was kept up by the discovery of the Coolgardie goldfields of West Australia, which led to the creation of a great number of com- panies, whose shares were ” introduced ” in London from 1895 onwards. Very few of these also were, or are, quoted in the official list. A minor ” boom ” occurred in the winter of 1900-1901 in West African shares, but although it created a good deal of noise, it was not to be compared in magnitude to the South African and West Australian movements. The West African goldfields are expected by the best authorities to be very pro- ductive eventually, but are at present in an early stage of development.

Recent events have been very unfavourable to the South African market, which has ceased to attract the attention it met with before the South African War. Many jobbers have left it for other markets, and the volume of business in it is so small that the additional day granted for the settlement of bargains in mining shares is said by some to be no longer necessary. Though the older mining markets are comparatively quiet, some new ones have come into existence, especially that for Siberian, British Columbian and New Zealand properties. There has also been an attempt to establish a market for Egyptian securities, chiefly those of land and financial companies; an extraordinary speculation took place in Cairo during 1905-1906, and collapsed in the early part of 1907 with unfortunate results to those who financed it. In 1910 a rubber market became active.

Paris. — The Paris Bourse is an institution of enormous strength, but it plays a smaller part in international business than might be expected, owing to the deep-rooted conservatism and caution of the French people in money matters. It is true that they are liable to occasional outbursts of imprudence, such as led to the loss of great sums in the Panama Canal Company; but, as a rule, it is difficult to induce the average Frenchman to place his money in anything which he does not think a safe interest- yielding security under French law: he almost always wants to invest, not to speculate. In Great Britain and America the distinction between the two is too frequently forgotten. Since the Panama collapse in 1894 the French investor — that is, the bulk of the French nation— has been very prudent. The French have gone on saving money, and have been very difficult to satisfy in the matter of the securities offered to them. Appeals to patriotism have drawn from some French capitalists a con- siderable amount of money from time to time for Russian govern- ment loans, but these appeals were backed by assurances given by large banking

institutions like the Credit Lyonnais, the Comptoir d'Escompte, and the Societe Generale, in addition to the Bank of France, that the interest was secure. As a rule, investments outside France are not popular with the French peasantry and middle classes; but there has always been a minority ready to speculate from time to time, besides the body of professional operators on the Bourse. The dimensions of this minority increased during the last eight or ten years of the 19th century, owing to the attractions presented by the South African goldfields. Operators and speculative investors in France were large holders of South African mining shares when the Boer War broke out in 1899, and though they sold them freely in consequence of the war, they did so with the intention of " coming in " again, and on more than one occasion made tenta- tive purchases. The great banking firms and institutions of Paris have been occupied a good deal with the finances of Spain, Portugal, Egypt, Turkey and other minor countries. They are often large purchasers of British Treasury bills, which during the first two years of the South African War afforded an extra- ordinary opportunity to the investor, it being possible to buy them at prices yielding a rate equal to 3! % per annum during the currency of the bills.

The Paris Bourse exists in virtue of the decree of the 7th of October, 1890, to regulate the execution of article 90 of the Code du Commerce and of the law of the 28th of March 1885, on marcMs a terme, as modified by the decree of the 29th of June 1898. Agents de change, who form the members of the official bourses in France, must be Frenchmen over twenty-five years of age, and must be in possession of civil and political rights. They are " nominated " by decrees countersigned by the minister of finance or the minister of commerce and industry. In a bourse possessing six or more agents de change a parquet may be formed, that is, a portion of the bourse may be railed off to which only agents de change have the right of entry, the rest of the bourse being known as the coulisse. A bourse providec' with a parquet elects a chambre syndicate, or committee, composed of a syndic and members varying in number according to the number of agents in the bourse. The maximum, when there are over sixty . agents, is eight. In Paris there were only sixty agents de change until 1898, but in that year the number !was raised to seventy, owing to the volume of securities to be dealt with on the bourse having expanded considerably. The individual members are not, in law, responsible for any liabilities that may be incurred by fellow-members, but the practice is that the chambre syn- dicate meets the liabilities of any defaulting member. Each member owns what is called a charge, for which he has paid a sum varying from

1,500,000 fr. to 2,000,000 fr. (£60,000 to £80,000) to his predecessor by a private arrangement. In addition the new member must deposit 250,000 fr. (£10,000) as caution monev, and 1 20,000 fr. (£4800) in the caisse commune of the chambre syndicate. The agents de change have a monopoly of many kinds of legal business ; they have various privileges denied to the dealers in the coulisse, as, for instance, the right to sell or buy certain securities for cash, the coulissiers being allowed only to deal for delivery at the settlement. The securities dealt in by the coulisse are known as valeurs en banque, and the coulisse is often called the marche en banque. The agents de change are responsible for the production of the official price list of the bourse, but the coulisse also issues a list of its own. A much bigger business is done in the coulisse than in the parquet, the market for foreign securities being in their hands; many coulissiers are wealthy men.

All continental securities are " to bearer," and when it is desired to induce French capitalists to take an interest in British securities which are inscribed or registered, it has been found necessary to convert a part of the stocks into bearer bonds or shares. The fact that all securities are to bearer has led to special arrangements being made for guarding against the delivery of bonds to which the seller's title may be considered doubtful. A journal called the Bulletin qfficiel des oppositions is published by the syndicat des agents de change, giving the designations and numbers of securities which have been frappes d' opposition, that is, whose currency on the bourse is temporarily stopped, either because they have been stolen or for other reasons. It is always necessary, before taking delivery in London of foreign bonds, to look through this list to see whether the bonds in question are included in it. Settlement (liquidation) in Paris takes place twice a month; that at the end of the month lasts five days, and that in the middle of the month four days. French rentes are " settled " at the end of the month.

New York. — The New York Stock Exchange is a wealthy association consisting of members, who must be citizens of the United States, of twsnty-one years of age or more. Their number cannot be increased except by the governing committee, which consists of the president, treasurer and secretary of the Stock Exchange, and forty members. There are twelve standing committees to deal with various departments of administration, the more important of these being the Admission, Arbitration and Clearing House committees.

Persons attain membership by election, or by transfer from a member who has died or resigned. Various dues and charges are payable by a

new member. A member who is admitted by transfer pays an " initiation fee " of $2000 (£400). When a

transfer is made the approval of the governing committee must be obtained before it can be completed. The person to whom the transfer is made pays a sum to the transferor for his " seat in the house," the amount of which is a matter of private arrange- ment; as much as $90,000 (£18,000) has been paid for a " seat " when business is active, but when it is quiet the price falls considerably below ithis. A member may transfer his seat to his son (if the committee approve) without charging anything for it; but in all cases the transferee pays the above-mentioned initia- tion fee of $2000.

The gratuity fund is an arrangement for providing for the families of deceased members. Every member on election pays $10 to this func ; when a member dies an assessment of $10 is levied on all other members, and the Stock Exchange hands over $10,000 (£2000) to the family of the deceased.

The New York Stock Exchange building is opened at 9.30 a.m., but business does not begin until 10 a.m. The daily session continues until 3 p.m. No transactions must be BusTness. entered into before 10 a.m. or after 3 p.m. (with certain exceptions) under severe penalties. The object of this is to enable all members to feel secure that no business has been done except within the official period, during which they are prepared to watch the market or provide for its being watched. Loans of money or securities, that is, what is called in London contango and backwardation business, may be arranged after 3 p.m. This latter provision is a necessary result of the settling arrangements on the Exchange.

Transactions may be: (a) for cash, in which case payment is made or stock delivered the same day; (b) " the regular way," i.e. the transaction is to be completed on the following day to that on which the bargain was made; (c) " three days," in this case the bargain must be carried out in three days; (d) in the case of options bargains may be made up to a limit of sixty days. If no time is specified when the bargain is made it is treated as being " regular way." It will be seen that these arrangements differ materially from those in London, Paris and Berlin, where business is done on the basis of fortnightly or, in the case of some classes of securities, monthly settlements.

New York has a daily settlement for the bulk of its transactions.

All leading banking and finance houses in New York have one partner who is a member of the Stock Exchange and attends to the firm's stock business. All partnerships in which a member is interested must be disclosed to the governing committee, who have very wide disciplinary powers which they can use if any- thing is done which is contrary to the rules, or the spirit of the rules, of the Exchange.

The Exchange building is situated in Wall Street, and the Exchange is colloquially known as " Wall Street," just as the London Exchange is sometimes called " Throgmorton Street " or " Capel Court." It has in it accommodation including a telephone installation for each member and a large staff of messengers, &c, for their service. The Exchange has met in the past with difficulties of the same kind as have troubled the London Exchange. In 1898 it was found necessary to regu- late the growth of direct dealings with provincial exchanges, which were held to constitute a breach of the rules relating to commissions. Dealing for " outside " exchanges of an irregular character was forbidden in 1896.

The New York Exchange is often the scene of gigantic specula- tive movements, and enormous sums are won and lost on it from time to time; but a huge investment business, or, at any rate, what is intended to be investment business, is done in Wall Street. Too frequently, however, the ideas of the purchaser as to what constitutes an investment are not very clear, and he finds that he has acquired a speculative article; this is inevitable in a country which still contains a good deal of dormant wealth which must sometimes be developed by new methods whose merits, when expressed in terms of capital expenditure, are not always as great as their enthusiastic authors imagined they would prove.

Berlin. — The business of the Berlin Borse is conducted under the strict regulations of the Imperial German law of the 22nd of

June 1896, a measure which was intended to put a check on speculation in stocks and commodities in the supposed interests of the community. The term " Borse " is applied equally to the EJfectenborse (or Fondsborse) , that is, the " market for securities " (the Stock Exchange), and to the Warenborse in which commodi- ties are dealt in. " Borse " is, in fact, a term equivalent to "exchange" as used in the expressions "stock exchange," " corn exchange," " wool exchange," &c. The brokers {Mahler) who carry on business at the

Berlin Bourse are under the super- vision of the Ober- President of the province of Brandenburg and the Ober- President of the city of Berlin, in accordance with the terms of the Maklerordnung fiir die Kursmakler an der Berliner Bdrse, which was issued in the form of a decree (Dec. 4, 1896) of the ministers of trade and industry.

The Bourse opens at 11.50 a.m. and closes at 3 p.m. for official dealings, and a quarter of an hour before and half an hour after those hours for " unofficial dealings." The unimportant part which the Berlin Bourse plays in the world of finance, owing to the legislative shackles with which it is loaded, has led to a movement in favour of a reform of the law, which would give more freedom to legitimate speculation in commodities as well as in securities. (W. Ho.)

STOCKHOLM, the capital of Sweden, on the east coast, not far south of the junction of the Baltic Sea and the Gulf of Bothnia. It is celebrated for the beauty and remarkable physical characteristics of its situation. The coast is here thickly fringed with islands (the skarg&rd), through which a main channel, the Saltsjo, penetrates from the open sea, which is nearly 40 m. from the mainland. A short stream with a fall normally so slight as to be sometimes reversed by the tide, drains the great lake Malar into the Saltsjo. The scenery of both the lake and the skarg&rd is similar, the numerous islands low, rocky, and generally wooded, the waterways between them narrow and quiet. The city stands at the junction of the lake and the sea, occupying both shores and the small islands intervening. From the presence of these islands a fanciful appellation for this city is derived — " the Venice of the North "; but actually only a small part is insular. There are three main divisions, Staden, the ancient nucleus of the city, properly confined to Stadholmen (the city island) which divides the stream from Malar into two arms, Norrstrom and Soderstrom; Norrmalm on the north shore of the channel, and Sodermalm on the south. The ancient origin of Staden is apparent in the narrow and winding streets, though the individual houses are not very old, owing to the ravages of frequent fires. A few, siadea. however, preserve antique narrow fronts with gables, as in some of the North German towns. The old market, still called Stortorg (great market) is now one of the smallest in Stockholm. At the north angle of the island is the Royal Palace (Slolt). The original building was destroyed by fire in 1697, the body of Charles XI. being with difficulty rescued from the flames. A new palace after designs of Nicodemus Tessin the younger (d. 1728) was not completed, owing to wars and the general distress, until 1754; while a restoration carried out in 1 901 included many ornamental details devised by

the architect, and executed at the expense of King Oscar II. The palace is quadrangular with two wings towards the east and four (two straight and two curving) towards the west. The style, that of the Italian Renaissance, is noble and refined, the royal apart- ments rich in treasures of art. In the north-east wing is a museum of armour and costume, one of the finest of the kind existing. West of the palace are the offices of the majority of the ministries, some of them in the former buildings of the Royal Mint. Beyond these, on the west side of the island, is a square named from the palace on its northern side, the Riddarhustorg. The Riddarhus (house of the nobility) was the meeting-place of the Council of the Nobles until 1866, and its hall is adorned with the armorial bearings of noble families. In the northern fore- court is a statue (1890) of Axel Oxenstjerna, the chancellor, by J. Borjeson. The town-hall is also in Riddarhustorg, and a statue of Gustavus Vasa, unveiled in 1773 on the 250th anniver- sary of his accession to the throne, stands here. Southrwest of

STOCKHOLM

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STOCKHOLM

and Environs

English Miles

1. Stortorg (Great Martlet)

2. Slott (Royal Palace)

3. Riddarhustorg

4. Storkyrha

5. Helgeandsholmen

6. Gustaf-Adolfs-Torg

7. Karl-den~Tolftes-Torg

8. Kungstradgard (Royal Garden)

9. Klarakyrka

10. Cenfra/ Railway Station

11. Observatory

12. St Johanneskyrka

13. Caroline Medical Institute

14. Serafimer Hospital

_ ˆni 15. Royal Library

r& JˆS?\ 16. National Museum

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the Royal Palace is the Storkyrka (great church), dedicated to St Nicholas, the oldest church of Stockholm, though greatly altered from its original state. The date of its foundation is 1264; but it was practically rebuilt in 17 26-1 743. Within it is richly adorned with paintings and wood-carving. Staden is the commercial centre of the city. At the broad shipping quay (Skeppsbro) which flanks the palace on the north and east, most of the sea-going steamers lie; and the exchange, custom-house, numerous banks and merchants' offices are in the immediate vicinity. Riddarholmen (nobles' island), lying immediately west of Stadholmen, contains the old Franciscan church (Riddar- hohnskyrka), no longer used for regular service, which since the time of.Gustavus Adolphus has been the burial-place of the royal family. It contains many trophies of the European wars of Sweden. On one side of it stands the old house of parliament; on the other a statue of Birger Jarl, the reputed founder of the city. On Riddarholm also are various government offices, and most of the steamers for Malar and the inland navigation lie alongside its quays.

Staden is connected with Norrmalm by the Norrbro (north bridge) and Vasabro, the first crossing Helgeandsholmen (the v„~ˆ..i™ island of the Holy Spirit), on which are the new Houses of Parliament and the Bank of Sweden. A third bridge connects with the main thoroughfare of Norrmalm, Drottningsgatan (Queen Street). The Norrbro gives upon Gustaf-Adolfs-Torg, where a statue of that king

stands between the royal theatre, royal opera house and the palace of the crown prince. Norrmalm is the finest quarter of the city, with broad straight streets, several open spaces with gardens, and handsome buildings. East and north of the theatre royal, the

Karl-den-Tolftes-Torg and Kungstradgard (royal garden) form the most favoured winter promenade. There are a statue of Charles XII. and a fountain with allegorical figures, by J. P. Molin, also a statue of Charles XIII. , and in the small Berzelii Park close at hand one of the chemist J. J. Berzelius. Near Drottningsgatan is the Klara church, the burial-place of the poet K. M. Bellman, and west of this, occupying one side of a square, is the central railway station. In the building of the academy of science is the national museum of natural history, including mineralogical, zoological, and ethnographical departments. Drottningsgatan terminates at the observatory, on a rocky eminence, near which are the offices for the distribution of the Nobel fund. To the east the modern Gothic church of St Johannes, with a lofty spire, stands con- spicuously on the Brunkebergsas, one of the highest points in the city. To the north is the small Vanad's Park. To the west is the modern quarter of Vasastad, with its park. On the island of Kungsholm, south of Vasastad, are the Caroline medical institute, several hospitals, the principal of which is the Serafimer (1752), the royal mint and factories. Ostermalm, lying east, that is, on the seaward side, of Norrmalm, is a good residential quarter, containing no public buildings of note, save the barracks of the Swedish Guards and the fine royal library, which is entitled to receive a copy of every work printed in Sweden. The library stands in the beautiful park of Humlegard (hop-garden), in which is also a statue of Linnaeus. South of Ostermalm, and east of the Kungstradgard and Staden, lies the peninsula of Blasieholm (formerly an island) and, connected by bridges, the islands of Skeppsholm and Kastellholm, the three forming the foreground in the beautiful seaward view from the Norrbro. On the first

is the national museum (1866), a Renaissance building, contain- ing historical, numismatic and art-industrial collections, with ancient and modern sculptures, picture-gallery and engravings. The numismatic collection is notable for its series of Anglo- Saxon coins. About 11,000 pieces came from the island of Gotland, some dating from 901-924, but the majority are later. In front of the museum is a bronze cast of the famous group of J. P. Molin (1859), the

Baltespannare (belt-bucklers), repre- senting an early form of duel in Scandinavia, in which the combatants were bound together by their belts. On Skeppsholm are naval and military depots, and on Kastellholm a small citadel. East of Skeppsholm an inlet, Ladugardslandsviken, so named from the proximity of the former royal farm-yard (ladugdrd), and bordered on the mainland by a quay with hand- some houses called Strandvagen, throws off a narrow branch (Djurgardsbrunnsviken) and separates from the mainland an island about 2 m. in length by f m. broad. This is mainly occupied by Djurgarden (the deer-park), a beautiful park con- taining the buildings of the northern museum, a collection of Scandinavian costumes and domestic and agricultural utensils, and a biological museum housed in a wooden building imitating the early Norwegian timber churches (stavekirke) . Here also is Skansen, an ingenious reproduction in miniature of the salient physical features of Sweden with its flora, fauna, and character- istic dwellings inhabited by peasants in the picturesque costumes of the various districts. Both the northern museum and Skansen were founded by Dr Arthur Hazelius (1833-1901). There is a bust of the poet K. M. Bellman, whose festival is held on the 26th of July. Sodermalm, the southern quarter, is principally residential. Rocky heights rise to 1 20 ft. above the water, and two steam lifts, Katarina-Hissen and Maria-Hissen, surmount them.

Environs. — The beautiful environment of sea and lake is fully appreciated by the inhabitants. To the north of the city, accessible by rail and water, are the residential suburbs of Haga and Ulriksdal, with royal chateaux, and Djursholm. Saltsjo- baden. 9 m. east of Stockholm, on Baggensfjord, is the nearest and most favoured seaside resort, but Dalaro (20 m. south-east) and Nynashamn (39 m. south) are much frequented. Vaxholm, 12 m. north-east by water, is a pleasant fishing-village where nurflerous villas have been built. A fortification on one of the islands here was erected by Gustavus Vasa, but has been modern- ized and is maintained.

Educational and Scientific Institutions. — Stockholm has no state university. A private university (Hbgskoler) was founded in 1878, and was brought under state control in 1904. The president of the governing body is appointed by the government, while the appoint- ment of the remaining members is shared by the Swedish Academy, the Academy of Sciences and the City Council. The faculties are four — philosophy and history, philology, mathematics and natural sciences, and jurisprudence. The Caroline Institute (Karolinska Mediko-Kirurgiska Institut) is a medical foundation dating from 1815, which ranks since 1874 with the state universities of Upsala

and Lund in the right to hold examinations and confer degrees in its special faculty. Special and secondary education is highly developed ; there are schools of agriculture, mining and forestry, military schools, technical schools, a veterinary school, a school of pharmacy, &c. Among the public colleges under state control, one, the Nya Elementarskolan, was founded experimentally in 1828, after the Education Committee of 1825-1828, among the membersof which were Tegner and Berzelius, had reported on the want of such schools. This school retains its separate governing board ; whereas others of the class are under a central board. The control of the primary schools in the parishes is similarly centralized ; whereas in Sweden generally each parish has its school-board. Stockholm is the seat of the principal learned societies and royal academies (see Sweden). There are schools of painting, sculpture and architecture under the direction of the Royal Academy of Arts; a conservatory of music under that of the Royal Academy of Music; and experimental gardens and laboratories under the Royal Society of Agriculture. The Natural History Museum, the observatory and meteorological office, and the botanical gardens are under the supervision of the royal academy of sciences. Minor collections deserving mention are the museums of the geological survey and the Caroline Medical Institute, and the archives in the record office (Riksarkivet).

Recreations. — Among places of entertainment, the royal theatre is managed by a company receiving a state subsidy. The Dramatic Theatre (Dramatiska Teatern), in Kungstradgards-Gatan, the Swedish (Svenska) theatre in Blasieholms-Gatan, and the Vasa theatre in Vasa-Gatan may also be mentioned. The Djurgard is

the principal place for variety entertainments in summer. Several of the- leading sporting clubs have their headquarters in Stockholm. An annual regatta is held early in August by the Royal Swedish Yacht Club {Svenska Segelsallkapet). A harbour much frequented by yachts is Sandhamn in the outer skdrgdrd. The Stockholm General Skating Club {Almdnna Skridskoklubb) is the leading institu- tion for the most favoured winter sport. A characteristic spectacle in winter is the tobogganing in the Humlegard on holidays. The principal athletic ground is the Idrottspark (Sports Park), on the north side of Ostermalm, with tennis courts and a cycling track, which may be changed into a skating-rink in winter. There is a similar park at Djursholm.

Commerce. — The industries of Stockholm are miscellaneous. The value of the output of these is nearly thrice those of Malmo or Gothen- burg, the next most important manufacturing towns, and the

indus- tries^ Stockholm exceed those of every Ian (administrative division) except Malmohus. The iron and steel industries are very important, including engineering in every branch, and shipbuilding. Factories for articles of human consumption {e.g. breweries and tobacco works) are numerous; and cork, wood, silk and leather works may also be mentioned. Fine ware is produced by the Rorstrand and Gustafs- berg porcelain works. In addition there are various government works, as the mint and printing works. Stockholm is the first port in Sweden for import trade, but as regards exports ranks about level with Malmo and is exceeded by Gothenburg. The imports average nearly 30% of those of the whole country, but the exports only 9 %, Stockholm having proportionately little share in the vast timber export trade. Vessels of 23 ft. draught can go up to the city (Skeppsbro and Blasieholm quays), and there is an outport at Vartan on the Lilla Vartan channel to the north-east.

Government. — Stockholm is the centre of government and the usual residence of the king; in summer he generally occupies one of the neighbouring country palaces. The city is the seat of the high court of justice (Hogsta Domstolen) and of the court of appeal for the northern and midland districts (Svea Hofrali). It is one of the two Swedish naval stations (Karlskrona being the principal one), and the headquarters of the fourth and fifth army divisions. As regards local government, Stockholm is a Ian (administrative district) in [itself, distinct from the rural Ian of the same name, under a high governor (dfverstathdttare) and deputy, with departments for secretarial work, taxation and police. The city is in the diocese of Upsala, but has a separate consistory, composed of the rectors of the city parishes, the president of which is the rector of St Nicholas (Storkyrka) .

Population. — Thepopulation of Stockholm in 1900 was 300,624. In 1751 it was 61,040; in 1850, 93,070; and in 1880, 176,875.

History. — Before the rise of Stockholm, Bjorko, Sigtuna and Upsala were places of great importance. Bjorko (" the isle of birches "), by foreign authors called Birka, was a kind of capital where the king lived occasionally at least; history speaks of its relations with Dorestad in the Netherlands, and the extensive refuse heaps of the old city, as well as the numerous sepulchral monuments, show that the population must have been large. But though situated at a central point on Lake Malar, it was destroyed, apparently before the beginning of the nth century (exactly when or by whom is uncertain) ; and it never recovered. Sigtuna, lying on the shore of a far-reaching northern arm of Lake Malar, also a royal residence and the seat of

the first mint in Sweden, where English workmen were employed by King Olaf at the beginning of the nth century, was destroyed in the 1 2th century. Stockholm was founded by Birger Jarl, it issaid, in or about 1255, at a time when pirate fleets were less common than they had been, and the government was anxious to establish commercial relations with the towns which were now beginning to flourish on the southern coast of the Baltic. The city was originally founded as a fortress on the island of Stadholm. The castle was erected at the north-eastern corner, and the city was surrounded with walls having fortified towers on the north and south. It came to be called Stockholm (" the isle of the log," Latin Holmia, German Holm) ; the true explanation of the name is not known. During the middle ages the city developed steadily, and grew to command all the foreign commerce of the midlands and north, but it was not until modern times that Stockholm became the capital of Sweden. The medieval kings visited year by year different parts of the kingdom.

See P. R. Ferlin, Stockholms Stad (Stockholm, 1854-1858); C. Lundin and A. Strindberg, Gamla Stockholm (Stockholm, 1882); C. Lundin Nya Stockholm (Stockholm, 1890) ; G. Nordensvan, Malar-drotlningcn ["the queen of Malar"] (Stockholm, 1896); E. W.

Dahlgren, Stockholm, Sveriges hufvuslad skildrad (Stockholm, 1897, issued by the municipal council on the occasion of the Stockholm Exhibition, 1897).

STOCKING (a diminutive of " stock," post, stump, properly that which is stuck or fixed), a close-fitting covering for the foot and lower part of the leg, formerly made of cloth but now of wool, silk or cotton thread knitted by hand or woven on a frame (see Hosiery). " Stock " being the stump, i.e. the part left when the body is cut off, the word was applied to the whole covering of the lower limbs, which was formerly in one piece, the " upper- stocks " and " nether-stocks " forming the two pieces into which it was subsequently divided, when the upper part became the trunk hose and later knee-breeches, the lower the " stockings." A parallel is found in French; the hose are chausses, the upper part haul de chausses, the stockings bas de chausses, or simply bas. The German StrumpJ, stocking, means also a stump, pointing to the original use of the word. Half-stockings, reaching to the lower part of the calf of the leg, and worn by men since the use of the long trousers has superseded knee-breeches, and

also by children, are usually styled " socks." This word is an adaptation of Latin soccus, a slipper or light shoe. It was the shoe worn by the actors in Roman comedy — and so was used symbolically of comedy, as " buskin," the high boot or cothurnus, was of tragedy.

STOCKMAR, CHRISTIAN FRIEDRICH, Baron von (1787- 1863), Anglo-Belgian statesman, who came of a Swedish family, was born at Coburg on the 22nd of August 1787. He waseducated as a physician, and in that capacity became attached in 1816 to Prince Leopold of Saxe- Coburg- Gotha on his marriage to Princess Charlotte of England. When she died next year he remained Leopold's private secretary, controller of the household and political agent, until the prince became in 1831 king of the Belgians. He was thus brought into contact with the leading statesmen of Europe, and his disinterestedness and profound acquaintance with English and European social and political questions impressed themselves on all who were associated with him. In 1831 he retired to his home at Coburg, in order not to excite Belgian jealousies by residing at his master's court in the capacity of confidential adviser, but he continued to be Leopold's right-hand man. In 1837 Leopold sent him to England as adviser to the young Queen Victoria, and in the next year he accompanied Prince Albert (afterwards Prince Consort) on his tour in Italy, partly as tutor but also with the direct object of satisfying King Leopold and the queen as to the fitness of the prince for the position already marked out for him in England. He won -the complete confidence of the prince as well as of the queen, and on their marriage in 1840 he became their trusted though unofficial counsellor, dividing his time more or less between England and the Continent. In 1848 he was the ambassador of Coburg to the German parliament. He had at heart the unity of Germany under Prussia and close relations between Germany and England, and for these he steadfastly worked; but his political activity was a good deal resented in English circles, which were jealous of Prince Albert's — and generally of German — influence. He died at Coburg on the 9th of July 1863.

See the articles on Victoria, Queen; and Albert, Prince Consort. Selections from Stockmar's papers were published by his son Ernest in 1872, and a biography by Justi appeared at Brussels in 1873; see also The Letters of Queen Victoria (1907).

STOCKPORT, a municipal, county and parliamentary borough of England, mainly in Cheshire, but partly in Lanca- shire, 6 m. S.E. of Manchester. Pop. (1901), 92,832. Itoccupies a hilly site at the

junction of the rivers Tame and Mersey; the larger part of the town lying on the south (left) bank, while the suburb of Heaton Norris is on the Lancashire bank. Several bridges cross the stream, and a lofty railway viaduct bestrides the valley. Stockport is served by the London & North Western, Midland, Great Central, Cheshire lines, and Sheffield & Midland railways, and has tramway connexion with Man- chester. It is a town of varied industries, but the most important are the cotton and hat manufactures. The church of St Mary was built mainly c. 1817, but the chancel belonged to a former church, and retains a Decorated east window and other good details. The town hall was designed by Sir Brumwell Thomas,

and opened in 1908, and St George's church (1897). On the acquisition of the market rights by the town from Lord Vernon in 1847 the corporation secured the site of Vernon Park, in which stands a museum presented in 1858 by James Kershaw and John Benjamin Smith. The grammar school was founded in 1487 by Sir Edmund Shaa or Shaw, lord mayor of London. The Stockport Sunday school, founded in 1784, is one of the largest in England. Stockport was enfranchised in 1832, and returns two members. Its most distinguished representative was Richard Cobden (1841-1847), who is commemorated by a statue in St Peter's Square. The town was incorporated in 1835, and is under a mayor, 16 aldermen and 48 councillors. The county borough was created in 1888. Area, 5492 acres.

During the Roman occupation of Britain there was a small military station on the site of Stockport, acting as an outpost to the Roman camp at Manchester. The convergence of Roman roads at this point would make the place a particularly convenient centre. The etymology of the name may be Saxon,' but there is no evidence of a Saxon settlement, and the place is not mentioned in Domesday. A castle was in existence in the 1 2th century, but is not mentioned after 1327. Stockport (Stokeporte, Stopport, Stopford) was made a free borough by a charter of Robert de Stokeport about the year 1220. It was then granted that the burgesses might elect from among themselves a chief officer, who was first called a mayor in 1296. The right of the burgesses to his election was, however, lost, and the mayor was always nominated by the lord of the manor. This arrangement lasted until 1565, when the burgesses put in a claim to their right of election, and it was decided that out of four burgesses nominated by the lord of the manor the jury of the court Ieet should select the mayor. Thus Stockport was not a true municipal borough until formally incorporated under the Municipal Corporations Act of 1835. The manufacture of hemp began in Stockport in the 16th

century, and that of silk-covered buttons in the 17th. In 1732 a silk mill was erected, but the silk trade was superseded by the cotton trade early in the 19th century. The hat trade developed at least as early as the end of the 18th century.

See Henry Heginbotham, Stockport Ancient and Modern (1882) ; J. P. Earwaker, East Cheshire (1877); John Watson, Memoirs of the Earls of Warren and Surrey (1782).

STOCKS, a wooden structure formerly in use both on the continent of Europe and in Great Britain as a method of punishment for petty offences. The culprit sat on a wooden bench with his ankles, and sometimes his wrists or even neck, thrust through holes in movable boards, generally for at least several hours. That stocks were used by the Anglo-Saxons is proved by their often figuring in drawings of the time (see Harleian MSS. No. 65). The second Statute of Labourers (1350) ordered the punishment for unruly artisans. It further enjoined that stocks (ceppes) should be made in every town between the passing of the act and the following Pentecost. The act appears to have been ill observed, for in 1376 the Commons prayed Edward III. that stocks should be set up in every village. Though never expressly abolished, the punishment of the stocks began to die out in England during the early part of the 19th century, though there is a recorded case of its use so late as 1865 at Rugby. In many of the villages in the country may still be seen well-preserved examples of stocks, in some cases with whipping posts attached. In the United States stocks were of frequent use in the 18th century, more particularly in the New England States; while in the Southern States they were employed for punishing slaves. _ STOCKS and SHARES. A " share," in the financial sense, is simply the right to participate in the profits of a particular joint- stock undertaking. In the United Kingdom, in the case of a company constituted under the Companies Acts 1862-1907 as a company limited by shares, the memorandum of association is required to state— among other matters — the amount of capital

with which the company proposes to be registered and the amount of the shares into which such capital is divided. Company statistics show a tendency of late years on the part of companies to register with a smaller nominal capital than they did. The tendency too has been to lower the denomination of the shares. £100 shares, for

instance, are now very rare. £i shares and £5 shares are the most common. They obviously appeal better to the small investor. A typical capital clause runs thus: " The capital of the company shall be £100,000 divided into 100,000 shares of £1 each with such rights as regards dividends and other privileges as are defined by the company's articles of association for the time being," or " The capital of the company is £150,000 divided into 50,000 preference shares of £1 and 100,000 ordinary shares of £1 each. Such preference shares shall confer a right to a fixed cumulative preferential dividend at the rate of 10% per annum." The form of capital clause varies of course, but the more approved practice now is to leave the rights of prefer- ential shareholders to be defined by the articles, and for this reason: that if such rights are fixed by the memorandum of association without qualification they cannot be subsequently varied. Articles, on the contrary, are always alterable, and as the preference shareholder takes his shares subject to this known liability to alteration no wrong is done him. If the powers of alteration were abused so as to amount to a fraud by the ordinary shareholders on the minority of preference shareholders the court would probably interfere by injunction. The preferential or other special privileges of any particular class of shareholders are now further safeguarded by s. 30 of the Companies Act 1907. The right of a preference shareholder is commonly confined to a preferential dividend and this dividend is prima facie cumulative, that is to say if the profits of the particular year are insufficient to pay it the deficiency must be made good out of the profits of subsequent years: but it is very common to give preference shareholders priority also as regards capital in the winding-up. Founders' shares originated with private companies, being a convenient means of securing to the partners in the vendor firm, on conversion, the control of the business as well as the lion's share of the profits. Thence they passed to ordinary trading companies, that is, companies which appeal to the public for their capital. Founders' shares in this connexion commonly entitle the holders to one-half or one-third of the company's profits after payment of a fixed dividend of, say, 7 to 10% to the ordinary shareholders. Founders' shares are mostly subscribed for by the vendors or promoters, though sometimes used by way of bonus to attract subscribers for the ordinary or deferred shares. They are now becoming rare.

Share Warrants to Bearer. — The Companies Act (1862) made no provision for the creation of shares to bearer. All shares under the act are registered and the title on the register is evidenced by a share certificate. The act of 1867 introduced shares to bearer under the

title of " share warrants to bearer." A share warrant entitles the bearer to the shares or stock specified in it and such shares or stock are transferable by delivery. of the warrant. The warrant is always treated as a negotiable instrument.

" Stock " in the case of companies constituted under the Companies Acts 1862-1907 is created by converting paid-up shares into stock. This may be done under s. 1 2 of the Companies Act 1862 by resolution. Under the same section a company may increase its capital by the issue of new shares or consolidate it into shares of larger amount; and by s. 21 of the Companies Act 1867 a company may subdivide its shares. The Companies Act 1907 (s. 39) gives a company a further power by special resolution, confirmed by an order of the court, to reorganize its capital, whether by the consolidation of shares of different classes or by the division of its shares into shares of different classes — but no preference or special privilege attached to any class of shares is to be interfered with except by a resolution passed by a majority of shareholders of that class representing three-fourths of the capital of that class. A limited company cannot reduce its capital without the sanction of the court.

Public Companies. — The provisions as to shares and stock under the Companies Clauses Acts 1845, 1863, 1869, are, with a few exceptions, analogous to those under the Companies Acts.

The capital of the company is to be divided into shares of a certain number and amount. A share register is to be kept and certificates are to be issued to shareholders; and power is given to convert paid-up shares into a general capital stock to be divided among the shareholders according to their respective interests therein. Such stock has been called a " set of shares put together in a bundle." Preference shares may be created, but there is this difference between preference shares under the Companies Clauses Act and under the Companies Acts, that under the Companies Clauses Acts preference shares are entitled to dividends only out of the profits of each year; under the Companies Acts the dividends as above stated are prima facie cumulative. Shares and stock may under the Companies Clauses Act be issued at a discount; under the Companies Acts they cannot. Under the Companies Clauses Acts if the old shares of the company are at a premium any new shares are to be offered first to the old shareholders. This is not found in the Com- panies Acts, but a similar provision is commonly inserted in the articles of companies formed under the acts. (E. Ma.)

STOCKTON, FRANCIS RICHARD (1834-1902), American novelist,

was born in Philadelphia, Pennsylvania, on the 5th of April 1834. He had a high school education; became a skilled wood engraver; wrote for the Philadelphia Morning Post, the New York Hearth and Home, Scribner's Monthly and St Nicholas, of which he became assistant editor in 1873; and about 1880 he gave up editorial work for independent authorship. Thereafter he lived in Nutley; New Jersey, in Convent, New Jersey, and after 1899 in the Shenandoah Valley, near Charles Town, West Virginia. He died in Washington, D.C. on the 20th of April 1902. His fanciful stories for children made him very popular; among them are The Ting-a-Ling Stories (1870), Roundabout Rambles in Lands of Fact and Fancy (1872), What Might Have Been Expected (1874), Tales Out of School (187 5) , A Jolly Fellowship (1880), The Floating Prince and Other Fairy Tales (188 1), The Story, of Viteau (1884), Personally Conducted (1889), and Captain Chap (1897). His amusing and original Rudder Grange (1879), a series of sketches rather than a novel, established his reputation with older readers and is his best long work. His peculiar talent was for the short story; and the best examples are the title stories of the volumes The Lady or the Tiger? (1884), one of the most popular of American stories, The Christmas Wreck (1886), The Bee Man ofOrn (1887), (also in the latter volume " A Tale of Negative Gravity "and" The Remarkable Wreck of the Thomas Hyke "), and the novelette The Casting Away of Mrs Leeks and Mrs Aleshine (1886), with its sequel The Dusantes (1888).

Among his other works of fiction are The Late Mrs Null (1886), The Hundredth Man (1887), Amos Kilbright: his Adscititious Experiences, with Other Stories (1888), The Great War Syndicate (1889), The Merry Chanter (1890), Ardis Claverden (1890), The Rudder Grangers Abroad, and Other Stories (1891), The House of Martha (1891), The Squirrel Inn (1891), The Watchmaker' s Wife and Other Stories (1893), Pomona's Travels (1894), The Adventures of Captain Horn (1895), with its sequel, Mrs Cliff's Yacht (1896), The Great Stone of Sardis (1898), Kate Bonnet (1902), and The Captain's Toil- Gate (with a memoir by Mrs Stockton, and a bibliography, 1903).

STOCKTON, a city and the county seat of San Joaquin county in central California, U.S.A., at the head of the Stockton channel of the San Joaquin river, about 48 m. S.E. of Sacramento. Pop. (1900), 17,506, of whom 4057 were foreign-born; (1910 census) 23,253. It is served by the Atchison, Topeka & Santa Fe, the Western Pacific and the Southern Pacific railways, and has also a considerable river trade with San Francisco. It is at the head of regular navigation on the river; at high water boats occasionally go to Hills Ferry, 150 m.

beyond Stockton. The channel has been much improved by the Federal government since 1877. Stockton has a perfectly level site, broad streets and a regular plan. In the city are a good public library, the San Joaquin county law library, St Agnes academy, St Mary's college, a children's home (1896; under the Ladies' Aid Society), St Joseph's home (1899) for the aged, and St Joseph's hospital (1899), both under the Sisters of St Dominic, the Pacific hospital, a county hospital and a state hospital for the insane (1851). Situated in the great valley of the San Joaquin, in the midst of a

rich agricultural region, it is one of the largest grain, vegetable and fruit markets of the West. It manufactures flour, lumber, agricultural machinery and implements, &c. Its factory product in 1905 was valued at $8,029,490, or 45-3% more than in 1900. Stockton rose into prominence in the early mining days. A settlement named Tuleberg, later called New Albany, stood on the city site in 1847; its future was precarious when the dis- covery of gold insured its prosperity. In the spring of 1849 a town was laid out and the present name adopted in honour of Commander Robert Field Stockton (1795-1866), who with Colonel John C. Fremont and General Stephen W. Kearny had gained possession of California for the United States during the war with Mexico. In 1850 Stockton became the county-seat and was chartered as a city.

STOCKTON-ON-TEES, a market town, municipal and parliamentary borough, and port of Durham, England, on the N. bank of the Tees, 55 m. above its mouth, and on the North Eastern railway, 236 m. N. by W. from London. Pop. (1901), 51,478. The parliamentary borough extends across the river into Yorkshire, to include the municipal borough of Thornaby-on- Tees. At Norton, 1 m. north, the church of St Mary, formerly collegiate, shows fine Norman work. The chief buildings are a town hall, with clock-tower and spire, borough-hall, exchange and public library. The quays are accessible to vessels drawing 20 ft. at high water spring tides. There are extensive steel works, blasting furnaces, iron and brass foundries and rolling-mills; and iron shipbuilding is an important industry. There are also sailcloth works, potteries, breweries and brick and tile works. Exports (iron manufactures, coal and agricultural produce) were valued at £435,439 in 1900; imports (timber, iron, grain, &c.) at £280,371; trade being chiefly with Holland and the Baltic ports, and coastal. The parliamentary borough returns one member. The municipal borough is under a mayor, 10 aldermen and 30 councillors, and has an area of 2935 acres.

It would seem that Stockton (Stokton) grew up round the castle of the bishops of Durham, to whom the town belonged even before their purchase of the earldom of Sadberge. In n 83 the Boldon Book records that the whole town rendered one milch cow and the ferry twenty pence to the bishop. The castle was probably built between 1183 and 1214. King John visited Bishop Philip of Poitou (d. 1 208) there and is said to have granted the place a charter similar to that of Hartlepool in 1214. Of this, however, no traces remain, the rights of the borough, which must have come into existence during the 13th century, being purely prescriptive. Stockton was divided into two parts: the " town," governed by the bailiff of the bishop and afterwards by the vicar and vestrymen, and the borough, under a mayor and alder- men. The bishop's bailiff was also the keeper of the castle, though in the 17th century the office belonged to the borough-bailiff. The borough is first mentioned in 1283, when the king took tallage from it during the vacancy of the see. It occurs again in a record of 1328, and in 1344 the mayor and bailiffs entered into an agreement with the mayor and bailiffs of New- castle for the regulation of trade between the two places. Bishop Hatfield's survey (1377-1382) gives a list of tenants within the borough: 22 burgages and 15 half-burgages are mentioned, the rent of which varies from twenty-two pence to a penny half- penny. In 1644 the parliamentary troops besieged and captured the castle, which was dismantled in 1652. In 1666 the popula- tion was only 544, for Stockton was an

isolated place with little trade. It became a parliamentary borough, returning one member, in 1867. In 1310 the bishop gave the town a market and a fair during the octave of the Translation of St Thomas the Martyr, reserving to himself the tolls; Bishop Morton revived the market, which had lapsed at the beginning of the 17th century. Camden speaks of Stockton as a neat, well-built corporation town and especially commends the ale brewed there and sent to various parts of the country. The importance of Stockton as a port dates from the end of the 18th century, when there was a considerable trade in lead, dairy produce and timber.

STODDARD, RICHARD HENRY (1825-1903), American author, was born in Hingham, Massachusetts, on the 2nd of

July 1825. He spent most of his boyhood in New York City, where he became a blacksmith and later an iron moulder, but in 1849 he gave up his trade and began to write for a living. He contributed to the Union Magazine, the Knickerbocker Magazine, Putnam's Monthly Magazine and the New York Evening Post. In 1853 Nathaniel Hawthorne helped him to secure the appointment of inspector of customs of the Port of New York. He was confidential clerk to George B. McClellan in the New York dock department in 1870-1872, and city librarian of New York in 1874-1875; literary reviewer for the New York World (1860-1870); one of the editors of Vanity Fair; editor of the Aldine (1869-1874), and literary editor of the Mail and Express (1880-1903). He died in New York on the 1 2th of May 1903. Among the numerous books that he edited are The Loves and Heroines of the Poets (1861); Melodies and Madrigals, Mostly from the old English Poets (1865) ; The Late English Poets (1865), selections; Griswold's Poets and Poetry of America (1872), and Female Poets of America (1874); The Bric-a-Brac 'Series, in 10 vols. (1874-1876); English Verse, in 5 vols, edited with W. J. Linton (1883); and four editions of Poe's works, with a memoir (1872-1894). His original poetry includes Footprints (1849), privately printed and afterwards suppressed ; Poems (1852); the juveniles, Adven- tures in Fairyland (1853); Town and Country (1857), and The Story of Little Red Riding Hood (1864) ; Songs of Summer (1857) ; The King's Bell (1862), one of his most popular narrative poems; Abraham Lincoln: A Horatian Ode (1865), The Book of the East (1867), Poems (1880), a collective edition; and The Lion's Cub, with Other Verse (1890). He also wrote Life, Travels and Books of Alexander von Humboldt (i860) ; Under the Evening Lamp (1892), essays dealing mainly with the modern English poets; and Recollections Personal and Literary (1903), edited by Ripley Hitchcock. More important than his critical was his poetical work,

whkh at its best is sincere, original and marked by delicate fancy, and felicity of form; and his songs have given him a high and permanent place among American lyric poets.

His wife Elizabeth Drew (Barstow) Stoddard (1823- 1902), poet and novelist, was born in Mattapoisett, Massa- chusetts, on the 6th of May 1823. She studied at Wheaton Seminary, Norton, Mass. After her marriage in 1852 she assisted her . husband in his literary work, and contributed stories, poems and essays to the periodicals. She wrote three novels — The Morgesons (1862), Two Men (1865) and Temple House (1867), and a volume of poems (1895). A new edition of her novels was issued in 1901. She died in New York on the 1st of August 1902.

STOFFLET, JEAN NICOLAS (1751-1796), Vendean general, was born at Luneville, the son of a miller. Long a private soldier in a Swiss regiment in France, and afterwards game- keeper to the comte de Colbert-Maulevrier, he joined the Vend6ans when they rose against the Revolution to defend their religious and royalist principles. During the war in La Vendee he served first under Gigot d'Elbee, fought at Fontenay, Cholet and Saumur, and distinguished himself at the battles of Beaupreau, Laval and Antrain. He was appointed major- general of the royalist army, and in 1794 succeeded La Roche- jaquelein as commander-in-chief. But his quarrels with another Vendean leader, F. A. Charette, and the reverses sus- tained by the Vendean arms, led him to give in his submission and to accept the terms of the treaty of La Jaunaie (May 2, 1795). He, however, soon violated this treaty, and at the instigation of royalist agents took arms in December 1795 on behalf of the count of Provence (the future Louis XVIII.) , from whom he had received the rank of mare'chal-de-camp. This last attempt of Stofflet's failed completely. He was taken prisoner by the republicans, condemned to death by a military commission, and shot at Angers on the 23rd of February 1796.

See General d'Andigne, Memoires, edited by E. Bir£ (1900- 1901) ; C. Loyer, " Cholet sous la domination de Stofilet," in L Anjou historique, vol. iii. (1902-1903J.

STOICHIOMETRY (Gr. croixˆo., fundamental parts, or elements, fitrpov, measure), in chemistry, a term introduced by

Benjamin Richter to denote the determination of the relative amounts in which acids and bases neutralize one another; but this definition may be extended to include the determination of the masses participating in any chemical reaction. The work of Richter and others who explored this field is treated under Element; here we discuss a particular branch of the subject, viz. the determination of equivalent and atomic weights of ele- ments, and the molecular weights of elements and compounds. Reference to Chemistry, Atom and Element will explain the principles involved. Every element has an " equivalent weight " which is usually defined as the amount of the element which combines with or replaces unit weight of hydrogen; the " atomic weight " may be regarded as the smallest weight of an element which can be present in a chemical compound, and the " mole- cular weight " is the weight of the least part of an element or compound which can exist alone. The atomic weight is there- fore some multiple of the equivalent weight, and the determin- ing factor is termed the valency (q.v.) of the element. We have mentioned hydrogen as our standard element, which was originally chosen as being the lightest known substance; but Berzelius, whose stoichiometric researches are classical, having pointed out that few elements formed stable compounds with hydrogen, and even these presented difficulties to exact analysis, proposed to take oxygen as the standard. This suggestion has been adopted by the International Committee of Atomic Weights, who take the atomic weight of oxygen as 16-000, hydrogen being 1 -oo87. 1

Deferring the discussion of gaseous elements and compounds we will consider the modus operandi of determining, first, the equivalent weight of an element which forms solid compounds, and, secondly, its atomic weight. Suppose we can cause our element in known quantity to combine with oxygen to form a definite compound, which can be accurately weighed, or, conversely, decompose a known weight of the oxide into its constituents, of which the element can be weighed, then the equivalent weight of the element may be exactly determined. For if x grams of the element yield y grains of the oxide, and if VV be the equivalent of the element, we have x grams of the element equivalent to y-x grams of oxygen, and hence the equivalent weight W, which corresponds to 8 grams of oxygen, is given by the proportion y-x : x : : 8 : W, i.e. W = 8x/(y—x). For example, Lavoisier found that 45 parts of red oxide of mercury on heating yielded 41 f parts of mercury; hence 415 parts of mercury is equivalent to 45 — 415 = 35 parts of oxygen, and the equivalent of mercury in this oxide is therefore 8 X 415 5 32 = 95- The question now arises : is this value the true equivalent, i.e. half the amount of

mercury which combines with one atom of oxygen (for one atom of oxygen is equivalent to two atoms of hydrogen)? Before considering this matter, however, we will show how it is possible to obtain the equivalent of elements whose oxides are not suitable for exact analysis. No better example can be found than Stas's classical determina- tion of the atomic weight of silver and of other elements. 2 It will be seen that the routine necessary to the chemical determination of equivalents consists in employing only such substances as can be obtained perfectly pure and stable (under the experimental conditions), and that the reactions chosen must be such as to yield a series of values by which any particular value can be checked or corrected.

Stas's experiments can be classified in five series. The object of the first series was to obtain the ratio Ag : O by means of the ratios KC1:0 and Ag:KCl. The ratio KChO was determined by de- composing a known weight of potassium chlorate (a) by direct heating, (b) by heating with hydrochloric acid and weighing the residual chloride. The reaction may be written for our purpose . in the form: KC103 = KCl+30; in case a the oxygen is liberated as such ; in case b it oxidizes the hydrochloric acid to water and chlorine oxides. The equation shows that one KC1 is equivalent

1 We may here state that the equivalent weight of oxygen on this basis is 8-ooo, i.e. one half of its atomic weight. This matter is considered below.

2 The formulae used in the following paragraph were established before Stas began his work; and as oxygen is taken as 16, the results are atomic and not equivalent weights.

to 3O, and hence if x grams of chlorate yields y grams of chloride, then the ratio KC1: = yl\(x — y). Taking O as 16 and the experimental value of x and y, Stas obtained KC1:0 = 74-9502. To find the ratio of Ag: KCl.a known weight of silver was dissolved in nitric acid and the amount of potassium chloride necessary for its exact precipitation, was determined. The reaction may be written as AgN0 3 +KCl = AgCl+KN0 3 , which shows that one Ag is equivalent to one KC1. The value found was Ag : KC1 = 1-447110. The ratio Ag:0 is found by combining these values, for Ag:0 = KCl:OXAg:KO = 74-9502 X 1-44710 = 107-9401.

In the second series the ratios AgCl:0 and AgChAg were obtained, the first by decomposing the chlorate by heating, and the second by synthesizing the chloride by burning a known weight of the metal in

chlorine gas and weighing the resulting chloride, and also by dissolving the metal in nitric acid and precipitating it with hydrochloric acid and ammonium chloride. These two sets yield the ratio Ag : O, and also the ratio CI : O, which, com- bined with the ratio KC1 : O obtained in the first series, gave the atomic weight of potassium. The third and fourth series resembled the second, only the bromate and bromide, and iodate and iodide were worked with. The experiments gave additional values for Ag : O and also the atomic weights of bromine and iodine.

The fifth series was concerned with the ratios Ag 2 S04 : Ag; Ag 2 S : Ag and Ag 2 S : O. The first was obtained by reducing silver" sulphate to the metal by hydrogen at high temperatures; the second by the direct combination of silver and sulphur, and also by the interaction of silver and sulphuretted hydrogen ; these ratios on combination gave the third ratio Ag 2 S : O. These experiments besides giving values for Ag:0, yielded also the atomic weight of sulphur. There is no need to proceed any further with Stas's work, but it is sufficient to say that the general routine which he em- ployed has been adopted in all chemical deterrn inations of equivalent weights.

The derivation of the atomic from the equivalent weight may be effected in several ways. The simplest are perhaps by means of Dulong and Petit's law of atomic heats (and by Neumann's extension of this law), and by Mitscherlich's doctrine of isomorphism. Dulong and Petit's law may be stated in the form that the product of the specific heat and atomic weight is approximately 64, or that an approximate value of the atomic weight is 6-4 divided by the specific heat. This appli- cation may be illustrated in the case of mercury. We have seen above that the red oxide yields a value of about 95 for the equivalent; but a green oxide is known which contains twice as much metal for each part of oxygen, and therefore in this compound the equivalent is about 190. The specific heat of mercury, however, is 0-033, an d this number divided into 6-4 gives an approximate atomic weight of 194. More accurate analyses show that mercury has an equivalent of 100 in the red oxide and 200 in the green; Dulong and Petit's law shows us that the atomic weight is 200, and that the element is divalent in the red oxide and monovalent in the green. For exceptions to this law see Chemistry: § Physical.

The application of isomorphism follows from the fact that chemically similar substances crystallize in practically identical forms, and, more important, form mixed crystals. If two salts yield mixed crystals it may be assumed that they are similarly constituted, and if

the formula of one be known, that of the other may be written down. For example gallium sulphate forms a salt with potassium sulphate which yields mixed crystals with potash alum; we therefore infer that gallium is trivalent like aluminium, and therefore its atomic weight is deduced by multiplying the equivalent weight (determined by converting the sulphate into oxide) by three. General chemical resemblances yield valuable information in fixing the atomic weight after the equivalent weight has been exactly determined.

Gases. — The generalization due to Avogadro — that equal volumes of gases under the same conditions of temperature and pressure contain equal numbers of molecules — may be stated in the form that the densities of gases are proportional to their molecular weights. It therefore follows that a comparison of the density of any gas with that of hydrogen gives the ratio of the molecular weights of the two gases, and if the molecular contents of the gases be known then the atomic weight is deter- minable. Gas reactions are available in many cases for solving the question whether a molecule is monatomic, diatomic, &c. Thus from the combination of equal volumes of hydrogen and chlorine to form twice the volume of hydrochloric acid, it may

be deduced that the molecule of hydrogen and of chlorine con- tains two atoms (see Atom); and similar considerations show that oxygen, nitrogen, fluorine, &c, are also diatomic. Physical methods may also be employed. For instance, in monatomic gases the ratio of the specific heat at constant pressure to the specific heat at constant volume is i-66; in diatomic gases 1-42; with other values for more complex molecules (see Mole- cule). This ratio may be determined directly by finding the velocity of sound in the gas (Kundt) or by other methods, or indirectly by finding the specific heats separately and then taking the ratio. It is found that the gases just mentioned are diatomic, whereas argon, helium, neon and the related gases, and also mercury and some other metals when in the gaseous con- dition, are monatomic. A knowledge of the atomicity of a gas combined with its density (compared with oxygen and hydrogen) would therefore give its atomic weight if Avogadro's law were rigorously true. But this is not so, except under extremely low pressures, and it is necessary to correct the observed densities. The correction involves a detailed study of the behaviour of the gas over a large range of pressure (presuming the densities are already

corrected to 0°), and may be conveniently

written in the form a = — !i(P v > m Thus if D be the observed pv dp

relative densities of a gas to hydrogen at o° and under normal atmospheric pressure, a x and a H the coefficients of the gas and hydrogen, then the true density, or ratio of molecular weights, is DX (i + a x)/(i+a„).

Lord Rayleigh and D. Berthelot have corrected several mole- cular weights in this fashion. The importance is well shown in the modification of Morley's observed density of oxygen, viz. 15-90, which, with Rayleigh 's values of a = — 0-00094 and o H = + 0-00053, gives the corrected density as 15-88. And this value is the atomic weight, for both hydrogen and oxygen molecules contain . two atoms. Compound gases can also be experimented with. For example Gray {Journ. Chem. Soc, 1905, 87, p. 1601) found that it was easier to prepare perfectly pure nitric oxide than to obtain pure nitrogen, and he therefore determined the density of this gas from which the atomic weight of 14-012, or, corrected for deviations from Avogadro's law, 14-006, was deduced.

The principle indicated here is applicable to the determination of the molecular weight of any vaporizable substance by the so-called method of vapour-density (see Density).

Solutes. — The theory of solution permits the investigation of the molecular weights of substances which dissolve in water or some other solvent. It is shown in Solution that a solute lowers the freezing point and raises the boiling point of the solvent in a regular manner as long as dilute solutions are dealt with. It has been shown that if one gram molecule of a solute be dissolved in 100 grams of solvent then the boiling point is raised by 0-02 T 2 /w. (say D) degrees, where T is the absolute boiling point and w the latent heat of vaporization of the solvent; this constant is known as the molecular rise of the boiling point, and varies from solvent to solvent. If we dissolve say m grams of a substance of molecular weight M in 100 grams of the solvent and observe the elevation in the boiling point, then M is givqn by M = niDjd. Similar considerations apply to the freezing points of solutions. In this case D = 0-02 T 2 /w, where T is the absolute freezing point of the pure solvent and w the latent heat of solidification. To apply these principles it is only necessary therefore to determine the freezing (or boiling) point of the solvent (of which a known weight is taken), add a known weight of the

solute, allow it to dissolve and then notice the fall (or rise) in the freezing (or boiling point), from which values, if the molecular depression (or elevation) be known, the molecular weight of the dissolved substance is readily calculated.

The following are the molecular depressions and elevations (with the freezing and boiling points in brackets) of the commoner solvents.

Molecular depressions: aniline (6°), 58-7; benzene (5-4°),

50-0; acetic acid (17-0°), 39-0; nitrobenzene (5-3°), 70-0; phenol (40), 72; water (0°), 18-5.

Molecular elevations: acetic acid (118-1°), 25-3; acetone (56), 17-1; alcohol (78), 11-7; ether (35), 21-7; benzene (79), 26-7; chloroform (61°), 35-9; pyridine (115°), 29-5; water (ioo°), 5-1.

The apparatus used in cryoscopic measurements is usually that devised by Beckmann (Zeit. phys Chem. ii. 307). The working part consists of a tube 2-3 cms. in diameter, bearing a side tube near the top; the tube is fitted with a cork through which pass a differ- ential thermometer of a range of about 6° and graduated in 50ths or iooths, and also a stout platinum wire to serve as a stirrer. The lower part of the tube is enclosed in a wider tube to serve as an air-jacket, and the whole is immersed in a large beaker. The ther- mometer is adjusted so that the freezing point of the pure solvent comes near the top of the scale. A weighed quantity of the solvent is placed in the inner tube, and the beaker is filled with a freezing mixture at a temperature a few degrees below the freezing point of the solvent. The thermometer is inserted and both solvent and freezing mixture are stirred. When the temperature is about 0-3° below the correct freezing point the tube is removed from the beaker and the stirring continued. There ensues a further fall in the thermometer reading until ice separates, whereupon the temperature rises to the correct freezing point. The ice is then melted and the operation repeated so as to obtain a mean value. A known weight of the substance is introduced through the side tube, and the freezing point determined as with the pure solvent. The difference of the readings gives the depression; and from this value, knowing the weight of the solute and solvent, and also the molecular depression, the molecular weight can be calculated from the formula given above.

In the boiling point apparatus of Beckmann the solvent is con- tained in a tube fitted with side tubes to which spiral condensers can be attached; the neck of the tube carries a stopper through which passes

a delicate differential thermometer, whilst the bottom is perforated by a platinum wire and contains glass beads, garnets or platinum foil to ensure regular boiling. The tube is surrounded by a jacket mounted on an asbestos box, so that the heating is regular. In conducting a determination the thermometer is adjusted so that the boiling point of the pure solvent is near the bottom of the scale. A known weight of the solvent is placed in the tube, the thermometer is inserted (so that the liquid completely covers the bulb), and the condensers put into position. The liquid is now cautiously heated, and when the thermometer becomes stationary the boiling point is reached. The temperature having been read, the apparatus is allowed to cool slightly, and the observa- tion repeated. A known weight of the substance is now intro- duced, and the solution so obtained treated in the same fashion as the original solvent.

A different procedure wherein the boiling tube is heated, not directly, but by a stream of the vapour of the pure solvent, was proposed by Sakurai (Journ. Chem. Soc, 1892, 61, p. 994). Sakurai's apparatus has been considerably modified, and the form now princi- pally used is essentially due to Landsberger (Ber., 1898, 31, p. 461). The boiling vessel is simply a flask fitted with a delivery tube, which is connected with the measuring tube. This consists of a graduated tube fitted with a stopper through which passes a ther- mometer and an inlet tube reaching nearly to the bottom. The measuring tube is surrounded by an outer tube which has an exit to a condenser at the side or bottom, communication being made between the measuring tube and jacket by a small hole near the top of the former. In outline the operation consists in placing some solvent in the measuring tube and passing in vapour until the condensed liquid falls at the rate of one drop per second or two seconds. The temperature is then read off. A known weight of the substance is introduced and the boiling point determined as before; but immediately the temperature is read the tube must be disconnected, so that no more vapour passes over and so alters the concentration of the solution. Two methods are in use for determining the quantity of the solvent. Landsberger weighed the tube; VValker and Lumsden {Journ. Chem. Soc., 1898, 73, p. 502) graduated the tube and thus measured the volume of the solvent; in W. E. S. Turner's apparatus {Journ. Chem. Soc., 1910. 97, p. 1 184) both the weight and volume can be determined. Whilst the calculations in both the Beckmann and Sakurai-Landsberger methods are essentially the same the " molecular elevations " differ according as one deals with 100 grams or 100 ccs. of solvent. In all these methods it is necessary to carefully choose the solvent in order to avoid dissociation or association. For example, most salts are dis-

sociated in aqueous solution ; and acids are bi-molecular in benzene but normal in acetic acid.

Other methods are available for dissolved substances such as measurements of the osmotic pressure, lowering of the vapour pressure and diminution of solubility, but these are little used. Mention may also be made of Ramsay and Shield's method of finding the molecular weights of liquids from surface tension measurements. (See Chemistry : § Physical.)

9 4 2

STOICS

STOICS, a school of philosophers founded at the close of the 4th century b.c. by Zeno of Citium, and so called from the Stoa or painted corridor (orod iroudkri) on the north side of the market-place at Athens, which, after its restoration by Cimon, the celebrated painter Polygnotus had adorned with frescoes representing scenes from the Trojan War. But, though it arose on Hellenic soil, from lectures delivered in a public place at Athens, the school is scarcely to be considered' a product of purely Greek intellect, but rather as the firstfruits of that inter- action between West and East which followed the conquests of Alexander. Hardly a single Stoic of eminence was a citizen of any city in the heart of Greece, unless we make Aristo of Chios, Cleanthes of Assus and Panaetius of Rhodes exceptions. Such lands as Cyprus, Cilicia and Syria, such cities as Citium, Soli, Hcraclea in Pontus, Sidon,' Carthage, Seleucia on the Tigris, Apamea by the Orontes, furnished the school with its scholars and presidents; Tarsus, Rhodes and Alexandria became famous as its university towns. As the first founder was of Phoenician descent, so he drew most of his adherents from the countries which were the seat of Hellenistic (as distinct from Hellenic) civilization; nor did Stoicism achieve its crowning triumph until it was brought to Rome, where the grave earnestness of the national character could appreciate its doctrine, and where for two centuries or more it was the creed, if not the philosophy, of all the best of the Romans. Properly therefore it stands in marked antithesis to that fairest growth of old Hellas, the Academy, which saw the Stoa rise and fall — the one the typical school of Greece and Greek intellect, the other of the Hellenized East, and, under the early Roman Empire, of the whole civilized world. The transcendent genius of its author, the vitality and romantic fortunes of his doctrine, claim our warmest sym- pathies for Platonism. But it should not be forgotten that for more than four centuries the tide ran all the other way. It was

Stoicism, not Platonism, that filled men's imaginations and exerted the wider and more active influence upon the ancient world ' at some of the busiest and most important times in all history. And this was chiefly because before all things it was a practical philosophy, a rallying-point for strong and noble spirits contending against odds. Nevertheless, in some depart- ments of theory, too, and notably in ethics and jurisprudence, Stoicism has dominated the thought of after ages to a degree not easy to exaggerate.

The history of the Stoic school may conveniently be divided in the usual threefold manner: the old Stoa, the middle or transition period (Diogenes of Seleucia, Boethus of Sidon, Panaetius, Posidonius), and the later Stoicism of Roman times. By the old Stoa is meant the period (c. 304-205 B.C.) down to the death of Chrysippus, the second founder; then was laid the foundation of theory, to which hardly anything of importance was afterwards added. Confined almost to Athens, the school made its way slowly among many rivals. Aristo of Chios and Herillus of Carthage, Zeno's heterodox pupils, Persaeus, his favourite disciple and housemate, the poet Aratus, and Sphaerus, the adviser of the Spartan king Cleomenes, are noteworthy minor names; but the chief interest centres about Zeno, Cleanthes, Chrysippus, who in succession built up the wondrous system. What originality it had — at first sight it would seem not much — belongs to these thinkers; but the loss of all their works except the hymn of Cleanthes, and the inconsistencies in such scraps of information as can be gleaned from unintelligent witnesses, for the most part of many centuries later, have rendered it a peculiarly difficult task to distinguish with certainty the work of each of the three. The common standpoint, the relation to contemporary or earlier systems, with all that goes to make up the character and spirit of Stoicism, can, fortunately, be more certainly established, and may with reason be attributed to the founder.

Zeno's residence at Athens fell at a time when the great movement which Socrates originated had spent itself in the second generation of his spiritual descendants. Neither Theophrastus at the Lyceum, nor Xeno- crates and Polemo at the Academy, nor Stilpo, who was drawing

Zeao.

crowds to hear him at Megara, could be said to have inherited much of the great reformer's intellectual vigour, to say nothing of his moral earnestness. Zeno visited all the schools in turn, but seems to have attached himself definitely to the Cynics; as a Cynic he composed at

least one of his more important works, ” the much admired Republic,” which we know to have been later on a stumbling-block to the school. In the Cynic school he found the practical spirit which he divined to be the great need of that stirring troublous age. For a while his motto must have been ” back to Socrates,” or at least ” back to Antisthenes.” The Stoics always counted themselves amongst the Socratic schools, and canonized Antisthenes and Diogenes; while reverence for Socrates was the tie which united to them such an accomplished writer upon lighter ethical topics as the versatile Persaeus, who, at the capital of Antigonus Gonatas, with hardly anything of the professional philosopher about him, reminds us of Xenophon, or even Prodicus. Zeno commenced, then, as a Cynic; and in the developed system we can point to a kernel of Cynic doctrine to which various philo- sophemes of other thinkers (more especially Heraclitus and Aristotle, but also Diogenes of Apollonia, the Pythagoreans, and the medical school of Hippocrates in a lesser degree) were added. Thus, quite apart from the general similarity of their ethical doctrine, the Cynics were materialists; they were also nominalists, and combated the Platonic ideas; in their theory of knowledge they made use of ” reason ” (\670s), which was also one of their leading ethical conceptions. In all these par- ticulars Zeno followed them, and the last is the more important, because, Chrysippus having adopted a new criterion of truth — ■ a clear and distinct perception of sense — it is only from casual notices we learn that the elder Stoics had approximated to Cynicism in making right reason the standard. At the same < time, it is certain that the main outlines of the characteristic physical doctrine, which is after all the foundation of their ethics and logic, were the work of Zeno. The Logos, which had been an ethical or psychological principle to the Cynics, received at his hands an extension throughout the natural world, in which Heraclitean influence is unmistakable. Reading the Ephesian doctrine with the eyes of a Cynic, and the Cynic ethics in the light of Heracliteanism, he came to formulate his dis- tinctive theory of the universe far in advance of either. In taking this immense stride and identifying the Cynic "reason," which is a law for man, with the " reason " which is the law of the universe, Zeno has been compared with Plato, who similarly extended the Socratic " general notion " from the region of morals — of justice, temperance, virtue — to embrace all objects of all thought, the verity of all things that are.

If the recognition of physics and logic as two studies co- ordinate with ethics is sufficient to differentiate the mature Zeno from the Cynic author of the Republic, no less than from his own heterodox

disciple Aristo, the elaboration on all sides of Stoic natural philosophy belongs to Cleanthes, who" certainly "was not the merely docile and receptive intelligence he is sometimes represented as being. He carried on and completed the assimilation of Heraclitean doctrine; but his own contributions were more distinctive and original than those of any other Stoic. Zeno's seeming dualism of God (or force) and formless matter he was able to transform into the lofty pantheism which breathes in every line of the famous hymn to Zeus. Heraclitus had indeed declared all to be in flux, but we ask in vain what is the cause for the unceasing process of his ever-living fire. It was left for Cleanthes to discover this motive cause in a conception familiar to Zeno, as to the Cynics before him, but restricted to the region of ethics — the conception of tension or effort. The soul of the sage, thought the Cynics, should be strained and braced for judgment and action; his first need is firmness (evrofia) and Socratic strength. But the mind is a corporeal thing. Then followed the flash of genius: this varying tension of the one substance everywhere present, a purely physical fact, accounts for the diverse destinies of all innumerable particular things; it is the veritable cause of the flux and process of the universe.

Cleanthes.

STOICS

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Herein lies the key to the entire system of the Stoics, as Cleanthes's epoch-making discovery continually received fresh applications to physics, ethics and epistemology. Other of his innovations, the outcome of his crude materialism, found less favour with his successor, who declined to follow him in iden- tifying the primary substance with fire, or in tracing all vitality to its ultimate source in the sun, the " ruling power " of the world — a curious anticipation of scientific truth. Yet under this poetical Heraclitean mystic the school was far from flourishing. The eminent teachers of the time are said to have been Aristo, Zeno's heterodox pupil, and Arcesilas, who in Plato's name brought Megarian subtleties and Pyrrhonian agnosticism to bear upon the intruding doctrine; and after a vigorous upgrowth it seemed not unlikely to die out. From all danger of such a fate it was rescued by its third great teacher, Chrysippus; " but for Chrysippus there had been no Porch."

Zeno had caught the practical spirit of his age — the desire for a popular philosophy to meet individual needs. But there was another

tendency in post-Aristotelian thought ' — to lean upon authority and substitute learning for independent research — which grew stronger just in pro- portion as the fresh interest in the problems of the universe and the zeal for discovery declined — a shadow, we may call it, of the coming Scholasticism thrown a thousand years in advance. The representative of this tendency, Chrysippus, addressed himself to the congenial task of assimilating, developing, systematizing the doctrines bequeathed to him, and, above all, securing them in their stereotyped and final form, not simply from the assaults of the past, but, as after a long and successful career of controversy and polemical authorship he fondly hoped, from all possible attack in the future. To his personal characteristics can be traced the hair-splitting and formal pedantry which ever afterwards marked the activity of the school, the dry repellent technical procedure of the Dialec- ticians par excellence, as they were called. He created their formal logic and contributed much that was of value to their psychology and epistemology; but in the main his work was to new-label and new-arrange in every department, and to lavish most care and attention on the least important parts — the logical terminology and the refutation of fallacies, or, as his opponents declared, the excogitation of fallacies which even he could not refute. In his Republic Zeno had gone so far as to declare the routine education of the day (e.g. mathe- matics, grammar, &c.) to be of no use. Such Cynic crudity Chrysippus rightly judged to be out of keeping with the re- quirements of a great dogmatic school, and he laboured on all sides after thoroughness, erudition and scientific completeness. In short, Chrysippus made the Stoic system what it was, and as he left it we proceed to describe it.

And first we will inquire, What is philosophy? No idle gratification of curiosity, as Aristotle fabled of his life intel- Coacaation lectual (which would be but a disguise for refined ofPhiioso- pleasure), no theory divorced from practice, no phy- pursuit of science for its own sake, but knowledge

so far forth as it can be realized in virtuous action, the learning of virtue by exercise and effort and training. So absolutely is the " rare and priceless wisdom " for which we strive identical with virtue itself that the three main divisions of philosophy current at the time and accepted by Zeno — logic, physics and ethics — are defined as the most generic or com- prehensive virtues. How otherwise could they claim our atten- tion? Accordingly Aristo, holding to Cynicism when Zeno himself had got beyond it, rejected two of these parts of philo- sophy as useless and out of reach — a divergence which excluded him from the school, but strictly consistent with his view that ethics

alone is scientific knowledge. Of the three divisions logic is the least important ; ethics is the outcome of the whole, and historically the all-important vital element; but the foun- dations of the whole system are best discerned in the science of nature, which deals pre-eminently with the macrocosm and the microcosm, the universe and man, including natural theology

and an anthropology or psychology, the latter forming the direct introduction to ethics.

The Stoic system is in brief: (a) materialism, (b) dynamic materialism, lastly © monism or pantheism, (a) The first of these characters is described by anticipation in . . Plato's Sophist (246 C seq.), where, arguing with those " who drag everything down to the corporeal " (a-Qfia), the Eleatic stranger would fain prove to them the existence of some- thing incorporeal, as follows. " They admit the existence of an animate body. Is soul then something existent (ovaia)? Yes. And the qualities of soul, as justice and wisdom — are they visible and tangible? No. Dp they then exist? They are in a dilemma." Now, however effective against Plato's contemporary Cynics or Atomists, the reasoning is thrown away upon the Stoics, who take boldly the one horn of this dilemma. That qualities of bodies (and therefore of the corporeal soul) exist they do not deny; but they assert most uncompromisingly that they are one and all (wisdom, justice, &c.) corporeal. And they strengthen their position by taking Plato's own definition (247 D), namely " being is that which has the power to act or be acted upon," and turning it against him. For this is only true of Body; action, except by contact, is inconceivable; and they reduce every form of causation to the efficient cause, which implies the. communication of motion from one body to another. Again and again, therefore, only Body exists. The most real realities to Plato and Aristotle had been thought and the objects of thought, vovs and votjto., whether abstracted from sensibles or inherent in " matter," as the incognizable basis of all concrete existence. But this was too great an effort to last long. Such spiritualistic theories were nowhere really maintained after Aristotle and outside the circle of his immediate followers. The reaction came and left nothing of it all; for five centuries the dominant tone of the older and the newer schools alike was frankly materialistic. " If," says Aristotle, " there is ho other substance but the organic substances of nature; physics will be the highest of the sciences," a conclusion which passed for axiomatic until the rise of Neoplatonism. The analogues therefore of metaphysical problems must be sought in physics; particularly that problem of the causes of things for which the Platonic idea and the Peripatetic " constitutive

form " had been, each in its turn, received solutions, (b) But the doctrine that all existence is confined within the limits of the sensible universe — that there is no being save corporeal being or body — does not suffice to characterize the Stoic system; it is no less a doctrine of the Epicureans. It is the idea of tension or tonicity as the essential attribute of body, in contradistinction to passive inert matter, which is distinctively Stoic. The Epicureans leave unexplained the primary con- stitution and first movements of their atoms or elemental solids; chance or declination may account for them. Now, to the Stoics nothing passes unexplained; there is a reason (X670S) for everything in nature. Everything which exists is at once capable of acting and being acted upon. In everything that exists, therefore, even the smallest particle, there are these two principles. By virtue of the passive principle the thing is susceptible of motion and modification; it is matter which determines substance (ovcria). The active principle makes the matter a given determinate thing, characterizing and qualifying it, whence it is termed quality (xotorijs). For all that is or happens there is an immediate cause or antecedent; and as " cause " means " cause of motion," and only body can act upon body, it follows that this antecedent cause is itself as truly corporeal as the matter upon which it acts. Thus we are led to regard the active principle " force " as everywhere co- extensive with " matter," as pervading and permeating it, and together with it occupying and filling space. This is that famous doctrine of universal permeation (/cpctcris Si' bXov), by which the axiom that two bodies cannot occupy the same space is practically denied. Thus that harmony of separate doctrines which contributes to the impressive simplicity of the Stek physics is only attained at the cost of offending healthy common

sense, for Body itself is robbed of a characteristic attribute. A thing is no longer, as Plato once thought, hot or hard or bright by partaking in abstract heat or hardness or brightness, but by containing within its own substance the material of these qualities, conceived as air-currents in various degrees of tension. We hear, too, of corporeal days and years, corporeal virtues, and actions (like walking) which are bodies (

stance or matter and pervading force or cause or quality? Here the Stoa shows signs of a development of doctrine. Zeno began, perhaps, by adopting the formulas of the Peripatetics, though no doubt with a

*conscious diffe- rence, postulating that form was always attached to matter, no less than matter, as known to us, is everywhere shaped or informed. Whether he ever overcame the dualism, which the sources, such as they are, unanimously ascribe to him is not clearly ascertained. It seems probable that he did not. But we can answer authoritatively that to Cleanthes and Chry- sippus, if not to Zeno, there was no real difference between matter and its cause, which is always a corporeal current, and therefore matter, although the finest and subtlest matter. In fact they have reached the final result of unveiled hylozoism, from which the distinction of the active *;nd passive principles is discerned to be a merely formal con- cession to Aristotle, a legacy from his dualistic doctrine. His technical term Form (etSos) they never use, but always Reason or God. This was not the first time that approaches had been made to such a doctrine, and Diogenes of Apollonia in particular was led to oppose Anaxagoras, who distinguished Nous or Thought from every other agent within the cosmos which is its work by postulating as his first principle something which should be at once physical substratum and thinking being. But until dualism had been thought out, as in the Peripatetic school, it was impossible that monism (or at any rate materialistic monism) should be definitely and consciously maintained. One thing is certain: the Stoics provided no loophole of escape by entrenching upon the " purely material " nature of matter; they laid down with rigid accuracy its two chief properties — extension in three dimensions, and resistance, both being traced back to force. There were, it is true, 'certain inconsistent conceptions, creations of thought to which nothing real and external corresponded, namely, time, space, void, and the idea expressed in language (*kt6p). But this inconsistency was covered by another: though each of these might be said to be something, they could not be said to exist.*

The distinction of force and matter is then something transitory and relative. Its history will serve as a sketch of the cosmogony _ of the Stoics, for they too, like earlier philosophers,

fcosmoˆoiiy.| lave tne ; r •< f a i ry tales of science." Before there was heaven or earth, there was primitive substance or Pneuma, the everlasting presupposition of particular things. This is the totality of all existence; out of it the whole visible universe proceeds, hereafter to be again resolved into it. Not the less is it the creative force, or deity, which develops and shapes this universal order or cosmos. To the question, What is God? Stoicism rejoins, What is God not? In this original state of Pneuma God and the world are absolutely identical. But even then tension, the essential

attribute of matter, is at work. Though the force working everywhere is one, there are diversities of its operation, corresponoing to various degrees of tension. In this primitive Pneuma ther» must reside the utmost tension and heat; for it is a fact of observation that most bodies expand when heated, whence we infer that there is a pressure in heat, an expansive and dispersive tendency. The Pneuma .cannot long withstand this intense pressure. Motion backwards and forwards once set up goes to cool the glowing mass of fiery vapour and to weaken the tension. Hereupon follows the first differentiation of primitive substance — the separation of force from matter, the emanation of the world from God. The germinal world- making powers |(o-jreppoTiKot A6701), which, in virtue of its tension, slumbered in Pneuma, now proceed upon their creative task. The primitive substance, be it remembered, is not Heraclitus's fire (though Cleanthes also called it flame of fire, <£X6£) any more than it is the air or " breath " of Anaximenes or Diogenes of Apollonia. Chrysippus determined it, following Zeno, to be fiery breath or ether, a spiritualized sublimed intermediate element. The cycle of its transformations and successive condensations constitutes the life of the universe, the mode of existence proper to finite and particular being. For the universe and all its parts are only different embodiments and stages in that metamorphosis of primi- tive being which Heraclitus had called a progress up and down (656s avu Kara). Out of it is separated, first, elemental fire, the fire which we know, which burns and destroys; and this, again, condenses into air or aerial vapour; a further step in the downward path derives water and earth from the solidification of air. At every stage the degree of tension requisite for existence is slackened, and the resulting element approaches more and more to " inert " matter. But, just as one element does not wholly pass over into another (e.g. only a part of air is transmuted into water or earth), so the Pneuma itself- does not wholly pass over into the elements. The residue that remains in original purity with its tension yet undiminished is the ether in the highest sphere of the visible heavens, encircling the world of which it is lord and head. From the elements the one substance is transformed into the multitude of individual things in the orderly universe, which again is itself a living thing or being, and the Pneuma pervading it, and conditioning life and growth everywhere, is its soul. But this process of differentiation is not eternal; it continues only until the times of the restoration of all things. For the world which has grown up will in turn decay. The tension which has been relaxed will again be tightened; there will be a gradual resolution of things into

elements, and of elements into the primary substance, to be consummated in a general confla- gration when once more the world will be absorbed in God. Then in due order a new cycle of development begins, reproducing the last in every minutest detail, and so on for ever.

The doctrine of Pneuma, vital breath or " spirit," arose in the medical schools. The simplest reflection among savages and half-civilized men connects vitality with the air inhaled in _ respiration; the disciples of Hippocrates, without much euma.

modifying this primitive belief, explained the maintenance of vital warmth to be the function of the breath within the organism. In the time of Alexander the Great Praxagoras discovered the distinction between the arteries and the veins. Now in the corpse the former are empty; hence, in the light of these preconceptions they were declared to be vessels for conveying Pneuma to the different parts of the body. A generation afterwards Erasistratus made this the basis of a new theory of diseases and their treatment. Vital spirit, inhaled from the outside air, rushes through the arteries till it reaches the various centres, especially the brain and the heart, and there causes thought and organic movement. But long before this the peculiar character of air had been recognized as something intermediate to the corporeal and the incorporeal: when Diogenes of Apollonia revived the old Ionian hylozoism in opposition to the dualism of Anaxagoras, he made this, the typical example of matter in the gaseous state, his one element. In Stoicism, for the moment, the two conceptions are united, soon, however, to diverge — the medical conception to receive its final development under Galen, while the philosophical conception, passing over to Philo and others, was shaped and modified at Alexandria under the influence of Judaism, whence it played a great part in the developments of Jewish and Christian theology.

The influence upon Stoicism of Heraclitus has been differently conceived. Siebeck would reduce it within very small dimensions, but this is not borne out by the concise history found at Contrast to Herculaneum (Index here, ed. Comparetti, col. 4 seq.). Herac i} luSt They substituted primitive Pneuma for his primitive fire, but so far as they are hylozoists at all they stand upon the same ground with him. Moreover, the commentaries of Cleanthes, Aristo and Sphaerus on Heraclitean writings (Diog. Laer. vii. 174, ix. 5, 15) point to common study of these writings under Zeno. Others again (e.g. Lassalle) represent the Stoics as merely diluting and distorting Heracliteanism. But this is altogether wrong, and the proofs offered, when rightly sifted, are often seen to rest upon the distortion of

Heraclitean doctrine in the reports of later writers, to assimilate it to the better known but essentially distinct innovations of the Stoics. In Heraclitus the constant flux is a metaphysical notion replaced by the interchange of material

elements which Chrysippus stated as a simple proposition of physics. Heraclitus offers no analogy to the doctrine of four (not three) elements as different grades of tension ; to the conception of fire and air as the " form," in Aristotelian terminology, of particulars; nor to the function of organizing fire which works by methodic plan to produce and preserve the world (irvp nxvi-ndv oSy fiahiiov M ■yevea u> aba imv) . Nor, again, is there any analogy to the peculiar Stoic doctrine of universal intermingling (xpocris &l &\ov). The two active elements interpenetrate the two iower or more relaxed, winding through all parts of matter and so pervading the greater masses that there is no mechanical mixture, nor yet a chemical combination, since both " force " and " matter " retain their relative characters as before. Even the distinction between " force " and " matter " — so alien to the spirit of Heraclitus — is seen to be a necessary consequence. Once assume that every character and property of a particular thing is determined solely by the tension in it of a current of Pneuma, and (since that which causes currents in the thing cannot be absolutely the same with the thing itself) Pneuma, though present in all things, must be asserted to vary indefinitely in quantity and intensity. So condensed and coarsened is the indwelling air-current of inorganic bodies that no trace of elasticity or life remains; it cannot even afford them the power of motion; all it can do is to hold them together (o-weKToci) Sucojuis), and, in technical language, Pneuma is present in stone or metal as a retaining principle (?£is=hold), explaining the attributes of continuity and numerical identity {awtxn ko£ Tivwukva.) which even these natural substances possess. In plants again and all the vegetable kingdom it is manifest as something far purer and possessing greater tension, called a "nature," or principle of growth (bais). Further, a distinction was drawn between irrational animals, or the brute creation, and the rational, i.e. gods and men, leaving room for a divergence, or rather development, of Stoic opinion. The older authorities conceded a vital principle, but denied a soul, to the brutes: animals, they say, are fao but not iti\j/vxa- Later on much evidence goes to show that (by a divergence from the orthodox standard perhaps due to Platonic influence) it was a Stoic tenet to

concede a soul, though not a rational soul, throughout the animal kingdom. To this higher manifestation of Pneuma can be traced back the " esprits animaux " of Descartes and Leibnitz, which continue to play so great a part even in Locke. The universal presence of Pneuma was confirmed by observation. A certain warmth, akin to the vital heat of organic being, seems to be found in inorganic nature: vapours from the earth, hot springs, sparks from the flint, were claimed as the last remnant of Pneuma not yet utterly slackened and cold. They appealed also to the velocity and dilata- tion of aeriform bodies, to whirlwinds and inflated balloons. The Logos is quick and powerful, and sharper than any two-edged sword, piercing even to the dividing asunder of the joints and marrow. Tension itself Cleanthes defined as a fiery stroke (irXr/yri irupij) ; in his hymn to Zeus lightning is the symbol of divine activity. Take the fundamental properties of body — extension and resistance. The former results from distance; but distances, or dimensions, are straight lines, i.e. lines of greatest tension (eis anpov Ttra)xkvi\). Tension produces dilatation, or increase in distance. Resistance, again, is explained by cohesion, which implies binding force. Again, the primary substance has rectilinear motion in two directions, back- wards and forwards, at once a condensation, which produces cohesion and substance, and a dilatation, the cause of extension and qualities. How near this comes to the scientific truth of attraction and repul- sion need hardly be noted. From the astronomers the Stoics borrowed their picture of the universe — a plenum in the form of a series of layers or concentric rings, first the elements, then the planetary and stellar spheres, massed round the earth as centre — a picture which dominated the imagination of men from the days of Eudoxus down to those of Dante or even Copernicus. As to the physical constitution of bodies, they were content to reproduce the Peripatetic doctrine with slight modifications in detail, of hardly any importance when compared with the change of spirit in the doctrine taught. But they rarely prosecuted researches in physics or astronomy, and the newly created sciences of biology and compara- tive anatomy received no adequate recognition from them.

If, however, in the science of nature the Stoics can lay claim

to no striking originality, the case is different when we come

to the science of man. In the rational creatures —

yt o ogy. man an(j tne g OC j s — p neuma i s manifested in a

high degree of purity and intensity as an emanation from the world-

soul, itself an emanation from the primary sub- stance of purest ether — a spark of the celestial fire, or, more accurately, fiery breath, which is a mean between fire and air, characterized by vital warmth more than by dryness. The physical basis of Stoic psychology deserves the closest attention. On the one hand, soul is corporeal, else it would have no real existence, would be incapable of extension in three dimensions (and therefore of equable diffusion all over the body), incapable of holding the body together, as the Stoics contended

that it does, herein presenting a sharp contrast to the Epicurean tenet that it is the body which confines and shelters the light vagrant atoms of soul. On the other hand, this corporeal thing is veritably and identically reason, mind, and ruling principle (X670S, vovs, rfftnoviKov) ; in virtue of its divine origin Cleanthes can say to Zeus, " We too are thy offspring," and a Seneca can calmly insist that, if man and God are not on perfect equality, the superiority rests rather on our side. What God is for the world that the soul is for man. The Cosmos must be conceived as a single whole, its variety being referred to varying stages of condensation in Pneuma. So, too, the human soul must possess absolute simplicity, its varying functions being con- ditioned by the degrees or species of its tension. It follows that of " parts " of the soul, as previous thinkers imagined, there can be no question; all that can consistently be maintained is that from the centre of the body — the heart — seven distinct air-currents are discharged to various organs, which are so many modes of the one soul's activity. 1 The ethical consequences of this position will be seen at a later stage. With this psy- chology is intimately connected the Stoic theory of knowledge. From the unity of soul it follows V ,eory 1 °J that all psychical processes — sensation, assent, impulse — proceed from reason, the ruling part; that is to say, there is no strife or division: the one rational soul alone has sensations, assents to judgments, is impelled towards objects of desire just as much as it thinks or reasons. Not that all these powers at once reach full maturity. The soul at first is void of content; in the embryo it has not developed beyond the nutritive principle of a plant (v

Note the parallel between the macrocosm and the microcosm. The soul of the world fills and penetrates it : in like manner the human soul pervades and breathes through all the body, informing and guiding it, stamping the man with his essential character of rational. There is in both alike a ruling part, though this is situate in the human heart at the centre — not in the brain, as the analogy of the celestial ether would suggest. Finally, the same cause, a relaxation of tension, accounts for sleep, decay and death of man and for the

dissolution of the world ; after death the disembodied soul can only maintain its separate existence, even for a limited time. by mounting to that region of the universe which is akin to its nature. It was a moot point whether all souls so survive, as Cleanthes thought, or the souls of the wise and good alone, which was the opinion of Chrysippus; in any case, sooner or later individual souls are merged in the soul of the universe, from which they proceeded. The relation of the soul of the universe to God is quite clear: it is an inherent property, a mode of His activity, an effluence or emanation from the fiery ether which surrounds the universe, penetrating and permeating it. A Stoic might consistently main- tain that World-Soul, Providence, Destiny and Germinal Reason are not mere synonyms, for they express different aspects of God, different relations of God to things. We find ourselves on the verge of a system of abstractions, or " attributes turned into entities," as barren as any excogitated in medieval times. In a certain sense, Scholasticism began with Chrysippus. To postulate different substances as underlying the different forces of nature would have been to surrender the fundamental thought of the system. What really is — the Pneuma— neither increases nor diminishes; but its modes of working, its different currents, can be conveniently distinguished and enumerated as evidence of so many distinct attributes.

One inevitable consequence of materialism is that subject and object can no longer be regarded as one in the act of perception, as Plato and Aristotle tended to assume, however imper- ˆ

*fectly the assumption was carried out. The presump- ** ree /"*< u, • tion of some merely external connexion, as between any other two corporeal things, is alone admissible and some form of the*

1 These derivative powers include the five senses, speech and the reproductive faculty, and they bear to the soul the relation of qualities to a substance. The ingenious essay of Mr R. D. Archer Hind on the. Platonic psychology (Journ. of Phil. x. 120) aims at establishing a parallel unification on the spiritualistic side; cf. Rep. x. 612 A.

representative hypothesis is most easily called in to account for perception. The Stoics explained it as a transmission of the per- ceived quality of the object, by means of the sense organ, into the

percipient's mind, the quality transmitted appearing as a disturbance or impression upon the corporeal surface of that " thinking thing," the soul. Sight is taken as the typical sense. A conical pencil of rays diverges from the pupil of the eye, so that its base covers the object seen. In sensation a presentation is conveyed, by an air-current, from the sense organ, here the eye, to the mind, i.e. the soul's " ruling part " in the breast; the presentation, besides attesting its own existence, gives further information ot its object — visible colour or size, or whatever be the quality in the thing seen. That Zeno and Cleanthes crudely compared this presentation to the impression which a seal bears upon wax, with protuberances and indentations, while Chrysippus more prudently determined it vaguoly as an occult modification or " mode " of mind, is an interest- ing but not intrinsically important detail But the mind is no mere passive recipient ol impressions from without, in the view of the Stoics. Their analysis of sensation supposes it to react, by a variation in tension, against the current from the sense-organ; and this is the mind's assent or dissent, which is inseparable from the sense presentation. The contents of experience are not all alike true or valid : hallucination is possible : here the Stoics join issue with Epicurus. It is necessary, therefore, that assent should not be given indiscriminately ; we must determine a criterion of truth, a special formal test whereby reason may recognize the merely plausible and hold fast the true. In an earlier age such an inquiry would have seemed superfluous. To Plato and Aristotle the nature and operation of thought and reason constitute a suffi- cient criterion. Since their day not only had the opposition between sense and reason broken down, but the reasoned scepticism of Pyrrho and Arcesilaus had made the impossibility of attaining truth the primary condition of well-being Yet the standard which ultimately found acceptance in the Stoic school was not put forward, in that form, by its founder. Zeno, we have reason to believe, adopted the Cynic Logos for his guidance to truth as well as to morality. As a disciple of the Cynics he must have started with a theory of knowledge somewhat like that developed in the third part of Plato's Theaetetus (201 C seq.) — that simple ideas are given by sense, whereas " opinion," which is a complex of simple ideas, only becomes knowledge when joined with Logos. We may further suppose that the more obvious of Plato's objections had led to the correction of " reason " into " right reason. ' However that may be, it is certain from Aristotle (Nic. Eth. vi. 13, 1144b, 17) that virtue was defined as a " habit " in accordance with right reason, and from Diog. Laer. vii. 54 that the earlier Stoics made right reason the standard of truth. The law which regulates our action is thus the ultimate criterion of what we know — practical

knowledge being understood to be of paramount importance. But this criterion was open to the persistent attacks of Epicureans and Academics, who made clear (1) that reason is dependent upon, if not derived from, sense, and (2) that the utterances of reason lack consistency. Chrysippus, therefore, conceded something to his opponents when he substituted for the Logos the new standards of sensation (aXa6jiat.s) and general conception (irp6X77ˆis = anticipation, i.e. the generic type formed in the mind unconsciously and spontaneously). At the same time he was more clearly defining and safeguarding his prede- cessors' position. For reason is consistent in the general conceptions wherein all men agree, because in all alike they are of spontaneous growth. Nor was the term sensation sufficiently definite. The same Chrysippus fixed upon a certain characteristic Tilt" °ˆ true P resen tations, which he denoted by the much disputed term " apprehensive " (KaraXˆTTTiKi) avTaala). Provided the sense organ and the mind be healthy, provided an external object be really seen or heard, the presentation, in virtue of its clearness and distinctness, has the power to extort the assent which it always lies in our power to give or to withhold.

Formerly this technical phrase was explained to mean " the perception which irresistibly compels the subject to assent to it as true." But this, though apparently supported by Sextus Empiri- cus {Adv. Math. vii. 257), is quite erroneous; for the presentation is called Ko.Ta\r\irTbv, as well as KaroXijirrocii avraala, so that beyond all doubt it is something which the percipient subject grasps, and not that which grasps or " lays hold of " the percipient. Nor, again, is it wholly satisfactory to explain xoTaXrj7rTwˆ as virtually passive, "apprehensible," like its opposite AxaTaXijrrros ; for we find avTiXTjjrrucˆ twv iiroKii/xivuv used as an alternative phrase (ibid. vii. 248). It would seem that the perception intended to con- stitute the standard of truth is one which, by producing a mental counterpart of a really existent external thing, enables the percipient, in the very act of sense, to _" lay hold of " or apprehend an object in virtue of the presentation or sense impression of it excited in his own mind. The reality of the external object is a necessary condi- tion, to exclude hallucinations of the senses ; the exact correspondence between the external object and the internal percept is also necessary, but naturally hard to secure, for how can we compare the two? The external object is known only in perception. However, the younger Stoics endeavoured to meet the assaults of their persistent critic Carneades by suggesting various modes of testing a single

presentation, to see whether it were consistent with others, especially

such as occurred in groups, &c. ; indeed, some went so far as to add to the definition " coming from a real object and exactly corresponding with it " the clause " provided it encounter no obstacle."

The same criterion was available for knowledge derived more directly from the intellect. Like all materialists, the Stoics can only distinguish the sensible from the intelligible as thinking when the external object is present (ali avTaaia. of which it is the necessary complement) ; if to a false or unapprehensive presentation, the result is " opinion " (5A£a), always deprecated as akin to error and ignorance, unworthy of a wise man. These processes are conceivable only as " modes " of mind, changes in the soul's substance, and the same is true of the higher conceptions, the products of generalization. But the Stoics were not slow to exalt the part of reason, which seizes upon the generic qualities, the essential nature of things. Where sense and reason conflict, it is the latter that must decide. One isolated " apprehension," however firm its grasp, does not constitute knowledge or science (eTruxTriiiri) ; it must be of the firmest, such as reason cannot shake, and, further, it must be worked into a system of such apprehensions which can only be by the mind's exercising the " habit " («{«) of attaining truth by continuous tension. Here the work of reason is assimilated to the force which binds together the parts of an inorganic body and resists their separation. There is nothing more in the order of the universe than extended mobile bodies and forces in tension in these bodies. So, too, in the order of knowledge there is nothing but sense and the force of reason maintaining its tension and connecting sensations and ideas in their proper sequence. Zeno compared sensation to the outstretched hand, flat and open; bending the fingers was assent ; the clenched fist was " simple apprehension," the mental grasp of an object; knowledge was the clenched fist tightly held in the other hand. The illustration is valuable for the light it throws on the essential unity of diverse intellectual operations as well as for enforcing once more the Stoic doctrine that different grades of knowledge are different grades of tension. Good and evil, virtues and vices, remarks Plutarch, are all capable of being " perceived "; sense, this common basis of all mental activity, is a sort of touch by which the ethereal Pneuma which is the soul's substance recognizes and measures tension.

With this exposition we have already invaded the province of logic. To this the Stoics assigned a miscellany of studies — rhetoric, dialectic, including grammar, in addition to formal intfe

logic — to all of which their industry made contributions. '

Some of their innovations in grammatical terminology have lasted until now: we still speak of oblique cases, genitive, dative, accusative, of verbs active (Ap9a), passive (jjima), neuter (oMh-epa), by the names they gave. Their corrections and fancied improvements of the Aristotelian logic are mostly useless and pedantic. Judgment (A£ £«p.a) they defined as a complete idea capable of expression in language (X«top afrroreXes), and to distinguish it from other enunciations, as a wish or a command, they added " which is either true or false." From simple judgments they proceeded to compound judgments, and declared the hypothetical syllogism to be the normal type of reason, of which the categorical syllogism is an abbreviation. Perhaps it is worth while to quote their treatment of the categories. Aristotle made ten, all co-ordinate, to serve as " heads of predication " under which to collect distinct scraps of information respecting a subject, probably a man. For this the Stoics substituted four summa genera, all subordinate, so that each in turn is more precisely determined by the next. They are Something, or Being, determined as (1) substance or subject matter, (2) essential quality, i.e. substance qualified, (3) mode or chance attribute, i.e. qualified substance in a certain condition (irws ex""), and, lastly, (4) relation or relative mode (in full uirofcei/teeox iroibv irpos t£ wws 1×0") ■ The zeal with which the school prosecuted logical inquiries had one practical result — they could use to perfection the unrivalled weapon of analysis. Its chief employment was to lay things hare and sever them from their surroundings, in order that they might be contemplated in their simplicity, with rigid exactness, as objects of thought, apart from the illusion and exaggeration that attends them when presented to sense and imagination. The very perfection and precision of this method constantly tempted the later Stoics to abuse it for the systematic depreciation of the objects analysed.

The ethical theory of the Stoics stands in the closest connexion with their physics, psychology and cosmology. A critical account of it will be found in the article Ethics. It may be Ethics briefly summarized here. Socrates had rightly said that Virtue is Knowledge, but he had not definitely shown in what this knowledge consists, nor had his immediate successors, the Cynics, made any serious attempt to solve the difficulty. The Stoics not only drew up an elaborate scheme of duties, but also crystallized their theory in a general law, namely that true goodness

lies in the knowledge of nature and is obtained by the exercise of Reason. The most elementary part of nature is pure ether, which is possessed of divine reason. This Reason even non-rational man unconsciously manifests in his mechanical or instinctive actions which tend to the preservation of himself. The truly wise man will therefore live as much as possible in conformity with nature, (i.e. nature uncorrupted by the errors of society), and, though as an individual and part of the whole not master of his fate, will yet have self-control even in the midst of misfortune and pain. All evil passion is due to erroneous judgment and morbid conditions of mind which may be divided into chronic ailments (voarinaTa) and infirmities {appuariiiiaTo.), i.e. into permanent or temporary disorders. In contrast to the Cyrenaics and the Epicureans, the Stoics denied that pleasure is actually or ought to be the object of human activity. The non-rational man aims at self-preserva- tion, and the wise man will imitate him deliberately, and when he fails he will suffer with equanimity. To him the so-called " goods " {e.g. health, wealth, &c.) are " indifferent " (aSiafopa) ; since he must live, he will exercise his reasoning faculty upon them, and will regard some as" preferred " (irpo-qyiieva.) and others as to be " rejected" (airoTrpoT)-rnfi>a), but he will not regard either class as possessed of an intrinsic value. The end of action is, therefore, a harmonious consistent life " according to nature " and (cf. Heraclitus) an ordered unity of action. Virtue is its own good; the highest exercise of reason is its own perfection. It follows (i) that pleasure, being quite outside the pale is not the object but merely an k-nykwima (accompaniment) of virtuous action, and (2) that there is, within the circle of virtue, no degree. An action is simply virtuous or not; it cannot be more or less virtuous. The result of this theory of ethics is of great value as emphasizing the importance of a sys- tematic view of conduct, but it fails to resolve satisfactorily the great Socratic paradox that evil is the result of ignorance. For even though they attempt to substantiate the idea of responsibility by maintaining that ignorance is voluntary, they cannot find any answer to the question whether some men may not be without the capacity tochoose learning (but see Ethics: History, § Stoics).

In their view of man's social relations the Stoics are greatly in advance of preceding schools. We saw that virtue is a law which governs the universe: that which Reason poiitanHm. an ˆ God ordain must be accepted as binding upon the particle of reason which is in each one of us. Human law comes into existence when men recognize this obligation; justice is therefore natural and not something merely conventional. The opposite tendencies, to allow to the individual

responsibility and freedom, and to demand of him obedience to law, are both features of the system; but in virtue even of the freedom which belongs to him qua rational, he must recognize the society of rational beings of which he is a member, and subordinate his own ends to the ends and needs of this society. Those who own one law are citizens of one state, the city of Zeus, in which men and gods have their dwell- ing. In that city all is ordained by reason working intelligently, and the members exist for the sake of one another; there is an intimate connexion (

unwise are slaves. Yet, while they accepted slavery as a per- manent institution, philosophers as wide apart as Chrysippus and Seneca sought to mitigate its evils in practice, and urged upon masters humanity in the treatment of their slaves.

The religious problem had peculiar interest for the school which discerned God everywhere as the ruler and upholder, and at the same time the law, of the world that _ … He had evolved from Himself. The physical ground- work lends a religious sanction to all moral duties, and Cleanthes's noble hymn is evidence how far a system of natural religion could go in providing satisfaction for the cravings of the religious temper:—

" Most glorious of immortals, O Zeus of many names, almighty and everlasting, sovereign of nature, directing all in accordance with law, thee it is fitting that all mortals should address. . . . Thee all this universe, as it rolls circling round the earth, obeys whereso- ever thou dost guide, and gladly owns thy sway. Such a minister thou holdest in thy invincible hands — the two-edged, fiery, ever- living thunderbolt, under whose stroke all nature shudders. No work upon earth is wrought apart from thee, lord, nor through the divine ethereal, sphere, nor upon the sea; save only whatsoever deeds wicked men do in their own foolishness. Nay, thou knowest how to make even the rough smooth, and to bring order out of disorder; and things not friendly are friendly in thy sight. For so hast thou fitted all things together, the good with the evil, that there might be one eternal law over all. . . . Deliver men from fell ignorance. Banish it, father, from their soul, and grant them to obtain wisdom, whereon relying thou rulest all things with justice."

To the orthodox theology of Greece and Rome the system stood in a twofold relation, as criticism and rationalism. That the popular religion contained gross errors hardly needed to be pointed out. The forms of worship were known to be trivial or mischievous, the myths unworthy or immoral. But Zeno declared images, shrines, temples,

sacrifices, prayers and worship to be of no avail. A really acceptable prayer, he taught, can only have reference to a virtuous and devout mind: God is best worshipped in the shrine of the heart by the desire to know and obey Him. At the same time the Stoics felt at liberty to defend and uphold the truth in polytheism. Not only is the primitive substance God, the one supreme being, but divinity must be ascribed to His manifestations — to the heavenly bodies, which are conceived, like Plato's created gods, as the highest of rational beings, to the forces of nature, even to deified men; and thus the world was peopled with divine agencies. Moreover, the myths were rationalized and allegorized, which was not in either case an original procedure. The search for a deeper hidden meaning beside the literal one had been begun by Democritus, Empedocles, the Sophists and the Cynics. It remained for Zeno to carry this to a much greater extent and to seek out or invent " natural principles " (X6701

Divination.

94-8

STOICS

it affords are included in the chain of causation. Even here, however, the bent of the system is apparent. They were at pains to insist upon purity of heart and life as an indispensable condition for success in prophesying and to enlist piety in the service of morality.

When Chrysippus died (01. 143 = 208-204 B.C.) the structure of Stoic doctrine was complete. With the Middle Stoa we enter upon a period at first of comparative inaction, stoa. afterwards of internal reform. Chrysippus's im-

mediate successors were Zeno of Tarsus, Diogenes of Seleucia (often called the Babylonian) and Antipater of Tarsus, men of no originality, though not without ability; the two last- named, however, had all their energies taxed to sustain the conflict with Carneades (q.v.). This was the most formidable assault the school ever encountered; that it survived was due more to the foresight and elaborate precautions of Chrysippus than to any efforts of that " pen-doughty " pamphleteer, Antipater (Ka\ano(i6a.s) , who shrank from opposing himself in person to the eloquence of Carneades. The subsequent history testified to the importance of this controversy. The special objects of attack were the Stoic theory of knowledge, their theology and their ethics. The physical basis of the system remained unchanged but neglected; all creative force or even original

research in the departments of physics and metaphysics vanished. Yet problems of interest bearing upon psychology and natural theology continued to be discussed. Thus the cycles of the world's existence, and the universal conflagration which terminates each of them, excited some doubt. Diogenes of Seleucia is said to have wavered in his belief at last; Boethus, one of his pupils, flatly denied it. He regarded the Deity as the guide and upholder of the world, watching over it from the outside, not as the immanent soul within it, for according to him the world was as soulless as a plant. We have here a compromise between Zeno's and Aristotle's doctrines. But in the end the universal conflagration was handed down without question as an article of belief. It is clear that the activity of these teachers was chiefly directed to ethics: they elaborated fresh definitions of the chief good, designed either to make yet clearer the sense of the formulas of Chrysippus or else to meet the more urgent objections of the New Academy. Carneades had emphasized one striking apparent inconsistency: it had been laid down that to choose what is natural is man's highest good, and yet the things chosen, the " first objects according to nature," had no place amongst goods. Antipater may have met this by distinguishing " the attainment " of primary natural ends from the activity directed to their attainment (Plut. De Comm. Not. 27, 14, p. 1072 F); but, earlier still, Diogenes had put forward his gloss, viz. " The end is to calculate rightly in the selection and rejection of things according to nature." Archedemus, a contemporary of Diogenes, put this in plainer terms still: " The end is to live in the performance of all fitting actions " {iravTO. to. Ka0riKoi > Ta twiTeXovvras £rjv). Now it is highly improbable that the earlier Stoics would have sanctioned such interpretations of their dogmas. The mere performance of relative or imperfect duties, they would have said, is some- thing neither good nor evil; the essential constituents of human good is ignored. And similar criticism is actually passed by Posidonius: " This is not the end, but only its necessary con- comitant; such a mode of expression may be useful for the refutation of objections put forward by the Sophists " (Carneades and the New Academy?), "but it contains nothing of morality or well-being " (Galen, De Plac. Hipp, et Plat. p. 470 K). There is every ground, then, for concluding that we have here one concession extorted by the assaults of Carneades. For a similar compromise there is express testimony: " good repute " («ufio£ia) had been regarded as a thing wholly indiffer- ent in the school down to and including Diogenes. Antipater was forced to assign to it " positive value," and to give it a place amongst " things preferred " (Cic. De fin. iii. 57). These modifications were retained by Antipater's successors. Hence come the increased importance and fuller

treatment which from this time forward fall to the lot of the " external duties "

The Sage

(Kadrj kovto) . The rigour and consistency of the older system became sensibly modified.

To this result another important factor contributed. In all that the older Stoics taught there breathes that enthusiasm for righteousness in which has been traced the earnestness of the Semitic spirit; but nothing presents more forcibly the pitch of their moral idealism than the doctrine of the Wise Man. All mankind fall into two classes — the wise or virtuous, the unwise or wicked — the dis- tinction being absolute. He who possesses virtue possesses it whole and entire; he who lacks it lacks it altogether. To be but a hand's-breadth below the surface of the sea ensures drown- ing as infallibly as to be five hundred fathoms deep. Now the wise man is drawn as perfect. All he does is right, all his opinions are true; he alone is free, rich, beautiful, skilled to govern, capable of giving or receiving a benefit. And his happiness, since length of time cannot increase it, falls in nothing short of that of Zeus. In contrast with all this, we have a picture of universal depravity. Now, who could claim to have attained to the sage's wisdom? Doubtless, at the first founding of the school Zeno himself and Zeno's pupils were inspired with this hope; they emulated the Cynics Antisthenes and Diogenes, who never shrank out of modesty from the name and its responsi- bilities. But the development of the system led them gradually and reluctantly to renounce this hope as they came to realize the arduous conditions involved. Zeno indeed could hardly have been denied the title conferred upon Epicurus. Cleanthes, the " second Hercules," held it possible for man to attain to virtue. From anecdotes recorded of the tricks played upon Aristo and Sphaerus (Diog. Laer. vii. 162, 117) it may be inferred that the former deemed himself infallible in his opinions, i.e. set up for a sage; Persaeus himself, who had exposed the pretensions of Aristo, is twitted with having failed to conform with the perfect generalship which was one trait of the wise man when he allowed the citadel of Corinth to be taken by Aratus (Atheh. iv. 102 D). The trait of infallibility especially proved hard to establish when successive heads of the school seriously differed in their doctrine. The prospect became daily more distant, and at length faded away. Chrysippus declined to call himself or any of his contemporaries a sage. One or two such manifesta- tions there may have been — Socrates and Diogenes? — but the wise man was rarer, he thought, than the phoenix. If his successors allowed one or two

more exceptions, to Diogenes of Seleucia at any rate the sage was an unrealized ideal, as we learn from Plutarch (De comm. not. 33, 1076 B), who does not fail to seize upon this extreme view. Posidonius left even Socrates, Diogenes and Antisthenes in the state of progress towards virtue. Although there was in the end a reaction from this Modifies- extreme, yet it is impossible to mistake the bearing tionsin of all this upon a practical system of morals. So Praclke ‘ long as dialectic subtleties and exciting polemics afforded food for the intellect, the gulf between theory and practice might be ignored. But once let this system be presented to men in earnest about right living, and eager to profit by what they are taught, and an ethical reform is inevitable. Conduct for us will be separated from conduct for the sage. We shall be told not always to imitate him. There will be a new law, dwell- ing specially upon the ” external duties ” required of all men, wise or unwise; and even the sufficiency of virtue for our happi- ness may be questioned. The introducer and expositor of such a twofold morality was a remarkable man. Born at Rhodes c. 1&5 B.C., a citizen of the most flourishing of Greek states and almost the only one which yet retained vigour and freedom, Panaetius lived for years in the house of Scipio Africanus the younger at Rome, accompanied him on embassies and cam- paigns, and was perhaps the first Greek who in a private capacity had any insight into the working of the Roman state or the character of its citizens. Later in life, as head of the Stoic school at Athens, he achieved a reputation second only to that of Chrysippus. He is the earliest Stoic author from whom we have, even indirectly, any considerable piece of work, as books i. and ii. of the De officiis are a richaufi, in Cicero’s

Panaetius.

fashion, of Panaetius ” Upon External Duty ” {irtpi tov KajSriKovToi) .

The introduction of Stoicism at Rome was the most momen- tous of the many changes that it saw. After the first sharp

collision with the jealousy of the national authorities Stoicism in j t f ounc i a re ady acceptance, and made rapid progress

amongst the noblest families. It has been well said that the old heroes

of the republic were unconscious Stoics, fitted by their narrowness, their stern simplicity and devotion o duty for the almost Semitic earnestness of the new doctrine. In Greece its insensibility to art and the cultivation of life was a fatal defect; not so with the shrewd men of the world, desirous of qualifying as advocates or jurists. It supplied them with an incentive to scientific research in archaeology and grammar; it penetrated jurisprudence until the belief in the ultimate identity of the jus gentium with the law of nature modified the praetor's edicts for centuries. Even to the prosaic religion of old Rome, with its narrow original conception and multitude of burdensome rites, it became in some sort a support. Scaevola, following Panaetius, explained that the prudence of statesmen had established this public institution in the service of order midway between the errors of popular superstition and the barren truths of enlightened philosophy. Soon the influence of the pupils reacted upon the doctrines taught. Of speculative interest the ordinary Roman had as little as may be; for abstract discussion and controversy he cared nothing. Indifferent to the scientific basis or logical development of doctrines, he selected from various writers and from different schools what he found most serviceable. All had to be simplified and disengaged from technical subtleties. To attract his Roman pupils Panaetius

would naturally choose simple topics susceptible

of rhetorical treatment or of application to indi- vidual details. He was the representative, not merely of Stoicism, but of Greece and Greek literature, and would feel pride in introducing its greatest masterpieces: amongst all that he studied, he valued most the writings of Plato. He admired the classic style, the exquisite purity of language, the flights of imagination, but he admired above all the philosophy. He marks a reaction of the genuine Hellenic spirit against the narrow austerity of the first Stoics. Zeno and Chrysippus had introduced a repellent technical terminology; their writings lacked every grace of style. With Panaetius the Stoa became eloquent: he did his best to improve upon the uncouth words in vogue, even at some slight cost of accuracy, e.g. to discard ■jrporfffi&vov for tvxpy\aTov, or else designate it" so-called good," or even simply " good," if the context allowed.

The part Panaetius took in philological and historical studies is characteristic of the man. We know much of the results of these studies; of his philosophy technically we know very little. He wrote only upon ethics, where historical knowledge would be of use. Crates of Mallus, one of his teachers, aimed at fulfilling the high functions

of a " critic " according to his own definition — that the critic must acquaint himself with all rational knowledge. Panae- tius was competent to pass judgment upon the critical " divination " of an Aristarchus (who was perhaps himself also a Stoic), and took an "interest in the restoration of Old Attic forms to the text of Plato. Just then there had been a movement towards a wider and more liberal education, by which even contemporary Epicureans were affected. Diogenes the Babylonian had written a treatise on language and one entitled The Laws. Along with grammar, which had been a prominent branch of study under Chrysippus, philosophy, history, geography, chronology and kindred subjects came to be recognized as fields of activity no less than philology proper. It has been recently established that Polybius the historian was a Stoic, and it is clear that he was greatly influenced by the form of the system which he learned to know, in the society of Scipio and his friends, from Panaetius. 1 Nor is it improbable that works of the latter served Cicero as the originals of his De republica and De legibus Thus the gulf between Stoicism and the later Cynics, who were persistently hostile to culture, could not fail to be widened.*

1 Hirzel, Vntersuch. ii. 841 seq. Polybius's rejection of divina- tion is decisive. See, e.g. his explanation upon natural causes of Scipio the Elder's capture of New Carthage, " by the aid of Neptune," X. II (cf. x. 2). P. Voigt holds that in vi. 5, I, twiv irkpms rO>v bCKoobfrjiv is an allusion to Panaetius.

1 This at least, is maintained by Schmekel.

*A wave of eclecticism passed over all the Greek schools in the 1st century B.C. Platonism and scepticism had left undoubted traces upon the doctrine of such a reformer as Panaetius. He – i*m& had doubts about a general conflagration ; possibly (he c sm ' thought) Aristotle was right in affirming the eternity of the present order of the world. He doubted the entire system of divination. On these points his disciples Posidonius and flecato seem to have reverted to orthodoxy. But in ethics his innovations were more suggestive and fertile. He separated wisdom as a theoretic virtue from the other three which he called practical. Hecato slightly modified this: showing that precepts {0tu>p-hiiaTa) axe needed for justice and temperance also, he made them scientific virtues, reserv- ing for his second class the unscientific virtue (dfleojpTjros Aperij) of courage, together with health, strength and such-like " excellen- cies." Further, Panaetius had maintained that pleasure is not altogether a thing indifferent : there is a natural as well as an unnatural pleasure. But, if so, it would follow that, since pleasure is an emotion, apathy*

or eradication of all emotions cannot be un- conditionally required. The gloss he put upon the definition of the end was " a life in accordance with the promptings givenus by nature "; the terms are all used by older Stoics, but the individual nature (■nn'iv) seems to be emphasized. From Posidonius, the last representative of a comprehensive study of nature _ .. . and a subtle erudition, it is not surprising that we get s " ' the following definition: the end is to live in contemplation of the reality and order of the universe, promoting it to the best of our power, and never led astray by the irrational part of the soul. The heterodox phrase with which this definition ends points to innova- tions in psychology which were undoubtedly real and important, suggested by the difficulty of maintaining the essential unity of the soul. Panaetius had referred two faculties (those of speech and of reproduction) to animal impulse and to the vegetative " nature " (bvais was changed to a true soul tyvxri) at birth. Posidonius, unable to explain the emotions as " judgments " or the effects of judgments, postulated, like Plato, an irrational principle (including a concupis- cent and a spirited element) to account for them, although he subordinated all these as faculties to the one substance of the soul lodged in the heart. This was a serious departure from the principles of the system, facilitating a return of later Stoicism to the dualism of God and the world, reason and the irrational part in man, which Chrysippus had striven to surmount. 3

Yet in the general approximation and fusion of opposing views which had set in, the Stoics fared far better than rival schools. Their system became best known and most widely used by indi- vidual eclectics. All the assaults of the sceptical Academy had failed, and within fifty years of the death of Carneades his degener- ate successors, unable to hold their ground on the question of the criterion, had capitulated to the enemy. Antiochus of Ascalon, the professed restorer of the Old Academy, taught a medley of Stoic and Peripatetic dogmas, which he boldly asserted Zeno had first borrowed from his school. The wide diffusion of Stoic phraseology and Stoic modes of thought may be seen on all hands — in the language of the New Testament writers, in the compendious " his- tories of philosophy " industriously circulated by a host of writers about this time (cf. H. Diels, Doxographi graeci).

The writings of the later Stoics have come down to us, if not entire, in great part, so that Seneca, Cornutus, Persius, Lucan, Epictetus, Marcus Aurelius are known at first hand. They do not profess to give a scientific exposition sˆ e J'" ter of doctrine, and may therefore be dismissed some- what briefly (see Epictetus and Marcus Aurelius). We learn much more about the Stoic system from the scanty frag- ments of the first founders, 4 or even from the epitomes of Dio- genes

Laertius and Stobaeus, than from these writers. They testify to the restriction of philosophy to the practical side, and to the increasing tendency, ever since Panaetius, towards a relaxation of the rigorous ethical doctrine and its approximation to the form of religious conviction. This finds .most marked expression in the doctrines of submission to Providence and universal philanthropy. Only in this way could they hold their ground, however insecurely, in face of the religious reaction of the 1st century. In passing to Rome, Stoicism quitted the school for actual life. The fall of the republic was a gain, for it

3 Works of Posidonius and Hecato have served as the basis of extant Latin treatises. Ciceio, De divinatione, perhaps De natura deorum, i. ii., comes in part from Posidonius; Cicero, De finibus, hi., and Seneca, De beneficiis, i.-iv., from Hecato, who is also the source of Stobaeus, Eel. eth. ii. no. Cf. H. H. Fowler, Panaetii el Hecatonis fragmenta (Bonn, 1885).

4 Cf. C. Wachsmuth, Commentationes II. de Zenone Citiensi et Cleanlhe Assio (Gottingen, 1874). Baguet's Chrysippus (Louvain, 1822) is unfortunately very incomplete.

released so much intellectual activity from civic duties. The life and death of Cato fired the imagination of a degenerate age in which he stood out both as a Roman and a Stoic To a long line of illustrious successors, men like Thrasea Paetus and Helvidius Priscus, Cato bequeathed his resolute opposition to the domi- nant power of the times; unsympathetic, impracticable, but fearless in demeanour, they were a standing reproach to the corruption and tyranny of their age. But when at first, under Augustus, the empire restored order, philosophy became bolder and addressed every class in society, public lectures and spiritual direction being the two forms in which it mainly showed activity. Books of direction were written by Sextius in Greek (as after- wards by Seneca in Latin), almost the only Roman who had the ambition to found a sect, though in ethics he mainly followed Stoicism. His contemporary Papirius Fabianus was the popular 'ecturer of that day, producing a powerful effect by his denun- ciations of the manners of the time. Under Tiberius, Sotion and Attalus were attended by crowds of hearers. In Seneca's time there was a professor, with few hearers it is true, even in a provincial town like Naples. At the same time the antiquarian study of Stoic

writings went on apace, especially those of the earliest teachers— Zeno and Aristo and Cleanthes.

*Seneca is the most prominent leader in the direction which Roman Stoicism now took. His penetrating intellect had mastered the subtleties of the system of Chrysippus, but they seldom appear in his works, at least without, apology. Incidentally we meet there with the doctrines of Pneuma and of tension, of the corporeal nature of the virtues and the affections, and much more to the same effect. But his attention is claimed for physics chiefly as a means of elevating the mind, and as making known the wisdom of Providence and the moral government of the world. To reconcile the ways of God to man had been the ambition of Chrysippus, as we know from Plutarch's criticisms. He argued plausibly that natural evil was a thing indifferent — that even moral evil was required in the divine economy as a foil to set off good. The really difficult problem why the prosperity of the wicked and the calamity of the just were permitted under the divine government he met in various ways: sometimes he alleged the forgetfulness of higher powers; sometimes he fell back upon the necessity of these contrasts and grotesque passages in the comedy of human life. Seneca gives the true Stoic answer in his treatise On Providence: the wise man cannot really meet with misfortune; all outward calamity is a divine instrument of training, designed to exercise his powers and teach the world the indifference of external conditions. In the soul Seneca recognizes an effluence of the divine spirit, a god in the human frame; in virtue of this he maintains the essential dignity and internal freedom of man in every human being. Yet*in striking coiitrast to this orthodox tenet is his vivid conception of the weakness and misery of men, the hopelessness of the struggle with evil, whether in society or in the individual. Thus he describes the body (which, after Epicurus, he calls the flesh) as a mere husk or fetter or prison of the soul; with its departure begins the soul's true life. Sometimes, too, he writes as if he accepted an irrational as well as a rational part of the soul. In ethics, if there is no novelty of doctrine, there is a surprising change in the mode of its applica- tion. The ideal sage has receded; philosophy comes as a physician, not to the whole but to the sick. We learn that there are various classes of patients in " progress " (irpoKoirr]) , i.e. on their way to virtue, making painful efforts towards it. The first stage is the eradication of vicious habits: evil ten- dencies are to be corrected, and a guard kept on the corrupt propensities of the reason. Suppose this achieved, we have yet to struggle with single attacks of the passions: irascibility may be cured, but we may succumb to a fit of rage. To achieve this second stage the*

impulses must be trained in such a way that the fitness of things indifferent may be the guide of conduct. Even then it remains to give the will that property of rigid infallibility without which we are always liable to err, and this must be effected by the training of the judgment. Other peculiarities of the later Stoic ethics are due to the condition

of the times. In a time of moral corruption and oppressive rule, as the early empire repeatedly became to the privileged classes of Roman society, a general feeling of insecurity led the student of philosophy to seek in it a refuge against the vicissitudes of fortune which he daily beheld. The less any one man could do to interfere in the government, or even to safe- guard his own life and property, the more heavily the common fate pressed upon all, levelling the ordinary distinctions of class and character. Driven inwards upon themselves, they employed their energy in severe self-examination, or they cultivated resignation to the will of the universe, and towards their fellow men forbearance and forgiveness and humility, the virtues of the philanthropic disposition. With Seneca this resignation took the form of a constant meditation upon death. Timid by nature, aware of his impending doom, and at times justly dissatisfied with himself, he tries all means of reconciling him- self to the idea of suicide. The act had always been accounted allowable in the school, if circumstances should call for it: indeed, the first three teachers had found such circumstances in the infirmity of old age. But their attitude towards the " way out " (i^aycoyri) of incurable discomforts is quite unlike the anxious sentimentalism with which Seneca dwells upon death.

From Seneca we turn, not without satisfaction, to men of sterner mould, such as Musonius Rufus, who certainly deserves a place beside his more illustrious disciple, Epic- .

tetus. As a teacher he commanded universal respect, and wherever we catch a glimpse of his activity he appears to advantage. His philosophy, however, is yet more concentrated upon practice than Seneca's, and in ethics he is almost at the position of Aristo. Epictetus testifies to the powerful hold he acquired upon his pupils, each of whom felt that Musonius spoke to his heart. The practical conclusion of his philosophy is that he must cheerfully accept the inevitable. In the life and teaching jof Epictetus this thought bore abundant fruit. The beautiful character which rose superior to weakness, poverty and slave's estate is also presented to us in the Discourses of his disciple Arrian as a model of religious resignation, of forbearance and love towards our brethren, that is, towards all

men, since God is our common father. With him even the " physical basis " of ethics takes the form of a religious dogma — the providence of God and the perfection of the world. We learn that he regards the Saificov or " guardian angel " as the divine part in each man; sometimes it is more nearly conscience, at other times reason. His ethics, too, have a religious character. He begins with human weakness and man's need of God: whoso would become good must first be convinced that he is evil. Submission is enforced by an argument which almost amounts to a retractation of the difference between things natural and things contrary to nature, as understood by Zeno. Would you be cut off from the universe? he asks. Go to, grow healthy and rich. But if not, if you are a part of it, then become resigned to your lot. Towards this goal of approximation to Cynicism the later Stoics had all along been tending. Withdrawal from the active duty of the world must lead to passive endurance, and, ere long, complete indiffer- ence. Musonius had recommended marriage and condemned unsparingly the exposure of infants. Epictetus, however, would have the sage hold aloof from domestic cares, another Cynic trait. So, too, in his great maxim " bear and forbear," the last is a command to refrain from the external advantages which nature offers. j Epictetus is marked out amongst Stoics by his renunciation of the world. He is followed by a Stoic emperor, M. Aurelius Antoninus, who, though in the world, was not of it. The Meditations give no systematic exposition of belief, but there are many indications of the religious spirit we have already observed, together with an almost Platonic psychology. Following Epictetus, he speaks of man as a corpse bearing about a soul; at another time he has a threefold division — (i) body, (2) soul, the seat of impulse (wveviiaTlov), and (3) vovs or intelligence, the proper ego. In all he writes there is a vein of sadness: the flux of all things, the vanity of

life, are thoughts which perpetually recur, along with resignation to the will of God and forbearance towards others, and the religious longing to be rid of the burden and to depart to God. These peculiarities in M. Antoninus may perhaps be explained in harmony with the older Stoic teaching; but, when taken in connexion with the rise of Neoplatonisra and the revival of superstition, they are certainly significant. None of the ancient systems fell so rapidly as the Stoa. It had just touched the highest point of practical morality, and in a generation after M. Antoninus there is hardly a professor to

be named. Its most valuable lessons to the world were preserved in Christianity; but the grand simplicity of its monism slumbered for fifteen centuries before it was revived by Spinoza.

Literature. — The best modern authority is Zeller, Phil. d. Griech. iii. pt. i. (3rd ed., 1880) — Eng. trans. Stoics, by Reichel (1879), and Eclectics, by S. F. Alley ne (1883). Further may be cited F. Ravaisson, Essai sur >e stoicisme (Paris, 1856); M. Heinze, Die Lehre vom Logos (Oldenburg, 1872); H. Siebeck, Vntersuchungen zi:r Phil. d. Griecken (Halle, 1873), and Gesch. d. Psychologie, i. 2 (Gotha, 1884); R. Hirzel, " Die Entwicklung der stoisch. Phil.," in Vntersuchungen zu Ciceros Schriften, ii. 1-566 (Leipzig, 1882); Ogereau, Essai sur le systime des Stoiciens (Paris, 1885); L. Stein, Die Psychologie der Stoa, i. p. ii. (Berlin, 1886-1888); A. C. Pearson, The Fragments of Zeno and Cleanthes (London 1891); A. Schmekel, Die Philosophic der mitlleren Stoa (Berlin 1892) ; A. Bonhoffer, Epictet und die Stoa (Stuttgart, 1890); Die Ethik des Stoikers Epictet (Stuttgart, 1894); A. Dyroff, Die Ethik der alten Stoa (Berlin, 1897). Indispens- able to the student are H. Diels, Doxographi . graeci (Berlin, '879) ; J- von Arnim, Stoicorum veterum fragmenta, i — iii. (Leipzig, 1903-1905). (R. D. H.)

STOKE NEWINGTON, a north-eastern metropolitan borough of London, England, bounded E. by Hackney and W. by Islington, and extending N. to the boundary of the county of London. Pop. (1901), 51,247. It is mainly occupied by small villas. On its western boundary, adjoining Green Lanes, lies Clissold Park (54 acres) and outside the north-western boundary is Finsbury Park (115 acres). In Church Street is the ancient parish church of St Mary, largely restored, but still bearing the stamp of antiquity; opposite to it stands a new church in Decorated style by Sir Gilbert Scott. In the north of the borough are the main waterworks and reservoirs of the New River Company, though the waterway continues to a head in Finsbury. Stoke Newington is partly in the north division of the parliamentary borough of Hackney, but the district of South Hornsey, included in the municipal borough, is in the Hornsey division of Middlesex. The borough council consists of a mayor, 5 aldermen and 30 councillors. Area, 863-5 acres.

STOKE-ON-TRENT, a market town and municipal and parliamentary borough of Staffordshire, England, on the upper Trent, in the heart of the Potteries district. -Pop. (1901), 30,458. This was the population of the separate borough of Stoke-upon-Trent (area, 1S82 acres) which existed until 1910. In 1908 arrangements were made whereby Stoke-upon-Trent, Burslem, Fenton, Hanley,

Longton and Tunstall should be amalgamated as one borough, under the name of Stoke-on- Trent, from the 31st of March 1910. The new corporation consists of a mayor, 26 aldermen and 78 councillors. Stoke is on the North Staffordshire railway, 146 m. north-west from London by the London & North- Western railway; and on the Grand Trunk (Trent and Mersey) Canal. The principal public build- ings in the old town of Stoke are the town hall, with assembly rooms, law library and art gallery, the market hall, the Minton memorial building, containing a school of art and science; the free library and museum, and the North Staffordshire infirmary, founded in 1815 at Etruria, and removed to its present site in 1868. The head offices of the North Staffordshire Railway Company are here. Four large firms manufacturing every variety of art china and earthenware alone employ over 5000 hands. Coal-mining and iron and machine manufactures are also carried on. A statue commemorates Josiah Wedgwood, born at Burslem in 1730; but other famous names in the pottery trade are more intimately connected with Stoke. Thus Josiah Spode the second was born here in 1754, and had a great house at Penkhull, on the western outskirts of Stoke. He

entered into partnership with the Copelands, who continued his business. Herbert Minton (1793-1858) was the founder of another of the large works. The parliamentary borough returns one member.

In the Domesday Survey of 1086 half the church of Stoke and lands in Stoca are said to have belonged to Robert of Stafford. Part of Stoke (Stoche or Stoca) at this time belonged to the Crown, since the royal estate of Penculla (now Penkhull) was included within its bounds. Frequent references to the parish church of Stoke are found during the 14th and 15th centuries. Contemporary writers from 1787 onwards describe Stoke as a market town, but the official evidence states that the market rights were not acquired until 1845. Since then the market days have been Saturday and Monday. Stoke-upon-Trent became the railway centre and ' head of the parliamentary borough of Stoke-upon-Trent, comprising the whole of the Staffordshire Potteries, which was created by the Reform Bill of 1832. In 1874 it was incorporated as a municipality. From 1833 to 1885 Stoke returned two members to parliament. From the early 17 th century, if not earlier, porcelain and earthenware manufactories existed at Stoke-upon-Trent, but they remained unnoticed until in 1686 Dr Plot wrote his survey of Stafford- shire. In the middle of the 18th century there was a great industrial development in the Pottery district.

See John Ward, The Borough of Stoke-upon-Trent (London, 1843).

STOKE POGES, a village in the south of Buckinghamshire, England, 3 m. N. of Slough, famous for its connexion with the poet Thomas Gray. The church of St Giles has portions of Norman, Early English, and later dates, and contains a fine Decorated canopied tomb and brasses of members of the family of Moleyns. A passage or cloister leading towards the ancient manor-house contains some good original stained-glass windows. Gray is buried beside his mother in the churchyard, and there is a monument to his memory in the adjacent Stoke Park. The churchyard is generally considered to be the original of the poet's Elegy in a Country Churchyard; and the manor-house finds mention in his Long Story. West End Cottage, where he often stayed, remains in altered form as Stoke Court. Burnham Beeches (q.v.), now preserved to public use, and a favourite resort of the poet, are 3 m. distant to the north-west.

STOKES, SIR GEORGE GABRIEL, Bart. (1819-1903), British mathematician and physicist, was the youngest son of the Rev. Gabriel Stokes, rector of Skreen, Co. Sligo, where he was born on the 13th of August 1819. After attending schools in Dublin and Bristol, he matriculated in 1837 a t Pembroke College, Cambridge, where, four years later, on graduating as senior wrangler and first Smith's prizeman, he was elected to a fellowship. This he had to vacate by the statutes of that society when he married in 1857, but twelve years later, under new statutes, he was re-elected, and retained his place on the founda- tion until 1902, when, on the day before he entered on his eighty-fourth year, he was elected to the mastership. But he did not long enjoy this position, for he died at Cambridge on the 1st of February in the following year. In 1849 he was appointed to the Lucasian professorship of mathematics in the university, and on the 1st of June 1899 the jubilee of his appointment was celebrated at Cambridge in a brilliant ceremonial, which was attended by numerous delegates from European and American universities. On that occasion a commemorative gold medal was presented to him by the chancellor of the university, and marble busts of him by Hamo Thornycroft were formally offered to Pembroke College and to the university by Lord Kelvin. Sir George Stokes, who was created a baronet in 1889, further served his university by representing it in parliament from 1887 to 1892. During a portion of this period (1885-1890) he was president of the Royal Society, of which he had been one of the secretaries since 1854, and thus, being at the same time Lucasian professor, he united in himself three offices which had only once before been held by one man, Sir Isaac Newton, who, however, did not hold all three simultaneously.

Stokes was the oldest of the trio of natural philosophers,

Clerk Maxwell and Lord Kelvin being the other two, who especi- ally contributed to the fame of the Cambridge school of mathe- matical physics in the middle of the 19th century. His original work began about 1840, and from that date onwards the great extent of his output was only less remarkable than the bril- liance of its quality. The Royal Society's catalogue of scientific papers gives the titles of over a hundred memoirs by him pub- lished down to 1883. Some of these are only brief notes, others are short controversial or corrective statements, but many are really long and elaborate treatises. In matter his work is distinguished by a certain definiteness and finality, and even of problems, which when he attacked them were scarcely thought amenable to mathematical analysis, he has in many cases given solutions which once and for all settle the main principles. This result must be ascribed' to his extraordinary combination of mathematical power with experimental skill, for with him, from the time when about 1840 he fitted up some simple physical apparatus in his rooms in Pembroke College, mathe- matics and experiment ever went hand in hand, aiding and checking each other. In scope his work covered a wide range of physical inquiry, but, as Alfred Cornu remarked in his Rede lecture of 1899, the greater part of it was concerned with waves and the transformations imposed on them during their passage through various media. His first published papers, which appeared in 1842 and 1843, were on the steady motion of incom- pressible fluids and some cases of fluid motion; these were followed in 1845 by one on the friction of fluids in motion and the equilibrium and motion of elastic solids, and in 1850 by another on the effects of the internal friction of fluids on the motion of pendulums. To the theory of sound he made several contributions, including a discussion of the effect of wind on the intensity of sound and an explanation of how the intensity is influenced by the nature of the gas in which the sound is pro- duced. These inquiries together put the science of hydro- dynamics on a new footing, and provided a key not only to the explanation of many natural phenomena, such as the suspension of clouds in air, and the subsidence of ripples and waves in water, but also to the solution of practical problems, such as the flow of water in rivers and channels, and the skin resistance of ships. But perhaps his best-known researches are those which deal with the undulatory theory of light. His optical work began at an early period in his scientific career. His

first papers on the aberration of light appeared in 1845 and 1846, and were followed in 1848 by one on the theory of certain bands seen in the spectrum. In 1849 he published a long paper on the dynami- cal theory of diffraction, in which he showed that the plane of polarization must be perpendicular to the direction of vibration. Two years later he discussed the colours of thick plates; and in 1852, in his famous paper on the change of refrangibility of light, he described the phenomenon of fluorescence, as exhibited by fluorspar and uranium glass, materials which he viewed as having the power to convert invisible ultra-violet rays into rays of lower periods which are visible. A mechanical model, illus- trating the dynamical principle of Stokes's explanation was shown in 1883, during a lecture at the Royal Institution, by Lord Kelvin, who said he had heard an account of it from Stokes many years before, and had repeatedly but vainly begged him to publish it. In the same year, 1852, there appeared the paper on the composition and resolution of streams of polarized light from different sources, and in 1853 an investigation of the metallic reflection exhibited by certain non-metallic substances. About i860 he was engaged in an inquiry on the intensity of light reflected from, or trans- mitted through, a pile of plates; and in 1862 he prepared for the British Association a valuable report on double refraction, which marks a period in the history of the subject in England. A paper on the long spectrum of the electric light bears the same date, and was followed by an inquiry into the absorption spec- trum of blood. The discrimination of organic bodies by their optical properties was treated in 1864; and later, in conjunction with the Rev. W. Vernon Harcourt, he investigated the relation between the chemical constitution and the optical properties of various glasses, with reference to the conditions of trans-

parency and the improvement of achromatic telescopes. A still later paper connected with the construction of optical instru- ments discussed the theoretical limits to the aperture of micro- scopical objectives. In other departments of physics may be mentioned his paper on the conduction of heat in crystals (1851) and his inquiries in connexion with the radiometer; his explana- tion of the light border frequently noticed in photographs just outside the outline of a dark body seen against the sky (1883); and, still later, his theory of the Rontgen rays, which he suggested might be transverse waves travelling as innumerable solitary waves, not in regular trains. Two long papers published in 184Q — one on attractions and Clairaut's theorem, and the other on the variation of gravity at the surface of the earth — also demand notice, as do his mathematical memoirs on

the critical values of the sums of periodic series (1847) and on the numerical calcula- tion of a class of definite integrals and infinite series (1850) and his discussion of a differential equation relating to the breaking of railway bridges (1849).

But large as is the tale of Stokes's published work, it by no means represents the whole of his services in the advancement of science. Many of his discoveries were not published, or at least were only touched upon in the course of his oral lectures. An excellent instance is afforded by his work in the theory of spectrum analysis. In his presidential address to the British Association in 1871, Lord Kelvin (Sir William Thomson, as he was then) stated his belief that the application of the prismatic analysis of light to solar and stellar chemistry had never been suggested directly or indirectly by any other savant when Stokes taught it to him in Cambridge some time prior to the summer of 1852, and he set forth the conclusions, theoretical and practical, which he learnt from Stokes at that time, and which he afterwards gave regularly in his public lectures at Glasgow. These statements, containing as they do the physical basis on which spectrum analysis rests, and the mode in which it is applicable to the identification of substances existing in the sun and stars, make it appear that Stokes anticipated Kirchhoff by at least seven or eight years. Stokes, however, in a letter published some years after the delivery of this address, stated that he had failed to take one essential step in the argument (not perceiving that emission of light of definite refrangibility not merely permitted, but necessitated, absorption of light of the same refrangibility), and modestly disclaimed " any part of Kirchhoff's admirable discovery," adding that he felt some of his friends had been over-zealous in his cause. It must be said, however, that English men of science have not accepted this disclaimer in all its fullness, and still attribute to Stokes the credit of having first enunciated the fundamental principles of spectrum analysis. In another way, too, Stokes did much for the progress of mathematical physics. Soon after he was elected to the Lucasian chair he announced that he regarded it as part of his professional duties to help any member of the university in difficulties he might encounter in his mathematical studies, and the assistance rendered was so real that pupils were glad to consult him, even after they had become colleagues, on mathematical and physical problems in which they found themselves at a loss. Then during the thirty years he acted as secretary of the Royal Society he exercised an enormous if inconspicuous influence on the advancement of mathematical and physical science, not only directly by his own investigations, but indirectly by suggesting problems for

inquiry and inciting men to attack them, and by his readiness to give encouragement and help. Several of the honours enjoyed by Sir George Stokes have already been enumerated. In addition, it may be mentioned that from the Royal Society, of which he became a fellow in 1851, he received the Rumford medal in 1852 in recognition of his inquiries into the refrangibility of light, and later, in 1893, the Copley medal. In 1869 he presided over the Exeter meeting of the British Association. From 1883 to 1885 he was Burnett lecturer at Aberdeen, his lectures on Light, which were published in 1884-1887, dealing with its nature, its use as a means of investigation, and its beneficial effects. In 1891, as Gifford lecturer, he published a volume on Natural Theology. His

academical distinctions included honorary degrees from many universities, together with membership of the Prussian Order Pour le Merite.

Sir George Stokes's mathematical and physical papers were

Cublished in a collected form in five volumes ; the first three (Cam- ridge, 1880, 1883, and 1901) under his own editorship, and the two last (Cambridge, 1904 and 1905) under that of Sir Joseph Larmor, who also selected and arranged the Memoir and Scientific Corre- spondence of Stokes published at Cambridge in 1907.

STOKES, WHITLEY (1830-1909), British lawyer and Celtic scholar, was a son of William Stokes (1804-1878), and a grand- son of Whitley Stokes (1763-1845), each of whom was regius professor of physic in the university of Dublin. In his day, William Stokes, who was the author of several books on medical subjects, was one of the foremost physicians in Europe. Edu- cated at Trinity College, Dublin, young Stokes became an English barrister in 1855, and in 1862 he went to India, where he filled several official positions. In 1877 he was appointed legal mem- ber of the viceroy's council, and he drafted the codes of civil and criminal procedure and did much other valuable work of the same nature. In 1879 he was president of the commission on Indian law. He returned to England in 1882. In 1887 he was made a C.S.I., and two years later a C.I.E.; he obtained honorary degrees from many universities, and was a fellow of the British Academy. He died in London on the 13th of April 1909. Whitley Stokes is perhaps most famous as a Celtic scholar, and in

this field he worked both in India and in England. He studied Irish, Breton and Cornish texts, and among his numerous works may be mentioned editions of Three Irish Glossaries (1862); Three Middle-Irish Homilies (1877); and Old Irish Glosses at Wursburg and Carlsruhe (1887). He was one of the editors of the hische Texte published at Leipzig (1880- 1900); and he edited and translated Lives of Saints from the Book of Lismore (1890). With Professor A. Bezzenberger he wrote Urkeltischer Sprachschatz (1894). His principal legal work was The Anglo-Indian Codes (1887).

STOKESLEY, JOHN (c. 1475-1539), English prelate, was born at Colly Weston in Northamptonshire, and became a fellow of Magdalen College, serving also as a lecturer. In 1498 he was made principal of Magdalen Hall, and in 1 505 vice-president of Magdalen College. Soon after 1509 he was appointed a member of the royal council and chaplain to Henry VIII. In 1520 he was at the Field of the Cloth of Gold; in 1529 and 1530 he went to France and Italy as ambassador to Francis I. and to gain opinions from foreign universities in favour of the king's divorce from Catherine of Aragon. In 1530 he became bishop of London. In 1533 he christened the princess Elizabeth, and his later years were troubled by disputes with Archbishop Cranmer. Stokesley opposed all changes in the doctrines of the Church and was very active in persecuting heretics. He was a man of learning, writ- ing in favour of Henry's divorce, and with Cuthbert Tunstall, bishop of Durham, a treatise against Cardinal Pole. He died on the 8th of September, 1539.

STOLBERG, FRIEDRICH LEOPOLD, Graf zu (1750-1819), German poet, the younger son of Count Christian Stolberg, was born at Bramstedt in Holstein on the 7 th of November 1750. He studied in Gottingen and was a prominent member of the famous Hain or Dichterbund. After leaving the university he made a journey to Switzerland with his brother Christian, in company with Goethe. In 1777 he was appointed envoy of the prince bishop of Liibeck at the court of Copenhagen, but often stayed at Eutin, where he was the intimate associate of his college friend and member of the Dichterbund, Johann Heinrich Voss. In 1782 he married Agnes von Witzleben, whom he celebrated in his poems. After her early death in 1788, he became Danish envoy at the court of Berlin, and contracted a second marriage with the countess Sophie von Redern in 1789. In 1 79 1 he was appointed president of the Liibeck episcopal court at Eutin; he resigned this office in 1800, and retiring to Minister in Westphalia, there joined, with his whole family, the eldest daughter only excepted, the Roman Catholic Church. For this step he was severely attacked by his former friend Voss (Wie ward Fritz Stolberg

ein Unfreier? 1819). After living for a while

(from 181 2) in the neighbourhood of Bielefeld, he removed to his estate of Sondermuhlen near Osnabriick, where he died on the 5th of December 18 19. He wrote many odes, ballads, satires and dramas — among the last the tragedy Timoleon (1784), translations of the Iliad (1778), of Plato (1796-1797), Aeschylus (1802), and Ossian (1806); he published in 181 5 a Leben Alfreds des Grossen, and a voluminous Geschichte der Religion Jesu Christi (17 vols., 1806-1818).

Stolberg's brother, Christian, Grafzu Stolberg (1748-1821), was also a poet. Born at Hamburg on the 15th of October 1748, he became a magistrate at Tremsbiittel in Holstein in 1777, and died on the 18th of January 182 1. Of the two brothers Friedrich was undoubtedly the more talented, but Christian, though not a poet of high originality, excelled in the utterance of gentle sentiment. They published together a volume of poems, Gedichte (edited by H. C, Boie, 1779); Schauspiele mit Chbren (1787), their object in the latter work being to revive a love for the Greek drama; and a collection of patriotic poems Vater- landische Gedichte (1815). Christian von Stolberg was the sole author of Gedichte aus dem Griechischen (1782), a translation of the works of Sophocles (1787), and of a poem in seven ballads, Die weisse Frau (1814), which last attained considerable popularity.

The Collected Works of Christian and Friedrich Leopold zu Stol- berg were published in twenty volumes in 1820-1825; 2nd ed. 1827. Friedrich's correspondence with F. H. Jacobi will be found in Jacobi's Briefwechsel (1825-1827) ; that with Voss has been edited by O. Hellinghaus (1891). Selections from the poetry of the two brothers will be found in A. Sauer's Der Gbttinger Dichterbund, iii. (Kiirschner's Deutsche Nationalliteratur, vol. 50, 1896). See also T. Menge, Der Graf F. L. Stolberg und seine Zeitgenossen (2 vols., 1862); J. H. Hennes, Aus F. L. von Stolbergs Jugendjahren (1876); the same, Stolberg in den zwei letzten Jahrzehnten seines Lebens (1875); J. Janssen, F. L. Graf zu Stolberg (2 vols., 1877), 2nd ed. 1882; W. Keiper, F. L. Stolbergs Jugendpoesie (1893).

STOLBERG, a town of Germany, in the Prussian Rhine Province, situated on the Vichtbach, 7 m. E. of Aix-la-Chapelle, on the main line of railway to Cologne. Pop. (1905), 14,963. It contains two Protestant and two Roman Catholic churches, a castle occupying the site of one said to have been used by Charlemagne as a hunting seat. It is the centre of a very active and varied industry, exporting its

produce to all parts of the world. The leading branch is metal-working, which is here carried on in important zinc, brass, and iron foundries, smelting- works of various kinds, puddling and rolling works, and manu- factories of needles, pins and other metal goods. The ore is mostly found in the mines around the town, but some is imported from a considerable distance. In or near the town there are also large chemical works, glass-works, a mirror-factory and various minor establishments. Extensive coal-mines in the neighbourhood provide the enormous supply of fuel demanded by the various industries. The industrial prosperity of the town was founded in the middle of the 17th century by French religious refugees, who introduced the art of brass-founding.

STOLE (Lat. stola and orarium, Fr. Hole, It. stola, Sp. estola, Ger. Stola), a liturgical vestment of the Catholic Church, peculiar to the higher orders, i.e. deacons, priests and bishops. It is a strip of stuff, usually silk, some 2§ yards long by 4 inches broad; in the middle and at the ends, which are commonly broadened out, it is ornamented with a cross. Its colour varies with the liturgical colour of the day, or of the function at which it is worn.

There is very little evidence as to the form and character of the stole before the Carolingian age; but from the 9th century onwards representa- tions of the stole show that it varied in no essential particular from that of the present day. In the nth, 1 2th and 13th centuries it was remarkably long and narrow. From the 9th to the 13th

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STOLEN GOODS

century it was mostly provided with a separate piece by way of finish to the ends, and this in the 12th and 13th centuries was as a rule trapeze-shaped. In the late middle ages the stole was usually of uniform breadth; but from the 16th century onwards the ends again began to be widened, until in the 1 8th century we have the hideous form with large shovel- shaped ends. Fringes, tassels, little bells and the like were used as decorations of the ends of stoles at least as early as the 9th century; but crosses in the middle md at the ends were rarely added during the middle ages. The usual material of medieval stoles was silk, and the better ones were embroidered with silk, gold thread, pearls, &c.

The stole is worn immediately over the alb; by deacons, scarf-wise over the left shoulder, across the breast and back to the right side; by priests and bishops, dependent from the neck, the two ends falling over the breast. In the case of bishops, however, the stole always hangs straight down; while priests wear it crossed over the breast when vested in the alb. Essenti- ally, the actual method of wearing the stole conforms to the original practice. During the middle ages there were, however, deviations of custom: e.g. priests, even according to the Roman use, did not wear the stole crossed over the alb, though this had been prescribed for Spain so early as 675 by the 4th canon of the council of Braga. In southern Italy, probably under Greek influence, and in Milan (where the custom still survives) the diaconal stole was put on over the dalmatic. Similarly in Spain and Gaul, anterior to the Carolingian age, the stole was worn by deacons over the alba or outer tunic.

According to the Roman use the stole is now only worn at mass, in administering the sacraments and sacramentalia,, when touching the Host, &c, but not e.g. at solemn offices or in proces- sions. In the middle ages, however, it was the custom to wear it at nearly all liturgical functions. In the 9th and 10th century it' was even made obligatory, by the decrees of the synods of Mainz (813) and Tribur (895), on priests throughout the Frank Empire to wear it at all times, especially when travelling. Else- where it was the custom to wear it always, at least for a year after ordination.

The custom of giving the stole to priests and deacons at their ordination is of great antiquity. So far as Spain is concerned there is evidence for it in the decrees of the 4th council of Toledo (633), and for Rome that of the 8th century Ordo of Mabillon. The present practice — according to which the bishop lays the stole over the left shoulder of the deacon, and crosses it over the breast of the priest — is already found in the pontificals of the 10th century.

There is no evidence to show when the stole was first used in the Western Church. In Gaul and Spain we already find it in the 6th century; our first evidence for its use in Rome is of the 8th century, which is however, of course, no proof that it was not in use earlier. The mosaic in the apse of S. Vitale at Ravenna, which has been taken to prove the existence of the stole in the first half of the 6th century, has no value as evidence, as the lower part of the figure of Bishop Ecclesius (see Vestments, fig. 2) was renewed in the 12th century. It is noteworthy that at Rome, until the 10th century, the stole was worn by the lower orders of the clergy also.

In the Eastern Church the stole (Gr. wpapuiv, the diaconal stole, ˆirirpaxˆXioi', the priestly stole; Slav, orar and epitrachil; Arm. urar; Syr. uroro; Nest, urara; Copt, orarion and patrashil) makes its appearance very early. The stole of the deacons is mentioned so early as the 4th and 5th centuries, the first instance being in the 22nd canon of the council of Laodicea, where it is mentioned specifically as the insignia of a deacon. Of a priestly stole we hear for the first time in the Theoria mystica (8th century) . In the Maronite, Syrian, and Nestorian Churches subdeacons also wear the stole, and among the Maronites the lectors as well. There is very little evidence as to the character of the stole in the ancient Church of the East. The stole of priests and bishops, decorated with crosses, was worn originally in all rites as in the West, i.e. hanging in two loose bands over the breast; at the present day, according to the Greek rite, the two bands are

firmly sewn together, while in the Armenian, Syrian and Coptic rites they have even been amalgamated into a single broad strip with an opening at the top for the head. Its ancient form has. been retained only by the Nestorians, who wear it crossed over the breast. The diaconal stole was and continues to be worn usually hanging over the left shoulder, the ends falling straight down before and behind. Only the Copts and Armenians wear it scarf-wise. Originally the diaconal stole would seem to have been a narrow strip of folded linen, and it appears in the pictures of the 9th century as a narrow band ornamented with crosses. Later, it was often the habit to embroider on Greek diaconal stoles the words AriOS AriOS AriOZ.

The question of the origin of the stole admits of no conclusive answer. It is certainly not derived from the antique stola, called tunica, as was formerly always held, nor yet from the prayer blanket (tallith) of the Jews. More careful investigation, moreover, throws very considerable doubt on the possibility of the derivation of the priest's stole from the ancient neck-cloth (ovarium) and of the

diaconal stole from a napkin used in the liturgy. A more reason- able theory seems to be that which suggests that, in the East, the stole was originally introduced as that which it was when it first appears in the 22 nd canon of Laodicea, viz. a special liturgical mark of distinction for deacons, which in course of time was extended to all the higher orders. In all probability it was introduced straight from the East into Spain and Gaul. Rome also probably imported it from the same quarter, but weakened its significance by making it a cloth sanctified by being laid on the Confessio ot St Peter, the bestowal of which at ordination was intended to express the fact that elevation to clerical office in the Roman Church was a grace bestowed de benedictione S. Petri and that the ordinands were undertaking with their consecration the duty of serving St Peter, i.e. the Roman Church.

Wherever the Reformation was introduced the stole was done away with, even when chasuble, alb and cope were retained; the reason being that it was the ensign of the major orders, which in the Catholic sense were rejected by the Reformers. 1 (J. Bra.)

STOLEN GOODS. In English law, various points of impor- tance arise in connexion with chattels which have been the subject of larceny and have not been returned to the possession of their owner. The owner of the goods stolen has an action against the thief for the goods or their value. How far he is entitled to pursue his civil right to the exclusion of criminal prosecution does not seem very clear upon the authorities. In Midland Insurance Co. v. Smith (1881, L.R. 6 Q.B.D., 568), Mr Justice Watkin Williams said: " It has been said that the true principle of the common law is that there is neither a merger of the civil right, nor is it a strict condition precedent to such right that there shall have been a prosecution of the felon, but that there is a duty imposed upon the injured person not to resort to the prosecution of his private suit to the neglect and exclusion of the vindication of the public law; in my opinion this view is the correct one." Dealing with stolen goods by persons other than the thief may affect the rights of such persons either criminally or civilly. Two varieties of crime arise from such dealings. (1) Receiving stolen goods knowing them to have been stolen, a misdemeanour at common law, is by the Larceny Act a felony punishable by penal servitude for fourteen years where the theft amounts to felony, a misdemeanour punish- able by penal servitude for seven years where the theft is a

'The stole was not one of the vestments prescribed by the rubrics of the first Prayer-book of Edward VI. (see Vestments). It was replaced in the Church of England from the Reformation onwards by the

scarf, a broad band of black silk, formerly part of the outdoor dress of the dignified clergy and without liturgical significance. This vestment has some resemblance to the stole, in that it is worn round the neck and hanging straight down in front over each shoulder. This resemblance led, during the 19th century, to a confusion of the two vestments. The scarf was narrowed into the black stole, sometimes ornamented with crosses embroidered in the centre behind and at the ends, and this was gradually replaced by coloured stoles, varying according to the church's seasons. The stole, either black or coloured, is now almost universally worn by the Anglican clergy, even where the other " eucharistic vestments" have not been adopted. It may be noted that, whatever may be the case with the other reformed churches, it is unsafe to argue from the disuse of the stole in the Church of England that, this was intended to symbolize the rejection of the major orders " in the Catholic sense," unless this sense be taken to imply a necessary connexion with the doctrine of transubstantiation and the sacrifice I of the mass. (W. A. P.)

misdemeanour, as in obtaining goods by false pretences. Recent possession of stolen property may, according to circumstances, support the presumption that the prisoner is a thief or that he is a receiver. The Prevention of Crime Act, 1871, made important changes in the law of evidence in charges of receiving. It allows, under proper safeguards, evidence to be given in the course of the trial of the finding of other stolen property in the possession of the accused, and of a previous conviction for any offence involv- ing fraud and dishonesty. (2) Compounding theft, or theftbole (redemptio furti), that is, taking back stolen goods or receiving compensation on condition of not prosecuting, is a misdemeanour at common law. It need not necessarily be committed by the owner of the goods. Under the Larceny Act it is a felony punish- able by seven years' penal servitude to take money or reward corruptly for helping to recover stolen goods without using all due diligence to bring the offender to trial. By the same act, to advertise or print or publish any advertisement offering a reward for the return of stolen goods, and using any words "purporting that no questions will be asked, &c, renders the offender liable to a penalty of £50. This penalty must, by the Larceny (Adver- tisements) Act 1870, be sued for within six months, and the assent of the attorney-general is necessary. Various acts provide for the liabilities of pawnbrokers, publicans, marine-store dealers, and others into whose possession stolen goods come.

Search for stolen goods can only be undertaken by a police officer under the protection of a search warrant. The law as to stolen goods, as far as it affects the civil rights and liabilities of the owner and third parties, is shortly as follows. As a general rule a purchaser takes goods subject to any infirmities of title. The property in money, bank-notes, and negotiable instruments passes by delivery, and a person taking any of these bona fide and for value is entitled to retain it as against a former owner from whom it may have been stolen. In the case of other goods, a bona fide purchaser of stolen goods in market overt (see Sale of Goods) obtains a good title (except as against the Crown), provided that the thief has not been convicted. After conviction of the thief the property revests in the owner, and the court before which the thief was convicted may order restitution, except in the cases specially mentioned in the Larceny Act, i.e. the bona fide discharge or transfer of a security for value without notice and the fraudulent dealing by a trustee, banker, &c, with goods and documents of title to goods entrusted to him. After conviction of the thief the goods must be recovered from the person in whose hands they are at the time of the conviction, for any sales and resales, if the first sale was in market overt, are good until conviction of the thief. The protection given by market overt is unknown in Scotland. If the goods were obtained by false pretences and not by larceny, the question then is whether the property in the goods has passed or not, and the answer to this question depends upon the nature of the false pretences employed. If the vendee obtains possession of goods with the intention by the vendor to transfer both the property and the possession, the property vests in the vendee until the vendor has done some act to dis- affirm the transaction. But if there was never any such inten- tion — if, for instance, the vendor delivers the goods to A.B. under the belief that he is CD. — the property does not vest in the transferee, and the owner may recover the goods even from a bona fide purchaser.

In the United States the law as to stolen goods is regulated by statute in the various states, but the broad principles are practically in accordance with English law. The doctrine of market overt is not, however, acknowledged by any state. The purchaser from a thief gets no title as against the owner. One who buys goods from a factor who procured them by larceny is not protected by the Factors Act in New York (Soltau v. Gerdau, 119 N.Y. 380). To the same effect (Gentry v. Singleton (1904), 128 Fed. R. 670) is a purchase of cattle from a thief. The U.S. Supreme Court held, in an action of detinue to recover five negro slaves, that the English rule as to sale in market overt did not apply in the United States {Ventress v. Smith, 10 Peters

175). In Pennsylvania there is no market overt and a purchaser of personal property cannot get a good title from one without

title by paying for it (1907, Heisley v. Economy Tool Co. 33, Pa. Super. Ct. 218). So in Maine {Combs v. Gorden, 59 Me. in). In Massachusetts a sale of butter in the open market by one who had feloniously acquired possession of it did not transfer the property (Dame v. Baldwin, 8 Mass. 518). So held also in New York where horses stolen from there were sold in Canada, though a purchaser there is entitled to be reimbursed before delivering to the owner (Edgerly v. Bush, 81 N.Y. 199).

See also False Pretences; Larceny.

STOLICZKA, FERDINAND (1838-1874), Austrian palaeonto- logist, was born at Hochwald, in Moravia, in May 1838. He was educated at Prague and at the university of Vienna where he graduated Ph.D. He was encouraged to work at geology and palaeontology by Professor E. Suess and Dr M. Hoernes; and as early as 1859 he communicated to the Vienna Academy a description of some freshwater mollusca from the Cretaceous rocks of the north-eastern Alps. In 1861 he joined the Austrian Geological Survey, and in the following year he was appointed palaeontologist to the Geological Survey of India. In Calcutta the description of the Cretaceous fossils of Southern India was placed in his hands, and the publication of this great work which formed part of the Palaeontologia indica, was commenced with the assistance of H. F. Blanford in 1863 and completed in 1873. During the last ten years of his life he published geological memoirs on the western Himalayas and Tibet, and numerous papers on all branches of Indian zoology, from mammals to insects and corals. In 1873 he was selected as naturalist and geologist to accompany a mission despatched by the Indian government to Yarkund and Kashgar under Mr (afterwards Sir Douglas) Forsyth. His health, which had been severely affected by his previous field work in India, proved unequal to the strain, and he died on the 19th of June 1874, at Shayok, in Ladak, while " returning loaded with the spoils and notes of nearly a year's research in one of the least-known parts of Central Asia." Memoir (with bibliography) by V. Ball, appended to Scientific Results of the second Yarkand Mission, 1886; Obituary by W. T. Blanford, Nature, July 9, 1 874.

STOLP, or Stolpe, a town of Germany, in the Prussian province of Pomerania, on the Stolpe, 10 m. from the Baltic Sea and 64 m. W. of Danzig on the railway to Stargard, and with branches to Stolpmiinde and Neustettin. Pop. (1905), 31,154. The large church of St Mary, with a lofty tower, dating from the 14th century, the Renaissance

castle of the 16th century, now used as a prison, and one of the ancient town-gates restored in 1872 are memorials of the time when Stolp was a prosperous member of the Hanseatic League. It has also the church of St John, built in the 13th century, a new town hall, and a statue of Bismarck. The manufacture of machinery, amber articles, tobacco and cigars, and bricks, with some iron-founding, linen-weaving, and salmon-fishing in the Stolpe, are the chief industrial occupations of the inhabitants, who also carry on trade in grain, cattle, spirits, timber, fish and geese. Stolpmiinde, a fishing-village and summer resort, at the mouth of the river, is the port of Stolp.

Stolp, mentioned in the nth century, received town rights in 1273. From the 14th to the 16th century it was a member of the Hanseatic League. Until 1637, when it passed to Branden- burg, the town was generally in the possession of the dukes of Pomerania.

STOMACH (Gr. crronaxos from arS/ia, a mouth), the bag-like digestive organ which in man is situated in the upper left part of the abdomen. See, for anatomical details, Alimentary Canal. For the diseases of the stomach in general see Digestive Organs; and for special forms Gastritis, Gastric Ulcer, Dyspepsia, &c; also Abdomen (Abdominal Surgery).

Cancer of the Stomach is a common disease. It occurs for the most part in persons at or after middle life, and in both sexes equally. Its favourite situation is the outlet (pyloric cancer), where a hard, fibrous growth forms a contracting ring of the scirrhous variety. But when cancer attacks the inlet of the stomach, the tumour is of the scaly epitheliomatous variety. It often begins in the tissues of the end of the gullet, spreading downwards to the stomach. Chronic gastric ulcer is not unfrequently the starting point of cancer.

The symptoms of cancer of the stomach are apt to be indefinite (for many weeks or months). There may be long-standing com- plaints of " indigestion," which is sometimes made better, sometimes worse, by taking food. Then comes a feeling of discomfort which can be often localized, the individual pointing with his finger to a. spot somewhere behind the end of the breastbone. Difficulty and pain in swallowing may be complained of when the cancer is beginning to block the inlet, but if it is situated at the pylorus the discomfort

comes on an hour or two after a meal — at the time that the partially digested food is trying to make its way into the small intestine. Much of the food remains in the stomach and, undergoing fermenta- tion, causes the evolution of gas which distends the stomach and gives rise to unavoidable belching. Later on vomiting occurs. The vomiting may take place every two or three days, enormous quantities of undigested food mixed with frothy, yeast-like mucous being thrown up. And whilst the stomach is slowly filling up again after one of these uncontrollable emptyings, sudden and violent movements of the individual may cause the fluid to give rise to audible " splashings." But even at this stage the disease may be unrecognizable, though the symptoms are extremely suggestive. But later the vomited matter is blackened by blood which has escaped into the stomach from the ulcerated growth. The patient then rapidly loses flesh and strength, and a hard lump may be felt in the upper part of the abdomen.

A characteristic feature of cancer is the carrying of the epithelial cells (which are the essential element of the growth) to the nearest lymphatic glands, and in cancer of the stomach the secondary implication of the glands may cause the formation of large masses between the stomach and the liver, which may press upon the large veins and give rise to dropsy. Secondary deposits are apt to form also in the liver and they may cause the appearance of a bulging below the ribs on the right side.

Another characteristic of cancer is that it spreads far and wide, drawing other tissues to itself by contracting fibrous bands. These are sometimes erroneously spoken of as the " roots " of cancer, and in the case of cancer of the stomach they may fix it to the pancreas, the liver, the bowels or the spine. The invasion of the lymphatic glands and the spreading of the growth into neighbouring organs, render the successful operative treatment of gastric cancer hazardous and disappointing. By the time that a tumour has made itself recognisable the probability is that it is too late for the attempt to be made for its removal. But in many cases the patient prefers that the abdomen should be opened for exploration for a possible operation than that he should hopelessly give himself over to the disease. And sometimes the surgeon is enabled by operation to give great relief, though the removal of the growth itself is impracticable.

When the growth is at the cardiac end of the stomach, blocking the gullet and causing slow starvation, the abdomen may advisedly be opened, and, the stomach having been fixed to the surface-wound, a permanent opening may be arranged for the introduction of an

adequate amount of food. This operation is called gastrostomy and may be the means of giving many weeks of comfort to the unhappy patient — provided that its performance is not too long postponed. In the case of pyloric obstruction a permanent opening may be established between the stomach and a neighbouring piece of intestine, so that the food may find its way along the alimentary canal greatly to the relief of the symptoms of gastric dilatation. This is called " short-circuiting."

In some early cases of pyloric cancer resection of the disease may be performed, the upper end of the intestine being afterwards joined to the middle of the stomach by a kind of short-circuiting operation. In certain rare cases the whole of the stomach has been removed, the bowel being brought up and spliced to the end of the gullet.

In the case of gastric dilatation from pyloric obstruction great relief may be afforded by washing out the viscus by means of a long rubber tube, a funnel, and a jug of hot water, as originally suggested by Adolf Kiissmaul.

Pyloroplasty. — Simple fibrous narrowing of the gateway of the stomach or of the intestine is dealt with by dividing it longitudinally and then suturing the edges of the wound transversely. This ingenious operation widens the track at the expense of an unimpor- tant fraction of its length. In cases of great dilatation of the stomach with no obstruction to the outlet the slack of the walls may be gathered up by pleating and so permanently secured by suturing. Loreta's operation for dilatation of the outlet of the stomach is now rarely performed. (E. O.)*

STONE, CHARLES POMEROY (1824-1887), American soldier, was born in Greenfield, Massachusetts, on the 30th of September 1824. He graduated at West Point in 1845, and in the Mexican War earned two brevets for distinguished conduct. In 1856 he resigned from the army; and in 1857-1861 he led a scientific expedition in the state of Sonora, Mexico. He re-entered the service in 1861, and became a brigadier-general, United States Volunteers, but the defeat of a detachment at Ball's Bluff (.Oct. 2i, 1861) was attributed to him, and he was imprisoned

for six months, being then released without any charge being brought against him. After serving for short periods in the latter stages of the war, he resigned his commission (Sept. 1864). He was engineer and superintendent of a mining company in Virginia from 1865 to 1870, when he entered the military service of the khedive of Egypt, whose

chief of staff and general aide-de-camp he became, with the rank of lieutenant-general and the title of " Ferik Pasha." He returned to the United States in 1883, and resumed his engineering work. He died in New York City on the 24th of January 1887.

STONE, EDWARD JAMES (1831-1897), British astronomer, was born in London on the 28th of February 1831. Educated at the City of London School, he obtained a studentship at King's College, London, and in 1856 a scholarship at Queen's College, Cambridge, graduated as fifth wrangler in 1859, and was immediately elected fellow of his college. The following year he succeeded the Rev. R. Main as chief assistant at the Royal Observatory, Greenwich, and at once undertook the fundamental task of improving astronomical constants. The most important of these, the sun's mean parallax, was at that time subject to considerable uncertainty. From a discussion of the observations of Mars made in i860 and 1862 at Greenwich and Williams- town (near Melbourne), Stone deduced for it a value of 8-932″ (Mon. Not. R.A.S. xxiii. 183), and in a further investigation in which he included the observations made in 1862, at the Cape of Good Hope, he obtained 8-945″ (Mem. of R.A.S. , vol. xxxiii.). Confirmatory results were afforded by his discus- sion of the observations of the transit of Venus in 1769 which yielded the figure 8-91″ (Mon. Not. R.A.S. xxviii. 255). In 1865 he contributed a memoir to the Royal Astronomical Society on the constant of lunar parallax. He also deter- mined the mass of the moon, and from a discussion of the Greenwich transit circle observations between 1851 and 1865 he found for the constant of nutation the value 9- 134". These services were recognized by the award of the Royal Astronomical Society's gold medal in 1869, and on the resig- nation of Sir Thomas Maclear in 1870 he was appointed Her Majesty's astronomer at the Cape. His first task on taking up this post was the reduction and publication of a large mass of observations left by his predecessor, from a selected portion of which (those made 1856-1860) he compiled a catalogue of n 59 stars. His principal work was, however, a catalogue of 12,441 stars to the 7th magnitude between the South Pole and 25 S. declination, which was practically finished by the end of 1878 and published in 1881. Shortly after the death of Main on the 9th of May 1878, Stone was appointed to succeed him as Radcliffe Observer at Oxford, and he left the Cape on the 27th of May 1879. At Oxford he extended the Cape observations of stars to the 7 th magnitude from 25 S. declination to the equator, and collected the results in the Radcliffe Catalogue for 1890, which contains the places of 6424 stars. Stone observed the transit of Venus of 1874 at the Cape, and organized the

government expeditions for the corresponding event in 1882. He was elected president of the Royal Astronomical Society (1882-1884), and he was the first to recognize the importance of the old observations accumu- lated at the Radcliffe Observatory by Hornsby, Robertson and Rigaud (Mon. Not. R.A.S., vol. lv.). He successfully observed the total solar eclipse of the 8th of August 1896 at Novaya Zemlya, and purposed a voyage to India for the eclipse of 1898, but died suddenly at the Radcliffe Observatory on the 9th of May 1897. The number of his astronomical publications exceeds 150, but his reputation depends mainly on his earlier work at Greenwich and his two great star catalogues — the Cape Catalogue for 1880 and the Radcliffe Catalogue for 1890.

See Proc. Roy. Society, lxii. 10; Month. Not. Roy. Ast. Soc. lviii. 143; The Times, 10th of May 1897; Observatory, xx. 234; Astr. Nach. No. 3426; Roy. Soc. Cat. Scient. Papers. (A M. C.)

STONE, FRANK (1800-1859), British painter, was born in Manchester, and was entirely self-taught. He was elected an associate of the Society of Painters in Water Colours in 1833 and member in 1843; and an associate of the Royal Academy in 185 1. The works he first exhibited at the Academy were portraits, but

from 1840 onwards he contributed figure pictures, scenes from Shakespeare, scripture and sentimental subjects, many of which were engraved.

STONE, GEORGE (1708-1764), archbishop of Armagh, was the son of Andrew Stone, a London banker, and was educated at Westminster School and Christ Church, Oxford. Having taken holy orders his advancement in the Church was very rapid, mainly through the influence of his brother Andrew. Andrew Stone (1703-17 73), who was five years older than George, became private secretary to the duke of Newcastle about 1729, and was for many years on the most intimate and confidential terms both with the duke and with his brother Henry Pelham. In 1734 he was appointed under-secretary of state, and he soon gained a position of great personal influence with George II. by whom he was made tutor to Prince George, afterwards George III. On the accession of the latter to the throne, Andrew Stone was appointed treasurer to Queen Charlotte, and attaching himself to Lord Bute he became an influential member of the party known as ”

the king's friends," whose meetings were frequently held at his house. He was, therefore, well able to promote the preferment of his brother George, who went to Ireland as chaplain to the duke of Dorset when that nobleman became lord-lieutenant in 1731. In 1733 George Stone was made dean of Ferns, and in the following year he exchanged this deanery for that of Derry; in 1740 he became bishop of Ferns, in 1743 bishop of Kildare, in 1745 bishop of Derry, and in 1747 archbishop of Armagh. During the two years that he occupied the see of Kildare he was also dean of Christchurch, Dublin.

From the moment that he became primate of Ireland, Stone proved himself more a politician than an ecclesiastic. " He was said to have been selfish, worldly-minded, ambitious and ostentatious; and he was accused, though very probably falsely, of gross private vice." 1 His aim was to secure political power, a desire which brought him into conflict with Boyle, the Speaker of the Irish House of Commons, who had organized a formidable opposition to the government. The duke of Dorset's reappoint- ment to the lord-lieutenancy in 1751, with his son Lord George Sackville as secretary of state for Ireland, strengthened the primate's position and enabled him to triumph over the popular party on the constitutional question as to the right of the Irish House of Commons to dispose of surplus Irish revenue, which the government maintained was the property of the Crown. But when Dorset was replaced by the duke of Devonshire in 1755, Boyle was raised to the peerage as earl of Shannon and received a pension, and other members of the opposition also obtained pensions or places; and the archbishop, finding himself excluded from power, went into opposition to the government in alliance with John Ponsonby. These two, afterwards joined by the primate's old rival Lord Shannon, and usually supported by the earl of Kildare, regained control of affairs in 1758, during the viceroyalty of the duke of Bedford. In the same year Stone wrote a remarkable letter, preserved in the Bedford Correspon- dence (ii. 357), in which he speaks very despondingly of the material condition of Ireiand and the distress of the people. The archbishop was one of the " undertakers " who controlled the Irish House of Commons, and although he did not regain the almost dictatorial power he had exercised at an earlier period, which had suggested a comparison between him and Cardinal Wolsey, he continued to enjoy a prominent share in the adminis- tration of Ireland until his death, which occurred in London on the 19th of December 1764.

Although this "much-abused prelate," as Lecky calls him, was a firm supporter of the English government in Ireland, he was far from being a man of tyrannical or intolerant disposition. It was due to his

influence that in the anti-tithe disturbances in Ulster in 1763 the government acted with conspicuous modera- tion, and that the movement was suppressed with very little bloodshed; he constantly favoured a policy of conciliation to- wards the Roman Catholics, whose loyalty he defended at

1 W. E. H. Lecky, Hist, of Ireland in the Eighteenth Century (1892), i. 462.

different periods of his career both in his speeches in the Irish House of Lords and in his correspondence with ministers in London. Archbishop Stone, who never married, was a man of remarkably handsome appearance; and his manners were " emi- nently seductive and insinuating." Richard Cumberland, who was struck by the " Polish magnificence " of the primate, speaks in the highest terms of his courage, tact, and qualities as a popu- lar leader. Horace Walpole, who gives an unfavourable picture of his private character, acknowledges that Stone possessed " abilities seldom to be matched"; and he had the distinction of being mentioned by David Hume as one of the only two men of mark who had perceived merit in that author's History of England on its first appearance. He was himself the author of several volumes of sermons which were published during his lifetime.

See Richard Mant, History of the Church of Ireland, vol. it. (London, 1840) ; J. A. Froude,77(e English in Ireland in the Eighteenth Century (3 vols., London, 1872-1874) ; W. E. H. Lecky, History of Ireland in the Eighteenth Century (5 vols., London, 1892); J. R. O'Flanagan, Lives of the Lord Chancellors and Keepers of the Great Seal of Ireland (2 vols., London, 1870).; Richard Cumberland, Memoirs (London, 1806) ; F. Hardy, Memoirs of the earl of Charlemont (2 vols., 2nd. ed., London, 1812) ; Horace Walpole, Memoirs of the Reign of George II. (3 vols., London, 1846); Bedford Correspondence (3 vols., London, 1842-1846); Correspondence of Chatham (4 vols., London, 1838-1840).

(R. J. M/j STONE, LUCY [Blackwell] (1818-1893), American reformer, anti-slavery and woman's-rights leader, was born in West Brookfield, Massachusetts, on the 13th of August 1818. Her father refused her the college education that she so eagerly desired, but she earned enough to carry her through Oberiin College, where she graduated in 1847. She immediately went on the lecture platform as an advocate of abolition and of woman's rights, and her remarkable voice and commanding eloquence often held in check the most disorderly audiences. In 1855 she married Dr Henry B. Blackwell

(1824-1909), a prominent abolitionist and advocate of woman's rights, who agreed that she should keep her maiden name; after 1870 he assisted his wife in the management of the Woman's Journal of Boston, of which she became editor in 1872. She allowed her New Jersey property to be sold for taxes, and then published a pamphlet on " taxation without representation." She cam- paigned for woman's suffrage amendments in Kansas (1867), Vermont (1870), Michigan (1874), Colorado (1877) and Nebraska (1892). She died in Dorchester, Mass., on the 18th of October 1893. Her daughter, Alice Stone Blackwell (b. 1857), carried on, with her father, the Woman's Journal after 1893, and in 1885-1905 edited the Woman's Column.

Her husband's sisters, Elizabeth Blackwell (1821-1910) and Emily Blackwell (1826-1910), were prominent physicians. The former graduated at the Geneva Medical College, Geneva, New York, in 1849, receiving the first physician's degree granted to a woman in the United States, and studied in Philadelphia, in Paris and in London, where she began to practise in 1869. She died at Hastings on the 1st of June 1910. Emily Blackwell graduated at the Medical Department of Western Reserve University in 1854; in 1853, with her sister, she founded the New York Infirmary for Women and Children; and she was for many years dean of the Woman's Medical College of the New York Infirmary which she and her sister established in 1 865 .

STONE, MARCUS (1840-), English painter, son of Frank Stone, A.R.A., was trained by his father and began to exhibit at the Academy before he was eighteen; and a few years later he illustrated with much success books by Charles Dickens, Anthony Trollope, and other writers, friends of his family. He was elected an associate of the Royal Academy in 1877, and academician in 1887. In his earlier pictures he dealt much with historical incidents, but in his later work he occupied himself chiefly with a particular type of dainty sentiment, treated with much charm, refinement and executive skill. One of his canvases is in the National Gallery of British Art. Most of his works have been engraved, and medals have been awarded to him at exhibitions in all parts of the world.

See the Life and Work of Marcus Stone, R.A., by A. L. Baldry (Art Journal office, 1896).

STONE, NICHOLAS (1586-1647), English sculptor and archi- tect, was the son of a quarryman of Woodbury, near Exeter, and as a boy was apprenticed to Isaac James, a London mason. About 1603 he went to Holland and worked under the sculptor Hendrik de Keyser (1567-1621) and his son Pieter, and married his master's daughter. Stone is said to have made the portico to the Westerkerk at Amsterdam. Returning to London about 1613 with Bernard Janssens [fl. 1610-1630), a fellow pupil, 1 he settled in South wark and obtained a large practice; in 161 9 he was appointed master-mason to James I., and in 1626 to Charles I.; and he died in London on the 24th of August 1647. Stone, whose work is associated with Inigo Jones's introduction of Renaissance architecture into England, ranks as the great sculptor of his time and the rejuvenator of the art in England. He is best known by his monuments, notably those to Sir Francis Vere, the earl of Middlesex, and Francis Holies in West-minster Abbey; Sir Dudley Digges at Chilham church, Kent; Henry Howard, earl of Northampton, in Dover Castle (removed to Greenwich); Sir Thomas Sutton, at the Charterhouse (with Janssens); Sir Robert Drury at Hawstead church, Suffolk; Sir William Stonhouse at Radley church, Berkshire; Sir Thomas Bodley at Merton College, Oxford; Sir William Pope, in Wroxton church, near Banbury; Sir Nicholas Bacon, in Redgrave church, Suffolk (with Janssens); Dr John Donne (winding-sheet), at St Paul's Cathedral; and Sir Julius Caesar, in St Helen's, Bishopsgate.

He had three sons: John (d. 1667), a sculptor; Henry (d. 1653) — commonly known as " Old Stone "—a painter, whose copies of Van Dyck were famous, and whose portraits of Charles I. and others are in the National Portrait Gallery, and Nicholas (d. 1647), a sculptor, who worked under Bernini at Rome and left a sketch-book, which, with a note-book of his father's (giving a list of his works between 1614 and 1641), is in the Soane Museum.

See an article by A. E. Bullock in the Architectural Review, 1907, and the same author's illustrated monograph Some Sculptural Works of Nicholas Stone (Batsford, London, 1908).

STONE, a market town in the western parliamentary division of Staffordshire, England, on the river Trent, 7 m. N. of Stafford by the North Staffordshire railway. Pop. of urban district (19,01), 5680. Part of the walls and crypt remain of an abbey which dates from the foundation of a college of canons in 670. The church of St Michael dates from 1750, the abbey church having collapsed in the previous year. Alleyne's grammar school is a foundation of 1558. The chief industry is shoemaking, but malting, brewing and tanning are also

carried on. At Bury Bank, on the hills to the north, an earthwork is traditionally considered to be the site of the capital of the Kingdom of Mercia; there are other works in the neighbourhood at Saxon Low.

STONE (O. Eng. stdn; the word is common to Teutonic languages, cf. Ger. Stein, Du. steen, Dan. and Swed. sten; the root is also seen in Gr. aria, pebble) , a detached piece or fragment of rock. The word is thus applied to the small fragments scattered in the ground or on roads, to the water-worn pebbles of the sea shore or river beds, and to the hewn, dressed or shaped rock used as a building material, with which this article deals. A qualifying word generally accompanies " stone " when the term is applied to pieces of rock cut to a particular size and shape and used for a specific purpose, e.g. " mill-stone," " hearth-stone," " grave- stone," &c. The term " precious stone " is used of those minerals which, from their beauty of colour, &c, their rarity, and some- times their hardness, are valued for their suitability for ornaments (see Gems). The word is also often applied to many objects resembling a stone or pebble, such as the hard kernel of certain fruits, as of the cherry, plum, peach, &c, or the calculi or con-

l Also called Janssen (Diet. Nat. Biog.), Jansen and Janson. Possibly he was the brother of the Gerard (Geraert) Jansen or John- son, of Southwark, who in 1616 executed the bust of Shakespeare in Stratford church ; but it is uncertain whether the latter was identical with, or the son of, the Dutch tomb-maker Gerard Jansen described in Sir W. Dugdale's Diary as having, in 1593, lived for twenty-six years in England and as the father of five sons.

cretions sometimes formed in the gall or urinary bladder or the kidneys (see Bladder Diseases and Kidney Diseases). The " stone " has been a common measure of weight in north- western Europe. In Germany the " Stein" was of 20 to 22 lb. In the British system of weights the "legal" stone, or "horse- man's " weight is of 14 lb avoirdupois; in weighing wool it was also of 14 lb, but is now usually 16 lb. The " customary " stone for fish or butcher's meat is of 8 lb.

Building-stone. — In selecting a stone for building purposes many important points have to be considered. The stone must be strong enough to bear the load place4 upon it, it must be durable and weather well in the atmosphere of the district, and its colour and appearance need to be studied. It must further be ascertained whether a sufficient supply is available, and the price also must be taken into account; some difficulty is often experienced in obtaining a suitable stone at a moderate cost, and considerations of expense

frequently have more to do with the choice of a stone than the architect would wish. Where there is risk of fire, as is often the case in business and factory premises, it is necessary to select a stone able to stand the effect of a great heat without damage. Great experience of the strength of stones and, of their behaviour in different situations is desirable; but even when this knowledge is given and the greatest care is combined with it, some point may be overlooked. For example, the stone facing of the Houses of Parliament at Westminster was chosen on the recommendation of a committee composed of men of eminent scientific and technical skill; yet it has not weathered well because it is not constituted to resist the destroying effects of the London atmosphere.

The prime factor in the choice of a building stone should be the climate to which the material has to be exposed. Stone that in the pure country air has proved extremely durable may quickly decay in an impure city atmosphere, or ConsiIt ” m when subjected to the strong salt winds from the sea. ” on- Extremes of temperature, too, are, generally speaking, prejudicial to the life of stone, the alternations of heat and cold setting up move- ments in the substances of the stone, which, though slight, will in many cases hasten its disintegration. There are few materials which more quickly decay and fail than stone placed under unsuitable conditions. An analysis, made by E. G. Clayton, of a sample of incrustation found on the Portland stone masonry of St Paul’s Cathedral, London, gave the following result : —

Weight per cent.

Water (lost at ioo°) 2-06

Water (lost at 150°) 22-48

Carbon (soot) i-io

Calcium sulphate 59 – 38

Calcium phosphate 2-22

Calcium silicate 1-63

Magnesium silicate 0-67

Iron silicate 2-40

Sand and uncombined silica . . . 8-06

The deposit when reduced to a fine grey powder and placed under the microscope did not appear to contain any organic matter. Mr Clayton says that this test points to the fact that the principal constituent of limestones, namely calcium carbonate, has been changed into calcium sulphate by the action of sulphurous and sulphuric acids ever present in the smoky London air. Impurities of this nature lodge on the face of the stone and are diluted and driven into the pores by subsequent rain. Having by their chemical action destroyed a portion of the substance of the material, they cause a slight crust to form on the surface which is in turn washed off. Carbonates of lime and magnesia, the chief constituents of ordinary marbles and limestones, are very susceptible to the solvent action of these acids. Pure water has little or no chemical action upon most building stones, but a danger arises to a porous stone even when situated in pure air. Water will soak into some stones in considerable quantities, and in frosty weather this fact constitutes a serious menace to the rock; for water when passing from the liquid to the solid state exerts if checked an enormous pressure, and the face, and sometimes the bulk, of the stone is frequently damaged in this way. One of the best precautions that can be taken by an architect is a personal visit to the quarry, to examine the stone in its natural situation. This, of course, will give little clue to its behaviour in an impure atmosphere, and therefore, if the particular stone has been previously used in the same district, the buildings in which it has been employed should also be inspected. A hard and lasting stone will show the marks of the tooling, and the arrises of the blocks will I be sharp and good, even after many years' exposure.

The colour has a considerable bearing upon the selection of a stone, but this, although a very important matter, must give way _. before the question of durability. In iarge towns and

oar ' manufacturing districts this is most emphatically the case, for within a few years of erection the exterior of a building in such districts is disguised under a coating of soot and grime.

Should the stone contain iron, especially in the form of " pyrites," there is a great likelihood of its being stained more or less badly by iron " rust." If the metal is distributed evenly in small particles throughout the mass the rusting may do no more harm than merely deepen the tone of the stone, but if present in large pieces the stain

may be so serious as to spoil the appearance entirely.

When the durability of stone has not been tried over some considerable period in a building actually erected, the most careful T tlav physical and chemical tests should be made. If the es stone passes the following tests satisfactorily it may

safely be assumed to be of good quality and likely to prove durable: (i) Resistance to crushing; (2) acid test; (3) absorption test; (4) microscopical examination.

The resistance to crushing varies to an enormous extent with the different kinds of stone, from a little over 60 tons per square foot, which is the limit for a weak limestone, up to a load of over 1300 tons necessary to crush the hardest granites. In general practice the load placed upon stone should not exceed one-tenth of the crushing weight as found by testing typical specimens. A six- inch cube is a convenient size often adopted for the blocks to which the crushing test is to be applied.

The effect produced by soaking pieces of stone for some days in a I % solution of sulphuric and hydrochloric acids will decide roughly whether it will be durable in a city atmosphere. The vessel containing the test should be agitated twice a day; the action of the acid is to dissolve any portions of the stone that would be decomposed by the action of smoke and acid fumes.

A block of the stone under consideration should be dried thoroughly in a warm kiln or oven and carefully weighed before it has time to absorb moisture from the air. It must then be placed to soak in clean water for twenty-four hours and after removal again weighed. The difference between the weights registered will give the weight of water absorbed, and this should not be more than 10% of the weight of the dry block. There are, however, exceptions to this test, some very porous stones being capable of taking up a large quantity of water and at the same time proving durable ii; use. But such material is liable to allow damp to penetrate through it to the interior of the building in which it is employed.

The microscope is the best means of determining the structure of a stone, and of recognizing the presence of matter likely to affect its usefulness adversely. Should iron pyrites be discovered in any quantity the stone should be rejected, as this impurity easily decomposes on exposure, and badly stains and sometimes splits the stone.

The hardest, least absorbent, and most compact and uniform stones are of ancient geological formation, and with time and in- crease of superimposed pressure have become dense and very hard. The softer stones are of later formation, and are usually lighter in weight and more porous. A good stone should ring clearly when struck with steel, and a fresh fracture should on examination be bright, clean and sharp in texture and free from loose grains. A dull earthy appearance indicates an inferior stone.

A simple test for determining whether a stone contains much earthy matter is this: Some small chippings from the stone are placed in a vessel with sufficient water to cover the pieces, and are left undisturbed for about three-quarters of an hour. The water is then gently agitated. With stone of a highly crystalline nature, having its particles well cemented together, the water will remain clear, but stone containing earth and ciay will cause the water to become thick and cloudy in appearance.

The action of the air of certain districts has been shown to be prejudicial to the durability of many stones. A striking instance of this peculiarity is afforded by Cleopatra's Needle on the Thames Embankment. This is an Egyptian monument of carved granite which undoubtedly stood for some thousands of years with little deterioration on the spot from which it was removed. But since its erection in London it has been found necessary to coat it periodically with a preservative solution in order to check the rapid decay set up by the impurities of the London atmosphere. Similarly the Egyptian obelisk in Central Park, New York, U.S.A., has for the same reason been coated with a preparation of paraffin containing creosote dissolved in turpentine. The surface of the stone was heated by means of lamps and charcoal stoves, and the compound applied hot.

The most usual method adopted for preserving stonework is to paint the exposed surfaces with ordinary oil colour. This fills the pores of the stone and forms a coat which, though weather- proof, completely hides the natural beauty of the stone. The paint- ing must be redone every four or five years. Boiled linseed oil is sometimes used on stonework, one or more coats being well brushed in after cleaning it. Its use deepens the colour of the stone, and unless very carefully done the work is apt to appear patchy. A large number of processes consist of coating the stonework with a

Preserva- tives.

solution of soluble silica. In Kuhlmann's process a solution of silicate

of potash or soda is brushed into the stone and, aided by the carbonic acid in the air, acts upon some of the constituents of the stone and forms a hard surface which is not liable to decay. In Ransome's process, a solution of silicate of soda is applied until the surface of the stone has become saturated. This is allowed to dry and a solution of chloride of calcium is then applied in a similar manner. The two solutions act together and by decomposition produce an insoluble silicate of lime which fills the pores of the stone and binds its par- ticles together, thereby checking decay. Baryta water will, when applied to limestone that has decayed owing to the action of sul- phurous fumes, penetrate into and solidify the crumbling portions, with the result that the stone is reconstituted and becomes hard and quite solid. Professor A. H. Church employed this method in arresting th'c decay of the frescoes in the Houses of Parliament and the stonework of the chapter house at Westminster was also treated by him in the same manner. Finale is the name given to a siliceous preservative specially recommended for use upon the limestones from the Bath district. It may also be applied to other limestones, and to bricks, tiles, terra-cotta, &c. It does not materially change the appearance of the stone but enters the pores and prevents decay. Stonework that is much decayed may be restored by Tabard's Metallic Stone, which is a natural stone of trachyte origin reduced to powder. The stone is restored to its original condition by mixing the powder with an acid which softens and reunites the molecules without decomposition. The invention is of French origin and has been used for much important work on the continent of Europe and in England.

The natural bed of a stone is that surface on which it was originally deposited. But. volcanic and other disturbances may have occurred since that time and completely altered its "lie";.. .,, . and therefore it frequently happens that a horizontal a ura line does not coincide with the natural bed of stone as it rests in the quarry. Care must be taken, however, before using the stone in a building, to find the proper bed and to set all stones with their laminae quite level. Exceptions to this rule occur in the projecting stones of cornices and string courses, especially those with undercut members which would be likely to drop off were the natural bed level ; in these cases the stones should be placed on edge with the laminae vertical, except of course at the angles of the building where the stone must be specially selected and laid on its natural bed. Limestones and sandstones which are granular in structure and are found with wide planes of cleavage, giving deep beds which can be quarried in large blocks having no tendency to split in any particular direction, are known as

freestone. t

Stone fresh from the quarry is found to contain a quantity of moisture called " quarry sap," on account of which all stones (even granite) are comparatively soft when first quarried. s ,

This water gradually evaporates, and after some months' eason "£• exposure stones that were quite soft and weak when quarried acquire hardness and strength. For these reasons it is desirable from an economical point of view to " work " the stone to its desired shape and mould and carve it when soft and easily workable. By adopting this method a considerable saving in carriage will be effected, and the durability of the stone is enhanced, for the quarry sap on drying out leaves a hard outer crust or protective skin which would be removed if the working of the stone were left until it had become seasoned. It is an interesting fact that Sir Christopher Wren directed that the stones used in the erection of St Paul's Cathedral should be seasoned for three years on the sea beach.

Building-stones are divided into several groups; limestones and sandstones are classified as aqueous or stratified rock, granite being the principal igneous or unstratified stone, Va " et,es – Limestones consist chiefly of calcium carbonate with small pro- portions of other substances. They are often classified under four heads: Compact limestones consist of carbonate of lime, either pure or in combination with clay and sand. Granular or oolitic limestones consist of grains of carbonate of lime cemented together by the same substance or mixed with sand and clay. The grains are egg-shaped (hence the name " oolite ") and vary in size from tiny particles to grains as Iarge as peas. Shelly limestones consist almost entirely of small shells, cemented together by carbonate of lime. Magnesian limestones are composed of carbonates of lime and magnesia in varying proportions, and usually also contain small quantities of silica, iron and alumina. Stones having less than T 5% of magnesia are not classed under this head. Dolomites are limestones containing equal proportions of carbonate of lime and carbonate of magnesia. Many of the finest building-stones are limestones. In England typical examples are the Bath stones, Portland stone and Kentish ragstone, and in America those from the states of New York, Indiana (Bedford quarry, light brown stone), Illinois (Grafton and Chester quarries) and Kentucky (Bowling Green stone, light grey, similar to Portland). Notable French limestones are obtained from the quarries at Peuren (cream), Chateau-Gaillard (white), Abrots, Normandoux (white), and Villars (light brown). The hardest and closest grained of these are capable of taking a fine polish. Limestones should be used with

care as they are uncertain in their behaviour and usually more difficult to work than sandstones, and as a general rule they do not stand the

action of fire well. On being treated with a dilute acid, limestones will effervesce and by this test they can easily be identified. Lime-stones weigh between 130 lb and 166 lb per cubic foot. They vary in colour, but most of them are cream or yellowish brown. Marble is a limestone which has been changed by the action of heat and pressure into a crystalline form. Many beautiful varieties are found which are suitable for interior decoration, such as for columns, wall lining, paving, &c, and in dry sunny climates they may be employed with great effect in external situations. They will take a high polish and the fine grained varieties are well adapted for intricate carving. The principal supplies of marble are drawn from Italy, Belgium and France, but the marbles from Ireland and those from Devon- shire and Derbyshire possess a remarkable range of colour and variety of markings. America has few notable coloured marbles; most of the stones quarried are white or black. The states of Vermont (West Rutland and Sutherland Falls quarries), Tennessee and Georgia produce large quantities of marble. Marezzo and scagliola are imitations of marbles, and their manufacture and use are described in Plasterwork.

Sandstones are composed of grains of sand held together by a cementing substance to form a compact rock. The cementing medium may be silica, alumina, carbonate of lime or an oxide of iron. Those stones that have a siliceous cement are the most durable. Sandstones vary more in colour than limestones, the colour being largely due to the presence of iron. Cream, brown, grey, pink, red, light and dark blue, and drab are common colours. Typical British sandstones are Corsehill (red) from Dumfriesshire, the Yorkshire sandstones (brown), Pennant stone and Forest of Dean (blue and grey) from Gloucestershire. In America sandstones are quarried in many states, principally Connecticut (brown stone), New York (Potsdam red stone), Ohio (Amherst Berea and other quarries, light brown or grey stone) and Massachusetts (Long- meadow brown stone). The texture of sandstones varies from a fine, almost microscopical, grain to one composed of large particles of sand, It will generally be found that the heaviest, densest, least porous and most lasting stones are those with a fine grain.

Granites are igneous rocks formed by volcanic action and are of all geological ages. Granite is composed of quartz, felspar and mica intimately compacted in varying proportions to form a hard granular stone. Quartz is the principal constituent and imparts to the rock the qualities of durability and strength. Stones containing a large proportion of quartz are hard and difficult to work. Felspar of an earthy nature is opaque in appearance and is liable to decay; it should be clear and almost transparent. The characteristic colour of the granite is generally due to this substance, but the stone is often affected by the nature of the mica it contains, whether it be light or dark in tint. Granite is the hardest, strongest and most durable of building-stones, and is difficult and costly to work. When polished, many varieties present a beautiful and lasting surface. By reason of its strength and toughness this stone is often used for foundations, bases, columns, kerbs and paving and in all positions where great strength is required. The granites from the Peterhead and Aberdeen districts of Scotland and from Cornwall and Devonshire in England are much used. In the United States good granites are quarried in Connecticut, Massachusetts and Minnesota. Canada, especially the eastern provinces, supplies many excellent varieties of granites. Much granite is also exported from Norway and Sweden. Syenitic granite contains hornblende in addition to quartz, felspar and mica. True syenite consists of quartz, felspar and hornblende, the latter taking the place of mica. It obtains its name from a stone found at Syene in Egypt, but it has since been discovered that this stone is not a " syenite " as it actually contains more mica than hornblende. These rocks are very hard and are UGed more for paving and road-metalling than for building purposes.

Slates. — The slate used for roofing and other purposes in building is a fine-grained and compact rock composed of sandy clay which has been more or less metamorphosed by the action of heat and tremendous pressure. Such rocks were originally deposited in the form of sediment by the sea or river, afterwards becoming compacted by the continual heaping up of superincumbent material. Owing no doubt to some sliding motion having at some time taken place, slaty rocks are capable of being split into thin sheets which are trimmed to the various marketable sizes. A good slate is hard, tough and non-absorbent, will give out a metallic ring if struck, and when trimmed it will not splinter nor will the edges become ragged. Slates range in colour from purple to grey and green. The best-known British slates are those of the Welsh and Westmor- land quarries. In America good slate is found in the states of New York, Pennsylvania and Maine. (See also Roofs.)

There are several kinds of artificial stone on the market, consisting of fine cement concrete placed to set in wooden or iron moulds. Although from an artistic point of view its use is not desirable, it is prepared with such care that its cheap- ness, strength and uniform character have led to its wide employment. One of the best-known varieties is Victoria stone which is composed of finely crushed Mount Sorrel (Leicestershire) granite and Portland cement, carefully mixed by machinery in the proportions of three to one, and filled into moulds of the required

shape. When the blocks are set hard the moulds are loosened and the blocks placed in a solution of silicate of soda for about two weeks for the purpose of indurating and hardening them. Many manufac- turers turn out a material that is practically non-porous and is able effectually to resist the corroding influence of sea air or the impure atmosphere of large towns.

See Rivington's Notes on Building Construction, vol. iii. ; F. E. Kidder, Building Construction and Superintendence, vol. i. ; P. Merril, Stones for Building and Decoration (American) ; H. Blagrove, Marble Decoration; W. R. Johnson, Report on Building Stone for Extension of United States Capitol; Report of Committee upon the Decay of Stone at the Palace at Westminster. (J. Bt.)

STONE AGE, the term employed by anthropologists to describe the earliest stage of human civilization when man had gained no knowledge of metals, and his weapons and utensils were formed of stone, horn or bone. The term has no chronological value, as the Stone Age was earlier in some parts of the world than in others, and even to-day races exist who are still in their Stone Age. This first period of human culture has been subdivided by Lord Aveburyinto Palaeolithic and Neolithic, words which have been generally accepted as expressing the two stages of the rough, unpolished and the finely finished and polished stone implements. (See Archaeology.)

STONE-FLY, the name given to medium-sized, neuropterous insects of the family Perlidae with long flexible antennae, wide thoracic sterna and with the wings resembling, as regards size, shape and the fan-like folding of the posterior pair, those typical of the Orthoptera except that the anterior pair is membranous and not coriaceous. The immature forms, which are aquatic, carnivorous and active, are very like the adults except in the absence of wings and in their method of

respiration, which is either cutaneous or effected by means of variously placed integu- mental tufts richly supplied with tracheae. By some authors the Perlidae are regarded as a special order, Plecoptera; by others as a sub-order of an order Platyptera, which contains the Termitidae and some other insects as well.

STONEHAM, a township of Middlesex county, Massachusetts, U.S.A. Pop. (1890), 615s; (1900), 6197; (1910, U.S. census), 7090. Area, 6-6 sq. m. In the township is Spot Pond, a large lake with islets, so named in 1632 by Governor John Wlnthrop and others who then first discovered it; it is a storage basin for the Metropolitan Water District, and supplies Medford, Melrose and Stoneham. A large part (730 acres) of the Middlesex Fells Reservation of the Metropolitan Park System is in Stoneham. The village of Stoneham, with the only post office in the town- ship, is about 9 m. north by east of Boston, and is served by the Boston & Maine railway and by inter-urban electric lines; it has a public library. Steam power was first used in tlie manufacture of shoes in Stoneham by John Hill & Co., who introduced many labour-saving devices, notably the heeling machine (1862). Stoneham, long a part of Charlestown and first settled about 1668, was incorporated as a township in 1725, but its boundaries have been frequently changed since then.

STONEHAVEN (locally Stanehive), a police burgh, seaport and county town of Kincardineshire, Scotland, 15 m. S.S.W. of Aberdeen by rail. Pop. (1901), 4577. It consists of two quarters, the old town picturesquely situated on the south bank of the Carron and the new on the land between this stream and the Cowie, the two being connected by the bridge which carries the main road from the south to Aberdeen. The principal buildings are the market-house and town hall, and the industries include distilling, brewing, tanning, the making of net, rope and twine and woollen manufactures. The harbour, a natural basin, is protected on the south-east by cliffs and has a quay. The trade is mostly in coal and lime and the exports are chiefly agricultural. The town is an important centre of the fishing industry, and has become a favourite watering-place. On the decay of Kincardine, the original capital, Stonehaven became the county town in 1600, and suffered heavily during the covenanting troubles, Montrose setting it on fire in 1645. The Slug Road to Banchory-Ternan, or Upper Banchory (pop. 1475), X S m – distant, a favourite residential resort of Aberdeen citizens, begins at Stonehaven. It pursues mainly a north-western direction, at one point being carried over the shoulder of Cairn mon-earn (1245 ft.).

STONEHENGE

STONEHENGE (Sax. Stankengist, hanging stones), a circular «;roup of huge standing stones (see Stone Monuments), situated on Salisbury Plain, Wiltshire, England, about 7 m. N. of Salisbury. Until comparatively recent times the surrounding district was in a state of nature with merely a thin coating of turf interspersed with tufts of heath and dwarf thistles, but bare of trees and shrubs and altogether devoid of the works of man, with the exception of a series of prehistoric barrows of the Bronze Age which, singly and in groups, studded the landscape. It is safe to say that no prehistoric monument in Great Britain has given rise to more speculation as to its origin, date and purpose; and although the few hoary stones still extant are but a small portion of the original structure they are still sufficiently imposing to excite the wonder of the passing traveller, and mysterious enough to puzzle the antiquary.

Stonehenge was first mentioned by Nennius in the 9th century, who asserts that it was erected in commemoration of the 400 nobles who were treacherously slain near the spot by Hengist in 472. A similar account of its origin is given in the triads of the Welsh bards, where its erection is attributed to Aurelius Ambrosius, the successor of Vortigern. This was regarded as a miraculous feat brought about by the incantations of the magician Merlin, who caused a great stone circle in Ireland (said to have been previously carried thither out of Africa by giants) to be trans- ported to Salisbury Plain, where, at Merlin's " word of power," all the stones moved into their proper places. On the other hand, the Welsh bard Aneurin states that Stonehenge existed before the time of Aurelius, whose title of Ambrosius may, as sug- gested by Davies, have been derived from Stonehenge. Geoffrey of Monmouth, in recording the death of Constantine, which took place about the middle of the 6th century (Historia britonutn), states that he was buried " close by Uther Pendragon, within the structure of stones which was set up with wonderful art not far from Salisbury, and called in the English tongue, Stone- henge." Inigo Jones, in his work on Stonehenge, published in 1655, endeavours to prove that it was a " Roman temple, inscribed to Coelus, the senior of the heathen gods, and built after the Tuscan order." This theory was attacked by Dr Charleton (1725), one of the physicians of Charles II., who maintained that it was erected by the Danes, and consequently after the departure of the Romans from Britain. The next controversialist who appeared on the scene was the famous Dr Stukely (1740) who propounded the theory that Stonehenge, the stone circle at Avebury (Abury), &c, were temples for serpent worship, " Dracontia " as he called them,

the serpent worship- pers being the Druids. Subsequent writers dropped the ophite portion of this theory, but still continued to regard Stonehenge as a temple or observatory of the Druids. Lord Avebury regards it as a temple of the Bronze Age (1500-1000 B.C.), though appar- ently it was not all erected at one time, the inner circle of small unwrought, blue stones being probably older than the rest {Prehistoric Times). On the other hand James Fergusson (187 2) contended that it was a sepulchral monument of the Saxon period.

The original number and position of the stones have suffered in the course of time from wind and weather, in days when archaeological interest was not alive to the importance of pre- serving so ancient a monument. That, however, these natural causes of its dilapidation were assisted by the sacrilegious hand of man there is no lack of documentary evidence. Thus Inigo Jones laments the disappearance of stones that were standing when he measured it; and both Stukely and Aubrey deplore the loss of fallen stones that were removed to make bridges, mill-dams and the like. On the evening of the 31st of December 1900, one of the outer trilithons (22 on plan), with its lintel, was blown down in the course of a severe storm, this being the first collapse since the 3rd of January 1797, when one of the fine trilithons (57, 58) of the horseshoe fell. This catastrophe attracted renewed attention to the state of Stonehenge, and much discussion took place as to the taking of precautions against further decay. The annexed plan, which is that of Professor Flinders Petrie,

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shows the state of Stonehenge at the moment preceding the fall of the trilithon on the 31st of December 1900. Within a circular earthwork, 300 ft. in diameter and approached from the north- east by a road or avenue which can still be traced by banks of earth, is an outer circle of trilithons (100 ft. in diameter) formed by great monoliths (sarsens), originally thirty in number, with large

SCALE OF FEET \ Stones standing on 30ˆDeeember 1900 Stones recumbent on same date.

lintel stones. About 9 ft. within this circle and concentric with it is another, formed of smaller " blue stones," originally forty in number, but only a few of which now remain in situ; within that was a horseshoe of five huge trilithons formed by ten monoliths with their imposts (all sarsens) ; and within the horse- shoe was an inner horseshoe of " blue stones," originally nine- teen in number. The open part of the horseshoe exactly faces the sunrise at the summer

*solstice. Beyond the outer circle (not shown on plan) a great monolith— the sun stone, or so-called ” Friar’s Heel ” — standing on the axis of the horseshoe, marks the point where a spectator, centrally placed within the horse- shoe, would se*e the sun rise on the horizon at the solstice. On the circumference of the earthern circle or surrounding rampart (not shown on plan), which is here intentionally broken, a great recumbent stone — the slaughter stone — lies along the axis: and across the axis, near the central curve of the inner horse- shoe, lies a fine recumbent stone — the altar stone — 15 ft. long.*

Only half the outer circle (sarsens) now remained upright, three on the west, thirteen on the east; and this indicated the effect of the prevalent west wind. The fall of trilithon 22 and its lintel opened a larger path to the wind, and added to the danger of further destruction. Moreover, the narrow passages between the eastern monoliths had become worn by use into hollows which threatened their foundations. The acquisition of Salisbury Plain by the war office for military purposes seemed likely, again, to add to the risk of harm from thoughtless visitors. For all reasons an attempt to preserve Stonehenge was desirable; and the owner, Sir Edmund Antrobus 1 was willing, on certain conditions, as to limitations of access, to co-operate with the Society of Antiquaries, Wiltshire Archaeological Society and Society for the Preservation of Ancient Monuments in taking such steps as might be necessary to prevent more stones from falling, and even (if possible) to set up some which had fallen.

1 The ownership of Stonehenge having been questioned, Sir E. Antrobus’s legal title to it was confirmed by a lawsuit in 1905.

The societies advised that trilithon 6, 7, with lintel— which had slewed round — and trilithon 56, which was leaning at a dangerous angle, should be examined with a view to replacement with as little excavation as possible; that the monolith and lintel 22 be replaced, and its companion sarsen (21) secured; and that trili- thon 57, 58, should be re-erected in its place, which was exactly known. Steps were taken to place the matter in the hands of engineering experts. On the 19th of September 1901 trilithon 56 was successfully raised

to a perpendicular position. It then presented an imposing appearance, standing 21 ft. above ground: its total length was found to be 29 ft. 6 in., and its weight about 30 tons. The excavations were carried to a depth of 8 ft. 3 in. below the datum line, and many objects were found, including chippings and lumps of the stones, stone tools, bones, and (in the upper strata) coins and fragments of pottery. Nearly 100 stone implements were excavated — axes, hammer axes, stone hammers and mauls — which, according to Dr Gowland, who superintended the work, had been used not only for breaking the rude blocks into regular forms, but also for working down their faces to a level or curved surface. No light was thrown, however, on the transport of the blocks.

Notwithstanding the many attempts, both by excavations and speculative writings, to elucidate the history of this unique monument, the archaeological data available are insufficient to decide definitely between the conflicting opinions held with regard to the date of its construction and the purposeior which it was originally intended. The finding of chips of " sarsens " and " blue stones " together " down to the bed of the rock " would seem to disprove the theory that the inner circle and inner horseshoe were built earlier than the rest of the monument. Dr Gowland at a meeting of the Society of Antiquaries (Dec. 19, 1 901), read a paper on his recent excavations on the site of Stonehenge, in which he came to the conclusion that the struc- ture was a temple dedicated to the worship of the sun, and he assigns its erection to the end of the Neolithic period (2000 to 1800 B.C.), on the ground that no bronze implements or relics were found during his explorations. It does not follow, however, from the fact that only stone tools were found at the bottom of the trenches that the monument was constructed when metal tools were unknown, because none of the Stonehenge tools have the characteristic forms of Neolithic implements, so that they might have been specially improvised for the purpose of roughly hewing these huge stones, for which, indeed, they were really better adapted, and more easily procured, than the early and very costly metal tools of the Bronze Age. On the other hand, the recorded discovery of iron armour, Roman and British pottery and coins, together with the bones and horns of deer and other animals, is of little evidential value without a precise record of the circumstances in which they were found. Only one object, viz. an incense burner, seems to the present .writer to have any chronological value, as it is an undoubted sepulchral relic of the Bronze Age.*

That the sun on midsummer day rises nearly, but not quite, in line with the " avenue " and over the Friar's Heel, has long been

advanced as the chief argument in support of the theory that Stonehenge was a temple for sun-worship. On the sup- position that this stone was raised to mark exactly the line of sunrise on midsummer's day when the structure was erected, it would naturally follow, owing to well-known astronomical causes, that in the course of time the direction of this line would slowly undergo a change, and that, at any subsequent date since, the amount of deviation would be commensurate with the lapse of time, thus supplying chronological data to astronomers for determining the age of the building. The solution of this problem has recently been attempted by Sir Norman Lockyer (Stonehenge and other British Stone Monuments), who calculates that on midsummer day, 1680 B.C., the sun would rise exactly over the Friar's Heel, and in a. direct line with the axis of the temple and " avenue." The above date he therefore considers to be the date of the erection of this great national monument, within a margin of possible error, on either side, of 200 years.

Looking at Stonehenge from the architectural standpoint,

there can be no hesitancy in regarding it as an advanced re- presentative of the ordinary stone circles, some two hundred of which, great and small, are known within the British Isles. It is, however, differentiated from them all by having hewn stones, capstones, tenons and sockets. That its analogues were chiefly used as sepulchres has been fully established, and this is presumptive evidence that the sepulchral element was, at least, one of the objects for which Stonehenge was constructed: and it was probably for this reason that it was erected on Salis- bury Plain, where there already existed an extensive necropolis of the Bronze Age. Nor would this by any means militate against its use as a temple for consecrating the dead, or for sun-worship, or any other religious purpose.

Authorities. — Among numerous writings on Stonehenge may be mentioned Stonehenge and Abury, by Dr William Stukely (1740; reprinted in 1840); Davies, Celtic Researches (1804), and Mythology of the Druids (1809) • Hoare, Ancient Wiltshire (1812), vol. i. ; Browne, An Illustration of Stonehenge and Abury (1823); Fergusson, Rude Stone Monuments (1872); Long, Stonehenge and its Barrows (1876); Gidley, Stonehenge viewed in the Light of Ancient History and Modern Observation (1877); W. M. Flinders Petrie, Stonehenge: Plans, Descriptions and, Theories (1880); E. T. Stevens, Jottings on Stone- henge (1882) ; Edgar Barclay, Stonehenge and its Earth Works (1895) ; Lockyer, Stonehenge and other British Stone Monuments, Astro- nomically Considered (1906). See also The Times (April 9, 1901). For a complete bibliography of Stonehenge

see The Wiltshire Archaeological and Natural History Magazine (Dec. 1901), by W. Jerome Harrison. (R. Mu.)

STONEMAN, GEORGE (1822-1894), American soldier, was born at Busti, in Chautauqua county, New York, on the 8th of August 1822. He graduated at West Point in 1846, served as second lieutenant with the Mormon battalion in California during the Mexican War, and became a captain in 1855. In February 1861, while in command of Fort Brown, Texas, he disregarded the orders of his superior officer, Major-General D. E. Twiggs, to surrender to the Confederate forces, and escaped with the garrison. He served on McClellan's staff during the West Virginia campaign, and was commissioned brigadier-general of volunteers and appointed chief of cavalry of the Army of the Potomac in August 1861, in which capacity he took part in the Peninsula campaign and the Seven Days' Battle. He commanded the III. corps in the Fredericksburg campaign; and was promoted, in November 1862, to be major-general of volunteers. During the Chancellorsville campaign he . made an unsuccessful cavalry raid toward Richmond. In the early months of 1864 he commanded the XXIII. corps, and then, as commander of the cavalry of the department of the Ohio, took part in the Atlanta campaign. While attempting to seize the Confederate prison at Andersonville (July 31, 1864), he was captured at Clinton, Georgia. After his release in October he commanded cavalry in East Tennessee, making successful raids into Virginia and North Carolina, and on the 12 th of April 1865 defeated a Confederate force near Salisbury, North Carolina, and captured a large number of prisoners. After- ward he held commands in Tennessee and Virginia until 1868. He was mustered out of the volunteer service in September 1866, but served in the regular army as colonel and brevet- major-general till 187 1. He then removed to California, was elected governor by the Democrats, and served from 1883 to 1887. In February 1891 he was made a colonel on the retired list, U.S. Army, and on the 5th of September 1894 died at Buffalo, New York.

STONE MONUMENTS, PRIMITIVE.— The raising of commemorative monuments of such enduring material as stone is a practice that may be traced in all countries to the remotest times. The highly sculptured statues, obelisks and other monumental erections of modern civilization are but the lineal representatives of the unhewn monoliths, dolmens, cromlechs, &c, of prehistoric times. Judging from the large number of the latter that have still survived the destructive agencies (notably those of man himself) to which they have been exposed during so many ages, it would seem that the motives which led to their erection had as great a hold on humanity

in its earlier stages of development as at the present time. In giving some

STONEHENGE

Plate.

STONE MONUMENTS

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idea of the characteristics of these rude and primitive monu- ments in Britain and elsewhere it will be convenient to classify them as follows: (1) Isolated pillars, or monoliths (pdvos, solitary, and M0os, stone) of unhewn stones raised on end, are called menhirs (Cornish, maenhir, and Welsh maen, a stone, and hir, long). (2) When these monoliths are arranged in lines they become alignments (ad, to, and Fr. ligne, a line), as at Menec, Carnac (see Plate, fig. 5). (3) But if their linear arrange- ment be such as to form an enclosure (enceinte), whether circular, oval or irregular, the group is designated by the name of cromlech (Gaelic, crom, crooked, and leac, Welsh llech, a flagstone), as at Carrowmore, Ireland (see Plate, fig. 4). (4) When the monoliths, instead of standing apart as in the previous structures, are placed close to each other and enclose an area sufficiently small and narrow to be roofed over by one or more capstones so as to form a rude chamber, the monument is called a dolmen (Breton, dolmen, from dol, a table, and men, Welsh maen, a stone). For illustrations of the dolmens at Keriaval and Kit's Coty House (see Plate, figs. 1 and 2). This megalithic chamber is sometimes wholly embedded in a mound of earth or stones so as to present to outward appearance the form of a tumulus or cairn. As, however, there are many tumuli and cairns which do not contain megalithic chambers, it is only partially that these prehistoric remains come under the category of primitive stone monuments. In the rare instances of a dolmen being constructed of two single standing stones supporting a third, like the lintel of a door, as may be seen at Stonehenge (q.v.), the monument is called a trilithon (rpiˆTpeis, three, and Xi0os, stone).

Menhirs. — Rude monoliths set on end appear to have been erected in all ages for a variety of commemorative purposes, such as on the accession of kings and chiefs, or to mark the site of a battle, a grave, or a boundary line, &c. Throughout the British Isles such standing stones are widely interspersed, especially in the less cultivated districts. In Scotland, when stones were used ceremonially in the act

of crowning a king, they were called tanist stones, the most celebrated of which was the Lia Fail, formerly at Scone (now at Westminster Abbey), on which the kings of Scotland used to be crowned. We read also of hare or hoer stones, cambus or camus stones (cam, crooked), cat (cath, battle) stones, witch stanes, Druid stanes, &c. The Hawk stane, or Saxum Falconis, at St Madoes, Perthshire, was erected in memory of the defeat of the Danes at Luncarty, and a monolith now standing on the field of Flodden is said to mark the place where King James fell. When menhirs were grouped together their number was often significant, e.g. twelve (Joshua iv. 5) or seven (Herod, iii. 8). Some standing stones are found to have been artificially perforated, and with these superstition has associated some curious ceremonies. As examples of this class may be mentioned the famous Stone of Odin near the circle of Stennis, the Clach-Charra, or Stone of Vengeance, at Onich near Balachulish, Argyllshire, and Men-en-tol (the holed-stone) in Cornwall. Two rude mono- liths in Scotland bear inscriptions — the famous Newton Stone in the district of Garioch, and the Cat Stane near Edinburgh. Others have cup-and-ring markings, spirals or concentric circles. In Ireland, Wales and Scotland they are occasionally found with Ogam inscriptions and in the north-east of Scotland (Pict- land) with some remarkable and hitherto unexplained symbolical figures, which were continued on the hewn and elaborately sculptured stones of early Christian times so largely found in that locality. In England monoliths are often associated with the cromlechs or stone circles, as the King's Stone at Stanton Drew, Long Meg at Little Salkeld, the Ring Stone at Avebury, &c. One of the finest British monoliths stands in the churchyard of Rudston, Yorkshire.

Menhirs are found in all countries which abound in mega- lithic structures. In France over r6oo isolated examples have been recorded, of which about the half, and by far the most remarkable, are within the five departments which constitute Brittany. Over the rest of France they are generally small

Locmariaquer, Morbihan, is the largest menhir in the world. It was in the form of a smooth-sided obelisk, but now lies on the ground broken into four fragments, the aggregate length of which amounts to 20-50 metres (about 67 ft.). It was made of granite foreign to the neighbourhood, and its weight, according to the most recent calculations, amounted to 347,531 kilogrammes, or 342 tons (UHomme, 1885, p. 193). The next largest menhir is at P16sidy (C6tes-du-Nord) , measuring about 37 ft. in height. Then follows a list of sixty-seven gradually diminishing to 16 ft. in height of which

the first ten (all above 26 ft.) are in Brittany. As regards form these menhirs vary greatly. Some are cylindrical, as the well-known pierre de champ-Dolent at Dol (height 30 ft.), and that of Cadiou in Finistere (28 ft.); while that of Penmarch (26 ft.) takes the shape of a partially expanded fan. A menhir of quartz at M6dr6ac (Ille-et-Vilairue) stands 165 ft. high in the form of a rectangular pillar indubitablement taillt. On the introduction of Christianity into France its adherents appear to have made use of these menhirs at an early period; many of them at present support a cross, and some a Madonna. While the scattered positions of some monoliths suggest that they were sometimes used as landmarks, or perhaps as places of rendezvous for hunters, the singular grouping of others shows that these were only secondary or subsidiary functions. So far as the Ogam inscriptions, found on some of the standing stones in Scotland, Ireland and Wales, have thrown light on the subject they appear to have been the headstones of graves. It is not uncommon to find a monolith overtopping a tumulus, thus simulating the bauta (grave or battle) stones of Scandinavia. Menhirs of all sizes are also met with in Algeria, Morocco, India, Central Asia, &c.

Alignments.— The most celebrated monuments of this class are to be seen in the vicinity of Carnac in Brittany. They are situated in groups at Menec (see Plate, fig. 5), Kermario, Ker- lescant, Erdeven and Ste Barbe — all within a few miles of each other, and in the centre of a district containing the most remark- able megalithic remains in the world. The first three groups are supposed by some archaeologists to be merely portions of one original and continuous series of alignments, which extended nearly 2 m. in length in a uniform direction from south- west to north-east. Commencing at the village of Menec the menhirs extend in eleven rows. At first they stand from ie> to 13 ft. above ground, but as we advance they become gradu- ally smaller till they attain only 3 or 4 ft. in height, and then cease altogether. After a vacant space of about 350 yards we come to the Kermario group, which contains only ten lines, but the menhirs are nearly of the same magnitude as those at the beginning of the former group. After a still greater interval the menhirs again appear at the village of Kerlescant, but this time in thirteen rows. In 1881 M. Felix Gaillard, Plouharnel, made a plan of the alignments at Erdeven, from which it appears that, out of a total of n 20 menhirs which originally constituted the group, 290 are still standing, 740 fallen, and 90 removed. The menhirs here may be traced for nearly a mile, but their linear arrangement is not so distinct, nor are the stones so large as those at Carnac. About 50 alignments are known in France. At Penmarch there is one containing over 200 stones arranged in

four rows. Others, however, are formed of only a single row of stones, as at Kerdouadec, Leure and Camaret. The first is 480 metres in length, and terminates at its southern ex- tremity in a kind of croix gamm&e. At Leur6 three short lines meet' at right angles. The third is situated on the rising ground between the town of Camaret and the point of Toulinguet. It consists of a base line, some 600 yards long, with 41 stones (others had apparently been removed), and two rectangular lines as short offsets. Close to it were a dolmen and a pros- trate menhir. All these monoliths consist of a coarse quartz and are of small dimensions, only one, at Leure, reaching a height of 9 ft. Alignments are also found in the regions flanking the Pyrenees, but here they are generally in single file mostly straight, but sometimes reptiliform. One at Peyrelade

and not to be compared in size to those of Brittany. At I (Billiere) runs in a straight line from north to south for nearly

300 yds. and contains 93 stones, some of which are of great size. At St Columb, in Cornwall, there is one called the Nine Maidens, which consists of eight quartz stones extending in a perfectly straight line for 262 ft. In Britain, however, the alignments are more frequently arranged in a double file, or in avenues leading to, or from, other megalithic monuments, such as still exist, or formerly existed, in connexion with the cromlechs or circles at Avebury, Stonehenge, Dartmoor, Shap, Callernish, &c. The stone circle at Callernish, in the island of Lewis, shows an unusually elaborate design with two parallel rows of upright stones running northwards and a single line across, thus presenting a cruciform appearance. A very tall menhir (17 ft. long) occupies the centre of the circle (42 ft. in diameter). The peat which in the course of ages had accumu- lated to a depth of 5 ft. was removed in 1858, and hence the characteristic features of this remarkable monument are well seen in the Plate, fig. 3. The only example in England comparable to the great alignments of Carnac is in the vale of the White Horse, in Berkshire. Here the stones, numbering about 800, are grouped in three divisions, and ei .end over an irregular parallelogram measuring from 500 to 600 yds. in length and from 250 to 300 yds. in breadth. Sir Henry D r yden describes several groups of alignments in Caithness, as at Garry- whin, Camster, Yarhouse, and the " Many Stones " at Clyth (Fergusson, Rude Stone Monuments, p. 529). Alignments in single and multiple rows have also been observed in Shetland, India,

Algeria, &c.

Cromlechs. — In Britain the use of the word cromlech is vir- tually synonymous with that of dolmen. In France, however, and on the Continent generally, it is exclusively applied to that class of monument for which in this country only the descrip- tive name of " stone circles," or " circles of standing stones," is used. This application of the term in various countries to different classes of monuments has given rise to some confusion. The earliest known use of the word occurs in Bishop Morgan's translation of the Bible into Welsh (1588), where " the clefts of the rocks " is rendered by cromlechydd y creigiau. Its earliest occurrence in the special sense in which it has continued to be used by British antiquaries is in a description of some ancient remains by the Rev. John Griffith of Llanddyfnan (1650), in which he says — " There is a crooked little cell of stone not far from Alaw, where according to tradition Bronwen Leir was buried; such little houses, which are common in this country, are called by the apposite name cromlechaw." In this article the word cromlech retains its continental meaning and is exclusively used to indicate enclosures (enceintes) formed of rude monoliths placed at intervals of a few yards; and as such enclosures generally assume a circular, or oval, shape they are not infrequently described as stone circles. Rectangular enclosures are, however, not unknown, examples of which may be seen at Curcunno (Morbihan), near the well known dolmen of that name, and at Saint Just (Ille-et-Vilaine). The former measures 37 by 27 yds., and is now composed of 22 menhirs, all of which are standing (some fallen ones having been restored by the government), while about a dozen appear to be wanting. A " donkey-shoe-shaped " enclosure has been described by Sir Henry Dryden in the parish of Latheron, Caithness, measur- ing 226 ft. long, no ft. wide in the middle, and 85 ft. wide at the two extremities. Stone circles are frequently arranged concentrically, as may be seen in the circles at Kenmore, near Aberfeldy, Perthshire, as well as in many other Scottish, Irish and Scandinavian examples. More rarely one large circle surrounds inner groups without having a common centre, as at Avebury where the outer circle (1200 ft. in diameter) sur- rounded two others each of which contained an inner con- centric circle. The stone circle of Ballynoe, Co. Down, Ireland, consists of inner and outer (eccentric) circles; the former measures about 57 ft. in diameter with 22 stones, and the latter 105 ft. in diameter with 45 stones. At Boscawen, in Cornwall, there is a group of circles confusedly attached and partially overlapping. Also, on the small island of Er-Lanic (near the famous tumulus of Gavr'inis), ther-j is a double

cromlech (now partially submerged) , the circles of which intersect each other. Cromlechs may also be connected by alignments or avenues, as already explained; and they are often associated with other megalithic monuments. Thus, at the end of the great Carnac alignments are the remains of a large circle which can be readily traced, notwithstanding that some houses are constructed within its area. In the British Isles and in the north of Europe they frequently surround dolmens (as at Carrowmore, Ireland— Plate, fig. 4), tumuli and cairns. A few examples of a dolmen being surrounded by one or more circles have been recorded by M. Cartailhac from the department of Aveyron, in France. Outside the stone circle there is also frequently to be found a circular ditch as at Avebury, Stone-henge, Arbor Low, Ring of Brogar, &c. The most remark- able megalithic monument of this class now extant is Stone- henge, which differs, however, from its congeners in having the stones of its outer circle partially hewn and attached by trans- verse lintels. The largest cromlech in France was situated at the village of Kergonan, on the Ile-aux-Moines (Morbihan), about the half of it being now destroyed by the encroachment of the houses. The remaining semi-circumference contains 36 menhirs, from 6 to 10 ft. high, and its diameter is abcut 328 ft. This cromlech, like so many English " circles," was not circular but slightly elliptical. Only a few of the British cromlechs exceed these dimensions, among which may be mentioned Avebury (1260 by 1170 ft.), Stonehenge (outer circle 300 ft., inner 106 ft.), Stanton Drew (360 ft.), Brogar (345 ft.), Long Meg and her Daughters (330 ft.). One near Dumfries with n stones and 291 ft. in diameter, called the Twelve Apostles, also closely approaches what Fergusson calls the 100-metre size; but, generally speaking, the Scotch and Irish examples are of smaller proportions, rarely exceeding 100 ft. in diameter. That most of the smaller circles have been used as sepulchres has been repeatedly proved by actual excavations which showed that interments had taken place within their areas. It is difficult, however, to believe that this could have been the main object of the larger ones. At Mayborough, near Penrith, there is a circular mound entirely composed of an immense aggregation of small stones in the form of a gigantic ring and enclosing a flat area, about 300 ft. in diameter. This ipace is entered by a wide aperture in the ring, and near the centre there is a fine monolith, one of several known to have formerly stood there. Of the same type is the Giant's Ring, near Bel- fast; but the ring in this instance is made of earth and it is considerably larger in diameter (580 ft.), while the central object is a fine dolmen. It is more probable that such enclosures were used, like many of our modern churches, for the double purpose of burying the dead and addressing

the living.

Dolmens. — In its simplest form a dolmen consists of three, four, or five stone supports, covered by one selected megalith called a capstone, or table. A well-known example of this kind in England is Kit's Coty House (see Plate), situated between Rochester and Maidstone, which is formed of three large sup- ports with a capstone measuring n by 8 ft. From this simple form there is an endless variety of structures till we reach the so-called Giant Graves and Grottes des Fies, which consist of numerous supports and several capstones. The dolmen of Bagneux, situated in the corner of a plantation on the outskirts of the town of Saumur, measures 18 metres in length, 6'So in breadth and 3 in height. It is constructed of huge flagstones, 4 on each side, and 4 capstones — the largest capstone measuring 7-50 metres in length, 7 in breadth and 1 in thickness. Another near Esse (Ille-et-Vilaine) called La Roche aux Fies, is con- structed of 30 supports and 8 capstones, including the vesti- bule. Dolmens of this kind are extremely rare in the British Isles, the only one comparable to them in form being Calliagh Birra's House near Monasterboice, Ireland, which consists of 4 capstones supported by 4 or 5 thin stones on edge to form each side, and one stone closing one end. Owing to its small size (12 ft. long by 4 wide) this monument is disappointing in appearance. These free standing megalithic chambers, generally I known as allies couvertes, as well as many other examples of the

STONE MONUMENTS

Plate.

Photo, Neuriein. pAoto> „_ FHl% & c ~

Fic. i.-DOLMEN OF KERIAVAL, CARNAC, FRANCE. Fig. 2.-KITS COTY HOUSE, AYLESFORD.

Photo, Valentine & Co.

Fig. 3.— DRUIDICAL STONES AT CALLANISH, STORNOWAY.

Photo, Neurdein. XXV. 964.

Fig. 5.— THE ALIGNMENT OF MfiNEC, CARNAC, FRANCE.

simple dolmen, show no evidence of having been covered aver with a mound. When there was a mound, it necessitated in the larger ones an entrance passage which, like the chamber, was constructed of a series of side stones and capstones. Some archaeologists maintain that all dolmens were formerly covered with a cairn or tumulus — a theory which undoubtedly derives some support from the condition of many examples still extant, especially in France, where they may be seen, as it were, in all stages of degradation from a partial to a complete state of denudation. Were the soil and stones which compose the tumulus of New Grange, Ireland, removed, leaving only the large stones which form its entrance passage and central chambers, there would be exposed to view a very imposing megalithic structure, not unlike the group of monoliths at Callernish in the Lewis (see Plate, fig. 3). The allies couvertes of France, Germany and the Channel Islands had their entrance at the end; but, on the other hand, those of the Drente, in Holland (Hune- bedden), had both ends closed and the entrance was on the side facing the sun. The covered dolmens are extremely variable in shape — circular, oval, quadrangular and irregular being forms commonly met with; and as to size they range from that of an ordinary barrow up to that of New Grange, which rises in the form of a truncated cone to a height of 70 ft. with a diameter of .S15 ft. at the base and 120 ft. at the top. Around its base was a circle of some thirty rude monoliths, placed about 10 yds. apart, and forming a circumference of 1000 ft.— only a few of these menhirs are now in situ. The entrance passage to the interior of this huge tumulus measures about 63 ft. long, 4 ft. 9 in. high, and 3 ft. 6 in. wide, and discloses some large blocks of stone; and its cruciform chamber measures 26 ft. long, 21 ft. broad and 10ˆ ft. high in the middle. The entrance gallery may be attached to the end of the chamber, as in the Grotte de Gavr'inis, or to the side, as in the Giant's Grave at Oem near Roskilde. In other instances there is no distinct chamber, but a long passage gradually widening from the entrance; and this may be bent at an angle, as in the dclmen du Rocher (Morbihan). Again, there may be several chambers communicating with one entrance passage; or, two or three chambers, having separate entrances, may be imbedded in the same tumulus. A curious specimen of the former may be seen in a ruined tumulus near St Helier, Jersey; and an excellent example of the latter is the partially destroyed tumulus of Rondosec, near Plouharnel railway station, which contains three separate dolmens. That such variations are not due to altered customs, in consequence of wideness of geographical range, is shown by de Mortillet, who gives plans of no less than 16 differently shaped dolmens (Musee pre-historique, pi. 58), all within a confined district in Morbihan.

Ruined dolmens are abundantly met with in the provinces of Hanover, Oldenburg and Mecklenburg. At Riestedt, near Uelzen in Hanover, there is, on the summit of a tumulus, a very singular dolmen which measures about 40 ft. long and 6 ft. wide. Another at Naschendorf, near Weimar, consists of a mound surrounded by a large circle of stones and a covered chamber on its summit. Remains of a megalithic structure at Rudenbeck, in Mecklenburg, though now very imperfect, show that originally it had been constructed like an allee couverte. It had four supports on each side, two at one end (the other end being open and forming the entrance), and two large capstones. The length in its completed state was about 20 ft., breadth 7ˆ ft., and height from the floor to the under surface of the roof 3 ft. According to Bonstetten, no less than 200 of these viegalithic monuments are distributed over the three provinces Liineburg, Osnabriick and Stade; and the most gigantic ex- amples in Germany are in the duchy of Oldenburg. In Holland, with one or two exceptions, they are confined to the province of Drente, where between 50 and 60 still exist, under tbe name of Hunebedden (Huns' beds). The Borger Hunebed, the largest of the group, is 70 ft. long and 14 ft. wide. In its original condition it contained 45 stones, ten of which were capstones. All the Drente monuments are now denuded, but a few show evidences which suggest that they had formerly been surrounded

by a mound containing an entrance passage. Only one dolmen has been recorded in Belgium; but in France their number amounts to 3000-4000. They are irregularly distributed over 78 departments, no less than 618 being in Brittany. In the centre of the country they are also numerous, some 435 having been recorded in Aveyron; but here they are of much smaller dimensions than in Brittany. From the Pyrenees these rude stone' monuments are sparsely traced along the north coast of Spain and through Portugal to Andalusia, where they occur in considerable numbers, but of their precise numbers and distribution we have no trustworthy accounts. According to Cartailhac {Ages prehistoriques de I'Espagne et du Portugal, p. 152) 118 were recorded up to 1879 under the name of antas, Many of them are in the form of free standing dolmens and allies couvertes. The most remarkable monument of this kind in Spain, and certainly one of the finest in Europe, is that near the village of Antequera, some distance north of Malaga. The chamber, slightly oval in shape, measures 24 metres long, 6-15 metres broad, and from 2-70 metres to 3 metres high. The entire structure comprises 31 monoliths — ten on each side, one at the end and five on the roof. Moreover, the roof is strengthened by three pillars placed along the middle line at the

widest part of the chamber. The huge stones are made of the Jurassic limestone of the district and, like those of Stonehenge, appear to have been partly dressed. The entire structure was originally, and still is partially covered by earth, which formed a mound about 100 ft. in diameter. In Africa dolmens are found in large groups in Morocco, Algeria and Tunis. General Faidherbe writes of having examined five or six thousand at the cemeteries of Bou Merzoug, l'Oued Berda, Tebessa, Gastal, &c. (Congres inter- national d'anlh. et d'arch. prehist., 1872, p. 408). In the Channel Islands every kind of megalithic monument is met with. At Mont Cochon, near St Helier, there was lately discovered in' a mound of blown sand an alUe couverte and, close to it, a stone circle surrounding a small dolmen. In the British Isles dolmens are common in many localities, particularly in the west of England, Anglesey, the Isle of Man, Ireland and Scotland. In the last named country they are not, however, the most numerous and striking remains among its rude stone monuments — tbe stone circles and cisted cairns having largely superseded them.

No dolmens exist in eastern Europe beyond Saxony. They reappear, however, in the Crimea and Circassia, whence they have been traced through Central Asia to India where they are widely distributed. Similar structures have also been recog- nized by travellers in Palestine, Arabia, Persia, Australia, Madagascar, Peru, &c. The irregular manner in which these megalithic monuments are distributed along the western parts of Europe bordering on the seashore has led to the theory that they were erected by a special people, but as to the when, whence and whither of this megalithic race we have no know- ledge whatever. Although the European dolmens, however widely apart they may be situated, have a strong family like- ness, yet they present some striking differences in certain locali- ties. In Scandinavia they are confined to Danish lands and a few provinces in the south of Sweden. In the former country the exposed dolmens are often placed on artificial mounds and surrounded by cromlechs which are either circular (runddysser) , or oval (langdysser) . In Sweden the sepulture a galerie is very rarely entirely covered up as in the Giant graves of Denmark.

In the absence of historical records and scientific investiga- tions it was formerly the custom to regard all these different varieties of primitive stone monuments as of Celtic origin. By some they were supposed to have been constructed by the Druids, the so-called priests of the Celts; and hence they have been described, especially since the time of Aubrey and Stukely, under the name of Celtic or Druidical monuments. But from more recent researches there can be

no doubt that the primary object of this class of remains was sepulchral, and that the mega- lithic chambers with entrance passages were used as family vaults. Against the theory that any of them were ever used as altars, there is prima facie evidence in the care taken to have

the smoothest and flattest surface of the stones composing the chambers always turned inwards. Moreover, cup marks and other primitive markings, when found on capstones, are almost invariably on their underside, as at the dolmens of Keria- val, Kercado and Dol ar Marchant. Also, all the six stones forming the three-sided chamber of the great tumulus of Gavr'inis (Morbihan) and most of those in the sides of its long entrance passage (44 ft.), are elaborately sculptured with primitive incised patterns, perfectly analogous to those on the walls of the chamber of New Grange (Ireland). From its position in the centre of a large circular enclosure, as uniformly even as a garden lawn, no dolmen could be more suggestive as a place of sacrifice than that within the Giant's Ring near Belfast; yet nothing could be more inappropriate for such a purpose that its capstone, which, in fact, is nothing more than a large granite boulder presenting on its upper side an unusually rounded surface.

No chronological sequence has been detected in the construc- tion and evolution of these primitive stone monuments; nor can their existence and special forms in different countries be said to indicate contemporaneity. The dolmens of Africa are often found to contain objects peculiar to the Iron Age, and it is said that in some parts of India the people are still in the habit of erecting menhirs, cromlechs, dolmens and other megalithic monuments. Scandinavian archaeologists assign their dolmens exclusively to the Stone Age. It would appear that, subsequent to the great chambered cairns of the Stone Age, a period of degradation in this kind of architecture occurred in Britain when the Bronze Age barrows replaced the dolmens, and these again gave way to simple burial in the earth. In Scandinavia the megalithic chamber seems to have been dis- carded in the Iron Age for burials, either by cremation or inhumation under huge tumuli, as may be seen in the three great mounds of Thor, Odin and Freya at Gamla Upsala, and the ship-barrow at Gokstad on the Sandefiord, the scene of the discovery of the Viking ship now exhibited in the museum at Christiania.

Just on the borderland between the works of nature and art comes the so-called Rocking-Stone (Logan, or Loggan, stone, French, pierre branlante), which usually is nothing more than an erratic, ice-transported boulder, poised so nicely over a rocky bed that gentle pressure with the hand may cause it to rock or oscillate. Such stones appear to be sparsely distributed over the whole area occupied by the primitive stone monu- ments, and, being very large, they were pre-eminently cal- culated to awaken astonishment in the minds of the worship- pers of the mysterious works of nature. Hence the important position assigned to them in the Druidical worship invented by Stukely and other antiquaries of the 18th century. Some rocking-stones are evidently artificial, having had the rock cut underneath them, leaving in each a pivot-like prominence on which the block rests; but, on the other hand, natural causes can produce similar results, the stone itself acting like an um- brella to protect the central portion of the bed while weathering outside is going on all around. The same process is often well illustrated on moraine-bearing glaciers where a huge stone may be seen resting on a pillar of ice several feet in height. That man sometimes imitated such striking natural phenomena is quite probable, and to this extent rocking-stones come within the category of primitive stone monuments.

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STONE RIVER, BATTLE OF, a battle of the American Civil War, called the battle of Murfreesboro by the Confederates, fought on the 31st of December 1862 and the 2nd of January 1863. After his appointment in October to command the Army

of the Cumberland, General W. S. Rosecrans with Chattanooga as his objective moved from Nashville upon General Braxton Bragg, who left the winter quarters he had established at Murfreesboro and met the Union army on Stone river imme- diately north of Murfreesboro, on the last day of December. The plan of attack on each side was to crush the enemy's right. Bragg's left, commanded by Lieut.General W. J. Hardee, over lapped and bore back the Union right under Major- General A. McD. McCook, and Major-General T. L.

Crittenden command- ing the Union left was hurriedly called back from his attack on the Confederate right to support McCook. The Union right was crumpled up on the centre, where Major-General G. H. Thomas's corps checked the Confederate attack. There was practically no fighting on the 1st of January, but on the 2nd the Con- federates renewed the attack, Major-General J. C. Breckinridge with Bragg's right attempting in vain to displace Crittenden's division on high ground above the river. On the night of the 3rd Bragg withdrew and the Union army occupied Murfreesboro. Tactically a drawn battle, Stone River was strategically a Union victory. The losses on both sides were heavy: of 37,712 Confederates present for duty, 1294 were killed, 7945 were wounded, and about 2500 were missing; and of 44,800 Union soldiers present for duty, 1677 were killed, 7543 were wounded and 3686 were missing.

STONINGTON, a township of New London county, Con- necticut, U.S.A., in the S.E. corner of the state, on Long Island Sound. Pop. of the township (1900), 8540 (of whom 1968 were foreign-born), (1910), 9154, including that of the borough of Stonington, 2083. Stonington is served by the New York, New Haven & Hartford railway, which has repair shops here, by an electric line connecting with New London, Conn., and Westerly, Rhode Island, and, in summer, by steamer to Watch Hill and Block Island. Its harbour is excellent, and it is a port of entry, but its foreign trade is unimportant. The township covers an area of about 45 sq. m., and includes, besides the borough of Stonington, the villages of Mystic, Old Mystic and Pawcatuck (which is closely allied with Westerly, Rhode Island). Among the manufactures of the township are foundry and machine-shop products, printing presses, silk machinery, fertilizers, spools, thread and cotton, and woollen, silk and velvet goods. Ship building and fishing are among the industries. After its settlement in 1649 ar >d the years immediately suc- ceeding by English planters from Rehoboth in Plymouth Colony (to whom a monument was erected in 1889 in Wequetequock Burying Ground), the territory now included in Stonington town- ship was first a part of New London township, and then (1658), in accordance with a boundary decision of the United Colonies of New England, a part (under the name of Southertown) of Suffolk county, Massachusetts, finally reverting to Connecticut in accordance with the new boundaries fixed by the Connecticut royal charter in 1662. In 1664 it gained representation in the General Court of Connecticut; in 1665 the name was changed to Mystic, and in 1666 to Stonington. In the 18th century the village (now the borough) of Stonington (settled in 1752) de- veloped a brisk trade with Boston, Plymouth and the West

Indies. Whaling and sealing were for many years important industries and a whaling captain of Stonington, Nathaniel B. Palmer, early in the 19th century, discovered Palmer Land in the Antarctic. The village was the seat of military stores during the War of Independence, and was bombarded by a British frigate in August 1775. In August 1814 another British attack, by a squadron under Commander Thomas M. Hardy, was successfully resisted. The borough of Stonington, the first in the state, was incorporated in 1801.

See R. A . Wheeler, History of the Town of Stonington (New London, 1900).

STONY POINT, a township in Rockland county, New York; U.S.A., on the west bank of the Hudson river, containing a village of the same name which is 35 m. N. of New York City and 12 m. S. of West Point. Pop. of the township (1890) 4614; (1900), 4161; (1905), 3862, (1910V. 36ˆ1. Area, about 30 sq. m. The village is served by the West Shore and the New York,

Ontario, and Western railways. Other villages in the township are Grassy Point, where, as in Stony Point, brick-making is the principal industry; Tomkins Cove, where there are stone crushing works; and Jones Point, which has a trade in gravel, building sand and crushed stone. The surface of the township is rough — Dunderberg (1090 ft.) and Bear Mountain (1350 ft.) are the principal eminences, and there is good farming land only at the margin of the river. The township was named from a rocky promontory which juts into the river in the north-east part of the township and rises precipitously on all sides to a height of about 140 ft. above the river. A small part of the promontory is under the jurisdiction of the United States Government which has erected a lighthouse here, and the remaining portion was bought by the state in 1897 for a state battlefield reservation, and has been laid out as a public park. At the entrance to the park is a Memorial Arch (1909), designed by H. K. Bush-Brown and presented to the state by the Daughters of the American Revolution. On Iona Island in the north part of the township is a United States naval magazine. The promontory guards the lower passage to the Highlands of the Hudson, and during the War of Inde- pendence, when the King's Ferry between it and Verplanck' s Point on the opposite bank was part of an important line of communication

between the New England and the Middle States, it was of considerable strategic importance. The Americans occupied it in November 1776, and about two years later erected a blockhouse upon it. The garrison, however, was very small, and on the 31st of May 1779, it was taken by the British, who immediately erected much stronger fortifications. On the night of the i5th/i6th of July it was recovered by General Anthony Wayne, in command of about 1350 picked American troops, the garrison (under Lieut.Colonel Henry Johnson) losing 63 in killed, 70 in wounded, and 543 in captured. The American loss was only 15 killed and 83 wounded. The Americans, however, had no thought from the first of holding the place and evacuated it on the 18th of July. The British immediately reoccupied it, and erected stronger fortifications, but late in October they, too, abandoned it. In the " old Treason House " in the township General Benedict Arnold and Major John Andre met before daylight on the 22nd of September 1780, to settle upon plans for the surrender of West Point by Arnold to the British.

See H. P. Johnston, The Storming of Stony Point (New York, 1900) ; H. B. Dawson, The Assault on Stony Point (Morrisania, N. Y., 1863) ; E. H. Hall and F. W. Halsey, Stony Point Batile-Field (New York, 1902); and D. Cole and E. Gay, History of Rockland County (ibid. 1884).

STOOL, a low seat without back or arms. The stool is an ancient piece of furniture which came into use when the need began to be felt for a seat more easily portable than heavy settles and benches — the chair was an appanage of rank and dignity to which no ordinary person dreamed of aspiring. Since it could also be used as a small table, it quickly became common. In the First Book of The Task William Cowper gives a sketch of the evolution of the stool which, for all its vapidity, is reasonably exact: —

" Joint stools were then created, on three legs Upborn they stood. Three legs upholding firm A massy slab, in fashion square or round.

1. ○ ■ ■ ■ ■

At length a generation more refined

Improved the simple plan; made three legs four,

Gave them a twisted form vermicular,

And o'er the seat, with plenteous wadding stuff'd,

Induc'd a splendid cover, green and blue,

Yellow and red, of tap'stry richly wrought,

And woven close, or needle-work sublime."

" Joint " or " joyned-stool " simply meant that the parts were joined or framed together with mortise and tenon. The wooden four-legged, square or oblong variety is often called a " coffin-stool." It may be perfectly true that it was used for supporting coffins, but that was merely one — and a very occasional one — of many uses, and the name is an entire misnomer. The round three-legged stool was a primitive

construction, destitute of .ornament and rudely, as well as heavily, made. By the middle of the 16th century stools had acquired four legs, braced together by stretchers, and the frame was often well carved. As the Renaissance impulse waned, forms relapsed into cumbrous and unadorned, and, so far as the oak stool of the yeoman and the farmer was concerned, little ornamentation was attempted after the middle of the 17th century. These seats continued to be made until about the end of that period — until, indeed, the increasing cheapness of the chair and the growth of habits of comfort caused it to fall into disuse. Towards the end of the Stuart period the up- holstered stool reached England from France. It was not entirely unknown at an earlier date, but what had been an occa- sional luxury then became a common plenishing of the houses of the rich. The legs and stretchers took the " twisted form vermicular " of which the poet speaks — so far as their under- framing was concerned these stools were, to all intents and purposes, chairs. Thenceforward, indeed, they followed very closely the fashions in seats with backs, acquiring the cabriole leg, the claw and ball or pad feet, the carved knees and other characteristics of chairs. The footstool is probably more ancient than the stool itself. The ducking-stool was a contri- vance whereby scolding or drunken women could be ducked in a pond without danger. The stool of repentance was reserved, chiefly in Scotland, for the public penance of persons who had offended against morality. The " cutty-stool," which Jenny Geddes threw — or, according to Dr Hill Burton, did not throw — at the beginning of the riotous protests against Laud's Liturgy in St Giles's Church, Edinburgh, in 1637, was of the fald-stool variety. " Cutty " simply means short. A fald-stool was originally a folding stool used chiefly for ecclesiastical purposes. Eventually, while retaining the old name, it became rigid, and the designation has now been extended to a litany-desk. The camp-stool is immediately derived from the original

form of the fald-stool. In France under the ancien regime, the stool, or tabouret, acquired a social and courtly significance of the first importance. The wives of princes, dukes, and a few of the highest dignitaries of the realm alone had the right to occupy a tabouret in the presence of the king, and ladies who became widows used every expedient of intrigue to retain a privilege which they regarded as the summit of earthly felicity. The prise du tabouret, when a lady first took possession of her seat, was an occasion of considerable ceremony.

STOOL-BALL, a game formerly very popular in England, and commonly considered as the ancestor of cricket. Joseph Strutt, writing in 1801, says of it: "I have been informed that a pastime called stool-ball is practised to this day in the northern parts of England, which consists simply in setting a stool upon the ground, and one of the players takes his place before it, while his antagonist, standing at a distance, tosses a ball with the intention of striking the stool, and this it is the business of the former to prevent by beating it away with the hand, reckoning one to the game for every stroke of the ball; if, on the contrary, it should be missed by the hand and touch the stool, the players change places; the conqueror at this game is he who strikes the ball most times before it touches the stool. I believe the same also happens if the person who threw the ball can catch and retain it when driven back, before it touches the ground." Some variety of the game, with modifications due to the development of cricket, has probably been played even since these days.
STOPPANI, ANTONIO (1824-1891), Italian geologist and palaeontologist, was born at Lecco on the 24th of August 1824, He became professor of geology in the Royal Technical Institute of Milan, and was distinguished for his researches on the Triassic and Liassic formations of northern Italy. Among his works were Paleontologie Lombarde (1858-1881); Les petrifactions d'£sino (1858-1860); Gtologie et palSontologie des conches A Avicula Contorta en Lombardie (1860-1865); Corso di geologia, (3 vols., 1871-1873); and L'Era Neozoica (1881). In this last work the author discussed the glaciation of the Italian Alps and the history of Italy during the Pleistocene age. He died at Milan on the 1st of January, 1891.

STORACE, STEPHEN (1763-1796), English musical composer, was born in London in 1763. His father, Stefano Storace, an Italian

contrabassist, taught him the violin so well that at ten years old he played successfully the most difficult music of the day. After completing his education at the Conservatorio di Sant' Onofrio, at Naples, he produced his first opera, Gli Sposi malcontenti, at Vienna, in 1785. Here he made the acquaint- ance of Mozart, in whose Nozze di Figaro his sister, Anna Selina Storace, first sang the part of Susanna. Here also he produced a second opera, Gli Equivoci, founded on Shakespeare's Comedy of Errors, and a " Singspiel " entitled Der Doctor und der Apethe- ker. But his greatest triumphs were achieved in England, whither he returned in 1787. After creating a favourable impression by bringing out his " Singspiel " at Drury Lane, under the title of The Doctor and the Apothecary, Storace attained his first great success in 1789, in The Haunted Tower, an opera which ran for fifty nights in succession. No Song, No Supper was equally successful in 1790; and The Siege of Belgrade scarcely less so in 1791. The music of The Pirates, produced in 1792, was partly adapted from Gli Equivoci, and is remarkable as affording one of the earliest instances of the introduction of a grand finale into an English opera. These works were followed by some less successful productions; but The Cherokee (1794) and The Three and the Deuce (1795) wene very favourably re- ceived, and the music to Colman's play, The Iron Chest, first performed on the 12th of March 1796, created even a greater sensation than The Haunted Tower. This was Storace's last work. He caught cold at the rehearsal, and died on the 19th of March 1796.

The character of Storace's music is pre-eminently English; but his early intercourse with Mozart gave him an immense advantage over his contemporaries in his management of the orchestra, while for the excellence of his writing for the voice he was no doubt indebted to the vocalization of his sister Anna. This lady was born in London in 1766, completed her education at Venice under Sacchini, sang for Mozart at Vienna, and first appeared at the King's Theatre in London in 1787. After contributing greatly to the success of The Haunted Tower and her brother's later operas, she crowned a long and brilliant career by winning great laurels at the Handel Commemoration at Westminster Abbey in 1791, retired from public life in 1808, and died on the 24th of August 181 7. During her stay in Vienna she married John Abraham Fisher, a celebrated violinist; but he used her so cruelly that she refused to bear his name, and in her will — bequeathing property to the amount of £50,000 — styled herself " spinster."

STORE (from O. Fr. estor or esloire, Late Lat. staurum or inslaurum, stock, provisions, supply, from the late use of in- staurare, to

provide, properly to construct, renew, restore), a stock or supply of provisions, goods or other necessaries kept for future daily or recurrent use or for a specific purpose; thus the term applies equally to the domestic supply of provisions, &c, and to the accumulated stock of arms, ammunition, cloth- ing, food, &c, kept for the general use of a navy or army. A common secondary meaning is that of the place where a supply or stock is kept, a storehouse, and thus the term is used particu- larly in the country districts of America for the general shop where goods of all kinds are sold by retail. In English the term " stores " has come into use for large general shops with many departments selling all kinds of goods.

STOREY (equivalents are Fr. etage, Ital. piano, Ger. Slock), the term in architecture given to the floor of a building, and employed generally when referring to a number of floors one above the other; thus a building may be of two, three or more storeys high. It used to be applied to a series of apartments on one floor, which are now generally known as a flat. " Storey " or " story " is from 0. Fr. esloree, building, estorer, to build, equip, furnish, store, from Lat. staurare, only seen in compound instaurare, to repair, restore, ultimately from root sta, to stand. " Story," a tale or narrative, is a shortened form of " history." STORK (A. S. store, Ger. S torch), the Ciconia alba of ornitho- logy, a well-known bird, which, however, though often visiting

Britain, has never been a native or even inhabitant of that country. It is a summer visitor to most parts of the European continent — the chief exceptions being France (where the native race has been destroyed), Italy and Russia— breeding from southern Sweden to Spain and Greece, and being especially common in Poland. 1 It reappears again in Asia Minor, the Caucasus, Persia and Turkestan, but farther to the eastward it is replaced by an allied species, C. boyciana, which reaches Japan. Though occasionally using trees (as was most likely its original habit) for the purpose, the stork most generally places its nest on buildings, 2 a fact familiar to travellers in Den- mark, Holland and Germany, and it is nearly everywhere a cherished guest, popular belief ascribing good luck to the house to which it attaches itself. 3 Its food, consisting mainly of frogs and insects, is gathered in the neighbouring pastures, across which it may be seen stalking with an air of quiet dignity; but in the season of love it indulges in gestures which can only be called grotesque — leaping from the ground with extended wings in a kind of dance, and, absolutely voiceless as it is, making a loud noise by the clattering of its mandibles. At other times it may be seen gravely resting on one leg on an elevated place, thence to sweep aloft and circle with a slow

and majestic flight. Apart from its considerable size — and a stork stands more than three feet in height — its contrasted plumage of pure white and deep black, with its bright red bill and legs, makes it a conspicuous and beautiful object, especially when seen against the fresh green grass of a luxuriant meadow. In winter the storks of Europe retire to Africa — some of them, it would seem, reaching Cape Colony — while those of Asia visit India. A second species, with much the same range, but with none of its relative's domestic disposition, is the black stork, C. nigra, of which the upper parts are black, brilliantly glossed with purple, copper and green, while it is white beneath— the bill and legs, with a patch of bare skin round the eyes, being red. The bird breeds in lofty trees, generally those growing in a large forest. Two other dark-coloured, but somewhat abnormal, species are the purely African C. abdimii and the C. episcopus, which has a wider range, being found not only in Africa but in India, Java and Sumatra. The New World has only one true stork, Dissura maguari, which inhabits South America, and resembles not a little the C. boyciana above mentioned, differing therefrom in its greenish-white bill and black tail. Both these species are very like C. alba, but are larger and have a bare patch of red skin round the eyes.

The storks form the family Ciconiidae, and togethejr with the ibises (Ibididae) are now ranked as a sub-order of Ciconiiform birds (see Bird). There is no doubt that they include, the jabiru (q.v.) and its allies, as well as the curious genus Ariaslomus (known in India as the " open-bill," because its lower mandible is hollowed out so as only to meet the maxilla at the base and the tip), of which there are an African and an Asiatic species. In all the storks the eggs are white and pitted with granular depressions. (A. N.)

STORM, THEODOR WOLDSEN (1817-1888), German poet and novelist, was born at Husum, in Schleswig, on the 14th of September 181 7. Having studied jurisprudence at Kiel and Berlin, where he formed a close friendship with the brothers Theodor and Tycho Mommsen, he settled in his native town as advocate; but, owing to his German sympathies, lost his post in 1853. Entering the Prussian service as assessor at Potsdam, he was appointed district judge at Heiligenstadt. After the

1 In that country its numbers are said to have greatly dimin- ished since about 1858, when a disastrous spring storm' overtook the homeward-bound birds. The like is to be said of Holland since about i860.

2 To consult its convenience a stage of some kind, often a cart-wheel, is in many places set up and generally occupied by successive generations of tenants.

3 Its common Dutch name is Ooijevaar, which can be traced through many forms (Koolmann, Worterb. d. ostfries. Spracke, i: S, sub voce " Adebar ") to the old word Odeboro (" the bringer of good "). In countries where the stork is abundant it enters, largely into popular tales, songs and proverbs, and from the days of Aesop has been a favourite in fable.

Danish War of 1864 Storm returned to Husum, and after filling various judicial appointments in the district, retired on a pension and died at Hademarschen on the 4th of July 1888. Storm is hardly less remarkable as a lyric poet than as a novelist. As the former, he made his d6but, with the two Mommsens, with Liederbuch dreier Freunde (1843); but his Gedichte (1852; 12th edition, 1900) first obtained for him general recognition. As a novelist he gained his first

great success with Immensee (1852; 51st edition, 1001); and this was followed by numerous other short stories. He was never weary of painting the scenes of rustic simplicity and the quiet joys of the simple life. He is at his best when dealing retrospectively with episodes and incidents from his own earlier life. Later he passed to psychological problems with Aquis submenus (1877) and Zur Chronik von Grieshuus (1884), and made a deep impression with his fantastic Schimmelreiter (1888).

Storm's Gesammelte Schriften appeared in 19 vols, between 1868 and 1889; new edition in 8 vols. (1898). His correspondence with E. Mdrike was published in 1891, with G. Keller in 1904. See E. Schmidt, Charakteristiken, i. (1886); also P. Schiitze, Theodor Storm, sein Leben und seine Dichtung (1887); F. Wehl, Theodor Storm, ein Bild seines Lebens und Schaffens (1888); A. Biese, Th. Storm und der moderne Realismus (1888); and P. Remer, Theodor Storm als norddeutscher Dichter (1897).

STORM (in O. Eng. storm, and so in Du. and Low Ger.; in O. H. Ger. and mod. Ger. Sturm; the root is probably that seen in " stir," to rouse, move, disturb, cf. Ger. storen), a disturbance of the atmosphere, accompanied by high winds or by heavy falls of rain, hail or snow, together with thunder and lightning. The word is not a part of scientific terminology, such terms as " area of low pressure " and " cyclone " being used. In the Beaufort scale {q.v.) the wind-force of a storm is estimated at io-n and the limit of velocity at from 56 to 75 m. per hour. (See Meteorology, and for magnetic storms Magnetism, Terrestrial.)

STORNOWAY (Norse, Stjama vagr, " St jama's Bay"), the chief and largest town in the western islands and also the principal town of the county of Ross and Cromarty. Pop. (1901), 3852. It is situated on the east coast of Lewis, at the head of a capacious harbour with ample quays and wharves, accessible at all tides and available for steamers of 3000 tons burden. The harbour is protected by two headlands, on the more southerly of which — Arnish Point — stands a lighthouse. From the end of this point there juts out a line of rocks on the extremity of which a beacon, 32 ft. high, has been erected, which is illuminated by means of a light thrown on to a prism in the lantern from the light in the lighthouse. Stornoway was made a burgh of barony by James VI., and is also a police burgh. It is the centre of the Outer Hebrides fishery district, and during the herring season the population is trebled. Among the public buildings are Lewis Hospital, Mossend Hospital, the Court House, the Drill Hall, the Masonic Hall, a commodious struc- ture in which the public library is housed, and

the fish mart. Stornoway Castle, overlooking the town from a height on the west side, is a handsome castellated mansion in the Tudor style, built as the residence of Sir James Matheson.

STORRS, RICHARD SALTER (1821-1900), American Congregational clergyman, was born in Braintree, Massachusetts, on the 21st of August 1821. He bore the same name as his grandfather (1763-1819), pastor at Long Meadow, Massachu- setts, from 1785 to 1819, and his father (1787-1873), pastor at Braintree, Massachusetts, from 181 1 to 1873 (except the years 183 1 -1836), both prominent Congregational ministers, who were descendants of Richard Mather. He graduated at Amherst in 1839, studied law in Boston under Rufus Choate, graduated at Andover theological seminary in 1845, and was pastor of the "Harvard Congregational church of Brookline, Massachusetts, in 1845-1846, and of the Church of the Pilgrims in Brooklyn, New York, from 1846 until shortly before his death in Brooklyn on the 5th of June 1900. He was a conservative in theology, and an historical writer of considerable ability. From 1848 to 1861 he was associate editor of the New York Independent, which he had helped to establish; from 1887 to 1897 he was president of

the American board of commissioners for foreign missions, and he was prominent in the Long Island Historical Society. His great-grandfather, John Storrs (1 735-1 799), a chaplain in the Continental Army, had been pastor of the Southold Church in 1763-1776 and in 1782-1787. Dr Storrs's more important published works were: John Wyclijfe and the First English Bible (1880), The Recognition of the Supernatural in Letters and in Life (1881), Bernard of Clairvaux (1892), and Foundation Truths of American Missions (1897). See Charles Storrs, The Storrs Family (New York, 1886).

STORY, JOHN (c. 1510-1571), English martyr, was educated at Oxford, where he became lecturer on civil law in 1535, being made later principal of Broadgates Hall, afterwards Pembroke College. He appears to have disavowed his Roman Catholic opinions just after the accession of Edward VI., but having been chosen a member of parliament in 1547 he gained notoriety by his opposition to the act of uniformity in 1548. For crying out " Woe unto thee, O land, when thy king is a child," he was imprisoned by the House of Commons, but he was soon released and went into exile. Returning to England in r553, he resigned his position at Oxford, which was now that of regius professor of civil law, and was made chancellor of the dioceses of London and of Oxford and dean of arches. Queen Mary

being now on the throne, Story was one of her most active agents in prose- cuting heretics, and was one of her proctors at the trial of Cranmer at Oxford in 1555. Under Elizabeth he was again returned to parliament, but in 1560 he underwent a short imprisonment for boasting about his work in the former reign. In 1563 he was again arrested, but managed to escape to Flanders, where he became a pensioner of Philip II. of Spain. The duke of Alva authorized him to exclude certain classes of books from the Netherlands and, in 1570, while engaged in this work, he was decoyed on to a ship at Antwerp and conveyed to Yarmouth. In spite of his claim that he was a Spanish subject, he was tried for high treason, and executed at Tyburn on the 1st of June 1571. In 1886 Story was beatified by papal decree.

STORY, JOSEPH (1779-1845), American jurist, was born at Marblehcad, Massachusetts, on the 18th of September 1779. He graduated at Harvard in 1798, was admitted to the bar at Salem, Mass., in 1801, and soon attained eminence in his profession. He was a member of the Democratic party, and served in the Massachusetts House of Representatives in 1805- 1808, and in 1810-1812 for two terms as speaker, and was a representative in Congress from December 1808 to March 1809. In November 181 1, at the age of thirty-two, he became, by President Madison's appointment, an associate justice of the United States Supreme Court. This position he retained until his death. Here he found his true sphere of work. The tradi- tions of the American people, their strong prejudice for the local supremacy of the states and against a centralized government, had yielded reluctantly to the establishment of the Federal legislative and executive in 1789. The Federal judiciary had been organized at the same time, but had never grasped the full measure of its powers. Soon after Story's appointment the Supreme Court began to bring out into plain view the powers which the constitution had given it over state courts and state legislation. The leading place in this work belongs to Chief Justice John Marshall, but Story has a very large share in that remarkable series of decisions and opinions, from 1812 until 1832, by which the work was accomplished. In addition to this he built up the department of admiralty law in the United States courts; he devoted much attention to equity jurisprudence, and rendered invaluable services to the department of patent law. In 18 19 he attracted much attention by his vigorous charges to grand juries, denouncing the slave trade, and in 1820 he was a prominent member of the Massachusetts Convention called to revise the state constitution. In 1829 he became the first Dane Professor of Law at

Harvard University, and continued until his death to hold this position, meeting with remarkable success as a teacher and winning the affection of his students, whom he imbued with much of his own enthusiasm. He died at

Cambridge, Mass., on the ioth of September 1845. His industry was unremitting, and, besides attending to his duties as an asso- ciate justice and a professor of law, he wrote many reviews and magazine articles, delivered various orations on public occasions, and published a large number of works on legal subjects, which won high praise on both sides of the Atlantic.

Among his publications are : Commentaries on the Law of Bailments (1832) ; Commentaries on the Constitution of the United States (3 vols., 1833), a work of profound learning which is still the standard treatise on the subject ; Commentaries on the Conflict of Laws (1834), by many regarded as his ablest work; Commentaries on Equity Jurisprudence (2 vols., 1835-1836) ; Equity Pleadings (1838) ; Law of Agency (1839) ; Law of Partnership (1841); Law of Bills of Exchange (1843); and Law of Promissory Notes (1845). He also edited several standard legal worts. His Supreme Court decisions may be found in Cranch's, Wheaton's and Peters's Reports, his Circuit Courts decisions in Mason's, Sumner's and Story's Reports. His Miscellaneous Writings, first published in 1835, appeared in an enlarged edition (2 vols, in 1851).

See The Lift 2nd Letters of Joseph Story (2 vols., Boston and London, 1851), by his son, W. W. Story.

STORY, ROBERT HERBERT (1833-1907), Scottish divine, principal of Glasgow Umversity, was born on the 28th of January 1835 at Rosneath, Dumbartonshire. He was educated at the universities of Edinburgh, St Andrews and Heidelberg. In 1859 he was assistant minister at St Andrew's Church, Montreal, and in February i860 was inducted as minister of Rosneath in succession to his father. In 1887 he removed to Glasgow as professor of church history; he had also been appointed in 1886 to a chaplaincy to Queen Victoria. In 1898 he became princi- pal of the university in succession to John Caird. He was moderator of the General Assembly in 1894, and its principal clerk from that year till his death on the 13th of January 1907. Story was a staunch supporter of his Church, and had little

sympathy for schemes of reunion with the other Presbyterian communities. He vigorously opposed the action of Bishop Welldon, then metropolitan of Calcutta, in excluding Scottish chaplains and troops from the use of garrison churches in India because these had received episcopal consecration. He was characterized by an absolutely fearless honesty, which sometimes gave offence, but at the basis of his nature there was a warm, tender and sympathetic heart, incapable of meanness or intrigue. In addition to lives of his father (1862), Professor Robert Lee (1870) and William Carstares (1876), he published a. devotional book Christ the Consoler; a volume of sermons, Creed and Conduct (1878); The Apostolic Ministry in the Scottish Church (Baird Lecture, 1897), and several pamphlets on church ques- tions.

See Principal Story, a Memoir by his Daughters (1909).

STORY, WILLIAM WETMORE (1819-1895), American sculptor and poet, son of the jurist, Joseph Story, was born at Salem, Massachusetts, on the 12th of February 1819. He gradu- ated at Harvard College in 1838 and at the Harvard Law School in 1840, continued his law studies under his father, was admitted to the Massachusetts bar, and prepared two legal treatises of value — Treatise on the Law of Contracts not under Seal (2 vols., 1844) an d Treatise on the Law of Sales of Personal Property (1847). Abandoning the law, he devoted himself to sculpture, and after 1850 lived in Rome, whither he had first gone in 1848, and where he was intimate with the Brownings and with Landor. He died at Vallombroso, Italy, on the 7th of October 1895. He was a man of rare social cultivation and charm of manner, and his studio in Rome was a centre for the gathering of dis- tinguished English and American literary, musical and artistic people. During the American Civil War his letters to the Daily News in December 1861 (afterwards published as a pamphlet, " The American Question," i.e. of neutrality), and his articles in Blackwood's, had considerable influence on English opinion. One of his earliest works in sculpture was a statue of h's father, now in the memorial chapel of Mount Auburn Cemetery, Cam- bridge, Mass. ; others are " Cleopatra " (of which there is an enthusiastic description in Hawthorne's Marble Faun) and " Semiramis " in the Metropolitan Museum of Art, New York; the "Libyan Sibil," "Saul," " Sardanapalus," "Judith,"

"Delilah," "Jerusalem Desolate," " Alcestis," "Medea," " Electra," " Nemesis," " Sappho " and other ideal figures; and portraits of George Peabody, erected in 1869 in London (a replica in bronze being in Baltimore, Maryland) ; President Quincy of Harvard, at Cambridge,

Mass.; Colonel Prescott, at Bunker Hill; Edward Everett, Public Gardens, Boston, Mass.; Chief Justice Marshall, on the west terrace of the Capitol, and Professor Henry for the Smithsonian Institution, Washington; and Francis Scott Key, San Francisco. Among his writings, in addition to the legal treatises mentioned above, are Life and Letters of Joseph Story (1851), Roba di Roma (1862), Proportions of the Human Figure (1866), Fiammetta (1885), a novel, Conversa- tions in a Studio (1890), Excursions in Art and Letters (1891), and several volumes of poems of considerable merit. His poems were collected in two volumes in 1885. Among the longer are " A Roman Lawyer in Jerusalem " (a rehabilita- tion of Judas Iscariot), " A Jewish Rabbi in Rome," " The Tragedy of Nero " and " Ginevra di Siena." The last named, with " Cleopatra," was included in his Graffiti d'ltaiia, a collection published in 1868.

His son, Julian Story (1857-), the portrait painter, was a pupil of Frank Duveneck, and of Boulanger and Lefebvre in Paris, and became a member of the Society of American Artists, 1892, a chevalier of the Legion of Honour, Paris, 1901, and an associate of the National Academy of Design. He married in 1891 Emma Eames (b. 1867), the operatic prima donna, who secured a divorce in 1907.

See also Henry James, William Wetmore Story and his Friends (2 vols., London, 1903).

STOSS, VEIT (1438 or 1440-1533), German sculptor and wood carver, was born in Nuremberg. In 1477 he went to Cracow, where he was actively engaged until 1499. It was here that he carved the high altar for the Marienkirche, between 1477 and 1484. On the death of King Kasimir IV. in 1492 Stoss carved his tomb in red marble for the cathedral in Cracow. To the same date is ascribed the marble tombstone of the arch- bishop Zbigniew OUsnicki in the cathedral at Gnesen; and soon after this he executed the Stanislaus altar for the Marienkirche at Cracow. In 1496 he returned to Nuremberg, where he did a great deal of work in completing altars. His main works are: a relief with the Coronation of the Blessed Virgin in the Germanic museum at Nuremberg, a statue of the Blessed Virgin in the Frauenkirche, the Annunciation in the Lorenzkirche and the circular rosary in the Germanic museum.

STOTHARD, CHARLES ALFRED (1786-1821), antiquarian draughtsman, son of Thomas Stothard (q.v.), was born in London on the 5th of July 1786. After studying in the schools of the Royal Academy, he began, in 1810, his first historical piece, the Death of Richard II. in Pomfret Castle. He published in 181 1 the first part of

his valuable work, The Monumental Effigies of Great Britain. He was appointed historical draughtsman to the Society of Antiquaries, and was deputed by that body to visit Bayeux-to make drawings of the tapestry. He was made a fellow of the society in 1819, and subsequently engaged in numerous journeys with the view of illustrating the works of D. Lysons. While engaged in tracing a portrait from one of the windows of the church of Beer Ferrers, Devonshire, he fell and was killed on the spot (May 27, 1821). His widow (after- wards Mrs Bray), with her brother, completed his Monumental Effigies, left unfinished at his death. A biography, by his widow, was published in 1823. STOTHARD, THOMAS (1755-1834), English subject painter, was born in London on the 17th of August 1755, the son of a well-to-do innkeeper in Long Acre. Being a delicate child, he was sent at the age of five to a relative in Yorkshire, and attended school at Acomb, and afterwards at Tadcaster and at Ilford irr Essex. Showing a turn for drawing he was apprenticed to a draughtsman of patterns for brocaded silks in Spitalfields, and during his leisure hours he attempted illustrations to the works of his favourite poets. Some of these drawings were praised by Harrison, the editor of the Novelist's Magazine, andj Stot- hard's master having died, he resolved to devote himself to art.

In 1778 he became a student of the Royal Academy, of which he I was elected associate in 1792 and full academician in 1794. In 181 2 he was appointed librarian, having served as assistant for two years. He died in London on the 27th of April 1834.

Among his earliest book illustrations are plates engraved for Ossian arid for Bell's Poets; and in 1780 he became a regular contributor to the Novelist's Magazine, for which he executed one hundred and forty-eight designs, including his eleven admir- able illustrations to Peregrine Pickle and his graceful subjects from Clarissa and Sir Charles Grandison. He contentedly de- signed plates for pocket-books, tickets for concerts, illustrations to almanacs, portraits of popular players — and into even the slightest and most trivial sketches he infused a grace and distinction which render them of value to the collectors of the present time. Among his more important series are the two sets of illustrations to Robinson Crusoe, one for the New Magazine and one for Stockdale's edition, and the plates to The Pilgrim's Progress (1788), to Harding's edition of Goldsmith's Vicar of Wakefield (1792), to The Rape of the Lock (1798), to the works

of Gessner (1802), to Cowper's Poems (1825), and to The Decameron; while his figure-subjects in the superb editions of Roger's Italy (1830) and Poems (1834) prove that even in latest age his fancy was still unexhausted, and his hand hardly at all enfeebled. He is at his best in subjects of a domestic or a gracefully ideal sort; the heroic and the tragic were beyond his powers. The designs by Stothard were estimated by R. N. Wornum to number five thousand, and of these about three thousand have been engraved. His oil pictures are usually small in size, and rather sketchy in handling. Their colouring is often rich and glowing, being founded upon the practice of Rubens, of whom Stothard was a great admirer. The " Vintage," perhaps his most important oil painting, is in the National Gallery. He was a contributor to Boydell's Shakespeare Gallery, but his best-known painting is the " Procession of the Canterbury Pilgrims," also in the National Gallery, the engraving from which, begun by Luigi and continued by Niccolo Schiavonetti and finished by James Heath, attained an immense popularity. The commission for this picture was given to Stothard by R. H. Cromek, and was the cause of a quarrel with his friend William Blake. It was followed by a companion work, the " Flitch of Bacon," which was drawn in sepia for the engraver but was never carried out in colour.

In addition to his easel pictures, Stothard adorned the grand staircase of Burghley House, near Stamford, with subjects of War, Intemperance, and the Descent of Orpheus in Hell (1799- 1803); the mansion of Hafod, North Wales, with a series of scenes from Froissart and Monstrelet (1810); the cupola of the upper hall of the Advocates' Library, Edinburgh (now occupied by the Signet Library), with Apollo and the Muses, and figures of poets, orators, &c. (1822); and he prepared designs for a frieze and other decorations for Buckingham Palace, which were not executed, owing to the death of George IV. He also designed the magnificent shield presented to the duke of Wellington by the merchants of London, and executed with his own hand a series of eight etchings from the various subjects which adorned it. In the British Museum is a collection, in four volumes, of engravings of Stothard's works, made by Robert Balmanno.

An interesting but most indiscriminately eulogistic biography of Stothard, by his daughter-in-law, Mrs Bray, was published in 1851. A. C. Coxhead's Thomas Stothard, R.A., an Illustrated Mono- graph (1906), contains a short biographical chapter, and an accurately dated summary of the various books and periodicals illustrated by Stothard ; see also Austin Dobson, Eighteenth Century Vignettes, xst series (1892).

STOUGHTON, JOHN (1807-1897), English Nonconformist divine, was born at Norwich on the 18th of November 1807. His father was an Episcopalian, his mother a member of the Society of Friends. Stoughton was educated at Norwich Grammar School, and, after an interval of legal study, at High- bury Congregational College. In 1833 he became minister at Windsor, in 1843 at Kensington; in 1856 he was elected chair-

man of the Congregational Union. From 1872 to 1884 he was professor of historical theology in New College, Hampstead. He died at Ealing on the 24th of October 1897. Stoughton was no controversialist, but did a good deal of sound historical work which was published in Church and State 1660-1663 (London, 1862); Ecclesiastical History of England 1640-1660 (4 vols., London, 1867-1870); Religion in England under Queen Anne and the Georges (2 vols., 1878); Religion in England from 1800 to 1880 (2 vols., 1884). He contributed an account of Nonconformist modes of celebrating the Lord's Supper to the ritual commission of 1870, arranged a conference on co-operation between Anglicans and dissenters (presided over by Archbishop Tait) in 1876, was one of Dean Stanley's lecturers in Westminster Abbey and a pall-bearer at his funeral. He was elected to the Athenaeum Club in 1874 on the nomination of Matthew Arnold.

Besides the books already mentioned he wrote a number of more popular works, among which Homes and Haunts of Luther (1875), The Italian Reformers (1881), and The Spanish Reformers (1883) are conspicuous. His Recollections of a Long Life (1894) furnish interesting autobiographical material.

STOUR, the name of several English rivers. (1) The East- Anglian Stour rises in the slight chalk hills in the south-east of Cambridgeshire and follows a course ranging from east to south- east to the North Sea at Harwich, passing Clare, Sudbury, Nay- land and Manningtree. It falls about 380 ft. in a course of 60 m., and drains an area of 407 sq. m. Over nearly its entire course it forms the boundary between Suffolk and Essex. From Manning- tree downward its course is estuarine, and it is joined immediately above Harwich by the estuary of the Orwell. It is navigable up to Sudbury but does not bear much traffic. (2) The Kentish Stour or Great Stour rises on the southern face of the North Downs, the branch called the East Stour having its source not far inland from Hythe, but flowing at first away from the sea, while the main or western branch rises near Lenham. They unite at Ashford. Passing Canterbury, the Stour divides into two branches, the larger reaching the English Channel in

Pegwell Bay, while the smaller runs north to the North Sea at Reculver. The larger branch is joined in the levels by the Little Stour from the south. The Stour is navigable to Fordwich near Canterbury, but is little used above Sand- wich. Its length is about 40 m., its fall from Ashford 150 ft., and its drainage area 370 sq. m. The name of Stour belongs also to (3) a considerable but unnavigable tributary of the Hampshire Avon, rising in Wiltshire, and touching Somersetshire and Dorsetshire before it joins the main river in Hampshire close to its mouth; (4) a left bank tributary of the Severn, which it joins at Stourport, its course being followed by the Worcestershire and Staffordshire canal; and (5) a small tributary of the upper Avon, rising in the north of Oxfordshire in the hills west of Banbury, and joining the main river a little below Stratford-on-Avon.

STOURBRIDGE, a market town in the Droitwich parlia- mentary division of Worcestershire, England, 144 m. N.W. by W. of London and 10 W. of Birmingham by the Great Western railway. Pop. of urban district (1901), 16,302. A branch Canal connects with the Worcestershire and Staffordshire system. The town stands on an eminence on the left bank of the Stour. Among public buildings are a town-hall (1887) and town offices, and a school of science and art. There is an endowed grammar school founded by Edward VI., and a bluecoat or hospital school. Dr Johnson received part of his education in this town (17 26-1727). The principal manufactures are in iron, leather and skins; there are glue works and fire-brick works. Coal and fire-clay are raised. The manufacture of glass was established in 1 556 by emigrants from Hungary, the place where they erected their factory being still known as Hungary Hill. Annual fairs are held. The town was originally called Bedcote, a name retained by the manor. The urban district includes the townships of Upper Swinford and Wollaston.

STOURPORT, a market town in trie Bewdley parliamentary division of Worcestershire, England, 145 m. N. by W. of Wor- cester by the Great Western railway. Pop. of urban district

(1901), 4529. It lies on the left bank of the Severn, at the junction of the Stour and the Staffordshire and Worcestershire canal. The town grew up after the opening of the canal in 1768. Ironworks, carpet-weaving and tanneries occupy many hands. At Redstone, the site of a former important ferry over the Severn, is a curious hermitage,

excavated out of the red sandstone bank.

STOVE, an apparatus for heating a room, building, green- house or hothouse, or for cooking. It is essentially closed or partially closed, as distinct from the open grate or fireplace, and consists of a receiver in which the fuel is burned, of cast or sheet- iron, tiles cemented together and backed or even of solid masonry. Stoves may be classified according to the fuel burned (see Heat- ing). The word was originally of wider meaning and was used of a heated room, house or chamber, thus the O. Eng. stofa glosses balneum, and mod. Ger. Stube and Dan. stue mean merely a room, O. H. Ger. Stuba, Stupa being used of a heated bathroom; early Du. stove also was used in this wider sense, the later form stoof is used as in modern English, and this may be the immediate source of the present meaning, the early word having been lost. Romanic languages borrowed it, e.g. Ital. stufa, Ft. Stuve, O. Fr. estuve, whence was adapted Eng. " stew," properly a bath or hothouse, used chiefly in plural " stews," a brothel, and " to stew," originally to bathe, then to boil slowly, and as a noun, a mess of stewed meat. " Stew," a fish-pond, is a Low German word stpuwe, dam, weir, fish-pond, from stouwen, to dam up, cf. Ger. stauen, Eng. stow.

STOW, JOHN (c. 1525-1605), English historian and antiquary, was the son of Thomas Stow, a tailor, and was born about 1525 in London, in the parish of St Michael, Cornhill. His parents were poor, for his father's whole rent for his house and garden was only 6s. 6d. a year, and Stow himself in his youth fetched every morning the milk for the family from a farm belonging to the nunnery of the Minories. He learned the trade of his father, but possibly did not practise it much after he grew up. In 1 549 he " kept house " near the well within Aldgate, but after- wards he removed to Lime Street ward, where he resided till his death. About 1560 he entered upon the work with which his name is associated. He made the acquaintance of the leading antiquaries of his time, including William Camden, and in 1561 he published his first work, The woorkes of Geffrey Chaucer, newly printed with divers addicions whiche were never in printe before. This was followed in 1565 by his Summarie of Englyshe Chronicles, which was frequently reprinted, with slight variations, during his lifetime. Of the first edition a copy was said to have been at one time in the Grenville library. In the British Museum there are copies of the editions of 1567, 1573, 1590, 1598 and 1604. Stow having in his dedication to the edition of 1567 referred to the rival publication of Richard Grafton (c. 1500-c. 1572) in con- temptuous terms, the dispute between them became extremely embittered. Stow's antiquarian tastes brought him under ecclesiastical suspicion as a

person " with many dangerous and superstitious books in his possession," and in 1568 his house was searched. An inventory was taken of certain books he possessed " in defence of papistry," but he was apparently able to satisfy his interrogators of the soundness of his Protestantism. A second attempt to incriminate him in 1570 was also without result. In 1580 Stow published his Annates, or a Generate Chronicle of England from Brute until the present yeare of Christ ij8o; it was reprinted in 1592, 1601 and 1605, the last being continued to the 26th of March 1605, or within ten days of his death; editions " amended " by Edmund Howes appeared in 161 5 and 163 1.

The work by which Stow is best known is his Survey of London, published in 1598, not only interesting from the quaint simplicity of its style and its amusing descriptions and anecdotes, but of unique value from its minute account of the buildings, social condition and customs of London in the time of Elizabeth. A second edition appeared in his lifetime in 1603, a third with additions by Anthony Munday in 1618, a fourth by Munday and Dyson in 1633, a fifth with interpolated amendments by John Strype in 1720, and a sixth by the same editor in 1754. The edition of 1ˆ98 was reprinted, edited by W. J. Thorns, in 1842,

in 1846, and with illustrations in 1876. Through the patronage of Archbishop Parker, Stow was enabled to print the Flores historiarum of Matthew of Westminster in ˆ67, the Chronicle of Matthew Paris in 1571, and the Historia brevis of Thomas Walsingham in 1574. At the request of Parker he had himself compiled a " farre larger volume," An history of this island, but circumstances were unfavourable to its publication and the manuscript is now lost. Additions to the previously published works of Chaucer were twice made through Stow's "own painful labours ' ' in the edition of 1 56 1 , referred to above, and also in 1 597 . A number of Stow's manuscripts are in the Harleian collection in the British Museum. Some are in the Lambeth lihrary (No. 306) ; and from the volume which includes them were pub- lished by the Camden Society, edited by James Gairdner, Three Fifteenth~Century Chronicles, with Historical Memoranda by John Slowe the Antiquary, and Contemporary Notes of Occurrences written by him (1880). Stow's literary labours did not prove very remunerative, but he accepted poverty in a cheerful spirit. Ben Jonson relates that once when walking with him Stow jocularly asked two mendicant cripples " what they would have to take him to their order." In March 1604 James I. authorized him and his deputies to collect " amongst our loving subjects their voluntary contributions and kind gratuities,"

and himself began " the largesse for the example of others." If the royal appeal was successful Stow did not live long to enjoy the increased comfort resulting from it, as he died on the 6th of April 1605. He was buried in the London church of St Andrew Undershaft, where the monument erected by his widow, exhibiting a terra-cotta figure of him, Still remains.

Stow's Survey of London has been edited with notes by C. L. Kingsford (Oxford, 1908).

STOWE, HARRIET ELIZABETH [Beecher] (1811-1896), American writer and philanthropist, seventh child of Lyman and Roxana (Foote) Beecher, was born at Litchfield, Connecticut, U.S.A., on the 14th of June 181 1. Her father (the Congregational minister of the town) and her mother were both descended from members of the company that, under John Davenport, founded New Haven in r638; and the community in which she spent her childhood was one of the most intellectual in New England. At her mother's death in 181 5 she came most directly under the influence of her eldest sister Catherine, eleven years her senior, a woman of keen intellect, who a few years later set up a school in Hartford to which Harriet went, first as a pupil, afterwards as teacher. In 1832 her father, who had for six years been the pastor of a church in Boston, accepted the presidency of the newly founded Lane Theological Seminary at Cincinnati. Catherine Beecher, who was eager to establish what should be in effect a pioneer college for women, accompanied him; and with her went Harriet as an assistant, taking an active part in the literary and school life, contributing stories and sketches to local journals and compiling a school geography. She was married on the 6th of January 1836 to one of the professors in the seminary, Calvin Ellis Stowe. In the midst of privation and anxiety, due largely to her husband's precarious health, she wrote continually, and in 1843' published The Mayflower, a collection of tales and sketches. Mrs Stowe passed eighteen years in Cincinnati under conditions which constantly ; thrust the problem of human slavery upon her attention. A river only separated Ohio from a slave-holding community. Slaves were continually escaping from their masters, and were harboured, on their way to Canada, by the circle in which Mrs Stowe lived. In the practical questions which arose, and in the great debate which was political, economical and moral, she took a very active part. When, therefore, in 1850, Mr Stowe was elected to a professorship in Bowdoin College, Brunswick, Maine, and removed his family thither, Mrs Stowe was prepared fc>? thegreat work which came to her, bit by bit, as a religious message which she must deliver. In the quiet of a country town, far removed from actual contact with painful scenes,

but on the edge of, the whirlwind raised by the. Fugitive Slave Bill, memory . and imagination had full scope, and she wrote for serial publication in The National Era, an anti-slavery paper of Washington, D.C.,

the story of " Uncle Tom's Cabin; or, Life among the Lowly." The publication in book form (March 20, 1852) was a factor which must be reckoned in summing up the moving causes of the war for the Union. The book sprang into unexampled popularity, and was translated into at least twenty-three tongues. Mrs Stowe used the reputation thus won in promoting a moral and religious enmity to slavery. She reinforced her story with A Key to Uncle Tom's Cabin, in which she accumulated a large number of documents and testimonies against the great evil; and in 1853 she made a journey to Europe, devoting herself especially to creating an entente cordiale between Englishwomen and Americans on the question of the day. In 1856 she pub- lished Dred; a Tale of the Dismal Swamp, in which she threw the weight of her argument on the deterioration of a society resting on a slave basis. The establishment of The Atlantic Monthly in 1857 gave her a constant vehicle for her writings, as did also The Independent of New York, and later The Christian Union, of each of which papers successively her brother, Henry Ward Beecher, was one of the editors. From this time forth she led the life of a woman of letters, writing novels, of which The Minister's Wooing (1859) is best known, and many studies of social life in the form both of fiction and essay. She published also a small volume of religious poems, and towards the end of her career gave some public readings from her writings. In 1852 Professor Stowe accepted a professorship in the Theological Seminary at Andover, Massachusetts, and the family made its home there till 1863, when he retired wholly from professional life and removed to Hartford. After the close of the war for the Union Mrs Stowe bought an estate in Florida, chiefly in hope of restoring the health of her son, Captain Frederick Beecher Stowe, who had been wounded in the war, and in this southern home she spent many winters. After the death of her husband in 1886 she passed the rest of her life in the seclusion of her Hartford home, where she died on the 1st of July 1896. She is buried by the side of her husband at Andover.

See Life of Harriet Beecher Stowe, compiled from her letters and journals by her son, Charles Edward Stowe (Boston, 1890). Life and

Letters of Harriet Beecher Stowe, edited by Annie Fields (Boston, 1898). (H. E. S.)*

STOWELL, WILLIAM SCOTT, Baron (1745-1836), English judge and jurist, was born at Heworth, a village about 4 m. from Newcastle, on the 17th of October 1745, the son of a " coalfitter" (or tradesman engaged in the transport of coal). His younger brother John became the famous Lord Chancellor Eldon. Scott was educated at the Newcastle grammar school and Corpus Christi College, Oxford, where he gained a Durham scholarship in 1 761. In 1764 he graduated and became first a probationary fellow and then — as successor to William (afterwards the well- known Sir William) Jones — a tutor of University college. As Camden reader of ancient history (1 7 74) he rivalled the reputation of Blackstone. Although he had joined the Middle Temple in 1762, it was not till 1776 that Scott devoted himself to a syste- matic study of law. In 1779 he graduated as doctor of civil law, and, after the customary " year of silence," commenced practice in the ecclesiastical courts. His professional success was rapid. In 1783 he became registrar of the court of faculties, and in 1788 judge of the consistory court and advocate-general, in that year too receiving the honour of knighthood; and in 1798 he was made judge of the high court of admiralty. Sir William Scott twice contested the representation of Oxford University — in 1780 without success, but successfully in 1801. He also sat for Downton in 1790. Upon the coronation of George IV. (1821) he was raised to the peerage as Baron Stowell. After a life of distinguished judicial service Lord Stowell retired from the bench — from the consistory court in August 182 1, and from the high court of admiralty in December 1827. His mental faculties became gradually feebler in his old age, and he died on the 28th of January 1836. Lord Stowell was twice married— in 1 781 to Anna Maria, eldest daughter and heiress of John Bagnall of Early Court, Berks., by whom he had four children, one of these, a daughter, survived him; and in 1813 to the dowager marchioness of Sligo.

Lord Stowell's judgments are models alike of literary execution and of judicial reasoning. His style is chaste yet not inornate, nervous without abruptness, and perfectly adjusted in every instance to the subject with which he deals. His decisions in the cases of Dalyrmple v. Dalyrmpk (Dr Dodson's Report) and Evans v. Evans (1 Hagg. 35) — from their combined force and grace, from the steadiness with which every collateral issue is set aside, from theif subtle insight into human motives and from the light which they cast on marriage law — deserve and will repay attentive perusal. Lord Stowell composed with great care, and some of the MSS. which he revised for Haggard

and Phillimore's Reports were full of inter- lineations. Stowell's mind was judicial rather than forensic — reason- ing, not as for a dialectic victory nor so as to convince the parties on whose suit he was deciding, but only with sufficient clearness, fulness and force to justify the decision at which he had arrived.

The chief doctrines of international law with the assertion and illustration of which the name of Lord Stowell is identified are these : the perfect equality and entire independence of all states (" Le Louis," 2 Dod. 243) — a logical deduction from the Austinian philosophy and still one of the fundamental principles of English jurisprudence; that the elementary rules of international law bind even semi-barbarous states (the " Hurtige Hane," 2 Rob. 325) ; that blockade to be binding must be effectual (the " Betsey" 1 Rob. 93) ; and that contraband of war is to be determined by " probable destina- tion " (the " Jonge Margaretha," 1 Rob. 189). In the famous Swedish convoy case (the "Maria," 1 Rob. 350; see, too, the " Recovery," 6 C. Rob. 348-9) Lord Stowell asserted that " a prize court is a court not merely of the country in which it sits but of the law of nations." " The seat of judicial authority," he added, in words which have become classic, " is indeed locally here, in the belligerent country, but the law itself has no locality." His dictum concerning the right of a belligerent to sink a neutral ship, when unable to take her before a prize court, was much quoted in 1904 in reference to the sinking of the " Knight Commander " by the Russians in the Far East.

The judgments of Lord Stowell were, almost without exception, confirmed on appeal, and they are to this day the international law of England, and have become presumptive though not conclusive evidence of the international law of America. " I have taken care," wrote Justice Story, " that they shall form the basis of the maritime law of the United States, and I have no hesitation in saying that they ought to do so in that of every civilized country in the world."

See Townsend, Lives of Twelve Eminent Judges, vol. ii. ; Quarterly Review, vol. lxxv. ; W. E. Surtees, Sketch of Lords Stowell and Eldon; Creasy, First Platform of International Law ; Reports of Prize Cases from 1745 to i8$q, ed. E. S. Roscoe (2 vols. 1905; contains all the more important of Lord Stowell's judgments).

STOWMARKET, a market town in the Stowmarket parlia- mentary division of Suffolk, England; 12 m. N.N.W. of Ipswich by the Great Eastern railway, on the river Gipping. Pop. of urban district (i9oi),4i62. The church of St Peter and St Mary is Decorated and

Early English, with a lofty tower and wooden spire. The ancient vicarage has associations with Milton through his tutor, Dr Young. The town has an extensive chemical manufactory, iron foundry, and factories for the manufacture of guncotton, agricultural implements and compressed leather. There is also considerable trade in corn, malt, coal, slate and timber.

STRABANE, a market town and the principal town of Co. Tyrone, Ireland. Pop. (1901), 5033. It stands at the junction of the rivers Mourne and Finn, which thenceforward form the Foyle. It is 161J m. N.W. by N. from Dublin by the Great Northern railway, and has also a station on the Donegal railway, the two companies using separate lines to Londonderry. Lifford, across the river, practically a suburb of Strabane, is the county town of Co. Donegal. A short canal connects the town with the point at which the Foyle becomes navigable. The trade in corn is considerable. Linen and shirt making, and iron and brass founding, are prosecuted. A castle of the time of James I. has left no remains. The town is governed by an urban district council. It returned two members to the Irish parliament until the Union in 1800.

STRABO (born c. 63 B.C.), Greek geographer and historian, was born at Amasia in Pontus, a city which had been much Hellenized, and was the royal residence of the kings of Pontus. We know nothing of his father's family, but several of his mother's relatives held important posts under Mithradates V. and VI. Some were of Hellenic, others of Asiatic origin, but Strabo himself was by language and education thoroughly Greek. The date of his birth cannot be exactly determined, but from various

indications in his work it seems to have been about 63 B.C. He studied at Nysa under the grammarian Aristodemus, under Tyrannio the grammarian at Rome, under the philosopher Xenarchus either at Rome or at Alexandria, and he had studied Aristotle along with Boethus (possibly at Rome under Tyrannio, who had access to the Aristotelian writings in Sulla's library). He states that he saw P. Servilius Isauricus, who died at Rome in advanced years in 44 B.C., from which it has been inferred that he visited Rome early in life. He also tells us that he was at Gyaros (one of the Cyclades) when Augustus was at Corinth on his return to Rome from the East in 29 B.C., and that he accom- panied the prefect of Egypt, Aelius Gallus,

on his expedition'to Upper Egypt, which seems to have taken place in 25-24 b.c. These are the only dates in his life which can be accurately fixed. The latest event, mentioned in his work is the death of Juba, king of Mauretania, which took place in a.d. 21.

Although he had seen a comparatively small portion of the regions which he describes, he had travelled much. As he states himself: " Westward I have journeyed to the parts of Etruria opposite Sardinia; towards the south from the Euxine to the borders of Ethiopia; and perhaps not one of those who have written geographies has visited more places than I have between those limits." He tells us that he had seen Egypt as far south as Syene and Philae, Comana in Cappadocia, Ephesus, Mylasa, Nysa and Hierapolis in Phrygia, Gyarus and Populonia. Of Greece proper he saw but little; it is by no means certain that he even visited Athens, and though he describes Corinth as an eye- witness, it is clear that he was never at Delphi and was not aware that the ruins of Mycenae still existed. He had seen Cyrene from the sea, probably on his voyage from Puteoli to Alexandria, where he remained a long time, probably amassing materials, and studying astronomy and mathematics. For nowhere could he have had a better means of consulting the works of historians, geographers and astronomers, such as Eratosthenes, Posidonius, Hipparchus and Apollodorus. We cannot tell where his Geo- graphy was written, but it was at least finally revised between a.d. 17 and 23, since we have historical allusions which can be dated to that time. Probably Strabo was then in Rome; the fact that his work passed unnoticed by Roman writers such as the elder Pliny does not prove the contrary.*

Works. — His earliest writing was an historical work now lost, which he himself describes as his Historical Memoirs, He tells us (xi. 9, 3) that the sixth book of the Memoirs was identical with the second of the Continuation of Polybius; probably, therefore, books i.-iv. formed an introduction to the main work. This accounts for the fact that he speaks (ii. 70) of having treated of the exploits of Alexander in his Memoirs, a topic which could not have found a place in a work which began where that of Polybius ended (146 B.C.). According to Su'idas, the continuation of Polybius was in forty-three books. Plutarch, who calls him " the Philosopher," quotes Strabo's Memoirs (Luc. 28); and cites him as an historian {Sulla, 26). Josephus, who constantly calls him " the Cappadocian," often quotes from him, but does not mention the title of the work.

The Geography is the most important work on that science which antiquity has left us. It was, as far as we know, the first attempt to

collect all the geographical knowledge at the time attainable, and to compose a general treatise on geography. It is not merely a new edition of Eratosthenes. In general outline it follows neces- sarily the work of the last-named geographer, who had first laid down a scientific basis for geography. Strabo made considerable alterations, but not always for the better. The three books of the older work formed a strictly technical geographical treatise. Its small size prevented it from containing any such general description of separate countries as Strabo rightly conceived to fall within the scope of the geographer. " Strabo indeed appears to beˆ the first who conceived a complete geographical treatise as comprising the four divisions of mathematical, physical, political and historical geography, and he endeavoured, however imperfectly, to keep all these objects in view." The incidental historical notices, which are often of great value and interest, are all his own. These digressions at times interrupt the symmetry of his plan; but Strabo had all the Greek love of legendary lore, and he discusses the journeyings of Heracles as earnestly as if they were events within recent history. ■He regarded Homer as the source of all wisdom and knowledge —

indeed, his description of Greece is largely drawn from Apollodorus's commentary on the Homeric "Catalogue of Ships " — and treated Herodotus with undeserved contempt, classing him with Ctesias and other " marvel-mongers." Yet in some respects Herodotus had better information (e.g. in regard to the Caspian) than Strabo him- self. Again, Strabo may be censured for discarding the statements of Pytheas respecting the west and north of Europe, accepted as they had been by Eratosthenes. But in this he relied on Polybius, whom he might justly consider as having from his position at Rome far better means of gaining accurate information. It must be admitted that the statements of Pytheas did not accord with the theory of Strabo just in those very points where he was at variance with Eratosthenes. He showed likewise an unwarranted scepticism in reference to the island of Cerne on the west coast of Africa, which without doubt the Carthaginians had long used as an emporium.

Strabo chiefly employed Greek authorities (the Alexandrian geographers Polybius, Posidonius and Theophanes of Mytilene, the companion of Pompey) and made comparatively little use of Roman authorities. Although he refers to Caesar's Commentaries once by name, and evidently made use of them in other passages, he but imperfectly availed himself of that work. He designed his geography as a sequel to his historical writings, and it had as it were grown out of his historical materials, which were chiefly Greek. Moreover Strabo probably amassed his material in the library of Alexandria,

so that Greek authorities would naturally furnish the great bulk of his collections. Doubtless, however, he returned to Rome after a long sojourn in Alexandria, a fact which explains the defectiveness of his information about the countries, to the east of his native land, and renders it possible for him to have made use of the " chorography " of Agrippa, a map of the Roman Empire and adjacent countries set up by order of Augustus in 'the Porticus Vipsaniae.

He designed the work for the statesman rather than for the student. He therefore endeavours to give a general sketch of the character, physical peculiarities and natural productions of each country, and consequently gives us much valuable information re- specting ethnology, trade and metallurgy. It was almost necessary that he should select what he thought most important for description, and at times omit what we deem of more importance. With respect to physical geography, his work is a great advance on all preceding ones. Judged by modern standards, his description of the direction of rivers and mountain-chains seems defective, but allowance must be made for difficulties in procuring information, and for want of accurate instruments. In respect of mathematical geography, his lack of scientific training was no great hindrance. He had before him the results of Eratosthenes, Hipparchus and Posidonius. The chief conclusions of astronomers concerning the spherical figure and dimensions of the earth, its relation to the heavenly bodies, and the great circles of the globe — rthe equator, the ecliptic and the tropics — were considered as well established. He accepted also the division into five zones; he quotes approvingly the assertion of Hipparchus that it was impossible to make real advances Ln geo- graphy without astronomical observations for determining latitudes and longitudes.

The work consists of seventeen books, of which the seventh is imperfect. The first two are introductory, the next eight deal with Europe (two being devoted to Spain and Gaul, two to Italy and Sicily, one to the north and east of Europe, and three to Greek lands). The eleventh book treats of the main divisions of Asia and the more easterly districts, the next three of Asia Minor. Book xv. deals with India and Persia, book xvi. with Assyria, Babylonia, Syria and Arabia, and the closing book with Egypt and Africa.

Editions. — The Aldine (Venice, 1516) was unfortunately based on a very corrupt MS. The first substantial, improvements in the text were due to Casaubon (Geneva, 1587; Paris, 1 620), whose text remained the basis of subsequent editions till that of Coraes (Paris, 1815-1819), who removed many corruptions. The MSS. were first scientifically collated by Kramer (Berlin, 1844-1852), who demon-

strated that Par. 1 397 was the best authority for the first nine books (it contains no more) and Vat. 1329 for the remainder. Of later editions the most important are those of C. Midler (Paris, 1853) and Meineke (Leipzig, 1866-1877). H. F. Tozer's volume of selections (Oxford, 1893) is useful. Napoleon I., an admirer of Strabo, caused a French translation of the Geography to be made by Coraes, Letronne and others(Paris 1805-1819) ; Grosskurd's German translation (Berlin, 1 831-1834), with notes, is a monumental work. The fragments of the Historical Memoirs have been edited by P. Otto (Leipziger Studien XI, 1891); see also Midler's. Fragmenta historicorum grae- corum, iii. 490 sqq. Bunbury's History of Ancient Geography, vol. ii. chs. 2 1 , 22 ; and F. Dubois's Examen de la giographie de Strabon (Paris, 1891) should also be consulted. (H. S. J.)

STRACHAN, JOHN (1 778-1867), first bishop of Toronto, son of John Strachan and Elizabeth Finlayson his wife, was born at Aberdeen, Scotland, on the 12th of April 1778. His father died in 1 792 from an accident in the granite quarries of which he was an overseer. Thus from an early age young Strachan bad to depend upon his own resources and even to assist his mother,

whom he loyally aided till her death in 1812. He managed, by undertaking private teaching and with the aid of a bursary, to go to the university of Aberdeen, where he took his M.A. degree. He attended some of the divinity classes at the university, where also he formed a lasting friendship with two of his fellow students, well known afterwards as Professor Duncan and Dr Chalmers. In 1799 he emigrated to Canada, having been recommended to the Hon. Richard Cartwright, of Kingston, Upper Canada, as suitable for tutorial work. Strachan went to Canada a Presby- terian. His associations there, however, were almost exclusively with Episcopalians, including Mr Cartwright and the Rev. Dr. Stuart, for a time the only clergyman in the district. Moreover, special provision had been made in the Constitutional Act of 1 791 for the liberal endowment of the Protestant religion, then identified in the official mind with the Church of England, through what were afterwards known as the Clergy Reserves, being one-seventh of the lands of the new townships opened for settlement. Having decided to enter the Episcopal Church, Strachan was ordained on the 22nd of May 1803, and was immediately afterwards appointed to the parish of Cornwall. Thither

he removed his school, which soon became the most noted educational institution in the country. There many future leaders of public and professional life in Canada came under the influence of Strachan's vigorous personality. In 1807 he married the youthful widow of Andrew McGill, a wealthy merchant of Montreal, and brother of the founder of McGill University. In 181 1 he received the honorary degree of D.D. from his alma mater, Aberdeen University. During the same year Dr Stuart of Kingston died and was succeeded by his son George O'Kill Stuart, incumbent at York, the capital of the province. Through the influence of Lieut. Governor Gore, supplemented by that of Sir Isaac Brock, Strachan was pre vailed upon in 181 2 to transfer himself to York, where he was soon deeply involved in civil and ecclesiastical politics.

During the War of 18 12 he was of special service to the executive government and the citizens of the town when the American troops captured York and burned the public buildings. He was chiefly instrumental also in founding the Loyal and Patriotic Society of Upper Canada, which raised funds for the relief of the wounded and the assistance of the widows and orphans of the slain. On the urgent recommendation of Lieut. – Governor Gore he was appointed to the executive council of Upper Canada in 1815. A man of great force of character and much ability, of keen ambitions and unusual shrewdness, though not remarkable for breadth of mind, he attained to great influence in the executive government and was soon the leading spirit in that dominant group known in Upper Canadian history as the Family Compact. In 1820 he was appointed by Sir Peregrine Maitland a member of the legislative council in order that the governor might have a confidential medium through whom to make communication to the council. At the instance of the lieutenant-governor he went to England in 1824, to discuss various colonial questions with the earl of Bathurst, then colonial secretary. Strachan had no difficulty in convincing Lord Bathurst of the justice of his claims on all essential matters, the most important of which was the exclusive right of the Church of England in Canada to the Clergy Reserves. Though in favour of selling a portion of these lands to provide a fund for the exist- ing needs of the Church, he secured the defeat of the proposal then before the government to dispose of the Clergy Reserves to the Canada Company. He took much interest in the educa- tional affairs of the province, and in 1807 was instrumental in having provision made for the establishment of the first grammar schools. In 1824 he secured the passing of an> act providing assistance for the public schools of each district. During his second visit to England in 1826-1827 he obtained a royal charter for

the university of King's College, with provision for its endow- ment out of the crown lands. It was, however, to be entirely under the control of the Church of England. In 1827 Strachan became archdeacon of York.

The break-up of the Liverpool ministry in 1827 interrupted the successful development of Strachan's plans for placing virtually

the whole of the government endowments for religion and education under the control of the Episcopal Church. The storm of protest of the other religious denominations caused the colonial office to undertake an investigation of the whole question, the result of which was presented in the report of 1828. After a long silence in the face of severe and persistent criticism, Strachan made a general reply in a very able speech in the legislative council in March 1828. When the storm had subsided the Clergy Reserves and university questions remained dormant until 1836, when the attempt to apply the Reserves to the endowment of rectories renewed the trouble and contributed largely to the crisis of 1837. Adverse criticism and a sugges- tion from the colonial office that he should cease from active participation in political affairs led to his resignation from the executive council, but he declined to give up his seat in the legislative council.

On the death of Bishop Stewart of Quebec the Canadian see was divided, and Strachan was made bishop of Toronto in August 1839. He energetically opposed the act of 1840, which sought to settle the Clergy Reserves question by dividing the proceeds among the different religious denominations, the larger share still remaining with the Church of England.

The university of King's College was finally established, with certain modifications of its charter, in 1843, Bishop Strachan being the first president. The renewed agitation finally resulted in the elimination of all religious tests by the act of 1849, which also changed the name to that of the university of Toronto. Strachan at once took steps to found another university which should be completely under the control of the Episcopal Church, hence the establishment of Trinity University, which was opened in 1852. Bishop Strachan also raised once more the question of the disposal of the Clergy Reserves. After several strong appeals and counter-appeals to the British government, the Canadian parliament was allowed to deal as it pleased with the question, with the result that the Reserves were completely secularized in 1854, provision being made for the life-interest of the beneficiaries at the time. Bishop Strachan devoted the

latter years of his long life entirely to his episcopal duties, and by introducing the diocesan synod he furnished the Episcopal Church in Canada with a more democratic organ of government. He died in November 1867.

STRACHEY, SIR JOHN (1823-1907), British Indian civilian, fifth son of Edward Strachey, was born in London on the 5th of June 1823. After passing through Haileybury, Strachey entered the Bengal civil service in 1842, and served in the North-Western Provinces, occupying many important positions. In 1861 Lord Canning appointed him president of a commission to investigate the great cholera epidemic of that year. In 1862 he became judicial commissioner in the Central Provinces. In 1864, after the report of the royal commission on the sanitary condition of the army, a permanent sanitary commission was established in India, with Strachey as president. In 1866 he became chief commissioner of Oudh, having been chosen by Lord Lawrence to remedy as far as possible the injustice done after the Mutiny by the confiscation of the rights of tenants and small proprietors of land, maintaining at the same time the privileges of the Talukdars of great landlords As member of the legislative council he introduced several bills for that purpose, which, with the full approval of the Talukdars, passed into law. In 1868 he became member of the governor-general's council, and on the assassination of Lord Mayo in 1872 he acted temporarily as viceroy. In 1874 he was appointed lieutenant-governor of the North-Western Provinces. In 1876, by request of LordLytton and the secretary of state, he consented to relinquish that office, and returned to the governor-general's council as financial minister, which post he retained until 1880. During this time, while Lord Lytton was viceroy, important reforms were carried out. The measures for decentralizing financial administration, initiated under Lord Mayo, were practically completed. The salt duties were reduced, and the system under which they were levied was altered, and that opprobrium of our administration, the inland customs line, was abolished. The removal of all

import duties, including those on English cotton goods, and the establishment of complete free trade, was declared to be the fixed policy of the government, and this was in great measure carried into effect before 1880, when Strachey left India. The defective system on which the military accounts were kept occasioned a very erroneous

estimate of the cost of the Afghan War of 1878- 80. For this error Strachey was technically responsible, and it was made the occasion of a violent party attack which resulted in bis resignation. The fact that almost the entire cost of the war was paid for out of revenue is a conclusive proof of the state of financial prosperity to which India attained as the result of his administration. From 1885 to 1895 Strachey was a member of the council of the secretary of state for India. He was joint author with Sir Richard Strachey of The Finances and Public Works of India (1882), besides writing India (3rd ed., 1903), and Hastings and the Rohilla War (1892). He died on the 19th of December 1907.

STRACHEY, SIR RICHARD (1817-1908), British soldier and Indian administrator, third son of Edward Strachey, was born on the 24th of July 181 7, at Sutton Court, Somersetshire. From Addiscombe he passed into the Bengal Engineers in 1836, and was employed for some years on irrigation works in the North- western Provinces. He served in the Sutlej campaign of 1845- 46, and was at the battles of Aliwal and Sobraon, was mentioned in despatches, and received a brevet-majority. From 1858 to 1865 he was chiefly employed in the public works department, either as acting or permanent secretary to the government of India, and from 1867 to 187 1 he filled the post of director-general of irrigation, then specially created. During this period the entire administration of public works was reorganized to adapt it to the increasing magnitude of the interests with which this department has had to deal since its establishment by Lord Dalhousie in 1854. For this reorganization, under which the accounts were placed on a proper footing and the forest adminis- tration greatly developed, Strachey was chiefly responsible. His work in connexion with Indian finance was important. In 1867 he prepared a scheme in considerable detail for decentraliz- ing the financial administration of India, which formed the basis of the policy afterwards carried into effect by his brother Sir John Strachey under Lord Mayo and Lord Lytton. He left India in 187 1, but in 1877 he was sent there to confer with the government on the purchase of the East Indian railway, and was then selected as president of the commission of inquiry into Indian famines. In 1878 he was appointed to act for six months as financial member of the governor-general's council, when he made proposals for meeting the difficulties arising from the depreciation of the rupee, then just beginning to be serious. These proposals did not meet with the support of the secretary of state. From that time he continued to take an active part in the efforts made to bring the currencies of India and England into harmony, until in 1892 he was appointed a member of Lord Herschell's

committee, which arrived at conclusions in accord- ance with the views put forward by him in 1878. He attended in 1892 the International Monetary Conference at Brussels as delegate for British India. Strachey was a member of the council of the secretary of state for India from 1875 to 1889, when he resigned his seat in order to accept the post of chairman of the East Indian Railway Company. Strachey's scientific labours in connexion with the geology, botany and physical geography of the Himalaya were considerable. He devoted much time to meteorological research, was largely instrumental in the forma- tion of the Indian meteorological department, and became chairman of the meteorological council of the Royal Society in 1883. From 1888 to 1890 he was president of the Royal Geo- graphical Society. In 1897 he was awarded one of the royal medals of the Royal Society, of which he became a fellow in 1854; and in the same year he was created G. C.S.I. He died on the 1 2th of February 1908. His widow, Lady Strachey, whom he married in 1880, became well-known as an authoress and a supporter of women's suffrage.

STRACHWITZ, MORITZ KARL WILHELM ANTON, Graf von (1822-1847), German poet, was bom on the 13th of March

1822 at Peterwitz near Frankenstein in Silesia. After studying in Breslau and Berlin he settled on his estate in Moravia, where he devoted himself to literary pursuits. When travelling in Italy in 1847 he was taken ill at Venice, and died on the nth of December at Vienna. Although he had thus only reached his twenty-fifth year, he revealed a lyric genius of remarkable force and originality. His first collection of poems, Lieder eines Erwachenden, appeared in 1842 and went through several editions. Neue Gedichte were published after his death in 1848. These poems are characteristic of the transition through which the German lyric was passing between 1840 and 1848; the old Romantic strain is still dominant, especially in his ballads, which are unquestionably his finest productions; but, side by side with it, there is to be seen the influence of Platen, to whose warmest admirers Strachwitz belonged, as well as echoes of the restless political spirit of those eventful years. His political lyric was, however, tempered by an aristocratic restraint which was absent from the writings of men like Herwegh and Freili- grath. Strachwitz's early death was a great loss to German letters; for he was by far the most promising of the younger lyric poets of his time.

Strachwitz's collected Gedichte appeared first in 1850 (8th ed., 1 891); a convenient reprint will be found in Reclam's Universal-bibliothek. See A. K. T. Tielo, Die Dichtung des Grafen Moritz von

Strachwitz (1902).

STRADELLA, ALESSANDRO (?i645-i682), Italian composer, was one of the most accomplished musicians of the 17th century. The hitherto generally accepted story of his life was first circumstantially narrated in Bonnet-Bourdelot's Histoire de la musique et de ses effets (Paris, 1715). According to this account, Stradella not only produced some successful operas at Venice, but also attained so great a reputation by the beauty of his voice that a Venetian nobleman engaged him to instruct his mistress, Ortensia, in singing. Stradella, the narrative goes on to say, shamefully betrayed his trust, and eloped with Ortensia to Rome, whither the outraged Venetian sent two paid bravi to put him to death. On their arrival in Rome the assassins learned that Stradella had just completed a new oratorio, over the performance of which he was to preside on the following day at S. Giovanni in Laterano. Taking advantage of this circumstance, they deter- mined to kill him as he left the church; but the beauty of the music affected them so deeply that their hearts failed them at the critical moment, and, confessing their treachery, they entreated the composer to Jensure his safety by quitting Rome immediately. Thereupon Stradella fled with Ortensia to Turin, where, notwithstanding the favour shown to him by the regent of Savoy, he was attacked one night by another band of assassins, who, headed by Ortensia's father, left him on the ramparts for dead. Through the connivance of the French ambassador the ruffians succeeded in making their escape; and in the meantime Stradella, recovering from his wounds, married Ortensia, by consent of the regent, and removed with her to Genoa. Here he believed himself safe; but a year later he and Ortensia were murdered in their house by a third party of assassins in the pay of the implacable Venetian.

Recent research has shown that Stradella was the son of a Cavaliere Marc' antonio Stradella of Piacenza, who in 1642-1643 was vice-marchese and governor of Vignola for Prince Bon- compagni,who did not wish to live in the dominions from which he took the title of marchese di Vignola. He was deprived of his office in 1643 for having surrendered the castle to the papal troops, although it might have sustained a siege of several days and the help of the duke of Modena was expected. An elder brother of Alessandro, Francesco by name, became a member of the Augustinian order, and seems to have enjoyed the protection of the house of Este. Alessandro is supposed to have been born about 1645 or earlier, probably at Vignola, or Monfestino, a town on the road from Modena to Pistoja, to which his father retired after his dismissal ; but no records of his birth have come to light in either of these places. The first certain date in his life

is 1672, in which year he composed a prologue for the performance of Cesti's opera La Dori at Rome; and we may conclude that he spent a considerable time at Rome about this period, since his

cantatas and other compositions contain frequent allusions to Rome and noble Roman families. There is, however, no proof that he ever performed the oratorio S. Giovanni Battista in the Lateran. Documents in the archives at Turin relate that in 1677 he arrived there with the mistress of Alvise Contarini, with whom he had eloped from Venice. Contarini demanded that both should be given up to him, or failing that, that Stradella should not be allowed to exercise his profession until the lady had been either placed in a convent or made his legitimate wife. Stradella was protected by the regent of Savoy, the duchess Giovanni Battista de Nemours, and the Contarini family, indignant at his audacity, sent two hired assassins to Turin, by whom Stradella was wounded but not murdered. We hear of Stradella last at Genoa. An opera by him, La Forza dell' amor paterno, was given there in 1678, and his last composition, 77 Barcheggio {i.e. a " Water-Music "), was performed on the 16th of June 1 68 1 in honour of the marriage of Carlo Spinola and Paola Brignole, which was solemnized on the 6th of July of the same year. Documents in the archives at Modena inform us that in February 1682 Stradella was murdered at Genoa by three brothers of the name of Lomellini, whose sister he had seduced.

It is extremely improbable that Stradella had any great reputa- tion as a singer, since the great Italian singers of the 17 th century were almost exclusively castraii; but he may well have been a teacher of singing, and he appears to have instructed his lady pupils in Genoa on the harpsichord. He is principally important as a composer of operas and chamber-cantatas, although com- pared with his contemporaries his output was small. In spite of his dissolute life his command of the technique of composition was remarkable, and his gift of melodic invention almost equal to that of A. Scarlatti, who in his early years was much influenced by Stradella. His best operas are II Floridoro, also known as II Mora per amore, and II Trespolo tutore, a comic opera in three acts which worthily carried on the best traditions of Florentine and Roman comic opera in the 17th century. His church music, on which his reputation has generally been based, is of less im- portance, though the well-known oratorio S. Giovanni Battista displays the same skill in construction and orchestration (so

far as the limited means at his disposal permitted) as the operas. A serenata for voices and two orchestras, Qual prodigo ch'io miri, was used by Handel as the basis of several numbers in Israel in Egypt, and was printed by Chrysander (Leipzig, 1888); the MS., however, formerly in the possession of Victor Schoelcher, from which Chrysander made his copy, has entirely disappeared. The well-known aria Pietd, signore, also sung to the words Se i ittiei sospiri, cannot possibly be a work of Stradella, and there is every reason to suppose that it was composed by Fetis, Niedermeyer or Rossini.

The finest collection of Stradella's works extant is that at the Biblioteca Estense at Modena, which contains 148 MSS., including four operas, six oratorios and several other compositions of a semi-dramatic character. A collection of cantate a voce sola was be-queathed by the Contarini family to the library of St Mark at Venice ; and some MSS. are also preserved at Naples and in Paris. Eight madrigals, three duets, and a sonata for two violins and bass will be found among the Additional MSS.,at the British Museum, five pieces among the Harleian MSS., and eight cantatas and a motet among those in the library at Christ Church, Oxford. The Fitz- william Museum at Cambridge possesses a large number of his chamber-cantatas and duets.

See also Heinz Hess, Die Opern Alessandro Stradellas (Leipzig, 1905), which includes the most complete catalogue yet made of Stradella's extant works; Catelani, Delle Opere di A. Stradella instenti nell' archivio musicale delta r. biblioteca palatina di Modena (Modena, 1865); and Sedley Taylor, The Indebtedness of Handel to other Composers (Cambridge, 1906).

STRADIVARI, ANTONIO (1644-1737), Italian violin-maker, is associated throughout his life with Cremona, where he brought the craft of violin-making to its highest pitch of perfection. The obscure details of his life have been thoroughly worked out in the monograph on him by W. H Hill, A. F. Hill and Alfred Hill (1902). He was still a pupil of Nicolas Amati in 1666, when he had already begun to insert his own label on violins of his making, which at first follow the smaller Amati model, froiidly constructed, with a thick yellow varnish. It was not

till 1684 that he began to produce a larger model, using a deepei coloured varnish, and beautifying the instruments in various details, his " long " patterns (from 1690) representing a complete innovation in its proportions; while from 1700, after for a few years returning to an earlier style, he again broadened and other- wise improved his

model. He also made some beautiful violon- cellos and violas. The most famous instruments by him are: — Violins: the " Hellier " (1679), the " Selliere " (before 1680), the " Tuscan " (1690), the " Betts " (1704), the" Ernst " (1709), " La Pucelle " (1709), the " Viotti " (1709), the " Vieuxtemps " (1710), the " Parke " (1711), the " Boissier " (1713), the "Dol- phin " (1714), the " Gillot " (1715), the " Alard," the finest of all (1715), the " Cessot " (1716), the " Messiah " (1716), the " Sas- serno " (1717), the " Maurin " (1718), the "Lauterbach" (1719), the "Blunt" (1721), the " Sarasate " (1724), the "Rode" (1722), the " Deurbroucq " (1727), the " Kiesewetter " (1731), the "Habeneck" (1736), the " Muntz " (1736). Violas: the " Tuscan " (1690), two of 1696 formerly belonging to the king of Spain, the " Archinto " (1696), the " Macdonald " (1701), and the " Paganini " (1731). Violoncellos: the "Archinto" (1689), the " Tuscan " (1690), the " Aylesford " (1696), the " Cristiani " (1700), the " Servais " (1701), the " Gore-Booth " (1710), the "Duport " (1711), the "Adam" (1713), the " Batta " (1714), the " Piatti," the finest of all (1720), the " Bandiot " (1725), the " Gallay " (1725). Antonio Stradivari's sons Fran- cesco (1671-1743) and Omobono (1679-1742) were also violin- makers, who assisted their father, together with Carlo Bergonzi, who appears to have succeeded to the possession of Antonio's stock-in-trade. The Stradivari method of violin-making created a standard for subsequent times; but what is regarded as Antonio's special advantage, now irrecoverable, was his varnish, soft in texture, shading from orange to red, the composition of which has been much debated. (See also Violin.)

STRAFFORD, EARLS OF. The first earl of Strafford was Charles I.'s friend and adviser, Thomas Wentworth (see below). When he was attainted and executed in May 1641 his honours were forfeited, but later in the year his only son, William (1626- 1695), was created earl of Strafford, his father's attainder being reversed by act of parliament in 1662. William died without issue on the 16th of October 1695, when all his titles, except the barony of Raby, became extinct. His estates passed to a kins- man, Thomas Watson, afterwards Watson- Wentworth (d. 1723), a son of Anne (1629-1695), daughter of the 1st earl, and her husband Edward Watson, 2nd Baron Rockingham. In 1746 Watson- Wentworth's son, Thomas Watson- Went worth (c. 1690- 1750), was created marquess of Rockingham, and when his son Charles, the 2nd marquess, died in 1782, the estates passed to his maternal nephew, William Fitzwilliam, 2nd Earl Fitzwilliam (1748-1833). His descendant, the present Earl Fitzwilliam, is the owner of Wentworth Woodhouse,

near Rotherham, and the representative of the Wentworth family.

The barony of Raby passed to the 2nd earl's cousin, Thomas Wentworth (1672-1739), son and heir of Sir William Wentworth of Northgate Head, Wakefield. In early life he saw much service as a soldier in the Low Countries, and was occasionally employed on diplomatic errands. From 1711 to 1714 he was British ambassador at the Hague, and in 171 1 he was created earl of Strafford. The earl was one of the British representatives at the congress of Utrecht, and in 1715 he was impeached for his share in concluding this treaty, but the charges against him were not pressed to a conclusion. He died on the 15th of November 1739. The earldom became extinct when Frederick Thomas, the 5th earl, died in August 1799. William, the 4th earl (1722-1791), had a sister Anne, who married William Connolly; and one of their daughters, Anne, married George Byng (d. 1789) of Wrotham Park, Middlesex. Their son, Sir John Byng (1772-1860), a distinguished soldier, was created earl of Strafford and Viscount Enfield in 1847. Having entered the army in 1793, Byng served in Flanders and commanded a brigade during the Peninsular War. He was present at Waterloo and became a field marshal in 1855. The earldom of Strafford is still held by his descendants.

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STRAFFORD, EARL OF

STRAFFORD, THOMAS WENTWORTH, Earl of (1593-1641), English statesman, son of Sir William Wentworth, of Wentworth Woodhouse, near Rotherham, a member of an ancient family long established there, and of Anne, daughter of Sir Robert Atkins of Stowell, Gloucestershire, was born on the 13th of April 1593, in London. He was educated at St John's College, Cam- bridge, was admitted a student of the Inner Temple in 1607, and in 161 1 was knighted and married Margaret, daughter of Francis Clifford, 4th earl of Cumberland. In 1614 he represented York- shire in the Addled Parliament, but, so far as is now known, it was not till the parliament of 162 1, in which he sat for the same constituency, that he took part in the debates. His position towards the popular party was peculiar. He did not sympathize with their zeal for war with Spain, but James's denial of the rights and privileges of parliament seems to have caused him to join in the vindication of the claims of the House of which he was a mem- ber, and he was a warm supporter of the protestation which drew down a sentence of dissolution upon the third parliament of James.

In 1622 Wentworth's wife died, and in February 1625 he married Arabella Holies, daughter of the earl of Clare. He was returned for Pontefract to the parliament of 1624, but appears to have taken no part in the proceedings. He had no sympathy with the popular outcry against Spain nor for wars undertaken for religious considerations to the neglect of the practical interests of the country. He desired also to avoid foreign complications and " do first the business of the commonwealth." To the advances of Buckingham he replied coldly that " he was ready to serve him as an honest man and a gentleman." In the first parliament of Charles I., June 1625, he again represented York- shire, and at once marked his hostility to the proposed war with Spain by supporting a motion for an adjournment before the house proceeded to business. He took part in the opposition to the demand made under the influence of Buckingham for war subsidies, and was consequently, after the dissolution in Novem- ber, made sheriff of Yorkshire, in order to exclude him from the parliament which met in 1626. Yet he had never taken up an attitude of antagonism to the king. His position was very different from that of the regular opposition. He was anxious to serve the Crown, but he disapproved of the king's policy. In January 1626 he had asked for the presidency of the council of the North, and had visited and been favourably received by Buckingham. But after the dissolution of the parliament he was dismissed from the justiceship of the peace and the office of custos rotulorum of Yorkshire, to which he had been appcinted in 161 s, as the result probably of his resolution not to support the court in its design to force the country to contribute money without a parliamentary grant. At all events he refused in 1627 to contribute to the forced loan, and was imprisoned in consequence.

Wentworth's position in the parliament of 1628 was a striking one. He joined the popular leaders in resistance to arbitrary taxation and imprisonment, but he tried to obtain his end with the least possible infringement of the prerogative of the Crown, to which he looked as a reserve force in times of crisis. With the approbation of the House he led the movement for a bill which would have secured the liberties of the subject as completely as the Petition of Right afterwards did, but in a manner less offen- sive to the king. The proposal was wrecked between the uncom- promising demands of the parliamentary party who would give nothing to the prerogative and Charles's refusal to make the necessary concessions, and the leadership was thus snatched from Wentworth's hands by Eliot and Coke. Later in the session he fell into conflict with Eliot, as, though he supported the Petition of Right in substance, he was anxious to come to a

compromise with the Lords, so as to leave room to the king to act unchecked in special emergencies.

On the 22nd of July 1628, not long after the prorogation, Wentworth was created Baron Wentworth, and received a promise of the presidentship of the Council of the North at the next vacancy. This implied no change of principle whatever. He was now at variance with the parliamentary party on two great subjects of policy, disapproving both of the intention of

parliament to seize the powers of the executive and also its inclination towards puritanism. When once the breach was made it naturally grew wider, partly from the engrossing energy which each party put into its work, and partly from the personal ' animosities which of necessity arose. Such and no other was the nature of Wentworth's so-called " apostacy."

As yet Wentworth took no part in the general government of the country. In December he became Viscount Wentworth and president of the Council of the North. In the speech delivered at York on his taking office he announced his intention, almost in the words of Bacon, of doing his utmost to bind up the prerogative of the Crown and the liberties of the subject in indis- tinguishable union. " Whoever," he said, " ravels forth into questions the right of a king and of a people shall never be able to wrap them up again into the comeliness and order he found them." His government here was characterized by the same feature which afterwards marked his administration in Ireland and which it was the gravest charge in his impeachment that he intended to introduce into' the whole English administration, namely the attempt to centralize all power with the executive at the expense of the individual in defiance of those constitutional liberties which ran counter to and impeded this policy.

The session of 1629 ended in a breach between the king and the parliament which made the task of a moderator hopeless. Wentworth had to choose between helping a Puritan House of Commons to dominate the king and helping the king to dominate a Puritan House of Commons. He instinctively chose the latter course, and he threw himself into the work of repression with characteristic energy, as if the establishment of the royal power was the one thing needful. Yet even when he was most resolute in crushing resistance he held that he and not his antagonists were maintaining the old constitution, which they had attempted to alter by claiming supremacy for parliament.

In November 1629 Wentworth became a privy councillor. In October 1631 he lost his second wife, and in October 1632 he married Elizabeth, daughter of Sir Godfrey Rhodes. In January 1632 he had been named lord-deputy of Ireland, and arrived in Dublin in July 1633.

Here he had to deal with a people who had not arrived at national cohesion, and amongst whom English colonists had been from time to time introduced, some of them, like the early Norman settlers, being Roman Catholics, whilst the later im- portations stood aloof and preserved their Protestantism. In his government here he showed the most remarkable abilities as a ruler. " The lord deputy of Ireland," wrote Sir Thomas Roe to the queen of Bohemia, " doth great wonders and governs like a king, and hath taught that kingdom to show us an example of envy, by having parliaments and knowing wisely how to use them." He reformed the administration, getting rid summarily of the inefficient English officials. He succeeded in so manipulating the parliaments that he obtained the necessary- grants, and secured their co-operation in various useful legis- lative enactments. He set on foot a new victualling trade with Spain, established or promoted the linen manufacture, and encouraged the development of the resources of the country in many directions. The customs rose from a little over £25,000 in 1633-1634 to £57,000 in 1637-1638. He raised an army. He swept the pirates from the seas. He reformed and instilled life into the Church and rescued church property. His strong and even administration broke down the tyranny of the great men over the poor. Such was the government of " Thorough," as Strafford expresses it. Yet these good measures were all carried out by arbitrary methods which diminished their use- fulness and their stability. Their aim moreover was not the prosperity of the Irish community but the benefit to the English exchequer, and Strafford suppressed the trade in cloth " lest it should be a means to prejudice that staple commodity of Eng- land." 1 Extraordinary acts of despotism took place, as in the case of Esmond, Lord Chancellor Loftus and Lord Mountnorris, the last of whom Strafford caused to be sentenced to death

1 Strafford's Report of 1636. Cat. of State Papers; Irish, 1633-1647, p. 134.

in order to obtain the resignation of his office, and then par- doned.

Promises of legislation such as the concessions known as the " graces " were not kept. In particular Strafford set at naught Charles's promise that no colonists should be forced into Connaught, and in 1635 he proceeded to that province, where, raking up an obsolete title — the grant in the 14th century of Connaught to Lionel, duke of Clarence, whose heir Charles was — he insisted upon the grand juries in all the counties finding verdicts for the king. One only, that of Galway, re- sisted, and the confiscation of Galway was effected by the court of exchequer, while he fined the sheriff £1000 for sum- moning such a jury, and cited the jurymen to the castle chamber to answer for their offence. In Ulster the arbitrary confis- cation of the property of the city companies aroused dangerous animosity against the government. Towards the native Irish Wentworth's bearing was benevolent but thoroughly un- sympathetic. Having no notion of developing their qualities by a process of natural growth, his only hope for them lay in converting them into Englishmen as soon as possible. They must be made English in their habits, in their laws and in their religion. " I see plainly," he once wrote, " that, so long as this kingdom continues popish, they are not a people for the Crown of England to be confident of." High-handed as Wentworth was by nature, his rule in Ireland made him more high-handed than ever. As yet he had never been consulted on English affairs, and it was only in February 1637 that Charles asked his opinion on a proposed interference in the affairs of the Con- tinent. In reply, he assured Charles that it would be unwise to undertake even naval operations till he had secured absolute power at home. He wished that Hampden and his followers " were well whipped into their right senses." The opinion of the judges had given the king the right to levy ship-money, but, unless his majesty had " the like power declared to raise a land army, the Crown " seemed " to stand upon one leg at home, to be considerable but by halves to foreign princes abroad." When the Scottish Puritans rebelled he advocated the most decided measures of repression, in February 1639 send- ing the king £2000 as his contribution to the expenses of the coming war, at the same time deprecating an invasion of Scot- land before the English army was trained, and advising certain concessions in religion.

Wentworth arrived in England in September 1639, after Charles's failure in the first Bishops' War, and from that moment he became Charles's principal adviser. Ignorant of the extent to which opposition had developed in England during his absence, he recommended the calling of a parliament to support a renewal of the war, hoping that by the offer of a loan from the privy councillors, to which he himself contributed £20,000, he would place Charles above

the necessity of submitting to the new parliament if it should prove restive. In January 1640 he was created earl of Strafford, and in March he went to Ireland to hold a parliament, where the Catholic vote secured a grant of subsidies to be used against the Presbyterian Scots. An Irish army was to be levied to assist in the coming war. When in April Strafford returned to England he found the Commons holding back from a grant of supply, and tried to enlist the peers on the side of the king. On the other hand he induced Charles to be content with a smaller grant than he had originally asked for. The Commons, however, insisted on peace with the Scots. Charles, on the advice, or perhaps by the treachery of Vane, returned to his larger demand of twelve subsidies; and on the 9th of May, at the privy council, Strafford, though reluctantly, voted for a dissolution. The same morning the Committee of Eight of the privy council met again. Vane and others were for a mere defence against invasion. Strafford's advice was the contrary. " Go on vigorously or let them alone .... go on with a vigorous war as you first designed, loose and absolved from all rules of government, being reduced to extreme necessity, everything is to be done that power might admit. .... You have an army in Ireland you may employ here to reduce this kingdom . . . ." He tried to force the citizens of London to lend money. He supported a project for debasing

the coinage and for seizing bullion in the Tower, the property of foreign merchants. He also advocated the purchase of a loan from Spain by the offer of a future alliance. He was ultimately appointed to command the English army, and was made a knight of the Garter, but he was seized with illness, and the rout of Newburn made the position hopeless. "Pity me," he wrote to his friend Sir George Radcliffe, ',' for never came any man to so lost a business .... In one word here alone to fight with all these evils, without any one to help." In the great council of peers, which assembled on the 24th of September at York, the struggle was given up, and Charles announced that he had issued writs for another parliament.

The Long Parliament assembled on the 3rd of November 1640, and Charles immediately summoned Strafford to London, promising that he " should not suffer in his person, honour or fortune." He arrived on the 9th and on the 10th proposed to the king to forestall his impeachment, now being prepared by the parliament, by accusing the leaders of the popular party of treasonable communications with the Scots. The plan however having been betrayed, Pym immediately took up the impeachment to the Lords on the nth. Strafford came to the house to confront his accusers, but was ordered to withr draw and committed into custody. On the 25th of November the

preliminary charge was brought up, whereupon he was sent to the Tower, and, on the 31st of January 1641, the accusa- tions in detail were presented. These were, in sum, that Strafford had: endeavoured to subvert the fundamental laws of the kingdom, and that the attempt was high treason. Much stress was laid on Strafford's reported words, already cited — " You have an army in Ireland you may employ here to reduce this kingdom," England, it being contended, and not Scotland being here meant. It is clear nevertheless that however tyran- nical and mischievous Strafford's conduct may have been, his offense was not one which could by any straining of language be included in the limits of high treason; while the copy of a copy of rough notes of Strafford's speech in the committee of the council, the genuineness of which was asserted only by the defendant's accusers or personal enemies and not supported by other councillors who had also been present on the occasion, could not be evidence which would convict in a court of law In addition, the words had to be arbitrarily interpreted as referring to the subjection of England and not of Scotland* and were also spoken on a privileged occasion. Advantage was freely taken by Strafford of the weak points in the attack, and the lords, his judges, were considerably influenced in his favour. But behind the legal aspect of the case lay the great consti- tutional question of the responsibility to the nation of the leader of its administration, a principle which was now to be revived after many centuries of neglect, and, in the circumstances which then prevailed, could only be enforced by the destruction of the offender. The Commons therefore, feeling their victim slipping from their grasp, dropped the impeachment, and brought in and passed a bill of attainder, though owing to the opposition of the Lords, and Pym's own preference for the more judicial method, the procedure of an impeachment was prac- tically adhered to. Strafford might still have been saved but for the king's ill-advised conduct. A scheme to gain over the leaders of the parliament, and a scheme to seize the Tower and to liberate Strafford by force, were entertained concurrently and were mutually destructive; and the revelation of the army plot on the 5th of May caused the Lords to pass the attainder. Nothing row remained but the king's signature. Charles had, after the passing of the attainder by the Commons, for the second time assured Strafford " upon the word of a king, you shall not suffer in life, honour or fortune." Strafford now wrote releasing the king from his engagements and declaring his willingness to die in order to reconcile Charles to his subjects. "I do most humbly beseech you, for the preventing of such massacres as may happen by your refusal, to pass the bill; by this means to remove . . . the unfortunate thing forth of the way towards that blessed*

agreement, which God, I trust, shall for ever establish between you and your subjects."

Finally Charles yielded, giving his fatal assent on the ioth of May. Strafford met his fate on the 12th of May on Tower Hill, receiving Laud's blessing, who was then also imprisoned in the Tower, on his way to execution.

Thus passed into history " the great person," as Clarendon well calls him, without doubt one of the most striking figures in the annals of England. Strafford's patriotism and ideas were fully as noble as those of his antagonists. Like Pym, a student of Bacon's wisdom, he believed in the progress of England along the lines of natural development, but that development, in opposition to Pym, he was convinced could only proceed with the increase of the power of the executive, not of the parliament, with a government controlled by the king and not by the people. He was equally an upholder of the union of interests and affection between the sovereign and his subjects, but believed this could only exist when the king's will, and not that of the parliament, was paramount. The development of the constitution, in his opinion, either in the direction of a democracy or an aristocracy, was equally fatal and could only lead to anarchy, to the waste of national re- sources and to degeneration. With a strong and untrammelled executive directed by a single will, wise reforms could be carried out, the weak defended against the strong, the resources of the country developed to their full extent, the hesitations, delays and contradictions caused by barren discussions avoided, and the national forces concentrated on objects worth the aim. For one brief moment it was given to Strafford to carry out his ideals, and the final failure of his Irish administration, and especially its inability to endure in spite of its undoubted suc- cesses, has afforded an object-lesson in one-man government for all time. If such was the event in Ireland, where political ideas were still rude and elementary, still less could success be expected from the attempt to introduce the centralization and absolute power of the executive into England, where principles of government had been highly developed both in theory and practice, and a contrary tendency had long been established towards the increase of the rights of the individual and the power of parliament.

While arousing in the course of his career the most bitter enmities —

and no man's death was ever received with more public rejoicing — Strafford was capable of inspiring strong friendships in private life. Sir Thomas Roe speaks of him as " Severe abroad and in business, and sweet in private con- versation; retired in his friendships but very firm; a terrible judge and a strong enemy." His appearance is described by Sir Philip Warwick: " In his person he was of a tall stature, but stooped much in the neck. His countenance was cloudy whilst he moved or sat thinking, but when he spake, either seriously or facetiously, he had a lightsome and a very pleasant air; and indeed whatever he then did he performed very grace- fully." He himself jested on his own " bent and ill-favoured brow," Lord Exeter replying that had he been " cursed with a meek brow and an arch of white hair upon it," he would never " have governed Ireland nor Yorkshire."

Strafford was married three times: (1) in 161 1 to Lady Margaret Clifford, daughter of Francis, 4th earl of Cumberland; (2) in 1625 to Lady Arabella Holies, daughter of John, 1st earl of Clare; (3)in 1632 to Elizabeth, daughter of Sir Godfrey Rhodes. He left three daughters and one son, William, 2nd earl of Strafford.

See the article on Strafford in the Diet. Nat. Biog. by S. R. Gar- diner; Strafford's Letters, ed. by W. Knowler (1739); R. Browning's

Life of Strafford, with introduction by C. H. Firth (1892); Papers relating to Thos. Wentworth. ed. by C. H. Firth for the Camden Society (1890), Camden Miscellany, vol. ix. ; Private Letters from the Earl of Strafford to his third Wife (Philobiblon Soc. Biog. & Hist. Misc. 1854, vol. i.) ; Lives by H. D. Traill (1889) in " English Men of Action Series," and by Elizabeth Cooper (1886) ; Cat, of State Papers, Domestic and Irish, esp. 1633-1647 Introduction ; Hist. MSS. Comm. MSS. of Earl Cowper; Strafford's Correspondence, ot which the volumes published by Knowler represent probably only a small selection, remains still in MS. in the collection of Earl Fitzwilliam at Wentworth Woodhouse. (P. C. Y.)

STRAIN (through 0. Fr. slraindre, estraindre, mod. itreindre, from Lat. stringere, to draw tight, related to stress, stretch, string, &c), to draw out, extend, stretch, especially with the idea of great effort or beyond measure or limit; hence, from the idea of pressure or constriction, to separate coarser matte' or light solids from a liquid by pressure through a " strainer," which may be either a sieve or a colander (Lat. colore, to strain), a metal vessel with perforations in the bottom. Another type is the filter (q.v.). Straining can also be effected by means of cloths, and the name strainer is used of a coarse

open cloth usually of flax; a coarser cloth of a more open texture is technically known as " screw."

For " strains "and " stresses " in physics see Mechanics; Elas- ticity and Strength of Materials.

STRAITS SETTLEMENTS, the collective name given to the crown colony formed by the British possessions on or adjacent to the mainland of the Malay Peninsula, as opposed to the Federated Malay States, the British protectorates in the same region. The Straits Settlements consist of the island of Singa- pore with about a score of islets of insignificant size lying in its immediate vicinity, of the town and territory of Malacca, the islands and territory of the Dindings, the island of Penang, sometimes officially called Prince of Wales Island, and Province Wellesley.

The colony of the Straits Settlements is administered by the governor with the aid of an executive council, composed wholly of official members, and there is a legislative council, composed partly of official and partly of nominated members, of which the former have a narrow permanent majority. The governor of the Straits Settlements is also high commissioner for the Federated Malay States of the peninsula, for British North Borneo, Brunei and Sarawak in Borneo, and since the admin- istration of the colony of Labuan, which for a period was vested in the British North Borneo Company, has been resumed by the British government he is also governor of Labuan. The Cocos Keeling Islands (which were settled and are still owned by a Scottish family named Ross) and Christmas Island were formerly attached to Ceylon, but in 1886 the care of these islands was transferred to the government of the Straits Settle- ments. Penang and Malacca are administered, under the governor, by resident councillors. British residents control the native states of Perak, Selangor, Negri Sembllan and Pahang, but since the ist of July 1896, when the federation of these states was effected, a resident-general, responsible to the high commissioner, has been placed in supreme charge of all the protectorates in the peninsula. The work of administration, both in the colony and in the Federated Malay States, is carried on by means of a civil service whose members are recruited by competitive examination held annually in London.

Population. — The following are the area and population, with details of race distribution, of the colony of the Straits Settlements, the figures being those of the census of 1901: —

Area in

Square

Miles.

Popula- tion in

1891.

Population in 1901.

Total.

Euro- peans.

Eura- sians.

Chinese.

Malays.

Indians.

Other Nationalities.

Singapore

Penang, Province Wellesley and)

*Dindings *

Malacca

206 381 659

184,554

235,618

92,170

228,555

248,207

95,487

3824 1 160

74

4120 1945 1598

164,041

98,424 19,468

36,080

106,000

72,978

17,823

38,051

1,276

2667

2627

93

Total . . .

1246

512,342

572,249

5058

7663

281,933

215,058

57,150

The population, which was 306,775 in 1871 and 423,384 in 1881, had in 1901 reached a total of 572,249. As in former years, the increase is solely due to immigration, more especially of Chinese, though a considerable number of Tamils and other natives of -India annually settle in the Straits Settlements. The total number of births registered in the colony during the year 1900 was 14,814, and the ratio per 1000 of the population during 1896, 1897 and 1898 respectively was 22-18, 2082 and 21 57; while the number of registered deaths for the years 1896-1900 gave a ratio per 1000 of 4221, 3690, 3043, 31-66 and 3625 respectively, the number of deaths registered during 1900 being 23,385. The cause to which the excess of deaths over births is to be attributed is to be found in the fact that the Chinese and Indian population, which numbers 339. 83, or over 59% of the whole, is composed of 261,412 males and only 77,671 females, and a comparatively small number of the latter are married women and mothers of families. The male Europeans also outnumber the females by about two to one; and among the Malays and Eurasians, who alone have a fair proportion of both sexes, the infant mortality is always excessive, this being due to early marriages and other well-known causes. The number of immigrants landing in the various settlements during 1906 was: Singapore 176,587 Chinese; Penang 56,333 Chinese and 52,041 natives of India; and Malacca 598 Chinese. The total number of immigrants for 1906 was therefore 285,560, as against 39,136 emigrants, mostly Chinese returning to China. In 1867, the date of the transfer of the colony from the East India Company to. the Crown, the total population was estimated at 283,384.

Finance. — The revenue of the colony in 186$ only amounted to $1,301,843. That for 1906 was $9,512,132, exclusive of $106,180 received on account of land sales. Of this sum $6,650,558 was derived from import duties on opium, wines and spirits, and licences to deal in these articles, $377,972 from land revenue, $592,962 from postal and telegraphic revenue, and $276,019 from port and harbour dues. The expenditure, which in 1868 amounted to $1,197,177, had risen in 1906 to $8,747,819. The total cost of the administrative establishments amounted to $4,450,791, of which $2,586,195 was on account of personal emoluments and

$1,864,596 was on account of other charges. The military expenditure (the colony pays on this account 20 % of its gross revenue to the Imperial

fovernment by way of military contribution) amounted in 1906 to 1,762,438. A sum of $578,025 was expended on upkeep and maintenance of existing public works, and $1,209,291 on new roads, streets, bridges and buildings.

Tke Bindings and Province WeUesley. — The various settle- ments of which the colony of the Straits Settlements is composed, and the protectorates named in this article, are all dealt with separately, except the Dindings and Province WeUesley. The former, which consists of some islands near the mouth of the Perak River and a small piece of territory on the adjoining main- land, belonged originally to Perak, and was ceded to the British government under the treaty of Pangkor in 1874. Hopes were entertained that its excellent natural harbour would prove to be valuable, but these have been doomed to disappointment, and the islands, which are sparsely inhabited and altogether unimportant both politically and financially, are now adminis- tered by the government of Perak.

Province WeUesley, which is situated on the mainland opposite to the island of Penang, was ceded to Great Britain by the sultan of Kedah in 1798. It marches with Perak on the south, but on the north and east with Kedah. The boundary with Kedah was rectified by treaty with Siam in 1867. It is administered by a district officer, with some assistants, who is responsible to the resident counciUor of Penang. The country consists, for the most part, of fertile plain, thickly populated by Malays, and occupied in some parts by sugar-planters and others engaged in similar agricultural industries and employing Chinese and Tamil labour. About a tenth of the whole area is covered by low hills with thick jungle. Large quantities of rice are grown by the Malay inhabitants, and between October and February there is excellent snipe-shooting to be had in the paddy-fields. A railway from Batu Kawan, opposite to Penang, runs through Province WeUesley into Perak, and thence via Selangor and the Negri SembUan to Malacca. There is also an extension via Muar, which is under the rule of the sultan of Johor, and through the last-named state to Johor Bharu, opposite the island of Singapore.

See Straits Settlements Blue Book, 1906 (Singapore, 1907) ; Straits Directory, 1908 (Singapore, 1908); Journal of the Straits branch of the Royal Asiatic Society (Singapore) ; Sir Frederick Weld and Sir William Maxwell, severally, on the Straits Settlements in the Journal

of the Royal Colonial Institute (London, 1884 and 1892);

Henry Norman, The Far East (London, 1894); Alley ne Ireland, The Far Eastern Tropics (London, 1904); Sir Frank Swettenham, British Malaya (London, 1906) ; The Life of Sir Stamford Raffles (London, 1856, 1898). (H. Cl.)

STRALSUND, a seaport of Germany, in the Prussian province of Pomerania, on the west side of the Strelasund, an arm of the Baltic, 1ˆm. wide, which separates the island of Riigen from the mainland, 135 m. by rail N. from Berlin and 45 m. N.W. of Ros- tock. Pop. (1905), 31,813, of whom more than a fourth reside in the Knieper, Tribseeser, Franken and other suburbs on the main- land. A steam raflway ferry connects it with the island railway on Riigen, and so with Sassnitz, whence a regular steamboat mail service affords communication with Trelleborg in Sweden. The situation of the town proper, on a smaU triangular islet only connected with the mainland by three moles and bridges at the angles, has always rendered its fortification comparatively easy, and. down to 1873 it was a fortress of the first rank. Since that year the ramparts have been levelled and their site occupied by public promenades and gardens. The defences of the place are now solely confined to the island of Danholm, known down to the 13th century as Strehla or Strehlo, lying in the Sound. The quaint architecture of the houses, many of which present their curious and handsome gables to the street, gives Stralsund an interesting and old-fashioned appearance. The four Gothic churches of St Nicholas, 1 St Mary, with a lofty steeple, St James and The Holy Ghost, and the fine medieval town hall, dating in its oldest part from 1306 and restored in 1882, are among the more striking buUdings. The last houses the pro- vincial antiquarian museum and the municipal library of 70,000 volumes. There is a fine monument commemorating the war of 1870-71, one (1859) to the local patriot Ferdinand von Schill, and another (1900) to the poet and patriot E. M. Arndt. Among the educational establishments of the place must be mentioned the classical school (Gymnasium), founded in 1560, and a school of navigation. The manufactures of Stralsund are more miscellaneous than extensive; they include machinery, playing cards, sugar, soap, cigars, gloves, furniture, paper, oil and beer. The trade is chiefly confined to the ship- ping of grain, fish, coal, malt and timber, with some cattle and wocl, and to the import of coal and tar, but of late years it has declined, despite excellent wharf accommodation and a consider- able depth of water (12-15 ft.). Stralsund entertains passenger- boat communications with Barth, Stettin, Rostock and Liibeck as well as with various small ports on the isle of Riigen.

Stralsund was founded in 1234, and, though several times destroyed, steadily prospered. It was one of the five Wendish towns whose alliance extorted from King Eric of Norway a favourable commercial treaty in 1 284-1 285; and in the 14th century it was second only to Liibeck in the Hanseatic League. Although under the sway of the dukes of Pomeiania, the city was able to maintain a marked degree of independence, which is stUl apparent in its municipal privileges. Its early Pro- testant sympathies placed it on the side of Sweden during the Thirty Years' War, and in 1628 it successfuUy resisted a siege of eleven weeks by Wallenstein, who had sworn to take it " though it were chained to heaven." He was forced to retire with the loss of 12,000 men, and a yearly festival in the town still celebrates the occasion. After the peace of Westphalia Stralsund was ceded with the rest of Western Pomerania to Sweden; and for more than a century and a half it was exposed to attack and capture as the tete-de-ponl of the Swedes in con- tinental Europe. It was taken by France in 1807, and in 1815 it passed to Prussia. In 1809 it was the scene of the death of Ferdinand von Schill, in his gallant though ineffectual attempt to rouse his countrymen against the French invaders.

See Mohnike and Zober, Stralsundische Chroniken (Stralsund, 1833-1834); Israel, Die Stadt Stralsund (Leipzig, 1893); Baier, Stralsundische Geschichten (Stralsund, 1902); and T. Reishaus, Wallenstein und die Belagerung Stralsunds (Stralsund, 1887).

1 A remarkable series of 14th-century frescoes, in perfect condition, were disclosed in 1909 by the removal of the whitewash which had for centuries covered the interior of this fine church.

STRAMONIOM, in medicine, a drug obtained from the leaves and. seeds of the Datura stramonium. Both contain an alkaloid known as daturine. From the seeds is made extractum stramonii. The linctura stramonii is made from the leaves. The physio- logical action of stramonium resembles that of belladonna, except that stramonium relaxes to a greater extent the un- striped muscle of the bronchial tubes; for this reason it is used in asthma to relieve the bronchial spasm. Cigarettes made of stramonium leaves may be smoked or the tincture may be taken internally. Frequently the leaves powdered together with equal quantities of the powdered leaves of the Cannabis Indica and lobelia mixed with potassium nitrate are burned in an open dish. The preparation gives off dense fumes which afford

great relief to the asthmatic paroxysm. Numerous patent " Cures " for asthma contain these ingredients in vaiying proportions. Daturine is used as daturinae sulphas. In acute mania it acts like hyoscyamine in producing sleep.- In large doses stramonium is a narcotic poison producing the well- marked stages of exaltation of function, diminution of functional activity, and later loss of function, sinking into coma and paralysis.

STRANG, WILLIAM (1850-), English painter and en- graver, was born at Dumbarton, N.B., on the 13th of February 1859, the son of Peter Strang, builder. He was educated at the Dumbarton Academy, and worked for fifteen months in the counting-house of a firm of shipbuilders. He went to London in 1875 when he was sixteen, and studied his art under Alphonse Legros at the Slade School for six years. Strang became assistant master in the etching class, and himself followed this art with great success. He was one of the original members of the Royal Society of Painter-Etchers, and exhibited at their first exhibition in 1881. Some of his early plates were published in the Portfolio and other art magazines. He worked in many manners, etching, dry point, mezzotint, sand-ground mezzotint, and burin engraving, and invented a draw-burin of his own. Lithography and wood-cutting were also used by him to re-produce his abundant imaginings. He cut a large wood- engraving of a man ploughing, that has been published by the Art for Schools Association. A privately produced catalogue of his engraved work contains more than three hundred items. Amongst his earlier works " Tinkers," " St Jerome," " A Woman washing her Feet," an " Old Book-stall with a man lighting his pipe from a flare," and " The head of a Peasant Woman," on a sand-ground mezzotint, may be remembered. Later plates such as " Hunger," " The Bachelor's End " and " The Salvation Army " cannot be forgotten. Some of his best etchings have been in series; one of the earliest, illustrating William Nicholson's ballad of " Aken Drum," is remarkable for delicate and clear workmanship in the shadow tones, show- ing great skill and power over his materials, and for strong drawing. Another good series was the " Pilgrim's Progress," revealing austere sympathy with Bunyan's teaching. Coleridge's " Ancient Mariner " and Strang's own " Allegory of Death " and the " Plowman's Wife," have served him with suitable imaginative subjects. Some of Rudyard Kipling's stories have been illustrated by him, too, and Strang's portrait of Kipling has been one of his most successful portrait plates. Other good etched portraits are of Mr Ernest Sichel, fine as a Vandyckj and of Mr J. B. Clark, with whom Strang collabo- rated in illustrating Baron Munchausen and Sinbad the Sailor and All Baba, published in 1895

and 1896. Thomas Hardy, Henry Newbolt and many other distinguished men also sat to him. Proofs from these plates have been much valued; in fact, Strang's portrait etchings have inaugurated a new form of reproductive portraiture. A portrait which is a work of art and can be reproduced a number of times without losing any of its art qualities is one ideal way of recording appearances, as such prints can be treasured by many owners. Strang pro- duced a number of good paintings, portraits, nude figures in landscapes, and groups of peasant families, which have been exhibited in the Royal Academy, the International Society, and several German exhibitions. He painted a decorative series

of scenes from the story of Adam and Eve for the library of Mr Hodson of Wolverhampton; they were exhibited at the Whitechapel exhibition in 1910. Some of his drawings from the nude model in silver point and red and black chalk are very beautiful as well as powerful and true. He also painted a number of landscapes, mostly of a small size. In later years he de- veloped a style of drawing in red and black chalk, with the whites and high lights rubbed out, on paper stained with water colour. This method gives qualities of .delicate modelling and refined form and gradations akin to the drawings of Holbein. He drew portraits in this manner of many members of the Order of Merit for the royal library at Windsor Castle. In 1902 Strang retired from the Royal Society of Painter-Etchers, as a protest against the inclusion in its exhibitions of etched or engraved reproductions of pictures. His work was sub- sequently seen principally in the exhibitions of the Society of Twelve, of the International Society, to which body he was elected in 1905, and of the Royal Academy. Strang was elected an associate engraver of the Royal Academy when that degree was wisely revived in 1906. (C. H.)*

STRANGE, SIR ROBERT (1721-1792), Scottish line engraver, descended from the Scottish family of Strange, or Strang, of Balcasky, Fife, was born in the mainland of Orkney, on the 14th of July 1 721. In his youth he spent some time in an attorney's office; but, having manifested a taste for drawing, he was apprenticed, in 1735, to Richard Cooper, an engraver in Edinburgh. After leaving Cooper in 1741 he started on his own account as an engraver, and had attained a fair position when, in 1745, he joined the Jacobite army as a member of the corps of life-guards. He engraved a half-length of the Young Pre- tender, and also etched plates for a bank-note designed for the payment of the troops. He was present at the battle of Cul- loden, and after the defeat remained in hiding in the Highlands, but ultimately returned to Edinburgh, where, in 1747, he

married Isabella, only daughter of William Lumisden, son of a bishop of Edinburgh. In the following year he proceeded to Rouen, and there studied drawing under J. B. Descamps, carrying off the first prize in the Academy of Design. In 1749 he removed to Paris, and placed himself under the celebrated Le Bas. It was from this master that he learned the use of the dry point, an instrument which he greatly improved and employed with excellent effect in his own engravings. In 1750 Strange returned to England. Presently he settled in London along with his wife and daughter, and superintended the illustrations of Dr William Hunter's great work on the Gravid Uterus, published in 1774. The plates were engraved from red chalk drawings by Van Rymsdyk, now preserved in the Hunterian Museum, Glas- gow, and two of them were executed with great skill by Strange's own hand. By his plates of the " Magdalen " and " Cleopatra," engraved after Guido in 1753, he at once established his pro- fessional reputation. He was invited in 1759 to engrave the portraits of the prince of Wales and Lord Bute, by Allen Ramsay, but declined, on the ground of the insufficient remuneration offered and of the pressure of more congenial work after the productions of the Italian masters. His refusal was attributed to his Jacobite proclivities, and it led to an acrimonious corre- spondence with Ramsay, and to the loss, for the time, of royal patronage. In 1760 Strange started on a long-meditated tour in Italy. He studied in Florence, Naples, Parma, Bologna, and Rome, executing innumerable drawings, of which many — the " Day " of Correggio, the " Danae " and the " Venus and Adonis " of Titian, the " St Cecilia " of Raphael, and the Bar- berini " Magdalen " of Guido, &c— were afterwards reproduced by his burin. On the Continent he was received with great distinction, and he was elected a member of the academies of Rome, Florence, Parma and Paris. He left Italy in 1764, and, having engraved in the French capital the " Justice " and the " Meekness " of Raphael, from the Vatican, he carried them with him to London in the following year. The rest of his life was spent mainly in these two cities, in the diligent prosecution of his art. In 1766 he was elected a member of the Incorporated Society of Artists, and in 1775, piqued by

the exclusion of engravers from the Royal Academy, he published an attack on that body, entitled An Enquiry into the Rise and Progress of the Royal Academy of Arts at London, and prefaced by a long letter to Lord Bute. In 1787 he engraved West's " Apotheosis of the Princes Octavius and Alfred," and was rewarded with the honour of

kinghthood. He died in London on the 5th of July 1792.

After his death a splendid edition of reserved proofs of his engravingswas issued; and a catalogue of his works, by Charles Blanc, was published in 1848 by Rudolph Wcigel of Leipzig, forming part of Le Graveur en taille douce.

See Memoirs of Sir Robert Strange, Knt., and his Brother-in-law Andrew Lumisden, by James Dennistoun of Denhistoun (1855).

STRANGFORD, VISCOUNT, an Irish title held by the family of Smythe, from 1625, when it was conferred upon Sir Thomas Smythe (d. 1635) of Ostenhanger and Ashford, Kent, until 1869, when it became extinct. From Sir Thomas the title passed down to his descendant, Percy Clinton Sydney Smythe (1780- 1855), who succeeded his father, Lionel, as 6th viscount in 1801. Entering the diplomatic service in 1802, Smythe represented his country at Lisbon, in Brazil, at Stockholm, Constantinople and St Petersburg, and in 1825 he was created a peer of the United Kingdom as Baron Penshurst. He had literary tastes, and in 1803 published Poems from the Portuguese of Camoens, with Remarks and Notes, Byron at this time describing him as " Hibernian Strangford "; he died on the 29th of May 1855.

His eldest son George Augustus Frederick Percy Sydney Smythe (1818-1857), who now became the 7th viscount, was associated with Disraeli and Lord John Manners in the conduct of the " Young England " party. He entered parliament in 1841, and was under-secretary for foregin affairs in 1845-1846, losing his seat at Canterbury in 1852. In 1852 he fought a duel at Weybridge with Colonel Frederick Romilly (1810-1887), the last encounter of this kind in England. Like his father, Smythe had literary tastes, and he is thought to be the original of Disraeli's Coningsby. In 1844 he wrote Historic Fancies, a collection of poems and essays, and his novel Angelo Pisani was published posthumously, with a memoir of the author in 1875. As a journalist he wrote in the Morning Chronicle. He died on the 23rd of November 1857, and was succeeded by his brother Percy Ellen Frederick William Sydney Smythe (1 826-1869) as 8th viscount.

Born at St Petersburg on the 26th of November 1826, during all his earlier years Percy Smythe was nearly blind, in con- sequence, it was believed, of his mother having suffered very great hardships on a journey up the Baltic in wintry weather shortly before his birth. His health through life was very delicate, but did not prevent his showing

quite early most re- markable powers of mind. His education was begun at Harrow, whence he went to Merton College, Oxford. From the very first he gave proofs of extraordinary ability as a linguist, and was nominated by the vice-chancellor of Oxford in 1845 a student- attache at Constantinople. A very interesting account of his colleagues, more especially of Mr Almerick Wood, who was a man of phenomenal capacity, was written by him later in life, and is to be found in the two volumes of his collected essays published by his widow. While at Constantinople, where he served under Lord Stratford de Redcliffe, Percy Smythe gained a mastery not only of Turkish and its dialects, but of almost every form of modern Greek, from the language of the literati of Athens to the least Hellenized Romaic. Before he went to the East he had a large knowledge both of Persian and Arabic, but until his duties led him to study the past, present and future of the sultan's empire he had given no attention to the tongues which he well described as those of the international rabble in and around the Balkan peninsula. He made, while in the East, a careful study of these, and was the first English- man to see that the Bulgarians were much more likely than the Servians to come to the front as the Ottoman power declined. He avowed himself a Liberal in English politics, and those with whom he chiefly lived were Liberals; but he was not an anti-Turk, as so many Liberals afterwards became. On

succeeding to the peerage in 1857 he did not abandon the East, but lived on at Constantinople for several years, immersed in Oriental studies. At length, however, he returned to England and began to write a great deal, sometimes in the Saturday Review, sometimes in the Quarterly, and much in the Pall Mall Gazette. A rather severe review in the first of these organs of the Egyptian Sepulchres and Syrian Shrines of Emily Anne Beaufort (d. 1887) led to a result not very usual — the marriage of the reviewer and of the authoress. One of the most interesting papers Lord Strangford ever wrote was the last chapter in his wife's book on the Eastern Shores of the Adriatic. That chapter was entitled " Chaos," and was the first of his writings which made him widely known amongst careful students of foreign politics. From that time forward everything that he wrote was watched with intense interest, and even when it was anonymous there was not the slightest difficulty in recognizing his style, for it was unlike any other. He died in London on the 9th of January 1869, when his titles became extinct. A Selection from the Writings of Viscount Strangford on Political, Geographical and Social Subjects was edited by his widow and published in 1869. His Original Letters and Papers upon Philology and Kindred Subjects

were also edited by Lady Strangford (1878).

See E. B. de Fonblanque, Lives of the Lords Strangford through Ten Generations (1877).

STRANRAER, a royal and police burgh and seaport of Wigtownshire, Scotland. Pop. (1901), 6036. It is situated at the head of Loch Ryan, an arm of the North Channel (Irish Sea), 59 m. S.S.W. of Ayr by the Glasgow & South-Western railway, with a station in the town and at the harbour. It lies 39 m. E. by N. of Larne in Co. Antrim, Ireland, with which there is daily communication by mail steamer. Stran- raer, originally called St John's Chapel, became a burgh of barony in 1596, and a royal burgh in 1617. In the centre of the town are the ruins of the castle of the 15th century, occupied for a time by John Graham of Claverhouse, Viscount Dundee, when he held the office of sheriff of Galloway (1682). The principal buildings within the parish are the old town hall, now used as a volunteer drill hall and armoury; the county buildings, containing the town hall and court house; the academy; reformatory and the Wigtownshire combination poor- house. Dairy utensils and implements are made; there are several nurseries; brewing and milling are carried on, but the bulk of the trade is in farm and dairy produce. Pier and harbour accommodation has been extended and the shipping is brisk. The oyster beds, for which Loch Ryan was once noted, are not cultivated, but the fisheries (white fish and herrings) are still of some consequence. Three miles east of Stranraer is Lochinch, the residence of the earl of Stair, a modern structure in the Scots Baronial style. It stands in grounds 4000 acres in extent, which include the White and Black Lochs and the ruins of Castle Kennedy, finely situated on the isthmus between the lakes. This castle was erected in the reign of James VI. for the earls of Cassilis, and passed into the hands of the Stair family in the 17 th century. It was struck by lightning in 1 7 16 and burned down and never rebuilt. The estate is famous for its plantations and Dutch gardens, the pinetum con- taining the most representative collection of araucarias, deodars and other conifers in Europe. A mile south are the green mounds marking the site of the abbey of Saulseat, founded for Premonstratensian monks by Fergus, " king " of Galloway, early in the 12 th century. It stood on the banks of a small loch and was known as the Monastery of the Green Lake from the mass of confervae with which the water was continually covered. Four miles west by north of Stranraer is situated Lochnaw Castle, the ancient seat of the Agnews, who were hereditary sheriffs of Galloway till 1747, when heredi table jurisdictions were abolished. The five-storied embattled tower in the centre dates from 1426, and the modern mansions from 1820. On the coast, i\ m.

south-west of Stranraer by rail, lies Portpatrick, formerly called Port Montgomerie. Owing to its proximity to Ireland (215 m. to Donaghadee), it was for more than 200 years a starting-point

of the mail service between Great Britain and Ireland. In consequence, however, of the frequent violence of the south- westerly gales and other causes, the communication ceased in the middle of the 19th century, and the artificial harbour de- signed by John Rennie has gradually fallen into decay. The town is in repute as a holiday resort for its healthy climate and beautiful situation.

STRASSBURG, or Strasburg (French Strasbourg), a town of Germany, the capital of the imperial province of Alsace-Lorraine and a fortress of the first rank, is situated in a fertile plain at the junction of the 111 and the Breusch, 2 m. W. of the Rhine, 88 m. by rail N. from Basel, 370 m. S.W. from Berlin, 30 m. E. of the French frontier. Pop. (1890), 123,500; (1900), 150,268; (1905), 167,342. Since 1871 it has been the seat of government for the German territory of Alsace-Lorraine, and it is also the see of a Roman Catholic bishop and the headquarters of the XV. Corps of the German army. It is surrounded by outlying fortifications and strategic works and contains a garrison of 16,000 men of all arms.

The town proper is divided by the arms of the 111 into three parts, of which the central is the largest and most important. Most of the streets in the heart of the city are narrow and irregular, and the quaint aspect of a free medieval town has to a considerable extent been maintained. The quarters which suffered most in the bombardment of 1870 have, however, been rebuilt in more modern fashion, and the recent widening of the circle of fortifications, with the destruction of the old walls, has given the city opportunity of expansion in all direc- tions; thus, with the exception of Berlin and Leipzig, there is perhaps no town in Germany which can show so many handsome new public buildings as Strassburg. Of its older edifices by far the most interesting and prominent is the cathedral, or Miinster, which in its present form represents the activity of four centuries. Part of the crypt dates from 1015; the apse shows the transition from the Romanesque to the Gothic style; and the nave, finished in 1275, is a fine specimen of pure Gothic. Of the elaborate west facade, with its screen of double tracery and its numerous sculptures, the original design was finished by Erwin von Steinbach

(d. 1318). The upper part of the facade and the towers were afterwards completed in accordance with a different plan, and the spire on the north tower was added in 1435. This tower is 465 ft. high, being thus one of the highest buildings in Europe, and it commands a fine view. The cathedral has some fine stained glass, a sculptured pulpit and the famous astronomical clock in the south transept; this contains some fragments of the clock built by the mathematician, Conrad Dasypodius, in 1574. The Protestant church of St Thomas, a Gothic building of the 13th and 14th centuries, contains a fine monument of Marshal Saxe, considered the chef d'ceuvre of the sculptor, Jean Baptiste Pigalle. Other notable churches are the Protestant Temple Neuf, or Neue Kirche, rebuilt since 1870, and the Roman Catholic church of the Sacred Heart, erected in 1889-1893.

The old episcopal palace, built in 1731-1741, was used for university purposes from 1872 to 1895; it is now the municipal museum of art. Other notable buildings are the Frauenhaus, with some interesting sculptures, and the H6tel du Commerce, the finest Renaissance building in the town. The imperial palace, designed by H. Eggert in the Florentine Renaissance style, was built in 1889-1893; it is crowned by a cupola 115 ft. high and is richly ornamented. The provincial and university library, with over 800,000 volumes, and the hall of the provincial Diet (Landesaussckuss) , built in 1888-1892, both in the Italian Renaissance style, occupy the opposite side of the Kaiserplatz, and behind the latter is the large new post office. Between the university and the library is the Evangelical garrison church (1892-1897), built of reddish sandstone in the early Gothic style. The principal squares of the town are the Kaiserplatz, the Broglieplatz, the Schlossplatz and the Kleberplatz. Still to be mentioned are the Grosse Metzig, containing the Hohenlohe museum, the theatre, the town hall, and the so-called Aubette, with the conservatorium of music. A new synagogue was

completed in 1898, and the viceregal palace was entirely rebuilt in 1872-1874. The town has new law courts, a Roman Catholic garrison church, an iron bridge across the Rhine to Kehl and statues of General Kleber and of the printer Gutenberg.

The university of Strassburg, founded in 1567 and suppressed during the French Revolution as a stronghold of German senti- ment, was reopened in 1872; it now occupies a site in the new town and is housed in a handsome building erected for it in 187 7-1894. This is adorned with statues and frescoes by modern German artists, and

has near it the chemical, physical, botanical, geological, seismological and zoological institutes, also the observatory, all designed by Eggert and built between 1877 and 1888. On the south of the old town are the various schools ; laboratories and hospitals of the medical faculty, all built since 1877. The university, which has six faculties, is attended by about 1400 students and has 130 professors. Other educa- tional establishments are the Protestant gymnasium, founded in 1538, various seminaries for teachers and theological students and numerous schools.

The chief industries of Strassburg are tanning, brewing, printing and the manufacture of steel goods, musical instru- ments, paper, soap, furniture, gloves and tobacco. To these must be added the fattening of geese for Strassburg's cele- brated pdtts de foie gras, which forms a useful source of income to the poorer classes. There is also a brisk trade in agricultural produce, hams, sausages, coal, wine, leather goods and hops. The development of this trade is favoured by the canals which connect the Rhine with the Rhone and the Marne, and by a new port of 250 acres in extent with quays and wharves on the Rhine, which has been constructed since 1891.

Strassburg has always been a place of great strategical impor- tance, and as such has been strongly fortified. The pentagonal citadel constructed by Vauban in 1682-1684 was destroyed during the siege of 1870. The modern German system of for- tification consists of a girdle of fourteen detached forts, at a distance of from three to five miles from the centre of the town. Kehl, the tete-de-pont of Strassburg, and several villages are included within this enceinte, and three of the outworks lie on the right bank of the Rhine, in the territory of Baden. In case of need the garrison can lay a great part of the environs under water.

The site of Strassburg was originally occupied as a Celtic settlement, which was captured by the Romans, who replaced it by the fortified station of Argenloratum, afterwards the head- quarters of the eighth legion. In the year 357 the emperor Julian saved the frontier of the Rhine by a decisive victory gained here over the Alamanni, but about fifty years later the whole of the district now called Alsace fell into the hands of that people. Towards the end of the 5th century the town passed to the Franks, who gave it its present name. The famous " Strassburg oaths " between Charles the Bold and Louis the German were taken here in 842, and in 923, through the homage paid by the duke of Lorraine to the German king Henry I., began the connexion of the town with the German kingdom which was to last for over seven centuries. The early history of Strassburg consists mainly of

struggles between the bishop and the citizens, the latter as they grew in wealth and power feeling that the fetters of ecclesiastical rule were inconsistent with their full development. This conflict was finally decided in favour of the citizens by the battle of Oberhausbergen in 1262, and the position of a free imperial city which had been conferred upon Strassburg by the German king, Philip of Swabia, was not again disputed. This casting off of the episcopal yoke was followed in 1332 by an internal revolution, which admitted the gilds to a share in the government of the city and impressed upon it the democratic character which it bore down to theFrench Revolution. Strassburg soon became one of the most flourish- ing of the imperial towns, and the names of natives or residents like Sebastian Brant, Johann Tauler and Geiler von Kaisersberg show that its eminence was intellectual as well as material.

In 1340 two thousand Jews were burned at Strassburg on a charge of causing a pestilence by poisoning the wells. In 1381

the city joined the Stadtebund, or league of Swabian towns, and about a century later it rendered efficient aid to the Swiss confederates at Granson and Nancy. The reformed doctrines were readily accepted in Strassburg about 1523, its foremost champion here being Martin Bucer, and the city was skilfully piloted through the ensuing period of religious dissensions by Jacob Sturm von Sturmeck, who secured for it very favourable terms at the end of the war of the league of Schmalkalden. In the Thirty Years' War Strassburg escaped without molestation by observing a prudent neutrality. In 1681, during a time of peace, it was suddenly seized by Louis XIV., and this un- justifiable action received formal recognition at the peace of Ryswick in 1697. The immediate effect of this change was a partial reaction in favour of Roman Catholicism, but the city remained essentially German until the French Revolution, when it was deprived of its privileges as a free town and sank to the level of a French provincial capital. In the war of 1870-71 Strassburg, with its garrison of 17,000 men, surrendered to the Germans on the 28th of September 187 1 after a siege of seven weeks. The city and the cathedral suffered considerably from the bombardment, but all traces of the havoc have now disap- peared. Before the war more than half of the inhabitants spoke German, and this proportion has increased greatly of recent years, owing to the large influx of pure German elements into the city and the almost

complete reconciliation of the older inhabitants to the rule of Germany.

The bishopric of Strassburg existed in the days of the Mero- vingian kings, being probably founded in the 4th century, and embraced a large territory on both banks of the Rhine, which was afterwards diminished by the creation of the bishoprics of Spires and Basel. The bishopric was in the archdiocese of Mainz and the bishop was a prince of the empire. The episcopal lands were annexed by France in 1789 and the sub- sequent Roman Catholic bishops of Strassburg discharged spiritual duties only.

For the history of the bishopric see Grandidier, Histoire de Veglise et des eveques- princes de Strasbourg (Strassburg, 1775-1778) ; Glockler, Geschichle des Bistums Strasburg (Strassburg, 1879-1880); and J. Fritz, Das Territorium des Bistums Strasburg (Strassburg, 1885).

For the city see the Strassburger Chroniken, edited by Hegel (Leipzig, 1870-1871); the Urkunden und Aklen der Stadt Strassburg (Strassburg, 1879 seq.); G. Schmoller, Strassburgs Bliite im 13. Jahr- hunderi (Strassburg, 1875); Schricker, Zur Geschichte der Universitat Strassburg (Strassburg, 1872); J. Kindler, Das goldene Buck von Strassburg (Vienna, 1885-1886); H. Ludwig, Deutsche Kaiser und Kimige'in Strassburg (Strassburg, 1 889); A. Seyboth, Strasbourg his- torique (Strassburg, 1894); and C. Stahling, Histoire contemporaine de Strasbourg (Nice, 1884 seq.).

STRATA-FLORIDA {Ysiradflar), the ruins of a celebrated Cistercian abbey of Cardiganshire, Wales, situated amidst wild and beautiful scenery near the source of the river Teifi. The abbey is 2 m. distant from the village of Pontrhydfendigaid (bridge of the blessed ford) on the Teifi, and about 4 m. from the station of Strata-Florida on the so-called Manchester and Milford branch line of the Great Western railway. The existing remains are not extensive, but the dimensions of the church, 213 ft. long by 61 ft. broad, are easily traceable, and excavations made at different times during recent years have brought to light encaustic tiles and other objects of interest. The most prominent feature of the ruined abbey is the elaborate western portal of the church, which is regarded as a unique specimen of the transitional Norman-English architecture of the 12th century. A fine silver seal of the abbey is preserved in the British Museum.

Founded and generously endowed in 1164 by Rhys ap Griffith, prince of South Wales, the Cistercian abbey of St Mary at Strata-

Florida (which was probably a revival of an older monastic house on or near the same site) continued for over a century to be reckoned one of the wealthiest and most influential of the Welsh religious houses. It was much favoured by Welsh bards, nobles and princes, several of whom were buried in the adjoin- ing cemetery; and in its library were deposited many official documents and records of the native princes. In 1138 Llewelyn ap Iorwerth, " the Great," summoned all his vassals to this

spot to do homage to his heir, afterwards Prince David II. The abbey suffered severely during the Edwardian wars, and in or about 1294 a large portion of its buildings was destroyed by fire, though whether as the result of accident or design remains unknown; in any case Edward I. gave a donation of £75 towards the restoration of the fabric. During Owen Glendower's rebellion in Henry IV. 's reign, the abbey was held for some months by Harry of Monmouth (Henry V.) with a body of troopers. With the extinction of Welsh independence the abbey lost much of its wealth and influence, and at the dissolution of the monasteries its gross revenue was returned at only £122, 6s. 8d. a year, one Richard Talley being its last abbot. The fabric of the abbey and its surrounding lands came into the possession of the Stedman family, whose 17th-century mansion, built out of materials from the monastic buildings, has long been used as a farmhouse. By marriage the abbey and the estate of the Stedmans passed into the possession of the family of Powell of Nanteos.

STRATEGUS (oTparrnos) , strictly the Greek word for a general, or officer in command of an army, but frequently the name of a state officer with much wider functions. Such an officer is found in many Greek states, the best known being the Athenian strategus, originally a military official, whose functions gradually developed until, in the latter half of the 5th century B.C., he became the most important magistrate in the state. According [to Aristotle's Constitution of Athens iv., the office existed in the time of Draco and the qualification was property to the value of 100 minae {i.e. ten times as high as that for the archonship) ; but it is certain that until the end of the 6th century the archon (q.v.) was the most important state official. If, as is probable, the chapter in the Constitution is a forgery (see Draco), we may conclude that the Strategia (board of ten generals) was a result of the tribal system of Cleisthenes, and that the college is to be ascribed to the year 501 B.C. Some maintain that Cleisthenes himself created it, but the evidence (Alh. Pol. xxii.) is against this. At all events, as late as the battle of Marathon the head of the army was the Polemarch (see Archon). It follows that the strategus was, until 487 b.c:, subordinate to the Polemarch. The

tribal unit was repre- sented in the army by the taxis, and each taxis was led by a strategus. After the Persian Wars the command of the taxis passed to officers called taxiarchs, who acted as colonels under the strategi. If Herodotus may be trusted, the command of the army, at the time of the battle of Marathon, passed to the strategi in turn from day to day. No trace of this system, however, is to be found in the subsequent history. It was the customary practice in the 5th century to appoint a certain number of the generals, usually three or five, for a particular field of operations, and to assign the chief command to one of them. Exceptions to this rule are found in the well-known instances of the Sicilian expedition (when the three commanders, Nicias, Alcibiades and Lamachus were given co-ordinate powers), and of the battle of Arginusae, when the command was divided among the whole board. In crises such as the Samian revolt, the outbreak of the Peloponnesian War or that which led to the recall of Alcibiades, we find the whole board subordinated to a single member (e.g. Pericles or Alcibiades). Originally each strategus was elected by and out of the tribe he commanded (Alh. Pol. lxi.), and it may probably be inferred from Plutarch (Cimon, viii.) that this system prevailed as late as the archonship of Apsephion (469 b.c). In the 4th century, however, the strategi were elected out of all the citizen body irrespective of tribes; the change must have occurred between 470 and 440 B.C., because in the latter year, and again in 433, one of Pericles' colleagues was Diotimus, a member of his own tribe (cf. Alci- biades and Adeimantus in 408 B.C.). But from Xenophon (Memorab. iii. 4) we learn that one strategus was still elected by each tribe, i.e. each strategus represented a tribe, though he might not be a member of it. Though the strategi were the nominal heads of the army, it is important to notice that thsy had no power to choose their taxiarchs, who, like the strategi, were elected by the tribes they were to command. It was only

as law as the lochagi (commanders of Aoxoi, companies) tbat the Ecclesia allowed them to select. From the Constitution (lxi. 3), however, it appears that in the 4th century, at any rate, the lochagi were appointed by the taxiarchs, not the strategi. By a gradual process in the course of the 5th century, the regi- mental command was transferred to the taxiarchs, the strategi thus becoming general officers in command, while they at the same time acquired important political functions (see below). On the other hand the strategi commanded by both land and sea, and thus held the power divided at

Sparta between the kings and the nauarchus (admiial).

In the course of the 5th century the powers of the strategia were increased by important political functions, especially in foreign affairs; hence the office, unlike that of the archon {q.i>.), remained on in its original elective character and was held by the most important men (e.g. Pericles, Nicias, Alcibiades). Owing to the' fact that the Boule was the chief administrative body, it was necessary to bring the strategi into close connexion with it; it was, therefore, provided that they, though not members, should be allowed to attend its meetings and to bring motions before it. As the Boule of one year rarely contained members of the previous Boule, the strategi acquired great power from the fact that they were frequently re-elected for many years together, and so had greater experience and con- tinuity of policy. Secondly, in the Ecclesia, the strategus had the advantage over the ordinary citizen that his business took precedence (the meetings always discussed first the question of national defence) and that he could in cases of emergency convene a special meeting (cf. Thuc. ii. 59 and iv. 118).

Many historians in dealing with the strategia have been misled by modern analogies. The strategia was, for example, by no means analogous to the British cabinet, which (1) has collective responsi- bility and (2) is executive in the sense that its members are heads of state departments. The strategi had no such characteristics; their influence over the Ecclesia in voting was merely that of a private citizen; there was no collective responsibility, no unanimous policy. Nor was the strategia a foreign office, though it clearly performed 1 a ministerial act in attaching its signature to treaties. In general it had no powers of originating negotiation, but merely carried out the psephism of the Ecclesia. It was their relation to the empire which gave the strategi their authority. It was they who took the oath on behalf of Athens when an alliance was concluded, and their advice would have special weight in settling the terms of the treaty and the amount of tribute to be paid. They were not, indeed, compelled to submit a budget, nor did an adverse vote by the Ecclesia involve their resignation. On the authority of Plutarch it has been asserted that there was always a president of the strategic college, and this may well haVe been the case during the Persian Wars (Themistocles, 480; Aristides, 478). The three alleged occasions in the later years of the 5th century when a single strategus was in absolute authority (see above) were all critical occasions and in no way represent the normal condition of affairs. It is abundantly clear that Pericles owed his long ascendancy to his personal force, not to the constitutional authority of his office. Though at first the strategi acted as a single

*body, in the 4th century and later special duties were assigned to particular members of the board. Thus we hear of strategi inl tovs 6xXlras, kiri T-qv xˆP av > *ˆ T V V barfy, ctti t&,s avuˆoplas, and inscriptions of the 3rd century refer to others. Under the Roman domination the strategus iwl ri. 6ir\a was the chief state officer. The law oi the emperor Hadrian regarding the export of oil to Athens speaks of him as managing the corn supply and presiding over the education of the Ephebi. In general, their duty was still mainly the foreign policy, offensive and defensive, of Athens; they nomi- nated trierarchs, and, if any nominee refused to serve, brought him before the Heliaea to defend his case. They had powers of life and death over the army in the field — even a trierarch might be put in irons by a strategus. They presided over certain religious festivals and processions, and appear to have been responsible for the protection of the corn supply.*

Authorities: 1 — A. H. J. Greenidge Handbook of Greek Cottr stitutional History (London, 1896), especially on the question of the presidency, p. 253; Gilbert, Greek Constitutional antiquities (Eng. trans., 1895); Hauvette-Besnault, Les Strateges atheniens (Paris, 1885); Beloch, D. att. Politik seit Perikles, pp. 276, 277 ; Paulus, Progr: v. Maulbronn (1883, 34 seq.) ; Aristotle's Constitution of Athens passim, but especially iv., xxii., lxi.; the general histories of Greece — Busolt, Meyer, Bury, Grote (ed. 1907). (J. M. M.)

1 All works written prior to 1 891 must be read in the light of the Constitution of Athens.

STRATEGY, a term literally meaning " the art of the leader or general ↖ (Gr. crTparriyos) . In the strict sense the word " strategy " was originally introduced into European military literature about the opening of the 18th century, when the practice of warfare had settled down into an established routine, and the need of some term arose which should express that peculiar quality of a general's mind which rendered victory the almost certain consequence of his appearance in the field. As at that period only some small departure from established precedent — a trick or stratagem— could turn the scale between armies of about equal power, the idea of a ruse became con nected with the word, and the essential quality in the general's personality which alone rendered ruses practicable, or guaran- teed success in their execution, passed out of men's minds, until the gradual disappearance of these methods in the Napoleonic period focused attention again on its essential meaning, i.e. the art of the leader. Then the term " strategy " became limited as a technical term to the " practice of the art of war by an executive agent of a supreme

government," or in Moltke's words," the practical adaptation of the means placed at a general's disposal to the attainment of the object in view." This definition fixes the responsibility of a commander-in-chief to the government he serves. He cannot be held answerable for the " means," not even for the training of the " means " for a particular operation, unless he be appointed to his task in adequate time. He is charged with their employment within the limits of the theatre of operations assigned to him. If he considers the means placed at his disposal inadequate he need not accept the position offered him, but he steps beyond his province as a strategist if he attempts to dictate to the government what, in the widest sense, the means supplied to him should be.

Since, however, the " means," i.e. the conditions of the pro- blems presented by war, are subject to infinite variation (climate, topography, equipment, arms and men, all being liable to col- lective or independent change) it is clear that their employment can never be reduced to a " science " but must retain to the full the characteristics of an " art." This distinction is essential, and must be borne in mind, for no soldier can expect to become a Napoleon merely by the study of that great strate- gist's campaigns. But if he lack practice and experience, and above all genius, the man who neglects such teachings as the contemplation of the works of his predecessors can supply does so at his own peril; and when, as in the case of the soldier, the whole destiny of an empire may depend on his action, he must be bold indeed who would neglect all possible precautions. The cases for study, however, rest on yet broader foundations, for, though theory deduced from history can never, from the nature of things, formulate positive prescriptions, it can at any rate enable the student to throw off the chains of convention and prepare his mind to balance the conflicting claims of the many factors which at every moment clamour for special recognition. To understand the subject thoroughly it is necessary to follow in some detail the successive stages of human evolution. From the earliest times the defeat of the fighting men of a race has been the most certain road to the acquisition of its wealth, or the trade conditions on which that wealth was based.

To defeat an enemy it was first necessary to march to meet him, and during that march the invaders must either live on the country or carry their own food. If the defender drove off the cattle and burnt the crops, the latter alternative was forced upon them. Thus, since the supplies which could be carried were of necessity small, the defenders had only to create or utilize some passive obstacle for defence which the invaders could not traverse or destroy in the limit

of time (fixed by the provisions they carried) at their disposal, to compel the latter to retire to their own country. Every sedentary nation, therefore, had a fixed striking radius which could only be extended by the exercise of ingenuity in the improvement of means of transport, i.e. carts and roads. The existence of roads, however, limited the march of an invader to certain directions, and hence it be- came possible for the defender to concentrate his efforts for their

defence on certain points, in fact, to create fortresses, greater or less in proportion to his fear of the enemy and his intelligent appreciation of the degree of sacrifice it was worth while to make to obtain security. A barbarian horde could be stopped by any barrier which could not be set on fire or escaladed without ladders or appliances. Ruses, such as the wooden horse of Troy, then became the fashion, and these had to be met by the cultivation of a higher order of intelligence, which naturally throve best in a crowded community, where each felt his dependence on his neighbour. Thus, for ages, the fort or fortress limited barbarian encroachments, and made possible the growth of civilization in the plains. Ultimately, when the civilized communities grew into contact with one another, developed antagonistic interests, and fell out with one another, intelligence was brought to bear on both sides, and the assailant met fortifi- cation with siege-craft. Then the whole cycle worked itself out again. To carry out a siege, men in numbers had to be concen- trated and fed whilst concentrated. The stores for attack were also heavy and difficult to convey, hence roads developed in- creased importance, and troops had to be abstracted from the fighting force to protect them. Thus again a limit of striking radius was fixed for the invader, and in proportion as the dimensions of the invaded country exceeded«this radius, and its people made the requisite sacrifices to maintain their fortifica- tions in order, the continued existence and growth of the smaller country was assured. Broadly, this equilibrium of forces remained for generations; the smallest states were eaten up, the larger ones continued to exist side by side with far more powerful enemies, but only on condition of their readiness to make the requisite sacrifice of their personal liberty and the property of their constituent units.

Then came the introduction of gunpowder and of siege artillery, and a fresh readaptation of conditions, which culmin- ated in the Netherlands during the 17th century and forms the starting-point of

all modern practice.

Essentially the change consisted in this, viz. that in spite of the superiority of the cannon-ball to the battering-ram, yet to attack a wall effectively many guns had to be employed, and while the duration of the siege was enormously shortened, a far greater strain was thrown on the line of supply, for not only did guns weigh as much as their predecessors but they could expend their own weight of ammunition in a day. Hence the impor- tance of good roads became enhanced and correspondingly the incentive to attack the fortresses which guarded them. In com- parison to the money devoted to modern armies, the sums sunk on passive defences during the 16th and 17th centuries were colossal, but they could not keep pace with the progress of the attack, and once more fresh readjustment of means to end became necessary. The obvious course was to carry the war into the enemy's country from the outset, but since this transferred the burden of the siege upon the aggressor, the latter was compelled to develop the standing mercenary army, as feudal levies could not keep the field long enough to reduce a fortress. Mercenary armies, however, were difficult to keep together. They had to be tactfully commanded to ensure contentment, and allowed to main- tain social order amongst themselves, and the prospect of loot while on active service had to be held out to them. The sack of a city became thus the absolute and undeniable right of the soldiers. If in this or any other way their employer broke his contract, individuals promptly deserted to the other side. But this right of sack led to a recrudescence of the spirit of resistance in the fortresses (War of Dutch Independence and Thirty Years' War), and hence to a reaction in favour of greater humanity in warfare. But this was only obtained by the concession of a higher scale of pay and comfort to the men, which again threw an increased strain upon the communications, and also upon the treasure chest of their employer.

The growth of the mercenary system, and the facility with which such men could and did change their allegiance, led very rapidly to almost complete uniformity in the composition, training and tactical methods of all armies. Every one knew in advance the degree of effort his adversary proposed to put

forward in the next campaign, and made corresponding prepara- tions to meet him. Practically the king desiring to make wai submitted his idea to the best-known generals of his day and asked them to tender for its execution. The king, on his side, generally agreed to find the bulk of the labour — his standing army, re- inforced by auxiliaries to any desired extent — and as in the case of

a modern government contract, the lowest tender was almost invariably accepted, with a pious exhortation to the successful competitor to spare his employer's troops to the best of his ability. Thus the opposing generals took the field, each equally fettered by the conditions of his tender. But two such armies, alike in almost every respect, were far too closely matched to be able easily to gain a decision in the open field. Once they were committed to a battle it was impossible to separate them until sheer physical exhaustion put a stop to the slaughter, and these highly trained men were difficult and expensive to replace. Naturally, then, the generals sought to destroy the existing equilibrium by other means. Primarily they took to strong entrenchments, but the building of these being a matter of time, the communications grew in importance and attempts agadnst them became more serious. One side or the other, consequently, to cover its communications, so extended its front that at length lines stretched right across whole frontiers till their flanks rested on the sea, or on some great fortress or neutral territory. The two armies would then face one another for months, each exhausting every device to induce the other to concentrate on one part of his front whilst an attempt was made by a rapid move to carry a relatively unguarded point elsewhere, e.g. Marlborough's surprise of the Ne plus ultra lines (see Spanish Succession). During such periods of immobility the works grew to the solidity of permanent fortifications, with wide and deep ditches, and with every obstacle known' to engineers, whilst to render them defensible by the minimum number of muskets, they were laid out so as to cross their fire over and over again opposite every weak point in their tracing. No amount of battering could alter their general trace, and so they remained defensible as long as their garrisons could be trusted to line the parapets at all. This state of things must have continued until progress in artillery had evolved a weapon with sufficient accuracy and shell power to drive the defenders from their parapets and keep them away till the last moment preceding assault, had not fresh factors evolved themselves from causes at work under totally different topo- graphical limitations and conditions.

First amongst these comes the accession to the throne of Prussia of a king who was commander-in-chief of his own army, and as such responsible to no one for the use he chose to make of it. This would really remove him at once from the category of strategists in the restricted sense in which the term is now employed, but since no convenient word exists to define the action of a ruler playing the double part of soldier and governor, it is convenient both in his case and in that of Napoleon to use the expression to cover the wider

sphere. The permanence of the association between king and army enabled Frederick the Great to train his men specifically for the work he intended them to perform. Realizing to the full the value of the foundation laid by his father in developing to its utmost the fire power of the infantry, he devoted special attention to imparting to them a skill and rapidity in manoeuvre which ensured that in the open field his generals would always be able to place the muskets at their disposal in the best positions relatively to the enemy; and his cavalry were trained to such a pitch of mobility and precision in drill that they could be relied on to arrive at the appointed time and place to reap the fruits which the infantry fire had sown. To these startling innovations the Austrians had no new ideas to oppose. The old school, the survival of the fittest in the special theatre df its growth, i.e. the Netherlands and the Rhine, could not deal with the complete change in topographic surroundings — the far wider area of operations, the comparative scarcity of fortresses and the general practicability of the country for the movement of troops — not trains — off the roads. Frederick, relying absolutely on the intrinsic superiority of his army, knew that if he could catch his enemy in the open victory

was a foregone conclusion. If the enemy, in accordance with precedent, fortified a position, a threat to his communications would force him to come out on pain of being surrounded (Pima 1756, Prague 1757). He followed this principle (see Seven Years' War) until the accession, first of France and the South German states, and afterwards of Russia, to the list of his enemies compelled him to give one enemy time to prepare a position whilst he was engaged against another. Before deliberately prepared positions his men were shot down in thousands, as they would have been in the Netherlands, and at length he was compelled, for want of an adequate artillery, to adopt the same procedure as his adversary. Thus the war ultimately came to an end by a process of mutual exhaus- tion. But it had brought out conspicuously the value of highly disciplined soldiery, and a fresh fetter was prepared for those on whom, after Frederick's death, the responsibility of command was to fall, and practically all Europe went back to the warfare by contract of the previous generation.

Meanwhile in France events were at work preparing the instrument Napoleon was destined to wield. Contrary to the prevailing opinion

amongst modern historians, it is the fact that at no time in history was the art of war, and of all things appertaining to it, more closely studied than during the last years of the old royal army of France. Gribeauval paved the way for the creation of the artillery destined to win for Napoleon his greatest victories, and authors and generals such as the prince de Ligne (q.v.), the due de Broglie, Guibert (q.v.), Bosroger, du Teil and many others, pointed out clearly the line reform must take if the existing deadlock between attack and defence was to be removed; but none could suggest the first practical steps to apply, because the existing conditions were too closely interwoven and consolidated. In fact reform was impossible until the dissolution of society itself gave its ultimate particles freedom to combine in more suitable formations. Broadly, however, all were agreed that the protracted and inde- cisive operations of former wars were economically disastrous. A crushing and decisive victory was the aim for which all should strive; as a first step towards this object decentralization of command was essential, for freedom of manoeuvre, the only answer to Frederician methods, was impossible without it. This led to the idea of the permanently organized division of all arms; and events had reached this point when the deluge of the French Revolution overwhelmed them, and in face of a coalition of all Europe it became necessary to build up a new army from the very foundations. The steps by which it was sought to provide the men are dealt with in the article Con- scription; it is only necessary to point out here that it was not till 1799 that the laws became sufficiently defined to ensure a regular annual increment of recruits, and it was this regularity of supply, and not the fact that compulsion was needed to enforce it, which rendered expedient the complete revolution in warfare which Napoleon was destined to effect.

Until this reform was complete the revolutionary commanders were compelled to make war as best they could under pressure of the law of self-preservation, with the consequence that the whole army became habituated to the fact that orders in the field had to be obeyed at any sacrifice of life and comfort, and that neither hunger nor want of shoes, even of muskets, could be accepted as an excuse for hesitation to advance and to fight. Threatened on all sides, France was at first compelled to guard every avenue of approach by small separate forces taking their instructions only from a central authority in Paris, and thus the " division," a mobile force of all arms, which the earlier reformers had demanded, came spontaneously into existence to meet the requirements of the moment, and, thrown on its own resources, developed the brain and nervous system, i.e. the staff, necessary to co-ordinate the action of

its limbs.

The next step in evolution came from the obvious advantage which must arise if these units, though starting from different bases, operated towards the attainment of a common purpose. The realization of this ideal, the starting-point of modern strategy, was the creation of Carnot, whose ideas, though far in

advance both of contemporary opinion and of the technical means of execution then available (especially in the matter of imperfect means of telegraphy), formed a necessary step in the preparation of the machinery Napoleon was to inherit.

These, therefore, were the materials placed at his disposal when he began to practise the art of the leader: (1) a practically inexhaustible supply of men (the law in fact was not passed till two years later, but the idea was sufficiently evident) ; (2) divisional units and commanders, trained to unhesitating obedience to field orders, and accustomed to solve the problems presented to them in their own way, without guidance from superior authority; (3) the idea of co-operation between separate columns for a common purpose; and (4) a tradition that the word "impossible" did not exist for French soldiers.

The equipment of the allies started from very different founda- tions. To them the individual soldier was a valuable possession, representing an investment of capital generally estimated at £200 cash (as great a strain on the exchequer then as £2,000 would be to-day); and not only was he exposed to the risk of death in action, but he might die of disease or exhaustion on the march, and could always desert if he felt discontented. Moreover, the last campaigns of the Seven Years' War seemed altogether to justify methods of evasion and " strong positions." Frederick the Great,- beginning with the most audacious offensive, had ended by copying the caution of his antagonists, and each side had learnt to gauge the fighting value of a single battalion so accurately that to move a force, recognized by both as adequate for its purpose, into a threatening position, sufficed of itself to induce the adversary to accept the situation thus created. Since the value of a fortified position depended largely on the ground, the cult of topography became a mania, and (as Clausewitz puts it) the world lost itself in debating whether " the battalion defended the mountain or the mountain defended the battalion." The care for the comfort of the private soldier was pushed to such a degree that commanders would not report their units fit for action until complete to the last gaiter button and provided in advance with

the regulation scale of rations for a fixed number of days. Over-centralization continued; though the expressions " divisions " and " corps " were already known, the idea these words now convey had not yet even come into existence. Though a certain number of units might be assigned to a subordinate commander, they still received all orders, except on the battlefield, from the central authority, and were, moreover, considered interchangeable. There was no personal bond between them and their general. To what lengths this system was pushed, and the consequences which flowed from it, may best be gauged from the fact that in 1805 Mack, when writing his defence for his failure at Ulm (see Napoleonic Campaigns), thought it quite natural to explain the delay in his movements on the day of Elchingen by the fact that when news of the French attack was received he was busy writing out the orders for the following day, which occupied fourteen pages of foolscap and "did not contain one super- fluous word." Further, the idea prevailed in middle Europe that war was a matter concerning the contending governments in which the ordinary citizen had no interest whatever. It was true that the result of a war might transfer his allegiance from one crown to another, but this was scarcely more to the people than a change of landlords. Consequently they took little if any interest in the progress of a war, and on the whole were most inclined to help the army which most respected their private property and was willing to pay highest for its accom- modation while billeted in their towns and villages. Since the goodwill of inhabitants is always valuable, commanders vied with one another in their efforts to purchase it, and respect for private property and rights reached an unprecedented level. Thus, during the whole of the campaign of the Netherlands in 1793 the Austrians paid hire to the owners of the fields in which they camped; and when on one occasion payment for lodgings hired for the wounded was in arrear, the wretched men were flung out on the streets. Yet another, and in a way more re- markable, illustration of this tendency occurred at the capture

of Mainz by the French (1794). A strong armed party of Austrians, endeavouring to escape across the Rhine to Kastel, were refused the use of the ferry boats until the regular payment was made, and actually laid down their arms to the enemy rather than break the law and seize the boats.

The cumulative influence of all these forces of retardation is easily

followed. To avoid the cost of innumerable petty cash transactions with the inhabitants the troops were compelled to have recourse to the magazine system, which in turn tied them absolutely to the main roads; and the roads being numerous the army had to be broken up into small detachments to guard them. Thus the so-called " cordon " system grew out of its surroundings in a perfectly natural way, and was not due to the imbecility of the generals who employed it, but to the restraints placed upon them by custom and public feeling. Nothing more fortunate for the French could be imagined. Destitute of all the paraphernalia hitherto considered necessary, and compelled to fight at any cost in order to live, they found in these accumulated magazines and moving convoys the best possible bait to attract their starving men; relieved of all impedimenta, they could move freely through forests and marshes generally considered impracticable; and since from the magnitude of front covered, and the relatively small number of troops available, the allies could not oppose an unbroken front to their raids, they could swarm around the flanks of the positions and thus compel their evacuation. This struggle to safeguard or turn the flanks of positions led, as before in Marlborough's time and in our own day in Manchuria and South Africa, to a competition in extension, and at Napoleon's advent it was common to find armies of 20,000 to 30,000 men fighting desultory actions over a front of 20 to 30 m. This over-extension gave him his first opportunity, when the fire and energy he threw into his work, and the reckless disregard of human life he immediately displayed, stamped him at once as a born leader of men, and laid the foundation of that confidence in his guidance on the part of his troops which to the last proved his truest talisman of victory.

For the details of Napoleon's evolution the reader is referred to the articles French Revolutionary Wars and Napoleonic Campaigns, and here it will suffice to point out the leading characteristics of those campaigns. Having swept the Austrians out of Sardinia, he turned against them in eastern Lombardy, and by a series of outflanking attacks threw them back into the Alps, defeating all their attempts to break out again by what is now known as a " series of operations on interior lines." All these were successful, not because of the form the operations took, but because the enormous increment of mobility he man- aged to impart to his men deprived his adversary of all accepted data by which to time his own combinations. It cannot with justice be said that the French won because they fought harder; but the rapid sequence of success confirmed both leader and men in a conviction of their combined superiority which led Napoleon in 1800 to the veiy brink of disaster. In 1796 through- out he was acting

fairly in accordance with the teaching he had imbibed from his studies; in 1800 he appears as if seeking to determine how many of the established rules he could afford to neglect. We find him advancing to meet his adversary on a widely extended front without even exploring the country to learn where or in what strength that adversary stood. In 1805 this mistake is not repeated; a cavalry screen covers his advance, and his orders are based on the intelligence it transmits. But this precaution also proves insufficient. Cavalry can only see, they cannot hold; and only a combination of circumstances which he could not by any possibility have foreseen prevents his enemy from evading the blow at the last moment. What the position of the French would have been had Mack carried out his intention of leaving Ulm and destroying all his accumu- lation of supplies can only be imagined. But contemporary evidence prove beyond doubt that Napoleon had already tr'ed the endurance of his men to the utmost.*

In 1806 the mistake of sole reliance on a cavalry screen is no longer repeated. The cavalry now is backed by a strong advanced guard, one quarter of the whole army, following

behind it at short distance; and the whole command is now disposed in such a manner that no matter in what direction the enemy may appear it can concentrate in forty^eight hours to meet him. It is another form of the idea, prominent in British campaigns in the Sudan, of the advance in squares through the desert against a mobile enemy, the difference being that Napoleon's great "bataillon carree" has the advantage of mobility over its adversary. Concentration within forty- eight hours, however, would in itself be worse than useless unless the enemy stood fast to receive the intended shock; and it was the special object of the strong advanced guards or flank detachments to secure that he should do so. This could only be attained by a resolute offensive; no mere feeling the enemy's position would suffice to compel him. to stand, and might even frighten him into retreat. Hence the task devolving upon the troops thus selected was essentially distinct from that usually connected with the idea of an advanced or flank guard, and involved the conception of purchasing with their lives and by the vigour of their action the time necessary for the rest of the army to deliver a decisive blow.

This is the true meaning of Napoleon's maxim: On ne manoeuvre qu'autour d'un point fixe, a phrase which has been much misunderstood. The troops first engaged fix the enemy by the vigour of their attack, and thus constitute a pivot about which the remainder can manoeuvre.

Hitherto, however, the French armies had been operating in a country in which roughly one square mile of area would feed one thousand men for two days. Their freedom from convoys and other impedimenta enabled them to sweep out an area sufficient for their needs from day to day. But events now led them into a region in which this relation between the day's march and their subsistence no longer obtained. The emperor in fact had formed no conception of the roadlessness and poverty of Poland and East' Prussia. His men, no longer able to pick up their day's food by a day's march, rapidly fell off in condition and discipline (for short commons with the French always en- tailed marauding). As men and horses lost in condition the day's march dwindled further, with the result that heavier demands were made on the supply columns; and these being improvised and entrusted to an untrained personnel, the sufferings of the troops became unendurable, while the mobility of the French army sank below that of the enemy. Under these conditions the system of the advanced guard could no longer be trusted to work. Moreover the Russians, though deficient in the dash necessary to win victories in attack, have always taken longer to defeat than any other continental troops, and in the short winter days of the first half of the Polish campaign the emperor had no longer time to beat them into dissolution. The Russians would fight all day and retreat at night. As they fell back along their communications their feeding was easy. The exhausted French could never overtake them, and the emperor was at length compelled to adopt an expectant attitude. Not before Friedland (June 14, 1807), when the days were long and the country dry and everywhere passable, did his calculations of time and space prove realized and the system justified by the results.

When in 181 2 he again attempted to apply it at Vilna and Smolensk the Russians successfully repeated their tactics of evasion on every occasion, until, when they had fallen back to Borodino, their enemy had so far diminished that a battle in a selected position promised reasonable chances of success.

Meanwhile a fresh development in the tactics of the three arms added a new weapon to Napoleon's armoury, rendering the application of his system or any variant of it markedly more certain and efficacious. Whilst the infantry which fought under Napoleon's eagles had been steadily deteriorating, owing to the exorbitant demands his ceaseless marching campaigns had made upon them, the quality of his enemies had been as steadily improving. The growth of the sentiment of nationality had rendered it possible to throw aside the rigidity and impedi- ments of the old conditions. There was no longer any fear that men would desert if called on to bivouac or if

rations failed to

come up to the accepted standard, and the essential points of the French infantry tactics having been assimilated they developed a relatively higher standard of endurance as measured by time. Means had to be discovered to ensure their destruc- tion before nightfall gave them the opportunity of withdrawal; and the evolution of the artillery arm (see Artillery) at last gave Napoleon the weapon he required to realize the ideal implanted in his mind by his teacher du Teil, vix. concentration of the destructive elements on the decisive point, which was derived originally from the analogy between the attack on a fortress and the conduct of a battle. A battle is but an abbrevi- ated siege, or a siege a prolonged battle. In the former the object is to purchase time at the cost of men's lives, in the latter to economize men by expenditure of time; but in both the final step is the same, viz. the creation of a breach of con- tinuity in the enemy's defence through which the assaulting columns can penetrate to the heart oi his position. Thanks to the increased mobility in the field artillery and skill in handling it (the result of years of experience), it was now pos- sible, once the aim of the enemy's infantry had been unsteadied, to bring up masses of guns to case-shot range and to breach the living rampart of the defence; and through the gap thus created, infantry or cavalry, or both combined, poured to overwhelm the last reserves beyond. This step completed Napoleon's means of destroying that " independent will power " of his adversary which is after all the greatest variable in the whole problem of war. His advanced guard engaged and fixed his enemy's attention, inducing him prematurely to use up his reserves, and when the battle was " ripe, " to use his own expression, the great blow was delivered with overwhelming suddenness by the balance of fresh troops which he had in hand. But the whole of his action depended essentially on an exact appreciation of the endurance of his own troops first engaged, at the cost of whom the reserves were saved up. It was the possession of this method which rendered Napoleon supreme upon the battlefield and fully justified the reluctance which his enemies showed to hazard its issue; but in the end it also proved the cause of his downfall, for in his fruitless efforts to bring the allies to action in 1813 he so completely wore out his troops that it became physically impossible for them to meet his demands. The campaign of 18 13 deserves attentive study, for in it Napoleon was both at his best and worst, acting as strategist pure and simple, applying the means at

hand to the attainment of the object in view almost without a second thought for the diplomatic relations which so often hampered his military action, notably in 1814. In the famous " defensive campaign " of the latter year, which is usually held up as a model for imitation, he can hardly be said to have acted as a strategist at all, his movements being primarily directed to the destruction of the personal relations existing between the three allied monarchs, not to the annihilation of their respective armies, a task for which from the first he knew his resources to be entirely inade- quate. The Waterloo campaign (q.v.) again reveals the appli- cation of this system in its most finished form. That it failed ultimately was due primarily to atmospheric influences beyond the emperor's control, and in the second place to the intro- duction of a new tactical method by the British army for which his previous experience had in no way prepared him.

That after the event Napoleon should have sought to justify himself is further proof of the essential duality of his nature, which only rose to intuitive genius in war under the pressure of visible and tangible realities. Relaxed from excitement, he was the creature of his surroundings, controlled by contemporary thought like everyone else; and it is to failure to recognize this duality in his mind that all subsequent confusion in strategical thought owes its origin. It was clear that the career of such a genius could not pass unnoticed by military critics, hence, even while it was still in the making, every student of the military art felt compelled to pass judgment upon its incidents merely to show thathe was abreast of the times. More or less, each one tried to show that Napoleon's victories were due to the observance of the critic's own hobbies. These men, brought up on the old

military classics, and unaware of the ceaseless current of sociai changes which was seething around them, instinctively distorted facts to fit in with their preconceived theories. This is always inevitable with regard to contemporary criticism, since distance of time is always needed to bring facts down to their true perspective. It is quite clear from his innumerable reported conversations, and it is quite natural when one considers Napoleon's age, that in the back of his mind he stood rather in awe of these older and often far more deeply-read men. In any case it was quite obvious to him that his military reputation would stand or fall by their collective judgment. Hence, as soon as he had leisure, he set himself to explain his exploits in terms which they could understand. That he would be criticized for his frequent de- parture from established practice (for instance, in neglecting his communications, and again and again

accepting or forcing on a battle in situations in which defeat must have spelt utter ruin) he was well aware. Hence to stifle such criticism in advance he went out of his way to accentuate the care he had devoted to his communications, as in the Marengo campaign, at Ulm, at Austerlitz, and again and again in the campaigns of Wagram and of Dresden. But the truth really is that as long as he adhered to his " bataillon carree " formation, and the country in which he was operating was fertile enough to support his men, his communications mattered little to him. His certainty of victory, if only the enemy could be induced to stand, was so great that he could fight his way through to where his rein- forcements were prepared for him, in whatever direction suited him best. Whilst he admitted, as all must do, the sound common sense at the bottom of all rules deduced from centuries of experi- ence, he never raised them to the dignity of inviolable principles, as he did the principle of the fixed point as a pivot for manoeuvres, the case-shot attack, and the employment of the avant-garde genirale. It seems indeed as if these fundamental principles appeared to his mind so self-evident that he assumed them as common knowledge in every intelligent mind, and hence never took the trouble to explain them to his marshals, though he did condescend to allude to them when writing to his brother Jerome and to Eugene de Beauharnais, with the limitations of whose minds he was quite familiar. Marmont, Rogniat, Soult and St Cyr were men for whose intellect he had the highest esteem, and all wrote at length on the subject of his campaigns, yet not an expression in their works, not a manceuvre in their independent commands, can be held to betray a knowledge of what was really the secret of the emperor's successes. For instance, by the year 18 12 Marmont may fairly be assumed to have learnt all he ever could learn from Napoleon's example; yet at Salamanca we find him manoeuvring quite like one of Frederick's generals. Napoleon would have attacked Welling- ton with a strong advanced-guard, one-fourth of his command at the least, and whilst the latter was busied in warding off his assailant's successive blows the emperor would have swung the remainder round upon his enemies' flank, and, with a three-to- one superiority at the decisive point, have driven him off the road back to Salamanca. This idea never even entered Marmont's head. Watching Wellington with a screen of vedettes only, he set his whole army in motion to march round his flank, like Frederick at Leuthen. An Austrian army in the old days would usually stand to be surrounded, but Wellington, instead, set his whole force in motion, i.e. manoeuvred. Again in 18 13 (just after frequent conversations with the emperor, in one of which the latter stated his opinion that war was a " science " like any other, and that some day he would write a book out of which

any one could learn it), Marmont, in command of the VI. corps, found himself opposed to the Silesian army under Bliicher, and immediately took up a defensive position, which he occupied by two lines of brigades deployed in line and echeloned from left to right. No one who had entered into the spirit of the emperor's method could have adopted such a formation. Instances of a similar nature might be multiplied, and their multiplicity need surprise no one who has studied the psychology of action taken under circumstances of intense excitement or imminent danger. Most of us know rules for

conduct in all kinds of emergencies, but how often afterwards could anyone describe with accuracy the mental process by which his action in such crises was dictated? Probably never. Intuitively the mind recognizes the right course and fixes upon it, and with the cessation of the emergency finds it impossible to recall the order in which the facts presented themselves to his consciousness. In war these emergencies are constantly arising, so that by degrees the recollection of them becomes blurred, and the chief actor's presentation of them is often the least trustworthy testimony we possess. The act speaks for itself. But where hundreds of thousands of acts are crowded into the short compass of a campaign, a true view of their whole can only be obtained when all have become accessible and time emancipates criticism from partiality. But nations cannot afford to wait until lapse of time renders it safe to publish all diplomatic and other secrets; and many were ready to attempt the solution of the problems of Napoleon's career.

The most prominent were Jomini (q. v.), speaking for the French army, and Clausewitz (q. v.) , for the Prussian. The former, a native of Switzerland, had attracted the attention of Napoleon by the insight his criticisms revealed, and had been attached by him to the staff, where he served under Ney almost continuously from 1806 to 1813. In the latter year there is no doubt that he

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did valuable service in the operations culminating with the battle of Bautzen; but, receiving no adequate recognition for them, he deserted to the allies, and was attached by the emperor Alexander, where again he rendered conspicuous service, notably at Leipzig; but his desertion caused him to be viewed with such marked disfavour by all honourable men that he speedily sank into social oblivion, although he remained in the Russian service until his death in 1869. Nevertheless, though he had deserted his cause, he still retained unbounded admiration for the genius of his great master, whose reputation certainly does not suffer at his hands, except for the excess of adulation and bombast with which his historical writings are disfigured. But his social isolation cut him off from authentic eyewitness sources, and he was by nature an inventor of systems. The secret of Napoleon's success he found in the system of " interior lines " — a phrase he invented to designate a method which was almost as old as war itself; and from this system he deduced its opposite, " exterior lines, " and a whole sequence of others, which in the end all resolve themselves into the same idea. A diagram will make the matter clearer than many words. If an army A stands in a

central position relatively to two other armies B, C, converging upon it, then, if it moves against each in succession and beats them both, it is said to act on " interior lines "; whilst B and G act on " exterior lines. " What it is said to do when at the first shock B beats it out of existence the books fail to inform us. From this theorem are deduced in succession the advantages and disadvantages of salient and re-entering angles, &c, with which, as a rule, military historians so freely befog their pages.

Since the object of all strategy is to bring the greatest possible force to bear against the decisive point, it is obvious to ask why armies should not always be concentrated, and why they should ever divide.

The answer is that a given district and a single road will only subsist a certain number of men, a number which in practice is found to be about 60,000 with their requisite guns and train. Hence an army, say of 1 20,000 men, not only cannot sub- sist on a single line or road, but when divided into two equal parts, and separated only by a short day's march, is really more ready for instant action than an army of 90,000 on one road. Separa- tion, therefore, when large numbers are in question, is a necessity of existence, not a matter of free choice; but when it is thus forced upon a commander he regulates the rate of his march so that his separate columns cannot be attacked singly before the heads of both are within supporting distance of one another; the jaws of the crackers then close on the nut, and unless the nut proves harder than the crackers the nut is crushed. But this calculation reposes on an accurate knowledge of the marching powers of the adversary, and it was in this that Napoleon's enemies failed. Accustomed only to their own deliberate methods, they were quite unable to imagine Napoleon's lightning-like rapidity. Marching twenty-five miles in a day, his whole army would hurl itself on one of the columns whilst the other was still too far off to come to its aid, or if they had already approached so close that mutual co-operation was imminent, he would send a detachment against one to purchase time by the sacrifice Of its men's lives, and would then strike at the other with the bulk of his forces united. How the detachment executed its task depended chiefly on the nature of the ground. It might fight a series of rear-guard actions if a succession of readily defensible sections favoured such action, or it might -conceal its weakness and impose caution and respect on its opponent by the vigour of its attacks; for that there could be no rule, and circumstances alone could decide. In this form Napoleon won most of his earlier successes, but a little reflection will show that the method depended essentially upon his superior mobility and the willingness of his enemy to fight or the reverse. In time this dawned upon his opponents also, and when in 1813 around Dresden he tried to put this plan into force the allied column immediately threatened retreated before him, whilst the other continued its advance, thus compelling him to return to succour his retaining detachment, which, of course, could not struggle on indefinitely against a marked superiority of numbers. He himself confessed during the September days in Dresden that this jeu de va-et- vient, as he described it, had completely broken down his army. If, on the other hand, the commander of the central army under- estimates his opponent's marching powers its doom is sealed, for both his flanks are turned in advance and he comes under a concentrated fire to which it can only oppose a divergent one. This difference is more marked now than

formerly; and stated in its extreme form, for rifle fire only, it really means that every bullet fired from the circumference stands a tenfold better chance of hitting something vulnerable than those directed from the centre towards the circumference. The only salvation for an army thus threatened is to move by a lateral march out- side the jaws of the crackers, and fall on one limb only, when, if it is tactically formidable, it stands a good chance of over- whelming the force immediately opposed to it before the others can arrive. For instance, at Koniggratz, if the Austrian main army, pivoting on the fixed point made by their 2nd and 4th corps engaged with Prince Frederick Charles's army, had swung round the remaining six corps upon that of the crown prince by a short march of from six to eight miles, the Elbe army would have struck a blow in the air, and the situation*

would have been rescued in spite of the slowness and indecision of previous movements. An army standing on interior lines, therefore, occupies a position of advantage or the reverse according to the skill of its leader and its own inherent fighting capacity, and this whether its position arises from opera- tions during the actual course of hostilities, or from circum- stances already pre-existent in peace time, as for instance, the configuration of frontiers. The phrase, therefore, " the use of interior lines, " though convenient to those who are thoroughly agreed as to its limitations, of itself explains nothing, and is a pitfall for the inexperienced.

A, however, in moving as suggested against his enemy's outer flank, exposes at the same time his own communications with any place lying directly behind his point of departure. If his army suffers only from slowness, but is really superior in fighting power, this risk may be lightly taken — victory settles all things. In proportion, however, as the result of collision is

doubtful, alternative lines of retreat or supply will be advan- tageous. Hence a broad, if possible a concave or re- entering, base or starting-line is of great importance, and, since as an invader penetrates into his enemy's country his base becomes salient, whilst that of the defender becomes re-entrant, we have here a compensating arrangement which, under given conditions of country,

equipment and the like, fixes the striking radius of an aggressor precisely as was the case in former times. The case of the French invasion of Russia in 1812 is an illus- tration. The Russian base at any moment may be considered as formed by lines traced just outside the striking radius of small bands of French marauders; the French base as including all the territory in their occupation, for within that area they were free to fortify or protect any accumulations of stores and supplies they chose to make. By the time the French reached Moscow the Russians could afford to attack them from any direction, for, whatever happened, retreat into their own undevastated country was always open. The South African war affords a modern example of the same thing.

These ideas are, after all, elementary, and readily grasped even by the average intellect, though many volumes have been devoted to proving them, and yet they are all that Jomini and his followers have to offer us — a fact that both explains and justifies the contempt with which military study was so long regarded by practical soldiers in England.

Clausewitz, however, approached his subject from a higher standpoint. Gifted with a mind of exceptional power, which he had trained to the utmost in the school of German philosophy, and having seen war from the beaten side, he knew well that something more than phrase-making was needed to force a great nation to the final abnegation of its independent will. He stood throughout in the closest connexion with the directing

wills which guided the German nation to achieve the final downfall of Napoleon; and he knew that these men were neither bunglers nor fools, but men whose experience well entitled them to the authority they exercised. Hence he reasoned that the catastrophes they had shared in common needed deeper analysis than they had as yet received. First of- all he sought a satisfactory definition of what war really meant, and he found the closest analogy to it in the " unrestricted competition of the business world. " Had he written in modern times he would doubtless have cast it in the Darwinian mould, viz. " war is the struggle for existence' transferred to the national plane, " and this is a far more important contribution to sociology and the welfare of humanity, and will certainly exercise much greater influence on the evolution of the nations (on which, after all, the fate of the individual depends) than all the works of Darwin and Herbert Spencer combined. This transference of the question to the national plane is in fact their very antithesis, for whereas the survival of the fittest threatens the stability of society on

the principle of the Kilkenny cats, the survival of the race necessitates its coherence. Next, Clause- witz analysed his subject into its constituent factors. In this process he investigates all the theories of bases and geometrical relations, only to discard them as quite inadequate solutions of war's many phenomena; and finally, as between equally armed opponents, he shows that essentially success in war depends on the moral factors only. First is " courage " in all its forms, from its lowest manifestation in the excitement of a charge, to its highest in the fearless acceptance of supreme reponsibility in face of the most imminent personal danger. Next comes " duty," again in its widest sense, from the uncomplaining endurance of the humblest musketeer in the ranks, to the readi- ness of the whole nation to submit to the sacrifice cf, and the restraint on, personal liberty that readiness for war entails. This " readiness, " moreover, he shows to be cardinal (for nations with land frontiers), for indubitably, under the conditions then prevailing, the surest guarantee of victory in the field was the concentration of every man, horse and gun in the shortest time on the decisive point. Thus only could the advantages of greater wealth, larger population and so forth be neutralized; and the growth of modern means of communication, railways, telegraphs, &c, have only confirmed his position. It has been the gradual appreciation of portions of Clausewitz's teaching, enforced by the drastic lessons of 1866 and 1870, which has turned all Europe into an armed camp, and this fact must, for generations, stultify all ideas of European disarmament. For since everything depends on instantaneous readiness for action, it is absurd to expect that any nation will voluntarily consent to throw away the advantages these sacrifices have obtained by agreeing to delay at the very moment when its existence is most gravely threatened. An unready nation has obviously everything to gain from delay.

All this portion of Clausewitz's work is fundamental, and no changes in armament or other conditions can ever affect it; it applies as much to land as to sea power, and essentially was the doctrine of Nelson and St Vincent. Indeed, at sea Nelson was in advance of Napoleon, for he quite understood the advan- tage to be gained in paralysing the independent will-power of his opponent by a vigorous attack, and was willing to stake his existence upon this principle, notwithstanding the infinitely more uncertain elements of wind and weather which conditioned his movements. But the rest of Clausewitz's teaching is too deeply coloured by his personal experiences, and he stood in too close a relation to the events of his time to be able to focus the details of the whole subject. Although he

was the first to seize the meaning of Napoleon's case-shot attack (the descrip- tion occurs for the first time in his Campaign of 1815), he did not realise how this might be applied to the destruction of what he himself formulated as the most serious of all the many indeterminate factors with which a commander is called upon to deal, viz. " the independent will-power of his opponent." He saw clearly enough that time and space were the underlying conditions of all strategical calculation, and that time could be

bought at the cost of men's lives; but he did not take the next step forward and show how these calculations must inevitably be upset if the enemy possessed the power of destroying men faster than experience led one to expect. He formulates from his experience that a force of the magnitude of a division, say 10,000 men, can hold an overpowering enemy at bay for about six hours, and an army corps can hardly be destroyed in less than a day; on these data he bases his estimates of the marching area which an army may safely cover. But what if a new and unexpected method of applying " the means at hand to the attainment of the object in view " suddenly wipes out the divi- sion in two hours, or the army corps in six? In that case, surely, the independent will-power of the adversary would receive a most unwelcome check. Nor did he ever clearly formulate as a principle the importance of mobility. Every one of course has in a general way understood the advantages of " getting there first," and all of us have for years been familiar with the importance which Napoleon attached to rapid marching. But the tendency has always been to consider the rate of marching in itself as an invariable factor, and to calculate every operation or disposition from the time a column normally takes to deploy into position from a road or defile. But no systematic attempt to determine the advantages which might on occasion be obtained by sacrificing comfort and convenience to the acceleration of a march has ever been undertaken. Yet Napoleon saw and appreciated the point, and it must remain a riddle for all time how such a mind as Clausewitz's, which again and again had seen at first hand the consequences which followed from Napoleon's marche dc manmuvre — guns and trains upon the roads, infantry and cavalry moving in mass across country — could have failed to place on record the enormous advantages which might follow its adoption. The book as it stood, however, became the bible of the Prussian army, and its comprehension is an indispensable preliminary to all useful study of contemporary practice in war. Moltke's mind, and

that of his whole generation, was formed upon it. To its strength the Germans owed all their successes, and to its weaknesses certain grave errors that were almost disasters.

Meanwhile the progress of invention suddenly destroyed the governing condition of all previous experience. The Napoleonic strategy, as we have shown, depended primarily on the certainty of decision conferred on him by his " case-shot attack "; but the introduction of the long-range infantry rifle (muzzle-loader) rendered it practically impossible to bring the masses of artillery to the close ranges required by the Napoleonic method. In the 1859 campaign (see Italian Wars) between France and Austria both sides were handled with such a general absence of intelligence, and the marksmanship of the Austrians in particular was so very inferior, that neither side derived advan- tage from the change. But when, in 1861-65 (see American Civil War), the theatre of interest was transferred across the Atlantic, the other causes united to give it immense importance. America in the sixties was almost as roadless as East Prussia and Silesia in Frederick the Great's time, and its forests, rivers and marshes were far more impenetrable. Both the Southern and Northern armies, moreover, were entirely new to their work, and consequently their operations became exceedingly slow. As far as the generals and staff had studied war at all they had been brought up to the Napoleonic tradition as handed down by Jomini and his school; and failing as a body to appreciate the intimate interdependence of the three arms, they believed that a resolute crowding on of masses (whether in line or column does not signify) upon the decisive point must suffice to overrun all opposition. But the slowness of operations gave time for entrenchments, and consequently scope for the powers of the new rifle. Whereas against the old musket one rush sufficed to cover the danger zone, the rifle widened this zone about threefold, so that human lungs and limbs could no longer accomplish the distance without pauses, during which pauses, since guns could no longer assist effectively, the attacking infantry had to protect itself by its own fire, standing in the open within point-blank range of the rifles of the cool, skilful

and well-covered defenders. Thus when similar experiences had established uniformity of practice in the two contending forces the result was a deadlock, which was ended only by enormous numerical superiority and the " policy of attrition." The lesson, however, passed unnoticed in Europe except in so far as popular attention was caught by the deadliness of the rifle fire, which was attributed, not as it should have been to the peculiar conditions under which it was

employed, but to the nature of the weapon itself; and from this conclusion it was a short step to the inference that the breech-loader, firing five rounds to one of the muzzle-loader, must prove a terrible instru- ment of destruction. Actually this inference has hampered strategic progress ever since.

The campaigns of 1866 in Bohemia, and of 1870 in France, furnish positive proof that Clausewitz had not appreciated the Napoleonic teaching to its full extent, for though the conditions again and again were ideal for its application, no trace of his fundamental principle is distinguishable in Moltke's orders. In the former it would seem from the maps that the Austrians actually possessed the form, though they had forgotten the spirit, as the detached group in Bohemia (see Seven Weeks' War) might well be considered as an avant-garde generate, and on the three days preceding Koniggratz, the distribution of the Austrian main army was such that the application of Napoleon's method must have followed had the idea been present. That Moltke himself never contemplated its employment is sufficiently evident from his unfulfilled plan of the 2nd of July, noon, wherein the whole Prussian army was to march across the front of the Austrians in position, precisely as Frederick had done with disastrous results at Kolin a century before.

No campaign, however, demonstrates in more striking manner the fatal consequences of ignoring Napoleon's saying, On ne manmuvre qn'autour d'une pointe fixe than 1870. Here was an army enormously superior in numbers and organization, disposing of an admirable cavalry and far superior artillery, repeatedly on the edge of disaster, not because of the superior cunning of their adversary, but simply because the mind of a reasonable man proved quite incapable of conceiving the blunders that his adversary perpetrated. Moltke always placed himself in his enemy's position and decided on what would be the rational course for him to pursue. He gave him the recog- nized three courses, but it happened that it was always the fourth (the unexpected, because from Moltke's standpoint so hopelessly irrational) that he took. The situations of the 8th, nth and 16th of August are all instances in point. On the last of these dates (see Franco-German War) the French commander-in-chief by merely standing still through irresolution found himself in a situation promising certain victory. It is true that he took no advantage of it, and nothing can detract from the magnifi- cent resolution of von Alvensleben, commander of the III. Corps, and the gallantry with which his troops and his comrades sup- ported him. But, equally, nothing can alter the fact that in spite of all Bazaine's mistakes the dawn of the 17th of August found the German headquarters with

only the debris of two corps on the ground face to face with the whole French army, of which only one-third had been seriously engaged.

Sedan nearly ended in the same way. The Germans had, with their cavalry, fixed to a man the precise position of their enen-13', but no troops were told off to hold them, and all throughout the afternoon of the 31st and morning of the 1st the French army was free to issue from the bridge-head of Torcy on a broad front in masse de manmuvre and separate the wings of the Prussian army. Judging by the way they actually fought in the hopeless position in which they elected to remain, their prospects of success in the suggested manoeuvre were not small. After the war it was easy and natural to place the blame for the situations in the early days on the shoulders of the German cavalry, but closer study of the facts has shown that in spite of all their shortcomings this arm did not deserve it, for they actually found the enemy and reported his positions, while nothing could be urged against them in respect to Sedan, for by that time they had established a relative superiority over their enemy which

was absolutely crushing. The truth is that the Prussian staff had not realized that cavalry reports alone, even if they arrive in time (which in fact very few ever did), do not afford a sufficient foundation on which to base a manoeuvre. If cavalry, three days' march in advance, report the presence of an enemy at a given spot, the fact affords no certain indication of where they may be even on the following day. It is not enough to find an enemy, he must also be fixed and held so that he cannot move; and the three arms, cavalry, artillery and infantry, form the most efficient combination for economically securing this end.

Twenty years at least elapsed before fresh light came; and then it came from France, not from Germany. No one can accuse the Germans of a tendency to sleep on their laurels; on the contrary, no army in history ever set itself to work with greater zeal and industry to profit by the lessons of its campaigns. But it is not in the ranks of the successful that the defects of the military machine are most surely revealed. Moreover, they were dazzled by the very brilliance of their victories, and gratitude to their leaders made them blind to those leaders' faults. The French started their reforms without these disadvantages. The younger officers, who had seen how splendidly

the old imperial army had fought, and the spirit with which it had endured the misery brought upon it by the ineptitude of its leaders, felt no desire to shield the reputation of the latter, while the bitterness of the cup they were compelled to drink filled them with the determination and energy necessary to ensure regeneration. They had been beaten by the palpable neglect of their own Napoleonic traditions, and this fact added additional sting to their sufferings. Accordingly a number of the most zealous amongst them banded themselves together to ensure that the reason for their shame should no longer be forgotten. Presently these men assumed, by sheer weight of merit and industry, the practical control of the military history section of the general staff, and here they trained one another for the posts of instructors at the staff college (Ecole de Guerre), whence ultimately the supply of future commanders would be drawn. As a first step in their progress they ransacked the archives of the War Office and subjected the whole correspondence of Napoleon to a critical investigation, exceeding in thoroughness anything it had as yet undergone. This correspondence is incom- plete without comparison with the actual reports on which the letters were based and the executive orders issued, which hitherto had never seen the light. From the juxtaposition of the two a connected system was by degrees evolved. As has been indi- cated above, Napoleon never really appreciated the enormous intellectual gulf which separated him from his marshals. He habitually treated them as enjoying his own clearness of vision in their work, and it is only in his letters to Jerome and Eugene (with whose limitations he was only too well acquainted, but whom he employed because their interests were identical with his own) that he explains things in a form which even a child might understand. From these indications the whole web of the modern doctrine of the Ecole de Guerre was gradually woven, substantially in the form in which we have given it above. With this work the names of Maillard, Langlois, Bonttal, Foch, Colin, Camon, Desbriere and others deserve to be for ever associated, for they averted intellectual despair in the nation and rendered it possible for the best minds in the country to continue their labours for its regeneration. Without some such basis hope would have been impossible in face of the ever- growing forces of their watchful antagonist. As matters stand, as long as France can keep her ports open to commerce she cannot be overwhelmed by invasion, for it is a question of time and space; and with her existing network of railway communications, which favour her the more the farther the invaders penetrate, the application of this system promises quite astounding possibilities.

All systems, however, must sooner or later be discovered by the adversary, and require, moreover, adaptation to their surroundings, which may vary from the roadlessness of Poland in 1807 or the United States in 1862 to the highly developed

networks of communications of all kind existing nowadays in western Europe; and in each, if the war lasts long enough, a deadlock must eventually come until some readaptation of exist- ing means is discovered which suffices to disturb this equilibrium. Wars, however, nowadays are so short that this condition of dead- lock can rarely arise. The side which starts with a pronounced superiority, whether due to more perfect organization, better tactics or the systematic training to some secret such as has been indicated above, will generally gain the lead from the outset and will keep it until its forces no longer suffice for the amount of work to be done. Then we get back to hard fighting pure and simple, in which the iron resolution of the commander ultimately decides the issue of events. But this resolution is not, as is generally supposed, a fixed quantity belonging in equal magni- tude to the leader at all times and places, but, is perhaps the most variable quantity of all. A human being can only put out a certain quantity of nervous energy or will-power in a given time, and of two men of equal character that one will succumb first upon whom the necessity for rapid decision is most fre- quently enforced. This holds good of every man throughout the whole army from highest to lowest. In this case the " art of the leader " will undoubtedly consist in adopting as his course of action that one which can be consistently followed without change of mind. Obviously his best course will be to seize the initiative and keep it up to the final act on the battlefield itself. The commander who is caught in the act of concentration or accepting battle of his own free choice cannot tell from one moment to the other at what point the attack may come or whether indeed it is coming at all, and the strain of expectancy is harder to bear than that of continuous action, and spreads also to every rank in his army. It has been held that as a consequence of the increase of range and rapidity of fire of modern weapons the defence has gained so enormously in power that a commander can accept the risks of a defensive battle with a light heart. This, however, ignores the fact that improved arms will be found in the hands of the assailant also, and every increment of range and rapidity of fire renders it easier to combine the action of many weapons on a single point. Formerly, when bullets barely travelled, with extreme elevation, 1000 yards, and the total artillery train of an army could be numbered in tens, not in hundreds as nowadays, tactical sur- prise was well-nigh impossible. Troops could*

always, either by selection of site or clearance around them, ensure that no formid- able force could assemble unnoticed within range of their position, while the round shot and the common shell of those days had little power of clearing or levelling solid parapets. Nowadays such selection of site, to say nothing of clearance, is impossible and inconceivable, and once the enemy's mounted men have been compelled to clear the field there is scarcely a limit to the fire power which may be brought into position unnoticed, and thence directed on any chosen point of the enemy's lines. One has but to take the map of Waterloo and its surroundings and consider how it would have facilitated Napoleon's purpose had it been possible for him to prepare the way for his infantry attack by a rain of modern shrapnel and H.E. shells directed from a balloon observatory and coming from every unseen point within a radius of say even 5000 yards. But Napoleon had to wait for several hours till the ground was dry enough to bring up even seventy-two guns to within effective case-shot range. Nowadays he could have switched on his whole two hundred at any moment after daybreak, and his balloon would have told him of the true position of his enemy's reserves. A balloon on the side of the allies could have told them no more than what they already knew, viz. that the whole French army was in front of them; and it is far easier to control and direct fire by observation on the relatively fixed targets which the de- fence necessarily presents than to do so upon the rapidly moving ones afforded by an assailant. Even where concealment can be practised to the utmost by the defender, and no balloons are available, the power still remains in the hands of the assailant of making any limited area he may choose absolutely untenable; it is only a question of turning on guns enough for the purpose.

But the less time the defender has been allowed in which to improve his position, the more rapidly will a given number of guns achieve the required result; and though we must admit the many difficulties of execution which prevent complete reali- zation of the ideal in practice, yet it is clear that the more closely one can approximate to this ideal, the less the demands which will be made upon the infantry when its turn comes to go for- ward. This matter is of such importance to the whole subject that we will put it forward in another form. Let us assume that the shells on bursting create only smoke and disturb the dust, delivering no man-killing fragments at all. Still it is clear that, say, 1 200 shells a minute bursting over a

front of some 600 yards would shroud that front so completely with smoke and dust that its occupants would be quite unable to direct their aim upon the approaching assailants, and under cover of this smoke and dust cloud the latter would be free to carry out what dispositions they might please with the minimum of loss. When finally the shell fire had to be stopped and the smoke lifted, the two infantries would be in presence of one another under conditions which have always been held to offer the maximum guarantee possible to the assailant, viz. an assured numerical superiority disposed in relatively the best positions for the use of their weapons, i.e. their fire converging on the point of attack.

From the consequent assault only entrenchments and physi- cally insuperable obstacles (a deep ditch for example) or wire entanglements which require machinery to tear away, can save the defenders. But such obstacles require time for their creation, hence the supreme importance of the utmost possible mobility. Now though in practice every great commander has utilized to the utmost such mobility as he might find in his troops (and by its use he has often, in countries well supplied with roads, succeeded in rendering the erection of entrenchments practically impossible, or in forcing an entrenched enemy to come out and fight in an unprepared position), yet no scientific attempt has hitherto been made to study the whole question of mobility, notwithstanding the fact that the Boer War of 1900-02 proved its importance up to the very hilt. The Boers were wanting in every quality which renders an enemy really formidable except mobility, but because of that supreme qualifi- cation and the fact that the enormous area of their country and their exact knowledge of its topography gave them every facility to employ it to the utmost, about nine times their numbers were required to subdue them; and the method ultimately adopted, though freely criticized, was in fact the only one feasible under the circumstances to bring them to a final surrender.

Actually, all systems, the Napoleonic as well as the others, can be defeated finally by an excess of mobility, the exact proportion depending on the topographical nature of the country fought over, the roads available and its extent. So great is its influence that it overrides all changes in armament or in tactics, as was shown in Manchuria in 1904-05, where in spite of both armies, or perhaps better because both armies were trained on western European lines, the actual form which the war assumed was that of Marlborough's times. It is sufficient to imagine the Japanese supplied with sufficient pioneer battalions, of the type employed on the Indian frontier, and a first-rate transport corps (which would have doubled their average

rate of daily progress), to see how completely the situation would have been altered. They could have reached Mukden in half the time actually required, and would then have possessed a numerical superiority sufficient to ensure for them a second Metz or even a Sedan. It is in this direction that all great progress is to be looked for, but it involves experiment and organization beyond the capacity of any single student. We may, however, indicate the general outline such a development would require. Primarily time is chiefly lost in the hesitation of leaders and in the preparation and circulation of orders. A clear apprehension of the powers which modern weapons confer on the attack will lead to the elimination of the first, and a higher intellectual training of the whole army will materially reduce the second, for the limit to the brevity of orders is fixed by the trained intelligence of the recipients. Napoleon's marshals could move effectively in

response to an order of a couple of sentences; Mack's generals needed fourteen sheets of foolscap.

Next comes the rapidity of movement of the troops themselves when on the road. They cannot march for longer hours than already at times they are called upon to do; but by a better distribution of the weights carried between the men and their transport, they might well cover much more ground in the same time. Here again determination to take the offensive, and to keep it, largely governs the situation. An army determined to attack needs no entrenching gear, certainly not on its men. Its fire is its best protection, and when as in; recent campaigns in Bulgaria and the Far East the need for entrenchments has arisen, that has only occurred because the whole weapon of attack, viz. that combination of the three arms which we call an army, was not properly balanced in its parts at those particular moments so as to enable it to maintain its forward impulse. Either, as in Bulgaria, the staff was not up to its duties, or, as in the case of the Japanese, the artillery arm was too slow, or was locally outclassed by the artillery power of its adversary. But in all countries, roadless ones in particular, the progress of the front is conditioned by the efficiency of the transport services in rear, and only because this branch of the army has never received all the attention it deserves has it been necessary to overload the men and horses at the front in the preposterous manner which custom has everywhere sanctioned, which for the most part has been inherited from the time of Marlborough. Over and over again in the past two centuries men have shown that literally only muskets and ammunition are required to win battles, and that a great victory won by rapid marching is by far the most economical use that can be

made of human powers. But again and again the pendulum has swung back, and the soldier, in order to be prepared for emergencies which only defeat can bring about, has been burdened down by a weight which has brought him on the field too late and too weary to win it, but in ample time to incur all the penalties of disaster.

In the future in western Europe that army whose transport service, based on motor vehicles and a good road maintenance corps of real working men, will relieve the soldier and his horse (where he has one) of every ounce of superfluous weight, includ- ing even in that expression greatcoats and all rounds of ammuni- tion in excess of 120 apiece, and whose men are uniformly trained to the Bersaglieri march (7 m. in one hour or 15 m. in three consecutive hours) , will possess a superiority over its adversary which he will require twofold odds to counteract. The suggestion that the ammunition supply should be limited may create sur- prise, but it is a logical consequence, and precisely one of those points on which the strategist of the future will require a firm conviction. The fundamental fact on which all tactical practice is based is this, that a relatively small loss suddenly inflicted exercises a far greater demoralizing effect upon its recipient than a much heavier punishment extended over a longer period. First-rate troops have often broken back in disorder under a sudden hail of bullets which has swept away not more than 2 to 3% of their strength, whilst exactly similar battalions in the same action have held out all day and remained an efficient fighting body after even 30% had fallen. But, armament being equal, this sudden loss can only be inflicted by placing the troops on the field in the best position possible, relatively to their enemy to derive the full benefit of their fire-power; and mobility is the chief factor in attaining this end. The point is most clearly seen in the case of the action of a well-mounted force against a slow-moving convoy ; the convoy forms a target which men can hardly miss; the assailants are a number of dots it is scarcely possible to hit. Two thousand rounds per man of the escort would scarcely suffice to obtain the same results as twenty rounds a man on the side of the assailants. This is a clear illustration of the principle involved, which should always be kept in mind.

Lastly the student should master the elementary principles of railway transportation. The progress since railways were last used in warfare in western Europe has been so enormoug that the data supplied therefrom are entirely antiquated, and

there is no indication that any general staff in Europe is alive to the possibilities they present in defence. As already pointed out, the assailant cannot count on their aid once he has penetrated within the enemy's country, and the farther he advances the worse matters become for him. It is enough to consider an invading force based on the east coast of Yorkshire with its head about Leeds; the technical excellence of English railways is so great that 1 20,000 men with all their share of guns and necessary equipment could be easily transferred say from Glasgow and Edinburgh round to Sheffield in twenty-four hours for a flank attack. Even double that number, from the south of England to the north of Yorkshire, could be moved in the same time. It is not suggested that such movements, might be in themselves desirable, but only that in face of such mobility of masses, no calculation of the enemy's movements would be possible.

In conclusion, the man who would fit himself for the highest commands in war, or even for the criticism, of those who exercise them, must never for one moment forget that the momentary spirit of the mass he directs is the fundamental condition of the success of every movement. Just as there is no movement so simple that its success may not be jeopardized by ill-will and despondency in execution, there is hardly any limit to what willing men can achieve, and it has been this power of evoking in their commands the spirit of blind trust and confidence that places men like Cromwell, Marlborough, Frederick and Napoleon almost beyond reproach. By the side of this power the technical knowledge and ingenuity displayed in their several undertakings appear quite trivial; probably the same ideas have occurred to thousands of quite mediocre men, but were never put into execution, because they could not count on the whole-souled devotion of their men to execute them. This power is born in a man, not acquired, but even those who possess it in embryo can increase and develop it enormously by a systematic study of the laws which govern the action of humanity in the mass.

From the above we arrive at the following definitions for the terms most generally employed by writers on military history and strategy.

Base. — The point, or line joining a series of points, from whence military operations originate. Ultimately military operations have their inception in an area, i.e. a whole country from which organization draws men, arms, food and material of all descriptions, forwarding them through a network of communications — roads, railways, canals, rivers, &c, and delivering them at points as near to

the proposed enemy as circumstances render expedient. As an army never has too many men, and normal civil transport is cheaper in every way than military, the tendency is always to maintain the collection of men and materials under civil administration as long as possible. Thus as an army moves forward, settling the district behind it as it advances, the civil administration follows after it, only ceasing to exercise its functions when these can be no longer carried out without military protection. Generally there is a zone in which civil transport and supply exist side by side with military precautions greater or less, but for all practical purposes each column, whatever its strength, has its " base " at that point where the existing magazines are filled by civilian con- tractors in the ordinary course of trade, and with no extra charge for war risks.

Line of Communication. — The line of communication is the great main road, trunk railway, canal or river, or any combination of these means, for the transport of stores leading from the base to the army at the front. Along these arteries of communication depots are established, military authority commands, and every arrangement is made that foresight can suggest to meet the abnormal demands that a condition of war naturally gives rise to. Napoleon always used the words route de Varmee, which conveyed perhaps a clearer idea of the conditions the road or other means of com- munication had to comply with than the current term. In propor- tion to the numbers which have to be supplied by this line of communication its importance naturally increases. Thus whereas in 1870 the Germans on the Loire had a choice of magnificent main roads, even of canals and railroads, and if one were temporarily interrupted could switch off the current of supply to another without great inconvenience, the Russians in 1904 were tied to a single railway, any interruption of which must have paralysed altogether their vast army which ultimately numbered 400,000 mouths to be fed. It is clear, therefore, that the importance attaching to the protection of the line of communications must vary in accordance with the nature of the country in which war is carried on, the state of its communications of all sorts, the facility for establishing new ones, and the number of men depending for subsistence on any single road, railway, river or canal.

Line of Operations is a term applied to an imaginary line drawn from the centre of gravity of the army at the front to the country from which it originates. Whereas lines of communication, being dependent on the topographical conformation of the district may be highly circuitous; the line of operations is merely a general direction more convenient to keep in mind than the more complex idea

embodied in the former word. Since practically all supply flows to an army along its line or lines of communication, and without them it can only exist for a limited period, practically all situations that can arise in war can be referred to their possible consequences in endangering more or less either one's own communications or those of the enemy. An army is thus said to " form front to a flank " when its communications run parallel to the direction it assumes when facing the enemy (see diagram). It is clear that in case of a defeat at or near A the communications are most gravely endangered, hence no commander voluntarily assumes such a posi- tion "unless he is absolutely confident in the power of his troops to beat the enemy and by so doing places his antagonist in even a worse position in case of defeat. This he can only do by placing himself more or less astride his adversaries' communications, when the latter if beaten is ruined beyond retrieval. Thus in the Marengo campaign, in 1800, Napoleon, in placing himself astride the Austrian communications, was himself compelled to form front to a flank, but this was only possible because the geographical relation of the French and Italian frontiers enabled him from the outset of the campaign to aim a blow in the rear of his opponents' actual front. Under modern conditions such situations in war between two great land powers can hardly arise. The preliminary concentration of armies is arranged in peace in such a manner that both armies will always start with their communications perpendicularly behind^ them. Hence though the advantage which can be gained by defeating an army when forming front to a flank is equally great, it cannot be attained except by accepting a corresponding risk, and the same holds good if one army places itself astride the com- munications of another, e.g. the Germans at Gravelotte. But when a land army has to deal with a great sea power controlling the va,st mercantile navies of the present day, the latter being free to land wherever he pleases can compel his adversary to form front to a flank almost as he pleases. This was the advantage Wellington derived from sea power in the campaign of Vittoria (see Peninsular War), and there are many theatres of war in which the operation might be repeated nowadays, for though armies have grown ten- fold in numbers the means of carrying them with certainty and speed have increased in a yet greater ratio. As between land powers the question may be complicated when the frontier is formed by some great natural obstacle, a great river or range of mountains. There can be an almost infinite range of gradation between the imagin- ary line marked across a plain by boundary pillars, and the hard and fast distinction drawn between sea and land. The advantage, however, always lies on the side of the nation that possesses behind such barrier the better means of lateral

communications. Those on land can never be so good as the sea, but in proportion as they approach that ideal their possessor can transfer masses of men in complete security and comparative secrecy, to whichever portion of the frontier may suit his purpose best.

Exterior Lines. — When armies operate from several bases by lines converging on an army centrally situated as regards them, they are said to operate on exterior lines, and conversely the army operating from a centre against armies converging upon it is said to be acting on " interior lines." The question of the relative superiority of the one form or the other has been discussed above. It is only necessary to point out here that the question again is one of mobility in its widest sense, i.e. the mobility resulting from better communications both of intelligence, orders and the actual material forces by which war is made. Owing to the configuration of frontiers, it may be absolutely necessary to attack on exterior lines, but once the convergence these imply has been attained, and a victory won, the advantage of the form, which is derived from the superiority of communications at the disposal of the nation acting from the broader base, passes over to the defender, who destroying all railways, &c. in his retreat, compels the assailant to advance by route marching only, whereas as he, the defender, falls back within his own territory, he preserves unimpeded control over his own railways, and can thus transfer troops from one flank of the assailant to another, as the case may require.

Obstacles. — All obstacles, whether formed by rivers, marshes, forests or mountains, are of value in strategy only in so far as they delay the rapidity of communications by limiting the number of the available means of transport, whether roads or railways, and whatever angle they may form with the line of operations of the contending forces the advantage they offer falls entirely to the side that commands the exits of the defiles by which they are traversed on the farther side. When neither side commands such exits from the outset, the advantage falls to the side which can accumu- late first at the desired point of passage a sufficient fire superiority to cover his subsequent necessary operations; in the case of a. river, the building of one or several bridges ; in the case of a mountain range, the deployment of his advance-guard. In the former case there is no particular reason why the facilities of communication should be greater on one bank than the other. In the latter the

side which has to traverse the mountains (marsh or forest) will

always be at a disadvantage for the actual attack, but at an advantage in regard to the secrecy with which he can fall upon the point of his own choice, and the more secure his telegraph lines, the greater will this advantage be. (F. N. M.)

STRATFORD, JOHN DE (d. 1348), archbishop of Canter- bury, was born at Stratford-on-Avon and educated at Merton College, Oxford, afterwards entering the service of Edward II. He served as archdeacon of Lincoln, canon of York and dean of the court of arches before 1323, when he became bishop of Winchester, an appointment which was made during his visit to Pope John XXII. at Avignon and which was very much disliked by Edward II. In 1327 the bishop joined Queen Isabella's partisans; he drew up the six articles against Edward II., and was one of those who visited the captive king at Kenil- worth to urge him to abdicate in favour of his son. Under Edward III. he became a member of the royal council, but his high political importance dates from the autumn of 1330, the time when Roger Mortimer lost his power. In November of this year Stratford became chancellor, and for the next ten years he was actively engaged in public business, being the king's most prominent adviser and being politically, says Stubbs, the " head of the Lancastrian or constitutional party." In 1333 he was appointed archbishop of Canterbury and he resigned the chan- cellorship in the following year; however, he held this office again from 1335 to 1337 and for about two months in 1340. In November 1340 Edward III., humiliated, impecunious and angry, returned suddenly to England from Flanders and vented his wrath upon the archbishop's brother, the chancellor, Robert de Stratford. Fearing arrest John de Stratford fled to Canter- bury, and entered upon a violent war of words with the king, and by his firm conduct led to the establishment of the principle that peers were only to be tried in full parliament before their own order (en pleyn parlement et devant les piers). But good relations were soon restored between the two, and the archbishop acted as president of the council during Edward's absence from England in 1345 and 1346, although he never regained his former position of influence. His concluding years were mainly spent in the discharge of his spiritual duties, and he died at Mayfield in Sussex on the 23rd of August 1348.

John's brother, Robert de Stratford, was also one of Edward III.'s principal ministers. He served for a time as deputy to his brother, and in 1337 became chancellor and bishop of Chichester; he lost the former office in 1340 and died on the 9th of April 1362.

Ralph de Stratford, bishop of London from 1340 until his death at

Stepney on the 7th of April 1354, was a member of the same family. All three prelates were benefactors to Stratford-on-Avon.

STRATFORD, a city and port of entry of Ontario, Canada, and capital of Perth county, situated 83 m. W.S.W. of Toronto by the Grand Trunk railway, on the Avon river. Pop. (1901), 995a. The repair and engineering shops of the railway, flour-, saw- and woollen-mills, engine and agricultural implement works are the principal industries. A large export trade in cheese and other dairy and farm produce is carried on.

STRATFORD DE REDCLIFFE, STRATFORD CANNING, Viscount (1 786-1880), British diplomatist, was born in Clement's Lane in the city of London, on the 4th of November 1786. His father, Stratford Canning, uncle of George Canning (q.v.), had been disinherited for his marriage with Mehetabel Patrick. He settled in London as a merchant. On his death, six months after the birth of his son, his widow took a house at Wanstead near Epping Forest. Stratford Canning was educated first at a dame's school at Wanstead, then at Hackney, and after 1794 at Eton. In 1805 he was elected a scholar of King's College, Cam- bridge, but he only kept two terms, and in 1807 was appointed precis writer to the foreign office by his cousin George Canning. He received his degree in 1812, residence having been dispensed with on the ground that he was absent on the king's service. In 1807 he went as secretary to Mr Merry on a diplomatic mission to Copenhagen. In 1808 he was appointed first secretary to. Mr (afterwards Sir Robert) Adair, who was sent as ambassador to Constantinople. When Mr Adair was transferred to Vienna in 1810, Canning remained at Constantinople as chargi d'affaires. The British government was then in the very crisis of its struggle

with Napoleon, and it left Canning entirely to his own discretion. His principal task was to persuade the Turkish government not to show undue favour to the French privateers which swarmed in the Levant. In May 1812 he was able to play the part of " honest broker " in arranging the peace of Bucharest between Turkey and Russia, which left a powerful Russian army free to take part in repelling Napoleon's invasion. Canning was able to hasten the decision of the Turks, by making judicious use of Napoleon's plan for the partition of their empire. A copy of it had been left in his hands by Mr Adair to be used at the proper moment. In July he left Constantinople with the sincere desire never to return, for he was tired of the corrupt and stiff-necked Turkish officials. His ambition was to lead an active career at home. But his success in arranging the treaty of Bucharest had marked him out for diplomatic employment. His absence from

home in early youth and the independent position he had held much before the usual age, had in fact disqualified him for the career of a parliamentary party man. By the friendly intervention of Castlereagh, his cousin's old opponent, he received a pension, or rather a retaining fee, of £1200 a year, on the " usual conditions " — which were that he should bind himself to accept the next diplomatic post offered, and should not attempt to enter parliament. Canning spent his leisure in travel- ling about England, and he wrote some poetry which gained him the praise of Byron, whom he had known in boyhood, and had met in Constantinople. In 1814 he was appointed minister plenipotentiary to Switzerland. In this capacity he had a share in reorganizing the confederacy after the fall of the Napoleonic settlement, and he attended the congress at Vienna. He was an eye-witness of the dramatic change produced at Vienna by Napo- leon's return from Elba. Canning retained his post in Switzer- land till 1818. In 1816 he married Miss Harriet Raikes, daughter of a governor of the Bank of England. Her death in child-birth in 1818, had a strong influence in inducing him to resign his post, of which he was thoroughly tired. The British minister to Switzer- land had merely formal duties to perform in normal times, and the place was wearisome to a man of Canning's capacity and desire for work. In 1819 he was appointed minister at Washing- ton, a station of great difficulty owing to the ill-feeling created by the war of 18 12 and the many delicate questions outstanding between the British and the American governments. Canning, whose naturally quick temper had been developed by early independence, came into occasional collision with John Quincy Adams, the American secretary of state, who was, on his. own showing, by no means of a patient disposition. Yet the American statesman recognized that the " arrogance " of the British minister was combined with absolute candour and that he wa £ above all petty diplomatic trickery. They parted with mutual respect. Canning returned to England in 1823 on leave and did not go back to Washington. The general treaty he had arranged with Mr Adams was rejected by the United States Senate.

In 1824 Canning was selected as ambassador to Turkey, and proceeded to Constantinople after a preliminary visit to Vienna and St Petersburg. In the Russian capital he »was engaged in discussing the arrangement of the Alaska boundary, and partly in sounding the Russian government as to the course to be taken with the Greek revolt against Turkey. He left for Constantinople in October 1825, accompanied by his second wife, the daughter of Mr Alexander of Somerhill near Tonbridge. At Constantinople he was engaged with the ambassadors of France and Russia in an enterprise which he

afterwards recognized as having been hopeless from the beginning — namely in endeavouring to induce Sultan Mahmud II. to make concessions to the Greeks, without applying to him the pressure of armed force. After tlie battle of Navarino (q.v.) on the 20th of October 1827, the ambassadors were compelled to retire to Corfu. Here Canning learned that his conduct so far had been approved, but as he desired to know what view was taken of the final rupture with the Porte he came home. He was sent out again on the 8th of July 1828. Canning did not agree on all points with his superior, Lord Aberdeen, and in 1829 he, for the time being, turned from diplomatic to

parliamentary life. He sat for Old Sarum, for Stockbridge (rotten boroughs) and for Southampton, but did not make much mark •in 'parliament. He was twice absent on diplomatic missions. At the end of 183 1 he went to Constantinople to attend the conferences on the delimitation of the Greek frontier, arriving immediately after the receipt of the riews of Mehemet Ali's invasion of Syria (see Mehemet Ali). Sultan Mahmud now proposed to Canning an alliance between Great Britain and Tur- key, and Canning strongly urged this upon Palmerston, pointing out the advisability of helping the sultan against Mehemet Ali in drder to forestall Russia, and of at the same time placating Mehemet Ali by guaranteeing him certain advantages. This advice, which largely anticipated the settlement of 1841, was not followed ; but Canning himself was in high favour with the sultan, from whom he received the unique distinction of the sovereign's portrait set in diamonds. In 1833 he was selected as ambassador t6 Russia, but the tsar Nicholas I. refused to receive him. The story that the tsar was influenced by merely personal animosity seems to be unfounded. Nicholas was no doubt sufficiently informed as to the peremptory character of Sir Stratford Canning (he had been made G.C.B. in 1828) to see his unfitness to represent Great Britain at a really independent court.

■ *After Canning had declined the treasurership of the Household and the governor-generalship of Canada, he was again named ambassador at Constantinople. He reached his post in January 1842 and retained it till his resignation in February 1858. His tenure of office in these years was made remarkable — first by his constant efforts t6 induce the Turkish government to accept reform and to conduct itself with humanity and decency; then by the Crimean War*

{q.v.). Canning had no original liking for the Turks. He was the first to express an ardent hope that they would be expelled from Europe with " bag and baggage " — a phrase made popular in after times by Gladstone. But he had persuaded himself that under the new sultan Abd-ul- Mejid they might be reformed, and he was willing to play the part of guiding providence. He certainly impressed himself on the Turks, and on all other witnesses, as a strong personality. In particular he struck the imagination of Kinglake, the author of the Invasion of the Crimea. In that book he appears as a kind of magician who is always mentioned as the " great Elchi " and who influences the fate of nations by mystic spells cast on pallid sultans. Great Elchi is the Turkish title for an ambassador, and Elchi for a minister plenipotentiary. The use made of the exotic title in Kinglake's book is only one of the Corinthian ornaments of his style. In sober fact Canning's exertions on behalf of reform in Turkey affected little below the surface. His share in the Crimean War cannot be told here. On the fall of Palmerston's ministry in February 1858 he resigned, and though he paid a complimentary farewell visit to Constantinople, he had no further share in public life than the occasional speeches he delivered from his place in the House of Lords. He had been raised to the peerage in 1852. During his later years he wrote several essays collected under the title of The Eastern Question (London, 1881)! In 1873 he published his treatise, Why I am a Christian, and in 1876 his play, Alfred the Great at Athelney. The only son of his second marriage died before him. His wife and two daughters survived him. Lord Stratford died on the 14th of August 1880, and was buried at Frant in Sussex. A monument to him was erected in Westminster Abbey in

1884.

See Life of Lord Stratford de Reddiffe, by S. Lane Poole (London,

*1*88).*

STRATFORD-ON-AVON, a market town and municipal borough in the Sfratford-on-Avon parliamentary division of Warwick- shire, England; on a branch line of the Great Western railway and on the East & West Junction railway, in connexion with which it is served from London by the Great Central (925 m.) and the London & North-Western railways. Pop. (1901), 8310. The town lies mainly on the right (west) bank of the Avon. The neighbourhood, comprised in the rich valley of the Avon, is beautiful though of no considerable elevation. The river

flows in exquisite wooded reaches, navigable only for small boats. The Stratford-on-Avon canal communicates with the Warwick and Birmingham canal. The river is crossed at Stratford by a stone bridge of 14 arches, built by Sir Hugh Clopton in the reign of Henry VII. The church of the Holy Trinity occupies the site of a Saxon monastery, which existed before 691, when the bishop of Worcester received it in exchange from Ethelred, king of Mercia. It is beautifully placed near the river, and is a fine cruciform structure, partly Early English and partly Perpendicular, with a central tower and lofty octagonal spire. It was greatly improved in the reign of Edward III. by John de Stratford, who rebuilt the south aisle. He also in 1332 founded a chantry for priests, and in 13 51 Ralph de Stratford built for John's chantry priests " a house of square stone," which came to be known as the college, and in connexion with which the church became collegiate. The present beautiful choir was built by Dean Balshall (1465-1491), and in the reign of Henry VII. the north and south transepts were erected. A window commemo- rates the Shakespearian scholar J. O. Halliwell-Phillipps. The foundation of the chapel of the gild of the Holy Cross was laid by Robert de Stratford. The gild, to which both sexes were admitted, was in existence early in the 13 th century, and it was incorporated by a charter from Edward III. in 1322. It was dissolved in 1547. The guildhall is a picturesque half-timbered building. A beautiful house of the 16th century belonged to one Thomas Rogers, whose daughter was mother of John Harvard, the founder of Harvard College, U.S.A. Among public buildings are the town hall, originally dated 1633, rebuilt 1767, and altered 1863; market house, corn exchange and three hospitals. There are recreation grounds. Brewing is carried on, but the trade is principally agricultural. Area, 4013 acres.

Shakespearian Connexion.— To no town has the memory of one famous son brought wider notoriety than that which the memory of William Shakespeare has brought to Stratford; yet this notoriety sprang into strong growth only towards the end of the 1 8th century. The task of preserving for modern eyes the buildings which Shakespeare himself saw was not entered upon until much of the visible connexion with his times had been destroyed. Yet the town is under no great industrial or other modernizing influence, and therefore stands in the position of an ancient shrine, drawing a pilgrimage of modern origin. The plan of Shakespeare's Stratford at least is preserved, for the road crossing Clopton's bridge is an ancient highway, and forks in the midst of the town into three great branches, about which: the village grew up. The high cross no longer stands at the market- place where these roads converged. But the

open space where is now a memorial fountain was the Rother market, and Rother Street preserves its name. The word signifies horned cattle, and is found in Shakespeare's own writing, in the restored line " It is the pasture lards the rother's sides " (Titnon of Athens), where " brother's " was originally the accredited reading. In Henley Street, close by, is the house in which the poet was bprn, greatly altered in external appearance, being actually two half-timbered cottages connected. A small apartment is by imme- morial tradition shown as his birth-room, bearing on its white- washed walls and its windows innumerable signatures of visitors, among which such names as Walter Scott, Dickens and Thacke- ray may be deciphered. Part of the building, used by the poet's father as a wool-shop, is fitted as a museum. Shakespeare may have attended the grammar school attached to the old guildhall in Church Street. This was a foundation in connexion with the gild of the Holy Cross, but was refounded after the dissolution by King Edward VI. in 1553, and bears his name. The site of Shakespeare's house, New Place, bought by him in 1597, was acquired by public subscription, chiefly through the exertions of J. 0. Halliwell-Phillipps, and was handed over to the trustees of the birthplace in 1876. The house was built by Sir Hugh Clopton. Shakespeare acquired a considerable property adja- cent to it, retired here after his active life in London, and here died. Sir John Clopton destroyed the house in 1702 (as it had reverted to his family), and the mansion he built was in turn destroyed by Sir Francis Gastrell in 1759. The site, which is

traceable, is surrounded by gardens. Shakespeare is buried in the chancel of Holy Trinity church, his wife lying next to him. The slab over the poet's grave bears the lines beginning " Good friend, for Jesus' sake forbeare To digg the dust enclosed heare " ;

while the effigy on the mural monument above may well be an authentic representation, though somewhat altered and damaged by time and restoration (see Shakespeare: Portraits).

Apart from the interest attaching to the pleasant country town and its pastoral environment, through their influence trace- able in Shakespeare's writings, there are further connexions with himself and his family to be found. The house adjacent to New Place known as Nash's house was that of Thomas Nash, who married Shakespeare's granddaughter Elizabeth Hall; it is used as a museum. At Shottery, i m. west of Stratford, is the picturesque thatched cottage in which Shakespeare's wife, Anne Hathaway, was born. It was purchased for the nation in 1892. The maiden name of the poet's mother was Mary Arden, and this name, that of an ancient county family, survives in the district north-west of Stratford, the Forest of Arden, though the true forest character is long lost. At Snitterfield to the north, where the low wooded hills begin to rise from the valley, lived Shakespeare's grandfather and uncle.

The principal modern monument to the poet's memory in Stratford is the Shakespeare Memorial, a semi-Gothic building of brick, stone and timber, erected in 1877 to contain a theatre, picture gallery and library. A performance of one of the plays is given annually. The memorial stands by the river above the church, and above again he the Bancroft or Bank croft gardens where, in 1769, a celebration in honour of the poet was organized by David Garrick. Evidence of the intense interest taken by American visitors in Stratford is seen in the memorial fountain and clock-tower presented in 1887, and in a window in the church illustrating scenes from the Incarnation and containing figures from English and American history.

History. — Stratford-on-Avon (Stradforde, Strafford, Strafford- on-Avon) is a place of great antiquity. A Roman road may have run past the site; coins, &c, have been found, and the district at any rate was inhabited in Roman times. The manor was granted by King Off a to the bishopric of Worcester; and it was under the protection of the bishops of Worcester, who were grant- ing them privileges as early as the reign of Richard I., that the inhabitants of the town assumed burghal rights at an early date. The Gild of the Holy Cross, founded

in the 13th century for the support of poor priests and others, exercised great authority over the town for many years. Its dissolution was the cause of the incorporation charter of Edward VI. in 1553, by which the town was incorporated under the title of the bailiff and burgesses, who were to bear the name of aldermen. Another charter, confirming former liberties but altering the constitution of the corporation, was granted in 161 1. By the charters of 1664 and 1674 the corporation was given the title of mayor, aldermen and burgesses. The governing body now consists of a mayor, 6 aldermen and- 18 councillors. A market, formerly held on Thursdays by a grant of 1309, is now held on Fridays. The various trades of weaving, saddlery, glove-making, collar- making, candle-making and soap-making were carried on during the 16th, 17th and 18th centuries, but have lost their importance.

STRATHAVEN (locally pronounced Strgvn), a manufacturing and market town of Lanarkshire, Scotland. Pop. (1901), 4076. It lies on the Avon, 16 m. S.S.E. of Glasgow by road, and is the terminus of the Caledonian Railway Company's branch line from Hamilton. It has manufactures of silk, cotton and hosiery and is a market for cheese and grain. The picturesque ruins of Avondale Castle are situated on Powmilion Burn, a stream that runs through Strathaven to join the Avon, a mile below the town. Remains of a Roman road are traceable for several miles immedi- ately to the south of the Avon. Stonehouse (pop. 2961), a mining and weaving town about 4 m. north-west, is claimed as the birthplace of the Scottish martyr, Patrick Hamilton (1504-1528). Six miles south-west of Strathaven, on the

moor of Drumelog, the Covenanters defeated John Graham of Claverhouse, Viscount Dundee, on the 1st of June 1679. A granite obelisk commemorates the battle, but the religious meetings that used to take place on the anniversary are no longer held.

STRATHCLYDE, the name given in the 9th and 10th centuries to the British (Welsh) kingdom, which from the 7th century onwards was probably confined to the basin of the Clyde, together with the adjacent coast districts, Ayrshire, &c, on the west of Scotland. Its capital was Dumbarton (fortress of the Britons), then known as Alclyde. On the south this kingdom bordered on the territories of the Niduari Picts of Galloway, including the modern counties of Wigtown and Kirkcudbright, a region which from the middle of the 7 th century seems to have been in the possession of the Northumbrians. Strathclyde is also sometimes called Cumbria, or Cumberland, and the survival of the latter name on the English side

of the border preserves the memory of a period when the territories of the northern Welsh were of much greater extent, though it is perhaps not certain that the race possessed political unity at that time. Of the origin of the kingdom of the North Britons we have no information, but there seems little reason to doubt that they were the dominant people in southern Scotland before the Roman invasion.

After the withdrawal of the Romans in the 5th century'the northern Britons seem to have 'shown greater determination in maintaining their independence than any of the southern kingdoms and, according to Welsh tradition, Cunedda, the ancestor of the kings of Gwynedd, had himself come from the north. In the Historia brittonum we read of several princes of the northern Britons. The chief of these appear to have been Urien, who is said to have fought against- the Northumbrian king Theodoric, and Rhydderch Hen who is mentioned also in Adamnan's Life of S. Columba. Rhydderch Hen appears to have secured the supremacy amongst these Welsh princes after the great battle of Ardderyd fought about the year 573, to which frequent reference is made in early Welsh poetry. His death seems to have taken place in 603. A late authority states that he was succeeded by his son Constantine, but the subsequent kings were descended from another branch of the same family.

Such notices as we have of the history of Strathclyde in the 7 th and 8th centuries are preserved only in the chronicles of the surrounding nations and even these supply us with little more than an incomplete record of wars with the neighbouring Scots, Picts and Northumbrians. It is probable that the Britons were allied with the Scots when Aidan, the king of the latter, invaded Northumbria in a.d. 597. In 642, however, we find the two Celtic peoples at war with one another, for in that year the Britons under their king Owen defeated and slew the Scottish king Domnall Breac. In the same year they came into conflict with the Northumbrian king Oswio. In 649 there appears to have been a battle between the Britons and the Picts, but about this time the former must have become subject to the Northumbrian kingdom. They recovered their independence, however, after the defeat of Ecgfrith by the Picts in 685. In 711 and again in 717 we hear of further wars between the Britons and the Scots of Dalriada, the former being defeated in both years. Towards the middle of the 8th century Strathclyde was again threatened by an alliance between the Northumbrians and Picts, and in 750 the Northumbrian king Eadberht wrested from them a consider- able part of their territories in the west including Kyle in Ayr- shire. In 756 the North Britons are said to have been forced into submission and from this time onwards we hear very little of their history, though

occasional references to the deaths of their kings show that the kingdom still continued tp exist.

In 870 Dumbarton was attacked and destroyed after four months' siege by the Scandinavian king Ivarr, and for some time after this the country was exposed to ravages by the Norsemen. It is believed that the native dynasty came to an end early in the 10th century and that the subsequent kings belonged to a branch of the Scottish royal family. At the end of the reign of Edward the Elder (925) the Britons of Strathclyde submitted to that king together with all the other princes of the north.

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STRATHGONA AND MOUNT ROYAL, BARON

In the reign of his successor ˆEthelstan, however, they joined with the Scots and Norwegians in attempts to overthrow the English supremacy, attempts which were ended by their defeat at the battle of Brunanburh in 937. In 945-46 Strathclyde was ravaged by King Edmund and given over to the Scottish king Malcolm I. The fall of the kingdom was only temporary, for we hear of a defeat of the Scottish king Cuilean by the Britons in 971. In the nth century Strathclyde appears to have been finally incorporated in the Scottish kingdom, and the last time we hear of one of its kings is at the battle of Carham in 1018 when the British king Owen fought in alliance with Malcolm II. The following is a list of kings whose names are mentioned in the chronicles : —

Rhydderch Hen d. 603

Constantine son of Rhydderch (?) —

Iudruis (?) d. 633

Owain (Eugein) d. 642

Gwraid (Gureit) d. 658

Dyfnwal (Domhnall), son of Owain .... d. 694

Beli, son of Elphin d. 722

Tewdwr (Teudubr), son of Beli d. 750

Dyfnwal (Dannagual), son of Tewdwr . . . d. 760

Cynan, son of Ruadrach d. 816

Artgha d. 872

Run, son of Artgha d. before 878 (?)

Dyfnwal (Donevaldus) d. 908

Dyfnwal (Donevaldus) , son of Ede (Aedh) Owain d. 934 Dyfnwal (Domhnall), son of Boghain (on pilgrimage) d. 975

Malcolm, son of Dyfnwal d. 997

Owain (Eugenius) 1018

See Chronicles of the Picts and Scots, edited by W. F. Skene (Edinburgh, 1867); W. F. Skene, Celtic Scotland (Edinburgh, 1876); and Sir John Rhys, Celtic Britain (London, 1904).

(F. G. M. B.)

STRATHCONA AND MOUNT ROYAL, DONALD ALEX- ANDER SMITH, Baron (1820-), Canadian statesman and financier, was born at Forres, Scotland, on the 6th of August 1820, the second son of Alexander Smith (d. 1850), a Highland merchant. His mother, Barbara Stewart, of Abernethy, was the sister of John Stewart (d. 1847), a famous fur trader in the Canadian North-West, who gave his name to Stewart Lake and Stewart river. Through him Donald Smith was appointed in 1838 a junior clerk in the Hudson's Bay Company, which at that time controlled the greater part of what is now the Dominion of Canada. Smith was sent to Labrador, and stationed at Hamilton Inlet. For thirteen years he roughed it there, mastering the work of the fur trade, introducing various improvements into the conditions of life, being the first to prove that potatoes and other vegetables could be grown with success on that bleak coast, and varying his business routine with much reading and letter- writing. Then he was for ten years on Hudson Bay, rising in the company's service to be a chief trader and then a chief factor. In 1868 he was appointed to the post of resident governor, with headquarters at Montreal. In the next year Louis Riel's (q.v.) re- bellion broke out on the Red river, caused chiefly by the transfer of territorial rights from the company to the Dominion of Canada, and in December Smith was sent by the Canadian govern- ment with wide powers as special commissioner to endeavour to cheek the rebellion, and to report " on the best mode of quieting and removing such discontent and dissatisfaction." On arriving at Fort Garry (now

Winnipeg) he advised the government that it would be necessary to send troops; in the meanwhile he kept cool in face of a very ugly situation, and it was largely owing to his tact and diplomacy that the lives of the numerous prisoners were saved, that Riel's position was gradually undermined and that the relief expedition under Colonel (afterwards Lord) Wolseley had no fighting to do. Apart from the rebellion, there was difficulty with the company's traders. The company's control over the North-West was to be surrendered to Canada for £300,000, certain grants of lands and certain trading privileges, and the traders on the spot feared that in the distribution of the money their rights might not be guarded, but Smith succeeded in persuading them to trust him to secure their share, and asserted their claims so effectually that £107,000 was paid to them. During these complications in the North-West he occupied for a time the position of acting governor: in December 1870. on the

first election to the legislative assembly of the new province of Manitoba, he was returned for Winnipeg; and iD March 1871, after a very bitter contest, he was elected as one cf the four Manitoba representatives to the Dominion House of Commons, as member for Selkirk. The reorganization of the Hudson's Bay Company in 187 1 — involving the loss of its administrative func- tions and its restriction to questions of trade only — made it necessary to appoint a chief commissioner for the North-West, and in 187 1 Smith received the appointment when in London, after his championship of the claims of the local traders. At Ottawa he at once became the spokesman of the new territories, though for a time subject to the suspicion of those who thought that the company had done too little to assist the Canadian government against Riel, and he was frequently attacked in parliament and out of it on various charges. In 1872 he became one of the original members of the first North-West council under the act providing for the government of the territories by the lieutenant-governor of Manitoba and a council of eleven.

It was at this time that the construction of the Canadian Pacific railway became a practical question. The terms of the entrance of British Columbia into the Dominion in 1871 included a stipulation for the immediate beginning of a railway from the Pacific towards the Rocky Mountains, and from a point to be selected east of the Rockies towards the Pacific; this line, connecting the Pacific seaboard with eastern Canada, was to be completed within ten years from the date of union. After a controversy on the merits of private or government construction, in 187 2 a charter was given by Sir John Macdonald's government to a company, with Sir Hugh Allan at

its head, for the construction of the line, with a subsidy in land grants and money, but in 1873 disclosures of corrupt practices in relation to this charter (the so-called Pacific Scandal) led to the fall of the government, and the company was soon afterwards dissolved. In the great debate which ended in the resignation of the govern- ment, one of the chief causes of its downfall was a moderate but powerful speech by Smith, which led to a temporary estrange- ment between him and Macdonald. The Liberal government which came into power early in 1874 reverted, though timidly, to the policy of government ownership.

Meanwhile Donald Smith, together with his cousin Mr George Stephen (afterwards Lord Mountstephen) , and other Canadian and American financiers, had bought out the Dutch bondholders of the insolvent St Paul & Pacific railway, an American line, which by 1873 had been completed from St Paul to Breckenridge, but which lacked funds to proceed farther. After long negotia- tions the new owners persuaded the government of Manitoba to build a line from Winnipeg to Pembina on the American frontier. This done, in 1879 the partners formed the St Paul, Minneapolis & Manitoba Railway Company, and by continuing the line from Breckenridge to Pembina united Manitoba with the south and west.

In 1878 the Liberal party was defeated, and Sir John Macdonald returned to office with the support of Smith, who had been driven to rejoin the Conservatives by the over-cautious railway policy of the Liberals. In 1880 the new government made a contract for building the railway with a syndicate of which Stephen was the chief director, and in which Smith, from the first largely interested, came more and more to the front. Both were prominent directors of the Bank of Montreal, and employed its resources in the work without hesitation. Smith also embarked in the work the whole of his private fortune, and it was his dogged perseverance which more than anything else enabled the company to bring its work to a successful conclusion. The contract allowed ten years for the completion of the line, but such energy was shown that on the 7th of November 1885, at Craigellachie in the Rocky Mountains, Donald Smith drove home the last spike of the first Canadian transcontinental railway. In 1882 he left parliament, but re- turned to it in 1887, and represented Montreal West till 1896, when he was appointed to succeed Sir Charles Tupper in London as high commissioner for Canada. In that year he was made G.C.M.G.; in 1897 he was raised to the peerage and in 1909 made G.C.V.O. In 1889 he became governor of the Hudson's Bay

Company. On the 21st of March 1896 he was appointed government commissioner to Manitoba and the Territories to endeavour to lessen the bitterness in the discussion as to Roman Catholic rights in the public schools, and the compromise of 1897 followed the lines which he suggested (see Canada).

In January 1000, during the war in South Africa, he raised, equipped and presented to the British government a regiment of irregular cavalry 600 strong. Strathcona's Horse, as it was called, was recruited in the Canadian West, and did good service during the war. Though this was perhaps the most striking of the many services which his great wealth enabled him to do for Canada and the British Empire, he left no side of Canadian life untouched. With his cousin, Lord Mountstephen, he founded and endowed the Royal Victoria Hospital in Montreal, and both in Canada and in Scotland gave largely and wisely to university work. He was the backbone of the emigration policy which from 1896 on did much to increase the population and the prosperity of Canada. He helped in the improvement of the waterways of the Canadian West, and in placing steamers on them, and gave much assistance to the proposed All Red Route of British-owned steamers, encircling the world. From the first he was a member of the Pacific Cable Board, controlling the cable laid in 1902 by the combined governments of Great Britain, Canada and Australia. No man did more to tighten the ties which bind Canada to the British Empire.

The Life by Beckles Willson contains some useful information. The Histories of the Hudson's Bay Company by Beckles Willson, Rev. George Bryce and Miss Agnes C. Laut tell his early struggles. Sir Wilfrid Laurier (2 vols.), by J. S. Willison, describes the financial dealings between the Canadian government and the Canadian Pacific railway. His parliamentary speeches are in the Canadian Hansard. (W. L. G.)

STRATHNAIRN, HUGH HENRY ROSE, ist Baron (1801- 1885), British field-marshal, third son of the Right Hon. Sir George Henry Rose of Sandhills, Christchurch, Hampshire (minister plenipotentiary at the Prussian court), was born at Berlin on the 6th of April 1801. He was educated at Berlin, and received military instruction at the cadet school. He entered the 93rd Sutherland Highlanders as an ensign on the 8th of June 1820, but was transferred to the 19th Foot,

then quartered in Ireland, and took part in preserving order during the " Ribbon " outrages. He was promoted rapidly, to a lieutenancy in 1821, a captaincy in 1824, and an unattached majority at the end of 1826. He was brought into the 92nd Highlanders as a regimental major in 1829, and the following year was appointed equercy to H.R.H. the duke of Cambridge. The 92nd Highlanders were in Ireland, and Rose again found himself employed in maintaining law and order. He rendered important services in suppressing disaffected meetings, but his conduct was so courteous to the ringleaders that he incurred no personal hostility. In 1833 he accompanied his regiment to Gibraltar, and three years later to Malta, where he exerted himself with so much zeal during a serious outbreak of cholera in attending to the sick soldiers that his conduct elicited an official approval from the governor and commander-in-chief. In 1839 he was promoted, by purchase, to an unattached lieutenant-colonelcy. In the following year Rose was selected, with other officers and detachments of Royal Artillery and Royal Engineers, for special service in Syria under the orders of the foreign office. They were to co-operate on shore, under Brigadier-General Michell, R.A.— in conjunction with the Turkish troops — with the British fleet on the coast, for the expulsion of Mehemet Ali's Egyptian army from Syria. Sir Stratford Canning sent Rose from Constantinople on a diplo- matic mission to Ibrahim Pasha, commanding the Egyptian army in Syria, and after its execution he was attached, as deputy adjutant-general, to the staff of Omar Pasha, who landed at Jaffa with a large Turkish force from the British fleet. Rose distinguished himself in several engagements, and was twice wounded at El Mesden in January 1841. He was mentioned in despatches, and received from the sultan the order of Nishan Iftihar in diamonds, the war medal and a sabre of honour. The king of Prussia sent him the order of St John, and expressed his pleasure that " an early acquaintance " had so gallantly dis-

tinguished himself. Shortly after he succeeded to the command of the British detachment in Syria with the local rank of colonel, and in April 1841 he was appointed British consul-general for Syria. For seven years, amidst political complications and intrigues, Rose, by his energy and force of character, did much to arrest the horrors of civil war, to prevent the feuds between the Maronites and Druses coming to a head, and to administer justice impartially. On one occasion in i84i,when he found the Maronites and Druses drawn up in two lines and firing at each other, he rode between them at imminent risk to his life, and by the sheer force of a stronger will stopped the conflict. In the first year of his appointment his action saved the lives of several hundred Christians at Deir el Khama, in the

Lebanon, and his. services were warmly recognized by Lord Aberdeen in the House of Lords, and he was made C.B. In 1845, by his promptness and energy, at great personal risk, he rescued 600 Christians belonging to the American mission at Abaye, in the Lebanon, from the hands of the Druses, and brought them to Beirut. In 1848, during the outbreak of cholera at Beirut, he was most devoted in his attention to the sick and dying.

At the end of this year he left Syria on leave of absence, and did not return, as Lord Palmerston appointed him secretary of embassy at Constantinople in January 1851. In the following year he was charge d'affaires in the absence of Sir Stratford Canning during the crisis of the question of the " holy places," and he so strengthened the hands of the Porte by his determined action that the Russian attempt to force a secret treaty upon Turkey was foiled. During the war with Russia in 1854-56 Rose was the British commissioner at the headquarters of the French army, with the local rank of brigadier-general. At Varna he succeeded in quenching a fire which threatened the French small-arm ammunition stores, and received the thanks of Marshal St Arnaud, who recommended him for the Legion of Honour. He was present at the battle of the Alma, and was wounded on the following day. At Inkerman he reconnoitred the ground between the British and French armies with great sang-froid under a withering fire from the Russian pickets, and his horse was shot under him. He distinguished himself on several other occasions in maintaining verbal communication between the allied forces, and by his tact and judgment contributed to the good feeling that existed between the two armies. His services were brought to notice by the commanders-in-chief of both armies, and he received the medal with three clasps and the thanks of parliament, was promoted to be major-general, and was made K.C.B. and commander of the Legion of Honour. On tie outbreak of the Indian Mutiny in 1857 Rose was given command of the Poona division. He arrived in September, and shortly after took command of the Central India force. In January 1858 he marched from Mhow, captured Rathgarh after a short siege, and defeated the raja of Banpur near Barodia in the same ˆ month. He then relieved Saugor, captured Garhakota and the fort of Barodia, and early in March defeated the rebels in the Madanpur Pass and captured Madanpur and Chanderi. He arrived before Jhansi on the 20th of March, and during its investment defeated a relieving force under Tantia Topi at the Betwa on the ist of April. Most of Rose's force was locked up in the investment, and to Tantia Topi's army of 20,000 he could only oppose 1590 men; yet with this small force he routed the enemy with a less of 1500 men and all their

stores. Jhansi was stormed and the greater part of the city taken on the 3rd, and the rest the follow- ing day, and the fort occupied on the 5th. Kunch was captured, after severe fighting in a temperature of 1 io° in the shade, on the 7th of May. Rose himself was only able to hold out by medical treatment, and many casualties occurred from the great heat. Under the same conditions the march was made on Kalpi. The rebels came out in multitudes on the 22nd of May to attack his small force, exhausted by hard marching and weakened by sickness, but after a severe fight under a burning sun, and in a suffocating hot wind, were utterly routed and Kalpi occupied the following day. Having completed his programme, Rose obtained sick leave, and Sir Robert Napier (q.v.) was appointed to succeed him, when news came of the defection of Sindhia's troops and th$

occupation of Gwalior by Tantia Topi. Rose at once resumed command and moved on Gwalior by forced marches, and on the 16th of June won the battle of Morar. Leaving Napier there, he attacked Gwalior on the 19th, when the city was captured. The fortress was stormed and won the following day, and Napier gained a signal victory over the flying enemy at Jaora-Alipur on the 22nd. Rose then made over the command to Napier and returned to Poona. It was to Rose's military genius that the suppression of the Indian Mutiny was largely due; but owing to official jealousy his outstanding merit was not fully recognized at the time. For his services he received the medal with clasp, the thanks of both houses of parliament, the regimental colonelcy of the 45th Foot, and was created G.C.B. By a legal quibble the Central India force, after protracted litigation, was not allowed its share of prize-money, a loss to Rose of £30,000. Rose was promoted lieutenant-general for his " eminent services " in February i860, and the next month was appointed commander- in-chief of the Bombay army, and on the departure of Lord Clyde from India in the following June he succeeded him as commander- in-chief in India. During his tenure of the command-in-chief Rose improved the discipline of the army, while his powerful assistance enabled the changes consequent upon the amalga- mation of the East India Company's army with the Queen's army to be carried out without friction. He was created K.C.S.I. in 1861 and G. C.S.I, on the enlargement of the order. On his return home he was made an honorary D.C.L. of Oxford University.

Rose held the Irish command from 1865 until 1870, was raised to

the peerage in 1866 as Baron Strathnairn of Strathnairn and Jhansi, transferred to the colonelcy of the 92nd Foot, and ap- pointed president of the army transport committee. By a good organization and disposition of the troops under his command in 1866 and 1867 he enabled the Irish government to deal successfully with the Fenian conspiracy. He was promoted general in 1867. On relinquishing the Irish command he was made an honorary LL.D. of Trinity College, Dublin. For the rest of his days he lived generally in London. He was gazetted to the colonelcy of the Royal Horse Guards in 1869, and pro- moted to be field marshal in June 1877. He died in Paris on the 1 6th of October 1885, and was buried with military honours in the graveyard of the Priory Church, Christchurch, Hampshire. An equestrian bronze statue, by E. Onslow Ford, R.A., was erected to his memory at Knightsbridge, London. He was never married.

See Sir Owen Tudor Burne, Clyde ana Strathnairn," Rulers of India Series" (1891). (R. H. V.)

STRATHPEFFER, a village and spa of the county of Ross and Cromarty, Scotland, 5 m. W. of Dingwall by a branch of the Highland railway. Pop. (1901), 354. It lies in a valley of varying elevation (200 to 400 ft. above the sea), but is sheltered on the west and north and has a comparatively dry and warm climate. There are several sulphurous springs — one saline, another strongly impregnated with sulphuretted hydro- gen — in great repute for gout, rheumatism, skin diseases and affections of the liver and kidneys. The well of effervescent chalybeate water is largely resorted to for anaemia and as a tonic. A peat bath, similar to those at Franzensbad in Bohemia, has also been established. The season runs from May to October, and during the past few years Strathpeffer has become a very popular resort. The pump-room (1829) and pavilion (1881) are situated in the middle of the village. Castle Leod (pron. Loud), a seat of the countess of Cromartie, upon whose pro- perty Strathpeffer is built, lies a mile to the north and is an example of the Scots Baronial style dating from 1660. The village was the scene of the fight between the MackenzieS and Macdonalds in 1478, and later between the Mackenzies and the Munros. The Mackenzies prevailed in both encounters. The ascent of Ben Wyvis (3429 ft.) is commonly made from Strathpeffer.

STRAUBING, a town of Germany, in the kingdom of Bavaria, pleasantly situated in a fertile plain, on the right bank of the Danube, here crossed by two bridges, 25 m. S.E. of Regensburg,

on the railway to Passau. Pop. (1905), 20,856, nearly all of whom

are Roman Catholics. Its oldest and most characteristic building is the tall square tower with its five pointed turrets, dating from 1208. It has eight Roman Catholic churches, among them being the church of St James, a handsome Late Gothic edifice, with some paintings ascribed to Wohlgemuth; the old Carmelite church containing a monument to Duke Albert II. of Bavaria; and that of St Peter with the tomb of Agnes Bernauer. It has also a Gothic townJiall, a castle, now used as barracks, and two fine squares. The numerous educational establishments include a gymnasium, an episcopal seminary for boys and a normal school. The industries of Straubing are tanning and brewing, the manufacture of bricks and cement, and trade in grain and cattle. Straubing is a town of remote origin, believed to be identical with the Roman station of Sorbiodurum. In definite history, however, it is known only as a Bavarian town, and from 1353 to 1425 it was the seat of the ducal line of Bavaria-Straubing. Its chief historical interest attaches to its connexion with the unfortunate Agnes Bernauer (q.v.), who lived at the chateau here with her husband Duke Albert III.

See Wimmer, Sammelblatter zur Geschichte der Stadt Straubing (Straubing, 1882-1884), and Ortner, Straubing in seiner Vergangenheit und Gegenwart (Straubing, 1902).

STRAUS, LUDWIG (1835-1899), Austrian violinist, was born at Pressburg on the 28th of March 1835. He studied at the Vienna Conservatorium from 1843 to 1848, as a pupil of Bohm; made his first appearance in 1850, and five years afterwards made a tour in Italy; in 1857 he became acquainted with his lifelong friend, the 'cellist Piatti, and toured with him in Ger- many and Sweden. From i860 to 1864 he was concert-meister at Frankfort, and during these years he visited England fre- quently, in the year 1864 taking up his residence there. He was for many years leader of Halle's orchestra in Manchester, and a familiar figure at the Popular Concerts in London. He was first violin in the Queen's Band. He retired, owing to ill health, in 1893, and from that time till his death, on the 23rd of October 1899, lived at Cambridge. His playing, whether of violin or viola, had very great qualities; he was perfect in ensemble, and his power of self-effacement was of a piece with his gentle disposition and with the pure love of art which distinguished him through life. A more lovable nature never existed, and his quiet influence on the art of his time was very great.

STRAUSS, DAVID FRIEDRICH (1808-1874), German theo- logian and man of letters, was born at Ludwigsburg, near Stuttgart, on the 27th of January 1808. In his thirteenth year he was sent to the

evangelical seminary at Blaubeuren, near Ulm, to be prepared for the study of theology. Amongst the principal masters in the school were Professors Kern and F. C. Baur, who infused into their pupils above all a deep love of the ancient classics. In 1825 Strauss passed from school to the university of Tubingen. The professors of philosophy there failed to interest him, but he was strongly attracted by the writings of Schleiermacher, which awoke his keen dialectical faculty and delivered him from the vagueness and exaggerations of romantic and somnambulistic mysticism. In 1830 he be- came assistant to a country clergyman, and nine months late,r accepted the post of professor in the high school at Maulbronn, having to teach Latin, history and Hebrew. In October 183 1 he resigned his office in order to study under Schleiermacher and Hegel in Berlin. Hegel died just as he arrived, and, though he regularly attended Schleiermacher' s lectures, it was only those on the life of Jesus which exercised a very powerful influence upon him. It was amongst the followers of Hegel that he found kindred spirits. Under the leading of Hegel's distinction, between Varstellung and Begriff, he had already conceived the idea of his two principal theological works — the Leben Jesu and the Christliche Dogmatik. In 1832 he returned to Tubingen and became repetent in the university, lecturing on logic, history of philosophy, Plato, and history of ethics, with great success. But in the autumn of 1833 he resigned this position in order to devote all his time to the completion of his projected

Leben Jesu (1835). The work produced an immense sensation and created a new epoch in the treatment of the rise of Chris- tianity. In 1837 Strauss replied to his critics (Streitschriften zur V erteidigung meiner Schrift iiber das Leben Jesu). In the third edition of the work (1839), and in Zwei friedliche Blatter, he made important concessions to his critics, which he with- drew, however, in the fourth edition (1840; translated into English by George Eliot, with Latin preface by Strauss, 1846). In 1840 and the following year he published his Christliche Glaubenslehre (2 vols.), the principle of which is that the history of Christian doctrines is their disintegration. Between the publication of this work and that of the Friedliche Blatter he had been elected to a chair of theology in the university of Zurich. But the appointment provoked such a storm of popular ill will in the canton that the authorities considered it wise to pension him before he entered upon his duties, although this concession came too late to save the government. With his Glaubenslehre he took

leave of theology for upwards of twenty years. In August 1841 he married Agnes Schebest, a cultivated and beautiful opera singer of high repute, but not adapted to be the wife of a scholar and literary man like Strauss. Five years afterwards, when two children had been born, a separation by arrangement was made. Strauss resumed his literary activity by the publication of Der Romantiker auf dem Thron der Casaren, in which he drew a satirical parallel between Julian the Apostate and Frederick William IV. of Prussia (1847). In 1848 he was nominated as member of the Frankfort parliament, but was defeated. He was elected for the Wurttemberg chamber, but his action was so conservative that his constituents requested him to resign his seat. He forgot his political disappointments in the production of a series of biographical works, which secured for him a permanent place in German literature (Schubarts Leben, 2 vols., 1849; Christian Marklin, 1851; Nikodetnus Frischlin, 1855; Ulrich von Hutten, 3 vols., 1858-1860, 6th ed. 1895; H. S. Reimarus, 1862). With this last-named work he returned to theology, and two years afterwards (1864) published his Leben Jesu fur das deutsche Volk (13th ed., 1904). It failed to produce an effect comparable with that of the first Life, but the replies to it were many, and Strauss answered them in his pamphlet Die Holben und die Ganzen (1865), directed specially against Schenkel and Hengstenberg. His Christus des Glaubens und der Jesus der Geschichte (1865) is a severe criticism of Schleiermacher's lectures on the life of Jesus, which were then first published. From 1865 to 1872 Strauss resided in Darmstadt, and in 1870 published his lectures on Voltaire (9th ed., 1907). His last work, Der alte und der neue Glaube (1872; 16th ed., 1904; English translation by M. Blind, 1873), produced almost as great a sensation as his Life of Jesus, and not least amongst Strauss's own friends, who wondered at his one-sided view of Christianity and his professed abandonment of spiritual philosophy for the materialism of modern science. To the fourth edition of the book he added a Nachwort als Vorwort (1873). The same year symptoms of a fatal malady appeared, and death followed on the 8th of February 1874.

Strauss's mind was almost exclusively analytical and critical, without depth of religious feeling or philosophical penetration, or historical sympathy; his work was accordingly rarely constructive. His Life of Jesus was directed against not only the traditional orthodox view of the Gospel narratives, but likewise the rationalistic treatment of them, whether after the manner of Reimarus or that of Paulus. The mythical theory that the Christ of the Gospels, excepting the most meagre outline of personal history, was the unintentional

creation of the early Christian Messianic expectation he applied with merciless rigour to the narratives. But his opera- tions were based upon fatal defects, positive and negative. He held a narrow theory as to the miraculous, a still narrower as to the relation of the divine to the human, and he had no true idea of the nature of historical tradition, while, as F. C. Baur com- plained, his critique of the Gospel history had not been preceded by the essential preliminary critique of the Gospels themselves.

Authorities. — Strauss's works were published in a collected edition in 12 vols., by E. Zeller (1876-1878), without his Christliche Dogmatik. His Ausgewdhlle Briefe appeared in 1895. On his life and works, see E. Zeller, David Friedrich Strauss in seinem Leben und seinen Schriften (1874}; A. Haiisrath, D. F. Strauss und die

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1908-1909).

STRAUSS, JOHANN (1 804-1 849), Austrian orchestral con- ductor and composer of dance-music, was born at Vienna on the 14th of March 1804. In 1819 he obtained his first engagement as a violinist in a small band then playing at the Sperl, in the Leopoldstadt, and after acting as deputy-conductor in another orchestra, he organized in 1825 a little band of fourteen per- formers on his own account. It was during the carnival of 1826 that Strauss inaugurated a long line of triumphs by introducing his band to the public of Vienna at the Schwan, in the Rossau suburb, where his famous Tduberl-W alzer (op. 1) at once estab- lished his reputation as the best composer of dance-music then living. Upon the strength of this success he was invited back to the Sperl, where he accepted an engagement, with an increased orchestra, for six years. Soon after this he was appointed kapell- meister to the 1st Burger regiment, and entrusted with the duty of providing the music for the court balls; while the number of his private engagements was so great that he found it neces- sary to enlarge his band from time to time until it consisted of more than two hundred performers. In 1833 he began a long and extended series of tours throughout northern Europe, eventually visiting England in 1838. In Paris he associated himself with Musard, whose quadrilles became not much less popular than his own waltzes; but his greatest

successes were achieved in London, where he arrived in time for the coronation of Queen Victoria, and played at seventy-two public concerts, besides innumerable balls and other private entertainments. The fatigue -of these long journeys seriously injured Strauss's health; but he soon resumed his duties at the Sperl; and on the 5th of May 1840 he removed with his band to the Imperial " Volksgarten," which thenceforth became the scene of his most memorable successes, his conducting being marked by a quiet power which ensured the perfection of every minutest nuance. In 1844 Strauss began another extensive series of tours. In 1849 he revisited London, and, after his farewell concert, was escorted down the Thames by a squadron of boats, in one of which a band played tunes in his honour. This was his last public triumph. On his return to Vienna he was attacked with scarlet fever, of which he died on the 25th of September 1849.

Strauss was survived by three sons — Johann (182 5-1 899), Joseph (1827-1870) and Eduard (b. 1835), all of whom dis- tinguished themselves as composers of dance-music, and assisted in recruiting the ranks and perpetuating the traditions of the still famous band.

STRAUSS, RICHARD (1864-), German composer, was born at Munich on the nth of June 1864, the son of. Franz Strauss, an eminent hornist. To some extent a prodigy, Strauss was something of a pianist at four, a composer at six, and at ten he was already seriously studying music under F. W. Meyer, the Munich Hofkapellmeister. Soon the result of this study began to make itself apparent. Singers sang Strauss's songs; the Walter Quartet played his Quartet in A (op. 2) ; Hermann Levi performed his D minor Symphony — a work that does not figure in the composer's list; and Biilow took the composer under his wing and introduced his early Serenade for wind instruments to the Meiningen public. For obvious reasons Strauss had not yet found himself. He had passed through the gymnasium and the university, and his music studies had been thorough. But all this had made of the youth merely an excellent technical musician, who in his Eight Songs (op. 10) and in his Pianoforte Quartet (op. 13) showed how strongly he was influenced by pre- decessors, Liszt in the one case, Mendelssohn in the other. Bulow's efforts to kindle in Strauss something of the fire of his own enthusiasm for Brahms's work ultimately proved fruitless. But to Biilow, and even more to Alexander Ritter, Strauss owed the awakening in his own mind of the interest in the modern development of music that eventually in its ripeness placed Strauss at the very top of the composers' tree of his time. In

1885 Strauss succeeded Btilow as conductor of the Meiningen orchestra, but the appointment was held only for a few months, since in April of this year Strauss resigned his post in order to travel in Italy, and on his return in the early autumniie became 3rd conductor of the Munich Opera under Hermann Levi. Four years later he was installed in Weimar as Hofkapell- meister, but once again he held his post only for a brief period, for in 1894, the year of his marriage to Pauline de Ahna, the eminent singer, he was promoted to be 1st conductor at Munich. Between these various appointments and Chat of Hofkapell- meister in Berlin (1899) Strauss travelled considerably in the near East and over Europe, now in search of health, anon in propagandism. His first professional visit to London was in 1897, and laid the foundation of a local English cult that culmi- nated six years later in a Strauss festival. From that time Strauss's path lay in pleasant places. He frequently returned to London, notably to conduct a performance of Elektra, in Beecham's. season at Covent Garden in the spring of 1910, and a part of a concert at Queen's Hall, when he achieved a genuine triumph by his conducting of Mozart's music.

Of the early period of Strauss the composer there is little of importance to be said. His early works were neither better nor worse than those of scores of talented students of an ad- vanced skill in matters of technique. Indeed it has often been said, with some show of authority, that the ultimate develop- ment of Strauss is seen to any appreciable extent first in the symphonic poem Macbeth (op. 23). Here, in spite of the earlier Don Juan (op. 20), Strauss is himself, thematically and orchestrally, for the first time, for Aus Italien (op. 16) is a comparatively poor and quite unrepresentative effusion apart altogether from the faux pas contained in it by the mistaking of a popular song composed in St John's Wood, London, for a Neapolitan folk-song. A year only divides Macbeth (1887) from Don Juan (1888)—" Tondramen ohne Worte," as they have been called. But there is an age between them and Tod und Verkl&rung (1889) — the bridge from one part to the other and the opening of the second section of which are amongst Strauss's most glorious inspirations. Between the last-named work and Till Eulenspiegels lustigen Streiche (1894), Strauss's first opera, Gunlram finds place (first per- formance, Weimar, 1894), the latter a work that in spite of much reclame for the composer failed to maintain a position upon the stage. In Till Eulenspiegel is to be found a sense of fun that is worthy

of note (as of emulation) , and it is perhaps worth recording that no more noteworthy example of the Rondo form exists in modern music, while its approximate successor, Don Quixote (1897), is an absolutely outstanding example of the Variation form. Further, Strauss reached in Don Quixote his zenith as a musical realist. In between there occurred the Nietzschean poem Also sprach Zarathustra (1895), which stirred up more temporary strife than any of its predecessors, if not so much perhaps as was engineered later on by the production of Ein Heldenleben (1898), or by the comparatively ingenuous Symphonia domestica (1904). For various reasons these compositions roused the somewhat sleepy academics of musical Europe from their lethargy. They re- vived, with the usual negative results, the ancient fight as to the legitimacy or otherwise of programme music. But though performances were comparatively rare in England up to the middle of 1910, those that had occurred proved undoubtedly attractive, while their rareness might quite reasonably be attri- buted to the very large fees demanded for their performance.

Up to 1910 Strauss had composed four operas. Of these, Guntram was on frankly Wagnerian lines. Feuersnot, on the other hand, a satirical, purely Munich work-ˆ-a page out of the Munich annals, as it were, so closely is it identified with the Bavarian capital in its musical and personal reference, though produced at Dresden in 1901, remained sufficiently alive to have merited performance at His Majesty's theatre, London, again under Thomas Beecham's direction in July 1910. The same enthusiastic musician had previously produced Elektra with immense yet equal success in London (Covent Garden)

in the early spring of 1910. Perhaps none of these operas enjoyed the reclame of Salome (Dresden 1905), which in England was originally barred by the censor of plays, but was performed several times at Covent Garden under Thomas Beecham in the autumn of 1910.

As a composer of songs Strauss enjoys the widest popularity in the conventional sense of the word. Many an example could be given from the hundred and more of his " Lieder " of Strauss's lawful right to be considered a lineal descendant of the royal line of German song writers. Some are transcendently beau- tiful. But this very fact has been thought to militate against his supreme greatness as a composer in the widest sense. The question, indeed, though in itself ridiculous, has been asked: which is the true Richard Strauss, the composer of the caco- phonous Ein Heldenleben or of the exquisite Morgen or Traum durch die Dammerung? But by 1910 he had at any rate won his place in the musical Walhalla. Whether the composer's name will

survive by means of his many exquisite " Lieder," by means of his satire and grim humour, by means of his realism or his original classicism, remains to be seen. That his position is assured among the immortals is clear if only on account of his absolute independence of thought and of expression, of his prodigious breadth of artistic view and of his capacity to say his say in the musical language of his own day. His heartiest detractors admit that Strauss has enlarged the means of musical expression even if they cavil at his somewhat realistic utterance on occasion. To put it no higher, he must rank as a 20th-century Berlioz with a vastly wider musical knowledge and equipment. (R. H. L.)

STRAW and STRAW MANUFACTURES. Straw (from strew, as being used for strewing), is the general term applied to the stalky residue of grain-plants (especially wheat, rye, oats, barley). It forms the raw material of some important industries. It serves for the thatching of roofs, for a paper- making material, for ornamenting small surfaces as a " straw- mosaic," for plaiting into door and table mats, mattresses, &c, and for weaving and plaiting into light baskets, artificial flowers, &c. These applications, however, are insignificant in compari- son with the place occupied by straw as a raw material for the straw bonnets and hats worn by both sexes. Of the various materials which go to the fabrication of plaited head-gear the most important is wheaten straw. It is only in certain areas that straw suitable for making plaits is produced. The straw must have a certain length of " pipe " between the knots, must possess a clear delicate golden colour and must not be brittle. The most valuable straw for plaits is grown in Tuscany, and from it the well-known Tuscan plaits and Leghorn hats are made. The straw of Tuscany, specially grown for plaiting, is distin- guished into three qualities — Pontederas Semone being the finest, Mazzuolo the second quality, from which the bulk of the plaits are made, while from the third quality, Santa Fioro, only " Tuscan pedals " and braids are plaited. The wheat-seed for these straws is sown very thickly on comparatively elevated and arid land, and it sends up long attenuated stalks. When the grain in the ear is about half developed the straw is pulled up by the roots, dried in the sun, and subsequently spread out for several successive days to be bleached under the influence of alternate sunlight and night-dews. The pipe of the upper joint alone is selected for plaiting, the remainder of the straw being used for other purposes. These pipes are made up in small bundles, bleached in sulphur fumes in a closed chest; assorted into sizes, and so prepared for the plaiters. Straw-plaiting is a domestic industry among the women and young children of Tuscany and some parts of Emilia. Tuscan plaits and hats vary

enormously in quality and value; the plait of a hat of good quality may represent the work of four or five days, while hats of the highest quality may each occupy six to nine months in making. The finest work is excessively trying to the eyes of the plaiters, who can at most give to it two or three hours' labour daily.

The districts around Luton in Bedfordshire and the neigh- bouring counties have, since the beginning of the 17th century, been the British home of the straw-plait industry. The straw

of certain varieties of wheat cultivated in that region is, in favourable seasons, possessed of a fine bright colour and due tenacity and strength. The straw is cut as in ordinary har- vesting, but is allowed to dry in the sun. before binding. Sub- sequently straws are selected from the sheaves, and of these the pipes of the two upper joints are taken for plaiting. The pipes are assorted into sizes by passing them through graduated openings in a grilled wire frame, and those of good colour are bleached by the fumes of sulphur. Spotted and discoloured straws are dyed either in pipe or in plait. The plaiters work up the material in a damp state, either into whole straw or split straw plaits. Split straws are prepared with the aid of a small instrument having a projecting point which enters the straw pipe, and from which radiate the number of knife-edged cutters into which the straw is to be split. The plaiting of straw in the countiesof Bucks., Beds., Berks, and Herts, formerly gave employment to many thousands of women and young children; but now vast quantities of plaits are imported at a very cheap rate from Italy, China and Japan. The result is that, while the Luton trade in the manufacture of straw and fancy hats of every description has largely extended, the number of English plaiters, all told, was not more than a few hundreds in 1907, as compared with 30,000 in 1871. The plaits are sewed partly by hand and in a special sewing-machine, and the hats or bonnets are finished by stiffening with gelatin size and blocking into shape with the aid of heat and powerful pressure, according to the dictates of fashion.

In the United States straw-plait work is principally centred in the state of Massachusetts.

Many substances besides straw are worked into plaits and braids for bonnets. Among these may be noticed thin strips of willow and cane

and the fronds of numerous palms. " Brazilian " hats made from the fronds of the palmetto palms, Sabal palmetto and 5. mexicana, are now largely made at St Albans. The famous Panama hats, fine qualities of which were at one time worth £20 to £30 each, are made from the leaves of the screw pine, Carludovica palmata. They are now manufactured at Dresden, Strassburg and Nancy, and can be purchased at 30s. or £2.

STRAWBERRY (Fragaria).— Apart from its interest as a dessert fruit, the strawberry has claims to attention by reason of the peculiarities of its structure and the excellent illustrations it offers of the inherent power of variation possessed by the plant and of the success of the gardener in availing himself of this tendency. The genus Fragaria consists of about eight species, native of the north temperate regions of both hemi spheres, as well as of mountain districts in warmer climes; one species is found in Chile. The tufted character of the plant, and its habit of sending out long slender branches (runners) which produce a new bud at the extremity, are well known. The leaves have usually three leaflets palmately arranged, but the number of leaflets may be increased to five or reduced to one. While the flower has the typical Rosaceous structure, the so-called fruit is very peculiar, but it may be understood by the contrast it presents with the " hip " of the rose. In the last- named plant the top of the flower-stalk expands as it grows into a vase-shaped cavity, the " hip," within which are concealed the true fruits or seed-vessels. In the rose the extremity of the floral axis is concave and bears the carpels in its interior. In the strawberry the floral axis, instead of becoming concave, swells out into a fleshy, dome-shaped or flattened mass in which the carpels or true fruits, commonly called pips or seeds, are more or less embedded but never wholly concealed. A ripe strawberry in fact may be aptly compared to the " fruit " of a rose turned inside out.

The common wild strawberry of Great Britain (fig. 1), which indeed is found throughout Europe and great part of temperate Asia and North America, is Fragaria vesca, and this was the first species brought under cultivation in the early part of the 17th century. Later on other species were introduced, such as F. elalior, a European species, the parent stock of the hautbois strawberries, and especially F. virginiana from the United States and F. chUoensis from Chile. From these species, crossed and recrossed in various manners, have sprung the vast number

of different varieties now enumerated in catalogues, whose characteristics are so inextricably blended that the attempt to trace

their exact parentage or to follow out their lineage has become impossible. The varieties at present cultivated vary in the most remarkable degree in size, colour, flavour, shape, degree of fertility, season of ripening, liability to disease and constitution of plant. Some, as previously stated, vary in foliage, others produce no runners, and some vary materially in the relative development of their sexual organs, for, while in most cases the flowers are in appearance hermaphrodite, at least in structure, there is a very general tendency towards a separa- tion of the sexes, so that the flowers are males or females only

Fig. 1. — Wild Strawberry {Fragaria vesca). In flower and fruit, and bearing a runner.

as to function, even although they may be perfect in construc- tion. This tendency to dioecism is a common characteristic among Rosaceae, and sometimes proves a source of disappoint- ment to the cultivator, who finds his plants barren where he had hoped to gather a crop. This happens in the United States more frequently than in Britain, but when recognized can readily be obviated by planting male varieties in the vicinity of the barren kinds. Darwin, in alluding to the vast amount of variability in the so-called " fruit " — a change effected by the art of the horticulturist in less than three centuries — contrasts with this variability the fixity and permanence of character presented by the true fruits, or pips, which are distributed over the surface of the swollen axis. The will and art of the gardener have been directed to the improvement of the one organ, while he has devoted no attention to the other, which conse- quently remains in the same condition as in the wild plant. Too much stress is not, however, to be laid on this point, for it must be remembered that the foliage, which is not specially an object of the gardener's " selection," nevertheless varies considerably.

The larger-fruited sorts are obtained by crossing from F. chUoensis and F. virginiana, and the smaller alpines from F. vesca. The alpine varieties should be raised from seeds; while the other sorts are continued true to their kinds by runners. If new varieties are desired, these are obtained by judicious crossing and seeding.

The seeds of the alpines should be saved from the finest fruit ripened early in the summer. They may at once be sown, either in a sheltered border outdoors or in pots, or better in March under glass, when they will produce fruits in June of the same year. The soil should be rich and light, and the seeds very slightly covered by sifting over them some leaf-mould or old decomposed cow dung. When the plants

appear and have made five or six leaves, they are

transplanted to where they are to remain for bearing. The seeds sown in pots may be helped on by gentle heat, and when the plants are large enough they are pricked out in fine rich soil, and in June transferred to the open ground for bearing; they will produce a partial crop in the autumn, and a full one in the following season. The same treatment may be applied to the choicer seedlings of the larger-fruited sorts from which new varieties are expected. Amongst the best alpine strawberries, to which the name of " perpetual " has now been given, are those known as St Joseph and St Anthony of Padua. The runners of established sorts should be allowed to root in the soil adjoining the plants, which should, therefore, be kept light and fine, or layered into small pots as for forcing. As soon as a few leaves are produced on each the secondary runners should be stopped. When the plants have become well-rooted they should at once be planted out. They do best in a rather strong loam, and should be kept tolerably moist. The scarlet section prefers a rich sandy loam. The ground should be trenched 2 or 3 ft. deep, and supplied with plenty of manure, a good proportion of which should lie just below the roots, 10 or 12 in. from the surface. The plants may be put in on an average about 2 ft. apart.

A mulching of strawy manure put between the rows in spring serves to keep the ground moist and the fruit clean, as well as to afford nourishment to the plants. Unless required, the runners are cut off early, in order to promote the swelling of the fruit. The plants are watered during dry weather after the fruit is set, and occasionally till it begins to colour. As soon as the fruit season is over, the runners are again removed, and the ground hoed and raked. The plantation should be renewed every second or third year, or less frequently if kept free of runners, if the old leaves are cut away after the fruit has been gathered, and if a good top-dressing of rotten dung or leaf-mould is applied. A top-dressing of loam is beneficial if applied before the plants begin to grow in spring, but after that period they should not be disturbed during the summer either at root or at top. If the plants produce a large number of flower-scapes, each should, if fine large fruit is desired, have them reduced to about four of the strongest. The lowest blossoms on the scape will be found to produce the largest, earliest and best fruits. The fruit should not be gathered till it is quite ripe, and then, if possible, it should be quite dry, but

not heated by the sun. Those intended for preserving are best taken without the stalk and the calyx.

Forcing. — The runners propagated for forcing are layered into 3-in. pots, filled with rich soil, and held firm by a piece of raffia, a peg or stone. If kept duly watered they will soon form independent plants. The earlier they are secured the better. When firmly rooted they are removed and transferred into well-drained 6-in. pots, of strong well-enriched loam, the soil being rammed firmly into the pots, which are to be set in an open airy place. In severe frosts they should be covered with dry litter or bracken, but do not necessarily require to be placed under glass. They are moved into the forcing houses as required. The main points to be kept in view in forcing strawberries are, first, to have strong stocky plants, the leaves of which have grown sturdily from being well exposed to light, and secondly, to grow them on slowly till fruit is set. When they are first introduced into heat, the temperature should not exceed 45 or 50 by fire heat, and air must be freely admitted; should the leaves appear to grow up thin and delicate, less fire heat and more air must be given, but an average temperature of 55° by day may be allowed and continued while the plants are in flower. When the fruit is set the heat may be gradually increased, till at the ripening period it stands at 65°, and occasionally at 75° by sun heat. While the fruit is swelling the plants should never be allowed to get dry, but when it begins to colour no more water should be given than is absolutely requisite to keep the leaves from flagging. The plants should be removed from the house as soon as the crop is gathered. The forced plants properly hardened make first-rate outdoor planta- tions, and if put out early in summer, in good ground, will often produce a useful autumnal crop.

Diseases. — The most troublesome fungoid attacks to which the strawberry is subject are mildew and leaf-spot. The former, like all mildews, attacks the leaves and spreads to the fruit, these being covered with the white mycelium. The fungus is identical with that causing mildew in hops (Sphaerotheca humuli), and its development is greatly furthered by exposure of its host to cold draughts or low night temperatures. Spraying the foliage with potassium sulphide (| oz. to 1 gallon of water) should hold it in check, but the plants should not be sprayed when the fruit is developing. The "leaf- spot " is caused by the fungus Sphaerella fragariae. The first symptom of this attack is the appearance of small, circular, white spots on the leaves, having a broad, definite, dark reddish margin.

Fig. 2. — Sphaerotheca humuli, Hop and Strawberry Mildew.

Small portion of surface of hop leaf showing the fructification or perithecia (p) of the fungus attached to the surface; h, a hair of the leaf surface. I, A single perithecium bursting: 2, a chain of spores or conidia. (I and 2 X 400.)

(From George Massee's Textbook of Plant Diseases, by permission of Duckworth & Co.) Fig. 3. — Sphaerella fragariae.

1, Strawberry leaf showing diseased spots.

2, Ascus with eight spores from a perithecium.

3, Spores or conidia of the Ramularia stage.

On these spots a whitish mould (formerly considered to be a distinct species under the name Ramularia tulasnei) develops, and this is followed later by the perfect form of the fungus, the fruits of which appear to the naked eye as small black spots seated on the white dead spot on the leaf. Potassium sulphide may be used as for the mildew, or, perhaps better, Bordeaux mixture. It has been recommended to cut off the leaves after fruiting and burn the beds over so as to destroy the fungus in the leaves.

The grubs of the cockchafer (Melolontha vulgaris) and the rose-chafer (Cetonia aurata) frequently feed upon the roots of the strawberry and do considerable damage, while the larvae of the garden swift moth (Hepialus) behave in a similar way. The imago of Cetonia aurata also frequently damages the flowers of the strawberry by devouring their centres, and is often troublesome in this way in forcing-houses particularly. The carnivorous ground beetles, particularly Pterostichus nigra and Harpalus rufimanus, when the fruit is ripe attack it at night, returning to the soil in the daytime. They are to be caught by placing jars containing some attractive matter, such as meat and water, at intervals about the beds with their mouths sunk level with the surface of the soil. Millepedes also are often found in the ripe fruit, but occur mostly where the soil is very rich in organic matter and poor in lime.

STREATHAM, a large residential district in the south of London, England, within the municipal borough of Wands- worth. The name appears to indicate its position on an ancient " street " or highway. According to Domesday, Streatham included several manors, two of which, Tooting and Balham (to follow the modern nomenclature), belonged to the abbot of St Mary de Bee in Normandy. One of several public grounds in the neighbourhood of Streatham is called Tooting

Bee Common. The parish church of St Leonard, Streatham, contains among its memorials that of Henry Thrale (d. 1781), with an inscription by Samuel Johnson, who was a constant visitor at Thrale's house, Streatham Park, which is no longer standing.

STREATOR, a city of La Salle county, Illinois, U.S.A., on

the Vermilion river, in the N. part of the state, about 95 m.

S.W. of Chicago. Pop. (1890), 11,414; (1900), 14,079, of whom

13740 were foreign-born; (1910 census) iˆ.ˆtj; land area,

2-97 sq. m. It is served by the Atchison, Topeka & Santa Fe, the Chicago, Burlington & Quincy, the Chicago & Alton, the Chicago, Indiana & Southern and the Wabash railways. Streator has a public library and a Chautauqua auditorium. It is in the Vermilion coal region, and clay for brick and tile is abundant in its vicinity. The city's manufactures include glass, brick, tile, foundry and machine-shop products, &c. In 1905 the factory product was valued at $1,888,894, being 51-4% greater than in 1900. Streator was laid out in 1868, was incorporated as a village in 1870 and was chartered as a city in 1882.

STREET, GEORGE EDMUND (1824-1881), English architect, was born at Woodford in Essex on the 20th of June 1824. He was the third son of Thomas Street, solicitor, by his second wife, Mary Anne Miliington. George went to school at Mitcham in about 1830, and later to the Camberwell collegiate school, which he left in 1839. For a few months he was in his father's business in Philpot Lane, but on his father's death he went to ■ live with his mother and sister at Exeter. There his thoughts first turned to architecture, and in 1841 his mother obtained a place for him as pupil in the office of Mr Owen Carter at Win- chester. Afterwards he worked for five years as an " improver " with Sir George Gilbert Scott in London. At an early age Street became deeply interested in the principles of Gothic architecture, and devoted an unsparing amount of time and labour to studying and sketching the finest examples of medieval buildings in England and on the Continent. His first com- mission was for the designing of Biscoray Church, Cornwall. In 1849 he took an office of his own. He was a draughtsman of a very high order; his sketches are masterpieces of spirit and brilliant touch. In 1855 he published a

very careful and well- illustrated work on The Brick and Marble Architecture of Northern Italy, and in 1865 a book on The Gothic Architecture of Spain, with very beautiful drawings by his own hand. Street's personal taste led him in most cases to select for his design the 13th- century Gothic of England or France, his knowledge of which was very great, especially in the skilful use of rich mouldings. By far the majority of the buildings erected by him were for ecclesiastical uses, the chief being the convent of East Grinstead, the theological college at Cuddesden and a very large number of churches, such as St Philip and St James's at Oxford, St John's at Torquay, All Saints' at Clifton, St Saviour's at Eastbourne, St Margaret's at Liverpool and St Mary Magdalene, Paddington. His largest works were the nave of Bristol Cathedral, the choir of the cathedral of Christ Church in Dublin, and, above all, the new courts of justice in London. The competition for this was prolonged and much diversity of opinion was expressed. Thus, the judges wanted Street to make the exterior arrangements and Barry the interior, while a special committee of lawyers recommended the designs of Alfred Waterhouse. In June 1868, however, Street was appointed sole architect; but the building was not complete at the time of his death in December 1881. Street was elected an associate of the Royal Academy in 1866, and R.A. in 1871; at the time of his death he was professor of architecture to the Royal Academy, where he had delivered a very interesting course of lectures on the develop- ment of medieval architecture. He was also president of the Royal Institute of British Architects. He was a member of the Royal Academy of Vienna, and in 1878, in reward for drawings sent to the Paris Exhibition, he was made a knight of the Legion of Honour. Street was twice married, first on the 17th of June 1852 to Mariquita, second daughter of Robert Proctor, who died in 1874, and secondly on the nth of January 1876 to Jessie, second daughter of William Holland, who died in the same year. The architect's own death, on the 18th of December 1881, was hastened by overwork and professional worries connected with the erection of the law courts. He was buried on the 29th of December in the nave of Westminster Abbey.

STRELITZ (Strjeltsi), a body of Russian household troops originally raised by the tsar Ivan the Terrible in the middle of the 1 6th century. They numbered 40,000 to 50,000 infantry, and formed the greater part of the Russian armies in the wars

of the i"6th and 17th centuries. They were a fierce and ill-disciplined force, individually brave and cruel in war, and almost ungovernable in peace. Their mutinies were frequent and dangerous, and at last, in 1682, an unusually serious out- break led Peter the

Great to compass the abolition of the force. The Strelitz were gradually drawn to the western frontier of Russia, and in 1698 they rose in mutiny for the last time. Crushed in battle by Peter's general, Patrick Gordon, they ceased to exist as a military force, and about 2000 of them who fell into the hands of the tsar were barbarously tortured and put to death.

STRENGTH OF MATERIALS, that part of the theory of engineering which deals with the nature and effects of stresses in the parts of engineering structures. Its principal object is to determine the proper size and form of pieces which have to bear given loads, or, conversely, to determine the loads which can be safely applied to pieces whose dimensions and arrange- ment are already given. It also treats of the relation between the applied loads and the changes of form which they cause. The subject comprises experimental investigation of the pro- perties of materials as to strength and elasticity, and mathe- matical discussion of the stresses in ties, struts, beams, shafts and other elements of structures and machines.

Stress is the mutual action between two bodies, or between two parts of a body, whereby each of the two exerts a force upon the other. Thus, when a stone lies on the ground there is at the surface of contact a stress, one aspect of which is the force directed downwards with which the stone pushes the ground, and the other aspect is the equal force directed upwards with which the ground pushes the stone. A body is said to be in a state of stress when there is a stress between the two parts which lie on opposite sides of an imaginary surface of section. A pillar or block supporting a weight is in a state of stress because at any cross section the part above the section pushes down against the part below, and the part below pushes up against the part above. A stretched rope is in a state of stress, because at any cross section the part on each side is pulling the part on the other side with a force in the direction of the rope's length. A plate of metal that is being cut in a shearing machine is in a state of stress, because at the place where it is about to give way the portion of metal on either side of the plane of shear is tending to drag the portion on the other side with a force in that plane.

Normal and Tangential Stress. — In a solid body which is in a state of stress the direction of stress at an imaginary surface of division may be normal, oblique or tangential to the surface. When oblique it is conveniently treated as consisting of a normal and a tangential component. Normal stress may be either push (com- pressive stress) or pull (tensile stress). Stress which is tangential to the surface is called shearing stress. Oblique stress may be regarded as so much

push or pull along with so much shearing stress. The amount of stress per unit of surface is called the intensity of stress. Stress is said to be uniformly distributed over a surface when each fraction of the area of surface bears a corresponding fraction of the whole stress. If a stress P is uniformly distributed over a plane surface of area S, the intensity is P/S. If the stress is not uniformly distributed, the intensity at any point is 5P/5S, where 5P is the amount of stress on an indefinitely small area SS at the point considered. For practical purposes intensity of stress is usually expressed in tons weight per square inch, pounds weight per square inch, or kilogrammes weight per square millimetre or per square centimetre.

Simple Longitudinal Stress. — The simplest possible state of stress is that of a short pillar or block compressed by opposite forces applied at its ends, or that of a stretched rope or other tie. In these cases the stress is wholly in one direction, that of the length. These states may be distinguished as simple longitudinal push and simple longitudinal pull. In them there is no stress on planes parallel to the direction of the applied forces.

Compound Stress. — A more complex state of stress occurs if the block is compressed or extended by forces applied to a pair of opposite sides, as well as by forces applied to its ends — that is to say, if two simple longitudinal stresses in different directions act together. A still more complex state occurs if a third stress be applied to the remaining pair of sides. It may be shown (see Elasticity) that any state of stress which can possibly exist at any point of a body may be produced by the joint action of three simple pull or push stresses in three suitably chosen directions at right angles to each

45

I

a

Fig. i. a maximum when 9 = 45°

Fig. 2.

other. These three are called principal stresses.and their flirections are called the axes of principal stress. These axes have the impor-

tant property that the intensity of stress along one of them is greater, and along another it is less, than in any other direction. These are called respectively the axes of greatest and least principal stress.

Resolution of Stress. — Returning now to the case of a single simple longitudinal stress, let AB (fig. i) be a portion of a tie or a strut which is being pulled or pushed in the direction of the axis AB with a total stress P. On any plane CD taken at right angles to the axis we have a normal pull or push of intensity p = P/S, S being the area of the normal cross-section. On a plane EF whose normal is inclined to the axis at an angle 6 we have a stress still in the direction of the axis, and therefore oblique to the plane EF, of intensity P/S', where S' is the area of the surface EF, or S/cos 6. The whole stress P on EF may be resolved into two components, one normal to EF, and the other a shearing stress tangential to EF. The normal com- ponent (P„ F fig- 2) is P cos 8: the tangential component (P«) is P sin 6. Hence the intensity of normal pull or push on EF, or p n , is p cos 2 8, and the intensity of shearing stress EF, or pi, is p sin 8 cos 8. This expression makes _": surfaces inclined at to the axis are called surfaces of maximum shearing stress; the intensity of shearing stress on them is \p.

Combination of Two Simple Pull or Push Stresses at Right Angles to One Another. — Suppose next that there are two principal stresses:

in other words that in addition to the simple pull or push stress of fig. I there is a second pull or push stress acting at right angles to it as in fig. 3. Call these P x and P„ respectively. On any inclined surface EF there will be an in- tensity of stress whose normal component p n and tangential com- ponent pi are found by summing up the effects due to P x and P„ separately. Let p x and p y be the intensities of stress produced by Pi and P„ respectively on planes perpendicular to their own direc- tions. Then

pn=(Px cosˆe+py sin 2 8, Pt = (px — py) sin 8 cos 0, 8 being the angle which the normal to the surface makes with the direction of P,.

The tangential stress p t becomes a maximum when 8 is 45°, and its value then is

Max. p, = i {px-pv). If in addition there is a third principal stress P, it will not produce any tangential component on planes perpendicular to the plane of the figure. Hence the above expression for the maximum tangential stress will still apply, and it is easy to extend this result so as to reach the important general proposition*

that in any condition of stress whatever the maximum intensity of shearing stress is equal to one- half the difference between the greatest and least principal stresses and occurs on surfaces inclined at 45° to them.

State of Simple Shear. — A spe- cial case of great importance occurs when there are two prin- cipal stresses only, equal in magnitude and opposite in sign; in other words, when one 5 is a simple push and the other a simple pull. Then on surfaces inclined at 45° to the axes of pull and push there is nothing but tangential stress, for p n — o\ and this intensity of tangential stress is numerically equal to p x or to py. This condition of stress is called a state of simple shear.

The state of simple shear may also be arrived at in another way. Let an elementary cubical part of any solid body (fig. 4) have tangen- tial stresses QQ applied to one pair of opposite faces, A and B, and equal tangential stresses applied to a second pair of faces C and D,

Figs. 3, 4, 5, 6, 15, 16, 17, 18, 19, 20, 23, 24 and 25 are from Ewing's Strength of Materials, by permission of the Cambridge University Press.

as in the figure. The effect is to set up a state of simple shear. On all planes parallel to A and B there is nothing but tangential stress, and the same is true of all planes parallel to C and D. The intensity of the stress on both systems of planes is equal throughout to the intensity of the stress which was applied to the face of the block.

To see the connexion between these two ways of specifying a state of simple shear consider the equilibrium of the parts into which the block may be divided by ideal diagonal planes of section. To balance the forces QQ (fig. 5), there must be normal pull on the diagonal plane, the amount of which is P = QV2. But the area of the surface over which P acts is greater than that of the surface over which Q acts in the proportion which P bears to Q, and hence the intensity of P is the same as the intensity of Q.

Fig

Fig. 5.

Again, taking the other diagonal plane (fig. 6), the same argument applies except that here the normal force P required for equilibrium is a push instead of a pull. Thus the state of stress represented in fig. 4 admits of analysis into two equal prin- cipal stresses, one of push and one of pull, acting in directions at right angles to one another

and inclined at 45° to the planes of shear stress.

Equality of Shearing Stress in Two Directions. — No tangential stress can exist in one direction without an equal intensity of tangential stress existing in another direction at right angles to the first. To prove this it is sufficient to consider the equilibrium of the elementary cube of fig. 4. The tangential forces acting on two sides A and B produce a couple which tends to rotate the cube. • No arrangement of normal stresses on any of the three pairs of sides of the cube can balance this couple ; that can be done only by equal tangential forces on C and D.

Fluid Stress. — Another important case occurs when there are three principal stresses all of the same sign and of equal intensity p. The tangential components on any planes cancel each other: the stress on every plane is wholly normal and its intensity is p. This is the only state of stress that can exist in a fluid at rest because a fluid exerts no statical resistance to shear. For this reason the state is often spoken of as a fluid stress.

Strain is the change of shape produced by stress. If the stress is a simple longitudinal pull, the strain consists of lengthen- ing in the direction of the pull, accompanied by contraction in both directions at right angles to the pull. If the stress is a simple push, the strain consists of shortening in the direction of the push and expansion in both directions at right angles to that; the stress and the strain are then exactly the reverse of what they are in the case of simple pull. If the stress is one of simple shearing, the strain consists of a distortion such as would be produced by the sliding of layers in the direction of the shearing stresses.

A material is elastic with regard to any applied stress if the strain disappears when the stress is removed. Strain which persists after the stress that produced it is removed is called permanent set. For brevity, it is convenient to speak of strain which disappears when the stress is removed as elastic strain.

Limits of Elasticity. — Actual materials are generally very perfectly elastic with regard to small stresses, and very imper- fectly elastic with regard to great stresses. If the applied stress is less than a certain limit, the strain is in general small \™ amount, and disappears wholly, or almost wholly when the stress is removed. If the applied stress exceeds this limit, the strain is, in general, much greater than before, and most of it is found, when the stress is removed, to consist of permanent set. The

limits of stress within which strain is wholly or almost wholly elastic are called limits of elasticity.

For any particular mode of stress the limit of elasticity is much more sharply defined in some materials than in others. When well denned it may readily be recognized in the testing of a sample from the fact that after the stress exceeds the limit of elasticity the strain begins to increase in a much more rapid ratio to the stress than before. This characteristic goes along with the one already mentioned, that up to the limit the strain is wholly or almost wholly elastic.

Hooke's Law. — -Within the limits of elasticity the strain produced by a stress of any one kind is proportional to the stress producing it. This is Hooke's law, enunciated by him in 1676.

In applying Hooke's law to the case of simple longitudinal stress — such as the case of a bar stretched by simple longitudinal pull — we may measure the state of strain by the change of length per unit of original length which the bar undergoes when stressed. Let the original length be I, and let the whole change of length be 8(when a stress is applied whose intensity p is within the elastic limit. Then the strain is measured by Sl/l, and this by Hooke's law is propor- tional to p. This may be written

where E is a constant for the particular material considered. The same value of E applies to push and to pull, these modes of stress being essentially continuous, and differing only in sign.

Young's Modulus. — This constant E is called the modulus of longitudinal extensibility, or Young's modulus. Its value, which is expressed in the same units as are used to express intensity of stress, may be measured directly by exposing a sample of the material to longitudinal pull and noting the extension, or indirectly by measuring the flexure of a loaded beam of the material, or by experiments on the frequency of vibrations. It is frequently spoken of by engineers simply as the modulus of elasticity, but this name is too general, as there are other moduli applicable to other modes of stress. Since E = pl/6l, the modulus may be defined as the ratio of the intensity of stress p to the longitudinal strain &1/1.

Modulus of Rigidity. — In the case of simple shearing stress, the strain may be measured by the angle by which each of the four

originally right angles in the square prism of fig. 3 is altered by the distortion of the prism. Let this angle be in radians; then by Hooke's law pl = C, where p is the intensity of shearing stress and C is a constant which measures the rigidity of the material. C is called the modulus of rigidity, and is usually determined by experiments on torsion.

Modulus of Cubic Compressibility. — When three simple stresses of equal intensity p and of the same sign (all pulls or all pushes) are applied in three directions, the material (provided it be isotropic, that is to say, provided its properties are the same in all directions) suffers change of volume only, without distortion of form. If the volume is V and the change of volume 8V, the ratio of the stress p to the strain SV/V is called the modulus of cubic compressibility, and will be denoted by K.

Of these three moduli the one of most importance in en- gineering applications is Young's modulus E. When a simple longi- tudinal pull or push of intensity p is applied to a piece, the longitudinal strain of extension or compression is £/E. This is accompanied by a lateral contraction or expansion, in each trans- verse direction, whose amount may be written p/

E ._2CK and ,.2(aK ± C2. 3K + C 3K- 21 —

Plastic Strain. — Beyond the limits of elasticity the relation of strain to stress becomes very indefinite. Materials then exhibit, to a greater or less degree, the property of plasticity. The strain is much affected by the length of time during which the stress has been in operation, and reaches its maximum, for any assigned stress, only after a long (perhaps an indefinitely long) time. Finally, when the stress is sufficiently increased, the ratio of the increment of strain to the increment of stress becomes indefinitely great if time is given for the stress to take effect. In other words, the substance then assumes what may be called a completely plastic state; it flows under the applied stress like a viscous liquid.

Ultimate Strength. — The ultimate strength of a material with regard to any stated mode of stress is the stress required to produce rupture. In reckoning ultimate strength, however, engineers take, not the actual intensity of stress at which rupture occurs, but the value which this intensity would have reached had rupture ensued without previous alteration of shape. Thus, if a bar whose original cross-section is 2 sq. in. breaks under a uniformly distributed pull of 60 tons, the ultimate tensile strength of the material is reckoned to be

30 tons per square inch, although the actual intensity of stress which produced rupture may have been much greater than this, owing to the contraction of the section previous to fracture. The convenience

of this usage will be obvious from an example. Suppose that a piece of material of the same quality be used in a structure under conditions which cause it to bear a simple pull of 6 tons per square inch; we conclude at once that the actual load is one-fifth of thar which would cause rupture, irrespective of the extent to which the material might contract in section if overstrained. The stresses which occur in engineering practice are, or ought to be, in all cases within the limits of elasticity, and within these limits the change of cross-section caused by longitudinal pull or push is so small that it may be neglected in reckoning the intensity of stress.

Ultimate tensile strength and ultimate shearing strength are well defined, since these modes of stress (simple pull and simple shearing stress) lead to distinct fracture if the stress is sufficiently increased. Under compression some materials yield so continuously that their ultimate strength to resist compression can scarcely be specified ; others show so distinct a fracture by crushing that their compressive strength may be determined with some precision.

Some of the materials used in engineering, notably timber and wrought iron, are so far from being isotropic that their strength is widely different for stresses in different directions. In the case of wrought iron the process of rolling develops a fibrous structure on account of the presence of streaks of slag which become inter-spersed with the metal in puddling; and the tensile strength of a rolled plate is found to be considerably greater in the direction of rolling than across the plate. Steel plates, being rolled from a nearly homogeneous ingot, have nearly the same strength in both directions, provided the process of rolling is completed at a tempera- ture high enough to allow recrystallizarion to take place in cooling. Cold-rolled or cold-drawn metal is not isotropic because the crystals of which it is made up have been elongated in one direction by the process: but isotropy may be restored by heating the piece sufficiently to allow the crystals to re-form.

Permissible Working Stress. — In applying a knowledge of the strength of materials to determine the proper sizes of parts in an engineering structure we have to estimate a permissible working stress. This is based partly on special tests and partly on experience of the behaviour of the material when used in similar structures. The working stress is rarely so much as one-third of the ultimate strength;

it is more commonly one-fourth or one-fifth and in some cases, especially where the loads to be borne are liable to reversal or to much change, it may be prudent to make the working stress even less than this.

Factor of Safety. — The ratio of the ultimate strength to the working stress is called the factor of safety. The factor should in general be such as to bring the working stress within the limit of elasticity and even to leave within that limit a margin which will be ample enough to cover such contingencies as imperfec- tion in the theory on which the calculation of the working stress is founded, lack of uniformity in the material itself, uncertainty in the estimation of loads, imperfections of workmanship which may cause the actual dimensions to fall short of those that have been specified, alterations arising from wear, rust and so forth. An important distinction has to be drawn in this connexion between steady or " dead " loads and loads which are subject to variation and especially to reversal. With the former the working stress may reach or pass the elastic limit without destroying the structure; but in a piece subject to reversals a stress of the same magnitude would lead inevitably to rupture, and hence a larger margin should be left to ensure that in the latter case the elastic limit shall not even be approached.

It is in fact the elastic limit rather than the ultimate strength of the material on which the question mainly depends of how high the working stress may safely be allowed to rise in any particular conditions as to mode of loading, and accordingly it becomes a matter of much practical importance to determine by tests the amount of stress which can be borne without per- manent strain. From an engineering point of view the struc- tural merit of a material, especially when variable loads and possible shocks have to be sustained, depends not only on the strength but also on the extent to which the material will bear deformation without rupture. This characteristic is shown in tests made to determine tensile strength by the amount of ultimate elongation, and also by the contraction of the cross- section which occurs through the flow of the metal before rup- ture. It is often, tested in other ways, such as by bending and unbending bars in a circle of specified radius, or by examining the effect of repeated blows. Tests by impact are generally

made by causing a weight to fall through a regulated distance on a

piece of the material supported as a beam.

Tests of Strength. — Ordinary tests of strength are made by submitting the piece to direct pull, direct compression, bending or torsion. Testing machines are frequently arranged so that they may apply any of these four modes of stress; tests by direct tension are the most common, and next to them come tests by bending. When the samples to be tested for tensile strength are mere wires, the stress may be applied directly by weights; for pieces of larger section some mechanical multi- plication of force becomes necessary. Owing to the plas- ticity of the materials to be tested, the applied loads must be able to follow considerable change of form in the test-piece: thus in testing the tensile strength of wrought iron or steel provision must be made for taking up the large extension of length which occurs before fracture. In most modern forms of large testing machines the loads are applied by means of hydraulic pressure acting on a piston or plunger to which one end of the specimen is secured, and the stress is measured by connecting

lever. The lower holder is jointed to a cross-head C, which is connected by two vertical screws to a lower cross-head B, upon which the hydraulic plunger shown in section in fig. 7 exerts its thrust. G is a counterpoise which pushes up the plunger when the water is allowed to escape. Hydraulic pressure may be applied to the plunger by pumps or by an accumulator. In the present instance it is applied by means of an auxiliary plunger Q, which is pressed by screw gearing into an auxiliary cylinder. Q is driven by a belt on the pulley D. This puts stress on the specimen, and the weight W is then run out along the lever so that the lever is just kept floating between the stops E, E. Before the test -piece is put in the distance between the holders is regulated by means of the screws connecting the upper and lower cross-heads C and B, these screws being turned by a handle applied at F. The knife edges are made long enough to prevent the load on them from ever exceeding 5 tons to the linear inch. To adapt a machine of this class for tests in compression, a small platform is suspended like a stirrup by four rods from the weigh-beam, and hangs below the cross-head, which is pulled

the other end to a lever or system of levers provided with adjust- able weights. In small machines, and also in some large ones, the stress is applied by screw gearing instead of by hydraulic pressure. Springs are sometimes used instead of weights to measure the stress, and another plan is to make one end of the specimen act on a diaphragm forming part of a hydrostatic pressure gauge.

Single-lever Testing Machine. — Figs. 7 and 8 show an excellent form of single-lever testing machine designed by J. H: Wick- steed (Proc. Inst. Meek. Eng., August 1882) in which the stress is applied by an hydraulic plunger and is measured by a lever or steelyard and a movable weight. The illustration shows a 30-ton machine, but machines of similar design are in common use which exert a force of 100 tons or more. AA is the lever, on which there is a graduated scale. The stress on the test- piece T is measured by a weight W of 1 ton (with an attached vernier scale), which is moved along. the lever by a screw-shaft S; this screw-shaft is driven by a belt from a parallel shaft R, which takes its motion, through bevel-wheels and a Hooke's joint in the axis of the fulcrum, from the hand-wheel H. (The Hooke's joint in the shaft R is shown in a separate sketch above the lever in fig. 8.) The holder for the upper end of the sample hangs from a knife-edge 3 in. from the fulcrum of the

Fig. 8.

down when the hydraulic cylinder is put in action. The arrange- ment is that of two stirrups linked with one another, so that when the two pull against each other a block of material placed between them becomes compressed. For tests in bending one of the stirrups, namely, the platform which hangs from the weigh-beam, is made some 4 or 5 ft. long, and carries two knife- edge supports at its ends on which the ends of the piece that is to be bent rest, while the cross-head presses down upon the middle of the piece. In both cases the force which is exerted is measured by means of the weigh-beam and travelling weight, just as in the tension tests. To apply the force continuously, without shock, and either quickly or slowly at will, a very con- venient plan is to use an hydraulic intensifier, consisting of a large hydraulic piston operating a much smaller one. By gradually admitting water to the large piston from any con- venient source under moderate pressure, such as the town water mains, a progressively increased pressure is produced in the fluid on which the small piston acts, and this fluid is admitted to the straining cylinder of the. machine. One of the advantages of the vertical type of machine, with its single horizontal lever, is the facility with which the correctness of its readings may be verified. The two things to be tested are (1) the distance between the knife-edges, one of Which forms the fulcrum of the

weigh-beam and from the other of which the shackle holding the upper end of the specimen is hung, and (2) the weight of the travelling poise. The weight of the poise is readily ascertained by using a supplementary known weight to apply a known moment to the beam, and measuring how far the poise' has to be moved to restore equilibrium. The distance between the knife-edges is then found by hanging a known heavy weight from the shackle, and again observing how far the poise has to be moved. Another example of the single-lever type is the Werder testing machine, much used on the continent of Europe. In it the specimen is horizontal; one end is fixed, the other is attached to the short vertical arm of a bell-crank lever, whose fulcrum is pushed out horizontally by an hydraulic ram.'

Multiple-lever Testing Machines. — In many other testing machines a system of two, three or more levers is employed to reduce the force between > the specimen and the measuring weight. In most cases the fulcrums are fixed, and the stress is applied to one end of the specimen by hydraulic power or by screw gear- ing, which takes up the stretch, as in the single-lever machines already described. David Kirkaldy, who was one of the earliest as well as one of the most assiduous workers in this field, applied in his 1,000,000 !b machine a horizontal hydraulic press directly to one end of the horizontal test-piece. The other end of the piece was connected to the short vertical arm of a bell- crank lever; the long arm of this lever was horizontal, and was connected to a second lever to which weights were applied.

Machines have been employed in which one end of the speci- men is held in a fixed support; an hydraulic press acts on the other end, and the stress is calculated from the pressure of fluid in the press, this being observed by a pressure-gauge. Machines of this class are open to the obvious objection that the friction of the hydraulic plunger causes a large and very uncertain difference between the force exerted by the fluid on the plunger and the force exerted by the plunger on the speci- men. It appears, however, that in the ordinary conditions of packing the friction is very nearly proportional to the fluid pressure, and its effect may therefore be allowed for with some exactness. The method is not to be recommended for work requiring precision, unless the plunger be kept in constant rota- tion on its own axis during the test, in which case the effects of friction are almost entirely eliminated.

Diaphragm Testing Machines. — In another class of testing machines the stress (applied as before to one end of the piece, by gearing or by

hydraulic pressure) is measured by connecting the other end to a flexible diaphragm, on which a liquid acts whose pressure is determined by a gauge. Fig. 9 shows

to 30 ft., and exerting a pull of 360 tons or a push of 480 tons by an hydraulic press at one end. The stress is taken at the other end by a group of four large vertical diaphragm presses, which communicate by small tubes with four similar small diaphragm presses in the scale case. The pressure of these acts on a system of levers which terminates in the scale beam. The joints and bearings of all the levers are made frictionless by using flexible steel connecting-plates instead of knife-edges. The total multiplication at the end of the scale beam is 420,00c 2 Stress-strain Diagrams. — The results of tests are very com- monly exhibited by means of stress-strain diagrams, or diagrams showing the relation of strain to stress. A few typical diagrams for wrought iron and steel in tension are given in fig. 10, the data for which are taken from tests of long rods by Kirkaldy. 8 Up to the elastic limit these diagrams show sensibly the same rate of extension for all the materials to which they refer. Soon after the limit of elasticity is passed, a point, which has been called by Sir A. B. W. Kennedy the yield-point, is reached,

Fig. 9.

Thomasset's testing machine, in which one end of the specimen is pulled by an hydraulic press A. The other end acts through a bell-crank lever B on a horizontal diaphragm C, consisting of a metallic plate and a flexible ring of india-rubber. The pressure on the diaphragm causes a column of mercury to rise in the gauge-tube D. The same principle is applied in the remarkable testing machine of Watertown. arsenal, built in 1879 by the U.S. government to the designs of A. H. Emery. This is a horizontal machine, taking specimens of any length up

1 Maschine zum Priifen d. Festigkeit d. Materidlen, &c. (Munich,

1882).

8 10 12 14

Extension. per cent Fig. 10.

re

18 20

which is marked by a very sudden extension of the specimen. After this the extension becomes less rapid; then it continues at a fairly regular and gradually increasing rate; neat the point of rupture the metal again begins to draw out rapidly. When this stage is reached rupture will occur through the flow of the metal, even if the load be somewhat decreased. The diagram may in this way be maide to come back towards the line of no load, by with- drawing a part of the load as the end of the test is approached.

Fig. 1 1 is a stress-strain diagram for cast iron in ex- tension and compression, taken from Eaton Hodg- kinson's experiments. 4 The extension was measured on a rod 50 ft. long; the compression was also mea- sured on a long rod, which

2 See Report of the U.S. Board appointed to test Iron, Steel and other Metals (2 vols., 1881). For full details of the Emery machine, see Report of the U.S. Chief of Ordnance (1883), app. 24.

3 Experiments on the Mechanical Properties of Steel by a Committee of Civil Engineers (London, 1868 and 1870).

- *Report of the Commissioners on the Application of Iron to Railway Structures (1849).*

Fig. 11.

was prevented from buckling by being supported in a trough with partitions. The full line gives the strain produced by loading; it is continuous through the origin, showing that Young's modulus is the same for pull and push. (Similar experiments on wrought iron and steel in extension and compression have given the same result.) The broken line shows the set produced by each load. Hodgkinson found that some set could be de- tected after even the smallest loads had been applied. This is probably due to the existence of initial internal stress in the metal, produced by unequally rapid cooling in different por- tions of the cast bar. A second loading of the same piece showed a much closer approach to perfect elasticity. The elastic limit is, at the best, ill denned; but by the time the ultimate load is reached the set has become a more considerable part of the whole strain. The pull curves in the diagram ex- tend to the point of rupture; the compression curves are drawn only up to a stage at which the bar buckled (between the partitions) so much as to affect the results.

Autographic Recorders. — Testing machines are sometimes fitted with autographic appliances for drawing strain diagrams. When the load is measured by a weight travelling on a steelyard, the diagram may be drawn by connecting the weight with a drum by means of a wire or cord, so that the drum is made to revolve through angles proportional to the travel of the weight. At the same time another wire, fastened to a clip near one end of the specimen, and passing over a pulley near the other end, draws a pencil through distances proportional to the strain, and so traces a diagram of stress and strain on a sheet of paper stretched round the drum. 1 In Wicksteed's autographic recorder the stress is determined by reference, not to the load on the lever, but to the pres- sure in the hydraulic cylinder by which stress is applied. The main cylinder is in communication with a small auxiliary hydraulic cylinder, the plunger of which is kept rotating to avoid friction at its packing. This plunger abuts against a spring, so that the distance through which it is pushed out varies with the pressure in the main cylinder. A drum covered with paper moves with the plunger under a fixed pencil, and is also caused to rotate by a wire from the specimen through distances proportional to the strain. The scale of loads is calibrated by occasional reference to the weighted lever. 2 In Kennedy's apparatus autographic diagrams are drawn by applying the stress to the test-piece through an elastic master- bar of larger section. The master-bar is never strained beyond its elastic limit, and within that limit its extension furnishes an accurage measure of the stress; this gives motion to a pencil, which writes on a paper moved by the extension of the test- piece. 3 In R. H. Thurston's pendulum machine for torsion tests, a cam attached to the pendulum moves a pencil through distances proportional to the stress, while a paper drum attached to the other end of the test-piece turns under the pencil through distances proportional to the angle of twist. 4

Strain beyond the Elastic Limit: Influence of Time. — Jn testing a plastic material such as wrought-iron or mild steel it is found that the behaviour of the metal depends very materially on the time rate at which stress is applied. When once the elastic limit is passed the full strain corresponding to a given load is reached only after a perceptible time, sometimes even a long

1 For descriptions of these and other types of autographic recorder, see a paper by Professor W. C. Unwin, " On the Employment of Autographic Records in Testing Materials," Journ. Soc. Arts (Feb., 1886) ; also Sir A. B. W. Kennedy's paper, " On the Use and Equip- ment of Engineering Laboratories," Proc. Inst. Civ. Eng. (1886), which contains much valuable information on the whole subject of

testing and testing machines. On the general subject of tests see also Adolf Martens's Handbook of Testing Materials, trans, by G. C. Henning.

2 Proc. Inst. Mech. Eng. (1886). An interesting feature of this apparatus is a device for preventing error in the diagram through motion of the test-piece as a whole.

- *Proc. Inst. Mech. Eng. (1886); also Proc. Inst. Civ. Eng. vol. Uxxviii. pi. I (1886).*
- *Thurston's Materials of Engineering, pt. ii. For accounts of work done with this machine, see Trans. Amer. Soc. Civ. Eng. (from 1876); also. Report of the American Board, cited above.*

time. If the load be increased to a value exceeding the elastic limit, and then kept constant, the metal will be seen to draw out (if the stress be one of pull), at first rapidly and then more slowly. When the applied load is considerably less than the ultimate strength of the piece (as tested in the ordinary way by steady increment of load) it appears that this process of slow extension comes at last to an end. On the other hand, when the applied load is nearly equal to the ultimate strength, the flow of the metal continues until rupture occurs. Then, as in the former case, extension goes on at first quickly, then slowly, but finally, instead of approaching an asymptotic limit, it quickens again as the piece approaches rupture. The same phenomena are observed in the bending of timber and other materials when in the form of beams. If, instead of being subjected to a constant load, a test-piece is set in a constant condition of strain, it is found that the stress required to maintain this constant strain gradually decreases.

The gradual flow which goes on under constant stress- approaching a limit if the stress is moderate in amount, and continuing without limit if the stress is sufficiently great— will still go on at a diminished rate if the amount of stress be reduced. Thus, in the testing of soft iron or mild steel by a machine in which the stress is applied by hydraulic power, a stage is reached soon after the limit of elasticity is passed at which the metal begins to flow with great rapidity. The pumps often do not

keep pace with this, and the result is that, if the lever is to be kept floating, the weight on it must be run back. Under this reduced stress the flow continues, more slowly than be- fore, until presently the pumps recover their lost ground and the increase of stress is resumed.

Again, near the point of rupture, the flow again becomes specially rapid; the weight on the lever has again to be run ‘ back, and the specimen finally breaks under a diminished load. These

ixtension Fig. 12.

features are well shown by fig. 12, which is copied from the autographic diagram of a test of mild steel.

Hardening Effect of Permanent Set. — But it is not only through what we may call the viscosity of materials that the time rate of loading affects their behaviour under test. In iron and steel, and probably in some other metals, time has another effect of a very remarkable kind. Let the test be carried to any point a (fig. 13) past the original limit of elasticity. Let the load then be removed; during the first stages of this removal the material continues to stretch slightly, as has been explained above. Let the load then be at once replaced and loading continued. It will then be found that there is a new yield-point b at or near the value of the load formerly reached. The full line be in fig. 13 shows the subsequent behaviour of the piece. But now let the experiment be repeated on another sample, with this difference, that an interval of time, of a few hours or more, is allowed to elapse after the load is removed and before it is replaced. It will then be found that a process of hardening has been going on during this interval of rest; for when the loading is continued the new yield-point appears, not at b as formerly, but at a higher load d. Other evidence that a change has taken place is afforded by the fact that the ultimate extension is reduced and the ultimate strength is increased (e, fig. 13).

A similar and even more marked hardening occurs when a load (exceeding the original elastic limit), instead of being removed and replaced, is kept on for a sufficient length of time without change. When loading is resumed a new yield-point

is found only after a considerable addition has been made to the load. The result is, as in the former case, to give greater ultimate strength and less ultimate elongation. Fig. 14 exhibits two experiments of this kind, made with annealed iron wire. A

d.-e

c

E

too

*jS”^*

V

*.*10*

.0

5

5 10 1S

Exten$ion,per cent

Fig. 13.

*c ..-d IT**

o 5 10 15

Extension ,per cent

Fig. 14.

load of 23^ tons per square inch was reached in both cases; ab shows the result of continuing to load after an interval of five minutes, and acd after an interval of 45I hours, the stress of 23 j tons being maintained during the interval in both cases. 1

It may be concluded that, when a piece of metal has in any way been overstrained by stress exceeding its limits of elasticity, it is hardened, and (in some cases at least) its physical properties go on slowly changing for days or even months. Instances of the hardening effect of permanent set occur when plates or bars are rolled cold, hammered cold, or bent cold, or when wire is drawn. When a hole is punched in a plate the material con- tiguous to the hole is severely distorted by shear, and is so much hardened in consequence that when a strip containing the punched hole is broken by tensile stress the hardened portion, being unable to extend so much as the rest,

receives an undue proportion of the stress, and the strip breaks with a smaller load than it would have borne had the stress been uniformly distri buted. This bad effect of punching is especially noticeable in thick plates of mild steel. It disappears when a narrow ring of material surrounding the hole is removed by means of a rimer, so that the material that is left is homogeneous. Another remarkable instance of the same kind of action is seen when a mild-steel plate which is to be tested by bending has a piece cut from its edge by a shearing machine. The result of the shear is that the metal close to the edge is hardened, and, when the plate is bent, this part, being unable to stretch like the rest, starts a crack or tear which quickly spreads across the plate on account of the fact that in the metal at the end of the crack there is an enormously high local intensity of stress. By the simple expedient of planing off the hardened edge before bending the plate homogeneity is restored, and the plate will then bend without damage.

Annealing. — The hardening effect of overstrain is removed by the process of annealing, that is, by heating to redness and cooling slowly. In the ordinary process of rolling plates or bars of iron or mild steel the metal leaves the rolls at so high a tem- perature that it is virtually annealed, or pretty nearly so. The case is different with plates and bars that are rolled cold: they, like wire supplied in the hard-drawn state (that is, without being annealed after it leaves the draw-plate), exhibit the higher strength and greatly reduced plasticity which result from permanent set.

Extensometers. — Much attention has been paid to the design of extensometers, or apparatus for observing the small deforma- tion which a test-piece in tension or compression undergoes before its limit of elasticity is reached. Such observations afford the most direct means of measuring the modulus of longitudinal elasticity of the material, and they serve also to determine the limits within which the material is elastic. In such a material 1 J. A. Ewing, Proc. Roy. Soc. (June, 1880).

as wrought iron the elastic extension is only about Tˆiins of the length for each ton per square inch of load, and the whole amount up to the elastic limit is perhaps T ˆ T u of the length; with a length of 8 in., which is usual in tensile tests, it is desirable to read the extension to, say, rnoTss in. if the modulus of elasticity is to be found with fair accuracy, or if the limits of proportionality between strain to stress are under examination. Measurements taken between marks on one side of the bar only are liable to be affected by bending of the piece, and it is essential either to make independent measurements on both

sides or to measure the dis- placement between two pieces which are attached to the bar in such a manner as to share equally the strain on both sides.

In experiments carried out by Bauschinger, independent measurements of the strains on both sides of the bar were made by using mirror micrometers ot the type illustrated diagrammatically in fig. 15. Two clips a and b clasp the test-piece at the place between

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Fig. 15. which the extension is to be measured. The clip b carries two small rollers di d 2 which are free to rotate on centres fixed in the clip. These rollers press on two plane strips Ci c 2 attached to the other clip. When the specimen is stretched the rollers consequently turn through angles proportional to the strain, and the amount of turning is read by means of small mirrors gi and g 2 , fixed to the rollers, which reflect the divisions- of a fixed scale/ into the reading telescopes e\ e 2 . In Martens's extensometer each of the rollers is replaced by a rhombic piece of steel with sharp edges, one of which bears against the test-piece, while the other rests in a groove formed in the spring projecting parallel to the test-piece from the distant clip. Much

B

QCJ§)Q

Fig. 16. excellent work has been done by extensometers of this class, but in point of convenience of manipulation it is of great advantage to have the apparatus self-contained. J. A. Ewing has introduced a microscope extensometer of the self-contained type which is shown in fig. 16; its action will be seen by reference to the diagram fig. 17. Two clips B and C are secured on the bar, each by means of a pair of opposed set-screws. Between the two is a rod B' which is hinged to B and has a blunt pointed up- per end which makes a ball-and- socket joint with C at P. Another bar R hangs from C, and carries a mark which is read by a microscope attached to B. Hence, when the specimen stretches, the length of B' being fixed, the bar R is pulled up relatively to the microscope, and the amount of the movement Fig. 17.

is measured by a micrometer scale in the eyepiece. A screw at P serves to bring the mark on R into

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©B

the field of view, and also to calibrate the readings of the micros meter scale. The scale allows readings to be taken to boJito ln > by estimating tenths of the actual divisions. The arms CP and CQ are equal, and hence the movement of Q represents twice the extension of the bar under test. In another form of the instru- ment adapted to measure the elastic compression of short blocks the arm CQ is four times the length of CP, and consequently there is a mechanical magnification of five besides the magnification afforded by the microscope.

When the behaviour of specimens of iron, steel, or other materials possessing plasticity, is watched by means of a sensitive extensometer during the progress of a tensile test, it is in general observed that a very close proportionality between the load and the extension holds during the first stages of the loading, and that during these stages there is little or no " creeping " or supplementary extension when any particular load is left in action for a long time. The strain is a linear function of the stress, almost exactly, and disappears when the stress is removed. In other words, the material obeys Hooke's law. This is the stage of approximately perfect elasticity, and the elastic limit is the point rather vaguely defined by observations of the strain, at which a tendency to creep is first seen, or a want of proportionality between strain and stress. " Creeping " is usually the first indication that it has been reached. As the load is further augmented, there is in general a clearly marked yield-point, at which a sudden large extension ensues. In metals which have been annealed or in any way brought into a condition which is independent of the effects of earlier applications of stress, this clastic stage is well marked, and the limit of elasticity is as a rule sharply defined. But if the metal has been previously overstrained, without having had its elasticity restored by annealing or other appropriate treatment, a very different

behaviour is exhibited. The yield-point may be raised, as, for instance, in wire which has been hardened by stretching, but the

elasticity is much impaired, and it is only within very narrow limits, if at all, that proportionality between stress and strain is found. Subsequent prolonged rest gradually restores the elasticity, and after a sufficient number of weeks or months the metal is found to be elastic up to a point which may be much higher than the original elastic limit. 1 It has been shown by

1 See experiments by Johann Bauschinger, Mitt, aus dem mech-tech. Lab. in Miinchen (1886), and by the writer, Proc. Roy. Soc, vol. xlviii. (1895). A summary of Bauschinger's conclusions will be found in Martens's book, cited above, and in Uawin's Testing of Materials.

J. Muir 2 that the rate at which this recovery of elasticity occurs depends on the temperature at which the piece is kept, and that complete recovery may be produced in iron or steel by exposure of the overstrained specimen for a few minutes to the tempera- ture of boiling water. Figs. 18 and 19 illustrate interesting points in Muir's experiments. In these figures the geometrical device is adopted of shearing back the curves which show extension in relation to load by reducing each of the observed extensions by an amount proportional to the load, namely, by one unit of extension for each 4 tons per square inch of load. The effect is to contract the width of the diagrams, and to make any want of straightness in the curves more evident than it would otherwise be. To escape confusion, curves showing successive operations are drawn from separate origins. In the experiment of figs. 18 and 19 the material under test was a medium steel, containing about 0-4% of carbon, which when tested in the usual way showed a breaking strength of 39 tons per square inch with a well-marked elastic limit at about 22 tons. In fig. 18 the line A relates to a test of this material in its primitive condition; the loading was raised to 35 tons so as to produce a condition of severe overstrain. The load was then removed, and in a few minutes it was reapplied. The line B exhibits the effect of this application. Its curved form shows plainly that all approach to perfect elasticity has disappeared, as a consequence of the overstraining. There is now no elastic limit, no range of stress within which Hooke's law applies. With the lapse of time the curve gradually recovers its straight- ness, and the material, if kept at ordinary atmospheric tempera- ture, would show almost complete recovery in a month or two. But in this instance the recovery was hastened by immersing the piece for four minutes in boiling water, and line C shows that this treatment restored practically perfect elasticity up to a limit as high as the load by which the previous overstraining had been effected. The loading in C was continued past a new yield-point ; this made the elasticity again disappear, but it was restored in the same way as before,

namely, by a few minutes' exposure to 100° C, and the line D shows the final test, in which the elastic limit has been raised in this manner to 45 tons. Other tests have shown that a temperature of even 50° C. has a considerable in- fluence in hastening the recovery of elasticity after overstrain.

In the non-elastic condition which follows immediately on overstrain the metal shows much hysteresis in the relation of

Fig. 19.

strain to stress during any cyclic repetition of a process of load- ing. This is illustrated in fig. 19, where the arrows indicate the sequence of the operations.

When a piece of iron or steel which has been overstrained in tension is submitted to compression, it shows, as might

1 Muir, " On the Recovery of Iron from Overstrain," Phil. Trans. A, vol. 193 (1900).

be expected, no approach to conformity with Hooke's law until recovery has been brought about either by prolonged rest at ordinary temperature or by exposure for a short time to some higher temperature. After recovery has taken place the elastic limit in compression is found to have been lowered; that is to say, it occurs at a lower load than in a normal piece of the same metal. But it appears from Muir's experiments that the amount of this lowering is not at all equal to the amount by which the elastic limit has been raised in tension. In other, words, the general effect of hardening by overstrain, followed by recovery of elasticity, is to widen the range within which a practically complete proportionality between strain and stress holds good.

Contraction of Section at Rupture. — The extension which occurs when a bar of uniform section is pulled is at first general, and is distributed with some approach to uniformity over the length of the bar. Before the bar breaks, however, a large additional amount of local extension occurs at and near the place of rupture. The material flows in that neighbourhood much more than in other parts of the bar, and the section is much more contracted there than elsewhere. The contraction of area at fracture is frequently stated as one of the

results of a test, and is a useful

little

j'ji :

Fig. 20.

index to the quality of materials. If a flaw is present sufficient to determine the section at which rupture shall occur the con- traction of area will in general be distinctly diminished as com- pared with the contraction in a specimen free from flaws, although little reduction may be noted in the total extension of the piece. Local extension and contraction of area are almost absent in cast iron and hard steel; on the other hand, they are specially prominent in wrought iron, mild steel and other metals that combine plasticity with high tensile strength. An example is shown in fig. 20, which is copied from a photograph of a broken test-piece of Whitworth mild fluid-compressed steel. The piece was of uniform diameter before the test.

Experiments with long rods show that the general extension which occurs in parts of the bar not near the break is somewhat irregular; 1 it exhibits here and there incipient local stretching, which has stopped without leading to rupture. This is, of course, due in the first instance to want of homogeneity. It may be supposed that when local stretching begins at any point in the earlier stages of the test it is checked by the hardening effect of the strain, until, finally, under greater load, a stage is reached in which the extension at one place goes on so fast that the hardening effect cannot keep pace with the increase in intensity of stress which results from diminution of area; the local extension is then unstable, and rupture ensues. Even at this stage a pause in the loading, and an interval of relief from stress, may harden the locally stretched part enough to make rupture occur somewhere else when the loading is continued.

Influence of Local Stretching on Total Elongation.— Local stretching causes the percentage of elongation which a test- piece exhibits before rupture (an important quantity in engineers' specifications) to vary greatly with the length and section of the piece tested. It is very usual to specify the length which is to exhibit an assigned percentage of elongation. This, however, is not enough; the percentage obviously depends on the relation of the transverse dimensions to the length. A fine wire 8 in. long will stretch little more in proportion to its length than a very long wire of the same quality. An 8-in. bar, say 1 in. in

diameter, will show something like twice as much the percentage of elongation as a very long rod. The experiments of Barba 2 show that, in material of uniform quality, the percentage of

1 See Kirkaldy's Experiments on Fagersta Steel (London, 1873).

5 M4m. de la soc. des ing. civ. (1880); see also a paper by W. Hackney, " On the Adoption of Standard Forms of Test-Pieces," Proc. Inst. Civ. Eng. (1884).

extension is constant for test -pieces of similar form, that is to say, for pieces of various size in which the transverse dimensions are varied in the same proportion as the length. It is to be regretted that in ordinary testing it is not practicable to reduce the pieces to a standard form with one proportion of transverse dimensions to length, since tests in which the relation of length to cross-section differ give results which are incapable of direct comparison with one another.

Influence on Strength. — The form chosen for test-pieces in tension tests affects not only the extension but also the ultimate strength. In the first place, if there is a sudden or rapid change in the area of cross-section at any part of the length under tension (as at AB, fig. 21), the stress will not be uniformly distributed there. The intensity will be greatest at the edges A and B, and the piece will, in consequence, pass its elastic limit at a less value of the total load than would be the case if the change from the larger to the smaller section were gradual. In a non-ductile material rupture will for the same reason take place at AB, with a less total load than would otherwise be borne. On the other hand, ■JLJ with a sufficiently ductile material, although the section AB is the first to be permanently deformed, rupture will preferably take place at some section AB, because at and near AB the contraction of

21.

Fig. not near

sectional area which precedes rupture is partly prevented by the presence of the projecting portions C and D. Hence, too, with a ductile material samples such as those of fig. 22, in

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Fig. 22.

which the part of smallest section between the shoulders or enlarged ends of the piece is short, will break with a greater load than could be borne by long uniform rods of the same section. In good wrought iron and mild steel the flow of metal preceding rupture and causing local contraction of section extends over a length six or eight times the width of the piece; and, if the length throughout which the section is uniform be materially less than this, the process of flow will be rendered more difficult and the breaking load of the sample will be raised. 3

These considerations have, of course, a wider application than to the mere interpretation of special tests. An important practical case is that of riveted joints, in which the metal left between the rivet holes is subjected to tensile stress. It is found to bear, per square inch, a greater pull than would be borne by a strip of the same plate if the strip were tested in the usual way with uniform section throughout a length great enough to allow complete freedom of local flow. 4

Fracture by Tension. — In tension tests rupture may occur by direct separation over a surface which is nearly plane and normal to the line of stress. This is not uncommon in hard steel and other comparatively non-ductile materials. But in ductile materials under tension the piece generally gives way by shearing on an inclined surface. Very often the effect is a more or less perfect ring-shaped crater on one side of the break and a truncated cone on the other.

3 The greater strength of nicked or grooved specimens seems to have been first remarked by Kirkaldy (Experiments on Wrought Iron and Steel, p. 74, also Experiments on Fagersta Steel, p. 27). See also a paper by E. Richards, on tests of mild steel, Journ. Iron and Steel Inst. (1882).

4 See Kennedy's " Reports on Rivetted Joints," Proc. Inst. Mech. Eng. (1881-1885). In the case of mild-steel plates a drilled strip may have as much as 12 % more tensile strength per square inch than an Undrilled strip. With punched holes, on the other hand, the remaining metal is much weakened, for the reason referred to in the text.

Fracture by Compression. — In compression tests of a plastic material, such as mild steel, a process of flow may go on without

f....ˆ.. « limit; the piece (which must of course

; |' be short, to avoid buckling) shortens

i | and bulges out in the form of a cask.

i I This is illustrated by fig. 23 (from

one of Sir W. Fairbairn's experi- ments), which shows the compres- sion of a round block of steel (the original height and diameter of which „ are shown by the dotted lines) by a

3- l oa d equal to 100 tons per sq. in. of

original sectional area. The surface over which the stress is distributed becomes enlarged, and the total load must be increased in a corresponding degree to maintain the process of flow. 1 The bulging often produces longitudinal cracks, as in the figure, especially when the material is fibrous as well as plastic (as in the case of wrought iron). A brittle material, such as cast iron, brick or stone, yields by shearing on inclined planes as in figs. 24 and 25, which are taken from

Fig. 24. Fig. 25.

Hodgkinson's experiments on cast iron. 2 The simplest fracture of this kind is exemplified by fig. 24, where a single surface (approximately a plane) of shear divides the compressed block into two wedges. With cast iron the slope of the plane is such that this simplest mode of fracture can take place only if the height of the block is not less than about -f the width of the base. When the height is less the action is more complex. Shearing must then take place over more than one plane, as in fig. 25, so that cones or wedges are formed by which the surrounding portions of the block are split off. The stress required to crush the block is consequently greater than if the height were sufficient for shearing in a single plane.

Plane of Shear. — The inclination of the surfaces of shear, when fracture takes place by shearing under a simple stress of pull or push, is a matter of much interest, throwing some light on the question of how the resistance which a material exerts to stress of one kind is affected by the presence of stress of another kind — a question scarcely touched by direct experiment. At the shorn surface there is, in the case of tension tests, a normal pull as well as a shearing stress, and in the case of compression tests a normal push as well as shearing stress. If this normal component were absent the material

(assuming it to be isotropic) would shear in the surface of greatest shearing stress, which, as has already been shown, is a surface inclined at 45 to the axis. In fact, however, it does not shear on this surface. Hodgkinson's experiments on the compression of cast iron give surfaces of shear whose normal is inclined at about 55 to the axis of stress, and Kirkaldy's, on the tension of steel, show that when rupture of a rod under tension takes place by shear the normal to the surface is inclined at about 25 to the axis. These results show that normal pull diminishes resistance to shearing and normal push increases resistance to shearing. In the case of cast iron under compression, the material prefers to shear on a section

1 For examples, see Fairbairn's experiments on steel, Brit. Assoc. Rep. (1867).

2 Report of the Royal Commissioners on the Application of Iron to Railway Structures (1849); see also Brit. Assoc. Rep. (1837).

where the intensity of shearing stress is only 0-94 of its value on the surface of maximum shearing stress (inclined at 43°), but where the normal push is reduced to o-66 of the value which it has on the surface of maximum shearing stress.

Luders's Lines. — It is interesting to refer in this connexion to the phenomenon observed in 1859 by W. Ltiders 3 of Magdeburg and afterwards studied more fully by L. Hartmann. 4 When a bar of plastic metal such as mild steel, preferably fiat and with a polished surface, is extended a little beyond its elastic limit, markings appear on the surface in the form of narrow bands running transversely across it. These bands are regions within which a shearing deformation has taken place, resulting from the tension, as has been explained with reference to fig. 1, and they are distinguished from the remainder of the bar because in the early stages of plastic strain the yielding is local. For the reason that has just been explained in speaking of surfaces of rupture, Luders's lines in a rod strained by direct pull are found to be inclined, not at 45 , but at an angle more nearly normal to the axis of pull (making about 65° with it). Their inclination shows that the metal prefers to elongate by shearing on a section where p t the shearing stress is not at its maximum, because p n the normal component — which is a pull — is greater there, and this can only mean that the presence of a normal component of the nature of a pull at any section reduces the resistance to yielding under the shearing stress which acts at that section, while similarly the presence of a normal component of the nature of a push increases the resistance to shear.

Yielding under Compound Stress. — A question of much theoretical interest and also of some practical importance is, what determines the yielding of a piece when it is subjected not to a simple pull or push alone but to a stress combined of two or of three principal stresses? According to one view, which in the absence of experimental data appears to have been taken by W. J. M. Rankine, the material yields when the greatest principal stress reaches a certain limit, irrespective of the existence of the other principal stresses. According to another view (Barre de Saint- Venant), it yields when the maximum strain reaches a certain limit, and as the strain depends in part on each of the three principal stresses this gives a different criterion. Neither the maximum stress theory nor the maximum strain theory can be regarded as satisfactory, and probably a much sounder view is that the material yields when the greatest shearing stress reaches a certain limit. Even this, however, requires some qualification in the light of what has just been said about the inclination of surfaces of shear and Luders's lines, for it is clear from these experimental indications that resistance to shear is affected by the presence of normal stress on the plane of shear, and conse- quently a theory which takes account of shearing stress only as the criterion of yielding cannot be completely correct. Accord- ing to the greatest shearing stress theory the yielding under compound stress depends directly on the difference between the greatest and least principal stress. In such cases of compound stress as have to be dealt with in engineering design this furnishes a criterion which though imperfect is certainly to be preferred to the criterion furnished by calculating the greatest principal stress.

Experiments on Compound Stress. — In experiments carried out by J. J. Guest (Phil. Mag., 1900, vol. 50) the action of combined stresses in causing yielding was investigated by sub- jecting thin tubes to (1) tension alone, (2) tension and torque, (3) tension and internal (fluid) pressure, and (4) torque and internal pressure, while measurements were made of the axial strain and the twist so as to detect the first failure of elasticity. The general result of the experiments, so far as they went, was to support the view that yielding depends primarily on the greatest shearing stress, that is to say, on the difference between the greatest and least principal stresses.

Fatigue of Metals. — A matter of great practical as well as scientific interest is the destructive action which materials

3 Dineler's Polytech. Journ. (i860), 155, p. 18.

4 Bulletin de la sociHi d 'encouragement (1896 and 1897).

may suffer through repeated changes in their state of stress. It appears that in some if not in all materials a limited amount of stress-variation may be repeated time after time without appreciable deterioration in the strength of the piece; in the balance-spring of a watch, for instance, tension and compression succeed each other some 150 millions of times in a year, and the spring works for years without apparent injury. In such cases the stresses lie well within the elastic limits. On the other hand, the toughest bar breaks after a small number of bendings to and fro, when these pass the elastic limits, although the stress may have a value greatly short of the normal ultimate strength. A laborious research by A. Wohler, 1 extending over twelve years, gave much important information regarding the effects on iron and steel of very numerous repeated alternations of stress from positive to negative, or between a higher and a lower value with- out change of sign. By means of ingeniously-contrived machines he submitted test pieces to direct pull, alternated with complete or partial relaxation from pull, to repeated bending in one direction and also in opposite directions, and to repeated twisting towards one side and towards opposite sides. The results show that a stress greatly less than the ultimate strength (as tested in the usual way by a single application of load continued to rupture) is sufficient to break a piece if it be often enough re moved and restored, or even alternated with a less stress of the same kind. In that case, however, the variation of stress being less, the number of repetitions required to produce rupture is greater. In general, the number of repetitions required to produce rupture is increased by reducing the range through which the stress is varied, or by lowering the upper limit of that range. If the greatest stress be chosen small enough, it may be reduced, removed, or even reversed many million times without destroying the piece. Wohler's results are best shown by quoting a few figures selected from his experiments. The stresses are stated in centners per square zoll; 2 in the case of bars subjected to bending they refer to the top and bottom sides, which are the most stressed parts of the bar. I. Iron bar in direct tension: —

Stress.

Number of Applications

Stress.

Number of Applications

Max. Min.

causing Rupture.

Max. Mm

causing Rupture.

480

800

320

10,141,645

440

106,001

400

340,853

440 200

2.373,424

360

480,852

440 240

Not broken with 4 millions.

II. Iron

bar bent by transverse

load : —

Stress.

Number of Bendings

Stress.

Number of Bendings

Max. Min.

causing Rupture.

Max. Min.

causing Rupture.

550

169.750

400

1,320,000

500

420,000

350

4.035,400

450

481,950

300

Not broken with 48 millions.

III. Steel bar bent by transvers

e load : —

Stress.

Number of Bendings

Stress.

Number of Bendings

Max. Min.

causing Rupture.

Max. Min

causing Rupture.

OOO

72,450

900 400

225.300

000 200

81.200

000 500

764,900 — mean of two trials.

qoo 300

156,200

000 600

Not broken with 33 £ millions-

IV. Iron

bar bent by supportin

g at one end, the other end being

loaded; alternations of stress fron

1 pull to

Dush caused by rotating

the bar: —

Stress.

Number of Rotations

Stress.

Number of Rotations

From T to —

causing Rupture.

From + to

— causing Rupture.

320

56.430

220

3,632.588

300

99,000

200

4,917,902

2S0

183,145

180

*ig,i86,79i_*

260

479,400

160

Not broken with 1321 millions.

240

909,810

From these and other experiments Wohler concluded that the wrought iron to which the tests refer could probably bear an indefinite number of stress changes between the limits stated (in round numbers) in the following table (the ultimate tensile strength was about 192 tons per sq. in.): — ■

Stress in Tons per Sq. In.

From pull to push +7 to —7

From pull to no stress 13 to o

From pull to less pull 19 to 10J

1 Die Festigkeits-Versuche mit Eisen und Stahl (Berlin, 1870), or Zeitschr. fiir Bamvesen (1860-1870); see also Engineering (1871), vol. xi. For early experiments by Fairbairn on the same subject, see Phil. Trans. (1864).

- According to Bauschinger the centner per square zoll in which Wohler gives his results is equivalent to 6837 kilos per sq. cm., or 00434 t° n P er sq. in.

Hence it appears that the actual strength of this material varies in a ratio which may be roughly given as 3 : 2 : 1 in the three cases of (a) steady pull, (b) pull alternating with no stress, very many times repeated, and © pull alternating with push, very many times repeated. For steel Wohler obtained results of a generally similar kind. His experiments were repeated by L. Spangenberg, who extended the inquiry to brass, gun-metal and phosphor-bronze.? A considerable amount of light has been thrown on the nature of fatigue in metals by miscroscopic investigations, which will be referred to presently.

Resilience. — A useful application of diagrams showing the relation of strain to stress is to determine the amount of work done in straining a piece in any assigned way. The term " resilience " is conveniently used to specify the amount of work done when the strain just reaches the corresponding elastic limit. Thus a rod in simple tension or simple compression has a re- silience per unit of volume = phE, where /is the greatest elastic pull or push. A blow whose energy exceeds the resilience (reckoned for the kind of stress to which the blow gives rise) must in the most favourable case produce a permanent set; in less favourable cases local permanent set will be produced although the energy of the blow is less than the resilience, in consequence of the strain being unequally distributed.

In a plastic material a strain exceeding the limit of elasticity absorbs a relatively large amount of energy, and generally increases the resilience for subsequent strains. Fracture under successive blows, as in the testing of rails by placing them as beams on two supports, and allowing a weight to fall in the middle from a given height, results from the accumulated set which is brought about by the energy of each blow exceeding the resilience.

Internal Stress. — Professor James Thomson 4 pointed out that the effect of any externally applied load depends, to a very material extent, on whether there is or is not initial internal stress, or, in other words, whether the loaded piece is initially in what Professor Karl Pearson has called a state of ease. Internal stress existing without the application of force from without the piece must satisfy the condition that its resultant vanishes over any complete cross-section. It may exist in consequence of set caused by previously applied forces (a case of which instances are given below), or in consequence of previous temperature changes, as in cast iron, which is thrown into a state of internal stress by unequally rapid cooling of the mass. Thus in (say) a spherical casting an outside shell solidifies first, and has become partially contracted by cooling by the time the inside has become solid. The inside then contracts, and its contraction is resisted by the shell, which is thereby compressed in a tangential direction, while the metal in the interior is pulled in the direction of the radius. Allusion has already been made to the fact, pointed out by J. Thomson, that the defect of elasticity under small loads which Hodgkinson discovered in cast iron is probably due to initial stress. In plastic metal a nearly complete state of ease is brought about by annealing; even annealed pieces, however, sometimes show, in the first loading, small defects of elasticity, which are probably due to initial stress, as they disappear when the load is reapplied.

Microscopic Examination. — Of all recent aids to a knowledge of the structure of metals, of their behaviour under stress, and of the nature of plastic strain, perhaps the most important is microscopic examination. The microscopic study of metals was initiated by H. C. Sorby as early as 1864 (see Brit. Assoc. Rep.

3 Ueber das Verhallen der Metalle bei iviederholten Anstrengungen (Berlin, 1875). For interesting notices of the fatigue of metals in railway axles, bridge ties, &c, and results of experiments showing reduced plasticity in fatigued metal, see Sir B. Baker's address to the Mechanical Section of the British Association (1885). In many of the cases where the fatigue of metals occurs in engineering practice the

phenomenon is complicated by the occurrence of blows or shocks whose energy is absorbed in producing strains often exceeding the elastic limits, sometimes of a very local character in consequence of the inertia of the strained pieces. Such shocks may cause an accumulation of set which finally leads to rupture in a way that is not to be confused with ordinary fatigue of strength. The effects of the accumulation may be removed by annealing.

4 Camb. and Dub. Math. J own. (Nov. 1848).

for that year) . After a period of neglect, it has been pursued with much energy by a large number of observers, and has yielded results which are of fundamental importance in relation to the strength of materials. For the purpose of microscopic examina- tion it is usually necessary to bring a small piece of the metal to a state of high surface polish, the final stage of which is per- formed by rubbing on a surface of wash-leather charged with a thin paste of rouge and water (see also Metallography). The specimen is then lightly etched in dilute acid or treated with a staining medium, such as liquorice or cocoa, to make the structure visible. When the surface is examined under a lens of suitable power it is seen to be made up of irregular areas with well-defined boundaries. The areas into which the surface is divided differ in apparent texture, and when illuminated obliquely it is found that some of them shine out brightly while others are dark ; by changing the direction of the incident light other areas become bright and those previously bright become dark. These areas are the sections of crystalline grains which constitute the mass of the metal. Each grain is a crystal, the elementary portions of which are all oriented one way, but the orientation changes as we pass from grain to grain. The irregular boundaries are the chance surfaces in which one grain meets another during the progress of its crystalline growth. Etching a polished surface develops a multitude of facets which have the same orientation over any one grain, and therefore give it a uniform texture and a uniform brightness in reflecting light of any particular incidence. The size of the grains depends very much upon the previous thermal treatment to which the metal has been subjected. Sudden cooling from a high temperature tends to make the grains small, slow cooling tends to keep them large; and protracted exposure to moderately high temperature has been observed in some cases to favour the growth of very large grains.

When the metal is strained in any manner beyond its limit of elasticity the grains are found to have altered their shape, becoming lengthened in the direction in which stretch has occurred. Subsequent exposure to a temperature which is high enough to remove the mechanical hardness produced by overstraining is found to bring about a reconstruction of the grains; the original pattern is not reproduced, but the reformed grains show no direction of predominating length. Researches by J. A. Ewing and W. Rosenhain (" The Crystalline Structure of Metals," Phil. Trans., 1900) showed that metals retain their crystalline character even when so severely strained as to exhibit qualities of plasticity which are at first sight inconsistent with the idea of crystalline structure. The manner in which a metal yields when the strain exceeds the elastic limit is by slips which occur in the cleavage or " gliding " planes of the individual crystals. These slips are seen under the microscope as sharply defined lines which appear on the polished surface of each grain as soon as the yield-point in any process of straining has been . _- . t

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*"/, ', 'I, ",, ", ",l'l","i,X iV^A**^\W\W«'*

Before straining

.':'//,

■< *V*

After straining

Fig. 26.

reached. Seen under normal illumination the lines are dark; seen under oblique illumination they may be made to appear as bright lines on a dark ground. The appearance of each line shows that it is a narrow step produced by the slipping of one part of the crystalline grain over another part. The diagram fig. 26 represents a section between two contiguous surface grains, having cleavage or gliding planes as indicated by the dotted lines, AB being a part of the polished surface. When straining beyond

the elastic limit takes place, as by a pull in the direction of the arrows, yielding occurs by finite amounts of slip at a limited number of places, as at a, b, c, d, e. This exposes short steps, which are portions of cleavage surfaces, and which, when viewed under

normally incident light, appear black because they return no light to the microscope. They consequently appear as dark lines or narrow bands extending over the polished surface in directions which depend on the intersection of that surface with the planes of slip. Many such lines appear as the process of straining goes on; they are spaced at more or less regular inter- vals, and in general three systems of them may be observed intersecting one another. With three independent systems of slips it is clear that the grain may take any shape in the process of straining; in many cases four systems of slips are seen. In this way severe deformations occur without affecting the crystal- line character of the structure, although the shape of each crystal undergoes much change. A bar of iron which has been rolled cold from a large to a small section shows, when it is polished and etched, a structure in which each grain has all the characteristics of a crystal, although the grains have been distorted into forms very different from those which are found in bars which are rolled at a red heat or are annealed after rolling. It appears that the process of straining has occurred through movements which preserve the parallelism of all the portions of each individual grain so long as continuity of the parts of the grain is preserved. In many metals, however, a further effect of severe strain is to develop twin crystals, and this implies a rotation of one group of elements through a definite angle with respect to the other elements of the same grain. Excessively severe straining, as, for instance, the squeezing of a block of lead into a thin flat plate, is found to produce a crystalline structure in which the grains have a greatly reduced size; the slips have in that case gone so far as to cause divisions and interpenetrations of the crystals.

Growth of Crystals. — Microscopic examination further shows that after severe straining the structure of a metal is far from stable, a fact which connects itself with what is observed in re- spect to mechanical quality. In some metals at least , and notably in lead, severe straining is followed, even at atmospheric temper- atures, by a protracted crystalline growth which results in the formation of crystals which are relatively very large. A piece of ordinary sheet lead shows the effects of this growth well; it will be found, when etched, to consist in general of crystals enormously larger than any that could have survived the process of manufacture by rolling. A similar growth may readily be traced from day to day or week to week in a piece of lead which is kept under observation after being severely strained. The process of growth is greatly accelerated by raising the temperature. That some process more or less analogous to this goes on in iron and steel during the change which occurs when

elastic recovery takes place after overstraining may be conjectured, though there is as yet no direct evidence on the point. The growth of large crystals which is seen to occur in lead at very moderate temperatures has perhaps a more direct relation to the changes which occur in iron or steel at temperatures high enough to produce annealing. The structure of steel as exhibited by the microscope has received much attention, notably at the hands of F. Osmond and J. O. Arnold. Microscopic examination of the low or medium carbon steel used for structural purposes shows it to consist of grains of iron (ferrite) , interspersed with grains which have in general a laminated structure and are composed of alternate bands of two constituents, namely, iron and carbide of iron (Fe» C). To these laminated grains the name of pearlite has been given. In steel such as is used for rails, containing about 0-4 or 0‘5% of carbon, the grains of pearlite occupy about as large a volume of the specimen as the grains of unlaminated ferrite; but when the proportion of carbon is increased to about 0-9% the whole is a mass of pearlite having an exceedingly intimate mixture of the two constituents. This appears to be a eutectic alloy, and the same intimately blended structure is characteristic of eutectic alloys generally. Important variations in the visible structure result from quenching, annealing, and

other varieties of thermal treatment, as well as from the presence of other constituents in the steel, but to discuss these would be beyond the scope of the present article.

In experiments by Ewing and J. C. W. Humfrey (” The Fracture of Metals under repeated Alternations of Stress,” Phil. Trans., 1903) the microscope was employed to examine the process by which metals break through ” fatigue ” when sub- jected to repeated reversals of stress. The test-pieces were short rods overhanging from a revolving mandrel and loaded at the end so as to produce a bending moment. A part near the support, where the stresses due to bending were greatest, was polished beforehand for observation in the microscope. After a certain number of reversals the surface was examined, and the examination was repeated at intervals as the process continued. The material was Swedish iron following Hooke’s law (in ten- sion) up to 13 tons per sq. in. and having a well-marked yield- point at 14- 1 tons per sq. in. It was found that the material suffered no damage from repeated reversals of a stress of 5 tons per sq. in., but that when the greatest stress was raised to 7 tons per sq.

in. incipient signs of fatigue began to be apparent after many reversals, though the piece was still intact after the number of reversals had reached three millions. With a stress of 9 tons per sq. in., or more, repeated reversals brought about fracture. The first sign of fatigue as detected in the microscope was that slip lines began to appear on one or more of the crystals in the region of greatest stress: as the process went on these became more distinct and tended to broaden, and at length some of them developed into cracks which were identified as such because they did not disappear when the surface was repolished. Once a crack had formed it quickly spread, and finally the piece broke with a sharp fracture, showing practically no plastic change of form before rupture.

It may be concluded that under repeated alternations of stress fatigue, leading to fracture, is liable to occur if, and only if, the stress is such as to produce slips in some of the crystals: in other words if, and only if, the limit of elasticity is locally exceeded; but the limit for particular crystals may be consider- ably lower than what is usually taken as the limit for the metal as a whole. The resistance to slip in any one crystal depends on three things: (1) the inherent strength of its own substance,

(2) the amount of support it receives from its neighbours, and

(3) the orientation of the crystal with respect to the surfaces of maximum shearing stress. It may be inferred that even in the most homogeneous metal some crystals have a liability to develop slips more readily than others, and that it is with them we are concerned in dealing with the safe limits of alternating stress. The same considerations have a bearing on certain effects of heat treatment. It is well known that in steel which has been over- heated (by unnecessarily prolonged exposure to a high tempera- ture) a somewhat gross crystalline structure is developed, showing large ferrite areas not broken up by intermixture with pearlite. The resistance to slip in the large ferrite crystals is comparatively small, and hence the overheated metal has a low elastic limit and shows but little power of resisting alternating stress. By suitable heat treatment, on the other hand, it is possible to bring the metal into a state in which the crystals are small and the ferrite and pearlite are so intimately blended that there is much mutual support: the elastic limit is high and the metal is well adapted to endure stresses which would otherwise cause fatigue.

It may be asked, How is the crystal constituted to admit of elastic and plastic strain? How can slip take place without destroying the

adhesion between the faces until that is destroyed by many back and forth rubbings at the surface of slip? _ J. A. Ewing has endeavoured to picture a molecular constitution in which the molecules are assumed to possess polar quality along three axes, and to be free to turn except in so far as they are constrained by the mutual forces between the pole of each molecule and those of its neighbours. This theory, which was developed by its author in his presidential address to the engineering section of the British Association in 1906, accords

well with many of the obscure phenomena of elastic and plastic strain, with what is known of fatigue, and with the loss of elasticity after overstrain and its subsequent recovery.

Influence of Foreign Matter. — It is a well-known characteristic of metals that small quantities of foreign matter may produce an altogether disproportionately large influence on their mechanical and other properties. The effect of small quantities of carbon in iron, of nickel in iron, of aluminium in copper, are important practical instances where a highly beneficial effect, in respect of strength and ductility, is produced. The wide and varied range of qualities possessed in steel from pure iron at one end to tool steel at the other is due to quantities of carbon which lie, for the most part, under 1%. The addition of about 3 or 4% of nickel to mild steel has given ah important new structural material possessing increased strength and a high elastic limit, and retain- ing ample capacity for plastic strain. The presence of manganese in small quantities is known to be an essential condition of strength in mild steel. The addition of from 15 to 3% of chromium enables steel to acquire, under suitable heat treat- ment, the excessive hardness desirable in armour plate and armour-piercing shell. Small quantities of vanadium added to steel improve it sufficiently to be advantageous in certain applications where saving of weight is important, notably in steel for motor carriage engines, notwithstanding the extra cost.

Data as to Strength of Steel. — A few figures may be quoted as to the strength and plasticity of steel, some of which are taken from the reports of the Engineering Standards Committee (1906-1907) specifying tests to which the material should conform.

Ordinary plates and bars of mild steel for structural purposes (bridges, ships, &c), containing as a rule not more than 2% of carbon, have a tensile strength of 28 to 32 tons per sq. in., and an 8-in. specimen with a cross-section of from | to l| sq. in. should stretch at least 20%. They should stand being bent cold through 180 on a radius i| times the thickness of the specimen, the test- piece for

bending being not less than l| in. wide. Rivet bars, of somewhat softer steel, have a tensile strength of 26 to 30 tons, with 25% of elongation on 8 in. Steel rails, containing 0-4 or 0-5% of carbon, have a tensile strength of 38 to 48 tons and stretch 15% on a 2-in. length, the area of section of the test-piece being i sq. in. Steel for axles has a tensile strength of 35 to 40 tons and stretches 25 to 30% on the 2-in. length. The elastic limit should be at least 50 % of the breaking load. Steel for tires may in some cases have a tensile strength as high as 60 tons with about 8 to 10 % extension in 2 in. Steel castings commonly range in tensile strength from 26 to 35 tons, with about 15% extension in 2 in. The strength of steel wire is considerably higher than that of bar or plates: 70 to 100 tons per sq. in. is not unusual, and in steel pianoforte wire it may be as high as 150 tons per sq. in.

Steel for guns, containing generally 0-3 to 0-4 % of carbon, has a tensile strength of 33 to 44 tons per sq. in., with at least 17 % extension in 2 in., the test-piece having the usual cross-section of i sq. in. . Nickel steel for guns, containing 0-4% of carbon and 4% nickel, has a strength of 45 to 55 tons and an extension of at least 16% in 2 in. Much the same figures apply to nickel-chrome steel for the same purpose, with I % of chromium, 4 % of nickel and 0-3 % of carbon. Flat specimens of gun steel f in. wide and 0375 in. thick stand bending cold through 180 on a radius of ii in. All these tests of gun steel are made after forging and after the normal heat treatment, which consists first of oil-hardening by plunging the steel at a temperature not lower than 1500 F. into a bath of oil, and then tempering, by reheating to a temperature generally about 900 to 1000° F. This heat treatment brings the metal into a con- dition in which the granular structure is minute and the constituents are very thoroughly intermixed, with the result of giving a high elastic limit. Tests made on gun steel containing about 0-35 % of carbon show that the yield-point occurred at 18 tons per sq. in. before the heat treatment, and at 25 tons after it, the extension remaining practically unchanged at 30 % in 2 in. In nickel steel the yield-point is initially higher, but in it too .the heat treatment effects a considerable improvement in this respect without reducing the extension.

It is remarkable that though the strength of wrought iron and steel may range from 20 tons per sq. in., or even less, up to 150 tons, the moduli which measure its elastic quality are nearly the same in all grades. Young's modulus E ranges from about 12,500 to 14,000 tons per sq. in., and the modulus of rigidity C from 5000 to 5700 tons per sq. in.

Graphic Representation of Distributed Stress. — Space admits of no more than a short and elementary account of some of the more simple straining actions that occur in machines and engineering structures. ‘

,g

The stress which acts on any plane surface AB (fig. 27), such as an imaginary cross-section of a strained piece, may be represented by a figure formed by setting up ordinates ha, Bb, &c, from points on the surface, the length of these being made proportional to the intensity of stress at each point. This gives an ideal solid, which may be called the stress figure, whose height shows the distribution of stress over the surface which forms its base. A line drawn from g, the centre of gravity of the stress figure, parallel to the ordinates ha, &c, determines the point c, which is called the centre of p stress, and is the point through which

” the resultant of the distributed stress

acts. In the case of a uniformly distributed stress, ab is a plane surface parallel to AB, and. c is the centre of gravity of the surface AB. When a bar is subjected to simple pull applied axially — that is to say, so that the resultant stress passes through the centre of gravity of every cross-section — the stress may be taken as (sensibly) uniformly distributed over any section not near a place where the form of the cross-section changes, provided the bar is homogeneous in respect of elastic quality and is initially in a state of ease and the stress is within the limits of elasticity.

Uniformly Varying Stress. — Uniformly varying stress is illustrated by fig. 28. It occurs (in each case for stresses within the elastic

limit) in a bent beam, in 3 a tie subjected to non- axial pull, and in a long strut or column where buckling makes the stress become non-axial. In uniformly varying stress B the intensity p at any point P is proportional to the distance of P from a line MN, called the neutral axis, which lies in the plane of the stressed surface and at right angles to the direction AB, which is assumed to be that in which the intensity of stress varies most rapidly. There is no variation of stress along lines parallel to MN. If MN passes

through C, the centre of gravity of the surface, as in fig. 29, it may easily be shown that the total pull stress on one side of the neutral axis is equal to the total push stress on the other side, whatever The resultant of the whole stress whose moment may be found as

Fig. 28.

Fig. 29.

be the form of the surface AB.

on AB is in that case a couple

follows. Let dS be an indefinitely small part of the surface at a

distance x from the neutral axis through C, and let p be the

1 intensity of stress on dS. The moment of the stress on dS is xpdS. But p = pix/xi = pixjxi (see fig. 29). The whole moment of the stress on AB is JxpdS = (piXi)fxHS = pil/xi or piMxi, where I is the moment of inertia of the surface AB about the neutral axis through C.

A stress such as that shown in fig. 28 or fig. 30 may be regarded as a uniformly distributed stress of intensity po (which is the in- tensity at the centre of gravity of the surface C) and a stress of the kind shown in fig. 29. The resul- tant is piB, where S is the whole area of the surface, and it C such that the moment £oS.CD = Hence pi = £0(1 +Z2S.CD/I), and

A

« X, =>«

B

Fig. 30. acts at a distance CD

from

*(Pi ~ £o)I/*l = (Pl+po)l/Xi.*

P^Poil-xS.CD/l).

Simple bending occurs when a beam is in equilibrium under equal and opposite couples in the plane of the beam. Thus if a beam (fig.

|W,

|W,

.A*!

f

P *-/.y

~7R

Fig. 31.

Fig. 32.

to a simple bending stress. On any section AB the only stress consists of pull and push, and has for its resultant a couple whose moment M = W1/1 = W2/2. This is called the bending moment at the section. If the stress be within the elastic limits it will be distributed as in fig. 32, with the neutral axis at the centre of gravity of the section. The greatest intensities of push and of pull, at the top and bottom edge respectively, are pi = Myi/l and ˆ 2 = My 2 /I, and the intensity at any point at a distance y above or below C is p = M.yl.

Bending beyond Elastic Limits. — Let the bend- ing moment now be increased; non-elastic strain will begin as soon as either pi or p2 exceeds the corresponding limit of elasticity, and the distribu- tion of stress will be changed in consequence of the fact that the outer layers of the beam are taking set while the inner layers are still following Hooke's law. As a simple instance we may , consider the case of a material strictly elastic up to a certain stress, and then so plastic that a relatively very large amount of strain is produced without further change of stress, a case not very far from being realized by soft wrought iron and mild steel. The diagram of stress will now take the form sketched in fig. 33. If the elastic limit is (say) less for compression than for tension, the diagram will be as in fig. 34, with the neutral axis shifted to- wards the tension side. When the beam is re- lieved from external load it will be left in a state of internal stress, repre- sented, for the case of %• 33. by the dotted lines in that figure.

In consequence of the p F

action which has been WJ UT

illustrated by these figures, the moment required to break the beam cannot be calculated by taking for / the value of the ultimate tensile or compressive strength of the material in the formula M =fl/y, because the distribution of stress which is assumed to exist in finding this relation ceases as soon as overstraining begins. Strain produced by Bending. — The strain produced by bending stress in a bar or beam is, as regards any imaginary filament taken along the length of the piece, sensibly the same as if that filament were directly pulled or compressed by itself. The resulting deformation of the piece consists, in the first place and chiefly, of curvature in the direction of the length, due to the longitudinal extension and compression of the filaments, and, in the second place, of transverse flexure, due to the lateral com- pression and extension which go along with the longitudinal extension and compression. Let h (fig. 35) be a short portion of the length of a beam strained by a bending moment M (within the limits of elasticity). The beam, which we assume to be originally straight, bends in the direction of its length to a curve of radius R, such that R/l=yi/dl, SI being the change of I by extension or compression at a distance yi from the neutral axis. But Sl = lpi/E, and £i = M;yi/I. Hence R = EI/M. The transverse flexure is not, in general, of practical importance. The centre of curva- ture for it is on the opposite side from the centre for longitudinal flexure, and the radius is R

Ordinary Bending of Beams. — Bending combined with shearing is the mode of stress to which beams are ordinarily subject, the loads, or externally applied forces, being applied at right angles to the direction of the length. Let HK (fig. 36) be any cross-section of a beam in equilibrium. The portion B of the beam, which lies on one side of HK, is in equilibrium under the joint action of the external

»

31), supported at its ends, be loaded at two points so that WiZi = W2/2, the portion of the beam lying between Wi and W2 is subjected

H

F,

P,

F,

4

■ – -x y – - .

5

>

4

.14

A I

C

B

F„

Fig. 36. forces Fi, F 2 , F 3 , &c, and the forces which the other portion A exerts en B in consequence of the state of stress at HK. The forces

Fj, Fj, F 3 , &c, may be referred to HK by introducing couples whose moments are Fjsci, F 2 xs, F»*i, &c. Hence the stress at HK must equilibrate, first, a couple whose moment is ZFx, and, second, a force whose value is SF, which tends to shear B from A. In these summations regard must of course be had to the sign of each force; in the diagram the sign of F« is opposite to the sign of Fi, Fj and F». Thus the stress at HK may be regarded as that due to a bending moment M equal to the sum of the moments about the section of the externally applied forces on one side of the section (SFk), and a shearing force equal to the sum of the forces about one side of the section (SF). It is a matter of convenience only whether the forces on B or on A be taken in reckoning the bending moment and the shearing force. The bending moment causes a uniformly varying normal stress on HK of the kind already discussed; the shearing force causes a shearing stress in the plane of the section, the distribu- tion of which will be investigated later. This shearing stress in the plane of the section is necessarily accompanied by an equal intensity of shearing stress in horizontal planes parallel to the length of the beam.

The stress due to the bending moment, consisting of longitudinal push in filaments above the neutral axis and longitudinal rjull in filaments below the neutral axis, is the thing chiefly to be considered in practical problems relating to the strength of beams. The general formula pi = M Vi/I becomes, for a beam of rectangular section of breadth b and depth h, pi = 6M/bh 2 =6M/Sh, S being the area of section. For a beam of circular section it becomes pi = 32M/irA 3 = 8M/SA. The material of a beam is disposed to the greatest advantage as regards resistance to bending when the form is that of a pair of flanges or booms at top and bottom, held apart by a thin but stiff web or by cross-bracing, as in J beams and braced trusses. In such cases sensibly the whole bending moment is taken by the flanges; the intensity of stress over the section of each flange is very nearly uniform, and the areas of section of the tension and compression flanges (Si and Sj respectively) should be proportioned to the value of the ultimate strengths in tension and compression /< and f c , so that Sift=Stf c – Thus for cast-iron beams Hodgkinson recommended that the tension flange should have six times the sectional area of the compression flange. The intensity of longitudinal stress on the two flanges of an I beam is approximately M/Sih and M/Sth, h being the depth from centre to centre of the flanges.

Diagrams of Bending Moment and Shearing Force. — In the examination of loaded beams it is convenient to represent graphically the bending moment and the shearing force at various sections by setting up ordinates to represent the values of these quantities, and so drawing curves of bending moment and shearing force.

*The area enclosed by the curve of shearing force, up to any ordinate, is equal to the bending moment at the same section. For let * be increased to x+bx, the bending moment changes to 2F(*-r-8x), or 4M=4*ZF. Hence the shearing force at any section is equal to the rate of change of the bending moment there per unit of the length, and the bending moment is the integral of the shearing force with respect to the length. In the case of a con- tinuous distribution of load, it should be observed that, when x is increased to x+Sx, the moment changes by an additional amount which depends on (5z) 2 and may therefore be neglected.*

Distribution of Shearing Stress. — To examine the distribution of shearing stress over any vertical section of a beam, we may consider

*II**

_P A.

two closely adjacent sections AB and DE (fig. 37), on which the bending moments are M and M + 5M respectively. The resultant horizontal fores due to the bending stresses on a piece ADHG enclosed be- tween the adjacent sections, and bounded by the hori- zontal plane GH at a distance 5 > o from the neutral axis, is shown by the shaded figure. This must be equilibrated by the horizontal shearing stress on GH, which is the only other horizontal force acting on the piece. At any height y the in- p IG -T] tensity of resultant horizontal

stress due to the difference of the bending moments is ySm/l, and the whole horizontal force on

w

B

GH is

T.

■*fyzdy.*

z being the breadth. If g be the intensity of

horizontal shearing stress on the section GH, whose breadth is zo, we have

*« aM Cyi , qzo&x = -j- I *yzdy.*

But iM/5 is the whole shearing force Q on the section of the beam. Hence*

and this is also the intensity of vertical shearing stress at the distance

yo from the neutral axis. This expression may conveniently be written g = QAy/zoI, where A is the area of the surface AG and y the distance of its centre of gravity from the neutral axis. The intensity q is a maximum at the neutral axis and diminishes to zero at the top and bottom of the beam. In a beam of rectangular section the value of the shearing stress at the neutral axis is a max. — iQ/ bh. In other words, the maximum intensity of shearing stress on any section is f of the mean intensity. Similarly, in a beam of circular section the maximum is $ of the mean. This result is of some importance in application to the pins of pin-joints, which may be treated as very short beams liable to give way by shearing.

In the case of an I beam with wide flanges and a thin web, the above expression shows that in any vertical section q is nearly con- stant in the web and insignificantly small in the flanges. Practically all the shearing stress is borne by the web, and its intensity is very nearly equal to Q divided by the area of section of the web.

Principal Stresses in a Beam. — The foregoing analysis of the stresses in a beam, which resolves them into longitudinal pull and push, due to bending moment, along with shear in longitudinal and transverse planes, is generally sufficient in the treatment of practical cases. If, however, it is desired to find the direction and magnitude of the principal stresses at any point we may proceed thus: —

Let AC (fig. 38) be an indefinitely small portion of the horizontal section of a beam, on which there is only shearing stress, and let AB be an indefinitely small portion of the vertical section at the same place, on which there is shearing and normal stress. Let q be the intensity of the shearing stress, which is the same on AB and AC, and let p be the intensity of normal stress on AB : it is required to find a third plane BC, such that the stress on it is wholly normal, and to find r, the intensity of that stress. Let 6 be the angle (to be determined) which BC makes with AB. of the triangular wedge ABC requires that

rBC cos0 = £.AB+g.AC, and rBC sin0 = g.AB; or (r — p) cos 0=q sin 6, and r sin = g cos 0.

Fig. 38. Then the equilibrium

Hence,

g 2 = r(r-

P), tan 28 = 2q/p,

r = i^,= t V(g 2 +iP 2). The positive value of r is the greater principal stress, and is of the same sign as p. The negative value is the lesser principal stress which occurs on a plane at right angles to the former. The equation for 6 gives two values corresponding to the two planes of principal stress. The greatest intensity of shearing stress occurs on the pair of planes inclined at 45 to the planes of principal stress, and its value is V(g 2 + y> 2).

Deflexion of Beams. — The deflexion of beams is due partly to the distortion caused by shearing, but chiefly to the simple bending which occurs at each vertical section. As regards the second, which

in most cases is the only important cause of deflexion, we have seen that the radius of curvature R at any section, due to a bending moment M, is EI/M, which may also be written Eyi/pi. Thus beams of uniform strength and depth (and, as a particular case, beams of uniform section subjected to a uniform bending moment) bend into a circular arc. In other cases the form of the bent beam, and che resulting slope and deflexion, may be determined by integrating the curvature throughout the span, or by a graphic process, which consists in drawing a Curve to represent the beam with its curvature greatly exaggerated, after the radius of curvature has been determined for a sufficient number of sections. In all practical cases the curvature is so small that the arc and chord are of sensibly the same length. Calling i the angle of slope, and u the dip or deflexion from the chord, the equation to the curve into which an originally straight beam bends may be written

(Pu

*Integrating this for a beam of uniform section, of span L, supported at its ends and loaded with a weight W at the centre, we have, for the greatest slope and greatest deflexion, respectively, t'i = WL 2 /i6EI, Mi = WL'/48EI. If the load W is uniformly distributed over L, *i = WL s /24EI and « t = 5WL»/384EI.*

The additional slope which shearing stress produces in any originally horizontal layer is g/C, where g is, as before, the intensity of shearing stress and C is the modulus of rigidity. In a round or rectangular bar the additional deflexion due to shearing is scarcely appreciable. In an I beam, with a web only thick enough to resist shear, it may be a somewhat considerable proportion of the whole.

Torsion of Solid and Hollow Shafts. — Torsion occurs in a bar to which equal and opposite couples are applied, the axis of the bar being the axis of the couples, and gives rise to shearing stress » planes- perpendicular to the axis. Let AB (fig. 39) be a uniform circular shaft held fast at the end A, and twisted by a couple applied in the plane BB. Assuming the strain to be within the limit of*

du _ ■ dx~ t '

elasticity, a radius CD turns round to CD', and a line AD drawn at any distance r froin the axis, and originally straight, changes into

the helix AD'. Let be the angle which this helix makes with lines parallel to the axis, or in other words the angle of shear at the distance

Fig. 39. r from the axis, and let i be the angle of twist DCD'. Taking two sections at a distance dx from one another, we have^ the arc Odx = rdi. Hence q, the intensity of shearing stress in a plane of cross-section, varies as r, since q = C0 = Cr di/dx. The resultant moment of the whole shearing stress on each plane of cross-section is equal to the twisting moment M. Thus

J2xr 2 gdr = M. Calling ri the outside radius (where the shearing stress is greatest) and 91 its intensity there, we have g = rgi/n, and hence, for a solid shaft, Si = 2M/nTi s . For a hollow shaft with a central hole of radius U the same reasoning applies : the limits of integration are now n and ri, and

*2Mn 91 -*ftf) The lines of principal stress are obviously helices inclined at 45 to the axis.*

If the shaft has any other form of section than a solid or symmetrical hollow circle, an originally straight radial line becomes warped when the shaft is twisted, and the shearing stress is no longer proportional to the distance from the axis. The twisting of shafts of square,- triangular and other sections has been investigated by Saint-Venant. In a square shaft (side = Js) the stress is greatest at the middle of each side, and its intensity there is g, = M/o-28ifc 3 .

For round sections the angle of twist per unit of length is

in hollow shafts.

*Oi 2M . ... . 2M * = cV, = 7U;* m solld and «C*

In what has been said above it is assumed that the stress is within the limit of elasticity. When the twisting couple is increased so that this limit is passed, plastic yielding begins in the outermost layer, and a larger proportion of the whole stress falls to be borne by layers nearer the centre. The case is similar to that of a beam bent beyond the elastic limit, described above. If we sup- pose the process of twisting to be continued, and that after passing the limit of elasticity the material is capable of much distortion without further increase of shearing stress, the distribution of stress on any cross section will finally have an approximately uniform value q', and the moment of torsion will be

*f r i l 2*r>q'dr = WW-ri i).*

In the case of a solid shaft this gives for M a value greater than it has when the stress in the outermost layer only reaches the intensity g', in the ratio of 4 to 3. It is obvious from this consideration that the ultimate strength of a shaft to resist torsion is no more deducible from a knowledge of the ultimate shearing strength of the material than the ultimate strength of a beam to resist bending is deducible from a knowledge of the tensile and crushing strength. It should be noticed also that as regards ultimate strength a solid shaft has an important advantage over a hollow shaft of the same elastic strength, or a hollow shaft so proportioned that the greatest working intensity of stress is the same as in the solid shaft.

Twisting Combined with Bending. — This important practical case is realized in a crank-shaft (fig. 40). Let a force P be applied at the

crank-pin A at right angles to the plane of the crank. At any section of the shaft C (between the crank and the bearing) there is a twisting moment Mi = P. AB and a bending mo- ment M 2 = P.BC. There is also a direct shearing force P, but this does not _ require to be taken into account in calculating the stress at points at the top or bottom of the cir- cumference (where the intensity is greatest), since the direct shearing stress is distributed so that its intensity is zero at these points. The stress there is consequently made up of longitudinal normal stress (due to

bending), pt =4M 2 /irri 3 , and shearing stress (due to torsion), gi = 2Mi/xn 3 . Combining these, as in § 64, we find for the prin- cipal stresses r = 2JM 8 ±V(Mi 2 -r-M s 2)}/irri 3 ,orr = 2P(BC±AC)/ irn 3 . The greatest shearing stress is2P. ACjirri 3 , and the axes of principal stress are inclined so that tan 20 =Mi/M 2 = AB/BC. The axis of greater principal stress bisects the angle ACB.

Long Columns and Struts : Compression and Bending. — A long strut or pillar, compressed by forces P applied at the ends in the direction of the axis, becomes unstable as regards flexure when P exceeds a certain value. Under no circumstances can this value of P be exceeded in loading a strut. But it may happen that the intensity of stress produced by smaller loads exceeds the safe com- pressive strength of the material, in which case a lower limit of load must be chosen. If the applied load is not strictly axial, if the strut is not initially straight, if it is subject to any deflexion by transverse forces, or if the modulus of elasticity is not uniform over each cross- section — then loads smaller than the limit which causes instability will

produce a certain deflexion which increases with increase of load, and will give rise to a uniformly varying stress of the kind illustrated in figs. 28 and 30. We shall first consider the ideal case in which the forces at the ends are strictly axial, the strut perfectly straight and free from transverse loads and perfectly symmetrical as to elasticity. Two conditions have to be distinguished — that in which the ends are held by pins or sockets which leave them free to rock, and that in which the ends are held fixed. Suppose in the first place that the ends are free to rock. The value of the load which causes instability will be found by considering what force P applied to each end would suffice to hold an originally straight strut in a bent state, supposing it to have received a small amount of elastic curvature in any way. It is shown by Euler that the force required to maintain the strut in its curved state is P=ir s EI/L 2 , and is independent of the deflexion. This means that with this particular value of P (which for brevity we shall write Pi) the strut will be in neutral equilibrium when bent; with a value of P less than Pi it will be stable; with a greater value it will be unstable. Hence a load exceeding Pi will certainly cause rupture. The value 7r 2 EI/L 2 applies to struts with ends free to rock. If the ends are fixed the effective length for bending is reduced by one half, so that Pi then is 4«ˆEI/L 2 . When one end is fixed and the other is free to rock Pi has an intermediate value, probably about 9VEI/4L 2 .

The above theory assigns Pi as a limit to. the strength of a strut on account of flexural instability; but a stress less than Pi may cause direct Crushing. Let S be the area of section, and f c the strength of the material to resist crushing. Thus a strut which conforms to the ideal conditions specified above will fail by simple crushing if / e S is less than Pˆ but by bending if f c S is greater than Pi. Hence with a given material and form of section the ideal strut will fail by direct crushing if the length is less than a certain multiple of the least breadth (easily calculated from the expression for Pi) , and in that case its strength will be independent of the length ; when the length is greater than this the strut will yield by bending, and its strength diminishes rapidly as the length is increased.

But the conditions which the above theory assumes are never realized in practice. The load is never strictly axial, nor the strut absolutely straight to begin with nor the elasticity uniform. The result is that the strength is in all cases less than either / C S or Pi, and the results of experiments are best expressed by means of a formula, which is in part empirical, giving continuous values for struts of any length. For very short struts we have seen that the ideal breaking load is fjS, and for Very long struts it is ir 2 EI/L 2 . If we write P=/ e S/(i+/cSL 2*

/ir 2 EI), we have a formula which gives correct values in these two extreme cases, and intermediate values for struts of medium length. By writing this P=/S/(i-fcSL 2 /I), and treating /and c as empirical constants, we have a practical formula which fits in well with experimental results and is applicable to struts of any length when the ends are free to rock. For fixed ends \c is to be taken in place of e.

Bursting Strength of Circular Cylinders and Spheres. — Space remains for the consideration of only one other mode of stress, of great importance from its occurrence in T T

boilers, pipes, hydraulic and steam cylin- '

ders and guns. The material of a hollow cylinder, subjected to pressure from within, is thrown into a stress of circumferential pull. When the thickness t is small compared with the radius R, we may treat this stress as uniformly distributed over the thickness. Let p be the intensity of fluid pressure within a hollow circular cylinder, and let / be the intensity of circumferential stress. Consider the forces on a small rectangular plate (fig. 41), with its sides parallel and perpendicular to the direction of the axis, of length / and width R50, 89 being the small angle it.subtends at the axis. Whatever forces act on this plate in the direction of the axis are equal and opposite. The remaining forces, which are in equilibrium,

Fig. 41.

are P, the total pressure from within, and a force T at each side due to the circumferential stress. P = plR&6 and T=flt. But by the triangle of forces (fig. 42) P = T80. Hence f=pR/t.

The ends of the cylinder may or may not be held together by longitudinal stress in the cylinder sides; if they are, then, whatever

be the form of the ends, a transverse section, the area of whch is 2irRt, has to bear a total force pirR?. Hence, if /' be the intensity of longitudinal stress, f =pR/2t = if.

A thin hollow sphere under internal pressure has equal circumferential pull in all directions. To find its value consider the plate of fig. 42. There are now four equal forces T, on each of the

four sides, to equilibrate the radial force P. Hence P = 2TS# and f=pR/2t.

Thick Cylinder.— When the thickness is not small compared with the radius, the radial pressure is transmitted from layer to layer with reduced intensity, and the circumferential pull diminishes towards the outside. In the case of a thick cylinder with free ends 1 we have to deal at any point with two principal stresses, radial and circum ferential, which may be denoted by p and p' respectively. Sup- posing (as we may properly do in dealing with a cylinder which is not very short) that a transverse section originally plane remains plane, the longitudinal strain is uniform. Since there is no longi- tudinal stress this strain is due entirely to the lateral action of the stresses p and p', and its amount is (p+p')/

cylinder, we have j~(pr) =p'.

These two equations give by integration, p = C--C'/r 2 , and p'^C-C'lrK

If ri be the external and ri the internal radius, and po the pressure on the inner surface, the conditions that p = po when r = r 2 and p = o when r = n give C = — p

In the construction of guns various devices have been used to equalize the circumferential tension. With cast guns a chilled core has been employed to make the inner layers solidify and cool first, so that they are afterwards compressed by the later contrac- tion of the outer layers. In guns built up of wrought-iron or steel hoops the hoops are bored small by a regulated amount and are shrunk on over the barrel or over the inner hoops. In J. A. Long- ridge's system, largely used for heavy ordnance, the jgun is made by winding steel wire or ribbon, with suitable initial tension, on a central steel tube.

The circumferential stress at any point of a thick hollow sphere exposed to internal fluid pressure is found, by a process like that of the last paragraph, to be — pon 3 (l+ri 3 /2r 3)/(n — r 2 3), which gives, for the greatest tension, the value*

*-Pt(r 1 > +2r,»)l2(.r 1 >-r t *). (J. A. E.)*

STRESA, a village of Piedmont, Italy, in the province of Novara, situated on the west side of Lago Maggiore, on the Simplon railway, 10 m. N. of Arona, 673 ft. above sea-level. Pop. (1901), 1477. It is remarkable for the beauty of its scenery and for its fine villas, and is a favourite resort in spring, summer and autumn.

STRICKLAND, AGNES (1806-1874), English historical writer, was born in 1806, the third daughter of Thomas Strickland, of Reydon Hall, Suffolk. Her first literary efforts were historical romances in verse in the style of Walter Scott — Worcester Field (published without date), Demetrius and other Poems (r833). From this she passed to prose histories, written in a simple style for the young. A picturesque sketch of the Pilgrims of Walsing- ham appeared in 1835, two volumes of Tales and Stories from History in the following year. Then, with the assistance of her sister, she projected a more ambitious work, The Lives of the Queens of England, from Matilda of Flanders to Queen Anne. The first volume appeared in 1840, the twelfth and last in 1849. Miss Strickland was a warm partisan on the side of royalty and

1 This condition is realized in practice when the fluid causing internal pressure is held in by a piston, and the stress between this piston and the other end of the cylinder is taken by some other part of the structure than the cylinder sides.

" The solution which follows in the text is applicable even when there is longitudinal stress, provided that the longitudinal stress is uniformly distributed over each transverse section. If we call this stress p", the longitudinal strain is p"IE + (p+p')/oE. Since the whole strain is uniform, and p" is uniform, the sum of p and p' is constant at all points, as in the case where the ends are free.

the church, but she made industrious study of " official records and other public documents," gave copious extracts from them, and drew interesting pictures of manners and customs. While engaged on this work she found time in 1843 to edit the Letters of Mary, Queen of Scots, whose innocence she championed with enthusiasm. In 1850 she followed up her Queens of England with the Lives of the Queens of Scotland, completing the series in eight volumes in 1859. Unresting in her industry, she turned next to the Bachelor Kings of England, about whom she published a volume in 1861. The Lives of the Seven Bishops followed in 1866— after a longer interval, part of which was employed in producing an abridged version of her Queens of England. Her last work was the Lives of the Last Four Stuart Princesses, published in 1872. In 1871 she obtained a civil-list pension of £100 in recognition of her merits. She died on the 8th of July 1874.*

A Life by her sister, Jane Margaret Strickland, appeared in 1887.

STRICKLAND, HUGH EDWIN (i8r 1-1853), English naturalist and

geologist, was born at Righton, in the East Riding of York- shire, on the 2nd of March i8ri, and was grandson of Sir George Strickland, Bart. As a lad he acquired a taste for natural history which dominated his life. He received his early education from private tutors and in 1829 entered Oriel College, Oxford. He attended the anatomical lectures of Dr John Kidd and the geological lectures of Dr W. Buckland and he became greatly interested both in zoology and geology. He graduated B. A. in 1831, and proceeded to'M.A. in the following year. Returning to his home at Cracombe House, near Tewkesbury, he began to study the geology of the Vale of Evesham, communicating papers to the Geological Society of London 0833-1834). He also gave much attention to ornithology. Becoming acquainted with Murchison he was introduced to William John Hamilton (i8o5-r867) and accompanied him in 1835 in a journey through Asia Minor, the Thracian Bosporus and the Island of Zante. Mr Hamilton afterwards published the results of this journey arid of a subsequent excursion by himself to Armenia in Researches in Asia Minor, Pontus and Armenia (1842). After his return in 1836 Strickland brought before the Geological Society several papers on the geology of the districts he had visited in southern Europe and Asia. He also described in detail the drift deposits in the counties of Worcester and Warwick, drawing particular attention to the fluviatile deposits of Cropthome in which remains of hippopotamus, &c, were found. With Murchison he read before the Geological Society an important paper " On the Upper Formations of the New Red Sandstone System in Gloucestershire, Worcestershire and Warwickshire" (Trans. Geol. Soc, 1840). In other papers he described the Bristol Bone-bed near Tewkesbury and the Ludlow Bone-bed of Woolhope. He was author likewise of ornithological memoirs communicated to the Zoological Society, the Annals and Magazine of Natural History and the British Association. He also drew up the report, in 1842, of a committee appointed by the British Association to consider the rules of zoological nomenclature. He was one of the founders of the Ray Society suggested in 1843 and established in r844, the object being the publication of works on natural history which could not be undertaken by scientific societies or by publishers. For this society Strickland corrected, enlarged and edited the MS. of Agassiz for the Bibliographia Zoologiae et Gedlogiae (1848). In r845 he edited with J. Buckman a second and enlarged edition of Murchison's Outline of the Geology of the neighbourhood of Cheltenham. In 1846 he settled at Oxford, and two years later he issued in conjunction with Dr A. G. Melville a work on The Dodo and its kindred. In r85o he was appointed deputy reader in geology at Oxford during the illness of Buckland, and in 1852 he

was elected F.R.S. In the following year, after attending the meeting of the British Association at Hull, he went to examinethe cuttings on the Manchester, Sheffield & Lincolnshire railway near Retford, and he was there knocked down and killed by a train on the r4th of September 1853. He was buried at Deerhurst church near Tewkesbury, where a memorial window was erected.

See Memoirs of II. E. Strickland, by Sir William Jardine, Bart.

(1858).

STRIEGAU, a town of Germany, in the Prussian province of Silesia, on the Striegau Water {Striegauer Wasser), 30 m. by rail S.W. of Breslau. Pop. (1905), 13,427. It contains four Roman Catholic churches, among which is that of St Peter and St Paul, with a vaulted roof 100 ft. in height, the highest in Silesia; a Protestant church and numerous educational and charitable institutions. The chief industries of the place are the making of cigars, malt and machinery; also of albums, portfolios and other articles in leather. Granite is quarried in the neighbourhood and there is an extensive trade in grain. It was near Striegau that Frederick the Great gained the important victory usually named after the village of Hohenfriedberg, on the 4th of June 1745. The town rights of Striegau date from 1242.

STRIKES AND LOCK-OUTS. A strike, in the labour sense, is a stoppage of work by common agreement on the part of a body of work-people for the purpose of obtaining or resisting a change in the conditions of employment. The body of work- people may be large or small, and the cessation of work may be simultaneous or gradual; e.g. if the notices to cease work happen to expire at different dates, the cessation may nevertheless be a strike, provided it takes place as the result of a common agreement. It will be seen from the above definition that a strike, though the immediate result of an agreement, formal or tacit, on the part of work-people to withhold their labour, may originate in a demand on the part of the employer as well as on the part of the employes. In the former case the stoppage is often (though loosely) termed a " lock-out." It is obvious, however, that to distinguish stoppages as strikes or lock-outs according to the source of the original demand for a change of conditions would lead to a very arbitrary and misleading classi- fication. Frequently it is not

easy to say which side made the original demand to which the dispute is to be attributed, and frequently a stoppage is the result of a break-down of nego- tiations in the course of which demands have been made by both sides. Moreover, in so far as the distinction can be drawn, it would lead to the result that in almost all cases a dispute in times of improving trade would be termed a strike, and in times of declining trade a lock-out. It is not possible to frame an entirely satisfactory definition of a lock-out which shall enable it always to be discriminated from a strike. It may be noticed that the attempt to make this distinction has been abandoned in the board of trade statistics since 1894, both kinds of stoppages being now included under the comprehensive title of " trade disputes."

The only basis of distinction between a " strike " and a " lock- out," which is sufficiently definite for precise or statistical purposes, is the source from which the actual notice to cease work emanates, cessations resulting from notices given by the employers being termed " lock-outs," while, those which either result from notices given by the men, or from their withdrawal from work without notice, would be termed " strikes." But whether the term " lock-out " be restricted as above, or applied, as in the popular use of the term, to any dispute in which the employers appear to be the aggressors, the distinction does not afford a sound basis for the statistical classification of disputes. The source of the actual notices to leave work is often quite an unimportant matter; while, on the other hand, if the ordinary current use of the terms be followed, there will be many disputes which, according to the workmen's view, should be termed lock- outs, and, according to the employers, should be termed strikes — a difficulty which was well illustrated in the controversy as to whether the " strike clauses " in admiralty contracts could be invoked in the case of work stopped through the engineering dispute of 1897. In the present article, therefore, no distinction is drawn for statistical purposes between a strike and a lock-out. Another distinction, perhaps of greater importance than the above, but which in practice it is sometimes difficult to draw, is between a stoppage in pursuance of a trade dispute and a stoppage due to a bona-fide dismissal or change of employment arising from the intention of an employer to cease to employ a particular set of men, or of a group of workmen to cease to work for a particular employer. Generally speaking, a stop- page may rightly be termed a trade dispute if there be an

intention on the part of both parties (at least at the beginning) to resume the relations of employer and employed on the satisfaction of certain specified conditions. Where the wil- lingness to resume this relation exists on one side only the question is more difficult, and

accordingly it is not uncommon for an employer to deny the existence of a trade dispute, although the men formerly in his employ may be actually drawing "strike pay" from their unions and "picketing" his works to prevent their places being filled. Such cases sometimes arise when the workmen consider that the dismissal of some of their colleagues is due not to personal faults or slackness of employment, but to some collective action which they have taken, or to their membership of some organization. Broadly speaking, however, the distinction is that a trade dispute is a temporary stoppage entered into to obtain or to resist a change of conditions of employment.

The essence of a strike or lock-out is a refusal on the part of a number of workmen collectively or of an employer to renew contracts of employment except on certain changed conditions. This simple situation may be complicated by actual breaches of contract, as when a body of work-people leave work without notice, or by attempts on their part to prevent other persons from entering into contracts of service, or to persuade other persons to terminate or break their contracts. But such features as these, though common to many strikes, are not essential. The question of the legal position of strikes, and of the methods adopted for the conduct of strikes, is discussed below. Here it is only necessary to point out that strikes, as such, are incidents arising out of the modern relationship of free contract as between employers and workmen, and have little real analogy with the revolts of servile or semi-servile labour in ancient or medieval times.

Trade Disputes in the United Kingdom. Since 1888 the board of trade have kept a record of strikes and lock-outs in the United Kingdom. The following table, based on the official returns published by that department, shows the number and importance of these stoppages in the United Kingdom from 1893 to 1907: —

Year.

Number of Dis- putes.

Number of Work-people affected.

Aggregate

Duration in

Working Days.

Directly.

Indirectly.

Total.

1893

615

594.H9

40,152

634,301

30,467,765

1894

929

257.3H

67,934

325,248

9,529,010

1895

745

207,239

55,884

263,123

5,724,670

1896

926

147,950

50,240

198,190

3,746,368

1897

864

167,453

62,814

230,267

10,345,523

1898

711

200,769

53,138

253,907

15,289,478

1899

719

138,058

42,159

180,217

2,516,416

1900

648

135.145

53.393

188,538

3,152,694

1 901

642

in.437

68,109

179,546

4,142,287

1902

442

116,824

139,843

256,667

3,479,255

1903

387

93,515

23,386

116,901

2,338,668

1904

355

56,380

30,828

87,208

1,484,220

1905

358

67,653

25,850

93,503

2,470,189

1906

486

157,872

59,90i

217,773

3,028,816

1907

601

100,728

46,770

H7,498

2,162,151

It should be noted that by " indirectly affected " are meant the work-people employed in the same establishments as those on strike, who are thrown out of employment owing to the strike, but are not themselves engaged in it. The board of trade statistics do not take into account the persons employed in kindred trades who are indirectly affected.

An important thing to note about the above statistics is that in many years they are dominated by a few large disputes. Some of the larger cases are shown on the following page.

In 1907 487 of the recorded disputes (or about four-fifths of the whole number) accounted for less than one-third of the total time lost, and this, it is to be remembered, is after the very small disputes have been excluded.

By " aggregate duration " or " time lost " is meant the product of the number affected multiplied by the duration of the dispute in working days, with some allowance for those

who have found work elsewhere or been replaced by others. Though this figure is the best general index of the importance of the disputes of each year, it is but a rough approximation to the time actually lost through disputes.

when there is most room for bona-fide disagreement as to the conditions of the labour market. These are undoubtedly the most critical times in the relations of employers and employed, but the disturbing influence of accidental causes is too great

Year.

Principal Disputes of the Year.

All other Disputes.

Trade and Locality.

Number of

Work-people

affected.

Aggregate

Duration in

Working Days.

Number

. of Disputes.

Number of

Work-people

affected.

Aggregate

Duration in

Working Days.

1893

18Q4

1895 1897

1898

(Coal Miners (Federated Districts) .... (Coal Miners (South Wales and Monmouth) .

Boot and Shoe Operatives

Engineers, Machinemen and others. . .) \ Engineers, Machinemen and others— continued) (Coal Miners (South Wales and Monmouth) .

300,000 90,000 70,000 46,000

47,500

100,000

*21,137,000 I 1,500,600 *

5,600,000 1,564,000

5 5,731,000

(1,118,000)

*11,650,000 *

613

928

744 863

710

244,301

255,248 217,123 182,767

153,907

7,830,765 3,929,010 4,160,670 4,614,523 2,521,478

For example, if a strike causes a postponement or accumulation of work, the extra demand for labour, and the overtime worked after its conclusion, may partially compensate for the stoppage. On the other hand, if a dispute should drive away trade or cause the closing of works, it may lessen the field of employment for a long period after its termination, and such lost time cannot be taken into account in the estimates of "aggregate duration."

For these reasons all estimates of wages lost through disputes are somewhat fallacious. The real importance of strikes lies less in the value of the actual time consumed by their duration, than in their indirect effects on the organization and effective- ness of the industry, and on the relations of employer to em- ployed, and also in their reaction on the conditions of allied trades. The comparative insignificance of the actual loss

Group of Trades.

Mean Annual

Percentage of Total Number employed who were affected by Disputes.

Percentage of

Aggregate

Working Time

occupied by

Disputes.

Number

of Disputes.

Number of Work-people

affected (directly and

indirectly).

Aggregate

Duration in

Working

Days.

Building

Mining and Quarrying . Metal, Engineering and Shipbuilding

Textile

Clothing

Other

43 133

95 90

36

72

5,260 87,509

22,470

27,736

4,992

9,047

234,651 1,348,289

534,549 326,468 104,619 180,793

o-5

8-7

1-6

2-3 0-7

0-2

0-07

o-45

0-13 0-09 0-05

O-OI

All Industries, except Agricultural Labour- ers, Seamen and Do- mestic Servants .

469

157,014

2,729,369

1-6

0-09

Causes.

to production owing to the mere loss of time caused by strikes will be seen from the fact that the total duration of strikes during the seven years 1901-1907, if spread over the entire adult male working population, would be equivalent to less than the loss of one-third of a day per head per annum. As a matter of fact, however, the loss owing to strikes is very un- equally distributed over the industrial population. In large groups of industries, e.g. agriculture, strikes are of rare occurrence. In others, such as the building trades, they are frequent, but mostly small and local; while in mining they are not only fre- quent and often prolonged, but in many cases they involve

large numbers of persons and extend over wide areas. Thus on an average of the seven years 1 901-1907 there were 43 disputes annually in the building trades, and 133 in mining and quarrying, but the latter disputes have involved nearly seven- teen times as many persons and had an aggregate duration nearly six times as great. Intermediate between these groups of trades is the metal, engineering and shipbuilding group, in which, more perhaps than in any other group, the importance of disputes varies according to the state of trade.

The principal facts relating to the distribution of trade dis- putes among the more important groups of trades are given in the above table for the mean of the seven years 1901-1907.

It wouid be natural to expect that trade disputes would be most prevalent at or just after a turn in the tide of employment, xxv. 33

to enable any regular law of variations in disputes to be estab- lished by statistical evidence. It is to be remembered that in recent years there has been a great development in the means available for avoiding stoppages by conciliatory action (see Arbitration and Conciliation), and this of itself would greatly complicate the task of tracing any correspondence between the prevalence of actual stoppages and the state of employ- ment. Broadly it may be said that the great majority of up- ward and downward changes of wages are settled nowadays without strikes, and in many trades actual stoppages, instead of being a normal feature in the relations between employer and employed, are rather to be looked on as cases of accidental breakdown of the recognized machinery of negotiation.

The causes of disputes are of course very varied, embracing all the matters relating to conditions of employment on which differences may arise between employers and employed. Experience shows, how- ever, that the great bulk of disputes relate to questions of wages, a much smaller proportion to hours of labour, and the balance to a large number of miscellaneous questions, such as the employment of per- sons or classes obnoxious to the strikers on the ground that they do not belong to their union, or have worked against its interests, or because they are held to have no " right " to the particular occupation on which they are employed, either on account of not having gone through the recognized training or of belonging to another trade. Among this class of strikes are to be included the so- called " de- marcation " disputes between two bodies of workmen as to the limits of their trades, which frequently cause suspension of work by both groups, to the great inconvenience of the employer.

Strikes are also not uncommon on the question of trade unionism pure and simple — i.e. to obtain or defend freedom to belong to a union, or to act through its agency in negotiations with em- ployers. This question enters more or less as a factor into a large number of disputes, most usually, however, as a secondary cause or object, so that it does not appear prominently in the tabulation of causes in the board of trade statistics, which is based on principal causes only. Thus the formulated demands of the strikers are usually for improved conditions of work, the ques- tion of " recognition " of the trade union only arising incidentally when the parties attempt to negotiate as to these demands. The following table, showing the principal causes of disputes for the seven years 1901-1907, is based on the official statistics: —

Percentage Proportion of Work-people directly affected by Disputes in the seven years, 1901-1907, relating to

Questions of Wages.

Questions of Hours.

Employment

of particular

Classes or

Persons.

Trade Unionism.

Other Causes.

54-5

3-6

9-2

18-2

14-5

II

1026

STRIKES AND LOCK-OUTS

The results of trade disputes axe nearly as varied as their causes. Sometimes a strike goes on until the employer is Methods of ru i ne d or retires from business, and is only ended Settlement by the permanent closing of the works; sometimes, and especially when trade is slack and the dispute

Results. not i ar gg ; tjj e places of the men are almost imme- diately filled, and the only economic result of the strike is to replace one body of men by another without perceptible inter- ruption of business. There have been frequent cases of this kind in strikes of unskilled labourers. Sometimes, on the other hand, the demand for labour is so active that .the whole of the strikers immediately find work elsewhere, and the only eco- monic result is to transfer a body of men from one set of employers to another with little or no interruption of their employment. In years of active employment the building trades have afforded many examples of this issue of a trade dispute. In other cases, after a more or less prolonged stoppage, the disputes end by the permanent " blocking " of an employer's establishment by a union, or the permanent refusal of the employer to take back any of his former employes. All these, however, are extreme, and on the whole exceptional cases. The vast majority of trade disputes are settled by mutual arrangement, and whether such arrangement is wholly in favour of one or other party, or involves a compromise, its terms provide that the whole or part of the body of work-people whose labour was withheld or excluded shall return on agreed conditions to their former employment.

During the period 1901 to 1007 there were on an average 465 disputes settled annually, affecting directly and indirectly 156,800 work-people, and of these only 44 disputes, involving 15,700 work-people, were ended by the return to work of the strikers on their employers' terms without negotiation of any kind, and 60 disputes involving 5500 persons by replacement of the work-people or by the closing of works. All the remain- ing disputes, 352 in number, involving 135,600 persons, were con- cluded by negotiation between the parties either with, or more usually without, the aid of an outside mediator or arbitrator.

The following figures for 1901-1907 (which practically coincide with those of the previous decennial average) show the compara- tive results of trade disputes. The percentages refer to the proportion of work-people directly involved in disputes which resulted in the manner indicated: —

Year.

In favor of Work-people.

In favor of Employers.

Com- promised.'

Indefinite.

Total.

19OI

1902 1903 1904

I905

1906

I907

27-5

3i-8

31-2 27-3 24-7 42-5 32-6

34-7

3if8

48-1 41-7

34-o

24-5 27-0

37-3 36-1 20-7

30-9 41-2 33-0 40-1

o-5 o-3

O'O

0-1

O-I

o-o o-3

8000000

OOOOOO OOOOOOO

Mean of 7 years

3i-i

34-5

34-2

0-2

ioo-o

It is, of course, to be understood that the figures in the above table only relate to the immediate results, as determined by the relative extent to which one or other of the parties succeed in enforcing their demands. The question of the ultimate effect of the stoppages on the welfare of the parties or of the com- munity generally is an entirely different question.

Organization of Strikes and Lock-outs. In the great majority of cases strikes are organized and controlled by trade unions. It does not, however, follow from /nffue/iceo/this that the growth of trade unionism has always Trade fostered and encouraged strikes, there being evidence Unions. j_ nat j n man y t rac j es the strengthening of organiza- tion has had the effect, not only of restraining ill-considered partial stoppages, but also of preventing more serious disloca- tions of industry by providing a channel for the expression of grievances and a recognized means of negotiating with employers. Much of the evidence given before the Royal

Commission on Labour (1891-1894) tended to show that the growth of trade unions has the effect on the whole of lessening the frequency, though of widening the area, of disputes. The commission, moreover, laid down that the stage of industry in which disputes are likely to be most frequent and bitter is that in which it is emerging from the " patriarchal " condition, in which each employer governs his establishment and deals with his own men with no outside interference, but has not fully entered into that other condition in

which transactions take place between strong associations fully recognizing each other. In this state of industrial organization bitterness is often caused by the insistence of the work-people on the " recognition " of their unions, and by the treatment of these unions by the em- ployers as outside parties interfering and causing estrangement between them and the work-people actually in their employ.

Probably next to the patriarchal stage, in which each factory is a happy family, the industrial conditions most favourable to peace are when a powerful trade union is face to face with a representative employers' association, both under the guidance of strong but moderate leaders and neither feeling it beneath its dignity to treat on equal terms with the other. When, on the other hand, some or all of these conditions are absent, the growth of combinations may tend to war rather than peace.

Whether, however, trade unionism tends generally to en- courage or to restrain strikesˆ the organization and policy of all trade-unions, as at present constituted, are based on the possibility of a collective withdrawal from work in the last resort. Dispute pay is consequently the one universal form of trade-union benefit. Though, however, in most of the disputes recorded the strikers are financially supported by some trade union, this is by no means always the case. Many strikes have been entirely carried out without the instrumentality of a permanent combination, the work-people affected belonging to no union and merely improvising a more or less represen- tative strike committee to control the movement. It is not uncommon, however, for a permanent union to originate in a strike of non-unionists. In other cases (e.g. in the London dock strike of i880) an insignificant trade union may initiate a strike movement involving several thousands of labourers out- side its membership. In the case quoted the membership of the Dockers' Union rose during the few weeks of strike from 800 to over 20,000. A conspicuous case of a widespread strike of workmen not belonging to a trade union was the South Wales coal-miners' dispute of 1898. Of the 100,000 men affected, probably not more than 12,000 belonged at the time to any trade union, but the workmen's representatives on the committee of the sliding scale (against which the movement was directed) formed the nucleus of a strike committee, and one result of the strike was the formation of the " South Wales Miners' Federation," affiliated to .the Miners' Federation. In the case of strikes of non-unionists, the strikers, of course, have to depend for their maintenance on their own resources or on the proceeds of public subscriptions. Frequently grants are made in their aid by sympathetic trade unions, and in the

case of the South Wales dispute above referred to, several boards of guardians gave out- door relief illegally to strikers who had exhausted their resources. The majority of strikers, however, belong to trade unions and receive " dispute benefit," which usually consists of a weekly payment of from ros. to 15s. In 1906 the sum expended by 100 of the principal trade unions in support of men engaged in disputes was £212,000. In years of big disputes this sum has been largely exceeded.

Although most strikes are controlled by trade unions, cases are comparatively rare in this country in which the central committee of a trade union takes the initiative and directs its members to cease work. More usually a local strike movement is initiated by the local workmen, and the central committee is generally empowered by the rules to refuse its sanction to a strike and to close it at its discretion, but has no authority to order it. In many unions a ballot is taken of the members of the districts affected before a strike is authorized, and a two-thirds (or even greater) majority, either of members or of

branches, in favour of a stoppage may be required before the sanction of the central executive is granted. Some unions in their rules draw a distinction between strikes to enforce new conditions (e.g. a rise of wages, a restriction of hours or of overtime) and strikes to oppose the introduction of new condi- tions by the employers, greater freedom being allowed to the local members in the case of " defensive " than of" offensive " strikes.

Sometimes also the executive committee, while refusing their official sanction to a strike, and declining to allow the funds of the society to be used to support the strikers, may tacitly permit a local committee to take what action it pleases and to collect funds for the purpose. Some strong unions, however, especially those which have entered into general agreements with em- ployers' associations, not only refuse financial support to an unauthorized strike, but even expel from their society strikers who refuse to obey their order to return to work. The Boiler- makers' and Iron Shipbuilders' Union has more than once taken drastic action of this kind, even to the extent of fining or superseding recalcitrant members and officials. In 1899 the National Union of Boot and Shoe Operatives, which is a party to an agreement with the Employers' Federation (known as the " Terms of Settlement ") was fined £300 by the umpire under that agreement for

failing to expel or to induce to return to work certain of their members who took part in a strike contrary to the provisions of the agreement. It sometimes happens, however, that the central committee of a trade union is not strong enough to withhold financial support even from an unauthorized strike. 1

When a strike has been authorized by the executive, the conduct of it is frequently entrusted to a " strike committee," appointed ad hoc, one reason being that a strike of any con- siderable dimensions often affects members of several unions, so that the common action necessary in a conflict with employers can only be attained by a committee representing all the socie- ties involved. A strike Committee has often no power to draw on the funds of the unions represented, each of which pays dispute pay in accordance with its rules to its own members, the financial power of the strike committee being limited to the support of non-unionists out of any funds available for the purpose, or the collection and administration of funds in case of the exhaustion of the resources of any of the unions represented.

The financial support of a local or sectional strike imposes but little strain on the resources of a large society, but where a considerable proportion of the members are affected it is usual for a union to replenish its funds by imposing a " levy " or special contribution on members remaining at work. During the en- gineering dispute of 1897-1898 the levies imposed by the Amal- gamated Society of Engineers rose to 2s. 6d. per week, and one of the main objects of the federated employers was to diminish the revenue obtained from this source by enlarging the area of the dispute.

When there is no regular provision for the financial support of strikers, or when this provision is exhausted, the strike leaders have a much more difficult task in preventing the return to work of some of their followers; and it is in these cases that intimidation and violence are most to be apprehended. In all strikes, however, except in the few cases in which the whole of the workmen in the trade are in the union, and the skill re- quired is such that no new labour can enter the trade during the dispute, there is the possibility of the strikers being replaced by other labour, and the efforts of the strike organizers are largely directed to the prevention of this by all means in their power. The chief method employed has generally been that known as "picketing," viz. the placing of members of the union to watch the approaches to the works or factories affected, to give in- formation as to the strike to any workmen who attempt to enter, and to endeavour to dissuade them from accepting employment.

Other methods of preventing workmen from taking the place of strikers may also be adopted or attempted, ranging from the

1 Noteworthy in this respect was the strike of boilermakers on the Tyne in 1910, in defiance of their executive.

Free Labour.

publication of information in leaflets Of otherwise as to the existence of a dispute, or appeals to workmen to avoid the works affected, to systematic annoyance or intimidation of workmen who take or retain employment during a stoppage by threats or by actual violence and outrage.

The methods adopted by strikers and strike organizers natur- ally suggest the counter measures adopted by employers. To break down the resistance of a body of work-people supplied with a weekly strike allowance by a powerful trade union employers sometimes have recourse to some method of mutual indemnification by which the financially weaker of their number are temporarily subsidized by the stronger, whether through the machinery of a permanent employers' association or of an emergency committee. Employers' associations being usually composed of much smaller numbers than trade unions, are, as a rule, able to act in concert with greater secrecy and less formality than is possible in. a workmen's union. Apart from any financial support which employers may guarantee their colleagues when attacked by a trade union, they have in some cases formed or aided organizations for the systematic provision of a reserve of " free labourers " available to replace men on strike. By " free labourers " is meant not necessarily non- unionist, but labourers pledged to work amicably with others whether members of a union or not. The Shipping Federation, an organization of shipowners and shipowners' associations which was formed in 1890 to combat the strikes than prevalent among seamen, arranged a system of shipping offices at which seamen could be engaged who were prepared to give a pledge that they would work with non-unionists. They also opened similar offices for shore labourers in some ports. Other independent agencies exist for supplying employers with labour during a dispute. It is not uncommon, in disputes in which there is any apprehension of intimidation or violence, for employers to board and lodge the imported work-people. Another method on which em- ployers in recent years showed an increased tendency to rely was the institution of legal proceedings to restrain individual strikers or the union to which they belong from taking wrongful action injurious to their business. This led to the passage of the Trade Disputes Act of 1906

legalizing several forms of action by strikers which the courts had declared illegal (see below). There has been no attempt in England to induce the courts to restrain bodies of work-people from striking by in- junction, as has been frequently done in American strikes affecting inter-state commerce. In many disputes the attitude of public opinion is of some importance in determining the results, and accordingly both sides frequently issue statements or manifestoes giving their versions of the difference, and in other ways (e.g. by an offer of arbitration) one party or the other endeavours to enlist public opinion on its side.

Public Action with regard to Strikes and Lock-outs.

Though the majority of labour disputes liave little impor- tance for third parties, stoppages of this kind sometimes acquire a special interest for the general public either by reason of the large number of work-people whose livelihood is affected, or of their indirect effects on employment in kindred trades, or of the danger and inconvenience that may be caused to the public, or of the fear that industry may be diverted abroad, or that a breach of the peace may be caused by attempts on the part of the strikers to coerce persons outside their combinations. For these and other reasons, strikes and lock-outs are usually regarded as a class of disputes in which legislative interference has more justification than in the case of other kinds of industrial and commercial differences.

*Legislative action, with the view of providing alternative methods of adjusting labour difficulties, is discussed in the article Arbitration and Conciliation. It is there shown that in New Zealand, New South Wales, Western Australia, the commonwealth of Australia and Canada (for certain in- dustries) alternative methods have been made compulsory, but there are indications that the great majority of employer**

and workmen in Great Britain would not be prepared for such measures, involving as they would the surrender by those directly concerned of their freedom to arrange these matters by voluntary agreement or by a trial of strength. Without the provision of some alternative by the state, it would be impos- sible in a free country to prohibit altogether the termination of labour contracts by collective agreement among work-people or employers.

The law, however, may and does restrict or prohibit the use of some of the methods of promoting or carrying on strikes which interfere with the liberty of other labourers, or inflict a wrong on employers, or injuriously affect the public interest.

The relation of the law in the United Kingdom to strikes and lock-outs is briefly as follows. Since the legislation of 1871 and 1875 there has been no question of the legality of a strike as f;«rf such, viz. of a combined abstention from work in order Kiadm to m fl uenc e the conditions of employment, but the d m yw-«A rnetnot * m wn ‘ cn the strike is carried out may subject Strikes. tne strikers either to criminal or civil liabilities. In this connexion the chief questions of interest relate to the limits within which strikers may lawfully act for the purpose of inducing other persons not to take their places, and for the purpose of bringing indirect pressure to bear upon the employer by influencing others not to work for or deal with him; and, on the other hand, the limits within which employers may act in inducing other employers to abstain from employing workmen or members cf a trade union with whom they have a dispute.*

Strikers are necessarily liable to the general criminal law, but the Conspiracy and Protection of Property Act 1875 enacted that an agreement or combination by two or more persons to do, or procure to be done, any act in contemplation or furtherance of a trade dispute between employers and workmen shall not be in- dictable as a conspiracy if such act if committed by one person would not be punishable as a crime, namely, on indictment or on summary conviction with the statutory liability of imprisonment either absolutely or alternatively for some other punishment. The Trade Disputes Act 1906 extended the exemption to civil liability providing that an act done in pursuance of an agreement or combination in contemplation or furtherance of a trade dispute shall not be actionable unless the act if done without such agreement or combination would be actionable. This act also extended the definition of trade dispute so as to include disputes between workmen and workmen, and also to make it clear that the workmen referred to need not necessarily be in the employment of the employer with whom a trade dispute arises.

The act of 1875 does, not affect any conspiracy punishable by statute nor the law relating to riot, unlawful assembly, breach of the peace or sedition, or any offence against the state or sovereign. The act also does not apply to seamen, or to apprentices to the sea service. Sudden breach of contract of service in gas and water under-takings, or under circumstances likely to endanger human life or

cause serious bodily injury, or expose valuable property to destruction or serious injury, are made punishable offences by special sections, but the miscellaneous provisions of the act are the most important in trade disputes. These provisions, as amended by the act of 1906, subject to a penalty of fine or imprisonment every person who, with a view to compel any other person to abstain from doing, or to do any act which such other person has a legal right to do or abstain from doing, wrongfully and without legal authority,

1. Uses violence to or intimidates such other person, or his wife or children, or injures his property; or

2. Persistently follows such other person about from place to place; or

3. Hides any tools, clothes or other property owned or used by such other person, or deprives him of or hinders him in the use thereof; or

4. Watches or besets the house or other place where such person resides, or works, or carries on business, or happens to be, or the approach to such house or place; or

5. Follows such other person with two or more other persons in a disorderly manner in or through any street or road.

It has, however, expressly provided by § 2 of the act of 1906 that " it shall be iawful for one or more persons, acting on their own behalf or on behalf of a trade union or of an individual employer or firm in contemplation or furtherance of a trade dispute, to attend at or near a house or place where a person resides or works or carries on business or happens to be, if they so attend merely for the pur- pose of peacefully obtaining or communicating information, or of peacefully persuading any person to work or abstain from working."

The above amendment of the law introduced by the act of 1906 was intended to nullify the effect of a series of recent decisions (of which Lyons v. Wilkins, 1896 and 1899, was the most important), which interpreted the act of 1875 to mean that all picketing was illegal except such as was merely for the purpose of obtaining or communicating information. Until recently it was supposed that for wrongs committed in strikes only the individual wrong-doers

could be made responsible. But the decision of the House of Lords in the Taff Vale railway case (1901) showed that a trade union could be sued in tort for acts done by its agents within the scope of their authority and might be sued in its collective capacity, and execution

of any damages recovered could be enforced against its general funds. The effect of this decision was nullified by § 4 (1) of the Trade Disputes Act of 1906, which expressly forbids any court to entertain any action against a trade union on behalf of all the members of the union in respect of any tortious act alleged to have been committed by or on behalf of the union.

Economic Effects. The question of the effectiveness or otherwise of strikes and lock-outs for the purpose of influencing the conditions of employment is part of the wider question of the economic effect of combinations, the strike or lock-out being only one of many methods adopted by combinations of workmen or employers to enforce their demands. (This matter is discussed in the article Trade Unions.) Apart, however, from the question of the extent of the immediate advantage, if any, which one party or the other is able to obtain from a stoppage, we have to consider generally the economic effects of strikes and lock-outs to the community as a whole. Stoppages of work are in their nature wasteful. Time, which might be em- ployed in work yielding wages to the work-people and profits to the employers, is lost never to be recovered, while many forms of fixed capital deteriorate during idleness. In attempting, however, to estimate the utility or disadvantage of strikes and lock-outs, whether to the parties themselves or to the industrial community as a whole, it is insufficient to take into account the value of the wages and profits foregone during the stoppage, and to balance these against the gains made by one party or the other. Attempts have often been made to measure the loss or gain due to strikes in this way, but even as applied to particular stoppages, looked at purely from the point of view of one or other of the parties involved, the method is unsatisfactory. On the one hand, the time and work apparently lost may be afterwards partially recouped by overtime, or some of the strikers may be replaced by others, or may them- selves find work elsewhere, so that the actual interruption of production may be less than would appear from the magnitude of the dispute. On the other hand, the total loss due to the stoppage may be augmented by the diversion of trade for a longer or shorter period after the resumption of work. Again, the ultimate effect of the forced concession of excessive demands may be damaging instead of advantageous to the nominal victors, by contracting the field of employment or by lowering the efficiency of the labour. If, however, the arithmetical computation of the value of the time lost compared with the value of the terms gained is an unsatisfactory test of the benefit or disadvantage of a particular strike to the parties concerned, it is wholly fallacious as a method of estimating the social utility or

otherwise of strikes and lock-outs as instruments for effecting changes in the condition of employment. For any satisfactory consideration of this wider question we must look not merely to the actual strike, but to the 'whole, process of free bargaining between employers and organized bodies of work-people, of which, as already shown, the strike may be regarded as merely an untoward incident. The actual cessation of work is a symptom that for the time there is a deadlock, and frequency of such cessations in any trade is a sign of the imperfection of means of negotiation. In many trades in which both employers and workmen are strongly organized various forms of machinery have been brought into existence for the purpose of minimizing the chance of stoppages (see Arbitration and Conciliation). But wherever there is free combined negotiation there is always in the background the possibility of combined stoppage. This being understood, the question of the utility of strikes as an industrial method resolves itself into the questions: (1) Whether the process of settling the terms of employment by agreements affecting considerable bodies of work-people and employers is superior to the method of individual settlements of labour contracts, or, at least, whether its advantages are sufficient to outweigh the cost of strikes

and lock-outs; (a) whether free collective negotiation could be replaced with advantage by any other method of settling the conditions of employment of bodies of work-people, which would dispense with the necessity of testing the labour market by a suspension of work.

1. The first of these questions is virtually the question of the advantages and disadvantages to the community of com- binations of workmen and employers, which is discussed at length in the article Trade Unions. As regards the question of the direct cost of strikes and lock-outs, it is proper to remember that individual bargaining does not do away with stoppages; in fact, the aggregate amount of time lost in the process of adjusting ten thousand separate labour contracts may be considerable — possibly not less than that consumedˆ on an average in effecting a single agreement involving the whole body, even if the chance of a collective stoppage of work occurring during the process of combined bargaining be taken into account.

While, then, the strikes and lock-outs which accompany the system

of combined bargaining are rightly to be described as wasteful, this is not so much because of the excessive amount of working time which they consume, as because of the dis- turbance and damage done to industry by the violent breach of continuity — a breach which may dislocate trade to an extent quite disproportionate to the actual loss of time involved, and the fear of which undoubtedly affects the minds of possible customers and hampers enterprise on the part of employers. The extent of the injury directly inflicted on the consuming public by a strike varies greatly in different cases, being at its maximum in the case of industries having the total or partial monopoly of supplying some commodity or service of prime necessity, e.g. gas-works, water- works, railway or tramway service; and least in the case of a local stoppage in some widely-spread manufac- turing or constructive industry open to active competition from other districts.

In speaking above of the loss occasioned by strikes and lock- outs attention has only been paid to the effects Of the actual stoppage as such, and not to the particular methods adopted by the strikers to make the stoppage effective. The evils arising from the practice of intimidation or violence towards other workmen, or from the increase of class-hatred and bitter- ness engendered by the strike between employer and employed, are patent to all, though they cannot be estimated from an economic point of view.

2. As to the second question, viz. the possibility of main- taining combined negotiation, but of substituting some better method than strikes of resolving a deadlock, it is hardly necessary to say that so far as such substitution can be voluntarily carried out with the assent of both parties, whether by the establish- ment of wages boards or joint-committees, or by agreements to refer differences to third parties, the result is an economic as well as a moral advantage.

But the increasing adoption of these voluntary expedients for diminishing the chance of industrial friction lends no coun- tenance to the expectation that a satisfactory universal substitute for strikes and lock-outs can be devised except at the price of economic liberty. Compulsory reference of dis- putes to a state tribunal cannot be reconciled with freedom of voluntary negotiations.

Unless, then, we are prepared for a scheme of compulsory regulation of industry by the state, strikes and lock-outs must be accepted as necessary evils, but their frequency may be greatly diminished with the improvement of means of infor- mation as to the true condition of the labour market, and the influences by which it is determined.

Many disputes arising purely from mismanagement and misunderstanding are wholly avoidable. While there is no warrant for expecting the total abolition of strikes and lock-outs, it is not Unreasonable to hope that the spread of education and the means of rapidly obtaining information, the improvement of class relations, and the adop- tion, where practicable, of conciliatory methods, may gradually tend to confine actual stoppages to the comparatively few cases

in which there is a genuine and serious difference of principle between the parties.

Important British Strikes and Lock-outs. Some of the niore important labour disputes which have occurred in various groups of trades in the United Kingdom are noted below. With regard to the statistics given, it may here be noted that although for the sake of brevity it is stated in some places that a certain number of men were idle for a specified number of days, it must not be supposed that in all cases the whole number affected were idle for the whole number of days.

Coal-Mining is an industry which has always been more con- vulsed by labour disputes than any other, probably owing to the violent oscillations of prices and wages, and to the varied and ever-changing conditions under which work is carried on. Several of the earliest recorded disputes among coal-miners, however, referred to the term of engagement rather than the rate of wages. In 1765 the Northumberland miners struck for several weeks unsuccess- fully against the system of a yearly bond of service, which was then prevalent. In 1810 a strike of seven weeks in the same district against a variation of the yearly bond ended in a compromise. Turbulent strikes in Northumberland and Durham are also re- corded in 1 83 1 and 1832; the former, in which the men were suc- cessful, for a general removal of grievances, and the latter, in which they were defeated, for the maintenance of the union. These strikes were attended with violence and destruction of property. In 1844 still another prolonged strike took place in the north of England to enforce alterations in the terms of the yearly bond. From 30,000 to 40,000 men were out for 18 weeks. New men, however, were obtained, and there were many evictions. In 1864 widespread strikes took place in South Yorkshire and South Staffordshire, the one for an advance and the other against a re- duction of wages. The Yorkshire strike is said to have affected 37,000 men, and the Staffordshire strike 20,000. The latter lasted over four months.

The rapid fall in the price of coal after the abnormal inflation in 1

871-1872 produced a series of obstinate strikes and lock-outs arising out of reductions of wages, in which the men were usually defeated. The South Wales miners, to the number of 70,000, were out for 11 weeks in 1873 and for 19 weeks in 1875, the latter dispute being a combined strike and lock-out, and leading to the formation of the first of the series of sliding scales under which the industry in South Wales was regulated until the end of the year 1902. In 1877 the West Lancashire miners (30,000) were out for 6 weeks, and the Northumberland men (14,000) for 8 weeks. The last-mentioned dispute was terminated by an arbitration award in the miner's favour. In 1879, 70,000 Durham men were out for 6 weeks, the dispute being terminated by an arbitration award giving half the reduction claimed by the coal-owners. The intro- duction of sliding scales in Durham and Northumberland in 1877 and 1879 did something to preserve peace in those districts, though the Durham scale did not prevent the dispute of 1879 mentioned above. Both scales, however, were terminated by the men in 1889 and 1887 respectively. Tn 1 880-1 881 the Lancashire coal- mining industry was stopped for 7 weeks by a strike of 50,000 to 60,000 men against " contracting out " of the Employers' Liability Act of 1880.

The fall of prices after 1890 led to a renewal of disputes. In 1892 there was a prolonged stoppage in the Durham coalfield, 75,000 men being out for about 11 weeks.

In 1893 the greatest dispute took place that has ever been recorded in the coal-mining industry, affecting the whole area covered by the Miners' Federation, viz. Yorkshire, Lancashire and Cheshire, and the Midlands. During the years 1891 and 1892 most of the districts covered by the Miners' Federation submitted to reductions of wages varying from 15% off the standard in Durham to 42i% in South Wales and 50% in Scotland, where the previous rise had been greatest. The Miners' Federation, however, refused to recognize the principle that wages should follow prices, and put forward instead the theory that a minimum or " living wage " should be fixed and prices left to adjust themselves to this rate. They declined altogether to agree to any reduction, and so strong was their combination that the coal-owners deferred any definite action until the middle of 1893, when they considered that some reduction was absolutely necessary to enable the trade to be carried on. On the 30th of June they passed a resolution after a conference with the men, demanding a reduction of 25% off the "standard" (equivalent to about 18% off current rates of wages), and offered arbitration as an alternative; but the federa- tion absolutely refused any reduction, and the contest began. Shortly before the beginning of the dispute Northumberland

and Durham had become affiliated to the federation, but these districts were not threatened by a reduction, and they seceded from the federation sooner than strike, as demanded by that body to obtain the return of the reductions sustained since 1891. These districts consequently remained at work throughout the dispute, as well as Scotland and (except for a part of August and September) South Wales, reaping the advantage of the increased prices and wages resulting from the restriction of production due to the stoppage.

Within the federation districts proper there were some localities in which no notices of reduction were posted, but the policy of the Miners' Federation was to make the stoppage as universal as possible, and all its members were required to leave work. The Cumberland miners, however, though members of the federation, were for special reasons permitted to continue at work. By the middle of August nearly 300,000 men were idle, or nearly half the total number of coal-miners In the United Kingdom. The early stages of the dispute were uneventful, but as the funds of the unions affiliated to the federation became exhausted, and the pinch of distress was felt, feeling ran high, and in some districts deplorable acts of violence were committed. At Featherstone, in Yorkshire, an attack was made on a colliery, in the course of which the military fired on the rioters, two of whom were killed.

The decision of the federation requiring all its members to leave work, whether under notice of reduction or not, had from the beginning met with considerable opposition in certain districts, and this opposition naturally grew stronger as the distress caused by the stoppage increased. At the end of August a ballot on the question snowed a small majority still in favour of a universal stoppage, but the experience of another month led to a formal reversal of policy in. this respect, a meeting of the federation at Chesterfield on the 29th of September deciding to allow all men to return to work who could do so at the old rates of pay, such men to pay a levy of is. a day in aid ot those still on strike. Up to October no step was taken towards a settlement beyond an offer on the part of the miners on the 22nd of August to pledge themselves not to ask for an advance until prices reached the 1890 level, and also to assist the employers to prevent underselling — an offer which was rejected by the coal-owners. On the 9th of October a meeting of the representatives of the parties was

held at Sheffield, at the invitation of the mayors of six important towns affected, but without definite result, beyond leading to an amended proposal on the part of the coal-owners for an immediate 15 % reduction, and the regulation of future changes in wages by a conciliation board. The men, however, still refused all reduction, and during October a number of coal-owners, especially in the Midlands, threw open their pits at the old rate of wages.

A further advance towards a compromise was made by the owners on the 25th of October, when they offered that the proposed '5% reduction should be returned to the men in the event of the conciliation board (with an independent chairman) deciding in their favour. In consequence of this offer a meeting was held between the representatives of the owners and the men in London on the 3rd and 4th of November, but without arriving at a settlement. Matters had now reached a deadlock, and accordingly, on the 13th of November, the government addressed an invitation to both parties to be represented at a conference under the presidency (without a casting vote) of Lord Rosebery, who was then foreign secretary. The conference took place at the foreign office on the 17th of November, and resulted in a settlement, the men to resume work at once at the old rate of wages, to be continued until the 1st of February 1894, from which date wages were to be regulated by a conciliation board, consisting of fourteen representatives of the coal- owners' and miners' federations respectively, with a chairman mutually elected, or in default nominated by the Speaker of the House of Commons, the chairman to have a casting vote.

This agreement terminated the dispute. The Speaker appointed Lord Shand as chairman of the board. In the middle of the following year, by mutual arrangement, the constitution of the conciliation board was modified so as to provide for limits below and above which wages should not move during a definite period. These limits have since been modified from time to time, but (with a gap from July 1896 to January 1899) the conciliation board con- tinued to regulate miners wages in the federated districts, and its formation has been followed by the institution of conciliation boards in most of the other important centres of the mining industry.

During the summer of 1893 there was also a strike of about 90,000 men in South Wales, which lasted about 5 weeks. 1894 saw a prolonged dispute in the Scottish coal-mining industry, the men vainly attempting to resist the fall of wages which followed the fall of coal prices from the abnormal level to which they had risen during the English stoppage of the previous year ; 70,000 men were out

from 15 to 16 weeks. In 1898 there was an unsuccessful stoppage lasting 25 weeks in South Wales and Monmouth affecting too,ooo men, for the abolition or amendment of the sliding scale agreement. In 1902 the dissatisfaction of the pit-lads with a reduction of wages awarded by the conciliation board threw a large body of miners idle for some time in various parts of the " federated districts." In 1906 a series of local strikes occurred in South Wales in order to compel non-unionists to join the Miners' Union, while in 1910 strikes in the Tonypandy district led to much rioting.

The record of strikes and lock-outs in the Cotton Trade goes back to a time before the repeal of the Combination Laws. Thus the year 1810 was marked by lock-outs of spinners in Lancashire and Glasgow, the former caused by a strike in the Stalybridge district to enforce Manchester rates of wages, and the latter having for its object the break-up of the men's union. In both cases the employers were successful. In 18 12 there was a stoppage of

40,000 looms in Scotland for some weeks, arising out of a wages dispute, in which the men were beaten, their union broken up, and their leaders imprisoned. Another unsuccessful strike attended with imprisonment of the men's leaders took place among the Manchester spinners in 1818, when 20,000 to 30,000 men were out for three or four months to obtain an advance of wages and reduction of hours. The year 1853 was one of great disturbance in the Lancashire cotton-spinning trade? For seven months 20,000 to 30,000 spinners in the Preston district were engaged in an unsuccessful strike for an advance of wages, and in the same year there was a stoppage of 65,000 spinners in Lancashire generally. The period of bad trade culminating in 1879 was marked by bitter disputes in the cotton trade, the men vainly trying to resist the reductions of wages which marked that period. Partial disputes at Bolton in 1877, and Oldham in 1878 were followed in the latter year by a general stoppage in north and north-east Lancashire affecting 70,000 persons for 9 weeks. The general dispute was attended with violent riots, and 68 persons were tried and convicted. The next important dispute was a strike Of 18,000 weavers in north-east Lancashire in 1884 against a reduction of wages, which ended after 8 Weeks in a compromise. Next year there was a strike at Oldham against a reduction of wages affecting 24,000 persons in the spinning and weaving branches. The dispute ended in a compromise, half the proposed reduction of 10% being agreed to. In 1892-1893 a great dispute in the cotton-spinning trade took place, 50,000 persons in the Oldham and surrounding districts being out for 20 weeks against a proposed reduction of 5%. The dispute was ended by the so- called " Brooklands Agreement,"

which provided for a reduction of about 3 %, and also contained rules for the settlement of future disputes by conciliatory methods. These rules do not, however, provide for a final appeal in cases of deadlock. A considerable strike in 1910, brought about by a dispute as to the allocation of duties of a single operative, was terminated by the intervention of the board of trade. _

The Building Trades have in most years been characterized by a large number of local and sectional disputes sometimes affecting comparatively small bodies of men. Often, however, all branches of building trades in a given district have been stopped simultaneously, but few of the building trade stoppages have affected a sufficiently large body of men to be noticed here as important disputes except in London. The years 1810 and 18 16 were marked by strikes on the part of the London carpenters, the first being a successful attempt to obtain a rise in wages, the second an unsuccessful resistance to a fall. In 1833 an important dispute laid idle the building trades of Liverpool and Manchester. The dispute arose out of the objection of the men to the contract system, and led to a general lock-out to compel the men to leave their unions, in which the employers were generally successful. In 1859-1860 a partial strike in London against the discharge of a delegate led to a lock- out of 25,000 building operatives for 7 months, and in 1861-1862 a renewed strike for a reduction of hours resulted in a compromise. In 1872 there was a successful strike of 10,000 London building operatives for a rise of wages, a shortening of hours being also obtained. In 1891 there was an unsuccessful strike of carpenters in London for a rise in wages, affecting 9000 men and lasting 24 weeks.

Engineering, Shipbuilding and Metal Trades. — Among the most noteworthy disputes in the engineering trade was that in 1852, soon after the formation of the Amalgamated Society of Engineers by the fusion of a number of local and sectional societies. The dispute originated in Lancashire, and turned on demands from the men for the abolition of piecework and overtime, the dispute being further complicated by questions relating to the employment of labourers in working machines. The men ceased working overtime, and were locked out to the number of over 13,000 for periods ranging from three to nine months. The men were completely beaten, and many engineering shops required the men to leave the union before resuming work. In 1871 a strike of 8000 to 9000 men in the north of England for a reduction of hours from 59 to 54 was successful after a stoppage of 20 weeks, and led to the general introduction of the nine-hour-day throughout the country.

In 1897-1898 there was a widespread and prolonged dispute turning on questions of hours and of freedom of management of works, which lasted 29 weeks and affected 47,500 men. The imme- diate occasion of the stoppage was a demand on the part of the men for an eight-hour-day in London workshops, but this issue was soon overshadowed in importance by other questions relating to the freedom of employers from interference by the unions in the management of their business, especially in such matters as piece-work, overtime, selection and training of workmen to work machines, employment of unionists and non-unionists, and other matters affecting the relations of employer and employed generally through- out the United Kingdom. For some time previous to the general dispute there had been a growing dissatisfaction op the part of the employers with the encroachments of the Amalgamated Society of Engineers and other societies in kindred trades on matters affect- ing the management of business, which the employers considered to be outside the legitimate functions of trade unions. In the absence of any general combination of employers, the unions were able to I bring their whole force to bear on employers in particular localities,

with the result that the stringency of the conditions and restrictions enforced varied very greatly in different districts, according to the comparative strength of the unions in those districts. , Employers complained of being subject to vexatious restrictions not imposed on their competitors, and they declared that they were severely handicapped as compared with America and other countries, where engineering employers had much more complete control over the management of their business. In 1895 was formed the Federation of Engineering Employers by the coalition of the local associations on the Clyde and in Belfast, and this federation gradually spread to other districts until it finally embraced the United Kingdom generally. The policy of the federation was to defeat the attempts of the unions to put pressure on particular individuals or localities by the counter-threat of a general lock-out of trade unionists over a wide area in support of the employers thus attacked. The lock-out notices were framed in such a way that 25% of the trade unionists employed were to be discharged at- the end of each week until the whole were locked out. Lock-out notices of this kind were twice posted— in August of 1896 and in the spring of 1897 — before the general dispute, but in each case the dispute was averted before the

notices took effect. But the conferences which took place in April 1897 between the representatives of employers and unions led to no agreement except on comparatively unimportant points. When, therefore, in June 1897 the London employers, threatened with a strike for an eight-hour-day, put their case in the hands of the Employers' Federation, and the federation determined to sup- port them by a general lock-out, it was understood that this lock-out was enforced, not only in order to resist the reduction of hours in London, but to obtain a settlement of all the important questions at issue l)etween the federation and the unions as a whole. The engineers replied to the notices of a gradual lock-out by withdrawing the whole of their members from work in federated workshops. At first the lock-out affected some 25,000 men employed in 250 establishments, but by the close of the dispute the number of employers involved had risen to 702, and of work-people to 4.7,500. Until November no meeting between the parties took place, but on the 24th of November and following days a conference was held in pursuance of negotiations with the parties by the board of trade, each side having its own chairman. The main point for which the employers contended was freedom on the part of each employer to introduce into his workshop, any condition of labour under which any members of the trade unions were working in any of the federated workshops at the beginning of the dispute, except as regards rates of wages and hours of labour. Arising out of this general principle of freedom of management, a number of special points were discussed and subsequently embodied in separate articles of the provisional agreement, and a system of local and general conferences for the settlement and avoidance of future disputes was also included there- in. The employers absolutely declined to grant any reduction of hours of labour. The negotiations dragged on for a considerable time, and were at one time broken off owing to the refusal of the men to ratify the provisional agreement. By the end of the year, however, it was evident that the position of the men was very much weakened owing to the depletion of their funds, while that of the employers was stronger than ever. On the 13th of January the London demand for an eight-hour-day was formally withdrawn, and after some further negotiation, and the embodiment in the agreement of the notes and explanations published by the employers, a settlement was arrived at and ratified by more than a two-thirds majority of the men, the final agreement being signed on the 28th of January.

The victory of the employers was complete, but the use made of it was moderate, and the relations between employers and workmen in

the engineering trades on the whole improved, all matters likely to cause dispute being now amicably discussed between the representatives of the respective associations.

In 1866 a strike of 3000 shipwrights on the Clyde led to a general lock-out of shipbuilders in the district. In 1877, 25,000 iron shipbuilders on the Clyde struck for 23 weeks for an advance of wages, the dispute being settled by arbitration.

1 n 1906 the shipbuilders in the Clyde district struck work for about 7 weeks to obtain an advance of wages of is. 6d. a week. The dispute ended in their defeat, about 15,000 men being affected.

In 1891 a prolonged dispute took place between the plumbers and engineers engaged in shipyards on the Tyne as to " demarca- tion "; 2460 men were idle from 7 to 8 weeks, the result being the drawing up of an elaborate list of apportionment applicable to the Tyne and Wear. The shipbuilding trades have from early times been marked by numerous " demarcation " disputes, mostly of a local character, as to the limits of the work of the various bodies of work-people — e.g. between shipwrights and boatbuilders ; shipwrights and joiners; shipwrights and boilermakers ; joiners and cabinetmakers ; boilermakers and engineers ; engineers and plumbers ; engineers and brassfinishers. Some of these matters are now dealt with by joint trade boards (see Arbitration and Conciliation). Among the more important disputes in the iron trade are to be mentioned a strike and lock-out of 30,000 ironworkers in Stafford- shire in 1865, in which the men were beaten after a costly stoppage of 18 weeks; an unsuccessful strike of 12,000 ironworkers in Middles- brough for 18 weeks in 1866; and an unsuccessful strike of 20,000

ironworkers in Staffordshire for 4 weeks in 1883 against a reduction of wages, attended by rioting and destruction of plant.

The nailmakers in the Dudley district engaged in widespread disputes in 1840, 1881 and 1887. The strike of 1840 against a reduction of wages was unsuccessful. Those of 1881 and 1887 were for advance of wages; the former was wholly, the latter partially successful. The women chain-makers of Cradley Heath successfully struck in 1910 for an increase of wages.

Other Trades.— Among other noteworthy disputes are to be mentioned : —

1. A successful strike of 14,000 persons in the Leicester hosiery trade

in 1819 for an advance in wages.

2. An unsuccessful strike of 13,000 or more tailors in London in 1834 for a rise of wages and reduction of hours, lasting several months.

3. A dispute among the pottery workmen in the Midlands in 1836 against the terms of yearly hiring, leading to a general lock-out of over 15,000 men for 10 weeks, which ended in the defeat of the men.

4. A series of disputes among agricultural labourers in 1 872-1 874 for increases of wages and other improvements in the conditions of employment, in which the men were mostly successful. These disputes, which are almost the only widespread disputes recorded in agriculture, evoked much public interest.

5. In 1889 there was a prolonged strike of dockand waterside labourers in London for a rise in wages and other alterations in conditions of employment, which was successful, mainly through the financial support received from the Australian trade unions and from the general public. It began on the 13th of August with a small local dispute at the West India Docks about the wages earned for discharging a certain cargo, but spread rapidly among all classes of dock labourers in the port, who took the opportunity of demanding an increase in the rate of pay for time work from 5d. to 6d., the abolition of contract and piece-work, and the remedy of, other grievances. They were joined by the stevedores and lightermen, who came out " in sympathy," though the latter class of men soon formulated a set of demands of their own. Employment was brisk, the weather. fine, and the public sympathetic, and in a few days' time not less than 16,000 men were idle. For the most part they were unconnected with trade unions which could give them strike pay, but during the month that the strike lasted the public at home and abroad subscribed nearly £50,000 in support of the strikers. Of this total over £30,000 came from Australia, where from the 29th of August onwards a series of meetings were held for the purpose of raising funds to assist the London labourers. The Australian subscriptions practically decided the issue of the contest. On the very day on which the first Australian meeting was held at Brisbane the leaders of the strike attempted by means of a " no-work manifesto " to widen the area of the dispute and cause a general stoppage of industry. Though this attempt was soon abandoned it caused considerable alarm and threatened to alienate public sympathy from the men. Early in September many of the wharfingers made separate settlements with the strikers, and the shipowners attempted to

put pressure on the dock companies to allow them to employ labour direct within the docks. The apprehensions of the public led to the formation of a conciliation committee at the Mansion House, including the Lord Mayor, the bishop of London, Cardinal Manning, Sir John Lubbock (Lord Avebury), and others, who mediated between the strikers and the dock directors, with the result that after one abortive attempt at a settlement, the terms of which were rejected by the men, an agreement was arrived at on the 14th of September, under which the dock labourers obtained the greater part of their demands. From the 4th of November the rate of hourly wages for time work was raised to 6d., with 8d. overtime; contract work was converted into piece-work, with a minimum rate of 6d., and other points in dispute were settled. Though during the strike cases of intimidation and violence on the part of pickets were by no means absent, the police-court charges arising out of the dispute were remarkably few. By the end of the year the Dock Labourers' Union (which had previously been known as the Tea Operatives and General Labourers' Union, and at the beginning of the dispute numbered about 800 members) had increased its membership in London to over 20,000 — a number which was afterwards further increased by the formation of provincial branches. In London, however, the membership rapidly declined during the following years of depression of trade. The stevedores, who, as above re- marked, came out " in sympathy " with the dock labourers, returned tp work as soon as the latter were satisfied, but the lightermen's demands were adjusted by an award of Lord Brassey before they returned to work.

6. The organization of labour at the principal ports which followed this dispute led to a series of struggles between the new unions and the shipowners, who formed an organization called the Shipping Federation Limited, and successfully established their right to employ " free labour " in opposition to the unions of seamen and other bodies of labourers. The last of these disputes on a large scale occurred at Hull in 1893, and ended in the defeat of the dock labourers after a stoppage affecting 11,000 men for 6 weeks.

7. In 1895 a general stoppage of 46,000 boot and shoe operatives was terminated, after a stoppage of 6 weeks, by a settlement effected through the board of trade. The issues of this dispute were of

interest as involving the scope and limits of the functions of trade union action and of arbitration in relation to the management of business. The terms of settlement, which were of an elaborate character, are still in operation.

8. Two prolonged disputes at Lord Penrhyn's slate quarries in North Wales in 1896 and 1900 attracted public notice from the obstinacy with which the contests were conducted on both sides. About 2500 work-people were affected, and the questions at issue were the recognition of the men's combination and the remedy of a number of alleged grievances, including the abolition of the con- tract system. After 48 weeks' stoppage, during which the board of trade vainly tried to mediate, the first dispute was ended by a compromise; but in 1900 another struggle began which was per- sisted in by many of the men until November 1903, but without success.

Foreign Countries.

Below is given a brief account of the most recent strike statistics in the principal countries other than the United Kingdom, except those of the United States, which are dealt with in a separate section.

France. — Detailed statistics of strikes and lock-outs in France have been published annually since 1890 by the French office du travail. The following are the figures for 1900-1906: —

Year.

1900 1901 1902 1003 1904 1905 1906

Mean of 7 yrs.

Number of Disputes.

903 523 512 571 1,028

835 1,314

812

Number of Work- people directly affected.

222,769 111,414 212,704

123,957 271,267 178,252 439,280

222,806

Aggregate

Duration in

Working Days.

3,761,227 1,862,050 4,675,081 2,443,219 3,936,774 2,785,167 9,445,420

4,129,1

The figures from 1901 are summarized below: —

Year.

Number of Disputes terminating in the year.

1901

1091

1902

1 106

1903

1444

1904

1990

1905

2657

1906

3626

1907

2512

Number of Work-people

directly and indirectly

affected.

68,191 70,696 135,522 145,480 542,564 376,415 286,016

The principal groups of industries affected by disputes were in 1900 and 1901 the transport, involving 47,125 and 36,636 work-people respectively; in 1902 the mining and quarrying, in- volving 119,181 work-people; in 1903 the textile manufacturing

In 1905, 232,425 work-people employed in the mining and smelting group 'were involved in disputes, and in 1906 and 1907 102,888 and 90,890 work-people employed in the building group of trades were so involved.

In the German statistics disputes are counted more than once if due to more than one separate cause. Of the total number of disputes tabulated in this way during the period 1901-1907, 56% were on questions of wages, 15% on questions of hours, 10% on questions of the employment of particular classes of persons and the balance on questions of working rules and other causes.

During the same period 20% of the disputes were settled in favour of the work-people, 45% in favour of the employers, and 35% were compromised.

Belgium. — The following figures are based on reports pub- lished'by the Belgian labour department.

The table given below shows the number of strikes and the number of work-people directly affected by strikes in each of the years 1901 to 1907.

The mining industry and the transport trades accounted for 20,813 an d !S,o63 of the work-people affected in 1901, and the mining industry and the textile industry accounted for 59,168 and 7975 of the work-people in 1905. In 1906 the mining industry accounted for 12,189 of the work-people affected, and in 1907 the transport trades accounted for 10,660, the mining

1901.

1902.

1903.

1904. '

1905-

1906.

1907.

Number of strikes

Number of work-people directly affected by strikes .

117

43,8i4

73

io,477

70 7,649

81 12,375

133

75,672

220 26,858

227 46,908

industry, involving 76,376 work-people; in 1904 the textile manufacturing industry, involving 76,293 work-people; the transport, involving 69,293 work-people, and the agricultural, forestry and fishing group, involving 52,333 work-people; in 1905 the building and metal trade groups of industries, involving about 32,000 work-people in each; and in 1906 the building, metal and mining quarrying groups of industries, involving about 90,000 work-people in each.

In the French statistics of causes of disputes a dispute due to several causes is entered as many times as there are causes, not merely under its principal cause, as in the United Kingdom statistics. It would be possible to summarize the relative prevalence of different groups of causes of trade disputes by the numbers involved, but it is sufficient to say that the results during the period 1900 to 1906 were as follows: 12% in favour of the work-people, 25% in favour of the employers, and 63% compromised. A general strike of railway

employees all over France in 1910 threatened to spread to other industries and caused an acute political crisis, but the energetic measures taken by M. Briand's government, especially the issue of mobilization orders to all the reservists on the affected lines, brought about its collapse in little more than a week.

Germany. — Before 1899 there were no official statistics of strikes and lock-outs throughout the German Empire, but certain figures were collected and published by the committee of the " Gewerkschaften," or Social Democratic trade unions, in their Correspondenzblalt. These figures, however, were admittedly incomplete. From 1899, however, statistics have been published by the German imperial statistical office for strikes and lock-outs other than in agriculture.

industry for 9626 and the textile industry for 7961 of the work-people affected. The causes of the strikes during the period were mainly questions of wages, nearly 80% of the work-people being involved on this account, and the results were mainly in favour 'of the employers, viz. 71%. Of the total number of work-people affected by strikes in the period 1901-1905 68% returned to work on employers' terms without negotiation. From 1906 particulars are given of lock-outs and of the number of work-people indirectly affected by strikes.

In 1906 five lock-outs were recorded, all in the textile industry, affecting 23,621 work-people, and in 1907 four lock-outs were recorded affecting 16,274 work-people (one of these lock-outs affecting 16,000 work-people employed in the transport trade).

The number of work-people indirectly affected by strikes was 11,468 in 1906 and 19,248 in 1907.

Sweden. — The Swedish labour department has published statistics of strikes since 1903. There were in 1903 142 dis- putes directly affecting 22,568 work-people, in 1904 215 disputes directly affecting 11,485 work-people, in 1905 175 disputes directly affecting 32,368 work-people, in 1906 277 disputes directly affecting 18,612 work-people, and in 1907 298 disputes directly affecting 21,722 work-people. Of the 1 107 disputes recorded in the five years 691 were caused by questions of wages. Of the 1107 disputes 362 ended in favour of the work-people, 272 in favour of the employers, and 395′ in a compromise. In 1909 there was a great national strike involving almost every industry, and lasting some six months.

Denmark. — The statistics of disputes in Denmark are pub- lished by the Danish statistical bureau. During the period 1900 to 1906 the number of disputes varied from 57 in 1901

to 89 in 1906, and the number of work-people directly affected, from 7606 (involved in 68 disputes) in 1900 to 1148 (involved in 43 disputes) in 1903. The number of work-people shown is the maximum number affected at any one time, but the number involved is not obtained for all disputes. Of the total number of disputes which took place during the seven years' period 1900-1906, viz. 518, 53% were caused by questions of wages, 3 % by hours of labour, 7 % by working arrangements, rules, &c, 6% by questions of trade unionism, and 31% by other causes or causes unknown.

Holland. — Statistics of disputes in Holland are published by the central statistical bureau. During the three years 1904, 1905 and 1906 the number of disputes recorded were 102, 132 and 181 respectively, and the number of work-people directly affected 11,186, 7364 and 18,858 respectively, but the number of work-people affected was not ascertained in every dispute. The causes of disputes are measured by the number of days lost by the work-people directly affected (though these particulars were not obtained for all disputes), and the days lost by disputes which had more than one cause are included under each cause or object. In 1904 25%, in 1905 53% and in 1906 51 % of the time lost was caused by questions of wages. The results of disputes in the three years are shown in the following table: —

Result.

Number of Disputes.

1904.

1905-

1906.

In favour of work-people . In favour of employers

Indeterminate or unknown

24 43 31

4

25 49

55 3

35 63 68

7

Total

102

132

173

The figure for 1906 does not include 8 ” sympathetic ” disputes which came to an end when the original dispute terminated in connexion with which they occurred.

Austria. — Particulars of strikes and lock-outs are published by the Austrian labour department.

The following table shows the number of strikes, the number of strikers and non-strikers affected, the number of working days lost by strikers, and the number of lock-outs and work- people involved in each of the seven years 1900 to 1906.

of working days lost during the same four years were 278,956, 284,140, 489,775 and 613,986 respectively. Of the total number of disputes in the seven years (859), 208 occurred in the building trades, 139 in the metal trades, 79 in the clothing trades, 62 in the mining industry, 60 in the transport trades and 48 in the food and tobacco preparation industry. Of the 740 disputes occur- ring in the same period for which a cause could be tabulated, 248 were for an increase in wages, 94 against the employment of particular persons, 64 were for both an increase in wages and a decrease in hours of labour, and 45 against a reduction in wages; and of the 841 disputes for which the result could be tabulated, 293 were in favour of the employers, 250 were in favour of the work-people, 200 were settled by compromise, and the balance (98) were indefinite in their settlement. Four of the Canadian provinces, Ontario, Nova Scotia,

British Columbia and Quebec, and the Dominion government have enacted laws with a view to the peaceful settlement of industrial disputes. Under the Industrial Disputes Investigation Act of 1907 strikes and lock-outs are unlawful in industries termed public utilities prior to or during a reference of such dispute to a board of conciliation, a provision which is enforced by heavy penalties. Thirty days' notice of intended changes in wages or hours have to be given under the act.

Australia and New Zealand. — Four of the Australian states (Victoria, New South Wales, South Australia and Western Australia) and the Commonwealth as a whole have enacted laws with a view to the peaceable settlement of disputes between employers and work-people, but the laws of Victoria and South Australia are inoperative though unrepealed. These two states and Queensland have, however, established wages boards which tend to prevent disputes on the question most frequently the cause of strikes or lock-outs. The original inspiration of the conciliation and arbitration laws arose from the great strikes of 1890 to 1892, which turned to a great extent on' the attempt of labour unions to secure a monopoly of employment. They all ended in the defeat of the work-people and in a great weakening of trade unionism in the colony.

In New Zealand a law has also been in force since 1894 for the encouragement of the formation of industrial unions and associations, and to facilitate the settlement of industrial disputes. Strikes and lock-outs are now illegal in New Zealand.

1900.

1901.

1902.

1903.

1904.

1905.

1906.

Number of strikes

Number of work-people taking part in strikes .

Number of working days lost by strikers ....

Number of lock-outs

Number of work-people directly involved in lock-

303 105,128

7,737

3,483,963

10

4,036

270

24,870

2,846

157,744 3

302

264

37,471

6,354

284,046

8

1,050

324

46,215

5,245

500,567

8

i,334

414 64,227

9,3 01

606,629

6

23,742

686

99,591

n,340

1,151,310

17

H,I97

1,083 153,688

13,098 2,191 ,815

50 67,872

In the tabulation of causes or objects of disputes the work- people are entered as many times as there are causes. During the period 1900 to 1906 questions of wages were the pre- dominating cause of dispute.

Twenty-five % of the work-people were involved in disputes during 1900 to 1906 which resulted in favour of the employers, 13% in disputes which resulted in favour of the work-people, and 62 % in disputes which were compromised.

The British Colonies. Canada. — Statistics of disputes are published by the depart- ment of labour. During the seven years 1901 to 1907 the total number of disputes recorded was 859, the number each year being as follows: —

1901.

104

1902.

123

1903.

160

1904.

103

1905.

87

1906.

138

1907.

144

In 1904 the number of work-people involved was 15,665; in 1905, 16,1 21 \ in iqo6. 26,014 and in 1907, 34,972. The number

Authorities.— The following are among the more important official publications on strikes and lock-outs: Reports of the Chief Labour Correspondent of the Board of Trade on Strikes and Lock- outs (annually from 1888); Labour Gazette (Board of Trade, monthly from May 1893); Reports of Royal Commission on Labour (1891-1894); Report of the Royal Commission on Trade Disputes and Trade Combinations (1906) ; Third Abstract of Foreign Labour Statistics (Board of Trade, 1906 — Section on Trade Disputes), and the publication of the offices given as the authorities for the strike statistics of the various foreign countries and colonies. (See also list of authorities on Trade Unions and Arbitration and Con- ciliation.) (X.) United Stales.

The first recourse to a strike in the United States occurred in 1740 or 1 74 1, when a combined strike of journeymen bakers occurred in New York City. An information was filed in 1741 against the strikers for conspiracy not to bake until their wages were raised. On this they were tried and convicted, but it does not appear that any sentence

was eˆer passed. In May 1796 an association of journeymen shoemakers in Philadelphia ordered a " turn-out " or strike to secure an increase of wages, and again in 1798, for the same purpose, both strikes being

successful. In 1799 the shoemakers of Philadelphia struck against a reduction of wages, the strike lasting about ten weeks, and being only partially successful. These four are the only strikes to which any reference can be found that occurred in the United States prior to the 19th century. The conditions of industry generally during the colonial days was not conducive to strikes. The factory system had not taken deep root, masters and men worked together, and so there was no opportunity for concerted action.

The first notable American strike occurred in November 1803, in the city of New York, and is commonly known as the Notable " sailors' strike." The sailors in New York had Early been receiving $10 per month. They demanded

Strikes. an j ncrease t jjjˆ. j n carrying out their purpose they formed in a body, marched through the city, and compelled other seamen who were employed at the old rates to leave their ships and join the strike. The strikers were pursued and dispersed by the constables, who arrested their leader and lodged him in gaol, the strike thus terminating unsuccessfully. In 1805 the Journeymen Shoemakers' Associa- tion of Philadelphia again turned out for an increase of wages. The demands ranged from 25 to 75 cents per pair increase. This strike lasted six or seven weeks and was unsuccessful. The strikers were tried for conspiracy, the result of the trial being published in a pamphlet which appeared in 1806. An account of this trial may be found in trie United States Supreme Court library. In November 1809 a strike among the cord- wainers occurred in the city of New York. The proprietors quietly took their work to other shops, and by this stratagem defeated the strikers; but the action being discovered, a general turn-out was ordered by the Journeymen Cordwainers' Asso- ciation against all the master workmen of the city, nearly 200 men being engaged in the strike. At that time a stoppage of work in one shop by the journeymen was called a " strike " ; a general stoppage in all shops in a trade was known as a " general turn-out." A member of a journeymen's associa- tion who did not keep his obligations to the organization was denominated a "

scab."

In 181 5 some of the journeymen cordwainers of Pittsburg, Pennsylvania, were tried for conspiracy on account of their connexion with a strike, and were convicted. In 181 7 a peculiar labour difficulty occurred at Medford, Massachusetts. Thacher Magoun, a ship-builder of that town, determined to abolish the grog privilege customary at that time. Mr Magoun gave notice to his people that no liquor should be used in his ship- yard, and the words " No rum! " " No rum! " were written on trie clapboards of the workshop and on the timbers in the yard. Some of Mr Magoun's men refused to work; but they finally surrendered, and a ship was built without the use of liquor in any form.

The period from 1821 to 1834 witnessed several strikes, but rarely more than one or two in each year. These strikes occurred among the compositors, hatters, ship carpenters and caulkers, journeymen tailors, labourers on the Chesapeake & Ohio Canal, the building trades, factory workers, shoemakers and others. One of the most notable of these, for its influence upon succeeding labour movements, occurred in 1834, in the city of Lynn, Massachusetts. During the latter part of the pre- ceding year the female shoebinders of that town began to agitate the question of an increase of wages. The women engaged in this work usually took the materials to their homes. The manufacturers were unwilling to increase the prices paid, so a meeting for consultation was held by more than one thousand binders. This was on the 1st of January 1834. The binders resolved to take out no more work unless the increase was granted. The employers, however, steadily refused to accede to the demands, as they found no difficulty in having their work done in neighbouring towns at their own prices. The strike, after three or four weeks, came to an unsuccessful termination. In February of the same year a disturbance of short duration occurred at Lowell, Mass., among the female factory operatives. Their strike was to prevent a reduction of wages. During the

year 1835 there was a large number of strikes throughout the country, instigated by both men and women. The number of strikes by dissatisfied employees had at this time become so numerous as to call forth protests from the public press, the New York Daily Advertiser of the 6th of June 1835 declaring that " strikes are all the fashion," and suggesting that it was " an excellent time for the journeymen to come from the country to the city."

The United States government, through the census office and the

*department (now bureau) of labour, has investigated the question of strikes, the result being a fairly continuous record from 1880 to the 31st of December tioas.'**' 1905 inclusive. In 1880, according to the tenth census, there were 610 strikes, but the number of establishments involved in them was not reported; the record must therefore commence with 1881, and since then the facts have been continuously and uniformly reported by the department (now bureau) of labour. This record, so far as numbers are concerned, is shown in the following table: —*

Year.

Strikes.

Lock-outs.

Number of

Establish-

Employees thrown out

Establish-

Employees

thrown out

strikes.

ments involved.

of employ- ment.

ments involved.

of employ- ment.

1881

471

2,928

129,521

9

655

1882

454

2,105

154,671

42

4,131

1883

478

2,759

H9,763

117

20,512

1884

443

2,367

147,054

354

18,121

1885

645

2,284

242,705

183

15,424

1886

1.432

10,053

508,044

1509

101,980

1887

1.436

6,589

379,676

1281

59,630

1888

906

3,506

147,704

180

15,176

1889

1.075

3,786

249,559

132

10,731

1890

1,833

9,424

351,944

324

21,555

1891

L7I7

8,116

298,939

546

31,014

1892

1,298

5,540

206,671

716

32,014

1893

1.305

4,555

265,914

305

21,842

1894

1,349

8,196

660,425

875

29,619

1895

1,215

6,973

392,403

370

14,785

1896

1,026

5,462

241,170

51

7,668

1897

1,078

8,492

408,391

171

7,763

J 898

1,056

3,809

249,002

164

14,217

1899

1,797

Ii,3i7

417,072

323

14,817

1900

1.779

9,248

505,066

2281

62,653

1901

2,924

10,908

543,386

451

20,457

1902

3.162

14,248

659,792

1304

31,715

1903

3.494

20,248

656,055

3288

131,779

1904

2,307

10,202

517,211

2316

56,604

I905

2,077

8,292

221,686

1255

80,748

Total

36,757

181,407

8,703,824

i8,547

825,610

Statistics of Strikes. — Out of the total of 181,407 establish- ments at which strikes took place during the period named, 69,899 were in building trades, 17,025 in coal and coke, 7381 in tobacco, 20,914 in clothing, 4450 in stone-quarrying and cutting, 1555 in boots and shoes, 1551 in furniture, 1476 in brick-making, 2999 in printing and publishing, and 1086 in cooperage. These ten industries supplied 128,336, or 70-74% of the whole number of establishments in which strikes occurred during the twenty- five years. In the lock-outs occurring during the same time five industries bore a very large proportion of the burden, involving 13,716, or 73-95% of the whole number of establish- ments, which was 18,547. The industries affected were: building trades, 10,142; clothing, 1943; stone-quarrying and cutting, 901; boots and shoes, 337; tobacco 393. The whole number of persons thrown out of employment by strikes was 8,703,824, of whom 90-57% were males and 9-43% were females; and the total number thrown out of employment by lock-outs during the same period was 825,610, of whom 84-18% were males and 15-82% were females. About 70% of the whole number of strikes were ordered by labour organizations; and of the number so ordered (25,353) 49-4 8 % succeeded, 15-87% succeeded partly, and 34-65% failed. Of the whole number of strikes, 47-94% succeeded, 15-28% succeeded partly and 36-78% failed. Of the lock-outs, 50-79% succeeded, 10-71% succeeded partly and 32-09% failed. The average duration

of the strikes for the whole period was 25-4 days, and of the lock-outs 846 days.

More strikes were occasioned by demands for increase of wages than for any other one cause, 32-24% of all strikes being for this cause, but this in combination with other causes attributable in whole or in part to demands for increase of wages brings the demands up to 40-72%.

The next most fruitful cause of strikes is disagreement con- cerning the recognition of the union and union rules. For this 18-84% of strikes were declared, and both alone and combined with other causes produced 32-35%. Objection to reduction of wages caused 11-90% while demands for reduction of hours alone and combined with other causes produced 9-78% of strikes.

Of the total number of establishments involved in strikes 57-91% were involved for causes either in whole or in part due to demands for increase of wages. The most important cause of lock-outs during the twenty-five years was disputes concern- ing the recognition of the union and union rules and employees' organizations, which alone and combined with various causes, produced nearly one-half of all lock-outs and more than one- half of all establishments involved in lock-outs. The United States government's account of losses from strikes is for the period from January 1881 to the 31st of December 1900, the five years from 1901 to 1905 inclusive not being included in that account. It is difficult to ascertain exactly the losses of em- ployees and employers resulting from strikes and lock-outs. Differences may counterbalance each other, so that the results given below for the period named may be considered as fairly accurate.

The total loss to employees and employers alike in the estab- lishments in which strikes and lock-outs occurred, for the period of twenty years, was thus $468,968,581. The number of establish- ments involved in strikes during this period was 117,509, making an average wage loss of $2194 to employees in each establishment in which strikes occurred. The number of persons thrown out of employment by reason of strikes was 6,105,694, making an average loss of $42 to each person involved. The number of establishments involved in lock-outs was 9933 , making an average loss of $4915 to employees in each establishment in which lock-

the number of establishments involved was 127,442, while 6,610,001 persons were thrown out of employment. These figures show an average wage-loss of $2406 to the employees in each establishment, and an average loss of $46 to each person involved. The assistance given to strikers by labour organizations during the period was $16,174,793; to those involved in lock-outs, $3,451,461,

or a total of $19,626,254. This sum represents but 6-40% of the total wage-loss incurred in strikes and lock-outs, and is probably too low. Much assist- ance was also furnished by outside sympathizers, the amount of which cannot be readily ascertained. The total loss to the establishments or firms involved in strikes and lock-outs during this period was'$i42,659,io4.

The states of Illinois, Massachusetts, New York, Ohio and Pennsylvania, being the leading manufacturing states, necessarily experienced the largest number of strikes. Out of 117,509 establishments having strikes during the period named, 87,87s, or 74-78% of the whole, were in these five states; and out of 9933 establishments having lock-outs, 8424, or 84-81% were in these states. In 1900 these states contained 45-02% of all the manufacturing establishments in the United States, and employed 55-15% of the entire capital invested in mechanical industries.

A significant feature of the report for the twenty-five year period relates to efforts to settle strikes, during the years 1901 to 1905 inclusive, a feature which had not been embodied before. The results are shown in the following table:—

Strikes.

Lock-outs.

Year.

Number.

Number settled by joint agree- ment.

Number settled by arbitration.

t "

Num- ber.

Number settled by joint agree- ment.

Number settled by arbitration.

1901 1902 1903 1904

I905

2,924 3,162

3.494 2,307 2,077

149 204 246 130 74

49 58 66

23

27

88

78

154

112

109

IO II

18

17

IO

2

I

3

2

3

Total

13,964

803

223

. 54i

66

11

■

Year.

188 1 1882 1883 1884 1885 1886 1887 1888 1889 1890 1891 1892

1893 1894

1895 1896

1897 1898 1899 1900

Total

Strikes.

To date when Strikers were

re-employed or employed

elsewhere.

Wage-loss of Employees.

$

3,372,578 9,864,228 6,274,480 7,666,717 10,663,248

14,992,453 16,560,534

6,377,749 10,409,686

13,875,338 14,801,505 10,772,622 9,938,048 37,145,532 13,044,830 11,098,207 17,468,904 10,037,284 15,157,965 18,341,570

257,863,478

Assistance to Employees by

Labour Organizations.

287,999

734,339 461,233 407,871 465,827 1,122,130

1,121,554

1,752,668

592,017

910,285

1-132,557

833,874

563.183

931,052

559,165

462,165

721,164

585,228

1,096,030

1,434,452

16,174,793

Loss of Employers.

9

1,919,483 4,269,094 4,696,027

3,393,073 4,388,893

12,357,808 6,698,495 6,509,017 2,936,752 5,135,404 6,176,688

5,i45,69i

3,406,195

18,982,129 5,072,282

5,304,235 4,868,687 4,596,462

7,443,407 9,431,209

122,731,121

Lock-outs.

To date when Employees locked

out were re-employed or

employed elsewhere.

Wage-loss of Employees.

$

18,519

. 466,345

1,069,212

1,421,410

901,173

4,281,058

4,233,700

1,100,057

1,379.722

957.966

883,709

2,856,013

6,659,401

2,022,769

79L703

690,945

583,606

880,461

1,485,174

16,136,802

48,819,745

Assistance to Employees by

Labour Organizations.

$ 3,150

47.668 102,253 314,027

89,488 549,452 155,846

85,931 115,389

77.2io

50,195 537,684 364,268 160,244

67,701

61,355

47,326

47,098

126,957

448,219

3,45i.46i

Historic Strikes.

Loss of Employers.

outs occurred, while the number of employees thrown out was 504,307, making an average loss of $97 to each person involved. Combining the figures for strikes and lock-outs, it is seen that

The figures given relate to all strikes, of whatever magnitude, occurring in the United States from 1881 to the 31st of December

1900 inclusive. Among them have occurred what may be called historic strikes, the first of which was in 1877, though of course many very severe strikes had taken place prior to that year. The great railway strikes of 1877 began on the Balti- more & Ohio Railroad at Martinsburg, West Vir- ginia, the immediate cause of the first strike being a 10% reduction of wages of all employees. This, however, was but one of many grievances. There was irregular employment. Men with families were permitted to work only three or four days per week, the remainder of the time being forced to spend away from home at their own expense, leaving them but little money for do- mestic use. Wages, pay- able monthly, were often retained several months. The tonnage of trains was increased, and the men were paid only for the number of miles run, irre- , „ spective of the time con-

sumed. _So there were many' alleged causes for the great strikes of 1877. Riot, destruction of property and loss of life occurred at Martinsburg, Baltimore and various places in Pennsylvania. The state militia at Martinsburg and Pittsburg sympathized with the strikers,

$

6,960 112,382

297,097 640,847

455.477

1,949,498

2,819,736

1,217,199

307,125

486,258

616,888

1,695,080

1,034,420

982,584

584,155

357,535

298,044

239,403

379,365

5,447,930

19,927,983

affiliated with them and refused to fire upon them. United States troops were ordered from Eastern garrisons, and they dispersed the mobs. In Cincinnati, Toledo and St Louis mobs of roughs and tramps collected, and succeeded in closing most of the shops, factories and rolling-mills in those cities. There were also for- midable demonstrations in Chicago, as well as in Syracuse, Buffalo, West Albany and Hornell, New York, where mobs were dispersed by the state militia without violence or destruction of property.

The Pennsylvania Railroad also had a memorable strike, accom- panied by riots and much violence and destruction of property, during the same year, the strike being ordered on account of a general reduction in wages and some other causes which came in to create the difficulty. The complete story of this strike is too long to relate here, but from the beginning the strikers had the active sympathy of a large proportion of the people of 'Pittsburg, where the chief movements occurred. The actual loss to the Pennsylvania Company, not including freight, has been estimated at $2,000,000, while the loss of property and loss of business at Pittsburg amounted to ¥5,000,000. Claims were presented before the courts in Alle- gheny county to the amount of over $3,500,000, while the actual

amount paid by compromise and judgments was over $2,750,000. Both the foregoing strikes were unsuccessful.

The next great strike was that of the telegraphists, which occurred in the year 1883. This strike was inaugurated to secure the abolition of Sunday work without extra pay, the reduction of day-turns to eight hours, and the equalization of pay between the sexes for the same kind of work. Universal increase of wages was also demanded. The strike commenced on the 19th of July and ended on the 23rd of August 1883, although it was declared off on the 17th of the latter month. It was unsuccessful, the employees losing $250,000 and expending $62,000 in assistance to destitute fellow operators. The employers lost nearly $1,000,000.

Another historic strike, only partially successful, was that on the South-Western or Gould system of railways in the years 1 885-1 886, but the most prominent labour controversies in the 19th century were those at Homestead, Pa., in July 1892, and at Chicago in 1894, concerning which a more detailed account is given below. Other great labour convulsions have occurred which help to identify the decade beginning 1890 with the great strike era of the century. Among them may be named the Lehigh Valley railroad strike in December 1893, the American Railway Union strike on the Great Northern railway in April 1894; the great coal strike, which occurred in the same month ; the difficulties at Lattimer, Pa. ; and those in the Coeur d'AIene district of Idaho.

In July 1892 there occurred a most serious affair between the Carnegie Steel Company and its employees at what is known as the Homestead Works, near Pittsburg, growing out of a Homestead (ii sa g reemen ˆ; n the previous month in regard to wages. The parties were unable to come to an agreement, and the company closed its works on the 30th of June and discharged its men. Only a small portion of the men were affected by the proposed adjustment of wages. The larger portion of them, who were members of the Amalgamated Association of Iron and Steel Workers, were not affected at all, nor was the large force of employees, some three thousand in number, who were not members of that association. The company refused to recognize the association as an organization, or to hold any conference with its representatives. Upon the failure to arrive at an adjustment of the wage difficulty the company proposed to operate its works by the employment of non-union men. The men, who could not secure recognition, refused to accept the reduced rates of wages, and also came to the determination that they would resist the company in every attempt to secure non-union workers.

The history of the events at Homestead shows that the lodges composing the Amalgamated Association proceeded to organize what was styled an " advisory committee " to take charge of affairs for the strikers. All employees of the company were directed to break their contracts and to refuse to work until the Amalgamated Association was recognized and its terms agreed to. The works were shut down two days prior to the time provided by the contract under which the men were working, and, as alleged, because the workmen had seen fit to hang the president of the company in effigy. On the 4th of July the officers of the company asked the sheriff of the county to appoint deputies to protect the works while they carried out their intention of making repairs. The employees, on their part organized themselves to defend the works against what they called encroachments or demands to enter; in fact, they took possession of the Homestead Steel Works. When the sheriff's men approached, the workmen, who were assembled in force, notified them to leave the place, as they did not intend to create any disorder, and would not allow any damage to be done to the property of the company. They further offered to act as deputies, an offer which was declined. The advisory committee, which had been able to preserve the peace thus far, dissolved on the rejection of their offer to serve as deputies and conservators of the peace, and all of their records were destroyed. The immediate cause of the fighting which subsequently took place at Homestead was the approach of a body of Pinkerton's detectives, who were gathered in two barges on the

Ohio river, some miles below the works. When the Pinkertons arrived the workmen broke through the mill fence, entrenching them- selves behind the steel billets, and made all preparations to resist the approach of the Pinkerton barges ; and they resisted all attempts to land, the result being a fierce battle, brought on by a heavy volley of shots from the strikers. The Pinkertons were armed with Winchesters, but they were obliged to land and ascend the embankment single file, and so were soon driven back to the boats, suffering severely from the fire of the strikers. Many efforts were made to land, but the position of the men they were attacking, behind their breastworks of steel rails and billets, was very strong, and from this place of safe refuge the detectives were subjected to a galling fire. This opening battle took place on the 5th of July, about four o'clock in the morning, and was continued in a desultory way during the day. It was renewed the following day. A brass ten-pound cannon had been secured by the strikers, and planted so as to command the barges moored at the banks of the river. Another force of one thousand men

had taken up a position on the opposite side of the river, where they protected themselves and a cannon which they had obtained by a breastwork of railway ties. A little before nine o'clock a bombardment commenced, the cannon being turned on the boats, and the firing was kept up for several hours. The boats were protected by heavy steel plates inside, so efforts were made to fire them. Hose was procured and oil sprayed on the decks and sides, and at the same time many barrels of oil were emptied into the river above the mooring place, the purpose being to ignite it and then allow it to float against the boats. Under these combined movements the Pinkertons were obliged to throw out a flag of truce, but it was not recognized by the strikers. The officers of the Amalgamated Association, however, interfered, and a surrender of the detectives was arranged. It was agreed that they should be safely guarded, under condition that they left their arms and ammunition; and, having no alternative, they accepted the terms. Seven had been killed and twenty or thirty wounded. On the 10th of July, after several days' correspondence with the state authorities, the governor sent the entire force of the militia of the state to Homestead. On the 12th the troops arrived, the town was placed under martial law, and order was restored. There had been much looting, clubbing and stoning, and as the detectives, after surrender, passed through the streets they were treated with great abuse. Eleven workmen and spectators were killed in the fights. Congress made an investigation of this strike, but no legislative action was ever taken. Some indictments were made and lawsuits ensued. The mills were gradually supplied with new people, but the strike was not declared off until the 20th of November 1892. The Homestead strike must be considered as the bitterest labour war in the United States prior to the Chicago strike in 1894. It was unsuccessful.

*Probably the most expensive and far-reaching labour controversy which can properly be classed among the historic controversies of this generation was the Chicago strike of June and _. „ July 1894. Beginning with a private strike at the 1 t~,, *° works of Pullman's Palace Car Company at Pullman, a cj-jt ”””” suburb of Chicago, it ended with a practical insurrection e ‘ of the labour employed on the principal railways radiating from Chicago and some of their affiliated lines, paralysing internal commerce, putting the public to great inconvenience, delaying the mails, and in general demoralizing business. Its influences were felt all over the country, to greater or less extent, according to the lines of traffic and the courses of trade. The contest was not limited to the parties with whom it originated, for soon there were brought into it two other factors or forces. The*

original strike grew out of a demand of certain employees of the Pullman Company in May 1894 for a restoration of the wages paid during the previous year. The company claimed that the reduction in the volume of business, owing to business depression, did not warrant the payment of the old wages. On account of the increased production of rolling-stock to meet the traffic incident to the World's Fair in 1893, orders for building cars were not easily obtainable, a large portion of the business of the Pullman Company being contract business in the way of building cars for railway companies generally. This state of affairs resulted in a partial cessation of car-building everywhere in the country, the Pullman Company suffering with all others. The demand of the employees therefore was not acceded to, and on the nth of May 1894 a strike was ordered. Several minor grievances were claimed to have existed and to have led to the action of the strikers, who had joined the American Railway Union, an association of railway employees which had achieved a partial success in a contest with the Great Northern Railway a few weeks previous to the Pullman strike. The Railway Union espoused the cause of the Pullman employees on the ground that they were members thereof. This union was said to number about 150,000 members. It undertook to force the Pullman Company to accede to the demands of its employees by boycotting Pullman cars; that is to say, they declared that they would not handle Pullman cars on the railways unless the Pullman Company would accede to the demands made upon it. The immediate antagonist of the Pullman Company in the extended controversy was therefore the American Railway Union.

Another force was soon involved in the strike, which was, very naturally, an ally of the Pullman Company. This was the General Managers' Association, a body of railway men representing all the roads, twenty-four in number, radiating from Chicago, and it was said to be the necessity of protecting the traffic of its lines that brought about its struggle with the American Railway Union. These roads represented a combined capital of more than $2,000,000,000, and they employed more than one-fourth of all the railway employees in the United States. These three great forces, therefore, were engaged in a battle for supremacy, and that rivalry alone, without reference to the conditions and circumstances attending the strike or accompanying it, makes this one of the historic strikes of the period.

According to the testimony of the officials of the railways involved, they lost in property destroyed, hire of United States deputy marshals and other incidental expenses, at least $685,308. The loss of earnings of these roads on account of the strike is esti- mated at nearly $5,000,000. About 3100 employees at Pullman lost in wages, as estimated, probably $350,000. About 100,000 employees upon the twenty-four railways radiating from Chicago, all of which were more or less involved in the strike, lost in wages, as estimated, nearly $1,400,000. Beyond these amounts very great losses, widely distributed, were suffered incidentally throughout the country. The suspension of transportation at Chicago paralysed a vast distributive centre, and imposed many hardships and much loss upon the great number of people whose manufacturing and business operations, employment, travel and necessary supplies depend upon and demand regular transportation to, from and through Chicago. The losses to the country at large are estimated by Bradstreets to be in the vicinity of $80,000,000. Whatever they are, whether more or less, they teach the necessity of preventing such disasters, and the strike illustrates how a small local disturbance, arising from the complaints of a few people, can affect a whole country. When the American Railway Union took up the cudgels for the Pullman strikers and declared their boycott against Pullman cars, and the General Managers' Association took every means to protect their interests and prevent the stoppage of transportation, the sympathies and antagonisms of the whole country were aroused. An unsuccessful attempt was made to induce all trades in Chicago to join in a great sympathetic strike.

The inevitable accompaniments of a great strike were brought into play at Chicago. Riots, intimidations, assaults, murder, arson and burglary, with lesser crimes, attended the strike. In this, as in some of the other historic strikes, troops were engaged. The city police, the county sheriffs, the state militia, United States deputy marshals and regulars from the United States army were all brought into the controversy. The United States troops were sent to Chicago to protect Federal property and to prevent obstruc- tion in the carrying of the mails, to prevent interference with inter- state commerce, and to enforce the decrees and mandates of the Federal courts. They took no part in any attempt to suppress che strike, nor could they, as such matters belong to the city and state authorities. The police of the city were used to suppress riots and protect the property of citizens, and the state militia was called in for the same service. The total of these forces employed during the strike was 14,186.

Many indictments and law-suits originated in the difficulties occurring in Chicago. But all the attending circumstances of the

strike point to one conclusion — that a share of the responsibility for bringing it on belongs in some degree to each and every party involved. The strike generated a vast deal of bitter feeling — so bitter that neither party was ready to consider the rights of the other. The attacking parties claimed that their grievances war- ranted them in adopting any means in their power to force con- cessions. This is the attitude of all strikers. The other parties, on the other hand, claimed that they were justified in adopting any means in their power to resist the demands of the attacking party. The probability is that neither recognized the rights of the public to such an extent as to induce them to forbear bringing inconvenience and disturbance to it. It was the most suggestive strike that has ever occurred in the United States, and if it only proves a lesson sufficiently severe to teach the public its rights in such matters, and to teach it to adopt measures to preserve these rights, it will be worth all it cost. It was unsuccessful, and resulted ultimately in the downfall of the American Railway Union.

The so-called steel strike of the year 1901 was a contest between the Amalgamated Association of Iron, Steel and Tin Workers and the United States Steel Corporation. It began on the first day of July, and lasted until the 15th of September

The Steel Strike, 1901.

1901, when work was resumed in accordance with an adjustment agreed to on the 13th of the latter month. The difficulty grew out of an attempt to adjust a sliding scale of wages with some of the constituent companies of the United States Steel Corporation, a new company having $i,404,ooo,ooocapitaliza- tion. This corporation was perfected after the difficulties really began, so the Amalgamated Association ultimately had to confront the new powerful corporation. The real nut of the difficulty was sot a question of wages, hours of labour, or rules or conditions of frork, but a contest for recognition of the right of the association

to demand the unionizing of mills, a demand, of course, which was positively refused by the United States Steel Corporation. There were no grievances, as intimated ; it was clearly and solely a conflict on the demand for recognition in the trade-union sense, and it was the first great struggle in the United States that was conducted solely on this issue. This issue has been contested many times, but usually in conjunction with some grievance or complicated with some demand as to wages or other economic conditions. The result wao that the Amalgamated Association did not secure the terms demanded; and it

lost further, because some of the mills which were subject to the union's rules were taken out and made non- union mills. The strike was conducted without any of the dramatic and tragic circumstances which attended the Homestead affair in 1892, in which the Amalgamated Association was one of the parties. In the contest of 1901 the association did not have the hearty endorsement of a large number of workmen, as it was not a movement to redress any grievance. It was fought for a principle, but the movers did not consider the power against which they were obliged to contend. Officers of the Amalgamated Association estimated that the number of men out of employment during the strike averaged 30,000 per day. At a conservative estimate there must have been a loss of more than $4,000,000 in wages. The steel company through its officers claimed that it experienced no great loss as the result of the strike.

A strike affecting more individual interests than any preceding it was the anthracite coal strike of 1902, which formally began on the 12th of May. It was ordered at a convention . , „._,. held at Hazleton, Pa., on the 15th of May, by a J™ i>trlke ' vote of 461 to 349. The leaders of the miners, with one or two exceptions, opposed the strike. It was therefore a strike of the workers themselves. Grievances had existed in the anthra cite coal region for many years, but more especially since the strike of 1900. An attempt was made in 1901 to secure some con- cessions, but the operating railways declined even to enter into a conference. This, of course, caused irritation, and constant appeals were made to the officeˆ of the union to make new demands, and failing to secure concessions, to organize a strike. The demands of the miners were as follows: (1) An increase of 20 % to those miners who are paid by the ton; (2) a reduction of 20% in the time of per diem employees ; (3) that 2240 lb constitute the ton on which payment is made for coal mined by weight. No grievances were presented. The powder question was practically settled in 1900. The miners' demands being rejected by the operators, the demands were subse- quently reduced one-half; i.e. 10% increase per ton where mining is paid by the ton, and 10% decrease in the working day. The miners also voted to leave the whole matter to arbitration and investigation, and to accept the results. They were willing to make a three years' contract on the terms proposed. The fundamental difficulty on the part of the operators related to efforts to secure and preserve discipline. They claimed that every concession already made had defeated this. The strike involved nearly 150,000 employees, and affected the consumers of anthracite coal throughout the eastern states.

After the most strenuous efforts of both parties to this strike, the

president of the United States, at the, request of the great coal operators and the officers of the Miners' Union, appointed a commission to adjust their differences, and after five months of hearings, listening to nearly six hundred witnesses, the commission submitted an award which was to be in effect three years from the 1st of April 1903. Both parties had agreed to abide by the award, whatever it might be. After the three years had expired, that is, the 31st of March 1906, the miners concluded to strike again, but after some negotiations both parties again unanimously agreed to extend the award made by the commission for three years more, i.e. until the 31st of March 1909.

After the coal strike of 1902 many very important disturbances occurred. There was one among the silver miners at Cripple Creek, Colorado, 1894, at Leadville, 1896-1897, at Lake City, 1899, and at Telluride in 1901 ; also another at Colorado City in 1903. All these strikes were attended with a great deal of violence, the militia was ordered out, many murders took place, and in three counties of Colorado there was a reign of terror, but on the whole the strikes were unsuccessful. The Western Federation of Miners was seriously crippled in these affairs.

It is gratifying to note the reduction in the number of strikes as shown by recent statistics. In 1903 the number of establishments was 20,248, but it had dropped to 8292 in 1905.

Authorities. — U. S. Commissioner of Labor, Twenty-first Annual Report (1906) ; reports of various State Bureaus of Labor Statistics; Pennsylvania Bureau of Industrial Statistics, Twentieth Annual Report (1892) ; U.S. House of Representatives, " Employ- ment of Pinkerton Detectives at Homestead, Pa.," Report No. 2ˆ47, 52nd Congress, 2nd Session (1892) ; United States Strike Commission, Report on Chicago Strike, Senate Ex. Doc. No. 7, 53rd Congress, 3rd Session (1894) ; " The Amalgamated Association of Iron and Steel Workers," Quarterly Report of Economics for November 1901; Industrial Evolution of United States, chs. xxv. and xxvi. ; Report of j the Anthracite Coal Strike Commission; U.S. Bulletin of Labor (May

1903) ; Report of Commissioner of Labor (1905) on labour disturbances in Colorado. .{C. D. W.)

STRINDBERG, AUGUST (1849-), Swedish author, was born at Stockholm on the 22nd of January 1849. He entered the university of Upsala in 1867, but was compelled by poverty to interrupt his studies, which were resumed in 1870. His gloomy experiences of student life are reflected in a series of sketches named after two districts of Upsala, Fran Fjerdingen och Svartbdcken (1877), which aroused great indignation at the time. After various experiments as schoolmaster, private tutor and actor, he turned to journalism, and afterwards more than avenged himself for the triviality and narrowness of his new surroundings in his famous Roda rummet (" The Red Room," 1879), described in the sub-title as sketches of literary and artistic life. The " red room " was the meeting-place in a small cafe in Stockholm of a society of needy journalists and artists, whose failure and despair are shown off against the prosperity of a typical bourgeois couple. In these stories Strindberg's fanatic hatred of womankind already makes its appearance, the disasters of the principal figures being precipi- tated by the selfishness and immorality of the women. In 1874 some friends procured him a place in the Royal library at Stockholm where he was employed until 1882. He was already an ardent student of physical science; he now gave proof of his versatility by learning Chinese in order to catalogue the Chinese MSS. in the library; and his French monograph on the early relations of Sweden with the Far East was read in 1879 before the Academy of Inscriptions in Paris. He continued to write for the newspapers and for the theatre. His first important drama, Master Olof, which had been refused in 1872 by the theatrical authorities, was produced after repeated revision in 1878. Although real historical personages— Gustavus Vasa, Olaus Petri the reformer and Gerdt the Anabaptist— figure as leading characters, they are made symbolic of the present-day forces of progress and reaction. The production of Master Olof marked the beginning of the new movement in Swedish litera- ture, and the Red Room and the collection of satirical sketches entitled Det nya riket (" The New Kingdom," 1882) increased the growing hostility to Strindberg. Two comedies drawn from medieval subjects, Gillets herrdighet (" The Secret of the Guild," 1880) and hen Bengt's Hustru (" Bengt's Wife," 1882), were followed by the legendary drama of Lycko Pers resa (" The Journal of Lucky Peter "), written in 1882 and produced with great success on the stage a year later.

In 1883 Strindberg left Sweden with his family, to travel in Germany, Italy, France and Denmark, writing for foreign reviews and producing various volumes of stories and articles. Meanwhile he had been developing his attack on the feminist movement, which had

received a great stimulus in Scandinavia from the dramas of Ibsen. In Giftas (" Married," 1884) he produced twelve stories of married life to support his view of the sex question; this was followed in 1886 by a second collection with the same title, which was written in a more violent tone and lacked some of the art of the earlier attack. He was prosecuted for assailing the dogma of the communion, but he returned to Sweden to defend himself, and was acquitted. Strindberg's mastery of the art of description is perhaps seen at its best in the novels of life in the Swedish archipelago, in Hemsbborna ("The Inhabitants of Hemso, 1887), one of the best existing novels of popular Swedish life, and Skiirkarlslif (" Life of an Island Lad," 1890). Tschaudala (1889) and I hajsbaiulet (" In the Bond of the Sea," 1890) show the influence of a study of Nietzsche. In 1887 he returned to drama with the powerful tragedy Fadren, produced in Paris also as Le pere; this was followed in 1888 by Froken Julie, described as a natural- istic drama, to which he wrote a preface in the nature of a manifesto, directed against critics who had resented the gloom of Fadren. Kamratema (" Comrades," 1888), which belongs to the same group of six plays, was followed by Himmelrikets- nycklar ("The Keys of the Kingdom of Heaven," 1892), a legendary drama, and by the historical dramas of Erik XIV. (1899), Guslav Adolf (1900), and Gustav Vasa (1899); Till

Damascus (1898) indicated a return in the direction of religion; Foikungasagan (1899) was represented in 1901; and the two plays Avent (" Advent ") and Brott och brott (" Crime for Crime "), printed together in 1899, were successfully represented in 1900, both in Sweden and Germany.

Strindberg has provided a quantity of what is really auto-biographical material, with an account of the origin of his various books, in the form of a novel, Tjensteqvinnans son (" The Son of a Servant," 1886-1887), with the sub-title of "A Soul's Develop-ment." The revelations of this book explain much of the bitterness of his work, and it was followed in 1893 by a fourth part in German, Die Beichte eines Thoren ("A Fool's Confession"), the printing of which was forbidden in Sweden. With these should be classed his Inferno (1897) and Somngangarndtter ("The Nights of a Somnambulist," 1900). Strindberg's first marriage was an unfortunate one, and was dissolved in 1893. He then married an Austrian lady, from whom he was separated in 1896. In 1901 he married the Swedish actress Harriet Bosse, from whom he was amicably separated soon afterwards. He suffered at different times from mental attacks, of which he gave analytic accounts on his recovery.

A number of criticisms on Strindberg from eminent hands are collected in En bok om Strindberg (Karlstad, 1894).

STRING, a general term for thin cord, or stout thread, a line or cord on which objects are strung. The 0. Eng. word is streng, cf. Dan. streng, Ger. Strang, and meant that which is strongly or tightly twisted; it is related to "strong," and is to be referred to the root seen also in Lat. stringere, to draw tight, whence " stringent " and " strict," and in Gr. arpayyaXri, a halter, whence comes " strangle," to choke, throttle. The word is particularly used of the cord of a bow, and of the stretched cords of gut and wire upon a musical instrument, the vibration of which produces the tones (see Stringed Instruments below). In architecture the term " string-course " is applied to the pro- jecting course or moulding running horizontally along the face of a building.

STRINGED INSTRUMENTS (Fr. instruments A cordes; Ger. Saiteninstrumente; Ital. strumenti a corde), a large and important section of musical instruments comprising subdivisions classed (^4) according to the method in which the strings are set in vibration (B) according to certain structural characteristics of the instruments themselves.

Section A. — This includes instruments with strings (1) plucked by fingers or plectrum; (2) struck by hammers or tangents; set in vibration (3) by friction of the bow, (4) by friction of a wheel or (5) by the wind. In all these classes we are also concerned with the manner in which the strings are stretched in order to ensure resonance, and with the measures taken to obtain more than one sound from each string.

I. Strings plucked by Fingers or Plectrum. — Twanging the strings by the fingers is the most primitive method, probably suggested by the feeble note given out by the tense string of the hunters' bow, which was the prototype of the harp. In this ancient instrument, popular in all ages and lands, the strings are stretched a vide between two supports of a frame, the lower of which acts as a soundboard from which the strings rise perpendicularly. The scale ot all harp-like instruments is produced by means of one string for each note, differ- ence in pitch being obtained by varying the length of the strings. In the modern pedal harp with double action the strings can.be short- ened sufficiently to raise the pitch a semitone or a tone by means of an ingenious system of levers set in motion by the pedals, which cause disks, each furnished with two studs, to turn and grasp the string, thus shortening the vibrating length. This device may be

regarded as an infringement of the principle of the harp, whereas in the chromatic harp (Pleyel Wolff & Co.) the same object has been obtained without violating the principle by ingeniously increasing the number of strings. The nanga of the ancient Egyptians, of which specimens are preserved in the British Museum, an instru- ment having a boat-shaped body with a long curved neck from which the strings stretch at right angles to the soundboard, is the only link as yet discovered between the bow and the harp. The next step observed is the device of stretching the strings partly over a soundboard and partly a vide, as in the cithara, the lyre, the rotta, the crwth, &c.

The strings lying parallel with the soundboard are slightly raised over a bridge; by means of which the vibrations are communicated to the belly of the instrument. Between the soundboard and the

cross-bar, upheld by two arms springing irom the body of the in- strument, the strings at first bridged an open space for greater convenience in twanging them with both hands. The gradual closing up of this open space marks the various steps in the transition from cithara to fiddle. In the Egyptian cithara the harp-like arrangement of the strings was maintained by making the cross- bar oblique. In the Assyrian and later in the Greek and Roman citharas and lyres all the strings were of the same length, difference in pitch being secured by varying the thickness of the strings.

A later development consisted in discarding the open space altogether, whereby the third method of stretching the strings was evolved. In these new instruments the strings lay over the sound- chest, raised on bridges which determined their vibrating length according to the method of stringing the harp or the cithara. As examples of this type may be cited the psalterion or psaltery and in the middle ages the zither.

The addition of a keyboard to the psaltery, as a means of in- creasing its scope, created a new class of instruments of which the principal members were the clavicymbalum, the virginal, spinet z -id the harpsichord. In these the principle of plucking the strings b/ means of a plectrum or quill was preserved, but the quill was fixed in the pivoted tongue of a piece of wood, known as a " jack," which rested on the end of a balanced key. The jack worked easy through a rectangular hole in the soundboard, and when the key was pressed

down the jack was thrown up, the quill catching the string and plucking it. The string thus plucked vibrated over the whole length from hitch-pin to belly-bridge (cf. the effect of the tangent in the clavichord).

When the principle of stopping strings by pressing them against a fingerboard in order to obtain several sounds from each had been discovered and applied by adding a neck to the body, a new sub-division was created in this class of instruments. The exact division of the strings necessary to produce the required intervals was measured off and indicated by ligatures of hide or gut (called frets), bound round the neck, against which the strings were pressed by the fingers. This principle involved a very great advance in technique, and produced the two great families of guitar and lute. During the middle ages, the bass lute (theorbo or barbiton) and the double- bass lutes (archlute and chitarrone) had, in addition to the strings stretched over the finger-board, for which the pegs were placed half-way up the neck, a complement of bass strings stretched a vide from the bridge tail-piece to the end of the neck, where a second peg-box was provided. In the chitarrone these bass strings, each of which produced but one note, were about 5 ft. long ; the archlute of similar construction was in size between the former and the theorbo.

The plectrum was used to pluck the strings in classic Greece and Rome, in order to provide an additional effect of brilliancy for joyous or martial themes. If the music gained in brilliancy, the instru- ment lost the power of expressing the performer's emotions. During the middle ages the use of wire and spun strings in some instruments, such as the mandola, rendered the use of the plectrum a necessity.

2. Strings struck by Hammers or Tangents.— The earliest known instrument thus played was the Assyrian dulcimer, or pisantir, represented on some of the stone slabs brought by Sir A. H. Layard from the mound of Kuyunjik, and preserved at the British Museum among scenes from the history of Sardanapalus ; it is the instrument erroneously rendered psaltery in Dan. lii. 5, while the instrument rendered dulcimer in the Authorized Version of the Bible should be bagpipe.

In the dulcimer the strings, as in the psaltery, were stretched over a rectangular or trapezoid sound-chest, the vibrating length being determined by means of two bridges. The strings were struck by means of two curved sticks, or by hammers, with an elastic wrist action, which produced clear, bell-like tones. The dulcimer has

survived in the cembalo or cimbalom of the Hungarian gipsies. The application of the keyboard to the dulcimer produced the clavichord and later the pianoforte. In the earliest clavi- chords, known as fretted (Ger. gebunden), one string was made to do duty for several notes. The tangent or upright blade of brass tapering towards the bottom, where it was fastened into the end of the key, replaced the hammer of the dulcimer, for which it was hardly a substitute for the following reason. The function of the tangent constitutes the main technical innovation; instead of giving a sharp blow and rebounding instantly from the string, like the hammer on the strings of the dulcimer, the tangent remained on the string as long as the key was pressed down, and as it rose cloth dampers stopped the vibration. It is usual to compare the tangent of the clavichord to the hammer of the dulcimer, but the action of the tangent more nearly resembles the pressure of the finger on the string of the violin. Just as the finger determines the vibrating length of the violin string from the bridge, so the tangent sets the string vibrating from the point of impact to the belly-bridge. By twisting the key levers, the tangents belonging to three or four different keys were brought to bear on the same string or group of unisons at different points, all the strings being of the same length. It was. not until the 18th century that fret- free or bund-frei clavichords were invented; thejj had throughout the compass a key and a tangent to each pair of unisons. The action

of the hammer of the dulcimer reappeared in the pianoforte. Owing to the peculiar action of the tangent it was possible to produce on the clavichord the vibrato effect (Bebung) as in the violin, an effect Which is impracticable on any other keyboard instrument.

3. Strings set in Vibration by Friction of the Bow.— Although used with various other instruments, such as the Oriental rebab and its European successor the rebec, with the oval vielle, the guitar- or troubadour-fiddle and the viols, it is with the effect of the bow on the perfected type represented by the violin family that we are mostly concerned. The strings in this case are all of the same length, difference in pitch being secured by thickness and tension. The fingers, by pressing the strings, produce a variety of notes from each string at will by shortening the vibrating section as the position of the fingers shift in the direction of the bridge. The friction of the bow on the string induces a twofold vibration, the actual longitudinal vibration of the string and the molecular, both of which are transmitted by the bridge to the soundboard, whereby they become intensified or reinforced. To this class belong also the Welsh crwth and the tromba marina.

4. Strings set in Vibration by Friction of a Wheel.— This class is small, being represented mainly by the organistrum and the hurdy gurdy and a few _ sostenente keyboard instruments. In these instruments the rosined wheel performs mechanically the function of the bow, setting the strings in vibration as it revolves. A row of ten or twelve keys controlling wooden tangents performs the function of the fingers in stopping the strings. Two or more strings outside the range of the tangents always sound the same drone bass, the fingers playing the melody on the treble strings.

5. Strings set in Vibration by the Wind. — An example is the aeolian harp. Here the eight strings of different thickness, but tuned strictly in unison and left slack, are set in vibration by a current of air passing obliquely across them, causing the strings to divide into aliquot parts, thus producing various harmonics.

Section B. — There are, besides, certain structural features in the instruments independent of the strings, which influence the quality of tone to a greater or lesser degree. First, the construction of the sound-chest, the box form consisting of back and belly or soundboard, joined by ribs of equal width, giving the best results in classes 1 and 3. The sound-chest, consisting of a vaulted back to which is glued a flat soundboard, gives very poor results in class 3, but is eminently suitable for class 1. The position and shape of the sound-holes on each side of the strings for bowed instruments, and in the centre for those of which the strings are plucked, are not without influence on the tone. (K. S.)

STRIP, to remove or tear off the outer covering of anything, hence to rob or plunder; also a narrow long piece of stuff or material, or a mark or division narrow in proportion to its length distinguished from its ground or surroundings by colour or other variation of texture, character, &c; a stripe; this last word is a variant of " strip," a particular meaning, that of a stroke or lash of a whip, is either due to the original meaning of " strip," to flay, or to the long narrow mark or wheal left by a blow. The O. Eng. strypan, to strip, is cognate with Du. stroopen, Ger. streifen, and the root is possibly seen in " strike," Lat. stringere. " To strip " has many technical meanings, e.g. to separate the tobacco leaf from the stems, to remove the over-lying soil from a mineral deposit before opening and working it, to turn a gun-barrel in a lathe, &c. In architecture, a " strip- pilaster " is a narrow pilaster such as is found in Saxon work and in the Italian Romanesque churches. " Stripling," a youth, is apparently a diminutive of " strip," in the sense of a young growing lad.

STRODE, RALPH (ft. 1350-1400), English schoolman, was probably a native of the West Midlands. He was a fellow of Merton College, Oxford, before 1360, and famous as a teacher of logic and philosophy and a writer on educational subjects. He belonged, like Thomas Aquinas and Bonaventura, to that " School of the Middle " which mediated between realists and nominalists. Besides his Logica, which has not survived, he wrote Consequentiae, a treatise on the syllogism, and Obliga- tiones or Scholastica militia, a series of " formal exercises in scholastic dialectics." He had some not unfriendly controversy with his colleague John Wyclif, against whom he defended the possession of wealth by the clergy, , and held that in the Church abuses were better than disturbance. He also attacked Wyclif 's doctrine of predestination. His positions are gathered from Wyclif's Responsiones ad Rodolphum Strodum (MS. 3926,

Vienna Imperial Library). Strode is also associated with John Gower in Chaucer's dedication of Troylus and Cryseyde, and Strode himself, according to the 15th-century Vetus cata- logus ot fellows of Merton, was a " poeta nobilis." Leland and Bale confirm this testimony, and Professor I. Gollancz has suggested the identification of the Phantasma Radulphi attri- buted to Strode in the Vetus catalogus with the beautiful 14th- century elegiac poem The Pearl. If this hold good, Strode wrote also Cleanness, Patience, and Sir Gawayne and the Green Knight. From 1375 to 1385 this Strode or another of the same name was common sergeant of the city of London; he died in 1387.

See Prantl, Gesckichle der Logii; for an attempt to distinguish between Strode the schoolman and Strode the poet, see J. T. T. Brown, in The Scottish Antiquary (1897), vol. xii.

STRODE, WILLIAM (1598-1645), English parliamentarian, second son of Sir William Strode, of Newnham, Devonshire (a member of an ancient family long established in that county, which became extinct in 1897), and of Mary, daughter of Thomas Southcote of Bovey Tracey in Devonshire, was born in 1598. He was admitted as a student 01 the Inner Temple in 1614, matriculated at Exeter College, Oxford, in 1617, and took the degree of B.A. in 1619. He was returned to parliament in 1624 for Beeralston, and represented the borough in all succeeding parliaments till his death. He from the first threw himself into opposition to Charles I. and took a leading part in

the disorderly scene of the 2nd of March 1629, when the speaker, Sir John Finch, refusing to put the resolution of Sir J. Eliot against arbitrary taxation and innovations in religion, was held down in the chair (see Holles, Denzix). Prosecuted before the star chamber, he refused " to answer anything done in the House of Parliament but in that House." On the 7th of May a fresh warrant was issued, and a month later, to prevent his release on bail, he was sent by Charles with two of his fellow members to the Tower. Refusing to give a bond for his good behaviour, he was sentenced to imprisonment during the king's pleasure, and was kept in confinement in various prisons for eleven years. In January 1640, in accordance with the king's new policy of moderation, he was liberated; and on the 13th of April took his seat in the Short Parliament, with a mind embittered by the sense of his wrongs. In the Long Parliament, which met on the 3rd of November 1640, he was the first to propose the control by parliament over ministerial appointments, the militia, and its own duration; supported the Grand Remonstrance of the 7th of November 1641; and displayed a violent zeal in pursuing the prosecution of Strafford, actually proposing that all who appeared as the prisoner's counsel should be " charged as conspirators in the same treason." As a result he was included among the five members impeached by Charles of high treason on the 3rd of January 1642. (See Pym, John; Eliot, Sir John; Hampden, John; Hesibrige, Sir Arthur; and Charles I.). He opposed all suggestions of compromise with Charles, urged on the preparations for war, and on the 23rd of October was present at the battle of Edgehill. In the prosecution ai Laud he showed the same relentless zeal as he had in that of Strafford, and it was he who, on the 28th of November 1644, carried up the message from the Commons to the Lords, desiring them to hasten on the ordinance for the archbishop's execution. Strode did not long survive his victim. He is mentioned as having been elected a member of the assembly of divines on the 31st of January 1645. He died on the 9th of September of the same year, and by order of parliament was accorded a public funeral in Westminster Abbey. The body was exhumed after the Restoration. Strode was a man of strong character, but of narrow, though clear and decided judgment, both his good and his bad qualities being exaggerated by the wrongs he had suffered: Clarendon speaks of him as a man " of low account and esteem," who only gained his reputation by his accidental association with those greater than himself; but to his own party his " insuperable constancie " gave him a title to rank with those who had, at a time when the liberties of England hung in the balance, deserved best of their country.

The identity of the W. Strode imprisoned in 1628 and of the W. Strode impeached in 1642 has been questioned, but is now established Q.Vorster, Arrest of the Five Members, p 198, note; Life of Sir J. Eliot, ed. 1872, ii. 237, note ; J. L. Sanford, Studies, p. 397 ; Gardiner, Hist, of England, ix. 223). On the other hand he is to be distinguished from Colonel Wm. Strode of Barrington, also parliamentarian and M.P., who died in 1666; and from William Strode (1602 or 1600- 1645), the orator, poet and dramatist, whose poetical works were edited, with a memoir, by Bertram Dobell in 1907.

STROMNESS, a police burgh and seaport, in the island of Pomona, county of Orkney, Scotland. Pop. (1901), 2450. It is situated on the side of a well-sheltered bay, 14 m. by steamer west of Kirkwall. Many ol the houses are within tidal limits and furnished with quays and jetties. The harbour admits vessels of all sizes and is provided with a pier and slips. The deep-sea fishery attracts hundreds of boats from the north of Scotland, and most of the catch is cured for the English, German and Dutch markets. Stromness is in daily communication with Scrabster pier (Thurso), and at frequent intervals with Kirkwall by coach and also by steamer. It is a port of call for ships trading with the north of Europe as well as for vessels outward bound to the Arctic regions, Hudson Bay and Canada. The magnificent scenery of the west coast of Pomona is commonly visited from Stromness. The tour includes Black Craig (400 ft.), on which the schooner " Star of Dundee " was wrecked in 1834; the grand stacks of North Gaulton Castle and Yesnaby Castle ; the Hole of Row, a natural arch carved out by the ocean; Birsay, where are the ruins of the palace built by Robert Stewart, earl of Orkney (d. 1592), natural son ol James V., the traces of a church which is believed to have been built by Jarl Thorfinn on his return from Rome, in which the remains of St Magnus reposed until their burial in Kirkwall Cathedral, and, on the Broch of Birsay (95 ft. high), the ruins of St Peter's church.

STRONGYLION, a Greek sculptor, the author of a bronze figure of a horse set up on the Acropolis of Athens late in the 5th century B.C., which represented the wooden horse of Troy with the Greek heroes inside it and looking forth. The inscribed basis of this figure has been found. Other works of the sculptor were a figure of Artemis at Megara, a group of the Muses, and an Amazon which was greatly admired by the emperor Nero.

STRONTIANITE, a mineral consisting of strontium carbonate, $SrC0_3$. It takes its name from Strontian in Argyllshire, where it appears

to have been known as far back as 1764, but it was not recognized as a distinct mineral until later, when the examination of it led to the discovery of the element strontium. It crystallizes in the orthorhombic system and is isomorphous with aragonite and witherite. Distinctly developed crystals are, however, of rare occurrence; they are usually acicular with acute pyramid-planes and are repeatedly twinned on the prism. Radiating, fibrous or granular aggregates are more common. The colour is white, pale green or yellowish brown. The hard- ness is 3I and the specific gravity 3-7. Strontium is sometimes partly replaced by an equivalent amount of calcium. The mineral occurs in metalliferous veins in the lead mines of Stron- tian in Argyllshire, Pateley Bridge in Yorkshire, Braunsdorf near Freiberg in Saxony; abundantly in veins in calcareous marl near Miinster and Hamm in Westphalia; and in limestone at Schoharie in New York. It is used for producing red fire in pyrotechny and for refining sugar. (L. J. S.)

STRONTIUM [Symbol Sr, atomic weight 87-62 (0=i6)], a metallic chemical element belonging to the alkaline earth group. It is found in small quantities very widely distributed in various rocks and soils, and in mineral waters; its chief sources are the minerals strontianite, celestine and barytocelestine. The metal was detected in the mineral strontianite, found at Stron- tian in Argyllshire, by Cruikshank in 1787, and by Crawford in 1790; and the discovery was confirmed by Hope in 1792 and by Klaproth in 1793. The metal was isolated in 1807 by Sir H. Davy by electrolysing the moist hydroxide or chloride, and has been obtained by A. Guntz and Roederer {Comptes rend-us, 1906, 142, p. 400) by heating the hydride in a vacuum to iooo°. By electrolysing an aqueous solution of the chloride with a mercury cathode, a liquid and a solid amalgam, SrHg u , are obtained;

the latter on heating gives a mixture of Sr^Hgs and SrHg«, and on distillation an amalgam passes over, and not the metal. It is a silver-white ductile metal (of specific gravity 2-54) which melts at 8oo°. It oxidizes rapidly when exposed to air, and burns when heated in air, oxygen, chlorine, bromine or sulphur vapour. With dry ammonia at 6o° the metal forms strontium ammonium, which slowly decomposes in a vacuum at 20 giving Sr(NH 3) 2 ; with carbon monoxide it gives Sr(CO)2; with oxygen it forms the monoxide and peroxide, and with nitric oxide it gives the hyponitrite (Roederer, Bull. soc. chim., 1906

[iii-1, 35, P- 7i5)-

The hydride, SrH 2 , was obtained by Guntz on heating strontium amalgam in a current of hydrogen. It is a white solid, which readily decomposes water in the cold and behaves as a strong reducing agent. It dissociates when heated to a high temperature and is not affected by oxygen. The monoxide or strontia, SrO ; is formed by strongly heating the nitrate, or commercially by heat- ing the sulphide or carbonate in superheated steam (at about 500-600 C). It is a white amorphous powder which resembles lime in its general character. By heating the amorphous form in the electric furnace H. Moissan succeeded in obtaiuing a crystalline variety. The amorphous form readily slakes with water, and the aqueous solution yields a crystalline hydrated hydroxide approxi- mating in composition to Sr(OH) 2 8H 2 or Sr(OH) 2 '9H 2 0, which on standing in vacuo loses some of its water of crystallization, leaving the monohydrated hydroxide, Sr(OH) 2 H 2 0. The ordinary hydrated variety forms quadratic crystals and behaves as a strong base. It is used in the extraction of sugar from molasses, since it combines with the sugar to form a soluble saccharate, which is removed and then decomposed by carbon dioxide. A hydrated dioxide, approximating in composition to Sr0 2 8H 2 0, is formed as a crystalline precipitate when hydrogen peroxide is added to an aqueous solution of strontium hydroxide.

Strontium fluoride, SrF 2 , is obtained by the action of hydro- fluoric acid on the carbonate, or by the addition of potassium fluoride to strontium chloride solution. It may be obtained crystalline by fusing the anhydrous chloride with a large excess of potassium hydrogen fluoride or by heating the amorphous variety to redness with an excess of an alkaline chloride. Strontium chloride, SrCl 2 6H 2 0, is obtained by dissolving the carbonate in hydrochloric acid, or by fusing the carbonate with calcium chloride and extracting the melt with water. It crystallizes in small colour- less needles and is easily soluble in water; the concentrated aqueous solution dissolves bromine and iodine readily. By concentrating the aqueous solution between 90-130 C, or by passing hydrochloric acid gas into a saturated aqueous solution, a second hydrated form of composition, SrCl 2 2H 2 0, is obtained. The anhydrous chloride is formed by heating strontium or its monoxide in chlorine, or by heating the hydrated chloride in a current of hydrochloric acid gas. It is a white solid, which combines with gaseous ammonia to form SrClj 8NH3, and when heated in superheated steam it decomposes with evolution of hydrochloric acid.

Strontium sulphide, SrS, is formed v/hen the carbonate is heated to redness in a stream of sulphuretted hydrogen. It phosphoresces very slightly when pure. Strontium sulphate, SrSO, found in the mineral kingdom as celestine, is formed when sulphuric acid or a soluble sulphate is added to a solution of a strontium salt. It is a colourless, amorphous solid, which is almost insoluble in water, its solubility diminishing with increasing temperature; it' is appre- ciably soluble in concentrated sulphuric acid. When boiled with alkaline carbonates it is converted into strontium carbonate.*

Strontium nitride, Sr 3 N 2 , is formed when strontium amalgam is heated to redness in a stream of nitrogen or by igniting the oxide with magnesium (H. R. Ellis, Chem. News, 1909, 99, p. 4). It is readily decomposed by water, with liberation of ammonia. Strontium nitrate, Sr(N0 3) 2 , is obtained by dissolving the carbonate in dilute nitric acid. It crystallizes from water (in which it is very soluble) in monoclinic prisms which approximate in composition to Sr(N0 3) 2 -4H 2 or Sr(N0 3) 2 -5H 2 0. When heated it fuses in its own water of crystallization and becomes anhydrous at no° C. It is used in pyrotechny for the manufacture of red-fire. A strontium boride, SrB6, was obtained as a black crystalline powder by H. Moissan and P. Williams (Comptes rendus, 1897, 123, p. 633) by reducing the borate with aluminium in the electric furnace.

Strontium carbide, SrC 2 , is obtained by heating strontium car- bonate with carbon in the electric furnace. It resembles calcium carbide, decomposing rapidly with water, giving acetylene. Stron- tium carbonate, SrC0 3 , found in the mineral kingdom as strontianite, is formed when a solution of a carbonate is added to one of a stron- tium salt. It is an amorphous solid, insoluble in water, but its solubility is increased in the presence of ammonium nitrate. It loses carbon dioxide when heatttl to high temperature.

Strontium salts may be recognized by the characteristic crimson colour they impart to the flame of the Bunsen burner and by the precipitation of the insoluble sulphate. On the preparation of

pure strontium salts, see Adrian and Bougarel, Journ. pharm. chem., 1892 (5), p. 345; and S. P. L. Soerenoen, Zeit. anorg. chem., 1895, 11, p. 305. Recent determinations of the atomic weight of strontium are due to T. W. Richards {Zeit. anorg. Chem., 1905, 47, p. 145), who, by estimating the ratios of strontium bromide and chloride to silver, obtained the values 87 -663 and 87 -66i.

STROPHANTHUS, a genus of plants of the natural order

Apocynaceae, deriving its name from the long twisted thread- like segments of the corolla, which in one species attain a length of 12 or 14 inches. The genus comprises about 30 species, mainly tropical African, extending into South Africa, with a few species in Asia, from farther India to the Philippines and China. Several of the African species furnish the natives with the principal ingredient in their arrow poisons. The inee or onaye poison of the Gaboon, the kombe of equatorial North Africa, the arquah of the banks of the Niger and the wanika of Zanzibar are all derived from members of this genus. The exact species used in each case cannot be said to be accurately known. There is no doubt, however, that S. hispidus and 5. kombS are those most frequently employed.

Both S. hispidus and S. kombi have hairy seeds with a slender thread-like appendage, terminating in a feathery tuft of long silken hairs, the seeds of the former being coated with short appressed brown hairs, and those of the latter with white hairs; but in the species used at Delagoa Bay and called "umtsuli" the thread-like appendage of the seed is absent. The natives pound the seeds into an oily mass, which assumes a red colour, portions of this mass being smeared on the arrow immediately behind the barb.

Under the name of strophanti semina, the dried ripe seeds of Strophanthus kombe, freed from awns, are official in the British and many other pharmacopeias. The seeds must be mature. They are about £ in. long, £ in. broad, greenish fawn, covered with flattened silky hairs, and oval-acuminate in shape. They are almost odourless, but have an intensely bitter taste. The chief constituent is a white microcrystalline glucoside, known as stro- phanthin, freely soluble in water and alcohol, but not in chloroform or ether, and melting at about 173° C. It constitutes about 50% of the mature cotyledons of the seed, the proportion rising as matur- ity is reached. It is very similar to, but not identical with, onabai'n. It is split up by acids into strophanthidin and a methyl-ether of a peculiar sugar. The seeds also contain an active principle, inein, a body known as kombic acid, fat, resin and starch. The resin is contained in the husk, and occurs in the alcoholic tincture of strophanthus, its presence tending to cause digestive disturbance and diarrhoea. When the seeds are treated with sulphuric . acid and heat is applied, a violet-coloration is produced. A section of the seed yields a green colour with cold sulphuric acid.

The British Pharmacopeia contains two preparations of this important and valuable drug, a dry extract and a tincture. The former is hardly ever prescribed. The official tincture is much inferior to that originally recommended by Sir Thomas Fraser, who

introduced the drug into medical practice, in being much too weak, and in being prepared with alcohol instead of ether, which differs from alcohol in not dissolving the resin contained in the husks. It is therefore advisable to order the tincture of the British Pharmacopeia of 1885, or to prescribe the current tincture in double the official dose and combined with cardamoms, ginger or capsicum, in order to counteract the irritant properties of the resin which it contains.

Strophanthin itself may be injected hypodermically in doses of sin to / grain. Unfortunately the injections usually cause some temporary local irritation. This method of exhibiting strophanthus is the only one of any avail when a result is wanted at once or even within several hours. Precisely the same observation applies to digitalis, the other great cardiac tonic.

Pharmacology. — The drug has no external actions. Taken internally it tends, after the repetition of large doses, to produce some gastric irritation. This is unquestionably less, however, than that produced by digitalis, and is probably due not at all to the active principle but entirely to the resin contained in the seed- husk. As ordinarily administered, the drug acts on the heart before influencing any other organ of tissue. Often indeed no other action can be observed. This is readily explained by the fact that the drug is carried by the coronary arteries to the cardiac muscle before it reaches any other part of the systemic circulation.

It is almost certain that strophanthus acts directly on no other cardiac structure than the muscle-fibre. No action can certainly be demonstrated either upon the terminals of the vagus nerves nor upon the intra-cardiac nervous ganglia. The muscular force is increased in a very marked degree. A secondary consequence of

this is that the diastole is prolonged, and the pulse thus rendered less frequent. If the heart is beating irregularly the drug tends to make it more regular. The action is similar to that of digitalis— and fifty years ago both these drugs would thus have been regarded, as indeed digitalis was, as cardiac sedatives. As the cardiac muscle receives its blood supply only during diastole, it follows that stro- phanthus, while increasing the force of each beat, yet lengthens the period during which the muscle rests and is fed— thus being, in a

paradoxical sense, a sedative as well as a stimulant. In fatal cases of strophanthus poisoning death is brought about by the arrest of the heart in systole, i.e. in a state of tetanic spasm from over-stimulation. This of course is a striking exception to the natural rule that death finds the heart in a state of relaxation and inability to contract. Strophanthus markedly raises the blood-pressure, but this action is proportional to and almost entirely due to the increased force of the heart; not, as in the case of digitalis, to constriction of the arterioles.

Its action on the heart causes strophanthus to exert a powerful diuretic action, especially in cases of dropsy of cardiac origin. It is a less powerful diuretic than digitalis as a rule. The drug has no action on the nervous system, but in toxic doses it powerfully affects the voluntary striped muscles. This action may be cor- related with that exerted upon the cardiac muscle, which is striped, though not voluntary, and contrasted with its want of action upon the muscular fibre of the arteries, which is involuntary and non- striped.

The drug, like onabain, has a slight anaesthetic action when locally applied to the eyeball, and also causes contraction of the pupil.

Strophanthin is one of the most active and lethal of all known substances. One-hundredth of a grain will kill a mammal weighing four pounds, and one-third of a grain will kill a man of average weight. Serum containing one part of strophanthin in ten millions will arrest the frog's heart in systole.

Strophanthus is used therapeutically only as a cardiac stimulant. When given by the mouth it acts somewhat more rapidly than digitalis, being more soluble; but it is of course far less speedy in action than ether, ammonia or such a pseudo-stimulant as ethyl alcohol. In mitral disease of the heart especially strophanthus is an invaluable drug. It frequently succeeds when digitalis has failed ; occasionally it fails where digitalis succeeds. It has the great advantage over digitalis of being non-cumulative, and can be ad-ministered continually for many weeks or even months at a time. It is never to be given in acute Bright's disease, but is frequently of use in chronic Bright's disease, where digitalis, owing to its influence on the already over-contracted arterioles, is absolutely contra-indicated.

STROPHE (Gr. arpoˆi], from o-Tpefaiv, to turn), a term in versification which properly means a turn, as from one foot to another, or from one side of a chorus to the other. In its precise choral significance a strophe was a definite section in the struc- ture

of an ode, when, as in Milton's famous phrase in the preface to Samson Agonisles, " strophe, antistrophe and epode were a kind of stanzas framed only for the music." In a more general sense the strophe is a collection of various prosodical periods combined into a structural unit. In modern poetry the strophe usually becomes identical with the stanza, and it is the arrange- ment and the recurrence of the rhymes which give it its character. But the ancients called a combination of verse-periods a system, and gave the name strophe to such a system only when it was repeated once or more in unmodified form. It is said that Archilochus first created the strophe by binding together systems of two or three lines. But it was the Greek ode-writers who introduced the practice of strophe-writing on a large scale, and the art was attributed to Stesichorus, although it is probable that earlier poets were acquainted with it. The arrangement of an ode in a splendid and consistent artifice of strophe, anti-strophe and epode was carried to its height by Pindar (see Ode). With the development of Greek prosody, various peculiar strophe-forms came into general acceptance, and were made celebrated by the frequency with which leading poets employed them. Among these were the Sapphic, the Elegiac, the Alcaic and the Asclepiadean strophe, all of them prominent in Greek and Latin verse. The briefest and the most ancient strophe is the dactylic distich, which consists of two verses of the same class of rhythm, the second producing a melodic counterpart to the first. The forms in modern English verse which reproduce most exactly the impression aimed at by the ancient ode- strophe are the elaborate rhymed stanzas of such poems as the " Nightingale " of Keats or the " Scholar-Gypsy " of Matthew Arnold (see Verse).

STROSSMAYER, JOSEPH GEORGE [Josip Juraj Stros- majer] (1815-1005), Croatian bishop and politician, was born at Esseg in Croatia-Slavonia on the 4th of February 181 5. Stross- mayer was of German descent and his parents had emigrated from Linz in Austria. He was educated at the Roman Catholic seminary of Djakovo, in his native country, and at Budapest, where he studied theology. In 1838 he took holy orders, and during the next ten years became lecturer on theology at Djakovo, chaplain to the Austrian emperor, and director of the Augustinian body at Rome. In 1849 he was consecrated bishop of Djakovo, with the official title " Bishop of Bosnia, Slavonia and Sirmium." He fostered the growth of Slavonic nationalism in Croatia-Slavonia, in Dalmatia, and among the Slovenes of south Austria, aiding the Ban Jellacic in his campaigns against Hungary (1848-49), and subsequently becoming a recog-nized leader of the opposition to Hungarian predominance (see

Croatia-Slavonia). Besides being foremost among the founders of the South Slavonic Academy in 1867, and of Agram University in 1874, he helped to reorganize the whole educa- tional system of Dalmatia and Croatia-Slavonia. He built a palace and cathedral at Djakovo, founded a seminary for the Bosnian Croats, presented the South Slavonic Academy with a gallery of valuable pictures, and published collections of national songs and tales. He also aided Augustin Theiner, then librarian at the Vatican, to compile his Vetera monumenta Slavorum meridionalium historiam illuslrantia (Rome, 1863). As a theologian, Strossmayer became prominent by his energetic opposition to the dogma of infallibility at the Vatican council of 1870, and by his denunciation of the Jesuits, while they in return charged him with allowing Roman Catholics to adopt the orthodox Greek confession. For years he refused to accept the doctrine of infallibility, but ultimately he yielded. Despite this attitude, he enjoyed the confidence of Pope Leo XIII. He headed the Slavonic deputations which visited Rome in 1881 and 1888, and won for them the retention of a Slavonic liturgy by the Roman Catholics of Illyria. Strossmayer withdrew from political life in 1888, in consequence of a rebuke administered to him by the emperor for his public expiession of sympathy with Russia and his consistent hostility to Hungary. He died in his ninety-first year, on the 10th of April 1905. He was a count of the Holy Roman Empire, a bishop of the pontifical throne, and a member of the theological faculties of Budapest and Vienna. By Leo XIII. he was decorated with the archiepiscopal pallium.

STROUD, a market town in the Stroud parliamentary division of Gloucestershire, England, 1025 m. W. by N. of London. Pop. of urban district (1901), 9153. It is served by the Great Western railway and a branch of the west-and-north line of the Midland. It lies on the steep flank of a narrow and picturesque valley and traversed by the Thames and Severn and the Stroudwater canals, which unite at Wallbridge close by. The church of St Lawrence is modern excepting the tower and spire. The Elizabethan town-hall and the school of science and art, com- memorating Queen Victoria, are noteworthy. Stroud is the principal seat of the west of England cloth manufacture, the industry extending to Stonehouse and other places in the vicinity. Stroud has also silk-mills, dyeworks, breweries, foundries, and a manufacture of umbrellas and walking-sticks.

There is no evidence of the existence of Stroud before the Conquest, and in 1087 it was still part of the manor of Bisley, from which it was separated in the reign of Edward II. It became a centre of the cloth trade in the Tudor period, and in 1607 Henry, Lord Danvers,

lord of the manor, obtained a charter from James I., authorizing a weekly market. During the 1 8th century the commercial importance of the town increased, though, owing to its distance from any of the great high- roads and to the localization of the clothing trade in scattered factories near water power, it was never a great centre of popula- tion. By the Reform Act of 1832 Stroud became a borough and returned two members to parliament until 1885, when it was merged in the Stroud division of Gloucestershire. The manufacture of very fine broadcloth and of scarlet-dyed cloth

has been carried on in the Stroud valley for centuries, the town being a distributing centre only, until the adoption of steam power and the erection of cloth factories in the town about 1830 led to considerable growth. Pin-making was introduced in 1835, carpet- weaving and iron-founding before 1850. Markets on Friday and Saturday are held under the grants of 1607 and

1832.

See Victoria County History: Gloucestershire; P. H. Fisher, Notes and Recollections of Stroud (1871); T. D. Fosbrooke, Gloucestershire Records (1807).

STROZZI, the name of an ancient and noble Florentine family, which was already famous in the 14th century. Palla Strozzi (1372-1462) played an important part in the public life of Florence, and founded the first public library in Florence in the monastery of Santa Trinita. Filippo Strozzi il Vecchio (1426-1491), son of Matteo and of Alessandra Macinghi, a famous literary woman, began to build the beautiful Strozzi palace in Florence. More celebrated was another Filippo Strozzi (1488- 1538), who, although married to a Medici, opposed the hegemony of that house and was one of the leaders of the rising of 1527. On the final overthrow of the republic in 1530 Alessandro de' Medici attempted to win over Filippo Strozzi, but Strozzi had no faith in the tyrant and retired to Venice. After the murder of Alessandro he undertook the leadership of a band of republican exiles with the object of re-entering the city (1537); but having been defeated and captured and put to the torture, he committed suicide. His son Leone (1515-1554) was a distinguished admiral in the service of France and fought against the Medici; he died of a wound received while attacking Sarlino. Another Filippo

(1541-1582) served in the French army, and was captured and killed by the Spaniards. Senator Carlo Strozzi (1587-1671) formed an important library and collected a valuable miscellany known as the Carle Slrozziane, of which the most important part is now in the state archives of Florence; he was the author of a Storietta della ciltd di Firenze dal 1279 al 1292 (unpublished) and a Storia della casa Barberini (Rome, 1640), The Strozzi acquired by marriage the titles of princes of Forano, dukes of Bagnolo, &c. The Strozzi palace, which belonged to the family until 1907, was bequeathed by will to the Italian nation.

See A. Bardi, Filippo Strozzi (Florence, 1894); B. Niccolini, Filippo Strozzi (Florence); C. Guasti, he Carte Slrozziane (Florence,

1884-1891).

STRUENSEE, JOHAN FREDERICK (1 731-17 7 2), Danish political philosopher, was born at Halle in 1731. His father, subsequently superintendent-general of Schleswig-Holstein, was a rigid pietist ; but young Struensee, who settled down in the 'sixties as a doctor at Altona, where his superior intelligence and elegant manners soon made him fashionable, revolted against the narrowness of his father's creed, became a fanatical propagandist of the atheism associated with the Encyclopddie, and scandalized his contemporaries by his frank licentiousness. But he was a clever doctor, and, having somewhat restored the king's health, and gained his affection, was retained as court physician, accompanied Christian VII. on a foreign tour and returned with him to Copenhagen. It had always been Struen- see's ambition to play a great part in the world and realize his dream of reform. He had gathered from various Danish friends, most of them involuntary exiles of doubtful character, that the crazy, old-fashioned Dano-Norwegian state, misruled by an idiot, was the fittest subject in the world for the experi- ments of a man of superior ingenuity like himself; and he pro- ceeded to worm his way to power with considerable astuteness.

First he reconciled the k>'ng and queen, for he calculated, shrewdly enough, that if the king was to be his tool he must needs make the queen his friend. At first Carolina Matilda disliked Struensee, but the unfortunate girl (she was scarce eighteen) could not fail to be deeply impressed by the highly gifted young doctor, who speedily and completely won her heart. By January 1770 he was notoriously her lover; a suc- cessful vaccination of the baby crown prince in May still further increased his influence; and when, in the course of the

year, the king sank into a condition of mental torpor, Struensee's

authority became paramount. Previously to this, the capable minister of foreign affairs, J. H. E. Bernstorff (?.».), was got rid of by a royal letter of the 13th of September 1770, and Struensee's disreputable friend, the exiled Count Rantzau- Ascheburg, was recalled to court; and with him came another Altona acquaintance of Struensee's, Enevold Brandt, who had also been living abroad under a cloud.

For a time Struensee kept himself discreetly in the back- ground, though from henceforth he was the wirepuller of the whole political machine. But he soon grew impatient of his puppets. In December the council of state was abolished.; and Struensee appointed himself maltre de requites. It was now his official duty to present to the king all the reports from the various departments of state; and, Christian VII. being scarcely responsible for his actions, Struensee dictated whatever answers he pleased. His next proceeding was to dismiss all the heads of departments, and to abolish the Norwegian stad- holderships. Henceforth the cabinet, with himself as its motive power, was to be the one supreme authority in the state. Un- fortunately, he had made up his mind to regenerate the benighted Danish and Norwegian nations on purely abstract principles, without the slightest regard for native customs and predilec- tions, which in his eyes were prejudices. He was hampered, moreover, by not knowing a word of Danish. Many of his reforms, such, for instance, as the establishment of foundling hospitals, the abolition of capital punishment for theft and of the employment of torture in judicial process, the doing away with such demoralizing abuses as perquisites, and of " lackeyism," or the appointment of great men's domestics to lucrative public posts, were distinctly beneficial if not original. Unfortunately reform was not as much a principle as a mania with Struensee, The mere fact that a venerable institution still existed was a sufficient reason, in his eyes, for doing away with it. Changes which a prudent minister might have effected in a generation he rushed through in less than a fortnight. Between the 29th of March 1771 and the 16th of January 1772 — the ten months during which he held absolute sway — he issued no fewer than 1069 cabinet orders, or more than three a day In order to be sure of obedi- ence he dismissed wholesale without pension or compensation the staffs of all the public departments, substituting for old and experienced officials nominees of his own, in many case untried men who knew -little or nothing of the country they were supposed to govern.*

The dictator's manners were even worse than his morals, He

habitually adopted a tone of insulting superiority, all the more irritating as coming from an ill-informed foreigner; and sometimes he seemed deliberately to go out of his way to shock the most sacred feelings of the respectable people. Nor was this all. His system of retrenchment, on which he particularly prided himself, was in the last degree immoral and hypocritical, for while reducing the number of the public officials, or clipping down their salaries to starvation points, he squandered thousands upon balls, masquerades, and other amusements of the court, and induced the imbecile king to present him and his friend Brandt with 60,000 rix-dollars apiece.

Still, in spite of all his blunders and brutalities, it 1 is clear that, for a : short time at least, middle-class opinion was, on the whole, favourable to him; and, had he been wise, he might perhaps have been able to defy any hostile combination. But such was his contempt for the Danish people that he cared not a jot whether they approved or disapproved of his reforms. What incensed the people most against him was the way in which he put the king completely on one side; and this feeling was all the stronger as, outside a very narrow court circle, nobody seems to have believed that Christian VII. was really mad, but only that his Will had been weakened by habitual ill usage; and this opinion was confirmed by the publication of the cabinet order of trie 14th of July 1771, appointing Struensee " gehejme kabinetsminister," with authority to issue cabinet orders which were to have the force of royal ordinances, even if unprovided with the royal sign-manual.

Nor were Struensee's relations with the queen less offensive to a nation which had a traditional veneration for the royal house of Oldenburg, while Caroline Matilda's shameless conduct in public brought the Crown into contempt. The society which daily gathered round the king and queen excited the derision of the foreign ambassadors. The unhappy king was little more than the butt of his environment, and once, when he threatened his keeper, Brandt, with a flogging for some impertin- ence, Brandt, encouraged by Struensee and the queen, actually locked him in his room and beat him with his fists till he begged for mercy. Things were at their worst during the winter of 177 1. Struensee, who had, in the meantime, created himself a count, now gave full rein to his licentiousness and brutality. If, as we are assured, he publicly snubbed the queen, we may readily imagine how he treated common folk. Before long the

people had an opportunity of expressing their disgust openly. In the summer of 177 1 Caroline Matilda was delivered of a daughter, who was christened Louisa Augusta; and a proclamation commanded that a " Te Deum " in honour of the event should be sung in all the churches; but so universal was the helief that the child was Struensee's that, at the end of the ordinary services, the congregation rose and departed en masse.

The general ill will against Struensee, which had been smoul- dering all through the autumn of 1771, found expression at last in a secret conspiracy against him, headed by Rantzau^Ascheburg and others, in the name of the queen-dowager Juliana Maria. Early in the morning of the 17th of January 1772 Struensee, Brandt and the queen were arrested in their respective bed- rooms, and " the liberation of the king," who was driven round Copenhagen by his deliverers in a gold carriage, was received with universal rejoicing. The chief charge against Struensee was that he had usurped the royal authority in contravention of the Kongeiov. He defended himself with considerable ability and, at first, confident that the prosecution would not dare to lay hands on the queen, he denied that their liaison had ever been criminal. But, on hearing that she was also a prisoner of state, his courage evaporated, and he was base enough to betray her, though she did all in her power to shield him. On the 25th of April Struensee and Brandt were con- demned first to lose their right hands and then to be beheaded; their bodies were afterwards to be drawn and quartered. Sen- tence of death was the least that Struensee had to expect. He had undoubtedly been guilty of lese-majeste and gross usurpation of the royal authority, both capital offences according to pars. 7 and 26 of the Kongeiov. The sentences were carried out on the 28th of April, Brandt suffering first.

See Elie Salomon Frangois Reverdil, Struensee et la cour de Copen-Hague 1760-1772 (Paris, 1858); Karl Wittich, Struensee (Leipzig, 1879); Peter Edward Holm, Danmark-Norges Historie, vol. iv. (Copenhagen, 1897-1905); Gustave Bascle De Lagreze, La Reine Caroline- Mathilde et le Comte Struensee (Paris, 1887) ; Robert Nisbet Bain, Scandinavia, cap. xv. (Cambridge, 1905) ; William Henry Wilkins, A Queen of Tears (London, 1904) ; Georg Friedrich von Jenssen-Tusch, Die Verschworung gegen die Konigin Karoline Mathilde und die Grafen Struensee und Brandt, nach bisher unge-druckten Originaiakten (Leipzig, 1864). (R. N. B.)

STRUTT, JEDEDIAH (1726-1797), British inventor and manufacturer, was born at South Normanton, Derbyshire, where his father occupied a farm, on the 28th of July 1726. He was educated

at a good country school, with a view to becoming a farmer, but, showing great aptitude for mechanical arts, he was in 1740 articled for seven years to a wheelwright at Findern, near Derby. Here he lodged with a hosier, Woollatt, whose daughter he married in 1755. In the meantime he had inherited, from his uncle, the stock on a farm at Blackwell, near south Normanton, now, and probably then, the property of the duke of Devonshire. While in occupation of this farm his brother-in-law, William Woollatt, brought to his notice the efforts that had been unsuccessfully made to produce ribbed as well as plain goods on the stocking frame/and here he invented Strutt's Derby ribbing machine. Patents were taken out by Strutt and Woollatt in 1758 and 1759. Strutt went to live at

Derby, and with his brother-in-law started a factory, " Derby Patent Ribs " at once becoming popular. In 1762 Strutt and Woollatt joined Samuel Need, a hosier of Nottingham, and carried on there and at Derby a very successful business. In 1768 they were approached by Richard Arkwright (q.v.), who had been recommended by Messrs Wright, bankers of Nottingham, to consult Need as to the possibilities of his cotton-spinning frame. Strutt at once realized its value, and was able to solve one or two minor difficulties which had interrupted the smooth working of the new mechanism. The firm of Arkwright, Strutt & Need started their first cotton mill at Nottingham, with horse power. Later works were erected at Cromford and, about 1780, after Strutt dissolved partnership with Arkwright, he built himself the mills at Belper and Milford, the greater part of which are still used,. The partnership with Need had termin- ated in 1773 with the expiration of the patents. Shortly before this Strutt had made the discovery, which revolutionized the manufacture of calico, that cotton could be used throughout in its making. To house the machinery for this new invention the first fire-proof mill in England was built at Derby. In order to be near his work Strutt built, from his own designs, Milford House, near Belper, where he lived until 179s, when ill health compelled him to return to Derby. Here he died in 1797. He left three sons and two daughters.

His eldest son, William Strutt (1756-1830), was also of great mechanical ability. It was he who designed the calico factory above mentioned; he applied himself to the house-heating problem and, finally, invented the Belper stove. He also devised a self-acting spinning mule, which had however no great success. He was a fellow of the Royal Society. His son, Edward Strutt (1801-1880), was for some time M.P. for Derby, and in 1856 was raised to the peerage with the title of Baron Belper of Belper.

STRUVE, FRIEDRICH GEORG WILHELM (1793-1864), German astronomer, the son of Jacob Struve (1755-1841), was born at Altona on the 15th of April 1793. In 1808 he entered the university of Dorpat (Yuriev) , where he first studied philology, but soon turned his attention to astronomy. From 18 13 to 1820 he was extraordinary professor of astronomy and mathe- matics at the new university and observer at the observatory, becoming in 1820 ordinary professor and director. He remained at Dorpat, occupied with researches on double stars and geodesy till 1839, when he removed to superintend the construction of the new central observatory at Pulkowa near St Petersburg, afterwards becoming director. Here he continued his activity until he was obliged to retire in 1861, owing to failing health. He died at St Petersburg on the 23rd of November 1864.

Struve's name is best known by his observations of double stars, which he carried on for many years. These bodies had first been regularly measured by W. Herschel, who discovered that many of them formed systems of two stars revolving round their common centre of gravity. After him J. Herschel (and for some time Sir James South) had observed them, but their labours were eclipsed by Struve. With the 9j-in. refractor at Dorpat he discovered a great number of double stars, and published in 1827 a list of all the known objects of this kind (Catalogus novus stellarum dupli- cium). His micrometric measurements of 2714 double stars were made from 1824 to 1837, and are contained in his principal work, Stellarum duplicium et multiplicium mensurae micrometricae (St Petersburg, 1837 seq. ; a convenient summary of the results is given in vol. i. of the Dunecht Observatory Publications, 1876). The places of the objects were at the same time determined with the Dorpat meridian circle (Stellarum fixarum imprimis duplicium et multiplicium positiones mediae, St Petersburg, 1852 seq.). At Pulkowa he redetermined the " constant of aberration," but was chiefly occupied in working out the results of former years' work and in the completion of the geodetic operations in which he had been engaged during the greater part of his life. He had com- menced them with a survey of Livonia (1816-1819),. which was followed by the measurement of an arc of meridian of more than 3i° in the Baltic provinces of Russia (Beschreibung der Breitengrad- messung in den Ostseeprovinzen Russlands, 2 vols. 4to, Dorpat, 1831). This work was afterwards extended by Struve and General Tenner into a measurement of a meridional arc from the north coast of Norway to Ismail on the Danube (Arc du m&ridien de 25° 20′ entre le Danube et la Mer Glaciale, 2 vols, and 1 vol. plates, 4to, St Petersburg, 1857-1860). (SeeGEODESY; Earth, Figure of.)

His son Otto Wilhelm Struve (b. 1819), having studied at the academy at St Petersburg, became assistant at Pulkowa in 1839, and director in 1862 on his father's resignation. From 1847 to 1862 he was advising astronomer to the headquarters of the army and navy; chairman of the International Astro- nomical Congress from 1867-1878; acting president of the International Metric Commission in 1872; and president of the International Congress for a Photographic Survey of the Stars in 1887, in which year he was also made a privy councillor. His contributions to astronomy cover a wide field: a list of his publications is given in Poggendorfi, Biographisch-Litterarische, vols. 2, 3, 4.

Another son, Heinrich Wilhelm Struve (b. 1822), studied chemistry, and obtained a public appointment as chemical expert to the administration of the Caucasus.

Two of Otto Wilhelm Struve's sons have also been prominent in the world of science. Karl Hermann Struve (b. 1854) studied mathematics at Dorpat, and became in 1883 assistant, and in 1890, on his father's retirement, astronomer at the observatory at Pulkowa. In 1895 he became professor at the Albertus University and director of the observatory at Konigs- berg; and in 1904 he was called to Berlin as professor and director of the observatory there. His investigation of the Saturnian system was crowned by the Royal Astronomical Society of London in 1903. Gustav Wilhelm Ludwig Struve (b. 1858) studied at Dorpat, Bonn and Leipzig, and became observer at the Dorpat observatory in 1886. This post he retained until 1894, when he migrated to the university of Cracow as extraordinary professor, becoming in 1897 ordinary professor of astronomy and geodesy.

STRYCHNINE, CˆHˆNA, an alkaloid discovered in 1818 by Pelletier and Caventou in St Ignatius's beans (Strychnos Ignatii) ; it also occurs in other species of Strychnos, e.g. S. Nux vomica, S. colubrina, S. Tieuti, and is generally accompanied by another alkaloid brucine, CaHiaˆOˆHzO, which was isolated by Pelletier and Caventou in 1819. Strychnine crystallizes from alcohol in colourless prisms, which are practically insoluble in water, and with difficulty soluble in the common organic solvents. Its taste is exceptionally bitter. It has an alkaline reaction, and is a tertiary monacid base. It is optically active, the natural form being laevorotatory. Brucine

closely resembles strychnine, and is its dimethoxy derivative. The constitutions are unknown (see J. Schmidt, Die Alkaloidchemie, 1004; 1909)-.

Medicine. — The B.P. dose of strychnine is ˆ to ˆ gr. in solution or in pill form. A preparation is syrupus ferri phos- : phatis cum quinina et strychnina, containing jrV gr. of strychnine in each fluid drachm. Strychninae hydrochloridum is also used; it is much more soluble than strychnine. From it is prepared liquor strychninae hydrochloridi, containing 1 gr. of hydrochloride in no minims. The United States pharma- copoeia also contains strychninae nilras and strychninae sulphas. Strychnine is incompatible with liquor arsenicalis and potassium iodide.

Physiological Action. — Applied externally strychnine is a powerful antiseptic, but its poisonous nature prevents it from being used for this purpose. Brucine is a local anaesthetic. Strychnine enters the blood as such, being freely absorbed from mucous surfaces or when given hypodermically. Internally strychnine acts as a bitter, increasing the secretion of gastric juice and the intestinal peristalsis, being a direct stimulant to the muscular coat; in this manner it has a purgative action. The specific effects of the drug, however, are upon the central nervous system. It excites the motor areas of the spinal cord and increases their reflex irritability. Small doses increase the sensibility of touch, sight and hearing; large doses cause twitching of the muscles and difficulty in swallowing; while in overdose violent convulsions are produced. The cerebral con- volutions remain unaffected, but the important centres of the medulla oblongata are stimulated. Not only is the respiratory centre stimulated but the cardiac centre is acted upon both directly by the drug and indirectly for a time by the enormous rise in blood pressure due to the contraction of the arterioles all over the body. Ordinary doses have no effect upon the temperature but in over- dose the temperature rises during a convulsion. Strychnine is eliminated by the kidneys as strychnine and strychnic acid. It is excreted very slowly and therefore accumulates in the system. Therapeutics. — Strychnine is chiefly used as a stimulant. It is

indicated in paralyses (chiefly functional), and is most valuable in the treatment of post-diphtheritic paralysis. In progressive lead palsy, beri-beri, and the paralysis following acute alcoholism, fairly large doses are useful. In pneumonia and other acute disease, where the patient is liable to sudden collapse, a hypodermic in- jection of strychnine will often save the patient's life. In collapse following severe haemorrhage and in sudden and accidental arrest of the heart

or respiration during chloroform narcosis an intra- muscular injection of jY gr. of the hydrochloride may stimulate the cardiac action. In acute opium poisoning strychnine is very valuable. It is a physiological antagonist of chloral hydrate, morphine and physostigmine, and may be given in poisoning by these drugs; In dyspnoea due to emphysema, phthisis and asthma, strychnine is of service, given internally in doses of 1 to 3 minims of the liquor. The syrup of iron, quinine and strychnine is used as a tonic.

Toxicology.— The symptoms of strychnine poisoning usually appear within twenty minutes of the ingestion of a poisonous dose, starting with an uneasy sensation, stiffness at the back of the neck, twitching of the muscles and a feeling of impending suffocation. The patient is then seized with violent convulsions of a tetanic char- acter; the arms are stretched out, respiration impeded, the muscles are rigid, the body is thrown into opisthotonos, i.e. it rests bow- form on the head and the heels (occasionally the body is flexed forward [emprosthotonos], the eyes remain wide open and fixed, and the mouth is drawn aside (risus sardonicus). After a minute the muscles relax, and the patient sinks back exhausted, conscious- ness being preserved throughout. Any noise, a draught of air or a touch may cause a convulsion. If the case is about to terminate fatally the spasms rapidly succeed each other and death usually occurs within two hours, either from asphyxia produced by spasm of the respiratory muscles or more rarely from exhaustion. After death the position of the body may or may not be flexed; usually rigor mortis develops rapidly. In cases which recover the con- vulsions diminish in severity , leaving the patient exhausted. Com- plications are infrequent. The average fatal dose for an adult is 1 J grs., but death has resulted in twenty minutes from § grain. On the other hand, recovery has taken place after 5 and 10 and even 20 grains have been swallowed, but in the latter case an emetic was at once administered. Idiosyncrasy plays a considerable part in determining the effects, some people being particularly susceptible; death has occurred in five minutes from the appearance of the first symptoms, but when a narcotic has been administered at the same time as the poison the development is proportionately slow. Tetanus resembles strychnine poisoning, but the development of the, symp- toms in tetanus is usually much slower, death rarely occurring within 24 hours. In strychnine poisoning trismus or lockjaw is generally secondary to spasm of the other muscles, while in tetanus it is usually the first symptom, no relaxation taking place between the spasms.

The treatment of strychnine poisoning is to immediately evacuate the

stomach with a stomach-pump or emetic, chloroform being administered to allay the spasms. If the patient can swallow, draughts of water containing tannic acid may be given. Nitrite of amy 1 inhalations are useful in the early stages when the respiratory muscles are freely movable.. Chloral and potassium bromide may be given as physiological antidotes. If death from asphyxia appears imminent artificial respiration may be resorted to.

STRYETENSK, or Sryetensk, a Cossack village of Asiatic Russia, in the province of Transbaikalia, 231 m. by rail E. of Chita, and a terminus of the Trans-Siberian railway, It is situated on both banks of the river Shilka, and its population of 8500 rises to over 10,000 during the season of navigation. Stryetensk has steam flour-mills and soap works.

STRYPE, JOHN (1643-1737), English historian and biographer, was born in Houndsditch, London, on the 1st of November 1643. He was the son of John Strype, or van Stryp, a member of a Brabant family who, to escape religious persecution, settled in London, in a place afterwards known as Strype's Yard in Petticoat Lane, as a merchant and silk throwster. The younger John was educated at St Paul's School, and on the 5th of July 1662 entered Jesus College, Cambridge; thence he proceeded to Catherine Hall, where he graduated B. A. in 1665 and M.A. in J669. On the 14th of July of the latter year he became perpetual curate of Theydon Bois, Essex, and a few months afterwards curate, and lecturer of Leyton in the same county. He was never instituted or inducted to the living of Leyton but in 1674 he was licensed by the bishop of London to preach and expound the word of . God, and to perform the full office of priest and curate while it was vacant, and until his death he received the profits of it. In 17 n he obtained from Archbishop Tenison the sinecure of West Tarring, Sussex, and he discharged the 4uties of lecturer at Hackney from 1689 till 1724. At the latter*

place he spent his last years with a married granddaughter, the wife of a surgeon, Thomas Harris, dying there on the nth of December 1737, at the age of ninety-four. He was buried in the church at Leyton.

Through his friendship with Sir William Hicks Strype obtained access to the papers of Sir Michael Hicks, secretary to Lord Burghley, from

which he made extensive transcripts; he also carried on an extensive correspondence with Archbishop Wake and Bishops Burnet, Atterbury and Nicholson. The materials thus obtained formed the basis of his historical and biographical works, which relate chiefly to the period of the Reformation. The greater portions of his original materials have been preserved, and are included in the Lansdowne manuscripts in the British Museum. His works can scarcely be entitled original compositions, his labour having consisted chiefly in the arrangement of his materials, but on this very account they are of considerable value as convenient books of reference, easier of access and almost as trustworthy as the original documents. The most important of Strype's works are the Memorials of Thomas Cranmer, Archbishop of Canterbury, 161)4 (ed. for the Eccl. Hist. Soc., in 3 vols., Oxford, 1848-1854; and in 2 vols, with notes by P. E. Barnes, London, 1853); Life of the learned Sir Thomas Smith (1698) ; Life and Acts of John Aylmer, Lord Bishop of London (1701) ; Life of the learned Sir John Cheke, with his Treatise on Superstition (i7°5); Annals of the Reformation in England (4 vols.; vol. i. 1709 [reprinted 1725], vol. ii. 1725, vol. iii. 1728, vol. iv. 1731; 2nd ed., 1735, 4 vols. ; 3rded., 1 736- 1738, 4 vols.) ; Life and Acts of Edmund Grindal, Archbishop of Canterbury (1710), of Matthew Parker, Archbishop of Canterbury (1711), and of John Whitgift, Archbishop of Canterbury (1718) ; An Accurate Edition of Slow's Survey of London (1720), a valuable edition of Stow, although its interference with the original text is a method of editing which can scarcely be reckoned fair to the original author ; and Ecclesiastical Memorials (3 vols., 1721; 3 vols., 1733). His Historical and Biographical Works were reprinted in 19 vols, at the Clarendon Press, Oxford, between 1812 (Cranmer) and 1824 (Annals). A general index by R. F. Laurence in 2 vols, was added in 1828. Strype also published, besides a number of single sermons, an edition of John Lightfoot's Works (1684); and in 1700 Some genuine Remains of John Lightfoot . . . with a large preface concerning the author.

STUART, ARABELLA (1575-1615), daughter of Charles Stuart, earl of Lennox, younger brother of. Lord Darnley and of Elizabeth, daughter of Sir William Cavendish and " Bess of Hardwick," is interesting historically as having been (by strict pedigree) next in succession to James VI. of Scotland to the thrones of England and Scotland, after Queen Elizabeth. Her father's mother was Margaret Douglas, the daughter of Henry VII. 's daughter, Queen Margaret of Scotland, and the earl of Angus. She was born in 1575 and early became the centre of the intrigues of those who in Elizabeth's reign

refused to accept James as her successor. Various suitors for her hand were proposed, including Henry IV. of France, the earl of North- umberland, and Esme Stuart, duke of Lennox. In 1590 a plot was formed by the moderate section of the Roman Catholics of marrying her to Ranuccio, eldest son of the duke of ˆarma, who was descended from John of Gaunt, and of raising her with Spanish support to the throne. She was in consequence regarded with suspicion and disfavour by Elizabeth and closely watched and guarded at Hardwick by the dowager countess of Shrewsbury. In 1602 the queen's suspicions were increased by the discovery of a plot to marry Arabella to Edward, eldest son of Lord Beauchamp, who as grandson of Edward Seymour, earl of Hertford, and of Lady Catherine Grey (younger sister of Lady Jane Grey), was heir to the throne after Elizabeth according to the will of Henry VIII. According to other accounts the intended husband was Thomas Seymour, a younger son of the earl of Hertford. Arabella entered with ardour into the project, and planned an escape from Hardwick with the aid of her chaplain Starkey, who after its failure committed suicide. In December she wrote secretly to Lord Hertford proposing her marriage with his grandson, but the latter immediately informed the council. In February 1603 another attempt at escape failed, and she was then transferred to the care of the earl of Kent at Wrest House. The anxiety and anger aroused by her conduct was reputed to be the cause of Elizabeth's death the same year. When James I. had gained secure possession of the throne, Arabella was received at court and treated with favour, and she showed her fidelity to James by revealing a communication made to her by the conspirators

in the Main and Bye Plots, in which her name had been used without her sanction. Every effort, however, was made to prevent her marriage. She is described at this time by Scaramelli, Venetian secretary in London, as " of great beauty and remark- able qualities, being gifted with many accomplishments, among them being the knowledge of Latin, French, Spanish, Italian, besides her native English "; as having " very exalted ideas, having been brought up in firm belief that she would succeed to the crown," as limited in means, of the Puritan persuasion, and very proud, insisting on a precedence over the princesses, though ordered back by the master of the ceremonies and in consequence being expelled from the court. A little later she is called " a regular termagant " and in 1607 " not very beautiful." 1 In December 1609 she planned an escape with Sir George Douglas to Scotland, apparently with a view of arranging a marriage with Stephen Bogdan, pretender to Moldavia, and on the scheme being discovered she was arrested. She was, however,

restored to favour, granted a pension of £1600 a year by James, and given 10,000 crowns to pay her debts. But on the 2nd of February 16 10 she became engaged to William Seymour, younger brother of Edward, and grandson of Lord Hertford, a suitor especially forbidden by James. A promise was exacted from them by the privy council that they would not marry without the king's consent, but nevertheless they were secretly married on the 22nd of June at Greenwich. Immediately it was known the culprits were imprisoned, Arabella at Lambeth and her husband in the Tower. In 161 1 she was placed in charge of the bishop of Durham. Her applica- tion for a writ of habeas corpus was refused, and on the 16th of March she left London, progressing however, on account of illness and prostration, only as far as Barnet. She escaped on the 3rd of June 161 1 disguised in man's clothing, and succeeded in getting on board a ship bound for Calais. Meanwhile her husband had also effected his escape and was sailing towards the French coast. Their two ships were drawing together when " a great wind arose and prevented them from seeing each other ever more." 2 Soon afterwards the unfortunate Arabella was captured and brought back to the Tower, where she spent the rest of her unhappy career. James was deaf to all intercession in her favour, and is reported to have answered the queen when pleading for her that " she had eaten of the forbidden fruit." In November 1613 a new plot for her escape failed. Abandoning at last all hope she sank into melancholy, ill health, and, according to some accounts, insanity, and died a victim to state policy on or about the 25th of September 1615. She was buried in the tomb of Mary Queen of Scots in Henry VII. 's chapel in Westminster Abbey. There appears to be no support for the statement that a child was born to her.

Her husband, after awaiting her in vain at Ostend, went on to Paris. He returned to England in 1616 after his wife's death and was restored to favour. He married in 1618 Frances, daughter of Robert Devereux, earl of Essex, became earl of Hertford by the death of his grandfather in 1621, and marquess in 1640. He took an active part in the civil war in Charles I.'s reign, was governor of the prince of Wales, and at the Restoration the dukedom of Somerset was revived in his favour. He died in 1660, and, on the failure of his male descendants in the person of his son John, 4th duke, the dukedom of Somserset passed to the descendants of his brother, Francis, Baron Seymour of Trowbridge, and, on the extinction of the latter's male line to the elder branch of the Seymour family, descended from Sit Edward Seymour of Berry Pomeroy, Devon.

See also The Life and Letters of Arabella Stuart, by E. T. Bradley

(1889), which supersedes the Life by E. Cooper (1866).

. STUART, GILBERT (1755-1828), American artist, was born at North Kingstown, Rhode Island, on the 3rd of December 1755. He studied at Newport, Rhode Island, with Cosmo Alexander, and went with him to Scotland, but returned to America after Alexander's death and obtained many portrait

1 Cat. of State Papers, Venetian, ix. 541, x. 42, 514. s Lotti, Venetian secretary, writing on the 23rd of Juno Athenaeum, vol. 97, it. 353.

commissions. In 1775 he went to England, and became a pupil of Benjamin West in 1778. His work, however, shows none of the influence of West, and after four years Stuart set up a studio for himself in London, meeting with much success. Living beyond his means, he got into financial difficulties, and in 1788 escaped to Dublin. In London he had painted George III. and the future George IV., and in Paris had painted Louis XVI., and his success was no less great in Ireland. After five years he left Ireland for his native land in order to paint General Washington, who was said to be the only person in whose presence Stuart found himself embarrassed, and his first por- trait Stuart felt was a failure; but Washington sat to him again, the result being the " Athenaeum " head on an unfinished canvas, showing the left side of the face. This remains the accepted likeness of Washington, of whom he also painted a full-length for Lord Lansdowne; of each of these portraits he executed many replicas. Among his portraits are chose of Presidents Washington, John Adams, Thomas Jefferson, James Madison, James Monroe and John Quincy Adams, and John Jay, Governor Winthrop, Generals Gates and Knox, Bishop White, Chief Justice Shippen, John Singleton Copley, Sir Joshua Reynolds, Benjamin West, Lords Clinton, Lyndhurst, and Inchiquin, Sir Edward Thornton, Mme Patterson-Bonaparte and Horace Binney. Stuart's original colouring and technique, and his insight into character, make him not only one of the few great American artists, but one of the greatest portrait painters of his time. He settled at Boston in 1805, and died there on the 27th of July 1828.

See George C. Mason, Life and Works of Gilbert Stuart (New York,

1879)-

STUART, JAMES EWELL BROWN (1833-1864), American soldier, was born in Virginia on fhe 6th of February 1833 and entered West Point military academy in 1850. Commissioned in 1854 second lieutenant of cavalry, he saw considerable service in Indian warfare, and took part also in the repression of civil disorder in Kansas. In 1855 he had married a daughter of Colonel Philip St George Cooke, who was regarded as the most capable cavalry officer in the United States service, and gave his son-in-law the benefit of his experience and judgment. In 1859 Stuart, while staying in Washington on official business, was sent to assist Colonel R. E. Lee in the suppression of the John Brown raid on Harper's Ferry. Two years later the Civil War presaged by the Kansas troubles and John Brown's expedition broke out, and when Virginia seceded Stuart resigned his commission in the United States army to share in the defence of his state. He had resigned as a lieutenant — a notification of his promotion to captain had actually crossed his letter of resignation in the post— but trained officers, especially of cavalry, were so scarce that he was at once made a colonel. With very little delay, and with the scantiest of formal training, his regiment was mustered into the Confederate army, and assigned to Joseph Johnston's force in the Shenandoah Valley. His men were mounted on their own horses, knew the country thoroughly, and in his capable hands soon made themselves proficient in outpost duty. In the opening campaign Stuart's command acted as a screen to cover Johnston's movement on Manassas, and at the first battle of Bull Run which followed, Stuart dis- tinguished himself by his personal bravery. During the autumn and winter of 1861 he continued his outpost service and was somewhat severely handled by General Ord's force at the action of Dranesville. He was now promoted brigadier-general and placed in command of the cavalry brigade of the army of Northern Virginia. Just before the Seven Days' Battle (q.v.) he was sent out by Lee to locate the right flank of McClellan's army, and not only successfully achieved his mission, but rode right round McClellan's rear to deliver his report to Lee at Richmond. After the battle of Gaines's Mill on the 27th of June Stuart's cavalry raided McClellan's abandoned line of communi- cation with White House, and his dismounted riflemen, aided by a light howitzer, successfully engaged a Federal gunboat on the Pamunkey. But such romantic and far-ranging raids on this occasion, as on several others, contributed little or nothing to the success of the army as a whole. In the next campaign,

it is true, he had the good fortune, in his raid against General Pope's

communications, not only to burn a great quantity of stores, but also, what was far more important, to bring otf the headquarters' staff document of the enemy, from which Lee was able to discover the strength and positions of his oppo- nents in detail. Stuart, now a major-general and commander of the cavalry corps, was present at the second battle of Bull Run, and during the Maryland campaign he brilliantly defended one of the passes of South Mountain (Crampton's Gap), thus enabling Lee to concentrate his disseminated army in time to meet McClellan's attack. After this battle the indefatigable troopers embarked upon a fresh raid, which, though without any definite object, had its value as an assertion of unbroken courage after the quasi-defeat of Antietam, and in addition wore out the Federal cavalry in vain efforts to pursue them. On this occasion the swift Virginians covered 80 miles in 27 hours and escaped with the loss of but three men. At Fredericksburg Stuart's cavalry were as usual in the flank of the army, and his horse artillery under Major Pelham rendered valuable service in checking Franklin's attack on " Stonewall " Jackson's corps by diverting a whole infantry division that formed part of Franklin's command. At Chancellorsville Stuart was specially appointed by Lee to take over command of the II. army corps after Jackson had been wounded, and though unused to commanding so large a force of all arms he acquitted himself so well in the second day's fighting that many considered that a grave injustice was done to him by the promotion of Major-General Ewell, Jackson's principal lieutenant, to fill the position left vacant by Jackson's death. The next campaign, Gettysburg, was preluded by the cavalry battle of Brandy Station, in which for the first time the Federal cavalry showed themselves worthy opponents for Stuart and his men. The march to the Potomac was screened by the cavalry corps, which held the various ap- proaches on the right flank of the army, but at the crisis of the campaign Stuart was absent on a raid, and although he attempted to rejoin Lee during the battle, he was met and checked some miles from the field by General Gregg, so that the skill and courage which might have turned the scale in favour of Lee on the first and second days of the great battle were employed only in covering his retreat. The cavalry took part in the war of manoeuvre between Meade and Lee in the autumn of 1863, and then went into winter quarters. Very shortly after the opening of the campaign of 1864 Stuart's corps was drawn away from Lee's army by the Union cavalry under Sheridan, and part of it, with which was Stuart himself, was defeated at Yellow Tavern on the 10th of May. Stuart himself was killed. Stuart possessed the ardent and resolute character of the true cavalry leader, and although he was fortunate enough to com- mand brigades and regiments exclusively composed

of men who were both born horsemen and natives of Virginia, and to be opposed, for the first two years, by docile but unenterprising squadrons which were recruited in a more ordinary way, yet it was undeniable that he possessed the gift, indeed the genius, of a great leader. That his energy was sometimes squandered on useless raids was but natural, considering the character of his forces,, but in regard to his performances in the more exhaust- ing and far more vital service of security and reconnaissance, General Johnston could ask " How can I sleep unless he is on the outpost? " and General Lee could say " He never brought me a false report." Stuart preserved under all circumstances the gaiety of a cavalry subaltern and the personal character of an earnest Christian, and the army regarded his loss as almost as heavy a blow to the Confederate cause as that of Jackson.

See Life by H. B. McClellan (1885).

STUART, SIR JOHN, Count of Maida (1.759-ˆ815), British lieutenant-general, was born in Georgia. His father, Colonel John Stuart, was superintendent of Indian affairs in. the southern district, and a prominent royalist in the War of Independence. Educated at Westminster School, young Stuart entered the 3rd Foot Guards in 1778, and almost immediately went to America with his regiment. He was present at the siege of

Charleston, the battles of Camden and Guildford court-house, and the surrender of Yorktown, returning a regimental lieu- tenant and an army captain, as was then usual in the Guards. Ten years later, as captain and lieutenant-colonel, he was present with the duke of York's army in the Netherlands and in northern France. He took part in the sieges and battles of the 1793 campaign, Valenciennes, Lincelles, Dunkirk and Lannoy. In the following year, now at the head of his battalion, he was present at Landrecies and at Pont-a-Chin or Tournay, and when the tide turned against the allies, he shared with his guards in the discomforts of the retreat. As a brigadier-general he served in Portugal in 1796, and in Minorca in 1799. At Alexandria, in 1801, his handling of his brigade called forth special commendation in general orders, and a year later he became substantive major-general. After two years in command of a brigade in Kent, Stuart went with Sir James Craig to the Mediterranean. The English were employed along with Lacy's

Russians in the defence of the king- dom of Naples, but Austerlitz led to the recall of the Russian contingent, and the British soon afterwards evacuated Italy. Thus exposed, Naples fell to the advancing troops of Massena, but Gaeta still held out for King Ferdinand, and Massena's main force soon became locked up in the siege of this fortress. Stuart, who was in temporary command, realized the weakness of the French position in Calabria, and on the 1st of July 1806 swiftly disembarked all his available forces in the gulf of S. Euphemia. On the 4th the British, 4800 strong, won the cele- brated victory of Maida over Reynier's detachment. Nothing, however, was done to follow up this success, as Stuart was too weak to shake Massena's foothold in Naples. After besieging and taking the castle of Scylla, the little force returned to Messina. Besides the dignity of count of Maida from the court of Palermo, Stuart received the thanks of parliament and an annuity of £1000, as well as the K.C.B. Superseded by two other generals, Fox and Moore, the latter of whom was his junior, Stuart came home in 1806. A year later, however, as a lieu- tenant-general, he received the Mediterranean command, which he held until 18 10. His operations were confined to south Italy, where Murat, king of Naples, held the mainland, and the British and Neapolitan troops held Sicily for the Bourbon king. Of the events of this time may be mentioned the failure to relieve Colonel Hudson Lowe at Capri, the expedition against Murat 's gunboats in the bay of Naples and the second siege of Scylla. The various attempts made by Murat to cross the straits uniformly failed, though on one occasion the French actually obtained a footing in the island. In 1810 Stuart returned to England. He died at Clifton in 181 5. Two months previously he had received the G.C.B.

STUART, JOHN M'DOUALL (1818-1866), South Australian explorer, was born at Dysart in Fifeshire, Scotland, in 1818, and arrived in the colony about 1839. He accompanied Captain Sturt's 1844-1845 expedition as draughtsman, and between 1858 and 1862 he made six expeditions into the interior, the last of which brought him on the 25th of July to the shores of the Indian Ocean at Van Diemen's Gulf, at the mouth of the Adelaide River. Stuart was not the first to cross the island continent from south to north; that honour belongs to the Burke and Wills expedition, which reached the Gulf of Carpentaria on the 6th of February 1861. Stuart returned to Adelaide exhausted and broken, and never recovered from the effects of the great priva- tions which he suffered. He returned to England, where he died on the 5th of June 1866. Stuart was rewarded with £3000 and a grant of 1000 sq. m. of grazing country in the interior rent free for seven years. His name is perpetuated by Central Mount

Stuart.

STUART, MOSES (1780-1852), American biblical scholar, was born in Wilton, Connecticut, on the 26th of March 1780. He was reared on a farm; graduated with highest honours at Yale in 1799; in 1802 was admitted to the Connecticut bar, and was appointed a tutor at Yale, where he remained for two years; and in 1806 became pastor of the Centre (Congrega- tional) Church of New Haven. In 1810 he was appointed

professor of sacred literature in the Andover Theological Semin- ary, organized in 1808. Here he succeeded Eliphalet Pearson (17 52-1826), the first preceptor of the Phillips (Andover) Academy and in 1 786-1806 professor of Hebrew and Oriental languages at Harvard. Stuart himself then knew hardly more than the elements of Hebrew and not very much more Greek than Hebrew; in 1810-1812 he prepared for the use of his students a Hebrew grammar which they copied day by day from his manuscript; in 1813 he printed his Grammar, which appeared in an enlarged form, " with a copious syntax and praxis," in 1821, and was republished in England by Dr Pusey in 1831. He gradually made the acquaintance of German works in hermeneutics, first Schleusner, Seiler and Gesenius, and taught himself Ger- man, arousing much suspicion and distrust among his colleagues by his unusual studies. But his recognition soon came, partly as a result of his Letter to Dr Charming on the Subject of Religious Liberty (1830), but more largely through the growing favour shown to German philology and critical methods. In 1848 he resigned his chair at Andover. He died in Andover on the 4th of January 1852. He has been called the " father of exegetical studies in America." He contributed largely by his teaching to the renewal of foreign missionary zeal — of his 1500 students more than 100 became foreign missionaries, among them such skilled translators as Adoniram Judson, Elias Riggs and William G. Schauffler.

Among his more important publications were: Winer's Greek Grammar of the New Testament (1825), with Edward Robinson; Commentary on the Epistle to the Hebrews (1827-1828); Commentary on the Epistle to the Romans (1832); Commentary on the Apocalypse (1845); Miscellanies (1846); Gesenius's Hebrew Grammar (1846), a version which involved Stuart in a long controversy with T. J. Conant, the earlier, and possibly more scholarly, translator of Gesenius; Commentary on Ecclesiastes (1851), and Commentary on the Book of Proverbs (1852).

See the memorial sermons by Edwards A. Park (Boston, 1852) and William Adams (New York, 1852).

STUBBS [Sttjbbe], JOHN (c. 1 543-1 591), English pamphleteer, was born in Norfolk about 1543. He was educated at Trinity College, Cambridge, and after studying law at Lincoln's Inn, took up his residence at Thelveton, Norfolk. His views were Puritan, and he regarded with disgust the negotiations for a marriage between Queen Elizabeth and the duke of Anjou. In 1579 he put his opinions into a pamphlet entitled The Dis- coverie of a Gaping Gulf whereinto

England is like to be Swallowed by another French Marriage. The circulation of this pamphlet was prohibited, and Stubbs,' his printer, and publisher were tried at Westminster", found guilty, and sentenced to have their right hands cut off. The printer was subsequently pardoned, but in the case of Stubbs and his publisher the sentence was duly carried out. Stubbs protested his loyalty from the first. His right hand having been cut off, he removed his hat with his left, and cried " God Save the Queen!" before fainting away. He was subsequently imprisoned for eighteen months. On being released he continued to write, publishing, among other pam- phlets, a reply to Cardinal Allen's Defence of the English Catholics. He died in 1591 at Havre, France, where he seems to have gone to volunteer for military service under Henry of Navarre.

STUBBS [Stubbes], PHILIP (c. 1555-c. 1610), English pamphleteer, was born about 1555. He is reputed to have been a brother or near relation of John Stubbs (q.v.). He was educated at Cambridge arid subsequently at Oxford, but did not take a degree, spending the greater portion of his time travelling about the country. He started writing about 1581, and in 1583 published The Anatomie of Abuses. This consisted of a virulent attack on the manners, customs, amusements and fashions of the period, and is still valuable for its copious information on those matters. In 1591 Stubbs published A Christal Glass for Christian Women, of which at least seven editions were called for, and he followed this with other semi-devotional works. He died, probably, about 1610.

STUBBS, WILLIAM (1825-1901), English historian and bishop of Oxford, son of William Morley Stubbs, solicitor, of Knares- borough, Yorkshire, was born on the 21st of June 1825, and was educated at the Ripon grammar school and Christ Church,

Oxford, where he graduated in 1848, obtaining a first-class in classics and a third in mathematics. He was elected a fellow of Trinity College, and held the college living of Navestock, Essex, from 1850 to 1866. He was librarian at Lambeth, and in 1862 was an unsuccessful candidate for the Chichele professorship of modern history at Oxford. In 1866 he was appointed regius professor of modern history at Oxford, and held the chair until 1884. His lectures were thinly attended, and he found them grievous interruptions to his historical work. Some of his statutory lectures are published in his

Lectures on Mediaeval and Modem History. He was rector of Cholderton, Wiltshire, from 1875 to 1879, when he was appointed a canon of St Paul's. He served on the ecclesiastical courts commission of 1 881-1883, and wrote the weighty appendices to the report. On the 25th of April 1884 he was consecrated bishop of Chester, and in 1889 was translated to the see of Oxford.

Until Bishop Stubbs found it necessary to devote all his time to his episcopal duties, he pursued historical study with un- remitting diligence. He rejected the theory of the unity and continuity of history so far as it would obliterate distinctions between ancient and modern history, holding that, though work on ancient history is a useful preparation for the study of modern history, either may advantageously be studied apart. He urged that history is not to be treated as an exact science, and that the effects of individual character and the operations of the human will necessarily render generalizations vague and conse- quently useless. While pointing out that history has a utility as a mental discipline and a part of a liberal education, he recom- mended its study chiefly for its own sake, for the truth's sake and for the pleasure which it brings. It was in this spirit that he worked; and his intellectual character was peculiarly fitted for his work, for he was largely endowed with the faculty of judgment and with a genius for minute and critical investigation. He was eminent alike in ecclesiastical history, as an editor of texts and as the historian of the English constitution. His right to be held as an authority on ecclesiastical history was proved in 1858 by his Registrant sacrum anglicanum, which sets forth episcopal succession in England, by many other later works, and particularly by his share in Councils and Ecclesiastical Documents, edited in co-operation with the Rev. A. W. Haddan, for the third volume of which he was specially responsible. His place as a master in critical scholarship and historical exposition is decided beyond debate by the nineteen volumes which he edited for the Rolls series of Chronicles and Memorials. It is, however, by his Constitutional History of England that he is most widely known as a historian. The appearance of this book, which traces the development of the English constitution from the Teutonic invasions of Britain till 1485, marks a distinct step in the advance of English historical learning. Specialists may here and there improve on a statement or a theory, but it will always remain a great authority, a monument of patient and exhaustive research of intellectual power, and of ripe and disciplined judgment. Its companion volume of Select Charters and other Illustrations of English Constitutional History, admirable in itself, has a special importance in that its plan has been imitated with good results both

in England and the United States.

Bishop Stubbs belongs to the front rank of historical scholars both as an author and a critic. Among Englishmen at least he excels all others as a master of every department of the historian's work, from the discovery of materials to the elaboration of well- founded theories and literary production. He was a good palaeographer, and excelled in textual criticism, in examination of authorship, and other such matters, while his vast erudition and retentive memory made him second to none in interpretation and exposition. His carefulness was exemplary, and his refer- ences are always exact. His merits as an author are often judged solely by his Constitutional History. The learning and insight which this book displays are unquestionable: it is well planned, and its contents are well arranged; but constitutional history is not a lively subject, and, in spite of the skill with which Stubbs handled it and the genius displayed in his narrative

chapters, the book does not afford an adequate idea of his place as a writer of history. What that is cannot be determined without taking into account the prefaces to some of the volumes which he edited for the Rolls series. Several of them contain monographs on parts, or the whole, of the author's work, written with remarkable literary skill. In these his language is vigorous and dignified; he states the results of his labour and thought with freshness and lucidity; tells numberless stories in a most delightful manner, and exhibits a wonderful talent for the repre- sentation of personal character; the many portraits of historic persons of all orders which he draws in these prefaces areas brilliant in execution as they are exact and convincing. Among the most notable examples of his work for the Rolls series are the prefaces to Roger of Hoveden, the Gesta regum of William of Malmesbury, the Gesta Henrici II., and the Memorials of St. Dunstan. Both in England and America Bishop Stubbs was universally acknowledged as the head of all English historical scholars, and no English historian of his time was held in equal honour in European countries. Among his many distinctions he was D.D. and hon. D.C.L. of Oxford, LL.D. of Cambridge and Edinburgh, Doctor in utroque jure of Heidelberg; an hon. member of the university of Kiev, and of the Prussian, Bavarian and Danish academies; he received the Prussian order Pour le merite, and was corresponding member of the Academie des sciences morales et politiques of the French Institute.

Stubbs was a High Churchman whose doctrines and practice were grounded on learning and a veneration for antiquity. His opinions were received with marked respect by his brother pre- lates, and he

acted as an assessor to the archbishop in the trial of the bishop of Lincoln. His tastes were those of a student, and he did not disguise his dislike of public functions and the constant little journeys which take up so much of a bishop's time. Nevertheless he fulfilled all his episcopal duties with diligence, and threw all his heart into the performance of those of a specially spiritual nature, such as his addresses at confirma- tions and to those on whom he conferred orders. As a ruler of the Church he showed wisdom and courage, and disregarded any effort to influence his policy by clamour. In character he was modest, kind and sympathetic, ever ready to help and encourage serious students, generous in his judgment of the works of others-, a most cheery companion, full of wit and humour. His wit was often used as a weapon of defence, for he did not suffer fools gladly. An attack of illness in November 1900 seriously impaired his health. He was able, however, to attend the funeral of Queen Victoria on the 2nd of February 1 90 1, and preached a remarkable sermon before the king and the German emperor on the following day. His illness became critical on the 20th of April, and he died on the ,22nd. In 1859 he had married Catherine, daughter of John Dollar, of Navestock, and had a numerous family.

See Letters of William Stubbs, Bishop of Oxford, ed. W. H. Hutton.

(W. Hu.)

STUCCO (Ital. stucco, adapted from O.H.G. stucchi, crust, piece, patch, Ger. Stuck, piece, allied to stock), a kind of plaster used for the covering of walls, or for decorative or ornamental features such as cornices, mouldings, &c, or for ceilings. The stucco used as an exterior covering for brick or stone work is coarse; a finer kind is used for decorative purposes. (See Plaster-Work.)

STUCK, FRANZ (1863-), German painter, was born at Tettenweis, in Bavaria, and received his artistic training at the Munich Academy. He first made a name with his illustrations for Fliegende Blatter, and vignette designs for programmes and book decoration. He did not devote himself to painting till after 1889, the year in which he achieved a marked success with his first picture, " The Warder of Paradise." His style in painting is based on a thorough mastery of design, and is sculptural rather than pictorial. His favourite subjects are of mythological and allegorical character, but in his treatment of time-worn motifs he is altogether unconventional. A statuette of an athlete, bronze casts of which are at the Berlin and Budapest

national galleries and the Hamburg Museum, affords convincing proof of his talent for plastic art. Among his paintings the best known are " Sin " and " War," at the Munich Pinakothek, " The Sphinx," " The Crucifixion," " The Rivals," " Paradise Lost," " Oedipus," " Temptation," and " Lucifer." Though Stuck was one of the leaders of the Munich Sezession, he enjoyed an appointment of professor at the academy.

STUCLEY (or Stukely), THOMAS (c. 1525-1578), English adventurer, son of Sir Hugh Stucley, of Affleton, near Ilfracombe, a knight of the body to King Henry VIII., ˆas supposed by some of his contemporaries to have been an illegitimate son of the king. He was a standard-bearer at Boulogne from 1547 to 1550, entered the service of the duke of Somerset, and after his master's 'arrest in 1551a warrant was issued against him, but he succeeded in escaping to France, where he served in the French army. His military talents brought him under the notice of Montmorency, and he was sent with a letter of recommendation from Henry II. of France to Edward VI. On his arrival he proceeded on the 16th of September 1552 to reveal the French plans for the capture of Calais and for a descent upon England, the furtherance of which had, according to his account, been the object of his mission to England. Northumberland evaded the payment of any reward to Stucley, and sought to gain the friend- ship of the French king by pretending to disbelieve Stucley's statements. Stucley, who may well have been the originator of the plans adopted by the French, was imprisoned in the Tower for some months. A prosecution for debt on his release in August 1553 compelled him to become a soldier of fortune once more, but he returned to England in December 1554 in the train of Philibert, duke of Savoy, after obtaining security against his creditors. He temporarily improved his fortunes by marry- ing an heiress, Anne Curtis, but in a few months had to return to the duke of Savoy's service. As early as 1558 he was sum- moned before the council on a charge of piracy, but was acquitted on the ground of insufficient evidence. In 1562 he obtained a warrant permitting him to bring French ships into English ports although England and France were nominally at peace. With six ships, one of which was supplied by Queen Elizabeth, he started buccaneering against French, Spanish and Portuguese ships, though his commission was concerned with an expedition to Florida. Repeated remonstrances on the part of the offended powers compelled Elizabeth to disavow Stucley, who surrendered in 1565, but his prosecution was merely formal.

He had met Shane O'Neill at the English court in the winter of 1 561-1562, and was employed in 1566 by Sir Henry Sidney in a vain effort to induce the Irish chief to enter into negotiations with the government. Sidney desired to allow Stucley to purchase the estates and office of Sir Nicholas Bagnall, marshal of Ireland, for £3000, but Elizabeth refused to permit the transaction. Undeterred by this failure, Stucley bought lands and the office.of seneschal of Wexford from Sir Nicholas Heron, but in June 1 568 he was dismissed, and in the next year im- prisoned in Dublin Castle on a charge of high treason, but was released in October. He now offered his services to Fenelon, the French ambassador in London, and was thenceforward continuously engaged in schemes against Elizabeth. Philip II. invited him to Madrid and loaded him with honours. He was known at the Spanish court by the curious title of "duke of Ireland," and was established with a handsome allowance in a villa near Madrid. He was knighted in 1571, and prepared to become a member of a religious order of knighthood. His credit with Spain was seriously injured by another Irish malcon- tent, Maurice Gibbon, archbishop of Cassel; but Stucley, who now desired to leave Spain, only obtained his passports after Elizabeth had demanded his dismissal. He commanded three galleys under Don John of Austria at the battle of Lepanto. His exploits restored him to favour at Madrid, and on the 2nd of March 1572 he was at Seville, offering to hold the narrow seas against the English with a fleet of twenty ships. In four years (1570-1574) he is said to have received over 27,000 ducats from Philip II. Wearied by the Spanish king's delays he sought more serious assistance from the new pope, Gregory XIII., who

aspired to make his illegitimate son, Giacomo Buoncompagno, king of Ireland. He set sail from Civita Vecchia in March 1578, but put into Lisbon, where he was to meet his confederate, James Fitzmaurice Fitzgerald, and to secure better ships before sailing for Ireland. There he was turned from his purpose by King Sebastian, with whom he sailed for Morocco. He com- manded the centre in the battle of Alcazar on the 4th of August 1578, and was killed, in fair fight apparently, though tradition asserted that he was murdered by his Italian soldiers after the battle.

Stucley's adventurous career made considerable impression on his contemporaries. A play generally assigned to George Peele, The Battell of Alcazar . . . with the Death of Captain Stukely, printed by E. Allde in 1594, was probably acted in 1592, and is perhaps identical with a popular piece referred to by Henslowe as Muley surnamed Abdelmilech. It deals with Stucley's arrival in Lisbon and his Moorish expedition, but in a long speech before his death he

recapitulates the events of his life. A later piece, The Famous History of the Life and Death of Captain Thomas Stukeley, printed for Thomas Panyer (1605), which is possibly the Stewtley played, accord- ing to Henslowe, on the nth of December 1596, is a biographical piece dealing with successive episodes, and seems to be a patchwork of older plays on Don Antonio and on Stucley. His adventures also form the subject of various ballads.

There is a detailed biography of Stucley, based chiefly on the English, Venetian and Spanish state papers, in R. Simpson's edition of the 1605 play (School of Shakespeare, 1878, vol. 1.), where the Stucley ballads are also printed. References in contemporary poetry are quoted by Dyce in his introduction to the Battle of Alcazar in Peek's Works.

STUD. (1) A number of horses kept for the purpose of breed- ing, also the place or establishment where they are kept; similarly, a "stud horse," a stallion, " stud groom," the head groom of a stud, "stud-book," the register containing the pedi- gree of thoroughbred horses. The word in Old English is stod, and cognate forms are found in Icelandic and Danish, cf, also German Gestiit; steed, now a literary word for horse, meant in Old English (steda) a stud-horse, and is the same as stud in origin. The root to which the word is referred is sta-, to stand. A stud meant, therefore, an establishment, (2) A word which is used of many different objecte, the primary meaning being a " prop " or support. The Old English word is studu, and cognates are found in Danish, Swedish and Icelandic. The ultimate origin is also the root sta-, to stand. The chief applications of the term are as follows: in architecture, to a post; quarter or upright in wooden partitions; to the transverse pieces of iron which strengthen the links of a chain; to a boss or knob inserted on a belt, collar, or piece of armour, often decorated and forming an ornamentation; and, particularly, to a species of button, consisting of a rounded head, neck and flat base, used for fastening a collar, shirt, &c.

STUDER, BERNHARD (1794-1887), Swiss geologist, was born at Buren, near Berne, in August 1794. Although educated as a clergyman, he became so interested in geology at the university of Gottingen that he devoted his life to its pursuit. He subse- quently studied at Freiburg, Berlin and Paris, and in 1816 was appointed teacher of mathematics and physics in the Berne Academy. In 1825 he published Beylrage zy, einer Monographic der Molasse. Later on he commenced his detailed investiga- tions of the western Alps, and published in 1834 his Geolqgie der westlichen Schweizer-Alpen. In

the same year, largely through his influence, the university of Berne was established and he became the first professor of mineralogy. His Geologie der Schweiz in two vols. (1851-1853), and his geological maps of Switzerland prepared with the assistance of Arnold Escher von der Linth, are monuments of his research. In 1859 he organized the geo- logical survey of Switzerland, being appointed president of the commission, and retaining this position until the close of his life. It has been remarked by Marcou that Studer was present at the first meeting of the Societe helvetique des sciences natur- elles at Geneva on the 6th of October 18 15, and remained a member during 72 years. He was awarded the Wollaston medal by the Geological Society of London, 1879.. He died at Berne on the 2nd of May 1887.

Obituary by Jules Marcou, Ann. rep. amer. acad. set. for 1888. '

STUKELE Y— STORE

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STUKELEY, WILLIAM (1687-1765), English antiquary, was born at Holbeach, Lincolnshire, on the 7th of November 1687; the son of a lawyer. After taking his M:B. degree at Cambridge, he went to London and studied medicine at St Thomas's Hospital. In 17 10 he started in practice in Lincolnshire, removing in 171 7 to London. In the same year he became a fellow of the Royal Society, and, in 17 18, joined in the establishment of the Society of Antiquaries, acting for nine years as its secretary. la 17 19 he took his M.D. degree and in 1720 became a fellow of the Royal College of Physicians, publishing in the same year his first contribution to antiquarian literature. His principal work, an elaborate account of Stonehenge, ap- peared in 1740, and he wrote copiously on other supposed Druid remains, becoming familiarly known as the " Arch-Druid." In 1729 he took holy orders, and, after holding two livings in Lincolnshire, was appointed rector of a parish in Bloomsbury, London. He died in London on the 3rd of March 1765.

STUMPF, JOHANN (1500-1576), one of the chief writers on Swiss history and topography, was born at Bruchsal (near Carlsruhe). He was educated there and at Strassburg and Heidelberg. In 1520 he was received as a cleric or chaplain into the order of the Knights Hospitallers or of St John of Jerusalem, was sent in 1521 to the preceptory of that order at Freiburg in Breisgau, ordained priest in Basel, and in 1522 placed in charge cf the preceptory at Bubikon (north of Rapperswil, in the canton of Zurich). But Stumpf soon went over to the Protestants, was present at the great Disputation in Berne

(1528), and took part in the first Kappel War (1529). He had carried over with him most of his parishioners whom he con- tinued to care for, as the Protestant pastor at Bubikon, till 1543, then becoming pastor at Stammheim (same canton) till 1561, when he retired to Zurich (of which he had been made a burgher in 1548), where he lived in retirement till his death in 1576. In 1529 he married the first of his four wives, a daughter of Heinrich Brennwald (1478-1551), who wrote a work (still in MS.) on Swiss history, and stimulated his son-in-law to undertake historical studies. Stumpf made wide researches, with this object, for many years, and undertook also several journeys, of which that in 1544 to Engelberg and through the Valais seems to be the most important, perhaps because his original diary has been preserved to us. The fruit of his labours (completed at the end of 1546) was published in 1548 at Zurich in a huge folio of 934 pages (with many fine wood engravings, coats of arms, maps, &c), under the title of Gemeiner loblicher Eydgnossenschaft Sletten, Landen, und Volckeren chronikwirdiger Thaaten Beschrey- bung (an extract from it was published in 1554, under the name of Schwytzer Chronika, while new and greatly enlarged editions of the original work were issued in 1586 and 1606). The wood- cuts are best in the first edition, and it remained till Scheuchzer's day (early 18th century) the chief authority on its subject. Stumpf also published a monograph (very remarkable for the date) on the emperor Henry IV. (1556) and a set of laudatory verses (Lobspriiche) as to each of the thirteen Swiss cantons (1573)- (W.A. B. C.)

STURDZA, or Sturza, the name of an ancient Rumanian family, of unknown origin, which probably came from Trebi- zond and settled in Moldavia. The Sturdza family has been long and intimately associated with the government first of Moldavia and afterwards of Rumania. Its members belong to two main divisions, which trace their descent respectively from John (loan) or from Alexander (Sandu), the sons of Kirak Sturdza, who lived in the 17th century, and may be regarded as the founder of the family.

i. To the first division belongs Michael [Michail] Sturdza (1795-1884), who was prince of Moldavia from 1834 to 1849. A man of liberal education, he established the first high school, a kind of university, in Jassy. He brought scholars from foreign countries to act as teachers, and gave a very powerful stimulus to the educational development of the country. In 1844 he decreed the emancipation of the gipsies. Until then the gipsies had been treated as slaves and owned by the Church or by private landowners; they had been bought and sold in

the open market. Michael Sturdza also attempted the seculari- zation of monastic establishments, which was carried out by Prince Cuza in 1864, and the utilization of their endowments for national purposes. He quelled the attempted revolution in 1848 without bloodshed by arresting all the conspirators and expelling them from the country. Under his- rule the in- ternal development of Moldavia made immense progress; roads were built, industry developed, and Michael is still gratefully remembered by the people.

See Michel Stourdza et son administration (Brussels, 1834); Michel Stourdza, ancien prince regnant de Moldavie (Paris, 1874); A. A. C. Sturdza, Regne de Michel Sturdza, prince de Moldavie 1834-184Q (Paris, 1907).

2. Gregory [Grigorie] Sturdza (1821-1901), son of the above, was educated in France and Germany, became a general in the Ottoman army under the name of Muklis Pasha, and afterwards attained the same rank in the Moldavian army. He was a candidate for the Moldavian throne in 1859, and subsequently a prominent member of the Russophil party in the Rumanian parliament. He wrote Lois fondamentales de Vunivers (Paris 1891).

3. John [loan] Sturdza, prince of Moldavia (1822-1828), was the most famous descendant of Alexander Sturdza. Imme- diately after the Greek revolution, Prince John Sturdza took an active part in subduing the roving bands of Greek Hetairists in Moldavia; he transformed the Greek elementary schools into Rumanian schools and laid the foundation for that scientific national development which Prince Michael Sturdza continued after 1834. In 1828 the Russians entered the country and took Prince John prisoner. He died in exile.

4. Alexander [Alexandru] Sturdza (1791-1854), Russian publicist and diplomatist, was a member of the same family, born in Bessarabia and educated in Germany. After entering the Russian diplomatic service, he wrote .Betr&cht-ungen iiber die Lehre und den Geist der orthodoxen Kirche (Leipzig, 1817). His MSmoire sur I' Stat actuel de I'AUemagne, written at the re- quest of the tsar during the congress of Aix-la-Chapelle, was an attack on the German universities, repeated in Coup d'mtt sur les universitSs de I'AUemagne (Aix, 1818). His other important works are La Grece en 1821 (Leipzig, 1822) and CEuvres posl- humes religieuses, historiques, philosophiques et UtUraires (5 vols., Paris, r8s8-i86i).

5. Demetrius [Dimitrie] Sturdza, Rumanian statesman, was born in

1833 at Jassy, and educated there at the Academia Michaileana. He continued his studies in Germany, took part in the political movements of the time, and was private secretary to Prince Cuza. Demetrius afterwards turned against Cuza, joined John Bratianu, and became a member of the so-called Liberal government. In 1899 he was elected leader of the party in succession to Bratianu and was four times prime minister (see Rumania: History). Though a man of great capacity for work, he represented the narrowest nationalism, and through his enmity to all that was " alien " did more than any other man to retard the political and industrial development of the country. He was appointed permanent secretary of the Rumanian Academy, and became a recognized authority on Rumanian numismatics. As secretary of the academy he was instrumental in assisting the publication of the collections of historic docu- ments made by Hurmuzaki (30 vols., Bucharest, 1876-1897), and other acts and documents (Bucharest, 1900 sqq.), besides a number of minor political pamphlets of transitory value. (M. G.)

STURE, an ancient patrician family of Sweden, the most notable members of which were the following: —

1. Sten Gustafsson, commonly called Sten Sture the Elder (1440 ~i 503) . In 1464 he came prominently forward in support of Bishop Kettil Karlsson Vasa in his struggle against Christian I. of Denmark, and showed great ability in winning over the peasants and making soldiers of them. In 1470 we find him in the fore- front of the Swedish national leaders and victorious over both Erik Karlsson Vasa and King Christian himself. After the death of Karl Knutsson, commonly called Charles VIII., Sture was elected regent of Sweden; and from 1470 to 1497 displayed some

of the highest qualities of a statesman. In 147 1 he again defeated Christian I. at the great battle of Brunkebjarg which materially- strengthened his position in Sweden. In 1483 he was obliged to acknowledge Hans of Denmark and Norway as king; but the strife of factions enabled him to hold his own till the arrival of Hans in Sweden in 1497. His position had in the meantime been weakened by a ruinous war with Russia. He succeeded, however, in annexing Oland to Sweden. After the terrible defeat of Hans by the Dithmarschers in 1500 Sture was a second time elected regent, holding that office till his death.

2. Svante Sture (d. 1512) is mentioned as a senator in 1482. He was one of the magnates who facilitated King Hans's conquest of Sweden by his opposition to Sten Sture the Elder. Subse- quently, however, he was reconciled to the latter and succeeded him as regent. He was by no means so imposing a figure as his predecessor, though, like him, Svante in his later years patriotically resisted the Danish claim of sovereignty. He died suddenly at Vesteras Castle.

3. Sten Sture, commonly called Sten Sture the Younger (1492-1520), the son of Svante. After his father's death he was elected regent by the majority of the lesser gentry to the exclusion of the candidate ot the high aristocratic faction, Erik Trolle, whence the inextinguishable hatred of the two families. In 1513 the aged archbishop of Upsala, Jakob Ulfsson, resigned in favour of Gustaf Trolle, son of Erik Trolle, who was elected by the cathedral chapter and recommended to the pope by the regent on condition that the new archbishop should do him homage. Unfortunately these two masterful young men (Trolle was twenty-seven, Sture barely twenty-three), who represented respectively the highest ecclesiastical and the highest civil authority in Sweden, were only too prone to carry on the family feud. On the return of Trolle from Rome he refused to do homage to the regent till all his enemies had been punished, and allied himself with Christian II. of Denmark, who hastened to the archbishop's assistance when Sture besieged Trolle in his strong- hold at Stake (1516). Nevertheless Sture not only defeated Christian II. at Vedla, but took and razed Stake to the ground, and shut up the archbishop in a monastery at Vesteras. A riksmote, or national assembly, held at Stockholm in 1517, declared unanimously that Sweden would never recognize Trolle as archbishop because he had defied the regent and brought the enemy into the land. The war with Denmark was then vigorously resumed. On Midsummer Day 1518 Christian II. appeared before Stockholm with his fleet and landed an army, but was again defeated by Sten Sture at Brankyrka. An attempt of the papal legate Arcimboldus to mediate between the two countries at Arboga (Dec. 1518) failed. In 1520 Christian, with a regular army, and armed with a papal bull excommunicat- ing Sture, again invaded Sweden. The armies clashed near Borgerund on Lake Aarunden (Jan. 19). At the very beginning Sture was hit by a bullet and his peasant levies fled to the wild mountainous regions of Tiveden where they made a last desperate but unsuccessful stand. The mortally-wounded regent took to his sledge and posted towards Stockholm, but expired on the ice of Lake Malar two days later, in his 27th year.

See Sveriges historia, vol. i. (Stockholm, 1877-1878) ; K. O. Arnold- son, Nordens Enhel och Krislian II. (Stockholm, 1899). (R. N. B.)

STURGE, JOSEPH (1793-1859), English philanthropist and politician, was the son of a farmer in Gloucestershire. He was a member of the Society of Friends, and refused, in his business as a corn factor, to deal in grain used in the manufacture of spirits. He went to Birmingham in 1822, where he became an alderman in 1835. He was an active member of the Anti- Slavery Society, and made a tour in the West Indies, publishing on his return an account of slavery as he there saw it in The West Indies in 1837 (London, 1837). After the abolition of slavery, to which, as Lord Brougham acknowledged in the House of Lords, he had largely contributed, Sturge started and gener- ously supported schemes for benefiting the liberated negroes. In 1841 he travelled in the United States with the poet Whittier to examine the slavery question there. On his return to England he gave his support to the ..Chartist movement, and in 1842 was

candidate for Nottingham, but was defeated by John Walter, the proprietor of The Times. He then took up the cause of peace and arbitration, to support which he was influential in the founding of the Morning Star in 1855. The extreme narrow- ness of Sturge's views was shown in his opposition to the Tjuilding of the Birmingham town-hall on account of his conscientious objection to the performance of sacred oratorio. He died at Birmingham on the 14th of May 1859. He married, first, in 1834, Eliza, daughter of James Cropper; and, secondly, in 1846, Hannah, daughter of Barnard Dickinson.

See Henry Richard, Memoirs of Joseph Sturge (London, 1864); John (Viscount) Morley, Life of Richard Cobden (London, 1881).

STURGEON {Acipenser), the name given to a small group of fishes, of which some twenty different species are known, from European, Asiatic and North American rivers. The distinguishing characters of this group, as well as its position in the system, are dealt with in the article Teleostomes. They pass a great part of the year in the sea, but periodically ascend large rivers, some in spring to deposit their spawn, others later in the season for some purpose unknown; only a few of the species are exclusively confined to fresh water. None occur in the tropics or in the southern hemisphere.

Sturgeons are found in the greatest abundance in the rivers of southern Russia, more than ten thousand fish being sometimes caught at a single fishing-station in the fortnight during which the up-stream migration lasts. They occur in less abundance in the fresh waters of North America, where the majority are caught in shallow

portions of the shores of the great lakes. In Russia the fisheries are of immense value. Early in summer the fish migrate into the rivers or towards the shores of freshwater lakes in large shoals for breeding purposes. The ova are very small, and so numerous that one female has been calculated to produce about three millions in one season. The ova of some species have been observed to hatch within a very few days after exclusion. Probably the growth of the young is very rapid, but we do not know how long the fry remain in fresh water before their first migration to the sea. After they have attained maturity their growth appears to be much slower, although continuing for many years. Frederick the Great placed a number of them in the Gorland Lake in Pomer-ania about 1780; some of these were found to be still alive in 1866. Professor von Baer also states, as the result of direct observations made in Russia, that the Hausen (Acipenser huso) attains to an age of from 200 to 300 years. Sturgeons ranging from 8 to 11 ft. in length are by no means scarce, and some species grow to a much larger size.

Sturgeons are ground-feeders. With their projecting wedge- shaped snout they stir up the soft bottom, and by means of their sensitive barbels detect shells, crustaceans and small fishes, on which they feed. Being destitute of teeth, they are unable to seize larger prey.

In countries like England, where few sturgeons are caught, the fish is consumed fresh, the flesh being firmer than that of ordinary fishes, well flavoured, though somewhat oily. The sturgeon is included as a royal fish in an act of King Edward II., although it probably but rarely graces the royal table of the present period, or even that of the lord mayor of London, who can claim all sturgeons caught in the Thames above London Bridge. Where sturgeons are caught in large quantities, as on the rivers of southern Russia and on the great lakes of North America, their flesh is dried, smoked or salted. The ovaries, which are of large size, are prepared for caviare; for this purpose they are beaten with switches, and then pressed through sieves, leaving the membranous and fibrous tissues in the sieve, whilst the eggs are collected in a tub. The quantity of salt added to them before they are finally packed varies with the season, scarcely any being used at the beginning of winter. Finally, one of the best sorts of isinglass is manufactured from the air- bladder. After it has been carefully removed from the body, it is washed in hot water, and cut open in its whole length, to separate the inner membrane, which has a soft consistency, and contains 76%. of glutin.

STURGIS— STURM, J.

The twenty species of sturgeons (Acipenser) are nearly equally divided between the Old and New Worlds. The more important are the following: —

1. The common sturgeon of Europe (Acipenser slurio) occurs on all the coasts of Europe, but is absent in the Black Sea. Almost all the British specimens of sturgeon belong to this species ; it crosses the Atlantic and is not rare on the coasts of North America. It reaches a large size (a length of 12 ft.), but is always caught singly or in pairs, so that it cannot be regarded as a fish of commercial importance. The form of its snout varies with age (as in the other species), being much more blunt and abbreviated in old than in young examples. There are 11-13 bony shields along the back and 29-31 along the side of the body.

2. Acipenser giildenstddtii is one of the most valuable species of the rivers of Russia, where it is known under the name " Ossetr " ; it is said to inhabit the Siberian rivers also, and to range eastwards as far as Lake Baikal. It attains to the same large size as the com- mon sturgeon, and is so abundant in the rivers of the Black and Caspian seas that more than one-fourth of the caviare and isinglass manufactured in Russia is derived from this species.

3. Acipenser stellatus, the " Seuruga " of the Russians, occurs likewise in great abundance in the rivers of the Black Sea and of the Sea of Azoff. It has a remarkably long and pointed snout, like the sterlet, but simple barbels without fringes. Though growing only to about half the size of the preceding species, it is of no less value, its flesh being more highly esteemed, and its caviare and isinglass fetching a higher price. In 1850 it was reported that more than a million of this sturgeon are caught annually.

4. The sturgeon of the great lakes of North America, Acipenser rubicundus, with which, in the opinion of American ichthyologists, the sea-going sturgeon of the rivers of eastern North America, Acipenser maculosus, is identical, has of late years been made the object of a large and profitable industry at various places on Lakes Michigan and Erie; the flesh is smoked after being cut into strips and after a slight pickling in brine; the thin portions and offal are boiled down for oil ; nearly all the caviare is shipped to Europe. One firm alone uses from ten to eighteen thousand sturgeons a year, averaging 50 lb each. The sturgeons of the lakes are unable to migrate to the sea, whilst those below the Falls of Niagara are great wanderers; and it is quite possible that a specimen of this species said to have been obtained from the Firth of Tay was really captured on the coast of

Scotland.

5. Acipenser huso, the " Hausen " of Germany, is recognized by the absence of osseous scutes on the snout and by its flattened, tape-like barbels. It is one of the largest species, reaching the enormous length of 24 ft. and a weight of 2000 lb. It inhabits the Caspian and Black seas, and the Sea of Azoff, whence in former years large shoals of the fish entered the large rivers of Russia and the Danube. But its numbers have been much thinned, and speci- mens of 1200 lb in weight have now become scarce. Its flesh, caviare and air-bladder are of less value than those of the smaller kinds.

6. The sterlet (Acipenser ruthenus) is one of the smaller species, which likewise inhabits both the Black and Caspian seas, and ascends rivers to a greater distance from the sea than any of the other sturgeons; thus, for instance, it is not uncommon in the Danube at Vienna, but specimens have been caught as high up as Ratisbon and Ulm. It is more abundant in the rivers of Russia, where it is held in high esteem on account of its excellent flesh, contributing also to the best kinds of caviare and isinglass. As early as the 18th century attempts were made to introduce this

valuable fish into Prussia and Sweden, but without success. The sterlet is distinguished from the other European species by its long and narrow snout and fringed barbels. It rarely exceeds a length ot 3 ft.

The family Acipenseridae includes one other jjenus, Scaphirhynchus, the shovel-head or shovel-nosed sturgeon, distinguished by the long, broad and flat snout, the suppression of the spiracles, and the union of the longitudinal rows of scales posteriorly. All the species are confined to fresh water. One of them is common in the Mississippi and other rivers of North America, the other three occur in the larger rivers of eastern Asia.

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STURGIS, RUSSELL (1836-1909), American architect and art critic, was born in Baltimore county, Maryland, on the 16th of October 1836. He graduated from the Free Academy in New York (now the College of the City of New York) in 1856, and studied architecture under Leopold Eidlitz and then for two years in Munich. In 1862 he returned to the United States. He designed the Yale University chapel and the Farnham and Durfee dormitories at Yale, the Flower Hospital, the Farmers' and Mechanics' Bank of Albany, and many

other buildings, but did comparatively little professional work after 1880. He was in Europe in 1880-1884; and for a short time after his return was secretary of the New York Municipal Civil Service Board. He was president of the Architectural League of New York in 1880-1893, was first president of the Fine Arts Federation in 1895-1897, and was a member of the National Society of Mural Painters, the National Sculpture Society, the National Academy of Design, and the New York chapter of the American Institute of Architects. He lectured on art at Columbia University, the Metropolitan Museum of Art in New York, the Peabody Institute of Baltimore and the Art Institute of Chicago; his lectures in Chicago being published under the title The Interdependence of the Arts of Design (1905). He is best known as a writer on art and architecture. He edited A Dictionary of Architecture and Building (3 vols., 1901-1902) and the English version of Wiihelm Luebke's Outlines of the History of Art (2 vols., 1904), and he wrote European Architecture (1896), How to Judge Architecture (1903), The Appreciation of Sculpture (1904), The Appreciation of Pictures (1905), A Study of the Artist's Way of Working in the Various Handicrafts and Arts of Design (2 vols., 1905), and an unfinished History of Architecture (1906 sqq.). During his last years he was nearly blind. He died in New York on the nth of February 1909.

STURM, JACQUES CHARLES FRANCOIS (1803-1855), French mathematician, of German extraction, was born at Geneva on the 29th of September 1803. Originally tutor to the son of Mme de Stael, he resolved, with his schoolfellow Colladon, to try his fortune in Paris, and obtained employment on the Bulletin universel. In 1829 he discovered the theorem, regarding the determination of the number of real roots of a numerical equation included between given limits, which bears his name (see Equation, V.), and in the following year he was appointed professor of mathematics at the College Rollin. He was chosen a member of the Academie des Sciences in 1836, became " repetiteur " in 1838, and in 1840 professor in the Ecole Poly technique, and finally succeeded S. D. Poisson in the chair of mechanics in the Faculte des Sciences at Paris. His works, Cours d'analyse de I'ecole polytechnique (1857-1863) and Cours de micanique de Vicole polytechnique (1861), were published after his death at Paris on the 18th of December 1855.

STURM, JULIUS (1816-1896), German poet, was born at

Kostritz in the principality of Reuss on the 21st of July 1816. He studied theology at Jena from 1837 to 1 84 1, and was ap- pointed preceptor to the here- ditary prince Henry XIV. of Reuss. In 1851 he

became pas- tor of Goschitz near Schleiz, and in 1857 at his native village of Kostritz. In 1885 he retired with the title of Geheimkirchen- rat. He died at Leipzig on the 2nd of May 1896. Sturm was a writer of lyrics and sonnets and of church poetry, breathing a spirit of deep piety and patriotism.

His religious poems were published in Fromtne Lieder (pt. i., Leipzig, 1852; 12th ed., 1893; pt. ii., 1858; pt. iii., 1892), Zwei Rosen, oder das hohe Lied der Liebe (Leipzig, 1854; 2nd ed., 1892), Israelitische Lieder (3rd ed., Halle, 1881) and Palme und Krone (Leipzig, 1888). His chief lyrics were issued in Gedichte (6th ed., Leipzig, 1892), Neue Gedichte (2nd ed., Leipzig, 1880), Lieder und Bilder (2nd ed., 1892), Kampf- und Siegergedichte (Halle, 1870),

Ntue Litder (1880, 2nd ed., 1888), Neue lyriscke Gedichie (Leipzig, 1894) and In Freud und Leid, letzte Lieder (1896).

See A. Hepding, Julius Sturm (Giessen, 1896); F. Hoffmann, Julius Sturm (Hamburg, 1898).

STURM VON STURMECK, JACOB (1489-1553), German statesman and reformer, was born at Strassburg, where his father, Martin Sturm, was a person of some importance, on the 10th of August 1489., He was educated at the universities of Heidelberg and Freiburg, and about 151,7 he entered the service of Henry, provost of Strassburg (d. 1552), a member of the Wittels- bach family. He soon became an adherent of the reformed doctrines, and leaving the service of the provost became a member of the governing body of his native city in 1524. He was responsible for the policy of Strassburg during the Peasants' War; represented the city at the Diet of Spires in 1526; and at subsequent Diets gained fame by his ardent championship of it6 interests. As an advocate of union among the Protestants he took part in the conference at Marburg in 1529; but when the attempts to close the breach between Lutherans and Zwinglians failed, he presented the Confessio tetrapolitana, a Zwinglian document, to the Augsburg Diet of 1530. As the representative of Strassburg Sturm signed the " protest " which was presented to the Diet of Spires in 1529, being thus one of the original " Protestants." He was on friendly terms with Philip, land- grave of Hesse. Owing largely to his influence Strassburg joined the league of Schmalkalden in 1531. The troops of Strassburg took the field when

the league attacked Charles V. in 1546; but in February 1547 the citizens were compelled to submit, when Sturm succeeded in securing very favourable terms from the emperor. He was also able to obtain for his native city some modification of the Interim issued from Augs- burg in May 1548. Sturm is said to have been in the pay of Francis I. of France, but this seems very unlikely, He founded the Bibliothek and a gymnasium in Strassburg, where he died on the 30th of October 1553.*

See H. Baumgarten, Jakob Sturm (Strassburg, 1876) ; A. Baum, Magistrat und Reformation in Strassburg bis i^3Q (Strassburg, '887); J. Rathgeber, Strassburg im 16 Jahrhundert (Stuttgart, 1871); O. Winckelmann, "Jakob Sturm," in the Allgemeine deutsche Biographic, Bd. xxxvii. (Leipzig, 1894); and Johannes Sturm, Consolatio ad senatum argentinensem de morte . . . Jacobi Sturmii (Strassburg, 1553).

STURT, CHARLES (d. 1869), English explorer in New South Wales and in South Australia, was born in England, and entered the army, reaching the rank of captain. Having landed in Australia with his regiment (the 39th), he became interested in the geographical problems which were exciting attention. A first expedition (1828) led to the discovery of the Darling river; and a second, from which the explorer returned almost blind, made known the existence of Lake Alexandrina. From his third journey (1844-1845), in which terrible hardships had to be endured, he returned quite blind, and he never altogether recovered his sight. He was appointed surveyor-general of South Australia in 1833, and subsequently chief secretary, which position he held until 1856 when responsible government was introduced, and Captain Sturt retired on a pension and went to live at Cheltenham, England, where he died on the 16th of June 1869, before he could be invested with the dignity of K.C.M.G. to which he had been designated.

STUTTGART, a city of Germany, capital of the kingdom of Wiirttemberg. It lies in a basin watered by the Nesenbach just above its confluence with the Neckar, 115 m. N.W. from Munich, and at the centre of a network of railways placing it in direct communication with all the principal towns of south Germany. Pop. (1905), 249,443, of whom about one-half reside in the suburbs of Cannstatt, Berg, Gaisburg, Gablenburg and others. Charmingly situated among vine-clad and wooded hills, Stuttgart stands at a height of nearly 900 ft. above the sea and enjoys a healthy climate. It is intersected from south- west to north-east by the long and handsome Konigsstrasse, dividing it into an upper and a lower town.

In all its main features it is essentially a modern town, and few of its principal buildings are older than the 19th century. Many of them,

however, are of considerable architectural importance and the revival of the Renaissance style is perhaps illustrated nowhere better than in Stuttgart. The lower, or south-eastern, part contains both the small group of streets belonging to old Stutt- gart, and also the most important part of the new town. Of the numerous churches in the city the most interesting are the Stiftskirche, with two towers, a fine specimen of 15th-century Gothic; the Leonhardskirche, also a Gothic building of the 15th century; the Hospitalkirche, restored in 1841, the cloisters of which contain the tomb of Johann Reuchlin; the fine modern Gothic church of St John; the new Roman Catholic church of St Nicholas; the Friedenskirche; and the English church. A large proportion of the most prominent buildings are clustered round the spacious Schlossplatz, with its fine promenades. Among these are the new palace, an imposing structure of the 18th century, finished in 1807; the old palace, a 16th-century building, with a picturesque arcaded court; the Konigsbau, a huge modern building with a fine colonnade, containing ball and concert rooms; the so-called Akademie, formerly the seat of the Karlschule, where Schiller received part of his education, and now containing the royal library; and the court theatre, destroyed by fire in 1902, and subsequently rebuilt. In the centre of the Schlossplatz is the lofty jubilee column, erected in 1 841 in memory of the king of Wiirttemberg, William I., and in the courtyard of the old palace is a bronze equestrian statue of Duke Eberhard the Bearded. On or near the Schloss- platz also are the new courts of justice; the Wilhelmspalast and the palace of the crown prince; the large royal stables; the new post office; and the central railway station, one of the handsomest structures of the kind in Germany. The city contains a fine statue of Schiller, designed by Thorvaldsen; a bronze statue of Christopher, duke of Wiirttemberg; a monu- ment to the emperor William I.; an equestrian statue of King William I. in the court of the museum of the plastic arts; and a large monumental fountain in the Eugensplatte. Other prominent buildings are: the Queen Olga buildings, erected in 1893-1895 in the Renaissance style; the national industrial museum (1800-1896) in the late Renaissance style, flanked by two cupola-crowned towers and decorated with medallions of famous Swabians; the magnificent new town-hall; and the railway viaduct across the valley of the Neckar, 740 yds. long.

The art collections of Stuttgart are numerous and valuable. The museum of art comprises a picture gallery, a collection of casts of Thorvaldsen's works and a cabinet of engravings. The royal library

contains about 400,000 printed volumes, including one of the largest collections of Bibles in the world, and also about 20,000 MSS., many of great rarity. To these may be added the industrial museum, the cabinet of coins, the museum of natural history, the collection of majolica vases in the new palace, and the Wiirttemberg museum of antiquities. The city also contains numerous excellent educational establish- ments, although the state university is not here but at Tubingen, and its conservatorium of music has long been renowned. The technical high school, which since 1899 has possessed the right to confer the degree of doctor of engineering, practically enjoys academic status and so do the veterinary high school and the school of art.

Stuttgart is the centre of the publishing trade of south Germany, and it has busy industries in everything connected with the production of books. Its other manufactures include machinery, pianos and other musical instruments, cotton goods, cigars, furniture, leather, paper, colours and chemicals. Its trade also in books, hops, horses, and cloth is considerable, and a large banking and exchange business is done here. The beauty of its situation and its educational advantages attract numerous foreign residents, especially English and American. Stuttgart is the headquarters of the XIII. corps of the German army, and contains a fairly large garrison for which accommodation is provided in the extensive barracks in and around the city. To the north-east of the new palace lies the beautiful palace park, embellished with statuary and artificial sheets of water, and extending nearly all the way to Cannstatt, a distance of

over two miles. Cannstatt, which was incorporated with Stutt- gart in 1903, attracts numerous visitors owing to its beautiful situation on the Neckar and its saline and chalybeate springs. In the environs o£ Stuttgart and Cannstatt lie Rosenstein, Wilhelma and other residences of the royal family of Wiirt- temberg.

Stuttgart seems to have originated in a stud (Stuten Garten) of the early counts of Wurttemberg, and is first mentioned in a document of 1229. Its importance, however, is of comparatively modern growth and in the early history of Wurttemberg it was overshadowed by Cannstatt, the central situation of which on the Neckar seemed to mark it out as the natural capital of the country. After the destruction of the castle of Wurttemberg early in the 14th century,

Count Eberhard transferred his residence to Stuttgart, which about 1500 became the recognized capital of Wurttemberg. But even as capital its growth was slow. At the beginning of the 19th century it did not contain 20,000 inhabitants, and its real advance began with the reigns of Kings Frederick and William I., who exerted themselves in every way to improve and beautify it. In 1849 Stuttgart was the place of meeting of the assembly called the Rumpfparlamenl.

See Pfaff, Geschichte der Stadt Stuttgart (2 vols., Stuttgart, 1845-1847); Wochner, Stuttgart sett 25 Jahren (Stuttgart, 1871); Seytter, Unser Stuttgart, Geschichte, Sage und Kullur (Stuttgart, 1903); J. Hartmann, Chronik der Stadt Stuttgart (Stuttgart, 1886) ; Barth, Stuttgarter Handel in alter Zeit (Stuttgart, 1896) ; Widmann, Wander- ung durch Stuttgart und Umgebung (Stuttgart, 1 896); M. Bach, Stuttgarter Kunst 1794-1860 (Stuttgart, 1900); Weinberg, Fuhrer durch die Haupt- und Residenzstadt Stuttgart (Stuttgart, 1906) ; M. Bach and C. Lotter, Bilder aus Alt-Stuttgart (Stuttgart, 1896); and the official Chronik der Haupt- und Residenzstadt Stuttgart (1898, seq.).

STUYVESANT, PETER (1592-1672), Dutch colonial governor, was born in Scherpenzeel, in southern Friesland, in 1592, the son of a minister. He studied at Franeker, entered the military service in the West Indies about 1625, and was director of the West India Company's colony of Curacao from 1634 to 1644. In April 1644 he attacked the Portuguese island of Saint Martin and was wounded; he had to return to Holland, and there one of his legs was amputated. Thereafter he wore a wooden leg ornamented with silver bands. In May 1645 he was selected by the West India Company to supersede William Kieft as director of New Netherland. He arrived in New Amsterdam (later New York) on the nth of May 1647, and was received with great enthusiasm. In response to the demand for self-govern- ment, in September 1647 he and the council appointed- — after the manner then followed in Holland — from eighteen repre- sentatives chosen by the people a board of nine to confer with him and the council whenever he thought it expedient to ask their advice; three of the nine, selected in rotation, were per- mitted to sit with the council during the trial of civil cases; and six were to retire each year, their successors to be chosen by the director and council from twelve candidates nominated by the board. The leading burghers were, however, soon alienated by his violent and despotic methods, by his defence of Kieft, and by his devotion to the interests of the company; the nine men became (as early as 1649, when they sent the famous Vertoogh, or Remonstrance, to the states-general asking for burgher government and other reforms) the centre of municipal

discontent; and a bitter quarrel ensued. In 1650 the states- general suggested a representative government to go into effect in 1653, but the company opposed it; in 1653, however, there was established the first municipal government for the city of New Amsterdam modelled after that of the cities of Holland. Stuyvesant also aroused opposition through his efforts. to increase the revenues of the company, to improve the system of defence, and to prevent the sale of liquor and firearms to the Indians, and through his persecution of Lutherans and Quakers, to which the company finally put an end. He had a bitter controversy with the patroon of Rensselaerwyck, who claimed to be inde- pendent of the West India Company. In 1647 he seized a Dutch ship illegally trading at New Haven and claimed juris- diction as far as Cape Cod; the New Haven authorities refused

to deliver to him fugitives from justice in Manhattan, he retali- ated by offering refuge to runaways from New Haven; but finally he offered pardon to the Dutch fugitives and revoked his pro- clamation. In September 1650 he came to an agreement With the commissioners of the United Colonies of New England at Hartford upon the boundary between New Netherland and Connecticut, involving the sacrifice of a large amount of territory, the new boundary crossing Long Island from the west side of Oyster Bay to the Atlantic Ocean, and on the mainland north from a point west of Greenwich Bay, 4 m. from Stamford. On Long Island, during Stuyvesant's rule, Dutch influence was ' gradually undermined by John Underhill. Stuyvesant's deal- ings with the Swedes were more successful. With a force of seven hundred men he sailed into the Delaware in 1655, captured Fort Casimir (Newcastle) — which Stuyvesant had built in 16 51 and which the Swedes had taken in 1654— and overthrew the Swedish authority in that region. He also vigorously suppressed Indian uprisings in 1655, 1658 and 1663. In March 1664 Charles II. granted to his brother, the duke of York, the territory between the Connecticut river and Delaware Bay, and Colonel Richard Nicolls with a fleet of four ships and about three or four hundred men was sent out to take possession. Misled by instructions from Holland that the expedition was directed wholly against New England, Stuyvesant made no preparation for defence until just before the fleet arrived. As the burghers refused to support him, Stuyvesant was compelled to surrender the town and fort on the 8th of September. He returned to Holland in 1665 and was made a scapegoat by the West India Company for all its failings in New Amsterdam; he went back to New York again after the treaty of Breda in 1667, having secured the right of free trade between Holland and New York. He spent the remainder of his life on his farm called the Bouwerie, from which the

present " Bowery " in New York City takes its name. He died in February 1672, and was buried in a chapel, on the site of which in 1799 was erected St Mark's Church.

See Bayard Tuckerman, Peter Stuyvesant (New York, 1893), in the " Makers of America " Series; and Mrs Schuyler Van Rensselaer, History of the City of New York in the Seventeenth Century (2 vols., New York, 1909).

STY, an enclosed place or pen to keep pigs in. The word means properly a pen or enclosure for any domestic animal, as is seen from its occurrence in Scandinavian languages and in German, e.g. Swed. and Icel. stia, penˆ gasstia, goose-pen, swinstia, pig-sty, Ger. Steige, hen-coop, Schweinsteige, pig-sty. It is usual to refer the word to stigan, to climb, which would connect it with stair and stile and with the Gr. crtixeiv- Some take the original meaning to be an enclosure raised on steps, others, in view of the Gr. arolxos, row, would take the basic sense to be a row of pales or stakes forming a pen or enclosure; cf. the use of arotxos for poles supporting nets to catch game in (Xen. Cyn. 6. ro). If the derivation from stigan is correct, the word is the same as that meaning a small inflamed swelling, tumour or abscess on the eyelid, the Old English word for which was stigend, i.e. short for stigend edge, a rising or swelling eye, hence in M. Eng. styang, taken as equivalent to "sty on eye."

STYLE (from Gr.

STYLE, in literature a term which may be defined as language regarded from the point of view of the characteristics which it

reveals; similarly, by analogy, in other arts, a mode or method of working characterized by distinctive features. The word (which is different from that used in architecture, see above) is derived from the instrument stilus (wrongly spelled stylus), of metal, wood or ivory, by means of which, in classic times, letters and words were imprinted upon waxen tablets. By the transition of thought known as metonymy the word has been transferred from the object which makes the impression to the sentences which are impressed by it, and a mechanical observa- tion has become an intellectual conception. To " turn the stylus " was to correct what had been written by the sharp end of the tool, by a judicious application of the blunt end,

and this responds to that discipline and self-criticism upon which literary excellence depends. The energy of a deliberate writer would make a firm and full impression when he wielded the stylus. A scribe of rapid and fugitive habit would press more irregularly and produce a less consistent text. The varieties of writing induced by these differences of temperament would reveal the nature of the writer, yet they would be attributed, and with justice, to the implement which immediately produced them. Thus it would be natural for any one who examined several tablets of wax to say, "The writers of these inscrip- tions are revealed by their stylus " ; in other words, the style or impression of the implement is the medium by which the temperament is transferred to the written speech.

If we follow this analogy, the famous phrase of Buffon becomes at once not merely intelligible but luminous — "■ le style est l'homme m£me." This axiom is constantly misquoted ("le style c'est l'homme "), and not infrequently miscomprehended. It is usual to interpret it as meaning that the style of a writer is that writer's self, that it reveals the essence of his individuality. That is true, and the statement of it is useful. But it is probably not the meaning, or at least not the original meaning, that Buffon had in mind. It should be recollected that Buffon was a zoolo- gist, and that the phrase occurs in the course of his great Natural History. He was considering man in the abstract, and differ- entiating him from other genera of the animal kingdom. Hence, no doubt, he remarked that " style was man himself," not as every reviewer repeats the sentence to-day, " the man." He meant that style, in the variety and elaboration of it, distinguished the language of man {Homo sapiens) from the monotonous roar of the lion or the limited gamut of the bird. Buffon was engaged with biological, not with aesthetic ideas.

Nevertheless, the usual interpretation given to the phrase " le style est l'homme meme " may be accepted as true and valuable. According to an Arab legend King Solomon inquired of a djinn, " What is language? " and received the answer, " a wind that passes." " But how," continued the wisest of men, " can it be held?" " By one art only," replied the djinn, " by the art of writing." It may be well to follow a little closely the processes of this art of writing. A human being in the artless condition, in whom, that is to say, the conception of personal expression has not been formed, uses written language to state primitive and general matters of fact. He writes, " The sea is rough to-day; the wind is cold." In these statements there is some observation, but as yet no personal note. We read them without being able to form the very smallest conjecture as to the character or condition of the writer. From these bald and plain words we may rise

in degree until we reach Victor Hugo's celebrated parallel of the ocean with the genius of Shakespeare, where every phrase is singular and elaborate, and every element of expression redolent of Victor Hugo, but of no other person who ever lived. Another example, in its own way still more striking, is found in comparison of the famous paragraph which occurs in the Cyrus-Garden (1658) of Sir Thomas Browne. A primitive person would say, "But it is time to go to bed"; this statement is drawn out by Browne into the wonderful page beginning, " But the quincunx of Heaven runs low," and collects around it as it proceeds on its voluptuous course the five ports of knowledge, cables of cobwebs, the bed of Cleopatra, the ghost of a rose, the huntsmen of Persia, and a dozen other examples of prolific and ornamented style. In its final form

it is so fully characteristic of its author that it may be justly said that the passage is Browne himself.

It follows from what has just been said that style appeals exclusively to those who read with attention and for the pleasure of reading. It is not even perceived by those who read primarily for information, and these form the great majority of readers. Even these have a glimmering impression that we must not live by bread alone; that the human heart, with its imagination, its curiosity and sensitiveness, cannot be satisfied by bald state- ments of fact delivered on the printed page as messages are shouted along the telephone. This instinct it is which renders the untaught liable to fall into those errors of false style to which we shall presently call attention. In the untrained there yet exists a craving for beauty, and the misfortune is that this craving is too easily met by gaudy rhetoric and vain repetitions. The effect on the nature of a human being which is produced by reading or listening to a book, or a passage from a book, which that being greatly admires, is often so violent as to resemble a physical shock to the nerves. It causes a spasm of emotion, which is betrayed by tears or laughter or a heightened pulse. This effect could not be produced by a statement of the fact conveyed in language, but is the result of the manner in which that fact is presented. In other words, it is the style which appeals so vividly to the physical and moral system of the reader — not the fact, but the ornament of the fact. That this emotion may be, and often is, caused by bad style, by the mere tinsel of rhetoric and jangle of alliteration, is not to the point The important matter is that it is caused by style, whether good or bad. Those juvenile ardours and audacities of expression which so often amuse the wise man and exasperate the pedant are but the effects of style acting on a fervid and unripe imagination. The deep delight with which a grown man of

experience reads Milton or Dante is but the same phenomenon produced in different conditions.

It is, however, desirable at the outset of an inquiry into the elements of style to insist on the dangers of a heresy which found audacious expression towards the close of the 19th century, namely, that style is superior to thought and independent of it. Against this may be set at once another of the splendid apo- thegms of Buffon, " Les idees seules forment le fond du style." Before there can be style, therefore, there must be thought, clearness of knowledge, precise experience, sanity of reasoning power. It is difficult to allow that there can be style where there is no thought, the beauty even of some poems, the sequence of words in which is intentionally devoid of meaning, being preserved by the characteristics of the metre, the rhymes, the assonances, all which are, in their degree, intellectual in character. A confusion between form and matter has often confused this branch of our theme. Even Flaubert, than whom no man ever gave closer attention to the question of style, seems to dislocate them. For him the form was the work itself: " As in living creatures, the blood, nourishing the body, determines its very contour and external aspect, just so, to his mind, the matter, the basis, is a work of art, imposed, necessarily, the unique, the just expression, the measure, the rhythm, the form in all its characteristics." This ingenious definition seems to strain language beyond its natural limits. If the adventures of an ordinary young man in Paris be the matter of L'Uducalion senti- mentale it is not easy to admit that they " imposed, necessarily," such a " unique " treatment of them as Flaubert so superlatively gave. They might have been recounted with feebler rhythm by an inferior novelist, with bad rhythm by a bad novelist and with no rhythm at all by a police-news reporter. What makes that book 2. masterpiece is not the basis of adventure, but the superstructure of expression. The expression, however, could not have been built up on no basis at all, and would have fallen short of Flaubert's aim if it had risen on an inadequate basis. The perfect union is that between adequate matter and an adequate form. We will borrow from the history of English literature an example which may serve to illuminate this point. Locke has no appreciable style; he has only thoughts. Berkeley has thoughts which are as valuable as those of Locke, and he

has an exquisite style as well. From the artist's point of view,

therefore, we are justified in giving the higher place to Berkeley, but in doing this we must not deny the importance of Locke. If we compare him with some pseudo-philosopher, whose style is highly ornamental but whose thoughts are valueless, we see that Locke greatly prevails. Yet we need not pretend that he rises to an equal height with Berkeley, in whom the basis is no less solid, and where the superstructure of style adds an emotional and aesthetic importance to which Locke's plain speech is a stranger. At the same time, an abstract style, such as that of Pascal, may often give extreme pleasure, in spite of its absence of ornament, by its precise and pure definition of ideas and by the just mental impression it supplies of its writer's distinguished vivacity of mind. The abstract or concrete style, moreover, what Rossetti called " fundamental brain-work," must always have a leading place.

When full justice has been done to the necessity of thought as the basis of style, it remains true that what is visible, so to speak, to the naked eye, what can be analysed and described, is an artistic arrangement of words. Language is so used as to awaken impressions of touch, taste, odour and hearing, and these are roused in a way peculiar to the genius of the individual who brings them forth. The personal aspect of style is therefore indispensable, and is not to be ignored even by those who are most rigid in their objection to mere ornament. Ornament in itself is no more style than facts, as such, constitute thought. In an excellent style there is an effect upon our senses of the mental force of the man who employs it. We discover himself in what he writes, as it was excellently said of Chateaubriand that it was into his phrases that he put his heart; again, D'Alem- bert said of Fontenelle that he had the style of his thought, like all good authors. In the words of Schopenhauer, style is the physiognomy of the soul. All these attempts at epigrammatic definition tend to show the sense that language ought to be, and even unconsciously is, the mental picture of the man who writes.

To attain this, however, the writer must be sincere, original and highly trained. He must be highly trained, because, without the exercise of clearness of knowledge, precise experience and the habit of expression, he will not be able to produce his soul in language. It will, at best, be perceived as through a glass, darkly. Nor can anyone who desires to write consistently and well, afford to neglect the laborious discipline which excel- lence entails. He must not be satisfied with his first sprightly periods; he must polish them, and then polish them again. He must never rest until he has attained a consummate adaptation of his language to his subject, of his words to his emotion. This is the most difficult aim which the writer can put

before him, and it is a light that flits ever onward as he approaches. Perf ec- tion is impossible, and yet he must never desist from pursuing perfection. In this connexion the famous tirade of Tamburlaine in Marlowe's tragedy cannot be meditated upon too carefully, for it contains the finest definition which has been given in any language of style as the unapproachable fen-fire of the mind: — " If all the pens that poets ever held Had fed the feeling of their master's thoughts, And every sweetness that inspired their hearts, Their minds, and muses, on admired themes — If all the heavenly quintessence they 'still From their immortal flowers of poesy, Wherein, as in a mirror, we perceive The highest reaches of a human wit — If those had made one poem's period, And all combined in beauty's worthiness, Yet should there hover in our restless heads One thought, one grace, one wonder, at the least. Which into words no virtue can digest."

Flaubert believed that every thougnt or grace or wonder had one word or phrase exactly adapted to express it, and could be " digested " by no other without loss of clearness and beauty. It was the passion of his life, and the, despair of it, to search for this unique phrase in each individual case. Perhaps in this research after style he went too far, losing something of that simplicity and inevitability which is the charm of natural writing, xxv. 34

It is boasted by the admirers of Flaubert that his style is an enamel, and those who say this perhaps forget that the beauty of an enamel resides wholly in its surface and not at all in the substance below it. This is the danger which lies in wait for those who consider too exquisitely the value and arrangement of their words. Their style becomes too glossy, too highly varnished, and attracts too much attention to itself. The greatest writing is that which in its magnificent spontaneity carries the reader with it in its flight; that which detains him to admire itself can never rise above the second place. Forgetfulness of self, absence of conceit and affectation, simph'city in the sense not of thinness or poorness but of genuineness — these are elements essentia] to the cultivation of a noble style. Here again, thought must be the basis, not vanity or the desire to astonish. We do not escape by our ingenuities from the firm principle of Horace, " scribendi recti sapere est et principium et fons."

In speaking of originality in style it must not be forgotten that memory exercises a strong and often an insidious effect upon writing. That which has been greatly admired will have a tendency to impregnate the mind, and its echo, or, what is worse, its cadence, will be unconsciously repeated. The clicks is the greatest danger

which lies in wait for the vapid modern author, who is tempted to adopt, instead of the one fresh form which suits his special thought, a word or even a chain of words, which conventionally represents it. Thus " the devouring element " was once a striking variant for the short word " fire," and a dangerous hidden place was once well described as " a veritable death-trap," but these have long been cliches which can only be used by writers who are insincere or languid. Worse than these are continuous phrases, and even sentences, such as are met with in the leaders of daily newspapers, which might be lifted bodily from their places and inserted elsewhere, so completely have they lost all vitality and reality.

With regard to the training which those who wish to write well should resign themselves to undergo, there is some difference of opinion, based upon difference of temperament. There are those who believe that the gift of style is inborn, and will reveal itself at the moment of mental maturity without any external help. There are others who hold that no amount of labour is excessive, if it be directed to a study and an emulation of what are called " the best models." No doubt these theories are both admissible. If a man is not born to write well, no toil in the imitation of Addison or Ruskin will make his style a brilliant one; and a born writer will express himself with exactitude and fire even though he be but an idle student of the classics. Yet, on the other hand, the very large number of persons who have a certain aptitude for writing, yet no strong native gift, will undoubtedly cure themselves of faults and achieve skill and smoothness by the study of those writers who have most kinship with themselves. To be of any service, however, it seems that those writers must have used the same language as their pupils. Of the imitation of the ancients much has been written, even to the extent of the publication of manuals. But what is that imitation of the verse of Homer which leads to- day to Chapman and to-morrow to Pope ? What the effect of the study of the prose of Theophrastus which results in the prose of Addison? The good poet or prose-man, however closely he studies an admirable foreign model, is really anxious to say something which has never before been said in his own language. The stimulus which he receives from any foreign predecessor must be in the direction of analogous or parallel effort, not in that of imitation.

The importance of words, indeed, is exemplified, if we regard it closely, in this very question, so constantly mooted, of the imitation of the ancients, by the loss of beauty fatally felt in a bad translation. The vocabulary of a great writer has been, as Pater says, " winnowed "; it is impossible to think of Sophocles or of Horace as using a word

which is not the best possible for introduction at that particular point. But the translator has to interpret the ideas of these ancient writers into a vocabulary which is entirely different from theirs, and unless he has a genius of almos eaual impeccability he will undo the winnowing work.*

He will scatter chaff and refuse over the pure grain which the classic poet's genius had so completely fanned and freed. The employment of vague and loose terms where the original author has been eclectic, and of a flood of verbiage where he has been frugal, destroys all semblance of style, although the meaning may be correctly preserved.

The errors principally to be avoided in the cultivation of a pure style are confusion, obscurity, incorrectness and affectation. To take the earliest of these first, no fault is so likely to be made by an impetuous beginner as a mingling together of ideas, images, propositions which are not on the same plane or have no proper relation. This is that mass of " stunning sounds and voices all confused " which Milton deprecates. One of the first lessons to be learned in the art of good writing is to avoid perplexity and fatigue in the mind of the reader by retaining clearness and order in all the segments of a paragraph, as well as propriety of grammar and metaphor in every phrase. Those who have overcome this initial difficulty, and have learned to avoid a jumble of misrelated thoughts and sentences, may nevertheless sin by falling into obscurity, which, indeed, is sometimes a wilful error and arises from a desire to cover poverty of thought by a semblance of profundity. The meaning of " obscurity " is, of course, in the first instance " darkness," but in speaking of literature it is used of a darkness which arises from unintelligi- bility, not from depth of expression, but from cloudiness and fogginess of idea.

Of the errors of style which are the consequences of bad taste, it is difficult to speak except in an entirely empirical spirit, because of the absence of any absolute standard of beauty by which artistic products can be judged. That kind of writing which in its own age is extravagantly cultivated and admired may, in the next age, be as violently repudiated; this does not preclude the possibility of its recovering critical if not popular favour. Perhaps the most

remarkable instance of this is the revolution made against the cold and stately Ciceronian prose of the middle of the 16th century by the so-called Euphuists. This occurred almost simultaneously in several nations, but has been traced to its sources in the Spanish of Guevara and in his English imitators, North and Pettie, whom Lyly in his turn followed with his celebrated Euphues. Along with these may not unfairly be mentioned Montaigne in France and Castiglione in Italy, for, although these men were not proficients in Guevara's artificial manner, his estilo alto, still, by their easiness and bright- ness, their use of vivid imagery and their graceful illumination, they marked the universal revulsion against the Ciceronian stiff- ness. Each of these new manners of writing fell almost immedi- ately into desuetude, and the precise and classic mode of writing in another form came into vogue (Addison, Bossuet, Vico, Johnson). But what was best in the ornamental writers of the 1 6th century is now once more fully appreciated, if not indeed admired to excess. A facility in bringing up before the memory incessant analogous metaphors is the property, not merely of certain men, but of certain ages; it flourished in the age of Marino and is welcomed again in that of Meredith. A vivid, con- crete style, full of colour and images, is not to be condemned because it is not an abstract style, scholastic and systematic. It is to be judged on its own merits and by its own laws. It may be good or bad; it is not bad merely because it is meta- phorical and ornate. The amazing errors which lie strewn along the shore of criticism bear evidence to the lack of sympathy which has not perceived this axiom and has wrecked the credit of dogmatists. To De Quincey, a convinced Ciceronian, the style of Keats " belonged essentially to the vilest collections of wax- work filagree or gilt gingerbread "; but to read such a judgment is to encourage a question whether all discussion of style is not futile. Yet that particular species of affectation which en- courages untruth, affectation, parade for the mere purpose of producing an effect, must be wrong, even though Cicero be guilty of it.

The use of the word " style," in the sense of the present remarks, is not entirely modern. For example, the early English critic Puttenham says that " style is a constant and continual

phrase or tenour of speaking and writing " (1585). But it 172? in France and in the great age of Louis XIV. that the aft of writing began to be carefully studied and ingeniously described. Mme de Sevigne, herself mistress of a manner exquisitely dis- posed to reflect her vivacious, tender and eloquent character, is particularly fond of using the word " style " in its modern sense, as the expression of a complete and rich personality. She says, in a phrase which might

stand alone as a text on the subject, " Ne quittez jamais le naturel, votre tour s'y est form£, et cela compose un style parfait." Her contemporary, Boileau, contributed much to the study, and spoke with just pride of " mon style, ami de la lumiere." The expression to form one's style, a se faire un style, appears, perhaps for the first time, in the works of the abbe d'Olivet (1682-1768), who was addicted to rhetorical speculation. Two great supporters of the pure art of writing, Swift and Voltaire, contributed much to the study of style in the 1 8th century. The former declared that " proper words in proper places make the true definition of a style "; the latter, mere particularly, that " le style rend singulieres les choses les plus communs, fortifie les plus faibles, donne de la grandeur aux plus simples." Voltaire speaks of " le melange des styles " as a great fault of the age in which he lived; it has come to be looked upon as a principal merit of that in which we live.

The problem of how to obtain a style has frequently been treated in works of more or less ephemeral character. In France the treatises of M. Albalat have received a certain amount of official recognition, and may be mentioned here as containing a good deal cf sound advice mixed with much that is jejune and pedagogic. If M. Albalat distributes a poison, the antidote is supplied by the wit of M. Remy de Gourmont; the one should not be imbibed without the other.

See Walter Pater, An Essay on Style (London, 1889); Walter Raleigh, Style (London, 1897); Antoine Albalat, L'Art d'ecrire enseigni en vingt legons (Paris, 1898), and De la Formation du style par V assimilation des auteurs (Paris, 1901); Remy de Gourmont, Le Probleme du style (Paris, 1902). Also Coyer-Linguet, Le Genie de la langue francaise (Paris, 1846), and " Loyson-Bridet " (i.e. Marcel Schwob), Moeurs des diurnales (Paris, 19O2), a satire on the principal errors to which modern writers in all languages are liable. (E: G.)

STYLOBATE (Gr. otDXos, a column, and |8acris, a base), the architectural term given to the upper step of the Greek temple on which the columns rest, and generally applied to the three steps.

STYRIA (German, Steiermark or Steyermark), a duchy and crownland of Austria, bounded E. by Hungary and Croatia, S. by Carniola, W. by Carinthia and Salzburg, and N. by Upper and Lower Austria. It has an area of 8670 sq. m. Almost all the district is mountainous, and is distinguished by the beauty of its scenery and by its mineral wealth. Geographically it is divided into northern or Upper Styria, and southern or Lower Styria, and is traversed by

various ramifications of the eastern Alps. To the north of the Enns are ramifications of the Salzkam- mergut and Enns Alps, which include the Dachstein (19830 ft.), and the Grimming (7713 ft.), and the groups of the Todtes Gebirge (6890 ft.) and of the Pyrgas with the Grosser Pyrgas (7360 f t.) . The last two groups are separated by the Pyhrn Pass (3100 ft.), traversed by a road constructed in the Roman period. Then comes the Buchstein group with the Grosser Buchstein (7294 ft.). This group forms the northern flank of the celebrated Gesause, a defile 12 m. long, between Admont and Hieflau, through which the Enns forces its course, forming a series of rapids. The southern flank is formed by the massif of the Reichensteiner Gebirge, which culminates in the Hochthor (7780 ft.) and belongs to the north Styrian Alps, also called Eisenerzer Alps. This group extends east of the Enns, and con- tains the Erzberg (5000 ft.) celebrated for its iron ores. Other groups of the north Styrian Alps are the Kochschwab, with the highest peak the Hochschwab (7482 ft.) and the Hochveitsch with the Hohe Veitsch (6501 ft.). Then come the Lower Austrian Alps with the groups of the Voralpe (5800ft.), of the Schneealpe (6245 ft.), and the Raxalpe, with the Heukuppe (6950 ft.). AH

these mountains belong to the northern zone of the eastern Alps. South of the Enns, Styria is traversed by groups of the cen- tral zone of the eastern Alps: the Niedere Tauern, the primitive Alps of Carinthia and Styria and the Styrian Nieder Alps. The principal divisions of the Niedere Tauern are: the Radstadter Tauern with the Hochgolling (9390 ft.), the WOlzer Alps with the Predigtstuhl (8340 ft.), the Rottenmanner Tauern with the Grosser Bosenstein (8032 ft.), and the Seckauer Alps or Zinken group, which culminates in the Zinkenkogel (7865 ft.). The principal ramifications of the primitive Alps of Carinthia and Styria are: the Stang Alps with the Konigsstuhl (7646 ft.) and Eisenhut (8007 ft.), the Judenburger or Seethaler Alps with the Zirbitzkogel (7862 ft.), and the Koralpen which culminates in the Grosser Speikkogel (7023 ft.). The Styrian Nieder Alps cover the country north and east of the Mur, and contain the Fisch- bacher Alps with the Hochlantsch (5646 ft.), the Wechsel group (5700 ft.), and the small Semmering group with the Stuhleck or Spitaler Alpe (5847 ft.), and the Sonnenwendstein (4994 ft.). In this group is the famous Semmering Pass, which leads from Lower Austria into Styria and is crossed by the Semmering railway. This railway, which was completed in 1854, is the oldest of the great

continental mountain railways, and is remarkable for its numerous and long tunnels, its viaducts and galleries. It has a length of 35 m., beginning at Gloggnitz in Lower Austria and ending at Murzzuschlag in Styria, and passes through some exceedingly beautiful scenery. The whole region is now a favourite summer resort. South of the Drave Styria is traversed by the following ramifications of the southern zone of the eastern Alps: the Bacher Gebirge with the Cerni Vrch or Schwarzer Berg (5078 ft.), and the Sannthaler or Steiner Alps with the Oistriza (7709 ft.) and the highest peak of the group, the Grintovc or Grintouz (8429 ft.), which is situated on the threefold boundary of Carinthia, Carniola and Styria. Here is also the mountain country of Cilli, with the highest peak, the Wachberg (3364 ft.). The mountains decrease in height from west to east, and the south-east of Styria may be described as hilly rather than mountainous. This part is occupied by the eastern outliers of the Alps, known as the Styrian hill country, and by the Windisch Biiheln, which is one of the most renowned vine districts in the whole of Austria. Styria belongs to the watershed of the Danube and its principal rivers are: the Enns with its affluent the Salza, the Raab with the Feistritz, the Mur with the Miirz, the Drau or Drave, and the Sau or Save, which receives the Sann and the Sotla. Styria has numerous small Alpine lakes of which the most important are the Grundel-see, the Toplitz-see, and the Leopoldsteiner-see. There is a mean annual difference of about 9° F. between the north-west and the south-east. The best known mineral springs are the alkaline springs of Rohitsch and Gleichenberg, the brine springs of Aussee, and the thermal springs of Tiiffer, Neuhaus and Tobelbad.

In spite of the irregular nature of the surface, but little of the soil can be called unproductive. Of its total area 47-49% is covered with fine forests. About 19% is arable land, 12% pastures, 5-60% meadows, while 1-06% is occupied by gardens and 1 -4% by vineyards which produce wine of a good quality. Cattle-rearing has taken a great development and also dairy- farming in the Alpine fashion. A good race of horses is bred in the valley of the Enns, while poultry-rearing and bee-keeping are carried on in the south. Fish and game are also plentiful. The great wealth of Styria, however, lies underground. Its extensive iron mines, mostly at Erzberg, which were worked during the Roman period, yield nearly half of the total produc- tion of iron in Austria. The principal foundries are at Eisenerz, Vordernberg, Trofaiach, Hieflau, Zeltweg and Neuberg. Next in importance comes the mining of brown coal, which has also been carried on for a long time. The richest coalfields are situated near Leoben, near Voitsberg and Koflach, near Eibis- wald and Wies, and round Trifail, Tiiffer

and Hrastnig. Its other mineral resources include graphite, copper, zinc, lead, salt, alum, potter's clay, marble and good mill and building stones. Iron-foundries, machine-shops and manufactures of various kinds of iron and steel goods are very numerous. A special

branch is the making of scythes and sickles which are exported in large quantities. Among its other industrial products are glass, paper, cement, cotton goods, chemicals and gunpowder. Linen-weaving is a household industry.

The population of Styria in 1900 was 1,356,058, which is equivalent to 156 inhabitants per square mile. This proportion is considerably above the rate in the other mountainous regions of Austria. Nearly all (98-74%), profess the Roman Catholic faith and are under the bishops of Seckau and of Lavant. The Protestants number only a little over 13,000, while there are about 2500 Jews. Two-thirds of the inhabitants are Germans; the remainder, chiefly found in the valleys of the Drave and Save, are Slavs (Slovenes). At the head of the educational institutions of the province stands the university of Graz. The local Diet, of which the two Roman Catholic bishops and the rector of the university of Graz are members ex officio, is composed of 63 members, while Styria sends 27 deputies to the Reichsrat at Vienna. For administrative purposes, the province is divided into 21 districts and 4 towns with autonomous municipalities, namely Graz (pop. 138,370), the capital, Cilli (6743), Marburg (24,501) and Pettau (4227). Other important places are Leoben (10,204), Bruck on the Mur (7527), Mariazell (1263), Miirzzu- schlag (4856), Eisenerz (6494), Vordernberg (3111), Judenburg (4001), Trifail (10,851), Eggenberg (957°), Donawitz (13,093), Koflach (3345) and Voitsberg (3321).

In the Roman period Styria, which even thus early was famed for its iron and steel, was inhabited by the Celtic Taurisci, and divided geographically between Noricum and Pannonia. Subse- quently it was successively occupied or traversed by Visigoths, Huns, Ostrogoths, Langobardi, Franks and Avars. Towards the end of the 6th century the last-named began to give way to the Slavs, who ultimately made themselves masters of the entire district. Styria was included in the conquests of Charlemagne, and was henceforth comprised in the German marks erected against the Avar and the Slav. At first the identity of Styria is lost in the great duchy of Carinthia, corresponding more or less closely to the Upper Carinthian mark. This duchy, however, afterwards fell to pieces, and a distinct mark of Styria was recog- nized, taking its name from the margrave Ottacar of Steier (1056). A century or so later it was

created a duchy. In n 92 the duchy of Styria came by inheritance to the house of Austria, and from that time it shared the fortunes of Upper and Lower Austria, passing like them to the Habsburgs in 1282. The Protestant Reformation met an early and general welcome in Styria, but the dukes took the most stringent measures to stamp it out, offering their subjects recantation or expatriation as the only alternatives. At least 30,000 Protestants preferred exile, and it was not till the edict of tolerance of 1781 granted by Joseph II. that religious liberty was recognized.

See Die Osterreichisch-ungarische Monarchic in Wort und Bild, vol. vii. (24 vols., Wien, 1885-1902); A. von Muchar, Geschichte des Herzogtums Steiermark (8 vols., Graz, 1844-1867). It treats the history till 1558. F. M. Mayer, Geschichte der Steiermark mil besonderer Rucksicht auf das Kulturleben (Graz, 1898) ; J. von Zahn, Styriaca (Graz, 1894-1896).

STYROLENE, C 6 H 5 -CH:CH 2 , also known as phenylethylene or vinylbenzene, an aromatic hydrocarbon found to the extent of 1 to 4% in storax; it also occurs with crude xylene in coal tar fractions. It may be obtained from storax by distillation with water, and synthetically by heating cinnamic acid with lime, by the action of aluminium chloride on a mixture of vinyl bromide and benzene, by removing the elements of hydrobromic acid from bromethylbenzene by means of alcoholic potash, or, best, by treating j9-bromhydrocinnamic acid with soda, when it yields styrolene, carbon dioxide and hydrobromic acid. It also results on condensing acetylene, and on reducing phenylacetylene by zinc dust and acetic acid. It is a clear, strongly refractive liquid, which has a pleasant odour; it boils at 144 and has a specific gravity of 0-925 at o°. Styrolene is oxidized by nitric or chromic acids to benzoic acid; reduction gives ethylbenzene ; hydrochloric and hydrobromic acids yield a-haloid ethylbenzenes, e.g. CeHs-CHCl'CHj; whilst chlorine and bromine give aj9-dihaloid ethylbenzenes, 'e.g. C„H 5 -CHC1-CH 2 C1.

Styrolene gives origin to three series of derivatives, two of which contain the substituents in the side chain, e.g. C6H 6 -CC1:CH 8 or a-compounds, and CeHs-CHrCHCl, or w-compounds, whilst in the third the benzene nucleus is substituted. The o-halogen compounds are obtained by heating styrolene chloride (or bromide) with lime or

alcoholic potash; they are liquids which have a penetrat- ing odour, and yield acetophenone when heated with water to 180 . The w-chlor compound results when /8-phenyl-a-chlorlactic acid (from hypochlorous acid and cinnamic acid) is heated with water; it has a hyacinthine odour and yields phenylacetaldehyde when heated with water. Nitrostyrolene results when styrolene is treated with fuming nitric acid.

Related to styrolene is phenylacetylene, CeHs-CjCH, which results when a-bromstyrolene or acetophenone chloride are heated to 130° with alcoholic potash, or phenylpropiolic acid with water to 120°. It is a liquid, boiling at 139° and having a pleasant odour. It re- sembles acetylene in yielding metallic derivatives with ammoniacal copper and silver solutions. On solution in sulphuric acid, followed by dilution with water, it yields acetophenone.

Stilbeneortoluylene, CeHs-CH : CH-CeHs, is symmetrical diphenyl- ethylene. It may be obtained by distilling benzyl sulphide or disulphide, by the action of sodium on benzaldehyde or benzal chloride, by distilling fumaric and cinnamic phenyl esters: C6H 5 O- OC-CH:CH-C0-OC6H 5 ˆC0 2 -r-C 6 H 5 -CH:CH-CO-0C 6 H 6 ˆ2C0 2 +C 6 Hs-CH:CH -Cells (Ber., 18, p. 1945), and from chlor asymmetrical diphenylethane derivatives which undergo a rearrangement when heated {Ber., 7. p. 1409). Stilbene (from Gr. arOifitur. to glisten) crystallizes in large, colourless, glistening monoclinic plates, which melt at 124 and boil at 306 . On passing the vapour through red-hot tubes it yields anthracene and toluene. Reduction with hydriodic acid gives dibenzyl, and heating with sulphur gives tetraphenyl- thiophene or thionessal. Many derivatives are known, some of which exist in two structural forms, exhibiting geometrical isomerism after the mode of fumaric and maleic acids. Those substituted in the benzene nucleus are obtained by condensing two molecules of a substituted benzyl and benzal chlorides. The diortho and dipara dinitro compounds result from the action of alcoholic potash on ortho- and para-nitrobenzyl chlorides. The latter on reduction yields a diamine compound, the disuiphonic acid of which on diazo- tization and coupling with a phenol, &c, gives valuable substantive cotton dyes after the type yielded by Benzidine. Stilbene bromide when treated with alcoholic potash gives diphenyl acetylene or tolane, CsHs-C-CCeHe.

STYX, in Greek mythology, a river which flowed seven times round the world of the dead. In the Iliad it is the only river of the underworld; in the Odyssey it is coupled with Cocytus and Pyriphlegethon, which flow into the chief river Acheron. Hesiod says

that Styx was a daughter of Ocean, and that, when Zeus summoned the gods to Olympus to help him to fight the Titans, Styx was the first to come and her children with her; hence as a reward Zeus ordained that the most solemn oath of the gods should be by her and that her children (Emulation, Victory, Power and Force) should always live with him. Again, Hesiod tells us that if any god, after pouring a libation of the water of Styx, forswore himself, he had to lie in a trance for a year without speaking or breathing, and that for nine years after- wards he was excluded from the society of the gods. In historical times the Styx was identified with a lofty waterfall near Nonacris in Arcadia. Pausanias (viii. 17, 6) describes the cliff over which the water falls as the highest he had ever seen, and indeed the fall is the highest in Greece. The ancients regarded the water as poisonous, and thought that it possessed the power of breaking or dissolving vessels of every material, with the exception of the hoof of a horse or a mule. Considering the undoubted importance attached by the ancients to an oath b}f, the water of the Styx (cf. Herodotus vi. 74), and the supposed fatal result of breaking it, it is probable that drinking the water originally formed a necessary part of the oath, and that we have to do with the tradition of an ancient poison ordeal, common amongst barbarous peoples (for the geography and similar ceremonies see Frazer's Pausanias, iv., pp. 250-255). The people in the neighbourhood, who call it Mavro Ner6 (the Black Water), still think that it is unwholesome, and that no vessel will hold it.

SUAKIN, or Sawakin, a seaport of the Anglo-Egyptian Sudan on the west side of the Red Sea in 19° 7′ N., 37 20′ E. Pop. (1905), 10,500. Suakin stands on a coralline islet connected with the suburb of El-Kef on the mainland by a causeway and a viaduct. Access is gained to the harbour through a winding and dangerous passage over 2 m. long, terminating in w deep oval- shaped basin several acres in extent, and completely sheltered

from all winds. For centuries the chief port of the eastern Sudan, Suakin has been since 1906 to some extent superseded by Port Sudan (q.v.), a harbour 36 m. to the north. The custom- house and government offices present an imposing frontage to the sea, and the principal houses are of white coral stone three storeys high. The mosques are not remarkable. The mainland part of the town is surrounded by a high coral wall, built in 1884 to resist dervish attacks. About a mile beyond is a line of outer forts. The climate is very hot, damp and unhealthy, and in the summer months the government headquarters are removed to Erkowit 35 m. west of Suakin, on a plateau 3000 ft. above the sea. Suakin is less

conveniently situated than some neighbouring points {e.g. Port Sudan) for the trade with the Nile Valley. The island is without water and the harbour indifferent ; yet the settle- ment is ancient. Here, as at Massawa, traders were presumably attracted by the advantages of an island site which protected them from the raids of the nomad Arabs of the mainland. The country inland belonged in the middle ages to the Beja {q.v.), but the trading places seem to have been always in the hands of foreigners since Ptolemais Theron was established by Ptolemy Philadelphus for intercourse with the elephant hunters. After the rise of Mahommedanism many Arabs settled on the coast and mixed with the heathen Beja, whose rule of kinship and succession in the female line helped to give the children of mixed marriages a leading position (Makrizi, Khitat, i. 194 seq., translated in Burckhardt's Travels in Nubia, app. iii.). Thus in 1330 Ibn Batuta found a son of the amir of Mecca reigning in Suakin over the Beja, who were his mother's kin. Makrizi says that the chief inhabitants were nominal Moslems and were called Hadarib. The amir of the Hadarib was still sove- reign of the mainland at the time of J. L. Burckhardt's visit (1814), though the island had an aga appointed by the Turkish pasha of Jidda. The place was seized in 1 5 1 7 by the Turks under Selim the Great, but Turkish control did not extend inland. Mehemet Ali after the conquest of the Sudan leased Suakin from Turkey. This lease lapsed with the pasha's death, but in 1865 Ismail Pasha reacquired the port for Egypt. Till the suppression of the slave trade Suakin was an important slave port and it has always been the place of embarcation for Sudan pilgrims to Mecca. Legitimate commerce, rapidly growing before the revolt of the mahdi (1 881), was greatly crippled during the continuance of the dervish power, though the town itself never fell into then- hands. After the fall of the khalifa trade revived, the imports in 1899 being valued at £180,000, as against £170,000 in 1880. In 1906 the figures were: imports, £324,000; exports, £113,000. Pearl fishing is an important industry and cotton is cultivated in the neighbourhood.

Suakin was the headquarters of the Egyptian and British troops operating in the eastern Sudan against the dervishes under Osman Digna (see Egypt, Military Operations, 1884, seq.). When these operations were begun a project for linking Suakin to Berber by railway, first proposed during Ismail's viceroyalty, was revived and a few miles of rails were laid in 1884. Then the Sudan was abandoned and the railway remained in abeyance until 1905-1906, when the line was at length built. The railway has a terminus at Suakin, but Port Sudan was chosen as the principal entrep6t of the commerce carried by the railway. Not- withstanding the rivalry of its newly

created neighbour, the trade of Suakin continued to develop. The port is connected by submarine cables with Suez and Aden and with Jidda, which lies 200 m. north-east on the opposite coast of the Red Sea (see Sudan, § Anglo- Egyptian).

SUARDI, BARTOLOMMEO {c. 1455-c. 1536), Italian painter and architect, frequently called Bramantino, was born in Milan, the son of Alberto Suardi. He executed a number of paintings containing portraits of celebrated personages for the Vatican. In 1508 he was engaged in Rome. Bramante d'Urbino taught Bramantino architecture, and the pupil assisted the master in the execution of the interior of the church of San Satiro, Milan. In 1525 Bramantino was appointed architect to the court by Duke Francis (II.) Sforza, and his aid as an engineer in tht defence of Milan brought him a multitude of rewards.

Bartolommeo Suardi has been much confused with a certain Bramantino da Milano, of whom Vasari makes . frequent and specific mention in his life of Piero della Francesca, his obser- vations on Benvenuto Garofalo and Girolamo da Carpi, and his life of Jacopo Sansovino. The Bramantino of Vasari, if he existed at all, worked for Pope Nicolas V. between 1450 and

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SUAREZ, FRANCISCO (1548-1617), Spanish theologian and philosopher, was born at Granada on the 5th of January 1548, and educated at Salamanca. Influenced by the Jesuit John Ramirez he entered the Society of Jesus in 1564, and after teaching philosophy at Segovia, taught theology at Valladolid, at Alcala, at Salamanca, and at Rome successively. After taking his doctorate at Evora, he was named by Philip II. principal professor of theology at Coimbra. Suarez may be con- sidered almost the last eminent representative of scholasticism. In philosophical doctrine he adhered to a moderate Thomism. On the question of universals he endeavoured to steer a middle course between the pantheistically inclined realism of Duns Scotus and the extreme nominalism of William of Occam. The only veritable and real unity in the world of existences is the individual; to assert that the universal exists separately ex parte rei would be to reduce individuals to mere accidents of one indivisible form. Suarez maintains that, though the humanity of Socrates does not differ from

that of Plato, yet they do not constitute realiter one and the same humanity; there are as many " formal unities " (in this case, humanities) as there are individuals, and these individuals do not constitute a factual, but only an. essential or ideal unity (" ita ut plura individua, quae dicuntur esse ejusdem naturae, non sint unum quid vera entitate quae sit in rebus, sed solum fundamentaliter vel per intellectum ")• The formal unity,, however, is not an arbitrary creation of the mind, but exists " in natura rei ante omnem operationem intellectus." In theology, Suarez attached himself to the doctrine of Luis Molina, the celebrated Jesuit professor of Evora. Molina tried to reconcile the doctrine of predestination with the freedom of the human will by saying that the, pre- destination is consequent upon God's foreknowledge of the free determination of man's will, which is therefore in no way affected by the fact of such predestination. Suarez endeavoured to reconcile this view with the more orthodox doctrines of the efficacy of grace and special election, maintaining that, though all share in an absolutely sufficient grace, there is granted to the elect a grace which is so adapted to their peculiar dispositions and circumstances that they infallibly, though at the same time quite freely, yield themselves to its influence. This mediatizing system was known by the name of " congruism," Suarez is probably more important, however, as a philosophical jurist than as a theologian or metaphysician. In his extensive work Tractatus de legibus ac deo legislatore (reprinted, London, 1679) he is to some extent the precursor of Grotius and Samuel Pufen- dorf. Though his method is throughout scholastic, he covers the same ground, and Grotius speaks of him in terms of high respect. The fundamental position of the work is that all legislative as well as all paternal power is derived from God, and that the authority of every law resolves itself into His. Suarez refutes the patriarchal theory of government and the divine right of kings founded upon it — doctrines popular at that time in England and to some extent on the Continent. Power by its very nature belongs to no one man but to a multitude of men; and the reason is obvious, since all men are born equal. It has been pointed out that this accords well with the Jesuit policy of depreciating the royal while exalting the papal preroga- tive. But Suarez is much more moderate on this point than a writer like Mariana, approximating to the modern view of the rights of ruler and ruled. In 1613, at the instigation of Pope Paul V., Suarez wrote a treatise dedicated to the Christian princes of Europe, entitled Defensio catholicae fidei contra anglicanae sectae errores. This was directed against the oath of allegiance which James I. exacted from his subjects. James caused it to be burned by the common hangman, and forbade its perusal under the severest penalties, complaining

bitterly at the same

time to Philip III. that he should harbour in his dominions a declared enemy of the throne and majesty of kings. Suarez lived a very humble and simple life. He died after a few days' illness on the 25th of September 1617 at Lisbon.

The collected works of Suarez have been printed at Mainz .and Lyons (1630), at Venice (1740-1751), at Besangon (1856-1862) and in the collection of the Abbe Migne. His life has been written by Deschamps (Vita Fr. Suaresii, Perpignan, 1671). The chief modern authorities are K. Werner's Franz Suarez u. die Scholastik der lelzten Jahrhunderte (Regensburg, 1861), and Stockl's Geschichte der Philosophie des Mittelalters, iii. 643 seq.

SUBIACO (anc. Sublaqueum), a town of Italy, in the province of Rome, from which it is 47 m. E. by rail, picturesquely situated on the right bank of the Anio, 1339 ft. above sea-level. Pop. (1901), 7076 (town), 8003 (commune). It has ironworks and paper-mills. Sublaqueum was so called from its position under the three artificial lakes constructed in the gorge of the Anio in connexion with the aqueduct of the Anio Novus, which had its intake at the lower end of the lowest of them (the Simbruina stagna of Tacitus). On the banks of this lake Nero constructed a villa, in the remains of which was found the beautiful head- less statue of a youth kneeling, now in the Museo delle Terme at Rome. There is no mention of the villa after Nero's time. The lakes gradually ceased to exist owing to the action of the Anio, the last dam being washed away in 1305. In 494 St Benedict retired to this spot, then already deserted, and took up his abode as a hermit in a cave (Sacro Speco) above the lakes of the Anio. In 505, probably, he founded the first of his twelve monasteries, completing their number between 510 and 529, when he went to Cassino. The chronicles state that the principal monastery was devastated by the Lombards in 601, and rebuilt in 705; but there is little foundation for these statements. The first authentic document that we have is the mention in the Liber pontificalis of the gift of vestments by Leo IV. (847-855) to the monastery of S. Silvester, S. Benedict and S. Scholastica, and to the church of SS. Cosmas and Damian. The former is probably that at the Sacro Speco. The monastery was confirmed in its possessions by Pope Gregory I. 1 and his successors, and had by the 10th century very considerable landed properties with feudal jurisdiction enumerated in several documents, the first dating from 926, and an inscription of 1052 (cf. Regesto sublacense, Rome, 1891). The church dedicated to S. Scholastica, S. Benedict's sister, was erected in 981, according to an inscrip- tion

belonging to a later date, but carved upon a slab decorated with reliefs of the end of the 8th, or the beginning of the 9th, century.

In 1053 the church was restored and a campanile built, which still exists; and in the middle of the 13th century the church was rebuilt in the Gothic style. Other buildings grew up round it; the cloister on the right is a fine Romanesque arcaded court with twisted columns and mosaics, the south side of which was con- structed by Lorenzo, the first of the family of the Cosmati, early in the 13th century, while the other three sides are due to his son Jacopo and to Jacopo's sons Luca and Jacopo, who worked here in the time of the abbot Lando (1227-1243). The irregular atrium in front of the church is probably contemporary with its reconstruction in the Gothic style about 1274, while the outer court dates from the end of the 16th century. The church, with the exception of the campanile, was modernized in 1771-1777. The right of the monks to elect their own abbot, who had by that time obtained a position of great importance, was cancelled in 1388, and in 1455 the abbot was suspended, and the administra- tion handed over to the Spanish cardinal, Giovanni Torquemada. For the whole of the 16th century it was in the hands of the Colonna family, who were commendatories of it. During the 17th century, the Barberini held it, but in 1753 Benedict XIV. separated the spiritual and temporal dominions, placing the latter under officials directly dependent on the papacy. The commendatories were as a rule cardinals. As regards monastic discipline, the abbey had since 1514 been subject to the rule of Monte Cassino, and it was only in 1872 that it regained from

1 The bull of 596 attributed to him is, however, now recognized as apocryphal.

Pius IX. its independence and became an autonomous congre- gation. Arnold Pannartz and Conrad Schweinheim, two German ecclesiastics, set up here the first printing press in Italy, issuing an edition of Donatus (1465), followed by one of Cicero (1465) and.of Lactantius (1465). Copies of the Lactantius, of the Augus- tine of 1467, which was probably printed not here but in Rome, whither the printers migrated in that year, and of other rare incunabula are still preserved here. Still more interesting is the monastery of the Sacro Speco, higher up the hill, dating, it would seem, from the 9th century, though little earlier than the 13th remains. The Grotta dei

Pastori contains some frescoes of the 9th century, while the Sacro Speco, or cave of St Benedict, contains frescoes of the 13th, and so does the lower church, the latter having been decorated in the first twenty years of the 13th century, and in part repainted in the latter half of the same century by an otherwise unknown master Conxolus. The upper 'church contains scenes from the life of Christ by an unknown Sienese master of the end of the 14th century, to whom is also attributable a remarkable fresco of the triumph of death, on the stairs from the tower church to the Cappella dei Pastori, and some 1 sth-century work, and in the chapel of S. Gregory a remarkable portrait of St Francis of Assisi (who was perhaps here in 1218), probably painted before 1228, as it lacks the halo and the stigmata. The whole group of buildings is constructed against the rocky sides of the gorge, part of it on massive sub- structions. The town contains various buildings constructed by Pius VI., who as cardinal was commendatory abbot of Subiaco. It is crowned by a medieval castle constructed originally by Gregory VII.

See P. Egidi, G. Giovannoni, F. Hermanin, V. Federici, I Monas- teri di Subiaco (Rome, 1904); A. Colasanti, L'Aniene (Bergamo, 1906). (T. As.)

SUBINFEUDATION, in English law, the practice by which tenants, holding land under the king or other superior lord, carved out in their turn by subletting or alienating a part of their lands new and distinct tenures. The tenants were termed " mesne-lords," with regard to those holding from them, the immediate tenant being tenant in capite. The lowest tenant of all was the freeholder, or, as he was sometimes termed tenant paravail. The Crown, who in theory owned all lands, was lord paramount. 1 The great lords looked with dissatisfaction on the increase of such subtenures. Accordingly in 1290 a statute was passed, Quia emptores, which allowed the tenant to alienate whenever he pleased, but the alienee or person to whom he granted was to hold the land not of the alienor but of the same immediate lord, and by the same services as the alienor held it before. (See further, Manor.)

SUBJECTIVISM, a philosophical term, applied in general to all theories which lay stress on the purely mental sides of experience opposed to objectivism. In the narrowest sense subjectivism goes to the logical extreme of denying that mind can know objects at all (cf. Solipsism). The doctrine originates in the fact that the most elementary psychic phenomena pre- suppose in addition to the data of the senses (which as such are momentary) a combining action of the mind. (See Idealism.)

SUBLEYRAS, PIERRE (1699-1749), French painter, was born at Uzds (Gard) in 1699. He left France for Italy in 1728, having carried off the grand prix. He there painted for the Canons of Asti " Christ's Visit to the House of Simon the Pharisee " (Louvre, engraved by Subleyras himself), a large work, which made his reputation and procured his admission into the Academy of St Luke. Cardinal Valenti Gonzaga next obtained for him the order for " Saint Basil and the Emperor Valens " (small study in Louvre), which was executed in mosaic for St Peter's. Benedict XIV. and all the princes of Rome sat to him, and the pope himself commanded two great paintings — the " Marriage of St Catherine " and the " Ecstasy of St Camilla " — which he placed in his private apartments. Subleyras shows greater individuality in his curious genre pictures, which he produced in considerable number (Louvre). In his illustrations of La

- *Paramount and paravail are derived from the Latin ad montem and ad vallem, signifying the highest and lowest, respectively.*

Fontaine and Boccaccio his true relation to the modern era comes out; and his drawings from nature are often admirable (see one of a man draped in a heavy cloak in the B ritish Museum) . Exhausted by overwork, Subleyras tried a change to Naples, but returned to Rome at the end of a few months to die (May 28, 1749). His wife, the celebrated miniature painter, Maria Felice Tibaldi, was sister to the wife of Tremolliere.

SUBLIME (Lat. sublimis, exalted), in aesthetics, a term applied to the quality of transcendant greatness, whether physical, moral, intellectual or artistic. It is specially used for a greatness with : which nothing else can be compared and which is beyond all possibility of calculation or measurement. Psychologically the effect of the perception of the sublime is a feeling of awe or helplessness. The first study of the value of the sublime is the treatise ascribed to Longinus (q.vJ), On the Sublime (strictly n«pi ityous). Burke and Kant both investigated the subject (cf. Burke's Essay on the Sublime and Beautiful,' 17 56) and both distinguished the sublime from the beautiful. Later writers tend to include the sublime in the beautiful (see Aesthetics).

SUBLIMINAL SELF. The phrase " subliminal self," which is one that has figured largely of recent years in discussions of the problems of " Psychical Research," owes its wide currency to the writings of F. W. H. Myers, especially to his posthumous work Human Personality and its survival of Bodily Death. It is used in a wider, looser sense and a narrower, stricter sense, which two senses are often confused in a

way very detri- mental to clear thinking. In the stricter usage the phrase implies the peculiar conception of human personality expounded at great length and with a wealth of learning and eloquence by Myers; it stands for an hypothesis which seemed to its author to bring almost all the strange facts he and his associates observed, as well as many alleged facts whose reality still remains in dis- pute, under one scheme of explanation and to bring them also into intelligible relation with the body of generally accepted scientific principles. But the phrase " Subliminal Self " is now Often used by those who do not fully accept Myers's hypothesis, as a convenient heading to which to : refer all the facts of many different kinds that seem to imply subconscious or unconscious mental operations. This article is- only concerned to expound the meaning of the phrase as it was employed by Myers, and it is much to be wished that it should only be used in this stricter sense.

In the speculations of Schopenhauer and of Eduard Von Hartmann, the " Unconscious " played a great part as a meta- physical principle explanatory of the phenomena of the life and mind of both men and animals. But with these exceptions, the' philosophers and psychologists of the 19th century showed them- selves in the main reluctant to admit the propriety of any con- ception of unconscious or subconscious mental states or opera- tions. The predominant tendency was to regard as the issue of " automatic " nervous action or of "unconscious cerebration " whatever bodily movements seemed to take place independently of the consciousness and volition of the subject, even if those movements seemed to be of an intelligent and purposeful character. This attitude towards the subconscious is still maintained by some of the more strictly orthodox scientists; but it is now very widely accepted that we must recognize in some sense the reality of subconsciousness or of subliminal psychical process. The conception of a limen (threshold) of consciousness, separating subconscious or subliminal psychical process from supraliminal or conscious psychical process, figured prominently in the works of G. T. Fechner, the father of psycho-physics, and by him was made widely familiar. Fechner sought to prove that a sensory stimulus too feeble to affect consciousness produces nevertheless a psychical effect which remains below the threshold of consciousness, and he tried to show ground for believing in the existence of a vast realm of such subliminal psychical processes. But his arguments, founded 1 though they were on epoch-making experiments, have failed to carry conviction ; and it is in the main on other grounds! than those adduced by Fechner that the reality of modes of mental operation which may properly be called subconscious or

subliminal is now generally admitted. During the last quarter of the 10th and the opening years of the 20th century, there has been accumulated a mass of observations which suffices, in the opinion of many of those best qualified to judge, to establish the reality of processes which express themselves in purposeful actions and which bear all the marks from which we are accus- tomed to infer conscious cognition and volition, but of which nevertheless the subject or normal personality has no knowledge or awareness other than such as may be shared by any second person observing his actions.

Among the commonest and most striking of such manifesta- tions is the " automatic writing " which a considerable proportion of normal persons are capable of producing. A person who has this power may sit absorbed in reading or in conversation, while his hand produces written words or sentences, of which he knows nothing until he afterwards reads them. The matter so written varies in different cases from illegibly scrawled fragments of words and sentences to long, connected, sometimes eloquent, frequently more or less dramatic, disquisitions. In some cases the " automatically " writing hand can be induced to make intelligible replies to questions whispered or otherwise put to the subject in such a way as not to draw his attention from some other object or topic with which it seems to be fully occupied. In some cases the matter so written states facts previously known to the subject but which he is unable to recollect by any voluntary effort. And in rare cases the matter written seems to imply knowledge or capacities which the subject was not believed to possess either by himself or by his friends. Other actions, including connected speech, may be produced in a similar fashion, and in the last case the subject hears and understands the words uttered from his own mouth in the same way only as those from the mouth of another person. " Table-tilting," " planchette-writing," and the various similar modes of spelling out by the aid of a code intelligible replies to questions, which have long been current in spiritistic circles and which, by those who practise them, are often regarded as the operations of disembodied intelligences, seem to belong to the same class of process. In extreme cases the manifestations of such subconscious or (better) co-conscious operations are so frequent, exhibit so much continuity and express so clearly a train of thought, pur- pose and memory, that they compel us to infer an organized personality of which they are the expression; such are the cases of double or multiple consciousness or personality.

Very similar manifestations of a " co-consciousness " may be produced in a considerable proportion of apparently normal persons by means of post-hypnotic suggestion; as when suggestions are made during hypnosis, which afterwards the subject carries out without being aware of the actions, or of the signals in response to which he acts, and without any awareness or remembrance of the nature of the suggestions made to him. The more sober-minded of the investigators of these phenomena have sought to display all such cases as instances of division of the normal personality, and as expli- cable by the principle of cerebral dissociation (see Hypnotism) ; the more adventurous, concentrating their attention on the more extreme instances, regard all such manifestations as in- stances of the possession and control (partial or complete) of the organism of one person by the spirit or soul of another, generally a deceased person. Myers's hypothesis of the subliminal self was a brilliant attempt to follow a middle way in the explanation of these strange cases, to reconcile the two kinds of explanation with one another, and at the same time to bring into line with these other alleged facts of perplexing character, especially veridical hallucinations (q.v.), various types of communication at a distance (see Telepathy), and all the more striking instances of the operation of suggestion and of hypnosis, including the exaltation of the powers of the senses, of the memory and of control over the organic processes.

Myers conceived the soul of man as capable of existing independently of the body in some super-terrestrial or extra- terrene realm. He regarded our normal mental life as only a very partial exnression of the capacities of the soul, so much

only as can manifest itself through the human brain. He regarded the brain as still at a comparatively early stage of its evolution as an instrument through which the soul operates in the material world. So much of the life of the soul as fails to find expression in our conscious and organic life through its interactions with this very inadequate material mechanism re- mains beneath the threshold of consciousness and is said to constitute the subliminal self. The subliminal self as thus con- ceived would be better described as the subliminal part of the self, a part which surpasses the supraliminal or normal conscious self to an indefinitely great degree as regards its range of psychical faculties. It was further conceived as being in touch with a realm of psychical forces from which it is able to draw supplies of energy which it infuses into the organism, normally in limited quantities, but, in exceptionally favourable circumstances, in great floods, which for the time being raise the mental operations and the powers of the mind over the body to an abnormally high

level.

It is a leading feature of. this protean conception, that many of the abnormal mental manifestations that have commonly been regarded as symptoms of mental or nervous disease or degenera- tion are by its aid brought into line with mental processes that are by common consent of an unusually high type, the intuitions of genius, the outbursts of inspired poesy, the emotional fervour or the ecstasy that carries the martyr triumphantly through the severest trials, the enthusiasm that enables the human organism to carry through incredible labours. Myers's hypothesis thus boldly inverts the dominant view, which sees in all depar- tures from the normal symptoms of weakness and degeneracy and which seeks to bring genius and ecstasy down to the level of madness and hysteria; the hypothesis of the subliminal self seeks to level up, rather than to level down, and to display many of these departures from normal mental life as being of the same nature as the operations of genius, as being, in common with these, uprushes of the subliminal self, which temporarily acquires a more complete control of the organism and therefore achieves at such times a more complete expression of its powers. And these rare displays of subliminal capacities are held to foreshadow the further course of mental evolution, to afford us a glimpse of the higher plane on which the mind of man may habitually and normally live, if further evolution of the nervous system shall render it a less inadequate medium for the exercise of the spiritual faculties and for the influx of the psychical energies which at present, owing to its imperfections, are for the most part latent or confined to the subliminal self.

This bold and far-reaching hypothesis has not up to the present time been accepted by any considerable number of pro- fessional psychologists, though its author's great literary power has secured for him a respectful hearing. The comparative indifference shown to it by the scientific and philosophical world must be ascribed to considerations of two kinds. In the first place, it is rightly felt that a very large proportion of the alleged facts which it is designed to explain are not yet supported by evidence of such a nature as warrants an unreserved acceptance of them. Secondly, even if further investigations of the type of those carried on by the Society for Psychical Research should prove Myers's belief in the reality of all or most of these facts to have been well-founded, there will remain difficulties and weak- nesses intrinsic to the hypothesis, which at present seem very serious. In addition to all the great difficulties that must attach to any conception of human personality as a spiritual entity capable of existing independently of the body,

Myers's conception raises many difficulties peculiar to itself, the chief of which may be briefly indicated. First, the conception of the relation of the subliminal to the normal or supraliminal self is in Myers's presentation extremely vacillating and uncertain, and it is probably radically incapable of definition and consistency. Secondly, two alleged supernormal phenomena, to the establish- ment of which " psychical research " has been devoted most energetically and (in the view of many of the workers) with the greatest success, and which from every point of view are the most important and interesting, are supernormal communications

between the living (telepathy) and communication between the dead and the living. Now, if either or both of these modes of communication should eventually prove to be facts of nature, neither will need the hypothesis of the subliminal self for its explanation. Such evidence as we have of the latter kind of communication is almost wholly of the form of messages written or spoken by entranced persons (see Trance) which claim to be sent by the souls of the dead to friends still living, and these messages (if they are what they claim to be) imply, and were held by Myers himself to imply, possession or control of the brain of the living medium by the soul of the dead who transmits the message. Both phenomena need, then, for their explanation only the two great assumptions — first, that the soul is an entity capable of disembodied existence; second, that in its psycho- physical interactions any soul is not strictly confined to inter- action with one particular brain.

The third great difficulty is of an emotional order. All the laborious research whose results Myers has sought to harmonize by means of his conception of the " subliminal self " has been

initiated and sustained by the desire of proving the continued existence of the human personality after the death of the body. But, if Myers's doctrine is true, that which survives the death of the body is not the normal self-conscious personality of a man such as is known and valued by his friends, but a personality of which this normal personality is but a stunted distorted frag- ment; and it would therefore seem that according to this doctrine death must involve so great a transformation that such slight continuity as obtains must be insufficient to yield the emotional satisfaction demanded. The hypothesis would thus seem to destroy in great measure the value of

the belief which it seeks to justify and establish.

See F. W. H. Myers, Human Personality and its Survival of Bodily Death (1st ed., London, 1903 ; 2nd ed., abridged and edited by L. H. Myers, London, 1907); Morton Prince, The Dissociation of a Personality (London, 1906); j. Jastrow, The Subconscious (London, 1906). See also many papers by various hands in Proceedings of the Society for Psychical Research, especially in part xlvi., vol. xviii., and the literature referred to under Trance. (W. McD.)

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Charles Scott Sherrington, D.Sc, M.D., M.A., F.R.S., LL.D.

Professor of Physiology, University of Liverpool. Foreign Member of Academies of Rome, Vienna, Brussels, Gottingen, &c. Author of The Integrative Action of the Nervous System.

C. Wilhelm.

Author of Essays on Ballet and Spectacle.

Sir Dietrich Brandis, K.C.I.E., F.R.S. (1824-1007).

Inspector-General of Forestry to the Indian Government, 1864-1883.

Rev. Duncan Crookes Tovey, M.A.

Rector of Worplesdon, Surrey. Editor of The Letters of Thomas Gray; &c.

Donald Francis Tovey.

Author of Essays in Musical Analysis: comprising The Classical Concerto, The Goldberg Variations, and analyses of many other classical works.

Sir David Gill, K.C.B., LL.D., F.R.S., F.R.A.S., D.Sc.

H.M. Astronomer at the Cape of Good Hope, 1879-1907. Served on Geodetic Survey of Egypt, and on the expedition to Ascension Island to determine the Solar Parallax by observations of Mars. Directed the Geodetic Survey of Natal, Cape Colony and Rhodesia. 'Author of Geodetic Survey of South Africa; Catalogue of Stars for the Equinoxes, 1850, i860, 1885, 1800, 1000; &c.

David George Hogarth, M.A.

Keeper of the Ashmolean Museum, Oxford, and Fellow of Magdalen College. Fellow of. the British Academy. Excavated at Paphos, 1888; Naticratis, 1899 and 1903; Ephesus, 1904-1905; Assiut, 1906-1907. Director, British School at Athens,

1897-1900. Director, Cretan Exploration Fund, 1899.

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Formerly British Vice-Consul at Barcelona. Author of Short History of the Royal Navy ; Life of Emilio Castelar ; &c.

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Daniel Lleufer Thomas.

Barrister-at-Law, Lincoln's Inn. Rhondda.

-j Thomson, James (1700-1748)1

[Suite: Music; Symphonic Poem; Symphony.

Telescope (in part).

Syria;

Tobruk;

Tokat.

Suflren, Admiral; Swold, Battle of.

\:

Stipendiary Magistrate at Pontypridd and < Swansea.

David Randall-Maciver, M.A., D.Sc. _ f

Curator of Egyptian Department, University of Pennsylvania. Formerly Worcester -< Sudan: Reader in Egyptology, University of Oxford. Author of Medieval Rhodesia; &c. [

Archaeology (in part).

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Editor of the Zoological Record. Formerly Curator of the Museum of Zoology, J Termite University of Cambridge, and President of the Entomological Society of London. 1 Author of ” Insecta ” in the Cambridge Natural History; &c. {

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Rev. Elkanah Armitage, M.A. J”

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Edward Augustus Freeman, LL.D., D.C.L. See the biographical article: Freeman, E. A.

Ernest Barker, M.A.

Fellow and Lecturer in Modern History, St John’s College, Oxford. Formerly Fellow and Tutor of Merton College. Craven Scholar, 1895.

Rt. Rev. Edward Cuthbert Butler, M.A., O.S.B., Litt.D.

■< Syracuse.

Tancred; Teutonic Order.

Abbot of Downside Abbey, Bath, in Cambridge Texts and Studies.

Author of ” The Lausiac History of Palladius

Edmund Gosse, LL.D., D.C.L.

See the biographical article : Gosse, Edmund.

Emile Garcke, M.Inst.E.E.

Managing Director of the British Electric Traction Co. Ltd. Electrical Undertakings ;&c.

Ernest Arthur Gardner, M.A.

See the biographical article: Gardner, Percy.

Author of Manual of-

„[Tertiaries; 1 Thomas of Celano. Sully-Prudhomme ; Sweden: Literature and

Philosophy; Swinburne, Algernon C; Tegner, Esaias; Tennyson, Alfred; Terza Rima. Telegraph: Commercial

Aspects; Telephone: Commercial

Aspects.

f Sunium; Tegea: Arckaeolegyi ■I Thebes (Greece); [Tiryns (in part).

VU1 E. H.*

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INITIALS AND HEADINGS OF ARTICLES

Ernest Harrison, M.A. f

Fellow and Lecturer in Classics, Trinity College, Cambridge. Author of Studies in ■{ Terence (in Part). Theognis. I

Edward Heawood, M.A. [

Gonville and Caius College, Cambridge. Librarian of the Royal Geographical “! Tanganyika, Lake. Society, London. I

Ellis Hovell Minns, M.A. ^ J T * ur i;.

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Textile-printing: Manu- facturing.

Eduard Meyer, Ph.D., D.Litt., LL.D. f Tigranes;

Professor of Ancient History in the University of Berlin. Author of Geschichte des < Tiridates; Alterthums; Geschichte des alten Aegyptens; Die Israeliten und ihre Nachbarstamme. Tissanhernes

Theopompus.

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Consulting Surgeon to St Mary’s Hospital, London, and to the Children’s Hospital, J Surgery: Modern practice; Great Ormond Street, London. Chevalier of the Legion of Honour. Author of 1 Tetanus.

A Manual of A natomy for Senior Students. (_

Edwin Otho Sachs, F.R.S. (Edin.), A.M.Inst.M.E.

Chairman of the British Fire Prevention Committee. Vice-President, National Fire Brigades' Union. Vice-President, International Fire Service Council. Author of Fires and Public Entertainments; &c.

Theatre: Modern stage mechanism.

Emmanuel Wheeler, M.A.

i Theophrastus.

Francis Crawford Burkitt, M.A., D.D.

Norrisian Professor of Divinity in the University of Cambridge. Fellow of the

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Sinaitic Palimpsest. Author of The Gospel History and its Transmission; Early

Eastern Christianity; &c.

Frederick George Meeson Beck, M.A.

Fellow and Lecturer of Clare College, Cambridge.

f Suebi; Sussex, Kingdom of; -j Sweden: Early History; [Teutoni.

J Terpenes.

-j Tammany Hall.

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Timur.

Thule.

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Franklin Henry Hooper.

Assistant Editor of the Century Dictionary.

Major-General Sir Frederick John Goldsmid. See the biographical article: Goldsmid: Family.

Francis John Haverfield, M.A., LL.D., F.S.A.

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Francis Llewellyn Griffith, M.A., Ph.D., F.S.A.

Reader in Egyptology, Oxford University. Editor of the Archaeological Survey and Archaeological Reports of the Egypt Exploration Fund. Fellow of Imperial – German Archaeological Institute. Author of Stories of the High Priests of Memphis; &c.

Frank Podmore, M.A. (1856-1910).

Sometime Scholar of Pembroke College, Oxford. Mesmerism and Christian Science; &c.

Sir Frederick Pollock, Bart., LL.D., D.C.L. See the biographical article: Pollock: Family.

Frederick Purser, M.A. (1840-1910). f

Formerly Fellow of Trinity College, Dublin. .Professor of Natural Philosophy in 1 Sur fece (in part). the University of Dublin. Member of the Royal Irish Academy. I

Thebes (Egypt); Thoth.

Author of Modern Spiritualism; i Table-turning.

{

Sword.

Frank R. Cana.

Author of South Africa from the Great Trek to the Union.

Vincent Brooks.

Managing Director of Messrs Vincent Brooks, Day & Son, Ltd., Lithograph Printers, London.

Sudan: Geography and Statistics, Archaeology (in part) and History;

Swaziland (in part); . Timbuktu; Tlemcen.

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INITIALS AND HEADINGS OF ARTICLES

IX

Frederick William Gamble, D.Sc, F.R.S. ,.-... rv *

Professor of Zoology in the University of Birmingham. Formerly Assistant Director of the Zoological Laboratories and Lecturer in Zoology in the University ofl Tapeworms. Manchester. Author of Animal Life. Editor of Marshall and Hurst's Practical [Zoology; &c. ,-

Frederick William Rudler, I.S.O., F.G.S. J Talc.

Curator and Librarian of the Museum of Practical Geology, London, 1879-1902. ˆ President of the Geologists' Association, 1 887-1 889.

Frank William Taussig. \ Tariff.

See the biographical article : Taussig, Frank William.

George A. Boulenger, D.Sc, F.R.S. [Tadpole;

Keeper of the Collections of Reptiles and Fishes, Department of Zoology, British -\ Xeleostomes. Museum. Vice-President of the Zoological Society of London. l

George Grenville Phillimore, M.A., B.C.L.

Christ Church, Oxford. Barrister-at-Law, Middle Temple.

-j Tithes: English.

REV R?cZoFsm E ton E |a T nd y ° X Be] d I s A "Formerly Lecturer in the Faculty of Theology J Teraphim (in part). University of Oxford, 1908-1909. Author of Translation of the Book of Isaiah; &c. I

Author of Insects: 1 Thysanoptera.

Tide.

George Herbert Carpenter.

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Sir George Howard Darwin, K.C.B., M.A., F.R.S., LL.D., D.Sc

Fellow of Trinity College, Cambridge, and Plumian Professor of Astronomy and Experimental Philosophy in the University. President of the British Association, , 1905. Author of The Tides and Kindred Phenomena in the Solar System ; &c. v.

George Johnston Allman, M.A., LL.D F.R S D.Sc. (1824-190;;). f

Professor of Mathematics in Queen's College, Galway, and in Queen s University of 1 males 01 fflliеius. Ireland, 1 853-1 893. Author of Greek Geometry from Thales to Euclid; &c. I

Georg Lunge, Ph.D., D.Ing.

See the biographical article : Lunge, G.

George Saintsbury, LL.D., D.C.L.

See the biographical article: Saintsbury,

Grant Showerman, A.M., Ph.D. . I Svncretism*

Professor of Latin at the University of Wisconsin. Member of the Archaeological J ^"T \ "' Institute of America. Member of the American Philological Association. Author laurODOllum. of With the Professor; The Great Mother of the Gods; &c. L

{

, George Edward Bateman.

Sulphuric Acid. Thiers.

Author of Wealth of] Tokyo.

Goji Ukita.

Formerly Chancellor of the Japanese Legation, London. Canada (in Japanese).

George Walter Prothero, M.A., Litt.D., LL.D. t

Editor of the Quarterly Review. Honorary Fellow, formerly Fellow of Kings College, Cambridge. Fellow of the British Academy. Professor of History in the – University of Edinburgh, 1894-1899. Author of Life and Times of Simon de Mont- fort; &c. Joint-editor of the Cambridge Modern History.

Rev. Griffithes Wheeler Thatcher, M.A., B.D. _ …j Tnra fa- Tha'Slihi-

Warden of Camden College, Sydney, N.S.W. Formerly Tutor in Hebrew and Old -j laraia, ina audi, Testament History at Mansfield College, Oxford.

Temple, Sir William.

r Suyuti; Tabari;

I TirmidhL

Henry Beauchamp Walters, M.A., F.S.A.

Assistant to the Keeper of Greek and Roman Antiquities, British Museum, of The Art of the Greeks; History of Ancient Pottery; &c.

Author -J Terracotta (in part).

r Sullivan, Sir Arthur; Hugh Chisholm, M.A. , . , Tennent, Sir E.;

Formerly Scholar of Corpus Christi College, Oxford. Editor of the nth edition of J Theatre: Modem (in part); the Encyclopaedia Britannica. Co-editor of the 10th edition. ‘

Rev. Hippolyte Delehaye, S. J.

Bollandist. Joint-editor of the Acta Sanctorum and the Analecta Bollandiana.

H. Dennis Taylor-

Inventor of the Cooke Photographic Lens.

Author of A System of Applied Optics.

{ Thompson, Francis.

(“Symeon Metaphrastes; t Synaxarium; Thecla, St.

Telescope (in part).

Rev. Henry Fanshawe Tozer, M.A., F.R.G.S.

Hon. Fellow, formerly Fellow and Tutor of Exeter College, Oxford. Fellow of the British Academy. Corresponding Member of the Historical Society of Greece. Author of History of Ancient Geography; Lectures on the Geography of Greece; &c.

Thessaly; Thrace.

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Keeper of the Bibliotheque Royale de Belgique, Brussels. vie et son auvre.

Author of Rubens: sa-\ Teniers (in part).

Henry Harvey Littlejohn, M.A., F.R.C.S. (Edin.)., F.R.S. (Edin.). ,

Professor of Forensic Medicine and Dean of the Faculty of Medicine in the University ‘ of Edinburgh.

Henry Jackson, Litt.D., LL.D., O.M. . .

Regius Professor of Greek in the University of Cambridge. Fellow of Ir. lnlt y, College. Fellow of the British Academy. Author of Texts to Illustrate the History of Greek Philosophy from Thales to Aristotle.

Suicide.

Thales of Miletus: Philosophy,

X

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J. C. E.

J. D. Pr. J. E. F. J. F.-K.

J. F. St.

J. Ga. J. G. F.

INITIALS AND HEADINGS OF ARTICLES

Hugh Longbourne Callendar, F.R.S., LL.D. C Thermodynamics;

Professor of Physics, Royal College of Science, London. Formerly Professor of ■> Thermoelectricity; Physics in McGill College, Montreal, and in University College, London. [Thermometry

Hector Munro Chadwick, M.A. f Teutonic Languages;

Fellow and Librarian of Clare College, Cambridge, and University Lecturer in -j Teutonic Peoples; Scandinavian. Author of Studies on Anglo-Saxon Institutions. I Thor.

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Electrician to the General Post Office, London. Book; &c.

Author of The Engineer’s Year

Telegraph; Telephone.

Henry Stuart Jones, M.A. f

Formerly Fellow and Tutor of Trinity College, Oxford, and Director of the British J _. , ,.-./•' \

School at Rome. Member of the German Imperial Archaeological Institute. 1 Theatre: Ancient (in part). Author of The Roman Empire; &c. I

Henry Tiedemann.

London Editor of the Nieuwe Rotterdamsche Courant.

Thorbecke.

Sir Hilaro William Wellesley Barlow, Bart. S Sword: Modern Military (in

Lieut. -Col. Royal Artillery. Superintendent of the Royal Laboratory, Woolwich. I part).

Henry William Carless Davis, M.A. f

Fellow and Tutor of Balliol College, Oxford. Fellow of All Souls College, Oxford, i Theobald. 1895-1902. Author of England under the Normans and Angevins; Charlemagne. I

Hope W. Hogg, M.A. _ _ ....._. { Thapsacus.

Professor of Semitic Languages and Literatures in the University of Manchester. I

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John Allen Howe.

Curator and Librarian of the Museum of Practical Geology, London. The Geology of Building Stones.

John Addington Symonds, LL.D.

See the biographical article: Symonds, J. Addington.

Right Hon. James Bryce, D.C.L., D.Litt.

See the biographical article: Bryce, James.

Joseph Braun, S.J.

Author of Die liturgische Gewandung ; &c,

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James Cossar Ewart, M.D., F.R.S.

Regius Professor of Zoology in the University of Edinburgh. Swiney Lecturer on Geology at the British Museum, 1907. Author of The Multiple Origin of Horses and Ponies ; &c.

Taylor, Zachary.

Telegraph: Wireless Telegraphy.

Author of i Tertiary.

•j Tasso. i Theodora.

f Surplice; 1 Tiara.

Timber.

Telegony.

John Dyneley Prince, Ph.D.

Professor of Semitic Languages in Columbia University, New York, in the Expedition to Southern Babylonia, 1 888-1 889.

Took part \ Sumer and Sumerian.

Rev. James Everett Frame, A.M.

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Dean, Fellow and Lecturer in Divinity and Hebrew, W a dham College, Oxford. University Lecturer in Aramaic.

James Gairdner, C.B., LL.D.

See the biographical article : Gairdner, James.

Thessalonians, Epistles to the.

Tamayo y Baus; Tirso de Molina.

J Targum.

Sir Joshua Girling Fitch, LL.D.

See the biographical article: Fitch, Sir J. G.

■■! Talbot (Family) (in part). JThring, Edward.

J. G. FT.

J. G. M. J. G. Se. J. H. M,

J. H. R. J. HI. R.

J. Ja.

J. K. I. J. K. L.

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J. P. P. J. P. Pe.

J. S. P.

Author of Burma

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Sir James George Scott, K.C.I.E.

Superintendent and Political Officer, Southern Shan States. The Upper Burma Gazetteer.

John Henry Middleton, M.A., Litt.D., F.S.A., D.C.L. (1846-1896). . _. , . . ,. ..

Slade Professor of Fine Art in the University of Cambridge, 1886-1895. Director Theatre: Ancient [in part); of the Fitzwilliam Museum, Cambridge, 1889-1892. Art Director of the South -j Modern (in part); Kensington Museum, 1892-1896. Author of The Engraved Gems of Classical 1 Tiryns (in part). Times; Illuminated Manuscripts in Classical and Mediaeval Times. ˆ

John Horace Round, M.A., LL.D.

Balliol College, Oxford. Author of Feudal England; Studies in Peerage and Family History; Peerage and Pedigree.

j Theinnl; \ Thibaw.

r.

Talbot (Family) (in part).

John Holland Rose, M.A. (Litt.D. f

Christ’s College, Cambridge. Lecturer on Modern History to the Cambridge J T a ii e vrand University Local Lectures Syndicate. Author of Life of Napoleon I.; Napoleonic | 1 <* lle J I '* uu ' Studies; The Development of the European Nations; The Life of Pitt; &c.

Joseph Jacobs, Litt.D.

Professor of English Literature in the Jewish Theological Seminary, New York. Formerly President of the Jewish Historical Society of England. Corresponding – Member of the Royal Academy of History, Madrid. Author of Jews of Angevin England; Studies in Biblical Archaeology; &c.

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See the biographical article : Ingram, John Kells.

Sir John Knox Laughton, M.A., Litt.D.

Professor of Modern History, King’s College, London. Secretary of the Navy Records Society. Served in the Baltic, 1854-1855; in China, 1856-1859. Mathe- matical and Naval Instructor, Royal Naval College, Portsmouth, 1866-1873; Greenwich, 1 873-1 885. President, Royal Meteorological Society, 1 882-1 884. ” Honorary Fellow of Gonville

and Caius College, Cambridge. Fellow of King's College, London. Author of Physical Geography in its Relation to the Prevailing Winds and Currents; Studies in Naval History; Sea Fights and Adventures; &c.

John Louis Emil Dreyer. f

Director of Armagh Observatory. Author of Planetary Systems from Tholes to \ Time, Measurement of. Kepler; &c. I

Sir John Macdonell, M.A., C.B., LL.D.

Master of the Supreme Court. Formerly Counsel to the Board of Trade and the London Chamber of Commerce; Quain Professor of Comparative Law, Uni- versity College, London. Editor of State Trials; Civil Judicial Statistics; &c. Author of Survey of Political Economy; The Land Question; &c.

Tabernacles, Feast of.

Sumptuary Laws.

Tegetthoff, Admiral.

Suzerainty.

Rev. James Moffatt, M.A., D.D.

Minister of the United Free Church of Scotland. Author of Historical New Testament; &c.

John McEwan, F.R.G.S., F.R.Met.Soc.

r Timothy, First Epistle to; Jowett Lecturer, London, 1907. 1 Timothy, Second Epistle

I Titus, Epistle to.

Tea.

to;

John Miller Gray (1850-1894). f

Art Critic. Curator of the Scottish National Portrait Gallery, 1884-1894. Author -j Tassie, James. of David Scott, R.S.A.; James and William Tassie. I

John Malcolm Mitchell.

Sometime Scholar of Queen's College, Oxford. Lecturer in Classics, East London College (University of London). Joint-editor of Grote's History of Greece.

Terramara; Themistocles; Thucydides (in

part).

John Purser, M.A., LL.D.

Formerly Professor of Mathematics in Queen's College, Belfast. Royal Irish Academy.

Member of the j Surface (in part).

Taille.

Jean Paul Hippolyte Emmanuel Adhemar Esmein.

Professor of Law in the University of Paris. Officer of the Legion of Honour. Member of the Institute of France. Author of Cours elementaire d histoire du droit ' francais; &c. |_

John Percival Postgate, M.A., Litt.D. r

Professor of Latin in the University of Liverpool. Fellow of Trinity College, J Textual Criticism; Cambridge. Fellow of the British Academy. Editor of the Classical Quarterly. 1 Tibullus, Albius. Editor-in-Chief of the Corpus poetarum Latinorum ; 8k. I

John Punnett Peters, Ph.D., D.D.

Canon Residentiary of the Protestant Episcopal Cathedral of St John the Divine, New York City. Formerly Professor of Hebrew in the University of Pennsylvania. \ Tigris,, In charge of the University Expedition to Babylonia, 1 888-1 895. Author of Nippur, or Explorations and Adventures on the Euphrates.

John Smith Flett, D.Sc, F.G.S. f Syenite;

Petrographer to the Geological Survey of the United Kingdom. Formerly Lecturer J Taehylytes – en Petrology in Edinburgh University. Neill Medallist of the Royal Society of | Tl . ',jL ' Edinburgh. Bigsby Medallist of the Geological Society of London. I mera""»'

J. S. Ga. J. S. R.

INITIALS AND HEADINGS OF ARTICLES

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James Sykes Gamble, M.A., C.I.E., F.R.S., F.L.S.

Indian Forest Service (retired). Formerly Director of the Imperial Forest School – at Dehra Dun. Author of A Manual of Indian Timbers; &c.

James Smith Reid, M.A., LL.D., Litt.D.

Professor of Ancient History and Fellow and Tutor of Gonville and Caius College, Cambridge. Honorary Fellow, formerly Fellow and Lecturer of Christ's College. ■ Browne's and Chancellor's Medals. Editor of editions of Cicero's Academic: De Amicitia; &c.

John Thomas Bealby.

Joint-author of Stanford's Europe. Formerly Editor of the Scottish Geographical Magazine. Translator of Sven Hedin's Through Asia, Central Asia and Tibet; &c.

J. T. C.

J. W. J. Wal.

J. W. G

J. W. He.

J. W. L. G.

K. A. M * K. L.

K. S.

Teak (in pari).

Tiberius.

Syr-Darya (River) (in part); Syr-Darya (Province) (in part); Takla Makan; Tambov (in part); Tarim; Tian-Shan; Tiflis (Town) (in pari);

Tobolsk (Government) (in part) ; Tomsk (Government) (in part).

Teredo.

Theatre: Law relating to

Theatres; .Tithes (Law).

Thermochemistry.

Joseph Thomas Cunningham, M.A., F.Z.S.

Lecturer on Zoology at the South-Western Polytechnic, London. Formerly Fellow < of University College, Oxford. Assistant Professor of Natural History in the " University of Edinburgh. Naturalist to the Marine Biological Association.

James Williams, M.A., D.C.L., LL.D.

All Souls Reader in Roman Law in the University of Oxford, and Fellow of Lincoln – College. Author of Wills and Succession ; &c.

James Walker, D.Sc, Ph.D., LL.D., F.R.S.

Professor of Chemistry in the University of Edinburgh. Professor of Chemistry,ˆ University College, Dundee, 1894-1908. Author of Introduction to Physical' Chemistry.

John Walter Gregory, D.Sc, F.R.S.

Professor of Geology in the University of Glasgow. Professor of Geology and Mineralogy in the University of Melbourne, 1900-1904. Author of The Dead Heart' of Australia; &c.

James Wycltffe Headi.am, M.A.

Staff Inspector of Secondary Schools under the Board of Education, London. Formerly Fellow of King's College, Cambridge. Professor of Greek and Ancient – History at Queen's College, London. Author of Bismarck and the Foundation of the German Empire; &c.

James Whitbread Lee Glaisher, M.A., D.Sc, F.R.S. f

Fellow of Trinity College, Cambridge. Formerly President of the Cambridge J Table Mathematical. Philosophical Society and the Royal Astronomical Society. Editor of Messenger j of Mathematics and the Quarterly Journal of Pure and Applied Mathematics. I

Kate A. Meakin (Mrs Budgett Meakin).

Rev. Kirsopp Lake, M.A.

Lincoln College, Oxford. Professor of Early Christian Literature and New Testa- ment Exegesis in the University of Leiden. Author of The Text of the New Testa- ment ; The Historical Evidence for the Resurrection of Jesus Christ ; &c.

Kathleen Schlesinger. r Symphonia- Tambourine-

Author of The Instruments of the Orchestra. Editor of The Portfolio of Musical < T -_i, ■ * '

Tasmania: Geology.

Taaffe, Count; Thun- Hohenstein.

J Tetuan; Sus.

r

Tatian.

L.

A. W.

L.

J. S.

M

B.

M

Ba.

Archaeology.

Laurence Austine Waddell, C.B., CLE., LL.D.

Lieut.-Colonel I. M.S. (retired). Author of Lhasa and its Mysteries; &c.

Timbrel.

j Tibet (in part).

. c L , f Sylvanite; Sylvite; r ormerly Scholar J _ . , .. Editor of the! Tetradymite;

[Tetrahedrlte; Thorite.

{

Taxidermy.

M. H. S.

M. J. de G. M. M. Bh.

Leonard James Spencer, M.A.

Assistant in the Department of Mineralogy, British Museum, of Sidney Sussex College, Cambridge, and Harkness Scholar.

Mineralogical Magazine.

Montagu Browne.

Author of Practical Taxidermy; Collecting Butterflies and Moths.

The Hon. Maurice Baring. r

Sometime Scholar of Trinity College, Cambridge. War Correspondent for the Morning Post in Manchuria, 1904; and Special Correspondent in Russia, 1905-1908, -j Taine. and in Constantinople, 1909. Author of Landmarks in Russian Literature; With I the Russians in Manchuria; A Year in Russia; &c. I

Marion H. Spielmann, F.S.A. f

Formerly Editor of the Magazine of Art. Member of the Fine Art Committee of the International Exhibitions of Brussels, Paris, Buenos Aires, Rome and the Franco-. British Exhibition, London. Author of History of “Punch”; British Portrait- Painting to the Opening of the Nineteenth Century; Works of G. F. Watts, R. A.; British Sculpture and Sculptors of To-day; Henriette Ronner; &c.

Michael Jan de Goeje.

See the biographical article: Goeje, Michael Jan de.

Sir Mancherjee Merwanjee Bhownaggree, K.C.I.E.

Fellow of Bombay University. M.P. for N.E. Bethnal Green, 1895-1906. of History of the Constitution of the East India Company; &c.

Thornycroft, William Hamo.

Thousand and one Nights.

Author^ Takhtsingji.

INITIALS AND HEADINGS OF ARTICLES

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P. A. K.

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R. A. Sa.

R. A. S. M.

R. C. J.

R. 6. R. 6n.

R. H. C. R. I. P.

Maximilian Otto Bismarck Caspari, M.A.

Reader in Ancient History in London University. University,

1905-1908.

Lecturer in Greek in Birmingham

Norman M'Lean, M.A.

Lecturer in Aramaic, Cambridge University. Fellow and Hebrew Lecturer, Christ's . College, Cambridge. Joint-editor of the larger Cambridge Septuagint.

Neill Malcolm, D.S.O., F.R.G.S.

Major, Argyll and Sutherland Highlanders. Served N.W. Frontier, India, 1897- 1898; South Africa, 1899-1900; Somaliland, 1903-1904; British Mission to Fez, – 1905. Editor of The Science of War.

Northcote Whitridge Thomas, M.A.

Government Anthropologist to Southern Nigeria. Corresponding Member of the Societe d'Anthropologie de Paris. Author of Thought Transference; Kinship and' Marriage in Australia; &c.

Oskar Henrik Dumrath, Ph.D.

Formerly Editor of foreign news in the Nya Dagligl Allehanda.

Osbert John Radcliffe Howarth, M.A.

Christ Church, Oxford. Geographical Scholar, Oxford, 1901. Assistant Secretary of the British Association.

Tegea; Theodosius I.-tli.;

Theramenes;

Thrasybulus.

Syrlac Language; Syriac Literature; Thomas of Marga.

Tactics.

Prince Peter Alexeivitch Kropotkin.

See the biographical article: Kropotkin, Prince P.A.

Peter Giles, M.A., LL.D., Litt.D.

Fellow and Classical Lecturer of Emmanuel College, Cambridge, and

University Reader in Comparative Philology. Formerly Secretary of the Cambridge Philo- logical Society. Author of Manual of Comparative Philology.

Paul George Konody.

Art Critic of the Observer and the Daily Mail. Formerly Editor of the Artist. Author of The Art of Walter Crane; Velasquez, Life and Work; &c.

Philip Lake, M.A., F.G.S.

Lecturer in Regional Geography in the University of Cambridge. Formerly of the Geological Survey of India. Author of Monograph of British Cambrian Trilobites. Translator and Editor of Keyser's Comparative Geology.

Sir Philip Magnus.

M.P. for the University of London. Superintendent and Secretary of the City and Guilds of London Institute. President of Council of College of Preceptors; Chair- .. man of Secondary Schools Association. Member of the Royal Commission on Technical Instruction, 1881-1884. Author of Industrial Education; &c.

Primrose McConnell, F.G.S.

Member of the Royal Agricultural Society.

Taboo; Telepathy.

j Sweden: History {in part).

f Sweden: Geography and \ Statistics; L Tibet {in part).

Syr-Darya: River {in part); Syr-Darya: Province {in part); Tambov {in part); Tatars {in part); Tiflis: Town {in part); Tobolsk: Government {in part) ; Tomsk: Government {in part).

Teniers {in part).' Sweden: Geology.

Technical Education.

Author of Diary of a Working Farmer. \ Thrashing.

Succession.

Sufiism; Sunnites {in part).

Sun.

Paul Vinogradoff, D.C.L., LL.D.

See the biographical article: Vinogradoff, Paul.

Reynold Alleyne Nicholson, M.A., Litt.D.

Lecturer in Persian in the University of Cambridge. Sometime Fellow of Trinity College, Cambridge, and Professor of Persian at University College, London. Author of Selected Poems from the Divani Shamsi Tabriz ; A Literary History of the Arabs; &c.

Ralph Allen Sampson, M.A., D.Sc, F.R.S.

Astronomer Royal for Scotland. Formerly Professor of Mathematics and Astronomy in the University of Durham, and Fellow of St John's College, Cambridge. Author of Tables of the Four Great Satellites of Jupiter; &c. |

Robert Alexander Stewart Macalister, M.A., F.S.A. r

St John's College, Cambridge. Director of Excavations for the Palestine Ex- J Tiberias, ploration Fund. |

Sir Richard Claverhouse Jebb, LL.D., D.C.L. r .

See the biographical article: Jebb, Sir Richard Claverhouse. j Thucyaides {in part).

Richard Garnett, LL.D.

See the biographical article: Garnett, Richard.

Sir Robert Giffen, F.R.S.

See the biographical article: Giffen, Sir Robert.

< Swift, Jonathan {in part).

J Taxation.

Rev. Robert Henry Charles, M.A., D.D., Litt.D. (Oxon).

Grinfield Lecturer and Lecturer in Biblical Studies, Oxford, and Fellow of Merton College. Fellow of the British Academy. Formerly Senior Moderator of Trinity . College, Dublin. Author and Editor of Book of Enoch; Book of Jubilees; Apoca- lypse of Baruch; Assumption of Moses; Ascension of Isaiah; &c.

Testaments of Patriarchs;

Testaments of Patriarchs.

the Three

the Twelve

Reginald Innes Pocock, F.Z.S.

Superintendent of the Zoological Gardens, London.

f Tarantula;

\ Tardigrada; Ticks.

XXV R. J. BL

R. L.*

R. Ma.

R. N. B.

R. P. S.

R.R.

8. A. C.

S. BL

St G. L. F.-P.

St G. S. S. K.

S.N. T. As.

T. A. A. T. A. C.

T. de L. T. H. T. H. H.*

INITIALS AND HEADINGS OF ARTICLES

Ronald John McNeill, M.A. f Sussex, 3rd Earl of;

Christ Church, Oxford. Barrister-at>Law. Formerly Editor of the St James's J Tandy, James Napper; Gazette (London). [Temple, Earl.

Richard Lydekker, F.R.S., F.G.S., F.Z.S. f s w j nP . Tanir (in bart)

Member of the Staff of the Geological Survey of India, 1 874-1 882. Author of I °„”™’ *f” K . V ”. Catalogue of Fosstl Mammals, Reptiles and Birds in the British Museum; The Deer 1 *ar sle r, nger \in pari), of all Lands ; The Game Animals of Africa , &c. [Tillodontia; Tltanothemdae

Rev. Robert Mackintosh, M.A., D.D. Jti,..™. ti,.^™

Tutor in Lancashire Independent College, Manchester. \ lneism, ineoiogy.

Svane, Hans;

Sweden: History (in part);

Sweyn I.;

Szeehenyi, Istvan, Count;

Szigligeti, Ede;

Tarnowski, Jan;

Tausen, Hans; Tessin, Count;

Theodore I. -III. of Russia;

Thfikoly, Imre; Tisza, Kalman;

Toll, Johan, Count;

Tolstoy, Petr, Count.

Robert Nisbet Bain (d. 1909).

Assistant Librarian, British Museum, 1883-1909. Author of Scandinavia: the Political History of Denmark, Norway and Sweden, 1513-1900; The First Romanovs, 1613 to 1725; Slavonic Europe: the

Political History of Poland and Russia from 1469 to 1796 ; &c.

R. Phene Spiers, F.S.A., F.R.I.B.A.

Formerly Master of the Architectural School, Royal Academy, London. Past President of Architectural Association. Associate and Fellow of King's College, . London. Corresponding Member of the Institute of France. Editor of Fergus son's History ef Architecture. Author of Architecture: East and West; &c.

Reinhold Rost, CLE., LL.D. (1822-1896).

Secretary of the Royal Asiatic Society, 1863-1869. Librarian at the India Office, London, 1869-1893. Editor of H. H. Wilson s Essays on the Religions of the Hindus; ' Hodgson's Essays on Indian Subjects; &c.

Stanley Arthur Cook, M.A.

Editor for the Palestine Exploration Fund. Lecturer in Hebrew and Syriac, and formerly Fellow, Gonville and Caius College, Cambridge.. Examiner in Hebrew and J Talmud. Aramaic, London University, 1904-1908. Author of Glossary of Aramaic In- scriptions; The Laws of Moses and Code of Hammurabi; Critical Notes on Old Testament History; Religion of Ancient Palestine; &c.

Temple {in part).

Tamils; Thugs.

f Thomsen, Grimur; 1 Thbroddsen, J6n.

Sigtus Blondal.

Librarian of the University of Copenhagen.

St George Lane Fox-Pitt, M.R.A.S. f

Associate of King's College, London. Treasurer and Vice-President of the Moral J Theosophy: Oriental. Education League and the International Moral Education Congress. [

St George Stock, M.A. r Therapeutae*

Pembroke College, Oxford. Lecturer in Greek in the University of Birmingham. -j Tnhil . %jL n'nnk of

Sten Konow, Ph.D. r

Professor of Indian Philology in the University of Christiania. Omcier de l'Acaddmie J Tibeto-Burman Languages. Francaise. Author of Slamavidhana Brahmana; &c. ˆ

Simon Newcomb, D.Sc , LL.D. J

See the biographical article: Newcomb, Simon. -jˆ Time,

Standard.

Thomas Ashby, M.A., Litt.D.

Director of the British School of Archaeology at Rome. Formerly Scholar of Christ Church, Oxford. CravenFellow, 1897. Conington Prizeman, 1906. Member . of the imperial German Archaeological Institute. Author ot The Classical Topo- graphy of the Roman Campagna.

Suessula; Sulci; Surrentum; Sutri; Sybaris;

Syracuse (in part); Taormina; Taranto; Tarenium; Tarquinii; Tegglano; Tergeste; Termini Imerese; Terracina; Tharros; Thurii; Tibur; Tiburtina, Via; Ticihum.

Thomas Andrew Archer, M.A.

Author of The Crusade of Richard I. ; &c.

■< Templars (in part).

Timothy Augustine Coghlan, I.S.O.

Agent-General for New South Wales. Government Statistician, New South Wales 1886-1905. Honorary Fellow of the Royal Statistical Society. Author of Wealth . and Progress of New South Wales; Statistical Account of Australia arid New Zea- land; &c.

Tasmania: Geography, Statistics and History.

A. Terrien de Lacouperie, Litt.D.

Formerly Professor of Indo-Chinese at University College, London.

Thomas Hodgkin, D.C.L., Litt.D.

See the biographical article: Hodgkin, Thomas.

Sih Thomas Hungerford Holdich, K.C.M.G., K.C.I.E., D.Sc.

Superintendent of Frontier Surveys, India, 1892-1898. Gold Medallist, R.G.S.,_ London, 1887. Author of The Indian Borderland; The Countries of the King's" Award; India; Tibet.

\ Tibet (in part).

I Theodoric.

Surveying (in part); Tibet (in part).

INITIALS AND HEADINGS OF ARTICLES

XV

T. H.

W.

T. L.B.

T.L.

H.

T. M.

L.

T. R.

R. S

T. Se.

V. W. Gli.

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W. A. B. C.

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W. E. Co.

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F. C.

w.

G. P.

w.

Hy.

w.

H.P.

w.

H. P.

w.

J. B.

W.L.*

W. McD.

Hudson Williams. Professor of Greek in the University College of North Wales, Bangor.

{

Theognis of Megara.

^^Ll^^J^^^l Theodoslus of Tripolis.

Treatise on Conic Sections; The

Sir Thomas Lauder Brunton, Bart., M.D., Sc.D., LL.D., F.R.S., F.R.C.P. J

Consulting Physician to St Bartholomew's Hospital, London. Author of Modern "j Therapeutics.

Therapeutics ; Therapeutics of the Circulation ; &c. I

Sir Thomas Little Heath, K.C.B., Sc.D. Assistant Secretary to the Treasury, London. Cambridge. Author of Apollonius of Perga; Thirteen Books of Euclid's Elements; &c.

Rev. Thomas Martin Lindsay, M.A., D.D. f

Principal and Professor of Church History, United Free Church College, Glasgow, -j Thomas a KempiS.

Author of Life of Luther ; &c. L

Rev. Thomas Roscoe Rede Stebbing, M.A., F.R.S., F.L.S., F.Z.S. f

Fellow of King's College, London. Hon. Fellow, formerly Fellow and Tutor, of J Thvrostraca Worcester College, Oxford. Zoological Secretary of the Linnaean Society, 1903- | ' 1907. Author of A History of Crustacea; The Naturalist of Cumbrae; &c. L

Thomas Seccombe, M.A.

Balliol College, Oxford. Lecturer in History, East London and Birkbeck Colleges, . University of London. Stanhope Prizeman, Oxford, 1887. Assistant Editor of the Dictionary of National Biography, 1891-1901. Author of The Age of Johnson; &c.

Valentine Walbran Chapman.

Swift, Jonathan (in part); Tichborne Claimant.

f Sugar: Sugar Manufacture (in \ part).

Wilfrid Airy, M.Inst.C.E. _ J Tacheometrv

Sometime Scholar of Trinity College, Cambridge. Technical adviser to the Standards “] eomeiry.

Department of the Board of Trade. Author of Levelling and Geodesy; &c. I

Rev. William Augustus Brevoort Coolidge, M.A., F.R.G.S., Ph.D.

Fellow of Magdalen College, Oxford. Professor of English History, St David’s College, Lampeter, 1880-1881. Author of Guide du Haut Dauphine; The Range of’ the Todi; Guide to Grindelwald ; Guide to Switzerland; The Alps in Nature and in History; Sec. Editor of the Alpine Journal, 1880-1881 ; &c.

Walter Alison Phillips, M.A.

Formerly Exhibitioner of Merton College and Senior Scholar of St John’s College, ” Oxford. Author of Modem Europe ; &c.

William Burton, M.A., F.C.S.

Chairman of the Joint Committee of Pottery Manufacturers of Great Britain. – Author of English Stoneware and Earthenware ; &c.

W. Baker Brown.

Lieut.-Colonel, Commanding Royal Engineers at Malta.

William Barclay Squire, M.A., F.S.A., F.R.G.S.

Assistant in charge of Printed Music, British Museum. Hon. Secretary of the Purcell Society. Formerly Musical Critic of the Westminster Gazette, the Saturday ‘ Review and the Globe.

Switzerland: Geography, Government, &c, History and Literature;

Tell, William; Thun (Town};

Thun, Lake of; Thurgau;

Ticino (Canton);

Tirol; Toggenburg, The.

Surplice: Church of England;

Templars (in part);

Titles of Honour.

Terra-cotta (in part); Tile.

Submarine Mines.

Thomas, Arthur Goring.

Rt. Rev. William Edward Collins, D.D. 1

Bishop of Gibraltar. Formerly Professor of Ecclesiastical History, King's College, J Tait, Archbishop; London. Lecturer at Selwyn and St John's Colleges, Cambridge. Author of The 1 Testamentum Domini. Study of Ecclesiastical History ; Beginnings of English Christianity ; &c.

t

William Feilden Craies, M.A.

Barrister-at-Law, Inner Temple. Lecturer on Criminal Law, King's College, London. Editor of Archbdld's Criminal Pleading (23rd edition).

William George Freeman.

Joint-author of Nature Teaching; The World's Commercial Products; &c. editor of Science Progress in the Twentieth Century.

William Henry.

Founder and Chief Secretary to the Royal Life Saving Society. Associate of the Order of St John of Jerusalem. Joint-author of Swimming (Badminton Library) ; &c.

J Summary Jurisdiction; I Summons; Sunday (Law).

Joint- < Tobacco.

Sir William Henry Flower, F.R.S.

See the biographical article : Flower, Sir W. H.

Walter Herries Pollock, M.A.

Trinity College, Cambridge. Editor of the Saturday Review, of Lectures on French Poets ; Impressions of Henry Irving ; &c.

Swimming.

f Tapir (in part); L Tiger (in part).

1 883-1 894. Author^ Thackeray.

Rev. William Jackson Brodribb, M.A.

Formerly Fellow of St John’s College, Cambridge, and Rector of Wootton-Rivers, Wilts.

Tacitus (in part).

Walter Lehmann, M.D.

Directorial Assistant of the Royal Ethnographical Museum, Munich. Exploring Expedition in Mexico and Central America, 1907-1909. publications on Mexican and Central American Archaeology.

William McDougall, M.A. _ f

Wilde Reader in Mental Philosophy in the University of Oxford. Formerly Fellow < Suggestion. of St John's College, Cambridge. i

Conducted J Toltecs. Author of

XVI

W. M. R. W. H. Ra. W. N. S.

W. P. A. W. RL

INITIALS AND HEADINGS OF ARTICLES

w.

R. S.

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Sh.

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S. R.

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W. R.*

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Y. S.

{

Tarsus.

William Michael Rossetti. f Tintoretto;

See the biographical article : Rossetti, Dante Gabriel. \ Titian.

Sir William Mitchell Ramsay, Litt.D., D.C.L.

See the biographical article: Ramsay, Sir W. Mitchell.

William Napier Shaw, M.A., LL.D., D.Sc, F.R.S.

Director of the Meteorological Office. Reader in Meteorology in the University of London. President of Permanent International Meteorological Committee. Member." Sunshine. of Meteorological Council, 1897-1905. Hon. Fellow of Emmanuel College, Cam- bridge. Fellow of Emmanuel College, 1877-1906; Senior Tutor, 1890-1899. Joint Author of Text-Book of Practical Physics; &c.

LlEUT.-COLONEL WlLLIAM PATRICK ANDERSON, M.INST.C.E.. F.R.G.S. f

Chief-Engineer, Department of Marine and Fisheries of Canada. Member of the J _ . r , Geographical Board of Canada. Past President of the Canadian Society of Civil 1 Superior. LaRe. Engineers. L

William Ridgeway, M.A., D.Sc, Litt.D.

Disney Professor of Archaeology, and Brereton Reader in Classics, in the University of Cambridge. Fellow of Gonville and Caius College. Fellow of the British Academy. President of the Royal Anthropological Institute, 1908. Author of The Early Age of Greece ; &c.

William Robertson Smith, LL.D.

See the biographical article: Smith, W. Robertson.

William Sharp.

See the biographical article: Sharp, William.

William Smyth Rockstro.

Thrace: Ancient Peopla

Teraphim {in part).

\ Thoreau, Henry David.

liam Smyth Rockstro. f

Author of A Great History of Music from the Infancy of the Greek Drama to the -J Tallis Thomas

Present Period ; &c. 1 ‘ ”

William Walker Rockwell, Lic.Theol. f Toledo, Councils of.

Assistant Professor of Church History, Union Theological Seminary, New York. \

William Young Sellar, LL.D.

See the biographical article: Sellar, William Young.

/Terence {in part).

PRINCIPAL UNSIGNED ARTICLES

Succession Duty. Succinic Acid. Suez Canal.

Suffolk, Earls and Dukes of. Suffolk.

Sulphonic Acids. Sulphur. Sumatra. Sunderland. Sundew. Sunflsh. Sunstroke. Swat.

Surgical Instruments and Appliances.

Surrey.

Sussex, Earls of. Sussex. Sutherland, Earls

Dukes of. Swabia.

Sweating-Sickness. Swithun, St. Sydney (N.S.W.). Syllogism. Syracuse (N.Y.). Sze-ch'uen. Synagogue. Table. Tahiti.

and

Tampa.

Tantalum.

Tarragona.

Tattooing.

Taunton.

Tellurium.

Tenby.

Teneriffe.

Tennessee.

Tennis.

Tent

Test Acts.

Tewkesbury.

Texas.

Thallium.

Thames.

Theodolite.

Theseus.

Thorium.

Thuringia.

Tibbu.

Tierra del Fuego.

Tiglath-Pileser.

Timor.

Tin.

Tipperary.

Titanium.

Togoland.

Toledo.

ENCYCLOPAEDIA BRITANNICA

ELEVENTH EDITION

VOLUME XXVI

SUBMARINE MINES. A submarine mine is a weapon of war used in the attack and defence of harbours and anchorages. It may be defined as ” A charge of explosives, moored at or beneath the surface of the water, intended by its explosion to put out of action without delay a hostile vessel of the class it is intended to act against.” It differs from the torpedo (q.v.) in being incapable of movement (except in the special form of drifting mines, which are not moored, but move with the tide or current). But this subdivision into two distinct classes was not made till 1870. Prior to that date the term ” torpedo ” was used for all explosive charges fired in the water.

Submarine mines may be divided into two main classes, con- trollable and uncontrollable, or, as they are often classified, ” electrical ” or ” mechanical.” In the first class the method of firing is by electricity, the source of the electric power whether by battery or dynamo being contained in a firing station on shore and connected to the mines by insulated cables. By simply switching off the electricity in the firing station, such mines are rendered inert and entirely harmless. In the second class, the means of firing are contained in the mine itself, the source of power being a small electric battery, or being obtained from a pistol, spring or suspended weight. In all mines of this class the impulse which actuates the firing gear is given by a ship or other floating object bumping against the mine. When mechanical mines have once been set for firing they are thus dangerous to friend and foe alike. Safety arrange- ments are employed to prevent the firing apparatus working while the mine is being laid, and clockwork is

sometimes added to render the mine inactive after a certain definite time or in case the mine breaks away from its mooring. Their principal advantages, as compared with the electrically controlled mines, are cheapness and rapidity of laying. ” Controllable ” mines are absolutely under the control of the operator on shore, their condition is always accurately known, and if any break adrift not only is the fact at once known but the mines themselves are harmless. Another advantage is that when fired by ” observa- tion ” as described below, they are placed at depths which will be well below the bottom of any vessels passing through the mine field. They can thus be used in channels which have to be kept open for traffic during hostilities.

Electrical mines take rather longer to prepare and lay out than the other class, as the electrical cables have to be laid and jointed, and they require rather more skill and training in the operators employed to lay and fire the mines. Such mines represent the highest development of this form of warfare, and the details given below refer mainly to this class of mine.

Electrical mines are arranged on two systems according to the method of ascertaining the proper moment to apply the firing xxvi. 1

current to the mine cables. These methods are by ” observa- tion ” or by ” circuit closer.”

The ” observation ” system depends on two careful observa- tions made by an operator on shore, one of the exact position in which the mines are laid, the other of the track of hostile ships passing over the mine field. The position of the mines when laid is marked on a special chart, on which the track of ships crossing the mine field can also be plotted. When the track is seen to be crossing the position of a mine, a switch is closed on shore and the mine is fired. To allow for errors in observation such mines are fitted with large charges of explosive and are usually arranged in lines of two, three or four mines placed across the channel, all the mines in a line being fired together. Observa- tion mines are placed either resting on the bottom or moored at depths which are well below the bottom of any friendly vessels and (except that anchoring in the mine field must be forbidden for fear of injury to cables) such mines offer no obstruc- tion to friendly traffic.

In the ” circuit closer ” or “-C.C.” system, each mine contains a small piece of apparatus which is set in action by the blow of a vessel or other object against the mine. When set in action, this apparatus completes an electrical circuit in the mine, through which the mine can be fired, if the main switch on shore is closed. If it is not wished to

fire, the C.C. is restored to its ordinary condition either automatically by a spring in the mine, or by an electrical device operated from the shore.

Such mines are necessarily placed near the surface, and are to this extent an interference with friendly traffic. A vessel passing by mistake through a mine field of this class would run no risk of an explosion while the mines are inactive, but might do some damage to the mines.

This class of mine is used in side channels which it is intended to close entirely, or to reduce the width of navigable channels where too wide to be defended by observation mines. Their principal advantage is that if the firing switch is closed they are effective in fog or mist, when observation mines could not be worked, and when the guns of the defence would be equally out of action. As they are fired only when close against the side of a ship, the charge can be comparatively small and the mines themselves are handy and easy to lay.

Compared with observation mines they use much less cable, as the action of the C.C. is such that only the mine which is struck can be fired. Several mines of this class can therefore share one cable from the shore, though in practice details of mooring and arrangement limit the number' connected to one cable to four. A set of mines on one cable is referred to as a " group."

The arrangements for firing the mines are contained in a firing station on shore, in which is the battery or other source of

electrical power for firing, and the necessary apparatus for testing the system of mines, which is usually done daily. To let the operator in the firing station know when the C.C. of a mine has been struck and the mine is ready to fire, a small electrical apparatus is provided in the firing station for each group of mines. This arrangement strikes a bell when the C.C. is worked and also closes a break in the firing circuit. The operator can then close the main switch and fire the mine, or if acting on the order to "fire all mines that signal" he has already closed his main switch, the signalling apparatus, in the act of striking the bell, completes the firing circuit A similar piece of apparatus is connected to each observing instrument, the completion of the circuit of any line at thft observing station then gives a signal in the firing station and the firing circuit is completed.

The firing station can be on a vessel moored near the mine field, but is more usually on shore, where it can be made abso- lutely secure against any form of attack. But the observing stations must be on shore to give stability to the observing instruments, they cannot be entirely protected as they must have a small opening facing the mine fieid, but can be made very inconspicuous.

Any explosive can be used in submarine mines, provided adequate means are taken to explode the charge, but the explo- sive which is easiest to handle and is in most general use is wet gun-cotton with a small dry primer and detonator to start ignition. The detonators for electrical mines are on the ” low tension ” system, that is, firing is effected by the heating of a small length of wire called a ” bridge,” round which is placed a priming which ignites and detonates a small charge of fulminate of mercury.

The charge is contained in a steel mine-case, which has an ” apparatus ” inside to contain the electrical arrangements and the C.C. when used. Cases for observation mines are usually cylindrical in shape for mines, to rest on the bottom and spherical for buoyant mines. The weight of charge is about 500 lb and the size of a buoyant case for this charge would be four feet in diameter. Cases for contact mines are spherical, about 39 in. in diameter, and can hold 100 lb of gun-cotton. They are always buoyant. Buoyancy is provided for by an air-space inside the case. Buoyant cases are moored to a heavy weight or ” sinker,” the connexion being by a steel wire rope, or in electrical mines, the cable itself. The cable is care- fully insulated and protected with a layer of steel wires. An earth return is used for the electrical circuit.

The employment of mines in any defence must depend entirely on the general character of the defence adopted, which will itself depend on the size and importance of the harbour to be defended and other details (see Coast Defence). The role of mines in a defence is to act as an obstacle to detain ships under fire and compel them to engage the artillery of the defence. Thus mines find their greatest usefulness in the defence of har- bours with long channels of approach. Mine fields can be de- stroyed by ” creeping ” for and cutting the electric cables, by ” sweeping ” for the mines themselves with long loops of chain or rope or by destroying the mines with “countermines.!’ To guard against any of these, the mine field should be protected by gun fire and lit at night by electric lights. As vessels sunk by mines may obstruct the channel, mines should not be used in very narrow channels.

Although the scientific development of submarine mining is the work of the last fifty years, attempts to use drifting charges against ships and bridges are recorded as early as the 16th century. Mines were used by the Americans in 1777, and in 1780 Robert Fulton produced an explosive machine which he called a ” torpedo,” and which was experimented with, not very successfully, up to 1815. In 1854 the Russians used mechanical mines in the Baltic, but without any marked success.

The first application of electricity to the explosion of sub- merged charges was made by Sir Charles Pasley in the destruc- tion of wrecks in the Thames and of the wreck of the ” Royal George ” at Spithead in 1839 and subsequent years. The first

military use of electrically-fired mines was made in the Americar Civil War of 1861-65 when several vessels were sunk or damaged by mines or torpedoes. From this date onwards most European nations experimented with mines, and they were actually used during the Franco-German War of 1870, the Russo-Turkish War of 1878 and the Spanish-American War of 1898. But the most interesting example of mine warfare was in the attack and defence of Port Arthur during the Russo-Japanese War (q.v.) of 1904-05 Both sides used mechanical mines only, and both suffered heavy losses from the mine warfare. Mines and tor- pedoes were first introduced into the English service about 1863, defence mines being! placed inthe charge’of the Royal Engineers, while torpedoes wire’ developed by the Royal Navy. Up to 1904 there were mine defences at most of the British ports, but in that year the responsibility of mines was placed on the navy) and since then the mine defences have been much reduced. ‘ (W. B. B.)

SUBSIDY (through Fr. from Lat. subsidium, reserve troops, aid, assistance, from subsidere, literally ” to sit or remain behind or in reserve,”) j an aid, subvention, assistance granted especially in money. The word has a particular use in economic histpry and practice. In English history it is the general term for a tax granted to the king by parliament, and so distinguished from those dues, such as the customs dues, which were raised by the royal prerogative; of these subsidies there were many varieties; such was the subsidy in excess of the customs on wool, leather, wine or cloth exported or imported by aliens, later extended to other articles and to native exporters and importers (see Tonnage and Poundage); there was also the subsidy which in the 14th century took the place of the old feudal levies. Apart from this application the term, in modern times, is particularly applied to the pecuniary assistance by means of bounties, &c, given by the state to industrial undertakings (see Bounty). Subsidies granted by

the state to literary, dramatic or other artistic institutions, societies, &c, are generally styled ” subventions ” (Lat. subvenirc, to come to the aid of) ■

SUCCESSION (Lat. successio, from succedere, to follow after) the act of succeeding or following, as of events, objects, places in a series, &c, but particularly, in law, the transmission or passing of rights from one to another.

In every system of law provision has to be made for a readjust- ment of things or goods on the death of the human beings who owned and enjoyed them. Succession to rights may be considered from two points of view: in some ways they depend on the personality of those who are concerned with them: if you hire a servant, you acquire a claim against a certain person and your claim will disappear on his death. But personal relations are commonly implicated in the arrangement of pro- perty: if a person borrows money, the creditor expects to be paid even should the debtor die, and the actual payment will depend to a great extent on the rules as to inheritance. Succes- sion, in the sense of the partition or redistribution of the pro- perty of a former owner is, in modern systems of law, the subject of many rules. Such rules may be based on the will of a de- ceased person. They will be found in such articles as Adminis- tration; Assets; Executors and Administrators; Inheri- tance; Intestacy; Legacy; Will; &c. There are cases, however, in which a will cannot be expressed; this eventuality is discussed in the present article, and there can be no doubt that it is the most characteristic one from the point of view of social conditions. It represents the view of society at large as to what ought to be the normal course of succession in the readjustment of property after the death of a citizen. We shall dwell chiefly on the customs of succession among the nations of Aryan stock. Other customs are noticed in the articles on Village Communities; Mahommedan Law; &c.

We have to start from a distinction between personal goods and the property forming the economic basis of existence for the family which is strongly expressed in early law. War booty, pro- ceeds of hunting, clothes and ornaments, implements fashioned by personal skill, are taken to belong to a man in a more persona] way than the land on which he dwells or the cattle of a herd.

SUCCESSION

It is characteristic that even in the strict law of paternal power formulated by the Romans an unemancipated son was protected in his rights in regard to things acquired in the camp (peculium castrense)

and later on this protection spread to other chattels (peculium quasi-castrense). The personal character of this kind of property has a decisive influence on the modes of succession to it. This part of the inheritance is widely considered in early law as still in the power of the dead even after demise. We find that many savage tribes simply destroy the personal belongings of the dead: this is done by several Australian and Negro tribes (Post, Grundriss der ethnologischen Jurisprudent, pp. 174-5) Sometimes this rule is modified in the sense that the goods remaining after deceased persons have to be taken away by strangers, which leads to curious customs of looting the house of the deceased. Such customs were prevalent, for example, among the North American Indians of the Delaware and Iro- quois tribes. Evidently the nearer relations dare not take over such things on account of a tabu rule, while strangers may appropriate them, as it were, by right of conquest.

The continuance of the relation of the deceased to his own things gives rise in most cases to provisions made for the dead out of his personal succession. The habit of putting arms, victuals, clothes and ornaments in the grave seems almost universal, and there can be no doubt that the idea underlying such usages consists in the wish to provide the deceased with all matters necessary to his existence after death. A very char- acteristic illustration of this conception may be given from the customs of the ancient Russians, as described about 921 by the Arabian traveller Ibn Fadhlan. The whole of the personal property was divided into three parts: one-third went to the family, the second third was used for making clothes and other ornaments for the dead, while the third was spent in carousing on the day when the corpse was cremated. The ceremony itself consisted in the following: the corpse was put into a boat and was dressed up in the most gorgeous attire. Intoxicating drinks, fruit, bread and meat were put by its side; a dog was cut into two parts, which were thrown into the boat. Then, all the weapons of the dead man were brought in, as well as the flesh of two horses, a cock and a chicken. The concubine of the de- ceased was also sacrificed, and ultimately all these objects were burned in a huge pile, and a mound thrown up over the ashes. This description is the more interesting because it starts from a division of the goods of the deceased, one part of them being affected, as it were, to his personal usage. This rule continues to be observed in Germanic law in later times and became the starting point of the doctrine of succession to personal property in English law. According to Glanville (vii. 5, 4) the chattels of the deceased have to be divided into three equal parts, of which one goes to his heir, one to his wife and one is reserved to the deceased himself. The same reser- vation of the third

to the deceased himself is observed in Magna Charta (c. 26) and in Bracton's statement of Common Law (fol. 60), but in Christian surroundings the reservation of " the dead man's part " was taken to apply to the property which had to be spent for his soul and of which, accordingly, the Church had to take care. This lies at the root of the com- mon law doctrine observed until the passing of the Court of Probate Act 1857. On the strength of this doctrine the bishop was the natural administrator of this part of the personalty of the deceased.

The succession to real property, if we may use the English legal expression, is not governed by such considerations or the needs of the dead. Roughly speaking, three different views may be taken as to the proper readjustment in such cases. Taking the principal types in a logical sequence, which differs from the historical one, we may say that the aggregate of things and claims relinquished by a deceased person may: (1) pass to relatives or other persons who stood near him in a way deter- mined by law. Should several persons of the kind stand equally near in the eye of the law the consequence would be a division of the inheritance. The personal aspect of succession rules in such systems of inheritance. (2) The deceased may be

considered as a subordinate member of a higher organism — a kindred, a village, a state, &c. In such a case there can be no succession proper as there has been no individual property to begin with. The cases of succession will be a relapse of certain goods used by the member of a community to that community and a consequent rearrangement of rights of usage. The law of succession will again be constructed on a personal basis, but this basis will be supplied not by the single individual whose death has had to be recorded but by some community or union to which this individual belonged. (3) The aggregate of goods and claims constituting what is commonly called an inheritance may be considered as a unit having an existence and an object of its own. The circumstance of the death of an individual owner will, as in case 2, be treated as an accidental fact. The unity of the inheritance and the social part played by it will con- stitute the ruling considerations in the arrangement of succession. The personal factor will be subordinated to the real one.

In practice pure forms corresponding to these main concep- tions occur seldom, and the actual systems of succession mostly appear as combinations of these various views. We shall try to give briefly an account of the following arrangements: (1) the joint family in so far as it bears on succession; (2) voluntary associations among co-heirs; (3) division of inheri- tance; (4) united succession in the shape of primogeniture and of junior right.

The large mass of Hindu juridical texts representing customs and doctrines ranging over nearly 5000 years contains many indications as to the existence of a joint family which was considered as the corporate owner of property and therefore did not admit in principle of the opening of succession through the death of any of its members. The father or head of such a joint family was in truth only the manager of its property during lifetime, and though on his demise this power and right of management had to be regulated anew, the property itself could not be said to pass by succession: it remained as formerly in the joint family itself. In stating this abstract doctrine we have to add that our evidence shows us in practice only characteristic consequences and fragments of it, but that we have not the means of observing it directly in a consistent and complete shape during the comparatively recent epochs which are reflected in the evidence. It is even a question whether such a doctrine was ever absolutely enforced in regard to chattels : even in the earliest period of Hindu law articles of personal apparel and objects acquired by personal will and strength fell to a great extent under the conception of separate property. Gains of science, art and craft are mentioned in early instances as subject to special ownership and corresponding rules of personal succession are framed in regard to them (Jolly, Tagore lectures on Partition, Inheritance and Adoption, 94). But on the other hand there are certain categories of movable goods which even in later law are considered as belong- ing to the family community and incapable of partition, e.g. water, prepared food, roads, vehicles, female slaves, property destined for pious uses and sacrifices, books. When law became rationalized these things had to be sold in order that the pro- ceeds of the sale should be divided, but originally they seem to have been regarded as owned by the joint family though used by its single members. And as to immovables — land and houses — they were demonstrably excluded in ancient customary law from partition among co-heirs.

In Greek law the most drastic expression of the joint family system is to be found in the arrangements of Spartan households, where brothers clustered round the eldest or ” keeper of the hearth” 1 (ecrTunrantov) , and not only the management of family property but even marriages were dependent on the unity of the shares and on the necessity of keeping down the offspring of the younger brothers. With the Romans there are hardly any traces of a primitive family community excluding succession, but the Celtic tribal system was to a great extent based On this fundamental conception (Seebohm, Tribal System in Wales).

1 The term illustrates the intimate connexion between inheritance and household religion in ancient Aryan custom.

During three generations the offspring of father, grandfather and great-grandfather held together in regard to land. The consequence was that, although separate plots and houses were commonly reserved for the uses of the smaller families included within the larger unit, the death of the principal brought about an equalization of shares first per stirpes and ultimately per capita until the final break-up of the community when it reached the stage of the great-grandsons of the original founder. But the most elaborate system of family ownership is to be observed in the history of the latest comers among the Aryan races — the Slavs. In the backward mountain regions which they occupied in the Balkan Peninsula and in the wilderness of the forests and moors of Eastern Europe they developed many characteristic tribal institutions and, among these, the joint family, the Zadruga, inokoshtina. The huge family communities of the southern Slavs have been described at length by recent observers, and there can be no doubt that their roots go back to a distant past (see Village Communities). There is no room in them for succession proper: what has to be provided for is the con- tinuity of business management by elders and the repartition of rights of usage and maintenance, a repartition largely depen- dent on varying customs and on the policy of the above-men- tioned elders. In Russia the so-called large family appears as a much less extensive application of the same idea. It extends rarely over more than three generations, but even as a cluster of members gathering around a grandfather or a great-uncle it presents an arrangement which hampers greatly private enter- prise and staves off succession until the moment when the great household breaks up between the descendants of a great-grand- father.

In Germanic law we catch a glimpse of a state of things in which side relations were not admitted to succession at all. The Frankish Edict of Chilperic (a.d. 571) tells us that if some- body died without leaving sons or daughters, his brother was to succeed him and not his neighbours (non vicini). This has to be construed as a modification of the older rule according to which the neighbours succeeded and not the brother. Under ” neighbours ” we cannot understand merely people connected with a person by proximity of settlement, but rather his kinsmen in their usual capacity of neighbours. The fact that kinsmen forming a settlement have precedence of such near relations as the brothers is characteristic enough, especially, as even the succession of sons and daughters is mentioned in a way which shows that there was still some doubt whether neighbouring kinsmen should not take inheritance instead of the latter. These are systems of a very archaic arrangement based on a close tribal community between the

members of a kindred. Such a community is not apparent in later legal custom, but there are many signs of a close union between members of the same family. The law of Scania, a province of southern Sweden, shows us a group settled around a grandfather. His sons even when married hold part of the property under him and it is with some difficulty that they and their wives succeed in separating some of the goods acquired by personal work or brought in by marriage from the rest of the household property (Scanian Law, Danish Text i. 5)- The same arrangement appears in Lombard law as regards brothers who remain settled in a common house (Edict of Rothari c. 167). Of course, in all such cases, there could be no real inheritance and succession, but merely the stepping in of the next generation into the rights and duties of the representative of an older generation on the latter's demise. In legal terminology it is a case of accretion and not of succession.

The next stage in the development of succession is presented by an arrangement which was common in Germany, viz. by the management of property under the rule of so-called Ganerb- schaft. Ganerben is the same as the Latin coheredes, com- participes, consortes. A capitulary of 818 mentions such com- munities of heirs holding in common (cf. Boretius Capitularia, i. 282). While the community lasted none of the shareholders could dispose of any part of the property by his single will. Legally and economically all transactions had to proceed from

common consent and common resolve. This did not preclude the possibility of any one among the shareholders claiming his own portion, in which case part of the property had to be meted out to him according to fair computation (swascara). There was no legal constraint over the shareholders to remain in common: division could be brought about either by common consent or by claims of individuals, and yet the constant occur- rence of these settlements of co-heirs shows that as a matter of fact it was more profitable to keep together and not to break up the unit of property by division. The customary union of co-heirs appears in this way as a corrective of the strict legal principle of equal rights between heirs of the same degree. In English practice the joint management of co-heirs is not so fully described, but there can be no doubt that under the older Saxon rule admitting heirs of the same degree to equal rights in suc- cession the interests of economic efficiency were commonly pre- served by the carrying on of common husbandry without any realization of the concurrent claims which would have broken up the object of succession. This accounts for the fact that notwithstanding the prevalence among the early English of the rule admitting all the sons or heirs in the same position to equal shares in the inheritance, the

organic units of hides, yardlands, &c. are kept up in the course of centuries. In the management of so-called gavelkind succession in Kent partition was legally possible and came sometimes to be effected, but there was the customary reaction against it in the shape of keeping up the ” yokes ” and ” sulungs.” A trace of the same kind of union between co-heirs appears in the so-called parage communities so often mentioned in Domesday Book.

In all these cases the principle of union and joint manage- ment is kept up by purely economic means and considerations. The legal possibility of partition is admitted by the side of it. It is interesting to watch two divergent lines of further develop- ment springing from this common source; on the one side we see the full realization of individual right resulting in frequent divisions; on the other side we watch the rise of legal restraints on subdivision resulting in the establishment, in respect of certain categories of property, of rules excluding the plurality of heirs for the sake of preserving the unity of the household. The first system is, of course, most easily carried out in countries where individualistic types of husbandry prevail. In Europe it is especially prevalent in the south with its intense cultivation of the arable and its habits of wine and olive growing. We shall not wonder, therefore, that the unrestricted subdivision among heirs is represented most completely by Roman law. Not to speak of the fact that already in the XII. Tables the principal mode of inheritance was considered to be inheritance by will while intestate succession came in as a subsidiary ex- pedient, we have to notice that there is no check on the dis- persion of property among heirs of the same degree. The only survival of a regime of family community may be found in the distinction between heredes sui (heirs of their own) and heredes extranet (outside heirs of the deceased). The first entered by their own right and took possession of property which had belonged to them potentially even during their ancestor’s life. The latter drew their claims from their relationship to the deceased and this did not give them a direct hold on the property in question. Apart from that the civil law of ancient Rome favoured complete division and the same principle is represented in all European legislation derived from Roman law or strongly influenced by it. Sometimes, as in the French Code Civil, even the wish of the owner cannot alter the course of such succession as no person can make a will depriving any of his children of their legal share.

In full contrast with this mode of succession prevailing in romanized countries we find the nations proceeding from Germanic stock and strongly influenced by feudalism developing two different kinds of restraints on subdivision. In Scandi- navian law this point of view is

expressed by the Norwegian customs as to Odal. The principal estates of the country, which, according to the law of the Gulathing have descended through five generations in the same family, cannot be dispersed and

alienated at pleasure. They are considered as rightly belong- ing to the kindred with which a historical connexion has been established. In order to keep these estates within the kindred they are to descend chiefly to men: women are admitted to property in them only in exceptional cases. Originally it is only the daughter of a man who has left no sons and the sister of one who has left no children and no brothers that are admitted to take Odal as if they were men. Nieces and first-cousins are admitted in the sense that they have to pass the property to their nearest male heir. They may, in certain eventualities, be bought out by the nearest male relative. A second peculiarity of Odal consists in the right of relations descending from one of the common ancestors to prevent strangers from acquiring Odal estate. Any holder of such an estate who wants to sell it in its entirety or in portion has first to apply to his relatives and they may acquire the estate at the price proposed by a stranger less one-fifth. Even if no relative has taken advantage of this privilege an Odal estate sold to a stranger may be bought back into the family by compulsory redemption if the relatives subsequently find the means and have the wish to resort to such redemption. Odal right does not curtail the claims of the younger sons or of any heirs in a similar position. As a matter of fact, however, customary succession in Norwegian peasant families sets great price on holding the property of the household well together. It is keenly felt that a gaard (farm) ought not to be parcelled up into smaller holdings, and in the common case of several heirs succeeding to the farm, they generally make up among themselves who is to remain in charge of the ancestral household: the rest are compensated in money or helped to start on some other estate or perhaps in a cottage by the side of the principal house. In medieval England, France and Ger- many the same considerations of economic efficiency are felt as regards the keeping up of united holdings, and it may be said that the lower we get in the scale of property the stronger these considerations become. If it is possible, though not perhaps profitable, to divide the property of a large farm, it becomes almost impossible to break-up the smaller units — so-called yardlands and oxgangs. Through being parcelled up into small plots, land loses in value, and, as to cattle, it is impossible to divide one ox or one horse in specie without selling them. No wonder that we find practices and customs of united suc- cession arising in direct contradiction with the

ancient rule that all heirs of the same degree should be admitted to equal shares. Glanville mentions expressly that the socagers of his time held partly by undivided succession and partly by divided inherit- ance. The relations of feudalism and serfdom contributed strongly towards creating such individual tenancies. It was certainly in the interest of the lord that his men, whether holding a military fief or an agricultural farm, should not weaken the value of their tenancies by dispersing the one or the other among heirs. But apart from these interests of over-lords there was the evident self-interest of the tenants themselves and therefore the point of view of unification of holdings is by no means confined to servile tenements or to military fiefs. The question whether the successor should be the eldest son or the youngest son is a secondary one. The latter practice was very prevalent all through Europe and pro- duced in England what is termed the Borough English rule. The quaint name has been derived from the contrast in point of succession between the two parts of the borough of Nottingham. The French burgesses transmitted their tenements by primogeniture, while in the case of the English tenants the youngest sons succeeded. A usual explanation of this passage of the holdings to the youngest is found in the fact that the youngest son remains longest in his father's house, while the elder brothers have opportunities of going out into the world at a time when the father is still alive and able to take care of his land. This is well in keeping with the view that customs of united succession arise in connexion with compensa- tion provided for co-heirs waiving their claims in regard to settlement in the original household. The succession of the youngest ai»pears also very characteristic in so far as it illustrates

the break up into small tenancies, as the youngest in the family is certainly not a fit representative of hierarchy and authority and could not have been meant to rule anything but his own restricted household.

One more feature of the ancient law of succession has to be noticed in conclusion, viz. the exclusion of women from inheritance in land. There can be no doubt that as regards movable goods women held property and transmitted it on a par with males right from the earliest time. According to Germanic conception personal ornaments and articles of household furni- ture are specially effected to their use and follow a distinct line of succession from woman to woman (Gerade). Norse law puts women and men on the same footing as to all forms of property equated to " movable money " (Losore); but as to land there is a prevalent idea that men should be privileged. Women are admitted to a certain extent, but always placed behind men of equal degree. Frankish and Lombard law originally excluded women from

inheritance in land, and this exclusion seems as ancient as the patriarchial system itself, whatever we may think about the position of affairs in prehistoric times when rules of matriarchy were prevalent. A common-sense explanation of one side of this doctrine is tendered by the law of the Thurin- gians {Lex Anglorum et Werinorum, c. 6). It is stated there that inheritance in land goes with the duty of taking revenge for the homicide of relatives and with the power of bearing arms. One of the most potent adversaries of this system of exclusion proved to be the Church. It favoured all through the view that land should be transmitted in the same way as money or chattels. A Frankish formula (Marculf) shows us a father who takes care to endow his daughter with a piece of land according to natural affection in spite of the strict law of his tribe. Such instruments were strongly backed by the Church, and the view that women should be admitted to hold land on certain occasions had made its way in England as early as Anglo-Saxon times.

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(P. Vi.)

SUCCESSION DUTY, in the English fiscal system, “a tax placed on the gratuitous acquisition of property which passes on the death of any person, by means of a transfer from one person (called the predecessor) to another person (called the successor).” In order properly to understand the present state of the English law it is necessary to describe shortly the state of affairs prior to the Finance Act 1894 — an act which effected a considerable change in the duties payable and in the mode of assessment of those duties.

The principal act which first imposed a succession duty in England was the Succession Duty Act 1853. By that act a duty varying from 1 to 10 % according to the degree of con- sanguinity between the predecessor and successor was imposed upon every succession which was defined as ” every past or future disposition of property by reason whereof any person has or shall become beneficially entitled to any property, or the income thereof, upon the death of any person dying after the time appointed for the commencement of this act, either immediately or after any interval, either certainly or contin- gently, and either originally or by way of substitutive limitation and every devolution by law of any beneficial interest in pro- perty, or the income thereof, upon the death of any person dying after the time appointed for the commencement of this act to

any other person in possession or expectancy.” The property which is liable to pay the duty is in realty or leasehold estate in the United Kingdom and personalty— not subject to legacy duty — which the beneficiary claims by virtue of English, Scottish or Irish law. Personalty in England bequeathed by a person domiciled abroad is not subject to succession duty. Successions of a husband or a wife, successions where the princi- pal value is under £100, and individual successions under £20, are exempt from duty. Leasehold property and personalty directed to be converted into real estate are liable to succession, not to legacy duty. Special provision is made for the collection of duty in the cases of joint tenants and where the successor is also the predecessor. The duty is a first charge on property, but if the property be parted with before the duty is paid the liability of the successor is transferred to the alienee. It is, therefore, usual in requisitions on title before conveyance, to demand for the protection of the purchaser the production of receipts for succession duty, as such receipts are an effectual protection notwithstanding any suppression or misstatement in the account on the footing of which the duty was assessed or any insufficiency of such assessment. The duty is by this act directed to be assessed as follows: on personal property, if the successor takes a limited estate, the duty is assessed on the principal value of the annuity or yearly income estimated according to the period during which he is entitled to receive the annuity or yearly income, and the duty is payable in four yearly instalments free from interest. If the successor takes absolutely he pays in a lump sum duty on the principal value. On real property the duty is payable in eight half-yearly instal- ments without interest on the capital value of an annuity equal to the annual value of the property. Various minor changes were made. By the Customs and Inland

Revenue Act 1881, personal estates under £300 were exempted. By the Customs and Inland Revenue Act 1888 an additional |% was charged on successions already paying 1% and an additional i\% on successions paying more than 1%. By the Customs and Inland Revenue Act 1889 an additional duty of 1% called estate duty was payable on successions over £10,000.

The Finance Acts 1894 and 1909 effected large changes in the duties payable on death (for which see Estate Duty; Legacy). As regards the succession duties they enacted that payment of the estate duties thereby created should include payment of the additional duties mentioned above. Estates under £1000 (£2000 in the case of widow or child of deceased) are exempted from payment of any succession duties. The succession duty payable under the Succession Duty Act 1853 was in all cases to be calculated according to the principal value of the property, i.e. its selling value, and though still payable by instalments interest at 3% is chargeable. The additional succession duties are still payable in cases where the estate duty is not charged, but such cases are of small importance and in practice are not as a rule charged.

United Slates. — The United States imposed a succession duty by the War Revenue Act of 1898 on all legacies or distributive shares of personal property exceeding $10,000. It is a tax on the privilege of succession. Devises or distributions of land are not affected by it. The rate of duty runs from 75 cents on fche $100 to $5 on the §100, if the legacy or share in question does not exceed $25,000. On those of over that value the rate is multiplied l| times on estates up to $100,000, twofold on those from $100,000 to $500,000, 2j times on those from $500,000 to a million, and threefold for those exceeding a million. This statute has been supported as constitutional by the Supreme Court. Many of the states also impose succession duties, or transfer taxes; generally, however, on collateral and remote successions; sometimes progressive, according to the amount of the succession. The state duties generally touch real estate successions as well as those to personal property. If a citizen of state A owns registered bonds of a corporation chartered by state B, which he has put for safe keeping in a deposit vault in state C, his estate may thus have to pay four succession taxes, one to state A, to which he belongs and which, by legal fiction, is the seat of all his personal property; one to state B, for permitting the transfer of the bonds to the legatees on the books of the corporation; one to state C, for allowing them to be removed from the deposit vault for that purpose; and one to the United States.

SUCCINIC ACID, C2H 4 (C0 2 H) 2 . Two acids corresponding to this

empirical formula are known — namely ethylene suc- cinic acid, H0 2 C-CH2-CH 2 -G02rI and ethylidene succinic acid CH 3 -CH(C0 2 H) 2 .

Ethylene succinic acid occurs in amber, in various resins and lignites, in fossilized wood, in many members of the natural Orders of Papaveraceae and Compositae, in unripe grapes, urine and blood. It is also found in the thymus gland of calves and in the spleen of cattle. It may be prepared by the oxidation of fats and of fatty acids by nitric acid, and is also a product of the fermentation of malic and tartaric acids. It is usually obtained by the distillation of amber, or by the fermentation of calcium malate or ammonium tartrate. Synthetically it may be obtained by reducing malic or tartaric acids with hydriodic acid (R. Schmitt, Ann., i860, 114, p. 106; V. Dessaignes, ibid., i860, 115, p. 120; by reducing fumaric and maleic acids with sodium amalgam; by heating bromacetic acid with silver to 130 C; in small quantity by the oxidation of acetic acid with potassium persulphate (C. MoritzandR. Wolffehstein, Ber., 1899, 32, p. 2534); by the hydrolysis of succinonitrile (from ethylene dibromide) C 2 H4-ˆC 2 Il4Br 2 -ˆC 2 H4(CN) 2 -ˆC 2 H 4 (C0 2 H) 2 ; by the hydrolysis of (3-cyanpropionic ester; and by the condensation of sodiomalonic ester with monochloracetic ester and hydrolysis of theresultirtg ethane tricarboxylic ester (R0 2 C) 2 CH- CH 2 -C0 2 R; this method is applicable to the preparation of substituted succinic acids. It is also produced by the electrolysis of a concentrated solution of potassium ethyl malonate.

It crystallizes in prisms or plates which melt at 185 C. and boil at 23 5 C. with partial conversion into the anhydride. It is readily soluble in water. Aqueous solutions of the acid are decomposed in sunlight by uranium salts, with evolution of carbon dioxide and the formation of propionic acid. Potassium permanganate, in acid solution, oxidizes it to carbon dioxide and water. The sodium salt on distillation with phosphorus trisulphide gives thiophene. The esters of the acid condense readily with aromatic aldehydes and ketones to form 7-di-substituted itaconic acids and 7-alkylen pyrotartaric acids (H. Stobbe, Ann., 1899, 308, p. 71). 7-Oxyacids are formed when aldehydes are heated with sodium succinate and sodium acetate. Numerous salts of the acid are known, the basic ferric salt being occasionally used in quantitative analysis for the separation of iron from aluminium.

Succinyl chloride, obtained by the action of phosphorus penta-chloride on succinic acid, is a colourless liquid which boils at I90°C. In many respects it behaves as though it were dichlorbutyro-lactone,

CjHi'f NO; e.g. on reduction it yields butyro-lactone, and when

condensed with benzene in the presence of aluminium chloride it yields chiefly 7-diphenylbutyro-lactone. Succinic anhydride, C 2 H4(CO) 2 0, is obtained by heating the acid or its sodium salt with acetic anhydride; by the action of acetyl chloride on the barium salt; by distilling a mixture of succinic acid and succinyl chloride, or by heating succinyl chloride with anhydrous oxalic acid. It crystallizes in plates which melt at 120 C, and distils without decomposition. It is slowly dissolved by water with the formation of the acid. It combines readily with the meta-aminophenols to form rhodamines, which are valuable dyestuffs. Heated in a current of ammonia it gives succinimide, which is also obtained on heating acid ammon- ium succinate. It crystallizes in colourless octahedra which melt at 125-126 O, and is easily soluble in water. When warmed with baryta water it yields succinamic acid, H02C-CH2-CH 2 -C0NH 2 ; and with alcoholic ammonia at ioo° C. it gives succinamide. The imino hydrogen atom is easily replaced by metals. Distillation with zinc dust gives pyrrol (q.v.). By the action of bromine in alkaline solution it is converted into /S-aminoprbpionic acid. Succinamide, C 2 H4(CONH 2) 2 , best obtained by the action of ammonia on diethyl succinate, crystallizes in needles which melt at 242- 243 C, and is soluble in hot water. Succinonitrile, C 2 H4(CN) 2 , is obtained by the action of potassium cyanide on ethylene dibromide or by the electrolysis of a solution of potassium cyan- acetate. It is an amorphous solid which melts at 54∼55° C. On reduction with sodium in alcoholic solution it yields tetraethylene diamine (putrescein) and pyrollidine. . . ; , .

Methyl succinic acid (pyrotartaric acid), H0 2 C-CH 2 -CH(CHa) -00211, is formed by the dry distillation of tartaric acid ; by heating pyruvic acid with concentrated hydrochloric acid to 180° C. ; by the 1 reduction of citraconic and mesaconic acids with sodium amalgam; and by

the hydrolysis of /3-cyanbutyric acid. It crystallizes in small prisms which melt at 112° C. and are soluble in water. It forms an anhydride when heated. The sodium salt oh heating with phosphorus trisulphide yields methylthiophen.

Elhylidene succinic acid or isosuccinic acid, CH 3 -CH(C02H) 2 , is produced by the hydrolysis of o-cyanpropionic acid and by the action of methyl iodide on sodio-malonic ester. It crystallizes in prisms which melt at 120° C. (T. Salzer, Journ. prak. Chem., 1898 [2], 57, p. 497), and dissolve in water. It does not yield an anhydride, but when heated loses carbon dioxide and leaves a residue of propionic acid. It may be

distinguished from the isomeric ethylene succinic acid by the fact that its sodium salt does not give a precipitate with ferric chloride.

SUCHER, ROSA (1849-), German opera singer, ne'e Hasselbeck, was the wife of Josef Sucher (1844-1908), a well- known conductor and composer. They were married in 1876, when she had already had various engagements as a singer and he was conductor at the Leipzig city theatre. Frau Sucher soon became famous for her performances in Wagner's operas, her seasons in London in 1882 and 1892 proving her great capacity both as singer and actress; in 1886 and 1888 she sang at Bayreuth, and in later years she was principally associated with the opera stage in Berlin, retiring in 1903. Her magnificent rendering of the part of Isolde in Wagner's opera is especially remembered.

SUCHET, LOUIS GABRIEL, Due D'Albufera da Vaiencia (1770-1826), marshal of France, one of the most brilliant of Napoleon's generals, was the son of a silk manufacturer at Lyons, where he was born on the 2nd of March 1770. He originally intended to follow his father's business; but having in 1792 served as volunteer in the cavalry of the national guard at Lyons, he manifested military abilities which secured his rapid promotion. As chef de bataillon he was present at the siege of Toulon in 1793, where he took General O'Hara prisoner. During the Italian campaign of 1796 he was severely wounded at Cerea on the 1 ith of October. In October 1797 he was appointed to the command of a demi-brigade, and his services, under Joubert in the Tirol in that year, and in Switzerland under Brune in 1797-98, were recognized by his promotion to the rank of general of brigade. He took no part in the Egyptian campaign, but in August was made chief of the staff to Brune, and restored the efficiency and discipline of the army in Italy. In July 1 799 he was made general of division and chief of staff to Joubert in Italy, and was in 1800 named by Mass6na his second in command. His dexterous resistance to the superior forces of the Austrians with the left wing of Massena's army, when the right and centre were shut up in Genoa, not only prevented the invasion of France from this direction but contributed to the success of Napoleon's crossing the Alps, which culminated in the battle of Marengo on the 14th of June. He took a prominent part in the Italian campaign till the armistice of Treviso. In the campaigns of 1805 and 1806 he greatly increased his reputation at Austerlitz, Saalfeld, Jena, Pultusk and Ostrolenka. He obtained the title of count on the 19th of March 1808, married Mlle-de Saint Joseph, a niece of Joseph Bonaparte's wife, and soon afterwards was ordered to Spain. Here, after taking part in the siege of Saragossa, he was named commander of the army of Aragon and governor of the province, which, by wise and (unlike that of most of the French generals) disinterested administration no less than by his

brilliant valour, he in two years brought into com- plete submission. He annihilated the army of Blake at Maria on the 14th of June 1809, and on the 22nd of April 1810 defeated O'Donnell at Lerida. After being made marshal of France (July 8, 1811) he in 1812 achieved the conquest of Valencia, for which he was rewarded with the title of due d'Albufera da Valencia (181 2). When the tide set against the French Suchet defended his conquests step by step till compelled to retire into France, after which he took part in Soult's defensive campaign. By Louis XVIII. he was on the 4th of June made a peer of France, but, having during the Hundred Days commanded one of Napoleon's armies on the Alpine frontier, he was deprived of his peerage on the 24th of July 1815. He died near Marseilles on the 3rd of January 1826. Suchet wrote M (moires dealing with the Peninsular War, which were left by the marshal in an

unfinished condition, and the two volumes and atlas appeared in 1829ˆ1834 under the editorship of his former chief staff officer, Baron St Cyr-Nogues.

See C. H. Barault-Roullon, Le Marechal Suchet (Paris, 1854); Choumara, Considerations militaires sur les memoires du Marechal Suchet (Paris, 1840), a controversial work on the last events of the Peninsular War, inspired, it is supposed, by Soult ; and Lieutenant-General Lamarque's obituary notice in the Spectateur mililaire (1826). See also bibliography in article Peninsular War.

SU-CHOW. There are in China three cities of this name which deserve mention.

1. Su-chow-Fu, in the province of Kiang-su, formerly one of the largest cities in the world, and in 1907 credited still with a population of 500,000, on the Grand Canal, 55 m. W.N.W. of Shanghai, with which it is connected by railway. The site is practically a cluster of islands to the east of Lake Tai-hu. The walls are about 10 m. in circumference and there are four large suburbs. Its silk manufactures are represented by a greater variety of goods than are produced anywhere else in the empire; and the publication of cheap editions of the Chinese classics is carried to great perfection. There is a Chinese proverb to the effect that to be perfectly happy a man ought to be born in Su-chow, live in Canton and die in Lien-chow. The nine- storeyed pagoda of the northern temple is one of the finest in the country. In i860 Su-chow was captured by the T'aip'ings, and when in 1863 it was recovered by General Gordon the city was almost a heap of ruins. It has since largely recovered its prosperity, and besides 7000 silk looms has cotton mills and an important trade in rice. Of the original splendour

of the place some idea may be gathered from the beautiful plan on a slab of marble preserved since 1247 in the temple of Confucius and reproduced in Yule's Marco Polo, vol. i. Su-chow was founded in 484 by Ho-lu-Wang, whose grave is covered by the artificial " Hill of the Tiger " in the vicinity of the town. The literary and poetic designation of Su-chow is Ku-su, from the great tower of Ku-su-tai, built by Ho-lu-Wang. Su-chow was opened to foreign trade by the Japanese treaty of 1895. A Chinese and European school was opened in 1900.

2. Su-chow, formerly Tsiu-tsuan-tsiun, a free city in the province of Kan-suh, in 39 48′ N., just within the extreme north-west angle of the Great Wall, near the gate of jade. It is the great centre of the rhubarb trade. Completely destroyed in the great Mahommedan or Dungan insurrection (1865-72), it was recovered by the Chinese in 1873 and has been rebuilt.

3. Su-chow, a commercial town situated in the province of Sze-ch'uen at the junction of the Min River with the Yang-tse- Kiang, in 28° 46′ 50″ N. Population (1907) about 50,000.

SUCKLING, SIR JOHN (1609-1642), English poet, was born at Whitton, in the parish of Twickenham, Middlesex, and bap- tized there on the 10th of February 1609. His father, S ; r John Suckling (1569-1627), had been knighted by James I. and was successively master of requests, comptroller of the household and secretary of state. He sat in the first and second parlia- ments of Charles I.'s reign, and was made a privy councillor. During his career he amassed a considerable fortune, of which the poet became master at the age of eighteen. He was sent to Trinity College, Cambridge, in 1623, and was entered at Gray's Inn in 1627. He was intimate with Thomas Carew, Richard Lovelace, Thomas Nabbes and especially with John Hales and Sir William Davenant, who furnished John Aubrey with information about his friend. In 1628 he left London to travel in France and Italy, returning, however, before the autumn of 1630, when he was knighted. In 1631 he volunteered for the force raised by the marquess of Hamilton to serve under Gustavus Adolphus in Germany. He was back at Whitehall in May 1632; but during his short service he had been present at the battle of Breitenfeld and in many sieges. He was hand- some, rich and generous; his happy gift in verse was only one of many accomplishments, but it commended him especially to Charles I. and his queen. He says of himself (" A Sessions of the Poets ") that he " prized black eyes or a lucky hit at bowls above all the trophies of wit." He was the best card- player and the best bowler at court. Aubrey says that he

invented the game of cribbage, and relates that his sisters came weeping to the bowling green at Piccadilly to dissuade him from play, fearing that he would lose their portions. In 1634 great scandal was caused in his old circle by a beating which he received at the hands of Sir John Digby, a rival suitor for the hand of the daughter of Sir John Willoughby; and it has been suggested that this incident, which is narrated at length in a letter (Nov. 10, 1634) from George Garrard 1 to Strafford, had something to do with his beginning to seek more serious society. In 1635 ne retired to his country estates in obedience to the proclamation of the 20th of June 1632 enforced by the Star Chamber 2 against absentee landlordism, and employed his leisure in literary pursuits. In 1637 ” A Sessions of the Poets ” was circulated in MS., and about the same time he wrote a tract on Socinianism entitled An Account of Religion by Reason (pr. 1646).

As a dramatist Suckling is noteworthy as having applied to regular drama the accessories already used in the production of masques. His Aglaura (pr. 1638) was produced at his own expense with elaborate scenery. Even the lace on the actors’ coats was of real gold and silver. The play, in spite of its felicity of diction, lacks dramatic interest, and the criticism of Richard Flecknoe {Short Discourse of the English Stage), 3 that it seemed ” full of flowers, but rather stuck in than growing there,” is not altogether unjustified. The Goblins (1638, pr. 1646) has some reminiscences of The Tempest; Brennoralt, or the Discontented Colonel (1639, pr. 1646) is a satire on the Scots, who are the Lithuanian rebels of the play; a fourth play, The Sad One, was left unfinished owing to the outbreak of the Civil War. Suckling raised a troop of a hundred horse, at a cost of £12,000, and accompanied Charles on the Scottish expedi- tion of 1639. He shared in the earl of Holland’s retreat before Duns, and was ridiculed in an amusing ballad (pr. 1656), in Musarum deliciae, ” on Sir John Suckling’.! most war-like preparations for the Scottish war.” 4 He was elected as member for Bramber for the opening session (1640) of the Long Parliament; and in that winter he drew up a letter addressed to Henry Jermyn, afterwards earl of St Albans, advising the king to disconcert the opposition leaders by making more con- cessions than they asked for. In May of the following year he was implicated in an attempt to rescue Strafford from the Tower and to bring in French troops to the king’s aid. The plot was exposed by the evidence of Colonel George Goring, and Suckling fled beyond the seas. The circumstances of his short exile are obscure. He was certainly in Paris in the summer of

1641. One pamphlet related a story of his elopement with a lady to Spain, where he fell into, the hands of the Inquisition. The manner of his death is uncertain, but Aubrey's statement that he put an end to his life by poison in May or June 1642 in fear of poverty is generally accepted.

Suckling's reputation as a poet depends on his minor pieces. They have wit and fancy, and at times exquisite felicity of expression. " Easy, natural Suckling," Millamant's comment in Congreve's Way of the World (Act iv., sc. i.) is a just tribute to their spontaneous quality. Among the best known of them are the " Ballade upon a Wedding," on the occasion of the marriage of Roger Boyle, afterwards earl of Orrery, and Lady !Hargaret Howard, "I prithee, send me back my heart," "Out upon it, I have loved three whole days together," and "Why so pale and wan, fond lover?" from Aglaura. "A 'Sessions of the Poets," describing a meeting of the con- temporary versifiers under the presidency of Apollo to decide who should wear the laurel wreath, is the prototype of many later satires.

A collection of Suckling's poems was first published in 1646 as Fragmenta aurea, the so-called Selections (1836) published by the

1 Strafford's Letters and Despatches (1739), t. 336.

2 For an account of the proceedings see Historical Collections, ed. by Rushworth (1680), 2nd pt., pp. 288-293.

3 Reprinted in Eng. Drama and Stage, ed. W. C. Hazlitt, Rox- burghe Library (1869), p. 277.

4 Attributed by Aubrey to Sir John Mennis (1599-1671). See also a song printed in the tract, Vox borealis (Harl. Misc. iii. 235),

Rev. Alfred Inigo Suckling, author of the History and Antiquities of Suffolk (1 846-1 848) with Memoirs based on original authorities and a portrait after Van Dyck, is really a complete edition of his works, of which W. C. Hazlitt's edition (1874 ; revised ed., 1892) is little more than a reprint with some additions. The Poems and Songs of Sir John Suckling, edited by John Gray and decorated with woodcut border and initials by Charles Ricketts, was artistically printed at the Ballantyne Press in 1896. In T9io Suckling's works in prose and verse were edited by A. Hamilton Thompson. For anecdotes of Suckling's life see John Aubrey's Brief Lives (Clarendon Press ed., ii. 242).

SUCRE, or Chuquisaca, a city of Bolivia, capital of the department of Chuquisaca and nominal capital of the republic, 46 m. N.E. of Potosi

in 19 2′ 45″ S., 65° 17′ W. Pop. (1900), 20,967; (1906, estimate), 23,416, of whom many are Indians and cholos. The city is in an elevated valley opening southward on the narrow ravine through which flows the Cachimayo, the principal northern tributary of the Pilcomayo. Its elevation, 8839 ft., gives it an exceptionally agreeable climate. There are fertile valleys in the vicinity which provide the city's markets with fruit and vegetables, while the vineyards of Camargo (formerly known as Cinti), in the southern part of the depart- ment, supply wine and spirits of excellent quality. The city is laid out regularly, with broad streets, a large central plaza and a public garden, or promenade, called the prado. Among its buildings are the cathedral, dating from 1553 and once noted for its wealth; the president's palace and halls of congress, which are no longer occupied as such by the national govern- ment; the cabildo, or town-hall; a mint dating from 1572; the courts of justice, and the university of San Xavier, founded in 1624, with faculties of law, medicine and theology. There is a pretty chapel called the " Rotunda," erected in 1852 at the lower end of the prado by President Belzu, on the spot where an attempt had been made to assassinate him. Sucre is the seat of the archbishop of La Plata and Charcas, the primate of Bolivia. It is not a commercial town, and its only note- worthy manufacture is the " clay dumplings " which are eaten with potatoes by the inhabitants of the Bolivian uplands. Although the capital of Bolivia, Sucre is one of its most isolated towns because of the difficult character of the roads leading to it. It is reached from the Pacific by way of Challapata, a station on the Antofagasta & Oruro railway.

The Spanish town, according to Velasco, was founded in 1 538 by Captain Pedro Angules on the site of an Indian village called Chuquisaca, or Chuquichaca (golden bridge), and was called Charcas and Ciudad de la Plata by the Spaniards, though the natives clung to the original Indian name. It became the capital of the province of Charcas, of the comarca of Chuquisaca, and of the bishopric of La Plata and Charcas, and in time it became the favourite residence and health resort of the rich mine-owners of Potosi. The bishopric dates from 1552 and the archbishopric from 1609. In the latter year was created the Real Audiencia de la Plata y Charcas, a royal court of justice having jurisdiction over Upper Peru and the La Plata provinces of that time. Sucre was the first city of Spanish South America to revolt against Spanish rule — on the 25th of May 1809. In 1840 the name Sucre was adopted in honour of the patriot commander who won the last decisive battle of the war, and then became the first president of Bolivia. The city has suffered much from partisan strife, and the removal of the government to La Paz greatly diminished its

importance.

SUCZAWA (Rumanian, Suceava), a town in Bukovina, Austria, 50 m. S. of Czernowitz by rail. Pop. (1900), 10,955. It is situated on the river Suczawa, which forms there the boundary between Bukovina and Rumania. One of its two churches, dating from the 14th century, contains the grave of the patron saint of Bukovina. The principal industry is the tanning and leather trade. Not far from Suczawa lies the monastery of Dragomirna, in Byzantine style, built at the beginning of the 17th century. Suczawa is a very old town and was until 1565 the capital of the principality of Moldavia. It was many times besieged by Poles, Hungarians, Tatars and Turks. In 1675 it was besieged by Sobieski, and in 1679 it was plundered by the Turks.

SUDAN

SUDAN (Arabic Bilad-es-Sudan, country of the blacks), that region of Africa which stretches, south of the Sahara and Egypt, from Cape Verde on the Atlantic to Massawa on the Red Sea. It is bounded S. (i) by the maritime countries of the west coast of Africa, (2) by the basin of the Congo, and (3) by the equatorial lakes, and E. by the Abyssinian and Galla high- lands. The name is often used in Great Britain in a restricted sense to designate only the eastern part of this vast territory, but it is properly applied to the whole area indicated, which corresponds roughly to that portion of negro Africa north of the equator under Mahommedan influence. The terms Nigritia and Negroland, at one time current, referred to the same region.

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The Sudan has an ethnological rather than a physical unity, and politically it is divided into a large number of states, all now under the control of European powers. These countries being separately described, brief notice only is required of the Sudan as a whole.

Within the limits assigned it has a length of about 4000 m., extending southwards at some points 1000 m., with a total area of over 2,000,000 sq. m., and a population, approximately, of 40,000,000. Between the arid and sandy northern wastes and the well-watered and

arable Sudanese lands there is a transitional zone of level grassy steppes (partly covered with mimosas and acacias) with a mean breadth of about 60 m. The zone lies between 17 and 18° N., but towards the centre reaches as far south as 15° N. Excluding this transitional zone, the Sudan may be described as a moderately elevated region, with extensive open or rolling plains, level plateaus, and abutting at its eastern and western ends on mountainous country. Crystalline rocks, granites, gneisses and schists, of the Central

African type, occupy the greater part of the country. Towards the south-east, slates, quartzites and iron-bearing schists occur, but their age is not known. The Congo sandstones do not appear to extend as far north. The Nubian sandstone borders the Libyan desert on the south and south-west, but it is doubtful if this sandstone is of Cretaceous or earlier date.

The Sudan contains the basin of the Senegal and parts of three other hydrographic systems, namely: the Niger, draining southwards to the Atlantic; the central depression of Lake Chad; and the Nile, flowing northwards to the Mediterranean. Lying within the tropics and with an average elevation of not more than 1500 to 2000 ft. above the sea, the climate of the Sudan is hot and in the river valleys very un-healthy. Few parts are suitable for the residence of Europeans. Cut off from North Africa by the Saharan desert, the inhabitants, who belong in the main to the negro family proper, are thought to have received their earliest civilization from the East. Arab influence and the Moslem religion began to be felt in the western Sudan as early as the 9th century and had taken deep root by the end of the nth. The existence of native Chris- tian states in Nubia hindered for some centuries the spread of Islam in the eastern Sudan, and throughout the country some tribes have remained pagan. It was not until the last quarter of the 19th century that the European nations became the ruling force.

The terms western, central and eastern Sudan are indicative of geographical position merely. The various states are politically divisible into four groups: (1) those west of the Niger; (2) those between the Niger and Lake Chad; (3) those between Lake Chad and the basin of the Nile; (4) those in the upper Nile valley.

The first group includes the native states of Bondu, Futa Jallon, Masina, Mossi and all the tribes within the great bend of the Niger. In the last quarter of the 19th century they fell under the control of France, the region being styled officially the French Sudan. In 1900 this title was abandoned. The greater part of what was the French

Sudan is now known as the Upper Senegal and Niger Colony (see Senegal, French West Africa, &c). The second group of Sudanese states Emuˆˆittrss j s a i mos t entirely within the British protectorate of Northern Nigeria. It includes the sultanate of Sokoto and its dependent emirates of Kano, Bida, Zaria, &c, and the ancient sultanate of Bornu, which, with Adamawa, is partly within the German colony of Cameroon (see Nigeria and Cameroon).

The third or central group of Sudanese states is formed of the sultanates of Bagirmi (q.v.) with Kanem and Wadai (q.v.). Wadai was the last state of the Sudan to come under European influence, its conquest being effected in 1909. This third group is included in French Congo (q.v.).

The fourth group consists of the states conquered during the 19th century by the Egyptians and now under the joint control of Great Britain and Egypt. These countries are known collectively as the Anglo-Egyptian Sudan (see below).

For the regions west of Lake Chad the standard historical work is the Travels of Dr Heinrich Barth (5 vols., London, 1857-1858). Consult also P. C. Meyer, Erforschungsgrschichte und Staatenbildungen des Westsudan (Gotha, 1897), an admirable summary with biblio- graphy and maps; Karl Kumm, The Sudan (London, 1907); Lady

Lugard, A Tropical Dependency (London, 1905); and the biblio- graphies given under the various countries named. For sources and history see Timbuktu. For the central Sudan the most im-

gˆrtant work is that of Gustav Nachtigal, Sahara und Sudan (3 vols., erlin 1879-1889). See also Boyd Alexander, From the Niger to the Nile (2 vols., London, 1907) ; Karl Kumm, From Haussaland to Egypt (London, 1910). For the eastern Sudan see the bibliographies under the following section. A good general work is P. Paulitschke's Die Sudanlander (Freiburg, 1885).

The Anglo-Egyptian Sudan

The region which before the revolt of the Arabized tribes

under the Mahdi Mahommed Ahmed in 1881-84 was known

as the Egyptian Sudan has, since its reconquest by and Area. * the Anglo-Egyptian expeditions of 1896-98, been

under the joint sovereignty of Great Britain and Egypt. The limits of this condominium differ slightly from those of the Egyptian Sudan of the pre-Mahdi period. It is bounded N. by Egypt (the 22nd parallel of N. lat. being the dividing-line), E. by the Red Sea, Eritrea and Abyssinia, S. by the Uganda Protectorate and Belgian Congo, W. by French Congo. North of Darfur is the Libyan Desert, in which the western and northern frontiers meet. Here the boundary is undefined. 1

As thus constituted the Anglo-Egyptian Sudan forms a com- pact territory which, being joined southwards by the Uganda Protectorate, brings the whole of the Nile valley from the equatorial lakes to the Mediterranean under the control of Great Britain. The Anglo-Egyptian Sudan extends north to south about 1200 m. in a direct line, and west to east about 1000 m. also in a direct line. It covers 950,000 sq. m., beitig about one- fourth the area of Europe. In what follows the term Sudan is used to indicate the Anglo-Egyptian condominium only.

Physical Features. — The Sudan presents many diversified features. It may be divided broadly into two zones. The northern portion, from about 16° N., is practically the south-eastern continuation of the Saharan desert; the southern region is fertile, abundantly watered, and in places densely forested. West ot the Nile there is a distinctly marked intermediate zone of steppes. In the southern district, between 5° and io° N., huge swamps extend on either side of the Nile and along the Bahr-el-Ghazal.

From south to north the Sudan is traversed by the Nile (5.”.), and all the great tributaries of that river are either partly or entirely within its borders. The most elevated district is a range of mountains running parallel to the Red Sea. These mountains, which to the south join the Abyssinian highlands, present their steepest face eastward, attaining heights within the Sudan of 4000 to over 7000 ft. Jebel Erba, 7480 ft., and Jebel Soturba, 6889 ft. (both between 21 and 22 N.), the highest peaks, face the Red Sea about 20 m. inland. Westward the mountains slope gradually to the Nile valley, which occupies the greater part of the country and has a general level of from 600 to 1600 ft. In places, as between Suakin and Berber and above Roseires on the Blue Nile, the mountains approach close to the river. Beyond the Nile westward extend vast plains, which in Kordofan and Dar Nuba (between io° and 15 N.) are broken by hills reaching 2000 ft. Farther west, in Darfur, the country is more elevated, the Jebel Marra range being from 5000

to 6000 ft. high. In the south-west, beyond the valley of the Bahr-el-Ghazal, the country gradually rises to a ridge of hills, perhaps 2000 ft. high, which running south-east and north-west form the water-parting between the Nile and the Congo.

Apart from the Nile system, fully described elsewhere, the Sudan has two other rivers, the Gash and the Baraka. These are inter- mittent streams rising in the eastern chain of mountains in Eritrea and flowing in a general northerly direction. The Gash enters the Sudan near Kassala and north of that town turns west towards the Atbara, but its waters are dissipated before that river is reached. The Gash nevertheless fertilizes a considerable tract of country. The Khor Baraka lies east of the Gash. It flows towards the Red Sea in the neighbourhood of Trinkitat (some 50 m. south of Suakin), but about 30 m. from the coast forms an inland delta. Except in seasons of great rain its waters do not reach the sea.

The Coast Region. — The coast extends along the Red Sea north to south from 22 N. to 18 N., a distance following the indentations of the shore of over 400 m. These indentations are numerous but not deep, the general trend of the coast being S.S.E. The most prominent headland is Ras Rawaya (21 N?) which forms the northern shore ot Dokhana Bay. There are few good harbours, Port

1 It was supposed to be indicated by the line which, according to the Turkish firman of 1841, describes a semicircle from the Siwa Oasis to Wadal, approaching the Nile between the Second and Third Cataracts. This line is disregarded by the Sudan government.

Sudan and Suakin being the chief port9. South of Stiakin is the shallow bay of Trinkitat. A large number of small islands He off the coast. A belt of sandy land covered with low scrub stretches inland ten to twenty miles, and is traversed by khors (generally dry) with ill-defined shifting channels. Beyond this plain rise Lhe mountain ranges already mentioned. Their seaward slopes often bear a considerable amount of vegetation.

The Desert Zone. — The greater part of the region between the coast and the Nile is known as the Nubian Desert. It is a rugged, rocky, barren waste, scored with khors or wadis, along whose beds there is scanty vegetation. The desert character of the country increases as the river is neared, but along either bank of the Nile is a narrow strip of cultivable land. West of the Nile there are a few oases — those of Selima, Zaghawa and El Kab — -but this district, part of the Libyan Desert, is even more desolate than the Nubian Desert.

The Intermediate Zone and the Fertile Districts. — East of the Nile the region of absolute desert ceases about the point of the Atbara confluence. The country enclosed by the Nile, the Atbara and the Blue Nile, the so-called Island of Merog, consists of very fertile soil, and along the eastern frontier, by the upper courses of the rivers named, is a district of rich land alternating with prairies and open forests. The fork between the White and Blue Niles, the Gezira, is also fertile land. South of the Gezira is Sennar, a well- watered country of arable and grazing land.

West of the Nile the desert zone extends farther south than on the east, and Kordofan, which comes between the desert and the plains of the Bahr-el-Ghazal, is largely barren and steppe land. South of 10° N. there is everywhere abundance of water. Darfur is mainly open, steppe-like country with extensive tracts of cultiv- able land and a central mountain massif, the Jebel Marra (see Sennar Kordofan, Darfur).

Climate. — The country lies wholly within the tropics, and as the greater part of it is far removed from the ocean and less than 1500 ft. above the sea it is extremely hot. The heat is greatest in the central regions, least in the desert zone, where the difference between summer and winter is marked. Even in winter, however, the day temperatures are high. Of this region the Arabs say ” the soil is like fire and the wind like a flame.” Nevertheless, the dryness of the air renders the climate healthy. The steppe countries, Kordofan and Darfur, are also healthy except after the autumn rains. At Khartum, centrally situated, the minimum temperature is about 40 ° F., the maximum 113 , the mean annual temperature being 8o°. January is the coldest and June the hottest month. Violent sand- storms are frequent from June to August. Four rain zones may be distinguished. The northern (desert) region is one of little or no rain. There are perhaps a few rainy days in winter and an occasional storm in the summer. In the central belt, where ” the rainy season ” is from mid-June to September, there are some 10 in. of rain during the year. The number of days on which rain falls rarely exceeds, however, fifteen. The rainfall increases to about 20 m. per annum in the eastern and south-eastern regions. In the swamp district and throughout the Bahr-el-Ghazal heavy rains (40 in. or more a year) are experienced. The season of heaviest rain is from April to September. In the maritime district there are occasional heavy rains between August and January. In the sudd region thunderstorms are frequent. Here the temperature averages about 85 F., the air is always damp and fever is endemic.

Flora. — In the deserts north of Khartum vegetation is almost confined

to stunted mimosa and, in the less arid districts, scanty herbage. Between the desert and the cultivated Nile lands is an open growth of samr, hashab {Acacia verek) and other acacia trees. Between Khartum and 12 N. forest belts line the banks of the rivers and khors, in which the most noteworthy tree is the sant or sunt {Acacia arabica). Farther from the rivers are open woods of heglig {Balanites aegyptiaca), hashab, &c, and dense thickets of laot (Acacia nubica) and kittr {Acacia mellifera). These open woods cover a considerable part of Kordofan, the hashab and talh trees being the chief producers of gum arabic. South of 12 ° N. the forest lands of the White Nile as far south as the sudd region are of similar character to that described. On the Blue Nile the forest trees alter, the most abundant being the babanus (Sudan ebony) and the silag {Anogeissus leiocarpus), while gigantic baobabs, called tebeldi in the Sudan, and tarfa {Sierculia cinerea) are numerous. In southern Kordofan and in the higher parts of the Bahr-el-Ghazal the silag and ebony are also common, as well as African mahogany (homraya, Khaya senegalensis) and other timber trees. In the Ghazal province also are many rubber-producing lianas, among them the Landolphia owariensis. There are also forest regions in the Bahr-el-Jebel, in the Mongalla mudiria and along the Abyssinian-Eritrean frontier. East of the Bahr-el-Jebel and north of the Bahr-el-Ghazal are vast prairies covered with tall coarse grass. Cotton is indigenous in the valley of the Blue Nile, and in some districts bamboos are plentiful. The castor-oil plant grows in almost every province. (See also § Agriculture, and, for the vegetation of the swamp region, Nile.)

Fauna. — Wild animals and birds are numerous. Elephants are abundant in the Bahr-el-Ghazal and Bahr-el-Jebel forests, and are found in fewer numbers in the upper valley of the Blue Nile.

The hippopotamus and crocodile abound in the swamp regions, which also shelter many kinds of water-fowl. The lion, leopard, giraffe and various kinds of antelope are found in the prairies and in the open woods. In the forests are numerous bright-plumaged birds and many species of monkeys, mostly ground monkeys — the trees being too prickly for climbing. Snakes are also plentiful, many poisonous kinds being found. In the steppe regions of Kordo- fan, Darfur, &c, and in the Nubian Desert ostriches are fairly plentiful. Insect life is very abundant, especially south of 12° N., the northern limit of the tsetse fly. The chief pests are mosqui- toes, termites and the serut, a brown

fly about the size of a wasp, with a sharp stab, which chiefly attacks cattle. Locusts are less common, but, especially in the eastern districts, occasionally cause great destruction. For domestic animals see § Agriculture.

Inhabitants. — The population, always sparse in the desert and steppe regions, was never dense even in the more fertile southern districts. During the Mahdia the country suffered severely from war and disease. Excluding Darfur the popula- tion before the Mahdist rule was estimated at 8,500,000. In 1905 an estimate made by the Sudan government put the population at 1,853,000 only, including 11,000 foreigners, of whom 2800 were Europeans. Since that year there has been a considerable natural increase and in 1910 the population was officially estimated at 2,400,000. There has also been a slight immigration of Abyssinians, Egyptians, Syrians and Europeans — the last named chiefly Greeks.

The term ” Bilad-es-Sudan ” (” country of the blacks “) is not altogether applicable to the Anglo-Egyptian condominium, the northern portion being occupied by Hamitic and Semitic tribes, chiefly nomads, and classed as Arabs. In the Nile valley north of Khartum the inhabitants are of very mixed origin. This applies particularly to the so-called Nubians who inhabit the Dongola mudiria (see Nubia). Elsewhere the inhabitants north of 12 N. are of mixed Arab descent. In the Nubian Desert the chief tribes are the Ababda and Bisharin, the last named grazing their camels in the mountainous districts towards the Red Sea. In the region south of Berber and Suakin are the Hadendoa. The Jaalin, Hassania and Shukria inhabit the country between the Atbara and Blue Nile; the Hassania and Hassanat are found chiefly in the Gezira. The Kabbabish occupy the desert country north of Kordofan, which is the home of the Baggara tribes. In Darfur the inhabitants are of mixed Arab and negro blood.

Of negro Nilotic tribes there are three or four main divisions. The Shilluks occupy the country along the west side of the Nile northward from about Lake No. The country east of the Nile is divided between the Bari, Nuer and Dinka tribes. The Dinkas are also widely spread over the Bahr-el-Ghazal province. South of Kordofan and west of the Shilluk territory are the Nubas, apparently the original stock of the Nubians. In the south-west of the Bahr-el-Ghazal are the Bongos and other tribes, and along the Nile-Congo water-parting are the A-Zande or Niam-Niam, a comparatively light-coloured race. (All the tribes mentioned are separately noticed.)

Social Conditions. — In contrast with the Egyptians, a most

industrious race, the Sudanese tribes, both Arab and negro, are as a general rule indolent. Where wants are few and simple, where houses need not be built nor clothes worn to keep out the cold, there is little stimulus to exertion. Many Arabs ” clothed in rags, with only a mat for a house, prefer to lead the life of the free-born sons of the desert, no matter how large their herds or how numerous their followings” {Egypt, No. 1 [1904], p. 147). Following the establishment of British control slave-raiding and the slave trade were stopped, but domestic slavery continues. A genuine desire for education is manifest among the Arabic- speaking peoples and slow but distinct moral improvement is visible among them. Among the riverain ” Arabs ” some were found to supply labour for public works, and with the money thus obtained cattle were bought and farms started. The Dongolese are the keenest traders in the country. The Arab tribes are all Mahommedans, credulous and singularly liable to fits of religious excitement. Most of the negro tribes are pagan, but some of them who live in the northern regions have embraced Islam.

Divisions and Chief Towns. — Darfur is under native rule. The rest of the Sudan is divided into mudirias (provinces) and these are subdivided intomamuria. The mudirias are Haifa, Red Sea, Dongola and Berber in the north (these include practically all the region known as Nubia) ; Khartum, Blue Nile and White Nile in the centre; Kassala and Sennar in the east; Kordofan in the west; and Bahr- el-Ghazal, Upper Nile (formerly Fashoda) and Mongalla in the south. The mudirias vary considerably in size.

The capital, Khartum (a. v.), pop. with suburbs about 70,000, is built in the fork formed by the junction of the White and Blue Niles. Opposite Khartum, on the west bank of the White Nile, is Omdurman (q.v.), pop. about 43,000, the capital of the Sudan during the Mahdia. On the Nile north of Khartum at the towns of Berber, Abu Hamed, Merawi (Merowe), Dongola and Wadi Haifa. On the Red Sea are Port Sudan and Suakin. Kassala is on the river Gash east of the Atbara and near the Eritrean frontier. (These towns are separately noticed.) On the Blue Nile are Kamlin, Sennar, Wad Medani (a. v.), pop. about 20,000, a thriving business centre and capital of the Blue Nile mudiria, and Roseires’, which marks the limit of navigability by steamers of the river. Gallabat is a town in the Kassala mudiria close to the Abyssinian frontier, and Gedaref lies between the Blue Nile and Atbara a little north of 14 N. El Obeid, the chief town of Kordofan, is 230 m. south- west by south of Khartum. Duiem, capital of the White Nile mudiria, is the river port for Kordofan. El Fasher, the capital of Darfur, is 500 m. W.S.W. of Khartum. All the towns named, except Roseires, are situated north of 13 N. In the south of the Sudan there

are no towns properly so called. The native villages are composed of straw or palm huts; the places occupied by Europeans or Egyptians are merely " posts " where the administrative business of the district is carried on. Fashoda (q.v.), renamed Kodok, is the headquarters of the Upper Nile mudiria.

Communications. — North of Khartum the chief means of communication is by railway ; south of that city by steamer. There are two trunk railways, one connecting the Sudan with Egypt, the other affording access to the Red Sea. The first line runs from the Nile at Wadi Haifa across the desert in a direct line to Abu Hamed, and from that point follows more or less closely the right (east) bank of the Nile to Khartum. At Khartum the Blue Nile is bridged and the railway is continued south through the Gezira to Sennar. Thence it turns west, crosses the White Nile near Abba Island, and is continued to El Obeid. The length of the line from Haifa to Khartum is 575 m. ; from Khartum to Obeid 350 m. The railway from the Nile to the Red Sea starts from the Haifa-Khartum line at Atbara Junction, a mile north of the Atbara confluence. It runs somewhat south of the Berber-Suakin caravan route. At Sallom, 278 m. from Atbara Junction, the line divides, one branch going north to Port Sudan, the other south to Suakin. The total distance to Port Sudan from Khartum is 493 m., the line to Suakin being 4 m. longer. Besides these main lines a railway, 138 m. long, runs from Abu Hamed on the right bank of the Nile to Kareima (opposite Merawi) in the Dongola mudiria below the Fourth Cataract. (The railway which started from Haifa and followed the right bank of the Nile to Kerma, 201 m. from Haifa, was abandoned in 1903.) The railways are owned and worked by the state.

In connexion with the Khartum-Haifa railway steamers ply on the Nile between Haifa and Shellal (Assuan) where the railway from Alexandria ends. The distance by rail and steamer between Khartum and Alexandria is about 1490 m. Steamers run on the Nile between Kerma and Kareima, and above Khartum the govern- ment maintains a regular service of steamers as far south as Gondo- koro in the Uganda Protectorate. During flood season there is also a steamship service on the Blue Nile. Powerful dredgers and sudd-cutting machines are used to keep open communications in the upper Nile and Bahr-el-Ghazal.

The ancient caravan routes Korosko-Abu Hamed and Berber- Suakin have been superseded by the railways, but elsewhere wells and rest-houses are maintained along the main routes between the towns and the Nile. On some of these roads a motor car service is maintained.

From Port Sudan and Suakin there is a regular steamship service to

Europe via the Suez Canal . There are also services to Alexandria, the Red Sea ports of Arabia, Aden and India.

There is an extensive telegraphic system. Khartum is connected by land lines with Egypt and Uganda, thus affording direct tele- graphic connexion between Alexandria and Mombasa (2500 m.). From Khartum other lines go to Kassala and the Red Sea ports. In some places the telegraph wires are placed 16 ft. 6 in. above the ground to protect them from damage by giraffes.

Agriculture and other Industries. — North of Khartum agricul- tural land is confined to a narrow strip on either side of the Nile and to the few oases in the Libyan Desert. In the Gezira and in the plains of Gedaref between the Blue Nile and the Atbara there are wide areas of arable land, as also in the neighbourhood of Kassala along the banks of the Gash. In Kordofan and Darfur cujtivation is confined to the khors or valleys. The chief grain crop is durra, the staple food of the Sudanese. Two crops are obtained yearly in several districts. On lands near the rivers the durra is sown after the flood has gone down and also at the beginning of the rainy season. Considerable quantities of wheat and barley are also

grown. Other foodstuffs raised are lentils, beans, onions and melons. The date-palm is cultivated along the Nile valley below Khartum, especially on the west bank in the Dongola mudiria and in the neighbouring oases. Dates are also a staple product in Darfur and Kordofan. Ground-nuts and sesame are grown in large quantities for the oil they yield, and cotton of quality equal to that grown in the Delta is produced. The Sudan was indeed the original home of Egyptian cotton.

For watering the land by the river banks sakias (water-wheels) are used, oxen being employed to turn them. There are also a few irrigation canals. In 1910, apart from the date plantations, about 1,500,000 acres were under cultivation. In 1910 a system of basin irrigation was begun in Dongola mudiria.

Gum and rubber are the chief forest products. The gum is obtained from eastern Kordofan and in the forests in the upper valley of the Blue Nile, the best gum coming from Kordofan. It is of two kinds, hashab (white) and talk (red), the white being the most valuable. Rubber is obtained from the Bahr-el-Ghazal — where there are Para and Ceara rubber plantations— and in the Sobat district. The wood of the sunt tree is used largely for boat- building and for fuel, and the mahogany tree yields excellent timber. Fibre is made from several trees and plants. Elephants are hunted for the sake of their ivory. The wealth of the Arab tribes consists largely in their herds of camels, horses and cattle. They also keep ostrich farms, the feathers being of good quality. The Dongola breed of horses is noted for its strength and hardness. The camels are bred in the desert north of Berber, between the Nile and Red Sea, in southern Dongola, in the Hadendoa country and in northern Kordofan. The Sudanese camel is lighter, faster and better bred than the camel of Egypt. The camel, horse and ostrich are not found south of Kordofan and Sennar. The negro tribes living south of those countries possess large herds of cattle, sheep and goats. The cattle are generally small and the sheep yield little wool. The Arabs use the cattle as draught-animals as well as for their milk and flesh; the negro tribes as a rule do not eat their oxen. Fowls are plentiful, but of poor quality. Donkeys are much used in the central regions; they make excellent transport animals.

Mineral Wealth. — In ancient times Nubia, i.e. the region between the Red Sea and the Nile south of Egypt and north of the Suakin- Berber line, was worked for gold. Ruins of an extensive gold- mine exist near Jebel Erba at a short distance from the sea. In 1905 gold mining recommenced in Nubia, in the district of Um Nabardi, which is in the desert, about midway between Wadi Haifa and Abu Hamed. A light railway, 30 m. long, opened in June 1905, connects Um Nabardi with the government railway system. The producing stage was reached in 1908, and between September 1908 and August 1909 the mines yielded 4500 oz. of gold. Small quantities of gold-dust are obtained from Kordofan, and gold is found in the Beni-Shangul country south-west of Sennar, but this region is within the Abyssinian frontier (agreement of the 15th of May 1902). There is lignite in the Dongola mudiria and iron ore is found in Darfur, southern Kordofan and in the

Bahr-el-Ghazal. In the last-named mudiria iron is worked by the natives. The district of Hofrat-el-Nahas (the copper mine) is rich in copper, the mines having been worked intermittently from remote times.

Trade. — The chief products of the Sudan for export are gum, ivory, ostrich feathers, dates and rubber. Cotton, cotton-seed and grain (durra, wheat, barley) sesame, livestock, hides and skins, beeswax, mother-of-pearl, senna and gold are also exported. Before the opening (1906) of the railway to the Red Sea the trade was chiefly with Egypt via the Nile, and the great cost of carriage hindered its development. Since the completion of the railway named goods can be put on the world's markets at a much cheaper rate. Besides the Egyptian and Red Sea routes there is considerable trade between the eastern mudirias and Abyssinia and Eritrea, and also some trade south and west with Uganda and the Congo countries. The Red Sea ports trade largely with Arabia and engage in pearl fishery. The principal imports are cotton goods, food-stuffs (flour, rice, sugar, provisions), timber, tobacco, spirits (in large quantities), iron and machinery, candles, cement and perfumery. The value of the trade, which during the Mahdist rule (1 884-1 898) was a few thousands only, had increased in 1905 to over £1,500,000. In 1908 the exports of Sudan produce were valued at ˆEsis.ooo 1 ; the total imports at £Ei, 892,000.

Government. — The administration is based on the provisions of a convention signed on the 19th of January 1809 between the British and Egyptian governments. The authority of the sovereign powers is represented by a governor-general appointed by Egypt on the recommendation of Great Britain. In 1910 a council consisting of four ex officio members and from two to four non-official nominated members was created to advise the governor-general in the exercise of his executive arid legislative functions. Subject to the power of veto retained by the governor- general all questions are decided by a majority of the council.

1 A£E(pound Egyptian) is equal to £1, os. 6d. British currency.

Each of the mudirias into which the country is divided is presided over by a mudir (governor) responsible to the central govern- ment at Khartum. The governor-general, the chiefs of the various departments of state and the mudirs are all Europeans, the majority being British military officers The minor officials are nearly all Egyptians or Sudanese. Revenue is derived as to about 60% from the customs and revenue-earning depart- ments (i.e. steamers, railways, posts and telegraphs), and as to the rest from taxes on land, date-trees and

animals, from royalties on gum, ivory and ostrich feathers, from licences to sell spirits, carry arms, &c, and from fees paid for the shooting of game. Expenditure is largely on public works, education, justice and the army. Financial affairs are managed from Khartum, but control over expenditure is exercised by the Egyptian financial department. The revenue, which in 1898 was £E3 5,000, for the first time exceeded a million in 1909, when the amount realized was £E 1,040, 200. The expenditure in 1909 was £Ei, 153.000. Financially the government had been, up to 1910, largely dependent upon Egypt. In the years 1901- 1909 ££4,378,000 was advanced from Cairo for public works in the Sudan; in the same period a further sum of about £E 2, 7 50,000 had been found by Egypt to meet annual deficits in the Sudan budgets (see Egypt, No. 1 [1910], pp. 5-6).

Justice. — The Sudan judicial codes, based in part on those of India and in part on the principles of English law and of Egyptian commercial law, provide for the recognition of " cus- tomary law " so far as applicable and " not repugnant to good conscience." In each mudiria criminal justice is administered by a court, consisting of the mudir (or a judge) and two magis- trates, which has general competence. The magistrates are members of the administrative staff, who try minor cases without the help of the mudir (or judge). The governor-general possesses revising powers in all cases. Civil cases of importance are heard by a judge (or where no judge is available by the mudir or his representative); minor civil cases are tried by magistrates. From the decision of the judges an appeal lies to the legal secretary of the government, in his capacity of judicial com- missioner. Jurisdiction in all legal matters as regards personal status of Mahommedans is administered by a grand cadi and a staff of subordinate cadis. The police force of each mudiria is independently organized under the control of the mudirs.

Education. — Education is in charge of the department of public instruction. Elementary education, the medium of instruction being Arabic, is given in kuttabs or village schools. There are primary schools in the chief towns where English, Arabic, mathematics, and in some cases land-measuring is taught. There are also government industrial workshops, and a few schools for girls. The Gordon College at Khartum trains teachers and judges in the Mahommedan courts and has annexed to it a secondary school. The college also contains the Wellcome laboratories for scientific research. Among the pagan negro tribes Protestant and Roman Catholic missions are established. These missions carry on educational work, special attention being given to industrial training.

Defence. — The defence of the country is entrusted to the Egyptian army, of which several regiments are stationed in the Sudan. The governor-general is sirdar (commander-in-chief) of the army. A small force of British troops is also stationed in the Sudan — chiefly at Khartum. They are under the com- mand of the governor-general in virtue of an arrangement made in 1905, having previously been part of the Egyptian command.

For topography, &c. ,see The Anglo-Egyptian Sudan, a compendium prepared by officers of the Sudan government and edited by Count Gleichen (2 vols., London, 1905) ; for administration, finance and trade the annual Reports [by the British agent at Cairo] on Egypt and the Sudan, since 1898; and the special report (Blue Book Egypt, No. ii., 1883) by Colonel D. H. Stewart. Consult also J. Petherick, Travels in Central Africa (2 vols., London, 1862); W. Junker, Travels in Africa, 1875-1886 (3 vols., London, 1890-1892); G. Schweinfurth The Heart of Africa (2 vols., London, 1873); J. Baumgarten, Ost- afrika, der Sudan und das Seengebiet (Gotha., 1890); E. D. Schoenfeld, ErythrOa und der agyptische Suddn (Berlin, 1904); C. E. Muriel, Report on the Forests of the Sudan (Cairo, 1901); H. F. Witherby, Bird Hunting on the White Nile (London, 1902). For ethnology.

&c, see A. H. Keane, Ethnology of the Egyptian Sudan (London, 1884) ; H. Frobenius, Die Heiden-Neger des agyptischen Sudan (Berlin, 1893). Scientific and medical subjects are dealt with in the Reports of the Wellcome Research Laboratories, Gordon College, Khartum. The Sudan Almanac is a valuable official publication. (F. R. C.)

Archaeology. — Archaeological study in the Sudan was retarded for many years by political conditions. The work which had been begun by Cailliaud, Champollion, Lepsius and others was interrupted by the rise of the Mahdist power; and with the frontiers of Egypt itself menaced by dervishes, the country south of Aswan (Assuan) was necessarily closed to the student of antiquity. Even after the dervishes had been overthrown at the battle of Omdurman (1898) it was some time before archaeologists awoke to a sense of the historical importance of the regions thus made accessible to them. Dr Wallis Budge visited several of the far southern sites and made some tentative excavations, but no extensive explorations were undertaken until an unexpected event produced a sudden outburst of activity. This was the resolution adopted by the Egyptian government to extend the

great reservoir at the First Cataract by raising the height of the Aswan dam. As a result of this measure all sites bordering the river banks from Aswan to Abu Simbel were threatened with inundation and the scientific world took alarm. A large sum of money was assigned by the government, partly for the preservation of the visible temples in the area to be submerged, partly for an official expedition under the charge of Dr G. A. Reisner which was to search for all remains of antiquity hidden beneath the ground. At the same time the university of Pennsylvania despatched the Eckley B. Coxe, jun., expedition, which devoted its attention to the southern half of Lower Nubia from Haifa to Korosko, while the govern- ment excavators explored from Korosko to Aswan. Thus in the five years 1907-1911 inclusive an immense mass of new material was acquired which throws a flood of light on the archaeology at once of Egypt and the Sudan. For it must be clearly appreciated that though all except the southern twenty miles of Lower Nubia has been attached for purposes of admini- stration of Egypt proper, yet this political boundary is purely artificial. The natural geographical and ethnical southern frontier of Egypt is the First Cataract; Egyptian scribes of the Old Empire recognized this truth no less clearly than Diocletian, and Juvenal anticipates the verdict of every modern observer when he describes the ” porta Syenes ” as the gate of Africa. It is the more necessary to emphasize this fact as the present article must unavoidably be concerned principally with the most northern regions of the country of the Blacks — for since the days of Lepsius there has been little new investigation south of Haifa. The hasty reconnaissances of Dr Wallis Budge, Professor A. H. Sayce, Mr Somers Clarke and Professor J. Garstang must be followed by more thorough and intensive study before it can be possible to write in more than very general terms of anything but the well-known monuments left by Egyptian kings whose history is already tolerably familiar from other sources. The inscriptions of these kings and their officials have been collected by Professor J. H. Breasted and some account of the temples and fortresses from Haifa to Khartum will be found in the following section, Ancient Monuments south of Haifa, while the history of the early and medieval Christian kingdoms is outlined in the articles Ethiopia and Dongola. The central and southern Sudan is therefore almost a virgin field for the archaeologist, but the exploration of Lower Nubia has made it possible to write a tentative preface to the new chapters still unrevealed.

The Sudan was well named by the medieval Arab historians, for it is primarily and above all the country of the black races, of those Nilotic negroes whose birthplace may be supposed to have been near the Great Lakes. But upon this aboriginal stock were grafted in very early

times fresh shoots of more vigorous and intellectual races coming probably from the East (cf. Africa: Ethnology). Lower Nubia was one of the crucibles in which several times was formed a mixed nation which defied or actually dominated Egypt. There is some scientific ground

for dating the earliest example of such a fusion to the exact period of the Egyptian Old Empire. It is certain in any case that the process was constantly repeated at different dates and in different parts of the country from Aswan to Axum, and to the stimulation which resulted from it must be ascribed the principal political and intellectual movements of the Sudanese nations. Thus the Ethiopians who usurped the crown of the Pharaohs from 740-660 B.C. were of a mixed stock akin to the modern Barabra; the northern Nubians who successfully defied the Roman emperors were under the lordship of the Blemyes (Blemmyes), an East African tribe, and the empire of the Candace dynasty, no less than the Christian kingdoms which succeeded it, included many heterogeneous racial elements (see also Nubia). The real history of the Sudan will therefore be concerned with the evolution of what may be called East African or East Central African civilizations.

Up to the present, however, this aspect has been obscured, for until 1907 scholars had little opportunity of studying ancient Ethiopia except as a colonial extension of Egypt. From the purely Egyptological standpoint there is much of value to be learned from the Sudan. The Egyptian penetration of the country began, according to the evidence of inscriptions, as early as the Old Empire. Under the XII th Dynasty colonies were planted and fortresses established down to the Batn-el-Hagar. During the XVIIIth Dynasty the political subjugation was completed and the newly won territories were studded with cities and temples as far south as the Fourth Cataract. Some two hundred years later the priests of Amen (Ammon), flying from Thebes, founded a quasi-Egyptian capital at Napata. But after this date Egypt played no part in the evolution of Ethiopia. Politically moribund, it succumbed to the attacks of its virile southern neigh- bours, who, having emerged from foreign tutelage, developed according to the natural laws of their own genius and environ- ment. The history of Ethiopia therefore as an independent civilization may be said to date from the 8th century B.C., though future researches may be able to carry its infant origins to a remoter past.

Of the thousand years or more of effective Egyptian occupa- tion many monuments exist, but on a broad general view it must be pronounced that they owe their fame more to the accident of survival

than to any special intrinsic value. For excepting Philae, which belongs as much to Egypt as to Ethiopia, Abu Simbel is the only temple which can be ranked among first rate products of Egyptian genius. The other temples, attractive as they are, possess rather a local than a universal interest. Similarly while the exploration of the Egyptian colonies south of the First Cataract has added many details to our knowledge of political history, of local cults and provincial organization, yet with one exception it has not affected the known outlines of the history of civilization. This exception is the discovery made by Dr G. A. Reisner that the archaic culture first detected at Nagada and Abydos and then at many points as far north as Giza extended southwards into Nubia at least as far as Gerf Husein. This was wholly unexpected, and if, as seems probable, the evidence stands the test of criticism, it is a new historical fact of great importance. The government expedition found traces between Aswan and Korosko of all the principal periods from this early date down to the Christian era. The specimens ˆobtained are kept in a separate room of the Cairo Museum, where they form a collection of great value.

The work of the Pennsylvanian expedition, however, while adding only a few details to the archaeology of the Egyptian periods, has opened a new chapter in the history of the African races. No records indeed were discovered of the founders of the first great Ethiopian kingdom from Piankhi to Tirhakah, nor has any fresh light been thrown upon the relations which that remarkable king Ergamenes maintained with the Egyptian Ptolemies. But the exploration of sites in the southern half of Lower Nubia has revealed the existence of a wholly unsus- pected independent civilization which grew up during the first six -centuries after Christ. The history of the succeeding periods, moreover, has been partially recovered and the study

of architecture enriched by the excavation of numerous churches dating from the time of Justinian, when Nubia was first Christian- ized, down to the late medieval period when Christianity was extirpated by Mahommedanism.

The civilization of the first six centuries a.d. may be called ” Romano-Nubian,” a term which indicates its date and suggests something of its character. It is the product of a people living on the borders of the Roman Empire who inherited much of the Hellenistic tradition in minor arts but combined it with a remarkable power of independent

origination. The sites on which it has been observed range from Dakka to Haifa, that is to say within the precise limits which late Latin and Greek writers assign to the Blemyes, and there is good reason t to identify the people that evolved it with this hitherto almost unknown barbarian nation. Apart from this, however, the greatest value of the new discoveries will consist in the fact that they may lay the foundations for a new documentary record of past ages. For the graves yielded not only new types of statues, bronzes, ivory carvings and painted pottery — all of the highest artistic value — but also a large number of stone stelae inscribed with funerary formulae in the Meroitic script.

In the course of sixty years the small collection of Meroitic inscriptions made by Lepsius had not been enlarged and no progress had been made towards decipherment. But the cemeteries of Shablul and Karanog alone yielded 1 70 inscriptions on stone, besides some inscribed ostraka. This mass of material brought the task of decipherment within the range of possibility, and even without any bilingual record to assist him, Mr F. LI. Griffith rapidly succeeded in the first stages of translation. As further explorations bring more inscriptions to light the records of Ethiopia will gradually be placed on a firm documentary basis and the names and achievements of its greatest monarchs will take their place on the roll of history.

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Ancient Monuments south of Haifa. — Ruins of pyramids, temples,

churches and other monuments are found along both banks of the Nile almost as far south as the Fourth Cataract, and again in the ” Island of Meroe.” In the following list the ruins are named as met with on the journey south from Wadi Haifa. Opposite that town on the east bank are the remains of Bohon, where was found the stele, now at Florence, com- memorating the conquest of the region by Senwosri (Usertesen) I. of Egypt (c. 2750 B.C.). Forty-three miles farther south are the ruins of the twin fortresses of Kumma and Semna. Here the Nile narrows and passes the Semna cataract, and graven on the rocks are ancient records of ” high Nile.” At Amara, some 80 m. above Semna, are the ruins of a temple with Meroitic hieroglyphics. At Sai Island, 130 m. above Haifa, are remains of a town arid of a Christian church. Thirteen miles south of Sai at Soleb are the ruins of a fine temple commemorating Amenophis (Amenhotep) III. (c. 1414 B.C.) to whose queen Taia was dedicated a temple at Sedeinga, a few miles to the north. At Sesebi, 40 m. higher up the Nile, is a temple of the heretic king Akhenaton re-worked by Seti I. (c. 1327 B.C.). Opposite Hannek at the Third Cataract on Tombos Island are extensive ancient granite quarries, in one of which lies an unfinished colossus. On the east side of the river near Kerma are the

remains of an Egyptian city. Argo Island, a short distance higher up, abounds in ruins, and those at Old Dongola, 320 m. from Haifa, afford evidence of the town having been of consider- able size during the time of the Christian kingdom of Dongola. From Old Dongola to Merawi (a distance of 100 m. by the river) are numerous ruins of monasteries, churches and fortresses of the Christian era in Nubia — notably at Jebel Deka and Magal. In the immediate neighbourhood of Jebel Barkal (the ” holy mountain ” of the ancient Egyptians), a flat-topped hill which rises abruptly from the desert on the right bank of the Nile a mile or two above the existing village of Merawi (Merowe), are many pyramids and six temples, the pyramids having a height of from 35 to 60 ft. Pyramids are also found at Zuma and Kurru on the right bank, and at Tangassi on the left bank of the river, these places being about 20 m. below Merawi. That village is identified by some archaeologists with the ancient Napata, which is known to have been situated near the ” holy mountain.” On the left bank of the Nile opposite Merawi are the pyramids of Nuri, and a few miles distant in the Wadi Ghazal are the ruins of a great Christian monastery, where were found gravestones with inscriptions in Greek and Coptic. Ruins of various ages extend from Merawi to the Fourth Cataract.

Leaving the Nile at this point and striking direct across the Bayuda Desert, the river is regained at a point above the Atbara confluence. Thirty miles north of the town of Shendi are the pyramids of Meroe

(or Assur) in three distinct groups. From one of these pyramids was taken ” the treasure of Queen Candace,” now 1 in the Berlin Museum. Many of the pyramids have a small shrine on the eastern side inscribed with debased Egyptian or Meroite hieroglyphics. These pyramids are on the right bank of the Nile, that is in the ” Island of Meroe.” Portions (in- cluding a harbour) of the site of the city of MeroS, atBegerawia, not far from the pyramids named, were excavated in 1909-1910 (see MeroE). In this region, and distant from the river, are the remains of several cities, notably Naga, where are ruins of four temples, one in the Classic style. On the east bank of the Blue Nile, about 13 m. above Khartum at Soba, are ruins of a Christian basilica. Farther south still, at Ceteina on the White Nile (in 1904), and at Wad el-Hadad, some miles north of Sennar, on the Blue Nile (in 1908), Christian remains have been observed.

Between the Nile at Wadi Haifa and the Red Sea are the remains of towns inhabited by the ancient miners who worked the district. The most striking of these towns is Deraheib (Castle Beautiful), so named from the picturesque situation of the castle, a large square building with pointed arches. The walls of some 500 houses still stand.

For a popular account (with many illustrations) of these ruins see J. Ward, Our Sudan: Its Pyramids and Progress (London, 1905).

(F. R. C.)

History A. From the Earliest Time to the Egyptian Conquest. — The southern regions of the Anglo-Egyptian Sudan are without recorded history until the era of the Egyptian conquest in the 19th century. In the northern regions, known as Ethiopia or Nubia, Egyptian influence made itself felt as early as the Old Empire. In process of time powerful states grew up with capitals at Napata and Meroe (see ante § Archaeology and Ethiopia and Egypt). The Nubians — that is the dwellers in the Nile valley between Egypt and Abyssinia — did not embrace Christianity until the 6th century, considerably later than their Abyssinian neighbours. The Arab invasion of North Africa in the 7th century, which turned Egypt into a Mahommedan country, had not the same effect in Nubia, the Moslems, though they frequently raided the country, being unable to hold it. On the ruins of the ancient Ethiopian states arose christian the Christian kingdoms of Dongola and Aloa, with Kingdoms ot capitals at Dongola and Soba (corresponding roughly ” a ‘ to Napata and Meroe). These kingdoms continued to exist until the middle of the 14th century or later (see Dongola: Mudirio). Meanwhile Arabs of the Beni Omayya tribe, under pressure from the Beni Abbas, had begun to cross the Red Sea

as early as the 8th century and to settle in the district around Sennar on the Blue Nile, a region which probably marked the southern limits of the kingdom of Aloa. The Omayya, who during the following centuries were reinforced by further immigrants from Arabia, intermarried with the negroid races, and gradually Arab influence became predominant and Islam the nominal faith of all the inhabitants of Sennar. In this way a barrier was erected between the Christians of Nubia and those of Abyssinia. By the 15th century the Arabized negro races of the Blue Nile had grown into a powerful nation known as the Funj (

The first of the Funj monarchs acknowledged king of the whole of the allied tribes, of which the Hameg were next in importance to the Funj, was Amara Dunkas, who Empire. reigned c. 1484-15 26. 1 During the reign of Adlan, c. 1 596-1603, the fame of Sennar attracted learned men to his court from such distant places as Cairo and Bagdad. Adlan's great-grandson Badi Abu Daku attacked the Shilluk negroes and raided Kordofan. This monarch built the great mosque at Sennar, almost the only building in the town to survive the ravages of the dervishes in the 19th century. In the early part of the 18th century there was war between the Sennari and the Abyssinians, in which the last named were defeated with great slaughter. It is said that the cause of quarrel was the seizure by the king of Sennar of presents sent by the king of France to the Negus. The victory over the " infidel" Abyssinians became celebrated throughout the Mahommedan world, and Sennar was visited by many learned and celebrated men from Egypt, Arabia and India. Towards the end of the 1 8th century the Hameg wrested power from the Funj and the kingdom fell into decay, many of the tributary princes refusing to acknowledge the king of Sennar. These disorders con- tinued up to the time of the conquest of the country by the Egyptians.

B. From the Egyptian Conquest to the Rise of the Mahdi. — The conquest of Nubia was undertaken in 1820 by order of Mehemet Ali, the pasha of Egypt, and was accomplished in Ezyo "" y tne tw0 y ears following. In its consequences this proved one of the most important events in the history of Africa. Mehemet Ali never stated the reasons which led him to order the occupation of the country, but his leading motive was, probably, the desire to obtain possession of the mines of gold and precious stones which he believed the Sudan contained. He also saw that the revenue of Egypt was falling through the diversion,

since about 1800, of the caravan routes from the Nile to the Red Sea ports, and may have wished to recapture the trade, as well as to secure a country whence thousands of slaves could be brought annually. Mehemet Ali also wished to crush the remnant of the Mamelukes who in r8i2 had established themselves at Dongola, and at the same time to find employment for the numerous Albanians and Turks in his army, of whose fidelity he was doubtful.

Mehemet Ali gave the command of the army sent to Nubia to his son Ismail, who at the head of some 4000 men left W.adi Haifa in October 1820. Following the Nile route he occupied Dongola without opposition, the Mamelukes fleeing before him. (Some of them went to Darfur and Wadai, others made their way to the Red Sea. This was the final dispersal of the Mame- lukes.) With the nomad Shagia, who dominated the district,

1 Various lists and dates of reign of the rulers of Sennar are given; reference may be made in Stokvis's Manuel d'histoire vol. i. (Leiden, 1888), and to The Anglo-Egyptian Sudan, vol. i. (London,

1905)-

Ismail had two sharp encounters, one near Korti, the other higher up the river, and in both fights Ismail was successful. Thereafter the Shagia furnished useful auxiliary cavalry to the Egyptians. Ismail remained in the Dongola province till Feb- ruary 182 1, when he crossed the Bayuda Desert and received the submission of the meks (kings) of Berber, Shendi and Halfaya, nominal vassals of the king of Sennar. Continuing his march south Ismail reached the confluence of the White and Blue Niles and established a camp at Ras Khartum. (This camp developed into the city of Khartum.) At this time Badi, the king of Sennar, from whom all real power had been wrested by his leading councillors, determined to submit to the Egyptians, and as Ismail advanced up the Blue Nile he was met at Wad Medani by Badi who declared that he recognized Mehemet Ali as master of his kingdom. Ismail and Badi entered the town of Sennar together on the 12th of June 182 1, and in this peaceable manner the Egyptians became rulers of the ancient empire of the Funj. In search of the gold-mines reported to exist farther south Ismail penetrated into the mountainous region of Fazokl, where the negroes offered a stout resistance. In February 1822 he set out on his return to Sennar and Dongola, having received reports of risings against Egyptian authority. The Egyptian soldiery had behaved throughout with the utmost barbarity, and their passage up the Nile was marked by rapine, murder, mutilation and fire. Of the rulers who had submitted to

Ismail, Nair Mimr, the mek of Shendi, had been compelled to follow in the suite of the Egyptians as a sort of hostage, and this man entertained deep hatred of the pasha. On Ismail's return to Shendi, October 1822, he demanded of the mek 1000 slaves to be supplied in two days. The mek, promising compliance, invited Ismail and his chief officers to a feast in his house, around which he had piled heaps of straw. Whilst the Egyptians were feasting the mek set fire to the straw and Ismail and all his companions were burnt to death.

Ismail's death was speedily avenged. A second Egyptian army, also about 4000 strong, had followed that of Ismail's up the Nile, and striking south-west from Debba had wrested, after a sharp campaign, the province of Kordofan (18 21) from the sultan of Darfur. This army was commanded by Mahommed Bey, the Defterdar, son-in-law of Mehemet Ali. Hearing of Ismail's murder the Defterdar marched to Shendi, defeated the forces of the mek, and took terrible revenge upon the inhabitants of Metemma and Shendi, most of the inhabitants, including women and children, being burnt alive. Nair Mimr escaped to the Abyssinian frontier, where he maintained his independence. Having conquered Nubia, Sennar and Kordofan the Egyptians set up a civil government, placing at the head of the administra- tion a governor-general with practically unlimited power. 2 About this period Mehemet Ali leased from the sultan of Turkey the Red Sea ports of Suakin and Massawa, and by this means got into his hands all the trade routes of the eastern Sudan. The pasha of Egypt practically monopolized the trade of the country except that in slaves, which became a vast " industry," the lands inhabited by negro tribes on the borders of the con- quered territories being raided annually for the purpose. From the negro population the army was so largely recruited that in a few years the only non-Sudanese in it were officers. The Egyptian rule proved harmful to the country. The governors- general and the leading officials were nearly all Turks, Albanians or Circassians, and, with rare exceptions, the welfare of the people formed no part of their conception of government. 3 Numerous efforts were made to extend the authority of Egypt. In 1840 — previous attempts having been unsuccessful — the fertile district of Taka, watered by the Atbara and Gash and near the Abyssinian frontier, was conquered and the town of

2 For a list of the governors-general see The Anglo-Egyptian Sudan, i. p. 280 (London, 1905).

3 Khurshid Pasha, governor-general for 13 years (1826-1839), was one of these exceptions. He gained a great reputation both for rectitude and vigour. He led expeditions up the White Nile against the

Dtnkas as far as Fashoda; defeated the Abyssinians on the Sennar frontier, and taught the natives of Khartum to build houses of brick.

Kassala founded. In 1837 the pasha himself visited the Sudan, going as far as Fazokl, where he inspected the goldfields.

In 1849 Abd-el-Latif Pasha became governor-general and attempted to remedy some of the evils which disfigured the administration. He remained in office, however, little more than a year, too short a period to effect reforms. The Sudan was costing Egypt more money than its revenue yielded, though it must not be forgotten that large sums found their way illicitly into the hands of the pashas. The successors of Mehemet Ali, in an endeavour to make the country more profitable, extended their conquests to the south, and in 1853 and subsequent years trading posts were established on the Upper Nile, the pioneer European merchant being John Petherick, British consular agent at Khartum. 1 Petherick sought for ivory only, but those who followed him soon found that slave-raiding was more profitable than elephant hunting. The viceroy Said, who made a rapid tour through the Sudan in 1857, found it in a deplorable condition. The viceroy ordered many reforms to be executed and proclaimed the abolition of slavery. The reforms were mainly inoperative and slavery continued. The project which Said also conceived of linking the Sudan to Egypt by railway remained unfulfilled. The Sudan at this time (c. 1862) is described by Sir Samuel Baker as utterly ruined by Egyptian methods of government and the retention of the country only to be accounted for by the traffic in slaves. The European merchants above Khartum had sold their posts to Arab agents, who oppressed the natives in every conceivable fashion. Ismail Pasha, who became viceroy of Egypt in 1863, gave orders for the suppression of the slave trade, and to check the operations of the Arab traders a military force was stationed at Fashoda (1865), this being the most southerly point then held by the Egyptians. Ismail's efforts to put an end to the slave trade, if sincere, were ineffective, and, moreover, south of Kordofan the authority of the government did not extend beyond the posts occupied by their troops. Ismail, however, was ambitious to extend his dominions and to develop the Sudan on the lines he had conceived for the development of Egypt. He obtained (1865) from the sultan of Turkey a firman assigning to him the administration of Suakin and Massawa; the lease which Mehemet Ali had of these ports having lapsed after the death cf that pasha. Ismail subsequently (1870-1875) extended his sway over

the whole coast from Suez to Cape Guardafui and garrisoned the towns of Berbera, Zaila, &c, while in 1874 the important town of Harrar, the entrepdt for southern Abyssinia, was seized by Egyptian troops. The khedive had also seized Bogos, in the hinterland of Massawa, a province claimed by Abyssinia. This action led to wars with Abyssinia, in which the Egyptians were generally beaten. Egyptian authority was withdrawn from the coast regions south of Suakin in 1884 (see below and also Abyssinia; Eritrea and Somaliland).

At the same time that Ismail annexed the seaboard he was extending his sway along the Nile valley to the equatorial lakes, and conceived the idea of annexing all the country between the Nile and the Indian Ocean. An expedition was sent (1875) to the Juba River with that object, but it was withdrawn at the request of the British government, as it infringed the rights of the sultan of Zanzibar. 2 The control of all territories south of Gondokoro had been given (April 1, 1869) to Sir Samuel Baker, who, however, only left Khartum to take up his governor- The ship in February 1870. Reaching Gondokoro on

Equatorial the 26th of May following, he formally annexed Regions: that station, which he named Ismailia, to the khedival Darfur domains. Baker remained as governor of the Equa- conquere . tQr j a j p rovmces un j;i August 1873, and in March 1874 Colonel C. G. Gordon took up the same post. Boˆh Baker and

1 The government monopoly in trade ceased after the death of Mehemet Ali in 1849.

2 The Juba was quite unsuitable as a means of communication between the Indian Ocean and the Nile. The proposal made to Ismail by Gordon was to send an expedition to Mombasa and thence up the Tana River, but for some unexplained reason, or perhaps by mistake, the expedition was ordered to the Juba (see Col. Gordon in Central Africa, 4th ed., 1885, pp. 65, 66, 150 and 151, and Geog. Journ.. Feb. I, 1909, p. 150).

Gordon made strenuous efforts towards crushing the slave trade, but their endeavours were largely thwarted by the inaction of the authorities at Khartum. Under Gordon the Upper Nile region as far as the borders of Uganda came effectively under Egyptian control, though the power of the government extended on the east little beyond the banks of the rivers. On the west the Bahr-el-Ghazal had been overrun by Arab or semi-Arab slave-dealers. Nominally subjects of the khedive, they acted as free agents, reducing the country over

which they terrorized to a state of abject misery. The most powerful of the slave traders was Zobeir Pasha, who, having defeated a force sent from Khartum to reduce him to obedience' invaded Darfur (1874). The khedive, fearing the power of Zobeir, also sent an expedition to Darfur, and that country, after a stout resist- ance, was conquered. Zobeir claimed to be made governor- general of the new province; his request being refused, he went to Cairo to urge his claim. At Cairo he was detained by the Egyptian authorities.

Though spasmodic efforts were made to promote agriculture and open up communications the Sudan continued to be a con- stant drain on the Egyptian exchequer. The khedive Ismail revived Said's project of a railway, and a survey for a line from Wadi Haifa to Khartum was made (1871), while a branch line to Massawa was also contemplated. As with Said's project these schemes came to naught. 3 In October 1876 Gordon left the Equatorial Provinces and gave up his appointment. In February 1877, under pressure from the British General and Egyptian governments, he went to Cairo, where Gordon he. was given the governorship of the whole of the Governor- Egyptian territories outside Egypt; namely, the genera ' Sudan provinces proper, the Equatorial Provinces, Darfur, and the Red Sea and Somali coasts. He replaced at Khartum Ismail Pasha Eyoub, a Turk made governor-general in 1873, who had thwarted as much as he dared all Gordon's efforts to reform. Gordon remained in the Sudan until August 1879. During his tenure of office he did much to give the Sudanese the benefit of a just and considerate government. In 1877 Gordon suppressed a revolt in Darfur and received the submission of Suliman Zobeir (a son of Zobeir Pasha), who was at the head of a gang of slave-traders on the Bahr-el-Ghazal frontier. In 1878 there was further trouble in Darfur and also in Kordofan, and Gordon visited both these provinces, breaking up many companies of slave-hunters. Meantime Suliman (acting on the instructions of his father, who was still at Cairo) had broken out into open revolt against the Egyptians in the Bahr-el- Ghazal. The crushing of Suliman was entrusted by Gordon to Romolo Gessi (1831-1881), an Italian who had previously served under Gordon "on the Upper Nile. Gessi, after a most arduous campaign (1878-79), in which he displayed great military skill, defeated and captured Suliman, whom, with other ring- leaders, he executed. The slave-raiders were completely broken up and over 10,000 captives released. A remnant of Zobeir's troops under a chief named Rabah succeeded in escaping west- ward, (see Rabah). Having conquered the province Gessi was made governor of the Bahr-el-Ghazal and given the rank of pasha.

When Gordon left the Sudan he was succeeded at Khartum by Raouf

Pasha, under whom all the old abuses of the Egyptian administration were revived. At this time the high European officials in the Sudan, besides Gessi, included Emin Pasha (q.v.) — then a bey only — governor of the Equatorial Province since 1878, and Slatin Pasha — then also a bey— governor of Darfur. Gessi, who had most successfully governed his province, found his position under Raouf intolerable, resigned his post in Sep- tember 1880 and was succeeded by Frank Lupton, an English- man, and formerly captain of a Red Sea merchant steamer, who was given the rank of bey. At this period (1880-1882) schemes for the reorganization and better administration of the Sudan were elaborated on paper, but the revolt in Egypt under Arabi (see Egypt: History) and the appearance in the Sudan of a Mahdi prevented these schemes from being put into

- Up to 1877, when the work was abandoned, some 50 m. of rails had been laid from Wadi Haifa at a cost of some £450,000.

execution (assuming that the Egyptian authorities were sincere in proposing reforms).

C. The Rise and Power of Mahdism. — The Mahdist move- ment, which was utterly to overthrow Egyptian rule, derived its strength from two different causes: the oppression under which the people suffered, 1 and the measures taken to prevent the Baggara (cattle-owning Arabs) from slave trading. Venality and the extortion of the tax-gatherer flourished anew after the departure of Gordon, while the feebleness of his successors inspired in the Baggara a contempt for the authority which prohibited them pursuing their most lucrative traffic. When Mahommed Ahmed (q.v.), a Dongolese, proclaimed himself the long-looked-for Mahdi (guide) of Islam, he found most of his original followers among the grossly superstitious villagers of Kordofan, to whom he preached universal equality and a community of goods, while denouncing the Turks 2 as unworthy Moslems on whom God would execute judgment. The Baggara perceived in this Mahdi one who could be used to shake off Egyptian rule, and their adhesion to him first gave importance to his “mission.” Mahommed Ahmed became at once the leader and the agent of the Baggara. He married the daughters of their sheikhs and found in Abdullah, a member of theTaaisha section of the tribe, his chief supporter. The first armed conflict The between the Egyptian troops and the Mahdi’s

Massacre of followers occurred in August 1881. In June 1882 nicks the Mahdi gained his first considerable success.

Pasha's The capture of El Obeid on the 17th of January Army. I ggˆ an £ j tne ann jiiilation in the November following

of an army of over 10,000 men commanded by Hicks Pasha (Colonel William Hicks [q.v.] formerly of the Bombay army) made the Mahdi undisputed master of Kordofan and Sennar. The next month, December 1883, saw the surrender of Slatin in Darfur, whilst in February 1884 Osman Digna, his amir in the Red Sea regions, inflicted a crushing defeat on some 4000 Egyptians at El Teb near Suakin. In April following Lupton Bey, governor of Bahr-el-Ghazal, whose troops and officials had embraced the Mahdist cause, surrendered and was sent captive to Omdurman, where he died on the 8th of May 1888.

On learning of the disaster to Hicks Pasha's army, the British government (Great Britain having been since 1882 in military occupation of Egypt) insisted that the Egyptian government should evacuate such parts of the Sudan as they still held, and General Gordon was despatched, with Lieut. Colonel Donald H. Stewart, 3 to Khartum to arrange the withdrawal of the Egyptian civil and military population. Gordon's instructions, based largely on his own suggestions, were not wholly consistent ; they contemplated vaguely the establishment of some form of stable government on the surrender of Egyptian authority, and among the documents with which he was furnished was a firman creating him governor general of the Sudan. 4 Gordon reached Khartum on the 18th of February 1884 and at first his mission, which had aroused great enthusiasm in England, promised success. To smooth the way for the retreat of the Egyptian garrisons and civilians he issued proclamations announcing that the suppression of the slave trade was abandoned, that the Mahdi was sultan of Kordofan, and that the Sudan was independent of Egypt. He enabled some thousands of refugees to make their escape to

1 Writing from Darfur in April 1879 Gordon said: " The govern- ment of the Egyptians in these far-off countries is nothing else but one of brigandage of the very worst description. It is so bad that all hope of ameliorating it is hopeless."

2 The Sudanese spoke of all foreigners as " Turks." This arose from the fact that most of the higher Egyptian officials were of Turkish nationality and that the army was officered mainly by Turks, Albanians,. Circassians, &c, and included in the ranks many Bashi-Bazuks (irregulars) of non-Sudanese origin.

3 Colonel Stewart had been sent to Khartum in 1882 on a mission of inquiry, and he drew up a valuable report, Egypt, No. II (1883).

4 It is unnecessary here to enter upon a discussion of the precise nature of Gordon's instructions or of the measure in which he carried them out. The material for forming a judgment will be found in Gordon's Journals (1885), Morley's Life of Gladstone (1903), Fitz-maurice's Life of Granville (1905), and Cromer's M"dern Egypt (1908). (See also Gordon, Charles George.)

Oordoa at Khartum.

Assuan and collected at Khartum troops from some of the out- lying stations. By this time the situation had altered for the worse and Mahdism was gaining strength among tribes in the Nile valley at first hostile to its propaganda. As the only means of preserving authority at Khartum (and thus securing the peaceful withdrawal of the garrison) Gordon repeatedly tele- graphed to Cairo asking that Zobeir Pasha might be sent to him, his intention being to hand over to Zobeir the government of the country. Zobeir {q.v.), a Sudanese Arab, was probably the one man who could have withstood successfully the Mahdi. Owing to Zobeir's notoriety as a slave-raider Gordon's request was refused. All hope of a peaceful retreat of the Egyptians was thus rendered impossible. The Mahdist movement now swept northward and on the 20th of May Berber was captured by the dervishes and Khartum isolated. From this time the energies of Gordon were devoted to the defence of that town. After months of delay due to the vacillation of the British government a relief expedition was sent up the Nile under the command of Lord Wolseley. It started too late to achieve its object, and on the 25th of January 1885 Khartum was captured by the Mahdi and Gordon killed. Colonel Stewart, Frank Power (British consul at Khartum) and M. Herbin (French consul) , who (accompanied by nineteen Greeks) had been sent down the Nile by Gordon in the previous September to give news to the relief force, had been decoyed ashore and murdered (Sept. 18, 1884). The fall of Khartum was followed by the withdrawal of the British expedition, Dongola being evacuated in June 1885. In the same month Kassala capitulated, but just as the Mahdi had practically completed the destruction of the Egyptian power 5 he died, in this same month of June 1885. He was at once succeeded by the khalifa Abdullah, whose rule continued until the 2nd of September i898, s when his army was completely overthrown by an Anglo-Egyptian force under Sir H. (afterwards Lord) Kitchener. The military operations are described elsewhere (see Egypt: Military Opera- tions), and here it is only necessary to consider the internal situation and the character of the

khalifa's govern- The ment. The Mahdi had been regarded by his adhe- Khalifa's rents as the only true commander of the faithful, ˆ ule ' endued with divine power to conquer the whole world. He had at first styled his followers dervishes {i.e. religious mendi- cants) and given them the jibba as their characteristic garment or uniform. Later on he commanded the faithful to call them- selves ansar (helpers), a reference to the part they were to play in his career of conquest, and at the time of his death he was planning an invasion of Egypt. He had liberated the Sudanese from the extortions of the Egyptians, but the people soon found that the Mahdi's rule was even more oppressive than had been that of their former masters, and after the Mahdi's death the situation of the peasantry in particular grew rapidly worse, neither life nor property being safe. Abdullah set himself steadily to crush all opposition to his own power. Mahommed Ahmed had, in accordance with the traditions which required the Mahdi to have four khalifas (lieutenants), nominated, besides Abdullah, Ali wad Helu, a sheikh of the Degheim and Kenana Arabs, and Mahommed esh Sherif, his son-in-law, as khalifas. (The other khalifaship was vacant having been declined by the sheikh es Senussi [.]). Wad Helu and Sherif were stripped of their power and gradually all chiefs and amirs not of the Baggara tribe were got rid of except Osman Digna, whose sphere of operations was on the Red Sea coast. Abdullah's rule was a pure military despotism which brought the country to a state of almost complete agricultural and commercial ruin. He was also almost constantly in conflict either with the Shilluks, Nuers and other negro tribes of the south; with the peoples of Darfur, where at one time an anti-Mahdi gained a great following; with the Abyssinians; with the Kabbabish and other Arab tribes who

5 Sennar town held out until the 19th of August, while the Red Sea ports of Suakin and Massawa never fell into the hands of the Mahdists. The garrisons of some other towns were rescued by the Abyssinians.

6 This period in the history of the Sudan is known as the Mahdia.

had never embraced Mahdism, or with the Italians, Egyptians and British. Notwithstanding all this opposition the khalifa found in his own tribesmen and in his black -troops devoted adherents and successfully maintained his position. The attempt to conquer Egypt ended in the total defeat of the dervish army at Toski (Aug. 3, 1889). The attempts to subdue the Equatorial Provinces were but partly

successful. Emin Pasha, to whose relief H. M. Stanley had gone, evacuated Wadelai in April 1889. The greater part of the region and also most of the Bahr-el-Ghazal relapsed into a state of complete savagery.

In the country under his dominion the khalifa's government was carried on after the manner of other Mahommedan states, but pilgrimages to the Mahdi's tomb at Omdurman were substi- tuted for pilgrimages to Mecca. The arsenal and dockyard and the printing-press at Khartum were kept busy (the workmen being Egyptians who had escaped massacre) . Otherwise Khartum was deserted, the khalifa making Omdurman his capital and compelling disaffected tribes to dwell in it so as to be under better control. While Omdurman grew to a huge size the population of the country generally dwindled enormously from constant warfare and the ravages of disease, small-pox being endemic. The Europeans in the country were kept prisoners at Omdurman. Besides ex-officials like Slatin and Lupton, they included several Roman Catholic priests and sisters, and numbers of Greek merchants established at Khartum. Although several were closely imprisoned, loaded with chains and repeatedly flogged, it is a noteworthy fact that none was put to death. From time to time a prisoner made his escape, and from the accounts of these ex-prisoners knowledge of the character of Dervish rule is derived in large measure. The fanaticism with which the Mahdi had inspired his followers remained almost unbroken to the end. The khalifa after the fatal day of Omdur- man fled to Kordofan where he was killed in battle in November 1899. In January 1900 Osman Digna, a wandering fugitive for months, was captured. In 1902 the last surviving dervish amir of importance surrendered to the sultan of Darfur. Mahdism as a vital force in the old Egyptian Sudan ceased, however, with the Anglo-Egyptian victory at Omdurman. 1

D. The Anglo-Egyptian Condominium. — Of the causes which led to the reconquest of the Sudan — the natural desire of the Egyptian government to recover lost territory, the equally natural desire in Great Britain to "avenge " the death of Gordon were among them — the most weighty was the necessity of securing for Egypt the control of the Upper Nile, Egypt being wholly dependent on the waters of the river for its prosperity. That control would have been lost had a European power other than Great Britain obtained possession of any part of the Nile valley; and at the time the Sudan was reconquered (1896-98) France was endeavouring to establish her authority on the river between Khartum and Gondokoro, as the Marchand expedition from the Congo to Fashoda demonstrated. The Nile constitutes, in the words of Lord Cromer, the true justification of the policy of re-

occupation, and makes the Sudan a priceless possession for Egypt. 2

The Sudan having been reconquered by ” the joint military and financial efforts” of Great Britain and Egypt, the British government claimed ” by right of conquest ” to share in the settlement of the administration and legislation of the country. To meet these claims an agreement (which has been aptly called the constitutional charter of the Sudan) between Great Britain and Egypt, was signed on the 19th of January 1899, establishing the joint sovereignty of the two states throughout

1 In the autumn of 1903 Mahommed-el-Amin, a native of Tunis, proclaimed himself the Mahdi and got together a following in Kordofan. He was captured by the governor of Kordofan and publicly executed at El Obeid. In April 1908 Abd-el-Kader, a Halowin Arab and ex-dervish, rebelled in the Blue Nile province, claiming to be the prophet Issa (Jesus). On the 29th of that month he murdered Mr C. C. Scott-Moncrieff, deputy inspector of the province, and the Egyptian mamur. The rising was promptly suppressed, Abd-el- Kader was captured and was hanged on the 17th of May.

8 Egypt, No. 1 (1905), P- no-

the Sudan. 3 The reorganization of the country had already begun, supreme power being centred in one official termed the ” governor-general of the Sudan.” To this post was appointed Lord Kitchener, the sirdar (commander-in-chief) of the Egyptian army, under whom the Sudan had been reconquered. On Lord Kitchener going to South Africa at the close of 1899 he was succeeded as sirdar and governor-general by Major-General Sir F. R. Wingate, who had served with the Egyptian army since 1883. Under a just and firm administration, which from the first was essentially civil, though the principal officials were officers of the British army, the Sudan recovered in a surprising manner from the woes it suffered during the Mahdia. At the head of every mudiria (province) was placed a British official, though many of the subordinate posts were filled by Egyptians. An exception was made in the case of Darfur, which before the battle of Omdurman had thrown off the khalifa’s rule and was again under a native sovereign. This potentate, the sultan Ali Dinar, was recognized by the Sudan government, on condition of the payment of an annual tribute.

The first duty of the new administration, the restoration of public order, met with comparatively feeble opposition, though tribes such as the Nuba mountaineers, accustomed from time immemorial to raid their weaker neighbours, gave some trouble. In 1906, in 1908, and

again in 1910 expeditions had to be sent against the Nubas. In the Bahr-el-Ghazal the Niam-Niams at first disputed the authority of the government, but Sultan Yambio, the recalcitrant chief, was mortally wounded in a fight in February 1905 and no further disturbance occurred. The delimitation (1903-1904) of the frontier between the Sudan and Abyssinia enabled order to be restored in a particularly lawless region, and slave-raiding on a large scale ended in that quarter with the capture and execution of a notorious offender in 1904. In Kordofan, Darfur and the Bahr-el-Ghazal the slave trade continued however for some years later.

With good administration and public security the population increased steadily. The history of the country became one of peaceful progress marked by the growing content- ment of the people. The Sudan government devoted much attention to the revival of agriculture and commerce, to the creation of an educated class of natives, and to the establishment of an adequate judicial system. Their task, though one of immense difficulty, was however (in virtue of the agreement of the 19th of January 1899) free from all the international fetters that bound the administration of Egypt. It was moreover rendered easier by the decision to govern, as far as possible, in accordance with native law and custom, no attempt being made to Egyptianize or Anglicize the Sudanese. The results were eminently satis- factory. The Arab-speaking and Mahommedan population found their religion and language respected, and from the first showed a marked desire to profit by the new order. To the negroes of the southern Sudan, who were exceedingly suspicious of all strangers — whom hitherto they had known almost exclusively as slave-raiders — the very elements of civilization had, in most cases, to be taught. In these pagan regions the Sudan government encouraged the work of missionary societies, both Protestant and Roman Catholic, while discouraging propaganda work among the Moslems.

In their general policy the Sudan government adopted a system of very light taxation; low taxation being in countries such as Egypt and the Sudan the keystone of the political arch. This policy was amply justified by results. In 1899 the revenue derived from the country was £Ei26,ooo, in 1909 it had risen to £E 1, 040,000, despite slight reductions in taxation, a proof of the growing prosperity of the land. This prosperity was brought about largely by improving the water-supply, and thus bringing more land under cultivation, by the creation of new industries, and by the improvement of means of communication. Ashorter route to the sea than that through Egypt being essential for the

‘ At first Suakin was excepted from some of the provisions of this agreement, but these exceptions were done away with by a supplementary agreement of the 10th of July 1899.

The Re- generative Work of Great Britain.

commercial development of the country, a railway from the Nile near Berber to the Red Sea was built (1004-1006). This line shortened the distance from Khartum to the nearest seaport by nearly 1000 m., and by reducing the cost of carriage of mer- chandise enabled Sudan produce to find a profitable outlet in the markets of the world. At the same time river communi- cations were improved and the numbers of wells on caravan roads increased. Steps were furthermore taken by means of irrigation works to regulate the Nile floods, and those of the river Gash.

To the promotion of education and sanitation, and in the administration of justice, the government devoted much energy with satisfactory results. Indeed the regenerative work of Great Britain in the Sudan has been fully as successful and even more remarkable than that of Great Britain in Egypt. A large part of this work has been accomplished by officers of the British army. Some of the most valuable suggestions about such matters as land settlement, agricultural loans, &c, emanated from officers who a short time before were performing purely military duties.

Nevertheless civil servants gradually replaced military officers in the work of administration, army officers being liable to be suddenly removed for war or other service, often at times when the presence of officials possessed of local experience was most important. In efficiency and devotion to duty the Egyptian officials under the new regime also earned high praise.

The relations of the Sudan government with its Italian, Abyssinian and French neighbours was marked by cordiality, Bahr-ei- but with the Congo Free State difficulties arose over Ohszaiaad claims made by that state to the Bahr-el-Ghazal Lado. (see Africa, § 5). Congo State troops were in 1904

stationed in Sudanese territory. The difficulty was adjusted in 1906 when the Congo State abandoned all claims to the Ghazal province (whence its troops were withdrawn during 1907), and it was agreed to

transfer the Lado enclave (q.v.) to the Sudan six months after the death of the king of the Belgians. Under the terms of this agreement the Lado enclave was incorporated in the Sudan in 1910. As to the general state of the country Sir Eldon Gorst after a tour of inspection declared in his report for 1909, ” I do not suppose that there is any part of the world in which the mass of the population have fewer unsatisfied wants.”

Authorities. — Summaries of ancient and medieval history will be found in E A. Wallis Budge, The Egyptian Sudan (2 vols., 1907) and The Anglo-Egyptian Sudan (1095), edited by Count Gleichen. The story of the Egyptian conquest and events up to 1850 are summarized in H. Deherain’s he Soudan igyptien sous Mehemet Ali (Paris, 1898). For the middle period of Egyptian rule see Sir Samuel Baker’s Ismailia (1874) ; Col. Gordon in Central Africa, edited by G. Birkbeck Hill (4th ed., 1885), being extracts from Gordon’s diary, 1 874-1 880; Seven Years in the Soudan, by Romolo Gessi Pasha (1892); and Der Sudan unter dgyptischer Herrschaft, by R. Buchta (Leipzig, 1888). The rise of Mahdism and events down to 1900 are set forth in (Sir) F. R. Wingate’s Mahdiism and the Egyptian Sudan (1891). This book contains translations of letters and proclamations of the Mahdi and Khalifa. For this period the Journals of Major General Gordon at Khartoum (1885); F. Power’s Letters from Khartoum during the Siege (1885), and the following four books written by prisoners of the dervishes are specially valuable : Slatin Pasha, Fire and Sword in the Sudan (1896); Father J. Ohrwalder (from the MSS. of, by F. R. Wingate), Ten Years’ Captivity in the Mahdi’ s Camp {1882-1892) (1892); Father Paolo Rosignoli, / miei dodici anni di prigionia in mezzo ai dervice del Sudan (Mondovi, 1898); C. Neufeldt, A Prisoner of the Khaleefa (1899). See also G. Dujarric, L’lttat mahdiste du Soudan (Paris, 1901). For the ” Gordon Relief ” campaign, &c, see the British official History of the Sudan Campaign (1890); for the campaigns of 1896-98, H. S. L. Alford and W. D. Sword, The Egyptian Soudan, its Loss and Recovery (1898); G. W. Steevens, With Kitchener to Khartum (Edinburgh, 1898) ; Winston S. Churchill, The River War (revised ed., 1902). The story of the Fashoda incident is told mainly in British and French official despatches ; consult also for this period G. Hanotaux, Fachoda (Paris, 1910); A. Lebon, La Politique de la France 1896-1898 (Paris, 1901); and R. de Caix, Fachoda, la France et I’Angleterre (Paris, 1899). Lord Cromer’s Modern Egypt (1908) covers Sudanese history for the years 1881-1907. Consult also the authorities cited under Egy pt) : Modern History, and H . Pensa, L’Egypte et le Soudan egyptien (Paris, 1895). Unless otherwise stated the place of publication is London. (F. R. C.)

SUDATORIUM, the term in architecture for the vaulted sweating-room {sudor, sweat) of the Roman thermae, referred to in Vitruvius (v. 2), and there called the concamerata sudatio.

In order to obtain the great heat required, the whole wall was lined with vertical terra-cotta flue pipes of rectangular section, placed side by side, through which the hot air and the smoke from the suspensura passed to an exit in the roof.

SUDBURY, SIMON OF (d. 138 1), archbishop of Canterbury, was born at Sudbury in Suffolk, studied at the university of Paris, and became one of the chaplains of Pope Innocent VI., who sent him, in 1356, on a mission to Edward III. of England. In October 1361 the pope appointed him bishop of London, and he was soon serving the king as an ambassador and in other ways. In 1375 he succeeded William Wittlesey as archbishop of Canter- bury, and during the rest of his life was a partisan of John of Gaunt. In July 1377 he crowned Richard II., and in 1378 John Wycliffe appeared before him at Lambeth, but he only took proceedings against the reformer under great pressure. In January 1380 Sudbury became chancellor of England, and the revolting peasants regarded him as one of the principal authors of their woes. Having released John Ball from his prison at Maidstone, the Kentish insurgents attacked and damaged the archbishop's property at Canterbury and Lambeth; then, rushing into the Tower of London, they seized the archbishop himself. Sudbury was dragged to Tower Hill and, on the 14th of June 1381, was beheaded. His body was afterwards buried in Canterbury Cathedral. Sudbury rebuilt part of the church of St Gregory at Sudbury, and with his brother, John of Chertsey, he founded a college in this town; he also did some building at Canterbury. His father was Nigel Theobald, and he is some- times called Simon Theobald or Tybald.

See W. F. Hook, Lives of the Archbishops of Canterbury.

SUDBURY, a post town and outport of Nipissing district, Ontario, Canada, on the Canadian Pacific railway, 443 m. W. of Montreal. Pop. (1901), 2027. It has manufactures of explosives, lumber and planing mills, and is the largest nickel mining centre in the world. Gold, copper and other minerals are also raised. Practically all the ore is shipped to the United States.

SUDBURY, a market town and municipal borough of England, chiefly in the Sudbury parliamentary division of Suffolk, but partly in the Saffron Walden division of Essex. Pop. (1901), 7109. It lies on the river Stour (which is navigable up to the town), 59 m. N.E. from

London by the Great Eastern railway. All Saints' parish church, consisting of chancel, nave, aisles and tower, is chiefly Perpendicular — the chancel being Decorated. It possesses a fine oaken pulpit of 1490. The church was restored in 1882. St Peter's is Perpendicular, with a finely carved nave roof. St Gregory's, once collegiate, is Perpendicular. It has a rich spire-shaped font-cover of wood, gilt and painted. The grammar school was founded by William Wood in 1491. There are some old half-timbered houses, including one very fine example. The principal modern buildings are the town-hall, Victoria hall and St Leonard's hospital. Coco-nut matting is an important manufacture; silk manufactures were transferred from London during the 19th century, and horsehair weaving was established at the same time. There are also flour-mills, malt-kilns, lime- works, and brick and tile yards. The town is governed by a mayor, 4 aldermen and 12 councillors. The borough lies wholly in the administrative county of West Suffolk. Area, 1925 acres.

The ancient Saxon borough of Sudbury (Sudbyrig, Sudberi, Suthberia) was the centre of the southern portion of the East Anglian kingdom. Before the Conquest it was a borough owned by the mother of Earl Morcar, from whom it was taken by William I., who held it in 1086. It was alienated from the Crown to an ancestor of Gilbert de Clare, 9th earl of Gloucester. In 1 27 1 the earl gave the burgesses their first charter confirming to them all their ancient liberties and customs. The earl of March granted a charter to the mayor and bailiffs of Sudbury in 1397. In 1440 and again in 1445 the men and tenants of Sudbury obtained a royal confirmation of their privileges. They were incorporated in 1553 under the name of the mayor, aldermen and burgesses of Sudbury, and charters were granted to the town by Elizabeth, Charles II. and James II. Its constitution was re- formed by the act of 1835. It was represented in parliament 1 by two burgesses from 1558 till its disfranchisement in

1844.. The lord of the borough had a market and fair in the 13th century, .and three fairs in March, July and December were held in 1792. Markets still exist on Thursdays and Saturdays. Weavers were introduced by Edward III., and the town became the chief centre of the Suffolk cloth industry after the Restoration.

SUDD, or Sadd (an Arabic word meaning "to dam"), the name given to the vegetable obstruction which has at various dates closed the waters

of the Upper Nile to navigation. It is composed of masses of papyrus and um suf (Vossia procera) and the earth adhering to the roots of those reeds. Mingled with the papyrus and um suf (Arabic for " mother-of-wool") are small swimming plants and the light brittle ambach. The papyrus and um suf grow abundantly along the Nile banks and the con- nected lagoons between 7 N. and 13 N. Loosened by storms these reeds drift until they lodge on some obstruction and form a dam across the channel, converted by fresh arrivals into blocks that are sometimes 25 m. in length, and extend 15 to 20 ft. below the surface. These masses of decayed vegetation and earth, resembling peat in consistency, are so much compressed by the force of the current that men can walk over them every- where. In parts elephants could cross them without danger. The pressure of the water at length causes the formation of a side channel or the bursting of the sudd. (For sudd cutting see Nile.)

In the Bahr-el-Ghazal the sudd, being chiefly composed of small swimming plants, is of less formidable nature than that of the main stream.

Consult, O. Deuerling, Die Pflanzenbarren der afrikanischen Fliisse (Munich, 1909), a valuable monograph; and the bibliography under Nile, especially Captain H. G. Lyons, The Physiography of the Nile and its Basin (Cairo, 1906).

SUDERMANN, HERMANN (1857-), German dramatist and novelist, was born on the 30th of September 1857 at Matzi- ken in East Prussia, close to the Russian frontier, of a Mennonite family long settled near Elbing. His father owned a small brewery in the village of Heydekrug, and Sudermann received his early education at the Realschule in Elbing, but, his parents having been reduced in circumstances, he was apprenticed to a chemist at the age of fourteen. He was, however, enabled to enter the Realgymnasium in Tilsit, and to study philosophy and history at Konigsberg University. In order to complete his studies Sudermann went to Berlin, where he was tutor in several families. He next became a journalist, was from 1881-1882 editor of the Deutsches Reichsblatt, and then devoted himself to novel-writing. The novels and romances Im Zwielickt (1886), Frau Sorge (1887), Geschwister (1888) and Der Katzensteg (1890) failed to bring the young author as much recognition as his first drama Die Ehre (1889), which inaugurated a new period in the history of the German stage. Of his other dramas the most successful were Sodoms Ende (1891), Heimat (1893), Die Schmetter- lingsschlacht (1894), Das Gliick im Winkel (1895), Morituri (1896), Johannes (1898), Die drei Reiherfedern (1899), Johannesfeuer (1900), Es lebe das Leben ! (1902), Der

Sturmgeselle Sokrates (1903) and Stein unter Steinen (1905). Sudermann is also the author of a powerful social novel, Es war (1904), which, like Frau Sorge and Der Katzensteg, has been translated into English.

See W. Kawerau, Hermann Sudermann (1897); H. Landsberg, Hermann Sudermann (1902); H. Jung, Hermann Sudermann (1902); H. Schoen, Hermann Sudermann, po'ete dramatique et romancier (1905); and I. Axelrod, Hermann Sudermann (1907).

SUE, EUGENE [Joseph Marte] (1804-1857), French novelist, was born in Paris on the 20th of January 1804. He was the son of a distinguished surgeon in Napoleon's army, and is said to have had the empress Josephine for godmother. Sue himself acted as surgeon both in the Spanish campaign undertaken by France in 1823 and at the battle of Navarino (1828). In 1829 his father's death put him in possession of a considerable fortune, and he settled in Paris. His naval experiences supplied much of the materials of his first novels, Kernock le pirate (1830), Atar-Gull (1831), La Salamandre (2 vols., 1832), La Coucaratcha (4 vols., 1 83 2-1 834), and others, which were composed at the height of the romantic movement of 1830. In the quasi-historical style he wrote Jean Cavalier, ouLes Fanatiquesdes Cevennes (4 vols., 1840) and Latrtaumont (2 vols., 1837). He was strongly affected by the

Socialist ideas of the day, and these prompted his most famous works: Les Mysteres de Paris (10 vols., 1842-1843) and Le Juif errant (10 vols., 1844-1845), which were among the most popular specimens of the roman-feuilleton. He followed these up with some singular and not very edifying books: Les Sept pechis capitaux (16 vols., 1847-1849), which contained stories to illustrate each sin, Les Mystbres du peuple (1849-1856), which was suppressed by the censor in 1857, and several others, all on a very large scale, though the number of volumes gives an exaggerated idea of their length. Some of his books, among them the Juif errant and the Mysteres de Paris, were dramatized by himself, usually in collab- oration with others. His period of greatest success and popu- larity coincided with that of Alexandre Dumas, with whom some writers have put him on an equality. Sue has neither Dumas's wide range of subject, nor, above all, his faculty of conducting the story by means of lively dialogue; he has, however, a com- mand of terror which Dumas seldom or never attained. From the literary point of view his style is bad, and his construction prolix. After the revolution of 1848 he sat for Paris (the Seine) in the Assembly from April 1850, and was exiled in consequence of his protest against the coup d'itat of the 2nd of December 1851. This exile

stimulated his literary production, but the works of his last days are on the whole much inferior to those of his middle period. Sue died at Annecy (Savoy) on the 3rd of August 1857.

SUEBI, or Suevi, a collective term applied to a number of peoples in central Germany, the chief of whom appear to have been the Marcomanni, Quadi, Hermunduri, Semnones and Langobardi. From the earliest times these tribes inhabited the basin of the Elbe. The Langobardic territories seem to have lain about the lower reaches of the river, while the Semnones lay south. The Marcomanni occupied the basin of the Saale, but under their king, Maroboduus, they moved into Bohemia during the early part of Augustus's reign, while the Quadi, who are first mentioned in the time of Tiberius, lay farther east towards the sources of the Elbe. The former home of the Marcomanni was occupied by the Hermunduri a few years before the Christian era. Some kind of political union seems to have existed among all these tribes. The Semnones and Langobardi were at one time subject to the dominion of the Marcomannic king Marobo- duus, and at a much later period we hear of Langobardic troops taking part against the Romans in the Marcomannic War. The Semnones claimed to be the chief of the Suebic peoples, and Tacitus describes a great religious festival held in their tribal sanctuary, at which legations were present from all the other tribes.

Tacitus uses the name Suebi in a far wider sense than that denned above. With him it includes not only the tribes of the basin of the Elbe, but also all the tribes north and east of that river, including even the Swedes (Suiones). This usage, which is not found in other ancient writers, is probably due to a confusion of the Suebi with the agglomeration of peoples under their supremacy, which as we know from Strabo extended to some at least of the eastern tribes.

In early Latin writers the term Suebi is occasionally applied to any of the above tribes. From the 2nd to the 4th century, however, it is seldom used except with reference to events in the neighbourhood of the Pannonian frontier, and here probably means the Quadi. From the middle of the 4th century onward it appears most frequently in the regions south of the Main, and soon the names Alamanni and Suabi are used synonymously. The Alamanni (q.v.) seem to have been, in part at least, the descendants of the ancient Hermunduri, but it is likely that they had been joined by one or more other Suebic peoples, from the Danubian region, or more probably from the middle Elbe, the land of the ancient Semnones. It is probably from the Alamannic region that those Suebi came who joined the Vandals in their invasion of Gaul, and eventually founded a kingdom in north-west Spain. After

the 1st century the term Suebi seems never to be applied to the Langobardi and seldom to the Baiouarii (Bavarians), the descendants of the ancient Marcomanni. But besides the Alamannic Suebi we hear

also of a people called Suebi, who shortly after the middle of the 6th century settled north of the Unstrut. There is evidence also for a people called Suebi in the district above the mouth of the Scheldt. It is likely that both these settle- ments were colonies from the Suebi of whom we hear in the Anglo-Saxon poem Widsith as neighbours of the Angli, and whose name may possibly be preserved in Schwabstedt on the Treene. The question has recently been raised whether these Suebi should be identified with the people whom the Romans called Heruli. After the 7th century the name Suebi is practically only applied to the Alamannic Suebi (Schwaben), with whom it remains a territorial designation in Wurttemberg and Bavaria until the present day.

See Caesa% De hello gallico, i. 37, 51 sqq., iv. I sqq., vi. 9 sqq. ; Strabo, p. 290 seq. ; Tacitus, Germania, 38 sqq. ; K. Zeuss, Die Deutschen und die Nachbarstamme, pp. 55 sqq., 315 sqq.; C. Bremer in Paul's Grundriss (2nd ed.), iii. 915-950; H.M.Chadwick, Originof the English Nation, 216 sqq. (Cambridge, 1907). (F. G. M. B.)

SUECA, a town of eastern Spain, in the province of Valencia, near the left bank of the river Jucar, and on the Silla-Cullera railway. Pop. (1900), 14,435. Sueca is separated from the Mediterranean Sea (7 m. east) by the Sierra de Cullera. It is a modern town, although many of the houses have the flat roofs, view-turrets (miradores) and horseshoe arches characteristic of Moorish architecture. There are a few handsome public buildings, such as the hospital, town-hall and theatre. Sueca has a thriving trade in grain and fruit from the Jucar valley, which is irrigated by waterways created by the Moors.

SUESS, EDUARD (1831-), Austrian geologist, was born in London on the 20th of August 1831, his father, a native of Saxony, having settled there as a German merchant. Three years later the family removed to Prague, and in 1845 to Vienna. Eduard Suess was educated for commercial life, but early dis- played a bent for geology. At the age of nineteen he published a short sketch of the geology of Carlsbad and its mineral waters; and in 1852 he was appointed an assistant in the Imperial museum of Vienna. There he studied the fossil Brachiopoda, and manifested such ability that in 1857 he was appointed professor

of geology at the university. In 1862 he relinquished his museum duties, and gave his whole time to special research and teaching, retaining his professorship until 1901. Questions of ancient physical geography, such as the former connexion between northern Africa and Europe, occupied his attention; and in 1862 he published an essay on the soils and water-supply of Vienna. He was elected a member of the town council, and in 1869 to a seat in the Diet of Lower Austria, which he retained until 1896. Meanwhile he continued his geological and palaeontological work dealing with the Tertiary strata of the Vienna Basin, also turning his attention to the problems connected with the evolu- tion of the earth's surface-features, on which he wrote a monu- mental treatise. This, the great task of his life, embodied the results of personal research and of a comprehensive study of the work of the leading geologists of all countries; it is entitled Antlitz der Erde, of which the first volume was published in 1885, the second in 1888, and pt. i. of the third volume in 1901. The work has been translated into French, and (in part) into English. Suess was elected a corresponding member of the Institute of France in 1889, and a foreign member of the Royal Society in 1894. In 1896 the Geological Society of London awarded to him the Wollaston medal.

Memoir (with portrait), by Sir A. Geikie, Nature (May 4, 1905).

SUESSULA, an ancient town of Campania, Italy, in the plain 15 m. W. of the modern Cancello, 9 m. S.E. of the ancient Capua. Its earlier history is obscure. In 338 B.C. it obtained Latin rights from Rome. In the Samnite and Hannibalic wars it was strategically important as commanding the entrance to the Caudine pass. Sulla seems to have founded a colony here. It is frequently named as an episcopal see up till the 10th century A.D., and was for a time the chief town of a small Lombard principality. It was several times plundered by the Saracens, and at last abandoned by the inhabitants in consequence of the malaria. The ruins of the town lie within the Bosco d'Acerra, a picturesque forest. They were more conspicuous in the 18th century than

they now are, but traces of the theatre may still be seen, and debris of other buildings. Oscan tombs were excavated there between 1878 and 1886, and important finds of vases, bronzes, &c, have been made. The dead were generally buried within slabs of tufa arranged to form a kind of sarcophagus (see F. von Duhn in Romische Mitteilungen, 1887, p. 235 sqq.). Suessula lay on the line of the Via Popillia, which was here intersected by a road which ran from Neapolis through Acerrae, and on to the Via Appia, which it reached just west of the Caudine pass. On the hills above Cancello to the east of Suessula was situated

the fortified camp of M. Claudius Marcellus, which covered Nola and served as a post of observation against Hannibal in Capua. (T. As.)

SUET (M. Eng. sewet, a diminutive of O. Fr. seu, suis, mod. suif, lard, from Lat. sebum, or sevum, tallow, grease, probably allied to sapo, soap), the hard flaked white fat lying round the kidneys of the sheep or ox; that of the pig forms lard. Beef- suet is especially used in cookery.

SUETONIUS TRANQUILLUS, GAIUS, Roman historian, lived during the end of the 1st and the first half of the 2nd century a.d. He was the contemporary of Tacitus and the younger Pliny, and his literary work seems to have been chiefly done in the reigns of Trajan and Hadrian (a.d. 98-ˆ38). His father was military tribune in the XHIth legion, and he himself began life as a teacher of rhetoric and an advocate. To us he is known as the biographer of the twelve Caesars (including Julius) down to Domitian. The lives are valuable as covering a good deal of ground where we are without the guidance of Tacitus. As Suetonius was the emperor Hadrian's private secretary (magister epistolarum), he must have had access to many important documents in the Imperial archives, e.g. the decrees and transactions of the senate. In addition to written and official documents, he picked up in society a mass of information and anecdotes, which, though of doubtful authenticity, need not be regarded as mere inventions of his own. They give a very good idea of the kind of court gossip prevalent in Rome at the time. He was a friend and cor- respondent of the younger Pliny, who when appointed governor of Bithynia took Suetonius with him. Pliny also recommended him to the favourable notice of the emperor Trajan, " as a most upright, honourable, and learned man, whom persons often remember in their wills because of his merits," and he begs that he may be made legally capable of inheriting these bequests, for which under a special enactment Suetonius was, as a childless married man, disqualified. Hadrian's biographer, Aelius Spartianus, tells us that Suetonius was deprived of his private secretaryship because he had not been sufficiently observant of court etiquette towards the emperor's wife during Hadrian's absence in Britain.

The Lives of the Caesars has always been a popular work. It is rather a chronicle than a history. It gives no picture of the society of the time, no hints as to the general character and tenden- cies of the period. It is the emperor who is always before us, and yet the portrait is drawn without any real historical judgment or insight. It is the personal anecdotes, several of which are very amusing, that give the lives their chief interest; but the author panders rather too much to a taste for scandal and gossip. None the less he throws considerable light on an

important period, and next to Tacitus and Dio Cassius is the chief (sometimes the only) authority. The language is clear and simple. The work was continued by Marius Maximus (3rd century), who wrote a history of the emperors from Nerva to Elagabalus (now lost). Suetonius was a voluminous writer. Of his De viris illustrious, the lives of Terence and Horace, fragments of those of Lucan and the elder Pliny and the greater part of the chapter on grammarians and rhetoricians, are extant. Other works by him (now lost) were: Praia (= Aci/iffices ■ = patch- work), in ten books, a kind of encyclopaedia ; the Roman Year, Roman Institutions and Customs, Children's Games among the Greeks, Roman Public Spectacles, On the Kings, On Cicero's Republic.

Editio princeps, 1470; editions by great scholars: Erasmus, Isaac Casaubon, J. G. Graevius, P. Burmann; the best complete annotated edition is still that of C. G. Baumgarten-Crusius (1816); recent editions by H. T. Peck (New York, 1889); Leo Preud'homme (1906); M. Ihm (1907). Editions of separate lives: Augustus, by E. S. Shuckburgh (with useful introduction, 1896); Claudius, by H. Smilda (1896), with notes and parallel passages from other authorities. The best editions of the text are by C. L. Roth (1886), and A. Reiffer- scheid (not including the Lives, i860). On the De viris illustribus, see

G. Kortge in Dissert, philolog. halenses (1900), vol. xtv. ; and, above all, A. Mace, Essai sur Suilone (1900), with an exhaustive bibliography. There are English translations by Philemon Holland (reprinted in the Tudor Translations, 1900), and by Thomson and Forester (in Bohn's Classical Library).

SUEZ, a port of Egypt on the Red Sea and southern terminus of the Suez Canal (q.v.), situated at the head of the Gulf of Suez in 29°s8'37'N.,32°3i'i8"'E. It is 80 m. E. by S". of Cairo in a direct line but 148 m. by rail, and is built on the north-west point of the gulf. Pop. (1907), 18,347. From the heights to the north, where there is a khedival chalet, there is a superb view to the south with the Jebel Ataka on the right, Mt Sinai on the left and the waters of the gulf between. Suez is supplied with water by the fresh-water canal, which starts from the Nile at Cairo and is terminated at Suez by a lock which, north of the town, joins it to the gulf. Before the opening of this canal in 1863 water had to be brought from " the Wells of Moses," a small oasis 3 m. distant on the east side of the gulf. About 2

m. south of the town are the harbours and quays constructed on the western side of the Suez Canal at the point where the canal enters the gulf. The harbours are connected with the town by an embankment and railway built across a shallow, dry at low water save for a narrow channel. On one of the quays is a statue to Thomas Waghorn, the organizer of the ” overland route ” to India. The ground on which the port is built has all been reclaimed from the sea. The accommodation provided includes a dry dock 410 ft. long, 100 ft. broad and nearly 36 ft. deep. There are separate basins for warships and merchant ships, and in the roadstead at the mouth of the canal is ample room for shipping. Suez is a quarantine station for pilgrims from Mecca; otherwise its importance is due almost entirely to the ships using the canal.

In the 7th century a town called Kolzum stood, on a site adjacent to that of Suez, at the southern end of the canal which then joined the Red Sea to the Nile. Kolzum retained some of the trade of Egypt with Arabia and countries farther east long after the canal was closed, but by the 13th century it was in ruins and Suez itself, which had supplanted it, was also, according to an Arab historian, in decay. On the Ottoman conquest of Egypt in the 16th century Suez became a naval as well as a trad- ing station, and here fleets were equipped which for a time dis- puted the mastery of the Indian Ocean with the Portuguese. According to Niebuhr, in the 18th century a fleet of nearly twenty vessels sailed yearly from Suez to Jidda, the port of Mecca and the place of correspondence with India. When the French occupied Suez in 1 798 it was a place of little importance, and the conflicts which followed its occupation in 1800 by an English fleet laid the greater part in ruins. The overland mail route from England to India by way of Suez was opened in 1 83 7 . The regular Peninsular & Oriental steamer service began a few years later, and in 1857 a railway was opened from Cairo through the desert. This line is now abandoned in favour of the railway which follows the canal from Suez to Ismailia, and then ascends the Wadi Tumilat to Zagazig, whence branches diverge to Cairo and Alexandria.

SUEZ CANAL. Before the construction of the Suez Canal there was no direct water communication between the Mediter- ranean and the Red Sea, but at various eras such communication existed by way of the Nile. Trade between Egypt and countries to the east was originally overland to ports south of the Gulf of Suez; the proximity of the roadstead at the head of that gulf to Memphis and the Delta nevertheless marked it as the natural outlet for the Red Sea commerce of Lower Egypt. The fertile Wadi Tumilat extending east of the Nile valley almost to the head of the gulf (which in ancient times reached

north to the Bitter Lakes) afforded an easy road between the Nile and the Red Sea, while the digging of a navigable canal connecting the river and the gulf gave the northern route advantages not possessed by the desert routes farther south, e.g. that between Coptos and Kosseir. Aristotle, Strabo and Pliny attribute to the legendary Sesostris (q.v.) the distinction of being the first of the pharaohs to build a canal joining the Nile and the Red Sea. From an inscription on the temple at Karnak it would appear

that such a canal existed in the time of Seti I. (1380 B.C.). This canal diverged from the Nile near Bubastis and was carried along the Wadi Tumilat to Heroopolis, near Pithom, a port at the head of the Heroopolite Gulf (the Bitter Lakes of to-day) . The channel of this canal is still traceable in parts of the Wadi Tumilat, and its direction was frequently followed by the engineers of the fresh- water canal. Seti's canal appears to have fallen into decay or to have been too small for later requirements, for Pharaoh Necho (609 B.C.) began to build another canal; possibly his chief object was to deepen the channel between the Heroopolite Gulf and the Red Sea, then probably silting up. Necho's canal was not completed — according to Herodotus 120,000 men perished in the undertaking. Darius (520 B.C.) continued the work of Necho, rendering navigable the channel of the Heroopolite Gulf, which had become blocked. Up to this time there appears to have been no connexion between the waters of the Red Sea and those of the Bubastis-Heroopolis canal ; vessels coming from the Mediterranean ascended the Pelusiac arm of the Nile to Bubastis and then sailed along the canal to Heroopolis, where their merchandise had to be transferred to the Red Sea ships. Ptolemy Philadelphus (285 B.C.) connected the canal with the waters of the sea, and at the spot where the junction was effected he built the town of Arsinoe. The dwindling of the Pelusiac branch of the Nile rendered this means of communication impossible by the time of Cleopatra (31 B.C.). Trajan (a.d. 98) is said to have repaired the canal, and, as the Pelusiac branch was no longer available for navigation, to have built a new canal between Bubastis and Babylon (Old Cairo), this new canal being known traditionally as Amnis Trajanus or Amnis Augustus. According to H. R. Hall, however, " It is very doubtful if any work of this kind, beyond repairs, was undertaken in the times of the Romans; and it is more probable that the new canal was the work of 'Amr " (the Arab conqueror of Egypt in the 7th century). The canal was certainly in use in the early years of the Moslem rule in Egypt; it is said to have been closed c. a.d. 770 by order of Abu Ja'far (Mansur), the second Abbasid caliph and founder of Bagdad, who wished to prevent supplies from reaching his enemies in Arabia by this means. 'Amr's canal (of which

the Khalig which passed through Cairo and was closed in 1897 is said to have formed part) had its ter- minus on the Red Sea south of the Heroopolite Gulf near the present town of Suez. In this neighbourhood was the ancient city of Clysma, to which in ‘Amr’s time succeeded Kolzum, perhaps an Arabic corruption of Clysma. The exact situation of Clysma is unknown, but Kolzum occupied the site of Suez, the hills north of which are still called Kolzum. After the closing of the canal in the 8th century it does not appear for certain that it was ever restored, although it is asserted that in the year 1000 Sultan Hakim rendered it navigable. If so it must speedily have become choked up again. Parts of the canal continued to be filled during the Nile inundations until Mehemet Ali (a.d. 181 i) ordered it to be closed ; the closing, however, was not completely effected, for in 1861 the eld canal from Bubastis still flowed as far as Kassassin. This part of the canal, after over 2500 years of service, was utilized by the French engineers in building the fresh-water canal from Cairo to Suez in 1861-1863. This canal follows the lines of that of ‘Amr (or Trajan).

Maritime Canal Projects. — Apart from water communication between the Mediterranean and the Red Sea by way of the Nile, the project of direct communication by a canal piercing the isthmus of Suez was entertained as early as the 8th century a.d. by H&run al-Rashid, who is said to have abandoned the scheme, being persuaded that it would be dangerous to lay open the coast of Arabia to the Byzantine navy. After the discovery of the Cape route to India at the close of the 15th century, the Venetians, who had for centuries held the greater part of the trade of the East with Europe via Egypt and the Red Sea, began negotiations with the Egyptians for a canal across the isthmus, but the con- quest of Egypt by the Turks put an end to these designs. In 1671 Leibnitz in his proposals to LouisXIV. of France regarding an expedition to Egypt recommended the making of a maritime canal, and the Sheikh al-Balad Ali Bey (c. 1770) wished to carry out the project. Bonaparte when in Egypt in 1798 ordered the

isthmus to be surveyed as a preliminary to the digging of a canal across it, and the engineer he employed, J. M. Lepere, came to the conclusion that there was a difference in level of 29 ft. between the Red Sea and the Mediterranean. This view was combated at the time by Laplace and Fourier on general grounds, and was finally disproved in 1 846-1 847 as the result of surveys made at the instance of the SocietS d’Etudes pour le Canal de Suez. This society was organized in

1846 by Prosper Enfantin, the Saint Simonist, who thirteen years before had visited Egypt in con- nexion with a scheme for making a canal across the isthmus of Suez, which, like the canal across the isthmus of Panama, was part of the Saint Simonist programme for the regeneration of the world. The expert commission appointed by this society reported by a majority in favour of Paulin Talabot's plan, according to which the canal would have run from Suez to Alexandria by way of Cairo.

injure British maritime supremacy, and that the proposal was merely a device for French interference in the East.

Although the sultan's confirmation of the concession was not actually granted till 1866, de Lesseps in 1858 opened the sub- scription lists for his company, the capital of which was 200 million francs in 400,000 shares of 500 francs each. In less than a month 314,494 shares were applied for; of these over 200,000 were subscribed in France and over 96,000 were taken by the Ottoman Empire. From other countries the subscriptions were trifling, and England, Austria and Russia, as well as the United States of America, held entirely aloof. The residue of 85,506 shares 1 was taken over by the viceroy. On the 25th of April 1859 the work of construction was formally begun, the first spadeful of sand being turned near the site of Port Said, but progress was not very rapid. By the beginning of 1862 the fresh- water canal had reached Lake Timsa, and towards the end of the

(Topography only from L'Isthme et le Canal de Suez, by G. Charles-Roux, by permission of Messrs Hachette & Co.)

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For some years after this report no progress was made; indeed, the society was in a state of suspended animation when in 1854 Ferdinand de Lesseps came to the front as the chief exponent of the idea. He had been associated with the Saint Simonists and for many years had been keenly interested in the question. His opportunity came in 1854 when, on the death of Abbas Pasha, his friend Said Pasha became viceroy of Egypt. From Said on the 30th of November 1854 he obtained a concession authorizing' him to constitute the Compagnie Universelle du Canal Maritime de Suez, which should construct a ship canal through the isthmus, and soon afterwards in concert with two French engineers, Linant Bey and Mougel Bey, he decided that the canal should run in a direct line from Suez to the Gulf of Pelusium, passing through the depressions that are now Lake Timsa and the Bitter Lakes, and skirting the eastern edge of Lake Menzala. In the following year

an international commission appointed by the viceroy approved this plan with slight modifications, the chief being that the channel was taken through Lake Menzala instead of along its edge, and the northern termination of the canal moved some 175 m. westward where deep water was found closer to the shore. This plan, according to which there were to be no locks, was the one ultimately carried out, and it was embodied in a second and amplified concession, dated the 5th of January 1856, which laid on the company the obligation of constructing, in addition to the mrritime canal, a fresh water canal from the Nile near Cairo to Lake TimSa, with branches running parallel to the maritime canal, one to Suez and the other to Pelusium. The concession was to last for 09 years from the date of the open ing of the canal between the Red Sea and the Mediterranean, after which, in default of other arrangements, the canal passes into the hands of the Egyptian government. The confirmation of the sultan of Turkey being required, de Lesseps went to Con- stantinople to secure it, but found himself baffled by British diplomacy; and later in London he was informed by LoTd Palmerston that in the opinion of the British government the <;anal was a physical impossibility, that if it were made it would

same year a narrow channel had been formed between that lake and the Mediterranean. In 1863 the fresh- water canal was continued to Suez.

So far the work had been performed by native labour; the concession of 1856 contained a provision that at least four-fifths of the labourers should be Egyptians, and later in the same year Said Pasha undertook to supply labourers as required by the engineers of the canal company, which was to house and feed them and pay them at stipulated rates. Although the wages and the terms of service were better than the men obtained normally, this system of forced labour was strongly disapproved of in England, and the khedive Ismail who succeeded Said on the latter's death in 1863 also considered it as being contrary to the interests of his country. Hence in July the Egyptian foreign minister, Nubar Pasha, was sent to Constantinople with the pro- posal that the number of labourers furnished to the company should be reduced, and that it should be made to hand back to the Egyptian government the lands that had been granted it by Said in 1856. These propositions were approved by the sultan, and the company was informed that if they were not accepted the works would be stopped by force. Naturally the company objected, and in the end the various matters in dispute were referred to the arbitration of the emperor Napoleon III. By his award, made in July 1864, the company was allowed 38 million francs as an indemnity for the abolition of the

corvie, 16 million francs in respect of its retrocessions of that portion of the fresh- water canal that lay between Wadi, Lake Timsa and Suez (the remainder had already been handed back by agreement), and 30 million francs in respect of the lands which had been granted it by Said. The company was allowed to retain a certain amount of land along the canals, which was necessary for purposes of con- struction, erection of workshops, &c, and it was put under the obligation of finishing the fresh-water canal between Wadi and

‘These formed part of the 176,602 shares which were bought for the sum of £3,976,582 from the khedive by England in 1875 at the instance of Lord Beaconsfield (q.v.).

Suez to such dimensions that the depth of water in it would be 2 1 metres at high Nile and at least i metre at low Nile. The supply of Port Said with water it was allowed to manage by any means it chose; in the first instance it laid a double line of iron piping from Timsa, and it was not till 1885 that the original plan of supplying the town by a branch of the fresh-water canal was carried out. The indemnity, amounting to a total of 84 million francs, was to be paid in instalments spread over 1 5 years.

The abolition of forced labour was probably the salvation of the enterprise, for it meant the introduction of mechanical appli- ances and of modern engineering methods. The work was divided into four contracts. The first was for the supply of 250,000 cubic metres of concrete blocks for the jetties of Port Said; the second, for the first 60 kilometres of the channel from Port Said, involved the removal of 22 million cubic metres of sand or mud; the third was for the next length of 13 kilometres, which included the cutting through the high ground at EI Gisr; and the fourth and largest was for the portion between Lake Timsa and the Red Sea. The contractors for this last section were Paul Borel and Alex- andre Levalley, who ultimately became responsible also for the second or 60 kilometres contract. For the most part the material was soft and therefore readily removed. At some points, how- ever, as at Shaluf and Serapeum, rock was encountered. Much of the channel was formed by means of dredgers. Through Lake Menzala, for instance, native workmen made a shallow channel by scooping out the soil with their hands and throwing it out on each side to form the banks; dredgers were then floated in and completed the excavation to the required depth, the soil being delivered on the other side of the

banks through long spouts. At Serapeum, a preliminary shallow channel having been dug out, water was admitted from the fresh-water canal, the level of which is higher than that of the ship canal, and the work was completed by dredgers from a level of about 20 ft. above the sea. At El Gisr, where the soil, composed largely of loose sand, rises 60 ft. above the sea, the contractor, Alphonse Couvreux, employed an excavator of his own design, which was practically a bucket- dredger working in the dry. A long arm projecting downwards at an angle from an engine on the bank carried a number of buckets, mounted on a continuous chain, which, scooped up the stuff at the bottom and discharged it into wagons at the top.

In 1865 de Lesseps, to show the progress that had been made, entertained over 100 delegates from chambers of commerce in different parts of the world, and conducted them over the works. In the following year the company, being in need of money, realized 10 million francs by selling to the Egyptian government the estate of El Wadi, which it had purchased from Said, and it also succeeded in arranging that the money due to it under the award of 1864 should be paid off by 1869 instead of 1879. Its financial resources still being insufficient, it obtained in 1867 permission to invite a loan of 100 million francs; but though the issue was offered at a heavy discount it was only fully taken up after the attractions of a lottery scheme had been added to it. Two years later the company got 30 million francs from the Egyptian government in consideration of abandoning certain special rights and privileges that still belonged to it and of hand- ing over various hospitals, workshops, buildings, &c, which it had established on the isthmus. The government liquidated this debt, not by a money payment, but by agreeing to forego for 25 years the interest on the 176,602 shares it held in the company, which was thus enabled to raise a loan to the amount of the debt. Altogether, up to the end of the year (1869) in which the canal was sufficiently advanced to be opened for traffic, the accounts of the company showed a total expenditure of 432,807,882 francs, though the International Technical Commission in 1856 had estimated the cost at only 200 millions for a canal of larger dimensions.

The formal opening of the canal was celebrated in November 1869. On the 16th there was an inaugural ceremony at Port Said, and next day 68 vessels of various nationalities, headed by the ” Aigle ” with the empress Eugenie on board, began the

passage, reaching Ismailia (Lake Timsa) the same day. On the 19th they continued their journey to the Bitter Lakes, and on the 20th they arrived at Suez. Immediately afterwards regular traffic began. In 1870

the canal was used by nearly 500 vessels, but the receipts for the first two years of working were considerably less than the expenses. The company attempted to issue a loan of 20 million francs in 1871, but the response was small, and it was only saved from bankruptcy by a rapid increase in its revenues.

The total length of the navigation from Port Said to Suez is 100 m. The canal was originally constructed to have a depth of 8 metres with a bottom width of 22 metres, but it soon became evident that its dimensions must be enlarged. Certain improvements in the channel were started in 1876, but a more extensive plan was adopted in 1885 as the result of the inquiries of an international commission which recommended that the depth should be increased first to 8| metres and finally to 9 metres, and that the width should be made on the straight parts a minimum of 65 metres between Port Said and the Bitter Lakes, and of 75 metres between the Bitter Lakes and Suez, increasing on curves to 80 metres. To pay for these works a loan of 100 million francs was issued. These widenings greatly improved the facilities for ships travelling in opposite directions to pass each other. In the early days of the canal, except in the Bitter Lakes, vessels could pass each other only at a few crossing places or gares, which had a collective length of less than a mile; but owing to the widenings that have been carried out, passing is now possible at any point over the greater part of the canal, one vessel stopping while the other proceeds on her way. From March 1887 navigation by night was permitted to ships which were provided with electric search-lights, and now the great majority avail themselves of this facility. By these measures the average time of transit, which was about 36 hours in 1886, has been reduced by half. The maximum speed permitted in the canal itself is 10 kilometres an hour.

The dues which the canal company was authorized to charge by its concession of 1856 were 10 francs a ton. In the first instance they were levied on the tonnage as shown by the papers on board each vessel, but from March 1872 they were charged on the gross register tonnage, computed according to the method of the British Merchant Shipping Act 1854. The result was that the shipowners had to pay more, and, objections being raised, the whole question 0/ the method of charge was submitted to an international conference which met at Con- stantinople in 1873. It fixed the dues at 10 francs per net register ton (English reckoning) with a surtax of 4 francs per ton, which, however, was to be reduced to 3 francs in the case of ships having on board papers showing their net tonnage calculated in the required manner. It also decided that the surtax should be gradually diminished as the traffic increased, until in the year after the net tonnage passing

through the canal reached 2,600,000 tons it should be abolished. De Lesseps protested against this arrangement, but on the sultan threatening to enforce it, if necessary by armed intervention, he gave in and brought the new tariff into operation in April 1874. By an arrangement with the canal company, signed in 1876, the British government, which in 1875 by the purchase of the khedive's shares, had become a large shareholder, undertook negotiations to secure that the successive reductions of the tariff should take effect on fixed dates, the sixth and last instalment of 50 centimes being removed in January 1884, after which the maximum rate was to be 10 francs per official net ton. But before this happened British shipowners had started a vigorous agitation against the rates, which they alleged to be excessive, and had even threatened to construct a second canal. In consequence a meeting was arranged between them and representatives of the canal company in London in November 1883, and it was agreed that in January 1885 the dues should be reduced to 9 J francs a ton, that subsequently they should be lowered on a sliding scale as the dividend increased, and that after the dividend reached 25% all the surplus profits should be applied in reducing the rates until they were lowered to 5 francs a ton. Under this arrangement they were fixed at 7I francs

per ton at the beginning of 1906. For ships in ballast reduced rates are in force. For passengers the dues remain at 10 francs a head, the figure at which they were originally fixed.

By the concessions of 1854 and 1856 the dues were to be the same for all nations, preferential treatment of any kind being forbidden, and the canal and its ports were to be open " comme passages neutres " to every merchant ship without distinction of nationality. The question of its formal neutralization by international agreement was raised in an acute form during the Egyptian crisis of 1881-82, and in August of the latter year a few weeks before the battle of Tel-el-Kebir, navigation upon it was suspended for four days at the instance of Sir Garnet Wolseley, who was in command of the British forces. At the international conference which was then sitting at Constanti- nople various proposals were put forward to ensure the use of the canal to all nations, and ultimately at Constantinople on the 29th of October 1888 Great Britain, Germany, Austria, Spain, France, Italy, the Netherlands, Russia and Turkey signed the Suez Canal Convention, the purpose of which was to ensure that the canal should " always be free and open, in time of war as in time of peace, to every vessel of commerce or of war, without distinction of flag. " Great Britain,

however, in signing, formulated a reservation that the provisions of the convention should only apply so far as they were compatible with the actual situation, namely the ” present transitory and excep- tional condition of Egypt, ” and so far as they would not fetter the liberty of action of the British government during its occupa- tion of that country. But by the Anglo-French agreement of the 8th of April 1904 Great Britain declared her adherence to the stipulations of the convention, and agreed to their being put in force, except as regards a provision by which the agents in Egypt of the signatory Powers of the convention were to meet once a year to take note of the due execution of the treaty. It was by virtue of this new agreement that the Russian war- ships proceeding to the East in 1904-1905 were enabled to use the canal, although passage was prohibited to Spanish war- ships in 1898 during the war between Spain and the United States.

L’Isthme el le Canal de Suez, historique, itat actuel, by J. Charles-Roux (2 vols., Paris 1901), contains reprints of various official documents relating to the canal, with plates, maps and a bibliography extending to 1499 entries.

SUFFOLK, EARLS AND DUKES OF. These English titles were borne in turn by the families of Ufford, Pole, Brandon, Grey and Howard. A certain holder of land in Suffolk, named John de Peyton, had a younger son Robert, who acquired the lordship of Ufford in that county and was known as Robert de Ufford. He held an important place in the government of Ireland under Edward I. and died in 1298; his son Robert (1279-1316) was created Baron Ufford by a writ of summons to parliament in 1309, and increased his possessions by marriage with Cicely, daughter and heiress of Robert de Valoines. This Robert had several sons, one of whom was Sir Ralph de Ufford (d. 1346), justiciar of Ireland, who married Maud, widow of William de Burgh, earl of Ulster, and daughter of Henry Plantagenet, earl of Lancaster. Robert’s eldest surviving son, another Robert (c. 1298-1369), was an associate of the young king Edward III., and was one of the nobles who arrested Roger Mortimer in 1330. In 1337 he was created earl of Suffolk. The earl was employed by Edward III. on high military and diplomatic duties and was present at the battles of Crecy and Poitiers. His son William, the 2nd earl (c. 1330-1382), held important appointments under Edward III. and Richard II. He played a leading part in the suppression of the Peasants’ Revolt in 138 1, but in the same year he supported the popular party in parliament in the attack on the misgovernment of Richard II. Although twice married he left no sons, and his earldom became extinct, his extensive estates reverting to the Crown.

In 1385 the earldom of Suffolk and the lands of the Uffords were granted by Richard II. to his friend Michael Pole (c. 1330- 1389), a son of Sir William atte Pole, a baron of the exchequer

and a merchant (see Pole Family). After an active public life as the trusted adviser of Richard II. Pole was dismissed from his office of chancellor, was impeached and sentenced to death, but escaped to France, where he died. His titles and estates were forfeited, but in 1399 the earldom of Suffolk and most of the estates were restored to his son Michael (c. 1361- 1415). Michael, the 3rd earl (1394-1415), was killed at the battle of Agincourt, and the earldom passed to his brother William (1396- 1450), who was created earl of Pembroke in 1443, marquess of Suffolk in 1444, and duke of Suffolk in 1448 (see Suffolk, William de la Pole, Duke of). The duke's son, John, 2nd duke of Suffolk (1442-1491), married Elizabeth, daughter of Richard, duke of York, and sister of King Edward IV., by whom he had six sons. The eldest, John (c. 1464-1487), was created earl of Lincoln, and was named heir to the throne by Richard III. He was killed fighting against Henry VII. at the battle of Stoke, and was attainted. His brother Edmund (c. 1472-1513) should have succeeded his father in the duke-dom in 149 1, but he surrendered this to Henry VII. in return for some of the estates forfeited by the earl of Lincoln, and was known simply as earl of Suffolk. Having incurred the displeasure of the king, he left his own country in 1501 and sought help for an invasion of England. Consequently he was attainted in 1504 and was handed over in 1506 to Henry. He was kept in prison until 15 13, when he was beheaded by Henry VIII. His brother Richard now called himself duke of Suffolk, and put forward a claim to the English crown. Known as the " white rose," he lived abroad until 1525, when he was killed at the battle of Pavia.

In 1 5 14 the title of duke of Suffolk was granted by Henry VIII. to his friend, Charles Brandon (see Suffolk, Charles Brandon, Duke of) and it was borne successively by his two sons, Henry and Charles, becoming extinct when Charles died in July 1 551. In the same year it was revived in favour of Henry Grey, marquess of Dorset, who had married Frances, a daughter of the first Brandon duke. Grey, who became mar-quess of Dorset in 1530, was a prominent member of the reform- ing party during the reign of Edward VI. He took part in the attempt to make his daughter, Jane, queen of England in 1553, but as he quickly made his peace with Mary he was not seriously punished. In 1554, however, he took part in the rising headed by Sir Thomas Wyat; he was captured, tried for treason and beheaded in February 1554, when the dukedom again became extinct. In 1603 Thomas Howard, Lord Howard de Walden, son of Thomas Howard, 4th duke of Norfolk, was

created earl of Suffolk, and the earldom has been held by his descendants to the present day (see Suffolk, Thomas Howard, ist earl of).

SUFFOLK, CHARLES BRANDON, ist Duke of (c. 1484- I 545)> was the son of William Brandon, standard-bearer ot Henry VII., who was slain by Richard III. in person on Bos- worth Field. Charles Brandon was brought up at the court of Henry VII. He is described by Dugdale as “a person comely of stature, high of courage and conformity of disposition to King Henry VIII.,” with whom he became a great favourite. He held a succession of offices in the royal household, becoming master of the horse in 1513, and received many valuable grants of land. On the 15th of May 1513 he was created Viscount Lisle, having entered into a marriage contract with his ward, Elizabeth Grey, Viscountess Lisle in her own right, who, how- ever, refused to marry him when she came of age. He dis- tinguished himself at the sieges of Terouenne and Tournai in the French campaign of 1513. One of the agents of Margaret of Savoy, governor of the Netherlands, writing from before Terouenne, reminds her that Lord Lisle is a second king and advises her to write him a kind letter. At this time Henry VIII. was secretly urging Margaret to marry Brandon, whom he created duke of Suffolk, though he was careful to disclaim (March 4, 1514) any complicity in the project to her father, the emperor Maximilian I. The regent herself left a curious account of the proceedings (Letters and Papers of Henry VIII. vol. i. 4850-4851). Brandon took part in the jousts which celebrated the marriage of Mary Tudor, Henry’s sister, with Louis XII.

of France. He was accredited to negotiate various matters with Louis, and on his death was sent to congratulate the new king Francis I. An affection between Suffolk and the dowager queen Mary had subsisted before her marriage, and Francis roundly charged him with an intention to marry her. Francis, perhaps in the hope of Queen Claude’s death, had himself been one of her suitors in the first week of her widowhood, and Mary asserted that she had given him her confidence to avoid his importunities. Francis and Henry both professed a friendly attitude towards the marriage of the lovers, but Suffolk had many political enemies, and Mary feared that she might again be sacrificed to political considerations. The truth was that Henry was anxious to obtain from Francis the gold plate and jewels which had been given or promised to the queen by Louis in addition to the

reimbursement of the expenses of her marriage with the king; and he practically made his acquiescence in Suffolk's suit dependent on his obtaining them. The pair cut short the difficulties by a private marriage, which Suffolk an- nounced to Wolsey, who had been their fast friend, on the 5th of March. Suffolk was only saved from Henry's anger by Wolsey, and the pair eventually agreed to pay to Henry £24,000 in yearly instalments of £1000, and the whole of Mary's dowry from Louis of £200,000, together with her plate and jewels. They were openly married at Greenwich on the 13th of May. The duke had been twice married already, to Margaret Mortimer and to Anne Browne, to whom he had been betrothed before his marriage with Margaret Mortimer. Anne Browne died in 1511, but Margaret Mortimer, from whom he had obtained a divorce on the ground of consanguinity, was still living. He secured in 1528 a bull from Pope Clement II. assuring the legitimacy of his marriage with Mary Tudor, and of the daughters of Anne Browne, one of whom, Anne, was sent to the court of Margaret of Savoy. After his marriage with Mary, Suffolk lived for some years in retirement, but he was present at the Field of the Cloth of Gold in 1520, and in 1523 he was sent to Calais to command the English troops there. He invaded France in company with Count de Buren, who was at the head of the Flemish troops, and laid waste the north of France, but disbanded his troops at the approach of winter. Suffolk was entirely in favour of Henry's divorce from Catherine of Aragon, and in spite of his obligations to Wolsey he did not scruple to attack him when his fall was imminent. The cardinal, who was acquainted with Suffolk's private history, reminded him of his ingratitude: " If I, simple cardinal, had not been, you should have had at this present no head upon your shoulders wherein you should have had a tongue to make any such report in despite of us. " After Wolsey's disgrace Suffolk's influence increased daily. He was sent with the duke of Norfolk to demand the great seal from Wolsey; the same noblemen conveyed the news of Anne Boleyn's marriage to Queen Catherine, and Suffolk acted as high steward at the new queen's coronation. He was one of the commissioners appointed by Henry to dismiss Catherine's household, a task which he found distasteful. He supported Henry's ecclesiastical policy, receiving a large share of the plunder after the suppression of the monasteries. In 1544 he was for the second time in command of an English army for the invasion of France. He died at Guildford on the 24th of August in the following year.

After the death of Mary Tudor on the 24th of June 1533 he had married in 1534 his ward Catherine (1520-1580), Baroness Willoughby de Eresby in her own right, then a girl of fifteen. His

daughters by his marriage with Anne Browne were Anne, who married firstly Edward Grey, Lord Powys, and, after the dissolution of this union. Randal Harworth; and Mary (b. 1510), who married Thomas Stanley, Lord Monteagle. By Mary Tudor he had Henry earl of Lincoln (1516-1634); Frances, who married Henry Grey, marquess of Dorset, and became the mother of Lady Jane Grey; and Eleanor, who married Henry Clifford, second earl of Cumberland. By Katherine Willoughby he had two sons who showed great promise, Henry (1535—1551) and Charles (c. 1537-1551), dukes of Suffolk. They died of the sweating sickness within an hour of one another. Their tutor,

Sir Thomas Wilson, compiled a memoir of them, Vita et obitus duorum fratrum Sujfolcensium (1551).

There is abundant material for the history of Suffolk's career in the Letters and Papers of Henry VIII. (ed. Brewer in the Rolls Series). See also Dugdale, Baronage of England (vol. ii. 1676); and G. E. C, Complete Peerage. An account of his matrimonial adventures is in the historical appendix to a novel by E. S. Holt entitled The Harvest of Yesterday.

SUFFOLK, THOMAS HOWARD, ist Earl of (1561-1626), second son of Thomas Howard, 4th duke of Norfolk, was born on the 24th of August 1561. He behaved very gallantly during the attack on the Spanish armada and afterwards took part in other naval expeditions, becoming an admiral in 1599. Created Baron Howard de Walden in 1597 and earl of Suffolk in July 1603, he was lord chamberlain of the royal household from 1603 to 1614 and lprd high treasurer from 1614 to 1618, when he was deprived of his office on a charge of misappropriating money. He was tried in the Star-chamber and was sentenced to pay a heavy fine. Suffolk's second wife was Catherine (d. 1633), widow of the Hon. Richard Rich, a woman whose avarice was partly responsible for her husband's downfall. She shared his trial and was certainly guilty of taking bribes from Spain. One of his three daughters was the notorious Frances Howard, who, after obtaining a divorce from her first husband, Robert Devereux, earl of Essex, married Robert Carr, earl of Somerset, and instigated the poisoning of Sir Thomas Overbury. The earl died on the 28th of May 1626. He built a magnificent residence at Audley End, Essex, which is said to have cost £200,000. One of Suffolk's seven sons was Sir Robert Howard (1 585-1653), who inherited Clun Castle, Shropshire, on the death of his brother, Sir Charles Howard, in 1622. He was twice imprisoned on account of his illicit relations with Frances, Viscountess Purbeck (d. 1645), a daughter of Sir Edward Coke, and after sitting in six parliaments was expelled from the House of Commons for executing

the king's commission of array in 1642. He died on the 22nd of April 1653, Another of Suffolk's sons, Edward (d. 1675), was created baron Howard of Escrick in 1628. He was one of the twelve peers who signed the petition on grievances, which he presented to Charles I. at York in 1640, and after the abolition of the House of Lords in 1649 he sat in the House of Commons as member for Carlisle, being also a member of the council of state. In 1651 he was expelled from parliament for taking bribes and he died on the 24th of April 1675. . His second son, William, 3rd lord Howard of Escrick {c. 1626-1694), was a member of the republican party during the Commonwealth; later he associated himself with the opponents of the arbitrary rule of Charles II., but turning informer he was partly respon- sible for the conviction of Lord William Russell and of Algernon Sydney in 1683. On the death of William's son, Charles, the 4th lord, in 1715 the barony of Howard of Escrick became extinct.

Suffolk's eldest son, Theophilus, 2nd earl of Suffolk (1584- 1640), was captain of the band of gentlemen pensioners under James I. and Charles I., and succeeded to the earldom in May 1626, obtaining about the same time some of the numerous offices which had been held by his father, including the lord- lieutenancy of the counties of Suffolk, Cambridge and Dorset. He died on the 3rd of June 1640, when his eldest son James (1619-1689) became 3rd earl. This nobleman, who acted as earl marshal of England at the coronation of Charles II., died in January 1689 when his barony of Howard de Walden fell into abeyance between his two daughters. 1 His earldom, however, passed to his brother George (c. 1625-1691), who

1 Having thus fallen into abeyance in 1689 the barony of Howard de Walden was revived in 1784 in favour of John Griffin Griffin, afterwards Lord Braybrooke, on whose death in May 1797 it fell again into abeyance. In 1799 the bishop of Derry, Frederick Augustus Hervey, 4th earl of Bristol, a descendant of the 3rd earl of Suffolk, became the sole heir to the barony. On Bristol's death in July 1803 it passed to Charles Augustus Ellis (1799-1868), a grandson of the bishop's elder son, John Augustus, Lord Hervey (175 7- 1 796), who had predeceased his father. It was thus separated from the marquessate of Bristol, which paseed to the bishop's only surviving son, and it has since been held by the family 01 Ellis.

became 4th earl of Suffolk. George's nephew, Henry, the 6th earl (c.

1670-1718), who was president of the board of trade from 1715 to 1718, left an only son, Charles' William (1693- 1722), who was succeeded in turn by his two uncles, the younger of them, Charles (1675-1733) becoming 9th earl on the death of his brother Edward in June 1731. This earl was the husband of Henrietta countess of Suffolk (c. 1681-1767), the mistress of George II., who was a daughter of Sir Henry Hobart, bart., of Blickling, Norfolk. When still the Hon. Charles Howard, he and his wife made the acquaintance of the future king in Hanover; after the accession of George I. to the English throne in 1 7 14 both husband and wife obtained posts in the household of the prince of Wales, who, when he became king as George II., publicly acknowledged Mrs Howard as his mistress. She was formally separated from her husband before 1731 when she became countess of Suffolk. The earl died on the 28th of Sep- tember 1733, but the countess, having retired from court and married the Hon. George Berkeley (d. 1746), lived until the 26th of July 1767. Among Lady Suffolk's friends wete the poets Pope and Gay and Charles Mordaunt (earl of Peterborough) . A collection of Letters to and from Henrietta Countess of Suffolk, and her Second. Husband, the Hon. George Berkeley, was edited by J. W. Croker (1824).

The 9th earl's only son Henry, the 10th earl (1706-1745), died without sons in April 1745, when his estate at Audley End passed to the descendants of the 3rd earl, being inherited in 1762 by John Griffin Griffin (1719-1797), afterwards Lord Howard de Walden and Lord Braybrooke. As owners of this estate the earls of Suffolk of the Howard line had hitherto been hereditary visitors of Magdalene College, Cambridge, but this office now passed away from them. The earldom of Suffolk was inherited by Henry Bowes Howard, 4th earl of Berkshire (1696-17 5 7), who was the great-grandson of Thomas Howard (c. 1 590-1669), the second son of the 1st earl of Suffolk, Thomas having been created earl of Berkshire in 1626. Since 1745 the two earldoms have been united, Henry Molyneux Paget Howard (b. 1877) succeeding his father, Henry Charles (1833-1898), as 19th earl of Suffolk and 12th earl of Berkshire in 1898.

SUFFOLK, WILLIAM DE LA POLE, Duke of (1396-1450), second son of Michael de la Pole, second earl of Suffolk, was born on the 16th of October 1396. His father died at the siege of Harfleur, and his elder brother was killed at Agincourt on the 25th of October 141 5. Suffolk served in all the later French campaigns of the reign of Henry V., and in spite of his youth held high command on the marches of Normandy in 1421-22. In 1423 he joined the earl of Salisbury in Champagne, and shared his victory at Crevant. He fought under John, duke of Bedford, at Verneuil on the 17th of August 1424, and throughout the next four

years was Salisbury's chief lieutenant in the direction of the war. When Salisbury was killed before Orleans on the 3rd of November 1428, Suffolk succeeded to the command. After the siege was raised, Suffolk was defeated and taken prisoner by Jeanne d'Arc at Jargeau on the 12th of June 1429. He was soon ransomed, and during the next two years was again in command on the Norman frontier. He returned to England in November 143 1, after over fourteen years' continuous service in the field.

Suffolk had already been employed on diplomatic missions by John of Bedford, and from this time forward he had an important share in the work of administration. He attached himself naturally to Cardinal Beaufort, and even thus early seems to have been striving for a general peace. But public opinion in England was not yet ripe, and the unsuccessful con- ference at Arras, with the consequent defection of Burgundy, strengthened the war party. Nevertheless the cardinal's authority remained supreme in the council, and Suffolk, as his chief supporter, gained increasing influence. The question of Henry VI. 's marriage brought him to the front. Humphrey of Gloucester favoured an Armagnac alliance. Suffolk brought about the match with Margaret of Anjou. Report already represented Suffolk as too friendly with French leaders like

Charles of Orleans, and it was with reluctance that he undertook the responsibility of an embassy to France. However, when he returned to England in June 1444, after negotiating the marriage and a two years' truce, he received a triumphant reception. He was made a marquess, and in the autumn sent again to France to bring Margaret home. The French contrived to find occasion for extorting a promise to surrender all the English possessions in Anjou and Maine, a concession that was to prove fatal to Suffolk and his policy. Still for the time his success was com- plete, and his position as the personal friend of the young king and queen seemed secure. Humphrey of Gloucester died in February 1447, within a few days of his arrest, and six weeks later Cardinal Beaufort died also. Suffolk was left without an obvious rival, but his difficulties were great. Rumour, though without sufficient reason, made him responsible for Humphrey's death, while the peace and its consequent concessions rendered him unpopular. So also did the supersession of Richard of York by Edmund Beaufort, duke of Somerset, in the French com- mand. Suffolk's promotion to a. dukedom in July 1448, marked the height of his power. The difficulties of his position may have led him to give some countenance to a treacherous attack on Fougeres during the time of truce (March 1449). The renewal of the war and the loss of all Normandy were its direct conse- quences.. When parliament met in November 1449, the

oppo- sition showed its strength by forcing the treasurer, Adam Molyneux, to resign. Molyneux was murdered by the sailors at Portsmouth on the 9th of January 1450. Suffolk, realizing that an attack on himself was inevitable, boldly challenged his enemies in parliament, appealing to the long and honourable record of his public services. On the 7th of February and again on the 9th of March the Commons presented articles of accusa- tion dealing chiefly with alleged maladministration and the ill success of the French policy; there was a charge of aiming at the throne by the betrothal of his son to the little Margaret Beaufort, but no suggestion of guilt concerning the death of Gloucester. The articles were in great part baseless, if not absurd. Suffolk, in his defence on the 13th of March, denied them as false, untrue and too horrible to speak more of. Ultimately, as a sort of compromise, the king sentenced him to banishment for five years. Suffolk left England on the 1st of May, He was inter- cepted in the Channel by the ship " Nicholas of the Tower, " and next morning was beheaded in a little boat alongside. The " Nicholas " was a royal ship, and Suffolk's murder was probably instigated by his political opponents.

Popular opinion at the time judged Suffolk as a traitor. This view was accepted by Yorkist chroniclers and Tudor historians, who had no reason to speak well of a Pole. Later legend made him the paramour of Margaret of Anjou. Though utterly baseless, the story gained currency in the Mirrour for Magis- trates, and was adopted in Shakespeare's 2 Henry VI. (act in. sc. ii.) . Suffolk's best defence is contained in the touching letter of farewell to his son, written on the eve of his departure (Paston Letters, i. 142), and in his noble speeches before parlia- ment (Rolls of Parliament, v. 176, 182). Of the former Lingard said well that it is " difficult to believe that the writer could have been either a false subject or a bad man. " The policy of peace which Suffolk pursued was just and wise; he foresaw from the first the personal risk to which its advocacy exposed him. This alone should acquit him of any base motive ; his conduct was " throughout open and straightforward " (Stubbs). What- ever his defects as a statesman, he was a gallant soldier, a man of culture and a loyal servant.

Suffolk's wife, Alice, was widow of Thomas, earl of Salisbury, and granddaughter of Geoffrey Chaucer. By her he had an only son John, second duke of Suffolk.

Bibliography. — Suffolk is necessarily prominent in all contem- porary authorities. The most important are J. Stevenson's Wars of the English in France, Thomas Beckington's Correspondence, T. Wright's Political Poems and Songs, ii. 222-234 (for the popular view) — these three are

in the Rolls Series; and the Paston Letters. Of French writers E. de Monstrelet and Jehan de Waurin are most useful for his military career, T. Basin and Matthieu d'Escouchy for his fall (all these are published by the Soci6t£ de l'Histoire de

France). For modern accounts see especially W. Stubbs, Constitutional History (favourable), The Political History of England (1906), vol. iv., by C. Oman (unfavourable), and G. du Fresne de Beau- court's Histoire de Charles VII. See also H. A. Napier's Historical Notices of Swincombe and Ewelme (1858). (C. L. K.)

SUFFOLK, an eastern county of England, bounded N. by Norfolk, E. by the North Sea, S. by Essex and W. by Cambridge- shire. The area is 1488-6 sq. m. The surface is as a whole but slightly undulating. In the extreme north-west near Mildenhall, a small area of the Fen district is included. This is bordered by a low range of chalk hills extending from Haverhill northwards along the western boundary, and thence by Bury St Edmunds to Thetford. The coast-line has a length of about 62 m., and is comparatively regular, the bays being generally shallow and the headlands rounded and only slightly prominent. The estuaries of the Deben, Orwell and Stour, however, are between 10 and 12 m. in length. The shore is generally low and marshy, with occasional clay and sand cliffs. It includes, in the declivity on which Old Lowestoft stands, the most easterly point of English land. Like the Norfolk coast, this shore has suffered greatly from incursions of the sea, the demolition of the ancient port of Dun- wich (q.v.) forming the most noteworthy example. The prin- cipal seaside resorts are Lowestoft, Southwold, Aldeburgh and Felixstowe. The rivers flowing northward are the Lark, in the north-west corner, which passes in a north-westerly direction to the Great Ouse in Norfolk; the Little Ouse or Brandon, also a tributary of the Great Ouse, flowing by Thetford and Brandon and forming part of the northern boundary of the county; and the Waveney, which rises in Norfolk and forms the northern boundary of Suffolk from Palgrave till it falls into the mouth of the Yare at Yarmouth. The Waveney is navigable from Bungay, and by means of Oulton Broad also communicates with the sea at Lowestoft. The rivers flowing in a south-easterly direction to the North Sea are the Blyth; the Aide or Ore, which has a course for nearly 10 m. parallel to the seashore; the Deben, from Debenham, flowing past Woodbridge, up to which it is navigable; the Orwell or Gipping, which becomes navigable at Stowmarket, whence it flows past Needham

Market and Ipswich; and the Stour, which forms nearly the whole southern boundary of the county, receiving the Brett, which flows past Lavenham and Hadleigh; it is navigable from Sudbury. At the union of its estuary with that of the Orwell is the important port of Harwich (in Essex). The county has no valuable minerals. Flints are worked, as they have been from pre-historic times; a considerable quantity of clay is raised and lime and whiting are obtained in various districts.

Geology. — The principal geological formations are the Chalk and the Tertiary deposits. The former occupies the surface, except where covered by superficial drift, in the central and north-west portions of the county, and it extends beneath the Tertiaries in the south-east and east. In the extreme north-west round Mildenhall the Chalk borders a tract of fen land in a range of low hills from Haverhill by Newmarket and Bury St Edmunds to Thetford. The Chalk is quarried near Ipswich, Bury St Edmunds, Mildenhall and elsewhere ; at Brandon the chalk flints for gun-locks and building have been exploited from early times. The Tertiary formations include Thanet sand, seen near Sudbury; and Reading Beds and London Clay which extend from Sudbury through Hadleigh, Ipswich, Wood- bridge and thence beneath younger deposits to the extreme north-east of the county. Above the Eocene formations lie the Pliocene ” Crags,” which in the north overlap the Eocene boundary on to the chalk. The oldest of the crag deposits is the Coralline Crag, pale sandy and marly beds with many fossils; this is best exposed west and north of Aldeburgh and about Sudbourne and Orford. Resting upon the Coralline beds, or upon other formations in their absence, is the Red Crag, a familiar feature above the London Clay in the cliffs at Felixstowe, and Baudsey, where many fossils used to be found ; inland it appears at Bentley, Stutton and Chillesford, where the ” Scrobicularia Clay ” and Chillesford beds of Prestwich appear above it. The last-named beds probably correspond with the Norwich Crag, the name given to the upper, paler portion of the Red Crag, together with certain higher beds in the north part of east Suffolk. The Norwich Crag is visible at Dunwich, Bavent, Easton and Wang- ford. In the north the Cromer Forest beds, gravels with fresh-water fossils and mammalian remains, may be seen on the coast at Corton and Pakefield. Between the top of the London Clay and the base of

the Crags is the ” Suffolk Bone Bed ” with abundant mammalian bones and phosphatic nodules. Glacial gravel, sand and chalky boulder clay are scattered over much of the county, generally forming stiffer soils in the west and lighter sandy soils in the east. Pebble gravels occur at Westleton and Halesworth, and later gravels, with palaeolithic implements, at Hoxne; while old river-gravels of still later date border

the present river valleys. The chalk and gault have been penetrated by a boring at Stutton, revealing a hard palaeozoic slaty rock at the depth of about 1000 ft. _ •

Agriculture. — Suffolk is one of the most fertile counties in England. In the 18th century it was famed for its dairy products. The high prices of grain during the wars of the French Revolution led to the extensive breaking up of its pastures, and it is now one of the principal grain-growing counties in England. There is con- siderable variety of soils, and consequently in modes of farming in different parts of the county. Along the sea-coast a sandy loam or thin sandy soil prevails, covered in some places with the heath on which large quantities of sheep are fed, interspersed with tracts, more or less marshy, on which cattle are grazed. The best land adjoins the rivers, and consists of a rich sandy loam, with patches of lighter and easier soil. In the south-west and the centre is much finer grain-land having mostly a clay subsoil, but not so tenacious as the clay in Essex. In climate Suffolk is one of the driest of the English counties; thus, the mean annual rainfall at Bury St Edmunds is rather less than 24 in. Towards the north-west the soil is generally

Eoor, consisting partly of sand on chalk, and partly of peat and open eath. Some four-fifths of the total area of the county is under cultivation. Barley, oats and wheat are the most important of the grain crops. The breed of horses known as Suffolk punches is one of the most valued for agricultural purposes in England. The breed of cattle native to the county is a polled variety, on the improvement of which great pains have been bestowed. The old Suffolk cows, famous for their great milking qualities, were of various Colours, yellow predominating. The improved are all red. Much milk is sent to London, Yarmouth, &c. Many cattle, mostly imported from Ireland, are grazed in the winter. The sheep are nearly all of the blackfaced improved Suffolk breed, a cross between the old Norfolk horned sheep and Southdowns. The breed of pigs most common is small and black.

Manufactures and Trade. — The county is essentially agricultural, and the most important manufactures relate to this branch of industry. They include that of agricultural implements, especially at Ipswich, Bury St Edmunds and Stowmarket, and that of artificial manures at Ipswich and Stowmarket, for which coprolites are dug. Malting is extensively carried on throughout the county. There are chemical and gun-cotton manufactories at Stowmarket and gun flints are still made at Brandon. At other towns small miscel- laneous manufactures are carried on, including silk, cotton, linen, woollen, and horsehair and coco-nut matting. The principal ports are Lowestoft, Southwold,

Aldeburgh, Woodbridge and Ipswich. Lowestoft is the chief fishing town. Herrings and mackerel are the fish most abundant on the coasts.

Communications. — The main line of the Great Eastern railway, entering the county from the south, serves Ipswich and Stowmarket, continuing north into Norfolk. The east Suffolk branch from Ipswich serves Woodbridge, Saxmundham. Halesworth, and Beccles, with branches to Felixstowe, to Framlingham, to Aldeburgh, and to Lowestoft; while the Southwold Light railway connects with that town from Halesworth.- The other principal branches are those from Stowmarket to Bury St Edmunds and westward into Cambridge- shire, from Essex into Norfolk by Long Melford, Bury St Edmunds and Thetford, and from Long Melford to Haverhill, which is the northern terminus of the Colne Valley railway.

Population and Administration. — The area of the ancient county is 952,710 ac.-es, with a population in 1891 of 371,235 and in 1901 of 384,293. Suffolk comprises 21 hundreds, and for administrative purposes is divided into the counties of East Suffolk (557,854 acres) and West Suffolk (390,914 acres). The following are municipal boroughs and urban districts.

(1) East Suffolk. Municipal boroughs — Aldeburgh (pop. 2405), Beccles (6898), Eye (2004), Ipswich, a county borough and the county town (66,630), Lowestoft (29,850), Southwold (2800). Urban districts — Bungay (3314), Felixstowe and Walton (5815), Halesworth (2246), Leiston-cum-Sizewell (3259), Oulton Broad (4044), Saxmundham (1452), Stowmarket (4162), Woodbridge (4640).

(2) West Suffolk. Municipal boroughs — Bury St Edmunds (16,255), Sudbury (7109). Urban districts — Glemsford (1975), Hadleigh (3245), Haverhill (4862), Newmarket (10,688), which is mainly in the ancient county of Cambridge.

Small market and other towns are numerous, such are Brandon, Clare, Debenham, Framlingham, Lavenham, Mildenhall, Needham Market and Orford. For parliamentary purposes the county constitutes five divisions, each returning one member, viz. north or Lowestoft division, north-east or Eye, north-west or Stow- market, south or Sudbury, and south-east or Woodbridge. Bury St Edmunds returns one member and Ipswich two; part of the borough of Great Yarmouth falls within the county. There is one court of quarter sessions for the two administrative counties, which is usually held at Ipswich for east Suffolk, and then by

adjournment at Bury St Edmunds for west Suffolk. East Suffolk is divided into 1 1 and west Suffolk into 8 petty sessional divisions. The boroughs of Bury St Edmunds, Ipswich, Sudbury, Eye, Lowestoft and Southwold have separate commissions of the peace, and the three first-named have also separate courts of quarter sessions. The total number of civil parishes is 519. The ancient county contains 465 ecclesiastical parishes and districts, wholly or in part ; it is situated partly in the diocese of Ely and partly in that of Norwich.

History. — The county of Suffolk (Sudfole, Suthfolc) was formed from the south part of the kingdom of East Anglia which had been settled by the Angles in the latter half of the 5th century. The most important Anglo-Saxon settlements appear to have been made at Sudbury and Ipswich. Before the end of the Norman dynasty strongholds had arisen at Eye, Clare, Walton and Framlingham. Probably the establishment of Suffolk as a separate shire was scarcely completed before the Conquest, and although it was reckoned as distinct from Nor- folk in the Domesday Survey of 1086, the fiscal administration of Norfolk and Suffolk remained under one sheriff until 1575. The boundary of the county has undergone very little change, though its area has been considerably affected by coast erosion. Parts of Gorleston and Thetford, which formerly belonged to the ancient county of Suffolk, are now within the administrative county of Norfolk, and other slight alterations of the administrative boundary have been made. Under the Local Government Act of 1888 Suffolk was divided into the two administrative counties of east and west Suffolk.

At first the whole shire lay within the diocese of Dunwich which was founded c. 631. In 673 a new bishopric was estab- lished at Elmham to comprise the whole of Norfolk which had formerly been included in the see of Dunwich. The latter came to an end with the incursion of the Danes, and on the revival of Christianity in this district Suffolk was included in the diocese of Elmham, subsequently removed from South Elmham to Thetford and thence to Norwich. In 1835-1836 the archdeaconry of Sudbury was transferred by the ecclesiastical commissioners to the diocese of Ely. This archdeaconry had been separated from the original archdeaconry of Suffolk in 1127. In 1256 the latter included thirteen deaneries which have since been sub- divided, so that- at present it contains eighteen deaneries; Sud- bury archdeaconry which comprised eight deaneries in 1256 now includes eleven. There were also three districts under peculiar jurisdiction of

Canterbury and one under that of Rochester.

The shire-court was held at Ipswich. In 1831 the whole county contained twenty-one hundreds and three municipal boroughs. Most of these hundreds were identical with those of the Domesday Survey, but in 1086 Babergh was rated as two hundreds, Cosford, Ipswich and Parham as half hundreds and Samford as a hundred and a half. Hoxne hundred was formerly known as Bishop's hundred and the vills which were included later in Thredling hundred were within Claydon hundred in 1086. Two large ecclesiastical liberties extended over more than half of the county; that of St Edmund included the hundreds of Risbridge, Thedwastry, Thingoe, Cosford, Lackford and Blackbournin which the king's writ did not run, and St Aethelreda of Ely claimed a similar privilege in the hundreds of Carleford, Colneis, Plumesgate, Loes, Wilford and Thredling. Among others who had large lands in the county with co-extensive jurisdiction were the lords of the honor of Clare, earls of Gloucester and Hereford and the lords of the honor of Eye, held successively by the Bigods, the Uffords and the De la Poles, earls of Suffolk. The Wingfields, Bacons and Herveys have been closely connected with the county.

Suffolk suffered severely from Danish incursions, and after the Treaty of Wedmore became a part of the Danelagh. In 1 1 73 the earl of Leicester landed at Walton with an army of Flemings and was joined by Hugh Bigod against Henry II. In 13 17 and the succeeding years a great part of the county was in arms for Thomas of Lancaster. Queen Isabella and Mortimer having landed at Walton found all the district in their favour. In 1330 the county was raised to suppress the supporters of the

earl of Kent; and again in 138 1 there was a serious rising of the peasantry chiefly in the neighbourhood of Bury St Edmunds. Although the county was for the most part Yorkist it took little part in the Wars of the Roses. In 1525 the artisans of the south strongly resisted Henry VIII. 's forced loan. It was from Suffolk that Mary drew the army which supported her claim to the throne. In the Civil Wars the county was for the most part parliamentarian, and joined the Association of the Eastern Counties for defence against the Papists.

The county was constantly represented in parliament by two knights from 1290, until the Reform Bill of 1832 gave four members to Suffolk, at the same time disfranchising the boroughs of Dunwich, Orford and Aldeburgh. Suffolk was early among the most populous of English counties, doubtless owing to its proximity to the continent. Fishing fleets have left its ports to bring back cod and ling from

Iceland and herring and mackerel from the North Sea. From the 14th to the 17th century it was among the chief manufacturing counties of England owing to its cloth-weaving industry, which was at the height of its prosperity during the 15th century. In the 17th and 18th centuries its agricultural resources were utilized to provide the rapidly-growing metropolis with food. In the following century various textile industries, such as the manufacture of sail-cloth, cocoa-nut fibre, horse-hair and clothing were estab- lished; silk- weavers migrated to Suffolk from Spitalfields, and early in the 19th century an important china factory flourished at Lowestoft.

Antiquities. — Of monastic remains the most important are those of the great Benedictine abbey of Bury St Edmunds, noticed under that town; the college of Clare, originally a cell to the abbey of Bee in Normandy and afterwards to St Peter's Westminster, converted into a college of secular canons in the reign of Henry VI., still retaining much of its ancient architecture, and now used as a boarding-school ; the Decorated gateway of the Augustinian priory of Butley ; and the remains of the Grey Friars monastery at Dunwich. A peculiarity of the church architecture is the use of flint for purposes of ornamentation, often of a very elaborate kind, especially on the porches and parapets of the towers. Another characteristic is the round towers, which are confined to East Anglia, but are considerably more numerous in Norfolk than in Suffolk, the principal being those of Little Saxham and Herringfleet, both good examples of Norman. It is questionable whether there are any remains of pre-Norman architecture in the county. The Decorated is well represented, but by far the greater proportion of the churches are Perpendicular, fine examples of which are so numerous that it is hard to select ex- amples. But the church of Blythburgh in the east and the exquisite ornate building at Lavenham in the west may be noted as typical, while the church of Long Melford, another fine example, should be mentioned on account of its remarkable lady chapel. Special features are the open roofs and woodwork (as at St Mary's, Bury St Edmunds, Earl Stonham and Stonham Aspall, Ufford and Blythburgh), and the fine fonts.

The remains of old castles are comparatively unimportant, the principal being the entrenchments and part of the walls of Bungay, the ancient stronghold of the Bigods; the picturesque ruins of Mettingham, built by John de Norwich in the reign of Edward III.; Wingfield, surrounded by a deep moat, with the turret walls and the drawbridge still existing; the splendid ruin of Framlingham, with high and massive walls, originally founded in the 6th century, but restored in the 12th; the outlines of the extensive fortress of Clare Castle, anciently the baronial residence of the earls of Clare; and the fine Norman keep of

Orford Castle, on an eminence overlooking the sea. Among the many fine residences within the county there are several interesting examples of domestic architecture of the reigns of Henry VIII. and Elizabeth. Hengrave Hall (c. 1530), 4 m. north-west from Bury St Edmunds, is a noteworthy example — an exceedingly picturesque building of brick and stone, enclosing a court-yard. Another is Helmingham Hall, a Tudor mansion of brick, surrounded by a moat crossed by a drawbridge. West Stow Manor is also Tudor; its gatehouse is fine, but the mansion has been adapted into a farmhouse.

See A. Suckling, The History and Antiquities of Suffolk (1846- 1848); William White, History, gazetteer and directory of Suffolk (1855); John Kirby, The Suffolk Traveller (1735); A. Page, Supple- ment to the Suffolk Traveller (1843) ; Victoria County History; Suffolk.

SUFFRAGAN (Med. Lat. suffraganeus suffragator, one who assists, from suffragari, to vote in favour of, to support) in the Christian Church, (1) a diocesan bishop in his relation to the metropolitan; (2) an assistant bishop. (See the article Bishop.)

3°

SUFFRAGE— SUFFREN SAINT TROPEZ

SUFFRAGE (Lat. suffragium), the right or the exercise of the right of voting in political affairs; in a more general sense, an expression of opinion, assent or approval; in ecclesiastical use, the short intercessory prayers in litanies spoken or sung by the people as distinguished from those of the priest or minister. (See Representation; Vote and Voting, and Registration: and, for the Women's Suffrage Movement, Women: § Political Rights.) The etymology of the Latin word sujfragium has been much discussed. It is usually referred to sub- and the root of frangere, to break, and its original meaning must thus have been a piece of broken tile or a potsherd' on which the names or initials of the candidates were inscribed and used as a voting tablet or tabella. There is, however, no direct evidence that this was ever the practice in the case of voting upon legislation in the assembly (see W. Corssen, Ueber Aussprache, &c, der Lateinischen Sprache, i. 397, and Mommsen, Rbmische Geschichte, iii. 412 n. i.).

SUFFREN SAINT TROPEZ, PIERRE ANDRfi DE (1720-1788), French admiral, was the third son of the marquis de Saint Tropez, head of a family of nobles of Provence which claimed to have emigrated from Lucca in the 14th century. He was born in the Chateau de Saint Canat in the present department of Aix on the 17th of July 1729. The French

navy and the Order of Malta offered the usual careers for the younger sons of noble families of the south of France who did not elect to go into the Church. The connexion between the Order and the old French royal navy was close. Pierre Andre de Suffren was destined by his parents to belong to both. He entered the close and aristo- cratic corps of French naval officers as a ” garde de la marine ” — : cadet or midshipman, in October 1743, in the ” Solide, ” one of the line of battleships which took part in the confused engage- ment off Toulon in 1744. He was then in the ” Pauline ” in the squadron of M. Macnemara on a cruise in the West Indies. In 1746 he went through the due D’Anville’s disastrous expedi- tion to retake Cape Breton, which was ruined by shipwreck and plague. Next year (1747) he was taken prisoner by Hawke in the action with the French convoy in the Bay of Biscay. His biographer Cunat assures us that he found British arro- gance offensive. When peace was made in 1 748 he went to Malta to perform the cruises with the galleys of the Order technically called ” caravans,” a reminiscence of the days when the knights protected the pilgrims going from Saint John d’Acre to Jerusalem. In Suffren’s time this service rarely went beyond a peaceful tour among the Greek islands. During the Seven Years’ War he had the unwonted good fortune to be present as lieutenant in the ” Orphee ” in the action with Admiral Byng {q.v.), which, if not properly speaking a victory, was at least not a defeat for the French, and was followed by the surrender of the English garrison of Minorca. But in 1757 he was again taken prisoner, when his ship the ” Ocean ” was captured by Boscawen off Lagos. On the return of peace in 1 763 he intended again to do the service in the caravans which was required to qualify him to hold the high and lucrative posts of the Order. He was, however, named to the command of the ” Cam61eon, ” a zebec — a vessel of mixed square and lateen rig peculiar to the Mediterranean — in which he cruised against the pirates of the Barbary coast. Between 1767 and 1771 he performed his caravans, and was promoted from knight to commander of the Order. From that time till the beginning of the War of American Independence he commanded vessels in the squadron of evolution which the French government had established for the purpose of giving practice to its officers. His nerve and skill in handling his ship were highly commended by his chiefs. In 1778 and 1779 he formed part of the squadron of D’Estaing (q.v.) throughout its operations on the coast of North America and in the West Indies. He led the line in the action with Admiral John Byron off Grenada, and his ship, the ” Fantasque ” (64), lost 62 men. His letters to his admiral show that he strongly disapproved of D’Estaing’s half-hearted methods. In 1780 he was captain cf the ” Zele ” (74), in the combined French and Spanish fleets which captured a great English convoy in

the Atlantic. His candour towards his chief had done him no harm in the

opinion of D'Estaing. It is said to have been largely by the advice of this admiral that Suffren was chosen to command a squadron of five ships of the line sent out to help the Dutch who had joined France and Spain to defend the Cape against an expected English attack, and then to go on to the East Indies. He sailed from Brest on the 22nd of March on the cruise which has given him a unique place among French admirals, and puts him in the front rank of sea commanders. He was by nature even more vehement than able. The dis- asters which had befallen the navy of his country during the last two wars, and which, as he knew, were due to bad adminis- tration and timid leadership, had filled him with a burning desire to retrieve its honour. He was by experience as well as by temperament impatient with the formal manoeuvring of his colleagues, which aimed at preserving their own ships rather than at taking the English, and though he did not dream of restoring the French power in India, he did hope to gain some such success as would enable his country to make an honourable peace. On the 16th of April 1781 he found the English expedi- tion on its way to the Cape under the command of Commodore, commonly called Governor, George Johnstone (1 730-1 787), at anchor in Porto Praya, Cape de Verd Islands. Remembering how little respect Boscawen had shown for the neutrality of Portugal at Lagos, he attacked at once. Though he was in- differently supported, he inflicted as much injury as he suffered, and proved to the English that in him they had to deal with an admiral of quite a different type from the Frenchmen they had been accustomed to as yet. He pushed on to the Cape, which he saved from capture by Johnstone, and then made his way to the Isle de France (Mauritius), then held by the French. M. D'Orves, his superior officer, died as the united squadrons, now eleven sail of the line, were on their way to the Bay of Bengal. The campaign, which Suffren now conducted against the English admiral Sir Edward Hughes (17207-1794), is famous for the number and severity of the encounters between them. Four actions took place in 1782: on the 17th of February 1782, south of Madras; on the 12th of April near Trincomalee; on the 6th of July off Cuddalore, after which Suffren seized upon the anchorage of Trincomalee compelling the small British garrison to surrender; and again near that port on the 3rd of September. No ship was lost by Sir Edward Hughes in any of these actions, but none were taken by him. Suffren attacked with unprecedented vigour on every occasion, and if he had not been ill-supported by some of his captains he would undoubtedly have gained a distinct victory; as it was, he maintained his squadron without the

help of a port to refit, and provided him- self with an anchorage at Trincomalee. His activity encouraged Hyder Ali, who was then at war with the Company. He refused to return to the islands for the purpose of escorting the troops coming out under command of Bussy, maintaining that his proper purpose was to cripple the squadron of Sir Edward Hughes. During the north-east monsoon he would not go to the islands but refitted in the Malay ports in Sumatra, and returned with the south-west monsoon in 1783. Hyder Ali was dead, but Tippoo Sultan, his son, was still at war with the Company. Bussy arrived and landed. The operations on shore were slackly con- ducted by him, and Suffren was much hampered, but when he fought his last battle against Hughes (April 20, 1783), with fourteen ships to eighteen he forced the English admiral to retire to Madras, leaving the army then besieging Cuddalore in a very dangerous position. The arrival of the news that peace had been made in Europe put a stop to hostilities, and Suffren returned to France. While refitting at the Cape on his way home, several of the vessels also returning put in, and the captains waited on him. Suffren said in one of his letters that their praise gave him more pleasure than any other compliment paid him. In France he was received with enthusiasm, and an additional office of vice-admiral of France was created for him. He had been promoted bailli in the Order of Malta during his absence. His death occurred very suddenly on the 8th of December 1788, when he was about to take command of a fleet collected in Brest. The official version of the cause of death was apoplexy, and as

he was a very corpulent man it appeared plausible. But many years afterwards his body servant told M. Jal, the historio- grapher of the French navy, that he had been killed in a duel by the prince de Mirepoix. The cause of the encounter, accord- ing to the servant, was that Suffren had refused in very strong language to use his influence to secure the restoration to the navy of two of the prince's relations who had been dismissed for misconduct.

Suffren was crippled to a large extent by the want of loyal and capable co-operation on the part of his captains, and the vehemence of his own temperament sometimes led him to disregard prudence, yet he had an indefatigable energy, a wealth of resource, and a thorough understanding of the fact— so habitually disregarded by French naval officers — that success at sea is won by defeating an enemy and not by merely out- manoeuvring him; and this made him a most

formidable enemy. The portraits of Suffren usually reproduced are worthless, but there is a good engraving by Mme de Cernel after an original by Gerard.

The standard authority for the life of Suffren is the Histoire du Bailli de Suffren by Ch. Cunat (1852). The Journal de Bord du Bailli de Suffren dans I'lnde, edited by M. Mores, was published in 1888. There is an appreciative study in Captain Mahan's Sea Power in History. (D. H.)

SUFllSM {ta$awwuf), a term used by Moslems to denote any variety of mysticism, is formed from the Arabic word S&fi, which was applied, in the 2nd century of Islam, to men or women who adopted an ascetic or quietistic way of life. There can be no doubt that Sufi is derived from suf (wool) in reference to the woollen garments often, though not invariably, worn by such persons: the phrase labisa's-suf ("he clad himself in wool") is commonly used in this sense, and the Persian word pashmina- push, which means literally "clothed in a woollen garment,," is synonymous with Sufi. Other etymologies, such as Safd (purity) — a derivation widely accepted in the East — and ao6s, are open to objection on linguistic grounds.

In order to trace the origin and history of mysticism in Islam we must go back to Mahomet. On one side of his nature' the Prophet was an ascetic and in some degree a mystic. Not- withstanding his condemnation of Christian monkery (rah- bdniya) , i. e. of celibacy and the solitary life, the example of the Hanifs, with some of whom he was acquainted, and the Christian hermits made a deep impression on his mind and led him to preach the efficacy of ascetic exercises, such as prayer, vigils and fasting. Again, while Allah is described in the Koran as the One God working his arbitrary will in unapproachable supremacy, other passages lay stress on his all-pervading pres- ence and intimate relation to his creatures, e.g. " Wherever ye turn, there is the face of Allah " (ii. 109), " We (God) are nearer to him (Man) than his neck-vein " (1. 15). The germs of mys- ticism latent in Islam from the first were rapidly developed by the political, social and intellectual conditions which prevailed in the two centuries following the Prophet's death. Devastat- ing civil wars, a ruthless military despotism caring only for the things of this world, Messianic hopes and presages, the luxury of the upper classes, the hard mechanical piety of the orthodox creed, the spread of rationalism and freethought, all this induced a revolt towards asceticism, quietism, spiritual feeling and emotional faith. Thou c ands, wearied and disgusted with worldly vanities, devoted themselves to God. The terrors of hell, so vividly depicted in the Koran, awakened in them an intense consciousness of

sin, which drove them to seek salvation in ascetic practices. Sufiism was originally a practical religion, not a speculative system; it arose, as Junayd of Bagdad says, ” from hunger and taking leave of the world and breaking familiar ties and renouncing what men deem good, not from disputation. ” The early Sufis were closely attached to the Mahommedan church. It is said that Abu Hashim of Kufa (d. before a.d. 800) founded a monastery for Sufis at Ramleh in Palestine, but such fraternities seem to have been exceptional. Many ascetics of this period used to wander from place to place, either alone or in small parties, sometimes living by alms and sometimes by their own labour. They took up and emphasized

certain Koranic terms. Thus dhikr (praise of God) consisting of recitation of the Koran, repetition of the Divine names, &c, was regarded as superior to the five canonical prayers incumbent on every Moslem, and tawakkul (trust in God) was defined as renunciation of all personal initiative and volition, leaving one’s self entirely in God’s hands, so that some fanatics deemed it a breach of ” trust ” to seek any means of livelihood, engage in trade, or even take medicine. Quietism soon passed into mysticism. The attainment of salvation ceased to be the first object, and every aspiration was centred in the inward life of dying to self and living in God. ” O God ! ” said Ibrahim ibn Adham, ” Thou knowest that the eight Paradises are little beside the honour which Thou hast done unto me, and beside Thy love, and Thy giving me intimacy with the praise of Thy name, and beside the peace of mind which Thou hast given me when I meditate on Thy majesty.” Towards the end of the 2nd century we find the doctrine of mystical love set forth in the sayings of a female ascetic, Rabi’a of Basra, the first of a long line of saintly women who have played an important role in the history of Sufiism. Henceforward the use of symbolical expressions, borrowed from the vocabulary of love and wine, becomes increasingly frequent as a means of indicating holy mysteries which must not be divulged. This was not an unneces- sary precaution, for in the course of the 3rd century, Sufiism assumed a new character. Side by side with the quietistic and devotional mysticism of the early period there now sprang up a speculative and pantheistic movement which was essentially anti-Islamic and rapidly came into conflict with the orthodox tdemd. It is significant that the oldest representative of this tendency— Ma’ruf of Bagdad- — was the son of Christian parents and a Persian by race. He defined Sufiism as a theosophy; his aim was “to apprehend the Divine realities.” A little later Abu Sulaiman al-

It is, no doubt, conceivable that the evolution of Sufiism up to this point might not have been very different even although it had

remained wholly unaffected by influences outside of Islam. But, as a matter of fact, such influences made them- selves powerfully felt. Of these, Christianity, Buddhism and Neoplatonism are the chief. Christian influence had its source, not in the Church, but in the hermits and unorthodox sects, especially perhaps in the Syrian Euchites, who magnified the duty of constant prayer, abandoned their all and wandered as poor brethren. Sufiism owed much to the ideal of unworldliness which they presented. Conversations between Moslem devotees and Christian ascetics are often related in the ancient Sufi biographies, and many Biblical texts appear in the form of sayings attributed to eminent Sufis of early times, while sayings ascribed to Jesus as well as Christian and Jewish legends occur in abundance. More than one Sufi doctrine — that of tawakkul may be mentioned in particular — show traces of Chris- tian teaching. The monastic strain which insinuated itself into Sufiism in spite of Mahomet's prohibition was derived, partially at any rate, from Christianity. Here, however, Buddhistic influence may also have been at work. Buddhism flourished in Balkh, Transoxiana and Turkestan before the Mahommedan conquest, and in later times Buddhist monks carried their religious practices and philosophy among the Moslems who had settled in these countries. It looks as though the legend of Ibrahim ibn Adham, a prince of Balkh who one day suddenly cast off his royal robes and became a wandering Sufi, were based on the story of Buddha. The use of rosaries, the doctrine of fana, which is probably a form of Nirvana, and the system of " stations" {maqamat) on the road thereto, would seem to be Buddhistic in their origin. The third great foreign influence on Sufiism is the Neoplatonic philosophy. Between a.d. 800 and S60 the tide of Greek learning, then at its height,

streamed into Islam from the Christian monasteries of Syria, from the Persian Academy of Jundeshapur in Khuzistan, and from the Sabians of Harran in Mesopotamia. The so-called " Theology of Aristotle," which was translated into Arabic about a. d. 840, is full of Neoplatonic theories, and the mystical writings of the pseudo-Dionysius were widely known throughout western Asia. It is not mere coincidence that the doctrine of Gnosis was first worked out in detail by the Egyptian Sufi, Dhu '1-Nun (d. a.d. 859), who is described as an alchemist and theurgist. Suflism on its theosophical side was largely a product of Alex- andrian speculation.

By the end of the 3rd century the main lines of the Sufi mysticism

were already fixed. It was now fast becoming an organized system, a school for saints, with rules of discipline and devotion which the novice was bound to learn from his spiritual director, to whose guidance he submitted himself absolutely. These directors regarded themselves as being in the most intimate communion with God, who bestowed on them miraculous gifts (kardmdt). At their head stood a mysterious personage called the Quib (Axis): on the hierarchy of saints over which he pre- sided the whole order of the universe was believed to depend. During the next two hundred years (a.d. 900-1100), various manuals of theory and practice were compiled: the Kitdb al Lutna by Abu Nasr al-Sarraj, the Qui al-Qtdub by Abu Talib al-Makkl, the Risala of Qushairl, the Persian Kashf al-Mahjub by ‘All ibn ‘Uthman al-Hujwiri, and the famous Ihya by Ghazali. Inasmuch as all these works are founded on the same materials, viz., the Koran, the Traditions of the Prophet and the sayings of well-known Sufi teachers, they necessarily have much in common, although the subject is treated by each writer from his own standpoint. They all expatiate on the discipline of the soul and describe the process of purgation which it must undergo before entering on the contemplative life. The traveller journeying towards God passes through a series of ascending “stations” (maqamat): in the oldest extant treatise these are (1) repentance, (2) abstinence, (3) renunciation, (4) poverty, (5) patience, (6) trust in God, (7) acquiescence in the will of God. After the ” stations ” comes a parallel scale of ” states ” of spiritual feeling (ahwdl), such as fear, hope, love, &c, leading up to contemplation (mushahadat) and intuition (yaqin). It only remained to provide Suflism with a metaphysical basis, and to reconcile it with orthodox Islam. The double task was finally accomplished by Ghazali (q.v.) . He made Islamic theology mystical, and since his time the revelation (kashf) of the mystic has taken its place beside tradition (naql) and reason (K aql) as a source and fundamental principle of the faith. Protests have been and are still raised by theologians, but Moslem sentiment will usually tolerate whatever is written in sufficiently-abstruse philosophical language or spoken in manifest ecstasy.

The Sufis do not form a sect with definite dogmas. Like the monastic orders of Christendom, they comprise many shades of opinion, many schools of thought, many divergent tendencies — from asceticism and quietism to the wildest extravagances of pantheism. European students of Suflism are apt to identify it with the panthe- istic type which prevails in Persia. This, although more interesting and attractive than any other, throws the transcendental and vision- ary aspects of $ufiism into undue relief. Nevertheless some account must be given here of the Persian theosophy which has fascinated the

noblest minds of that subtle race and has inspired the most beautiful religious poetry in the world. Some of its characteristic features occur in the sayings attributed to BSyezId (d. A.D. 874), whom Buddhistic ideas unquestionably influenced. He said, for example, ” I am the winedrinker and the wine and the cup-bearer,” and again, ” I went from God to God, until they cried from me in me, ‘ O Thou I.’ ” The peculiar imagery which distinguishes the poetry of the Persian Sufis was more fully developed by a native of Khorasan, Abu Sa’id ibn Abi’l-Khair (d. a.d. 1049) in his mystical quatrains which “express the relation between God and the soul by glowing and fantastic allegories of earthly love, beauty and intoxication. Henceforward, the great poets of Persia, with few exceptions, adopt this symbolic language either seriously or as a convenient mask. The majority are Suf is by profession or conviction. ” The real basis of their poetry,” says A. von Kremer, ” is a loftily inculcated ethical system, which recognizes in purity of heart, charity, self-renunciation and bridling of the passions the neces- sary conditions of eternal happiness. Attached to this we find a pantheistic theory of the emanation of all things from God and their

ultimate reunion with him. Although on the surface Islam is not directly assailed, it sustains many indirect attacks, and frequently the thought flashes out, that all religions and revelations are only the rays of a single eternal sun ; that all prophets have only delivered and proclaimed in different tongues the same principles of eternal goodness and eternal truth which flow from the divine soul of the world.” The whole doctrine of Persian §ufiism is expounded in the celebrated Mathnawi of Jalaluddin Rumi (q.v.), but in such a discursive and unscientific manner that its leading principles are not easily grasped. They may be stated briefly as follows : —

God is the sole reality (al-Haqq) and is above all names and definitions. He is not only absolute Being, but also absolute Good, and therefore absolute Beauty. It is the nature of beauty to desire manifestation; the phenomenal universe is the result of this desire, according to the famous Tradition in which God says, ” I was a hidden treasure, and I desired to be known, so I created the creatures in order that I might be known.” Hence the §ufis, influenced by Neoplatonic theories of emanation, postulate a number of inter- mediate worlds or descending planes of existence, from the primal Intelligence and the primal Soul, through which ” the Truth ” (al-Haqq) diffuses itself. As things can be known only through their opposites, Being can only be known through Not-being, wherein as in a mirror Being is reflected; and this reflection is the phenomenal universe, which accordingly has no more reality than a shadow cast by the sun. Its central point is

Man, the microcosm, who reflects in himself all the Divine attributes. Blackened on one side with the darkness of Not-being, he bears within him a spark of pure Being. The human soul belongs to the spiritual world and is ever seeking to be re-united to its source. Such union is hindered by the bodily senses, but though not permanently attainable until death, it can be enjoyed at times in the state called ecstasy (hal), when the veil of sensual perception is rent asunder and the soul is merged in God. This cannot be achieved without destroying the illusion of self, and self-annihilation is wrought by means of that divine love, to which human love is merely a stepping-stone. The true lover feels himself one with God, the only real being and agent in the universe; he is above all law, since whatever he does proceeds directly from God, just as a flute produces harmonies or discords at the will of the musician; he is indifferent to outward forms and rites, preferring a sincere idolaterto an orthodox hypocrite and deeming the ways to God as many in number as the souls of men. Such in outline is the Sufi theosophy as it appears in Persian and Turkish poetry. Its

Cerilous consequences are plain. It tends to abolish the distinction etween good and evil — the latter is nothing but an aspect of Not-being and has no real existence — and it leads to the deifica- tion of the hierophant who can say, like Hu?ain b. Mansur al-Hallaj, “I am the Truth.” $ufi fraternities, living in a convent under the direction of a sheikh, became widely spread before A.D. 1 100 and gave rise to Dervish orders, most of which indulge in the practice of exciting ecstasy by music, dancing, drugs and various kinds of hypnotic suggestion (see Dervish).

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SUGAR, in chemistry, the generic name for a certain series of carbohydrates, i.e. substances of the general formula C n (H 2 0) m . Formerly the name was given to compounds having a sweet taste, e.g. sugar of lead, but it is now restricted to certain oxy- aldehydes and oxy-ketones, which occur in the vegetable and animal kingdoms either free or in combination as glucosides (q.v.) and to artificial preparations of similar chemical structure. Cane sugar has been known for many centuries; milk sugar was obtained by Fabrizio Bartoletti in 161 5; and in the middle of the 1 8th century Marggraf found that the sugars yielded by the

beet, carrot and other roots were identical with cane sugar. The sugars obtained from honey were investigated by Lowitz and Proust, and the latter decided on three species: (i) cane sugar/ (2) grape sugar, and (3) fruit sugar; the first has the formula C12H22O11, the others C 6 Hi 2 6 . This list has been con- siderably developed by the discovery of natural as well as of synthetic sugars.

It is convenient to divide the sugars into two main groups: monosaccharoses (formerly glucoses) and disaccharoses (formerly saccharoses). The first term includes simple sugars containing two to nine atoms of carbon, which are known severally as bioses, trioses, tetroses, pentoses, hexoses, &c. ; whilst those of the second group have the formula C| 2 H a On and are characterized by yielding two monosaccharose molecules on hydrolysis. In addition tri- saccharoses are known of the formula dsHˆOˆ; these on hydrolysis yield one molecule of a monosaccharose and one of a disaccharose, or three of a monosaccharose. It is found also that some mono- saccharoses behave as aldehydes whilst others contain a keto group ; those having the first character are called aldoses, and the others ketoses. All sugars are colourless solids or syrups, which char on strong heating; they are soluble in water, forming sweet solutions but difficultly soluble in

alcohol. Their solutions are optically active, i.e. they rotate the plane of polarized light; the amount of the rotation being dependent upon the concentration, temperature, and, in some cases, on the age of the solution (cf. Glucose). The rotation serves for the estimation of sugar solutions (saccharimetiy). They are neutral to litmus and do not combine with dilute acids or bases ; strong bases, such as lime and baryta, yield saccharates, whilst, under certain conditions, acids and acid anhydrides may yield esters. Sugarsare also liable to fermentation. 1 Our knowledge of the chemical structure of the monosaccharoses may be regarded as dating from 1880, when Zincke suspected some to be ketone alcohols, for it was known that glucose and fructose, for example, yielded penta-acetates, and on reduction gave hexahydric alcohols, which, when reduced by hydriodic acid, gave normal and secondary hexyliodide. The facts suggested that the six carbon atoms formed a chain, and that a hydroxy group was attached to five of them, for it is very rare for two hydroxy groups to be attached to the same carbon atom. The remaining oxygen atom is aldehydic or ketonic, for the sugars combine with hydrocyanic acid, hydroxy- lamine and phenylhydrazine. The correctness of this view was settled by Kiliani in 1885. He prepared the cyanhydrins of glucose and fructose, hydrolysed them to the corresponding oxy-acids, from which the hydroxy groups were split out by reduction; it was found that glucose yielded normal heptylic acid and fructose methylbutylacetic acid; hence glucose is an aldehyde alcohol, CH 2 OH-(CH-OH) 4 -CHO, whilst fructose is a ketone alcohol CH 2 OH(CH-OH) 3 CO-CH 2 OH. 2 Kiliani also showed that arabinose, C s Hi 2 6 , a sugar found in cherry gum, was an aldopentose, and thus indicated an extension of the idea of a ” sugar.”

Before proceeding to the actual synthesis of the sugars, it is advisable to discuss their decompositions and transformations.

I. Cyanhydrins. — The cyanhydrins on hydrolysis give mono-carboxylic acids, which yield lactones; these compounds when / educed by sodium amalgam in sulphuric acid solution yield a sugar containing one more carbon atom. This permits the formation of a higher from a lower sugar (E. Fischer)

CH 2 OH CH-OH

(CH’OH), CHO

CH 2 OH

Pentose

/CH ˆ/(CH-OH),

°\ CH-OH

\CO ■* Lactone

CH 2 OH CH-OH (CH-OH) 2 CH-OH CHO Hexose.

CH 2 OH CH-OH • (CH-OH) 2 CH-OH CN Cyanhydrin

2. Oximes. — The oximes permit the reverse change, i.e. the passage from a higher to a lower sugar. Wohl forms the oxime and converts it into an acetylated nitrile by means of acetic anhydride and sodium acetate; ammoniacal silver nitrate solution removes hydrocyanic acid and the resulting acetate is hydrolysed by acting with ammonia to form an amide, which is finally decomposed with sulphuric acid.

CH,OH CH 2 OH CH 2 OH CH 2 OH

(CH-OH), -> (CH-OH), -♦ (CH-OH) 3 -+ (CH-OH) 3

CH-OH CH-OH CH-OH CHO

CHO CH :NOH CN

Hexose — » Oxime — > Nitrile — > Pentose.

Ruff effects the same change by oxidizing the sugar to the oxy-acid,

1 See Fermentation; and for the relation of this property to structure see Stereoisomerism.

2 These formulae, however, require modification in accordance with the views of Lowry and E. F. Armstrong, which postulate a y oxidic structure (see Glucose). This, however, does not disturb the tenor of the following arguments.

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and then further oxidizing this with Fenton's reagent, i.e. hydrogen peroxide and a trace of a ferrous salt :

C4H s ,0 1 (CH-OH)-CHO-ˆC4H 9 04(CH-OH)-C0 2 H->C 4 H 9 4 -CHO Hexose -> Acid -> Pentose.

3. Phenylhydrazine Derivatives. — Fischer found that if one molecule of phenylhydrazine acted upon one molecule of an aldose or

ketose a hydrazone resulted which in most cases was very soluble in water, but if three molecules of the hydrazine reacted (one of which is reduced to ammonia and aniline) insoluble crystalline substances resulted, termed osazones, which readily characterized the sugar from which it was obtained.

R R R

CH-OH -» CH-OH -> C:N-NHPh

CHO CH:NNHPh. CH:N-NHPh.

Aldose — > Hydrazone — > Osazone;

R R R

CO -> C:N-NHPh. -► C:N-NHPh

CH 2 OH CH 2 OH CH:N-NHPh.

Ketose — > Hydrazone — ► Osazone.

On warming the osazone with hydrochloric acid the phenylhydra- zine residues are removed and an osone results, which on reduction with zinc and acetic acid gives a ketose.

R R R

C:N-NHPh. — CO —CO

CH:N-NHPh. CHO CH 2 OH

Osazone — » Osone — > Ketose.

A ketose may also be obtained by reducing the osazone with zinc and acetic to an osamine, which with nitrous acid gives the ketose :

R R R

C:N-NHPh. -> CO — CO

CH:N-NHPh. CH 2 NH 2 CH 2 OH.

Osazone — > Osamine — » Ketose.

These reactions permit the transformation of an aldose into a ketose; the reverse change can only be brought about by reducing the ketose

to an alcohol, and oxidizing this compound to an aldehyde. It is seen that aldoses and ketoses which differ stereochemically in only the two final carbon atoms must yield the same osazone; and since i-mannose, d-glucose, and d-fructose do form the same osazone (

It may here be noticed that in the sugars there are asymmetric carbon atoms, and consequently optica! isomers are to be expected. Thus glucose, containing four such atoms, can exist in 16 forms; and the realization of many of these isomers by E. Fischer may be regarded as one of the most brilliant achievements in modern chem- istry. The general principles of stereochemistry being discussed in Stereoisomerism (q.v.), we proceed to the synthesis of glucose and fructose and then to the derivation of their configurations.

In 1 861 Butlerow obtained a sugar-like substance, methylenitan, by digesting trioxymethylene, the solid polymer of formaldehyde, with lime. The work was repeated by O, Loew, who prepared in 1885 a sweet, unfermentable syrup, which he named formose, C 6 H l2 O e and, later, by using magnesia instead of lime, he obtained the fermentable methose. Fischer showed that methose was identical with the a-acrose obtained by himself and Tafel in 1887 by decomposing acrolein dibromide with baryta, and subsequently prepared by oxidizing glycerin with bromine in alkaline solution, and treating the product with dilute alkali at 0°. Glycerin appears to yield, on mild oxidation, an aldehyde, CH 2 OH-CH(OH)-CHO, and a ketone, CH 2 OH-CO-CH 2 OH, and these condense as shown in the equation:

CH 2 OH-CH(OH)-CHO + CH 2 OH-CO-CH 2 OH =

CH 2 OH-CH(OH)-CH(OH)-CH(OH)-CO.CH 2 OH + H 2 0.

The osazone prepared from a-acrose resembled most closely the glucosazone yielded by glucose, mannose, and fructose, but it was optically inactive; also the ketose which it gave after treatment with hydrochloric acid and reduction of the osone was like ordinary fructose except that it was inactive. It was surmised that a-acrose was a mixture of dextro and laevo fructose, a supposition which was proved correct by an indirect method. The starting point was ordinary (

‘ To distinguish the isomerides of opposite optical activity, it is usual to prefix the letters d- and 1-, but these are used only to indicate the genetic relationship, and not the character of the optical activity ; ordinary fructose, for example, being represented as d-fructose — although it exercises a laevorotatory power — because it is derived

from d-glucose.

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on further oxidation gives a mannonic acid, CsHjˆHˆ-COsH; this acid readily yields a lactone. Also Kiliani found that the lactone derived from the cyanhydrin of natural arabinose (laevo) was identical with the previous lactone except that its rotation was equal and opposite. On mixing the eslactones and reducing (a + /)-mnanitol was obtained, identical with a-acritol. A separation of o-acrose was made by acting with beer yeast, which destroyed the ordinary fructose and left /-fructose which was isolated as its osazone. Also (d + /) mannonic acid can be split into the d and I acids by fractional crystallization of the strychnine or brucine salts. The acid yields, on appropriate treatment,

The next step was to prepare glucose. This was effected in- directly. The identity of the formulae and osazones of d-mannose and d-glucose showed that the stereochemical differences were situated at the carbon atom adjacent to the aldehyde group. Fischer applied a method indicated by Pasteur in converting dextro into laevo-tartaric acid; he found that both d-mannonic and d-gluconic acids (the latter is yielded by glucose on oxidation) were mutually convertible by heating with quinoline under pressure at 140 . It was then found that on reducing the lactone of the acid obtained from d-mannonic acid, ordinary glucose resulted.

Fischer's o-acrose therefore led to the synthesis of the dextro and laevo forms of mannose, glucose and fructose; and these substances have been connected synthetically with many other sugars by means of his cyanhydrin process, leading to higher sugars, and Wohl and Ruff's processes, leading to lower sugars. Certain of these relations are here summarized (the starting substance is in italics) :■; —

/-Glucose 4r- -arabinose — > /-mannose — ? Z-mannoheptose ; gluconono se 4— a-gluco-octose <— a-glucoheptose <— d-glucose — >

0-giucoheptose —7 /9-gluco-dctose ; d-mannose— >d-mannoheptose — >manno-octose~>mannononose; d-glucose — > d-arabinose —} d-erythrose. -glucose— £ 6-arabinose —$ Z-erythrose.

Their number is further increased by spatial inversion of the dicarb-oxylic acids formed on oxidation, followed by reduction ; for example : d- and /-glucose yield d-and /-gulose ; and also by Lobry de Bruyn and Van Ekenstein's discovery that hexoses are transformed into mixtures of their isomers when treated with alkalis, alkaline earths, lead oxide, &c.

Monosaccharoses.

Biose. — The only possible biose is glycollic aldehyde, CHO-CHsOH, obtained impure by Fischer from bromacetaldehyde and baryta water, and crystalline by Fenton by heating dihydroxyrnaleic acid with water to 6o°. It polymerizes to a tetrose under the action of sodium hydroxide.

Triases.— The trioses are the aldehyde and ketone mentioned above as oxidation products of glycerin. Glyceric aldehyde, CH 2 OH-CH(OH)-CHO, was obtained pure by Wohlon oxidizing acrolein acetal, CH 2 -CH(OC 2 H 6) 2 , and hydrolysing. Although containing an asymmetric carbon atom it has not been resolved. The ketone, dihydroxyacetone, CH 2 OH-CO-CH 2 OH, was obtained by Piloty by condensing formaldehyde with nitromethane, reducing to a hydroxylamino compound, which is oxidized to the oxime of dihydroxyacetone ; the ketone is liberated by oxidation with bromine water :

3 H-CHO + CH s N0 2 -> (CH 2 OH) 3 C-N0 2 -> (CHjOH),C-NH OH > (CH 2 OH) 2 C: NOH(CH 2 OH) 2 CO. The ketone is also obtained when Bertrand's sorbose bacterium acts on glycerol ; this medium also acts on other alcohols to yield ketoses; for example: erythrite gives erythrulose, arabite arabinulose, mannitol fructose, &c.

Tetroses.— Four active tetroses are possible, and three have been obtained by Ruff and Wohl from the pentoses. Thus Wohl pre- pared /-threose from /-xylose and /-erythrose from /-arabinose, and Ruff obtained d- and /-erythrose from d- and /-arabonic acids, the oxidation products of d- and /-arabinoses. Impure inactive forms result on the polymerization of glycollic aldehyde and also on the oxidation of erythrite, a tetrahydric alcohol found in some lichens. d-Erythrulose is a ketose of this series.

Pentoses. — Eight stereoisomeric pentaldoses are possible, and six are known: d- and /-arabinose, d- and /-xylose, /-ribose, and d-lyxose. Scheibler discovered /-arabinose in 1869, and regarded it as a glucose; in 1887 Kiliani proved it to be a pentose. d-Arabinose is obtained from

d-glucose by Wohl's method. /-Xylose was dis- covered by Koch in 1886; its enantiomorph is prepared from d-gulose by Wohl's, method. /-Ribose and d-lyxose are prepared by inversion from /-arabinose and /-xylose; the latter has also been obtained from d-galactose. We may notice that the pentoses differ from other sugars by yielding furfurol when boiled with hydrochloric acid. Rhamnose or isodulcite, a component of certain glucosides, fucose, found combined in seaweeds and chinovose, present as its ethyl ester, chinovite, in varieties of quina-bark, are methyl pentoses. /-Arabinulose obtained from arabite and Bertrand's sorbium bacterium is a ketose.

Hexoses. — The hexoses may be regarded as the most important

sub-division of the monosaccharoses. The reader is referred to Glucose and Fructose for an account of these substances. The next important aldose is mannose. d-Mannose, first prepared by oxidizing rf-mannite, found in plants and manna-ash (Fraxinus omus), was obtained by Tollens and Gans on hydrolysing cellulose and by Reis from seminine (reserve cellulose), found in certain plant seeds, e.g. vegetable ivory. /-Mannose is obtained from /-mannonic acid. Other forms are: d- and /-gulose, prepared from the lactones of the corresponding gulonic acids, which are obtained from d- and /-glucose by oxidation and inversion; d- and /-idose, obtained by inverting with pyridine d- and /-gulonic acids, and reducing the resulting idionic acids; d- and /-galactose, the first being obtained by hydrolysing milk sugar with dilute sulphuric acid, and the second by fermenting inactive galactose (from the reduction of the lactone of d, /-galactonic acid) with yeast; and d- and Z-talose obtained by inverting the galactonic acids by pyridine into d- and /-talonic acids and reduction. Of the ketoses, we notice d-sorbose, found in the berries of mountain-ash, and d-tagatose, obtained by Lobry de Bruyn and van Ekenstein on treating galactose with dilute alkalis, talose and /-sorbose being formed at the same time. The higher sugars call for no special notice.

Configuration of the Hexaldoses. 1 — The plane projection of molecular structures which differ stereochemically is discussed under Stereo- isomerism; in this place it suffices to say that, since the terminal groups of the hexaldose molecule are different and four asymmetric carbon atoms are present, sixteen hexaldoses are possible; and for the hexahydric alcohols which they yield on reduction, and the tetrahydric dicarboxylic acids which they give on oxidation, only ten forms are possible. Employing the notation in which the molecule is represented vertically with the aldehyde group at the bottom, and calling a carbon atom + or— according as the hydrogen atom is to the left or right, the possible configurations are shown in the diagram. The

grouping of the forms 5 to 10 with 11 to 16 is designed to show that the pairs 5, 11 for example become identical when the terminal groups are the same.

11

12

13

14

15

16

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5

6

7

8

9

10

We can now proceed to the derivation of the structure of glucose. Since both d-glucose and COH group.

It remains to distinguish between 5 and 11,9 and 1 5 as representing glucose and gulose. To settle this point it is necessary to consider the configuration of the isomeric pentoses — arabinose and xylose — ■ from which they may be prepared. Arabinose being convertible into 7-glucose and xylose into /-gulose, the alternative formulae to be considered are —

CH 2 (OH)- +COH

CH 2 (OH) + -r J f-OOH.

1 The following account is mainly from H. E. Armstrong's article Chemistry in the 10th edition of this Encyclopaedia ; the representation differs from the projection of Meyer and Jacobsen.

If the asymmetric system adjoining the COH group, which is that introduced in synthesizing the hexose from the pentose, be eliminated i the formulae at disposal for the two pentoses are

CH 2 (OH) COH

CH 2 (OH) + —COH. When such compounds are converted into corresponding dibasic acids, C0 2 H.[CH(OH)] 3 .C0 2 H, the number of asymmetric carbon atoms becomes reduced from three to two, as the central carbon atom is then no longer associated with four, but with only three; different radicles. Hence it follows that the ” optical ” formulae of the acids derived from two pentoses having the configuration given above will be

CO,H-0-CO 2 H CO.H+0-CO 2 H, and that consequently only one of the acids will be optically active. As a matter of fact, only arabinose gives an active product on oxida- tion ; it is therefore to be supposed that arabinose is the

compound, and consequently

CH 2 (OH) h COH = /-glucose

CH 2 (OH) + COH = /-gulose.

When xylose is combined with hydrocyanic acid and the cyanide is hydrolysed, together with /-gulonic acid, a second isomeric acid, i-idonic acid, is produced, which on reduction yields the hexaldose J-idose. When Z-gulonic acid is heated with pyridine, it is converted into Z-idonic acid, and vice versa; and d-gulonic acid may in a similar manner be converted into d-idonic acid, from which it is possible to prepare d-idose. It follows from the manner in which

f-idose is produced that its configuration is CH 2 (OH) -\ [-COH.

The remaining aldohexoses discovered by Fischer are derived from d-galactose from milk-sugar. When oxidized this aldohexose is first converted into the monobasic galactonic acid, and then into dibasic mucic acid; the latter is optically inactive, so that its configuration must be one of those given in the sixth and seventh columns of the table. On reduction it yields an inactive mixture of galactonic acids, some molecules being attacked at one end, as it were, and an equal number of others at the other. On reducing the lactone prepared from the inactive acid an inactive galactose is obtained from which /-galactose may be separated by fermentation, lastly, when d-galactonic acid is heated with pyridine, it is con- verted into talonic acid, which is reducible to talose, an isomeride I caring to galactose the same relation that mannose bears to

glucose. It can be shown that d-galactose is CH 2 (OH) -\ 1 — COH,

and hence d-talose is CH 2 (OH) H -+ COH.

The configurations of the penta- and tetra-aldoses have been determined by similar arguments; and those of the ketoses can be deduced from the aldoses.

Disaccharoses.

The disaccharoses have the formula CˆHˆOn and are character- ized by yielding under suitable conditions two molecules of a hexose : Ci 2 H 22 On + H 2 = C6Hi20e + CeHi 2 6 . The hexoses so obtained are not necessarily identical : thus cane sugar yields d-glucose and d-fructose (invert sugar); milk sugar and melibiose give d-glucose and d-galactose, whilst maltose yields only glucose. Chemically they appear to be ether anhydrides of the hexoses, the union being effected by the aldehyde or alcohol groups, and in consequence they are related to the ethers of glucose and other hexoses, i.e. to the alkyl glucosides. Cane sugar has no reducing power and does not form an hydrazone or osazone; the other varieties, however, reduce Fehling's solution and form hydrazones and osazones, behaving as aldoses, i.e. as containing the group •CH(OH)-CHO. The relation of the disaccharoses to the a- and (J-glucosides was established by E. F. Armstrong {Journ. Chem. Soc, 1903, 85, 1305), who showed that cane sugar and maltose were a-glucosides, and raffinose an a-glucoside of melibiose. These and other considera- tions have led to the proposal of an alkylen oxide formula for glucose, first proposed by Tollens ; this view, which has been mainly developed by Armstrong and Fischer, has attained general acceptance (see Glucose and Glucoside). Fischer has proposed formulae for the important disaccharoses, and in conjunction with Armstrong devised a method for determining how the molecule was built up, by forming the osone of the sugar and hydrolysing, whereupon the hexosone obtained indicates the aldose part of the molecule. Lactose is thus found to be glucosido-galactose and melibiose a galactosido-glucose.

Several disaccharoses have been synthesized. By acting with hydrochloric acid on glucose Fischer obtained isomaltose, a disac- charose very similar to maltose but differing in being amorphous and unfermentable by yeast. Also Marchlewski (in 1899) synthe- sized cane sugar from potassium fructosate and acetochloro- glucose; and after Fischer discovered that acetochlorohexoses readily resulted from the interaction of the hexose penta-acetates and liquid hydrogen chloride, several others have been obtained.

Cane sugar, saccharose or saccharobiose, is the most important sugar; its manufacture is treated below. When slowly crystallized it forms large monoclinic prisms which are readily soluble in water but

difficultly soluble in alcohol. It melts at 160°, and on cooling solidifies to a glassy mass, which on standing gradually becomes

opaque and crystalline. When heated to about 200° it yields a brown amorphous substance, named caramel, used in colouring liquors, &c. Concentrated sulphuric acid gives a black carbon- aceous mass; boiling nitric acid oxidizes it to d-saccharic, tartaric and oxalic acids; and when heated to 160° with acetic anhydride an octa-acetyl ester is produced. Like glucose it gives saccharates with lime, baryta and strontia.

Milk sugar, lactose, lactobiose, CˆHˆOn, found in the milk of mammals, in the amniotic liquid of cows, and as a pathological secretion, is prepared by evaporating whey and purifying the sugar which separates by crystallization. It forms hard white rhombic prisms (with 1H 2 0), which become anhydrous at 140 and melt with decomposition at 205 . It reduces ammoniacal silver solutions in the cold, and alkaline copper solutions on boiling. Its aqueous solution has a faiht sweet taste, and is dextro-rotatory, the rotation of a fresh solution being about twice that of an old one. It is difficultly fermented by yeast, but readily by the lactic acid bacillus. It is oxidized by nitric acid to d-saccharic and mucic acids ; and acetic anhydride gives an octa-acetate.

Maltose, malt-sugar, maltobiose, CˆHmOu, is formed, together with dextrine, by the action of malt diastase on starch, and as an intermediate product in the decomposition of starch by sulphuric acid, and of glycogen by ferments. It forms hard crystalline crusts (with 1H 2 0) made up of hard white needles.

Less important disaccharoses are: Trehalose or mycose, CiˆHmOu-zHijO, found in various fungi, e.g. Boletus edulis, in the Oriental Trehala and in ergot of rye; melibiose, CuHmOu, formed, with fructose, on hydrolysing the trisaccharose melitose (or raffinose), Ci 8 H 32 Oi6-5H 2 0, which occurs in Australian manna and in the molasses of sugar manufacture; touranose, Ci 2 H S2 0u 1 formed with d-glucose and galactose on hydrolysing another trisaccharose, melizitose, CisHsjOhˆHuO, which occurs in Pinus larix and in Persian manna; and agavose, Ci 2 H 22 0ii, found in the stalks of Agave americana. (X.)

Sugar Manufacture

Sugar-cane is a member of the grass family, known botani- cally as Saccharum officinarum, the succulent stems of which are the source of

cane sugar. It is a tall perennial grass-like plant, giving off numerous erect stems 6 to 12 ft. or more in height from a thick solid jointed root-stock. The stems are solid and marked with numerous shining, polished, yellow, purple or striped joints, 3 in. or less in length, and about i| in. thick. They are unbranched and bear in the upper portion numerous long narrow grass-like leaves arranged in two rows; the leaf springs from a large sheath and has a more or less spreading blade 3 ft. in length or longer, and 3 in. or more wide. The small flowers or spikelets are borne in pairs on the ultimate branches of a much branched feathery plume-like terminal grey inflorescence, 2 ft. or more long. Production of flowers is uncertain under cultivation and seed is formed very rarely. The plant is readily propagated by cuttings, a piece of the stem bearing buds at its nodes will root rapidly when placed' in sufficiently moist ground. The sugar-cane is widely cultivated in the tropics and some sub-tropical countries, but is not known as a wild plant. Its native country is unknown, but it probably originated in India or some parts of eastern tropical Asia where it has been cultivated from great antiquity and whence its cultivation spread westwards and eastwards. Alphonse de Candolle (Origin of Cultivated Plants, p. 158) points out that the epoch of its introduction into different countries agrees with the idea that its origin was in India, Cochin-China or the Malay Archipelago, and regards it as most probable that its primitive range extended from Bengal to Cochin-China. The sugar-cane was introduced by the Arabs in the middle ages into Egypt, Sicily and the south of Spain where it flourished until the abundance of sugar in the colonies caused its cultivation to be abandoned. Dom Enrique, Infante of Portugal, surnamed the Navigator (1394-1460) transported it about 1420, from Cyprus and Sicily to Madeira, whence it was taken to the Canaries in 1503, and thence to Brazil and Hayti early in the 16th century, whence it spread to Mexico, Cuba, Guadeloupe and Martinique, and later to Bourbon. It was introduced into Barbadoes from Brazil in 1641, and was distributed from there to other West Indian islands. Though cultivated in sub-tropical countries such as Natal and the Southern states of the Union, it is essentially tropical in its requirements and succeeds best in warm damp climates such as

Cuba, British Guiana and Hawaii, and in India and Java in the Old World. The numerous cultivated varieties are dis- tinguished mainly by the colour of the internodes, whether yellow, red or purple, or striped, and by the height of the culm. Apart from the sugar-cane and

the beet, which are dealt with in detail below, a brief reference need only be made here to maple sugar, palm sugar and sorghum sugar.

Maple Sugar. — This is derived from the sap of the rock or sugar maple (Acer saccharinum), a large tree growing in Canada and the United States.

The sap is collected in spring, just before the foliage develops, and is procured by making a notch or boring a hole in the stem of the tree about 3 ft. from the ground. A tree may yield 3 gallons of juice a day and continue flowing for six weeks; but on an average only about 4 lb of sugar are obtained from each tree, 4 to 6 gallons of sap giving I lb of sugar. The sap is purified and concentrated in a simple manner, the whole work being carried on by farmers, who themselves use much of the product for domestic and culinary purposes.

Palm Sugar. — That which comes into the European market as jngZ er y or khaur is obtained from the sap of several palms, the wild date (Phoenix sylvestris), the palmyra (Borassus flabellifer), the coco-nut (Cocos nucifera), the gomuti (Arenga saccharifera) and others. The principal source is Phoenix sylvestris, which is cultivated in a portion of the Ganges valley to the north of Calcutta. The trees are ready to yield sap when five years old ; at eight years they are mature, and continue to give an annual supply till they reach thirty years. The collection of the sap (toddy) begins about the end of October and continues, during the cool season, till the middle of February. The sap is drawn off from the upper growing portion of the stem, and altogether an average tree will run in a season 350 lb of toddy, from which about 35 lb of raw sugar — jaggery — is made by simple and rude processes. Jaggery production is entirely in native hands, and the greater part of the amount made is consumed locally ; it only occasionally reaches the European market.

Sorghum Sugar. — The stem of the Guinea corn or sorghum (Sorghum saccharatum) has .long been known in China as a source of sugar. The sorghum is hardier than the sugar-cane; it comes to maturity in a season; and it retains its maximum sugar content a considerable time, giving opportunity for leisurely harvesting. The sugar is obtained by the same method as cane sugar.

Cane Sugar Manufacture. — The value of sugar-canes at a given plantation or central factory would at first sight appear Commercial to vary directly as the amount of saccharine con- Vaiues 0/ tained in the juice expressed from them varies, Sugar-canes. an(j jf canes with juice indicating o° Beaume be made a basis of value or worth, say at 10s.

per ton, then canes with juice indicating

in degrees Beaum6 io° 9 8° 7° 6°

and containing in

sugar. . . . 18-05 1 16-23 14-42% 12-61% Io-8o% would be worth per

ton

n/ii 10/-

8/10J

7/9i

6/8

But this is not an accurate statement of the commercial value of sugar-canes — that is, of their value for the production of sugar to the planter or manufacturer— because a properly equipped and balanced factory, capable of making 100 tons of sugar per day, for 100 days' crop, from canes giving juice of g° B., or say 10,000 tons of sugar, at an aggregate expenditure for manufacture (i.e. the annual cost of running the factory) °f £3 P er ton > or ii , 000 P er annum, will not be able to make as much sugar per day with canes giving juice of 8° B., and will make still less if they yield juice of only 6° B. In practice, the expenses of upkeep for the year and of manufacturing the crop remain the same whether the canes are rich or poor and whether the crop is good or bad, the power of the factory being limited by its power of evaporation. For example, a factory able to evaporate 622 tons of water in 24 hours could treat 1000 tons of canes yielding juice of o° B., and make therefrom j 00 tons of sugar in that time; but this same factory, if supplied with canes giving juice of 6° B., could not treat more than 935 tons of canes in 24 hours, and would only make therefrom 62-2 tons of sugar.

The following table may be useful to planters and central factory owners. It shows the comparative results of working with juice of the degrees of density mentioned above, under the conditions described, for one day of 24 hours, and the real value, as raw material for manufacture, of cane giving juice of 6° B. to io° B., with their apparent value based solely on the percentage of sugar in the juice.

The canes in each case are assumed to contain 88 % of juice and 12 % of fibre, and the extraction by milling to be 75 % of the weight of

canes — the evaporative power of the factory being equal to 622 tons per 24 hours. The factory expenses are taken at £30,000 per annum, or £3 per ton on a crop of 10,000 tons (the sugar to cost £8 per ton all told at the factory) — equivalent to £300 per day for the 100 working days of crop time.

Degrees Beaume.

6°

7°

8°

9°

10°

Tons of canes

crushed per day

935-6

956-2

977-4

1000

1023-8

Tons of juice ex-

pressed

701-7

717-2

733-1

75o

767-9

Tons of water

evaporated .

622

622

622

622

622

Tons of 1st Mas-

secuite

79-7

95-2

iii-i

128

145-9

Tons sugar of all

classes recovered

62-2

74-3

86-7

100

114-0

Total output of

sugar in 100

days. Tons

6220

743°

8670

10,000

11,400

Total value of all

sugars per day

at £8 per ton Less factory ex-

£497. 61-

£594. 4/-

£693, 61-

£800

£912

penses per day .

£300

£300

£300

£300

£300

Leaves for canes

crushed .

£197. 67-

£294. 4/~

£393, 67-

£500

£612

Real value of

canes per ton

4/2I

6/2

8/-

10/-

n/ilj

Apparent value (see preceding

Table) . . .

6/8

7/91

8/ioJ

10/-

11/1}

But it is obvious that it would not pay a planter to sell canes at 4s. 2| d. a ton instead of at 10s. a ton, any more than it would pay a factory to make only 62-2 tons of sugar in 24 hours, or 6220 tons in the crop of 100 days, instead of 10,000 tons. Hence arises the imperative necessity of good cultivation by the planter, and of circumspection in the purchase and acceptance of canes on the part of the manufacturer.

The details of manufacture of sugar from canes and of sugar from beetroots differ, but there are five operations in the production of the sugar of commerce from either material which are common to both processes. These are : —

1. The extraction of the juice.

2. The purification or defecation of the juice.

3. The evaporation of the juice to syrup point.

4. The concentration and crystallization of the syrup.

5. The curing or preparation of the crystals for the market by

separating the molasses from them. Extraction of Juice. — The j uice is extracted from canes by squeezing them between rollers. In India at the present day there are thou- sands of small mills worked by hand, through which Bxtravtloa the peasant cultivators pass their canes two or three bvPressure at a time, squeezing them a little, and extracting per- ‘ haps a fourth of their weight in juice, from which they make a substance resembling a dirty sweetmeat rather than sugar. In Barbadoes there are still many estates making good Mascabado sugar; but as the juice is extracted from the canes by windmills, and then concentrated in open kettles heated by direct fire, the financial results are disastrous, since nearly half the yield obtainable from the canes is lost. In the best organized modern cane sugar estates as much as 12I % of the weight of the canes treated is obtained in crystal sugar of high polarizing power, although in Louisiana, where cultivation and manufacture are alike most carefully and admirably carried out, the yield in sugar is only about 7% of the weight of the canes, and sometimes, but seldom, as much as 9%. This is due to conditions of climate, which are much less favourable for the formation of saccharine in the canes than in Cuba. The protection afforded to the planters by their government, however, enables them to pursue the industry with considerable profit, notwithstanding the poor return for their labour in saleable produce. As an instance of the influence of climatic conditions combined with high cultivation the cane lands of the Sandwich Islands may be cited. Here the tropical heat is tempered by constant trade winds, there is perfect immunity from hurricanes, the soil is peculi- arly suited for cane-growing, and by the use of specially-prepared fertilizers and an ample supply of water at command for irrigation the land yields from 50 to 90 tons of canes per acre, from which from 12 to 14% of sugar is produced. To secure this marvellous return, with an annual rainfall of 26 in., as much as 52,000,000 gallons of water are pumped per 24 hours from artesian wells on one estate alone. With an inexhaustible supply of irrigation water obtainable, there is no reason why the lands in Upper Egypt, if scientifically cultivated and managed, should not yield as abundantly as those in the Sandwich Islands.

In the Paris Exhibition of 1900 a cane-crushing mill was shown with

three rollers 32 in. in diameter by 60 in. long. It is driven by a powerful engine through triple gearing of 42 to I, and speeded to have a surface velocity of rollers of 15 ft. 9 in. per minute. This mill is guaranteed to crush thoroughly and efficiently from 250 to 300 tons of canes in 24. hours. In Louisiana two mills, set one behind the other, each with three rollers 32 in. in diameter by 78 in. long, and driven by one engine through gearing of 15 to I, are speeded to have a surface velocity of rollers of 25 ft. 6 in. per minute (or 60% more than that of the French mill described above), and they are efficiently crushing 900 to 1200 tons of canes in 24 hours. In Australia, Demerara, Cuba, Java and Peru double crushing and maceration (first used on a commercial scale in Demerara by the late Hon. William Russell) have been generally adopted; and in many places, especially in the Hawaiian Islands, triple crushing (i.e. passing the canes through three consecutive sets of rollers, in order to extract everything possible of extraction by pressure) is employed. In the south of Spain, in some favoured spots where sugar-canes can be grown, they are submitted even to four successive crushings.

It has been found in practice advantageous to prepare the canes for crushing in the mills, as above described, by passing them through a pair of preparing rolls which are grooved or indented in such manner as to draw in and flatten down the canes, no matter in which way they are thrown or heaped upon the cane- carrier, and thus prepare them for feeding the first mill of the series; thus the work of crushing is carried on uninterruptedly and without constant stoppages from the mills choking, as is often the case when the feed is heavy and the canes are not prepared.

Although it cannot be said that any one system of extraction is the best fpr all places, yet the following considerations are of general application : —

a. Whatever pressure be brought to bear upon it, the vegetable or woody fibre of crushed sugar-canes will hold and retain for the Yield from mome . nt a quantity of moisture equal to its own weight, Crashing anc ˆ m P ract ‘ ce IO % more than its own weight; or in

*” other words, 100 lb of the best crushed megass will consist of 47-62 lb of fibre and 52-38 lb of moisture — that is, water with sugar in solution, or juice.

b. Canes vary very much in respect of the quality and also as to the quantity of the juice they contain. The quantity of the juice is the test to which recourse must be had in judging the effi- ciency of the

extraction, while the quality is the main factor to be taken into account with regard to the results of subsequent manufacture.

For the application of the foregoing considerations to practice, the subjoined table has been prepared. It shows the greatest quantity of juice that may be expressed from canes, according to the different proportions of fibre they contain, but without employing maceration or imbibition, to which processes reference is made hereafter. The percentages are percentages of the original weight of the uncrushed canes.

Per

Per

Per

Per

Per

Per

Cent.

Cent.

Cent.

Cent.

Cent.

Cent.

Percentage of fibre

in canes .

10

11

12

13

‘4

15

Percentage of juice

in canes .

90

89

88

87

86

85

Percentage of juice retained in me-

gass ….

10

II

12

13

14

15

Percentage of maxi-

mum expression.

80

7«

76

74

72

70

Percentage of best

average expres-

sion, in practice.

79

76-9

74-9

72-9

70-6

68-5

Percentage of juice

left in megass, in

practice .

11

I2-I

13-2

14-3

15-4

16-5

The British Guiana Planters' Association appointed a sub-com- mittee to report to the West India Commission on the manufacture of sugar, who stated the following: —

With canes containing 12% fibre the following percentages of sugar are extracted from the canes in the form of juice: —

Single crushing 76 %

Double crushing 85 %

Double crushing with 12% dilution 88%

Triple crushing with 10% dilution 90%

Diffusion with 25 % dilution 94%

These results are equivalent to

66-88% extraction for single crushing.

74-80% ,, ,, double crushing.

77-44% ,, „ double crushing with 12% dilution.

79-20% ,, „ triple „ ,, 10% „

82-72% „ „ diffusion with 25%

To prevent the serious loss of juice left in the megass by even the best double and triple crushing, maceration or imbibition was introduced. The megass coming from the first mill M .

was saturated with steam and water, in weight equal “Vtihi? to between 20 % and 30 % and up to 40 % of the original ?f’ weight of the uncrushed canes. Consequently, after the last crushing the mixture retained by the residual megass was not juice, as was the case when crushing was employed without maceration, but juice mixed with water; and it was found that the loss in juice was reduced by one-half. A further saving of juice was sometimes possible if the market prices of sugar were such as to compensate for the cost of evaporating an increased quantity of added water, but a limit was imposed by the fact that water might be used in excess. Hence in the latest designs for large factories it has been proposed that as much normal juice as can be. extracted by double crushing only shall be treated by itself, and that the megass shall then be soused with twice as much water as there is juice remaining in it; after which, on being subjected to a third crushing, it will yield a degraded juice, which would also be treated by itself. It is found that in reducing the juice of these two qualities to syrup, fit to pass to the vacuum pans for cooking to crystals, the total amount of evaporation from the degraded juice is about half that required from the normal juice produced by double crushing.

Great improvements have been made in the means of feeding the mills with canes by doing away with hand labour and substituting mechanical feeders or rakes, which by means of a „ hanicMl simple steam-driven mechanism will rake the canes j ” from the cane waggons on to the cane-carriers. By ˆenis ‘ the adoption of this system in one large plantation in the West Indies, crushing upwards of 1200 tons of canes per day, the labour of sixty-four hands was dispensed with, and was thus made available for employment in the fields. In Louisiana the use of mechanical feeders is almost universal.

With a view of safeguarding themselves from breakdowns caused by the inequality of feeding, or by the action of malicious persons introducing foreign substances, such as crowbars, bolts, &c, among the canes, and so into the mills, many planters have adopted so- called hydraulic attachments, applied either to the megass roll or the top roll

bearings. These attachments, first invented by Jeremiah Howard, and described in the United States Patent Journal in 1858, are simply hydraulic rams fitted into the side or top caps of the mill, and pressing against the side or top brasses in such a manner as to allow the side or top roll to move away from the other rolls, while an accumulator, weighted to any desired extent, keeps a constant pressure on each of the rams. An objection to the top cap arrangement is, that if the volume or feed is large enough to lift the top roll from the cane roll, it will simultaneously lift it from the megass roll, so that the megass will not be as well pressed as it ought to be; and an objection to the side cap arrangement on the megass roll as well as to the top cap arrangement is, that in case more canes are fed in at one end of the rolls than at the other, the roll will be pushed out farther at one end than at the other; and though it may thus avoid a breakdown of the rolls, it is apt, in so doing, to break the ends off the teeth of the crown wheels by putting them out of line with one another. The toggle-joint attachment, which is an extremely ingenious way of attaining the same end as the hydraulic attachments, is open to the same objections.

Extraction of cane juice by diffusion (a process more fully de- scribed under the head of beetroot sugar manufacture) is adopted in a few plantations in Java and Cuba, in Louisiana „ 1rmBU _ and the Hawaiian Islands, and in one or two factories T* nJ2/Jl_ in Egypt; but hitherto, except under exceptional ˆ conditions (as at Aska, in the Madras Presidency, where the local price for sugar is three or four times the London price), it would not seem to offer any substantial advantage over double or triple crushing. With the latter system practically as much sugar is obtained from the canes as by diffusion, and the resulting megass furnishes, in a well-appointed factory, sufficient fuel for the crop. With diffusion, however, in addition to the strict scientific control necessary to secure the benefits of the process, fuel — that is, coal or wood — has to be provided for the working off of the crop, since the spent chips or slices from the diffusers are useless for this purpose; although it is true that in some plantations the spent chips have to a certain extent been utilized as fuel by mixing them with a portion of the molasses, which otherwise would have been sold or converted into rum. The best results from extraction by diffusion have been obtained in Java, where there is an abundance of clear, good water; but in the Hawaiian Islands, and in Cuba and Demerara, diffusion has been abandoned on several well mounted estates and replaced by double and triple crushing; and it is not likely to be resorted to again, as the extra cost of working is not compensated by the slight increase of sugar produced. In Louisiana diffusion is successfully worked on two or three large estates; but the

general body of planters are shy of using it, although there is no lack of water, the Mississippi being near at hand.

Purification. — The second Operation is the coagulation of the albumen, and the separation of it with other impurities from the

juice which holds them in suspension or solution. The moment the juice is expelled from the cells of the canes chemical inversion commences, and the sooner it is stopped the better. This is effected by the addition of lime to neutralize the free acid. As cold juice has a greater affinity for lime than hot juice, it is best to treat the juice with lime when cold. This is easily done in liming or measuring tanks of known capacity, into which the juice is run from the mill. The requisite amount of milk of lime set up at 10° Beaum6 is then added. Cream of lime of 17 Beaume is sometimes used, but the weaker solution is preferable, since the proper proportion is more easily adjusted. In Demerara and other places the juice is then heated under pressure up to 220 F. to 250 F. for a few moments, on its way to a steam and juice separator, where the steam due to the superheated juice flashes off, and is either utilized for aiding Subsiding tne steam supplied to the multiple effect evaporators, Tanks or ˆ or heating cold juice on its way to the main heater, or it is allowed to escape into the atmosphere. The boiling juice is run down into subsiding tanks, where it cools, and at the same time the albumen, which has been suddenly coagulated by momentary exposure to high temperature, falls to the bottom of the tank, carrying with it the vegetable and other matters which were in suspension in the juice. After reposing some time, the clear juice is carefully decanted by means of a pipe fixed by a swivel joint to an outlet in the bottom of the tank, the upper end of the pipe being always kept at the surface of the liquor by a float attached to it. Thus clear liquor alone is run off, and the mud and cloudy liquor at the bottom of the tank are left undisturbed, and discharged separately as required.

In Australia a continuous juice separator is generally used, and preferred to ordinary subsiding or filtering tanks. It is a cylin- _ .. drical vessel about 6 ft. deep, fitted with a conical

jui'Je''''''' S DOttom °f about the same depth. Such a vessel is Seoarator conven > ent ly made of a diameter which will give the cylindrical portion sufficient capacity to hold the juice expressed from

the cane-mill in one hour. The hot liquor is con- ducted downwards' in a continuous steady stream by a central pipe to eight horizontal branches, from which it issues into the separator at the level of the junction of the cylindrical and conical portions of the vessel. Since the specific gravity of hot liquor is less than that of cold liquor and since the specific gravity of the scum and particles of solid matter in suspension varies so slightly with, the temperature that practically it remains constant, the hot liquor rises to the top of the vessel, and the scums and particles of solid matter in suspension separate themselves from it and fall to the bottom. By the mode of admission the hot liquor at its entry is distributed over a large area relatively to its volume, and while this is necessarily effected with but little disturbance to the contents of the vessel, a very slow velocity is ensured for the current of ascending juice. In a continuous separator of which the cylindrical portion measures 13 ft. in diameter and 6 ft. deep (a suitable size for treating a juice supply of 4000 to 4500 gallons per hour), the upward current will have a velocity of about I inch per minute, and it is found that all the impurities have thus ample time to separate themselves. The clear juice when it arrives at the top of the separator flows slowly over the level edges of p. cross canal and passes in a continuous stream to the service tanks of the evapo- rators or vacuum pan. The sloping sides of the conical bottom can be freed from the coating of scum which forms upon them every two or three hours by two rotatory scrapers, formed of L-irons, which can be slowly turned by an attendant by means of a central shaft provided with a suitable handle. The scums then settle down to the bottom of the cone, whence they are run off to the scum tank. Every twenty-four hours or so the flow of juice may be conveniently stopped, and, after all the impurities have subsided, the superincumbent clear liquor may be decanted by a cock placed at the side of the cone for the purpose, and the vessel may be washed out. These separators are carefully protected by non-conducting cement and wood lagging, and are closed at the top to prevent loss of heat ; and they will run for many hours without requiring to be changed, the duration of the run depending on the quality of the liquor treated and amount of impurities therein. Smaller separators of the same construction are used for the treatment of syrup.

In Cuba, Martinique, Peru and elsewhere the old-fashioned double-bottomed defecator is used, into which the juice is run n direct, and there limed and heated. This defecator is

Double- m ade with a hemispherical copper bottom, placed in Defecators an outer cast-iron casing, which forms a steam jacket, and is fitted with a cylindrical curb or breast above the bottom. If double-

bottomed defecators are used in sufficient number to allow an hour and a half to two hours for making each defecation, and if they are of a size which permits any one of them to be filled up by the cane-mill with juice in ten to twelve minutes, they will make as perfect a defecation as is obtainable by any known system; but their employment involves the expenditure of much high-pressure steam (as exhaust steam will not heat the juice quickly enough through the small surface of the hemispherical inner bottom), and also the use of filter presses for treating the scums. A great deal of skilled superintendence is also required, and first cost is comparatively large. When a sufficient number are not available for a two hours' defecation, it is the practice in some factories to

skim off the scums that rise to the top, and then boil up the juice for a few minutes and skim again, and, after repeating the operation once or twice, to run off the juice to separators or subsiders of any of the kinds previously described. In Java and Mauritius, where very clean canes are grown, double-bottomed defecators are generally used, and to them, perhaps as much as to the quality of the canes, may be attributed the very strong, fine sugars made in those islands. They are also employed in Egypt, being remnants of the plant used in the; days when the juice passed through bone-black before going to the evaporators.

A modification of the system of double-bottom defecators _has lately been introduced with considerable success in San Domingo and in Cyba, by which a continuous and steady discharge Contl of clear defecated juice is obtained on the one hand, and nefecaUaa on the other a comparatively hard dry cake of scum or cachaza, and without the use of filter presses. These results are brought about by adding to the cold juice as it comes from the mill the proper proportion of milk of lime set up at 8° B., and then delivering the limed juice in a constant steady stream as near the bottom of the defecator as possible; it is thus brought into immediate contact with the heating surface and heated once for all before it ascends, with the result of avoid- ing the disturbance caused in the ordinary defecator by pouring cold juice from above on to the surface of the heated juice, and 60 establishing down-currents of cold juice and up-currents of hot juice. In the centre of the defecator an open-topped cylindrical vessel is placed, with its bottom about 6 in. above the bottom of the defecator and its top about 12 in. below the top of the defecator. In this vessel is placed the short leg of a draw-off siphon, reaching to nearly the bottom. The action of the moderate heat, 210 F., on the limed juice causes the albumen in it to coagulate; this rising to the surface collects the cachazas, which form and float thereon. The clear juice in the meantime flows over the

edge of the cylindri- cal vessel without disturbance and finds its way out by the short leg of the siphon, and so passes to the canal for collecting the defecated juice. The admission of steam must be regulated with the greatest nicety, so as to maintain an equable temperature, 208 to 210 F., hot enough to act upon the albumen and yet not enough to cause ebullition or disturbance in the juice, and so prevent a proper separation of the cachazas. This is attained by the aid of a copper pipe, 4 in. in diameter, which follows the curve of the hemispherical bottom, and is fitted from one side to the other of the defecator; one end is entirely closed, and the other is connected by a small pipe to a shallow circular vessel outside the defecator, covered with an india-rubber diaphragm, to the centre of which is attached a light rod actuating a steam throttle-valve, and capable of being adjusted as to length, &c. The copper pipe and circular vessel are filled with cold water, which on becoming heated by the sur- rounding juice expands, and so forces up the india-rubber diaphragm and shuts off the steam. By adjusting the length of the connecting rod and the amount of water in the vessel, the amount of steam admitted can be regulated to a nicety. To make this apparatus more perfectly automatic, an arrangement for continually adding to and mixing with the juice the proper proportion of milk of lime has been adapted to it; and although it may be objected that once the proportion has been determined no allowance is made for the variation in the quality of the juice coming from the mill owing to the variations that may occur in the canes fed into the mills, it is obviously as easy to vary the proportion with the automatic arrangement from time to time as it is to vary in each separate direction, if the man in charge will take the trouble to do so,' which he very seldom does with the ordinary defecators, satisfying himself with testing the juice once or twice in a watch. The scums forming on the top of the continuous defecator become so hard and dry that they have to be removed from time to time with a specially constructed instrument like a flat spade with three flat prongs ip front. These scums are not worth passing through the filter presses, and are sent to the fields direct as manure.

The scums separated from the juice by ordinary defecation entangle and carry away with them a certain amount of the juice with its contained saccharine. In some factories they are collected in suitable tanks, and steam is blown into

Treatment of the

them, which further coagulates the albuminous par- „ tides. These in their upward passage to the top, “”” where they float, free themselves from the juice, which they leave below them comparatively clear. The

juice is then drawn off and pumped up to one of the double-bottomed defecators and redefecated, or, where juice-heaters have' been used instead of defecators, the scums from the separators or subsiders are heated and forced through filter presses, the juice expressed going to the evaporators and the scum cakes formed in the filter presses to the fields as manure.

In diffusion plants the milk of lime is added, in proper propor- tion, in the cells of the diffusion battery, and the chips or slices themselves act as a mechanical filter for the juice; while in the Sandwich Islands coral-sand filters have been employed for some years, in addition to the chips, to free the juice from impurities held in mechanical suspension. In Germany very similar filters have also been used, pearl-quartz gravel taking the place of coral sand, which it closely resembles. In Mexico filters filled with dry

powdered megass have been found very efficient for removing the large quantity of impurities contained in the juice expressed from the very vigorous but rank canes grown in that wonderfully fertile country, but unless constant care is taken in managing them, and in changing them at the proper time, there is great risk of inversion taking place, with consequent loss of sugar.

After the juice has been defecated or purified by any of the means above mentioned it is sent to the evaporating apparatus, hereinafter described, where it is concentrated to 26° or 28° 6eaum6, and is then conducted in a continuous stream either into the service tanks of the vacuum pan, if dark sugars are required, or, if a better colour is wanted, into clarifiers. The latter are circular or rectangular vessels, holding from 500 to 1500 gallons each, accord- ing to the capacity of the factory, and fitted with steam coils at the bottom and skimming troughs at the top. In them the syrup is quickly brought up to the boil and skimmed for about five minutes, when it is run off to the service tanks of the vacuum pans. The heat at which the syrup boils in the clarifiers, 220 F., has the property of separating a great deal of the gum still remaining in it, and thus cleansing the solution of sugar and water for crystalliza- tion in the vacuum pans; and if after skimming the syrup is run into separators or subsiders of any description, and allowed to settle down and cool before being drawn into the vacuum pan for crystalli- zation, this cleansing process will be more thorough and the quality of the final product will be improved. Whether the

improvement will be profitable or not to the planter or manufacturer depends on the market for the sugar, and on the conditions of foreign tariffs, which are not infrequently hostile.

Evaporation of the Juice to Syrup. — The third operation is the concentration of the approximately pure, but thin and watery, juice to syrup point, by driving off a portion of the water in vapour through some system of heating and evaporation. Since on an average 70 % by measurement of the normal defecated cane juice has to be evaporated in order to reduce it to syrup ready for final concentration and crystallization in the vacuum pan, and since to attain the same end as much as 90 to 95% of the volume of mixed juices has to be evaporated when maceration or imbibition is employed, it is clear that some more economical mode of evapora- tion is necessary in large estates than the open-fire batteries still common in Barbados and some of the West Indian islands, and in small haciendas in Central America and Brazil, but seldom seen elsewhere. With open-fire batteries for making the syrup, which was afterwards finished in the vacuum pan, very good sugar was produced, but at a cost that would be ruinous in to-day's markets. In the best days of the so-called Jamaica Trains in Demerara, three-quarters of a ton of coal in addition to the megass was burned per ton of sugar made, and with this for many years planters were content, because they pointed to the fact that in the central factories, then working in Martinique and Guadeloupe, with charcoal filters and triple-effect evaporation, 750 kilos of coal in addition to the megass were consumed to make 1000 kilos of sugar. All this has now been changed. It is unquestionably better and easier to evaporate in vacuo than in an open pan, and with a better system of firing, a more liberal provision of steam generators, and multiple-effect evaporators of improved construction, a far larger yield of sugar is obtained from the juice than was possible of attainment in those days, and the megass often suffices as fuel for the crop.

The multiple-effect evaporator, originally invented and con- structed by Norberto Rilleux in New Orleans in 1840, has under- gone many changes in design and construction since Multiple- t j, at year . The growing demand for this system of Btlecl evaporation for application in many other industries

Evaporators, ˆggjˆgg tnat f suga r has brought to the front a large number of inventors. Forgetful or ignorant of the great prin- ciple announced and established by Rilleux, they have mostly devoted their energies and ingenuity to contriving all sorts of complicated arrangements to give the juice the density required, by passing and repassing it over the heating surface of the apparatus, the saving of a

few square feet of which would seem to have been their main object. In some instances the result has been an addi- tional and unnecessary expenditure of high-pressure steam, and in all the well-known fact — of the highest importance in this connexion — appears to have been disregarded, that the shorter the time the juice is exposed to heat the less inversion will take place in it, and therefore the less will be the loss of sugar. But this competition among inventors, whatever the incentive, has not been without benefit, because to-day, by means of very simple improvements in details, such as the addition of circulators and increased area of connexions, what may be taken to be the standard type of multiple-effect evaporator (that is to say, vertical vacuum pans fitted with vertical heating tubes, through which passes the liquor to be treated, and outside of which the steam or vapour circu- lates) evaporates nearly double the quantity of water per square foot of heating surface per hour which was evaporated by apparatus in use so recently as 1885 — and this without any increase in the steam pressure. That evaporation in vacuo, in a multiple-effect evaporator, is advantageous by reason of the increased amount of sugar obtained from a given quantity of juice, and by reason of economy of fuel, there is no doubt, but

Howard's

Vacuum

Pan.

whether such an apparatus should be of double, triple, quadruple or quintuple effect will depend very much on the amount of juice to be treated per day, and the cost of fuel. Thus, supposing that 1000 lb of coal were required to work a single vacuum pan, evaporat- ing, say, 6000 lb of water in a given time, then 500 tt> of coal would be required for a double-effect apparatus to do the same work, 333 R> for a triple effect, 250 for a quadruple effect, and 200 lb for a quintuple effect. In some places where coal costs 60s. a ton, and where steam is raised by coal, as in a beetroot factory, it might pay to adopt a quintuple-effect apparatus, but on a cane-sugar estate, where the steam necessary for the evaporator is raised by burning the megass as fuel, and is first used in the engines working the mills, the exhaust alone passing to the evaporator, there would be very little, if anv, advantage in employing a quadruple effect instead of a triple effect, and practically none at all in having a quintuple-effect apparatus, for the interest and sinking fund on the extra cost would more than counterbalance the saving in fuel.

With the juice of some canes considerable difficulty is encountered in keeping the heating surfaces of the evaporators clean and free from incrustations, and cleaning by the use of acid has to be resorted to. In places where work is carried on day and night throughout the week, the standard type of evaporator lends itself more readily to cleaning operations than any other. It is obviously easier to brush out and clean vertical tubes open at both ends, and about 6 ft. long, on which the scale has already been loosened by the aid of boiling with dilute muriatic acid or a weak solution of caustic soda in water, than it is to clean either the inside or the outside_ of horizontal tuDes more than double the length. This consideration should be carefully remembered in the future by the planter who may require an evaporator and by the engineer who may be called upon to design or construct it, and more especially by a constructor without practical experience of the working of his constructions.

Concentration and Crystallization. — The defecated cane juice, having lost about 70% of its bulk by evaporation in the multiple- effect evaporator, is now syrup, and ready to enter the vacuum pan for further concentration and crystalliza- tion. In a patent (No. 3607, 1812) granted to E. C. Howard it is stated, among other things, that ” water dissolves the most uncrystallizable in preference to that which is mostcrystallizable sugar,” and the patentee speaks of ” a discovery I have made that no solution, unless highly concentrated, of sugar in water can without material injury to its colouring and crystalliz- ing power, or to both, be exposed to its boiling temperature during the period required to evaporate such solution to the crystallizing point.” He stated that ” he had made a magma of sugar and water at atmospheric temperature, and heated the same to 190° or 200 F. in a water or steam bath, and then added more sugar or a thinner magma, and the whole being then in a state of imperfect fluidity, but so as to close readily behind the stirrer, was filled into moulds and purged ” (drained). ” I do further declare,” he added, ” that although in the application of heat to the refining of sugar in my said invention or process I have stated and mentioned the tempera- ture of about 200 F. scale as the heat most proper to be used and applied in order to secure and preserve the colour and crystalliz- ability of the sugars, and most easily to be obtained with precision and uniformity by means of the water bath and steam bath, yet when circumstances or choice may render the same desirable I do make use of higher temperatures, although less beneficial.” Howard at any rate saw clearly what was one of the indispensable requisites for the economical manufacture of fine crystal sugar of good colour —•the treatment of saccharine solutions at temperatures very Con- siderably lower than 212 F.,

which is the temperature of water boil- ing at normal atmospheric pressure. Nor was he long in providing means for securing these lower temperatures. His patent (No. 3754 of 1813) describes the closed vacuum pan and the air pump with condenser for steam by injection, the use of a thermometer immersed in the solution in the pan, and a method of ascertaining the density of the solution with a proof stick, and by observations of the temperature at which, while fluid and not containing grain, it could be kept boiling under different pressures shown by a vacuum gauge. A table is also given of boiling points from 115 F. to 1 75° F., corresponding to decimal parts of an inch of mercury of the vacuum gauge. Since Howard published his invention the vacuum pan has been greatly improved and altered in shape and power, and especially of recent years, and the advantages of concen- trating in vacuo having been acknowledged, the system has been adopted in many other industries, and crowds of inventors have turned their attention to the principle. In endeavouring to make a pan of less power do as much and as good work as one of greater power, they have imagined many ingenious mechanical contrivances, such as currents produced mechanically to promote evaporation and crystallization, feeding the pan from many points in order to spread the feed equally throughout the mass of sugar being cooked, and so on. All their endeavours have obtained at best but a doubtful success, for they have overlooked the fact that to evaporate a given weight of water from the syrup in a vacuum pan at least an equal weight (or in practice about 15% more) of steam must be condensed, and the first cost of mechanical agitators, together' with the expenditure they involve for motive power and

maintenance, must be put against the slight saving in the heating surface effected by their employment. On the other hand, the advocates of admitting the feed into a vacuum pan in many minute streams appeal rather to the ignorant and incompetent sugar- boiler than to a man who, knowing his business thoroughly, will boil 150 tons of hot raw sugar in a pan in a few hours, feeding it through a single pipe and valve 10 in. in diameter. Nevertheless, it has been found in practice, when syrups with low quotient of purity and high quotient of impurity are being treated, injecting the feed at a number of different points in the pan does reduce the time required to boil the pan, though of no practical advantage with syrups of high quotient of purity and free from the viscosity which impedes circulation and therefore quick boiling. Watt, when he invented the steam engine, laid

down the principles on which it is based, and they hold good to the present day. So also the prin- ciples laid down by Howard with respect to the vacuum pan hold good to-day : larger pans have been made and their heating surface has been increased, but it has been found by practice now, as it was found then, that an ordinary worm or coil 4 in. in diameter and 50 ft. long will be far more efficient per square foot of surface than a similar coil 100 ft. long. Thus the most efficient vacuum pans of the present day are those which have their coils so arranged that no portion of them exceeds 50 or 60 ft. in length; with such coils, and a sufficient annular space in the pan free from obstruction, in order to allow a natural down-current of the cooking mass, while an up-current all round is also naturally produced by the action of the heated worms or coils, rapid evaporation and crystallization can be obtained, without any mechanical adjuncts to require attention or afford excuse for negligence.

The choice of the size of the crystals to be produced in a given pan depends upon the market for which they are intended. It is of course presupposed that the juice has been properly defecated, because without this no amount of skill and knowledge in cooking in the pan will avail; the sugar resulting must be bad, either in colour or grain, or both, and certainly in polarizing power. If a very large firm grain like sugar-candy is required the syrup when first brought into the pan must be of low density, say 20 to 21° Beaume, but if a smaller grain be wanted it can easily be obtained from syrup of 27 ° to 28 Beaume. On some plantations making sugar for particular markets and use in refineries it is the custom to make only one class of sugar, by boiling the molasses produced by the purging of one strike with the sugar in the next strike. On other estates the second sugars, or sugars produced from boil- ing molasses alone, are not purged to dryness, but when sufficiently separated from their mother-liquor are mixed with the defecated juice, thereby increasing its saccharine richness, and after being converted into syrup in the usual manner are treated in the vacuum pan as first sugars, which in fact they really are.

In certain districts, notably in the Straits Settlements, syrup is prepared as described above for crystallization in a vacuum pan, but instead of being cooked in vacuo it is slowly hoiled up in open double-bottom pans. These pans are sometimes heated by boiling oil, with the idea that under such conditions the sugar which is kept stirred all the time as it thickens cannot be burnt or caramel- ized ; but the same object can be attained more economically with steam of a given pressure by utilizing its latent heat. The sugar thus produced, by constant stirring and evaporation almost to dryness, forms a species of small-grained concrete. It is called ” basket sugar,” and meets with a

brisk sale, at remunerative prices, among the Chinese coolies; and as the sugar as soon as cooled is packed ready for market, without losing any weight by draining, this branch of sugar-making is a most lucrative one where- ever there is sufficient local demand. Very similar kinds of sugar are also produced for local consumption in Central America and in Mexico, under the names of ” Panela ” and ” Chancaca,” but in those countries the sugar is generally boiled in pans placed over special fire-places, and the factories making it are on a comparatively small scale, whereas in the Straits Settlements the ” basket sugar ” factories are of considerable importance, and are fitted with the most approved machinery.

Curing or Preparation of Crystals for the Market. — The crystal- lized sugar from the vacuum pan has now to be separated from the molasses or mother-liquor surrounding the crystals. In some parts of Mexico and Central America this separation is still effected by running the sugar into conical moulds, and placing on the top a layer of moist clay or earth which has been kneaded in a mill into a stiff paste. The moisture from the clay, percolating through the mass of sugar, washes away the adhering molasses and leaves the crystals comparatively free and clear. It may be noted that sugar that will not purge easily and freely with clay will not purge easily and freely in centrifugals. But for all practical purposes the system of claying sugar is a thing of the past, and the bulk of the sugar of commerce is now purged in centrifugals, as indeed it has been for many years. The reason is obvious. The claying system involved the expense of large curing houses and the em- ployment of many hands, and forty days at least were required for completing the operation and making the sugar fit for the market, whereas with centrifugals sugar cooked to-day can go to market to- morrow, and the labour employed is reduced to a minimum.

When Cuba was the chief sugar-producing country making clayed sugars it was the custom (followed in refineries and found advan- tageous in general practice) to discharge the strike of crystallized sugar from the vacuum pan into a receiver heated below by steam, and to stir the mass for a certain time, and then distribute it into the moulds in which it was afterwards clayed. When centrifugals were adopted for purging the whole crop (they had long been used for curing the secona or third sugars), the system then obtaining of running the sugar into wagons or coolers, which was necessary for the second and third sugars cooked only to string point, was continued, but latterly ” crystallization in movement,” a develop- ment of the system which forty years ago or more existed in refineries and in Cuba, has come into general use, and with great advantage, especially where proprietors have been able to erect appropriate buildings and

machinery for carrying out the system efficiently. The vacuum pan is erected at a height which commands the crystal- lizers, each of which will, as in days gone by in Cuba, hold the con- tents of the pan, and these in their turn are set high enough to allow the charge to fall into the feeding-trough of the centrifugals, thus obviating the necessity of any labour to remove the raw sugar from the time it leaves the vacuum pan to the time it falls into the centrifugals. For this reason alone, and without taking into consideration any increase in the yield of sugar brought about by ” crystallization in movement,” the system is worthy of adoption in all sugar factories making crystal sugar.

The crystallizers are long, horizontal, cylindrical or semi-cylin- drical vessels, fitted with a strong horizontal shaft running from end to end, which is kept slowly revolving. The shaft „

carries arms and blades fixed in such a manner that JJ 1 ˆ the mass of sugar is quietly but thoroughly moved, _ ‘“era- while at the same time a gentle but sustained evaporation is pro- duced by the continuous exposure of successive portions of the mass to the action of the atmosphere. Thus also the crystals already formed come in contact with fresh mother-liquor, and so go on adding to their size. Some crystallizers are made entirely cylin- drical, and are connected to the condenser of the vacuum pan; in order to maintain a partial vacuum in them, some are fitted with cold-water pipes to cool them and with steam pipes to heat them, and some are left open to the atmosphere at the top. But the efficiency of all depends on the process of almost imperceptible yet continuous evaporation and the methodical addition of syrup, and not on the idiosyncrasies of the experts who manage them; and there is no doubt that in large commercial processes of manu- facture the simpler the apparatus used for obtaining a desired result, and the more easily it is understood, the better it will be for the manufacturer. The sugar made from the first syrups does not require a crystallizer in movement to prepare it for purging in the centrifugals, but it is convenient to run the strike into the crystallizer and so empty the pan at once and leave it ready to commence another strike, while the second sugars will be better for twenty-four hours’ stirring and the third sugars for forty-eight hours’ stirring before going to the centrifugals. To drive these machines electricity has been applied, with indifferent success, but they have been very efficiently driven, each independently of the others in the set, by means of a modification of a Pelton wheel, supplied with water under pressure from a pumping engine. A comparatively small stream strikes the wheel with a pressure equivalent to a great head, say 300 ft., and as the quantity of water and number of jets striking the wheel can be regulated with the greatest ease and nicety, each machine can without

danger be quickly brought up to its full speed when purging high-class sugars, or allowed to run slowly when purging low-class sugars, until the heavy, gummy molasses have been expelled; and it can then be brought up to its full speed for finally drying the sugar in the basket, a boon which all practical sugar-makers will appreciate. The water forced by the force-pump against the Pelton wheels returns by a waste-pipe to the tank, from which the force-pump takes it again.

Recent Progress. — The manufacture of cane sugar has largely increased in volume since the year 1901-1902. This, apart from the effect of the abolition of the sugar bounties, has been mainly the result of the increased employment of improved processes, carried on in improved apparatus, under skilled supervision, and with due regard to the importance of the chemical aspects of the work.

Numerous central factories have been erected in several countries with plant of large capacity, and many of them work day and night for six days in the week. There were 173 of these central factories working in Cuba in 1908-1909, among which Factories the "Chaparra," in the province of Oriente, turned, out upwards of 69,000 tons of sugar in the crop of about 20 weeks, and the " Boston " had an output of about 61,000 tons in the same time. Of the 178 factories at work in Java in 1908- 1909, nearly all had most efficient plant for treating the excellent canes grown in that favoured island. (See Jaarboek voor suiker- fabrikanten op Java, 13″ Jaargang IQ08-IQ09, pp. 22-61 Amster- dam, J. H. de Bussy.) The severance of the agricultural work, i.e. cane-growing, from the manufacturing work, sugar-making, must obviously conduce to better and more profitable work of both kinds.

The use of multiple-effect evaporation made it possible to raise the steam for all the work required to be done in a well-equipped factory, making crystals, under skilful management, by means of the bagasse alone proceeding from the

Green Bagasse as

PurHIca' Hon.

P eL canes ground, without the aid of other fuel. The bagasse

" so used is now commonly taken straight from the cane

mill to furnaces specially designed for burning it, in its moist state and without previous drying, and delivering the hot gases from it to suitable boilers, such as those of the multitubular type or of the water-tube type. The value of fresh bagasse, or as it is often called ” green ” bagasse, as fuel varies with the kind of canes from which it comes, with their treatment in the mill, and with the skill used in firing; but it may be stated broadly that 1 lb of fresh bagasse will produce from 1$ lb to 2\ lb of steam, according to the conditions.

The use of preparing rolls with corrugations, to crush and equalize the feed of canes to the mill, or to the first of a series of mills, has E tract In become general. The Krajewski crusher has two such of J ice ” stee ‘ ro ” s > w ‘ tn V-shaped corrugations extending longi- tudinally across them. These rolls run at a speed about 30% greater than the speed of the first mill, to which they deliver the canes well crushed and flattened, forming a close mat of pieces of cane 5 to 6 in. long, so that the subsequent grinding can be carried on without the stoppages occasioned by the mill choking with a heavy and irregular feed. The crusher is preferably driven by an independent engine, but with suitable gearing it can be driven by the mill engine. The Krajewski crusher was invented some years ago by a Polish engineer resident in Cuba, who took out a patent for it and gave it his name. The patent has expired. The increase in the output for a given time obtained by the use of the Krajewski crusher has been estimated at 20 to 25 % and varies with the quality of the canes; while the yield of juice or extraction is increased by 1 or 2%.

The process of continuous defecation which was introduced into Cuba from Santo Domingo about 1900 had by 1910 borne the test of some ten years’ use with notable success. The Hatton defecator, which is employed for working it, has been already described, but it may be mentioned that the regulation of the admission of steam is now simplified and secured by a patent thermostat — a selt-acting apparatus in which the unequal expansion of different metals by heat actuates, through compressed air, a diaphragm which controls the steam step-valve — and by this means a constant temperature of 210 F. (98-8° C.) is maintained in the juice within the defecator during the whole time it is at work.

Earthy matter and other matter precipitated and fallen on the copper double bottom may be dislodged by a slowly revolving scraper — say every twelve hours — and ejected through the bottom discharge cock; and thus the heating surface of the copper bottom will be kept in full efficiency. With ordinary care on the part of the men in charge Hatton defecators will work continuously for several days and nights, and the

number required to deal with a given volume of juice is half the number of ordinary defecators of equal capacity which would do the same work; for it must be borne in mind that an ordinary double-bottomed defecator takes two hours to deliver its charge and be in readiness to receive a fresh charge, i.e. 20 minutes for filling and washing out after empty- ing; 60 minutes for heating up and subsiding; and 40 minutes for drawing off the defecated juice, without agitating it. Apart from increased yield in sugar of good quality, we may sum up the advantages procurable from the use of Hatton defecators as follows: cold liming; heating gently to the temperature required to coagulate the albumen and not beyond it, whereby disturbance would ensue; the continuous separation of the scums; the gradual drying of the scums so as to make them ready for the fields, without carrying away juice or requiring treatment in filter presses; and the con- tinuous supply of hot defecated juice to the evaporators, without the use of subsiding tanks or eliminators; and, finally, the saving in expenditure on plant, such as filter presses, &c, and wages.

Beetroot Sugar Manufacture. — The sugar beet is a cultivated variety of Beta maritima (nat. ord. Chenopodiaceae), other varieties of which, under the name of mangold or mangel-wurzel, are grown as feeding roots for cattle.

About 1760 the Berlin apothecary Marggraff obtained in his laboratory, by means of alcohol, 6-2% of sugar from a white variety of beet and 4-5% from a red variety. At the present day, thanks to the careful study of many years, the improve- ments of cultivation, the careful selection of seed and suitable manuring, especially with nitrate of soda, the average beet worked up contains 7% of fibre and 93% of juice, and yields in Germany 12-79% and in France 11 6% of its weight in sugar. In Great Britain in 1910 the cultivation of beet for sugar was being seriously undertaken in Essex, as the result of careful consideration during several years. The pioneer experi ments on Lord Denbigh's estates at Newnham Paddox, in

Warwickshire, in 1900, had produced excellent results, both in respect of the weight of the beets per acre and of the saccharine value and purity of the juice. The average weight per acre was over 2 si tons, and the mean percentage of pure sugar in the juice exceeded 15ˆ. The roots were grown under exactly the same cultivation and conditions as a crop of mangel-wurzel — that is to say, they had the ordinary cultivation and manuring of the usual root crops. The weight per acre, the saccharine contents of the juice, and the quotient of purity compared favourably with the best results obtained in Germany or France, and with those achieved by the Suffolk farmers, who between

1868 and 1872 supplied Mr Duncan's beetroot sugar factory at Lavenham; for the weight of their roots rarely reached 15 tons per acre, and the percentage of sugar in the juice appears to have varied between 10 and 12. On the best-equipped and most skilfully managed cane sugar estates, where the climate is favourable for maturing the cane, a similar return is obtained. Therefore, roughly speaking, one ton of beetroot may be con- sidered to-day as of the same value as one ton of canes; the value of the refuse chips in one case, as food for cattle, being put against the value of the refuse bagasse, as fuel, in the other. Before beetroot had been brought to its present state of per- fection, and while the factories for its manipulation were worked with hydraulic presses for squeezing the juice out of the pulp produced in the raperies, the cane sugar planter in the West Indies could easily hold his own, notwithstanding the artificial competition created and maintained by sugar bounties. But the degree of perfection attained in the cultivation of the roots and their subsequent manipulation entirely altered this situa- tion and brought about the crisis in the sugar trade referred to in connexion with the bounties (see History below) and dealt with in the Brussels convention of 1902.

In beetroot sugar manufacture the operations are washing, slicing, diffusing, saturating, sulphuring, evaporation, concentration and curing.

Slicing. — The roots are brought from the fields by carts, canals and railways. They are weighed and then dumped into a washing machine, consisting of a large horizontal cage, submerged in water, in which revolves a horizontal shaft carrying arms. The arms are set in a spiral form, so that in revolving they not only stir the roots, causing them to rub against each other, but also force them forward from the receiving endjof the cage to the other end. Here they are discharged (washed and freed from any adherent soil) into an elevator, which carries them up to the top of the building and delivers them into a hopper feeding the slicer. SHcers used to be constructed with iron disks about 33 to 40 in. diameter, which were fitted with knives and made 140 to 150 revolutions per minute, under the hopper which received the roots. This hopper was divided into two parts by vertical division plates, against the bottom edge of which the knives in the disk forced the roots and sliced and pulped them. Such machines were good enough when the juice was expelled from the small and, so to speak, chopped slices and pulp by means of hydraulic presses. But hydraulic presses have now been abandoned, for the juice is universally obtained by diffusion, and the small slicers have gone out of use, because the large amount of pulp they produced in proportion to slices is not suitable for the diffusion process, in which evenly cut slices are required,

which present a much greater surface with far less resistance to the diffusion water. Instead of the small slicers, machines made on the same principle, but with disks 7 ft. and upwards in diameter, are used. Knives are arranged around their circumference in such a way that the hopper feeding them presents an annular opening to the disk, say 7 ft. outside diameter and 5 ft. inside, with the necessary division plates for the knives to cut against, and instead of making 140 to 150 revolutions the disks revolve only 60 to 70 times per minute. Such a slicer is capable of efficiently slicing 300,000 kilos of roots in twenty-four hours, the knives being changed four times in that period, or oftener if required, for it is necessary to change them the moment the slices show by their rough appearance that the knives are losing their cutting edges.

Diffusion. — The diffusion cells are closed, vertical, cylindrical vessels, holding generally 60 hectolitres, or 1320 gallons, and are arranged in batteries of 12 to 14. Sometimes the cells are erected in a circle, so that the spout below the slicing machine revolving above them with a corresponding radius can discharge the slices into the centre of any of the cells. In other factories the cells are arranged in lines and are charged from the slicer by suitable telescopic pipes or other convenient means. A circular disposition of the cells facilitates charging by the use of a pipe rotating above them, but it renders the disposal of the hot spent slices somewhat

difficult and inconvenient. The erection of the cells in straight lines may cause some little complication in charging, but it allows the hot spent slices to be discharged upon a travelling band which takes them to an elevator, an arrangement simpler than any which is practicable when the cells are disposed in a circle. Recently, however, a well-known sugar maker in Germany has altered his battery in such manner that instead of having to open a large door below the cells in order to discharge them promptly,_ he opens a comparatively small valve and, applying compressed air at the top of the cell, blows the whole contents of spent slices up a pipe to the drying apparatus, thus saving not only a great deal of time but also a great deal of labour of a kind which is both arduous and painful, especially during cold weather. The slices so blown up, or elevated, are passed through a mill which expels the surplus water, and are then pressed into cakes and dried until they hold about 12% of water and 88% of beet fibre. These cakes, sold as food for cattle, fetch as much as £4 per ton in

Rumania, where four or five beetroot factories are now at work. A cell when filled with fresh slices becomes the head of the battery, and where skilled scientific control can be relied upon to regulate the process, the best and most economical way of heating the slices, previous to admitting the hot liquor from the next cell, is by direct steam; but as the slightest inattention or carelessness in the admission of direct steam might have the effect of inverting sugar and thereby causing the loss of some portion of saccharine in the slices, water heaters are generally used, through which water is passed and heated up previous to admission to the freshly-filled cell. When once a cell is filled up and the slices are warmed through, the liquor from the adjoining cell, which hitherto has been running out of it to the saturators, is turned into the new cell, and beginning to displace the juice from the fresh slices, runs thence to the saturators. When the new cell comes into operation and becomes the head of the battery, the first or tail cell is thrown out, and number two be- comes the tail cell, and so the rounds are repeated; one cell is always being emptied and one filled or charged with slices and heated up, the latter becoming the head of the battery as soon as it is ready.

Saturation. — The juice, previously treated with lime in the diffusion battery, flows thence into a saturator. This is a closed vessel, into which carbonic acid gas (produced as described here- after) is forced, and combining with the lime in the juice forms carbonate of lime. The whole is then passed through filter presses, the clear juice being run off for further treatment, while the carbon- ate of lime is obtained in cakes which are taken to the fields as manure. The principal improvement made of recent years in this portion of the process has been the construction of pipes through which the carbonic acid gas is injected into the juice in such a manner that they can be easily withdrawn and a clean set substituted. The filter presses remain substantially unchanged, although many ingenious but slight alterations have been made in their details. The juice, which has now become comparatively clear, is again treated with lime, and again passed through a saturator and filter presses, and comes out still clearer than before. It is then treated with sulphurous acid gas, for the purpose of decolorization, again limed to neutralize the acid, and then passed through a third saturator wherein all traces of lime and sulphur are removed.

A process for purifying and decolorizing the juice expressed from beetroots by the addition of a small quantity of manganate of lime (20 to 50 grammes per hectolitre of juice), under the influence of an electric current, was worked with considerable success in a sugar factory in the department of Seine-et-Marne in the year 1900-1901. A

saving of 40% is stated to be effected in lime. The use of sulphurous acid gas is entirely abandoned, and instead of three carbonatations with corresponding labour and plant only one is required. The coefficient of purity is increased and the viscosity of the juice diminished. The total saving effected is stated to be equivalent to 3 francs per ton of beetroot worked up. This system is also being tried on a small scale with sugar-cane juice in the West Indies. If by this process a more perfect defeca- tion and purification of the juice is obtained, it will no doubt be highly beneficial to the cane planter, though no great economy in lime can be effected, because but very little is used in a cane factory in comparison with the amount used in a beet factory.

Evaporation and Crystallization. — The clear juice thus obtained is evaporated in a multiple-effect evaporator and crystallized in a vacuum pan, and the sugar is purged in centrifugals. From the centrifugal the sugar is either turned out without washing as raw sugar, only fit for the refinery, or else it is well washed with a spray of water and air until white and dry, and it is then offered in the market as refined sugar, although it has never passed through animal charcoal (bone-black). The processes of evaporation and concentration are carried on as they are in a cane sugar factory, but with this advantage, that the beet solutions are freer from gum and glucose than those obtained from sugar-canes, and are therefore easier to cook.

Curing. — There are various systems of purging refined, or so- called refined, sugar in centrifugals, all designed with a view of obtaining the sugar in lumps or tablets, so as to appear as if it had been turned out from moulds and not from centrifugals, and great

ingenuity and large sums of money have been spent in perfecting these different systems, with more or less happy results. But the great achievement of recent manufacture is the production, without the use of animal charcoal, of a cheaper, but good and wholesome article, in appearance equal to refined sugar for all intents and purposes, except for making preserves of fruits in the old-fashioned way. The wholesale jam manufacturers of the present day use this sugar; they boil the jam in vacuo and secure a product that will last a long time without deteriorating, but it lacks the delicacy and distinctive flavour of fruit preserved by a careful housekeeper, who boils it in an open pan with cane sugar to a less density, though exposed for a short time to a greater heat.

Carbonatation. — The carbonic acid gas injected into the highly limed juice in the saturators is made by the calcination of limestone in a kiln

provided with three cleaning doors, so arranged as to allow the lime to be removed simultaneously from them every six hours. The gas generated in the kiln is taken off at the top by a pipe to a gas-washer. In this it passes through four sheets of water, by which it is not only freed from any dust and dirt that may have come over with it from the kiln, but is also cooled to a temperature which permits an air-pump to withdraw the gas from the kiln, through the gas- washer, and force it into the saturators, without overheating. In some factories for refining sugar made from beet or canes this system of carbonatation is used, and en- ables the refiner to work with syrups distinctly alkaline and to economize a notable amount of animal charcoal.

Refining. — Briefly, sugar-refining consists of melting raw or unrefined sugar with water into a syrup of 27 to 28 Beaume, or 1230 specific gravity, passing it through filtering cloth to remove the sand and other matters in mechanical suspension, and then through animal charcoal to remove all traces of colour- ing matter and lime, thus producing a perfectly clear white syrup, which, cooked in the vacuum pan and crystallized, becomes the refined sugar of commerce.

Melting Pans.— The melting pans are generally circular vesselsi fitted with a perforated false bottom, on which the sugar to be melted is dumped. The pans are provided with steam worms to keep the mass hot as required, and with mechanical stirrers to keep it in movement and thoroughly mixed with the water and sweet water which are added to the sugar to obtain a solution of the specific gravity desired. Any sand or heavy matter in suspension is allowed to fall to the bottom of the pan into the ” sandbox ” before the melted sugar is run off to the cloth filters. In a process employed with great success in some refineries the raw sugars are washed before being melted, and thus a purer article is obtained for subsequent treatment. In this process the raw sugar is mixed with a small amount of syrup so as to form a suitable magma, and is then run into a continuous centrifugal, where it is sufficiently washed, and from which it runs out, com- paratively clean, into the melting pans described above.

Filters.— Taylor bag filters are generally used for clearing the melted liquor of its mechanical impurities. They were introduced years ago by the man whose name they still retain, but they are very different in construction to-day from what they were when first employed. They consist of tanks or cisterns fitted with ” heads” from which a number of bags of specially woven cloth are suspended in a suitable manner, and into which the melted sugar or liquor to be filtered flows from the melting pans. The bags, though 60 in. or more in circumference, are folded up in such a way that a sheath about 15 in. in circumference

can be passed over them. Thus a maximum of filtering surface with a minimum of liquor in each bag is obtained, and a far greater number of bags are got into a given area that would otherwise be possible, while the danger of bursting the bags by leaving them unsupported is avoided. As the liquor goes on filtering through the bags they gradually get filled up with slime and sludge, and the clear liquor ceases to run. Steam is then turned on to the outside of the bags and sheaths, and hot water is run through them to wash out all the sweets they contain. Large doors at the side of the cistern are then opened, and as soon as the bags are cool enough they are removed at the expense of very exacting labour and considerable time, and fresh bags and sheaths are fixed in their places ready for filtering fresh liquor. The dirty bags and sheaths are then washed, mangled arid dried, and made ready for use again. In a refinery in Nova Scotia a system has been introduced by which a travelling crane above the bag filters lifts up any head bodily with all its bags attached, and runs it to the mud and washing tanks at the end of the battery, while another similar crane drops another head, fitted with fresh bags, into the place of the one just removed. The whole operation of thus changing a filter occupies about ten minutes, and there is no need for anyone to enter the hot cistern to detach the bags, which are removed in the open air above the mud tank. By this arrangement the work of a refinery can be carried on with about one-half the cisterns otherwise required, because, although it does not reduce the number of bags required per day for a given amount of work, it enables the refiner to use one cistern twice a day with

fresh bags, instead of only once as heretofore. In some refineries the travelling cranes are now run by electricity, which still further facilitates the work. Another method of enabling more work to be done in a given time in a given cistern is the use of a bag twice the ordinary length, open at both ends. This, being folded and placed in its sheath, is attached by both ends to the head, so that the melted liquor runs into both openings at the same time. The mud collects at the bottom of the (j, and allows the upper part of the bag to filter for a longer time than would be the case if the bottom end were closed and if the bag hung straight like the letter |.

The clear, bright syrup coming from the bag filters passes to the charcoal cisterns or filters. These are large cylindrical vessels from 20 to 50 ft. high, and of such diameter as to hold a given quantity of

animal charcoal (also called ” bone-black ” and ” char “) in proportion to the contemplated output of the refinery. A very usual size of cistern forming a convenient unit is one that will hold 20 tons of char. Each cistern is fitted with a perforated false bottom, on which a blanket or specially woven cloth is placed, to receive the char which is poured in from the top, and packed as evenly as possible until the cistern is filled. The char is then ” settled ” by water being slowly run on to it, in order to prevent the syrup making channels for itself and not permeating the whole mass evenly. The cistern being thus packed and settled is closed, and the syrup from the bag filters, heated up to nearly boiling point, is admitted at the top until the cistern is quite full. A small pipe entering below the false bottom allows the air in the cistern to escape as it is displaced by the water or syrup. In some refineries this pipe, which is carried up to a higher level than the top of the cistern, is fitted with a whistle which sounds as long as the air escapes. When the sound ceases the cistern is known to be full, and the entrance of further water or syrup is stopped. The syrup in the cistern is allowed to remain for about twelve hours, by which time the char will have absorbed all the colouring matter in it, as well as the lime. A cistern well packed with 20 tons of char will hold, in addition, about 10 tons of syrup, and after settling, this can be pressed out by allowing second quality syrup, also heated to nearly boiling point, to enter the cistern slowly from the top, or it may be pressed out by boiling water. By carefully watching the flow from the discharge cock of the cistern the change from the first liquor to the next is easily detected, and the discharge is diverted from the canal for the first liquor to the canal for the second liquor, and, when required, to the canals for the third and fourth liquors. Finally, boiling water is admitted and forces out all the last liquor, and then continues to run and wash out the sweets until only a trace remains. This weak solution, called ” sweet water,” is sometimes used for melt- ing the raw sugar, or it is evaporated in a multiple-effect apparatus to 27° Beaume density, passed through the char filter, and cooked in the vacuum pan like the other liquors. After the sweets have come away, cold water is passed through the char until no trace of lime or sulphate of lime is found in it; then a large manhole at the bottom of the cistern is opened, and the washed and spent char is removed. In most modern refineries the cisterns are so arranged that the spent char falls on to a travelling band and is conducted to an elevator which carries it up to the drying floor of the charcoal kiln.

Retorts for Reburning Char. — The kilns are made with either fixed or revolving retorts. The former perhaps produce a little better char, but the latter, working almost automatically, require less labour and

attention for an equal amount of work, and on the whole have proved very satisfactory. From the drying floor on which the spent char is heaped up it falls by gravitation into the retorts. These are set in a kiln or oven, and are kept at as even a tempera- ture as possible, corresponding to a dull cherry-red. Below each retort, and attached to it, is a cooler formed of thin sheet-iron, which receives the hot char as it passes from the retort, and at the bottom of the cooler is an arrangement of valves which permits a certain amount of char to drop out and no more. With the fixed retorts these valves are worked from time to time by the attendant, but with revolving retorts they are worked continuously and automatically and allow from sixteen to twenty-four ounces of char to escape per minute from each cooler, and so make room in the retort above for a corresponding quantity to enter from the drying floor. The reburnt and cooled char is collected and 6ent back to the char cisterns. In the best-appointed refineries, the whole of the work in connexion with the char is performed mechani- cally, with the exception of packing the filter cisterns with fresh char and emptying the spent and washed char on to the carrying bands. In former days, when refining sugar or ” sugar baking ” was supposed to be a mystery only understood by a few of the initiated, there was a place in the refinery called the ” secret room,” and this name is still used in some refineries, where, how- ever, it applies not to any room, but to a small copper cistern, constructed with five or six or more divisions or small canals, into which all the charcoal cisterns discharge their liquors by pipes led up from them to the top of the cistern. E«ch pipe is fitted with a cock and swivel, in such a manner that the liquor from the cistern can be turned into the proper division according to its quality.

Vacuum Pans and Receivers.— The filtered liquors, being collected in the various service tanks according to their qualities, are drawn up into the vacuum pans and boiled to crystals. These are then discharged into large receivers, which are generally fitted with stirrers, and from the receivers the cooked mass passes to the centrifugal machines. As in the beetroot factories, these machines work on different systems, but nearly all are arranged to turn out sugar in lumps or tablets presenting an appearance similar to that of loaf sugar made in moulds, as this kind of sugar meets with the greatest demand. Granulated sugar, so called, is made by passing the crystals, after leaving the centrifugals, through a large and slightly inclined revolving cylinder with a smaller one inside heated Dy steam. The sugar fed into the upper end of the cylinder gradually works its way down to the lower, showering itself upon the heated central cylinder. A fan blast enters the lower end, and, passing out at the

upper end, carries off the vapour produced by the drying of the sugar, and at the same time assists the evapora- tion. The dry sugar then passes into a rotating screen fitted with two meshes, so that three grades of sugar are obtained, the coarsest being that which falls out at the lower end of the revolving screen.

Recent Improvements. — Systematic feeding for the vacuum pan and systematic washing of the massecuite have been recently introduced not only into refineries, but also into sugar houses or factories on plantations of both cane and beetroot, and great advantages have resulted from their employment. The first- mentioned process consists of charging and feeding the vacuum pan with the richest syrup, and then as the crystals form and this syrup becomes thereby less rich the pan is fed with syrup of lower richness, but still of a richness equal to that of the mother-liquor to which it is added, and so on until but little mother-liquor is left, and that of the poorest quality. The systematic washing of the massecuite is the reverse of this process. When the massecuite, well pugged and prepared for purging, is in the centrifugals, it is first washed with syrup of low density, to assist the separation of mother-liquor of similar quality, this washing being supple- mented by the injection of pure syrup of high density, or ‘ clairce,” when very white sugar is required. The manufacturers who have adopted this system assert that, as compared with other methods, not only do they obtain an increased yield of sugar of better quality, but that they do so at a less cost for running their machines and with a reduced expenditure in sugar and ” clairce.” ” Clairce ” is the French term for syrup of 27° to 30 Beaume specially prepared from the purest sugar.

Apart from modifications in the details of sugar refining which have come into use in late years, it should be mentioned that loaf sugar made in conical moulds, and sugars made otherwise, to re-* semble loaf sugar, have practically disappeared from the trade, having been replaced by cube sugar, which is found to be more economical as subject to less waste by grocers and housekeepers, and also less troublesome to buy and sell. Its manufacture was introduced into England many years ago by Messrs Henry Tate & Sons, and they subsequently adopted and use now the improved process and apparatus patented in March 1890 by M Gustave Adant, a foreman sugar refiner of Brussels.

The following is a brief description of the process and apparatus, as communicated by the courtesy of Messrs Henry Tate & Sons, Ltd. : Groups of cells or moulds are built within and against a cylindrical iron casing, by means of vertical plates inserted in grooves and set

radially to the axis of the casing. Each cell is of suitable dimen- sions to turn out a slab of sugar about 14 in. long — this being about the height of the cell — and about 8 in. wide and about \ in. to I in. thick. By means of a travelling crane the casing is placed within an iron drum, to which it is secured, and is then brought under an overhead vacuum pan, from which the cells are filled with massecuite. After cooling, the casing is lifted out of the drum by a crane, assisted by compressed air, and is then con- veyed by a travelling crane to a vertical centrifugal, inside of which it is made fast. Suitable provision is made for the egress of syrup from the massecuite in the cells when undergoing purging in the centrifugal; and the washing of the crystals can be aided by the injection of refined syrup and completed by that of "claircе." When this is done, the casing is hoisted out of the centrifugal and the vertical plates and the slabs of sugar are extracted. The slabs are sent by a conveyor to a drying stove, whence they issue to pass through a cutting machine, provided with knives so arranged that the cutting takes place both downwards and upwards, and here the slabs are cut into cubes. The cubes fall from the cutting machine on to a riddling machine, which separates those which are defective in size from the rest. These latter pass to automatic weighing machines, which drop them, in quantities of I cwt., into wooden boxes of uniform measurement, made to contain that weight; and the boxes are then conveyed to the storehouse, ready for sale.

History and Statistics. — Strabo xv. i. 20, has an inaccurate notice from Nearchus of the Indian honey-bearing reed, and various classical writers of the first century of our era notice the sweet sap of the Indian reed or even the granulated salt- like product which was imported from India, or from Arabia

and Opone (these being entrep6ts' of Indian trade), 1 under the name of saccharum or crdKxapt (from Skr. sarkara, gravel, sugar), and used in medicine. The art of boiling sugar was known in Gangetic India, from which it was carried to China in the first half of the 7th century; but sugar refining cannot have then been known, for the Chinese learned the use of ashes for this purpose only in the Mongol period, from Egyptian visitors. 2 The cultivation of the cane in the West spread from Khuzistan in Persia. At Gunde-Shapur in this region " sugar was prepared with art " about the time of the Arab conquest, 3 and manufacture on a large scale was carried on at Shuster, Sus and Askar-Mokram throughout the middle ages. 4 It has been plausibly

conjectured that the art of sugar refining, which the farther East learned from the Arabs, was developed by the famous physicians of this region, in whose pharmacopoeia sugar had an important place. Under the Arabs the growth and manufacture of the cane spread far and wide, from India to Sus in Morocco (Edrisi, ed. Dozy, p. 62), and were also introduced into Sicily and Andalusia.

In the age of discovery the Portuguese and Spaniards became the great disseminators of the cultivation of sugar; the cane was planted in Madeira in 1420; it was carried to San Domingo in 1494; and it spread over the occupied portions of the West Indies and South America early in the 16th century. Within the first twenty years of the 1 6th century the sugar trade of San Domingo expanded with great rapidity, and it was from the dues levied on the imports brought thence to Spain that Charles V. obtained funds for his palace-building at Madrid and Toledo. In the middle ages Venice was the great European centre of the sugar trade, and towards the end of the 15th century a Venetian citizen received a reward of 100,000 crowns for the invention of the art of making loaf sugar. One of the earliest references to sugar in Great Britain is that of 100,000 lb of sugar being shipped to London in 1319 by Tomasso Loredano, merchant of Venice, to be exchanged for wool. In the same year there appears in the accounts of the chamberlain of Scotland a payment at the rate of is. 9ˆd. per lb for sugar. Throughout Europe it continued to be a costly luxury and article of medicine only, till the increasing use of tea and coffee in the 18th century brought it into the list of principal food staples. The increase in the consumption is exemplified by the fact that, while in 1700 the amount used in Great Britain was 10,000 tons, in 1800 it had risen to 150,000 tons, and in 1885 the total quantity used was almost 1,100,000 tons.

In 1747 Andreas Sigismund Marggraf, director of the physical classes in the Academy of Sciences, Berlin, discovered the existence of common sugar in beetroot and in numerous other fleshy roots which grow in temperate regions. But no practical use was made of the discovery during his lifetime. The first to establish a beet-sugar factory was his pupil and successor, Franz Carl Achard, at Cunern (near Breslau) in Silesia in 1801. The processes used were at first very imperfect, but the extra- ordinary increase in the price of sugar on the Continent caused by the Napoleonic policy gave an impetus to the industry,

1 Lucan iii. 237; Seneca, Episl. 84; Pliny, H.N. xii. 8 (who supposes that sugar was produced in Arabia as well as in India); Peripl. mar. Eryth. § 14; Dioscorides ii. 104. The view, often repeated, that the

saccharum of the ancients is the hydrate of silica, sometimes found in bamboos and known in Arabian medicine as tabdshir, is refuted by Yule, Anglo-Indian Glossary, p. 654; see also Not. et extr. des MSS. de la bibl. nat. xxv. 267 seq.

- Marco Polo, ed. Yule, ii. 208, 212. In the middle ages the best sugar came from Egypt (KazwinI i. 262), and in India coarse sugar is still called Chinese and fine sugar Cairene or Egyptian.

- So the Armenian Geography ascribed to Moses of Chorene (q.v. for the date of the work); St Martin, Mlm. sur I'Arm&nie, ii. 372.

4 Istakhri p. 91; Yakut ii. 497. Tha'alibi, a writer of the nth century, says that Askar-Mokram had no equal for the quality and quantity of its sugar, " notwithstanding the great production of 'Irak, Jorjan and India." It used to pay 50,000 lb of sugar to the sultan in annual tribute (Lat&if, p. 107). The names of sugar in modern European languages are derived through the Arabic from the Persian ihakar.

and beetroot factories were established at many centres both in Germany and in France. In Germany the enterprise came to an end almost entirely with the downfall of Napoleon I.; but in France, where at first more scientific and economical methods of working were introduced, the manufacturers were able to keep the industry alive. It was not, however, till after 1830 that it secured a firm footing; but from 1840 onwards it advanced with giant strides.

Under the bounty system, by which the protectionist countries of Europe stimulated the beet sugar industry by bounties on exports, the production of sugar in bounty-paying countries was encouraged and pushed far beyond the limits it could have reached without state aid. At the same time the con- sumption of sugar was greatly restricted owing to the heavy excise duties imposed mainly to provide for the payment of the bounties. The very large quantity of output made available for export under these exceptional conditions brought about the flooding of the British and other markets with sugars at depressed prices, not unfrequently below the prime cost of production, to the harassment of important industries carried on by British refiners and sugar-growing colonies. In these circumstances, the British government sent out invita- tions on the 2nd of July 1887 for an international conference to meet in London. The conference met, and on the 30th of August 1888 a convention was signed by all the powers represented except France — namely, by Austria, Belgium, Germany, Great Britain, Italy, the Netherlands, Russia and Spain. France

withdrew because the United States was not a party to it. The first article declared that ” The high contracting parties engage to take such measures as shall constitute an absolute and com- plete guarantee that no open or disguised bounty shall be granted on the manufacture or exportation of sugar.” The seventh article provided that bountied sugars (sucres primes) must be excluded from import into the territories of the signatory powers, by absolute prohibition of entry or by levying thereon a special duty in excess of the amount of the bounties, from which duty sugars coming from the contracting countries, and not bounty- fed, must be free. The convention was to be ratified on the 1st of August 1890, and was to be put in force on the 1st of September 1891.

The convention of 1888 was never ratified, and it is doubtful whether its ratification was urged, for a bill introduced by the British government in 1889 to give it effect was not pressed, and it was manifest that there was hesitation — which presently became refusal — to uphold the policy of the penalties on the importation of bountied sugar imposed by the seventh article, without which the convention would be so much waste paper.

Eight years later, on the 1st of August 1896, the bounties offered by the governments of Germany and Austria-Hungary were approximately doubled, and France had a bill in prepara- tion to increase hers correspondingly, although it was computed that they were even then equivalent to a grant of £3, 5s. per ton. So wrote Mr Chamberlain, the colonial secretary, on the 9th of November following, to the treasury. The minute plainly stated that it had become a question whether the continued enjoyment of advantages resulting from the importation of cheap bounty-fed sugar to some British industries did not involve the ruin of the British sugar-producing colonies; and that he was not prepared, as secretary of state for the colonies, to accept the responsibility of allowing matters to take their course and to acquiesce in the policy of non-intervention hitherto pursued in regard to the bounties without having satisfied himself as to what such a policy might entail as regarded both the colonies and the exchequer. Mr Chamberlain concluded by asking whether the treasury would consent to sending a royal commission to the West Indies to inquire into the effect of the foreign sugar bounties on their principal industry.

The treasury accepted the proposal, and a royal commission proceeded to the West Indies in December 1896, and reported a few months later in 1897. Only one commissioner, however, denounced the bounties as the real cause of the utter breakdown of trade and of

the grievous distress which all three had witnessed

and fully acknowledged. But the minute and commission were not barren of result. A fresh conference of the powers assembled at Brussels, on the invitation of the Belgian government, on the 7 th of June 1898; and although the British delegates were not empowered to consent to a penal clause imposing counter- vailing duties on bountied sugar, the Belgian premier, who pre- sided, was able to assure them that if Great Britain would agree to such a clause, he could guarantee the accession of the govern- ments of Germany, Austria, Holland and his own. Of all the countries represented— Germany, Austria-Hungary, Belgium, Spain, France, Great Britain, the Netherlands, Russia and Sweden — only one, namely France, was opposed, to the com- plete suppression of all export bounties, direct or indirect; and Russia declined to discuss the question of her internal legislation, contending that her system did not amount to a bounty on exportation.

Apart from the proceedings at the sittings, much of the actual work of the conference was done by informal discussion, under- taken to discover some means of arriving at a common under- standing. Was a compromise possible which would bring about a satisfactory settlement? The British delegates wrote that it appeared that there were at that time but two methods of securing the suppression of the bounty system — an arrangement for limitation of the French and Russian bounties acceptable to the other sugar-producing states, in return for the total abolition of their bounties; or, a convention between a certain number of these states, providing for the total suppression of their bounties, and for the prohibition of entry into their terri- tory of bounty-fed sugars, or countervailing duties prohibiting importation.

The Belgian government thought a compromise might be possible. A proposal was annexed to the proces-verbal of the final sitting, and the president closed the first session of the conference on the 25th of June 1898 with the expression of a hope that the delegates would soon reassemble.

The annual aggregate output of cane and date sugar in India was short of 4,000,000 tons. Exportation had long ceased, partly owing to the bountied competition of beet sugar, and partly because the people had

become able to afford the con- sumption of a greater quantity than they produced; and German and Austrian sugars were pouring into the country to supply the deficiency. But the importation of foreign sugar, cheapened by foreign state aid to a price which materially reduced the fair and reasonable profit of native cultivators, was a state of things the Indian government could not accept. On the 20th of March 1899 an act, authorizing the imposition of countervail- ing duties on bounty-fed articles at the port of importation, was passed by the Council of India, and received the assent of the governor-general.

This decisive step was not long in making itself felt in the chanceries of Europe. In October 1900 a conditional agree- ment for the reduction of the bounties was made in Paris between France, Germany and Austria Hungary; in February 1 901 the Belgian government proposed a new session of the Con ference of 1898, and on the 16th of December following Brussels welcomed once more the delegates of all the powers, with the exception of Russia, to the eighth European Sugar Bounty Con- ference since that of Paris in 1862. The discussion lasted over eight sittings-, but the conference, to which the British delegates had come with powers to assent to a penal clause, arrived at an understanding, and a convention was signed in March 1902. This was ratified on the 1st of February 1903, subject to a declaration by Great Britain that she did not consent to penalize bounty-fed sugar from the British colonies.

It was agreed ” to suppress the direct and indirect bounties which_ might benefit the production or export of sugar, and not to establish bounties of this kind during the whole duration of the convention,” which was to come into force on the 1st of September 1903, and to remain in force five years, and thenceforward from year to year, in case no state denounced it twelve months before the 1st of September in any year. A permanent commission was established to watch its execution.

The full text in French, with an English translation, of the Sugar Convention, signed at Brussels on the 5th of March 1902 by the plenipotentiaries of the governments of Germany, Austria- Hungary, Belgium, Spain, France, Great Britain, Italy, the Nether- lands and Sweden, will be found in a return presented to parliament in April 1902 (Miscellaneous, No. 5, 1902, Cd. 1013).

Table I. — Amounts (reduced to English money per cwt. avoir- dupois) of the total net sugar bounties granted by European powers, according to the computation issued by the secretary of the United States treasury on the 12th of December 1898.

Sugars polarizing

From . To . .

75° 88°

88° 93°

65°

98

90°

98°

88° 99°

93° 99i°

98° 991°

98°

100°

99° 1 991° 100° | 100°

Bounties (per cwt.)

s. d.

S. d.

s. d.

s. d

s. d.

s. d.

s.d.

s. d.

s. d.

s. d.

Countries- Russia . Austria- Hungary France . Crystals Refined Germany

2 3‘3

(

I 2

4 4l

1 2

2 III

1 3

I 6

4 6J 410I

3 4 65

19 3

!9‘3

Sugars classed as (per cwt.)

Raw Sugar.

Refined Sugar.

Countries —

s. d.

1 10

s. d.

2 2\

076

Sugars analysing in pure sugar (per cwt.)

Hard Dry Refined.

Less than . Country — Holland . .

98%

3. d.

I 108

98 % and over s. d.

1 6

(Additional) s. d.

3

Sir H. Bergne reported on the 27th of July 1907 to Sir Edward Grey that —

” The permanent session had met in special session on the 25th of July, to consider the suggestion of His Britannic Majesty’s government to the effect that, if Great Britain could be relieved from the obligation to enforce the penal provisions of the conven- tion, they would be prepared not to give notice on the 1st of Sep- tember next of their intention to withdraw on the 1st of September 1908 a notice which they would otherwise feel bound to give at the appointed time “; and he added that ” At this meeting, a very general desire was expressed that, in these circumstances, arrange- ments should, if possible, be made which would permit Great Britain to remain a party to the Sugar Convention.”

On the 1st of August 1907 the Belgian minister in London transmitted to Sir Edward Grey a draft additional act pre- pared by the commission for carrying out the proposal of His Britannic Majesty’s government, and on the 28th of August following an additional act was signed at Brussels by the plenipotentiaries of the contracting parties, by which they undertook to maintain the convention of the 5th of March 1902 in force for a fresh period of five years.

On the 2nd of December 1907 Sir H. Bergne wrote to the foreign office from Brussels, reporting that a special session of the permanent commission, established under the sugar bounties convention, had opened on the 18th of November, and the principal matter for its consideration had been the applica- tion of Russia to become a party

to the convention on special terms. A protocol admitting Russia to the sugar convention was signed at Brussels on the 19th of December 1907.

Sir A. H. Hardinge on behalf of Great Britain made the following declaration: —

" The assent of His Majesty's government to the present protocol is limited to the provisions enabling Russia to adhere to the convention, and does not imply assent to the stipulation tending to restrict the importation of Russian sugar."

When, in April 1908, Mr Asquith became premier, and Mr Lloyd George chancellor of the exchequer, the sugar convention

Table II. The world's trade in cane and beet sugar in tons avoirdupois at decennial periods from 1840 to 1870, inclusive, and yearly from 1871 to 1901 inclusive, with the percentage of beet sugar and the average price per cwti in shillings and pence. Tons avoirdupois of 2240 lb = 1016 kilogrammes. ˆ

Year.

1840

1850

i860

1870 187 1-1872 1872-1873 1873-1874 1874-1875 1875-1876 1876-1877 1877-1878 1 878-1879 1879-1880 1880-1881 1881-1882 1 882-1 883 1883-1884

Cane.

1,100,000 1,200,000 1,510,000 1,585,000

i,599.ooo

1,793,000 1,840,000 1,712,000 1,590,000 1,673,000 1,825,000 2,010,000 1,852,000 1,911,000 2,060,000 2,107,000 2,323,000.

Beet.

50,000 200,000 389,000 831,000 1,020,000 1,210,000 1,288,000 1,219,000 1,343,000 1 ,045,000 1,419,000 1,571,000 1,402,000 1,748,000 1,782,000 2,147,000 2,361,000

Total.

1,150,000 1,400,000 1,899,000 2,416,000 2,619,000 3,003,000 3,128,000 2,931,000

2,933.ooo

2,718,000 3,244,000 3,581,000 3,254,000 3,659,000 3,842,000 4,254,000 4,684,000

Per cent. Beet.

4-35 14-29 20-43 34-40

38-95 40-29 41-17 41-59 45-78 38-44 43-74 43-89

43-o8

46-13 46-38 50-47 5040

Average

price per cwt.

s.

48

40

35

32

24

24

22

20

18

22

23

19

19

20

20

20

16

d. o o o o

9

8 10 1 1 8

o

2 3 4 4 2

Year.

1 884-1 885 1 885-1 886 1 886-1 887 1887-1888 1 888-1 889 1 889-1 890

1891-1892 1 892-1 893 1 893-1 894 1 894-1 895 1 895-1 896 1 896-1 897 1 897-1 898 1898-1899 1 899-1900 1900-1901

Cane.

2,351,000

2,339.ooo

2,345,000 2,465,000 2,263,000 2,069,000

2,555.ooo

2,852,000 3,045,000 3,490,000 3,530,000 2,830,000 2,864,000 2,898,000 2,995,000 2,904,000 2,850,000

Beet.

2,545,000 2,223,000

2,733.ooo

2,451,000 2,725,000 3,633,000 3,710,000 3,501,000 3,428,000 3,890,000 4,792,000 4,315,000 4,954,000 4,872,000 4,977.000 5,510,000 5,950,000

Total.

4,896,000 4,562,000 5,078,000 4,916,000 4,988,000 5,702,000 6,265,000

6,353.ooo

6,473,000 7,380,000 8,322,000 7,145,000 7,818,000 7,770,000 7,972,000 8,414,000 8,800,000

Per cent. Beet.

51-98 48-72 53-82 49-85 54-63 63-71 59-21

55-IO

52-95 52-71

57-75 50-30 56-18 62-70 62-70 65-48 67-61

Average

price per cwt.

s.

12

13 11 12

H

15 14 13

H

13 9 10

9 11 11 11 11

d.

4 1

9

9 10

1

o

6

3

5 11

7 3 9 9 6 6

The quantities of cane sugar are based on the trade circulars of Messrs Willett & Gray of New York- those of beet sugar on the trade circulars of Messrs F. O. Licht of Magdeburg; and the prices are obtained from statements supplied by importers into the United States of the cost in foreign countries of the sugars which they import. The table has been adapted from the Monthly Summary of Commerce and Finance of the United States, January 1902, prepared in the Bureau of Statistics, Treasury Department, Washington Government Printing Office, 1902.

Table III.

Quantities of raw and refined cane and beet sugar in tons avoirdupois imported into the United Kingdom in 1870 and in 187”;

yearly from 1880 to 1901 inclusive, with the consumption per head of the population in lb and the price per cwt of and refined sugar. v v

and raw

Year.

1870

1875 1880 1881 1882 1883 1884 1885 1886 1887 1888 1889 1890 1891 1892

1893 1894

1895 1896

1897 1898 1899 1900 1901

Raw Cane.

Tons.

556,000 705,000 590,000 623,000 726,000 597,000 582,000 561,000
468,000 439,000 574,000 470,000 283,000 349,000 386,000 368,000
324,000 388,000 381,000 242,000 286,000 186,000 150,000 178,472

Raw Beet.

Tons.

84,000 107,000 260,000 310,000 265,000 420,000 399,000 410,000
339,000 461,000 319,000 407,000 503,000 461,000 429,000 434,000
391.000 463,000 406,000 434,000 478,000 469,000 512,000 526,451

Refined Cane.

Tons.

3,000

16,000

11,000

5,000

6,000

7,000

53.ooo

114,000

71,000

39,000

2,000

1,000

15,000

27,000

2,000

2,000

1,000

1,000

1,000

1,000

1,000

1,000

1,000

1,000

Refined Beet.

Tons.

82,000 128,000 140,000 135.000 133,000 157,000 160,000 152,000 247,000 311,000 342,000 448,000 484,000 540,000 529,000

575.ooo

696,000 706,000 738,000 793,000 825,000 889,000 961,000 1.079,553

Total.

Tons.

725.000 956,000 1,001,000 1,071,000 1,130,000 1,183,000 1,194,000 1,237,000 1,125,000 1 ,250,000 1,237,000 1,326,000 1,285,000

l,377,0OO

1,346,000 1,379,000 1,412,000 1,558,000 1,526,000 1,469,060 1,560,000 1,545,000 1,624,000 1,785,476

Consumption per head.

Raw.

lb

50-64 51-09 56-01 58-78 58-73 55-57 55-46 44-61 50-80 47-97 48-38 42-87 45-08

44-58 42-41

37-18 45-28 40-94 34-52 39-89 35-63 35-48 36-80

Refined.

lb

8-88

9-46

8-44

8-38

9-87

12-58

15-75

18-75

20-25

19-99

26-54

28-22

32-94

30-63

33-17 39-90 40-10 41-53 43-92 45-29

ˆ8-68

52-23 56-40

Total.

lb

59-52

6o-55

64-45 67-16

68-io

68-15 71-21 63-36 71-05 67-96 74-92 71-09 78-02 75-21 75-58 77-08 85-38 82-47 78-44 85-18 84-31 87.71 93-20

Price per cwt.

Raw.

21

2

21

9

21

9

21

1

20

1

15

6

13

10

13

12

1

13

5

15

5

12

6

12

10

13

H

2

II

5

9

7

10

5

9

9

8

10

6

10

5

10

6

Refined.

30 29 28 28

27 28 18 16 15 17 19 16 16

17 18

15

13 13 12 12 12 12 12

d.

4

5 11

8

2 11

2

8 8

4 6 1

4 6

4 7 3 5 7 10

o

J

of 1902 had thus been renewed in a modified form. Great Britain, instead of agreeing to prohibit the importation of bounty-fed sugar,

was allowed to permit it under certain limits. Russia, which gave bounties, was to be allowed to send into European markets not more than 1,000,000 tons within the next five years, and Great Britain undertook to give certificates guaranteeing that sugar refined in the United Kingdom and exported had not been bounty-fed. The renewal of the con- vention was disapproved by certain Liberal politicians, who in- sisted that the price of sugar had been raised by the convention; and Sir Edward Grey said that the government had intended to denounce the convention, but other countries had urged that Great Britain had induced them to enter into it, and to alter their fiscal system for that purpose, and it would be unfair to upset the arrangement. Besides, denunciation would not have meant a return to prior conditions; for other countries would

have continued the convention, and probably with success, and would have proposed prohibitive or retaliatory duties in respect of British sugar, with bad results politically. Still the British government had been prepared to denounce the con- vention in view of the penal clause which had ensured the ex- clusion of bounty-fed sugar, either directly or through the imposition of an extra duty. But this had been removed, and it was now unreasonable to insist on denunciation. Russia would have made the same arrangement she had obtained had we seceded from the convention. She had formerly sent to England about 40,000 tons of sugar yearly; she might now send 200,000 tons. Was this limitation a reason for sacrificing the advantages we had gained? Under the original terms of the convention Great Britain might have been asked to close her ports to sugar proceeding from one country or another. This was now impossible.

i

SUGAR

Table IV.

47

The cane and beet sugar crops of the world for 1909-1910, with the average of the crops for the seven preceding years from 1902-1903,

in tons of 2240 lb. A. — Cane sugar (compiled from the Weekly Statistical Sugar Trade Journal of Messrs Willett & Gray of New York, and books and reports

published under the authority of the government of India).

Country.

Crop.

1909-1910

Average crop for 7 years end- ing 1908-1909.

Country.

Crop.

1909-1910

Average crop for 7 years end- ing 1908-1909.

Africa —

Egypt

Mauritius

Reunion

Natal

Total in Africa .

America— .

Argentina

Brazil

British Colonies —

Trinidad

Barbadoes ….

Jamaica

Antigua and St Kitts .

Demerara

Lesser Antilles Total in British Colonies

Costa Rica

Cuba

Danish Colony, St Croix Dutch Colony, Surinam

French Colonies —

Martinique . . . .

Guadeloupe . . . . Total in French Colonies

Ecuador

Guatemala

Haiti and Santo Domingo .

Mexico

Nicaragua

Peru

Salvador

United States —

Louisiana

Texas

Porto Rico …. Hawaiian Islands . Total in United States .

Tons avoirdupois.

55.000 220,000

45,000 45.000

Tons avoirdupois.

67.592 183,688

33.299 27.857

365,000

312.436

120,000

276,000

132.41

218,214

45,000 40,000 12,000 25,000 115,000

6,00O

45.232 37.492 13.253 21,857 114,922

I0.7I5

243,000

243.471

Venezuela .

Total in America

Asia —

British India and Depen- dencies ….

China

Dutch Colony — Java and Madoera

Japan and Formosa .

United States possession- Philippine Islands

Siam

Total in Asia .

Tons avoirdupois.

3,000

Tons avoirdupois.

3,000

3‘955.’

3.107,252

3,750,000

3,6oo,000

1,000,000

1,000,000

I.QI9.739

130,000

94.225

145,000

125,468

7,000

6,000

6,232,000

5,845,432

2,500

2,657

1,700,000

1,180,203

15,000

12,857

5.OO0

13.149

40,000 40,000

80,000

34-279 37,500

71,779

7,000

6,H3

7,500

8,016

90,000

36,043

130,000

114,790

4,500

4,260

150,000

6,500

I43.6I9

5,646

325,000

10,000

280,000

400,000

300,714

9,571

176,286

404,424

Australia and Polynesia — British Colonies —

Fiji Islands . ...

Queensland ....

New South Wales .

Total in Australia and

Polynesia ....

Europe —

Spain

Total in Europe .

Summary —

Africa

America .....

Asia

Australia and Polynesia .

Europe

69,000

136,000

14,500

49,928

144,000

20,706

19,50

214,634

16,000

19,473

19,473

365,000 3,955,000 6,232,000

219,500 16,000

312,436 3,107,252

5,845,432

214,634

19,473

1,105,000

890,995

Total production sugar in the world

of

10,787,500

9,499,227

B. — Beet sugar (compiled from data furnished by the Statistisches Bureau fur die Rubenzucker Industrie des Deutschen Reiches, of

Mr F. 0. Licht, Magdeburg).

Country.

Crop,

1902-1903.

Crop,

1903-1904.

Crop,

1904-1905.

Crop,

1 905- 1 906.

Crop,

1906-1907.

Crop,

1 907- 1 908.

Crop,

1 908-1 909.

Estimated

crop,

1909-1910.

Average of 7

years 1 902- 1903

to 1908-1909.

Tons

Tons

Tons

Tons

Tons

Tons

Tons

Tons

Tons

avoirdupois.

avoirdupois.

avoirdupois.

avoirdupois.

avoirdupois.

avoirdupois.

avoirdupois.

avoirdupois.

avoirdupois.

Austria-Hungary .

1,040,987

1,149,516

S75,383

1,485,944

1,322,716

1,402,157

1,376,501

1,240,102

1,236,172

Belgium

220,550

200,233

173,679

323,577

278,338

228,682

254.258

246,051

239,902

Denmark

36,004

46,258

44,161

64,958

65,942

53,H7

64,367

63,973

53,548

France .

820,050

791,605

612,592

1,072,473

744,153

716,218

794.312

811,970

793,058

Germany

1,734,624

1,897,234

1,572,923

2,379,959

2,203,810

2,095,959

2,049,951

2,007,780

‘,990,637

Holland

IOO,793

I2I,6oo

134.394

203,912

178,551

172,417

210,958

196,841

160,375

Italy

82,433

128,794

77.H3

92,433

104,702

133,818

162,701

114,168

III,7l8

Russia .

1,236,469

1,ˆ87,848

938,565

953.204

1,417,386

1,387.732

1,237,530

1,131,840

1,194,105

United States

192,376

204,847

206,410

279,236

426,171

433.248

377,945

418,288

302,890

Other countries

201,510

249.254

205,548

246,384

289,220

268,498

289,935

274,594

250,050

Total crop of the world

5.665,796

5,977.189

4,840,798

7,102,080

7,030,989

6,891,876

6,818,458

6,505,607

6,332,455

The matter temporarily dropped, but certain Liberal members of parliament continued to press for the withdrawal of Great Britain from the convention, it being stated that a promise had been privately given by Sir Henry Campbell-Bannerman that the government would withdraw as soon as practicable. On the 15th of July 1908, Mr Asquith said that Sir Edward Grey had announced in the House of Commons on the 6th of June 1907 that the British government intended to negotiate with the powers for the renewal of the convention, on condition that they would relinquish the penal clause, and that none of

the obligations in the convention as renewed were penal or required statutory authority.

Tables II., III. (p. 773) and IV. (p. 774) give statistics of cane and beet sugar production.

The quantities for India have been computed from information furnished by the India office, and publications made under authority of the secretary of state and the commercial intelligence department of the Indian government.

The whole of the sugar produced in India is consumed in the country and sugar is imported, the bulk of it being cane sugar coming from Mauritius and Java, and about 85 % of the import is of high quality resembling refined sugar.

4»

SUGAR-BIRD— SUGGESTION

It would appear that the purchasing power of the inhabitants of India has increased of late years, and there is a growing demand for refined sugar, fostered by the circumstance that modern pro- cesses of manufacture can make a quality of sugar, broadly speaking, equal to sugar refined by animal charcoal, without using charcoal, and so the religious objections to the refined sugars of old days have been overcome. (A. Ch. ; V. W. Ch.)

SUGAR-BIRD, the English name commonly given in the West India Islands to the various members of the genus Certhiola (belonging to the Passerine family Coerebidae 1) for their habit of frequenting the curing-houses where sugar is kept, apparently attracted thither by the swarms of flies. They often come into dwelling-houses, hopping from

one piece of furniture to another and carefully exploring the surrounding objects with intent to find a spider or insect. In their figure and motions they remind a northern naturalist of a nuthatch, while their coloration — • black, yellow, olive, grey and white — recalls to him a titmouse. They generally keep in pairs and build a domed but untidy nest, laying therein three eggs, white, blotched with rusty-red. Many species are recognized, some of them with a very limited range; three are continental, with a joint range extending from southern Mexico to Peru, Bolivia and south-eastern Brazil, while others are peculiar to certain of the Antilles, and several of them to one island only. Thus C. caboti is limited, so far as is known, to Cozumel (off Yucatan), C. tricolor to Old Provi- dence, C. flaveola (the type of the genus) to Jamaica, and so on, while islands that are in sight of one another are often inhabited by different ” species.” The genus furnishes an ex- cellent example of the effects of isolation in breaking up an original form, while there is comparatively little differentiation among the individuals which inhabit a large and continuous area. The non-appearance of this genus in Cuba is very remarkable. (A. N.)

SUGER (c. 1081-1151), French ecclesiastic, statesman and historian, was born of poor parents either in Flanders, at St Denis near Paris or at Toury in Beauce. About rooi he entered the abbey of St Denis. Until about 1104 he was educated at the priory of St Denis de l’Estree, and there first met his pupil King Louis VI. From 1104 to 1106 Suger attended another school, perhaps that attached to the abbey of St Benoit-sur-Loire. In 1106 he became secretary to the abbot of St Denis. In the following year he was made provost of Berneval in Normandy, and in 1100 of Toury. In n 18 he was sent by Louis VI. to the court of Pope Gelasius II. at Maguelonne, and lived from 1121 to ir22 at the court of his successor, Calixtus II. On his return from Italy Suger was appointed abbot of St Denis. Until n 27 he occupied himself at court mainly with the temporal affairs of the kingdom, while during the following decade he devoted himself to the reorganization and reform of St Denis. In 1137 he accompanied the future king, Louis VII., into Aquitaine on the occasion of that prince’s marriage to Eleanor of Aquitaine, and during the second crusade was one of the regents of the kingdom (1147-1140). He was bitterly opposed to the king’s divorce, having himself advised the marriage. Although he disapproved of the second crusade, he himself, at the time of his death, on the 31st of January 11 51, was preaching a new crusade.

Suger was the friend and counsellor both of Louis VI. and Louis VII. He urged the king to destroy the feudal bandits, was responsible for the royal tactics in dealing with the communal movements, and

endeavoured to regularize the administration of justice. He left his abbey, which possessed considerable property, enriched and embellished by the con- struction of a new church built in the nascent Gothic style.

Suger was the “foremost historian of his time. He was the

1 Known in French as Guitguits, a name used for them also by some English writers. The Guitguit of Hernandez (Rer. medic. N. hisp. thesaurus, p. 56), a name said by him to be of native origin, can hardly be determined, though thought by Montbeillard (Hist. nat. oiseaux, v. 529) to be what is now known as Coereba caerulea, but that of later writers is C. cyanea. The name is probably onomatopoetic, and very likely analogous to the ” quit applied in Jamaica to several small birds.

author of a panegyric on Louis VI. (Vita Ludovici regis), and part-author of the perhaps more impartial history of Louis VII. (Historia gloriosi regis Ludovici). In his Liber de rebus in administratione sua gestis, and its supplement Libellus de con- secratione ecclesiae S. Dionysii, he treats of the improvements he had made to St Denis, describes the treasure of the church, and gives an account of the rebuilding. Suger’s works served to imbue the monks of St Denis with a taste for history, and called forth a long series of quasi-official chronicles.

See O. Cartellieri, Abt Suger von Saint-Denis (Berlin, 1898); A. Luchaire, Louis le Gros (Paris, 1890) ; F. A. Gervaise, Histoire de Suger (Paris, 1721).

SUGGESTION. By the older British writers on psychology the words ” suggest ” and ” suggestion ” were used in senses very close to those which they have in common speech; one idea was said to suggest another when it recalled that other to mind or (in the modern phrase) reproduced it. Modern studies in mental pathology and hypnotism (q.v.) have led to the use of these words by psychologists in a special and technical sense. The hypnotists of the Nancy school rediscovered and gave general currency to the doctrine that the most essential feature of the hypnotic state is the unquestioning obedience and docility with which the hypnotized subject accepts, believes, and acts in accordance with every command or proposition of the hypno- tizer. Commands or propositions made to the subject (they may be merely implied by a gesture, a glance, or a chance remark to a third person) and accepted with this peculiarly uncritical and intense belief were called ” suggestions “; and the subject that accepted them in this

fashion was said to be ” suggestible.” It has also been made abundantly clear, chiefly by the labours of French physicians, that a high degree of ” suggestibility ” is a leading feature of hysteria, and that this fact is the key to the understanding of very many of its protean manifestations.

It is also becoming widely recognized that the suggestibility of hypnosis and of hysteria is conditioned by a peculiar state of the brain, namely a cerebral or mental dissociation, which in hypnosis is temporarily induced by the operations of the hypnotist, and in hysteria arises from some deficiency of energy in the whole psycho-physical system. In respect to these points there is now a wide consensus of opinion among the leading authorities; but as to the range and scope of suggestion in our mental life great differences of opinion still obtain. We may distinguish three principal views. Firstly, it is maintained by a number of physicians (notably by Professor Pierre Janet, whose profound studies of hysterical patients are justly cele- brated) that all hypnotizable persons are hysterical and that suggestibility is a condition peculiar to hysterical subjects. In view of the assertions in recent years of several physicians of high repute to the effect that they find more than 90% of all subjects hypnotizable, it would seem that this view can- not be maintained, and that this restriction of suggestion to hysterical subjects only, and the stigmatization of suggestibility as in every case a morbid symptom, are errors arising from too exclusive occupation with its manifestations in this field. A second group consists of writers who admit that suggestion may operate in normal minds, but who, while recognizing that it is not an essentially pathological process, maintain that it is a process of very peculiar and exceptional nature that has little or no affinity with normal mental operations. They hold that suggestion, whether it occurs in morbid or in healthy subjects, always implies the coming into operation of some obscurely conceived faculty or region of the mind which is present in all men, but which usually lies hidden or submerged beneath the flow of our more commonplace mental activities. This sub- merged faculty or system of faculties, which is held by these authors to be operative in all processes of suggestion, is variously designated by them the secondary or submerged stratum of con- sciousness, the subconscious or subliminal self (see Subliminal Self). The writers of this group insist upon the more start- ling of the effects producible by suggestion, the more pro- found changes of bodily and mental processes, such as paralysis,

contracture, hyperesthesia, increased power of recollection, hallucinations (q.v.), &c; and they regard dissociation as the process by which the submerged and supernormal faculty (or faculties) that they postulate is liberated from the dominance of the normal waking self.

A third view has been rapidly gaining ground and is now predominant. It connects itself with, and bases itself upon, the view of Professor Bernheim and his colleagues of the Nancy school of hypnotism. According to this view all men are normally suggestible under favourable conditions, and the hypnotic subject and the hysteric patient differ from the normal human being chiefly in that their normal suggestibility is more or less (sometimes very greatly) increased, owing to the prevalence of the state of cerebral dissociation.

According to this third view, suggestion may be defined as the communication of any proposition from one person (or persons) to another in such a way as to secure its acceptance with conviction, in the absence of adequate logical grounds for its acceptance. The idea or belief so introduced to the mind of the recipient is held to operate powerfully upon his bodily and mental processes in proportion to the degree of its dominance over all other ideas or mental processes; and the extraordinary character of the effects, both bodily and mental, of suggestion in hypnotic and hysterical subjects is held to be due to the fact that, in these conditions of mental dissociation, the dominance of the suggested idea is complete and absolute; whereas in the absence of such dissociation the operation of the suggested idea is always subject to some weakening or inhibition through the influence of many opposed or incompatible tendencies and ideas, even if these do not rise into explicit consciousness.

This third view seems justified by the facts that no sharp line can be drawn between the suggestibility of normal men and that of hypnotized or hysterical subjects, and that under favour- able conditions many of the most striking results of suggestion (e.g. hallucinations, contractures, inability to move, insensibility of various sense-organs, and so forth) may be produced in subjects who present at the time no other symptom of the hypnotic or hysterical condition.

If, then, we recognize, as we must, that the alogical produc- tion of conviction is the essence of suggestion, and that this frequently occurs in normal minds as well as in those suffering from various degrees of dissociation, it becomes necessary to define the conditions that favour the operation of suggestion in normal minds.

These conditions are resident, on the one hand, in the recipient of the suggestion, and, on the other hand, in the source from which the suggestion comes. Of the conditions of the former class three seem to be of principal importance.

(a) Defect of knowledge: the defect may be quantitative or qualitative, i.e. it may consist in the lack of knowledge or of firmly established beliefs about the subject of the proposition, or it may consist in the lack of systematic organization of such knowledge as the mind possesses. The well-trained mind is relatively insuggestible, firstly because it possesses large stores of knowledge and belief; secondly, because this mass of know- ledge and belief is systematically organized in such a way that all its parts hang together and mutually support one another. On the other hand, the young child, the uncultured adult, and especially the savage, are apt to be suggestible in regard to very many topics, first, because they have relatively little know- ledge; secondly, because what little they have is of a low degree of organization; i.e. it does not form a logically coherent system whose parts reciprocally support one another. Suggestion in such cases may be said to be conditioned by primitive credulity or the suggestibility of ignorance, (b) But the same person will not be found to be equally suggestible at all times under similar external conditions. There are changes of mental state which, without overstepping the limits of the normal, condition varying degrees of increased suggestibility. A man is least suggestible when his mind works most efficiently, when he is most vigorous and most wide awake; every departure from this state, due to fatigue, bodily ill-health, emotional perturbation,

drugs or any other cause, favours suggestibility, (c) Persons of equal degrees of knowledge or ignorance will be found, even at their times of greatest mental efficiency, to be unequally suggestible owing to differences of native disposition; one person is by nature more open than another to personal influence, more easily swayed by others, more ready to accept their dicta and adopt their opinions for his own. Differences of this kind are probably the expression of differences in the native strength of one of the fundamental instinctive dispositions of the human mind, an instinct which is called into play by the presence of persons of superior powers and the excitement of which throws the subject into an attitude of submission or subjection towards the impressive personality.

Considered from the side of the agent, suggestion is favoured by whatever tends to render him impressive to the subject or patient — great bodily strength or stature, fine clothes, a con- fident manner,

superior abilities of any kind, age and experience, any reputation for special capacities, high social position or the occupation of any position of acknowledged authority; in short, all that is summed up by the term ” personality,” all that contributes to make a personality ” magnetic ” or to give it prestige renders it capable of evoking on the part of others the submissive suggestible attitude. A group of persons in agreemen I is capable of evoking the suggestible attitude far more effectively than any single member of the group, and the larger the group the more strongly does it exert this influence. Hence the suggestive force of the popularly accepted maxims and well-established social conventions; such propositions are collective suggestions which carry with them all the immense collective prestige of organized society, both of the present and the past; they embody the wisdom of the ages. It is in the main through the suggestive power of moral maxims, endowed with all the prestige of great moral teachers and of the collective voice of society, that the child is led to accept with but little questioning the code of morals of his age and country; and the propagation of all religious and other dogma rests on the same basis. The normal suggesti- bility of the child is thus a principal condition of its docility, and it is in the main by the operation of normal suggestion that society moulds the characters, sentiments, and beliefs of its members, and renders the mass of its elements harmonious and homogeneous to the degree that is a necessary condition of its collective mental life. Normal suggestion produces its most striking effects in the form of mass-suggestion, i.e. when it operates in large assemblies or crowds, especially if the members have but little positive knowledge and culture. For, when a belief is propagated by collective suggestion through the large mass of men, each falls under the suggestive sway of the whole mass; and under these conditions the operation of suggestion is further aided by the universal tendency of mankind to imitation and sympathy, the tendency to imitate the actions of, and to experience the emotions expressed by, those about one.

Conditions very favourable to mass-suggestion prevailed during the middle ages of European history; for these “dark ages ” were characterized by the existence of dense populations, among whom there was free intercourse but very little positive knowledge of nature, and who were dominated by a church wielding immense prestige. Hence the frequent and powerful operations of suggestion on a large scale. From time to time fantastic beliefs, giving rise to most extravagant behaviour, swept over large areas of Europe like virulent epidemics — epi- demics of dancing, of flagellation, of hallucination, of belief in the miraculous powers of relics or of individuals, and so

forth. In these epidemics all the conditions favourable to normal sugges- tion were generally present in the highest degree, with the result that in great numbers of persons there were produced the more extreme effects of suggestion, such as are usually associated with the hysterical or hypnotic state. At the present time similar manifestations occur in a modified form, as e.g. the popular pilgrimages to Lourdes, Holywell and other places that from time to time acquire reputations for miraculous curative powers.

Auto-suggestion. — Although auto-suggestion does not strictly fall under the definition of suggestion given above, its usage to

denote a mental process which produces effects very similar to those producible by suggestion is now so well established that it must be accepted. In auto-suggestion a proposition is formulated in the mind of the subject rather than communicated from another mind, and is accepted with conviction in the absence of adequate logical grounds. Generally the belief is initiated by some external event or some bodily change, or through some interpretation of the behaviour of other persons; e.g. a man falls on the road and a wagon very nearly passes over his legs, perhaps grazing them merely; when he is picked up, his legs are found to be paralysed. The event has induced the conviction that his legs are seriously injured, and this conviction operates so effectively as to realize itself. Or a savage, suffering some slight indisposition, interprets the behaviour of some person in a way which leads him to the conviction that this person is compassing his death by means of magical practices ; accordingly he lies down in deep despondency and, in the course of some days or weeks, dies, unless his friends succeed in buying off, or in some way counteracting, the malign influence. Or, as a more familiar and trivial instance of auto-suggestion, we may cite the case of a man who, having taken a bread pill in the belief that it contains a strong purgative or emetic, realizes the results that he expects.

Literature. — H. Bernheim, De la Suggestion, el de ses applications & la therapeutique (2nd ed., Paris, 1887); Pierre Janet, The Major Symptoms of Hysteria (London, 1907) ; Otto Stoll, Suggestion und Hypnotismus in der Volkerpsychologie (2nd ed., Leipzig, 1904) ; Boris Sidis, The Psychology of Suggestion (New York, 1898); W. M. Keatinge, Suggestion in Education (London, 1907) ; F. W. H. Myers, Human Personality and its Survival of Bodily Death (London, 1903;

2nd ed., abridged, 1907) ; A. Binet, La Suggestibiliti (Paris, 1900). See also literature under Hypnotism. (W. McD.)

SUHL, a town of Germany, in the province of Prussian Saxony, picturesquely situated on the Lauter, on the southern slope of the Thuringian Forest, 6ˆ m. N.E. of Meiningen and 29 m. S.W. of Erfurt by rail. Pop. (1905), 13,814. The armourers of Suhl are mentioned as early as the 9th century, but they enjoyed their highest vogue from 1 550 to 1634. The knights of south Germany especially prized the swords and armour of this town, and many of the weapons used in campaigns against the Turks and in the Seven Years' War are said to have been manufactured at Suhl. It has suffered considerably in modern times from the competition of other towns in this industry, especially since the introduction of the breech-loading rifle. It still contains, however, large factories for firearms military and sporting, and side arms, besides ironworks, machine-works, potteries and tanneries. The once considerable manufacture of fustian has declined. A brine spring (Soolquelle) at the foot of the neigh- bouring Domberg is said to have given name to the town.

Suhl, which obtained civic rights in 1527, belonged to the principality of Henneberg, and formed part of the possessions of the kingdom of Saxony assigned to Prussia by the Congress of Vienna in 1815.

See Werther, Chronik der Stadt Suhl'{2 vols., Suhl, 1846-1847).

SUICIDE (from Lat. sui, of oneself, and cidium, from caedere, to kill), the act of intentionally destroying one's own life. The phenomenon of suicide has at all times attracted a large amount of attention from moralists and social investigators. Its existence is looked upon, in Western civilization, as a sign of the presence of maladies in the body politic which, whether remediable or not, deserve careful examination. It is, of course, impossible to compare Western civilization in this respect with, say, Japan, where suicide in certain circumstances is part of a distinct moral creed. In Christian ethics and Christian law it is wrong, indeed illegal, as a felo de se, self-murder. It is within comparatively recent years that the study of suicide by means of the vital statistics of various European countries has demonstrated that while the act may be regarded as a purely voluntary one, yet that suicide as a whole conforms there to certain general laws, and is influenced by conditions other than mere individual circumstances or surroundings. Thus it can be shown that each country has a different suicide-rate, and that while the rate for each country may fluctuate from year to year, yet it maintains practically the same relative proportions to the rates Qf other

countries. The following table shows the suicide-rate for various European countries (Bertillon): —

Table I.

Country.

Saxony ….

Denmark

Switzerland

Baden ….

Wurttemberg

France ….

Prussia . . . .

Belgium

Sweden ….

England and Wales

Norway

Scotland

Ireland . . . .

Annual Number

Period of

of Suicides

Observation.

per Million

Inhabitants.

1878-1882

392

1 880-1 882

251

1878-1882

239

”

198

1877-1881

189

1878-1882

180

166

Jl

100

”

92

”

75

»»

69

1877-1881

49

1878-1882

17

In addition to furnishing materials for an approximately accurate estimate of the number of suicides which will occur in any country in

a year, statistics have demonstrated that the proportion of male to female suicides is practically the same from year to year, viz. 3 or 4 males to 1 female; that it is possible to predict the month of greatest prevalence, the modes of death adopted by men on the one hand and women on the other, and even the relative frequency of suicide amongst persons following different professions and employments; and that in most of the countries of Europe the suicide-rate is increasing. In England and Wales the annual death-rate per million from suicide has steadily advanced, as is shown by the following figures for quinquennial periods: —

1861-1865 .

65 per

million living

1 866-1 870 .

66

>» it

1871-1875 .

66

»» »j

1 876-1 880 .

74

it tt

1 881-1885 •

75

tt »,

1886-1890 .

79

>t tt

1 891-1895 .

88

»t ff

1896-1900 .

89

t f 1 1

1901-1905 .

100

t f f f

The next table illustrates the continued increase in recent years, and at the same time shows the total number and the number of male and female suicides each year from 1886 to

1905.

Table II. Total Suicides — Male and Female — in England and Wales, 1886-IQO!), together with the annual rate per million living (Registrar-General's Reports).

Suicide- rate

Year.

Male.

Female.

Total.

per Million Living.

1886

1694

560

2254

82

1890

1635

570

2205

77

i»95

2071

726

2797

92

1896

1979

677

2656

86

1897

2090

702

2792

90

1898

2166

7ii

2877

91

1899

2121

723

2844

89

1900

2166

730

2896

90

1901

2318

803

3121

96

1902

2460

807

3267

99

1903

2640

871

351 1

105

1904

2523

822

3345

99

1905

2683

862

3545

104

Total.

28,546

9564

38,110

—

The reason of the high suicide-rate in some countries as com- pared with others, and the causes of its progressive increase, are not easily determined. Various explanations have been offered, such as the influence of climate, the comparative prevalence of insanity, and the proportionate consumption of alcoholic drinks, but none satisfactorily accounts for the facts. It may, however, be remarked that suicide is much more common amongst

SUIDAS— SUITE

5*

Protestant than amongst Roman Catholic communities, while Jews have a smaller suicide-rate than Roman Catholics. A point of considerable interest is the increase of suicide in relation to the advance of elementary education. Ogle states that suicide is more common among the educated than the illiterate classes. It is also more prevalent in urban than in rural districts. A curious feature in large towns is the sudden outbreak of self-destruction which sometimes occurs, and which has led to its being described as epidemic. In such cases force of example and imitation undoubtedly play a considerable part, as it is well recognized that both these forces exert an influence not only in causing suicide, but also in suggesting the method, time and place for the act. No age above five years is exempted from furnishing its quota of suicidal deaths, although self-destruction between five and ten years is very rare. Above this age the proportion of suicides increases at each period, the maximum being reached between fifty-five and sixty-five. Among females there is a greater relative prevalence at earlier age periods than among males. The modes of suicide are found to vary very slightly in different countries. Hanging is most common amongst males; then drowning, injuries from fire-arms, stabs and cuts, poison and precipitation from heights. Amongst females, drowning comes first, while poison and hanging are more frequent than other methods entailing effusion of blood and disfigurement of the person. The methods used in England and Wales by suicides during 1888-1897, and in Scotland during the years 1881-1897, are given in the following table:—

Table III. Modes of Suicide in England and Wales, 1 888-1 897.

Order of Fre- quency.

Males.

Females.

Both Sexes.

Mode.

Num- ber.

Mode.

Num- ber.

Mode.

Num- ber.

1

2 3 4 5 6

Hanging

Stab-cut

Drowning

Poison

Fire-arms

Otherwise

5669 3594 3443 2264 2152 1773

Drowning

Poison

Hanging

Stab-cut

Fire-arms

Otherwise

2089 1652 1336

771 52

527

Hanging

Drowning

Stab-cut

Poison’

Fire-arms

Otherwise

7005 5532 4365 3916 2204 2300

Total

18,895

Total

6427

Total

25-322

Modes of Suicide in Scotland, 1881-1897.

Order of Fre- quency.

Males.

Females.

Both Sexes.

Mode.

Num- ber.

Mode.

Num- ber.

Mode.

Num- ber.

1

2 3 4 5 6

Hanging

Drowning

Stab-cut

Poison

Fire-arms

Otherwise

741 630

556 257 245 207

Drowning

Hanging

Poison

Stab-cut

Fire-arms

Otherwise

430 257 145 144 6 100

Drowning

Hanging

Stab-cut

Poison

Fire-arms

Otherwise

1060 998 700 4.02 251 307

Total

2636

Total

1082

Total

The season of the year influences suicide practically uniformly in all European countries, the number increasing from the com- mencement of the year to a maximum in May or June, and then declining again to a minimum in winter. Morselli attempts to account for this greater prevalence during what may well be called the most beautiful months of the year by attributing it to the influence of increased temperature upon the organism, while Durkheim suggests that the determining factor is more probably to be found in the length of the day and the effect of a longer period of daily activity. The suicide-rate is higher in certain male occupations and professions than in others (Ogle). Thus it is high amongst soldiers, doctors, innkeepers and chemists, and low for clergy, bargemen, railway drivers and stokers. The suicide-rate is twice as great for unoccupied males as for occupied males.

Authorities. — Morselli, II Suicidio (Milan, 1879) ; Legoyt, Le Suicide ancien et modern (Paris, 1881) ; Westcott, Suicide: its History,

Literature, &c. _ (London, 1885); Ogle, “Suicides in England and Wales, in relation to Age, Sex, Season, and Occupation,” Journal of the Statistical Society (1886), vol. xlix. ; Strahan, Suicide and Insanity (London, 1893); Mayr, ” Selbstmord statistik,” in Hand- worterbuch der Staatstvissenschaften (Jena, 1895); Durkheim, Le Suicide (Paris, 1897). (H. H. L.)

SUlDAS, Greek lexicographer. Nothing is known of him, except that he must have lived before Eustathius (i2th-i3th century), who frequently quotes him. Under the heading ” Adam ” the author of the lexicon (which a prefatory note states to be ” by Suidas “) gives a brief chronology of the world, ending with the death of the emperor John Zimisces (975), and under ” Constantinople ” his successors Basil and Constantine are mentioned. It would thus appear that Suidas lived in the latter part of the 10th century. The passages in which Michael Psellus (end of the nth century) is referred to are considered later interpolations. The lexicon of Suidas is arranged alphabetically with some slight deviations, letters and combinations of letters having the same sound being placed together; thus, 01 ande follow 5, and «, 77, t follow f . It partakes of the nature of a dictionary and encyclopaedia. It includes numerous quotations from ancient writers; the scholiasts on Aristophanes, Homer, Sophocles and Thucydides are also much used. The biographical notices, the author tells us, are condensed from the Onomatologion or Pinax of Hesychius of Miletus; other sources were the excerpts of Con- stantine Porphyrogenitus, the chronicle of Georgius Monachus, the biographies of Diogenes Laertius and the

works of Athenaeus and Philostratus. The work deals with scriptural as well as pagan subjects, from which it is inferred that the writer was a Christian. A prefatory note gives a list of dictionaries from which the lexical portion was compiled, together with the names of their authors. Although the work is uncritical and probably much interpolated, and the value of the articles is very unequal, it contains much information on ancient history and life.

Editio princeps, by Demetrius Chalcondyles (1499); later editions by L. Kuster (1705), T. Gaisford (1834), G. Bernhardy (1834-1853) and I. Bekker (1854); see A. Daub, De S. Biographicorum origine el fide (1880) and Studien zu den Biographika des S. (1882); and J. E. Sandys, Hist, of Cassical Scholarship (1906), p. 407.

SUIDUN (Chinese, Sui-din-chen) , a town of China, capital of the province of Kulja. It is the residence of the governor- general, and was founded in 1762 during the Mussulman rising, and rebuilt in 1883. It is a military town, with provision stores, an arsenal and an arms workshop. Its walls are armed with steel guns.

SUINA, a group of non-ruminating artiodactyle ungulate mammals typified by the swine (Suidae), but also including the hippopotamus (Hippopotamidae) , and certain extinct forms. (See Artiodactyla; Hippopotamus; Peccary; Swine.)

SUITE (Suite de pieces; Ordre; Partita), in music, a group of dance tunes, mostly in binary form, of a type which may be described as ” decorative ” (see Sonata Forms) ; constituting that classical form of early 18th-century instrumental music which most nearly foreshadows the later sonata. As understood by Bach, it consists essentially of four principal movements with the insertion of one or more lighter movements between the third and the last. The first movement is the allemande, of solid and intricate texture, in slow common time and rich flowing rhythm, beginning with one or three short notes before the first full bar. The second movement is the courante, of which there are two kinds. The French courante is again an intricate movement, also beginning with one or three notes before the main beat, and in a triple time {%) which, invariably at the cadences and sometimes elsewhere, drops into a crossing triple rhythm of twice the pace (4). The effect is restless and confused, and was supposed to form a contrast to the allemande; but it seldom did so effectively. Bach’s study of Couperin led him to use the French courante frequently, but he was happier with the Italian type of corrente, which did not owe its name, like the French type, to the use of spasmodic runs, but was a brilliant continuously running piece in quick triple time (f or §),

forming a clear and lively contrast both to the allemande and to the third movement, which is generally a sarabande.

The sarabande is a slow movement in triple time beginning on the full bar, and with at least a tendency to the rhythm

of which Handel's aria Lascia I J J j J J ch'io pianga is a familiar example.

Bach's sarabandes are among the most simply eloquent and characteristic of his smaller com- positions. Then come the galanteries, from one to three in number. These are the only suite-movements which ever have an alternative section and a da capo (with the exception of Couperin's courantes and the courante in Bach's first English suite). The commonest galanteries are: (i) the minuet, often with a second minuet which is called "trio" only when it is in real three-part writing. It is a little faster than the stately minuet in Mozart's Don Giovanni, but it is never so quick as the lively minuets of Haydn's quartets and symphonies which led to the Beethoven scherzo; and it invariably begins, unlike many later minuets, on the full bar; (2) the gavotte, a lively dance in a not too rapid alia breve time (the textbooks say 4 time, but there is no case in Bach which could possibly be played so slowly, whatever the time signature may be). The gavotte always begins on the half-bar. A second alternating gavotte is frequently founded on a pedal or drone-bass, and is then called musette; (3) the bourree, which is not unlike the gavotte, but quicker, and beginning on the last quarter of the bar; (4) the passepied, a lively dance in quick triple time, beginning on the third beat. These dances are not always cast in binary form, and there are famous examples of gavottes and passepieds en rondeau. Other less common galanteries are (5) the loure, 1 a slow dance in | time and dotted rhythm (dactylic in accent and amphimacer in quantity); (6) the polonaise, a leisurely triple-time piece, either a shade quicker or (as in the exquisite unattached examples of Friedemann Bach) much slower than the modern dance-rhythm of that name, with cadences on the second instead of the third beat of the bar; (7) the air, a short movement, quietly flowing, in a more florid style than its name would suggest. It sometimes precedes the sara- bande. The suite concludes with a gigue, in the finest examples of which the decorative binary form is combined with a light fugue style of the utmost liveliness and brilliance. The gigue is gener- ally in some triplet rhythm, e.g. |, %, §,

V; but examples in a graver style maybe found in slow square time with dotted rhythms, as in Bach's first French suite and the sixth Partita of the Klavier- iibung. In gigues in the typical fugato style Bach is fond of making the second part either invert the theme of the first, or else begin with a new subject to be combined with the first in double counterpoint. The device of inversion is also prominent in many of his allemandes and French courantes.

All suites on a large scale, with the exception of Bach's second and fourth solo violin sonatas, begin with a great prelude in some larger form. Bach's French Suites are small suites without prelude. His English Suites all have a great first movement which, except in the first suite, is in full da capo concerto form. His clavier Partitas show a greater variety of style in the dance movements and are preceded by preludes, in each case of a different type and title. Some large suites have finales after the gigue; the great chaconne for violin solo being the finale of a partita (see Variations).

Handel's suites are characteristically nondescript in form, but, in the probably earlier sets published after what is called his first set, there is a most interesting tendency to make several of the movements free variations of the first. Earlier composers had already shown the converse tendency to make variations take the forms of suite movements. In general Handel's suites are effective groups of movements of various lengths,with a tendency to use recognizable suite movements of a Franco-Italian type.

In modern times the term " suite " is used for almost any group of movements of which the last is in the same key as the first, and of which a fair proportion show traces of dance-rhythm, or at least use dance titles. It is often said that the suite-forms have shown more vitality under modern conditions than the classical

1 The loure of Bach's fifth French suite has in some editions been called the second bourree, to the utter mystification of musicians.

sonata forms. But this only means that when composers do not feel inclined to write symphonies or sonatas they give their groups of movements the name of suite. Certainly there is no such thing as a definite modern suite-form distinguishable from the selection composers make, for use in concert rooms, of incidental music written for plays, such as Grieg's Peer Gynt suites. (D. F. T.)

SUKHUM-KALEH, a seaport of Russian Caucasia in the government of Kutais. Pop. (1900), about 16,000. It is situated 106 m. N. of Batum,

and has the best roadstead on the east coast of the Black Sea, being sheltered by mountains on three sides and never freezing. In spite of the difficulties of communication with the interior, and the malarial marshes which surround the town, it has become important for the export of grain (chiefly maize). There is also a trade in tobacco. It stands on the site of the ancient Greek colony of Dioskurias. The annual mean temperature is 50° F. There are here a cathedral and a botanical garden. The town was captured by the Russians in 1809, but not formally relinquished by Turkey until 1829. In 1854 and again in 1877 it was occupied by the Turks.

SUKKUR, or Sajchar, a town and district of British India, in Sind, Bombay. The town is situated on the right bank of the Indus, 24 m. N.W. of Skikarpur. Pop. (1901), 31,316. Sukkur has always commanded the trade of Sind, and the river is now crossed by a cantilever bridge carrying the North-Western railway to Kotri. The town was ceded to the Khairpur mirs between 1809 and 1824. In 1833 Shah Shuja defeated the Talpurs here with great loss. In 1842 it came under British rule.

The District of Sukkur was created in 1901 out of part of Shikarpur district, the remainder of which was formed into the district of Larkana. Area, 5403 sq. m. It is chiefly alluvial plain, but there are slight hills at Sukkur and Rohri. In the higher-lying parts are salt lands (Kalar), or even desert in the area known as the Registan. The climate is hot, dry and ener- vating. The annual rainfall at Sukkur town averages only 45 in. The population in 1901 was 523,345, showing an increase of 10% in the decade. A considerable part of the district is irrigated, the principal crops being wheat, millets, rice, pulses and oil seeds. Earthen, leathern and metal ware, cotton cloth and tussore silk are manufactured, also pipe-bowls, snuff-boxes and scissors. Lines of the North-Western railway serve the district, and there is a branch from Sukkur towards Quetta.

SULA ISLANDS (Sulla, Xuila; Dutch Soela), a chain of islands forming a prolongation of the eastern peninsula of Celebes and the Banggai Islands, Dutch East Indies. The three main islands are long and narrow (Taliabu, 68 m. long, Mangoli or Mangala, 63 m. and Besi, 30 m.). The two first lie in line, separated by the narrow Chapalulu Strait; Besi extends at right angles to the south coast of Mangoli. The natives of Taliabu are allied to those of the Banggai Islands and the eastern peninsula of Celebes; but immigrant Malays are the principal inhabitants. Economically, Besi is the most important island. A Dutch commissioner resides at Sanana, at its northern extremity. It is fertile, and produces wax and honey, and coal has been found.

SULCI, an ancient town (mod. S. Antioco), situated on the east coast of an island on the south-west of Sardinia. The date of its foundationis not known, but it is certainly of Carthaginian origin. The assumption that it was originally an Egyptian colony is not justified. Its walls, of large rectangular blocks of stone, can be traced for a circuit of upwards of a mile : it extended to the low ground on the shore near the modern cemetery, where a dedica- tory inscription set up by the people of Sulci in honour of Hadrian in a.d. 128 was found (F. Vivanet in Notizie degli Scavi, 1897, 407). Various discoveries have been made within the circuit, both of Phoenician and of Roman antiquities, including several statues 2 and inscriptions and many smaller objects, gems, &c, but at present few traces of ancient buildings are left, owing to their continued destruction in medieval and modern times. A cistern of fine masonry, perhaps dating from the Punic period,

s A statue of Drusus, the brother of Tiberius (?) was found in

1908.

in the low ground below the modern town, may be mentioned. Close to it, among the houses of the modern town, a solid base about 25 ft. square, belonging possibly to a lighthouse or a tomb, records the existence of a temple of Isis and Serapis during the imperial period. A bilingual inscription of the 1st century B.C. (?) in Latin and in neo-Punic records the erection of a statue to Himilkat, who had carried out a decree of the local senatus for the erection of a temple to a goddess (described in the Punic version as domina dea — possibly Tanit herself) by his son Himilkat (T. Mommsen in Corp. inscr. lai. x. 7513, 7514). The Phoenician tombs consist of a chamber cut in the rock, measuring about 14 ft. square and 8 ft. high, and approached by a staircase: some of these have been converted into dwellings in modern times. Many of the curious sculptured stelae found in these tombs are now in the museum of Cagliari. On many of them the goddessTanit is represented, often in a form resembling Isis, which gave rise to the unfounded belief of the Egyptian origin of Sulci. The Roman tombs, on the other hand, are simply trenches excavated in the rock.

There are also several catacombs: a group still exists under the church, in which was discovered the body of the martyr St Antiochus, from whom the modern town takes its name. The church is cruciform, with heavy pillars between nave and aisles, and a dome over the crossing:

it belongs to the Byzantine period, and contains an inscription of Torcotorius, protospatarius and Salusius, apxwv, dating from the 10th century a.d. (A. Taramelli in Archivio storico sardo, 1907, 83 sqq.). Others farther south-west were Jewish; they have inscriptions in red painted on the plaster with which they are lined, and the seven-branched candlestick occurs several times. The fort which occupies the highest point — no doubt the acropolis of the Punic period— is quite modern. The long, low isthmus which, with the help of bridges, connects the island with the mainland, is very likely in part or entirely of artificial origin; but neither it nor the bridges show any definite traces of Roman date. On either side of it ships could find shelter then as nowadays.

The origin of Sulci is attributed by Pausanias to the Cartha- ginians, and the Punic antiquities found there go to indicate the correctness of his account. It is mentioned in the account of the First Punic War as the place at which the Carthaginian admiral Hannibal took refuge after his defeat by C. Sulpicius, but was crucified. In 46 B.C. the city was severely punished by Caesar for the assistance given to Pompey's admiral Nasidius. Under the empire it was one of the most flourishing cities of Sardinia. It was attacked by the Vandals and Saracens, but ceased to exist before the 13th century. Previously to this it had been one of the four episcopal sees into which Sardinia was divided. A castle in the low ground, attributed to the index Torcotorius, to the south of the modern town, was destroyed in modern times.

See A. Tarawelli in Notizie degli scavi (1906), 135; (I9°8), 145, 192.

(T. As.)

SULEIMAN I. 1 the "Magnificent" (1494-1566), sultan of Turkey, succeeded his father Selim I. in 1520. His birth coin- cided with the opening year of the 10th century of Mussulman chronology (a.h. 900), the most glorious period in the history of Islam. Eventful as the age was both in Europe, where the Renaissance was in full growth, and in India, where the splen- dour of the emperor Akbar's reign exceeded alike that of his pre- decessors and his successors, Suleiman's conquests overshadowed all these. It is noteworthy that though in Turkey he is dis- tinguished only as the law-giver (kanuni), in European history he is known by such titles as the Magnificent. He was the most fortunate of the sultans. He had no rival worthy of the name. From his father he inherited a well-organized country, a dis- ciplined army and a full treasury. He united in his person the best qualities of his predecessors, and possessed the gift of taking full advantage of the talents of the able generals, admirals and

1 Suleiman, eldest son of Bayazid I., who maintained himself as sultan at Adrianople from 1402 to 1410, is not reckoned as legiti- mate by the Ottoman historiographers, who reckon Suleiman the Magnificent as the first of the name. By others, however, the latter is sometimes styled Suleiman II.

viziers who illustrated his reign. If his campaigns were not always so wisely and prudently planned as those of some of his predecessors, they were in the main eminently fortunate, and resulted in adding to his dominions Belgrade, Budapest, Temesvar, Rhodes, Tabriz, Bagdad, Nakshivan and Rivan, Aden and Algiers, and in his days Turkey attained the culminating point of her glory.

The alliance concluded by him with France reveals him at once as rising superior to the narrow prejudices of his race and faith, which rejected with scorn any union with the unbeliever, and as gifted with sufficient political insight to appreciate the advantage of combining with Francis I. against Charles V. His Persian campaign was doubtless an error, but was due in part to a desire to find occupation, distant if possible, for his janissaries, who were always prone to turbulence while inactive at the capital. He was perhaps wanting in firmness of character, and the undue influence exercised over him by unscrupulous ministers, or by the seductions of fairer but no less ambitious votaries of statecraft, led him to make concessions which tarnished the glory of his reign, and were followed by baneful results for the welfare of his empire. It is from Suleiman's time that historians date the rise of that occult influence of the harem which has so often thwarted the best efforts of Turkey's most enlightened statesmen.

Suleiman's claims to renown as a legislator rest mainly on his organization of the Ulema, or clerical class, in its hierarchical order from the Sheikh-ul-Islam downwards. He reformed and improved the administration of the country both civil and mili- tary, inaugurated a new and improved system for the feudal tenures of limitary fiefs, and his amelioration of the lot of his Christian subjects is net his least title to fame. He was also not unknown to fame as a poet, under the pseudonym of " Muhibbr " (see Hammer-Purgstall, Gesch. d. Osman. Reichs, ii. 331; and further Turkey: History),

Suleiman died on the 5th of September 1566, at the age Of 72, while conducting the siege of Szigetv&r.

SULEIMAN II. (1641-1691), sultan of Turkey, was a son of Sultan Ibrahim, and succeeded his brother Mahommed IV. in 1687. Forty-six years of enforced retirement had qualified him for the cloister rather

than for the throne, and his first feeling when notified of his accession was one of terror for his brother's vengeance. Nor were the circumstances following on his elevation to the throne of a nature to reassure him, as one of the most violent of the revolts of the janissaries ended in the murder of the grand vizier and the brutal mutilation of his family, with general massacre and pillage throughout Con- stantinople. The war with Austria was for Turkey a suc- cession of disasters. At this time, fortunately for the Ottoman Empire, a third great kuprili (Mustafa) arose and re-estab- lished order in the sorely-tried state (see Kuprili). In the reforms which followed, whereby the situation of the Christian subjects of the Porte was greatly improved, Suleiman is at least to be given the credit of having allowed Mustafa Kuprili a free hand. With an improved administration Turkey's fortunes in the war began to revive, and the reconquest of Belgrade late in 1690 was the last important event of the reign, which ended in 1691 by Suleiman's death. (See also Turkey: History.)

SULEIMANIEH, or Suleimania, the chief town of a sanjak of the same name in Asiatic Turkey, in the vilayet of Mosul, situated on a treeless plain in the Kurdistan Mountains, in the region known as Shehrizor, some 40 or 50 m. from the Persian frontier, at an elevation of 2895 ft. It is a military station, and was founded towards the close of the nth century. The estimated population is about 12,000, of whom 11,000 are Kurds, and the majority of the remaining 1000 Jews.

SULIMAN HILLS, a mountain system on the Dera Ismail Khan border of the north-west frontier of India. From the Gomal river southward commences the true Suliman system, presenting an impenetrable barrier between the plains of the Indus and Afghanistan. The Suliman Mountains finally merge, into the hills of Baluchistan, which are inhabited by the Marri and Bugti tribes. The chief mass of the range is known as

Takht-i-Suliman or Solomon's throne. It may be seen on the western horizon from Dera Ismail Khan, a grey, flat-looking rampart rising from the lower line of mountains north and south of it, slightly saddle-backed in the middle, but culminating in a very well-defined peak at its northern extremity. The legend of the mountain is that Solomon visited Hindostan to marry Balkis, and that as they were returning through the air, on a throne supported by genii, the bride implored the bridegroom to let her look back for a few moments on her beloved

land. Solomon directed the genii to scoop out a hollow for the throne on the summit of the mountain. The hollow is a cavity some 30 ft. square cut out of the solid rock, at the southern extremity of the mountain and is a place of pilgrimage for both Hindus and Mahommedans. The actual shrine is about two m. south of the highest peak. The whole mountain was traversed and surveyed by the Takht-i-Suliman Survey Expedition of 1883 (see Sherani) and was found to consist of two parallel ridges running roughly north and south, the southern end of the eastern ridge culminating in a point 1 1 ,070 ft. high, which is the Takht proper on which the shrine is situated, and the western ridge culminating at its north- ern end in a point 1 1 ,300 ft. high known as Kaisargarh. Between these two ridges is a connecting tableland about 9000 ft. high. This plateau and the interior slopes of the ridges are covered with chilghosa (edible pine) forests. The mass of the mountain is composed of nummulitic limestone. No water is to be found on the summit.

SULINA, a town in Rumania, at the mouth of the Sulina branch of the Danube. Pop. (1900), 5611. Sulina is the only free port on the Danube, and is much used for the transhipment into sea- going vessels of grain which is brought down the river in large lighters from Rumania, Russia, Bulgaria, Servia and Austria- Hungary. No agricultural produce is grown in its neighbour- hood, owing to the reed-covered Swamps with which it is sur- rounded. Sulina is the headquarters of the technical depart- ment of the European Commission of the Danube (q.v.). Large steamers navigate up to Galatz and Braila. In 1901, 141 1 steamers and sailing craft aggregating 1,830,000 tons register cleared from Sulina for European ports carrying, besides other merchandise, nearly 13,000,000 quarters of grain. Owing to the improvements effected by the European Commission, there is a depth of 24 ft. of water on the bar, and of 18 to 22 ft. in the fairway. A lighthouse overlooks the estuary. The town contains the only English church in Rumania.

SULITELMA, a mountain on the frontier between Norway and Sweden, forming a salient (6158 ft.) of the Kj6l or ” keel ” of the Scandinavian peninsula. The mass, composed of three peaks, is situated in 67 10′ N., and covered with a snow-field from which many glaciers descend. In these rise feeders of the Swedish rivers Lilla Lule and Pite, flowing south-east. Westward, the foothills descend upon the Skjerstad Fjord, above which are two lakes, Nedre and Ovre Vand. From Sjohstaa steamers on the Langvand and a light railway give communication between the sea and Furulund, the headquarters of the Swedish Sulitelma Mining Company. A mountain track descends from Sulitelma to Kvickjock (or Kvikkjokk) , a considerable village

magnificently situated on the Tarrajock, a head-stream of the Lilla Lule. This is distant three days' journey on foot from Furulund.

SULLA, LUCIUS CORNELIUS (138-78 B.C.), surnamed Felix, Roman general, politician and dictator, belonged to a minor and impoverished branch of the famous patrician Cornelian gens. He received a careful education, and was a devoted student of literature and art. His political advancement was slow, and he did not obtain the quaestorship until 107, when he served in the Jugurthincwar under Marius in Africa. In this he greatly distinguished himself, and claimed the credit of having terminated the war by capturing Jugurtha himself. In these African campaigns Sulla showed that he knew how to win the confidence of his soldiers, and throughout his career the secret of his success seems to have been the enthusiastic devotion of his troops, whom he continued to hold well in hand, while allowing them to indulge in plundering and all kinds of excess. From 104 to 101 he served again under Marius in the war with the Cimbri and

Teutones and fought in the last great battle in the Raudian plains near Verona. It was at this time that Marius's jealousy of his legate laid the foundations of their future rivalry and mutual hatred. When the war was over, Sulla, on his return to Rome, lived quietly for some years and took no part in politics. In 93 he was elected praetor after a lavish squandering of money, and he delighted the populace with an exhibition of a hundred lions from Africa. Next year (92) he went as propraetor of Cilicia with special authority from the senate to make Mithra- dates VI. of Pontus restore Cappadocia to Ariobarzanes, one of Rome's dependants in Asia. Sulla with a small army soon won a victory over the general of Mithradates, and Rome's client-king was restored. An embassy from the Parthians now came to solicit alliance with Rome, and Sulla was the first Roman who held diplomatic intercourse with that remote people. In the year 91, which brought with it the imminent prospect of sweeping political change, with the enfranchisement of the Italian peoples, Sulla returned to Rome, and it was generally felt that he was the man to lead the conservative and aristocratic party.

Meanwhile Mithradates and the East were forgotten in the crisis of the Social or Italic War, which broke out in 91 and threatened Rome's very existence. The services of both Marius and Sulla were given; but Sulla was the more successful, or, at any rate, the more fortunate. Of the Italian peoples Rome's old foes the Samnites were the most formidable; these Sulla van- quished, and took their chief town, Bovianum. In recognition of this and other brilliant services, he was elected consul in 88, and brought the revolt to an end by the capture

of Nola in Campania. The question of the command of the army against Mithradates again came to the front. The senate had already chosen Sulla; but the tribune Publius Sulpicius Rufus moved that Marius should have the command. Rioting took place at Rome at the prompting of the popular leaders, Sulla narrowly escaping to his legions in Campania, whence he marched on Rome, being the first Roman who entered the city at the head of a Roman army. Sulpicius was put to death, and Marius fled; and he and his party were crushed for the time.

Sulla, leaving things quiet at Rome, quitted Italy in 87, and for the next four years he was winning victory after victory against the armies of Mithradates and accumulating boundless plunder. Athens, the headquarters of the Mithradatic cause, was taken and sacked in 86 ; and in the same year, at Chaeroneia, the scene of Philip II. of Macedon's victory more than two and a half centuries before, and in the year following, at the neighbour- ing Orchomenus, he scattered immense hosts of the enemy with trifling loss to himself. Crossing the Hellespont in 84 into Asia, he was joined by the troops of C. Flavius Fimbria, who soon deserted their general, a man sent out by the Marian party, now again in the ascendant at Rome. The same year peace was concluded with Mithradates on condition that he should be put back to the position he held before the war; but, as he raised objections, he had in the end to content himself with being simply a vassal of Rome.

Sulla returned to Italy in 83, landing at Brundisium, having previously informed the senate of the result of his campaigns in Greece and Asia, and announced his presence on Italian ground. He further complained of the ill-treatment to which his friends and partisans had been subjected during his absence. Marius had died in 86, and the revolutionary party, specially represented by L. Cornelius Cinna, Cn. Papirius Carbo and the younger Marius, had massacred Sulla's supporters wholesale, confiscated his property, and declared him a public enemy. They felt they must resist him to the death, and with the troops scattered throughout Italy, and the newly enfranchised Italians, to whom it was understood that Sulla was bitterly hostile, they counted confi- dently on success. But on Sulla's advance at the head of fcis 40,000 veterans many of them lost heart and deserted their leaders, while the Italians themselves, whom he confirmed in their new privileges, were won over to his side. Only the Sam- nites, who were as yet without the Roman franchise, remained his enemies, and it seemed as if the old war between Rome and Samnium had to be fought once again. Several Roman nobles.

among them Gnaeus Pompeius (Pompey the Great), Q. Caecilius Metellus Pius, Marcus Licinius Crassus, Marcus LiciniusLucullus, joined Sulla, and in the following year (82) he won a decisive victory over the younger Marius near Praeneste (mod. Palestrina) and then marched upon Rome, where again, just before his defeat of Marius, there had been a great massacre of his adherents, in which the learned jurist Q. Mucius Scaevola perished. Rome was at the same time in extreme peril from the advance of a Samnite army, and was barely saved by Sulla, who, after a hard- fought battle, routed the enemy under Pontius Telesinus at the Colline gate of Rome. With the death of the younger Marius, who killed himself after the surrender of Praeneste, the civil war was at an end, and Sulla was master of Rome and of the Roman world. Then came the memorable ” proscription,” when for the first time in Roman history a list of men declared to be outlaws and public enemies was exhibited in the forum, and a reign of terror began throughout Rome and Italy. The title of ” dictator ” was revived and Sulla was in fact emperor of Rome. After celebrating a splendid triumph for the Mithradatic War, and assuming the surname of ” Felix ” (” Epaphroditus,” ” Venus’s favourite,” 1 he styled himself in addressing Greeks), he carried in 80 and 79 his great political reforms (see Rome: History, II. ” The Republic “). The main object of these was to invest the senate, which he recruited with a number of his own party, with full control over the state, over every magistrate and every province; and the mainstay of his political system was to be the military colonies which he had established with grants of land throughout every part of Italy, to the ruin of the old Italian freeholders and farmers, who from this time dwindled away, leaving whole districts waste and desolate.

In 79 Sulla resigned his dictatorship and retired to Puteoli (mod. Pozzuoli), where he died in the following year, probably from the bursting of a blood-vessel. The story that he fell a victim to a disease similar to that which cut off one of the Herods (Acts xii. 23) is probably an invention of his enemies. The ” half lion, half fox,” as his enemies called him, the ” Don Juan of politics ” (Mommsen), the man who carried out a policy of ” blood and iron ” with a grim humour, amused himself in his last days with actors and actresses, with dabbling in poetry, and completing the Memoirs (commentarii, vwoiivi\)xara) of his event- ful life (see H. Peter, Historicorum romanorum reliquiae, 1870). Even then he did not give up his interest in state and local affairs, and his end is said to have been hastened by

a fit of passion brought on by a remark of the quaestor Granius, who openly asserted that he would escape payment of a sum of money due to the Romans, since Sulla was on his death-bed. Sulla sent for him and had him strangled in his presence ; in his excitement he broke a blood-vessel and died on the following day. He was accorded a magnificent public funeral, his body being removed to Rome and buried in the Campus Martius. His monument bore an inscription written by himself, to the effect that he had always fully repaid the kindnesses of his friends and the wrongs done him by his enemies. His military genius was displayed in the Social War and the campaigns against Mithradates; while his constitu- tional reforms, although doomed to failure from the lack of suc- cessors to carry them out, were a triumph of organization. But he massacred his enemies in cold blood, and exacted vengeance with pitiless and calculated cruelty ; he sacrificed everything to his own ambition and the triumph of his party.

The ancient authorities for Sulla and his time are his Life by Plutarch (who made use of the Memoirs) ; Appian, Bell. civ. ; for the references in Cicero see Orelli's Onomasticon Tullianum. Modern treatises by C. S. Zacharia, L. Cornelius S. als Ordner des rbmischen Freystaates (1834); T. Lau, Lucius Cornelius Sulla (1855); E. Linden, De bello civili Sullano (1896); P. Cantalupi, La Guerra civile Sullana in Italia (1892) ; C. W. Oman, Seven Roman Statesmen (1902) ; F. D. Gerlach, Marius und Sulla (1856) ; J. M. Sunden, " De tribunicia potestate a Lucio Sulla imminuta" in Skrifter utgifna af k. humanistika Vetenskapssamfundet i Upsala, v., 1897, in which it is argued against Mommsen that Sulla did not deprive the tribunes of the right of proposing rogations. See also Mommsen's History of Rome, vol. iii., bk. iv., ch., 8, 9; Drumann, Geschichte Roms,

1 A short epigjram on Aphrodite in the Greek Anthology (Anth. Pal., Appendix, 1. 153) is ascribed to him.

2nd ed. by Groebe, ii. 364-432; Pauly-Wissowa, Realencyclopddie, iv. 1522-1566 (Frohlich).

His nephew (as some say, though the degree of relationship cannot be clearly established), Publitjs Cornelius Sulla was consul in 66 B.C. with P. Autronius Paetus. Both were convicted of bribery, and Paetus subsequently joined Catiline in his first conspiracy. There is little doubt that Sulla also was implicated; Sallustdoes not mention it, but other authorities definitely assert his guilt. After the second conspiracy he was accused of having taken part in both conspiracies. Sulla was defended by Cicero and Hortensius, and acquitted. There is no doubt

that, after his first conviction, Sulla remained very quiet, and, whatever his sympathies may have been, took no active part in the conspiracy. When the civil war broke out, Sulla took the side of Caesar, and commanded the right wing at the battle of Pharsalus. He died in 45.

See Cicero, Pro Sulla, passim (ed. J. S. Reid, 1882); Ad Fam. ix. 10, xv. 17; Dio Cassius xxxvi. 44, xxxvii. 25; Suetonius, Caesar, 9; Caesar, Bell, civ., iii. 51, 89; Appian, Bell. civ. ii. 76.

SULLIVAN, SIR ARTHUR SEYMOUR (1842-1900), English musical composer, was born in London on the 13th of May 1842, being the younger of the two sons of Thomas Sullivan, a culti- vated Irish musician who was bandmaster at the Royal Military College, Sandhurst, from 1845 to l8 5°> and taught at the Military School of Music at Kneller Hall from 1857 till his death in 1866. His mother, nie Mary Coghlan (1811-1882), had Italian blood in her veins. Arthur Sullivan was brought up to music from boy- hood, and he had learnt to play every wind instrument in his father's band by the age of eight. He was sent to school at Bayswater till he was twelve, and then, through Sir George Smart, he was, at his own persistent request, made a Chapel Royal chorister, and entered Mr Helmore's school for Chapel Royal boys in Cheyne Walk. He had a fine treble voice, and sang with exceptional taste. In 1856 the Mendelssohn Scholar- ship at the Royal Academy of Music was thrown open for the first time for competition, and was won by Sullivan, his nearest rival being Joseph Barnby. At the Academy he studied under Sterndale Bennett, Arthur O'Leary and John Goss, and did so well that he was given an extension of his scholarship for two years in succession. In 1858, his voice having broken, he was enabled by means of his scholarship to go to study at the con- servatorium of Leipzig. There he had for teachers Moscheles and Plaidy for pianoforte, Hauptmann for counterpoint, Rietz and Reinecke for composition, and F. David for orchestral playing and conducting. Among his fellow-students were Grieg, Carl Rosa, Walter Bache, J. F. Barnett and Edward Dannreuther. Instead of the Mendelssohn cuitus which represented orthodoxy in London, German musical interest at this period centred in Schumann, Schubert and the growing reputation of Wagner, whilst Liszt and Von Bulow were the celebrities of the day. Sullivan thus became acquainted for the first time with master- pieces which were then practically ignored in England. He entered enthusiastically into the spirit of the place, and after two years' hard study returned to London in April 1861. Before doing so, however, he had composed his incidental music for The Tempest, which he had begun as a sort of diploma work. Sullivan set himself to find converts in London to the enthusiasms he had imbibed

at Leipzig. He became acquainted with George Grove, then secretary of the Crystal Palace, and August Manns, the conductor there; and at his instigation Schumann's First Symphony was introduced at one of the winter concerts. Early in 1862 Sullivan showed Grove and Manns his Tempest music, and on the 5th of April it was performed at the Crystal Palace. The production was an unmixed triumph, and Sullivan's exceptional gifts as a composer were generally recognized from that moment. He had hitherto been occupying himself with teaching, and he continued for some years to act as organist at St Michael's, Chester Square, but henceforth he devoted most of his time to composition. By 1864 he had produced his " Kenil- worth " cantata (remembered chiefly for the lovely duet, " How sweet the Moonlight "), the " Sapphire Necklace " overture, and the five beautiful songs from Shakespeare, which include

" Orpheus with his Lute," " Oh Mistress Mine " and " The Willow Song." His attractive personality, combined with his un- doubted genius and brilliant promise, brought him many friends. Costa, who was conductor at Covent Garden, gave him the post of organist, and in 1864 he produced there his L'lle Enchantee ballet. Some of his spare time was spent in Ireland, where in 1863 he began the composition of his (" Irish ") Symphony in E, which was produced at the Crystal Palace in 1866. The most important event, however, at this period, as bearing upon his later successes, was his co-operation with F. C. Burnand in the musical extravaganza Cox and Box, which first showed his capacity for musical drollery. This was acted privately in 1866, and was completed for public performance in 1867, in which year Sullivan again co-operated with Burnand in Contrabandista. Meanwhile he was in request as a conductor, and was made professor of composition at the Academy. His father's sudden death in 1866 inspired him to write the fine " In Memoriam " overture, which was produced at the Norwich Festival. In 1867, besides producing his " Marmion " overture, he and Grove did a great service to their art by bringing to light at Vienna a number of lost Schubert MSS., including the Rosamunde music. About this time Sullivan induced Tennyson to write his song- cycle "The Window," to be illustrated by Millais, with music by himself. But Millais abandoned the task, and Tennyson was not happy about his share; and the series, published in 187 1, never became popular, in spite of Sullivan's dainty setting. In 1869 he brought out his oratorio The Prodigal Son at Worcester, and in 1870 his overture " Di Ballo " at Birmingham. In 187 1 Sullivan had become

acquainted with W. S. Gilbert (q.v.), and in 1872 they collaborated in a piece for the Gaiety Theatre, called Thespis; or, The Gods Grown Old, which was a great success in spite of the limited vocal resources of the per- formers. In 1875 R. D'Oyly Carte, then acting as manager for Selina Dolaro at the Royalty, approached Gilbert with a view to his collaborating with Sullivan in a piece for that theatre. Gilbert had already suggested to Sullivan an operetta with its scene in a law court, and within three weeks of his completing the libretto of Trial by Jury the music was written. The piece succeeded beyond all expectation; and on the strength of its promise of further successes D'Oyly Carte formed his Comedy Opera Company and took the Opera Comique Theatre. There in 1877 The Sorcerer was produced, George Grossmith and Rutland Barrington being in the cast. In 1878 H.M.S. Pinafore, was brought out at the Opera Comique. At first it did not attract large audiences, but eventually it became a popular success, and ran for 700 nights. In America it was enthusiastically received, and the two authors, with D'Oyly Carte, went over to the States in 1879, with a company of their own, in order to produce it in New York. To secure the American rights for their next opera, they brought out The Pirates of Penzance first at New York in 1879. In 1880, in London, it ran for nearly 400 nights. In 1 88 1 Patience was produced at the Opera Comique, and was transferred later in the year to the Savoy Theatre. There all the later operas came out: Iolanthe (1882), Princess Ida (1884), The Mikado — perhaps the most charming of all — (1885), Ruddigore (1887), The Yeomen of the Guard (1888), The Gondoliers (1889). This succession of pieces by Gilbert and Sullivan had made their united names stand for a new type of light opera. Its vogue owed something to such admirable performers as George Gros- smith — famous for his " patter songs " — Rutland Barrington, Miss Jessie Bond, Miss Brandram, and later W. H. Denny and Walter Passmore; but these artistes only took advantage of the opportunities provided by the two authors. In place of the old adaptations of French opera bouffe they had substituted a genuinely English product, humorous and delightful, without a tinge of vulgarity or the commonplace. But disagreements now arose between them which caused a dissolution of partner- ship. Sullivan's next Savoy opera, Haddon Hall (1892), had a libretto by Sydney Grundy; and the resumption of Gilbert's collaboration in 1893 in Utopia, Limited, and again in 1896 in The Grand Duke, was not as successful as before. Sullivan's music, however, still showed its characteristic qualities in The

Chieftain (1894)— largely an adaptation of Contrabandista; The Beauty Stone (1898), with a libretto by A. W. Pinero and J. Comyns Carr; and particularly in The Rose of Persia (1900), with Captain Basil

Hood.

In the public mind Sir Arthur Sullivan (who was knighted in 1883) had during these years become principally associated with the enormous success of the Savoy operas; but these by no means exhausted his musical energies. In 1872 his Te Deum for the recovery of the prince of Wales was performed at the Crystal Palace. In 1873 he produced at the Birmingham Musical Festival his oratorio The Light of the World, in 1877 he wrote his incidental music to Henry VIII., in 1880 his sacred cantata The Martyr of Antioch, and in 1886 his masterpiece, The Golden Legend, was brought out at the Leeds Festival. The Golden Legend satisfied the most exacting critics that for originality of conception and grandeur of execution English music possessed in Sullivan a composer of the highest calibre. In 1891, for the opening of D'Oyly Carte's new English opera- house in Shaftesbury Avenue he wrote his " grand opera" Ivanhoe to a libretto by Julian Sturgis. The attempt to put an English opera on the stage for a long run was doomed to failure, but Ivanhoe was full of fine things. In 1892 he composed inci- dental music to Tennyson's Foresters. In 1897 he wrote a ballet for the Alhambra, called Victoria and Merrie England. Among his numerous songs, a conspicuous merit of which is their admir- able vocal quality, the best known are " If Doughty Deeds " (1866), " The Sailor's Grave " (1872), " Thou'rt Passing Hence " (1875), " I would I were a King " (1878), " King Henry's Song " (1878) and " The Lost Chord " (1877). This last, hackneyed as it became, was probably the most successful English song of the 19th century. It was written in 1877, during the fatal illness of Sullivan's brother Frederic, who, originally an architect, had become an actor, and by means of his fine voice and powers as a comedian (best shown as the Judge in Trial by Jury) had won considerable success. Among Sullivan's many hymn tunes, the stirring " Onward, Christian Soldiers! " (1872) is a permanent addition to Church music. In 1876 he accepted the principalship of the National Training School of Music, which he held for six years; this was the germ of the subsequent Royal College. He received the honorary degree of Mus. Doc. from Cambridge (1876) and Oxford (1879). In 1878 he was a member of the royal com- mission for the Paris Exhibition. He was conductor of the Leeds Festivals from 1879 to 1898, besides being conductor of the Philharmonic Society in 1885. Apart from his broad sympathy and his practical knowledge of instruments, his work as a con- ductor must always be associated with his efforts to raise the standard of orchestral playing in England and his unwearying exertions on behalf of British music and British musicians. Sullivan liked to be associated in the public mind with patriotic objects, and his setting of Rudyard Kipling's

” Absent-minded Beggar” song, at the opening of the Boer War in 1899, was, with the exception of The Rose of Persia, the last of his compositions brought out in his lifetime. He died somewhat suddenly of heart failure on the 22nd of November 1900, and his burial in St Paul’s Cathedral was the occasion of a remarkable demon- stration of public sorrow. He left unpublished a Te Deum written for performance at the end of the Boer War, and an unfinished Savoy opera for a libretto by Captain Hood, which, completed by Edward German, was produced in 1901 as The Emerald Isle.

Sullivan was the one really popular English composer of any artistic standing in his time; and his celebrity as a public man has somewhat interfered with a definite judgment as to his place in the history of English music. In his own time, English musical taste developed in a very remarkable degree ; and musical criticism in serious quarters was a little disinclined to do justice to what was ” popular.” One of the most agreeable companions, broad-minded, and free from all affectation, he was intensely admired and loved in all circles of society; and though his health was not robust, for he suffered during many years at intervals from a painful ailment, he was a man of the world who enjoyed the life which his success opened out to him without being spoilt

by it. He was always a devoted and an industrious musician, and from the day he left Leipzig his influence was powerfully exerted in favour of a wider and fuller recognition of musical culture. He was accused in some quarters of being unsympathetic towards Wagner and the post-Wagnerians, yet he had been one of the first to introduce Wagner’s music to English audiences. He was keenly appreciative of new talent, but his tastes were too eclectic to satisfy the enthusiasts for any particular school; he certainly had no liking for what he considered uninspired academic writing. Serious critics deplored, with more justifica- tion, that he should have devoted so much of his great natural gift not merely to light comic opera, but to the production of a number of songs which, though always musicianly, were really of the nature of ” pot-boiling.” Sullivan was an extremely rapid worker, and his fertility in melody made it easy for him to produce what would please a large public. Moreover, it must be admitted that his great social success, so early achieved, was not calculated to nourish a rigidly artistic ideal. But when all is said, his genius remains undisputed; and it was a genius essentially English. His church music

alone would entitle him to a high place among composers; and The Golden Legend, Ivanhoe, the In Memoriam overture, the ” Irish ” symphony and the charming ” incidental music ” to The Tempest and to Henry VIII. form a splendid legacy of creative effort, characterized by the highest scholarly qualities in addition to those beauties which appeal to every ear. Whether his memory will be chiefly associated with these works, or rather with the world-wide popularity of some of his songs and comic operas, time alone can tell. The Savoy operas did riot aim at intellectual or emotional grandeur, but at providing innocent and wholesome pleasure; and in giving musical form to Gilbert’s witty librettos Sullivan showed once for all what light opera may be when treated by the hand of a master. His scores are as humorous and fanciful qud music as Gilbert’s verses are qud dramatic literature. Bubbling melody, consummate orchestration, lovely songs and concerted pieces (notably the famous vocal quintets) flowed from his pen in un- exhausted and inimitable profusion. If he had written nothing else, his unique success in this field would have been a solid title to fame. As it was, it is Sir Arthur Sullivan’s special distinction not only to have been prolific in music which went straight to the hearts of the people, but to have enriched the English repertoire with acknowledged masterpieces, which are no less remarkable for their technical accomplishment.

See also Sir Arthur Sullivan: Life-story, Letters, and Reminiscences, by Arthur Lawrence (London: Bowden, 1899). Besides being largely autobiographical, this volume contains a complete list of Sullivan’s works, compiled by Mr Wilfrid Bendall, who for raanv years acted as Sir Arthur’s private secretary. (H. Ch.)

SULLIVAN, JOHN (1740-1795), American soldier and politi- cal leader, was born in Somersworth, New Hampshire, on the 18th of February 1740. He studied law in Portsmouth, N.H., and practised at Berwick, Maine, and at Durham, N.H. He was a member of the New Hampshire Provincial Assembly in 1774, and in 1774-1775 was a delegate to the Continental Congress. In 1772 he had been commissioned a major of New Hampshire militia, and on the 15th of December 1774 he and John Langdon led an expedition which captured Fort William and Mary at New Castle. Sullivan was appointed a brigadier-general in the Continental army in June 1775 and a major-general in August 1776. He commanded a brigade in the siege of Boston. In June 1776 he took command of the American army in Canada and after an unsuccessful skirmish with the British at Three Rivers (June 8) retreated to Crown Point. Rejoining Washing- ton’s army, he served under General Israel Putnam in the battle of Long Island (August 27) and was taken prisoner. Released on parole, he

bore a verbal message from Lord Howe to the Continental Congress, which led to the fruitless conference on Staten Island. In December he was exchanged, succeeded General Charles Lee in command of the right wing of Wash- ington's army, in the battle of Trenton led an attack on the Hessians, and led a night attack against British and Loyalists on Staten Island, on the 22nd of August 1777. I n the battle of

Brandywine (Sept. 11, 1777) he again commanded the American right; he took part in the battle of Germantown (Oct. 4, 1777); in March 1778 he was placed in command in Rhode Island, and in the following summer plans were made for his co-operation with the French fleet under Count d'Estaing in an attack on Newport, which came to nothing. Sullivan after a brief engage- ment (Aug. 29) at Quaker Hill, at the N. end of the island of Rhode Island, was obliged to retreat. In 1 7 79 Sullivan, with about 4000 men, defeated the Iroquois and their Loyalist allies at New- town (now Elmira), New York, on the 29th of August, burned their villages, and destroyed their orchards and crops. Although severely criticised for his conduct of the expedition, he received, in October 1779, the thanks of Congress. In November he resigned from the army. Sullivan was again a delegate to the Continental Congress in 1780-1781 and, having accepted a loan from the French minister, Chevalier de la Luzerne, he was charged with being influenced by the French in voting not to make the right to the north-east fisheries a condition of peace. From 1782 to 1785 he was attorney -general of New Hampshire. He was president of the state in 1 786-1 787 and in 1789, and in 1786 suppressed an insurrection at Exeter immediately pre- ceding the Shays Rebellion in Massachusetts. He presided over the New Hampshire convention which ratified the Federal constitution in June 1788. From 1789 until his death at Durham, on the 23rd of January 1795, he was United States District Judge for New Hampshire.

See O. W. B. Peabody, " Life of John Sullivan " in Jared Sparks's Library of American Biography, vol. iii. (Boston, 1844); T. C. Amory, General John Sullivan, A Vindication of his Character as a Soldier and a Patriot (Morrisania, N.Y., 1867); John Scales, " Master John Sullivan of Somersworth and Berwick and his Famify," in the Proceedings of the New Hampshire Historical Society, vol. iv. (Concord, 1906); and Journals of the Military Expedition of Major-General John Sullivan against the Six Nations of Indians (Auburn, N. Y., 1887).

SULLIVAN, THOMAS BARRY (1824-1891), Irish actor, was born at Birmingham, and made his first stage appearance at Cork about 1840. His earliest successes were in romantic drama, for which his graceful

figure and youthful enthusiasm fitted him. His first London appearance was in 1852 in Hamlet, and he was also successful as Angiolo in Miss Vandenhoff's Woman's Heart, Evelyn in Money and Hardman in Lord Lytton's Not so Bad as we Seem. Claude Melnotte — with Helen Faucit as Pauline — was also a notable performance. A tour of America in 1857 preceded his going to Australia (1861) for six years, as actor and manager. He completed a trip round the world in 1866. From 1868-1870 he managed the Holborn theatre, where Beverley in The Gamester was one of his most powerful impersonations. Afterwards he travelled over the United States, Canada, Australia and England. A mon g his later London performances were several Shakespearian parts, his best, perhaps, being Richard III. He was the Benedick of the cast of Much Ado About Nothing with which the Shake- speare Memorial was opened at Stratford-on-Avon. He died on the 3rd of May 1891.

SULLY, JAMES (1842-), English psychologist, was born on the 3rd of March 1842 at Bridgwater, and was educated at the Independent College, Taunton, the Regent's Park College, Gottingen and Berlin. He was originally destined for the Nonconformist ministry, but in 1871 adopted a literary and philosophic career. He was Grote professor of the philosophy of mind logic at University College, London, from 1892 to 1903, when he was succeeded by Carveth Read. An adherent of the associationist school of psychology, his views had great affinity with those of Alexander Bain. His monographs, as that on pessimism, are ably and readably written, and his text- books, of which The Human Mind (1892) is the most important, are models of sound exposition.

Works. — Sensation and Intuition (1874), Pessimism (1877), Illusions (1881; 4th ed., 1895), Outlines of Psychology (1884; many editions), Teacher's Handbook of Psychology (1886), Studies of Childhood (1895), Children's Ways (1897), and An Essay on Laughter (1902).

SULLY, MAXIMILIEN DE BETHUNE, Due de (i 560-1641), French statesman, was born at the chateau of Rosny near Mantes, on the i3thof December 1560, of a noble family of Flemish descent. His father, Francois de Bethune, baron de Rosny, (1532-1575), was the son of Jean de Bethune, to whom in 1529 his wife Anne de Melun brought as part of her dowry a seigneurie at Rosny-sur-Seine, which later (1601) was made a marquisate. Brought up in the Reformed faith, Maximilien was presented to Henry of Navarre in 157 1 and was

thenceforth attached to the future king of France. The young baron de Rosny was taken to Paris by his patron and was studying at the college of Bour- gogne at the time of the massacre of St Bartholomew's Day, from which he escaped by discreetly carrying a book of hours under his arm. He then studied mathematics and history at the court of Henry of Navarre, and on the outbreak of civil war in 1575 he enlisted in the Protestant army. In 1576 he accompanied the duke of Anjou on an expedition into the Netherlands in order to regain the former Rosny estates, but being unsuccessful he attached himself for a time to the prince of Orange. Later rejoining Henry of Navarre in Guienne, he dis- played bravery in the field and particular ability as an engineer. In 1583 he was Henry's special agent in Paris. In 1584 he married Anne de Courtenay, a wealthy heiress, who died, however, in 1589. On the renewal of civil war Rosny again joined Henry of Navarre, and at the battle of Ivry (1590) was seriously wounded. He counselled Henry IV. 's conversion to Roman Catholicism, but steadfastly refused himself to become a Roman Catholic. As soon as Henry's power was established, the faithful and trusted Rosny received his reward in the shape of numerous estates and dignities. On the death of D'O, the superintendent of finances, in 1594, the king had appointed a finance commission of nine members, to which he added Rosny in 1596. The latter at once made a tour of inspection through the generalities, and introduced some order into the country's affairs. He was probably made sole superintendent of, finances in 1598, although this title does not appear in official documents until the close of 1601. He authorized the free exportation of grain and wine, reduced legal interest from 83 to 6j%, estab- lished a special court for the trial of cases of peculation, forbade provincial governors to raise money on their own authority, and otherwise removed many abuses of tax-collecting, abolished several offices, and by his honest, rigorous conduct of the country's finances was able to save between 1600 and 1610 an average of a million livres a year. His achievements were by no means solely financial. In 1 599 he was appointed grand commissioner of highways and public works, superintendent of fortifications and grand master of artillery; in 1602 governor of Mantes and of Jargeau, captain-general of the queen's gens d'armes and governor of the Bastille; in 1604 governor of Poitou; and in 1 606 duke" and peer of Sully, ranking next to princes of the blood. He declined the office of constable because he would not become a Roman Catholic. Sully encouraged agriculture, urged the free circulation of produce, promoted stock-raising, forbade the destruction of the forests, drained swamps, built roads and bridges, planned a vast system of canals and actually began the canal of Briare. He strengthened the French military establishment; under his direction

Evrard began the construction of a great line of defences on the frontiers. Sully opposed the king's colonial policy as inconsistent with the French genius, and likewise showed little favour to industrial pursuits, although on the urgent solicitation of the king he established a few silk factories. He fought in corripany with Henry IV. in Savoy (1600-1601) and negotiated the treaty of peace in 1602; in 1603 he represented Henry at the court of James I. of England; and throughout the reign he helped the king to put down insurrections of the nobles, whether Roman Catholic or Protestant. It was Sully, too, who arranged the marriage between Henry IV. and Marie de Medicis.

The political role of Sully practically ended with the assassi- nation of Henry IV. on the 14th of May 1610. Although a member of the council of regency, his colleagues were not dis- posed to brook his domineering leadership, and after a stormy

debate he resigned as superintendent of finances on the 26th of January 161 1, and retired to private life. The queen- mother gave him 300,000 livres for his services and confirmed him in possession of his estates. He attended the estates-general in 1614, and on the whole was in sympathy with the policy and government of Richelieu. He disavowed the plots at La Rochelle, in 1621, but in the following year was arrested at Moulins, though soon released. The baton of marshal of France was conferred on him on the 18th of September 1634. The last years of his life were spent chiefly at Villebon, Rosny and Sully. He died at Villebon, on the 22nd of December 1 641. By his first wife Sully had one son, Maximilien, marquis de Rosny (1587-1634), who led a life of dissipation and debauchery. By his second wife, Rachel de Cochefilet, widow of the lord of Chateaupers, whom he married in 1592 and who turned Protestant to please him, he had nine children, of whom six died young, and one daughter married in 1605 Henri de Rohan.

Sully was not popular. He was hated by most Roman Catholics because he was a Protestant, by most Protestants because he was faithful to the king, and by all because he was a favourite, and selfish, obstinate and rude. He amassed a large personal fortune, and his jealousy of all other ministers and favourites was extravagant. Nevertheless he was an excellent man of business, inexorable in punishing malversation and dishonesty on the part of others, and opposed to the ruinous court expenditure which was the bane of almost all European monarchies in his day. He was gifted with executive ability, with confidence and resolution, with fondness for work, and above all with deep devotion to his master. He was implicitly trusted by Henry IV. and proved himself the most able

assistant of the king in dispelling the chaos into which the religious and civil wars had plunged France. To Sully, next to Henry IV., belongs the credit for the happy transformation in France between 1598 and 1610 by which agriculture and commerce were benefited and foreign peace and internal order were maintained.

Sully left a curious collection of memoirs written in the second person and bearing the quaint title, Memoires des sages et royales (economies d'estat, domestiques, politiques, et militaires de Henry le Grand, Vexemplaire des roys, le prince des vertus, des armes, et des loix, et le phre en effet de ses peuples franQois; et des servitudes utiles, obissances convenables, et administrations loyales de Maxim, de Bethune, Vun des plus confidens, familiers, et utiles soldats et serviteurs du grand Mars des Francois: dediees a la France, a tous les bans soldats, et tous peuples frangois. The memoirs are very valuaible for the history of the time and as an autobiography cf Sully, in spite of the fact that they contain many fictions, such as a mission under-taken by Sully to Queen Elizabeth in 1601, and the famous " Grand Design," a plan for a Christian republic, which some historians have taken seriously. Two folio volumes of the memoirs were splendidly printed, nominally at Amsterdam, but' really ender Sully's own eye, at his chateau in 1638; two. other, volumes appeared posthumously in Paris in 1662. The abbe de l'Ecluse rewrote the memoirs in ordinary narrative form and edited them in 1745. The best edition of the original is that in J. F. Michaud and J. J. F. Poujoulat, Nouvelle collection des memoires relatifs & I'histoire de France (1854), vols, xvi.-xvii. An English translation by Charlotte Lennox appeared in 1756 and was later revised and republished (4 vols., London, 1856).

See E. Lavisse, Sully (Paris, 1880) ; L. Dussieux, Etude bio- graphique sur Sully (Paris, 1887) ; G. Fagniez, iLconomie sociale de la France sous Henri IV. (Paris, 1897); B. L. H. Martin, Trois grands ministres, Sully, Richelieu et Colbert (Paris, 1898); E. Lavisse, ed. Histoire de France (Paris, 1905), vol. vi. ; P. Robiquet, Histoire muni- cipale de Paris, vol. iii. Histoire de Henri IV. (Paris, 1904) ; E. Bonnal, L'Exonomie politique au XVI" siecle: Sully economiste (Paris, 1872); J. Gourdault, Sully et son temps (Tours, 1873); T. Kiikelhaus, Der Ursprung des Planes vom ewigen Frieden in den Memoiren des Herzogs von Sully (Berlin, 1892); C. Pfister, "Les '(Economies royales ' de Sully et le grand dessein de Henri IV." in Revue historique (1894), vols, liv.-lvi. ; Desclozeaux, ." Gabrielle d'Estrees et Sully " in Revue historique (1887), vol. xxxiii. (C. H. Ha).

SULLY, THOMAS (1783-1872), American artist, was born at Horncastle, England, on the 8th of June 1783. His parents, who were

actors, took him to America when he was nine years old, settling at Charleston, South Carolina, and he was first instructed in art by a French miniature painter. Afterwards he was a

pupil of Gilbert Stuart in Boston, and in 1809 he went to London and entered the studio, of Benjamin West. He returned in 1810, and made Philadelphia his home, but in 1837 again visited London, where he painted a full length portrait of Queen Victoria for the St George's Society of Philadelphia. Sully was one of the best of the early American painters. He died in Philadelphia on the 5th of November 1872. Among his por- traits are those of Commodore Decatur (City Hall, New York) ; the actor George Frederick Cooke, as Richard III. (Pennsylvania Academy of the Fine Arts, Philadephia) ; Lafayette (Indepen- dence Hall); Thomas Jefferson (U.S. Military Academy, West Point, New York); Charles and Frances Anne Kemble, and Reverdy Johnson. His son Alfred Sully (1821-1879) an officer in the United States army, was a brigade-commander in the Army of the Potomac in 1862-63, an d after 1863 commanded the department of Dakota and conducted several campaigns against hostile Indians in the north-west. In 1865 he was breveted brigadier-general in the regular army and major- general of volunteers.

SULLY-PRUDHOMME, RENE FRANCOIS ARMAND PRUD- HOMME (1830-1007), French poet, was born in Paris on the 16th of March 1839. He was educated at the Lycee Bonaparte, where after a time he took his degree as Bachelier es Sciences. An attack of ophthalmia then interrupted his studies and necessitated an entire change in the course of his career. The scientific habit of mind, however, which he had derived from these years of technical study never left him; and it is in the combination of this scientific bent, with a soul aspiring towards what lies above and beyond science, and a conscience per- petually in agitation, that the striking originality of Sully- Prudhomme's character is to be found. He found employment for a time in the Schneider factory at Creuzot, but he soon abandoned an occupation to which he was eminently unsuited. He subsequently decided to read law, and entered a notary's office at Paris. It was during this period that he composed those early poems which were not long in acquiring celebrity among an ever-widening circle of friends. In 1865 he pub- lished his first volume of poems, which had for sub-title Stances et poemes. This volume was favourably reviewed by Sainte- Beuve, to whose notice it had been brought by Gaston Paris. It was at this

moment that the small circle of which Leconte de Lisle was the centre were preparing the Pamasse, to which Sully-Prudhomme contributed several pieces. In 1866 Lemerre published a new edition of the Stances et poemes and a collection of sonnets entitled Les Upreuves (1866). From this time forward Sully-Prudhomme devoted his life entirely to poetry. It was in the volume of Lcs Epreuves that the note of melancholy which was to dominate through the whole work of his life was first clearly discernible. In 1869 he published a translation of the first book of Lucretius with a preface, and Les Solitudes. In 1870 a series of domestic bereavements and a serious paralytic illness resulting from the strain and fatigue of the winter of 1870, during which he served in the Garde Mobile, shattered his health. In 1872 he published Les Ecuries d'augias, Croquis italicns, Impressiotis de la guerre (1866-72) and Les Destins, La Revolte des heurs in 1874, in 1875 Les Vaines tendresses, in 1878 La Justice, in 1886 Le Prisme, and in 1888 Le Bonheur. All these poems were collected and republished under the title of Poesies, occupying four volumes of his QLuvres (6 vols., 1883- 1904). After the publication of Le Bonheur he practically ceased to produce verse, and devoted himself almost entirely to philo- sophy. He published two volumes of prose criticism L 'expression dans les beaux arts (18S4) and Reflexions sur I'art des vers (1892). Various monographs by him appeared from time to time in the philosophical reviews, and among them a remarkable series of essays (Revue des deux mondes, Oct. 15th, Nov. 15th, 1890) on Pascal, and a valuable study on the " Psychologie du libre arbitre " in the Revue de metaphysique ct de morale (1906). He was elected to the Academy on the 8th of December 1881. On the 10th of December .1901 he was awarded the Nobel prize for literature, and devoted most of the money to the foundation of a prize for poetry to be awarded by the Societe de gens de

lettres. He was one of the earliest champions of Captain Dreyfus. In 1902 he wrote, in collaboration with Charles Richet, Le Probleme des causes finales. During? his later years he lived at Chatenay in great isolation, a victim of perpetual ill-health, and mainly occupied with his Vraie religion selon Pascal (1905). He had been partially paralysed for some time when he died suddenly on the 6th of September 1907. He left a volume of unpublished verse and a prose work, Le Lien social, which was a revision of an introduction which he had contributed to Michelef s La Bible de I'humanite.

What strikes the reader of Sully- Prudhomme's poetry first and foremost is the fact that he is a thinker; and moreover a poet who thinks, and not a thinker who turns to rhyme for recreation. The most strikingly original portion of his work is to be found in his philosophic

and scientific poetry. If he has not the scientific genius of Pascal, he has at least the scientific habit of mind and a delight in mathematic certainties. In attempting to interpret the universe as science reveals it to us he has created a new form of poetry which is not lacking in a certain grandeur. One of his most beautiful poems, “• LTdeal ” {Stances et poemes), is inspired by the thought, which is due to scientific calculations, of stars so remote from our planet that their light has been on its way to us since thousands of centuries and will one day be visible to the eyes of a future generation. The second chief characteristic of Sully-Prud- homme’s poetry is the extreme sensibility of soul, the pro- foundly melancholy note which we find in his love lyrics and his meditations. Sully-Prudhomme is above all things intro- spective; he penetrates into the hidden corners of his heart; he lays bare the subtle torments of his conscience, the shifting currents of his hopes and fears, belief and disbelief in face of the riddle of the universe to an extent so poignant as to be sometimes almost painful. And to render the fugitive phases and tremulous adventures of his spirit he finds incomparably delicate shades of expression, an exquisite and sensitive diction. We are struck in reading his poems by the nobility of his ideas, by a religious elevation like that of Pascal; for there is in his work something both of Lucretius and of Pascal. Yet he ; is far from being either an Epicurean or a Jansenist; he is rather a Stoic to whom the deceptions of life have brought pity instead of bitterness.

As an artist Sully-Prudhomme is remarkable for the entire absence of oratorical effect ; for the extreme simplicity and fas- tidious precision of his diction. Other poets have been endowed with a more glowing imagination; his poetry is neither exuberant in colour nor rich in sonorous harmonies of rhyme. The grace of his verse is a grace of outline and not of colour, his melody one of subtle rhythm; his verse is as if carved in ivory, his music like that of a perfect unison of stringed instruments. His imagination is inseparable from his ideas, and this is the reason of the extraordinary perspicuity of his poetic style. He extends poetry to two extreme limits; on the one hand to the borderland of the unreal and the dreamlike, as in a poem such as ” Le Rendezvous ” (Vaines tendresses), in which he seems to express the inexpressible in precise language; on the other hand, in his scientific poems he encroaches on the province of prose. His poetry is plastic in the creation of forms which fittingly express his fugitive emotions and his elevated ideas. Both by the charm of his pure and perfect phrase, by his consummate art, and the dignity which informs all his work, Sully-Prudhomme deserves rank among the foremost of modern poets. (E. G.)

See C. Heraon, La Philosophie de Sully-Prudhomme (1907), Sully-Prudhomme by E. Zyromski (Paris 1907).

SULMONA, or Solmona (anc. Sulmo), a city and episcopal see of the Abruzzi, Italy, in the province of Aquila, 40 m. by rail S.E. by E. of that town, and 107 m. E. by N. of Rome (75 m. direct). Pop. (1901), 13,372 (town), 18,247 (commune). Sulmona is situated at a height of 1322 ft. above the sea on the Gizio, a tributary of the Pescara, which supplies water-power to its paper-mills, fulling-mills and copper - works. Its cathedral of San Panfilio has a 14th-century portal. The interior has been modernized, but in the crypt are some medieval sculptures.

Sulmona has also in S. Maria della Tomba a good example of pure Gothic. S. Francesco d'Assisi occupies the site of an older and larger church, the Romanesque portal of which still stands at the end of the Corso Ovidio, and forms the entrance to the meat market. Opposite is a picturesque aqueduct of 1266 with pointed arches. S. Agostino has a good Gothic portal. The Ospedale Civico, next to the church of the Annunziata, begun in the first half of the 15th century, shows an interesting mixture of Gothic and Renaissance styles. The window of the Palazzo Tabassi is similar, and both are due to Lombard masters. In the court of the grammar school is a fine 15th- century statue of Ovid, the most celebrated native of the town, whose memory is preserved among the peasants in songs and folk-lore. The Porta Napoli is an interesting gate of the early 14th century. Innocent VII. was a native of the town. In the vicinity of the town is Monte Morrone where Pietro di Morone lived (c. 1254) as a hermit and founded a monastery for his hermits, who after his elevation to the papacy as Celes- tine V. took the name of Celestines; the monastery (S. Spirito) remained till 1870, when it was transformed into a prison. There are some ruins of the imperial period, attributed, ground- lessly, to the house of Ovid near it. The church contains a Gothic tomb of 141 2 by a German master, in which Renaissance influence is, according to Burckhardt, traceable for the first time in south Italy in the realistic characterization of the portrait figures.

Sulmo, a city of the Paeligni, is first mentioned during the Second Punic War (211 B.C.). It was the second town of the Paeligni in importance, Corfinium coming first. It became a Roman colony probably in the reign of Augustus, and as a muni- cipium it continued

to flourish throughout the empire. It was situated 7 m. south-east of Corfinium on the road to Aesernia, and was famous for its ironsmiths. Hardly any remains of the ancient city exist above ground, owing to frequent earth- quakes. A number of discoveries of tombs (both archaic and of the Roman period), &c, have however been made (cf. A. de Nino, in Notizie degliScavi, passim). Charles V. erected it into a principality, which he bestowed on Charles Lannoy, who had captured ‘ Francis I. at the battle of Pavia. It ultimately passed to the Corno and Borghese families. The bishopric is known as that of Valva and Sulmona.

SULPHONAL, or acetone diethyl sulphone (CH 3) 2 C(S0 2 C 2 H 6)2, a valuable hypnotic prepared by condensing acetone with ethyl mercaptan in the presence of hydrochloric acid, the mer- captol (CHj)2C(SC 2 H 5) 2 formed being subsequently oxidized by potassium permanganate (E. Baumann, Ber., 1886, 19, p. 2808). It is also formed by the action of alcoholic potash and methyl iodide on ethylidene diethyl sulphine, CH3-CH(S0 2 C 2 H 5) 2 (which is formed by the oxidation of dithioacetal with potassium permanganate). It crystallizes in prisms melting at 125° C, which are practically insoluble in cold water, but dissolve in 1 5 parts of hot and also in alcohol and ether.

It is the sulphonalum of the B.P., and the sulphomethanum of the U.S. P. It produces lengthened sleep in functional nervous insomnia, and is also useful in insanity, being given with mucilage of acacia or in hot liquids, owing to its insolubility, or in large capsules. Its hypnotic power is not equal to that of chloral, but as it is not a depressant to the heart or respiration it can be used when morphine or chloral are contra-indicated. It is, however, very uncertain in its action, often failing to produce sleep when taken at bedtime, but producing drowsiness and sleep the following day. The drowsiness the next day following a medicinal dose can be avoided by a saline laxative the morning after its administration. It is unwise to use it continuously for more than a few days at a time, as it tends to produce the sulphonal habit, which is attended by marked toxic effects, disturbances of digestion, giddiness, staggering gait and even paralysis of the lower extremities. These effects are accompanied by skin eruptions, and the urine becomes of a dark red colour (haematoporphinuria). Sulphonal vs cumulative in its effects. Many fatal cases of sulphonal poisoning are on record, both from chronic poisoning and from

a single large dose. Trional (CH3)(C 2 H 5)C(S02C2H S)2, and tetronal, (C 2 H5)2C(S0 2 C 2 H6)2, are alsp hypnotics. They are faster in action than sulphonal, and trional does not disorder the

digestion.

SULPHONIC ACIDS, in organic chemistry, a group of com- pounds of the type R-SOsH, where R is an alkyl or an aryl group.

Aliphatic Sulphonic Acids. — The members of this class may be prepared by the direct sulphonation of some paraffins (I. Worstall, Amer. Chem. Journ., 1898, 20, p. 664) , by the oxidation of mercaptans with concentrated nitric acid (H. Kopp, Ann., 1840, 35, p. 346) ; in the form of their salts from the alkyl halides and alkaline sulphites, and as esters from the alkyl halides and silver sulphite. They are colourless oils or crystalline solids which are extremely hygroscopic, very soluble in water and have a strongly acid reaction. They are unaffected by heating with aqueous alkalis or acids and are stable towards concentrated nitric acid. Phosphorus pentachloride converts them into the corresponding acid chlorides, R-S0 2 C1, which are decomposed slowly by water. These chlorides, on reduction by zinc and sulphuric acid, pass readily into the mercaptans, whilst if zinc dust and alcohol be used they are converted into the sulphinic acids, RS0 2 H.

Methyl sulphonic acid, CHa-SOsH, was obtained by H. Kolbe {Ann., 1845, 54, p. 174) by reducing trichloromethyl sulphonic chloride (formed from chlorine and carbon bisulphide in the presence of water :CS 2 +5Cl 2 +2H 2 = CCl 3 SO !1 Cl+4HCl|-SCl2) with sodium amalgam. It is a colourless syrup which decomposes when heated above 130 C. The corresponding acid chloride is an extremely stable solid which melts at 135 C. It is formed by the action of carbon bisulphide on potassium bichromate in the presence of nitric and hydrochloric acids (Loew, Zeit. f. Chem., 1869, p. 82). When heated under pressure it decomposes with the final produc- tion of carbonyl and thionyl chlorides: CCl 3 -S0 2 Cl = CCl4+S0 2 = COCl 2 +SOCl 2 . Ethyl sulphonic acid, C 2 H s S0 3 H, is a crystalline deli quescent solid formed by oxidizing ethyl mercaptan or by reducing vinyl sulphonic acid, CH 2 :CH-S0 3 H (Kohler, Amer. Chem. Journ., 1898, 20, p. 687).

Thiosulphonic acids of the type R-S0 2 -SH are formed by the action of the sulphochlorides on a concentrated solution of potassium sulphide: R-S0 2 C1 + K 2 S = R-S0 2 K+S + KC1=KC1+R-SCVSK: or by the action of the salt of a sulphinic acid on an alkaline sulphide in the presence of iodine (Otto, Ber., 1891, 24, p. 144).

Aromatic Sulphonic Acids. — The acids of this group are very similar to the corresponding aliphatic sulphonic acids and are usually

obtained by the direct heating of an aromatic hydro- carbon with concentrated sulphuric acid, fuming sulphuric acid or sulphur chlorhydrin. After the action is completed they may frequently be ” salted out ” by adding common salt to the acid solution until no more dissolves, when the sodium salt of the acid separates (L. Gattermann, Ber., 1891, 24, p. 2121). They are also formed by oxidizing thiophenols or by decompos- ing diazonium salts with sulphurous acid. The free acids are usually hygroscopic, crystalline solids which are readily soluble in water. When heated under pressure with concentrated hydrochloric acid to about 150 C. they yield hydrocarbons and sulphuric acid. The salts usually crystallize well, and those of the alkali metals are employed in the preparation of phenols, into which they pass when fused with the caustic alkalis. When distilled with potassium cyanide they yield the aromatic nitriles. The sulphonic acids with phosphorus penta- chloride are converted into sulphochlorides which are stable to cold water, but with ammonia they yield sulphonamides, R-S0 2 NH 2 , and with alcohols esters of the sulphonic acids.

Benzene sulphonic acid, CeHs-SOsH.lJHjO, crystallizes in small plates and is very deliquescent. Benzene sulphochloride, C6H5SO2O, is a colourless fuming liquid which boils at 120° C. (10 mm.). The aminobenzene sulphonic acids, particularly the meta and para compounds, are of importance owing to their employment in the colour industry. The direct sulphonation of aniline yields the para acid, sulphanilic acid, C6H 4 (NH 2)(S0 3 H), which crystallizes in small plates and is sparingly soluble in cold water. When fused with caustic potash it yields aniline, whilst oxidation with chromic acid yields benzoquinone. In constitution it is probably to be regarded

/NHsx as a cyclic ammonium salt, CeH4\ ” /. When diazotized in

x so»/

acid solution and coupled with dimethyl aniline it yields heliantbine,

the sodium salt of which is used as an indicator (q.v.). Metanilic icid CsHˆNHj) (SOaH) [1.3], which crystallizes in prisms, is formed by the reduction of meta-nitrobenzene sulphonic acid and is used in the preparation of various azo dyes.

Sulphinic acids, R-S0 2 H, are formed by reducing sulpho- chlorides

with zinc dust; by the action of sulphur dioxide on the zinc alkyls (Hobson, Ann, 1857, 102, p. 72; 1858, 106, p. 287) ; by the action of sulphochlorides on mercaptans in alkaline solution; and by the action of the Grignard reagent on sulphur dioxide or thionyl chloride (Rosenheim, Ber., 1904, 37, p. 2152; Oddo, R. Accad. Lin., 1905 (5), 14 (i.), p. 169). The free acids are unstable. They are readily oxidized to sulphonic acids and reduced to mercaptans. Their alkali salts on treatment with the alkyl halides yield sulphones, R 2 S0 2 . Ethyl sulphinic acid, C 2 H 5 -S0 2 H, is a colourless syrup. Benzene sulphinic acid, CsHj-SOoH, crystallizes in large prisms and acts as a reducing agent. It decomposes when heated with water under pressure: 3C«H 5 -S0 2 H = C 6 H 5 -S0 2 H+C 6 H 5 -S0 2 SC 6 H 6 +H 2 0. The potas sium salt when fused with caustic potash yields benzene and potassium sulphite.

SULPHUR [symbol S, atomic weight 32-07 (0=i6)], a non-metallic chemical element, known from very remote times and regarded by the alchemists, on account of its inflammable nature, as the principle of combustion; it is also known as brimstone (q.v.). The element occurs widely and abundantly distributed in nature both in the free state and in combination. Free or native sulphur, known also as ” virgin sulphur,” occurs in connexion with volcanoes and in certain stratified rocks in several modes, viz. as crystals, and as stalactitic, encrusting, reniform, massive, earthy and occasionally pulverulent forms as ” sulphur meal.” It seems rather doubtful whether the unstable monoclinic modification of sulphur (j3-sulphur) is ever found in a native state.

The crystals belong to the orthorhombic system, and have usually a pyramidal habit (fig), but may be sphenoidal or tabular. Twins are rare. The cleavage is imperfect, but there is a well-marked conchoidal fracture. The hardness ranges from about I to 2 , and the sp.gr. from I 9 to 2 ■ 1 . Crystals of sulphur are transparent or translucent and highly refractive with strong birefringence; they have a resinous or slightly adamantine lustre, and present the characteristic sulphur-yellow colour. Impurities render the mineral grey, greenish or red-dish, bituminous matter being often present in the massive varieties. Sulphur containing selenium, such as occurs in the isle of Vulcano in the Lipari Isles, may be orange-red; and a similar colour is seen in sulphur which contains arsenic sulphide, such as that from La Solfatara near Naples. The presence of tellurium in native sulphur is rare, but is known in certain specimens from Japan.

Volcanic sulphur usually occurs as a sublimate around or on the walls of the vents, and has probably been formed in many cases by the

interaction of sulphur dioxide and hydrogen sulphide. Sub- limed sulphur also results from the spontaneous combustion of coal seams containing pyrites. Deposits of sulphur are frequently formed by the decomposition of hydrogen sulphide, on exposure to the atmosphere: hence natural sulphureous waters, especially hot springs, readily deposit sulphur. The reduction of sulphates to sulphides by means of organic matter, probably through the agency of sulphur-bacteria, may also indirectly furnish sulphur, and hence it is frequently found in deposits of gypsum. Free sulphur may also result from the decomposition of pyrites, as in pyritic shales and lignites, or Irom the alteration of galena: thus crystals of sulphur occur, with anglesite, in cavities in galena at Monteponi near Iglesias in Sardinia; whilst the pyrites of Rio Tinto in Spain sometimes yield sulphur on weathering. It should be noted that the oxidation of sulphur itself by atmospheric influence may give rise to sulphuric acid, which in the presence of limestone will form gypsum : thus the sulphur-deposits of Sicily suffer alteration of this kind, and have their outcrop marked by a pale earthy gypseous rock called briscale.

Some of the most important deposits of sulphur in the world are worked in Sicily, chiefly in the provinces of Caltanisetta and Girgenti, as at Racalmuto and Cattolica; and to a less extent in the provinces of Catania, Palermo (Lercara) and Trapani (Gibellina). The sulphur occurs in Miocene marls and limestone, associated with gypsum, celestine, aragonite and calcite. It was formerly believed that the sulphur had a volcanic origin, but it is now generally held that it has either

been reduced from gypsum by organic agencies, or more pro- bably deposited from sulphur-bearing waters. Liquid occasion- ally enclosed in the sulphur and gypsum has been found by 0. Silvestri and by C. A. H. Sjogren to contain salts like those of sulphur-springs. An important zone of sulphur-bearing Miocene rocks occurs on the east side of the Apennines, constituting a great part of the province of Forli and part of Pesaro. Cesena and Perticara are well-known localities in this district, the latter yielding crystals coated with asphalt. Sulphur is occasionally found crystallized in Carrara marble; and the mineral occurs also in Calabria. Fine crystals occur at Conil near Cadiz; whilst in the province of Teruel in Aragon, sulphur in a compact form replaces fresh-water shells and plant-remains, suggesting its origin from sulphur-springs. Nodular forms of sulphur occur in Miocene marls near Radoboj in Croatia, and near Swoszowic, south of Cracow. Russia possesses large deposits of sulphur in Daghestan in Transcaucasia, and in the Transcas- pian steppes. Important deposits of sulphur are worked at several localities in Japan, especially at the

Kosaka mine in the province of Rikuchiu, and at Yatsukoda-yama, in the province of Mutsu. Sulphur is worked in Chile and Peru. A complete list of localities for sulphur would include all the volcanic regions of the world. In the United States, sulphur occurs in the following states, in many of which the mineral has been woiked: Louisiana (q.v.) , Utah, Colorado, California, Nevada, Alaska, Ida- ho, Texas and Wyoming. The Rabbit Hole sulphur-mines are in Nevada, and a great deposit in Utah occurs at Cove Creek, Beaver county. In the British Islands native sulphur is only a mineralogical rarity, but it occurs in the Carboniferous Limestone of Oughterard in Co. Galway, Ireland. 1

In combination the element chiefly occurs as metallic sul- phides and sulphates. The former are of great commercial importance, being, in most cases, valuable ores, e.g. copper pyrites (copper), galena (lead), blende (zinc), cinnabar (mer- cury), &c. Of the sulphates we notice gypsum and anhydrite (calcium), barytes (barium) and kieserite (magnesium). Gaseous compounds, e.g. sulphur dioxide and sulphuretted hydrogen, are present in volcanic exhalations (see Volcano) and in many mineral waters. The element also occurs in the animal and vegetable kingdoms. It is present in hair and wool, and . in albuminous bodies; and is also a constituent of certain vegetable oils, such as the oils of garlic and mustard. There is, in addition, a series of bacteria which decompose sulphureous compounds and utilize the element thus liberated in their protoplasm (see Bacteriology).

Extraction. — As quarried or mined free sulphur is always contaminated with limestone, gypsum, clay, &c; the principle underlying its extraction from these impurities is one of simple liquation, i.e. the element is melted, either by the heat of its own combustion or other means, and runs off from the earthy residue.

In the simplest and crudest method, as practised in Sicily, a mass of the ore is placed in a hole in the ground and fired ; after a time the heat melts a part of the sulphur which runs down to the bottom of the hole and is then ladled out. This exceptionally wasteful process, in which only one- third of the sulphur is recovered, has been improved by conducting the fusion in a sort of kiln. A semicircular or semi-elliptical pit (calcarone) about 33 ft. in diameter and 8 ft. deep is dug into the slope of a hill, and the sides are coated with a wall of stone. The sole consists of two halves slanting against each other, the line of intersection forming a descending gutter which runs to the outlet. This outlet having been closed by small stones and sulphate of lime cement, the pit is filled with sulphur ore, which is heaped up considerably beyond the edge of the pit and covered with a layer of

burnt-out ore. In building up the heap a number of narrow vertical passages are left to afford a draught for the fire. The ore is kindled from above and the fire so regulated (by making or unmaking air-holes in the covering) that, by the heat produced

1 References. — A very full article (" Zolfo ") by G. Aichino, of the Geological Survey of Italy, will be found in the Encyclopedia delle arte e Industrie (Turin, 1898). This includes a full bibliography. See also J. F. Kemp in Rothwell's Mineral Industry (1893), vol. ii. ; Jules Brunfaut, De V Exploitation des soufres (2nd ed., 1874) ; Georgio Spezia, Suit' origine del solfo nei giacementi solfiferi delta Sicilia (Turin, 1892). For Japanese sulphur see T. Wada, Minerals oj Japan (Tokyo, 1904).

by the combustion of the least sufficient quantity of sulphur, the rest is liquefied. The molten sulphur accumulates on the sole, whence it is from time to time run out into a square stone receptacle, from which it is ladled into damp poplar-wood moulds and so brought into the shape of truncated cones weighing no to 130 lb each. These cakes are sent out into commerce. A calcarone with a capacity of 28,256 cub. ft. burns for about two months, and yields about 200 tons of sulphur. The yield is about 50%. The immense volumes of sulphurous acid evolved give rise to many complaints; all the minor pits suspend work during the summer to avoid destruc- tion of the crops. A calcarone that is to be used all the year round must be at least 220 yds. from any inhabited place and '10 yds. from any field under cultivation.

More efficient is the Gill kiln which uses coke as a fuel. The kiln consists of two (or more) connected cells which are both charged with the ore. The first cell is heated and the products of combustion are led into the second cell where they give up part of their heat to the contained ore, so that by the time the first cell is exhausted the mass in the second cell is at a sufficiently high temperature to ignite spontaneously when air is admitted. Other methods have been employed, but with varying commercial success. For example, in the Gritti and Orlando processes the ore is charged into retorts and the fusion effected by superheated steam, the sulphur being run off as usual; or as was suggested by R. E. Bollman in 1867 the ore may be extracted by carbon bisulphide.

Crude sulphur, as obtained from kilns, contains about 3 % of earthy

impurities, and consequently needs refining. The following apparatus (invented originally by Michel of Marseilles and improved subsequently by others) enables the manufacturer to produce either of two forms of ” refined ” sulphur which commerce demands. It consists of a large stone chamber which communicates directly with two slightly slanting tubular retorts of iron. The retorts are charged with molten sulphur from an upper reservoir, which is kept at the requisite temperature by means of the lost heat of the retort fires. The chamber has a safety value at the top of its vault, which is so balanced that the least surplus pressure from within sends it up. The first puff of sulphur vapour which enters the chamber takes fire and converts the air of the chamber into a mixture of nitro- gen and sulphur dioxide. The next following instalments of vapour, getting diffused throughout a large mass of relatively cold gas, condense into a kind of ” snow,” known in commerce and valued as ” flowers of sulphur ” (flores sulphuris). By conducting the distillation slowly, so that the temperature within the chamber remains at a sufficiently low degree, it is possible to obtain the whole of the product in the form of “flowers.” If compact (“roll”) sulphur is wanted the distillation is made to go on at the quickest admissible rate. The temperature of the interior of the chamber soon rises to more than the fusing-point of sulphur (113° C.), and the distillate accumulates at the bottom as a liquid, which is tapped off from time to time to be cast into the customary form of rods.

The Louisiana deposits are worked by a process devised by Herman Frasch in 1891. It consists in sinking a bore-hole, after the manner of a petroleum well, and letting in four pipes centrally arranged, the odier pipe being 10 in. in diameter, the next 6 in., the next 3 in. and the innermost 1 in. The operation consists in forcing down the 3-in. pipe superheated steam at 330 F. to melt the sulphur. Compressed air is now driven down the i-in. pipe and bubbles into the melted sulphur and water; the specific gravity of which is greatly diminished, so that it rises to the surface through the outer pipes; it is then run off to settling tanks. The sulphur so obtained is 98 % pure.

In some places sulphur is extracted from iron pyrites by one of tvvo methods. The pyrites is subjected to dry distillation from out of iron or fire-clay tubular retorts at a bright red heat. One- third of the sulphur is volatilized — $3FeS2 = Fe\ 3\ S\ 4 + 2S$ — and obtained as a distillate. The second method is analogous to the calcarone method of liquation: the ore is placed in a limekiln-like furnace over a mass of kindled fuel to start a partial combustion of the mineral, and the process is so regulated that, by the heat gener- ated, the unburnt part is decomposed with elimination of sulphur, which collects in the molten state on an inverted roof-shaped sole below the furnace and is

thence conducted into a cistern. Such pyrites sulphur is usually contaminated with arsenic, and conse- quently is of less value than Sicilian sulphur, which is characteris- tically free from this impurity.

Large quantities are also recovered from alkali waste (see Alkali M axufactcre) : another source is the spent oxide of gas manufacture (see Gas).

The substance known as ” milk of sulphur ” (lac sulphuris) is very finely divided sulphur produced by the following, or some analogous, chemical process. One part of quicklime is slaked with 6 parts of water, and the paste produced diluted with 24 parts of water: 2-3 parts of flowers of sulphur are added; and the whole is boiled for about an hour or longer, when the sulphur dissolves. The mixed solution of polysulphides and thiosulphate of calcium thus produced is clarified, diluted largely, and then mixed with enough of pure dilute hydrochloric acid to produce a feebly alkaline mixture when sulphur is precipitated. The addition of more acid would produce an additional supply of sulphur (by the action of the H2S2O3 on the dissolved H 2 S) ; but this thiosulphate sulphur is yellow and compact, while the polysulphide part has the desired qualities,

forming an extremely fine, almost white, powder. The precipitate is washed, collected, and dried at a very moderate heat.

Properties. — Sulphur exists in several allotropic modifications, but before considering these systematically we will deal with the properties of ordinary (or rhombic) sulphur. Commercial sulphur forms yellow crystals which melt at 113° and boil at 444-53° C. under ordinary pressure (H. L. Callendar, Chem. News, 1891, 6$, p. 1); just above the boiling point the vapour is orange-yellow, but on continued heating it darkens, being deep red at 500 ; at higher temperatures it lightens, becoming straw-yellow at 650 . These colour changes are connected with a dissociation of the molecules. At 524° Dumas deduced the structure S 6 from vapour-density determinations, whilst for the range 860° to 1040°; Sainte-Claire Deville and Troost deduced the formula S 2 . Biltz (Be*., 1888, 21, p. 2013; 1901, 34, p. 2490) showed that the vapour density decreased with the tem- perature, and also depended on the pressure. G. Preuner and W. Schupp {Zeit. phys. Chem., 1909, 69, p. 157), in a study of the dissociation isotherms over 3oo°-85o°, detected molecules of S s , S 6 and S 2 , whilst Si appears to exist below pressures of 30 mm. Boiling and freezing-point determinations of the molecular weight in solution indicate the formula S 8 . The density of solid sulphur is 2-062 to 2-070, and the specific heat 0-1712; it is a bad conductor of electricity and becomes

negatively electrified on friction. It ignites in air at 363° and in oxygen at 275-280 (H. Moissan, Compt. rend., 1903, 137, p. 547), burning with a characteristic blue flame and forming much sulphur dioxide, recognized by its pungent odour. At the same time a little trioxide is formed, and, according to Hempel (Ber., 1890, 23, p. 1455), half the sulphuris converted into this oxide if the combustion be carried out in oxygen at a pressure of 40 to 50 atmospheres. • Sulphur also combines directly with most of the elements to form sulphides. The atomic weight was determined by Berzelius, Erdmann and Marchand, Dumas and Stas. Thomsen (Zeit. phys. Chem., 1894, 13, p. 726) obtained the value 32-0606.

Allotropic Modifications. — Sulphur assumes crystalline, amor- phous and (possibly) colloidal forms. Historically the most important are the rhombic (S a) and monoclinic (Sp) forms, discussed by E. Mitscherlich in 1822 (see Ann. chim. phys., 1823, 24, p. 264). The transformations of these two forms are discussed in Chemistry: Physical. Rhombic sulphur may be obtained artificially by slowly crystallizing a solution of sulphur in carbon bisulphide, or, better, by exposing pyridine saturated with sulphuretted hydrogen to atmospheric oxidation (Ahrens, Ber., 1890, 23, p. 2708). It is insoluble in water, 1 but readily soluble in carbon bisulphide, sulphur chloride and oil of tur- pentine. The common monoclinic variety is obtained by allowing a crust to form over molten sulphur by partially cooling it, and then breaking the crust and pouring off the still liquid portion, whereupon the interior of the vessel will be found coated with long needles of this variety. Like S„ it is soluble in carbon bisulphide. Three other monoclinic forms have been described. By acting upon a solution of sodium hyposulphite with potassium bisulphate, Gernez (Compt. rend.; 1884, 98, p. 144) obtained a form which he termed nacre (or pearly) sulphur; the same modification was obtained by Sabatier (ibid., 1885, 100, p. 1346) on shaking hydrogen persulphide with alcohol or ether. It is readily transformed into rhombic sulphur. Another form, mixed with the variety just described, is obtained by adding 3 to 4 volumes of alcohol to a solution of ammonium sulphide saturated with sulphur and exposing the mixture to air at about 5 . Engel's monoclinic form (Compt. rend., 1891, 112, p. 866) is obtained by mixing a solution of sodium hyposulphite with double its volume of hydrochloric acid, filtering and extracting with chloroform; the extract yielding the variety on evaporation. A triclinic form is claimed to be obtained by Friedel (Bull. soc. chim., 1879, 32, p. 14) on subliming ordinary sulphur.

1 It is a common practice of keepers of dogs tt> place a piece of roll sulphur in the animal's water but this serves no useful purpose owing

to this property.

Amorphous sulphur or S T exists in two forms, one soluble in carbon bisulphide, the other insoluble. Milk of sulphur (see above), obtained by decomposing a polysulphide with an acid, contains both forms. The insoluble variety may also be obtained by decomposing sulphur chloride with water and by other re- actions. It gradually transforms itself into rhombic sulphur.

The colloidal sulphur, Ss, described by Debus as a product of the interaction of sulphuretted hydrogen and sulphur dioxide in aqueous solution, is regarded by Spring (Rec. ttav. chim., 1906, 25, p. 253) as a hydrate of the formula S 8 H 2 0. The ” blue sulphur,” described by Orloff, has been investigated by Paterno and Mazzucchelli (Abs. Journ. Chem. Soc, 1907, ii 45i)-

Molten Sulphur. — Several interesting phenomena are witnessed when sulphur is heated above its melting point. The solid melts to a pale yellow liquid which on continued heating grad- ually darkens and becomes more viscous, the maximum vis- cosity occurring at 180°, the product being dark red in colour. This change is associated with a change in the spectrum (N. Lockyer). On continuing the heating, the viscosity diminishes while the colour remains the same. If the viscous variety be rapidly cooled, or the more highly heated mass be poured into water, an elastic substance is obtained, termed plastic sulphur. This substance, however, on standing becomes brittle. The character of molten sulphur has been mainly elucidated by the researches of A. Smith and his collaborators. Smith (Abs. Journ. Chem. Soc, 1907, ii. 20, 451, 757) regards molten sulphur as a mixture of two isomers Sa and S M in dynamic equilibrium, Sa being light in colour and mobile, and Sˆ dark and viscous. At low temperatures Sa predominates, but as the temperature is raised S M increases; the transformation, however, is retarded by some £..3es, e.g. sulphur dioxide and hydrochloric acid, and accelerated by others, e.g. ammonia. The solid derived from Sa is crystalline and soluble in carbon bisulphide, that from Sˆ is amorphous and insoluble. As to the formation of precipitated sulphur, Smith considers that the element first separates in the liquid Sˆ condition, which is transformed into Sa and finally into S a ; the insoluble (in carbon bisulphide) forms arise when little of the Sˆ has been transformed; whilst the soluble consist mainly of S a . Similar views are adopted by H. Erdmann (Ann., 1908, 362, p. 133), but he

regards S M as the polymer S3, analogous to ozone O3; Smith, however, regards Sfi as S 8 .

Compounds.

Sulphuretted hydrogen, H 2 S, a compound first examined by C. Scheele, may be obtained by heating sulphur in a current of hydrogen, combination taking place between 200 C. and 358 C, and being complete at the latter temperature, dissociation taking place above this temperature (M. Bodenstein, Zeit. phys. Chem.,

1899, 29, p. 315); by heating some metallic sulphides in a current of hydrogen; by the action of acids on various metallic sulphides (ferrous suiphide and dilute sulphuric acid being most generally employed) ; by the action of sulphur on heated paraffin wax or vaseline, or by heating a solution of magnesium sulphydrate. It is also produced during the putrefaction of organic substances containing sulphur and is found among the products obtained in the destructive distillation of coal. To obtain pure sulphuretted hydrogen the method generally adopted consists in decomposing precipitated antimony sulphide with concentrated hydrochloric acid. As an alternative, H. Moissan (Comp. rend., 1903, 137, p. 363) condenses the gas by means of liquid air and fractionates the product.

Sulphuretted hydrogen is a colourless gas possessing an extremely offensive odour. It acts as a strong poison. It burns with a pale blue flame, forming sulphur dioxide and water. It is moderately soluble in water, the solution possessing a faintly acid reaction. This solution is not very stable, since on exposure to air it slowly oxidizes and becomes turbid owing to the gradual precipitation of sulphur. The gas is much more soluble in alcohol. It forms a hydrate of composition H2S-7H20. (De Forcrand, Compt. rend., 1888, 106, p. 1357. y The gas may be liquefied by a pressure of about 17 atmospheres, the liquid so obtained boiling at —61 -8° C. ; and by further cooling it yields a solid, the melting point of which is given by various observers as — 82 to — 86° C. (see Ladenburg, Ber.,

1900, 33, p. 637). It is decomposed by the halogens, with liberation of sulphur. Concentrated sulphuric acid also decomposes it: H 2 S0 4 + H2S = 2H 2 0 + S02 + S. It combines with many metals to form sulphides, and also decomposes many metallic salts with consequent production of sulphides, a property which renders it

extremely useful in chemical analysis. It is frequently used as a reducing agent: in adid solutions it reduces ferric to ferrous salts,

arsenates to arsenites, permanganates to manganous salts, &c, whilst in alkaline solution it converts many organic nitro compounds into the corresponding amino derivatives. Oxidizing agents rapidly attack sulphuretted hydrogen, the primary products of the reaction being water and sulphur.

By the action of dilute hydrochloric acid on metallic polysulphides, an oily product is obtained which C. L. Berthollet considered to be H 3 Ss. L. Thenard, on the other hand, favoured the formula H2S2. It was also examined by W. Ramsay (journ. Chem. Soc., 1874, 12, p. 857). Hofmann, who obtained it by saturating an alcoholic solution of ammonium sulphide with sulphur and mixing the product with an alcoholic solution of strychnine, considered the resulting product to be H 2 S 3 ; while P. Sabatier by fractionating the crude product in vacuo obtained an oil which boiled between 60° and 85 ° C. and possessed the composition H4S5.

Several halogen compounds of sulphur are known, the most stable of which is sulphur fluoride, SF 6 , which was first prepared by H. Moissan and Lebeau (Compt. rend., 1900, 130, p. 865) by fractionally distilling the product formed in the direct action of fluorine on sulphur. It is tasteless, colourless and odourless gas, which is exceedingly stable and inert. It may be condensed and yields a solid which melts at —55° C. Sulphuretted hydrogen decomposes it with formation of hydrofluoric acid and liberation of sulphur. Sulphur chloride, S 2 C1 2 , is obtained as a by-product in the manufac- ture of carbon tetrachloride from carbon bisulphide and chlorine, and may also be prepared on the small scale by distilling sulphur in a chlorine gas, or by the action of sulphur on sulphuryl chloride in the presence of aluminium chloride (O. Ruff). It is an amber- coloured, fuming liquid possessing a very unpleasant irritating smell. It boils at 139° C. and is solid at —80° C. It is soluble in carbon bisulphide and in benzene. It is gradually decomposed by water: 2S2CI2 + 3H 2 = 4HC1 + 2S + H 2 S20 3> the thiosulphuric acid pro- duced in the primary reaction gradually decomposing into water, sulphur and sulphur dioxide. Sulphur chloride dissolves sulphur with great readiness and is consequently used largely for vulcanizing rubber; it also dissolves chlorine. The chloride SCl 2 according to the investigations of O. Ruff and Fischer (Ber., 1903, 36, p. 418) did not appear to exist, but E. Beckmann (Zeit. phys. Chem., 1909, 42, p. 1839) obtained it by distilling the product of the interaction of chlorine and S2CI2 at low pressures. The tetrachloride, SCU, is formed by saturating S2CI2 with chlorine at —22° C. (Michaelis, Ann., 1873, 170, p. 1). It is a yellowish brown liquid which dissoci- ates rapidly with rise of temperature. On cooling it solidifies to a crystalline mass

which fuses at — 80 ° C. (Ruff, ibid.). Water decomposes it violently with formation of hydrochloric and sul- phurous acids. Sulphur bromide, S 2 Br 2 , is a dark red liquid which boils with decomposition at about 200 C. The products obtained by the action of iodine on sulphur are probably mixtures, although E. Mclvor (Chem,. News, 1902, 86, p. 5) obtained a substance of composition S3I2 (which in all probability is a chemical individual) as a reddish-coloured powder by the action of sulphuretted hydrogen on a solution of iodine trichloride.

Four oxides of sulphur are known, namely sulphur dioxide, SO2, sulphur trioxide, SO3, sulphur sesquioxide, S2O3, and persulphuric anhydride, SjOt. The dioxide has been known since the earliest times and is found as a naturally occurring product in the gaseous exhalations of volcanoes and in solution in some volcanic springs. It was first collected in the pure condition by J. Priestley in 1775 and its composition determined somewhat later by A. L. Lavoisier. It is formed when sulphur is burned in air or in oxygen, or when many metallic sulphides are roasted. It may also be obtained by heating carbon, sulphur and many metals with concentrated sulphuric acid : C + 2H 2 SO« = 2S0 2 f C0 2 + 2H 2 ; S + 2H2SO4 = 3S0 2 + 2H 2 0; Cu + 2H 2 S0 4 = S0 2 + CuS0 4 + 2H s O; and by decomposing a sulphite, a thiosulphate or a thionic acid with a dilute mineral acid. It is a colourless gas which possesses a characteristic suffocating odour. It does not burn, neither does it support com- bustion. It is readily soluble in alcohol and in water, the solution in water possessing a strongly acid reaction. It is easily liquefied, the liquid boiling at —8° C, and it becomes crystalline at —72-7° C. (Walden, Zeit. phys. Chem., 1902, 43, p. 432). Walden (ibid.) has shown that certain salts dissolve in liquid sulphur dioxide forming additive compounds, two of which have been prepared in the case of potassium iodide: a yellow crystalline solid of composition, KI-I4-S02, and a red solid of composition, KI-4S0 2 . It is decom- posed by the influence of strong light or when strongly heated. It combines directly with chlorine to form sulphuryl chloride and also with many metallic peroxides, converting them into sulphates. In the presence of water it frequently acts as a bleaching agent, the bleaching process in this case being one of reduction. It is frequently used as an ” antichlor,” since in presence of water it has the power of converting chlorine into hydrochloric acid : SO2 + Cl 2 + 2H 2 = 2HC1 + H 2 SO«. In many cases it acts as a reducing agent (when used in the presence of acids) ; thus, permanganates are reduced to manganous salts, iodates are reduced with liberation of iodine, &c, 2KMnOi + 5S0 2 + 2H 2 = K 2 S0 4 + 2MnS0 4 + 2H 2 S0 4 ; 2KI0 3 + 5SO, + 4H a O = U +

2KHS0 4 + 3H 2 S0 4 .

It is prepared on the industrial scale for the manufacture of sulphuric acid, for the preparation of sodium sulphate by the Hargreaves process, and for use as a bleaching-disinfecting agent and as a preservative. When compressed it is also used largely as a refrigerating agent, and in virtue of its property of neither burning nor supporting combustion it is also used as a fire extinctor. The solution of the gas in water is used under the name of sulphurous acid. The free acid has not been isolated, since on evaporation the solution gradually loses sulphur dioxide. This solution possesses re- ducing properties.and gradually oxidizes to sulphuric acid on exposure. , When heated in a sealed tube to 180° C. it is transformed into sul- phuric acid, with liberation of sulphur. Numerous salts, termed sulphites, are known. Since the free acid would be dibasic, two series of salts exist, namely, the neutral and acid salts. The neutral alkaline salts are soluble in water and show an alkaline reaction, the other neutral salts being either insoluble or difficultly soluble in water. The acid salts have a neutral or slightly acid reaction. The sulphites are prepared by the action of sulphur dioxide on the oxides, hydroxides or carbonates of the metals, or by processes of precipitation. Sulphurous acid may have either of the constitutions

/OH O. /OH 0:S< or »S(, or be an equilibrium mixture of these

X>H (K \H two substances. Although the correct formula for the acid is not known, sulphites are known of both types. Sodium sulphite is almost certainly of the second and unsymmetrical type. Two ethyl sulphites are known, the first or symmetrical form being derived from sulphuryl chloride and alcohol, and the second and unsym- metrical from sodium sulphite and ethyl iodide; the junction of one ethyl group with a sulphur atom in the second salt follows because it yields ethyl sulphonic acid, also obtainable from ethyl mercaptan, C2H5SH. Two isomeric sodium potassium sulphites are known, and may be obtained by neutralizing acid sodium sulphite with potassium carbonate, and acid potassium sulphite with sodium carbonate; their formulae are : 2 SK(ONa) and 2 SNa(OK).

There are various haloid derivatives of sulphurous acid. Thionyl fluoride, SOF 2 , has been obtained as a fuming gas by decomposing arsenic fluoride with thionyl chloride (Moissan and Lebeau, Compt.

rend., 1900, 130, p. 1436). It is decomposed by water into hydrofluoric and sulphurous acids. Thionyl chloride, $SOCl_2$, may be obtained by the action of phosphorus pentachloride on sodium sulphite ; by the action of sulphur trioxide on sulphur dichloride at 75 — 80 ° C. (Journ. Chem. Soc, 1903, p. 420); and by the action of chlorine monoxide on sulphur at low temperature. It is a colourless, highly refracting liquid, boiling at 78°; it fumes on exposure to moist air. Water decomposes it into hydrochloric and sulphurous acids. On treatment with potassium bromide it yields thionyl bromide, $SOBr_2$, an orange-yellow liquid which boils at 68° C. (40 mm.) (Hartoz and Sims, Chem. News, 1893, 67, p. 82).

Sulphur trioxide, SO_3, mentioned by Basil Valentine in the I5tn century, was obtained by N. Lemery in 1675 by distilling green vitriol. It may be prepared by distilling fuming sulphuric acid, or concentrated sulphuric acid over phosphorus pentoxide, or by the direct union of sulphur dioxide with oxygen in the presence of a catalyst, such as platinized asbestos (see Sulphuric Acid). This oxide exists in two forms. The a- form is readily fusible and melts at 14-8° C. It corresponds to the simple molecular complex SO_3. The 0- variety is infusible, but on heating to 50° C. is transformed into the a- form. It corresponds to the molecular complex $(S0_3)_2$. When perfectly dry this oxide has no caustic properties ; it combines rapidly, however, with water to form sulphuric acid, with the development of much heat. It combines directly with concentrated sulphuric acid to form pyrosulphuric acid, $H_2S_2O_7$. It reacts most energetically with many organic compounds, removing the elements of water in many cases and leaving a carbonized mass. It com- bines directly with many elements and compounds and frequently acts as energetic oxidizing agent. It finds considerable application in the colour industry.

Sulphuryl fluoride, SO_2F_2, formed by the action of fluorine on sulphur dioxide (H. Moissan, Compt. rend. 132, p. 374), is an exceedingly stable colourless gas at ordinary temperatures, becoming solid at about — 120° C. Sulphuryl chloride, SO_2CI_2, first obtained in 1838 by Regnault {Ann. chim. phys., 1838, (2), 69, p. 170), by the action of chlorine on a mixture of ethylene and sulphur dioxide, may also be obtained by the direct union of sulphur dioxide and chlorine (especially in the presence of a little camphor) ; and by heating chlorsulphonic acid in the presence of a catalyst, such as mercuric sulphate (Pawlewski, Ber., 1897, 30, p. 765) : $2S0_2C1\text{-}0H = S02Cl_2 + H_2S0_4$. It is a colourless fuming liquid which boils at 69? C. and which is readily decomposed by water into sulphuric and hydrochloric acids. Fluorsulphonic acid, $SQ_2F\text{-}OH$, is a mobile liquid obtained by the action of an excess of hydrofluoric acid on well-cooled

sulphur trioxide. It boils at 162-6° and is decomposed violently bv water. Chlorsulphonic acid, S0 2 C1-0H, first prepared by A. Williamson (Proc Roy. Soc, 1856, 7, p. 11) by the direct union of sulphur trioxide with hydrochloric acid gas, may also be obtained by distill- ing concentrated sulphuric acid with phosphorus oxychloride: 2H 2 S0 < +P0C1 3 =2S02C1-0H+HC14-HP0 3 . It is a colourless fuming liquid which boils at 152-153° C. When heated under

pressure it decomposes, forming sulphuric acid, sulphuryl chloride, &c. (Ruff, Ber., 1901, 34, p. 3509). It is decomposed by water with explosive violence. Disulphuryl chloride, S 2 0sCl2i corresponding to pyrosulphuric acid, is obtained by the action of sulphur trioxide on sulphur dichloride, phosphorus oxychloride, sulphuryl chloride or dry sodium chloride :6S0 3 +2P0CU = P 2 6 + 3S 2 O s Cl2; S2CI2 + 5S0 3 = S 2 5 Cl2 + 5S0 2 ; SO3 + S0 2 C1 2 = S 2 6 C1 2 ; 2NaCl + 3SO3 – S 2 05Cl 2 +Na 2 S04. It may also be obtained by distilling chlor- sulphonic acid with phosphorus pentachloride: 2S0 2 CT0H4-PC1 5 = S2O6CI2 + POCI3 + 2HC1. It is a colourless, oily, fuming liquid which is decomposed by water into sulphuric and hydrochloric acids. An oxychloride of composition S 2 3 Cl4 has been described.

Sulphur sesquioxide, S 2 03, is formed by adding well-dried flowers of sulphur to melted sulphur, trioxide at about 12-15° C. The sulphur dissolves in the form of blue drops which sink in the liquid and finally solidify in blue-green crystalline crusts. It is unstable at ordinary temperatures and rapidly decomposes into its generators on warming. It is readily decomposed by water with formation of sulphurous, sulphuric and thiosulphuric acids, with simultaneous liberation of sulphur. Hyposulphurous acid, H 2 S 2 4 , was first really obtained by Berthollct in 1789 when he showed that iron left in contact with an aqueous solution of sulphur dioxide dissolved with- out any evolution of gas, whilst C. F. Schonbein subsequently showed the solution possessed reducing properties. P. Schutzen- bergcr (Compt. rend., 1869, 69, p. 169) obtained the sodium salt by the action of zinc on a concentrated solution of sodium bisulphite: Zn + 4NaHS0 3 = Na 2 S 2 04 + ZnS0 3 + Na 2 S0 3 + 2H 2 0, the salt being separated from the sulphites formed by fractional precipita- tion. A solution of the free acid may be prepared by adding oxalic acid to the solution of the sodium salt. This solution is yellow in colour, and is very unstable decomposing at ordinary temperature into sulphur and sulphur dioxide. A pure zinc salt has been prepared by Nabl (Monats., 1899, 20, p. 679) by acting with zinc on a solution of sulphur dioxide in absolute alcohol, whilst H. Moissan (Compt. rend., 1902, 135, p. 647) has also obtained salts by the action of dry sulphur dioxide on various metallic hydrides. Considerable controversy arose as to the

constitution of the salts of this acid, the formula of sodium salt, for example, being written as NaHS0 2 and Na 2 S 2 0,i; but the investigations of C. Bernthsen (Ann., 1881, 208, p. 142; 1882, 211, p. 285; Ber., 1900, 33, p. 126) seem to decide definitely in favour of the latter (see also T S. Price, Journ. Chem. Soc; also Buchercr and Schwalbe, Zeit. angew. Chem . 1904, 17, p. 1447). Although this acid appears to be derived from an oxide S2O3, it is not certain that the known sesquioxide is its anhydride.

Persulphuric anhydride, S 2 07, is a thick viscous liquid obtained by the action of the silent discharge upon a mixture of sulphur trioxide and oxygen. It solidifies at about 0° C. to a mass of long needles, and is very volatile. It is decomposed readily into sulphur trioxide and oxygen when heated. Water decomposes it with forma- tion of sulphuric acid and oxygen : 2S 2 Ov + 4H 2 = 4H2SO4 + 2 . Persulphuric acid, HSO4, the acid corresponding to S 2 0;, has not been obtained in the free state, but its salts were first prepared in 1 89 1 by H. Marshall (Journ. Chem. Soc, 1891, p. 771) by electrolysing solutions of the alkaline bisulphates. The potassium salt, after recrystallization from warm water, separates in large tabular crystals. Its aqueous solution gradually decomposes with evolution of oxygen, behaves as a strong oxidant, and liberates iodine from potassium iodide. Solutions of persulphates in the cold give no precipitate with barium chloride, but when warmed barium sulphate is precipi- tated with simultaneous liberation of chlorine : K2S2O8 + BaCl 2 = BaS0 4 + K2SO4 + Cl 2 . The conductivity measurements of G. Bredig point to the salt possessing the double formula.

Thiosulphuric acid, formerly called hyposulphurous acid, H 2 S20 3 , cannot be preserved in the free state, since it gradually decomposes with evolution of sulphur dioxide and liberation of sulphur : H 2 S 2 3 = S+SOs+HjO. The salts of the acid, however, are stable, the sodium salt in particular being largely used for photographic purposes under the name of ” hypo.” This salt may be prepared by digesting flowers of sulphur with sodium sulphite solution or by boiling sulphur with milk of lime. In this latter reaction the deep yellow solution obtained is exposed to air when the calcium polysulphide formed is gradually converted into thiosulphate by oxidation, and the calcium salt thus formed is converted into the sodium salt by sodium carbonate or sulphate. The thiosulphates are readily decomposed by mineral acids with liberation of sulphur dioxide and precipitation of sulphur : Na 2 S 2 3 + 2HCI = 2NaCl + S + S0 2 + H 2 0. They form many double salts and give a dark violet coloration with ferric chloride solution, this colour, however, gradually disappearing on standing, sulphur being precipitated. The acid is considered to possess the structure 2

S(SH) (OH), since sodium thiosulphate reacts with ethyl bromide to give sodium ethyl thiosulphate, which on treatment with barium chloride gives presumably banurn ethyl thiosulphate. This salt, on standing, decomposes into barium dithionate, BaSjOs, and diethyl disulphide, (C 2 H 5)2S 2 , which points to the presence of the SH group in the molecule.

The thionic acids are a group of sulphur-containing acids of general formula H 2 S„O e , where « = 2, 3. 4. 5 and possibly 6 Dithiomc acid, H2S2O6, prepared by J. Gay-Lussac in 1819, is usually obtained

in the form of its barium salt by suspending freshly precipitated hydrated manganese dioxide in water and passing sulphur dioxide into the mixture until all is dissolved; the barium salt is then pre- cipitated by the careful addition of barium hydroxide. Much manganese sulphate is formed during the reaction, and H. C. Car- penter (Journ.-Chem. Soc, 1902, 81, p. 1) showed that this can be almost entirely avoided by replacing the manganese oxide by hydrated ferric oxide, the reaction proceeding according to the equation: 2Fe(OH) 3 + 3S0 2 = FeSzOe + FeS0 3 + 3H 2 0. He points out that the available oxygen in the oxides may react either as SO2 + H 2 + O = HjSCˆ or as 2S0 2 + H 2 + O = HjSjOe ; and that in the case of ferric oxide 96 % of the theoretical yield of dithionate is obtained, whilst manganese oxide only gives about 75 %. A solution of the free acid may be obtained by decomposing the barium salt with dilute sulphuric acid and concentrating the solution in vacuo until it attains a density of about 1-35 (approximately), further concentra- tion leading to its decomposition into sulphur dioxide and sulphuric acid. The dithionates are all soluble in water and when boiled with hydrochloric acid decompose with evolution of sulphur dioxide and formation of a sulphate. Trithionic acid, H 2 S 8 06, is obtained in the form of its potassium salt by the action of sulphur dioxide on a solution of potassium thiosulphate : 2K2S2O3 + 3S0 2 = 2K 2 S 3 06 + S ; or by warming a solution of silver potassium thiosulphate: KAgSsCh = Ag 2 S f K 2 S 3 6 ; whilst the sodium salt may be prepared by adding iodine to a mixture of sodium thiosulphate and sulphite : Na 2 S0 3 + Na 2 S20 3 + I2 = Na 2 S 3 6 + 2NaI. The salts are un- stable; and a solution of the free acid (obtained by the addition of hydrofluosilicic acid to the potassium salt) on concentration in vacuo decomposes rapidly: H 2 S 3 6 = H 2 SC>4 + S + S0 2 . Tetrathionic acid, H2S4O6, is obtained in the form of its barium salt by digesting barium

thiosulphate with iodine: 2Ba 2 S 2 3 + I2 = BaSˆe + 2BaI, the barium iodide formed being removed by alcohol; or in the form of sodium salt by the action of iodine on sodium thiosulphate. The free acid is obtained (in dilute aqueous solution) by the addition of dilute sulphuric acid to an aqueous solution of the barium salt. It is only stable in dilute aqueous solution, for on concentration the acid decomposes with formation of sulphuric acid, sulphur dioxide and sulphur.

Wackenroder's solution (Debus, Journ. Chem. Soc, 1888, 53, p. 278) is prepared by passing sulphuretted hydrogen gas into a nearly saturated aqueous solution of sulphur dioxide at about 0° C. The solution is then allowed to stand for 48 hours and the process repeated many times until the sulphur dioxide is all decomposed. The reactions taking place are complicated, and the solution contains ultimately small drops of sulphur in suspension, a colloidal sulphur (which Spring (Rec trav. chim., 1906, 25, p. 253) considers to be a hydrate of sulphur of composition Ss-H 2 0), sulphuric acid, traces of trithionic acid, tetra- and pentathionic acids and probably hexathionic acid. The solution obtained may be evaporated in vacuo until it attains a density of 1-46 when, if partially saturated with potassium hydroxide and filtered, it yields crystals of potassium pentathionate, K 2 Ss06-3H 2 0. The formation of the pentathionic acid may be represented most simply as follows : 5S0 2 + 5H 2 S = H 2 S 6 06 + 5S f 'IH2O. The aqueous solution of the acid is fairly stable at ordinary tenperatures. The pentathionates give a brown colour on the addition of ammoniacal solutions of silver nitrate and ultimately a black precipitate. Hexathionic acid, H 2 Se06, is probably present ir the mother liquors from which potassium pentathionate is prepared. The solution on the addition of ammoniacal silver nitrate behaves simi- larly to that of potassium pentathionate, but differs from it in giving an immediate precipitate of sulphur with ammonia, whereas the solu- tion of the pentathionate only gradually becomes turbid on standing. The per-acids of sulphur were first obtained in 1898 by Caro (Zeit. angew. Chem., 1898, p. 845) who prepared monopersulphuric acid by the action of sulphuric acid on a persulphate. This acid may also be prepared by the electrolysis of concentrated sulphuric acid, and it is distinguishable from persulphuric acid by the fact that it immediately liberates iodine from potassium iodide. It behaves as a strong oxidant and in aqueous solution is slowly hydrolysed. It most probably corresponds to the formula H 2 S0 5 . See H. E. Armstrong and Lowry, Chem. News (1902), 85, p. 193; I-owry and West, Journ. Chem. Soc. (1900), 77, p. 950; H. E. Arm- strong and Robertson, Proc. Roy. Soc, 50, p. 105; T. S. Price, Ber., 1902. 35, p. 291 ; Journ. Chem. Soc

(1906), p. 53; A. v. Baeyer and V. Villiger, Ber., passim.

Pharmacology. — The sources of all sulphur preparations used in medicine (except calx sulphurata) are native virgin sulphur and the sulphides of metals. Those contained in the British Pharmacopoeia are the following : (1) Sulphur sublimatum, flowers of sulphur (U.S. P.), which is insoluble in water. From it are made (a) confectio sulphuris ; (b) unguenlum sul'phuris ; (c) sulphur praecipitatum, milk of sulphur (U.S.P.) which has a sub-preparation trochiscus sulphuris each lozenge containing 5 grs. of precipitated sulphur and I gr. of potassium acid tartrate; (d) potassa sulphurata (liver of sulphur), a mixture of salts of which the chief are sulphides of potassium; (e) sulphuris iodidum (U.S.P.) , which has a preparation unguenlum sulphuris iodidi, strength I in 25. From the heating of native calcium sulphate and carbon is obtained calx sulphurata (U.S. and B.P.), or sulphurated lime, a greyish-white powder.

XXVI. 3

Therapeutics. — Externally, sulphur is of use in skin affections. Powdered, it has little effect upon the skin, but in ointment or used by fumigation it has local therapeutic properties. In scabies (itch) it is the best remedy, killing the male parasite, which remains on the surface of the skin. To get at the female and the ova prolonged soaking in soap and water is necessary, the epiderm being rubbed away and the ointment then applied. Precipitated sulphur is also useful in the treatment of acne, but sulphurated lime is more power- ful in acne pustulosa and in the appearance of crops of boils. Inter- nally, sulphur is a mild laxative, being converted in the intestine into sulphides. Milk of sulphur, the confection and the lozenge, is used for this purpose. Sulphur and sulphur waters such as those of Harrogate, Aix-la-Chapelle and Aix-les-Bains, have a powerful effect in congested conditions of the liver and intestines, haemor- rhoids, gout and gravel. Sulphur is of use in chronic bronchial affections, ridding the lungs of mucus and relieving cough. In chronic rheumatism sulphur waters taken internally and used as baths are effectual. Sulphur in some part escapes unchanged in the faeces.

When sulphur is burned in air or oxygen, sulphur dioxide is produced, which is a powerful disinfectant, used to fumigate rooms which have been occupied by persons suffering from some infectious disease.

SULPHURIC ACID, or Oil of Vitriol, H_2SO_4 , perhaps the most important of all chemicals, both on account of the large quanti- ties made in all industrial countries and of the multifarious uses to which

it is put. It is not found in nature in the free state to any extent, and although enormous quantities of its salts, especially calcium and barium sulphate, are found in many localities, the free acid is never prepared from these salts, as it is more easily obtainable in another way, viz. by burning sulphur or a sulphide, and combining the sulphur dioxide thus formed with more oxygen (and water).

Originally prepared by heating alum, green vitriol and other sulphates, and condensing the products of distillation, sulphuric acid, or at least an impure substance containing more or less sulphur trioxide dissolved in water, received considerable at- tention at the hands of the alchemists. The acid so obtained from ferrous sulphate (green vitriol) fumes strongly in moist air, hence its name “fuming sulphuric acid”; another name for the same product is ” Nordhausen sulphuric acid,” on account of the long-continued practice of this process at Nordhausen.

Ordinary sulphuric acid, H2SO4, may be prepared by dissolv- ing sulphur trioxide in water, a reaction accompanied by a great evolution of heat; by the gradual oxidation of an aqueous solution of sulphur dioxide, a fact which probably explains the frequent occurrence of sulphuric acid in the natural waters rising in volcanic districts; or by deflagrating a mixture of sulphur and nitre in large glass bells or jars, absorbing the vapours in water and concentrating the solution. The latter process, which was known to Basil Valentine, was commercially applied by the quack doctor, Joshua Ward (1685-1761), of Twickenham, England, to the manufacture of the acid, which was known as ” oil of vitriol made by the bell ” or per campanum. Dr John Roebuck (1718-1794), of Birmingham, replaced the glass vessels by leaden ones, thereby laying the foundation of the modern method of manufacture (see below) .

Properties. — Pure sulphuric acid, H2SO4, is a colourless, odourless liquid of an oily consistency, and having a specific gravity of 1-8384 at 15°. It boils at 338 , and at about 400° the vapour dissociates into sulphur trioxide and water; at a red heat further decomposition ensues, the sulphur trioxide dis- sociating into the dioxide and water. It freezes to a colourless crystalline mass, melting at 10-5°. The acid is extremely hygroscopic, absorbing moisture from the atmosphere with great rapidity; hence it finds considerable application as a desiccating agent. The behaviour of aqueous solutions of sul- phuric acid is very interesting. The pure acid (100% H 2 S0 4) cannot be prepared by boiling down a weaker acid under any pressure (at least between 3 and 300 centimetres of mercury), an acid of the composition H 2 S04,tVH 2 or 12S0 3 ,13H 2 being invariably obtained. Neither is

there any advantage gained by mixing this hydrate with sulphur trioxide; for when such a mixture is concentrated by evaporation, sulphur trioxide is vaporized until the same hydrate is left. The pure acid, however, may be obtained by strongly cooling this hydrate.

when it separates in the form of white crystals, which melt at 10-5°, and on gentle heating evolve sulphur trioxide and again form the same hydrate. When strong sulphuric acid is mixed with water there is a great development of heat; the heat evolved when four parts of acid are mixed with one of water being sufficient to raise the temperature from o° to ioo° C. (Hence the laboratory precaution of always adding the acid to the water and not the water to the acid.) In addition to the heat evolu- tion there is also a diminution in volume, the maximum occurring when the components are present in the ratio H 2 S04:2H 2 0, thus pointing to the existence of a hydrate H2SO4, 2H 2 0. A second hydrate, H 2 S0 4 ,H 2 0, may be obtained as rhombic crystals, which melt at 7 and boil at 205°, by diluting the strong acid until it has a specific gravity of, 1-78, and cooling the mixture; this compound is sometimes known as glacial sulphuric acid. Both the mono- and di-hydrates form freeing mixtures with snow. Other hydrates have also been described.

Reactions. — Sulphuric acid has the widest commercial application of all chemical reagents. Here only reactions of commercial utility will be considered, and reference should be made to the article Sulphur for reactions which are more of a purely scientific interest. In inorganic chemistry its principal applications are based on its solvent power for metals, and its power of expelling other acids from their salts. In the first group we have to notice the use of iron or zinc and dilute sulphuric acid for the manufacture of hydro- gen, which may be used directly, as for inflating balloons or for purposes of combustion, or in the nascent condition, for reduction purposes, as generally is the case in organic chemistry (see Aniline). It is worthy of notice that while many metals dissolve in cold dilute sulphuric acid, with the liberation of hydrogen, in accordance ivith the typical equation: M + H 2 S0 4 = MSO4 + H 2 (M denoting one atom of divalent or two atoms of a monovalent metal), there are several (copper, mercury, antimony, tin, lead and silver) which arc insoluble in the cold dilute acid, but dissolve in the hot strong acid with evolution of sulphur dioxide, thus: M + 2Hi2S04 = MSO4 + S0 2 + 2H 2 0. Carbon decomposes hot strong sulphuric acid on long continued boiling, with the formation of

carbon dioxide and sulphur dioxide. The power which sulphuric acid exhibits for expelling other acids from their combinations, a power occasioned by its comparative involatility and high degree of avidity, forms the basis of a considerable number of commercial processes. Hydro- chloric, hydrobromic, hydriodic, hydrofluoric, nitric, phosphoric and many other acids are manufactured by the action of sulphuric acid on their salts; the alkali and chlorine industries, and also the manufacture of bromine and iodine, employ immense quantities of this acid.

In organic chemistry sulphuric acid is extensively employed. Its powerful affinity for the elements of water makes it a valuable dehydrating and condensation agent. It extracts the elements of water from formic acid, giving carbon monoxide; from oxalic acid, giving a mixture of carbon monoxide and dioxide; from alcohol, to give ether or ethylene according to the conditions of the experi- ment; and from many oxygenated compounds (e.g. sugar, tartaric acid, &c), with the production of charred masses. The formation of esters and ethers are generally facilitated by the presence of this acid. It also acts in an opposite manner in certain cases, adding the elements of water to compounds; thus, nitriles are converted into acid-amides, and various acetylene derivatives may be caused to yield ketonic derivatives. As an oxidizing agent its application is limited. The transformation of piperidine into pyridine by \V. KSnigs, and the observation that anthraquinone yielded oxyanthraquinones when treated in the cold with strong sulphuric acid, and the recent introduction of fuming sulphuric acid for the oxidation of naphthalene to phthalic acid, a process of great value in the manufacture of artificial indigo, may be noted. But its chief technical application depends upon the formation of sulphonic acids when it reacts with aromatic hydrocarbon residues; these compounds being important either as a step towards the preparation of hydroxy-compounds, e.g. resorcin, the naphthols, alizarin, &c, or for preparing dye-stuffs in a more soluble form.

Sulphates. — Sulphuric acid, being a dibasic acid, forms two series of salts with monovalent metals: an acid sulphate, MHSO4, and a normal sulphate, M 2 S04. Acid sodium sulphate, NaHSC>4, has been employed in the manufacture of sulphur trioxide. When heated it loses water to form sodium pyrosulphate, Na 2 S 2 7 , which on treatment with sulphuric acid yields normal sodium sulphate and sulphur trioxide. The normal sulphates are the more impor- tant, and occur widely and abundantly distributed in the mineral kingdom ; anhydrite, gypsum, anglesite, barytes, celestite and kieserite are among the commonest species. As a general class, the sulphates are soluble in water, and exhibit well crystallized forms. Of the most

insoluble we may notice the salts of the metals of the alkaline earths, barium, strontium and calcium, barium sulphate being practically insoluble, and calcium sulphate sparingly but quite appreciably soluble. Lead sulphate is very slightly

soluble in water, soluble in strong sulphuric acid, and almost insoluble in alcohol.

Sulphates may be detected by heating the salt mixed with sodium carbonate on charcoal in the reducing flame of the blowpipe; sodium sulphide is thus formed, and may be identified by the black stain produced if the mass be transferred to a silver coin and then moistened. In solution, sulphates are always detected and estimated by the formation of a white precipitate of barium sulphate, insoluble in water and all the common reagents.

Manufacture.— The first step in its manufacture is the com- bustion of sulphur. Formerly this was employed exclusively in the free state as brimstone, and this is still the case to a considerable extent in some countries, notably in the United States, but the great bulk of sulphuric acid is now made from metallic sulphides, especially those of iron and zinc. Most of the brimstone of trade comes from Sicily, but in the United States Louisiana sulphur is playing an important part, and seems likely to oust the Sicilian sulphur. Free sulphur is also contained as ” gas sulphur ” in the ” spent oxides ” of gasworks, which are actually utilized for the manufacture of sulphuric acid. Sulphur is also recovered in a very pure state from the ” alkali waste ” of the Leblanc process, but this ” recovered sulphur ” is too expensive to be burned for the purpose in question. In the United Kingdom much gas sulphur is used for the manufacture of sulphuric acid, together with a limited quantity of Sicilian sulphur for the production of sulphuric acid free from arsenic.

A much larger percentage of the sulphuric acid is made from

f>yrites, i.e. more or less pure disulphide of iron which occurs in arge quantities in many countries. Great Britain produces very little of it, Ireland a little more, but of poor quality. Most of the pyrites consumed in the United Kingdom come from Spain; this Spanish pyrites generally (not always) contains enough copper (say 3 or 4%) to make its extraction from the residues (” cinders “) a paying process, and this of course cheapens the price of the sulphur to the acid manufacturer. Spain also supplies much pyrites to Germany, France and America, all of which countries are them- selves producers of this ore. Sweden and Norway are exporters of it to all these countries. Good pyrites contains

from 48 to 50 %, exceptionally up to 52 % of sulphur, of which all but from 1 to 4% is utilized when burning the ore. Another metallic sulphide, blende, ZnS, is of importance for Germany, Belgium and the United States, much less so for the United Kingdom, as a source of sulphur. Blende contains only about half as much sulphut as good pyrites, and this cannot be burned off as easily as from pyrites, but this ” roasting ” has to be done somehow in any case in order to prepare the ore for the extraction of the zinc.

Brimstone is easily burned without any extraneous help; indeed the only precaution required is to take care lest the heat produced by the burning sulphur should not volatilize part of it in the un- burned state. This can never be entirely avoided, and sometimes causes trouble in the succeeding apparatus.

The roasting of pyrites always takes place without using any extraneous fuel, the heat given off by the oxidation of the sulphur and the iron being quite sufficient to carry on the process. If the ore is in pieces of the size of a walnut or upwards, it is roasted in plain ” kilns ” or ” burners,” provided with a grating of suitable construction for the removal of the cinders, with a side door in the upper part for charging in the fresh ore on the top of the partially burned ore, and with an arch-shaped roof, from which the burner- gas is carried away in a flue common to a whole set of kilns. The latter are always set in a row of twelve or more, and are one after another charged once or twice a day at appropriate intervals, so that a regular evolution of gas takes place all the day round. By employing suitable precautions, a gas of approximately uniform composition is obtained, containing from 6 to 8 % sulphur dioxide, S0 2 , with a little trioxide, SO3, and about 12% of oxygen, which is more than sufficient for converting later all the S0 2 into SO3 or H 2 S0 4 . The burning of ” smalls “or” dust ” was formerly considered much more difficult and incomplete than that of pieces, but this difficulty has been entirely overcome in various ways, principally by the ” shelf-burner,” originally constructed by E. Maletra, and mechanical burners, which were formerly almost entirely confined to America, where the saving of labour is a primary consideration. The first really successful mechanical pyrites-burner was constructed many years ago by’ MacDougall Bros, of Liverpool. The drawbacks still present in this burner caused it to be abandoned after a few years, but they have since been overcome by several recent inventors, principally American. The Hereshoff burner has been most widely introduced, both in America and in European countries. The roasting of blende is nothing like so easy as that of pyrites, since the heat developed by the oxidation of the zinc sulphide itself is not sufficient for carrying on the process, and external heat must be

applied. It is now usually performed by a series of muffles, superposed one over another, so that the whole forms a kind of shelf-burner, with internally heated shelves (the " Rhenania " furnace). This operation is both more costly and more delicate than the roasting of pyrites, but it is now perfectly well understood, and gas is obtained from blende furnaces hardly inferior in quality to that yielded by pyrites kilns. In America, and quite exceptionally also in Europe, mechanical furnaces are used for the roasting of blende.

The gas produced in the burning of sulphur ores, when issuing from the burner, holds in mechanical suspension a considerable quantity of " flue-dust," which must be removed as far as is practic- able before the gas is subjected to further treatment. Flue-dust contains principally ferric oxide, zinc oxide, arsenious and sulphuric acids, and small quantities of the various metals occurring in the raw ore. All the thallium and selenium on the market is obtained from this source. Sometimes the burner-gas is employed directly for the sake of the SO2 which it contains, principally in the manu- facture of " sulphite cellulose " from wood. When the gas is to be utilized for the manufacture of sulphuric acid the SO» must be combined with more oxygen, for which purpose an " oxygen carrier " must be employed. Until recently the only agent practically used for this purpose was furnished by the oxides of nitrogen; more recently other oxygen carriers, acting by " contact processes," have also come into use (see below).

The production of sulphuric acid by the assistance of the oxides of the nitrogen is carried out in the " vitriol chambers." These are immense receptacles, mostly from 100 to 200 ft. long, 20 to 30 ft. wide, and 15 to 25 ft. high, constructed of sheet-lead, the joints of the sheets being made by " burning " or autogenous soldering, i.e. fusing them together by a blow-pipe without the aid of solder (which would be quickly destroyed by the acid). The vitriol chambers must be supported on all sides by suitable wooden or iron framework, and they are always erected at a certain height over the ground, so that any leaks occurring can be easily detected. In nearly all cases several of these chambers are connected so as to form a set of a cubic capacity of from 100,000 to 200,000 cub. ft. The burner gas is introduced at one end, the waste gases issue from the other, the movement of the gases being impelled partly by their own chemical reactions, partly by the draught produced by a chimney (or tower), or by mechanical means. At the

same time water is introduced in a number of places in the shape of steam or finely divided as a spray, to furnish the material for the reaction : $SO_2 + O + H_2O = H_2SO_4$. As this reaction of its own accord takes place only to a very small extent, an ” oxygen carrier” is always introduced in the shape of the vapours of nitric acid or the lower oxides of nitrogen. By the play of reactions induced in this way practically the whole of the SO_2 is ultimately converted into sulphuric acid, and at the same time the nitrogen oxides are always recovered with comparatively very slight losses and made to serve over again.

The reactions taking place in the vitriol chambers are very complicated, and have been explained in many different ways. The view hitherto accepted by most chemists is that developed by G. Lunge, according to which there are two principal reactions succeeding each other, it may be in quite contiguous places, but under different conditions. Where the nitrous fumes prevail and there is less water present, sulphur dioxide combines with nitrous acid and oxygen to form nitroso-sulphuric acid, a crystalline sub- stance of the formula $SO_2(OH)(ONO)$. The reaction is therefore: $SO_2 + O + HNO_2 = SO_5NH$. The solid substance is, however, only exceptionally met with, as it at once dissolves in the mist of sulphuric acid floating in the chamber and forms ” nitrous vitriol.” Wherever this nitrous vitriol comes into contact with liquid water (not steam), which is also present in the chamber in the shape of mist, and practically as dilute sulphuric acid, it is decomposed into sulphuric and nitrous acid, thus: $SO_2(ONO) + H_2O = H_2SO_4 + HNO_2$. The re-formed nitrous acid, although not stable, any more than is its anhydride, N_2O_3, is nevertheless the ” oxygen carrier ” in question, as the products of its spontaneous decomposition, when meeting with other compounds, always react like nitrous acid itself and thus may transfer an indefinite quantity of oxygen to the corresponding quantities of SO_2 and H_2O, with the corresponding formation of H_2SO_4. This theory at once explains, among other things, why the acid formed in the vitriol chambers always contains an excess of water (the second of the above-quoted reactions requiring the ” mass action ” of this excess), and why the external cooling produced by the contact of the chamber sides with the air is of great importance (liquid water in the shape of a mist of dilute sulphuric acid being necessary for the process).

In 1906 Lunge (in a paper published with Bert) to some extent modified his views, by introducing an intermediate compound, sulphonitronic acid, SO_6NH_2, which had been noticed by various chemists for some time through its property of imparting a deep blue colour to sulphuric acid. It is evident that the nitrous gases ” present in the vitriol chamber consist essentially of a mixture of NO and NO_2,

the latter being formed from NO by the excess of oxygen present. The N0 2 (or NO + O) reacts upon S0 2 + H 2 0, forming S0 5 NH 2 , which, being extremely unstable, is at once oxidized to SOjNH (nitroso-sulphuric acid). The latter is now either con- verted by hydrolysis into sulphuric acid and nitrogen oxides: 2SO s NH + H 2 = 2H2SO4 + NO + N0 2 , the latter acting as before: or it reacts with more SO2, forming again sulphonitronic acid: 2S0 6 NH + S0 2 + 2H 2 = H 2 S04 + 2S0 6 NH2. The latter can also split up directly into NO and SO4H2.

Whatever be the true theory of the vitriol-chamber process, there is no doubt about the way in which the reactions have to be carried out in practice. Since the reactions occur among gases

and liquids in the nebulous state, vast spaces have to be provided in which the process may be carried out as completely as possible before the waste gases are allowed to escape into the outer air. These spaces cannot be constructed in any other way than is actu- ally done in the shape of the lead chambers ; neither iron nor brick- work can be employed for this purpose, as they would be quickly destroyed by the acid liquids and gases.

When issuing from the chambers, the gases still contain the whole of the free nitrogen contained in the air which had entered into the burners, together with about a third, or at least a fourth, of the oxygen originally present therein, such excess of oxygen being re- quired in order to carry out the conversion of the sulphur dioxide into sulphuric acid as completely as possible. For similar reasons it is necessary to employ much more water than is required to form H2SO4; and this is all the more necessary as strong sulphuric acid dissolves the nitrous compounds in the shape of nitroso-sulphuric acid, and thus withdraws these oxygen carriers from the gas-space of the chambers where the necessary reactions take place. It follows from this that the acid collecting at the bottom of the chambers must never exceed a certain concentration, say 70%, H2SO4 having a specific gravity of 1-615, but it is preferable to make it only 66 to 67%, having a specific gravity of 1-57 to 1-58. On the other hand, it should never go down below 60 % H2SO4, equivalent to a specific gravity of 1-50.

The commercial production of sulphuric acid imperatively requires that the nitrogen oxides (which originally were always introduced in the shape of nitric acid) should be available as long as possible, before being lost mechanically or by reduction to the inactive forms of nitrous oxide or elementary nitrogen. The first step towards securing this requirement was taken as early as 1827 by Gay-Lussac, who

discovered that the nitrous fumes, otherwise carried away from the lead chambers by the waste atmo- spheric nitrogen and oxygen, could be retained by bringing the gases into contact with moderately strong sulphuric acid, the result being the formation of nitroso-sulphuric acid: $2H_2SO_4 + N_2O_3 = 2SO_2(OH)(ONO) + H_2O$, and the latter remaining dissolved in sulphuric acid as " nitrous vitriol." But this important invention was of little use until John Glover, about 1866, found that the nitrous vitriol could be most easily reintroduced into the process by subjecting it to the action of burner-gas before this enters into the lead chambers, preferably after diluting it with chamber acid, that is, acid of from 65 to 70%, H_2SO_4, as formed in the lead chambers. The reaction is then : $2SO_2(OH)(ONO) + SO_2 + 2H_2 = 3H_2SO_4 + 2NO$; that is to say, all the " nitre " is returned to the chambers in the shape of NO; the sulphuric acid employed in the Gay-Lussac process is not merely recovered, but an additional quantity is formed from fresh SO_2 ; as the heat of the burner-gases also comes into play, much water is evaporated, which supplies part of the steam required for the working of the chambers ; and the acid issues from the apparatus in a " denitrated " and sufficiently concentrated state (78 to 80% H_2SO_4) to be used over again for absorbing nitrous vapours or any other purpose desired. Since that time, in every properly appointed sulphuric acid manufactory, the following cycle of operations is carried out. To begin with, in the burners pyrites (or, as the case may be, brimstone or blende) is made to yield hot burner-gas containing about 7 % (in the case of brimstone 10 or II %) of SO_2 . This, after having been deprived of most of the flue-dust, is passed through the "Glover tower," i.e. an upright cylindrical or square tower, consisting of a leaden shell lined with heat- and acid-proof stone or brick, and loosely filled or " packed " with the same material, over which a mixture of acid from the Gay-Lussac tower and from the chambers trickles down in such proportions that it arrives at the bottom as denitrated acid of from 78 to 80 % H_2SO_4. The gases now pass on to the lead chambers, described above, where they meet with more nitrous vapours, and with steam, or with water, converted into a fine dust or spray. Here the reactions sketched above take place, so that " chamber-acid " as already described is formed, while a mixture of gases escapes containing all the atmospheric nitrogen, some oxygen in excess, about 0-5 % of the total SO_2, and some oxides of nitrogen. This gas is now passed through the Gay-Lussac tower, which somewhat resembles the Glover tower, but is usually filled with coke, over which sulphuric acid of about 80% H_2SO_4 trickles down in sufficient quantity to retain the nitrous vapours. Ulti- mately the waste gas is drawn off by a chimney, or sometimes by mechanical means.

Of course a great many special improvements have been made in the plant and the working of chamber systems ; of these we mention only some of the most important. By judiciously watching all stages of the process, by observing the draught, the strength of the acid produced, the temperature, and especially by frequent analyses of the gases, the yield of acid has been brought up to 98 % of the theoretical maximum, with a loss of nitre sometimes as low as two parts to 100 of sulphur burned. The supply of the nitric acid required to make up this loss is obtained in England by ” potting that is, by decomposing solid nitrate of soda by sulphuric acid in a flue between the pyrites burners and the chambers. On the continent of Europe makers generally prefer to employ liquid nitric acid, which is run through the Glover tower together

with the nitrous vitriol. Although this method appears more troublesome, it allows the amount of nitre to be more easily and more accurately regulated. The size of the Glover towers, and more especially that of the Gay-Lussac towers, has been progressively increased, and thereby the cube of the lead chambers themselves has been diminished to a much greater extent. By improved

(From Thorpe’s Inorganic Chemistry.)

Sulphuric Acid Plant.

A, Pyrites burners.

B, Nitre oven.

C, Glover tower.

D, Gay-Lussac tower.

E, Cooling pipes for Glover-

tower acid.

F, F, F, Vitriol chambers.

G, Steam boiler.

H, Acid eggs or reservoirs for pumping the acid to top of towers. I, Steam engine and stone- breaker for breaking up pyrites. Chimney. Engine for compressing air.

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” packing ” the towers have been rendered more durable, and in the case of the Gay-Lussac tower the loss of nitre has been diminished by avoiding the use of a coke packing, which acts upon that substance as a reducing agent. Many attempts have been made to reduce the chamber space by apparatus intended to bring about a better mixture of the gases, and to facilitate the interaction of the misty particles of nitrous vitriol and dilute acid floating in the chamber with each other and with the chamber atmosphere. The earliest really successful, and still the most generally applied apparatus of this kind, is the Lunge-Rohrmann ” plate columns ” or “reaction towers” placed between the chambers, but though this and similar apparatus has proved to be very useful in the later stages of the process, it has not been found practicable to do away with the lead chambers entirely. The pumping of the acids up to the top of the towers is now always performed by means of com- pressed air, either in the old ” acid eggs,” or more economically in ” pulsometers.”

Most of the sulphuric acid manufactured is not required to be of higher strength than is furnished by the vitriol chambers, either directly (65 to 70%), or after a passage through the Glover tower (78 to 80%). This, for instance, holds good of the acid employed in the manufacture of sulphate of soda and hydrochloric acid from common salt, and in the manufacture of superphosphates. But for many purposes more highly concentrated acid is required. Formerly all such acid was made by boiling down the dilute acid, for which purpose a great variety of apparatus was invented. The first question is always that of material. Lead can be used for the purpose only when the boiling-point of the acid is reduced by means of a vacuum — a plan which has not met with much success. Formerly glass vessels were

generally employed and they still sur- vive in England, but elsewhere they are not much used. Porcelain, enamelled iron, for high concentrations even cast-iron without any protection, are also in use. On the continent of Europe platinum vessels have been for a long time almost universal, and they have been greatly improved by an internal lining of gold. The second

consideration is the form of the vessels; these may be open pans or dishes, or closed retorts, or combinations of both. We also note the Faure and Kessler apparatus, which consists of a platinum pan, surmounted by a double-walled leaden hood, in such a manner that, while the hood is constantly cooled from the outside by water, the thin acid condensing on its inside is carried away without being allowed to flow back into the pan. The majority of acid makers, however, prefer retorts made entirely of platinum, preferably pro- vided by the Heraeus process with a dense, closely adherent coating of gold, including the top or ” dome.” The new Kessler furnace is a very ingenious apparatus, in which the fire from a gas-producer travels over the sulphuric acid contained in a trough made of Volvic lava, and surmounted by a number of perforated plates, over which fresh acid is constantly running down ; the temperature is kept down by the production of a partial vacuum, which greatly promotes the volatilization of the water, whilst retarding that of the acid. This furnace is also very well adapted for impure acids, unsuitable for platinum or platinum-gold stills on account of the crusts forming at the bottom of the retorts ; and it is more and more coming into use both in Great Britain and on the Continent. A third consideration is the condensation of the vapours formed in the con- centrating process; the further the concentration proceeds the more sulphuric acid they contain. Condensation is a comparatively easy task in the case of platinum apparatus, but with glass or porcelain beakers or retorts it presents great difficulties. In this respect the Kessler furnace has also proved to be very efficacious, so that it is at the present time considered the best apparatus for the concentration of sulphuric acid found in the trade.

The highest strength of sulphuric acid practically attainable by boiling down is 98 % hUSO*, and this is only exceptionally reached, since it involves much expenditure of fuel, loss of acid and wear and tear of apparatus. The usual strength of the O.V. cf commerce, mostly designated by its specific gravity as 168 Twaddell, is from 93 to 95, or at most 96 % H2SO4. When attempts are made to push the process beyond 98 % it is found that the acid which distils over is as strong as that which remains behind. Real ” monohydrate ” or acid approaching 100 % can be made by Lunge’s process of cooling strong O.V. down to

—16° C. when H2SO4 crystallizes out, or by the addition of anhydrous SO3 in the shape of fuming acid.

Since the development of the contact processes the fuming acid has become so cheap that it is now exclusively used for the prepara- tion of the acids approaching the composition of ” monohydrate.” Fuming or Nordhausen Oil of Vitriol, a mixture or chemical com- pound of H2SO4, with more or less SO3, has been made for centuries by exposing pyritic schist to the influence of atmospheric agents, collecting the solution of ferrous and ferric sulphate thus formed, boiling it down into a hard mass (” vitriolstein “) and heating this to a low red heat in small earthenware retorts. Since about 1800 this industry had been confined to the north-west of Bohemia, and it survived just till 1900, when it was entirely abandoned — not because its product had become any less necessary, but, quite on the contrary, because the enormously increasing demand for fuming sulphuric acid, arising through the discovery of artificial alizarine and other coal-tar colours, could riot possibly be supplied by the clumsy Bohemian process. Other sources of supply had accordingly to be sought, and they were found by going back to a reaction known since the first quarter of the 19th century, when J. W. Dobereiner discovered the combination of S0 2 and into SO3 by means of spongy platinum. This reaction, now known by the name of the catalytic or contact process, was made the subject of a patent by Peregrine Phillips, in 1 831, and was tried later in many ways, but had been always considered as useless for practical purposes until 1875, when it was simultaneously and independently taken up by Clemens Winkler in Freiberg, and by W. S. Squire and R. Messel in London. Both these inventors began in the same way, viz. by decomposing ordinary sulphuric acid by a high temperature into SO2, O, and H2O (the last of course being in the shape of steam)* absorbing the water by sulphuric acid, and causing the SO2 and O to combine to S0 3 by means of moderately heated platinum in a fine state of division. Winkler showed that this division was best obtained by soaking asbestos with a solution of platinum chloride and reducing the platinum to the metallic state, and he described later a specially active kind of ” contact substance,” prepared frbm platinum chloride at a low temperature. This revival of the synthetical production of SOs, at a period when this article had suddenly become of great importance, caused the greatest excitement among chemists and led to numerous attempts in the same direction, some of which were at once sufficiently successful to compete with the Bohemian process. It was soon found that the production of a mixture of S0 2 and O from sulphuric acid, as above described, was both too troublesome and costly, and after a number of experiments in

other directions inventors went back to the use of ordinary burner-gas from pyrites and sulphur burners. For a good many years the further development of this industry was surrounded by great mystery, but it is now known that a satisfac- tory solution of the difficulties existing in the above respect was attained in several places, for instance, at Freiberg and in London, by the labours of the original inventors, Professor Winkler and Dr Messel. These difficulties were mostly caused by the solid impurities

contained in the burner-gases in the shape of flue-dust, especially the arsenic, which after a short time rendered the contact substance inactive, in a manner not as yet entirely understood. Another difficulty arose from the fact that the reaction $SO_2 + O = SO_3$ is reversible, the opposite reaction, $SO_3 = SO_s + O$ setting in but little above the temperature required for the synthesis of SO_3. As far as is known (so much secrecy having been observed), the best results obtained in various places, save one, did not exceed 67 % of the theoretical quantity, the remaining 33% of SO_2 having to be converted into sulphuric acid in the ordinary lead chambers. As is now known, the exception (undoubtedly the only one until 1899) was the process discovered as early as 1889 by Dr R. T. J. Knietsch, of the Badische Anilin-und Soda-Fabrik, at Ludwigshafen, but kept strictly secret until 1899, when the patents were published. The principal features of this invention are, first, a much more thorough purification of the burner-gas than had been practised up to that time, both in a chemical and a mechanical sense, and second, the prevention of superheating of the contact substance, which formerly always occurred by the heat generated in the process itself. As the Badische* process effects this prevention by cooling the contact apparatus by means of the gaseous mixture to be later submitted to the catalytic action, the mixture is at the time heated up to the requisite temperature, and a considerable saving of fuel is the conse- quence. Altogether this process has been brought to such a pitch of simplicity and perfection, that it is cheap enough, not merely for the manufacture of fuming oil of vitriol of all strengths, but even for that of ordinary sulphuric acid of chamber-acid strength, while it is decidedly cheaper than the old process in the case of stronger acids, otherwise obtained by concentration by fire. It should be noted that these are not the results of a few years' working with an experimental plant, but of many years' work with large plant, now equal to a capacity of 120,000 tons of pyrites per annum. It is therefore not too much to say that, in all probability, the contact

process will ultimately be employed generally for concentrated acids. Still, for the reasons given in the beginning of this article, the revolution thus impending will require a certain time for its accomplishment. Since the Badische process has become known several other new contact processes have come into the field, in some of which ferric oxide is employed as contact substance, but we must refrain from describing these in detail. (G.L.)

Medicine. — Sulphuric acid or oil of vitriol is_ a colourless oily-looking liquid incompatible with alkalis and their carbonates, lead and calcium. There are two medicinal preparations: (1) Acidum sulphuricum dilutum, containing 13 65% of hydrogen sulphate, (2) acidum sulphuricum aromaticwn (elixir of vitriol), containing'alcohol, spirit of cinnamon and ginger and I3'8% of hydrogen sulphate.

Therapeutics — For external use, sulphuric acid is a powerful irritant and caustic, acting by its powerful affinity for water and therefore dehydrating the tissues and causing them to turn black. It coagulates the albumen. Strong sulphuric acid is occasionally used as a caustic to venereal sores, warts and malignant growths. It is difficult, however, to limit its action, and glacial acetic and nitric acids are preferable for this purpose. Considerable burns on the face or body may result from the application of sulphuric acid in the practice known as " vitriol-throwing," a brownish black eschar serving to distinguish the burns produced by this acid from those of other corrosive fluids. Internally, dilute sulphuric acid is used in poisoning by alkalis as a neutralizing agent. Both it and the aromatic solution are powerful intestinal astringents, and are there- fore useful in diarrhoea of a serious type, being strongly recom- mended both as a prophylactic and as a treatment during epidemics of Asiatic cholera. Small doses of the aromatic acid also serve as a prophylactic to those artisans who work in lead and as a treatment in lead poisoning in order to form an insoluble sulphate of lead. Sponging the body with very dilute solutions of sulphuric acid is useful to diminish the night-sweats of phthisis.

• Toxicology. — Given in toxic doses or in strong solution, sulphuric acid is a severe gastro-intestinal irritant, causing intense burning pain, extending from the mouth to the stomach, and vomiting of mucous and coffee-coloured material. The effects of the ingestion of large quantities may be so rapid that death may take place in a couple of hours, owing to collapse, consequent on perforation of the walls of the oesophagus or stomach, or from asphyxia due to swelling of the glottis consequent on some of the acid having entered the larynx. Should the patient survive the first twenty-four hours death generally results later

from stricture of the oesophagus or intestine, from destruction of the glands of the stomach or from exhaustion. Death has occurred in a child from the ingestion of half a teaspoonful of the strong acid, but recovery is recorded after half an ounce had been swallowed. The treatment consists in the prompt neutralization of the acid, by chalk, magnesia, whiting, plaster, soap or any alkaline substance at hand; emetics or the stomach pump should not be used. Morphine may be given hypodermically to mitigate the pain. Should the patient survive he will probably have to be fed by rectal enemata. The prognosis of sulphuric acid poisoning is bad, 60 to 70% of the cases proving fatal. The post-mortem appearances will be those of corrosive poisoning. The buccal mucous membrane will be greyish, brown or black in colour, due to the corrosive effects of the acid.

SULPICIA, the name of two Roman poets. The earlier lived in the reign of Augustus, and was a niece of Messalla, the patron of literature. Her verses, which were preserved with those of Tibullus and were for long attributed to him, are elegiac poems addressed to a lover called Cerinthus, possibly the Cornutus addressed by Tibullus in two of his Elegies (bk. ii., 2 and 3; see Schanz, Gesch. d. rom. Lift. § 284; F. Plessis, La Poisie latine, pp. 376-377 and references there given). The younger Sulpicia lived during the reign of Domitian. She is praised by Martial (x. 35, 38), who compares her to Sappho, as a model of wifely devotion, and wrote a volume of poems, describing with consider- able freedom of language the methods adopted to retain her husband Calenus's affection. An extant poem (70 hexameters) also bears her name. It is in the form of a dialogue between Sulpicia and the muse Calliope, and is chiefly a protest against the banishment of the philosophers by the edict of Domitian (a.d. 94), as likely to throw Rome back into a state of barbarism. At the same time Sulpicia expresses the hope that no harm will befall Calenus. The muse reassures her, and prophesies the downfall of the tyrant. It is now generally agreed that the poem (the MS. of which was discovered in the monastery of Bobbio in 1493, but has long been lost) is not by Sulpicia, but is of much later date, probably the 5th century; according to some it is a 15th-century production, and not identical with the Bobbio poem.

Editions by O. lahn (with Juvenal and Persius, revised by F. Biicheler, 1893) and in E. Bahrens, De Sulpiride quae vocatur satira (!873) ; see also monograph by J. C. Boot (1868) ; R. Ellis in Academy, (Dec. it, 1869) and Journal of Philology (1874), vol. v. ; O. Ribbeck, Geschichle der romischen Dichtung (1892), vol. Hi.; H. E. Butler, Post-Augustan Poetry (1909), pp. 174-176; M. Schanz, Geschichle det romischen Litteratur (1900), iii. 2; Teuffel, Hist, of Roman Literature

(Eng. trans., 1900), p. 233, 6. There are English translations by L. Evans in Bohn's Classical Library (prose, with Juvenal and Persius) and by J. Grainger (verse, 1759)-

SULPICIUS RUFUS, PUBLIUS (e. 121-88 B.C.), Roman orator and statesman, legate in 89 to Cn. Pompeius Strabo in the Social War, and in 88 tribune of the plebs. Soon afterwards Sulpicius, hitherto an aristocrat, declared in favour of Marius and the popular party. He was deeply in debt, and it seems that Marius had promised him financial assistance in the event of his being appointed to the command in the Mithradatic War. To secure the appointment for Marius, Sulpicius brought in a franchise bill by which the newly enfranchised Italian allies and freedmen would have swamped the old electors (see further Rome, History, II. " The Republic ")• The majority of the senate were strongly opposed to the proposals; a justitium (cessation of public business) was proclaimed by the consuls, but Marius and Sulpicius got up a riot, and the consuls, in fear of their lives, withdrew the justitium. The proposals of Sulpicius became law, and, with the assistance of the new voters, the command was bestowed upon Marius, then a mere privates. Sulla, who was then at Nola, immediately marched upon Rome. Marius and Sulpicius, unable to resist him, fled from the city. Marius managed to escape to Africa, but Sulpicius was discovered in a villa at Laurentum and put to death; his head was sent to Sulla and exposed in the forum. Sulpicius appears to have been originally a moderate reformer, who by force of circumstances became one of the leaders of a democratic revolt. Al- though he had impeached the turbulent tribune C. Norbanus (q.v.), and resisted the proposal to repeal judicial sentences by popular decree, he did not hesitate to incur the displeasure of the Julian family by opposing the candidature for the consulship of C. Julius Caesar (Strabo Vopiscus), who had never been praetor and was consequently ineligible. His franchise proposals, as far as the Italians were concerned, were a necessary measure of justice; but they had been carried by violence. Of Sulpicius as an orator, Cicero says (Brutus, 55) : " He was by far the most dignified of all the orators I have heard, and, so to speak, the most tragic; his voice was loud, but at the same time sweet and clear; his gestures were full of grace; his language was rapid and voluble, but not redundant or diffuse; he tried to imitate Crassus, but lacked his charm." Sulpicius left no written

speeches, those that bore his name being written by a ‘certain P. Canutius (or Cannutius). He is one of the interlocutors in Cicero’s De oratore. :

See Appian, Sell. civ. i. 55-60; Plutarch, Sulla and Marius; Veil. Pat. ii. 18; Livy, Epii. 77; E. A. Ahrens, Die drei Volkstribunen (Leipzig, 1836); Mommsen, Hist, of Rome, bk. iv: ch. 7; Long, Decline of the Roman Republic, vol. ii. ch. 17.

SULPICIUS RUFUS, SERVIUS (c. 106-43 B.C.), surnamed Lemonia from the tribe to which he belonged, Roman orator and jurist. He studied rhetoric with Cicero, and accompanied him to Rhodes in 78 B.C. Finding that he would never be able to rival his teacher he gave up rhetoric for law (Cic. Brut. 41). In 63 he was a candidate for the consulship, but was defeated by L. Licinius Murena (q.v.), whom he subsequently accused of bribery; in 51 he was successful. In the Civil War, after considerable hesitation, he threw in his lot with Caesar, who made him proconsul of Achaea in 46. He died in 43 while on a mission from the senate to Antony at Mutina. He was ac- corded a public funeral, and a statue was erected to his memory in front of the Rostra. Two excellent specimens of Sulpicius’s style are preserved in Cicero {Ad. Fam. iv. 5 and 12). Quintilian (Inslit. x. 1, 116) speaks of three orations by Sulpicius as still in existence; one of these was the speech against Murena, another Pro or Contra Aufidium, of whom nothing is known. He is also said to have been a writer of erotic poems. It is as a jurist, however, that Sulpicius was chiefly distinguished- He left behind him a large number of treatises, and he is often quoted in the Digest, although direct extracts are not found (for titles see Teuffel-Schwabe, Hist, of Roman Lit. 174, 4). His chief characteristics were lucidity, an intimate acquaintance with the principles of civil and natural law, and an unrivalled power of expression.

See R. Schneider, De Servio Sulpicio Rufo (Leipzig, 1834) ; O. Karlowa, Romische Rechtsgeschichte, vol. i. (Leipzig, 1885); the chief ancient authority is Cicero. ‘ ; ‘■ : ■• ,.•..’■:’■; ‘

SULTAN (an Arabic word meaning ” victorious ” or ” a ruler,” sultat, dominion), a title o! honour borne by a great variety of rulers of very varying powers and importance in Mahom- medan Africa and the East. The word has thus no exact equivalent in English, and was early imported into the language in the Middle English form of soudan (from old Fr. soudan, souldan). This title is that conventionally applied by foreigners to the ruler of the Ottoman Empire, the sultan- par excellence, whose proper styles are, however, padishah (emperor)

and ” commander of the faithful” (see Amir). The feminine form ” sultana ” is derived from the Italian (fern, of sultano).

SULTANPUR, a town and district of British India, in the Fyzabad division of the United Provinces. The town is on the right bank of the river Gurhti, midway between Benares” and Lucknow, on the Oudh & Rohilkhand railway. Pop. (1901),

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The District of Sultanpur has an area of 17 13 sq. m. The surface is generally level, being broken only by ravines in the neighbourhood of the rivers. The central portion is highly cultivated, while in the south are widespread arid plains and swampy jhils or marshes. The principal river is the Gumti, winch passes through the centre of the district and affords a valuable highway for commerce. Minor streams are the Kandu, Pili, Tengha and Nandhia, the last two being of some importance, as their channels form the outlet for the superfluous water of the jhils, draining into the Sai. There are no forests in the district, only stunted dhdk jungles used for’ fuel. In rpoi the population was 1,083,004, showing an increase of less than 1 % in the decade. Sultanpur is a purely agricultural district with a very dense population. The principal crops are rice, pulses, wheat, barley, sugar-cane and a little poppy. The main line of the Oudh & Rohilkhand railway from Lucknow to Rae Bareli and Mogul Serai serves the south-western portion,

The only incident worthy of note in the history of the district since the British annexation of Oudh is the revolt of the native troops stationed at Sultanpur during the Mutiny. The troops rose in rebellion on the 9th of June 1857, and, after murdering

two of their officers, sacked the station. Upon the restoration of order Sultanpur cantonment was strengthened by a detach- ment, of British troops; but in 1861 it was entirely abandoned as a military station.

See Sultanpur District Gazetteer (Allahabad, 1903).

SUMACH. The Sumach of commerce is the finely ground leaves of Rhus corwria, a native of the North Mediterranean region from Portugal to Asia Minor; it is a shrub or low tree with hairy leaves composed of n to 15 elliptical leaflets with large blunt teeth, and large loose panicles of whitish-green flowers. Another species, Rhus cotinus, known as Venetian Sumach,

I. Flower.

Sumath, Rhus coriaria. 2. Cluster of fruit. 3. One fruit.

4. A seed.

also a native of southern Europe and Asia Minor, yields the yellow dye-wood known as young fustic; it is also known as the Smoke-plant or Wig-tree, from the feathery or hairy appearance of the flower-stalks, which become elongated and hairy after the flowering. The genus Rhus is a member of the natural order Anacardiaceae and contains about 120 species of trees or shrubs mostly native in the temperature regions of both hemi- spheres. The leaves are alternate and simple or compound, with few to many entire-margined or serrated leaflets, and terminal or axillary panicles of small flowers with parts in fours or sixes. The species are mostly poisonous, some being especially noxious. Such are Rhus toxicodendron, the North American poison ivy, a shrub climbing on rocks and trees by means of rootlets, and poisonous to the touch. R. venenata, the North American poison elder sumach or dogwood, also contains an extrernely irritant poison. R. vermicifera is the Japan lacquer or varnish-tree. Several species are cultivated in the British Isles as store, greenhouse or hardy trees.

SUMATRA, the westernmost and, next to Borneo, the largest of the Great Sunda Islands in the Malay Archipelago. It stretches N.W. to S.E. from Malacca Passage to Sunda Strait, between 5 40′ N. and 5° 59′ S., and 95 16′ and 106 3′ 45″ E. Its length is about 1100 m., its extreme breadth 250 m., and its area, including the neighbouring islands, except Banka and Billiton, is 178,338 sq. m. The northern half runs roughly parallel to the Malay Peninsula, from which it is separated by the Strait of Malacca, and the southern end is separated by the

nanrow Sunda Strait from Java. Unlike Java, Sumatra has a series of considerable islands (Nias Islands, Mentawi Islands, &c.) arranged like outworks in front of the west coast, which faces the open Indian Ocean. The general physical features of the island are simple: a chain of lofty mountain ranges extends throughout its length, the western slopes descending rapidly towards the ocean and the eastern looking out over a vast alluvial tract of unusual uniformity.

Towards the north end of the island the spurs of the main chain sometimes extend towards the neighbourhood of the east coast and

the eastern plain widens from north to south. Owing to this configuration of the island the watercourses of the western

Olerttalif

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SUMATRA

English Miles *122 S*

Railways…. Marslies — *”■_«

daries of Residencies ˆj.

Chief towns of Residencies

\~ Higher Padang 2 = Lower Padang

Longitude Hast 100 of Greenwich

side are comparatively short: only very few of them are large enough to be navigable. Those of the eastern slope, on the other hand, such as the Musi, Jambi, Indragiri, Kampar, Siak, Rokan, Panei, Bila and Asahan, are longer, and with many of their affluents are navigable in their middle and lower courses over considerable stretches for craft drawing 6 to 10 ft. The Musi and Jambi are navigable for 372 and 407 m. respectively. As waterways all t he rivers labour under the drawbacks of rapids, mud-banks at their mouths, banks overgrown with forest, sparse population, and currents liable to serious variations due to irregularity of supply from the mountains and sudden rain-falls. In their lower courses some of them form enormous intercommunicating deltas. The mountainous regions contain numerous lakes, many evidently occupying the craters of extinct volcanoes. When, as sometimes happens, two or three of these craters have merged into one, the lake attains a great size. Among the larger lakes may be mentioned Toba; Maninyu, west of Fort de Kock; Singkara, south-cast of Fort de Kock; Korinchi, inland from Indrapura; and Raima, in the south- west.

Orography. — In order to appreciate the orography of the island the following sections of Sumatra should be discriminated one from another: (1) The valley of the Achin or Atjeh River. (2) The plains

around the lake of Toba, which are of varied level and physical character. Those on the south and north lie at an elevation of 4000 ft.,

having the character of steppes, with scanty forest-cover, and, save in the narrow valleys and river-courses, are suitable for cattle-rearing. The plains on the east and west lie at a lower level and are eroded by larger rivers, clothed with forest, showing more sawahs and ladangs, or dry ricefields, and, near the rivers, planted with jagong (maize), coffee and fruits. Except on the south-east, where the Asahan flows away to the east coast, Toba Lake is sur- rounded by steep shores. According to R. D. M. Verbeek, P. van Dyk, B. Hagen and W. Volz, the lake had its origin in the collapse of a volcano. (3) The valley of the Batang Toru, with the plateau of Sipirok in the east and the mountain chain of Tapanuli in the west. On the south and south-east the valley is bounded by two volcanoes, Lubuk Raja and Si Buwal Buwali, whence were derived the volcanic tuffs of the valley and of the plateau of Sipirok, with their lakes, which are drained by the Batang Toru and its affluents. The valley, varies in breadth from 5 J m. to half a mile and less. Flowing in a deep bed cut in. the tuff strata, the river is not navi- gable. (4) The longitudinal valley of the Batang Gadis, with its affluent the Angkola, and in the south the valley of the Sumpur, the upper course of the Rokan, between Lubuk Raja in the north and Aft Merapi in the south. This valley is 64 m. long, with a mean breadth of 4 to 5 m. All the rivers of this valley, flowing in deep beds of eroded diluvial tuffs, with a fall as much sometimes as 330 to 660 ft. a mile, are unnavigable. The valley is bounded east and west by chains of slate and Palaeozoic rocks. The bottom is in many parts the diluvium of lakes drained by the rivers. (5) The section of middle Sumatra between the line of the three volcanoes, Singalang- Tandikat, Merapi and Sago on the north, and that of the three mountains Patah Sembilan, Korinchi and Tujuh on the south. This section is divided by the Middengebergte or middle chain into a northern half watered by the Ombilin or upper Indragiri with its affluents, and a southern half traversed by the Batang Hari or upper Jambi. To the north of the volcanoes, which rise to 9500 ft. or more, there is a high plateau of volcanic forma- tion, whose elevation declines in a direction from west to east from 2950 to 1640 ft., with the lake of Maninyu (about 40 sq. m. in area) filling the hollow of an old volcano, and with rivers which have eroded their beds in the tuffs to a depth of 300 ft. and more. South of the volcanoes the northern affluents of the Ombilin — Sumpur, Sello and Sinamar — -flow through valleys parallel to one another in a north-west to south-east direction. Here, too, are found fertile tuffs, and the valleys are densely populated.. The rivers, like those already characterized, and Emery w.m.r s& £ or ˆe same reason, are not available as waterways. Singkara Lake (44 sq. m.) is of origin similar to that of Maninyu. The Ombilin, issuing out of the lake on the east side and flowing through a plateau of Eocene sandstone, has on

its banks the coalfields of Sungei Durian, &c, but is not serviceable as a waterway for that part of Sumatra. The coal has to be transported by railway via Solok to Padang (Emmahaven), a seaport on the west coast. Solok lies on the Sumami, which, flowing from the south to the lake of Singkara, prolongs the valley of the Sumpur to the Midden-gebergte. Unlike the -northern, the southern affluents of the Ombilin do not follow longitudinal valleys hemmed in by the Barisan range and ranges of slate, limestone and sandstone. Here prevailing granite and diabase give rise to a complicated mountain system through which the rivers ckave their way in a curved and irregular course. South of the Middengebergte, however, the northern affluents of the Batang Hari, the Seliti, Gumanti, Si Potar, Mamun and Pangean, at least those in the west, again run in longitudinal valleys. These affluents and the Batang Hari itself (except the part at the mouth, Mamun-Simalidu) are navigable only by praus drawing not more than 12 in. (6) South Sumatra, so far as known, presents everywhere in its valleys the same character as that of the Batang Toru, Batang Gadis, Sumpur, &c. They also are closed in on the north and south by volcanoes 'which have here produced similar masses of tuff, with lakes and rivers of the same formation as in the north. Such are the valley of Korinchi, with the river of the same name, between the peak of Korinchi and Mt Raja; the valleys of Serampei and Sungei Tenang (as imperfectly known as that of the Korinchi), in which are to be sought the sources of the Tambesi and Asei, both affluents of , the Jambi; the longitudinal valley of

Ketaun, in Lebong, flowing to the west coast, and of the upper Musi, flowing to the east coast ; the valleys of Makakau and Selabung or the upper Komering, an affluent of the Musi, between Sebelat and Kaba. The Makakau and Selabung drain into Lake Ranau, which on the south side is dammed by the volcano Seminung. The southernmost longitudinal valley of Sumatra is that of the Semangka, which flows into the bay of the same name. Generally the lower valleys of the rivers lie at elevations of 600 to 1000 ft.; higher up they rise to 2500 or 3000 ft. ; the mountain chains rise to 5500 ft. ; the volcanoes tower up from 6500 to nearly 10,000 ft. (7) The section of south Sumatra between the eastern chain of old rocks and the east coast with its numerous river mouths is formed of the alluvium of sea and rivers. In the river-beds, however, and at some distance from the sea, older strata and eruptive rocks underlie the alluvium. The strata near the mountain chains and volcanoes consist of diluvial tuffs.

Geology. — The oldest rocks are gneiss, schist and quartzite, the schist often containing gold. They probably belong to several geological periods, but all were folded and denuded before the Carboniferous beds were deposited. They form the backbone of the island, and crop out on the surface at intervals along the mountain chain which runs parallel to the west coast. Here and there they are penetrated by granitic intrusions which are also Pre-Carboni- ferous. The next series of rocks consists of slates below and lime- stones above. It lies unconformably upon the older rocks; and the limestone contains Fusulina, Pkillipsia and Productus, indicating that it belongs to the Upper Carboniferous. These beds are found only in northern Sumatra. They are accompanied by intrusions of diabase and gabbro, and they are sometimes folded, sometimes but little disturbed. No Permian beds are known, and for many years Mesozoic deposits were supposed to be entirely absent, but Triassic clays and sandstones with Daonella have been found in the upper part of the basin of the Kwalu (East Sumatra). They rest unconformably upon the Carboniferous beds, and have them- selves been tilted to a steep angle. Cretaceous beds also have been recorded by Bucking. Tertiary deposits are very widely spread over the plains and low-lying country. They consist of breccias, conglomerates, sandstones, marls, and limestones, with seams of coal and lignite. The most valuable coal occurs in the Eocene beds. At the close of the Eocene period great eruptions of augite-andesite took place from two fissures which ran along the west coast. The Miocene consists chiefly of marls, with occasional beds of lignite and limestone. On the east coast it sometimes yields petroleum. The Pliocene occurs chiefly in the low-lying land and is generally covered by drift and alluvium. Sometimes it contains thick seams of lignite or brown coal.

The present volcanoes lie along a line (with offshoots) which runs parallel to the west coast, but some distance to the east of the fissures ffom which the early Tertiary lavas were poured. Lava streams are seldom emitted from these volcanoes, the material erupted consisting chieftjr of ash and scoriae, which are spread over a very wide extent of country. Augite-andesite predominates, but basalt and rhyolite also occur.

Climate.— As throughout the whole of the Malayan Archipelago, so in Sumatra, which lies about equally balanced on both sides of the equator, the temperature stands at a high level subject to but slight variations. The monthly temperature mounts only from 77° F. in February to 8o-6° in May, August and November. In the distribution of the rainfall, as dependent on the direction of the winds, the following parts of Sumatra must be distinguished :

(1) south-east Sumatra, on which, as on Banka and Billiton, the heaviest rainfall occurs during the north-west monsoon, the annual volume of rainfall increasing from 98-4 in. in the east to 139 in. in the west. Of the 139 in. of yearly rainfall, 91-7 in. are brought by the north-west and 47-3 in. by the south-east monsoon.

(2) The west coast. Here the rainfall for the year increases from the southern and northern extremities towards the middle. Ben- kulen, e.g. gets 126 in.; Singkel (2° 15′ N.), 172 in.; and Padang 184 in. in the year. Here, too, the prevailing rainfall is brought by the north-west monsoon, but in this belt its prevalence is not so pronounced, Padang getting 94 in. of rain during the north-west monsoon, against 90 in. during the south-east. The mountain chain immediately overhanging it, the high temperature of the sea wash- ing it, the frequent thunderstorms to which it is subject, the moist atmosphere of its equatorial situation, and the shorter regime of the dry south-east wind are the principal causes of the heavier rainfall on the west coast. The higher stations of middle Sumatra, on the .lee side of the western mountain chain, have a yearly rainfall of only 78-7 in. (3) The northern and north-eastern parts of Sumatra are swept by a variety of winds. The south-east wind, however, predominates. Blowing over land and in the direction of the longitudinal valleys, the south-east wind is comparatively dry, and thus favours the formation of steppes in the north such as the Toba plains. The north-east and south-west winds, on the other hand, being laden with the moisture of the sea, bring rain if they blow for any length of time.

Fauna. — Though Sumatra is separated from Java by so narrow a ‘fait, both the zoologist and the botanist at once find that Hiry have jroken new ground on crossing to the northern island. The Pat ky-

dermata are strongly characteristic of the Sumatran fauna : not only are the rhinoceros (Rh. sumatranus) , the Sus vittalus, and the tapir common, but the elephant, altogether absent from Java, is repre- sented in Sumatra by a species considered by some to be peculiar. The Sumatran rhinoceros differs from the Javanese in having two horns, like the African variety. It is commonest in the marshy lowlands, but extends to some 6500 ft. above sea-level. The range of the elephant does not extend above 4900 ft. The wild Bos sundaicus does not appear to exist in the island. An antelope (kambing-utan) occurs in the loneliest parts of the uplands. The common Malay deer is widely distributed, Cervus muntjac less so. The orang-utang occurs, rarely, in the north-east. The siamang (Siamanga syndactyla) is a great ape peculiar to the island. The ungko (Hylo- bates agilis) is not so common. A fairly familiar form is the simpei {Semnopitkecus

melalophus). The chigah (Cercocebus cynomolgus) is the only ape found in central Sumatra in a tame state. The pig- tail ape (Macacus nem&strinus)—a.s Raffles described it in his " Descriptive Catalogue of a Zoological Collection made in Sumatra," Trans. Linn. Soc. (1820), xiii. 243 — is trained by the natives of Benkulen to ascend coco-nut trees to gather nuts. The Galeo- pithecus volans (kubin, flying cat or flying lemur) is fairly common. Bats of some twenty-five species have been registered; in central Sumatra they dwell in thousands in the limestone caves. The Pteropus edulis {kalong, flying fox) is to be met with almost every- where, especially in the durian trees. The tiger frequently makes his presence felt, but is seldom seen ; he prefers to prowl in what the Malays call tiger weather, that is, dark, starless, misty nights. The clouded tiger or rimau bulu (Felis macroscelis) is also known, as well as the Malay bear and wild dog. Paradoxurus musanga (" coffee-rat " of the Europeans) is only too abundant. The Sumatran hare (Lepus netscheri), discovered in 1880, adds a second species to the Lepus nigricollis, the only hare previously known in the Malay Archipelago. The Manis javanicus is the only repre- sentative of the Edentata. Some 350 species of birds are known, and the avifauna closely resembles that of the Malay Peninsula and Borneo, including few peculiar species.

Flora. — Rank grasses (lalang, glagd), which cover great areas in Java, have an even wider range in Sumatra, descending to within 700 or 800 ft. of sea-level ; wherever a space in the forest is cleared these aggressive grasses begin to take possession of the soil, and if once they are fully rooted the woodland has great difficulty in re-establishing itself. Among the orders more strpngly represented in Sumatra than in Java are the Dipterocarpaceae, Chrysobalanaceae, sclerocarp Myrtaceae, Melastomaceae, Begonias, Nepenthes, Oxali- daceae, Myristicaceae, Ternstromiaceae, Connaraceae, Amyridaceae, Cyrtandraceae, Epacridaceae and Eriocaulaceae. Many of the Sumatran forms which do not occur in Java are found in the Malay Peninsula. In the north the pine tree {Pinus Merkusii) has advanced almost to the equator, and in the south are a variety of species characteristic of the Australian region. The distribution of species does not depend on elevation to the same extent as in Java, where the horizontal zones are clearly marked; and there appears to be a tendency of all forms to grow at lower altitudes than in that island. A remarkable feature of the Sumatran flora is the great variety of trees that vie with each other in stature and beauty, and as a timber-producing country the island ranks high even among the richly wooded lands of the archipelago. Forest products — gums and resins of various sorts, such as gutta-percha — are valuable articles of

export. The pro- cess of reckless deforestation is perceptible in certain districts, the natives often destroying a whole tree for a plank or rafter. The principal cultivated plants, apart from sugar-cane and coffee, are rice (in great variety of kinds), the coco-nut palm, the areng palm, the areca and the sago palms, maize, yams, and sweet potatoes; and among the fruit trees are the Indian tamarind, pomegranate, guava, papaw, orange and lemon. Even before the arrival of Europeans Sumatra was known for its pepper plantations; and these still form the most conspicuous feature of the south of the island. For the foreign market coffee is the most important of all the crops, the Padang districts being the chief scat of its cultivation. Benzoin was formerly obtained almost exclusively from Sumatra from the Styrax benzoin.

Population. — The following table gives the area and estimated population of the several political divisions of Sumatra and of the island as a whole (excluding the small part belonging to the Riouw-Lingga residency) : —

Division.

Area in sq. m.

Population.

1900.

Sumatra, West Coast …. Sumatra, East Coast …. Benkulen ……

Lampong Districts

Palembang

Achin (Atjeh)

31.649

35.312

9,399

11,284

53.497 20,471

1.527,297 421,090 162,396 142,426 804,299 110,804

Total

161,612

3.168,312

SUMATRA

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Of the total population, about 5000 are Europeans, 93,000 Chinese, 2 500 Arabs, 7000 foreigners of other nations, and the rest natives. In 1905 the total population was given as 4,029,505.

The natives of the mainland of Sumatra are all of Malay stock (those of the north being the most hybrid), but it is doubtful to what extent Malay has here absorbed pre-Malay blood. The different tribes vary in language, customs and civilization. No race of true Negrito type has been found. The Kubus {q.v.), a savage forest people of the highlands, were believed by some to be Negrito owing to the frizzled character of their hair, but it appears certain that they are Malayan. The north of Sumatra is occupied by the Achinese (see Achin). South of Achin and west of Lake Toba is the country of the Battas (q.v.) or Battaks. In the hill-country south of the lake are two forest tribes, Orang-ulu and Orang-lubu, pure savages of whom practically nothing is known, affiliated by most authorities to the Battas. The plains east of this territory are occupied by the Siaks, and farther south on the east coast are the Jambis, both Malays. Above Padang are the several tribes of the prosperous and com- paratively civilized Menangkabos (q.v.). The Korinchis live among the mountains south of Padang, and farther south on the borders of Palembang and Benkulen are the Rejangers, a peculiar tribe who employ a distinctive written character which they cut with a kris on bamboo or lontar. The same character is employed by their immediate neighbours to the south, the Pasumas, who bear traces of Javanese influence. In the extreme south are the Lampong people, who claim descent from the Menangkabos, but have also an admixture of Javanese blood. The inhabitants of the islands west of Sumatra are of mixed origin. Simalu is peopled partly by Achinese and partly by Menangkabo settlers. They profess Mahommedanism but are practically savages. Nias (q.v.) has an interesting native population, apparently of pre-Malayan origin; and the Mentawi islands (q.v.) are inhabited by a race generally held to be a Polynesian settlement which has escaped fusion with Malayan stock. As regards education and the spread of Christianity among the natives, the west coast division is far in advance of the rest of the island. Here about 32,000 natives profess

Christianity and there are about 300 schools; elsewhere schools are comparatively few and the adhesion to Christianity very slight.

Administrative Divisions and Towns. — In the west coast lands European influence, fertile soil, comparatively good roads, agriculture, timber, and coalfields have created populous settlements on the coast at Padang (the capital of the west coast, with 35,158 inhabitants in 1897, of whom 1640 were Europeans), Priaman, Natal, Ayer Bangis, Siboga, Singkel, and also on the plateaus at Fort de Kock, Payokombo, &c. In the east coast lands it is only at the mouths of rivers — Palembang at the mouth of the Musi, with 53,000 inhabitants, and Medan in Deli, the residence of the highest civil and military officials of the east coast, in which a fine government house has been erected — that considerable centres of population are to be found. Nine-tenths of the natives of Sumatra live by agri- culture, the rest by cattle-rearing, fishing, navigation, and, last but not least, from the products of the forests; they are therefore little concentrated in towns.

The Dutch government of the west coast, extending along the shore of the Indian Ocean from 2° 53′ N. to 2° 25′ S., comprises the residencies of the Padang lowlands, Tapanuli and the Padang highlands. The governor has his residence at Padang, which is also the capital of the lowlands residency. Padang Sidempuan, the chief town of Tapanuli, lies inland, south of Mt Lubu Raja. The town of Siboga has considerable commercial importance, the bay on which it stands being one of the ‘finest in all Sumatra. Bukit Tinggi, or, as it is commonly called, Fort de Kock, is the capital of the residency of the Padang highlands. To the government of the west Coast belong the following islands: Simalu; Banyak Islands, a small limestone group, well wooded and sparsely peopled ; Nias; Batu Islands (Pulu Pini, Tana Masa, Tana Bala, &c.) ; Mentawi and Pegeh or Nassau Islands. The residency of Bankulen (i.e. Bang Kulon, ” west coast “) lies along the west coast from the southern extremity of the west coast government to the south- western end of the island. The capital, Benkulen, is on the coast near Pulu Tiku, or Rat Island, in a low and swampy locality, and on an open roadstead. This was the chief establishment possessed by the British East India Company in Sumatra. Among other noteworthy places are Mokko-Mokko, with the old British fort Anna; Pasar Bintuhan, and Lais (Laye), the former seat of the British resident.

The residency of the Lampong districts is the southernmost in the island, being separated from Palembang by the Masuji River. It is partly mountainous, partly so fiat as to be under water in the. rainy season. The more important places are Telok Betong, chief town of the

residency, Menggala (with a good trade), Gunung Sugi, Sukadana, Tanjong Karang, and Kota Agung.

The residency of Palembang consists of the former kingdom of this name and various districts more or less dependent on that monarchy. Between the mainland dependency of the Riouw- Lingga residency and the residency of Palembang lies Jambi, an extensive sultanate, of which a portion belongs to the residency of Palembang as a protectorate, the sultan having in his capital (also called Jambi) a Dutch " comptroller," who represents the resident of Palembang; another portion is claimed by a quasi-independent sultan who reigns in the interior. Of this interior very little was known until the scientific expedition despatched by the Dutch Royal Geographical Society towards the end of the 'seventies, but in 1901 an armed Dutch expedition, necessitated by frequent dis- turbances, penetrated right into the Jambi hinterland, the Gajo districts, where until then no European had ever trod. The town of Palembang is a large place on the river Musi, with 50,000 inhabitants (2500 Chinese), extensive barracks, hospitals, &c, a mosque (1740), considered the finest in the Dutch Indies, and a traditional tomb of Alexander the Great. The residency of Riouw, which embraces many hundreds of islands, great and small, also includes a portion of the Sumatra mainland, between the residencies of Palembang to the south and the east coast of Sumatra to the north. This is the old kingdom of Indragiri, and lies on either hand of the river of that name.

The residency of the east coast was formed in 1873 of the territory of Siak and its dependencies and the state of Kampar. In includes perhaps the richest and best-developed districts of northern Sumatra, namely, Deli (with an assistant-resident), Langkat, Serdang, &c. — districts little known in 1873, but by the beginning of the 20th century famous among the chief tobacco-producing countries in the world. Belawan is the harbour to Deli, but the capital is Medan, where the sultan and the Dutch resident reside. Belawan is connected with Medan by a railway, constructed before 1890 by a private company, almost entirely dependent for its earnings upon the numerous tobacco plantations, several of which belong to British corporations. The plantation labourers are almost entirely alien coolies, largely Chinese, and the Malays are comparatively few in number. The tobacco plantations of British North Borneo were nearly all started by planters from Deli.

The government of Achin (q.v.) occupies the northern part of the island. No little progress has been made by the Dutch even in this war-ridden territory. There is a railway in the lower valley of the Achin

River, connecting the capital, Kotaraja, and neighbourhood with Olehleh, a good, free port, with an active trade, carried on by numerous steamers, both Dutch and foreign. Edi on the north-east coast, with another harbour, is capital of a sultanate which formerly owed allegiance to the sultan of Achin. but has formed a political division of the government of Achin since 1889, when an armed expedition restored order. Edi is a centre of the still extensive pepper trade, carried on mainly with the Chinese at Singapore and Penang, which island faces Edi.

Products and Industry. — Forests and natural vegetation cover a much larger part of Sumatra than of Java. Whereas in Java tall timber on the mountains keeps to altitudes of not less than 3000 ft., the tall timber on the mountains of Sumatra commonly descends below 1000 ft., and in many cases right down to the coast. In Sumatra, as in Java, the vegetation of the lowlands up to nearly 1000 ft. is distinct from the vegetation of the mountain slopes and plateaus from that elevation up to 4000 ft. and over. The principal exports from all the regencies alike are black and white pepper., bamboo (rotan), gums, caoutchouc, copra, nutmegs, mace and gambir. From the west coast and Palembang coffee is also exported, and from Deli, tobacco. The system of compulsory cultivation of coffee was abolished in Sumatra in 1908.

Sumatra possesses various kinds of mineral wealth. Gold occurs in the central region, where it is worked at a profit, and it has also been worked in the Menangkabo district and the interior of Padang. Tin is known, especially in Siak.. Copper has been worked in the Padang highlands (most largely in the district of Lake Singkara) and at Muki in Achin. Iron is not infrequent. The most important mineral economically, however, is coal. Coal seams exist in the Malabuh valley (Achin), in the Sinamu valley, and on both sides of the Ombilin River; the Ombilin field was brought into especial notice by D. D. Veth of the 1877-79 expedition. The production of this field increased from 1730 tons in 1892 to 78,500 metric tons in 1899. The profit on the working, which is carried on by the state, is slight. Lignite of good quality is found in several localities. The production of petroleum began to be strongly developed towards the close of the 19th century; on the Lepan River in Langkat it mounted from 362,880 gallons in 1891 to 20,141,000 gallons in 1899. Muara Enim in Palembang also produces petroleum. Perlak, formerly a tributary state of Achin and now a political division of the Achin government, has become one of the chief centres of the petroleum industry. The crude oil is conveyed in pipes to Aru Bay,

on the east coast?, and refined in the island of Sembilan. Arsenic, saltpetre, alum, naphtha and sulphur may be collected in the volcanic districts. A systematic mineralogical survey has been undertaken in central Sumatra.

Roads and Railways. — In the west, with its long line of coast and numerous valleys, the transport of coffee has induced the construction of very good roads as far as the Lake of Toba, owing to the want of navigable rivers. There is a railway connecting not only the coalfields of the Ombilin valley with Padang, but also the Ombilin river and the Lake of Singkara with the most productive and densely populated plateaus and valleys, north and south of the line of the volcanoes Singalang, Merapi ana Sago. A second railway in the district of Deli connects the inland plantations with the coast ; and there is another, as already indicated, in the lower Achin valley. Good roads traverse the broad plains of Benkulen, Palembang and the Lampong districts.

History. — As far as is known, Sumatran civilization and culture are of Hindu origin; and it is not improbable that the island was the first of all the archipelago to receive the Indian immi- grants who played so important a part in the history of the region. Certain inscriptions discovered in the Padang high- lands seem to certify the existence in the 7th century bf a power- ful Hindu kingdom in Tanah Datar, not far from the site of the later capital of Menangkabo. In these inscriptions Sumatra is called the ” first Java.” The traces of Hindu influence still to be found in the island arc extremely numerous, though far from being so important as those of Java. There are ruins of Hindu temples at Butar in Deli, near Pertibi, on the Panbi river at Jambi, in the interior of Palembang above Lahat, and in numerous other localities. One of the principal Hiridu ruins is at Muara Takus on the Kampar river. The buildings (includ- ing a stupa 40 ft. high) may possibly date from the nth century. At Pagar Rujung are several stones with inscriptions in Sanskrit and Menangkabo Malay. Sanskrit words occur in the various languages spoken in the island; and the Ficus religiosa, the sacred tree of the Hindu, is also the sacred tree of the Battas. At a later period the Hindu influence in Sumatra was strengthened by an influx of Hindus from Java, who settled in Palembang, Jambi and Indragiri, but their’ attachment to Sivaism prevented them from coalescing with their Buddhist brethren in the north. In the 13th century Mahomrnedanism began to make itself felt, and in course of time took a firm hold upon some of trie most important states. In Menangkabo, for instance, the Arabic alphabet displaced the Kavi

(ancient Javanese) character previously employed. Native chronicles derive the Menangkabo princes from Alexander the Great; and the Achinese dynasty boasts its origin from a missionary of Islam. The town of Samudera was at that period the seat of an important principality in the north of the island, whose current name is probably a corruption of this word. There is a village called Samudra near Pasei which possibly indicates the site.

Sumatra first became known to Europeans through the Portuguese, Diogo Lopes de ; Sequeira, in 1 508. The Portuguese were the first to establish trading posts on the island, but at the end of the century they were driven out by the Dutch. At this time the most powerful native state in the island was Achin (q.v.) . Elsewhere Dutch sovereignty was gradually extended — in 1664 over Indrapura; in 1666 over Padang, until by 1803 it was established over much of the southern part of the eastern lands, including Palembang. Meanwhile, in 1685 the British had acquired a footing in Benkulen, and between them and the Dutch there was always much jealousy and friction until in 1824 a treaty was made under which the British vacated Sumatra in favour of the Dutch, who reciprocated by giving up Malacca. In May 1825 Benkulen was taken over from the British. In the second half of the 19th century the Dutch found a Succession of armed expeditions necessary to consolidate their power. Thus in 1851 a revolt was suppressed in Palembang, and an expedition was sent to the Lampong districts. In 1853 Raja Tiang Alam, ringleader of the revolt in Palembang, surrendered. In 1858 an expedition was sent against Jambi; the sultan was dethroned and a treaty made with his successor. In i860 Rejang was added to the Palembang residency. In 1863 there was an expedition against Nias, and in 1865 another against Asahan and Serdang (east coast). In 1873 war was declared

against Achin. In 1876 there was an expedition against Kota Jutan (east coast) and the emancipation of slaves was carried out on the west coast. In 1878 Benkulen was made a residency, and the civil administration of Achin and dependencies was entrusted to a governor. From 1883 to 1894 the government, with the help of missionaries, extended its authority over the south-east and south-west of the island, and also over some of the lands to the east and north of Toba lake, including the districts of Toba, Silindong and Tanah Jawa, and in 1895 over the southern part of the peninsula of Samosir in Toba lake. Its jurisdiction was also extended over Tamiang, till then the northern frontier of the Dutch east coast of Sumatra. By military expeditions (1890-95) the Dutch influence on the Batang Hari, or Upper Jambi, was increased; as also in 1899 in the Lima Kotas 1 in central Sumatra, included within the territory of Siak. The

war in Achin did not materially retard the develop- ment of Sumatra, and although the titular sultan of Achin continued a desultory guerrilla warfare against the Dutch in the mountainous woodlands of the interior, the almost inacces- sible Pasei country, really active warfare has long ceased. All along the main coasts of the former sultanate of Achin military posts have been established and military roads constructed; even in Pedir, on the notth coast, until 1899 the most actively turbulent centre of resistance of the sultan's party, and still later only pacified in parts, Dutch engineers were able to build a highway to connect the west with the east coast, and other works have been successfully carried out. Practically the whole of the island is now more or less explored and under control.

The literature dealing with Sumatra is very extensive. Of the older, works the best known is W. Marsden, History of Sumatra (London, 1811). A full list of other older authorities will be found in P. J. Veth's Aardrijkskundtg Woordenboek van Nederl. Indie (1869). Among later works one of great importance is Midden- Sumatra; Reizen en Onderzoekingen der Sumatra .Expeditie, 1877- 1879 (Leiden, 1881, sqq.), edited by P. J. Veth. See also Brau de Saint-Pol Lias, llede Sumatra (Paris, 1884); E. B. Kielstra, Beschrij- ving van der Atjeh Oorlog (1 885-1 886), and " Sumatras West-Kust van 1819-1825," in Bijd. tot Land-,&c, Kunde (1887); on the history of Palembang, west coast and the war in Achin, in Indisch militair Tijdschrift (1886-1889); Tijdschr. bat. Gen. (1887-1892). For topo- graphy and geology, see R. Fennema, " Topographische en geolo- gische Beschrijving van het Noordelijk gedeelte . . . Westkust, &c," Jaarb. v. het Mijnwezen (1887) ; R. D. M. Verbeek, Topographische en geologische Beschrijving van een Deel van Sumatra's Westkust, with atlas (Batavia, 1883) ; similar work dealing with south Sumatra, Jaarb. v. het Mijnwezen (1881), and Supplement (1887). W. Volz, "i Beitrage zur geologischen Kenntniss von Nord-Sumatra," Zeitschr. deuts'ch. geol. Gesell. (1899), vol. li.; H. Bucking, ." Zur Geologie von Nord- und Ostˆ Sumatra, " Samml. geol. Reichs-Mus. 1st series, vol. viii., with map and five plates (Leiden, 1904); D. J. Erb, " Beitrage zur Geologie und Morphologie der siidlichen West-Kuste von Sumatra," Z. Ges. E. Berlin (1905); J. F. Hoekstra, Die Gro- und Hydrographie Sumatras (Groningen, 1893); J. W. Ijzerman, &c, Dwars door Sumatra, Tocht van Padang naar Siak (Haarlem, 1895); A. Maas, Quer durch Sumatra (Berlin, 1904) ; E. Otto, Pflanzen- und Jagerleben auf Sumatra (Berlin, 1903) ; B. Hagen, " Die Gajo-Lander," Jahresb. Frankfurter V.G., lxvi., lxvii. (1901-1903) ; Climate : J. P. van der Stok, Regenwaarnemingen and Atlas of Wind and Weather (Batavia, 1897). Consult further Tijd. Aardr. Gen., Tijd. Batav. Gen., Jaarb. van het Mijnwezen, and

Koloniale Verslagen, passim. (See also Malay Archipelago.)

SUMBA (TjendanA, or Sandalwood), one of the Lesser Sunda Islands in the Dutch East Indies, lying south of Flores, from which it is separated by Sumba strait, about io° S., 120° E. It has an area of about 4600 sq. m., consists of a plateau with an extreme elevation of about 3300 ft., and appears to be composed mainly of sedimentary rocks. It has a large Malay population (estimated at 200,000). Some trade is carried on in cotton, ponies, edible birds' nests, tortoiseshell, &c, mainly by Bugis and Arabs, the chief centre for which is Waingapu or Nangamessi on the north-east coast. Sumba is included in the Dutch residency of Timor, together with the lesser island of Savu, to the east. From this last island the sea is enclosed by Timor, Sumba and the islands between them, and Flores and the chain of islands east of it is called the Savu Sea.

1 " Kota " means settlement or township, and a great many districts have been named from the number of kotas they contain; e.g. the VII. Kotas, the VIII. Kotas, &c.

SUMBAWA (Dutch Soembawa), one of the Little Sunda islands in the Dutch East Indies, east of Lombok, from which it is separated by the narrow Alas Strait. It has an area of 4300 sq. m., or, including the neighbouring islands, 5240 sq. m. The deep bay of Sale or Sumbawa on the north divides the island into two peninsulas, and the isthmus is further reduced by the narrower Bay of Chempi on the south. The eastern peninsula is deeply indented on the north by the Bay of Bima. Four mountain chains cross the island in a west to east direction. The northern, as in Bali and Lombok, is of volcanic origin. Tambora, forming a minor peninsula east of Sumbawa Bay, is said to have lost a third of its elevation in the eruption of 1815, but is still 9055 ft. high. In the southern chain is found a limestone formation analogous to that in Bali, Lombok and Java. Between these two chains are round hills consisting of lavas or sometimes of volcanic tuffs, covered with the long silvery grass which also clothes vast prairies in Java and Sumatra. There are no navigable streams. The climate and productions are not unlike those of Java, though the rains are heavier, the drought more severe, and the fertility less. Sulphur, arsenic, asphalt and petroleum exist. The natives live solely by agri- culture. But out of a total population of about 75,000 there are 11,000 foreigners, living mostly by trade and navigation. The natives consist of Sumbawans

proper, a people of Malayan stock; of Buginese and Macassar immigrants, and of wild tribes of the mountains of whom nothing is known. Mahommedanism prevails throughout the island, except among the mountain tribes.

Politically Sumbawa, with its four independent states, belongs to the confederated states of the government of Celebes and its dependencies, a situation to be explained by the fact of the old supremacy of the Macassaresi over Sumbawa, Flores and Sumba. The independent states are Sumbawa proper, Dompo, Sangar and Bima. Two other states on the northern extremity of the island were so far devastated by the Tambora eruption of 181 5 that their territory, after lying for long uninhabited, was in 1866 divided between Dompo and Sangar. Sumbawa proper occupies the western peninsula. The residence of the sultan is Sumbawa on the north coast. It is surrounded with a palisade and ditches. The inhabitants of this state employ sometimes the Malay and sometimes the Macassar character in writing. A considerable trade is carried on in the export of horses, buffaloes, goats, dinding (dried flesh), skins, birds' nests, wax, rice, katyang, sappanwood, &c. Sumbawa. entered into treaty relations with the Dutch East India Company in 1674. Dompo is the western half of the eastern peninsula. The capital of the state, Dompo, lies in the heart of the country, on a stream that falls into Chempi Bay. Bada, the sultan's residence, is farther west. Sangar occupies the north-western promontory of the island, and Bima the extreme east. Bima or Bodjo, the chief town of the latter state, lies on the east side of the Bay of Bima; it has a stone-walled palace and a mosque, as well as a Dutch fort.

See Zollinger, " Soembawa," in Verhandelingen van het Batav. Cenootschap, xxiii.; Ligtvoet, " Anteekeningen betreffende den economischen Toestand en de Ethnographie van Soembawa," in Tijdschr. Bat. Gen. xxiii.

SUMBUL, or Sumbal, also called Musk Root, a drug occasion- ally employed in European medical practice. It consists of the root of Ferula sumbul, Hook., a tall Umbelliferous plant found in the north of Bokhara, its range apparently extending beyond the Amur. It was first brought to Russia in 1 S3 5 as a substitute for rnusk; and in 1867 was introduced into the British pharmacopoeia. The root as found in com- merce consists of transverse sections an inch or more in thickness and from 1 to 3 or more inches in diameter. It has a dark thin papery bark, a spongy texture, and the cut surface is marbled with white and blackish or pale brown; it has a musky odour and a bitter aromatic taste. The action and uses of the drug are the same as those of

asafetida (q.v.) It owes its medicinal properties to a resin and an essential oil. Of the former it contains about 9% and of the latter \ %. The resin is soluble in ether and has a musky smell, which is not fully developed until after contact with water.

Under the name of East Indian sumbul, the root of Dorema ammoniacum, Don., has occasionally been offered in English commerce. It is of a browner hue, has the taste of ammoniacum, and gives a much darker tincture than the genuine drug; it is thus easily detected. The name ” sumbal ” (a word of Arabic origin,

signifying a spike or ear) is applied to several fragrant roots in the East, the principal being Nardostachys jatamansj, D.C. (see Spikenard). West African sumbul is the root of a species of Cyperus.

SUMER and SUMERIAN. The Babylonian name Shumer was used in the cuneiform inscriptions together with Akkad, viz. mat Shumeri u Akkadi, ■” land of S. and. A.,” to denote Babylonia in general (see Akkad). In the non-Semitic ideo- graphic documents; the equivalent for Shumer is Kengi, which seems to be a combination of ken, “land” + gi, “reed,” i.e. ” land of reeds,” and, appropriate; designation for Babylonia, which is essentially a district of reedy marshes formed by the Tigris and Euphrates. It was formerly thought that Shumer was employed especially to denote the south of Babylonia, while Akkad was used only of the north, but this view is no longer, regarded as tenable. It is more probable that the expres- sion Shumer designated the whole of Babylonia in much the same manner as did Akkad, and that the two words ” Shumer and Akkad” were used together as a comprehensive term. That Shumer actually did mean all Babylonia appears evident from the biblical use of Shinar = Shumer to describe the district which contained the four chief Babylonian cities, viz. Babel, Erech, Accad and Calneh (Gen. x. io), which, according to the Old Testament account, constituted the beginnings of Nimrod’s kingdom. The identity of Shinar and Shumer is also demon- strated by the Septuagint rendering of Shinar in Isaiah xi. 11 by ” Babylonia.” In short, there can be no doubt that the biblical name Shinar was practically equivalent to the mat Shumeri u Akkadi = n

The actual meaning of the word Shumer is uncertain. Dr T. G. Pinches has pointed out 1 that Shumer may be a dialectic form of an as yet unestablished non-Semitic form, Shenger, just as the non-Semitic word dimmer, ” god,” is equivalent to another form, dingir: Others have seen in the ancient Baby- lonian place-name Gir-m an inversion of Su-gir = Su-h~gir , which has also been identified with Shumer. In this connexion Hommel’s theory 2 should.be mentioned, that the word

Shumer was a later, palatalization of Ki-imgir, ” land of Imgir ” = Shi-imgir, subsequently Shingi with palatalized k = sh and elision of the final r. The form imgir (imgur), however, as a place-name for Babylonia is uncertain. All that can be said at present about this difficult, etymology is that in the non-Semitic Babylonian the medial m represented quite evidently an indeterminate nasal which could also be indicated by the combination vg. Hence we find Shumer, probably pronounced Shuwer, with a sound similar to that h«ard to-day in the Scottish Gaelic word lamh, ” hand “; viz. a sort of nasalized w. This gave rise to the later inaccurate forms: Greek, Senaar; Syriac, Sen’ar; and biblical Hebrew, Shinar = Shingar.

The so-called ” Sumerian problem,” which has perplexed Assyriologists for many years, may be briefly stated as follows. In a great number of Babylonian inscriptions an idiom has long been recognized which is clearly not ordinary Semitic in character. This non-Semitic system, which is found, in many instances, on alternate lines with a regular Semitic translation, in other cases in opposite columns to a Semitic rendering, and again without any Semitic equivalent at all, has been held by one school, founded and still vigorously defended by the distinguished French Assyriologist,, Joseph Haleyy, to be nothing more than a priestly system of cryptography based, of course, on the then] current Semitic speech. This cryptography, according to seme of the Halevyans, was read aloud in Semitic, but, according to other expositors, the system was read as an ” ideophonic,” secret, and purely artificial language.

The opposing school (the Sumerists) insists that these 1 Hastings’s Did. Bible, iv. 503. 2 Ibid. i. 224b.

non-Semitic documents were evidently in an agglutinative language, naturally not uninfluenced by Semitic elements, but none the less essentially non-Semitic in origin and fundamental character. Scholars of this opinion believe that this language, which has been arbitrarily called ” Akkadian ” in England and ” Sumerian ” on the European continent and in America, was primitively the speech of the pre-Semitic inhabitants of the Euphratean region who were conquered by the invading Semites. These invaders, according to this latter view, adopted the religion and culture of the conquered Sumerians; and, consequently, the Sumerian idiom at a comparatively early date began to be used exclusively in the Semitic temples as the written vehicles of

religious thought in much the same way as was the medieval Latin of the Roman Church. The solution of this problem is of vital importance in connexion with the early history of man's development in the Babylonian region.

The study of the Sumerian vocabulary falls logically into three divisions. These are (i) the origin of the cuneiform signs, (2) the etymology of the phonetic values, and (3) the elucidation of the many and varied primitive sign-meanings.

Previous to Professor Friedrich Delitzsch's masterly work on the origin of the most ancient Babylonian system of writing, 1 no one had correctly understood the facts regarding the be- ginnings of the cuneiform system, which is now generally recog- nized as having been originally a pure picture writing which later developed into a conventionalized ideographic and syllabic sign-list. In order to comprehend the mysteries of the Sumerian problem a thorough examination of the beginning of every one of these signs is, of course, imperative, but it is equally necessary that every phonetic Sumerian value and word-combination be also studied, both in connexion with the equivalent signs and with other allied phonetic values. This etymological study of Sumerian is attended with incalculable difficulties, because nearly all the Sumerian texts which we possess are written in an idiom which is quite evidently under the influence of Semitic. With the exception of some very ancient texts, the Sumerian literature, consisting largely of religious material such as hymns and incantations, shows a number of Semitic loanwords and grammatical Semitisms, and in many cases, although not always, is quite patently a translation of Semitic ideas by Semitic priests into the formal religious Sumerian language. Professor Paul Haupt may be termed the father of Sumerian etymology, as he was really the first to place this study on a scientific basis in his Sumerian Family Laws and Akkadian and Sumerian Cuneiform Texts. 2 It is significant that all phonetic and gram- matical work in Sumerian tends to confirm nearly every one of Haupt 's views. Professors Peter Jensen and Zimmern have also done excellent, work in the same field and, together with Haupt, have established the correct method of investigating the Sumerian vocables, which should be studied only in relation to the Sumerian literature. Sumerian words should by no means be compared with words in the idioms of more recent peoples, such as Turkish, in spite of many tempting resemblances. 3 Until further light has been thrown on the nature of Sumerian, this language should be regarded as standing quite alone, a prehistoric philological remnant, and its etymology should be studied only with reference to the Sumerian inscriptions them- selves. On the other hand, grammatical and constructional

examples may be cited from other more modern agglutinative idioms, in order to establish the truly linguistic character of the Sumerian peculiarities and to disprove the Halevyan contentions that Sumerian is really not a language at all. 4

It is not surprising that Halevy's view as to the cryptographic nature of Sumerian should have arisen. In fact, the first impression given by the bewildering labyrinth of the Sumerian

1 Die Entstehune des altesten Schriftsystems oder der Ur sprung der Keilschriftzeichen (Leipzig, 1897).

2 Die sumerischen Familiengesetze (1879). Die akkadische Sprache (Berlin, 1883). Akkadische und sumerische Keilschrifttexte (Leipzig, 1 881). See especially his Sumerian grammar in this latter work, PP- '33-H7 •

3 Cf. A. H. Sayce's interesting article in Philological Society (1877-1878), pp. I-i20.

4 Prince, Materials for a Sumerian Lexicon, pp. 18, 21.

word-list is the conclusion that such a vocabulary could never have arisen in a regularly developed language. For example, anyone studying Brunnow'sLwJ 5 will find the same sign denot- ing pages of meanings, many of which have apparently no con- nexion with any other meaning belonging to the sign in question. A great multiplicity of meanings is also attributed, apparently quite arbitrarily, to the same sign, sound-value or word. In these instances, however, we can explain the difficulty away by applying that great fundamental principle followed by the Semitic priests and scribes who played with and on the Sumerian idiom, and in the course of many centuries turned what was originally an agglutinative language into what has almost justified Halevy and his followers in calling Sumerian a crypto- graphy. This principle is that of popular etymology, i.e. of sound-association and idea-association which has brought together in the word-lists many apparently quite distinct meanings, probably primarily for purposes of mnemonic aid. The present writer in his Materials for a Sumerian Lexicon has mentioned this ruling phenomenon again and again. A very few examples, however, will suffice here. Thus the word ag = the sign ~RAM = rdmu, "love" (proper meaning) is associated with ramdmu, " to roar," for phonetic reasons only. The word a= the sign A= " water " (original meaning) can indicate anything whatever connected with the idea moisture. Thus, a—" water, moisture, weep, tears, inundate, irrigate," &c. The

wcrd a can also mean ” shining, glistening,” an idea evidently developed from the shining rippling of water. Note that in Turkish su means both ” water ” and ” the lustre of a jewel,” while in English we speak of ” gems of the first water.” The combination a-md-tu, literally ” water enter ship,” means abubu, ” deluge,” ordinarily, but in one passage a-md-tu is made the equivalent of shabubu, ” flame,” a pure pun on abtlbu,” deluge.” Examples of this, the leading principle which was followed by the framers of the Sumerian system, might be cited almost ad infinitum.

Facts of this character taken by themselves would perhaps be sufficient to convince most philologists that in Sumerian we have an arbitrarily compounded cryptography just as Halevy believes, but these facts cannot be taken by themselves, as the evidences of the purely linguistic basis of Sumerian are stronger than these apparent proofs of its artificial character.

Briefly considered there are six most striking proofs that the Sumerian was based on a primitive agglutinative language. These may be tabulated concisely’ as follows: —

1. Sumerian presents a significant list of internal phonetic variations which would not have been possible in an arbitrarily invented language. Thus, taking the vowels alone; e = a by the principle of umlaut. Hence, we find the words ga and ge, a and e for the same idea respectively. The vowel i could become e as de = di, &c. Consonantal variation is most common. Thus, b = m, as barun = marun. Compare the modern Arabic pronunciation Maalbek for Baalbek. Perhaps the most interesting of these consonantal interchanges is that occurring between n and the sibilants sh and z; ner = sher; na=za, which by some scholars has been declared to be pho- netically impossible, but its existence is well established between the modern Chinese colloquial idioms. For example, Pekingese zhen, Hakka nyin, Fuchow nong, Ningpo zhing and nying, Wonchow zang and nang all =” man.” This demonstrates beyond a doubt the possibility of a strongly palatalized n becoming a palatal sibilant or vice versa, between which utterances there is but a very slight tongue movement.

The discussion of these phenomena brings us to another point which precludes the possibility of Sumerian having been merely an artificial system, and that is the undoubted existence in this language of at least two dialects, which have been named, following the inscriptions, the Eme-ku, ” the noble or male speech,” and the Eme-sal, ” the woman’s language.” The existence and general phonetic character of the ” woman’s language ” were first pointed out by Professor Paul Haupt,

6 R. E. Briinnow, A Classified List of all Simple and Compound Ideographs (1889).

who cited, for example, the following very common interdia- lectic variations: Eme-ku gir = Eme-sal meri, ” foot ” ; Eme-ku wr = Eme-sal sher, “ruler”; Eme-ku duga = Eme-sal zeba, ” knee,” &c. Such phonetic and dialectic changes, so different from any of the Semitic linguistic phenomena, are all the more valuable because they are set before us only by means of Semitic equivalents. Certainly no cryptography based exclusively on Semitic could exhibit this sort of interchange.

It should be added here in passing that the geographical or tribal significance of these two Sumerian dialects has never been established. There can be no doubt that Eme-sal means ” woman’s language,” and it was perhaps thus designated because it was a softer idiom phonetically than the other dialect. In it were written most of the penitential hymns, which were possibly thought to require a more euphonious idiom than, for example, hymns of praise. It is doubtful whether the Eme-sal was ever really a woman’s language similar in character to that of the Carib women of the Antilles, or that of the Eskimo women of Greenland. It is much more likely that the two dialects were thus designated because of their respectively harsh and soft phonetics. 1

2. Sumerian has a system of vowel harmony strikingly like that seen in all modern agglutinative languages, and it has also vocalic dissimilation similar to that found in modern Finnish and Esthonian. Vocalic harmony is the internal bringing together of vowels of the same class for the sake of greater euphony, while vocalic dissimilation is the deliberate insertion of another class of vowels, in order to prevent the disagreeable monotony arising from too prolonged a vowel harmony. Thus, in Sumerian we find such forms as numunnib-bi, ” he speaks not to him,” where the negative prefix nu and the verbal prefix tnun are in harmony, but in dissimilation to the infix nib, ” to him,” and to the root bi, ” speak,” which are also in harmony. Compare also an-sud-dam, ” like the heavens,” where the ending dam stands for a usual dim, being changed to a hard dam under the influence of the hard vowels in an-sud.

3. Sumerian has only postpositions instead of prepositions, which

occur exclusively in Semitic. In this point also Sumerian is in accord with all other agglutinative idioms. Note Sumerian e-da. ” in the house ” (e, ” house,” +da, ” in,” by dissimilation), and compare Turkish ev, ” house,” de, ” in,” and aide, ” in the house.”

4. The method of word formation in Sumerian is entirely non- Semitic in character. For example, an indeterminative vowel, a, e, i or u, may be prefixed to any root to form an abstract; thus, from me, “speak,” we get e-me, “speech”; from ra, ” to go,” we get a-ra, ” the act of going,” &c. In connexion with the very complicated Sumerian verbal system 2 it will be sufficient to note here the practice of infixing the verbal object which is, of course, absolutely alien to Semitic. This phenomenon appears also in Basque and in many North American languages.

5. Sumerian is quite devoid of grammatical gender. Semitic, on the other hand, has grammatical gender as one of its basic principles.

6. Furthermore, in a real cryptography or secret language, of which English has several, we find only phenomena based on the language from which the artificial idiom is derived. Thus, in the English ” Backslang,” which is nothing more than ordinary English deliberately inverted, in the similar Arabic jargon used among school children in Syria and in the Spanish thieves’ dialect, the principles of inversion and substitution play the chief part. Also in the curious tinker’s ” Thary ” spoken still on the English roads and lanes, we find merely an often inaccurately inverted Irish Gaelic. But in none of these nor in any other artificial jargons can any grammatical development be found other than that of the language on which they are based.

7. All this is to the point with regard to Sumerian, because these very principles of inversion and substitution have been

1 Prir.ce, Materials for a Sumerian Lexicon, p. 14.

2 Ibid. pp. 20-34.

cited as being the basis of many of the Sumerian combinations. Deliberate inversion certainly occurs in the Sumerian documents, and it is highly probable that this was a priestly mode of writing, but never of speaking; at any rate, not when the language was in common use. It is not necessary to imagine, however, that these devices originated with the Semitic priesthood. It is quite conceivable that the still earlier Sumerian priesthood invented the method of orthographic inversion, which after all is the very first device which suggests itself

to the primitive mind when endeavouring to express itself in a manner out of the ordinary. For example, evident Sumerian inversions are Gibil, ” the fire god,” for Bil-gi; ushar for Sem. sharru, ” king,” &c.

It is, moreover, highly probable that Sumerian had primitively a system of voice-tones similar to that now extant in Chinese. Thus, we find Sumerian ab, “dwelling,” “sea”; ab, “road,” and -ab, a grammatical suffix, which words, with many others of a similar character, were perhaps originally uttered with different voice-tones. In Sumerian, the number of conjectural voice- tones never exceeds the possible number eight.

It is also clear that Sumerian was actually read aloud, probably as a ritual language, until a very late period, because we have a number of pure Sumerian words reproduced in Greek trans- literation; for example, Delephat = Dilbat, “the Venus-star”; lllinos = the god Mil = Bel: aidb — itu, “month,” &c.

In view of the many evidences of the linguistic character of Sumerian as opposed to the one fact that the language had engrafted upon it a great number of evident Semitisms, the opinion of the present writer is that the Sumerian, as we have it, is fundamentally an agglutinative, almost polysynthetic, language, upon which a more or less deliberately constructed pot-pourri of Semitic inventions was superimposed in the course of many centuries of accretion under Semitic influences. This view stands as a connecting link between the extreme idea of the Halevyan school and the extreme idea of the opposing Sumerist school.

ˆLiterature. — Radau, ‘Early Babylonian History; Lenormant, Etudes accadiennes, ii. 3, p. 70; Eberhardt Schrader. Keilinschriften u. das Alte Testament, ii. 118 sqq., Keilinschriften u. Geschichts- forschung, pp. 290, 533; Weissbach, Zur Losung der sumerischen Frage; T. G. Pinches, ” Language of the Early Inhabitants of Mesopotamia,” in Journ. Roy. Asiatic Soc. (1884), pp. 301 sqq.; ” Sumerian or Cryptography,” ibid. (1900), pp. 75 sqq., 343, 344, 55 1 . 552; article ” Shinar ” in Hastings’s Diet. Bible, iv. 503-505; Halevy, Journal asiatiaue (1874), 3rd series, vol. iv. pp. 461 sqq.; Comptes rendus, 3rd series, vol. iv. p. 477; 3rd series, vol. iv. pp. 128, 130; Journal asiatique, 7th series, vol. viii. pp. 201 sqq.; Recherch.es critiques sur Vorigine de la civilisation babylonienne (Paris, 1876); J. D. Prince, Journal of the American Oriental Society, xxv. 49- 67; American Journal of Semitic Languages, xix. 203 sqq.; Materials for a Sumerian Lexicon, with grammatic introduction (Leipzig, 1905-1907). Compare also the material cited in the foot- notes above, and note the

correspondence between Brtlnnow and Halevy in the Revue semitique (1906). (J. D. Pr.)

SUMMANUS, according to some, an old Sabine or Etruscan deity; the name, however, is Latin, formed by assimilation from sub-manus (cf. mane, Matula), signifying the god of the time " before the morning." His sphere of influence was the nocturnal heavens, thunderstorms at night being attributed to him, those by day to Jupiter. Summanus had a temple at Rome near the Circus Maximus, dedicated at the time of the invasion of Italy by Pyrrhus, king of Epirus (278), when a terra-cotta image of the god (or of Jupiter himself) on the pediment of the Capitoline temple was struck by lightning and hurled into the river Tiber. Here sacrifice was offered every year to Summanus on the 20th of June, together with cakes called summanalia baked in the form of a wheel, supposed to be sym- bolical of the car of the god of the thunderbolt. In Plautus (Bacchides iv. 8, 54) Summanus and the verb summanare are used for the god of thieves and the act of stealing, with obvious reference to Summanus as a god of night, a time favourable to thieves and their business. The later explanation that Summanus is a contraction from Summus Manium (the greatest of the Manes), and that he is to be identified with Dis Pater, is now generally rejected.

Sec Augustine, De civitate dei, iv. 23; Ovid, Fasti, vi. 729; Festus,

s.v. Provorsum fulgor; G. Wissowa, Religion und Kultus der Romer (1902) ; W. W. Fowler, The Roman Festivals (1899).

SUMMARY JURISDICTION. In the widest sense this phrase in English law includes the power asserted by courts of record to deal brevi manu with contempts of court without the interven- tion of a jury. Probably the power was originally exercisable only when the fact was notorious, i.e. done in presence of the court. But it haslong been exercised as to extra curial contempts (see Contempt of Court). The term is also applied to the special powers given by statute or rules to the High Court of Justice and to county courts for dealing with certain classes of causes or matters by methods more simple and expeditious than the ordinary procedure of an action (see Summons). But the phrase in modern times is applied almost exclusively to certain forms ot jurisdiction exercised by justices of the peace out of general or quarter sessions, and without the assistance of a jury.

Ever since the creation of the office of justice of ‘the peace (q.v.) the tendency of English legislation has been to enable them to deal with minor offences without a jury. Legislation was necessary because, as Blackstone says, except in the case of contempts the common law is a stranger to trial without a jury, and because even when an offence is created by statute the procedure for trying must be by indictment and trial before a jury, unless by the statute creating the offence or some other statute another mode of trial is provided. In one remarkable instance power is given by an act of 1725 (12 Geo. I. c. 29, s. 4) to judges of the superior courts summarily to sentence to trans- portation (penal servitude) a solicitor practising after conviction of barratry, forgery or perjury (Stephen, Dig. Crim. Law, 6th ed., 113). In other words all the summary jurisdiction of justices of the peace is the creation of statute. The history of the gradual development of the summary jurisdiction of justices of the peace is stated in Stephen’s Hist. Crim. Law, vol. i. ch. 4. The result of legislation is that summary jurisdiction has been conferred by statutes and by-laws as to innumerable petty offences of a criminal or quasi-criminal character (most of which in French law would be described as contraventions), ranging through every letter of the alphabet. The most important perhaps are those under the Army, Game, Highway, Licensing, Merchant Shipping, Post Office, Public Health, Revenue and Vagrancy Acts.

A court of summary jurisdiction is defined in the Inter- pretation Act 1889 as ” any justice or justices of the peace or other magistrate, by whatever name called, to whom jurisdiction is given by, or who is authorized to act under, the Summary Jurisdiction Acts, whether in England, Wales or Ireland, and whether acting under the Summary Jurisdiction Acts or any of them or any other act or by virtue of his commission or under the common law ” (52 & 53 Vict. c. 63, s. 13 [n]). This defini- tion does not apply to justices of the peace sitting to hold a preliminary inquiry as to indictable offences, or in the discharge of their quasi-administrative functions as licensing authority. The expression ” Summary Jurisdiction Acts ” means as to England and Wales the Summary Jurisdiction Acts of 1848 (n & 12 Vict. c. 42) and 1879 (42 & 43 Vict. c. 49) and any act amending these acts or either of them. These acts define the procedure to be followed by justices in those cases in which they are empowered by statute to hear and determine civil or criminal cases without the intervention of a jury or the forms of an action or indictment at law or a suit in equity. Besides these two acts the procedure as to the exercise of summary jurisdiction is also regulated by acts of 1857 (20 & 21 Vict. c. 1, c. 43), 1884 (47 & 48 Vict. c. 43) and 1899 (62 & 63 Vict. c. 22),

and by the Summary Jurisdiction Process Act 1881 (44 & 45 Vict. c. 24).

The act of 1848 repealed and consolidated the provisions of a large number of earlier acts. The act of 1857 provided a mode of appeal to the High Court by case stated as to questions of law raised in summary proceedings. The act of 1879 amended the procedure in many details with the view of uniformity, and enlarged the powers of justices to deal summarily with certain classes of offences ordinarily punishable on indictment. The act gives power to make rules regulating details of procedure.

The rules now in force were made in 1886, but have since been amended in certain details. The act of 1884 swept away special forms of. procedure contained in a large number of statutes, and substituted the procedure of the Summary Jurisdiction Acts. The act of 1899 added the obtaining of property by false pretences to the list of indictable offences which could sub modo be summarily dealt with. The statutes above mentioned form a kind of code as to procedure and to some extent also as to jurisdiction.

As already stated, to enable a justice to deal summarily with an offence, whether created by statute or by-law, some statutory authority must be shown. A very large number of petty offences (contraventions) have been created (e.g. poaching, minor forms of theft, malicious damage and assault), and are annually being created (1) by legislation, or (2) by the by-laws of corporations made under statutory authority, or (3) by departments of state acting under such authority. The two latter classes differ from the first in the necessity of proving by evidence the existence of the by-law or statutory rule, and if need be that it is intra vires.

In the case of offences which are primarily made punishable only on summary conviction, the accused, if the maximum punishment is imprisonment for over three months, can elect to be tried by a jury (act of 1879, s. 17).

In the case of offences which are primarily punishable only on indictment, power to convict summarily is given in the following cases : —

1. All indictable offences (except homicide) committed by children over seven and under twelve, if the court thinks it expedient and the parent or guardian does not object (1879, s. 10).

2. All indictable offences (except homicide) committed by young persons of twelve and under sixteen, if the young person consents after being told of his right to be tried by a jury (1879, s. 11; i899,s.2)._

3. The indictable offences specified in sched. I, col. 2 of the act of 1879 and in the act of 1899, if committed by adults, if they consent to summary trial after being told of their right to be tried by a jury (1879, s. 12). ‘ _

4. The indictable offences specified in sched. 1, col. I of the act of 1879 and the act of 1899, if committed by an adult who pleads guilty after due caution that if he does so he will be summarily convicted (1879, s. 13).

Adults cannot be summarily dealt with under 3 or 4 if the offence is punishable by law with penal servitude owing to previous convic- tion or indictment of the accused (1879, s. 14).

It will be observed that as to all the indictable offences falling under heads 1 to 4, the summary jurisdiction depends on the consent of the accused or a person having authority over him after receiving due information as to the right to go to a jury, and that the punish- ments on summary conviction in such cases are not those which could be imposed after conviction or indictment, but are limited as follows: —

Case I. Imprisonment for not more than one month or fine not exceeding 40s. and (or) whipping of male children (not more than six strokes with a birch) ; sending to an industrial school or reforma- tory.

Case 2. Imprisonment with or without hard labour for not more than three months or fine not exceeding £10 and (or) whipping of males (not more than twelve -strokes with a birch) ; sending to an industrial school or reformatory.

Case 3. Imprisonment for not more than three months with or without hard labour or fine not exceeding £20.

Case 4. Imprisonment with or without hard labour for not over six months.

These limitations of punishment have had a potent effect in inducing culprits to avoid the greater risks involved in a jury trial.

Where the offence is indictable the accused is brought before the justices either on arrest without warrant or on warrant or summons

under the Indictable Offences Act 1848. and the summary jurisdiction procedure does not apply till the necessary option has been taken.

Where the offence is indictable only at the election of the accused the summary jurisdiction procedure applies until On being informed of his option the accused elects for jury trial (act of 1879, s. 17).

In the case of an offence punishable on summary conviction the procedure is ordinarily as follows : —

Information, usually oral, is laid before one or more justices of the peace alleging the commission of the offence. An information must not state more than a single offence, but great latitude is given as to amending at the hearing any defects in the mode of stating an offence. Upon receipt of the information the justice may issue his summons for the attendance of the accused at a time and place named to answer the charge. It is usual to summon to a petty sessional court (i.e. two justices or a stipendiary magistrate, or, in the city of London, an alderman). The summons is usually served by a constable. If the accused does not attend in obedience to the summons, after proof of service the court may either issue a warrant for his arrest or may deal with the charge, in his absence.

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Occasionally a warrant is issued in place of a summons in the first instance, in which case the information must be laid in writing and be verified by oath. The proceedings must be begun, i.e. by laying the information, not later than six months after the commission of the offence, unless by some particular statute another period is named or unless the offence is what is called a continuing offence.

In a certain number of summary cases the accused is arrested under statutory authority without application to a justice, e.g. in the case of rogues and vagabonds and certain classes of offences committed in the street in view of a constable or by night. Whether the accused is brought, before the court on arrest with or without warrant or attends in obedience to summons, the procedure at the hearing is the same. The hearing is ordinarily before a petty ses- sional court, i.e. before two or more justices sitting at their regular place of meeting or some place temporarily appointed as the sub- stitute for the regular court-house, or before a stipendiary magis- trate, or in the city of London an alderman, sitting at a place where he may by law do alone what in other places may be done by two justices (1879, s. 20; 1889, s. 13). A

single justice sitting alcne in the ordinary court-house or two or more justices sitting together at an occasional court-house have certain jurisdiction to hear and determine the case, but cannot order a fine of more than 20s. or imprisonment for more than fourteen days (1879, s. 20 [7]). The hearing must be in open court, and parties may appear by counsel or solicitor. If both parties appear, the justices must hear and determine the case. If the defendant does not appear, the court may hear and determine in his absence, or may issue a warrant and adjourn the hearing until his apprehension. Where the defen- dant is represented by solicitor or counsel but is not himself present it is usual, except in serious cases, to proceed in his absence. If the defendant is present the substance of the information is stated to him and he is asked whether he is guilty or not guilty. If he pleads guilty the court may proceed to conviction. If he does not the court hears the case, and witnesses for the prosecution and defence are examined and cross-examined. If the complainant does not appear, the justices may dismiss the complaint or adjourn the hearing.

If necessary rebutting evidence may be called. The prosecutor is not allowed to reply in the case of the defendant. On the com- pletion of the evidence the court proceeds to convict or acquit. Where the case is proved but is trifling the court may, without proceeding to conviction, make an order dismissing the information subject to payment of damages for injury or compensation for loss up to £10 or any higher limit fixed by statute as to the offence, and costs, or discharging the accused conditionally on his giving security forgood behaviourand on paying damagesand costs (1907,0. 17, s. 1). To this order probationary conditions may be attached (s. 2). Subject to this provision the punishment which may be enforced depends as a general rule on the statute or by-law defining the offence, and consists in imprisonment and (or) fine, except in cases where a minimum fine is stipulated for by a treaty, &c, with a foreign state, e.g. in sea fishery conventions. The court may mitigate the fine in the case of a first offence, even in a revenue case, or may reduce the period of imprisonment and impose it without hard labour, or substitute a fine not exceeding £25 for imprisonment. A scale is prescribed for imprisonment on failure to pay money, fines, or costs, adjudged to be paid on a conviction, or in default of a sufficient distress to satisfy the sum adjudged (1879, s. 5). Instead of sending the defendant to prison for not paying fine and costs the court may direct its levy by distress warrant, or may accept payment by instalments. In the case of distress the wearing apparel and bedding of the defendant and his family, and to the value of £5 the tools and implements of his trade, may not be taken (act of 1879, s. 21). If the defendant after going to prison can

pay part of the money his imprisonment is reduced proportionally (Prison Act 1898, s. 9). The imprisonment is without hard labour unless hard labour is specially authorized by the act on which the conviction is founded. The maximum term of imprisonment without the option of a fine is in most cases six months, but depends on the particular statute. Imprisonment under order of a court of summary jurisdiction is in the common gaol (5 Hen. IV. c. 10), i.e. in a local prison declared by the home secretary to be the common gaol for the county, &c, for which the court acts. The place of imprisonment during remands or in the case of youthful offenders may in certain cases be elsewhere than in a prison.

The court has power to order costs to be paid by the prosecutor or the defendant. Where the order is made on a conviction it is enforceable by imprisonment in default of payment or sufficient distress.

The extent of the local jurisdiction of justices exercising summary jurisdiction is defined by s. 46 of the act of 1879 with reference to offences committed on the boundaries of two jurisdictions or during journeys or on the sea or rivers or in harbours.

Proceedings under the Bastardy Acts are regulated by special legislation, but as to proof of service and the enforcement of orders and appeals are assimilated to convictions under the Summary Jurisdiction Acts. The same rule applies (except as to appeals) to orders made under the Summary Jurisdiction (Married Women) Act 1895, as amended by the Licensing Act 1902.

A warrant of arrest is executed by the constable or person to whom it is directed within the local jurisdiction of the issuing court; or a fresh pursuit within seven miles of its boundaries, with- out endorsement, in the rest of England and Wales, and in Scotland, the Channel Islands and Isle of Man after endorsement by a com- petent magistrate of the place where the accused is, and in Ireland by a justice of the peace or an inspector of constabulary. An English summons to a defendant or witness, except in respect of civil debts, is served in Scotland after endorsement by a competent magistrate there (Summary Jurisdiction Process Act 1881, 44 and 45 Vict. c. 24). The attendance of a witness who is in prison is obtained by writ of habeas corpus or by a secretary of state's order under the Prison Act 1898. If a witness will not attend on summons he can be brought to the court by warrant, and if he will not answer questions lawfully put to him may be sent to prison for seven days or until he sooner consents to ansv er.

Civil Jurisdiction. — In cases where justices have a summary civil jurisdiction, e.g. as to certain civil debts recoverable summarily, or to make orders to do or to abstain from doing certain acts, e.g. with reference to nuisances and building, the procedure differs in certain details from that in criminal cases.

1. The summons is issued on a complaint which need not be in writing nor on oath, and not on an information, and warrants of arrest cannot be issued.

2. The rules as to the evidence of the defendant and his or her spouse are the same as in civil actions.

3. The court's decision is by order and not by conviction.

4. The order if for payment of a civil debt or costs in connexion therewith is enforceable by distress and sale of the defendant's effects or by imprisonment, but only on proof that the defendant has had since the order means of paying and has refused or neglected topay(i879,s.35).

Proceedings for the enforcement of local rates are not affected by the Summary Jurisdiction Acts except as to the power of sub- mitting to the High Court questions of law arising on a summons to enforce rates (re Allen, 1894, 2 Q.B., 924). The functions of justices as to such rates are sometimes but not quite accurately described as ministerial, for their powers of inquiry though limited are judicial and of a quasi-criminal character.

Appeal. — The orders and convictions of a court of summary jurisdiction are in many cases appealable to quarter sessions. The right to appeal is always dependent on the specific provisions of a statute. The Summary Jurisdiction Act 1879 gives a general power of appeal against an adjudication on conviction (but not on plea of guilty) to imprisonment without the option of a fine, whether as punishment for an offence or for failure to do or abstaining from doing any act, other than compliance with an order to pay money or find security or enter into recognizances or to find sureties (1879, s. 19). The procedure on the appeals is regulated and n ade uniform by the acts of 1879, ss. 31, 32; and 1884. These provisions are supplementary of the particular provisions of many statutes authorizing an appeal.

The decisions of courts of summary jurisdiction on points of law are generally reviewed by a casa stated for the opinion of the High Court under the acts of 1857 and 1879, but are occasionally corrected by the

common law remedies of mandamus, prohibition or certiorari. The application of the last-named remedy is restricted by many statutes. The court of appeal has jurisdiction to review judgments and orders of the High Court dealing with appeals, &c, from the decisions of justices in the exercise of their civil juris- diction; but not when the subject-matter is a criminal cause or matter.

In proceedings between husband and wife for separation orders there is a special form of appeal on facts as well as law to the probate, divorce and admiralty division of the High Court (Summary Jurisdiction [Married Women] Act 1895; Licensing Act 1902,

s 5)

Scotland. Civil. — In the Court of Session there are certain forms of summary civilˆ proceedings by petition, e.g.with reference to entails, custody of children, guardians and factors of minors and lunatics, which are applications for exercise of the nobile officium or extraordinary jurisdiction of the court (see Mackay, Court of Session Practice, i. 209, ii. 353). Summary jurisdiction is given to justices of the peace as to the recovery of small debts.

Criminal and Quasi-criminal. — The only act relating to summary jurisdiction procedure common to England and Scotland is the Summary Jurisdiction Process Act 1881. Summary jurisdiction in Scotland depends chiefly upon the Summary Jurisdiction (Scot- land) Acts 1864 and 1881. The acts follow, to some extent, the lines of English legislation, but the sheriff and his deputies and substitutes are included in the definition of the court, as are stipendiary magis- trates (1897, c. 48). The acts also apply to proceedings before burgh courts, or burgh magistrates, and to justices of the peace where they have by other statutes power to try offences or enforce penalties. All proceedings for summary conviction or for recovery of a penalty must be by way of complaint according to one of the forms in the schedule to the act of 1864. The English summons and warrant are represented in Scotland by the warrant of citation and the warrant of apprehension. Where no punishment is fixed for a

statutory offence, the court cannot sentence to more than a fine of £5 or sixty days' imprisonment, in addition to ordering caution to keep the peace. The act of 1881 adopts certain of the provisions of the

English act of 1879 as to mitigation of fines, terms of imprison- ment, &c, and also gives a discretion as to punishment to a sheriff trying by jury in cases where the prosecution might have been by complaint under the acts. By the Youthful Offenders Act 1901, Scottish courts of summary jurisdiction have acquired the same jurisdiction as to offences by children as was conferred on English justices in 1879. Appeals from courts of summary jurisdiction are now mainly regulated by the act of 1875 (38 and 39 Vict. c. 62), and proceed on case stated by the inferior judge. A bill was sub- mitted to parliament in 1907 for consolidating and amending the Scottish summary procedure.

Ireland. — In Ireland the High Court has the same summary powers in cases of contempt, and the term ” court of summary jurisdiction ” has the same meaning as in England (Interpretation Act 1889, s. 13 [11]), subject to the definition of the Summary Jurisdiction (Ireland) Acts, which are, as regards the Dublin metro- politan police district, the acts regulating the powers and duties of justices of the peace or of the police of that district, and as respects any other part of Ireland the Petty Sessions (Ireland) Act 1851 (14 and 15 Vict. c. 93) and any act amending the same. The acts are more extensive in their purview than the English acts, as they form in a great degree a code of substantive law as well as of pro- cedure. By an act of 1884 the same jurisdiction was given as to offences by children as by the act of 1879 in England. Stipendiary or resident magistrates may be appointed in the place of unpaid justices under an act of 1836 (6 & 7 W. IV. c. 13). The exceptional political circumstances of Ireland have led to the conferring at different times on courts of summary jurisdiction of an authority, generally temporary, greater than that which they can exercise in Great Britain. Recent instances are the Peace Preservation Act 1881, and the Prevention of Crimes Act 1882, both expired, and the Criminal Law and Procedure (Ireland) Act 1887.

British Dominions beyond the Seas.— The legislation of British possessions as to summary jurisdiction follows the lines of English legislation, but, and especially in crown colonies, there is a disposition to dispense with the jury more than under. English procedure, and in most colonies stipendiary magistrates are more freely employed than unpaid justices of the peace (see British Guiana, Ord. No. 10 of 1893). Many of the colonial criminal codes include a number of offences punishable on summary convic- tion. The procedure closely follows English models, but has in many cases been consolidated and simplified (■e.g. Victoria, Justices Act 1890, No. 1 105; British Guiana, Ord. No. 12 of 1893). In many colonies stipendiaries and justices of the peace exercise civil jurisdiction as to matters dealt with

in England by the county court (e.g. British Guiana, Ord. No. 11 of 1893).

United States. — By art. iii. s. 2 of the constitution, the trial of all crimes, except in cases of impeachment, is to be by jury. By art. v. of the amendments no person can be held to answer for a capital or otherwise infamous crime unless on a presentment or indictment of a grand jury. Considerable changes have been made by state legislation in the direction of enlarging the powers of courts of summary jurisdiction.

European Countries. — -On the continent of Europe trial of criminal cases by a bench of judges without a jury is the original and normal method, and continues except in those cases as to which under the penal and procedure codes jury trial is made necessary. In France the place of courts of summary jurisdiction is filled by tribunaux correctionels. (W. F. C.)

SUMMIT, a city of Union county, New Jersey, U.S.A., in the north-east of the state, about 21 m. W. of New York City. Pop. (1900) 5302, of whom 1397 were foreign-born; (1905) 6845; (1910) 7500. It is served by the Morris & Essex and the Passaic & Delaware divisions of Delaware, Lackawanna & Western railroad, and by the Rahway Valley railroad extending to Roselle, 9 m. distant. Summit is picturesquely situated on the crest of a ridge called Second Mountain, with a mean eleva- tion of 450 ft. It is a residential suburb of New York, and attracts a number of summer residents. Among its institu- tions are a public library (1874), a home for blind children, the Overlook hospital and the Kent Place school (1894) for girls. On Hobart Hill there is a monument marking the site of a beacon light and a signal gun used during the War of Independence. Summit was incorporated as a township in 1869 from parts of the townships at Springfield and New Providence, and was chartered as a city in 1899.

SUMMONS (Fr. semonce, from semonner or semondre, Lat. summonere, summon Mo) , in English law (1) a command by a superior authority to attend at a given time or place or to do some public duty; (2) a document containing such command, Mid not infrequently also expressing the consequences entailed

by neglect to obey. The oral summons or citation seems to have preceded the written summons in England, just as in Roman law in jus vocatio existed for centuries before the libellus conveniionis. The antiquity and importance of the summons as a legal form in England is shown by the presence of the ” sompnour,” or summoner of the

ecclesiastical court, as one of the characters in the Canterbury Tales, and in The History of Sir John Oldcastle, where the sumner is made to eat a citation issued from the bishop of Rochester's court. The term is used with reference to a demand for the attendance of a person in the high court of parliament. As regards English courts of justice it is equivalent to what in the civil and canon law and in Scots law, and in English courts deriving their procedure from those sources, is known as " citation." That term is still preserved in English ecclesiastical courts and in matrimonial causes.

It is an essential principle of justice that a court should not adjudicate upon any question without giving the parties to be affected or bound by the adjudication the opportunity of being heard and of bringing their witnesses before the court. The most usual term in English law for the process by which attendance is commanded or required is the " summons."

Civil Proceedings. — In the High Court of Justice, civil actions are begun by obtaining from the officers of the court a document known as a " writ of summons." In this document are stated the names of the parties and the nature of the claim made (which in the case of liquidated sums of money must be precise and particu- lar). It is sealed and issued to the party suing it out, and served on the opposing party, not by an officer of the court but by an agent of the plaintiff. The tenor of the writ is to require the defendant to appear and answer the claim, and to indicate the consequences of non-appearance, viz. adjudication in default.

Many proceedings in the High Court and some in the county court are initiated by forms of summons different from the writ of summons. Of those issued in the High Court three classes merit mention : —

1. For determining interlocutory matters of practice and pro- cedure arising in " a pending cause or matter.' These are now limited as far as possible to a general summons for directions, intro- duced in 1883 so as to discourage frequent and expensive applica- tions to the masters or judges of the High Court on questions of detail. These summonses are sealed and issued on application at the offices of the High Court. The matters raised are dealt with by a master or judge in chambers summarily. In matters of practice and procedure there is no appeal from a judge at chambers without leave from him or from the court of appeal.

2. For determining certain classes of questions with more despatch and less cost than is entailed by action or petition. This kind of

summons is known as an ” originating summons,” because under it proceedings may be originated without writ for certain kinds of relief specified in the rules (R. S. C, O. 55, r. 3). The originating summons may be used in all divisions of the High Court, but is chiefly employed in the chancery division, where it to a great extent supersedes actions for the administration of trusts or of the estates of deceased persons; 1 and for the foreclosure of mortgages a similar but not identical procedure was created by the Vendor and Purchaser Act 1874, and the Conveyancing Act 1 88 1, with reference to questions of title, &c, to real property. In the king’s bench and probate divisions the originating summons is used for determining summarily questions as to property between husband and wife, or the right to custody of children, and many other matters (O. 54, rr. 4 B-4 F). The proceedings on an originating summons are conducted summarily at chambers without pleadings, and the evidence is usually written. In the chancery division where the questions raised are important the summons is adjourned into court. An appeal lies to the court of appeal from decisions on originating summonses.

The forms of summonses and the procedure thereon in civil cases in the High Court are regulated by the Rules of the Supreme Court 1883 to 1907.

3. Certain proceedings on the crown side of the king’s bench division are begun by summons, e.g. applications for bail; and in vacation writs of habeas corpus, mandamus, prohibition and certiorari are asked for by summons as the full court is not in session. (See Crown Office Rules, 1906).

In the county courts an action is begun by plaint and summons. Two kinds of summons are in use — the ordinary summons used for every form of county court action, and the default summons, which is an optional remedy of the plaintiff in actions for debts or liquidated demands exceeding £5, and in all actions for the price or hire of goods

1 A similar practice existed before 1883 under the powers given by 15 & 16 Vict. c. 86, but was very limited in its operation, as it applied simply to the personal estate of a deceased person.

sold or let to the defendant to be used in the way of his calling. It may also issue by leave of the judge or registrar in other cases, with the

single exception that no leave can be given in claims under £5 where the claim is not for the price or hire of goods sold or let as above, if the affidavit of debt discloses that the defendant is a servant or person engaged in manual labour. The advantage of a default summons is that judgment is entered for the plaintiff without hearing unless the defendant gives notice of defence within a limited time. A default summons must as a rule be served personally on the defendant; an ordinary summons need not be served personally, but may in most cases be delivered to a person at the defendant's house or place of business. A summons is also issued to a witness in the county court. Forms of summons are given in the County Court Rules 1903. These include certain special forms used in admiralty and interpleader actions and in proceedings under the Friendly Societies Acts and the Married Women's Property Acts. Summonses issued from county courts are usually served by a bailiff of the court and not by the party suing them out.

Justices of the peace have power to issue summonses to persons accused of indictable offences, or of offences summarily punishable, for their attendance, for preliminary inquiry or summary trial according to the nature of the charge, and also to persons against whom a complaint of a civil nature within the justices' jurisdiction is made. On failure to attend on summons, attendance may be enforced by warrant; and in the case of indictable offences this is the course always adopted. The forms in use for indictable offences are scheduled to the Indictable Offences Act 1848, and those for other purposes to the Summary Jurisdiction Rules 1886 (see Summary Jurisdiction).' The attendance of witnesses before justices of the peace may be required by witness summons, enforced in the event of disobedience by arrest under warrant (see Witness).

The attendance of jurors in civil or criminal trials is required by jury summons sent by registered post.

In courts for the trial of indictable offences the attendance of the accused and of the witnesses is not secured by summons. Both ordinarily attend in obedience to recognizances entered into before justices for their attendance. In the absence of recognizances the attendance of the accused is enforced by bench warrant of the court of trial, or by justices' warrant, and that of the witnesses by writ of subpoettA issued from the crown office of the High Court. Disobedience to the writ is punished as contempt of court.

Scotland. — Summons is a term confined in strictness to the beginning of an action in the Court of Session. The summons is a writ in the

sovereign's name, signed by a writer to the signet, citing the defender to appear and answer the claim. The " will of the summons " is the conclusion of a writ containing the will of the sovereign or judge, charging the executive officer to cite the party whose attendance is required. It is regulated by several acts, e.g. The Debtors (Scotlandl Act 1838 (1 & 2 Vict. c. 114) and the Court of Session (Scotland) Act 1868 (31 & 32 Vict. c. 100). A privileged summons is one where the induciae are shortened to six days against defenders within Scotland (Court of Session [Scotland] Act 1825, s. 53). Defects in the summons are cured by amendment or by a supplementary summons. The summons goes more into detail than the English writ of summons, though it no longer states, as it once did, the grounds of action, now stated in the condescendence and pursuer's pleas in law annexed to the summons. The form of the summons is regulated by the Court of Session (Scotland) Act 1850, s. 1 and schedule A. After the action has been set on foot by summons, the attendance of the parties and witnesses is obtained by citation. The Citation Amendment Acts 1871 and 1882 give additional facilities for the execution of citations in civil cases by means of registered letters, instead of by the old process known as " lock hole citation." In the act of 1871 the term " summons " is used to denote part of the process of inferior civil courts.

In the sheriff court an action is now begun by writ (Sheriff Courts [Scotland] Act 1907), and not as formerly by petition or summons.

In criminal cases the summons of the accused, or of witnesses, is by warrant of citation, and of jurors by citation sent by registered post (1868, c. 95, s. 10).

Ireland. — In Ireland summonses are used substantially for the same purposes and in the same manner as in England, but generally speaking under statutes and rules applying only to the Irish courts.

(W. F. C.)

SUMMUM BONUM (Lat. for "highest good "), in ethics, the ideal of human attainment. The significance of the term depends upon the character of the ethical system in which it occurs. It may be viewed as a perfect moral state: as pleasure or happiness (see Hedonism; Eudaemonism) ; as physical perfection; as wealth, and so forth. If, however, we abandon intuitional ethics, it is reasonable to argue that the term summum bonum ceases to have any real significance inasmuch as actions are not intrinsically good or bad, while the complete sceptic strives after no systematic ideal.

SUMNER, CHARLES (1811-1874), American statesman, was born in Boston, Massachusetts, on the 6th of January 1S11.

He graduated in 1830 at Harvard College, and in 1834 graduated at the Harvard Law School. Here, in closest intimacy with Joseph Story, he became an enthusiast in the study of juris- prudence: at the age of twenty-three he was admitted to the bar, and was contributing to the American Jurist, and editing law texts and Story's court decisions. What he saw of Congress during a month's visit to Washington in 1834 filled him with loathing for politics as a career, and he returned to Boston resolved to devote himself to the practice of law. The three years (183 7-1840) spent in Europe were years of fruitful study and experience. He secured a ready command of French, German and Italian, equalled by no American then in public life. He formed the acquaintance of many of the leading statesmen and publicists, and secured a deep insight into continental systems of government and of jurisprudence. In England (1838) his omnivorous reading in literature, history and jurisprudence made him persona grata to leaders of thought. Lord Brougham declared that he " had never met with any man of Sumner's age of such extensive legal knowledge and natural legal intellect." Not till many years after Sumner's death was any other American received so intimately into the best. English circles, social, political and intellectual.

In his thirtieth year, a broadly cultured cosmopolitan, Sumner returned to Boston, resolved to settle down to the practice of his profession. But gradually he devoted less of his time to practice and more to lecturing in the Harvard Law School, to editing court reports and to contributions to law journals, especi- ally on historical and biographical lines, in which his erudition was unsurpassed. In his law practice he had disappointed himself and his friends, and he became despondent as to his future. It was in a 4th of July oration on " The True Grandeur of Nations," delivered in Boston in 1845, that he first found himself. His oration was a tremendous arraignment of war, and an impassioned appeal for freedom and for peace, and proved him an orator of the first rank. He immediately became one of the most eagerly sought orators for the lyceum and college platform. His lofty themes and stately eloquence made a profound impression, especially upon young men; his platform presence was imposing, for he was six feet and four inches in height and of massive frame; his voice was clear and of great power; his gestures unconventional and individual, but vigorous and impressive. His literary style was somewhat florid. Many of his speeches were monuments of erudition, but the wealth of detail, of allusion, and of quotation, often from the Greek and Latin, sometimes detracted from their effect.

Sumner co-operated effectively with Horace Mann for the improvement of the system of public education in Massachusetts. Prison reform and peace were other causes to which he gave ardent support. In 1847 the vigour with which Sumner de- nounced a Boston congressman's vote in favour of the Mexican War Bill made him the logical leader of the " Conscience Whigs," but he declined to accept their nomination for Congress. He took an active part in the organizing of the Free Soil party, in revolt at the Whigs' nomination of a slave-holding southerner for the presidency; and in 1848 was defeated as a candidate for the national House of Representatives. In 185 1 control of the Massachusetts legislature was secured by the Democrats in coalition with the Free Soilers, but after filling the state offices with their own men, the Democrats refused to vote for Sumner, the Free Soilers' choice for United States senator, and urged the selection of some less radical candidate. A deadlock of more than three months ensued, finally resulting in the election (April 24) of Sumner by a majority of a single vote.

Sumner thus stepped from the lecture platform to the Senate, with no preliminary training. At first he prudently abstained from trying to force the issues in which he was interested, while he studied the temper and procedure of the Senate. In the closing hours of his first session, in spite of strenuous efforts to prevent it, Sumner delivered (Aug. 26, 1852) a speech, " Free- dom national; Slavery sectional," which it was immediately felt marked a new era in American history. The conventions

of both the great parties had just affirmed the finality of every provision of the Compromise of 1850. Reckless of political expediency, Sumner moved that the Fugitive Slave Act be forthwith repealed; and for more than three hours he denounced it as a violation of the constitution, an affront to the public conscience, and an offence against the divine law. The speech provoked a storm of anger in the South, but the North was heartened to find at last a leader whose courage matched his conscience. In 1856, at the very time when " border ruffians " were drawing their lines closer about the doomed town of Law- rence, Kansas, Sumner in the Senate (May 19-20) laid bare the " Crime against Kansas." He denounced the Kansas-Nebraska Bill as in every respect a swindle, and held its authors, Stephen A. Douglas and Andrew P. Butler, up to the scorn of the world as the Don Quixote and Sancho Panza of " the harlot, Slavery." Two days later

(May 22) Preston S. Brooks (1819-1857), a congressman from South Carolina, suddenly confronted Sumner as he sat writing at his desk in the Senate chamber, denounced his speech as a libel upon his state and upon Butler, his relative, and before Sumner, pinioned by his desk, could make the slight- est resistance, rained blow after blow upon his head, till his victim sank bleeding and unconscious upon the floor. That brutal assault cost Sumner three years of heroic struggle to restore his shattered health— years during which Massachusetts loyally re-elected him, in the belief that in the Senate chamber his vacant chair was the most eloquent pleader for free speech and resistance to slavery. Upon returning to his post, in 1859, the approaching presidential campaign of i860 did not deter him from delivering a speech, entirely free from personal rancour, on ” The Barbarism of Slavery ” — to this day one of the most comprehensive and scathing indictments of American slavery ever presented.

In the critical months following Lincoln’s election Sumner was an unyielding foe to every scheme of compromise. After the withdrawal of the Southern senators, Sumner was made chair- man of the committee on foreign relations (March 8, 1861), a position for which he was pre-eminently fitted by his years of intimate acquaintance with European politics and statesmen. While the war was in progress his letters from Cobden and Bright, from Gladstone and the duke of Argyll, at Lincoln’s request were read by Sumner to the cabinet, and formed a chief source of light as to political thought in England. In the turmoil over the ” ‘ Trent’ affair,” it was Sumner’s word that convinced Lincoln that Mason and Slidell must be given up, and that reconciled the public to that inevitable step. Again and again Sumner used the power incident to his chairmanship to block action which threatened to embroil the United States in war with England and France. Sumner openly and boldly advocated the policy of emancipation. Lincoln described Sumner as ” my idea of a bishop,” and used to consult him as an embodiment of the conscience of the American people.

The war had hardly begun when Sumner put forward his theory of reconstruction, that the seceded states by their own act had ” become felo de se,” had ” committed state suicide,” and that their status and the conditions of their readmission to membership in the Union, lay absolutely at the determination of Congress; as if they were Territories and had never been states. He resented the initiative in Reconstruction taken by Lincoln, and later by Johnson, as an encroachment upon the powers of Congress. Throughout the war Sumner had con- stituted himself the special champion of the negro, being the most vigorous advocate of emancipation, of enlisting the blacks in the Union army,

and of the establishment of the Freedmen's Bureau The credit or the blame for imposing equal suffrage rights for negroes upon the Southern states as a condition of Reconstruc- tion must rest with Charles Sumner more than with any other one man Heedless of the teachings of science as to the slow evolu- tion of any race's capacity for self-government, he insisted on putting the ballot forthwith into the hands of even the most ignorant blacks, lest their rights be taken from them by their former masters and the fruits of the war be lost. But it must be remembered that in Sumner's plan equal suffrage was

to be accompanied by free homesteads and free schools for negroes.

In the impeachment proceedings against Johnson, Sumner was one of the president's most implacable assailants. Sumner's opposition to Grant's pet scheme for the annexation of San Domingo (1870), after the president mistakenly supposed that he had secured a pledge of support, brought upon him the president's bitter resentment. Sumner had always prized highly his popularity in England, but he unhesitatingly sacri- ficed it in taking his stand as to the adjustment of claims against England for breaches of neutrality during the war. Sumner laid great stress upon " national claims." He held that England's according the rights of belligerents to the Confederate states had doubled the duration of the war, entailing inestimable loss. He therefore insisted that England should be required not merely to pay damages for the havoc wrought by the " Alabama " and other cruisers fitted out for Confederate service in her ports, but that, for " that other damage, immense and infinite, caused by the prolongation of the war," the withdrawal of the British flag from this hemisphere could " not be abandoned as a condition or preliminary of such a settlement as is now proposed." (At the Geneva arbitration conference these " national claims " were abandoned.) Under pressure from the president, on the ground that Sumner was no longer on speaking terms with the secretary of state, he was deposed on the 10th of March 1871 from the chairmanship of the committee on foreign relations, in which he had served with great distinc- tion and effectiveness throughout the critical years since 1861. Whether the chief cause of this humiliation was Grant's vin- dictiveness at Sumner's opposition to his San Domingo project or a genuine fear that the impossible demand, which he insisted should be made upon England, would wreck the prospect of a speedy and honourable adjustment with that country, cannot be determined. In any case it was a cruel blow to a man already broken by racking illness and domestic sorrows. Sumner's last years were further saddened by the misconstruction put upon one of his most magnanimous acts. In 1872 he introduced in the Senate a resolution providing that the names of

battles with fellow citizens should not be placed on the regimental colours of the United States. The Massachusetts legislature denounced this battle-flag resolution as ” an insu’t to the loyal soldiery of the nation ” and as ” meeting the unqualified con- demnation of the people of the Commonwealth.” For more than a year all efforts— headed by the poet Whittier — to rescind that censure were without avail, but early in 1874 it was annulled. On the 10th of March, against the advice of his physician, Sumner went to the Senate — it was the day on which his colleague was to present the rescinding resolution. With those grateful words of vindication from Massachusetts in his ears Charles Sumner left the Senate chamber for the last time. That night he was stricken with an acute attack of angina pectoris, and on the following day he died.

Sumner was the scholar in politics. He could never be in- duced to suit his action to the political expediency of the moment. ” The slave of principles, I call no party master,” was the proud avowal with which he began his service in the Senate. For the tasks of Reconstruction he showed little aptitude. He was less a builder than a prophet. His was the first clear programme proposed in Congress for the reform of the civil service. It was his dauntless courage in denouncing compromise, in demanding the repeal of the Fugitive Slave Act, and in. insisting upon emancipation, that made him the chief initiating force in the struggle that put an end to slavery.

See Sumner’s Works (15 vols., Boston, 1870-188,5), and Edward L. Pierce’s Memoir and Letters of Charles Sumner (4 vols.,. Boston, 1877-1893). Briefer biographies have been written by Anna L. Dawes (New York, 1892); Moorfield Storey (Boston, 1900); and George H. Haynes (Philadelphia, 1909).

SUMNER, CHARLES RICHARD (1790-1874), English bishop, was born at Kenilworth on the 22nd of November 179c, and was educated at Eton and at Trinity College, Cambridge. He graduated B.A. in 1814, M.A. in 1817, and was ordained deacon

and priest. In the two winters of 1814-1816 he ministered to the English congregation at Geneva, and from 1816 to 1821 was curate of Highclere, Hampshire. In 1820 George IV. wished to appoint him canon of Windsor, but the prime minister, Lord Liverpool, objected; Sumner received instead a royal chaplaincy and librarianship, and

other preferments quickly followed, till in 1826 he was consecrated bishop of Llandaff and in 1827 bishop of Winchester. In his long administration of his latter diocese he was most energetic, tactful and munificent. Though evangelical in his views he by no means confined his patronage to that school. Ih 1869 he resigned his see, but continued to live at the official residence at Farnham until his death on the 15th of August 1874. He published a number of charges and sermons, and The Ministerial Character of Christ Practically Considered (London, 1824). He also edited and translated John Milton's De doctrina Christiana, which was found in the State Paper office in 1823, and formed the text of Macaulay's famous essay on Milton.

See the Life, by his son, G. H. Sumner (1876).

SUMNER, EDWIN VOSE (1707-1863)* American soldier, was born at Boston, Massachusetts, and entered the United States army in 181 9. He served in the Black Hawk War and in various Indian campaigns. In 1838 he commanded the cavalry instructional establishment at Carlisle, Pennsylvania. He took part in the Mexican War as a major, and for his bravery at Molino del Rey he received the brevet rank of colonel. In 1857 he commanded an expedition against the Cheyenne Indians. At the outbreak of the Civil War, four years later, Sumner had just been promoted brigadier-general U.S.A. and sent to replace Sidney Johnston in command on the Pacific coast. He thus took no part in the first campaign of the Civil War. But in the autumn he was brought back to the East to command a division, and soon afterwards, as a major-general U.S.V., a corps in the army that was being organized by McClellan. This corps, numbered II., retained its independent existence throughout the war, and under the command of Sumner, Couch, Han- cock and Humphreys it had the deserved reputation of being the best in the Union army. Sumner, who was by far the oldest of the generals in the army of the Potomac, led his corps through- out the peninsular campaign, was wounded during the Seven Days' Battle, and received the brevet of major-general U.S.A., and was again wounded in the battle of Antietam. When Burnside succeeded to the command of the army of the Potomac he grouped the corps in " grand divisions," and appointed Sumner to command the right grand division. In this capacity the old cavalry soldier took part in the disastrous battle of Fredericksburg, in which the II. corps suffered most severely. Soon afterwards, on Hooker's appointment to command the army, Sumner was relieved at his own request. He died suddenly, on the 21st of March 1863, while on his way to assume supreme command in Missouri.

SUMNER, JOHN BIRD (1780-1862), English archbishop, elder brother of Bishop Charles Sumner, was born at Kenilworth, Warwickshire, and educated at Eton and Cambridge. In 1802 he became a master at Eton, and in the following year he took orders. He was elected a fellow of Eton in 181 7, and in 1818 the college presented him to the living of Maple Durham, Oxfordshire. After holding a prebendaryship of Durham for some years, he was consecrated bishop of Chester in 1828. During his episcopate many churches and schools were built in the diocese. His numerous writings were much esteemed, especially by the evangelical party, to which he belonged; the best known are his Treatise on the Records of Creation and the Moral Attributes of the Creator (London, 1816) and The Evidence of Christianity derived from its Nature and Reception (London, 1821). In 1848 he was consecrated archbishop of Canterbury, in which capacity he dealt impartially with the different church parties. In the well-known “Gorham case” 1 he came into

1 George Cornelius Gorham (1787-1857) was refused institution by Bishop Phillpotts because of his Calvinistic views on baptismal regeneration. The court of arches upheld the bishop, but its decision was reversed by the privy council.

conflict with Bishop Henry Phillpotts of Exeter (1778-1869), who accused him of supporting heresy and refused to com- municate with him. He supported the Divorce Bill in parlia- ment, but opposed the Deceased Wife’s Sister Bill and the bill for removing Jewish disabilities.

SUMNER, WILLIAM GRAHAM (1840-1910), American economist, was born, of English parentage, in Paterson, New Jersey, on the 30th of October 1840. He was brought up in Hartford, Connecticut, graduated at Yale College in 1863, studied French and Hebrew in Geneva in 1863-1864 and divinity and history at Gottingen in 1864-1866, and in 1866-1869 was a tutor at Yale. He was ordained a priest of the Protestant Episcopal Church in 1869, was assistant rector of Calvary Church, New York City, and in 1870-1872 was rector of the Church of the Redeemer, Morristown, New Jersey. From 1872 to 1909, when he became professor emeritus, he was professor of political and social science at Yale. In 1909 he was president of ths American Sociological Society. He died at Englewood, New Jersey, on the 12th of April 1910.

He was notable especially as an opponent of protectionism, and was a great teacher. He wrote: History of American Currency (1874); Lectures on the History of Protection in the United States (1875); Life of Andrew Jackson (1882), in the ” American Statesmen Series”; What

Social Classes Owe to Each Other (1883); Collected Essays in Political and Social Sciences (1885); Protectionism (1885); Alexander Hamilton (1891), and Robert Morris (1891), in the ” Makers of America Series”; The Financier and Finances of the American Revolution (2 vols., 1891); A History of Banking in the United States (1896); and Folkways: a Study of the Sociological Importance of Usages, Manners, Customs, Mores and Morals (1907), a valuable sociological summary.

SUMPTER, a pack-horse or mule, a beast for carrying burdens, particularly for military purposes. There were two words once in use, which in sense, if not in form, have coalesced. These are ” sommer ” or ” summer ” and ” sumpter.” The first comes through the Old French sommier, a pack-horse, the other through sommetier, a pack-horse driver. Both come ultimately from Late Lat. salma, from sagma, a pack, burden, Old French somtne, saume; Greek cayfia, burden, aarTuv, to load. ” Sumpter ” in the sense of a driver of a pack-horse is rare, and the word is always joined with another explanatory word.

SUMPTUARY LAWS (from Lat. sumptuarius, belonging to cost or expense, sumptus) , those laws intended to limit or regulate the private expenditure of the citizens of a community. They may be dictated by political, or economic, or moral con- siderations. They have existed both in ancient and in modern states. In Greece, it was amongst the Dorian races, whose temper was austere and rigid, that they most prevailed. All the inhabitants of Laconia were forbidden to attend drinking entertainments, nor could a Lacedaemonian possess a house or furniture which was the work of more elaborate implements than the axe and saw. Among the Spartans proper simple and frugal habits of life were secured rather by the institution of the pheiditia (public meals) than by special enactments. The possession of gold or silver was interdicted to the citizens of Sparta, and the use of iron money alone was permitted by the Lycurgean legislation. ” Even in the cities which had early departed from the Doric customs,” says K. O. Mtiller, ” there were frequent and strict prohibitions against expensiveness of female attire, prostitutes alone being wisely excepted.” In the Locrian code of Zaleucus citizens were forbidden to drink undiluted wine. The Solonian sumptuary enactments were directed principally against the extravagance of female apparel and dowries of excessive amount; costly banquets also were forbidden, and expensive funeral solemnities. The Pytha- goreans in Magna Graecia not only protested against the luxury of their time but encouraged legislation with a view to restraining it.

At Rome the system of sumptuary edicts and enactments was largely developed, whilst the objects of such legislation were concurrently

sought to be attained through the exercise of the censorial power. The code of the Twelve Tables con- tained provisions limiting the expenditure on funerals. The most important sumptuary laws of the Roman commonwealth are the following: —

(i) The Oppian law, 215 B.C., provided that no woman should possess more than half an ounce of gold, or wear a dress of different colours, or ride in a carriage in the city or within a mile of it except on occasions of public religious ceremonies. This law, which had been partly dictated by the financial necessities of the conflict with Hannibal, was repealed twenty years later, against the advice of Cato. Livy (xxxiv. 1-8) gives an interesting account of the com- motion excited by the proposal of the repeal, and of the exertions of the Roman women against the law, which almost amounted to a female emeute. (2) The Orchian law, 187 B.C., limited the number of guests at entertainments. An attempt being made to repeal this law, Cato offered strong opposition and delivered a speech on the subject, of which some fragments have been preserved. (3) The Fannian law, 161 B.C., limited the sums to be spent on enter- tainments; it provided amongst other things that no fowl should be served but a single hen, and that not fattened. (4) The Didian law, 143 B.C., extended to the whole of Italy the provisions of the Fannian law, and made the guests as well as the givers of entertain- ments at which the law was violated liable to the penalties. After a considerable interval, Sulla anew directed legislation against the luxury of the table and also limited the cost of funerals and of sepulchral monuments. We are told that he violated his own law as to funerals when burying his wife Metella, and also his law on entertainments when seeking to forget his grief for her loss in extravagant drinking and feasting (Plut. Suit. 35). Julius Caesar, in the capacity of praefectus moribus, after the African War re-enacted some of the sumptuary laws which had fallen into neglect; Cicero implies (Ep. ad Att. xiii. 7) that in Caesar's absence his legis- lation of this kind was not attended to. Suetonius tells us that Caesar had officers stationed in the market-places to seize such provisions as were forbidden by law, and sent lictors and soldiers to feasts to remove all illegal eatables (Jul. 43). Augustus fixed anew the expense to be incurred in entertainments on ordinary and festal days. Tiberius also sought to check inordinate expense on banquets, and a decree of the senate was passed in his reign forbid- ding the use of gold vases except in sacred rites, and prohibiting the wearing of silk garments by men. But it appears from Tacitus (Ann. lii. 5, where a speech is put

into his mouth very much in the spirit of Horace's" Quid leges sine moribus vanae proficiunt? ") that he looked more to the improvement of manners than to direct legislative action for the restriction of luxury. Suetonius mentions some regulations made by Nero, and we hear of further legislation of this kind by Hadrian and later emperors. In the time of Tertullian the sumptuary laws appear to have been things of the past (Apol. c. vi.).

In modern times the first important sumptuary legislation was: in Italy that of Frederick II.; in Aragon that of James I., in 1234; in France that of Philip IV.; in England that of Edward II. and Edward III. In 1294 Philip IV. made provisions as to the dress and the table expenditure of the several orders of men in his kingdom. Charles V. of France forbade the use of long-pointed shoes, a fashion against which popes and councils had protested in vain. Under later kings the use of gold and silver embroidery, silk stuffs and fine linen wares was restricted — at first moral and afterwards economic motives being put forward, the latter especially from the rise of the mercantile theory. In England we hear much from the writers of the 14th century of the extravagance of dress at that period. They remark both on the great splendour and expensiveness of the apparel of the higher orders and on the fantastic and deforming fashions adopted by persons of all ranks. The parliament held at Westminster in 1363 made laws (37 Edw. III. c. 8-14) to restrain this undue expenditure and to regulate the dress of the several classes of the people. These statutes were repealed in the following year, but similar ones were passed again in the same reign. They seem, however, to have had little effect, for in the reign of Richard II. the same excesses prevailed, apparently in a still greater degree. Another statute was passed in the year 1463 (3 Edw. IV. c. 5) for the regulation of the dress of persons of all ranks. In this it was stated that " the commons of the realm, as well men as women, wear excessive and inordi- nate apparel to the great displeasure of God, the enriching of strange realms, and the destruction of this realm." An act of 1444 had previously regulated the clothing, when it formed part of the wages, of servants employed in husbandry: a bailiff or overseer was to have an allowante of 5s. a year for his clothing, a hind or principal servant 4s., and an ordinary servant 3s. 4d. — sums equivalent respectively to 50s., 40s. and 33s. 4d. of our money (Henry). Already in the reign of Edward II. a proclama- tion had been issued against the " outrageous and excessive

multitude of meats and dishes which the great men of the king- dom had used, and still used, in their castles," as well as " per- sons of inferior rank imitating their example, beyond what their stations required and their circumstances could afford "; and the rule was laid

down that the great men should have but two courses of flesh meat served up to their tables, and on fish days two courses of fish, each course consisting of but two kinds. In 1336 Edward III. attempted also to legislate against luxurious living, and in 1363, at the same time when costumes were regulated, it was enacted that the servants of gentlemen, merchants and artificers should have only one meal of flesh or fish in the day, and that their other food should consist of milk, butter and cheese. Similar acts to those above mentioned were passed in Scotland also. In 1433 (temp. James I.), by an act of a parliament which sat at Perth, the manner of living of all orders in Scotland was prescribed, and in particular the use of pies and baked meats, which had been only lately introduced into the country, was forbidden to all under the rank of baron. In 1457 (temp. James II.) an act was passed against ” sumptuous cleithing.” A Scottish sumptuary law of 1621 was the last of the kind in Great Britain.

In Japan sumptuary laws have been passed with a frequency and minuteness of scope such as has no parallel in the history of the western world. At the beginning of the nth century we find an Imperial edict regulating the size of a house and even imposing restrictions as to the materials of which it is to be built. But it was during the Tokugawa period that sumptuary laws and regulations were passed in the most bewildering profusion; every detail of a man’s life was regulated down to the least particular — from the wearing of a beard or the dressing of the hair down to the cost of his wife’s hairpins or the price of his child’s doll. 1

A. Ferguson and others have pointed out that ” luxury ” is a term of relative import and that all luxuries do not deserve to be dis- couraged. Roscher has called attention to the fact that the nature of the prevalent luxury changes with the stage of social develop- ment. He endeavours to show that there are three periods in the history of luxury — one in which it is coarse and profuse; a second in which it aims mainly at comfort and elegance; and a third, proper to periods of decadence, in which it is perverted to vicious and unnatural ends. The second of these began, in modern times, with the emergence of the Western nations from the medieval period, and in the ancient communities at epochs of similar transi- tion. Roscher holds that the sumptuary legislation which regularly appears at the opening of this stage was then useful as promoting the reformation of habits. He remarks that the contemporary formation of strong governments, disposed from the consciousness of their strength to interfere with the lives of their subjects, tended to encourage such legislation, as did also the jealousy felt by the hitherto dominant ranks of the rising wealth of the citizen classes, who are apt to imitate the conduct of their

superiors. It is certainly desirable that habits of wasteful expenditure and frequent and wanton changes of fashion should be discouraged. But such action belongs more properly to the spiritual than to the temporal rjower. In ancient, especially Roman, life, when there was a confusion of the two powers in the state system, sumptuary legislation was more natural than in the modern world, in which those powers have been in general really, though imperfectly, separated. Political econo- mists are practically unanimous in their reprobation of the policy of legislative compulsion in these matters. In a well-known passage Adam Smith protests against the ” impertinence and presumption of kings and ministers in pretending to watch over the economy of private people and to restrain their expense, being themselves always and without any exception the greatest spendthrifts in the society.” Yet he does not seem to have been averse from all attempts to influ- ence through taxation the expenditure of the humbler classes. The modern taxes on carriages, coats of arms, male servants, playing cards, &c, ought perhaps not to be regarded as resting on the principle of sumptuary laws, but only as means of proportioning taxation to the capacity of bearing the burden.

The loci classici on Roman sumptuary laws are Gellius, Nocks atticae, ii. 24, and Macrobius, Saturn, iii. 17. For Great Britain see Henry of Huntingdon, Historia Anglorum (” Rolls Series,” ed. T. Arnold, 1879); W. Cunningham, Growth of English Industry and

1 See Captain F. Brinkley’s Japan, its History, Arts and Litera- ture (1904), i. 138, 205, 140-144, ii. 98, 99, iv. 157-162; Trans. of the Asiatic Soc. of Japan, vol. xix., ” Notes on Land Tenure and Local Institutions in Old Japan,” ed. by Professor J.H.Wigmore;

Commerce; W. J. Ashley, introduction to English Economic History and Theory (1893) ; W. Denton, England in the Fifteenth Century (1888). One of the best extant. treatments of the whole subject is that by Roscher, in his essay, Ober den Luxus, republished in his Ansichten der Volkswirthschaft auf dent eeschichtlichen Slandpunkte (3rd ed., 1878). (J. K. I.)

SUMTER, THOMAS (1736-1832), American soldier, was born in Hanover county, Virginia, on the 14th of July 1736. He served in the Virginia militia during the French and Indian War and was present at Braddock’s defeat (1755). Some time after 1762 he removed to South

Carolina. He is best known for his service during the War of Independence, but he saw little active service until after the fall of Charleston in May 1780. In July 1780 he became a brigadier-general of state troops. During the remainder of the war he carried on a partisan cam- paign, and earned the sobriquet of the ” Gamecock.” He failed in an attack upon Rocky Mount (Chester county) on the 1st of August 1780, but on the 6th defeated 500 Loyalists and regulars at Hanging Rock (Lancaster county), and on the 15th inter- cepted and defeated a convoy with stores between Charleston and Camden. His own regiment, however, was almost annihilated by Lieut. -Colonel Banastre Tarleton (1754-1833) at Fishing Creek (Chester county) on the 18th. A new force was soon recruited, with which he defeated Major James Wemys at Fishdam (Union county) on the night of the 8th-oth of Novem- ber, and repulsed Tarleton’s attack at Blackstock (Union county) on the 20th, when he was wounded. In January 1781 Congress formally thanked him for his services. He was a member of the state convention which ratified the Federal constitution for South Carolina in 1788, he himself opposing that instrument; of the national House of Representatives in 1780-1793 and again in 1797-1801, and of the United States Senate from 1801 to 1810. At the time of his death at South Mount, South Carolina, on the 1 st of June 1832, he was the last surviving general officer of the War of Independence.

See Edward McCrady, The History of South Carolina in the Revolu- tion (2 vols., New York, 1901-1902).

SUMTER, a city and the county-seat of Sumter county, South Carolina, U.S.A., 42 m. by rail E. by S. of Columbia. Pop. (1900) 5673 (3160 negroes); (1910) 8109. Sumter is served by several divisions of the Atlantic Coast line and by the Southern railways. It is the seat of St Joseph’s Academy (Roman Catholic) for girls. The region produces tobacco, vegetables and cotton, and there are various manufactories in the city. Sumter was founded in 1800 and was named in honour of General Thomas Sumter; it was first chartered as a city in 1887.

SUMY, a town of Little Russia, in the government of Kharkov, 122 m. by rail N.W. of the city of Kharkov, founded in 1658. Pop. (1900), 28,519. It is an important centre for the trade of Great Russia with Little Russia — cattle and corn being sent to the north in exchange for manufactured and grocery wares. It has important sugar manufacture, and a technical school.

SUN (O. Eng. sunnc, Ger. sonne. Fr. soleil, Lat. sol, Gr. »}\ios, from which comes helio- in various English compounds), the name of the central body of the solar system, the luminous orb from which the

earth receives light and heat; (see Sunshine); hence by analogy other heavenly bodies which form the centre of systems are called suns.

To understand the phenomena of the sun, we should reproduce them upon the earth; but this is clearly impossible since they take place at temperatures which volatilize all known substances. Hence our only guides are such general laws of mechanics and physics as we can hardly believe any circumstances will falsify. But it must be remembered that these require extrapolation from experience sometimes sufficiently remote, and it is possible they may lead to statements that are obscure, if not contra- dictory. The body of the sun must consist of uncombined gases; at the surface the temperature is some 2000° C. above the boiling point of carbon, and a little way within the body it may probably exceed the critical point at which increase of pressure can produce the liquid state in any substance. But as the mean density

exceeds that of water, and probably falls but little from the centre to the surface, these gases are gases only in the sense that if the pressure of neighbouring and outward parts gravitating to- wards the centre were relaxed, they would expand explosively, as we see happening in the eruptive prominences. They have lost completely the gaseous characteristic of producing a line spectrum, and radiate like incandescent solids. The surface region which yields a continuous spectrum is called the photo- sphere; it possesses optically a sharp boundary, which is gener- ally a perfect sphere, but shows occasionally at the rim slight depressions or more rarely elevations. Enclosing the photo- sphere is a truly gaseous envelope which is called the chromo- sphere, and which shows a spectrum of bright lines when we can isolate its emission from that of the photosphere. This envelope is also sharply defined, but its normal appearance is compared to the serrations which blades of grass show on the skyline of a hill, and it is disturbed by the outbursts, called prominences, of which details are given below. Outside this again is an envelope of matter of enormous extent and extreme tenuity, whether gaseous or partly minute liquid or solid drops, which is called the corona. It has no sharp boundary, its brightness diminishes rapidly as we recede from the limb, and such structure as it .shows consists of long streaks or filaments extending outwards from the limb in broad curved sweeps. Finally there is the envelope of still vaster extent and of unknown constitution which gives the zodiacal light (q.v.); its greatest extent is along the ecliptic, but it can also be certainly traced for 35 in a perpen- dicular direction. The lower gaseous cloaks absorb a large part of the light admitted by the photosphere, and especially at the limb and for the more refrangible rays the loss of intensity is very

marked.

In the instants when a sharp image of the photosphere is seen or photographed, it shows a granulated appearance like white flakes strewed fairly evenly upon a dark ground. The figs. 1, 2, 3, 4 (plate) show enlargements from photo- General graphs by Hansky at Pulkowa (June 25, 1905); Appearance they are separated by intervals from 25 to 80 of Photo- seconds, and he has succeeded in showing identity sp ere ‘ in many of the granules, or more properly, clouds represented. Thus they exhibit at once general appearance and its changes. The diameters range from 400 m. or less up to 1200 m., and the speeds relative to the spot range up to 2 or 3 m. per second. M. Hansky believes these motions may be the consequences of matter rising from below and thrusting the surface groups aside. Usually the changes are such that it is impossible even to recognize the formations in successive photographs. Besides granulations the sun’s disk shows, as a rule, one or more spots or groups of spots. Each spot shows with more or less completeness a ring-shaped penumbra enclosing a darker umbra; the umbra, which looks black beside the photosphere, is actually about as brilliant as limelight. In the neighbourhood surrounding the penumbra the granules appear to be packed more closely, forming brilliant patches called faculae. In the shape of a spot there is neither rule nor permanence, though those that are nearly circular seem to resist change better than the others. They arise from combinations of smaller spots, or from nothing, in a short period, say a day. They are never wholly quiescent. Bridges, more brilliant than the rest of the photosphere, form across them, and they may divide into two parts which separate from one another with great velocity. The largest spots are easily seen by the naked eye, if the brilliancy of the disk is veiled; the umbra may be many — ten or more — diameters of the earth in breadth. The length of their life is difficult to assign, because there is some tendency for a new group to arise where an old one has disappeared; but one is recorded which appeared in the same place for eighteen months; the average is perhaps two months. They are carried across the disk by the sun’s rotation, partaking in the equatorial acceleration; they also show marked dis- placements of their own, whether with, or relative to, the neigh- bouring photosphere does not appear; at the beginning of their life they usually outrun the average daily rotation appropriate to their latitude. Spots are rarely found on the equator, or

more than .3,5° N. or S. of it, and at 43 are practically unknown. Their occurrence within these zones follows statisti- cally a uniform law (see Aurora). Other information about the spots is given below, in connexion with their spectra. It may be said that nothing definite has .been established as to what they are. The statement known as A. Wilson's- theory (1774), that they, are hollows in the photosphereˆ long supposed to be proved by perspective effects as the spot approached the limb, is discredited by F. Howlett's careful drawings, which, however, do not establish the contrary. To draw a trustworthy conclusion it is necessary that the ,spot should be quiescent, show a well-developed and fairly symmetrical penumbra, and be observed near the limb and also near the centre, and these conditions are satisfied in so few cases as to withdraw all statistical force from the conclusion. Figs. 5, 6, , 7, 8 (plate) are reproductions of the Greenwich photographs of the sun from the 30th of January to the 8th of February 1905. The first, taken alone, might seem to bear out Wilson's theory, but the others show that the penumbra is really very unsymmetrical and much broader on the side towards the limb, apart from anything which perspective may have to say. The photosphere does not rotate in one piece, lower latitudes outrunning higher. This was discovered by R. C. Carrington from observations of the spots, extending from 1853 Rotation of to 186 1, from which he determined also the position the Photo- of the sun's axis. But conclusions from the spots sphere. are £ u jj f an0 malies. E. W. Maunder and Mrs Maunder found that different spots in the same zone differ more than do the means for different zones, while a long-lived spot settles down to give more consistent results than are furnished by spots of one apparition. In the span of two complete sun- spot periods no evidence was found of periodic or other change with lapse of time. The problem still awaits complete discussion. The irregularities incidental to use of the spots are escaped by comparing the relative Doppler displacements of the same spectral line as given by the receding, and advancing limbs of the sun. The observation is a delicate one, and was first success- fully handled by N. C. Duner in 1890. But his determinations, repeated recently {Acta upsal.1V. vol. i., 1907) as well as those of J. Halm at Edinburgh (Ast. Nach. vol. 173, 1907), are super- seded by a photographic treatment of the problem by W. S. Adams {Astrophys. Joum., xxvi., 1907).

The diagram (fig. 9) shows Adams's value for the angular velocity J for different latitudes , the dots representing the actual observa- tions. Fig. 10 shows the consequent distortion qf a set of meridians after one revolution (at lat. 30). Ah important feature added to the discussion by Adams is the different behaviour of spectral lines

720

700

Or 10′ 20* 30″ 40* 50″ 60″ 70″ 80′ 90″ #

Fig. g.

which are believed to originate? at different levels. The data given above refer to the mean reversing layer. Lines of lanthanum and carbon which art believed to belong to a low level showed system- atically smaller angular velocity than the average. This promises to be a fertile field for future inquiry. Pending Wiore conclusive evidence from the . spectroscope, the interpretation of the peculiar surface rotation of the sun appears to :be that, the central parts of the body are rotating ‘ faster than those outside them; for if such were the case the observed phehom’ehon would arise. ‘ For

consider first a frictionless fluid. The equations of surfaces of equal angular motion wopld be of the form r = R (i— c cos 2 0), where « is proportional to the square of the angular motion, supposed small, and R increases as e diminishes. Consider the traces these surfaces cut on any sphere r = a: we have <2e/<20 = 2esinflcos0/{cos 2 — aRˆdR/ dt], which is positive and has a maximum in the middle latitudes; so that, proceeding from the polfe to the equator along any meridian, the angular velocity would continually in- crease, at a rate which was greatest in the middle latitudes. This is exactly what the ob- servations show. Now if this state be supposed established in a frictionless fluid, the con- sideration of internal friction would simply extend the char- acteristics found at any spot to the neighbourhood,, and there- fore if the boundary were a sphere and so for a frictionless fluid an exception, it Would cease to be an exception when we allow for viscosity. But this theory gives no clue to the results relating to hydrogen, which belongs to a high level, and which Adams has shown to move with an angular velocity decidedly greater than the equatorial angular velocity below it, and not to show any sign of falling off towards the poles.

It is useful to form a conception of the mechanical state within the sun’s body. Its temperature must be dominated directly or indirectly by the surface radiation, and since the Mechanical matter is gaseous and so open to redistribution, the State same is true of density and pressure. It is true that Inlemal, y- within the body radiations must be stifled within a short distance of their source; none the less, they will determine a temperature gradient, falling from the centre to the

borders, though for the most part falling very slowly, and we may ask what relative temperatures in different parts would maintain themselves if once established. Stefan's law of radiation ac- cording to the fourth power of the temperature is too difficult to pursue, but if we are content with cognate results we can follow them out mathematically in a hypothetical law of the first power. We then find that the density would increase as we go outwards, at first slowly, but finally with extreme rapidity, the last tenth of the radius comprising half the mass. The radiation from such a body would be practically nil, no matter how hot the centre was. Of course such a state would be statically unstable. It would never get established because currents would arise to exchange the positions of the hotter, less dense, inner parts and the cooler, more dense, outer ones. By this interchange the inner parts would be opened out and the total radiation raised. Since the only cause for these convection currents is the statical instability produced by radiation, and the rapid stifling of radiations within the body produces there a temperature gradient falling very slowly, they would be for the most part extremely slight. Only near the surface would they become violent, and only there would there be a rapid fall of temperature and density. Through the main body these Would remain nearly constant. Indeed it seems that, in the final distribution of density throughout the part which is not subject to violent convection currents, it must increase slightly from the centre outwards, since the currents would cease altogether as soon as a uniform state was restored. In the outer strata a different state must prevail. Rapidly falling temperature must (and visibly does) produce furious motions which wholly outrun mere restoration of statical balance. Portions change places so rapidly and so continually, that we may take it, where any average is reached, the energy is so distributed that there is neither gain nor loss when Such a change occurs^ Thii is the law of connective equilibrium. But in the sun's atmosphere gravitation alone is a misleading guide. Convective equilibrium, which depends upon it, gives far too steep a temperature gradient, for it yields a temperature of 6000° only' 200 m. Within the free surface, whereas the chromosphere is of an average thickness 1 of 5000 m., and attains that temperature only at its base. Probably the factor which thus diminishes the effective

SUN

Plate i.

(.!"> 19»5- June 25

(2) 1905, June 25c!. 4h. 17m. 15s.

(3) 1905. June 25(1. 4h. 17m. 40s.

(4) 1905, June 25d. 4I1. 19m. os.

ENLARGED PHOTOGRAPHS OF THE SOLAR SURFACE. Taken by M. A. Hansky at the Observatory ol Fulkowa . _ (ˆOS. June 25), at intervals from 25s. to 80s.

PlATE IL

SUN

x 905, Jan. 30d. 12I1. 8m. 27s.

1905. Jan. 3id. nh. 17m. 27s.

1905, Feb. 2d. loh. 50m. 28s.

1905, Feb. 8d. 13I1. 3111. 5s.

PHOTOGRAPHS OF THE SUN, TAKEN AT THE ROYAL OBSERVATORY, GREENWICJi. Observer: E. W. Maunder, Instrument, Thompson Photoheliograph. Focal length, 9 ft. Aperture, 9 in.

" The Black Body."

condensing power of gravitation at the sun's borders is the pressure of radiation.

The radiations from the sun must be considered in two parts, corresponding respectively to the continuous spectrum and the line-spectrum. The latter is considered below; it is indicative of the chemical elements frcm which the lines can proceed, and its state at the time of emission; the former is indicative only of the rate of loss of energy from the sun by radiation, and is inwoven with a remark- able group of physical theory and experiment, known as the theory of the black body, or as black radiation. The " black body " is an ideal body with surface so constituted as to reflect no part of any radiations that fall upon it; in the case of such a body Kirchhofl and Balfour Stewart showed that unless energy were to be lost the rate of emission and absorption must be in fixed ratio for each specific wave-length.

The name has no reference to the appearance of the body to the eye ; when emitting energy, its radiations will be of all wave-lengths, and if intense enough will appeal to the eye as luminous between about wave-lengths 7600 and 4000 tenth-metres; this intensity is a question of temperature, and as it is exquisitely inappropriate to speak of the bulk of the solar radiations as black, the writer will speak instead of amorphous radiations from an ideal radiator. The ideal radiator is realized within any closed cavity, the walls of which are maintained at a definite temperature. The space within is filled with radiations corresponding to this temperature, and these attain a certain equilibrium which permits the energy of radiation to be spoken of as a whole, as a scalar quantity, without express reference to the propagation or interference of the waves of which it is composed. It is then found both by experiment and by thermo- dynamic theory that in these amorphous radiations there is for each temperature a definite distribution of the energy over the spectrum according to a law which may be expressed by s 4 > (0X)dX, between the wave-lengths X, X + dX; and as to the form of the function , Planck has shown (Sitzungsber. Berlin Akod.

544) that an intelligible theory can be given which leads to the form (j > (ff \) = Cil\exp(c 2 /)iB) — 1}, a form which agrees in a satisfactory way with all the experi- ments. Fig. n shows the resulting distribution of energy. The enclosed area for each temperature represents the total emission of energy for that tem- perature, the abscissae are the wave- lengths, and the ordinates the corre- sponding intensities of emission for that wave-length. It will be seen that the maximum ordinates lie upon the curve A0 = constant dotted in the figure, and so, as the temperature of the ideal body rises, the wave-length of most intense radiation shifts from the infra-red ˆ towards the luminous part of the spectrum. When we speak of the sun's radiation as a whole, it is assumed that it is of the character of the radiations from an ideal radiator at an appropriate temperature. 1

The first adequate determination of the character as well as amount of solar radiation was made by S. P. Langley in 1893 at Mount Whitney in California (14,000 ft.), with the bolometer, an exceedingly sensitive instrument which he in-

vented, and which enabled him to feel his way Constant, thermally over the whole spectrum, noting all the

chief Fraunhofer lines and bands, which were shown by sharp serrations, or more prolonged depressions of the curve which gave the emissions, and discovering the lines and bands of the invisible ultra-red portion. The holograph thus obtained must be cleared of the absorption of the earth's atmosphere, and that of the transmitting apparatus — a spectro- scope and siderostat. The first in itself requires an elaborate study. The first essential is an elevated observatory; the next is a long series of holographs taken at different times of the year and of the day, to examine the effect of interposing different thicknesses of air and its variation in transparency (chiefly due to water vapour). It is found that atmospheric absorption is generally greater in summer than in winter, a difference of 20% being found between March and August; morning hours show a rapid and often irregular increase of transparency, culminating shortly after noon, after which the diminution is slow and comparatively regular.

The resulting allowances and conclusion are illustrated in fig. 12,

Fig. 11.

taken from an article by Langley in the Astrophysical Journal (1903)* xvii. 2. The integrated emission of energy is given by the area of the outer smoothed curve (4), and the conclusion from this one holograph is that the " solar constant " is 2-54 calories. The meaning of this statement is that, arguing away the earth's atmo- sphere, which wastes about one-half what

is received, a square

(From flslrophysical Journal, xvii. 2, by permission; of the University of Chicago Press.)

Fig. 12.

centimetre, exposed perpendicularly to the sun's rays, would receive sufficient energy per minute to raise 2-54 grams of water 1° C. Langley's general determination of the constant was greater than this — 3-0 to 3-5 calories; more recently C. G. Abbot at Mount Wilson, with instruments and methods in which Langley's expe- rience is embodied, has reduced it greatly, having proved that one of Langley's corrections was erroneously applied. The results vary between 1-89 and 2-22, and the variation appears to be solar, not terrestrial. Taking the value at 2-1 the earth is therefore receiving energy at the rate of 1-47 kilowatts per square metre, or 1-70 horse-power per square yard. The corresponding intensity at the sun's surface is 4-62 Xio 4 as great, or 6-79 Xio 4 kilowatts per square metre = 7-88X10 horse-power per square yard — enough to melt a thickness of 13-3 metres (=39-6 ft.) of ice, or to vaporize i-8i metres (=5-92 ft.) of water per minute.*

If we assume that the holograph of solar energy is simply a graph of amorphous radiation from an ideal radiator, so that the con- Temnemt stants c u c ?> °f Planck's formula determined terrestrially . . ,, Bre apply to it; the hyperbola of maximum intensity is X0 = esun. 2.(j 2 iXl0 7 ; a nd as the sun's maximum intensity occurs for about X = 4900, we find the absolute temperature to be 5960 abs. If we calculate from the total energy emitted, and not from the position of maximum intensity, the same result is obtained within a few degrees. But to call this the temperature of the sun's surface is a convention, which sets aside some material factors. We may ask first whether the matter of which the surface is composed is such as to give an ideal radiator; it is impossible to answer this, but even if we admit a departure as great as the greatest known terrestrial exception, the estimated temperature is diminished only some 10%. A second question relates to the boundaries. The theory refers to radiation homogeneous at all points within a single closed boundary maintained at uniform temperature; in the actual case we have a double boundary, one the sun's surface, and the other infinitely remote, or say, non-existent, and at zero temperature; and it is assumed that the density of radiation in the free space varies inversely as the squares of the distance from the sun. Though there is no experiment behind this assumption it can hardly lead to error.

A third question is mote difficult. The temperature gradient at the confines of the photosphere must certainly ascend sharply at first. When we say the

sun's temperature is 6000 , of what level are we speaking ? The fact is that radiation is not a superficial phenomenon but a molar one, and Stefan's law, exact though it be, is not an ultimate theory but only a convenient halting-place, and the radiations of two bodies can only be compared by it when their surfaces are similar in a specific way. One characteristic of such surfaces is fixity, which has no trace of parallel in the sun. The confines of the sun are visibly in a state of turmoil, for which a sufficient cause can be assigned in the relative readiness with which the outer portions part with heat to space, and so condensing produce a state of static instability, so that the outer surface of the sun in place of being fixed is continually circulating, portions at high tempera- tures rising rapidly from the depths to positions where they will part rapidly with their heat, and then, whether perceived or not, descending again. It is clear that at least a considerable part of the solar radiations comes from a more or less diffuse atmosphere. With the help of theory and observation the part played by this atmosphere is tolerably precise. Its absorptive effects upon the radiations of the inner photosphere can be readily traced progres- sively from the centre to the rim of the sun's disk, and it has been measured as a whole by Langley, W. E. Wilson and others, and for each separate wave-length by F. W. Very (Astropkys. Journ., vol. xvi.). The entries in the table on following page express the reduction of intensity for different wave-lengths X, when the slit is set at distances 7 X radius from the centre of the disk.

Building upon these results A. Schuster has shown (Astrophys. Journ., vol. xvi.) that, if for the sake of argument the solar atmo- sphere be taken as homogeneous in temperature and quality, forming a sheet which itself radiates as well as absorbs, the radiation which an unshielded ideal radiator at 6ooo° would give is represented well, both in sum and in the distribution of intensity with respect to wave-length, by another ideal radiator— now the actual body of

the sun — at about 6700°, shielded by an atmosphere at an average temperature of 5500 , and that such an atmosphere itself provides about 0-3 of the total radiations that reach us.

In connexion with this subject it may be mentioned that the highest measured temperature produced terrestrially, that of the arc, is about 3500 to 4000 ° abs.

X.

7 = o-5-

7 = o-75-

7 = 0-95-

mm.

1500

0-959

0-950

0-856

IOIO

0-943

0-894

0-765

781

0-941

0-885

o-749

615

0-948

0-845

o-68i

550

o-933

0-831

0-587

468

0-902

0-764

0-462

416

0-858

0-744

0-471

Age of the Sua.

The energy which the sun pours out into space is, so far as we know, and except for the minute fraction intercepted by the disks of the planets (i2(nruOTnr?i) absolutely lost for the pur- poses of further mechanical effect. The amount is such that, supposing the average specific heat of the sun's body as high as that of water, there would result a general fall of temperature of 2-o° to 2-5° C. in the lapse of each year. Hence, if no other agency is invoked, at an epoch say a; X 1000 years ago, the sun's heat would have been greater than now by the factor i--x/3n, where nX6ooo° is taken for the sun's present mean temperature. It seems possible that n is not a large number, and if we take x equal, say, to 200, we come to the most recent estimate — the astronomical — of the date of the earth's glacial epoch, when the sun's radiation was certainly not much more than it is now, while this factor would differ materially from unity. Hence loss does not go on without regeneration, and we are apparently at a stage when there is an approximate balance between them. It is in fact an impossi- bility that loss should go on without regeneration, for if any part of the sun's body loses heat, it will be unable to support the pressure of neighbouring parts upon it; it will therefore be compressed, in a general sense towards the sun's centre, the velocities of its mole- cules will rise, and its temperature will again tend upwards. In consequence of the radiation of heat the whole body will be more condensed than before, but whether it is hotter or colder than before will depend on whether the contraction set up is more or less than enough to restore an exact balance. If we are dealing with com- paratively recent periods there is no evidence of progressive change, but if we go to remote epochs and suppose the sun to have once been diffused in a nebulous state, it is clear that its shrinkage, in spite of radiation, has left it hotter, so that the shrinkage has outrun what would suffice to maintain its radiation. It is equally clear that there is a point

beyond which contraction cannot go, and thereafter, if not before, the body will begin to grow colder. There is thus a turning-point in the life of every star. The movement towards contraction and consequent rise of temperature which radiation sets up, like other motions, overruns the equilibrium- point, only however by a minute amount ; the accumulated excesses from all past time now stored in the sun would maintain its radiations at their present rate for nX3000 years, that is, for a few thousand years only.

There is a superior limit to the quantity of energy which can be derived from contraction. If we suppose the sun's mass once existed in a state of extreme diffusion, the energy yielded by collect- ing it into its present compass would not suffice to maintain its present rate of radiation for more than 17,000,000 years in the past; nor if its mean density were ultimately to rise to eight times its present amount, for more than the same period in the future. This supposes the present density nearly uniform; if it is not uniform, any amount added to the former period is subtracted from the latter. A contraction of 0-2″ or 90 m. in the sun's radius would maintain the present emission for 3500 years. Such a rate of change would be quite insensible, and we can affirm that for recent times there is no reason to look for any other factor than contraction ; but if we consider the remote past it is a different matter. We know nothing quantitatively of the radiations from a nebulous body; and it is quite possible that the loss of radiant energy in this early stage was very small ; but it is at least as certain as any other physical inference that 17,000,000 years ago the earth itself was of its present dimensions, a comparatively old body with sea and living creatures upon it, and it is impossible to believe that the sun's radiations were wholly different ; but, if they were not, they have been maintained from some other source than contraction.

The fall of meteoric matter into the sun must be a certain source of energy; if considerable, this external supply would retard the sun's contraction and so increase its estimated age, but to bring about a reconciliation with geological theory, very nearly the whole amount must be thus supplied. It is easy to calculate that this would be produced by an annual fall of matter equal to one nineteen millionth of the sun's mass, which would make an envelope eight metres thick, at the sun's mean density; this would be collected

during the year from a spherical space extending beyond the orbit of Jupiter. The earth would intercept an amount of it proportional to the solid angle it subtends at the sun; that is to say, it would receive a deposit of meteoric matter about one-tenth of a millimetre, of density say 2, over its whole surface in the course of the year. So far there is nothing impossible in the theory. But there are two fatal objections. The sun is a small target

for a meteorite coming from infinity to hit, and if this considerable quantity reaches its mark, a much greater amount will circulate round the sun in parabolas, and there is no evidence of it where it would certainly make itself felt, in perturbations of the planets. A second objection is that it fails in its purpose, because 20,000,000 years ago it would give a sun quite as much changed as the contraction theory gave. If we examine chemical sources for maintenance of the sun's heat, combustion and other forms of combination are out of the question, because no combinations of different elements are known to exist at a temperature of 6000°. A source which seems plausible, perhaps only because it is less easy to test, is rearrangement of the structure of the elements' atoms. An atom is no longer figured as indivisible, it is made up of more or less complex, and more or less permanent, systems in internal circulation. Now under the law of attraction according to the inverse square of the distance, or any other inverse power beyond the first, the energy of even a single pair of material points is unlimited, if their possible closeness of approach to one another is unlimited. If the sources of energy within the atom can be drawn upon, and the phenomena of radio-activity leave no doubt about this, there is here an incalculable source of heat which takes the cogency out of any other calculation respecting the sources maintaining the sun's radiation. An equivalent statement of the same conclusion may be put thus: supposing a gaseous nebula is destined to condense into a sun, the elementary matter of which it is composed will develop in the process into our known terrestrial and solar elements, parting with energy as it does so.

The continuous spectrum leads to no inference, except that of the temperature of the central globe; but the multitude of dark lines by which it is crossed reveal the elements composing _ cirum ot the truly gaseous cloaks which enclose it. A table of thl Sua these lines is a physical document as exact as it is intricate. The visual portion extends from about w.l.3700 to 7200 . tenth-metres; the ultra-violet begins about 2970, beyond which point our atmosphere is almost perfectly opaque to it; the infra- red can be traced for more than ten times the visual length, but the gaps which indicate absorption-lines have not been mapped beyond 9870. The ultra-violet and the visual portion are re- corded photographically; Rowland's classical work shows some 5700 lines in the former, and 14,200 in the latter, on a graduated scale of intensities from 1000 to o, or 0000, for the faintest lines; between a quarter and a third of these lines have been identified, fully 2000 belonging to iron, and several hundred to water vapour and other atmospheric absorption. The infra-red requires special appliances; it has been examined visually by the help of phosphor- escent plates (Becquerel), and with special photographic plates (Abney); but the most efficient way is to use the bolometer or radiomicrometer; by this means some 500 or 600 lines have been mapped.

The first problem of the spectrum is to identify the effects of atmospheric absorption, especially oxygen, carbonic acid and water vapour; this is done generally by comparing the spectra of the sun at great and small zenith-distances, or by reducing the atmo- spheric effect by observing from a great elevation, as did P. J. C. Janssen from the summit of Mont Blanc, but the only unquestion- able test is to find those lines which are not touched by Doppler effect when the receding and advancing limbs of the sun are compared (Cornu) ; by this method H. F. Newall has verified the presence of cyanogen in the photosphere, and it had previously served to disprove the solar origin of certain oxygen lines. In fact, doubt long surrounded the presence of oxygen in the sun, and was not set at rest until K. D. T. Runge and F. Paschcn in 1896 identified an unmistakable oxygen triplet in the infra-red, which is shown terres- trially only in the vacuum tube, where the spectrum is very different from that of atmospheric absorptions. The absence of lines of the spectrum of any element from the solar spectrum is no proof that the element is absent from the sun; apart from. the possibility that the high temperature and other circumstances may show it trans-formed into some unknown mode, which is perhaps the explanation of the absence of nitrogen, chlorine and other non-metals; if the element is of high atomic weight we should expect it to be found only in the lowest strata of the sun's atmosphere, where its tempera- ture was nearly equal to that of the central globe, and so any absorp- tion line which it showed would be weak. This is undoubtedly the case with lead" and silver, and probably with mercury also. In Rowland's table lines from the arc-spectra of the following are identified. The order is approximately that of the numbers of identified lines. Excepting strontium, those which are low upon the list are represented also by lines of small intensity. The chromo- sphere adds the three last of the list. The strongest lines are those due to calcium, iron, hydrogen, sodium, nickel, in the order named.

SUN

8 9

Iron

Nickel

Titanium

Manganese

Chromium

Cobalt

Carbon

Vanadium

Zirconium

Cerium

Calcium

Scandium

Neodymium

Lanthanum

Yttrium

Niobium

Molybdenum

Palladium

Magnesium

Sodium

Silicon

Hydrogen

Strontium

Barium

Aluminium

Cadmium

Rhodium

Erbium

Zinc

Copper

Silver

Germanium

Glucinum

Tin

Lead

Potassium

Bismuth (?)

Tellurium

Indium

Oxygen

Tungsten

Mercury (?)

Helium

Ytterbium

Europium

The spectrum taken near the limb of the sun shows increased general absorption, but also definite peculiarities of great interest in connexion with the spectra of the spots, which it will be convenient to describe first.

When the slit of the spectroscope is set across a spot, it shows, as might be expected, a general reduction of brightness as we pass from S a-soot tne Photosphere to the penumbra ; and a still greater one

Spectrum.

as we pass to the umbra. This is not a uniform shade

over the whole length of the spectrum, but shows in bands or flutings of greater or less darkness, which in places and at intervals have been resolved by Young, Duner and other unques- tionable observers into hosts of dark lines. Besides this the spectrum shows very many differences from the mean spectrum of the disk, the interpretation of which is at present far

from clear. Generally speaking, the same absorption lines are present, but with altered intensities, which differ from one spot to another. Some lines of certain elements are always seen fainter or thinner than on the photosphere, or even wholly obliterated ; others sometimes show the same features, but not always; other lines of the same elements, perhaps originating at a level above the spot, are not affected ; there are also bright streaks where even theigeneral absorption of the spot is absent, and sometimes such a bright line will, correspond to a dark line on the photosphere; most generally the lines are intensified, generally in breadth, sometimes in darkness, sometimes in both together, sometimes in one at the expense of the other; certain lines not seen in the photosphere show only across the umbra, others cross umbra and penumbra, others reach a short distance over the photosphere. A few of the lines show a double reversal, the dark absorption line being greatly increased in breadth and showing a bright emission line in its centre. The umbra of a spot is generally not tormented by rapid line-of-sight motions; where any motion has been found G. E. Hale and W. S. Adams make its direction down- wards ; but round the rim and on bridges the characteristic distortions due to eruptive prominences are often observed. There appears to be some connexion between prominences and spots; quiescent promi- nences are sometimes found above the spots, and W. M. Mitchell records an eruptive prominence followed next day in the same place by the appearance of a small spot. It does not appear that the affe-ted lines follow in any way the sun-spot cycle. The radiation from a spot changes little as it approaches the sun's limb; in fact Hale and Adams find that the absorption from the limb itself differs from that of the centre of the disk in a manner exactly resembling that from a spot, the same lines being strengthened or weakened in the same way, though in much less degree, with, however, one material exception: if a line is winged in the photosphere the wings are generally increased in the spot, but on the limb they are weakened or obliterated. If the spot spectrum is compared with that of the chromosphere it appears that the lines of most frequent occurrence in the latter are those least affected in the spot, and the high level chromospheric lines not at all ; the natural interpretation is that the spot is below the chromosphere. As to whether the spots are regions of higher or lower temperature than the photosphere, the best qualified judges are reserved or discordant, but recent evidence seems to point very definitely to a lower temperature. Hale and Adams have shown that the spectrum contains, besides a strong line- spectrum of titanium, a faint banded spectrum which is that of titanium oxide, and a second banded part remarked by Newall has been identified by A. L. Fowler as manganese hydride. The band spectrum, which corresponds to the compound or at least to the molecule of titanium, certainly belongs to a lower temperature than the line spectrum of the same metal. Hence above the spots there are vapours of temperature low enough to give the banded spectra of this

refractory metal, while only line spectra of sodium, iron and others fusible at more moderate temperatures are found (see also Spectroheliograph).

The chromosphere, which surrounds the photosphere, is a cloak of gases of an average depth of 5000 m., in a state of luminescence c . _ less intense than that of the photosphere. Hence when

romo- tne p no t OS ph ere i s viewed through it an absorption sp er ‘ spectrum is shown, but when it can be viewed separately

a bright line spectrum appears. Most of the metallic vapours that produce this lie too close to the photosphere for the separation to be made except during eclipses, when a flash spectrum of bright lines chines out for, say, five seconds after the continuous spectrum has disappeared, and again before it reappears (see Eclipse). F. W. Dyson has measured some eight hundred lines in the lower chromo- sphere and identified them with emission spectra of the following

elements: hydrogen, helium, carbon with the cyanogen band- sodium, magnesium, aluminium, silicon, calcium, scandium, tita- nium, vanadium, chromium, manganese, iron, zinc, strontium, yttrium, zirconium, barium, lanthanum, cerium, neodymium, ytterbium, lead, europium, besides a few doubtful identifications; it is a curious fact that the agreement is with the spark spectra of these elements, where the photosphere shows exclusively or more definitely the arc lines, which are generally attributed to a lower temperature. In the higher chromosphere the following were recognized: helium and parhelium, hydrogen, strontium, calcium, iron, chromium, magnesium, scandium and titanium.

In the higher chromosphere on occasions metallic gases are carried up to such a level that without an eclipse a bright line spectrum of many elements may be seen, but it is always possible to see those of hydrogen and helium, and by opening the slit of the spectroscope so as to weaken still further the continuous spectrum from the photosphere (now a mere reflection) the actual forms of the gaseous structures called prominences round the sun’s rim may be. seen. In the visual spectrum there are four hydrogen lines and one helium line in which the actual shapes may be examined. The features seen differ according to the line used, as the circumstances prevailing at different levels of the chromosphere call out one line or another with greater intensity. The helium formations do not reach the sun’s limb, and it is another puzzling detail that the spectrum of the disk shows no absorption line of anything like an intensity to correspond with the emission line of helium in the chromosphere. The promi nences are of two kinds, quiescent and eruptive. Some of the former are to be seen at the limb on most occasions ; they may hang for days about the same place; they reach

altitudes of which the average is perhaps 20,000 m., and show the spectral lines of hydrogen and helium. Sometimes they float above the surface, sometimes they are connected with it by stems or branches, and they show delicate striated detail like cirrus cloud. The eruptive prominences, called also metallic, because it is they which show at their bases a complete bright line spectrum of the metallic elements, rush upwards at speeds which it is difficult to associate with transfers of matter; the velocity often exceeds 100 m. a second; W. M. Mitchell watched one rise at 250 m. a second to the height of 70,000 m., and in five minutes after it had faded away and the region was quiet. This is remarkable only in point of velocity. Much greater heights occur. Young records one which reached an elevation of 350,000 m., or more than three-quarters of the sun's radius. Since identification of spectral lines is a matter of extreme refinement, any cause which may displace lines from their normal places, or otherwise change their features, must be examined scrupulously. We have seen above numerous applications of the Doppler effect. Two other causes of displacement call for mention in their bearing on the solar spectrum — pressure and anomalous dispersion. The pressure which produces a continuous spectrum in gases at a temperature of 6000 must be very great. Recent experiments on arc spectra at pressures up to 100 atmospheres by W. J. Humphreys and by W. C. Duffield show several suggestive peculiarities, though their bearing on solar phenomena is not yet determined. The lines are broadened (as was already known), the intensity of .emission is much increased, but some are weakened and some strengthened, nor is the amount of broadening the same for all lines, nor is it always symmetrical, being sometimes greater on the red side; but besides the effect of unsymmetrical broadening, every line is displaced towards the red ; different lines again behave differently, and they may be arranged somewhat roughly in a few groups according to their behaviour; reversals are also effected, and the reversed line does not always correspond with the most intense part of the emission line. For example, in the iron spectrum three groups about wave-length 4500 are found by Duffield to be displaced respectively 0-17, 0-34, o-66 tenth-metres, at 100 atmospheres. This shift towards the red J. Larmor suggests is due to relaxation of the spring of the sur- rounding ether by reason of the crowding of the molecules; a shift of 0-17 tenth-metres would, if interpreted by Doppler's principle, have been read as a receding velocity of 1 1 km. per second. It is clear that these results may give a simple key to some puzzling anomalies, and on the other hand, they may throw a measure of uncertainty over absolute determinations of line-of-sight velocities.

The possible applications of anomalous dispersion are varied and interesting, and have recently had much attention given to them. W. H. Julius holds that this sole fact robs of objective reality almost all the

features of the sun, Anomalous

Effect of Pressure on Spectral Lines.

including prominences, spots, faculae and flocculi, and

Dispersion.

even the eleven-year period. Though few follow him so far, an ex-planation of the principle will make it clear that there are numerous possible opportunities for anomalous dispersion to qualify inferences from the spectrum. Theoretically anomalous dispersion is insepar- able from absorption. When a system vibrating in a free period of its own encounters, say through the medium of an enveloping aether, a second system having a different free period, and sets it in vibration, the amplitude of the second vibration is inconsiderable, except when the periods approach equality. In such a case the two systems must be regarded as a single more complex one, the absorbed vibration becomes large, though remaining always finite, and the transmitted vibration undergoes a remarkable change in

ˆo

SUN

its period. This is illustrated in fig. 13, where the effect of a single absorbing system upon vibrations of all wave-lengths is shown.

The line ij shows the factor by which the index of refraction of the transmitted vibration is multiplied, and the curve p the intensity of the absorbed vibra- tion for that wave-length. The relative increase of index takes place on the side where the wave- length is greater than that of the absorbing system. The effect of such a change may be to bend rlG. 13. back the coloured ribbon of the

spectrum upon itself, but just where this is done all its light will be robbed to maintain the absorbing system in vibration. Theory is here much less intricace than fact, but it seems to cover the most important features and to be well confirmed. Omitting extreme examples, like fuchsin, where the spectrum is actually cut in two, it is of more general importance to detect the phenomenon in the ordinary absorption lines of the metallic elements. This has been done most completely by L. Puccianti, who measured it by the interferometer in the case of more than a hundred lines of different metals; he found its degree to differ much in different lines of the same spectrum.

Differences of refractive index produce their greatest dispersive effects when

incidence on the refracting surface is nearly tangential. W. H. Julius has used this fact in an admirable experiment to make the effects visible in the case of the D lines of sodium. A burner was constructed which gave a sheet of flame 750 mm. long and I mm. thick and to which sodium could be supplied in measured quantity. Light from an arc lamp was so directed that only that part reached the spectroscope which fell upon the flame of the burner at grazing incidence, and was thereby refracted. As the supply of sodium was increased, the lines, besides becoming broader, did so unsymmetrically, and a shaded wing or band appeared on one side or the other according as the beam impinged on one side or the other of the flame. These bands Julius calls dispersion bands, and then, assuming that a species of tubular structure pre- vails within a large part of the sun (such as the filaments of the corona suggest for that region), he applies the weakening of the light to explain, for instance, the broad dark H and K calcium lines, and the sun-spots, besides many remoter applications. But it should be noted that the bands of his experiment are not due to anomalous dispersion in a strict sense. They are formed now on one side, now on the other, of the absorption line; but the rapid increase of refractive index which accompanies true anomalous dispersion, and might be expected to produce similar bands by scattering the light, appears both from theory and experiment to belong to the side of greater wave-length exclusively. Julius's phenomenon seems inseparable from grazing incidence, and hence any explanation it supplies depends upon his hypothetical tubular structure for layers of equal density. There are other difficulties. In calcium, for instance, the g line shows in the laboratory much stronger anomalous dispersion than H and K; but in the solar spectrum H and K are broad out of all comparison to g. Hale has pointed out other respects in which the explanation fails to fit facts. In connexion with the question whether the phenomena of the sun are actually very different from what they superficially appear, A. Schmidt's theory of the photosphere deserves mention; it explains how the appearance of a sharp boundary might be due to a species of mirage. Consider the rays which meet the eye (at unit distance) at an angle d from the centre of the sun's disk; in their previous passage through the partially translucent por- tions of this body we have the equation sin d = rn sin i (fig. 14). Now generally n will decrease as r increases, but the initial value of 11 is not likeiy to be more than, say, twice its final value of unity, while r increases manifold in the same range, hence in general rji. will increase with r, and therefore for a given Value of d, i will continually increase as we go inwards up to 90 , which it will attain for a certain value of r, and this will be the deepest

Schmidt's Theory of the Photo- sphere,

Fig. 14.

level of the sun's body from which rays will reach the eye at the given angle d. But if there is a region, say from r' to r" throughout which ru decreases as r increases, any ray which cuts the outer envelope r' at an acute angle will cut the inner one r" also, and can be traced still further inwards before the angle i amounts to go°.

The Sun's Distance.

Apart then from absorption there will be a discontinuous change in brightness in the apparent disk at that value of the angular radius d which corresponds to tangential emission from the upper lever r' of this mirage-forming region. Of course we are unable to say whether such a region is an actuality in the sun, on the earth it is an exception and transient, but the greater the dimensions of the body the more probable is its occurrence. The theory can be put to a certain test by considering its implications with respect to colour. The greater jn is, the greater would be the value of d, the apparent angular radius, corresponding to horizontal emission from a given level r, and that whether we accept Schmidt's theory or.not. Hence if the sun's diameter were measured through differently coloured screens, the violet disk must appear greater than the red. Now measures made by Auwers with the Cape heliometer showed no difference, amounting to o-i", and so far negative the idea that the rays reach us after issuing from a level where y. is sensibly differ- ent from unity. Presumably, then, the inner emissions are absorbed and those which reach us start from very near the surface.

The sun's distance is the indispensable link which connects terrestrial measures with all celestial ones, those of the moon alone excepted ; hence the exceptional pains taken to deter- mine it. The transits of Venus of 1874 and 1882 were observed by expeditions trained for the purpose before-hand with every possible foresight, and sent out by the British, French and German governments to occupy suitable stations distributed over the world, but they served only to demonstrate that no high degree of accuracy can ever be expected from this method. It is the atmosphere of Venus that spoils the observation. Whatever be the subsequent method of reduction, the instant is required when, the planet's disk is in internal contact with that of the sun ; but after contact has plainly passed it still remains connected with the sun's rim by a " black drop," with the result that trained observers using similar instruments set up a few feet from one another sometimes differed by half a minute of time in their record. It is little wonder, then, that the several reductions of the collected results were internally discordant so as to leave outstanding a considerable " probable error," but showed themselves able to yield very different conclusions when the same set was discussed by different persons. Thus from the British observations of 1874 Sir G. B. Airy deduced a parallax of 8-76" and E. J. Stone 8-88";

from the French observa- tions of the same date Stone deduced 8-88″ and V. Puiseux 8-91 “. The first really adequate determinations of solar parallax were those of Sir David Gill, measured by inference from the apparent diurnal shift of Mars among the stars as the earth turned diurnally upon its axis; the observations were made at the island of Ascension in 1878. The disk of Mars and his colour are certain disadvantages, and Gill afterwards superseded his own work by treating in the same way the three minor planets Victoria, Iris and Sappho — the last was observed by W. L. Elkin. These planets are more remote than Mars, but that loss is more than outweighed by the fact that they are indistinguishable in appearance from stars. The measures were made with the Cape heliometer and have never been superseded, for the latest results with the minor planet Eros exactly confirm Gill’s result — 8-8o”- — while they decidedly diminish the associated probable error. The planet Eros was discovered in 1899, and proved to have an orbit between the earth and Mars, while every one of the other five or six hundred known asteroids lies between Mars and Jupiter. Its mean distance from the sun is 1-46 times that of the earth; but, besides, the eccentricity of its orbit is large (0-22), so that at the most favourable opportunity it can come within one-seventh of the distance of the sun. This favour- able case is not realized at every opposition, but in 1900 the distance was as little as one-third of that of the sun, and it was observed from October 1900 to January 1901 photographically upon a concerted but not absolutely uniform plan by many observatories, of which the chief were the French national observatories, Greenwich, Cambridge, Washington and Mount Hamilton. The planet showed a stellar disk varying in magnitude from 9 to 12. On some plates the stars were allowed to trail and the planet was followed, in others the reverse procedure was taken ; in either case the planet’s position is measured by referring it to ” comparison stars ” of approximately its own magnitude situated within 25′ to 30′ of the centre of. the plate, while these stars are themselves fixed by measurement from brighter ” reference stars,” the positions of which are found by meridian observations if absolute places are desired. The best results seem to be obtained by comparing an evening’s observations with those of the following morning at the same observatory; the reference can then be made to the same stars and errors in their position are therefore virtually eliminated ; even if the observations of a morning with those of the following evening are used the prob- able error is doubled. The observations at Greenwich thus reduced gave errors ±0-0036″ and ±0-0080″ respectively. The general result is 8-8oo” ±0-0044”.. To collate the whole of the material accu- mulated at different parts of the world is a much more difficult task ; it requires first of all a most carefully constructed star-catalogue ; upon which the further discussion may be built. The discussion was completed in 1909 by A. R. Hinks, and includes the material from some hundreds of plates taken at

twelve observatories; in general it may be said the discussion proves that the material is distinctly

heterogeneous, and that in places where it would hardly be expected. The result is nearly the same as found at Greenwich alone, 8-806″ ±0-0026”, or a mean distance of 92,830,000 m. = l-493Xio u cm. with an error which is as probably below as above 30,000 miles.

The sun’s distance enters into other relations, three of which permit of its determination, viz. the equation of light, the constant of aberration, and the parallactic inequality of the moon; the value of the velocity of propagation of light enters in the reduction of the two first, but as this is better known than the sun’s parallax, no disadvantage results. The equation of light is the time taken by light to traverse the sun’s mean distance from the earth ; it can be found by the acceleration or retardation of the eclipses of Jupiter’s satellites according as Jupiter is approaching opposition or conjunc- tion with the sun; a recent analysis shows that its value is 4986”, which leads to the same value of the parallax as above, but the internal discrepancies of the material put its authority upon a much lower level. The constant of aberration introduces the sun’s distance by a comparison between the velocity of the earth in its orbit and the velocity of light. Its determination is difficult, be- cause it is involved with questions of the changing orientation of the earth’s axis of rotation. S. C. Chandler considers the value 20-52″ is well established; this would give a parallax of 8-78”. The chief term in the lunar longitude which introduces the ratio of the distances of the sun and moon from the earth explicitly is known as the parallactic inequality ; by analysis of the observations P. H. Cowell finds that its coefficient is 124-75”, which according to E. W. Brown’s lunar theory would imply a parallax 8-778”.*

The best discussion of the sun’s apparent diameter has been made by G. F. J. A. Auwers, in connexion with his reduction of the German observations of the transit of Venus of 1874 and 1882. It was found that personality played

Toe Sun’s Dimensions,

“an important part ; the average effect might be I

but frequently it reached 3”, 4”, 5″ or even 10”, with the same

instrument and method, nor was it fixed for the same observer.

Some 15,000 observations, from 1851 to 1883, taken by one hundred observers at Greenwich, Washington, Oxford and NeuchStel, cleared as far as possible of personal equation, showed no sign of change that could with probability be called progressive or periodic, particularly there was no sign of adhesion to the sun-spot period. Better determinations of the actual value came from the heliometer, and gave an angular diameter of 31′ 59-26″ ±0-10”, and the value of the polar diameter exceeded the equatorial by 0-038″ ±0-023”. The conclusion is that the photosphere is very sharply defined and shows no definite departure from a truly spherical shape. Using the parallax 8-8o”, the resulting diameter of the sun is 864,000 m. = 1-390X10″ cm.

If we regard the sun as one of the stars, the first four questions we should seek to answer are its distance from its neighbours,

■*wl. o proper motion, magnitude and spectral type. In some*

7 ne sun us ,. ., .- ,. r ., • • •

_. respects the systematic prosecution of these inquiries has only begun, and properly considered they involve vast researches into the whole stellar system. It would take us too far to treat them at any length, but it may be convenient to summarize some of the results. The sun’s nearest neighbour is

Centauri, which is separated from it by 270,000 times the earth’s distance, a space which it would take light four years to traverse. It is fairly certain that not more than six stars lie within twice this distance. No certain guide has been found to tell which stars are nearest to us; both brightness and large proper motion, though of course increased by proximity, are apparently without systematic average relation to parallax.

The sun's proper motion among the stars has been sought in the past as the assumption that the universe of stars showed as a whole no definite displacement of its parts, and, on this assumption, different methods of reduction which attributed apparent relative displacement of parts to real relative displacement of the sun agreed fairly well in concluding that the "apex of the sun's way " was directed to a point in right ascension 275 , declination + 37° (F. W. Dyson and W. G. Thackeray), that is to say, not far from the star Vega in the constellation Lyra, and was moving thither at a rate of twelve miles per second. But recent researches by J. C. Kapteynand A. S. Eddington, confirmed by Dyson, show that there is better ground for believing that the universe is composed mainly of two streams of stars, the members of each stream actuated by proper motions of the same sense and magnitude on the average, than that the relative motions of the stars with one another are fortuitous (see Star). This removes completely the ground upon which the direction of the sun's way has hitherto been calculated, and leaves the question wholly without answer.

A star is said to rise one unit in magnitude when the logarithm of its brightness diminishes by 0-4. Taking as a star of magnitude

1 a Tauri or a Aquilae, where would the sun stand in this scale ? Several estimates have been made which agree well together; whether direct use is made of known parallaxes, or comparison is made with binaries of well-determined orbits of the same spectral type as the sun, in which therefore it may be assumed there is the same relation between mass and brilliancy (Gore), the result is found that the sun's magnitude is —26-5, or the sun is IO 11 times as brilliant as a first magnitude star; it would follow that the sun viewed from

a Centauri would appear as of magnitude 0-7, and from a star of average distance which has a parallax certainly less than o-l", it would be at least fainter than the fifth magnitude, or, say, upon the border-line for naked-eye visibility. We cannot here do more than refer to the spectral type of the sun. It is virtually identical with a group known as the " yellow stars/' of which the most prominent examples are Capella, Pollux and., Arcturus ; this is not the most numerous group, however ; more than one half of all the stars whose spectra are known belong to a simpler type in which the metallic lines are faint or absent, excepting hydrogen and Sometimes helium, which declare themselves with increased prominence. These are the white stars, and the most prominent examples are Sirius, Vega, and Procyon. It is commonly though not universally held that the difference between the white and yellow stars arises from their stages of development merely, and that the former represent the earlier stage. . This again is disputed, and there is indeed as yet slight material for a decisive statement.

Summary of Numerical Data. Parallax : 8-806″ ± 0-003”. Mean distance from earth: 92,830,000 m. = i-493Xio 13 cm.

(Time taken by light to traverse this distance: 498-6”). Diameter: Angular, at mean distance, 1919-3”.

Linear, iogXearth’s equatorial diameter = 864,000 m -= i-390Xlo u cm. Mass: 332,oooXmass of the earth. Mean density: -2_56Xmean density of earth = i‘4i5. Equator; inclination to ecliptic: 7 15’.

Longitude of ascending node (1908-0), 74 28-6’. Rotation period ; latitude 0° : 24-46 d 30°:26-43

Effective temperature, as an ideal radiator or “black body”; 6000 abs.

Bibliography— Nearly all the chief data respecting the sun have lately been and still are under active revision, so that publications have tended to fall rapidly out of date. The most important series is the Astrophysical Journal, which is indispensable, and in itself almost sufficient ; among other matter it contains all the publications of Mount Wilson Solar Observatory (Professor G. E. Hale), H. A- Rowland’s Tables of Wave-Lengths, many theoretical papers, and some reproductions of important papers issued elsewhere. But there are also papers which cannot be disregarded in Monthly Notices and Memoirs of the Royal Astronomical Society, and in Astronomische Nachrichten. S. P. Langley’s Researches on Solar Heat are published by the War Department (Signal Service, xv.) (Washington, 1884), and Gill’s parallax researches in Cape Annals, vols, vi., vii. Auwer’s discussion of the sun’s diameter is in the discussion of the transit of Venus observations for 1874 and 1882. The best single volume upon the whole subject is C. A. Young’s The Sun, 2nd ed, (Inter. Sci. Series), and an excellent summary of solar spectroscopy, as far as rapid progress permits, isin Frost’s translation of Scheiner, Astronomical . Spectro- scopy (1894). Scheiner’s volume, Strahlung.u. Temperatur d, Sonne (1899), contains a great quantity of interesting matter carefully collected and discussed. For authoritative declarations upon the latest moot points the Transactions of the International tjnion for Solar Research (Manchester) may be consulted, vol. i. having been issued in 1906, and vol. ii. in 1908. (R. A. Sa.)

SUN-BIRD, a name more or less in use for many years, 1 and now generally accepted as that of a group of over 100 species of small birds, but when or by whom it was first applied is un- certain. Those known to the older naturalists were for a long while referred to the genus Certhia (Tree-creeper, q.v.) or some other group, but they are now fully recognized as forming a valid Passerine family Nectariniidae, from the name Nec- tarinia invented in 1881 by Illiger. They inhabit the Ethiopian, Indian, and

Australian regions, 2 and, with some notabte exceptions, the species mostly have but a limited range. They are considered to have their nearest allies in the Meliphagidae (see Honey-eater) and the members of the genus Zosterops;

1 Certainly since 1826 (cf. Stephens, Gen, Zoology, vol. xiv. pt. I, p. 292). W. Swainson (Nat. Hist, and Classif. Birds, i. 145) says they are " so called by the natives of Asia in allusion to their splendid and shining plumage," but gives no hint as to the nation or language wherein the name originated. By the French they have been much longer known as " Souimangas,".from the Madagascar name of one of the species given in 1658 by Flacourt as Soumangha.

2 One species occurs in Baluchistan, which is perhaps outside of the Indian region, but the fact of its being found there may be a reason for including that country within the region, just as the presence of another species in the Jordan valley induces zoographers_ to regard the Ghor as an outlier of the Ethiopian region.

but their relations to the last require further investigation. Some of them are called " humming-birds " by Anglo-Indians and colonists, but with that group, which, as before indicated (see Humming-bird), belongs to the Picariae, the sun-birds, being true Passeres, have nothing to do. Though part of the plumage in many sun-birds gleams with metallic lustre, they owe much of their beauty to feathers which are not lustrous, though almost as vivid, 1 and the most wonderful combination of the brightest colours — scarlet, purple, blue, green and yellow — is often seen in one and the same bird. One group, however, is dull in hue, and but for the presence in some of its members of yellow or flame-coloured precostal tufts, which are very characteristic of the family, might at first sight be thought not to belong here. Graceful in form and active in motion, sun-birds flit from flower to flower, feeding on small insects which are attracted by the nectar and on the nectar itself; but this is usually done while perched and rarely on the wing as is the habit of humming-birds. The extensible tongue, though practically serving the same end in both groups, is essentially different in its quasi-tubular structure, and there is also considerable difference between this organ in the Nectariniidae and the Meliphagidae. 2 The nests of the sun-birds, domed with a penthouse porch, and pensile from the end of a bough or leaf, are very neatly built. The eggs are generally three in number, of a dull white covered with confluent specks of greenish grey.

The Nectariniidae form the subject of a sumptuous Monograph by G. E. Shelley (4to, London, 1876-1880), in the coloured plates of which full justice is done to the varied beauties which these gloriously arrayed little beings display, while almost every available source of information has been consulted and the results embodied. This author divides the family into three sub-families: Neodrepaninae, consisting of a single genus and species peculiar to Madagascar; Nectariniinae, containing 9 genera, one of which, Cinnyns, has more than half the number of species in the whole group; and Arachnc- therinae (sometimes known as " spider-hunters "), with 2 genera including 11 species — all large in size and plain in hue. To these he also adds the genus Promerops, 3 composed of 2 species of South African birds, of very different appearance, whose affinity to the rest can as yet hardly be taken as proved. According to E. L. Layard, the habits of the Cape Promerops, its mode of nidification, and the character of its eggs are verv unlike those of the ordinary Nectari- niidae. In the British Museum Catalogue of Birds (ix. 1-126 and 291) H. J. Gadow has more recently treated of this family, reducing the number of both genera and species, though adding a new genus discovered since the publication of Shelley's work.

(A. N.)

SUN-BITTERN, the Eurypyga helias of ornithology, a bird that has long exercised systematists and one whose proper place can scarcely yet be said to have been determined to everybody's satisfaction.

According to Pallas, who in 1781 gave (N. nordl. Beytrdge, vol.'n. pp. 48-54, pi. 3) a good description and fair figure of it, calling it the " Surinamische Sonnenreyger," Ardea helias, the first author to notice this form was Fermin, whose account of it, under the name of " Sonnenvogel," was published at Amsterdam in 1759 (Descr., &c, de Surinam, ii. 192), but was vague and meagre. In 1772, however, it was satisfactorily figured and described in Rozier's Observations sur la physique, &c. (vol. v. pt. I, p. 212, pi. i),as thePetit paon des roseaux — by which name it was known in French Guiana. 4 A few years later D'Aubenton figured it in his well-known series (PL Enl., p. 782), and then in 1781 came Buffon (H.N., Oiseaux, vol. viii. pp. 169, 170, pi. xiv.), who, calling it " Le Caurla ou petit paon des roses," announced it as hitherto undescribed and placed it among the Rails. In the same year appeared the above-cited paper by Pallas, who, notwithstanding his remote abode, was better informed as to its history than his great contemporary, whose ignorance, real or affected, of his fellow-countryman's priority in the field is inexplic- able; and it must have been by inadvertence that, writing " roses "

for " roseaux," Buffon turned the colonial name from one that had a good

meaning into nonsense. In 1783 Boddaert, equally ignorant of what Pallas had done, called it Scolopax Solaris, 6 and in referring it to that genus he was followed by Latham (Synopsis, iii. 156), by whom it was introduced to English readers as the " Caurale Snipe. ' Thus within a dozen years this bird was referred to three perfectly distinct genera, and in those days genera meant much more than

1 Cf. H. J. Gadow, Proc. Zool. Soc. (1882), pp. 409-421, pis. xxvii. xxviii.

2 Ibid. (1883), pp. 62-69, pi. xvi.

- *According to M. J. Brisson (Orniihologie, ii. 460), this name was the invention of Reaumur. It seems to have become Anglicized.*
- *This figure and description were repeated in the later issue of this work in 1777 (vol. i. pp. 679-781, pi. 1).*

*(From Cambridge Natural History, vol. ix., " Birds. * by permission of Macraillan & Co., Ltd.)*

Fig. 1. — Sun-Bittern (Eurypyga helias).

they do now. Not until 181 1 was it recognized as forming a genus of its own. This was done by Illiger, whose appellation, Eurypyga has been generally accepted.

The sun-bittern is about as big as a small curlew, but with much shorter legs and a rather slender, straight bill. The wings are moderate, broad, and rounded, the tail rather long and broad. The head is black with a white stripe over and. another under each eye, the chin and throat being also white. The rest of the plumage is not to be described in a limited space otherwise than generally, being variegated with black, brown, chestnut, bay, buff, grey and white — so mottled, speckled and belted either in wave like or zigzag forms as somewhat to resemble certain moths. The bay colour forms two conspicu- ous patches on each wing, and also an antepenultimate bar on the tail, behind which is a subterminal band of black. The irides are red; the bill is greenish olive; and the legs are pale yellow. As in the case of most South American birds, very little is recorded of its habits in freedom, except that it fre- quents the muddy and wooded banks of rivers, feeding on small fishes and insects. In captivity it soon becomes tame, and has several times made its nest and reared its young (which, when hatched, are clothed with mottled down: Proc. Zool. Soc, 1866, p. 76, pi. ix. fig. 1) in the Zoological Gardens (London), where examples are generally to be seen and their plaintive piping heard. It ordinarily walks with slow and precise steps, keeping its body in a

horizontal position, but at times, when excited, it will go through a series of fantastic performances, spreading its broad wings and tail so as to display their beauti- ful markings. This species inhabits Guiana and the interior of Brazil; but in Colombia and Central America occurs a larger and somewhat differently coloured form which is known as E. major.

For a long while it seemed as if Eurypyga had no near ally, but on the colonization of New Caledonia by the French, an extremely curious bird was found inhabiting most parts of that island, to which it is peculiar. This the natives called the Kagu, and it is the Rhinochetus jubatus of ornithology. Its original describers, MM. Jules Verreaux and Des Murs, regarded it first as a heron and then as a crane (Rev. et Mag. de Zoologie, i860, pp. 439-441, pi. 21 ; 1862, pp. 142-144); but, on Mr George Bennett sending two live examples to the Zoological Gardens, Mr Bartlett quickly detected in them an affinity to Eurypyga (Proc. Zool. Soc, 1862, pp. 218, 219, pi. xxx.), and in due time anatomical investigation showed him to be right. The kagu, however, would not strike the ordi- nary observer as having much outward resemblance to the sun- bittern, of which it has neither the figure nor posture. It is rather a long-legged bird, about as large as an ordinary fowl, walking quickly

s Possibly he saw in the bird's variegated plumage a resemblance to the painted snipes, Rhynchaea. His specific name shows that he must have known how the Dutch in Surinam called it.

and then standing almost motionless, with bright red bill and legs, large eyes, a full pendent crest, and is generally of a light slate-colour, paler beneath, and obscurely barred on its longer wing-coverts and tail with a darker shade. It is only when it spreads its wings that these are seen to be marked and spotted with white, rust-colour, and

Fig. 2. — Kagu (Rhinochetus jubatus).

black, somewhat after the pattern of those of the sun-bittern. Like that bird, too, the kagu will, in moments of excitement, give up its ordinary placid behaviour and execute a variety of violent gesticu- lations, some of them even of a more extraordinary kind, for it will dance round, holding the tip of its tail or one of its wings in a way that no other bird is known to do. Its habits in its own country were described at some length in 1863 by M. Jouan (Mem. Soc. Sc. Nat. Cherbourg, ix. 97 and 235), and in 1870 by M. Marie (Acles Soc. Linn. Bordeaux, xxvii. 323-326), the last of whom

predicts the speedy extinction of this interesting form, a fate foreboded also by the statement of Messrs Layard (Ibis, 1882, pp. 534, 535) that it has nearly disappeared from the neighbourhood of the more settled and inhabited parts.

The internal and external structure of both these remarkable forms is now fully known and it appears that they, though separable as distinct families, Eurypygidae and Rhinochetidae, must be deemed the relics of very ancient and generalized types more or less related to the Rallidae (see Rail), and Psophiidae (see Trumpeter). It is only to be remarked that the eggs of both Eurypyga and Rhinochetus have a very strong ralline appearance — stronger even than the figures published (Proc. Zool. Soc, 1868, pi. 12) would indicate.

(A. N.)

SUNBURY, a borough and the county seat of Northumber- land county, Pennsylvania, U.S.A., on the Susquehanna river about 53 m. by rail N. by E. of Harrisburg. Pop. (1900), 9810, of whom 197 were foreign-born; (1910 U.S. census) 13,770. It is served by the Pennsylvania, the Northern Central (controlled by the Pennsylvania) and the Philadelphia & Reading railways. Sunbury's principal industry is the manufacture of silk; the Pennsylvania railway has repair shops here. The total value of the borough's factory products increased from $1,868,157 in 1900 to $2,592,829 in 1905, or 38-8%. The borough stands on the site of the old Indian village, Shamokin, which was occupied by Delawares, Senecas and Tutelos, and was long the most prominent Indian village in the province; in 1 747-1755 there was a Moravian mission here. Owing to the strategic importance of the place the provincial government erected Fort Augusta here in 1756; during the War of Independence many of the fugitives from the Wyoming Massacre came to this fort. Sunbury was first surveyed in 1772 and was incorporated as a borough in 1797.

SUNBURY-ON-THAMES, an urban district in the Uxbridge parliamentary division of Middlesex, England, 17 m. S.W. of St Paul's Cathedral, London, on a branch of the London & South Western railway. Pop. (1901), 4544. It is a favourite riverside resort and has grown considerably as a residential district. The church of St Mary, Byzantine in style, dates from 1752. There are pumping works and filtration beds for the water-supply of London. To the north-east is Kempton

Park, the manor-house of which was a royal residence early in the 14th century. The park is famous for its race-meetings, the principal fixture being the Jubilee Handicap; established in 1887. The manor was granted by Edward the Confessor to Westminster Abbey, and passed in the 13th

century to the see of London and in the 16th tc the Crown; but was not so held later than 1603.

SUN COPYING, or Photo Copying, the name given to that branch of photographic contact printing which is carried out without the aid of a camera-made negative. It is now used very extensively for copying documents, especially the plans of architects and engineers.

The earliest discovered process, the ferroprussiate, is still the one most largely used, on account of its economy and per- manence, combined with a simplicity of manipulation that renders it highly suitable for office use; it was invented in 1840 by Sir John Herschel. This method has the disadvantage that the copies are blue in colour, and, as it is a negative process, the black lines of the original become the white lines of the print; the development is by washing in water, so that the important feature of accuracy of scale is lost. The next step of importance was in 1864, when William Willis of Birmingham, the father of the inventor of the platinotype system of photographic printing, invented the aniline process. In this method a paper sensitized with bichromate of potassium is exposed to light, with the document (generally a tracing) in front of it; the un- protected lines are bleached out, but the protected ones remain and are developed by contact with vapour of aniline, a sub- sequent washing for the removal of chemicals completing the print. For twenty years this process was successfully used with little opposition other than that of the blue prints pre- viously referred to, and of the Pellet process, which gave a blue line on a white ground, the inventor being associated throughout with the firm of Vincent Brooks, Day & Son; but since that time a large number of other methods have come into use, some requiring a paper negative in the first instance and some not, but all much aided by improved methods of applying electric light. The earliest of these improved systems utilizing electric light was that invented by Mr B. J. Hall, whose photo-copier consists of two semi-circular glasses forming a cylinder, which may be revolved, and through which an arc lamp travels, while the tracing and sensitized paper are strapped to its outer surface.

Between 1900 and 1908 attention was chiefly directed to overcoming the variation of scale that is inevitable in all Systems that require a final washing in water either for development o>: for the removal of chemicals; and at least four excellent systems have arisen. While Mr F. R. Vandyke was perfecting the system which he patented in 1901 and which has been adopted by the Ordnance Survey Department at Southampton, Messrs Vincent Brooks, Day & Son were working along somewhat similar lines, the outcome of which was their ” True-to-Scale Photo Litho ” system. In both these methods a reversed positive print is secured on zinc, from which copies can be made in printer’s ink of any colour by the usual lithographic

method on almost any material that may be desired. The plates prepared by these methods are so sensitive to light that excellent results can be secured from drawings made even on semi-transparent material such as drawing paper, and of course the plates when made are capable of alteration or addition and can be stored for reprints.

An admirable process had since been invented by MM. Dorel Freres of Paris, which is even more expeditious, and being less in prime cost is more suitable when only a small number of prints is required. In this case a large sheet of thin zinc is coated with chemically-treated gelatin, with the result that when a ferroprussiate print is pressed down on it either with the hand or by a roller the protected lines affect the gelatin in such a way that the parts that have been in contact with them receive a greasy ink while the remainder of the surface reject? it, so that a small number (not generally exceeding six) of very excellent prints can be secured. The inventors refrained from taking out a patent either in France or elsewhere, preferring to

work their invention as a secret process, but the formula appears either to have leaked out or to have been discovered, so that the process is, perhaps with slight variations, used under numerous names. With the aid of the various systems of rotary copiers, by which blue prints of almost any length can be secured, Dorel prints identical in scale with the originals have been made of the length of 22 feet. An interesting kindred process but with well denned variations is known as velography.

For the technical and chemical details of the various methods reference may be made to Ferric and Heliographic Processes by G. E. Brown (Dawbarn & Ward). (F. V. B.)

SUNDA ISLANDS, the collective name of the islands in the Malay Archipelago which extend from the Malay Peninsula to the Moluccas. They are divided into the Great Sunda Islands — i.e. Sumatra, Java, Borneo, Celebes, Banka and Billiton, with their adjacent islands — and the Little Sunda Islands, of which the more important are Bali, Lombok, Sumbawa, Flores, Sumba and Timor.

Sunda Strait is the channel separating Sumatra from Java and uniting the Indian Ocean with the Java Sea. It is 15 m. broad between the south-eastern extremity of Sumatra and the town of Anjer in Java. In the middle is the low-lying well-wooded island of Dwars-in-den-Weg (" right in the

way "), otherwise Middle Island or Sungian. In 1883 Sunda Strait was the scene of the most terrific results of the eruption of Krakatoa (q.v.), a volcanic island further west in the strait.

SUNDARBANS, or Stjndekbtjnds, a tract of waste country in Bengal, India, forming the seaward fringe of the Gangetic delta. It has never been surveyed, nor has the census been extended to it. It stretches for about 165 m., from the mouth of the Hugli to the mouth of the Meghna, and is bordered inland by the three settled districts of the Twenty-four Parganas, Khulna and Backergunje. The total area (including water) is estimated at 6526 sq. m. It is a water-logged jungle, in which tigers and other wild beasts abound. Attempts at reclamation have not been very successful. The forest department realizes a large revenue, chiefly by tolls on produce removed. The characteristic tree is the sundri {Heritiera littoralis), from which the name of the tract has probably been derived. It yields a hard wood, used for building, and for making boats, furniture, &c. The Sundarbans are everywhere intersected by river channels and creeks, some of which afford water communication between Calcutta and the Brahmaputra valley, both for steamers and for native boats.

SUNDAY, or the Lord's Day (tJ tov rfklov •fiyipa, dies solis; fi KvpMKr] fijiipa, dies dominica, dies dominicus x) , in the Chris- tian world, the first day of the week, celebrated in memory of the resurrection of Christ, as the principal day for public worship. An additional reason for the sanctity of the day may have been found in its association with Pentecost or Whitsun. 2 There is no evidence that in the earliest years of Christianity there was any formal observance of Sunday as a day of rest or any general cessation of work. But it seems to have from the first been set apart for worship. Thus according to Acts xx. 7, the disciples in Troas met weekly on the first day of the week for exhortation and the breaking of bread; 1 Cor. xvi. 2 implies at least some observance of the day; and the solemn com- memorative character it had very early acquired is strikingly indicated by an incidental expression of the writer of the Apoca- lypse (i. 10), who for the first time gives it that name ("the Lord's Day ") by which it is almost invariably referred to by all writers of the century immediately succeeding apostolic times. 3 Indications' of the manner of its observance during this period are not wanting. Teaching of the Apostles (c. 14)

1 The Teutonic and Scandinavian nations adopt the former designation (Sunday, Sonntag, Sbndag, &c), the Latin nations the latter {dimanche, domenica, domingo, &c).

- *From an expression in the Epistle of Barnabas (c. 15), it would almost seem as if the Ascension also was believed by some to have taken place on a Sunday.*

8 In the Epistle of Barnabas already referred to (c. 15) it is called "the eighth day ": " We keep the eighth day with joyfulness, the day also in which Jesus rose again from the dead." Cf. Justin Martyr, Dial, c, Tryph. c. 13,8.

contains the precept: " And on the Lord's day of the Lord (Kara KvpiaKi\v Kvplov) come together and break bread and give thanks after confessing your transgressions, that your sacrifice may be pure." Ignatius (Ad Magn. c. 0) speaks of those whom he addresses as " no longer Sabbatizing. but living in the observance of the Lord's day (Kara. Kvpiaxrjv faVres) on which also our life sprang up again." 4 Eusebius [H.E iv. 23) has preserved a letter of Dionysius of Corinth (a.d. 175) to Soter, bishop of Rome, in which he says: " To-day we have passed the Lord's holy day, in which we have read your epistle ", and the same historian (H.E. iv. 26) mentions that Melito of Sardis (a.d. 170) had written a treatise on the Lord's day. Pliny's letter to Trajan in which he speaks of the meetings of the Christians " on a stated day " need only be alluded to. The first writer who mentions the name of Sunday as applicable to the Lord's day is Justin Martyr; this designation of the first day of the week, which is of heathen origin (see Sabbath), had come into general use in the Roman world shortly before Justin wrote. He describes (Apol. i, 67) how " on the day called Sunday " town and country Christians alike gathered together in one place for instruction and prayer and charitable offerings and the distribution of bread and wine; they thus meet together on that day, he says, because it is the first day in which God made the world, and because Jesus Christ on the same day rose from the dead.

As long as the Jewish Christian element continued to have any influence in the Church, a tendency to observe Sabbath as well as Sunday naturally persisted. Eusebius (H.E. iii. 27) mentions that the Ebionites continued to keep both days, and there is abundant evidence from Tertullian onwards that so far as public worship and abstention from fasting are concerned the practice was widely spread among the Gentile churches. Thus we learn from Socrates (H.E. vi. c. 8) that in his time public worship was held in the churches of Constantinople on both days; the Apostolic Canons (can. 66 [65]) sternly prohibit fasting on Sunday or Saturday (except Holy Saturday) ; and the injunction of the Apostolic Constitutions (v. 20; cf. ii. 59, vii. 23) is tu " hold your solemn assemblies and rejoice every Sabbath day (excepting one), and every Lord's day." Thus the earliest observance of the day was confined to congregational worship, either in the early morning or late evening. The social con- dition of the early Christians naturally forbade any general suspension of work. Irenaeus (c. 140-202) is the first of the early fathers to refer to a tendency to make Sunday a day of rest in his mention that harvesting was forbidden by the Church on the day. Tertullian, writing in 202, says " On the Lord's day we ought abstain from

all habit and labour of anxiety, putting off even our business." But the whole matter was placed on a new footing when the civil power, by the constitu- tion of Constantine mentioned below, began to legislate as to the Sunday rest. The fourth commandment, holding as it does a conspicuous place in the decalogue, the precepts of which could not for the most part be regarded as of merely transitory obligation, and never of course escaped the attention of the fathers of the Church; but, remembering the liberty given in the Pauline writings " in respect of a feast day or a new moon or a Sabbath " (Col. ii. 16; cf. Rom. xiv. 5, Gal. iv..io, 11), they usually explained the " Sabbath day " of the commandment as meaning the new era that had been introduced by the advent of Christ, and interpreted the rest enjoined as meaning cessation from sin. But when a series of imperial decrees had enjoined with increasing stringency an abstinence from labour on Sun- day, it was inevitable that the Christian conscience should be roused on the subject of the Sabbath rest also, and in many minds the tendency would be such as finds expression in the Apostolic Constitutions (viii. 33): "Let the slaves work five days; but on the Sabbath day and the Lord's day let them have

1 The longer recension runs: " But let every one of you keep the Sabbath after a spiritual manner . . , And after the observance of the Sabbath let every friend of Christ keep the Lord's day as a fes- tival, the resurrection day, the queen and chief of all the days." The writer finds a reference to the Lord's day in the titles to Ps. vi. and xii., which are " set to the eighth."

leisure to go to church for instruction in piety." There is evi- dence of the same tendency in the opposite canon (29) of the council of Laodicea (363), which forbids Christians from Judaiz- ing and resting on the Sabbath day, and actually enjoins them to work on that day, preferring the Lord's day and so far as possible resting as Christians. About this time accordingly we find traces of a disposition in Christian thinkers to distinguish between a temporary and a permanent element in the Sabbath day precept; thus Chrysostom (10th homily on Genesis) discerns the fundamental principle of that precept to be that we should dedicate one whole day in the circle of the week and set it apart for exercise in spiritual things. The view that the Christian Lord's day or Sunday is but the Christian Sabbath transferred from the seventh to the first day of the week does not find categorical expression till a much later period, Alcuin being apparently the first to allege of the Jewish Sabbath that " ejus observationem mos Christianus ad diem dominicam compe- tentius transtulit " (cf. Decalogue).

Law Relating to Sunday The earliest recognition of the observance of Sunday as a legal duty is a constitution of Constantine in 321 a.d., enacting that all courts of justice, inhabitants of towns, and workshops were to be at rest on Sunday (venerabili die solis), with an exception in favour of those engaged in agricultural labour. This was the first of a long series of imperial constitutions, most of which are incorporated in the Code of Justinian, bk. iii. tit. 12 (De feriis). The constitutions comprised in this title of the code begin with that of Constantine, and further provide that emancipation and manumission were the only legal proceedings permissible on the Lord's day (die dominico), though contracts and compromises might be made between the parties where no intervention of the court was necessary. Pleasure was forbidden as well as business. No spectacle was to be exhibited in a theatre or circus. If the emperor's birthday fell on a Sunday, its celebration was to be postponed. The seven days before and after Easter were to be kept as Sundays. In Cod. i. 4, 9, appears the regulation that prisoners were to be brought up for examination and interrogation on Sunday. On the other hand, Cod. iii. 12, 10, distinctly directs the torture of robbers and pirates, even on Easter Sunday, the divine pardon (says the law) being hoped for where the safety of society was thus assured. After the time of Justinian the observance of Sunday appears to have become stricter. In the West, Charlemagne forbade labour of any kind. A century later in the Eastern Empire No. liv. of the Leonine constitutions abolished the exemption of agricultural labour contained in the constitution of Constantine; but this exemption was specially preserved in England by a constitution of Archbishop Meopham. The canon law followed the lines of Roman law. The decrees of ecclesiastical councils on the subject have been numerous. Much of the law is con- tained in the Decretals of Gregory, bk. ii. tit. 9 (De feriis), c. 1 of which (translated) runs thus: " We decree that all Sundays be observed from vespers to vespers (a vespera ad vesperam), and 'that all unlawful work be abstained from, so that in them trading or legal proceedings be not carried on, or any one con- demned to death or punishment, or any oaths be administered, except for peace or other necessary reason." Works of necessity (especially in the case of perishable materials or where time was important, as in fishing) were allowed, on condition that a due proportion of the gain made by work so done was given to the church and the poor. The consent of parties was in- sufficient to give jurisdiction to a court of law to proceed on Sunday, though it was sufficient in the case of a day sanctified by the ecclesiastical authority for a temporary purpose, e.g. a thanksgiving for vintage or harvest.

In England legislation on the subject began early and con- tinues down to the most modern times. As early as the 7th century the laws of Ina, king of the West Saxons, provided that, if a " theowman " worked on Sunday by

his lord's command, he was to be free and the lord to be fined 30s.; if a freeman worked without his lord's command, the penalty was forfeiture

of freedom or a fine of 60s., and twice as much in the case of a priest. The laws of ˆEthelstan forbade marketing, of ˆEthelred folkmoots and hunting, on the Sunday. In almost all the pre- Conquest compilations there are admonitions to keep the day holy. The first allusion to Sunday in statute law proper is in 1354 (28 Edw. III. c. 14 rep.), forbidding the sale. of wool at the staple on Sunday. The mass of legislation from that date downwards may be conveniently, if not scientifically, divided into five classes — ecclesiastical, constitutional, judicial, social and commercial. The terms "Sunday" and "Lord's day" are used in the statutes, but the term " Sabbath " occurs only in ordinances of the Long Parliament. " Sabbath-breaking " is sometimes used to describe a violation of the Sunday obser- vance acts, but is objected to by Blackstone as legally incorrect. Good Friday and Christmas Day are as a rule in the same legal position as Sunday. In English law Sunday is reckoned from midnight to midnight, not as in canon law a vespera ad vesperam.

The acts to be mentioned are still law unless the contrary is stated.

Ecclesiastical. — Before the Reformation there appears to be little or no statutory recognition of Sunday, except as s day on which trade was interdicted or national sports directed to be held. Thus the repealed acts of 1388 (12 Ric. II. c. 6) and 1409 (n Hen. IV. c- 4) enjoined the practice of archery on Sunday. The church itself by provincial constitutions and other means declared the sanctity of the day, and was strong enough to visit with its own censures those who failed to observe Sunday. At the Reformation it was thought necessary to enforce the obser- vance of Sunday by the state in face of the question mooted at the time as to the divine or merely human institution of the day as a holy day. Sunday observance was directed by injunctions as well as by statutes of Edward VI. and Elizabeth. The second Act of Uniformity of 1551 (5 & 6 Edw. IV. c.i.) enacted that all inhabitants of the realm were to endeavour themselves to resort to their parish church or chapel accustomed, or upos. reasonable let thereof to some usual place where common prayer is used every Sunday, upon pain of punishment by the censures of the church. The same principle was re-enacted by the Act of Uniformity of 1558 (1 Eliz. c. 2), with the addition of a tem- poral punishment, viz. a fine of twelve pence for each offence. This section of the act is, however, ho longer law., and it appears that the only penalty now incurred by non-attendance at church is the shadowy one of ecclesiastical censure. Protestant dis- senters, Jews and Roman Catholics were in 1846 (9 & 10, Vict. c. 59) exempted from the act, and the pecuniary penalties were abrogated as to all persons; but the acts as to Sundays and holy days are still binding on members of the Church of

England [Marshall v. Graham, 1907, 2 K.B. 112]. ,■

An act of 1551 (5 & 6 Edw. VI. c. 3) directed the keeping of all Sundays as holy days, with an exception in favour of husbandmen, labourers, fishermen and other persons in harvest or other time of necessity. Canon 13 of the canons of 1603 provides that ".all manner of persons within the Church of England shall celebrate and keep the Lord's day, commonly called Sunday, according to God's holy will and pleasure and the orders of the Church of England prescribed in that behalf, that is, in hearing the word of God read and taught, in private and public prayers, in acknowledging their offences to God and amendment of the same, in reconciling them- selves charitably to their neighbours where displeasure hath been, in oftentimes receiving the communion of the body and blood of Christ, in visiting the poor and sick, using all godly and sober con- versation." The Long Parliament, by an ordinance of 1 644, C, 51, directed the Lord's day to be celebrated as holy, as being the Christian Sabbath. Ordinances of 1650, c. 9, and 1656, c. 1 5, con- tained various minute descriptions of crimes against the sanctity of the Lord's day, including travelling and " vainly and profanely walking." These ordinances lapsed at the Restoration. The Act of Uniformity of 1661 (13 & 14 Car. II. c. 4) enforced the reading on every Lord's day of the morning and evening prayer according to the form in the Book of Common Prayer — a duty which had been previously enjoined by canon 14 of 1603. By the Church Building Act 181S, the bishop may direct a third service, morning or evening, where necessary, in any church built under the act (s. 65). By the Church Building Act 1838, he may order the performance of two full services, each if he so direct to include a sermon (s. 8). The Burial Laws Amendment Act 1880, which authorizes burials in churchyards of the Church of England without the use of the funeral

office of that church, does not allow such burials to take place on Sunday, Good Friday or Christmas Day if the parson of the church objects. Under the Metropolitan Police and Streets Acts, the Town Police Clauses Act 1841 and the Public Health Acts, street traffic may be regulated during the hours of divine service.

Constitutional. — Parliament has occasionally sat on Sunday in cases of great emergency, as on the demise of the Crown. Occasionally divisions in the House of Commons have taken place early on Sunday morning. The Ballot Act 1872 enacts that in reckoning time for election proceedings Sundays are to be excluded. A similar provision is contained in the

Municipal Corporations Act 1882, as to proceedings under that act.

Judicial. — As a general rule Sunday for the purpose of judicial proceedings is a dies non juridicus on which courts of justice do not sit (9 Co. Rep. 666). By s. 6 of the Sunday Observance Act 1677 legal process cannot be served or executed on Sunday, except in cases of treason, felony or breach of the peace. Proceed- ings which do not need the intervention of the court are good, e.g. service of a citation or notice to quit or claim to vote. By s. 4 of the Indictable Offences Act 1848 justice may issue a warrant of apprehension or a search warrant on Sunday. The rules of the Supreme Court provide that the offices of the Supreme Court shall be closed on Sundays, that Sunday is not to be reckoned in the computation of any limited time less than six days allowed for doing any act or taking any proceeding, and that, where the time for doing any act or taking any proceeding expires on Sunday, such act or proceeding is good if done or taken on the next day. In the divorce rules Sundays are excluded from compilation. In the county court rules they are excluded if the time limited is less than forty-eight hours, and the only county court process which can be executed on Sunday is a warrant of arrest in an Admiralty action. Where a time is fixed by statute, the Sundays are counted in. Where a term of imprisonment expires on Sunday, Christmas Day or Good Friday, the prisoner is entitled to discharge on the day next preceding (Prison Act 1898, s. n).

Social. — Under this head may be grouped the enactments having for their object the regulation of Sunday travelling and amusements. The earliest example of non-ecclesiastical inter- ference with recreation appears to be the Book of Sports issued by James I. in 1618. Royal authority was given to all but recusants to exercise themselves after evening service in dancing, archery, leaping, vaulting, May-games, Whitsun-ales, morris- dances and setting up of Maypoles; but bear and bull-baiting, interludes and bowling by the meaner sort were prohibited. The Sunday Observance Act 1625 (1 Car. I. c. 1), following the lines of the Book of Sports, inhibited meetings, assemblies or concourse of people out of their own parishes on the Lord's day for any sports and pastimes whatsoever, and any bear-baiting, bull-baiting, interludes, common plays or other unlawful exer- cises and pastimes used by any person or persons within their own parishes, under a penalty of 3s. 4d. for every offence. The right to enforce ecclesiastical censures is left untouched by the act. The act impliedly allows sports other than the excepted ones as long as only parishioners take part in them. In 1897 some lads were prosecuted at Streatley under this . act for playing football in an adjoining parish, but the justices dismissed the charge, treating the act as obsolete. But in 1906 the Society for the Prevention of Cruelty to Animals instituted a prosecu- tion under the act with the object of preventing extra-parochial rabbit-coursing on Sundays. The Game Act

1831 (1 & 2 Will. IV. c. 32, s. 3) makes it punishable to kill or take game, or to use a dog, net or other instrument (e.g. a snare), for that purpose on Sunday. The prohibition only applies to game proper and does not extend to rabbits.

There is no law in England against fishing on Sunday except as to salmon. Fishing for salmon on Sunday by any means other than a rod and line is prohibited by the Salmon Fishery Act 1861, and free passage for salmon through all cribs, &c, used for fishery is to be left during the whole of Sunday.

The Sunday Observance Act 1781 (21 Geo. III. c. 49), drawn by Dr Porteus, bishop of London, enacls that any place opened or used for public entertainment and amusement or for public

debate upon any part of the Lord's day called Sunday, to which persons are admitted by payment of money or by tickets sold for money, is to be deemed a disorderly house. The keeper is to forfeit £200 for every day on which it is opened or used as aforesaid on the Lord's day, the manager or master of the cere- monies £100 and every doorkeeper or servant £50. The adver- tising or publishing any advertisement of such an entertainment is made subject to a penalty of £50. Proceedings under this act for penalties may be instituted by a common informer within six months of the offence. It was held in 1868 that a meeting the object of which was not pecuniary gain (though there was a charge for admission), but an honest intention to introduce religious worship, though not according to any estab- lished or usual form, was not within the act. The hall used was registered for religious worship. On this principle, forms of worship such as Mormonism or Mahommedanism are pro- tected. In 1875 actions were brought against the Brighton Aquarium Company and penalties recovered under the act. As doubts were felt as to the power of the Crown to remit the penalties in such a case, an act was passed in 1875 to remove such doubts and to enable the sovereign to remit in whole or in part penalties recovered for offences against the act of 1781.

The substantive effect of the act is to hit all Sunday exhibitions or performances where money is charged for admission. In 1895 it was decided that the chairman of a meeting held to hear a lecture was not liable as manager of the meeting, and the solicitor of the liquidator of a company was held not to be liable for merely letting the hall for the meeting. In 1906 an attempt was unsuccessfully made to apply the act of 1 781 to open-air meetings for rabbit- coursing. The rules for the government of theatres and places of public entertainment, and the terms of the licences issued, usually prohibit performances on Sundays. The lessees of certain places of public resort in London have in some cases obtained their licences

from the London County Council on condition that they do not hold Sunday concerts, but the recent policy of the Council has been not to interfere with or restrict the giving of Sunday concerts unless they are given for private gain or by way of trade. The Council has no legal authority to dispense with the Sunday Observance Act 178 1, which enforces penalties on giving entertainments to which persons are admitted by payment of money or by tickets sold for money. The law has been judicially interpreted, however, to mean that charges for reserved seats are not incompatible with free admission. In consequence of this ruling Sunday concerts have been regularly given at the Albert Hall, which is not under the licensing jurisdiction of the London County Council, and at the Queen's Hall and other

E laces within that jurisdiction. No charge is made for admission, ut those who wish for seats must pay for them, and the proceeds of the concerts are not made the subject of profit. At the licensing sessions conflicts have annually arisen on this subject between the advocates and opponents of Sunday music.

Bands play on Sundays in most of the parks in London, whether royal or under municipal control; and it is said that local authorities cannot make bylaws forbidding bands of music in the streets on Sunday (Johnson v. Croydon Corporation, 1886, 16 Q.B.D. 708). Libraries, museums and gymnasiums maintained by local authorities may, it would seem, be lawfully opened on Sundays, and the national galleries and museums are now so open for part of Sunday.

Commercial. — At common law a contract made on Sunday is not void, nor is Sunday trading or labour unlawful, and enlist- ment of a soldier on a Sunday has been held valid. At an early period, however, the legislature began to impose restrictions, at first by making Sunday trade impossible by closing the places of ordinary business, later by declaring certain kinds of trade and labour illegal, still later by attempting to prohibit all trade and labour. 28 Edw. III. c. 14 (1354; now repealed) closed the wool market on Sunday. An act of 1448 (27 Hen. VI. c. 5) prohibits fairs and markets on Sunday (necessary victual only excepted), unless on the four Sundays in harvest — an exemption repealed in 1850 (by 13 & 14 Vict. c. 23) 4 Edw. IV. c. 7 (1464 rep.) restrained the shoemakers of London from carrying on their business on Sunday. An act of 1627 (3 Car. I. c. 2) imposes a penalty of 20s. on any carrier, wagoner or drover travelling on the Lord's day, and a penalty of 6s. 8d. on any butcher killing or selling on that day. The act does not apply to stage coaches. Both this and the act of 1625 were originally passed only for a limited period, but by subsequent legislation they have become perpetual. Next in order is the Sunday Observance Act 1677 (29 Car. II. c. 7), "An act for

the better observance of the Lord's day, commonly called Sunday."

After an exhortation to the observation of the Lord's day by exer- cises in the duties of piety and true religion, publicly and privately, the act provides as follows: No tradesman, artificer, workman, labourer or other person (ejusdem generis) whatsoever shall do or exercise any worldly labour, business or work of their ordinary callings upon the Lord's day or any part thereof (works of necessity and charity only excepted) ; and every person being of the age of fourteen years or upwards offending in the premises shall for every such offence forfeit the sum of 5s. ; and no person or persons what- soever shall publicly cry, show forth or expose to sale any wares, merchandises, fruit, herbs, goods or chattels whatsoever upon the Lord's day or any part thereof upon pain that every person so offending shall forfeit the same goods so cried, or showed forth, or exposed to sale (s. 1). A barber was held in 1900 not to be a trades- man, artificer, &c. within the act, and to be free to shave customers on Sunday 1 ; nor is a farmer. No drover, horse-courser, wagoner, butcher, higgler or any of their servants, shall travel or come into his or their lodging upon the Lord's day or any part thereof, upon pain that each and every such offender shall forfeit 20s. for every such offence; and no person or persons shall use, employ or travel upon the Lord's day with any boat, wherry, lighter or barge, except it be upon extraordinary occasion to be allowed by some justice of the peace. &c, upon pain that every person so offending shall forfeit and lose the sum of 5s. for every such offence. In default of distress or non-payment of forfeiture or penalty the offender may be set publicly in the stocks for two hours (s. 2), a punishment now obsolete. Nothing in the act is to prohibit the dressing of meat in families, or the dressing or selling of meat in inns, cooks' shops — which in- clude fried fish shops (Bullen v. Ward, 1905, 74 L.J.K.B. 916) — or victualling houses for such as cannot be otherwise provided, nor the crying or selling of milk before nine in the morning or after four in the afternoon (s. 3). Prosecutions must be within ten days after the offence (s. 4). The hundred is not responsible for robbery of persons travelling upon the Lord's day (s. 5). This act has fre- quently received judicial construction. The use of the word " ordinary " in section 1 has led to the establishment by a series of decisions of the principle that work done out of the course of the ordinary calling of the person doing it is not within the act. Thus the sale of a horse on Sunday by a horse-dealer would not be en- forceable by him and he would be liable to the penalty, but these results would not follow in the case of a sale by a person not a horse- dealer. Certain acts have been held to fall within the exception as to works of necessity and charity, e.g. baking provisions for customers (but -ot

baking bread in the ordinary course of business), running stage coaches, or hiring farm-labourers. The legislature also inter- vene! to obviate some of the inconveniences caused by the act. By 10 Will. III. c. 13 (1698) mackerel was allowed to be sold before and after service. By II Will. III. c. 21 (1699), forty watermen were allowed to ply on the Thames on Sunday. By 9 Anne, c. 23 (1710), licensed coachmen or chairmen might be hired on Sunday. By an act of 1794 (34 Geo. III. c. 61), bakers were allowed to bake and sell bread at certain hours. These acts are all repealed. Still law are the acts of 1762 (2 Geo. III. c. 15 s. 7), allowing fish carriages to travel on Sunday in London and Westminster; 1827 (8 Geo. IV. c 75), repealing s. 2 of the act of 1677 as far as regards Thames boatmen. The Bread Acts of 1822 (3 Geo. IV. c. 106) allow bakers in London, and of 1836 (6 & 7 Will. IV. c. 37) allow bakers out of London, to carry on their trade up to 1.30 p.m. Since 1871, by an act annually continued (34 & 35 Vict. c. 87), no prosecution or proceeding for penalties under the act of 1677 can be instituted except with the consent in writing of the chief officer of a police dis- trict or the consent of two justices or a stipendiary magistrate, which must be obtained before beginning the prosecution, i.e. before applying for a summons {Thorpe v. Priestnall, 1897, I, Q.B. 159).

The act of 1 871 does not apply to breaches of the Bread Acts (R. v. Mead, 1902, 2 K.B. 212).

A good many bills have been introduced with respect to Sun- day trading. Most have been directed to the closing of public- houses on that day; but the Shop Hours Bill introduced in 1907 contained clauses for closing shops on Sundays, with the excep- tion of certain specified trades. The result of the act of 1871 in London has been in substance to make the Lord's Day acts a dead letter as to Sunday trading. The commissioner of police rarely if ever allows a prosecution for Sunday trading. Sunday markets are usual in all the poorer districts, and shopkeepers and hawkers are allowed freely to ply their trades for the sale of eatables, temperance drinks and tobacco. But the conditions

1 It is curious that by an order in council of Hen. VI. to regulate the sanctuary of St Martin-le-Grand it was provided that all artificers dwelling within the said sanctuary (as well barbers as others) keep holy the Sundays and other great festival days without breach or exercising their craft as do the citizens of London (Gomme, Govern- ance of London, 1907, p. 329).

of licences for the sale of intoxicants and for refreshment houses are strictly enforced with respect to Sunday. In districts where the town councils have control of the police, prosecutions for Sunday trading are not

infrequent; but they seem to be instituted rather from objection to the annoyance caused by street traders than from religious scruples. The limitation of the time for prosecution to ten days, and the necessity of the previous consent of the chief constable, have a great effect in restricting prosecutions. In most districts there is a distinct disposition to refrain from enforcing the strict letter of the older law, and to permit the latitude of what is described as the " Continental Sunday," except in the case of businesses carried on so as to interfere with the public comfort. In most districts liberality in administration has progressed pari passu with a change in public opinion as to the uses to which Sunday may properly be put ; it is becoming less of a holy day and more of a holiday.

There is great activity among those interested in different theories as to the proper use of Sundays. On the one side, Lord's day observance societies and the organizations concerned in the promotion of " temperance " (i.e. of abstinence from alcoholic drinks) have been extremely anxious to enforce the existing law against Sunday trading and against the sale of intoxicants to persons other than bona fide travellers, and to obtain legislation against the sale of any alcohol on Sundays. On the other side, the Sunday League and other like organiza- tions have been active to organize lectures and concerts and excursions on Sundays, and to promote so far as possible every variety of recreation other than attendance at the exercises of any religious body. Travelling and boating on Sunday are now freely resorted to, regardless of any restrictions in the old acts, and railway companies run their trains at all hours, the power to run them being given by their special acts. Tram- cars and omnibuses run freely on Sundays, subject only to certain restrictions. Hackney carriages may in London ply for hire on Sundays (1 & 2 Will. IV. c. 22).

Besides the general act of 1677, there are various acts dealing with special trades; of these the Licensing Acts and the Factory and Workshop Acts are the most important. By the Licensing Acts, 1872 and 1874, premises licensed for the sale of intoxicating liquors by retail are to be open on Sunday only at certain hours, varying according as the premises are situate in the metropolitan district, a town or populous place, or elsewhere. The hours may be varied to fit in with the hours of religious worship in the district. An exception is made in favour of a person lodging in the house or a bona fide traveller, who may be served with refreshment during prohibited hours, unless in a house with a six- day licence. In the case of sixrday licences, no sale of liquor may be made except to persons lodging in the house. Attempts have often been made to induce the legislature to adopt the principle of complete Sunday closing in England as a whole, or in particular counties. 2 In the session of 1886 a bill for Sunday closing in Durham was passed by the Commons but rejected by the Lords. The advocates of Sunday closing in Wales have been more successful. The

Sunday Closing (Wales) Act 1881 contains no exceptions of towns and the only exemption is the sale of intoxicating liquors at railway stations. Public billiard tables may not be used on Sunday (8 & 9 Vict. c. 109). The Factory and Workshop Act (1901) forbids the employment of women, young persons or children on Sunday in a factory or work- shop (s. 34). But a woman or young person of the Jewish religion may be employed on Sunday by a Jewish manufacturer if he keeps his factory or workshop closed throughout Saturday, and does not open it for traffic on Sunday, and does not avail himself of the exceptions authorizing employment of women or young persons on Saturday evening or for an additional hour on other weekdays (ss. 47, 48). There are a few other legislative provisions of less importance which may be noticed. Carrying on the business of a pawnbroker on Sunday is an offence within the Pawnbrokers Act 1872. Distilling and rectifying spirits on Sunday is forbidden by the Spirits Act 1880. The effect of Sunday upon bills of exchange is declared by the Bills of Exchange Act 1882. A bill is not invalid by reason only of its bearing date on a Sunday (s. 13). Where the last day of grace falls on a Sunday, the bill is payable on the pre- ceding business day (s. 14). Sunday is a " non-business day " for the purposes of the act (s. 92).

Scotland. — The two earliest acts which dealt with Sunday are somewhat out of harmony with the general legislation on

2 The act I James I. c. 9 (now repealed) appears, however, to have provided for closing ale-houses in most cases, except on usual working days.

the subject. That of 1457, c. 6, ordered the practice of archery on Sunday; that of 1526, c. 3, allowed markets for the sale of flesh to be held on Sunday at Edinburgh. Then came a long series of acts forbidding the profanation of the day, especially by salmon-fishing, holding fairs and markets, and working in mills and salt-pans. The act of 1579, c. 70, and 1661, c. 18, prohibit handy labouring and working, and trading on the Sab- bath. Under the act of 1579 the House of Lords in 1837 held that it was illegal for barbers to shave their customers on Sun- days, although the deprivation of a shave might prevent decently disposed men from attending religious worship, or associating in a becoming manner with their families and friends through want of personal cleanliness. The later legislation introduced an exception in favour of duties of necessity and mercy, in accord- ance with ch. 21 of the Confession of Faith (1690,0. 5).

In more modern times the exigencies of travelling have led to a still further extension of the exception. In these acts the v/ord Sabbath is generally used as in the Commonwealth ordinances. The Sabbath Observance Acts were frequently confirmed, the last time by the Scots parliament in 1696. The Scottish Episcopalians Act 171 1 (10 Anne, c. 10) contains a proviso that all the laws made for the frequenting of divine service on the Lord's day commonly called Sunday shall be still in force and executed against all persons who shall not resort either to some church or to some congregation or assembly of religious worship allowed and permitted by this act. The Scots acts were held by the High Court of Justiciary in 1870 to be still subsisting, as far as they declare the keeping open shop on Sunday to be an offence by the law of Scotland (Bute's Case, 1 Couper's Reports, 495), but all except those of 1579 and 1661 above specified were repealed in 1906. The Licensing (Scotland) Act 1903 provides by the scheduled forms of certificate for the closing on Sunday of public-houses, and places licensed for the sale of excisable liquor, and in the case of inns and hotels forbids the sale of intoxicants except for the accommodation of lodgers or travellers. There has been litigation as to the legality of running tram-cars on the Sabbath.

By the Herring Fishery (Scotland) Act 1815, s. 11, herring nets set or hauled on the coast or within two leagues thereof on Sundays are forfeited. By the Salmon Fisheries (Scotland) Act 1868, s. 15, fishing for salmon on Sunday, even with a rod and line, is an offence, as is taking or attempting to take or assisting in fishing for salmon.

As to contracts and legal process, the law is in general accordance with that of England. Contracts are net void, apart from statute, simply because they are made on Sunday. Diligence cannot be executed but a warrant of imprisonment or meditatio fugae is " exercisable."

Ireland. — In Ireland an act of 1695 (7 Will. III. c. 17) covers the same ground as the English act of 1677, but the acts referred to under England do not apply. An act of 1851 (14 & 15 V. c. 93, s. 11) provides for the issue and execution of warrants for indictable offences and search-warrants on Sundays. But proceedings to obtain sureties for the peace taken on Sunday are void. The Irish act of 1787 against killing game on Sunday (27 Geo. III. c. 35, s. 4) includes rabbits and quail, landrail or other wild fowl. The Sunday closing of public-houses with exemptions as to certain cities and as to railway stations, packet-boats and canteens, is enforced by legislation of 1878, continued annually until 1906 and then made perpetual with certain modifications (1906, c. 39, s. 1), and in the case of six- day licences by acts of 1876, 1877 and 1880.

In 1899 a race-course used for Sunday racing was closed by injunction as

causing a nuisance to the Sunday peace and quiet of the neighbourhood and the services of the adjacent churches.

Where railway trains are run on Sundays one cheap train each way is to be provided (7 & 8 Vict. c. 85, s. 10; repealed in 1883 as to Great Britain).

British Colonies.— The English law as to Sunday observance was the original law of the colonies acquired by settlement, and in many of them so much of it as does not relate to the Church of England is left to operate without colonial legislation. In other colonies it is supplemented or superseded by colonial acts. Canada has an act (No. 27 of 1906) prohibiting all buying and selling and all exercise by a man of his ordinary vocations or business, either by himself or his employees on the Lord's day, except in case of works of necessity or mercy. In New Zealand an act of 1884 (c. 24, s. 16; amended 1906, c. 36) pro- hibits the carrying on on Sunday of any trade or calling, but the exceptions are numerous, and, besides works of necessity

or charity, include driving live stock, sale of medicines, sale or delivery of milk, hairdressing or shaving before 9 a. m., driving public or private carriages, keeping livery stables, working railways, ships and boats, and letting boats for hire, and work in connexion with post offices and telegraphs and with daily newspapers. (W. F. C.)

Foreign Countries. — Consequent on the introduction of a Weekly Rest Day Bill (which obtained a second reading) in the English House of Lords in 1908, a parliamentary paper was published in 1909 (cd. 4468) containing " Reports from His Majesty's Representatives Abroad as to Legislation in Foreign Countries Respecting a Weekly Rest Day." The principal points are summarized below: —

Austria. — Legislation is embodied in laws of 1895 and 1905, which prohibit any industrial work on Sunday, rest on that day beginning not later than 6 a.m., and lasting for not less than twenty- four hours. Permission is given for absolutely necessary work, provided the employer submits to the authorities a list giving the names of the persons employed, and the place, duration and nature of_ their employment. Sunday work is permitted in certain indus- tries. As to buying and selling, Sunday trading is permitted for not more than four hours, local authorities being the power for arranging the time ; they may also forbid Sunday trading altogether, if they think it necessary. Traders who do not employ workmen may not work for themselves unless the doors by which the public may enter are closed. On feast-days, employees must, according to their respective religious beliefs, be allowed the necessary time for attendance at morning

service. Offences are punishable by fine ; a warning, however, is given on the first offence, and the fine (4s. 2d. for the first offence) rises for each subsequent offence.

Belgium. — Laws of 1905 and 1907 forbid work on Sunday to per- sons engaged in industrial and commercial enterprises, with certain exceptions, such for example, as industries which exist only at certain periods of the year, or which have a press of work at certain times, or open-air industries which depend on the weather.

Denmark. — The only legislation is a law of 1904 concerning the public peace on the National Church holidays and Constitution Day. It forbids all kinds of occupations, which, on account of noise, might disturb the holiday's peace. In the large towns carriage traffic for business purposes is also forbidden after 10 a.m.

France. — A law of the 13th of July 1906 established a weekly day of rest, for every workman or employee of not less than twenty- four consecutive hours. The weekly day of rest must be Sunday. The law applies irrespective of the duration or character of the work done, and to employees in all establishments of a commercial or industrial character. There are certain necessary exceptions, such as shops for retailing food, occupations in which place, season, the habits of the public, &c, make observance impossible, and in such the weekly day of rest must be given in rotation to the employees or a compensating holiday instead.

Germany. — Regulations as to Sunday rest are contained in the Trade Regulations (Gewerbeordntmg) of the 26th of July 1900, accord- ing to which manufacturers cannot compel workmen to work on Sundays or holidays, except in certain cases of necessity. Nor in trading businesses may assistants, apprentices or workmen be em- ployed at all on Christmas Day, Easter Sunday and Whitsunday, or on other Sundays and holidays more than five hours. The regula-. tions do not apply to hotels, cafes, &c, or to theatres or other places of amusement, or to means of communication. Infringement of the regulations is punishable by a fine, not exceeding 600 marks or by imprisonment.

Hungary. — By a law of 1891 and others of 1903 and 1908 all industrial work is prohibited on Sundays and St Stephen's Day (the patron saint of Hungary). Certain categories of industries are exempted on account of necessity or the needs of the consuming public; independent small craftsmen who work at home without assistants are also exempted. The law is enforced by the police authorities and infringement is punished by fine.

Italy. — A weekly rest day has been enacted by a law of the 7th of July

1907. Exceptions to 'the law are river, lake and maritime navigation ; agricultural, hunting and fishing industries ; state rail- ways and tramways and state public services and industrial under- takings.

Other European countries which have legislation are the Nether- lands (law of 1889, as amended by a law of 1906; Spain (law of March 1904, Regulations of April 1905) ; and Switzerland (1906).

United States. — In the United States there is no Federal law, the question of a rest day being left entirely to the state legis latures, consequently " there exists considerable diversity of legislation on the subject, ranging from the old Quaker laws of the state of Pennsylvania of the beginning of the 18th century to the modern regulations of the Far Western agricultural and mining states . . . There is no state, however, where it is specifically laid down that an employee who is forced to work

on Sunday shall receive another equivalent day of rest." (Report of H.M. Ambassador to the U.S. vide supra). In Massachusetts, which may be fairly taken as representing the Eastern states, public service corporations, such as railway, street railway, steamboat, telegraph, telephone, electric lighting, water and gas companies, are permitted to serve the public in the usual manner. Public parks and baths are open. Tobacco may be sold by licensed innholders, common victuallers, druggists and news- dealers. Bake shops may be open during certain hours. All other shops must be closed. Saloons are closed, and liquor can be served only to the guests of licensed innholders. Horses, carriages, boats and yachts may be let for hire. All games and entertainments, except licensed sacred concerts, are prohibited. In Connecticut Sunday recreation is still prohibited, but electric and steam cars are allowed to run. Sunday is a close time for game and birds (1899). In many of the YVes<.ern states base-ball, games and various entertainments for pay are permitted, and in some saloons are open. In many but not all the states such persons as by their religion are accustomed to observe Saturday are allowed to pursue their ordinary business on Sunday. In Delaware and Illinois barbers may not shave customers on Sun- days; and in Georgia guns and pistols may not be fired (1898). In North Dakota the fines for Sabbath-breaking have been raised.

SUNDERLAND, CHARLES SPENCER, 3RD Earl of (c. 1674- 1722), English statesman, was the second son of the 2nd earl, but on the death of his elder brother Henry in Paris in Septem- ber 1688 he became heir to the peerage. Called by John Evelyn " a youth of extraordinary hopes," he completed his education at Utrecht, and in 1695 entered the House of Commons as mem- ber for Tiverton. In the same year he married Arabella,

daughter of Henry Cavendish, 2nd duke of Newcastle; she died in 1698 and in r7oo he married Anne Churchill, daughter of the famous duke of Marlborough. This was an important alliance for Sunderland and for his descendants; through it he was introduced to political life and later the dukedom of Marl- borough came to the Spencers. Having succeeded to the peerage in 1702, the earl was one of the commissioners for the union between England and Scotland, and in 1705 he was sent to Vienna as envoy extraordinary. Although he was tinged with republican ideas and had rendered himself obnoxious to Queen Anne by opposing the grant to her husband, Prince George, through the influence of Marlborough he was foisted into the ministry as secretary of state for the southern depart- ment, taking office in December 1706. From 1708 to 1710 he was one of the five whigs, called the Junta, who dominated the government, but he had many enemies, the queen still disliked him, and in June 1710 he was dismissed. Anne offered him a pension of £3000 a year, but this he refused, saying " if he could not have the honour to serve his country he would not plunder it."

Sunderland continued to take part in public life, and was active in communicating with the court of Hanover about the steps to be taken in view of the approaching death of the queen. He made the acquaintance of George I. in 1706, but when the elector became king the office which he secured was the comparatively unimportant one of lord-lieutenant of Ireland. In August 1715 he joined the cabinet as lord keeper of the privy seal, and after a visit to George I. in Hanover he secured in April 171 7 the position of secretary of state for the northern department. This he retained until March 1718, when he became first lord of the treasury, holding also the post of lord president of the council. He was now prime minister. Sunderland was especially interested in the proposed peerage bill, a measure designed to limit the number of members of the House of Lords, but this was defeated owing partly to the opposi- tion of Sir Robert Walpole. He was still at the head of affairs when the South Sea bubble burst and this led to his political ruin. He had taken some part in launching the scheme of 1720, but he had not profited financially by it; however, public opinion was roused against him and it was only through the efforts of Sir Robert Walpole that he was acquitted by the House of

Commons, when the matter was investigated. In April 1721 he resigned his offices, but he retained his influence with George I. until his death on the 19th of April 1722.

Sunderland inherited his father's passion for intrigue, while his manners were repelling, but he stands high among his associates for disinterestedness and had an alert and discerning mind. From his early years he had a great love of books, and he spent his leisure and his wealth in forming the library

at Althorp, which in 1703 was described as " the finest in Europe." In 1749 part of it was removed to Blenheim.

The earl's second wife having died in April 1716, after a career of considerable influence on the political life of her time, in 17×7 he married an Irish lady of fortune, Judith Tichborne (d. 1749). By Lady Anne Churchill he had three sons and two daughters. Robert (1701-1729), the eldest son, succeeded as 4th earl, and Charles (1706-1758), the second son, became the 5th earl. In 1733 Charles- inherited the dukedom of Marlborough and he then transferred the Sunderland estates to his brother John, father of the 1st Earl Spencer (see Marlborough, Earls and Dukes of).

For the career of Sunderland see W. Coxe, Memoirs of Marlborough (1847-1848); Earl Stanhope, History of England (1853), and I. Si Leadam, Political History of England, 1702-1760 (1909).

SUNDERLAND, ROBERT SPENCER, 2nd Earl or (1640-1702); English politician, was the only son of Henry Spencer (1620- 1643), who succeeded his father, William, as 3rd Baron Spencer of Wormleighton in 1636. This barony had been bestowed in 1603 upon Sir Robert Spencer (d. 1627), the only son of Sir John Spencer (d. 1600) of Althorp, Northamptonshire, who claimed descent from the baronial family of Despenser. The fortunes of the family were founded by Sir John Spencer (d. 1522) of Snitterfield, Warwickshire, a wealthy grazier. His descendant, Sir Robert Spencer, the 1st baron, was in 1603, " reputed to have by him the most money of any person in the kingdom." Sir Robert's grandson, Henry, the 3rd baron, was created earl of Sunderland in June 1643, an d was killed at the' battle of Newbury when fighting for the king a little later in the same year. He married Dorothy (1617-1684), daughter of Robert Sidney, 2nd earl of Leicester. She was the Sacharissa of the poems of her admirer, Edmund Waller, and for her second husband she married Sir Robert Smythe. Their son Robert, the 2nd earl, was educated abroad and at Christ Church, Oxford, and in 1665 married Anne (d. 1715), daughter of John Digby, 3rd earl of Bristol; she was both a beauty and an heiress, and is also famous for her knowledge and love of intrigue. Having passed some time in the court circle, Sunderland was successively ambassador at Madrid, at Paris and at Cologne; in 1678 he was again ambassador at Paris. In February 1679, when the country was agitated by real or fancied dangers to the Protestant religion, the earl entered political life as secretary of state for the northern department and became at once a member of the small clique responsible for the government of the country. He voted for the exclusion of James, duke of York, from the throne, and made overtures to William, prince of Orange, and consequently in 1681 he lost both his secretaryship and his seat on the privy council. Early in 1683, however,

through the influence of the king's mistress, the duchess of Portsmouth, Sunderland regained his place as secretary for the northern department, the chief feature of his term of office being his rivalry with his brother- in-law, George Savile, marquess of Halifax. By this time he had made his peace with the duke of York, and when in February 1685 James became king, he retained his position of secretary, to which was soon added that of lord president of the council, He carried out the wishes of the new sovereign and after the intrigues of a few months he had the satisfaction of securing the dismissal of Lawrence Hyde, earl of Rochester, from his post as lord treasurer. He was a member of the commission for ecclesiastical causes, and although afterwards he claimed that he had used all his influence to dissuade James from removing the tests, and in other ways illegally favouring the Roman Catholics, he signed the warrant for the committal of the seven bishops, and appeared as a witness against them. It should be mentioned that while Sunderland was thus serving James II., he was receiving a pension from France, and through his wife's lover, Henry Sidney, afterwards earl of Romney, he was furnish- ing William of Orange with particulars about affairs in England.

In the last months of James's reign he was obviously uncomfort- able. Although he had in 1687 openly embraced the Roman Catholic faith, he hesitated to commit himself entirely to the acts of the fierce devotees who surrounded the king, -whom he advised to reverse the arbitrary acts of the last year or two, and in October 1688 he was dismissed by James with the remark " I hope you will be more faithful to your next master than you have been to me."

Sunderland now took refuge in Holland, and from Utrecht he sought to justify his recent actions in A letter to a friend in the country. He had been too deeply involved in the arbitrary acts of James II. to find a place at once among the advisers of William and Mary, and he was excepted from the act of indemnity of 1690. However, in 1691, he was permitted to return to Eng- land, and he declared himself a Protestant and began to attend the sittings of parliament. But his experience was invaluable and soon he became prominent in public affairs, a visit which William III. paid him at Althorp, his Northamptonshire seat, in 1 69 1, being the prelude to his recall into the royal counsels. It was his advice which led the king to choose all his ministers from one political party, to adopt the modern system, and he managed to effect a reconciliation between William and his sister-in-law, the princess Anne. From April to December 1697 he discharged the duties of lord chamberlain, and for part of this time he was one of the lords

justices, but the general suspicion with which he was regarded terrified him, and in December he resigned. The rest of his life was passed in seclusion at Althorp, where he died on the 28th of September 1702. The earl was a great gambler, but he was wealthy enough also to spend money on improving his house at Althorp, which he beautified both within and without. His only surviving son was Charles Spencer, 3rd earl of Sunderland (q.v.).

Lord Sunderland possessed a keen intellect and was consumed by intense restlessness; but his character was wanting in stead- fastness, and he yielded too easily to opposition. His adroitness in intrigue and his fascinating manners were exceptional even in an age when such qualities formed part of every statesman's education; but the characteristics which ensured him success in the House of Lords and in the royal closet led to failure in his attempts to understand the feelings of the mass of his country-men. Consistency of conduct was not among the objects which he aimed at, nor did he shrink from thwarting in secret a policy which he supported in public. A large share of the discredit attaching to the measures of James II. must be assigned to the earl of Sunderland.

The best account of Sunderland is the article by T. Seccombe in the Diet. Nat. Biog., which gives a full bibliography.

SUNDERLAND, a seaport and municipal, county and parlia- mentary borough of Durham, England, at the mouth of the river Wear, on the North-Eastern railway, 261 m. N. by W. from London. Pop. (1891), 131,686; (1901) 146,077. The borough includes the township of Bishopwearmouth, to the south of Sunderland proper, which lies on the south bank of the river; and that of Monkwearmouth, on the north bank. Adjacent to Monkwearmouth on the north-west is the exten- sive urban district of Southwick, within the parliamentary borough. A great cast-iron bridge crosses the river with a single span of 236 ft. and a height of 100 ft. above low water. It was designed by Rowland Burdon, opened in 1796, and widened under the direction of Robert Stephenson in 1858. The only building. of antiquarian interest is the church of St Peter, Monkwearmouth, in which part of the tower and other portions belong to the Saxon building attached to the monastery founded by Benedict Biscop in 674. The church of St Michael, Bishopwearmouth, is on an ancient site, but is a rebuilding of the 19th century. There is a large park at Roker on the north-east of the town, a favourite seaside resort, and (among other parks) that at Bishopwearmouth contains a bronze statue of Sir Henry Havelock, who was born (1795) at Ford Hall in the neighbourhood.

The prosperity of Sunderland rests on the coalfields of the neigh-

bourhood, the existence of which gave rise to an export trade in the reign of Henry VII., which has grown to great importance. Manu- facturing industries include shipbuilding, iron and steel works, engineering, anchor and chain cable, glass and bottle and chemical works and paper mills. Limestone is largely worked. For 5 m. above its mouth the Wear resembles on a reduced scale the Tyne in its lower course. The harbour is constantly undergoing improve- ment. The docks cover an area of upwards of 200 acres, and there are several graving docks up to 441 ft. in length. The parliamentary borough returns two members. The municipal borough is under a mayor, 16 aldermen and 42 councillors, and has an area of 3357 acres.

The history of Sunderland is complicated by the name Wear- mouth (Wiramuth, Wermuth) being applied impartially to the Monk's town on the north bank of the Wear; the Bishop's town on the south and the neighbouring port now known as Sunderland. In both Monk's and Bishop's Wearmouth the settlement was connected with the church. Benedict Biscop in 674 obtained from Ecgfrith king of Northumbria seventy hides of land on the north bank of the river, on which he founded the Benedictine monastery of St Peter. Not more than a year after the foundation Benedict brought over skilled masons and glass-workers from Gaul who wrought his church in the Roman fashion, the work being so speedily done that Mass was celebrated there within the year. A subsequent visit to Rome resulted in a letter from Pope Agatho exempting his monastery from all external control. Later Benedict acquired three hides on the south side of the river. The abbey, where Bede was educated, was destroyed by the Danes and probably not rebuilt until Bishop Walcher (1071-1081) settled Aldwin and his companions there. They found the walls in ruins from the neglect of 208 years, but the church was soon rebuilt. Bishop William of St Carileph (1081-1099), desiring to acquire the possessions of the house for his new foundation of Durham, transferred the monks there, Wearmouth becoming henceforward a cell of the larger house. Meanwhile Bishop's Wearmouth was becoming important, having been granted to the bishops by ˆEthelstaD in 930. As a possession of the see it is mentioned in Boldon Book in conjunction with Tunstall as an ordinary rural vill rendering one milch cow to the bishop, while the demesne and its mill rendered £20, the fisheries £6 and the borough of Wearmouth 20s. There seems no doubt but that the borough, identical with that to which Bishop Robert de Pinset granted his charter, was in reality Sunderland, the name Wearmouth being used to cover Bishop's and Monk's Wearmouth and the modern Sunderland. It was from Wearmouth that Edgar iEtheling set sail for Scotland, the account implying that this was a frequented port. In 1197 the town of Wearmouth rendered 37s. 4d. tallage during the vacancy of the see, and in 1306-1307 the assessment of a tenth for Bishop's Wearmouth was £5, 5s. 4d., while

that of Monk's Wearmouth was £1, 6s. 8d. Probably the northern town remained entirely agricultural, while the shipping trade of Bishop's Wearmouth was steadily increasing. In 1382 what was probably a dock there rendered 2s., and in 1385 the issues of the town were worth £45,93. 2d. annually. In 143 1 the rent of assize from the demesne lands of Monk's Wearmouth was £5, is. od. A further contrast is shown by the number of houseling persons, or those who received the sacrament, returned in 1548: Bishop's Wearmouth had 700 and Monk's Wearmouth 300. From this time, at least, Bishop's Wearmouth seems to have been completely identified with Sunderland: in 1567 Wearmouth was one of the three ports in Durham where pre- cautions were to be taken against pirates, while no mention is made of Sunderland. Monk's Wearmouth remained purely agricultural until 1775, when a shipbuilding yard was estab- lished and prospered to such an extent that by 1795 five similar yards were at work.

The Boldon Book states that Sunderland was at farm in 1183 and rendered 100 shillings and the town of Sunderland rendered 58 shillings tallage in 1197 during the vacancy of the see. In 1382 Thomas Menvill held the borough, which with its yearly free rent, courts and tolls was worth £1, 12s. 8d. Edward IV. in 1464, sede vacante, granted a lease of the borough, and in 1507, Cardinal Bainbridge granted it by copyhold at a rent of £6,

which dropped to £4 in 159°- Bishop Morton incorporated Sunderland in 1634, stating that it had been a borough from time immemorial under the name of the New Borough of Wear- mouth. This charter lapsed during the Civil Wars, when the borough was sold with the manor of Houghton-le-Spring for £2851, 9s. 6d. Nevertheless the inhabitants retained their rights. Sunderland became a parliamentary borough returning two members in 1834. The charter of 1634 granted a market and annual fair which are still held. The charter of Bishop Hugh provided for pleas between burgesses and foreign mer- chants, and directed that merchandise brought by sea should be landed before sale, except in the case of salt and herrings. Bishop Hatfield gave a lease of the fisheries in 1358. In trie 15th century commissions were held touching salmon-fisheries and obstructions in the Wear, while Bishop Barnes (1577-1587) appointed a water-bailiff for the port, and licensed the building of wharves for the sale of coal. During the 17th century Sunderland was the seat of a vice-admiralty court for the county palatine and in 1660 letters patent permitted the erection of a pier and lighthouse as the harbour was " very commodiously situate for the shipping of vast quantities of sea-coles plentifully gotten and wrought there."

See William Hutchinson, History and Antiquities of the County Palatine of Durham (Newcastle, 1785-1794) ; J. W. Summers, History and Antiquities of Sunderland (Sunderland, 1858); Victoria County History: Durham.

SUNDEW, in botany, the popular name for a genus of plants Known as i>0.sera(Gr. Spoaos, dew; Fr. rossolis, Ger. Sonnenthau) so called from the drops of viscid transparent glittering secretion borne by the tentacles which cover the leaf-surface. It is a cosmopolitan genus of slender glandular herbs, with leaves arranged in a basal rosette or alternately on an elongated stem, and is represented in Britain by three species, which are found in spongy bogs and heaths.

The common sundew (D. rolundifolia) has extremely small roots, and bears five or six radical leaves horizontally extended in a rosette around the flower-stalk. The upper surface of each leaf is covered with gland-bearing filaments or " tentacles," of which there are on an average about two hundred. Each gland is surrounded by a large dew-like drop of the viscid secretion. A small fibro-vascular bundle (6, fig. 3, B), consisting mainly of spiral

(After Darwin.)

Fig. i. — Leaf of Sundew {Drosera rolundifolia).

vessels, runs up through the stalk of the tentacle and is surrounded by a layer of elongated parenchyma cells outside of which is the epidermis filled with a homogeneous fluid tinted purple by a derivative of chlorophyll (eryhrophyll). The epidermis bears small multicellular prominences. The glandular head of the tentacle contains a central mass of spirally thickened cells (tracheids) in immediate contact with the upper end of the fibrovascular bundle. Around these is a layer of large colourless thin walled cells which

reaches the surface at the base of the head and acts as absorbing cells. Outside these are two layers (the outer one the epidermis) filled with purple fluid.

Insects are attracted by the leaves ; a fly alighting on the disk, or even only touching one or two of the exterior tentacles, is immediately entangled by the viscid secretion; the tentacles to which it is adhering begin to bend, and thus pas9 on their prey to the tentacles next succeed- ing them inwards, and the insect is thus carried by a curious rolling movement to the centre of the leaf. The tentacles on all sides become similarly inflected; the blade or the leaf may even become almost cup- shaped; and the insect, bathed in the abundant secretion which soon closes up its tracheae, is drowned in about a quarter of an hour. The leaves clasp also, but for a much shorter time, over inorganic bodies.

The bending of the tentacle takes place near its base, and may be excited (1) by repeated touches,

although not by gusts of wind or … , , ,

*drops of rain, thus saving the plant a , **. ° f meat P laced on from much useless movement ; (2) by ‘*

contact with any solid, even though insoluble and of far greater minuteness than could be appreciated by our sense of .touch — a morsel of human hair weighing only ˆitf OI a grain, and this

After Darwin.

Fig. 2. — Leaf of Sundew , en- larged, with the tentacles on one side inflected over

(Alter Dodel-Port.)

Fig. 3. — Glands of Sundew magnified. A, External aspect with drop of secretion; B, Internal structure.

largely supported too by the viscid secretion, sufficing to induce movement ; (3) by the absorption of a tracaof certain fluids, mostly nitrogenous. During the inflexion of the tentacle, and even before it touches the stimulating object, the secretion of the gland increases in quantity, and, instead of remaining neutral, becomes acid. The secretion contains a digestive enzyme which renders soluble the nitrogenous substances of the insect's body; these are then absorbed through thin-walled cells at the base of the gland. After absorp- tion the tentacles recurve and the leaf assumes its normal appearance.

Closely allied to Drosera is Drosophylium lusitanicum, which catches such vast numbers of flies in a state of nature that the Portuguese cottagers call it the fly-catcher, and hang up branches of it in their houses for this purpose. Its long narrow leaves are thickly covered with stalked glands, which resemble in the main the tentacles of Drosera, save in that they are incapable of movement, and that

the secretion is less viscid and freely leaves ,

the gland to wet the insect, which, creeping 'J 6, <■ .,„ onward, soon clogs its wings and dies. There Le a } t oi P rosot>hyUum are, moreover, many minute colourless sessile lusiuinicum. glands, which, when stimulated by the absorption of nitrogenous matter, excrete an acid digestive secretion similar to that of the sundew, by means of which the body of the captured insect is digested and absorbed.

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SUNDSVALL— SUNFLOWER

SUNDSVALL, a seaport of Sweden in the district (Ian) of Vesternorrland, on a wide bay of the Baltic, at the north of the Seianger River, 360 m. N. by W. of Stockholm, the terminus of a branch from Ange on the northern railway. Pop. (1900), 14,831. It was rebuilt in brick and stone after a destructive fire in 1888. In the town and its vicinity are numerous steam saw-mills, besides wood-pulp factories, steelworks, brickworks, engineering shops, breweries and joineries, but Sundsvall owes its chief importance to its export trade in timber (6 to 7 million cub. ft. annually), the bulk of which goes to Germany, France and Great Britain. It also exports wood-pulp, iron and fish. There is a special trade with Finland. The harbour, which is usually closed by ice from about the middle of December to the second week in May, is sheltered against the east winds by a group of islands.

SUNFISH, a name chiefly and properly applied to a marine fish

(Orthagoriscus) of the order Plectognathi, which by its large size, grotesque appearance and numerous peculiarities of organi- zation has attracted the attention equally of fishermen as of naturalists. Only two species are known, the rough or short sunfish (0. mola), which is found in all seas of the temperate and tropical zones; and the smaller and scarcer smooth or oblong sunfish (O. truncatus), of which only a small number of specimens have been obtained from the Atlantic and Indian oceans.

Sunfishes have the appearance of tailless fish. This is due to the extreme shortening of the caudal region which is sup- ported .by only a few short vertebrae; the caudal fin is absent, what appears to be a tail being formed by the confluence of dorsal and ventral fins: pelvic fins are also wanting. The anterior parts of the dorsal and ventral fins are high and broad, similar to each other in size and triangular in form. The head is com- pletely merged in the trunk, the boundary between them being indicated only by a very small and narrow gill-opening and a comparatively small pectoral fin. This fin can be of but little use in locomotion, and the horizontal and vertical movements of the fish, as well as the maintenance of its body in a vertical position, are evidently executed by the powerful dorsal and anal fins. The small mouth, situated in front of the head, is armed with an undivided dental plate above and below, similar to but weaker than the teeth of the globe-fish (Diodon).

Sunfishes are truly pelagic, propagating their species in the

Sunfish (Orthagoriscus mola).

open sea, and only occasionally approach the coast. During the stormy season they live probably at some depth, but in calm, bright weather they rise and rest or play on the surface with their dorsal fin high above the water. This habit has given rise

to the popular name " sunfish," a term also sometimes applied to the basking-shark. In some years the rough sunfish is by no means scarce on the south coast of England and on the Irish coasts, where it appears principally in the summer months. The usual size is from 3 to 4 ft. in length, but this species attains to 7 ft. and more. One of the largest specimens (shown in the figure) was caught near Portland (Dorsetshire) in 1846, and is now in the British Museum; its length is 7 ft. 6 in. The sunfish has no economic value, and is rarely, if ever, eaten.

Whilst the rough sunfish has a granulated, rough, shagreen- like skin, the second species (O. truncatus) has the surface of the body smooth and polished, with its small dermal scutes arranged in a tesselated fashion. It is oblong in shape, the body being much longer than it is deep. The sides are

finely ornamented with transverse silvery, black-edged stripes running downwards to the lower part of the abdomen. It has not been found to exceed 2 ft. in length. Only a few specimens have been captured on the coasts of Europe, at the Cape of Good Hope and off Mauritius.

SUNFLOWER. The common sunflower, known botanically as Helianthus annuus, a member of the natural order Compositae, is a native of the western United States. It is an annual herb with a rough hairy stem 3 to 12 ft. high, broad coarsely toothed rough leaves 3- to 12 in, long, and heads of flowers 3 to 6 in. wide in wild specimens and often a foot or more in cultivated. Double forms are in cultivation, one (globosus fistulosus) having very large globular heads. The plant is valuable from an economic as well as from an ornamental point of view. The leaves are used as fodder, the flowers yield a yellow dye, and the seeds contain oil and are used for food. It is cultivated in Russia and other parts of Europe, in Egypt and India and in several parts of England hundreds of plants are grown on sewage farms for the seeds. The yellow sweet oil obtained by compression from the seeds is considered equal to olive or almond oil for table use. Sunflower oilcake is used for stock and poultry feeding; and largely exported by Russia to Denmark, Sweden and elsewhere. The genus Helianthus contains about fifty species, chiefly natives of North America, a few being found in Peru and Chile. They are tall, hardy annual or perennial herbs, several of which are well known in gardens where they are of easy cultivation in moderately good soil. H. decapetalus is a perennial about 5 ft. high with solitary heads about 2 in. across in slender twiggy branchlets; H. multiflorus is a beautiful species with several handsome double varieties; H. orygalis is a graceful perennial 6 to 10 ft. high, with drooping willow-like leaves and numerous comparatively, small yellow flower-heads. H. atrorubens, better known as Harpaliwm rigidum, is a smaller plant, 2 to 3 ft. high, the flower heads of which have a dark red or purple disk and yellow rays. There are many fine forms of this now, some of which grow 6 to 9 ft. high and have much larger and finer flowers than the type. Other fine species are H. giganteus, 10 to 12 ft.; H. laetiflorus, 6 to 8 ft'., and H. mollis, 3 to 5 ft. H. tuber osus is the Jerusalem artichoke.

Since the word " sunflower," or something corresponding to it, existed in English literature before the introduction of Helianthus annuus, or, at any rate, before its general diffusion in English gardens, it is obvious that seme other flower must have been intended. The marigold (Calendula officinalis) is considered by Dr Prior to have been the plant intended by Ovid (Met. iv. 269-270) —

"... Ilia suum, quˆnvis radice tenetur, Vertitur ad solem; mutataque servat amorem " —

and likewise the solsaece of the Anglo-Saxon, a word equivalent to solsequium (sun-following). But this movement with the sun is more imaginary than real, the better explanation for the application of the name to a flower being afforded by the re- semblance to " the radiant beams of the sun," as Gerard expresses it. The rock-rose (Helianthemum vulgare) was also termed sunflower in some of the herbals from its flowers opening only in the sunshine. Actinella grandiflora, a pretty perennial 6 to 9 in. high, from the Colorado mountains, is known as the Pigmy sunflower.

SUNIUM (Zoiiviov; mod. Cape Colonna), a cape at the southern extremity of Attica, with a temple of Poseidon upon it, which serves as a landmark for all ships approaching Athens from the east. The rocky promontory on which the temple stands was fortified by a wall with towers, in 413 B.C., as a protection against the Spartans in Decelea; but it was soon after seized by a body of fugitive slaves from the Laurium mines. In the 4th century it was still kept up as a fortress. The temple was shown by an inscription found in 1898 to be dedicated to Poseidon, not, as formerly supposed, to Athena, the remains of whose temple are to be seen about a quarter of a mile away to the north-east; they are of a peculiar plan, consisting of a hall with a colonnade on two sides only. The extant temple on the promontory was probably built in the time of Pericles. It took the place of an earlier one, of similar proportions but built of tufa or " poros " stone. There are still standing nine columns of the south side and two of the north of the peristyle, and one of the antae and an inner column of the pronaos. They are built of local white marble, which has suffered much from the weather. In form they resemble those of the Parthenon and Theseum, but they have only sixteen flutings. Recent excava- tions have revealed porticoes, a gateway and other buildings, and also the remains of several colossal early statues, the best preserved of which is now in the museum at Athens. The site of Cape Colonna is extolled by Byron, and is the scene of Falconer's " Shipwreck." (E. Gr.)

SUNN, or India Hemp (Crotalaria juncea), a plant which is a native of India and Ceylon. It frequently receives other names, e.g. false hemp, brown hemp, Bombay hemp, Jubbulpore hemp, sana, &c. The plant is an annual, requires a light soil, and is easily cultivated. The ground is ploughed two or three times, and from 80 to 100 lb of seed are sown broadcast. The seedlings quickly appear above the surface, but it is about four months before the plant begins to flower. Sometimes the seed is sown in October for the winter crop, and sometimes in May or June for the summer crop. When the seeds are sown in May, the bright yellow flowers

appear in August, when the plant may be gathered. It is not unusual, however, to defer this operation until the seed is ripe, especially if a fibre of great strength is desired. The stems may be pulled up, as is the case with flax, or they may be cut down. Different opinions exist as to whether the stems should be steeped immediately after they are pulled, or left to dry and then steeped: in the wet dis- tricts they are taken direct to the water. Since the root ends are much thicker and coarser than the tops, it is common to place the bundles erect, and to immerse the root ends in about a foot of water. Afterwards the bundles are totally immersed in the ponds, and in two to four days the fibre should be ready for stripping. There is the same danger of over-retting and under- retting as in other fibres, but when the retting is complete, the workmen enter the ponds, take up a handful of stems, and swish them upon the surface of the water until the fibre becomes loose. After the fibre has been peeled off it is hung over poles to dry. When intended for cloth it is combed in order to remove any foreign matter, but if it is intended to be used for rope or similar purposes, the fibres are simply separated and the woody matter combed out with the fingers. The fibre is of a light grey colour, and has an average length of 3 to 4 ft. It is extensively used for rope and cordage and also for paper-making in its native country, but it has made little, if any, progress in this country. According to Warden, the fibre was tried in Dundee in the beginning of the 19th century. About 1820 the price of India hemp bagging, as quoted in the Dundee Advertiser, was i|d. per yard below hemp bagging, and |d. a yard below tow warp bagging.

It is stated in Sir G. Watt's Dictionary of the Economic Products of India that a cord 8 in. in size of best Petersburg hemp broke with 14 tons, 8 cwt. 1 qr., while a similar rope of sunn only gave way with 15 tons, 7 cwt. 1 qr. Roxburgh's experiments with ropes made from this and other fibres appear on p. 607 of the above work. The ropes were tested in the fresh state, and also after having been im- mersed in water for no days. His results, reproduced in the following table, show the comparison.

Names of the Plants.

Average Weight at which each sort of line broke.

When fresh.

After no days' macera- tion.

White.

Tanned.

Tarred.

White.

Tanned.

Tarred.

English hemp, a piece of new tiller-rope

J105

—

—

Rotten, as was also the English log-line.

Hemp from the East IndiaCompany's farm near. Calcutta.

r"

139

45

All rotten.

Sunn hemp of the Ben-

\ 68

69

60

Rotten

51

65

Jute (Bunghi-pat) .

68

69

61

40

49

60

It would appear that, after maceration, neither ordinary hemp nor sunn hemp can compare with jute for strength.

SUNNITES, literally, " those of the path," sunna, i.e. followers of the Prophet's directions, the name of one of the two main divisions of Islam, the other being the Shi'ites (q.v.). The Sunnites, who accept the orthodox tradition (Sunna) as well as the Koran as a source of theologico-juristic doctrines, pre- dominate in Arabia, the Turkish Empire, the north of Africa t Turkestan, Afghanistan and the Mahommedan parts of India and the east of Asia; the Shi'ites have their main seat in Persia, where their confession is the state religion, but are also scattered over the whole sphere of Islam, especially in India and the regions bordering on Persia, except among the nomad Tatars, who are all nominally Sunnite. Even in Turkey there are many native Shi'ites, generally men of the upper classes, and often men in high office (see generally Mahommedan Religion).

Orthodox Islam preserves unchanged the form of doctrine established in the 10th century by Abu. '1-Hasan al-Ash'ari (see Ash'ari). The attacks of rationalism, aided by Greek philosophy, were repelled and vanquished by the weapons of scholastic dialectic borrowed from the enemy; on most points of dispute discussion was forbidden altogether, and faith in what is written in Koran and tradition was enjoined without question as to how these things were true (bila kaifa). Freer allegorical views, however, were admitted on some specially perplexing points, such as the doctrine of the eternity of the Koran, the crude anthropomorphisms of the sacred text, &c; and, since Mo'tazilite (Mu'tazilite) views had never taken deep root among the masses, while the caliphs required the help of the clergy, and from the time of Motawakkil (a.d. 847) became ever more closely bound to orthodox views, the freethinking tendency was thoroughly put down, and to the present day no rationalizing movement has failed to be crushed in the bud. Philosophy still means no more than scholastic dialectic, ahd is the humble servant of orthodoxy, no man venturing on devious paths except in secret. In the years 1872-1878 the Afghan Jamal ud-Din, a professor in the Azhar mosque at Cairo, at- tempted to read Avicenna with his scholars, and to exercise them in things that went beyond theology, bringing, for example, a globe into the mosque to explain the form of the earth. But the other professors rose in arms, forbade him to enter the mosque, and in 1879 procured his exile on the pretext that he entertained democratic and revolutionary ideas. Thus the later movements of thought in Islam never

touch on the great questions that exercised Mahommedanism in its first centuries, e.g. the being and attributes of God,' the freedom of the will, sin, heaven and hell, &c. Religious earnestness, ceasing to touch the higher problems of speculative thought, has expressed itself in later times exclusively in protest against the extravar gances of the dervishes, of the worship of saints, and so forth, and has thus given rise to movements analogous to Puritanism.

That even in early times the masses were never shaken in their attachment to the traditional faith, with all its crude and grotesque conceptions, is due to the zeal of the uiema ulcma (clergy). Mahommedanism has no priest-hood standing between God and the congregation, but Koran and Sunna are full of minute rules for the details of private

and civil life, the knowledge of which is necessarily in the hands of a class of professed theologians. These are the 'ulema (q.v.), " knowers," theology being briefly named " the knowledge " ('Urn). Their influence is enormous and hardly has a parallel in the history of religions. For it is not supported by temporal agencies like the spiritual authority of the Christian priesthood in the middle ages, but is a pure power of knowledge over the ignorant masses, who do nothing without 'consulting their spiritual advisers. When the vigorous Spanish sultan Mansur b. Abl 'Amir proposed to confiscate a religious foundation and the assembled ulema refused to approve the act, and were threatened by his vizier, one of them replied, " All the evil you say of us applies to yourself; you seek unjust gains and support your injustice by threats; you take bribes and practise ungodliness in the world. But we are guides on the path of righteousness, lights in the darkness, and bulwarks of Islam ; we decide what is just or unjust and declare the right; through us the precepts of religion are maintained. We know that the sultan will soon think better of the matter; but, if he persists, every act of his government will be null, for every treaty of peace and war, every act of sale and purchase, is valid only through our testimony." With this answer they left the assembly, and the sultan's apology overtook them before they had passed the palace gate. 1 The same consciousness of inde- pendent authority and strength still survives among the ulema. Thus the sheikh ul-Islam 'AbbasI (who was deposed by the professors of the Azhar in 1882) had in the first period of his presidency a sharp conflict with 'Abbas Pasha, viceroy of Egypt, who asked of him an unjust legal opinion in matters of inherit- ance. When bribes and threats failed, the sheikh was thrown into chains and treated with great severity, but it was the pasha who finally yielded, and "AbbasI was recalled to honours and rich rewards.

The way in which the ulema are recruited and formed into a hierarchy with a vigorous esprit de corps throws an instructive light on the whole subject before us. The brilliant days are past when the universities of Damascus, Bagdad, Nlshapur, Cairo, Kairawan, Seville, Cordova, were thronged by thousands of students of theology, when a professor had often hundreds or even, like Bukhari, thousands of hearers, and when vast estates in the hands of the clergy fed both masters and scholars. Of the great universities but one survives — the Azhar mosque at Cairo — where thousands of students still gather to follow a course of study which gives an accurate picture of the Mahom- medan ideal of theological education.

The students of theology generally begin their course in early youth, but not seldom in riper years. Almost all come from the

" lowest orders, a few from the middle classes, and none

Theological [rom t) le highest ranks of society — a fact which in to itself excludes all elements of freer and more refined

education. These sons of poor peasants, artisans or tradesmen are already disposed to narrow fanaticism, and generally take up study as a means of livelihood rather than from genuine religious interest. The scholar appears before the president's secretary with his poor belongings tied up in a red handkerchief, and after a brief interrogatory is entered on the list of one of the four orthodox rites— Shafi'ite, Hanifite, Malikiteand Hanbalite (see Mahommedan Law). If he is lucky he gets a sleeping-place within the mosque, a chest to hold his things, and a daily ration of bread. The less fortunate make shift to live outside as best they can, but are all day in the mosque, and are seldom deserted by Moslem charity. Having kissed the hands of the sheikh and teachers of his school, the pupil awaits the beginning of the lectures. For books a few compendiums suffice him. Professors and students gather every morning for the daily prayer; then the professors take their seats at the foot of the pillars of the great court and the students crouch on mats at their feet. The beginner takes first a course in the grammar of classical Arabic, for he has hitherto learned only to read, write and count. The rules of grammar are read out in the memorial verses of the Ajrumlya, and the teacher adds an exposition, generally read from a printed commentary. The student's chief task is to know the rules by heart; this accomplished, he is dismissed at the end of the year with a certificate (ijaza), entered in his textbook, which permits him to teach it to others. The second year is devoted to dogmatic (kalam and tawlfid), taught in the same mechanical way. The dog- mas of Islam are not copious, and the attributes of God are the chief

1 Von Kremer, Gesch. d. herrschenden Ideen d. Islams, p. 464 (Leipzig,

1868).

subject taken up. They are demonstrated by scholastic dialectic, and at the end of his second year the student, receiving his certificate, deems himself a pillar of the faith. The study of law (fiqh), which rests on Koran and tradition, is more difficult and complex, and begins, but is often not completed, in the third year. The student had learned the Koran by heart at school and has often repeated it since, but only now is the sense of its words explained to him. Of the traditions of the Prophet he has learned something incidentally in other lectures; he is now regularly introduced to their vast artificial system. From these two sources are derived all religious and civil laws, for Islam is a political as well as a religious institution. The five main points of religious law, " the pillars of Islam," have been enumerated in the article Mahommedan Religion; the civil law, on the development of which Roman law had some influence, is treated under heads similar to those of Western jurisprudence. It is here that the differences between the four schools come most into notice: the Hanifite praxis is the least rigorous, then the Shafi'ite; the Hanbalites, whose system is the strictest, have practically dis- appeared in the Malikites. The Hanifite rite is official in the Turkish Empire, and is followed in all government offices whenever a decision still depends on the sacred law, as well as by all Mahommedans of Turkish race. In this as in the previous studies a compendium is learned by heart, and explanations are given from commentaries and noted down by the students word for word. The professors are expressly forbidden to add anything of their own. The recognized books of jurisprudence, some of which run to over twenty folio volumes, are vastly learned, and occasionally show sound sense, but excel mainly in useless hair-splitting and feats of scholastic gymnastics, for which the Arabian race has a natural gift.

Besides the three main disciplines the student takes up according to his tastes other subjects, such as rhetoric (ma'am wabayan), logic (inantiq), prosody ('ariid), and the doctrine of the correct pronunciation of the Koran (qira'a watajvAd). After three or four years, fortified with the certificates of his various professors, he seeks a place in a law-court or as a teacher, preacher, cadi, or mufti of a village or minor town, or else one of the innumerable posts of con- fidence for which the complicated ceremonial of Mahommedanism demands a theologian, and which are generally paid out of pious foundations. A place is not hard to find, for the powerful corporation of the ulema seeks to put its own members into all posts, and, though the remuneration is at first small, the young 'Slim gradually accumulates the revenues of several offices. Gifts, too, fall in, and with his native avarice and economy he rises in wealth, position and reputation for piety. The commonalty revere him and kiss his hand ; the rich show him at least outward respect ; and even the government treats him as a person to whom

consideration is due for his influence with the masses.

This sketch of his education is enough to explain the narrow- mindedness of the 'Slim. He deems all non-theological science to be vain or hurtful, has no notion of progress, and regards true science — i.e. theology — as having reached finality, so that a new supercommentary or a new students' manual is the only thing that is perhaps still worth writing. How the mental faculties are blunted by scholasticism and mere memory work must be seen to be believed ; such an education is enough to spoil the best head. All originality is crushed out and a blind and ludicrous dependence on written tradition — even in things profane — takes its place. Acuteness degenerates into hair-splitting and clever plays on words after the manner of the rabbins. The Azhar students not seldom enter government offices and even hold important administrative posts, but they never lose the stamp of their education — the narrow, un- teachable spirit, incapable of progress, always lost in external details, and never able to grasp principles and get behind forms to the substance of a matter.

Yet it is but a small fraction of the ulema of the Moslem world that enjoy even such an education as the Azhar affords. It draws few students from foreign parts, 2 where the local schools „. • .are of the poorest kind, except in India (thanks to a British °° '

government) and perhaps in Constantinople. 3 Bokhara was once a chief seat of learning, but is now so sunk in narrow fanaticism that its eighty madrasas (medresses) with their 5000 students only turn out a bigoted and foolish clergy (VambeVy). 4 But for this very reason Bokhara is famed as a luminary of pure theology and spreads its influence over Turkestan, Siberia, China, Kashmir, Afghanistan, and even over India. Minor schools attached to mosques are found in other places, but teach still less than the great schools already mentioned.

Except ! in India, where it is controlled by the government,

2 In 1878 seventeen lecture-rooms of the Azhar had 3707 students, of whom only 64 came from Constantinople and the northern parts of the Ottoman Empire, 8 from North Arabia, I from the government of Bagdad, 12 from Kurdistan, and 7 from India with its thirty million Sunnites.

3 In Kazan also the standard of learning seems to have been raised by Russian and Western scholars.

4 The madrasa is here a college, generally attached to a mosque, with lands whose revenues provide the means of instruction and in part also food and residence for scholars and teachers.

the organization of the priestly and judicial persons trained in the schools is a compromise between what theological prin- Call h t c 'pl es dictate and what the state demands. Neither a „d Koran nor Sunna distinguishes between temporal

Temporal and spiritual powers, and no such distinction was So Y*~ known as long as the caliphs acted in all things as

y ' successors of the prophets and heads of the community of the faithful. But, as the power of the 'Abbasids declined (see article Caliphate, ad fin.) and external authority fell in the provinces into the hands of the governors and in the capital into those of the amir al-omara, the distinction became more and more palpable, especially when the Bfiyids, who were disposed to Shi'ite views, proclaimed themselves sultans, i.e. possessors of all real authority. The theologians tried to uphold the ortho- dox theory by declaring the sultanate to be subordinate to the imamate or sovereignty of the caliphs, and dependent on the latter especially in all religious matters; but 'their artificial theories have never modified facts. The various dynasties of sultans (Buyids, Ghaznevids, Seljuks, and finally the Mongols) never paid heed to the caliphs, and at length abolished them; but the fall of the theocracy only increased the influence of the clergy, the expounders and practical administrators of that legislation of Koran and Sunna which had become part of the life of the Mahommedan world. The Mamelukes in Egypt tried to make their own government appear more legitimate by nominally recognizing a continuation of the spiritual dignity of the caliphate in a surviving branch of the 'Abbasid line which they protected, and in 923 a.h. (151 7) the Ottoman Selim, who destroyed the Mameluke power, constrained the 'Abbasid Motawakkil III., who lived in Cairo, to make over to him his nominal caliphate. The Ottoman sultans still bear the title of " successors of the Prophet," and still find it useful in foreign relations, since there is or may be some advantage in the right of the caliph to nominate the chief cadi {kadi) of Egypt and in the fact that the spiritual head of Khiva calls himself only the nakib (vicegerent) of the sultan. 1 In India too the sultan owes something perhaps to his spiritual title. But among his own subjects he is compelled to defer to the ulema. and has no con- siderable influence on the composition of that body. He nomin- ates the Sheikh ul-lslam or mufti (q.v.) of Constantinople (grand mufti) , who is his representative in the imamate and issues judg- ments in points of faith and law from which there is no appeal; but the non-ination must fall on one of the mollahs? who form the upper s*iatum of the hierarchy of ulema. And, though the various plat.es of religious dignity are conferred by the

sultan, no one can hold office who has not been examined and certified iby older ulema. so that the corporation is self-propagating, and palace intrigues, though not without influence, can never break through its iron bonds. The deposition of 'Abd ul-AzIz is an example of the tremendous power that can be wielded by the ulema at the head of their thousands of pupils, 3 when they choose to stir up the masses; nor would Mahmud II. in 1826 have ventured to enter on his struggle with the janissaries unless he had had the hierarchy with him.

The student who has passed his examinations at Constanti- nople or Cairo may take up the purely religious office of imam (president in worship) or khaHb (preacher) at a mosque. These offices, however, are purely ministerial, are not necessarily limited to students, and give no place in the hierarchy and no particular consideration or social status. On the other hand, he may become a judge or •cadi. Every place of any importance has at least one cadi, who is nominated by the government, 4 but has no further dependence

1 Till the Russians gained preponderating influence the khan of Khiva also acknowledged the sultan as his suzerain.

4 Mollah is the Perso- Turkish pronunciation of the Arabic mar.ta, literally " patron," a term applied to heads of orders and other "eligious dignitaries of various grades.

3 Called in Constantinople softa, Persian sokhta, burned up, soil., with zeal or love to God.

4 In Egypt before the time of Sa'id Pasha (1854-18C3) the local judges were appointed by the chief cadi of Cairo, who is sent from Constantinople. Since then they have becD nominated by the Egyptian government

Judicial Offices.

on it, and is answerable only to a member of the third class of the ulema, viz. the mufti or pronouncer of fatwas. A fatwa is a decision according to Koran and Sunna, but witheut reasons, on an abstract case of law which is brought before the mufti by appeal from the cadi's judgment or by reference from the cadi himself. For example, a dispute between master and slave may be found by the cadi to turn on the general question, " Has Zaid, the master of 'Amr, 5 the absolute right to dispose of his slave's earnings?" When this is put to the mufti, the answer will be simply " Yes," and from this decision there is no appeal, so that the mufti is supreme judge in his own district. The grand mufti of Constantinople is, as we have seen, nominated by the sultan, but his hold on the people makes him quite an

independent power in the state; in Cairo he is not even nominated by the government, but each school of law chooses its own sheikh, who is also mufti, and the Hanifite is head mufti because his school is official in the Turkish Empire.

All this gives the judges great private and political influence. But the former is tainted by venality, which, aggravated by the scantiness of judicial salaries or in some cases by the judge having no salary at all, is almost changes. universal among the administrators of justice. Their political influence, again, which arises from the fusion of private and political law in Koran and Sunna, is highly inconvenient to the state, and often becomes intolerable now that relations with Western states are multiplied. And even in such distant parts as Central Asia the law founded on the conditions of the Prophet's lifetime proves so unsuited to modern life that cases are often referred to civil authorities rather than to canonical jurists. Thus a customary law ("or/) has there sprung up side by side with the official sacred law (shari'a), much to the displeasure of the mollahs. In Turkey, and above all in Egypt, it has been found necessary greatly to limit the sphere and influence of the canonical jurists and to introduce institutions nearer to Western legal usage. We do not here speak of the paper constitutions (kkait-i-sherif) and the like, created to impose upon Western diplomatists, but of such things as consular and commercial courts, criminal codes, and so forth.

The official hierarchy, strong as it is, divides its power with the dervishes. A religion which subdues; to itself a race with strongly marked individuality is always influenced in cultus and dogma by the previous views and tendencies of that race, to which it must in some measure accommodate itself. Mahomet himself made a concession to heathen traditions when he recog- nized the Ka'ba and the black stone; and the worship of saints, which is now spread throughout Islam and supported by obviously forged traditions, is an example of the same thing. So too are the religious orders now found everywhere except in some parts of Arabia. Mystical tendencies in Mahommedanism arose mainly on Persian soil (see Sufiism), and Von Kremer has shown that these Eastern tendencies fell in with a disposition to asceticism and flight from the world which had arisen among the Arabs before Islam under Christian influence. 6 Inter- course with India had given Persian mysticism DervjsSes. the form of Buddhistic monkery, while the Arabs imitated the Christian anchorites; thus the two movements had an inner kinship and an outer form sc nearly identical that they naturally coalesced, and that even the earliest organiza- tions of orders of dervishes, whether in the East or the West, appeared to Mahommedan judgment to be of one type. Thus, though the name of Silft (see Suiiisn) is first applied to AbQ Hashim, who died in Syria in 150 a.h. (767), we find it transferred without question to the mystical brotherhood which appears in Khorasan

under Abu Sa'id about 200 a.h. (815/816). Yet these two schools of Sufis were never quite similar; on Sunnite soil Sufiism could not openly impugn orthodox views, while in Persia it was saturated with Shi'ite heresy and the pantheism of the extreme devotees of 'All. Thus there have always beer? tw6 kinds of Sufis, and, though the course of history and the wandering habits which various orders borrowed from Buddhism

5 Zaid and 'Amr are the Caius and Sempronius of Arabian law.

6 Op. cit. p. 52 seq.

have tended to bring them closer to one another, we still find that of the thirty-six chief orders three claim an origin from the caliph Abubekr, whom the Sunnites honour, and the rest from 'All, the idol of the Shfites. 1 Mystic absorption in the being of God, with an increasing tendency to pantheism and ascetic practices, are the main scope of all Suflism, which is not necessarily confined to members of orders; indeed the secret practice of contemplation of the love of God and contempt of the world is sometimes viewed as specially meritorious. And so ultimately the word sujl has come to denote all who have this religious direction, while those who follow the' special rules of an order are known as dervishes (beggars, in Arabic fuqara, sing, jaqir — names originally designating only the rriendicant orders). In Persia at the present day a Sufi is much the same as a free-thinker. 2

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SUNSHINE. As a meteorological element sunshine requires some conventional definition. There is uninterrupted continu- ance of gradation from the burning sunshine of a tropical noon to the pale luminosity that

throws no shadow, but just identifies the position and shape of the sun through the thin cloud of northern skies.

The Campbell-Stokes Sunshine Recorder. — In the British Isles the sun is allowed to be its own timekeeper and the scorch of a specially prepared card used as the criterion for bright sunshine. The practice arose out of the use of the sunshine recorder which depends upon the scorching effect of a glass sphere in the sun's rays. The original form of the instrument was suggested by J. F. Campbell of Islay in 1857. He used a glass sphere within a hemispherical bowl of wood. The scorching of the wood along successive lines of the bowl as the sun alters its declination from solstice to solstice leaves a rugged monument of the duration and intensity of the sunshine during the half-year, but does not lend itself to numerical measurement. The design of a metal frame to carry movable cards and thus give a decipherable record of each day's sunshine is due to Sir G. G. Stokes. The excursions of the sun to the north and south of the equator are limited by the tropical circles, and the solar record on the hemi- spherical bowl will be confined within a belt 23° 27′ north and south of the plane through the centre parallel to the equator or perpendicular to the polar axis. Thus a belt 46 54′ in angular width will be suitable for a sunshine recorder for any part of the world. Whatever place be chosen for the observation the same belt will do if it is set up perpendicular to the earth's polar axis. But there can be no record if the sun is below the horizon; hence any part of the belt projecting above the horizon is not only useless for recording but is liable to shadow a part of the belt where there might be a record. Hence to meet the requirements of a particular locality the belt as set up round the polar axis should be cut in two by a horizontal plane through the centre and the half projecting above the horizontal removed. Reversed it makes a half belt, exactly similar to what is left, and thus each complete belt is cut by a horizontal plane through the centre into two frames suitable for sunshine recorders for the particular locality.

The cutting of the belt may, of course, vary between the direct transverse cut along the polar axis which gives a half-ring belt to be set vertical in order to receive the record for a point on the equator, and the cut perpendicular to the polar axis which

1 These claims to early origin are mere fables, like the claim of the Oweisi order to spring from Oweis, one of the oldest traditionalists, and so forth.

2 For the dervish orders see Dervish.

divides the belt into two similar rings suitable for recording trie sunshine at the poles. Clearly, when the belt is so cut that two complete rings are formed, a continuous record of sunshine throughout the twenty-four hours

may be expected, so that for the polar circles the cut will run diagonally between opposite points of the extreme circles of the sun's records. As examples of the cutting of the belt for different latitudes we may put side by side the recorder as used in temperate latitudes (fig. 1) and

Fig. 1. — Campbell-Stokes Sunshine Recorder.

the special form designed in the Meteorological Office, London, for use on the National Antarctic Expedition, 1901-1904 (fig. 2). A belt cut for a particular latitude is serviceable for some io°

Antarctic Sunshine Recorder, to carry 24-hour record.

Fig. 2. — Antarctic Sunshine Recorder, to carry 12-hour record.

on either side of that latitude if the cards are not trimmed too closely to the cutting of the belt. The belt must always be adjusted round the parallel to the polar axis. If the cut of the belt is too oblique for the latitude of the place where it is exposed, and the cards are cut strictly to the belt, the northern side of the cut will be below the horizon and the southern side above it,

some sunshine may be lost near sunrise or sunset in the winter because there is no card to receive it. The part projecting above the horizon in summer will partly shadow the globe, and faint sunshine may be lost, for at most only half the globe can be solarized at sunset. But the loss due to this cause is unimportant. Stokes designed the compkte belt to use successively three cards

(From the Obstrver's Handbook, by permission of the Controller of H.M. Stationery Office.)

Fig. 3.

of different shape for different times of the year. The equinoctial card forms a portion of a cylinder round the polar axis for spring and autumn, the summer card and the winter card each forms a part of a cone making a vertical angle of 16 with the polar axis as indicated in fig. 3.

Adjustments. — The adjustments of the instrument are to set the belt so that its axis is parallel to the polar axis and symmetrically adjusted with reference to the meridian of the place, and to set the sphere so that its

centre coin- cides precisely with the centre of the belt. No one of the three adj ustments is easy to make or to test because neither the centre of the sphere nor the centre (nor indeed the axis) of the belt can be easily identified. For an instrument for testing these adjustments see Quart. Journ. Roy. Met. Soc. xxxii. 249.

Instruments differ accord- ing to the means provided for mounting or adjusting the positions of the belt or sphere, and in that known as the Whipple Casella instrument the fixed belt is replaced by

regard to the equinoctial card. The section of the supporting surface by a plane through, the polar axis is to be as in fig, 3.

The. Sphere. — The material for the. sphere must be "crown" glass,' colourless, or, of a very pale yellow tint. The diameter 4 in. The weight between 2-92 and 3-02 lb. The focal length from the centre of the sphere to the gmmˆricˆI focus for parallel rays should be between 2-96 in. and 2-99 m, ' ,, ...•:.

Measurement. oj 'Ike-Sunshine Records—It was mentioned that the Campbell-Stokes recorder involves a conventional definition of .sunshine. The recorded day of ,'surishirie .js less than the actual time during which the sun is above the- horizon by ahout twenty minutes at "sunnSr and, „sunset on account -»of the want of burning power of a very Jctwr sun. Some 'further convention is necessary in order-ta obtain a tabulation of the records which will serve as., the basis of a comparison of results for climato- logical purposes. The spat which is scorched on the card by the sun is not quite limited to- the image of the sun, and a few seconds of really strong sunshine will- produce a, circular burn which is hardly distinguishable in size from that of- a minute's record. (See fig. 4.) Consequently with intermittent sunshine exaggera- tion of .the actual duration of burning is very probable. , Strictly speaking- measurements ought to be between the diameters of the. circular ends of the burns; but, the practice of measuring all the trace that can be distinctly recognized as scorched has become almost universal in Great Britain, and appears tpgive a working basis of comparisons.

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Fig. 4.— Records obtained by exposing a Campbell-Stokes Sunshine Recorder for measured intervals varying from one second to thirty minutes. The duration of the- exposure of the separate burns increases from right to left of the diagram. ..•!■>. . r . ,

a movable card holder.

The chief advantage of Stokes's specification is the simplicity of the use oi the instrument when once it has been properly adjusted and fixed.

It is essential that the glass sphere should be of the proper size and refractive index to give an image of the sun on the prepared card or within the 20th of an inch of it nearer the centre. It is also essential that " the cards used should not only be of suitable material but also of the right dimensions for the bowl. The colour and material of the cards were selected by Stokes in consultation with Warren De la Rue, who was at that time his col- league on the Meteorological Council, and the cards used by the meteoro- logical office are still supplied by Messrs De la Rue & Co. Accuracy in the comparative measurements of sun- shine by this method depends upon the proper adjustment of the dimen- sions of the different constituent parts of the recorder and accordingly the following specification of standard dimensions has been adopted by the meteorological office.

The Time Scale. — On the time scale of the equinoctial card twelve hours are represented by 9-00 in.

The Bowl.— The diameter of the bowl, measured between the centres of the 6 o'clock marks on a metal equi- noctial card of thickness 0-02 in. when in its place, is to be 5-73 in. (= > = o-oi in.).

Other Types of Sunshine Recorder. — There are, however, various other conventions as to sunshine which are used as the basis of recorders of quite

different types. The Jordan recorder uses.ferro- cyanide paper and the sun keeps the time of its own record by the traverse of a spot of light over the sensitive paper, arranged as a

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*exposure edges of the upper winter flange and the lower summer flange must not be less than 2-45 in., nor exceed 2-50 in. The distances from the middle line on the equinoctial card to the middle lines on the summer and winter cards are to be 070 in. (> * 002 in.). The inclination of the summer card, in place, to the winter card, in place, is to be 32° ± j°, symmetrically arranged with*

Fig. 5. — -Sunshine Record (June 19 and 20, 1908). The distance between the ‘ cylinder about a line parallel to the polar axis. The effect thereby recorded is a photochemical one, and the composite character of the sun’s radiation, modified by the elective absorption of the atmosphere makes the 1 relation of the record to that of the sun’s scorching power dependent upon atmospheric conditions and therefore on: different occasions, so that the two records give different aspects of the solar influence. Other recorders use the thermal or photographic effect

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SUNSHINE

of the sun’s rays and record duration by a clock instead of allowing | exclusively local, the sun to keep its own time. In the Marvin sunshine recorders of | any station is a

Fortnoon,(a.m.) n M „ Afternoon, (p.m.)

HtureA January

February

March

April

May

June

July

August

September

October November

December

Fig. 6. — Monthly Average Duration of bright Sunshine for each hour of the day

at Valencia (Ireland), the United States weather bureau an electrical contact is made by the thermal effect of the sun and the duration of the contact is recorded. An instrument which gives a corresponding result is described by W. H. Dines (Quart. Journ. Roy. Met. Soc. xxvi. 243). These define sunshine by the effect necessary to produce or maintain a certain thermal effect, but the definition once accepted there is no uncertainty as to the record. The Callendar sunshine recorder 1 gives a record of the difference of temperature of two wires, one solarized and the other not, and it is therefore a continuous record of the thermal effect of solar and terrestrial radiation. It is vastly more detailed than that of other instruments (see fig. 5), but the interpretation of the record in terms suitable for meteorological or climatological purposes is a special study, which has not yet been attempted. In a somewhat similar way information about the duration and intensity of sunshine with an abundance of detail can be obtained from the record upon photographic paper passing under an aperture in a drum which revolves with the sun, as in the Lander recorder, but the study of such details has not been begun.

Sunshine Records for the British Isles. — The interest in the use of sunshine recorders is more widely extended in the British Isles than elsewhere, and it is, so far as the public are concerned, the most important meteorological element, but it is singular that up to the present a knowledge of the total amount of sunshine recorded during the day, the week, the month or the year is all that is apparently required. Except for the observatories in connexion with the meteorological office and a few others the distribution of sunshine during the day is not taken out, so that we are still some distance from attacking the problems presented by the finer details of solar records. Fig. 6 shows the average duration of bright sunshine for each hour of the day for each month at Valencia. The expectation of sunshine is greatest at I p.m. and 2 p.m. in May, while there is a well-marked secondary maximum in September.

Exposure. — We now consider what the daily sunshine record for a

particular station means. An ideal exposure has an uninter- rupted view of those parts of the horizon in which the sun rises or sets; and elsewhere the view of the sun must not be obstructed by the ground, buildings, trees or any other obstacle; but ideal exposures are not always to be obtained. In mountainous districts particularly it may be impossible to find a site in which the sun is not obstructed for an appreciable part of the day. In these circumstances it becomes a question whether the amount of sunshine recorded should be referred to the maximum possible for an un- interrupted horizon or the maximum possible for the particular exposure.

The answer to the question really depends upon the purpose for which the information is wanted. As a climatological factor of the locality the shadow cast by the surrounding hills is of importance, it is part of the difference between the fertility of the southern and northern slopes of hill country. This importance is, of course, in many respects

and indeed the possible duration of sunshine at local characteristic which it is desirable to know. Consequently as evidence of the peculiarity of the site the recorded sunshine might be referred to the total possible with a free horizon. On the other hand, taking the record of sunshine as an indication of the clearness of the sky for the purposes of general meteorology, the screening of the sun by hills must be regarded simply as limiting the time during which observation is possible and the duration of the sunshine recorded should be referred to the possible duration at the particular site. It would, therefore, be desirable in publishing records of the duration of sunshine recorded to note also the possible amount for the instrument as exposed (see Hourly Means at Five Observatories under the Meteorological Council, 1891, No. 113, p. 10). The table shows the number of hours the sun is above the horizon during each month in the latitude of the British Isles.

By way of exhibiting the results obtained from sunshine records we reproduce (fig. 7) the sunshine map of the British Isles taken from the annual summary of the Monthly " Weather Report," 1908 (British Meteorological Year-Booh, pt. ii.). Corresponding maps embodying data from over 130 stations are prepared each month; fig. 8 shows the variation in the distribution of sunshine that may take place in different months. Further, fig. 9 represents the average weekly distribution of sunshine in different sections of the British Isles according to the average of twenty-five years.

Fig. 7,-7-Sunshine in the British Isles in 1908.

Possible Duration of Bright

Sunshine in the “Latitude’ of the Brit

ish Isles.

Lati- tude.

Jan.

Feb.

Leap Year.

March

April

May

June

July

Aug.

Sept.

Oct.

Nov.

Dec.

5o°

262

278

288

36.S

410

473

482

485

442

373

327

266

246

51°

257

276

286

365

411

477

487

489

444

373

325

262

241

S2″

251

273

284

365

412

481

491

494

446

374

324

258

236

53°

247

271

281

364

414

486

498

499

45°

375

323

254

231

54°

243

268

279

363

417

490

503

505

453

375

322

251

225

,SS°

237

265

276

363

418

494

5io

5ii

456

376

319

245

218

56″

232

263

273

362

420

499

5ib

5ib

459

376

316

239

211

S7°

226

260

270

362

423

504

524

523

463

377

314

236

205

58″

219

257

267

361

426

5io

532

530

467

378

312

232

197

59°

211

253

263

361

429

517

541

53«

47i

379

309

225

187

1 Brit. Assoc. Report (1900), p. 44.

Sunshine in the Antarctic Regions. — It is clear that so far as con- cerns the zone from 50° to 60° N. in this particular region, the annual amount of sunshine diminishes as one goes northward. It would, however, not be safe to conclude that this diminution in the aggre- gate duration of sunshine during the year goes on without inter- ruption as one proceeds northward. At least the corresponding statement would not be true of the southern hemisphere. No doubt

the frequency of cloud and the consequent loss of duration of sunshine would increase for corresponding latitudes from the tropical anti- cyclone southward, but beyond the region of minimum pressure at the winter quarters of the " Discovery " in latitude 77 51′ S., longitude 166° 45′ E., the amount of bright sunshine recorded during the two years 1902 and 1903 was remarkably large. The total for 1903 equalled that for Scilly, and in December of that year an average of 16 hours per day was registered.

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750,200,250,300 and 350hrs.

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May 1909.

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June 1909.

Fig. 8. — Sunshine in the British Isles in May and

June 1909.

Sunshine Results for Other Parts of the World. — Maps showing the average annual distribution of sunshine over Europe and North America are given in Bartholomew's Physical Atlas, vol. iii. Atlas of Meteorology. Over Europe the largest totals, over 2750 hours per annum, are shown over central Spain. In North America, values exceed 3250 hours per annum in the New Mexico region. For other parts of the world the information available is not suffi- ciently extensive for the construction of charts.

Effect upon Sunshine Records of the Smoke of Great Cities.— Much discussion has taken place from time to time as to whether the climate of a locality can be altered by artificial means. Questions have been raised as to the effect of forests upon rainfall, as to the indirect effect of irrigation or the converse process, the oblitera tion of natural irrigation by blown sand, and as to the possibility of producing, arresting or modifying rainfall by the discharge of explosives.

The one question of the kind to which the sunshine recorder gives an absolutely incontrovertible answer is as to the effect of the smoke of great cities in diminishing the sunshine in the immediate

Fig. 9.-

-Average Duration of bright Sunshine in the British Isles for each week.

neighbourhood. This may be illustrated by the figures for sunshine during the winter months off Bunhill Row, E.C., in the middle of London, Westminster, Kew and Cambridge.

Monthly Average Duration of Bright Sunshine derived from Observa- tions extending over Twenty Years.

Station.

November.

December.

January.

February.

Bunhill Row

Westminster

Kew ….

Cambridge .

22-8

27-7 50-8

61 -o

7-5 13-1 38-1 40-6

14-1 18-4

40-3 48-9

30-6 32-8 54-6 73-8

This is not a question which comes out merely by taking averages. The answer can be seen directly by comparing the daily cards (see fig. 10, Sunshine Cards for Cambridge, Westminster and Bunhill Row for December 1904). Thus it appears that the direct effect of the local contamination of the London atmosphere results in the

diminution of the recorded sunshine for the whole year by 37 %, and it is clear that the contamination extends in some degree as far as Kew, where the loss amounts to about 10 %. There is evidence of various kinds to show that the effect of the smoke cloud of cities

Cambridge.

Westminster.

Bunhill Row.

Fig. 10.

can be traced sometimes for great distances, and in special conditions of weather with easterly winds the effect is sometimes remarkably persistent.

(W. N. S.)

SUNSTONE, a felspar exhibiting in certain directions a bril- liant spangled appearance, which has led to its use as an ornamental stone. The effect appears to be due to reflections from enclosures of red haematite, in the form of minute scales, which are hexagonal, rhombic or irregular in shape, and are dis- posed parallel to the principal cleavage-plane. These enclosures give the stone an appearance something like that of aventurine (q.v.), whence sunstone is known also as " aventurine-felspar." It is not common, the best-known locality being Tvedestrand, near Arendal, in south Norway, where masses of the sunstone occur embedded in a vein of quartz running through gneiss. It is found also near Lake Baikal, in Siberia, and at several localities in the United States, notably at Middletown, Delaware county, Pennsylvania, and at Statesville in North Carolina. The felspar which usually displays the aventurine appearance is oligoclase (q.v.), but the effect is sometimes seen also in orthoclase (q.v.): hence two kinds of sunstone are distinguished as " oligoclase sunstone " and " orthoclase sunstone." The latter has been found near Crownpoint and at several other localities in the state of New York, as also at Glen Riddle in Delaware county, Pennsylvania, and at Amelia Court House, Amelia county, Virginia.

SUNSTROKE (Heatstroke; Insolation; Thermic Fever; Siriasis), a term applied to the effects produced upon the central nervous system, and through it upon other organs of the body, by exposure to the sun or to overheated air. Although most frequently observed in tropical regions, this disease occurs also in temperate climates during hot weather. A moist condition of the atmosphere, which interferes with cooling of the overheated body, greatly increases the liability to suffer from this ailment.

Sunstroke has been chiefly observed and investigated as occurring among soldiers in India, where formerly, both in active service and in the routine of ordinary duty, cases of this disease constituted a considerable item of sickness and mortality. The increased attention now paid by military authorities to the personal health and comfort of the soldier, particularly as regards barrack accommodation and dress, together with the care taken in adjusting the time and mode of movement of troops, has done much to lessen the mortality from this cause. It would appear that, while any one exposed to the influence of

strong solar heat may suffer from the symptoms of sunstroke, there are certain conditions which greatly predispose to it in the case of individuals. Causes calculated to depress the health, such as previous disease, particularly affections of the nervous system — anxiety, worry or overwork, irregularities in food, and in a marked degree intemperance —

have a powerful predisposing influence, while personal uncleanliness, which prevents among other things the healthy action of the skin, the wearing of tight garments, which impede the functions alike of heart and lungs, and living in overcrowded and insanitary dwellings have an equally hurtful tendency.

While attacks of sunstroke are frequently precipitated by exposure, especially during fatigue, to the direct rays of the sun, in a large number of instances they come on under other circum- stances. Cases are of not infrequent occurrence among soldiers in hot climates when there is. overcrowding or bad ventilation in their barracks, and sometimes several will be attacked in the course of a single night. The same remark applies to similar conditions existing on shipboard. Further, persons whose occupation exposes them to excessive heat, such as stokers, laundry workers., &c, are apt to suffer, particularly in hot seasons. In the tropics Europeans, especially those who have recently arrived, are more readily affected than natives. But natives are not exempt.

The symptoms of heatstrdke, which obviously depend upon the disorganization of the normal heat-regulating mechanism, as well as of the functions of circulation and respiration, vary in their intensity and likewise to some extent in their form. Three chief types of the disease are usually described. –

1 . Heat Syncope. — In this form the symptoms are those of exhaus- tion, with a tendency towards fainting or its actual occurrence. A fully developed attack of this description is usually preceded by sickness, giddiness, some amount of mental excitement followed by drowsiness, and then the passage into the syncopal condition, in which there are pallor and coldness of the skin, a weak, quick and intermittent pulse, and gasping or sighing respiration. The pupils are often contracted. Death may quickly occur; but if timely treatment is available recovery may take place.

2. Heat Apoplexy or Asphyxia.— la. this variety the attack, whether preceded or not by the premonitory symptoms already mentioned, is usually sudden, and occurs in the form of an apoplectic seizure, with great vascular engorgement, as seen in the flushed face, congested eyes, quick full pulse and stertorous breathing. There is usually insensibility, and convulsions are not infrequent. Death is often very sudden. This form, however, is also amenable to treatment.

3. Thermic Fever. — This variety is characterized chiefly by the excessive development of fever (hyperpyrexia), the temperature of the body rising at such times to io8°to no° F. or more. Accompany- ing this are the other symptoms of high febrile disturbance, such as great thirst, quick full pulse,

pains'throughout the body, headache, nausea and vomiting, together with respiratory embarrass- ment. After the attack has lasted for a variable period, often one or two days, death may ensue from collapse or from the case assuming the apoplectic form already described,- But here, too, treatment may be successful if it is promptly applied.

Besides these, other varieties depending on the prominence of certain symptoms are occasionally met with. The chief changes in the body after death from heatstroke are those of anaemia of the brain and congestion of the lungs, together with softness of the heart and of the muscular tissues generally. The blood is dark, and fluid and the blood corpuscles are somewhat altered in shape. ; Attacks of sunstroke are apt to leave traces of their effects upon the constitu- tion, especially upon the nervous system. A liability to severe headache, which in many cases would seem to depend upon a condi- tion of chronic meningitis, epileptic fits, mental irritability and alterations in the disposition are among the more important. It is often observed that heat in any form is ever afterwards ill borne, while there also appears to be an abnormal susceptibility to the action of stimulants. The mortality from sunstroke is estimated at from 40 to 50%.

Treatment. — : Means should be adopted to prevent attacks in the case of those who must necessarily be exposed to the sun. These consist in the wearing of loose clothing, with the exception of the head-dress, which ought to be worn close to the head, in due attention to the function of the skin, and in the avoidance of alcoholic and other excesses. Cold water may be drunk in small quantities at frequent intervals. Sleeping in the open air in very hot seasons is recommended. The treatment of a patient suffering from an attack necessarily depends upon the form it has assumed. In all cases he should if possible be at once removed into a shaded or cool place. Where the symptoms are mostly those of shock and there is a

in

tendency to death from heart failure, rest in the recumbent position, the use of diffusible stimulants, such as ammonia or ether, &c, together with friction or warmth applied to the extremities, are the means to be adopted. Where, on the other hand, the symptoms are those ot apoplexy or of hyperpyrexia, by far the most successful results are obtained by the use of cold (the cold affusion, rubbing the surface with ice, enemata of ice-cold water). The effect is a marked lowering of the temperature, while at the same time a stimulus is given to the respiratory function. Mustard or turpentine applied to the nape of the neck or chest is a useful adjuvant. Should the temperature be lowered in this way but unconsciousness still

persist, removal of the hair and blistering the scalp are recommended. The subsequent treatment will depend upon the nature of the result- ing symptoms, but change to a cool climate is often followed by marked benefit.

SUPERANNUATION (formed on the basis of "annual," " annuity," from the Late Lat. superannatus, one that has lived beyond the year, super, above, and annus, year, Fr. suranner, to grow very old) , properly a disqualification or relief from office or service on account of old age, infirmity, or of passing the limit of age fixed for service, hence the pension or allowance granted in respect of service at the expiry of the term or the retirement (see Pension). Educationally the term is specifically used of the removal of a backward pupil, who would otherwise remain in a class or form below that which his age demands.

SUPERCARGO, a term in maritime law (adapted from the Span, sobrecargo, one over or in charge of a cargo) for a person employed on board a vessel by the owners of the cargo to manage their trade, sell the merchandise at the ports to which the vessel is sailing, and buy and receive goods for shipment homewards. He has control of the cargo unless expressly or impliedly limited by his contract or agreement. He differs from a factor, who has a fixed place of residence at a port or trading place, by sailing from port to port with the vessel to which he is attached.

SUPEREROGATION (Late Lat. supererogatio, payment beyond what is due or asked, from super, beyond, erogare, to pay out, expend, ex, out, rogare, to ask), the performance of more than is asked for, the action of doing more than duty requires. In the theology of the Roman Church, " works of supereroga- tion " are those which are performed beyond what is required by God, thus forming a reserve store of works of merit which can be drawn upon for the dispensation of those whose works fall short of the standard required.

SUPERINTENDENT, a term" which, apart from its general use for an official in charge, has a distinct religious connotation, being applied, e.g. to the head of a Sunday school and to the chief minister in a Methodist circuit. In its most important historical sense it refers to certain ecclesiastical officers of reformed churches of the Lutheran model.

At the Reformation the question of the ordering and con- stitution of the churches was urgent. The greatest confusion prevailed: the priests were often dissolute, the people were ignorant, and meanwhile nobles were seizing the Church lands. Luther and Melanchthon would have preferred to retain the old episcopal control, and to have charged the bishops with the duty of making the necessary alterations in the ecclesiastical constitution.

For, while they taught that in spiritual powers all ministers were equal, they recognized the propriety of allowing administrative distinctions. But the bishops were unwilling lo come to any terms with the Reformers, and it became necessary 10 appoint officers of some new kind. The name of super- intendent was then given to a class of men who discharged many of the functions of the older bishops, while bearing a character which in several respects was new. Only in Denmark was the name of bishops reserved for the new officers after the Lutheran model had been adopted and the older bishops had been deposed and imprisoned. It is still used there, though no claim is made that it is the sign of formal apostolical succes- sion. In Scotland the First Book of Discipline provided not only for ministers, teachers, elders and deacons, but also for superintendents and readers. The superintendents (who were appointed because of the scarcity o5 Protestant pastors) took charge of districts corresponding in some degree with the episcopal dioceses, and made annual reports to the general

assembly of the ecclesiastical and religious state of their provinces, in the churches of which they also preached.

The distinctive character borne by the. new officers was determined by the cardinal principles which Luther had laid down in his work regarding the religious functions of the .state. He conceived of the secular government asan ordinance of God, and as being set to direct and control the external fortunes of the Church. He hoped that righteous magistrates would at all times form a sound court of appeal in times.of ecclesiastical disorder, and that they would guard the interests of truth and justice more securely than had been done under papal jurisdic- tion. The superintendents who now had to undertake large administrative responsibilities in the Church were therefore to be appointed by the civil power and to be answerable to it, They were to stand as intermediaries between the prince or magistrates on the one hand, and the ministers in their districts on the other.

In his earlier writings Luther had laid his main emphasis on the spiritual priesthood of all believers. Every sincere Christian was declared free, not only to preach, but also to administer the sacraments and to rebuke evil livers. The differences in office and function between the members implied no difference in rank, for the members of Christ's Church were all members of His body, and Luther believed that they would all be ruled into true order and charity by the Head. But he was shaken by the Peasants' War, and his faith in the virtues of the average man never recovered itself. The result was seen in his later writings, where he expresses his conviction that men need to be directed and restrained from without, and he looks to the state to undertake this duty. In the last resort the civil magistrates must take control of the Church. His vindication for thus subordinating the ecclesiastical to the civil lay in his assumption that the rulers of a Christian

land would themselves be Christian, and that it was the Christian duty of the Church to render obedience to those who had been ordained of God to bear rule. He, and the rest of the Reformers, were as firm believers in a visible Catholic Church as were any of those of whom he speaks as " the adherents of the old religion," and Luther, always conservative in feeling, clung to an alliance with the state and denied that the repudiation by the Reformers of papal authority had severed them from the visible Church.

The character of the office and duties of the superintendent were not everywhere the same. Luther shrank from imposing any stereotyped forms and asked that the special circumstances of each separate district should be consulted. He hoped that as few changes as possible would be made, and trusted that the reformed doctrines would spread peacefully throughout the country. After the Diet of Speyer (1526) the civil authori- ties were invited to reorganize the Church in their respective dominions as they thought best. This was not .felt, to present any great difficulties in the free towns, for institutions of. self- rule had there grown strong and schemes of ecclesiastical readjustment were speedily drawn up. Richter andSehling 1 have published a number of these ordinances, and they show that as a rule one of the city clergy was appointed superintendent by the city fathers and set in a position of administrative authority over all the churches within their jurisdiction. They were answerable to those fathers for their good order. Greater difficulties presented themselves in the territories of the German princes, and in the case of Saxony Luther proposed to the .elector that his first step should be to send out a commission of visitation which should report on the moral and spiritual condition of his principality, district by district. His proposal was carried out, and Luther himself became one of the visitors (1527-1528). He found the people in a state of such religious indifference and ignorance, and the clergy living often in such grossness, that his faith in their fitness to govern themselves, ecclesiastically sank even lower than before, and he resisted all schemes for self-government such as had been proposed by Francis Lambert. The church organization which he devised for Saxony provided

1 Tn their works on Die evangeh schen Kirchenordnung des l6ten Jahrhunderts (Weimar, 1846; and Leipzig, 1 902-1904).

no place for democratic or representative elements: the grasp of the state must at all times be felt. The superintendent must speak at all times as a minister of the state, and the state must be represented in the synod to which he makes his first report, for upon the synod there must sit not only

the pastors but also a delegate from every parish. If any appeal should be made from the decisions of the synod it must be heard in the court of the electoral prince, for he, as supreme civil ruler, possessed the jus episcopate, the right of oversight of the churches. Luther proposed that he should exercise this right by appointing a consistorial court composed in part of theologians and in part of canon lawyers, and it was thus that in 1542 the Wittenberg ecclesiastical consistory was formed. Other principalities adopted the model, so that the institution became common throughout the Lutheran churches.

In this scheme the superintendent (or superattendant) was charged with such part of the duty of the older bishops as had been purely administrative. He must concern himself with the discharge of their duties by the pastors of the churches, as well as with their character and demeanour. He must supervise their conduct of public worship, as well as give them licence to preach. He must take cognizance of their ministry to the indigent in their parishes, and of their management of the schools. He must further direct the studies of candidates for the pastoral office. He was answerable to the civil authorities to report all evil-living and false teaching, and those authorities had final power in the matters referred to them. If those matters, however, presented technical difficulties, they could be referred to the consistorial courts.

The earliest occasion of the appointment of such a superintendent would seem to be found in the decisions of Prince John of Saxony about 1527. He assigns the duties of the office, and summons the newly appointed officer to give diligent heed to the conduct and teaching of the pastors under him, faithfully to warn them of all errors, and, in case they prove obstinate, to report them to the electoral court. He must further give close attention to the due observance of the marriage laws, for in this matter the previously appointed visitors to the principality had reported grave laxity. The title of this office was not new, but was taken over from the later Scholastics, who had employed it as a suitable translation of the word ijrioxoiroi, but Prince John made it clear that his superinten- dents were not to be bishops in the old sense of the term. For every pastor was declared in the reformed doctrine to be truly a bishop and to have the spiritual functions and authority of a bishop; but the older bishops had also claimed a large number of administrative powers, and these for the future must be retained in the hands of the secular power, which would express itself in the first instance through the state-appointed superintendent. In the few cases in which the old bishoprics were retained in Lutheran communities their tenants held office directly from the state.

Some of the smaller principalities appointed but a single super- intendent for their territory, who, instead of being answerable to a consistory, sat as

spiritual member on the territorial council, whilst in towns the superintendent was summoned to the town council whenever Church matters arose for discussion. In larger states there were various classes of superintendents with their respective duties severally assigned.

In modern times the functions of the superintendent have been somewhat confused in consequence of the introduction into Lutheran Church theory of inconsistent elements of Presbyterian and synodal type.

See T. M. Lindsay, History of the Reformation (1906), i. 400-416; and the articles " Kirchenordnung " and "Superintendent" in Herzog-Hauck's ReaJencyklopddie fur protestanlische Theologie und Kirche. (E. Ar.)*

SUPERIOR, the most north-westerly of the Great Lakes of North America, and the largest body of fresh water in the world, lying between 46 30′ and 48 N., and 84 30′ and 92 W. It is bounded E. and N. by the province of Ontario, W. by the state of Minnesota, and S. by Wisconsin and Michigan. It has deep, extremely cold, clear water, and high and rocky shores along a large portion of its coast. Its general form is that of a wide crescent convex towards the north, but its shores are more irregular in outline than those of the other lakes. Following the curves of its axis from west to east the lake is about 383 m. long, and its greatest breadth is 160 m. Its maximum recorded depth is 1008 ft., and its height above mean sea level is 602 ft., or about. 21 ft. above that of lakes Michigan and Huron, to which it is joined at its eastern ex- tremity through the river St Mary. The lake receives the waters of 200 rivers, and drains a territory of 48,600 sq. m., the total area of its basin being 80,400 sq. m. The largest river which

empties into it is the St Louis, at its western end. The prin- cipal rivers on the north shore are the Pigeon, which forms the international boundary line, the Kaministikwia, the Nipigon, which drains the lake of the same name and together with the lake is about 200 m. long, the Pic, the White and the Michi- picoten. No large rivers empty into Lake Superior from the south. There are not many islands in the lake, the largest being Isle Royal, 44 m. long; Michipicoten Island in the eastern part; St Ignace, in the northern part, off the mouth of the Nipigon River; Grand Island between Pictured Rocks and Marquette; Manitou Island, east of Keweenaw Point, and the Apostle Group, to the north of Chequamegon Bay.

The boundary between the United States and Canada runs up the middle of the outlet of the lake and follows a median line approximately to about mid-lake; thence it sweeps north- westward, so as to include Isle Royal within the territory of the United States, and continues near the north shore, to the mouth of Pigeon River, which it follows westward, leaving the whole west end of the lake in United States territory.

Lake Superior lies in a deep rift in rocks principally of Archean and Cambrian age, of the Laurentian, Huronian and Keweenaw formations, rich in minerals that have been ex- tensively worked. The lake is, as it were, surrounded by iron, which is the probable cause of very strong magnetic fields of influence. Native silver as well as silver ores exist around Thunder Bay, native copper was formerly worked on Isle Royal, and rich copper mines are worked on the south shore, while nickel abounds in the country north of the lake. The Archean rocks produce a picturesque coast-line, the north shore par- ticularly being indented by deep bays surrounded by high cliffs, mostly burnt off and somewhat desolate; the islands also rise abruptly to considerable heights, the north shore furnish- ing the boldest scenery of the Great Lakes. On the south coast, opposite the broadest part of the lake, are precipitous walls of red sandstone, extending about 14 m., famous as the Pictured Rocks, so called from the effect of wave action on them. There are no appreciable tides and little current. A general set of the water towards the outlet exists.; especially on the southern shore. From the Apostle Island's to the eastward of Keweenaw point this current has jfreat width, and towards the eastern end of the lake spreads out in the shape of a fan, a branch passing to the northward and westward reaching the north coast. Autumn storms raise dangerous .seas. The level varies with the season, and also from year to year, the maximum variation, covering a cycle of years, being about 5 ft. The discharge of the lake is computed to be 75,200 cubic ft. per second at mean stage of water.

The season of navigation, controlled by the opening and closing of the Sault Ste Marie canals, averages about eight months — from the middle of April to the middle of December. The season has been extended for a few days, in both spring and autumn, by the use of ice-breaking tugs at Fort William and Port Arthur, this service being organized by the govern- ment particularly to facilitate the movement of grain from the Canadian North-west. The lake never freezes over, though the temperature of the water does not, even in summer, rise far above freezing point. The bays freeze over and there is border ice, often gathered by wind into large fields in the bays and extremities of the lake.

Lake Superior is fairly well provided with natural harbours, and works of improvement have created additional harbours of refuge at various points. Marquette, Mich., Presque He Point, Mich., Agate Bay, Minn., Grand Marais, Minn., and Ashland, Wis., are on bays which have protective breakwaters across their mouths. Duluth, Superior, Port Wing, Wis., Ontonagon, Mich., and Grand Marais, Mich., are harbours with entrances formed by parallel jetties extending across obstructing bars. On the Canadian side Fort William, in the mouth of the Kaministikwia, and Port Arthur, four miles distant, an artificial harbour, are the only important shipping points, being the lake terminals of three great trans- continental

railway systems, though the whole north shore is liber- ally supplied with natural harbours. The traffic on Lake Superior grows constantly in volume, the increase in tonnage of each year over that of the preceding year having, for 50 years past, averaged 20%. The freight carried into and out of the lake, as gauged by

the statistics gathered at the Sault Canal offices, aggregated in 1907 over 58,000,000 (short) tons. The principal freight shipped east- ward consists of flour, wheat and other grains, through Duluth- Superior from the United States, and through Fort William-Port Arthur from the Canadian prairies; copper ore from the mines on the south shore; iron ore in immense quantities from both shoees, the principal ore shipping ports being Ashland, Two Harbors, Marquette, Superior and Michipicoten, and lumber produced on the tributary rivers. West-bound freight consists largely of coal for general distribution and for terminal railway points.

The fishing industry of Lake Superior is important, salmon-trout (Salvelinus namaycush, Walb), ranging from 10 to 50 lb in weight, being gathered from the individual fishermen by steam tenders and shipped by rail to city markets. The river Nipigon, on the north shore, is famous for speckled-trout {Salvelinus fontinalis, Mitchill) of unusual size; and all rivers and brooks falling into the lake are trout streams.

See Bulletin No. 17, Survey of Northern and North-Western Lakes, U.S. War Department, Lake Survey Office, Detroit (1907); Sailing Directions for Lake Superior and the St Mary’s River, U.S. Hydro- graphic Office publication No. 108 A. (Washington, 1906), with supplements. (W. P. A.)

SUPERIOR, a city, a port of entry and the county-seat of Douglas county, Wisconsin, U.S.A., about 140 m. N. by E. of Minneapolis and St Paul, on Superior, St Louis and Allouez bays at the head of Lake Superior, and directly opposite Duluth, Minnesota, with which it is connected by ferry and by railway and road bridges. Pop. (1890), 11,983; (1900), 31,091, of whom 11,419 were foreign-born (2854 Swedish, 2404 English Cana- dians, 2026 Norwegian, and 801 German), and 186 were negroes; U910, U.S. census), 40,384. Superior is served by the Northern Pacific, the Duluth, South Shore & Atlantic, the Wisconsin’ Central, the Great Northern, the Minneapolis, St Paul & Sault Ste Marie, and the Chicago & North-Western railways, and (for freight only) by the Chicago, Milwaukee & St Paul. A belt line railway connects the several systems. Superior shares with Duluth one of the finest natural inland harbours in the world. The

harbour, which has been improved by the Federal govern- ment, is formed by two narrow strips of sandy land, known as Minnesota and Wisconsin Points, which extend several miles across the head of the lake from the Minnesota and Wisconsin shores respectively and almost meet in the centre. The body of water thus formed, Superior and Allouez bays, varies in width from 1 to ij m., and is 95 m. long. St Louis Bay, on the west, is about ij by 4 m. The city is situated on gently rising ground facing these bays, and has 29 m. of harbour frontage. The settlement of Superior at different times and in different places is responsible for the large area covered by the city (36-1 sq. m.) and its appearance is that of three distinct towns. The intervening portions have however been platted and are now largely settled. Superior is the seat of a state normal school (1896), which occupies a splendidly equipped building, and, in addition to the ordinary normal courses, has departments of kindergarten training, manual training and domestic science. The city is the see of a Roman Catholic bishop. Superior has a cheap fuel supply and power is furnished by electricity gene- rated on the St Louis river. In 1905 the value of its factory products was $6,356,981. Flour is the principal product, and shipbuilding is important. Among steel ships, the type known as the " whaleback " originated here; and iron and wooden ships, launches and small pleasure craft are also made. Other manufactures are railway cars, casks, cooperage, saw and planing mill products, furniture, wooden ware, windmills, gas-engines, and mattresses and wire beds. Superior is an important grain market. Much iron and copper ore is shipped from the Duluth-Superior harbour; and large quantities of coal, brought by lake boats, are distributed from here throughout the American and Canadian North-west. The total tonnage of the Duluth- Superior Harbour was estimated in 1908 to be exceeded in the United States only by that of New York and that of Philadelphia.

Pierre Esprit Radisson and Medard Chouart des Groseil- liers probably visited the site of Superior in 1661, and it is prac- tically certain that other French coureurs-des-bois were here at different times before Daniel Greysolon, Sieur Du Lhut (Duluth), established a trading post in the neighbourhood about 1678. About 1820 the Hudson's Bav Cyarpany established a

post here, but there was no permanent settlement until aftet the middle of the 19th century. Attention was directed to the site by a survey made by George R. Stuntz, a government surveyor, in 1852, and in 1853 a syndicate of capitalists, at the head of which was William Wilson Corcoran, the wealthy Washington banker, associated with whom were Senators Stephen A. Douglas (from whom the county was named), R. M. T. Hunter and J. B. Bright, Ex-Senator Robert J. Walker, Congressmen John C. Breckinridge and John L. Dawson, and others, largely Southern

politicians and members of Con- gress, bought lands here and platted a town which was named Superior. The proprietors secured in 1856 the construction of a military road to St Paul, Minnesota, 160 m. long. The town grew rapidly, and in 1856-1857 had about 2500 inhabitants. The panic of 1857 interrupted its growth, and the population dwindled so that in i860 there were only a few hundred settlers on the town-site. The Civil War increased the depression, and the lands of those who had taken part against the Union were confiscated. In 1862 a series of stockades was built as a protection from the Indians. Within the area under the govern- ment of the town of Superior, which was at first co-extensive with the county, West Superior was platted in 1883 and South Superior soon afterwards. A village government was estab- lished in September 1887, including the three settlements men- tioned, and in April 1889 Superior was chartered as a city. The harbour was surveyed in 1823-182 5 by Lieut. Henry Wolsey Bayfield (1795-1885) of the British Navy. In 1860-1861 it was resurveyed by Captain George G. Meade, who was engaged in the work at the outbreak of the Civil War. A branch of the Northern Pacific railway was built to Superior in 188 1.

SUPPfi, FRANZ VON (1820-1895), Austrian musical com- poser, whose real name was Francesco Ezechiele Ermenegildo Suppe-Demelli, was born at Spalato, in Dalmatia, in 1820, and died at Vienna in 1895. Originally he studied philosophy at the university of Padua, but on the death of his father devoted himself to music, studying at the Vienna conservatoire. He began his musical career as a conductor in one of the smaller Viennese theatres, and gradually worked his way up to be one of the most popular composers of ephemeral light opera of the day. Outside Vienna his works never won much success. Of his sixty comic operas Fatinitza (Vienna, 1876; London, 1878) was the most successful, while Boccaccio (Vienna, 1879; London, 1882) only enjoyed moderate favour. Suppe's overture to Dichter und Bauer is his most successful orchestral work. He also wrote some church music.

SUPPLY (through Fr. from Lat. supplere, to fill up), pro- vision; more particularly the money granted by a legislature to carry on the work of government. In the United Kingdom the granting of supply is the exclusive right of the House of Commons, and is carried out by two committees of the House, one of supply and the other of ways and means (see Parlia- ment). In the United States supply originates in the House of Representatives (see United States: Appropriation).

In Scotland commissioners of supply were officers appointed to assess and collect the land tax offered as supply to the sovereign. Under the Lands Valuation (Scotland) Act 1854 all owners of property of a certain value were qualified as commissioners of supply. Their duties were also enlarged

to comprise the general administration of the country, but by the Local Government (Scotland) Act 1889 all their powers and duties were transferred to and vested in the county council. They still meet annually, but transact only formal business.

SUPPLY AND TRANSPORT, MILITARY. In all ages the operations of armies have been influenced, and in many cases absolutely controlled, by the necessity of providing and distri- buting food, forage and stores for men and horses. In modern history these supplies have become more and more varied as weapons developed in complexity, power and accuracy of work-manship. In proportion, the branches of an army which are charged with the duties of " supply and transport " have become specialized as regards recruiting, training and organization.

The predatory armies of the middle ages not only lived upon the country they traversed, but enriched themselves with the

plunder they obtained from it, and this method of subsisting and paying an army reached its utmost limits in the Thirty Years' War. During the last stages of this war Germany had been so thoroughly devastated that the armies marched hither and thither like packs of hungry wolves, every soldier accom- panied by two or three non-combatants — camp followers of all sorts, mistresses, ragged children and miserable peasants who had lost all and now sought to live by robbing others under the protection of the army. An English traveller, as early as 1636, twelve years before the peace of Westphalia, reported that at Bacharach-on-Rhine he had found " the poor people dead with grass in their mouths," and that a village at which he stayed "hath been pillaged eight-and-twenty times in two years, and twice in one day."

From these horrors there followed a revulsion to the other extreme. Unless ordered by higher authority for political reasons to sack a particular town or to pillage a particular district, the soldiers were rigidly kept in hand, rationed by their own supply officers and hanged or flogged if at any moment an outbreak of the old vices made the example necessary. After 1648 there were very few districts in Middle Europe that could support an army for even a few days, and the burden of their sustenance had to be distributed over a larger area. Thus, at the mere rumour of an army's approach, the peasantry fled with all their belongings into the fortified places, armies soon came to be supplied from " magazines," which were filled either by contract from the home country or by inducing the

peasantry— by means of good conduct and cash payments — to bring their produce to, market. .These magazines were placed in a strong place, and if one was not available, a siege had to be undertaken to meet the demand. Moreover, soldiers in Marlborough's time were not as easily obtained as in the Thirty Years' War, and they had to be housed and fed comfortably enough to make it worth their while to stay with the colours instead of deserting. From these and similar conditions there grew up a system of supply. and transport usually called the "magazine system," under which an army was bound, under penalty of dissolution, to go no farther than seven marches from the nearest fortress, two days from the nearest field bakery, and so on. When an 18th-century army foraged for itself it was because the regular supply service was interrupted, i.e. when it was in extremis. But the relative rarity of wars in the 18th century, the habit of demanding nothing from the inhabitants of the country traversed by an army, and the virtual exclusion of the people from the prince's quarrels, gave Europe a century's respite in which to recover from the drain of the Thirty Years' War. And therefore, when the French Revolution came, the attempts of the armies of old Europe to suppress it without robbing a single Frenchman of a loaf of bread proved futile, and soon the national army created by the Revolution, unencumbered by tents, magazines and supply trains, swept over southern Ger- many and Italy. The Revolutionary armies differed indeed from those of the old wars in this, that they did not devastate wantonly, nor did they murder for the sake of loot. But they were merciless in their exactions, and, moreover, the tides of their invasions flowed in particular channels, so that the greater part of the invaded country escaped. This had a considerable, sometimes even a predominant, influence on the strategy pur- sued, a retreat along their own lines of communication being often in fact avoided by the French as being the worst fate that could befall them. Napoleon, however, systematized the waste- ful and irregular requisitioning that his predecessors had intro- duced, and in his hands the supply service, like all else connected with the art of war, underwent a thorough reform. His strategy 1 in the offensive passed through two distinct stages—

(a) the swift and sudden descent into the theatre of war, and

(b) the close grouping of his armies in view of the decisive blow. The first stage was characterized by extraordinarily swift move- ment, complete independence of all trains (other than the reserves of ammunition) and thorough exploitation of the food resources of the traversed zone. If the troops suffered, as well

1 H.Camon, Guerre napoMonienne.

as the inhabitants, this did not shake the emperor's purpose in the slightest.

If all the disorders which are the natural conse- quence of ill-regulated requisitioning— that is, marauding — cost the army 50,000 men, he had foreseen the loss and taken 50-, 000 men more than he needed for the battle. But the second stage, which as a rule involved three or four days' occupation, without considerable movement, of a restricted area, required other measures of supply. In this the army lived upon maga- zines, which were filled from the captured supply trains from the available supplies in the area, and from the resources accumulated in requisitioned vehicles close to the head of the routes followed in the first period. These resources were col- lected in the towns within this concentration area, and placed " out of reach of an insult " (that is, made safe against raiders) with a garrison and field works to supplement the town walls and gates. From this centre of operations Napoleon never allowed himself to be severed, whereas to the preservation of the route between France and that centre of operations he gave very little thought and assigned few or no troops, and most of the confusion of strategical thought since his time has beeii due to the general failure to perceive the essential distinction, in Napoleonic practice, between a centre of operations and a " base."

In the 19th century, however, there came the inevitable reaction. Purely political wars, and the consequent indifference of the inhabitants to the operations of war, produced as before a return to the system of cash payments and convoy supply, "especially in the Austrian army. As regards Europe the intro- duction of railways enormously facilitated the supply and trans- port service, and campaigns were neither as barren nor as pro- longed as they had been under the old conditions. The French and British armies did not, at least to the same extent, wage political wars, but their ceaseless colonial warfare imposed upon them the magazine and convoy system, and habituated them to it. The French, in 1870, stood still in the midst of the rich fields of Lorraine, and as a prolonged halt is fatal to the system of living on the country, it would have failed, even had it been tried. The Germans, on the other hand, levied requisitions, civilian transport, and contributions in money in accordance with Napoleonic tradition, though (owing to the existence of railways) with much less than Napoleonic severity. Their system has been accepted as the best for European warfare by all the great powers, whose organizations and methods ©f transporting and issuing supplies are the same in principle.

This principle is based on the Napoleonic distinction between supplies required during an advance and those required during a concentrated halt. The British Field Service Regulations (1909), pt. ii., lay it down that " the system of subsistence should be elastic and readily adaptable to every situation as it arises," but that it must always be based on the rule that " all mobile supplies are to be regarded as a reserve " for use when neither local nor line-of-communication resour9es are available. As a general rule

local resources should be used before the line of communication is called upon, and last of all the call is made on the mobile supplies in the hands of the fighting units. During a strategical concentration or a long halt " the resources of the immediate neighbourhood cannot be expected to support the troops. At such times they may be supplied from field depots established at convenient centres, and filled with supplies that are obtained by purchase or requisition and collected by requisitioned or hired (civilian) transport." During an advance, on the other hand, " by far the most advantageous method is for the troops to be rationed by the inhabitants on whom they are billeted . . . This method should be employed whenever possible."

The extent to which it can be employed varies considerably with the place and the season, but the British and all continental armies have their own " rules of thumb " or rough generaliza- tions based on experience. General Lewal {Strategic de marche, p. 47) says that in a country of ordinary fertility, with 70 inhabitants to the square kilometre, or 180 to the square mile, 10,000 men can be subsisted for one day on an area of 22 square

kilometres or 8f square miles, of 1200 per square mile. General Bonnal in his Sadowa gives 36 square miles as sufficient for the maintenance of an army corps (30,000-35,000) or about 1 100 men to the square mile during the assembly period, but only on condition of helping out local resources by special sup- plies from the base. The British Field Service Regulations state that ordinary agricultural districts of Western Europe, not previously traversed by troops, will support a force of twice the strength of the population for a week at a maximum. This would mean exacting fourteen rations from each inhabitant, but the incidence of the burden is spread over several days. A practical rule therefore would seem to be, in a district of 200 inhabitants to the square mile, to allot 1400 men per square mile for a flying passage of one day and 400 for a stay of one week, the resources of the country being more thoroughly and syste- matically exploited in the latter case. A British division (com- batant column only) closing up to half its marching depth at the end of the day would require 12 square miles, and as its depth would be about 55 miles, its front or width would perhaps extend for only a mile on either side of the route. It is quite possible to move two divisions for several consecutive days on the same road, living on the country exclusively, subject to the condition that the second should halt on the areas which the first has passed through without stopping. In continental armies the rule is, in fact, "one army corps (=2 British divisions) on one road."

During the period of concentration, however, even if in move- ment, a modern army will necessarily be supplied in somewhat the same way as Napoleon's. The billets will be allotted " without subsistence," and the regimental reserve supplies will be called upon to ration their men, while all around the occupied towns and villages the supply officers and their mounted escorts will requisition food and vehicles to bring the food into the concentration area. In view of this, " supply officers will be sent on with cavalry or mounted brigades to investigate the resources of the country ahead of the main body, and if possible to collect supplies at suitable points." Only commis- sioned officers and, as a rule, only those officers to whom the power is expressly delegated are entitled to carry out requisi- tions, though in an emergency a commander of any rank may obtain from the inhabitants articles or services by requisition and on his own responsibility, which responsibility may mean answering to a charge of " plundering " before a court-martial. On purely requisitioning work direct contact between the troops and the inhabitants is to be avoided.

Generally, then, a British regiment operating in Europe would be fed, during an advance, (a) by the inhabitants who provide the billets, without the necessity of a supply officer's interven- tion, (b) by the regimental reserves, which would be filled up as they were emptied from the field depdts, of food-stuffs re- quisitioned by the supply officers, or © on emergency by direct requisitioning. During a concentration it would be fed (a) in the first instance by " billets with subsistence," as in an advance, (b) in so far as this was insufficient, by regimental, brigade and divisional reserves, which would refill partly from the lines of communication and partly from the field dep6ts created by the requisitioning supply officers. Thus, as regards food and forage, the British Regulations — though it was not until 1009 that they appeared — are baaed on the fundamental principles of Napoleon that strategy must be the master, not the servant of supply, and that this mastery is most complete when — by means of " billets with subsistence " or by means of field depots of requisitioned food-stuffs— an army makes itself practically independent, as regards food, of its lines of communication.

The general organization of the supply service in Great Britain, calculated for a campaign under European conditions, is as follows: There are depots of various kinds and " mobile supplies." The former are classified as (a) base dSpdt, which is the great reserve magazine that collects all resources that come from outside the theatre of war; (b) intermediate d&pMs (filled from the base or by local requisitioning) at intervals along the line of communication, which serve principally to

feed the troops posted on the line of communication and those passing along it to the front, but can also be used as an " over- flow " magazine if

the base depdt is full, and as a means of bringing reserves nearer to the front: (c) advanced depdts at the head of the line of communication, which serve as the expense-ˆ magazine, issuing to the " mobile supplies " what these need to enable them to supplement local resources; (d) field depdts, fre- quently alluded to above, which are small temporary dep6ts (filled by requisitioning) in the immediate neighbourhood of the front, and from which, in preference to their own mobile reserves, the troops draw supplies if the inhabitants do not furnish them directly in the billets; field depots may also be utilized for storing local supplies surplus to the immediate wants of the army. The "mobile supplies " are classified as follows: (a) Regimental, which are carried partly by man and horse in the ranks and partly in "regimental transport " vehicles, and consist of the current day's ration and the " emer- gency ration " of compressed food (which is never to be used except in an extremity) on man or horse, and a complete ration for every man and horse on the ration strength of the unit, with an extra " grocery ration " and some compressed forage in the vehicles, (b) Column, which are carried iri i the 'Atf iny Service Corps " supply columns" of the division and carry one day's complete ration 1 and one emergency ration per head of men and animals— these are in a sense mobile field depdts and depend either on requisitioning or on the advanced depot of the line of communication, (c) Park, which are carried in " divisional parks " that move a day's march (often more) in rear of the divisions and comprise a last mobile reserve of three days' rations of food and forage for the troops.

In warfare in savage or undeveloped countries the conditions are far less favourable, and each case has to be dealt with on its merits. But, in general, such warfare always necessitates an almost complete dependence on magazine supply. There are few or no " billets with subsistence " or " field d6p6ts " which are the backbone of the supply system in European warfare, and the regimental and column supply vehicles have generally such difficulty in keeping touch with the advanced depot of the line of communication that the striking radius of the army is strictly limited to the position and output of the line of communications. Moreover, the difficulty — even the principal difficulty — is the transport of the supplies obtained from the line of communication. The alternative, which has often to be adopted by " punitive " expeditions, is to carry all supplies for the calculated duration of the movements with the troops, but the penalty for this freedom to move is either slow- ness of movement — the fighting troops regulating their pace by that of the supply vehicles or pack animals — or a dispropor- tionate number of " useless mouths " or non-combatants who must be fed. Altogether, the supply difficulty in expeditions in the Sudan, or West Africa, or on the Indian frontier infinitely outweighs all difficulties of country or enemy. Moreover,, para- doxical as it may be, the triumphant surmounting of ; tjEiese difficulties has its disadvantages as regards

European warfare, Generals and supply officers who have always dealt with the maximum of difficulty find it almost impossible to bring them^ selves to deal with easier conditions. In 1805 Mack vainly sought to teach the Austrian soldier how to live on the country in the Napoleonic fashion. In 1806 the Prussians starved in the midst of riches, in 1870 the French moved as slowly and kept themselves as closely concentrated as desert columns in Algeria, and so deprived themselves of the resources of their own country.

Military transport — other than water and rail— may be classed in respect of the means employed as draught and pack, and in respect of its organization and functions as transport on the line of com- munications and transport in the field, the latter being subdivided into first line and second line. The British army, on account of its frequent expeditions into undeveloped countries, makes a large — in the view of many, far too large — use of pack transport, for which mules, camels and human carriers are employed. But in

1 One day's supply of meat is usually taken with the column " on the hoof."

European, and to a large extent in other warfare, horsed transport is by far the most generally used. Mechanical transport (generally either traction engines with trucks or motor lorries) is, however, superseding horse draught to a considerable extent in second-line transport. The vehicle usually employed for military transport is the " General Service Wagon," a heavily-built springless four- wheeled vehicle drawn by six or four horses according to circum- stances, which weighs empty about 18 cwt., and allows of a maximum load of 30 cwt. There are also four-horse " limbered wagons " consisting of body and limber, weighing 13 cwt. empty and 43 cwt. fully loaded, and lighter two-wheeled carts which can take 13-15 cwt. load.

As regards organization and functions, road transport is used on the line of communications to supplement the railway, and consists of locally hired or requisitioned vehicles worked by the Army Service Corps, or by civilian personnel under A.S.C. control. Transport with the field units is, as has been said, divided into first line, which accompanies the fighting troops, and second line, which follows them at a distance. Both lines are, as a rule, manned exclusively by the A.S.C. (or regimental details in the case of regimental transport) and composed of regulation-pattern carts and wagons. The first-line vehicles include ammunition wagons and carts, tool carts, engineer vehicles and medical vehicles. All baggage and store and supply wagons, as well as a proportion of medical, ammunition and

engineer vehicles, form the second line.

(C. F. A.)

SUPRA-RENAL EXTRACT. The extract of the supra-renal gland is one of the most valuable remedies recently introduced in medicine. Feeding with the fresh gland of sheep was at first practised, but the sterilized glycerin preparation known as supra-renal extract is now used, the dose being 5 to 15 minims. The active principle of the gland, best known as adrenaline or epinephrine, occurs only in the medulla of the gland. It forms minute white crystals, soluble in weak solutions of hydrochloric acid. The U.S. P. contains a desiccated preparation, Glandulae suprarenales siccae. Adrenaline is most frequently used in 1 % solutions of the chloride.

Adrenaline has no action on the unbroken skin, but locally applied to mucous membranes it causes blanching of the part owing to its powerful constriction of the capillaries by stimulating the muscular fibres of the vessel walls. It acts rapidly in a similar manner when hypodermically injected. The vessels of the uterus are strongly acted upon by it, but the effect on the cerebral vessels is slight, and the pulmonary vessels are unaffected. The heart is slowed and the systole increased. Adrenaline stimulates the salivary glands. It also produces a temporary glycosuria. In poisonous doses it causes haemorrhages into the viscera and oedema of the lungs.

In Addison's disease the use of supra-renal extract has been beneficial in some cases, but its chief use is in the control of hae- morrhage. For this purpose it is given in conjunction with local anaesthetics such as cocaine in order to produce bloodless opera- tions on the eye, nose and elsewhere. It is also useful in hae- morrhage from small vessels, where it can be applied at the bleeding spot, as in epistaxis. In menorrhagia and metrorrhagia it is also of service. In surgical shock and in chloroform syncope an injection of adrenaline often saves life through the rise of blood pressure produced. An attack of bronchial asthma may be cut short by a hypodermic injection of adrenaline solution. It should never be used in the treatment of haemoptysis. Similar commercial pro- ducts on the market are hemisine, renaglandine, suprarenine, adnephrine, paranephrine and renostyptine. Supra-renal snuff containing the dry extract with menthol and boric acid is of use in hay fever. Rhinodyne is of this type. Suppositories containing supra-renal extract are used to check bleeding piles.

The chemistry of adrenaline has been mainly elucidated by the investigations of Pauly, Jowett and Bertrand; Jowett proposing

a constitution (see annexed for-

HO mula) now accepted as correct.

HO / >CH(OH).CH 2 -NHMe Man y substances having related

\ / constitutions have been synthe-

Adrenaline. sized, and it has been found that

they resemble adrenaline in increasing the blood pressure. For example, the corresponding ketone, adrenalone (obtained in 1904 by Stolz) is active, and the methyl group can be replaced by hydrogen or another radical without destroying the activity. It seems that the para-hydroxyl group is essential.' For instance, para-hydroxyphenylethylamine, HO-C 6 H4CH2-CH2NH 2 , which is one of the active bases of ergot, closely resembles adrenaline (G. Barger, Journ. Chem. Soc, 1909, 95, pp. 1 1 23, 1720; K. W. Rosenmund, Ber., 1909, 42, p. 4778); as does also its dimethyl derivative hordenine, an alkaloid found in barley (G. Barger, ibid., p. 2193). Adrenaline is optically active, the naturally occurring isomer being the laevo form; it is interest- ing to note that, like nicotine, the iaevo base has a much greater physiological activity than the dcxtro.

SUPREME COURT OF JUDICATURE, in England, a court of law established by the Judicature Act 1873, by section 3 of which it was provided that the high court of chancery, the courts of king's bench, common pleas, and exchequer, the high court of admiralty, the court of probate and the divorce court, should be united under this name. By section 4, the Supreme Court was to consist of two divisions, one to be called the " high-court of justice " and the other the " court of appeal." See further under Judicature Acts, and also the articles under the headings of the different courts enumerated above.

The Supreme Court of the United States is the head of the national judiciary. Its establishment was authorized by article iii. of the Constitution, which states that " the judicial power of the United States shall be vested in one Supreme Court, and in such inferior courts as the Congress may from time to time ordain and establish " (3. i.). Section ii. states that " the judicial power shall extend to all cases in law and equity arising under this Constitution, the laws of the United States, and treaties made, or which shall be made, under their authority; to all cases affecting ambassadors, other public ministers and consuls; to all cases of admiralty and maritime jurisdiction; to controversies between two or more states, between a state and citizens of another state, between citizens of different states, between citizens of the same state claiming lands under grants of different states, and between a state, and the citizens thereof, and foreign states, citizens, or subjects. In all cases affecting ambassadors, other public

ministers and con- suls, and those in which a state shall be party, the Supreme Court shall have original jurisdiction. In all the. other cases before mentioned the Supreme Court shall have appellate jurisdiction both as to law and fact, with such exceptions and under such regulations as the Congress shall make." The Supreme Court of the United States also occupies the unique position of being guardian of the Constitution. It has to decide whether a measure passed by the legislative powers is unconstitutional or not, and it may thus have to veto the deliberate resolutions of both houses of Congress and the president.

See United States.

SURABAYA (Dutch Soerabaja), a seaport of Java, in the eastern division of the island, on the narrow Surabaya strait, which separates the island of Madura from Java, and at the mouth of the Kali Mas River. Pop. (1900), 146,944 (Europeans 8906; Chinese 13,035). Surabaya is the principal mercantile town in Java. Its roadstead is sheltered by Madura, and it has important dockyards. It is also the headquarters of the military authorities for East Java, and has artillery workshops. Railways running north-west, south-west and south give it connexions throughout the island. In the old town, with its partly demolished fortifications, houses, shops and warehouses are more closely packed and the streets are narrower than in most East Indian towns, and, although a considerable number of Europeans live in this quarter, the outlying quarters, such as Simpang (where is the government house) and Tuntungan, are preferable for residence.

SURAJ-UD-DOWLAH (d. 1757), ruler of Bengal. The date of his birth is uncertain, but is generally placed between 1729 and 1736. His name was Mirza Mahommed, and he succeeded his grandfather Aliverdi Khan as nawab of Bengal on the 9th of April 1756. He was a cruel and profligate fanatic. Being offended with the English for giving protection to a native official who had escaped with treasure from Dacca, he attacked and took Calcutta on the 20th of June 1756. He then permitted the massacre known in history as " The Black Hole of Calcutta " (see Calcutta). This atrocious act was soon avenged. Cal- cutta was retaken by Clive and Admiral Watson on the 2nd of January 1757, and on the 23rd of June, Suraj-ud-Dowlah, routed at Plassey, fled to Rajmahal, where he was captured. He was put to death on the 4th of July 1757 at Murshidabad, by order of Miran, son of Mir Jafar, who had conspired against Suraj-ud-Dowlah and had been present at Plassey without taking part in the battle.

SURAT, a city and district of British India in the northern division of Bombay. The city is on the site where the English first established a factory on the mainland, and so planted the seed of the British Empire in India. Local traditions fix the establishment of the modern city in the last year of the fifteenth century, and in 15 14 the Portuguese traveller Barbosa described it as an important seaport, frequented by many ships from Malabar and all parts. During the reigns of Akbar, Jahangir and Shah Jahan it rose to be the chief commer- cial city of India. At the end of the 16th century the Por- tuguese were undisputed masters of the Surat seas. But in 161 2 Captain Best, and after him Captain Downton, destroyed the Portuguese naval supremacy and obtained an imperial firman making Surat the seat of a presidency under the English East India Company, while the Dutch also founded a factory. In 1664 Sir George Oxenden defended the factory against Sivaji with a bravery that deserves to rank with Clive's defence of Arcot. The prosperity of the factory at Surat received a fatal blow when Bombay was ceded to the Company (1668) and shortly afterwards made the capital of the Company's posses- sions and the chief seat of their trade. From that date also the city began to decline. At one time its population was estimated at 800,000, by the middle of the 19th century the number had fallen to 80,000; but in 1901 it had risen again to 119,306. Surat was taken by the English in 1759, and the conquerors assumed the undivided government of the city in 1800. Since the introduction of British rule the district has remained com- paratively tranquil; and even during the Mutiny peace was not disturbed, owing in great measure to the loyalty of the leading Mahommedan families.

The city is situated on the left bank of the river Tapti, 14 m. from its mouth, and has a station on the Bombay, Baroda & Central India railway, 167 m. north of Bombay. A moat indicates the dividing-line between the city, with its narrow streets and handsome houses, and the suburbs, mostly scattered among cultivated lands; but the city wall has almost disappeared. On the river frontage rises the irregular picturesque fortress built about 1540. A fire and a flood in 1837 destroyed a great number of buildings, but there remain several of interest, such as the mosque of Nav Saiyid Sahib, with its nine tombs, the Saiyid Edroos mosque (1634) and the ornate Mirza Sami mosque and tomb (1540). The most interesting monuments are the tombs of English and Dutch merchants of the 17th century, especially that of the Oxenden brothers. Surat is still a centre of trade and manufacture, though some of its former industries, such as ship-building, are extinct. There are cotton mills, factories for ginning and pressing cotton, rice-cleaning mills and paper mills. Fine cotton goods are woven in hand-looms, and there are special manufactures of silk brocade and embroidery. The chief trades are organized in gilds. There are many wealthy Parsee, Hindu and Mahom- medan merchants.

The District of Surat has an area of 1653 sq. m., and the population in 1901 was 637,017, showing a decrease of 2% in the decade. The district has a coast-line of 80 m., consisting of a barren stretch of sand drift and salt marsh; behind this is a rich, highly -cultivated plain, nearly 60 m. in breadth, at the mouth of the Tapti, but narrowing to only 15 m. in the southern part, and on the north-east are the wild hills and jungle of the Dangs. The principal crops are millets, rice, pulses, cotton and a little wheat. After Surat city the chief centre of trade is Bulsar. The district is traversed by the main line of the Bombay & Baroda railway, with a branch along the Tapti valley to join the Great Indian Peninsula railway in Khandesh. Near the coast, under the influence of the sea breeze, an equable temperature prevails, but 8 to 11 m. inland the breeze ceases to blow. The coast also possesses a much lighter rainfall than the interior, the annual average ranging from 30 in. in Olpad to 72 in Chikhli, while at Surat city the average is 39 § in.

The Surat Agency consists of three native states: Dharampur (q.v.), Bansda {q.v.) and Sachin, together with the tract known

as the Dangs. Total area, i960 sq. m.; pop. (1901), 179,975. Sachin has a revenue of £17,000 and its chief is a Mahommedan.

SURBASE (Lat. super, whence the Fr. sur, above or upon, and base, q.v.), i.e. upper base, the term in architecture applied to what, in the fittings of a room, is called the chair-rail. It is also used to distinguish the cornice of a pedestal or podium and is separated from the base by the dado or die.

SURBITON, an urban district in the Kingston parliamentary division of Surrey, England, 13 m. S.W. of Charing Cross, London; on the London & South- Western railway. Pop. (1891), 12,178; (1901), 15,017. It has a frontage upon the right bank of the Thames, with a pleasant esplanade. The district is largely residential. Surbiton is the headquarters of the Kingston Rowing Club and the Thames Sailing Club.

SURETY, in law, the party liable under a contract of guar- antee (q.v.). In criminal practice sureties bound by recognizance (q.v.) are a means of obtaining compliance with the order of a court of justice, whether to keep the peace or otherwise.

SURFACE, the bounding or limiting parts of a body. In the article Curve the mathematical question is treated from an historical point of view, for the purpose of showing how the lead- ing ideas of the theory were successively arrived at. These leading ideas apply to surfaces, but the ideas peculiar to surfaces are scarcely of the like fundamental nature, being rather develop- ments of the former set in their application to a more

advanced portion of geometry; there is consequently less occasion for the historical mode of treatment. Curves in space are considered in the same article, and they will not be discussed here; but it is proper to refer to them in connexion with the other notions of solid geometry. In plane geometry the elementary figures are the point and the line; and we then have the curve, which may be regarded as a singly infinite system of points, and also as a singly infinite system of lines. In solid geometry the elementary figures are the point, the line and the plane; we have, moreover, first, that which under one aspect is the curve and under another aspect the developable (or torse), and which may be regarded as a singly infinite system of points, of lines or of planes; and secondly, the surface, which may be regarded as a doubly infinite system of points or of planes, and also as a special triply infinite system of lines. (The tangent lines of a surface are a special complex.) As distinct particular cases of the first figure we have the plane curve and the cone, and as a par- ticular case of the second figure the ruled surface, regulus or singly infinite system of lines; we have, besides, the congruence or doubly infinite system of lines and the complex or triply infinite system of lines. And thus crowds of theories arise which have hardly any analogues in plane geometry; the re- lation of a curve to the various surfaces which can be drawn through it, and that of a surface to the various curves which can be drawn upon it, are different in kind from those which in plane geometry most nearly correspond to them — the relation of a system of points to the different curves through them and that of a curve to the systems of points upon it. In particular, there is nothing in plane geometry to correspond to the theory of the curves of curvature of a surface. Again, to the single theorem of plane geometry, that a line is the shortest distance between two points, there correspond in solid geometry two extensive and difficult theories — that of the geodesic lines on a surface and that of the minimal surface, or surface of minimum area, for a given boundary. And it would be easy to say more in illustration of the great extent and complexity of the subject.

In Part I. the subject will be treated by the ordinary methods of analytical geometry; Part II. will consider the Gaussian treatment by differentials, or the E, F, G analysis.

Part I.

Surfaces in General; Torses, £fc.

*1. A surface may be regarded as the locus of a" doubly infinite system of points — that is, the locus of the system of points deter- mined by a single equation £/=($, y, z, 1)", =0, between the. cartesian co-ordinates (to fix the ideas, say rectangular co-ordinates) x, y, z; or, if we please, by a single homogeneous relation U = (*S#> y> z < w)" I =o, between the*

quadriplanar co-ordinates x, y, s, w.

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SURFACE

Order, Class and Rank.

The degree n of the equation is the order of the surface; and this definition of the order agrees with the geometrical one, that the order of the surface is equal to the number of. the inter- sections of the surface by an arbitrary line. Starting from the foregoing point definition of the surface, we might develop the notions of the tangent line and the tangent plane; but it will be more convenient to consider, the surface; ab initio from the more general point of view in its relation to the point, the line and the plane. ‘ ‘

2. Mention has been made of the plane curve and the eerie; it is proper to recall that the order of a plane curve is equal to the

number of its , intersections by. an arbitrary line (in the plane of the curve), and that its class is equal to the number of tangents to trie curve which pass through an arbitrary pbint (in the plane of the curve). The cone is a figure correlative to the plane curve: dorresponding to the plane of the curve we have the vertex of .the cone, to its tangents the generating lines of the cone, and to its points the tangent planes of the cone. But from a different’ point of view’ we ‘may consider the generating lines of the cone as corresponding to the points of the curve and its tangent planes, as corresponding to the tangents of the curve.. From this point ; of view we define the order of the cone as equal to the number of its intersections (generating lines) by an arbitrary plane through the vertex,’ and its- class - as equal to the number of the tangent planes which pass through an arbitrary line through the vertex. And in the same way that a plane curve has singularities (singular, points and singular tangents) so a cone has singularities (singular generating lines and singular tangent planes).

3. Consider now a surface in connexion with an arbitrary line. The line meets the surface in a certain number of points, and, as already mentioned, the order of the surface is equal to the number of these intersections. We have through the line a certain number of tangent planes of the surface, and the class of the surface is equal to the number of these tangent planes.
•

But, further, through the line. imagine a plane; this meets the surface in a curve the order of which, is equal (as is at once seen) to the order of the surface. Again, on the line imagine a point; this is the vertex of a cone circumscribing the surfaie, and the class of this cone is equal (as is at once

seen) to the class of the sur- face. The tangent lines of the surface which lie in the plane are nothing else than the tangents of the plane section, and thus form a singly infinite series of lines; similarly, the tangent lines of the sur- face which pass through the point are nothing else than the generat- ing lines of the circumscribed cone, and thus form a singly infinite series of lines. But, if we consider those tangent lines of the sur- face which are at once in the plane and through the point, we see that they are finite in number; and we define the rank of a surface as equal to the number of tangent lines which lie in a given plane and pass through a given point in that plane. It at once follows that the class of the plane section and the order of the circum- scribed cone are ,each equal to the rank of the surface, and are thus equal to each other. It may be noticed that for a general surface (fx, y, z, to)", =0, of order n without point' singularities the rank is a, =n(n — i), and the class is »', =»(« — i) 2 ; this implies (what is in fact the case) that the circumscribed cone has line singularities, for otherwise its class, that is the class of the surface, would be a (a — 1), which .is not =n(» — i) 2 .*

4. The notions of thetangent line and the tangent plane have been assumed as known, but they require to be further explained Taneent m re f erence to the original point definition of the sur-> Lines and ^ ace- Speaking generally, we may say that the points Planes °^ the surface consecutive to a given pbint on it lie in a

plane which is 'trie tangent plane at the given point, and conversely the given point is' the point of contact of this tangent plane, and that any line through the point of contact and in the tangent plane is a tangent line touching the surface at the point of contact. Hence we .see at once that the tangent line is any line meeting the surface'in two consecutive points, or — L what is the same thing — a line meeting the surface in the point of contact counting as two intersections and in »— 2. other points. But, from the foregoing notion of the tangent plane as a : plane containing the point of contact and the consecutive points of the surface, the passage to the true definition of the tangent plane is not equally obvious. A plane in general meets the surface of the order n in a curve of that order without double points; but the plane may be such that the curve has a double point, and when this is so the plane is a tangent plane having the double point for its point of contact. The double point is either an acnode (isolated point), then the surface' at the point in question' is Convex' towards (that i&,' concave away from) the tangent plane; or else it is a crunode, and the surface at the point in question is then concavo-convex, that is, it has its two curvatures in opposite senses (see below, par. 16). Observe that in either case any line whatever in the plane and through the point meets the surface in the points in which it meet's the plane curve, viz: in the point of contact, which qua' double point. Counts as two intersections, and in n— 2 other

points'; that is, we have the preceding definition of the tangent litre. ,

5. The complete enumeration and discussion of the singularities of a surface is a question of extreme difficulty which has not yet

*been solved. 1 A plane curve has point singularities and : ijne singularities ; corresponding to these we have for the surface isolated point singularities and isolated plane singularities, but there are besides continuous singularities applying to ^"“g" **r curves on or torses circumscribed to the surface, and ,es * it is among these that we have the non-special singularities which play the most important part in the theory. Thus the plane curve represented by the general equation* ***($x, y, 2) n = o, of any given order n, has the non-special line singularities of inflexions and double tangents; corresponding to this the surface represented by the general equation*** *($#, y,-.B, w)"=o, of any given order n, has,, not the isolated, plane singularities, but the continuous singularities of the spinode curve or torse' and the node-couple curve or torse. A plane may meet the surface in a curve having (1) a cusp (spinode) or (2) a pair of double points; in each case there is a singly infinite system of such singular tangent planes, and the locus of the points of contact is the curve, the envelope of the tangent planes the torse. The reciprocal singularities to these are the nodal curve and the cuspidal curve: the surface may intersect or touch itself along a curve in such wise that, cutting the surface by an arbitrary plane, the curve of inter- section has .at each intersection of the plane, with the curve on the surface (1) a double point (node) or (2) a cusp. Observe that these are singularities not occurring in the surface represented by the general equation (*Jk, y, z, w) n =0 of any order ; observe further that in the case of both or either of these singularities the definition of the tangent plane must be modified. A tangent plane is a plane such that there is in the plane section a double point in addition to the nodes or cusps at the intersections with the singular lines on the surface.*

6. As regards isolated singularities, it will be sufficient to mention the point singularity of the conical point (or enicnode) and the corresponding plane singularity of the conic of contact (or cnictrbpe). In the former case we have a point such that the consecutive points, instead of lying in a tangent plane, lie on a quadric cone, having the point for its vertex; in the latter case we have a plane touching the surface along a conic; that is, the complete intersection of the surface by the plane is made up of the conic taken twice and of a residual curve of the order n — 4.

7. We may, in the general theory of surfaces, consider either a surface, and its reciprocal surface, the reciprocal surface being taken to be the surface enveloped by the polar planes (in regard to a given quadric surface) of the points of the original surface ; or — what is better — we may consider a

given surface in reference to the reciprocal relations of its order, rank, class and singularities. In either case we have a series of unaccented letters and a corre- sponding series of accented letters, and the relations between them are such that we may in any equation interchange the accented and the unaccented letters; in some cases an unaccented letter may be equal to the corresponding accented letter. Thus, let n, n' be as before the order and the class of the surface, but, instead of immediately defining the rank, let a be used to denote the class of the plane section and a' the order of the circumscribed cone; also let S, S' be numbers referring to the singularities. The form of the relations is a — a' (= rank of surface); a'=n (» — 1)— S; n' = n (n — i) 2 — 5; a = n' (»' — 1) — S'; n — n' (»' — i) 2 — S'. In these last equations S, S' are merely written down to denote proper corresponding combinations of the several numbers referring to the singularities collectively denoted by 5, 5′ respectively. The theory, as already mentioned, is a complex and difficult one.

8. A torse or developable corresponds to a curve in space in the same manner as a cone corresponds to a plane curve: although capableof representation by an equation £/= ($x,y,z,w) n*

= 0, and so of coming under the foregoing point ' or . or . , definition of a surface, it is an entirely distinct geo- eve °^ a metrical conception. We may indeed, qua surface, regard it as a surface characterized by the property that each of its tangent planes touches it, not at a single point, but along a line ; this is equivalent to saying that it is the envelope, not of a doubly infinite series of planes, as is a proper surface, but of a singly infinite system of planes. But it is perhaps easier to regard it as the locus of a singly infinite system of lines, each line meeting the consecutive line, or, what is the same thing, the lines being tan- gent lines of a curve in space. The tangent plane is then the plane through two consecutive lines, or, what is the same thing, an oscu- lating plane of the curve, whence also the tangent plane intersects the surface in the generating line counting twice, and in a residual curve of, the order n — 2. The curve is said to be the edge of re- gression of the developable, and it is a cuspidal curve thereof; that is to say, any plane section of the developable has at each point of intersection with the edge of regression a cusp. A sheet of paper bent in any manner without crumpling gives a developable;

1 In a plane curve the only singularities which need to be con- sidered are those that, present . themselves in Pliicker's equations, for every higher singularity whatever is equivalent to a certain number of nodes, cusps, inflexions and double tangents. As re- gards a surface, no such reduction of the higher singularities has as yet been made.

SURFACE

but we cannot with a single sheet of paper properly exhibit the form in the neighbourhood of the edge of regression: we need two sheets connected along a plane curve, which, when the paper is bent, becomes the edge of regression and appears as a cuspidal curve on the surface.

It may be mentioned that the condition which must be satisfied in order that the equation £/ = o shall represent a developable is H(U) =0; that is, the Hessian or functional determinant formed with the second differential coefficients of U must vanish in virtue of the equation U = o, or — what is the same thing— H(U) must contain U as a factor. If in cartesian co-ordinates the equation is taken in the form z— f (x, y) = o, then the condition is rt — s 2 = = o identically, where r, s, t denote as usual the second differential coefficients of z in regard to x, y respectively.

9. A regulus or ruled surface is the locus of a singly infinite system of lines, where the consecutive lines do not intersect; this

is a true surface, for there is a doubly infinite series of Regulus or tangent planes — in fact any plane through any one Wuterf f the |j nes j s a tangent plane of the surface, touching

Surface. it at a po ; nt on tne line, and in such wise that, as the tangent plane turns about the line, the point of contact moves along the line. The complete intersection of the surface by the tangent plane is made up of the line counting once and of a residual curve of the order n — 1. A quadric surface is a regulus in a two- fold manner, for there are on the surface two systems of lines each of which is a regulus. A cubic surface may be a regulus (see below, par. 11).

Surfaces of the Orders 2, 3 and 4.

10. A surface of the second order or a quadric surface is a surface such that every line meets it in two points, or — what comes to the

same thing — such that every plane section thereof Quadric ; s a con ; c or quadric curve. Such surfaces have been

Surfaces. studied from every point of view. The only singular forms are when there is (1) a conical point (cnicnode), when the_ sur- face is a cone of the second order or quadricone; (2) a conic, of contact (cnictrope), when the surface is this conic; from a different point of view it is a " surface aplatie " or flattened surface. Ex- cluding these degenerate forms, the surface is of the order, rank and class each = 2, and it has no singularities, Distinguishing the forms according to reality, we have the

ellipsoid, the hyper- boloid of two sheets, the hyperboloid of one sheet, the elliptic paraboloid and the hyperbolic paraboloid (see Geometry: § Analytical). A particular case of the ellipsoid is. the sphere; in abstract geometry this is a quadric surface passing through a given quadric curve, the circle at infinity. The tangent plane of a quadric surface meets it in a quadric curve having a node, that is, in a pair of lines ; hence there are on the surface two singly infinite sets of lines. Two lines of the same set do not meet, but each line of the one set meets each line of the other set; the surface is thus a regulus in a two- fold manner. The lines are real for the hyperboloid of one sheet and for the hyperbolic paraboloid; for the other forms of surface they are imaginary.

n. We have next the surface of the third order or cubic surface, which has also been very completely studied. Such a surface may have isolated point singularities (cnicnodes or points of higher singularity), or it may have a nodal line; we have thus 21 +2, =23 cases. In the general case of a surface without any singularities, the order, rank and class are = 3, 6, 12 respectively. The surface has upon it 27 lines, lying by threes in 45 planes, which are triple tangent planes. Ob- serve that the tangent plane is a plane meeting the surface in a curve having a node. For a surface of any given order n there will be a certain number of planes each meeting the surface in a curve with 3 nodes, that is, triple tangent planes; and, in the particular case where « = 3, the cubic curve with 3 nodes is of course a set of 3 lines; it is found that the number of triple tangent planes is, as just mentioned, =45. This would give 135 lines, but through each line we have 5 such planes, and the number of lines is thus =27. The theory of the 27 lines is an extensive and interesting one; in particular, it rnay be noticed that we can, in thirty-six ways, select a system of 6X6 lines, or " double sixer," such that no two lines of the same set intersect each other, but that each line of the one set intersects each line of the other set.

A cubic surface having a nodal line is a ruled surface or regulus; in fact any plane through the nodal line meets the surface in this line counting twice and in a residual line, and there is thus on the surface a singly infinite set of lines. There are two forms.

12. As regards quartic surfaces, only particular forms have been much studied. A quartic surface can have at most 16 conical points (cnicnodes) ; an instance of such a surface is Quartic Fresnel's wave surface, which has 4 real cnicnodes in

Surfaces. one j tne p r i nc ip a l planes, 4X2 imaginary ones in the other two principal planes, and 4 imaginary ones at infinity— in all 16 cnicnodes; the same surface has also 4 real + 12 imaginary planes each touching the surface along a circle (cnictropes)— in all 16 cnictropes. It

was easy by a mere homographic transforma-

Cublc Surfaces.

Congru. euces.

tion to pass to the more general surface called the tetrahedroid ; but this was itself only a particular form of the general surface with 16 cnicnodes and 16 cnictropes first studied by Kummer. Quartic surfaces with a smaller number of cnicnodes have also been considered.

Another very important form is the quartic surface having a nodal conic ; the nodal conic may be the circle at infinity, and we have then the so-called anallagmatic surface, otherwise the cyclide (which includes the particular form called Dupin's cyclide). These correspond to the bicircular quartic curve of plane geometry. Other forms of quartic surface might be referred to.

Congruences and Complexes.

13. A congruence is a doubly infinite system of lines. A line depends on four parameters and can therefore be determined so as to satisfy four conditions ; if only two conditions are imposed on the line >we have a doubly infinite system of lines or a congruence. For instance, the lines meeting each of two given .lines form a congruence. It is hardly necessary to remark that, imposing on the line one more condition, we have a ruled surface or regulus; thus we can in an infinity of ways separate the congruence into a singly infinite system of reguli or oftorses (see below, par. 16).

Considering in connexion with the congruence two arbitrary lines, there will be in the congruence a determinate number of lines which meet each of these two lines ; and the number of lines thus meeting the two lines is said to be the order-class of the congruence; If the two arbitrary lines are taken to intersect each other, the congruence lines which meet each of the two lines separate them- selves into two sets — those which lie in the plane of the two lines and those which pass through their intersection, There will be in the former set a determinate number of congruence lines which is the order of the congruence, arid in the latter set a determinate 1 number of congruence lines which is the class of the congruence. In other words, the order of the congruence is equal to the number of congruence lines lying in an arbitrary plane, and its class to the number of congruence lines passing through an arbitrary point.

The following systems of lines form each of them a congruence: (A) lines meeting each of two given curves; (B) lines meeting a given curve twice;

(C) lines meeting a given curve and touching a given surface; (D) lines touching each of two given surfaces; (E) lines touching a given surface twice, or, say, the bitangents of a given surface.

The last case is the most general one; and conversely for a given congruence there will be in general a surface having the congruence lines for bitangents. This surface is said to be the focal surface of the congruence ; the general surface with 16 cnicnodes first pre- sented itself in this manner as the focal surface of a congruence. But the focal surface may degenerate into the forms belonging to the other cases A, B, C, D.

14. A complex is a triply infinite system of lines — for instance, the tangent lines of a surface. Considering an arbitrary point in connexion with the complex, the complex lines which comolexes pass through the point form a cone ; considering a plane

in connexion with it, the complex lines which lie in the plane envelop a curve. It is easy to see that the class of the curve is equal to the order of the cone ; in fact each of these numbers is equal to the number of complex lines which lie in an arbitrary plane and pass through an arbitrary point of that plane; and we then say order of complex = order of curve; rank of complex = class of curve = order of cone; class of complex = class of cone. It is to be observed that, while for a congruence there is in general a surface having the congruence lines for bitangents, for a complex there is not in general any surface having the complex lines for tangents'; the tangent lines of a surface are thus only a special form of complex. The theory of complexes first presented itself in the researches of Malus on systems of rays of light in connexion with double refraction.

*15. The analytical theory as well of congruences as of complexes is most easily carried out by means of the six co-ordinates of a line; viz. there are co-ordinates (a, b, c, f, g, h) connected by the equation af + bg--ch = o, and therefore such that the ratios a:b:c:f:g:h constitute a system of four arbitrary parameters. We have thus a congruence of the order n represented by a single homogeneous equation of that order (*Ja, b, c, /, g, h) n = o between the six co-ordinates; two such relations determine a congruence. But we have in regard to congruences the same difficulty as that which presents itself in regard to curves in space: it is not every congru- ence which can be represented completely and precisely by two such equations (see Geometry: § Line).*

*The linear equation (*Jo : , b, c, /, g, h) = 0 represents a congruence of the first order or linear congruence; such congruences are inter- esting both in geometry arid in connexion with the theory of forces acting on a rigid body.*

16. The normals of a surface forma congruence. In any con- gruence the lines consecutive to a given congruence tine do not

in general meet this line; but there is a determinate number of consecutive lines which do meet it; or, attending for the moment to only one of these, say the congruence line is met by a consecutive congruence-line. In particular, each normal is met by a consecutive normal; this again is met by a consecutive normal, and so on. That is, we have a singly infinite system of normals each meeting the consecutive normal, and so forming a torse: starting from different normals successively, we obtain a singly infinite system of such torses. But each normal is in fact met by two consecutive normals, and, using in the construction first the one and then the other of these, we obtain two singly infinite systems of torses each intersecting the given surface at right angles. In other words, if in place of the normal we consider the point on the surface, we obtain on the surface two singly infinite systems of curves such that for any curve of either system the normals at consecutive points intersect each other; moreover, for each normal the torses of the two systems intersect each other at right angles ; and therefore for each point of the surface the curves of the two systems intersect each other at right angles. The two systems of curves are said to be the curves of curvature of the surface.

The normal is met by the two consecutive normals in two points which are the centres of curvature for the point on the surface; these lie either on the same side of the point or on opposite sides, and the surface has at the point in question like curvatures or opposite curvatures in the two cases respectively (see above, par. 4).

17. In immediate connexion with the curves of curvature we have the so-called asymptotic curves (Haupt-tangentenlinien). The tangent plane at a point of the surface cuts the surface in a curve having at that point a node. Thus we have at the point of the surface two directions of passage to a consecutive point, or, say, two elements of arc; and. passing along one of these to the consecutive point, and thence to a consecutive point, and so on, we obtain on the surface a curve. Starting successively from different points of the surface we thus obtain a singly infinite system of curves; or, using first one and then the other of the two directions, we obtain two singly infinite systems of curves, which are the curves above referred to. The two curves at any point are equally inclined to the two curves of curvature at

that point, or — what is the same thing — the supplementary angles formed by the two asymptotic lines are bisected by the two curves of curvature. In the case of a quadric surface the asymptotic curves are the two systems of lines on the surface.

Geodetic Lines.

18. A geodetic line (or curve) is a shortest curve on a surface; more accurately, the element of arc between two consecutive points of a geodetic line is a shortest arc on the surface. We are thus led to the fundamental property that at each point of the curve the osculating plane of the curve passes through the normal of the surface ; in other words, any two consecutive arcs PP', P'P" are in piano with the normal at P' . Starting from a given point P on the surface, we have a singly infinite system of geodetics proceeding along the surface in the direction of the several tangent lines at the point P ; and, if the direction PP' is given, the property gives a construction by successive elements of arc for the required geodetic line.

Considering the geodetic lines which proceed from a given point P of the surface, any particular geodetic line is or is not again intersected by the consecutive generating line; if it is thus inter- sected, the generating line is a shortest line on the surface up to, but not beyond, the point at which it is first intersected by the con- secutive generating line; if it is not intersected, it continues a shortest line for the whole course.

In the analytical theory both of geodetic lines and of the curves of curvature, and in other parts of the theory of surfaces, it is very convenient to consider the rectangular co-ordinates x, y, z of a point of the surface as given functions of two independent parameters p, q; the form of these functions of course determines the surface, since by the elimination of p, q from the three equations we obtain the equation in the co-ordinates x, y, z. We have for the geodetic lines a differential equation of the second order between p and q; the general solution contains two arbitrary constants, and is thus capable of representing the geodetic line which can be drawn from a given point in a given direction on the surface. In the case of a quadric surface the solution involves hyperelliptic integrals of the first kind, depending on the square root of a sextic function.

Curvilinear Co-ordinates.

19. The expressions of the co-ordinates x, y, z in terms of p, q may contain a parameter r, and, it this is regarded as a given con- stant, these expressions will as before refer to a point on a given surface. But, if p, q, r are regarded as three independent para- meters x, y, z will be the co-

ordinates of a point in space, deter- mined by means of the three parameters p, q, r; these parameters are said to be the curvilinear co-ordinates, or (in a generalized sense of the term) simply the co-ordinates of the point. We arrive other- wise at the notion by taking p, q, r each as a given function of

- *2 . y . z-*

x, y. z; say we have p=fi(x, y, z), q=f(x, y, 2), / =/.•>(*, y, z), which equations of course lead to expressions for p, q, r each as a function of x, y, z. The first equation determines a singly infinite set of sur- faces : for any given value of p we have a surface ; and similarly the second and third equations determine each a singly infinite set of surfaces. If, to fix the ideas, /1, / 2 , / 3 are taken to denote each a rational and integral function of *, y, z, then two surfaces of the same set will not intersect each other, and through a given point of space there will pass one surface of each set; that is, the point will be determined as a point of intersection of three surfaces be- longing to the three sets respectively ; moreover, the whole of space will be divided by the three sets of surfaces into a triply infinite system of elements, each of them being a parallelepiped.*

Orthoiomic Surfaces; Parallel Surfaces.

20. The three sets of surfaces may be such that the three surfaces through any point of space whatever intersect each other at right angles; and they are in this case said to be orthotomic. The term curvilinear co-ordinates was almost appropriated by Lame, to whom this theory is chiefly due, to the case in question: assuming that the equations p=fi{x, y, 2), g=fe(x, y, 2), r=f s (x, y, z) refer to a system of orthotomic surfaces, we have in the restricted sense p, q, r as the curvilinear co-ordinates of the point.

An interesting special case is that of confocal quadric surfaces. The general equation of a surface confocal with the ellipsoid x 2 y 2 z 2

ˆr+e" + ~TFW + "F+F = 1 ' and ' if in this

equation we consider x, y, z as given, we have for a cubic equation with three real roots p, q, r, and thus we have through the point three real surfaces, one an ellipsoid, one a hyperboloid of one sheet, and one a hyperboloid of two sheets.

21. The theory is connected with that of curves of curvature by Dupin's theorem. Thus in any system of orthotomic surfaces each surface of any one of the three sets is intersected by the surfaces of the other two sets in its curves of curvature.

22. No one of the three sets of surfaces is altogether arbitrary: in the equation p =fi{x, y,z), p is not an arbitrary function of x, y, z, but it must satisfy a certain partial differential equation of the third order. Assuming that p has this value, we have q=fc{x, y, z) and r=fs{x, y, z) determinate functions of x,y,z such that the three sets of surfaces form an orthotomic system.

23. Starting from a given surface, it has been seen (par. 16) that the normals along the curves of curvature form two systems of torses intersecting each other, and also the given surface, at right angles. But there are, intersecting the two systems of torses at right angles, not only the given surface, but a singly infinite system of surfaces. If at each point of the given surface we measure off along the normal one and the same distance at pleasure, then the locus of the points thus obtained is a surface cutting all the normals of the given surface at right angles, or, in other words, having the same normals as the given surface; and it is therefore a parallel surface to the given surface. Hence the singly infinite system of parallel surfaces and the two singly infinite systems of torses form together a set of orthotomic surfaces.

The Minimal Surface.

24. This if the surface of minimum area — more accurately, a surface such that, for any indefinitely small closed curve which can be drawn on it round any point, the area of the surface is less than it is for any other surface whatever through the closed curve. It at once follows that the surface at every point is concavo-convex; for, if at any point this was not the case, we could, by cutting the surface by a plane, describe round the point an indefinitely small closed plane curve, and the plane area within the closed curve would then be less than the area of the element of surface within the same curve. The condition leads to a partial differential equation of the second order for the determination of the minimal surface: considering 2 as a function of x, y, and writing as usual p, q, r, s, t for the first and the second differential coefficients of z in regard to x, y respectively, the equation (as first shown by Lagrange) is (1 + 2 2)/ — 2pqs + (1 + fP)t =0, or, as this may also

be written, y

i +

o. The general

dy Vi+^+g 2 dx yi+£ 2 +2 2 integral contains of course arbitrary functions, and, if we imagine these so determined that the surface may pass

through a given closed curve, and if, moreover, there is but one minimal surface passing through that curve, we have the solution of the problem of finding the surface of minimum area within the same curve. The surface continued beyond the closed curve is a minimal surface, but it is not of necessity or in general a surface of minimum area for an arbitrary bounding curve not wholly included within the given closed curve. It is hardly necessary to remark that the plane is a minimal surface, and that, if the given closed curve is a plane curve, the plane is the proper solution; that is, the plane area within the given closed curve is less than the area for any other surface through the same curve. The given closed curve is not

of necessity a single curve: it may be, for instance, a skew polygon of four or more sides.

The partial differential equation was dealt with in a very remarkable manner by Riemann. From the second form given

, , qdx — pdy

above it appears that we have , Asjf "! = a complete diffe- rential, or, putting this = df, we introduce into the solution a vari- able f, which combines with 2 in the forms 2± if (i=V— 0- The boundary conditions have to be satisfied by the determination of the conjugate variables tj, 77′ as functions of 2+ if, 2— if, or, say, of Z, Z respectively, and by writing S, S' to denote x+iy, x — iy respectively. Riemann obtains finally two ordinary differ- ential equations of the first order in S, S', tj, t', Z, Z', and the results are completely worked out in some very interesting special cases.

(A. Ca.)

Part II. We proceed to treat the differential geometry of surfaces, a study founded on the consideration of the expression of the lineal element in terms of two parameters, u, v,

ds* = Edu*+2Fdudv+ Gdv*,

u = const, v = const, being thus systems of curves traced on the surface. This method, which may be said to have been inaugurated by Gauss in his classical paper published in 1828, Disquisitiones generates circa superficies curvas, has the great advantage of dealing in the most natural way with all questions connected with geodetics, geodetic curvature, geodetic circles, &c. — in fact, all relations of lines on a surface which can be formulated without reference to anything external to the surface. All such relations when deduced for any particular surface can be at once generalized in their application, holding good for any other surface which has the same expression for its lineal element; e.g. relations involving great circles and small circles on a sphere furnish us with corresponding relations for geodetics and geodetic circles, on any synclastic surface of constant specific curvature.

I. Gauss begins by introducing the conception of the integral curvature {curvatura Integra) of any portion of a surface. This he defines to be the

area of the corresponding portion of a sphere of unit radius, traced out by a radius drawn parallel to the normal at each point of the surface; i.e. it is ff ds/RR' where R, R' are the principal radii of curvature. The quotient obtained by dividing the integral curvature of a small portion of the surface round a point by the area of that portion, that is l/RR', he naturally calls the measure of curvature or the specific curvature at the point in question. He proceeds to establish his leading proposition, that this specific curvature at any point is expressible in terms of the E, F and G which enter into the equation for the lineal element, to- gether with their differential coefficients with respect to the variables, u and v.

It is desirable to make clear the exact significance of this theorem. Of course, for any particular surface, the curvature can be expressed in an indefinite variety of ways. The speciality of the Gaussian expression is that it is deduced in such a manner as to hold good for all surfaces which have the same expression for the lineal element. The expression for the specific curvature, which is in general somewhat elaborate, assumes a very simple form when a system of geodetics and the system of their orthogonal trajectories are chosen for the parameter curves, the parameter u being made the length of the arc of the geodetic, measured from the curve, w = o selected as the standard. If this be done the equation for the lineal element becomes ds 2 = du 2 f P 2 dv' z , and that for the specific curvature (RR 1) _1 =— P 1 d 2 P/du'. By means of this last ex pression Gauss then proves that the integral curvature of a triangle formed by three geodetics on the surface can be expressed in terms of its angles, and is equal to A + B + C — ?r.

This theorem may be more generally stated : —

The integral curvature of any portion of a surj 'ace = 2ir — Xdi round the contour of this portion, where di denotes the angle of geodetic contingence of the boundary curve. The angle of geodetic contingence of a curve traced on a surface may be defined as the angle of intersection of two geodetic tangents drawn at the ex- tremities of an element of arc, an angle which may be easily proved to be the same as the projection on the tangent plane of the ordinary angle of contingence. The geodetic curvature, p-\ is thus equal to the ordinary curvature multiplied by cos , being the angle the osculating plane of the curve makes with the tangent plane.

Gauss's theorem may be established geometrically in the following simple manner: If we draw successive tangent planes along the curve, these will intersect in a system of lines, termed the conjugate tangents, forming a developable surface. If we unroll this develop- able then di = d$—dt, where di is the angle of geodetic con-

tingence, 38 the angle between two consecutive conjugate tangents, 4/ the angle the conjugate tangent makes with the curve. There- fore, as ˆ returns to its original value when we integrate round the curve, we have ~Zdi = 2d$. This equation holds for both the curve on the given surface and the representative curve on the sphere. But the tangent planes along these curves being always parallel, their successive intersections are so also; therefore ~SdO is the same for both; consequently ~S,di for the curve on the surface = Xdi for the representative curve on the sphere. Hence integral curvature of curve of surface = area of representative curve on sphere,

= 27r— Zdi on sphere by spherical geometry,

= 2t— 2di for curve on surface.

A useful expression for the geodetic curvature of one of the curves, »= const, can be obtained. If a curve receive a small displacement on any surface, so that the displacements of its two extremities are normal to the curve, it follows, from the calculus of variations, that the variation of the length of the curve =fp- 1 &nds where p- 1 is the geodetic curvature, and hn the normal component of the dis- placement at each point. Applying this formula to one of the v curves, we find

sfpdv = f(dP/du)Sudv-8 length of curve =/p- 1 SuPdv, and as hu is the same for all points of the curve, p- 1= P~ 1 dP/du.

We can deduce immediately from this expression Gauss's value for the specific curvature. For applying his theorem to the quadri- lateral formed by the curves u, «i, v, »i, and remembering that 2di along a geodetic vanishes, we have

// (RR')- 1 Pdudv = – Xdi for curve BC- Zdi for curve DA, = — ~2p-Hs for curve BC+ Xpˆds for curve AD,

- *- fr, d -F-Ydv for curve BC+ (± ~Pdv for curve AD, J P du J P du*

*=-J !(£)< *- ©J ˆ*

therefore passing to the limit P/RR' = — dˆP/duˆ.

Gauss then proceeds to consider what the result will be if a surface be deformed in such a way that no lineal element is altered. It is easily seen that this involves that the angle at which two curves on the surface intersect is unaltered by this deformation; and since obviously geodetics remain geodetics, the angle of geodetic contin- gence and consequently the geodetic curvature are also unaltered. It therefore follows from his theorem that the

integral curvature of any portion of a surface and the specific curvature at any point are unaltered by non-extensional deformation.

Geodetics and Geodetic Circles.

A geodetic and its fundamental properties are stated in part I., where it is also explained in that article within what range a geodetic possesses the property of being the shortest path between two of its points. The determination of the geodetics on a given surface depends upon the solution of a differential equation of the second order. The first integral of this equation, when it can be found for any given class of surfaces, gives us the characteristic property of the geodetics on such surfaces. The following are some of the well- known classes for which this integral has been obtained: (1) quadrics; (2) developable surfaces; (3) surfaces of revolution.

I. Quadrics. — Several mathematicians about the middle of the 19th century made a special study of the geometry of the lines of curvature and the geodetics on quadrics, and were rewarded by the discovery of many wonderfully simple and elegant analogies between their properties and those of a system of confocal conies and their tangents in piano. As explained above, the lines of curvature on a quadric are the systems of orthogonal curves formed by its inter- section with the two systems of confocal quadrics. Joachimsthal showed that the interpretation of the first integral of the equation for geodetics on a central quadric is, that along a geodetic pD = con- stant (C,) p denoting the perpendicular let fall from the centre on the tangent plane, and D the semidiameter drawn parallel to the element of the geodetic, the envelope of all geodetics having the same C being a line of curvature. In particular, all geodetics passing through one of the real umbilics (the four points where the indicatrix is a circle) have the same C.

Michael Roberts pointed out that it is an immediate consequence of the equation £D = C, that if two umbilics, A and B (selecting two not diametrically opposite), be joined by geodetics to any point P on a given line of curvature, they make equal angles with such line of curvature, and consequently that, as P moves along a line of curvature, either PA + PB or PA — PB remains constant. Or, conversely, that the locus of a point P on the surface, for which the sum or difference of the geodetic distances PA and PB is constant, is a line of curvature. It follows that if the ends of a string be fastened at the two umbilics of a central quadric, and a style move over the surface keeping the string always stretched, it will describe a line of curvature.

Another striking analogue is the following: As, in piano, if a variable point or an ellipse be joined to the two foci S and H,

tan ˆ PSH tan JPHS = const, and for the hyperbola tan |PSH/tan JPHS = const, so for a line of curvature on a central quadric, if P be joined to two umbilics S and H by geodetics, either the product or the ratio of the tangents of iPSH and |PHS will be constant.

Chasles proved that if an ellipse be intersected in the point A by a confocal hyperbola, and from any point P on the hyperbola tangents PT, PT' be drawn to the ellipse, then the difference of the arcs of the ellipse TA, T'A = the difference of the tangents PT, PT'; and subsequently Graves showed that if from any point P on the outer of two confocal ellipses tangents be drawn to the inner, then the excess of the sum of the tangents PT, PT' over the intercepted arc TT' is constant. Precisely the same theorems hold for a quadric replacing the confocals by lines of curvature and the rectilineal tangents by geodetic tangents Hart still further developed the analogies with confocal conies, and established the following : If a geodetic polygon circumscribe a line of curvature, and all its vertices but one move on lines of curvature, this vertex will also describe a line of curvature, and when the lines of curvature all belong to the same system the perimeter of the polygon will be constant.

2. Geodetics on Developable Surfaces. — On these the geodetics are the curves which become right lines when the surface is unrolled into a plane. From this property a first integral can be immediately deduced.

3. Geodetics on Surfaces of Revolution. — In all such the geodetics are the curves given by the equation r sin = const, r being the perpendicular on the axis of revolution, the angle at which the curve crosses the meridian.

The general problem of the determination of geodetics on any surface may be advantageously treated in connexion with that of " parallel " curves. By " parallel " curves are meant curves whose geodetic distances from one another are constant — in other words, the orthogonal trajectories of a system of geodetics. In applying this method the determination of a system of parallel curves comes first, and the determination of the geodetics to which they are orthogonal follows as a deduction. If (u, v) = const be a system of parallel curves, it is shown that must satisfy the partial differential equation

E © 2 – 2F (S)©) + G ©) 2 = EG :- F2 –

If (u, v, a) = const be a system of parallel curves satisfying this equation, then d/da = const is proved to represent the orthogonal geodetics. The

same method enables us to establish a result first arrived at by Jacobi, that whenever a first integral of the differential equation for geodetics can be found, the final integral is always reducible to quadratures. In this method tf> corresponds to the characteristic function in the Hamiltonian dynamics, the geodetics being the paths of a particle confined to the surface when no extraneous forces are in action.

The expression for the lineal element on a quadric in elliptic co-ordinates suggested to Liouville the consideration of the class of surfaces for which this equation takes the more general form ds 2 =(U-V)(UiW+ViW), where U, Ui are functions oi u, and V, Vi functions of v, and shows that, for this class, the first integral of the equation of the parallels is immediately obtainable, and hence that of the corresponding geodetics. It is to be remarked that for this more general class of surfaces the theorems of Chasles and Graves given above will also hold good.

Geodetics on a surface corresponding to right lines on a plane, the question arises what curves on a surface should be considered to correspond to plane circles. There are two claimants for the posi- tion : first, the curves described by a point whose geodetic distance from a given point is constant ; and, second, the curves of constant geodetic curvature.

On certain surfaces the curves which satisfy one of these conditions also satisfy the other, but in general the two curves must be carefully

distinguished. The pro- perty involved in the second definition is more intrinsic, and we shall therefore, following Liou- ville, call the curves pos- ,X sessing it geodetic circles. It may be noted that geodetic circles, except on surfaces of constant specific curvature, do not return back upon them- selves like circles in piano. As a particular instance, a geodetic on an ellipsoid (which is, of course, a geodetic circle of zero curvature), starting from an umbilic, when it returns again, as it does to that umbilic, makes a finite angle with its original starting position. As to the curve described by a point whose geodetic distance from a given centre is constant, Gauss showed from the fundamental property of a

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1 1

: equator

1

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1 I t t • /

i+B

Fig. 2. sinh uar 1 , according as the If a geodetic circle (curv-

FlG. I.

geodetic that this curve resembles the plane circle in being every- where perpendicular to its radius. In the same way it holds that the curve described .

by a point the sum (or i

difference) of whose geo- detic distances from two given points (foci) is con- stant, resembles the plane ellipse (or hyperbola) in the property that it bisects at every point the external (or internal) angle between the geodetic focal radii, and, as a consequence, that the curves on any sur- face answering to confocal ellipses and hyperbolas intersect at right angles. The equation for the lineal element enables us to dis- cuss geodetic circles on sur- faces of constant specific curvature; for we have seen that if we choose as parameters geodetics and their orthogonal trajec- tories, the equation becomes ds 2 = <2tt 2 +P 2 dM 2 ; and since (RR')" 1 = - P-ˆP/dw 2 , and here (RR')-'= ±aˆ, it follows P = A cos ua v + B sin uar 1 , or P = A cosh surface is synclastic or anticlastic. ature fc _1) be chosen for the starting curve u — o, and if v be made the length of the arc OY, intercepted on this circle by the curve i> = const (see fig. 1), then A and B can be proved to be inde- pendent of u and P = cos uaˆ+ak" 1 sin ua~ l for a synclastic surface, P = cosh Ma. -1 fafe _1 sinh uar 1 for an anticlastic sur face. It follows from the expression for the geodetic curvature p _1 = P~ l dPldu that in both classes of surfaces all the other orthogonal curves tt = const will be geo- detic circles. It also appears that on a syn- clastic surface of con- stant specific curvature all the geodetics normal to a geodetic circle converge to a point on either side as on a sphere, and can be described with a stretched string taking either of these points as centre, the length of the string being a tan L ahr 1 (see fig. 2). These normals will be all cut orthogonally by an equator, that is, by a geodetic circle of zero curvature.

For anticlastic surfaces, however, we must dis- tinguish two cases. If the curvature k~ l of the geo- detic circle > a 1 the geo detic normals meet in a point on the concave side of the geodetic circle, and can be described as on the synclastic by a stretched string, the length of the string being a tanh -1 ak 1 , but in this case the geo detic normals have no equator (see fig. 3).

If on the other hand the curvature of the geodetic circle be

Fig. 3.

Fig. 4.

come nearer together than they do anywhere else (see fig. 4).

On a synclastic surface of constant specific curvature a -2 two near geodetics proceeding from a point always meet again at the geodetic

distance mi; and more generally for any synclastic surface whose specific curvature at every point lies between the limits a -2 and Jr 2 two near geodetics proceeding from a point always meet again at a geodetic distance intermediate in value between ira and irb. On an anticlastic surface two near geodetics proceeding from a point never meet again.

Representation of Figures on a Surface by Corresponding Figures on a Plane; Theory of Maps. The most valuable methods of effecting such representation are those in which small figures are identical in shape with, the figures which they represent. This property is known to belong to the representation of a spherical surface by Mercator's method as well as to the representation by stereographic projection. The problem of effecting this " conformable " representation is easily seen to be equivalent to that of throwing the expression for the lineal element into what is known in the theory of heat conduction as the isothermal form ds- = \(du 2 + di?), for we have then only to choose for the representative point on the plane that whose rectangular co-ordinates are x = u, y = v. A curious investigation has been made by Beltrami — when is it possible to represent a surface on a plane in such a way that the geodetics on the surface shall correspond to the right lines on the plane (as, for example, holds true when a spherical surface is projected on a plane by lines through its centre)? He has proved that the only class of surface for which such representation is possible is the class of uniform specific curvature.

Just as the intrinsic properties of a synclastic surface of uniform specific curvature are reducible to those of a particular surface of

this type, i.e. the sphere, so we can deal with an anticlastic surface of constant specific curvature, and reduce its properties to a particular anticlastic surface. A convenient surface to study for this purpose is that known as the pseudosphere, formed by the revolution of the tractrix (an

involute of the caten- ary) round its base (see fig. 5). Its equations are r = a sin , z=a(cos +log tan \). This surface can be conformably repre- sented as a plane map by choosing x'=o> where « is the longitude of the point and y —a/sin . It will then be found that ds = ads'/y', where ds = lineal element on the surface, ds' = same on the map. It easily appears that geodetic circles on the surface are represented by circles on the map, the angle if/ at which these circles cut the base depending only upon the

axis of revohitwri Fig. 5.

t -S^ 2 ^55fe

Line y'"a

•x

Fig. 6.

curvature of the geodetic circle, cos it being equal to p _1 . As a particular case it follows that the geodetics on the surface are represented by those special circles on the map whose centres lie on the base (see fig. 6). The geodetic distance between two points P and Q on the surface is represented by the logarithm of the anhar- monic function AP'BQ', where P'Q' are the representing points on the map, A B the points in which the circle on the map which passes through P' and 0/ and has its centre on the base cuts the base. The perimeter (/) of a geodetic circle of curvature p~ l turns out to be 27rap/V(a 2 — p 2), and its area (lp~ 1 — 2w)a?. The geometry of coaxal circles in piano accordingly enables Us to demonstrate anew by means of the pseudosphere the properties which we have shown to hold good in all anticlastic surfaces of constant curvature. Thus the system of geodetics cutting orthogonally a geodetic circle C will be represented on the map by circles having their centres on the base, and cutting a given circle C orthogonally, i.e. by a coaxal system of circles. We know that the other orthogonal trajectories of this last system are another coaxal system, and therefore, going back to the pseudosphere, we learn that if a system of geodetics be drawn normal to a geodetic circle, all the orthogonals to this system are geodetic circles. It is to be noted that while every point on the surface has its representative on the map, the converse does not hold. It is

only points lying above the line y' ***a which have their prototypes on the surface, the portion of the plane below this line not answering to any real part of the surface. If we take any curve C on the map crossing this line, the part of the curve above this line has as its prototype a curve on the surface. When C reaches this line, C reaches the circular base of the pseudosphere, and there terminates abruptly. The***

distinction between the two cases of a geodetic circle with curvature greater and one with curvature less than a~ l also comes out clearly. For if curvature of C *> 1 the map circle C lies entirely above the base, and the coaxal system cutting C ortho gonally passes through a real point ; therefore C has a centre. If curvature of C*

Minimal Surfaces. From the definition given in part I. readily follows the well- known property of these surfaces — that the two principal curvatures are at every point of such a surface equal and opposite. For familiar instances of the class we have the surface formed by the revolution of a catenary round its base called by French mathema- ticians the alysseide, and the right conoid, z — a ta.n~ 1 (y/x), formed by the successive edges of the steps of a spiral staircase. Monge succeeded in expressing the co - ordinates of the most general minimal surface in two parameters, and in a form in which the variables are separated. The separation of the variables in the expression signifies that every minimal surface belongs to the class of surfaces which can be generated by a movement of translation of a curve. Enneper has thrown the expression for the co-ordinates into the following convenient forms : —

x – |f(i -« 2)/(«)&){v)dv, y = i'/(i +u?)f(u)du hif(i +v>Mv)dv, z= juf(u)du+jv(v)dv.*

It is noteworthy that the expression for the lineal element on a minimal surface assumes the isothermal form ds i = \{du i --dtf) — (1) when the curves u = const, » = const are so chosen as to be the lines of curvature; and (2) when they are chosen to be the lines in which the surface is intersected by a system of parallel planes and the orthogonal trajectories of these lines. It is easily proved that a minimal surface possesses the property of being conformable to its spherical representation. For since the indicatrix at every point is a rectangular hyperbola, the angle between the elements of two intersecting curves = angle between their conjugate tangents; but this=angle between conjugate tangents to representative curves on sphere = angle between these curves themselves.

The problem of finding a minimal surface to pass through a given curve in space, known as Plateau's problem, possesses an exceptional interest from the circumstance that it can be always exhibited to the eye in the following way by an actual physical experiment. Dip a wire having the form of the given curve in a soap-bubble solution, and the film adhering to the wire when it is withdrawn is the surface required. This is evident, since from the theory of surface-tension we know that a very thin film must assume that form for which the area of its surface is the least possible. The same theory also fur- nishes us with an elementary proof of the characteristic property that the sum of the curvatures is everywhere zero, inasmuch as the normal

pressure on the film, here zero, is known to be proportional to the surface-tension multiplied by the sum of the curvatures.

Riemann, adopting a method depending upon the use of the com- plex variable, has succeeded in solving Plateau's problem for several interesting cases, e.g. 1° when the contour consists of three infinite right lines ; 2° when it consists of a gauche quadrilateral ; and 3 when it consists of any two circles situated in parallel planes. (For Lie's investigations in this domain, see Groups, Theory of.)

Non-extensional Deformation.

We have already explained what is meant by this term. It is a subject to which much study has been devoted, connecting itself, as it does, with the work of Gauss in pure geometry on the one hand and with the theory of elasticity on the other. Several questions have been opened up: (1) What are the conditions which must be fulfilled by two surfaces such that one can be " deformed " so as to fit on the other? (2) What instances have we of known surfaces applicable to one another? (3) What surfaces are applicable to themselves? (4) In regard to infinitely small deformations, what are the differential equations which must be satisfied by the displace- ments? (5) Under what circumstances can a surface not be deformed? Can a closed surface ever be deformed?

I. Of course if two surfaces are applicable we must be able to get two systems of parameter curves « = const, v — const, on the first

surface, and two systems on the second, such that the equation for the lineal element, when referred to these, may have an identical form for the two surfaces. The problem is now to select these corre- sponding systems. We may conveniently take for the co-ordinate it the specific curvature on each surface, and choose for v the function dujdn which denotes the rate of increase of u along a direction normal to the curve w = const. Then, since at corresponding points both « and v will be the same for one surface as for the other, if the surfaces are applicable, E, F and G, inˆhe equation ds % = E.du 2 +2Fdudv-{-Gdv :l , must be identical for the two surfaces. Clerk Maxwell has put the geometrical relation which exists between two applicable surfaces in the following way: If we take any two corresponding points P and P' on two such surfaces, it is always possible to draw two elements through P parallel to conjugate semi-diameters of the indicatrix at P, such that the corresponding elements through P' shall be parallel to

conjugate semi-diameters of the indicatrix at P'. The curves made up of all these elements will divide the two surfaces into small parallelograms, the four parallelograms having P as common vertex being identical in size and shape with the four having P' as vertex. Maxwell regards the surfaces as made up in the limit of these small parallelograms. Now, in order to render these sur- faces ready for application, the first step would be to alter the angle between two of the planes of the parallelograms at P, so as to make it equal to that between the corresponding planes at P'. If this be done it is readily seen that all the angles between the other planes at P and P', and at all other corresponding points, will become equal also. The curves which thus belong to the conjugate systems common to the two surfaces may be regarded as lines of bending.

2. Any surface of uniform specific curvature, whether positive or negative, is applicable to another surface of the same uniform specific curvature in an infinite variety of ways. For if we arbi- trarily choose two points, O and O', one on each surface, and two elements, one through each point, we can apply the surfaces, making O and O' corresponding points and the elements corresponding elements. This follows from the form of the equation of the lineal element, which is for synclastic surfaces ds' 2 = du i --a- sin J («a- 1)(io 2 , and for anticlastic, ds 2 =d« , +a s smh 2 (uar i)dˆ, and is therefore identical for the two surfaces in question. Again, a ruled surface may evidently be deformed by first rotating round a generator, the portion of the surface lying to one side of this generator, then round the consecutive generator, the portion of the surface lying beyond this again, and so on. It is clear that in such deformation the rectilinear generators in the old surface remain the rectilinear generators in the new; but it is interesting to note that two ruled surfaces can be constructed which shall be applicable, yet so that the generators will not correspond. For, deform a hyperboloid of one sheet in the manner described, turning the portions of the surface round the consecutive generators of one system, and then deform the hyperboloid, using the generators of the other system. The two surfaces so obtained are, of course, applicable to one another, yet so that their generators do not now correspond. Conversely Bonnet has shown that, whenever two ruled surfaces are thus applicable, without correspondence of generators, they must be both applicable to the same hyperboloid of one sheet. The alysseide is a good example of a surface of revolution applicable to a ruled surface, in this case the right circular conoid, the generators of the conoid coinciding with the meridians of the alysseide.

3. As instances of surfaces applicable to themselves, we may take surfaces of uniform specific curvature, as obviously follows from the reasoning already given; also surfaces of revolution, inasmuch as any such surface can be turned round its axis and still fit upon its old position. Again, helicoidal surfaces possess this property. A helicoidal surface means that

traced out by a rigid wire, which is given a screw motion round a fixed axis, or, which comes to the same thing, the surface made up of a system of helices starting from the points of a given curve, all having the same axis and the same interval between the successive threads. The applicability of such a surface to itself, if given a screw motion round the axis, is evident from the law of its formation.

4. The possible small variations £, 7), f of the points of a surface when it is subject to a small inextensional deformation are condi- tioned by the equation dxdˆ--dydrt--dzdˆ — Q, or making x and y the independent variables,

- *(g+49 + **(?,£$+«£) *■©$) =°-*

From this it follows that the three equations must separately hold

*ft-Lˆ – n ft j- d * jlJ? j-„ d ? – n dr >j-A -n*

Accordingly, the determination of a possible small deformation cf a given surface is reduced to the analytical problem of finding three functions {, 17, f of the variables x and y to satisfy these equations. Changing the co-ordinates to a and /S where = const, /3 = const, are the curves of inflexion on the surface, the solution of the equations can be shown to depend upon that of the equation d i wldadf} = \w, where X is a function of a and /3 depending on the form of the surface. The last equation can be integrated, and the possible deformation determined in the case of a spherical surface, or of any surface of

uniform specific curvature. It is easily shown that if we have determined the displacements for any surface S we can do so for any surface obtained from S by a linear transformation of the variables. For let

x' = a, 1 x = b i y+ciz+d u y = a 2 x--b i y+C2Z--d i , z' =a 3 x J i-bzy+c 3 z+d s , then the displacements

r=A,J + Bˆ-l-Cif, V = A..J+B 2 ,, +C 2 f, f = Arf+B ffl -(-C,f, where Ai Bi, &c, are the minors of the determinant [

dx'dt.' + dy'd-n' + dz'd? = 0. Accordingly the known solution for a sphere furnishes us with a solution for any quadric. Moutard has pointed out a curious connexion between the problem of small deformation and that of the applicability of two finitely different surfaces.

For if dxd£+dydti--dzdt; = 0, it follows that if k be any constant,

\d{x + ki)} 2 + \d(y + HY + {d{z + H)Y- = {d{x – kZ)? + \d(y –

ki))\> + {diz – k!)\ Consequently, if we take two surfaces such that for the first

X = x+k£, Y = y+H Z = z+fef, and for the second

then

X' = x-ki, Y' = y-k v , Z' = z-fef, dX 2 +r<2Z 2 = dX'*+dY' 2 = dZ'\

and therefore the new surfaces are applicable.

5. Jellett and Clerk Maxwell have shown by different methods that, if a curve on a surface be held fixed, there can be no small deformation, except this curve be a curve of inflexion. This may be also proved thus : There can be no displacement of the tangent planes along the fixed curve, for, at any point of the curve the geodetic curvature cannot alter; but in present case the ordinary curvature of the curve is also fixed, therefore their ratio is constant, so that 5cos0=— sin 069=0, where 8 is the angle which the osculating plane makes with the tangent plane; therefore unless sin = 0, as it is along a curve of inflexion, 59 = 0, and therefore the tangent plane at each point is unaltered. Hence it can be shown that along the given curve not only {, y, f vanish, but also their differential coefficients of all orders, and therefore no displacement is possible.

The question has been much discussed: Can a closed synclastic surface be deformed? There seems to be a prevalent opinion amongst mathematicians that such deformation is always impossible, but we do not think any unimpeachable demonstration of this has yet been given. It is certain that a complete spherical surface does not admit of inextensive deformation, for if it did it would follow from Gauss's theorem that the new surface would have a uniform specific curvature. Now, it is not difficult to prove that the only closed surface possessing this property is the sphere itself, provided that the surfaces in question be such that all their tangent planes lie entirely outside them. We can then, by the method of linear transformation already given, extend the theorem of the impossibility of deformation to any ellipsoid.

The theorem that a sphere is the only closed surface of constant specific curvature may, we suggest, be established by means of the following two propositions, which hold for integration on any closed surface, p being the perpendicular from the origin on the tangent plane: —

(I)

(2)

ff{i/R + i/R') dS = 2jfpdS[RR' 2jJdS = ffp{i/R + i/R')dS.

Now multiply both sides of the first equation by the constant VRR', and subtract the second, and we get :—

//{(R'/R)i – {R/R'y^dS+Jfp(,i/Ri~ilR'i)HS =

which is impossible unless R' = R everywhere, since in accordance with the proviso p is everywhere positive.

Theorems (1) and (2) are deduced by Jellett by means of the calculus of variations in his treatise on that subject. They may also be very simply proved thus: Draw normals to the surface along the contours of the small squares formed by lines of curvature, and let these meet successive parallel surfaces at distances dn, then the volume bounded by two parallel surfaces

=JjT(dS f n o dn(i + n/R) (1 + n/R 1)

=JJdS{n + jnKi/R + i/R') + l» J /RR') ;

but taking origin inside, the perpendiculars let fall from O on a tan- gent plane to the outer surface = p+n on account of the parallelism of the surfaces. Also dS for outer surface =

= iff (P + n) (1 + n/R) (1 + n/RVS – iffpdS

-i*ff(i+&+£>)tt+Wff (&,*&) dS + i "7/p^^

SURGE— SURGERY

"5

Hence equating coefficients of the powers of n —

//>(i/R + i/R0

and jjipdSIRK' ~fj (i/R + i/R')dS.

References to the original memoirs will be found in Salmon's Analytical Geometry of Three Dimensions, Frost's Solid Geometry and, more completely, in Darboux's Lecons sur la theorie gen&rale des surfaces. (J. Pu. ; F. Pu.)

SURGE, in meteorology, an irregular fluctuation of the barometer, extending over a long period (e.g. a month), in contradistinction to the shorter fluctuations, covering two or three days, caused by alternating conditions of high and low pressure. The cause of surges is not understood.

SURGERY (Fr. chirurgie, from Gr. xˆpovpyla, i.e. hand- work), the profession and art of the surgeon (chirurgien), connected specially with the cure of diseases or injuries by operative manual and instrumental treatment.

History. — Surgery in all countries is as old as human needs. A certain skill in the stanching of blood, the extraction of arrows, the binding up of wounds, the supporting of broken limbs by splints, and the like, together with an instinctive reliance on the healing power of the tissues, has been common to men everywhere. In both branches of the Indo-European stock surgical practice (as well as medical) reached a high degree of perfection at a very early period. It is a matter of controversy whether the Greeks got their medicine (or any of it) from the Hindus (through the medium of the Egyptian priesthood), or whether the Hindus owed that high degree of medical and surgical knowledge and skill which is reflected in Charaka (ist century a.d.) and Susruta (2nd century) (commentators of uncertain date on the Yajur-Veda) to their contact with Western civiliza- tion after the campaigns of Alexander. The evidence in favour of the former view is ably stated by Wise in the Introduction to his History of Medicine Among the Asiatics (London, 1868). The correspondence between the Suirula and the Hippocratic Collection is closest in the sections relating to the ethics of medical practice; the description, also, of lithotomy in the former agrees almost exactly with the account of the Alexandrian practice as given by Celsus. But there are certainly some dexterous operations described in Susruta (such as the rhinoplastic) which were of native invention; the elaborate and lofty ethical code appears to be of pure Brahmanical origin; and the copious materia medica (which included arsenic, mercury, zinc, and many other substances of permanent value) does not contain a single article of foreign source. There is evidence also (in- Arrian, Strabo and other writers) that the East enjoyed a proverbial reputation for medical and surgical wisdom at the time of Alexander's invasion. We may give the first place, then, to the Eastern branch of the Indo-European stock in a sketch of the rise of surgery, leaving as insoluble the question of the date of the Sanskrit compendiums or compilations which pass under the names of two representative persons, Charaka and Susruta (the dates assigned to these ranging as widely as 500 years on each side of the Christian era).

The Susruta speaks throughout of a single class of practitioners who undertook both surgical and medical cases. Nor were „, j there any fixed degrees or orders of skill within the

profession; even lithotomy, which at Alexandria was assigned to specialists, was to be undertaken by any one, the leave of the raja having been first obtained. The only distinction recognized between medicine and surgery was in the inferior order of barbers, nail-trimmers, ear-borers, tooth-

drawers and phlebotomists, who were outside the Brahmanical caste.

Susruta describes more than one hundred surgical instruments, made of steel. They should have good handles and firm joints, be well polished, and sharp enough to divide a hair; they should be perfectly clean, and kept in flannel in a wooden box. They included various shapes of scalpels, bistouries, lancets, scarifiers, saws, bone- nippers, scissors, trocars and needles. There were also blunt hooks, loops, probes (including a caustic-holder), directors, sounds, scoops and forceps (for polypi, &c), as well as catheters, syringes, a rectal speculum and bougies. There were fourteen varieties of bandage. The favourite form of splint was made of thin slips of bamboo bound

together with string and cut to the length required. Wise says that he had frequently used " this admirable splint," particularly for fractures of the thigh, humerus, radius and ulna, and it was subse- quently adopted in the English army under the name of the " patent rattan-cane splint."

Fractures were diagnosed, among other signs, by crepitus. Dis- locations were elaborately classified, and the differential diagnosis given; the treatment was by traction and countertraction, circum- duction and other dexterous manipulation. Wounds were divided into incised, punctured, lacerated, contused, &c. Cuts of the head and face were sewed. Skill in extracting foreign bodies was carried to a great height, the magnet being used for iron particles under certain specified circumstances. Inflammations were treated by the usual antiphlogistic regimen and appliances; venesection was practised at several other points besides the bend of the elbow; leeches were more often resorted to than the lancet; cupping also was in general use. Poulticing, fomenting and the like were done as at present. Amputation was done now and then, notwithstanding the want of a good control over the haemorrhage; boiling oil was applied to the stump, with pressure by means of a cup-formed bandage, pitch being sometimes added. Tumours and enlarged lymphatic glands were cut out, and an arsenical salve applied to the raw surfaces to prevent recurrence. Abdominal dropsy and hydro- cele were treated by tapping with a trocar; and varieties of hernia were understood, omental hernia being removed by operation on the scrotum. Aneurisms were known, but not treated; the use of the ligature on the continuity of an artery, as well as on the cut end of it in a flap, is the one thing that a modern surgeon will miss somewhat noticeably in the ancient surgery of the Hindus; and the reason of their backwardness in that matter was doubtless their want of familiarity with the course of the arteries and with the arterial circu- lation. Besides the operation already mentioned, the abdomen was opened by a short incision below the umbilicus slightly to the left of the middle line for the purpose of removing intestinal concretions or other obstruction (laparotomy). Only a

small segment of the bowel was exposed at one time; the concretion when found was removed, the intestine stitched together again, anointed with ghee and honey, and returned into the cavity. Lithotomy was practised, without the staff. There was a plastic operation for the restoration of the nose, the skin being taken from the cheek adjoining, and the vascularity kept up by a bridge of tissue. The ophthalmic surgery included extraction of cataract. Obstetric operations were various, including caesarean section and crushing the foetus.

The medication and constitutional treatment in surgical cases were in keeping with the general care and elaborateness of their practice, and with the copiousness of their materia medica. Oint- ments and other external applications had usually a basis of ghee (or clarified butter), and contained, among other things, such metals as arsenic, zinc, copper, mercury and sulphate of iron. For every emergency and every known form of disease there were elaborate and minute directions in the sastras, which were taught by the physician-priests to the young aspirants. Book learning was considered of no use without experience and manual skill in opera- tions; the different surgical operations were shown to the student upon wax spread on a board, on gourds, cucumbers and other soft fruits; tapping and puncturing were practised on a leathern bag filled with water or soft mud; scarifications and bleeding on the fresh hides of animals from which the hair had been removed ; puncturing and lancing upon the hollow stalks of water-lilies or the vessels of dead animals; bandaging was practised on flexible models of the human body; sutures on leather and cloth; the plastic operations on dead animals; and the application of caustics and cauteries on living animals. A knowledge of anatomy was held to be necessary, but it does not appear that it was systematically acquired by dissec- tion. Superstitions and theurgic ideas were diligently kept up so as to impress the vulgar. The whole body of teaching, itself the slow growth of much close observation and profound thinking during the vigorous period of Indo-Aryan progress, was given out in later times as a revelation from heaven, and as resting upon an absolute authority. Pathological principles were not wanting, but they were derived from a purely arbitrary or conventional physiology (wind, bile and phlegm) ; and the whole elaborate fabric of rules and direc- tions, great though its utility must have been for many generations, was without the quickening power of reason and freedom, and became inevitably stiff and decrepit.

The Chinese appear to have been far behind the Hindus in their knowledge of medicine and surgery, notwithstanding that China profited at the same time as Tibet by the missionary propagation of Buddhism. Surgery in particular had hardly developed among them beyond the merest rudiments, owing to their religious respect for dead bodies and their unwillingness to draw blood or otherwise interfere with the living structure. Their anatomy

and physio- logy have been from the earliest times unusually fanciful, and their surgical practice has consisted almost entirely of external applications. Tumours and boils were treated by scarifications

or incisions. The distinctive Chinese surgical invention is acupuncture, or the insertion of fine needles, of hardened silver or gold, for an inch or more (with a twisting motion) into the seats of pain or inflammation. Wise says that " the needle is allowed to remain in that part several minutes, or in some cases of neuralgia for days, with great advantage "; rheumatism and chionic gout were among the localized pains so treated. There are 367 points specified where needles may be inserted without injuring great vessels and vital organs.

Cupping- vessels made of cow-horn have been found in ancient Egyptian tombs. On monuments and the walls of temples are figures of patients bandaged, or undergoing ˆ yp ' operation at the hands of surgeons. In museum collections of Egyptian antiquities there are lancets, forceps, knives, probes, scissors, &c. Ebers interprets a passage in the papyrus discovered by him as relating to the operation of cataract. Surgical instruments for the ear are figured, and artificial teeth have been found in mummies. Mummies have also been found with well-set fractures. Herodotus describes Egypt, notwith- standing its fine climate, as being full of medical practitioners, who were all " specialists." The ophthalmic surgeons weTe celebrated, and practised at the court of Cyrus.

Greek Surgery. — As in the case of the Sanskrit medical writings, the earliest Greek compendiums on surgery bear witness to a long organic growth of knowledge and skill through many generations. In the Homeric picture of society the surgery is that of the battlefield, and it is of the most meagre kind. Achilles is concerned about the restoration to health of Machaon for the reason that his skill in cutting out darts and applying salves to wounds was not the least valuable service that a hero could render to the Greek host. Machaon probably represents an amateur, whose taste had led him, as it did Melampus, to converse with centaurs and to glean some of their traditional wisdom. Between that primitive state of civilization and the date of the first Greek treatises there had been a long interval of gradual progress.

The surgery of the Hippocratic Collection (age of Pericles) bears every

evidence of finish and elaboration. The two treatises on Hipoocrutie lractures an d on dislocations respectively are hardly Surgery surpassed in some ways by the writings of the present mechanical age. Of the four dislocations of the shoulder the displacement downwards into the axilla is given as the only one at all common. The two most usual dislocations of the femur were backwards on to the dorsum ilii and forwards on to the obturator region. Fractures of the spinous processes of the vertebrae are described, and caution advised against trusting those who would magnify that injury into fracture of the spine itself. Tubercles (<ˆi/iaro) are given as one of the causes of spinal curvature, an anticipation of Pott's diagnosis. In all matters of treatment there was the same fertility of resource as in the Hindu practice ; the most noteworthy point is that shortening was by many regarded as inevitable after simple fracture of the femur. Fractures and dislocations were the most complete chapters of the Hippocratic surgery ; the whole doctrine and practical art of them had arisen (like sculpture) with no help from dissection, and obviously owed its excellence to the opportunities of the palaestra. The next most elaborate chapter is that on wounds and injuries of the head, which refers them to a minute subdivision, and includes the depressed fracture and the contrecoup. Trephining was the measure most commonly resorted to, even where there was no compression. Numerous forms of wounds and injuries of other parts are specified. Ruptures, piles, rectal polypi, fistula in ano and prolapsus ani were among the other conditions treated. The amputation or excision of tumours does not appear to have been undertaken so freely as in Hindu surgical practice; nor was lithotomy performed except by a specially expert person now and then. The diagnosis of empyema was known, and the treatment of it was by an incision in the intercostal space and evacuation of the pus. Among their instru- ments were forceps, probes, directors, syringes, rectal speculum, catheter and various kinds of cautery.

Between the Hippocratic era and the founding of the school of Alexandria (about 300 B.C.) there is nothing of surgical

progress to dwell upon. The Alexandrian epoch Period, ”” stands out prominently by reason of the enthusiastic

cultivation of human anatomy — there are allegations also of vivisection— at the hands of Herophilus (335-280 B.C.) and Erasistratus (280 B.C.). The substance of this movement appears to have been precision of diagnosis (not unattended with

pedantic minuteness), boldness of operative procedure, sub- division of practice into; a number of specialities, but hardly a single addition to the stock of physiological or pathological ideas, or even to the traditional wisdom of the Hippocratic time. “The surgeons of the Alexandrian school

were all distinguished by the nicety and complexity of their dressings and bandagings, of which they invented a great variety." Herophilus boldly used the knife even on internal organs such as the liver and spleen, which latter he regarded " as of little consequence in the animal economy." He treated retention of urine by a particular kind of catheter, which long bore his name. Lithotomy was much practised by a few specialists, and one of them (Ammonius Lithotomos, 287 B.C.) is said to have used an instrument for breaking the stone in the bladder into several pieces when it was too large to remove whole. A sinister story of the time is that concerning Antiochus, son of Alexander, king of Syria (150 B.C.), who was done to death by the lithqtomists when he was ten years old, under the pretence that he had stone in the bladder, the instigator of the crime being his guardian and supplanter Diodotus.

The treatise of Celsus, De re medico, (reign of Augustus), reflects the state of surgery in the ancient world for a period of several centuries : it is the best record, of the Alexandrian practice itself, and it may be taken to stand for the Roman practice of the period following. Great jealousy of Greek medicine and surgery was expressed by many of the Romans of the republic, notably by Cato the Elder (234-149 B.C.), who. himself practised on his estate according to the native traditions. His medical observations are given in De re rustica. In reducing dislocations he made use of the following incantation: " Huat hanat ista pista sista damiato damnaustra." The first Greek surgeon who established himself in Rome is said to have been Archagathus, whose fondness for the knife and cautery at length led to his expulsion by the populace. It was in the person of Asclepiades, the contemporary and friend of Cicero, that the HeUenic medical practice acquired a permanent footing in Rome. He confined his practice mostly to medicine, but he is credited with practising the operation of tracheotomy. He is one of those whom Tertullian quotes as practising vivisections for the gratification of their curiosity (De anima, 15). The next figure in the surgical' history is Celsus, who devotes the 7th and 8th books of his De re medico, exclusively to,' surgery. There is not much in these beyond the precepts of the Brahmanical s&stras Celsas. and the maxims and rules of Greek surgery. Plastic operations for the restoration of the nose, lips and ears are described at some length, as well as the treatment of hernia by taxis and operation; in the latter it was recommended to apply the actual cautery to the canal after the hernia had been returned. The celebrated description of lithotomy is that of the operation as practised long before in India and at Alexandria. The treatment of sinuses in various regions is dwelt upon, and in the case of sinuses of the thoracic wall resection of the rib is mentioned. Trephining has the same prominent place assigned to it as in the Greek surgery. The resources of contemporary surgery may be estimated by the fact that subcutaneous urethrotomy was practised when

the urethra was blocked by a calculus. Amputation of an extremity is described in detail for the first time in surgical literature. Mention is made of a variety of ophthalmic operations, which were done by specialists after the Alexandrian fashion.

Galen's practice of surgery was mostly in the early part of his career (b. a.d. 130), and there is little of special surgical interest in his writings, great as their importance aalea is for anatomy, physiology and the general doctrines of disease. Among the operations credited to him are resection of a portion of the sternum for caries and ligature of the temporal artery. It may be assumed that surgical practice was in a flourishing condition all through the period of the empire from the accounts preserved by Oribasius of the great surgeons Antyllus, Leonides, Rufus and Heliodorus. Antyllus (a.d. 300) is claimed by Haser as one of the greatest of the world's surgeons; he had an operation for Empire. aneurism (tying the artery above and below the sac, and evacuating its contents), for cataract, for the cure of stammering; and he treated contractures by something like tenotomy. Rufus and Heliodorus are said to have practised torsion for the arrest of haemorrhage; but in later periods both that and the ligature appear to have given way to the actual cautery. Haser speaks of the operation for scrotal hernia attributed to Heliodorus as " a brilliant example of the surgical skill during' the empire." The same surgeon treated stricture

of the urethra by internal section. Both Leonides and Antyllus removed glandular swellings of the neck (strumae) ; the latter ligatured vessels before cutting them, and gives directions for avoiding the carotid artery and jugular vein. Flap-amputations were practised by Leonides and Heliodorus. But perhaps the most striking illustration of the advanced surgery of the period is the freedom with which bones were resected, including the long bones, the lower jaw and the upper jaw.

Whatever progress or decadence surgery may have experienced during the next three centuries is summed up in the authoritative Byzantine treat ' se °f Paulus of Aegina (a.d. 650). Of his ' seven books the sixth is entirely devoted to opera- tive surgery, and the fourth is largely occupied with surgical diseases. The importance of Paulus fox surgical history during several centuries on each side of his own period will appear from the following remarks of Francis Adams (1796-1861) in his translation and commentary (ii. 247): —

" This book (bk. vi.) contains the most complete system of opera- tive

surgery which has come down to us from ancient times. . . . Haly Abbas (d. a.d. 994) in the 9th book of his Practica copies almost everything from Paulus. Albucasis [Abulcasis] (10th century A.D.) gives more original matter on surgery than any other Arabian author, and yet, as will be seen from our commentary, he is indebted for whole chapters to Paulus. In the Continens of Rhases, that precious repository of ancient opinions on medical subjects, if there be any surgical information not to be found in our author it is mostly derived from Antyllus and Archigenes. As to the other authorities, although we will occasionally have to explain their opinions upon particular subjects, no one has treated of surgery in a systematical manner; for even Avicenna, who treats so fully of everything else connected with medicine, is defective in his accounts of surgical operations; and the descriptions which he does give of them are almost all borrowed 'from our author. The accounts of fractures and dislocations given by Hippocrates and his commentator Galen may be pronounced almost complete; but the information which they supply upon most other surgical subjects is scanty."

Paulus' sixth book, with the valuable commentary of Adams, brings the whole surgery of the ancient world to a focus. Paulus is credited with the principle of local depletion as against general, with the lateral operation for stone instead of the mesial and with understanding the merits of a free external incision and a limited internal, with the diagnosis of aneurism by anastomosis, 'with an operation for aneurism like that of Antyllus, with amputa- tion of the cancerous breast by crucial incision, and with the treatment of fractured patella.

The Arabians have hardly any greater merit in medicine than that of preserving intact the bequest of the ancient world. Arabian ^° sur g erv i n particular their services are small- first, because their religion proscribed the practice of anatomy, and, secondly, because it was a characteristic of their race to accept with equanimity the sufferings that fell to them, and to decline the means of alleviation. The great names of the Arabian school, Avicenna (980-1037) and Averroes (n 26-1 198), are altogether unimportant for surgery. Their one distinctively surgical writer was Abulcasim (d. n 22), who is chiefly celebrated for his free use of the actual cautery and of caustics. He showed a good deal of character in declining to operate on goitre, in resorting to tracheotomy but sparingly, in refusing to meddle with cancer, and in evacuating large abscesses by degrees.

For the five hundred y«ars following the work of Paulus of Aegina there is nothing to record but the names of a few Medieval practitioners at the court and of imitators or comˆ pilers. Meanwhile in western Europe (apart from the Saracen civilization) a medical school had grown up at Salerno, which in the roth century had already become famous. From it issued the Regimen salernitanum, a work used by the laity for several centuries, and

the Compendium salernitanum, which circulated among the profession: The decline of the school dates from the founding of a university at Naples in 1224. In its best period princes and nobles' resorted to it for treatment from all parts of Europe. The h6tel dieu of Lyons had been founded in 560, and that of Paris a century later. The school of Montpellier was founded in 1025, and became the rallying point of Arabian and Jewish learning. A good deal of the medical and surgical practice was in the hands of the religious

orders, particularly of the Benedictines, The practice of surgery by the clergy was at length forbidden by the Council of Tours (1163). The surgical writings of the time were mere reproductions of the classical or Arabian authors. One of the first to go back to independent observation and reflection was William of Saliceto, who belonged to the school of Bologna; his work (1275) advocates the use of the knife in many places where the actual cautery was used by ancient prescription. A greater name in the history of medieval surgery is that of his pupil Lanfranchi of Milan, who migrated (owing to political troubles) first to Lyons and then to Paris. He distinguished between arterial and venous haemorrhage, and is said to have used the ligature for the former. Contemporary with him in France was Henri de Mondeville (Hermondaville) of the school of Montpellier, whose teaching is best known through that of his more famous pupil Guy de Chauliac; the Chirtirgie of the latter bears the date of 1363, and marks the advance in precision' which the revival of anatomy by Mondino had made possible. Eighteen years before Lanfranchi came to Paris a college of surgeons was founded there (1279) by Pitard, who had accom- panied St Louis to Palestine as his surgeon. The college was under the protection of St Cosmas and St Damianus, two practitioners of medicine who suffered martyrdom in the reign of Diocletian, and it became known as the College de St Come. From the time that Lanfranchi joined it it attracted many pupils. It maintained its independent existence for several centuries, alongside the medical faculty of the university; the corporations of surgeons in other capitals, such as those of London and Edinburgh, were modelled upon it.

The 14th and 15th centuries are almost entirely without interest for surgical history. The dead level of tradition is broken first by two men of originality and genius — P. Paracelsus (1493-1541) and Pare, and by the revival of anatomy at the hands of Andreas Vesalius (1514-1564) and Gabriel Fallopius (1523-ˆ62), professors at Padua. Apart from the mystical form in which much of his teaching was cast, Paracelsus has great merits as a reformer of surgical practice. p arace ˆ USm " The high value of his surgical writings," says Haser, " has been recognized at all times, even by his opponents." It is not, however, as an innovator in operative surgery, but rather as a direct observer of natural processes, that Paracelsus is

distinguished. His description of "hospital gangrene," tot example, is perfectly true to nature; his numerous observations on syphilis are also sound and sensible; and he was the first to point out the connexion between cretinism of the offspring and goitre of the parents. He gives most prominence to the healing of wounds. His special surgical treatises are Die kleine Chirurgie (1528) and Die grosse Wund-Arznei (1536-1537) —the latter being the best known of his works. Somewhat later in date, and of much greater concrete importance for surgery than Paracelsus, is Ambroise Par6 (1510- p aT i,

1590). He began life as apprentice to a barber- surgeon in Paris and as a pupil at the hotel dieu. His earliest opportunities were in military surgery during the campaign of Francis I. in Piedmont. Instead of treating gunshot wounds with hot oil, according to the practice of the day, he had the temerity to trust to a simple bandage; and from that beginning he proceeded to many other developments of rational surgery.- In 1545 he published at Paris La MSlhode de tr.aieter les playes f aides par hacquebutes et aullres bastons a feu. The same year he began to attend the lectures of Sylvius, the Paris teacher of anatomy, to whom he became prosector; and his next book was an Anatomy (1550). His most memorable service was to get the use of the ligature for large arteries generally adopted, a method of controlling the haemorrhage which made amputation on a large scale possible for the first time. Like Paracelsus, he writes in the language of the people, while he is free from the encumbrance of mystical theories, which detract from the merits of his fellow reformer in Germany. It is only in his book on monsters, written towards the end of his career, that he shows himself to have been by no means free from superstition. Pari was adored by the army and greatly esteemed by successive

French kings; but his innovations were opposed, as usual, by the faculty, and he had to justify the use of the ligature as well as he could by quotations from Galen and other ancients.

Surgery in the 16th century recovered much of the dexterity and resource that had distinguished it in the best periods of antiquity, while it underwent the developments Century °P e ned up to it by new forms of wounds inflicted by new weapons of warfare. The use of the staff and other instruments of the " apparatus major " was the chief improvement in lithotomy. A " radical cure " of hernia by sutures superseded the old application of the actual cautery. The earlier modes of treating stricture of

the urethra were tried; plastic operations were once more done with something like the skill of Brahmanical and classical times; and ophthalmic surgery was to some extent rescued from the hands of ignorant pre-tenders. It is noteworthy that even in the legitimate profession dexterous special operations were kept secret; thus the use of the " apparatus major " in lithotomy was handed down as a secret in the family of Laurence Colot, a contemporary of Pare's.

The 17th century was distinguished rather for the rapid progress of anatomy and physiology, for the Baconian and Cartesian philosophies, and the keen interest taken Century ln complete systems of medicine, than for a high standard of surgical practice. The teaching of Pare that gunshot wounds were merely contused and not poisoned, and that simple treatment was the best for them, was enforced anew by Magati (1579-1647), Wiseman and others. Trephining was freely resorted to, even for inveterate migraine; Philip William, prince of Orange, is said to have been trephined seventeen times. Flap-amputations, which had been practised in the best period of Roman surgery by Leonides and Heliodorus, were reintroduced by Lowdham, an Oxford surgeon, in 1679, and probably used by Wiseman, who was the first to practise the primary major amputations. Fabriz von Hilden (1560-1634) introduced a form of tourniquet, made by placing a piece of wood under the bandage encircling the limb; out of that there grew the block-tourniquet of Morel, first used at the siege of Besancon in 1674; and this, again, was superseded by Jean Louis Petit's (1674-1750) screw-tourniquet in 1718. Strangu- lated hernia, which was for long avoided, became a subject ol operation. Lithotomy by the lateral method came to great perfection in the hands of Jacques Beaulieu. To this century also belong the first indications (not to mention the Alexandrian practice of Ammonius) of crushing the stone in the bladder. The theory and practice of transfusion of blood occupied much attention, especially among the busy spirits of the Royal Society, such as Boyle, Lower and others. The seat of cataract in the substance of the lens was first made out by two French surgeons, Quarre and Lasnier. Perhaps the most important figure in Wiseman tne sur 8i ca l history of the century is Richard Wise- man (i622? i676) the father of English surgery. Wiseman took the Royalist side in the wars of the Common wealth, and was surgeon to James I. and Charles I., and accom- panied Charles II. in his exile in France and the Low Countries. After serving for a time in the Spanish fleet, he joined the Royalist cause in England and was taken prisoner at the battle of Worcester. At the Restoration he became serjeant-surgeon to Charles II., and held the same office under James II. His Seven Chirurgical Treatises were first published in 1676, and went through several editions; they relate to tumours, ulcers, diseases of the anus, king's evil (scrofula), wounds, fractures, luxations and lues venerea. Wiseman was the first to advocate primary amputation

(or operation before the onset of fever) in cases of gunshot wounds and other injuries of the limbs. He introduced also the practice of treating aneurisms by com- pression, gave an accurate account of fungus articulorum, and improved the operative procedure for hernia.

The 1 8th century marks the establishment of surgery on a broader basis than the skill of individual surgeons of the court and army, and on a more scientific basis than the rule of thumb of the multitude of barber-surgeons and other inferior

orders of practitioners. In Paris the College de St C6me gave way to the Academy of Surgery in 1731, with Petit as director, to which was added at a later date the Ecole Pra- tique de Chirurgie, with Francois Chopart (1743- century. 1795) and Pierre Desault (1744-1795) among its first professors. The Academy of Surgery set up a very high standard from the first, and exercised great exclusiveness in its publica- tions and its honorary membership. In London and Edinburgh the development of surgery proceeded on less academical lines, and with greater scope for individual effort. Private dissecting rooms and anatomical theatres were started, of which perhaps the most notable was Dr William Hunter's (1718-1783) school in Great Windmill Street, London, inasmuch as it was the first perch of his more famous brother John Hunter (1728-1793). In Edinburgh, Alexander Monro (1697-1767), first of the name, became professor of anatomy to the company of surgeons in 1 7 19, transferring his title and services to the university the year after; as he was the first systematic teacher of medicine or surgery in Edinburgh, he is regarded as the founder of the famous medical school of that city. In both London and Edin- burgh a company of barbers and surgeons had been in existence for many years before; but it was not until the association of these companies with the study of anatomy, comparative anatomy, physiology and pathology that the surgical pro- fession began to take rank with the older order of physicians. Hence the significance of the eulogy of a living surgeon on John Hunter: " More than any other man he helped to make us gentlemen " (Hunterian Oration, 1877). The state pf surgery in Germany may be inferred from the fact that the teaching of it at the new university of Gottingen was for long in the hands of Albrecht von Haller (1708-1777), whose office was " professor of theoretical medicine." In the Prussian army it fell to the regimental surgeon to shave the officers. At Berlin a medico-chirurgical college was founded by Surgeon-General Ernst von Holtzendorff (1688-1751) in 1714, to which was joined in 1726 a school of clinical surgery at the Charit6. Military surgery was the original purpose of the school, which still exists, side by side with the surgical cliniques of the faculty, as the Friedrich Wilhelm's Institut. In Vienna, in like manner, a school for the training of army surgeons was founded in 1785— Joseph's Academy or the Josephinum. The first systematic teaching of surgery in the

United States was by Dr Shippen at Phila- delphia, where the medical college towards the end of the century was largely officered by pupils of the Edinburgh school. A great part of the advance during the 18th century was in surgical pathology, including Petit's observations on the formation of thrombi in severed vessels, Hunter's account of the reparative process, Benjamin Bell's classification of ulcers, the observations of Duhamel and others on the formation of callus and on bone- repair in general, Pott's distinction between spinal curvature from caries or abscess of the vertebrae and kyphosis from other causes, observations by various surgeons on chronic disease of the hip, knee, and other joints, and Cheselden's description of neuroma. Among the great improvements in surgical procedure we have Cheselden's operation of lithotomy (six deaths in eighty cases), Sir Caesar Hawkins's (1711-1786) cutting gorget forthe same (1753), Hunter's operation (1785) for popliteal aneurism by tying the femoral artery in the canal of the triceps where its walls were sound ("excited the greatest wonder," Assalini), Petit's, Desault's and Percival Pott's (1714-1788) treatment of fractures, Gimbernat's (Barcelona) operation for strangulated femoral hernia, Pott's bistoury for fistula, Charles White's (1728-1813, Manchester) and Henry Park's (1745-1831, Liver- pool) excision of joints, Petit's invention of the screw-tourniquet, the same surgeon's operation for lacrymal fistula, Chopart's partial amputation of the foot, Desault's bandage for fractured clavicle, William Bromfield's (1712-1792) artery hook, and William Cheselden's (1688-1752) operation of iridectomy. Other surgeons of great versatility and general merit were Sharp of London, Benjamin Gooch (fl. 1775) of Norwich, William Hey (1736-1819) of Leeds, David and Claude Nicolas Le Cat (1705- 1768) of Rouen, Raphael Sabatier (1732-1811), Georges de La

Faye (1701-1781), Ledran, Antoine Louis (1723-1792), Sauveur Morand (1697-1773) and Pierre Percy (1754-1825) of Paris, Bertrandi of Turin, Troja of Naples, Palleta of Milan, Schmucker of the Prussian army, August Richter of Gottingen, Siebold of Wiirzburg, Olaf Acrel of Stockholm and Callisen of Copen- hagen.

Two things gave surgical knowledge and skill in the 19th century a character of scientific or positive cumula- tiveness and a wide diffusion through all ranks Century. °^ tne profession. 1 The one was the founding of museums of anatomy and surgical pathology by the Hunters, Guillaume Dupuytren (1777-1835), Jules Cloquet (1790-1843), J. F. Blumenbach (1752-1840), John Barclay (1758- 1826), and a great number of more modern anatomists and surgeons; the other was the method of clinical

teaching, exemplified in its highest form of constant reference to principles by Thomas Lawrence (1711-1783) and James Syme (1 799-1870). In surgical procedure the discovery of the anaesthetic 'properties of ether, chloroform, methylene, &c, was of incalculable service; while the conservative principle in operations upon diseased or injured parts, and especially what may be called the hygienic idea (or, more narrowly, the antiseptic and aseptic principles) in the conditions governing surgery, were strikingly beneficial.

The following were among the more important additions to the resources of the surgical art: the thin thread ligature for arteries, introduced by Jones of Jersey (1805) ; the revival of torsion of arteries by Jean Amussat (1796-1856) [1829]; the practice of drainage by Pierre Marie Chassaignac (1805-1879) [1859]; aspiration by Philippe Pelletan (1 747-1829) and recent improvers; the plaster-of-Paris bandage or other immovable application for simple fractures, club- foot, &c. (an old Eastern practice recommended in Europe about 1 8 14 by the English consul at Basra); the re-breaking of badly set fractures; galvano-caustics and ecraseurs; the general introduction of resection of joints (Sir William Fergusson (1808-1877), Syme and others); tenotomy by Jacques Delpech (1777-1832) and Louis Stromeyer (1804-1876) [1831]; operation for squint by Johann Dieffenbach (1795-1847) [1842]; successful ligature of the external iliac for aneurism of the femoral by John Abernethy (1764-1831) [1806]; ligature of the subclavian in the third portion by Astley Cooper (1768-1841) [1806], and in its first portion by Colles; crushing of stone in the bladder by Gruithuisen of Munich (1819) and Jean Civiale (1792-1867) of Paris [1826] ; cure of ovarian dropsy by remov- ing the cyst (since greatly perfected) ; discovery of the ophthalmo-scope, and many improvements in ophthalmic surgery by Alfred von Grafe (1 830-1899) and others; application of the laryngoscope in operations on the larynx by Jean Czermak (1828-1873) [i860] and others ; together with additions to the resources of aural surgery and dentistry. The great names in the surgery of the first half of the century besides those mentioned are: Antonio Scarpa of Italy (1747-1832); Alexis Boyer (1757-1833), Felix Larrey (1766-1842) — • to whom Napoleon left a legacy of a hundred thousand francs, with the eulogy: " C'est l'homme le plus vertueux que j'aie connu," Philibert Roux (1780-1854), Jacques Lisfranc (1790-1847), Alfred Louis Velpeau (1795-1868), Joseph Malgaigne (1806-1865), Auguste Nelaton (1807-1873) — all of the French school ; of the British school, John Bel! (1763-1820), Charles Bell (1774-1842), Allan Burns (1781—1813), Robert Liston (1794-1847), James Wardrop (1782- 1869), Astley Cooper, Henry Cline (1750-1827), Benjamin Travers (1783-1858), Benjamin Brodie (1783-1862), Edward Stanley (1793- 1862) andGeorgeGuthrie(i785-i856) ; in the United States, V.

Mott, S. D. Gross and others; in Germany, Kern and Schuh of Vienna, Von Walther and Textor of Wiirzburg, Chelius, Hesselbach and the two Langenbecks — Konrad (1776-1851) and Bernhard (1810-1887).

Authorities. — Wise, History of Medicine among the Asiatics (2 vols., London, 1868); Paulus Aegineta, translated with commentary on the knowledge of the Greeks, Romans and Arabians in medicine and surgery, by Francis Adams (3 vols., London, 1844-1847), Haser, Gesch. d. Medicin (3rd ed., 1875-1881), vols. i. and li. (C. C.)

Modern Practice of Surgery. 2 — A great change has taken place in the practice of surgery since the middle of the 19th century, in consequence of the new science of bacteriology, and the introduc- tion of aseptic methods, due to the teaching of Lord Lister.-

It had long been known that subcutaneous injuries followed a far more satisfactory course than those with wounds, and the history of surgery gives evidence that surgeons endeavoured, by the use of various dressings, empirically to prevent the evils which were matters of common observation during the healing

1 The Royal College of Surgeons in London was established in 1800, the title being changed in 1843 to Royal College of Surgeons of England.

2 For the surgery of any particular region or organ, reference should be made to the article on that region or organ.

of open wounds. Various means were also adopted to prevent the entrance of air, as, for instance, in the opening of abscesses by the " valvular method " of Abernethy, and by the subcutaneous division of tendons in " club-foot." Balsams and turpentine and various forms of spirit were the basis of many varieties o{ dressing. These different dressings were frequently cumber- some and difficult of application, and they did not attain the object aimed at, while, at the same time, they shut in the dis- charges and gave rise to other evils which prevented rapid and painless healing. In the beginning of the 19th century these complicated dressings began to lose favour, and operating surgeons went to the opposite extreme and applied a simple dressing, the main object of which was to allow a free escape of discharge. Others applied no dressing at all, laying the stump of a limb after amputation on a piece of dry lint, avoiding thereby any unnecessary movement of the parts. Others, again, left the wound open for some hours after an operation, preventing in this way any accumulation, and brought its edges and sur- faces together after all oozing of blood had ceased, and after the effusion, the result of injury to the tissues in the operation had to a great extent subsided. As a result of these measures many wounds healed

kindly. But in other cases inflammation occurred, accompanied by pain and swelling, and the formation of pus. High fever also, due to the unhealthy state of the wound, was observed. These conditions often proved fatal, and surgeons attributed them to the constitution of the patient, or else thought that some poison had entered the wound, and, passing from it into the veins, had contaminated the blood and poisoned the patient. The close association between the forma- tion of pus in wounds and the fatal " intoxication " of many of those cases encouraged the belief that the pus cells from the wound entered the circulation. Hence came the word " pyaemia." It was also observed that a septic condition of the wound was usually associated with constitutional fever, and it was supposed that the septic matter passed into the blood — whence the term " septicaemia." It was further observed that the crowding together of patients with open wounds increased the liability to these constitutional disasters, so every endeavour was made to separate the patients and to improve ventilation. In building hospitals the pavilion and other systems, with windows on both sides, with cross-ventilation in the wards, were adopted in order to give the utmost amount of fresh air. Hospital buildings were spread over as large an area as possible, and were restricted in height, if practicable, to two storeys. The term " hospitalism " was coined by Sir J. Y. Simpson, who collected statistics comparing hospital and private practice, by which he endeavoured to show that private patients were far less liable to such catastrophes than were those who were treated in hospitals.

This was the condition of affairs when Lister in i860, from a study of the experimental researches of Pasteur into the causes of putrefaction, stated that the evils observed in open wounds were due to the admission into them J i nilse P tk of organisms which exist in the air, in water, on urgery ' instruments, on sponges, and on the hands of the surgeon or the skin of the patient. Having accepted the germ theory of putrefaction, Lister applied himself to discover the best way of preventing all harmful organisms from reaching the wound from the moment that it was made until it was healed. In the germ he had to deal with a microscopic plant, and he desired to render its growth impossible. This, he thought, could be done either by destroying the plant itself before it had the chance of entering the wound or after it had entered, or by facilitating the removal of the discharges and preventing their accumulation in the wound, and by doing everything to prevent the lowering of the vitality of the wounded tissues, because unhealthy tissues are the most liable to attack. Several sub- stances were then known as possessing properties antagonistic to sepsis or putrefaction, and hence called " antiseptic." Acting on a suggestion of Lemaire, Lister chose for his experiment? carbolic acid, which he used at first in a crude form. He had many difficulties to contend with — the impurity of the substance.

its irritating properties and the difficulty of finding the exact strength in which to use it: he feared to use it too strong, lest it should impair the vitality of the tissues and thus prevent healing; and he feared to use it too weak, lest its antiseptic qualities should be insufficient for the object in view. As dressings for wounds he used various chemical substances., which, being mixed with carbolic acid, were intended to give off a certain quantity of carbolic acid in the form of vapour, so that the wound might be constantly surrounded by an antiseptic which would destroy any organisms approaching it, and, at the same time, not interfere with its healing. At first, although he prevented pyaemia in a marked degree, he, to a certain extent, irritated the wounds and prevented rapid healing. He began his historic experiments in Glasgow and continued them on his removal to the chair of clinical surgery in Edin- burgh. After many disappointments, he gradually perfected his method of performing operations and dressing wounds, which was somewhat as follows.

A patient was suffering, for instance, from disease of the foot necessitating amputation at the ankle joint. The part to be operated on was enveloped in a towel soaked with a 5% solution of carbolic acid. The towel was applied two hours before the operation, with the object of destroying the putre- factive organisms present in the skin. The patient was placed on the operating table, and brought under the influence of chloroform; the limb was then elevated to empty it of bloody and a tourniquet was applied round the limb below the knee. The instruments to be used during the operation had been previously purified by lying for half an hour in a flat porcelain dish containing carbolic acid (1 in 20). The' sponges lay in a similar carbolic lotion. Towels soaked in the same solution were laid over the table and blankets near the part to be operated upon. The hands of the operator, as well as those of his assist- ants, were thoroughly cleansed by washing them in carbolic lotion, free use being made of a nail brush for this purpose. The operation was performed under a cloud of carbolized watery vapour (1 in 30) from a steam spray-producer. The visible bleeding points were first ligated; the tourniquet was removed; and any vessels that had escaped notice were secured. The wound was stitched, a drainage-tube made of red rubber being introduced at one corner to prevent accumulation of discharge; a strip of " protective " — oiled silk coated with carbolized dextrin — was washed in carbolic lotion and applied over the wound. A double ply of carbolic gauze was soaked in the lotion laid over the protective, overlapping it freely. A dressing consisting of eight layers of dry gauze was placed over all, covering the stump and passing up the leg for about six inches. Over that a piece of thin mackintosh cloth was placed,

and the whole arrangement was fixed with a gauze bandage. The mackintosh cloth prevented the carbolic acid from escaping and at the same time caused the discharge from the wound to spread through the gauze. The wound itself was shielded by the protective from the vapour given off by the carbolic gauze, whilst the surrounding parts, being constantly exposed to its activity, were protected from the intrusion of septic contamina- tion. And these conditions were maintained until sound healing took place. Whenever the discharge reached the edge of the mackintosh the case required to be dressed, and a new supply of gauze was applied round the stump. Whenever the wound was exposed for dressing the stump was enveloped in the vapour of carbolic acid by means of the steam spray-producer. At first a syringe was used to keep the surface constantly wet with- lotion and then a hand -spray . These dressings were repeated at intervals until the wound was healed. The drainage-tube was gradually shortened, and was ultimately removed altogether.

The object Lister had in view from the beginning of his experiments was to place the open wound in a condition as regards the entrance of organisms as nearly as possible like a truly subcutaneous wound, such as a contusion or a simple fracture, in which the unbroken skin acted as a protection to the wounded tissues beneath. The introduction of this practice by Lister effected a complete change in operative

surgery. The dark times of suppurating wounds, of foul discharges, of secondary haemorrhage, of pyaemic abscesses and hospital gangrene constitute what ia now spoken of in surgery as the pre-Listerian era.

As years went on, surgeons tried to simplify and improve the somewhat complicated and expensive measures and dressings and chemists were at pains to supply carbolic acid in a pure form and- to discover new antiseptics, the great object being to get a non-irritating antiseptic which should at the same time be a powerful germicide. Iodoform, oil of eucalyptus, salicylic acid, boracic acid, mercuric iodide, and corrosive sublimate were used.

For some years Lister irrigated a wound with carbolic lotion during the operation and at the dressings when it was exposed, but the introduction of the spray displaced the irrigation method. All these different procedures, however, as regards both the antiseptic used and the best method of its application in oily and watery solutions and in dressings, were subsidiary to the great principle involved — namely, that putrefaction in a wound is an evil which can be prevented, and that, if it is prevented, local irritation, in so far as it is due to putrefaction, is obviated and septicaemia and pyaemia cannot occur. Alongside of this great improvement the immense advantage of free drainage was universally acknowledged. Moreover,

surgeons at once began to take greater care in securing the cleanliness of wounds, and some of them, LawsOri Tait and Bantock, for example, produced such excellent results by the adoption merely of methods of strict cleanliness, and became so aggressive in their championship of them, that many of the older practitioners were ˆbewildered and unable to decide as to where truth began and where it ended in the new doctrine. But though the actual methods, as taught and practised by Lister, have, with the spray-producers, passed away and given place to new, still the great light which he shed in the surgical world burns as brightly ag ever it did, and all the methods which are practised to-day are the direct results of his teaching.

By 1885 the carbolic acid spray, which to some practitioners had apparently been the embodiment of the Listerian theory and practice, was beginning to pass into desuetude, though for a good many years after that time certain surgeons continued to employ it during operation, and during the subsequent dressings of the wound. Surgeons who, having had practical experience of the unhappy course which their operation-cases had been apt to run in the pre-Listerian days, and of the vast improvements which ensued on their adoption of the spray-and-gauze method in its entirety, were, not unnaturally, reluctant to operate except in a cloud of carbolic vapour. So, even after Lister himself had given up the spray, its use was continued by many of his disciples. It was in the course of 1888 that operating surgeons began to neglect the letter of the antiseptic treatment and to bring themselves more under the broadening influence of its spirit. Certain adventurous and partially unconvinced surgeons began to give up the carbolic spray gradually, by imparting a smaller percentage of carbolic acid to the vapour, until at last the antiseptic disappeared altogether, apparently without detriment to the excellence of the results obtained. But while some surgeons were thus ceasing to apply the anti- septic spray to the wound during operation, others were pouring mild carbolic lotion, or a very weak solution of corrosive sub- limate (an extremely potent germicide) over the freshly-cut surfaces. These measures were in turn given up, to the advan- tage of the patient; for it was hardly to be expected that a chemical agent which was strong enough to destroy or render inert septic micro-organisms in and about a wound would fail to injure exposed and living tissues. Eventually it becalne generally admitted that if a surgeon was going to operate upon the depths of an open abdomen for an hour or more, the chilling and the chemical influences of the spray must certainly lower the vitality of the parts exposed, as well as interfere with the prompt healing of the wounded surfaces. With the spray went also the " protective," the paraffin gauze, and the mackintosh sheeting which enveloped the bulky dressing.

SURGERY

Years before this happened, in the address on surgery given at the Cork meeting of the British Medical Association, Sh-

William (then Mr) Savory had somewhat severely Slavery, criticized the rigid exchisiveness of the members of

the spray -and-gauze school: the sum and substance of the address was that every careful surgeon was an anti- septic surgeon, and that the success of the Listerian surgeon did not depend upon the spray or the gauze, or the two together, but upon cleanliness — that the surgeon's fingers and instruments and the area operated on must be surgically clean. Though precise experiments show that it is impossible for the Surgeon to remove every trace of septicity from his own hands and from the skin of his patient, still with nail-brush, soap and water, and alcohol or turpentine, with possibly the help of some mer- curic germicide, he can, for all practical purposes, render his hands safe. Recognizing this difficulty many surgeons prefer to operate in thin rubber gloves which can, for certain, by boiling, be rendered free of all germs; others, in addition, put on a mask, sterile overalls, and india-rubber shoes. , But thesj excessive refinements do not seem to be generally acceptable, whilst the results of practice show that they are by no means necessary. The careful, the antiseptic surgeon of 1885 is to-day represented by the careful, the aseptic surgeon. The antiseptic surgeon was waging a constant warfare against germs which his creed told him were on bis hands, in the wound, in the air, everywhere — and these he attacked with potent chemicals which beyond question often did real damage to the healthy, tissues laid bare during the operation. If, as was frequently the case, his own hands became sore and rough from contact with the antiseptics he employed, it was not to be wondered at if a peritoneal surface or an incised tissue became more seriously affected. The surgeon of to-day has much less commerce with antiseptics: he operates with hands which, for all practical purposes,- may be considered as germless; he uses instruments which are certainly germless, for they have just been boiled for twenty minutes in water (to which a little common soda has been added to prevent tarnish- ing of the steel), and he operates on tissues which have been duly made clean in a surgical sense. If he were asked what he con- siders the chief essentials for securing success in his operative practice, he would probably reply, •" Soap. and water and a nail-brush." He uses no antiseptics during the operations, he keeps the wound dry by gently swabbing it with aseptic, absorbent cotton-wool, and he dresses it with a pad of aseptic gauze. This is the simple aseptic method which has been gradually evolved from the Listerian antiseptic system. But though the pendulum has swung so far in the direction of aseptic surgery, a very large proportion of operators still adhere to the antiseptic measures

which had proved so highly beneficial. The judicious employment of weak, solutions of carbolic acid, or of mercuric salts, and the application of unirritating dressings of an anti- septic nature cannot do any harm, and, on the other hand, they may be of great service in the case of there having been some flaw in the carrying out of what should have been an absolutely aseptic operation.

A great change has taken place in connexion with the use of soft india-rubber drainage-tubes. In former years most

surgeons placed one or more of these in the dependent tabes Sge ‘ P arts ˚f the area of operation, so that the blood or

serum oozing from the injured tissues might find a ready escape. But to-day, except in dealing with a large abscess or other septic cavity, many surgeons make no provision for drainage, but, bandaging the part beneath a pad of aseptic wool, put on so much pressure that any little leakage into the tissues is quickly absorbed. If a drainage-tube can be dispensed with, so much the better, for if it is not actually needed its presence keeps up irritation and delays prompt healing. But inasmuch as a tube if rightly placed in a deep wound is an insur- ance against the occurrence of ” tension,” and as it can easily be withdrawn at the end of twenty-four hours (even if it has served no useful purpose) , it is improbable that the practice of drainage of freshly made cavities will ever be entirely given up. If the tube is removed after twenty-four hours its presence

can have done no harm and sometimes the large amount of fluid which it has drained from the wound affords clear evidence that its use has saved the patient discomfort and has probably expedited his recovery. For septic cavities drainage-tubes are still used, but it must be remembered that the tube cannot remain long in position without causing and keeping up irrita-tion; hence, even in septic cases, the modern surgeon discards the tube at the earliest possible moment. If after he has taken it out septic fluids collect, and the patient’s temperature rises, it can easily be reinserted. But it is better to take out the tube too soon than to leave it in too long; this remark applies with special force to the treatment of abscess of the pleural cavity (empyema), in the treatment of which a drainage-tube has almost certainly to be employed.

Poultices are now never used: they were apt to be foul and offensive, and Were certainly septic and dangerous. If moisture and warmth are needed for a wound they can be obtained by the use of a fold of clean lint, or by some aseptic wool which has been wrung out in a hot solution of boracic or carbolic acid, and applied under some waterproof material, which effectually pre- vents evaporation and chilling. There was no special virtue

in poultices made of linseed meal or even of scraped carrot: they simply stored up the moisture and heat. They possessed no possible advantage over the modern fomentation under oil- silk.

Much less is heard now of so-called " bloodless " operations. The bloodlessness was secured by the part to be operated on — an arm, for instance— being raised and compressed-. . from the fingers to the shoulder by successive turns operations. of an india-rubber roller-bandage (Esmarch's), the main artery of the limb being then compressed by the application of an elastic cord above the highest turn of the bandage. The bandage being removed, the operation Was performed through bloodless tissues. But when it was completed and the elastic cord removed from around the upper part of the limb, a reac- tionary flow of blood took place into every small vessel which had been previously squeezed empty, so that though the operation itself had actually been bloodless, the wound could not be closed because of the occurrence of unusually free haemorrhage or troublesome oozing. A further objection to the application of such an elastic roller-bandage was that septic or tuberculous material might by chance be squeezed from the tissues in which it was perhaps harmlessly lying, forced into the blood vessels, and so widely disseminated through the body. Esmarch's bandage is therefore but little used now in operative surgery. Instead, each bleeding point at an operation is promptly secured by a small pair of nickel-plated clip-forceps, which generally have the effect, after being left on for a few minutes, of completely and permanently arresting the bleeding. These clips were specially introduced into practice by Sir Spencer Wells, and it is no unusual thing for a surgeon to have twenty or thirty pairs of them at hand during an extensive operation. Seeing how convenient, not to say indispensable, they are in such circum- stances, the surgeon of to-day wonders how he formerly managed to get on at all without them.

Biers's treatment by passive congestion is carried out by gently assisting the return of venous blood from a part of the body without in any way checking the arterial flow. In the case of tuberculous disease of the knee-joint, for instance, an elastic band is gently placed round the thigh for several hours a day, and in disease of the wrist or elbow the girth is applied round the arm. The skin below becomes flushed, and the arterial blood which, as shown by the pulse, is still flowing into the affected part, is compelled to linger in the affected tissues, giving the serum and the white corpuscles time to exert their beneficial influence upon the disease.

In the case of tuberculous, or septic, affections of the lymph- atic glands of the neck, or of other parts where the constriction cannot be conveniently obtained, effective congestion can be secured by the use of cupping glasses. And if so ! be that suppuration is taking place in the interior of an inflamed

gland, the cupping-glasses can be applied after a small puncture has

been made into the softened part of the gland. In this way the whole of the broken-down material can be got away without the necessity of making an actual incision or of resorting to scraping. The method of inducing hyperaemia should be so conducted as to give the patient no pain whatever: it must not be carried out with excessive energy.

By means of the Rontgen or X-rays (see X-Ray Treatment) the surgeon is able to procure a distinct shadow-portrait of deeply-placed bones, so that he can be assured as Rontgen to tne p resence or absence of fracture or dislocation, or of outgrowth of bone, or of bone-containing tumours. By this means also he is able to locate with absolute precision the situation of a foreign body in the tissues — of a coin in the windpipe or gullet, of a broken piece of a needle in the hand, of a splinter cf glass in the foot, or of a bullet deeply embedded in soft tissues or bone. This effect may be obtained upon a fluorescent screen or printed in a permanent form upon glass or paper. The shadow is cast by a 10- or 12-in. spark from a Crookes vacuum tube. The rays of Rontgen find their way through dead and living tissues which are far beyond the reach of the rays of ordinary light, and they are thus able even to reveal changes in the deeply placed hip-joint which have been produced by tuberculous disease. In examining an injured limb it is not necessary to take off wooden splints or bandages except in cases where the latter have been treated with plaster of paris, lime-salts obstructing the rays and throwing a shadow. Thus the rays may pass through an ordinary uric acid calculus in the kidney or bladder; but if it contains salts of lime, as does the mulberry calculus (oxalate of lime), a definite shadow is cast upon the screen. The value of the X-rays is not limited to the elucidation of obscure problems such as those just indi- cated: they are also of therapeutic value; for example, in the treatment of certain forms of skin disease, as well as of cancer.

Too much, however, must not be expected from them. For the treatment of a patch of tuberculous ulceration (lupus), or for a superficial cancerous sore (epithelioma), they may be of service, but in the treatment of a deeply-seated malignant growth — as a cancer of the breast — they have not proved of value. Moreover, the X-rays sometimes cause serious burns of the skin; and although this happens less often now than was pre- viously the case, still the frequent application of the rays is apt to be followed by cutaneous warty growths which are apt in turn to develop into cancer. In many cases in which the X-rays are used a more prompt and efficient

means of treatment would probably be by excision. One great advantage which operative treatment by the knife must always have over the treatment by X-rays is thai the secondary implication of the lymphatic glands can be dealt with at the same time. And this, in many cases, is a matter of almost equal importance to that of removal of the cancer itself.

The employment of radium in surgery is still in its infancy. Doubtless radium is a very powerful agent, but even if it were found of peculiar value in treatment its cost would, for the present, put it out of the reach of most practitioners. Probably it will be found useful in the treatment of naevus, rodent ulcers and superficial malignant growths. As to what influence radium may have in the treatment of deeply-seated cancers it is as yet impossible even to guess. For those sad cases, however, which the practical surgeon is reluctantly compelled to admit as being beyond the reach of his operative skill, the influence of radium should be tried with determination and thoroughness. The therapeutic influence of radium may eventually be found to be great, or it may be disappointing. The fact that under direct royal patronage an institution has been established in London for the investigation of the physical and therapeutic value of this newly discovered agent should satisfy every one that its properties will be duly inquired into and made known without mystery or charlatanism and absolutely in the interest of the people. But in the mean- while too much must not be expected from it as a surgical agent. (E. O.)*

Radium.

SURGICAL INSTRUMENTS AND APPLIANCES. The pur- pose of this article is to give an account of the more important surgical instruments that are now in general use, and to show by what modifications, and from what discoveries in science, the present methods of an operation have come to be what they are. The good surgeon is careful to use the right sort and pattern of instrument, and the chief fact about the surgery of the present day, that it is aseptic or antiseptic, is recorded in the make of surgical instruments and in all the installation of an operating- theatre. Take, for instance, a scalpel and a saw that are figured in Ambroise Pare's (1510-1590) surgical writings. The scalpel folds into a handle like an ordinary pocket-knife, which alone was enough in those days to keep it from being aseptic. The handle is most elegantly adorned with a little winged female figure, but it does not commend itself as likely to be surgically

Fig. 1. — Needle-holders.

A, Hagedorn's; B, Macphail's; C, Allen and Hanbury's, for

Hagedorn or ordinary needles.

clean. The saw, after the same fashion, has a richly chased metal frame, and, at the end of the handle, a lion's head in bold relief, with a ring through its mouth to hang it up by. It may be admirable art, but it would harbour all sorts of germs. If one contrasts with these artistic weapons the

Fig. 2. — Tenotomy Knives forged in one piece, instruments of 1850, one finds no such adornment, and for general finish Savigny's instruments would be hard to beat; but the wooden or ivory handles, cut with finely scored lines like the cross-hatching of an engraving, are not more likely to be aseptic than the handles of Pare's instruments. At the present time, instead of such handles as these, with blades riveted into them, scalpels are forged out of one piece of steel, their handles are nickel-plated and perfectly smooth, that they may afford no crevices, and may be boiled and immersed in carbolic lotion without tarnishing or rusting; ths scalpel has become just a single, smooth, plain piece of metal, having this one purpose that it shall make an aseptic wound. In the same way the saw is made in one piece, if this be possible; anyhow, it must be, so far as possible, a simple, smooth, unrusting metal instrument, that can be boiled and laid in lotion; it is a foreign body that must be introduced into tissues susceptible of infection, and it must not carry infection with it.

Or we may take, at different periods of surgery, the various kinds of ligature for the arrest of bleeding from a divided blood- vessel. In Pare's time (he was the first to use the ligature in amputation, but the existence of some sort of ligature is as

old as Galen) the ligature was a double thread, bon fil qui soit en double; and he employed a forceps to draw forward the cut end of the vessel to be ligatured. From the time of Ambroise Pare to the time of Lord Lister no great improvement was made. In the middle of last century it was no uncommon thing for the house-surgeon at an operation to hang a leash of waxed threads, silk or flax, through his button-hole, that they might

Fig. 3. — Amputating Saws.

be handy during the operation. Then came Lord Lister's work on the absorbable ligature; and out of this and much other experimental work has come the present use of the ligature in its utmost perfection — a thread that can be tied, cut short, and left in the depth of the wound, with absolute certainty that the wound may at once be closed from end to end and nothing more will ever be heard of the ligatures left buried in the tissues.

The choice of materials for the ligature is wide. Some surgeons prefer catgut, variously prepared; ethers prefer silk; fcr certain purposes, as for the obliteration of a vessel not divided but tied in its course for the cure of aneurism, use is made of kangaroo-tendon, or some other animal substance. But what- ever is chosen is made aseptic by boiling, and is guarded vigilantly from contamination on its way from the sterilizer into the body of the patient. The old ligatures were a common cause of suppuration. Therefore the wound was not closed along its whole length, but the ligatures were left long, hanging out of one end of the wound, and from day to day were gently pulled until they came away. Certainly they served thus to drain the wound, but they were themselves a chief cause of the suppuration that required drainage.

Sutures, like ligatures, were a common cause of suppuration in or around the edges of the wound. Therefore, in the hope of avoiding this trouble, they were made of silver wire, which was inconvenient to handle, and gave pain at the time of removal of the sutures. At the present time they are of silkworm-gut, catgut, silk or horsehair; they are made aseptic by boiling, and can be left any number of days without causing suppuration and can then be removed without pain.

Next may come the consideration of surgical dressings. In the days when inflammation and suppuration were almost inevitable, the dressings were usually something very simple, that could be easily and frequently changed — ointment, or wet compresses, to begin with, and poultices when suppuration was established. It is reported of the great Sir William Fergusson that he once told his students, " You may say what you like, gentlemen, but after all, there's no better dressing than cold water." This is not the place to try to tell the long history of the quest after a perfect surgical dressing, and the advance that was begun when Lord Lister invented his carbolic paste. The work was done slowly in the international unity of science during many years. The perfect antiseptic dressing must fulfil many requirements: it must be absorbent, yet not let its medicament be too quickly soaked out of it; and it must be antiseptic, yet not virulent or poisonous. Of the many gauzes

now available, that which is chiefly used is one impregnated with a double cyanide of zinc and mercury. Its pleasant amethystine tint has no healing virtue, but is used to distinguish it from other gauzes — carbolized gauze, tinted straw-colour; iodoform gauze, tinted yellow; sublimate, blue; chinosol, green. The chinosol gauze is especially used in ophthalmic surgery; for general surgery the cyanide gauze is chiefly employed. The various preparations of absorbent wool {i.e. wool that has been freed of its grease, so that it readily takes up moisture) are used not only for outside dressings, but also as sponges at the time of operation, and have to a great

extent done away with the use of real sponges. The gauzes in most cases are used not dry, but just wrung out of carbolic lotion, that their anti-septic influence may act at once.

The whole subject of surgical instruments may be considered in more ways than one. It may be well, for the sake of clearing the ground, to take first some of the more common instruments of general

Fig. 4. — Artery Forceps.' A, Pean's; B, Spencer Wells's.

surgery, and then to note the working out, in the operations of surgery, of the three great principles — the use of anaesthetics, the use of antiseptic or aseptic methods, and the surgical uses of electricity.

Of the essential instruments that are common to all operations, we may well believe that they have now become, by gradual develop- ment, perfect. Take, for instance, the ordinary surgical needle. In the older forms the eye was slit-shaped, not easily threaded, and the needle was often made of a triangular outline, like a miniature bayonet. At the present time the needles used in general surgery are mostly Hagedorn's, which have a full-sized round eye, easy for threading, are flat for their whole length and have a fine cutting edge

on one side, near the point. Thus they enter the skin very easily, like a miniature knife, and the minute wound they make is not a hole, but a tiny slit that is at once drawn together and, as it were, obliterated by the tying of the suture. Or, for another simple instrument in universal use, take the catch-forceps that is used for taking hold of a bleeding point till it is ligatured. This forceps is as old as the time of Pare, but he made use of a very heavy and clumsy pattern. Up to the last few years the artery-forceps was made with broad, curved, fenestrated blades, with the catch set close to the blades. At the present time the forceps in general use, named after Dr Pean in France and after Sir Spencer Wells in England, is made with very narrow grooved blades, and the catch is placed not near the blades, but near the handles: thus it takes a surer hold, and can be set free when the ligature is tied by a moment's extra pressure on the handles.

Among other instruments in universal use are divers forms of retractors, for holding gently the edges of a wound : the larger patterns are made with broad, slightly-concave, highly-polished surfaces, that they may, so far as possible, reflect light into the wound. Among tourniquets, the old and elaborate Petit's tourni- quet, which was a band carrying a pad screwed

down over the main artery of the limb, has given place to the elastic tourniquet with Esmarch's bandage. For example, in an amputation, or in an operation on a joint or on a vessel or a nerve in a limb, the limb is

Fig. 6. — Tourniquet (Esmarch's).

raised, and the Esmarch's elastic bandage is applied from below upward till it has reached a point well above the site of the opera- tion; then an elastic tourniquet is wound round the limb at this point, the bandage is removed, and the limb is thus kept almost bloodless during the operation.

Fig. 7. — Lithotrite (Bigelow's).

It is not possible to describe here the many forms of other ordinary instruments of general surgery — probes, directors, scissors, forceps, and many more — nor those that are used in operations on the bones. Nor again can the numerous instruments used in special departments of surgery be discussed in detail. But, with regard to the special

Fig. 8. — Tonsillotome (Mathieu's).

surgery of the eye, and of the throat and ear, it is to be noted that the chief advance in treatment arose from the invention of the present instruments of diagnosis, and that these are of compara- tively recent date. The oplhalmoscope was the work of Helmholtz. The laryngoscope was invented by Manuel Garcia in the middle of the

Fig. 9. — Ophthalmoscope (Landolt's).

19th century ; and the use of a frontal mirror, for focussing a strong light on the membrana tympani, in the. examination of the ear, was in use somewhat earlier. Before the ophthalmoscope it was impossible to study the internal diseases of the eye; before the laryngoscope the diseases of the larynx were invisible, and were mainly a matter of guess-work, and of vague and often futile treat-

ment. Before the use of the frontal mirror the diseases of the ear were hardly studied, in that sense in which they are studied now. The wonderful advance of the special departments of surgery was, of course, the result of many forces, but one of the chief of these

Fig. 10. — Laryngoscope (Lennox Browne's).

forces was the invention of proper instruments of diagnosis. The textbooks that were written immediately before those instruments became available were not far in advance of Ambroise Pare, so far as these special

departments are concerned.

It may be well next to consider in what ways the conduct of an operation is influenced by those two great discoveries of anaesthetics, and the more gradual development of the principles of antiseptic and aseptic surgery ; with special reference to the use of the instruments of surgery. The jubilee year of anaesthesia was 1896; the first use of nitrous oxide was on the nth of December 1844; the first opera- tion under ether was on the 30vh of September 1846; the first use of chloroform was on the 4th of November 1847. The choice of the anaesthetic, or of some combination of anaesthetics, that is best suited to each particular case, is a matter of careful consideration; but, on the whole, the tendency in England is to keep to the via media between the more general use of chloroform in Scotland and the more general use of ether in the United States. Of the methods of administering chloroform there is no need to say much ; by some

Fig. 11. — Inhaler (Junker's), anaesthetists no instrument is used save a fold of lint or some such stuff, or a piece of flannel made into a sort of cone or mask. Use is generally made of a modification of " Junker's inhaler," whereby the vapour o, chloroform Is administered by means of a hand-ball. For the administration of ether some form of Clover's inhaler is generally used, whereby the ether in a small metal chamber passes as vapour into an indiarubber bag, and there is combined with the patient's breath in pro- portions determined by the anaesthetist through- out the operation. The metal chamber is so de- signed that by turning it the exact proportion of ether to air is fixed in accordance with the requirements of the case. Of late years, by the use of an iron cylinder of nitrous oxide, connected by a tube with a Clover's inhaler, it is possible to begin with nitrous oxide, and to go on, without interruption, with ether. More recently an admir- able method has been devised of administering nitrous oxide with the

admixture of air or of FlG _ I2 ._ Gas and Ether Apparatus oxygen in such a way (Hewitt's),

that the anaesthesia pro- _ _ '

duced by the gas may be maintained for time enough to allow of an operation of some length.

SURGICAL INSTRUMENTS AND APPLIANCES

**35*

Instrument Sterilizer.

The series of discoveries which, in its application to surgery, has brought about the present antiseptic and aseptic methods of opera- tion, is concerned both with the shape or use of the instruments of

surgery and with their prepara- tion for use. The mere steriliza- tion, by boiling or by steaming, of all instruments and dressings, is enough to ensure their freedom from the ordinary; micro-organ- isms of suppuration; but the surgeon cannot boil or steam either himself or his patient. The preparation, therefore, of the surgeon's hands, and of the skin over the area of operation, is made not only by scrubbing with soap and hot water, but by careful use of antiseptic lotions. Again, ligatures and sutures, which must be kept in stock ready for use, are kept, after careful sterilization, in antiseptic lotion, or are again sterilized immediately before an operation. Again, all towels used at an operation must be prepared, either by sterilization or by im- mersion in antiseptic lotion. The sterilization of all instruments and dressings is a simple matter: the usual sterilizer is a vessel like a fish-kettle, with a per- forated metal tray in it, so that the instruments can be immersed in boiling water, and can be lifted on the tray and transferred straight from the sterilizer into vessels containing sterilized water or antiseptic lotion. For the sterilization of dressings an upper vessel is fitted to the sterilizer, so that the steam may permeate the dressings placed in it. In hospital practice it is used also to sterilize all towels, aprons and the like in a large cylindrical vessel. Steriliza- tion by boiling or steaming, together with the use of antiseptic lotions, or of water that has been boiled, for all such things as cannot be boiled or steamed, is the essential principle of the surgery of the present day; and practically the antiseptic method and the aseptic method have become one, varying a little this way or that according to the nature and circumstances of the case.

Beside anaesthetics and antiseptics, there is a third series of discoveries that has profoundly influenced surgery — the use of the forces of electricity. The uses of electricity are fivefold.

I. The Gakiano- Cautery. — The original form of the cautery, the fer ardent of Parc's time, for the arrest of haemorrhage after amputa- tion, was a terrible affair. Happily for mankind, nis invention of the ligature put an end to this use of the cautery, but it was still used in a small number of other cases. Subsequently Claude Andre Paquelin (b. 1836) invented a very ingenious form of cautery, a series of metal blades or points of different shapes and sizes, that could be fitted to a handle: these points were hollow inside, and were filled with fine platinum gauze, and, by means of a bottle and hand- bellows they could be kept heated with benzene-vapour. Thus, when they had once been raised to a glowing heat by holding them

Fig. 14. — Galvano-cautery Set.

over a spirit-lamp, they could be kept at any desired heat. This instrument is still in use for a few cases where very rapid and exten- sive cauterization is necessary. But for all finer use of actual heat the galvano-cautery alone is used — 3 series of very minute points of platinum, with a suitable trigger-handle, connected with a battery or (by means of a converter) with the ordinary house supply of electri- city. In this way it is possible to apply a glowing point with a fineness and accuracy of adjustment that were wholly impossible with Paquelin's cautery.

2. Electrolysis. — This method is of great value, in suitable cases,

for the arrest or obliteration of small growths. The passage of the electric cur- rent between needles intro- duced into or under the skin brings about a gradual shrinking or cicatrization of the tissues subjected to it, without the production of any unsightly scar.

3. Electro-Motor Power. —

During recent years the use

come into the practice of

for the

Electrolysis Needle-holders.

better method for the use of a fine drill or burr, for example, than the" dental engine," where the power is generated by a pedal turning a wheel, and it will probably come into wide use both for dental surgery and for those operations of general surgery that require very gradual and delicate removal of small circumscribed areas of bone, especially of the cranial bones.

4. The X-Rays. — This, the most unexpected and, as it were, the most sensational discovery that has been bestowed on physicians and surgeons since the discovery of anaesthetics, is now used over a very wide and varied field of practice. Its value does not stop at the detection and localization of foreign bodies; indeed, this is but a small part of its work. It is used constantly for cases of actual or suspected fracture or dislocation ; for cases of congenital or acquired

mS

of a

small electro-motor machine has .

surgery for certain operations on the bones; especially operation fur disease involving the mastoid bone. It is, of course, a

Fig. 16. — Cystoscope (Nitze's).

deformity; for cases involving difficulties of diagnosis between a swelling of the bone due to inflammation and a swelling due to a tumour; and for obscure cases of spinal disease, hip disease and the like. Moreover, it has been found possible, by Dr Hugh Walsham, and others to obtain pictures of the thoracic organs that are a very valuable guide in many obscure cases of disease of the lungs or of the pleura, and in many cases of thoracic aneurism or of intra-thoracic tumour. Every year the number and the range of the cases where the X-rays are helpful for diagnosis and for treatment become greater; and it is impos- sible to say at what point the surgical value of this discovery will find its limits. Beyond these uses, it is probable that the X-rays will maintain and extend the import- ance that they already have in the direct treat- ment of certain cases of

disease of Ae skin (see _ IT , ._ . , , . ,

X- Ray Treatment). Fig. 17. — Urethroscope (Fenwick s), also

5. The Electric Light.— used for ear < nose > throat, &c.

Beside the general superiority of this light to other lights for the routine work of surgery, there are several special uses for it. Of these, the most important is the cystoscope, a long narrow tube, shaped and curved somewhat like a catheter, and having at its end a very minute glow-lamp and re- flector, and a small window. Its other end is fitted with a lens, and is connected by a switch with the main cur- rent. With this instrument, in skilled hands, it is possible to inspect the interior of the bladder, and in many cases to make an exact diagnosis under circumstances where otherwise it would be im- possible. Another instance of the value of the electric lamp in diagnosis is given by the trans-illumination of the facial bones in cases of sus- pected disease of the central cavity of the superior max- illary bone. A small glow- lamp is held in the closed mouth, in a darkened room, and by a comparison of the shadows on the two sides of the face, thus trans-illumin- ated, an exact diagnosis can often be obtained as to the presence or absence of pus in this central cavity. Again, a small glow-lamp, duly sterilized, is often of great value in deep operations on the abdominal cavity.

The bactericidal properties of light have long been demonstrated by Bie and others. Professor Niels Finsen of Copenhagen first used the ultra-violet rays

of solar light in the treatment of skin diseases.

Fig. 18.— Fi

-Reyn Lamp.

notably of lupus. He later invented the lamp which bears his name. The original Finsen lamp comprised a voltaic arc of 60 to 80 amperes round which four tubes collected the light by quartz lenses, the light being cooled by passing through water and the tubes being surrounded by a water-jacket. The usual exposure was one hour. In the Finsen-Reyn modification now used, a single collect- ing tube fitted on an adjustable stand is placed in front of a scissors arc lamp consuming 20 amperes. The rays are cooled and water-jacketed as in the original. A suitable quartz compressor with a chamber containing circulating water is pressed upon the skin of the part to be treated and held at right angles to the impinging rays. The time of exposure is now reduced to forty-five minutes.

Radium when used in surgery is applied by means of applicators, either having the fixed salts on square or oblong metallic plates or cloths or by applicators having free radium in sealed metal tubes. These tubes are sometimes buried in the tissues. Sometimes a method of " screening " is adopted in order to modify the intensity of the radiation. This is done by enveloping the tubes containing

Fig. 19. — Radium Applicators.

the radium in cases of silver, lead or nickel of various thicknesses. In this, known as the method of Dr Dominici, the a and /S rays are intercepted by the metal screens and the highly penetrative rays only applied to the morbid tissues.

The illustrations in this article are by permission of Messrs Allen & Hanbury, London, and that of the radium applicators by permission of Messrs Siemens Brothers, London.

SURICATE, or Meerkat (Suricata tetradactyla) , a small South African mammal of the civet family, ranging from Cape Colony to Algoa Bay. The head and body arc about 14 in. long, and the tail half as much; the fur is long and soft, light grizzled grey in colour, and banded with black on the lower part of the back. Meerkats are sociable animals, living in holes in the rocks on the mountains, and burrowing in the sandy soil of the plains. They

form amusing pets, and in a wild state, writes Mrs A. Martin, they feed chiefly on " succulent bulbs, which they scratch up with the long, curved, black claws on their fore-feet. They are devoted sun-worshippers and in the early morning, before it is daylight, they emerge from their burrows and wait in rows till their divinity appears, when they bask joyfully in his beams."

SURINAM TOAD (Pipa americana), an aglossal tailless Batrachian, rendered famous by its mode of reproduction, first observed in 17 10 by the Dutch anatomist F. Ruisch. It inhabits South America east of the Andes and north of the Amazons, and is thoroughly aquatic. In its extremely flattened head it is paralleled by two other vertebrates only, which, curiously, inhabit the same parts of South America, viz. the Silurid fish Aspredo balrachus and the Chelonian Chelys matamata; the end of the snout and the angles of the jaws bear several lappets, the fingers terminate in a star-shaped appendage, the toes are very broadly webbed and the eyes are minute and without lids.

The eggs are carried on the back Dy the mother, and the skin thickens and grows round the eggs until each is enclosed in a dermal cell, which is finally covered by a horny lid, believed to be formed by a secretion of the skin or else to represent the remains of the gelatinous capsule which at first surrounded the eggs. These, which may number about one hundred and measure live to seven millimetres in diameter, develop entirely within these pouches, and the young hop out in the perfect condition, without a vestige of a tail. Pairing takes place in the water, the male clasping the female round the waist. The way in which the eggs reach the back of the female has been observed in specimens kept in the London Zoological Gardens. During oviposition the cloaca projects from the vent as a bladder- like pouch, which is inverted forwards, between the back of the female and the breast of the male, and by means of this ovi-

positor the eggs are evenly distributed over the whole back How the eggs are fertilized has not been ascertained.

Authorities. — G. Gronberg and A. von Klinckowstrom, " Zur Anatomie der Pipa americana," Zool. Jahrb. Anal vii. 609; A D. Bartlett, " Note on the Breeding of the Surinam Water Toad," Proc. Zool. Soc. (1896), p. 595.

SURMA, or Barak, a river of Assam, India. It is one of the two chief rivers of the province, watering the southern valley as the Brahmaputra waters the northern and larger valley. It rises in the Barail range to the north of Manipur, its sources being among the southern spurs of Japvo. Thence its course is south with a slight westerly bearing, through the Manipur hills to

British territory. The name of Barak is given to the upper part of the river, in Manipur and Cachar. A short distance below Badarpur in Cachar it divides into two branches. One of these, which passes Sylhet, is called Surma. The other is called Kusiara till it subdivides into (a) a branch called Bibiana or Kalni, which joins the Surma near Ajmiriganj, and (b) a branch which resumes the name of Barak and joins the Surma near Habiganj. At Bhairab Bazar in Mymensingh the Surma unites with the old Brahmaputra and becomes known as the Meghna. The river is navigable by steamers as far as Silchar in the rains. Total length about 560 m.

The Surma Valley and Hill Districts Division is a division of the province of Eastern Bengal and Assam. It includes the five districts of Sylhet Cachar, Lushai hills, Naga hills, and Khasi and Jaintia hills, with a total area of 25,481 sq. m. and a population in 1901 of 3,084,527.

SURPLICE (Late Lat. super pelliceum; Fr. super, over, and pellis, fur; Span, sobrepellice; Fr. surplis; in Ital. cotta and Ger. Chorrock, choir coat) , a liturgical vestment of the Christian Church. It is a tunic of white linen or cotton material, with wide or moderately wide sleeves, reaching — according to the Roman use — barely to the hips and elsewhere in the churches of the Roman communion to the knee It is usually decorated witljjlace, but in modern times — in Germany at least — also with embroidered bordures. The surplice originally reached to the feet, but as early as the 13th century it began to be shortened, though as late as the 15th century it still fell to the middle of the shin, and it was not till the 17th and 18th centuries that it was considerably shortened. More drastic were other modifications which it underwent in course of time in several localities, which led to the appearance of various sub- sidiary forms alongside of the original type. Such were the sleeveless surplice, which was provided at the sides with holes to put the arms through; the surplice with slit up arms or lappels (so-called ” wings “) instead of sleeves; the surplice of which not only the sleeves but the body of the garment itself were slit up the sides, precisely like the modern dalmatic; and, finally, a sort of surplice in the form of a bell-shaped mantle, with a hole for the head, which necessitated the arms being stuck out under the hem. The first two of these forms were very early developed; and, in spite of their prohibition by synods here and there (e.g. that of Liege in 1287), they survive in various places to the present day. The latter two only appeared after the close of the middle ages: the first of them in South Germany, the second more especially in Venetia, where its use is attested by numerous pictorial records. As a rule, however, these subsidiary forms of surplice were worn mostly by the lower clergy. They were the result partly of the influence of the secular fashions, but more particularly of considerations of convenience.

The surplice belongs to the vestes sacrae, though it requires no benediction. It is proper to all clerics, even to those who have only received the tonsure, the bishop himself vesting with it those who have been newly tonsured by him. Its use in divine service is very varied. It is worn in choir at the solemn offices; it is the official sacral dress of the lower clergy in their liturgical functions; it is worn by the priest when administering the sacra- ments, undertaking benedictions, and the like; the use of the alb being nowadays almost exclusively confined to the mass and functions connected with this. In general it may be said

that this was, in all main particulars, the custom so early as the 14th century.

The older history of the surplice is obscured by lack of exact information. Its name is derived, as Durandus and Gerland also affirm, from the fact that it was formerly put on over the fur garments which used to be worn in church and at divine service as a protection against the cold. It has been maintained that the surplice was known in the 5th century, the evidence being the garments worn by the two clerics in attendance on Bishop Maximian represented in the mosaics of S. Vitale at Ravenna; in this case, however, the dalmatic has been confused with the surplice. In all probability the surplice is no more than an expansion of the ordinary liturgical alb, due to the necessity for wearing it over thick furs. It is first mentioned in the nth century, in a canon of the synod of Coyaca in Spain (1050) and in an ordinance of King Edward the Confessor. In Rome it was known at least as early as the 12th century. It probably origi- nated outside Rome, and was imported thence into the Roman use. Originally only a choir vestment and peculiar to lower clergy, it gradually — certainly no later than the 13th century — replaced the alb as the vestment proper to the administering of the sacraments and other sacerdotal functions.

In the Oriental rites there is no surplice, nor any analogous vestment. Of the non-Roman Churches in the West the sur- plice has continued in regular use only in the Lutheran churches of Denmark, Norway and Sweden, and in the Church of England (see below). (J. Bra.)

Church of England. — The surplice was prescribed by the second Prayer-Book of Edward VI., as, with the tippet or the academical hood, the sole vestment of the minister of the church at " all times of their ministration," the rochet being practically regarded as the episcopal surplice. Its use was furiously assailed by the extremer Reformers but, in spite of their efforts,

was retained by Elizabeth's Act of Uniformity, and enforced by the advertisements and injunctions issued under her authority, which ordered the " massing vestments " — chasubles, albs, stoles and the like — to be destroyed. It has since remained, with the exception of the cope (q.v.), the sole vestment authorized by law for the ministers, other than bishops, of the Church of England (for the question of the vest- ments prescribed by the " Ornaments Rubric " see Vestments). Its use has never been confined to clerks in holy orders, and it has been worn since the Reformation by all the " ministers " (including vicars-choral and choristers) of cathedral and colle- giate churches, as well as by the fellows and scholars of colleges in chapel. The distinctive mark of the clergy (at least of the more dignified) has been the tippet or scarf above mentioned, a broad band of black silk worn stole-wise, but not to be confused with the stole, since it has no liturgical significance and was originally no more than part of the clerical outdoor dress (see Stole). The surplice was formerly only worn by the clergy when conducting the service, being exchanged during the sermon for the " black gown," i.e. either a Geneva gown or the gown of an academical degree. This custom has, however, as a result of the High Church movement, fallen almost completely obsolete. The "black gown," considered wrongly as the ensign of Low Church views, survives in comparatively few of even " evangelical " churches; it is still, however, the custom for preachers of university sermons to wear the gown of their degree.

The traditional form of the surplice in the Church of England is that which survived from pre-Reformation times, viz. a wide- sleeved, very full, plain, white linen tunic, pleated from the yoke, and reaching almost, or quite, to the feet. Towards the end of the 17th century, when large wigs came into fashion, it came for convenience to be constructed gown-wise, open down the front and buttoned at the neck, a fashion which still partially survives, notably at the universities. In general, however, the tendency has been, under continental influence, to curtail its proportions. The ample vestment with beautiful falling folds has thus in many churches given place to a scanty, unpleated garment scarce reaching to the knee. In the more " extreme "

churches the surplices are frank imitations of the Roman cotta. (W. A. P.)

SURRENDER, in law, a mode of alienation of real estate. It is defined by Lord Coke to be " the yielding up of an estate for life or years to him that hath an immediate estate in reversion or remainder " (Coke upon Littleton, 337 b). It is the converse of release, which is a conveyance by the reversioner or remainder- man to the tenant of the particular estate. A surrender is the usual means of effecting the alienation of copyholds. The surrender is made to the lord, who grants admittance to the purchaser, an entry of the surrender and admittance being made upon the court rolls.

Formerly a devise of copyholds could only have been made by surrender to the use of the testator's will followed by admittance of the devisee. The Wills Act of 1837 now allows the devisee of copyholds without surrender, though admittance of the devisee is still necessary. A surrender must, since the Real Property Act 1845, be by deed, except in the case of copyholds and of surrender by operation of law. Surrender of the latter kind generally takes place by merger, that is, the combination of the greater and less estate by descent or other means without the act of the party (see Remaindek). In Scots law surrender in the case of a lease is represented by renunciation. The nearest approach to surrender of a copyhold is resignation in remanenliam (to the lord) or resignation in favor em (to a purchaser). These modes of conveyance were practically superseded by the simpler forms introduced by the Conveyancing Act 1874.

SURRENTUM (mod. Sorrento, q.v.), an ancient town of Campania, Italy, situated on the N. side of the promontory which forms the S.E. extremity of the Bay of Naples. The legends indicate a close connexion between Lipara and Surrentum, as though the latter had been a colony of the former; and even through the Imperial period Surrentum remained largely Greek. Before the Roman supremacy it was one of the towns subject to Nuceria, and shared its fortunes up to the Social War; it seems to have joined in the revolt of 90 B.C. like Stabiae; and was reduced to obedience in the following year, when it seems to have received a colony. Its prosperity dates from the imperial period, when Capreae was a favourite residence of Augustus and Tiberius. Numerous sepulchral inscriptions of Imperial slaves and freedmen have been found at Surrentum. An inscription shows that Titus in the year after the earthquake of a.d. 79 restored the horologium of the town and its architectural decoration. A similar restora- tion of an unknown building in Naples in the same year ia recorded in an inscription from the last-named town (cf. A. Sogliano in Notizie degli Scavi, 1901, p. 363). The most important temples of Surrentum were those of Athena and of the Sirens (the latter the only one in the Greek world in historic times); the former gave its name to the promontory. In antiquity Surrentum was famous for its wine (oranges and lemons which are now so much cultivated there not having been introduced into Italy in antiquity), its fish, and its red Campanian vases; the discovery of coins of Massilia, Gaul and the Balearic Islands here indicates the extensive trade which it carried on. The position of Surrentum was very secure, it being protected by deep gorges, except for a distance of 300 yds. on the south-west where it was defended by walls, the line of which is necessarily followed by those of the modern town. The arrangement of the modern streets preserves that of the ancient town, and the disposition of the walled paths which divide the plain to the east seems to date in like manner from Roman times. No ruins are now pre- served in the town itself, but there are many remains in the villa

quarter to the east .of the town on the road to Stabiae, of which traces still exist, running much higher than the modern road, across the mountain; the site of one of the largest (possibly belonging to the Imperial house) is now occupied by the Hotel Victoria, under the terrace of which a small theatre was found in 1855; an ancient rock-cut tunnel descends hence to the shore. Remains of other villas may be seen, but the most important ruin is the reservoir of the (subterranean) aqueducts just outside the town on the east, which had no less than twenty-seven I chambers each about 90 ft. by 20 ft- Greek and Oscan tombs

have also been found. Another suburb lay below the town and on the promontory on the west of it; under the Hotel Sirena are substructions and a rock-hewn tunnel. To the north-west on the Capo di Sorrento is another villa, the so-called Bagni della Regina Giovanna, with baths, and in the bay to the south-west was the villa of Pollius Felix, the friend of Statius, which he describes in Silvae ii. 2, of which remains still exist. Farther west again are villas, as far as the temple of Athena on the pro- montory named after her at the extremity of the peninsula (now Punta Campanella) . Neither of this nor of the famous temple of the Sirens are any traces existing.

See J. Beloch, Campanien, p. 252 sqq. (2nd ed., Breslau, 1890).

(T. As.)

SURREY, EARLDOM OF. There is some doubt as to when this earldom was created, but it is unquestionably of early origin. A Norman count, William de Warenne (c. 1030-1088), is generally regarded as its first holder and is thought to have been made an earl by William II. about 1088. William and his successors were styled earls of Surrey or Earls Warenne indifferently, and the family became extinct when William, the 3rd earl, died in 1148. The second family to hold the earldom of Surrey was descended from Isabel de Warenne (d. 1 199), daughter and heiress of Earl William, and her second husband Hamelin Plantagenet (d. 1202), an illegitimate half-brother of King Henry II. Hamelin took the name of Warenne and was recognized as earl of Surrey or Earl Warenne, and his descendants held the earldom until Earl John died without legitimate issue in 1347.

The earldom and estates of the Warennes now passed to John's nephew, Richard Fitzalan, earl of Arundel (c. 1307-1376), being forfeited when Richard's son, Richard, was beheaded for treason in 1397. Then for about two years there was a duke of Surrey, the title being borne by Thomas

Holand, earl of Kent (1374-1400), from 1397 until his degradation in 1399. In 1400 Richard Fitzalan's son, Sir Thomas Fitzalan (1381-1415), was restored to his father's honours and became earl of Arundel and earl of Surrey, but the latter earldom reverted to the Crown when he died. In 1451 John Mowbray (1444-1476), afterwards duke of Norfolk, was created earl of Surrey, but the title became extinct on his death.

The long connexion of the Howards with the earldom of Surrey began in 1483 when Thomas Howard, afterwards duke of Norfolk, was created earl of Surrey. Since that time, with the exception of brief periods when some of its holders were under attainder, the title has been borne by the duke of Norfolk. The courtesy title of the duke's eldest son is earl of Surrey.

See the articles Warenne, Earls; and Arundel, Earls of; also G. E. C. (okayne), Complete Peerage, vol. vii. (1896).

SURREY, HENRY HOWARD, Earl of (isi8?iS47), English poet, son of Lord Thomas Howard, afterwards 3rd duke of Norfolk, and his wife Elizabeth Stafford, daughter of the duke of Buckingham, was born probably in 1518. 1 He suc ceeded to the courtesy title of earl of Surrey in 1524, when his father became duke of Norfolk. His early years were spent in the various houses belonging to the Howards, chiefly at Kenning- hall, Norfolk. He had as tutor John Clerke, who, beside in- structing him in the classics, inculcated a great admiration for Italian literature. The duke of Norfolk was proud of his son's attainments (Chapuys to the emperor, December 9; 1529). The duke was governor of Henry Fitzroy, duke of Richmond, the natural son of Henry VIII. and Elizabeth Blount. Surrey was a little more than a year older than Fitzroy, and became his companion and friend. Fitzroy was at Windsor from 1530 to 1532, and it musjt be to these years that Surrey refers in the lines written in prison at Windsor, " where I, in lust and joy, with a king's son, my childish years did pass." Anne Boleyn tried to arrange a marriage between the princess Mary and her kinsman, Surrey. The Spanish ambassador, in the hope of detaching the duke of Norfolk's interest from Anne Boleyn in favour of Catherine

1 The only authority for the date of his birth is the legend Sat. super est, Aetatis XXIX, on a portrait of Henry Howard at Arundel Castle.

of Aragon, seems to have been inclined to favour the project; but Anne changed her mind, and as early as October 1 530 arranged a marriage for Surrey with Lady Frances de Vere, daughter of the 15th earl of Oxford. This was concluded at the earliest possible date, in February 1532, but in consequence of the extreme youth of the contracting parties, Frances did not join her husband until 1535. In October Surrey accompanied Henry VIII. to Boulogne to meet Francis I., and, rejoining the duke of Richmond

at Calais, he proceeded with him to the French court, where the two Englishmen were lodged with the French royal princes. Surrey created for himself a reputation for wisdom, soberness and good learning, which seems curious in view of the events of his later life. Meanwhile in spite of his marriage with Frances de Verc, the project of a contract between him and the princess Mary was revived in a correspondence between Pope Clement VII. and the emperor Charles V., but definitely rejected by the latter. Surrey only returned to England in the autumn of 1533, when the duke of Richmond was recalled to marry his friend's sister, Mary Howard. Surrey made his home at his father's house of Kenning- hall, and here was a witness of the final separation between his parents, due to the duke's relations with Elizabeth Holland, who had been employed in the Howards' nursery. Surrey took his father's side in the family disputes, and remained at Kenning- hall, where his wife joined him in 1535. In May 1536 he filled his father's functions of earl marshal at the trial of his cousins Anne Boleyn and Lord Rochford. In the autumn of that year he took part with his father in the bloodless campaign against the rebels in Yorkshire and Lincolnshire, in the " Pilgrimage of Grace." Although he had supported the royal cause, insinuations were made that he secretly favoured the insurgents. Hasty in temper, and by no means friendly to the Seymour faction at court, he struck a man who repeated the accusation in the park at Hampton Court. For breaking the peace in the king's domain he was arrested (1537), but thanks to Cromwell, who had yielded to the petition of the young man's father, he was not compelled to appear before the privy council, but was merely sent to reside for a time at Windsor. During this imprisonment and the subsequent retirement at Kenninghall, he had leisure to devote himself to poetry. In 1539 he was again received into favour. In May 1540 he was one of the champions in the jousts cele- brated at court. The fall of Thomas Cromwell a month later increased the power of the Howards, and in August Henry VIII. married Surrey's cousin, Catherine Howard. Surrey was knighted early in 1541, and soon after he received the order of the Garter, was made chancellor of the duchy of Lancaster, and, in con- junction with his father, grand seneschal of the university of Cambridge. He apparently preserved the royal favour after the execution of Catherine Howard (at which he was present), for in December 1541 he received the grant of certain manors in Norfolk and Suffolk. In 1 542 he was imprisoned in the Fleet for a quarrel with a certain John Leigh, but on appeal to the privy council he was sent to Windsor Castle, and, after being bound over to keep the peace with John Leigh under a penalty of 10,000 marks, he was soon liberated. Shortly after his release he joined his father on the Scottish expedition. They laid waste the country, but retreated before the earl of Huntly, taking no part in the victorious operations that led up to Solway Moss. To this year no doubt belong the poems in memory of Sir Thomas Wyat. His ties with Wyat, who was fifteen years his elder and of opposite

politics, seem to have been rather literary than personal. He appears to have entered into closer relations with the younger Wyat. In company with " Mr Wyat," he amused himself by breaking the windows of the citizens of London on the 2nd of February 1543. For this he was accused by the privy council, a second charge being that he had eaten meat in Lent. In prison probably he wrote the satire on the city of London, in which he explains his escapade by a desire to rouse Londoners to a sense of their wickedness. In October he joined the English army co-operating with the imperial forces in Flanders, and on his return in the next month brought with him a letter of high commendation from Charles V. In the campaign of the next year he served as field marshal under his

father, and took part in the unsuccessful siege of Montreuil. In August 1545 he was sent to the relief of Edward Poynings, then in command of Boulogne, and was made lieutenant-general of the English possessions on the Continent and governor of Boulogne. Here he gained considerable successes, and insisted on the retention of the town in spite of the desire of the privy council that it should be surrendered to France. A reverse on the 7 th of January at St Etienne was followed by a period of inaction, and in March Surrey was recalled.

Surrey had always been an enemy to the Seymours, whom he regarded as upstarts, and when his sister, the duchess of Rich- mond, seemed disposed to accept a marriage with Sir Thomas Seymour, he wrote to her insinuating that this was a step to- wards becoming the mistress of Henry VIII. By his action in thwarting this plan he increased the enmity of the Seymours and added his sister to the already long list of the enemies which he had made by his haughty manner and brutal frankness. He was now accused of quartering with his own the arms of Edward the Confessor, a proceeding which, it was alleged, was only permissible for the heir to the crown. The details of this accusa- tion were false; moreover, Surrey had long quartered the royal arms with his own without offence. The charge was a pretext covering graver suspicions. Surrey had asserted in the presence of a certain George Blage, who was inclined to the reforming movement, that on Henry's death, his father, the duke of Nor- folk, as the premier duke in England, had the obvious right of acting as regent to Prince Edward. He also boasted of what he would do when his father had attained that position. All of this was construed into a plot on the part of his father and himself to murder the king and the prince. The duke of Norfolk and his son were sent to the Tower on the 12th of December 1546. Every effort was made to secure evidence. The duchess of Richmond was one of the

witnesses (see her depositions in Herbert of Cherbury, Life and Reign of Henry VIII., l64g) against her brother, but her statements were too doubtful to add anything to the formal indictment. On the 13th of January 1547 Surrey defended himself at the guildhall on the charge of high treason for having illegally made use of the arms of Edward the Confessor, before judges selected for their known hatred of himself. He was condemned by a jury, packed for the occasion, to be hanged, drawn and quartered at Tyburn. This sentence was not carried out. Surrey was beheaded on Tower Hill on the 19th of the month, and was buried in the church of All Saints, Barking. His remains were afterwards removed by his son the earl of Northampton to Framlingham, Suffolk. His father, who was charged with complicity in his son's crime, was, as a peer of the realm, not amenable to a common jury. The consequent delay saved his life. He was imprisoned during the whole of the reign of Edward VI., but on Mary's accession he was set free, by an act which also assured the right of the 1 Howards, as descendants of the Mowbray family, to bear the arms of the Confessor.

Surrey's name has been long connected with the " Fair Geraldine," to whom his love poems were supposed to be addressed. The story is founded on the romantic fiction of Thomas Nashe, The Unfortunate Traveller, or Life of Jack Wilton (1594), according to which Surrey saw in a magic glass in the Netherlands the face of Geraldine, and then travelled throughout Europe challenging all comers to deny in full field the charms of the lady. At Florence he held a tournament in her honour, and was to do the same in other Italian cities when he was recalled by order of Henry VIII. The legend, deprived of its more glaring discrepancies with Surrey's life, was revived in Michael Drayton's Englands Heroicall Epistles (1598). Geraldine was the daughter of the earl of Kildare, Lady Elizabeth Fitzgerald, who was brought up at the English court in company with the princess Elizabeth (see James Graves, a Brief Memoir of Lady Elizabeth Fitzgerald, 1874). She was ten years old when in 1537 Surrey addressed to her the sonnet " From Tuskane came my ladies worthy race," and nothing more than a passing admiration of the child and an imaginative anticipation of her beauty can be attributed to Surrey. " A Song … to a ladie that refused to daunce with him," is addressed to Lady Hertford, wife of his bitter enemy, and the two poems, " O happy dames " and " Good ladies, ye that have your pleasures in exile," are addressed to his wife, to whom, at any rate in his later years, he seems to have been sincerely attached.

His poems, which were the occupation of the leisure moments of

his short and crowded life, were first printed in Songs and Sonettes written by the ryght honorable Lorde Henry Howard late Earle of Surrey, and other (apud Richardum Tottel, 1557). A second edition followed in July

1557, and others in 1559, 1565, 1567, 1574, 1585 and 1587. Although Surrey's name, probably because of his rank, stands first on the title-page, Wyat was the earlier in point of time of Henry's " courtly makers." Surrey, indeed, expressly acknow- ledges Wyat as his master in poetry. As their poems appeared in one volume, long after the death of both, their names will always be closely associated. Wyat possessed strong individuality, which found expression in rugged, forceful verse. Surrey's contributions are distinguished by their impetuous eloquence and sweetness. He revived the principles of Chaucer's versification, which his prede- cessors had failed to grasp, perhaps because the value of the final e was lost; He introduced new smoothness and fluency into English verse. He never allowed the accent to fall on a weak syllable, nor did he permit weak syllables as rhymes. His chief innovation as a metrician lies outside the Miscellany. His translation of the second and fourth books of the Aeneid into blank verse— the first attempt at blank verse in English— was published separately by Tottel in the same year with the title of Certain Bokes of Vir gilts Aeneis turned into English meter. It has been suggested that in this matter Surrey was influenced by the translation of Virgil published at Venice by Ippolito de' Medici in 1541, but there is no direct evidence that such was the case. His sonnets are in various schemes of verse, and are less correct in form and more loosely constructed than those of Wyat. They commonly consist of three quatrains with indepen- dent rhymes, terminating with a rhyming couplet. But his sonnets, his elegy on the death of Wyat, his lover's complaint cast in pastoral form, and his lyrics in various measures, served as models to more than one generation of court poets. Both in form and substance Surrey and his fellow poets were largely indebted to Italian prede- cessors; most of his poems are in fact adaptations from Italian originals. The tone of the love sentiment was new in English poetry, very different in its earnestness, passion and fantastic extravagance from the lightness and gaiety of the Chaucerian school.

See Professor E. Arber's reprint of Songs and Sonettes {English Reprints, 1870) ; the Roxburghe Club reprint of Certain Bokes of Virgiles Aeneis (1814) ; Dr G. F. Nott, The Works of Henry Howard, Earl of Surrey (1815); and The Poetical Works of Henry Howard, Earl of Surrey (Aldine edition, 1866). The best account of Surrey's life is in Edmond Bapst's Deux Gentilhommes-poctes de la cour de Henry VIII. (1891), which rectifies Dr Nott's memoir in many points. See also Brewer and Gairdner, Letters and State Papers of Henry VIII. ; Lord Herbert of Cherbury, Life and Raigne of Kinge Henry the Eighth (1649) ; J. A. Froude, History of England (chs. xxi. and xxii.) ; W. j. Courthope, History of English Poetry (1897), vol. ii. ch. iii., where the extent and value of Surrey's innovations in English poetry are estimated; F. M. Padelford, The MS. Poems of Henry Howard, Earl of Surrey (1906); O. Fest, " Uber Surreys Virgilubersetzung," in

Paldstra, vol. xxxiv. (Berlin, 1903).

SURREY, a south-eastern county of England bounded N. by the Thames, separating it from Buckinghamshire and Middlesex, E. by Kent, S. by Sussex, and W. by Hampshire and Berkshire. The administrative county of London bounds that of Surrey (south! of the Thames) on the north-east. The area is 758 sq. m. The north Downs are a picturesque line of hills running east and west through the county somewhat south of the centre (see Downs). Leith Hill, south-west of Dorking (965 ft.), is the highest summit, and commands a prospect unrivalled in the south of England; Holmbury Hill close by reaches 857 ft., and the detached summit of Hindhead above Haslemere in the south- west reaches 895 ft. At Guildford the Wey breaches the hills; and at Dorking the Mole. These are the chief rivers of the county ; they reach the Thames near Weybridge and at East Molesey respectively. The Wandle is a smaller tributary in the north- east of the county. Surrey is thus almost entirely in the Thames basin. In the south-east it includes headstreams of the Eden, a tributary of the Med way; and in the south a small area drains to the English channel. Three types of scenery appear — that of the hilly southern district; that of the Thames, with its richly- wooded banks; and, in the north-west, that of the sandy heath- covered district, abundant in conifers, which includes the healthy open tracts ot Bagshot Heath and other commons, extending into Berkshire and Hampshire. Possessing these varied attrac- tions, Surrey has become practically a great residential district for those who must live in the neighbourhood of London.

Geology. — The northern portion of the county, in the London basin, belongs to the Eocene formation : the lower ground is occupied chiefly by the London Clay of the Lower Eocene, stretching (with interruptions) from London to Farnham ; this is fringed on its southern edge by the underlying Woolwich beds of the same group,

which also appear in isolated patches at Headley near Leatherhead ; and the Thanet Sands at the base crop out between Beddington, Banstead and Leatherhead. .The north-western portion of the county, covered chiefly by heath and Scotch fir, belongs to the Upper Eocene, Bagshot Sands : the Fox hills and the bleak Chobham Ridges are formed of the upper series of the group, which rests upon the middle beds occupying the greater part of Bagshot Heath and Bisley and Pirbright commons, while eastwards the commons of Chobham, Woking and Esher belong to the lower division of the group. To the south of the Eocene formations the smooth rounded

outlines of the chalk hills extend through the centre of the county from Farnham to Westerham (Kent). From Farnham to Guildford they form a narrow ridge called the Hog's Back, about half a mile in breadth with a higher northern dip, the greatest elevation reached in this section being 505 ft. East of Guildford the northern dip decreases and the outcrop widens, throwing out picturesque summits, frequently partly wooded, and commanding wide and beautiful views over the Weald. The Upper Greensand, locally known as firestone, and quarried and mined for this purpose and for hearthstone near Godstone, crops out underneath the Chalk along the southern escarpment of the Downs. The Gault, a dark blue sandy clay, rests beneath the Upper Greensand in the bottom of the long narrow valley which separates the chalk Downs from the well-marked Lower Greensand hills. The Lower Greensand includes the subordinate divisions known as the Folkestone Sands, exploited near Godstone for commercial purposes ; the Sandgate beds, to which the well-known fuller's earth of Nutfield belongs, and the Hythe beds, which contain the Kentish Rag, a sandy glauconitic limestone used for road repairs and building; also a hard, conglomeratic phase of this series locally called Bargate stone. To this formation belong the heights of Leith Hill, Hindhead and the Devil's Punchbowl, Holmbury Hill. Between the Lower Greensand and the Weald Clay is a narrow inconspicuous belt of Atherfield Clay. The Weald Clay itself consists of a blue or brown shaly clay, amid which are deposited river shells, plants of tropical origin and reptilian remains. The lower portion of the Wealden series, the Hastings Sands, occupy a small area in the south-eastern corner of the county. Bordering the Thames there are terraced deposits of gravel and loam.

Agriculture. — Between one-half and three- fifths of the area of the county, a low proportion, is under cultivation, and of this about five-ninths is in permanent pasture. There are considerable varieties of soil, ranging from plastic clay to calcareous earth and bare rocky heath. The plastic clay is well adapted for wheat, but oats are the most largely grown of the decreasing grain crops. A considerable area is occupied by market gardens on the alluvial soil along the banks of the Thames, especially in the vicinity of London. In early times the market gardeners were Flemings, who introduced the culture of asparagus at Battersea and of carrots at Chertsey. Rhododendrons and azaleas are largely grown in the north-western district of the county. In the neighbourhood of Mitcham various medicinal plants are cultivated, such as lavender, mint, camomile, anise, rosemary, liquorice, hyssop, &c. The calcareous soil in the neighbourhood of Farnham is well adapted for hops, but this crop in Surrey is of minor importance. There is a large area under wood. Oak, chestnut, walnut, ash and elm are extensively planted; alder and willow plantations are common; and the Scotch fir propagates naturally from seed on the commons in the north-

west. The extent of pasture land is not great, with the exception of the Downs, which are chiefly occupied as sheep-runs. Dairy-farming is a more important industry than cattle-feeding, large quantities of milk being sent to London.

Manufactures and Communications. — The more important manufactures are chiefly confined to London and its immediate neighbour- hood. The rivers Mole and Wandle, however, supply power for a variety of manufactures, such as oil, paper and sheet-iron mills. Communications include the navigation of the Thames and Wey, and the Basingstoke canal, communicating with the Wey from Frimley and Woking. Owing to its proximity to London the county is served by many lines of railway, the companies being the London & South-Western, the London Brighton & South Coast and the South-Eastern & Chatham.

Population and Administration. — The area of the ancient county is 485,122 acres, with a population in 1901 of 2,012,744. The population in 1801 was 268,233, and in 1851, 683,082; and it nearly doubled between 1 871 and 1901. Under the provisions of the Local Government Act 1888, part of the county was transferred to the county of London. Thus the area of the ancient county, extra- metropolitan, is 461,999 acres, with a population in 1901 of 675,774. The area of the administrative county is 461,807 acres. The county contains 14 hundreds. Croydon (pop. 133,895) is a county borough, and the other municipal boroughs are Godalming (8748), Guildford (15,938), Kingston (34,375). Reigate (25,993), Richmond (31,672), Wimbledon (41,652). The following are urban districts: Barnes (17,821), Carshalton (6746), Caterham (9486), Chertsey (12,762), Dorking (7670), East and West Molesey (6034), Egham (10,187), Epsom (10,915), Esher and The Dittons (9489), Farnham (6124), Frimley (8409), Ham (1460), Leatherhead (4964), The Maidens and Coombe (6233), Surbiton (15,017), Sutton (17,223), Walton- jn-Thames (10,329), Weybridge (5329), Woking (16,244). There

are six parliamentary divisions — North Western or Chertsey, Mid or Epsom, Kingston, North Eastern or Wimbledon, South Eastern or Reigate, South Western or Guildford ; each returning one member. The borough of Croydon returns one member. Surrey is in the south-eastern circuit, and assizes are held at Guildford and Kingston alternately. The administrative county has one court of quarter sessions, and is divided into eleven petty sessional divisions The boroughs of Croydon, Godalming, Guildford, Kingston, Reigate and Richmond have separate commissions of the peace, and Croydon and Guildford have in addition separate courts of quarter sessions. The central criminal court has jurisdiction over certain parishes adjacent to London. All those civil parishes within the county of Surrey, of which any part is within 12 m. of, or of which no part is more than 15 m.

from, Charing Cross, are in the metropolitan police district. The total number of civil parishes is 144. The ancient county contains 230 ecclesiastical parishes or districts, wholly or in part situated in the dioceses of Rochester, Winchester, Canterbury, Oxford and Chichester.

History. — The early history of this district is somewhat un- certain. Ethelwerd, in the Anglo-Saxon Chronicle for 823, places it in the " Medii Angli " or " Medii Saxones." Its position between the Weald and the Thames decided its northern and southern borders, and the Kentish boundary probably dates from the battle of Wibbandune between Ethelbert of Kent and Ceawlin of Wessex, which traditionally took place at Wimbledon, though this is disputed. The western border, like the southern, was a wild uncultivated district; no settled boundary probably existing at the time of the Domesday Survey. The number of hundreds at that time was fourteen as now, but the hundred of Farnham was not so called, the lands of the bishop of Win- chester being placed in no hundred, but coinciding with the present hundred of that name. There is no record of Surrey ever having been in any diocese but Winchester, of which it was an archdeaconry in the 12th century. At the time of the Domesday Survey there were four deaneries: Croydon, Southwark, Guild- ford and Ewell. Croydon was a peculiar of Canterbury, in which diocese it. was included in 1291. In the time, of Henry VIII., Croydon was comprehended in the deanery of Ewell, some of its rectories being included in the deanery of Southwark. The old deanery of Guildford was included in the modern one of Stoke. In 1877, Southwark, with some parishes, was transferred to the diocese of Rochester. In the 7th century Surrey was under the overlordship of Wulfhere, king of Mercia, who founded Chertsey abbey, but in 823, when the Mercians were defeated by Egbert of Wessex, it was included in the kingdom of Wessex, as the Anglo-Saxon Chronicle relates.

Surrey was constantly overrun by Danish hordes in the 9th century and until peace was established by the accession of Canute. In 857 a great national victory over the Danes took place at Ockley near Leila Hill. Surrey is not of great historical importance, except its northern border, the southern part having been forest and waste land, long uninhabited and almost impassable for an army. Guildford, though the county town, and often the seat of the court under John and Henry III., was of little importance beside Southwark, the centre of trade and commerce, the residence of many ecclesiastical dignitaries, a frequent point of attack on London, and a centre for rebellions and riots. The Norman army traversed and ravaged the county in their march on London, a large portion of the county having been in the hands of Edward and Harold, fell to the share of William himself; his most important tenants in chief being Odo of Bayeux and Richard de Tonebridge, son of Count Gilbert, afterwards " de Clare." The church also had large possessions in the county, the abbey of Chertsey

being the largest monastic house. Besides these private jurisdictions, there were the large royal parks and forests, with their special jurisdiction. The shire court was almost certainly held at Guildford, where the gaol for both Sussex and Surrey was from as early as 1202 until 1487, when Sussex had its own gaol at Lewes. The houses of Warenne and de Clare were long the two great rival influences in the county; their seats at Reigate and Blechingley being repre- sented in parliament from the time of Edward I. till the Reform bills of the 19th century. At the time of the Barons' Wars their influence was divided — de Clare marching with Montfort, and de Warenne supporting the king. In the Peasants' Rising of 1381,

and during Jack Cade's Rebellion in the next century, Southwark was invaded, the prisons broken open and the bridge into London crossed. London was unsuccessfully attacked from the Surrey side in the Wars of the Roses; and was held for three days and pillaged during a rising of the southern counties under Mary. During the fears of invasions from Spain, levies were held in readiness in Surrey to protect London; and it was an even more important bulwark of London in the Civil War, on account of the powder mills at Chilworth and the cannon foundries of the Weald. In common with the south-eastern district generally, Surrey was parliamentarian in its sympathies. Sir Richard Onslow and Sir Poynings More were the most prominent local leaders. Farnham Castle and Kingston, with its bridge, were several times taken and held during the war by the opposing parties, and in the later part of the war, when the parliament and army were treating, three of the line of forts defending London were on the Surrey side, from which the army entered London.

The last serious skirmish south of the Thames took place near Ewell and Kingston, where the earl of Holland and a body of the Royalists were routed. This was the last real fighting in the county, though it was often a centre of riots; the most serious being those of 1830, and of the Chartists in 184S, who chose Kennington Common as their meeting-place. The Mores of Loseley and the Onslows were among the most famous county families under the Tudors, as at the time of the Civil War; the Onslows being even better known later in the person of Sir Arthur Onslow, Speaker of the House under George I.

The earliest industries in Surrey were agricultural. The stone quarries of Limpsfield and the chalk of the Downs were early used, the latter chiefly for lime-making. Fuller's earth was obtained from Reigate and Nutfield; and the facilities afforded by many small streams, and the excellent sheep

pasture, made it of importance in the manufacture of cloth, of which Guildford was a centre. Glass and iron were made in the Weald district, whose forests produced the necessary charcoal for smelting. Chiddingfold is mentioned in 1266 for its glass- making, and was one of the chief glass-producing districts in late Tudor times. The ironworks of Surrey were of less impor- tance, and much later in development than those of Kent and Sussex, owing to the want of good roads or waterways, but the increasing demand for ordnance in the 16th century led to the spread of the industry northward; the most considerable works in Surrey being those of Viscount Montague at Haslemere. Chil- worth, which was famous for its powder mills in the 16th century, remains a seat of the industry. Southwark and its neighbour- hood early became a suburb of London and a centre of trades which were crowded out of London. The earliest Delft ware manufactory in England was at Lambeth, which maintains its fame as a centre of earthenware manufacture. The beautiful encaustic tiles of Chertsey Abbey are thought to have been made in English monasteries and date from the 13th century. Although the county was doubtless represented in the representative councils of the reign of Henry III., the first extant returns of two knights of the shire are for the parliament of 1290. The Reform Bill of 1832 gave Surrey four members; dividing the county into east and west divisions. Several boroughs were disfranchized then and in 1867, when East Surrey was again divided into east and mid divisions, on account of the growth of London suburbs, two more members being added at the same time. In 1855 all old boroughs and divisions were superseded; the county being divided into the electoral divisions of Chertsey, Guildford, Reigate, Epsom, Kingston and Wimbledon, each returning one member. Finally, in 1888, the new county of London annexed large portions of Surrey along the northern border.

Antiquities. — The only ecclesiastical ruins worthy of special mention are the picturesque walls of Newark Priory, near Woking, founded for Augustinians in the time of Richard Cceur de Lion; and the Early English crypt and part of the refectory of Waverley Abbey, the earliest house of the Cistercians in England, founded in n 28. The church architecture is of a very varied kind, and has no peculiarly special features. Among the

more interesting churches are Albury (the old church), near Guildford, the tower of which is of Saxon or very early Norman date; Beddington, a fine example of Perpendicular, containing monuments of the Carew family; Chaldon, remarkable for its fresco wall-paintings of the 12th century, discovered during restoration in 1870; Compton, which, though mentioned in Domesday, possesses little of its original architecture, but is worthy of notice for its two-storeyed chancel and its carved wooden balustrade surmounting the pointed transitional Norman arch which separates the nave from the chancel; Leigh, Perpen- dicular, possessing some very fine

brasses of the 15th century; Lingfield, Perpendicular, containing ancient tombs and brasses of the Cobhams, and some fine stalls (the church was formerly collegiate) ; Ockham, chiefly Decorated, with a lofty embattled tower, containing the mausoleum of Lord Chancellor King (d. 1734), with full-length statue of the chancellor by Rysbrack; Stoke d'Abernon, Early English, with the earliest extant English brass, that of Sir John d'Abernon, 1277, and other fine examples. Churches at Guildford, Reigate and Woking are also noteworthy. Of old castles the only examples are Farnham, occupied as a palace by the bishops of Winchester, originally built by Henry of Blois, and restored by Henry III.; and Guildford, with a strong, quadrangular Norman keep. Of ancient domestic architecture examples include Beddington Hall (now a female orphan asylum), the ancient mansion of the Carews, rebuilt in the reign of Queen Anne, and in modern times, but retaining the hall of the Elizabethan building; Crowhurst Place, built in the time of Henry VII., the ancient seat of the Gaynesfords, and frequently visited by Henry VIII.; portions of Croydon Palace, an ancient seat of the archbishops of Canterbury; the gate tower of Esher Place, built by William of Waynflete, bishop of Win- chester, and repaired by Cardinal Wolsey; Archbishop Abbot's hospital, Guildford, in the Tudor style; the fine Elizabethan house of Loseley near Guildford; Smallfield Place near Reigate, now a farmhouse, once the seat of Sir Edward Bysshe (c. 161 5- T 679), garter king-at-arms; Sutton Place near Woking, dating from the time of Henry VIII. , possessing curious mouldings and ornaments in terra-cotta; and Ham House, of red brick, dating from 1610-

See Topley's Geology of the Weald and Whitaker's Geology of London Basin, forming part of the Memoirs of Geological Survey of United, Kingdom (London, 1875) ; J. Aubrey, Natural History and Antiquities of Surrey (5 vols., London, 1718-1719); D. Lysons, Environs of London (5 vols., London, 1800-1811); Baxter, Domes- day Book of Surrey (1876) ; O. Manning and W. Bray, History and Antiquities of Surrey (3 vols., London, 1804-1814); E. W. Brayley, Topographical History of Surrey (5 vols., London, 1841-1848); another edition, revised by E. Walford (London, 1878); Archaeo- logical Collections (Surrey Archaeological Society; London, from 1858); Eric Parker, Highways and Byways in Surrey (London,

1908).

SURROGATE (from Lat. surrogate, to substitute for), a deputy of a bishop or an ecclesiastical judge, acting in the absence of his principal and strictly bound by the authority of the latter. Canon 128 of the canons of 1603 lays down the qualifications necessary for the office of surrogate and canon 123 the regulations for the appointment to the office. At present the chief duty of a surrogate in England is the granting of marriage licences, but

judgments of the arches court of Canterbury have been delivered by a surrogate in the absence of the official principal. The office is unknown in Scotland, but is of some importance in the United States as denoting the judge to whom the jurisdiction of the probate of wills, the grant of administration and of guardian- ship is confided. In some states he is termed surrogate, in others judge of probate, register, judge of the orphans' court, &c. His jurisdiction is local, being limited to his county.

SURTEES, ROBERT (1770-1834), English antiquary and topographical historian, was the son of Robert Surtees of Mainsforth, Durham. He was educated at Christ Church, Oxford, and after studying law without being called to the bar he settled on the family estate at Mainsforth, which he inherited on his father's death in 1802, and where he lived in retirement for the rest of his life, devoting himself to the study of local antiqui- ties and collecting materials for his History of Durham. This

book was published in four volumes, the first of which appeared in 1816, and the last in 1840, after the author's death. The work contains a large amount of genealogical and antiquarian infor- mation; it is written in a readable style, and its learning is enlivened by humour. Surtees had also a gift for ballad writing, and he was so successful in imitating the style of old ballads that he managed to deceive Sir Walter Scott himself, who gave a place in his Minstrelsy of the Scottish Border to a piece by Surtees called " The Death of Featherstonehaugh," under the impression that it was ancient. Surtees, who in 1807 married Anne Robinson, died at Mainsforth on the nth of February 1834. As a memorial of him the " Surtees Society " was founded in 1834 for the purpose of publishing ancient unedited manuscripts bearing on the history of the border country.

See G. Taylor, Memoir of Robert Surtees, with additions by J. Raine (Surtees Society, London, 1852).

SURTEES, ROBERT SMITH (1803-1864), English novelist and sporting writer, was the second son of Anthony Surtees of Hamsterley Hall, a member of an old Durham family. Educated to be a solicitor, Surtees soon began to contribute to the Sporting Magazine, and in 1831 he published a treatise on the law relating to horses and particularly the law of warranty, entitled The Horseman's Manual. In the following year he helped to,found the New Sporting Magazine, of which he was the editor for the next five years. To this periodical he contributed between 1832 and 1834 the papers which were afterwards collected and published in 1838 as Jorrocks's

Jaunts and Jollities. This humorous narrative of the sporting experiences of a cockney grocer, which suggested the more famous Pickwick Papers of Charles Dickens, is the work by which Surtees is chiefly re- membered, though his novel Handley Cross, published in 1843, in which the character of " Jorrocks " is reintroduced as a master of fox-hounds, also enjoyed a wide popularity. The former of these two books was illustrated by "Phiz" (H. K. Browne), and the latter, as well as most of Surtees's subsequent novels, by John Leech, whose pictures of " Jorrocks " are everywhere familiar and were the chief means of ensuring the lasting popu- larity of that humorous creation. In 1838, on the death of his father, Surtees, whose elder brother had died in 183 1, inherited the family property of Hamsterley Hall, where he lived for the rest of his life. The later novels by Surtees included Hillingdon Hall (1845), in which " Jorrocks " again appears; Hawbuck Grange (1847); Mr Sponge's Sporting Tour (1853); Ask Mamma (1858); Plain or Ringlets? (i860); Mr Facey Romford's Hounds (1865). The last of these novels appeared after the author's death, which occurred on the 16th of March 1864. In 1841 he married Elizabeth Jane, daughter of Addison Fenwick of Bishop- wearmouth, by whom he had one son and two daughters, the younger of whom, Eleanor, in 1885 married John Prendergast Vereker, afterwards 5th Viscount Gort.

See R. S. Surtees, Jorrocks's Jaunts and Jollities (London, 1869), containing a biographical memoir of the author; W. P. Frith, John Leech, His Life and Work (2 vols., London, 1891); Samuel Halkett and J. Laing, Dictionary of Anonymous and Pseudonymous Literature of Great Britain (4 vols., Edinburgh, 1882-1

SURVEYING, the technical term for the art of determining the position of prominent points and other objects on the surface of the ground, for the purpose of making therefrom a graphic representation of the area surveyed. The general principles on which surveys are conducted and maps computed from such data are in all instances the same; certain measures are made on the ground, and corresponding measures are protracted on paper on whatever scale may be a convenient fraction of the natural scale. The method of surveying varies with the magnitude of the survey, which may embrace an empire or represent a small plot of land. All surveys rest primarily on linear measurements for the direct determination of distances; but linear measure- ment is often supplemented by angular measurement which enables distances to be determined by principles of geometry over areas which cannot be conveniently measured directly, such, for instance, as hilly or broken ground. The nature r f the survey depends on the proportion which the linear and

angular measures bear to one another and is almost always a combination of both.

History. — The art of surveying, i.e. the primary art of map making from linear measurements, has no historical beginning. The first rude attempts at the representation of natural and artificial features on a ground plan based on actual measurements of which any record is obtainable were those of the Romans, who certainly made use of an instrument not unlike the plane-table for determining the alignment of their roads. Instruments adapted to surveying purposes were in use many centuries earlier than the Roman period. The Greeks used a form of log line for recording the distances run from point to point along the coast whilst making their slow voyage from the Indus to the Persian Gulf three centuries B.C. ; and it is improbable that the adaptation of this form of linear measurement was confined to the sea alone. Still earlier (as early as 1600 B.C.) it is said that the Chinese knew the value of the loadstone and possessed some form of magnetic compass. But there is no record of their methods of linear measurements, or that the distances and angles measured were applied to the purpose of map-making (see Compass and Map). The earliest maps of which we have any record were based on inaccurate astronomical determinations, and it was not till medieval times, when the Arabs made use of the Astrolabe (q.v.), that nautical surveying (the earliest form of the art) could really be said to begin. In 1450 the Arabs were acquainted with the use of the compass, and could make charts of the coast-line of those countries which they visited. In 1498 Vasco da Gama saw a chart of the coast-line of India, which was shown him by a Gujarati, and there can be little doubt that he benefited largely by information obtained from charts which were of the nature of practical coast surveys. The beginning of land surveying (apart from small plan-making) was probably coincident with the earliest attempts to discover the size and figure of the earth by means of exact measurements, i.e. with the inauguration of geodesy (see Geodesy and Earth, Figure of the), which is the fundamental basis of all scientific surveying.

Classification. — For convenience of reference surveying may be considered under the following heads — involving very distinct branches of the art dependent on different methods and instru- ments 1 : —

5. Traversing, and fiscal or revenue surveys.

6. Nautical surveys.

1. Geodetic triangulation.

2. Levelling.

3. Topographical surveys.

4. Geographical surveys.

1. Geodetic Triangulation Geodesy, as an abstract science dealing primarily. with the dimensions and figure of the earth, may be found fully discussed in the articles Geodesy and Earth, Figure or the; but, as furnishing the basis for the construction of the first framework of triangulation on which all further surveys depend (which may be described as its second but most important function), geodesy is an integral part of the art of surveying, and its relation to subsequent processes requires separate consideration. The part which geodetic triangulation plays in the general surveys of civilized countries which require closely accurate and various forms of mapping to illustrate their physical features for military, political or fiscal purposes is best exemplified by reference to some completed system which has already served its purpose over a large area. That of India will serve as an example.

The great triangulation of India was, at its inception, calculated to satisfy the requirements of geodesy as well as geography, because the latitudes and longitudes of the points of the triangulation had to be determined for future reference by process of calculation combining the results of the triangulation with the elements of the earth's figure. The latter were net then known with much accuracy, for so far geodetic operations had been mainly carried on in Europe, and additional operations nearer the equator were much wanted; the survey was conducted with a view to supply this want. Thus high accuracy was aimed at from the first.

Primarily a network was thrown over the southern peninsula. The triangles on the central meridian were measured with extra care and checked by base-lines at distances of about 2° apart in

1 The subject of tacheometry is treated under its own heading.

latitude in order to form a geodetic arc, with the addition of astronomically determined latitudes at certain of the stations. The base-lines were measured with chains and the principal angles with a 3-ft. theodolite. The signals were cairns of stones or poles. The chains were somewhat rude and their units of length had not been determined originally, and could not be afterwards ascertained. The results were good of their kind and sufficient for geographical pur- poses; but the central meridional arc-— the "great arc" — was eventually deemed inadequate for geodetic requirements. A superior instrumental equipment was introduced, with an improved

Trigono- metrical Survey of India.

Fig. 1. modus operandi, under the direction of Colonel Sir G. Everest in 1832. The network system of triangulation was superseded by meridional and longitudinal chains taking the form of gridirons and resting on base-lines at the angles of the gridirons, as repre- sented in fig. I. For convenience of reduction and nomenclature the triangulation west of meridian 92 ° E. has been divided into five sections — the lowest a trigon, the other four quadrilaterals distinguished by cardinal points which have reference to an ob- servatory in Central India, the adopted origin of latitudes. In the north-east quadrilateral, which was first measured, the meridional chains are about one degree apart ; this distance was latterly much increased and eventually certain chains — as on the Malabar coast and on meridian 84 ° in the south-east quadrilateral — were dispensed with because good secondary triangulation for topography had been accomplished before they could be begun.

All base-lines were measured with the Colby apparatus of com- pensation bars and microscopes. The bars, 10 ft. long, were set up horizontally on tripod stands; the microscopes, 6 in. apart, were mounted in pairs revolving round a vertical axis and were set up on tribrachs fitted to the ends of the bars. Six bars and five central and two end pairs of microscopes — the latter with their vertical axes perforated for a look-down telescope — constituted a complete apparatus, measuring 63 ft. between the ground pins or registers. Compound bars are more liable to accidental changes of length than simple bars; they were therefore tested from time to time by comparison with a standard simple bar; the microscopes were also tested by comparison with a standard 6-in. scale. At the first base-line the compensated bars were found to be liable to sensible variations of length with the diurnal variations of tempe- rature; these were supposed to be due to the different thermal conductivities of the brass and the iron components. It became necessary, therefore, to determine the mean daily length of the bars precisely, for which reason they were systematically compared with the standard before and after, and sometimes at the middle of, the base-line measurement throughout the entire day for a space of three days, and under conditions as nearly similar as possible to those obtaining during the measurement. Eventually thermo- meters were applied experimentally to both components of a compound bar, when it was found that the diurnal variations in length were principally due to difference of position relatively to the sun, not to difference of conductivity — the component nearest the sun acquiring heat most rapidly or parting with it most slowly, notwithstanding that both were in the same box, which was always sheltered from the sun's rays. Happily the systematic comparisons of the compound bars with the standard were found to give a sufficiently exact determination of the mean daily length. An elaborate investigation of

*theoretical probable errors (p.e.) at the Cape Comorin base showed that, for any base-line measured as usual without thermometers in the compound bars, the p.e. may be taken as ± I-5 millionth parts of the length, excluding unascertainable constant errors, and that on introducing thermometers into these bars the p.e. was diminished to = *= 0ˆ55 millionths.*

In all base-line measurements the weak point is the determination of the temperature of the bars when that of the atmosphere is rapidly rising or falling; the thermometers acquire and lose heat more rapidly than the bar if their bulbs are outside, and more slowly if inside the bar. Thus there is always more or less lagging, and its effects are only eliminated when the rises and falls are of equal amount and duration; but as a rule the rise generally predominates greatly during the usual hours of work, and whenever this happens lagging may cause more error in a base-line measured with simple bars than all other sources of error combined. In India the probable average lagging of the standard-bar thermometer was estimated as not less than 0-3° F., corresponding to an error of — 2 millionths in the length of a base-line measured with iron bars. With compound bars lagging would be much the same for both com- ponents and its influence would consequently be eliminated. Thus the most perfect base-line apparatus would seem to be one of com- pensation bars with thermometers attached to each component; then the comparisons with the standard need only be taken at the times when the temperature is constant, and there is no lagging.

The plan of triangulation was broadly a system of internal meridional and longitudinal chains with an external border of oblique chains following the course of the frontier and the coast lines. The design of each chain was necessarily much influenced by the physical features of the country over which it was carried. The most difficult tracts were plains, devoid of any commanding points of view, in some parts covered with forest and jungle, malarious and almost uninhabited, in other parts covered with towns and villages and umbrageous trees. In such tracts triangulation was impossible except by constructing towers as stations of observation, raising them to a sufficient height to overtop at least the earth's curvature, and then either increasing the height to surmount all obstacles to mutual vision, or clearing the lines. Thus in hilly and open country the chains of triangles were generally made " double " throughout, i.e. formed of polygonal and quadrilateral figures to give greater breadth and accuracy; but in forest and close country they were carried out as series of single triangles, to give a minimum of labour and expense. Symmetry was secured by restricting the angles between the limits of 30 and 90 °. The average side length was 30 m. in hill country and 11 in the plains; the longest principal side was 62-7 m., though in the secondary- tri- angulation to the Himalayan peaks there

were sides exceeding 200 m. Long sides were at first considered desirable, on the prin- ciple that the fewer the links the greater the accuracy of a chain of triangles; but it was eventually found that good observations qn long sides could only be obtained under exceptionally favourable atmospheric conditions. In plains the length was governed by the height to which towers could be conveniently raised to surmount the curvature, under the well-known condition, height in feet = f X square of the distance in miles; thus 24 ft. of height was needed at each end of a side to overtop the curvature in 12 m., and to this had to be added whatever was required to surmount obstacles on the ground. In Indian plains refraction is more frequently negative than positive during sunshine; no reduction could therefore be made for it.

The selection of sites for stations, a simple matter in hills and open country, is often difficult in plains and close country. In the early operations, when the great arc was being carried across the wide plains of the Gangetic valley, which are covered with villages and trees and other obstacles to distant vision, masts 35 ft. high were carried about for the support of the small reconnoitring theodolites, with a sufficiency of poles and bamboos to form a scaffolding of the same height for the observer. Other masts 70 ft. high, with arrangements for displaying blue lights by night at 90 ft., were erected at the spots where station sites were wanted. But the cost of transport was great, the rate of progress was slow, and the results were unsatisfactory. Eventually a method of touch rather than sight was adopted, feeling the ground to search for the obstacles to be avoided, rather than attempting to look over them; the " rays " were traced either by a minor triangulation, or by a traverse with theodolite and perambulator, or by a simple alignment of flags. The first method gives the direction of the new station most accurately; the second searches the ground most closely; the third is best suited for tracts of uninhabited forest in which there is no choice of either line or site, and the required station may be built at the intersection of the two trial rays leading up to it. As a rule it has been found most economical and expeditious to raise the towers only to the height necessary for surmounting the curvature, and to remove the trees and other obstacles on the lines.

Each principal station has a central masonry pillar, circular and 3 to 4 ft. in diameter, for the support of a large theodolite, and around it a platform 14 to 16 ft. square for the observatory tent, observer and signallers. The pillar if, isolated from the plat- form, and when solid carries the station mark — a dot surrounded by a circle — engraved on a stone at its surface, and on additional stones or the rock in situ, in the normal of the upper mark; but, if the height is considerable and there is a liability to deflection, the pillar is constructed with a central vertical shaft to enable the

theodolite to be plumbed over the ground-level mark, to which access is obtained through a passage in the basement. In early years this precaution against deflection was neglected and the pillars were built solid throughout, whatever their height; the surrounding platforms, being usually constructed of sun-dried bricks or stones and earth, were liable to fall and press against the pillars, some of which thus became deflected during the rainy seasons that inter- vened between the periods during which operations were arrested or the beginning and close of the successive circuits of triangles. Large theodolites were invariably employed. Repeating circles were highly thought of by French geodesists at the time when the operations in India were begun; but they were not used in the survey, and have now been generally discarded. The principal theodolites were somewhat similar to the astronomer's alt-azimuth instrument, but with larger azimuthal and smaller vertical circles, also with a greater base to give the firmness and stability which are required in measuring horizontal angles. The azimuthal circles had mostly diameters of either 36 or 24 in., the vertical circles having a diameter of 18 in. In all the theodolites the base was a tribrach resting on three levelling foot-screws, and the circles are read by microscopes; but in different instruments the fixed and the rotatory parts of the body varied. In some the vertical axis was fixed on the tribrach and projected upwards; in others it revolved in the tribrach and projected downwards. In the former the azimuthal circle was fixed to the tribrach, while the telescope pillars, the microscopes, the clamps and the tangent screws were attached to a drum revolving round the vertical axis; in the latter the microscopes, clamps and tangent screws were fixed to the tribrach, while the telescope pillars and the azimuthal circle were attached to a plate fixed at the head of the rotary vertical axis.

Cairns of stones, poles or other opaque signals were primarily employed, the angles being measured by day only; eventually it was found that the atmosphere was often more favourable for observing by night than by day, and that distant points were raised well into view by refraction by night which might be invisible or only seen with difficulty by day. Lamps were then introduced of the simple form of a cup, 6 in. in diameter, filled with cotton seeds steeped in oil and resin, to burn under an inverted earthen jar, 30 in. in diameter, with an aperture in the side towards the ob- server. Subsequently this contrivance gave place to the Argand lamp with parabolic reflector ; the opague day signals were discarded for heliotropes reflecting the sun's rays to the observer. The introduction of luminous

signals not only rendered the night as well as the day available for the observations but changed the char- acter of the operations, enabling work to be done during the dry and healthy season of the year, when the atmosphere is generally hazy and dust-laden, instead of being restricted as formerly to the rainy and unhealthy seasons, when distant opaque objects are best seen. A higher degree of accuracy was also secured, for the luminous signals were invariably displayed through diaphragms of appropriate aperture, truly centred over the station mark; and, looking like stars, they could be observed with greater precision, whereas opaque signals are always dim in comparison and are liable to be seen excentrically when the light falls on one side. A signal- ling party of three men was usually found sufficient to manipulate a pair of heliotropes — one for single, two for double reflection, according to the sun's position — and a lamp, throughout the night and day. Heliotropers were also employed at the observing stations to flash instructions to the signallers.

The theodolites were invariably set up under tents for protection against sun, wind and rain, and centred, levelled and adjusted for „ . the runs of the microscopes. Then the signals were

easu ag observed in regular rotation round the horizon, alter- Anetes" " nate 'y Irom right to left and vice versa ; after the pre- ' scribed minimum number of rounds, either two or three, had been thus measured, the telescope was turned through 180 , both in altitude and azimuth, changing the position of the lace of the vertical circle relatively to the observer, and further rounds were measured; additional measures of single angles were taken if the prescribed observations were not sufficiently accordant. As the microscopes were invariably equidistant and their number was always odd, either three or five, the readings taken on the azi- muthal circle during the telescope pointings to any object in the two positions of the vertical circle, " face right " and " face left," were made on twice as many equidistant graduations as the number of microscopes. The theodolite was then shifted bodily in azimuth, by being turned on the ring on the head of the stand, which brought new graduations under the microscopes at the telescope pointings; then further rounds were measured in the new positions, face right and face left. This process was repeated as often as had been pre- viously prescribed, the successive angular shifts of position being made by equal arcs bringing equidistant graduations under the microscopes during the successive telescope pointings to one and the same object. By these arrangements all periodic errors of graduation were elimin- ated, the numerous graduations that were read tended to cancel accidental errors of division, and the numerous rounds of measures to minimize the errors of observation arising from atmospheric and personal causes.

Under this system of procedure the instrumental and ordinary

errors are practically cancelled and any remaining error is most probably due to lateral refraction, more especially when the rays of light graze the surface of the ground. The three angles of every triangle were always measured.

The apparent altitude of a distant point is liable to considerable variations during the twenty-four hours, under the influence of changes in the density of the lower strata of the atmo- sphere. Terrestrial refraction is capricious, more par- ticularly when the rays of light graze the surface of the ground, passing through a medium which is liable to extremes of rarefaction and condensation, under the alternate influence of the sun's heat radiated from the surface of the ground and of chilled atmospheric vapour. When the back and forward verticals at a pair of stations are equally refracted, their difference gives an exact measure of the difference of height. But the atmospheric conditions are not always identical at the same moment everywhere on long rays which graze the surface of the ground, and the ray between two reciprocating stations is liable to be differently refracted at its extremities, each end being influenced in a greater degree by the conditions prevailing around it than by those at a distance; thus instances are on record of a station A being invisible from another B, while B was visible from A.

When the great arc entered the plains of the Gangetic valley, simultaneous reciprocal verticals were at first adopted with the hope of eliminating refraction; but it was soon found n e f rac u 0B , that they did not do so sufficiently to justify the ex- pense of the additional instruments and observers. Afterwards the back and forward verticals were observed as the stations were visited in succession, the back angles at as nearly as possible the same time of the day as the forward angles, and always during the so-called " time of minimum refraction," which ordinarily begins about an hour after apparent noon and lasts from two to three hours. The apparent zenith distance is always greatest then, but the refraction is a minimum only at stations which are well elevated above the surface of the ground; at stations on plains the refraction is liable to pass through zero and attain a consider able negative magnitude during the heat of the day, for the lower strata of the atmosphere are then less dense than the strata imme- diately above and the rays are refracted downwards. On plains the greatest positive refractions are also obtained — maximum values, both positive and negative, usually occurring, the former by night, the latter by day, when the sky is most free from clouds. The values actually met with were found to range from + 1-21 down to -0-09 parts of the contained arc on plains; the normal " coefficient of refraction " for free rays between hill stations below 6000 ft. was about 0-07, which diminished to 0-04 above

18,000 ft., broadly varying inversely as the temperature and directly as the pressure, but much influenced also by local climatic conditions.

In measuring the vertical angles with the great theodolites, graduation errors were regarded as insignificant compared with errors arising from uncertain refraction; thus no arrangement was made for. effecting changes of zero in the circle settings. The ob- servations were always taken in pairs, face right and left, to eliminate index errors, only a few daily, but some on as many days as possible, for the variations from day to day were found to be greater than the diurnal variations during the hours of minimum refraction.

In the ordnance and other surveys the bearings of the surround- ing stations are deduced from the actual observations, but from the " included angles " in the Indian survey. The Weights observations of every angle are tabulated vertically in as many columns as the number of circle settings face left and face right, and the mean for each setting is taken. For several years the general mean of these was adopted as the final result; but subsequently a " concluded angle " was obtained by combining the single means with weights inversely proportional to g 2 + o 2 e n — g, being a value of the e.m.s. 1 of graduation derived empirically from the differences between the general mean and the mean for each setting, the e.m.s. of observation deduced from the differences between the individual measures and their respective means, and n the number of measures at each setting. Thus, putting w\, Wi, . . . for the weights of the single means, w for the weight of the con- cluded angle, M for the general mean, C for the concluded angle, and di, di, . . . for the differences between M and the single means, we have

mi + wi f w

and w=u>i + w% j (2)

C — M vanishes when n is constant ; it is inappreciable when g is much larger than 0; it is significant only when the graduation errors are more minute than the errors of observation; but it was always small, not exceeding 0-14* with the system of two rounds of measures and 0-05″ with the system of three rounds.

The weights of the concluded angles thus obtained were employed in the primary reductions of the angles of single triangles and polygons which were made to satisfy the geometrical conditions

1 The theoretical " error of mean square " = 1-48 X " probable error."

iziag Angles.

of each figure, because they were strictly relative for all angles measured with the same instrument and under similar circumstances and conditions, as was almost always the case for each single figure. But in the final reductions, when numerous chains of triangles composed of figures executed with different instruments and under different circumstances came to be adjusted simultaneously, it was necessary to modify the original weights, on such evidence of the precision of the angles as might be obtained from other and more reliable sources than the actual measures of the angles. This treatment will now be described.

Values of theoretical error for groups of angles measured with the same instrument and under similar conditions may be obtained

in three ways — (i.) from the squares of. the reciprocals Theoretical Q j ˆ we jgh t w deduced as above from the measures Z rr0 . rs ° of such angle, (ii.) from the magnitudes of the excess of • "2 es – tne sum f the angles of each triangle above i8o° + the spherical excess, and (iii.) from the magnitudes of the corrections which it is necessary to apply to the angles of polygonal figures and networks to satisfy the several geometrical conditions.

Every figure, whether a single triangle or a polygonal network,

was made consistent by the application of corrections to the observed

, angles to satisfy its geometrical conditions. The three

Harmon- ang] es f ev ery triangle having been observed, their

sum had to be made = i8o° + the spherical excess;

in networks it was also necessary that the sum of the angles measured round the horizon at any station should be exactly = 360 , that the sum of the parts of an angle measured at different times should equal the whole and that the ratio of any two sides should be identical, whatever the route through which it was com- puted. These are called the triangular, central, toto-partial and side conditions; they present n geometrical equations, which contain I unknown quantities, the errors of the observed angles, / being always >n. When these equations are satisfied and the deduced values of errors are applied as corrections to the observed angles, the figure

becomes consistent. Primarily the equations were treated by a method of successive approximations ; but afterwards they were all solved simultaneously by the so-called method of minimum squares, which leads to the most probable of any system of correc- tions.

The angles having been made geometrically consistent inter se in each figure, the side-lengths are computed from the base-line

onwards by Legendre's theorem, each angle being dimin-

T ˆnel ished by one-third of the spherical excess of the triangle

na g es. tQ w hich it appertains. The theorem is applicable

without sensible error to triangles of a much larger size than any

that are ever measured.

A station of origin being chosen of which the latitude and longitude are known astronomically, and also the azimuth of one of the Latitude and surrounding stations, the differences of latitude and Z-ongfladeo/longitude and the reverse azimuths are calculated in Stations; succession, for all the stations of the triangulation, Azimuth of by Puissant's formulae (Traite de geodesie, 3rd ed., Paris, Sides. 1842).

Problem. — Assuming the earth to be spheroidal, let A and B be two stations on its surface, and let the latitude and longitude of A be known, also the azimuth of B at A, and the distance between A and B at the mean sea-level; we have to find the latitude and longitude of B and the azimuth of A at B.

The following symbols are employed: a the major and b the

minor semi-axis

(a 1 — V) 5 ; e the excentricity, = j — \ '• P tne radius of

a(i-e 2)

curvature to the meridian in latitude X, =-,

1— e 2 sin 2 XU

; v the normal

to the meridian in latitude X, = < _,t \„%\\ ~\ x and L the given

\ L c- Sill A j 2

latitude and longitude of A; X + AX and L + AL the required lat tude and longitude of B; A the azimuth of B at A; B the azimutn of A at B; AA = B — (w+A); c the distance between Aand B. Then, all azimuths being measured from the south, we have

AX" =

cos A cosec 1

p

1 c 2 — — — sin 2 .4 tan X cosec 1"

p.v

c 2

_i

4 p>' I — e

+ LJL

6 p.v

cosM sin 2X cosec l"

AL" =

+ ;;

sin 2 /l cos .4(i-f 3 tan 2 X) cosec 1'

c sin A .,

r cosec 1

v cos X

1 1- sin 2/4 tan X

2 ir

cos X

-cosec I

I c 3 (l-r”5 tan 2 X) sin 2.4 cos/1 ,

a -J lbr\ cosec I’

o ir cos X

sinM tan 2 X ,,

cosec I

+ – -

cos X

(3)

f(4)

— sin A tan X cosec 1′

(5)

T C t fi COS A }

a a 11 H 5 \ I +2 tan 2 X 1 — = \ sin 2ˆ4 cosec 1′

A/1 or J 4 j/ 2 (‘ 1— e 2 \

B-(t+A) =] c 3 /5 , „ Ntan X . . . „

~ pHfi”” J 2 sln co c °sec 1′

I c 3 -fg-jsin 3 /! tan X (1+2 tan 2 X) cosec 1″

Each A is the sum of four terms symbolized by Si, 5 2 , 83 and &r, the calculations are so arranged as to produce these terms in the order 8\, dL, and SA, each term entering as a factor in calculating the following term. The arrangement is shown below in equations in which the symbols P, Q, . . . Z represent the factors which depend on the adopted geodetic constants, and vary with the latitude; the logarithms of their numerical values are tabulated in the Auxiliary Tables to Facilitate the Calculations of the Indian Survey. 8 l K=—P.cosA.c SiL = +8{K.Q.sec’.ta.nA SiA = -NiL.sinXl

S 2 X= +81A .R.sinA.c 8 2 L = -«j. S.zotA 8 2 A = +S 2 L .T \ ,,.

S»\=-iiA.V .cotA S 3 L = +S s .U.sinA.c 8 3 A=+S 3 L.W (yb > 5 4

X=-53A.J?._tanA S t L = +8i. Y.tanA StAˆ+StL.Z J

The calculations described so far suffice to make the angles of the several trigonometrical figures consistent inter se, and to give preliminary values of the lengths and azimuths of the sides and the latitudes and longitudes of the stations. Reduction The results are amply sufficient for the requirements of Principal of the topographer and land surveyor, and they are Triangula- published in preliminary charts, which give full numerical ˆ”” , details of latitude, longitude, azimuth and side-length, and of height also, for each portion of the triangulation — secondary as well as principal — as executed year by year. But on the com- pletion of the several chains of triangles further reductions became necessary, to make the triangulation everywhere consistent inter se and with the verificatory base-lines, so that the lengths and azimuths of common sides and the latitudes and longitudes of common stations should be identical at the junctions of chains and that the measured and computed lengths of the base-lines should also be identical.

As an illustration of the problem for treatment, suppose a combination of three meridional and two longitudinal chains com- prising seventy-two single triangles with a base-line at each corner as shown in the accompanying C B

diagram (fig. 2); suppose the /\/\/V\/\/V\AAA/ three angles of every triangle L Y v v v -Y J/ V V V \C to have been measured and made consistent. Let A be the origin, with its latitude and longitude given, and also the length and azimuth of the adjoining base-line. With . these data processes of cal- culation are carried through D the triangulation to obtain the _,

*lengths and azimuths of the *’ IG- 2-*

sides and the latitudes and longitudes of the stations, say in the fol- lowing order: from A through B to E, through F to E, through F to D, through F and E to C, and through F and D to C. Then there are two values of side, azimuth, latitude and longitude at E — one from the right-hand chains via B, the other from the left-hand chains via F; similarly there are two sets of values at C; and each ot the base-lines at B, C and D has a calculated as well as a measured value. Thus eleven absolute errors are presented for dispersion over the triangulation by the application of the most appropriate correction to each angle, and, as a preliminary to the determination of these corrections, equations must be con- structed between each of the absolute errors and the unknown errors of the angles from which they originated. For this purpose assume X to be the angle opposite the flank side of any triangle, and Y and Z the angles opposite the sides of

continuation ; also let x, y and z be the most probable values of the errors of the angles which will satisfy the given equations of condition. Then each equation may be expressed in the form \ax+by+cz] =E, the brackets indicating a summation for all the triangles involved. We have first to ascertain. the values of the coefficients a, b and c of the unknown quantities. They are readily found for the side equations on the circuits and between the base-lines, for x does not enter them, but only y and z, with coefficients which are the cotangents of Y and Z, so that these equations are simply [cot Y.y — cot'Z.z] =E. But three out of four of the circuit equations are geodetic, corre- sponding to the closing errors in latitude, longitude and azimuth, and in them the coefficients are very complicated. They are ob- tained as follows. The first term of each of the three expressions for AX, AL, and B is differentiated in terms of c and A, giving

d.A\ =

AX

if"

(dc

■dA tan A sin 1"

!.AL= AL\— + dA cot A sin 1"

dB=dA+AA] Y+dA cot A sin 1" |

(7)

in which dc and dA represent the errors in the length and azimuth of any side c which have been generated in the course of the triangulation up to it from the base-line and the azimuth station at the origin. The errors in the latitude and longitude of any station which are due to the triangulation are d\, = [d.A\], and dL, = [d.AL]. Let station 1 be the origin, and let 2,3,... be the succeeding stations taken along a predetermined line of traverse, which may either run from vertex to vertex of the successive triangles, zigzagging between the flanks of the chain, as in fig. 3 (1), or be carried directly along one of the flanks, as in fig. 3 (2). For the general symbols of the differential equa- tions substitute AX„, AL n , AA„, c n , An, and B n ,

for the side between stations n and « + l of the traverse; and let bc n and bA n be the errors generated between the sides Cn-i and c„; then

Fig. 3.

dci Sci Cl ~ Cj ‘

dAt=bAi

SCi , §£2. = Cl c 2 ‘

dc-i dA 2 = dB!+5A 2

dCn

Cn 1 L c J ‘

dA„ = d3n-l+SA n .

Performing the necessary substitutions and summations, we get

dB„ =

ˆ[AAp+yAp+.-.+AAnf

1 Ci £■ (-2 wi

A

kLti-j-1 —

+ (i+”[Aˆ cot A] sin i”)5Ai + (i+“l&A cot A] sin i”)SA 2

+ . . .SA n . >X]|l;[AX]|a + ...+AX„f=

1 Ci – t-2 t-n

- j”[AX tan A]dA 1 + n 2 [iˆ tan A]bA t + . . . L +AX„ tan A n 6An] sin I ”

+ |”IAZ. cot i]84,+”[AL cot A]bA z + . . . I +AL n cot AnSAn] sin I “.

Thus we have the following expression for any geodetic error: —

6cj Mi 7ˆ+- ■

Cl

lJri?>A 1 +... +«SAn—

C n

E,

(8)

where m and 4> represent the respective summations which are the coefficients of be and bA in each instance but the first, in which I is added to the summation in forming the coefficient oi bA. _

The angular errors x, y and z must now be introduced, in place of be and bA, into the general expression, which will then take differ- ent forms, according as the route adopted for the line of traverse was the zigzag or the direct. In the former, the number of stations on the traverse is ordinarily the same as the number of triangles, and, whether or no, a common numerical notation may be adopted for both the traverse stations and the collateral triangles; thus the angular errors of every triangle enter the general expression in the form *=4ix+cotY.iJ.'y— cot Z.n'z,

in which m' = M sin 1 ", and the upper sign of is taken if the triangle lies to the left, the lower if to the right, of the line of traverse. When the direct traverse is adopted, there are only half as many traverse stations as triangles, and therefore only half the number of /j-'s and 's to determine; but it becomes necessary to adopt different numberings for the stations and the triangles, and the form of the coefficients of the angular errors alternates in successive triangles. Thus, if the pth triangle has no side on the line of the traverse but only an angle at the /th station, the form is

+ 4>i ■ x p + cot Yj, . Mi' • Jv — cot Z p . nl . z v . If the gth triangle has a side between the /th and the (/+l)th stations of the traverse, the form is cot X q (ii{ – m'i + i)*» + (<*>i + m'i + i cot Y q)y q – {i+i – nl cot Z„)z q .

As each circuit has a right-hand and a left-hand branch, the errors of the angles are finally arranged so as to present equations of the general form

[ax + by + cz] r — [ax + by + cz] j = E.

The eleven circuit and base-line equations of condition having been duly constructed, the next step is to find values of the angular errors which will satisfy these equations, and be the most probable of any system of values that will do so, and at the same time will not disturb the existing harmony of the angles in each of the seventy- two triangles. Harmony is maintained by introducing the equation of condition x+y-r-z=o for every triangle.

The most probable results are obtained by the method of minimum squares, which may be applied in two ways.

i. A factor X may be obtained for each of the eighty-three equa-

—+ ’—+- is made a minimum,

u, v and w being the reciprocals of the weights of the observed angles. This necessitates the simultaneous solution of eighty-three equations to obtain as many values of X. The resulting values of the errors of the angles in any, the pth, triangle, are

*x p = u p [a p \; y P = v p [bp\]; z p = *w p [cp\]. (9)*

ii. One of the unknown quantities in every triangle, as x, may be eliminated from each of the eleven circuit and base-line equa- tions by substituting its equivalent — (y+s) for it, a similar substi- tution being made in the minimum. Then the equations take the form [{b— a)y--(c— a)z] = E, while the minimum becomes

*[” (y+s) 2 , y 2 ■ *]*

L U “““ill ‘wj ‘

Thus we have now to find only eleven values of X by a simultaneous solution of as many equations, instead of eighty-three values from eighty-three equations; but we arrive at more complex expressions for the angular errors as follows: —

y v =:

l p +V p +W p

i (« P +w p) [Q> p – a„)X] — w p [(c p — a p)\]}

(IO)

z p= u + v “+ w [{u P +v P)[(c p – a„)\]-]v p [(b p – a p)X]}J

The second method has invariably been adopted, originally be- cause it was supposed that, the number of the factors X being re- duced from the total number of equations to that of the circuit and base-line equations, a great saving of labour would be effected. But subsequently it was ascertained that in this respect there is little to choose between the two methods; for, when x is not eliminated, and as many factors are introduced as there are equations, the factors for the triangular equations may be readily eliminated at the outset. Then the really severe calculations will be

restricted to the solution of the equations containing the factors for the circuit and base-line equations as in the second method.

In the preceding illustration it is assumed that the base-lines are errorless as compared with the triangulation. Strictly speaking, however, as base-lines are fallible quantities, presumably of differ- ent weight, their errors should be introduced as unknown quantities of which the most probable values are to be determined in a simul- taneous investigation of the errors of all the facts of observation, whether linear or angular. When they are connected together by so few triangles that their ratios may be deduced as accurately, or nearly so, from the triangulation as from the measured lengths, this ought to be done; but, when the connecting triangles are so numerous that the direct ratios are of much greater weight than the trigonometrical, the errors of the base-lines may be neglected. In the reduction of the Indian triangulation it was decided, after examining the relative magnitudes of the probable errors of the linear and the angular measures and ratios, to assume the base-lines to be errorless.

The chains of triangles being largely composed of polygons or other networks, and not merely of single triangles, as has been assumed for simplicity in the illustration, the geometrical harmony to be maintained involved the introduction of a large number of " side," " central " and " toto-partial " equations of condition, as well as the triangular. Thus the problem for attack was the simul- taneous solution of a number of equations of condition = that of all the geometrical conditions of every figure + four times the number of circuits formed by the chains of triangles -f-the number of base- lines — I , the number of unknown quantities contained in the equations being that of the whole of the observed angles – the method of procedure, if rigorous, would be precisely similar to that already indicated for " harmonizing the angles of trigonometrical figures," of which it is merely an expansion from single figures to great groups.

The rigorous treatment would, however, have involved the simul- taneous solution of about 4000 equations between 9230 unknown quantities, which was impracticable. The triangulation was therefore divided into sections for separate reduction, of which the most important were the five between the meridians of 67 ° and 92 (see fig. 1), consisting of four quadrilateral figures and a trigon, each comprising several chains of triangles and some base- lines. This arrangement had the advantage of enabling the final reductions to be taken in hand as soon as convenient after the completion of any section, instead of being postponed until all were completed. It was subject, however, to the condition that the sections containing the best chains of triangles were to be first reduced; for, as all chains bordering contiguous sections would necessarily be " fixed "as a part of the section first reduced, it was obviously desirable to run no risk of impairing the best

chains by forcing them into adjustment with others of inferior quality. It happened that both the north-east and the south-west quadrilaterals contained several of the older chains ; their reduction was therefore made to follow that of the collateral sections containing the moderp chains.

But the reduction of each of these great sections was in itself a very formidable undertaking, necessitating some departure from a purely rigorous treatment. For the chains were largely composed of polygonal networks and not of single triangles only as assumed in the illustration, and therefore cognizance had to be taken of a

number of " side " and other geometrical equations of condition, which entered irregularly and caused great entanglement. Equa- tions 9 and 10 of the illustration are of a simple form because they have a single geometrical condition to maintain, the triangular, which is not only expressed by the simple and symmetrical equation $x+y+z = o$*, but — what is of much greater importance— recurs in a regular order of sequence that materially facilitates the general solution. Thus, though the calculations must in all cases be very numerous and laborious, rules can be formulated under which they can be well controlled at every stage and eventually brought to a successful issue. The other geometrical conditions of networks are expressed by equations which are not merely of a more complex form but have no regular order of sequence, for the networks pre- sent a variety of forms; thus their introduction would cause much entanglement and complication, and greatly increase the labour of the calculations and the chances of failure. Wherever, therefore, any compound figure occurred, only so much of it as was required to form a chain of single triangles was employed. The figure having previously been made consistent, it was immaterial what part was employed, but the selection was usually made so as to introduce the fewest triangles. The triangulation for final simultaneous reduction was thus made to consist of chains of single triangles only; but all the included angles were " fixed " simultaneously. The excluded angles of compound figures were subsequently har- monized with the fixed angles, which was readily done for each figure per se.*

This departure from rigorous accuracy was not of material im- portance, for the angles of the compound figures excluded from the simultaneous reduction had already, in the course of the several independent figural adjustments, been made to exert their full in- fluence on the included

angles. The figural adjustments had, how- ever, introduced new relations between the angles of different figures, causing their weights to increase caeteris paribus with the number of geometrical conditions satisfied in each instance. Thus, suppose w to be the average weight of the t observed angles of any figure, and n the number of geometrical conditions presented for satisfaction; then the average weight of the angles after adjustment

may betaken as w. . _ , the factor thus being 1-5 for a triangle,

1 '8 for a hexagon, 2 for a quadrilateral, 2-5 for the network around the Sironj base-line, &c.

In framing the normal equations between the indeterminate factors X for the final simultaneous reduction, it would have greatly added to the labour of the subsequent calculations if a separate weight had been given to each angle, as was done in the primary figural reductions; this was obviously unnecessary, for theoretical requirements would now be amply satisfied by giving equal weights to all the angles of each independent figure. The mean weight that was finally adopted for the angles of each group was therefore taken as

t

p being the modulus.

The second of the two processes for applying the method of minimum squares having been adopted, the values of the errors y and 2 of the angles appertaining to any, the pth, triangle were finally expressed by the following equations, which are derived from (10) by substituting u for the reciprocal final mean weight as above determined : —

Vp '

t(A

= ^[{2c v – a P

(11)

The following table gives the number of equations of condition and unknown quantities — the angular errors — in the five great sections of the triangulation, which were respectively included in the simultaneous general reductions and relegated to the sub- sequent adjustments of each figure per se;—

Simultaneous.

External Figural.

Equations.

Equations.

Section.

31

• .2

S

■ig

1

E

Side.

s3

*3**

I.

N.W. Quad. .

23

550

16,50

267

104

152

6

761

no

2.

S.E. Quad.

15

277

»3i

164

64

92

2

476

68

3-

N.E. Quad. .

49

573

1719

112

56

69

341

50

4-

Trigon.

22

303

009

192

79

IOI

2

S47

77

5-

S.W. Quad. .

24

172

«3

32

52

1

237

40

The corrections to the angles were generally minute, rarely ex- ceeding the theoretical probable errors of the angles, and therefore applicable without taking any liberties with the facts pf observa- tion.

Azimuth observations in connexion with the principal triangula- tion were determined by measuring the horizontal angle between a referring mark and a circumpolar star, shortly before . , . and after elongation, and usually at both elongations _f ”” **in order to eliminate the error of the star’s place. System- „**‘”’*’ atic changes of ” face ” and of the zero settings of the azimuthal circle were made as in the measurement of the principal angles; but the repetitions on each zero were more numerous; the azimuthal levels were read and corrections applied to the star observations for dislevelment. The triangulation was not adjusted, in the course of the final simultaneous reduction, to the astronomi- cally determined azimuths, because they are liable to be vitiated by local attractions; but the azimuths observed at about fifty stations around the primary azimuthal station, which was adopted as the origin of the geodetic calculations, were referred to that station, through the triangulation, for comparison with the primary azimuth. A table was prepared of the differences (observed at the origin — computed from a distance) between the primary and the geodetic azimuths; the differences were assumed to be mainly due to the local deflexions of the plumb-line and only partially to error in the triangulation, and each was multiplied by the factor

tangent of latitude of origin, P = .

tangent of latitude of comparing station in order that the effect of the local attraction on the azimuth ob- served at the distant station — which varies with the latitude and is =the deflexion in the prime vertical X the tangent of the latitude — might be converted to what it would have been had the station been situated in the same latitude as the origin. Each deduction was

given a weight, w, inversely proportional to the number of triangles connecting the station with the origin, and the most prob- able value of the error of the observed azimuth at the origin was taken as

[(observed— computed) p w] . .

*- [w] a 2);

the value of x thus obtained was — 1 • 1 “.

The formulae employed in the reduction of the azimuth observa- tions were as follows. In the spherical triangle PZS, in which P is the pole, Z the zenith and 5 thp star, the co-latitude PZ and the polar distance PS are known, and, as the angle at 5 is a right angle at the elongation, the hour angle and the azimuth at that time are found from the equations

cosP = tanP5cotPZ,

cosZ = cosP5sinP. The interval, SP, between the time of any observation and that of the elongation being known, the corresponding azimuthal angle, SZ, between the two positions of the star at the times of observa- tion and elongation is given rigorously by the following expression — tan SZ

2sin 2 *5P

cotPSsinPZsinPj 1 +tan 2 P5cos5P 4-sec 2 P5cotPsin5P j which is expressed as follows for logarithmic computation —

m tan Z cos 2 PS

(13).

SZ = -‘■

where m

■ ,

2 sin 2 — cosec 1

1 — n + I

»P

= 2 sin 2 PS sin 2 —, and

l = cot P sin SP; I, m, and n are tabulated.

Let A and B (fig. 4) be any two points the normals at which meet at C, cutting the sea-level at p and g; take Dq = Ap, then BD is

Height and Refraction.

*the difference of height; draw the tangents An and Bb at A and B, then aAB is the depression of B at A and bBA that of A at B; join AD, then BD is determined from the triangle A BD. The triangulation gives the distance between A and B at the sea-level, whence pq = c; thus, putting Ap, the height of A above the sea-level, = *H, and pCˆr,*

AD •<{+!£) < *4). Putting D a and Db for the actual depres sions at A and B, S for the angle at A, usually called the " subtended angle," and h for BD—*

S = h{D h -Da) (15),

and h = ADˆ-ˆ- (16).

cos Db v '

The angle at C being = Di,4-D a , 5 may

be expressed in terms of a single vertical

observations have been taken at only one

• -

Fig. 4.

angle and C when of the two points.

C, the "contained arc,"

p + v 'C— — cosec

2pv

1 " in seconds. Putting D' a

and D'b for the observed vertical angles, and a , fa for the amounts by which they are affected by refraction, D a = D' a +ˆ> a and Db = D' b + b ; tj> a and b may differ in amount, but as they

cannot be separately ascertained they are always assumed to be equal; the hypothesis is sufficiently exact for practical purposes when both verticals have been measured under similar atmospheric conditions. The retractions being taken equal, the observed verticals are substituted for the true in (15) to find 5, and the difference of height is calculated by (16) ; the third term within the brackets of (14) is usually omitted. The mean value of the refraction is deduced from the formula

4, = h{C-D' a +D' b)} (17).

An approximate value is thus obtained from the observations between the pairs of reciprocating stations in each district, and the corresponding mean "coefficient of refraction," s-C, is computed for the district, and is employed when heights have to be deter- mined from observations at a single station only. When either of the vertical angles is an elevation — E must be substituted for D in the above expressions. 1

2. Levelling

Levelling is the art of determining the relative heights of points on the surface of the ground as referred to a hypothetical surface which cuts the direction of gravity everywhere at right angles. When a line of instrumental levels is begun at the sea-level, a series of heights is determined corresponding to what would be found by perpendicular measurements upwards from the surface of water communicating freely with the sea in underground channels; thus the line traced indicates a hypothetical prolonga- tion of the surface of the sea inland, which is everywhere conformable to the earth's curvature.

The trigonometrical determination of the relative heights of points at known distances apart, by the measurements of their mutual vertical angles — is a method of levelling. But the method to which the term " levelling " is always applied is that of the direct determination of the differences of height from the readings of the lines at which graduated staves, held vertically over the points, are cut by, the horizontal plane which passes through the eye of the observer. Each method has its own advantages. The former is less accurate, but best suited for the requirements of a general geographical survey, to obtain the heights of all the more prominent objects on the surface of the ground, whether accessible or not. The latter may be conducted with extreme precision, and is specially valuable for the deter- mination of the relative levels, however minute, of easily accessible points,

however numerous, which succeed each other at short intervals apart; thus it is very generally undertaken pari passu with geographical surveys to furnish lines of level for ready reference as a check on the accuracy of the trigonometrical heights. In levelling with staves the measurements are always taken from the horizontal plane which passes through the eye of the observer; but the line of levels which it is the object of the operations to trace is a curved line, everywhere conforming to the normal curvature of the earth's surface, and deviating more and more from the plane of reference as the distance from the station of observation increases. Thus, either a correction for curvature must be applied to every staff reading, or the instru- ment must be set up at equal distances from the staves; the curvature correction, being the same for each staff, will then be eliminated from the difference of the readings, which will thus give the true difference of level of the points on which the staves are set up.

Levelling has to be repeated frequently in executing a long line of levels — say seven times on an average in every mile — and must be conducted with precaution against various errors. Instru mental errors arise when the visual axis of the telescope is not perpendicular to the axis of rotation, and when the focusing tube does not move truly parallel to the visual axis on a change of focus. The first error is eliminated, and the second avoided, by placing the instrument at equal distances from the staves; and as this procedure has also the advantage of eliminating the corrections for both curvature and refraction, it should invariably be adopted.

1 In topographical and levelling operations it is sometimes con- venient to apply small corrections to observations of the height for curvature and refraction simultaneously. Putting d for the distance, r for the earth's" radius, and k for the coefficient of refraction, and expressing the distance and radius in miles and the correction to height in feet, then correction for curvature = §d 2 ; correction for refraction = — f/cd 2 ; correction for both

Errors of staff readings should be guarded against by having the staves graduated on both faces, but differently figured, so that the observer may not be biased to repeat an error of the first reading in the second. The staves of the Indian survey have one face painted white with black divisions — feet, tenths and hundredths — from o to 10, the other black with white divisions from 5-55 to !5"55- Deflexion from horizontality may either be measured and allowed for by taking the readings of the ends of the bubble of the spirit-level and applying corresponding corrections to the staff readings, or be eliminated by setting the bubble to the same position on its scale at the reading of the second staff as at that of the first, both being equidistant from the observer.

Certain errors are liable to recur in a constant order and to accumulate to a considerable magnitude, though they may be too minute to attract notice at any single station, as when the work is carried on under a uniformly sinking or rising refraction- — from morning to midday or from midday to evening— or when the instru- ment takes some time to settle down on its bearings after being set up for observation. They may be eliminated (i.) by alternating the order of observation of the staves, taking the back staff first at one station and the forward first at the next; (ii.) by working in a circuit, or returning over the same line back to the origin; (iii.) by dividing a line into sections and reversing the direction of operation in alternate sections. Cumulative error, not eliminable by working in a circuit, may be caused when there is much northing or southing in the direction of the line, for then the sun's light will often fall endwise on the bubble of the level, illuminating the outer edge of the rim at the nearer end and the inner edge at the farther end, and so biasing the observer to take scale readings of edges which are not equidistant from the centre of the bubble; this introduces a tendency to raise the south or depress the north ends of lines of level in the northern hemisphere. On long lines, the employment of a second observer, working independently over the same ground as the first, station by station, is very desirable. The great lines are usually carried over the main roads of the country, a number of " bench marks " bging fixed for future reference. In the ordnance survey of Great Britain lines have been carried across from coast to coast in such a manner that the level of any common crossing point may be found by several independent lines. Of these points there are 166 in England, Scotland and Wales; the dis- crepancies met with at them were adjusted simultaneously by the method of minimum squares.

The sea-level is the natural datum plane for levelling opera- tions, more particularly in countries bordering on the ocean. The earliest surveys of coasts were made for the use ,. of navigators and, as it was considered very important that the charts should everywhere show the minimum depth of water which a vessel would meet with, low water of spring- tides was adopted as the datum. But this does not answer the requirements of a land survey, because the tidal range between extreme high and low water differs greatly at different points on coast-lines. Thus the generally adopted datum plane for land surveys is the mean sea-level, which, if not absolutely uniform all the world over, is much more nearly so than low water. Tidal observations have been taken at nearly fifty points on the coasts of Great Britain, which were connected by levelling operations; the local levels of mean sea were found to differ by larger magnitudes than could fairly be attributed to errors in the lines of level, having a range of 12 to 15 in. above or below the mean of all at points on the open coast, and more in tidal rivers. 2 But the general mean of the coast stations for England and

Wales was practically identical with that for Scotland. The observations, however, were seldom of longer duration than a fortnight, which is insufficient for an exact determination of even the short period components of the tides, and ignores the annual and semi- annual components, which occasionally attain considerable mag- nitudes. The mean sea-levels at Port Said in the Mediterranean and at Suez in the Red Sea have been found to be identical, and a similar identity is said to exist in the levels of the Atlantic and the Pacific oceans on the opposite coasts of the Isthmus of Panama. This is in favour of a uniform level all the world over; but, on the other hand, lines of level carried across the continent of Europe make the mean sea-level of the Mediterranean at Marseilles and Trieste from 2 to 5 ft. below that of the North Sea and the Atlantic at Amsterdam and Brest — a result which

2 In tidal estuaries and rivers the mean water-level rises above the mean sea-level as the distance from the open coast-line increases ; for instance, in the Hooghly river, passing Calcutta, there is a rise of 10 in. in 42 m. between Sagar (Saugor) Island at the mouth of the liver and Diamond Harbour, and a further rise of 20 in. in 43 m. between Diamond Harbour and Kidderpur.

it is not easy to explain on mechanical principles. In India various tidal stations on the east and west coasts, at which the mean sea-level has been determined from several years' observa- tions, have been connected by lines of level run along the coasts and across the continent; the differences between the results were in all cases due with greater probability to error generated in levelling over lines of great length than to actual differences of sea-level in different localities.

The sea-level, however, may not coincide everywhere with the geometrical figure which most closely represents the earth's Qeoidor surface, but may be raised or lowered, here and there, Deformed under the influence of local and abnormal attrac- Surface. t ions, presenting an equipotential surface — an ellip- soid or spheroid of revolution slightly deformed by bumps and hollows— which H. Bruns calls a " geoid." Archdeacon Pratt has shown that, under the combined influence of the positive attraction of the Himalayan Mountains and the negative attrac- tion of the Indian Ocean, the sea-level may be some 560 ft. higher at Karachi than at Cape Comorin; but, on the other hand, the Indian pendulum operations have shown that

there is a deficiency of density under the Himalayas and an increase under the bed of the ocean, which may wholly compensate for the excess of the mountain masses and deficiency of the ocean, and leave the surface undisturbed. If any bumps and hollows exist, they cannot be measured, instrumentally; for the instrumental levels will be affected by the local attractions precisely as the sea-level is, and will thus invariably show level surfaces even should there be considerable deviations from the geometrical figure. .

3. Topographical Surveys

The skeleton framework of a survey over a large area should be triangulation, although it is frequently combined with travers- ing. The method of filling in the details is necessarily influenced to some extent by the nature of the framework, but it depends mainly on the magnitude of the scale and the requisite degree of minutiae. In all instances the principal triangles and circuit traverses have to be broken down into smaller ones to furnish a sufficient number of fixed points and lines for the subsequent operations. The filling in may be performed wholly by linear measurements or wholly by direction intersections, but is most frequently effected by both linear and angular measure's, the former taken with chains and tapes and offset poles, the latter with small theodolites, sextants, optical squares or other reflect- ing instruments, magnetized needles, prismatic compasses and plane tables. When the scale of a survey is large, the linear and angular measures are usually recorded on the spot in a field- book and afterwards plotted in office; when small they are sometimes drawn on the spot on a plane table and the field-book is dispensed with.

In every country the scale is generally expressed by the ratio of some fraction or multiple of the smallest to the largest national units of length, but sometimes by the fraction which indicates the ratio of the length of a line on the paper to that of the correspond- ing line on the ground. The latter form is obviously preferable, being international and independent of the various units of length adopted by different nations (see Map). In the ordnance survey of Great Britain and Ireland and the Indian survey the double unit of the foot and the Gunter's link (= fAof a foot) are employed, the former invariably in the triangulation, the latter generally in the traversing and filling in, because of its convenience in calculations and measurements of area, a square chain of 100 Gunter's links being exactly one-tenth of an acre.

In the ordnance survey all linear measures are made with the Gunter's chain, all angular with small theodolites only; neither magnetized nor reflecting instruments nor plane tables are ever employed, except in hill sketching. As a rule the filling in is done by triangle-chaining only;

traverses with theodolite and chain are occasionally resorted to, but only when it is necessary to work round woods and hill tracts across which right lines cannot be carried.

Detail surveying by triangles is based on the points of the minor triangulation. The sides are first chained perfectly straight, all the points where the lines of interior detail cross the sides being fixed; the alignment is effected with a small theodolite, and marks are established at the crossing points and at any other

points on the sides where they may be of use in the subsequent operations. The surveyor is given a diagram of the triangulation, but no side lengths, as the accuracy of his chaining is tested by comparison with the trigonometrical values. Then straight lines are carried across the intermediate detail between the points established on the sides; they constitute the principal " cutting up or split lines"; their crossings of detail are marked in turn and straight lines are run between them. The process is continued until a sufficient number of lines and marks have been established on the ground to enable all houses, roads, fences, streams, railways, canals, rivers, boundaries and other details to be conveniently measured up to and fixed. Perpendicular offsets are limited to eighty and twenty links for the respective scales of 6 in. to a mile and j^n,.

When a considerable area has to be treated by traverses it is divided into a number of blocks of convenient size, bounded by roads, rivers or parish boundaries, and a " traverse on the meridian of the origin " is carried round the periphery of each block. Be- ginning at a trigonometrical station, the theodolite is set to circle reading 0° o' with the telescope pointing to the north, and at every ' forward " station of the traverse the circle is set to the same reading when the telescope is pointed at the " back " station as was obtained at the back station when the telescope was pointing to the forward one. When the circuit is completed and the theodo- lite again put up at the origin and set on the last back station with the appropriate circle reading, the circle reading, with the telescope again pointed to the first forward station, will be the same as at first, if no error has been committed. This system establishes a convenient check on the accuracy of the operations and enables the angles to be readily protracted on a system of lines parallel to the meridian of the origin. As a further check the traverse is connected with all contiguous trigonometrical stations by measured angles and distances. Traverses are frequently carried between the points already fixed on the sides of the minor triangles; the initial side is then adopted, instead of the meridian, as the axis of co-ordinates for the plotting, the telescope being pointed with circle reading 0° o' to 'either of the trigonometrical stations at the ex- tremities of the side.

The plotting is done from the field-books of the surveyors by a separate agency. Its accuracy is tested by examination on the ground, when all necessary addenda are made. The examiner —who should be surveyor, plotter and draughtsman— verifies the accuracy of the detail by intersections and productions and occasional direct measurements, and generally endeavours to cause the details under examination to prove the accuracy of each other rather than to obtain direct proof by remeasurement. He fixes con- spicuous trees and delineates the woods, footpaths, rocks, precipices, steep slopes, embankments, &c, and supplies the requisite infor- mation regarding minor objects to enable a draughtsman to make a perfect representation according to the scale of the map. In ex- amining a coast-line he delineates the foreshore and sketches the strike and dip of the stratified rocks. In tidal rivers he ascertains and marks the highest points to which the ordinary tides flow. The examiner on the 25-344 in- scale (= ss Vb) is required to give all necessary information regarding the parcels of ground of different character— whether arable, pasture, wood, moor, moss, sandy — defining the limits of each on a separate tracing if necessary. He has also to distinguish between turnpike, parish and occupation roads, to collect all names, and to furnish notes of military, baronial and ecclesiastical antiquities to enable them to be appropriately represented in the final maps. The latter are subjected to a double examination — first in the office, secondly on the ground; they are then handed over to the officer in charge of the levelling to have the levels and contour lines inserted, and finally to the hill sketchers, whose duty it is to make an artistic representation of the features of the ground.

In the Indian survey all filling in is done by plane-tabling on a basis of points previously fixed ; the methods differ simply in the extent to which linear measures are introduced to supplement the direction rays of the plane-table. When the scale of the survey is small, direct measurements of distance are rarely made and the filling is usually done wholly by direction intersections, which fix all the principal points, and by eye-sketching; but as the scale is increased linear measures with chains and offset poles are introduced to the extent that may be desirable. A sheet of drawing paper is mounted on cloth over the face of the plane-table; the points, previously fixed by triangulation or otherwise, are projected on it— the collateral meridians and parallels, or the rectangular co- ordinates, when these are more convenient for employment than the spherical, having first been drawn; the plane-table is then ready for .«se. Operations are begun at a fixed point by aligning with the sight rule on another fixed point, which brings the meridian line of the table on that of the station. The magnetic needle may now be placed on the table and a position assigned to it for fu t ure reference. Rays are drawn from the station point on the table to all conspicuous objects around with the aid of the sight rule. The table is then

taken to other fixed points, and the process of ray-drawing is repeated at each; thus a number of objects, some °' whlc " ma .y become available as stations of observation, are fixed. Additional stations may be established by setting up the

table on a ray, adjusting it on the back station— that from which the ray was drawn— and then obtaining a cross intersection with the sight rule laid on some other fixed point, also by interpolating between three fixed points situated around the observer. The magnetic needle may not be relied on for correct orientation, but is of service in enabling the table to be set so nearly true at the outset that it has to be very slightly altered afterwards. The error in the setting is indicated by the rays from the surrounding fixed points intersecting in a small triangle instead of a point, and a slight change in azimuth suffices to reduce the triangle to a point, which will indicate the position of the station exactly. Azimuthal error being less apparent on short than on long lines, interpolation is best performed by rays drawn from near points, and checked by rays drawn to distant points, as the latter show most strongly the magnitude of any error of the primary magnetic setting. In this way, and by self-verificatory traverses " on the back ray " between fixed points, plane-table stations are established over the ground at appropriate intervals, depending on the scale of the survey; and from these stations all surrounding objects which the scale permits of being shown are laid down on the table, sometimes by rays only, sometimes by a single ray and a measured distance. The general configuration of the ground is delineated simultaneously. In checking and examination various methods are followed. For large scale work in plains it is customary to run arbitrary lines across it and make an independent survey of the belt of ground to a dis- tance of a few chains on either side for comparison with the original survey; the smaller scale hill topography is checked by examination from commanding points, and also by traverses run across the finished work on the table.

4. Geographical Surveying

The introduction by mechanical means of superior graduation in instruments of the smaller class has enabled surveyors to effect Base good results more rapidly, and with less expenditure

Measure- on equipment and on the staff necessary for transport meats. ; n t

jj e ne i c j j than was formerly possible. The 12-in. theodolite of the present day, with micrometer adjustments to assist in the reading of minute subdivisions of angular graduation, is found to be equal to the old 24-in. or even 36-in. instruments. New Methods for the measurement of bases have largely superseded the laborious process of measurement by the align- ment of " compensation " bars, though not entirely independent of them. The Jaderin apparatus, which consists of a wire 25 metres in length stretched along a series of cradles or supports, is the simplest means of measuring a base yet devised; and experi- ments with it at the Pulkova observatory show it to be capable of producing most accurate results. But there is' a measurable defect in the apparatus, owing to the liability of the wires to change in length under variable conditions of temperature. It is therefore considered necessary, where base measurements for geodetic purposes are to be made with scientific exactness, that the Jaderin wires should be compared before and after use with a standard measurement, and this standard is best attained by the use of the Brunner, or Colby, bars. The direct process of measurement is not extended to such lengths as formerly, but from the ends of a shorter line, the length of which has been exactly determined, the base is extended by a process of triangulation.

There are vast areas in which, while it is impossible to apply the elaborate processes of first-class or " geodetic " triangulation, Secondary it is nevertheless desirable that we should rapidly Triangula- acquire such geographical knowledge as will enable tioa. us to i av (j own political boundaries, to project roads

and railways, and to attain such exact knowledge of special localities as will further military ends. Such surveys are called by various names— military surveys, first surveys, geographical surveys, &c. ; but, inasmuch as they are all undertaken with the same end in view, i.e. the acquisition of a sound topographical map on various scales, and as that end serves civil purposes as much as military, it seems appropriate to designate them geo- graphical surveys only.

The governing principles of geographical surveys are rapidity and economy. Accuracy is, of course, a recognized necessity, but Principles t ˆ e term must a ˆ m ˆ ° * a certain elasticity in geo- whkn graphical work which is inadmissible in geodetic

govern Geo- or cadastral functions. It is obviously foolish to graphical eX p en d as much money over the elaboration of topo- graphy in the unpeopled sand wastes which border the Nile valley, for instance (albeit those deserts may be full of

topographical detail), as in the valley itself — the great centre of Egyptian

cultivation, the great military highway of northern Africa. On the other hand, the most careful accuracy attainable in the art of topographical delineation is requisite in illustrating the nature of a district which immediately surrounds what may prove hereafter to be an important military position. And this, again, implies a class of technical accuracy which is quite apart from the rigid attention to detail of a cadastral survey, and demands a much higher intelligence to compass.

The technical principles of procedure, however, are the same in geographical as in other surveys. A geographical survey must equally start from a base and be supported by triangulation, or at least by some process analogous surrey ‘ to triangulation, which will furnish the necessary skeleton on which to adjust the topography so as to ensure a complete and homogeneous map.*

This base may be found in a variety of ways. If geodetic triangulation exists in the country, that triangulation should of course include a wide extent of secondary determina- _. _ tions, the fixing of peaks and points in the landscape far away to either flank, which will either give the data for further extension of geographical triangulation, or which may even serve the purposes of the map-maker without any such extension at all. In this manner the Indus valley series of the triangulation of India has furnished the basis for surveys across Afghanistan and Baluchistan to the Oxus and Persia.

Should no such preliminary determinations of the value of one or two. starting-points be available, and it becomes necessary to measure a base and to work ab initio, the Jaderin wire apparatus may be adopted. It is cheap (cost about £50), and far more accurate than the process of measuring either by any known ” subtense ” system (in which the distance is computed from the angle subtended by a bar of given length) or by measurement with a steel chain. This latter method may, however, be adopted so long as the base can be levelled, repeated measurements obtained, and the chain compared with a standard steel tape before and after use.

The initial data on which to start a comprehensive scheme of triangulation for a geographical survey are: (1) latitude; ,,,,,.,,, ,,,,,,,, (2) longitude; (3) azimuth; and (4) altitude, and wn ‘ a,uata – this data should, if possible, be obtained pari passu with the measurement of the base.

A 6-in. transit theodolite, fitted with a micrometer eyepiece and extra vertical wires, is the instrument par excellence for work of this nature; and it possesses the advantages of portability and comparative cheapness.

The method of using it for the purposes of determining values for (1) and (3), i.e. for ascertaining the latitude of one end of the base and the azimuth of the other end from it, are , fully explained in Major Talbot s paper on Military ˆ a ,, e . anU Surveying in the Field (J. Mackay & Co., Chatham, Az,muth – 1889), which is not a theoretical treatise, but a practical illustration of methods employed successfully in the geographical survey of a very large area of the Indian transfrontier districts. It should be noted that these observations are not merely of an initial character. They should be constantly repeated as the survey advances, and under certain circumstances (referred to subsequently) they require daily repetition.

The problems connected with the determination of (2) longitude have of late years occupied much of the attention of scientific surveyors. No system of absolute determination is accurate _ enough for combination with triangulation, Loa Z ,tu < ie – as affording a check on the accuracy of the latter, and the spaces in the world across which geographical surveying has yet to be carried are rapidly becoming too restricted to admit of any liability to error so great as is invariably involved in such determinations. It is true that absolute values derived from the observation of lunar distances, or occultations, have often proved to be of the highest value; but there remains a degree of uncertainty (possibly due to the want of exact knowledge of the moon's position at any in- stant of time), even when observations have been taken with all the advantages of the most elaborate arrangements and the most scientific manipulation, which renders the roughest form of tri- angulation more trustworthy for ascertaining differential longitude than any comparison between the absolute determination of any two points. Consequently, if an absolute determination is neces- sary it should be made once, with all possible care, and the value obtained should be carried through the whole scheme of triangula- tion. It rests with the surveyor to decide at what point of the general survey this value can best be introduced, provided he

can estimate the probable longitudinal value of his initial base within a few minutes of the truth. A final correction in longi- tude is constant, and can easily be applied. With reference to such absolute determinations of longitude, Major S. Grant’s ” Dia- gram for determining the parallaxes in declination and right ascen- sion of a heavenly body and its application to the prediction of occultations ” (Roy. Geog. Soc. Journ. for June 1896) will afford the observer valuable assistance.

But the recognized method of obtaining a longitude value in recent geographical fields is by means of the telegraph — a method so simple and so accurate that it may be applied with Telegraph advantage even to the checking of long lines of tri- 7. rm " angulation. No effort should be spared to introduce a ons ' telegraphic longitude value into any scheme of geo-

graphical survey. It involves a clear line and an instructed observer at each end, but, given these desiderata, the interchange of time signals sufficient for an accurate record only requires a night or two of clear weather. But inasmuch as rigorous accuracy in the observations for time is necessary, it would be well for the surveyor in the field to be provided with a sidereal chronometer. Under all other circumstances demanding time observations (and they are an essential supplement to every class of astronomical determina- tion) an ordinary mean time watch is sufficient.

With reference to altitude determinations, there has lately been observable amongst surveyors a growing distrust of barometric results and a reaction in favour of direct levelling, or of differential results derived from direct observation with the theodolite (or clinometer) rather than from comparison of those determined by aneroid or hypsometer. It is indeed impossible to eliminate the uncertainties due to the variable atmospheric pressure introduced by " weather " changes from any barometric record. A mercurial barometer advantageously placed and carefully observed at fixed diurnal intervals throughout a comparatively long period may give fairly trustworthy results if a constant comparison can be maintained throughout that period with similar records at sea- level, or at any fixed altitude. Yet observations extending over several months have been found to yield results which compare most unfavourably with those attained during the process of triangulation by continued lines of vertical observations from point to point, even when the uncertainties of the correction for refraction are taken into account. Errors introduced into vertical observa- tions by refraction are readily ascertainable and comparatively unimportant in their effect. Those due to variable atmospheric conditions on barometric records are still indefinite, and are likely to remain so. The result has been that the latter have been rele- gated to purely local conditions of survey, and that whenever practicable the former are combined with the general process of triangulation.

*The conditions under which geographical surveys can be carried out are of infinite variety, but those conditions are rare which absolutely preclude the possibility of any such under whtch survevs at au – Perfect freedom of action, and the aeographi- recognition of such work as a public benefit, are not cal Surveys often attainable. Far more frequently the oppor- * r J t carrled tunity offers itself to the surveyor with the progress of a political mission or the advance of an army in the field. It cannot be too strongly*

insisted on that geographical surveys are functions of both civil and military operations. Very much of such work is also possible where a country lies open to exploration, not actively hostile, but yet unsettled and adverse to strangers. The geographical surveyor has to fit himself to all such conditions, and it may happen that a continuous, compre- hensive scheme of triangulation as a map basis is impossible. Under such circumstances other expedients must be adopted to ensure that accuracy of position which cannot be attained by the topographer unaided.

During a long-continued march extending through a line of country generally favourable for survey purposes— a condition which frequently occurs — when forward movement is Route a neccss ; tVj alK j an average of 10 tc 15 m. of daily

urvey og. p r0 g ress ; s maintained, one officer and an assistant can measure a daily base, obtain the necessary astronomical deter- minations, triangulate from both ends so as to fix the azimuth and distance from the base of points passed yesterday and those to be passed to-morrow ; project those points on to the topographer's- plane-table to be ready for the next day's work, and check each day's record by latitude; whilst a second assistant runs the topo- graphy through the route, basing his work on points so fixed, on the scale of 2 or 4 m. to the inch, according to the amount of detail. Occasionally a hill can be reached in the course of the day's march, or during a day's halt, which will materially assist to consolidate and strengthen the series.

It may. however, frequently be impossible to maintain a con- sistent series of triangulation for the " control " (to use an American:

expression) of the topography, even when the configuration of the land surface is favourable. In such circumstances the method of observing azimuths to points situated approximately near to the probable route in advance, and of deter- Triangula- mining the exact position of those points in latitude J-° D /"\ as one by one they are passed by the moving force, on ™ ' has been found to yield results which are quite sufficiently accurate to ensure the final adjustment of the entire route geography to any subsequent system of triangulation which may be extended through the country traversed, without serious discrepancies in compilation. It is,' however, obvious that as accuracy depends greatly on the exact determination of absolute latitude values, this method is best adapted to a route running approximately parallel to a meridian, and is at complete disadvantage in one running east and west. Where the conditions are favourable to its application, it has been adopted with most satisfactory results; as, for instance, on the route between Seistan and Herat, where the initial data for the Russo- Afghan boundary delimitation was secured by this means, and

more recently on the boundary surveys of western Abyssinia.

When an active enemy is in the field, and topographical opera- tions are consequently restricted, it is usually possible to obtain the necessary control " (i.e. a few well-fixed points determined by triangulation) for topography in advance y: ary . of a position securely held. With a very little assist- aeo S ra P y- ance from the triangulator an experienced topographer will be able to sketch a field of action with far more certainty and rapidity than can be attained by the ordinary so-called "military surveyor," and he may, in favourable circumstances, combine his work with that of the military balloonist in such a way as to represent every feature of importance, even in a widely extended position held by the enemy. The application of the camera and of telephotography to the evolution of a map of the enemy's position is well understood in France (vide Colonel Laussedat's treatise on " The History of Topography "), as it is in Russia, and we must in future expect that all advantages of an expert and professional map of the whole theatre of a campaign will lie in the hands of the general who is best supplied with professional experts to compass them. Geo- graphical surveying and military surveying are convertible terms, and it is important to note that both equally require the services of a highly trained staff of professional topographers. During the war between Russia and- Turkey (1877-78) upwards of a hundred professional geographical surveyors were pressed into military service, besides the regular survey staff which is attached to every army corps. Triangulation was carried across the Balkans by eight different series; every pass and every notable feature of the Balkans and Rhodope Mountains was accurately surveyed, as well as the plains intervening between the Balkans and Constantinople. Surveys on a scale which averaged about 1 m. = 1 in. were carried up to the very gates of the city.

The use of trie camera as an accessory to the plane table (i.e. the art of photo-topography) has been applied almost exclusively to geographical or exploratory surveys. The camera is specially prepared, resting on a graduated horizontal ™ ™""> P°- plate which is read with verniers, and with a small- P a P"y- telescope and vertical arc attached. Cross wires are fixed in the focal plane of the camera, which is also fitted with a magnetic needle and a scale so placed that the magnetic declination, the scale, and the intersection of the cross wires are all photographed on the plate containing the view. A panoramic group of views (slightly overlapping each other) is taken at each station, and the angular distance between each is measured on the horizontal circle. The process of constructing the horizontal projection from these perspective views involves plotting the skeleton tri- angulation, as obtained from the primary triangulation, with the theodolite (which precedes the photo-topographical survey), or from the horizontal plate of the camera. fcWith several stations so plotted, the view

from each of them of a certain portion of the country may be projected on the plane of the map, and salient points seen in perspective may be fixed by intersection.

The field work of a photo-topographic party consists primarily in execution of a triangulation by the usual methods which would be adapted to any ordinary topographical survey. To this is added a secondary triangulation, which is executed pari passu with the photography for the purpose of fixing the position of the camera stations. From such stations alone the topographical details are finally secured with the aid of the phonographs. Great care is necessary in the selection of stations that' "Will be suitable both for the extension of triangulation and the purposes of closely overlooking topographical details. In order to obtain means for correctly orienting the photographic views when plotting the map from them, it is usual, whilst making the exposures, to observe two or three points in each view with the alt-azimuth attached to the camera, in order to ascertain the horizcxntal and vertical angles between them. It is also advisable to keep an outline sketch of the landscape for the purpose of recording names of roads, buildings, &c.

The process of projecting the map from the photographs involves the use of two drawing-boards, on one of which the graphical determination of the points is made, and on the other the details

of the final topography are drawn. The principal trigonometrical points are plotted on both these boards by their co-ordinates, and the camera stations either by their co-ordinate values or by intersection. Intermediate points, selected as appearing on two or more negatives, are then projected by intersection. The horir zontal projection of a panorama consisting of any given number of plates is a regular geometrical figure of as many sides as there are plates, enclosing an inscribed circle whose radius is the focal length of the camera. Having correctly plotted the position of one plate, or view, with reference to the projected camera station by means of the angle observed to some known point within it, it is possible to plot the position of the rest of the series, with reference to the camera station and the orienting triangulation point, by the angular differences which are dependent on the number of photographs forming the sides of the geometrical figure. Having

secured the correct orientation of the horizontal plan, direction lines are drawn from the plotted camera station to points photographed, and the position of topographical features is fixed by intersection from two or more camera stations.

The plane-table is the instrument, par excellence, on which the geographical surveyor must depend for the final mapping of the physical features of the country under survey. The methods of adapting the plane-table to geographical requirements differ with those varying climatic con- ditions which affect its construction. In the comparatively dry climate of Asiatic Russia or of the United States, where errors arising from the unequal expansion of the plane-table board are insignificant, the plane-table is largely made use of as a triangulat- ing instrument, and is fitted with slow-motion screws and with other appliances for increasing the certainty and the accuracy of observations. Such an adaptation of the plane-table is found to be impossible in India, where the great alternations of tempera- ture, no less than of atmospheric humidity, tend to vitiate the ac- curacy of the projections on the surface of the board by the unequal effects of expansion in the material of which it is composed. The Indian plane-table is of the simplest possible construction, and it is never used in connexion with the stadia for ascertaining the distances of points and features of the ground (as is the case in America); and in place of the complicated American alidade, with its telescope and vertical arc, a simple sight rule is used, and a chirometer for the measurement of vertical angles. The Indian plane-table approximates closely in general construction to the " Gannett " pattern of America, which is specially constructed for exploratory surveys.

The scale on which geographical surveys are conducted is neces- sarily small. It may be reckoned at from I : 500000 to I : 125000, or from 1 in. = 8 m. to 1 in. = 2 m. The I in. = 1 m. Scale. scale is the normal scale for rigorous topography, and

although it is impossible to fix a definite line beyond which geo- graphical scales merge into topographical (for instance, the i-in. scale is classed as geographical in America whenever the con- tinuous line contour system of ground representation gives place to hachuring), it is convenient to assume generally that geographical scales of mapping are smaller than the i-in. scale.

On the smaller scales of I : 500000 or I : 250000 an experienced geographical surveyor, in favourable country, will complete an area of mapping from day to day which will practically cover out-turn. near [y a n t jj at f a n s w ithin his range of vision; and he will, in the course of five or six months of continuous travelling (especially if provided with the

necessary "control") cover an area of geographical mapping illustrating all important topographical features representable on the small scale of his survey, which may be reckoned at tens of thousands of square miles. But inasmuch as everything depends upon his range of vision, and the constant occurrence of suitable features from which to extend it, there is obviously no guiding rule by which to reckon his probable out-turn. The same uncertainty which exists about " out-turn " manifestly exists about " cost." The normal cost of the I-in. rigorous topo- Cost graphical survey in India, when carried over districts

which present an average of hills, plains and forests, may be estimated as between 35 to 40 shillings a square mile. This compares favourably with the rates which obtain in America over districts which probably present far more facilities for survey- ing than India does, but where cheap native labour is unknown. The geographical surveyor is simply a topographer employed on a smaller scale survey. His equipment and staff are somewhat less but, on the other hand, his travelling expenses are greater. It is found that, on the whole, a fair average for the cost of geo- graphical work may be struck by applying the square of the unit of scale as a factor to I-in. survey rates; thus a quarter-inch scale survey (i.e. 4 m. to the in.), should be one-sixteenth of the cost per mile of the i-in. survey over similar ground. A geographical recon- naissance on the scale of I : 500000 (8 m. = 1 in.) should be one-sixty- fourth of the square-mile cost of the I-in. survey, &c. This is, indeed, a close approximation to the results obtained on the Indian transfrontier, and would probably be found to hold good for British colonial possessions.

In processes of map reproduction an invention for the reproduction of drawings by a method of direct printing on zinc without the intervention of a negative has proved of great value. By this

method a considerable quantity of work has been turned out in much less time and at a much lower cost than would be mapR^pro- involved by any process of photo-zincography or iu ^ loa \ lithography. A large number of cadastral maps have been reproduced at about one-ninth of the ordinary cadastral rate.

For the rapid reproduction of geographical maps in the field in order to meet the requirements of a general conducting a campaign, or of a political officer on a boundary mission, no better method has been evolved than the ferrotype process, by which blue prints can be secured in a few hours from a drawing of the original on tracing-cloth. The sensitized paper and printing-frame are far more portable than any photo-lithographic apparatus. Sketches illustrative of a field of action may be placed in the hands of the general commanding on the day following the action, if the

weather conditions are favourable for their development. The necessity for darkness whilst dealing with the sensitized material is a draw- back, but it may usually be arranged with blankets and waterproof sheets when a tent is not available.

5. Traversing and Fiscal, or Revenue, Surveys Traversing is a combination of linear and angular measures in equal proportions; the surveyor proceeds from point to point, measuring the lines between them and at each point the angle between the back and forward lines; he runs his lines as much as possible over level and open ground, avoiding obstacles by work- ing round them. The system is well suited for laying down roads, boundary lines, and circuitous features of the ground, and is very generally resorted to for filling in the interior details of surveys based on triangulation. It has been largely employed in certain districts of British India, which had to be surveyed in a manner to satisfy fiscal as well as topographical requirements; for, the village being the administrative unit of the district, the boundary of every village had to be laid down, and this necessi- tated the survey of an enormous number of circuits. Moreover, the traverse system was better adapted for the country than a network of triangulation, as the ground was generally very flat and covered with trees, villages, and other obstacles to distant vision, and was also devoid of hills and other commanding points of view. The principal triangulation had been carried across it, but by chains executed with great difficulty and expense, and therefore at wide intervals apart, with the intention that the intermediate spaces should be provided with points as a basis for the general topography in some other way. A system of traverses was obviously the best that could be adopted under the circumstances, as it not only gave all the village boundaries, but was practically easier to execute than a network of minor triangulation.

In the Indian survey the traverses are executed in minor circuits following the periphery of each village and in major circuits comprising groups of several villages; the former are done with 4″ to 6″ theodolites and a single chain, the latter with 7″ to 10″ theodolites and a pair of chains, which are compared frequently with a standard. The main circuits are connected with every station of the principal triangulation within reach. The meridian of the origin is determined by astronomical obser- vations; the angle at the origin between the meridian and the next station is measured, and then at each of the successive stations the angle between the immediately preceding and follow- ing stations; summing these together, the ” inclinations ” of the lines between the stations to the meridian of the origin are succes- sively determined. The distances between the stations, multi- plied by the cosines and sines of the inclinations, give the distance of each station from the one preceding it, resolved in the direc- tions parallel and perpendicular respectively to the meridian of the origin ; and the algebraical sums of these

quantities give the corresponding rectangular co-ordinates of the successive stations relatively to the origin and its meridian. The area included in any circuit is expressed by the formula

area = half algebraical sum of products (xi + xi) (y%— yi) (18), Xi, yi being the co-ordinates of the first, and ac 2j y 2 those of the second station, of every line of the traverse in succession round the circuit.

Of geometrical tests there are two, both applicable at the close of a circuit : the first is angular, viz. the sum of all the interior angles of the described polygon should be equal to twice as marc,

right angles as the figure has sides, less four; the second is linear, viz. the algebraical sum of the x co-ordinates and that- of the y co-ordinates should each be = o. The astronomical test is this: at any station of the traverse the azimuth of a referring mark may be determined by astronomical observations; the inclination of the line between the station and the referring mark to the meridian of the origin is given by the traverse, the two should differ by the convergency of the meridians of the station and the origin. In practice the angles of the traverse are usually adjusted to satisfy their special geometrical and astronomical tests in the first instance, and then the co-ordinates of the stations are calculated and adjusted by corrections applied to the longest, that the angles may be least disturbed, as no further corrections are given them.

The exact value of the convergence, when the distance and azi- Conver- muth of the second astronomical station from the first geacyof are known, is that of B — (tt + A) of equation (5); Meridians, but, as the first term is sufficient for a traverse, we have

cosecl *" convergency = x tap X ,

substituting x, the co-ordinate of the second station perpendicular to the meridian of the origin, for c sin A.

The co-ordinates of the principal stations of a trigonometrical survey are usually the spherical co-ordinates of latitude and longi- tude ; those of a traverse survey are always rectangular, plane for a small area but spherical for a large one. It is often necessary, therefore, for purposes of com- parison and check at stations common to surveys of both descriptions, to

convert either rectangular co- ordinates into latitudes and longitudes, or vice versa, in order that the errors of traverses may be dispersed by proportion over the co-ordinates of the traverse stations, if desired, or adjusted in the final mapping. The latter is generally all that is necessary, more particularly when the traverses are referred to successive trigonometrical stations as origins, as the operations are being extended, in order to prevent any large accumulation of error. Similar conversions are also frequently necessary in map projections. The method of effecting them will now be indicated.

Let A and B be any two points, Aa the meridian of A, Bb the parallel of latitude of B; then Ab, Bb will be their differences in _ . latitude and longitude; from B draw BP

y aDS/ ° r,na ‘ perpendicular to Aa; then AP, BP tioa of Co- w jjj k e tne rec tangular spherical co-ordin- ordinales. ates of B relatively t0 A _ p ut BP = x, AP = y, the arc P6 = i), and the arc Bb, the differ- ence of longitude, = w ; also let X„, Xj and X p be the latitudes of A, B, and the point P, p p the radius of curvature of the meridian, and v p the normal ter- mmating in the axis minor for the latitude X p ; and Fig. 5. j et po b e tne radius of curvature for the latitude “s(Xo+X|0- Then, when the rectangular co-ordinates are given, we have, taking A as the origin, the latitude of which is known,

Adjustment of Tra- verses to Triangula- tioa.

Xp — Aa

+ — cosec 1 ‘ po

1; = tan X„ cosec 1”;

2p p v p

■X = — cosec 1″ — 7j;w = Po

“(19).

(20).

of Ur.visked Point.

— sec(X(,(- Jri) cosec 1″ And, when the latitude and longitude are given, we have l

“=(f)S sin2X > sini “l

y = Po(Xi,-X„ +7))sin 1″ [x = aic,cos (Xj-f- ˆi))sin i”J

When a hill peak or other prominent object has been observed from a number of stations whose co-ordinates are already fixed, the Co-ordinates conver S in g ra Y s ma Y be projected graphically, and from an examination of their several intersections the most probable position of the object may be obtained almost as accurately as by calculations by the method of least squares, which are very laborious and out of place for the deter- mination of a secondary point. The following is a description of the application of this method to points on a plane surface in the calculations of the ordnance survey. Let si, s 2 , . . . be stations whose rectangular co-ordinates, x u x 2 , ■ . . perpendicular, and yi, v 2 , . . . parallel, to the meridian of the origin are given; let ai,

1 In the Indian survey, tables are employed for these calculations which give the value of 1″ of arc in feet on the meridian, and on each parallel of latitude, at intervals of 5′ apart ; also a corresponding table of arc-versines (Pb) of spheroidal arcs of parallel {Bb) i° in length, from which the arc-versines for shorter or longer arcs are obtained proportionally to the squares of the arcs; x is taken as the difference of longitude converted into linear measure.

indicate the directions of north, south, east and west. Calculate accurately (y P — Ji) tan a u and compare with (x p —Xi); the differ- ence will show how far the direction of the ray from Si falls to the east or west of p. Or calculate {x p — Xi) cot ai, and compare with (yp — yi) to nn d ˆow far the direction falls to the north or south of p. Set off the distance on the corresponding axis of p, and through

Fig. 6. the point thus fixed draw the direction Oi with a common protractor. All the other rays around p may be drawn in like manner; they will intersect each other in a number of points, the centre of which may be adopted as the most probable position of P. The co-ordinates of P will then be readily obtained from those of £ ± the distances on the meridian and perpendicular. In the annexed diagram (fig. 6) P is supposed to have been observed from five stations, giving as many intersecting rays, (1, 1), (2, 2), . . . ; there are ten points of intersection, the mean position of which gives the true position of P, the assumed position being p. The advantages claimed for the method are that, the bearings being independent, an erroneous bearing may be redrawn without disturbing those that are correct; similarly new bearings may be introduced without disturbing previous work, and observations from a large number of stations may be readily utilized, whereas, when calculation is resorted to, observations in excess of the minimum number required are frequently rejected because of the labour of computing them.

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(T. H. H.) 6. Nautical Surveying*

The great majority of nautical surveys are carried out by H.M. surveying vessels under the orders of the hydrographer of the admiralty. Plans of harbours and anchorages are also received from H.M. ships in commission on foreign stations, but surveys of an extended nature can hardly be executed except by a ship specially fitted and carrying a trained staff of officers. The introduction of steam placed means at the disposal of nautical surveyors which largely modified the con- ditions under which they had to work in the earlier days of sailing vessels, and it has enabled the ship to be used in various ways previously impracticable. The heavy draught of ships in the present day, the growing increase of ocean and coasting traffic all over the world, coupled with the desire to save distance by rounding points of land and other dangers as closely as possible, demand surveys on larger scales and in greater detail than was formerly necessary; and to meet these modern requirements resurveys of many parts of the world are continually being called for. Nautical surveys vary much in character according to the nature of the work, its importance to nav^a^'on, and the time available. The elaborate methods and rigid accuracy of a triangulation for geodetic purposes on shore are unnecessary,

lastni' meats.

and are not attempted; astronomical observations at intervals in an

extended survey prevent any serious accumulation of errors consequent upon a triangulation which is usually carried out with instruments, of which an 8-in. theodolite is the largest size used, whilst 5-in. theodolites generally suffice, and the sextant is largely employed for the minor triangulation. The scales upon which nautical surveys are plotted range from \ in. to 2 or 3 in. to the sea-mile in coast surveys for the ordinary purposes of navigation, according to the requirements; for detailed surveys of harbours or anchorages a scale of from 6 to 12 in. is usually adopted, but in special cases scales fis large as 60 in. to the mile are used.

The following are the principal instruments required for use in the field : Theodolite, 5 in., fitted with large telescope of high power, with coloured shades to the eye-piece for observing the sun for true bearings. Sextant, 8 in. observing, stand and artificial horizon. Chronometers, eight box, and two or three pocket, are usually supplied to surveying vessels. Sounding sextants, differing from ordinary sextants in being lighter and handier. The arc is cut only to minutes, reading to large angles of as much as 140°, and fitted with a tube of bell shape so as to include a large field in the telescope, which is of high power. Measuring chain 100 ft. in length. Ten-foot pole for coast-lining, is a light pole carrying two oblong frames, 18 in. by 24 in., covered with canvas painted white, with a broad vertical black stripe in the centre and fixed on the pole 10 ft. apart. Station-pointer, an instru- ment in constant requisition either for sounding, coast-lining, or topographical plotting, which enables an observer's position to be fixed by taking two angles between three objects suitably situated. The movable legs being set to the observed angles, and placed on the plotting sheet, the chamfered edges of the three legs are brought to pass through the points observed. The centre of the instrument then indicates the observer's position. Heliostats, for reflecting the rays of the sun from distant stations to indicate their position, are invaluable. The most convenient form is Galton's sun signal ; but an ordinary swing mirror, mounted to turn horizontally, will answer the purpose, the flash being directed from a hole in the centre of the mirror. Pocket aneroid barometer, required for topographical purposes. Prismatic compass, patent logs (taffrail and harpoon), Lucas wire sounding machine (large and small size), and James's submarine sentry are also required. For chart-room use are pro- vided a graduated brass scale, steel straight-edges and beam com- passes of different lengths, rectangular vulcanite or ivory protractors of 6-in. and 12-in. length, and semicircular brass protractors of 10-in, radius, a box of good mathematical drawing instruments, lead weights, drawing boards and mounted paper.

Every survey must have fixed objects which are first plotted on the sheet, and technically known as " points." A keen eye is „ . , required for natural marks of all kinds, but these must Beacons" °^ cn De supplemented by

whitewash marks, cairns, tripods or bushes covered with white canvas or calico, and flags, white or black according to background. On low coasts, flagstaff's upwards of 80 ft. high must sometimes be erected in order to get the necessary range of vision, and thereby avoid the evil of small triangles, in working through which errors accumulate so rapidly. A barling spar 35 ft. in length, securely stayed and carrying as a topmast (with proper guys) a somewhat lighter spar, lengthened by a long bamboo, will give the required height. A lixed beacon can be erected in shallow water, 2 to 3 fathoms in depth, by constructing a tripod of spars about 45 ft. long. The heads of two of them are lashed together, and the heels kept open at a fixed distance by a plank about 27 ft. long, nailed on at about 5 ft. above the heels of the spars. These are taken out by three boats, and the third tripod leg lashed in position on the boats, the heel in the opposite direction to the other two. The first two legs, weighted, are let go together ; using the third leg as a prop, the tripod is hauled into position and secured by guys to anchors, and by addi- tional weights slipped down the legs. A vertical pole with bamboo can now be added, its weighted heel being on the ground and lashed to the fork. On this a flag 14 ft. square may be hoisted. Floating beacons can be made by filling up flush the heads of two 27-gallon casks, connected by nailing a piece of thick plank at top and bottom. A barling spar passing through holes cut in the planks between the casks, projecting at least 20 ft. below and aoout 10 ft. above them, is toggled securely by iron pins above the upper and below the lower plank. To the upper part of the spar is lashed a bamboo, 30 to 35 ft. long, carrying a black flag 12 to 16 ft. square, which will be visible from the ship 10 m. in clear weather. The ends of a span of 5-in. chain are secured round the spar above and below the casks with a long link travelling upon it, to which the cable is attached by a slip, the end being carried up and lightly stopped to the bamboo below the flag. A wire strop, kept open by its own stiffnesses fitted to the casks for convenience in slipping and picking up. The beacon is moored with chain and rope half as long again as the depth of water. Beacons have been moored by sounding line in as great depth as 3000 fathoms with a weight of 100 lb.

"Fixing.'

There is nothing in a nautical survey which requires more attention" than the " fix "; a knowledge of the principles involved is essential in order to select properly situated objects. The method of fixing by two angles between three fixed points is generally known as the "two-circle method," but there are really three circles involved. The " station-pointer " is the instrument used for plotting fixes. Its contraction depends upon the fact that angles subtended by the chord of a segment of a circle measured from any point in its circumference are equal. The lines joining three fixed points form the chords of segments of three circles, each of which passes through the

observer's position and two of the fixed points. The more rectangular the angle at which the circles intersect each other, and the more sensitive they are, the better will be the fix; one condition is useless without the other. A circle is " sensitive " when the angle between the two objects responds readily to any small movement of the observer towards or away from the centre of the circle passing through the observer's position and the objects. This is most markedly the case when one object is very close to the observer and the other very distant, but not so when both objects are distant. Speaking generally, the sensi- bility of angles depends upon the relative distance of the two objects from the observer, as well as the absolute distance of the nearer of the two. In the accompanying diagram A, B, C are the objects, and X the observer. Fig. 7 shows the circle passing through C, B and X, cutting the circle ABX at a good angle, and therefore fixing X independently of the circle CAX, which is less sensitive than either of the other two. In fig. 8 the two first circles are very sensitive, but being nearly tangential

Fig. 7.

Fig. 8. they give no cut with each other. The third circle cuts both at right angles; it is, however, far less sensitive, and for that reason if the right and left hand objects are both distant the fix must be bad. In such a case as this, because the angles CXB, BXA are both so sensitive, and the accuracy of the fix depends on the precision with which the angle CXA is measured, that angle should be observed direct, together with one of the other angles composing it. Fig. 9 represents a case where the points are badly disposed, approaching the condition known as " on the circle," passing through the three points. All three circles cut one another at such a fine angle as to give a very poor fix. The centre of the station-pointer could be moved considerably without materially affecting the coincidence of the legs with the three points. To avoid a bad fix the following rules are safe: —

1. Never observe objects of which the central is the furthest unless it is very distant relatively to the other two, in which case the fix is admis- sible, but must be used with caution.

2. Choose objects disposed as follows: (a) One outside object distant and the other two near, the angle between the two near

objects being not less than 30 or more than 140°. The amount of the angle

between the middle and distant object is immaterial. (b) The three objects nearly in a straight line, the angle between any two being not less than 30°. (c) The observer's position being inside the triangle formed by the objects.

A fix on the line of two points in transit, with an angle to a third point, becomes more sensitive as the distance between the transit points increases relatively to the distance between the front transit point and the observer; the more nearly the angle to the third point approaches a right angle, and the nearer it is situated to the observer, the better the fix. If the third point is at a long distance, small errors either of observation or plotting affect the result largely. A good practical test for a fix is afforded by noticing whether a very slight movement of the centre of the station-pointer will throw one or more of the points away from the leg. If it can be moved without appreciably disturbing the coincidence of the leg and all three points, the fix is bad.

Tracing-paper answers exactly the same purpose as the station- pointer. The angles are laid off from a centre representing the position, and the lines brought to pass through the points as before. This entails more time, and the angles are not so accurately measured with a small protractor. Nevertheless this has often to be used, as when points are close together on a small scale the central part of the station-pointer will often hide them and prevent the use of the instrument. The use of tracing-paper permits any number of angles to different points to be laid down on it, which under certain conditions of fixing is sometimes a great advantage.

Although marine surveys are in reality founded upon triangula- tion and measured bases of some description, yet when plotted Bases irregularly the system of triangles is not always apparent. The triangulation ranges from the rough triangle of a running survey to the carefully formed triangles of detailed surveys. The measured base for an extended survey is provisional only, the scale resting ultimately mainly upon the astronomical positions observed at its extremes. In the case of a plan the base is absolute. The main triangulation, of which the first triangle contains the measured base as its known side, establishes a series of points known as main stations, from which and to which angles are taken to fix other stations. A sufficiency of secondary stations and marks enables the detail of the chart to be filled in between them. The points embracing the area to be worked on, having been plotted, are transferred to field boards, upon which the detail of the work in the field is plotted; when complete the work is traced and re-transferred to the plotting-sheet, which is then inked in as the finished chart, and if of large extent it is graduated on the gnomonic projection on the astronomical positions of two points situated near opposite corners of the chart.

The kind of base ordinarily used is one measured by chain on flat ground, of § to 15 m. in length, between two points visible from one another, and so situated that a triangulation can be readily extended from them to embrace other points in the survey forming well-conditioned triangles. The error of the chain is noted before leaving the ship, and again on returning, by cdhi- paring its length with the standard length of 100 ft. marked on the ship's deck. The correction so found is applied to obtain the final result. If by reason of water intervening between the base stations it is impossible to measure the direct distance between them, it is permissible to deduce it by traversing.

A Masthead Angle Base is useful for small plans of harbours, &c, when circumstances do not permit of a base being measured on shore. The ship at anchor nearly midway between two base stations is the most favourable condition for employing this method. Theodolite reading of the masthead with its elevation by sextant observed simultaneously at each base station (the mean of several observations being employed) give the necessary data to calculate the distance between the base stations from the two distances resulting from the elevation of the masthead and the simultaneous theodolite-angles between the masthead and the base stations. The height of the masthead may be temporarily increased by secur- ing a spar to extend 30 ft. or so above it, and the exact height from truck to netting is found by tricing up the end of the measuring

chain. The angle of elevation should not be diminished below about 1° from either station.

Base by Sound. — The interval in seconds between the flash and report of a gun, carefully noted by counting the beats of a watch or pocket chronometer, multiplied by the rate per second at which sound travels (corrected for temperature) supplies a means of obtaining a base which is sometimes of great use when other methods are not available. Three miles is a suitable distance for such a base, and guns or small brass Cohorn mortars are fired alternately from either end, and repeated several times. The arithmetical mean is not strictly correct, owing to the retardation of the sound against the wind exceeding the acceleration when travelling with

2tt'

it; the formula used is therefore T = — p -, where T is the mean

interval required, t the interval observed one way, t' the interval the other way. The method is not a very accurate one, but is suffi- ciently so when the scale is finally determined by astronomical observations, or for sketch surveys. The measurement should be across the wind if possible, especially

if guns can only be fired from one end of the base. Sound travels about 1090 ft. per second at a temperature of 32° F., and increases at the rate of 1-15 ft. for each degree above that temperature, decreasing in the same proportion for temperatures below 32 °.

Base by Angle of Short Measured Length. — An angle measured by sextant between two well-defined marks at a carefully measured distance apart, placed at right angles to the required base, will give a base for a small plan.

Astronomical Base. — The difference of latitude between two stations visible from each other and nearly in the same meridian, combined with their true bearings, gives an excellent base for an extended triangulation; the only drawback to it is the effect of local attraction of masses of land in the vicinity on the pendulum, or, in other words, on the mercury in the artificial horizon. The base stations should be as far apart as possible, in order to minimize the effect of any error in the astronomical observations. The obser- vation spots would not necessarily be actually at the base stations, which would probably be situated on summits at some little distance in order to command distant views. In such cases each observation spot would be connected with its corresponding base station by a subsidiary triangulation, a short base being measured for the pur- pose. The ship at anchor off the observation spot frequently affords a convenient means of effecting the connexion by a masthead angle base and simultaneous angles. If possible, the observation spots should be east or west of the mountain stations from which the true bearings are observed.

If the base stations A and B are so situated that by reason of distance or of high land intervening they are invisible from one another, but both visible from some main station C between them, when the main triangulation is completed, the ratio of the sides AC, BC can be determined. From this ratio and the observed angle ACB, the angles ABC, BAC can be found. The true bearing of the lines AC or BC being known, the true bearing of the base stations A and B can be deduced.

Extension of Base. — A base of any description is seldom long enough to plot from directly, and in order to diminish errors of plotting it is necessary to begin on the longest side possible so as to work inwards. A short base measured on flat ground will give a better result than a longer one measured over inequalities, provided that the triangulation is carefully extended by means of judiciously selected triangles, great care being taken to plumb the centre of each station. To facilitate the extension of the base in as few triangles as possible, the base should be placed so that there are two stations., one on each side of it, subtending angles at them of from 30 to 40°, and the distances between which, on being calculated in the triangles of the quadrilateral so formed, will constitute the first extension of

the base. Similarly, two other stations placed one on each side of the last two will form another quadrilateral, giving a yet longer side, and so on.

The angles to be used in the main triangulation scheme must be very carefully observed and the theodolite placed exactly over the centre of the station. Main angles are usually repeated several times by resetting the vernier g ™, ailo ” at at intervals equidistant along the arc, in order to eliminate instrumental errors as well as errors of observation. The selection of an. object suitable for a zero is important. It should, if possible, be another main station at some distance, but not so far or so high as to be easily obscured, well defined, and likely to be permanent. Angles to secondary stations and other marks need not be repeated so many times as the more important angles, but it is well to check all angles once at least. Rough sketches from all stations are of great assistance in identifying objects from different points of view, the angles being entered against each in the sketch.

False Station.—- When the theodolite cannot for any reason be placed over the centre of a station, if the distance be measured

225 Jncrematf’

Fig. io.

13b

and the theodolite reading of it be noted, the observed angles may be reduced to what they would be at the centre of the station. False stations have frequently to be made in practice; a simple rule to meet all cases is of great assistance to avoid the possibility of error in applying the correction with its proper sign. This may very easily be found as follows, without having to bestow a moment’s thought beyond applying the rule, which is a matter of no small gain in, time when a large number of angles have to be corrected.

Rule. — Put down the theodolite reading Which it is required to correct (increased if necessary by 360°), and from it subtract the theodolite reading of the centre of the station. Call this remainder 8. With as a ” course ” and the number of feet from the theodolite to the station as a ” distance,” enter the traverse table and take out the greater increment if $

lies between 45 and 135 , or between 225 and 315 , and the lesser increment for other angles. The accompanying dia- gram (fig. 10) will assist the memory. Refer this increment to the " table of subtended angles by various lengths at different distances " (using the distance of the object observed) and find the corresponding correction in arc, which mark + or — according as 8 is under or over 180 . Apply this correction to the observed theodolite angle. A " table of subtended angles " is unnecessary if the formula

... , number of feet subtended X 34 . . ■ ˆ ,

Angle in seconds = 3ˆ— j — jˆ — t—- n— be used instead.

distance 01 object in sea-miles

Convergency of Meridians. — The difference of the reciprocal true bearings between two stations is called the " convergency." The formula for calculating it is : Conv. in minutes = dist. in sea-miles X sin. Merc, bearing X tan. mid. lat. Whenever true bearings are used in triangulation, the effect of convergency must be con- sidered and applied. In north latitudes the southerly bearing is the greater of the two, and in south latitudes the northerly bearing. The Mercatorial bearing between two stations is the mean of their reciprocal true bearings.

After a preliminary run over the ground to note suitable positions for main and secondary stations on prominent head- Triaagu- lands, islands and summits not too far back from lated Coast the coast, and, if no former survey exists, to make • Survey. at ˆ e sa me time a rough plot of them by compass and patent log, a scheme must be formed for the main triangulation with the object of enclosing the whole survey in as few triangles as possible, regard being paid to the limit of vision of each station due to its height, to the existing meteoro- logical conditions, to the limitations imposed by higher land intervening, and to its accessibility. The triangles decided upon should be well-conditioned, taking care not to introduce an angle of less than 30 to 35°, which is only permissible when the two longer sides of such a triangle are of nearly equal length, and when in the calculation that will follow one of these sides shall be derived from the other and not from the short side. In open country the selection of stations is comparatively an easy matter, but in country densely wooded the time occupied by a triangulation is mainly governed by the judicious selection of stations quickly reached, sufficiently elevated to command distant views, and situated on summits capable of being readily cleared of trees in the required direction, an all-round view being, of course, desirable but not always attainable. The positions of secondary stations will also generally be decided upon during the preliminary reconnaissance. The

object of these stations is to break up the large primary triangles into triangles of smaller size, dividing up the distances between the primary stations into suitable lengths; they are selected with a view to greater accessibility than the latter, and should therefore usually be near the coast and at no great elevation. Upon shots from these will depend the position of the greater number of the coast-line marks, to be erected and fixed as the detailed survey of each section of the coast is taken in hand in regular order. The nature of the base to be used, and its position in order to fulfil the con- ditions specified under the head of Bases must be considered, the base when extended forming a side of one of the main triangles. It is immaterial at what part of the survey the base is situated, but if it is near one end, a satisfactory check on the accuracy of the triangulation is obtained by comparing the length of a

side at the other extreme of the survey, derived by calculation through the whole system of triangles, with its length deduced from a check base measured in its vicinity. It is generally a saving of time to measure the base at some anchorage or harbour that requires a large scale plan. The triangulation involved in extending the base to connect it with the main triangulation scheme can thus be utilized for both purposes, and while the triangulation is being calculated and plotted the survey of the plan can be proceeded with. True bearings are observed at both ends of the survey and the results subsequently compared. Astronomical observations for latitude are obtained at observa- tion spots near the extremes of the survey and the meridian distance run between them, the observation spots being connected with the primary triangulation; they are usually disposed at intervals of from 100 to 150 m., and thus errors due to a tri- angulation carried out with theodolites of moderate diameter do not accumulate to any serious extent. If the survey is greatly extended, intermediate observation spots afford a satis- factory check, by comparing the positions as calculated in the triangulation with those obtained by direct observation.

Calculating the Triangulation. — The triangles as observed being tabulated, the angles of each triangle are corrected to bring their sum to exactly 180 . We must expect to find errors in the triangles of as much as one minute, but under favourable conditions they may be much less. In distributing the errors we must consider the general skill of the observer, the size of his theodolite relatively to the others, and the conditions under which his angles were observed; failing any particular reason to assign a larger error to one angle than to another, the error must be divided equally, bearing in mind that an alteration in the small angle will make more difference in the resulting position than in either of the other two, and as it approaches 30 (the limit of a receiving angle) it is well to change it but very slightly in the absence of any strong reason to the contrary. The length of base being determined, the sides of all the triangles involved are calculated by the

ordinary rules of trigonometry. Starting from the true bearing observed at one end of the survey, the bearing of the side of each triangle that forms the immediate line of junction from one to the other is found by applying the angles necessary for the purpose in the respective triangles, not forgetting to apply the convergency between each pair of stations when reversing the bearings. The bearing of the final side is then compared with the bearing obtained by direct observa tion at that end of the survey. The difference is principally due to accumulated errors in the triangulation; half of the difference is then applied to the bearing of each side. Convert these true bearings into Mercatorial bearings by applying half the convergency between each pair of stations. With the lengths of the connecting sides found from the measured base and their Mercatorial bearing, the Mercatorial bearing of one observation spot from the other is found by middle latitude sailing. Taking the observed astronomical positions of the observation spots and first reducing their true difference longitude to departure, as measured on a spheroid from

the formula Dep. = T. D. long. ?”■ ft. in I m. of lo ng. h .

no. ft. in 1 m. of lat. d. lat. and dep. the Mercatorial true bearing and distance between the observation spots is calculated by middle latitude sailing, and compared with that by triangulation and measured base. To adjust any discrepancy, it is necessary to consider the probable error of the observations for latitude and meridian’ distance ; within those limits the astronomical positions may safely be altered in order to harmonize the results; it is more important to bring the bearings into close agreement than the distance. From the amended astronomical positions the Mercatorial true bearings and distance between them are re-calculated. The difference between this Mercatorial bearing and that found from the triangulation and measured base must be applied to the bearing of each side to get the final corrected bearings, and to the logarithm of each side of the triangulation as originally calculated must be. added or sub- tracted the difference between the logarithms of the distance of the amended positions of the observation spots and the same distance by triangulation.

Calculating Intermediate Astronomical Positions. — The latitude and longitude of any intermediate main station may now be calculated from the finally corrected Mercatorial true bearings and lengths of sides. The difference longitude so found is what it , would be if measured on a true sphere, whereas we require it as measured on a spheroid, which is slightly less. The correction

= d. long. — ■— ‘• must therefore be subtracted; or the true

difference longitude may be found direct from the formula

dep. — , ‘ ■ — n ‘• From the foregoing it is seen that

v no. ft. in I m. of long. & a

in a triangulation for hydrographical purposes both the bearings

of the sides and their lengths ultimately depend almost entirely upon the astronomical observations at the extremes of the survey ; the observed true bearings and measured base are consequently more in the nature of checks than anything else. It is obvious, therefor?, that the nearer together the observation spots, the greater effect will a given error in the astronomical positions have upon the length and direction of the sides of the triangulation, and in such cases the bearings as actually observed must not be altered to any large extent when a trifling change in the astronomical positions might perhaps effect the required harmony. For the reasons given under Astronomical Base, high land near observation spots may cause very false results, which may often account for discrepancies when situated on opposite sides of a mountainous country.

Great care is requisite in projecting on paper the points of a survey. The paper should be allowed to stretch and shrink “lottin as ˆ Pl eases until it comes to a stand, being exposed to the air for four or five hours daily, and finally well flattened out by being placed on a table with drawing boards placed over it heavily weighted. If the triangulation has been calculated beforehand throughout, and the lengths of all the different sides have been found, it is more advantageous to begin plotting by distances rather than by chords. The main stations are thus got down in less time and with less trouble, but these are only a small proportion of the points to be plotted, and long lines must be ruled between the stations as zeros for plotting other points by chords. In ruling these lines care must be taken to draw them exactly through the centre of the pricks denoting the stations, but, however carefully drawn, there is liability to slight error in any line projected to a point lying beyond the distance of the stations between which the zero line is drawn. In plotting by distances, therefore, all points that will subsequently have to be plotted by chords should lie well within the area covered by the main triangulation. Three distances must be measured to obtain an intersection of the arcs cutting each other at a sufficiently broad angle; the plotting of the main stations once begun must be completed before distortion of the paper can occur from change in the humidity of the

atmosphere. Plotting, whether by distance or by chords, must be begun on as long a side as possible, so as to plot inwards, or with decreasing distances. In plotting by chords it is impor- tant to remember in the selection of lines of reference (or zero lines), that that should be preferred which makes the smallest angle with the line to be projected from it, and of the angular points those nearest to the object to be projected from them.

Irregular Methods of Plotting. — In surveys for the ordinary purposes of navigation, it frequently happens that a regular cystem of triangulation cannot be carried out, and recourse must be had to a variety of devices; the judicious use of the ship in such cases is often essential, and with proper care excellent results may be obtained. A few examples will best illustrate some of the methods used, but circumstances vary so much in every survey that it is only possible to meet them properly by studying each case as it arises, and to improvise methods. Fixing a position by means of the " back-angle " is one of the most ordinary expedients. Angles having been observed at A, to the station B, and certain other fixed points of the survey, C and D for instance ; if A is shot up from B, at which station angles to the same fixed points have been observed, then it is not necessary to visit those points to fix A. For instance, in the triangle ABC, two of the angles have been observed, and there- fore the third angle at C is known (the three angles of a triangle being equal to 180), and it is called the " calculated or back-angle from C." A necessary condition is that the receiving angle at A, between any two lines (direct or calculated), must be sufficiently broad to give a good cut ; also the points from which the " back-angles " are calculated should not be situated at too great distances from A, relatively to the distance between A and B. A station may be ylotted by laying down the line to it from some other station, and lien placing on tracing-paper a number of the angles taken at it, including the angle to the station from which it has been shot up. If the points to which angles are taken are well situated, a good position is obtained, its accuracy being much strengthened by being able to plot on a line to it, which, moreover, forms a good zero line for laying off other angles from the station when plotted. Sometimes the main stations must be carried on with a point plotted by only two angles. An effort must be made to check this subsequently by getting an " angle back " from stations dependent upon it to some old well-fixed point; failing this, two stations bc : ng plotted with two angles, pricking one and laying down the line to the other will afford a check. A well-defined mountain peak, far inland and never visited, when once it is well fixed is

often invaluable in carrying on an irregular triangulation, as it may remain visible when all other original points of the survey have disappeared, and " back-angles " from it may be continually obtained, or it may be used for plotting on true bearing lines of it. In plotting the true bearing of such a peak, the convergency must be found and applied to get the reversed

bearing, which is then laid down from a meridian drawn through it; or the reversed bearing of any other line already drawn through the peak being known, it may simply be laid down with that as a zero. A rough position of the spot from which the true bearing was taken must be assumed in order to calculate the convergency. Fig. 1 1 will illustrate the foregoing remarks. A and B are astronomical observation spots at the extremes of a survey, from both of which the high, inaccessible peak C is visible. D, E, F are intermediate stations; A and D, D and E, E and F, F and B being respectively visible from each other. G is visible from A and D, and C is visible from all stations. The latitudes of A and B and meridian distance between them being determined, and the true bear- ing of C being observed from both

observation spots, angles are observed at all the stations. Calcu- lating the spheroidal correction (from the formula, correction = d. long. cos2 mid – 'at. \ and at jd; n g j t to t h e true (or chronometric)

difference longitude between A and B to obtain the spherical d. long.; with this spherical d. long, and the d. lat., the Meif- catorial true bearing and distance is found by middle latitude sailing (which is an equally correct but shorter method than by spherical trigonometry, and may be safely used when dealing with the distances usual between observation spots in nautical surveys). The convergency is also calculated, and the true bearing of A from B and B from A are thus determined. In the plane triangle ABC the angle A is the difference between the calculated bearing ot B and the observed bearing of C from A ; similarly angle B is the difference between calculated bearing of A and observed bearing of C from B. The distance AB having been also calculated, the side AC is found. Laying down AC on the paper on the required scale, D is plotted on its direct shot from A, and on the angle back from C, calculated in the triangle ACD. G is plotted on the direct shots from A and D, and on the angle back from C, calculated either in the triangle ACG or GCD. The perfect intersection of the three lines at G assures these four points being correct. E, F and B are plotted in a similar manner. The points are now all plotted, but they depend on calculated angles, and except for the first four points we have no check whatever either on the accuracy of the angles observed in the field or on the plotting. Another well-defined object in such a position, for instance as Z, visible from three or more stations, would afford the necessary check, if lines laid off to it from as many stations as possible gave a good intersection. If no such point, however, exists, a certain degree of check on the angles observed is derived by applying the sum of all the calculated angles at C to the true bearing of A from C (found by reversing observed bearing of C from A with convergency applied), which will give the bearing of B from C. Reverse this bearing with convergency applied, and compare it with the observed bearing of C from B. If the discrepancy is but small, it will be a

strong presumption in favour of the substantial accuracy of the work. If the calculated true bearing of B from A be now laid down, it is very unlikely that the line will pass through B, but this is due to the discrepancy which must always be expected between astronomical positions and trian- gulation. If some 01 the stations between A and B require to be placed somewhat closeiy to one another, it may be desirable to obtain fresh true bearings of C instead of carrying on the original bearing by means of the calculated angle.

In all cases of irregular plotting the ship is very useful, especially If she is moored taut without the swivel, and angles are observed from the bow. Floating beacons may also assist an irregular triangulation.

Surveys of various degrees of accuracy are included among sketch surveys. The roughest description is the ordinary running survey, when the work is done by the ship steaming along the coast, fixing points, and sketching in the coast-line by bearings and angles, relying for her position upon her courses and distances as registered by patent log, necessarily regardless of the effect of wind and current and errors of steerage. At the other extreme comes the modified running survey, which in point of practical accuracy falls little short of that attained by irregular triangulation. Some of these modifications will be briefly noticed. A running survey of a coast-line between two harbours, that have been surveyed inde- pendently and astronomically fixed, may often be carried out

Sketch Surveys.

by fixing the ship on the points already laid down on the harbour surveys and shooting up prominent intermediate natural objects, assisted possibly by theodolite lines from the shore stations. Theodolite lines to the ship at any of her positions are particu- larly valuable, and floating beacons suitably placed materially increase the value of any such work. A sketch survey of a coast upon which it is impossible to land may be well carried out by dropping beacons at intervals of about ib m., well out from the land and placed abreast prominent natural objects called the " breastmarks," which must be capable of recognition from the beacons anchored off the next " breastmark " on either side. The distance between the beacons is found by running a patent log both ways, noting the time occupied by each run; if the current has remained constant, a tolerably good result can be

obtained. At the first beacon, angles are observed between the second beacon and the two " breastmarks," an " intermediate " mark, and any other natural object which will serve as " points." At the second beacon, angles are observed between the first beacon and the same objects as before. Plotting on the line of the two beacons as a base, all the points observed can be pricked in on two shots. At a position about midway between the beacons, simultaneous angles are observed to all the points and laid off on tracing-paper, which will afford the necessary check, and the foundation is thus laid for filling in the detail of coast-line, topography, and soundings off this particular stretch of coast in any detail desired. Each section of coast is complete in itself on its own base; the weak point lies in the junction of the different sections, as the patent log bases can hardly be expected to agree precisely, and the scales of adjacent sections may thus be slightly different. This is obviated, as far as possible, by fixing on the points of one section and shooting up those of another, which will check any great irregularity of scale creeping in. The bearing is preserved by getting occasional true bearing lines at the beacons of the most distant point visible. Space does not here permit of dwelling upon the details of the various pre- cautions that are necessary to secure the best results the method is capable of; it can only be stated generally that in all cases of using angles from the ship under weigh, several assistants are necessary, so that the principal angles may be taken simul- taneously, the remainder being connected immediately after- wards with zeros involving the smallest possible error due to the ship not being absolutely stationary, these zeros being included amongst the primary angles. When close to a beacon, if its bearing is noted and the distance in feet obtained from its elevation, the angles are readily reduced to the beacon itself. Astronomical positions by twilight stars keep a check uoon the work.

Sketch Surveys by Compass Bearings and Vertical Angles. — In the case of an island culminating in a high, well-defined summit visible from all directions, a useful and accurate method is to steam round it at a sufficient distance to obtain a true horizon, stopping to make as many stations as may be desirable, and fixing by compass bearing of the summit and its vertical angle. The height is roughly obtained by shooting in the summit, from two positions on a patent log base whilst approaching it. With this approximate height and Lecky's vertical danger angle tables, each station may be plotted on its bearing of the summit. From these stations the island is shot in by angles between its tangents and the summit, and angles to any other natural features, plotting the work as we go on any convenient scale which must be con- sidered only as provisional. On completing the circuit of the island, the true scale is found by measuring the total distance in inches on the plotting-sheet from the first to the last station, and dividing it by the distance in miles between them as shown by patent log. The final

height of the summit bears to the rough height used in plotting the direct proportion of the provisional scale to the true scale. This method may be utilized for the sketch survey of a coast where there are well-defined peaks of sufficient height at convenient intervals, and would be superior to an ordinary running survey. From positions of the ship fixed by bearings and elevations of one peak, another farther along the coast is shot in and its height determined; this second peak is then used in its turn to fix a third, and so on. The smaller the vertical angle the more liability there is to error, but a glance at Lecky's tables, will show what effect an error of say i ' in altitude will produce for any given height and distance, and the limits of distance must depend upon this consideration.

Surveys of Banks out of Sight of Land. — On striking shoal soundings

Coast- lining.

unexpectedly, the ship may either be anchored at once and the shoal sounded by boats starring round her, using prismatic com- pass and masthead angle; or if the shoal is of large extent and may be prudently crossed in the ship, it is a good plan to get two beacons laid down on a bearing from one another and patent log distance of 4 or 5 m. With another beacon (or mark-boat, carrying a large black flag on a bamboo 30 ft. high) fixed on this base, forming an equilateral triangle, and the ship anchored as a fourth point, soundings may be carried out by the boats fixing by station-pointer. The ship's position is determined by observations of twilight stars.

In a detailed survey the coast is sketched in by walking along it, fixing by theodolite or sextant angles, and plotting by tracing- paper or station-pointer. A sufficient number of fixed marks along the shore afford a constant check on the minor coast-line stations, which should be plotted on, or checked by, lines from one to the other wherever possible to do so. When impracticable to fix in the ordinary way, the ten-foot pole may be used to traverse from one fixed point to another. With a coast fronted by broad drying, coral reef or flats over which it is possible to walk, the distance between any two coast-line stations may be found by measuring at one of them the angle subtended by a known length placed at right angles to the line joining the stations. There is far less liability to error if the work is plotted at once on the spot on field board with the fixed points pricked through and circled in upon it; but if circumstances render it necessary, the angles being registered and sketches made of the bits of coast hetween the fixes on a scale larger than that of the chart, they may be plotted after-wards; to do this satisfactorily, however, requires the surveyor to appreciate instinctively exactly what angles are necessary at the time. It is with the high-water line that the coast-liner is concerned, delineating its

character according to the admiralty symbols. The officer sounding off the coast is responsible for the position of the dry line at low-water, and on large scales this would be sketched in from a small boat at low-water springs. Heights of cliffs, rocks, islets, &c, must be inserted, either from measurement or from the formula,

*h ‘ ht i f t = al>g * e °f elevation in seconds X distance in miles, eig n ee ˆ*

and details of topography close to the coast, including roads, houses and enclosures, must be shown by the coast-liner. Rocks above water or breaking should be fixed on passing them. Coast- line may be sketched from a boat pulling along the shore, fixing and shooting up any natural objects on the beach from positions at anchor.

The most important feature of a chart is the completeness with which it is sounded. Small scale surveys on anything less than one inch to the mile are apt to be very misleading; „ .. such a survey may appear to have been closely sounded, ‘

but in reality the lines are so far apart that they often fail to disclose indications of shoal-water. The work of sounding may be proceeded with as soon as sufficient points for fixing are plotted; but off an intricate coast it is better to get the coast- line done first. The lines of soundings are run by the boats parallel to one another and perpendicular to the coast at a dis- tance apart which is governed by the scale; five lines to the inch is about as close as they can be run without overcrowding; if closer lines are required the scale must generally be increased. The distance apart will vary with the depth of water and the nature of the coast; a rocky coast with shallow water off it and projecting points will need much closer examination than a steep-to coast, for instance. The line of prolongation of a point under water will require special care to ensure the fathom lines being drawn correctly. If the soundings begin to decrease when pulling off-shore it is evidence of something suspicious, and intermediate lines of soundings or lines at right angles to those previously run should be obtained. Whenever possible lines of soundings should be run on transit lines; these may often be picked up by fixing when on the required line, noting the angle on the protractor between the line and some fixed mark on the field board, and then placing the angle on the sextant, reflecting the mark and noting what obiects are id line at that angle. On

large scale surveys whitewash marks or flags should mark the ends of the lines, and for the back transit marks natural objects may perhaps be picked up; if not, they must be placed in the required positions. The boat is fixed by two angles, with an occasional third angle as a check; the distance between the fixes is dependent upon the scale of the chart and the rapidity with which the depth alters; the 3, 5 and 10 fathom lines should always be fixed, allowing roughly for the tidal reduction. The nature of the bottom must be taken every few casts and recorded. It is best to plot each fix on the sounding board at once, joining the fixes by straight lines and numbering them for identification. The tidal reduction being obtained, the reduced soundings are written in the field-book in red underneath each sounding as originally noted; they are then placed in their proper position on the board between the fixes. Suspicious ground should be closely examined; a small nun buoy anchored on the shoal is useful to guide the boat while trying for the least depth. Sweep- ing for a reported pinnacle rock may be resorted to when sounding fails to discover it. Local information from fishermen and others is often most valuable as to the existence of dangers. Up to depths of about 15 fathoms the hand lead-line is used from the boats, but beyond that depth the small Lucas machine for wire effects a great saving of time and labour. The deeper soundings of a survey are usually obtained from the ship, but steamboats with wire sounding machines may assist very materi- ally. By the aid of a steam winch, which by means of an endless rounding line hauls a 100-lb lead forward to the end of the lower boom rigged out, from which it is dropped by a slipping apparatus which acts on striking the water, soundings of 40 fathoms may be picked up from the sounding platform aft, whilst going at a speed of 45 knots. In deeper water it is quicker to stop the ship and sound from aft with the wire sounding machine. In running long lines of soundings on and off shore, it is very essential to be able to fix as far from the land as possible. Angles will be taken from aloft for this purpose, and a few floating beacons dropped in judiciously chosen positions will often well repay the trouble. A single fixed point on the land used in conjunc- tion with two beacons suitably placed will give an admirable' fix. A line to the ship or her smoke from one or two theodolite stations on shore is often invaluable; if watches are compared, observations may be made at stated times and plotted after- wards. True bearings of a distant fixed object cutting the line of position derived from an altitude of the sun is another means of fixing a position, and after dark the true bearing of a light may be obtained by the time azimuth and angular dis- tance of a star near the prime vertical, or by the angular distance of Polaris in the northern hemisphere.

A very large percentage of the bugbears to navigation denoted

by vigias 1 on the charts eventually turn out to have no ex-

istence, but before it is possible to expunge them a

ˆ as ‘ large area has to be examined. No-bottom soundings are but little use, but the evidence of positive soundings should be conclusive. Submarine banks rising from great depths necessarily stand on bases many square miles in area. Of recent years our knowledge of the angle of slope that may be expected to occur at different depths has been much extended. From depths of upwards of 2000 fathoms the slope is so gradual that a bank could hardly approach the surface in less than 7 m. from such a sounding; therefore anywhere within an area of at least 1 50 sq. m. all round a bank rising from these depths, a sounding must show some decided indications of a rise in the bottom. Under such circumstances, soundings at intervals of 7 m., and run in parallel lines 7 m. apart, enclosing areas of only 50 sq. m. between any four adjacent soundings, should effectually clear up the ground and lead to the discovery of any shoal; and in fact the soundings might even be more widely spaced. From depths of 1500 and 1000 fathoms, shoals can scarcely occur within 35 m. and 2 m. respectively; but as the depth decreases the angle of slope rapidly increases, and a shoal might occur within three-quarters of a mile or even half a mile of such a

1 A Spanish word meaning ” look-out,” used of marks on the chart signifying obstructions to navigation.

sounding as 500 fathoms. A full appreciation of these facts will indicate the distance apart at which it is proper to place soundings in squares suitable to the general depth of water. Contour lines will soon show in which direction to prosecute the search if any irregularity of depth is manifested. When once a decided indication is found, it is not difficult to follow it up by paying attention to the contour lines as developed by suc- cessive soundings. Discoloured water, ripplings, fish jumping or birds hovering about may assist in locating a shoal, but the sub- marine sentry towed at a depth of 40 fathoms is here invaluable, and may save hours of hunting. Reports being more liable to errors of longitude than of latitude, a greater margin is necessary in that direction. Long parallel lines east and west are prefer- able, but the necessity of turning the ship more or less head to wind at every sounding makes it desirable to run the lines with the wind abeam, which tends to disturb the dead reckoning least. A good idea of the current may be obtained from the general direction of the ship’s head whilst sounding considered with reference to the strength and direction of the wind, and it should be allowed for in shaping the course to preserve the paral- lelism of the lines, but the less frequently the course is altered the better. A good position in the morning should be obtained by pairs of stars on opposite bearings, the lines of position of one pair cutting those of another pair nearly at right angles. The dead reckoning should be checked by lines of position from observations of the sun about every two hours

throughout the day, preferably whilst a sounding is being obtained and the ship stationary. Evening twilight stars give another position.

Tides.— The datum for reduction of soundings is low-water ordinary springs, the level of which is referred to a permanent bench mark in order that future surveys may be reduced to the same datum level. Whilst sounding is going on the height of the water above this level is observed by a tide gauge. The time of high-water at full and change, called the " establishment," and the heights to which spring and neap tides respectively rise above the datum are also required. It is seldom that a sufficiently long series of observations can be obtained for their discussion by har- monic analysis, and therefore the graphical method is preferred; an abstract form provides for the projection of high and low waters, lunitidal intervals, moon's meridian passage, declination of sun and moon, apogee and perigee, and mean time of high-water following superior transit, and of the highest tide in the twenty-four hours. A good portable automatic tide gauge suitable for all requirements is much to be desired.

Tidal Streams and Surface Currents are observed from the ship or boats at anchor in different positions, by means of a current log ; or the course of a buoy drifted by the current may be followed by a boat fixing at regular intervals. Tidal streams often run for some hours after high and low water by the shore; it is important to find but whether the change of stream occurs at a regular time of the tide. Undercurrents are of importance from a scientific point of view. A deep-sea current meter, devised (1876) by Lieut. Pillsbury, U.S.N., has, with several modifications, been used with success on many occasions, notably by the U.S. Coast and Geodetic Survey steamer " Blake " in the investigation of the Gulf Stream. The instrument is first lowered to the required depth, and when ready is put into action by means of a heavy weight, or messenger, travelling down the supporting We e P- s «a line and striking on a metal plate, thus closing the uˆ" jaws of the levers and enabling the instrument to meter ' begin working. The rudder is then free to revolve inside the framework and take up the direction of the current; the small cones can revolve on their axis and register the number of revolu- tions, while the compass needle is released and free to take up the north and south line. On the despatch of a second messenger, which strikes on top of the first and fixes the jaws of the levers open, every part of the machine is simultaneously, locked. Having noted the exact time of starting each of the messengers, the time during which the instrument has been working at the required depth is known, and from this the velocity of the current can be calculated, the number of revolutions having been recorded, while the direction is shown by the angle between the compass needle and the direction of the rudder.

The instrument is shown in fig. 12. AA are the jaws of the levers through

which the first messenger passes and strikes on the metal plate B. The force of the blow is sufficient to presu B down, thus bringing the jaws as close together as possible, and putting, the meter into action. The second messenger falling on the first opens the levers again and prevents their closing, thus keeping all parts of the machine locked. C is the rudder which takes up the direction of the current when the levers are unlocked. D is a set of small levers on the rudder in connexion with AA. The

outer end on the tail of the rudder fits into the notches on the outer ring of the frame when the machine is locked and thus keeps the rudder fixed, but when the first messenger has started the machine by pressing down B and opening the levers AA, this small lever is raised and the rudder can revolve freely. EE are four small cones

which revolve on their axis in a vertical plane, similar to an anemometer; the axis is connected by a worm screw to geared wheels which register the number of revolutions up to 5000, corresponding to about 4 nautical miles. There is a small lever in connexion with AA which prevents the cones revolving when the machine is locked, but allows them to revolve freely when the machine is in action. Below the rudder-post is a compass-bowl F, which is hung in gimbals and capable of removal. The needle is so arranged that it can be lifted off the pivot by means of a lever in connexion with AA; when the meter is in action the needle swings freely on its pivot, but when the levers are

Fig. 12.

locked it is raised off its pivot by the inverted cup-piece K placed inside the triple claws on the top of the compass and screwed to the lever, thus locking the needle without chance of moving. The compass bowl should be filled with fresh water before lowering the instrument into the sea, and the top screwed home tightly. The needle should be removed and carefully dried after use, to pre- vent corrosion. The long arm G is to' keep the machine steady in one direction ; it works up and down a jackstay which passes between two sheaves at the extremity of the long arm. This also assists to keep the machine in as upright a position as possible, and prevents it from being drifted astern with the current. A weight of as much as 8 or 10 cwt. is required at the bottom of the jackstay in a very strong current. An elongated weight of from 60 to 80 lb must be suspended from

the eye at the bottom of the meter to help to keep it as vertical as possible. On the outer part of the horizontal notched ring forming the frame, and placed on the side of the machine opposite to the projecting arm G, it has been found necessary to bolt a short arm supported by stays from above, from which is sus- pended a leaden counterpoise weight to assist in keeping the appara- tus upright. This additional fitting is not shown in fig. 12. A f- in. phosphor-bronze wire rope is used for lowering the machine; it is rove through a metal sheave H and india-rubber washer, and spliced round a heart which is attached to metal plate B. The messengers are fitted with a hinged joint to enable them to be placed round the wire rope, and secured with a screw bolt. To obtain the exact value of a revolution of the small cones it is necessary to make experiments when the actual speed of the current is known, by immersing the meter just below the surface and taking careful observations of the surface-current by means of a current log or weighted pole. From the number of revolutions registered by the meter in a certain number of minutes, and taking the mean of several observations, a very fair value for a revolution can be deduced. On every' occasion of using the meter for under-current observations the value of a revolution should be re-determined, as it is apt to vary owing to small differences in the friction caused by want of oil or the presence of dust or grit ; while the force of the current is probably another important' factor in influencing the number of revolutions recorded.

The features of the country should generally be delineated

as far back as the skyline viewed from seaward, in order to assist

the navigator to recognize the land. The summits

opo ? rap y- of ·j an(j conS p; cuous spurs aie fixed either by

fines to or by angles at them; their heights are determined by theodolite elevations or depressions to or from stations

Latitudes.

whose height above high-water is known. As much of the ground as possible is walked over, and its shape is delineated by contour lines sketched by eye, assisted by an aneroid barometer. In wooded country much of the topography may have to be shot in from the ship; sketches made from different positions at anchor along the coast with angles to all prominent features, valleys, ravines, spurs of hills, &c, will give a very fair idea of the general lie of the country.

Circum-meridian altitudes of stars on opposite sides of the zenith observed by sextant in the artificial horizon is the method adopted wherever possible

for observations for latitudes. Arranged in pairs of nearly the same altitude north and south of zenith, the mean of each pair should give a result from which instrumental and personal errors and errors due to atmospheric conditions are altogether eliminated. The mean of several such pairs should have a probable error of not more than ± 1". As a rule the observations of each star should be confined to within 5 or 6 minutes on either side of the meridian, which will allow of from fifteen to twenty observa- tions. Two stars selected to " pair " should pass the meridian within an hour of each other, and should not differ in altitude more than 2° or 3 . Artificial horizon roof error is eliminated by always keeping the same end of the roof towards the observer ; when observing a single object, as the sun, the roof must be reversed when half way through the observations. The observa- tions are reduced to the meridian by Raper's method. When pairs of stars are not observed, circum-meridian altitudes ol the sun alone must be resorted to, but being observed on one side of the zenith only, none of the errors to which all observa- tions are liable can be eliminated.

Sets of equal altitudes of sun or stars by sextant and artificial horizon are usually employed to discover chronometer errors. Six sets of eleven observations, a.m. and p.m., chrono- observing both limbs of the sun, should give a result meter which, under favourable conditions of latitude and Errors. declination, might be expected to vary less than two-tenths of a second from the normal personal equation of the observer. Stars give equally good results. In high latitudes sextant observations diminish in value owing to the slower movement in altitude. In the case of the sun all the chronometers are compared with the " standard " at apparent noon; the com- parisons with the chronometer used for the observations on each occasion of landing and returning to the ship are worked up to noon. In the case of stars, the chronometer compari- sons on leaving and again on returning are worked up to an intermediate time. A convenient system, which retains the advantage of the equal altitude method, whilst avoiding the necessity of waiting some hours for the p.m. observation, is to observe two stars at equal altitudes on opposite sides of the meridian, and, combining the observations, treat them as rela- ting to an imaginary star having the mean R.A. and mean declination of the two stars selected, which should have nearly the same declination and should differ from 4 to 8* in R.A.*

The error of chronometer on mean time of place being obtained, the local time is transferred from one observation spot to another by the ship carrying usually eight box chronometers. The best results are found by using travelling rates, pˆ dla " s which are deduced from the difference of the errors found on leaving an observation spot and returning to it; from this difference is eliminated that portion which may have accumulated during an interval between two determinations of error at the other, or any

intermediate, observation spot. A travelling rate may also be obtained from observations at two places, the meridian distance between which is known; this rate may then be used for the meridian distance between places observed at during the passage. Failing travelling rates, the mean of the harbour rates at either end must be used. The same observer, using the same instrument, must be employed throughout the observations of a meridian distance.

If the telegraph is available, it should of course be used. The error on local time at each end of the wire is obtained, and a number of telegraphic signals are exchanged between the

observers, an equal number being transmitted and received at either end. The local time of sending a signal from one place being known and the local time of its reception being noted, the difference is the meridian distance. The retardation due to the time occupied by the current in travelling along the wire is elimin- ated by sending signals in both directions. The relative personal equation of the observers at either end, both in their observa- tions for time, and also in receiving and transmitting signals, is eliminated by changing ends and repeating the operations. If this is impracticable, the personal equations should be deter- mined and applied to the results. Chronometers keeping solar time at one end of the wire, and sidereal time at the other end, materially increase the accuracy with which signals can be exchanged, for the same reason that comparisons between sidereal clocks at an observatory are made through the medium of a solar clock. Time by means of the sextant can be so readily obtained, and within such small limits of error, by skilled observers, that in hydrograph.ic surveys it is usually employed; but if transit instruments are available, and sufficient time can be devoted to erecting them properly, the value of the work is greatly enhanced in high latitudes.

True bearings are obtained on shore by observing with theo- dolite the horizontal angle between the object selected as the zero and the sun, taking the latter in each quadrant Searines as defined by the cross-wires of the telescope. The altitude may be read on the vertical arc of the theo- dolite; except in high latitudes, where a second observer with sextant and artificial horizon are necessary, unless the pre- cise errors of the chronometers are known, when the time can be obtained by carrying a pocket chronometer to the station. The sun should be near the prime vertical and at a low altitude; the theodolite must be very carefully levelled, especially in the position with the telescope pointing towards the sun. To elimin- ate instrumental errors

the observations should be repeated with the vernier set at intervals equidistant along the arc, and a.m. and p.m. observations should be taken at about equal altitudes.

At sea true bearings are obtained by measuring with a sextant the angle between the sun and some distant well-defined object making an angle of from ioo° to 120° and observing the altitude of the sun at the same time, together with that of the terrestrial object. The sun's altitude should be low to get the best results, and both limbs should be observed. The sun's true bearing is calculated from its altitude, the latitude, and its declination; the horizontal angle is applied to obtain the true bearing of the zero. On shore the theodolite gives the horizontal angle direct, but with sextant observations it must be deduced from the angular distance and the elevation.

For further information see Wharton, Hydrographicol Surveying (London, 1898); Shortland, Nautical Surveying (London, 1890).

(A. M. F.)*

"SURVILLE, CLOTILDE DE," the supposed author of the Poesies de Clolilde. The generally accepted legend gave the following account of her. Marguerite Eleonore Clotilde de Vallon Challis, dame de Surville, was born in the early years of the 15th century at Vallon. In 142 1 she married Berenger de Surville, who was killed at the siege of Orleans in 1428. Her husband's absence at the war inspired her heroic verses and his death her elegiac poems. The last of her poems is a chant royal addressed to Charles VIII.

In 1803 Charles Vanderbourg published as the PoSsies de Clotilde some forty poems dealing with love and war. The history given in the introduction of the discovery of the manu- script was evidently a fable, and the poems were set down by most authorities as forgeries, especially as they contained many anachronisms and were written in accordance with modern laws of prosody. The manuscript had been in the possession of Jean Francois Marie, marquis de Surville, an Emigre who returned to France in 1798 to raise an insurrection in Provence, and had paid the penalty with his life. In 1863 Antonin Mace made further inquiries on the subject and discovered letters from Vanderbourg to Surville's widow. This correspondence makes it clear that Vanderbourg was innocent of forgery and believed that xxvi. 6

the poems were of 15th-century date, and that the anachronisms of matter and form were due to retouching by Surville. But the researches of M. Mace interested local antiquarians, and documentary evidence was

produced that the wife of Berenger de Surville was Marguerite Chalis, not Clotilde, and that the marriage dated only from 1428. Moreover Berenger, whose death at the siege of Orleans was one of the leading motives of the book, lived for twenty years after that date. Friends of M. de Surville also disclosed the fact that the marquis had contributed archaic poetry to a Lausanne journal.

See A. Mac6, Un proces d'histoire litteraire (1870); A. Mazon, Marguerite Chalis et la legende de Clotilde de Surville (1875); articles by Gaston Parisinthe Revue critique d'histoireetdclitterature (March 1, 1873 and May 30, 1874), by Paul Cottin in the Bulletin du bibliophile (1894); E. K. Chambers, Literary Forgeries (1891); and further references in the Bibliographie des femmes cel'ebres (Turin and Paris, 1892, &c).

SUS, a province of southern Morocco, once an independent kingdom, and still too unruly to be opened to Europeans, who have nevertheless for centuries past made efforts to secure a foothold. Its principal towns are Tarudant, High (the old capital), and Glimin on the Wad Nun. Tarudant, the present capital, flourished in the 12th century on account of the neighbouring copper-mines. Saltpetre is now the only important product. Ports might be opened at Agadir Ighir (once occupied by the Portuguese for thirty years as Santa Cruz), Massa, Ifni, Arksis and Assaka at the mouth of the Wad Nun. As a coveted district, all kinds of natural riches are attributed to Sus, but it may be assumed that they are exaggerated. Europeans land at their peril, since the coast is by imperial order closed to trade, no custom-house being provided. Most of the business of Sus is carried on at great fairs lasting eight or fifteen days, during which time all roads of approach are guaranteed safe by the tribesmen that trade may be uninterrupted. Caravans from Sus laden with copper-ware, olive oil, butter, saffron, wax, skins, dates, dried roses, &c, are sent to Marrakesh, four days' journey from Tarudant. Susis are well known in the north of Morocco as able tradesmen and clever metal workers. They live frugally, and are only prodigal in powder and human life. Their language is almost exclusively Shilhah, a dialect of Berber. (K.A.M.)*

SUSA (Biblical, Shushan), the capital of Susiana or Elam and from the time of Darius I. the chief residence of the Achae- menian kings. It had been the centre of the old monarchy of Elam and had undergone many vicissitudes before it fell into the hands of the Persians (see Elam). The site, fixed by the explorations of W. K. Loftus, lies in the plain, but within sight of the mountains, between the courses of the Kerkha (Choaspes) and the Dizful, one of the affluents of the Pasitigris. The Shaur, a small tributary of the Dizful, washes the eastern base of the mounds of Shush, and seems to be the representative of the ancient Ulai or Eulaeus. Thus the whole district was fruit- ful and well watered; the surrounding rivers with their canals

gave protection and a waterway to the Persian Gulf; while the position of the town between the Semitic and Iranian lands of the empire was convenient for administrative purposes. Susa therefore became a vast and populous capital; Greek writers assign to it a circuit of is or 20 m.

The remains include four mounds, of which one is the site of the citadel called Memnonion by the Greeks, while another (the Apadana to the east of it) represents the palace of Darius I. and Artaxerxes II. Mnemon. This latter has been excavated by M. Dieulafoy and the enamelled bricks with which its walls were adorned are now in the Louvre. South of these two mounds is the site of the royal Elamite city. The fourth mound, covering the remains of the poorer houses, is on the right bank of the river between the Shaur and the Kerkha. J. de Morgan's excava- tions (since 1897) have been principally in the citadel mound, which measures rougnly 1500 ft. by 825 ft. and is 125 ft. high. The two lowest strata belong to the stone age, and the first is characterized by a fine thin pottery, with yellow paste decor- ated with geometrical patterns and animal or vegetable figures in black and brown-red. Some of it is similar to the prehistoric

pottery of Egypt. The pottery of the second neolithic stratum is much inferior. Above these strata come the remains of Elamite and early Babylonian civilization with inscribed objects, the oldest of which exhibit the pictorial characters out of which the cuneiform were evolved. Under the foundations of the temple of In-Susinak (in the north-west part of the mound) a vast quantity of bronze objects has been discovered, for the most part earlier than the ioth century B.C. Among the monuments brought to light in other parts of the mound are the obelisk of Manistusu (see Babylonia), the stela of Naram-Sin and the code of Khammurabi, along with a great number of historically valuable boundary-stones. The upper portions of the mounds have yielded, besides Persian remains, Greek pottery and inscriptions of the 4th century B.C., numerous coins of the Kamnaskires dynasty and other kings of Elymais in the Seleucid era, and Parthian and Sassanian relics. In the Sassanian period the city was razed in consequence of a revolt, but rebuilt by Sapor (Shapur) II.; the walls were again destroyed at the time of the Mahommedan conquest, but the site, which is now deserted, was a seat of sugar manufacture in the middle ages.

Bibliography. — W. K. Loftus, Travels and Researches in Chaldaea and Susiana (1857); M. Dieulafoy, L 'Art antique de la Perse (1884-85), L'Acropole de Suse (1890) ; A. Billerbeck, Susa (1893) ; J. de Morgan, Memoires de la delegation en Perse, vols, i.-viii. (from 1899). See also

Persia: Ancient History, § v. 2, (A. H. S.)

SUSA (Fr. Sousse), a city of Tunisia, on the Gulf of Hammamet, in 35 49′ N., 10° 39′ E., 36 m. by rail E. by N. of Kairawan, of which it is the port, and 93 m. S. by E. by rail of Tunis. Susa, which occupies part of the site of the ancient Hadrumetum, is built on the side of a hill sloping seawards, and is surrounded by a crenellated wall, strengthened by towers. Recesses in the inner side of the wall are used as shops and warehouses. The kasbah, or citadel, built on the highest point within the town, was thoroughly restored by the French after their occupa- tion of the country in 1881, and serves as military headquarters for the district, the camp for the troops being outside the walls west of the citadel. The native town has been little changed since the French occupation, but north of the port a European quarter has been created, and here are public buildings such as law courts, a museum and a town-hall. The museum contains many archaeological treasures, notable mosaics and sculptures. The most interesting buildings in the old town are the Kasr- er-Ribat and the Kahwat-el-Kubba. The Kasr-er-Ribat is a square fortress with a high tower and seven bastions. Its date is uncertain, but is not later than the 9th century. The Kahwat- el-Kubba (Cafe of the Dome) is a curious house, square at the base, then cylindrical, and surmounted by a fluted dome. It was probably a church during the Byzantine period. Another domed building, now used as oil-mills, dates from Roman and Byzantine times. In the Bab-el-Gharbi (West Gate) a Roman sarcophagus of marble has been built into the wall, and serves as a drinking fountain. The grand mosque is in the north-east part of the town. The ancient harbours are silted up, but vestiges of the Roman breakwaters may be seen. The modern port, completed in 1901, enables steamers drawing 21 ft. to lie at the quays. Exports are chiefly phosphates and other minerals, olive oil, esparto and cereals; imports: cotton goods, building material, &c. The population, less than 10,000 at the time of the French occupation, had increased in 1907 to over 25,000, of whom 1500 were French and 4000 other Europeans, chiefly Italians and Maltese.

Susa, the Arab town which succeeded Hadrumetum (q.v.), was fortified by the Aghlabite rulers of Kairawan in the 9th century a.d. It shared the general fortunes of Tunisia and became a noted "haunt of pirates, who raided the coast of Italy. In 1537 it was unsuccessfully besieged by the marquis of Terra Nova, in the service of Charles V., but in 1539 was captured for the emperor by Andrea Doria. As soon as the imperial forces were withdrawn it became again the seat of Turkish piracy. The town was attacked by the French and the Knights of St John in 1770, and by the Venetians in 1764. It remained, however, in the possession of the bey of Tunis.

Some 35 m. due south of Susa, and half way on the road to Sfax is El Jem,

the site of the city of Thysdrus. Of the ancient city there are scarcely any remains save the amphitheatre — a magnificent ruin scarcely inferior to that of the Colosseum in Rome. There is nc record of the building of the amphitheatre, which is usually assigned to the reign of Gordian III. (a.d. 238-244). It is made of limestone brought from Sallecta, 20 m. distant, bears evidence of hasty con- struction, and was probably never finished. It is of four storeys — three open arcades crowned by a fourth storey with windows. The first and third arcades are Corinthian ; the middle one Composite. Each of these galleries has sixty-four columns and the same number of arches. Constantly used as a fortress since the Arab invasion, the amphitheatre suffered much, and in 1697 the bey of Tunis made a great breach in its western end to prevent it being again used for defences But even in its present condition the amphitheatre — standing solitary in a desolate district — is grandly impressive. Its major axis is 488 ft., its minor axis 406 ft. (The figures of the Colosseum are 615 and 510J respectively.)

SUSA (anc. Segusio, q.v.), a city and episcopal see of Piedmont, Italy, in the province of Turin, from which it is 33 m. W. by rail. Pop. (1901), 3607 (town); 5023 (commune). It is situated on the Dora Riparia, a tributary of the Po, 1625 ft. above sea-level, and is protected from the northern winds by the Rocciamelone. Among the medieval buildings of Susa the first place belongs to the church of San Giusto, founded in 1029 by Olderico Manfredi II. and the countess Berta, and in 1772 raised to be the cathedral. It has a fine brick campanile and brick decoration, and contains a bronze triptych of 1358 in niello, with the Virgin and Child. In the Valle di Susa, about 14 m. east of it, towards Turin, near S. Ambrogio di Torino, is the monastery of S. Michele with a Romanesque church, situated on a rocky mountain (998-1002).

After the time of Charlemagne a marquisate of Susa was established ; and the town became in the nth century the capital of Adelaide countess of Savoy, who was mistress of the whole of Piedmont. On his retreat from Legnano in n 76 Barbarossa set fire to Susa; but the town became more than ever important when Emmanuel Philibert fortified it at great expense in the 16th century. It was, however, dismantled by Napoleon I. in 1796.

SUSARION, Greek comic poet, a native of Tripodiscus in Megaris. About 580 B.C. he transplanted the Megarian comedy (if the rude extempore jests and buffoonery deserve the name) into the Attic deme of Icaria, the cradle also of Greek tragedy and the oldest seat of the worship of Dionysus. According to the Parian Chronicle, there appears to have been a competition on this occasion, in which the prize was a basket of figs and an amphora of wine. Susarion's improvements in his native farces did not include a separate actor or a regular plot, but probably consisted in substituting metrical compositions for the old extempore effusions of the

chorus. These were intended for recitation, and not committed to writing. But such per- formances did not suit the taste of the Athenians, and nothing more is heard of them until eighty years after the time of Susarion. U. von. Wilamowitz-Mollendorff (in Hermes, ix.) considers the so-called Megarian comedy to have been an invention of the Athenians themselves, intended as a satire on Megarian coarse- ness and vulgarity. The lines attributed to Susarion (in Meineke, Poetarwm comicorum graecorum fragmenta) are probably not genuine.

SUSO [Seuse], HEINRICH (1300-1366), German mystic, was born of good family at Uberlingen on Lake Constance on the 21st of March, in all probability in the year 1300; he assumed the name of his mother, his father being a Heir von Berg. He was educated for the Church, first at Constance, then at Cologne, where he came under the influence of the greatest of the German mystics, Meister Eckart. He subsequently entered a monastery in Constance, where he subjected himself to the severest ordeals of asceticism. In 1335 he wandered through Swabia as a preacher, and won all hearts by his gentle, persuasive eloquence; the effusive lyricism of his language made him an especial favourite among the nuns. About 1348 he seems to have settled in Ulm, where he died on the 25th of January 1366. Suso's first work, Das Buchlein der Wahrheit, was written in Cologne about 1329; setting out from Eckart's doctrines, he presents the mystic faith from its speculative or theoretical side; whereas

in Das Biichkin der ewigen Weisheit, written some years later in Constance, he discusses the practical aspects of mysticism. The latter work, which Suso also translated into Latin under the title of Horologium sapientiae, has been called the finest fruit of German mysticism. Suso is the poet of the early mystic movement, " the Minnesinger of GoUesminne." But his faith is purely medieval in tone, inspired by the romanticism of the age of chivalry; the individualism, the philosophic insight and the anti-Catholic tendencies which made the mystic movement in its later manifestations so important a forerunner of the Reformation are absent.

Suso's works were collected as early as 1482 and again in 1512; recent editions: Heinrich Suso's Leben und Schriften, ed. by M. Diepenbrock (1829; 4th ed., 1884); Suso's Deutsche Schriften, by F. H. S. Denifle (1878-1880, not completed), and Deutsche Schriften, by K. Bihlmeyer (2 vols., 1907). See also W. Preger, Die Brief e Heinrich Susos (1867); W. Preger, Geschichte der deutschen Mystik (1882), vol. ii. ; J. Jager, Heinrich Sense aus Schwaben (1894).

SUSPENSURA, the architectural term given by Vitruvius (v. 10) to the hollow space under the floor of a Roman bath, in which the smoke from the furnace passed to the vertical flues in the wall (see Hypocaust).

SUSSEX, EARLS OF. The early history of the earldom of Sussex, a title that has been borne at different periods by several English families, is involved in some obscurity, owing to the fact that under the Norman kings the titles of earls were often indifferently derived from a county, from its chief town, or from the earl's principal residence, although the distinctive mark of an earl was deemed to be his right to " the third penny " of the pleas of a county (see Earl). Thus in the 12th century the same person is sometimes found described as earl of Sussex, sometimes as earl of Chichester, and sometimes as earl of Arundel, while the inclusion of the counties of Sussex and Surrey under »the jurisdiction of a single sheriff led at one time, as will be seen, to a further confusion between the earldoms of those counties. The difficulty is, again, increased by the Crown's admission in 1433 that the possession of the castle of Arundel carried with it the right to the title of earl of Arundel, though later investiga- tion (see Lords' Reports on the Dignity of a Peer, i. 404-429) has proved the invalidity of the claim, and Mr J. H. Round and other modern authorities maintain that inasmuch as Norman earls were earls of counties, the earldom of Arundel was strictly that of Sussex.

On the other hand G. E. Cockayne {Complete Peerage, i. 138, 139) holds that Roger de Montgomery, who received grants from William the Conqueror of a large part of the county of Sussex, including the city of Chichester and the castle and honour of Arundel, besides lands in Shropshire with the castles of Shrewsbury and Montgomery, but who does not appear to have had " the third penny " of any county, " was an earl pure and simple, and that, as was usual in those early times, his earldom was indifferently styled either from the territories of Chichester or of Shropshire, or from the castles of Arundel, Shrewsbury or Montgomery." This Roger de Montgomery was considered by Dugdale, a 17th-century authority, to have been earl of Sussex.

Whatever Roger's titles may have been, they were forfeited to the Crown when his son Robert was attainted in 1102, and the forfeited estates were conferred by Henry I. on his second wife Adelicia, who after Henry's death married William de Albini, or d'Aubigny. The latter was created earl of Sussex by King Stephen, and " the third penny " of that county was confirmed to him by an instrument of the reign of Henry II., in which however, he is styled earl of Arundel, a designation by which he was more generally known. His grandson William, 3rd earl of Sussex, was one of King John's sureties for the observance of Magna Carta; and the earldom remained in his family till 1243, when it reverted to the Crown on the

death of Hugh de Albini, 5th earl of the line (see Arundel, Earls of) . This Hugh married Isabel, daughter of William de Warenne, earl of Surrey, who survived him by nearly forty years, during which time she held the estates of the earldom of Sussex in dower; after her death in 1282 her brother John de Warenne, earl of Surrey,

was in various writs described as " earl of Surrey and Sussex," the same style being also used by his grandson and successor, another John de Warenne (1 286-1347), though it is not clear that either of these Warennes had any right to the Sussex title, the confusion having . perhaps arisen through both counties being under the jurisdiction of one sheriff. In any Case the earl- dom of Sussex, if vested in the younger Warenne, reverted to the Crown on his death without legitimate issue in 1347, when his estates devolved on his nephew Richard Fitzalan, earl of Arundel. Since the death of the last earl of the de Albini line in 1243 the earldoms of Arundel and Sussex had been separate.

For nearly two hundred years, from 1347 to 1529, the title of earl of Sussex did not exist in the English peerage. In 1529, however, it was conferred on Robert Radcliffe, Radclyffe or Ratclyffe (c. 1483-1542), who had been made Viscount Fitzwalter in 1525. Radcliffe was a son of John Radcliffe, Baron Fitzwalter (c. 145 2-1496), and a grandson of Sir John Radcliffe of Attle- borough in Norfolk, who became Baron Fitzwalter by right of his wife Elizabeth. The younger John Radcliffe shared in the conspiracy of Perkin Warbeck and was beheaded for high treason in 1496. The attainder being reversed in 1 506, his Son Robert became Baron Fitzwalter in 1506 and was soon a prominent person at the court of Henry VIII. In 1529 he was created earl of Sussex and in 1540 he was appointed great chamberlain of England. He died on the 26th of November 1542, when his son Henry (c. 1506-1557) became the 2nd earl. Henry's son, Thomas Radcliffe (see below) , became the 3rd earl. Thomas was succeeded in 1583 by his brother Henry (c. 1 530-1 593) who served Elizabeth in Ireland. Hisson Robert (c. 1569-1629)ˆ6 5th earl, was a soldier and a patron of men of letters. When Robert's son, Edward, the 6th earl (c. 1552-1641), died, the title became extinct, but the barony of Fitzwalter passed to the family of Mildmay, which held it until 1756, when it fell into abeyance.

In 1644 Thomas Savile {c. 1590-c. 1659), son of John Savile, 1st Baron Savile of Pontefract (1 566-1630), was created earl of Sussex. Having been elected to the House of Commons as member for Yorkshire in 1624, Savile became an opponent of Wentworth, afterwards earl of Strafford, the rivalry between the Saviles and the Wentworths having long been a feature of the history of Yorkshire, and attaching himself to the duke of Buckingham, he was created Viscount Savile of Castlebar in the peerage of

Ireland in 1628, and two years later succeeded to his father's English peerage. His growing enmity to Straf- ford led him into violent opposition to the government as the earl's power increased, and in 1640 he entered into correspon- dence with the Scots, to whom he sent a promise of support to which he forged the signatures of six peers. He was appointed lord president of the council of the north in succession to Straf- ford, but after the fall of the latter he went over to the Royalist party, in whose interest he exerted his influence in Yorkshire in a manner that brought upon him the displeasure of the parliament in 1642. His efforts to exonerate himself led to his being suspected by the Royalists, and to his arrest, while his residence, Howley Hall, was sacked by Newcastle, the Royalist general. Having been pardoned by Charles, whom Savile attended at Oxford, he was created earl of Sussex in 1644; but his efforts to promote peace on terms distasteful to the king brought him again into disfavour, and in 1645 he was imprisoned and accused of high treason. Escaping from this charge on the ground of his privilege as a peer, he went to London and again ingratiated himself with the popular party. Intriguing simultaneously with both parties, he continued to play a double game with considerable skill, although he suffered imprisonment in 1645 for accusing Holies and Whitelocke of treachery in negotiations with the king, and was heavily fined. After this he retired into private life at Howley Hall, where he died about 1659. He was succeeded in the earldom of Sussex by his son James, on whose death without issue in 1671 the title became extinct. It was revived in 1684 in favour of Thomas Lennard, 15th Baron Dacre, whose wife Ann (d. 1722) was a daughter of the famous duchess of Cleveland by King Charles II., and again became extinct at this nobleman's death in 1715. The title

was next conferred in 1717 on Talbot Yelverton, 2nd Viscount de Longueville and 16th Baron Grey de Ruthyn (c. 1 692-1 731), from whom it descended to his two sons successively, becoming once more extinct on the death of the younger of these, Henry, 3rd earl of Sussex of this creation, in 1799.

In 1801 Prince Augustus Frederick (1 773-1843) the sixth son of George III., was created duke of Sussex. Spending his early years abroad, the prince was married in Rome in 1793 to Lady Augusta (d. 1830) daughter of John Murray, 4th earl of Dunmore. The ceremony was repeated in London and two children were born, but under the Royal Marriage Act of 1772 the Court of Arches declared the union illegal. The children took the name of d'Este. The son, Sir Augustus Frederick d'Este (1794-1848), became a colonel in the British army. In 1843 he claimed his father's honours, but the House of Lords decided against him. He died unmarried. The daughter, Augusta Emma (1801- 1866) married Sir Thomas Wilde, afterwards Lord Truro. Unlike his brothers the duke of Sussex was a man of liberal ideas; he favoured the abolition of the slave trade, the repeal of the corn laws, and the removal of the civil disabilities of Roman Catholics, Dissenters and Jews. His second wife, Cecilia, widow of Sir George Buggin, was created duchess of Inverness in 1840. He died at Kensington Palace on the 21st of April 1843.

The older title of earl of Sussex was revived in 1874 when it was conferred upon Prince Albert, the third son of Queen Victoria, who at the same time was created duke of Connaught and Strathearn.

See G. E. C, Complete Peerage, s.v. " Sussex," " Surrey," " Arun- del," vols. i. and vii. (London, 1 887-1896) ; Sir William Dugdale, The Baronage of England (London, 1675). For the earls of the Radcliffe family see also John Strype, Memorials of Thomas Cranmer (London, 1694), Annals of the Reformation (London, 1725), and Ecclesiastical Memorials (3 vols., London, 1721); P. F. Tytler, England under the Reigns of Edward VI. and Mary (2 vols., London, 1839) ; Calendars of State Papers: Letters and Papers of the Reign of Henry VIII. For the 1st earl of the Savile line see S. R. Gardiner, Hist, of England, 1603-1642 (10 vols., London, 1883-1884), and Hist, of the Great Civil War (3 vols., London, 1886-1891); and John Rushworth, Historical Collections (8 vols., London, 1659-1701).

SUSSEX, THOMAS RADCLYFFE [or Ratclyffe], 3 rd Earl of (c. 1525-1583), lord-lieutenant of Ireland, eldest son of Henry, 2nd earl of Sussex (see Sussex, Earls of), by his first wife, Elizabeth, daughter of Thomas Howard, 2nd duke of Norfolk, was born about 1525, and after his father's succession to the earldom in 1542 was styled Viscount Fitzwalter. After serving in the army abroad, he was employed in 1551 in negotiating a marriage between Edward VI. and a daughter of Henry II., king of France. His prominence in the kingdom was shown by his inclusion among the signatories to the letters patent of the 1 6th of June 1553 settling the crown on Lady Jane Grey; but he nevertheless won favour with Queen Mary, who employed him in arranging her marriage with Philip of Spain, and who raised him to the peerage as Baron Fitzwalter in August 1553.

Returning to England from a mission to the emperor Charles V. in April 1556, Fitzwalter was appointed lord deputy of Ireland. The prevailing anarchy in Ireland, a country which, nominally subject to the English Crown, was torn by feuds among its practically independent native chieftains, rendered the task of the lord deputy one of no ordinary difficulty; a difficulty that was increased by the ignorance of English statesmen con- cerning Ireland and Irish conditions, and by their incapacity to devise or to carry into execution any consistent and thorough- going policy for bringing the half-conquered island under an orderly system of administration. The measures enjoined upon Fitzwalter by the government in London comprised the reversal of the partial attempts that had been made during the short reign of Edward VI. to promote Protestantism in Ireland, and the " plantation " by English settlers of that part of the country then known as Offaly and Leix. But before Fitzwalter could give his attention to such matters he found it necessary to make an expedition into Ulster, which was being kept in a constant state of disturbance by the Highland Scots from Kintyre and the Islands who were making settlements along

the Antrim coast in the district known as the Glynnes (glens), and by the efforts of Shane O'Neill to convert into effective sovereignty the chieftainship of his clan which he had recently wrested from his father, Conn, 1st earl of Tyrone. Having defeated O'Neill and his allies the MacDonnells, the lord deputy, who by the death of his father in February 1557 became earl of Sussex, returned to Dublin, where he summoned a parliament in June of that year. Statutes were passed declaring the legiti- macy of Queen Mary, reviving the laws for the suppression of heresy, forbidding the immigration of Scots, and vesting in the Crown the territory comprised in what are now the King's County and Queen's County, which were then so named after Philip and Mary respectively. Having carried this legislation, Sussex endeavoured to give forcible effect to it, first by taking the field against Donough O' Conor, whom he failed to capture, and

afterwards against Shane O'Neill, whose lands in Tyrone he ravaged, restoring to their nominal rights the earl of Tyrone and his reputed son Matthew O'Neill, baron of Dungannon (see O'Neill). In June of the following year Sussex turned his attention to the west, where the head of the O'Briens had ousted his nephew Conor O'Brien, earl of Thomond, from his possessions, and refused to pay allegiance to the Crown; he forced Limerick to open its gates to him, restored Thomond, and proclaimed The O'Brien a traitor. In the autumn of 1558 the continued inroads of the Scottish islanders in the Antrim glens called for drastic treatment by the lord deputy. Sussex laid waste Kintyre and some of the southern Hebridean isles, and land- ing at Carrickfergus he fired and plundered the settlements of the Scots on the Antrim coast before returning to Dublin for Christmas.

In the metropolis the news reached him of the queen's death. Crossing to England, he took part in the ceremonial of Queen Elizabeth's coronation in January 1559; and in the following ˆ July he returned to Ireland with a fresh commission, now as lord lieutenant, from the new queen, whose policy required him to come to terms if possible with the troublesome leaders of the O'Neills and the MacDonnells. Shane O'Neill refused to meet Sussex without security for his safety, and having estab- lished his power in Ulster he demanded terms of peace which Elizabeth was unwilling to grant. Sussex failed in his efforts to bring Shane to submission, either by open warfare or by a shameful attempt to procure the Irish chieftain's assassination. He was preparing for a fresh attempt when he was superseded by the e>rl of Kildare, who was commissioned by Elizabeth to open negotiations with O'Neill, the result of which was that the latter repaired to London and made formal submission to the queen. Shane's conduct on his return to Ireland was no less rebellious than before, and energetic measures against him became more imperative than ever. Having obtained Eliza- beth's sanction, Sussex conducted a campaign in the summer of 1563 with Armagh as his temporary headquarters; but except for some indecisive skirmishing and the seizure of many of O'Neill's cattle, the operations led to no result and left Shane O'Neill with his power little diminished. His continued failure to effect a purpose for the accomplishment of which he possessed inadequate resources led Sussex to pray for his recall from Ireland; and his wish was granted in May 1564. His govern- ment of Ireland had not, .however, been wholly without fruit. Sussex was the first representative of the English Crown who enforced authority to any considerable extent beyond the limits of the Pale; the policy of planting English settlers in Offaly and Leix was carried out by him in 1562 with a certain measure of success; and although he fell far short of estab- lishing English rule throughout any large part of Ireland, he made its influence felt in remote parts of the island, such as Thomond and the Glynnes of Antrim, where the independence of the native septs had hitherto*

been subjected not even to nominal interference. His letters from Ireland display a just conception of the problems with which he was confronted, and of the methods by which their solution should be undertaken; and his failure was due, not to lack of statesmanship or of executive capacity on his own part, but to the insufficiency

o the resources placed at his command and want of insight and persistence on the part of Elizabeth and her ministers.*

On his return to England, Sussex, who before leaving Ireland had to endure the indignity of an inquiry into his administra- tion instigated by his enemies, threw himself into opposition to the earl of Leicester, especially in regard to the suggested marriage between that nobleman and the queen. He does not appear to have on that account incurred Elizabeth's dis- pleasure, for in 1 566 and the following year she employed him in negotiations for bringing about a different matrimonial alliance which he warmly supported, namely, the proposal that she should bestow her hand on the archduke Charles. When this project fell to the ground Sussex returned from Vienna to London in March 1568, and in July he was appointed lord president of the north, a position which threw on him the responsibility of dealing with the rebellion of the earls of Northumberland and Westmorland in the following year. The weakness of the force at his disposal rendered necessary at the outset a caution which engendered some suspicion of his loyalty; and this suspicion was increased by the counsel of moderation which he urged upon the queen; but in 1570 he laid waste the border, invaded Scotland, and raided the country round Dum- fries, reducing the rebel leaders to complete submission. In July 1572 Sussex became lord chamberlain, and he was hence- forth in frequent attendance on Queen Elizabeth, both in her progresses through the country and at court, until his death on the 9th of June 1583.

The earl of Sussex was one of the great nobles of the Eliza- bethan period. Though his loyalty was questioned by his enemies, it was as unwavering as his patriotism. He shone as a courtier; he excelled in diplomacy; he was a man of cultivation and even of scholarship, a patron of literature and of the drama on the eve of its blossoming into the glory it became soon after his death. He was twice married: first to Elizabeth, daughter of Thomas Wriothesley, earl of Southampton; and secondly to Frances, daughter of Sir William Sidney. His second wife was the foundress of Sidney Sussex College at Cambridge, which she endowed by her will, and whose name commemorates the father and the husband of the countess. The earl left no

children, and at his death his titles passed to his brother Henry (see Sussex, Earls of).

See P. F. Tytler, England under the Reigns of Edward VI. and Mary (2 vols., London, 1839); Richard Bagwell, Ireland under the Tudors (3 vols., London, 1 885-1 890); Calendar of the Carew MSS.; John Stow, Annates (London, 1631) ; Charles Henry Cooper, Athenae canta- brigienses, vol. i. (Cambridge, 1858), containing a biography of the earl of Sussex; John Strype, Ecclesiastical Memorials (Oxford, 1822); Sir Cuthbert Sharpe, Memorials of the Rebellion of l?;6g (London, 1840) ; John Nichols, Progresses and Public Processions of Queen Elizabeth (3 vols., London, 1823) ; Sir William Dugdale, The Baronage of England (London, 1675). (R. J. M.)

SUSSEX, a southern county of England, bounded N. by Surrey, N.E. by Kent, S. by the English Channel, and W. by Hampshire. The area is 1459-2 sq. m. The extreme length from E. to W. is 78 m., while the breadth never exceeds 28 m., but the county is not wholly on the southward slope, for in the middle northern district it contributes a small drainage area to the Thames basin, and the river Medway rises in it. A line of hills known as the Forest Ridges forms the watershed. Its direction is E.S.E. from the northern part of the county to the coast at Fairlight Down east of Hastings, and it reaches a height of about 800 ft. in the neighbourhood of Crowborough. The salient physical feature of the county, however, is the hill range called the South Downs (see Downs). Entering in the west, where its summit is about 10 m. from the sea, it runs east for some 50 m., gradually approaching the coast, and terminating in the bold promontory of Beachy Head near Eastbourne. The average height is about 500 ft., though some summits exceed 700, and Ditchling Beacon is over 800. The portion of the county north of the South Downs is called the Weald (q.v.). It was formerly covered with forest, and this part of the county is till well wooded. About 1660 the total area under forest .■•as estimated to exceed 200,000 acres, but much wood was

cut to supply the furnaces of the ironworks which formed an important industry in the county down to the 17th century, and survived even until the early years of the 19th.

The rivers wholly within the county are small. All rise in the Forest Ridges, and all, except the Rother, which forms part of the boundary with Kent, and falls into the sea below Rye, breach the South Downs. From east to west they are the Cuckmere, rising near Heathfield; the Ouse, Adur and Arun, all rising in the district of St Leonard's Forest, and having at their mouths the ports of Newhaven, Shoreham and Little- hampton respectively. The natural trench known as the Devil's Dike is a point greatly favoured by

visitors from Brighton. The coast-line is practically coextensive with the extreme breadth of the county, and its character greatly varies. The sea has done great damage by incursion at some points, and has receded in others, within historic times. Thus what is now marsh- land or "Levels" round Pevensey was formerly an island- studded bay. In the east Winchelsea and Rye, members 01 the Cinque Ports, and great medieval towns, are deprived of their standing, the one wholly and the other in part, since a low flat tract interposes between their elevated sites where formerly was a navigable inlet. Yet the total submergence of the site of Old Winchelsea was effected in the 13th century. The site of the ancient cathedral of Selsey is a mile out at sea. Between 1292 and 1340 upwards of 5500 acres were submerged. In the early part of the 14th century Pagham Harbour was formed by a sudden irruption of the sea, devastating 2700 acres, since reclaimed. There is reason to believe that the whole coast- line has subsequently been slightly raised. These changes are reflected in the numerous alterations recorded in the course of certain of the rivers near their mouths. Thus the Rother was diverted by a great storm on the 12th of October 1250, before which date it entered the sea 12 m. to the east. The out- let of the Ouse was at Seaford until 1570, and that of the Adur formerly shifted from year to year, ranging east and west over a distance of 2 m. Submerged forests are found off the shore at various points. Long stretches of firm sand, and the mild climate of the coast, sheltered by the hills from ncrth and east winds, have resulted in the growth of numerous watering-places, of which the most popular are Brighton, Hastings, Eastbourne, Bexhill, Seaford, Shoreham, Worthing, Littlehampton and Bognor.

Geology. — The disposition of the rock formations of Sussex is simple. The South Downs consist of chalk, which extends from Beachy Head by Seaford, Brighton, Lewes, Steyning and Goodwood to the western border. The dip of the chalk is southerly, while a strong escarpment faces the north. From the summit of the Downs the hilly country observed on the northern side is occupied mainly by the Hastings Beds and the Weald Clay; at the foot of the escarp- ment lie the Gault and Upper Greensand, while between these forma- tions and the Wealden rocks there is an elevated ridge 0/ ground formed by the Lower Greensand. On the southern side, narrow at Brighton but broadening westward, is a level tract, 8 m. wide in the peninsula of Selsey, which owes its level character to the action of marine planation. This tract is occupied partly by Chalk and partly by Tertiary rocks, both much obscured by more recent deposits. On this side the chalk hills are deeply notched by dry valleys or coombs, which frequently end in cirques near the north- ward escarpment. The present aspect of the strata has been determined by the broad east and west fold with its subordinate members, known as the Wealden anticline. Only the southern and central portions of this anticline are included in this country ; at one time there is

no doubt that the Chalk, Greensand and Gault covered the entire area in the form of an uplifted dome, but denudation has removed the Chalk and most of the other formations as far as the North Downs, exposing thereby the underlying Wealden Beds. The oldest rocks thus brought to light along the crest of the anticline are the Purbeck Beds, small patches of shale and limestone, with some important beds of gypsum, which lie north-west of Battle. A deep boring (1905 ft.) at Netherfield, passed through Portlandian Beds and Kimmeridge Clay into Oxford Clay, but these do not appear anywhere at the surface. Above the Purbeck Beds, and covering all the north-eastern portion of the county from the coast at Bexhill and Rye to Horsham, are sands and clays of the Lower Wealden or Hastings Beds. This includes the following local subdivisions, in ascending order; the Fairlight Clay, Ashdown Sand, Wadhurst Clay, Lower Tunbridge Wells Sand, Grinstead Clay and Upper Tunbridge Wells Sand (with Tilgate stone at the top and Cuckfield Clay at the base). The Weald Clay occupies a belt of lower ground

on the south and west of the Hastings Sands, it consists of blue and mottled clays with thin sand layers and beds of hard limestone, the " Sussex marble" with the shells of Paludina. The Horsham Stone is another local hard bed. Near Tilgate the remains of Iguanodon have been found in this formation. Bordering the outcrop of the Weald Clay is the Lower Greensand; it appears a little north of Eastbourne and passes thence through Ringmer, Storrington, Pulborough, Petworth, Midhurst and Linchmere. It contains the following divisions in ascending order — the Atherfield Clay, Hythe Beds (sandy limestone, sandstone and chert), Sandgate Beds and Folkestone Beds. The Eocene strata lying south of the Downs and west of Brighton — with the exception of some outliers of Reading Beds near Seaford — include the Woolwich and Reading Beds, London Clay (with hard " Bognor Rock"), the Bagshot and Brackles- ham Beds ; the last-named formation is very fossiliferous in the bay of that name. As already mentioned, superficial deposits cover much of the low ground west of Brighton; these .include glacial deposits with large boulders, raised beaches, brick earth and gravels, marine and estuarine, and the interesting Coombe rock or Brighton Elephant Bed, a coarse rubble of chalk waste formed late in the Glacial period, well exposed in the cliff at Black Rock east of Brighton, where it rests on a raised beach. The natural gas of Heathfield comes from the Lower Wealden and Purbeck Beds. The Wadhurst Clay was formerly an important source of iron ore.

Climate and Agriculture. — The climate of the coast district is mild,

equable and dry, while that of the Wealden shows greater extremes of temperature, and is rather wetter. The mean daily range of temperature in the Weald is about half as much again as on the coast. The influence of the sea in modifying the temperature of the coast district is specially noticeable in the autumn months, when the temperature is higher than in the Weald and other parts of England northwards. The coast district is specially suitable for market gardens and for growing fruit trees. The fig gardens of West Tarring are celebrated. About seven-tenths of the total area is under cultivation, and of this nearly three-fifths is in permanent pasture. Sussex is still one of the best-wooded counties in England. The acreage under grain crops shows a large decrease; nearly the whole of it is occupied by oats and wheat. The acreage under green crops is mainly devoted to turnips and other food for cattle and to the supply of vegetables for the London market. The growing of hops has not kept pace with that in the neighbouring county of Kent. Cattle are kept in increasing numbers both for breeding and for dairy purposes. The South Downs afford excellent pasture for sheep and Sussex is famed for a special breed of black-faced sheep. The numbers, however, show a steady decrease. Poultry farming is largely carried on in some parts. The custom of borough-English, by which land descends to the youngest son, prevailed to an extra- ordinary degree in Sussex, and no fewer than 140 manors have been catalogued in which it was found. Gavelkind tenure existed in Rye, in the large manor of Brede, and in Coustard manor (in Brede parish).

Other Industries. — The manufacturing industries are meagre. The London, Brighton & South Coast Railway Company has large works at Brighton. At Heathfield in 1901 the development of the field of natural gas was begun by a private company. The fisheries are of great importance, including cod, herrings, mackerel, sprats, plaice, soles, turbot, shrimps, crabs, lobsters, oysters, mussels, cockles, whelks and periwinkles. Bede records that St Wilfrid, when he visited the county in 681, taught the people the art of net-fishing. At the time of the Domesday survey the fisheries were extensive, and no fewer than 285 salinae (saltworks) existed. The customs of the Brighton fishermen were reduced to writing in 1579.

Communications. — Communications are provided by the London, Brighton & South Coast railway by lines from the north to St Leonards and Hastings, to Eastbourne, to Lewes and Newhaven, to Brighton, to Shoreham, and to Arundel and Chichester, with numerous branches and a connecting line along the coast. The South-Eastern & Chatham railway serves Bexhill, St Leonards and Hastings, with a coastal branch eastward by Rye. Light railways run from Chichester to Selsey (Selsey railway) and from Roberts- bridge to Bodiam and Tenterden (Rother Valley railway). There are no good harbours, and none of the ports is of first importance. From Newhaven, however, a large trade is carried on with France, and

daily services of passenger steamers of the Brighton Railway Company ply to Dieppe.

Population and Administration. — The area of the ancient county is 933,887 acres, with a population in 1891 of 550,446 and in 1901 of 605,202. The earliest statement as to the population is made by Bede, who describes the county as containing in the year 681 land of 7000 families; allowing ten to a family (not an unreasonable estimate at that date), the total population would be 70,000. In 1693 the county is stated to have contained 21,537 houses. If seven were allowed to a house at that date, the total population would be 150,759. It is curious, therefore, to observe that in 1801 the population was only 159,311. The decline of the Sussex iron-works probably accounts for the small increase of population during several centuries, although after the massacre of St Bartholomew upwards of 1500 Huguenots landed at Rye, and in 1685, after the revocation of the Edict of Nantes, many more refugees were added to the county.

An act of Henry VII. (1504) directed that for convenience the county court should be held at Lewes as well as at Chichester, and this apparently gave rise to the division of Sussex into east and west parts, each of which is an administrative county. East Sussex has an area of 528,807 acres and West Sussex of 403, 602 acres. Sussex includes the county boroughs of Brighton and Hastings. East Sussex contains the municipal boroughs of Bexhill (pop. 12,213), Brighton (123,478), Eastbourne (43,344), Hastings (65,528), Hove (3 6 i535). Lewes (11,249) and Rye (3900). The urban districts in this division are Battle (2996), Burgess Hill (4888), Cuckfield (1813), East Grinstead (6094), Haywards Heath (3717), Newhaven (6772), Portslade-by-Sea (5217), Seaford (3355) and Uckfield (2895). In West Sussex the municipal boroughs are Arundel (2739), Chichester, a city (12,244) and Worthing (20,015). The urban districts are Bognor (6180), Horsham (9446), Littlehampton (7363), Shoreham (3 8 37) and Southwick (3364). The ancient county, which is almost entirely in the diocese of Chichester, contains 377 ecclesiastical parishes or districts, wholly or in part. The total number of civil parishes is 338. Sussex is divided into the following parliamentary divisions: northern or East Grinstead, eastern or Rye, southern or Eastbourne, mid or Lewes, south-western or Chichester, north- western or Horsham, each returning one member; and contains the parliamentary boroughs of Brighton, returning two members, and Hastings, returning one.

History. — Apart from conclusions to be drawn from pre- historic remains, the history of Sussex begins in 477, when the Saxons landed in the west of the county under Ella and his three sons, and built up the kingdom of the South Saxons (see Sussex, Kingdom of, below). They took the Roman city of Regnum, which became Chichester, and drove the British westward, into

the forest of Andred. The Roman fortress of Anderida, the site of the castle of Pevensey, also fell to the Saxons. Ella became the most influential of the contemporary Saxon chiefs, and was, according to Bede, the first Bretwalda. After his time the kingdom of Sussex gradually declined, and fell entirely under the dominion of Wessex in 823. Interest- ing Saxon remains are found in numerous cemeteries, and scattered burial places along the south slopes of the Downs. The cemetery on High Down hill, where weapons, ornaments and vessels of various kinds were found, and the Chanctonbury hoard of coins, are among the most noticeable relics. A coin of Offa of Mercia, found at Beddingham, recalls the charter of Archbishop Wilfred in 825, in which Offa's connexion with the monastery in that place is recorded. From 895 Sussex suffered from constant raids by the Danes, till the accession of Canute, after which arose the two great forces of the house of Godwine and of the Normans. Godwine was probably a native of Sussex, and by the end of the Confessor's reign a third part of the county was in the hands of his family. Norman influence was already strong in Sussex before the Conquest; the harbours of Hastings, Rye, Winchelsea and Steyning being in the power of the Norman abbey of Fecamp, while the Norman chaplain of Edward the Confessor, Osbern, afterwards bishop of Exeter, held the estate of Bosham.

The county was of great importance to the Normans; Hastings and Pevensey being on the most direct route for Normandy. William was accordingly careful to secure the lines of com- munication with London by placing the lands in the hands of men bound by close ties to himself, such as his half-brother, the count of Mortain, who held Pevensey, and his son-in-law, William de Warenne, who held Lewes. With the exception of lands held by the Church and the Crown, the five rapes of Sussex were held by these and three other Norman tenants-in- chief: William de Braose, the count of Eu, and Roger, earl of Montgomery, who held respectively Bramber, Hastings and Arundel. The honour of Battle was afterwards made into a rape by the Conqueror, and provides one of the arguments in favour of the theory of the Norman origin of these unique divisions of the county. – The county was divided into five (afterwards six) strips, running north and south, and having each a town of military, commercial and maritime importance. These were the rapes, and each had its sheriff, in addition to the sheriff of the whole county. Whether the origin of the rapes, as districts, is to be found in the Icelandic territorial division hreppr (rejected in the New English Dictionary), or in the Saxon rap, a rope, or is of Norman origin, as lordships

they undoubtedly owed their existence to the Normans. The holdings — which had been scattered under the Saxons, so that one man's holding might be in more than one rape— were now determined, not by the manors in which they lay, but by the borders of the rape. Another peculiarity of the division of land in Sussex is that, apparently, each hide of land had eight instead of the usual four virgates.

The county boundary was long and somewhat indeterminate on the north, owing to the dense forest of Andredsweald, which was uninhabited till the nth century. Evidence of this is seen in Domesday Book by the survey of Worth and Lodsworth under Surrey, and also by the fact that as late as 1834 the pre- sent parishes of north and south Amersham in Sussex were part of Hampshire. At the time of the Domesday Survey Sussex contained sixty hundreds, which have been little altered since. A few have been split up into two or three, making seventy- three in all; and the names of some have changed, owing probr ably to the meeting-place of the hundred court having been altered. These courts were in private hands in Sussex; either of the Church, or of great barons and local lords. The county court was held at Lewes and Shoreham until the Great Inquest, when it was moved to Chichester. After several changes the act of 1 504 arranged for it to be held alternately at Lewes and Chichester. There was no gaol in the county until 1487; that at Guildford being used in common by Surrey and Sussex, which were under one sheriff until 1567.

Private jurisdictions, both ecclesiastical and lay, played a large part in the county. The chief ecclesiastical franchises were those of the archbishop of Canterbury, of the bishop of Chichester, of the Saxon foundation of Bosham, where Bishop Wilfred had found the only gleam of Christianity in the county, and of the votive abbey of Battle, founded by the Conqueror. This abbey possessed, besides land in many other counties, the " Lowy of Battle," a district extending for 3 m. round the abbey. The see of Chichester was co-extensive with the county, and has altered little. It is one of the oldest bishoprics, having been founded by Wilfred at Selsey; the seat was re- moved to Chichester by W'illiam I. Among the lay franchises, the most noticeable are those of the Cinque Ports and of the honor of Pevensey, named the honor of the Eagle from the lords of L'Aigle or Aguila.

Sussex, from its position, was constantly the scene of pre- parations for invasion, and was often concerned in rebellions. Pevensey and Arundel play a great part in rebellions and forfeiture during the troubled times of the early Norman kings. In the barons' wars the county was a good centre for the king's forces; Lewes being in the hands of the king's brother-in-law, John de Warenne, earl of Surrey, Pevensey and Hastings in those of his uncle, Peter of Savoy. The forces of the king and of De Montfort met at Lewes, where the famous battle and " Mise of Lewes " took place. The

corrupt and burdensome administration of the county during the 13th and 14th centuries, combined with the constant passage of troops for the French wars and the devastating plagues of the 14th century, were the causes of such rebellions as the Peasants' Rising of 1381 and Jack Cade's Rebellion in 1450. In the former Lewes Castle was taken, and in the latter we find such men engaged as the abbot of Battle and the prior of Lewes. During Elizabeth's reign there was again constant levying of troops for warfare in Flanders and the Low Countries, and preparations for defence against Spain. The sympathies of the county were divided during the Civil War, Arundel and Chichester being held for the king, Lewes and the Cinque Ports for the parliament. Chichester and Arundel were besieged by Waller, and the Roundheads gained a strong hold on the county, in spite of the loyalty of Sir Edward Ford, sheriff of Sussex. A royalist gathering in the west of the county in 1645 caused preparations for resistance at Chichester, of which Algernon Sidney was governor. In the same year the " Clubmen " rose and endeavoured to compel the armies to come to terms. Little active part in the national history fell to Sussex from that time till the French Revolution, when numbers of volunteers were raised in defence. At the

outbreak of war with France in 1793 a camp was formed at Brighton; and at Eastbourne in 1803, when the famous Martello towers were erected.

The parliamentary history of the county began in 1290, for which year we have the first extant return of knights of the shire for this county, Henry Hussey and William de Etchingham, representatives of two well-known Sussex families, being elected. Drastic reformation was effected by the Redistribution Act of 1832, when Bramber, East Grinstead, Seaford, Steyning and Winchelsea were disfranchised after returning two members each, the first being classed among the worst of the " rotten " boroughs. Before 1832 two members each had been returned also by Arundel, Chichester, Hastings, Horsham, Lewes, Mid- hurst, New Shoreham (with the rape of Bramber) and Rye. Arundel, Horsham, Midhurst and Rye were each deprived of a member in 1832, Chichester and Lewes in 1867, and Hastings in 1885. Arundel was disfranchised in 1868, and Chichester, Horsham, Midhurst, New Shoreham and Rye in 1885. In the 1 8th century the duke of Newcastle was all-powerful in the county, where the Pelham family had been settled from the time of Edward I.; the earl of Chichester being the present repre- sentative of the family. Among the oldest county families of Sussex may be mentioned the Ashburnhams of Ashburnham, the Gages of Firle and the Barttelots of Stopham.

The industries of Sussex, now mainly agricultural, were once varied. Among those noted in the Domesday Survey were the herring fisheries, the salt pans of the coast and the wool trade; the South Down sheep being noted for their wool, at home and abroad, as early as the 13th century.

The iron mines of the county, though not mentioned in Domesday, are known to have been worked by the Romans; and the smelting and forging of iron was the great industry of the Weald from the 13th to the 1 8th century, the first mention of the trade in the county being in 1266. In the 15th century ordnance for the government was made here. Some old banded guns with the name of a Sussex maker on them may be seen at the Tower of London. The first cast-iron cannon made in England came from Buxted in Sussex, and were made by one Ralph Hogge, whose device can be seen on a house in Buxted. The large supply of wood in the county made it a favourable centre for the industry, all smelting being done with charcoal till the middle of the 18th century. In the time of Henry VIII. the destruction of the forest for fuel began to arouse attention, and enactments for the preservation of timber increased from this time forward, till the use of pit-coal for smelting was perfected, when the industry moved to districts where coal was to be found. Camden, Thomas Fuller, and Drayton in his Polyolbion refer to the busy and noisy Weald district, and lament the destruction of the trees. The glass-making industry, which had flourished at Chiddingfold in Surrey, and at Wesborough Green, Loxwood and Pet worth in Sussex, was destroyed by the prohibition of the use of wood fuel in 161 5. The timber trade had been one of the most considerable in early times; the Sussex oak being considered the finest shipbuilding timber. Among the smaller industries weaving and fulling were also to be found, Chichester having been noted for its cloth, also for malt and needles.

Antiquities. — From early times castles guarded three impor- tant entries from the coast through the South Downs into the interior provided by the valleys of the Ouse, the Adur and the Arun. These are respectively at Lewes, Bramber and Arundel. The ruins of the first two, though imposing, do not compare in grandeur with the third, which is still the seat of the dukes of Norfolk. More famous than these are the massive remains, in part Norman but mainly of the 13th century, of the strong- hold of Pevensey, within the walls of Roman Anderida. Other ruins are those of the finely situated Hastings Castle; the Norman remains at Knepp near West Grinstead; the picturesque and remarkably perfect moated fortress of Bodiam, of the 14th century; and Hurstmonceaux Castle, a beautiful 15th-century building of brick. Specimens of ancient domestic architecture are fairly numerous; such are the remnants of old

palaces of the archbishops of Canterbury at Mayfield and West Tarring; Amberley Castle, a residence until the 16th century of the bishops of Chichester; and the Elizabethan mansions of Parham and of Danny at Hurstpierpoint. There are many fine residences dating from the 18th century or later; Goodwood is perhaps the most famous. Here and

elsewhere are fine collections of paintings, though the county suffered a loss in this respect through the partial destruction by fire of the modern castle of Knepp in 1904.

Monastic remains are few and generally slight. The ruins of Bayham Abbey near Tunbridge Wells, and of Battle Abbey, may be noticed. There are numerous churches, however, of great interest and beauty. Of those in the towns may be mentioned the cathedral of Chichester, the churches of Shoreham and Rye, and the mother church of Worthing at Broadwater. Construction of pre-Norman date is seen in the churches of Bosham, Sompting and, most notably, Worth. There is very rich Norman work of various dates in the church of St Nicholas, Steyning. Several perfect specimens of small Early English churches are found, as at West Tarring, and at Climping near Littlehampton. Perhaps the most interesting church in the county is the magnificent Decorated fragment at Winchelsea; another noteworthy church of this period is at Etchingham, near the eastern border. The church of St Denis, Midhurst, is mainly Perpendicular; but this style is not otherwise pre- dominant. The large church at Fletching, of various styles, contains the tomb of Gibbon the historian. At Cowfold, south- east of Horsham, is a great Carthusian monastery, founded in 1877. The iron memorial slabs occurring in several churches recall the period of the iron industry in Sussex.

Dialect. — A large number of Saxon words are retained and pronounced in the old style; thus gate becomes ge-at. The letter a is very broad in all words, as if followed by u, and in fact con- verts words of one syllable into words of two, as fails (face), taiist (taste), &c. Again, a before double d becomes at, as arder and larder for adder and ladder; oi is like a long i, as spile (spoil), intment (ointment) ; an e is substituted for a in such words as rag, flag, &c. The French refugees in the 16th and 17th centuries introduced many words which are still in use. Thus a Sussex woman when unpre- pared to receive visitors says she is in dishabille (deshabille, undress) ; if her child is unwell, it looks pekid (piqud), if fretful, is a little peter- grievous (petit-grief); she cooks with a broach (broche, a spit), and talks of coasts (coste, O. Fr.), or ribs of meat, &c.

Authorities. — See T. W. Horsfield, History, Antiquities and Topography of Sussex (Lewes, 1835) ; J- Dallaway, History of the Western Division of Sussex (London, 1815-1832) ; M. A. Lower, History of Sussex (Lewes, 1870), Churches of Sussex (Brighton, 1872) and Worthies of Sussex (Lewes, 1865); Sussex Archaeological Society's Collections; W. E. Baxter, Domesday Book for . . . Sussex (Lewes, 1876); Sawyer, Sussex Natural History and Folklore (Brighton, 18&3), Sussex Dialect (Brighton, 1884) and Sussex Songs and Music (Brighton, 1885); A. J. C. Hare, Sussex (London, 1894).

SUSSEX, KINGDOM OF (5H3 Seaxe, i.e. the South Saxons), one of the kingdoms of Anglo-Saxon Britain, the boundaries of which coincided in general with those of the modern county of Sussex. A large part of that district, however, was covered in early times by the forest called Andred. According to the traditional account given in the Anglo-Saxon Chronicle, it was in 477 that a certain Ella (ˆElle) led the invaders ashore at a place called Cymenes ora and defeated the inhabitants. A further battle at a, place called Mearcredes burne is recorded under the year 485, and in the annal for 491 we read that Ella and Cissa his son sacked Anderida and slew all the inhabitants. Ella is the first king of the invading race whom Bede describes as exercising supremacy over his fellows, and we may probably regard him as an historical person, though little weight can be attached to the dates given by the Chronicle.

The history of Sussex now becomes a blank until 607, in which year Ceolwulf of Wessex is found fighting against the South Saxons. In 681 Wilfrid of York, on his expulsion from North- umbria by Ecgfrith, retired into Sussex, where he remained until 686 converting its pagan inhabitants. According to Bede, ˆEthelwald, king of Sussex, had been previously baptized in Mercia at the suggestion of Wulfhere, who presented him with the Isle of Wight and the district about the Meon. After Wilfrid's exertions in relieving a famine which occurred in

Sussex the king granted to him eighty-seven hides in and near the peninsula of Selsey which, with a lapse until 709 after Wilfrid's retirement, remained the seat of the South Saxon bishopric until the Norman Conquest. Shortly afterwards, however, ˆEthelwald was slain and his kingdom ravaged by the exiled West Saxon prince Ceadwalla. The latter was eventually expelled by two princes named Berhthun and Andhun, who thereupon assumed the government of the king- dom. In 686 the South Saxons attacked Hlothhere, king of Kent, in support of his nephew Eadric, but soon afterwards Berhthun was killed and the kingdom subjugated for a time by Ceadwalla, who had now become king of Wessex.

Of the later South Saxon kings we have little knowledge except from occasional charters. In 692 a grant is made by a king called Nothelm to his sister, which is witnessed by two other kings called Nunna and " Uuattus." Nunna is probably to be identified with Nun, described in the Chronicle as the kinsman of Ine of Wessex who fought with him against Gerent, king of the West Welsh, in 710. According to Bede, Sussex was subject to Ine for a number of years. A grant, dated by Birch about 725, is made by Nunna to Eadberht, bishop of Selsey, and to this too " Uuattus " appears as a witness. In 722 we find Ine of Wessex at war with the South Saxons, apparently because they were supporting a certain Aldbryht, probably an exile from Wessex. An undated grant is made by Nunna about this time,

which is witnessed by a King ˆEthelberht. After this we hear nothing more until shortly before 765, when a grant of land is made by a king named Aldwulf with two other kings, Aelfwald and Oslac, as witnesses. In 765 and 770 grants are made by a King Osmund, the latter of which is witnessed by Offa of Mercia. Offa also appears as witness to two charters of an jEthelberht, king of the South Saxons, and in 772 he grants land himself in Sussex, with Oswald, dux of the South Saxons, as a witness. It is probable that about this time Offa definitely annexed the kingdom of Sussex, as several persons, Osmund, -iElfwald and Oslac, who had previously used the royal title, now sign with that of dux. In 825 the South Saxons submitted to Ecgberht, and from this time they remained subject to the West Saxon dynasty. The earldom of Sussex seems later to have been held sometimes with that of Kent.

Authorities. — Anglo-Saxon Chronicle, pp. 449, 477, 485, 491, 607, 722, 725, 823, 827 (ed. Earle and Plummer, Oxford, 1899) ; Bede, Historia Ecclesiastica, i. 15, ii. 5, iv. 13, 15, 16, 26, v. 18, 19, 23 (ed. C. Plummer, Oxford, 1896); W. de G. Birch, Cartularium Saxonicum, Nos. 78, 144, 145, 197, 198, 206, 208, 211, 212, 1334 (London, 1885-1893). (F. G. M. B.)

SUTHERLAND, EARLS AND DUKES OF. The first earl of Sutherland was a certain William (d. 1284), whose father, Hugh Freskin (d. 1204), acquired the district of Sutherland about 1197. Probably about 1230 William was created earl of Suther- land. His descendant William, the 4th earl (d. 1370), was a person of some importance in the history of Scotland; he married Margaret (d. 1358), daughter of King Robert Bruce. His descendant John, the 9th earl, a man of weak intellect, died unmarried in 1514.

John's sister Elizabeth (d. 1535) married Adam Gordon (d. 1537), a younger son of George Gordon, 2nd earl of Huntly, and a grandson of King James I., and before 1516 Gordon be- came earl of Sutherland by right of his wife. He was succeeded by his grandson John (c. 1526-1567), the 2nd earl of his line, who played his part in the turbulent politics of the time and was poisoned at the instigation of George Sinclair, 4th earl of Caithness. His great-grandson John, the 5th earl (1609-1663), was a strong Covenanter, being called by his associates " the good Earl John"; he fought against Montrose at Auldearn, but afterwards he rendered good service to Charles II. John Gordon (c. 1660-1733), who became the seventh earl in 1703, supported the revolution of 1688 and was a commissioner for the union of England and Scotland. He was a Scottish repre- sentative peer in four parliaments, president of the board of trade and manufactures, and lord-lieutenant of the eight northern counties of Scotland. He was active in putting down the rising

of 1715. This earl, who took the name of Sutherland instead of that of Gordon, was succeeded by his grandson William (c. 1708-1750), a representative peer, who helped to suppress the rebellion of 1745. William, the next earl, died without male issue in 1766. This earl's daughter Elizabeth (1765-1839) claimed the peerage, and although her title thereto was con- tested by Sir Robert Gordon, Bart., a descendant of the first Gordon earl, it'was confirmed by the House of Lords in 1771.

Established in the possession of the title and the vast estates of the earldom, the countess of Sutherland was married in 1785 to George Granville Leveson-Gower (1758-1833), who succeeded his father as second marquess of Stafford in 1803. In addition to the estates of the marquessate of Stafford, Leveson-Gower inherited the Bridgewater Canal and estates from his maternal uncle, Francis Egerton, 2nd duke of Bridgewater, and these properties, together with his wife's estates, which included almost the whole of the county of Sutherland, made him a " leviathan of wealth," as he is called by Charles Greville. In 1833 he was created duke of Sutherland. Leveson-Gower was a member of parliament from 1778 to 1784 and again from 1787 to 1798 and was British ambassador in Paris from 1790 to 1792. From 1799 to 1810 he was joint postmaster-general. He was a collector of paintings, and purchased Stafford House, still the London residence of the dukes of Sutherland. As a landlord he greatly improved his estates in Staffordshire and Shropshire and then turned his attention to those of his wife in Sutherlandshire. He was responsible for the construction of about 450 m. of road and of many bridges, but his policy of removing a large number of his tenants from the interior to the coast aroused bitterness and criticism. However, he reduced rents and brought thousands of acres into cultivation. He died at Dunrobin Castle on the 5th of July 1833.

His elder son, George Granville (1786-1861), became the 2nd duke, but the valuable Bridgewater estates passed to his younger son, Lord Francis Leveson-Gower, who was created earl of Ellesmere in 1846. The 2nd duke's wife, Harriet Elizabeth Georgiana (1806-1868), a daughter of George Howard, 6th earl of Carlisle, was one of Queen Victoria's most intimate friends. She was mistress of the robes to the queen, whose refusal to part with her in 1839 led to a ministerial crisis. Some of her letters are published in Stafford House Letters, edited by her son Lord Ronald Gower (1891).

George Granville William, the 3rd duke (1828-1892), spent large sums in

improving his estates. His wife Anne (1829-1888), daughter of John Hay Mackenzie, was created countess of Cromartie in 1861, and the earldom descended to her second son Francis (1852-1893). When he died without sons the earldom fell into abeyance, but this was terminated in 1895 in favour of his daughter Sibell Lilian (b. 1878), the author of The Days cf Fire and other books.

In 1892 Cromartie Leveson-Gower (b. 1851), who had been M.P. for Sutherlandshire, became 4th duke of Sutherland. His wife, Millicent Fanny, daughter of the 4th earl of Rosslyn, became well known in literary as well as in social and philan- thropic circles.

See Sir Robert Gordon and George Gordon, Genealogical History of the Earldom of Sutherland (Edinburgh, 1813) ; and also the article Stafford, Earls and Marquesses of.

SUTHERLANDSHIRE, a northern county of Scotland, bounded N. and W. by the Atlantic, E. by Caithness, S.E. by the North Sea and S. by the shire of Ross and Cromarty. It has an area of 1,297, 846 acres or 2,028 sq. m., being the fifth largest shire in Scotland. The western and northern shores are much indented and terminate at many points in precipices and rugged headlands. The mountains are distinguished by grandeur of outline. Ben More (3273 ft.) in Assynt is the highest in the shire, and next to it in height is Ben Clibreck (3154). Ben Hope (Icelandic hop, haven, 3040), in the north, is noted as the only place in Great Britain where the Alpine Alsine rubella is found, and also for its fauna, ptarmigan being common, and even the wild cat and golden eagle occurring at rare intervals. Other lofty hills include Foinaven (wart mountain, 2980) in

the north-west; Ben Hee (2864); the highest point in Reay Forest; the serrated ridge of Quinag (2653) and Glasven (2541) north, and the cone of Canisp (2779) south of Loch Assynt; the precipitous Cam Stackie (2630) in Durness; Ben Arkle (2580) and Ben Stack (2364), frowning above Loch Stack; the fantastic peaks of Ben Loyal (the hill of the young calves, or deer, 2504) in Tongue; and Suilven (2399). The greater part of the mountainous region consists of wild and desolate moorlands. The chief river is the Oykell, which, rising in Coniveall (3234), a peak of Ben More, flows south and then south-east for 33 m. to Dornoch Firth, forming the major part of the southern boundary of the shire. Its principal left-hand tributaries are the Shin and Cassley. Other rivers flowing to Dornoch Firth are the Helmsdale (22 m.), issuing from Loch an Ruathair; the Brora (28 m.), rising in Mt Uaran and pre- serving in its name (bridge river) the fact that its bridge was cˆce the only important one in the county; and the Fleet (17), the head of the estuary of which was embanked for 1000 yds. in 1813 by Thomas Telford, whereby a considerable tract of rich alluvial land

was reclaimed from the sea. The longest rivers flow- ing to the north coast are the Dionard (14) to Kyle of Durness, the Naver (17) to Torrisdale Bay, and the Halladale (22), rising in Knockfin on the borders of Caithness and entering the sea to the east of Portskerry. Much of the surface in the district of Assynt is honeycombed with lakes and tarns, but the only large lake is Loch Assynt, which is 6| m. long, lies 215 ft. above the sea, has a drainage area of 43 sq. m.,and a greatest depth of 282 ft., and empties into the sea by the Inver. Other lakes are Loch Crocach, little more than 1 m. long by § m. wide, in which the ratio of the area of islands to the total area of the loch is greater than in any otherBritish lake; Loch Shin (17 m. long); Loch Loyal (4 m.); Loch Hope (6 rn.); Loch Naver (6 m.); and Loch More (4 m.). The principal inlets of the sea are, on the north coast, Kyle of Tongue — on the east shore of which stands Tongue House, once the property of the Reay family, now a seat of the duke of Sutherland — Loch Eriboll and Kyle of Durness; on the west, Lochs Inchard, Laxford (salmon fjord), Cairnbawn, Glendhu, Glencoul, Eddrachilis Bay and Loch Inver; and, on the south-east, Loch Fleet. There are many waterfalls in the county. Those of Escuallin, near the head of Glencoul, are among the finest in Great Britain. There are three principal capes — Strathy Point on the north; Cape Wrath at the extreme north-west; and Ru Stoer, near which is the Old Man of Stoer, a detached pillar of rock about 250 ft. high. On its seaward face Cape Wrath (a corruption of the Icelandic hvarf, turning-point) rises in precipitous cliffs to a height of 300 ft. The gneiss rocks are scored with pink granite. Sunken reefs keep the sea almost always in tumult. Of the larger islands Handa, usually visited from Scouiie on the west coast, has magnificent cliff scenery, distinguished for its beautiful coloration, its caverns and the richness and variety of the bird life, especially on the north-west, where the Torri- donian sandstone rocks are 406 ft. high. The cave of Smoo (Icelandic smuga, hole: same root as smuggle) on the north coast, 1 m. east of Durness, is the most famous cavern in the shire; it consists of three chambers hollowed out of the lime- stone; the entrance hall, ˆ ft. high and 203 ft. long, is separated from the inner chamber, 70 ft. long by 30 ft. wide, by a ledge of rock beneath which pours a stream that descends as a cataract from a hole in the roof, 80 ft. above. Behind the waterfall is the third chamber, 120 ft. long by 8 ft. wide, which can only be seen by artificial light.

Geology. — A very irregular line from Loch Eriboll on the north coast to the neighbourhood of Cromalt near the southern boundary separates the two rock groups that form the foundation of the major portion of the county. On the western side of this line are the ancient gneisses and schists (the Lewisian gneiss) ; these are pene- trated by innumerable basic and acid dikes which generally have a north-west to south-east trend. On the eastern side of the line, occupying the whole of the remaining area except

the eastern fringe of the county, is a younger series of metamorphic rocks, the Moine schists. Resting with marked unconformability upon the old gneiss near Cape Wrath, at Ru Stoer, Quinag, Canisp and Suilven are the dark red conglomerates, breccias and sandstones of Torridonian

age: Cambrian rocks succeed the Torridonian, again with strong unconformity; they are represented in ascending order by (1) false bedded quartzite, (2) quartzite with annelid burrows, the " pipe rock," (3) the fucoid beds with Olenellus band, (4) serpulite grit, (5) Durness limestone and dolomite and their marmorized equivalents. The white quartzite that has been left as a cap on such dark Torridonian hills as Quinag and Canisp forms a striking feature in the landscape. These Cambrian rocks occupy a very irregular belt along the line above mentioned; the broadest tract is in the neighbourhood of Loch Assynt, another large area lies about the southern end of Loch Eriboll and the Durness limestone is extensively developed near the loch of that name. Along the belt of Cambrian rocks there is abundant evidence of crustal deformation on the most extensive scale ; one after another great slices of rock, often miles in extent, have been sheared off and pushed forward by thrusts from a south-easterly direction, so that in several places it is possible to find the Lewisian gneiss dragged up and carried forward right on to the Cambrian; in the Durness district the eastern schists have been so transported from a distance of 10 m. The most striking of the planes of thrusting is that known as the Moine, others of great magnitude occur to the west of it, such as those by Glencoul and Ben More. Masses of granite appear in the eastern schists on the county boundaryby Strath Halladale.at BenLaoghal, Ben Stomino and east of Lairg. The Old Red Sandstone forms some elevated ground around Dornoch and Golspie and patches occur at Portskerra and elsewhere. A narrow strip of Mesozoic strata lies along the coast from Golspie Burn to Ord. Triassic marls are seen in the Golspie stream; these are succeeded northwards, near Dun- robin Castle, by Lias, then by Great Oolite, with the Brora coal, followed by Oxfordian, Corallian and Kimeridgian beds. Evidence of ice action is everywhere apparent, the striations show that the ice travelled towards the north-west and north, and from the eastern part of the county, towards Moray Firth.

Climate and Agriculture. — The rainfall varies greatly, being lowest on the south-east and highest in the mountainous hinterland of the west, with an annual mean of 44'7 in. The average temperature for theyearis47° F., for January 38-5°F.,for July 56-5°F. Only one- fortieth of the total area is under cultivation, the shire ranking lowest in Scotland in this respect. The great mass of the surface is grazing ground and deer forest. The best land adjoins Dornoch Firth, where farming is in an advanced condition, but

there are fer- tile patches along the river valleys. At the beginning of the 19th century the crofters occupied almost every cultivable spot, and were more numerous than the soil could support. The first duke of Sutherland (then marquis of Stafford) adopted a policy of wholesale clearance. Between 181 1 and 1820 fifteen thousand peasants were evicted from their holdings in the interior and transferred to the coast. The duke incurred great obloquy, but persisted in his re- forms, which included reduction of rent, improvement in the well- being of the people, reclamation of thousands of acres, and abolition of the tacksman or middleman, so that tenants should hold directly of himself. He also did much to open up the shire generally. Be- tween 1812 — when there was only one bridge and no road in Suther- land — and 1832, he bore half the cost, the government contributing the rest, of constructing 450 m. of road, 134 bridges, some of con- siderable size, and the iron bridge at Bonar of 150 ft. span. The 3rd duke (1828-1892) carried out a large plan of reclamation. Attempts have been made to repeople some of the glens (Strath- naver, for example) depopulated by the clearances. Crofters still largely predominate, nearly two-thirds of the holdings being under 5 acres — the highest proportion in Scotland. The chief grain crops are oats and barley, the chief green crops turnips (including swedes) and potatoes. The raising of livestock is the staple business of the county. The sheep are mostly Cheviots, the cattle West Highland, shorthorn and crossbred. Horses — principally ponies, though Clydesdales are used on the bigger farms — are almost wholly kept for agricultural purposes, and pigs are also reared. The deer forests belonging to the duke of Sutherland are Reay, 64,600 acres; Ben Armine and Coirna-fearn, 35,840; Glen Canisp, 34,490; and Dun- robin, 12,180 — in all 147,110 acres, or more than one-ninth of the whole area. Excepting the south-east coast, the valley of the Shin, and a considerable portion of Strath Oykell, there are very few districts under wood.

Other Industries. — Next to agriculture, the deep-sea fishery and the salmon fisheries in the rivers are the most important interest. Helmsdale (pop. 1259) is the only port of any consequence. Her- rings are the principal catch, but cod, ling and other fishes are also taken. Whisky is distilled at Clyne and Brora; some woollens are manufactured at Rogart ; coal is mined at Brora, marble quarried in Assynt and limestone and sandstone in several districts. The exceptional facilities offered by the deer forests, moors and the many lochs and rivers attract large numbers of sportsmen whose custom is valuable to the inhabitants; and Dornoch and Lochinver are in growing repute as holiday resorts. The Highland railway enters the county at Invershin, goes northward to Lairg, then east to Brora and north-east to Helmsdale, whence it runs north-west to Kildonan, and north to Forsinard, where it shortly afterwards leaves the shire. The Glasgow steamers call at Lochinver once a week, and mail-cars run

periodically from Lairg to Lochinver and Scourie in the west and to Durness and Tongue in the north; from Helmsdale,

by the coast, to Berriedale, Dunbeath, Latheron and Lybster; and from Tongue to Thurso. Considering its scanty and scattered population and mountainous character, the county is well inter- sected by roads, many of which were constructed by successive dukes of Sutherland, who own four-fifths of the shire.

Population and Administration. — In 1891 the population amounted to 21,896, and in 1901 it was 21,440, or 11 persons to the square mile, the least populous of Scottish counties. Several islands lie off the west and north coast, but only Roan, at the entrance to Kyle of Tongue, is inhabited (67). In 1901 there were 469 persons speaking Gaelic only, 14,083 who spoke Gaelic and English. The county returns a member to parliament, and Dornoch, the county town, belongs to the Wick group of parliamentary burghs. Sutherland forms a joint sheriffdom with Ross and Cromarty, and a sheriff-substitute presides at Dornoch. The county is under school-board jurisdiction; some of the schools earn the grant for higher education, and the " residue " grant is expended in bursaries. The Sutherland combination poorhouse is situated in Creich and there is a hospital, the Lawson Memorial, in Golspie.

History and Antiquities. — Of the Picts, the original inhabi- tants, there are considerable remains in the form of brocks (or round towers), numerous and widely scattered, Picts' houses, tumuli, cairns and hut circles. Dun Dornadilla, in the parish of Durness, 4 m. south of Loch Hope, is a tower, 150 ft. in circumference, still in good preservation. The Norse jarl Thorfinn overran the country in 1034 and the Scandinavian colonists called it, in relation to their settlements in the Orkneys and Shetlands, Sudrland, the " southern land," or Sutherland. After the conquest of the district by the Scottish kings, Suther- land was conferred on Hugh Freskin (a descendant of Freskin of Moravia or Moray), whose son William was created earl of Sutherland in 1228 by Alexander II. Assynt was peopled by a branch of the Macleods of Lewis, till they were dispossessed by the Mackenzies, who sold the territory to the earl of Sutherland about the middle of the 18th century. The vast tract of the Reay country, belonging to the Mackays, an ancient clan, also fell piece by piece into the hands of the Sutherland family. Killin, on the east bank of Loch Brora, was the site of an old chapel dedicated to St Columba, an association commemorated in the name of Kilcolmkill House, hard by. On the south shore of Helmsdale creek stand the ruins of the castle in which the nth earl of Sutherland and his wife were poisoned by his uncle's widow in 1567, with a view to securing the title for

her only child who was next of kin to the earl and his son. Ardvreck Castle, now in ruins, at the east end of Loch Assynt, was the prison of the marquis of Montrose after his defeat at Invercarron (1650), whence he was delivered up by Neil Macleod of Assynt for execution at Edinburgh. In the graveyard of the old church of Durness is a monument to Robert Mackay, called Rob Donn (the brown), the Gaelic poet (1714-1778).

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SUTLEJ, a river of India, one of the " Five Rivers " of the Punjab. It rises E.S.E. of the Manasarowar lakes in Tibet, at an elevation of about 15,200 ft., threads its way through the gorges of the Himalayas with heights of 20,000 ft. on either side, crosses Bashahr and the Simla hill states, and enters the British district of Hoshiarpur. Thence it flows through the plains of the Punjab, receives the Beas in Kapurthala state, and joins the Chenab near Madwala. From that point the whole river bears the name of Panjnad (" five rivers ") until it falls into the Indus near Mithankot after a course of 900 m. In the time of Ranjit Singh the Sutlej formed the boundary line between the Sikh and British dominions, and the Sikh states south of the river still bear the title of Cis-Sutlej.

The Sutlej supplies two systems of irrigation works: the Sir- hind canal, which draws off the whole of the cold season supply of the Sutlej at Rupar, 100 m. above its junction with the

Beas; and the inundation canals of the Upper and Lower Sutlej, Ferozepur and Bahawalpur, which come below the junction.

SUTLER, a camp-follower who sells provisions, liquor and other things to an army in the field, in camp or in quarters. The word was one of the numerous naval and military terms adapted in English from the Dutch, where it appears as soetelaar or zoetelaar. It meant originally one who does dirty work, a drudge, a scullion, and is derived from zoetelen, to foul, sully, a word cognate with " suds," hot soapy water, " seethe," to boil, and " sodden."

SUTRI (anc. Sutrium), a town and episcopal see of Italy, in the province of

Rome, 4 m. W.N.W. of the railway station of Capranica, which is 36 m. from Rome; 955 ft. above sea-level. Pop. (1901), 2701. The town is picturesquely situated on a narrow hill, surrounded by ravines, a narrow neck on the west alone connecting it with the surrounding country. There are some remains of the ancient city walls of rectangular blocks of tufa on the southern side of the town, and some rock-cut sewers in the cliffs below them. The cathedral is modern, but the crypt, with twenty columns, is old, and the campanile dates from the 13th century. In the cliffs opposite the town on the south is the rock-cut church of the Madonna del Parto, developed, no doubt, out of an Etruscan tomb, of which there are many here; and close by is a rock-hewn amphitheatre of the Roman period, with axes of 55 and 44 yds., now most picturesque.

The position of Sutri was important, commanding as it did the road into Etruria, the later Via Cassia; and it is spoken of by Livy as one of the keys of Etruria, Nepet being the other. It came into the hands of Rome after the fall of Veii, and a Latin colony was founded there; it was lost again in 386, but was recovered and recolonized in 383 '(?). It was besieged by the Etruscans in 311-10 B.C., but not taken. With Nepet and ten other Latin colonies it refused further help in the Hannibalic War in 209 B.C. Its importance as a fortress explains, according to Festus, the proverb Sutrium ire, of one who goes on important business, as it occurs in Plautus. It is mentioned in the war of 41 B.C., and received a colony of veterans under the triumviri (Colonia coniuncta lulia Sutrina). Inscriptions show that it was a place of some importance under the empire, and it is mentioned as occupied by the Lombards.

See G. Dennis, Cities and Cemeteries of Etruria, i. 62 (London, 1883). (T. As.)

SUTTEE (an English corruption of Sanskrit sati, " good woman " or true " wife "), the rite of widow-sacrifice, i.e. the burning the living widow on the funeral pyre of her husband, as practised among certain Hindu castes. As early as the Atharva Veda the rite is mentioned as an " old custom," but European scholars have shown that the text of the still earlier Rig Veda had been corrupted, probably wilfully, by the Hindu priesthood, and that there was no injunction that the rite should be observed. The directions of the Rig Veda seem to have involved a merely symbolic suttee: the widow taking her place on the funeral pile, but being recalled to " this world of life " at the last moment by her brother-in-law or adopted child. The practice was sporadically observed in India when the Mace- donians reached India late in the 4th century B.C. (Diod. Sic. xix. 33 _ 34); DUt tne earlier Indian law books do not enjoin it, and Manu simply commands the widow to lead a life of chastity and asceticism. About the 6th century a.d. a recrudescence of the rite took place, and with the help of corrupted Vedic

texts it soon grew to have a full religious sanction. But even so it was not general throughout India. It was rare in the Punjab; and in Malabar, the most primitive part of southern India, it was forbidden. In its medieval form it was essentially a Brahminic rite, and it was where Brahminism was strongest, in Bengal and along the Ganges valley and in Oudh and Rajputana, that it was most usual.

The manner of the sacrifice differed according to the district. In south India the widow jumped or was forced into the fire-pit; in western India she was placed in a grass hut, supporting the corpse's head with her right hand while her left held the torch; in the Ganges valley she lay down upon the already lighted pile;

while in Nepal she was placed beside the corpse, and when the pile was lighted the two bodies were held in place by long poles pressed down by relatives. The earliest attempt to stop suttee was made by Akbar (1542-1605), who forbade compulsion, voluntary suttees alone being permitted. Towards the end of the 18th century the British authorities, on the initiative of Sir C. Malet and Jonathan Duncan in Bombay , took up the question, but nothing definite was ventured on till 1829 when Lord William Bentinck, despite fierce opposition, carried in council on the 4th of December a regulation which declared that all who abetted suttee were "guilty of culpable homicide." Though thus illegal, widow-burning continued into modern days in isolated parts of India. In 1905 those who assisted at a suttee in Behar were sentenced to penal servitude.

Widow sacrifice is not peculiar to India, and E. B. Tylor in his Primitive Culture (ch. 11) has collected evidence to support a thepry that the rite existed among all primitive Aryan nations. He thinks that in enjoining it the medieval priesthood of India were making no innovation, but were simply reviving an Aryan custom of a bar- baric period long antedating the Vedas. See also Jakob Grimm, Verbrennen der Leichen.

SUTTNER, BERTHA, Baroness von (1843-), Austrian writer, was born at Prague on the 9th of July 1843, the daughter of Count Franz Kinsky, Austrian field marshal, who died shortly after her birth. On her mother's side she was descended from the family of the German poet, Theodor KSrner. After receiv- ing a careful education she travelled abroad and resided for a long period in Paris and in Italy. In 1876 she married the novelist, Freiherr Arthur Gundaccar von Suttner (1850-1902), and for the next nine years lived with him at Tiflis in the Caucasus. After 1885 she resided at Schloss Harmansdorf, near Eggenburg, in Lower Austria. The Baroness von Suttner, a fertile writer, has produced numerous tales, books on social science and romances, among which the best known are Inven- tarium einer Seele (1882), Die Waffen nieder (1889), Hanna (1894), La

Traviata (1898), Schach der Qual (1898), Martha's Kinder (1903), a continuation of Die Wajfen nieder. She was at one time secretary to Alfred Nobel, and as a champion of the " brotherhood of nations," had much influence on him and others; and in this connexion has published Krieg und Frieden (1896), Das Maschinen-Zeitalter, Zukunjts-Vorlesungen iiber unsere Zeti (1899) and Die Haager Friedenskonferenz (1900). In 1905 she was awarded a Nobel prize of £5000 for her endeavours in the cause of peace.

Her Memoiren, full of interesting autobiographical matter, were published at Stuttgart in 1908.

SUTTON, SIR RICHARD (d. c. 1524), the founder, with William Smyth, bishop of Lincoln, of Brasenose College, Oxford, and the first lay founder of any college, is said to have come of a good north-country family, the Sutions of that ilk, near Macclesfield, Cheshire. Little is known of his life, but he was a banister, and in 1497 a member of the privy council. In 1513 he became steward of the monastery of Sion, a house of Brigittine nuns at Isleworth. How Smyth and Sutton came to plan a college is not known, but in 1508 we find Edmund Croston, or Crofton, bequeathing £6, 13s. 4d. towards the building of " a college of Brasynnose " if the projects of " the bishop of Lincoln and master Sotton " were carried into effect within a stipulated period. In the same year Sutton obtained a ninety- two year lease of Brasenose Hall and Little University Hall for £3 per annum, and from that time until the end of his life was occupied in purchasing estates with which he might endow the new college. He is thought to have contributed to the funds of Corpus Christi College, Oxford, as well. He was knighted some years before his death, which occurred about 1524.

SUTTON, THOMAS (c. 1332-1611), founder of Charterhouse school and hospital, was the son of an official of the city of Lincoln, and was educated at Eton College and probably at Cambridge. He then spent some time travelling in Europe and appears to have acted as secretary to two or three English noblemen. He, became a soldier, and in 1569 was with the troops engaged in suppressing the rising in the north of England; in 1570 be was

made master and surveyor of the ordnance in the northern parts of the realm and in this capacity he took part in the siege of Edinburgh Castle by the English in May 1573. Sutton obtained great wealth by the ownership of coal mines in Durham and also by his marriage in 1582 with Elizabeth (d. 1602), widow of John Dudley of Stoke Newington. His wish to devote

some of his money to charitable purposes led him in 161 1 to purchase for £13,000 the Charterhouse (q.v.) from Thomas Howard, earl of Suffolk. On this spot Sutton erected the hospital and school which he had originally intended to build at Hallingbury in Essex. Sutton died at Hackney on the 12th of December 161 1 and was buried in the chapel in the Charterhouse. His wealth was left for charitable uses, but in 1613 James I. ordered his executors to make an allowance to his natural son, Roger Sutton.

SUTTON, an urban district in the Epsom parliamentary division of Surrey, England, n m. S. of London by the London Brighton & South Coast railway. Pop. (1891), 13,977; (1901), 17,223. It is pleasantly situated at the edge of the Downs, and is in favour as an outer residential district of London. The manor, according to Domesday, belonged to the abbey of Chertsey at the Conquest and continued so until the dissolution of the monasteries by Henry VIII.

SUTTON COLDFIELD, a municipal borough in the Tamworth parliamentary division of Warwickshire, England, 7 m. N.E. from Birmingham on branches of the London & North- Western and Midland railways. Pop. (1901), 14,264. The town, which lies high in a hilly situation, is the centre of a residential district for persons having their business offices in Birmingham, Wal- sall and other towns. The church of the Holy Trinity, Early English and Late Perpendicular, enlarged in 1879, contains a fine Norman font and the tomb of Bishop Vesey. On the picturesque park near the town, 2400 acres in extent, the inhabitants have the right of grazing horses and cattle at a small fee. This, with the Crystal Palace gardens, forms a recreation ground for the people of Birmingham. In the vicinity are New Hall, an interesting mansion of the 13th century, with a hall of the 16th, used as a boys' school; and Peddimore Hall, a moated mansion of the ancient family of Arden, of which there are slight remains. The town is governed by a mayor, 6 aldermen and 18 councillors. Area, 12,828 acres.

Sutton Coldfield (Svtone, Sutton in Colefeud, Sutton Colfild, King's Sutton) is mentioned in the Domesday Survey as a possession of the Conqueror and as having been held before that time by Edwin, earl of Mercia. Henry I. exchanged it with Roger de Newburgh, earl of Warwick, whose descendant, William de Beauchamp, in the reign of Edward I., claimed by prescription a court leet with assize of bread and ale and other liberties here, which were allowed him, as it was found that his ancestors had held the same. By the time of Henry VIII. the town had fallen " into much ruin," according to Leland, and would never have reached its present position but for the interest of John Vesey, bishop of Exeter, a native of the place, who procured for it a charter of incorporation in 1529 under the title of the " Warden and Society of the Royal Town of Sutton Coldfield." The charter

also appointed a warden and twenty- two fellows to be the common hall, and granted the town and park to the corporation at a yearly rent of £58. Another charter, dated 1664, appointed two capital burgesses to be justices of the peace with the warden. In 1855 Sutton was divided into six wards, with an alderman and three councillors for each. Markets granted in 1300, 1353 and 1529 have been discontinued. Fairs were granted in 1300, 1353 and 1529, to be held at the feasts of Trinity, Michaelmas and St Simon and St Jude, and are now held on Trinity Monday, the 14th of March, the 19th of September and the 8th of November. Vesey set up here a cloth trade which, however, soon became neglected.

SUTTON-IN-ASHFIELD, an urban district in the Mansfield parliamentary division of Nottinghamshire, England, lying in a picturesque district on the border of Sherwood Forest, on branch lines of the Midland and Great Northern railways, 15 m. N. by W. of Nottingham. Pop. (1891), 10,562; (i$oi), 14,862.

The church of St Mary Magdalene of the 12th and 14th cen- turies was restored in 1868. There are collieries and limeworks in the vicinity. Cotton hosiery and thread are the principal manufactures.

SUVAROV. Alexander Vasilievich, Count Suvarov Rimniksky, Prince Italysky (1729-1800), Russian field marshal, was born at Moscow on the 24th of November 1729, the descendant of a Swede named Suvor who emigrated to Russia in 1622. He entered the army as a boy, served against the Swedes in Finland and against the Prussians during the Seven Years' War. After repeatedly distinguishing himself in battle he was made a colonel in 1762. He next served in Poland, dispersed the Polish forces under Pulawski, stormed Cracow (1768) and was made a major-general. In his first campaigns against the Turks in 1773-74, and particularly in the battle of Kosludscki in the latter year, he laid the foundations of his reputation. In 1775 he suppressed the rebel- lion of Pugachev, who was decapitated at Moscow. From 1777-1783 he served in the Crimea and the Caucasus, becoming a lieutenant-general in 1780, and general of infantry in 1783, on the conclusion of his work there. From 1787 to 1791 he was again fighting the Turks and won many victories; he was wounded at Kinburn (1787), took part in the siege of Ochakov, and in 1 788 won two great victories at Focsani and on the Rimnik. For the latter victory, in which an Austrian corps under Prince Josias of Saxe-Coburg participated, Catherine II. made him a count with the name Rimniksky in addition to his own name, and the emperor Joseph II. created him a count of the Holy Roman Empire. On the 22nd of December 1790 Suvarov stormed Ismail in Bessarabia, and the sack and the massacre that followed the capture equals in horror such events as the " Spanish Fury " and the fall of Magdeburg. He was next placed at the head of the army which subdued the Poles, and

repeated the triumph, and some of the cruelties, of Ismail at Warsaw. He was now made a field marshal, and was retained in Poland till 1795, when he returned to St Petersburg. But his sovereign and friend Catherine died in 1796, and her suc- cessor Paul dismissed the veteran in disgrace. Suvarov then lived for some years in retirement on his estate of Konchauskoy, near Moscow. He criticized the new military tactics and dress introduced by the emperor, and some of his caustic verse reached the ears of Paul. His conduct was therefore watched and his correspondence with his wife, who had remained at Moscow — for his marriage relations had not been happy — was tampered with. On Sundays he tolled the bell for church and sang among the rustics in the village choir. On week days he worked among them in a smock frock. But in February 1799 he was summoned by the tsar to take the field again, this time against the French Revolutionary armies in Italy.

The campaign (see French Revolutionary Wars) opened with a series of victories (Cassano, Trebbia, Novi) which reduced the French government to desperate straits and drove every French soldier from Italy, save for the handful under Moreau, which maintained a foothold in the Maritime Alps and around Genoa. Suvarov himself was made a prince. But the later events of the eventful year went uniformly against the allies. Suvarov's lieutenant Korsakov was defeated by Massena at Zurich, and the old field marshal, seeking to make his way over the Swiss passes to the Upper Rhine, had to retreat to the Vorarlberg, where the army, much shattered and almost destitute of horses and artillery, went into winter quarters. Early in 1800 Suvarov returned to St Petersburg in disgrace. Paul refused to give him an audience, and, worn out and ill, he died a few days afterwards on the 18th of May 1800 at St Petersburg. Lord Whitworth, the English ambassador, was the only person of distinction present at the funeral. Suvarov lies buried in the church of the Annunciation in the Alexandro-Nevskii monastery, the simple inscription on his grave being, according to his own direction, " Here lies Suvarov." But within a year of his death the tsar Alexander I. erected a statue to his memory in the Field of Mars, St Petersburg.

His son Arkadi (1 783-181 1) was a general officer in the

Russian army during the Napoleonic and Turkish wars of the early 19th century, and was drowned in the river Rimnik in 1811. His grandson Alexander Arkadievich (1804-1882) was also a Russian general.

Among the Russians the memory of Suvarov is cherished to this day. A great captain, viewed from the standpoint of any age of military history, he is specially the great captain of the Russian nation, for the character of his leadership responded to the character of the Russian soldier. In an age when war had become an act of diplomacy he restored its true significance as an act of force. He was reckless of human life, bent only on the achievement of the object in hand, and he spared his own soldiers as little as he showed mercy to the population of a fallen city. He was a man of great simplicity of manners, and while on a campaign lived as a private soldier, sleeping on straw and contenting himself with the humblest fare. But he had himself passed through all the gradations of military service; moreover, his education had been of the rudest kind. His gibes procured him many enemies. He had all the contempt of a man of ability and action for ignorant favourites and ornamental carpet-knights. But his drolleries served, sometimes to hide, more often to express, a soldierly genius, the effect of which the Russian army has not outgrown. If the tactics of the Russians in the war of 1904-05 reflected too literally some of the maxims of Suvarov's Turkish wars, the spirit of self-sacrifice, resolution and indifference to losses there shown was a precious legacy from those wars. Drago- mirov (q.v.) avowed that his teaching was based on Suvarov's practice, which he held to be representative of the fundamental truths of war and of the military qualities of the Russian nation.

See Anthing, Versuch einer Kriegsgeschichte des Grafen Suworow (Gotha, 1 796-1 799); F. von Smitt, Suworows Leben und Heerziige (Vilna, 1 833-1 834) and Suworow und Polens Untergang (Leipzig, 1858); Von Reding-Biberegg, Der Zug Suworows durch die Schweiz (Zurich, 1896); Lieut.-Colonel Spalding, Suvorof (London, 1890); G. von Fuchs, Suworows Korrespondenz, 1799 (Glogau, 1835) ; Souvorov en Italie, by Gachot, Mass6na's biographer (Paris, 1903); and the standard Russian biographies of Polevoi (1853; Ger. trans., Mitau, 1853); Rybkin (Moscow, 1874) and Vasiliev (Vilna, 1899).

SUWALKI, a government of Russian Poland, of which it occupies the N.E. corner, extending to the N. between East Prussia and the Russian governments of Vilna and Grodno, with the government of Kovno on the N. Its area is 4846 sq. m. It includes the east of the low Baltic swelling (800 to 1000 ft. above the sea) and is studded with lakes. Its northern slopes descend to the valley of the Niemen, while in the south it falls away gently to the marshy tract of the Biebrz. The rivers flow there in deep-cut gorges and hollows, diversifying the surface. The Niemen forms its eastern and northern boundary and has many affluents from both slopes of the swelling. The Augustowo canal connects the navigable Hancza, a tributary of the Niemen, with a tributary of the Biebrz, which belongs to the basin of the Vistula, and an active traffic is carried on by this canal. Forests cover

about one-fourth of the area. Tertiary and cretaceous strata occupy large areas, and the entire surface is covered with Post- Tertiary deposits. The bottom moraine of the great ice-sheet of north Germany, containing scratched boulders and furrowed by depressions having a direction N.N.E. and S.S.W., ex- tended over immense tracts of the ridge of the lake-districts and its slopes, while limited spaces are covered with well- washed. glacial sands and gravel. On the northern slopes of the coast-ridge, the boulder-clay being covered with lacustrine deposits, there are in many places areas of fertile soil; and in the southern parts of the province the boulder-clay is stony, and sometimes covered with gravel. . Still, nearly nine-tenths of the surface are suitable for cultivation.

The population in 1906 was estimated at 633,900. The majority (52-2%) are Lithuanians, mostly in the north; there are 21-5% Poles (and Mazurs), chiefly in the towns; 16-7% Jews; 5-3% Germans and 4-2% Russians. The chief towns of the seven districts into which the government is divided are Suwalki, Augustowo, Kalwarya, Mariampol, Seiny, Wilkowiszki (or Volkovyshki) and Wladislawow. The principal crops are rye, wheat, oats, barley and potatoes, which are largely exported to Prussia for use in the distilleries. Bee-keeping is widely spread, and about 40,000 lb of honey are obtained every year. The weaving of linen, woollen cloth and fishing-nets is extensively carried on in the villages as a domestic industry, and in small factories. A large number of the inhabitants are compelled to

seek work in winter in other parts of the empire. The felling of timber, which is floated down the Niemen, gives occupation to many.

SUWALKI, a town of Russian Poland, capitalof the govern- ment of the same name, situated at the source of the Hancza, a tributary of the Niemen, 65 m. by rail N.W. of Grodno. Pop. 27,165. In the 15th century it was a small village amid forests, peopled by Lithuanians. Its trade is chiefly in timber, grain, woollen cloth and other manufactured goods.

SUYUTI [Abii-1 Fadhl'Abd ur-Rahman ibn Abl Bakr Jalal ud-Dln us-Suyuti] (144 5-1 505), Arabian encyclopaedic writer, was the son of a Turkish slave woman. His father, who was of Persian descent, had been cadi in Suyut (Upper Egypt) and professor in Cairo, but died before his son was six years old. The boy's training was taken in hand by a Sufi friend of the father. He was precocious and is said to have known the Koran by heart before he was eight years old. In 1462 he was already a teacher; in 1464 he made the pilgrimage to Mecca; in 1472 he became a professor, and in i486 was promoted to a chair in the mosque of Bibars. Here, however, he provoked a revolt among the students and in 1501 was discharged for maladministration of trust funds. Two years later he was offered the same post again, but declined, and worked in seclusion at

Rauda, an island of the Nile, and there died in 1505. He was one of the most prolific writers of the East, though many of his works are only pamphlets and some are mere abridgments of the work of others.

We know of 561 separate titles of his works, and over 316 exist in manuscript. A list of these is given in C. Brockelmann's Gesch. der Arabischen Litteratur, ii. 144-158 (Berlin, 1902). They deal with almost every branch of Moslem science and literature. Among the best known are the Itqan fi ' Ulum ul-Quran (on the exegetic sciences of the Koran), published with an analysis by A. Sprenger (Calcutta, 1852-1854) and often in Cairo; the commentary on the Koran, known as the Tafslr ul-Jalalain, begun by Jalal ud-DIn ul-Mahalli (1389-1459) and finished by SuyutI, published often in the East; and the history of the caliphs, published at Calcutta (1858) and elsewhere. (G. W. T.)

SUZERAINTY. " Suzerain," a term of feudal law, is now used to describe persons or states in positions of superiority to others. Its etymology, according to Professor W. W. Skeat {Etymological Dictionary), is as follows: " A coined word; made from French sus, Latin susum or sursum, above, in the same way as sovereign is made from Latin super; it corresponds to a Low Latin type suseranus." Another form of the word is souseran (F. Godefroy, De I'Ancienne langue franqaise) . Suzerain has been defined as " Qui possede un fief dont d'autres fiefs relevent " (Littre and Dictionnaire de I'academie frangaise). C. Loyseau, in his Traite des seigneuries (3rd ed., 1610, p. 14), explains that there are two kinds of public seigneuries, that is, sovereign seigneurs, possessing summum impcrium, and suzerains, " Les suzeraines sont celles qui ont puissance superieure mais non supreme." Elsewhere he says that suzerainty is a form of public seigneuries which has been " usurpee par les particuliers pour laquelle exprimer il nous a fallu forger un mot expres, et l'appeller suzerainete, mot qui est aussi etrange comme celle espece de seigneuries est absurde " (p. n). Loyseau adds, " Seigneurie suzeraine est dignity d'un fief ayant justice" (p. 38). Bousquet (Nouveau dictionnaire de droit) defines suzerain as '■ superieur, celui dont un fief relevait "; Rogulau {Glossaire du droit franqois) , " supe- rieur en quelque charge ou dignite autre que le roy." The name does not occur in the Consuetudines feudorum, or in Hotoman's De verbis fevdalibus commentarius. It was rare in feudal times in England. But it was used in France to describe a feudal lord, the supreme suzerain being the king. Merlin, under suzerainete, shows that the word was not used by all feudal writers in the same sense. (See also Chas. Butler's note to Coke on Litt. 191 a.)

In modern times the term has come to be used as descriptive of relations, ill-defined and vague, which exist between powerful and dependent states; its very indefiniteness being its Modern recommendation. According to

feudal law the vassal Usage. owed certain duties to the lord; he promised fidelity and service; and the lord was bound to perform reciprocal duties, not very

clearly defined, to the vassal — Dominus vassallo conjux et amicus dicitur. The relation between a lord and his vassals, implied in the oath of fealty, has been extended to states of unequal power; it has been found convenient to designate certain states as vassal states, and their superiors as suzerains. Originally and properly applicable to a status recognized by feudalism, the term vassal state has been used to describe the subordinate position of certain states once parts of the Ottoman Empire, and still loosely connected therewith. Such are Egypt and Bulgaria. Rumania, Servia and Montenegro, once vassal states, may now be regarded as independent. The relations of these states to the Ottoman Porte are very varied. Egypt has been variously described as a vassal state or as a protectorate. But all of these pay tribute to the sultan, or in some way acknowledge his supremacy (Emanuel Ullmann, Volkerrecht, § 16); M. de Martens (Traiti de droit international, 1883, i. 333 n.) thus defines the term: " La suzerainete est la souverainete limitee exercee par le pouvoir supreme d'un etat sur un gouvernment mi-sou verain," a definition applicable to protectorates, with which it is often confounded. Thus Mommsen (History of Rome) indiscriminately describes the supremacy of Rome over Armenia as " suzerainty " or " protectorate." To illustrate the vague use of the word in modern diplomacy may be quoted the description of suzerainty given by Lord Kimberley, which Mr Chamberlain in the correspondence as to South Africa mentioned with approval: " Superiority over a state possessing independent rights of government subject to reservations with reference to certain specified matters" (1899 [C. 9057], p. 28).

M. Gairal (Le Protectorat international) distinguishes suzerainty from protectorate in these respects: (a) suzerainty proceeds Protecto- from a concession on the part of the suzerain nie and (p. 1 1 2); (b) the vassal state is bound to perform Suzerainty. S p ec ifi c services; and © tfre vassal state has larger powers of action than those belonging to a protected state; (d) there is reciprocity of obligation. According to M. F. Despagnet the term suzerain is applicable to a case in which a state concedes a fief, in virtue of its sovereignty (Essai sur le protectorat international, p. 46), reserving to itself certain rights as the author of this concession.

Another writer draws these distinctions: (a) a state connected by protectorship with another previously enjoyed autonomy; the vassal state

did not; (b) the protected state retains its nationality and its internal administration; the vassal state acquires a dis- tinct nationality; (c) the establishment of a protectorate modifies few of the institutions of the protectorate state except as to foreign relations; the establishment of a suzerainty changes the institutions of the vassal state; (d) the protected state exercises its internal sovereignty a peu pres plcinement; the vassal state remains subordinate in several respects; (e) while the protected state has the right to be assisted in case of war by the protecting state, but is not bound to defend the latter, the vassal state is bound to aid its suzerain (Tchomacoff, De la SouverainetS, p. 53). See also Hachenburger, De la Nature juridique du protectorat.

W. E. Hall thus defines vassal states: " States under the suzerainty of others are portions of the latter which during a process of gradual disruption or by the grace of the sovereign have acquired certain of the powers of an independent com- munity, such as that of making commercial conventions, or of conferring their exequatur on foreign consuls. Their position differs from that of the foregoing varieties of states (protectorates, &c), in that a presumption exists against the possession by them of any given international capacity (International Law, 4th ed., p. 31).

Another suggested distinction is this: Suzerainty is title with- out corresponding- power; protectorate is power without cor- responding title (Professor Freund, Political Science Quarterly, 1899, p. 28).

On the whole, usage seems to favour this distinction: while a protectorate flows from, or is a reduction of, the sovereignty of the protected state, suzerainty is conceived as derived from, and a reduction of, the sovereignty of the dominant state.

As to the power of making treaties, a vassal state cannot, as a

rule; conclude them; such power does not exist unless it is specially given. On the other hand, a protected state, unless the contrary is stipulated, retains the power of concluding treaties (Bry, p. 294).

It is sometimes said that a protected state, unlike a vassal state, has the right of sending representatives to foreign states. But such distinctions are of doubtful value: the facts of each case must be considered (Ullmann, § 26).

There is one practical difference between the two relations; while the protecting and protected states tend to draw nearer, the reverse is true of the' suzerain and vassal states; a protectorate is generally the preliminary to incorporation, suzerainty to separation. Sometimes it is said that the

territory of the vassal state forms part of the territory of the suzerain; a proposition which is true for some purposes, but not for all.

All definitions of suzerainty are of little use. Each instru- ment in which the word is used must be studied in order to ascer- tain its significance. Even in feudal times suzerainty might be merely nominal, an instance in point being the suzerainty or over-lordship of the papacy over Naples. In some cases it may be said that suzerainty brings no practical advantages andimplies no serious obligations. Among the instances in which the term is actually used in treaties are these: the General Treaty, Peace of Paris, 1856 (arts. 21 and 22), recog- sugeraˆaty. nized the suzerainty of Turkey over the Danubian principalities Moldavia and Wallachia, modifying the " sove- reignty " of Turkey recognized by the Treaty of Adrianople. " Les principautes de Valachie et de Moldavia continueront a jouir, sous la suzerainete de la Porte et sous la garantie des Puissances cbntractantes, des privileges et des immunites dont elles sont en possession." The convention of the 19th of August 1858 (Hertslet x. 1052) organized the then principalities " under the suzerainty of che sultan" (art. 1). The internal govern- ment was to be exercised by a hospodar, who received his investiture from the sultan, the sign of vassalship, it has been said (Tchomacoff p. 45). The autonomy of these vassal states has been fully recognized by the Treaty of Berlin of 1878 (art. 1). In the Interpretation Act, 1889, s. 18 (5), " suzerainty " is used to describe the authority of the sovereign over native princes.

The word suzerain is used in the Pretoria convention of the 3rd of August 1 88 1 between the British government and the late South African Republic. The convention (by its preamble) granted to the inhabitants complete self-government, ". subject to the suzerainty of her Majesty," and this suzerainty was reaffirmed in the articles. Even when the convention was being negotiated doubts arose as to its meaning, and legal authorities were divided as to its effect (see speech of Lord Cairns, Hansard, 269, p. 261; Lord Selborne, 260, p. 309; answer of attorney-general 260, 1534). It was doubtful whether territory could be ceded by the Crown of its own authority; and if the power existed the cession could, it was said, be made only by virtue of clear words. From the articles substituted in the London convention of the 27th of February 1884 for those of 1881, the word " suzerainty " was omitted. Fresh doubts arose as to the effect of this omission; and a correspondence on the subject took place between the British government and the government of the republic before the outbreak of hostilities in South Africa, the former main- taining that the preamble of 1881, by which alone any self- government was granted, was still in force, and therefore that the suzerainty — whatever it involved — remained; the Transvaal government, on the other hand, contending that the suzerainty had been abolished by the substitution of the 1884 convention for that of

1881. Writers on international law differ greatly as to the exact position of the South African republic under the later con- vention. Some considered it an independent sovereign state. Mr Taylor (A Treatise of International Public Law, p. 174) treats the Transvaal after the convention of 1884 as a " neutralized state only part sovereign." Other writers describe the relation as that of a protectorate (see Professor J. Westlake, Revue de droit inter- national, 1896, p. 268 seq.; International Law, pt. 1, p. 27). Professor de Louter defines it as " une servitude du droit des gens (servitus juris gentium), et qui difiere de la servitude du

droit prive en ce qu'elle ne constitue pas tin droit reel (jus in re aliena) mais un droit entre deux personnes de droit inter- national (subjecta juris gentium) " (Revue de droit international, 1899, p. 330). Dr F. Von Liszt (Das Volkerrecht, p. 331) treats the South African republic as an example of a half sovereign state. M. Gairal describes it as a vassal state. Probably the soundest opinion is that the British Crown reserved no other rights than those expressly stated in the convention of 1884.

See Stubbs, " Suzerainty, or the Rights and Duties of Suzerain and Vassal States " (1882), Revue de droit international (1896), pp. 39, 278; Westlake, " L'Angleterre et la republique sud-africaine," Revue de droit international (1896), p. 268; Boriihak, Etnseilige A bhdngigkeitsverhaltnisse unter den modernen Staaten (i 896) ; Ullmann, Volkerrecht (1908), p. 25; Tchomacoff, De la SouverainetS (1901); Jellinek, Die Lehre von den Staatenverbindungen (1882); Correspon- dence Relating to South African Republic (1899) [C. 9507]; Law Magazine (1900), p. 413; Law Quarterly Review (5896), p. 122; Journal of Comparative Legislation, new series, vol. i. p. 432 ; Merignhac, Droit public international (1905), p. 204. (J. M.)

SVANE [or Svaning], HANS (1606-1668), Danish statesman and ecclesiastic, was born on the 27th of March 1606, at Horsens, where his father, Hans Riber, was burgomaster. His mother Anne was a daughter of the historian Hans Svaning, whose name, subsequently altered to Svane, he adopted. At Copenhagen Svane devoted himself to the study of Oriental languages, and between 1628 and 1635 completed his education abr6ad, at Franeker in Friesland, Wittenberg, Oxford and Paris. After seven years' residence abroad Svane returned to occupy the chair of Oriental languages at the university of Copenhagen. In 1646, finding promotion slow, he turned to theology and was " created " Dr theol. by his old patron Jesper Brochmand, now bishop of Sjaelland, whom he succeeded in the

metropolitan see of Denmark on the 26th of January 1655. As a theologian he belonged to the severely orthodox Lutheran school. His scholarship, despite the erudition of his commentary to the prophet Daniel in two huge folio volumes, is questionable. But in Latin and Danish he won distinction as a speaker, and his funeral orations in both languages were admired by his contemporaries. At the famous rigsdag of 1660 he displayed debating talent of a high order and played an important political role. It was Svane who, at the opening of the rigsdag, proposed that only members of the council of state should be entitled to fiefs and that all other estates should be leased to the highest bidder whatever his social station. At a hint from the king he laboured to get the royal charter abolished and the. elective monarchy transformed into an hereditary monarchy. The clerical deputies followed him in a serried band, as the burgesses followed Nansen, and the bishop's palace was one of the meeting- places for the camarilla which was privy to the absolutist designs of Frederick III. Throughout the session Svane was chairman of " the Conjoined Estates " in their attacks upon the nobility, his watchword being: Equal rights for all and a free hand for the king. It was on his motion (Oct. 8) that the Commons agreed " to offer his majesty the crown as an hereditary crown," to which proposition the nobility acceded, under severe pressure, two days later. When, on the 13th, the three estates assembled at the castle, it was Svane's speech, as president of the estate of the clergy, which gave the solemnity itsultra-royalist character. He, too, quashed the timid attempt of the more liberal minded of the deputies to obtain a promise from the king of some sort of a constitution. In fact, excepting the king and queen, nobody contributed so powerfully to the introduction of absolutism into Denmark as the bishop of Copenhagen. He was raised to the dignity of archbishop, a title which no other Danish prelate has since borne, and as president of the academic consistory of the university fan office which was invented for and died with him) he toek precedence of the rector magnificus. He was also created a royal councillor, an assessor of the supreme court and a member of the stats kollcgict or council of state. His elevation seems to have turned his head. The university suffered the most from his extravagant pretensions; and his quarrels with all the professors at last caused such a scandal that the king had to interfere per- sonally. A bishop who was at the same time a privy councillor,

a minister of state and a judge of the supreme court could have but little time for spiritual duties. Yet Svane was not altogether neglectful of them. Especially noteworthy is his plan for the erection of a consistorial college for managing all the temporal affairs of the church, including education and poor relief, anticipating to some extent the modern ministries of education and public worship, which unfortunately was not adopted. Moreover, the privileges which he obtained for the clergy did much to

increase the welfare and independence of the Danish Church in difficult times, while his representations to the king that Danish theology was not likely to be promoted by placing Germans over the heads of native professors bore good fruit. Svane died on the 26th of July 1668, in his 62nd year.

See Detlev Gotthard Zwergius, Siellandske clerisie (Copenhagen, 1754). (R. N. B.)

SVANET1A, a mountainous district on the south slopes of the Caucasus, immediately underneath the loftiest glaciated peaks of the middle of the system. It extends over the upper valleys of the Rlon, Ingur and Tskhenis-tskhali, and is included in the modern government of Kutais. The Svanetians belong to the Georgian race. (See Caucasia and Caucasus.)

SVENDBORG, a seaport of Denmark, capital of the ami (county) of its name, on the south shore of the island of Fiinen. Pop. (1901), 11,543. The situation is pleasant. The narrow Svendborg Sund separates Fiinen from the lesser islands of Taasinge and Turo, of which the former rises to 245 ft. Inland from the town there is also elevated ground, the Ovinehoi. The harbour is accessible to vessels drawing 20 ft. There are tobacco and earthenware manufactories, boat-building yards, and dis- tilleries. Butler is the principal export, and petroleum, coal and iron the imports. Neighbouring to the town are the ruined castle of Orkil, the watering-place Christiansminde, and the extensive Orchards of Gammel Hestehave, where wine is produced.

SVENDSEN, JOHANN SEVERIN (1840-), Norwegian composer, was born in Christiania on the 30th of September 1840. He learnt the elements of music and violin-playing from his father, and after serving for some time in the army, and later touring as violinist with a troup of instrumentalists, he entered the conserva- torium at Leipzig through the aid of the king of Sweden. After another tour, which extended to the British Isles, Svendsen spent a year in Paris, and in 1871-1872 was leader of the once famous Euterpe concerts in Leipzig. In 187 1 he married an American, and from 1872 to 1877 he conducted the Christiania Musical Society, while in 1877-1879 he lived in Rome, London and Paris. In 1883 Svendsen became court kapellmeister at Copenhagen. Probably we have to go back to Schubert to find a 'composer Whose Opus 1 has attained the wide popularity of Svendsen's A minor string quartet, while his beautiful octet, Opus 3, added to his fame. Though Svendsen was at one time intimate with Wagner, the latter docs not seem to have influenced his music, which includes two symphonies, a violin concerto, and a. romance for violin, as well as a number of Norwegian rhapsodies for the orchestra.

SVERDRUP, JOHAN (1816-1892), Norwegian statesman, was born at Jar Is berg on the 30th of July 18 16. His father, Jakob "Sverdrup, was a land steward, and the founder of the first school of agriculture in Norway. Johan entered the Storthing in 1850, sitting first for Laurvik, and then for the district of Akershus, and was its president from 1871 to 1884, during the whole of the dispute over the prerogative of the Crown. He built up a strong political party, which, relying for support chiefly on the Norwegian peasantry, was determined to secure strict constitutional government and practically to destroy the power of the king. Under his leadership the opposition, in 1872, secured the passing of a bill for the admission of the ministers to the Storthing, which was a step to the establishment of the dependence of the cabinet on a majority in that assembly. King Charles XV. refused his sanction to this bill, and on its third passing in 1880 Oscar II. opposed his veto, at the same time claiming his right to the absolute veto. Sverdrup then proposed the proclamation of the law in defiance of the king's action. The

retirement of Frederik Stang removed Sverdrup's chief political opponent from the field. He was aided in his campaign by Bjornstjerne Bjornson, and after a series of political crises he became prime minister in June 1884. But when he became prime minister he soon found himself at issue with Bjornson on church matters. Inspired chiefly by his nephew Johan he secured the refusal of a pension to the novelist Kielland because of his anti-clerical views, and he further wished to give the parish councils the right to strike off the voting list persons who had broken away from church discipline. Therefore, although during his term of office no fewer than eighty-nine measures, many of them involving useful reforms, became law, he failed to satisfy the extremists among his supporters, and was driven to rely on the moderate Liberals. He was compelled to retire in 1889, and died on the 17 th of February 1892 at Christiania.

SWABIA, Suabia or Suevia (Ger. Schwaben), one of the stem-duchies of medieval Germany, taking its name from the Suevi, a tribe who inhabited the district in the first century of the Christian era. Dwelling in the angle formed by the Rhine and the Danube, they were joined by other tribes, and were called Alamanni, whilst the district was called Alamannia, until about the nth century, when the form Swabia began to prevail. In 496 the Alamanni were defeated by Clovis, king of the Franks, brought under Frankish rule, and governed by dukes who were dependent on the Frankish kings. In the 7th century the people were converted to Christianity, bishoprics were founded at Augsburg and Constance, and in the 8th

century abbeys at Reichenau and St Gall. The Alamanni had gradually thrown off the Frankish yoke, but in 730 Charles Martel again reduced them to dependence, and his son Pippin the Short abolished the tribal duke and ruled the duchy by two counts palatine, or Kammerboten.

The duchy, which was divided into gaus or counties, took about this time the extent which it retained throughout the middle ages, and was bounded by the Rhine, the lake of Constance, the Lech and Franconia. The Lech, separating Alamannia from Bavaria, did not form, either ethnologically or geographically, a very strong boundary, and there was a good deal of inter-communion between the two races. During the later and weaker years of the Carolingian rule the counts became almost independent, and a struggle for supremacy took place between them and the bishops of Constance. The chief family in Ala- mannia was that of the counts of Raetia, who were sometimes called margraves, and one of whom, Burkhard, was called duke of the Alaminnia. Burkhard was killed in 911, and two counts palatine, Bertold and Erchanger, were accused of treason, and put to death by order of the German king Conrad I. In 917, Burkhard, count in Raetia, took the title of duke, and was recognized as such by King Henry I., the Fowler, in 919. His position was virtually independent, and when he died in 926 he was succeeded by Hermann, a Franconian noble, who married his widow. When Hermann died in 948 Otto the Great gave the duchy to his own son Ludolf, who had married Hermann's daughter Ida; but he reduced the ducal privileges and appointed counts palatine to watch the royal interests. Ludolf revolted, and was deposed, and other dukes followed in quick, succession. Burkhard II., son of Burkhard I., ruled from 954 to 973, Ludolf's son, Otto, afterwards duke of Bavaria, to 982, and Conrad I., a relative of Duke Hermann I., until 997. Hermann II., possibly a son of Conrad, succeeded, and, dying in 1003, was followed by his son Hermann III. During these years the Swabians were loyal to the kings of the Saxon house, probably owing to the influence of the bishops. Hermann III. had no children, and the succession passed to Ernest, son of his eldest sister Gisela and Ernest I., margrave of Austria. Ernest held the duchy for his son until his own death in 1015, when Gisela undertook the government, and was married a second time, to Conrad, duke of Franconia, who was afterwards the German king Conrad II. When Ernest came of age he quarrelled with his step-father, who deposed him, and, in 1030, gave the duchy to Gisela's second son, Hermann IV. and, on his death in 1038, to Henry, his own son by Gisela. In 1045 Henry,

who had become German king as Henry III., granted Alamannia to Otto, grandson of the emperor Otto II. and count palatine of the Rhine, and, in 1048, to Otto, count of Schweinfurt. Rudolph, count of Rheinfelden, was the next duke, and in 1077 he was chosen German king in opposition to the emperor Henry IV., but found little support in Swabia, which was given

by Henry to his faithful adherent, Frederick I., count of Hohen- staufen. Frederick had to fight for his position with Bertold, son of Duke Rudolph, and the duke's son-in-law, Bertold II., duke of Zahringen, to whom he ceded the Breisgau in 1096. Frederick II. succeeded his father in n 05, and was followed by Frederick III., afterwards the emperor Frederick I. The earlier Hohenstaufen increased the imperial domain in Swabia, where they received steady support, although ecclesiastical influences were very strong. In n 52 Frederick I. gave the duchy to his kinsman, Frederick, count of Rothenburg and duke of Franconia, after whose death in 1167 it was held successively by three sons of the emperor, the youngest of whom, Philip, was chosen German king in 1198. During his struggle for the throne Philip purchased support by large cessions of Swabian lands, and the duchy remained in the royal hands during the reign of Otto IV., and came to Frederick II. in 1214. Frederick granted Swabia to his son Henry, and, after his rebellion in 1235, to his son Conrad, whose son Conradin, setting out in 1266 to take possession of Sicily, pledged his Swabian inheritance to Ulrich II. count of Wurttemberg. The duchy was ripe for dissolution and, after Conradin's death, in 1268, the chief authority in Swabia fell to the counts of Wurttemberg, the mar- graves of Baden, the counts palatine of Tubingen, the counts of Hohenzollern and others.

When the emperor Maximilian I. divided Germany into circles in 1512, one, which was practically coterminous with the duchy, was called the Swabian circle. The area, which was formerly Swabia, is now covered by the kingdom of Wurttemberg, the grand-duchy of Hesse and the western part of the kingdom of Bavaria. Although the name Swabia is occasionally used in a general way to denote the district formerly occupied by the duchy, the exact use of the name is now confined to a Bavarian province, with its capital at Augsburg.

See J. Leichtlen, Schwaben muter den Romern (Freiburg, 1825); J. C. v. Pfister, Pragmatische Geschichte von Schwaben (Heilbronn, first part, 1803, continuation to 1496, 1827).

SWABIAN LEAGUE, an association of German cities, prin- cipally in the territory which had formed the old duchy of Swabia. The name, though usually given to the great federa- tion of 1488, is applicable also to several earlier leagues (e.g. those of 1331, 1376). The Swabian cities had attained great prosperity under the protection of the Hohenstaufen emperors, but the extinction of that house in 1268 was followed by dis- integration. Cities and nobles alike, now owing allegiance to none but the emperor, who was seldom able to defend them, were exposed to the aggression of ambitious princes.

In 1331, twenty-two Swabian cities, including Ulm, Augsburg, Reutlingen

and Heilbronn, formed a league at the instance of the emperor Louis the Bavarian, who in return for their support promised not to mortgage any of them to a vassal. The count of Wurttemberg was induced to join in 1340. Under Charles IV. the lesser Swabian nobles began to combine against the cities, and formed the Schlegelerbund (from Schlegel, a maul) . Civil war ensuing in 1367, the emperor, jealous of the growing power of the cities, endeavoured to set up a league under his own control, for the maintenance of public peace (Landfriedens- bund, 1370). The defeat of the city league by Eberhard II. of Wurttemberg in 1372, the murder of the captain of the league, and the breach of his obligations by Charles IV., led to the formation of a new league of fourteen Swabian cities led by Ulm in 1376. This league triumphed over the count of Wurttem- berg at Reutlingen in 1377, and the emperor having removed his ban, it assumed a permanent character, set up an arbitration court, and was rapidly extended over the Rhineland, Bavaria and Franconia. In 1382 an alliance was made at Ehingen with the archduke of Austria, and through his mediation with the

three chief knightly associations of Swabia. The new king, Wenceslaus, hoped at first, like his father Charles, to check the federal movement by associating all estates of the realm under his own lead in Landjriedenseinigungen, but such a compact made at Heidelberg in 1384, although renewed at Mergentheim three years later, was a mere makeshift. The struggle between burghers and nobles was precipitated by the inclusion of the urban members of the Swiss confederation in the league in 1385 and the overthrow of Archduke Leopold of Austria by the latter at Sempach in the following year. A quarrel between the duke of Bavaria and the archbishop of Salzburg gave the signal for a general war in Swabia, in which the cities, weakened by their isolation, mutual jealousies and internal conflicts, were defeated by Count Eberhard II. at Doffingen (Aug. 24, 1388), and were severally taken and devastated. Most of them quietly acquiesced when Wenceslaus proclaimed a Landfriede at Eger in 1389 and prohibited all leagues between cities. The professed aims of the cities which had formed this league of 1376 were the maintenance of their imperial status (Reichs- unmittelbarkeit), security against sale or mortgage and against excessive taxation, the protection of property, trade and traffic, and the power to suppress disturbances of the peace. There is no trace of co-operation with the Hanseatic towns. The league necessarily opposed the pretensions of the emperors and the electoral princes, especially as set forth in the Golden Bull, and in accordance with the growing spirit of civil freedom demanded a share in the government, but that there was any widespread conscious desire for a fundamental change in the constitution,

for the abolition of aristocratic privilege or for a republic, as certain historians maintain, is improbable (K. Kliipfel, Der schwabische Bund).

For nearly a century there was no great effort at federation among the Swabian cities, attention being diverted to the ecclesiastical controversies of the time, but there were partial and short-lived associations, e.g. the league of twelve Swabian cities in defence of their liberties in 1392, the Marbach league in 1405 against the German king, Rupert, and in 1441 the union of twenty-two cities (in 1446 thirty-one) headed by Ulm and Nuremberg, for the suppression of highway robbery. This latter union in 1449 formed a standing army and waged war on a confederation of princes led by Albert Achilles, afterwards elector of Brandenburg (q.v.).

The growing anarchy in Swabia, where the cities were violently agitated by the constant infringement of their liberties (e.g. the annexation of Regensburg by Bavaria in i486), induced Frederick III., who required men and money for the Hungarian War, to conciliate the cities by propounding a scheme of pacifica- tion and reform. His commissioner, Count Hugo of Werdenberg, met the Swabian estates at Esslingen and laid before them a plan probably drawn up by Bertold, elector of Mainz, and on the 14th of February 1488 the Great Swabian League was con- stituted. There were four constituent parties, the archduke Sigismund of Austria, Count Eberhard V. (afterwards duke) of Wiirttemberg, who became the first captain of the league, the knightly league of St George, and lastly twenty-two Swabian imperial cities. The league received a formal constitution with a federal council consisting of three colleges of nine coun- cillors each, a captain and a federal court with judicial and executive powers. The armed force which was to police Swabia consisted of 12,000 foot and 1200 horse, each party contributing one-fourth. The league gained strength by the speedy accession of Augsburg and other Swabian cities, the margraves of Branden- burg-Ansbach, Baireuth and Baden, the four Rhenish electors, &c, and in 1490 of Maximilian, king of the Romans, whom the league had helped to rescue; from the hands of the Netherlanders in 1488. It did not render him the support he expected in his foreign policy, but it performed its primary work of restoring and maintaining order with energy and efficiency. In 1492 it compelled Duke Albert of Bavaria to renounce Regensburg; in 1519 it expelled the turbulent duke, Ulrich of Wiirttemberg, who had seized Reutlingen, and it sold his duchy to Charles V.; and in 1523 it defeated the Franconian knights who had taken

up arms with Franz von Sickingen. In 1525, Truchsess, the league captain, aided by the forces of Trier and the palatinate, overthrew the rebel peasants of Konigshofen on the Tauber and at Ingolstadt.

The league, which had been several times renewed, expired on the 2nd of

February 1534, its dissolution being due to internal dissensions regarding the reformation. Futile attempts were made to renew it, in 1535 by the Bavarian chancellor, Eck, and in 1547 by Charles V.

See E. Osann, Zur Ceschichte des schwabischen Bundes (Giessen, 1861); K. Kliipfel, " Der schwabische Bund " (in Hist. Taschenbuch, 1883-1884), Urkunden zur Ceschichte des schwabischen Bundes (Stuttgart, 1846-1853). (A. B. Go.)

SWADLINCOTE, a town in the southern parliamentary division of Derbyshire, England, 15 m. S.S.W. of Derby, and 4 m. S.E. of Burton-upon-Trent, on the Midland railway. Pop. (1901), urban district of Swadlincote distr:'ct, 18,014 This includes the civil parishes of Swadlincote, Church Gres- ley and Stanton and Newhall, which together form a large industrial township, mainly devoted to the manufacture of earthenware and fireclay goods. There are collieries in the neighbourhood.

SWAFFHAM, a market town in the south-western parlia- mentary division of Norfolk, England; in m. N.N.E. from London by the Great Eastern railway. Pop. of urban district (1901), 3371. The town lies high, in an open, healthy district. The church of St Peter and St Paul is Perpendicular, a hand- some cruciform structure with central tower, and has a fine carved roof of wood. The town, which has a town-hall and assembly rooms, possesses iron foundries and a considerable agricultural trade, with cattle fairs. At Castle Acre, 4 m. N., are the picturesque ruins of a Cluniac priory, founded shortly after the Conquest by William de Warren. These comprise portions of the church, including the fine west front, arcaded, with three Norman doors and a Perpendicular window, with the chapter-house, cloisters and conventual buildings. The majority of the remains are Norman or Perpendicular. The castle of the same founder has left little but its foundations, but it was erected within the protection of a remarkable series of earthworks, which remain in good condition. These are apparently in part Roman, in part earlier. The site, on which Roman coins, pottery and other remains have been discovered, was on an ancient trackway running north and south. It may be noted that de Warren founded a similar castle and priory at Lewes in Sussex. The church of St James, Castle Acre, contains good Early English and Perpendicular work.

SWAHILI (Wa-Swahili, i.e. coast people, from the Arabic sdhil, coast), a term commonly applied to the inhabitants of Zanzibar and of the opposite mainland between the parallels of 2 and 9 S., who speak the Ki-Swahili language. The Swahili are essentially a mixed people, the result of long crossing between the negroes of the coast and the Arabs, with an ad-mixture of slave blood from nearly all the East African tribes. Among Swahili are found every shade of colour and every type of physique from

the full-blooded negro to the pure Semite. Usually they are a powerfully built, handsome people, inclined to stoutness and with Semitic features. They number about a million. They figured largely in the history of African enter- prise during the 19th century. The energy and intelligence derived from their Semitic blood have enabled them to take a leading part in the development of trade and the industries, as shown in the wide diffusion of their language, which, like the Hindustani in India and the Guarani in South America, has become the principal medium of intercommunication in a large area of Africa south of the equator. During his journey from the Indian Ocean to the Atlantic (1873-1874) Commander- V. Lovett Cameron found that a knowledge of this language enabled him everywhere to dispense with the aid of an inter- preter, as it was understood by one or more persons in all the tribes along the route. Owing to this circumstance the Swahili have been found invaluable assistants in every expedition from the eastern seaboard to the interior after they began to be

employed by J. H. Speke and Richard Burton as porters and escorts in 1857. The language is somewhat archaic Bantu, much mixed with Arabic, while Indian, Persian and even English, Portuguese and German words have contributed to the vocabulary. Grammatical treatises on it have been published, and into it portions of the Bible have been translated by Bishop Steere. 1 The Swahili are Mahommedans, but in disposition are genuine negroes. Christian missions among them have met with little success.

See Johann Ludwig Krapf, Dictionary of Swahili Language (London, 1882); Bishop Steere, Handbook of the Swahili Language (London, 1894); Collection of Swahili Folk-Tales (1869); A. C. Madan, English- Swahili Dictionary (Oxford, 1894) ; Delaunay, Grammaire Kiswahili (Paris, 1898). See also Bantu Languages.

SWALLOW (A. S. swalewe, Icel. svala, Du. zwaluw, Ger. Schwalbe), the bird which of all others is recognized as the harbinger of summer in the northern hemisphere. The name Hirundo rustica of Linnaeus is now employed for the common chimney-swallow of Europe, which has been divided into four or five races. In summer it ranges all over Europe, and in Asia extends to Manchuria and China; in winter it migrates south, reaching India, Burma, the Malay Peninsula and the whole of Africa. The common swallow of North America, usually called the barn-swallow, is H. erythrogastra, but in summer it also reaches Alaska and Greenland and extends across to Lake Baikal. The winter migration extends to Burma for the Asiatic swallows and to South Brazil for those of America. In all some

twenty-seven species of Hirundo are recognized, the range of the genus being practically world-wide. Returning, usually already paired, to its summer haunts, after its winter sojourn in southern lands, and generally reaching England about the first week in April, the English swallow at once repairs to its old quarters, nearly always around the abodes of men; and, about a month later, the site of the nest is chosen, resort being had in most cases to the very spot that has formerly served the same purpose— the old structure, if still remaining, being restored and refurnished. So trustful is the bird that it commonly establishes itself in any of men's works that will supply the necessary accommodation, and a shed, a barn, or any building with an open roof, a chimney that affords a support for the nest, or even the room of an inhabited house — if chance should give free access thereto — to say nothing of extraordinary positions, may be the place of its choice. Where- soever placed, the nest is formed of small lumps of moist earth, which, carried to the spot in the bird's bill, are duly arranged and modelled, with the aid of short straws or slender sticks, into the required shape. This is generally that of a half-saucer, but it varies according to the exigencies of the site. The materials dry quickly into a hard crust, which is lined with soft feathers, and therein are laid from four to six white eggs, blotched and speckled with grey and orange-brown deepening into black. Two broods are usually reared in the season, and the young on leaving the nest soon make their way to some leafless bough, whence they try their powers of flight, at first accompanying their parents in short excursions on the wing, receiving from them the food which they are as yet unable to capture, until able to shift for themselves. They collect in flocks, often of many hundreds, and finally leave the country about the end of August or early in September, to be followed, after a few weeks, by their progenitors. They moult their feathers in their winter quarters, and this fact affords one of the strongest arguments against the popular belief (which, curious to say, is still partly if not fully entertained by many who should know better) of their becoming torpid in winter, for a state of torpidity would suspend all animal-action. 2 The chestnut forehead and throat,

1 The language was first reduced to writing by the Arabs, who still use the Arabic character. But the European missionaries have replaced this by the Roman system, which is more suited for the transliteration of most African, and especially of the Bantu, tongues.

2 See John Hunter's Essays and Observations in Natural History, edited by Sir R. Owen in 1 861 (ii. 280). An excellent bibliography of the swallow-torpidity controversy, up to 1878, is given by Professor Coues (Birds of the Colorado Valley, pp. 378-390), who seems still to hanker after the ancient faith in " hibernation."

-SWAN, J. M.

the shining steel-blue upper plumage, and the dusky white —in some cases reddening so as almost to vie with the frontal and gular patches — of the lower parts are well known to every person of observation, as is the markedly forked tail, which is become proverbial of this bird.

Taking the word swallow in a more extended sense, it is used for all the members of the family Hirundinidae, 3 excepting a few to which the name martin (q.v.) has been applied, and this family includes from 80 to 10b species, which have been placed in many different genera. The true swallow has very many affines, some of which range- almost as widely as itself does, while others seem to have curiously restricted limits, and much the same may be said of several of its more distant relatives. But altogether the family forms one of. the most circumscribed and therefore one of the most natural groups of Oscines, having no near allies; for, though in outward appearance and in some habits the swallows bear a con- siderable resemblance to swifts (q.v.), the latter belong to a different order, and are not Passerine birds at all, as their structure, both internal ; and external, proves. It has been sometimes stated that the Hirundinidae have their nearest relations in the flycatchers (q.v.) ; but the assertion is very questionable, and the supposition that they are allied to the Ampelidae (cf . Wax wing) , though possibly better founded, has not been confirmed. An affinity to the Indian and Australian Artamus (the species of which genus are often known as wood-swallows or swallow-shrikes) has also been suggested but has not been accepted. (A. N.)

SWALLOW-HOLE, in physical geography the name applied to a cavity resulting from the solution of rock under the action of water, and forming, or having at some period formed, the entrance to a subterranean stream-channel. Such holes are common in calcareous (limestone or chalky) districts, or along the line of outcrop of a limestone belt among non-calcareous strata. These cavities are also known as sinks, dolinas or butter-tubs, and by other local names, and sometimes as pot- holes; the last term, however, is also synonymous with Giant's Kettle (q.v.). See Cave.

SWAMMERDAM, JAN (1637-1680), Dutch naturalist, was born on the 12th of February 1637 at Amsterdam, the son of an apothecary and naturalist. He was destined for the Church; but he preferred the profession of medicine, taking his doctor's degree at' Leiden in 1667. Having necessarily to interest himself in human anatomy, heˆdevoted much attention to the preservation and better demonstration of the various structures, and he devised the method of studying the circulatory system by means of injections. He also spent much time in the study of insects, investigating the subject of their metamorphosis, and in this and other ways laying the beginnings of their natural classification, while his researches on the anatomy of mayflies and bees were also of great importance. His

devotion to science led to his neglect of practice; his father, resenting this, stopped all supplies and thus Swammerdam experienced a period of considerable privation, which had the most unfortunate con- sequences to his health, both bodily and mental. In 1675 his father died, leaving him an adequate fortune, but the mischief was irreparable. He became a hypochondriac and mystic, joined the followers of Antoinette Bourignon, and died at Amsterdam on the 15th of February 1680.

His Allgemeene 'Verhandeling van bloedeloose diertjens appeared at Utrecht in 1669, and his Biblia naturae, sive Historia insectorum in certas classes redacta was published after his death by H. Boer- haeve in 1 737-1 738. He was also the author of Miraculum naturae, seu Uteri muliebris fabrica. (Leiden, 1672).

SWAN, JOHN MACALLAN (1847-1910), English painter and sculptor, received his art training first in England at the Worcester and Lambeth schools of art and the Royal Academy schools, and subsequently in Paris, in the studios of J. L. Gdrdme and E. Fremiet. He began to exhibit at the Academy in 1878, and was elected associate in 1894 and academician in 1905. He was appointed a member of the Dutch Water-Colour Society in 1885; and associate of the Royal Society of Painters in Water Colours in 1896 and full member in 1899. A master of the oil, water-colour and pastel mediums, an accomplished

3 An enormous amount of labour has been bestowed upon the Hirundinidae by R. B. Sharpe (Cat. B. Brit. Mus. x. 85-210), and in the finely-illustrated Monograph which he and C. W. Wyatt have published (2 vols. 4to, London, 1885-1894).

painter and a skilful draughtsman, he ranks also as a sculptor of distinguished ability. He has treated the human figure with notable power, but it is by his representations of the larger wild animals, mainly the felidae, that he chiefly established his reputation; in this branch of practice he has scarcely a rival. His picture " The Prodigal Son," bought for the Chan trey collection in 1889, is in the National Gallery of British Art. He was awarded first class gold medals for painting and sculpture in the Paris Exhibition, 1900. He died on the 14th of February 1910.

See Sculpture; " The Work of J. M. Swan," by A. L. Baldry, in The Studio, vol. xxii. ; and Drawings of John M. Swan, R.A. (George Newnes, Ltd.).

SWAN, SIR JOSEPH WILSON (1828-), English physicist and electrician,

was born at Sundeiland on the 31st of October 1828. After serving his apprenticeship with a chemist in his native town, he became first assistant and later partner in a firm of manufacturing chemists in Newcastle. Among its operations this firm included the manufacture of photographic plates, and thus Swan was led to one of the advances in photo- graphy with which his name is associated — the production of extremely rapid dry plates, which were the outcome of an original observation made by him on the effect of heat in increasing the sensitiveness of a gelatino-bromide of silver emulsion. In 1862 he patented the first commercially practicable process for carbon printing in photography. This depended on the fact that when gelatine is exposed to light in the presence of bichromate salts it is rendered insoluble and non-absorbent of water. Swan took a surface of gelatine, dusted over with lampblack and sensitized with bichromate of ammonium, and exposed it to light below a photographic negative; the result was to make the gelatine from the surface downwards insoluble to a depth depending on the intensity, and therefore- penetration, of the light which had reached it through the negative. In this operation the surface of the gelatine was also rendered insoluble, and it therefore became necessary to get at its back in order to be able to wash away the portions that still remained soluble; this was effected by cementing the insoluble surface to a fresh sheet of paper by means of indiarubber solution, and then detaching the original support. It thus became possible to reach the soluble portions with water and to obtain a representation of the picture, though reversed as to right and left, in relief on the pigmented gelatine. This process has been simplified and improved by subsequent workers, but in its essential features it forms the basis of some of the methods of photographic reproduction most widely used at the present day. But Swan's name deserves remembrance even more in connexion with the invention of the incandescent electric lamp than with improvements in photographic tech- nique. He was one of the first to undertake the production of an electric lamp in which the light should be produced by the passage of an electric current through a carbon filament, and he was almost certainly far ahead, in point of time, of any other worker in the same field in realizing the conditions to be met and the difficulties to be overcome. So far back as i860 he constructed an electric lamp with a carbon filament, which was formed by, packing pieces of paper or card with charcoal powder in a crucible and subjecting the whole to a high temperature. The carbonized paper thus obtained he mounted in the form of a fine strip in a vacuous glass vessel and connected it with a battery of Grove's cells, which though not strong enough to raise it to complete incandescence, were sufficient to make it red-hct. This was substantially the method adopted by Edison nearly twenty years later, after various fruitless efforts to make a practical lamp with a filament of platinum or a platinum alloy had convinced him of the unsuitability of that metal for the purpose — a conclusion which Swan

had reasoned out for himself many years before. By the time Edison had hit upon the idea of carbonizing paper or bamboo by heat to form the filament, Swan had devised the further improvement of using cotton thread " parchmentized " by the action of sulphuric acid, and it was by the aid of such carbon filaments that on the 20th of October 1880 he gave at Newcastle the first public exhibition

on a large scale of electric lighting by means of glow lamps. In another method devised by him for the manufacture of fila- ments, collodion was squirted into a coagulating solution and the tough threads thus obtained carbonized by heat. He also devoted attention to apparatus for measuring electric currents, to the improvement of accumulators and to the conditions governing the electro-deposition of metals. He was elected a fellow of the Royal Society in 1894, and served as president of the Institution of Electrical Engineers in 1898-1899 and of the Society of Chemical Industry in 1901. In the last-named year he received the honorary degree of D.Sc. from Durham University, and he was knighted in 1904.

SWAN (A. S. swan and swon, Icel. svanr, Du. zwaan, Ger. Schwan), a large swimming-bird, well known from being kept in a half domesticated condition throughout many parts of Europe, whence it has been carried to other countries. In England it was far more abundant formerly than at present, the young, or cygnets, 1 being highly esteemed for the table, and it was under especial enactments for its preservation, and regarded as a " bird royal " that no subject could possess without licence from the Crown, the granting of which licence was accompanied by the condition that every bird in a " game " (to use the old legal term) of swans should bear a distinguishing mark of owner ship (cygninota) on the bill. Originally this privilege was 1 conferred on the larger freeholders only, but it was gradually extended, so that in the reign of Elizabeth upwards of 900 distinct swan-marks, being those of private persons or corporations, were recognized by the royal swanherd, Whose jurisdiction extended over the whole kingdom. It is impossible here to enter into further details on this subject, interesting as it is from various points of view. 2 It is enough to remark that all the legal protection afforded to the swan points out that it was not indigenous to the British Islands, and indeed it is stated (though on uncertain authority) to have been introduced to England in the reign of Richard Cceur de Lion; but it it now so perfectly naturalized that birds having the full power of flight remain in the country. There is no evidence to show that its numbers are ever increased by immigration from abroad, though it is known to breed as a wild bird not farther from the British shores than the extreme south of Sweden and possibly in Den- mark, whence it may be traced, but with considerable vacuities, in a south-easterly direction to the valley of the Danube and the western part of. Central Asia. In Europe, however, no definite limits can be assigned for its

natural range, since birds more or less reclaimed and at liberty consort with those that are truly wild, and either induce them to settle in localities beyond its boundary, or of themselves occupy such localities, so that no difference is observable between them and their untamed brethren. From its breeding-grounds, whether they be in Turkestan, in south-eastern Europe or Scania, the swan migrates southward towards winter, and at that season may be found in north-western India (though rarely), in Egypt, and on the shores of the Mediterranean.

The swan just spoken of is by some naturalists named the mute or tame swan, to distinguish it from one to be presently mentioned, but it is the swan simply of the English language

1 Here, as in so many other cases, we have what may be called the " table-name " of an animal derived from the Norman-French, while that which it bore when alive was of Teutonic origin.

2 The king and the Companies of Dyers and Vintners still maintain their swans on the Thames, and a yearly expedition is made in the month of August to take up the young birds — thence called " swan- upping " and corruptly " swan-hopping " — and mark them. The largest swannery in England, indeed the only one worthy of the name, is that belonging to Lord Ilchester, on the water called the Fleet, lying inside the Chesil Bank on the coast of Dorset, where from 700 to double that number of birds may be kept— a st<5ck doubtless too great for the area, but very small when compared with the numbers that used to be retained on various rivers in the country. The swanpit at Norwich seems to be the only place now existing for fattening the cygnets for the table — an expensive pro- cess, but one fully appreciated by those who have tasted the results. The English swan-laws and regulations have been concisely but admirably treated by Serjeant Manning (Penny Cyclopaedia, xxiii. 271, 272).

and literature. Scientifically it is usually known as Cygnus olor. Its large size, its spotless white plumage, its orange-red bill, surmounted by a black knob (technically the " berry “) larger in the male than in the female, its black legs and stately appear- ance on the water are familiar, either from figures innumerable or from direct observation, to almost every one. When left to itself its nest is a large mass of aquatic plants, often piled to the height of a couple of feet and possibly some six feet in diameter. In the midst of this is a hollow which contains the eggs, generally from five to nine in number, of a greyish-olive colour. The period of incubation is

between five and six weeks, and the young when hatched are clothed in sooty-grey down, which is succeeded by feathers of sooty-brown. This suit is gradually replaced by white, but the young birds are more than a twelve-month old before they lose all trace of colouring and become wholly white.

It was, however, noticed by Plot (N.H. Staffordshire, p. 228) more than 200 years ago that certain swans on the Trent had white cygnets; and it was subsequently observed of such birds that both parents and progeny had legs of a paler colour, while the young had not the " blue bill " of ordinary swans at the same age that has in some parts of the country given them a name, besides offering a few other minor differences. These, being examined by W. Yarrell led him to announce (Proc. Zool. Society, 1838, p. 19) the birds presenting them as forming a distinct species, C. immutabilis, to which the English name of " Polish " swan had already been attached by the London poulterers, 1 but which is now regarded merely as a variety, not in any way specially associated with Poland but possibly a dimorphic form.

The whooper, whistling or wild swan 2 of modern usage, Cygnus musicus, which was doubtless always a winter- visitant to Britain, though nearly as bulky and quite as purely white in its adult plumage, is at once recognizable from the species which has been half domesticated by its wholly different but equally graceful carriage, and its bill — which is black at the tip and lemon-yellow for a great part of its base. This entirely distinct species is a native of Iceland, eastern Lapland and northern Russia, whence it wanders southward in autumn, and the musical tones it utters (contrasting with the silence that has caused its relative to be often called the mute swan) have been celebrated from the time of Homer to our own. Otherwise in a general way there is little difference between the habits of the two, and very closely allied to the whooper is a much smaller species, with very well marked characteristics, known as Bewick's Swan, C. bewicki. This was first indicated as a variety of the last by P. S. Pallas, but its specific validity is now fully established. Apart from size, it may be externally distinguished from the whooper by the bill having only a small patch of yellow, which inclines to an orange rather than a lemon tint; while internally the difference of the vocal organs is well marked, and its cry, though melodious enough, is unlike. It has a more easterly home in the north than the whooper, but in winter not infrequently occurs in Britain.

Both the species last mentioned have their representatives in North America, and in each case the transatlantic bird is con- siderably larger than that of the Old World. The first is the trumpeter-swan, C. buccinator, which has the bill wholly black, and the second the C. columbianus — greatly resembling Bewick's swan, but with the coloured patches on the bill of less extent and deepening almost into scarlet. South America produces

two very distinct birds commonly regarded as swans, Cygnus melanocoryphus , the black-necked swan, and that which is called Coscoroba. This last, C. Candida, which inhabits the southern extremity of the continent to Chile and the Argentine territory and visits the Falkland Islands, is the smallest species known — pure white in colour except the tip of its primaries, but having a red bill and red feet. 3 The former, if not discovered by earlier navigators, was

1 M. Gerbe, in his edition of Degland's Ornithologie Europeenne (ii. 477), makes the amusing mistake of attributing this name to the fourreurs (furriers) of London, and of reading it Cygne du pile (polar, and not Polish, swan)!

2 In some districts it is called by wild-fowlers " elk," which per- haps may be cognate with the Icelandic Alft and the Old German Elbs or Elps (cf. Gesner, Ornithologia, pp. 358, 359), though by modern Germans Elb-schwan seems to be used for the preceding species.

3 Dr Stejneger (Proc. U. S. Nat. Museum, 1882, pp. 177-179) has been at much pains to show that this is no swan at all, but merely a large Anatine form. Further research may prove that his views are well founded, and that this, with another very imperfectly known species, C. davidi, described by Swinhoe (Proc. Zool. Soc,

observed by Narbrough on the 2nd of August 1670 in the Strait of Magellan, as announced in 1694 in the first edition of his Voyage (p. 52). It was subsequently found on the Falkland Islands during the French settlement there in 1 764-1 765, as stated by Pernetty (Voyage, 2nd ed., ii. 26, 99), and was first technically described in 1782 by Molina (Saggio sulla stor. nat. del Chile, pp. 234, 344). Its range seems to be much the same as that of the Coscoroba, except that it comes farther to the northward, to the coast of southern Brazil on the east, and perhaps into Bolivia on the west. It is a very handsome bird, of large size, with a bright red nasal knob, a black neck and the rest of its plumage pure white. It has been introduced into Europe, and breeds freely in confinement.

A greater interest than attaches to the South American birds last mentioned is that which invests the black swan of Australia, Chenopis alrata. Considered for so many centuries to be an im- possibility, the knowledge of its existence seems to have impressed (more perhaps than anything else) the popular mind with the notion of the extreme divergence — not to say the contrariety — of the organic products of that country. By a singular stroke of fortune we are able to name the precise day on which this unexpected dis- covery was made. The Dutch navigator Willcm de Vlaming, visiting the west coast of Zuidland (Southland), sent two of his boats on the 6th of

January 1697 to explore an estuary he had found. There their crews saw at first two and then more black swans, of which they caught four, taking two of them alive to Batavia ; and Valentyn, who several years later recounted this voyage, gives in his work 4 a plate representing the ship, boats and birds, at the mouth of what is now known from this circumstance as Swan river, the most important stream of the thriving colony of West Australia, which has adopted this very bird as its armorial symbol. Valentyn, however, was not the first to publish this interesting discovery. News of it soon reached Amsterdam, and the burgo- master of that city, Witsen by name, himself a fellow of the Royal Society, lost no time in communicating the chief facts ascertained, and among them the finding of the black swans, to Martin Lister, by whom they were laid before that society in October 1698, and printed in its Philosophical Transactions, xx. 361. Subsequent voyagers, Cook and others, found that the range of the species extended over the greater part of Australia, in many districts of which it was abundant. It has since rapidly decreased in numbers, but is not likely soon to cease tp exist as a wild bird, while its singular and ornamental appearance will probably preserve it as a modified captive in most civilized countries. The species scarcely needs description : the sooty black of its general plumage is relieved by the snowy white of its flight-feathers and its coral-like bill banded with ivory.

The Cygninae admittedly form a well-defined group of the family Anatidae, and there is now no doubt as to its limits, except in the case of the Coscoroba above mentioned. This bird would seem to be, as is so often found in members of the South American fauna, a more generalized form, presenting several characteristics of the Anatinae, while the rest, even its black-necked compatriot and the almost wholly black swan of Australia, have a higher morphological rank. Excluding from consideration the little-known C. davidi, of the five or six species of the northern hemisphere four present the curious character, somewhat analogous to that found in certain cranes (q.v.), of the penetration of the sternum by the trachea nearly to the posterior end of the keel, whence it returns forward and upward again to revert and enter the lungs; but in the two larger of these species, when adult, the loop of the trachea between the walls of the keel takes a vertical direction, while in the two smaller the bend is horizontal, thus affording an easy mode of recognizing the respective species of each. Fossil remains of more than one species of swan have been found. The most remarkable is C. falconeH, which was nearly a third larger than the mute swan, and was described from a Maltese cave by W. K. Parker in the Zoological Society's Transactions, vi. 1 19-124, pi. 30. (A.N.)

SWANAGE, a watering-place and seaport in the eastern parliamentary division of Dorsetshire, England, 9 m. S.S.W. from Bournemouth by sea, and 132 m. S.W. by W. from London by the London & South-Western

railway. Pop. of urban district (1901), 3408. It lies on the picturesque Swanage Bay, on the east coast of the so-called Isle of Purbeck, the district lying south of Poole Harbour. The coast is wild and pre- cipitous, and numerous caves occur in the cliffs. Inland are open, high-lying downs. Swanage Bay has a beautiful sandy beach affording excellent bathing. In the town, the church

1870, p. 430) from a single specimen in the Museum of Peking, should be removed from the sub-family Cygninae. Of C. coscoroba Mr Gibson remarks (Ibis, 1880, pp. 36, 37) that its " note is a loud trumpet-call," and that it swims with " the neck curved and the wings raised after the true swan model."

1 Commonly quoted as Oud en nieww Oost Indien (Amsterdam, 1726). The incidents of the voyage are related in Deeliii. Hoofdst. iv. (which has for its title Description of Banda), pp. 68-71.

of St Mary has a massive tower possibly of pre-Norman date; there are a town-hall, an institute with library and lecture hall, and memorials to a victory gained by King Alfred over the Danes in the bay in 877, and to Albert, Prince Consort. A large export trade is carried on in stone from the Purbeck quarries.

SWANSEA, a municipal, county and parliamentary borough, market town, and seaport of Glamorganshire, South Wales, finely situated in an angle between lofty hills, on the river Tawe or Tawy near its mouth in Swansea Bay, a beautiful recess of the Bristol Channel, 201 m. W. of London by rail and 45I m. W.N.W. of Cardiff. The Great Western main line has a junction within the borough at Landore, whence a branch runs into a more central part of the town. The Vale of Neath branch of the same railway and the Rhondda & Swansea Bay railway (now worked by the Great Western) have terminal stations near the docks on the other (eastern) side of the river, as also has the Midland railway from Hereford and Brecon. All these lines approach the town from the north and east through an un- attractive industrial district, but the central Wales branch of the London & North-Western railway from Craven Arms in entering it on the west passes through some beautiful wood- lands and then skirts the bay, having parallel to it for the last 3 m. the light (passenger) railway which runs from Swansea to Mumbles Pier. The older part of the town, being the whole of the municipal borough previous to 1836, occupies the west bank of the Tawe near its mouth and is now wholly given up to business. Stretching

inland to the north along the river for some 3 m. through Landore to Morriston, and also eastwards along the sea margin towards Neath, is the industrial quarter, while the residential part occupies the sea front and the slopes of the Town Hill (580 ft. high) to the west, stretching out to the pleasant suburb of Sketty. The east side of the river (known as St Thomas's and Port Tennant) is approached from the west by a road carried over the North Dock Lock and the river by two girder drawbridges, each of which has a double line of roadway (on which tramways are laid), two footpaths and a line of railway. All the main thoroughfares are spacious, and in two or three instances even imposing, but most of the resi- dential part consists of monotonous stuccoed terraces. The climate is mild and relaxing and the rainfall averages about 40 in. annually.

Public Buildings, &c. — The old castle, first built by Henry de Newburgh about 1099, has entirely disappeared; but of the new castle, which was probably intended only as a fortified house, there remain the great and lesser halls, a tower and a so-called keep with the curtain wall connecting them, its chief architectural feature being a fine embattled parapet with an arcade of pointed arches in a style similar to that of the episcopal palaces of St Davids and Lamphey built by Henry Gower (d. 1347), bishop of St Davids, to whom the building of the new " castle " is also ascribed. Part of it is now used as the headquarters of the 4th Welsh (Howitzer) Brigade R.F.A. Possibly some traces of St Davids Hospital, built by the same prelate in 1 33 1 , are still to be seen at Cross Keys Inn. The parish church of St Mary was entirely rebuilt in 1895-1898. It pre- viously consisted of a tower and chancel (with a fine Decorated window) built by Bishop Gower, the piers of the chancel arch being partly built on earlier Norman work, the Herbert Chapel (originally St Ann's) of about the same date as the chancel and rebuilt in the early part of the 16th century, and a na"e built in 1739. Of the earlier work there remains the door of the rood loft (built into a wall), a 15th-century brass-inlaid marble slab with a representation of the resurrection, in memory of Sir Hugh Johnys (d. c. 1463) and his wife, and three canopied altar tombs — one with the effigy of a priest and another with effigies of Sir Matthew Cradock and his wife. Within the parish of St Mary was St John's, the church of a small parish of the same name lying to the north of St Mary's and once owned by the Knights Hospitallers. This church, which was entirely rebuilt in 1820, was renamed St Matthew in 1880, when a new St John's was built within its own parish. There are

26 other churches and 10 mission rooms belonging to the Church of England, besides 2 Roman Catholic churches, a synagogue and 84 Nonconformist chapels (31 Welsh and 53 English) and 20 mission rooms, but all are modern buildings. There are 9 ecclesiastical parishes and parts of two or three others, all in the diocese of St Davids. The Royal Institution of South Wales, founded in 1835, is housed in a handsome building in the

Ionic style erected in 1838-1839 and possesses a museum in which the geology, mineralogy, botany and antiquities of the district are well represented, there being a fine collection of neolithic remains from the Gower Caves and from Merthyr Mawr. Its library is rich in historical and scientific works relating to Wales and Welsh industries and contains the collection of historical MSS. made by Colonel Grant-Francis, some time its honorary librarian, but one of its most valued possessions is the original contract of affiance between Edward II. (when prince of Wales) and Isabella. Its art gallery has many prints and drawings of great local interest and here the Swansea Art Society holds its annual exhibition. The Swansea Scientific Society also meets here. In its early days the institution was the chief centre of scientific activity in South Wales, those asso- ciated with its work including L. W. Dillwyn, James Motley, Dr Gutch and J. E. Bicheno, all botanists, J. Gwyn Jeffreys, conchologist, Sir W. R. Grove and the 1st Lord Swansea, the last three being natives of the town.

The free library and art gallery of the corporation, a four- storeyed building in Italian style erected in 1887, contains the library of the Rev. Rowland Williams (one of the authors of Essays and Reviews) , the rich Welsh collection of the Rev. Robert Jones of Rotherhithe, a small Devonian section (presented by the Swansea Devonian Society), and about 8000 volumes and 2500 prints and engravings, intended to be mutually illustra- tive, given by the Swansea portrait-painter and art critic, John Deffett Francis, from 1876 to 1881, to receive whose first gift the library was established in 1876. It also contains a complete set of the patent office publications.

The grammar school founded in 1682 by Hugh Gore (1613- 1691), bishop of Waterford, is now carried on by the town council under the Welsh Intermediate Education Act of 1889, and there is a similar school for girls. The technical college is also carried on by the town council, the chief features of its curriculum being chemistry, metallurgy and engineering. A training college for school-mistresses, established by the British and Foreign School Society in 1872, was transferred to the town council in 1008.

The other public buildings of the town include the gildhall and law courts, in the Italian style with Corinthian pillars and pilasters, built in 1847 and internally remodelled in 1901; a prison (1829); a fine market hall (1830), rebuilt in 1897; a cattle market and abattoirs (1869); the Albert Hall for concerts and public meet- ings (1864); the Royal Metal Exchange (1897); harbour trust offices (1904); a central post office (1901) and two theatres. The benevolent institutions include the general hospital, founded in 1817, removed to the present site in 1867, extended by the addition of two wings in 1878 and of an eye department in 1890; a con- valescent home for twenty patients from the hospital only (1903) ; the Royal Cambrian

Institution for the Deaf and Dumb, estab- lished in 1847 at Aberystwyth, removed to Swansea in 1850, and several times enlarged, so as to have at present accommodation for ninety-eight pupils; the Swansea and South Wales Institution for the Blind, established in 1865 and now under the Board of

I Education; the Swansea and South Wales Nursing Institute (1873),

: providing a home for nurses in the intervals of their employment; a nursing institution (1902) for nursing the sick poor in their own

! homes, affiliated with the Queen's Jubilee Institute of London;

I the Sailors' Home (1864); a Sailors' Rest (1885); and a Mission to

' Seamen's Institute (1904).

The town possesses 103 acres of parks and open spaces, the chief being Llewelyn Park of 42 acres in the north of the town near Morris- ton, Victoria Park (16 acres) and recreation ground (8 acres) abutting on the sands in the west, with the privately owned football field between them, Cwmdonkin (13 acres) commanding a fine panoramic view of the bay, and Brynmill (9 acres) with a disused reservoir constructed in 1837 and now converted into an ornamental lake. Other features of these parks are a small botanical garden in Cwmdonkin, a good collection of waterfowl in Brynmill, and a small aviary of the rarer British birds in Victoria Park, which also has a meteorological station in connexion with the meteorological office,

and a statue of Mr William Thomas of Lan erected in 1905 in appre- ciation of the work done by him in preserving and obtaining " open spaces " for Swansea. In the town itself there are statues of J. Henry Vivian and of his son Sir Henry Husscy Vivian (created Lord Swansea in 1893) each in his turn the " copper king." The corporation owns about 645 acres of land within the limits of the ancient borough. This consists mainly of land acquired under an Inclosure Act of 1761, but a small part is surplus land acquired in 1 876-1 879 in connexion with an improvement scheme for clearing a large insanitary area in the centre of the town.

The town is lighted with gas supplied by a gas company first incorporated in 1830 and by electricity supplied by the corporation. There is a good system of electrically worked tramways, 5J m. being owned by a company

and nearly 6 m. by the corporation, but the whole worked by the company. The town obtains its chief supply of water from moorlands situated on the Old Red Sandstone formation in the valley of the Cray, a tributary of the Usk in Brecon- shire where a reservoir of 1,000,000,000 gallons capacity has been constructed at a cost of £547,759, under parliamentary powers obtained in 1892, 1902 and 1905. The water is brought to the town in a conduit consisting of 23J m. of iron pipes and 3 m. of tunnel into a service reservoir of 3,000,000 gallons capacity made on the Town Hill at an elevation of 580 ft. above sea-level. There is a further supply obtained from three reservoirs of a combined capacity of 513,000,000, constructed in 1866, 1874 and 1889 respec- tively in the Lliw and adjoining valleys, in the drainage area of the Loughor, about 10 m. to the north of Swansea.

Harbour and Commerce. — Swansea owes its commercial prosperity to its great natural advantages as a harbour and its situation within the South Wales coal basin, for the anthracite portion of which it is the natural port of shipment. It is the most westerly port of the Bristol Channel and the nearest to the open sea, only 35 m. from the natural harbour of refuge at Lundy, and there is sheltered anchorage under the Mumbles Head at all states of the tide.

The modern development of the port dates from about the middle of the 1 8th century when coal began to be extensively worked at I.lansamlet and copper smelting (begun at Swansea in 1717, though at Neath it dated from 1584) assumed large proportions. The coal was conveyed to the works and for shipment to a wharf on the east bank, on the backs of mules and somewhat later by means of a private canal. The common quay was on the west bank; all ships coming in had to lie in the river bed or in a natural tidal basin known as Fabian's Bay, on the east. Under an act of 1791 harbour trustees were appointed who cleared and deepened the river bed and built a long pier on either side of it; in 1796 the approach to the port was made safer by means of an improved light on Mumbles Head. A canal connecting the tidal part of the river Neath with the mouth of the Tawe, made in 1789, was in 1824 connected with the Vale of Neath canal by means of an aqueduct across the Neath river, when also a small dock, Port Tennant (so named after its owner) or Salthouse Dock, was made near the east pier, and this continued to be used till 1880. Meanwhile in 1798 the whole coalfield of the Swansea Valley was connected with the port by a canal l6| m. long (acquired by the Great Western railway in 1872). In 1851 the river was diverted eastward into a new channel (called the New Cut) and its old channel was locked and floated, thereby forming the North Dock with an area of 11 J acres and a half-tide basin 500 yards long covering i\ acres. The Swansea Valley canal has a connecting lock with this dock, and on the island between the dock and the New Cut are patent fuel works, copper ore yards and other mineral sheds and large grain stores

and flour mills. The South Dock, begun in 1847 under powers obtained that year by a private company, transferred in 1857 to the harbour trustees and opened in 1859, is mainly used for shipping coal and for discharging timber and fish. Lying parallel to the sea front and to the west of the entrance channel from which it runs at right angles, it has an area of 13 acres with a half -tide basin of 4 acres and a lock 300 ft. long by 60 ft. wide. The next development was on the east side of the river where the natural inlet of Fabian's Bay, inside the harbour mouth, was utilized for the construction of the Prince of Wales's Dock (authorized 1874, opened October 1881, extension opened March 1898). Its total area is 27 acres, its quays are nearly 7000 ft. long, and it is connected with the Tennant canal. The very rapid increase in the demand for anthracite coal (for the shipment of which Swansea has practically a monopoly) soon necessitated still further accommodation and in July 1904 was begun the King's Dock, which lies farther east and has an entrance direct from the bay. By means of the embankment made in connexion with it, 400 acres were reclaimed from the sea. It has an area of 68 acres, its lock measures 875 ft. by 90 ft. and its quays 10,550 ft. long, and it has a depth of 32 ft. of water, or inner cill. The total dock area of Swansea has thus been increased to about 147 acres with a total length of quays exceeding 3 m. The harbour docks and adjacent railways (which exceed 20 m.) are owned and administered by a harbour trust of 26 members, of whom one is the owner of the Briton Ferry estate (Earl Jersey), 4 represent the lord of the seigniory of Gower (the duke of Beaufort), 12 are proprietary members and 9 are elected annually by the corporation of Swansea. The trustees

are conservators of the river Tawe and parts of Swansea Bay, and the pilotage and lighthouse authority of the district. They were incorporated by the Harbour Act of 1854. There are 9 private graving docks.

The total exports (foreign and coastwise) from Swansea during 1907 amounted to 4,825,898 tons, of which coal and coke made up 3,655,050 tons; patent fuel, 679,002 tons; tin, terne and black plates, 348,240 tons; iron and steel and their manufactures, 38,438 tons; various chemicals (mostly the by-products of the metal industries), 37,100 tons; copper, zinc and silver, 22,633 tons. Its imports during the same year amounted to 899,201 tons, including 172,319 tons of grain and other agricultural produce, 156,620 tons of firewood, 145,255 tons of pig-iron and manufactured iron and steel, 47,201 tons of iron ore, 121, 168 tons of copper, silver, lead, tin and nickel with their ores and alloys, 63,009 tons of zinc, its ores and alloys, 41,029 tons of sulphur ore, phosphates and other raw material for the chemical trade. The town (which is often called " the metallurgical capital of Wales ") is the chief seat of the copper, spelter, tin-plate and patent fuel industries, and has within a compass of 4 m. over 100 different works of 36 varieties (exclusive of collieries) for the

treatment or manufacture of copper, gold, silver, lead, sulphate of copper, spelter, tinplates, steel and iron, nickel and cobalt, yellow metal, sulphuric acid, hydrochloric acid, creosote, alkali, galvanized sheets, patent fuel as well as engin- eering works, iron foundries, large flour and provender mills, fuse works and brick works. Copper smelting, which during most of the 19th century was the chief industry, has not maintained its relative importance, though Swansea is still the chief seat of the trade, but three-fourths of the tinplates manufactured in Great Britain and nineteen-twentieths of the spelter or zinc are made in the Swansea district, and its tube works are also the largest in the kingdom. While the bulk of the coal is sent to France and the Mediterranean ports, an increasing quantity of anthracite is shipped to Germany, and, in sailing vessels to the Pacific ports of America, patent fuel is largely sent to South America, whence return cargoes of mineral ores and grain are obtained, while Germany, France, Italy, Rumania, the United States and the Far East are the chief customers for tinplates. Over one hundred fishing-smacks and trawlers usually land their catches at the south dock, where there is a flourishing fish-market. There is also a large ice factory.

From 1535 to 1832 (with the exception of 1658-1659) Swansea was associated with the other boroughs of Glamorgan in sending one representative to Parliament. In 1658 Cromwell gave the town the right of separately returning a member of its own, but this right lapsed with the Restoration. In 1832 St John's, St Thomas and parts of the parishes of Llansamlet and Llangy- felach were added to the parliamentary borough of Swansea, to which along with the boroughs of Neath, Aberavon, Kenfig and Loughor a separate representative was given. In 1836 the municipal borough was made coextensive with the par- liamentary borough and continued so till 1868, when some further small additions were made to the latter, with which the municipal borough was once more made co-extensive in 1889. Meanwhile in 1885 the parliamentary constituency was made into two divisions with a member each, namely Swansea Town consisting of the original borough with St Thomas's, and Swan- sea District consisting of the remainder of the borough with the four contributory boroughs. In 1888 Swansea was made a county borough and in 1900 the various parishes constituting it were consolidated into the civil parish of Swansea. Its total area is 5194 acres. The corporation consists of 10 aldermen and 30 councillors. The assizes and quarter sessions for Gla- morgan are held at Swansea alternately with Cardiff. The borough has a separate commission of the peace, and, since 1891, a court of quarter sessions.

The population of the old borough was 6099 in 1801 and 13,256 in 1831; after the first extension it amounted to 24,604 in 1 84 1. The population in 1901 was 94,537. Of those who were three years of age and upwards, nearly 67 % were returned as speaking English only, 29% as speaking both

English and Welsh, and 35% as speaking Welsh only.

History. — No traces "of any Roman settlement have been discovered at Swansea, though there seems to have been a small one at Oystermouth, 5 m. to the south, and the Via Julia from Nidum (Neath) to Loughor probably passed through the northern part of the present borough where a large quantity of Roman coins was found in 1835. The name Swanse? stands for Sweyn's " ey " or inlet, and may have been derived from King Sweyn Forkbeard, who certainly visited the Bristol Channel

and may have established a small settlement at the estuary of the Tawe. The earliest known form of the name is Swey- nesse, which occurs in a charter granted by William earl of Warwick some time previous to 1184; in King John's charter (12 1 5) it appears as Sweyneshe, and in the town seal, the origin of which is supposed to date from about the same period, it is given as " Sweyse." An attempt has been made to derive the name from Sein Henydd, the Welsh name of a Gower castle which has been plausibly identified with the first castle built at Swansea, but that derivation is etymologically impossible. The Welsh name, Aber Tawy, first appears in Welsh poems of the beginning of the 13th century. The town grew up round the castle which Henry de Beauchamp (or Beaumont) on his conquest of Gower about 1099, built on the west bank of the river. The castle passed with the lordship or seigniory of Gower, of which it was the caput, into the hands of the De Braose family in 1203 (by grant from King John) and eventually it came by marriage to the Somersets and is still held by the dukes of Beaufort, whose title of barons de Gower dates from 1506. The castle was frequently attacked and on several occasions more or less demolished, in the 12th and 13th cen- turies by the Welsh under the princes of Dynevor. It was visited by King John in 1210 and probably by Edward II. in 1326, for, after his capture, the chancery rolls were found de- posited in the castle and were thence removed to Hereford. It was finally destroyed by Glendower, was a " ruinous build- ing " when seen by Leland (1536) and has since wholly disap- peared. In the Civil War the town was royalist till the autumn of 1645 when Colonel Phiiip Jones, a native of the adjoining parish of Llangyfelach and subsequently a member of Crom- well's upper house, was made its governor. Cromwell stayed in the town in May 1648, and July 1649, on his way to Pembroke and Ireland respectively, and later showed it exceptional favour by giving it a liberal charter and parliamentary representation. The town claimed to be a borough by prescription, for its only known charters of incorporation are those of Cromwell and James II., which were never acted upon. It probably

received its first grant of municipal privileges from William 3rd earl of W'arwick some time before 1184. By a charter of 1215 (confirmed by Henry II. in 1234, by Edward II. in 1312 and Edward III. in 1332), John himself granted the burgesses the right of trading, free of all customs due, throughout the whole kingdom (except in London), a right which was previously limited to the seigniory. By 1305 the burgesses had become so powerful as to wring a most liberal grant of privileges from their then seigneur William de Braose (fourth in descent from his namesake to whom Gower was granted by King John in 1203), and he bound himself to pay £500 to the king and 500 marks to any burgess in the event of his infringing any of the rights contained in it. By this charter the burgesses acquired the right of nominating annually two of their number for the office of portreeve so that the lord's steward might select one of them to exercise the office, an arrangement which continued till 1835; the bailiff's functions were defined and curtailed, and the lord's chancery was to be continually kept open for all requiring writs, and in Gower — not wherever the lord might happen to be. A patent of murage and pavage — from which it may probably be inferred that Swansea was a walled town — was granted by Edward II. in 13 17 and another by Edward III. in 1338. Cromwell's charter of 1655, though reciting that " time out of mind " Swansea had been " a town corporate," incorporated it anew, and changed the title of portreeve into mayor, in whom, with twelve aldermen and twelve capital burgesses, it vested the government of the town. The mayor, ex-mayor and one selected alderman were to be justices of the peace with exclusive jurisdiction and the mayor was the coroner. Four annual fairs were appointed, namely on the 8th of May, 2nd of July, 15th of August and 8th of October — the first, how- ever, being the only new one. In 1658 the protector by another charter granted the town independent representation in par- liament. At the Restoration, Cromwell's charters lapsed, but in 1685 James II. granted another charter which contained the

arbitrary proviso that the king by order in council might remove any officer or members of the corporation. This charter was not adopted by the burgesses.

De Braose's charter of 1305 bears some evidence to the im- portance of the shipping of Swansea even at that date, for by it there was granted or confirmed to the burgesses the right to take from the lord's woods sufficient timber to make four great ships at a time and as many small vessels as they wished. Coal was even then worked in the district. Cromwell in his charter of 1655 recognized Swansea as "an ancient port town and populous, situate on the sea coast towards France conve- nient for shipping and resisting foreign invasions." Its status was only that of a "creek" in the port of Cardiff till 1685, when it was made an independent port with jurisdiction over Newton (now Porthcawl), Neath or Briton Ferry and

South Burry, its limits being defined in 1847 as extending from Nash Point on the east to Whitford Point on the west, but in 1904 Port Talbot, which was included in this area, was made into a separate port.

From about 1768 to 1850 Swansea had a somewhat famous pottery. Beginning with earthenware which twenty years later was improved into " opaque china," it produced from 1814 to 1823 superior porcelain which was beautifully decorated with landscapes, birds, butterflies and flowers and is much prized by connoisseurs. During a short period (1845-1850) an imita- tion of Etruscan ware was also produced with figures of rich red colour over a body of black.

See Lewis W. Dillwyn, Contributions towards a History of Swansea (1840) ; Colonel G. Grant-Francis, Charters Granted to Swansea (1867), and The Smelting of Copper in the Swansea District (2nd ed., 1881); S. C. Gamwell, A Guide to Swansea and District (1880); Lieut.-Colonel W. LI. Morgan, R.E., An Antiquarian Survey of East Gower. (D. Ll. T.)

SWANWICK, ANNA (1813-1899), English writer and philan- thropist, was the youngest daughter of John Swanwick of Liverpool, and was born on the 22nd of June 1813. She was educated partly at home and partly at one of the fashionable boarding-schools of the day, where she received the usual edu- cation of accomplishments. Dissatisfied with her own intel- lectual attainments she went in 1839 to Berlin, where she took lessons in German, Greek and Hebrew. On her return to London she continued these pursuits, aloug with the study of mathematics. In 1843 appeared her first volume of translations, Selections from the Dramas of Goethe and Schiller. In 1847 she published a translation of Schiller's Jungfrau von Orleans; this was followed in 1850 by Faust, Tasso, Iphigenie and Egmont. In 1878 she published a complete translation of both parts of Faust, which appeared with Retsch's illustrations. It passed through several editions, was included in Bohn's series of trans- lations, and ranks as a standard work. It was at the sug- gestion of Baron Bunsen that she first tried her hand at trans- lation from the Greek. In 1865 she published a blank verse translation of Aeschylus's Trilogy, and in 1873, a complete edition of Aeschylus, which appeared with Flaxman's illus- trations. Miss Swanwick is chiefly known by her translations, but she also published some original work. In 1886 appeared Books, our Best Friends and Deadliest Foes; in 1888, An Utopian Dream and How it may be Realized; in 1892, Poets, the Inter- preters of thei-<- Age; and in 1894, Evolution and the Religion of the Future. Miss Swanwick was interested in many of the social and philanthropic movements of her day. In 1861 she signed John Stuart Mill's petition to parliament for the political enfranchisement of women. She helped in the higher education movement, took part in the foundation of Queen's and Bedford Colleges, and continued to take a sympathetic interest in the

movement which led to the opening of the universities to women. Her work was acknowledged by the university of Aberdeen, which bestowed on her the degree of LL.D. She died in November 1899.

See Memoir, by Miss Bruce (1904).

SWARTZ, OLOF (1760-1818), Swedish botanist, was born in 1760, He commenced his botanical studies in Upsala, under

Linnaeus and Thunberg, and began early to make excursions. He made a voyage to America in 1783, visited England in 1788, returned to Sweden in 1789, and was made professor of natural history in Stockholm. He was the author of many systematic works, and largely extended our knowledge of both flowering plants and cryptogams. He died in 1818.

SWAT, a tract on the Peshawar border of the North-West Frontier Province of India, consisting of the valley of the Swat river above its confluence with the Panjkora. This valley is some 70 m. long, varying from 10 m. to a few hundred yards in breadth; it is intersected by ravines and glens, which bring down the drainage of the ranges on either side. Only that portion of the valley which lies beyond the Peshawar frontier hills, and which is reached by the Malakand, the Shahkot and other passes from the south, is Swat. To the east are the independent hill tracts of Kohistan and Buner, all bordering the Indus, and to the west are Dir and Bajour.

The Swat river rises among snow mountains in the Kohistan, not far from the source of the Gilgit river. After flowing due south for nearly 70 m., it turns to the west and is joined by the Panjkora. It then passes through the Mohmand country, and on entering Peshawar district spreads out to the south- east in many channels which ultimately fall into the Kabul river. Total length about 400 m. In British territory its waters have been utilised by a series of canals to irrigate an area of about 160,000 acres; and the system is now being extended by means of a tunnel through the Malakand range, which will tap the river much higher up.

Swat was better known to the ancients, and to the warriors of Baber's time, than it was to us until the frontier risings of 1895-97 gave British surveyors the opportunity of visiting the country. The ancient name of the river was Suastos, and that of the Panjkora was Ghoura, under which names they figure in the history of Alexander's campaign. The site of the city Massaga, the capital of the Assakeni, is supposed to be near the modern Manglaur. But since the adoption of the Khyber as the main high road from Kabul to

India the Swat routes had passed into oblivion. Only the lower portion of the Swat valley, where the river intervenes between Malakand and the passes leading to Dir from the Panjkora, is of military significance. The upper valley is closely gripped between mountain spurs stretching southwards from the Hindu Koh, rising to 15,000 ft. on one side and 19,000 ft. on the other, leaving but a narrow space between their rugged summits and the banks of the river. The valley, narrow though it is, and traversed by the worst conceivable type of hill tracks, contains many villages or hamlets, and is pretty thickly populated. The district has come into prominence of recent years, on account of its lying on the direct road to Chitral.

The Swatis are a clan of Yusafzai Pathans numbering 40,000 fighting men but are of weakly and thin physique, due to the malaria with which the valley is saturated. They are divided into three main clans, the Baizais, Ranizais and Khwaz- ozais. They had not much name for valour, but they opposed a stout resistance to Sir Robert Low's advance over the Malakand Pass in 1895 to the relief of Chitral; and again in 1897, under the influence of fanaticism, they showed desperate bravery in the attack on the Malakand Fort and Chakdara. They are all Suni Mahommedans, and have earned the reputatior. of being the most bigoted of all the Afghan tribes. For many years they were under the religious dominance of the Akhund of Swat, Abdul Ghafur, who, born in 1794, obtained ascendancy by means of his ascetic practices, ruled practically undisputed in Swat for the last 30 years of his life, and died in 1877. The Akhund, after his experience of the British strength in the Umbeyla Campaign of 1863, always exerted his influence in favour of peace with the British government, though in his earlier days he was sometimes troublesome. He was succeeded by his son Mian Gul, who never possessed the same influence as his father.

SWATOW (also Shan tow), a port of China, in the province of Kwang-tung, opened to foreign trade in 1869. The population

is upwards of 60,000. The town is situated at the mouth of the main branch of the river Han, which 30 miles inland flows past the great city of Ch'aochow Fu, or Tai-chu (Tie-chu), while the surrounding country is more populous and full of towns and villages than any other part of the province. The climate is good, but being situated at the southern end of the Formosa Strait the town is exposed to the full force of the typhoons, and much destruction is occasionally wrought. English merchants settled on Double Island in the river as early as 1856; but the city, which is built on ground but recently recovered from the sea, was formerly a mere fishing village. The trade of the port has rapidly increased. In 1869 the total value of the trade was £4,800,000, in 1884 £5,519,772, and in 1904 £7,063,579. The surrounding country is a great sugar- cane district producing annually

about 2,400,000 cwt. of sugar, and there is an extensive refinery in the town employing up- wards of 600 workmen and possessing a reservoir for 7,000,000 gallons of water. Next in value comes the manufacture of bean-cake, which is also imported in large quantities from Niu- chwang, Chifu, Shanghai, Amoy and Hong-Kong. Among the leading exports are tea (since about 1872); grass-cloth, manufactured at Swatow from so-called Taiwan hemp (the fibre of the Boehmeria nivea from Formosa); pine-apple cloth, manufactured in the villages about Chieh-Yang (a town 22 m. distant) ; oranges, for which the district is famous; cheap fans; and pewter, iron and tin wares. Swatow is also a great emi- gration port and was the scene of many kidnapping adventures on the part of foreigners in the early days. Their outrages gave rise to much hostile feeling towards foreigners who were not allowed to enter the city of Ch'aochow Fu until the year 1 86 1. Of the whole foreign trade of the port upwards of 83% is in British bottoms, the trade with Hong-Kong being of especial importance.

About 1865 the whole Swatow district was still divided into a number of " independent townships, each ruled by its own head- men," and the population was described in the official gazetteer, as " generally rebellious and wicked in the highest degree." Mr Forrest, British consular agent, relates that in that year he was witness to the preparations for a fight between the people living on the opposite sides of the estuary, which was only pre- vented by a British war-vessel. The T'aip'ings swept over the country, and by their ravages and plundering did much to tame the independence of the clans. The punishment inflicted in 1869 by Commander Jones on the inhabitants of Otingpui (Ou-ting-pei), about 8 m. from Swatow, for the attack they had made on the boats of H.M.S. " Cockchafer," showed the Chinese authorities that such piratical villages were not so strong as had been supposed. General Fang (a native of Ch'aochow Fu) was sent to reduce the district to order, and he carried out his instructions with remorseless rigour.

SWAZILAND (native name Pungwane), a country of British South Africa bounded S., W. and N. by the Transvaal, E. by the Portuguese possessions at Delagoa Bay and the Ingwavuma division of Zululand. It lies between the Drakensberg and Lebombo Mountains and is separated from the Indian Ocean by lc% land varying in width from 30 to 50 m. It has an area of 6536 sq. m. (being .somewhat larger than Yorkshire) and a population (1904), of 85,484, of whom 898 were whites. The natives are nearly all Ama-Swazi Bantus, commonly called Swazis, and are closely allied to the Zulus.

Spurs from the Drakensberg occupy a large part of the country, which may be divided into three parallel belts running north and south. The western belt has an average altitude of about 4500 ft., and is known as the high

veld. It is succeeded by the middle veld — not more than 2500 ft. above the sea, and that by the low veld — 1000 ft. high, which reaches to the foot of the Lebombo Mountains. These are flat-topped, nowhere higher than 2000 ft. The country is well watered by numerous rivers, all of which discharge into Delagoa Bay. The central and southern parts are drained by the Usutu and other tributaries of the Maputa; the northern region by the Komati (q.v.) and the Umbelozi. The Umbelozi has two chief headstreams, the Black and the White Umbelozi, the White branch being the more southerly. The climate is warm but healthy save in some of the river valleys. The flora and fauna differ in no

essential respects from the corresponding regions of the Transvaal and Zululand (see those articles).

Towns and Communications. — The seat of the administration is Embabaan (Mbabane), a town on a northern tributary of the Usutu 4300 ft. above the sea, 40 m. south of Barberton and 180 m. east of Johannesburg. It replaced (1904) the former capital of Bremersdorp situated in the middle veld 23 m. south-east of Embabaan, and destroyed by Boer forces during the war of 1899- 1902. Pigg's Peak and Forbes Reef are mining settlements in northern Swaziland. Hlatikulu, the chief place in southern Swazi- land, is built on a plateau about 3000 ft. .above the sea. Zombodi, the principal native kraal, lies about 18 m. east of Embabaan.

A railway from Lourencp Marques, 47 m. long, runs through Portuguese territory to the Swaziland border at Umbelozi Poort. This line is the eastern link in the direct railway connexion de- signed between Johannesburg and Delagoa Bay. From Johannes- burg the line runs eastward past Springs and had reached Breyten (143 m.) in 1907. A number of good roads have been constructed. There is telegraphic connexion with the Transvaal.

Industries and Trade. — The soil is generally fertile. On the high veld, where green herbage is found all the year round, large numbers of sheep and cattle are pastured. This region serves as a winter grazing ground for sheep from the Transvaal. The middle veld is suitabb for grain crops as well as bananas, sugar, coffee, tea and other semi-tropical produce. Millet, maize, pumpkins and ground- nuts are extensively cultivated. On the low veld cotton is grown. Some species of the cotton plant are indigenous.

Besides agriculture the only considerable industries are gold, tin and coal mining. The goldfields, situated in the north-western part of the country,

are a continuation of the De Kaap (Barberton) fields. The auriferous region is stated to be about 25 sq. m. in extent. Up to the outbreak of the Anglo-Boer War in 1899 the value of the gold exported from Swaziland was about £350,000. Gold mining re-started on a small scale in 1904. The output for 1906- 1908 was valued at £40,000. Alluvial tin mining is carried on successfully in the neighbourhood of Embadaan, cassiterite to the value of £46,000 being exported in 1905-1907. The output for 1908-1909 was valued at £36,000. Anthracite coal of a good quality is found over a large area of the low veld. Copper is also found. All mining is carried on under concessions. Imports are chiefly food-stuffs and cotton goods; they were valued in 1906 at £38,000 and in 1909 at £47,000. Up to 1906 no statistics of the trade of the country were kept. Trade is with the Transvaal and Delagoa Bay. The abolition of monopolies in 1904 (see below History) gave an impetus to trade. Up to that date some £4,000,000 of foreign capital had been sunk in the country with very little return. A large number of Swazis find employment in the Rand gold mines.

Administration, 6"c. — Swaziland forms a crown colony under the government of the High Commissioner for South Africa. It is administered by a resident commissioner. Legislation is by ordin- ance. Roman-Dutch common law prevails except when modified by statute, the laws of the Transvaal being in force as far as applicable to the country. Native laws and customs are generally respected and the chiefs exercise civil jurisdiction over their tribesmen, subject to appeal to the resident commissioner's court. There is a special court to deal with serious civil and criminal cases in which Europeans are concerned. Order is maintained by a special police force. Education is mainly dependent on the efforts of missionary societies, but the administration has a few schools.

Revenue is derived chiefly from a poll-tax on natives of £1 per annum, concession rents, royalties and customs. For the period 1904-1909 the revenue — apart from loans — was about £40,000 a year, the normal expenditure being approximately the same amount. Since 1904 considerable sums (e.g. £49,000 in 1909) have been spent by the administration on the expropriation of monopolies. Swazi- land is a member of the South African Customs Union (see South Africa).

History. — Ama-Swazi tribes are believed to have occupied the country now known as Swaziland from the period of the invasion of South East Africa by the Bantu peoples. They were formerly called Ba-Rapuza or Barabuza after a chief under whom in the 18th century they acquired homogeneity. In the early part of the 19th century they fell under the dominion of the newly constituted Zulu nation. In 1843, the year in which the British annexed Natal and with it a part of the country hitherto ruled by the Zulus, the Barabuza, under a chief named Swazi, took advantage of

the comparative weakness of the Zulu power, achieved independence and founded the present state. According to Kaffir custom they adopted the name of their deliverer. The Boers of the Transvaal were then begin- ning to occupy the regions adjacent to Swaziland and in 1855 the Swazis in order to get a strip of territory between themselves and the Zulus, whose power they still dreaded, ceded to the Boers the narrow strip of land north of the Pongola river now

known as the Piet Retief district. The Zulus under Cetywayo claimed the ceded district as theirs and the Swazis as their subjects and for over ten years no white farmers were able to settle in the district. With the Boers the Swazis remained on friendly terms and this friendship was extended to the British on the occupation of the Transvaal in 1877. In 1879 they joined the British in the attack on the Bapedi chief Sikukuni, whom they looked upon as an ally of the Zulus.

They captured from Sikukuni certain " rain medicine," the possession of which has since greatly increased the prestige of the paramount chief of the Swazis among the Kaffirs of South Africa. On the retrocession of the Transvaal in 1881 the in- dependence of the Swazis was recognized by the Boers and the Pretoria convention of that year denned the boundaries of the country. By the London convention of 1884 the Transvaal again recognized the independence of Swaziland. Immediately afterwards, however, the Boers began a series of efforts to obtain control of the country. In 1886 the governor of Natal received a paper from Umbandine (Mbandini), the paramount chief of the Swazis, stating that Piet Joubert had called on him and requested him to sign a paper saying that " he and all the Swazis agreed to go over and recognize the authority of the Boer government, and have nothing more to do with the Eng- lish." On his refusal the Boers replied to him, "Why do you refuse to sign the paper? You know we defeated the English at Majuba." The Boers further added that if the Swazis were relying on the British, they were leaning on a broken reed, and would find themselves left in the lurch. Umbandine followed up this communication with a request for British protection, but without result. Later on, in 1887, bGth Boers and gold prospectors of all nationalities were overrunning his country, and Umbandine asked for a British resident. This request was also refused. The Boers now determined to adopt towards Swaziland the policy which had proved so successful in Zululand. A colony of Boers settled within the Swazi territories and proclaimed " The Little Free State." Umban- dine was then at length induced to ask the Transvaal for annex- ation. The Transvaal applied in 1889 to Great Britain for permission to accede to this request, but the British government replied that the only intervention to which they would consent must be a dual one. Consequently a joint commission was appointed to visit Swaziland and report on the condition of things there. Sir

Francis de Winton, the British commissioner, who was accompanied by Generals Joubert and Smit on behalf of the Transvaal, reported that Umbandine had already granted concessions, such as " postal, telegraphic, banking, customs, "&c, to the Transvaal, and concessions of land mining and grazing rights to various adventurers. Umbandine had in short granted concessions of every conceivable character, including exemption from taxation. A charter of self-government had also been granted (1888) to the whites in the country. In the circum- stances de Winton considered a British protectorate inadvisable and impracticable. A dual control was arranged in 1890, but the convention then signed proved abortive owing to the objection of the Transvaal to join the South African Customs Union. In 1893 a further conference on the Swazi question took place between Sir Henry Loch, high commissioner for South Africa, and President Kruger, the result of which was that the admin- istration of Swaziland, with certain reservations as to the rights of the natives, was made over to the South African Republic. In the following year six Swazi envoys visited England for the purpose of asking Queen Victoria to take Swaziland under her protection. In view, however, of the arrangement come to, this petition had to be refused. In 1894 a convention was signed between Great Britain and the Transvaal, and the Boers, in spite of the Swazi opposition, assumed administration of the country. The Boers' object in intriguing to acquire Swazi- land was not merely that of obtaining that country. They desired also to annex the coast lands to its east and thus obtain — at Kosi Bay — a seaport of their own. This object they might have attained if they had agreed to de Winton's proposals, but Great Britain in view of the increasingly hostile attitude

assumed by the Transvaal government now intervened and by annexing in 1895 Amatongaland, the region in question, blocked the Boers' further progress towards the sea (see South Africa: History) .

Swaziland suffered during the struggle between the Transvaal and Great Britain as to its destiny. Umbandine died in 1889 and had various successors. Ubanu, installed by the Boers as paramount chief in 1894, was a sanguinary despot and was compelled to flee in 1898. The principal personage in the country after Umbandine's death was, however, his widow Naba Tsibeni, known to Europeans as the queen regent. She more than once appealed to the British to cause the Boers to respect the terms of the conventions, and before the outbreak of the Anglo-Boer war in 1899 she took the side of the British. On the annexation of the Transvaal in 1901 the queen regent asked that Swaziland might be annexed also. On the

cessation of hostilities a British special commissioner was sent into the country — then in a condition bordering on anarchy — and a pro- visional administration established. In June 1903 an order in council formally conferred the government of the country on the governor of the Transvaal (then Lord Milner). Lord Milner visited Swaziland in July 1904 and denounced " the abominable network of concessions " in which the country was entangled. On the 3rd of October following the governor issued a pro- clamation providing further for the administration, and for the expropriation of the concessions other than those relating to land and minerals. In September 1906 Lord Selborne, who had succeeded Lord Milner, conferred with the queen regent and her councillors on questions specially affecting the natives. A lad named Sobhuza, born about 1898, was selected as para- mount chief, Naba Tsibeni, his grandmother, being confirmed as regent during his minority. In December 1906 the control of Swaziland was severed from the governorship of the Transvaal and transferred to the High Commissioner for South Africa, and in March 1907 a resident commissioner was appointed. When the Union of South Africa was established in 1910, Swaziland, with other native territories, remained under direct Imperial control.

See A. M. Miller, " Swaziland," in Journ. Roy. Col. Inst. (1900), vol. xxxi., and "Swaziland: its agricultural and pastoral future," in Transvaal Agricultural Journ., vol. iv. (1906); T. R. Jones, "Notes on the Geology of West Swaziland" in Geol. Mag. (1899), vol. vi. Colonial office reports on the country have been issued annually since 1908. Consult also the Colonial Office List issued yearly. In it are cited the Blue Books dealing with Swaziland. For history see also Transvaal: Bibliography.

(A. P. H.;F. R. C.)

SWEARING (0. Eng. swerian, to swear, originally to speak aloud, cf. andstverian, to answer, Ger. schworen, Dan. svaerge, &c, all from root swer-, to make a sound, cf. " swarm," pro- perly the buzzing of bees, Lat. susurrus) , the affirmation or utter- ing of a solemn declaration with an appeal to the Deity, some holy personage or sacred object as confirmation, hence the act of declaring the truth of a statement upon oath (see Oath and Evidence). The common use of the word is for the uttering of profane oaths or curses. In English law, while blasphemy {q. v.) was at common law an indictable offence, cursing or swearing was left to the ecclesiastical courts. The Profane Oaths Act 1745 inflicted a sliding scale of fines for the use of profane oaths according to the rank of the offender, is. for a common labourer, soldier or seaman, 2s. for everyone below the rank of gentleman and 5s. for those of or above that rank; procedure under this act is regulated by the Summary Juris- diction Acts. By s. 8 of the Town Police Clauses Act 1847 the use of profane or obscene language is an offence

punishable on summary conviction by a fine not exceeding 40s. or im- prisonment not exceeding 14 days. The offence must be com- mitted in a street and the act is confined to urban sanitary districts or to such rural districts to which s. 276 of the Public Health Act 1875 has extended it. By s. 12 of the Metropolitan Police Court Acts 1839 a similar offence is punishable in the metropolitan police area, and various districts have put in force by-laws for punishing swearing, cursing, or causing annoyance

in public places. The restriction as to the place where the offence must be committed to be liable to punishment has led to the enforcement on occasions of the Profane Oaths Act, which applies to the whole of England and Wales and is not limited to cursing in the streets. It should not, however, apply to obscene language.

SWEATING-SICKNESS. A remarkable form of disease ; not known in England before, attracted attention at the very beginning of the reign of Henry VII. It was known indeed a few days after the landing of Henry at Milford Haven on the 7th of August 1485, as there is clear evidence of its being spoken of before the battle of Bosworth on the 22nd of August. Soon after the arrival of Henry in London on the 28th of August it broke out in the capital, and caused great mortality. This alarming malady soon became known as the sweating-sickness. It was regarded as being quite distinct from the plague, the pestilential fever or other epidemics previously known, not only by the special symptom which gave it its name, but also by its extremely rapid and fatal course.

From 1485 nothing more was heard of it till 1507, when the second outbreak occurred, which was much less fatal than the first. In 1517 was a third and much more severe epidemic. In Oxford and Cambridge it was very fatal, as well as in other towns, where in some cases half the population are said to have perished. There is evidence of the disease having spread to Calais and Antwerp, but with these exceptions it was confined to England.

In 1528 the disease recurred for the fourth time, and with great severity. It first showed itself in London at the end of May, and speedily spread over the whole of England, though not into Scotland or Ireland. In London the mortality was very great; the court was broken up, and Henry VIII. left London, frequently changing his residence. The most remark- able fact about this epidemic is that it spread over the Continent, suddenly appearing at Hamburg, and spreading so rapidly that in a few weeks more than a thousand persons died. Thus was the terrible sweating-sickness started on a destructive course, during which it caused fearful mortality throughout eastern Europe. France, Italy and the southern countries were spared. It spread much in the same way as cholera, passing, in one direction, from

north to south, arriving at Switzerland in December, in another northwards to Denmark, Sweden and Norway, also eastwards to Lithuania, Poland and Russia, and westwards to Flanders and Holland, unless indeed the epidemic, which declared itself simultaneously at Antwerp and Amsterdam on the morning of the 27th of September, came from England direct. In each place which it affected it prevailed for a short time only — generally not more than a fortnight. By the end of the year it had entirely disappeared, except in eastern Switzerland, where it lingered into the next year; 1 and the terrible " English sweat " has never appeared again, at least in the same form, on the Continent.

England was, however, destined to suffer from one more out- break of the disease, which occurred in 1551, and with regard to this we have the great advantage of an account by an eye- witness, John Kaye or Caius, the eminent physician.

Symptoms. — The symptoms as described by Caius and others were as follows. The disease began very suddenly with a sense of apprehension, followed by cold shivers (sometimes very violent), giddiness, headache and severe pains in the neck, shoulders and limbs, with great prostration. After the cold stage, which might last from half-an-hour to three hours, followed the stage of heat and sweating. The characteristic sweat broke out suddenly, and, as it seemed to those accustomed to the disease, without any obvious cause. With the sweat, or after that was poured out, came a sense of heat, and with this headache and delirium, rapid pulse and intense thirst. Palpitation and pain in the heart were frequent symptoms. No eruption of any kind on the skin was generally observed; Caius makes no allusion to such a symptom. In the later stages there was either general prostration and collapse, or an irresistible tendency to sleep, which was thought to be fatal if the patient were permitted to give way to it. The malady was

1 Guggenbiihl, Der englische Schweiss in der Schweiz (Lichtensteig,

1838).

remarkably rapid in its course, being sometimes fatal even in two or three hours, and some patients died in less than that time. More commonly it was protracted to a period of twelve to twenty-four hours, beyond which it rarely lasted. Those who survived for twenty-four hours were considered safe.

The disease, unlike the plague, was not especially fatal to the poor, but rather, as Caius affirms, attacked the richer sort and those who were free livers according to the custom of England in those days. "They which had this sweat sore with peril of death were either men of wealth, ease or welfare, or of the poorer sort, such as were idle persons, good ale drinkers and taverne haunters."

Causes. — Some attributed the disease to the English climate, its moisture and its fogs, or to the intemperate habits of the English people, and to the frightful want of cleanliness in their houses and surroundings which is noticed by Erasmus in a well-known passage, and about which Caius is equally explicit. But we must conclude that climate, season, and manner of life were not adequate, either separately or collectively, to produce the disease, though each may have acted sometimes as a predisposing cause. The sweating- sickness was in fact, to use modern language, a specific infective disease, in the same sense as plague, typhus, scarlatina or malaria.

The only disease of modern times which bears any resemblance to the sweating-sickness is that known as miliary fever (" Schweiss- friesel," " suette miliaire " or the " Picardy sweat "), a malady which has been repeatedly observed in France, Italy and southern Germany, but not in the United Kingdom. It is characterized by intense sweating, and occurs in limited epidemics, not lasting in each place more than a week or two (at least in an intense form). On the other hand, the attack lasts longer than the sweating-sickness did, is always accompanied by eruption of vesicles, and is not usually fatal. The first clearly described epidemic was in 1718 (though probably it existed before), and the last in 1861. Between these dates some one hundred and seventy-five epidemics have been counted in France alone.

Authorities.— For history see Bacon's Life of Henry VII., and the chronicles of Grafton, Holinshed, Baker, Fabyan, &c. The only English medical account is that of John Caius, who wrote in English A Boke or Counseill Against the Disease commonly called the Siveate, or Sweating Sichnesse (London, 1552) ; and in Latin De ephemera britannica (Louvain, 1556; reprinted London, 1721). The English tract is reprinted in Babington's translation of Hecker's Epidemics of the Middle Ages (Syd. Soc., 1844). This also contains Hecker's valuable treatise on the English sweat, published in German (1834), and also printed in his Volkskrankheiten des Mittel- alters, edited by Hirsch (Berlin, 1865). Grüner's Scriptores de sudore anglico (Jena, 1847), contains nearly all the original documents, including the two treatises of Caius. See also Hirsch, Handbook of Geographical and Historical Pathology, trans, by Creighton (New Syd. Soc., 1885).

SWEATING SYSTEM, a term loosely used in connexion with oppressive industrial conditions in certain trades. This " system " originated early in the 19th century, when it was known as " the contract system." Contractors supplying the govern- ment with clothing for the army and navy got the work done by giving it out to sub-contractors, who in some cases made the garments or boots themselves, with the assistance of other work- men, and in others sublet their sub-contracts to men who carried them out with similar help. Afterwards this plan was adopted in the manufacture of ready-made clothing for civilian use, and of " bespoke " garments (made to the order of the customer). Previously the practice had been for coats, &c, to be made up by workmen employed on the premises of the master tailor or working together in common workshops, but in either case directly employed by the master tailor. The new plan brought a large number of workpeople possessing little skill and belonging to a very needy class into competition with the regular craftsmen; and in consequence a fall in wages took place, which affected, to a greater or less extent, the whole body of workmen in the tailoring trade. The work was done in overcrowded and insanitary rooms, and the earnings of the workers were extremely low. In 1850 a vigorous agitation against " the sweating system " was com- menced, based mainly upon a series of articles in the Morning Chronicle, which were followed by a pamphlet, Cheap Clothes and Nasty, written by Charles Kingsley under the name of " Parson Lot," and by his novel Alton Locke. Kingsley and his friends, the Christian Socialists, proposed to combat the evils of the sweating system by promoting the formation of co-operative workshops; and several experiments of this nature were made, which, however, met with little success. Except that in 1876- 1877 the outcry against the sweating system was renewed (principally on the ground of the risk of infection from garments

made up in insanitary surroundings) , the matter attracted little public notice until 1887, when the system again came into prominence in connexion with the immigration of poor foreigners into East London, where large numbers of these people were employed in various trades, especially in the tailoring, boot- making, and cabinet-making industries, under conditions generally similar to those complained of in the earlier agitations. In 1888 a select committee of the House of Lords was appointed to inquire into the subject; and after a lengthy investigation — in the course of which evidence was given by 291 witnesses in relation to tailoring, boot-making, furriery, shirt-making, mantle-making, cabinet-making and upholstery, cutlery and hardware manu- facture, chain and nail-making, military accoutrements, saddlery and harness-making, and dock labour — this committee presented its final report in April 1890. The committee found themselves unable to assign an exact meaning to the term " sweating," but enumerated the following conditions as those to which that name was

applied: " (1) A rate of wages inadequate to the necessities of the workers or disproportionate to the work done; (2) excessive hours of labour; (3) the insanitary state of the houses in which the work is carried on." They stated that, "as a rule, the observations made with respect to sweating apply, in the main, to unskilled or only partially skilled workers, as the thoroughly skilled workers can almost always obtain adequate wages." With regard to the sweating system, the committee declared that this cannot be regarded as responsible for the industrial conditions described; for " the middleman is the consequence, not the cause of the evil; the instrument, not the hand which gives motion to the instrument, which does the mischief. Moreover, the middle- man is found to be absent in many cases in which the evils complained of abound." While, on the one hand, we find, as pointed out by this committee, that " sweating " exists without the presence of the " middleman " (the fact being that many grossly underpaid workpeople are in the direct employment of large firms) , it is, on the other hand, no less true that the " middle- man " {i.e. subordinate employer) is common in numerous trades in which there is no trace of any such oppression of the work- people employed by the sub-contractors as is denoted by the term " sweating." Thus, for example, in shipbuilding in many cases men work in squads, the leading workmen employing their own helpers; in the cotton trade the mule-minders engage and pay their own piecers, and the weavers their own tenters; in the manufactured-iron trade, in mining, &c, a good deal of work is done under sub-employers employing their own assistants, none of these sub-contractors being alleged to " sweat " their helpers. There is, in short, no system of employment which can properly be called " the sweating system." At the same time, wherever workers possessing a small degree of skill and deficient in organization are employed under a number of small masters, there " sweating " is likely to obtain.

The common idea that the " sweater " is an unscrupulous tyrant, who fulfils no useful function, and who makes enormous profits, has no counterpart in fact. Whatever may have been the case in earlier days, before the internecine competition of the " middlemen " had time to produce its inevitable effects upon the position of these sub-employers, it may now be considered to be beyond dispute that the small master (" sub-contractor," " garret master," " fogger," &c.) usually works at least as hard as his employes, and that his gains are, as a rule, no more than a fair return for the work which he performs — work which in many instances consists in doing some difficult part of the job, and in all cases in organizing the labour engaged. So far as concerns the " manufacturer," by whom the " sweater " is employed, and who is clearly the causa causans of " the sweating system," for him the practice of getting his work done in outside workshops is undoubtedly convenient, especially in localities where

rent is high, because he is saved the expense of providing accommoda- tion for those who do his work. He is also free from restrictions as to the subdivision of labour and the employment of a certain class of workpeople which the sentiment of the regular factory workers would impose upon him. The regular tailor, for example, thinks that no one who has not, by a lengthy period of tuition,

acquired the capacity to make a coat " right out " ought to be allowed to enter the tailoring trade. But in the workshop of the sub-contractor the work is split up into fractions, each of which is soon learned, so that it becomes possible to introduce into the trade persons possessing no previous training, and gener- ally willing to work for wages far lower than those to which the regular tailors consider themselves entitled, and which, so long as they are not exposed to the competition of these outsiders, they are usually able to secure. On the other hand, while it may suit the manufacturer, anxious to keep down the cost of production, to give his work out to middlemen, it is beyond question that any form of the "small master" system is neces- sarily liable to abuse in many directions. Among these small masters the eagerness to secure employment is usually so keen that the work is often taken at a price too low for it to be possible for these sub-employers to pay to their workpeople wages adequate to provide the reasonable requirements of working- class life. The workshops of the middlemen are scattered over large districts, and these little masters frequently move their business from one house to another. Both of these are circum- stances which tend strongly to make efficient regulation by the factory and the sanitary inspectors very difficult. Not seldom, especially when trade is brisk, these work-places are overcrowded in a manner injurious to health, and in not a few cases their sanitary condition is defective. It will readily be under- stood that combination among the people employed in these numerous small isolated work-places is much less easy than among the compact bodies of workers employed in large factories, so that any attempt to resist oppressive conditions of employment by trade-union organization meets with serious obstacles. But perhaps the worst of all the features which this method of manu- facture presents is the absence of motor power and machinery. The fact that a manufacturer has laid out a large sum in plant, thus entailing a heavy expenditure in " standing charges," necessarily induces him to do his best to make employment regular. In the little outside workshop, on the other hand, lengthy spells of enforced idleness are followed by short periods of most severe toil, during which the hours of daily labour are prolonged to an inhuman extent. At the same time, the work- people employed in the ill-equipped workshop of the.

lit tie master are competing with the much more efficient production of the factory provided with labour-saving machinery driven by steam or other mechanical power; and in many cases their only chance of retaining the work under these circumstances is to take it at starvation prices. But the progress of invention moves fast, and antiquated methods of production are gradually being abandoned. Already, in many of the trades in which the sweating system has hitherto largely prevailed, especially in the tailoring, the boot-making, the cabinet-making and the nail-making industries, the factory system is coming so far to the front in the race for cheapness of production that, although in certain industrial centres, in which the rents of factories are high and a specially abundant supply of needy and unskilled workpeople is available, a good deal of work is still given out to small outside masters, the proportion of the total output manufactured in this manner is day by day diminishing. (D. Sch.)

An endeavour has been made in the United Kingdom to combat legislatively the evils of sweating. The Trade Boards Act 1909 established trade boards for trades to which the act applied. The trades specified were ready-made and wholesale tailoring, the making of paper or chip boxes, machine-lace making and chain-making, but the board of trade was given power to apply the act under a provisional order to any other trade in which exceptionally low -wages prevailed. The duties of the trade boards are to fix, subject to certain restrictions, minimum rates of wages for time-work for their trades, while they may also fix general minimum rates of wages for piece-work, and these rates may apply either universally to the trade, or to any special process in the work of the trade or to any special class of workers, or to any special area. The rates so fixed become obligatory by order of the board of trade upon the expiration of six months from the date when made by a trade board, but they may, in the meantime, have a limited operation (1) in the absence of a written agreement; fc) where an employer has given written notice to the board of

trade that he is willing to pay them ; and (3) in the case of contracts vith government departments and local authorities. If the mini- mum rate of wages has been made obligatory and an employer has been summarily convicted of not paying same, he is liable to a penalty of not exceeding £20 in respect of each offence and to a penalty of not exceeding £5 for each day on which the offence is continued after conviction. He may also be ordered to pay, in addition, a sum equal to the wages due. The trade boards consist of an equal number of representative members of employers and workers, together with appointed members whose number must be less than half the total of representative members. Trade boards may also establish district trade committees with a con- stitution similar to their own and may delegate to them their powers and duties under the act. Women are eligible for membership of trade boards or district committees indeed, in

case of a trade board for a trade in which women are largely employed, at least one of the appointed members must be a woman.

SWEDEN [Sverige], a kingdom of northern Europe, occupying the eastern and larger part of the Scandinavian peninsula. It is bounded N.E. by Finland (Russian Empire), E. by the Gulf of Bothnia and the Baltic Sea, S.W. by the Cattegat and Skagerrack, and W. by Norway. It extends from 69 3′ 21 to ss° 20′ 18″ N., and from n° 6′ 19″ E. on the south-west coast to 24 9′ n" E. on the Finnish frontier, the extreme length being about 990 m., the extreme breadth (mainland) about 250 m., and the- total area estimated at 173,547 sq. m. Out of a detailed total estimate of the boundary line at 6100 m., 4737 m. are coastal, the Norwegian frontier is 1030 m., and the Finnish 333 m.*

Physical Features. — The backbone of the Scandinavian peninsula is a range, or series of masses, of mountains (in Swedish Kolen, 1 the keel) extending through nearly the whole length of the peninsula towards the western side. The eastern or Swedish flank has, there- fore, the slighter slope. This range forms, in a measure, a natural boundary between Sweden and Norway from the extreme north to the_ north of Svealand, the central of the three main territorial divisions of Sweden (Norrland, Svealand and Gotaland) ; though this boundary is not so well markd that the political frontier may follow it throughout. Sweden itself may be considered in four main physical divisions — the mountains and highland district, covering all Norr- land and the western part of Svealand; the lowlands of central Sweden; the so-called Smaland highlands, in the south and south- east; and the plainsof Skane, occupying the extreme southward projection of the peninsula.

The first district, thus defined, is much the largest, and includes the greatest elevations in the country and the finest scenery. The highest mountains are found in the north, the bold peak of KAnekaise reaching 7005 ft., Sarjektjacko, „. f T. t r ", 6972 ft., being the loftiest point of a magnificent group "v""""" 111 – including the Sarjeksfjall, Alkasfjall and Partefjall, which range from 6500 ft. upwards; and, farther south, Sulitelma, 6158 ft-, long considered the highest point in Scandinavia. Elevation then decreases slightly, through Stuorevarre (5787 ft.) and Areskutan (4656 ft.), to the south of which the railway from Trondhjem in Norway into Sweden crosses the fine pass at Storlien. South of this again, before the main chain passes into Norway, are such heights as Helagsfjall (5896 ft.) and Storsylen (5781 ft.) ; and a group of mountains in the northern part of the province of Dalecarlia (Dalarne) ranges from 3600 to 4500 ft. in height. The neighbour- hood of Areskutan and the Dalarne highlands, owing to the railway and the development of communications by steamer on the numer- ous lakes, are visited by considerable numbers of travellers,

both Swedish and foreign, in summer ; but the northern heights, crossed only by a few unfrequented tracks, are known to few, and to a considerable extent, indeed, have not been closely explored. From the scenic standpoint the relatively small elevation of these mountains finds compensation in the low snow-line, which ranges from about 3000 ft. in the north to 5500 ft. in the south of the region. All the higher parts are thus snow-clad ; and glaciers, numerous in the north, occur as far south as the Helagsfjall. The outline of the mountains is generally rounded, the rocks having been subjected to erosion from a very early geological age, but hard formations cause bold peaks at several points, as in Kebnekaise and the Sarjeksfjall.

1 In Swedish the definite article (masc. and fern, en, neut, et) is added as a suffix to the substantive (when there is no epithet). Geographical terms are similarly suffixed to names, thus Dalelfven, the river Dal. The commonest geographical terms are : elf, Strom, river; sjij, lake; 0, island; holm, small island; fjdll, mountain, group or range; dal, valley; vik, bay. In Norrland the following terms are common: a, river, often attached to the names of the large rivers, as Tornea, Lulea (although properly it means a smaller river than elf) ; the names of towns at their mouths always following this form; tra.sk (local, properly meaning marsh), jaur (Lapp), afva, lake (provincial Swedish, properly a kind of creek opening from a river). A is pronounced o.

Rivers of the North.

From the spinal mountain range a series of large rivers run in a south-easterly direction to the Gulf of Bothnia. In their upper parts they drain great lakes which have resulted from the formation of morainic dams, and in some cases perhaps from the incidence of erratic upheaval of the land. All lie at elevations between 900 and 1300 ft. All are narrow in comparison with their length, which is not infrequently magnified to view when two lakes are connected by a very short stretch of running water with a navigable fall of a few feet, such as those between Hornafvan, Uddjaur and Storafvan on the Skellefte river. The following are the principal rivers from north to south : The Tome, which with its tributary the Muonio, forms the boundary with Finland, has a length of 227 m., and drains lake Torne (Torne- trsisk), the area of which is 126 sq. m. The Kalix is 208 m. in length. The Lule is formed of two branches, Stora and Lilla (Great and

Little) Lule; the length of the main stream is 193 m. The Stora Lule branch drains the Langas and Stora Lule lakes (Langasjaur, Luletrask), which have a length together exceeding 50 m., a fall between them of some 16 ft. and a total area of only 87 sq. m., as they are very narrow. Below Stora Lule lake the river forms the Harsprang (hare's leap; Nj uommelsaska of the Lapps), the largest and one of the finest cataracts in Europe. The sheer fall is about 100 ft., and there is a further fall of 150 ft. in a series of tremendous rapids extending for l\ m. Farther up, at the head of Langasjaur, is the Stora Sjofall (great lake fall; Lapp, Atna Muorki Kartje),a fall of 130 ft. only less grand than the Harsprang. Both are situated in an almost uninhabited country and are rarely visited. Following the Pite river (191 m.), the Skellefte (205 m.) drains Hornafvan and Storafvan, with a fall of 20 ft., and an area together of 275 sq. m. Hornafvan is a straight and sombre trough, flanked by high hills of unbroken slope, but Storafvan and the inter- vening Uddjaur are broad, throwing off deep irregular inlets, and picturesquely studded with numerous islets. The Ume (237 m.) receives a tributary, the Vindel, of almost equal length, on the north bank some 20 m. from its mouth, and among several lakes drains Stor Uman (64 sq. m.). The further principal rivers of this region are the Angerman (242 m.), Indal (196 m.), draining the large lakes Kallsjo and Storsjo, Ljusnan (230 m.), Dal and Klar. Of these the two last rise in the southernmost part of the mountain region described, but do not as a whole belong to the region under considera- tion. The Angerman receives the waters of a wider system of streams and lakes than the rivers north of it, and has thus a drain- age area of 12,591 sq. m., which is exceeded only by that of the Torne (16,690 sq. m.), the average of the remaining rivers named being about 7700 sq. m.

Beyond the Harsprang and the Stora Sjofall the northern rivers do not generally form great falls, though many of the rapids are grand. The Indal, by changing its course in 1796 near Bispgarden on the northern railway, has left bare the remarkable bed of a fall called Doda (dead) Fall, in which many " giant's caldrons " are exposed. In the uplands above the chain of lakes called Stroms- vattudal, which are within the drainage area on the Angerman, the Hailing stream forms the magnificent Hallingsa Fall. In the southern mountain valleys of the region there are several beautiful falls, such as the Tannfors, not far from Areskutan, the Storbo, Handol and Rista.

Eastward from the main mountain range the highland region is divided into two belts: a middle belt of morainic deposits and marshes, and a coastal belt. The middle belt is gently undulating; viewed from rare eminences the landscape over the boundless forests resembles a dark green sea, through which the great rivers flow straight between steep, flat-topped banks, with long quiet reaches broken by occasional rapids. The few lakes they form in

this belt are rather mere wideningsin their courses; but the tribu- tary streams drain numerous small lakes and peat-mosses. In the extreme north this belt is almost flat, a few low hills standing isolated and conspicuous; and the rivers have serpentine courses, while steep banks are absent. The middle belt merges into the coastal belt, covered by geologically recent marine deposits, reaching an extreme height of 700 to 800 ft., and extending inland some 60 to 80 m. in the north and 40 m. in the south. Small fertile plains are characteristic, and the rivers have cut deep into the soft deposits of sand and clay, leaving lofty and picturesque bluffs (nipor).

The orographical division of the central lowlands bears com- parison in formation with the coastal belt of marine deposits to Central tne nortn – . ˆere are " at fertile plains of clay, well Lowlands vvo °d e d, with innumerable lakes, including the four great lakes, Vener, Vetter, Malar and Hjelmar. These, except the last, far exceed in area any of the northern lakes, and even Hjelmar (185 sq. m.) is only exceeded by Hornafvan-Storafvan. The areas of the other three lakes are respectively 2149, 733 and 449 sq. m. Vener, Vetter and Hjelmar are broad and open; Malar is very irregular in form, and of great length. Malar, Vener and Hjel- mar contain many islands; in Vetter there are comparatively few. None of the lakes is of very great depth, the deepest sounding occurring in Vetter, 390 ft. In Hjelmar, which measures 38 m. from east to west, and is 12 m. in extreme width, the greatest depth is only 59 ft., but as its flat shores were formerly subject to inundation its level was sunk 6 ft. by deepening the navig- able channel through it and clearing out various waterways (the

Eskilstuna river, Hjelmar canal, &c.) in 1878-1887. The scenery of these lakes, though never grand, is always quietly beautiful, especi- ally in the case of Malar, the wooded shores and islands of which form a notable feature in the pleasant environs of the city of Stock- holm. The elevation of the central lowlands seldom exceeds 300 ft., but a few isolated heights of Silurian rock appear, such as Kinnekulle, rising 988 ft. above sea-level on the south-eastern shore of Vener, Billingen (978 ft.) between that lake and Vetter, and Omberg (863 ft.) on the eastern shore of Vetter. Noteworthy local features in the landscape of the central lowlands are the eskers or gravel-ridges (&sar), traversing the land in a direction from N.N.W. to S.S.E., from 100 to 200 ft. in height above the surround- ing surface. Typical instances occur in the cities of Stockholm (Brunkebergsasen) and Upsala (Upsala-asen).

South of the central lowlands the so-called Smaland highlands extend over the old province of Smaland in the south-east, and lie roughly south of Lake Vetter and of Gothenburg, Sm i lgnd

Highlands.

where they reach the south-west coast; The general elevation of this region exceeds 300 ft., and in the eastern part 600 ft. ; the principal heights are Tomtabacken (1237 ft.) and Ekbacken (1175 ft.), about 25 m. respectively south-east and west of the town of Jonkoping at the southern extremity of Lake Vetter. Gentle forest-clad undulations, many small lakes and peat-mosses, are characteristic of the region; which, in fact, closely resembles the middle belt of the northern highland region. The Smaland highlands abut southward upon the plains of Skine, the last of the main orographical divisions, which coincides roughly with the old province of Skane (Scania). Level plains, with rich open meadows and cultivated lands, the monotony of which is in some parts relieved by beech woods, are separated by slight ridges with a general direction from N.W. to S.E., such as Hallandsasen in the north-west, with an extreme elevation of 741 ft.

The hydrographical survey may now be completed. The Dal river, which enters the Gulf of Bothnia near Gefie, is formed of the union of eastern and western branches (Oster Dal, „. .

Vester Dal) not far from the town of Falun. The eastern „ Sout „ branch drains various small lakes on the Norwegian frontier, and in its lower course passes through the beautiful Lake Siljan. The length of the whole river including the eastern as the main branch is 283 m. The Klar river (228 m.) rises as the Faemund river in Faemundsjo, a large lake in Norway close west of the sources of the Dal. The Klar flows south into Lake Vener, which is drained to the Cattegat by the short Gota river, on which, not far below the lake, are the celebrated falls of Trollhattan. Lake Vetter drains eastward by the Motala to the Baltic, Lake Malar drains in the same direction by a short channel at Stockholm, the normal fall of which is so slight that the stream is sometimes reversed. The Smaland highlands are drained to the Baltic and Cattegat by numerous rivers of less importance. Excepting Finland no country is so full of lakes as Sweden. About 14,000 sq. m., nearly one-twelfth of the total area, are under water.

The coast of Sweden is not indented with so many or so deep fjords as that of Norway, nor do the shores of the Gulf of Bothnia, the Baltic and the Cattegat share in the peculiar coast

grandeur of the North Sea coast. All, however, have a common feature in the fringe of islands which, throughout nearly the entire length, shelters the coast of the mainland from the open sea. This ” skerry-fence ” (in Swedish, skdrg&rd) is only interrupted for any considerable distance (in the case of Sweden) round the southern shore off the fiat coast of Skane, between the towns of Varberg on the west and Ahus on the east. Between it and the mainland lies a connected series of navigable sounds of the greatest

advantage to coastwise traffic, and also of no little importance as a natural defence. The skargard of the Cattegat, north of Varberg, is bald and rugged. ‘ The two largest islands are Orust and Tjorn, north of Gothenburg. Off the south-east coast the place of the skargard is in a measure taken by the long narrow island of Oland, but north of this the skargard begins to widen, and the most con- siderable fjords are found, such as Bravik, which penetrates the land for 35 m. nearly up to the town of Norrkoping. The island belt is widest (some 45 m.) off the city of Stockholm, the approach to which from the sea is famous for its beauty. Farther north, a narrow sound (Alands Haf) intervening on the Swedish side, the vast Aland archipelago, belonging to Russia, extends across to the Finnish coast. The skargard of the Gulf of Bothnia is less fully developed than that of either the Baltic or the Cattegat. The islands of the skargard as a whole are rugged and picturesque, though never lofty like many of those off the Norwegian coast. In the Baltic many are well wooded, but the majority are bare or heath- clad, as arc those of the Gulf of .Bothnia. Of the large islands in the Baltic and Cattegat, besides Oland, only Gotland is Swedish.

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Geology. — The fundamental rocks of Sweden belong to the Azoic or pre-Cambrian formation, and consist of crystalline rocks. _ Three divisions are distinguished by some authors — the grey gneiss, the red iron gneiss and the granulite.

The grey gneiss predominates in the northern and eastern parts of the country, from Vesternorrland down to the province of Kalmar. The rock has a prevalent grey colour, and contains as characteristic minerals garnet and in some parts graphite.

The red iron gneiss prevails in western Sweden in the provinces

of Vermland, Skaraborg, Elfsborg, and down to the province of Kristianstad. The formation is very uniform in its character, the gneiss having a red colour and containing small granules of magnetite, but, nevertheless, not a single iron mine belongs to this region. The red gneiss contains in many places beds or masses of hyperite.

The granulite, also called eurite and halleflinta, is the most important of the Pre-Cambrian formation, as it contains all the metalliferous deposits of Sweden. It prevails in the middle part of the country, in Kopparberg,

.Vestmanland, Upsala and parts of Vermland. It occurs also in Ostergotland, Kalmar and Krono- berg. The rock is a very compact and fine-grained mixture of felspar, quartz and mica, often graduating to mica schist, quartzite and gneiss. With these are often associated limestones, dolomites and marbles containing serpentine (Kolmarden). The metalliferous deposits have generally the form of beds or layers between the strata of granulite and limestone. They are often highly con- torted and dislocated.

The iron deposits occur in more or less fine-grained gneiss or granulite (Gellivara, Grangesberg, Norberg, Striberg), or separated from the granulite by masses of augitic and amphibolous minerals (gronskarn), as in Persberg and Nordmark. Sometimes they are surrounded by halleflinta and limestone, as at Dannemora, Langban, Pajsberg, and then carry manganiferous minerals. Argentiferous galena occurs at Sala in limestone, surrounded by granulite, and at Guldsmedshytta (province of Orebro) in dark halleflinta. Copper pyrites occur at Falun in mica-schists, surrounded by halleflinta. Zinc-blende occurs in large masses at Ammeberg, near the northern end of Lake Vetter. The cobalt ore consists of cobalt-glance (Tunaberg in the province of Sodermanland) and of linneite (at Gladhammar, near Vestervik). The nickel ore of Sweden is magnetic pyrites, containing only a very small percentage of nickel, and gener- ally occurs in diorite and greenstones. Besides the crystalline gneiss and halleflinta there are also sedimentary deposits which are believed to be of pre-Cambrian age. The most important of these are the Dala Sandstone (chiefly developed in Dalarne), the Almas- akra and Visingso series (around Lake Vetter) and the Dalsland formation (near Lake Vener).

Large masses of granite are found in many parts of Sweden, in Kronoberg, Orebro, Goteborg, Stockholm, &c. Sometimes the granite graduates into gneiss; sometimes (as north of Stockholm) it encloses large angular pieces of gneiss. Intrusions of hyperite, gabbro (anorthite-gabbro at Radmanso in the province of Stock- holm) and diorite are also abundant.

The Cambrian formation generally occurs along with the Ordovi- cian, and consists of many divisions. The oldest is a sandstone, in which are found traces of worms, impressions of Medusae, and shells of Mickwitzia. The upper divisions consist of "bituminous limestones, clay-slates, alum-slate, and contain numerous species of trilobites of the genera Paradoxides, Conocoryphe, Agnostus, Sphaerophthalmus, Peltura, &c. The Ordovician formation occurs in two distinct facies — the one shaley and containing graptolites; the other calcareous, with brachiopods, trilobites, &c. The most constant of the calcareous divisions is the Orthoceras limestone, a red or grey limestone with Megalaspis and Orthoceras. The sub- divisions of the system may be grouped as follows: (1) Ceratopyge Limestone; (2) Lower

Graptolite Shales and Orthoceras Limestone; (3) Middle Graptolite Shales, Chasmops and other Limestones, Trinucleus beds. The Cambrian and Ordovician strata occur in isolated patches in Vesterbotten, Jemtland (around Storsjo), Skara- borg, Elfsborg, Orebro, Ostergotland and Kristianstad. The whole of the island of Oland consists of these strata. The deposits are in most places very little disturbed and form horizontal or slightly inclined layers. South of Lake Vener they are capped by thick beds of eruptive diabase (called trapp). North of Lake Siljan (pro- vince of Kopparberg), however, they have been very much dislocated. The Silurian has in Sweden almost the same character as the Wenlock and Ludlow formation of England and consists partly of graptolite shales, partly of limestones and sandstones. The island of Gotland consists entirely of this formation, which occurs also in some parts of the province of Kristianstad. In the western and northern alpine part of Sweden, near the boundaries of Norway, the Silurian strata are covered by crystalline rocks, mica schists, quartzites, &c, of an enormous thickness, which have been brought into their present positions upon a thrust-plane. These rocks form the mass of the high mountain of Areskutan, &c.

The Triassic formation (Rhaetic division) occurs in the northern part of Malmohus. It consists partly of sandstones with impressions of plants (cycads, ferns, &c), and partly of clay-beds with coal.

The Cretaceous formation occurs in the provinces of Malmohus and Kristianstad and a few small patches are found in the province of Blekinge. Only the higher divisions (Senonian and Danian) of the system are represented. The deposits are marls, sandstones and limestones, and were evidently formed near the shore-line.

The most recent deposits of Sweden date from the Glacial and Post-Glacial periods. At the beginning of the Glacial period the height of Scandinavia above the level of the sea was greater than at present, Sweden being then connected with Denmark and Germany and also across the middle of the Baltic with Russia. On the west the North Sea and Cattegat were also dry land. On the elevated parrs of this large continent glaciers were formed, which, proceeding

downwards to the lower levels, gave origin to large streams and rivers, the abundant deposits of which formed the diluvial sand and the diluvial clay. In most parts of Sweden these deposits were swept away when the ice advanced, but in Skane they often form still, as in northern Germany, very thick beds. At its maximum the inland ice not only covered Scandinavia but also passed over the present boundaries of Russia and Germany. When the climate became less severe the ice slowly receded, leaving its moraines, called in Sweden krosstenslera and krosstensgrus. Swedish geologists

distinguish between bottengrus (bottom gravel, bottom moraine) and ordinary krossgrus (terminal and side moraine). The former generally consists of a hard and compact mass of rounded, scratched and sometimes polished stones firmly embedded in a powder of crushed rock. The latter is less compact and contains angular boulders, often of a considerable size, but no powder. Of later origin than the krosstensgrus is the rullstensgrus (gravel of rolled stones), which often forms narrow ranges of hills, many miles in length, called asar. During the disappearance of the great inland ice large masses of mud and sand were carried by the rivers and deposited in the sea. These deposits, known as glacial sand and glacial clay, cover most parts of Sweden south of the provinces of Kopparberg and Vermland, the more elevated portions of the pro- vinces of Elfsborg and Kronoberg excepted. In the glacial clay shells of Yoldia arctica have been met with in many places (e.g. near Stockholm). At this epoch the North Sea and the Baltic were connected along the line of Vener, Vetter, Hjelmar and Malar. On the other side the White Sea was connected by Lakes Onega and Ladoga with the Gulf of Finland and the Baltic. In the depths of the Baltic and of Lakes Vener and Vetter there actually exist animals which belong to the arctic fauna and are remnants of the ancient ice-sea. The glacial clay consists generally of alternate darker and lighter coloured layers, which give it a striped appearance, for which reason it has often been called hvarfvig lera (striped clay). The glacial clay of the Silurian regions is generally rich in lime and is thus a marl of great fertility. The deposits of glacial sand and clay are found in the southern part of Sweden at a height ranging from 70 to 150 ft. above the level of the sea, but in the interior of the country at a height of 400 ft. above the sea.

On the coasts of the ancient ice-sea, in which the glacial clay was deposited, there were heaped-up masses of shells which belong to species still extant around Spitzbergen and Greenland. Most renowned among these shell-deposits are the Kap'ellbackarne near Uddevalla. With the melting of the great ice-sheet the climate became milder, and the southern part of Sweden was covered with shrubs and plants now found only in the northern and alpine parts of the country [Salix polaris, Dryas octopetala, Betula nana, &c). The sea fauna also gradually changed, the arctic species migrating northward and being succeeded by the species existing on the coasts of Sweden. The Post-Glacial period now began. Sands (mosand) and clays {akerlera and fucuslera) continued to be deposited on the lower parts of the country. They are generally of insignificant thickness. In the shallow lakes and enclosed bays of the sea there began to be formed and still is in course of formation a deposit known by the name gyttja, characterized by the diatomaceous shells it contains. Sometimes the gyttja consists mainly of diatoms, and is then called bergmjol. The gyttja of the lakes is generally covered over by peat of a later date. In many of the lakes of Sweden there

is still in progress the formation of an iron ore, called sjomalm, ferric hydroxide, deposited in forms resembling peas, coins, &c, and used for the manufacture of iron. (P. La.)

Climate. — The climate of the Scandinavian peninsula as a whole is so far tempered by the warm Atlantic drift from the south-west as to be unique in comparison with other countries of so high a latitude. The mountains of the Keel are not so high as wholly to destroy this effect over Sweden, and the maritime influence of the Baltic system has also to be considered. Sweden thus occupies a climatic position between the purely coastal conditions of Norway and the purely continental conditions of Russia; and in some years the climate inclines to the one character, in others to the other. As a result of the wide latitudinal extent of the country there are also marked local variations to be contrasted. About one-seventh of the whole country is north of the Arctic Circle. The mean annual temperature ranges from 26-6° F. at Karesuando on the northern frontier to 44-8° at Gothenburg and 44-6° at Lund in the south (or 29-5° to 45 reduced to sea-level). Between these extremes the following actual average temperatures have been observed at certain stations from north' to south which are appropriately grouped for the purpose of comparison (heights above sea-level following each name) : —

Jockmock (850 ft.), at the foot of the lake-chain'on the Little Lule River — 29-7°; and Haparanda (30 ft.), at the head of the Gulf of Bothnia — 32-4°.

Stensele (1076 ft.), at the foot of the lake-chain on the Ume — 31 -8° ; and Umea (39 ft.) at its mouth on the Gulf of Bothnia — 34-9°.

Ostersund (1056 ft.) on Storsjo — 35-2°; and Hernosand (49 ft.) on the Gulf of Bothnia — 37-8°.

Karlstad (180 ft.) at the head of Lake Vener — 42-3°; Orebro (102 ft.) at the west of Lake Hjelmar — 41-4°; and Stockholm (144 ft.) —42-1°.

Gothenburg (26 ft.) on the Cattegat — 44-8°; Jonkoping (312 ft.)

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SOUTHERN SWEDEN

(For General Map see Norway)

Scale, 1:2,750,000

English Miles

Boundaries of Provinces • .- St. = Stor.a, great;

County (LanJ boundaries Skt. = Sankt, Saint;

Capitals of Counties .» C. = Canal;

Railways -”» C. = Gamla, old;*

‘Canals > ~— Ytt, – Ytter, outer;

3 Longitude East 14 of Greenwich Q

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FLORA AND FAUNA]

SWEDEN

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at the south of lake Vetter— 42-4°; and Vestervik (,43 ft.) on the Baltic— 43-2°.

But the local variations thus indicated are brought out more fully by a consideration of seasonal, and especially winter, temperatures. In Sweden July is generally the hottest month, the average tempera- ture ranging from about 51° to 62 . In January, however, it ranges from 4 to 32 (February is generally a little colder). Moreover, there are two well-marked centres of very low winter temperature in the inland parts. The one is in the mountainous region of the south of Jemtland and the north of Dalarne, extending into Norway and thus lying in the middle of the peninsula about 62 °.N. Here the average temperature in January is 8-5°, whereas at Ostersund it is over 15°. The other and more strongly marked centre is in the far north, extending into Norway and Finland, where the average is 3-8°. The effect of the spinal mountain range in modifying oceanic conditions is thus illustrated. The same effect is well shown by the linguiform isotherms. In January, for example, the isotherm of 14 , after skirting the north coast of the Scandinavian peninsula, turns southward along the Keel, crossing the upper part of the district of the great northern

lakes. It continues in this direction as far as the northern end of Lake Mjosen in Norway (61° N.), then turns sharply north-north-eastward, runs west of Lake Siljan and bends north-east to strike the Bothnian coast near Skelleftea. In July, on the other hand, the isotherms show an almost constant temperature all over the country, and the linguiform curves are wanting.

The relative length of the seasons shows contrasts similar to those of temperature. In the north spring begins in May, summer in the middle of June and autumn in the middle of August. In the south and south-west spring begins in March, summer in the middle of May and autumn in October. At Karesuando the last frost of spring occurs on an average on the 15th of June, and the first of autumn on the 27th of August, though night frosts may occur earlier ; while at Stockholm 42 months are free of frost. Ice forms about October in the north, in November or December in the midlands and south, and breaks up in May or June and in April respectively. Ice covers the lakes for 100 to 1 15 days annually in the south, 150 in the midlands and 200 to 220 in the north. A local increase of the ice period naturally takes place in the upper parts of the Smaland highlands ; and in the case of the great lakes of Norrland, the western have a rather shorter ice period than the eastern. As to the seas, the formation of ice on the west and south coasts is rare, but in the central and northern parts of the Baltic drift-ice and a fringe of solid ice along the coast arrests navigation from the end of December to the beginning of April. Navigation in the southern part of the Gulf of Bothnia is impeded from the end of November to the beginning of May, and in the north the gulf is covered with ice from November to the last half of May. Snow lies 47 days on an average on the plains of Skane, while in the north it lies from 140 to 190 days.

The northern summers find compensation for brevity in duration of sunshine and light. At Karesuando in 68° 26′ N. and 1093 ft. above sea-level the sun is seen continuously above the horizon from the 26th of May to the 18th of July; at Haparanda for 23 hours, at Stockholm for 18J hours and atLund for 17J hoursat the summer solstice. Atmospheric refraction causes the sun to be visible for periods varying from south to north for a quarter to half an hour after it has actually sunk below the horizon. With the long twilight, perhaps the most exquisite period of a season which provides a succession of beautiful atmospheric effects, daylight lasts without interruption from the 16th to the 27th of June as far south as Herno- sand(62°38'N.).

The average annual rainfall for Sweden is 19-72 in., locally in- creasing on the whole from north to south, and reaching a maximum towards the south-west, precipitation on this coast greatly exceeding that on the south-

east. Thus the average in the north of Norrland is 16-53 in., in the south of Norrland 22-6 in. At Boras, midway between the south end of Lake Vetter and the Cattegat, the average is 35-08 in., and 45-82 in. were registered in 1898. At Kalmar, however, on the Baltic opposite Oland, the average is 14-6 in. This is an extreme instance for the locality, but the minimum for all Sweden is found at Karesuando, with 12-32 in. The period of maximum is generally the latter half of summer, and the minimum in February and March; but the maximum occurs in October at coast stations in Skane and in the island of Gotland. The propor- tion of total precipitation which falls as snow ranges from 36% in the north to 9 % in the south.

Flora. — In the preceding physical description indications are given of the vast extent of forest in Sweden. The alpine treeless region occupies only the upper flanks of the spinal mountain-range above an elevation varying from 1800 ft. in the north to 3000 ft. in the south. It is belted by a zone of birch woods, with occasional mountain-ash and aspen, varying in width from about 20 m. in the north to a fraction of a mile in the south. Below this extends a great region of firwood covering the whole country north-east of Lake Vener and north of the Dal River. The fir (Pinus syhestris) and pine (Pinus abies) are the predominating trees Spruce is common, and even predominates in the higher parts (between the great valleys and immediately below the birch-belt) in the north of Norrland. South of the southern limit indicated in the midland

district of the great lakes, the oak (Quercus pedunculated) appears as well as pine and fir; and, as much of this area is under cultivation, many other trees have been introduced, as the ash, maple, elm and lime. South of a line running, roughly, from the foot of Lake Vener to Kalmar on the Baltic coast the beech begins to appear, and in Skane and the southern part of the Cattegat seaboard becomes predominant in the woods which break the wide cultivated places. Of wild flowering plants only a very few are endemic species (though more are endemic varieties) ; the bulk are immigrants after the last glacial epoch. Of these most are common to arctic lands, or occur as alpine plants in lower latitudes. The number of species decreases according to geographical distribution from south to north; thus while upwardsof 1000 are found in Skane, there are only about 700 in the midlands, 500 in the lower parts of southern Norrland and less than 200 in the extreme north.

Fauna. — The effects of the great latitudinal range of Sweden on its climate and flora has its parallel to a modified extent in the case of fauna. Only a few animals are common to the entire country, such as the hare (Lepus timidus) and the weasel ; although certain others may be added if the high mountain region be left out of consideration, such as the squirrel, fox and various shrews. Among large animals, the common bear and the

wolf have been greatly reduced in numbers even within later historic times. These and the lynx are now restricted to the solitary depths of the northern forests. Characteristic of the high mountainous region are the arctic fox, the glutton and the lemming, whose singular intermittent migrations to the lowlands have a considerable temporary influence on the distribution of beasts and birds of prey. There may also be mentioned the wild reindeer, which is rare, though large domesticated herds are kept by the Lapps. The elk, carefully preserved, haunts the lonely forests from the Arctic Circle even to the Smaland high- lands. The roe-deer and red-deer are confined to the southern parts; though the first is found in the south of the midland plains. In these plains the fox is most abundant, and the badger and hedgehog are found. Martens and otters are to some extent hunted for their skins. A white winter fur is characteristic of several of the smaller animals, such as the hare, fox and weasel. The common and grey seals are met with in the neighbouring seas, and Phoca foetida is confined to the Baltic. Among birds by far the greater proportion is migrant. Characteristic types common to the whole country are the teal, snipe, golden plover and wagtail. In the northern moun- tains the ptarmigan is common, and like other creatures assumes a white winter dress; ducks and other water-fowl frequent the lakes; the golden eagle, certain buzzards and owls are found, and among smaller birds the Lappland bunting (Plectrophanes laponicus) may be mentioned. In the coniferous forests the black grouse, hazel grouse and willow grouse, capercailzie and woodcock are the principal game birds; the crane is found in marshy clearings, birds of prey are numerous, and the Siberian jay in the north and the common jay in the south are often heard. But in the northern forests small birds are few, and even in summer these wilds give a strong general impression of lifelessness. In the midlands the par- tridge is fairly common, though not readily enduring the harder winters; and ring-doves and stock-doves occur. The lakes are the homes of a variety of aquatic birds. On the coasts a number of gulls and terns are found, also the eider-duck and the sea-eagle, which, however, is also distributed far over the land. The species of reptiles and amphibians are few and chiefly confined to the southern parts. There are three species of snake, including the viper; three of lizard; and eleven of batrachians. The rivers and lakes are generally well stocked with fish, such as salmon, trout of various species, gwyniad and vendace (especially in the north), pike, eels, perch of various species, turbot, bream and roach. The few sportsmen who have visited the higher parts of the great northern rivers have found excellent trout-fishing, with pike, perch, char and grayling, the char occurring in the uppermost parts of the rivers, and the grayling below them. The fisheries, both fresh-water and sea, are important, and fall for consideration as an industry. The herring, cod, flatfish, mackerel and sprat are taken in the seas, and also great numbers of a small herring called stromming. In the brackish waters of the east coast sea fish are found,

together with pike, perch and other fresh-water forms. The crayfish is common in many places in central and southern Sweden. Pearls are sometimes found in the fresh-water mussel {Margaritana margaritifera) ; thus a tributary of the Lilla Lule River takes its name, Perle River, from the pearls found in it. Among the lower marine animals a few types of arctic origin are found, not only in the Baltic but even in Lakes Vener and Vetter, having remained, and in the case of the lakes survived the change to fresh water, after the disappearance of the connexion with the Arctic seas across the region of the great lakes, the Baltic, and north-east thereof. The molluscan fauna is fairly rich, and insect fauna much more so, even in the north. In summer in the uplands and the north the mosquito is sufficiently common to cause some little annoyance.

People. — The population of Sweden in 1900 was 5,136,441. The census is taken in an unusual manner, being drawn up from the registries of the clergy according to parishes every ten years. Approximate returns are made by the clergy annually. The

following table shows the distribution of population in that year through the Ian or administrative districts. The first column shows the older divisions of the county into provinces, the names and boundaries of which differ in many cases from the lan. These names, as appears elsewhere in this article, remain in common use. The distribution of provinces and Ian between the three main territorial divisions, Norrland (northern), Svealand (central) and Gotaland (southern) is also indicated.

Old Provinces.

Norrland —

Lappland, Norrbotten Lappland, Vesterbotten Angermanland, Medel-

pad

Jemtland, Herjedal Helsingland, Gestrik- land

Svealand —

Dalarne (Dalecarlia) . Vermland ….

Vestmanland ~| Nerike I

Sodermanland | Uppland J

Gotaland —

Ostergotland “1 Vestergotland I Dal f

Bohuslan J

Halland . . Smaland .

Blekinge

Skane .

Gotland Oland 2 .

Liin.

Norrbotten Vesterbotten

Vesternorrland Jemtland

Gefleborg

Kopparberg Vermland Orebro . Vestmanland Sodermanland . Upsala . Stockholm dist. Stockholm, city

Ostergotland Skaraborg . Elfsborg Goteborg och

Bohus Halland Jonkoping Kronoberg Kalmar Blekinge Kristianstad Malmohus Gotland 1

Total

Area sq. m.

40,867 22,771

9,855 19,675

7,615

n,524

7,459

3,5H

2,612 2,631 2,051

3,oi5

13

4,264 3,273 4,912

1,948 1,900

4-447 3,825 4,456 1,164 2,488 1,864 1,219

Pop.

1900.

134-769

H3,735

232,311

in.39 1

238,048

217,708 254,284 194,924 148,271 167,428 123,863 172,852 300,624

279,449 241,069

279,5H

337,175 141,688 203,036

159,124 227,625 146,302 219,166 409,304 52,781

172,875′ 5,136,441

The population in 1 908 was about 5,429,600. In 1751 it was 1,802,373, and in 1865, 4,114,141. The average annual increase was 7-86 per thousand in the 19th century, reaching a maximum of 10-39 ln 1841-1860, before the period of extensive emigration set in. Emigrants numbered 584,259 men and 424,566 women between 1851 and 1900, these figures helping to account for the considerable excess of women over men in the resident popula- tion, which in 1900 was as 1049 to 1000. The periods of greatest emigration were 1868-1873 and 1879-1893; the

decline in later years is regarded as a favourable sign. The United States of America receive a large majority of the emigrants, and only a very small percentage returns. The Swedish people belong to the Scandinavian branch, but the population includes in the north about 20,000 Finns and 7000 Lapps. Other foreigners, however, are few, and the population is as a whole homogeneous. Immigrants in the period 1851-1900 numbered only 165,357.

Population is naturally denser in the south than in the north, and densest of all in the districts along the southern coasts; thus Malmohus Lan has about 220 persons per sq. m., Goteborg och Bohus Lan 174 and Blekinge 127. In Norrland as a whole, however, there are less than 9 persons per sq. m., in Norrbottens Lan less than 4, and in the uplands of this division and Vesterbottens Lan much less than this. However, the annual increase per thousand has been greater in Norrland than elsewhere. The annual excess of births over deaths is high, the proportion being as 168 to 1. The birth-rate between 1876 and 1900 averaged 28-51 per thousand; the death-rate between 1891 and 1900 was 16-36 per thousand, the lowest ever recorded over such a period for any European country. The lowest mortality is found in the districts about Lakes Vener and Vetter; the highest in Norbotten, the east midland districts, Skane, and Goteborg och Bohus Lan.

The percentage of i llegiti macy is rather hig h (though it decreased

1 The island and adjacent islets.

2 Island included in Kalmar Lan.

3 Including the four great lakes, Vener, Vetter, Malar Hjelmar, 3516 sq. m.

during the second half of the nineteenth century) ; one cause of this may be found in the fact that the percentage of married persons is lower than in most European countries. As regards social evils generally, however, the low, though undoubtedly improving, standard of Sweden has had one of its chief reasons in the national intemperance. In 1775 Gustavus III. made the sale of spirits (brdnnvin) a government monopoly, and the drinking habit was actually fostered. About 1830 this evil reached its highest development, and it is estimated that nine gallons of spirits were then consumed annually per head of the population. Mainly through the efforts of Peter Wieselgren, dean of Gothenburg (1800-1877), a strong temperance reform movement set in, and in 1855 important liquor laws were passed to restrict both production and sale of intoxicating liquors. The so-called Gothenburg System, providing for municipal control of the sale of intoxicants (see' Liquor Laws), came into full operation in Gothenburg in 1865. The temperance movement has had its reward ; the average of consumption of

beer and spirits in Sweden is considerably lower than in Europe as a whole, though the effect of intoxicants is sometimes very apparent.

A marked difference of temperament is noticeable between the Swedes and Norwegians, the Swedes being the more light- hearted and vivacious. In some of the more remote, parts of the country old customs are maintained and picturesque local costumes still worn, as in Dalecarlia (q.v.). The Lapps moreover retain their distinctive dress. In other cases early costumes are preserved only as a historical reminiscence at festivities. Although the characteristic celebrations at weddings or periodical festivals are, as elsewhere, decreasing in favour, there are certain occasions which are observed as holidays with much ceremony. Such are Christmas Day, and, not unnaturally in this northern land, Midsummer (June 23 and 24). The food of the people in the midlands and south is plentiful and good; in the remoter parts of the north an unfavourable summer is followed by a winter of scarcity or even famine; and in these parts meat is little used. Rye is extensively employed in the rural districts for the making of a hard bread in flat cakes (kndckebrod). A prevalent custom among the better classes is that of beginning meals with a selection of such viands as anchovies, smoked salmon or slices of meat, of which a number of small dishes are provided (smorgasbord). These are taken with bread and butter and a glass of spirits. The more characteristic Swedish sports are naturally those of the winter. These include ski-running (skidlopning), skating and skate-sailing, tobogganing and sledging. The numerous inland waters and sheltered channels within the skdrgdrd have caused the high development of sailing as a summer sport, the Royal Swedish Yacht Club having its headquarters in Stockholm. Athletic sports are in high favour, especially such winter sports as snow-shoeing (ski), and, among ball games, lawn-tennis, and to some extent football, together with the game of park, peculiar to Gotland, are played.

Towns. — In the first half of the 19th century the percentage of urban population remained nearly stationary at a little less than 10. In 1880 it was 15-12, and in 1900 21-49. The towns with a popula- tion exceeding 15,000 in 1900 are Stockholm (300,624), Gothenburg {130,609), Malmo (60,857), Norrkoping (41,008), Gene (29,522). Helsingborg (24,670), Karlskrona (23,955), Jonkoping (23,143), Upsala (22,855), Orebro (22,013), Lund (16,621), Boras (15,837), Halmstad (15,362).

Swedish towns, though rarely of quite modern foundation, generally appear so, for the use of brick in building is mainly of modern introduction, and is still by no means general, so that the partial or total destruction of a town by fire is now only less common than formerly. The rectangular method of laying out streets is general, and legislation has been directed against narrow streets and buildings of excessive height. The common material of

the characteristic domestic architecture in rural districts is wood, except in Skane, where stone is available and has been used from early times. Some of the old wooden farm-buildings, especially in Dalarne, such as are pre- served in Skansen Museum at Stockholm, are extremely picturesque. Another notable_ form in old wooden building is the belfry (klok- slapel) of some village churches, examples of which are seen at Habo near Jonkoping and Hasjo in Jemtland on the northern railway. In the midlands and south fine castles and manor houses of the i6th_and 17th centuries are fairly numerous, and there are a few remains of previous date. The fortified dwelling-house at Glim- mingehus in the extreme south near Simrishamn is a good early example. Several of the southern ports have old citadels. That of Kalmar, on its island, is specially fine, while those at Vestervik (Stakeholm), MalrnS, Falkenberg and Varberg may also be men- tioned. Among country palaces or mansions that of Gripsholm ■ s notable, overlooking Lake Malar, the shores of which are specially

Archi- tecture.

COMMUNICATIONS]

SWEDEN

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"ich in historic sites and remains In ecclesiastical architecture Sweden possesses the noble cathedrals of Lund, Upsala and Linko- ping; while that of Skara, near the southern shore of Lake Vencr, dates originally from 1150, and that of Strengniis on Lake Malar was consecrated in 1 291. There is a remarkably perfect Roman- esque church, with aisles, eastern apse and ambulatory, at Varnhem in Skaraborg Lan, and there are a few village churches of the same period in this district and in Skane. The monastic church at Vadstena on Lake Vetter is a beautiful example of Gothic of the 14th and 15th centuries. But the richest locality as regards ancient ecclesiastical architecture is the island of Gotland (g.fl.).

Travel and Communications . — As a resort for foreign travellers and tourists Sweden lacks the remarkable popularity of Norway. The Gota canal route, however, is used by many; the uplands of Dalecarlia (Dalarne) are frequented; and the railway through the Jemtland highlands to Trondhjem gives access to a beautiful region, where numerous sanatoria are in favour with the Swedes themselves. The northern railway offers a land route to the Arctic coast of Nor- way. Along the southern coasts there are many watering-places. Marstrand near Gothenburg is one of the most fashionable; Strom- stad, Lysekil and Varbergon the same coast, Ronneby on the Baltic, with its chalybeate springs, Visby the capital of Gotland, and

several villages in the neighbourhood of Stockholm may also be noted. The headquarters of the Swedish Touring Club (Svenska Turist- foreningcn) are in Stockholm, but its organization extends through- out the country, and is of special value to travellers in the far north.

The first railway in Sweden was opened for traffic in 1856, and the system has developed extensively; more so, in fact, in proportion to population, than in any other European country. Railways. About 8000 m. of railway are open, but extensions are constantly in progress. About two-thirds are private lines and one- third government lines. The central administration of the govern- ment lines is in the hands of a board of railway directors, and there are local administrative bodies for each of five districts. A railway council, created in 1902, acts as an advisory body on large economical questions and the like. Private railways are controlled by the regu- lations of the board, while a joint traffic union has as its object the provision of uniformity of administration, tariff, &c. The government has made grants towards the construction of some of the private lines, and has in a few cases taken over such lines. The railways form a network over the country as far north as Gene and the district about Lake Siljan. The government works the trunk lines from Stockholm to Malmo, to Gothenburg and to Christiania as far as the Norwegian frontier, and other important through routes in the south. The great northern line is also worked by the government. It runs north from Stockholm roughly parallel with the east coast, throwing off .branches to the chief seaports, and also a branch from Bracke to Ostersund and Storlien, where it joins a line from Trondhjem in Norway. At Boden the main line joins a line originally built to connect the iron-mines of Gellivara with the port of Lulea; the system is continued past Gellivara to Narvik on the Ofoten Fjord in Norway, this being far north of the Arctic Circle, and the line the most northerly in the world. The gauge of all the government lines and about 66 % of the private lines is 1-435 metres (4 ft. 8 J in.). Nearly all the fines are single. Passen- ger travelling is slow, but extremely comfortable. The principal connexions with the south are made across the sound from Malmo to Copenhagen, and from Trelleborg to Sassnitz in Germany.

The extensive system of natural waterways, especially in central Sweden, has been utilized to the full in the development of internal ... navigation, just as the calm waters within the skargard ?} an . .. afford opportunity for safe and economical coastwise avgai • tra fg c _ The earliest construction of canals dates from the 15th century, the patriot Engelbrekt and King Gustavus Vasa both foreseeing its importance. The theories of construction remained rudimentary until early in the 19th century, when the Gota {q.v.) canal was opened. The total length of the canalized water-system of Sweden is a little over 700 m., though wholly artificial waterways amount only to 115 m. out of this total. A large local traffic is carried on by steam

launches on the lakes during the season of open navigation ; and vessels have even been introduced on some of the lakes and rivers of the far north, principally in con- nexion with the timber trade. Posting, which is of importance only in the highland districts and the valley roads of Norrland, is carried on by posting-stations (skjutsstation) under government regulations; similar regulations apply when, as in the upper valleys of the great northern rivers, rowing boats on the lakes form the only means of travel. The condition of the high roads is fair as a whole, and has been much improved by increased state grants towards their upkeep; but -in Norrland they are naturally not of the best class. The postal and telegraph system is efficacious, and the telephone service, maintained partly by the state and partly by companies, is very fully developed. About twenty telephones are in use per thousand of population, and a system of trunk-lines between the important towns has been established since 1889.

Agriculture. — Of the total land area of Sweden only about 12 % is arable or meadow land, but the percentage varies greatly in different parts, as will be understood from a recollection of the main physical divisions. Thus in Skane nearly 60% of the land is under cultiva- tion; In -he midlands about 30%; io the north from 4-5% in

southern Norrland to 3% in northern Norrland. Almost exactly half the total area is under forest, its proportion ranging from 25% in Skane to upwards of 70% in the inland parts of Svea- land and in the south of Norrland. Land which is neither cultivable nor under forest (marsh land or, in the northern mountainous districts, land above the upper limit of the forests) amounts to 61 % in the far north and 36 % in the Smaland highlands, but only to 15 % in the central plains and in Skane. In the more highly cultivated districts of the south reclamation of such lands is constantly pro- ceeding. Agriculture and cattle-breeding employ over one-half the whole population. The average size of farms is 25 acres of cultivated land ; only 1 % exceeds 250 acres, whereas 23 % are of 5 acres or less. The greater part of the land has always been held by small independent farmers (only about 15% of the farms are worked by tenants), but until late in the 18th century a curious method of parcelling the land resulted in each man s property consisting of a number of detached plots or strips, the divisions often becoming so minute that dissension was inevitable. Early in the 19th century various enactments made it possible for each property to become a coherent whole. A legal parcelling (Jaga skifte) was introduced in 1827 and slowly carried out in the face of considerable local opposition; indeed, in the island of Gotland the system could not be enforced until 1870-1880. Roughly about 48-5% of the total cultivated area is under cereals, 33-8 under fodder plants, 5-8 under root-

crops, and 1 1 -8 fallow, this last showing a steady decrease. Oats, rye, barley, mixed grain and wheat are the grain-crops in order of importance. During the 19th century the percentage under wheat showed a general tendency to increase; that under oats increased much in the later decades as livestock farming became common, rye maintained a steady proportion, but barley, formerly the principal grain-crop, decreased greatly. This last is the staple crop in Norrland, becoming the only grain-crop in the extreme north ; in the richer agricultural lands of the midlands and south rye is predominant in the east, oats in the west. The high agricultural development of the plains of Skane appears from the fact that although that province occupies only one-fortieth of the total area of Sweden, it produces 30% of the entire wheat cop, 33% of the barley, 18% of the rye and 13% of the oats. A system of rotation (cereal, roots, grass) is commonly followed, each division of land lying fallow one year as a rule ; not more than two ripe grain-crops are commonly taken consecutively. Potatoes occupy 4'4% of the total area, and other root-crops 1-4%. These include the sugar-beet, the profitable growing of which is confined to Skane and the islands of Oland and Gotland. The sugar industry, however, is very important. Orchards and gardens occupy about I % of the cultivated area. Fruit-trees are grown, mainly in the south and midlands; northward (as far as Hernosand) they flourish only in sheltered spots on the coast. Between 1850 and 1900 the total head of livestock increased from 4,500,000 to 5,263,000, and the great advance of cattle-farming is evident from the follow- ing proportions. Whereas in 1 870-1 875 imported cattle and cattle- farming produce exceeded exports as 12 to 7, in 1900 the value of exports was nearly double that of imports ; and it may be added that whereas as late as 1870-1880 the exports of agricultural produce exceeded imports in value, in 1896-1900 they were less than one- tenth. The principal breeds of cattle are the alpine in Norrland, and Ayrshire, short-horn, and red-and-white Swedish in the midlands and south. The Gotland, an old native light yellow breed, survives in the island of Gotland. Oxen, formerly the principal draught animals, have been replaced by horses. Cattle, especially cows, and pigs form the bulk of the livestock, but sheep and goats have greatly decreased in numbers. The Lapps own upwards of 230,000 head of reindeer. Dairy-farming is profitable, England and Den-mark being the principal foreign consumers of produce, and the industry is carefully fostered by the government. A board of agriculture had been in operation for many years when in 1900 a separate department of agriculture was formed. There are one or more agricultural societies in each lan, and there are various state educational establishments in agriculture, such as the agricultural high schools at Ultuna near Upsala, and at Alnarp near Lund in Skane, an important agricultural centre, with dairy schools and other branch establishments. Finally, there are numerous horticultural societies, large nurseries and gardening schools at Stockholm,

Alnarp and elsewhere, and botanical gardens attached to the universities of Lund and Upsala.

Forests and Forestry. — Of the forests about one-third are public: the majority of these belong to the Crown, while a small proportioii- bclongs to hundreds and parishes. The remainder is in private hands. The public forests are administered by the office of Crown lands through a forest service, which employs a large staff of forest- masters and i'angers. The private forests are protected from abuse chiefly by the important legislation of 1903, which prescribes penalties for excessive lumbering and any action liable to endanger the regrowth of wood. The administration of the law devolves upon local forest conservancy boards. In the great fir forests of the north the limit set in respect of cutting down living trees for sawing and export is a diameter of the trunk, without bark, of 8J in. at 15! ft. from the base. Members of the forest service undergo a preliminary course of instruction at a school of forestry, »cd a further course at the Institute of Forestry, Stockholm, which

dates from 1828. There are very numerous sawmills, using water- power, steam and electricity; they are situated chiefly in the coast districts of the Gulf of Bothnia, from Gene northwards, especially in the neighbourhood of Sundsvall and along the Angerman River, and in the neighbourhood of all the ports as far north as Lulea and Haparanda. There are also upland mills in Dalarne and Vermland, and a considerable number in the neighbourhood of Gothenburg. The wood-pulp industry centres in the districts west and north of Lake Verier and south of Lake Vetter. In the north vast quantities of timber are floated down the great rivers, and the lesser streams are used as floating-ways by the provision of flumes and dams. The millowners either own forests, or lease the right of cutting, or buy the timber when cut, in the Crown or private forests. Among the special articles exported may be mentioned railway-sleepers, pit- props, and wood-pulp.

Fisheries. — The sea-fisheries, which are prosecuted principally in the calm waters within the skargard, are a variable source of wealth. For example, in 1894 nearly 2,000,000 cwt. of fresh fish (principally herring) were exported, but in subsequent years the fisheries were much less prolific; in 1900 only 80,000 cwt. were exported, and in 1903 less than 150,000 cwt. As a rule each crew jointly owns its boat and tackle. The fishery is of

ancient importance; at the old towns of Falsterbo and Skanor, south of Malmo, thousands of fisher- men were employed until the harbours became choked in 1 63 1, and the fish were a valuable item in the Hanseatic commerce. There are rich salmon-fisheries in the lower parts of the great northern rivers, especially the Tome, Kalix, Lule, Angerman and Indal ; in the Dal, the Klar and Gota, and several of the lesser rivers of the south. In the majority of rivers no special necessity has been found to protect the fishing. As a general rule the owner of the shore owns the river- fishing. The chief inspector of fisheries is a member of the board of agriculture.

Mining.- — The iron-mining industry is of high importance, the output of iron ore forming by far the largest item in the total output of ores and minerals. Thus in 1902 the total output was nearly 3J million tons, of which 2,850,000 tons were iron ore. The output of iron ore has greatly increased; in 1870-1880 it averaged annually little more than one-quarter of the amount in 1902. The deposits of iron ore are confined almost wholly to the extreme north of Norr- land, and to a midland zone extending from the south of the Gulf of Bothnia to a point north of Lake Vener, which includes the Dannemora ore fields in the eastern part. In Norrland the deposits at Gellivara have long been worked, with the assistance of a railway to the Bothnian port of Lulea, but in 1903 the northern railway was completed across the Norwegian frontier to Narvik on Ofoten Fjord, and the vast deposits at the hills of Kirunavara and Luossavara began to be worked. These deposits alone are estimated to have an extent exceeding one-quarter of the total ore fields worked in the country. The deposits are generally in pockets, and the thickness of the beds ranges from 100 to nearly 500 ft. at Kirunavara, up to 230 ft. at Gellivara, and in the midland fields generally from 40 to 100 ft., although at the great field of Grangesberg, in Kopparberg and Orebro Lan, a thickness of nearly 300 ft. is found. Nearly all the ore is magnetite, and in the midlands it is almost wholly free of phosphorus. The percentage of iron in the ore is high, as much as 66% in the Kirunavara-Luossavara ore; and little less in that of Grangesberg; this far exceeds other European ores, though it is equalled by some in America. Sweden possesses little coal, and

Eig-iron is produced _ with charcoal only; its quality is excellent, ut Sweden's proportion to the world's produce is hardly more than I %, whereas in the 17th and 18th centuries, before the use of coal elsewhere, it was much greater. As an industry, however, the pro- duction both of pig-iron and of wrought iron and steel is increasingly prosperous. The ironworks and blast-furnaces are almost wholly in the midland districts. Copper has been mined at Falun since the 14th century; it is also produced at Atvidaberg in Ostergotland. The production, however, has greatly decreased. A little gold and silver are extracted at Falun, and the silver mines at Sala in Vest- manlands Lan have been worked at least since the

16th century, but here again the output has decreased. Lead is produced at Sala and Kafveltorp, and zinc ore at Ammeberg. Coal is found in small beds in Skane, east and north of Helsingborg, at Billesholm, Bjuf andHoganas; but the amount raised, although increasing, is only some 300,000 tons annually. Mining administration is in the charge of a special bureau of the board of trade. The Iron Institute (Jdrnkontoret) was established in 1748 as a financial institution, in which the chief iron-mining companies have shares, for the advance- ment of advantageous loans and the promotion of the industry generally. It maintains a special education and investigation fund. There are schools of mining at Stockholm (the higher school), Falun and Filipstad in Vermland.

Manufactures. — If the total value of the output of the manufac- turing industries in Sweden be taken as 100, the following are the most important of those industries, according to the approximate percentage of each to the whole : iron industries 18-3, and mechanical works 4; saw-milling 12-5 and wood-pulp works 2-5; cloth-factories and spinning-mills 8; flour-mills 64; sugar-refining and beet-sugar works 6; spirit distilling and manufacture 4-7, and brewing 2-6; dairy products 4-4; papermaking 1-6; leaving a remainder of 29% for other industries. The total annual value of the output is about

£72,000,000. The great mechanical works are found at or near Maimo, Stockholm, Jonkoping, Trollhattan, Motala on Lake Vetter, Lund, Gothenburg, Karlstad, Falun and Eskilstuna, which is especially noted for its cutlery. A few other establishments includ- ing both mechanical workshops and ore-extraction works may be mentioned: Domnarfvet, on the Dal River, near Falun; Sandviken, near Gene ; and Bof ors in Orebro Lap. The principal centres of the textile industry are Norrkoping in Ostergotland and Boras in Elfs- borg Lan, where there are weaving schools; and the industry is spread over Elfsborg Lan and the vicinity of Gothenburg. There is a linen industry in Smaland and in the south of Norrland. One of the most notable special industries of Sweden is match-making, for which there are large works at Jcnkoping, Tidaholm in Skaraborg Lan and in the neighbourhood of Kalmar. The centre of the beet- sugar industry is Skane, but it is also carried on in the island of Gotland ; its great access of prosperity is chiefly owing to the existence of a protective duty on imported sugar. Spirit distillation centres in Kristianstad Lan. Among other industries may be mentioned the earthenware works at Hoganas at the north end of the Sound, the cement works of Lomma in this vicinity, and the pottery works of Rorstrand in, and Gustafsberg near, Stockholm; where beautiful ware is produced. Stone is worked chiefly in Goteborg och Bohus and Blekinge Lan.

Commerce. — Exports approach £30,000,000 and imports £40,000,000

in average annual value.

Of the total exports that of timber, wrought and unwrought, represents 50%; the other principal exports with approximate percentage are: iron and steel 13-5, iron ore 3-6, machinery and implements 3-2, and other iron and steel goods 2-7; butter 10; paper 3-4; carpentry work 3; matches 2-3. The principal imports with percentage to the whole are: coal and coke 15, grain 8, coffee 4-6, machinery 4, wool, yarn, thread, cotton and woollen goods 9-4; hides and skins 2-5. Oil and fish are also important. The principal countries trading with Sweden are the United Kingdom (exports from Sweden 38-2%, imports to Sweden 25-7), Germany (exports 16%, imports 39) and Denmark (exports 14%, imports 12-5). Other countries with which Sweden has mainly an export trade are France, the Netherlands and Norway. With Russia on the other hand the trade is principally import. In the case of the United Kingdom, Germany, Denmark and Norway, the transit trade forms an important proportion of the whole. The coal imported (which forms over 90% of the whole consumed) comes mainly from Great Britain; while most of the colonial produce, such as coffee and tobacco, comes through Germany. The match and paper export trade is principally with the United Kingdom. Between 1865 and 1888 Sweden employed a modified system of free trade, but various enactments in 1888 and 1892 reintroduced methods of protection.

Shipping. — The total number of vessels in the Swedish commercial fleet is about 3000 of 650,000 tons register; of which steamers represent about 380,000 tons. On an average about 73,000 vessels, of an aggregate tonnage of 17,500,000, enter and clear the ports. The principal ports of register are Gothenburg, Stockholm, Helsing- borg and Gefle, in order; though the principal commercial ports are Stockholm, Gothenburg and Malmo. Owing to the natural configura- tion of the coast and the skargard excellent natural harbours are almost without number. Artificial harbours are consequently few, but those at Helsingborg, Malmo, Halmstad, Ystad and Kalmar may be mentioned, i he principal docks are at Gothenburg, Stock- holm, Malmo, Oskarshamn and Norrkoping, besides the naval docks at Karlskrona; and the principal ports where large vessels can be accommodated on slips are Malmo, Gothenburg, Stockholm, Karls- krona and Gefle. A list of the chief ports may be conveniently classified. On the west coast north of Gothenburg are Stromstad., near the Norwegian frontier, and Uddevalla, on a deep inlet behind the island of Orust, 35 m. from the open Cattegat. South of Gothen- burg on the open coast are Varberg and Halmstad ; and on the Sound are the three large ports of Helsingborg, Landskrona and Malmo. Passing to the Baltic, Trelleborg and Ystad lie on the southernmost coast of the country, and Simrishamn, Ahus the outport of Kristian- stad, Karlshamn, Ronneby and Karlskrona on the wide Han6 Bay. On Kalmar Sound are Kalmar and Oskarshamn ; and

continuing northward, Vestervik, Soderkoping at the head of the inlet Slat-baken, Norrkoping, similarly situated on Braviken, and Stockholm, far within the skargard. On the Bothnian coast there is a port at or near the mouth of each great river, where the timber floated down from the interior is both worked and exported. The chief ports here, from south to north, are: Gefle, Soderhamn, Hudiksvall, Sundsvall, Hernosand, Ornskoldsvik, Umea, Skelleftea, Pitea and Lulea, the last exporting the ore from the northern iron-mines.

Banks.— The first Swedish bank, called the Palmstruch bank after its founder, Johan Palmstruch, was incorporated in 1656. It began to issue notes in 1661. It was shortly afterwards bankrupt, and in 1668 the Bank of Sweden {Sveriges Riksbank) succeeded it. This is managed by a board of seven delegates, the chairman being elected by the government, while the Riksdag (parliament) elects the remainder. It began to issue notes in 1 701. This ability was shared by private banks with solidary responsibility until 1903, but under a reform of 1897 the riksbank took over, from 1904, the whole right of issuing paper currency, which is in wide use. The capital of the riksbank is 50,000,000 kronor (£2,250,000). The

other banks are joint-stock banks and savings-banks, of which the first was opened at GothenDurg in 1820. The post office savings bank was opened in 1884.

Coinage. — The counting unit in the Swedish coinage is the krona, equal to i-i shilling. The monetary unit is 10 kronor gold, and gold pieces, not widely met with in circulation, are struck of 20, 10 and 5 kronor. The krona equals 100 ore. Silver pieces of 2 and 1 krona, 50, 25 and 10 ore are struck, and bronze pieces of 5, 2, and 1 ore. Sweden, Norway and Denmark have the same monetary system.

Finance. — In the budget for 1910 revenue and expenditure were estimated at £12,674,300. The principal sources of income in the ordinary revenue are railways, forests, telegraphs and rent from Crown lands; and those in the revenue voted (bevillningar) , which is about seven-eighths of the whole, customs, the taxes on spirits and beet- sugar, and income from the post office The departments to which the bulk of expenditure is devoted are those of the army, the interior, the navy and education. A large proportion of the army expendi- ture was formerly defrayed by a system of

military tenure on certain lands. Land-taxes, however, were finally abolished in 1904, and their place was taken by an increased taxation on real estate, revised triennially, and by an income tax arranged on a sliding scale, up to 4 % of the income (9-6 pence in the £), settled according to individual declaration. The national debt was practically nil until c. 1855, and the debt contracted thereafter owes its existence almost wholly to railway construction. It increased from about £2,300,000 in i860 to £6,400,000 in 1870 and £18,600,000 in 1900. In 1904 it exceeded £19,000,000. The greater proportion of communal revenue comes from income and property tax. the sale of spirits under the Gothenburg System, and contributions from the treasury. Primary education, poor relief, and Church purposes form the principal items of expenditure.

Constitution and Government. — Sweden is a limited monarchy, the constitution resting primarily on a law (regerings-formen) of the 6th of June 1809. The king is irresponsible, and executive power is vested in him alone. All his resolutions, however, must be taken in the presence of the cabinet (slatsr&d). The cabinet councillors are appointed by the king and are responsible to the parliament (Riksdag). They are eleven in number, one being prime minister, two others consultative ministers, and the remaining eight heads of the departments of administration, which are justice, foreign affairs, land defence, naval defence, home affairs, finance, public works, agriculture. The councillors must be of Swedish birth and adherents of the Lutheran confession. The appointment of the majority of public officials is vested in the king, who can himself dismiss cabinet ministers and certain others, whereas in most cases a judicial inquiry is necessary before dismissal. The king shares legislative powers with the Riksdag, (parliament or diet), possessing the rights of initiation and absolute veto. He has also, in certain adminis- trative and economic matters, a special legislative right.

The Riksdag consists of two chambers. The members of the first chamber are elected by the landsthing, or representative bodies of the Ian, and by the municipal councils of some of the larger towns. They number 150, and are distributed among the constituencies in proportion to population; the distribution being revised every tenth year. Eligibility necessitates Swedish birth, an age of at least 35 years, and the possession, at the time of election and for three years previously, either of real property to the value of 80,000 kronor (£4400), or an annual income on which taxes have been paid of 4000 kronor (£220). Members are unpaid. The members of the second chamber number 230, of whom 150 are elected from rural constituencies and 80 from towns. The members receive a salary of 1200 kronor (£66), and are elected for a period of three years by electors, or directly, according to the resolution of the electoral district. If a member retires during that period, or if the chamber is dissolved, suc- ceeding

members are elected for the remainder of the three years, and thus the house is wholly renewed at regular intervals, which is not the case with the first house. The franchise was for long extremely limited in comparison with other countries, but in 1907 universal manhood suffrage was introduced, after protracted dissension and negotiation between the two houses. Eligibility to the lower house necessitates possession of the elective franchise, an age of at least 25 years, and residence within the constituency. Both chambers have in theory equal power. Before bills are discussed they may be prepared by committees, which play an important part in the work of the house. The agreement of both chambers is necessary before

a bill becomes law, but when they differ on budget questions the matter is settled by a common vote of both, which arrange- ment gives the second chamber a certain advantage from the greater number of its members. By revisers elected annually the Riksdag controls the finances of the kingdom, and by an official (justitieombudsman) elected in the same way the adminis- tration of justice is controlled; he can indict any functionary of the state who has abused his power. The bank of the kingdom is superintended by trustees elected by the Riksdag, and in the same way the public debt is administered through an office (riksgaldskontoret) , whose head is appointed by the Riksdag.

Local Government. — For the purposes of local government Sweden is divided into 25 administrative districts called Ian, a list of which is given in the paragraph dealing with population. The elected representative body in each is the landsthing, which deliberates on the affairs of the Ian and has a right to levy taxes. The chief official of the Ian is the landshbfding, under whom are secretarial and fiscal departments. Privileged towns, receiving their privileges from the government (not necessarily on the basis of population), are under a mayor (borgmdstare) and aldermen (rddmdn), the alder- men being elected by the citizens, while the mayor is appointed by the government from the first three aldermen on the poll, is paid, and holds office for life. Gothenburg has two mayors, and the city of Stockholm {q.v.), a Ian in itself, has a special form of govern- ment. The major rural divisions are the fdgderier, under bailiffs, a subdivision of which is the lansmansdistrikt under a lansman.

Justice. — Justice is administered by tribunals of three instances.

(1) There are 119 rural judicial districts (domsagor), which may be subdivided into judicial divisions (tingslag). Each tingslag has a court (hdradsrdtt), consisting of a judge and twelve unpaid assessors (ndmndeman) , of whom seven form a quorum, elected by the people. These, if unanimously of a different opinion to the judge, can out- vote

him. The town-courts in the privileged towns are called rddstufvurdtter, and consist of the mayor and at least two aldermen.

(2) There are three higher courts {hof ratter), in Stockholm, Jonkop- ing and Kristianstad. (3) The Supreme Court (Hogsta Domstolen) passes sentences in the name of the king, who is nominally the highest judicial authority. The court has a membership of 18 justices (juslitierdd) , two of whom are present in the council of state when law questions are to be settled ; while the body also gives opinion upon all proposed changes of law.

Army and Navy. — General military service is enforced. Every Swedish man belongs to the conscripts (vdrnpligtige) between the age of 21 and 40, during which time he serves eight years in the first levy, four in the second, and eight in the reserves. The con- scripts were formerly trained for 90 days, but according to the law of 1901, the conscript is bound to serve in time of peace — in the infantry, position artillery, fortress artillery, fortress engineers, and the army service corps a total of 240 days ; and in the cavalry, field artillery, field engineers, and field telegraph corps a total of 365 days. The permanent cadres number about 22,000, and about 85,000 men are annually trained as recruits or recalled for further training. The organization of the army in time of peace is as follows : 82 battalions of infantry (28 regiments), 50 squadrons of cavalry, 71 field artillery and 7 position artillery batteries, 10 fortress artillery, 16 engineer, and 18 army service corps companies. There are six divisions, quartered at Helsingborg, Linkoping, Skofde, Stockholm (two), and Hernosand; in addition to the Gotland troops quartered at Visby. A division in time of war would probably consist of 2 batta- lions of infantry (4 regiments, 12 battalions), with 4 squadrons of cavalry, 1 artillery regiment, 1 company of engineers, &c. A cavalry division would consist of 2 brigades of 8 squadrons each, and 1 brigade of horse artillery. It is estimated that 500,000 rr.en are available for service in the various capacities in case of war. There are fortresses at Stockholm (Vaxholm and Oscar-Fredriks- borg), Boden on the northern railway near the Russian frontier, Karlsborg on Lake Vetter, and Karlskrona ; and there are forts at Gothenburg and on Gotland. The reforms of 1901 abolished the indelta, a body including both infantry and cavalry who lived in various parts of the country, in some cases having their houses provided for them. This peculiar system of military tenure {indel- ningsverket) originated in the 17th century, when certain landowners were exempt from other military obligations if they provided and maintained armed men. The navy is small, including II ironclads of 3100 to 3650 tons. The personnel consists of a cadre, reserve and about 17,000 conscripts. It also includes two coast-artillery regi- ments, with headquarters at Vaxholm and Karlskrona. The prin- cipal naval station is Karlskrona, and there is another at Stockholm.

Religion. — More than 99 % of the total population belong to the Swedish Lutheran Church, of which the king is the supreme head. Sweden is divided into 12 dioceses and 186 deaneries, the head of the diocese of Upsala being archbishop. _ The parish is an important unit in secular as well as ecclesiastical connexions. The rector presides over the local school board, which is appointed by the church assembly (kyrkostdmman) , and thus an intimate relation between the church and education has long been maintained. A peculiar duty of the clergy is found in the husforhor or meetings

designed to enable the priest to test and develop the religious knowledge of his parishioners by methods of catechism. It was formerly enjoined upon the clergy to visit parishioners for this purpose, and the system is still maintained in the form of meetings, which have in some cases, however, acquired a character mainly devotional. The parishes number 2556, but one living may include more than one parish. In the sparsely inhabited districts of the north the parish is sometimes of enormous extent, thus that of Gellivara has an area of about 6500 sq. m. In such cases the priest otten makes protracted journeys from farm to farm through his parish, and on certain occasions the congregation at his church will include many, both Swedes and Lapps, who have travelled perhaps for several days in order to be present. Dissenters are bound to contribute to the maintenance of the Swedish Church, in considera- tion of the secular duties of the priests.

Education. — The connexion between the church and education is so close that the control of both is vested in a single department of the government. Primary education is carried on in common schools of different grades, under both local and state inspec- tion, the parish being the school district. Seminaries are maintained for common school teachers, with a four years' course. At Haparanda and Mattisudden in Norbotten there are special institutions for teachers for the Finnish and Lapp population respectively. Wide attention was attracted to Swedish educational methods principally by the introduction of the system of Sloyd (slbjd), initiated at the Naas seminary near Gothenburg, and con- cerned with the teaching of manual occupations, both for boys and for girls. The higher education of the people is provided by people's high schools in the rural districts, especially for the peasantry, maintained by the county councils, agricultural societies and the state, and providing a two years' course both in general education and in special practical subjects according to local needs. The men's course is held

in winter; and a women's course, in some in- stances, in summer. The workmen's institutes in the towns have a similar object. A system of university extension has been de- veloped on the English pattern, summer courses being held at Upsala and Lund. In connexion with the army reform of 1901 a system of army high schools was proposed for conscripts while serving. Technical education is provided in higher schools at Stockholm, Gothenburg and certain other large industrial centres; and in lower schools distributed throughout the country, in which special atten- tion is given to the prevailing local industries. The agricultural and forestry schools have been mentioned in the paragraphs on these subjects. Public schools for boys are provided by the state, each bishop being superintendent (eforus) of those in his diocese. In the three lowest classes (out of a total of nine) a single system of instruc- tion is practised; thereafter there are classical and scientific sides. Greek is taught only in a section of the upper classical classes. Of modern languages, German is taught throughout; English in all classes of the scientific side, and the upper classical classes. Much attention is paid to singing, drill and gymnastics. The school terms together occupy 34! weeks in the year. At the schools examinations are held for entrance to the universities and certain higher special schools. Owing to the high development of state public schools, private schools for boys are few; but higher schools for girls are all private, excepting the higher seminary for teachers and the state normal school at Stockholm. The state universities are at Upsala and Lund, and with these ranks the Caroline Medical Institution at Stockholm. There are universities (founded by private individual benefactions, but under state control) at Stock- holm and Gothenburg. The faculties at Upsala and Lund are theology, law, medicine and philosophy (including both art and science). The courses are long, ranging from six to nine years; and the degrees are those of candidate, licentiate and doctor. The students, who are distinguished by their white caps, are divided for social purposes into " nations " (landskap) of ancient origin, based upon the distinctions between natives of different parts.

Scientific Institutions. — Among the scientific and literary societies are to be noted the Swedish Academy, consisting of t8 members, which was instituted in 1786 by Gustavus III., after the pattern of the Academie Francaise, for the cultivation of the Swedish language and literature; and the 'Academy of Science, founded in 1739 by Linnaeus and others for the promotion of the natural sciences. The first distributes one and the second two of the prizes of the Nobel foundation. A fourth prize is distri- buted by the Caroline Institution at Stockholm. There may be mentioned further the Royal Academies of Literature, History and Antiquities (1786), of Agriculture (181 1), of Arts (1735) and of Music (1771). The principal museums and art and other collections are in Stockholm, Upsala and Lund, and Gothenburg. The Royal Library in the Humleg&rd Park at Stockholm,

and the university libraries at Upsala and Lund are entitled to receive a copy of every publication printed in the kingdom. Certain of the large towns have excellent public libraries, and parish libraries are widely distributed.

See Sweden, its People and its Industry, a government publication (ed. G. Sundbarg) dealing with the land and people in every aspect (Eng. vers., Stockholm, 1904) ; Bidrag till Sveriges officiela statistik (Stockholm, 1857 seq.) ; Statistisk Tidskrift, periodically from 1862; Publications (year-book, guides, &c.) of the Svenska Turistforeningen

(Swedish Touring Club) Stockholm; periodical Bulletin cf the Geological Institute of Upsala University, in which may be noted K. Ahlenius, Beitrdge zur Kenntniss asr Seenkettenregion in Schwedisch- Lappland, No. v. (1900) ; Also Dahlman, Inledning til Sveriges physikalska geografi (Stockholm, 1857) ; Statistiskt Lexicon ofrer Sverige (Stockholm, 1859-1870); M. Hojer, Konungariket Sverige (Stockholm, 1875-1883); C. Almqvist, La Suede, ses progres sociaux (Stockholm, 1879) ; P. B. Du Chaillu, The Land of the Midnight Sun (London, 1881); C. M. Rosenberg, Geografiskt-statistiskt handlexicon ofrer Sverige (Stockholm, 1882-1883) ; W. W. Thomas, Sweden and the Swedes (Chicago and New York, 1891) ; Healey, Educational Systems of Sweden, Norway and Denmark (London, 1893); Nystrom, Handbok i Sveriges geografi (Stockholm, 1895), and Sveriges rike (Stockholm, 1902) ; G. Andersson, Geschichte der Vegetation Schwedens (Leipzig, 1896); K. Ahlenius, Sverige, geografisk, topografisk, statistisk beskrif- ning (Stockholm) ; and for geology, A. G. Nathorst, Sveriges geologi (Stockholm). For more detailed accounts of the various districts see the publications of the Sveriges Geologiska Under sbkning, and also the volumes of the Geologiska Fbreningens i Stockholm Forhandlingar. (O. J. R. H.)

History

Remains dating from the Stone Age are found scattered over the southern half of Sweden, but it is only along the south coast and in the districts bordering on the Cattegat that they occur in any considerable quantity. The antiquities of the Bronze Age are much more widely distributed and reach as far as the north of Helsingland. It is evident that the country must at this time have been fairly populous. So far as can be judged from the human remains found the population in general in both the Stone and Bronze Ages seems to have been similar in type to that of the present day, and there is no clear evidence for the advent of a new race. The Iron Age probably began in the south of Sweden at any rate some three or four centuries before the beginning of the Christian era. (See further Scandi- navian Civilization.)

The first historical notice relating to Sweden is contained in Tacitus, Germania, cap. 44. This book was probably published in a.d. 98 or 99 and in the passage mentioned we find the name of the chief people of the peninsula, the Early Swedes proper, Suiones (O. N. Sviar, Swed. Races and Svear, A. S. Sweon), who eventually gave their DIy,sl < > aa – name to the whole country. According to Tacitus they were governed by a king whose power was absolute and comprehen- sive, and possessed a strong fleet which secured them from the fear of hostile incursions. Hence arms were not borne in times of peace but stored away under charge of a slave, and Tacitus suggests in explanation that the royal policy did not commit this trust to noble, freeman or freedman. Their original territories lay on both sides of the Malar, in the provinces later known as Upland, S5dermanland and Westmanland. Tacitus mentions another tribe, the Sitones, which he places next to the Suiones, but they have not been identified, and it is not clear from his description whether they lived within the peninsula 01 not. The only information he gives about them is that they were ruled over by a woman. Other early Roman writers, Mela and Pliny, mention the country under the name Scandinavia (Skane), a name which in native records seems always to have been confined to the southernmost district in the peninsula. Little information, however, is given by these authorities with regard to the inhabitants.

The people next in importance to the Suiones in the peninsula (Swed. Gotar, O. N. Gautar, A. S. Geatas) are first mentioned by Ptolemy (under the form Goutai for Gautoi), together with a number of other tribal names, most of which unfortunately cannot be identified, owing to the corrupt state of the text. Ptolemy puts the Gotar in the southern part of the country, and from the earliest historical times their name has been given to the whole region between the Cattegat and the Baltic, exclusive of the provinces of Halland and Skane which down to the 17th century always belonged to Denmark. The coast of the Cattegat north of the Gota Elv was reckoned in Norway. Gotaland consisted of the provinces of Vestergotland and Ostergotland divided from one another by Lake Vetter, together with Smaland. In early times Vestergotland seems to have been by far the most important.

Vermland, the district to the north of Lake Vener and the

Beowulf.

whole of the country to the north of Svealand seem to have been of small importance. Jamtland was always considered a part of Norway. After the time of Ptolemy we Jordanes. ˆ ear n0 more °f Sweden until the 6th century, when a surprisingly full account of its peoples is given by the Gothic historian Jordanes. He mentions both the Svear (Swethans) and the Gotar together with other peoples, the names of several of which can be recognized in the district- names of later times, in spite of the numerous corruptions of the text. He praises the horses of the Svear and speaks of their great trade in furs of arctic animals which were transferred from merchant to merchant until they reached Rome. About the other peoples of Sweden he gives a few details, chiefly of physical or moral characteristics, commenting upon the warlike nature of the Visigauti, the mildness of the Finns, the lofty stature of the Vinovii and the meat and egg diet of the Rere-fennae. Jordanes's statement regarding the prevalence of trade with Sweden is corroborated by the fact that many coins and bracteates of the period have been found in the country. Of these the coins are chiefly Roman and Byzantine gold pieces of the 5th century, the bracteates copies of Roman coins of the same period.

Procopius, the contemporary of Jordanes (Gothica, ii. 15) likewise gives an account of Sweden, which he calls Thule,but the only tribes which he names are the Skrithephinnoi (A. S. Scri9efinnas), a wild people of Finnish stock, and the Gotar (Gautoi) whom he describes as a " nation abounding in men." For the same period we derive a consider- able amount of information with regard to Swedish affairs from the Anglo-Saxon poem Beowulf. The hero himself belonged to the Greatas (i.e. in all probability Gotar, though the identifica- tion is disputed by some scholars), his mother being the daughter of their king Hrethel. Haethcyn, the son and successor of this Hrethel, is said to have perished in a disastrous battle against the Svear, but his fall was avenged by his brother Hygelac in a subsequent engagement in which the Swedish king Ongentheow was killed. This Hygelac is clearly identical with that Chochi- laicus wrongly described as a Danish king by Gregory of Tours (iii. 3) who made a piratical expedition to the lower Rhine which ended in his defeat and death in a battle with the Franks under Theodberht about a.d. 520. The poem contains several allusions to this disaster. We learn further that about the time of Hygelac's death strife broke out in the royal family of the Svear, between Onela, the son and successor of Ongentheow, and Eanmund and Eadgils, the sons of his brother Ohthere. The latter fled for protection to the Gotar and the war which ensued cost the lives of Eanmund and of Heardred the son and successor of Hygelac. According to the poem Beowulf himself now be- came king of the Gotar and assisted Eadgils in a campaign which resulted in the death of Onela and the acquisition of the throne by his nephew. What is said in the poem with regard to the end of Beowulf belongs to the realm of

myth, and for three centuries after this time we have no reference to Swedish affairs in English or other foreign authorities. Moreover after the time of Beowulf and Jordanes there are very few references to the kingdom of the Gotar and in Olaf Skottkonung's time it was merely an earldom. The kingdom must have come to an end between the 6th and 10th centuries a.d., and probably quite early in that period.

The Ynglingatal, a poem said to have been composed by Thiooolfr of Hvin, court-poet of Harold Fairhair, king of Norway, The gives a genealogy of Harold's family, which it carries

Ynglagatals back to the early kings of the Svear. Snorri Stur- andYog- l uson (1178-1241) the Icelandic author using this aga aga. p 0em as a basis an(j amplifying it from other sources, wrote the Ynglinga Saga, which traces back the history of the family, generation by generation, to its beginning. In this saga ASils (the Eadgils of Beowulf), son of Ottarr is one of the most prominent figures. The account given of him agrees in general with the statements in Beowulf, though the nature of his relations with Ali (Onela) has been misunderstood. The decisive battle between the two kings is said to have taken place

on the frozen surface of Lake Wener. Ongentheow appears to have been entirely forgotten in Norse tradition and his place is taken by a certain Egill. The saga further states that Agils was an enthusiastic horse-breeder and that he met with his death through a fall from his horse. This point is of interest in con- nexion with the notice of Jordanes, mentioned above, with regard to the horses of the Svear. Other northern authorities such as Saxo and the Hrolfs Saga Kraka represent A5ils in a very unfavourable light as niggardly and addicted to sorcery.

The Ynglingatal and Ynglinga Saga enumerate Asil's ancestors to no less than seventeen generations, with short accounts of each. We have no means of checking the genealogy from other sources, and the majority of the characters are probably to be regarded as mythical. The origin of the family is traced to the god Frey, son of Nioror, who is said to have founded Upsala, the ancient capital of Sweden. His reign is represented as a golden age of peace and prosperity and the great wealth of the sanctuary is said to have taken its beginning from the offerings at his tomb. His full name appears to have been Yngvifreyr or Ingunar Freyr and his descendants are collectively termed Ynglingar, though we also occasionally meet with the name Skilfingar, which corresponds with the name Scilfingar borne by the Swedish royal family in Beowulf.

After the time of A8ils the Ynglingar remained in possession of Upsala for four generations according to the saga. Ultimately the treachery and the

murderous disposition of the king named Ingialdr led to his overthrow by a prince from Skine, called Ivarr ViofaSmi. His son Olafr Tretelgia withdrew to Vermland, which he brought into a state of cultivation, though he Was subsequently sacrificed by his subjects in a time of famine. It is stated in the saga that the Swedish kings were believed to have control over the seasons like their ancestor, the god Frey, and traces of this belief seem to have lingered in the country down to the times of Gustavus Vasa. The sons. of Olafr Tretelgia moved westward into Norway, and if we may trust the. saga, the Swedish kingdom never again came into the possession of their family.

The subsequent kings of Sweden are said to have been descended from Ivarr ViSfaBmi. The most prominent figures in this family are Haraldr Hilditonn Ivarr's grandson and his introduc- nephew Sigur8r Hringr. The story of the battle tlon of between these two at Bravik, in which Haraldr lost Cbristlaalt y- his life, is one of the most famous in northern literature. But the position of these kings with regard to Sweden is far from clear. Their home is probably to be placed on the Cattegat rather than on the Baltic. The same is true also of Ragnarr Lo5brok, who is said to have been the son of Sigur5r Hringr. About the year 830 the missionary bishop Ansgar made his first expedition to Sweden. He made his way to Birca On the Malar. The king whom he found reigning there is called Bjorn (Bern) and is generally identified with the king Bjorn for whom Bragi the Old composed the poem called Ragnarsdrdpa. On his subsequent journeys to Sweden Ansgar encountered kings called Olafr and Onundr. He appears to have met with consider- able immediate success in his missionary enterprises, although there is no evidence to show that the churches he founded long survived his death, and no serious mission seems to have been attempted for more than a century afterwards.

During the 9th century extensive Scandinavian settlements were made on the east side of the Baltic, and even as early as the reign of Louis I. we hear of piratical expedi- gcaadi- tions on the Black Sea and on the Caspian. The navian famous expeditions of Rurik and Askold which Settlements resulted in the origin of the Russian monarchy f" ss ' a ' appear to have taken place towards the middle of the 9th century, but it has not been found possible to connect these names with any families known to us from Swedish tradition. Proofs of extensive Scandinavian settlement in Russia are to be found partly in the Russian names assigned to the Dnieper rapids by Constantine Porphyrogenitus, partly in references to this people made by foreign representatives at the court of Byzantium. The fact that many of the names which occur

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in Russian chronicles seem to be peculiarly Swedish suggests that Sweden was the home of the settlers, and the best authorities consider that the original Scandinavian conquerors were Swedes who had settled on the east coast of the Baltic.

In the time of Harold Fairhair, probably about the beginning of the ioth century, we hear of a king named Eric the son of Kings in Emund at Upsala, whose authority seems to have thetoth reached as far as Norway. Later in the century Century, there is record of a king named Bjorn a Haugi who is said to have been the son of Eric and to have reigned fifty years. Bjorn's sons and successors were Olaf and Eric the Victorious. Styrbiorn Starki, the son of Olaf, being refused his share of the government by Eric after his father's death, made himself a stronghold at Jomsborg in Pomerania and spent some years in piratical expeditions. Eventually he betook him- self to Harold Bluetooth, then king of Denmark, and endea- voured to secure his assistance in gaining the Swedish throne by force of arms. Although he failed in this attempt he was not deterred from attacking Eric, and a battle took place between the two at the Fyrisa (close to Upsala) in which Styrbiorn was defeated and killed. Eric himself died ten years after this battle, apparently about 993. According to the story he had obtained victory from Odin in return for a promise to give himself up at the end of ten years. Under his son and successor Olaf, surnamed Establish- Skottkonung, Christianity was fully established in meotof Sweden. Olaf Tryggvason, the king of Norway, Cbristi- }j a(j married his sister Ingibiorg to Ragnvald, earl antty – of Vestergotland, on condition that he should receive baptism, and the Swedish king's wife was also a Christian, though he himself was not baptized until 1008 by Sigfrid at Husaby. A quarrel arose in the last years of the ioth century between Olaf Skottkonung and Olaf Tryggvason. The latter had applied for the hand of Sigri8, the widow of Eric the Victorious, but had insulted her on her refusal to become a Christian. In the year 1000, when the Norwegian king was in Pomerania, a coalition was formed between the king of Sweden, Sweyn Forkbeard, king of Denmark, and earl Eric of Lade, and the allies waylaid their enemy off the coast near Riigen and overthrew him in Reign of the great sea-battle of Svolder. Under Olaf Skott- oisf skott- konung Sweden became the mightiest of the king- konung. d oms f the north, in spite of the king's own inactivity. She lost her lands east of the Baltic, but received as compensation in Norway part of Trondhjem and the district now called Bohuslan. These lands Olaf handed over to Earl Sweyn, brother of Earl Eric (whose father Haakon had governed Norway), as a marriage portion for his daughter HolmfriS. Some years later we hear of hostilities between Olaf Skottkonung

and another Norwegian prince, Olaf Haraldsson (the Fat), who raided Sweden and was besieged in the Malar by the Swedish king. In 1014, the year of Earl Eric's departure to England with Canute, Olaf Haraldsson, returning to Norway as king, put an end to the Swedish and Danish supremacy, and in 1015 he forced Earl Sweyn to leave the country. Trifling border-quarrels followed, but in 1017 a truce was arranged between Norway and Vestergotland, where Earl Ragnvald was still in power. Olaf of Norway now sent his marshal Bjorn to Ragnvald to arrange a peace. Ragnvald brought him to a great assembly at Upsala in February 1018. At this meeting Bjorn, supported by the earl, asked for peace, and Olaf was compelled by the pressure of the lawman Thorgny to agree to this and also to promise his daughter IngegerS in marriage to the Norse king. The marriage, however, never got beyond the betrothal stage, and at Earl Ragnvald's suggestion Astrid, her half-sister, was substituted, contrary to the will of Olaf Skottkonung. Such was the anger of the king that Ragnvald was forced to accompany Ingeger5 to Russia, where she was married to the grand-duke Jaroslav at Novgorod. In Sweden, however, both the Vestgotar and the Upland Sviar were discontented, the former on account of the breaking of the king's promise to Olaf of Norway and the latter on account of the introduction of the new religion, and their passions were further inflamed by the lawman Anund of Skara. A rising in Upland compelled Olaf to share his power

with his son Jacob, whose name was changed to Anund by the leaders of the revolt. A meeting was then arranged between the kings of Norway and Sweden at Kongelf in 1019, and this resulted in a treaty. The death of Olaf Skottkonung is assigned by Snorri Sturluson to the winter of 1021-1022. His grave is still shown at Husaby in Vestergotland.

Anund, now sole king, early in his reign allied himself with Olaf Haraldsson against Canute of Denmark, who had demanded the restitution of the rights possessed by his father King Anund, Sweyn in Norway. The allies took advantage of c./ftM- the Danish king's absence to harry his land. On c ' his return an indecisive battle was fought at Helgi A, and Anund returned to Sweden. Olaf was driven from Norway by the Danes, but returning in 1030 he raised a small army in Sweden and marched through Jamtland to Trond- v, hjem only to meet his death at the battle of Stiklestad. After death he was worshipped in Sweden, especially in Gotland. We hear from Adam of Bremen that Anund was young in years but old in wisdom and cunning; he was called Kolbrannea because he had the houses of evildoers burnt. Like Olaf Skottkonung he caused coins to be struck at Sigtuna, of which a few remain. The moneyers' names are English. The coins of Anund surpass all that were struck during the next two centuries. He appears to have died about 1050, according to Adam of Bremen. He was succeeded by his brother Emund the Old, who Emund the

had been previously passed over because his mother Old, wso- was unfree, the daughter of a Slav prince and t06 °- captured in war. This king had become a Christian, but soon quarrelled with Adalhard, archbishop of Bremen, and endeavoured to secure the independence of the Swedish church, which was not obtained for another century. Emund, who was given the name Slemme, had territorial disputes with Denmark in the early part of his reign. These disputes were settled by a rectification of boundaries which assigned Blekinge to Denmark.

With the death of Emund, which took place in 1060, the old family of Swedish kings dies out. The successor of Emund the Old was a king named Steinkel who had married the daughter of his predecessor. He was the son 1060-1066. of a certain Ragnvald, perhaps connected with the Vestergotland Ragnvald, of the reign of Olaf Skottkonung. Steinkel was born in Vestergotland and was warmly attached to the Christian religion. The Adalhard who had quarrelled with Emund the Old now sent a bishop, Adalhard the younger, to Scara. Christianity was by this time firmly established throughout most of Sweden, its chief strength being in Vestergotland. The Uplanders, however, still held out against it, and Adalhard, though he succeeded in destroying the idols in his own district Vestergotland, was unable to persuade Steinkel to destroy the old sanctuary at Upsala. During his reign grants of land in Vermland made by the king to the Norse earl Haakon Ivarsson led to a successful invasion of Gotaland by Harold Hardrada of Norway. Steinkel also had disputes with Denmark. On his death in 1066 a civil war broke out in which the leaders were two obscure princes named Eric. Probably the division of feeling between Vestergotland and Upland in the matter of religion was the real cause of this war, but nothing is known of the details, though we hear that both kings as well as the chief men of the land fell in it.

A prince called Haakon the Red now appears as king of Sweden and is said to have occupied the throne for thirteen years. In the Vestergotland regnal lists he appears Haakon the before Steinkel and it is possible that the authority Red, 1066- of that king was not regularly acknowledged in lm 9t the province. In 1081 we find the sons of Steinkel, Inge and Halstan, reigning in Sweden. Inge's attachment to Christianity caused him to be expelled after a short time by his brother-in-law Sweyn or Blotsweyn, so called Halstan, from his revival of the old sacrifices. Sweyn retained In z e aad the kingship only for three years. After that B,otswe y- interval Inge returned and slew him, and his fall marks the final overthrow of the old religion.

The interesting account of Upsala preserved by Adam of

Temple at Upsala.

Bremen in his History (iv. 26) apparently dates from the period immediately preceding these events. He describes the temple as one of great splendour and covered with gilding. In it stood the statues of the three chief deities Thor, Odin and Fricco (by whom he probably means Frey). Every nine years a great festival was held there to which embassies were sent by all the peoples of Sweden. A large number of animals and even men were sacrificed on such occasions. In the neighbourhood of the temple was a grove of peculiar sanctity in which the bodies of the victims were hung up. After the introduction of Christianity the importance of Upsala began steadily to decline, and owing to its intimate associations with the old religion the kings no longer made it their residence.

Authorities for Early History. — Tacitus, Germania, cap. 44; Claudius Ptolemaeus, Geographica ii. 11 ad fin.; Jordanes, De origine actibusque Getarum, cap. 3; Procopius, De hello gothico, ii. 15; Beowulf, Rimbertus, Vita S. Ansgarii in monumenta Germaniae historica, ii. 683-725 (Hanover, 1829); King Alfred's transla- tion of Orosius i. I • Adam of Bremen, Gesta hammaburgensis ecclesiae pontificum iii. and iv. ; Ynglinga Saga, with the poem Ynglingatal contained in the Heimskringla; Olafs Sagan Tryggvasonar and Olafs Saga hins Helga, both contained in Heimskringla and in Fornmanna sogur; Saxo grammaticus, gesta Danorum; a collection of later Swedish Chronicles contained in Rerum suecicarum scrip- tores, vol. iii. (ed. Annerstedt, Upsala, 1871 and 1876); Sveriges historia, vol. i. (Montelius & Hildebrand, Stockholm, 1875-1877) ; Thomsen, The Relations between Ancient Russia and Scandinavia and the Origin of the Russian State (Oxford and London, 1877).

(F. G. M. B.)

Under Blotsweyn's grandson. King Sverker (1134-1155), who permanently amalgamated the Swedes and Goths (each Organha- of the two nations supplying the common king tioa of the alternately for the next hundred years), Sweden Kingdom. began to feel the advantage of a centralized mon- archical government. Eric IX. (n 50-1 160) organized the Swedish Church on the model prevalent elsewhere, and under- took a crusade against the heathen Finlanders, which marks the beginning of Sweden's overseas dominion. Under Charles VII., 1 the archbishopric of Upsala was founded (1164). But the greatest medieval statesman of Sweden was Earl Birger, who practica'ly ruled the land from 1248 to 1266. To him is attributed the

foundation of Stockholm; but he is best known as a legislator, and his wise reforms prepared the way for the abolition of serfdom. The increased dignity which the royal power owed to Earl Birger was still further extended by King Magnus Ladulas (1275-1290). Both these rulers, by the institution of separate and almost independent duchies, attempted to introduce into Sweden a feudal system similar to that already established elsewhere in Europe; but the danger of thus weakening the realm by partition was averted, though not without violent and tragic complications. Finally, in 1319, the severed portions of Sweden were once more reunited. Mean- Separatioo while the political development of the state was of the steadily proceeding. The formation of separate

Estates. orders, or estates, was promoted by Magnus Ladulas, who extended the privileges of the clergy and founded an here- ditary nobility (Ordinance of AlsnS, 1280). In connexion with this institution we now hear of a heavily armed cavalry as the kernel of the national army. The knights too now Burghers, became distinguishable from the higher nobility. To this period belongs the rise of a prominent burgess class, as the towns now began to acquire charters. At the end of the 13th century, and the beginning of the 14th too, provincial codes of laws appear and the king and his council execute legislative functions.

The first union between Sweden and Norway occurred in 1319, when the three-year-old Magnus, son of the Swedish royal duke First Union Eric and of the Norwegian princess Ingeborg, with who had inherited the throne of Norway from his

Norway. grandfather Haakon V.. was in the same year elected king of Sweden (Convention of Oslo). A long minority weakened the royal influence in both countries, and Magnus lost both his

1 A legendary list oi kings gives to this Charles six predecessors of the same name. Subsequent kings of Sweden have always given this Charles the title of Charles VII.

kingdoms before his death. The Swedes, irritated by his misrule, superseded him by his nephew, Albert of Mecklenburg (1365). In Sweden, Magnus's partialities and necessities led directly to the rise of a powerful landed aristocracy, and, indirectly, to the growth of popular liberties. Forced by the unruliness of the magnates to lean upon the middle classes, the king sum- moned (1359) the first Swedish Riksdag, on which occasion representatives from the towns were invited to appear along with the nobles and clergy. His successor, Albert, was forced to go a step farther and, in 1371, to take the first coronation oath. In 1388, at the request of the Swedes themselves, Albert was driven out by Margaret, regent of Denmark

u„i oa a t and Norway; and, at a convention of the repre- Katmar, sentatives of the three Scandinavian kingdoms held 139r – at Kalmar (1397), Margaret's great-nephew, Eric of Pome- rania, was elected the common king, but the liberties of each of the three realms were expressly reserved and confirmed. The union was to be a personal, not a political union.

*Neither Margaret herself nor her successors observed the stipulation that in each of the three, kingdoms only natives should hold land and high office, and the efforts Flrst of Denrhark (at that time by far the strongest Breach of member of the union) to impose her will on the the Union, weaker kingdoms soon produced a rupture, or, rather, a series of semi-ruptures. The Swedes first broke away from it in 1434 under the popular leader Engelbrecht, and after his murder they elected Karl Knutsson Bonde their king under the title of Charles VIII. (1436). In 1441 Charles VIII had to retire in favour of Christopher of Bavaria, who was already king of Denmark and Norway; but, on the death of Christopher (1448), a state of confusion ensued in the course of which Charles VIII. was twice expelled and twice reinstated. Finally, on his death in 1470, the three kingdoms were reunited under Christian I. of Denmark, the prelates and higher nobility of Sweden being favourable to the union, though the great majority of the Swedish people always detested it as a foreign usurpation. The national party was represented by the three great Riks- forestdndare, or presidents of the realm, of the Sture family (see Store), who, with brief intervals, from 1470 to 1520 successively defended the independence of Sweden against the Danish kings and kept the national spirit alive. But the presidentship was too casual and anomalous an institution to Election of rally the nations round it permanently, and when Oustavus the tyranny of Christian II. (q.v.) became intoler- Vasa > ***«*• able the Swedish people elected Gustavus Eriksson Vasa, who as president had already driven out the Danes (see Denmark: History), king of Sweden at Strengnas (June 6, 1523).*

The extraordinary difficulties of Gustavus (see Gustavus I.) were directly responsible for the eccentric development, both political and religious, of the new kingdom which his genius created. So precarious was the position jg^jggg " of the young king, that he was glad to make allies wherever he could find them. Hence his desire to stand well with the Holy See. Only three months after his accession, he addressed letters to the pope begging him to appoint new bishops " who would defend the rights of the Church without detriment to the Crown." He was especially urgent for the confirmation of his nominee Johannes Magni as primate, in the place of the rebellious archbishop Gustavus Trolle, who as a convicted traitor had been formally deposed by the Riksdag and was actually an outlawed exile. If the pope would confirm the elections of his bishops, Gustavus promised to be

an obedient son of the Church. Scarcely had these letters been despatched when the king received a papal bull ordering the immediate reinstatement of Gustavus Trolle. The action of the Curia on this occasion was due to its conviction of the imminent triumph of Christian II. and the instability of Gustavus's position. It was a conviction shared by the rest of Europe; but, none the less, it was another of the many blunders of the Curia at this difficult period. Its immediate effect was the loss of the Swedish Church. Gustavus could not accept as primate an open and

determined traitor like Trolle. He publicly protested, in the sharpest language, that unless Johannes Magni were recognized at Rome as archbishop of Upsala, he was determined, Rome ˚f n ˆ s own r ˚y a l authority, henceforward to order

the affairs of the Church in his realm to the glory of God and the satisfaction of all Christian men. But the Holy See was immovable, and Gustavus broke definitely with Rome. He began by protecting and promoting the Swedish reformers Olavus and Laurentius Petri, and Laurentius Andreae. The new teaching was allowed to spread, though at first unostenta- tiously and gradually. A fresh step in the direction of Lutheran- Progress of ism was the translation of the New Testament into theRefor- Swedish, which was published in 1526. Simul- matloa. taneously, a systematic attack was made upon the religious houses, beginning with the sequestration of the monastery of Gripsholm in January 1526. But the affair caused such general indignation that Gustavus felt obliged, in May, to offer some justification of his conduct. A few months later there was an open rupture between the king and his own primate, who ultimately was frightened into exile by a sudden accusation of treason. But the other bishops were also against Gustavus, and, irritated by their conscientious opposition, the king abandoned the no longer tenable position of a mode- rator and came openly forward as an antagonist. In 1526 the Catholic printing-presses were suppressed, and two-thirds of the Church's tithes were appropriated to the payment of the national debt. On the 18th of February 1527 two bishops, the first martyrs of Catholicism in Sweden, were gibbeted at Stockholm after a trial which was a parody of justice. This act of violence, evidently designed to terrorize the Church into submission, was effectual enough, for at the subsequent Riksdag of Vesteras (June, 1527), the bishops durst not even present a protest which they had privately prepared, and the assembly r 6 i tse lf was bullied into an absolute

submission to the

Ordinance royal will. The result was the Vesteras Recess oi vesteras, which transferred all ecclesiastical property to the 1527. Crown. By the subsequent Vesteras Ordinance

the Swedish Church was absolutely severed from Rome. Never- theless, the changes so made were mainly administrative. There was no modification of doctrine, for the general resolution that God's Word should be preached plainly and purely was not contrary to the teaching of the ante-Tridentine Church. Even at the synod of Orebro, summoned in February 1529, "for the better regulation of church ceremonies and discipline according to God's Word," there was no formal protest against Rome; and the old ritual was retained for two years longer, though it was to be explained as symbolical. Henceforth the work of the Reformation continued uninterruptedly. In 1531 Laurentius Petri was elected the first Protestant primate of Sweden. Subse- quently matters were much complicated by the absolutist tendencies of Gustavus. From 1 539 onwards there was a breach between him and his own prelates in consequence of his arbitrary appropriation of the Church's share of the tithes, in direct violation of the Vesteras Recess. Then Gustavus so curtailed the power of the bishops (ordinances of 1539 and 1540) that they had little of the dignity left but the name, and even that he was disposed to abolish, for after 1543 the prelates appointed by him, without any pretence of previous election by the cathedral chapters, were called ordinaries, or superintendents. Finally, at the Riksdag of Vesteras, in 1544. though no definite con- fession of faith was formulated, a final breach was made with the traditions of the old religion.

Thus the Reformation in Sweden was practically the work of one strong man, acting (first from purely political and latterly from purely economical reasons) for the good of the state as he understood it. In this Gustavus acted contrary to the religious instincts of the vast majority of the Swedish nation; for there can be no doubt at all that the Swedes at the beginning of the 16th century were not only still devoted to the old Church, but violently anti-Protestant. This popular Romanism was the greatest of all Gustavus's difficulties, because it tended to alienate the Swedish peasants.

For the last hundred years the peasants had been a leading factor in the political life of the land; and perhaps in no other contemporary European state could so self-reliant The a class of yeomen have been found. Again and Peasants. again they had defended their own and the national liberties against foreign foes. In the national assemblies, too, their voice had always been powerful, and not infrequently predominant. In a word, they were the sound kernel of the still but partially developed Swedish constitution, the

democratic safeguard against the monarchical tendency which was enveloping the rest of Europe. Gustavus's necessities had compelled him to break with the ecclesiastical traditions of Sweden; and they also compelled him, contrary to his masterful disposition, to accept constitutionalism, because without it his footing in his own kingdom would have been insecure. The peasants there- fore were his natural allies, but, from the nature of the case, they tended to become his most formidable rivals. They prided themselves on having " set King Gus in the high seat," but they were quite ready to unseat him if his rule was not to their liking, and there were many things with which they were by no means contented. This anomalous state of things was responsible for the half-dozen peasant risings with which Gustavus had to contend from 1525 to 1543. In all these rebellions the religious difficulty figured largely, though the increasing fiscal burdens were undoubtedly grievous and the peasants had their particu- lar grievances besides. The wholesale seizure and degradation of Church property outraged them, and they formally protested against the introduction of " Luthery." They threatened, more than once, to march upon and destroy Stockholm, because the Reformers had made of it " a spiritual Sodom." They insisted on the restoration of the ancient Catholic customs, and would have made neglect of fasting and other sins of omission penal offences. Though he prevailed in the end, Gustavus was obliged to humour the people throughout. And thus, though he was strong enough to maintain what he had established and finish what he had begun, he was not strong enough to tamper seriously with the national liberties or to crush altogether Catholic aspirations. At the time of his death the Riksdag was already a power in the state, and a Catholic reaction in Sweden was by no means an impossibility, if only the Catholics had been able to find capable leaders.

Gustavus's foreign policy at first aimed at little more than self-preservation. Only with the pecuniary assistance of the wealthy merchants of Lubeck had he been able to Foreign establish himself originally; and Lubeck, in return, Policy of had exploited Sweden, as Spain at a later day austavus – was to exploit her American colonies. When, with the aid of Denmark, Gustavus at last freed himself from this greedy incubus (see Denmark; Gustavus I.; Christian III.) by the truce of the 28th of August 1537, Sweden for the first time in her history became the mistress of her own waters. But even so she was but of subordinate importance in Scandi- navian politics. The hegemony of Denmark was indisputable, and Gustavus regarded that power with an ever-increasing suspicion which augured ill for peace in the future. The chief cause of dispute was the quartering by the Danish king of the three crowns of Sweden on the Dano-Norwegian shield, which was supposed to indicate a claim of sovereignty. Still more offensive was the attitude of Sweden's eastern neighbour Muscovy, with whom the Swedish king was nervously anxious to stand on good terms. Gustavus attributed to

Ivan IV., whose resources he unduly magnified, the design of establishing a universal monarchy round the Baltic.

Nevertheless events were already occurring which ultimately compelled Sweden to depart from her neutrality and lay the foundations of an overseas empire. In the last year of Gustavus's life (1560), the ancient military tsw'Jea order of the Sword, amalgamated, since 1237, with the more powerful order of the Teutonic Knights, had by the seculari- zation of the latter order into the dukedom of Prussia (1525) become suddenly isolated in the midst of hostile Slavonians. It needed but a jolt to bring down the crazy anachronism, and

the jolt came when, in 1558-60, floods of Muscovites poured over the land, threatening the whole province with destruction. In his despair the last master of the order, Gotthard von Kettler, appealed to all his more civilized neighbours to save him, and his dominions were quickly partitioned between Poland, Denmark and Sweden. Sweden's original share of the spoil was Reval, which, driven to extremities, placed itself beneath the protection of the Swedish crown in March 1561. From the moment that Sweden got a firm footing in Esthonia by the acquisition of Reval she was committed to a policy of combat and aggrandisement. To have retreated would have meant the ruin of her Baltic trade, upon which the national prosperity so much depended. Her next-door neighbours, Poland and Russia, were necessarily her competitors; fortunately they were also each other's rivals; obviously her best policy was to counterpoise them. To accomplish this effectually she required to have her hands free, and the composition of her long-outstanding differences with Denmark by the Treaty of Stettin on the 13th of December 1570 (see Denmark: History), which put an end to the Dano-Swedish war of 1 563-1 570, the chief political event of the reign of Eric XIV. (1 560-1 568), the eldest son -and successor of Gustavus Vasa, was therefore a judicious act on the part of the new king of Sweden, John III. (1568-159 2). Equally judicious was the anti-Russian league with Stephen Bathory, king of Poland, concluded in 1578. The war between Russia and Sweden for the possession of Esthonia and Livonia (1571-77) had been uninterruptedly disastrous to the latter, and, in the beginning of 1577, a countless Russian host sat down before Reval, Sweden's last stronghold in those parts. The energetic intervention of Bathory, however, speedily turned the scales in the opposite direction. Six months after his humiliating peace with the Polish monarch, Ivan IV. was glad to conclude a truce with

Sweden also on a uti possidetis basis at Pliusa (Aug. 5, 1582).

The amicable relations between Sweden and Poland promised, at first, to be permanent. Sixteen years before his accession to the throne, John III., then duke of Finland, had Poland. wedded Catherine Jagiellonica, the sister of Sigis- mund II., king of Poland (Oct. 4, 1562). Duke Sigismund, the fruit of this union, was brought up by his mother in the Catholic religion, and, on the 19th of August 1587, he was elected king of Poland. Sixteen days later the Articles of Kalmar, signed by John and Sigismund, regulated the future relations between the two countries when, in process of time, Sigismund should succeed his father as king of Sweden. The Articles of two kingdoms were to be in perpetual alliance, but Kalmar, each of them was to retain its own laws and customs. 1587. Sweden was also to enjoy her religion, subject to

such changes as a general council might make; but neither pope nor council was to claim or exercise the right of releas- ing Sigismund from his obligations to his Swedish subjects. During Sigismund's absence from Sweden that realm was to be ruled by seven Swedes, six elected by the king and one by his uncle Duke Charles of Sudermania, the leader of the Swedish Protestants. No new tax was to be levied in Sweden during the king's absence, but Sweden was never to be administered from Poland. Any necessary alterations in these articles were only to be made with the common consent of the king, Duke Charles, the senate and the gentry of Sweden.

The endeavours of Swedish statesmen to bind the hands of their future king were due to their fear of the rising flood of Sweden and the Catholic reaction in Europe. Under Eric XIV. the Catholic the Reformation in Sweden had proceeded on much Reaction. t ˆ e same i; nes as d ur mg the reign of his father, retaining all the old Catholic customs not considered con- trary to Scripture. Naturally, after 1544, when the Council of Trent had formally declared the Bible and tradition to be equally authoritative sources of all Christian doctrine, the contrast between the old and the new teaching became more obvious; and in many countries a middle party arose which aimed at a compromise by going back to the Church of the Fathers. King John III., the most learned of the Vasas, and

somewhat of a theological expert, was largely influenced by these " middle " views. As soon as he had mounted the throne he took measures to bring the Swedish Church j OBn ///, an(/ back to "the primitive Apostolic Church and the the Swedish Catholic faith"; and, in 1574, persuaded a synod Caurca – assembled at Stockholm to adopt certain articles framed by himself on what we should call a High Church basis. In February 1575 a new Church ordinance, approximating still more closely to the patristic

*Church, was presented to another synod, and accepted thereat, but very unwillingly. In 1576 a new liturgy was issued on the model of the Roman missal, but with consider- able modifications. To a modern High Anglican these innova- tions seem innocent enough, and, despite the opposition of Duke Charles and the ultra-Protestants, they were adopted by the Riksdag of 1577. These measures g*eatly encouraged the Catholic party in Europe, and John III. was ultimately persuaded to send an embassy to Rome to open negotiations for the reunion of the Swedish Church with the Holy See. But though the Jesuit Antonio Possevino was sent to Stockholm to complete John's " conversion," John would only consent to embrace Catholicism under certain conditions which were never kept, and the only result of all these subterraneous negotia- tions was to incense the Protestants still more against the new liturgy, the use of which by every congregation in the realm without exception was, nevertheless, decreed by the Riksdag of 1582. At this period Duke Charles and his Protestant friends were clearly outnumbered by the promoters of the via media. Nevertheless, immediately after King John's death, a synod summoned to Upsala by Duke Charles rejected the new liturgy and drew up an anti-Catholic confession of faith (March 5, 1593). Holy Scripture and the three primitive creeds were declared to be the true foundations of Christian faith, and the Augsburg Confession was adopted. That Sigismund, now the lawful king of Sweden, should regard the summoning of qmi War. the synod of Upsala without his previous knowledge Expulsion of and consent as a direct infringement of his pre- Sig">mund. rogative was only natural. On his arrival in Sweden, how- ever, he tried to gain time by provisionally confirming what had been done; but the aggressiveness of the Protestant faction and the persistent usurpations of Duke Charles (the Riksdag of 1595 proclaimed him regent though the king had previously refused him that office) made a civil war inevitable. The battle of Stangabro (Sept. 25, 1598) decided the struggle in favour of Charles — and Protestantism. Sigismund fled from Sweden, never to return, and on the 19th of March 1600 the Riksdag of Linkoping proclaimed the duke king /voc/ama- under the title of Charles IX. Sigismund and his tion of posterity were declared to have forfeited the Swedish Charles IX., crown which was to pass to the heirs male of Charles. I600 ' Not till the 6th of March 1604, however, after Duke John, son of John III., had formally renounced his hereditary right to the throne, did Charles IX. begin to style himself king. At the Riksdag of the same year, the estates committed themselves irrevocably to Protestantism by excluding P ˆ c !l a ˆ a Catholics from the succession to the throne, and prohibiting them from holding any office or dignity in Sweden. Henceforth, too, every recusant was to be deprived of his estates and banished the realm.*

It was in the reign of Charles IX. that Sweden became not only a predominantly Protestant, but also a predominantly military monarchy.

This momentous change, which Establish- was to give a martial colouring to the whole policy mentofa of Sweden for the next hundred and twenty years, Regular dates from a decree of the Riksdag of Linkoping Arm y- establishing, at the urgent suggestion of Charles, a regular army; each district in the country being henceforward liable to provide and maintain a fixed number of infantry and cavalry for the service of the state. The immediate enemy was war with Poland, now dynastically as well as territorially Poland and opposed to Sweden. The struggle took the shape of a Rms'"- contest for the possession of the northern Baltic provinces. Esthonia was recovered by the Swedes in 1600, but their

War of Kalmar.

determined efforts (i 601-9) to gain a foothold in Livonia were frustrated by the military ability of the grand hetman of Lithuania, Jon Karol Chodkiewicz. In 1608 hostilities were transferred to Russian territory. At the beginning of that year Charles had concluded an alliance with Tsar Basil IV. (q.v.) against their common foe, the Polish king; but when, in 1611, Basil was deposed by his own subjects and the whole tsardom seemed to be on the verge of dissolution, Sweden's policy towards Russia changed its character. Hitherto Charles had aimed at supporting the weaker Slavonic power against the stronger; but now that Muscovy seemed about to disappear from among the nations of Europe, Swedish statesmen naturally sought some compensation for the expenses of the war before Poland had had time to absorb everything. A beginning was made by the siege and capture of Kexholm in Russian Finland (March 2, 161 1); and, on the 16th of July, Great Novgorod was occupied and a convention concluded with the magistrates of that wealthy city whereby Charles IX. 's second son Philip was to be recognized as tsar, unless, in the meantime, relief came to Great Novgorod from Moscow. But now, when everything depended on a concentration of forces, Charles's imprudent assumption of the title of " King of the Lapps of Nordland," which people properly belonged to the Danish Crown, involved him in another war with Denmark, a war known in Scandinavian history as the war of Kalmar because the Swedish fortress of Kalmar was the chief theatre of hostilities. Thus the Swedish forces were diverted from their real objective and transferred to another field where even victory would have been comparatively unprofitable. But it was disaster, not victory, which Charles IX. reaped from this fool- hardy enterprise. Still worse, the war of Kalmar, prudently

Peace of concluded by Charles's son, Gustavus Adolphus, Kaired, in the second year of his reign, by the peace of Knared 1613. (Jan. 20, 16T3) imposed such onerous pecuniary

obligations and such intense suffering upon Sweden as to en- kindle into a fire of hatred, which was to burn fiercely for the next two centuries, the long smouldering antagonism between the two sister nations of Scandinavia which dated back to the bloody days of Christian II.

The Russian difficulty was more easily and more honourably adjusted. When Great Novgorod submitted provisionally to Peace of the suzerainty of Sweden, Swedish statesmen had stoibova, believed, for a moment, in the creation of a Trans- ,617, baltic dominion extending from Lake Ilmen north-

wards to Archangel and eastwards to Vologda. The rallying of the Russian nation round the throne of the new tsar, Michael Romanov, dissipated, once for all, this ambitious dream. By the beginning of 1616, Gustavus had become convinced of the impossibility of partitioning reunited Muscovy, while Muscovy recognized the necessity of buying off the invincible Swedes by some cession of territory. By the Peace of Stoibova (Feb. 27, 1617), the tsar surrendered to the Swedish king the provinces of Kexholm and Ingria, including the fortress of Noteborg (the modern Schliisselburg), the key of Finland. Russia, furthermore, renounced all claims upon Esthonia and Livonia, and paid a war indemnity of 20,000 roubles. In return for these concessions, Gustavus restored Great Novgorod and acknowledged Michael Romanov as tsar of Muscovy.

The same period which saw the extension of the Swedish Empire abroad, saw also the peaceful development of the Swedish Rale of constitution at home. In this, as in every other Qustr.vus matter, Gustavus himself took the initiative. Adolphus. Nominally the Senate still remained the dominant power in the state; but gradually all real authority had been transferred to the crown. The Riksrad speedily lost its ancient character of a grand council representing the semi- Coastttu- feudal landed aristocracy, and became a bureau- tioaai cracy holding the chief offices of state at the good Changes. pi easure { the king. The Riksdag also changed its character at the same time. Whilst in every other European country except England, the ancient popular representation by estates was about to disappear altogether, in Sweden

under Gustavus Adolphus it grew into an integral portion of the constitution. The Riksdag ordinance of 1617 first converted a turbulent and haphazard mob of " riksdagmen," huddling together like a flock of sheep " or drunken boors," into a dignified national assembly, meeting and

deliberat- ing according to rule and order. One of the nobility (first called the Landtmarskalk) , or marshal of the Diet, in the Riksdag ordinance of 1526) was now regularly appointed by the king as the spokesman of the Riddarhus, or House of Nobles, while the primate generally acted as the talman or president of the three lower estates, the clergy, burgesses and peasants, though at a later day each of the three lower estates elected its own talman. At the opening of every session, the king submitted to the estates " royal propositions," or bills, upon which each estate proceeded to deliberate in its own separate chamber. The replies of the estates were delivered to the king at a subse- quent session in congress. Whenever the estates differed amongst themselves, the king chose whatever opinion seemed best to him. The rights of the Riksdag were secured by the Konungaforsakran, or assurance given by every Swedish king on his accession, guaranteeing the collaboration of the estates in the work of legislation, and they were also to be consulted on all questions of foreign policy. The king possessed the initiative; but the estates had the right of objecting to the measures of the government at the close of each session. It is in Gustavus's reign, too, that we first hear of the Hemliga Utskott, or " secret committee " for the transaction of extra- ordinary affairs, which was elected by the estates themselves. The eleven Riksdags held by Gustavus Adolphus were almost exclusively occupied in finding ways and means for supporting the ever-increasing burdens of the Polish and German wars. And to the honour of the Swedish people be it said that, from first to last, they showed a religious and patriotic zeal which shrank from no sacrifice. It was to this national devotion quite as much as to his own qualities that Gustavus owed his success as an empire-builder.

The wars with Denmark and Russia had been almost exclu- sively Scandinavian wars; the Polish war was of world-wide significance. It was, in the first place, a struggle for the Baltic littoral, and the struggle was intensified Po %Zt by the knowledge that the Polish Vasas denied the right of Gustavus to the Swedish throne. In the eyes of the Swedish king, moreover, the Polish War was a war of religion. Gustavus regarded the Scandinavian kingdoms as the two chief pillars on which the Evangelical religion reposed. Their disunion, he argued, would open a door in the north to the Catholic league and so bring about the destruction of Den- mark and Sweden alike. Hence his alliance with Denmark to defend Stralsund in 1628. There is much of unconscious exaggeration in all this. As a matter of fact the Polish republic was no danger whatever to Protestantism. Sigismund's obsti- nate insistence upon his right to the Swedish crown was the one impediment to the conclusion of a war which the Polish Diet heartily detested and very successfully impeded. Apart from the semi-impotent Polish court, no responsible Pole dreamed of aggrandisement in Sweden. In fact, during the subsequent reign of Wladislaus IV.

(1632-1648), the Poles pre- vented that martial monarch from interfering in the Thirty Years' War on the Catholic side. Gustavus, whose lively imagination was easily excited by religious ardour, enormously magnified clerical influence in Poland and frequently scented dangers where only difficulties existed.

For eight years (1621-29) the exhausting and expensive Polish war dragged on. By the beginning of 1626 Livonia was conquered and the theatre of hostilities was transferred to the Prussian provinces of Poland (see Gustavus II. Adolphus; Koniecpolski [Stanislaus]). The fertile and easily defensible delta of the Vistula was now occupied and Gustavus treated it as a permanent conquest, making his great minister Axel Oxen- stjerna its first governor-general. But this was the limit of the Swedish advance. All Gustavus's further efforts were frustrated by the superior strategy of the Polish grandhetman Koniecpolski,

and, in June 1629, the king gladly accepted the lucrative truce of Altmark. By this truce Sweden was, for six years, to retain possession of her Livonian conquests, besides holding Elbing, the Vistula delta, Braunsberg in West, and Pillau and Memel in East Prussia, with the right to levy tolls at Pillau, Memel, Danzig, Labiau and Windau. From these tolls Gustavus derived, in 1629 alone, 500,000 rix-dollars, a sum equivalent to the whole of the extraordinary subsidies granted to him by the Riksdag. Thus Sweden held, for a time, the control of the principal trade routes of the Baltic up to the very confines of the empire; and the increment of revenue resulting from this commanding position was of material assistance to her during the earlier stages of the war in Germany, whither Gustavus transferred his forces in June 1630.

The motives of Gustavus in plunging into the Thirty Years' •War and the details of the struggle as regards Sweden are else- Sweden and where set forth (see Gustavus II.; Oxenstjerna the Thirty [Axel]; Baner [Johan]; Torstensson [Len- Years' War. NART |) Here the only point to be insisted upon is the extreme precariousness of the Swedish position from first to last — a precariousness due entirely to inadequacy of material resources. In 1632 all Germany lay at the feet of Sweden; two years later a single disaster (Nord- lingen) brought her empire to the verge of ruin. For the next seven years the German War as regards Sweden was a struggle for existence. She triumphed in the end, it is true, but it was a triumph due

entirely to a lucky accident — the possession, during the crisis, of the greatest statesman and the greatest captain of the age. It was the exploits of Oxenstjerna and Baner which alone enabled Sweden to obtain even what she did obtain at the great Westphalian peace congress in 1648. Her original demands were Silesia (she held most of the fortresses there), Pomerania (which had been in her possession for nearly twenty years), and a war indemnity of 20,000,000 rix- dollars. What she actually got was (1) Upper Pomerania, with the islands of Riigen and Usedom, and a strip of Lower Pomerania on the right side of the Oder, including the towns of Stettin, Garz, Damm and Gollnow, and the isle of Wollin, with the right of succession to the rest of Lower Pomerania in the case of the extinction of the Brandenburg Hohenzollerns; (2) the town of Wismar with the districts of Poel and Neukloster; (3) the secularized bishoprics of Bremen and Verden; and (4) 5,000,000 rix-dollars. These German possessions were to be held as fiefs of the empire; and in respect thereof Sweden was to have a vote in the imperial Diet and to " direct " the Lower Saxon Circle alternately with Brandenburg. France and Sweden, moreover, became joint guarantors of the treaty with the emperor, and were entrusted with the carrying out of its pro- visions, which was practically effected by the executive congress of Nuremberg in 1650.

Sweden's reward for the exertions and sacrifices of eighteen years was meagre, almost paltry. Her newly won possessions later- were both sma U an d scattered, though, on the other

national hand, she had secured the practical control of the Position of three principal rivers of north Germany — the Oder, Sweden. the E j be and tne Weser— and reaped the full advantage of the tolls levied on those great commercial arteries. The jealousy of France and the impatience of Queen Christina were the chief causes of the inadequacy of her final recompense. Yet, though the immediate gain was small, she had not dissipated her blood and treasure .altogether in vain. Her vigorous intervention had saved the cause of religious liberty in Europe; and this remains, for all time, her greatest political achievement. Henceforth till her collapse, seventy years later, she was the recognized leader of Continental Protestantism. A more questionable benefit was her rapid elevation to the rank of an imperial power, an elevation which imposed the duty of remaining a military monarchy, armed cap-A-pie for every possible emergency. Every one recognizes now that the poverty and sparse population of Sweden unfitted her for such a tremendous destiny. But in the middle of the 17th century the incompatibility between her powers and her pretensions was

not so obvious. All her neighbours were either decadent or exhausted states; and France, the most powerful of the Western powers, was her firm ally.

For the moment, however, Sweden held the field. Everything depended upon the policy of the next few years. Very careful statesmanship might mean permanent dominion Queen on the Baltic shore, but there was not much margin Christina, for blundering. Unfortunately the extravagance ^^ids^ of Gustavus Adolphus's two immediate successors, Christina 1 and Charles X., shook the flimsy fabric of his empire to its very base. Christina's extravagance was financial. At the time of her abdication the state was on the verge of bank- ruptcy, and the financial difficulty had superinduced a serious political agitation. The mass of the Swedish people was penetrated by a justifiable fear that the external, artificial greatness of their country might, in the long run, be purchased with the loss of their civil and political liberties. In a word, the natural equili- brium of Swedish society was seriously threatened by the pre- ponderance of the nobility; and the people at large looked to the new king to redress the balance. A better arbiter between the various estates than Charles X.

Charles X.,

1654-1666.

it would have been difficult to find. It is true that, primarily a soldier, his whole ambition was directed towards military glory; but he was also an unusually sharp-sighted politician. He affected to believe that only by force of arms could Sweden retain the dominion which by force of arms she had won; but he also grasped the fact that there must be no disunion at home if she were to continue powerful abroad. The most pressing question of the day, the so-called Reduktion, or restitution of the alienated crown lands, was adjusted provisionally at the Riksdag of 1655. The king proposed that the actual noble holders of crown property should either pay an annual sum of 200,000 rix-dollars, to be allowed for out of any further crown lands subsequently falling in to them, or should surrender a fourth of the expectant property itself to the estimated amount of 600,000 rix-dollars. The nobility attempted to escape taxation as cheaply as possible by stipulating that the 6th of November 1632, the day of Gustavus Adolphus's death, should be the extreme limit of any restrospec- tive action on the part of the crown in regard to alienated crown property, and that the present subsidy should be regarded as " a perpetual ordinance " unalterably to be observed by all future sovereigns — in other words, that there should be no further restitution of alienated crown property. Against this interpretation of the subsidy bill the already over-taxed lower estates protested so energetically that the Diet had to be sus- pended. Then the king intervened personally; not to quell the commons, as the senate insisted, but to compel the nobility to give way. He proposed that the whole matter should be thoroughly investigated by a special committee before the meeting of the next Riksdag, and that in the meantime a con- tribution should be levied on

all classes proportionately. This equitable arrangement was accepted by the estates forthwith.

Charles X. had done his best to obviate the effects of the financial extravagance of Christina. It may well be doubted, however, whether his own extravagant desire for military glory was not equally injurious to his WarSt country. In three days he had succeeded in per- suading the Swedish estates of the lucrative expediency of his unnecessary and immoral attack on Poland (see Poland: History) ; but when he quitted Stockholm for Warsaw, on the 10th of July 1654, he little imagined that he had embaiked on an adventure which was to contribute far more to his glory than to the advantage of his country. How the Polish War expanded into a general European war; how Charles's miraculous audacity again and again ravished favours from Fortune and Nature (e.g. the passage of the Belts) when both those great powers combined against him; how, finally, he emerged from all his difficulties triumphant, indeed, but only to die of sheer exhaustion

1 Christina's reign dates, properly, from 1644 when she attained her majority. From 1632 to 1644 Axel Oxenstjerna was virtually the n>ler of Sweden.

in his thirty-eighth year — all this has elsewhere been described (see Charles X., king of Sweden; Czarniecki [Stephen] ; Frederick III., king of Denmark). Suffice it to say that, immediately after his death, the regency appointed to govern Charles XI Sweden during the minority of his only son and

successor, Charles XI., a child four years old, hastened to come to terms with Sweden's numerous enemies, which now included Russia, Poland, Brandenburg and Denmark.

The Peace of Oliva (May 3, 1660), made under Oliva 1660. F rencn mediation, put an end to the long feud with

Poland and, at the same time, ended the quarrel between Sweden on the one side, and the emperor and the elector of Brandenburg on the other. By this peace, Sweden's possession of Livonia, and the elector of Brandenburg's sovereignty over east Prussia, were alike confirmed; and the king of Poland renounced all claim to the Swedish crown. As regards

Denmark, the Peace of Oliva signified the desertion of her three principal allies, Poland, Brandenburg and the emperor, and thus compelled her to reopen negotiations with Sweden direct. The differences between the two states were finally adjusted by the peace of Copenhagen (May 27, 1660), Denmark ceding the three Scanian provinces to Sweden but receiving back the Norwegian province of Trondhjem and the isle of Bornholm which she had surrendered by the peace of Roskilde two years previously. Denmark was also compelled to recog- nize, practically, the independence of the dukes of Holstein- Gottorp. The Russian War was terminated by the Peace of Kardis (July 2, 1661), confirmatory of the Peace of Stolbova, whereby the tsar surrendered to Sweden all his Baltic provinces — Ingria, Esthonia and Kexholm.

Thus Sweden emerged from the war not only a military power of the first magnitude, but also one of the largest states of Sweden as Europe, possessing about twice as much territory a Great as modern Sweden. Her area embraced 16,800 Power. geographical square miles, a mass of land 7000 sq. m. larger than the modern German Empire. Yet the Swedish Empire was rather a geographical expression than a state with natural and national boundaries. Modern Sweden is bounded by the Baltic; during the 17th century the Baltic was merely the bond between her various widely dispersed dominions. All the islands in the Baltic, except the Danish group, belonged to Sweden. The estuaries of all the great German rivers (for the Niemen and Vistula are properly Polish rivers) debouched in Swedish territory, within which also lay two-thirds of Lake Ladoga and one-half of Lake Peipus. Stock- holm, the capital, lay in the very centre of the empire, whose second greatest city was Riga, on the other side of the sea. Yet this vast empire contained but half the population of modern Sweden — being only 2,500,000, or about 140 souls to the square mile. Further, Sweden's new boundaries were of the most insecure description, inasmuch as they were anti-ethnographical, parting asunder races which naturally went together, and behind which stood powerful neighbours of the same stock ready, at the first opportunity, to reunite them.

Moreover, the commanding political influence which Sweden had now won was considerably neutralized by her loss of moral prestige. On Charles X.'s accession in 1655, Sweden's neigh- bours, though suspicious and uneasy, were at least not adver- saries, and might have been converted into allies of the new great power who, if she had mulcted them of territory, had, any- how, compensated them for the loss with the by no means con- temptible douceur of religious liberty. At Charles X.'s death, five years later, we find Sweden, herself bled to exhaustion point, surrounded by a broad belt of desolated territory and regarded with ineradicable hatred by every adjacent state. To sink in five years from the position' of the champion of Protestantism to that of the common enemy of every Protestant power was

a degradation not to be compensated by any amount of military glory. Charles's subsequent endeavour, in stress of circum- stances, to gain a friend by dividing his Polish conquests with the aspiring elector of Brandenburg was a reversal of his original policy and only resulted in the establishment on the southern

confines of Sweden of a new rival almost as dangerous as Denmark, her ancient rival in the west.

In 1660, after five years of incessant warfare, Sweden had at length obtained peace and with it the opportunity of organizing and developing her newly won empire. Unfor- tunately, the regency which was to govern her during charlesXI. the next fifteen years was unequal to the difficulties of a situation which might have taxed the resources of the wisest statesmen. Unity and vigour were scarcely to be ex- pected from a many-headed administration composed of men of mediocre talent whose contrary opinions speedily gave rise to contending factions. There was the high-aristocratic party with a leaning towards martial adventure headed by Magnus de la Gardie (q.v.), and the party of peace and economy whose ablest representative was the liberal and energetic Johan Gyllenstjerna (q.v.). After a severe struggle, de la Gardie'S party prevailed; and its triumph was marked by that general decline of personal and political morality which has given to this regency its unenviable notoriety. Sloth and carelessness speedily invaded every branch of the administration, destroying all discipline and leading to a general neglect of business. Another characteristic of the de la Gardie government was its gross corruption, which made Sweden the obsequious hireling of that foreign power which had the longest purse. This shame- ful "subsidy policy" dates from the Treaty of Fontainebleau, 1661, by a secret paragraph of which Sweden, in exchange for a considerable sum of money, undertook to support the French candidate on the first vacancy of the Polish throne. The com- plications ensuing from Louis XIV.'s designs on the Spanish Netherlands led to a bid for the Swedish alliance, both from the French king and his adversaries. After much hesitation on the part of the Swedish government, the anti-French faction pre- vailed; and in April 1668 Sweden acceded to the Triple Alliance, which finally checkmated the French king by bringing about the Peace of Aix-la-Chapelle. For the next four years Sweden remained true to the principles of the Triple Alliance; but, in 1672, Louis XIV. succeeded in isolating the Dutch republic and regaining his ancient ally, Sweden. By the Treaty of Stockholm (April 14, 1672), Sweden became, for the next ten years, a "mercenarius Galliae," pledging w uh" , p r > aace herself, in return for 400,000 crowns per annum in peace and 600,000 in war-time, to attack, with 16,000 men, any German princes who might be disposed to assist Holland. In

1674 Louis XIV. peremptorily called upon Sweden to fulfil her obligations by invading Brandenburg. In the course of May 1675 a Swedish army advanced into the Mark, but on the 1 8th of June was defeated at Fchrbellin, and hastily retreated to Demmin. The Fehrbellin affair was a mere skirmish, the actual casualties amounting to less than 600 men, but it rudely divested Sweden of her nimbus of invincibility and was the signal for a general attack upon her, known as the Scanian War.

In the course of the next three years her- empire w ˆ r caa ”” seemed to be crumbling away everywhere. In

1675 Pomerania and the bishopric of Bremen were overrun by the Brandenburgers, Austrians and Danes. In December 1677 the elector of Brandenburg captured Stettin. Stralsund fell on the 15th of October 1678. Greifswald, Sweden's last possession on the Continent, was lost on the 5th of November. A defensive alliance with Sobieski (August 4, 1677) was rendered inoperative by the annihilation of Sweden's sea-power (battle of Oland, June 17, 1676; battle of Fehmarn, June 1677) and the difficulties of the Polish king.

Two accidents at this crisis alone saved Sweden from ruin— the splendid courage of the young king who, resolutely and success- fully, kept the Danish invaders at bay (see Charles XL, king of Sweden), and the diplomatic activity of Louis XIV. In March 1677 a peace congress began its sessions at Nijmwegen; and in the beginning of April 1678 the French king dictated the terms of a general pacification. One of his chief conditions was the complete restitution of Sweden. A strong Sweden was necessary to the accomplishment of his plans. He suggested, however, that Sweden should rid herself Q f her enemies by

making some ” small cession ” to them. This Charles XI. refused to do, whereupon Louis took it upon himself to conclude peace on Sweden's account without consulting the wishes of Treaty of the Swedish king. By this Treaty of Nijmwegen Nijmwegen, (Feb. 7) and of St Germain (June 29, 1679) 1679. Sweden virtually received full restitution of her

German territory. On the 2nd of September by the Peace of Fontainebleau (confirmed by the subsequent Peace of Lund, Oct. 4, 1679), Denmark was also forced to retrocede her conquests. It is certain that Sweden herself could never have extorted such favourable terms, yet ” the insufferable

tutelage ” of France on this occasion inspired Charles XL with a per- sonal dislike of the mighty ruler of France and contributed to reverse the traditional diplomacy of Sweden by giving it a strong anti-French bias (see Charles XL; Oxenstjerna, Benedict).

The remainder of the reign of Charles XL is remarkable for a revolution which converted the government of Sweden into Ch rie XI a sern i- a bsolute monarchy. The king emerged from and the ‘ the war convinced that if Sweden were to retain her Swedish position as a great power she must radically reform CoostHu- j, er wno i e economical system, and, above all, cir- cumscribe the predominant and mischievous in- fluence of an aristocracy which thought far more of its privileges than of its public duties. He felt that he could now draw upon the confidence and liberality of the lower orders to an unlimited extent, and he proceeded to do so. The Riksdag which assembled in Stockholm in October 1680 begins a new era of Swedish history. On the motion of the Estate of Peasants, which had a long memory for aristocratic abuses, the question of the recovery of the alienated crown lands was brought before the Riksdag, and, despite the stubborn opposition of the magnates, a resolution of the Diet directed that all countships, baronies, domains, manors and other estates producing an annual rent of more than £70 per annum should revert to the Crown. The same Riksdag decided that the king was not bound by any particular constitution, but only by law and the statutes. Nay, they added that he was not even obliged to consult the council of state, but was to be regarded as a sovereign lord, responsible to God alone for his actions, and requiring no intermediary between himself and his people. The council thereupon acquiesced in its own humiliation by meekly accepting a royal brief changing its official title from Riksrdd (council of state) to Kungligar&d (royal council) — a visible sign that the senators were no longer the king’s colleagues but his servants.

Thus Sweden, as well as Denmark, had become an absolute monarchy, but with this important difference, that the right of the Swedish people, in parliament assembled, to be consulted on all important matters was recognized and acted upon. The Riksdag, completely overshadowed by the throne, was during the reign of Charles XL to do little more than register the royal decrees; but nevertheless it continued to exist as an essential part of the machinery of government. Moreover, this transfer of authority was a voluntary act. The people, knowing the king to be their best friend, trusted him implicity and co- operated with him cheerfully. The Riksdag of 1682 proposed a fresh Reduktion, and declared that the whole question of how far the king was empowered by the law of the land to bestow fiefs, or, in case of urgent national distress, take them back again, was exclusively his majesty’s affair. In other words, it made the king the disposer of his subjects’ temporal property. Presently this new principle of autocracy was

extended to the king's legislative authority also, for, on the 9th of December 1682, all four estates, by virtue of a common declaration, not only confirmed him in the possession of the legislative powers enjoyed by his predecessors, but even conceded to him the right of interpreting and amending the common law.

The recovery of the alienated crown lands occupied Charles XL for the rest of his life. It was conducted by a commission which was ultimately converted into a permanent department of state. It acted on the principle that the titles of all private

landed estate might be called in question, inasmuch as at some time or other it must have belonged to the Crown; and the burden of proof of ownership was held not to lie with the Crown which made the claim, but with the actual owner of the property. The amount of revenue accruing to the Crown from the whole Reduktion it is impossible to estimate even approximately; but by these means, combined with the most careful manage- ment and the most rigid economy, Charles XL contrived to reduce the national debt from £2,567,000 to £700,000. . These operations represent only a part of Charles XL's gigantic activity. Here we have only space sufficient to glance at his reorganization of the national armaments. Reorganiza- Charles XL re-established on a broader basis the tloa of indelningsverk introduced by Charles IX. — a system Armaments. of military tenure whereby the national forces were bound to the soil. Thus there was the rusth&ll tenure, under which the tenants, instead of paying rent, were obliged to equip and maintain a cavalry soldier and horse, while the knekthallarer supplied duly equipped foot soldiers. These indelning soldiers were provided with holdings on which they lived in times of peace. Formerly, ordinary conscription had existed alongside this indelning, or distribution system; but it had proved inadequate as well as highly unpopular; and, in 1682, Charles XL came to an agreement with the peasantry whereby an extended indelning system was to be susbstituted for general conscription. The navy, of even more importance to Sweden if she were to maintain the dominion of the Baltic, was entirely remodelled; and, the recent war having demon- strated the unsuitability of Stockholm as a naval station, the construction of a new arsenal on a gigantic scale was simul- taneously begun at Karlskrona. After a seventeen years' struggle against all manner of financial difficulties, the twofold enter- prise was completed. At the death of Charles XL Sweden could boast of a fleet of forty^three three-deckers (manned by 11,000 men and armed with 2648 guns) and one of the finest arsenals in the world.

Charles XL had carefully provided against the contingency of his successor's minority; and the five regents appointed by him, if not great statesmen, were at least practical politicans who had not been trained in

his austere 169T^1718. ” school in vain. At home the Reduktion was cautiously pursued, while abroad the successful conclusion of the great peace congress at Ryswick was justly regarded as a signal triumph of Sweden’s pacific diplomacy (see Oxenstjerna Family). The young king was full of promise, and had he been permitted gradually to gain experience and develop his naturally great talents beneath the guidance of his guardians, as his father had intended, all might have been well for Sweden, Unfortunately, the sudden, noiseless revolution of the 6th of November 1697, which made Charles XII. absolute master of his country’s fate in his fifteenth year (see Charles XII.) , and the league of Denmark, Saxony and Russia, formed two years later to partition Sweden (see Patkul, Johann Reinhold; ‘ Peter the Great; Charles XII.) , precipitated Sweden into a sea of troubles in which she was finally submerged.

From the very beginning of the Great Northern War Sweden suffered from the inability of Charles XII. to view the situation from anything but a purely personal point of view. areat His determination to avenge himself on enemies Northern overpowered every other consideration. Again and War ‘ again during these eighteen years of warfare it was in his power to dictate an advantageous peace. After the dissipation of the first coalition against him by the peace of Travendal (Aug. 18, 1700) and the victory of Narva (Nov. 20, 1700), the Swedish chancellor, Benedict Oxenstjerna, rightly regarded the universal bidding for the favour of Sweden by France and the maritime powers, then on the eve of the War of the Spanish Succession, as a golden opportunity of ” ending this present lean war and making his majesty the arbiter of Europe.” But Charles, intent on dethroning Augustus of Poland, held haughtily aloof. Subsequently in 1701 he rejected a personal appeal from William III. to conclude peace on his

own terms. Five years later (Sept. 24, 1706) he did, indeed, conclude the Polish War by the peace of Altranstadt, but as this treaty brought no advantage to Sweden, not even com- pensation for the expenses of six years of warfare, it was politically condemnable. Moreover, two of Sweden’s Baltic provinces, Esthonia and Ingria, had been seized by the tsar, and a third, Livonia, had been well-nigh ruined. Yet even now Charles, by a stroke of the pen, could have recovered nearly everything he had lost. In 1707 Peter was ready to retrocede everything except St Petersburg and the line of the Neva, and again Charles preferred risking the whole to saving the greater part of his Baltic possessions (for details see Charles XII.; Peter

the Great). When at last, after the catastrophe of Poltava (June 1709) and the flight into Turkey, he condescended to use diplomatic methods, it was solely to prolong, not to terminate, the war. Even now he could have made honourable terms with his numerous enemies. The resources of Sweden were still very far from being exhausted, and, during 17 10 and 1711, the gallant Magnus Stenbock (g.v.) upheld her military supremacy in the north. But all the efforts of the Swedish government were wrecked on the determination of Charles XII. to surrender nothing. Thus he rejected advantageous offers of mediation and alliance made to him, during 171 2, by the mari- time powers and by Prussia; and, in 1714, he scouted the friendly overtures of Louis XIV. and the emperor, so that when peace was finally concluded between France and the Empire, at the congress of Baden, Swedish affairs were, by common consent, left out of consideration. When, on the 14th of September 17 14, he suddenly returned to his dominions, Stralsund and Wismar were all that remained to him of his continental possessions; while by the end of 1715 Sweden, now fast approaching the last stage of exhaustion, was at open war with England, Hanover, Russia, Prussia, Saxony and Denmark, who had formed a coalition to partition her continental territory between them. Nevertheless, at this the eleventh hour of her opportunities, Sweden might still have saved something from the wreck of her empire if Charles had behaved like a reasonable being (see Charles XII. ; Peter the Great; Gortz, Georg Heinrich von; Osterman, Andrei); but he would only consent to play off Russia against England, and his sudden death before Fredrikshald (Dec. 11, 17 18) left Sweden practically at the end of her resources and at the mercy of her enemies. At the beginning of 1719 pacific overtures were made to England,

Hanover, Prussia and Denmark. By the treaties of Stockholm Stockholm (Feb. 20, 17 19, and Feb. 1, 1720) Hanover and obtained the bishoprics of Bremen and Verden for

FredeHks- herself and Stettin for her confederate Prussia. ami 1720 ˆ t ‘ le treatv °f Frederiksborg or Copenhagen

(July 3, 1720) peace was also signed between Den- mark and Sweden, Denmark retroceding Rugen, Further Pomerania as far as the Peene, and Wismar to Sweden, in exchange for an indemnity of 600,000 rix-dollars, while Sweden relinquished her exemption from the Sound tolls and her protectorate over Holstein-Gottorp. The prospect of coercing Russia by means of the British fleet had alone induced Sweden to consent to such sacrifices; but when the last demands of England and her allies had been complied with, Sweden Peace of was ˆˆ to come to terms as best she could with Nystad, the tsar. Negotiations were reopened with Russia at 1721. Loss Nystad, in May 1720, but peace was not concluded

nlvlnˆs'" tiU the 3 ° th of Au S ust X 7 2I > and then onl y under the direst pressure. By the peace of Nystad Sweden ceded to Russia Ingria and Esthonia, Livonia, the Finnish province of Kexholm and the fortress of Viborg. Finland west of Viborg and north of Kexholm was restored to Sweden. She also received an indemnity of two millions of thalers and a solemn undertaking of non-interference in her domestic affairs.

It was not the least of Sweden's misfortunes after the Great Northern War that the new constitution, which was to compensate her for all her past sacrifices, should contain within it the elements of many of her future calamities.

*Early in 1720 Charles XII. 's sister, Ulrica Leonora, who had been elected queen of Sweden immediately after his death, was permitted to abdicate in favour of her hus- p n deric*i. band the prince of Hesse, who was elected king 1720-17SU under the title of Frederick I.; and Sweden was, The Limited at the same time, converted into the most limited Monarch y- of monarchies. All power was vested in the people as represented by the Riksdag, consisting, as before, of four distinct estates, nobles, priests, burgesses and peasants, sitting and deliberating apart. The conflicting interests and mutual jealousies of these four independent assemblies made the work of legislation exceptionally difficult. No measure could now become law till it had obtained the assent of three at least of the four estates; but this provision, which seems to have been designed to protect the lower orders against the nobility, pro- duced evils far greater than those which it professed to cure. Thus, measures might be passed by a bare majority in three estates, when a real and substantial majority of all four estates in congress might be actually against it. Or, again, a dominant action in any three of the estates might enact laws highly detri- mental to the interests of the remaining estate — a danger the more to be apprehended as in no other country in Europe were class distinctions so sharply defined as in Sweden.*

Each estate was ruled by its talman, or speaker, who was now elected at the beginning of each Diet, but the archbishop was, ex officio, the talman of the clergy. The landl- constltu- marskalk, or speaker of the House of Nobles, presided tloa of the when the estates met in congress, and also, by Estates. virtue of his office, in the hemliga utskott, or secret committee. This famous body, which consisted of 50 nobles, 25 priests, 25 burgesses, and, very exceptionally, 25 peasants, possessed during the session of the Riksdag not only the supreme executive but also the surpeme judicial and legislative functions. It pre- pared all bills for the Riksdag, created and deposed all ministries, controlled the foreign policy of the nation, and claimed and often exercised the right of superseding the ordinary courts of justice. During the parliamentary recess, however, the executive remained in the

hands of the rad, or senate, which was responsible to the Riksdag alone.

It will be obvious that there was no room in this republican constitution for a constitutional monarch in the modern sense of the word. The crowned puppet who possessed a casting vote in the rad, of which he was the nominal president, and who was allowed to create peers once in his life (at his coronation), was rather a state decoration than a sovereignty.

*At first this cumbrous and complicated instrument of govern- ment worked tolerably well under the firm but cautious control of the chancellor, Count Arvid Beernhard Horn political (q.v.). In his anxiety to avoid embroiling his country Parties. abroad, Horn reversed the traditional policy of Hats *”>d Sweden by keeping France at a distance and draw- Ca P s – ing near to Great Britain, for whose liberal institutions he professed the highest admiration. Thus a twenty years’ war was succeeded by a twenty years’ peace, during which the nation recovered so rapidly from its wounds that it began to forget them. A new race of politicians was springing up. Since 17 19, when the influence of the few great territorial families had been merged in a multitude of needy gentle- men, the first estate had become the nursery and afterwards the stronghold of an opposition at once noble and democratic which found its natural leaders in such men as Count Carl Gyllenborg and Count Carl Gustaf Tessin (q.v.). These men and their followers were never weary of ridiculing the timid caution of the aged statesman who sacrificed everything to perpetuate an inglorious peace and derisively nicknamed his adherents ” Night-caps ” (a term subsequently softened into ” Caps “), themselves adopting the sobriquet ” Hats,” from the three- cornered hat worn by officers and gentlemen, which was con- sidered happily to hit off the manly self-assertion of the opposi- tion. These epithets instantly caught the public fancy and had already become party badges when the estates met in 1738. This Riksdag, was to mark another turning-point in Swedish*

history. The Hats carried everything before them; and the aged Horn was finally compelled to retire from a scene where, for three and thirty years, he had played a leading part.

The policy of the Hats was a return to the traditional alliance between France and Sweden. When Sweden descended to her natural position as a second-rate power the Alliance French – alliance became too costly a

luxury. Horn had clearly perceived this; and his cautious neutrality was therefore the soundest statesmanship. But the politicians who had ousted Horn thought differently. To them prosperity without glory was a worthless possession. They aimed at restoring Sweden to her former position as a great power. France, naturally, hailed with satisfaction the rise of a faction which was content to be her armour- bearer in the north; and the golden streams which flowed from Versailles to Stockholm during the next two generations were the political life-blood of the Hat party.

The first blunder of the Hats was the hasty and ill-advised war with Russia. The European complications consequent War with upon the almost simultaneous deaths of the emperor Russia, Charles VI. and Anne, empress of Russia, seemed 174,1 to favour their adventurous schemes; and, despite

the frantic protests of the Caps, a project for the invasion of Russian Finland was rushed through the premature Riksdag of 1740. On the 20th of July 1741 war was formally declared against Russia; a month later the Diet was dissolved and the Hat landlmarskalk set off to Finland to take command of the army. The first blow was not struck till six months after the declaration of war; and it was struck by the enemy, who routed the Swedes at Villmanstrand and captured that frontier fortress. Nothing else was done on either side for six months more; and then the Swedish generals made a " tacit truce " with the Russians through the mediation of the French ambassador at St Petersburg. By the time that the " tacit truce " had come to an end the Swedish forces were so demoralized that the mere rumour of a hostile attack made them retire panic-stricken to Helsingfors; and before the end of the year all Finland was in the hands of the Russians. The fleet, disabled by an epidemic, was, throughout the war, little more than a floating hospital.

To face the Riksdag with such a war as this upon their consciences was a trial from which the Hats naturally shrank; but, to do them justice, they showed themselves better parlia- mentary than military strategists. A motion for an inquiry into the conduct of the war was skilfully evaded by obtaining precedence for the succession question (Queen Ulrica Leonora had lately died childless and King Frederick was old) ; and nego- tiations were thus opened with the new Russian empress, Elizabeth, who agreed to restore the greater part of Finland if her cousin, Adolphus Frederick of Holstein, were elected successor to the Swedish crown. The Hats eagerly caught at the opportunity of recovering the grand duchy and their own prestige along with it. By the peace of Abo (May Abo 1743. 7> J 743) the terms of the empress were accepted; and only that small part of Finland which lay beyond the Kymmene was retained by Russia.*

In March 1751 old King Frederick died. His slender pre- rogatives had

gradually dwindled down to vanishing point. Adolphus Adolphus Frederick (q.v.) would have given even less Frederick trouble than his predecessor but for the ambitious //., 1751- promptings of his masterful consort Louisa Ulrica, 1771. Frederick the Great's sister, and the tyranny of the

estates, who seemed bent upon driving the meekest of princes into rebellion. An attempted monarchical revolution, planned by the queen and a few devoted young nobles in 1756, was easily and remorselessly crushed; and, though the unhappy king did not, as he anticipated, share the fate of Charles Stuart, he was humiliated as never monarch was humiliated before.

The same years which beheld this great domestic triumph of the Hats saw also the utter collapse of their foreign "system." At the instigation of France they plunged recklessly into the Seven Years' War; and the result was ruinous. The French sub- sidies, which might have sufficed for a six weeks' demonstration

(it was generally assumed that the king of Prussia would give little trouble to a European coalition), proved quite in- adequate; and, after five unsuccessful campaigns, the unhappy Hats were glad to make peace and ighomini- years' War% ously withdraw from a little war which had cost the country 40,000 men and £2,500,000. When the Riksdag met in 1760, the indignation against the Hat leaders was so violent that an impeachment seemed inevitable; but once more the superiority of their parliamentary tactics prevailed, and when, after a session of twenty months, the Riksdag was brought to a close by the mutual consent of both the exhausted factions, the Hat government was bolstered up for another four years. But the day of reckoning could not be postponed for ever; and when the estates met in 1765 it brought the Caps into power at last. Their leader, Ture Rudbeck, was elected marshal of the Diet over Frederick Axel von Fersen (q.v.), the Hat candi- date, by a large majority; and, out of the hundred seats in the secret committee, the Hats succeeded in getting only ten.

The Caps struck at once at the weak point of their opponents by ordering a budget report to be made; and it was speedily found that the whole financial system of the Hats had been based upon reckless improvidence and c ˆ p e Si wilful misrepresentation, and that the only fruit of their long rule was an enormous addition to the national debt and a depreciation of the note circulation to one- third of its face value. This revelation led to an all-round retrenchment, carried into effect with a drastic thoroughness which has earned for this parliament the name of the " Reduk- tion Riksdag." The Caps succeeded in transferring £250,000 from the pockets of the rich to the empty exchequer, reducing the national debt by £575,179, and establishing some sort of equilibrium between revenue and expenditure. They also introduced a few useful reforms, the most remarkable of which was the liberty of the press. But their most important political act was to throw their lot definitely in with Russia, so as to counterpoise the influence of France. Sweden was Alliance. not then as

now quite outside the European Concert. Alghough no longer a great power, she still had many of the responsibilities of a great power; and if the Swedish alliance had considerably depreciated in value, it was still a marketable commodity. Sweden's peculiar geographical position made her virtually invulnerable for six months out of the twelve, her Pomeranian possessions afforded her an easy ingress into the very heart of the moribund empire, while her Finnish frontier was not many leagues from the Russian capital.

A watchful neutrality, not venturing much beyond defensive alliances and commercial treaties with the maritime powers, was therefore Sweden's safest policy, and this the older Caps had always followed out. But when the Hats became the armour- bearers of France in the north, a protector strong enough to counteract French influence became the cardinal exigency of their opponents, the younger Caps, who now flung themselves into the arms of Russia, overlooking the fact that even a pacific union with Russia was more to be feared than a martial alliance with France. For France was too distant to be dangerous. She sought an ally in Sweden and it was her endeavour to make that ally as strong as possible. But it was as a future prey, not as a possible ally, that Russia regarded her ancient rival in the north. In the treaty which partitioned Poland there was a secret clause which engaged the contracting powers to uphold the existing Swedish constitution as the swiftest means of sub- verting Swedish independence; and an alliance with the credu- lous Caps, " the Patriots " as they were called at St Petersburg, guaranteeing their constitution, was the corollary to this secret understanding. Thus, while the French alliance of the warlike Hats had destroyed the prestige of Sweden, the Russian alliance of the peaceful Caps threatened to destroy her very existence.

Fortunately, the domination of the Caps was not for long. The general distress occasioned by their drastic reforms had found expression in swarms of pamphlets which bit and stung the Cap government, under the protection of the new press laws. The senate retaliated by an order in council (which the.

king refused to sign) declaring that all complaints against the measures of the last Riksdag should be punished with fine and imprisonment. The king, at the suggestion of the crown prince (see Gustavus III.), thereupon urged the senate to summon an extraordinary Riksdag as the speediest method of

relieving the national distress, and, on their refusing to comply with his wishes, abdicated. From the 15th of December to the 21st of December 1768 Sweden was without a regular government. Then the Cap senate gave way and the estates were convoked for the 19th of April 1769.

On the eve of the contest there was a general assembly of the Hats at the French embassy, where the Comte de Modene furnished them with 6,000,000 livres, but not till they had signed in his presence an undertaking to reform the constitution in a monarchical sense. Still more energetic on the other side, the Russian minister, Ivan Osterman, became the treasurer as well as the counsellor of the Caps, and scattered the largesse of the Russian empress with a lavish hand; and so lost to all feeling of patriotism were the Caps that they openly threatened all who ventured to vote against them with the Muscovite vengeance, and fixed Norrkoping, instead of Stockholm, as the place of meeting for the Riksdag as being more accessible to the Russian fleet. But it soon became evident that the Caps were playing a losing game; and, when the Riksdag met theCaps. at Norrkoping on the 19th of April, they found them- selves in a minority in all four estates. In the contest for the marshalate of the Diet the leaders of the two parties were again pitted against each other, when the verdict of the last Riksdag was exactly reversed, Fersen defeating Rudbeck by 234, though Russia spent no less a sum than £11,500 to secure the election of the latter.*

The Caps had short shrift, and the joint note which the Russian, Prussian and Danish ministers presented to the estates protesting, in menacing terms, against any " reprisals " on the part of the triumphant faction, only hastened the fall of the government. The Cap senate resigned en masse to escape impeachment, and an exclusively Hat ministry took its place. The On the 1st of June the Reaction Riksdag, as it

Reaction was generally called, removed to the capital; and Riksdag. j t was now tnat j-jjg F renc h ambassador and the

crown prince Gustavus called upon the new senators to redeem their promise as to a reform of the constitution which they had made before the elections. But when, at the fag-end of the session, they half-heartedly brought the matter forward, ' the Riksdag suddenly seemed to be stricken with paralysis. Im- pediments multiplied at every step; the cry was raised: " The constitution is in danger "; and on the 30th of January 1770 the Reaction Riksdag, after a barren ten months' session, rose amidst chaotic confusion without accomplishing anything.

Adolphus Frederick died on the 12th of February 1771. The elections held on the demise of the Crown resulted in a Gustavus partial victory for the

Caps, especially among the ///., 1771- lower orders; but in the estate of the peasants 1792. their majority was merely nominal, while the mass

of the nobility was dead against them. Nothing could be done, however, till the arrival of the new king (then at Paris), and every one felt that with Gustavus III. an entirely incalculable factor had entered into Swedish politics. Unknown to the party leaders, he had already renewed the Swedish alliance with France and had received solemn assurances of assistance from Louis XV. in case he succeeded in re-establishing monarchical rule in Sweden. France undertook, moreover, to pay the outstanding subsidies to Sweden, amounting to one and a half millions of livres annually, beginning from January 1772; and Vergennes, one of the great names of French diplo- macy, was to be sent to circumvent the designs of Russia at Stockholm as he had previously circumvented them at Con- stantinople. Immediately after his return to Stockholm, Gustavus endeavoured to reconcile the jarring factions by in- ducing the leaders to form a composition committee to adjust their differences. In thus mediating he was sincere enough, but all his pacific efforts were frustrated by their jealousy of

him and of each other. Still worse, the factions now intrenched still further on the prerogative. The new coronation oath con- tained three revolutionary clauses. The first aimed at making abdications in the future impossible by binding the king to reign uninterruptedly. The second obliged him to abide, not by the decision of all the estates together, as heretofore, but by that of the majority only, with the view of enabling the actually dominant lower estates (in which was a large Cap majority) to rule without, and even in spite of, the nobility. The third clause required him, in all cases of preferment, to be guided not " principally," as heretofore, but " solely " by merit, thus striking at the very root of aristocratic privilege. It was clear that the ancient strife of Hats and Caps had become merged in a conflict of classes; the situation was still further complicated by the ominous fact that the non-noble majority was also the Russian faction.

All through 1771 the estates were wrangling over the clauses of the coronation oath. A second attempt of the king to mediate between them foundered on the suspicions of the estate of burgesses; and, on the 24th of February 1772, the nobility yielded from sheer weariness. The non-noble Cap majority now proceeded to attack the senate, the last stronghold of the Hats, and, on the 25th of April, succeeded in ousting their opponents. It was now, for the first time, that Gustavus; reduced to the condition of a roi faineant, began seriously to consider the possibility of a revolution; of its necessity there could be no doubt. Under the sway of the now dominant faction, Sweden, already the vassal, could not fail speedily to become the victim of Russia. She was on the point of being absorbed in that Northern

System, the invention of the Russian minister of foreign affairs, Nikita Panin (q.v.), which that patient statesman had made it the ambition of his life to realize. Only a swift and sudden coup d'etat could save the inde- Moaarchlai pendence of a country isolated from the rest of Coup d'etat Europe by a hostile league. The details of the ot 1T72 – famous revolution of the 19th of August 1772 are elsewhere set forth (see GuStavus III.; Toll, Johan Kristoffer; Sprengtporten, Jakob Magnus). Here we can only dwell upon its political importance and consequences. The new constitution of the 20th of August 1772, which Gustavus imposed upon the terrified estates at the bayonet's point, converted a weak and disunited republic into a strong but limited monarchy, in which the balance of power inclined, on the whole, to the side of the monarch. The estates could only assemble when summoned by him; he could dismiss them whenever he thought fit; and their deliberations were to be confined exclusively to the propositions which he might think fit to lay before them. But these very extensive powers were subjected to many important checks. Thus, without the previous consent of the estates, no new law could be imposed, no old law abolished, no offensive war undertaken, no extraordi- nary war subsidy levied. The estates alone could tax them-: selves; they had the absolute control of the Bank of Sweden, and the inalienable right of controlling the national expendi- ture. Thus the parliament held the purse; and this seemed a sufficient guarantee both of its independence and its frequent convention. The senate, not the Riksdag, was the chief loser by the change; and, inasmuch as henceforth the senators were appointed by the king, and were to be responsible to him alone, a senate in opposition to the Crown was barely conceivable.

Abroad the Swedish revolution made a great sensation. Catherine II. of Russia saw in it the triumph of her arch-enemy France, with the prolongation of the costly Turkish War as its immediate result. But the absence of troops on the Finnish border, and the bad condition of the frontier fortresses, con- strained the empress to listen to Gustavus's pacific assurances, and stay her hand. She took the precaution, however, of concluding a fresh secret alliance with Denmark, in which the Swedish revolution was significantly described as " an act of violence " constituting a casus foederis, and justifying both powers in seizing the first favourable opportunity for intervention to restore the Swedish constitution of 1720.

In Sweden itself the change was, at first, most popular. But Gustavus's first

Riksdag, that of 1778, opened the eyes of the deputies to the fact that their political supremacy had departed. The king was now their sovereign lord; and, for all his courtesy and gentleness, the jealousy with which he guarded and the vigour with which he enforced the prerogative plainly showed that he meant to remain so. But it was not till after eight years more had elapsed that actual trouble began. The Riksdag of 1778 had been obsequious; the Riksdag of 1786 was mutinous. It rejected nearly all the royal measures outright, or so modified them that Gustavus himself withdrew them. When he dismissed the estates, the speech from the throne held out no prospect of their speedy revocation.

Nevertheless, within three years, the king was obliged to summon another Riksdag, which met at Stockholm on the 26th of January 1789. His attempt in the interval to rule without a parliament had been disastrous. It was only by a breach of his own constitution that he had been able to declare war against Russia (April 1788); the conspiracy of Anjala (July) had para- lysed all military operations at the very opening of the cam- paign; and the sudden invasion of his western provinces by the Danes, almost simultaneously (September), seemed to bring him to the verge of ruin. But the contrast, at this crisis, between his self-sacrificing patriotism and the treachery of the Russophil aristocracy was so striking that, when the Riksdag assembled, Gustavus found that the three lower estates were ultra-royalist, and with their aid he succeeded, not without running great risks (see Gustavus III.; .Nordin, Gustaf; Wallqvist, Olaf), in crushing the opposition of the nobility by a second coup d'itat (Feb. 16, 1789), and passing the The Act of famous Act of Union and Security which gave the Valoaaad king an absolutely free hand as regards foreign Security, affairs and the command of the army, and made 1789. further treason impossible. For this the nobility

never forgave him. It was impossible, indeed, to resist openly so highly gifted and so popular a sovereign; it was only by the despicable expedient of assassination that the last great monarch of Sweden was finally removed, to the infinite detriment of his country.

The ensuing period was a melancholy one. The aristocratic classes loudly complained that the young king, Gustavus IV., Gustavus still a minor, was being brought up among crypto- iv„ 1792- Jacobins; while the middle classes, deprived of 1809. the stimulating leadership of the anti-aristocratic

" Prince Charming," and becoming more and more inoculated with French political ideas, drifted into an antagonism not merely to hereditary nobility, but to hereditary monarchy likewise. Everything was vacillating and uncertain; and the general instability was reflected even in foreign affairs, now that the master-hand of Gustavus III. was withdrawn. Sweden and

The renewed efforts of Catherine II. to interfere Revolu- in Sweden's domestic affairs were, indeed, vigorously tlonary repulsed, but without tact or discretion, so that the

Frame. g 00(j understanding between the two countries

was seriously impaired, especially when the proclivities of Gustaf Reuterholm (q.v.), who then virtually ruled Sweden, induced him to adopt what was generally considered an indecently friendly attitude towards the government at Paris. Despite the execution of Louis XVI. (Jan. 21, i793) > Sweden, in the hope of obtaining considerable subsidies, recognized the new French republic; and secret negotiations for con- tracting an alliance were actually begun in May of the same year, till the menacing protests of Catherine, supported as they were by all the other European powers, finally induced Sweden to suspend them.

The negotiations with the French Jacobins exacerbated the hatred which the Gustavians already felt for the Jacobin councillors of the duke-regent (see Charles XIII., king of Sweden). Smarting beneath their grievances and seriously believing that not only the young king's crown but his very life was in danger, they formed a conspiracy, the soul of which was Gustaf Mauritz Armfelt (

with the aid of a Russian fleet, supported by a rising of the Dalecarlians. The conspiracy was discovered and vigorously suppressed.

The one bright side of this gloomy and sordid period was the rapprochement between the Scandinavian kingdoms during the revolutionary wars. Thus, on the 27th of March Alliance 1794, a neutrality compact was formed between with Denmark and Sweden; and their united squadrons Denmark. patrolled the North Sea to protect their merchantmen from the British cruisers. This approximation between the two govern- ments was happily followed by friendly feelings between the two nations, under the pressure of a common danger. Presently Reuterholm renewed his coquetry with the French republic, which was officially recognized by the Swedish government on the 23rd of April 1795. In return, Sweden received a subsidy of £56,000; and a treaty between the two powers was signed on the 14th of September 1795. On the other hand, an attempt to regain the friendship of Russia, which had broken off diplo- matic relations with Sweden, was frustrated by the refusal of the king to accept the bride, the grand duchess Alexandra, Catherine II. 's granddaughter, whom Reuterholm had provided for him. This was Reuterholm's last official act. On the 1st of November 1796, in accordance with the will of his father, Gustavus IV., now in his eighteenth year, took the government into his own hands.

The government of Gustavus IV. (q.v.) was almost a pure autocracy. At his very first Riksdag, held at Norrkoping in March 1800, the nobility were compelled, at last, to ratify Gustavus III.'s detested Act of Union and Security, which hitherto they had steadily refused to do. Shortly after this Riksdag rose, a notable change took place in Sweden's foreign policy. In December 1800 Denmark Sweden and Russia acceded to a second Armed Neutrality of the North, directed against Great Britain; and the arsenal of Karlskrona, in all probability, was only saved from the fate of Copenhagen by the assassination of the emperor Paul, which was followed by another change of system in the north. Hitherto Sweden had kept aloof from continental complications; but the arrest Q,, s < avus /v and execution of the due d'Enghien in 1804 inspired joins the Gustavus IV. with such a hatred of Napoleon that European when a general coalition was formed against the Coalition, French emperor he was one of the first to join it ,804 ° (Dec. 3, 1804), pledging himself to send an army corps to co- operate with the English and Russians in driving the enemy out of Holland and Hanover. But his senseless quarrel with Frederick William III. of Prussia detained him in Pomerania; and when at last (December 1805) he led his 6000 men towards the Elbe district the third coalition had already been dissipated by the victories of Ulm and Austerlitz. In 1806 a rupture between Sweden and Prussia was only prevented by Napoleon's assault upon the latter power. After Jena Napoleon attempted to win over Sweden, but Gustavus rejected every overture. The result was the total loss of Pomerania, and the Swedish army itself was only saved from destruction by the ingenuity of J. K. Toll (q.v.).

At Tilsit the emperor Alexander I. had undertaken to compel " Russia's geographical enemy," as Napoleon designated Sweden, to accede to the newly established Continental Russian System. Gustavus IV. naturally rejected all the Conquest ot proposals of Alexander to close the Baltic against Finland, the English; but took no measures to defend Finland 180S ' against Russia, though, during the autumn of 1807, it was notorious that the tsar was preparing to attack the grand duchy. On the 21st of February 1808 a Russian army crossed the Finnish border without any previous declaration of war. On the 2nd of April the king ordered a general levy of 30,000 men; but while two army corps, under Armfelt and Toll, together with a British contingent of 10,000 men under Moore, were stationed in Scania and on the Norwegian border in anticipation of an attack from Denmark, which, at the instigation of Napoleon, had simultaneously de- clared war against Sweden, the little Finnish army was left altogether unsupported. The conquest of Finland, after

an heroic struggle against overwhelming odds, is elsewhere recorded (see Finland: History). Its immediate consequence Deposition in Sweden proper was the deposition of Gustavus of Oustavus IV. (March 13, 1809), who was clearly incapable of iv., 1809. governing. The nobility took advantage of this opportunity to pay off old scores against Gustavus III. by excluding not only his unhappy son but also that son's whole family from the succession — an act of injustice which has never been adequately defended. But indeed the whole of this inter- mediate period is full of dark subterranean plots and counter- plots, still inexplicable, as, for instance, the hideous Fersen murder (June 20, 1810) (see Fersen, Hans Axel von) evidently intended to terrorize the Gustavians, whose loyalty to the ancient dynasty was notorious. As early as the 5th of Charles June 1809 the duke regent was proclaimed king, xiii., 1809- under the title of Charles XIII. '(?.».), after accepting 1819. tne new jjberal constitution, which was ratified by

the Riksdag the same day.

The new king was, at best, a useful stopgap, in no way likely to interfere with the liberal revolution which had placed him on the throne. Peace was what the exhausted nation now required; and negotiations had already been opened at Fredrikshamn. But the Russian demands were too humiliating, and the war was resumed. But the defeats of Savarsbruk and Ratan (Aug. 19, 1809) broke the spirit of the Swedish army; and peace was obtained by the sacrifice of Finland, the Aland islands, " the fore-posts of Stockholm," as Napoleon rightly described them, and Vesterbotten as far as the rivers Tornea. and Muonio (treaty of Fredrikshamn, Sept. 17, 1809).

% The succession to the throne, for Charles XIII. was both infirm and childless, was settled, after the mysterious death Bernadotte (May 28, 1810) of the first elected candidate, chosen as Prince Charles Augustus of Augustenburg, by the Crown selection of the French marshal, Bernadotte (see Pr,nce – Charles XIV., king of Sweden), who was adopted by Charles XIII. and received the homage of the estates on the 5th of November 1810.

The new crown prince was very soon the most popular and the most powerful man in Sweden. The infirmity of the old Influence king, and the dissensions in the council of state, and Policy of placed the government and especially the control of Bernadotte. f ore jg n affairs almost entirely in his hands; and he boldly adopted a policy which was antagonistic indeed to the wishes and hopes of the old school of Swedish statesmen, but, perhaps, the best adapted to the circumstances. Finland he at once gave up for lost. He

knew that Russia would never voluntarily relinquish the grand duchy, while Sweden could not hope to retain it permanently, even if she reconquered it. But the acquisition of Norway might make up for the loss of Finland; and Bernadotte, now known as the crown prince Charles John, argued that it might be an easy matter to persuade the anti- Napoleonic powers to punish Denmark for her loyalty to France by wresting Norway from her. Napoleon he rightly distrusted, though at first he was obliged to submit to the emperor's dicta- tion. Thus on the 13th of November 1810, the Swedish govern- ment was forced to declare war against Great Britain, though the British government was privately informed at the same time that Sweden was not a free agent and that the war would be a mere demonstration. But the pressure of Napoleon became more and more intolerable, culminating in the occupation of Pomerania by French troops in 181 2. The Swedish government thereupon concluded a secret convention with Russia (treaty of Petersburg, April 5, 181 2), undertaking to send 30,000 men to operate against Napoleon in Germany in return for a promise from Alexander guaranteeing to Sweden the possession of Norway. Too late Napoleon endeavoured to outbid Alexander by offering to Sweden Finland, all Pomerania and Mecklenburg, in return for Sweden's active co-operation against Russia.

The Orebro Riksdag (April- August 181 2), remarkable besides for its partial repudiation of Sweden's national debt and its reactionary press laws, introduced general conscription into Sweden, and thereby enabled the crown prince to carry out his

ambitious policy. In May 181 2 he mediated a peace between Russia and Turkey, so as to enable Russia to use all her forces against France (peace of Bucharest); and on the 18th of July, at Orebro, peace was also concluded between Great Britain on one side and Russia and Sweden on the other. These two treaties were, in effect, the corner-stones of a fresh coalition against Napoleon, and were confirmed on the outbreak of the Franco- Russian War by a conference between Alexander and Charles John at Abo on the 30th of August 181 2, when the tsar undertook to place an army corps of 35,000 men at the disposal of the Swedish crown prince for the conquest of Norway.

The treaty of Abo, and indeed the whole of Charles John's foreign policy in 181 2, provoked violent and justifiable criticism among the better class of politicians in Sweden. The immorality of indemnifying Sweden at the expense of a weaker friendly power was obvious; and, while Finland was now definitively sacrificed, Norway had still to be won. Moreover, Great Britain and Russia very properly insisted that Charles John's first duty was to the anti-Napoleonic coalition, the former power vigorously objecting to the expenditure of her subsidies on the nefarious Norwegian adventure

before the common enemy had been crushed. Only on his very ungracious compliance did Great Britian also promise to countenance the union of Norway and Sweden (treaty of Stockholm, March 3, 1813); and, on the 23rd of April, Russia gave her guarantee to the same effect. The. Swedish crown prince rendered several important services to the allies during the campaign of 1813 (see Charles XIV., king of Sweden); but, after Leipzig, he went his own way, determined at all hazards to cripple Denmark and secure Norway.

How this " job " was managed contrary to the dearest wishes of the Norwegians themselves, and how, finally (Nov. 14, 1814), Norway as a free and independent kingdom

•«. a / c A a i- ■ Union with

was united to Sweden under a common king, is Norway.

elsewhere described (see Denmark; Norway; Charles XIV., king of Sweden; Christian VIII., king of Denmark).

Charles XIII. died on the 5th of February 1818, and was succeeded by Bernadotte under the title of Charles XIV. John. The new king devoted himself to the promotion of Charles the material development of the country, the Gota xiv.,1818- canal absorbing the greater portion of the twenty- 1844 ~ four millions of dalers voted for the purpose. The external debt of Sweden was gradually extinguished, the internal debt consider- ably reduced, and the budget showed an average annual surplus of 700,000 dalers. With returning prosperity the necessity for internal reform became urgent in Sweden. The antiquated Riksdag, where the privileged estates predominated, while the cultivated middle class was practically unrepresented, had become an insuperable obstacle to all free development; but, though the Riksdag of 1840 itself raised the question, the king and the aristocracy refused to entertain it. Yet the reign of Charles XIV. was, on the whole, most beneficial to Sweden; and, if there was much just cause for complaint, his great services to his adopted country were generally acknowledged. Abroad he maintained a policy ef peace based mainly on a good

understanding with Russia. Charles XIV. 's son

Oscar I and successor King Oscar I. was much more liberally i844-i8S9.

inclined. Shortly after his accession (March 4, 1844)

he laid several projects of reform before the Riksdag; but the

estates would do little more than abolish the obsolete marriage and inheritance laws and a few commercial monopolies. As the financial situation necessitated a large increase of taxation, there was much popular discontent, which culminated in riots in the streets of Stockholm (March 1848). Yet, when fresh proposals for parliamentary reform were laid before the Riksdag in 1849, they were again. rejected by three out of the four estates. As regards foreign politics, Oscar I. was strongly anti-German. On the outbreak of the Dano-Prussian War of 1848-49, Sweden sympathized warmly with Denmark. Hundreds of Swedish volunteers hastened to Schleswig-Holstein. The Riksdag voted 2,000,000 dalers for additional armaments. It was Sweden, too, I who mediated the truce of Malmo (Aug. 26, 1848), which

helped Denmark out of her difficulties. During the Crimean War Sweden remained neutral, although public opinion was decidedly anti-Russian, and sundry politicians regarded the conjuncture as favourable for regaining Finland.

Oscar I. was succeeded (July 8, 1859) by his son, Charles XV. (q.v.), who had already acted as regent during his father's ill—

*nesses. He succeeded, with theinvaluable assistance 1859-1872 " °f *-he mm i st:er of justice, Baron Louis Gerhard de*

Geer {q.v.) , in at last accomplishing the much-needed reform of the constitution. The way had been prepared in i860 by a sweeping measure of municipal reform; and, in January 1863, the government brought in a reform bill by the terms of CoastHu- which the Riksdag was henceforth to

consist of two tioaal chambers, the Upper House being a sort of aristo-
Reform, cratic senate, while the members of the Lower House were to be elected triennially by popular suffrage. The new constitution was accepted by all four estates in 1865 and promulgated on the 22nd of January 1866. On the 1st of September 1866, the first elections under the new system were held; and on the 19th of January 1867, the new Riksdag met for the first time. With this one great reform Charles XV. had to be content; in all other directions he was hampered, more or less, by his own creation. The Riksdag refused to sanction his favourite project of a reform of the Swedish army on the Prussian model, for which he laboured all his life, partly from motives of economy, partly from an appre- hension of the king's martial tendencies. In 1864 Charles XV. had endeavoured to form an anti-Prussian league with Denmark; and after the defeat of Denmark he projected a Scandinavian union, in order, with the help of France, to oppose Prussian predominance in the north — a policy which naturally collapsed with the overthrow of the French Empire in 1870. He died on the 18th of September 1872, and was succeeded by his brother, the duke of Gothland, who reigned as Oscar II. (R. N. B.)

The economic condition of Sweden, owing to the progress in

material prosperity which had taken place in the country as the

result of the Franco-German War, was at the accession

Oscar 11

1872-1907. °f O sca r II- t° the throne en the 18th of September 1872 fairly satisfactory. Politically, however, the out- look was not so favourable. In their results, the reforms inaugurated during the preceding reign did not answer expecta- tions. Within three years of the introduction of the new electoral laws De Geer's ministry had forfeited much of its former popularity, and had been forced to resign. In the vital matter of national defence no common understanding had been arrived at, and during the conflicts which had raged round this question, the two chambers had come into frequent collision and paralysed the action of the government. The peasant proprietors, who, under the name of the "Landtmanna" party, 1 formed a compact majority in the Second Chamber, pursued a consistent policy of class interests in the matter of the taxes and burdens that had, as they urged, so long oppressed the Swedish peasantry; and conse- quently when a bill was introduced for superseding the old system of army organization by general compulsory service, they de- manded as a condition of its acceptance that the military burdens should be more evenly distributed in the country, and that the taxes, which they regarded as a burden under which they had wrongfully groaned for

centuries, should be abolished. In these circumstances, the " Landtmanna " party in the Riksdag, who desired the lightening of the military burden, joined those who desired the abolition of landlordism, and formed a compact and predominant majority in the Second Chamber, while the burgher and Liberal parties were reduced to an impotent " intelligence " minority. This majority in the Lower Chamber

1 The Swedish " Landtmanna " party was formed in 1867. It consisted mostly of the larger and smaller peasant proprietors, who at the time of the old " Standers Riksdag " were always opposed to the nobility and the clergy. The object of the party was to bring about a fusion between the representatives of the large landed proprietors and the regular peasant proprietors, to support the interests of landed proprietors in general against those of the town representatives, and to resist Crown interference in the administration pf local affairs.

was at once attacked by another compact majority in the Upper, who on their side maintained that the hated land taxes were only a kind of rent-charge on land, were incidental to it and in no way weighed upon the owners, and, moreover, that its abolition would be quite unwarrantable, as it was one of the surest sources of revenue to the state. On the other hand, the First Chamber refused to listen to any abolition of the old military system, so long as the defence of the country had not been placed upon a secure basis by the adoption of general compulsory military service. The government stood midway between these con- flicting majorities in the chambers, without support in either.

Such was the state of affairs when Oscar II., surrounded by his late brother's advisers, began his reign. One of his first cares was to increase the strength of his navy, but in The Party consequence of the continued antagonism of the Compromise political parties, he was unable to effect much. otl874 – In the first Riksdag, however, the so-called " compromise," which afterwards played such an important part in Swedish political life, came into existence. It originated in the small " Scania " party in the Upper House, and was devised to establish a modus vivendi between the conflicting parties, i.e. the champions of national defence and those who demanded a lightening of the burdens of taxation. The king himself perceived in the com- promise a means of solving the conflicting questions, and warmly approved it. He persuaded his ministers to constitute a special inquiry into the proposed abolition of land taxes, and in the address with which he opened the Riksdag of 1875 laid particular stress upon the necessity of giving attention to the settlement of these two burning questions, and in 1880 again came forward with a new proposal for increasing the number of years of service with the militia. This motion having been rejected, De Geer resigned, and was succeeded by Count Arvid

Posse. The new prime minister endeavoured to solve the question of defence in accordance with the views of the " Landtmanna " party. Three parliamentary committees had prepared schemes for a remission of the land taxes, for a new system of taxation, for a reorganiza- tion of the army based on a stammtrupp (regular army), by the enlistment of hired soldiers, and for naval reforms. In this last connexion the most suitable types of vessels for coast defence as for offence were determined upon. But Count Posse, deserted by his own party over the army bill, resigned, and was succeeded on the 16th of May 1884 by Oscar Themptauder, who had been minister of finance in the previous cabinet. The new premier succeeded in persuading the Riksdag to pass a bill increasing the period of service with the colours in the army to six years and that in the militia to forty-two days, and as a set-off a remission of 30% on the land taxes.

Influenced by the economic reaction which took place in 1879 in consequence of the state of affairs in Germany, where Prince Bismarck had introduced the protectionist system, a Protec- protectionist party had been formed, which tried to tloalst gain adherents in the Riksdag. It is true that in Movement – the Riksdag of 1882 the commercial treaty with France was renewed, but since 1885 the protectionist party was prepared to begin the combat, and a duty on corn, which had been proposed in the Riksdag of the same year, was rejected by only a slight majority. During the period of the unusually low price of corn of 1886, which greatly affected the Swedish farmers, protection gained ground to such an extent that its final triumph was considered as certain within a short time. During the Riksdag of the same year, however, the premier, Themptauder, emphati- cally declared himself against the protectionist party, and while the parties in the Second Chamber were equal in number, the proposed tax on corn was rejected in the First Chamber. In the Riksdag of 1887 there was a majority for protection in the Second Chamber, and in the first the majority against the tax was so small that the tax on corn would have triumphed in a combined meeting of the two chambers. The government, availing itself of its formal right not to dissolve the chamber in which it had the support of a majority, therefore dissolved only the Second Chamber (March 1887).

The new Riksdag assembled in May with a free trade majority

in the Second Chamber, but nothing in connexion with the great question of customs was settled. In the meantime, the powerful majority in the Second

Chamber split into two groups— the new " Landtmanna " party, which approved protection in the interests of agricultural classes; and a somewhat smaller group, the old " Landtmanna " party, which favoured free trade.

The victory of the free traders was not, however, destined to be of long duration, as the protectionists obtained a majority in both chambers in the next Riksdag (1888). To the First Chamber protectionists were almost exclusively elected, and in the Second all the twenty-two members for Stockholm were disqualified, owing to one of their number not having paid his taxes a few years previously, which prevented his being eligible. Instead, then, of twenty-two free traders representing the majority of the Stockholm electors, twenty-two protectionists, representing the minority, were elected, and Stockholm was thus represented in the Riksdag by the choice of a minority in the capital. This singular way of electing members for the principal city in the kingdom could not fail further to irritate the parties. One result of the Stockholm election came at a convenient time for the Themptauder ministry. The financial affairs of the country were found to be in a most unsatisfactory state. In spite of reduced expenses, a highly estimated revenue, and the contem- plated raising of taxes, there was a deficit, for the payment or discharge of which the government would be obliged to demand supplementary supplies. The Themptauder ministry resigned. The king retained, however, for a time several members of the ministry, but it was difficult to find a premier who would be able, during the transition from one system to another, to com- mand sufficient authority to control the parties. At last Baron Gillis Bildt, who, while Swedish ambassador in Berlin, had wit- nessed the introduction by Prince Bismarck of the agrarian protectionist system in Germany, accepted the premiership, and it was under his auspices that the two chambers imposed a series of duties on necessaries of life. The new taxes, together with an increase of the excise duty on spirits, soon brought a surplus into the state coffers. At a council of state (Oct. 12, 1888) the king declared his wishes as to the way in which this surplus should be used. He desired that it should be applied to a fund for insurance and old age pensions for workmen and old people, to the lightening of the municipal taxes by state contributions to the schools and workhouses, to the abolition of the land taxes and of the obligation of keeping a horse and man for military service, and, lastly, to the improvement of the shipping trade; but the Riksdag decided to devote it to other objects, such as the payment of the deficit in the budget, the building of railways and augmentation of their material, as well as to improvements in the defences of the country.

Baron Bildt resigned as soon as the new system seemed settled, making room for Baron Gustav Akerhjelm. The latter, however, also soon resigned, and was succeeded on the lothof July 1 891 by Erik Gustav Bostrom, a landed proprietor. The protectionist system gained in favour on the expiry

of the commercial treaty with France in 1892, as it could now be extended to articles of industry. The elections of 1890, when the metropolis returned free traders and Liberals to the Second Chamber, certainly effected a change in the latter, as the representatives of the towns and the old " Landtmanna " party joined issue and established a free-trade majority in the chamber, but in the combined meetings of the two chambers the compact protectionist majority in the First Chamber turned the scale. The customs duties were, however, altered several times in accordance with market prices and ruling circumstances. Thus in 1892, when the import duty on unground corn was reduced from 2s. iod. to is. 5d., and that on ground corn from- 4s. 9d. to 2s. rod. for 100 kilogrammes, the same duties were also retained for the following year. They were also retained for 1894 at the request of the government, which desired to keep faith with their promise that while the new organization of the army was going on no increase of duties on the necessaries of life should take place.- This measure caused much dissatisfaction, and gave rise to a strong agrarian move- ment, in consequence of which the government, in the beginning

of 1895, before the assembling of the Riksdag, made use of its right of raising the two duties on corn just referred to, 3s. 7d. and 7s. 2d., which were afterwards somewhat reduced as far as seed corn for sowing purposes was concerned.

The question of customs duties now settled, that of national defence was taken up afresh, and in the following year the government produced a complete scheme for the ., ,

1. Vi- 1 ˆ1 r j x ■ .l c j. National

abolition of the land tax m the course 01 ten years, Defence. in exchange for a compensation of ninety days' drill for those liable to military service, proposed to retain the old military system of the country and to strengthen the defences of Norrland, and the government bill for a reorganization of the army was accepted by the Riksdag in an extraordinary session. But it was soon perceived that the new plan was unsatisfactory and required recasting, upon which the minister of war, Baron Rappe, resigned, and was succeeded by Colonel von Crustebjorn, who immediately set to work to prepare a complete reorganiza- tion of the army, with an increase of the time of active service on the lines of general compulsory service. The Riksdag of 1900, in addition to grants for the fortifications at Boden, in the pro- vince of Norrbotten, on the Russian border, and other military objects, voted a considerable grant for an experimental mobiliza- tion, which fully exposed the defects and faults of the old system. In the Riksdag of 1901 E. G. Bostrom resigned, and was succeeded by Admiral F. W. von Otter, who introduced a new bill for the army reorganization, the most

important item of which was the increase of the period of training to 365 days. The cost in con- nexion with the new scheme was expected to amount to 22 millions of kronor. The Riksdag, however, .did not accept the new plan in its full extent. The time of drilling was reduced to 240 days for the infantry, to 300 days for the navy, while for the cavalry and artillery the time fixed was 365 days. The plan, thus modified, was then accepted by the government.

After the elections in 1890, the alliance already mentioned between the old " Landtmanna " party and the representatives of the towns had the result that the Liberals in the Second Chamber, to whom the representatives of the je e / orn ,. towns mostly belonged, were now in a position to decide the policy which the two united parties should follow. In order to prevent this, it was proposed to readjust the number of the members of the Riksdag. The question was only settled in 1894, when a bill was passed fixing the number of the members of the Riksdag in the First Chamber at 1 50, and in the Second at 230, of which 150 should represent the country districts and 80 the towns. The question of protection being now considered settled, there was no longer any reason for the continued separa- tion of the two " Landtmanna" parties, who at the beginning of the Riksdag of 1895 joined issue and became once more a compact majority in the Second Chamber, as they had been up to the Riksdag of May 1887. The influence of the country represen- tatives was thus re-established in the Second Chamber, but now the demands for the extension of the franchise came more and more to the front, and the premier, Bostrom, at last felt bound to do something to meet these demands. He accordingly intro- duced in the Riksdag of 1896 a very moderate bill for the exten- sion of the franchise, which was, nevertheless, rejected by both chambers, all similar proposals by private rrenbers rreeting the same fate. When at last the bill for the reorganization of the army, together with a considerably increased taxation, was accepted by the Riksdag of 1901, it was generally acknowledged that, in return for the increased taxation, it would only be just to extend the right of taking part in the political life and the legislative work of the country to those of the population who hitherto had been excluded from it. The governrrent eventually laid a proposal for the extension of the franchise before the Riksdag of 1902, the chief feature of which was that the elector should be twenty-five years of age, and that married men over forty years should be entitled to two votes. The Riksdag, how- ever, finally agreed to a proposal by Bishop Billing, a member of the First Chamber, that an address should be presented to the king asking for a full inquiry into the question of extending the franchise for the election of members to the Second Chamber.

HISTORY!

In 1897 the Riksdag had received among its members the first socialistic representative in the person of R. H. Brauting, the leader of the Swedish Social Democrats. The Movement Socialists, who had formerly confined their activity to questions affecting the working classes and their wages, took, however, in 1902 an active part in the agitation for the extension of the franchise. Processions of many thousands of workmen were organized, in Stockholm and in other towns of the kingdom, just before the Riksdag began the discussion on the above-mentioned bill of the government, and when the bill was introduced in the chambers a general and well- organized strike took place and continued during the three days the debate on the bill lasted. As this strike was of an exclu- sively political kind, and was intended to put pressure on the chambers, it was generally disapproved, and failed in its object. The prime minister, Admiral von Otter, resigned shortly after the end of the session, and was succeeded by Bostrom, the ex-premier, who at the request of the king again assumed office.

The relations with Norway during King Oscar's reign had great influence on political life in Sweden, and more than once it Relations seemed as if the union between the two countries was with on the point of being wrecked. The dissensions

Norway, ,hiefly had their origin in the demand by Norway for separate consuls and foreign ministers, to which reference is made under Norway. At last, after vain negotiations and discussions, the Swedish government in 1895 gave notice to Norway that the commercial treaty which till then had existed between the two countries and would lapse in July 1897 would, according to a decision in the Riksdag, cease, and as Norway at the time had raised the customs duties, a considerable diminution in the exports of Sweden to Norway took place. The Swedish minister of foreign affairs, Count Lewenhaupt, who was considered as too friendly disposed towards the Norwegians, resigned, and was replaced by Count Ludvig Douglas, who represented the opinion of the majority in the First Chamber. When, however, the Norwegian Storthing, for the third time, passed a bill for a national or " pure " flag, which King Oscar eventually sanctioned, Count Douglas resigned in his turn and was succeeded by the Swedish minister at Berlin, Lagerheim, who managed to pilot the questions of the union into more quiet waters. He succeeded all the better as the new elections to the Riksdag of 1900 showed clearly that the Swedish people was not inclined to follow the ultra conservative or so-called " patriotic " party, which resulted in the resignation of the two leaders of that party, Professor Oscar Alin and Count Marschal Patrick Reutersvard as members of the First

Chamber. On the other hand, ex-Professor E. Carlson, of the High School of Gothenburg, succeeded in forming a party of Liberals and Radicals to the number of about 90 members, who, besides being in favour of the extension of the franchise, advocated the full equality of Norway with Sweden in the management of foreign affairs. (O. H. D.)

The state of quietude which for some time prevailed with regard to the relations with Norway was not, however, to be of TheDissoiu-ˆ OIi S duration. The question of separate consuls Hon 0/ the for Norway soon came up again. In 1902 the Union with Swedish government proposed that negotiations in orway. ˆj s matter should be opened with the Norwegian government, and that a joint committee, consisting of repre- sentatives from both countries, should be appointed to consider the question of a separate consular service without in any way interfering with the existing administration of the diplomatic affairs of the two countries. The result of the negotiations was published in a so-called " communique," dated the 24th of March 1903, in which, among other things, it was proposed that the relations of the separate consuls to the joint ministry of foreign affairs and the embassies should be arranged by identical laws, which could not be altered or repealed without the consent of the governments of the two countries. The proposal for these identical laws, which the Norwegian government in May 1904 submitted, did not meet with the approval of the Swedish government. The latter in their reply proposed that the

Swedish foreign minister should have such control over the Norwegian consuls as to prevent the latter from exceeding their authority. 1 This proposal, however, the Norwegian government found unacceptable, and explained that, if such control were insisted upon, all further negotiations would be purposeless. They maintained that the Swedish demands were incompatible with the sovereignty of Norway, as the foreign minister was a Swede and the proposed Norwegian consular service, as a Nor- wegian institution, could not be placed under a foreign authority. A new proposal by the Swedish government was likewise rejected, and in February 1905 the Norwegians broke off the negotiations. Notwithstanding this an agreement did not appear to be out of the question. All efforts to solve the consular question by itself had failed, but it was considered that an attempt might be made to establish separate consuls in combination with a joint admini- stration of diplomatic affairs on a full unionistic basis. Crown Prince Gustaf , who during the illness of King Oscar was appointed regent, took the initiative of renewing the negotiations between the two countries, and on the 5th of April in a combined Swedisa and Norwegian council of state made a proposal for a reform both of the administration of diplomatic affairs and of the consular service on the basis of full equality between the two kingdoms, with the express reservation, however, of a joint foreign minister — Swedish or Norwegian — as a condition for the existence of the

union. This proposal was approved of by the Swedish Riksdag on the 3rd of May 1905. In order that no obstacles should be placed in the way for renewed negotiations, Mr Bostrom, the prime minister, resigned and was succeeded by Mr Ramstedt. The proposed negotiations were not, however, renewed.

On the 23rd of May the Norwegian Storthing passed the government's proposal for the establishment of separate Nor- wegian consuls, and as King Oscar, who again had resumed tne reins of government, made use of his constitutional right to veto the bill, the Norwegian ministry tendered their resignation. The king, however, declared he could not now accept their resignation, whereupon the ministry at a sitting of the Norwegian Storthing on the 7th of June placed their resignation in its hands. The Storthing thereupon unanimously adopted a resolution stating that, as the king had declared himself unable to form a govern- ment, the constitutional royal power " ceased to be operative," whereupon the ministers were requested, until further instruc- tions, to exercise the power vested in the king, and as King Oscar thus had ceased to act as " the king of Norway," the union with Sweden was in consequence dissolved.

In Sweden, where they were least of all prepared for the turn things had taken, the action of the Storthing created the greatest surprise and resentment. The king solemnly pro- _. „. tested against what had taken place and summoned Extra- an extraordinary session of the Riksdag for the 20th ordinary of June to consider what measures should be taken f^" 1 "' with regard to the question of the union, which had arisen suddenly through the revolt of the Norwegians on the 7th of June. The Riksdag declared that it was not opposed to negotiations being entered upon regarding the conditions for the dissolution of the union if the Norwegian Storthing, after a new election, made a proposal for the repeal of the Act of Union between the two countries, or, if a proposal to this effect was made by Norway after the Norwegian people, through a plebiscite, had declared in favour of the dissolution of the union. . The Riksdag further resolved that 100 million kroner (about £555,000) should be held in readiness and be avail- able as the Riksdag might decide. On the resignation of the Ramstedt ministry Mr Lundeberg formed a coalition ministry consisting of members of the various parties in the Riksdag, after which the Riksdag was prorogued on the 3rd of August.*

After the plebiscite in Norway on the 13th of August had decided in favour of the dissolution of the union and after the Storthing had requested the Swedish government to The co-operate with it for the repeal of the Act of Union, Karlstad a conference of delegates from both countries was Conveat,oa – convened at Karlstad on the 31st of August. On the 23rd 1 For further details see Norway : History.

of September the delegates came to an agreement, the principal points of which were: that such disputes between the two countries which could not be settled by direct diplomatic negotiations, and which did not affect the vital interests of either country, should be referred to the per- manent court of arbitration at the Hague, that on either side of the southern frontier a neutral zone of about fifteen kilometres width should be established, and that within eight months the fortifications within the Norwegian part of the zone should be destroyed. Other clauses dealt with the rights of the Laplanders to graze their reindeer alternatively in either country, and with the question of transport of goods across the frontier by rail or other means of communication, so that the traffic should not be hampered by any import or export prohibitions or otherwise.

From the 2nd to the 19th of October the extraordinary Riksdag was again assembled, and eventually approved of the _.„ – arrangement come to by the delegates at Karlstad Extra- with regard to the dissolution of the union as well ordinary as the government proposal for the repeal of Riksdag. tne ˆ ct f Tj n i on a nd the recognition of Norway as an independent state. An alteration in the Swedish flag was also decided upon, by which the mark of union was to be replaced by an azure-blue square. An offer from the Norwegian Storthing to elect a prince of the Swedish royal house as king in Norway was declined by King Oscar, who now on behalf of himself and his successors renounced the right to the Norwegian crown. Mr Lundeberg, who had accepted office only to settle the question of the dissolution of the union, now resigned and was succeeded by a Liberal government with Mr Karl Staaff as prime minister.

The question of the extension of the franchise, which was a burning one, was to be the principal measure of the Staaff The government. It brought in a bill for manhood

Franchise suffrage at elections for the Second Chamber, Ques oa. t g e ther with single member constituencies and election on the absolute majority principle. The bill was passed by the Second Chamber on the 15th of May 1906, by 134 to 94 votes, but it was rejected by the First Chamber by 126 to 18. The latter chamber instead passed a bill for manhood suffrage at elections for the Second Chamber, on the condition that the elections for both chambers should take place on the basis of proportional representation. Both chambers thereupon decided to ask the opinion of the

king with regard to the simultaneous extension of the franchise to women at elections for the Second Chamber. The government bill having, however, been passed by the Second Chamber, the prime minister proposed to the king that the Riksdag should be dissolved and new elections for the Second Chamber take place in order to hear the opinion of the country, but as the king did not approve of this Mr Staaff and his government resigned.

A Conservative government was then formed on the 29th of May by Mr Lindman, whose principal task was to find a solution of the suffrage question which both chambers could accept. A government bill was introduced, proposing the settlement of the question on the basis of the bill carried by the First Chamber in the Riksdag of the preceding year. A compromise, approved of by the government, was adopted by the First Chamber on the 14th of May 1907 by no votes against 29 and in the Second Chamber by 1 28 against 98. By this act proportional representa- tion was established for both chambers, together with universal manhood suffrage at elections for the Second Chamber, a reduc- tion of the qualifications for eligibility for the First Chamber and a reduction of the electoral term of this chamber from nine to six years, and finally payment of members of the First Chamber, who hitherto had not received any such emolument.

King Oscar II. died on the 9th of December 1907, sincerely regretted by his people, and was succeeded as king of Sweden by his eldest son, Prince Gustaf. During King Oscar's reign many important social reforms were carried out by the legislature, and the country developed in all directions. In the Riksdag of 1884 a new patent law was adopted, the age at which women should

be held to attain their majority was fixed at twenty-one years and the barbarous prison punishment of " bread and water " abolished. In order to meet the cost of the new army organiza- tion the Riksdag of 1902 increased the revenue by progressive taxation, but only for one year. Bills for the improvement of the social conditions of the people and in the interests of the working classes were also passed. During the five years 1884-1889 a committee was occupied with the question of workmen's insur- ance, and thrice the government made proposals for its settle- ment, on the last occasion adopting the principle of invalidity as a common basis for insurance against accidents, illness or old age. The Riksdag, however, delayed coming to a decision, and contented itself by earmarking money for an insurance fund. At last the Riksdag of 1901 accepted a Bill for insurance against accidents which also extended to agricultural labourers, in connexion with the establishment of a state institution for insurance. The bill for protection against accidents, as well as for the limitation of working hours for women and children, was passed, together with one for the

appointment of special factory inspectors. When in 1897 King Oscar celebrated his jubilee of twenty-five years as king, the exhibition which had been organized in Stockholm offered a convincing proof of the progress the country had made in every direction.

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Swedish Literature

Swedish literature, as distinguished from compositions in the common norraena tunga of old Scandinavia, cannot be said to exist earlier than the 13th century. Nor until the period of the Reformation was its development in any degree rapid or copious. The oldest form in which Swedish exists as a written language (see Scandinavian Language) is the series of manuscripts known as Landskapslagarne, or ” The Common Laws.” These are supposed to be the relics of a still earlier age, and it is hardly believed that we even possess the first that was put down in writing. The most important and the most ancient of these codes is the ” Elder West Gota Law,” reduced to its present form by the law-man Eskil about 1230. Another of great interest is Magnus Eriksson’s ” General Common Law,”

which was written in 1347. These ancient codes have been collected and edited by the learned jurist, K. J. Schlyter (1 795-1888) as Corpus juris Sveo-Gotorum antiqui (4 vols., 1827-1869). The chief ornament of medieval Swedish literature is Urn styrilse kununga ok hofdinga (" On the Conduct of Kings and Princes "), first printed by command of Gustavus II. Adolphus, in 1634. The writer is not known; it has been conjecturally dated 1325. It is a hand- book of moral and political teaching, expressed in terse and vigor- ous language. St Bridget, or Birgitta (1303-1373), an historical figure of extraordinary interest, has left her name attached to several important religious works, in particular to a collection of Uppenbarelser (" Revelations "), in which her visions and ecstatic

meditations are recorded, and a version, the first into Swedish, of the five books of Moses. This latter was undertaken, at her desire, by her father-confessor Mattias (d. 1350), a priest at Lin- koping. The translation of the Bible was continued a century later by a monk named Johannes Budde (d. 1484).

*In verse the earliest Swedish productions were probably the folk-song. 1 The age of these, however, has been commonly exaggerated. It is doubtful whether any still exist which are as old, in their present form, as the 13th century. The bulk are now attributed to the 15th, and many are doubtless much later still. The last, such as " Axel och Valborg," " Liten Karin," " Kampen Grimborg," and " Habor och Signild," deal with the adventures of romantic medieval romance. Almost the only positive clue we hold to the date of these poems is the fact that one of the most characteristic of them, *' Engelbrekt," was written by Thomas, bishop of Strengnas, who died in 1443. Thomas, who left other poetical pieces, is usually called the first Swedish poet. There are three rhyming chronicles in medieval Swedish, all anonymous. The earliest, Erikskronikan, 2 is attributed to 1320; the romance of Karl Magnus, Nya Karls- kronikan, describing the period between 1387 and 1452, which is sometimes added to the earlier work, dates from the middle of the 15th century; and the third, Slurekronikorna, was probably written about 1500. The collection of rhymed romances which bears the name of Queen Euphemia's Songs must have been written before the death of the Norwegian queen in 13 12. They are versions of three medieval stories taken from French and German sources, and dealt with the Chevalier au lion, of Chrestien de Troyes, with Duke Frederick of Normandy, and with Flores and Blancheflor. They possess very slight poetic*

merit in their Swedish form. A little later the romance of King Alexander 3 was translated by, or at the command of, Bo Jonsson Grip; this is more meritorious. Bishop Thomas, who died in 1443, wrote many political songs; and a number of narrative poems date from the close of the century. A brilliant and pathetic relic of the close of the medieval period exists in the Love Letters addressed in 1498 by Ingrid Persdotter, a nun of Vadstena, to the young knight Axel Nilsson. The first book printed in the Swedish language appeared in 1495.

The 16th century added but little to Swedish literature, and that little is mostly connected with the newly-founded university of Upsala. The Renaissance scarcely made itself felt in Scandi- navia, and even the Reformation failed to waken the genius of the country. Psalms and didactic spiritual poems were the main products of Swedish letters in the 16th century. Two writers, the brothers Petri, sons of a smith at Orebro, take an easy prominence in so barren a period. Olaus Petri (1493-1552) and The Petri. Laurentius Petri (1499-1573) were Carmelite monks who adopted the Lutheran doctrine while studying at Wittenberg, and came back to Sweden in 1518 as the apostles of the new faith. Olaus, who is one of the noblest figures in Swedish annals, was of the executive rather than the meditative class. He became chancellor to Gustavus Vasa, but his reform- ing zeal soon brought him into disgrace, and in 1540 he was condemned to death. Two years later he was pardoned, and allowed to resume his preaching in Stockholm. He found time, however, to write a Swedish Chronicle, which is the earliest prose history of Sweden, a mystery-play, Tobiae comedia, which is the first Swedish drama, and three psalm-books, the best known being published in 1530 under the title of Ndgre gudhelige vijsor (" Certain Divine Songs "). His Chronicle was based on a number of sources, in the treatment of which he showed a discrimination which makes the work still useful. Laurentius Petri, who was a man of calmer temperament, was archbishop of all Sweden, and edited or superintended the translation of the

1 Skanska folkvisor, edited by E. G. Geijer and A. A. Afzelius (3 vols., Stockholm, 1879).

2 See Cederschiold, Om Erikskronikan (1899).

3 Editions of these chronicles and romances have been issued by the " Svenska Fornskrift Sallskapet " (Stockholm) : Ivan Lejon- riddaren (ed. Stephens), Hertig Fredrik of Normandie (ed. Ahlstrand) Flores och Blancheflor (ed. G. E. Klemming), Alexander (ed. Klem- ming), Carl Magnus (ed. Klemming, in Prosadikter frin medeltiden.

Bible published at Upsala in 1540. He also wrote many psalms. Laurentius

Andreae, 1552, had previously prepared a translation of the New Testament, which appeared in 1526. He was a polemical writer of prominence on the side of the Reformers. Finally, Petrus Niger (Peder Svart), bishop of Vesteras (d. 1562), wrote a chronicle of the life of Gustavus I. up to 1533, in excel- lent prose. The same writer left unpublished a history of the bishops of Vesteras, his predecessors. The latter half of the 1 6th century is a blank in Swedish literature.

With the accession of Charles IX., and the consequent develop- ment of Swedish greatness, literature began to assert itself in more vigorous forms. The long life of the royal librarian, Johannes Bure or Buraeus (1568-1652), formed a link between the age of the Petri and that of Stjern- hjelm. Buraeus studied all the sciences then known to mankind, and confounded them all in a sort of Rabbinical cultus of his own invention, a universal philosophy in a multitude of unread- able volumes. 4 But he was a patient antiquary, and advanced the knowledge of ancient Scandinavian mythology and language very considerably. He awakened curiosity and roused a public sympathy with letters; nor was it without significance that two of the greatest Swedes of the century, Gustavus Adolphus and the poet Stjernhjelm, were his pupils. The reign of Charles IX. saw the rise of secular drama in Sweden. The first comedy was the Tisbe of Magnus Olai Asteropherus (d. 1647), a coarse but witty piece on the story of Pyramus and Thisbe, acted by the schoolboys of the college of Arboga in 16 10. This play is the Ralph Roister Doister of Swedish literature. A greater dramatist was Johannes Messenius (1 579-1636), who was the son of a miller near Vadstena and had been carefully educated abroad by the Jesuits. Being discovered plotting against the government during the absence of Gustavus in Russia, he was condemned to imprisonment for life — that is, for twenty years. Before this disaster he had been professor of jurisprudence in Upsala, where his first historical comedy Disa was performed in 1611 and the tragedy of Signill in 16 12. The design of Messenius was to write the history of his country in fifty plays; he completed and pro- duced six. These dramas 6 are not particularly well arranged, but they form a little body of theatrical literature of singular interest and value. Messenius was a genuine poet; the lyrics he introduces have something of the charm of the old ballads. He wrote abundantly in prison; his magnum opus was a history of Sweden in Latin, but he has also left, in Swedish, two important rhyme-chronicles. Messenius was imitated by a little crowd of playwrights. Nikolaus Holgeri Catonius (d. 1655) wrote a fine tragedy on the Trojan War, Troijenborgh, in which he excelled Messenius as a dramatist. Andreas Prytz, who died in 1655 as bishop of Linkoping, produced several religious chronicle plays from Swedish history. Jacobus Rondeletius (d. 1662) wrote a curious " Christian tragi-comedy " of Judas redivivus, which contains some amusing scenes from daily Swedish life. Another good play was an

anonymous Holof ernes and Judith (edited at Upsala, 1895, by O. Sylwan). These plays were all acted by schoolboys and university youths, and when they went out of fashion among these classes the drama in Sweden almost entirely ceased to exist. Two historians of the reign of Charles IX., Erik Goransson Tegel (d. 1636) and Aegidius Girs (d. 1639), deserve mention. The chancellor Magnus Gabriel de la Gardie (1622-1686) did much to promote the study of Swedish antiquities. He founded the College of Antiquities at Upsala in 1667, and bought back the Gothic Codex argenteus which he presented to the university library.

The reign of Gustavus Adolnhus was adorned by one great writer, the most considerable in all the early history of Sweden. The title of " the Father of Swedish poetry " has stiernhiehn been universally awarded to Goran Lilja, better known by his adopted name of Georg Stjernhjelm (q.v.; 1598-1672). Stjernhjelm was a man of almost universal attain- ment, but it is mainly in verse that he has left his stamp upon

4 Selections from his writings were edited by G. E. Klemming, (Upsala, 1883-1885).

5 Edited for a learned society (Upsala, 1886, &c.) by H. Schiick.

the literature of his country. He found the language rough and halting, and he moulded it into perfect smoothness and elasticity. His master, Buraeus, had written a few Swedish hexameters by way of experiment. Stjernhjelm took the form and made it national.

The claim of Stjernhjelm to be the first Swedish poet may be contested by a younger man, but a slightly earlier writer, l Gustaf Rosenhane (1610-1684), who was a reformer "on quite other lines. If Stjernhjelm studied Opitz, Rosenhane took the French poets of the Renaissance for his models, and in 1650 wrote a cycle of one hundred sonnets, the earliest in the language; these were published under the title Venerid in 1680. Rosenhane printed in 1658 a " Com- plaint of the Swedish Language " in thirteen hundred rattling rhyming lines, and in 1682 a collection of eighty songs. He was a metrist of the artistic order, skilful, learned and unirri- passioned. His zeal for the improvement of the literature of his country was beyond question. Most of the young poets, however, followed Stjernhjelm

rather than Rosenhane. As personal friends and pupils of the former, the brothers Colum- bus deserve special attention. They were sons of a musician and poet, Jonas Columbus (1586-1663). Each wrote copiously in verse, but Johan (1640-1684), who was professor of poetry at Upsala, almost entirely in Latin, while Samuel (1642 -1679), especially in his Odae svelicae, showed himself an apt and fervid imitator -of the Swedish hexameters of Stjernhjelm, to whom he was at one time secretary, and whose Hercules he dramatized. His works were included by P. Hanselli in vol. ii. of Samlade vitterhets arbeten, &c.

Of a rhyming family of Hjarne, it is enough to mention one member, Urban Hjarne (1641-1724), who introduced the new form of classical tragedy from France, in a species of transition from the masques of Stjernhjelm to the later regular rhymed dramas. His best play was a Rosimunda. Lars Johansson (1642-1674), who called himself " Lucidor the Unfortunate," has been the subject of a whole tissue of romance, most of which is fabulous. It is true, however, that he was stabbed, like Marlowe, in a midnight brawl at a tavern. His poems were posthumously collected as Flowers of Helicon, Pinched and Distributed on various occasions by Lucidor the Unfortunate. Stripped of the myth which had attracted so much attention to his name, Lucidor proves to be an occasional rhymester of a very low order. Haquin Spegel (1645-17 14), the famous arch- bishop of Upsala, wrote a long didactic epic in alexandrines, God's Labour and Rest, with an introductory ode to the Deity in rhymed hexameters. He was also a good writer of hymns. Another ecclesiastic, the bishop of Skara, Jesper Svedberg (1653-1735), wrote sacred verses, but is better remembered as the father of Swedenborg. Peter Lagerlof (1648-1699) cultivated a pastoral vein in his ingenious lyrics Elisandra and Lycillis; he was professor of poetry, that is to say, of the art of writing Latin verses, at Upsala. Olof Wexionius (1656-1690?) pub- lished his Sinne-Afvel, a collection of graceful miscellaneous pieces, in 1684, in an edition of only 100 copies. Its existence was presently forgotten, and the name of Wexionius had dropped out of the history of literature, when Hanselli recovered a copy and reprinted its contents in 1863.

We have hitherto considered only the followers of Stjernhjelm; we have now to speak of an important writer who followed in the footsteps of Rosenhane. Gunno Eurelius, ""afterwards ennobled with the name of Dahlstjerna {q.v.; 1661-1709), early showed an interest in the poetry of Italy. In 1690 he translated Guarini's Pastor Fido, and in or just after 1697 published, in a folio volume without a date, his Kunga-Skald, the first original poem in ottava rima produced in Swedish. This is a bombastic and vainglorious epic in honour of Charles XL, whom Eurelius adored; it is not, however, without great merits, richness of language, flowing metre, and the breadth of a genuine poetic enthusiasm. He published a little collection of

lamentable sonnets when his great master died. Johan Paulinus Liljenstedt (1655-1732), a Finn, was a graceful imitator of Ronsard and Guarini. Johan

Dahlstjeraa.

Runius (1670-1713), called the " Prince of Poets," published a collection entitled Dudaim, in which there is nothing to praise, and with him the generation of the 17th century closes. Talent had been shown by certain individuals, but no healthy school of Swedish poetry had been founded, and the latest imitators of Stjernhjelm had lost every vestige of taste and independence. In prose the 17th century produced but little of importance in Sweden. Gustavus Adolphus (1 594-1632) was the most polished writer of its earlier half, and his speeches dm take an important place in the development of the language. The most original mind of the next age was Olof Rudbeck (1630-1702), the famous author of Alland eller Manhem. He spent nearly all his life in Upsala, building anatomical laboratories, conducting musical concerts, laying out botanical gardens, arranging medical lecture rooms — in a word, expending ceaseless energy on the practical improvement of the university. He was a genius in all the known branches of learning; at twenty-three his physiological discoveries had made him famous throughout Europe. His Atland (or Atlantika) appeared in four folio volumes, in Latin and Swedish, in 1675-1698; it was an attempt to summon all the authority of the past, all the sages of Greece and the bards of Iceland, to prove the inherent and indisputable greatness of the Swedish nation, in which the fabulous Atlantis had been at last discovered. It was the literary expression of the majesty of Charles XL, and of his autocratical dreams for the destiny of Sweden. From another point of view it is a monstrous hoard or cairn of rough-hewn antiquarian learning, now often praised, sometimes quoted from, and never read. Olof Verelius (1618- 1682) had led the way for Rudbeck, by his translations of Icelandic sagas, a work which was carried on with greater intelligence by Johan Peringskjold (1654-1720), the editor of the Heimskringla (1697), and J. Hadorph (1630-1693). The French philosopher Descartes, who died at Christina's court at Stockholm in 1650, found his chief, though posthumous, disciple in Andreas Rydelius (1671-1738), bishop of Lund, who was the master of Dalin, and thus connects us with the next epoch. His chief work, Nodiga fornuftsbfningar … (5 vols.) appeared in 1718. Charles XII., under whose special patronage Rydelius wrote, was himself a metaphysician and physiologist of merit.*

A much more brilliant period followed the death of Charles XII. The influence of France and England took the place of that of Germany and Italy. The taste of Louis XIV., tempered by the study of Addison and Pope, gave its tone to the academical court of Queen Louise Ulrica, who founded

in 1758 the academy of literature, which developed later into the academy of literature, history and antiquities.

Sweden became completely a slave to the periwigs of literature, to the unities and graces of classical France. Nevertheless this was a period of great intellectual stimulus and activity, and Swedish literature took a solid shape for the first time. This Augustan period in Sweden closed somewhat abruptly about 1765. Two writers in verse connect it with the school of the preceding century. Jacob Frese (1692 ?-i728 ?), a Finn, whose poems were published in 1726, was an elegiacal writer of much grace, who foreshadowed the idyllic manner of Creutz. Atterbom pronounces Frese the best Swedish poet between Stjernhjelm and Dalin. Samuel von Triewald (1688-1743) played a very imperfect Dryden to Dalin's Pope. He was the first Swedish satirist, and introduced Boileau to his country- men. His Satire upon our Stupid Poets may still be read with entertainment. 1 Both, in verse and prose Olof von Dalin {q.v.; 1 708-1 763) takes a higher place than any writer since Stjernhjelm. He was inspired by the study of his great English contemporaries. His Swedish Argus (1733-1734) was modelled on Addison's Spectator, his Thoughts about Critics (1736) on Pope's Essay on Criticism, his Tale of a Horse on Swift's Tale of a Tub. Dalin's style,

1 The works of the chief writers between Sternhjelm and Dalin were edited by P. Hanselli (Upsala, 1856, &c.) as Samlade vitterhets-

arheten-af svenska forfattare.

whether in prose or verse, was of a finished elegance. As a prose writer Dalin is chiefly memorable for his History of the Swedish Kingdom (4 vols., 1746-1762). His great epic, Swedish Freedom (1742) was written in alexandrines of far greater smoothness and vigour than had previously been attempted. When in 1737 the new Royal Swedish Theatre was opened, Dalin led the way to a new school of dramatists with his Bryn-hilda, a regular tragedy in the style of Crebillon p'ere. In his comedy of The Envious Man he introduced the manner of Moliere, or more properly that of Holberg. His songs, his satires, his occasional pieces, without displaying any real originality, show Dalin's tact and skill as a workman with the pen. He stole from England and France, but with the plagiarism of a man of genius; and his multifarious labours raised Sweden to a level with the other literary countries of Europe. They formed a basis upon which more

national and more scrupulous writers could build their various structures. A foreign critic, especially an English one, will never be able to give Dalin so much credit as the Swedes do; but he was certainly an unsurpassable master of pastiche. His works were collected in 6 vols., 1767.

The only poet of importance who contested the laurels of Dalin was a woman. Hedvig Charlotta Nordenflycht (1718- 1763) was the centre of a society which took the tiycbt. "name of Tankebyggare Orden and ventured to rival that which Queen Louise Ulrica created and Dalin adorned. Both groups were classical in taste, both worshipped the new lights in England and France. Fru Nordenflycht wrote with facility and grace; her collection of lyrics, The Sorrowing Turtledove (1743), in spite of its affectation, enjoyed and merited a great success; it was the expression of a deep and genuine sorrow — the death of her husband after a very brief and happy married life. It was in 1744 that she settled in Stockholm and opened her famous literary salon. She was called " The Swedish Sappho," and scandal has been needlessly busy in giving point to the allusion. It was to Fru Nordenflycht's credit that she discovered and encouraged the talent of two very distinguished poets younger than herself, Creutz and Gyllenborg, who published volumes of poetry in collaboration. Count Gustaf Philip Creutz (q.v.; 1731-1785) was a Finlander who achieved an ex- traordinary success with his idyllic poems, and in particular with the beautiful pastoral of Atis och Camilla, long the most popular of all Swedish poems. His friend Count Gustaf Fredrik Gyllenborg (1731-1808) was a less accomplished ea org ' poet, less delicate and touching, more rhetorical and artificial. His epic Taget ofver Bdlt (" The Expedition across the Belt") (1785) is an imitation, in twelve books, of Voltaire's Henriade, and deals with the prowess of Charles X. He wrote fables, allegories, satires, and a successful comedy of manners, The Swedish Fop. He outlived his chief contemporaries so long that the new generation addressed him as " Father Gyllenborg." Anders Odel (1718-1773) wrote in 1739 the famous " Song of Malcolm Sinclair," the Sinclairsvisa. The writers of verse in this period were also exceedingly numerous.

In prose, as was to be expected, the first half of the 18th century was rich in Sweden as elsewhere. The first Swedish novelist was Jakob Henrik Mork (1714-1763). His romances have some likeness to those of Richard- son; they are moral, long-winded, and slow in evolution, but written in an exquisite style, and with much knowledge of human nature. Adalrik och Gothilda, which went on appearing from 1742 to 1745, is the best known; it was followed, between 1748 and 1758, by Thecla. Jakob Wallenberg (1746-1778) described a voyage he took to the East Indies and China under the very odd title of Min son pa galejan (" My Son at the Galleys "), a work full of humour and originality.

Johan Ihre (1707-1780), a professor at Upsala, edited the Codex argenteus of Ulfilas, and produced the valuable Svenskt Dialect Lexicon (1766) based on an earlier learned work, the Dialectologia of Archbishop Erik Benzelius (d. 1743). He settled for some time at Oxford. Ihre's masterpiece is the

Creutz.

Prose Writers.

Glossarium sueogothicum (1769), a historical dictionary with many valuable examples from the ancient monuments of the language. In doing this he was assisted by the labours of two other grammarians, Sven Hof (d. 1786) and Abraham Sahlstedt (d. 1776). The chief historians were Sven Lagerbring (1707-1787), author of a still valuable history of Sweden down to 1457 (Svea Rikes historia, 4 vols., 1769-1783); Olof Celsius (17 16-1794), bishop of Lund, who wrote histories of Gustavus I. (1746-1753) and of Eric XIV. (1774); and Karl Gustaf Tessin (1695-1770) who wrote on politics and on aesthetics. Tessin's Old Man's Letters to a young Prince were addressed to his pupil, afterwards Gustavus III. Count Anders Johan von Hopken (1712-1789), the friend of Louise Ulrica, was a master of rhetorical compliment in addresses and funeral orations.

In spite of all the encouragement of the court, drama did not flourish in Sweden. Among the tragic writers of the age we may mention Dalin, Gyllenborg, and Erik Wrangel (1686- 1765). In comedy Reinhold Gustaf Modee (d. 1752) wrote three good plays in rivalry of Holberg.

In science Linnaeus, or Karl von Linne (1707-1778), was the name of greatest genius in the whole century; but he wrote almost entirely in Latin. The two great Swedish chemists, Torbern Olof Bergman (1 735-1 784) and Karl Vilhelm Scheele (1742-1786), flourished at this time. In pathology a great name was left by Nils Rosen von Rosenstein (1706-1773), in navigation by Admiral Fredrik Henrik af Chapman (d. 1808), in philology by Karl Aurivillius (d. 1786). But these and other distinguished savants whose names might be enume- rated scarcely belong to the history of Swedish literature. The same may be said about that marvellous and many-sided genius, Emanuel Swedenborg (1688-1772), who, though the son of a Swedish poet, preferred to prophesy to the world in Latin.

What is called the Gustavian period is supposed to com- mence with the reign of Gustavus III. in 1771 and to close with the abdication of Gustavus IV. in 1809. This The period of less than forty years was particularly Gustavian rich in literary talent, and the taste of the people P erioA in literary matters widened to a remarkable extent. Jour- nalism began to

develop; the Swedish Academy was founded; the drama first learned to flourish in Stockholm; and literature began to take a characteristically national shape. This fruitful period naturally divides itself into two divisions, equivalent to the reigns of the two kings. The royal personages of Sweden have commonly been protectors of literature; they have strangely often been able men of letters themselves. Gustavus III. (1746-1792), the founder of the Swedish Academy and of the Swedish theatre, was himself a playwright of no mean ability. One of his prose dramas, Siri Brake och Johan Gyllensljerna, held the stage for many years. But his best work was his national drama of Gustaf Vasa (1783), written by the king in prose, and afterwards versified by Kellgren. In 1773 the king opened the national theatre in Stockholm, and on that occasion an opera of Thetis och Pelee was performed, written by himself. In 1786 Gustavus created the Swedish Academy, on the lines of the French Academy, but with eighteen members instead of forty. The first list of immortals, which included the survivors of a previous age and such young celebrities as Kellgren and Leopold, embraced all that was most bril- liant in the best society of Stockholm; the king himself pre- sided, and won the first prize for an oration. The works of Gustavus III. in six volumes were printed at Stockholm in

1802-1806.

The principal writers of the reign of Gustavus III. bear the name of the academical school. But Karl Mikael Bellman (q.v.; 1740-1795), the most original and one of the most able of all Swedish writers, an improvisatore of the first order, had nothing academical in his composition. The riot of his dithyrambic hymns sounded a strange note of nature amid the conventional music of the Gustavians. Of the academical poets Johan Gabriel Oxenstjerna (1750-1818), the nephew of Gyllenborg, was a descriptive idyllist of grace.

Lidaer.

He translated Paradise Lost. A writer of far more power and versatility was Johan Henrik Kellgren (q.v.; 1751-1795), the

leader of taste in his time. He was the first writer

‘ of the end of the century in Sweden, and the

second undoubtedly was Karl Gustaf af Leopold 1 (1756-1829),

" the blind seer Tiresias-Leopold," who lived on to

represent the old school in the midst of romantic times. Leopold attracted the notice of Gustavus III. by a volume of Erotic Odes (1785). The king gave him a pension and rooms in the palace, admitting him on intimate terms. He was not equal to Kellgren in general poetical ability, but he is great in didactic and satiric writing. He wrote a satire, the Enebomiad, against a certain luckless Per Enebom, and a classic tragedy of Virginia. Gudmund Goran Adlerbeth (1751- 1818) made translations from the classics and from the Norse, and was the author of a successful tragic opera, Cora och Alonzo (1782). Anna Maria Lenngren (1754-1817) was a very popular sentimental writer of graceful domestic verse, chiefly between 1792 and 1798. She was less French and more national than most of her contemporaries; she is a Swedish Mrs Hemans. Much of her work appeared anonymously, and was generally attributed to her contemporaries Kellgren and Leopold.

Two writers of the academic period, besides Bellman, and a generation later than he, kept apart, and served to lead up to

the romantic revival. Bengt Lidner (1759-1793),

a melancholy and professedly elegiacal writer, had analogies with Novalis. He interrupted his studies at the university by a voyage to the East Indies, and only returned to Stockholm after many adventures. In spite of the patronage of Gustavus III. he continued to lead a disordered, wandering life, and died in poverty. A short narrative poem, The Death of the Countess Spastara (1783), has retained its popularity. Lidner was a genuine poet, and his lack of durable success must be set down to faults of character, not to lack of inspiration. His poems appeared in 1788. Thomas Thorild (1759-1808) was a much stronger nature, and led the revolt against prevailing

taste with far more vigour. But he is an irregular

and inartistic versifier, and it is mainly as a prose writer, and especially as a very original and courageous critic, that he is now mainly remembered. He settled in Germany and died as a professor in Greifswald. Karl August Ehrensvard (1745-1800) may be mentioned here as a critic whose aims somewhat resembled those of Thorild. The creation of the Academy led to a great production of aesthetic and philosophical writing. Among critics of taste may be mentioned Nils Rosen von Rosenstein (17 52-1824); the rhetorical bishop of Linkoping, Magnus Lehnberg (1758-1808); and Count

Georg Adlersparre (1760-1809). Rosen von Rosenstein embraced the principles of the encyclopaedists while he was attached to the Swedish embassy in Paris. On his return to Sweden he became tutor to the crown prince, and held in succession a number of im- portant offices. As the first secretary of the Swedish Academy he exercised great influence over Swedish literature and thought. His prose writings, which include prefaces to the works of Kellgren and Lidner, and an eloquent argument against Rousseau's theory of the injurious influence of art and letters, rank with the best of the period. Kellgren and Leopold were both of them important prose writers.

The excellent lyrical poet Frans Mikael Franzen (q.v.; 1772- 1847) and a belated academician Johan David Valerius (1776- 1852), fill up the space between the Gustavian period and the

*domination of romantic ideas from Germany. It skald'**' was Lorenzo Hammarskold (1785-1827) who in*

1803 introduced the views of Tieck and Schelling by founding the society in Upsala called " Vitterhetens Vanner," and by numerous critical essays. His chief work was Svenska vitterheten (1818, &c.) a history of Swedish literature. Hammar- skold's society was succeeded in 1807 by the famous " Aurora ... . forbundet," founded by two youths of genius, Per

Daniel Amadeus Atterbom (1790-1855) and Vilhelm Fredrik Palmblad (1788-1852). These young men had at 1 His works were edited by C. R. Nyblom (2 vols., 1873).

Thorild.

first to endure bitter opposition and ridicule from the academic writers then in power, but they supported this with cheerfulness, and answered back in their magazines Polyfem and Fosforos (1810-1813). They were named " Fosforisterna " (" Phos- phorists ") from the latter. Another principal member of the school was Karl Frederik Dahlgren (q.v.; 1791-1844), a humorist who owed much to the example of Bellman. Fru Julia Nyberg (1785-1854), under the title of Euphrosyne, was their tenth Muse, and wrote agreeable lyrics. Among the Phos- phorists Atterbom was the man of most genius. On the side of the Academy they were vigorously attacked by Per Adam Wallmark (1777-1858), to whom they replied in a satire which was the joint work of several of the romanticists, Markall's Sleepless Nights. One of the innovators, Atterbom, eventually forced the doors of the Academy itself.

In 181 1 certain young men in Stockholm founded a society for the

elevation of society by means of the study of Scandi- navian antiquity. This was the Gothic Society, which began to issue the magazine called Iduna as its organ. Of its patriotic editors the most prominent was Erik Gustaf Geijer (q.v.; 1783-1847), but he was presently joined by a young man slightly older than himself, Esaias Tegner (q.v.; 1782-1846), afterwards bishop of Vexio, the greatest of Swedish writers. Even more enthusi astic than either in pushing to its last extreme the

Gothic Society.

Oeljer.

worship of ancient myths and manners was Per

Wallin.

Stagnelius.

Tegner.

Henrik Ling (1776-1839), now better remembered as the father of gymnastic science than as a poet. The Gothic Society eventually included certain younger men than these — Arvid August Afzelius (1785-1871), the first editor of the Swedish folk-songs; Gustaf Vilhelm Gumaelius (1789-1877), who has been somewhat pretentiously styled " The Swedish Walter Scott," author of the historical novel of Tord Bonde; Baron Bernhard von Beskow (q.v.; 1796-1868), lyrist and dramatist; and Karl August Nicander (1799-1839), a lyric poet who approached the Phosphorists in manner. The two great lights of the Gothic school are Geijer, mainly in prose, and Tegner, in his splendid and copious verse. Johan Olof Wallin (1779-1839) may be mentioned in the same category, although he is really distinct from all the schools. He was archbishop of Upsala, and in 1819 he published the national hymn-book of Sweden ; of the hymns in this collection, 1 26 are written by Wallin himself.

From 1810 to 1840 was the blossoming-time in Swedish poetry, and there were several writers of distinguished merit who could not be included in either of the groups enumerated above. Second only to Tegner in genius, the brief life and mysterious death of Erik Johan Stagnelius (1793- 1823) have given a romantic interest to all that is con- nected with his name. His first publication was the epic of Vladimir the Great (1817); to this succeeded the romantic poem Blanda. His singular dramas, The Bacchantes (1822), Sigurd Ring, which was posthumous, and The Martyrs (1821), are esteemed by many critics to be his most original productions. His mystical lyrics, entitled Liljor i Saron (" Lilies in Sharon "; 1820), and his sonnets, which are the best in Swedish, may be recommended as among the most

delicate products of the Scandinavian mind. Stagnelius has been compared, and not improperly, to Shelley. 2 Erik Sjoberg, who called himself " Vitalis " (1 794-1 8 28), was another gifted poet whose career was short and wretched. A volume of his poems appeared in 1820; they are few in number and all brief. His work divides itself into two classes — the one profoundly melancholy, the other witty or boisterous. Two humorous poets of the same period who deserve mention are Johan Anders Wadman (1777-1837), an improvisatore of the same class as Bellman, and Christian Erik Fahlcrantz (q.v. ;

1 790-1 866).

Among the poets who have been mentioned above, the

2 His collected works were edited by C. Eichhorn (2 vols., Stockholm, 1867-1868). Several of Stagnelius' poems were trans- I lated into English by Edmund Gosse 1886).

Sjoberg.

majority distinguished themselves also in prose. But the period was not one in which Swedish prose shone with any special lustre. The first prosaist of the time was, without question, the novelist, Karl Jonas Ludvig Almqvist, (q.v.; 1 793-1866), around whose extraordinary personal character and career a mythical romance has already collected (see Almqvist). He was encyclopaedic in his range, although his stories preserve most charm; on whatever subject he wrote his style was always exquisite. Fredrik Cederborgh (1784-1835) revived the comic novel in his Uno von Trasenberg and Ottar Trailing. The historical novels of Gumaelius have already been alluded to. Swedish history supplied themes for the romances of Count Per Georg Sparre (1790-1871) and of Gustaf Henrik Mellin (1803-1876). But all these writers sink before the sustained popularity of the Finnish Bremer! P oet Fredrika Bremer (q.v.; 1801-1865), whose stories reached farther into the distant provinces of the world of letters than the writings of any other Swede except Tegner. She was preceded by Sofia Margareta Zelow, afterwards Baroness von Knorring (1797-1848), who wrote a long series of aristocratic novels.

A polemical writer of great talent was Magnus Jakob Crusen- stople (1795-1865), of whose work it has been said that " it is not history and it is not fiction, but something brilliant between the one and the other." As an historian of Swedish literature Per Wieselgren (1800-1877) composed a valuable work, and made other valuable contributions to history and bibliography. In hiftory we meet again with the great name of Geijer, with that of Jonas Hallenberg (1748-1834), and with that of Anders Magnus Strinnholm (1786-1862), whose labours in the field of Swedish history were extremely valuable. Geijer and Strinn- holm prepared the way for the most popular of all Swedish historians, Anders Fryxell (1795-1881), whose famous Ber'dt- telser ur svenska historien appeared in parts during a space of nearly sixty years, and awakened a great interest in Swedish history and legend.

In 1850 the first poet of S%veden, without a rival, was Johan Ludvig Runeberg {q.v.; 1804-1877), whose reputation rivals that of Tegner. Bernhard Elis Malmstrom (18 16- 1865), who was a professor of aesthetics at the uni- versity of Upsala, was the author of many important books on artistic and literary history, notably a monograph on Franzen. His poetry, although small in volume, gives him a place beside Runeberg. A volume of elegies, Angelika (1840), established his fame, and two volumes of poems published in 1845 and 1847 contain a number of ballads, romances and lyrics which keep their hold on Swedish literature. He was an exact and discriminating critic, and inclined to severity in his strictures on the romanticists. The other leading verse-writers were Karl Vilhelm Bottiger (1807-1878), the son-in-law and biographer of Tegner, who, in addition to his lyrical poetry, chiefly of the sentimental kind, wrote an admirable series of monographs on Swedish men of letters; Johan Borjesson (1790-1866), the last of the Phosphorists, author of various romantic dramas; Vilhelm August Detlof von Braun (1813-1860), a humorous lyrist; " Talis Qualis," whose real name was Karl Vilhelm August Strandberg (1818-1877); Oscar Patrick Sturzen-Becker (1811- 1869), better known as " Orvar Odd," a lyrical poet who was also the author of a series of amusing sketches of everyday life; and August Teodor Blanche (1811-1868), the popular dramatist Blanche produced a number of farces and comedies which were announced as pictures from real life. His pieces aboand in comic situations, and some of them, Magister Bldck- stadius (1844), Rika Morbror (1845), E n iragedi i Vimnterby (1848) and others; maintain their reputation. Fredrik August Dahlgren (1816-1895) gained a great reputation as a dramatist by his national opera, V ermlandingarne (1846). He is also the author of translations from Shakespeare and Calderon, and of considerable historical works. Other notable plays of the period were the En Komedi of J. C. John (1818-1884) and the Brollo- pet pa Ulfasa (1865) of Frans Hedberg (1828-1908). But Runeberg is the only

great poetic name of this period.

Runeberg.

In prose there was not even a Runeberg. The best novelist of the time was Emilie Flygare-Carlen (1807-1892). The art was sustained by Karl Anton Wetterbergh (1804-1889), who called himself " Onkel Adam," by August Blanche the dramatist, and by Marie Sofie Schwartz (1819-1892). Fru Schwartz (nee Birat) wrote novels demonstrating the rights of the poor against the rich, of which The Man of Birth and the Woman of the People (Eng. trans., 1868) is a good example. Lars Johan Hierta (1801-1872) was the leading journalist, Johan Henrik Thomander, bishop of Lund (1798-1865), the greatest orator, Matthias Alexander Castren (1813-1852) a prominent man of science, and Karl Gustaf af Forsell (1783- 1848), the principal statistician of this not very brilliant period. Elias Lonnrot (q.v.; 1802-1884) is distinguished as the Finnish professor who discovered and edited the Kalevala.

The most popular poet at the close of the 19th century was the patriotic Finn, Zakris Topelius (q.v.; 1818-1898). Of less im- portance were Karl Herman Satherberg (1812-1897), a romantic poet who was also a practising physician of distinction; the elegiac poet Johan Nybom (1815-1889); and the poet, novelist, and dramatist Frans Hedberg (d. 1908), who in his old age made many concessions to the modern taste. The posthumous poems of the bishop of Strangnas, Adam Teodor Stromberg (1820-1889), were collected by Wirsen, and created some sensa- tion. A typical academician was the poet, antiquary and con- noisseur, Nils Fredrik Sander (1828-1900). The improvisator of Gluntame, Gunnar Wennerberg (q.v.; 1817-1901) survived as a romantic figure of the past. Still older was the poetess Wilhelmina Nordstrom (1815-1902), long a schoolmistress in Finland. The aesthetic critic and poet, Carl Rupert Nyblom (1832-1907), continued the studies, translations and original pieces which had created him a reputation as one of the most accomplished general writers of Sweden. His wife, Helene Nyblom, was well known as a novelist. A: T. Gellerstedt (b. 1836), an architect of position, was known as a poet of small range but of very fine quality. Among writers of the earlier generation were Achatius Johan Kahl (1794-1888), the biographer of Tegner; Per Erik Bergfalk (1798-1890), the critic and supporter of Geijer; the distinguished historian and academician, Karl Johan Schlyter (1795-1888) and the historical writers, Fredrik Ferdinand Carlson (1811-1887), Vilhelm Erik Svedelius (1816-1889), and Martin Weibull (1835-1902). The work of King Oscar II. (q.v.) himself had given him a worthy place among the intellectuals of the country. But the interest of such veteran reputations is eclipsed by the more modern school.

The serenity of Swedish literature was rudely shaken about 1884 by an incursion of realism and by a stream of novel and vio- lent imaginative impulse. The controversy between the old and the new schools raged so fiercely, and Movement. the victory has remained so obviously in the hands of the latter, that it is difficult, especially for a foreigner, to hold the balance perfectly even. It will therefore be best in this brief sketch to say that the leader of the elder school was Viktor Rydberg (q.v.; 1828-1895) and that he was ably supported by Carl Snoilsky (q.v.; 1841-1904) who at the beginning of the 20th century was the principal living poet of the bygone generation in Sweden. Snoilsky was prominent for the richness of his lyrical style, his cosmopolitan interests and his great width of culture. Carl David af Wirsen (b. 1842) distinguished himself, and made himself very unhappy, by his dogged resistance to every species of renaissance in Swedish thought, or art, or literature. A man of great talent, he was a violent reactionary, and suffered from the consequences of an attitude so unpopular. He found a vehicle for his criticism in the Post och Inrikes Tidningar, of which he was editor. He published his Lyrical Poems in 1876; New Lyrical Poems in 1880: Songs and Sketches in 1885.

Four influences may be mentioned as having acted upon young Sweden, and as having combined to release its literature from the old hard-bound conventions. These are English philosophy in the writings of Herbert Spencer, French realism

in the practice and the preaching of Zola, Norwegian drama mainly through Ibsen, and Danish criticism in the essays and monographs of Georg Brandes. Unquestionably the greatest name in recent Swedish literature is that of Johan August Strindberg (q.v.; b. 1849). His drama of Master Olof in 1878 began the revolutionary movement. In 1879 the success of his realistic novel, The Red Room, fixed universal attention upon his talent. It was the sensation caused in 1884 by the lawsuit brought against Strindberg's Married (a collection of short stories dealing realistically with some of the seamy sides of marriage) which brought to a head the rebellion against the ele- gant and superficial conventions which were strangling Swedish literature. He affronts every canon of taste, more by a radical absence, it would seem, of the sense of proportion than by any desire to shock. His diatribes against woman suggest a touch of madness, and he was in fact at one time seized with an attack of insanity. He writes like a man whose view is distorted by physical or mental pain. His phraseology

and his turns of invention are too empirically pseudoscientific for the simplicity of nature. With all these faults, and in spite of a terrible vulgarity of mind, an absence of humour, and a boundless confidence in the philosophy of Nietzsche, Strindberg is a writer of very remarkable power and unquestionable originality. His mind underwent singular transformations. After devoting him- self wholly to realism of the coarsest kind, he began in 1889 his series of mystico-pathological novels about life in the archipelago of Stockholm. This led him to a culte du moi, of which the strangest result was an autobiography of crude invective, A Fool's Confession (1893), the printing of which in Swedish was forbidden. He rapidly passed on, through books like Inferno (1897), the diary of a semi-lunatic, up into the sheer mysticism of To Damascus (1898), where he reconciles himself at last to Christianity. His best work is classic in its breadth of style, exquisite in local colour and fidelity to the national character- istics of Sweden.

A curious antidote to the harsh pessimism of Strindberg was offered by the delicate and fantastic temperament of Ola Hansson (b. i860), whose poems came prominently before the public in 1884, and who, in Sensitiva amorosa (1887), preached a gospel of austere self-restraint. Hansson has been as ardent in the idolatry of woman as Strindberg has been in his hostility to the sex. Of those who have worked side by side with Strind-berg, the most prominent and active was Gustaf af Geijerstam (b. 1858), in his curious and severely realistic studies of country life in his Poor People (1884) and other books. In 1885 he pro- duced a gloomy sketch of student life at Upsala, Erik Grane, which made a great sensation. Since then Geijerstam has published more than forty volumes, and has become one of the most popular writers of the north of Europe. A melancholy interest surrounds the name of Victoria Benedictsson (Ernst Ahlgren, 1850-1889), who committed suicide in Copenhagen after achieving marked success with her sketches of humble life in Fran Skanc, and with the more ambitious works Money and Marianne. She was perhaps the most original of the many women writers of modern Sweden, and Money was hailed by Swedish critics as the most important work of fiction since Strindberg's Red Room. Her biography, a most affecting narrative, was published by Ellen Key, and her autobiography by Axel Lundegard (b. 1861), who, after some miscellaneous writing, produced in 1889 a curious novel of analysis called The Red Prince, and who, becoming a devout clerical, published a number of popular stories in a neo-romantic manner. In 1 898- 1 900 he produced a historical trilogy, Struensee, tracing the career of the minister from his early years as a doctor in Altona to his final -downfall. In 1904 appeared the first volume of a second historical trilogy, The Story of Queen Philippa. Fru Alfhild Agrell (nee Martin), who was born in 1849, produced a series of plays dealing with the woman question,

Rescued (1883) and others. She also showed great ability as a novelist, among the best of her books being a series of sketches of country life (1884-1887). An historical novelist of unequal powers, but great occasional merit, is Matilda Mailing, nee Kruse (b. 1864),

whose romance about Napoleon (1894) enjoyed a huge success. Tor Hedberg (b. 1861) also began as a decided realist, and turned to a more psychological and idealist treatment of life. His most striking work was Judas (1886); he has written some excellent dramas. Late successes in the novel has been those of Hilma Angered-Strandberg (On the Prairie, 1898) and Gustaf Janson (Paradise, 1900). The most remarkable of the novelists of the latest group is Selma Lagerlof (b. 1858), who achieved a great success with Gbsta Berlings Saga in 1891- 1892. She employs the Swedish language with an extraordinary richness and variety, and stands in the front rank of Swedish novelists. But perhaps the most cosmopolitan recent novelist of Sweden is Per Hallstrom (b. 1866), who spent much of his youth in America, and appeared as an imaginative writer first in 1891. He has published volumes of ballads, short stories and sketches, fantastic and humoristic, all admirable in style. His play, A Venetian Comedy, enjoyed a substantial success in 1904.

Among the recent lyrical poets of Sweden, the first to adopt the naturalistic manner was Albert Ulrik Baath (b. 1853), whose earliest poems appeared in 1879. In his rebellion against the sweetness of Swedish convention he proved himself somewhat indifferent to beauty of form, returned to " early national " types of versification, and concentrated his attention on dismal and distressing conditions of life. He is a resolute, but, in his early volumes, harsh and rocky writer. From 1882 onwards Baath was steadily productive. Karl Alfred Melin (b. 1849) has described in verse the life in the islands of the Stockholm archipelago. Among lyrists who have attracted attention in their various fields are Oskar Levertin (1862-1906) and Emil Kleen (1 868-1 898). Of these Levertin is the more highly coloured and perfumed, with an almost Oriental richness; Kleen has not been surpassed in the velvety softness of his language. But by far the most original and enjoyable lyrical genius of the later period is that of Gustaf Froding (b. i860), whose collection of poems, called Guitar and Accordion, humorous, amatory and pathetic, produced a great sensation in 1891. Three other volumes followed in 1894, 1895 and 1897, each displaying to further advantage the versatility and sensuous splendour of Froding's talent, as well as its somewhat scandalous recklessness. In 1897 he was struck down with insanity, and after three months' confinement in the asylum at Upsala, although he recovered his senses, all his joyousness and wildness had left him. He became gloomily religious, and in a new volume of poems he denounced all that he valued and enjoyed before his. conversion. A younger poet is K. G. Ossian-Nilssen (b. 1875), the author of several

volumes of vigorous dramatic and satiric verse.

The writer who was exercising most influence in Sweden at the opening of the 20th century was Verner von Heidenstam (b. 1859). He started authorship with a book of verse in 1888, after which time he led a reaction against realism and pessimism, and has turned back to a rich romantic idealism in his novels of Endymion (1889) and Hans Alienus (1892), and in his stories (1897) of the time of Charles XII. Heidenstam also published interesting volumes of literary criticism, and he is a lyrical poet of very high attainment. Miss Ellen Key (b. 1849), a secularist lecturer of great fervour, became an author in biographical and critical studies of remarkable originality. She is distinguished from Selma Lagerlof, who is simply an artist, by her exercise of pure intellect; she is a moral leader; she has been called " the Pallas of Sweden." She published in 1897 a biography of the Swedish author, Almqvist; in 1899 she collected her finest essays in the volume called Thought Pictures; in 1900 appeared, under the title Human Beings, studies of the Brownings and of Goethe ; but the finest of Ellen Key's books is The Century of Childhood (1901), a philosophical survey of the progress of elementary education in the last hundred years. She exercises a very remarkable power over the minds of the latest generation in Sweden. A polemical essayist of elaborate delicacy of style is Hjalmar Soderberg (b. 1869), who has been influenced by Strindberg and by Anatole

France. His ironic romance, Martin Birck's Youth, created a sensation in 1901. Karl Johan Warburg (b. 1852) has done good work both as an essayist and as an historian of literature. But in this latter field by far the most eminent recent name in Swedish literature is that of Professor Johan Henrik Schiick (b. 1855), who has made great discoveries in the 16th and 17th centuries, and who has published, besides a good book about Shakespeare, studies in which a profound learning is relieved by elegance of delivery. Warburg and Schiick have written an excellent history of Swedish literature down to 1888. The poet Levertin, who- was also a distinguished critic, wrote a good book about the Swedish theatre. Drama has rarely flourished in Sweden, but several of the poets mentioned above have written important plays, and, somewhat earlier, the socialistic problem- pieces of Anne Charlotte Edgren-Leffler, duchess of Cajanello (1849-1803), possessed considerable dramatic talent, working under a direct impulse from Ibsen; but her greatest gift was as a novelist. The plays of Harald Johan Molander (1858-1900) have been popular in the theatres of Sweden and Finland since his first success with Rococo in 1880.

Altogether a remarkable revival of belles-lettres has taken place in Sweden after a long period of inertness and conventionality. It is regrettable, for its own sake, that the Swedish Academy, which in earlier generations had identified itself with the manifestations of original literary genius, has closed its doors to the new writers w r ith an almost vindictive pertinacity.

Swedish Philosophy. — Swedish philosophy proper began in the I ~th century with the introduction of Cartesianism. The protagonist of the movement was J. Bilberg (1646-1717), who, in various theses and discussions, defended the new ideas against the scholastic Aristotelianism of the orthodox churchmen. A. Rydelius (1671- 1738), an intimate friend of Charles XII., endeavoured to find a common ground for the opposing schools, and the Leibnitzio- Wolffian philosophy was maintained by N. Wallerius (1706-1764). Towards the close of the 18th century, a number of thinkers began to expound the philosophy of the Enlightenment under the influence of English and French ideas — J. H. Kellgren (1751-1795), K. G. af Leopold (1756-1829), T. Thorild (1759-1808), K. A. Ehrensvard (l 745-1 800); while the Kantian dialectic was worthily defended by D. Boethius (1751-1810), whose work paved the way for a great idealistic speculative movement headed by B. Hoijer (1 767-1812), the poet P. D. A. Atterbom (1790-1855), a follower of Schelling, and J.J. Borelius (b. 1823), the great Swedish exponent of Hegelianism.

All the above thinkers reflected the general development of European thought. There exists, however, a body of thought which is the product of the peculiar genius of the Swedish people, namely, the development of the individual soul in accordance with a coherent social order and a strong religious spirit. This Personal Philosophy owes its development to K. J. Bostrom (q.v.), and, though traceable ultimately to Schelling's idealism, received its distinctive character from the investigations of N. F. Biberg (1776— 1827), S. Grubbe (1786-1853) and E. G. Geijer (q.v.) (1783-1847), all professors at Upsala. Bostrom's philosophy is logically expressed and based on the one great conception of a spiritual, eternal, immut- able Being, whose existence is absolute, above and external to the finite world of time and space. It has for a long time exercised almost unquestioned authority over Swedish thought, religious and philosophical. It is strong in its unequivocal insistence on personal purity and responsibility, and in the uncompromising simplicity of its fundamental principle. Bostrom wrote little, but his views are to be found in the works of two groups of thinkers. The older group includes S. Ribbing (1816-1899), C. Y. Sahlin (b. 1824), K. Claeson (1827-1859), H. Edfeldt (b. 1836), the editor of Bostrom's works, A. Nyblaeus (1821-1899) and P. J. H. Leander (b. 1831); the younger writers, less in agreement with one another, but adhering in the main to the same tradition, are E. O. Burman (b. 1845), K. R. Geijer (b. 1849), L. H. Aberg (1851- 1895), F. v. Scheele

(b. 1853), J. V. A. Norstrom (b. 1856), of Gothenburg, and P. E. Liljeqvist (b. 1865), of Lund. Of these, Nyblaeus compiled a lucid account of Swedish philosophy from the beginning of the 18th century up to and including Bostrom; Ribbing (Platos Ideelara and Socratische Studien) showed how closely Swedish idealism is allied to Greek. P. Wikner (1837-1888) broke away from the Bostrcmian tradition and followed out a path of his own in a more essentially religious spirit. V. Rydberg (q.v.) (1828-1895) closely followed Bostrom, and in his numerous and varied writings did much to crystallize and extend the principles of idealism. Among prominent modern writers may also be mentioned H. Larrson and A. Herrhn at Lund, and A. Vannerus in Stockholm.

Authorities.— The Svecia litterata (1680) of J. Schefferus (1621- 1679) ls the first serious attempt at a bibliography of Swedish litera- ture. The Svenska siare och skalder (Upsala, 1841-1855) contains an admirable series of portraits of Swedish writers up to the end of

the reign of Gustavus III.; many of Atterbom's judgments are reversed in the Grunddragen af Svenska vitterhetens historia (1866- 1868) of B. E. Malmstrom; and a body of excellent criticism of the subsequent period was supplied by G. Ljunggren in his Svenska vitterhetens hafder fr&n Gustaf dod (1818-1819; new ed. by Sonden III.'s. 1833), which remains a classic exposition of the views of the romanticists. The history of Swedish letters as it reflects the life of the nation is dealt with by C. R. Nyblom, Estetiska studier (Stock- holm, 1873-1884). Among general works on the subject, see H. Schiick, Svensk literaturhistoria (1885, &c.) Schiick and Warburg, Illustrerad Svensk literatur historia (1896); H. Paul, Grundriss der germanischen Philologie (new ed., Strassburg, 1901, &c). The official handbook of Sweden prepared by the Swedish Central Bureau of Statistics for the Paris Exhibition (English ed., Stockholm, 1904); Ph. Schweitzer, Geschichte der skandinavischen Litteratur, forming vol. viii. of Geschichte der Welt Litteratur in Einzeldarstellungen (Leipzig, 3 pts., 1886-1889); Oscar Levertin, Svenska Gestalter 1904- (E. G.)

SWEDENBORG (or Swedberg), EMANUEL (1688-1772), Swedish scientist, philosopher and mystic, was born at Stock- holm on the 29th of January 1688. His father, Dr Jesper Swedberg, subsequently professor of theology at Upsala and bishop of Skara, was a pious and learned man, who did not escape the charge of heterodoxy, seeing that he placed more emphasis on the cardinal virtues of faith, love and communion with God than on the current dogmas of the Lutheran Church. Having completed his university course at Upsala, in 17 10, Swedenborg undertook a European tour, visiting England, Holland, France and Germany, studying especially natural philosophy and writing Latin verses, a collection of which he published in 17 10. In 1715 he returned to Upsala, and devoted himself to

natural science and various engineering works. From 1716 to 1718 he published a scientific periodical, called Daedalus hyperboreus, a record of mechanical and mathematical inventions and discoveries. In 1716 he was introduced to Charles XII. , who appointed him assessor-extraordinary on the Swedish board of mines. His reports on smelting and assaying were remarkable for their detail and for the comparisons drawn between Swedish and other methods. Two years later he distinguished himself at the king's siege of Frederikshall by the invention of machines for the transport of boats and galleys overland from Stromstadt to Iddefjord, a distance of 14 m. The same year he published various mathematical and mechani- cal works. At the death of Charles XII. Queen Ulrica elevated him and his family to the rank of nobility, by which his name was changed from Swedberg to Swedenborg, the " en " corˆ responding to the German " von." In the Swedish House of Nobles his contributions to political discussion had great in- fluence, and he dealt with such subjects as the currency, the decimal system, the balance of trade and the liquor laws (where he was the pioneer of the Gothenburg system) with marked ability. He strongly opposed a bill for increasing the power of the crown. The next years were devoted to the duties and studies connected with his office, which involved the visitation of the Swedish, Saxon, Bohemian and Austrian mines. In 1724 he was offered the chair of mathematics in the university of Upsala, which he declined, on the ground that it was a mistake for mathematicians to be limited to theory. His in- quiring and philosophical mind gradually led him to wider studies. As early as 1721 he was seeking to lay the foundation of a scientific explanation of the universe, when he published his Prodromus principiorum rerum naturalium, and had already written his Principia in its first form. In 1734 appeared in three volumes (Opera philosophica et mineralia, the first volume of which (his Principia) contained his view of the first principles of the universe, a curious mechanical and geometrical theory of the origin of things. The other volumes dealt with (a) iron and steel, (b) copper and brass, their smelting, conversion and assaying, and chemical experiments thereon.

There is no doubt that Swedenborg anticipated many scientific facts and positions that are usually regarded as of much more modern date. It was only towards the end of the 19th century that his voluminous writings began to be properly collected and examined, with the result of proving that there was hardly one department of scientific activity in which he was not far ahead of

his time. His work on palaeontology shows him the predecessor of all the

Scandinavian geologists, and his contributions in this field alone would have been sufficient to perpetuate his fame. He was also a great physicist and had arrived at the nebular hypo- thesis theory of the formation of the planets and the sun long before Kant and Laplace. His theory of light and theory of the cosmic atoms were equally astonishing. He wrote a lucid account of the phenomena of phosphorescence, and adduced a molecular magnetic theory which anticipated some of the chief features of the hypothesis of to-day. The great French chemist, Dumas, gives him the credit for the first attempt to establish a system of crystallography. He was the first to employ mercury for the air-pump, and devised a method of determining longitude at sea by observations of the moon among the stars. He suggested the use of experimental tanks for testing the powers of ship models, invented an ear-trumpet for the deaf, improved the common house-stove of his native land, cured smoky chimneys, took a lively interest in machine-guns and even sketched a flying machine.

This flying machine consisted of a light frame covered with strong canvas and provided with two large oars or wings moving on a horizontal axis, and so arranged that the upstroke met with no resistance while the downstroke provided the lifting power. Sweden- borg knew that the machine would not fly, but suggested it as a start and was confident that the problem would be solved. He said " It seems easier to talk of such a machine than to put it into actuality, for it requires greater force and less weight than exists in a human body. The science of mechanics might perhaps suggest a means, namely, a strong spiral spring. If these advantages and requisites are observed, perhaps in time to come some one might know how better to utilize our sketch and cause some addition to be made so as to accomplish that which we can only suggest. Yet there are sufficient proofs and examples from nature that such flights can take place without danger, although when the first trials are made you may have to pay for the experience, and not mind an arm or leg." •

In 1734 he also published Prodromus philosophiae ratio- cinantis de infinito et causa finali crealionis, which treats of the relation of the finite to the infinite, and of the soul to the body, seeking to establish a nexus in each case as a means of overcoming the difficulty of their relation. From this time he applied himself to the problem of discovering the nature of soul and spirit by means of anatomical studies. In all his researches he acknowledged and contended for the existence and the supremacy of the spiritual and the divine. He travelled in Germany, France and Italy, in quest of the most eminent teachers and the best books dealing with the human frame, and published, as the results of his inquiries among other works, his Oeconomia regni animalis (London, 1740-1741) and Regnum animate (the Hague, 1 744-1 745; London, 1745). In no field were Swedenborg's researches more noteworthy than in those of physio- logical

science. In 1001, Professor Max Neuberger of Vienna called attention to certain anticipations of modern views made by Swedenborg in relation to the functions of the brain. The university of Vienna appealed to the Royal Swedish Academy for a complete issue of the scientific treatises, and this resulted in the formation of a committee of experts who have been entrusted with the task. It is clear that Swedenborg showed (150 years before any other scientist) that the motion of the brain was synchronous with the respiration and not with the action of the heart and the circulation of the blood, a discovery the full bearings of which are still far from being realized. He had arrived at the modern conception of the activity of the brain as the combined activity of its individual cells. The cere- bral cortex, and, more definitely, the cortical elements (nerve cells), formed the seat of the activity of the soul, and were ordered into departments according to various functions. His views as to the physiological functions of the spinal cord are also in agreement with recent research, and he anticipated many of the pre-eminent offices of the ductless glands which students of the present time are only beginning to discover.

Up to middle age Swedenborg's position was that of a scholar, a scientist, a practical administrator, a legislator, and a man of affairs. But a profound change was coming over him, which led him to leave the domain of physical research for that of

psychical and spiritual inquiry. Neither by geometrical, nor physical, nor metaphysical principles had he succeeded in reach- ing and grasping the infinite and the spiritual, or in elucidating their relation to man and man's organism, though he had caught glimpses of facts and methods which he thought only required confirmation and development. Late in life he wrote to Oetinger that " he was introduced by the Lord first into the natural sciences, and thus prepared, and, indeed, from the year 1710 to 1745, when heaven was opened to him." This latter great event is described by him in a letter to Thomas Hartley, rector of Winwick, as " the opening of his spiritual sight," " the mani- festation of the Lord to him in person," " his introduction into the spiritual world." Before his illumination he had been instructed by dreams, and enjoyed extraordinary visions, and heard mysterious conversations. According to his own account, the Lord filled him with His spirit to teach the doctrines of the New Church by the word from Himself; He commissioned him to do this work, opened the sight of his spirit, and so let him into the spiritual world, permitting him to see the heavens and the hells, and to converse with angels and spirits for years; but he never received anything relating to. the doctrines of tlie church from any angel but from the Lord alone while he was reading the word (True Christian Religion, No. 779). He elsewhere speaks of his office as principally an opening of the spiritual sense of the word. His friend Robsahm reports, from Swedenborg's own account to him, the

circumstances of the first extraordinary revelation of the Lord, when He appeared t to him and said, " I am God the Lord, the Creator and Redeemer of the world. I have chosen thee to unfold the spiritual sense of the Holy Scripture. I will Myself dictate to thee what thou shalt write." From that time he gave up all worldly learning and laboured solely to expound spiritual things. In the year 1747, to the great regret of his colleagues, he resigned his post of assessor of the board of mines that he might devote himself to his higher vocation, requesting only to be allowed to receive as a pension the half of his salary. He took up afresh his study of Hebrew, and began his voluminous works on the interpretation of the Scriptures. His life from 1747 was spent alternately in Sweden, Holland and London, in the composition of his works and their publication, till his death, which took place in London on the 29th of March 1772. He was buried in the Swedish church in Princes Square, in the parish of St George's-in-the- East, and on the 7th of April 1908 his remains were removed at the request of the Swedish government to Stockholm.

Swedenborg was a man who won the respect, confidence and love of all who came into contact with him. Though people might disbelieve in his visions, they feared to ridicule them in his presence. Those who talked with him felt that he was truth itself. He never disputed on matters of religion, and if obliged to defend himself, did it with gentleness and in a few words. His manner of life was simple in the extreme ; his diet consisted chiefly of bread and milk and large quantities of coffee. He paid no attention to the distinc- tion of day and night, and sometimes lay for days together in a trance, while his servants were often disturbed at night by hearing what he called his conflicts with evil spirits. But his intercourse with spirits was often perfectly calm, in broad daylight, and with all his faculties awake. Three extraordinary instances are produced by his friends and followers in proof of his seership and admission into the unseen world. But there exists no account at first hand of the exact facts, and Swedenborg's own reference to one of these instances admits of another explanation than the supernatural one. Immanuel Kant was struck by them in 1763, but in 1765, after further inquiries, concluded that two of them had " no other foundation than common report (gemeine Sage)." See Kehrbach's edition of Kant's Traume eines Geistersehers (Leipzig, 1880).

As a theologian Swedenborg never attempted to preach or to found a sect. He believed that members of all the churches could belong to the New Church without forming a separate organization. His theological writings roughly fall into four groups: (1) books of spiritual philosophy, including The Divine Love and Wisdom, The Divine Providence, The Intercourse between the Soul and the Body, Conjugial Love; (2) Expository, including Arcana Celestia (giving the spiritual sense of Genesis and Exodus), The Apocalypse Revealed, The Apocalypse Explained; (3) Doctrinal, including

The New Jerusalem and its Heavenly Doctrines, The Four Chief Doctrines, The Doctrine of Charity, The True Christian Religion, Canons of the New Church; (4) Eschatological, including Heaven and Hell, and The Last Judgment. About forty volumes are available in English, and many have been translated into most

of the European languages as well as into Arabic, Hindi and Japanese.

Swedenborg's theosophic system is most briefly and comprehen- sively presented in his Divine Love and Wisdom. The point of view from which God must be regarded is that of His being the Divine Man. His esse is infinite love; His manifestation, form or body is infinite wisdom. Divine love is the self-subsisting life of the universe. From God emanates a divine sphere, which appears in the spiritual world as a sun, and from this spiritual sun again proceeds the sun of the natural world. The spiritual sun is the source of love and intelligence, or life, and the natural sun the source of nature or the receptacles of life; the first is alive, the second dead. The two worlds of nature and spirit are perfectly distinct, but they are intimately related by analogous substances, laws and forces. Each has its atmospheres, waters and earths, but in the one they are natural and in the other spiritual. In God there are three infinite and uncreated " degrees " of being, and in man and all things corresponding three degrees, finite and created. They are love, wisdom, use; or end, cause and effect. The final ends of all things are in the Divine Mind, the causes of all things in the spiritual world, and their effects in the natural world. By a love of each degree man comes into conjunction with them and the worlds of nature, spirit and God. The end of creation is that man may have this conjunction and become the image of his Creator and creation. In man are two receptacles for God — the will for divine love and the understanding for divine wisdom — that love and wisdom flowing into both so that they become human. Before the fall this influx was free and unhindered, and the con- junction of man with God and the creation complete, but from that time the connexion was interrupted and God had to interpose by successive dispensations. At last the power and influence of the spirits of darkness, with whom man associates himself by his sin, became so great that the existence of the human race was threatened, and Jehovah was necessitated to descend into nature to restore ˆhe connexion between Himself and man. He could not come in His unveiled divinity, for the " hells " would have then perished, whom he did not seek to destroy but only to subjugate. Another purpose of Jehovah's incarnation was the manifestation of His divine love more fully than ever before. Swedenborg wholly rejects the

orthodox doctrine of atonement; and the unity of God, as opposed to his idea of the trinity of the church, is an essential feature of his teaching. Another distinctive feature is that Jehovah did not go back to heaven without leaving behind him a visible repre- sentative of Himself in the word of the Scripture. This word is an eternal incarnation, with its threefold sense — natural, spiritual, celestial. And Swedenborg is the divinely commissioned expounder of this threefold sense of the word, and so the founder of the New Church, the paraclete of the last dispensation. That he might perceive and understand the spiritual and the celestial senses of the word he enjoyed immediate revelation from the Lord, was admitted into the angelic world, and had committed to him the key of " correspondences " with which to unlock the divine treasures of wisdom. Swedenborg claimed also to have learnt by his admis- sion into the spiritual world the true states of men in the next life, the scenery and occupations of heaven and hell, the true doctrine of Providence, the origin of evil, the sanctity and perpetuity of marriage and to have been a witness of the " last judgment," or the second coming of the Lord, which is a contemporary event. " All religion," he said, " has relation to life, and the life of religion is to do good." " The kingdom of Heaven is a kingdom of uses." He exercised a great influence over S. T. Coleridge, Robert and Elizabeth Browning, Coventry Patmore, Henry Ward Beecher and Thomas Carlyle. And the attention of modern psychologists is now being drawn to his doctrine of the relation of the elements of the universe to the membranes of the body.

Swedenborgianism, as professed by Swedenborg's followers, is based on the belief of Swedenborg's claims to have witnessed the last judgment, or the second advent of the Lord, with the inaugura- tion of the New Church, through the new system of doctrine promul- gated by him and derived from the Scriptures, into the true sense of which he was the first to be introduced. The " doctrines " of the New Church as given in the Liturgy (which also contains the " Creed " and " Articles of Faith ") are as follows: —

1. That there is one God, in whom there is a Divine Trinity; and that He is the Lord Jesus Christ.

2. That a saving faith is to believe on Him.

3. That evils are to be shunned, because they are of the devil and from the devil.

4. That good actions are to be done, because they are of God and from God.

5. That these are to be done by a man as from himself ; but that it ought to

be believed that they are done from the Lord with him and by him.

Swedenborgians now constitute a widely spread and considerable society, with a regularly constituted ecclesiastical organization and a zealous missionary activity (see New Jerusalem Church).

See R. L. Tafel, Documents concerning the Life and Character of Swedenborg, collected, translated and annotated (3 vols., Swedenborg Society, 1875-1877); J. Hyde, A Bibliography of the Works of Emanuel Swedenborg (743 pp., Swedenborg Society). Of English

lives the principal are those by J. J. G. Wilkinson (London, 1849) ; E. Paxton Hood (London, 1854); William White (1856, rewritten in 1867 and in 1868); G. Trobridge (London, 1907); also Emanuel Swedenborg, the Spiritual Columbus, a Sketch, by U. S. E. (2nd ed., London, 1877). Some of his writings, e.g. The Divine Providence and Heaven and Hell have been published in popular editions. A useful handbook of Swedenborg's theology is the Compendium of the Theo- logical Writings of Emanuel Swedenborg by the Rev. Samuel Warren (London, 1885). Summaries of his system and writings are given in all the above biographies, also in Edmund Swift, Manual of the Doctrines of the New Church (London, 1885) ; and T. Parsons, Out- lines of Swedenborg' s Religion and Philosophy. Important critiques from independent points of view are " The Mystic," in R. W. Emerson's Representative Men (1850) ; Kant's Traume eines Geister- sehers (1766; the best edition by Kehrbach, Leipzig, 1880); J. G. Herder's " Emanuel Swedenborg," in his Adrastea {Werke zur Phil. und Gesch., xii. 1 10-125); J. J. von Goerres's Emanuel Swedenborg, seine Visionen und sein Verhdltniss zur Kirche (1827); A. Dorner's Geschichte der protestantischen Theologie, pp. 662-667 (Munich, 1867). See also Transactions of the International Swedenborg Congress (London, 1910), summarized in The New Church Magazine (August, 1910). (A. J. G.)

SWEETBREAD, a popular term for certain glands of animals, particularly when used as articles of food; these are usually the pancreas, the " stomach-sweetbread " of butchers, and the thymus, or " breast sweetbread." The term is also sometimes used to include the salivary and lymphatic glands (see Duct- less Glands, Pancreas and Lymphatic System).

SWEET POTATO. This plant, known botanically as Ipomaea batatas (formerly as Convolvulus batatas), and a member of the natural order Convolvulaceae, is generally cultivated in most tropical countries for the sake of its tuberous root, which is an article of diet greatly in request. It is a climbing perennial with entire or palmately-lobed leaves very variable in shape borne on slender twining stems. The flowers are borne on long stalks in loose clusters or cymes, and have a white or rosy funnel- shaped corolla

like that of the common bindweed of English hedges. The edible portion is the root, which dilates into large club-shaped masses filled with starch. It is ill suited to the climate of the United Kingdom, but in tropical countries it is as valuable as the potato is in higher latitudes. The plant is not known in a truly wild state, nor has its origin been ascer- tained. A. de Candolle concludes that it is in all probability of American origin, where it has been cultivated from pre- historic times by the aborigines. It is mentioned by Gerard as the " potato," or " potatus " or " potades," in contra- distinction to the " potatoes " of Virginia (Solanum tuberosum). He grew it in his garden, but the climate was not warm enough to allow it to flower, and in winter it perished and rotted. But as the appellation " common " is applied to them the roots must have been introduced commonly, Gerard tells us he bought those that he planted at " the Exchange in London," and he gives an interesting account of the uses to which they were put, the manner in which they were prepared as " sweetmeats," and the invigorating properties assigned to them. The allusions in the Merry Wives of Windsor and other of Shake- speare's plays in all probability refer to this plant, and not to what we now call the " potato." The plants require a warm sunny climate, long season, and a liberal supply of water during the growing season. For an account of the cultivation in North America, where large quantities are grown in the Southern states, see L. H. Bailey, Cyclopaedia of American Horticulture (1902). Sir George Watt, Dictionary of the Economic Products of India (1890), gives an account of its cultivation in India, where some confusion has arisen by the use of the name batatas for the yam (q.v.) ; the author suggests that the introduction of the sweet potato into India is comparatively recent.

SWEET-SOP, or Sugar Apple, botanical name Anona squamosa, a small tree or shrub with thin oblong-ovate leaves, solitary greenish flowers and a yellowish-green fruit, like a shortened pine cone in shape with a tubercle corresponding to each of the carpels from the aggregation of which it has been formed. The fruit is 3 to 4 in. in diameter and contains a sweet creamy- yellow custard-like pulp. It is a native of the West Indies and tropical America; it is much prized as a fruit, and has been widely introduced into the eastern hemisphere.

Another species, A. muricala, is the sour-sop, a small ever- green tree bearing a larger dark-green fruit, 6 to 8 in. long and i to 5 lb in weight, oblong or bluntly conical in shape, with a rough spiny skin and containing a soft white juicy sub- acid pulp with a flavour of turpentine. It is a popular fruit in the West Indies, where it is native, and is grown with special

excellence in Porto Rico. A drink is made from the juice. A. reticulata is the custard apple (q.v.) and A. palustris the alligator apple.

SWELLENDAM, a town of South Africa, Cape province, in the valley of the Breede River, 192 m. by rail E. by S. of Cape Town. Pop. (1904), 2406, of whom 1 139 were white. Swellen- dam is one of the older Dutch settlements in the Cape, dating from 1745, and was named after Hendrik Swellengrebel (then governor of the Cape) and his wife, whose maiden name was Damme. Early in 1795 the burghers of the town and district rose in revolt against the Dutch East India Company, pro- claimed a " free republic," and elected a so-styled national assembly. At the same time the burghers of Graaff Reinet also rebelled against the Cape authorities, who were powerless to suppress the insurrectionary movement. One of the claims of the " free republic " was " the absolute and unconditional slavery of all Hottentots and Bushmen." In September of that year Cape Town surrendered to the British and the " National " party at Swellendam quietly accepted British rule.

The town is a trading centre of some importance, and in the surrounding district are large sheep and ostrich farms. The neighbourhood is noted for its abundance of everlasting flowers.

SWETCHINE, MADAME (1782-1857), Russian mystic, whose maiden name was Soymanof, was born in Moscow, and under the influence of Joseph de Maistre became a member of the Roman Catholic Church in 181 5. In the following year she settled in Paris where, until her death, she maintained a famous salon remarkable no less for its high courtesy and intellectual brilliance than for its religious atmosphere. Though not physically beautiful she had a personality of rare spiritual charm, nurtured in the private chapel of her house. Her hus- band, General Swetchine, was 25 years her senior. Her Life and Works (of which the best known are " Old Age " and " Resigna- tion ") were published by M. de Falloux (2 vols., i860) and her Letters by the same editor (2 vols., 1861).

See Sainte-Beuve, Nouveaux lundis, vol. i.; and E. Scherer, £tudes sur la litterature contemporaine, vol. i.

SWEYN I., King of Denmark (1014), son of Harold Bluetooth, the christianizer of Denmark, by his peasant mistress Aesa, according to the Jomsvikinga Saga, though more probably his mother was Queen Gunild, Harold's consort. The lad was a born champion and buccaneer. His first military expedition, in alliance with the celebrated Jomsborg Viking, Palnatoke, was against his own father, who perished during the struggle (c. 986). Six years later he conducted a large fleet of warships to England, which did infinite damage, but failed to capture London. During his

absence, Denmark was temporarily occu pied by the Swedish king, Eric Sersel, on whose death (c. 994) Sweyn recovered his patrimony. About the same time he repudiated his first wife Gunild, daughter of duke Mieszko of Poland, and married King Eric's widow, Sigrid. This lady was a fanatical pagan of a disquieting strength of character. Two viceroys, earlier wooers, were burned to death by her orders for their impertinence, and she refused the hand of Olaf Trygvesson, king of Norway, rather than submit to baptism, whereupon the indignant monarch struck her on the mouth with his gauntlet and told her she was a worse pagan than any dog. Shortly afterwards she married 'Sweyn, and easily persuaded her warlike husband to unite with Olaf, king of Sweden, against Olaf Trygvesson, who fell in the famous sea-fight off Svolde (1000) on the west coast of Rugen, after a heroic resistance immortalized by the sagas, whereupon the confederates divided his kingdom between them. After his first English expedition Sweyn was content to blackmail England instead of ravaging it, till the ruthless massacre of the Danes on St Brice's day, the 3rd of November 1002, by Ethelred the Unready (Sweyn's

sister was among the victims) brought the Danish king to Exeter (1003). During each of the following eleven years, the Danes, materially assisted by the universal and shameless disloyalty of the Saxon ealdormen, systematically ravaged England, and from 991 to 1014 the wretched land is said to have paid its invaders in ransoms alone £158,000. Sweyn died suddenly at Gainsborough on the 13th of February 1014. The data relating to his whole history are scanty and obscure, and his memory has suffered materially from the fact that the chief chroniclers of his deeds and misdeeds were ecclesiastics. It was certainly unfortunate that he began life by attacking his own father. It is undeniable that his favourite wife was the most stiff-necked pagan of her day. His most remarkable exploit, Svolde, was certainly won at the expense of Christianity, resulting, as it did, in the death of the saintly Olaf. Small wonder, then, if Adam of Bremen, and the monkish annalists who follow him, describe Sweyn as a grim and bloody semi-pagan, perpetually warring against Christian states. But there is another side to the picture. Viking though he was, Sweyn was certainly a Christian viking. We know that he built churches; that he invited English bishops to settle in Denmark (notably Godibald, who did good work in Scania); that on his death-bed he earnestly commended the Christian cause to his son Canute. He was cruel to his enemies no doubt, but he never forgot a benefit. Thus he rewarded the patriotism of the Danish ladies who sacrificed all their jewels to pay the heavy ransom exacted from him by his captors, the Jomsborg pirates, by enacting a law whereby women were henceforth to inherit landed property in the same way as their male relatives. Of his valour as a captain and his capacity as an administrator there can be no question. His comrades adored him for his liberality, and

the frequent visits of Icelandic skalder to his court testify to a love of poetry on his part, indeed one of his own strophes has come down to us. As to his personal appearance we only know that he had a long cleft beard, whence his nickname of Tiugeskaeg or Fork-Beard.

See Danmarks riges historic Oldtiden og den celdre middelalder, pp. 364-381 (Copenhagen, 1897-1905). (R. N. B.)

SWIFT, JONATHAN (1667-1745), dean of St Patrick's, Dublin, British satirist, was born at No. 7 Hoey's Court, Dublin, on the 30th of November 1667, a few months after the death of his father, Jonathan Swift (1640-1667), who married about 1664 Abigaile Erick, of an old Leicestershire family. He was taken over to England as an infant and nursed at Whitehaven, whence he returned to Ireland in his fourth year. His grandfather, Thomas Swift, vicar of Goodrich near Ross, appears to have been a doughty member of the church militant, who lost his possessions by taking the losing side in the Civil War and died in 1658 before the restoration could bring him redress. He married Elizabeth, niece of Sir Erasmus Dryden, the poet's grandfather. Hence the familiarity of the poet's well-known " cooling-card " to the budding genius of his kinsman Jonathan: " Cousin Swift, you will never be a poet." The young Jonathan was educated mainly at the charges of his uncle Godwin, a Tipperary official, who was thought to dole out his help in a somewhat grudging manner. In fact the apparently prosperous relative was the victim of unfortunate speculations, and chose rather to be reproached with avarice than with imprudence. The youth was resentful of what he regarded as curmudgeonly treatment, a bitterness became ingrained and began to corrode his whole nature; and although he came in time to grasp the real state of the case he never mentioned his uncle with kindness or regard. At six he went to Kilkenny School, where Congreve was a schoolfellow; at fourteen he entered pensioner at Trinity College, Dublin, where he seems to have neglected his opportunities. He was referred in natural, philosophy, including mathematics, and obtained his degree only by a special but by no means infrequent act of indul- gence. The patronage of his uncle galled him : he was dull and unhappy. We find in Swift few signs of precocious genius. As with Goldsmith, and so many other men who have become artists of the pen, college proved a stepmother to him.

In 1688 the rich uncle, whose supposed riches had dwindled

so much that at his death he was almost insolvent, died, having decayed, it

would seem, not less in mind than in body and estate, and Swift sought counsel of his mother at Leicester. After a brief residence with his mother, who was needlessly alarmed at the idea of her son falling a victim to some casual coquette, Swift towards the close of 1689 entered upon an engagement as secretary to Sir William Temple, whose wife (Dorothy Osborne) was distantly related to Mrs Swift. It was at Moor Park, near Farnham, the residence to which Temple had retired to cultivate apricots after the rapid decline of his influence during the critical period of Charles II. 's reign (1679-1681), that Swift's acquaint- ance with Esther Johnson, the " Stella " of the famous Journal, was begun. Stella's mother was living at Moor Park, as servant or dame de compagnie of Temple's strong-minded sister, Lady Giffard. Swift was twenty-two and Esther eight years old at the time, and a curious friendship sprang up between them. He taught the little girl how to write and gave her advice in reading. On his arrival at Moor Park, Swift was, in his own words, a raw, inexperienced youth, and his duties were merely those of account- keeper and amanuensis: his ability gradually won him the con- fidence of his employer, and he was entrusted with some impor- tant missions. He was introduced to William III. during that monarch's visit to Sir William's, and on one occasion accompanied the king in his walks round the grounds. In 1693 Temple sent him to try and convince the king of the inevitable necessity of triennial parliaments. William remained unconvinced and Swift's vanity received a useful lesson. The king had previously taught him " how to cut asparagus after the Dutch fashion." Next year, however, Swift (who had in the meantime obtained the degree of M.A. ad eundem at Oxford) quitted Temple, who had, he considered, delayed too long in obtaining him preferment. A certificate of conduct while under Temple's roof was required by all the Irish bishops he consulted before they would proceed in the matter of his ordination, and after five months' delay, caused by wounded pride, Swift had to kiss the rod and solicit in obsequious terms the favour of a testimonial from his discarded patron. Forgiveness was easy to a man of Temple's elevation and temperament, and he not only despatched the necessary recom- mendation but added a personal request which obtained for Swift the small prebend of Kilroot near Belfast (January 1695), where the new incumbent carried on a premature flirtation with a Miss Jane Waring, whom he called " Varina." In the spring of 1696 he asked the reluctant Varina to wait until he was in a position to marry. Just four years later he wrote to her in terms of such calculated harshness and imposed such conditions as to make further intercourse virtually impossible.

In the meantime he had grown tired of Irish life and was glad to accept Temple's proposal for his return to Moor Park, where he continued until Temple's death in January 1699. During this period he wrote much and burned most of what he had written. He read and learned even more than

he wrote. Moor Park took him away from brooding and glooming in Ireland and brought him into the corridor of contemporary history, an intimate acquaintance with which became the chief passion of Swift's life. His Pindaric Odes, written at this period or earlier, in the manner of Cowley, indicate the rudiments of a real satirist, but a satirist struggling with a most uncongenial form of expression. Of more importance was his first essay in satiric prose which arose directly from the position which he occupied as domestic author in the Temple household. Sir William had in 1692 pub- lished his Essay upon Ancient and Modern Learning, transplant- ing to England a controversy begun in France by Fontenelle. Incidentally Temple had cited the letters of Phalaris as evidence of the superiority of the Ancients over the Moderns. Temple's praise of Phalaris led to an Oxford edition of the Epistles nomin- ally edited by Charles Boyle. While this was preparing, William Wotton, in 1694, wrote his Reflections upon Ancient and Modern Learning, traversing Temple's general conclusions. Swift's Battle of the Books was written in 1697 expressly to refute this. Boyle's Vindication and Bentley's refutation of the authenticity of Phalaris came later. Swift's aim was limited to co-operation in what was then deemed the .well-deserved putting down of xxvi. 8

Bentley by Boyle, with a view to which he represented Bentley and Wotton as the representatives of modern pedantry, trans- fixed by Boyle in a suit of armour given him by the gods as the representative of the " two noblest of things, sweetness and light." The satire remained unpublished until 1704, when it was issued along with The Tale of a Tub. Next year Wotton declared that Swift had borrowed his Combat des livres from the Histoire poetique de la guerre nouvellement declarSe entre les anciens et les modemes (Paris, 1688). He might have derived the idea of a battle from the French title, but the resemblances and parallels between the two books are slight. Swift was manifestly extremely imperfectly acquainted with the facts of the case at issue. Such data as he displays may well have been derived from no authority more recondite than Temple's own essay.

In addition to £100, Temple left to Swift the trust and profit of publishing his posthumous writings. Five volumes appeared in 1700, 1703 and 1709. The resulting profit was small, and Swift's editorial duties brought him into acrimonious relation with Lady Giffard. The dedication to King William was to have procured Swift an English prebend, but this miscarried owing to the negligence or indifference of Henry Sidney, earl of Romney. Swift then accepted an offer from Lord Berkeley, who in the summer of 1699 was appointed one of the lords justices of Ireland. Swift was to be his chaplain and secretary, but upon reaching Ireland Berkeley gave the secretaryship to a Mr Bushe, who had persuaded him that it was an unfit post for a clergyman. The rich deanery of Derry then became vacant and Swift applied for it. The secretary had already accepted a bribe, but Swift

was informed that he might still have the place for £1000. With bitter indignation Swift denounced the simony and threw up his chaplaincy, but he was ultimately reconciled to Berkeley by the presentation to the rectory of Agher in Meath with the united vicarages of Laracor and Rathbeggan, to which was added the prebend of Dunlavin in St Patrick's — the total value being about £230 a year. He was now often in Dublin, at most twenty miles distant, and through Lady Berkeley and her daughters he became the familiar and chartered satirist of the fashionable society there. At Laracor, near Trim, Swift rebuilt the parsonage, made a fish-pond, and planted a garden with poplars and willows, bordering a canal. His congregation consisted of about fifteen persons, " most of them gentle and all of them simple." He read prayers on Wednesdays and Fridays to himself and his clerk, beginning the exhortation " Dearly beloved Roger, the Scripture moveth you and me in sundry places." But he soon began to grow tired of Ireland again and to pay visits in Leicester and London. The author of the Tale of a Tub, which he had had by him since 1696 or 1698, must have felt conscious of powers capable of far more effective exercise than reading-desk or pulpit at Laracor could supply; and his resolution to exchange divinity for politics must appear fully justified by the result. The Discourse on the Dissensions in Athens and Rome (September 1701), written to repel the tactics of the Tory commons in their attack on the Partition Treaties " without humour and without satire," and intended as a dissua- sive from the pending impeachment of Somers, Orford, Halifax and Portland, received the honour, extraordinary for the maiden publication of a young politician, of being generally attributed to Somers himself or to Burnet, the latter of whom found a public disavowal necessary. In April or May 1 704 appeared a more remarkable work. Clearness, cogency, masculine simplicity of diction, are conspicuous in the pamphlet, but true creative power told the Tale of a Tub. " Good God ! what a genius I had when I wrote that book ! " was his own exclamation in his latter years. It is, indeed, if not the most amusing of Swift's satirical works, the most strikingly original, and the one in which the compass of his powers is most fully displayed. In his kindred productions he relics mainly upon a single element of the humorous — logical sequence and unruffled gravity bridling in an otherwise frantic absurdity, and investing it with an air of sense. In the Tale of a Tub he lashes out in all directions. The humour, if less cogent and cumulative, is richer and more varied; the invention, too,

is more daringly original and more completely out of the reach of ordinary

faculties. The supernatural coats and the quintes- sential loaf may be paralleled but cannot be surpassed; and the book is throughout a mine of suggestiveness, as, for example, in the anticipation of Carlyle's clothes philosophy within the compass of a few lines. At the same time it wants unity and coherence, it attains no conclusion, and the author abuses his digressive method of composition and his convenient fiction of hiatuses in the original manuscript. The charges it occasioned of profanity and irreverence were natural, but groundless. There is nothing in the book inconsistent with Swift's professed and real character as a sturdy Church of England parson, who accepted the doctrines of his Church as an essential constituent of the social order around him, battled for them with the fidelity of a soldier defending his colours, and held it no part of his duty to understand, interpret, or assimilate them.

In February 1701 Swift took his D.D. degree at Dublin, and before the close of the year he had taken a step destined to exercise a most important influence on his life, by inviting two ladies to Laracor. Esther, daughter of a merchant named Edward Johnson, a dependant, and legatee to a small amount, of Sir William Temple's (born in March 1680), whose acquaintance he had made at Moor Park in 1689, and whom he has immortalized as "Stella," 1 came over with her companion Rebecca Dingley, a poor relative of the Temple family, and was soon permanently domiciled in his neighbourhood. The melancholy tale of Swift's attachment will be more conveniently narrated in another place, and is only alluded to here for the sake of chronology. Mean- while the sphere of his intimacies was rapidly widening. He had been in England for three years together, 1701 to 1704, and counted Pope, Steele and Addison among his friends. The success of his pamphlet gained him ready access to all Whig circles, but already his confidence in that party was shaken, and he was beginning to meditate that change of sides which has drawn down upon him so much but such unjustifiable obloquy. The true state of the case may easily be collected from his next publications — The Sentiments of a Church of England Man, and On the Reasonableness of a Test (1708). The vital differences among the friends of the Hanover succession were not political, but ecclesiastical. From this point of view Swift's sympathies were entirely with the Tories. As a minister of the Church he felt his duty and his interest equally concerned in the support of her cause; nor could he fail to discover the inevitable tendency of Whig doctrines, whatever caresses individual Whigs might bestow on individual clergymen, to abase the Establishment as a corporation. He sincerely believed that the ultimate purpose of freethinkers was to escape from moral restraints, and he had an unreasoning antipathy to Scotch Presbyterians and English Dissenters. If Whiggism could be proved to entail Dissent, he was prepared to abandon it. One of his pamphlets, written about this time, contains his recipe for the

promotion of religion, and is of itself a sufficient testimony to the extreme materialism of his views. Censorships and penalties are among the means he recommends. His pen was exerted to better purpose in the most consummate example of his irony, the Argument to prove that the abolishing of Christianity in England may, as things now stand, be attended with some inconveniencies (1708). About this time, too (November 1707), he produced his best narrative poem, Baucis and Philemon, while the next few months witnessed one of the most amusing hoaxes ever perpetrated against the quackery of astrologers. In his Almanac for 1707 a Protestant alarmist and plot vaticinator styled John Partridge warned customers against rivals and impostors. This notice attracted Swift's attention, and in January 1708 he issued predictions for the ensuing year by Isaac Bickerstaff, written to prevent the people of England being imposed upon by vulgar almanac makers. In this brochure he predicts solemnly that on the 29th of March

1 The name " Stella " is simply a translation of Esther. Swift may have learned that Esther means " star " from the Elementa linguae persicae of John Grsaves or from some Persian scholar; but he is more likely to have seen the etymology in the form given from Jewish sources in Buxtorf's Lexicon, where the interpretation takes the more suggestive form " Stella Veneris."

at n o'clock at night Partridge the almanac maker should infallibly die of a raging fever. On the 30th of March he issued a letter confirming Partridge's sad fate. Grub Street elegies on the almanac maker were hawked about London. Partridge was widely deplored in obituary notices and his name was struck off the rolls at Stationers' Hall. The poor man was obliged to issue a special almanac to assure his clients and the public that he was not dead: he was fatuous enough to add that he was not only alive at the time of writing, but that he was also demonstrably alive on the day when the knave Bickerstaff (a name borrowed by Swift from a sign in Long Acre) asserted that he died of fever. This elicited Swift's most amusing Vindication of Isaac Bicker- staff Esq. in April 1 709. The laughter thus provoked extinguished the Predictions for three years, and in 1715 Partridge died in fact ; but the episode left a permanent trace in classic literature, for when in 1709 Steele was to start the Taller, it occurred to him that he could secure the public ear in no surer way than by adopting the name of Bickerstaff.

From February 1708 to April 1709 Swift was in London, urging upon the Godolphin administration the claims of the Irish clergy to the first-fruits and twentieths (" Queen Anne's Bounty "), which brought in about £2500 a year, already granted to their brethren in England. 2 His having been selected for such a commission shows that he was not yet regarded as a

deserter from the Whigs, although the ill success of his represen- tations probably helped to make him one. By November 17 10 he was again domiciled in London, and writing his Journal to Stella, that unique exemplar of a giant's playfulness, "which was written for one person's private pleasure and has had indestruc- tible attractiveness for every one since." In the first pages of this marvellously minute record of a busy life we find him depicting the decline of Whig credit and complaining of the cold reception accorded him by Godolphin, whose penetration had doubtless detected the precariousness of his allegiance. Within a few weeks he had become the lampooner of the fallen treasurer, the bosom friend of Oxford and Bolingbroke, and the writer of the Examiner, a journal established as the exponent of Tory views (November 1 7 10) . He was now a power in the state, the intimate friend and recognized equal of the first writers of the day, the associate of ministers on a footing of perfect cordiality and familiarity. " We were determined to have you," said Boling-broke to him afterwards; " you were the only one we were afraid of." He gained his point respecting the Irish endowments; and, by his own account, his credit procured the fortune of more than forty deserving or undeserving clients. The envious but graphic description of his demeanour conveyed to us by Bishop Kennet attests the real dignity of his position no less than the airs he thought fit to assume in consequence. The cheerful, almost jovial, tone of his letters to Stella evinces his full contentment, nor was he one to be moved to gratitude for small mercies. He had it, in fact, fully in his own power to determine his relations with the ministry, and he would be satisfied with nothing short of familiar and ostentatious equality. His advent marks a new era in English political life, the age of public opinion, created indeed by the circumstances of the time, but powerfully fostered and accelerated by him. By a strange but not infrequent irony of fate the most imperious and despotic spirit of his day laboured to enthrone a power which, had he himself been in authority, he would have utterly detested and despised. For a brief time he seemed to resume the whole power of the English press in his own pen and to guide public opinion as he would. His services to his party as writer of the Examiner, which he quitted in July 1 71 1, were even surpassed by those which he rendered as the author of telling pamphlets, among which The Conduct of the Allies and of the Late Ministry, in beginning and carrying on the Present War, and Remarks on the Barrier Treaty (November and December 1711) hold the first rank. In truth, however, he was lifted by the wave he seemed to command. Surfeited with glory,

2 The grant of the first-fruits was to be made contingent on a concession from the Irish clergy in the shape of the abolition of the sacramental test. This Swift would not agree to. He ultimately won his point from Harley, and his success marks his open rupture with the Whigs.

which it began, after Malplaquet, to think might be purchased at too heavy a cost, the nation wanted a convenient excuse for relinquishing a burdensome war, which the great military genius of the age was suspected of prolonging to fill his pockets. The Whigs had been long in office. The High Church party had derived great strength from the Sacheverell trial. Swift did not bring about the revolution with which, notwithstanding, he associated his name. There seems no reason to suppose that he was consulted respecting the great Tory strokes of the creation of the twelve new peers and the dismissal of Marlborough (Decem- ber 1 711), but they would hardly have been ventured upon if The Conduct of the Allies and the Examiners had not prepared the way. A scarcely less important service was rendered to the ministry by his Letter to the October Club, artfully composed to soothe the impatience of Harley's extreme followers. He had every claim to the highest preferment that ministers could give him, but his own pride and prejudice in high places stood in his way.

Generous men like Oxford and Bolingbroke cannot have been unwilling to reward so serviceable a friend, especially when their own interest lay in keeping him in England. Harley by this time was losing influence and was becoming chronically incapable of any sustained effort. Swift was naturally a little sore at seeing the see of Hereford slipping through his fingers. He had already lost Waterford owing to the prejudice against making the author of the Tale of a Tub a bishop, and he still had formidable antagon- ists in the archbishop of York, whom he had scandalized, and the duchess of Somerset, whom he had satirized. Anne was particu- larly amenable to the influence of priestly and female favourites, and it must be considered a proof of the strong interest made for Swift that she was eventually persuaded to appoint him to the deanery of St Patrick's, Dublin, vacant by the removal of Bishop Sterne to Dromore. It is to his honour that he never speaks of the queen with resentment or bitterness. In June 17 13 he set out to take possession of his dignity, and encountered a very cold reception from the Dublin public. The dissensions between the chiefs of his party speedily recalled him to England. He found affairs in a desperate condition. The queen's demise was evidently at hand, and the same instinctive good sense which had ranged the nation on the side of the Tones, when Tories alone could terminate a fatiguing war, rendered it Whig when Tories manifestly could not be trusted to maintain the Protestant succession. In any event the occupants of office could merely have had the choice of risking their heads in an attempt to exclude the elector of Hanover, or of waiting patiently till he should come and eject them from their posts; yet they might have remained formidable could they have remained united. To

the indignation with which he regarded Oxford's refusal to advance him in the peerage the active St John added an old disgust at the treasurer's pedantic and dilatory formalism, as well as his evident propensity, while leaving his colleague the fatigues, to engross for himself the chief credit of the administration. Their schemes of policy diverged as widely as their characters: Bolingbroke's brain teemed with the wildest plans, which Oxford might have more effectually discountenanced had he been prepared with anything in their place. Swift's endeavours after an accommodation were as fruitless as unremitting. His mortification was little likely to temper the habitual virulence of his pen, which rarely produced anything more acrimonious than the attacks he at this period directed against Burnet and his former friend Steele. One of his pamphlets against the latter (The Public Spirit of the Whigs set forth in their Generous Encouragement of the Author of the Crisis, 17 14) was near involving him in a prosecution, some invectives against the Scottish peers having proved so exasper- ating to Argyll and others that they repaired to the queen to demand the punishment of the author, of whose identity there could be no doubt, although, like all Swift's writings, except the Proposal for the Extension of Religion, the pamphlet had been published anonymously. The immediate withdrawal of the offensive passage, and a sham prosecution instituted against the printer, extricated Swift from his danger.

Meanwhile the crisis had arrived, and the discord of Oxford

and Bolingbroke had become patent to all the nation. Fore- seeing, as is probable, the impending fall of the former, Swift retired to Upper Letcombe, in Berkshire, and there spent some weeks in the strictest seclusion. This leisure was occupied in the composition of his remarkable pamphlet, Some Free Thoughts on the Present State of Affairs, which indicates his complete conversion to the bold policy of Bolingbroke. The utter exclu- sion of Whigs as well as Dissenters from office, the remodelling of the army, the imposition of the most rigid restraints on the heir to the throne — such were the measures which, by recom- mending, Swift tacitly admitted to be necessary to the triumph of his party. If he were serious, it can only be said that the desperation of his circumstances had momentarily troubled the lucidity of his understanding; if the pamphlet were merely intended as a feeler after public opinion, it is surprising that he did not perceive how irretrievably he was ruining his friends in the eyes of all moderate men. Bolingbroke's daring spirit, however, recoiled from no extreme, and, fortunately for Swift, he added so much of his own to the latter's MS. that the produc- tion was first delayed and then, upon the news of Anne's death, immediately suppressed. This incident but just anticipated the revolution which, after Bolingbroke had enjoyed a three days' triumph over Oxford, drove him into exile and prostrated his party, but enabled Swift to perform the noblest action of his life. Almost the first acts of Bolingbroke's

ephemeral premiership were to order him a thousand pounds from the exchequer and despatch him the most flattering invitations. The same post brought a letter from Oxford, soliciting Swift's company in his retirement; and, to the latter's immortal honour, he hesitated not an instant in preferring the solace of his friend to the offers of St John. When, a few days afterwards, Oxford was in prison and in danger of his life, Swift begged to share his captivity; and it was only on the offer being declined that he finally directed his steps towards Ireland, where he was very ill received. The draft on the exchequer was intercepted by the queen's death.

These four busy years of Swift's London life had not been entirely engrossed by politics. First as the associate of Steele, with whom he quarrelled, and of Addison, whose esteem for him survived all differences, afterwards as the intimate comrade of Pope and Arbuthnot, the friend of Congreve and Atterbury, Parnell and Gay, he entered deeply into the literary life of the period. He was treasurer and a leading member of the Brothers, a society of wits and statesmen which recalls the days of Horace and Maecenas. He promoted the subscription for Pope's Homer, contributed some numbers to the Taller, Spectator, and Intelli- gencer, and joined with Pope and Arbuthnot in establishing the Scriblerus Club, writing Martinus Scriblerus, his share in which can have been but small, as well as John Bull, where the chapter recommending the education of all blue-eyed children in depravity for the public good must surely be his. His miscellanies, in some of which his satire made the nearest approach perhaps ever made to the methods of physical force, such as A Meditation upon a Broomstick, and the poems Sid Hamet's Rod, The City Shower, The Windsor Prophecy, The Prediction of Merlin, and The History of Vanbrugh's House, belong to this period. A more laboured work, his Proposal for Correcting, Improving and Ascer- taining the English Tongue (1712), in a letter to Harley, suggest- ing the regulation of the English language by an academy, is chiefly remarkable as a proof of the deference paid to French taste by the most original English writer of his day. His History of the Four Last Years of the Reign of Queen Anne is not on a level with his other political writings. To sum up the incidents of this eventful period of his life, it was during it that he lost his mother, always loved and dutifully honoured, by death; his sister had been estranged from him some years before by an imprudent marriage, which, though making her a liberal allow- ance, he never forgave.

The change from London to Dublin can seldom be an agreeable one. To Swift it meant for the time the fall from unique authority to absolute insignificance. All share in the adminis- tration of even Irish affairs was denied him; every politician

shunned him; and his society hardly included a single author or wit. He " continued in the greatest privacy " and " began to think of death." At a later period he talked of " dying of rage, like a poisoned rat in a hole"; for some time, however, he was buoyed up by feeble hopes of a restoration to England. So late as 1726 he was in England making overtures to Walpole, but he had no claim on ministerial goodwill, and as an opponent he had by that time done his worst. By an especial cruelty of fate, what should have been the comfort became the bane of his existence. We have already mentioned his invitation of Esther Johnson and Mrs Dingley to Ireland. Both before and after his elevation to the deanery of St Patrick's these ladies continued to reside near him, and superintended his household during his absence in London. He had offered no obstacle in 1704 to a match proposed for Stella to Dr William Tisdall of Dublin, and, with his evident delight in the society of the dark-haired, bright- eyed, wittyi.beauty — a model, if we may take his word, of all that woman should be — it seemed unaccountable that he did not secure it to himself by the expedient of matrimony. A consti- tutional infirmity has been suggested as the reason, and the con- jecture derives support from several peculiarities in his writings. But, whatever the cause, his conduct proved none the less the fatal embitterment of his life and Stella's and yet another's. He had always been unlucky in his relations with the fair sex. In 1695 he had idealized " Varina." Varina was avenged by Vanessa, who pursued Swift to far other purpose. Esther Vanhomrigh (b. February 14, 1690), the daughter of a Dublin merchant of Dutch origin, who died in 1703 leaving £16,000, had become known to Swift at the height of his political influence. He lodged close to her mother, was introduced to the family by Sir A. Fountaine in 1708 and became an intimate of the house. Vanessa insensibly became his pupil, and he insensibly became the object of her impassioned affection. Her letters reveal a spirit full of ardour and enthusiasm, and warped by that perverse bent which leads so many women to prefer a tyrant to a companion. Swift, on the other hand, was devoid of passion. Of friendship, even of tender regard, he was fully capable, but not of love. The spiritual realm, whether in divine or earthly things, was a region closed to him, where he had never set foot. As a friend he must have greatly preferred Stella to Vanessa. Marriage was out of the question with him, and, judged in the light of Stella's dignity and womanliness, this ardent and un- reasoning display of passion was beyond comprehension. But Vanessa assailed him on a very weak side. The strongest of all his instincts was the thirst for imperious domination. Vanessa hugged the fetters to which Stella merely submitted. Flattered to excess by her surrender, yet conscious of his binding obligations and his real preference, he could neither discard the one beauty nor desert the other. It is humiliating to human strength and

consoling to human weakness to find the Titan behaving like the least resolute of mortals, seeking refuge in temporizing, in evasion, in fortuitious circumstance. He no doubt trusted that his removal to Dublin would bring relief, but here again his evil star interposed. Vanessa's mother died (1714), and she followed him to Ireland, taking up her abode at Celbridge within ten miles of Dublin. Unable to marry Stella without destroying Vanessa, or to openly welcome Vanessa without destroying Stella, he was thus involved in the most miserable embarrassment ; he continued to temporize. Had the solution of marriage been open Stella would undoubtedly have been Swift's choice. Some mysterious obstacle intervened. It was rumoured at the time that Stella was the natural daughter of Temple, and Swift himself at times seems to have been doubtful as to his own paternity. There is naturally no evidence for such reports, which may have been fabrications of the anti-deanery faction in Dublin. From the same source sprang the report of Swift's marriage to Stella by Bishop Ashe in the deanery garden at Clogher in the summer of 1 7 16. The ceremony, it is suggested, may have been extorted by the jealousy of Stella and have been accompanied by the express condition on Swift's side that the marriage was never to be avowed. The evidence is by no means complete and has never been exhaustively reviewed. John Lyon, Swift's constant

attendant from 1733 onwards, disbelieved the story. It was accepted by the early biographers, Deane Swift, Orrery, Delany and Sheridan; also by Johnson, Scott, Dr Garnett, Craik, Dr Bernard and others. The arguments against the marriage were first marshalled by Monck Mason in his History of St Patrick's, and the conjecture, though plausible, has failed to convince Forster, Stephen, Aitken, Hill, Lane Poole and Churton Collins. Never more than a nominal wife at most, the unfortunate Stella commonly passed for his mistress till the day of her death (in her will she writes herself spinster), bearing her doom with uncom- plaining resignation, and consoled in some degree by unquestion- able proofs of the permanence of his love, if his feeling for her deserves the name. Meanwhile his efforts were directed to soothe Miss Vanhomrigh, to whom he addressed Cadenus [Decanus] and Vanessa, the history of their attachment and the best example of his serious poetry, and for whom he sought to provide honour- ably in marriage, without either succeeding in his immediate aim or in thereby opening her eyes to the hopelessness of her passion. In 1720, on what occasion is uncertain, he began to pay her regular visits. Sir Walter Scott found the Abbey garden at Celbridge still full of laurels, several of which she was accustomed to plant whenever she expected Swift, and the table at which they had been used to sit was still shown. But the catastrophe of her tragedy was at hand. Worn out with his evasions, she at last (1723) took the desperate step of writing to Stella or, accord- ing to another account, to

Swift himself, demanding to know the nature of the connexion with him, and this terminated the melan- choly history as with a clap of thunder. Stella sent her rival's letter to Swift, and retired to a friend's house. Swift rode down to Marley Abbey with a terrible countenance, petrified Vanessa by his frown, and departed without a word, flinging down a packet which only contained her own letter to Stella. Vanessa died within a few weeks. She left the poem and correspondence for publication. The former appeared immediately, the latter was suppressed until it was published by Sir Walter Scott.

Five years afterwards Stella followed Vanessa to the grave. The grief which the gradual decay of her health evidently occa- sioned Swift is sufficient proof of the sincerity of his attachment, as he understood it. It is a just remark of Thackeray's that he everywhere half-consciously recognizes her as his better angel, and dwells on her wit and her tenderness with a fondness he never exhibits for any other topic. On the 28th of January 1728, she died, and her wretched lover sat down the same night to record her virtues in language of unsurpassed simplicity, but to us who know the story more significantly for what it conceals than for what it tells. A lock of her hair is preserved, with the inscription in Swift's handwriting, most affecting in its apparent cynicism, " Only a woman's hair!" " Only a woman's hair," comments Thackeray; " only love, only fidelity, purity, inno- cence, beauty, only the tenderest heart in the world stricken and wounded, and passed away out of reach of pangs of hope deferred, love insulted and pitiless desertion ; only that lock of hair left, and memory, and remorse, for the guilty, lonely wretch, shuddering over the grave of his victim." The more unanswer- able this tremendous indictment appears upon the evidence the greater the probability that the evidence is incomplete. Tout comprendre c'est tout pardonner.

Between the death of Vanessa and the death of Stella came the greatest political and the greatest literary triumph of Swift's life. He had fled to Ireland a broken man, to all appearance politically extinct; a few years were to raise him once more to the summit of popularity, though power was for ever denied him. Consciously or unconsciously he first taught the Irish to rely upon themselves and for many generations his name was the most universally popular in the country. With his fiercs. hatred of what he recognized as injustice, it was impossible that he should not feel exasperated at the gross misgovernment of Ireland for the supposed benefit of England, the systematic exclusion of Irishmen from places of honour and profit, the spoliation of the country by absentee landlords, the deliberate discouragement of Irish trade and manufactures. An Irish patriot in the strict sense of the term he was not; he was proud

of being an Englishman, who had been accidentally " dropped in Ireland"; he looked upon the indigenous population as conquered savages; but his pride and sense of equity alike re- volted against the stay-at-home Englishmen's contemptuous treatment of their own garrison, and he delighted in finding a point in which the triumphant faction was still vulnerable. His Proposal for the Universal Use of Irish Manufactures, published anonymously in 1720, urging the Irish to disuse English goods, became the subject of a prosecution, which at length had to be dropped. A greater opportunity was at hand. One of the chief wants of Ireland in that day, and for many a day afterwards, was that of small currency adapted to the daily transactions of life. Questions of coinage occupy a large part of the correspondence of the primate, Archbishop Boulter, whose anxiety to deal rightly with the matter is evidently very real and conscientious. There is no reason to think that the English ministry wished otherwise; but secret influences were at work, and a patent for supplying Ireland with a coinage of copper halfpence was accorded to William Wood on such terms that the profit accruing from the difference between the intrinsic and the nominal value of the coins, about 40%, was mainly divided between him and George I.'s favourite duchess of Kendal, by whose influence Wood had obtained the privilege. Swift now had his opportunity, and the famous six letters signed M. B. Drapier (April to Dec. 1724) soon set Ireland in a flame. Every effort was used to discover, or rather to obtain legal evidence against, the author, whom, Walpole was assured, it would then have taken ten thousand men to apprehend. None could be procured; the public passion swept everything before it; the patent was cancelled; Wood was compensated by a pension; Swift was raised to a height of popularity which he retained for the rest of his life; and the only real sufferers were the Irish people, who lost a convenience so badly needed that they might well have afforded to connive at Wood's illicit profits. Perhaps, however, it was worth while to teach the English ministry that not everything could be done in Ireland. Swift's pamphlets, written in a style more level with the popular intelligence than even his own ordinary manner, are models alike to the controversialist who aids a good cause and to him who is burdened with a bad one. The former may profit by the study of his marvellous lucidity and vehemence, the latter by his sublime audacity in exaggeration and the sophistry with which he involves the innocent halfpence in the obloquy of the nefarious patentee.

The noise of the Drapier Letters had hardly died away when Swift acquired a more durable glory by the publication of Travels Into Several Remote Nations of the World, in four parts. By Lemuel Gulliver, first a surgeon and then a captain of several ships (Benjamin Motto, October 1726). The first hint came to him at the meetings of the Scriblerus Club in 17 14, and the

work was well advanced, it would seem, by 1720. Allusions show that it was circulated privately for a considerable period before its actual (anonymous) publication, on the 28th of October 1726. Pope arranged that Erasmus Lewis should act as literary agent in negotiating the manuscript. Swift was afraid of the recep- tion the book would meet with, especially in political circles. The keenness of the satire on courts, parties and statesmen cer- tainly suggests that it was planned while Swift's disappoint- ments as a public man were still rankling and recent. It is Swift's peculiar good fortune that his book can dispense with the interpretation of which it is nevertheless susceptible, and may be equally enjoyed whether its inner meaning is appre- hended or not. It is so true, so entirely based upon the facts of human nature, that the question what particular class of persons supplied the author with his examples of folly or misdoing, however interesting to the commentator, may be neglected by the .eader. It is also fortunate for him that in three parts out of the four he should have entirely missed " the chief end I propose to myself, to vex the world rather than divert it." The world, which perhaps ought to have been vexed, chose rather to be diverted; and the great satirist literally strains his power ut pueris placeat. Few books have added so much to the

innocent mirth of mankind of the first two parts of Gulliver; the misanthropy is quite overpowered by the fun. The third part, equally masterly in composition, is less felicitous in invention; and in the fourth Swift has indeed carried out his design of vexing the world at his own cost. Human nature indignantly rejects her portrait in the Yahoo as a gross libel, and the protest is fully warranted. An intelligence from a superior sphere, bound on a voyage to the earth, might actually have obtained a fair idea of average humanity by a preliminary call at Lilliput or Brobdingnag, but not from a visit to the Yahoos. While Gulliver is infinitely the most famous and popular of Swift's works, it exhibits no greater powers of mind than many others. The secret of success, here as elsewhere, is the writer's marvel- lous imperturbability in paradox, his teeming imagination and his rigid logic. Grant his premises, and all the rest follows; his world may be turned topsy-turvy, but the relative situation of its contents is unchanged. The laborious attempts that have been made, particularly in Germany, to affiliate the Travels only serve to bring Swift's essential originality into stronger relief. He had naturally read Lucian and Rabelais— possibly Crusoe and the Arabian Nights. He had read as a young man the lunary adventure of Bishop Wilkins, Bishop Godwin and Cyrano de Bergerac. He had read contemporary accounts of Peter the Wild Boy, the History of Sevarambes by D'Alais (1677) and Foligny's Journey of Jacques Sadeut to Australia (1693). He may have read Joshua Barnes's description of a race of "Pygmies" in his Gerania of 1675. He copied the account of the storm in the second voyage almost literally from Sturmy's Compleat Mariner.

Travellers' tales were deliberately embalmed by Swift in the amber of his irony. Something similar was attempted by Raspe in his Munchausen sixty years later.

Swift's grave humour and power of enforcing momentous truth by ludicrous exaggeration were next displayed in his Modest Proposal for Preventing the' Children of Poor People from being a Burden to their Parents or the Country, by fattening and eating them (1729), a parallel to the Argument against Abolishing Christianity, and as great a masterpiece of tragic as the latter is of comic irony. The Directions to Servants (first published in 1745) in like manner derive their overpowering comic force from the imperturbable solemnity with which all the misdemeanours that domestics can commit are enjoined upon them as duties. The power of minute observation dis- played is most remarkable, as also in Polite Conversation (written in 1731, published in 1738), a surprising assemblage of the vulgarities and trivialities current in ordinary talk. As in the Directions, the satire, though cutting, is good-natured, and the piece shows more animal spirits than usual in Swift's latter years. It was a last flash of gaiety. The attacks of giddiness and deafness to which he had always been liable increased upon him. Already in 17 21 he complains that the buzzing in his ears disconcerts and confounds him. After the Directions he writes little beyond occasional verses, not seldom indecent and com- monly trivial. He sought refuge from inferior society often in nonsense, occasionally in obscenity. An exception must be made in the case of the delightful Hamilton's Bavin, and still more of the verses on his own death (1731), one of the most powerful and also one of the saddest of his poems. In The Legion Club of 1736 he composed the fiercest of all his verse satires. He hated the Irish parliament for its lethargy and the Irish bishops for their interference. He fiercely opposed Arch- bishop Boulter's plans for the reform of the Irish currency, but admitted that his real objection was sentimental: the coins should be struck as well as circulated in Ireland. His exertions in repressing robbery and mendicancy were strenuous and successful. His popularity remained as great as ever (he received the freedom of Dublin in 1729), and, when he was menaced by the bully Bettesworth, Dublin rose as one man to defend him. He governed his cathedral with great strictness and conscientiousness, and for years after Stella's death con- tinued to hold a miniature court at the deanery. But his failings of mind were exacerbated by his bodily infirmities; he

grew more and more whimsical and capricious, morbidly sus- picious and morbidly parsimonius; old friends were estranged or removed by death, and

new friends did not come forward in their place. For many years, nevertheless, he maintained a correspondence with Pope and Bolingbroke, and with Arbuth- not and Gay until their deaths, with such warmth as to prove that an ill opinion of mankind had not made him a misanthrope, and that human affection and sympathy were still very necessary to him. The letters become scarcer and scarcer with the decay of his faculties; at last, in 1740, comes one to his kind niece, Mrs Whiteway, of heartrending pathos: —

" I have been very miserable all night, and to-day extremely deaf and full of pain. I am so stupid and confounded that I cannot express the mortification I am under both of body and mind. All I can say is that I am not in torture; but I daily and hourly expect it. Pray let me know how your health is and your family : I hardly understand one word I write. I am sure my days will be very few ; few and miserable they must be. I am, for those few days, yours entirely — Jonathan Swift.

" If I do not blunder, it is Saturday, July 26, 1740.

” If I live till Monday I shall hope to see you, perhaps for the last time.”

Account book entries continue until 1742.

In March 1742 it was necessary to appoint guardians of Swift’s person and estate. In September of the same year his physical malady reached a crisis, from which he emerged a helpless wreck, with faculties paralysed rather than destroyed — ” He never talked nonsense or said a foolish thing.” The particulars of his case have been investigated by Dr Bucknill and Sir William Wilde, who have proved that he suffered from nothing that could be called mental derangement until the ” labyrinthine vertigo ” from which he had suffered all his life, and which he erroneously attributed to a surfeit of fruit, produced paralysis, ” a symptom of which was the not uncommon one of aphasia, or the auto- matic utterance of words ungoverned by intention. As a con- sequence of that paralysis, but not before, the brain, already weakened by senile decay, at length gave way, and Swift sank into the dementia which preceded his death.” In other words he retained his reason until in his 74th year he was struck down by a new disease in the form of a localized left-sided apoplexy or cerebral softening. Aphasia due to the local trouble and general decay then progressed rapidly together, and even then at 76, two more years were still to elapse before ” he exchanged the sleep of idiocy for the sleep of death.” The scene closed on the 19th of October 1745. With what he himself described as a satiric touch, his fortune was bequeathed to found a hospital for idiots and lunatics, now an important institution, as it was in many respects a pioneer bequest. He was interred in his cathedral at midnight on the 22nd of October, in the same coffin as Stella, with the epitaph, written by himself, ” Hie depositum est corpus Jonathan Swift, S.T.P., hujus ecclesiae cathedralis decani; ubi saeva indignatio cor ulterius lacerare nequit. Abi, viator, et imitare, si poteris, strenuum pro virili libertatis vindicem.”

The stress which Swift thus laid upon his character as an assertor of liberty has hardly been ratified by posterity, which has apparently neglected the patriot for the genius and the wit. Not unreasonably; for if half his patriotism sprang from an instinctive hatred of oppression, the other half was disappointed egotism. He utterly lacked the ideal aspiration which the patriot should possess: his hatred of villany was far more intense than his love of virtue. The same cramping realism clings to him everywhere beyond the domain of politics — in his religion, in his fancies, in his affections. At the same time, it is the secret of his wonderful concentration of power: he realizes everything with such intensity that he cannot fail to be impressive. Except in his unsuccessful essay in history, he never, after the mistake of his first Pindaric attempts, strays beyond his sphere, never attempts what he is not qualified to do, and never fails to do it. His writings have not one

literary fault except their occa- sional looseness of grammar and their frequent indecency. Within certain limits, his imagination and invention are as active as those of the most creative poets. As a master of humour, irony and invective he has no superior; his reasoning powers

are no less remarkable within their range, but he never gets beyond the range of an advocate. Few men of so much mental force have had so little genius for speculation, and he is con- stantly dominated by fierce instincts which he mistakes for reasons. As a man the leading note of his character is the same — strength without elevation. His master passion is imperious pride — the lust of despotic dominion. He would have his superiority acknowledged, and cared little for the rest. Place and profit were comparatively indifferent to him; he declares that he never received a farthing for any of his works except Gulliver's Travels, and that only by Pope's management; and he had so little regard for literary fame that he put his name to only one of his writings. Contemptuous of the opinion of his fellows, he hid his virtues, paraded his faults, affected some failings from which he was really exempt, and, since his munifi- cent charity could not be concealed from the recipients, laboured to spoil it by gratuitous surliness. Judged by some passages of his life he would appear a heartless egotist, and yet he was capable of the sincerest friendship and could never dispense with human sympathy. Thus an object of pity as well as awe, he is the most tragic figure in our literature — the only man of his age who could be conceived as affording a groundwork for one of the creations of Shakespeare. " To think of him," says Thackeray, " is like thinking of the ruin of a great empire." Nothing finer or truer could be said.

Swift inoculated the Scriblerus Club with his own hatred of pedantry, cant and circumlocution. His own prose is the acme of incisive force and directness. He uses the vernacular with an economy which no other English writer has rivalled. There is a masculinity about his phrases which makes him as clear to the humblest capacity as they are capable of being made to anyone. Ironist as he is, there is no writer that ever wrote whose meaning is more absolutely unmistakable. He is the grand master of the order of plain speech. His influence, which grew during the 18th century in spite of the depreciation of Dr Johnson, has shared in the eclipse of the Queen Anne wits which began about the time of Jeffrey. Yet as the author of Gulliver he is still read all over the world, while in England discipleship to Swift is recognized as one of the surest passports to a prose style. Among those upon whom Swift's influence has been most discernible may be mentioned Chesterfield, Smollett, Cobbett, Hazlitt, Scott, Borrow, Newman, Belloc.

Authorities. — Among the authorities for Swift's life the first place is still of course occupied by his own writings, especially the fragment of autobiography now at Trinity College, Dublin, and his Correspondence,

which still awaits an authoritative annotated edition. The most important portion is contained in the Journal to Stella. Twenty-five of these letters on Swift's death became the property of Dr Lyon. Hawkesworth bought them for his 1766 edition of the Works and eventually gave them to the British Museum. Forty additional letters were published by Dean Swift in 1768 (of these only No. 1 survives in the British Museum). Sheridan brought out the complete Journal in 1784 in a mangled form, but the text has as far as possible been restored by modern editors such as Forster, Rylands and Aitken. A full annotated edition is in course of preparation by H. Spencer Scott. The Vanessa correspondence was used by Sheridan, but first published in full by Sir Walter Scott, and Swift's letters to his friend Knightley Chetwode of Woodbrook between 1714 and 1731, over fifty in number, were first issued by Dr Birkbeck Hill in 1899. The ncre or less contemporary lives of Swift, most of which contain a certain amount of apocrypha, are those of Lord Orrery (1751) ; Dr Delany's Observations on Orrery (1754); Dean Swift's Essay upon the Life of Swift_ (1755) ; and Thomas Sheridan's Life (of 1785). Dr. Hawkes- worth, in the life prefixed to his edition of the Works in 1755, adds little of importance. Dr Johnson's Life is marred by manifest prejudice. Dr Barrett produced an Essay upon the Early Life of some value (in 1808). Six years later came the useful biography of Sir Walter Scott, and (in 1819) appeared the elaborate Life by W. Monck Mason in the form of an appendix to his ponderous History of St Patrick's. A new epoch of investigation was inaugu- rated by John Forster, who began a new scrutiny of the accumulated material and published his first volume in 1875. Invaluable in many respects, it exhibited the process as well as the result of bio- graphy, and never got beyond 171 1. The Life by Sir Henry Craik (1882 and reissues) now holds the field. Valuable monographs have been produced by Sir Leslie Stephen (Men of Letters and the Memoirs, in the Diet. Nat. Biog.), by Thackeray, in his English Humourists, by W. R. Wilde, in his Closing Years of Dean Swift's

Life, by Lecky, in his Leaders of Public Opinion, by G. P. Moriarty, J. Churton Collins (1893), Max Simon (1893), Henriette Cordelet (1907) and Sophie Shilleto Smith (1910). The anecdotes of Swift related in Spence, Laetitia Pilkington, Wilson's Swiftiana, Delany's Autobiography, &c, though often amusing, can hardly be accepted as authentic.

The collective editions of Dr Hawkesworth (various issues, 1755- 1779), T. Sheridan (1785), John Nichols (1801, 1804, 1808), Scott (18 14 and 1 821) and Roscoe (2 vols., 1849) have been in most respects superseded by

the edition in Bohn's Standard Library in fourteen volumes (including the two subsequently issued volumes of Poems) (1897-1910); arranged as follows: I. Biog. Introduction by W. E. H. Lecky; Tale of a Tub; Battle of the Books; Critical Essay upon the Faculties of the Mind; The Bickerstaff Pamphlets, &c, ed. Temple Scott. II. Journal to Stella, ed. F. Ryland (two por- traits of Stella). III. and IV. Writings on Religion and the Church, ed. Temple Scott. V. Historical and Political Tracts — English, ed. Temple Scott. VI. Historical and Political Tracts — Irish, ed. Temple Scott. VII. The Drapier's Letters, ed. Temple Scott. VIII. and XI. Literary Essays, including Gulliver's Travels (ed. G. R. Dennis); A Proposal for Correcting, Improving and Ascertain- ing the English Tongue; Hints towards an Essay on Conversation; Character; Directions to Servants; and Autobiographical Fragment, ed. Temple Scott. IX. Contributions to the F.xaminer, Taller, Spectator, &c, ed. Temple Scott. X. Historical Writings, including the Four Last Years ; A bstract of English History ; and Remarks on Burnet, ed. Temple Scott. XII. Essays on the Portraits, &c, Bibliography by W. Spencer Jackson, and Index. Twelve por- traits of Swift are included in the work, in addition to two portraits of Stella and one of Vanessa. XIII. and XIV. Poems, ed. W. Ernst Browning.

Translations and editions of Gulliver's Travels have been numerous. " Valuable Notes for a Bibliography of Swift " were published by Dr S. Lane Poole in The Bibliographer (November 1884).

(R. G.;T. Se.) SWIFT, a bird so called from the extreme speed of its flight, which apparently exceeds that of any other British species, the Hiruhdo apus of Linnaeus and Cypselus apus or murarius of modern ornithologists. Swifts were formerly associated with swallows (q.v.) in classification, but whilst the latter are true Passeres, it is now established that swifts are Coraciiform birds (see Birds) and the sub-order Cypseli has been formed to include them and their nearest allies, the humming-birds. The four toes are all directed forwards, whereas in the Passeres the hallux is directed backwards and by opposing the other three makes the foot a grasping organ. In the swifts, moreover, the middle and outer digits have only three joints and the metatarsi and even the toes may be feathered. Swifts are divided into three sub-families: Macropteryginae, the true swifts, of tropical Asia, which form a nest gummed by saliva to branches of trees; Chaeturinae, building in rocks or houses, and with an almost world-wide range: it includes Chaetura palagica, the " chimney-swallow " of the United States, Collo- calia fuciphaga which obtained its specific name from the erroneous idea that its edible nests were formed by partly digested seaweed; Cypselinae, also world-wide and containing Cypselus apus, the common European swift. All the swifts are migTatory. Well known as a summer visitor throughout the greater part of Europe, the swift is one of the latest to return from Africa, and its stay in the country of its birth is of the shortest,

for it generally disappears from England very early in August, though occasionally to be seen for even two months later.

The swift commonly chooses its nesting-place in holes under the eaves of buildings, but a crevice in the face of a quarry, or even a hollow tree, will serve it with the accommodation it requires. This, indeed, is not much, since every natural function except sleep, oviposition and incubation, is performed on the wing, and the easy evolutions of this bird in the air, where it remains for hours together, are the admiration of all who witness them. Though considerably larger than a swallow, it can be recognized at a distance less by its size than by its peculiar shape. The head scarcely projects from the anterior outline of the pointed wings, which form an almost continuous curve, at right angles to which extend the body and tail, resembling the handle of the crescentic cutting-knife used in several trades, while the wings represent the blade. The mode of flight of the two birds is also unlike, that of the swift being much more steady, and, rapid as it is, ordinarily free from jerks. The whole

plumage, except a greyish white patch under the chin, is a sooty black, but glossy above. Though its actual breeding-places are by no means numerous, its extraordinary speed and discur- sive habits make the swift widely distributed; and throughout England scarcely a summer's day passes without its being seen in most places. A larger species, C. melba or C. alpinus, with the lower parts dusky white, which has its home in many of the mountainous parts of central and southern Europe, has several times been observed in Britain, and two examples of a species of a very distinct genus Chaetura, which has its home in northern Asia, but regularly emigrates thence to Australia, have been obtained in England (Proc. Zool. Soc, 1880, p. 1).

Among other peculiarities the swifts, as long ago described (probably from John Hunter's notes) by Sir E. Home (Phil. Trans. 1817, pp. 332 et seq., pi. xvi.), are remarkable for the development of their salivary glands, the secretions of which serve in most species to glue together the materials of which the nests are composed, and in the species of the genus Collocalia form almost the whole substance of the structure. These are the " edible " nests so eagerly sought by Chinese epicures as an ingredient, for soup. These remarkable nests consist essentially of mucus, secreted by the sali- vary glands above mentioned, which dries and looks like isinglass. Their marketable value depends on their colour and purity, for they are often intermixed with feathers and other foreign substances. The swifts that construct these " edible " nests form a genus Collo- calia, with many species; but they inhabit chiefly the islands of the Indian Ocean from the north of Madagascar eastward, as well as many of the tropical islands of the Pacific so far as the Marquesas — one species occurring in the hill-

country of India. They breed in caves, to which they resort in great numbers, and occupy them jointly and yet alternately with bats — the mammals being the lodgers by day and the birds by night. (A.N.)

SWIMMING (from " swim," A.S. swimman, the root being common in Teutonic languages), the action of self-support and self -propulsion on or in water; though used by analogy of inanimate objects, the term is generally connected with animal progression and specially with the art of self-propulsion on water as practised by man. Natation (the synonym derived from Lat. natare) is one of the most useful of the physical acquirements of man. There have been cases in which beginners have demonstrated some ability in the art upon their first immersion in deep water, but generally speaking it is an art which has to be acquired. For many years Great Britain held the supremacy in this particular form of athletics, but continental, Australian and American swimmers have so much improved and have developed such speedy strokes, that the claim can no longer be maintained. English swimmers have, however, the satisfaction of knowing that in a great measure through them has come about the very great interest which is now taken in the teaching of swimming throughout the world, and more particularly on the continent of Europe, where they have made frequent tours and given instructive displays of swimming, life-saving (see Drowning), and water polo (q.v.); the latter a water game entirely British in its origin.

The teaching of swimming has been taken up in schools, and where the work is well done it is customary to use a form of land drill so as to impress upon the pupils some idea of the motions which have to be made in order to progress through the water. This drill is the preliminary practice to the teaching of the breast stroke. This stroke is about the most useful of all the known forms of swimming, more particularly when any one is thrown overboard in clothes; and though speed swimmers look upon it as obsolete, it is undoubtedly the best for a long-distance swim, such as across the English Channel, or other similar feats. A knowledge of it, as well as of the back stroke, is essential to the effective saving of life.

When learning the breast stroke, the first thing to avoid is undue haste and rapidity in the movements. It is this fault, probably born of nervousness, which causes many to aver that though eager to do so, they have never been able to learn to swim. Rapid action of the arms only exhausts the learner, whose breath- ing then becomes hurried and irregular, and as a consequence he fails to preserve the buoyancy necessary for carrying him along the surface. When starting for the first stroke the be- ginner should draw the elbows nearly to the side, at the same

time bringing up the forearm and hands to the front of the chest with the palms of the hands downwards near to the surface of the water, the fingers being extended and closed and the forefingers and thumbs nearly touching. The hands are then pushed forward in front of the body to the full extent of the arms, the palms of the hands are turned slightly outwards, and the arms swept round until in a right angle with the shoulders, when the elbows are dropped and the hands come up in front of the chest for the next stroke. The arms should not be kept rigid, but allowed to work gracefully. As the arms are swept backwards the legs are drawn up, the knees being turned out- ward to the right and left and the heels nearly touching. The legs are then kicked outward and swept round as the arms are being pushed forward to their fullest extent, a " flip " being given with each of the feet, which must be kept loose at the ankles and in the same position as when standing. All beginners have the great fault of trying to make the limbs too rigid, thereby causing stiff- ness and possibly cramp. Another difficulty with them is the question of breathing, but if the learner will remember to inhale when making each backward sweep of the arms, much of the difficulty usually experienced at the start will be overcome. Expiration should be carried out during the other portion of each stroke. The important thing is to keep the body as level along the surface as possible, and at the same time get regular and natural breathing. The holding of the breath for two or three strokes will exhaust the beginner more than anything else.

A knowledge of the back stroke can easily be acquired by those who are able to swim on the breast, for the leg action is very similar and the principles relating to the use of the arms are almost the same. The arms, instead of being moved through the water, are lifted in the air and carried out to beyond the head with the palms upwards. The palms are then slightly turned and the arms swept round. Just as this action is being made the legs are drawn up as in the breast stroke, the body being allowed to travel on with the force of the kick as the arms are extended beyond the head. The great difficulty that a back swimmer has to contend with in open water is that of steering, and the best way to overcome it is to take an object for a guide before starting and hold the head slightly to the side so as to steer by it.

At one time the side stroke was the great racing stroke; the body being placed on the side, the upper arm worked from the head to the upper side of the body, the lower arm taken down- wards through the water to the underside of the body and a scissor-like kick made with the legs; but this has now been generally given up in favour of the over-arm, trudgen and crawl strokes.

In the over-arm stroke the body is usually turned on the right side. At the start the lower arm is pulled downwards towards the hips, the fingers being kept closed and the hand flat, so as to present a large surface to the water. When the stroke is finished the hand is turned quickly palm upwards, so that together with the lower part of the arm it cuts the water sideways, the arm being almost bent double. Then, as it is shot forward, the hand is gradually turned from palm upwards to palm downwards, until, when it arrives at its position beyond the head, it is ready for the next stroke. The recovery and the pull ought to be effected as quickly as possible. The upper arm stroke is started when the downward stroke of the under or right arm is finished. It is started in front of the forehead, the arm being slightly bent and the fingers pointing downwards. The hand is pulled past the face and chest with the arm bent at right angles and swept back in front of the body, the arm gradu- ally straightening as it leaves the water opposite the hip. When the hand is opposite the hip it should be brought quickly out of the water and sent forward for the next stroke. When the upper arm is opposite the shoulder in its pull through the water the legs are kicked wide apart and closed again at the moment when the hand leaves the water. The kick is completed and the legs straightened before the left hand is replaced ready for the next stroke. As the legs are opened the upper leg is kicked forward with the knee slightly bent, and the foot kept in its

ordinary position. The lower leg is bent double until the heel approaches the thigh, which is brought backwards slightly. In the actual kick the upper leg is sent forward, and as it is straightened vigorously the under leg from the knee downward comes forward to meet it with a vicious kick; the swirl of the feet and closing of the legs drives the body forward. This is what has come to be known in Great Britain as the " Northern Kick," by reason of its first being introduced by Lancashire swimmers.

The trudgen stroke, more commonly known as the trudgeon stroke, and on the continent of Europe as Spanish swimming, was first made prominent in England in 1873 by a swimmer named J. Trudgen, who stated that he had acquired a knowledge of it while in South America. It was, however, known to Clias, a writer on swimming, who described it in 1825 as " The Thrust." Trudgen's speed was so great for his time that swimmers quickly copied his style, and it is from this stroke that the crawl stroke has been developed. When swimming Trudgen kept on the chest and lifted the upper part of his body at each stroke out of the water, and at each swing of the arms pulled himself forward, a considerable swirl of the water occurring as each movement was finished. The arms were brought forward sideways, each completing a circle on each side of the body, and the head kept completely above water. Those who copied Trudgen soon found it was less laborious and equally as fast to use a double over-arm stroke with the head and chest well down, and thus have the body supported by the water, using

the ordinary over- arm leg kick. At first it was considered a stroke only useful for short distances and for water polo where speed is essential, but the idea was quickly dispelled, and several men, as well as women, have swum as far as fifteen miles with this stroke.

The crawl stroke is, like the trudgen, an adaptation from native swimmers. It was not generally known in Great Britain until 1902, when Mr Richard Cavill came from Australia to compete in the English championships, but it is said to be common with natives of the South Sea Islands, and from there introduced into Australia about the year 1900. From thence it came to Europe, and there Mr C. M. Daniels, the American amateur champion, made so excellent a study of it that he not only so greatly increased his own pace as to be able to win the English championship, and beat the world's record for a hundred yards, but also introduced various improvements upon it. This stroke is distinct from any other form of swimming: the legs from the knee upwards are kept in line with the body and almost closed; there is no opening of the legs or drawing up of the knees as for the breast, back and side strokes. The swimmer lies flat upon his breast on the surface, the lower part of the legs from the knee downward are alternately lifted above the surface up to the middle of the calf and then they are struck down upon the water with the instep with all force possible. This striking is done from an upward to a downward direction, one leg at a time. The arms are used somewhat similarly as in the trudgen stroke, they are bent at the elbows, dipped in just beyond the head and drawn smartly backwards till they come out of the water at the hips. The right arm is dipped in when the left foot strikes downward and vice versa. The result of this movement is that when one or the other of the limbs is pulling or propelling the body through the water at the same moment another limb is being recovered for the next stroke, most of the limbs are recovered through the air, fewer dead or retarding points are produced than in any other stroke, and less resistance is caused in the line of progress. In performing any other stroke most of the limbs are recovered through the water.

One of the most useful accomplishments for a swimmer is that of floating, but curiously enough many of them cannot acquire a knowledge of it. It is purely a matter of buoyancy, and requires constant practice before one can become perfect in it. In learning to float the beginner experiences great diffi- culty in overcoming the tendency of the legs to sink, and if after frequent trials they are still found to sink he should get some one to hold them up or else place them on the steps or behind the rail of the bath, and thus assisted learn to balance the body on

the surface. Before doing so he should completely fill his lungs, spread his legs wide, and then lie backwards with the arms extended in a line with the body and beyond the head, with the palms upwards, care being taken to throw as much weight beyond the head as possible. Furthermore he must lie perfectly still and take care not to hollow the back or raise the abdomen above water. One may sink for an instant, but if the breath be held the lips will come above the surface, when easy breathing may be indulged in. Only the face, chest and toes should appear above the surface of the water. If the feet still have a tendency to sink after they have been gently released from the step or rail, more weight should be thrown beyond the head by turning it well back and lifting the hands out of the water, which will raise the feet. A knowledge of floating is of good service to those attempting to save life and is also essential to those desirous of making a study of the many tricks and scientific feats which are performed by swimmers.

The usual method of entering the water is by what is known as diving; some think that it should be termed " springing." The best method of learning to dive is to stand on the side of the bath or on the bank of the river, and then stoop down until the body is nearly double, stretch out the arms in front of the head, sink the head between them and gradually fall over into the water. The ability to enter the water head first will then soon be acquired. To begin, the legs should be placed together and the body kept erect, then a few short inspirations should be made and the lungs cleared and inflated, the arms should be swung from the front and a spring made from the diving base. As the feet leave the base they should be thrown upwards, the body straightened and the head placed between the arms, which should be kept at full stretch beyond the head, with the hands palm downwards and the thumbs touching so as to act as a cut- water. Immediately the body has entered the water, the hands should be turned upwards and the body will then come to the surface at once. In high diving a leap is made into mid- air, the body straightened almost to horizontal level, the arms and head then declined towards the water and the legs brought up. This action causes the body to shoot towards the water at a proper angle and the dive is thereby made clean and effective. A useful accomplishment is that known as surface diving, be- cause it enables you to find and bring an object to the surface. The correct method of performing it is to first swim a few yards on the surface with the breast stroke, take a breath, then suddenly depress the head, look downwards, elevate the body at the hips, and at the same time make a powerful stroke with the legs and an upward stroke with the hands. The impetus thus obtained will suffice to take the swimmer to the bottom in 10 ft. of water. Once under the surface it is only necessary to keep the head depressed and swim by means of the breast stroke in order to find the object of search. When about to rise to the

surface, the head should be turned backwards with the eyes upwards, and a vigorous stroke made with arms and legs. Plunging is not very generally practised, though there is a championship for it. A plunge is a standing dive made head first from a firm take off, free from spring. The body must be kept motionless face downwards, no progressive movement must be imparted other than the action of the dive. The plunge terminates when the plunger raises his face above the surface of the water. With the idea of preventing long tests without breathing, it was deemed in 1893 advisable by the swimming association to impose a time limit of one minute in all competitions. Yet even with this time limit, over 80 ft. has been plunged. In Sweden and Germany skilled forms of acrobatic and gymnastic diving have been more largely practised than in England, and as a consequence diving in those countries is in a much higher state of perfection than in England, though even in England great improvement has been made owing to a large influx of Swedish teachers.

Most of the principal races are decided in baths, but there has been a tendency of late years to revert to open water in the summer and also to encourage long-distance swimming. The

first public baths in Great Britain were opened by the corpora- tion of Liverpool in 1828 and the Baths and Washhouses Act was passed in 1846, the first of the London parishes to adopt the act being St Martin's in the Fields, who opened baths in Green Street, Leicester Square in 1846. Since then public baths have been erected all over Great Britain and Ireland, and bath swimming has become, by reason of the lack of reasonable open water accommodation, the principal means of the teaching of the young. But open water swimming, and more particularly swimming in the sea, is the best training and practice for those who really love the art, because they are able to swim under normal climatic conditions, instead of in tepid water. Many persons in England bathe in the open all the year round, notably in the Serpentine in London, on the sea-coast and in various inland waters.

When bathing in the open, care has to be taken to avoid weeds or undercurrents. In the event of accidentally getting hold of a bed of weeds, the swimmer should cease kicking and work with the arms, and the current will then take him through. If he tries to swim the weeds will entangle his legs and put him in an awkward plight. If he be carried away by a current in a river, he should select a spot on either bank and swim diagonally towards it, never minding where he has left his clothes. When in the sea, the conditions are not always the same, though the general rule of swimming diagonally for shore also applies. For sea bathing, however, it is far better, no matter how good a swimmer one may be, to have a boat in attendance. Before bathing in any strange place, the swimmer should make himself acquainted with the currents and the direction of the tide. When

the tide is going out the course should be made along the coast, close in shore. In a rough sea the swimmer should not attempt to breast the waves, but as each wave rises he should- swim through, thereby saving himself from buffeting, which if long continued would cause insensibility or else great waste of physical power. When using a boat for bathing the best way is to dive from the stern, to which some steps or a rope ladder should be fixed, in order to aid the swimmer when getting in again. Failing these being at hand, the best way is to lay hold of the stern with both hands and then, making a hard rising kick, raise the body till it rests on the edge of the hips. Then smartly slip the hands a little forward, turn to a sitting position and enter the boat.

Speed swimming records are so frequently altered, that students had best obtain the Amateur Swimming Association's Annual Handbook, in which are detailed the accepted records up to date. The improvement in speed has been most remarkable. In 1877 the mile amateur record was 29 m. 25J sees.; and that stood until 1892. The record in 1907 was 24 m. 42I sees, made by Mr D. Billington. The hundred yards record has been similarly reduced. In 1878 it svas 1 m. i6f sees.; in 1888 it had been lowered by Mr J. Nuttall to 1 m. 6| sees.; and in 1907 Mr C. M. Daniels, of America, created a world's record of 55! sees. The records over intermediate distances have also been considerably lowered and many long-distance swimming records have from time to time been created. One of the most remarkable of these long-distance swims is the race which is known as the " Swim through London," from Richmond lock and weir to Blackfriars, which was instituted in 1907 and won by Mr J. A. Jarvis of Leicester, in 3 hours 24 minutes 6$ sees. In this event 34 started, and 21 finished the distance, which goes to show that much attention is being devoted to long-distance trials; in this event Miss Lilian M. Smith finished fourteenth. Much interest has centred in attempts to swim across the English Channel; Captain Webb, D. Dalton and F. Cavill, all claim to have done it, but only the swim of Captain Webb has been accepted as genuine. The first recorded attempt was made on the 24th of August 1872 by J. B. Johnson, who started from Dover, but remained in the water only 65 minutes. It was on the 12th of August 1875 that Captain Matthew Webb made his first attempt. He started from Dover and remained in the water 6 hours 49 m., when the weather became too rough for him to continue. It is estimated that he was about 13ˆ m.

across when he had to give up. On the 24th-2Sth of August 1875, he swam across the English Channel, diving from the Admiralty Pier, Dover, and

touching Calais sands, France, after swimming for 21 hours 45 m. It is the greatest swim ever recorded, and at the time of the accomplishment created a great sensation in England. Since this great achievement, numerous unsuccessful attempts have been made, the best being those of Montague Holbein, Jabez Wolff and T. W. Burgess, and their efforts created an interest in long-distance swimming in all parts of the world, which has resulted in the accomplishment of trials and tests once thought impossible.

Bibliography. — The literature of the subject of swimming is considerable ; the most useful work of general reference is Swimming, by Ralph Thomas (London, 1904), with bibliography. Other chief works on the technic of swimming that may be mentioned are: Thevenot, The Art of Swimming (London, 1789) ; Steedman, Manual of Swimming (Melbourne, 1867) ; W. Wilson, The Swimming Instruc- tor (London, 1883) ; A. Sinclair and W. Henry, Swimming (Badmin- ton Library, London, 1893); C. M. Daniels, How to Swim and Save Life (Spalding's Library, London, 1907). (W. Hy.)

SWINBURNE, ALGERNON CHARLES (1837-1909), English poet and critic, was born in London on the 5th of April 1837. He was the son of Admiral Charles Henry Swinburne (of an old Northumbrian family) and of Lady Jane Henrietta, a daughter of George, 3rd earl of Ashburnham. It may almost be said to have been by accident that Swinburne owned London for his birthplace, since he was removed from it immediately, and always felt a cordial dislike for the surroundings and influences of life in the heart of a great city. His own childhood was spent in a very different environment. His grandfather, Sir John Edward Swinburne, bart., owned an estate in Northumberland, and his father, the admiral, bought a beautiful spot between Ventnor and Niton in the Isle of Wight, called East Dene, together with a strip of undercliff known as the Landslip. The two homes were in a sense amalgamated. Sir Edward used to spend half the year in the Isle of Wight, and the admiral's family shared his northern home for the other half; so that the poet's earliest recollections took the form of strangely contrasted emotions, inspired on the one hand by the bleak north, and on the other by the luxuriant and tepid south. Of the two, the influences of the island are, perhaps naturally, the stronger in his poetry; and many of his most beautiful pieces were actually written at the Orchard, an exquisite spot by Niton Bay, which belonged to relatives of the poet, and at which he was a constant visitor.

After some years of private tuition, Swinburne was sent to Eton, where he remained for five years, proceeding to Balliol College, Oxford, in 1857. He was three years at the University, but left without taking a degree. Clearly he must have culti- vated while there his passionate and altogether unacademic love for the literature of Greece; but his undergraduate career

was unattended by university successes, beyond the Taylorian prize for French and Italian, which he gained in 1858. He contributed to the " Undergraduate Papers," published during his first year, under the editorship of John Nichol, and he wrote a good deal of poetry from time to time, but his name was probably regarded without much favour by the college authorities. He took a second class in classical moderations in 1858, but his name does not occur in any of the " Final " honour schools. He left Oxford in i860, and in the same year published those remark- able dramas, The Queen Mother and Rosamond, which, despite a certain rigidity of style, must be considered a wonderful per- formance for so young a poet, being fuller of dramatic energy than most of his later plays, and rich in really magnificent blank verse. The volume was scarcely noticed at the time, but it attracted the attention of one or two literary judges, and was by them regarded as a first appearance of uncommon promise.

It is a mistake to say, as most biographers do, that Swinburne, after leaving Oxford, spent some time in Italy with Walter Savage Landor. The facts are quite otherwise. The Swin- burne family went for a few weeks to Italy, where the poet's mother, Lady Jane, had been educated, and among other places they visited Fiesole, where Landor was then living in the house that had been arranged for him by the kindness of the Brownings.

Swinburne was a great admirer of Landor, and, knowing that he was likely to be in the same town with him, had provided himself with an introduction from his friend, Richard Monckton Milnes. Landor and Swinburne met and conversed, with great interest and mutual esteem; but the meetings were not for more than an hour at a time, nor did they exceed four or five in number. Swinburne never lived in Italy for any length of time. In 1865 appeared the lyrical tragedy of Atalanta in Calydon, followed in the next year by the famous Poems and Ballads, and with them the poet took the public gaze, and began to enjoy at once a vogue that may almost be likened to the vogue of Byron. His sudden and imperative attraction did not , it is true, extend, like Byron's, to the unliterary; but among lovers of poetry it was sweeping, permeating and sincere. The Poems and Ballads were vehemently attacked, but Dolores and Faustine were on everyone's lips: as a poet of the time has said, " We all went about chanting to one another these new, astonishing melodies." Chastelard, which appeared between Atalanta and Poems and Ballads, enjoyed perhaps less unstinted attention; but it is not too much to say that by the close of his thirtieth year, in spite of hostility and detraction, Swinburne had not only placed himself in the highest rank of contemporary poets, but had even established himself as leader of a choir of singers to whom he was at once master and prophet.

Meanwhile, his private life was disturbed by troublous influences. A

favourite sister died at East Dene, and was buried in the little shady churchyard of Bonchurch. Her loss overwhelmed the poet's father with grief, and he could no longer tolerate the house that was so' full of tender memories. So the family moved to Holmwood, in the Thames Valley, near Read- ing, and the poet, being now within sound of the London literary world, grew anxious to mix in the company of the small body of men who shared his sympathies and tastes. Rooms were found for him in North Crescent, off Oxford Street, and he was drawn into the vortex of London life. The Pre-Raphaelite movement was in full swing, and for the next few years he was involved in a rush of fresh emotions and rapidly changing loyalties. It is indeed necessary to any appreciation of Swinburne's genius that one should understand that his inspiration was almost invariably derivative. His first book is deliberately Shake- spearian in design and expression; the Atalanta, of course, is equally deliberate in its pursuit of the Hellenic spirit. Then, with a wider swing of the pendulum, he recedes, in Poems and Ballads, to the example of Baudelaire and of the Pre-Raphaelites themselves; with the Song of Italy (1867) he 'is drawing towards the revolt of Mazzini ; by the time Songs before Sunrise are com- pleted (in 1871) he is altogether under the influence of Victor Hugo, while Rome has become to him " first name of the world's names." But, if Swinburne's inspiration was derivative, his manner was in no sense imitative; he brought to poetry a spirit entirely his own, and a method even more individual than his spirit. In summing up his work we shall seek to indicate wherein his originality and his service to poetry has lain; meanwhile, it is well to distinguish clearly between the influences which touched him and the original, personal fashion in which he assumed those influences, and made them his own. The spirit of Swinburne's muse was always a spirit of revolution. In Poems and Ballads the revolt is against moral conventions and restraints; in Songs before Sunrise the arena of the contest is no longer the sensual sphere, but the political and the ecclesiastical. The detestation of kings and priests, which marked so much of the work of his maturity, is now in full swing, and Swin- burne's language is sometimes tinged with extravagance and an almost virulent animosity. With Bothwell (1874) he returned to drama and the story of Mary Stuart. The play has fine scenes and is burning with poetry, but its length not only precludes patient enjoyment, but transcends all possibilities of harmonious unity. Erechtheus (1876) was a return to the Greek inspiration of Atalanta; and then in the second series of Poems and Ballads (1878) the French influence is seen to be at work, and Victor Hugo begins to hold alone the place possessed, at different times, by Baudelaire and Mazzini. At

this time Swinburne's energy was at fever height; in 1879 he published his eloquent Study of Shakespeare, and in 1880 no fewer than three volumes, The Modern Heptalogia, a brilliant anonymous essay in parody, Songs of the Springtides, and Studies in Song. It was shortly after this date that Swinburne's friendship for Theodore Watts-Dunton (then Theodore Watts) grew into one of almost more than brotherly intimacy. After 1880 Swinburne's life remained without disturbing event, devoted entirely to the pursuit of literature in peace and leisure. The conclusion of the Elizabethan trilogy, Mary Stuart, was published in 1881, and in the following year Tristram of Lyonesse, a wonderfully individual contribution to the modern treatment of the Arthurian legend, in which the heroic couplet is made to assume opulent, romantic cadences of which it had hitherto seemed incapable. Among the publications of the next few years must be mentioned A Century of Roundels, 1883; A Mid- summer Holiday, 1884; and Miscellanies, 1886. The current of his poetry, indeed, continued unchecked; and though it would be vain to pretend that he added greatly either to the range of his subjects or to the fecundity of his versification, it is at least true that his melody was unbroken, and his mag- nificent torrent of words inexhaustible. His Marino Falicro (1885) and Locrine (1887) have passages of power and intensity unsurpassed in any of his earlier work, and the rich metrical effects of Astrophel (1894) and The Tale of Balin (1896) are inferior in music and range to none but his own masterpieces. In 1899 appeared his Rosamund, Queen of the Lombards; in 1908 his Duke of Gardia; and in 1904 was begun the publication of a collected edition of his Poems and Dramas in eleven volumes.

Besides this wealth of poetry, Swinburne was active as a critic, and several volumes of fine impassioned prose testify to the variety and fluctuation of his literary allegiances. His Note on Charlotte Bronte (1877) must be read by every student of its subject; the Study of Shakespeare (1880) — followed in 1909 by The Age of Shakespeare — is full of vigorous and arresting thought, and many of his scattered essays are rich in suggestion and appreciation. His studies of Elizabethan literature are, indeed, full of " the noble tribute of praise," and no contemporary critic did so much to revive an interest in that wonderful period of dramatic recrudescence, the side-issues of which have been generally somewhat obscured by the pervading and dominating genius of Shakespeare. Where his enthusiasm was heart-whole, Swin- burne's appreciation was stimulating and infectious, but the very qualities which give his poetry its unique charm and character were antipathetic to his success as a critic. He had very little capacity for cool and reasoned judgment, and his criticism is often a tangled thicket of prejudices and predilec- tions. He was, of course, a master of the phrase; and it never happened that he touched a subject without illuminating it with some lightning-flash of genius, some vivid

penetrating suggestion that outflames its shadowy and confused environment. But no one of his studies is satisfactory as a whole; the faculty for sustained exercise of the judgment was denied him, and even his best appreciations are disfigured by error in taste and proportion. On the other hand, when he is aroused to literary indignation the avalanche of his invective sweeps before it judgment, taste and dignity. His dislikes have all the superlative violence of his affections, and while both alike present points of great interest to the analyst, revealing as they do a rich, varied and fearless individuality, the criticism which his hatreds evoke is seldom a safe guide. His prose work also includes an early novel of some interest, Love's Cross-currents, disinterred from a defunct weekly, the Taller, and revised for publication in 19Q5.

Whatever may be said in criticism of Swinburne's prose, there is at least no question of the quality of his poetry, or of its important position in the evolution of English literary form. To treat first of its technique, it may safely be said to have revolutionized the whole system of metrical expression. It found English poetry bound in the bondage of the iambic; it left it revelling in the freedom of the choriambus, the dactyl

and the anapaest. Entirely new effects; a richness of orchestra- tion resembling the harmony of a band of many instruments; the thunder of the waves, and the lisp of leaves in the wind; these, and a score other astonishing poetic developments were allied in his poetry to a mastery of language and an overwhelm- ing impulse towards beauty of form and exquisiteness of imagina- tion. In Tristram of Lyonesse the heroic couplet underwent a complete metamorphosis. No longer wedded to antithesis and a sharp caesura, it grew into a rich melodious measure, capable of an infinite variety of notes and harmonies, palpitating, intense. The service which Swinburne rendered to the English language as a vehicle for lyrical effect is simply incalculable. He revolutionized the entire scheme of English prosody. Nor was his singular vogue due only to this extraordinary metrical ingenuity. The effect of his artistic personality was in itself intoxicating, even delirious. He was the poet of youth insurgent against all the restraints of conventionality and custom. The young lover of poetry, when first he encounters Swinburne's influence, is almost bound to be swept away by it; the wild, extravagant licence, the apparent sincerity, the vigour and the verve, cry directly to the aspirations of youth like a clarion in the wilderness. But, while this is inevitable, it is also true that the critical lover of poetry outgrows an unquestion- ing allegiance to the Swinburnian mood more quickly than any other of the diverse emotions aroused by the study of the great poets. It is not that what has been called his " pan-anthropism" — his universal worship of the holy spirit of man — is in itself an unsound philosophy; there have been many creeds founded on such a basis which have impregnably withstood the attacks of criticism. But the

unsoundness of Swinburne's philosophy lies in the fact that it celebrates the spirit of man engaged in a defiant rebellion that leads nowhere; and that as a " criticism of life " it has neither finality nor a sufficiently high seriousness of purpose. Walt Whitman preaches very much the same gospel of the " body electric " and the glory of human nature; but Whitman's attitude is far saner, far more satisfying than Swinburne's, for it is concerned with the human spirit realizing itself in accordance with the unchangeable laws of nature; while Swinburne's enthusiasm is, more often than not, directed to a spiritual revolution which sets the laws of nature at defiance. It is impossible to acquit his poetry entirely of the charge" of an animalism which wars against the higher issues of the spirit — an animalism sometimes of love, sometimes of hatred, but, in both extremes, out of centre and harmony. m

Yet, when everything has been said that can be said against the unaesthetic violences of the poet's excesses, his service to contemporary poetry outweighed all disadvantages. No one did more to free English literature from the shackles of formalism; no one, among his contemporaries, pursued the poetic calling with so sincere and resplendent an allegiance to the claims of absolute and unadulterated poetry. Some English poets have turned preachers; others have been seduced by the attractions of philosophy; but Swinburne always remained an artist absorbed in a lyrical ecstasy, a singer and not a seer. When the history of Victorian poetry comes to be Written, it will be found that his personality was, in its due perspective, among the most potent of his time; and as an artistic influence it will be pronounced both inspiring and beneficent. The topics that he touched were often ephemeral; the causes that he celebrated will, many of them, wither and desiccate; but the magnificent freedom and lyrical resource which he introduced into the language will enlarge its borders and extend its sway so long as English poetry survives.

On the 10th of April 1909, after a short attack of influenza followed by pneumonia, the great poet died at the house on Putney Hill, " The Pines," where with Mr Watts-Dunton he had lived for many years. He was buried at Bonchurch, Isle of Wight. (E. G.)

SWINDON, a market town and municipal borough in the Cricklade parliamentary division of Wiltshire, England, 77! m. W. of London by the Great Western railway. Pop. (1891), 33,001; (1901), 45,006. It has two parts, New and Old. The

new town grew up around the vast locomotive and wagon works of the Great Western railway, and is an important junction on that system with a separate station on the Midland and South- western Junction railway. It arose rapidly on a strip of waste land, and churches and chapels were built for the workmen, whose numbers soon exceeded 10,000. Each man contributes to a medical fund which maintains the fever, accident and general hospitals; providing also laundries and baths. There are a mechanics' institute, containing a large library, theatre, reading- rooms and lecture-hall. The company owns a park with football and cricket grounds. An aisle of St Saviour's Church, dedicated in 1905, was built by the priest and congregation with their own hands. The picturesque old town stands on a hill over- looking the Gloucestershire borders, the White Horse Vale and Lambourn Down in Berkshire, and the great chalk uplands of Marlborough ; while the camps of Blunsdon, Ringsbury, Barbury and Badbury are all visible. Here the chief buildings are the church, town-hall, market-hall and corn exchange. Old Swindon received the right of holding a fair from Charles I. Coate Reservoir, less than 2 m. south-east, is a broad lake which supplies a branch of the Berks and Wilts Canal. Its shores are beautifully wooded, and it abounds with fish. Swindon is governed by a mayor, 1 2 aldermen and 36 councillors. Area, 4265 acres.

SWINE, a name properly applicable to the domesticated pig (Sus scrofa), but also including its wild relatives. As stated in the article Artiodactyla, these animals typify the family Suidae, which, with the Hippopotamidae, constitute the section Suina, a group of equal rank with the Pecora. The Suidae are divisible into the true Old World swine (Suinae) and the American peccaries (Dicotylinae). Of the former the leading characteristics are as follows: an elongated mobile snout, with an expanded, truncated, nearly naked, flat, oval terminal surface in which the nostrils are placed. Feet narrow, with four com- pletely developed toes on each. Hoofs of the two middle toes with their contiguous surfaces flattened. The outer toes not reaching to the ground in the ordinary walking position. Teeth variable in number, owing to the suppression in some forms of an upper incisor and one or more premolars.

In the typical genus Sus, as exemplified by domesticated pigs (see Pig) and the wild boar (see Boar), the dentition is i.\, c.{, p.\, m.%\ total 44; the upper incisors diminishing rapidly in size from the first to the third, and the lower incisors long, narrow, closely approxi- mated, and almost horizontal in position, their tips inclining towards the middle line, the second slightly larger than the first, the third much smaller. The tusks or canines are strongly developed, with

Fig. 1. — Dentition of Boar (Sus scrofa).

persistent roots and a partial enamel covering, those of the upper jaw not having the usual downward direction, but curving out- wards, upwards and finally inwards, while those of the lower jaw are directed upwards and outwards with a gentle backward curve, their hinder edges working and wearing against the front edges of the upper pair. The tusks appear externally to the mouth, the form of the upper lip being modified to allow of their protrusion, but are much less developed in females than in males. The teeth of the molar series gradually increase in

size and complexity from first to last, and are arranged in contiguous series, except that the first lower premolar is separated by an interval from the second. First and second upper premolars with compressed crowns and two roots; and the third and fourth with an inner lobe of the crown, and an additional pair of roots. The first and second molars have quadrate crowns, with four principal obtuse conical cusps, around which numerous accessory cusps are clustered. The crown of the third molar is nearly as long as those of the first and second together, having, in addition to the four principal lobes, a large posterior heel, composed of clustered conical cusps, and sup- ported by additional roots. The lower molars resemble generally those of the upper jaw, but are narrower. Milk dentition : »'.§-, c. {, m. | ; total 28 — the first permanent premolar having no predecessor. The third incisor in both upper and lower jaws is large, developed before the others, with much the size, form and direction of the canine. Vertebrae: C. 7, D. 13-14, L. 6, S. 4, Ca. 20-24. The hairy covering of the body varies under different conditions of climate, but when best developed, as in the European wild boar, consists of long stiff bristles, abundant on the back and sides, and of a close softer curling under-coat.

All the typical swine are further characterized by the fact that the young are longitudinally striped with bands of dark brown and some paler tint; this striped coat disappearing in the course of a few months. On the other hand, this peculiar marking is rarely seen in domestic pigs in any part of the world, although it has been occasionally observed. It is stated by Darwin that the pigs which have run wild in Jamaica and New Granada have resumed this aboriginal character, and produce longitudinally striped young; these being the descendants of domestic animals introduced from Europe since the Spanish conquest, as before that time there were no true pigs in the New World. Another character by which the European domesticated pig differs from any of the wild species is the concave outline of the frontal region of the skull.

In the wild boar (Sus scrofa) the upper or hinder surface of the lower tusk, which has no enamel, inclines obliquely outwards and is broader than the outer surface. The distributional area

Fig. 2. — Wild Boar and Young (Sus scrofa).

of this species includes northern Africa, Europe and central and northern Asia as far as Amurland. Whether the Nubian S. senarensis is really distinct, seems doubtful. To the same group belongs the Indian 5. cristatus, distinguished by the more pronounced development of the crest of long hairs on the nape of the neck, and closely related to the next species. The third species is the banded pig 5. vittatus, of Sumatra, characterized by having a broad reddish or whitish band running from the middle of the snout along the upper lip to disappear on the side of the neck; the skull being short and high, with the facial portion of the lachrymal bone small. Races of this type are also met with in Java, Cochin-China and Formosa; the pig from the latter island having been named 5. tdivanus. Near akin is the Japanese 5. leucomystax and the small Andamanese 5. andamanensis. Whether the New Guinea S. papuensis and S. niger are really indigenous members of this group or modified descendants of European tame pigs is doubtful; although the general character of the Papuan fauna supports the idea that they are introduced.

SWINEMUNDE— SWING, D.

A second group is typified by the warty pig, 5. verrucosus, of Java, in which the hinder or upper unenamelled surface of the lower tusk is narrower than the outer, concave, and set nearly in the long axis of the skull. The skull itself is elongated, with comparatively simple and primitive molars, the latter being relatively short. There are also three small warts on each side of the face, the largest of which is just below the eye and carries long bristles. The small 5. celebensis of Celebes and S. philip- pinensis are probably only varieties of this species. The bearded pig 5. barbatus { = longiroslris) of Borneo is a very distinct member of this group, distinguished by the great elongation of the skull, and the presence of a tuft of long hair near the muzzle. In Sumatra it is represented by the sub- species 5. b. 6i, and in south-west Borneo by S. b. gargantua.

Some doubt exists whether the pygmy hog of the Nepal Terai, which is not much larger than a hare, is best regarded as a member of the typical genus, under the name of Sus salvanius or as representing a genus by itself, with the title Porcula salvania.

Similar doubts have also been entertained with regard to the African bush-pigs or river-hogs, but from geographical considerations alone these are but regarded as representing a separate genus, Potamoehoerus, although they are nearly allied to the verrucosus group of Sus. They are specially distinguished by the great development of the anterior half of the zygomatic arch of the skull, and by the presence in the boars of a horny protuberance

of the skin in front of each eye, which overlies a tuberosity on the nasal bone; the molars are also small and simple, and the anterior premolars are generally shed at an early stage of life. The group is represented in Madagascar, as well as in Africa south of the Sahara. (See River-Hog.)

The recently discovered Hylochoerus of the equatorial forest- districts of Africa comes nearest to the under-mentioned wart- hogs, but the skull is of a much less specialized type, while the upper tusks are much smaller although they have the same general curvature and direction, and the cheek-teeth lack the peculiar characteristics of those of Phacochoerus, although they present a certain approximation thereto. On the other hand, resemblance to that genus is shown by the reduction of the upper incisors to a single pair. The skin is clothed with a thick coat of coarse black hair of a bristly nature, but there are a few whitish hairs on the face and in the groin.

In the African wart-hogs {Phacochoerus), which take their name from the large warty lobes projecting from each side of the face, the teeth are remarkably modified. The milk-dentition, and even the early condition of the permanent dentition, is formed on the same general type as that of Sus, except that certain teeth are absent, the formula being i\, c{, p\, m\, total 34; but as age advances all the teeth have a tendency to disappear, except the canines and the posterior molars, but these, which in some cases are the only teeth left in the jaws, attain an extraordinary development. The upper canines especially are of great size, and curve outwards, forwards and upwards. Their enamel covering is confined to the apex, and soon wears away. The lower canines are much more slender, but follow the same curve ; except on the posterior surface, their crowns are covered with enamel ; both pairs of canines are large in the two sexes. The third or last molar tooth of both jaws is of great size, and presents a structure at first sight unlike that of any other mammal, being composed of numerous (22-25) parallel cylinders or columns, each with pulp-cavity, dentine and enamel-covering, and packed together with cement. Examination will, however, show that a modification similar to that which has transformed the comparatively simple molar tooth of the mastodon into the extremely complex grinder of the Indian elephant has served to change the tooth of the common pig into that of Phacochoerus. The tubercles which cluster over the surface of the crown of the common pig are elongated and drawn out into the columns of the wart-hog, as the low transverse ridges of the mastodon's tooth become the leaf-like plates of the elephant's molar. (See Wart-Hog.)

The last existing representative of the Suidae is the babirusa of Celebes, alone representing the genus of the same name, and readily distinguished by the extraordinary size and form of the tusks of the old males. (For the characteristics of this animal see Babirusa.)

Extinct Swine. — Species of Sus are met with in PKocene strata of Europe and Asia, the Lower Pliocene 5. erymanthius of Greece and S. giganteus and 5, titan of India being enormous animals; the last

with comparatively simple molars. The European 5. palaeochoerus and the Indian S. hysudricus are smaller forms ; the first exhibiting signs of relationship with Potamoehoerus. In India also occurs Hippohyus distinguished by the extremely complicated structure of its molars. In the European Miocene we have Hyotherium and Palaeochoerus, and in the Upper Oligocene Propalaeochoerus, which have square molars without any tendency to a selenodont structure in their cusps. Curiously enough a selenodont type is, however, apparent in those of the imperfectly known Egyptian Geniohyus of the Upper Eocene, the earliest species which can be included in the family. Even in this the forward direction of the lower incisors is noticeable. Choeropotamus is a European Oligocene genus with bunodont molars which show a conspicuous basal cingulum in the lower dentition; the first premolar is absent. In the European Miocene Listriodon, which also occurs in the Indian Tertiaries, the molars have a pair of transverse ridges, like those of the proboscidean Dinotherium (q.v.) ; but the genus is believed to be related to the Oligocene Doliochoerus and Choerotherium, in which these teeth show a more normal type of structure.

For the genus Elotherium, of the Lower Miocene and Upper Oligocene of both hemispheres, which is often placed next the Suidae, see Artiodactyla. The American Dicotylinae are noticed under Peccary. (R. L.)'*

SWINEMUNDE, a port and seaside resort of Germany, in the Prussian province of Pomerania, situated at the east extremity of the island of Usedom, and on the left bank of the river Swine which connects the Stettiner Haff with the Baltic. Pop. (1905), 13,272. It serves as the outer port of Stettin (q.v.), 42 m. distant by water, with which, as with Heringsdorf, it has direct railway communication. Its broad unpaved streets and one-storey houses built in the Dutch style give it an almost rustic appear- ance, although its industries, beyond some fishing, are entirely connected with its shipping. The entrance to the harbour, the best on the Prussian Baltic coast, is protected by two long breakwaters, and is strongly fortified. The grand lighthouse, 216 ft. high, rises beside the new docks on the island of Wollin, on the other side of the narrow Swine. In 1897 the river con- tinuation of the Kaiserfahrt was opened to navigation, and, further, the waterway between the Haff and the Baltic was deepened to 24 ft. in 1900-1901 and in other ways improved. The connexion between Swinemunde and Stettin is kept open in winter by ice breakers. Formerly ships of heavy burden bound for Stettin discharged or lightened their cargo

at Swine- miinde, but since the recent deepening of the river Oder they can proceed direct to the larger port.

The Swine, the central and shortest passage between the Stettiner Haff and the Baltic Sea, was formerly flanked by the fishing villages of West and East Swine. Towards the beginning of last century it was made navigable for large ships, and Swinemunde, which was founded on the site of West Swine in 1748, was fortified and raised to the dignity of a town by Frederick the Great in 1765.

See Wittenberg, Swinemunde, Ahlbeck und Heringsdorf (Linz,

1893).

SWING, DAVID (1830-1894), American clergyman, was born of Alsatian stock in Cincinnati, Ohio, on the 23rd of August 1830. He spent most of his boyhood on a farm and earned his schooling; graduated at Miami University in 1852; studied theology at Lane Seminary; and was principal of the preparatory school at Miami in 1853-1866. He became pastor in 1866 of the Westminster Presbyterian Church (after 1868 the Fourth Church) in Chicago, which was destroyed in the fire of 1871; he then preached in McVicker's theatre until 1874, when a new building was completed. In April 1874 he was tried before the presbytery of Chicago on charges of heresy preferred by Dr Francis Landey Patton, who argued that Professor Swing preached that men were saved by works, that he held a " modal" Trinity, that he did not believe in plenary inspiration, that he unduly countenanced Unitarianism, &c. The presbytery acquitted Dr Swing, who resigned from the presbytery when he learned that the case was to be appealed to the synod. As an action was taken against the church, of which he had remained pastor, he resigned the pastorate, again leased McVicker's theatre (and after 1880 leased Central Music Hall, which was built for the purpose), and in 1875 founded the Central Church, to which many of his former parishioners followed him, and in which he

built up a large Sunday school, and established a kindergarten, industrial schools, and other important charities. He died in Chicago on the 3rd of October 1894. He was an excellent preacher, but no theologian. He published Sermons (1874), including most of his " heretical " utterances, Truths for To-day (2 vols., 1874-1876), Motives of Life (1879), and Club Essays

(1881).

See Joseph F. Newton, David Swing, Poet-Preacher (Chicago,

1909).

SWINTON, an urban district in the Rotherham parliamentary division of the West Riding of Yorkshire, England, 105 m. N.E. of Sheffield, on the Midland, North Eastern and Great Central railways. Pop. (1891), 9705; (1901), 12,217. It is situated at the junction of the Dearne and Dove navigation with the river Don navigation. In the churchyard of St Margaret's church (rebuilt in 1817) two beautiful Norman arches of the old church are preserved. There are collieries, quarries and brickfields in the neighbourhood. There are also flint and glass- bottle works, ironworks (for stoves, grates, fenders and kitchen ranges), and earthenware manufactures. The town was formerly renowned for its Rockingham ware. A free warren was granted to Swinton by Henry II.

SWINTON AND PENDLEBURY, an urban district in the Eccles parliamentary division of Lancashire, England, 5 m. N.W. of Manchester, with stations on the Lancashire & York- shire railway. Pop. (1901), 27,005. The church of St Peter, a fine building of stone with a lofty western tower, was erected from the designs of Sir Gilbert Scott in 1869. The Swinton industrial schools, opened in February 1846, are a fine range of buildings of brick with stone facings, surrounded with grounds extending to 20 acres. The manufacture of cotton, and coal- mining are the chief industries. Anciently a large part of Swinton was possessed by the Knights Hospitallers of St John of Jerusalem.

SWITCHBACK, a form of pleasure railway, built over alternate descents and ascents, the train or car first gathering momentum by running down an incline, and surmounting by means of this a lesser ascent. Switchbacks were originally merely an imitation, using cars upon wheels, of the sledge-coasting courses of Russia, and were indeed named by the French montagnes russes. They were introduced in Paris in 1816, but soon disappeared in con- sequence of several serious accidents. About 1880 they again became popular both in Europe and America. A variation of the switchback, though lacking its essential principle of climb- ing by means of momentum, is the water-chute, an imitation of the Canadian toboggan-slide, in which cars built in the shape of boats glide down steep inclines into artificial lakes at their bases. This is popularly called " shooting the chutes." A further variation is " looping the loop," in which a heavy car on wheels, or a bicycle, starting at a considerable altitude, descends an incline so steep that sufficient momentum is accumulated to carry it completely round a track in the form of a perpendicular loop, in the course of which journey the occupants or rider, while crossing the top of the loop, are actually head downwards. Later it was made even more dangerous by

taking out part of the top of the loop, so that the car or bicycle actually passes through the air across the gap.

SWITCH PLANTS, a botanical term for plants, such as broom, with leaves very small or absent, and slender green shoots.

SWITHUN (or Swithin), ST (d. 862), bishop of Winchester and patron saint of Winchester Cathedral from the 10th to the 1 6th century. He is scarcely mentioned in any document of his own time. His death is entered in the Anglo-Saxon Chronicle under the year 861; and his signature is appended to several charters in Kemble's Codex diplomaticus. Of these charters three belong to 833, 838, 860-862. In the first the saint signs as " Swithunus presbyter regis Egberti," in the second as " Swithunus diaconus," and in the third as " Swithunus epis- copus." Hence if the second charter be genuine the first must be spurious, and is so marked in Kemble. More than a hundred years later, when Dunstan and Ethelwold of Winchester were inaugurating their church reform, St Swithun was adopted

as patron of the restored church at Winchester, formerly dedi- cated to St Peter and St Paul. His body was transferred from its almost forgotten grave to Ethelwold's new basilica on the 15th of July 971, and according to contemporary writers, numerous miracles preceded and followed the translation.

The revival of St Swithun's fame gave rise to a mass of legendary literature. The so-called Vitae Swithuni of Lantfred and Wulstan, written about A.D. 1000, hardly contain any germ of biographical fact; and all that has in later years passed for authentic detail ol St Swithun's life is extracted from a biography ascribed to Gotzelin, a monk who came over to England with Hermann, bishop of Salis- bury from 1058 to 1078. From this writer, who has perhaps pre- served some fragments of genuine tradition, we learn that St Swithun was born in the reign of Egbert, and was ordained priest by Helmstan, bishop of Winchester (838-c. 852). His fame reached the king's ears, who appointed him tutor of his son Adulphus (ˆEthel- wulf) and numbered him amongst his chief friends. Under ˆEthel- wulf he was appointed bishop of Winchester, to which see he was consecrated by Archbishop Ceolnoth. In his new office he was remarkable for his piety and his zeal in building new churches or restoring eld ones. At his request iEthelwulf gave the tenth of his royal lands to the Church. His humility was such that he made his diocesan journeys on foot; and when he gave a banquet he invited the poor and not the rich. He built near the eastern gate of his cathedral city a bridge whose stone arches were so strongly constructed that in Gotzelin's time they seemed a work "non leviter ruiturus." He died on the 2nd of July 862, and gave orders that he was not to be buried within the church, but outside in " a vile and unworthy place."

William of Malmesbury adds that, as Bishop Alhstan of Sherborne was iEthelwulf 's minister for temporal, so St Swithun was for spiritual matters. The same chronicler uses a remarkable phrase in recording the bishop's prayer that his burial might be " ubi et pedibus praeter- euntium et stillicidiis ex alto rorantibus esset obnoxius." This expression has been taken as indicating that the well-known weather myth contained in the doggrel lines —

St Swithin's day if thou dost rain

For forty days it will remain ;

St Swithin's day if thou be fair

For forty days 'twill rain na mair— had already, in the 12th century, crystallized round the name of St Swithun; but it is doubtful if the passage lends itself by any straining to this interpretation. James Raine suggested that the legend was derived from the tremendous downpour of rain that occurred, according to the Durham chroniclers, on St Swithun's day, 1315 {Hist. Dunelm. pp. xiii. 96-97). Another theory, more plausible, but historically worthless, traces it to a heavy shower by which, on the day of his translation, the saint marked his dis- pleasure towards those who were removing his remains. This story, however, cannot be traced further back than some two or three centuries at the outside, and is at variance with the 10th- century writers, who are all agreed that the translation took place in accordance with the saint's desire as expressed by vision. More probable is John Earle's suggestion that in the legend as now current we have the survival of some pagan or possibly prehistoric day of augury, which has successfully sheltered "itself under the protection of an ecclesiastical saint. This view is supported by the fact adduced in Notes and Queries (1st series, xii. 137) that in France St M6dard (June 8) and StGervase and St Protais (June 19) are credited with an influence on the weather almost identical with that attri- buted to St Swithun in England. Similarly we have in Flanders St Godelieve (July 6) and in Germany the Seven Sleepers' Day (June 27). Of other stories connected with St Swithun the two most famous are those of the Winchester egg-woman and Queen Emma's ordeal. The former is to be found in Gotzelin's life (c. I ioo), the latter in T. Rudborne's Historia major (15th century) — a work which is also responsible for the not improbable legend that Swithun accompanied Alfred on his visit to Rome in 856.

The so-called lives of St Swithun written by Wulstan, Lantfred, and perhaps others towards the end of the 10th century may be found in Bollandus's Acta sanctorum (July), i. 321-327; Mabillon's Acta SS. O. B. vi. 70, &c, vii. 628, &c. ; and J. Earle's Life and Times of St Swithun, 59, &c. See also

William of Malmesbury, Gest. reg. i. 150, and De gest. pont. 160, 167, 179; Florence of Worcester, i. 168; T. Rudborne ap. Wharton's Anglia sacra, i. 287; T. D. Hardy's Cat. of MSS. i. 513-517; J. Brand's Popular Antiquities; R. Chambers's Booh of Days ; Ethelwulf 's Tithe Charters, nearly all of which refer to St Swithun in the body of the text, may be studied in Haddon and Stubbs's Councils, iii. 636-645 ; a com- parison of the charter on page 642 with Gotzelin's life (ap. Earle, 69) and William of Malmesbury {Gest. reg. 150; De gest. pont. 160) seems to show that these charters, even if forgeries, date back at least to the nth century, as well as the story of his being Ethelwulf's " altor et ductor."

SWITZERLAND, a republican country of central Europe, comprising the Swiss Confederation, and bounded N. by the

PHYSICAL FEATURES]

SWITZERLAND

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German Empire, E. by Austria (except where the principality of Liechtenstein intervenes), S. by Italy, and W. by France.

Physical Description. — Switzerland extends between the parallels 45° 49′ 2″ and 47 48′ 32″ lat. (Greenwich) and the meridians 5° 57′ 26″ and 10° 29′ 40″ long. (Greenwich). It forms an irregular quadrilateral, of which the greatest length from east to west is 2265 m., and the greatest breadth from north to south is nearly 137 m. (136-8). It has, however, no proper physical unity, as it consists of a number of small districts, differing from each other widely in language, religion, ethnology, customs, &c, but bound together in a political alliance, made originally for common defence against a common foe. It is therefore an artificial land, just as its inhabitants form an artificial nation, though nowadays it is becoming more homogeneous in both respects. Its political boundaries thus do not coincide with those of nature. The entire canton of Ticino is south of the Alps, as are the valleys of Simplon (Valais), Mesocco, Bregaglia, Poschiavo and Miinster (all in the Grisons); the whole canton

3. The Swiss portion of the main chain of the Alps and this great northern outlier run parallel to each other from the Mont Dolent to near Coire, while for a short distance they actually unite near the Pizzo Rotondo (west of the St Gotthard Pass), parting again near the Oberalp Pass (east of the St Gotthard). Between these two great snowclad ranges flow two of the mightiest European rivers, the Rhone towards the west and the Rhine towards the east, their headwaters being only separated by the tangled

mountain mass between the Pizzo Rotondo and the Oberalp Pass, which sends the Reuss towards the north and the Ticino towards the south.

4. To the north of this great northern outlier rises the Jura range (q.v.), really a huge spur of the Alps (with which it is connected by the Jorat range), while between the northern outlier and the Jura extends what may be called the plains or " plateau " of Switzerland, consisting all but wholly of the undulating valley of the Aar (below Thun) with its numerous affluents. To that river valley we must add the valley of the Thur (a direct affluent of the Rhine), that lies between the Aar basin and the Rhine basin (the Lake of Constance).

We may thus roughly describe Switzerland (as it exists at the present time) as consisting of three great river valleys (Rhone, Rhine and Aar) with the smaller one of the Thur, which

THE SWISS

CONFEDERATION

1291 – 1798

Names of tho 13 Cantons u nderlined

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The 3 original CantonsfDie (Jrkantone)1231-1332

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The 8 ancient Cantons IXhH.ldHlWJmmm Th m n„„*« n c iM-S.i/uaˆ/ fˆjˆi, r— ~ (5 ad ded between 1332 and 1353) (5 added between 1481 and 1513)*

Allied and Protected Districts L~~_~J Subject Districts&MM Dates of Confederation, Alliance or Conquestare shown thus:-T$l2

Subject States incorporated with Cantons are indicated by the word To with the date of incorporation:- To Bern 1536

of Schaffhausen and part of that of Basel are north of the Rhine, while a large part of the Grisons lies to the east of the Rhine basin, and Porrentruy is far down on the western slope of the Jura. But it is to be noted that all these exceptional cases were outside the limits of the Swiss Confederation up to 1798. Putting them aside, the physical geography of Switzerland may thus be described: —

1. On the south runs the main chain of the Alps (q.v.), which is joined, at the Mont Dolent (12,543 ft.) in the chain of Mont Blanc, by the lower ranges that rise south of the Lake of Geneva, and which continues partly Swiss till close to the Stelvio Pass on the east.

2. To the north of this main chain there is another great range of mountains (wholly Swiss) only slightly inferior in extent and height, which starts from the hills known as the Jorat range above Lausanne, and culminates in the great snowy summits of the Bernese Oberland and of the Todi group, before trending to the north near Coire, and, after rising once more in the Santis group, dies away on the southern shore of the Lake of Constance.

all lie to the north of the main chain of the Alps and include the region between the Alps and the Jura. If we examine matters more carefully we note that the Rhone and Rhine valleys are shut off from that of the Aar (and, of course, of the Thur) by the great northern outlier of the Alps, which consists of the Bernese Oberland and Todi Alps. Two wide and undulat- ing valleys (Aar and Thur) and two deeply cut trenches (Rhone and Rhine) thus lie on the northern slope of the Alps, to the north and south respectively of the great northern outlier of the Alps. The main chain cf the Alps rises in Swiss territory to the height of 15,217 ft. in the loftiest summit or Dufourspitze (wholly Swiss) of Monte Rosa, though the Dom (14,942 ft.), in the Mischabel range, between Zermatt and Saas, is the highest mountain mass which is entirely Swiss. The great northern outlier attains a height of 14,026 ft. in the Finsteraarhorn (Bernese Oberland), while the lowest level (581 ft.) within the Confederation is on the Lago Maggiore. The highest

permanently inhabited village in Switzerland is Juf (6998 ft.), at the head of the Avers valley (a tributary of the Hinter Rhine, Grisons), while the lowest is Ascona (666 ft.), on the Lago Maggiore and just south-west of Locarno.

According to the most recent calculations, the total area of Switzerland is 15,951 sq. m. (some 2500 sq. m. less than that of Servia). Of this 11,927-5 sq. m. (or 74-8%) are reckoned as " productive," forests occupying 3,390-9 sq. m. and vine- yards 108-7 sq. m., the remainder, or 8427-7 sq. m., consisting of arable and pasture land. Of the " unproductive " area of 4023-5 sq. m (or 25-2%) much consists of lakes and rivers, while glaciers cover 709-7 sq. m. Approximately the Alps occupy one-

sixtieth of this area, the Jura about one-tenth, and the " plateau " the rest. Of the entire area the great cantons of the Grisons, Bern and the Valais take up 7411-8 sq. m., or nearly one- half, while if to them be added Vaud, Ticino and St Gall the extent of these six (out of twenty-two) cantons is 10,527-6 sq. m., or almost two-thirds of the area of the Confederation. Not included in the total area of Switzerland are three small " enclaves " (4 sq. m. in all), Blisingen and Verenahof (both in Schaffhausen) belonging to Baden, while Campione (opposite Lugano) is Italian. Switzerland borders on many countries — France west and south-west, Italy south, Austria east (Tirol and Vorarlberg), and Germany north (Bavaria, Wurttemberg, Baden and Alsace). Switzerland sends its waters to four great river basins (which drain to three different seas) in the following proportions: Rhine basin, 11,159 sq. m.; Rhone basin, 2768 sq. m.; Po basin, 1361 sq. m.; and Inn basin, 663 sq. m.

The thirteen cantons which till 1798 formed the Confederation are all comprised in the Rhine basin, the ten oldest (i.e. all before 1500) being within that of the Aar, and it was only after 1 798 that certain Romonsch-, French- and Italian-speaking " allies " and subject lands — with their river basins — were tacked on to them.

Most of the great Swiss rivers, being in their origin mere mountain torrents, tend to overflow their banks, and hence much is required and has been done to prevent this by embanking them, and regaining arable land from them. So the Rhine (between Ragatz and the Lake of Constance), the Rhone, the Aar, the Reuss; and in particular we may mention the great work on the Linth (1807-1816) carried out by Hans Konrad Escher, who earned by his success the surname of " Von der Linth," and on the Zihl near the lakes of Neuchatel and Bienne, while the diversion of the Kander from its junction with the Aar at Thierachern to a channel by which it flows into the Lake of Thun was effected as early as 1714.

There are very many lakes, large and small, in Switzerland. The two most extensive, those of Geneva and of Constance, balance each other, as it were, at the south-west and north-east corners of the land. But neither of these is wholly Swiss, this distinction being claimed by the next in size, that of Neuchatel (92-4 sq. m.), the Lago Maggiore (partly Swiss only) coming next in the list, and being followed by the wholly Swiss lakes of Lucerne and of Zurich. Then come Lugano, Thun, Bienne, Zug, Brienz, Morat, the Walensee, and Sempach (5! sq. m.). These fourteen only are over 4 sq. m. in extent. Eleven of them are in the Rhine basin (also in that of the Aar), two (Maggiore and Lugano) in that of the Po, and one (Geneva) in that of the Rhone. There are no large lakes in the Swiss portion of the Inn basin, the most extensive being that of §ils (1^ sq. m.). Of the smaller lakes those best known to travellers are the Daubensee (near the summit of the

Gemmi), the Oeschinensee (at the foot of the Blumlis Alp range) and the Marjelensee, formed by the damming up of the waters of the Great Aletsch glacier by a huge lateral moraine. Alpine tarns are innumerable.

Of the countless waterfalls in Switzerland those of the Rhine (near Schaffhausen) have volume but not height, while the reverse is the case in varying degrees with those of the Aar at the Handegg, of the Reichenbach, of Pissevache, and particularly of the Staubbach, a mere thread of water falling clear of a cliff of great height.

There are said to be 1077 glaciers in Switzerland, but it is really impossible to estimate the number accurately, as practically all are now in retreat, and it is not easy to say whether an isolated fragment of ice is or is not entitled to rank as an independent glacier. From them flow ah the more important Swiss rivers and streams. Yet their distribution is very unequal, for eleven cantons (just one-half of the Confederation) have none. The Valais heads the list with 375 sq. m., then come the Grisons (138-6), Bern (111-3), Un (44-3), Glarus (13-9) and Ticino (13-1). The five others (Unter- walden, Vaud, St Gall, Schwyz and Appenzell) boast of 13-3 all together. The three longest glaciers in the Alps are all in the gieat northern outlier (not in the main chain)— the Great Aletsch (I6J m.), the Fiescher and the Unteraar (each 10 m.). In the main chain the Gorner (9} m.) is the longest. Of glaciers covering an area of over 6 sq. m. no fewer than 17 are in Switzerland, as against

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two each in the French portion of the chain of Mont Blanc and in the Eastern Alps.

Forests cover 21-2% (3390-99 sq. m.) of the total area of Switzerland . Of the six most extensive cantons five are also at the head 111 the matter of forests: Bern (591 sq. m.), the Grisons (50V), Vaud (320), the Valais (297-4) and Ticino (267-2). St Gall (157) ranks in this respect after Zurich (180-8) and Aargau (172), while the only other cantons with over 100 sq. m. are Lucerne (120-4) Fribourg (119) and Soleure (111-3), the lowest place being taken by Geneva (9-9). By far the greater part (67 %) of the forest E o ea o/ ■ – gS t0 communes or private corporations, while

28-5/0 is in the hands of private individuals (much of this having become private property in the time of Napoleon I.), but only 4-5 % is in the hands of the state, in consequence of the suppression of many monasteries. The communes own 94-3% of the forest area in the Valais, private individuals 78-8% in Lucerne, and the state 16 /o in Schaffhausen. Schaffhausen and the Jura cantons are the most wooded in proportion to their area, while at

the other end of the scale are the towns of Geneva and Basel, and the barren canton of Un. The great floods of 1834, 1852 and 1868 drew attention to the negligent administration of the forests, considered specially as a protection against damage due to the forces of nature. A forestry department was created in the polytechnic school in Zurich when it was opened in 1855. The Federal Constitution of 1874 (art. 24) handed over to the Confederation the oversight of the forests ' in the high mountains," this being interpreted to mean the Alps with their spurs, but not to include the Jura, and a law of 1876 was enacted to carry out this task. In 1897 the limitation mentioned above was struck out, so that the Confederation now has oversight of all forests within its territory, a law of 1902 regulating in detail the whole subject. Since 1876 much has been done, either directly by the Confederation or indirectly bv subsidizing the efforts of the cantons, to reafforest districts where the trees had been recklessly cut down, and to ensure the proper administration of forests generally.

Geology.— The greater part of Switzerland is occupied by the belts of folded rock which constitute the Alps and the Jura (q.v.). The central plain, however, is covered by nearly undisturbed deposits of Ohgocene and Miocene age, concealed in many places by glacial, alluvial and other accumulations of later date. Both the Ohgocene and the Miocene beds are, for the most part, of fresh- water or brackish-water origin, but the middle of the Miocene series is formed of marine deposits. During this period an arm of the Mediterranean spread up the valley of the Rhone. It reached its maximum extension during the middle portion of the Miocene period, when it appears to have stretched continuously along the outer border of the Alps from the present Golfe du Lion into Austria ; but at an earlier and a later date it was represented in Switzerland only by a series of brackish-water lagoons or fresh-water lakes.

Climate. — In Switzerland, where the height above sea-level ranges from 581 ft. (Lago Maggiore) to 15,217 ft. (Monte Rosa), we naturally find very many climates, from the regions of olives, vines, oaks and beeches, pines and firs, to those of the high mountain pastures, rhododendrons, and of eternal snow. It has been reckoned that, while in Italian Switzerland winter lasts only three months, at Glarus (1578 ft.) it lasts four, in the Engadine (5945 to 3406 ft.) six on the St Gotthard (6936 ft.) eight, on the Great St Bernard (81 1 1 ft.) nine, and on the St Theodule Pass (10,899 ft-) practically always. The highest mean annual temperature (53° F.) in Switzerland is naturally that at Lugano (909 ft.), while at Bevers (5610 ft.. Upper Engadine) the lowest mean temperature in winter is -14 F., but the highest in summer is 77° F., an immense difference. At Montreux the annual mean is 50°, at Sion, Basel, Geneva and Coire about 49 °, at Zurich 48 °, at Bern and Lucerne 47-5°, at St Gall 45 , atˆ Davos 37-5°, at Sils-Maria 34-5°, and on the Great St Bernard 29 . Of course many factors,

such as the shape of the ground, the sheltered position of the place, the degree of exposure to sunshine, counterbalance the mere height at which the town is situated.

_ The snow-clad Alps of course have the heaviest rain- or snow-fall in Switzerland, this being estimated at 89-7 in. per annum. The greatest actually recorded rainfall (87-3 in.) was on the San Bernar- dino Pass (6769 ft.), while the lowest (21-7 in.) was at Sierre.(i767 ft., Valais). At Lugano the average annual rainfall is 65-4 in., on the Great St Bernard 48-7 in., at Lucerne 45-6 in., at Montreux 42-6 in., at Sils-Maria 37 in., at Bern and Davos 36-6 in., and at Basel, Coire and Geneva about 32-7 in. It has been shown by careful observa- tions that the rain- or snow-fall is greatest as we approach the Alps, whether from the north or the south, the flanks of the great ranges and the valleys opening out towards the plains receiving much more rain than the high Alpine valleys enclosed on all sides by lofty ridges. Thunderstorms generally vary in frequency with the amount of rainfall, being most common near the great ranges, and often very local. The floods caused by excessive rainfall are some- times very destructive, as in 1834, ˆ52 and 1868, while the same cause leads to landslips, of which the most remarkable have been those of the Rossberg above Goldau (1806), at Evionnaz (1835) and at Elm (1881). The Fohh (q.v.) is the most remarkable local wind.

For all these reasons Switzerland has many varieties of climate; and, while, owing to the distribution of the rainfall, the Ticino and

Aar valleys are very fertile, the two great trenches between the main chain and its north outlier, though warm, are less productive, as the water comes from the rivers and not from the skies.

People. — The first estimate of the population of Switzerland with any pretence to accuracy was that of 1817, which put the number at 1,687,900. The first regular census took place in 1836 to 1838, but was therefore not synchronous, while it was also not very systematic — the number was put at 2,190,258. That of 1850 was better organized, while in i860 the census was declared decennial, a slight alteration being made as to that of 1888 for practical reasons. The following was the number of the population usually resident (the number of those actually present was also taken, but all detailed subdivisions refer only to the residents) : in 1850,

2,392,740; in i860, 2,510,494; in 1870, 2,655,001; in 1880, 2,831,787; in 1888, 2,917,754; and in 1900, 3,315,443. The density per square mile was as follows: 150 in 1850; 157 in i860; 159 in 1870; 177 in 1880; 182 in 1888; and 207 in 1900. The increase in the whole of the country from 1850 to 1900 was 39%. Thirteen cantons showed an increase lower than this average, the lowest of all being Aargau, Glarus and Lucerne; while in Bern the increase of the towns did not counterbalance the diminution in the country districts. The nine cantons which increased above the average rate did so either owing to special circumstances (e.g. the construction of the Simplon railway in the Valais), or because their industries were very flourishing (e.g. St Gall), or because they contain great towns (e.g. Zurich). The highest rates of increase were shown by Geneva (107% increase) and the half canton of Urban Basel (278% increase). As to the actual distribution of the population, the Alpine regions are the sparsest generally (with the exception of the Outer Rhodes of Appenzell), the Jura region has a much higher ratio, while the densest region of all is the Swiss plateau. The strong attraction of the towns is shown by the facts that between 1850 and 1900 the population of the nineteen largest nearly tripled, while, in 1900, of the 187 " political districts " in Switzerland 41 showed a decrease, and they were all exclusively rural.

The shifting of the population within the country is also proved when we note that in 1900 but 38-5 % of the Swiss citizens inhabited their commune of birth, though the proportion was 64% in 1850. If we consider the different cantons, we find that in 1900 31-5% (in 1850 but 26-4%) lived in another commune within their canton of birth, while 18-4% (as against 6-6% in 1850) dwelt in -a canton other than their canton of birth. To sum up, in 1850, out of the 25 cantons and half cantons, no fewer than 21 had a majority of citizens living in their commune of birth, while in 1900 the number was but II, and those all rural cantons. Of the 3164 communes (or civil parishes) in Switzerland, only 21 in 1900 had a population exceeding 10,000, while 20 had under 50 inhabitants. If we look at the height of the communes above the sea-level, we find that there were but 3 (with a population of 463 souls) above 1900 metres (2953 ft.), while 68 (with a total population of 188,394) were below 300 metres (984 ft.). The number of inhabited houses rose from 347,327 in i860 (the number was not taken in 1850) to 434,084 in 1900, while that of separate households mounted from 485,087 in 1850 (528,105 in i860) to 728,920 in 1900.

The non-Swiss element of the population increased from 3 % in 1850 to n-6% in 1900, and its number from 71,570 in 1850 to 383,424 in 1900. The Germans are the most numerous, next in order come Italians, French and Austrians. In 1900 there were 3535 British subjects resident in Switzerland, and 1559 citizens of the United States. Of course most of the

non-Swiss are found in the towns, or in rural districts where any great railway line is being constructed.

The emigration of Swiss beyond seas was but 1691 in 1877, though it rose in 1883 to 13,502 (the maximum as yet attained). Then the number fell pretty steadily till 1899 (2493), then rose again, and in 1906 was 5296. About 89% go to the United States, and about 6% to the Argentine Republic (mainly from the French-speaking cantons). Bern, Zurich, .Ticino, the town of Basel and St Gall are the chief cantons which furnish emigrants.

In the matter of religion, the Protestants formed 59-3% in 1850 and 578 % in 1900, and the Roman Catholics (including the " Chris- tian " or " Old " Catholics, who arose in 1874) 40-6% and 41-6% respectively, while the Jews increased from 1% in 1850 to 4% in 1900 — the remainder (other religions or none) being 2 % in i860 (not reckoned separately in 1850) and in 1900. Ten and a half cantons have a majority of Protestants, while in the rest the " Catholics " have the upper hand. The same proportion prevailed in 1850, save that then Geneva had a Protestant majority, whereas

in 1870 already the balance had shifted, owing to the number of immigrants from France and Italy.

As to languages habitually spoken, Switzerland presents a very variegated picture. By the Federal Constitutions of 1848 (art. 109) and 1S74 (art – 1IO)i German, French and Italian are recognized as " national languages," so that debates in the Federal parliament may be carried on in any of the three, while Federal laws, decrees, &c, appear also in the three. The old historical dialects of Romonsch and Ladin (nearly confined to the canton of the Grisons, q.v.) enjoy no political recognition by the Confederation, are largely maintained by artificial means in the shape of societies founded for their preserva- tion, and are not even in the majority (which is German) in the Gri- sons. Of the other 21 cantons, all have a German-speaking majority save 6 — French prevails in Fribourg, Vaud, the Valais, Neuchatel and Geneva, and Italian in Ticino. Since the census of 1880, when detailed inquiries as to language were made for the first time, there has been a certain amount of shifting, as is shown by the following figures. German was spoken by 71-3 of the population in 1880, by 71-4 in 1888 and by 69-8 in 1900; the figures for French are respectively 21-4, 21-8 and 22, and for Italian 5-7, 5-3 and 6-7, while Romonsch fell from 1-4 to 1-3 and 1-2 %. " Other languages " were 2, 2 and 3 %. Thus in 1900 there were nearly 70 % of German- speaking persons, as against nearly 30 % who spoke one or other of the Romance tongues. The most interesting cases are the cantons of Fribourg (q.v.) and the Valais (q.v.), in

which French is advancing at the expense of German.

Chief Political Divisions and Towns. — When considering Switzerland it must never be forgotten that, strictly speaking, the only political " divisions " are the 187 " districts " into which the cantons are divided (Bern has 30, Vaud 19 and St Gall 15, no others having over 15). These are administrative districts, created for political purposes. The cantoris themselves are not " divisions " but sovereign states, which have formed an alliance for certain purposes, while they are built up out of the 3164 " communes," which are really the political units. Of the 22 cantons, 1 3 are subdivided — Unterwalden (from before 1291) into Obwalden and Nidwalden, and Appenzell (since 1597) into the Outer Rhodes and the Inner Rhodes, while Basel (since 1833) forms urban Basel (the city) and rural Basel (the country districts). The Swiss political capital is Bern (by virtue of a Federal law of 1848), while the Federal Supreme Tribunal is (since its foundation in 1874) at Lausanne, and the Federal Polytechnic School (since it was opened in 1855) at Zurich.

In 1000 there were 19 towns in Switzerland which had a population exceeding 10,000 souls, all having increased very much within the 50 previous years. The following are the six largest, the figures for 1850 being enclosed within brackets: Zurich, 150,703 (35,483); Basel, 109,161 (27,844); Geneva, 104,796 (42,127), Bern, 64,227 (2 7.558); Lausanne, 46,732 (17,108), and La ChauxdeFonds, 35,968 (!3.659). Thus Geneva was first in 1850, but only third in 1900, Thirteen of these nineteen towns are cantonal capitals, though La Chaux de Fonds, Winterthur, Bienne, Tablat (practically a suburb of St Gall), Le Locle and Vevey are not, while no fewer than twelve cantonal capitals (Sion, Bellinzona, Aarau, Altdorf, Schwyz, Frauenfeld, Glarus, Liestal, Sarnen, Stans, Appenzell and Zug) are below this limit. It is reckoned that while the 19 Swiss towns having over 10,000 inhabitants had in 1850 a population of 255,722, that number had swollen in 1900 to 742,205.

Communications. — The carriage roads of Switzerland were much improved and increased in number after a strong Federal government was set up in 1848, for it largely subsidized cantonal undertakings. In the course of the 19th century many splendid roads were carried over the Alpine passes, whether within or leading from Swiss territory; in the latter case with financial aid from Italy (or till 1859 Austria, as the mistress of the Milanese). The earliest in date was that over the Simplon (1800-1807), while others were opened respectively over the Furka (7992 ft.) in 1867, to the top of the Great St Bernard (8111 ft.) in 1893, over the Grimsel (7100 ft.) in 1895, and over the Klausen Pass (6404 ft.) in 1900. The highest carriage road entirely within Switzerland is that over the Umbrail Pass (8242 ft.), opened in 1901, and leading from the Swiss

upper Miinster valley to close to the Stelvio.

The first Swiss lake over which a steamer plied regularly was that of Geneva (1823), followed by Constance (1824), Lago Mag- giore (1826), Neuchatel (1827), Thun (1835), Lucerne (1835) and

1 The cantons are — Aargau, Appenzell, Basel, Bern, Fribourg, Geneva, Glarus, Grisons, Lucerne, Neuchatel, St Gall, Schaffhausen, Schwyz, Soleure, Thurgau, Ticino, Unterwalden, Uri, Valais, Vaud, Zug, Zurich (see separate articles).

Brienz (1839). The first railway opened within Switzerland was that (14 m. long) from Zurich to Baden in Aargau (1847), though the Swiss bit of that from Basel to Strassburg had been opened in 1844. From 1852 to 1872 the cantons granted concessions for the building of railways to private companies, but from 1872 onwards the conditions were other and the lines were con- structed under Federal supervision. In the 'fifties and 'sixties many lines were built, but not always according to sound finan- cial principles, so that in 1878 the great " National Railway " became bankrupt. Hence the idea of the state purchase of the chief lines made considerable progress, so that in 1898 such a scheme was accepted by the Swiss people. Accordingly in 1901 most of the great lines became Federal railways, and the Jura-Simplon in 1903, while the Gotthard line became Federal in 1909. This state ownership only applies to the main lines, not to the secondary lines or to the mountain cog-wheel railways (of which the first was that from Vitznau up the Rigi, 1871) now so widespread throughout the country. The highest point as yet attained in Switzerland by a mountain railway is the Eismeer station (10,371 ft.) of the line towards the Jungfrau. Many tunnels have been pierced through the Swiss Alps, such as the St Gotthard (1882), the Albula (1903) and the Simplon (1906). The highest line carried over a Swiss pass is that over the Little Scheidegg (6772 ft.).

Industries. — a. Of the Land. If we look at the annual turnover there is no doubt that the principal Swiss industry is that of the entertainment of foreign visitors, for its gross receipts are larger than those of any other branch. It appears from the official statis- tics that in 1905 its gross receipts amounted to rather over £7,500,000 (as against about £4,500,000 in 1894, and rather over £2,000,000 in 1880), the net profit

being nearly £1,500,000 (as against £656,000 and nearly £300,000 respectively), while in 1905 the capital invested in this industry was rather over £31,000,000 (as against £20,750,000 and £12,750,000 respectively). In 1905 there were in Switzerland 1924 hotels (of which 402 were in Bern and 358 in the Grisons) specially built for the accommodation of foreign visitors, containing 124,068 beds, and employing 33,480 servants (the numbers for 1894 and 1880 are 1693 and 1002, 88,634 and 58,137, and 23,997 and 16,022 respectively). Part of this increase is due to the fashion of visiting Switzerland in winter for skating, tobogganing, skiing, &c.

Of the actual " productive " soil about two-thirds is devoted to arable or pasturage purposes, but the latter branch is by far the more important, occupying about 83 % of this two-thirds, for Switzerland is much more a pastoral than an agricultural country- In 1906 the number of cattle was officially put at 1,497,904 (as against 1,340,375 in 1901 and 993,291 in 1866). In summer they are supported on the numerous mountain pastures or " alps " (see Alps, 2), which number 4778, and are of an estimated capital value of rather over £3,000,000, while in winter they are fed on the hay mown on the lower meadows or purchased from outside. Two main breeds of cattle are found in Switzer- land, the dun race (best represented by, the cattle of Schwyz) and the dappled race (of which the Simme valley beasts are of the red and white kind, and those of the Gruyere of the black and white variety). The best Swiss cheeses are those of the Emmenthal and of the Gruyere, while the two principal condensed milk factories (Nestle at Vevey and that at Cham) are now united. It should be noted that the proportion of the land devoted to pastoral pursuits increases, like the rainfall, from the west and north-west to the east and north-east, so that it is highest (nearly 90%) in Appenzell and St Gall. As regards other domestic animals, the number of swine increased from 304,428 in 1866 to 566,974 in 1896 (the maximum recorded), but in 1906 fell to 548,355. The number of goats has remained pretty steady (359,913 in 1906 to 375,482 in 1866, the maximum, 416,323, being attained in 1886), but that of sheep has decreased from 447,001 in 1866 to 209,443 i n 1906.

It is stated that but 14% of the " productive " area of Switzerland is corn-growing, this proportion being however doubled in Vaud. Hence for its food supply the country is largely dependent on its imports, the home supply sufficing for 153 days only. Tobacco is grown to a certain extent, especially near Payerne in the Broye valley (Vaud) and in Ticino, while more recently beetroot has been cultivated for the purpose of manufacturing sugar. Fruit and vegetables are made into jams and concentrated foods at Lenzburg and Kemptthal, while kirschwasser (cherry brandy) is made in Zug. Forests cover about 285 % of the " productive " area of Switzerland. They are now well cared for, and produce

considerable profits.

Vineyards in Switzerland now cover 108-7 sc l- m -i though the area is steadily decreasing owing to the competition of foreign cheap wines. The only cantons which have over 10% of their area thus planted are Vaud (25 %), Ticino (20 %), Zurich (17 %) and the Valais (10-7 %). Among the best Swiss wines are those of La C&te, Lavaux and Yvorne (all in Vaud), and Muscat, Fendant and Vin du Glacier (all in the Valais). Those grown near Neuchatel, at the northern

end of the lake of Zurich, near Baden (Aargau), and along the Swiss bank of the Rhine, are locally much esteemed.

Among the raw mineral products of Switzerland the most impor- tant is asphalt, which is worked by an English company in the Val de Travers (Neuchatel). Various metals (even including gold and silver) exist in Switzerland, but are hardly worked at all, save iron (Delemont), copper (Val d'Anniviers) and argentiferous lead (Lots- chenthal). True coal is wholly absent, but lignites occur here and there, and are sometimes worked (e.g. at Kapfnach, Zurich). An- thracite is found in the Valais, while peat is worked in many parts. Salt was first found at Bex (Vaud) in 1544, and the mines are still worked. But far more important are the saline deposits along the Rhine, from near Basel to Coblenz (at the junction of the Rhine and the Aar), which were discovered at Schweizerhall in the year 1836, at Kaiseraugst in 1844, at Rheinfelden in 1845 and at Ryburg in 1848. 'Marble, sandstone and granite are worked in various spots for building purposes. Marl, clay and limestone are also found, and are much used for the manufacture of various kinds of cement. There are said to be 620 mineral springs in Switzerland, the best known being those at Baden in Aargau and at Schinznach (both sulphur), Schuls-Tarasp and St Moritz, Stachelberg, Ragatz and Pfafers, Leukerbad and Weissenburg. The most important slate quarries are those in the canton of Glarus. The relative importance of the Swiss industries concerned with the land is best shown by the census taken in 1900 as to the occupations of the inhabitants. No fewer than 1,035,010 (about one-third of the total population) were engaged in pastoral or agricultural pursuits, as against 19,334 employed in market gardening, 18,233 in various matters touching the forests, 12,785 in the vineyards and 12,323 in extracting minerals (of these 8004 were employed in stone or marble quarries).

b._ Manufactures. — The same census also shows the relative importance of the chief branches of manufacture in Switzerland — textile industries 270,114 (of which 88,457 were in the silk branch and 63,853 in that of cotton), watchmaking 115,617, embroidery 89.558, besides 74,148 engaged in the manufacture of machinery. Eastern Switzerland is the

industrial portion of the land, though watchmaking and some minor industries are carried on in the Jura. The textile industries are by far the most important in Switzerland, Zurich and its neighbourhood being the main centre both for silk (this branch was revived by the Protestant exiles from Italy in the 16th century) and cotton, while St Gall, Appenzell and Thurgau are mainly devoted to embroidery, and Basel to the silk ribbon and floss silk departments. The watchmaking industry has been established in Geneva since the end of the 16th century, and spread in the early 18th century to the Neuchatel portion of the Jura (centre La Chaux de Fonds and Le Locle). Musical boxes are chiefly made at Ste Croix in the Vaud section of the Jura, while Geneva is famous for its jewelry and goldsmiths' work. The growth of the manufacture of machines is much more recent, having originally been a mere adjunct of the textile industry, and developed in order to secure its independence of imports from England. Its centres are in and around Zurich, Winterthur, St Gall and Basel. Among other products' and industries are chocolate (Suchard, Cailler, Spriingli, Tobler, Peter, Maestrani, &c), shoemaking (Schonenwerd), straw plaiting (Aargau and Gruyere), wood carving (Brienz in the Bernese Oberland since 1825), concentrated soups and meats (Maggi's factory is at Kemptthal near Winterthur), aniline dyes (Basel), aluminium (Neuhausen in Schaffhausen).

Commerce. — Switzerland is naturally adapted for free trade for it depends on the outside world for much of its food-stuffs and the raw materials of its manufactures. After the adoption of the Federal Constitution of 1848, customs duties within the land were abolished, while moderate duties only were levied on imports, the sum increasing as the articles came more or less within the category of luxuries, but being lowest on necessaries of life. Down to- 1870 Switzerland was all but entirely on the side of free trade. Since that time it has been becoming more and more protectionist. This change was due in part to the increased tariffs levied in Germany and Prance, and in part to the strong pressure exercised by certain branches of the Swiss manufacturing industries, while treaties of commerce have been made with divers countries. Hence in 1903 the Swiss people adopted the principle of a greatly increased scale of duties, the detailed tariff of the actual sums levied on the various articles coming into force on the 1st of January 1906. These higher duties were meant to serve as a weapon for obtaining better terms in future commercial treaties, but were finally increased still more at the instigation of certain of the great manufacturers, so that Switzerland became decidedly a protectionist country. In 1901 the receipts from the customs duties were about £1,858,000, while in 1905 they were £2,541,000, and in 1907 rather more (£2,894,000).

Excluding goods in transit, the total value of imports rose from about

£36,500,000 in 1895 to about £55,000,000 in 1905, while between the same dates the exports rose from about £26,500,000 to £38,750,000 — in other words, the unfavourable balance of trade had increased from £10,000,000 in 1895 to £16,250,000 in 1905.

The increase during the same period in the case of the four great articles of export from Switzerland was as follows: silk from nearly £8,500,000 to rather over £10,000,000, embroideries from nearly £3,000,000 to £5,000,000, watches from £3,500,000 to £5,250,000, and machinery from rather under £1,000,000 to £2,250,000.

GOVERNMENT]

SWITZERLAND

H$

Government. — The Swiss Confederation must be carefully- distinguished from the 22 cantons of which it is composed, and which are sovereign states, save in so far as they have given up their rights to the Federal government. These cantons them- selves are built up of many political communes, or Gemeinden, or civil parishes, which are the real political units of the country (and not merely local subdivisions); for any one desiring to become naturalized a Swiss must first become (by purchase or grant) a member of a commune, and then, if his burghership of the commune is confirmed by the cantonal authorities, he obtains also, simultaneously, both cantonal and Federal citizenship.

a. Now in Switzerland there are 3164 political communes (municipalites or Einwohner gemeinden). These are composed of all male Swiss citizens over twenty years of age, of good character and resident in the commune for at least three months. The meeting of these persons is called the assemblee gSnerale or Gemeindeversammlung, while the executive council chosen by it is the conseil municipal or Gemeinderat, the chief person in the commune (elected by the larger meeting) being termed the syndic or make, the Gemeindeprdsident or the Gemeindeammann. This kind of commune includes all Swiss residents (hence the German name) within its territorial limits, and has practically all powers of management of local affairs, including the carrying out of cantonal and Federal laws or decrees, save and except matters relating to the pastures and forests held in common. This class of commune dates only from the time of the Helvetic republic (1798-1802), and its duties were largely increased after the liberal movement of 1830; the care of the highways, the police, the schools, the administration of the poor law being successively handed over to it, so that it became a political body. As regards Swiss citizens belonging to cantons

other than that in which they reside, the Federal Constitution of 1848 (art. 41) gave them rights of voting there in cantonal and Federal matters, but not in those relating exclusively to the commune itself. The Federal Constitution of 1874 (art. 43) gives to such persons as those named above (istablis or Niedergelassenen — that is, permanent settlers) all voting rights, Federal, cantonal and communal (save as below), the two last named after a stay of three months. Temporary residents being Swiss citizens (e.g. labourers, servants, students, officials not being communal officials) are called risidents or Aufenthalter, and are in most cantons considered to be as such incapable of voting in communal matters until after a residence of three months, though some cantons require a longer sojourn. Foreign residents are included under this class of Aufenthalter.

The burgher communes (communes bourgeoises or Biirgergemeinden), now principally of historical interest, having for the most part gradually merged with the other class of communes, were originally simply the communities that dealt with the management of the " lands subject to common user " or Allmend (mainly summer pastures and forests), but gradually obtained, by purchase or other- wise, the manorial rights, the burghers then being themselves the lords of the manor (as at Brixham in Devonshire). But when after the Reformation, owing to the suppression of the monasteries, the care of the poor was imposed by the Federal Diet, in 1551, on the several communes, these naturally aided only their own members, a course which gave rise to a " communal burghership," a system designed to prevent persons from gaining a " settlement " in any commune to which they did not properly belong. Thus all non- burgher residents, permanent or temporary, were excluded from any share in the enjoyment of the lands subject to common user, or in their management, and remained complete outsiders, though paying local rates. With the increased facilities of communication and the rise of a shifting industrial population such restrictions became invidious and unfair, particularly after the introduction, under the Helvetic republic, of a Federal citizenship, superior to cantonal citizenship, and after the communes became more and more burdened with public duties, so that the amount of the rates equalled, if it did not exceed, the sums produced by the " common lands." To avoid some of these inconveniences " political communes " were set up, consisting practically of all Swiss permanent residents. But the relation between these and the old Biirgergemeinden (the burghers of which only have rights of user over the common lands) was very delicate, and has been settled (if settled at all) in various fashions. In some cases the older communes simply merged with the newer, the ownership of the common lands thus passing from one to the other class. In other cases the Biirgergemeinden still

exist as distinct from the " political communes," but solely for purposes (enjoyment, management, &c.) relating to the common lands, and thus

form a sort of privileged community inside the larger and now more generally important community. In some cases the common lands have been divided in varying proportions between the two classes of communes, the Biirgergemeinden thus continuing to exist solely as regards that part of the common lands which they have retained. In other cases the common lands, whether before or after 1798, have passed into the possession of a small number of the burghers, who form a close corporation, the revenues of which are enjoyed by the members as such, and not as citizens — in short are subject to no public obligations or burdens save rates and taxes.

b. The twenty-two cantons (three are subdivided — Unter- walden, Appenzell and Basel — into two halves) are divided into " administrative districts " (187 in number), which are ruled by prefects, in the French fashion, appointed by the cantonal autho- rities. These are the true local divisions in the country. Each canton has its own legislature, executive and judiciary. The older cantons have in some cases (Uri, Unterwalden, Appenzell and Glarus) preserved their ancient democratic assemblies (or Landes gemeinden), in which each burgher appears in person, and which usually meet once a year, on the last Sunday in April or the first Sunday in May, always (weather permitting) in the open air. These annual assemblies elect annually a sort of standing committee, and also the chief magistrate or Landam- mann, as well as the judiciary. In the other eighteen cantons the legislature (Gross Rat or grand conseil) is composed of representatives chosen by the cantonal voters in proportion, varying in each canton, to the population. They are thus local parliaments rather than mere county councils. The executive (Regierungsrat or conseil d'etat) is elected everywhere (save Fribourg, the Valais and Vaud) by a popular vote, this plan having gradually superseded election by the cantonal legislature. All the cantons (save Fribourg) have the referendum and initiative, by which the electors can exercise control over their elected representatives. The cantonal judiciary is chosen by the people.

c. In 1848 the Federal government was reorganized according to the plan adopted in the United States, at any rate so far as regards the legislature (Bundesversammlung or assemblee fidSrale) . This is composed of two houses: (1) the Stdnderat or conseil des Stats, to which each canton, great or small, sends two repre- sentatives (generally chosen for varying terms by the people, but, in 1907, still by the cantonal legislature in Bern, Fribourg, Neuchatel, St Gall, the Valais and Vaud), this house being like the American Senate; (2) the Nationalrat or conseil national, composed of representatives (at present 167 in number) elected within the cantons in the proportion of 1 to every 20,000 (or fraction over 10,000) of the population, and holding office for three years, before the expiration of which it cannot be dissolved. The two houses are on an absolutely equal footing, and bills are introduced into one or the other simply because of

reasons of practical convenience. The Federal parliament meets, at least, once a year, in Bern, the Federal capital. The Federal executive (Bundesrat or conseil fideral) was set up in 1848 and is composed of seven members, who are elected for three years by the two houses of the Federal legislature, sitting together as a congress, but no two members may belong to the same canton. The Federal parliament annually names the president (Bundes-prasident or president de la consideration) and the vice-president, so that the former is really but the chairman of a committee, and not in any way like the American president. The Federal president always holds the foreign portfolio (the " political department "), the other portfolios being annually redistributed among the other members, but all decisions proceed from the council as a whole. The Federal councillors cannot be at the same time members of either house of the Federal parliament, though they may speak or introduce motions (but not vote) in either house. The Federal Supreme Court (Bundesgericht or tribunal }6diral) was created by the Federal Constitution of 1874 and is (since 1904) composed of 19 full members (plus 9 substitutes), all elected by the two houses of the Federal parliament, sitting together and holding office for six years; the Federal parliament also elects every two years the presid • nt

and vice-president of the Federal tribunal. Its seat is at Lausanne. Its jurisdiction extends to disputes between the Confederation, the cantons, and private individuals, so far as these differences refer to Federal matters. An appeal lies in some cases (not too clearly distinguished) to the Federal council, and in some to the two houses of the Federal legislature sitting together. As to the referendum and initiative (whether as to the revision of the constitution or as to bills) see Referendum. It was natural that, as the members of the Swiss Confedera- tion were drawn closer and closer together, there should arise the idea of a Federal code as distinguished from the manifold cantonal legal systems. The Federal Constitution of 1874 conferred on the Federal authorities the power to legislate on certain defined legal subjects, and advantage was taken of this to revise and codify the Law of Obligations (1881) and the Law of Bankruptcy (1889). The success of these attempts led to the adoption by the Swiss people (1898) of new constitutional articles, extending the powers of the Federal authorities to the other departments of civil law and also to criminal law. Drafts carefully prepared by commissions of specialists were slowly considered during nearly two years by the two houses of the Federal parliament, which finally adopted the civil code on the 10th of December 1907, and it was

expected that by 191 2 both a complete Federal civil code and a complete Federal criminal code would come into operation.

Before 1848 there was scarcely such a thing as Federal finances for there was no strong central Federal authority. As the power of those authorities increased, so naturally did their expenditure and receipts. In 1849 the receipts were nearly £240,000, as against an expenditure of £260,000. By 1873 each had risen to rather over £1,250,000, while in 1883 they just overtopped £2,000,000 sterling each, and in 1900 the receipts were just over £4,000,000 sterling, as against an expenditure of nearly £4,000,000. The figures for 1907 are £5,750,000 as against just over £5,500,000, and are the highest yet recorded. The funded Federal debt rose from a modest £150,000 in 1849 to rather over £2,000,000 in 1891, and rather over £4,000,000 in 1903,. standing in 1905 at £3,250,000.

By the Federal Constitution of 1848 the post office was made a Federal attribute, and the first Federal law on the subject was passed in 1849 (postage stamps within the country in 1850, for foreign lands in 1854, and post-cards in 1870), while a Federal law of 1 85 1 extended this privilege to the electric telegraph, so that in 1852 the first line was opened with thirty-four offices. In the Federal Constitution of 1874 both branches are declared to fall within the jurisdiction of the Confederation, while in 1878 this privilege was extended to the newly invented telephone. Inviol- ability of communications in all three cases is guaranteed.

In 1891 the Swiss people accepted the principle of a state bank with a monopoly of note issue. A first scheme was rejected by a popular vote in 1897, but a second was more successful in 1905. The " Swiss National Bank " was actually opened on the 20th of June 1907, its two chief seats being at Zurich and at Bern. It has a capital of £2,000,000 sterling, divided into 100,000 shares. Two-fifths of this capital is reserved to the cantons in proportion to their population in 1900, and two-fifths were taken up by public subscription in June 1906. The remaining fifth was reserved to the existing thirty-six banks in Switzerland (all founded between 1834 and 1900), which have hitherto enjoyed the right of issuing notes. It was stipulated that within three years of the opening of the National Bank all notes issued by these thirty- six banks must be withdrawn, and many had by 1907 taken this course in anticipation.

There is no " established Swiss Church " recognized by the Federal Constitution, but there may be one or more " established churches " in any canton. The Federal Constitution of 1874 guarantees full religious liberty and freedom of worship, not being contrary to morals and the public peace, as well as exemption from any compulsory church rates (arts. 49 and 50). But it repeats, with fresh pricks (art. 51), the provision of the Constitution

of 1848 by which the Jesuits and all affiliated religious orders are forbidden to settle in Switzerland, extending this prohibition to any other orders that may endanger the safety of the state or the public peace. It also introduces a new article (No. 52) forbidding the erection of new religious orders or new monasteries or the re-establishment of old ones, and also a new clause (last part of art. 50) by which the erection of new bishop- rics on Swiss soil is subject to the approval of the Federal authorities. The Jesuit article was due to the " Sonderbund " War of 1847, and the rest of this exceptional legislation to the " Kulturkampf " which raged in Switzerland in 1872-1874. The Protestants form rather over three-fifths of the population, but have the majority in 10J of the 22 cantons only. In the German-speaking cantons they are Zwing- lians, and in the French-speaking cantons Calvinists, though in neither case of the original and orthodox shade. The Protestants

alone are " established " in the Outer Rhodes of Appenzell; while the Romanists alone are " established " in 75 cantons (Lucerne, Uri, Schwyz, Unterwalden, Zug, Ticino, the Valais, and the Inner Rhodes of Appenzell), but only jointly in the 3 other cantons (Fribourg, St Gall and Soleure) in which they are in a majority. In June 1907 Geneva decided on the complete separation of church and state, and now stands alone in Switzerland in not having any " established church " at all (previously it had two — Protestants and Christian Catholics). In the other 21 cantons, the Protestants and Romanists are jointly " established " in 11J, as are the Protes- tants and the Christian Catholics in I J, in which the Christian Catholics take the place of the Romanists. Thus out of the 21 cantons with " established churches " (Landeskirchen or iglises nalionalcs) the Protestants are solely or jointly " established " in I3i, and the Romanists in 19 (not in Bern, Urban Basel and the Outer Rhodes of Appenzell), while the Christian Catholics are recognized in 7 cantons, in two of which (Basel and Neuchatel) they are also " endowed." The case of Neuchatel is particularly striking, as it has three " established churches " (Protestants, Romanists and Christian Catholics), while there the Jewish rabbis, as well as the pasteurs of the Free Evangelical Church, are exempt from military service. Besides a few parishes in Bern there are also three " Evan- gelical Free Churches " (Uglises libres), viz. in Vaud (since 1847), in Geneva (since 1848) and in Neuchatel (since 1873). The Romanists have five diocesan bishops in Switzerland — Sion (founded in the 4th century) , Geneva (4th century) .Basel (4th century, but reorganized in 1828), Coire (5th century), Lausanne (6th century), and St Gall (till 1 824 part of the bishopric of Constance, and a separate see since 1847). There are besides the sees of Lugano (erected in 1888 for Italian Switzerland — till then in Milan or Como — but united for the present to the see of Basel, though administered by a suffragan bishop) and Bethlehem (a see in parlibus,

annexed in 1840 to the abbacy of St Maurice in the Valais). The Christian Catholics (who resemble the Old Catholics in Germany) split off from the Romanists in 1874 on the question of papal infallibility (in Bern and Geneva politics also played a great part), and since 1876 have had a bishop of their own (consecrated by the German Old Catholic, Bishop Reinkens), who resides in Bern, but bears no diocesan title. The Christian Catholics (who in the census are counted with the Romanists) are strongest in Bern, Soleure and Geneva, while their number in 1906 was estimated variously at from twenty to thirty-four thousand — ' they have 38 parishes (10 being in French-speaking Switzerland) and some 57 pastors. There are still a few monasteries in Switzer- land which have escaped suppression. The principal are the Benedictine houses cf Disentis (founded in the 7th century by the Irish monk Sigisbert), Einsiedeln (q.v. ; 10th century) and Engelberg (q.v. ; 12th century) as well as the houses of Austin Canons at St Maurice (held by them since 1 128, though the house was founded by Benedictines in the 6th century) and on the Great St Bernard (nth century).

Education. — Education of all grades is well cared for in Switzer- land, and large sums are annually spent on it by the cantons and the communes, with substantial grants from the Confederation (these last in 1905 were about £224,000), so far as regards primary and higher education. Four classes of educational establishments exist.

a. In the case of the primary education, the Confederation has the oversight (Federal Constitution of 1874, art. 27), but the cantons the administration. It is laid down that in the case of the public primary schools four principles must be observed by the cantons: the instruction given must be sufficient, it must be under state (i.e. lay) management (ecclesiastics as such can have no share in it), attendance must be compulsory, and the instruction must be gratuitous, while members of all religions must be able to frequent the schools without offence to their belief or consciences (this is interpreted to mean that the general instruction given must be undenominational, while if any denominational instruction is given attendance at it must not be made compulsory). By an amendment to the Federal Constitution adopted in 1902 the Confederation is empowered to make grants in aid in the case of primary schools, while a Federal law of 1903, regulating such grants to be appropriated solely to certain specified purposes, provides that the term " primary schools " shall include continuation schools it attendance is compul- sory. The cantons organize primary education in their territories, delegating local arrangements (under the control of a cantonal inspector) to a committee (Schulkommission) elected ad hoc in each commune, so that it is not a committee of the communal council. The general principles laid down by the Confederation are elaborated into laws by each canton, while the communal councils pass by-laws. Hence there is a great variety in

details between canton and canton. The school age varies from 6 to 16 (for younger scholars there are voluntary kindergarten schools or ecoles enjantines), and attendance during this period is compulsory, it not being possible to obtain exemption by passing a certain standard. Two-thirds of the schools are " mixed " ; in the towns, however, boys are often separated from girls. The teachers (who must hold a cantonal certificate of effi- ciency) are chosen by the Schulkommission from among the candi- dates who apply for the vacant post, but are elected and paid by the communal council. Religious tests prevail as to teachers, who must declare the religion they profess, and are required to impart the

religious instruction in the school, this being compulsory on the children professing the religion that is in the majority in that par- ticular commune — consequently a Protestant teacher would never be appointed in a Romanist school or vice versa. The religious teach- ing occupies an hour (always at the beginning of the school hours) thrice a week, while special dogmatic instruction is imparted by the pastor, outside the school-house as a rule, or in a room specially set apart therein. The pastor is ex officio president of the Schulkom- mission, while the religious teaching in school is based on a special " school Bible," containing short versions of the chief events in Bible history. The exact curriculum (code) is prescribed by the canton, and also the number of hours during which the school must be open annually, but the precise repartition of these is left to the local Schulkommission. The attendance registers kept by the teachers are submitted to the Schulkommission, which takes measures against truant children or negligent parents by means of a written warning, followed (if need be) by a summons before a court. The treasurer of the Schulkommission receives and distributes the money contributions of the cantons (including the grant in aid from the Confederation) and also of the communes, or of benevolent private individuals. The school hours are as a rule four hours (from 7 a.m. in summer and 8 a.m. in winter) in the morning and (in the winter) three hours in the afternoon, but on two afternoons in the week there is a sewing school for the girls, the boys being then free. There are no regular half-holidays. Private schools are permitted, but receive no financial aid from the outside, while the teacher must hold a certificate of efficiency as in the state schools, must adopt the same curriculum, and is subject to the by-laws made by the Schulkommission. On the other hand he is not bound by any conscience clause and can charge fees. A cantonal inspector examines each school (of either class) annually

and reports to the cantonal educational authorities, who point out any deficiencies to the local Schulkommission, which must remedy them. There is no payment by results, nor do the money contributions (from any source) depend on the number of attendances made, though of course they are more or less in proportion to the number of scholars attending that particular school. Some favour the idea of making the primary schools wholly dependent financially on the Confedera- tion. This course has obvious conveniences, but a first attempt was defeated in 1882, and the scheme is still opposed, mainly on the ground that it would seriously impair the principle of cantonal sovereignty, and immensely strengthen the power of the Federal educational authorities. By the law of 1903 the quota of the Federal subvention was fixed at sixpence per head of the resident population of each canton, but in the case of 6| cantons (the poorer ones) an extra twopence was added.

b. The secondary schools are meant on the one side to help those scholars of the primary schools who desire to increase their know- ledge though without any idea of going on to higher studies, and on the other to prepare certain students for entrance into the middle schools. The attendance everywhere is optional, save in the city of Basel, where it is compulsory. These schools vary very much from canton to canton. The course of studies extends over two to four years, and students are admitted at ages from ten upwards. The curriculum includes the elements of the classical and modern languages, of mathematics, and of the natural sciences. They receive no Federal subvention, but are supported by the cantons and the communes. In 1905 the cantons contributed £20,000 less than the communes to the total cost of about £234,000.

c. Under the general name of middle schools (Mittelschulen or ecoles moyennes) the Swiss include a variety of educational establish- ments, which fall roughly under two heads: — –

1. Technical schools (like those at Bienne and Winterthur) and

schools for instruction in various professions (commerce, agriculture, forestry and the training colleges for teachers).

2. Grammar schools, colleges and cantonal schools, which in

some cases prepare for the universities and in some cases do

not. The expenses of both classes fall mainly on the cantons (in 1905 about £300,000 to £130,000 from the communes), who for the former class (including certain departments of the second) receive a grant in aid from the Confederation — in 1905 about £84,500.

d. As regards the higher education the Federal Constitution of 1874 (art. 27) empowered the Confederation to erect and support, besides the existing Federal Polytechnic School (opened at Zurich in 1855, having been founded by virtue of art. 22 of the Federal Constitution of 1848), a Federal university (this has not yet been done) and other establishments for the higher education (see c. 1 above). This clause would seem to authorize the Confederation to make grants in aid of the cantonal universities, but as yet this has not been done, while the cantons are in no hurry to give up their local universities. There are seven full universities in Switzerland — Basel (founded in 1460), Zurich (1833), Bern (1834), Geneva (1873, founded in 1559 as an academic), Fribourg (international Catholic, founded in 1889), Lausanne (1890, founded in 1537 as an academie) and Neuchatel (existed 1 840-1 848, refounded in 1866, and raised from the rank of an academie to that of a university in 1909). There is besides a law school at Sion (existed 1807-1810, refounded in 1824). In general they each (save Sion, of course) have four faculties — theology, medicine, law and philosophy. Fribourg and Neuchatel

both lack a medical faculty, while Zurich and Bern have distinct faculties for veterinary medicine, and Zurich a special one for den- tistry (in Geneva there is a school of dentistry), while Geneva and Neuchatel support observatories. The theological faculty is in every case Protestant, save that in Fribourg there is only a Romanist faculty (192 students in 1907), while Bern has both a Protestant faculty and also a Christian Catholic faculty (11 students in 1907), but no Romanist faculty, despite the fact that the Romanists (mainly in the Bernese Jura) form about one-sixth of the population, while there are not very many Christian Catholics. These eight academical institutions were maintained by the cantons at a cost in 1905 of about £155,000, while in the winter session of 1906 the total number of matriculated students (of whom 3784 were non- Swiss) was 6444 (of whom 1904 were women — Fribourg does not receive them), besides 2077 " hearers" — in all 8521. The largest institution was Bern (1626 matriculated students) arid the smallest Neuchatel (163). The Federal Polytechnic School is fixed at Zurich and now comprises seven departments — architecture, engineering, industrial mechanics, industrial chemistry, agriculture and forestry, training of teachers in mathematics, physics and the natural sciences, and military science, besides a department for philosophy and political science. It enjoys a very high reputation and is much frequented by non-Swiss, who in the winter session of 1905-1906 numbered 522 out of the 1325 matriculated students (women are not admitted). In 1905 the cost of the maintenance of the school (which falls entirely upon the Confederation) was about £56,000. ■

Army. — The Swiss army is a purely militia force, receiving only periodical training (so far as regards men between 20 and 48 years of age), based

upon the principle of universal compulsory personal military service. Till 1848 the cantons alone raised, armed, equipped and trained all military units and nominated the officers. By the Federal Constitution of 1848 (art. 20) the Confederation was entrusted with the training of the engineers, the artillery and the cavalry, with the education of instructors for all other arms, and with the higher training of all arms, while it was empowered to found military schools, to organize general military manoeuvres, and to supply a part of the war materiel. The Confederation, too, was given the supervision of the training of the infantry, as well as the furnishing, the construction and the maintenance of all war materiel, which the cantons were bound to supply to the Confederation. The Federal Constitu- tion of 1874 marked an advance on that of 1848 as to the follow- ing points. The principle of universal military service and the organization of the Federal army were developed according to the proportion of the population capable of bearing arms (in contradistinction to the 1848 system, art. 19, of fixed contingents in the proportion of 3 to every 100 men of the population of each canton) ; the entire military training and arming of these men and the cost of their uniform and equipment were taken over by the Confederation, which, too, supervised the military administration of the cantons. The uniform, equipment and weapons of the men were to be free of cost to them, while compensation was due from the Confederation to the families of those killed or permanently injured in the course of their mili- tary service, as well as to the invalids themselves. There thus remained to the cantons the raising of all the infantry units and of most of the cavalry and artillery units as well as the nomina- tion of the officers of all arms; all these acts were subject to the supervision of the Confederation and had to be in accordance with Federal laws and regulations. An attempt made in 1895 to extend still further the sphere of action of the Confederation in military matters was rejected by a vote of the Swiss people. Thus the present system rests partly on the 1874 Constitution, and partly on the new military law, passed by the Federal parliament on the 12th of April 1907.

a. The 1874 Constitution forbids the maintenance of any standing army (art. 13), and also (art. 11) the practice (formerly very widespread) of hiring out contingents of mercenary soldiers by the Confederation or the cantons to foreign powers (" military capitulations "). The Federal government can, at or without the request of any canton, repress any disturbances within Switzer- land by means of Federal troops, the cantons being bound to allow these free passage over their territory (arts. 16-17). By art. 18 every Swiss male citizen is subject to the obligation of personal military service (the families of those killed or permanently injured in the course of active Federal service as well as the invalids them- selves are provided for by the Confederation), and the tax for those exempted is to be fixed by a Federal law, while every recruit receives free of cost his first

uniform, equipment and weapons. Art. 16

provides that the Confederation has control of the Federal army and of the war materiel, the cantons being only allowed certain denned rights within their respective territories. By art. 20 the limits of the jurisdiction of the Confederation and of the cantons are denned. The Confederation has the sole right of legislation in military matters, but the execution of these laws is in the hands of the cantons, though under Federal supervision, while all branches of military training and arming are handed over to the Confederation ; on the other hand, the cantons supply and keep up the equipment and the uniforms of the soldiers, though these expenses are reim- bursed by the Confederation according to a certain scale fixed by Federal regulations to be made later on. Art. 21 enacts that, where military considerations do not stand in the way, the military units are to be formed of men of the same canton, but the actual raising of these units and the maintenance of their numbers, as well as the nomination and the promotion of the officers, belong to the cantons, subject to certain general principles to be laid down by the Confedera- tion. Finally, the Confederation has (art. 22) the right of using or acquiring military drill grounds, buildings,_ &c, belonging to the cantons on payment of moderate compensation according to prin- ciples to be laid down in a Federal law. It will thus be seen that the Swiss army is by no means wholly in the hands of the Federal authorities, the cantons still having a large share in its management, though the military department of the Federal executive has the ultimate control and pays most of the military expenses. _ In fact it has been said in jest that the coat of a soldier belongs to his canton and his rifle to the Confederation.

b. After much discussion and careful consideration of the opinions of many experts, the Federal law of 1907 was enacted, by which more uniformity was introduced into administrative matters and the whole system remodelled, of course according to the general principles formulated in the Federal Constitution of 1874 and summarized under a.

The following is a bird's-eye view of the actual organization of the Swiss army. Every Swiss male citizen is bound to render personal military service between the ages of twenty and forty- eight. Certain classes are exempt, such as high Federal officials, clergymen (not being military chaplains), officials of hospitals and prisons, as well as custom-house officials and

policemen and officials of public means of communication, but in the latter case only those whose services would be indispensable in time of war, e.g. post office, telegraph, telephone, railway and steamer employes (all exempted before 1907) — custom-house men, policemen and the officials last n,amed must have had a first period of training before they are exempt. Those who are totally disqualified for any reason must, till the age of forty, pay an extra tax of 6 francs a head, plus ij francs on every 1000 francs of their net property, and \ francs on every 100 francs of their net income, the maximum tax that can be levied in any particular case being 3000 francs a year (property under 1000 francs and the first 600 francs of income are free from this tax, which is only levied as to its half in case of the men in the Landwehr) : this tax is equally divided between the Confederation and the cantons, its total yield in 1905 being about £171,000. The cantonal authorities muster in certain fixed centres their young men of twenty years, who must appear personally in order to submit themselves at the hands of the Federal officials to a medical examination, a literary examination (reading, arithmetic, elementary Swiss geography and history, and the composition of a short written essay), as well as (since 1905) pass certain elementary gymnastic tests (a long jump of at least 8 ft., lifting at least four times a weight of about 37 lb in both hands at once, and running about 80 yds. in under 14 seconds), different marks being given according to the degree of proficiency in these literary and gymnastic departments. Those falling below a certain standard — bodily, mental or muscular — are exempted, but may be " postponed " for not more than four years, in hopes that before that date the desired standard will be attained. If not totally disqualified (in that case they pay a tax) they may be incorporated not in the territorial army, but in the auxiliary forces (e.g. pioneers, hospital, commissariat, intelligence and transport departments). The cantons (under Federal super- vision) see that the lads, while still at school, receive a gymnastic training, while the Confederation makes money grants to societies which aim at preparing lads after leaving school for their military service, whether by stimulating bodily training or the practice of rifle shooting, in which case rifles, ammunition and equipment are supplied free — in all these cases the attendance of the lads is purely voluntary. In some cantons the young men, between the ages of eighteen and twenty, are required, to attend a night school (in order to rub up their school knowledge) for sixty hours a winter for two winters, the teacher being paid by the Confederation and the lads being under military law. Naturally the lads from the large towns and the more prosperous cantons do best in the literary examination and those who belong to gymnastic societies in the gymnastic tests, though sheer bodily untrained strength avails much in the lifting of weights. In 1906 26,808 young men of twenty years of age were examined (this is exclusive of older men then first mustered). Of this number 14,045 (52-4%) were at once enrolled as recruits, 3497 (13%)

were " postponed " for one or two years, and 9266 (34-6%) were exempted wholly — these ratios vary but little, for the standard is kept rather high, partly owing to con-

siderations of expense, so that a young fellow of twenty who becomes a " recruit " at once may be taken to be distinctly above the average in bodily and mental qualities. By the new law of 1907 the army is divided into three (not, as previously, four) classes — the Auszug or elite (men from twenty to thirty-two), the Landwehr (men between thirty-three and forty) and the Landsturm or reserve (men between forty-one and forty-eight). The recruits serve for different periods during their first year according tc the arm of the service into which they are incorporated — infantry and engineers sixty-five days, artillery and garrison troops seventy-five days and cavalry ninety days, while those in the auxiliary troops serve but sixty days. Soldiers in the Elite are called out seven times during their term of service for a period ol eleven days a year (fourteen days for the artillery and garrison troops), while the Landwehr is only called out once for a training period of eleven days. Cavalry men serve ten years in the Elite (no service in the Landwehr), and during that period are called out eight times for a training period of eleven days a year. Between the ages of twenty and forty each soldier must attain a certain proficiency in marksmanship (at least 30 points out of 90 in 10 shots), while there is an annual inspection (by cantonal officials) of arms, uniform and equipment. The Confederation also makes money grants to rifie societies, which in 1906 numbered 3732, had 220,951 members (all soldiers between twenty and forty must be members), and received Federal grants to the amount of about £13,500. Rifle and uniform become the full property of the soldier after he has completed his full term of service. Officers serve in the Elite till thirty-eight years of age, and in the Landwehr till forty-four (in the case of officers on the staff the service lasts till forty-eight years of age), while they remain in the Landsturm till fifty-two years of age. The Swiss army is made up (according to the new law of 1907) of a staff, composed of all the commanding officers on active service from the rank of major upwards (in this as in all the following cases the actual number is to be fixed by a Federal law), the general staff, the army service corps (post office, telegraph, railways, motor cars, chaplains, police, courts of justice, secretaries, &c, and the auxiliary services), while the soldiers proper are divided into a number of classes — infantry (including sharp- shooters and cyclists), cavalry, artillery (including the mountain batteries), engineers (including sappers and railway labourers), garrison troops, the medical, veterinary (veterinary surgeons and farriers), commissariat and transport services (drivers and leaders of laden horses and mules). On the first of January 1907 (still under the old system) the numbers of the Swiss army were as follows : the Elite had 139,514 (of which 104,263 were infantry,

*5183 cavalry, 18,544 artillery and 5567 engineers), and the Landwehr 93,163 (including 67,955 infantry, 4378 cavalry, 13,332 artillery and 4313 engineers) — making thus a total of 232,677 men between the ages of twenty and forty-four years of age (17,221 infantry, 9561 cavalry, 31,866 artillery and 9880 engineers). To this total must be added 44,294 men in the armed Landsturm (forty-five to fifty years of age) and 262,138 auxiliary troops (pioneers, workmen in military establishments, medical, commissariat and transport departments, police, firemen, clerks, and men at a military dep6t). The total of the Landsturm and the auxiliary services is 306,432, so that a grand total is 539,109 men (under the old system officers served in the Landwehr till forty-eight, and in the Landsturm till fifty-five). The total expenses of the Swiss army rose from £928,000 in 1896 to £1,400,000 in 1906. Rifles are manufactured in Bern, ammunition at Thun and at Altdorf , uniforms are made*in Bern, and the cavalry remount depSt is at Thun, which is also the chief artillery centre of Switzerland. There is a department for military science at the Federal Polytechnic School at Zurich, one section being meant for students in general, and the other specially for officers. (W. A. B. C.)*

History The Swiss Confederation is made up of twenty-two small states, differing from each other in nearly every point- religious, political, social, industrial, physical and linguistic; yet it forms a nation the patriotism of whose members is univers- ally acknowledged. History alone can supply us with the key to this puzzle; but Swiss history, while thus essential if we could thoroughly grasp the nature of the Confederation, is very intricate and very local. A firm hold on a few guiding principles is therefore most desirable, and of these there are three which we must always bear in mind. (1) The first to be mentioned is the connexion of Swiss history with that of the Empire. Swiss history is largely the history of the drawing together of bits of each of the imperial kingdoms (Germany, Italy and Burgundy) for common defence against a common foe — the Habsburgs; and, when this family have secured to themselves the permanent possession of the Empire, the Swiss League little by little wins its independence of the Empire, practically in 1499, formally in 1648. Originally a member of the Empire, the Confederation becomes first an ally, then merely a friend. (2) The second is the German origin and nature of the Confederation. Round

a German nucleus (the three Forest districts) there gradually gather other German districts; the Confederation is exclusively German (save partially

in the case of Fribourg, in which after its admission in 1481 Teutonic influences gradually supplanted the Romance speech); and it is not till 1803 and 1815 that its French- and Italian-speaking " subjects " are raised to political equality with their former masters, and that the Romonsch-speaking Leagues of Raetia (Graubiinden) pass from the status of an ally to that of a member of the Confederation. (3) Swiss history is a study in federalism. Based on the defensive alliances of 1291 and 1315 between the three Forest districts, the Confederation is enlarged by the admission of other districts and towns, all leagued with the original three members, but not necessarily with each other. Hence great difficulties are en- countered in looking after common interests, in maintaining any real union ; the Diet was merely an assembly of ambassadors with powers very strictly limited by their instructions, and there was no central executive authority. The Confederation is a Staatenbund, or permanent alliance of several small states. After the break-up of the old system in 1798 we see the idea of a Bundesstaat, or an organized state with a central legislative, executive and judiciary, work its way to the front, an idea which is gradually realized in the Constitutions of 1848 and 1874. The whole constitutional history of the Confederation is summed up in this transition to a federal state, which, while a single state in its foreign relations, in home matters maintains the more or less absolute independence of its several members.

*Swiss history falls naturally into five great divisions: (1) the origins of the Confederation — up to 1291 (for the legendary origin see Tell, William); (2) the shaking off dependence on the Habsburgs — up to 1394 (1474); (3) the shaking off dependence on the Empire — up to 1499 (1648); (4) the period of religious divisions and French influence — up to 1814; (5) the construction of an independent state as embodied in the Constitutions of 1848 and 1874. **

1. On the 1st of August 1291 the men of the valley of Uri {homines vallis Uraniae), the free community of the valley of Schwyz (universitas vallis de Switz), and the association of the men of the lower valley or Nidwalden (communitas hominum intramontanorum vallis inferioris) — Obwalden or the upper valley is not mentioned in the text, though it is named on the Early seal appended — formed an Everlasting League for

History of the purpose of self-defence against all who should the Three attack or trouble them, a league which is expressly stated to be a confirmation of a former one (aniiquam confederation's formam juramento vallatam presentibus innovando). This league was the foundation of the Swiss Confederation.

What were these districts? and why at this particular moment was it necessary for them to form a defensive league? The legal and political

conditions of each were very different, (a) In 853 Louis the German granted (inter alia) all his lands (and the rights annexed to them) situated in the pagellus Uraniae to the convent of Sts Felix and Regula in Zurich (the present Frau- miinster), of which his daughter Hildegard was the first abbess, and gave to this district the privilege of exemption from all jurisdiction save that of the king (Reichsfreiheit), so that though locally within the Zurichgau it was not subject to its count, the king's deputy. The abbey thus became possessed of the greater part of the valley of the Reuss between the present Devil's Bridge and the Lake of Lucerne, for the upper valley (Urseren) belonged at that time to the abbey of Disentis in the Rhine valley, and did not become permanently allied with Uri till 1410. The privileged position of the abbey tenants gradually led the other men of the valley to " commend " themselves to the abbey, whether they were tenants of other lords or free men as in the Schachenthal. The meeting of all the inhabitants of the valley, for purposes connected with the customary cultivation of the soil according to fixed rules and methods, served to prepare them for the enjoyment of full political liberty in later days. The important post of " protector " (advocatus or vogt) of the abbey was given to one family after another by the emperor as a sign of trust; but when, on the extinction of the house of Zaringen in 12 18, the office was granted to the Habsburgs,

the protests of the abbey tenants, who feared the rapidly rising power of that family, and perhaps also the desire of the German king to obtain command of the St Gotthard Pass (of which the first authentic mention occurs about 1236, when of course it could only be traversed on foot), led to the recall of the grant in 1 23 1, the valley being thus restored to its original privileged position, and depending immediately on the king. (6) In Schwyz (first mentioned in 972) we must distinguish between the districts west and east of Steinen. In the former the land was in the hands of many nobles, amongst whom were the Habsburgs; in the latter there was, at the foot of the Mythen, a free community of men governing themselves and cultivating their land in common; both, however, were politically subject to the king's delegates, the counts of the Zurichgau, who after 1 1 73 were the ever-advancing Habsburgs. But in 1240 the free community of Schwyz obtained from the emperor Frederick II. a charter which removed them from the jurisdiction of the counts, placing them in immediate dependence on the king, like the abbey men of Uri. In a few years, however, the Habsburgs contrived to dispense with this charter in practice, (c) In Unterwalden things were very different. The upper valley (Obwalden or Sarnen), like the lower (Nidwalden or Stans), formed part of the Zurichgau, while in both the soil was owned by many ecclesiastical and lay lords, among them being the Habsburgs and the Alsatian abbey of Murbach. Hence in this district there were privileged tenants, but no free

community, and no centre of unity, and this explains why Obwalden and Nidwalden won their way upwards so much more slowly than their neighbours in Uri and Schwyz. Thus the early history and legal position of these three districts was very far from being the same. In Uri the Habsburgs, save for a brief space, had absolutely no rights; while in Schwyz, Obwalden and Nidwalden they were also, as counts of the Zurichgau, the representatives of the king.

The Habsburgs had been steadily rising for many years from the position of an unimportant family in the Aargau to that of a powerful clan of large landed proprietors in Swabia and Alsace, and had attained a certain political importance as counts of the Zurichgau and Aargau. In one or both qualities the cadet or Laufenburg line, to which the family estates in the Forest districts round the Lake of Lucerne had fallen on the division of the inheritance in 1232, seem to have exercised their legal rights in a harsh manner. In 1240 the free men of Schwyz obtained protection from the emperor, and in 1244 we hear of the castle of New Habsburg, built by the Habsburgs on a promontory jutting out into the lake not far fj2gf" g " e from Lucerne, with the object of enforcing their real or pretended rights. It is therefore not a matter for sur- prise that when, after the excommunication and deposition of Frederick II. by Innocent IV. at the Council of Lyons in 1 245, the head of the cadet line of Habsburg sided with the pope, some of the men of the Forest districts should rally round the emperor. Schwyz joined Sarnen and Lucerne (though Uri and Obwalden supported the pope) ; the castle of New Habsburg was reduced to its present ruined state; and in 1247 the men of Schwyz, Sarnen and Lucerne were threatened by the pope with excommunication if they persisted in upholding the emperor and defying their hereditary lords the counts of Habsburg. The rapid decline of Frederick's cause soon enabled the Habsburgs to regain their authority in these districts. Yet these obscure risings have an historical interest, for they are the foundation in fact (so far as they have any) of the legendary stories of Habsburg oppression told of and by a later age. After this temporary check the power of the Habsburgs continued to increase rapidly. In 1273 the head of the cadet line sold all his lands and rights in the Forest districts to the head of the elder or Alsatian line, Rudolph, who a few months later was elected to the imperial throne, in virtue of which he acquired for his family in 1282 the duchy of Austria, which now for the first time became connected with the Habsburgs. Rudolph recog- nized the privileges of Uri but not those of Schwyz; and, as he now united in his own person the characters of emperor, count of the Zurichgau, and landowner in the Forest districts (a name occurring first in the 14th century), such a union of offices might

be expected to result in a confusion of rights. On the 16th of April 1 29 1 Rudolph bought from the abbey of Murbach in Alsace (of which he was " advocate ") all its rights over the town of Lucerne and the abbey estates in Unterwalden. It thus seemed probable that the other Forest districts would be shut off from their natural means of communication with the outer world by way of the lake. Rudolph's death, on the 15th of July of the same year, cleared the way, and a fortnight later (August 1) the Everlasting League was made between the men of Uri, Schwyz and Nidwalden (the words el vallis superioris, i.e. Obwalden, were inserted, perhaps between the time of the draw- ing up of the document, the text of which does not mention Obwalden, and the moment of its sealing on the original seal of Nidwalden) for the purpose of self-defence against a common foe. We do not know the names of the delegates of each valley who concluded the treaty, nor the place where it was made, nor have we any account of the deliberations of which it was the result. The common seal — that great outward sign of the right of a corporate body to act in its own name — appears first in Uri in 1243, in Schwyz in 1281, in Unterwalden not till this very document of 1291; yet, despite the great differences in their political status, they all joined in concluding this League, and confirmed it by their separate seals, thereby laying claim on behalf of their union to an independent existence. Besides promises of aid and assistance in the case of attack, they agree to punish great criminals by their own authority, but advise that, in minor cases and in all civil cases, each man should recognize the " judex " to whom he owes suit, engaging that the Confederates will, in case of need, enforce the decisions of the " judex." At the same time they unanimously refuse to recognize any " judex " who has bought his charge or is a stranger to the valleys. All disputes between the parties to the treaty are, as far as possible, to be settled by a reference to arbiters, a principle which remained in force for over six hundred years. " Judex " is a general term for any local official, especially the chief of the community, whether named by the lord or by the community; and, as earlier in the same year Rudolph had promised the men of Schwyz not to force upon them a " judex " belonging to the class of serfs, we may conjecture from this very decided protest that the chief source of disagreement was in the matter of the jurisdictions of the lord and the free community, and that some recent event in Schwyz led it to insist on the insertion of this provision. It is stipulated also that every man shall be bound to obey his own lord " convenienter," or so far as is fitting and right. The antiqua conjoederatio mentioned in this document was probably merely an ordinary agreement to preserve the peace in that particular district, made probably during the interregnum (1254-1273) in the Empire.

2. In the struggle for the Empire, which extended over the years following the conclusion of the League of 1291, we find Monrarten ˆat tne Confederates supported without exception and the the anti-Habsburg candidate. On the 16th of League of October 1291 Uri and Schwyz allied themselves with Zurich, and joined the general rising in Swabia against Albert, the new head of the house of Habsburg. It soon failed, but hopes revived when in 1292 Adolf of Nassau was chosen emperor. In 1297 he confirmed to the free men of Schwyz their charter of 1240, and, strangely enough, confirmed the same charter to Uri, instead of their own of 123 1. It is in his reign that we have the first recorded meeting of the " Landsgemeinde " (or legislative assembly) of Schwyz (1294). But in 1 298 Albert of Habsburg himself was elected to the Empire. His rule was strict and severe, though not oppressive. He did not indeed confirm the charters of Uri or of Schwyz, but he did not attack the ancient rights of the former, and in the latter he exercised his rights as a landowner and did not abuse his political rights as emperor or as count. In Unterwalden we find that in 1304 the two valleys were joined together under a common administrator (the local deputy of the count) — a great step forward to permanent union. The stories of Albert's tyrannical actions in the Forest districts are not heard of till two centuries later, though no doubt the union of offices in his

person was a permanent source of alarm to the Confederation. It was in his time too that the " terrier " (or list of manors and estates, with enumeration of all quit rents, dues, &c, payable by the tenants to their lords) of all the Habsburg possessions in Upper Germany was begun, and it was on the point of being extended to Schwyz and Unterwalden when Albert was murdered (1308) and the election of Henry of Luxemburg roused the free men to resist the officials charged with the survey. Despite his promise to restore to the Habsburgs all rights enjoyed by them under his three predecessors (or maintain them in posses- sion), Henry confirmed, on the 3rd of June 1309, to Uri and Schwyz their charters of 1297, and, for some unknown reason, confirmed to Unterwalden all the liberties granted by his pre- decessor, though as a matter of fact none had been granted. This charter, and the nomination of one royal bailiff to administer the three districts, had the effect of placing them all (despite historical differences) in an identical political position, and that the most privileged yet given to any of them — the freedom of the free community of Schwyz. A few days later the Confeder- ates made a fresh treaty of alliance with Zurich; and in 1310 the emperor placed certain other inhabitants of Schwyz on the same privileged footing as the free community. The Habsburgs were put off with promises; and, though their request (1311) for an inquiry into their precise rights in Alsace and in the Forest districts was granted, no steps were taken to carry out this investigation. Thus in Henry's time the struggle was between the Empire and the Habsburgs as to the

recognition of the rights of the latter, not between the Habsburgs and those dependent on them as landlords or counts.

On Henry's death in 13 13 the electors hesitated long between Frederick the Handsome of Habsburg and Louis of Bavaria. The men of Schwyz seized this opportunity for making a wanton attack on the great abbey of Einsiedeln, with which they had a long-standing quarrel as to rights of pasture. The abbot caused them to be excommunicated, and Frederick (the choice of the minority of the electors), who was the hereditary " advocate " of the abbey, placed them under the ban of the Empire. Louis, to whom they appealed, removed the ban; on which Frederick issued a decree by which he restored to his family all their rights and possessions in the three valleys and Urseren, and charged his brother Leopold with the execution of this order. The Confederates hastily concluded alliances with Glarus, Urseren, Arth and Interlaken to protect themselves from attack on every side. Leopold collected a brilliant army at the Austrian town of Zug in order to attack Schwyz, while a body of troops was to take Unterwalden in the rear by way of the Briinig Pass. On the 15th of November 13 15, Leopold with from 15,000 to 20,000 men moved forward along the shore of the Lake of Aegeri, intending to assail the town of Schwyz by climbing the slopes of Morgarten above the south-eastern end of the lake. There they were awaited by the valiant band of the Confederates from 1300 to 1500 strong. The march up the rugged and slippery slope threw the Austrian army into disarray, which became a rout and mad flight when huge boulders and trunks of trees were hurled from above by their foes, who charged down and drove them into the lake. Leopold fled in hot haste to Winterthur, and the attack by the Briinig was driven back by the men of Unterwalden. On the 9th of December 1315 representatives of the victorious highlanders met at Brunnen, on the Lake of Lucerne, not far from Schwyz, and renewed the Everlasting League of 1291. In their main lines the two docu- ments are very similar, the later being chiefly an expansion of the earlier. That of 1315 is in German (in contrast to the 1291 League, which is in Latin), and has one or two striking clauses largely indebted to a decree issued by Zurich on the 24th of July 1 291. None of the three districts or their dependents is to recognize a new lord without the consent and counsel of the rest. (This is probably meant to provide for an interregnum in or disputed election to the Empire, possibly for the chance of the election of a Habsburg.) Strict obedience in all lawful matters is to be rendered to the rightful lord in each case, unless he attacks or wrongs any of the Confederates, in which case they are to be

free from all obligations. No negotiations, so long as the " Lander " have no lord, are to be entered on with outside powers, save by common agreement of all. Louis solemnly recognized and confirmed the new league in 1316, and in 1318 a truce was concluded between the Confederates and the Habsburgs, who treat with them on equal terms. The lands and rights annexed belonging to the Habsburgs in the Forest districts are fully recognized as they existed in the days of Henry of Luxemburg, and freedom of commerce is granted. But there is not one word about the political rights of the Habsburgs as counts of the Ziirichgau and Aargau. This distinction gives the key to the whole history of the relations between the Confederates and Habsburgs; the rights of the latter as landowners are fully allowed, and till 1801 they possessed estates within the Con- federation; it is their political rights which were always contested by the Swiss, who desired to rule themselves.

As early as 1320 we find the name " Switzerland " (Sweicz) (derived from Schwyz, which had always been the leader in the The League struggle) applied to the three Forest cantons, and in ofBight 1352 extended to the Confederation as a whole. Members. g ut j t was no t till after Sempach (1386) that it came into popular use, the historian J. von Miiller (1785) fixing the distinction between " Schweiz " (for the country) and " Schwyz " (for the canton), and it did not form the official name of the Confederation till 1803. (Officially in the middle ages and later the Confederation was named " les Ligues de la Haute Allemagne," or, as Commines, late in the 15th century, puts it, " les vieilles Ligues d' Allemagne qu'on appelle Suisses," while fromc. 145 2 onwards the people were called" Swiss "). This is in itself a proof of the great renown which the League won by its victory at Morgarten. Another is that as years go by we find other members admitted to the privileges of the original alliance of the three Forest districts. First to join the League (1332) was the neighbouring town of Lucerne, which had grown up round the monastery of St Leodegar or Leger (whence the place took its name), perhaps a colony, certainly a cell of the great house of Murbach in Alsace, under the rule of which the town remained till its sale in 1291 to the Habsburgs. This act of Lucerne was opposed by the house of Austria, but, despite the decision of certain chosen arbitrators in favour of the Habsburg claims, the town clung to the League with which it was connected by its natural position, and thus brought a new element into the pastoral association of the Forest districts, which now surrounded the entire Lake of Lucerne. Next, in 1351, came the ancient town of Zurich, which in 1218, on the extinction of the house of Zaringen, had become a free imperial city in which the abbess of the Fraumunster (the lady of Uri) had great influence, while in 1336 there had been a great civic revolution, headed by Rudolph Brun, which had raised the members

of the craft gilds to a position in the municipal government of equal power with that of the patricians, who, however, did not cease intriguing to regain their lost privileges, so that Brun, after long hesitation, decided to throw in the lot of the town with the League rather than with Austria. In this way the League now advanced from the hilly country to the plains, though the terms of the treaty with Zurich did not bind it so closely to the Confederates as in the other cases (the right of making alliances apart from the League being reserved though the League was to rank before these), and hence rendered it possible for Zurich now and again to incline towards Austria in a fashion which did great hurt to its allies. In 1352 the League was enlarged by the admission of Glarus and Zug. Glarus belonged to the monastery of Sackingen on the Rhine (founded by the Irish monk Fridolin), of which the Habsburgs were " advocates," claiming therefore many rights over the valley, which refused to admit them, and joyfully received the Con- federates who came to its aid; but it was placed on a lower footing than the other members of the League, being bound to obey their orders. Three weeks later the town and district of Zug, attacked by the League and abandoned by their Habsburg masters, joined the Confederation, forming a transition link between the civic and rural members of the League. The immediate occasion of the union of these two districts was the war begun by the

Austrian duke against Zurich, which was ended by the Branden- burg peace of 1352, by which Glarus and Zug were to be restored to the Habsburgs, who also regained their rights over Lucerne. Zug was won for good by a bold stroke of the men of Schwyz in 1364, but it was not till the day of Nafels (1388) that Glarus recovered its lost freedom. These temporary losses and the treaty made by Brun of Zurich with Austria in 1356 were, how- ever, far outweighed by the entrance into the League in 1353 of the famous town of Bern, which, founded in 1191 by Berthold V. of Zaringen, and endowed with great privileges, had become a free imperial city in 12 18 on the extinction of the Zaringen dynasty. Founded for the purpose of bridling the turbulent feudal nobles around, many of whom had become citizens, Bern beat them back at Dornbuhl (1298), and made a treaty with the Forest districts as early as 1323. In 1339, at the bloody fight of Laupen, she had broken the power of the nobles for ever, and in 1352 had been forced by a treaty with Austria to take part in the war against Zurich, but soon after the conclusion of peace entered the League as the ally of the three Forest districts, being thus only indirectly joined to Lucerne and Zurich. The special importance of the accession of Bern was that the League now began to spread to the west, and was thus brought into connexion for the first time with the French-speaking land of Savoy. The League thus numbered eight members, the fruits of Morgarten, and no further members were admitted till 1481, after the Burgundian War. But,

in order thoroughly to understand the nature of the League, it must be remembered that, while each of the five new members was allied with the original nucleus — the three Forest districts — these five were not directly allied to one another: Lucerne was allied with Zurich and Zug; Zurich with Lucerne, Zug and Glarus; Glarus with Zurich; Zug with Lucerne and Zurich; Bern with no one except the three original members. The circumstances under which each entered the League can alone explain these very intricate relations.

After a short interval of peace the quarrels with Austria broke out afresh ; all the members of the League, save the three Forest districts and Glarus, joined (1385) the great union of the south German cities; but their attention was soon called to events nearer home. Lucerne fretted much under the Austrian rule, received many Austrian subjects among her citizens, and refused to pay custom duties to the Austrian bailiff at Rothenburg, on the ground that she had the right of free traffic. An attack on the custom-house at Rothenburg, and the gift of the privileges of burghership to the discontented inhabi- tants of the little town of Semppch a short way off, so irritated Leopold III. (who then held all the possessions of his house out- side Austria) that he collected an army, with the intention of crushing his rebellious town. Lucerne meanwhile had summoned the other members of the League to her aid, and, though Leopold's feint of attacking Zurich caused the troops of the League to march at first in that direction, they discovered their mistake in time to turn back and check his advance on Lucerne. From 1500 to 1600 men of Uri, Schwyz, Unterwalden, and Lucerne opposed the 6000 which made up the Austrian army. The decisive fight took place on the 9th of July 1386, near Sempach, on a bit of sloping meadow-land, cut up by streams and hedges, which forced the Austrian knights to dismount. The great heat of the day, which rendered it impossible to fight in armour, and the furious attacks of the Confederates, finally broke the Austrian line after more than one repulse and turned the day (see Winkel- ried). Leopold, with a large number of his followers, was slain, and the Habsburg power within the borders of the Confederation finally broken. Glarus at once rose in arms against Austria, but it was not till the expiration of the truce made after Sempach that Leopold's brother, Albert of Austria, brought an army against Glarus, and was defeated at Nafels (not far from Glarus) on the pth of April 1388, by a handful of Glarus and Schwyz men

In 1389 a peace for seven years was made, the Confederates being secured in all their conquests; an attempt made in 1393 by Austria by means of Schono, the chief magistrate of Zurich snd leader of the patrician party, to stir up a fresh attack

Sempach.

failed owing to a rising of the burghers, who sympathized with Freedom tne Confederates, and on the 16th of July 1394 the from the peace was prolonged for twenty years (and again in Political 1412 for fifty years) , various stipulations being made < H^b'b 0,tbe by wnicn tne lon § struggle of the League against the Habsburgs was finally crowned with success. By the peace of 1394 Glarus was freed on payment of £200 annually (in 1395 it bought up all the rights of Sackingen); Zug too was released from Austrian rule. Schwyz was given the advocatia of the great abbey of Einsiedeln; Lucerne got the Entlebuch (finally in 1405), Sempach and Rothenburg, Bern and Soleure were confirmed in their conquests. Above all, the Confederation as a whole was relieved from the overlordship of the Habsburgs, to whom, however, all their rights and dues as landed proprietors were expressly reserved; Bern, Zurich and Soleure guaranteeing the maintenance of these rights and dues, with power in case of need to call on the other Confederates to support them by arms. Though the house of Habsburg entertained hopes of recovering its former rights, so that technically the treaties of 1389, 1394 and 141 2 were but truces, it finally and for ever renounced all its feudal rights and privileges within the Confederation by the " Everlasting Compact " of 1474.

It is probable that Bern did not take any active share in the Sempach War because she was bound by the treaty of peace made with the Austrians in 1368; and Soleure, allied with Bern, was doubtless a party to the treaty of 1394 (though not yet in the League), because of its sufferings in 1382 at the hands of the Kyburg line of the Habsburgs, whose possessions (Thun, Burgdorf, &c.) in 1384 fell into the hands of the two allies.

We may mention here the foray (known as the English or Gugler War) made in 1375 by Enguerrand de Coucy (husband of Isabella, daughter of Edward III. of England) and his freebooters (many of them Englishmen and Welshmen), called ” Gugler ” from their pointed steel caps, with the object of obtaining possession of certain towns in the Aargau (including Sempach), which he claimed as the dowry of his mother Catherine, daughter of the Leopold who was defeated at Morgarten. He was put to rout in the Entlebuch by the men of Bern, Lucerne, Schwyz and Unterwalden in December 1375. This victory was commemorated with great rejoicings in 1875.

3. The great victory at Sempach not merely vastly increased the fame of the

Everlasting League but also enabled it to extend Struggles /nboth its influence and its territory. The 15th Appenzeii, century is the period when both the League and st Gall audits several members took the aggressive, and the the Valais. ex p ans j on f their power and lands cannot be better seen than by comparing the state of things at the beginning and at the end of this century. The pastoral highlands of Appenzeii (Abbatis Cella) and the town of St Gall had long been trying to throw off the rights exercised over them by the great abbey of St Gall. The Appenzellers, especially, had offered a stubborn resistance, and the abbot's troops had been beaten back by them in 1403 on the heights of Vogelinseck, and again in 1405 in the great fight on the Stoss Pass (which leads up into the high- lands), in which the abbot was backed by the duke of Austria. The tales of the heroic defence of TJri Rotach of Appenzeii, and of the appearance of a company of Appenzeii women disguised as warriors which turned the battle, are told in connexion with this fight, but do not appear till the 17th and 18th centuries, being thus quite unhistorical, so far as our genuine evidence goes. Schwyz had given them some help, and in 141 1 Appenzeii was placed under the protection of the League (save Bern), with which in the next year the city of St Gall made a similar treaty to last ten years. So too in 1416-1417 several of the " tithings " of the Upper Valais {i.e. the upper stretch of the Rhone valley), which in 1388 had beaten the bishop and the nobles in a great fight at Visp, became closely associated with Lucerne, Uri and Unterwalden. It required aid in its final struggle (1418-19) against the great house of Raron, the count-bishop of Sitten (or Sion), and the house of Savoy, which held the Lower Valais— the Forest districts, on the other hand, wishing to secure them- selves against Raron and Savoy in their attempt to conquer

permanently the Val d'Ossola on the south side of the Simplon Pass. Bern, however, supported its burgher, the lord of Raron, and peace was made in 1420. Such were the first links which bound these lands with the League; but they did not become full members for a long time — Appenzeii in 1 513, St Gall in 1803, the Valais in 18 15.

Space will not allow us to enumerate all the small conquests made in the first half of the 15th century by every member of the League; suffice it to say that each increased and rounded off its territory, but did not give the conquered lands any political rights, governing them as " subject lands," often very harshly. The same phenomenon of lands which had woii their own freedom playing the part of tyrant over other lands which joined them more or less by their voluntary action is seen on a larger scale in the case of the conquest of the Aargau, and in the first attempts to secure a footing south of the Alps.

In 141 2 the treaty of 1394 between the League and the Habs- burgs had

been renewed for fifty years; but when in 1415 Duke Frederick of Austria helped Pope John XXII. to escape from Constance, where the great oecumenical council was then sitting, and the emperor Sigismund placed the duke under the ban of the Empire, summoning all members of the Empire to arm against him, the League hesitated, because of their treaty of 141 2, till the emperor declared that all the rights and lands of Austria in the League were forfeited, and that their compact did not release them from their obligations to the Empire. In the name, there- fore, of the emperor, and by his special command, the different members of the League overran the extensive Habsburg posses- sions in the Aargau. The chief share fell to Bern, but certain districts (known as the Freie Aemter) were joined together and governed as bailiwicks held in common by all the members of the League (save Uri, busied in the south, and Bern, who had already secured the lion's share of the spoil for herself). This is the first case in which the League as a whole took up the position of rulers over districts which, though guaranteed in the enjoyment of their old rights, were nevertheless politically unfree. As an encouragement and a reward, Sigismund had granted in advance to the League the right of criminal jurisdiction {haute justice or Blutbann), which points to the fact that they were soon to become independent of the Empire, as they were of Austria. As the natural policy of Bern was to seek to enlarge its borders at the expense of Austria, and later of Savoy, so we find that Uri, shut off by physical causes from extension in other directions, as steadily turned its eyes towards the south. In 1410 the valley of Urseren was finally joined to Uri; though First communications were difficult, and carried on only by Italian means of the " Stiebende Briicke," a wooden bridge Conquests. suspended by chains over the Reuss, along the side of a great rocky buttress (pierced in 1707 by the tunnel known as the Urnerloch), yet this enlargement of the territory of Uri gave it complete command over the St Gotthard Pass, long commercially important, and now to serve for purposes of war and conquest. Already in 1403 Uri and Obwalden had taken advantage of a quarrel with the duke of Milan as to custom dues at the market of Varese to occupy the long narrow upper Ticino valley on the south of the pass called the Val Leventina; in r4ii the men of the same two lands, exasperated by the insults of the local lords, called on the other members of the League, and all jointly (except Bern) occupied the Val d'Ossola, on the south side of the Simplon Pass. But in i4r4 they lost this to Savoy, and, with the object of getting it back, obtained in 1416-1417 the alliance of the men of the Upper Valais, then fighting for freedom, and thus regained (1416) the valley, despite the exertions of the great Milanese general Carmagnola. In 1419 Uri and Obwalden bought from its lord the town and district of Bellinzona. This rapid advance, however, did not approve itself to the duke of Milan, and Car- magnola reoccupied both valleys; the Confederates were not at one with regard to these southern conquests; a small body pressed on in

front of the rest, but was cut to pieces at Arbedo near Bellinzona in 1422. A bold attempt in 1425 by a Schwyzer, Peter Rissi by name, to recover the Val d'Ossola caused the I Confederates to send a force to rescue these adventurers; but

the duke of Milan intrigued with the divided Confederates, and finally in 1426, by a payment of a large sum of money and the grant of certain commercial privileges, the Val Leventina, the Val d'Ossola and Bellinzona were formally restored to him. Thus the first attempt of Uri to acquire a footing south of the Alps failed; but a later attempt was successful, leading to the inclusion in the Confederation of what has been called "Italian Switzerland."

The original contrasts between the social condition of the different members of the League became more marked when the

period of conquest began, and led to quarrels and ill- Civit War leeum J m tne matter of the Aargau and the Italian

conquests which a few years later ripened into a civil war, brought about by the dispute as to the succession to the lands of Frederick, count of Toggenburg, the last male representa- tive of his house. Count Frederick's predecessors had greatly extended their domains, so that they took in not only the Toggen- burg or upper valley of the Thur, but Uznach, Sargans, the Rhine valley between Feldkirch and Sargans, the Prattigau and the Davos valley. He himself, the last great feudal lord on the left bank of the Rhine, had managed to secure his vast possessions by making treaties with several members of the League, par- ticularly Zurich (1400) and Schwyz (1417) — from 1428 inclining more and more to Schwyz (then ruled by Ital Riding), as he was disgusted with the arrogant behaviour of Stiissi, the burgomaster of Zurich. His death (April 30, 1436) was the signal for the breaking out of strife. The Prattigau and Davos valley formed the League of the Ten Jurisdictions in Raetia (see below), while Frederick's widow sided with Zurich against Schwyz for different portions of the great inheritance which had been promised them. After being twice defeated, Zurich was forced in 1440 to buy peace by certain cessions (the " Hofe ") to Schwyz, the general feeling of the Confederates being opposed to Zurich, so that several of them went so far as to send men and arms to Schwyz. Zurich, however, was bitterly disappointed at these defeats, and had recourse to the

policy which she had adopted in 1356 and 1393 — an alliance with Austria (concluded in 1442), which now held the imperial throne in the person of Frederick III. Though tech- nically within her rights according to the terms on which she had joined the League in 1351, this act of Zurich caused the greatest irritation in the Confederation, and civil war at once broke out, especially when the Habsburg emperor had been solemnly received and acknowledged in Zurich. In 1443 the Zurich troops were completely defeated at St Jakob on the Sihl, close under the walls of the city, Stiissi himself being slain. Next year the city itself was long besieged. Frederick, unable to get help elsewhere, procured from Charles VII. of France the despatch of a body of Armagnac free lances (the Ecorcheurs), who came, 30,000 strong, under the dauphin Louis, plundering and harrying the land, till at the very gates of the free imperial city of Basel (which had made a twenty years' alliance with Bern), by the leper house of St Jakob on the Birs (Aug. 26, 1444), the desperate resistance of a small body of Confederates (1200 to 1500), till cut to pieces, checked the advance of the freebooters, who sustained such tremendous losses that, though the victors, they hastily made peace, and returned whence they had come. Several small engagements ensued, Zurich long declining to make peace because the Con- federates required, as the result of a solemn arbitration, the abandonment of the Austrian alliance. At length it was concluded in 1450, the Confederates restoring, almost all the lands they had won from Zurich. Thus ended the third attempt of Austria to conquer the League by means of Zurich, which used its position as an imperial free city to the harm of the League, and caused the first civil war by which it was distracted. These fresh proofs of the valour of the Confederates, and of the growing importance of the League, did not fail to produce Constitution important results. In 1452 the " Confederates of of the the Old League of Upper Germany" (as they styled

League, themselves) made their first treaty of alliance with c 1450. France, a connexion which was destined to exercise so much influence on their history. Round the League there began to gather a new class of allies (known as " Zugewandte

Orte," or associated districts), more closely joined to it, or to certain members of it, than by a mere treaty of friendship, yet not being admitted to the rank of a full member of the League. Of these associates three, the abbot (1451) and town of St Gall (1454), and the town of Bienne (Biel), through its alliance (1352) with Bern, were given seats and votes in the Diet, being called socii; while others, known as confoederati, were not so closely bound to the League, such as the Valais (1416-1417), Schaffhausen (1454), Rottweil (1463), Miihlhausen (1466), (to the class of confoederati belonged in later times Neuchatel 1406-1501), the Three Leagues of Raetia (1497-1498), Geneva (1519-1536), and the bishop of

Basel (1579). Appenzell, too, in 1452, rose from the rank of a " protected district " into the class of associates, outside which were certain places " protected " by several members of the League, such as Gersau (1359), the abbey of Engelberg (c. 1421), and the town of Rapperswil (1464), The relation of the " associates " to the League may be compared with the ancient practice of " commendation ": they were bound to obey orders in declaring war, making alliances, &c.

In 1439 Sigismund succeeded his father Frederick in the Habsburg lands in Alsace, the Thurgau, and Tirol and, being much irritated by the constant encroachments of the Confeder- ates, in particular by the loss of Rapperswil (1458), declared war against them, but fared very badly. In 1460 the Confederates overran the Thurgau and occupied Sargans. Winterthur was only saved by an heroic defence. Hence in 1461 Sigismund had to give up his claims on those lands and renew the peace for fifteen years, while in 1467 he sold Wintherthur to Zurich. Thus the whole line of the Rhine was lost to the Habsburgs, who retained (till 1801) in the territories of the Confederates the Frickthal only. The Thurgovian bailiwicks were governed in common as " subject " lands by all the Confederates except Bern, The touchiness of the now rapidly advancing League was shown by the eagerness with which in 1468 its members took up arms against certain small feudal nobles who were carrying on a harassing guerrilla warfare with their allies Schaffhausen and Miihlhausen. They laid siege to Waldshut, and to buy them off Sigismund in August 1468 engaged to pay 10,000 gulden as damages by the 24th of June 1469; in default of payment the Confederates were to keep for ever the Black Forest, and Walds- hut, one of the Black Forest towns on the Rhine. A short time before (1467) the League had made treaties of friendship with Philip the Good, duke of Burgundy, and with the duke of Milan. All was now prepared for the intricate series of intrigues which led up to the Burgundian War — a great epoch in the history of the League, as it created a common national feeling, enormously raised its military reputation, and brought about the close connexion with certain parts of Savoy, which finally (1803-1815) were admitted into the League.

Sigismund did not know where to obtain the sum he had promised to pay. In this strait he turned to Charles the Bold (properly the Rash), duke of Burgundy, who was The then beginning his wonderful career, and aiming at Burgundian restoring the kingdom of Burgundy. For this purpose War – Charles wished to marry his daughter and heiress to Maximilian, son of the emperor, and first cousin of Sigismund, in order that the emperor might be induced to give him the Burgundian crown. Hence he was ready to meet Sigismund's advances. On the 9th of May 1469 Charles promised to give Sigismund 50,000 florins, receiving as security for repayment Upper Alsace, the Breisgau, the Sundgau, the Black Forest, and the four Black

Forest towns on the Rhine (Rheinfelden, Sackingen, Laufenburg and Walds- hut), and agreed to give Sigismund aid against the Swiss, if he was attacked by them. It was not unnatural for Sigismund to think of attacking the League, but Charles's engagement to him is quite inconsistent with the friendly agreement made be- tween Burgundy and the League as late as 1467, The emperor then on his side annulled Sigismund's treaty of 1468 with the Swiss, and placed them under the ban of the Empire. Charles committed the mortgaged lands to Peter von Hagenbach, who proceeded to try to establish his master's power there by such harsh measures as to cause the people to rise against him.

The Swiss in these circumstances began to look towards Louis XI. of France, who had confirmed the treaty of friendship made with them by his father in 1452. Sigismund had applied to him early in 1469 to help him in his many troubles, and to give him aid against the Swiss, but Louis had point-blank refused. Anxious to secure their neutrality in case of his war with Charles, he made a treaty with them on the 13th of August 1470 to this effect. All the evidence goes to show that Sigismund was not a tool in the hands of Louis, and that Louis, at least at that time, had no definite intention of involving Charles and the Swiss in a war, but wished only to secure his own flank.

Sigismund in the next few years tried hard to get from Charles the promised aid against the Swiss (the money was paid punctually enough by Charles on his behalf), who put him off with various excuses. Charles on his side, in 1471-1472, tried to make an alliance with the Swiss, his efforts being supported by a party in Bern headed by Adrian von Bubenberg. Probably Charles wished to use both Sigismund and the Swiss to further his own interests, but his shifty policy had the effect of alienating both from him. Sigismund, disgusted with Charles, now inclined towards Louis, whose ally he formally became in the summer of 1473 — a change which was the real cause of the emperor's flight from Treves in November 1473, when he had come there expressly to crown Charles. The Confederates on their side were greatly moved by the oppression of their friends and allies in Alsace by Hagenbach, and tried in vain (January 1474) to obtain some redress from his master. Charles's too astute policy had thus lost him both Sigismund and the Swiss. They now looked upon Louis, who, thoroughly aware of Charles's ambition, and fjaring that his disappointment at Treves would soon lead to open war, aimed at a master stroke — no less than the

reconciliation of Sigismund and the Swiss. This on the face of it seemed impracticable, but common need and Louis's dexterous management brought it to pass, so that on the 30th of March 1474 the Everlasting Compact was signed at Constance, by which Sigismund finally renounced all Austrian claims on the lands of the Confederates, and guaran- teed them in quiet enjoyment to them; they, on the other hand, agreed to support him if Charles did not give up the mortgaged lands when the money was paid down. The next day the Swiss joined the league of the Alsatian and Rhine cities, as also did Sigismund. Charles was called on to receive the money contributed by the Alsatian cities, and to restore his lands to Sigismund. He, however, took no steps. Within a week the oppressive bailiff Hagenbach was captured, and a month later (May 9, 1474) he was put to death, Bern alone of the Confederates being represented. On the 9th of October the emperor, acting of course at the instance of Sigismund, ordered them to declare war against Charles, which took place on the 25th of October. Next day Louis formally ratified his alliance with the Con- federates, promising money and pensions, the latter to be increased if he did not send men. Throughout these negotiations and later Bern directs Swiss policy, though all the Confederates are not quite agreed. She was specially exposed to attack from Charles and Charles's ally (since 1468) Savoy, and her best chance of extending her territory lay towards the west and south. A forward policy was thus distinctly the best for Bern, and this was the line supported by the French party under Nicholas von Diesbach, Adrian von Bubenberg opposing it, though not with any idea of handing over Bern to Charles. The Forest districts, however, were very suspicious of this movement to the west, by which Bern alone could profit, though the League as a whole might lose; then, too, Uri had in 1440 finally won the Val Leventina, and she and her neighbours favoured a southerly policy — a policy which was crowned with success after the gallant victory won at Giornico in 1478 by a handful of men from Zurich, Lucerne, Uri and Schwyz over 12,000 Milanese troops. Thus Uri first gained a permanent footing south of the Alps, not long before Bern won its first conquests from Savoy.

The war in the west was begun by Bern and her allies (Fribourg, Soleure, &c.) by marauding expeditions across the Jura, in which Hericourt (November 1474) and Blamont (August 1475) were taken, both towns being held of Charles by the " sires " de

Neuchatel, a cadet line of the counts of Montbeliard. It is said that in the former expedition the white cross was borne (for the first time) as the ensign of the Confederates, but not in the other. Meanwhile Yolande, the duchess of Savoy, had, through fear of her brother Louis XL and hatred of Bern, finally joined Charles and Milan (January 1475), the immediate result of which was the capture, by the Bernese and friends (on the way

back from a foray on Pontarlier in the free county of Bur- gundy or Franche-Comte), of several places in Vaud, notably Grandson and Echallens, both held of Savoy by a member of the house of Chalon, princes of Orange (April 1475), as well as of Orbe and Jougne, held by the same, but under the count of Burgundy. In the summer Bern seized on the Savoyard district of Aigle. Soon after (October-November 1475) the same energetic policy won for her the Savoyard towns of Morat, Avenches, Estavayer and Yverdon; while (September) the Upper Valais, which had conquered all Lower or Savoyard Valais, entered into alliance with Bern for the purpose of opposing Savoy by preventing the arrival of Milanese troops. Alarmed at their success, the emperor and Louis deserted (June-September) the Confederates, who thus, by the influence of Louis and Bernese ambition, saw themselves led on and then abandoned to the wrath of Charles, and very likely to lose their new conquests. They had entered on the war as " helpers " of the emperor, and now became principals in the war against Charles, who raised the siege of Neuss, made an alliance with Edward IV. 'of England, received the surrender of Lorraine, and hastened across the Jura (February 1476) to the aid of his ally Yolande. On the 21st of February Charles laid siege to the castle of Grandson, and after a week's siege the garrison of Bernese and Fribourgers had to surrender (Oct. 28), while, by way of retaliation for the massacre of the garrison of Estavayer in 1475, of the 412 men two only were spared in order to act as executioners of their comrades. This hideous news met a large body of the Confederates gathered together in great haste to relieve the garrison, and going to their rendezvous at Neuchatel, where both the count and town had become allies of Bern in 1406. An advance body of Bernese, Fribourgers and Schwyzers, in order to avoid the castle of Vauxmarcus (seized by Charles), on the shore of the Lake of Neuchatel, and on the direct road from Neuchatel to Grandson, climbed over a wooded spur to the north, and attacked (March 2) the Burgundian outposts. Charles drew back his force in order to bring down the Swiss to the more level ground where his cavalry could act, but his rear mis- interpreted the order, and when the main Swiss force appeared over the spur the Burgundian army was seized with a panic and fled in disorder. The Swiss had gained a glorious victory, and regained their conquest of Grandson, besides capturing very rich spoil in Charles's camp, parts of which are preserved to the present day in various Swiss armouries. Such was the famous battle of Grandson. Charles at once retired to Lausanne, and set about reorganizing his army. He resolved to advance on Bern by way of Morat (or Murten), which was occupied by a Bernese garrison under Adrian von Bubenburg, and laid siege to it on the 9th of June. The Confederates had now put away all jealousy of Bern, and collected a large army. The decisive battle took place on the afternoon of the 22nd of June, after the arrival of the Zurich contingent under Hans Waldmann. English archers were in Charles's army, while with the Swiss

was Rene, the dispossessed duke of Lorraine. After facing each other many hours in the driving rain, a body of Swiss, by outflanking Charles's van, stormed his palisaded camp, and the Burgundians were soon hopelessly beaten, the losses on both sides (a contrast to Grandson) being exceedingly heavy. Vaud was reoccupied by the Swiss (Savoy having overrun it on Charles's advance); but Louis now stepped in and pro- cured the restoration of that region to Savoy, save Grand- son, Morat, Orbe and Echallens, which were to be held by the Bernese jointly with the Fribourgers, Aigle by Bern alone — Savoy at the same time renouncing all its claims over Fri- bourg. Thus French-speaking districts first became permanently

connected with the Confederation, hitherto purely German, and the war had been one for the maintenance of recent conquests, rather than purely in defence of Swiss freedom. Charles tried in vain to raise a third army; Rene recovered Lorraine, and on the 5th of January 1477, under the walls of Nancy, Charles's wide-reaching plans were ended by his defeat and death, many Swiss being with Rene's troops. The wish of the Bernese to overrun Franche-Comte was opposed by the older members of the Confederation, and finally, in 1479, Louis, by very large payments, secured the abandonment of all claims on that province, which was annexed to the French crown.

These glorious victories really laid the foundation of Swiss nationality; but soon after them the long-standing jealousy Internal between the civic and rural elements in the Con- Disputes in federation nearly broke it up. This had always the League, hindered common action save in the case of certain pressing questions. In 1370, by the " Parsons' ordinance " (Pfaffenbrief), agreed on by all the Confederates except Bern and Glarus, all residents whether clerics or laymen, in the Confederation who were bound by oath to the duke of Austria were to swear faith to the Confederation, and this oath was to rank before any other; no appeal was to lie to any court spiritual or lay (except in matrimonial and purely spiritual questions) outside the limits of the Confederation, and many regulations were laid down as to the suppression of private wars and keeping of the peace on the high roads. Further, in 1303, the " Sempach ordinance" was accepted by all the Confederates and Soleure; this was an attempt to enforce police regulations and to lay down " articles of war " for the organization and discipline of the army of the Confederates, minute regulations being made against

plunder- ing — women, monasteries and churches being in particular protected and secured. But save these two documents common action was limited to the meeting of two envoys from each member of the Confederation and one from each of the " socii " in the Diet, the powers of which were greatly limited by the instructions brought by each envoy, thus entailing frequent reference to his government, and included foreign relations, war and peace, and common arrangements as to police, pestilence, customs duties, coinage, &c. The decisions of the majority did not bind the minority save in the case of the affairs of the baili- wicks ruled in common. Thus everything depended on common ' agreement and good will. But disputes as to the divisions of the lands conquered in the Burgundian War, and the proposal to admit into the League the towns of Fribourg and Soleure, which had rendered such good help in the war, caused the two parties to form separate unions, for by the latter proposal the number of towns would have been made the same as that of the " Lander," which these did not at all approve. Suspended a moment by the campaign in the Val Leventina, these quarrels broke out after the victory of Giornico; and at the Diet of Stans (December 1481), when it seemed probable that the failure of all attempts to come to an understanding would result in the disruption of the League, the mediation of Nicholas von der Flue (or Bruder Klaus), a holy hermit of Sachseln in Obwalden, though he did not appear at the Diet in person, succeeded in bringing both sides to reason, and the third great ordinance of the League — the " compact of Stans " — was agreed on. By this the promise of mutual aid and assistance was renewed, especially when one member attacked another, and stress was laid on the duty of the several governments to maintain the peace, and not to help the subjects of any other member in case of a rising. The treasure and movables captured in the war were to be equally divided amongst the combatants, but the territories and towns amongst the members of the League. As a practical proof of the reconciliation, on the same day the towns of Fribourg and Soleure were received as full members of the Confederation, united with all the other members, though on less favourable terms than usual, for they were forbidden to make alliances, save with the consent of all or of the greater part of the other members. Both towns had long been allied with Bern, whose influence was greatly increased by their admission. Fribourg, founded in 11 78 by Berthold IV. of Zaringen, had on

the extinction of that great dynasty (12 18) passed successively by inheritance to Kyburg (1218), by purchase to Austria (1277), and by commendation to Savoy (1452); when Savoy gave up its claims in 1477 Fribourg once more became a free imperial city. She had become allied with Bern as early as 1243, but in the 14th and 15th centuries became Romance-speaking, though from 1483 onwards German gained in strength

and was the official language till 1798. Soleure (or Solothurn) had been associated with Bern from 1295, but had in vain sought admission into the League in 1411. Both the new members had done much for Bern in the Burgundian War, and it was for their good service that she now procured them this splendid reward, in hopes perhaps of aid on other important and critical occasions.

The compact of Stans strengthened the bonds which joined the members of the Confederation ; and the same centralizing ten- dency is well seen in the attempt (1483-1489) of Hans Waldmann, the burgomaster of Zurich, to assert the rule of his city over the neighbouring country districts, to place all power in the hands of the gilds (whereas by B run's constitution the patricians had an equal share), to suppress all minor jurisdictions, and to raise a uniform tax. But this idea of concentrating all powers in the hands of the government aroused great resistance, and led to his overthrow and execution. Peter Kistler succeeded (1470) better at Bern in a reform on the same lines, but less sweeping.

*The early history of each member of the Confederation, and of the Confederation itself, shows that they always professed to belong to the Empire, trying to become immediately dependent on the emperor in order to prevent oppression by middle lords, and to enjoy practical liberty. The Empire itself had now become very much of a shadow; cities and princes were gradually asserting their own independence, sometimes breaking away from it altogether. Now, by the practical time of the Burgundian War, the Confederation Freedom stood in a position analogous to that of a powerful *"""" tne free imperial city. As long as the emperor's nominal Bmpire. rights were not enforced, all went well; but, when Maximilian, in his attempt to reorganize the Empire, erected in 1495 at Worms an imperial chamber which had jurisdiction in all disputes between members of the Empire, the Confederates were very unwilling to obey it — partly because they could maintain peace at home by their own authority, and partly because it interfered with their practical independence. Again, their refusal to join the " Swabian League," formed in 1488 by the lords and cities of South Germany to keep the public peace, gave further offence, as well as their fresh alliances with France. Hence a struggle was inevitable, and the occasion by reason of which it broke out was the seizure by the Tyrolese authorities in 1499 of the Miinsterthal, which belonged to the " Gottes- hausbund," one of the three leagues which had gradually arisen in Raetia. These were the " Gotteshausbund " in 1367 (taking in all the dependents of the cathedral church at Chur living in the Oberhalbstein and Engadine) ; the " Ober " or " Grauer Bund " in 1395 and 1424 (taking in the abbey of Disentis and many counts and lords in the Vorder Bhein valley, though its name is not derived, as often stated, from the " grey coats " of the first members, but from " grawen " or " grafen," as so many counts formed part*

of it) ; and the " League of the Ten Jurisdictions " (Zehngerichtenbund), which arose in the Pratti- gau and Davos valley (1436) on the death of Count Frederick of Toggenburg, but which, owing to certain Austrian claims in it, was not quite so free as its neighbours. The first and third of these became allied in 1450, but the formal union of the three dates only from 1524, as documentary proof is wanting of the alleged meeting at Vazerol in 147 1, though practically before 1524 they had very much in common. In 1497 the Ober Bund, in 1498 the Gotteshausbund, made a treaty of alliance with the Everlasting League or Swiss Confederation, the Ten Jurisdic- tions being unable to do more than show sympathy, owing to Austrian claims, which were not bought up till 1649 an d 1652. Hence this attack on the Miinsterthal was an attack on an "associate" member of the Swiss Confederation, Maximilian being supported by the Swabian League; but its real historical importance is the influence it had on the relations of the Swiss

to the Empire. The struggle lasted several months, the chief fight being that in the Calven gorge (above Mais; May 22, 1499), in which Benedict Fontana, a leader of the Gotteshausbund men, performed many heroic deeds before his death. But, both sides being exhausted, peace was made at Basel on the 22nd of September 1499. By this the matters in dispute were referred to arbitration, and the emperor annulled all the decisions of the imperial chamber against the Confederation; but nothing was laid down as to its future relations with the Empire. No further real attempt, however, was made to enforce the rights of the emperor, and the Confederation became a state allied with the Empire, enjoying practical independence, though not formally freed till 1648. Thus, 208 years after the origin of the Confedera- tion in 1 291, it had got rid of all Austrian claims (1394 and 1474), as well as all practical subjection to the emperor. But its further idvance towards the position of an independent state was long checked by religious divisions within, and by the enormous influence of the French king on its foreign relations.

With the object of strengthening the northern border of the Confederation, two more full members were admitted in 1501 — Basel and Schaffhausen — on the same terms as Fribourg and Soleure. The city of Basel had originally been ruled by its bishop, but early in the 14th century it became a free imperial city; before 1501 it had made no permanent alliance with the Confederation, though it had been in continual relations with it.

Schaffhausen had grown up round the Benedictine monas- tery of All Saints, and became in the early 13th century a free imperial city, but was mortgaged to Austria from 1330 to 1415, in which last year the emperor Sigismund declared all Duke Frederick's rights forfeited in consequence of his abetting the flight of Pope John XXII. It bought its' freedom in 1418 and became an " associate " of the Confederation in 1454.

•A few years later, in 1513, Appenzell, which in 1411 had become a " protected " district, and in 1452 an " associate " The League member of the Confederation, was admitted as the enlarged to thirteenth full member; and this remained the Thirteen number till the fall of the old Confederation in 1798.

em ers. R oun(j t ne t nree original members had gathered first five others, united with the three, but not necessarily with each other; and then gradually there grew up an outer circle, consisting of five more, allied with all the eight old members, but tied down by certain stringent conditions. Constance, which seemed called by nature to enter the League, kept aloof, owing to a quarrel as to criminal jurisdiction in the Thurgau, pledged to it before the district was conquered by the Confederates.

In the first years of the 16th century the influence of the Confederates south of the Alps was largely extended. The system of giving pensions, in order to secure the right of enlisting men within the Confederation, and of capitulations, by which the different members supplied troops, was originated by Louis XI. in 1474, and later followed by many other princes. Though a tribute to Swiss valour and courage, this practice had very evil results, of which the first- fruitswereseeninthe Milanese troubles (1 500- 1 5 1 6) , of which the following is a summary. Both Charles VIII. (1484) andLouis XII. (1499 for ten years) renewed Louis XL's treaty. The French at- tempts to gain Milan were largely carried on by the help of Swiss mercenaries, some of whom were on the opposite side; and, as brotherly feeling was still too strong to make it possible for them to fight against one another, Lodovico Sforza's Swiss troops shamefully betrayed him to the French at Novara (1500). In 1500, too, the three Forest districts occupied Bellinzona (with the Val Blenio) at the request of its inhabitants, and in 1503 Louis XII. was forced to cede it to them. He, however, often held back the pay of his Swiss troops, and treated them as mere hirelings, so that when the ten years' treaty came to an end Matthew Schinner, bishop of Sitten (or Sion), induced them to join (1510) the pope, Julius II., then engaged in forming the Holy League to expel the French from Italy. But when, after the battle of Ravenna, Louis XII. became all-powerful in Lombardy, 20,000 Swiss poured down into the Milanese and occupied it, Felix Schmid, the burgomaster of Zurich, naming Maximilian (Lodovico's son) duke of Milan, in return for which

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he ceded to the Confederates Locarno, Val Maggia, Mendrisio and Lugano (1512), while the Raetian Leagues seized Chiavenna, Bormio and the Valtellina. (The former districts, with Bellin- zona, the Val Blenio and the Val Leventina, were in 1803 made into the canton of Ticino, the latter were held by Raetia till 1797.) In 1513 the Swiss completely defeated the French at Novara, and in 1515 Pace was sent by Henry VIII. of England to give pensions and get soldiers. Francis I. at once on his accession (1515) began to prepare to win back the Milanese, and, successfully evading the Swiss awaiting his descent from the Alps, beat them in a pitched battle at Marignano near Milan (Sept. 13, 1515)1 which broke the Swiss power in north Italy, so that in 1516 a peace was made with France — the Valais, the Three Raetian Leagues and both the abbot and town of St Gall being included on the side of the Confederates. Pro- vision was made for the neutrality of either party in case the other became involved in war, and large pensions were promised. This treaty was extended by another in 1521 (to which Zurich, then under Zwingli's influence, would not agree, holding aloof from the French alliance till 1614), by which the French king might, with the consent of the Confederation, enlist any number of men between 6000 and 16,000, paying them fit wages, and the pensions were raised to 3000 francs annually to each member of the Confederation. These two treaties were the starting- point of later French interference with Swiss affairs.

4. In 1499 the Swiss had practically renounced their allegi- ance to the emperor, the temporal chief of the world according to medieval theory; and in the 16th century a great number of them did the same by the world's spiritual ma e tlo ˆ or " chief, the pope. The scene of the revolt was Zurich, and the leader Ulrich Zwingli (who settled in Zurich at the very end of 1518). But we cannot understand Zwingli's career unless we remember that he was almost more a political reformer than a religious one. In his former character his policy was threefold. He bitterly opposed the French alliance and the pension and mercenary system, for he had seen its evils with his own eyes when serving as chaplain with the troops in the Milanese in 1512 and 1 51 5. Hence in 152 1 his influence kept Zurich back from joining in the treaty with Francis I. Then, too, at the time of the Peasant Revolt (1525), he did what he could to lighten the harsh rule of the city over the neighbouring rural districts, and succeeded in getting serfage abolished. Again he had it greatly at heart to secure for Zurich and Bern the chief power ' in the Confederation, because of their importance and size; he wished to give them extra votes in the Diet, and would have given them two-thirds of the " common bailiwicks " when these were divided. In his character as a religious reformer we must remember that he was a humanist, and deeply read in classical literature, which accounts for his

turning the canonries of the Grossmtinster into professorships, reviving the old school of the Carolinum, and relying on the arm of the state to carry out religious changes (see Zwingli). After succeeding at two public disputations (both held in 1523) his views rapidly gained ground at Zurich, which long, however, stood quite alone, the other Confederates issuing an appeal to await the decision of the asked-for general council, and proposing to carry out by the arm of the state certain small reforms, while clinging to the old doctrines. Zwingli had to put down the extreme wing of the Reformers — the Anabaptists — by force (1525-1526). Quarrels soon arose as to allowing the new views in the " common baili- wicks." The disputation at Baden (1526) was in favour of thq maintainers of the old faith; but that at Bern (1528) resulted in securing for the new views the support of that great town, and so matters began to take another aspect. In 1528 Bern joined the union formed in December 1527 in favour of religious freedom by Zurich and Constance (Chrislliches Burgrecht), and her example was followed by Schaffhausen, St Gall, Basel, Bienneand Muhlhausen (1528-1529). This attempt virtually to break up the League was met in February 1529 by the offensive and defensive alliance made with King Ferdinand of Hungary (brother of the emperor) by the three Forest districts, with Lucerne and Zug, followed (April 1529) by the " Christliche Vereinigung," or union between these five members of the

League. Zurich was greatly moved by this, and, as Zwingli held that for the honour of God war was as necessary as icono- clasm, hostilities seemed imminent; but Bern held back; and the first peace of Kappel was concluded (June 1529), by which the Hungarian alliance was annulled and the principle of " religious parity " (or freedom) was admitted in the case of each member of the League, while in the " common bailiwicks " the majority in each parish was to decide the religion of that parish. This was at once a victory and a check for Zwingli. He tried to make an alliance with the Protestants in Germany, but failed at the meeting at Marburg (October 1529) to come to an agreement with Luther on the subject of the Eucharist, and the division between the Swiss and the German Reformations was stereo- typed. Zwingli now developed his views as to the greater weight which Zurich and Bern ought to have in the League. Quarrels, too, went on in the " common bailiwicks," for the members of the League who clung to the old faith had a majority of votes in matters relating to these districts. Zurich tried to cut off supplies of food from reaching the Romanist members (contrary to the wishes of Zwingli), and,

on the death of the abbot of St Gall, disregarding the rights of Lucerne, Schwyz and Glarus, who shared with her since 1451 the office of protectors of the abbey, suppressed the monastery, giving the rule of the land and the people to her own officers. Bern in vain tried to moderate this aggressive policy, and the Romanist members of the League indignantly advanced from Zug towards Zurich. Near Kappel, on the nth of October 1531, the Zurich vanguard under Goldli was (perhaps owing to his treachery) surprised, and despite reinforcements the men of Zurich were beaten, among the slain being Zwingli himself. Another defeat completed the discomfiture of Zurich, and by the second peace of Kappel (November 1531) the principle of " parity " was recognized, not merely in the case of each member of the League and of the " common bailiwicks," but in the latter Romanist minorities in every parish were to have a right to celebrate their own wor- ship. Thus everywhere the rights of a minority were protected from the encroachments of the majority. The " Christliches Burgrecht " was abolished, and Zurich was condemned to pay heavy damages. Bullinger succeeded Zwingli, but this treaty meant that neither side could now try to convert the other wholesale. The League was permanently split into two religious camps: the Romanists, who met at Lucerne, numbered, besides the five already mentioned, Fribourg, Soleure, Appenzell (Inner Rhoden) and the abbot of St Gall (with the Valais and the bishop of Basel), thus commanding sixteen votes (out of twenty-nine) in the Diet; the Evangelicals were Zurich, Bern, Schaffhausen, Appenzell (Ausser Rhoden), Glarus and the towns of St Gall, Basel and Bienne (with Graubunden), who met at Aarau.

Bern had her eyes always fixed upon the Savoyard lands to the south-west, in which she had got a footing in 1475, and now Conquest of made zeal for religious reforms the excuse for resum- Vaudby ing her advance policy. In 1526 Guillaume Farel,

r " – a preacher from Dauphine, had been sent to reform

Aigle, Morat and Neuchatel. In 1532 he came to Geneva, an ancient city of which the rule had long been disputed by the prince-bishop, the burgesses and the house of Savoy, the latter holding the neighbouring districts. She had become in isigthe ally of Fribourg, in 1526 that of Bern also; and in 1530, by their influence, a peace was made between the contending parties. The religious changes introduced by Farel greatly displeased Fribourg, which abandoned the alliance (1534), and in 1535 the Reformation was firmly planted in the city. The duke of Savoy, however, took up arms against Bern (1536), who overran Gex, Vaud and the independent bishopric of Lausanne, as well as the Chablais to the south of the lake. Geneva was only saved by the unwillingness of the citizens. Bern thus ruled north and south of the lake, and carried matters with a high hand. Shortly

after this John Calvin, a refugee from Picardy, was, when passing through Geneva, detained by Farel to aid him, and, after an exile from 1538-1541, owing to opposition of -the papal party and of the burghers, who objected to Bernese rule, he was recalled (1541) and set up his wonderful theocratic

government in the city, in 1553 burning Servetus, the Unitarian (see Calvin and Servetus), and in 1555 expelling many who upheld municipal liberty, replacing them by French, English, Italians and Spaniards as new burghers, whose names are still frequent in Geneva {e.g. Candolle, Mallet, Diodati). His theo- logical views led to disputes with the Zurich Reformers, which were partly settled by the Consensus Tigwinus of 1549, and more completely by the Helvetic Confession of- 1 562-1 566, which formed the basis of union between the two parties.

By the time of Calvin's death (1564) the old faith had begun to take the offensive; the reforms made by the Council of Trent urged on the Romanists to make an attempt to recover lost ground. Emmanuel Philibert, duke of Savoy, the hero of St Quentin (1557), and one of the greatest generals of the day, with the support of the Romanist members of the League, demanded the restoration of the districts seized by Bern in 1536, and on the 30th of October 1564 the Treaty of Lausanne confirmed the decision of the other Confederates sitting as arbitrators (according to the old constitutional custom). By this treaty Gex, the Genevcis and the Chablais were to be given back, while Lausanne, Vevey, Chillon, Villeneuve, Nyon, Avenches and Yverdon were to be kept by Bern, who engaged to maintain the old rights and liberties of Vaud. Thus Bern lost the lands south of the lake, in which St Francis of Sales, the exiled prince-bishop of Geneva (1602-1622), at once proceeded to carry out the restoration of the old faith. In 1555 Bern and Fribourg, as creditors of the debt-laden count, divided the county of Gruyere, thus getting French-speaking subjects. In 1558 Geneva renewed her alliance with Bern, and in 1584 she made one with 'Zurich. The duke of Savoy made several vain attempts to get hold of Geneva, the last (in 1602) being known as the " escalade."

The decrees of the Council of Trent had been accepted fully by the Romanist members of the League, so far as relates to dogma, but not as regards discipline or the relations TheCoantet- of church and state, the sovereign rights and juris- Reforma- diction of each state being always carefully reserved. tioa – The counter-Reformation, however, or reaction in favour of the old faith, was making rapid progress in the Confederation, mainly through the indefatigable exertions of Charles Borromeo, from 1560 to 1584 archbishop of Milan (in which diocese the Italian bailiwicks were included), and nephew of Pius IV., supported at Lucerne by Ludwig Pfyffer, who, having been (1562-1570) the chief of the Swiss mercenaries in the French wars of religion, did so much till his death (1594) to further

the religious reaction at home that he was popularly known as the " Swiss king." In 1574 the Jesuits, the great order of the reaction, were established at Lucerne; in 1579 a papal nuncio came to Lucerne; Charles Borromeo founded the " Collegium Helveticum " at Milan for the education of forty-two young Swiss, and the Catholic members of the League made an alliance with the bishop of Basel; in 1581 the Capuchins were introduced to influence the more ignorant classes. Most impor- tant of all was the Golden or Borromean League, concluded (Oct. 5, 1586) between the seven Romanist members of the Confederation (Uri, Schwyz, Unterwalden, Lucerne, Zug, Fribourg and Soleure) for the maintenance of the true faith in their territories, each engaging to punish backsliding members and to help each other if attacked by external enemies, notwith- standing any other leagues, old or new. This league marks the final breaking up of the Confederation into two great parties, which greatly hindered its progress. The Romanist members had a majority in the Diet, and were therefore able to refuse admittance to Geneva, Strassbrlrg and Muhlhausen. Another result of these religious differences was the breaking up of Appenzell into two parts (1597), each sending one representative to the Diet — " Inner Rhoden " remaining Romanist, " Ausser Rhoden " adopting the new views. We may compare with this the action of Zurich in 1555, when she received the Protestant exiles (bringing with them the silk-weaving industry) from Locarno and the Italian bailiwicks into her burghership, and Italian names are found there to this day {e.g. Orelli, Muralt).

In the Thirty Years' War the Confederation remained neutral, being bound both to Austria (1474) and to France (1516), and

neither religious party wishing to give the other an excuse for calling in foreign armies. But the troubles in Raetia threatened entanglements. Austria wished to secure the Miinsterthal (belonging to the League of the Ten Jurisdictions), and Spain wanted the command of the passes leading from the Valtellina (conquered by the leagues of Raetia in 1512), the object being to connect the Habsburg lands of Tirol and Milan. In the Valtellina the rule of the Three Raetian Leagues was very harsh, and Spanish intrigues easily brought about the massacre of 1620, by which the valley was won, the Romanist members of the Confederation stopping the troops of Zurich and Bern. In 1622 the Austrians conquered the Prattigau, over which they still had certain feudal rights. French troops regained the Valtellina in 1624, but it was occupied once more in 1629 by the imperial

troops, and it was not till 1635 that the French, under Rohan, finally succeeded in holding it. The French, however, wished to keep it permanently; hence new troubles arose, and in 1637 the natives, under George Jenatsch, with Spanish aid drove them out, the Spaniards themselves being forced to resign it in 1639. It was only in 1649 and 1652 that the Austrian rights in the Prattigau were finally bought up by the League of the Ten Jurisdictions, which thus gained its freedom.

In consequence of Ferdinand II. 's edict of restitution (1629), by which the status quo of 1552 was re-established — the high- water mark of the counter-Reformation — the abbot of St Gall tried to make some religious changes in his territories, but the protest of Zurich led to the Baden compromise of 1632, by which, in the case of disputes on religious matters arising in the " com- mon bailiwicks, " ftte decision was to be, not by a majority of the cantons, but by means of friendly discussion — a logical application of the doctrine of religious parity — or by arbitration.

But by far the most important event in Swiss history in this age is the formal freeing of the Confederation from the empire. Formal Basel had been admitted a member of the League Freedom in 1501, two years after the Confederation had been from the practically freed from the jurisdiction of the imperial mp ”’ chamber, though the city was included in the new division of the empire into ” circles ” (1521), which did not take in the older members of the Confederation. Basel, however, refused to admit this jurisdiction; the question was taken up by France and Sweden at the congress of Miinster, and formed the subject of a special clause in both the treaties of Westphalia, by which the city of Basel and the other ” Helvetiorum cantones ” were declared to be ” in the possession, or almost in the posses- sion, of entire liberty and exemption from the empire, and nullatenus subject to the imperial tribunals.” This was intended to mean formal exemption from all obligations to the empire (with which the Confederation was connected hereafter simply as a friend), and to be a definitive settlement of the question. Thus by the events of 1499 and 1648 the Confederation had become an independent European state, which, by the treaty of 1516, stood as regards France in a relation of neutrality.

In 1668, in consequence of Louis XIV.‘s temporary occupation of the Franche Comte, an old scheme for settling the number of men to be sent by each member of the Confederation to the joint army, and the appointment of a council of war in war time, that is, an attempt to create a common military organiza- tion, was accepted by the Diet, which was to send two deputies to the council, armed with full political powers. This agreement, known as the Defensionale, is the only instance of joint and unanimous action in this miserable period of Swiss history, when religious divisions crippled the energy of the Confederation.

Throughout the 17th and 18th centuries the Confederation was practically a dependency of France. In 1614 Zurich for French the first time joined in the treaty, which was renewed influence, m j(,()ˆ with special provisions as regards the D/wf/ons Protestant Swiss mercenaries in the king’s pay and and Rise of a promise of French neutrality in case of civil war anAiisio- in the League. The Swiss had to stand by while cracy. L ouis xiV. won Alsace (1648), Franche Comte

(1678) and Strassburg (1681). But, as Louis inclined more and more to an anti-Protestant policy, the Protestant members

of the League favoured the Dutch military service; and it was through their influence that in 1707 the ” states ” of the princi- pality of Neuchatel, on the extinction of the Longueville line of these princes, decided in favour of the king of Prussia (repre- senting the overlords — the house of Chalon-

Orange) as against the various French pretenders claiming from the Longueville dynasty by descent or by will. In 17 15 the Romanist members of the League, in hopes of retrieving their defeat of 171 2 (see below), agreed, while renewing the treaty and capitulations, to put France in the position of the guarantor of their freedom, with rights of interfering in case of attack from within or from without, whether by counsel or arms, while she promised to procure restitution of the lands lost by them in 1712. This last clause was simply the surrender of Swiss independence, and was strongly objected to by the Protestant members of the Confederation, so that in 1777 it was dropped, when all the Confederates made a fresh defensive alliance, wherein their sovereignty and independence were expressly set forth. Thus France had succeeded to the position of the empire with regard to the Confederation, save that her claims were practically asserted and voluntarily admitted.

Between 1648 and 1798 the Confederation was distracted by religious divisions and feelings ran very high. A scheme to set up a central administration fell through in 1655, through jealousy of Bern and Zurich, the proposers. In 1656 a question as to certain religious refugees, who were driven from Schwyz and took refuge at Zurich, brought about the first Villemergen War, in which the Romanists were successful, and procured a clause in the treaty asserting very strongly the absolute sove- reignty, in religious as well as in political matters, of each member of the League within its own territories, while in the " common bailiwicks " the Baden arrangement (1632) was to prevail. Later, the attempt of the abbot of St Gall to enforce his rights in the Toggenburg swelled into the second Villemergen War (17 1 2), which turned out very ill for the defeated Romanists. Zurich and Bern were henceforth to hold in severalty Baden, Rapperswil, and part of the " common bailiwicks " of the Aargau, both towns being given a share in the government of the rest, and Bern in that of Thurgau and Rheinthal, from which, as well as from that part of Aargau, she had been carefully excluded in 141 5 and 1460. The only thing that prospered was the principle of " religious parity," which was established completely, as regards both religions, within each parish in the " common bailiwick."

The Diet had few powers; the Romanists had the majority there; the sovereign rights of each member of the League and the limited mandate of the envoys effectually checked all pro gress. Zurich, as the leader of the League, ma.naged matters when the Diet was not sitting, but could not enforce her orders. The Confederation was little more than a collection of separate atoms, and it is really marvellous that it did not break up through its own weakness.

In these same two centuries, the chief feature in domestic Swiss politics is

the growth of an aristocracy: the power of voting and the power of ruling are placed in the hands of a small class. This is chiefly seen in Bern, Lucerne, Fribourg and Soleure, where there were not the primitive democracies of the Forest districts nor the government by gilds as at Zurich, Basel and Schaffhausen. It was effected by refusing to admit any new burghers, a practice which dates from the middle of the 16th century, and is connected (like the similar movement in the smaller local units of the " communes " in the rural districts) with the question of poor relief after the suppression ■ of the monasteries. Outsiders (Hintersasse or Niedergelassene) had no political rights, however long they might have resided, while the privileges of burghership were strictly hereditary. Further, within the burghers, a small class succeeded in securing the monopoly of all public offices, which was kept up by the practice of co-opting, and was known as the " patriciate." So in Bern, out of 360 burgher families 69 only towards the close of the 18th century formed the ruling oligarchy — and, though to foreigners the government seemed

admirably managed, yet the last thing that could be said of \t was that it was democratic. In 1749 Samuel Henzi (dis- gusted at being refused the post of town librarian) made a fruitless attempt to overthrow this oligarchy, like the lawyer, Pierre Fatio at Geneva in 1707. The harsh character of Bernese rule (and the same holds good with reference to Uri and the Val Leventina) was shown in the great strictness with which its subject land Vaud was kept in hand: it was ruled as a conquered land by a benevolent despot, and we can feel no surprise that Major J. D. A. Davel in 1723 tried to free his native land, or that it was in Vaud that the principles of the French Revolution were most eagerly welcomed. Another result of this aristocratic tendency was the way in which the cities despised the neighbouring- country districts, and managed gradually to deprive them of their equal political rights and to levy heavy taxes upon them. These and other grievances (the fall in the Drice of food after the close of the Thirty Years' War, the lowering of the value of the coin, &c), combined with the presence of many soldiers discharged after the great war, led to the great Peasant Revolt (1653) in the territories of Bern, Soleure, Lucerne and Basel, interesting historically as being the first popular rising since the old days of the 13th and 14th centuries, and because reminiscences of legends connected with those times led to the appearance of the " three Tells," who greatly stirred up the people. The rising was put down at the cost of much bloodshed, but the demands of the peasants were not granted. Yet during

this period of political powerless- ness a Swiss literature first arises: Conrad Gesner and Giles Tschudi in the 16th century are succeeded by J. J. Scheuchzer, A. von Haller, J. C. Lavater, J. J. Bodmer, H. B. de Saussure, J. J. Rousseau, J. von M tiller; the taste for Swiss travel is stimulated by the publication (1793) of the first real Swiss guide-book by J. G. Ebel (q.v.), based on the old Deliciae; industry throve greatly. The residence of such brilliant foreign writers as Gibbon and Voltaire within or close to the territories of the Confederation helped on this remarkable intellectual revival. Political aspirations were not, however, wholly crushed, and found their centre in the Helvetic Society, founded in 1762 by F. U. Balthasar and others.

The Confederation and France had been closely connected for so long that the outbreak of the French Revolution could -.. . not fail to affect the Swiss. The Helvetian Club,

Effects or _.. imi-iti-

the French founded at Pans in 1790 by several exiled Vaudois

Revolution and Fribourgers, was the centre from which the new on the Con- ˆeas were spread ir. the western part of the Confede- e era on. rat f 011 > an(ˆ r i sm g S directed or stirred up. In 1790 the Lower Valais rose against the oppressive rule of the upper districts; in 1791 Porrentruy defied the prince-bishop of Basel, despite the imperial troops he summoned, and proclaimed (November 1792) the " Rauracian republic," which three months later (1793) became the French department of the Mont Terrible; Geneva was only saved (1792) from France by a force sent from Zurich and Bern; while the massacre of the Swiss guard at the Tuileries on the 10th of August 1792 aroused intense indignation. The rulers, however, unable to enter into the new ideas, contented themselves with suppressing them by force, e.g. Zurich in the case of Stafa (1795). St Gall managed to free itself from its prince-abbot (1795-1797), but the Leagues of Raetia so oppressed their subjects in the Valtellina that in 1797 Bonaparte (after conquering the Milanese from the Austrians) joined them to the Cisalpine republic. The Diet was distracted by party struggles and the fall of the old Con- federation was not far distant. The rumours of the vast treasures stored up at Bern, and the desire of securing a bulwark against Austrian – attack, specially turned the attention of the directory towards the Confederation; and this was utilized by the heads of the Reform party in the Confederation — Peter Ochs (1752-1821), the burgomaster of Basel, and Frederic Cesar Laharpe (1754-1838; tutor, 1783-1794, to the later tsar Alexander I.), who had left his home in Vaud through disgust at Bernese oppression, both now wishing for aid from Autside in order to free their land from the rule of the oligarchy. xxvi. 9

*Hence, when Laharpe, at the head of some twenty exiles from Vaud and Fribourg, called (Dec. 9, 1797) on the Directory to protect the liberties of Vaud, which, so he said (by a bit of purely apocryphal history), France by the treaty of 1565 was bound to guarantee, his appeal found a ready answer. In February 1798 French troops occupied Muhlhausen and Bienne (Biel), as well as those parts of the lands of the prince-bishop of Basel (St Imier and the Miinsterthal) as regards which he had been since 1579 the ally of the Catholic members of the Confederation. Another army entered Vaud (February 1798), when the " Lemanic republic " was proclaimed, and the Diet broke up in dismay without taking any steps to avert the coming storm. Brune and his army occupied Fribourg and Soleure, and, after fierce fighting at Neuenegg, entered (March 5) Bern, deserted by her allies and distracted by quarrels within. With Bern, the stronghold of the aristocratic party, fell the old Confederation. The revolution triumphed throughout the country. Brune (March 16-19) P u t forth a wonderful scheme by which the Confederation with its " associates " and " subjects " was to be split into three republics- — the Tellgau (i.e. the Forest districts), the Rhodanic {i.e. Vaud, the Valais, the Bernese Oberland and the Italian bailiwicks), and the Helvetic (i.e. the northern and eastern portions) ; but the direc- tory disapproved of this (March 23), and on the 29th of March the " Helvetic republic, one and indivisible," was The proclaimed. This was accepted by ten cantons Helvetic only as well as (April 12) the constitution drafted * e P»Wfe by Ochs. By the new scheme the territories of the Everlasting League were split up into twenty-three (later nineteen, Raetia only coming in in 1799) administrative districts, called " can- tons," a name now officially used in Switzerland for the first time, though it may be found employed by foreigners in the French treaty of 1452, in Commynes and Machiavelli, and in the treaties of Westphalia (1648). A central government was set up, with its seat at Lucerne, comprising a senate and a great council, together forming the legislature, and named by electors chosen by the people in the proportion of 1 to every 100 citizens, with an executive of five directors chosen by the legislature, and having four ministers as subordinates or " chief secretaries." A supreme court of justice was set up; a status of Swiss citizen- ship was recognized; and absolute freedom to settle in any canton was given, the political " communes " being now com- posed of all residents, and not merely of the burghers. For the first time an attempt was made to organize the Confederation as a single state, but the change was too sweeping to last, for it largely ignored the local patriotism which had done so much to create the Confederation, though more recently it had made it politically powerless. The three Forest districts rose in rebellion against the invaders and the new constitutions which destroyed their ancient prerogatives; but the valiant resistance of the Schwyzers, under Alois Reding, on the heights of Morgarten (April and May), and that of the Unterwaldners (August and September), were put*

down by French armies. The proceedings of the French, however, soon turned into disgust and hatred the joyful feelings with which they had been hailed as liberators. Geneva was annexed to France (April 1798); Gersau, after an independent existence of over 400 years, was made a mere district of Schwyz; immense fines were levied and the treasury at Bern pillaged; the land was treated as if it had been conquered. The new republic was compelled to make a very close offensive and defensive alliance with France, and its directors were practically nominated from Paris. In June-October 1799 Zurich, the Forest cantons and Raetia became the scene of the struggles of the Austrians (welcomed with joy) against the French and Russians. The manner, too, in which the reforms were carried out alienated many, and, soon after the directory gave way to the consulate in Paris (18 Brumaire or Nov. 10, 1799), the Helvetic directory (January 1800) was replaced by an executive committee.

The scheme of the Helvetic republic had gone too far in the direction of centralization ; but it was not easy to find the happy mean, and violent discussions went on between the " Unitary "

(headed by Ochs and Laharpe) and " Federalist " parties. Many drafts were put forward and one actually submitted to but rejected by a popular vote (June 1802). In July 1802 the French troops were withdrawn from Switzerland by Bonaparte, ostensibly to comply with the treaty of Amiens, really to show the Swiss that their best hopes lay in appealing to him. The Helvetic government was gradually driven back by armed force, and the Federalists seemed getting the best of it, when (Oct. 4) Bonaparte offered himself as mediator, and summoned

ten of the chief Swiss statesmen to Paris to discuss AUdMJon. matters with him (the " Consulta "—December 1802).

He had long taken a very special interest in Swiss matters, and in 1802 had given to the Helvetic republic the Frickthal (ceded to France in 1801 by Austria), the last Austrian possession within the borders of the Confederation. On the other hand, he had made (August 1802) the Valais into an independent republic. In the discussions he pointed out that Swiss needs required a federal constitution and a neutral posi- tion guaranteed by France. Finally (Feb. 19, 1803) he laid before the Consulta the Act of

Mediation which he had elaborated and which they had perforce to accept — a document which formed a new departure in Swiss history, and the influence of which is visible in the present constitution.

Throughout, " Switzerland " is used for the first time as the official name of the Confederation. The thirteen members of the old Confederation before 1798 are set up again, and to them are added six new cantons — two (St Gall and Graubunden or Grisons) having been formerly " associates," and the four others being made up of the subject lands conquered at different times — Aargau (1415), Thurgau (1460), Ticino or Tessin (1440, 1500, 1512), and Vaud (1536). In the Diet, six cantons which had a population of more than 100,000 (viz. Bern, Zurich, Vaud, St Gall, Graubunden and Aargau) were given two votes, the others having but one apiece, and the deputies were to vote freely within limits, though not against their instructions. Meetings of the Diet were to be held alternately at Fribourg, Bern, Soleure, Basel, Zurich and Lucerne — the chief magis trate of each of these cantons being named for that year the " landamman of Switzerland." The " landsgemeinden," or popular assemblies, were restored in the democratic cantons, the cantonal governments in other cases being in the hands of a " great council " (legislative) and the " small council " (executive) — a property qualification being required both for voters and candidates. No canton was to form any political alliances abroad or at home. The " communes " were given larger political rights, the burghers who owned and used the common lands became more and more private associations. There was no Swiss burghership, as in 1798, but perfect liberty of settlement in any canton. There were to be no privileged classes or subject lands. A very close alliance with France (on the basis of that of 1516) was concluded (Sept. 27, 1803). The whole constitution and organization were far better suited for the Swiss than the more symmetrical system of the Helvetic republic; but, as it was guaranteed by Bonaparte, and his influence was predominant, the whole fabric was closely bound up with him, and fell with him. Excellent in itself, the constitution set forth in the Act of Mediation failed by reason of its setting.

For ten years Switzerland enjoyed peace and prosperity under the new constitution. Pestalozzi and Fellenberg worked

out their educational theories; K. Escher of Zurich of 1815. embanked the Linth, and his family was thence

called "von der Linth"; the central government prepared many schemes for the common welfare. On the other hand, the mediator (who became emperor in 1804) lavishly expended his Swiss troops, the number of which could only be kept up by a regular blood tax, while the " Berlin decrees " raised the price of many articles. In 1806 the principality of Neuchitel was

given to Marshal Berthier; Tessin was occupied by French troops from 1810 to 1813, and in r8io the Valais was made into the department of the Simplon, so as to secure that pass. At home, the liberty of moving from ODe canton to

another (though given by the constitution) was, by the Diet in 1805, restricted by requiring ten years' residence, and then not granting political rights in the canton or a right of profiting by the communal property. As soon as Napoleon's power began to wane (1812-1813), the position of Switzerland became endangered. Despite the personal wishes of the tsar (a pupil of Laharpe's), the Austrians, supported by the reactionary party in Switzerland, and without any real resistance on the part of the Diet, as well as the Russians troops, crossed the frontier on the 21st of December 1813, and on the 29th of December the Diet was induced to declare the abolition of the 1803 con- stitution, guaranteed, like Swiss neutrality, by Napoleon. Bern headed the party which wished to restore the old state of things, but Zurich and the majority stood out for the nineteen cantons. The powers exercised great pressure to bring about a meeting of deputies from all the nineteen cantons at Zurich (April 6, 1814, " the long Diet "); party strife was very bitter, but on the 1 2th of September it decided that the Valais, Neuchatel and Geneva should be raised from the rank of " associates " to that of full members of the Confederation (thus making up the familiar twenty-two). As compensation the congress of Vienna (March 20, 181 5) gave Bern the town of Bienne (Biel), and all (save a small part which went to Basel) of the territories of the prince- bishop of Basel (" the Bernese Jura "); but the Valtellina was granted to Austria, and Miihlhausen was not freed from" France.

On the 7th of August 181 5 the new constitution was sworn to by all the cantons save Nidwalden, the consent of which was only obtained (Aug. 30) by armed force, a delay for which she paid by seeing Engelberg and the a t %lsT valley above (acquired by Nidwalden in 1798) given to Obwalden. By the new constitution the sovereign rights of each canton were fully recognized, and a return made to the lines of the old constitution, though there were to be no subject lands, and political rights were not to be the exclusive privilege of any class of citizens. Each canton had one vote in the Diet, where an absolute majority was to decide all matters save foreign affairs, when a majority of three-fourths was required. The management of current business, &c, shifted every two years between the governments of Zurich, Bern and Lucerne (the three "Vororte"). The monasteries were guaranteed in their rights and privileges; and no canton was to make any alliance contrary to the rights of the Confederation or of any other canton. Provision was made for a Federal army. Finally, the Congress, on the 20th of November 1815, placed Switzerland and parts of North Savoy (Chablais, Faucigny and part of the Genevois) under the guarantee of the

Great Powers, who engaged to maintain their neutrality, thus freeing Switzerland from her 300 years' subservience to France, and compensating in some degree for the reactionary nature of the new Swiss constitution when compared with that of 1803.

5. The cities at once secured for themselves in the cantonal great councils an overwhelming representation over the neigh- bouring country districts, and the agreement of 1805 as to migration from one canton to another was Betorm. renewed (1819) by twelve cantons. For some time there was little talk of reforms, but in 1819 the Helvetic Society definitely became a political society, and the foundation in 1824 of the Marksmen's Association enabled men from all cantons to meet together. A few cantons (notably Tessin) were beginning to make reforms, when the influence of the July revolution (1830) in Paris and the sweeping changes in Zurich led the Diet to declare (Dec. 27) that it would not interfere with any reforms of cantonal constitutions provided they were in agreement with the pact of 1815. Hence for the next few years great activity in this direction was displayed, and most of the cantons reformed themselves, save the most conservative (e.g. Uri, Glarus) and the advanced who needed no changes (e.g. Geneva, Graubunden). Provision was always made for revising these constitutions at fixed intervals, for the changes were not felt to be final, and seven cantons— Zurich, Bern, Lucerne, Soleure, St Gall, Aargau and Thurgau — joined together to guarantee their new free constitu- tions (Siebener Concordat of March 17, 1832). Soon after, the

question of revising the Federal pact was brought forward by a large majority of cantons in the Diet (July 17), whereon, by the league of Sarnen (Nov. 14), the three Forest cantons, with Neuchatel, the city of Basel, and the Valais, agreed to maintain the pact of 1815 and to protest against the separation of Basel in two halves (for in the reform struggle Schwyz and Basel had been split up, though the split was permanent only in the latter case). A draft constitution providing for a Federal administra- tion distinct from the cantons could not secure a majority in its favour; a reaction against reform set in, and the Diet was forced to sanction (1833) the division of Basel into the " city " and " country " divisions (each with half a vote in the Diet), though fortunately in Schwyz the quarrel was healed. Religious quarrels further stirred up strife in connexion with Aargau, which was a canton where religious parity prevailed, later in others. In Zurich the extreme pretensions of the Radicals and freethinkers (illustrated by offering

a chair of theology in the university to D. F. Strauss of Tubingen because of his Life of Jesus, then recently published) brought about a great reaction in 1839, when Zurich was the " Vorort." In Aargau the parties were very evenly balanced, and, when in 1840, on occasion of the re- vision of the constitution, the Radicals had a popular majority the aggrieved clerics stirred up a revolt (1840), which was put down, but which gave their opponents, headed by Augustine Keller, an excuse for carrying a vote in the great council to suppress the eight monasteries in the canton (Jan. 1841). This was flatly opposed to the pact of 181 5, which the Diet by a small majority decided must be upheld (April 1841), though after many discussions it determined (Aug. 31, 1843) to accept the compromise by which the men's convents only were to be suppressed, and declared that the matter was now settled. .On this the seven Romanist cantons — Uri, Schwyz, Unter- walden, Lucerne, Zug, Fribourg and the Valais — formed (Sept. 13, 1843) a " Sonderbund " or separate league, which (February 1844) issued a manifesto demanding the reopening of the question and the restoration of all the monasteries. Like the Radicals in former years the Romanists went too far and too fast, for in October 1844 the clerical party in Lucerne (in the majority since 1841, and favouring the reaction in the Valais) officially invited in the Jesuits and gave them high posts, an act which created all the more sensa- tion because Lucerne was the " Vorort." Twice (December 1844 and March 1845) parties of free lances tried to capture the city. In December 1845 the Sonderbund turned itself into an armed confederation, ready to appeal to war in defence of the rights of each canton. The Radicals carried Zurich in April 1845 and Bern in February 1846, but a majority could not be secured in the Diet till Geneva (Oct. 1846) and St Gall (May 1847) were won by the same party. On the 20th of July 1847, the Diet, by a small majority, declared that the Sonderbund was contrary to the Federal pact, which on the 16th of August it was resolved to revise, while on the 3rd of September it was decided to invite each canton to expel the Jesuits. Most of the Great Powers favoured the Sonderbund, but England took the con- trary view, and the attempt of Metternich, supported by Louis Philippe, to bring about European intervention, on the plea of upholding the treaties of Vienna, was frustrated by the policy of masterly inactivity pursued by Lord Palmerston, who delayed giving an answer till the forces of the Sonderbund had been defeated, a friendly act that is still gratefully remembered in the country. On the 29th of October the deputies of the unyielding cantons left the Diet, which ordered on the 4th of November that its decree should be enforced by arms. The war was short (Nov. 10-29), mainly owing to the ability of the general, G. H. Dufour (1787-1875), and the loss of life trifling. One after another the rebellious cantons were forced to surrender, and, as the Paris revolution of February 1848, entailing the retirement of Guizot (followed three weeks later by that of Metternich), occupied all the

attention of the Great Powers (who by the constitution of 1815 should have been consulted in the revision of the pact), the Swiss were enabled to settle their own affairs quietly. Schwyz and Zug abolished their

" landsgemeinden," and the seven were condemned to pay the costs of the war (ultimately defrayed by subscription), which had been waged rather on religious than on strict particularist or states-rights grounds. The Diet meanwhile debated the draft constitution drawn up by Johann Conrad Kern (1808- of Thurgau and Henri Druey (1799-1855) 0I Vaud, which

in the summer of 1848 was accepted by fifteen and a half cantons,

the minority consisting of the three Forest cantons, the Valais,

Zug, Tessin and Appenzell (Inner Rhoden) , and it was proclaimed

on the 1 2th of September.

The new constitution inclined rather to the Act of Mediation

than to the system which prevailed before 1798. A status of

" Swiss citizenship " was set up, closely joined to _ _,„ ,.

. .. ,\ ..(.' . J .Constitution

cantonal citizenship; a man settling in a canton not f/g48.

being his birthplace got cantonal citizenship after

a residence of at most two years, but was excluded from all local

rights in the " commune " where he might reside. A Federal

or central government was set up, to which the cantons gave up

a certain part of their sovereign rights, retaining the rest. The

Federal Legislature (or assembly) was made up of two houses —

the Council of States (Standerai), composed of two deputies

from each canton, whether small or great (44 in all), and the

National Council (N ationalral) , made up of deputies elected

for three years, in the proportion of one for every 20,000 souls

or fraction over 10,000, the electors being all Swiss citizens. The Federal council or executive (Bundesrai) consisted of seven members elected by the Federal Assembly sitting as a congress; they were jointly responsible for all business, though for sake of convenience there were various departments, and their chairman was called the president of the Confederation. The Federal judiciary (Bundesgerichf) was made up of eleven members elected for three years by the Federal Assembly sitting in congress; its jurisdiction was chiefly confined to civil cases, in which the Confederation was a party (if a canton, the Federal council may refer the case to the Federal tribunal) , but took in also great political crimes — all constitutional questions, however, being reserved for the Federal Assembly. A Federal university and a polytechnic school were to be founded. All military capitulations were forbidden in the future. Every canton must treat Swiss citizens who belong to one of the Christian confessions like their own citizens, for the right of free settlement is given to all such, though they acquired no rights in the " commune." All Christians were guaranteed the exercise of their religion, but the Jesuits and similar religious orders were not to be received in any canton. German, French and Italian were recognized as national languages.

The constitution as a whole marked a great step forward; though very many rights were still reserved to the cantons, yet there was a fully organized central government. Almost the first act of the Federal Assembly was to exercise the power given them of determining the home of the

Federal authorities, and on the 28th of November 1848 Bern was chosen, though Zurich still ranks as the first canton in the Confederation. Soon after 1848 a beginning was made of organizing the different public services, which had now been brought within the jurisdic- tion of the central Federal authority. Thus in 1849 a uniform letter post service was established, in 1850 a single coinage replaced the intricate cantonal currencies, while all customs duties between cantons were abolished, in 1851 the telegraph service was organized, while all weights and measures were unified (in 1868 the metrical system was allowed, and in 1875 declared obligatory and universal), in 1854 roads and canals were taken in hand, while finally in 1855 the Federal Polytechnic School at Zurich was opened, though the Federal university authorized by the new constitution has not yet been set up. These were some of the non-political benefits of the creation of a Federal central executive. But in 1852 the Federal Assembly decided to leave the construction of railways to private enterprise and so had to buy them up in 1903 at a vastly enhanced price.

By this early settlement of disputes Switzerland was protected from the general revolutionary movement of 1848, and in later

years her political history has been uneventful, though she has felt the weight of the great European crises in industrial and social matters.

The position of Neuchatel, as a member of the Confederation (as regards its government only) and as a principality ruled by the king of Prussia, whose rights had been expressly recognized by the congress of Vienna, was uncertain. She had not sent troops in 1847, and, though in 1848 there was a republican revolution there, the prince did not recognize the changes. Finally, a royalist conspiracy in September 1856 to undo the work of 1848 caused great excitement and anger in Switzerland, and it was only by the mediation of Napoleon III. and the other powers that the prince renounced (1857) all his rights, save his title, which his successor (the German emperor) has also dropped. Since that time Neuchatel has been an ordinary member of the Confederation. In 1859-1860 the cession of Savoy (part of it neutralized in 1815) to France aroused considerable indigna- tion, and in 1862 the long-standing question of frontiers in the Vallee des Dappes was finally arranged with France. In 1871 many French refugees, especially Bourbaki's army, were most hospitably received and sheltered. The growth of the Old Catholics after the Vatican Council (1870) caused

many disturb- ances in western Switzerland, especially in the Bernese Jura. The attack was led by Bishop Eugene Lachat (1819-1886) of Basel, whose see was suppressed by several cantons in 1873, but was set up again in 1884 though still not recognized by Bern. The appointment by the pope of the abbe Gaspard Mermillod (1 824-1 892) as " apostolic vicar " of Geneva, \vhich was separated from the diocese of Fribourg, led to Monseigneur Mermillod's banishment from Switzerland (1873), but in 1883 he was raised to the vacant see of Lausanne and Geneva and allowed by the Federal authorities to return, but Geneva refused to recognize him, though he was created a cardinal in 1890. An event of great importance to Switzerland was the opening of the St Gotthard tunnel, which was begun in 1871 and opened in 1882; by it the Forest cantons seem likely to regain the importance which was theirs in the early days of the Confederation.

From 1848 onwards the cantons continually revised their constitutions, always in a democratic sense, though after the Sonderbund War Schwyz and Zug abolished their " lands- gemeinden " (1848). The chief point was the introduction of the referendum, by which laws made by the cantonal legislature may (facultative referendum) or must (obligatory referendum) be submitted to the people for their approval, and this has obtained such general acceptance that Fribourg- alone does not possess the referendum in either of its two forms. It was therefore only natural that attempts should be made to revise the federal constitution of 1848 in a democratic and centralizing sense, for it had been provided that the Federal Assembly, on its own initiative or on the written request of S° > 000 Swiss electors, could submit the question of revision to a popular vote. In 1866 the restriction of certain rights (mentioned above) to Christians only was swept away; but the attempt at final revision in 1872 was defeated by a small majority, owing to the efforts of the anti-centralizing party. Finally, however, another draft was better liked, and on the 19th of April 1874 the Revised n ? w constitution was accepted by the people — 14! Constitution cantons against 7! (those of 1848 without Tessin, of 187-4. jj Ut w j t jj F r i DOUr g anc i Lucerne) and 340,199 votes as against 198,0×3. This constitution is still in force, and is mainly a revised edition of that of 1848, the Federal power being still further strengthened. Among the more important novelties three points may be mentioned. A system of free elementary education was set up, under the superintendence of the Confederation, but managed by the cantons. A man settling in another canton was, after a residence of three months only, given all cantonal and communal rights, save a share in the common property (an arrangement which as far as possible kept up the old principle that the " commune " is the true unit out of which cantons and the Confederation are built), and the membership of the commune carries with it cantonal and federal rights. The " Referendum " was introduced in its

"facultative" form; i.e. all federal laws must be submitted to popular vote on the demand of 30,000 Swiss citizens or of eight cantons. But the " Initiative " (i.e. the right of com- pelling the legislature to consider a certain subject or bill) was not introduced into the Federal Constitution till 1891 (when it was given to 50,000 Swiss citizens) and then only as to a partial (not a total) revision of that constitution. By the constitutions of 1848 and 1874 Switzerland has ceased to be a mere union of independent states jointed by a treaty, and has become a single state with a well-organized central government, to which have been given certain of the rights of the independent cantons, but increased centralization would destroy the whole character of the Confederation, in which the cantons are not administrative divisions but living political communities. Swiss history teaches us, all the way through, that Swiss liberty has been won by a close union of many small states, and we cannot doubt that it will be best preserved by the same means, and not by obliterating all local peculiarities, nowhere so striking and nowhere so historically important as in Switzerland.

M. Numa Droz (who was for seventeen years — 1876 to 1892 — a member of the Federal executive, and twice, in 1881 and in 1887, president of the Swiss Confederation) expressed the opinion shortly before his death in December 18,99 (ne was b° m m 1844) that while the dominant note of Swiss politics from 1848 to 1874 was the establishment of a Federal state, that of the period extending from 1874 to 1899 (and this is true of a later period) was the direct rule of the people, as distinguished from govern ment by elected representatives. Whether this distinction be just or not, it is certain that this advance towards democracy in its true sense is due indirectly to the monopoly of political power in the Federal government enjoyed by the Radical party from 1848 onwards: many were willing to go with it some part of the way, but its success in maintaining its close monopoly has provoked a reaction against it on the part of those who desire to see the Confederation remain a Confederation, and not become a strongly centralized state, contrary to its past history and genius. Hence after 1874 we find that democratic measures are not advocated as we should expect by the Radicals, but by all the other political parties with a view of breaking down this Radical monopoly, for it is a strange fact that the people elect and retain Radical representatives, though they reject the. measures laid before them for their approval by the said Radical representatives. For these reasons the struggle between Fede- ralists and Centralists (the two permanent political parties in Switzerland), which up to 1874 resulted in favour of the Centralists, has been turning gradually in favour of the Fede- ralists, and that because of the adoption of such democratic institutions as the Referendum and the Initiative.

The general lines on which Swiss politics have run since 1874 may be most conveniently summarized under three headings — the working of the

political machinery, the principal political events, and then the chief economical and financial features of the period. But it must be always borne in mind that all the following remarks relate only to Federal politics, those of the several cantons being much more intricate, and of course turning more on purely local differences of opinion.

1. Political Machinery. — The Federal Constitution of 1848 set up a permanent Federal executive, legislature and tribunal, each and all quite distinct from and independent of any cantonal government. This system was a modified revival of the state of things that had prevailed from 1798 to 1803, and was an imitation of the political changes that had taken place in the cantonal constitutions after 1830. Both were victories of the Centralist or Radical party, and it was therefore but natural that this party should be called upon to undertake the Federal government under the new constitution, a supremacy that it has kept ever since. To the Centralists the Council of States (two members from each canton, however large or small) has always been a stumbling-block, and they have mockingly nick- named it " the fifth wheel of the coach." In the other house of the Federal legislature, the National Council (one member per 20,000, or fraction of over 10,000 of the entire population), the

Radicals have always since its creation in 1848 had a majority. Hence, in the Congress formed by both houses sitting together, the Radicals have had it all their own way. This is particularly important as regards the election of the seven members of the Federal executive which is made by such a Congress. Now the Federal executive (Federal Council) is in no sense a cabinet, i.e. a committee of the party in the majority in the legislature for the time being. In the Swiss Federal Constitution the cabinet has no place at all. Each member of the Federal executive is elected by a separate ballot, and holds office for the fixed term of three years, during which he cannot be turned out of office, while as yet but a single instance has occurred of the rejection of a Federal councillor who offered himself for re-election. Further, none of the members of the Federal executive can hold a seat in either house of the Federal legislature, though they may appear and speak (but not vote) in either, while the Federal Council as such has not necessarily any common policy, and never expresses its views on the general situation (though it does as regards particular legislative and administrative measures) in anything resembling the " speech from the Throne " in England. Thus it seems clear that the Federal executive was

intended by the Federal Constitution of 1848 (and in this respect that of 1874 made no change) to be a standing committee of the legis- lature as a whole, but not of a single party in the legislature, or a " cabinet," even though it had the majority. Yet this rule of a single political party is just what has taken place. Between 1848 and the end of 1908, 38 Federal councillors were elected (24 from German-speaking, 12 from French-speaking and 2 from Italian-speaking Switzerland, the canton of Vaud heading the list with 7). Now of these 38 three only were not Radicals, viz. M Paul Ceresole (1870-1875) of Vaud, who was a Protestant Liberal-Conservative, Herren Josef Zemp (1891-1908) and Josef Anton Schobinger (elected 1908), both of Lucerne and Romanist Conservatives, yet the Conservative minority is a large one, while the Romanists form about two-fifths of the population of Switzerland. But despite this predominance of a single party in the Federal Council, no true cabinet system has come into existence in Switzerland, as members of the council do not resign even when their personal policy is condemned by a popular vote, so that the resignation of Herr Welti (a member of the Federal Council from 1867 to 1891), in conse- quence of the rejection by the people of his railway policy, caused the greatest amazement and consternation in Switzerland.

The chief political parties in the Federal legislature are the Right, or Conservatives (whether Romanists or Protestants), the Centre (now often called " Liberals," but rather answering to the Whigs of English political language, the Left (or Radicals) and the Extreme Left (or the Socialists of varying shades). In the Council of States there is always a Federalist majority, since in this house the smaller cantons are on an equality with the greater ones, each indifferently having two members. But in the National Council (167 elected members) there has always (since 1848) been a considerable Radical majority overall other parties. The Socialists long worked under the wing of the Radicals, but now in every canton (save Geneva) the two parties have quarrelled, the Socialist vote having largely increased, especially in the town of Zurich. In the country the anti- Radical opposition is made up of the Conservatives, who are strongest in the Romanist, and especially the Forest, cantons, and of the " Federalists " of French-speaking Switzerland. There is no doubt that the people are really anti-Radical, though occasionally led away by the experiments made recently in the domain of State socialism: they elect, indeed, a Radical majority, but very frequently reject the bills laid before them by their elected representatives.

2. Politics. — The cantons had led the way before 1848, and they continued to do so after that date, gradually introducing reforms all of which tended to give the direct rule to the people. The Confederation was bound to follow this example, though it adopted a far more leisurely pace.

Hence, in 1872 a new Federal Constitution was drafted, but was rejected on a popular vote by a small majority, as it was thought to go too far in a

centralizing direction, and so encountered the combined oppo- sition of the Conservatives and of the Federalists of French- speaking Switzerland. The last-named party was won over by means of concessions as to military matters and the proposed unification of cantonal laws, civil and criminal, and especially by strong provisions as to religious freedom, since the " Kultur- kampf " was then raging in French-speaking Switzerland. Hence a revised draft was accepted in 1874 by a considerable popular majority, and this is the existing Federal Constitution. But it bears marks of its origin as a compromise, and no one party has ever been very eager to support it as a whole. At first all went smoothly, and various very useful laws carrying out in detail the new provisions of the constitution were drafted and accepted. But divisions of opinion arose when it was proposed to reform the military system at a very great expendi- ture, and also as to the question of the limitation of the right to issue bank-notes, while (as will be seen under 3 below) just at this time grave financial difficulties arose with regard to the Swiss railways, and in consequence of Prince Bismarck's anti-free trade policy, which threatened the prosperity of Switzerland as an exporting country. Further, the disturbed political state of the canton of Ticino (or Tessin) became more or less acute from 1873 onwards. There the Radicals and the Conservatives are nearly equally balanced. In 1872 the Conservatives obtained the majority in this canton, and tried to assure it by some certainly questionable means. The Radicals repeatedly ap- pealed to the Federal government to obtain its armed inter- vention, but in vain. In 1876 the Conservatives at a rifle match at Stabio fired on the Radicals, but in 1880 the accused persons were acquitted. The long-desired detachment of Ticino from the jurisdiction of the foreign dioceses of Como and Milan was effected in 1888 by the erection of a see at Lugano, but this event caused the Radicals to fear an increase of clerical influence. Growing impatient, they finally took matters in their own hands, and in September 1890 brought about a bloody revolu- tion. The partial conduct of the Radical Federal commissioner was much blamed, but after a state trial at Zurich in 1891 the revolutionists were acquitted, although they loudly boasted of their share in this use of force in political matters.

From 1885 onwards Switzerland had some troubles with foreign powers owing to her defence of the right of asylum for fugitive German Socialists, despite the threats of Prince Bis- marck, who maintained a secret police in Switzerland, one member of which, Wohlgemuth, was expelled in 1889, to the prince's huge but useless indignation. From about 1890, as the above troubles within and without gradually subsided, the agitation in the country against the centralizing policy of the Radicals became more and more strongly marked. By the united exertions of all the opposition parties, and

against the .steady resistance of the Radicals, an amendment was introduced in 1891 into the Federal Constitution, by which 50,000 Swiss citizens can by the " Initiative " compel the Federal legislature and executive to take into consideration some point in the Federal Constitu- tion which, in the opinion of the petitioners, requires reform, and to prepare a bill dealing with it which must be submitted to a popular vote. Great hopes and fears were entertained at the time as to the working of this new institution, but both have been falsified, for the Initiative has as yet only succeeded in inserting (in 1893) in the Federal Constitution a provision by which the Jewish method of killing animals is forbidden, and another (in 1908) prohibiting the manufacture or sale of absinthe in the country. On the other hand, it has failed (in 1894) to secure the adoption of a Socialist scheme by which the state was bound to provide work for every able-bodied man in the country, and (also in 1894) to carry a proposal to give to the cantons a bonus of two francs per head of the population out of the rapidly growing returns of the customs duties, similarly in 1000 an attempt to introduce the election of the Federal executive by a popular vote and proportional representation in the Nationalral failed, as in 1903 did a proposal to make the elections to the Nationalrat depend on the Swiss population only, instead of the total population of the country.

[HISTORY

The great rise in the productiveness of the customs duties (see 3 below) has tempted the Swiss people of late years to embark on a course of state socialism, which may be also described as a series of measures tending to give more and more power to the central Federal government at the expense of the cantons. So in 1890 the principle of compulsory universal insur- ance against sickness and accidents was accepted by a popular vote, in 1891 likewise that of a state or Federal bank, and in 1898 that of the unification of the cantonal laws, civil and criminal, into a set of Federal codes. In each case the Federal government and legislature were charged with the preparation of laws carrying out in detail these general principles. But in 1897 their proposals as to a Federal bank were rejected by the people, though another draft was accepted in 1905, so that the bank (with a monopoly of note issue, a provision accepted by a popular vote in 1891) was actually opened in 1907. At the beginning of 1900 the suspicion felt as to the insurance proposals elaborated by the Federal authonties was so keen that a popular demand for a popular vote was signed by 117,000 Swiss citizens, the legal minimum being only 30,000: they were rejected (May 20, 1900) on a popular vote by a nearly two to one majority. The

prepara- tion of the Federal civil and criminal codes has progressed quietly, drafts being framed by experts and then submitted for criticism to special commissions and public opinion, but finally the civil code was adopted by the Federal Assembly in December 1907. By a popular vote in 1887 the Federal authorities were given a monopoly of alcohol, but a proposal to deal similarly with tobacco has been very ill received (though such a monopoly would undoubtedly produce a large amount), and would pretty certainly be refused by the people if a popular vote were ever taken upon it. In 1895 the people declined to sanction a state monopoly of matches, even though the unhealthy nature of the works was strongly urged, and have also resolutely refused on several occasions to accept any projects for the centralizing of the various branches of military administration, &c, though in 1897 the forests high up on the mountains were placed under Federal supervision, while in 1902 large Federal grants in aid were made to the cantons towards the expenses of primary education, and in 1908 the supervision of the employment of the power derived from rivers and streams was given to the Confederation. Among other reforms which have recently been much discussed in Switzerland are the introduction of the obligatory referendum (which hitherto has applied only to amendments to the Federal Constitution) and the extension of the initiative (now limited to piecemeal revision of the Federal Constitution) to all Federal laws, &c. The first-named scheme is an attempt to restrain important centralizing measures from being presented as laws (and as such exempt from the compulsory referendum), and not as amendments to the Federal Constitution.

Besides the insurance project mentioned above, two great political questions have engaged the attention of the Swiss.

a. State Purchase of the Railways. — In 1891 the purchase of the Central railway was rejected by a popular vote, but in 1898, by the aid of various baits thrown out, the people were induced to accept the principle of the purchase by the Confederation of the five great Swiss railway lines — three in 1901, viz. the Central, the North-Eastern, and the United Swiss lines; one (the Jura-SimplonJ in 1903, and one (the St Gotthard line) in 1909, this delay being due to international conventions that still have some years to run. Further, very important economical consequences, e.g. as to strikes, may be expected to result from the transformation of all railway officials of whatever grade into state servants, who may naturally be expected to vote (as in other cases) for their employers, and so greatly increase the strength of the Centralist political party.

b. The " Double Initiative."— This phrase denotes two purely political reforms that have been coupled together, though in reality they are by no means inseparable. One is the introduction of proportional representation

(within the several cantons) into the elections for the National Council of the Federal parliament, the object being thus to secure for several large minorities a number of M.P.'s more in accordance with the size of those

minorities in the country than is now possible under the regime of pure majorities: naturally these minorities would then receive a proper share of political power in the senate house, instead of merely exerting great political influence in the country, while if they were thus strengthened in the legislature they would soon be able to claim the right of naming several members of the Federal executive, thus making both legislature and executive a mirror of the actual political situation of the country, instead of the preserve of one political party. The other reform is the election of the members of the Federal executive by popular vote, the whole body of voters voting, not by cantons, but as a single electoral constituency. This would put an end to the " lobbying " that goes on previously to the election of a member of the executive by the two houses of the Federal parliament sitting jointly in Congress; but, on the other hand, it might stereotype the present system of electing members of the executive by the majority system, and so reduce large minorities to political impotence. The " double initiative " scheme was launched in the beginning of 1899, and by the beginning of the following July secured more than the requisite number of signatures (50,000), the first-named item having been supported by nearly 65,000 citizens, and the second item by 56,000. Hence the Federal parliament was bound to take these two reforms into formal consideration, but in June 1900 it rejected both, and this decision was confirmed by a popular vote taken in the following November.

3. Economics and Finance. — Soon after the adoption of the Federal Constitution of 1874 the economical and financial state of the Confederation became very unsatisfactory. The great financial crisis in Vienna in 1873 was a severe blow to Swiss commerce, which had taken a very great start after the Franco- German War of 1870-71. In the later 'seventies, too, the financial position of some of the great Swiss railway lines was very unfavourable: the bankruptcy of the National line ruined for the time (till a Federal loan at a very low rate of interest was forced upon them) the four Swiss towns which were its guarantors; the North-Eastern line had to beg for a "moratorium" (a legal delay of the period at which it had to pay its debts) from the Federal government; the Bern-Lucerne line was actually put up to auction, and was bought by the canton of Bern. Further, the expenses of constructing the St Gotthard railway vastly exceeded all estimates, and in 1876 over 100,000,000 francs more were required. Hence the subventions already granted had to be increased. Germany (which gave originally 20,000,000 francs) and Italy (original contribution 45,000,000 francs) each promised 10,000,000 francs more; the St Gotthard company itself gave 12,000,000, and the two Swiss

railway lines interested (Central and North-Eastern) added 1,500,000 to the 20,000,000 they had already agreed to give jointly with the cantons interested in the completion of this great undertaking. But these latter refused to add anything to their previous contributions, so that finally the Federal government proposed that it should itself pay the 6,500,000 francs most urgently required. This proposal aroused great anger in east and west Switzerland, but the matter was ultimately settled by the Confederation paying 4,500,000 francs and the interested cantons 2,000,000, the latter gift being made dependent on a grant of 4,500,000 francs by the Federal government for new tunnels through the Alps in east and west Switzerland, and of 2,000,000 more for the Monte Cenere tunnel between Bellinzona and Lugano. This solution of a most thorny question was approved by a popular vote in 1879, and the St Gotthard line was successfully completed in 1882. Gradually, too, the other Swiss railway lines, attained a state of financial equilibrium, owing to the more careful management of new directors and managers. The completion of the Simplon tunnel (1906), the commencement (1906) of that beneath the Lotschen Pass (q.v.), and the rival claims of projected tunnels under the Splugen Pass (q.v.), besides the struggle for or against a tunnel under the Faucille (supported by Geneva almost alone), show that railway politics play a very prominent part in Swiss national life. They are, too, complicated by many local rivalries, which in this country are of greater importance than

elsewhere because of the considerable share of power still legally belonging to the cantons. Another kindred question (owing to the rapid development of electric traction in Switzerland) is the equitable proposal (accepted in 1908) that the utilization of the immense force supplied by the many rivers and torrents in Switzerland should become a Federal monopoly, so as to secure to the Confederation the control over such important sources of revenue as otherwise might easily be unscrupulously exploited by private companies and firms.

Switzerland, by reason of natural conditions, is properly a free trade country, for it exports far more than it imports, in order to supply the demand for objects that it cannot itself produce. But Prince Bismarck's protectionist policy in 1879 was imitated by France, Austria and Italy, so that Switzerland was gradually shut in by a high wall of tariffs. Hence in 1891 the Swiss people approved, in sheer self-defence, a great increase of the customs duties, and in 1903 sanctioned a further very con- siderable

advance in these duties, so that it is now a thoroughly Protectionist country, despite its obvious natural disadvantages. The huge increase in revenue naturally led to increased expendi- ture, which took the form of lavish subventions to all sorts of cantonal objects, magnificent Federal buildings, most useful improvements in the post and telegraph services, and extensive and lamentable construction of military fortifications in Uri and the Valais against some unknown foe. In 1894 it was pro- posed to distribute part of this new wealth in giving a bonus to the cantons at the rate of 2 francs per head of the population, but this extravagant proposal (nicknamed the " Beutezug ") was rejected, owing to the cool common sense of the Swiss people, by a majority of over two to one. These prosperous circumstances, however, contributed mainly to the adoption or suggestion of various measures of state socialism, e.g. compulsory sick insurance, Federal subvention to primary schools, purchase of the five great Swiss railway lines, giving a right to every able- bodied man to have work at the expense of the state, subventions to many objects, &c. (W. A. B. C.)

Literature

There is no such thing as a Swiss national vernacular literature properly speaking, this being explained by the diversity between the states of which it is composed, which has not favoured any common intellectual life. But there are four branches which make up a literature of Switzerland, distin- guished according to the language in which the works in each are composed. As the Confederation, from its founda- tion in 1 291 till 1798, was exclusively composed (with a partial exception in the case of Fribourg) of German-speaking districts, the real Swiss vernacular literature (if any one branch is to be dignified by that name) is in German, though in the 18th century French became the fashionable language in Bern and elsewhere, while the influence of the French- speaking ' allies " and subject lands was more marked than before. Hence the German branch is by far the more important and more national, while the French branch is not really Swiss till after 181 5, when these regions took full rank as cantons. Thus Geneva and Lausanne in the 18th century, with their respective brilliant societies, were only " Swiss " in so far as Geneva was an " ally " and Vaud a " subject land." The Italian and Romonsch-Ladin branches are of not sufficient importance to deserve more than a passing notice.

a. German Branch. — It is noticeable that while the original League of 1291 (like the earlier charters of liberties to the first members of the Confederation) is drawn up in Latin, all later alliances among the cantons, as well as documents concerning the whole Confederation (the Parsons' Ordinance of 1370, the Sempach Ordinance of 1393, and the Compact of Stans 1481) and all the Recesses of the Diets are compiled in German. Though such political documents are not " literature." yet they show that

these early pre- Reformation alliances rested on the popular consent, and so were expressed in vernacular German rather than in clerkly Latin. But this vigorous popular life found other channels in which to develop its energy. First in order of date are the Minne- singers, the number of whom in the districts that ultimately formed part of the medieval Swiss Confederation are said to have exceeded thirty. Zurich then (as now) was the chief literary centre of the

Confederation. The two Manesses (father and son) collected many of their songs in a MS. that has happily come down to us and is preserved in Paris. The most prominent personage of this circle of the muses was Master John Hadlaub, who flourished in the second half of the 13th and the first quarter of the 14th centuries. Next we.have a long series of war songs, celebrating the marvellous victories of the early Swiss. One of the earliest and most famous of these was composed by Hans Halbsuter of Lucerne to commemorate the glorious fight of Sempach (1386), not far from his native town. There are other similar songs for the victory of Nafels (1388) and those of Grandson and Morat (both 1476) in the Burgundian War, while in the 14th century the Dominican friar Ulrich Boner of Bern versified many old fables. Still more important are the historical chronicles relating to different parts of Switzerland. Thus in the 14th century we have Christian Kuchimtister's continuation of the annals of the famous monastery of St Gall, in the early 15th century the rhymed chronicle of the war between the Appenzellers and the abbot of St Gall, and rather later in the same century the chronicles of Conrad Justinger of Bern and Hans Friind (d. 1469) of Lucerne, besides the fantastical chronicle of Strattligen and a scarcely less fanciful poem on the supposed Scandinavian descent of the men of Schwyz and of Ober Hasle, both by Eulogius Kiburger (d. 1506) of Bern. In the 15th century, too, we have the White Book of Sarnen and the first Tell song (see Tell), which gave rise to the well-known legend, as well as the rather later play named the Urnerspiel dealing with the same subject. The Burgundian War witnessed a great outburst of historical ardour in the shape of chronicles written by Diebold Schilling (d. i486) of Bern, by Melchior Russ (d. 1499), Diebold Schilling (d. between 1516 and 1523) and Petermann Etterlin (d. 1509), all three of Lucerne as well as by Gerold Edlibach (d. 1530) of Zurich, and by Johnanes Lenz (d. 1 541) of Brugg. In the vernacular, too, are the earliest descriptions of the Confederation, those by Albert von Bonstetten of Einsiedeln (1479) and by Conrad Turst of Zurich (1496), to whom also we owe the first map of the country (1495-1497).

The Swiss Humanists wrote naturally in Latin, as did also, what was more surprising, the Swiss Reformers, at any rate for the most part, though the Zurich Bible of 153 1 forms a striking exception. But Nicholas Manuel (1484-1530), a many-sided Bernese, composed satirical poems in German

against the pope, while Valerius Anshelm (d. 1540), also of Bern, wrote one of the best Swiss chronicles extant. Giles Tschudi (q.v.) of Glarus, despite great literary activity, pub- lished but a single German work in his lifetime — the Uralt warhafflig Alpisch Rhaelia sampt dem Tract der anderen Alpgebirgen (1538) — besides his map of Switzerland (same date). Sebastian Miinster (q.v.), who was a Swiss by adoption, published (1544) his Cosmo-

fraphia in German, the work being translated into Latin in 1550. !ut the many-sided Conrad Gesner (q.v.), a born Swiss, wrote all his works in Latin, German translations appearing only at a later date. Thus the first important original product in German was the very remarkable and elaborate history and description of Switzerland, issued in 1548 at Zurich by Johannes Stumpf (q.v.) of that town. But Josias Simler (q.v.), who was in a way his continuator, wrote all his works, theological and geographical, in Latin. Matthew Merian (q.v.) engraved many plates, which were issued in a series of volumes (1642-1688) under the general title of Topographia, the earliest volume describing Switzerland, while all had a text in German by an Austrian, Martin Zeiller. Very characteristic of the age are the autobiography of the Valais scholar Thomas Platter (1499-1582) and the diary of his still more distinguished son Felix (1536-1614), both written in German, though not published till long after. But gradually Swiss historical writers gave up the use of Latin for their native tongue, so Michael Stettler (1580-1642) of Bern, Franz Haffner (1609-1671) of Soleure, and quite a number of Grisons authors (though the earliest in date, Ulrich Campell of Siis, c. 1509- c. 1582, still clung to Latin), such as Bartholomew Anhorn (1566- 1646) and his son of the same name (1616-1670) and Johannes Guler (1562-1637). Yet Fortunatus Sprecher (1585-1647) preferred to write his Pallas raetica in Latin, as did Fortunatus Juvalta (1567-1654) in the case of his autobiography. But we have some compensation in the delightful autobiography of Hans Ardiiser of Davos (1557-post 1614) and the amusing dialogue between the Niesen and the Stockhorn by Hans Rudolf Rebmann (1566-1605), both composed in naive German. J. B. Plantin (1625-1697) wrote his description of Switzerland in Latin, Helvetia nova et antiqua (1656), but J. J. Wagner's (1641-1695) guide to Switzerland is in German, despite its titles Index memorabilium Helvetiae (1684) and Mercurius helvcticus (1688), though he issued his scientific description of his native land in Latin, Historia naturalis Helvetiae curiosa (1 680) .

In the 1 8th century the intellectual movement in Switzerland greatly developed, though it was naturally strongly influenced by local characteristics. Basel, Bern and especially Zurich were the chief literary centres. Basel was particularly distinguished for its mathematicians, such as Leonhard Euler (1707-1783, q.v.) and three members of the Bernoulli

family (q.v.) refugees from Antwerp, the brothers Jakob (1654-1705) and Johannes (1667-1748), and the latter's son Daniel (1 700-1 782). But its chief literary glory was Isaac Iselin (1728-1783), one of the founders of the Helvetic Society

(1760) and of the Economical Society (1777), and author of a treatise on the philosophy of history entitled Geschichte der Menschheit (1764), and of another on ideal politics, Philosophische und patrio- tische Traume eines Menschenfreundes (1755), while many of his economical tracts appeared (1776-1782) under the general title of Ephemeriden der Menschheit. At Bern Albrecht von Haller (q.v.), though especially distinguished as a scientific writer, yet by his poem Die Alpen (1732) and his travels in his native country did much to excite and stimulate the love of mountain scenery. Another Bernese, Charles Victor de Bonstetten (q.v.), is a type of the gallicized Liberal Bernese patrician, while Beat Ludwig von Muralt (1665- 1749) analysed the racial characteristics of other nations for the instruction of his fellow-countrymen, his Lettres sur les anglais et les francais (1725) being his principal work. Samuel Wyttenbach (1 748-1830) devoted himself to making known the beauties of his country to its natives, travelling much and writing much about his travels. Gottlieb Sigmund Gruner (q.v.) wrote the Eisgebirge des Schweizerlandes (1760), a work describing the ice-clad mountains of Switzerland, though it is rather a useful compilation than an original contribution to knowledge, but a decided advance on his fellow Bernese Johann Georg Altmann's (1697-1758) Versuch einer histor- ischen und physischen Beschreibung der helvetischen Eisgebirge (1751). In another department of knowledge a son of Albrecht von Haller, Gottlieb Emmanuel von Haller (1735-1786), compiled a most useful bibliography of writings relating to Swiss history, the Bibliothek der Schweizer -geschichte (6 vols., 1 784-1 787), that is still indispensable to the historical student.

But in the 1 8th century Zurich was undoubtedly the intellectual and literary capital of German-speaking Switzerland, and gained the title of " Athens on the Limmat." One of its earliest and most famous celebrities was J. J. Scheuchzer (q.v.), who travelled much in Switzerland, and wrote much (his travels are described in Latin) as to its natural curiosities, being himself an F.R.S., and closely associated with Newton and the other English scientific men of the day. But in the purely literary domain the names of J. J. Bodmer (q.v.) and of his friend Johann Jakob Breitinger

(1701-1776), are the most prominent. By their united exertions the antiquated tradi- tions of German literature w-ere broken down to a large extent, while great praise was bestowed on English poets, Shakespeare, Milton and others. Their views were violently opposed by Gottsched, the leader of the Saxon school, and the controversy that arose forms part of the history of German literature. In 1 721-1723 they published jointly the Discourse der Maler, a periodical which spread their views, while more elaborate and systematic expositions of their critical doctrine as to poetry are Bodmer's Krilische Abhandlung von dem Wunderbaren in der Poesie (1740), and Breitinger's Critische Dichtkunst (also in 1740). Their untiring efforts helped to prepare the way for the later outburst of German literature begun by Klop- stock, Wieland and Lessing. Another famous Zurich writer was Solomon Gesner (q.v.), the pastoral poet, and yet another was J. K. Lavater (q.v.), now best remembered as a supporter of the view that the face presents a perfect indication of character and that physiognomy may therefore be treated as a science. Other well-known Zurich names are those of J. H. Pestalozzi (1746-1827, q.v.), the educationalist, of Johann Caspar Hirzel (1725-1803), another of the founders of the Helvetic Society, and author of Die Wirthschaft eines philosophischen Bauers (1761), and of Johann Georg Sulzer (1720-1779), whose chief work is one on the laws of art or aesthetics, entitled Allgemeine Theorie der schonen Kiinste

(1771-1774). _

Outside the three towns named above there were several writers of German-speaking Switzerland who must be mentioned. One of the best known even now is Johann Georg Zimmermann (1728- 1795 q.v.), whose Betrachtungen iiber die Einsamkeit (1756-1784- 1785) profoundly impressed his contemporaries. He, like the fabulist A. E. Frohlich (q.v.), was born at Brugg. Johannes von Miiller (q.v.) of Schaffhausen, was the first who attempted to write (1780) a detailed history of Switzerland, which, though inspired rather by his love of freedom than by any deep research, was very character- istic of his times. J. G. Ebel (q.v.) was a Swiss by adoption only, but deserves mention as the author of the first detailed guide- book to the country (1793), which held its ground till the days of "Murray" and "Baedeker." A later writer, Heinrich Zschokke (1771-1848), also a Swiss by adoption only, produced (1822) a history of Switzerland written for the people, which had a great vogue.

In the later literary history of German-speaking Switzerland three names stand out above all others — Albrecht Bitzius (q.v.), known as Jeremias Gotthelf from the first of his numerous tales of peasant life in the Emmenthal, Gottfried Keller (q.v.), perhaps the most genuinely Swiss poet and novelist of the century, and Conrad Ferdinand Meyer (q.v.), also a

poet and novelist, but of more cosmopolitan leanings and tastes. Jakob Burckhardt (q.v.) was a famous writer on Italian art, while Jakob Frey (1824-1875) continued the work of Bitzius by his tales of Swiss peasant life. Ulrich Hegner (1 759-1840) of Winterthur wrote novels full of local colour, as is also the case with David Hess (1 770-1 843) in his description of a cure at Baden in Aargau and various tales. Johann Martiu Usteri (1763-1828) of Zurich was one

of the earliest to write poems in his native dialect. Later we have a number of Zurich poets or versifiers, some of whose writings have become very well known. Such were Heinrich Leut- hold (1827-1879), August Corrodi (1826-1885) and Leonhard Widmer (1808-1868), the author of Trittst im Morgenrot daher (1842), which, set to music by the Cistercian monk Alberic Zwyssig (1 808-1 854), is now known as the " Swiss Psalm," of Es lebt in jeder Schweizerbrust (1842), and Wo Berge sich erheben (1844). To the Bernese poet, Johann Rudolf Wyss (1781-1830), whose father, J. D. Wyss (1743- 1818), was the author of the Swiss Family Robinson, we owe the Swiss national anthem, Rufst du mein Vaterland? and the song, Herz, myn Herz, warum so trurig? — while Johann Georg Krauer (1792-1845), of Lucerne, wrote the Riitlilied, Von feme sei herzlich gegriisset, and Gottfried Keller himself was responsible for mein Heimatland. Gottlieb Jakob Kuhn (1775-1845) wrote many poems in the Bernese dialect as to the Alps and their inhabitants. Less national in sentiment and more metaphysical are the lyrics of " Oranmor," the pen-name of the Bernese Ferdinand Schmid

(1823-1888).

Among the chief contemporary Swiss writers in the department of belles-lettres, novelists, poets, &c, may be mentioned Ernst Zahn, Meinrad Lienert, Arnold Ott, Carl Spitteler, Fritz Marti, Walther Siegfried, Adolf Frey, Hermann Hesse, J. C. Herr, J. V. Widmann, and Gottfried Strasser.

Isabella Kaiser, by her poems and stories, upholds the honour of the fair sex, while the fame won by Johanna Spyri (d. 1891) for her children's stories is still fresh. Of historical writers in different departments of their subject in the course of the 19th century some of the principal were (in alphabetical order) : Ildefons von Arx (T 755~l833), the historian of St Gall, of which he had been a monk, E. Blosch (1838-1900), the historian of the Protestant churches in German-speaking Switzerland, J. J. Blumer (1819-1875), and J. C. Bluntschli (1808-1881), who both devoted their energies to Swiss constitutional matters, J. J. Hottinger (1783-1860), the continuator of J. von Miiller's Swiss history, J. E. Kopp (1793-1866), who rewrote early Swiss history on the basis of authentic documents, R. Maag (1866-1899), who began the publication of the invaluable Habsburg terrier

of the early 14th century, but had to leave the completion of the work to other competent hands, P. C. von Planta (1815-1902) and J. A. Pupikofer (1797-1882), the historians re- spectively of the Grisons and of the Thurgau, A. P. von Segesser (1817-1888), the historian and statesman of Lucerne, A. F. Stettler (1796-1849), A. von Tillier (1792-1854), E. von Wattenwyl (1815- 1890), and J. L. Wurstemberger (1783-1862) who all four wrote on Bernese history, G. von Wyss (1816— 1893), to whom we owe, among many excellent works, an admirable account of all Swiss historians and their works, his step-brother F. von Wyss (1818-1907), a great authority on the legal and constitutional history of Switzerland, and J. C. Zellweger (1768-1855), the historian of Appenzell. Among contemporary historical writers of German-speaking Switzerland we may mention (in alphabetical order), A. Biichi, J. L. Brandstetter, W. Burckhardt, K. Dandliker, J. Dierauer, R. Durrer, H. Escher, A. Heusler, R. Hoppeler, T. von Liebenau, W. Merz, G. Meyer von Knonau, W. F. von Mulinen, W. Oechsli, J. R. Rahn, L. R. von Salis, P. Schweizer, J. Schollenberger, J. Strickler, R. Thommen, and H. Wartmann.

b. French Branch. — The knight Othon of Grandson is the earliest figure in the literature of the Suisse romande. He was killed in a judicial duel in 1397, the last scion of his ancient house, and left some amatory poems behind him, while one is extant only in a translation by Chaucer, who makes flattering mention'of him. In the 15th and 16th centuries many miracle plays in the local Romance dialect were known. The Chronique des chanoines de Neuch&tel was formerly supposed to date from the 15th century, but is now considered by many to be a forgery. More individual and character- istic are the romance about Charlemagne, entitled Fierabras le Geant (1478), by Jean Bagnyon, and the poem named Congie pris du siecle seculier (1480), by Jacques de Bugnin. But the first really prominent personage in this department 6f literature is Frangois Bonivard (q.v. ; d. 1570) who wrote the Chroniques de Geneve that extend down to 1530 and were continued to 1562 by Michel Roset (d. 1613). The first Protestant French translation of the Bible was issued at Neuchatel in 1535, its principal authors being Pierre Robert (nicknamed Olivetan) and . Pierre de Vingle. Asa sort of pendant to the Protestant Bonivard, we have the nun Jeanne de Jussie who in her Levain du Calvinisme (c. 1545) recounts the establishment of Calvinism at Geneva, while the noble Pierre de Pierrefleur in his Memoires does the same in a lighter and less lachrymose style for Orbe, his native district. Naturally the Reformers of the Suisse Romande used French much in their theological and polemical works. Of more general interest are the writings of two Frenchmen who were driven by religious persecu- tions to end their lives at Geneva — the memoirs and poems of Theodore Agrippa d'Aubigne (1552-1630), and the historical writings and poems of Simon Goulart (1543-1628). The great deliverance

of Geneva from the duke of Savoy, known as the Escalade (1602), was described in prose by David Piaget (1580- 1644) in his Histoire de V escalade and celebrated in verse by Samuel Chappuzeau (i625-i70i)in his Geneve delivrSe, though the narratives

of Goulart and that (published officially by the government) attri- buted to Jean Sarasin (1574-1632), the author of the Citadin de Geneve (1606), are more laconic and more striking. J. B. Plantin (1625-1697), of Vaud, wrote his topography of Switzerland, Helvetia antiqua et nova (1656), in Latin, but his Abrege de Vhistoire generate de la Suisse (1666) in French, while Georges de Montmollin (1628- l 7°i) °f Neuchatel wrote, besides various works as to local history, Memoires of his times which have a certain historical value.

But the 17th century in the Suisse Romande pales before the glories of the 18th century, which forms its golden age, and was in a large degree due to the influence of French refugees who, with their families, flocked thither after the Revocation of the Edict of Nantes (1685) and settled down there for the rest of their lives. Such was Louis Bourguet (1 678-1 743), who, besides his geological, works, founded two periodicals which in different ways did much to stimulate the intellectual life of the Suisse Romande; these were the Bibliotheque italique (1729-1734), which aimed at making more wide'y known the results of Italian research, and the Mercure Suisse which, first issued in 1732, lasted till 1784, under different names ('rora 1738 onwards the literary section bore the name of Journi 1 helvetique), and secured contributions from most of the lead- ing writers of the Suisse Romande of the day, such as Firmin Abauzit (1679-1767), Abraham Ruchat (1678-1750), and others. Ruchat is now best remembered as the author (under the pen-name of Gottlieb Kypselcr) of an excellent guide-book to Switzerland, the Delices de la Suisse, which first appeared in 1714 and passed through many editions, the latest being issued in 1778; but his Histoire de la Reformation de la Suisse (1727-1728) was much esteemed in his day. Another Vaudois historian and antiquary was Charles Guillaume Loys de Bochat (1695-1754) whose Memoires critiques sur divers points de I'ancienne histoire de la Suisse (1747- 1749) still form a treasure-house for archaeologists. Yet a third Lausanne man was J. P. de Crousaz (1663-1750; q.v.), who intro- duced there the philosophy of Descartes, and was, by his books, the master of Gibbon in logic. A French refugee at Lausanne, Jean Barbeyrac (1674-1744), published in 1712 the*

Droit de la nature et des gens, a translation of Puffendorf's treatise, with a striking preface of his own. A precursor of Montesquieu and of Rousseau was Jean Jacques Burlamaqui (1694-1750) in his Principes du droit naturel et politique (1747 and 1751, issued together in 1763), while the celebrated international lawyer, Emeric de Vattel (1714- 1767), was a native of Neuchatel by birth and descent, and, though he spent most of his life at foreign courts, died at Neuchatel, not so very long after the publication of his famous Droit des gens (1758).

The year 1754 is a great date in the literary history of the Suisse Romande, for in that year Rousseau came back for good to Geneva, and Voltaire established himself at Ferney, while in 1753 Gibbon had begun his first residence (which lasted till 1758) in Lausanne. The earlier writers mentioned above had then nearly all dis- appeared, and a more brilliant set took their place. But Rousseau (q.v.), though a Genevese, belongs rather to European than to Swiss literature, as do later Jacques Necker (q.v.) and his daughter, Madame de Stael (q.v .), Benjamin Constant (q.v.) and Sismondi (q.v.). Madame de Charnere (1740-1805) was Dutch by birth, but married to a native of Neuchatel. Among her earlier works were two novels, Le Mari sentimental (1783), and the Letlres de Mistress Henley (1784), both of which had a great vogue in their day and paint, from her own experience, the sad results of an unsuitable marriage. More celebrated by reason of the liveliness and acuteness with which the manners of a little provincial town are described are her Letlres de Lausanne (1871), and her Lettres neuchdteloises (1784), particularly the second part of a story of the former, entitled Caliste, and published in 1788, for, according to Sainte-Beuve, it was a sort of foreshadowing of the more famous Corinne (1807) of Madame de Stael. P. H. Mallet (q.v.), a Genevese, who held a chair at Copenhagen, devoted himself to making known to the educated world the history and antiquities of Scandinavia. But more characteristic of Geneva were the efforts of a group of men to spread the cause of natural science by personal investigations in the higher Alps, then but little known. Possibly their interest in such matters had been stimu- lated by the scientific and psychological speculations of Charles Bonnet (q.v.). The chief of this school was H. B. de Saussure (q.v.) one of the founders of geology and meteorology, while his Alpine ascents (undertaken in the cause of science) opened a new world even to non-scientific travellers. The brothers De Luc (q.v.) devoted themselves mainly to questions of physics in the Alps, while Senebier (q.v.), the biographer of Saussure, was more known as a physiologist than as a physicist, though he wrote on many branches of natural science, which in those days was not yet highly specialized. On the other hand Marc Theodore Bourrit (q.v.), the contemporary of these three men, was rather a curious and inquisitive traveller than a scientific investigator, and charms us even now by his genial simplicity as contrasted

with the austerity and gravity of the three writers we have mentioned. Philippe Cyriaque Bridel (1757-1845), best known as the "doyen Bridel," was the earliest of the Vaudois poets by virtue of his Poesies helvt- tiennes (1782). But he is better known as the painter of the scenery and people among whom he worked as pastor at Basel, at Chateau d'Oex, and at Montreux successively. His Course de Bdle d. Bienne

par les vallees du Jura appeared in 1802, while descriptions of his travels, as well as of the manners of the natives, local history, and in short everything that could stimulate national sentiment, were issued in a series of periodicals from 1783 to 1831 under the successive titles of Etrennes helvetiennes and of Conservaleur Suisse. His patriotic aim met with great success, while his impressions of his mountain wanderings are fresh and unspoilt by any straining after effect. He was the first writer of the Suisse Romande to undertake such wanderings, so that, with obvious differences, he may be re- garded not merely as the forerunner, but as the inspirer and model of later Vaudois travellers and climbers in the Alps, such as Rodolphe Topffer (q.v.), of E. Rambert (q.v.), and of the last-named's most brilliant pupil, Emile Javelle (1844-1883), whose articles were col- lected in 1886 by the pious care of his friends under the title of Souvenirs d'un alpiniste. As a poet Juste Olivier (q.v.) surpassed Bridel. Nor can we wonder that with the advance of knowledge Bridel's history is found to be more picturesque than scientific. Two Vaudois, Charles Monnard (1 790-1 865) and Louis Vulliemin (1797-1879) carried out their great scheme of translating (1837- 1840) J. von Midler's Swiss history with its continuation by Hottin- ger, and then completed it (1841-1851) down to 181 5. This gigantic task did not, however, hinder the two friends from making many solid contributions to Swiss historical learning. Later in date were Alexandre Daguet (1816-1894) who wrote an excellent history of Switzerland, while Jean Joseph Hisely (1800-1866), Albert Rilliet (1809-1883), and Pierre Vaucher (1833-1898), all devoted much labour to studying the many problems offered by the early authentic history (from 1291 onwards) of the Swiss Confederation. A different type of history is the work of an honest but partisan writer, the Genevese Jules Henri Merle d'Aubigne (1794-1872), entitled Histoire de la reformation au temps de Calvin (1835-1878). The Vaudois noble Frederic Gingins-la-Sarra (1790-1863) represents yet another type of historian, devoting himself mainly to the medieval history of Vaud, but occasionally going beyond the number- less authentic documents brought to light by him, and trying to make them prove more than they can fairly be expected to tell us. Jean Antoine Petit-Senn (1792-1870) was a thorough Genevese and a biting satirist, a pensive poet, the " Genevese La Bruyere," as he liked to be called, but was not fully appreciated till after his death, when his widely scattered writings were brought together. Alexandre Vinet (q.v.), the

theologian, and H. F. Amiel (q.v.), the philosopher, in a fashion balance each other, and need only be mentioned here. Jean Jacques Porchat (1800-1864) was one of the most prominent among the minor poets of the region, very French owing to his long residence in Paris, and best remembered probably by his fables, first published in 1837 under the title of Glanures d'Esope (reissued in 1854 as Fables et paraboles), though in his day his stories for the young were much appreciated. Urbain Olivier (1810-1888), a younger brother of the poet, wrote many tales of rural life in Vaud, while the Genevese novelist Victor Cherbuliez (1829-1899, q.v.) was perhaps the most brilliant of a brilliant family. Fribourg has produced the local novelist Pierre Scioberet (1830-1876) and the Bohemian poet Etienne Eggis (1830-1867), and Neuchatel Auguste Bachelin (1830-1890) whose best novel was Jean Louis, a tale of which the scene is laid in the old-fashioned little village of St Blaise. Another Neuchatel writer, Alice de Chambrier, the poetess, died young, as did the Genevese poet Louis Duchosal, both showing in their short lives more promise than performance. Madame de Gasparin's (1813- 1894) best tale is Horizons prochains (1857), a very vivid story of rural life in the Vaudois Jura, remarkable for the virile imagination of its descriptions.

Edouard Rod (q.v.) the novelist, and Marc Monnier (q.v.), critic, poet, dramatist and novelist, are the most prominent figures in the recent literature of the Suisse Romande. Amongst lesser stars we may mention in the department of belles-lettres (novelists, poets or critics) Charles Du Bois-Melly, "T. Combe" (the pen name of Mile Adele Huguenin), Samuel Cornut, Louis Favre, Philippe Godet, Oscar Huguenin, Philippe Monnier, Noelle Roger, Virgile Rossel, Paul Seippel and Gaspard Vallette. The chief literary organ of the Suisse Romande is the Bibliotheque univer- sale, which in 1816 took that title in lieu of Bibliotheque britannique (founded in 1796), and in 1861 added that of Revue Suisse, which it then absorbed. Amongst historians the first place is due to one of the most learned men whom Switzerland has ever produced, and whose services to the history of the Valais were very great, and abbe Jean Gremaud (1823-1897) of Fribourg. The principal contemporary historians are Victor van Berchem, Francis De Crue, Camille Favre, Henri Fazy, B. de Mandrot, Berthold van Muyden and Edouard Rott.

c. Italian Branch. — Italian Switzerland is best known by its artists, while its literature is naturally subject to strong Italian influences, and not to any of a strictly Swiss nature. Stefano Franscini (1796-1857) did much for his native land, especially in educational matters, while his chief published work (1835) was one that gave a general account of the canton. But this is not so thorough and good as a later book by Luigi Lavizzari (1814-1875), entitled Escursioni nel cantone Ticino (1863), which is very complete from all points of view. Angelo Baroffio (d. 1893) and Emilio

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Motta represent the historical sciences, the latter contributing much to the Bollettino delta Svizzera Italiana (from 1879 onwards), which,' though mainly historical, devotes much space to literary and historical matters relating to the canton. The art of novel writing does not flourish in Ticino. But it has produced a great number of poets such as Pietro Peri (1794-1869), who translated the Swiss national anthem into Italian, J. B. Buzzi (1825-1898), Giovanni Airoldi (died before 1900) and Carlo Cioccari (1829-1891) — the two former were lyric poets, and the third a dramatist. Two younger singers are F. Chiesa and M. A. Nessi.

d. Romonsch and Ladin Branch. — In the Grisons alone still lingers a quaint Romance dialect, which is a laggard sister of French and Italian, and has therefore not much to show in the way of literary activity. Indeed it would probably have perished altogether by this time had not certain energetic men and societies more or less successfully tried to bring about a sort of artificial revival. It is distinguished into two main dialects, that of the Bundner Oberland or the valley of the Vorder Rhine being called Romonsch, while that spoken in the Engadine and the neighbouring valleys is known as Ladin. Both took their origin from the spoken tongue or lingua rustica Romana in the days of the later empire. The earliest known monument of this interesting survival was discovered in 1907, and consists of a few lines, in an early form of the Romonsch dialect, of interlinear translation (with the original Latin text) of a sermon attributed to St Augustine. This monument is said to date from the early 12th century. The first poem in Ladin was one on the Musso War, written in 1527 by Johann von Travers (1483-1563), though it was not published till 1865. The first book printed in it (at Poschiavo in 1552) was the translation of a German catechism, and the next a translation of the New Testament, also at Poschiavo, but in 1560. Most of the works in both these dialects are translations of books of a religious or educa- tional nature. The principal writers in the Romonsch dialect (the less literary of the two) of recent times are Theodor von Castelbcrg (1748-1830), a poet and translator of poetry, and P. A. de Latour (about 18 14) also a poet, while the best of all poets in this dialect was Anton Huonder, whose lyrics are considered remarkable. Alexander Balletta (1842-1887) wrote prose romances and sketches, while J. C. Muoth (1844-1906), himself a most typical and characteristic figure, wrote much in prose and verse as regards his native region. In Ladin one of the chief figures was the poet Conradin von Flugi (1787-1874), who published volumes of poems in 1845 and 1861, but the poems, novels and

translations of J. F. Caderas (1 830-1 891) are placed above them. Other Ladin poets are Florin Valentin, O. P. Juvalta and S. Caratsch (d. 1892), while P. Lansel represents a younger generation. Zaccaria Pallioppi (1 820-1 873) also wrote poems, but the excellent Ladin dictionary that he compiled was not published till 1895 by the care of his son. (W. A. B. C.)

Bibliography. — a. General. — The indispensable work for any one desiring to know what books have been written on any subject relating to Switzerland is the officially published Bibliographic der schweizerischen Landeskunde, a series of detached parts, each complete in itself, and issued separately (Bern, from 1892 onwards). In particular may be mentioned: A. Waber's Landes- und Reisebe- schreibungen (1899; with a supplement, 1909), that deals with works of travel in Switzerland (see, too, the new edition, London, 1899, of J. Ball's Hints and Notes for Travellers in the Alps, pp. 140- 152), and J. H. Graf, Kartenwesen (1896), which enumerates all the maps of Switzerland and its various districts. Among the best of the older descriptions may be mentioned those of A. von Bon- stetten (1479), Conrad Tiirst (1495), Sebastian Miinster (1544), J. Stumpf (1348), J. Simler (1574), M. Merian (1642), J. J. Scheuchzer (1723), G. S. Gruner (1760), P. F. D. de Zurlauben (1777) and W. Coxe (1779). More modern, but still useful in many ways, are Max Wirth, Allgemeine Beschreibung und Statistik der Schweiz (3 vols., Zurich, 1871-1875), and H. A. Berlepsch, Schweizerkunde (2nd ed., Brunswick, 1875). The most complete and recent mono- graph on the country from all points of view is the work (700 pp.) entitled La Suisse (also in German), with atlas of 48 maps, reprinted from the Dictionnaire geographique de la Suisse (Neuchatel, 1909). For a pretty complete detailed account of its chief towns, villages and mountains, by far the best work is the Dictionnaire geographique de la Suisse (Neuchatel, 1902, and following years; it is also issued in German). A complete account of the country in the 19th century is given in the work entitled La Suisse au xix me Steele (3 vols., Lausanne, 1899-1900; also issued in German). For statistics see the official census of 1900 (Bern, 3 vols., 1904-1907), as well as the annual official publication Statistisches Jahrbuch der Schweiz (from 1 891, see specially the vol. for 1897, Atlas graphique et statistique de la Suisse, with many diagrams), and another (appearing six times a year at Bern, since 1865) the Zeitschrift fur schweizerische Statistik. For educational matters the annual official Jahrbuch fur Vnter- richtswesen in der Schweiz (Zurich, from 1894) is very useful. For mountaineers there is the Climbers' Guides Series (London, from 1890, now comprising 11 vols, relating to Switzerland), and the two works published by the Swiss Alpine Club, Clubfuhrer durch die Glarner Alpen (1902), and Clubfuhrer durch die Vrner Alpen (2 vols., 1905). Murray's Handbook for Travellers in Switzerland

was thoroughly revised (19th edition) in 1904, while it is not neces- sary to do more than mention the guide-books of Baedeker and Joanne, of which new editions often appear (that by Iwan von Tschudi is no longer kept up to date).

The best maps of Switzerland are those published by the Federal Topographical Bureau at Bern. One, called from the director of the survey (G. H. Dufour, 1787-1875) the Dufour Map (scale I : 100,000), was published in twenty-five sheets between 1845 and 1863 (see the detailed history of this map in the work entitled Die schweizerische Landesvermessung, 183 2-1864, Bern, 1896). It has however, been practically superseded by the issue (revised and corrected) of the original survey (scale I : 25,000 for the plains and I : 50,000 for the mountain districts) in 598 sheets, of which the publication began in 1870— this magnificent map, one of the finest ever executed, is named the Siegfried Atlas, from the successor of Dufour at the head of the survey, Hermann Siegfried (1819-1879). The history of Swiss travel has been told by G. Peyer, Geschichte des Reisens in der Schweiz (Basel, 1885), and W. A. B. Coolidge, Swiss Travel and Swiss Guide-Books (London, 1889). That of the exploration of the Swiss Alps is contained in Gottlieb Studer's Vber Eis und Schnee (Bern, 3 vols., new ed., 1896-1899), while Bernard Studer's Geschichte der physischen Geographie der Schweiz bis 18 1 5 (Bern, 1863) describes the gradual examination of the country from the scientific point of view. The last-named work contains many short lives of eminent Swiss. These are narrated more in detail in R. Wolf's Biographieen zur Kultur geschichte der Schweiz (4 vols., Zurich, 1858-1862); E. Secretan's Galerie Suisse (3 vols., Lausanne, 1873-1880); and Sammlung berner Biographieen (Bern, as yet 5 vols., 1884-1906). (See also Alps and Glaciers.)

As to languages in Switzerland the best general work is J. Zim- merli's Die deutsch-franzosische Sprachgrenze in der Schweiz (3 vols., Basel and Geneva, 1891-1899) ; while for the Swiss-German dialects there is the splendid Schweizerisches Idiotikon (of which the publica- tion began at Frauenield in 1 881) ; and the Glossaire des patois de la Suisse romande. For one branch of the curious Ladin dialect, see Z. and E. Pallioppi's Dizionari dels idioms romauntschs d'Engia- dina, &c. (Samaden, 1895); while for select extracts of all branches of the Romonsch or Ladin literature consult C. Decurtins, Rato- romanische Chrestomathie (8 vols., Erlangen, 1894-1907), of which the vols, i., ii., iii. and iv. refer to the Romonsch dialect of the Bundner Oberland, and the rest to the Ladin dialect of the Engadine. F. J. Stalder's Versuch eines schweizerischen Idiotikon (2 vols.- Aarau, 1806-1812) is still useful, as is his later work Die Landes- sprachen der Schweiz (Aarau, 1819).

The Archiv fur Voikskunde published by the Societe Suisse des traditions populaires (Zurich, from 1897), contains much that is interesting in the way of folk-lore, while for Swiss legends in general consult E. Kohlrusch, Schweizerisches Sagenbuch (Leipzig, 1854); A. Liitolf, Sagen, Brduche, Legenden aus den Filnf Orten (Lucerne, 1862); M. Tscheinen and P. J. Ruppen, Walliser- Sagen (Sion, 1872); A. Ceresole, Mgendes des alpes vaudoises (Lausanne, 1885); J. Kuoni, Sagen des Rontons St Gallen (St Gall, 1903); T. Verna- leken, Alpensagen (Vienna, 1858) ; D. Gempeler's Sagen und Sagen- geschichten aus dem Simmenthal (Thun,i883-i893) ; and Walliser-Sagen (2 vols., Brieg, 1907). Another feature of the life of the people in Switzerland is treated in H. Herzog's Schweizerische Volksfeste, Sitten, und Gebrduche (Aarau, 1884).

For educational matters the two following books (with the Jahrbuch fur Vnterrichtswesen in der Schweiz, already mentioned) will be found specially useful: F. Escali, V Instruction primaire en Suisse _ (Paris, 1883) and the annual volume (Geneva, from 1904) entitled L'Education en Suisse. For the Swiss universities see the special histories mentioned in the articles on the several cantons, while for the Swiss Polytechnic School at Zurich, consult W. Oechsli's Geschichte der Griindung des eidg. Polytechnicums (Frauenfeld. 1905).

_ As to the mountain pastures, see Alp, where a list of books is given.

Swiss carriage, roads, especially across the Alpine passes, are described in S. Bavier, Die Strassen der Schweiz (Zurich, 1878), and the official book, Die schweizerischen Alpenpdsse (2nd ed., 1893). For the history of the several Swiss Alpine passes consult in particular P. H. Scheffel, Verkehrs geschichte der Alpen (Berlin, 1908-1909); R. Reinhard, Passe und Strassen in den schweizer Alpen (Lucerne, 1903), which gives full references; and E. Oehl- mann's articles " Die Alpenpasse im Mittelalter," published in vols. iii. and iv. (Zurich, 1878-1879) of the Jahrbuch fur schweizer- ische Geschichte). The Simplon has a special history, F. Barbey, La Route du Simplon (Geneva, 1906), as has also the St Gotthard; E. Motta, Dei Personaggi celebri che varcarono il Gottardo nei tempi anlichi e moderni (Bellinzona, 1884; later continued in the Bollet- tino delta Svizzera Italiana). As to Swiss railways in general, see R. Herold, Der schweizerische Bund und die Eisenbahnen bis zur Jahrhundertwende (Munich, 1902); P. Weissenbach, Die Eisen- bahnverstaatlichung in der Schweiz (Berlin, 1905) ; and C. P. Wiede- mann, Die geschichtliche Entwicklung der schweizer. Eisenbahn- gesetzgebung (Zurich, 1905). The St Gotthard railway and its history are treated of at length by M. Wanner in his two works — Geschichte der Begriindung des Gotthardunternehmens (Lucerne, 1880); and

Geschichte des Baues der Gotthardbahn (Lucerne, 1885). For a general estimate of the commercial importance of the Simplon railway, see A. Mohring, Die Simplonbahn — eine verkehrswirth- schaftliche Sludie (Bern, 1907). For a technical description of the works for the Simplon tunnel see an article (also issued separately) by K. Pressel in vol. xlvii. of the Schweizerische Bauzeitung (Zurich), while similar details, as well as more general notices, relating to the Spliigen tunnel are given in G. Bener and R. Herold, Studien zur Ostalpenbahnfrage (Zurich, 1907) ; and A. Mettler, Der Spliigen als ostschweizerische Alpenbahn (Zurich, 1907). As to the Jungfrau railway, see A. H. Guyer-Zeller, Das Projekt der Jungfraubahn (Zurich, 1896, with atlas of plates) ; and S. Herzog, Die Jungfraubahn (Zurich, 1904). A special part of the Bibliographie der schweizer. Landeskunde is devoted to Swiss railways.

Economical: Trade and Commerce. — As to the general economical state of Switzerland, the older Volkswirthschafts-Lexikon der Schweiz, by A. Furrer (Bern, 4 vols., 1885-1892), may still be consulted with advantage, while naturally more up to date is N. Reichesberg's Handworterbuch der Schweiz. Volkswirthschaft, Socialpolitik und Verwaltung (Bern, since 1903). A very useful and well-arranged work is A. Le Cointe's Inventaire des institutions economiques et sociales de la Suisse d la fin du xix me siecle (Geneva, 1900). W. H. Dawson's Social Switzerland (London, 1897), deals with matters rather from the social than from the strictly economical standpoint, but contains a variety of interesting information, while H. D. Lloyd's The Swiss Democracy (London, 1908), is rather more political. A very handy, trustworthy and admirable work of moderate size on Switzerland generally from an economical point of view is T. Geering and R. Hotz's Economie politique de la Suisse (Zurich, 1903, trans, of a German work issued in 1902) — the German only has the detailed bibliography. P. Clerget's La Suisse au xx ime Steele (Paris, 1908), is very useful. Other works relating to Swiss industries and commerce are T. Geering, Die Handelspolitik der Schweiz am Ausgang des xix. Jahrhunderts (Berlin, 1902); E. Hofmann, Die Schweiz als Industriestaat (Zurich, 1902) ; and H. Wartmann, Industrie und Handel der Schweiz im xix. Jahrhundert (Bern, 1902). The following are historical monographs as to some of the principal Swiss industries : A. Biirkli-Meyer, Die Geschichte der zuricherischen Seidenindustrie (Zurich, 1894); H. Lehmann, Die aargauische Strohindustrie (Aarau, 1896); and A. Steinmann, Die ostschweizerische Stickerei-1 ndustrie (Zurich, 1905) ; while the following

deal rather with local centres of industry: H. Wartmann, Industrie und Handel des Kantons St Gallen auf 1866 (St Gall, 1870, besides many reports as to local industry, 1708 to 1890) ; T. Geering, Handel und Industrie der Stadt Basel (Basel, 1886) ; A. Bachelin, L'Horlogerie neuchateloise (Neuchatel, 1888); and A. Pfleghart, Die schweizerische Uhrenindustrie (Leipzig, 1908). A full technical and weli-illustrated description of some of the chief industrial establishments in Switzerland is given in Die induslrielle und kom- merzielle Schweiz beim Eintriti ins xx. Jahrhundert (Zurich, since 1900); while B. de Cerenville's Le Systhme continental et la Suisse, 1803-1813 (Lausanne, 1906) treats of an interesting period in Swiss commercial history. Swiss mercantile law is expounded in A. Curti's Schweizerisches Handelsrecht (Zurich, 1903). For purely financial matters the Finanz Jahrbuch (Bern, from 1899), contains much information of the latest date; while H. Ernst's Eine schweizer- ische Bundesbank (Winterthur, 1904) sketches the foundation of the Swiss National Bank that was successfully launched in 1907. G. Schanz's Die Steuern der Schweiz (5 vols., Stuttgart, 1890) is a remarkably complete and instructive work; while the later book by J. Steiger, Grundzuge des Finanzhaushaltes der Kantone und Gemeinden (2 vols., Bern, 1903), is specially devoted to taxes levied by the cantons and the communes, and is of the greatest utility in studying a very complicated subject. E. Naef's Tabak- monopol und Biersteuer (Zurich, 1903), treats of two special sources of revenue in the Swiss financial system. The history of the Swiss coinage is admirably narrated, with many fine illustrations, by L. Coraggioni, in his Milnzgeschichte der Schweiz (Geneva, 1896), and is the chief authority on Swiss numismatics in general.

As to the fine arts, the best general work on medieval Swiss architecture is J. R. Rahn's Geschichte der bildenden Kunste in der Schweiz (Zurich, 1876). The same author has also collected various of his art essays in his Kunst- und Wanderstudien in der Schweiz (Vienna, 1883), while he has described (alone or with the help of others) the chief art monuments in the various Swiss cantons — these notices appeared in the Anzeiger filr schweiz. Alterthumskunde (Zurich, from 1868), and for the cantons of Soleure, Ticino, Thurgau and Unterwalden, form appendices which are really art monographs. An older and more special work on the same subject is J. D. Blavignac's Histoire del' architecture sacree du iv 1 "" au x ine siecle dans les anciens evecheS de Geneve, Lausanne, et Sion (Geneva, 1853). There are two general books on the special subject of Swiss castles — Mme de Montmolier's Les Chateaux suisses (1816-1823, new ed., later); and F. Kupfer's Burgen und Schlosser der Schweiz (n.d.). Many have now special monographs; so Habsburg (1896) and Lenz- burg (1904), both by W. Merz, whose later work Die mitteldlterlichen Burganlagen und Wehrbauten des Kantons Aargau (2 vols., Aarau, 1906)

is a very complete treatise on the most castellated region of the country. For the Bernese castles we have E. L. C. Eden

and A. von Fischer's Die Schlosser d. Kant. Bern (Bern, about 1898). All the great churches of Switzerland have also been made the sub- ject of monograph's — so the Milnster in Bern, by B. Haendcke and V. Muller (Bern, 1894); Lausanne, by E. Dupraz (Lausanne, 1906), &c. As to the wooden architecture so characteristic of Switzerland, consult E. G. Gladbach's Die Holz-Architektur der Schweiz (2nd ed., Leipzig, 1885 — the same author has also issued several series of plates illustrating this subject). Domestic Swiss architecture in general is represented by J. Hunziker's Das Schweizerhaus (Aarau), which includes 4 vols, dealing respectively with the Valais (1900), Ticino (1902), the Grisons and Glarus (1905), and the Jura with most of the Suisse Romande (1907). A. Robida's Les Vieilles villes de Suisse (Paris, 1879) is a pleasantly written book. The biographies of Swiss artists are conveniently summarized in the Schweizerisches Kiinstler-Lexikon (Frauenfeld, from 1902 onwards), the order followed being alphabetical, while full references to special works, are given in each case. For Swiss glass painting, see H. Meyer's Die schweizerische Sitte der Fenster- und Wappenschenkung vom xv. bisxvii. Jahrhundert (Frauenfeld, 1884); and B. Haendcke's Die schweiz. Malerei im xvi. Jahrhundert unter Beriicksichtigung der Glasmalerei, des Formschnittes, und des Kupferstiches (Aarau, 1893); while Swiss fresco painting is treated of in Konrad Escher's Unter suchungen zur Geschichte der Wand- und D eckenmalsrei in der Schweiz vom ix. bis zum Anfang des xvi. Jahrhunderts (Strass- burg, 1906) ; while the town shields are depicted in P. Kupfer's Armorial des villes suisses (Basel, 1885); and their seals in E. Schul- thess's Die Sladte- und Landes-Siegel der Schweiz (Zurich, 1853). Early Swiss heraldry is historically described in P. Ganz's Geschichte d. herald. Kunst in der Schweiz im xii. und xiii. Jahrhundert (Frauen- feld, 1899). The Swiss Renaissance is dealt with by G. Schneeli, Renaissance in der Schweiz (Munich, 1896); while J. H. Heer in his Die schweiz. Malervi des xix. Jahrhunderts (Leipzig, 1905), has printed his lectures relating to most of the best-known modern Swiss painters. Many splendid series of reproductions in various departments of Swiss art have appeared, two of the most striking being the three series of Handzeichnungen schweizerischer Meister des xv.xviii. Jahrhunderts (Basel, from 1904) ; and the Kunstdenk mdler der Schweiz (2nd series, Geneva, from 1901), to which we may add R. Anheisser's Altschweizerische Baukunst (Bern, 1906-1907) ; R. Hinderer, Alte schweizer Bauweise (Frankfort, 1907) ; and the four series (Bern, 1883-1887) of E. von Rodt's Kunstgeschichtliche Denkmdler der Schweiz. The most artistic and accurate repro- ductions of Swiss costumes are the thirty-six coloured plates, drawn after originals, published by Fr. Julie Heierli (Zurich, 1897, sqq.), under the title of Die schweizer Trachten

vom xvii.-xix. Jahrhundert.

b. History. — The great collection (officially published in 32 vols., 1 858-1905) entitled Amtliche Sammlung der altern eidgenossischen Abschiede contains all the recesses of the Diet, &c, from 1245 to 1848, and is absolutely indispensable. A series of selected extracts from chroniclers, documents, &c, is given in W. Oechsli's Quellenbuch zur Schweizer geschichte (2 vols. 2nd ed. of vol. i. 1901, and 1st ed. of vol. ii., Zurich, 1893). The texts (with short introductions) of all the Federal Constitutions from 1798 onwards are conveniently- collected in S. Kaiser and J. Strickler's Geschichte und Texte der Bundesverfassungen der schweiz. Eidgenossenschaft von 1798 bis zur Gegenwart (Bern, 1901). The texts of the early alliances (1291- I 5 I 3) are reprinted in J. von Ah's Die Bundesbriefe der alien Eidge- nossen (Einsiedeln, 1891), while a commentary on all the Federal Constitutions from 1291 (with reprints of certain texts) is furnished by C. Hilty in his Die Bundesverfassungen der schweiz. Bidgenossen- schaft (Bern, 1891; also in French). For more recent documents and laws see the Amtliche Sammlung der Bundesgesetze (from 1849 onwards), which are conveniently arranged and classified by P. Wolf in his Die schweizerische Bundesgesetzgebung (2nd ed., 3 vols., Basel, 1905-1908). G. von Wyss's Geschichte der Histori ographie in der Schweiz (Zurich, 1895) is an admirable guide to the works and lives of all Swiss historians up to about 1850, while all arti- cles (published in Swiss periodicals from 1812 to 1900) relating to the subject are most carefully indexed and classified in J. L. Brandstetter and H. Barth's Repertorium iiber die in Zeit- und Sammelschriften enthaltenen Aufsdtze und Mitteilungen schweizer- geschichtlichen Inhaltes (2 vols., Basel, 1892 and 1906).

The latest revised texts of the Federal Constitution and (often) of the cantonal constitutions can be procured separately, but. the last official collection of all in one volume dates from 1891 (Recueil des constitutions federates et cantonales), since which time many changes have been made. These can generally be discovered, and much valuable present-day knowledge of Swiss matters gained, in C. Hilty's Politisches Jahrbuch der schweizer. Eidgenossenschaft (published at Bern annually since 1886).

The best general recent histories are J. Dierauer, Geschichte der schweizerischen Eidgenossenschaft (3 vols., up to 1648, Zurich, 1887- 1 907 to be continued), which gives in detail the original authorities and the statements of modern writers for every point ; W. D. McCrackan, The Rise of the Swiss Republic (2nd ed., New York, 1901), and B. van Muyden, Histoire de la nation Suisse (3 vols., Lausanne, 1896- 1899). Some of the older histories (such as those of Daguet and Dandliker) may still be consulted with advantage, while W. Oechsli's

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Lehrbuch fiir den Geschichtsunterricht in der Sekunddrschule (Zurich, 1885), is very accurate and handy. Far more popular in style than any yet mentioned are J. Sutz's Schweizer-Geschichte fur das Volk erzdhlt (La Chaux de Fonds, 1899), and A. Gobat, Histoire de la Suisse racontee au peuple (Neuchitel, 1900). A very attractive summary (including social and economical history) is given in H. Vulliety's La Suisse & Iravers les Ages (Basel and Geneva, 1901).

J. Heierli's Urgeschichte der Schweiz (Zurich, 1901) has superseded all earlier works (such as Heer) on prehistoric Switzerland. The authentic early history of the Confederation (see also Tell, Tschudi, and Winkelried) is admirably told in W. Oechsli's Die Anfdnge der schweizerischen Eidgenossenschaft (Zurich, 1891, also in French), as well as in the older work by A. Rilliet, Les Origines de la confedera- tion Suisse (2nd ed., Geneva and Basel, 1869). For the earlier medieval history (1273-1334) J. E. Kopp's Geschichte der eidge- nbssischen Biinde (5 vols., Leipzig, Lucerne and Basel, 1845-1882) is a perfect storehouse of information, while the medieval political Swiss system in relation to the empire has been very clearly described by W. Oechsli in his article (published in vol. v., 1890, of Hilty's Politisches Jahrbuch) " Die Bezieh- ungen der schweiz. Eidgenossenschaft zum Reiche bis zum Schwabenkrieg, 1499," while the same writer's article (pub- lished in vol. xiii., 1888, of the Jahrbuch fiir schweizerische Geschichte) " Orte und Zugewandte," gives an admirable account of the relations of many small districts and towns to the Swiss Con- federation, as " allies," from the earliest times to 1798. The two following works trace certain phenomena throughout Swiss history — P. Schweizer, Geschichte der schweizerischen Neutralitdt (Frauen- feld, 1895), and J. Schollenberger, Geschichte der schweizer. Politik (2 vols., Frauenfeld, 1906 and 1908). As to the more recent history of Switzerland (since. 1798) see, besides various articles in Hilty's Jahrbuch, C. Hilty, Offentliche Vorlesungen iiber die Helvetik (Bern, 1878); W. Oechsli, Geschichte der Schweiz im xix. Jahrhundert (vol. i., Leipzig, 1903, extends from 1798 to 1813); F. Burckhardt, Die schweizerische Emigration, 1798-1901 (Basel, 1908) ; B. van Muyden, La Suisse sous le pacte de 1815 (2 vols., 1815-1838, Lausanne, 1890-1891) ; G. H. Dufour, Der Sonderbunds-Krieg und die Ereignisse von 1836 in Neuenburg (Basel, 1876; also in French, Paris, 1876); G. Grote, Seven Letters concerning the Politics of Switzerland (1847, enlarged ed., London, 1876); T. Curti, Die schweizerischen Volksrechte, 1848-1900 (Bern, 1900) ; J. Schollenberger,

Die Schweiz seit 1848 (Berlin, 1908); and the blue-book (London, 1848) entitled Correspondence Relative to the Affairs of Switzerland, with the following volumes of memoirs by Swiss statesmen: A. P. Segesser, Fiinf und vierzig Jahre im luzernischen Staalsdienst, 1841-1887 (Bern, 1887) ; J. C. Kern, Souvenirs politiques, 1838-1883 (Bern, 1887) ; and Numa Droz, Eludes et portraits politiques (Geneva, 1895), as well as lives of others. For the history of Switzerland in the 19th century see T. Curti, Geschichte der Schweiz im xix. Jahrhundert (Neuchatel, 1902), and the work entitled La Suisse au xix"" Steele (3 vols., Lausanne, 1899-1900; also issued in German).

The following works are very useful for various departments of Swiss history : Genealogisches Handbuch zur schweizer Geschichte (in course of publication since 1900 at Zurich); P. Ganz, Geschichte der heraldischen Kunst in der Schweiz im xii. and xiii. Jahrhundert (Frauenfeld, 1899); E. Schulthess, Die Stddte- und Landes-Siegel der Schweiz (Zurich, 1853); P. Kupfer's Armorial des villes suisses (120 shields, Basel, 1885) ; A. Gautier, Les Armoiries et les couleurs de la confederation et des cantons suisses (2nd ed., Geneva and Basel, 1879); and L. Tobler's Schweizerische Volkslieder (2 vols., Frauen- feld, 1 882-1 884; many historical ballads, texts with introductions). The best historical atlas is the Historisch-geographischer Atlas der Schweiz by J. C. Vogelin, G. Meyer von Knonau and G. von Wyss (new ed., Zurich, 1870), while L. Poirier-Delay and F. Mullhaupt's Historischer Atlas der Schweiz (Bern, 1898), and J. S. Gerster's small maps (Zurich, 1886) are also useful. There is a set of small Swiss historical maps in one sheet (No. 25) in Droysen's Allgemeiner historischer Atlas (Bielefeld, 1886), and a single general one (No. 44) in R. L. Poole's Historical Atlas of Modem Europe (Oxford, 1 902). For the pre- 1798 constitution of Switzerland see J. Simler, De Helvetiae republicd (Zurich 1576; also in German and French), and Abraham Stanyan's An Account of Switzerland (London, 1714). The best and most recent works on the existing Swiss constitution of 1874 and its history are the large volume by W. Burckhardt, Kommentar der schweiz. Bundesverfassung von 1874 (Bern, 1905), and the smaller one by J. Schollenberger, Bundesverfassung der Schweiz. Eidgenossenschaft. Kommentar mit Einleitung (Berlin, 1905), while the same author's Das Bundesstaatsrecht der schweiz. Geschichte und System (Berlin, 1902) and his Grundriss der Staats- und Verwalti-ngsrechts der schweiz. Kantone (2 vols., Zurich, 1898- 1899) are clear, and, especially the last-named, very useful as to cantonal matters. In English there is nothing better than J. M. Vincent's Government in Switzerland (New York and London, 1900), for the work by F. O. Adams and C. D. Cunningham is not very satisfactory, though better in its French edition (Basel and Geneva, 1890) than in its original English shape (London, 1889). The decisions of the Swiss Federal Tribunal

as to Swiss constitutional law are collected (up to the end of 1902) in L. R. von Salis's Schweizerisches Bundesrecht (2nd ed., 5 vols., Bern, 1903-1904), while

H. Ryffel's Die schweizer. Landsgemeinden (Zurich, 1904) and T. Curti's Die schweizer. Volksrechte (Bern, 1900) touch on special sides of the subject. See, too, Commune (Swiss) and Referendum and Initiative. Many of the older works are still worth consulting, such as those by Snell (1839-1844), Stettler (1847), Ullmer (1862- 1866), Pfaff (1870), Bluntschli (2nd ed., 1875), Meyer (1875-1878), Dubs (1878), Orelli (1885), and Blumer (latest ed., vol. i., 1891; vols. ii. and iii., 1880-1887). There are also useful articles in Furrer's and Reichesberg's dictionaries. J. J. Blumer's Stoats- und Rechtsgeschichte der schweiz. Demokratieen (2 vols., St Gall, 1850- 1858) deals collectively with the old democratic cantons — Uri, Schwyz, Unterwalden, Glarus, Zug and Appenzell — and is still very useful for local history ; the special works as to the constitutional history of other cantons are mentioned in the articles relating to them. A general theoretical work on federal constitutions in general is L. le Fur's litat Federal et Confederation d'etats (Paris, 1896), vol. i. of a new German edition of which (prepared by the author with the help of P. Posener) appeared at Breslau in 1902; this is more up to date than E. A. Freeman's Federal Government (new ed. of vol. i., London, 1893), or than J. B. Westerkamp's Staatenbund und Bundesstaat (Leipzig, 1900).

There is no really satisfactory general ecclesiastical history of Switzerland before the Reformation, though monographs abound, and much material has been collected in the Zeitschrift fiir Schweizer- ische Kirchengeschichte (Stans, from 1907). E. E. Gelpke's Kirchen- geschichte der Schweiz (2 vols., Bern, 1856-1861) is now out of date, and only includes the early portion of the period (it is written front a Protestant standpoint), while vol. ii. of B. Fleischlin's Sludien und Beitrdge zur schweizer. Kirchengeschichte (Lucerne, 1902-1903) includes the period 800 to 1520, but is written from a strong Romanist point of view. As to the early history consult E. Egli's Die christlichen Inschriften der Schweiz von iv-ix. Jahrhundert (Zurich, 1895), and his Kirchengeschichte der Schweiz bis auf Karl den Grossen (Zurich, 1893) ; S. Guyer, Die christlichen Denkmaler des ersten Jahrtausends in der Schweiz (Leipzig, 1907) ; A. Liitolf, Die Glaubensboten der Schweiz vor St Gallus (Lucerne, 1871); and E. F. Gelpke, Die christliche Sagengeschichte der Schweiz (Bern, 1862). As to the medieval saints in Switzerland see E. A. Stilckelberg, Geschichte der Reliquien in der Schweiz (2 vols., Zurich and Basel, 1902 and 1908), and his Die schweiz. Heiligen des Mittelalters (Zurich, 1903), and J. Genoud's Les Saints de la Suisse francaise (new ed., 2 vols., Fribourg, 1897). For the documentary history of some of the medieval Swiss dioceses see Regesta episcoporum

constantiensium, edited by P. Ladewig and T. M tiller (2 vols., from 596 to 1383, as yet published, Innsbruck, 1895 and 1905); M. Besson, Recherches sur les origines des evechis de Geneve, Lausanne, et Sion (Fribourg, 1906), and L. Stouff, Le Pouvoir temporal des eveques de Bdle (2 vols., Paris, 1891). E. E. von Miilinen's Helvetia sacra (2 vols., Bern, 1858 and 1861) gives the succession of the various bishops, abbots, provosts, &c, but requires bringing up to date. For the medieval Swiss monasteries we have Die Regesten der Archive in der schweiz. Eidgenossenschaft (edited by T. von Mohr; 2 vols., Coire, 1851-1854), though it refers only to a few monasteries, for which it is indispensable, while Arnold Nuscheler's Die Gotteshauser der Schweiz (3 pts., Zurich, 1 864-1 873, continued by the author and others in the Geschichlsfreund and Argovia, complete index issued as an appendix to the Anzeiger für schweizerische Geschichte, 1900) is most valuable and useful. Some of the great monasteries have histories of their own, such as Einsie- deln (q.v.), Engelberg (q.v.), and Muri, the last by Pater M. Kiem, Geschichte der Benedicliner-Abtei Muri (2 vols., Stans, 1888 and 1891). Two monographs may be mentioned : R. G. Bindschedler, Kirch- liches Asylrecht und Freistdtten in der Schweiz (Stuttgart, 1906), and Augusta Steinberg, Studien zur Geschichte der Juden in der Schweiz wdhrend des Mittelalters (Zurich, 1903). For the Reformation and later times consult (on the Protestant side), besides biographies, &c, of Calvin and Zwingli {qq. v.), E. Bloesch, Geschichte der schweizerisch- reformierten Kirchen (2 vols., Bern, 1898-1&99); and W. Hadorn, Geschichte des Pietismus in der schweiz. reform. Kirchen (Constance, 1901), and the same author's Kirchengeschichte der reformierten Schweiz (since 1906). F. Meyer's work, Die evangelische Gemeinde in Locarno (2 vols., Zurich, 1836), treats of an important event of that period. The Romanist standpoint is presented in vols. iii. and iv. (1904 sqq.) of Fleischlin's work mentioned above, and also in J. G. Mayer s Das Conzil von Trient und die Gegenreformation in der Schweiz (2 vols., Stans, 1901 and 1903).

*For more modern days the best book, especially from the consti- tutional side, is C. Gareis and P. Zorn, Stoat und Kirche in der Schweiz (2 vols., Zurich, 1877-1878), which tells the story down to the date of publication. Special subjects are treated of in M. Kothing, Die Bisthumsverhandlungen der schweizerisch-konstanzischen Diozesan- stdnde von 1803-1862 (Schwyz, 1863); F. Troxler, Der Kulturkampf von 1863-1888 (Bienne, 1889); Ch. Woeste, Histoire du Culturkampf en Suisse, 1871-1886 (Brussels, 1887, Romanist work) ; and P. Gschwind, Geschichte der Entstehung der christkatholischen Kirche der Schweiz (vol. i. appeared at Basel in 1904). The work by A. Biichi entitled Die katholische Kirche in der Schweiz (Munich, 1902) gives a full and authorized account of the present state of th< * Roman Catholic Church in Switzerland.*

c. Literature. — For the Swiss medieval Minnesingers see Karl Bartsch, Die schweizer Minnesinger (Frauenfeld, 1887, texts, with introductions) ; and for popular ballads, historical or not, L. Tobler, Schweizerische Volkslieder (2 vols., Frauenfeld, 1882-1884, texts, with notes and introductions). In general consult J. Bachtold, Geschichte der deutschen Literatur in der Schweiz (Frauenfeld, 1892); E. H. Gaullieur, Eludes sur Vhistoire litteraire de la Suisse francaise, particulierement dans la seconde moitie du xviii me siecle (Paris, 1856); P. Godet, Histoire litteraire de la Suisse romande (2nd ed., Neuchatel and Paris, 1895); H. E. Jenny, Die Alpendichtung der deutschen Schweiz (Bern, 1905); J. C. Morikofer, Die schweizerische Literatur des xviii. Jahrhunderts (Leipzig, 1861); F. Rausch, Geschichte der Literatur des rhato-romanischen Volkes (Frankfort-on-the-Main, 1870) ; Virgile Rossel, Histoire litteraire de la Suisse romande (2 vols., Geneva and Paris, 1889-1891); R. Weber, Die poetische National- literatur der deutschen Schweiz (3 vols., Glarus, 1866-1867). For the more recent Swiss writers see the literary sections of the work entitled La Suisse au xix me siecle, vol. ii. ch. 4 (Lausanne, 1889- 1900), and the biographers of the several writers noted under the separate articles. (W. A. B. C.)

SWOLD (or Swold), BATTLE OF, the most famous of the sea-fights of the ancient Norsemen. It took place on the 9th of September 1000. The place cannot now be identified, as the formation of the Baltic coast has been much modified in the course of subsequent centuries, partly by the gradual silting up of the sea, and partly by the storms of the 14th century. Swold was an island probably on the North German coast, near Riigen. The battle was fought between Olaf Trygvesson, king of Norway, and a coalition of his enemies— Eric Hakonson, his cousin and rival; Olaf, the king of Sweden; and Sweyn Forkbeard, king of Denmark. The poets, and the poetically minded authors of the sagas, who are the only authorities, have told the story with many circumstances of romance. But when the picturesque details, which also have no doubt at least a foundation of truth, are taken at their true value, the account of the battle still presents a very trustworthy picture of the sea-fighting of the Norsemen. Olaf had been during the summer in the eastern Baltic. The allies lay in wait for him at the island of Swold on his way home.. The Norse king had with him seventy-one vessels, but part of them belonged to an associate, Sigwald, a chief of the Jomsburg vikings, who was an agent of his enemies, and who deserted him. Olaf's own ships went past the anchor- age of Eric Hakonson and his allies in a long column without order, as no attack was expected. The king was in the rear of the whole of his best vessels. The allies allowed the bulk of the Norse ships to pass, and then stood out to attack Olaf. He

might have run past them by the use of sail and oar to escape, but with the true spirit of a Norse warrior he refused to flee, and turned to give battle with the eleven ships immediately about him. The disposition adopted was one which is found recurring in many sea-fights of the middle ages where a fleet had to fight on the defensive. Olaf lashed his ships side to side, his own — the "Long Serpent," the finest war-vessel as yet built in the north — being in the middle of the line, where her bows projected beyond the others. The advantage of this arrange- ment was that it left all hands free to fight, a barrier could be formed with the oars and yards, and the enemy's chance of making use of his superior numbers to attack on both sides would be, as far as possible, limited — a great point when all fighting was with the sword, or with such feeble missile weapons as bows and javelins. The Norse long ships were high in the bulwark — or, as the Greeks would have said, " cataphract." Olaf, in fact, turned his eleven ships into a floating fort. The Norse writers, who are the only authorities, gave all the credit to their own countrymen, and according to them all the intelli- gence of Olaf's enemies, and most of their valour, were to be found in Eric Hakonson. They say that the Danes and Swedes rushed at the front of Olaf's line without success. Eric Hakon- son attacked the flank. His vessel, the "Iron Ram," was " bearded," that is to say, strengthened across the bows by bands of iron, and he forced her between the last and last but one of Olaf's line. In this way the Norse ships were carried one by one, till the " Long Serpent " alone was left. At last she too was overpowered. Olaf leapt into the sea holding his shield edgeways, so that he sank at once and the weight of his hauberk dragged him down. A legend of later days has it that

at the last moment a sudden blaze of light surrounded the king, and when it cleared away he had disappeared. King Olaf is one of the same company as Charlemagne, King Arthur and. Sebastian of Portugal— the legendary heroic figures in whose death the people would not believe, and whose return was looked for.

See the Heims-Kringla, in the Saga Library, trans, by W. Morris and E. Magmusson (1893) and the Saga of King Olaf Tryggwason, trans, by J. Sephton (1895). (D. H.)

SWORD (O. Eng. sweord; ultimately from an Indo-European root meaning to wound), a general term for a hand weapon of metal, characterized, by a longish blade, and thus distinct from all missile weapons on the one hand, and on the other hand from staff weapons — the pike, bill, halberd and the like — in which the metal head or blade occupies only a fraction of the effective length. The handle of a sword provides a grip for the hand that wields it, or sometimes for two hands; it may add protection, and in most patterns does so to a greater or less extent. Still it is altogether subordinate to the blade. For want of a metal-headed lance or axe, which indeed were

of later invention, a sharpened pole or a thin-edged paddle will serve the turn. But a sword-handle without a blade is naught ; and no true sword-blade can be made save of metal capable of taking an edge or point.

1. Historical. — There are so-called swords of wood and even stone to be found in collections of savage weapons. But these are really flattened clubs; and the present writer Origins and agrees with the late General Pitt-Rivers in not Barty believing that such modifications of the club have Porms – had any appreciable influence on the form or use of true swords. On this last point, however, the opinions of competent archaeo- logists have been much divided. We will only remark that the occurrence in objects of human handiwork of a form, or even a series of forms, intermediate between two types is not conclu- sive evidence that those forms are historical links between the different types, or that there is any historical connexion at all. In the absence of dates fixed by external evidence this kind of comparison will seldom take us beyond plausible conjecture. A traveller who had never seen velocipedes might naturally suppose, on a first inspection, that the tricycle was a modification of the old four-wheeled velocipede, and the bicycle a still later invention; but we know that in fact the order of development was quite different.

It is more difficult as a matter of verbal definition to distinguish the sword from smaller hand weapons. Thus an ordinary sword is four or five times as long as an ordinary dagger: but there are long daggers and short swords; neither will the form of blade or handle afford any certain test. The real difference lies in the intended use of the weapon; we associate the sword with open combat, the dagger with a secret attack or the sudden defence opposed to it. One might say that a weapon tco large to be concealed about the person cannot be called a dagger. Again, there are large knives, such as those used by the Afridis and Afghans, which can be distinguished from swords only by the greater breadth of the blade as compared with its length. Again, there are special types of arms, of which the yataghan is a good example, which in their usual forms do not look much like swords, but in others that occur must be classed as varieties of the sword, unless we keep them separate by a more or less artificial theory, referring the type as a whole to a different origin.

Of the actual origin of swords we have no direct evidence. Neither does the English word nor, so far as we are aware, any of the equivalent words in other languages, Aryan or otherwise, throw any light on the matter. Daggers shaped from reindeer antlers occur among the earliest relics of man, and there are flint daggers of the Neolithic period, which may be supposed to have been the model for the first hand weapons made of copper. Bronze took the place cf copper about 2000 B.C., and the transition from bronze to iron is assigned to the period from 1000 to 700

B.C. 1 Whatever may be the further discoveries of archaeologists, we know that swords are found from the earliest

1 As to the overlapping of the bronze and iron ages in the Homeric poems, see Burrows, The Discoveries in Crete (1907), p. 214. As co Britain, O. Montelius in Archaeologia, 61, pp. 155-6; Cowper, Art of Attack, 124 sqq. (Ulverston, 1906).

times of which we have any record among all people who have acquired any skill in metal-work. There are two very ancient types, which we may call the straight-edged and the leaf- shaped. Assyrian monuments represent a straight and narrow sword, better fitted for thrusting than cutting. Bronze swords of this form have been found in many parts of Europe, at Mycenae, side by side with leaf -shaped specimens, and more lately in Crete. 1 We have also from Mycenae some very curious and elaborately wrought blades, so broad and short that they must be called ornamental daggers rather tnan swords. The leaf-shaped blade is common everywhere among the remains of men in the " Bronze Period " of civilization, and this was the shape used by the Greeks in historical times, and is the shape familiar to us in Greek works of art. It is impossible, however, to say whether the Homeric heroes were conceived by the poet as wearing the leaf-shaped sword, as we see it, for example, on the Mausoleum sculptures, or a narrow straight-edged blade of the Minoan and Mycenaean pattern. In any case, the sword holds a quite inferior position with Greek warriors of all times.

(1-5, from Gerhard's Griechische V asenbilder ; 6-15, from Lindenschmit , Tracht und Bewajnung dcs rimischen Hceres wahrend der Kaiserzeit, Brunswick, 1882.)

Fig. 1. 1-5, Greek Swords of the classical type; 6-15 Roman Swords.

So-called " sword of Tiberius"

from Mainz (Brit. Mus.).

Bonn (private collection),

length 765 mm.

Legionary (monument at

Wiesbaden).

9, Cavalry (monumentat Mainz).

10, Cavalry (monument at Worms).

12, 13, Sword handles (Kiel and Mainz).

11, 14, 15, From Trajan's column.

The relation of the Minoan long sword to the Greek leaf-shaped blade is obscure. It is conceivable that the leaf-shape was modified from a longer straight blade for the sake of handiness and cutting power, but not less so that the leaf-shape was

1 The Cretan finds are fully described by Arthur J. Evans, " The Prehistoric Tombs of Knossos," {Archaeologia (1905), 59, pt. 2; also separately published (1906). There are long (91-95 cm., 341 in.~ 37 1 in.) and short (50-61 cm., 20-242 in.), swords, daggers and bronze knives. A fine original specimen and several facsimiles (Mycenaean as well as Minoan) may be seen in the Ashmolean Museum at Oxford. Bronze daggers preceded both swords and spear- heads (Greenwell and Brewis, in Archaeologia, 61, pp. 443, 453).

independently produced by imitation in metal of flint daggers. Independence appears, on the whole, slightly more probable; the existence of specimens which might belong to an intermediate type is only an ambiguous fact without a more exact chronology than we have as yet, as it may be due to experiment or imitation after both types were in use. Strange as it is to a modern swordsman, representations in Minoan art seem to show that not only the bronze daggers but the long swords were used with an overhand stabbing action like a modern Asiatic dagger. 2 The handles are too short for any but a rigid grip without finger-play. Before about 1500 B.C. the rapier type was the prevailing one; but there is no evidence of historical connexion between the Assyrian and the Minoan rapiers. It is thought that the leaf- shaped blade came to the Mediterranean countries from the north. So far as we know from works of art, it was mostly used with a downright cutting blow, regardless of the consequent exposure of the swordsman's body; this, however, matters little when defence is left to a shield or armour, or both. Attic vases also show warriors giving point, though less often. The use of the sword as a weapon of combined offence and defence — swordsmanship as we now understand it — is quite modern. If the sword was developed from a spearhead or dagger, it would naturally have been (and it seems in fact to have been) a thrusting weapon before it was a cutting one. But when we come to historical times we find

that uncivilized people use only the edge, and that the effective use of the point is a mark of advanced skill and superior civilization. The Romans paid special attention to it, and Tacitus tells us how Agricola's legionaries made short work of the clumsy and pointless arms of the Britons when battle was fairly joined. 3 The tradition was preserved at least as late as the time of Vegetius, who, as a technical writer, gives details of the Roman soldier's sword exercise. Asiatics to this day treat the sword merely as a cutting weapon, and most Asiatic swords cannot be handled in any other way.

The normal types of swords which we meet with in historical times, and from which all forms now in use among civilized nations are derived, may be broadly classified as straight- edged or curved. In the straight-edged type, in itself Types. a very ancient one, either thrusting or cutting qualities may predominate, and the blade may be double-edged or single-edged. The double-edged form was prevalent in Europe down to the 17th century. The single-edged blade, or back- sword as it was called in England, is well exemplified among the Scottish weapons commonly but improperly known as claymores (the real claymore, i.e. great sword, claidheamh mor, is an earlier medieval form), and is now all but exclusively employed for military weapons. But these, with few exceptions, have been more or less influenced by the curved Oriental sabre. Among early double-edged swords the Roman pattern {gladius, the thrusting sword, contrasted with the barbarian ensis) stands out as a workmanlike and formidable weapon for close fight. In the middle ages the Roman tradition disappeared, and a new start was made from the clumsy barbarian arm which the Romans had despised. Gradually the broad and all but pointless blade was lightened and tapered, and the thrust, although its real power was unknown, was more or less practised from the 1 2th century onwards. St Louis anticipated Napoleon in calling on his men to use the point; and the heroes of dismounted combats in the Morte a" Arthur are described as " foining " at one another. In the first half of the 16th century a well- proportioned and well-mounted cut-and-thrust sword was in general use, and great artistic ingenuity was expended, for those who could afford it, on the mounting and adornment. T ne growth and variations of the different parts of the hilt, curiously resembling those of a living species, would alone be matter enough for an archaeological study. One peculiar form, that of the Scottish basket-hilt, derived from the Venetian pattern known as schiavone, has persisted without material change.

2 As the spear still was in historical times (Furtwangler-Reichhold, Gr. Vasenmalerei, iii. 122).

3 Agric. 36: " Britannorum gladii sine mucrone complexum armorum et in aperto pugnam non tolerabant." The short Roman infantry sword,

however, dates only from the Second Punic War.

Quite different from the European models is the crescent- shaped Asiatic sabre, commonly called scimitar. We are not acquainted with any distinct evidence as to the origin of this in time or place. Dr R. Forrer thinks the whole family of curved swords was developed from bronze knives. The Frankish scramasax would then represent an intermediate type. How- ever that may be, the fame of the Damascus manufacture of sword-blades is of great antiquity, as is also that of Khorasan, still the centre of the best Eastern work of this kind. Who- ever first made these blades had conceived a very definite idea — that of gaining a maximum of cutting power regardless of loss in other qualities — and executed it in a manner not to be improved upon. The action of the curved edge in delivering a blow is to present an oblique and therefore highly acute-angled section of the blade to the object struck, so that in effect the cut is given with a finer edge than could safely be put on the blade in its direct transverse section. In a well-made sabre the setting of the blade with regard to the handle (" leading forward ") is likewise ordered with a view to this result. And the cutting power of a weapon so shaped and mounted is un- doubtedly very great. But the use of the point is abandoned,

(Reproduced by permission from Egerton's Illustrated Handbook of Indian Arms, published by the India Office, 1880, new ed. s.t. Indian and Oriental Armour, 1896.)

Fig. 2. — Oriental Swords.

, Persian talwar. , Kukri (Nepal). , 9, 10, Mahratta, showing tran- sition to gauntlet sword.

1,2, Decorated Persian arms.

3, Gauntlet sword.

4, Common type of talwar (North-

West Provinces).

5, Yataghan type.

and the capacities of defensive use (to which Orientals pay little or no attention) much diminished. These drawbacks have caused the scimitar

type, after being in fashion for European "light cavalry during the period of Napoleon's wars and some- what longer, to be discarded in our own time. But, as long as

Easterns adhere to their rigid grasp of a small handle and sweep- ing cut delivered from the shoulder, the Persian scimitar or Indian talwar will remain the natural weapon of the eastern horseman. Indian and Persian swords are often richly adorned; but their appropriate beauty is in the texture of the steel itself, the " damascening " or " watering " which distinguishes a superior from a common specimen.

There are special Asiatic varieties of curved blades of which the origin is more or less uncertain. Among these the most remarkable is perhaps the yataghan, a weapon pretty much coextensive with the Mahommedan world, though it is reported to be not common in Persia. It was imported from Africa, through a French imitation, as the model of the sword-bayonets which were common for about a generation in European armies; probably the French authorities caught at it to satisfy the sentiment, which lingered in continental armies long after it had disappeared in England, that even the infantry soldier after the invention of the bayonet must have some kind of sword. A compact and formidable hand weapon was thus turned into a clumsy and top-heavy pike. If we try to make a bayonet that will cut cabbages, we may or may not get a useful chopper, but we shall certainly get a very bad bayonet. The modern short sword-bayonet is a reversion to the original dagger type, and not open to this objection. The double curve of the yata- ghan is substantially identical with that of the Gurkha knife (kukri), though the latter is so much broader as to be more like a woodman's than a soldier's instrument. It is doubtful, however, whether there is any historical connexion. Similar needs are often capable of giving rise to similar inventions without imitation or communication. There are yet other varieties, belonging to widely spread families of weapons, which have acquired a strong individuality. Such are the swords of Japan, which are the highly perfected working out of a general Indo-Chinese type; they are powerful weapons and often beautifully made, but a European swordsman would find them ill-balanced, and the Japanese style of sword-play, being two- handed, has little to teach us.

Other sorts of weapons, again, are so peculiar in form or historical derivation, or both, as to refuse to be referred to any of the normal divisions. The long straight gauntlet-hilted sword (patd, fig. 3) found both among the Mahrattas in the south of India and among the Sikhs and Rajputs in the north, is an elongated form of the broad-bladed dagger with a cross-bar handle (kaldr, figs. 9, 10), as is shown by a transitional form, much resembling in shape and size of blade the medieval English anlace, and furnished with a guard for the back of the hand. This last-mentioned

pattern seems, however, to be limited to a comparatively small region. When once the combination of a long blade with the gauntlet hilt was arrived at, any straight blade might be so mounted; and many appear on examination to be of European workmanship — German, Spanish or Italian. There are various other Oriental arms, notably in the Malay group, as to which it is not easy to say whether they are properly swords or not. The Malay " parang latok " is a kind of elongated chopper sharpened by being bevelled off to an edge on one side, and thus capable of cutting only in one direction. The anlace incidentally mentioned above seems to be merely an overgrown dagger; the name occurs only in English and Welsh; in which language first, or whence the name or thing came, is unknown. In the course of the 16th century the straight two-edged sword of all work was lengthened, narrowed, and more finely pointed, till it became the Italian and Spanish Later Bum- rapier, a weapon still furnished with cutting edges, pean De- but used chiefly for thrusting. We cannot say how vel °P meats – far this transition was influenced by the estoc or Panzer sleeker, 1 a late medieval thrusting weapon carried by horsemen rather as an auxiliary lance than as a sword. The Roman preference of the point was rediscovered under new conditions, and fencing became an art. Its progress was from pedantic complication to lucidity and simplicity, and the fashion of the weapon was

1 Probably this was the kind of sword called Broch in 14th-century English {Eyre of Kent, Selden Soc, 1910, p. 100).

simplified also. Early in the 18th century, the use of the edge having been finally abandoned in rapier-play, the two-edged blade was supplanted by the bayonet-shaped French duelling sword, on which no improvement has since been made except in giving it a still simpler guard. The name of rapier was often but wrongly given to this by English writers. About the same time, or a little earlier, the primacy of the art passed from Italy to France. There is still a distinct Italian school, but the rest of the world learns from French masters. It is unnecessary here to consider the history of fencing {q.v.) ; Mr Egerton Castle's book on the subject will be found a trustworthy guide, and almost indispensable for those who wish really to understand the passages relating to sword-play in our Elizabethan literature, of which the fencing scene in Hamlet is the most famous and obvious example.

(Reproduced by permission from Mr Egerton Castle's Schools and Masters of Fence.) Fig. 3. — Typical European Swords, i6th-i8th centuries.

1, Early 16th century.

2, German, c. 1550. Italian rapier, third quarter

16th century. Spanish rapier, late 1 6th

century. Italian, same period.

6, English, same period.

7, English musketeer's

early 17th century.

8, Spanish broadsword, early 17th century.

9, Venetian, c. 1550.

10, Italian, late 16th century.

11, English, time of Common- wealth.

12, French rapier, c. 1650.

13, German flamberg, early 17th century.

14, 15, Small-swords, 1700-1750.

Meanwhile a stouter and broader pattern, with sundry minor varieties, continued in use for military purposes, and gradually the single-edged form or broadsword prevailed. The well- known name of Ferrara, peculiarly associated with Scottish blades, appears to have originally belonged to a Venetian maker,

sword,

or family of makers, towards the end of the 16th century. The Spanish blades made at Toledo had by that time acquired a renown which still continues. Somewhat later Oriental examples, imported probably by way of Hungary, induced the curvature found in most recent military sabres, which, however, is now kept within such bounds as not to interfere with the effective use of the point. An eccentric specialized variety — we may call it a " sport ' : — of the sabre is the narrow and flexible " Schlager " with which German students fight their duels (for the most part not arising out of any quarrel, but set trials of skill), under highly conventional rules almost identical with those of the old English " backswording " practised within living memory, in which, however, the swords were represented by

sticks. These " Schlager " duels cause much effusion of blood, but not often serious danger to life or limb.

There are plenty of modern books on sabre-play, but com- paratively little attention has been given to its scientific treat- ment. It is said that the Italian school is better than the French, and the modern German and Austrian the best of all. Some of the English cavalry regiments have good traditions, enriched by the application of a knowledge of fencing derived from eminent French masters.

The following description, written for the 9th edition of this work from personal inspection, applies to the process used by the best private makers till near the end of the 19th Manufacture century, and is purposely left unchanged. The of Swords by present method of making army swords is separately H a˚d-work. described below. Mechanical invention has not been able to supersede or equal hand-work in the production of good sword-blades. The swordsmith's craft is still, no less than it was in the middle ages, essentially a handicraft, and it requires a high order of skill. His rough material is a bar of cast and hammered steel tapering from the centre to the ends; when this is cut in two each half is made into a sword. The "tang" which fits into the handle is not part of the blade, but a piece of wrought iron welded on to its base. From this first stage to the finishing of the point it is all hammer and anvil work. Special tools are used to form grooves in the blade according to the regulation or other pattern desired, but the shape and weight of the blade are fixed wholly by the skilled hand and eye of the smith. [Machine forging in the early stages is now common, and there is no difficulty in making the blade and tang of the same metal.] Measuring tools are at hand, but are little used. Great care is necessary to avoid overheating the metal, which would produce a brittle crystalline grain, and to keep the surface free from oxide, which would be injurious if hammered in. In tempering the blade the workman judges of the proper heat by the colour. Water is preferred to oil by the best makers, notwithstanding that tempering in oil is much easier. With oil there is not the same risk of the blade coming out distorted and having to be forged straight again (a risk, however, which the expert swordsmith can generally avoid) ; but the steel is only surface-hardened, and the blade therefore remains liable to bend. [This is disputed.] Machinery comes into play only for grinding and polishing, and to some extent in the manufacture of hilts and appurtenances. The finished blade is proved by being caused to strike a violent blow on a solid block with the two sides flat, with the edge, and lastly with the back; after this the blade is bent flatwise in both directions by hand, and finally the point is driven through a steel plate about an eighth of an inch thick. In spite of all the care that can be used both in choice of material and in workmanship, about 40% of the blades thus tried [now only about 10%] fail to stand the proof, and are rejected. The

process we have briefly described is that of making a really good sword; of course, plenty of cheaper and commoner weapons are in the market, but they are hardly fit to trust a man's life to. It is an interesting fact that the peculiar skill of the swordsmith is in England so far hereditary that it can be traced back in the same families for several generations.

The best Eastern blades are justly celebrated, but they are not_ better than the best European ones; in fact, European swords are often met with in Asiatic hands, remounted in Eastern fashion.

SWORD

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The " damascening " or " watering " of choice Persian and Indian arms is not a secret of workmanship, but is due to the peculiar manner of making the Indian steel itself, in which a crystallizing process is set up; when metal of this texture is forged out, the result is a more or less regular wavy pattern running through it. There were early medieval damascened (in German called wurmbunte) blades. No difference is made by this in the practical qualities of the blade. (F. Po.)

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Fig. 6.

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a

Fig. 9.

(Figs. 6, 8, 9, Messrs Wilkins & Co. Fig. 7 , H.M. War Office.)

Fig.

Length of

Blade from

hilt to point.

Weight without Scabbard.

Material

of Scabbard.

4 5

6

7

8 9

French cavalry sword (men),

pattern 1898

German cavalry sword (men),

pattern 1889

British cavalry sword (officers) British cavalry sword (men),

pattern 1908 (two sizes) British infantry sword (officers) British general officer's sword.

Inches.

35

32 §

35

j 35i&34l j

3 2 2

32i

lb. oz.

2 6

2 8i

2

2 I3j & 2 15J

2 3 1 12

Steel .with wood lining.

2. Modern Military Swords. — The present military swords are descended from the straight " back-sword " and the Eastern scimitar or talwar. The difference between the curved " sabre " and straight " sword " has been preserved abroad, not only in fact but in name {e.g. in German, Degen stands for the straight, and Sabel for the curved, sword), though in English the single word " sword " covers both varieties. The shape of the sword has varied considerably at different times; this is due to the fact

that it is practically impossible to decide by trial whether a straight or a curved sword is the better under all circumstances. The trooper can use his sword in three different ways — to cut, to guard and to point; and his success depends upon the training of his horse, his skill in horsemanship, and, above all, upon the dexterity and methods of his adversary. Thus the effect the cavalryman can produce in combat depends upon much besides his arm or arms, and those other con- ditions cannot be reproduced accurately enough to make trustworthy tests. The result is that changes have often been made in cavalry armament under the erroneous impression that the arm used has been the main cause of success. The Ottoman cavalry up to the end of the 18th century was regarded as one of the best in Europe, and so much was it dreaded that the Austrians and Russians in their wars with Turkey at that time often carried " chevaux-de-frise " to protect their infantry against these redoubtable horse- men. The curved European cavalry sabre so long in use may undoubtedly be traced to this cause, the superiority of the Turks being put down to their curved scimitars, though there can be no doubt that horsemanship and dash were really the dominating factors.

The shape of the sword to be chosen depends obviously on the purpose for which it is mainly intended. If for cutting a curved blade, and for thrusting a straight and pointed one, will be adopted. The question naturally arises as to which is the better plan to adopt, and it is improbable that a definite answer can ever be given to it. The French, for instance, in 1822 adopted a curved blade for a short time for all their cavalry, and in 1882 again for a short time a straight blade, and in 1898 again a straight blade. In this much-debated matter the facts appear to be as follows: A determined thrust, especially when delivered by a horseman at full speed, is difficult to parry: if it gets home, it will probably kill the recipient outright or disable him for the rest of the campaign. That this is the case is borne out by the very large proportion of killed as compared with wounded in the British cavalry when engaged with that of the French in the Peninsular War, the French making much use of the point, and their heavy cavalry being armed with a long straight- sword. On the other hand, to deliver a bold thrust, while dis- regarding the uplifted sword of the adversary, and leaving one's

own body and head open to an impending blow, demands complete confidence that the thrust will get home before the blow can descend, or that the adversary's cut will probably be weakened by a momentary uncertainty as to whether it would not be better to convert the intended cut into a parry. Such confidence, it is argued with much truth, can only be the fruit of long training, especially as it is the natural tendency of all men to cut when excited ; therefore, as the trooper in modern armies will often be a reservist who has not been able to keep up his swordsmanship, or a young soldier liable to lose his head and forget the lessons of peace in the excitement of the melee, it is considered by many most unwise to adopt a sword with which a powerful cut cannot be delivered as well as an effective thrust. The swords recently adopted by most nations have represented a compromise. They have blades which are nearly straight, but of suffi- cient weight towards their points to enable an efficient cut to be delivered with them. France, however, in 1898 decided on a long straight sword designed wholly for thrusting (see fig. 1), practically identical with that which was in use about a century ago. The following year Great Britain introduced a slightly curved weapon, but in 1908 a new sword was adopted which has a long straight blade and is intended to be used chiefly for thrusting.

As regards the swords worn by officers and men of corps other than cavalry, no remarks are necessary. As long as they are worn they should be efficient ; but with the officer the sword is largely a badge of rank. From 1901 to 1908 the sword was worn only for ceremonial purposes by British infantry officers, but in the latter year it was again ordered to be worn on active service and at manoeuvres. Mounted men in general wear cavalry swords, and swords are also worn by warrant officers and by certain staff-sergeants of dismounted arms and branches.

A good sword should be elastic, so as to stand bending or a heavy blow without breaking or permanent deformation, and yet stiff enough to deliver a powerful thrust without yielding too readily from the straight ; it must also be as light as is possible consistently

with strength, and well balanced. All four desiderata are met in the main by the use of a suitable steel, properly treated and disposed, but balance is also dependent on the weight and form of the hilt. As regards the effect of disposition, grooving or " fullering " the flats of the blade reduces weight without impairing strength, and is now very largely adopted.

The operations of manufacture, as carried out at the Royal Small Arms

Factory at Enfield, may be described briefly as follows, the weapon being the pattern 1899 cavalry sword, which was slightly curved : —

The steel blank, about i7"Xi|"Xi", is heated and drawn out to about double its length under a mechanical hammer; it is then reheated and rolled out between rolls suitably shaped, and the fullers formed ; the tang (to which the hilt and grips are ultimately attached) is then formed by stamping under a machine hammer, and the blade is cut to length and roughly pointed. The blade, though approximately in its finished form, is now straight; the fins are ground off, the tang annealed, the blade set for grinding, and afterwards rough-ground. It is heated and set to curve in a press, then reheated and hardened by being plunged into a bath of oil kept cool by a water jet. On removal from the bath the blade is dead hard and so brittle that it can be broken by a slight blow, and consequently has to be let down by tempering. This is accom- plished by heating in a bath of molten lead until the steel assumes a particular colour, at which stage, while hot, the blade is adjusted for straightness and curve, this being a delicate operation, as it must be performed while the blade retains its temper and heat before finally cooling. It is now ground to size, and the tang, which, though not hardened purposely, is harder than is desired for machining, is softened by cooling, and machined to the required form. The blade is then ground, reheated to spring temper and set, then tested as follows: When tempered and set before polishing it is fixed in a machine and caused to strike an oak block with a blow of 120 lb with both its edge and back, and with similar blows, but with a force of 60 lb, with both flats. These tests detect flaws, and over or under tempering, by the breakage or distortion of the blade, the blows by the flat being particularly searching tests. If the blade passes the above tests, it is then placed vertically in a machine and shortened 5 in. by bending towards each flat, and must recover perfect straightness; it is then shortened I in., and must recover itself when supporting a weight of 35 lb bearing on its tang. This tests the elasticity of the blade. After polishing it is again tested for stiffness as above, and must recover perfect straightness, but only under 32 lb, and for elasticity by a further shortening of 5 in., but towards one flat only.

The introduction of the system described above has greatly simplified and cheapened the process of manufacture, while the greater excellence of the product and the severe and certain tests applied, to it by mechanical means have increased the standard of efficiency of the swords in the hands of the troops. It is certainly true that, of old, excellent blades were occasionally turned out by hand, but they were exceedingly costly, and the average merit of sword-blades when turned out in numbers by hand was poor. It must not, however, be supposed that the regular methods described have eliminated the necessity for personal skill. The steel can still be spoilt by over- or under- heating, whether for rolling or hardening; .tempering and

setting require much experience and skill, and blades can be easily injured both in form and temper by unskilful grinding. Sword-making, therefore, though not the somewhat uncertain art it once was, still requires skilled craftsmen for its successful accomplishment.

(H. W. B.;F. Po.)

Authorities. — The following list of works is intended to guide the reader, if desired, to fuller acquaintance with the literature and authorities of the subject : —

Archaeology and General History. — R. Forrer, " Der Werdegang von Dolch und Schwert," introduction to Die Schwerter und Schwert- knaufe der Sammlung Carl von Schwerzenbach (Leipzig, 1905), the best monograph ; Dr Julius Naue, Die vorromischen Schwerter aus Kupfer, Bronze und Risen (Munich, 1903), with atlas of illustrations, a standard work for the prehistoric periods (neither of these authors has been able to use the Cretan materials) ; R. F. Burton, The Book of the Sword (only I vol. published; London, 1884); Colonel Lane Fox (afterwards Maior-General Pitt- Rivers), Catalogue of Anthropological Collection, South Kensington Museum (London, 1874); "Primitive Warfare," in Journal of the Royal United Service Institution (1867, 1868, 1869). For special regions and periods, see Lord Egerton of Tatton, Indian and Oriental Armour (London, 1896); Lindenschmit, Tracht und Bewaffnung des rbmischen Heeres wahrend der Kaiserzeit (Brunswick, 1882) ; Drum-mond and Anderson,, Ancient Scottish Weapons (Edinburgh and London, 1881). The general treatises and handbooks on arms and armour, such as Grose, Meyrick, Hewitt, Lacombeand Demmin, may be consulted with advantage, but with caution in details. The same may be said of published catalogues of museums and private collections. W. Boeheim, Handbuch der Waffenkunde (Leipzig, 1900); R. C. Clephan, The Defensive Armour and the Weapons and Engines of War of Medieval Times and of the Renaissance (London, 1900); Ashdown, British and Foreign Arms and Armour (London, 1909); and G. F. Laking, The Armour of Windsor Castle (European

section; London, 1904), are trustworthy guides. " The Forms and History of the Sword," in Proceedings of the Royal Institution (1883), by the present writer, reprinted in Oxford Lectures, &c. (London, 1890), gives further references and citations on various points.

Swordsmanship. — Egerton Castle, Schools and Masters of Fence from the Middle Ages to the Eighteenth Century (including a critical bibliography; London, 1892); Carl A. Thimm, Bibliography of Fencing and Duelling (London, 1896). For the beginnings of the art in Italy, Flos duellatorum (a

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For the technique of Japanese swords, see A. Dobree, " Japanese Sword Blades," Archaeol. Journal, lxii. 1, 218 (London, 1905); as to export of European blades to India, Lord Dillon, " Arms and Armour Abroad," ibid. 67, 69-72. (F . Po.)

SWORDFISH, the name given to a small family of spiny- rayed fishes (Xiphiidae), the principal characteristic of which consists in the prolongation of the upper jaw into a long pointed sword-like weapon. The " sword " is formed by the coalescence of the intermaxillary and maxillary bones, which possess an extremely hard texture; it has the shape of a much elongated cone, more or less flattened throughout its whole length; the end is sharply pointed. It is smooth above and on the upper part of the sides, and rough below owing to the presence of innumerable rudimentary teeth, which have no function.

The general form of the body is well proportioned, somewhat elongate, and such as is always found in fishes with great power

Swordfish {Histiophorus pulchellus).

of swimming, as, for instance, in the mackerel and tunny, and the tail terminates in a powerful bilobed caudal fin. A long fin occupies nearly the whole length of the back, whilst the ana] fin is generally interrupted in the middle and consequently appears to be double. The skin is very firm, partly naked, partly with small lanceolate scales deeply embedded in the skin. The teeth of the lower jaw are, like those of the upper, merely rudimentary structures, which render the surface of the bone rough without possessing any special function.

Swordfishes have been divided into three generic groups: —

a. Histiophorus, with a high dorsal fin which can be spread out like a sail, and with ventral fins which are reduced to a pair of long styliform appendages.

b. Tetrapturus, with a dorsal fin of which the anterior rays only are elongate, the remainder of the fin being low or partly obsolete, and with styliform ventral fins as in the preceding genus.

c. Xiphias, with the dorsal fin shaped as in Tetrapturus, but without ventral fins.

Swordfishes are truly pelagic fishes, which either singly or in pairs or in smaller or larger companies roam over the oceans of the tropical and subtropical zones of both hemispheres. Some species wander regularly or stray far into the temperate seas. Some of the tropical forms are the largest of Acanthopterygian fishes, and not exceeded in size by any other Teleostean; such species attain to a length of from 12 to 15 ft., and swords have been preserved more than 3 ft. long and with a diameter of at least 3 in. at the base. The Hisliophori, which inhabit chiefly the Indo-Pacific

Ocean, but occur also in the Atlantic, seem to possess in their high dorsal fin an additional aid for locomotion. During the rapid movements of the fish this fin is folded down- wards on the back, as it would impede the velocity of progress by the resistance it offers to the water; but, when the fish is swimming in a leisurely way, it is frequently seen with the fin

erected, and projecting out of the water, and when quietly floating on the surface it can sail by the aid of the fin before the wind, like a boat.

The food of the swordfishes is the same as that of tunnies, and consists of smaller fish, and probably also in great measure of pelagic cuttle-fishes. It has been ascertained by actual observation that swordfishes procure their food by dashing into a school of fishes, piercing and killing a number of them with their swords; and this kind of weapon would seem to be also particularly serviceable in killing large cuttle-fish, like the saw of sawfishes, which is used for the same purpose. But the swords of the large species of Histiophorus and Tetrapturus are, besides, most formidable weapons of aggression. These fishes never hesitate to attack whales and other large cetaceans, and, by repeatedly stabbing them, generally retire from the combat victorious. That they combine in these attacks with the thresher-shark is an often-repeated story which is discredited by some naturalists on the ground that the dentition of the thresher-shark is much too weak to make an impression on the skin of any cetacean. The cause which excites swordfishes to such attacks is unknown; but they follow the instinct so blindly that they not rarely assail boats and ships in a similar manner, evidently mistaking them for cetaceans. They easily pierce the light canoes of the natives of the Pacific islands and the heavier boats of the professional swordfish fishermen, often dangerously wounding the persons sitting in them. Attacks by swordfishes on ocean-going ships are so common as to be included among sea-risks: they are known to have driven their weapon through copper-sheathing, oak-plank and timber to a depth of nearly 10 in., part of the sword projecting into the inside of the ship; and the force required to produce such an effect has been described by Sir R. Owen in a court of law as equal to ” the accumulated force of fifteen double-handed hammers,” and the velocity as ” equal to that of a swivel-shot ” and ” as dangerous in its effects as a heavy artillery projectile.” Among the specimens of planking pierced by swordfishes which are preserved in the British Museum there is one less than a foot square which encloses the broken ends of three swords, as if the fishes had had the object of concentrating their attack on the same vulnerable point of their supposed enemy. The part of the sword which penetrates a ship’s side is almost

always broken off and remains in the wood, as the fish is unable to execute sufficiently powerful backward movements to free itself by extracting the sword.

In the Mediterranean and on the Atlantic coasts of the United States the capture of swordfishes forms a regular branch of the fishing industry. The object of the fishery in the Mediterranean is the common European swordfish (Xiphias gladius), the aver- age weight of which is about 1 cwt., and which is abundant off the Sicilian coasts and on the opposite coast of Calabria. Two methods are employed — that by harpoons, chiefly used for larger fish, and that by peculiarly constructed nets called palamilare. This fishery is very productive: a company of fishermen frequently capture from twenty to fifty fish in a single day, and the average annual catch in Sicily and Calabria is reported to be 140,000 kilogrammes (138 tons). The products of the fishery are consumed principally in a fresh state, but a portion is preserved in salt or oil. The flesh of the swordfish is much preferred to that of the tunny, and always commands a high price. This species is occasionally captured on the British coast.

On the coast of the United States a different species, Histio- phorus gladius, occurs; it is a larger fish than the Mediterranean swordfish, attaining to a length of from 7 to 12 ft. and an average weight of 300 or 400 lb. It is captured only by the use of the harpoon. From forty to fifty vessels, schooners of some 50 tons, are annually engaged in this fishery, with an aggregate catch amounting annually to about 3400 swordfishes, of a value of $45,000. The flesh of this species is inferior in flavour to that of the Mediterranean species, and is principally consumed after having been preserved in salt or brine.

Useful and detailed information on the swordfish fishery can be obtained from A. T. Tozzetti, " La Pesca nei mari d'ltalia e la

pesca all' estero esercitata da Italiani," in Catalogo esposizione inlemazionale di pesca in Berlino (1880) ; also from La Pesca del pesce-spada nello Stretto di Messina (Messina, 1880), and from G. Brown Goode, " Materials for a History of the Sword-fish," in Report of the Commissioner of Fish and Fisheries, pt. viii. (Washington, 1883). (A. C. G.)

SWYNFORD, CATHERINE (c. 1350-1403), wife of John of Gaunt, duke of Lancaster, was a daughter of Sir Payne Roelt, a knight who came to England from Hainault in the train of Edward III.'s queen, Philippa. About 1367 she married Sir Hugh Swynford (1340-1372), a Lincolnshire man, by whom she had a son, Thomas {c. 1368-1433), who was a friend and com- panion of Henry IV. both before and after he came to the English

throne. Soon after her husband's death in 1372 Catherine became the mistress of John of Gaunt, and in 1396, nearly two years after the duke had become a widower for the second time, she was married to him at Lincoln. She died at Lincoln on the 10th of May 1403. By John of Gaunt Catherine had four children, all of whom were born before their marriage. They were declared legitimate in 1397 and took the name of Beaufort from one of their father's castles in Anjou (see Beaufort).

SYAGRIUS (d. 487), the last of the independent Roman administrators of Gaul, was the son of Aegidius, who had seized Gaul while Ricimer was master of Italy. From 464 to 486 he governed that part of Gaul which lies between the Maas, the Scheldt and the Seine, and was termed " king of the Romans " by the German invaders, Franks, Burgundians and Visigoths, who already occupied the rest of Gaul. Defeated in 486 by Clovis, king of the Salian Franks, at the battle of Soissons, Syagrius fled, leaving his land at the mercy of the Franks. He sought refuge with Alaric II., king of the Visigoths, at Toulouse, but Alaric imprisoned him instead of granting him refuge, and delivered him up to Clovis. He was executed in 487, secretly and by the sword, according to Gregory of Tours.

SYBARIS, a city of Magna Graecia, on the Gulf of Tarentum, between the rivers Crathis (Crati) and Sybaris (Coscile), which now meet 3 m. from the sea, but in ancient times had independent mouths, was the oldest Greek colony in this region. It was an Achaean colony founded by Isus of Helice (about 720 B.C.), but had among its settlers many Troezenians, who were ultimately expelled. Placed in a very fertile, though now most unhealthy, region, and following a liberal policy in the admission of citizens from all quarters, the city became great and opulent, with a vast subject territory and divers daughter colonies even on the Tyrrhenian Sea (Posidonia, Laus, Scidrus). For magnificence and luxury the Sybarites were proverbial throughout Greece, and in the 6th century probably no Hellenic city could compare with its wealth and splendour. At length contests between the democrats and oligarchs, in which many of the latter were expelled and took refuge at Crotona, led to a war with that city, and the Crotoniats with very inferior forces were com- pletely victorious. They razed Sybaris to the ground and turned the waters of Crathis to flow over its ruins (510 B.C.). Explora- tions undertaken by the Italian government in 1879 and 1887 failed to lead to a precise knowledge of the site. The only discoveries made were (1) that of an extensive necropolis, some 8 m. to the west of the confluence of the two rivers, of the end of the first Iron age, known as that of Torre Mordillo, the contents of which are now preserved at Potenza; (2) that of a necropolis of about 400 B.C. — the period of the greatest prosperity of Thurii (q.v.) — consisting of tombs covered by tumuli (called locally timponi), in some of which were found fine gold plates with mystic inscriptions in Greek characters; one of these tumuli was over 90 ft. in

diameter at the base with a single burial in a sarcophagus in the centre.

See F. Lenormant, La Grande-Grice, 1. 325 seq. (Paris, 1881); F. S. Cavallari, in Notizie degli Scavi (1879, passim; 1880, 68, 152); A. Pasqui, ibid. (1888), 239, 462, 575, 648; P. Orsi, in AM del con- gresso di scienze storiche, v. 195 sqq. (Rome, 1904) (T. As.)

SYBEL, HEINRICH YON (1817-1895), German historian, sprang from a Protestant family which had long been established at Soest, in Westphalia. He was born on the 2nd of December 1817 at Dusseldorf, where his father held important posts in

the public service both under the French and the Prussians; in 183 1 he had been raised to the hereditary nobility. His home was one of the centres of the vigorous literary and artistic life for which at that time Diisseldorf was renowned. Sybel was educated at the gymnasium of his native town, and then at the university of Berlin, where he came under the influence of Savigny and of Ranke, whose most distinguished pupil he was to become. After taking his degree, he settled down in 1841 as Privatdozent in history at the university of Bonn. He had already made himself known by critical studies on the history of the middle ages, of which the most important was his Geschichte des ersten Kreuzzuges (Diisseldorf, 1841; new ed., Leipzig, 1881), a work which, besides its merit as a valuable piece of historical investigation, according to the critical methods which he had learnt from Ranke, was also of some significance as a protest against the vaguely enthusiastic attitude towards the middle ages encouraged by the Romantic school. Lady Duff-Gordon published in 1861 an English translation of part of this book, to which are added lectures on the crusades delivered in Munich in 1858, under the title History and Literature of the Crusades. This was followed by a study on the growth of German kingship (Die Entstehung des deutschen Konigtums, Frankfort, 1844, and again 1881), after which he was appointed professor.

In the same year (1844) Sybel came forward prominently as an opponent of the Ultramontane party. The exhibition of the Holy Coat at Trier had attracted enormous numbers of pilgrims, and so, indignant at what appeared to him an imposture, he assisted to publish an investigation into the authenticity of the celebrated relic. From this time he began to take an active part in contemporary politics and in controversy as a strong though moderate Liberal. In 1846 he was appointed professor at Marburg, and though this small university offered little scope for his activities as a

teacher, a seat in the Hessian Landtag gave him his first experience of political affairs. In 1848 he was present at Frankfort, but he did not succeed in winning a seat for the National Assembly. His opposition to the extreme democratic and revolutionary party made him unpopular with the mob, who broke his windows, as his liberalism made him suspected at court. He sat in the Erfurt parliament of 1850, and was attached to the Gotha party, which hoped for the regeneration of Germany through the ascendancy of Prussia. During the years that followed all political activity was impossible, but he was fully occupied with his great work Geschichte der Revolutionszeit 187Q-1800, for which he had made prolonged studies in the archives of Paris and other countries. The later editions of the earlier volumes are much enlarged and altered, and a new edition was published at Stuttgart in 1882. The first three volumes have been translated into English by W. C. Perry (1867-1869). In this work he for the first time showed the connexion between the internal and external history of France; he was also the first, by a systematic study of the records, to check and correct the traditional account of many episodes in the internal history. His demonstration that letters attributed to Marie Antoinette were not genuine" roused much interest in France. For the history of German thought it was of the greatest importance that a Liberal from the Rhine, by a systematic history of the Revolution, attempted to over- throw the influence which the revolutionary legend, as expounded by French writers, had acquired over the German mind; and the book was an essential part of the influences which led to the formation of a National Liberal school of thought. Sybel had been much influenced by Burke, on whom he had published two essays. The work was in fact the first attempt to substitute for the popular representations of Thiers and Lamartine the critical investigation which has been carried on with such brilliance by Taine and Sorel.

In 1856, on the recommendation of Ranke, Sybel accepted the post of professor at Munich, where King Maximilian II. of Bavaria, a wise and generous patron of learning, hoped to establish a school of history. He found here a fruitful field for his activity. Besides continuing his work on the Revolution

and on the middle ages, he was occupied with the Historical Seminar which he instituted; with the Historische Zeitschrift which he founded, the original arid model of the numerous technical historical publications which now exist; and as secretary of the new historical commission. Political differences soon interfered with his work; as an adherent of Prussia and a Protestant, especially as a militant champion against the Ultramontanes, he was from the first an object of sus- picion to the Clerical party. In the political excitement which followed the war of 1859 he found that he could not hope for the unreserved support of the king, and therefore in 1861 he accepted a professorship at Bonn, which he held till 1875. He was at once

elected a member of the Prussian Lower House, and during the next three years was one of the most active members of that assembly: in several important debates he led the attack on the government, and opposed the policy of Bismarck, not only on financial but also on the Polish and Danish affairs. In 1864 he did not stand for re-election, owing to an affection of the eyes, but in 1866 he was one of the first to point out the way to a reconciliation between Bismarck and his former opponents. He had a seat in the Constituent Assembly of 1867, and while he joined the National Liberals he distinguished himself by his opposition to the introduction of universal suffrage, the effects of which he, as did many other Liberals, much distrusted. In 1874 he again accepted a seat in the Prussian parliament, in order to support the government in their conflict with the Clericals, and after 1878 with the Socialists. In two pamphlets, by an analysis of the teaching of the Socialists and a survey of Clerical policy during the 19th century, he explained and justified his opinions. In 1880 he retired, like so many other Liberals, disheartened by the change in political life, which he attributed to universal suffrage.

In 1875 he had been appointed by Bismarck to the post of director of the Prussian archives. Under his superintendence was begun the great series of publications, besides that of the correspondence of Frederick the Great, in the editing of which he himself took part. His last years were occupied on his great work, Die Begriindung des deutschen Reiches durch Wilhelm I. (Munich, 1889-1894), a work of great importance, for he was allowed to use the Prussian state papers, and was therefore enabled to write a history of the greatest events of his own time with full access to the most secret sources of information. As a history of Prussian policy from i860 to 1866 it is therefore of incomparable value. After the fall of Bismarck the permission to use the secret papers was withdrawn, and therefore vols. vi. and vii., which deal with the years 1866 to 1870, are of less importance. This work has been translated into English as The Founding of the German Empire, by M. L. Perrin and G. Bradford (New York, 1890-1891). Sybel did not live to write the account of the war with France, dying at Marburg on the 1st of August 1895. His other writings include Die deutsche Nation und das Kaiserreich (1862) and a large number of historical articles.

Sybel left two sons, one of whom became an officer in the Prussian army; the other, Ludwig von Sybel (b. 1846), pro- fessor of archaeology in the university of Marburg, is the author of several works dealing with Greek archaeology.

Some of Sybel's numerous historical and political essays have been collected in Kleinc historische Schriften (3 vols., 1863, 1869, 1881; new ed., 1897); Vortrage und Aufsatze (Berlin, 1874); and Vortrage und Abhandlungen, published after his death with a biographical introduction

by C. Varrentrapp (Munich, 1897).

SYCOPHANT (Gr. avKoˆavr-qs) , in ancient Greece the counter- part of the Roman delator (q.v.), a public informer. According to ancient authorities, the word (derived by them from (jvkov, " fig, "and 4 > aiv&.v, " to show ") meant one who informed against another for exporting figs (which was forbidden by law) or for stealing the fruit of the sacred fig-trees, whether in time of famine or on any other occasion. Another old explanation was that fines and taxes were at one time paid in figs, wine and oil, and those who collected such payments in kind were called sycophants because they " presented," publicly handed them

over to the state. Bockh suggested that the word signified one who laid an information in reference to an object of trifling value, such as a fig (cf. " I don't care a fig about it "), but there seems no authority for such a use of ovkov in Greek. According to C. Sittl {Die Gebdrden der Griechen und Romer, Leipzig, 1890), the word refers to an obscene gesture of phallic significance (see also A. B. Cook in Classical Review, August 1907), called " showing the fig " (faire lafigue,far lafica or lefiche), originally prophylactic in character. Such gesture, directed towards an inoffensive person, became an insult, and the word sycophant might imply one who insulted another by bringing a frivolous or malicious accusation against him. According to S. Reinach (Revue des eludes grecques, xix., 1906), who draws special attention to the similar formation " hierophant, " the sycophant was an official connected with the cult of the Phytalidae, whose epony- mus Phytalus was rewarded with a fig-tree by the wandering Demeter in return for his hospitality. The final act of the cult, the " exaltation " of the fig, with which Reinach compares the " exaltation " of the ear of corn by the hierophant at the Eleusinian mysteries, was performed by the sycophant. Again, like the hierophant, the sycophant publicly pronounced the formula of exclusion of certain unworthy persons from the celebration of the mysteries of the fig. As the cult of the Phytalidae sank into insignificance beside the greater mysteries, the term sycophant survived in popular language in the sense of an informer or denouncer, whose charges deserved but little consideration. L. Shadwell suggests that the real meaning is " fig-discoverer," not " fig-informer," referring to the blackmailer who discovers the " figs " (that is, the money) of the rich man and forces him to hand it over by the threat of bringing a criminal accusation against him. It must be remembered that any Athenian citizen was at liberty to accuse another of a public offence, and the danger of such a privilege being abused is sufficiently obvious. The people naturally

looked upon all persons of wealth and position with suspicion, and were ready to believe any charge brought against them. Such prosecutions also put money into the pockets of the judges, and, if successful, into the public treasury. In many cases the accused persons, in order to avoid the indignity of a public trial, bought off their accusers, who found in this a fruitful source of revenue. Certain legal remedies, intended to prevent the abuses of the system, undoubtedly existed. Persons found guilty of bringing false charges, of blackmail, or of suborning false witnesses, were liable to criminal prosecution by the state and a fine on conviction. Penalties were also inflicted if an accuser failed to carry the prosecution through or to obtain a fifth part of the votes. But these remedies were rather simple deterrents, and instances of informers being actually brought to trial are rare. Sycophants were an inseparable accompaniment of the democracy, and the profession, at least from a political point of view, was not regarded as in any way dishonourable. The idea of encouraging the citizens to assist in the detection of crime or treason against the state was commendable; it was not the use, but the abuse of the privilege that was so injurious. Allusions to the sycophants are frequent in Aristophanes and the Attic orators. The word is now generally used in the sense of a cringing flatterer of the great.

See Meier and Schomann, Der attische Process (ed. J. H. Lipsius, 1883-1887); article by C. R. Kennedy and H. Holden, in Smith's Dictionary of Antiquities (3rd ed., 1891).

SYDENHAM, CHARLES EDWARD POULETT-THOMSON,

ist Baron(i799-i84i), British statesman, was born on the 13th of September 1799, being the son of John Buncombe-Poulett- Thomson, a London merchant. After some years spent in his father's business in Russia and in London he was returned to the House of Commons for Dover in 1826. In 1830 he joined Lord Grey's ministry as vice-president of the board of trade and treasurer of the navy. A free-trader and an expert in financial matters he was elected M.P. for Manchester in 1832, a seat which he occupied for many years. He was continuously occupied with negotiations affecting international commerce until 1839, when he accepted the governor-generalship of Canada,

where it fell to his lot to establish the union of Upper and Lower Canada. His services in establishing the Canadian constitution were recognized in 1840 by a K.C.B. and a peerage. He took the title of Baron Sydenham of Sydenham in Kent and Toronto in Canada. He died unmarried on the 4th of September 1841, when his peerage became extinct.

His Memoirs were published by his brother, G. J. Poulett Scrope, in 1843.

SYDENHAM, THOMAS (1624-1689), English physician, was born on the 10th of September 1624 at Wynford Eagle in Dorset, where his father was a gentleman of property and good pedigree. At the age of eighteen he was entered at Magdalen Hall, Oxford; after a short period his college studies appear to have been interrupted, and he served for a time as an officer in the army of the parliament. He completed his Oxford course in 1648, graduating as bachelor of medicine, and about the same time he was elected a fellow of All Souls College. It was not until nearly thirty years later (1676) that he graduated as M.D., not at Oxford, but at Pembroke Hall, Cambridge, where bis eldest son was then an undergraduate. After 1648 be seems to have spent some time studying medicine at Oxford, but he was soon again engaged in military service, and in 1654 he received the sum of £600, as a result of a petition he addressed to Cromwell, setting forth that various arrears were due to two of his brothers who had been killed and that he himself had faithfully served the parliament with the loss of much blood. In 1655 he resigned his fellowship at All Souls and married, and probably a few years later went to study medicine at Montpellier. In 1663 he passed the examinations of the College of Physicians for their licence to practice in Westminster and 6 m. round; but it is probable that he had been settled in London for some time before that. This minimum qualification to practise was the single bond between Sydenham and the College of Physicians through- out the whole of his career. He seems to hive been distrusted by some members of the faculty because he was an innovator and something of a plain-dealer. In his letter to John Mapletoft he refers to a class of detractors " qui vitio statim vertunt si quis novi aliquid, ab illis non prius dictum vel etiam inauditum, in medium proferat "; and in a letter to Robert Boyle, written the year before his death (and the only authentic specimen of his English composition that remains), he says, "I have the happiness of curing my patients, at least of having it said con- cerning me that few miscarry under me; but [I] cannot brag of my correspondency with some other of my faculty …. Though yet, in taken fire at my attempts to reduce practice to a greater easiness, plainness, and in the meantime letting the mountebank at Charing Cross pass unrailed at, they contradict themselves, and would make the world believe I may prove more considerable than they would have me." Sydenham attracted to him in warm friendship some of the most discriminat- ing men of his time, such as John Locke and Robert Boyle. His first book, Methodus curandi febres, was published in 1666; a second edition, with an additional chapter on the plague, in 1668; and a third edition, much enlarged and bearing the better-known title of Observationes medicae, in 1676. His next publication was in 1680 in the form of two Epistolae respon- soriae, the one, " On Epidemics, " addressed to Robert Brady, regius professor of physic at Cambridge, and the other " On the Lues venerea, " to Henry Paman, public orator at Cambridge and Gresham

professor in London. In 1682 he issued another Dissertatio epistolaris, on the treatment of confluent small-pox and on hysteria, addressed to Dr William Cole of Worcester. The Tractatus de podagra et hydrope came out in 1683, and the Schedula monitoria de novae febris ingressu in 1686. His last com- pleted work, Processus integri, is an outline sketch of pathology and practice; twenty copies of it were printed in 1692, and, being a compendium, it has been more often republished both in England and in other countries than any other of his writings separately. A fragment on pulmonary consumption was found among his papers. His collected writings occupy about 600 pages 8vo, in the Latin, though whether that or English was the I language in which they were originally written h disputed.

Hardly anything is known of Sydenham's personal history in London. He died in London on the 29th of December 1689, and was buried in the church of St James's, Piccadilly, where a mural slab was put up by the College of Physicians in 1810.

Although Sydenham was a highly successful practitioner and saw, besides foreign reprints, more than one new edition of his various tractates called for in his lifetime, his fame as the father of English medicine, or the English Hippocrates, was decidedly posthumous. For a long time he was held in vague esteem for the success of his cooling (or rather expectant) treatment of small-pox, for his laudanum (the first form of a tincture of opium), and for his advocacy of the use of Peruvian bark in quartan agues. There were, however, those among his contemporaries who understood something of Sydenham's importance in larger matters than details of treatment and pharmacy, chief among them being the talented Richard Morton. But the attitude of the academical medicine of the day is doubtless indicated in Martin Lister's use of the term " sectaries " for Sydenham and his admirers, at a time (1694) when the leader had been dead five years. If there were any doubt that the opposition to him was quite other than political, it would be set at rest by the testimony of Dr Andrew Brown, 1 who went from Scotland to inquire into Sydenham's practice and has incidentally revealed what was commonly thought of it at the time, in his Vindicatory Schedule concerning the New Cure of Fevers. In the series of Harveian orations at the College of Physicians, Syden- ham is first mentioned in the oration of Dr John Arbuthnot (1727), who styles him " aemulus Hippocratis." H. Boerhaave, the Leyden professor, was wont to speak of him in his class (which had always some pupils from England and Scotland) as " Angliae lumen, artis Phoebum, veram Hippocratici viri speciem." A. von Haller also marked one of the epochs in his scheme of

medical progress with the name of Sydenham. He is indeed famous because he inaugurated a new method and a better ethics of practice, the worth and diffusive influence of which did not become obvious (except to those who were on the same line with himself, such as Morton) until a good many years afterwards. It remains to consider briefly what his innovations were.

First and foremost he did the best he could for his patients, and made as little as possible of the mysteries and traditional dogmas of the craft. All the stories told of him are characteristic. Called to a gentleman who had been subjected to the lowering treatment, and finding him in a pitiful state of hysterical upset, he "conceived that this was occasioned partly by his long illness, partly by the previous evacuations, and partly by emptiness. I therefore ordered him a roast chicken and a pint of canary." A gentleman of fortune who was a victim to hypochondria was at length told by Sydenham that he could do no more for him, but that there was living at Inverness a certain Dr Robertson who had great skill in cases like his; the patient journeyed to Inverness full of hope, and, finding no doctor of the name there, came back to London full of rage, but cured withal of his complaint. Of a piece with this is his famous advice to Sir Richard Blackmore. When Black- more first engaged in the study of physic he inquired of Dr Sydenham what authors he should read, and was directed by that physician to Don Quixote, " which," said he, " is a very good book; I read it still." There were cases, he tells us, in his practice where " I have consulted my patient's safety and my own reputation most effectu- ally by doing nothing at all." It was in the treatment of small- pox that his startling innovations in that direction made most stir. It would be a mistake, however, to suppose that Sydenham wrote no long prescriptions, after the fashion of the time, or was entirely free from theoretical bias. Doctrines of disease he had, as every practitioner must have ; but he was too much alive to the multi- plicity of new facts and to the infinite variety of individual con- stitutions to aim at symmetry in his theoretical views or at con- sistency between his practice and his doctrines; and his treatment was what he found to answer best, whether it were secundum artem or not. His fundamental idea was to take diseases as they pre- sented themselves in nature and to draw up a complete picture (" Krankheitsbild " of the Germans) of the objective characters of each. Most forms of ill-health, he insisted, had a definite type, comparable to the types of animal and vegetable species. The con- formity of type in the symptoms and course of a malady was due to the uniformity of the cause. The causes that he dwelt upon were the " evident and conjunct causes," or, in other words, the morbid phenomena ; the remote causes he thought it vain to seek after. Acute diseases, such as fevers and inflammations, he regarded as a wholesome conservative effort or reaction of the organism to meet the blow of some injurious influence operating from without; in this he followed the

Hippocratic teaching closely as well as the Hippocratic practice of watching and aiding the natural crises. Chronic diseases, on the other hand, were a depraved state of the humours, mostly due to errors of diet and general manner of life, for which we ourselves were directly accountable. Hence his famous dictum : " acutos dico, qui ut plurimum Deum habent authorem,

1 See Dr John Brown's Horae subsecivae, art. " Dr Andrew Brown ■tnd Sydenham."

sicut chronici ipsos nos." Sydenham's nosological method is essentially the modern one, except that it wanted the morbid anatomy part, which was first introduced into the " natural history of disease " by Morgagni nearly a century later. In both depart- ments of nosology, the acute and the chronic, Sydenham con- tributed largely to the natural history by his own accurate observa- tion and philosophical comparison of case with case and type with type. The Observationes medicae and the first Epistola responsoria contain evidence of a close study of the various fevers, fluxes and other acute maladies of London over a series of years, their differ- ences from year to year and from season to season, together with references to the prevailing weather — the whole body of observa- tions being used to illustrate the doctrine of the " epidemic con- stitution " of the year or season, which he considered to depend often upon inscrutable telluric causes. The type of the acute disease varied, he found, according to the year and season, and the right treatment could not be adopted until the type was known. There had been nothing quite like this in medical literature since the Hippocratic treatise, Ilepi &ipuv, iSarav, rbirup; and there are probably some germs of truth in it still undeveloped, although the modern science of epidemiology has introduced a whole new set of considerations. Among other things Sydenham is credited with the first diagnosis of scarlatina and with the modern definition of chorea (in Sched. monit.). After small-pox, the diseases to which he refers most are hysteria and gout, his description of the latter (from the symptoms in his own person) being one of the classical pieces of medical writing. While Sydenham's " natural history " method has doubtless been the chief ground of his great post- humous fame, there can be no question that another reason for the admiration of posterity was that which is indicated by R. G. Latham, when he says, " I believe that the moral element of a liberal and candid spirit went hand in hand with the intellectual qualifications of observation, analysis and comparison."

Among the lives of Sydenham are one (anonymous) by Samuel Johnson in John Swan's translation of his works (London, 1742), another by C. G. Kilhn in his edition of his works (Leipzig, 1827), and a third by Dr R. G. Latham in his translation of his works published in London by the Sydenham Society in 1848. See also Frederic Picard, Sydenham, sa vie, ses csuvres (Paris, 1889), and J. F. Payne, T. Sydenham (London, 1900). Dr

John Brown's " Locke and Sydenham," in Horae subsecivae (Edinburgh, 1858), is of the nature of eulogy. Many collected editions of his works have been pub- lished, as well as translations into English, German, French and Italian. Dr W. A. Greenhill's Latin text (London, 1844, Syd. Soc.) is a model of editing and indexing. The most interesting summary of doctrine and practice by the author himself is the introduction to the 3rd edition of Observationes medicae (1676).

SYDENHAM, a large residential district in the south of London, England, partly within the metropolitan borough of Lewisham (q.v.). The Crystal Palace (q.v.) is in this district.

SYDNEY, the capital of New South Wales, Australia, in Cumberland county, on the east coast of the continent, situated on the south shore of Port Jackson (q.v.), in 33 15′ 44″ S., 151° 12′ 23″ E. Few capitals in the world can rival Sydney in natural advantages and beauty of site. It stands on undulating and easily drained ground, upon a bed of sandstone rock, on a peninsula jutting into one of the deepest, safest and most beautiful harbours in the world; and in addition it lies in the centre of a great carboniferous area. The metropolitan area of Sydney consists of a peninsula, about 13 m. in length, lying between the Parramatta and George's rivers. The sea frontage of this area stretches for 12 m. from the South Head of Port Jackson to the North Head of Botany Bay; it consists of bold cliffs alternating with beautiful beaches, of which some are connected with the city by tramway, and form favourite places of resort. The city proper occupies two indented tongues of land, having a water frontage on Port Jackson, and extending from Rushcutter's Bay on the east to Blackwattle Bay on the west, a distance of 8 m., nearly two miles of which is occupied by the Domain and the botanical gardens. The business quarter is a limited area lying between Darling Harbour and the Domain. The streets are irregular in width, some of them narrow and close together, while those leading down to Darling Harbour have a steep incline. Sydney has in consequence more than usually the appearance of an old-world town. . The main street of the city, George Street, is 2 m. long, running from north to south; it contains the town-hall, the post office and the Anglican cathedral. The post office is a hand- some sandstone building in Renaissance style; it is colonnaded on two sides with polished granite columns and surmounted by a clock tower, containing a peal of bells. The town-hall, a large

Emery Walker sc.

SYDNEY

florid building of Classic order, stands on an eminence, and its clock tower forms a landmark; it contains the spacious Centennial Hall (commemorating the first Australian colonization here in 1787), and has one of the finest organs in the world. Opposite are the Queen Victoria Markets, a striking Byzantine erection, capped by numerous turrets and domes. Adjoining the town hall is the Anglican cathedral of St Andrew, in the Perpendicular style; it has two towers at the west end and a low central tower above the intersection of the nave and transepts, with a very handsome chapter house. Second in importance to George Street is Pitt Street, which runs parallel to it from the Circular Quay to the rail- way station; Macquarie Street runs alongside the Domain and contains a number of public buildings, including the treasury, the office of public works, the houses of parliament and the mint. In Bridge Street, behind the office of public works, are the ex- change and the crown lands office. All these government offices are in classical style. The Roman Catholic Cathedral of St Mary lies on the north-east side of Hyde Park; it is a splendid Gothic structure, the finest in Australia. This cathedral has been twice destroyed by fire, and the existing building, from the designs of Mr W. W. Wardell, was consecrated in 1905. Govern- ment House, the residence of the governor-general, an excellent Tudor building erected in 1837, an d several times enlarged, is delightfully situated in the Domain, overlooking Farm Cove. The residence of the state governor is at Rose Bay, east of the city. At the top of King Street there is a statue of Queen Victoria and close by a statue of Prince Albert, at the entrance to Hyde Park, in which the most elevated spot is occupied by a statue of Captain Cook. The university stands in its own grounds on the site of Grose Farm, the scene of one of the earliest attempts at government farm- ing. Like most of the buildings at Sydney, the university is built of the excellent sandstone from the quarries of Pyrmont; it is 15th-century Gothic in style and stands at the top of a gentle slope, surrounded by gardens. Around it lie three Gothic colleges in the 14th-century style, affiliated to the university and known as St Paul's, St John's and St Andrew's. They are residential colleges belonging respectively to the Anglicans, Roman Catholics and Presbyterians. The university provides instruction and grants degrees in arts, law, medicine, science and engineering; instruction in theology, however, is given, not by the university, but by the different affiliated colleges.

To compensate for the narrowness of its streets and its lack of fine promenades Sydney possesses a number of grand parks, surpassed in few other capitals. Hyde Park is a plateau almost in the centre of the city, which in the early days of Sydney was used as a race-course. Adjoining are two smaller parks, Cook Park and Philip Park, while north of these stretches the Domain and the botanical gardens. The Domain embraces

138 acres, extending along one side of Woolloomooloo Bay and surrounding Farm Cove, in which the warships belonging to the Australian station are usually anchored; in this charming expanse of park land are the governor's residence and the National Art Gallery, which houses a splendid collection of pictures by modern artists, statuary, pottery and other objects of art. The botanical gardens on the southern shores of Farm Cove are the finest in the Commonwealth and are distinguished for their immense collection of exotics. On the south-east of the city lie Moore Park, 600 acres in extent, containing two fine cricket grounds and the show grounds of the agricultural society, and Centennial Park, formerly a water reserve of 768 acres. Adjoining Moore Park is the metropolitan race-course of Rand wick. There are numerous other and smaller parks, of which the chief are Wentworth Park laid out on the site of Blackwattle Swamp, Prince Alfred Park, Belmore Park and Victoria Park adjoining the university grounds.

Sydney harbour is divided into a number of inlets by pro- jecting headlands. The head of Woolloomooloo Bay, Sydney Cove, the shallow bay between Dawes and Millers Point, and Darling Harbour, are lined with wharves. The Circular Quay at the head of Sydney Cove is 1300 ft. long, and here all the great ocean liners from Europe, China and Japan are berthed,

while to the great wharf in Woolloomooloo Bay, 3000 ft. in length, the American liners and the majority of the' small coasting vessels come to discharge their cargoes. The whole of the eastern side of Darling Harbour is occupied by a succession of wharves and piers, there being in all 4000 ft. of wharfage. Connected with the main railway system of the colony is the Darling Harbour Wharf 1260 ft. long and equipped with electric light, stationary and travelling hydraulic cranes, machinery for meat freezing, and large sheds for storing corn and wool. In addition to these there are wharves at Pyrmont and Blackwattle Bay, respectively 3500 ft. and 1400 ft. long. These harbours on the eastern side of Sydney are mainly frequented by cargo boats trading in coal, corn, frozen meat, wool, hides and various ores. The total length of quays and wharves belonging to the port amounts to some 23 m. The dock accommodation is extensive. On Cockatoo Island, a few miles west of the city, the government have two large dry docks, the Fitzroy dock, 450 ft. long, and the Sutherland dock, 630 ft. Mort's dock, another large dry dock, is at Mort's Bay, Balmain, while there are five floating docks with a combined lifting power of 3895 tons, and the three patent slips in Mort's Bay can raise between them 3040 tons. Prior to 1899 the jurisdiction of the port was in the hands of a marine board, three members of which were elected by the shipping interest, and the remaining four nominated by the government, but in that year the board was replaced by a single official, known as the

superintendent of the department of navigation and responsible to the colonial secretary.

Sydney has a great number of learned, educational and charit- able institutions; it possesses a Royal Society, a Linnean Society and a Geographical Society, a women's college affiliated to the university, an astronomical observatory, a technical college, a school of art with library attached, a bacteriological institute at Rose Bay, a museum and a free public library. Standing in the centre of a great coal-bearing basin, Sydney is naturally the seat of numerous manufactures, to the prosperity of which the abundance and cheapness of coal has been highly conducive. In addition to the industries connected with the shipping, large numbers of hands are employed in the government railway works, where the locomotives and rolling stock used by the state railways are manufactured. There are several large tobacco factories, flour mills, boot factories, sugar refineries, tanneries, tallow works, meat-preserving, glue and kerosene-oil factories and soap works. Clothing, carriages, pottery, glass, paper and furniture are made, and there are numerous minor industries.

Sydney is governed municipally by a city council. The gas and electric lighting is in the hands of private firms. The adminis- tration of the park, the city improvements and the water and sewerage departments have been handed over to boards and trusts. The control of the traffic is in the hands of the police, who, with the wharves and the tramways, are directed by the state government. The whole district between Sydney and Parramatta on each side of the railway is practically one con- tinuous town, the more fashionable suburbs lying on the east of the city while the business extension is to the westward and the southern quarters are largely devoted to manufacturing. The suburbs comprise the following distinct municipalities, Alexandria, with a population in 1901 of 9341; Annandale, 8349; Ashfield, 14,329; Balmain, 30,076; Bexley, 3079; Botany, 3383; North Botany, 3772; Burwood, 7521; Camperdown, 7931; Canterbury, 4226; Concord, 2818; Darlington, 3784; Drum- moyne, 4244; Enfield, 2497; Erskineville, 6059; Glebe, 19,220; Hunter's Hill, 4232; Hurstville, 4019; Kogarah, 3892; Lane Cove, 1918; Leichhardt, 17,454; Manly, 5035; Marrickville, 18,775; Eastwood, 713; Mosman, 5691; Newtown, 22,598; North Sydney, 22,040; Paddington, 21,984; Petersham, 15,307; Randwick, 9753; Redfern, 24,219; Rockdale, 7857; Ryde, 3222; St Peter's, 5906; Vaucluse, 1152; Waterloo, 9609; Waverley, 12,342; Willoughby, 6004; Woollahra, 12,351. These suburbs are connected with the city, some by railway, some by steam, cable and electric tramways, and others by ferry across Port Jackson. The tramway system is owned by the government. There are numerous places of resort for the citizens. Many

of the bays in the harbour are largely visited on Sundays and holidays. The rnost popular resorts are Manly Beach, Chowder Bay and Watson's Bay, in the harbour; Cabarita, on the Parra- matta river; Middle Harbour; and Coogee Bay and Bondi, on the ocean beach; Botany, Lady Robinson's Beach, Sandringham and Sans Souci on Botany Bay. Besides these there are two splendid national reserves, an hour's journey by rail from Sydney, viz. National Park, comprising an area of 36,810 acres, surrounding the picturesque bay of Port Hacking; and Kurringai Chase, with an area of 35,300 acres.

The two principal cemeteries are at Waverley and Rookwood. The former is most picturesquely situated on the cliff overlooking the Pacific Ocean.

The climate of Sydney is mild and equable; in summer sea breezes blow from the north-east, which, while they temper the heat, make the air exceedingly humid; in winter the winds blow from the west and the climate is dry and bracing. The mean average temperature is 63° Fahr., and the rainfall 49-66 in.

The population has increased with marvellous rapidity. In 1861 it was (city and suburbs inclusive) 95,000; in 1881, 237,300; in 1891, 399,270; and in 1901, 487,900. The proportion of city dwellers to suburban is as follows: in 1901 — city, 112,137; suburbs, 369,693; total, 487,900. The incorporated area of the metropolitan district is about 142 sq. m., or 91,220 acres, so that the average density of population was 5-35 persons per acre, some of the more immediate suburbs being more densely popu- lated than the city itself.

SYDNEY, the chief town of Cape Breton county, Nova Scotia, on a good harbour, the eastern terminus of the Intercolonial railway. Pop. (1891), 2427, (1901), 9900. Formerly a quiet country town, it became between 1891 and 1901 the chief shipping port of the Dominion Coal Company, and the site of the large works of the Dominion Iron and Steel Company. On the opposite side of the harbour are the flourishing towns of North Sydney and of Sydney Mines. It is the starting point for the line of steamers to the Bras d'Or lakes, and a favourite summer resort.

SYENITE, a name first used by Pliny to designate rocks of the same type as the hornblendic granite of Syene (Assouan) in Upper Egypt, so extensively used in ancient times for archi- tectural work and monuments. Transferred by Werner to a rock of much the same appearance, though not identical in mineral- ogical character with the Egyptian granite, from the Plauen 'scher Grund near Dresden, it is now used as the group name of a class of holo-

crystalline plutonic rocks composed essentially of an alkali felspar and a ferromagnesian mineral. The structure and appearance are very much the same as that of a hornblendic granite; from which it is difficult to distinguish these rocks in hand specimens. The important difference, however, is the absence or scarcity of quartz in the syenites. Their essential components are orthoclase, often with some albite, and augite, hornblende or biotite. The orthoclase is white or pink, and forms nearly one half of the rock. It may be veined with albite (microperthite) and small crystals of plagioclase (mostly andesine and oligoclase) often are present, usually having better crystal- line forms than the potash felspar. The prevalent hornblende is green, but brown hornblende and dark blue hornblende, of strong pleochroism, occur in some syenites which are rich in

apatite, zircon, magnetite and pyrites; quartz as above stated is rarely absent but should never be abundant, otherwise the rock becomes a granite. Nepheline and sodalite occur only in those rocks which show transitions to the nepheline-syenites.

The structure of syenites is almost exactly the same as that of the granites ; varieties with porphyritic felspar are known but none of these rocks are evenly granular. The apatite, zircon and magne- tite crystallize first, and occur as small well-shaped crystals enclosed in the other minerals. Sphene also is of early formation; then follow augite, biotite and hornblende, the pyroxene usually taking precedence, but regular intergrowths due to simultaneous crystalliza- tion of these three minerals are common. The plagioclase felspar succeeds the ferromagnesian minerals, and the alkali felspar is last to crystallize with the exception of the small amount of quartz and of micropegmatite, if these are present. Exceptions to this rule occur, as for example when part of the soda-lime felspar has sepa- rated out of the magma before the ferric minerals have ceased to grow, and is consequently enclosed in them in ophitic fashion. Some syenites have a fluxion or even " augen " structure, due to movements during consolidation; orbicular structure may also occur but is very rare.

Although syenites are by no means common rocks and are not of equal importance with granites and diorites from a geological standpoint, they exhibit many varieties which are of interest. Transi- tional forms between syenite and granite are common as these rocks very frequently occur in the same mass and can hardly be separated from one another in the field. These syenites, comparatively rich in quartz, have been called syenite-granites. Many of the rocks known to the older geologists and shown on the early maps as " syenite " are of this type ; others are hornblendic granites in which quartz is not abundant or conspicuous. Another variety of quartz-syenite, very rich in pink alkali felspar (microperthite), is known as nordmarkite; it occurs in Norway, Sweden and Scotland, and con- tains

usually only a small amount of brown biotite and green augite.

The more normal syenites (with only small percentages of quartz) may be divided into augite-, hornblende- and biotite-syenites, according to their prevalent ferric mineral, but usually the rock contains two or even three of the dark-coloured bisilicates. Augite- syenites occur in Saxony and in Norway. In the latter country the most abundant type is laurvikite. These rocks may be red or grey in colour and very largely consist of a perthitic or crypto- perthitic alkali felspar having a beautiful shimmering dull metallic reflection or play of colours. They are coarse-grained rocks, and their great freshness and iridescent appearance when polished make them favourite ornamental stones for facades and pillars. The large felspars have often an elongated elliptical form and are arranged in sub-parallel fashion apparently by fluxion movements. Quartz is usually absent and plagioclase is still more uncommon, but the occasional presence of nepheline and sodalite indicates that these rocks are connected with the nepheline-syenites of the laurvikite type. The ferromagnesian minerals show a great variety and include diopside, aegirine-augite, biotite, brown hornblende, hypersthene and olivine. Zircon is often abundant (zircon-syenite). Rocks very similar to the laurvikites of Norway are known in the Sawtooth Mountains of Texas. These augite-syenites which have plagioclase and orthoclase felspar in nearly equal quantity are called nonzonites. Hornblende-syenites are regarded as being the typical members of the group, hence the best-known syenite, the original rock which Werner described, is of this kind; they are not very common, but occur in Germany, Piedmont and other places, usually with hornblende-granites and diorites. Biotite- syenites also are not frequent, being usually accompanied by granites of which they represent modifications poor in quartz. Most of the rocks formerly known as mica-syenites are now grouped with the lamprophyres as minettes. The following analyses show the chemical composition of a few of the principal types of syenite. They are characterized by a moderate amount of silica, relatively high alkalis (with potash usually preponderating) and alumina, while lime and magnesia are more variable but never in great amount.

(J- S. F.)

Si0 2 .

A1 2 3 .

Fe 2 3 .

FeO.

MgO.

CaO.

Na 2 0.

K 2 0.

I. Hornblende-syenite (Plauen 'schcr Grund,

Dresden)

59-83 58-88 59-88

16-85 20-30

17-87

3-63

2-67

7-01 2-58 1-50

2-6l

0-79 1-04

4-43

3-°3

2-OI

2-44

5-73 7-96

6-57

4-5o

5-69

HI. Nordmarkite (Christiania)

alkalis. The augite is usually pale green and may be in perthitic intergrowth with the hornblende. The mica is always of brown colour, as muscovite is

not known to occur in these rocks. In the alkali syenites dark green soda augites may be present; other syenites contain a violet augite which has the lamella structure of diallage. The accessory minerals include sphene (very frequent),

SYLBURG, FRIEDRICH (1 536-1 596), German classical scholar, son of a farmer, was born at Wetter near Marburg. He studied at Marburg, Jena, Geneva, and, lastly, Paris, where his teacher was Henry Estienne (Stephanus), to whose great Greek Thesaurus Sylburg afterwards made important contribu- tions. Returning to Germany, he held educational posts at Neu- haus near Worms and at Lich near Giessen, where he edited a

useful edition of the Institutiones in graecam linguam (1580) of Nicolaus Clenardus (Cleynaerts, 1495-1542). In 1 583 he resigned his post at Lich and moved to Frankfort-on-the-Main to act as corrector and editor of Greek texts for the enterprising publisher Johann Wechel. To his Frankfort period belong the editions of Pausanias, Herodotus, Dionysius of Halicarnassus (one of his best pieces of work and highly praised by Niebuhr), Aristotle, the Greek and Latin sources for the history of the Roman emperors and the Ilepl s of Apollonius Dyscolus. In 1591 he removed to Heidelberg, where he became librarian to the elector palatine. The Wechel series was continued by Hierony- mus Commelinus of Heidelberg, for whom Sylburg edited Clement of Alexander, Justin Martyr, the Etymologicum magnum, the Scriptores de re rustica, the Greek gnomic poets, Xenophon, Nonnus and other works. All Sylburg's editions show great critical power and indefatigable industry. He died on the 17th of February 1596, a victim of over- work.

See F. Koldewey, in Allgemeine deittsche Biographie; K. W. Justi, in Strieder's Hessische Gelehrlen-Geschichte, xviii. (Marburg, 1819); C. Bursian, Geschichte der classischen Philologie in Deutschland (1883); J. E. Sandys, Hist, of Class. Schol., ii. (1908), p. 270.

SYLHET, a town and district of British India, in the Surma valley division of Eastern Bengal and Assam. The town is on the right bank of the river Surma, on rising ground, embowered in groves. Pop. (1901), 13,893. There are manufactures of mats, carved ivory and shells, and furniture. There is an unaided college, founded in 1892, which is mainly supported by a native gentleman. There are two dispensaries and an English church. The great earthquake of the 12th of June 1897 destroyed every substantial building, but caused very little loss of life. Sylhet is the largest town in

Assam, but is steadily decaying, being 30 m. from a railway and inaccessible to steamers during the dry season.

The District of Sylhet has an area of 5388 sq. m. It consists of the lower valley of the Surma or Barak river, and for the most part is a uniform level broken only by scattered clusters of sandy hillocks called tilds, and intersected by a network of rivers and drainage channels. It is a broad and densely- cultivated plain, except in the extreme north, where the enormous rainfall converts many square miles of land into one huge lake during the rains, and in the south, where eight low ranges of hills, spurs of the Tippera mountains, run out into the plain, the highest range being about 1 500 ft. above sea-level. There is also a small detached group in the centre of the district called the Ita hills. The district is watered by the branches of the Surma (q.v.) which are navigable by large boats, and support a busy traffic. The climate is extremely damp and the rainfall is heavy, reaching an annual average of over 1 50 in. ; the rainy season generally lasts from April to October.

In 1901 the population was 2,241,848, showing an increase of 4% in the decade. More than half are Mahommedans. Tea cultivation is a flourishing industry in the southern hills. The Assam-Bengal railway crosses the district, but trade is still largely river-borne. Great damage was done by the earthquake of June 1897, which was followed by an outbreak of malarial fever.

Sylhet passed into the hands of the British in 1765, with the rest of Bengal, of which it formed an integral part until 1874, being included in the Dacca division. In that year it was annexed, together with the adjoining district of Cachar, to the chief-commissionership of Assam which was amalgamated with eastern Bengal in 1905.

See Sylhet District Gazetteer (Calcutta, 1905).

SYLLABUS (from Gr. 0vWa.11fia.ve1v , to take together, cf. ” syllable “), literally something taken together, a collection (Late Lat. syllabus), hence a compendium, table or abstract giving the heads, outline or scheme of a course of lectures, teaching, &c. The word in the sense of a list or catalogue is used of a collection of eighty condemned propositions, addressed by order of Pius IX. to all the Catholic episcopate, under the date of the 8th of December 1864. The official title is: ” A collection (syllabus) containing the principal errors of our

times as noted in the Allocutions, Encyclicals and other Apostolic Letters of our Holy Father Pope Pius IX.” This collection has a rather curious history. As early as 1849, the council of Spoleto asked the pope for a collective

condemnation of all errors concerning the Church, her authority and property. In 1851 the Civilta catlolica proposed that this should be drawn up in connexion with the definition of the Immaculate Concep- tion of Mary. In 1852, Cardinal Fornari wrote by order of the pope to a certain number of bishops and laymen asking for their assistance in the study of the errors most prevalent in modern society. The answers are unknown; but after the definition of the Immaculate Conception (December 8, 1854), the commission of theologians charged with the preparatory investi- gations was entrusted with the further mission of studying modern errors. For six years it gave no outward signs of activity; but in i860 Mgr Gerbet, bishop of Perpignan, pub- lished his Instruction pastorale sur diverses erreurs du temps present; in it he enumerated 85 erroneous propositions, grouped under eleven heads. Pius IX. was much impressed by this work; he had it printed, and communicated it to the commission, to which he added a few new members, desiring them to take it as a fresh basis for their researches. In 1861 the commission had various meetings, at which the principal propositions were chosen and formulated in Latin, and the theological censure which they incurred applied to them. The result was a collection first of 70, and later of 61 propositions, of which only 27 have the note haeretica; Mgr Gerbet's divisions, and frequently his text, are adhered to. This Syllabus, which was excellently drawn up, was not promulgated, owing to an indiscretion. On the occasion of the festivals of the canonization of the Japanese martyrs, Pius IX. had gathered around him three hundred bishops from all parts of the world; he had the projected Syllabus communicated to each of them, under the seal of secrecy for the purpose of asking their opinion on it; each bishop was also, still under the seal of secrecy, empowered to consult a theologian selected by himself. But in October 1862, the Turin Mediatore published the catalogue in full, and Mgr Bourget, bishop of Montreal, thinking that it had been published in Rome, officially promulgated it for his diocese in December 1863. Pius IX. then modified his plans: a new commission was appointed to extract from the Allocutions, Encyclicals and papal Letters the chief errors dealt with in them. This work lasted about a year; the result of it was the Syllabus, in eighty propositions, arranged under the distinct heads; the propositions are not accompanied by any theological censure, but simply by a reference to the Allocution, Encyclical or Letter from which each had been more or less textually extracted. This was addressed to the episcopate together with a letter from Cardinal Antonelli, and dated the 8th of December 1864, the same date as the Encyclical Quanta cura, from which, however, it remains quite distinct. Its publication aroused the most violent polemics; what was then called the Ultramontane party was loud in its praise; while the liberals treated it as a declaration of war made by the Church on modern society and civilization. Napoleon III.'s government forbade its publication, and suspended the newspaper VUnivers for having published it. Controversies

were equally numerous as to the theological value of the Sylla- bus. Most Catholics saw in it as many infallible definitions as condemned propositions; others observed that the pope had neither personally signed nor promulgated the collection, but had intentionally separated it from the Encyclical by sending it merely under cover of a letter from his secretary of state; they said that it was hastily, and sometimes unfortunately drawn up (cf. prop. 61); they saw in it an act of the pontifical authority, but without any of the marks required in the case of dogmatic definitions; they concluded, therefore, that each proposition was to be appreciated separately, and in consequence that each was open to theological comment. That such is the true view is proved by the fact that Rome never censured the theologians who, like Newman, took up this position.

The errors enumerated in the Syllabus are grouped under the ten following heads: (1) Pantheism, naturalism and absolute

rationalism; (2) Moderate rationalism; (3) Indifferentism, lati- tudinarianism; (4) Socialism, communism, secret societies, Bible societies, clerico-liberal societies; (5) Errors regarding the Church and her rights; (6) Errors regarding civil society both in itself and in its relations with the Church; (7) Errors regarding Christian and natural morality; (8) Errors regarding Christian marriage; (9) Errors concerning the temporal power of the pope; (10) Errors relative to modern Liberalism. It was paragraphs S, 6 and 10 which especially gave rise to discussion. In reality, however, the Syllabus did not contain a new doctrine: the Church was defending, her traditional doctrine against the progressive invasion of what were called modern ideas of liberty, i.e. the independence of religious authority shown by secular societies, liberty of conscience, equality of all religious confessions before the state, &c. She upheld her theoretical position as in the time of Philip the Fair or of the Reformation, and the Syllabus goes no further in this respect than the En- cyclical Quanta curaoi the same date, or that of Gregory XVI., Mirari vos, of the 15th of August 1832. But the unusual form of the document should be considered: instead of an exposition of doctrine it enumerates the errors in the form of bare proposi- tions, without any qualification, and with no variation in the degree of condemnation; the result being that many people on both sides were misled.

The name Syllabus has sometimes also been given to the collection of 65 " modernist " propositions condemned by the decree Lamenlabili of the Holy Office, dated the 3rd of July 1907; but this name is in no wise official.

Bibliography. — The documents from which the propositions of the Syllabus were borrowed have been collected together in the Recueil des allocutions const storiales, &c. citees dans I encyclique et le syllabus (Paris, 1865). For the history of the Syllabus: P. Hourat, Le Syllabus, etude documentaire (Paris, 1904) ; and P. Rinaldi, II Valore del sillabo (Rome, 1888). For its theological value: Newman, A Letter Addressed to his Grace the Duke of Norfolk (London, 1875); P. Viollet, U Infallibility du pape et le syllabus (Paris, 1904) ; L. Choupin, Valeur des decisions doctrinales et dis- ciplinaires du Saint Siege (Paris, 1907). See also Mgr. Dupanloup, La Convention du 15 septembre et I 'encyclique du 8 decembre (Paris, 1865); and for the opposite view, see Trarieux, Le Syllabus et la declaration des droits de I'homme (Paris, 1902). (A. Bo.)*

SYLLOGISM (Gr. cmXXoTtcrˆos, from avv, and A07O?, an argument resulting from combination, i.e. of premises), in logic, an argument consisting of premises and a conclusion. Aris- totle's definition is {Anal. Pr. a i. 24 b 18; cf. Top. a i. 100 a 2 5) : ffvWoyicrfjids tan X670S kv $ redevroov rivuv 'irepbv tl twv Keijuvwv !£ avayKT]s ovfifiaivu tQ ravra elvcu, a syllogism is an argument in which, certain things being posited (the premises), something other than the premises necessarily results from their being true." This definition, though it contains the really important facts, is too wide in two respects. (1) Aristotle -himself and subsequent logicians restrict the term to arguments in which there are but two premises. (2) In point of fact, all logicians further confine the syllogism to arguments in which the terms are related as subject and predicate (or attribute in the widest sense). A fortiori arguments, for example, wherein relations of quantity are brought together, though syllogistic in type, are generally excluded. Owing largely to the simplicity and symmetry of the syllogism it has been a commonplace of logic to make the syllogistic form the type of all thought. Modern logicians (cf. especially F. H. Bradley in his Logic) have, however, shown that in practice its importance is greatly exaggerated.

*A. The Deductive Syllogism. — This argument is the simplest form of " mediate " inference, i.e. an argument in which two terms are brought into a necessary relation by the aid of a " middle " term which serves as a bridge. It requires, therefore, two propositions known as premises * (also spelled premisses, as being more in accordance with the Lat. praemissae [pro- positions sententiae], things put or posited in advance) which*

1 Aristotle irpoTacms, originally translated propositiones ; prae- missae dates from 12th century Latin translations of Arabic versions of Aristotle. The term " premises " (a house, &c), is derived loosely from the legal phase denoting that which has already been mentioned in a document, and is etymologically the same.

contain one common term and one other term each. In the conclusion the middle term disappears and the other two are brought together. The premises are assumed: whether true or false, the conclusion follows necessarily. If the premises are true, the conclusion must be true: if they are false the great probability is that the conclusion is false. The predicate of the conclusion is called the major term, the subject the minor term; the term which is common to the premises and disappears in the conclusion is the middle term. Hence the premise which contains the major term is called the major premise: that which contains the minor, the minor premise. The form of the syllogism is therefore: —

A is B Major premise

CisA Minor ,,

.'. CisB Conclusion

Syllogisms differ in (a) " figure " and (6) " mood." (a) Difference of figure depends on the order of the terms in the premises. The above is the scheme of figure I. If the middle term is the predicate in both premises, the syllogism is in figure II.: if the subject in both, figure III. These are the only figures recognized by Aristotle, though he points out that the premises in figure I. may justify a conclusion in which the predicate is not, as normally, the major term, but the minor. This possibility, according to Averroes, led to the adoption by the physician Galen of the so-called fourth figure, in which the middle term is predicate of the major and subject of the minor. This, however, destroys the appropriateness of the phrases major and minor term which are specially chosen because in fact the major term does imply the more comprehensive notion. The conclusion is an artificial proposition which would be stated naturally in the converse.

b. The distinction of moods is according to the quantity or quality of the propositions of the syllogism (universal, particular, affirmative, negative, in all the possible combinations). So far as mere form goes, each mocd may occur in every figure, though in many cases the conclusion apparently yielded from the premises is invalid. A simple calculation shows that formally there are 64 possible moods. Investigation shows that of these nineteen 2 only are valid, and rules have been formulated which give the reasons for the invalidity of the remaining 45.

The rules which govern syllogistic arguments thus described are:— m

i. A syllogism must contain three and three terms only. (a) Four terms would mean the absence of any connecting link. (6) If the middle term is ambiguous there are really four not three terms. The violation of (a) is the

fallacy " Quaternio terminorum "; of (6) " ambiguous middle."

ii. The middle term must be distributed in one premise at least, i.e. it must be taken universally, as including all the particulars over which it extends (see Extension). Violation of this is the fallacy of " undistributed middle."

iii. No inference can be made from two negative premises.

iv. If either premise is negative, the conclusion is negative.

v. The conclusion cannot be negative, if both premises are affirmative.

vi. No term may be distributed in this conclusion which was not distributed in the premise in which it occurs. Violation of this rule is called an " illicit process of the major (or the minor) term." l h /' –

vii. From two particular premises nothing can be inferred. 3

viii. If either premise is particular, the conclusion must be particular. 3

2 The following mnemonic hexameter verses are generally given (first apparently in Aldrich's Artis logicae rudimenta) to aid in remembering these moods. The vowels in the words, A, E, I, O, show the quantity and quality of the premises: —

Barbara Celarent Darii Ferioque prioris;_ Cesare Camestres Festino Baroco secundi; Tertia Darapti Disamis Datisi Felapton Bocardo Ferison habet : quarta insuper addit Bramantip Camenes Dimaris Fesapo Fresison.

3 These latter are corollaries of previous rules.

The general criticism of the syllogism as a means of discovering truth is that it is a petitio principii, or begging of the question. This accusation is based to some extent on the Aristotelian " Dictum de omni et nullo " (Anal. Pri. a i. 24, b 26-30), generally stated as " That which is affirmed or denied of any whole may be affirmed or denied of anything contained within (or ' any part of ') that whole." To take a concrete instance of a valid mood: all men are mortal, all Frenchmen are men, therefore all Frenchmen are mortal (the mood Barbara). It is argued that either there is here no real discovery (i.e. new truth) or the major premise is improperly used (begs the question) inasmuch as unless we knew that all Frenchmen are mortal we could not state that all men are mortal. The problem raised

is a real one, and has been discussed by all logicians, from the time of Mill especially. In brief, the solution depends upon the view we take of the major premise, "all men are mortal." If that judgment is taken as a mere enumeration of particulars, i.e. in extension, as meaning that all men have been investigated and found to be mortal, clearly it could not be used to make the new discovery that a particular group of men are mortal; the syllogism so understood is a petitio principii. If, however, we take the true view of the major premise, namely, that it is not a mere summary of observed particulars but the enunciation of a necessary connexion between two concepts or universals, then the conclusion assumes a different character. The " whole " (ontne) of the dictum, the major term, ceases to be taken in extension, and becomes intensive or connotative, and the inference consists in subsuming the minor under (bringing it into connexion with) the major. This is the true view of the scientific or inductive universal (as opposed to that of nominalism or pure empiricism). It remains true that in fact the conclusion is contained in the premises— this is essential to the validity of the syllogism— but the inference is a real one because it brings out and shows the necessity of a conclusion which was not before in our minds.

Hypothetical and Disjunctive Syllogisms. — The term syllogjsm has been extended to cover certain forms of ratiocination which are not based on categorical propositions. The propriety of this extended use is open to question and is denied by some logicians.

a. Hypothetical " Syllogisms " are those in which one premise is a hypothetical proposition, the other a categorical. Two forms are possible (i.) modus ponens (which establishes the consequent set down in the major premise) : if A is B, it is C (or C is D) ; A is B; therefore A is C (or C is D), and (ii.) modus tollens (which dis- proves the antecedent) : if A is B, it is C (or C is D) ; A is not C (or C is not D) ; therefore it is not B (or A is not B). In (i.) a valid conclusion follows from the affirmation of the antecedent: in (ii.) from denying the consequent, but in neither case conversely. The distinction is of greater importance than would appear when one realizes how obvious the facts really are, and in practice it happens frequently that speakers claim with success to disprove a proposition by disproving the fact alleged in support of it, or to establish a hypothesis by showing that facts agree with its consequences.

b. Disjunctive " Syllogisms " are those in which one premise is a disjunctive proposition, the other a categorical proposition which states or denies one of the two alternatives set forth. Again two forms occur: (i.) modus ponendo tollens which by the affirmation of one alternative denies the other (A is either B or C; A is B ; therefore it is not C : or either A is B, or C is D ; A is B ; therefore C is not D : or either A or B is C ; A is C ;

therefore B is not C) ; (ii.) modus tollendo ponens which by the denial of the one, establishes the validity of the other alternative (A is either B or C; A is not B ; therefore it is C : or either A or B is C ; A is not C ; therefore B is C: or either A is B, or C is D ; A is not B ; therefore C is D). The validity of such arguments depends upon the sense in which we understand the disjunctive proposition: we must assume that the alternatives are mutually exclusive. 1

Sorites. — Finally it is necessary to mention a complex syllogistic argument known as the Sorites (Gr. irapos, heap). It has been de- fined as a syllogism in Fig. 1 (see above) having many middle terms; it is really a series of syllogisms (a polysyllogism), each one proving a premise of another, the intermediate conclusions being suppressed. Its form is A is B, B is C, C is D . . . . Y is Z, there- fore A is Z. Each syllogism of the series is called a " prosyllogism " 2 in relation to t he one that succeeds, and an " episyllogism " in

- *For a dilemma which includes both hypothetical and dis- junctive reasoning see Dilemma.*

2 Where one premise of a prosyllogism is omitted (see Enthy- MEME), this argument is sometimes called an " epicheirema."

relation to its predecessors. Resolution of the sori'ito into its con- stituent elements gives the rules (a) that no premise except the first may be particular and (/3) that no premise except the last may be negative.

B. The Inductive Syllogism, like the deductive, is first systematized by Aristotle, who described it as 6 e£ e7rayco7rjs cruXXoyio-yuos. Unlike the deductive it consists in establishing a conclusion from particular premises, i.e. of referring the major term to the middle by means of the minor. The form is " A B C D, &c, are P; A B C D are all M; thus all M are P." This so-called syllogism has been much criticized by modern logicians on various grounds (see Logic).

Discussions of the syllogism will be found in all textbooks on Logic, and the more elaborate syllogistic forms are discussed in the article Logic.

SYLPH, an imaginary spirit of the air; according to Paracel- sus, the first modern writer who uses the word, an air-elemental, coming between material and immaterial beings. In current usage, the term is applied to a feminine spirit or fairy, and is often used in a figurative sense of a graceful, slender girl or young woman. The form of the word points to a Greek origin, and Aristotle's al\T), a kind of beetle (Hist. anim. 8. 17. 8), has usually been taken as the source. Similarly, the earth- elementals or earth-

spirits were in Paracelsus's nomenclature, " gnomes " (Gr. yv&firi, intelligence, yiyvwanav, to know) as being the spirits that gave the secrets of the earth to mortals. Littre, however, takes the word to be Old Celtic, and meaning " genius," and states that it occurs in such forms as sidfi, sylfi, &c, in inscriptions, or latinized as sulevae or suleviae.

SYLT (probably from the O. Fris. Silendi, i.e. sealand), the largest German island in the North Sea, being about 38 sq. m. in area and nearly 23 m. long. It is, however, very narrow, being generally about half a mile in width, except in the middle, where it sends out a peninsula to the east 7 m. across. It belongs to the Prussian province of Schleswig-Holstein, and lies from 7 to 12 m. from the Schleswig coast. The central peninsula contains some marshland and moorland pasture, on which a few thousand sheep graze; but the rest of the island consists merely of dunes or sandhills. These attain at places a height of from 100 to 150 ft., and are continually shifting to the westward. The inhabitants (3500) are of Frisian origin, and the official language is German, though in the extreme north of the island, known as List, Danish is spoken. Their occupations are fishing, oyster-dredging, seafaring and wild-duck catching. The chief places are Keitum, Tinnum, Morsum, Rantum and Westerland. Westerland, one of the most frequented sea-bathing places of Germany, lies on the west side of the island, separated from the sea, which is seldom perfectly calm, by a chain of sand dunes, across which board walks lead to the beach. The island is reached by a regular steamboat service from Hoyer on the main- land to Munkmarsch, which is connected by a steam tram with Westerland. Another line of steamers runs from Hamburg to Sylt via Heligoland. During the Danish War of 1864, after suffering severely at the hands of the Danes, the island was occupied by the Prussians on the 13th of July (see Frisian Islands).

See P. Knuth, Botanische Wanderungen auf der Insel Sylt (Tondern, 1890); C. P. Hansen, Das Nordseebad Westerland auf Sylt (Garding, 1891); Meyn, Geologische Beschreibung der Insel Sylt (Berlin, 1876) ; and Kepp, Wegweiser auf Sylt (Tondern, 1885).

SYLVANITE, a mineral consisting of gold and silver telluride, AuAgTe 4 , containing gold 24-2 and silver 13-3 %; an im- portant ore of gold. Crystals are monoclinic and often very rich in faces; they are frequently twinned, giving rise to branch- ing forms resembling written characters; on this account the mineral was early known as " graphic gold " or " graphic tellurium " (Ger. Schrifterz). It was also known as " white gold," the colour being tin-white with a brilliant metallic lustre. The hardness is 2 and the specific gravity 8-2. It occurs with native gold in veins traversing porphyry at Offenbanya and Nagyag, near Deva in Transylvania (from which country it takes' its name); also at several places in Boulder county,

Colorado, and at Kalgoorlie in Western Australia. Sylvanite may be

readily distinguished from calaverite (AuTe 2) by its perfect cleavage in one direction (parallel to the plane of symmetry), but in this character it resembles the very rare orthorhombic mineral krennerite ([Au, Ag]Tes). (L. J. S.)

SYLVESTER, JAMES JOSEPH (1814-1897), English mathe- matician, was born in London on the 3rd of September 1814. He went to school first at Highgate and then at Liverpool, and in 183 1 entered St John's College, Cambridge. In his Tripos examination, which through illness he was prevented from taking till 1837, he was placed as second wrangler, but being a Jew and unwilling to sign the Thirty-nine Articles, he could not compete for one of the Smith's prizes and was ineligible for a fellowship, nor could he even take a degree: this last, however, he obtained at Trinity College, Dublin, where religious restrictions were no longer in force. After leaving Cambridge he was appointed to the chair of natural philosophy at University College, London, where his friend A. De Morgan was one of his colleagues, but he resigned in 1840 in order to become professor of mathematics in the university of Virginia. There, however, he remained only six months, for certain views on slavery, strongly held and injudiciously expressed, entailed unpleasant consequences, and necessitated his return to England, where he obtained in 1844 the post of actuary to the Legal and Equitable Life Assurance Company. In the course of the ensuing ten years he published a large amount of original work, much of it dealing with the theory of invariants, which marked him as one of the foremost mathematicians of the time. But he failed to obtain either of two posts — the professorships of mathematics at the Royal Military Academy and of geometry in Gresham College — for which he applied in 1854, though he was elected to the former in the following year on the death of his successful competitor. At Woolwich he remained until 1870, and although he was not a great success as an elementary teacher, that period of his life was very rich in mathematical work, which included remarkable advances in the theory of the partition of numbers and further contributions to that of invariants, together with an important research which yielded a proof, hitherto lacking, of Newton's rule for the discovery of imaginary roots for algebraical equations up to and including the fifth degree. In 1874 he produced several papers suggested by A. Peaucellier's discovery of the straight line link motion associated with his name, and he also invented the skew pentagraph. Three years later he was appointed professor of mathematics in the Johns Hopkins Uni- versity, Baltimore, stipulating for

an annual salary of $5000, to be paid in gold. At Baltimore he gave an enormous impetus to the study of the higher mathematics in America, and during the time he was there he contributed to the American Journal of Mathematics, of which he was the first editor, no less than thirty papers, some of great length, dealing mainly with modern algebra, the theory of numbers, theory of partitions and universal algebra. In 1883 he was chosen to succeed Henry Smith in the Savilian chair of geometry at Oxford, and there he produced his theory of reciprocants, largely by the aid of his " method of infinitesimal variation." In 1893 loss of health and failing eyesight obliged him to give up the active duties of his chair, and a deputy professor being appointed, he went to live in London, where he died on the 15th of March 1897. Sylvester's work suffered from a certain lack of steadiness and method in his character. For long periods he was mathemati- cally unproductive, but then sudden inspiration would come upon him and his ideas and theories poured forth far more quickly than he could record them. All the same his output of work was as large as it was valuable. The scope of his researches was described by Arthur Cayley, his friend and fellow worker, in the following words: " They relate chiefly to finite analysis, and cover by their subjects a large part of it — algebra, deter- minants, elimination, the theory of equations, partitions, tactic, the theory of forms, matrices, reciprocants, the Hamiltonian numbers, &c; analytical and pure geometry occupy a less prominent position; and mechanics, optics and astronomy are not absent." Sylvester was a good linguist, and a diligent com- poser of verse, both in English and Latin, but the opinion he

cherished that his poems were on a level with his mathematical achievements has not met with general acceptance.

The first volume of his Collected Mathematical Papers, edited by H. F. Baker, appeared in 1904.

SYLVESTER, JOSHUA (1563-1618), English poet, the son of a Kentish clothier, was born in 1563. In his tenth year he was sent to school at Southampton, where he gained a knowledge of Frencn. After about three years at school he appears to have been put to business, and in 1591 the title-page of his Yvry states that he was in the service of the Merchant Adventurers' Company. He was for a short time a land steward, and in 1606 Prince Henry gave him a small pension as a kind of court poet. In 161 3 he obtained a position as secretary to the Merchant Adven- turers. He was stationed at Middelburg, in the Low Countries, where he died on the 28th of September 161 8. He translated into English heroic couplets the scriptural epic of Guillaume du Bartas. His Essay of the Second Week was published in 1598; and in 1604 The Divine Weeks of the World's Birth. The ornate style of the original offered no difficulty to Sylvester, who was

himself a disciple of the Euphuists and added many adornments of his own invention. The Sepmaines of Du Bartas appealed most to his English and German co-religionists, and the trans- lation was immensely popular. It has often been suggested that Milton owed something in the conception of Paradise Lost to Sylvester's translation. His popularity ceased with the Restora- tion, and Dryden called his verse " abominable fustian."

His works were reprinted by Dr A. B. Grosart (1880) in the " Chertsey Worthies Library." See also C. Dunster's Considerations on Milton's early Reading (1800).

SYLVITE, a mineral consisting of potassium chloride (KC1), first observed in 1823, as an encrustation on Vesuvian lava. Well-formed crystals were subsequently found in the salt deposits of Stassfurt in Prussia and Kalusz in Austrian Galicia. It crystallizes in the cubic system with the form of cubes and cubo- octahedra and possesses perfect cleavages parallel to the faces of She cube. Although the crystals are very similar in appear- ance to crystals of common salt, they are proved by etching experiments to possess a different degree of symmetry, namely plagihedral-cubic, there being no planes of symmetry but the full number of axes of symmetry. Crystals are colourless (sometimes bright blue) and transparent; the hardness is 2 and the specific gravity i'g8. Like salt, it is highly diathermanous. The name sylvite or sylvine is from the old pharmaceutical name, sal digestivus sylvii, for this salt. (L. J. S.)

SYMBOL (Gr. crvufiokov, a sign), the term given to a visible object representing to the mind the semblance of something which is not shown but realized by association with it. This is conveyed by the ideas usually associated with the symbol; thus the palm branch is the symbol of victory and the anchor of hope. Much of early Christian symbolism owes its origin to pagan sources, the interpretations of the symbols having a different meaning; thus " the Good Shepherd with the lamb " is thought by some to have been derived from the figure of Hermes (Mercury) carrying the goat to sacrifice, and " Orpheus charming the wild beasts," which, when painted in the cata- combs, was probably intended as the representation of a type of Christ. One of the earliest symbols of the Saviour, the fish, was derived from an acrostic of the Greek word ixdvs, the component letters of which were the initials of the five words 'lt}crovs Xp«rr6s, Qeov Ttos, 1i6iTi}p, Jesus Christ, Son of God, Saviour. The ship, another early symbol, represented the Church in which the faithful are carried over the sea of life. Other symbols are those which were represented by animals, real or fabulous, and were derived from Scripture: thus the lamb typified Christ from St John's Gospel (i. 29 and 36), and the lion from the Book of Revelations, in which Christ is called the " Lion of the tribe of Judah." The peacock stood for immortality; the phoenix for the Resurrection; the dragon

or the serpent for Satan ; and the stag for the soul thirsting for baptism. The sacred monogram Chi Rho, £ supposed to have been the celestial sign seen by the emperor Constantine on the eve of the defeat of Maxentius, represents the two first letters of the Greek word

Xpioros which Constantine figured on his labarum, or standard, and is found on early Christian coins, bearing also the favourite decoration of the Byzantine sarcophagi. The four evangelical symbols are taken from the book of Ezekiel and from the Book of Revelations; thus the winged man is St Matthew, the winged lion St Mark, the winged ox St Luke and the eagle St John; and these four symbols became the favourite subject for representation in the Church. Besides these the other evangelists and the saints carry emblems by which they may be recognized; thus St Andrew by the cross, St Peter by the keys, St Paul by the sword, St Edward by a cup and dagger, St Mary Magdalene by a box or vase, St Lawrence by a gridiron, St Faith also by a gridiron, &c.

SYME, JAMES (1799-1870), Scottish surgeon, was born at Edinburgh on the 7th of November 1799. His father was a writer to the signet and a landowner in Fife and Kinross, who lost most of his fortune in attempting to develop the mineral resources of his property. James was sent to the high school at the age of nine, and remained until he was fifteen, when he entered the university. For two years he frequented the arts classes (including botany), and in 181 7 began the medical curri- culum, devoting himself with particular keenness to chemistry. His chemical experiments led him to the discovery that "a valuable substance is obtainable from coal tar which has the property of dissolving india-rubber," and could be used for waterproofing silk and other textile fabrics — an idea which was patented a few months afterwards by Charles Mackintosh, of Glasgow. In the session 1818-1819 Syme became assistant and demonstrator of the dissecting room of Robert Liston, who had started as an extra-mural teacher of anatomy in competition with his old master, Dr John Barclay; in those years he held also resident appointments in the infirmary and the fever hospital, and spent some time in Paris practising dissection and operative surgery. In 1823 Liston handed over to him the whole charge of his anatomy classes, retaining his interest in the school as a pecuniary venture; the arrangement did not work smoothly, and a feud with Liston arose, which did not terminate until twenty years later, when the latter was settled in London. In 1824-1825 he started the Brown Square school of medicine, but again disagreed with his partners in the venture. Announcing his intention to practise surgery only, Syme started a surgical hospital of his

own, Minto House hospital, which he carried on from May 1829 to September 1833, with great success as a surgical charity and school of clinical instruction. It was here that he first put into practice his method of clinical teaching, which consisted in having the patients to be operated or prelected upon brought from the ward into a lecture-room or theatre where the students were seated conveniently for seeing and taking notes. His private practice had become very consider- able, his position having been assured ever since his amputation at the hip joint in 1823, the first operation of the kind in Scotland. In 1833 he succeeded James Russell as professor of clinical surgery in the university. Syme's accession to the clinical chair was marked by two important changes in the conditions of it: the first was that the professor should have the care of surgical patients in the infirmary in right of his professorship, and the second, that attendance on his course should be obliga- tory on all candidates for the medical degree. When Liston removed to London in 1835 Syme became the leading consulting surgeon in Scotland. On Liston's death in 1847 Syme was offered his vacant chair of clinical surgery at University College, London, and accepted it. He began practice in London in February 1848; but early in May the same year difficulties with two of his colleagues at Gower Street and a desire to " escape from animosity and contention " led him to throw up his appointment. He returned to Edinburgh in July, and was reinstated in his old chair, to which the crown authority had meanwhile found a difficulty in appointing. The judgment of his friends was that " he was always right in the matter, but often wrong in the manner, of his quarrels." In 1849 he broached the subject of medical reform in a letter to the lord advocate; in 1854 and 1837 he addressed open letters on the

same subject to Lord Palmerston; and in 1858 a Medical Act was passed which largely followed the lines laid down by him- self. As a member of the general medical council called into existence by the act, he made considerable stir in 1868 by an uncompromising statement of doctrines on medical education, which were thought by many to be reactionary; they were, however, merely an attempt to recommend the methods that had been characteristic of Edinburgh teaching since William Cullen's time — namely, a constant reference of facts to principles, the subordination (but not the sacrifice) of technical details to generalities, and the preference of large professional classes and the " magnetism of numbers " to the tutorial system, which he identified with "cramming." In April 1869 he had a paralytic seizure, and at once resigned his chair; he never recovered his powers, and died near Edinburgh on the 26th of June 1870.

Syme's surgical writings were numerous, although the terseness of his style and directness of his method saved them from being bulky. In 1831 he published A Treatise on the Excision of Diseased Joints (the celebrated ankle-joint amputation is known by his name). Mis Principles of Surgery

(often reprinted) came out a few months later ; Diseases of the Rectum in 1838; Stricture of the Urethra and Fistula in Perineo in 1849; and Excision of the Scapula in 1864. In 1848 he collected into a volume, under the title of Contributions to the Pathology and Practice of Surgery, thirty-one original memoirs published in periodicals from time to time; and in 1861 he issued another volume of Observations in Clinical Surgery. Syme's character is not inaptly summed up in the dedication to him by his old pupil, Dr John Brown, of the series of essays Locke arid Sydenham: " Verax, capax, perspicax, sagax, efficax, tenax."

See Memorials of the Life of James Syme, by R. Paterson, M.D., with portraits (Edinburgh, 1874).

SYMEON METAPHRASTES, 1 the most renowned of the Byzantine hagiographers. Scholars have been very much divided as to the period in which he lived, dates ranging from the 9th century to the 14th having been suggested; but it is now generally agreed that he flourished in the second half of the 10th century. Still greater divergences of opinion have existed as to the lives of saints coming from his pen, and here again the solution of the problem has been attained by studying the composition of the great Greek menologies. The menology of Metaphrastes is a collection of lives of saints for the twelve months of the year, easily recognizable among analogous collections, and consisting of about 150 distinct pieces, some of which are taken bodily from older collections, while others have been subjected to a new recension (neTatfrpao-is) . Among other works attributed (though with some uncertainty) to Symeon are a Chronicle, a canonical collection, some letters and poems, and other writings of less importance. Symeon's great popularity is due more particularly to his collection of lives of saints. About his life we know only very few details. The Greeks honour him as a saint on the 28th of November, and an office has been composed in his honour.

See L. Allatius, De Symeonum scriptis diatriba (Paris, 1664) ; F. Hirsch, Byzantinische Studien, pp. 303-355 (Leipzig, 1876); A. Ehrhard, Die Legendensammlung des Symeon Metaphrastes (Rome, 1897); and in Rbmische Quartalschrift (1897), pp. 67-205 and 531-553; H. Delehaye, La Vie de S. Paul le jeune et la chrono- logie de Metaphraste (1893); Analecta Bollandiana, xvi. 312-327 and xvii. 448-452. (H. De.)

SYMMACHUS, pope from 498 to 514, had Anastasius II. for his predecessor and was himself followed by Hormisdas. He was a native of Sardinia, apparently a convert from paganism, and was in deacon's orders at the time of his election. The choice was not unanimous, another candidate, Laurentius, having the support of a strong Byzantine party; and both competitors were consecrated by their friends, the one in the Lateran

Church and the other in that of St Mary, on the 22nd of November 498. A decision was not long afterwards obtained in favour of Symmachus from Theodoric, to whom the dispute had been referred; but peace was not established until 505 or 506, when the Gothic king ordered the Laurentian party to surrender the churches of which they had taken possession. An important incident in the protracted controversy was the

1 The surname is based on the title, Metaphrasis, of some of his works.

decision of the " palmary synod." The remainder of the pontifi- cate of Symmachus was uneventful; history speaks of various churches in Rome as having been built or beautified by him.

SYMMACHUS, the name of a celebrated Roman family of the 4th to 6th centuries of our era. It belonged to the gens Aurelia and can be traced back to Aurelius Julianus Symmachus, proconsul of Achaea (according to others, vicar or vice-prefect of Macedonia) in the year 319. Lucius Aurelius Avianius Symmachus, presumably his son, was prefect of Rome in the year 364, and had also other important posts. He was cele- brated for his virtues and the senate awarded him in 377 a gilded statue.

Quintus Aurelius Symmachus (c. 345-410), son of the last- named, was one of the most brilliant representatives in public life and in the literature of 4th-century paganism in Rome. He was educated in Gaul, and, having discharged the functions of praetor and quaestor, rose to higher offices, and in 373 was pro- consul of Africa (for his official career see C.I.L. vi. 1699). His public dignities, which included that of pontifex maximus, his great wealth and high character, added to his reputation for eloquence, marked him out as the champion of the pagan senate against the measures which the Christian emperors directed against the old state religion of Rome. In 382 he was banished from Rome by Gratian for his protest against the removal of the statue and altar of Victory from the senate-house (see Gibbon, Decline and Fall, ch. 28), and in 384, when he was prefect of the city, he addressed to Valentinian II. a letter praying for the restoration of these symbols. This is the most interesting of his literary remains, and called forth two replies from St Ambrose, as well as a poetical refutation from Prudentius. After this Symmachus was involved in the rebellion of Maximus, but obtained his pardon from Theodosius, and appears to have continued in public life up to his death. In 391 he was Consul ordinarius. His honesty, both in public and in private affairs, and his amiability made him very popular. The only reproach that could be

made against this last valiant defender of paganism is a certain aristocratic conservativeness, and an exaggerated love of the past. As his letters do not extend beyond the year 402, he probably died soon after that date.

Of his writings we possess: (1) Panegyrics, written in his youth in a very artificial style, two on Valentinian I. and one on the youthful Gratian. (2) Nine books of Epistles, and two from the tenth book, published after his death by his son. The model followed by the writer is Pliny the Younger, and from a reference in the Saturnalia of Macrobius (bk. v., i. §7), in which Symmachus is introduced as one of the interlocutors, it appears that his contemporaries deemed him second to none of the ancients in the " rich and florid " style. We find them vapid and tedious. (3) Fragments of Complimentary Orations, five from a palimpsest (also containing the Panegyrics), of which part is at Milan and part in the Vatican, discovered by Mai, who published the Milan fragments in 1815, the Roman in his Scriptorum veterum nova collectio, vol. i. (1825), and the whole in 1846. (4) The Relationes, which contain an interesting account of public life in Rome, composed for the emperor. In these official writings (reports as prefect of the city), Symmachus is not preoccu- pied by style and becomes sometimes eloquent ; especially so in his remarkable report on the altar of Victory.

His son, Quintus Fabius Memmius Symmachus, was pro- consul of Africa (415) and prefect of the city (418). He was probably the father of the Symmachus who was consul in 446, and whose son was Quintus Aurelius Memmius Symmachus (d. 525), patrician, one of the most cultivated noblemen of Rome of the beginning of the 6th century, editor (e.g. of Macrobius, Somnium Scipionis) and historian, and especially celebrated for his building activity. He was consul in 485. Theodoric charged him with the restoration of the theatre of Pompey. He was father-in-law of Boetius (q.v.), and was involved in his fate, being disgraced and finally put to death by Theodoric in 523.

See E. Morin, Etudes stir Symmaque (1847); G. Boissier, La Fin du paganisme (1891), vol. ii. ; T. R. Glover, Life and Letters in the Fourth Century (1901); S. Dill, Roman Society in the last century of the Western Empire (1898); T. Hodgkin, Italy and Iter Invaders, (1880-1899) vol. iii. (on the Boetius "conspiracy"); M. Schanz, Geschichte der romischen Litteratur (1904), vol. iv. pt. 1 ; and Teuffel- Scliwabe, Hist, of Roman Literature (Eng. trans., 1900), pp. 425, 477, 4.

All editions, of the works of Symmachus are no-w superseded by that of O. Seeck in Monumenta Germaniae historica. Auctores antiquis- simi (1883), vi. I, with introductions on his life, works and chronology, and a genealogical table of the family.

SYMONDS, JOHN ADDINGTON (1840-1893), English critic and poet, was born at Bristol, on the 5th of October 1840. He was the only son of John Addington Symonds, M.D. (1807- 1871), the author of an essay on Criminal Responsibility (1869), The Principles of Beauty (1857) and Sleep and Dreams (2nd ed., 1857). His mother, Harriet Symonds, was the eldest daughter of James Sykes of Leatherhead. He was a delicate boy, and at Harrow, where he was entered in 1854, took no part in school games and showed no particular promise as a scholar. In 1858 he proceeded to Balliol as a commoner, but was elected to an exhibition in the following year. The Oxford training and association with the brilliant set of men then at Balliol called out the latent faculties in Symonds, and his university career was one of continual distinction. In i860 he took a first in " Mods," and won the Newdigate with a poem on The Escorial; in 1862 he was placed in the first class in Literae Humaniores, and in the following year was winner of the Chan- cellor's English Essay. In 1862 he had been elected to an open fellowship at Magdalen. The strain of study unfortunately proved too great for him, and, immediately after his election to a fellowship, his health broke down, and he was obliged to seek rest in Switzerland. There he met Janet Catherine North, whom, after a romantic betrothal in the mountains, he married at Hastings on the 10th of November 1864. He then attempted to settle in London and study law, but his health again broke down and obliged him to travel. Returning to Clifton, he lectured there, both at the college and to ladies' schools, and the fruits of his work in this direction remain in his Introduction to the Study of Dante (1872) and his admirably vivid Studies of the Greek Poets (1873-1876). Meanwhile he was occupied upon the work to which his talents and sympathies were especially attracted, his Renaissance in Italy, which appeared in seven volumes at intervals between 1875 and 1886. The Renaissance had been the subject of Symonds' prize essay at Oxford, and the study which he had then given to the theme aroused in him a desire to produce something like a complete picture of the reawakening of art and literature in Europe. His work, how- ever, was again interrupted by illness, and this time in a more serious form. In 1877 his life was in acute danger, and upon his removal to Davos PJatz and subsequent recovery there it was felt that this was the only place where he was likely to be able to enjoy life. From that time onward he practically made his home at Davos, and a charming picture of his life there will be found in Our Life in the Swiss Highlands (1 89 1) . Symonds, indeed, became in no common sense a citizen of the town; he took part in its municipal business, made friends with the peasants, and shared their interests. There he wrote most of his books: biographies of Shelley (1878), Sir Philip Sidney (1886), Ben Jonson (1886), and Michelangelo (1893), several volumes of poetry and of essays, and a fine translation of the Autobiography of Benvenuto Cellini (1887). There, too, he completed his study of the Renaissance, the work by which he will be longest

remembered. He was assiduously, feverishly active through- out the whole of his life, and the amount of work which he achieved was wonderful when the uncertainty of his health is remembered. He had a passion for Italy, and for many years resided during the autumn in the house of his friend, Horatio F. Brown, on the Zattare, in Venice. He died at Rome on the 19th of April 1893, and was buried close to Shelley.

He left his papers and his autobiography in the hands of Mr Brown, who published in 1895 an excellent and comprehensive biography. Two works from his pen, a volume of essays, In the Key of Blue, and a monograph on Walt Whitman, were pub- lished in the year of his death. His activity was unbroken to the last. In life Symonds was morbidly introspective, a Hamlet among modern men of letters, but with a capacity for action which Hamlet was denied. Robert Louis Stevenson described I him, in the Opalstein of Talks and Talkers, as " the best of talkers,

singing the praises of the earth and the arts, flowers and jewels, wine and music, in a moonlight, serenading manner, as to the light guitar." But under his excellent good-fellowship lurked a haunting melancholy. Full of ardour and ambition, sym- pathy and desire, he was perpetually tormented by the riddles of existence; through life he was always a seeker, ardent but unsatisfied. , This side of his nature stands revealed in his gnomic poetiy, and particularly in the sonnets of his Animi Figura (1882), where he has portrayed his own character with great subtlety. His poetry is perhaps rather that of the student than of the inspired singer, but it has moments of deep thought and emotion. It is, indeed, in passages and extracts that Symonds appears at his best. Rich in description, full of " purple patches," his work has not that harmony and unity that are essential to the conduct of philosophical argument. He saw the part more clearly than the whole; but his view, if partial, is always vivid and concentrated. His translations are among the finest in the language; here his subject was found for him, and he was able to lavish on it the wealth of colour and quick sympathy which were his characteristics. He was a lover of beauty, a poet and a philosopher; but in his life and his work alike he missed that absolute harmony of conviction and concentration under which alone the highest kind of literature is produced. (A. Wa.) v

SYMONDS, WILLIAM SAMUEL (1818-1887), was born in Hereford in 1818. He was educated at Cheltenham and Christ's College, Cambridge, where he graduated B.A. in 1842. Having taken holy orders he was appointed curate of Offenham, near Evesham in 1843, and two years later

he was presented to the living of Pendock in Worcestershire, where he remained until 1877. While at Offenham he became acquainted with H. E. Strickland and imbibed from him such an interest in natural history and geology, that his leisure was henceforth devoted to these subjects. He was one of the founders of the Woolhope Naturalists' Field Club (1851) and of the Malvern Naturalists' Field Club (1853), and was an active member of the Cottes- wold Field Club and other local societies. In 1858 he edited an edition of Hugh Miller's Cruise of the " Betsey." He was the author of numerous essays on the geology of the Malvern country, notably of a paper " On the passage-beds from the Upper Silurian rocks into the Lower Old Red Sandstone at Ledbury " (Quart. Journ. Geol. Soc. i860). His principal work was Records of the Rocks (1872). He was author of Stones of the Valley (1857), Old Bones, or Notes for Young Naturalists (1859, 2nd ed. 1864), and other popular works. He died at Cheltenham on the 15th of September 1887.

See A Sketch of the Life of the Rev. W. S. Symonds, by the Rev. J. D. La Touche.

SYMOND'S YAT, one of the most famous view points on the river Wye. England. At a point 9 m. above Monmouth and 12 m. below Ross by water, the Wye makes a sweep of nearly 5 m. round a peninsula whose neck is only some 600 yds. across. The peninsula is occupied by the limestone acclivity of Hunts- ham Hill. Caverns are seen in the limestone on both precipitous banks of the river. The Yat or Gate is situated on the west side of the neck, which reaches an elevation over 500 ft., and a road from the east drops to a ferry, which was of early im- portance as a highway between England and Wales. The boundary between Herefordshire and Gloucestershire crosses the neck; the Yat is in the county first named, but the railway station, on the east side (left bank) is in Gloucestershire. It is on the Ross-Monmouth line of the Great Western railway. There are here groups of cottages and several inns on both banks, while opposite the Yat itself is the hamlet of New Weir, and a little above it the village of Whitchurch. The river banks are densely wooded, except where they become sheer cliffs, as at the Coldwell rocks above the station. The surrounding country is hilly and rich, and the views from the Yat are superb, embracing the Forest of Dean to the south and east, and backed bv the mountains of the Welsh border in the west.

'SYMONS, ARTHUR (1865-), English poet and critic, was born in Wales on the 28th of February 1865, of Cornish

parents. He was educated privately, spending much of his time in France and Italy. In 1884-1886 he edited four of Quaritch's Shakespeare Quarto Facsimiles, and in 1888-1889 seven plays of the " Henry Irving "

Shakespeare. He became a member of the staff of the Athenaeum in 1891, and of the Saturday Review in 1894. His first volume of verse, Days and Nights (1889), consisted of dramatic monologues. His later verse is influenced by a close study of modern French writers, of Baudelaire and especially of Verlaine. He reflects French tendencies both in the subject-matter and style of his poems, in their eroticism and their vividness of description. His volumes of verse are: Silhouettes (1892), London Nights (1895), Amoris viclima (1897), Images of Good and Evil (1899), A Book of Twenty Songs (1905). In 1902 he made a selection from his earlier verse, published as Poems (2 vols.). He translated from the Italian of Gabriele d'Annunzio The Dead City (1900) and The Child of Pleasure (1898), and from the French of Emile Verhaeren The Dawn (1898). To The Poems of Ernest Dowson (1905) he prefixed an essay on the deceased poet, who was a kind of English Verlaine and had many attractions for Mr Symons. Among his volumes of collected essays are: Studies in Two Literatures (1897), The Symbolist School in Literature (1899), Cities (1903), word- pictures of Rome, Venice, Naples, Seville, &c, Plays, Acting and Music (1903), Studies in Prose and Verse (1904), Spiritual Adventures (1905), Studies in Seven Arts (1906).

SYMONS, GEORGE JAMES (1838-1900), English meteorologist, was born in Pimlico, London, on the 6th of August 1838. In i860 he obtained a post in the meteorological department of the Board of Trade under Admiral Robert Fitzroy, who was then deeply interested in the subject of storm-warnings, and, in the same year he published the first annual volume of British Rainfall, which contained records from 168 stations in England and Wales, but none from Scotland or Ireland. Three years later he resigned his appointment at the Board of Trade, where his rainfall inquiries were not appreciated — at least not as a prior study of storm-warnings- — and devoted his whole energies to the organization of a band of volunteer observers for the collection of particulars of rainfall throughout the British Isles. So successful was he in this object that by 1866 he was able to show results which gave a fair representation of the distribution of rainfall, and the number of recorders gradually increased until the last volume of British Rainfall which he lived to edit (that for 1899) contained figures from 3528 stations— 2894 in England and Wales, 446 in Scotland, and 188 in Ireland. Apart from their scientific interest, these annual reports are of great practical importance, since they afford engineers and others engaged in water supply much-needed data for their calculations, the former absence of which had on some occasions given rise to grave mistakes. Symons himself devoted special study not only to rainfall, but also to the evaporation and percolation of water as affecting underground streams, and his extensive knowledge rendered him a valuable witness before parliamentary committees. In other branches of meteorology also he took a

keen interest, and he was particularly indefatigable, though consistently unsuccessful, in the quest of a genuine thunderbolt. The history of the science too attracted his attention, and he possessed a fine library of meteorological works, which passed to the Meteorological Society at his death. Of that society he became a member when only eighteen, and he retained his connexion with it in various official capacities up to the end of his life. He served as its president in 1880, and in view of the celebration of its jubilee was re-elected to that office in 1900, but the illness that caused his death prevented him from acting. He died in London on the 10th of March 1900.

SYMPATHETIC SYSTEM, in physiology. By the "sym- pathetic system " is understood a set of nerves and ganglia more or less sharply marked off from the cerebro-spinal, both functionally and anatomically. (For anatomy see Nervous System.) Formerly it was thought more independent from the rest of the general nervous system than recent discoveries have found it actually to be. It used to be supposed that the ganglia of the sympathetic system were analogous in function to the

great central nervous masses forming the brain and spinal cord. These latter masses, as now becomes more and more evident, are the only structures in which occurs the work of transmuting afferent-nerve impulses into efferent-nerve impulses with all the accompanying changes in intensity, rhythm; &c, which make up reflex action. Such functions, it is now known, are not attributable to sympathetic ganglia. These last are structures in which one neurone makes communication with other neurones. To that extent, therefore, redistribution of nervous impulses does occur in them, impulses arriving by a few neurones being distributed so as to affect many. But the sympathetic gangKa are not the seat of reflex action. The sympathetic system is now known to consist entirely of conducting paths which, like the nerve-trunks of the cerebro-spinal system, merely conduct nerve impulses either toward the great nervous centres of the spinal cord and brain, or, on the other hand, away from those great centres. In the cerebro-spinal nerves the pre- ponderance of the conduction is toward the centres, in the sympathetic system the preponderance of conduction is away from the centres.

More is known of the sympathetic system from its efferent aspect than its afferent, and we shall consider the former first. One great difference between the efferent paths of the sym- pathetic and those of the ordinary cerebro-spinal system is that the former carry nervous impulses not only to

muscular tissue but to secreting glands, whereas the latter convey them to muscle only, indeed only to muscle of the striated kind. Another difference is that the efferent path which the sympathetic affords from the great central nervous centres to its muscles and glands consists always of two nerve-cells or neurones, whereas the efferent path afforded by the cerebro-spinal motor nerves con- sists of one neurone only. The two neurones forming the sympathetic path are so arranged that one of them whose cell-body lies in the spinal cord has a long axone-process passing out from the cord in the motor spinal root, and this extends to a group of nerve-cells, a sympathetic ganglion, quite distant from the spinal cord and somewhere on the way to the distant organ which is to be innervated. In this ganglion the first sympathetic neurone ends, forming functional connexion with ganglion cells there. These ganglion cells extend each of them an axone process which attains the organ (muscular cell or gland cell), which it is the office of the sympathetic path to reach and influence. The axone-process of the first nerve cell is a myelinated nerve-fibre extending from the spinal cord to the ganglion; it constitutes the pre-ganglionic fibre of the conduction chain. The axone-process of the second nerve- cell, that is the neurone whose cell-body lies in the ganglion, is usually non-myelinate and constitutes the post-ganglionic fibre of the chain.

This construction, characteristic as it is of the sympathetic efferent path, has been found also in certain other efferent paths outside the sympathetic proper. And as these other efferent paths convey impulses to the same kind of organs and tissues as do those of the sympathetic itself, it has been proposed to embrace them and the sympathetic under one name, the auto-nomic system. This term includes all the efferent paths of the entire body excepting only those leading to the voluntary muscles.

That the term " autonomic system " is not merely a conveni- ence of nomenclature, but really represents a physiological entity, seems indicated by the action of nicotin. This drug acts selectively on the autonomic ganglia and not on the cerebro- spinal. In the former it paralyses the nexus between pre- ganglionic and post-ganglionic fibre. It is by taking advantage of this property that many of the recent researches which have done so much to elucidate the sympathetic have been executed.

The term " autonomic system " must not be taken to imply that this system is independent of the central nervous system. As mentioned above in regard to the sympathetic, that is not the case. The autonomic system is closely connected with the central nervous system through the ordinary channel of the nerve-roots, spinal and cranial. It may, in fact, be regarded as

an appendage of the cranial and spinal roots, or rather of certaip of them, for with a considerable proportion of their number it is not connected.

The sympathetic is that part of the autonomic system which is connected with the spinal roots from the second thoracic to the second lumbar inclusive (man). Its ganglia are divided by anatomists into the vertebral, those which lie , as a double chain on the ventral face of the vertebral column, and those which lie scattered at various distances among the viscera, the pre-vertebral. Langley has shown that there is no essential difference between these except that the vertebral send some of their post-ganglionic fibres into the spinal nerves, whereas the latter send all their fibres to the viscera. The sympathetic sends its post-ganglionic fibres —

i. To the muscular coats of the whole of the alimentary canal from the mouth to the rectum; to the glands opening into the canal from the salivary glands in front back to the intes- tinal glands; to the bloodvessels of the whole of the canal from mouth to anus inclusive.

2. To the generative organs, external and internal, and to the muscular coats of the urinary bladder.

3. To the skin; (a) to its blood vessels, (b) to its cutaneous glands, (c) to unstriated muscle in the skin, e.g. the erectors of the hairs.

4. To the iris muscles and blood vessels of the eyeball. The sympathetic nervous system is sometimes called the

visceral. It will be seen from the above that this term is not well suited in some respects, because the sympathetic supplies many structures which are not visceral. Another objection is that a great deal of important nerve-supply to the viscera is fur- nished by parts of the autonomic system other than sympathetic. That the sympathetic does, however, of itself constitute a more or less homogeneous entity is indicated by a curious fact. The substance adrenalin, which is the active constituent of extracts of the adrenal gland, has the property when introduced into the circulation of exciting all over the body just those actions which stimulation of the efferent fibres of the sympathetic causes, and no others. It is possible that when a nerve is stimulated some body at the nerve ending is set free, and this by combining with another chemical substance induces activity in the end organ (gland or muscle). It may be that when a sympathetic nerve is excited adrenalin is set free and combines with some substance which induces activity.

The rest of the autonomic system consists of two portions, a cranial and a sacral, so called from their proceeding from cranial and sacral nerve-roots respectively. The cranial portion is subdivided into a part belonging to the mid-brain and a part belonging to the hind-brain. The ciliary ganglion belonging to the eyeball is the ganglion of the former part, and its post-

ganglionic fibres innervate the iris and the ciliary muscles. The hind-brain portion gives pre-ganglionic fibres to the facial (intermedius) glossopharyngeal and vagus nerves; its post- ganglionic distribution is to the blood vessels of the mucous membrane of the mouth and throat, to the musculature of the digestive tube from the oesophagus to the colon, to the heart, and to the musculature of the windpipe and lungs.

The sacral part of the autonomic system issues from the spinal cord with the three foremost sacral nerves. Its ganglia are scattered in the neighbourhood of the pelvic organs, which they innervate. The distribution of its post-ganglionic fibres is to the arteries of rectum, anus and external genitalia, to the musculature of colon, rectum, anus and the urinary bladder, and to that of the external genitalia.

The part played by the sympathetic and the rest of the autonomic system in the economy of the body is best con- sidered by following broad divisions of organic functions.

Movements of the Digestive Tube. — It is those movements of alimentation not usually within range of our consciousness which the- autonomic system regulates and controls. Nor is its control over them apparently essential or very complete. For instance, the pendular and peristaltic movements of the intestine still go forward when all nerves reaching the viscus

have been severed. Extirpation of the abdominal sympathetic has not led to obvious disturbance of digestion or nutrition in the dog. It is noteworthy that the sympathetic inhibits con- traction of the musculature of the stomach and intestine, while the other, the vagus, portion of the autonomic system excites it. The actions of these two components of the system are, therefore, mutually opposed on the viscera innervated by both.

Action on the Circulation. — The blood supply of most organs is under the control of vaso-constrictor nerves. All vaso-con- strictor nerves are sympathetic. Organs to which vaso-con- strictor nerves are supplied either poorly or not at all are the lungs, heart, liver, brain and probably the skeletal muscles. The blood vessels of certain parts of the body have, in addition to vaso-constrictor nerves, nerves which relax their muscular wall, vaso-dilatator nerves. The latter are never furnished by the sympathetic, they are in the mucous membranes and glands at the oral end of the body furnished by the cranial portion of the autonomic system. In regions at the aboral end of the body they are furnished by the sacral portion of the

autonomic system. Elsewhere the vaso-dilatators when present are derived from the nerve-cells of the spinal ganglia (Bayliss).

The control of the calibre of the blood vessels by the autonomic system is of importance in several well-ascertained respects. By constricting the blood vessels of the viscera the system is able to favour an increase of blood supply to the brain. A noteworthy instance of such an action occurs when the erect attitude is assumed after a recumbent posture. Were it not for vaso-constriction in the abdominal organs the blood would then, under the action of gravity, sink into the more dependent parts of the body and the brain would be relatively emptied of its supply, and fainting and unconsciousness result. Again, it is essential to the normal functioning of the organs of warm- blooded animals that their temperature, except in the surface layer of the skin, should be kept constant. Part of the regula- tive mechanism for this lies in nervous control of the quantity of blood flowing through the surface sheet of the skin. That sheet is a cool zone through which a greater or smaller quantity of blood may, as required, be led and cooled. By the sym- pathetic vaso-constrictors the capacity of these vessels in the cool zone can be reduced, and thus the loss of heat from the body through that channel lessened. In cold weather the vaso- constrictors brace up these skin vessels and lessen the loss of heat from the body's surface. In hot weather the tonus of these nerves is relaxed and the skin vessels dilate; a greater proportion of the blood then circulates through the compara- tively cool skin-zone.

The heart itself is but a specialized part of the blood-vascular tubing, and its musculature, like that of the arteries, receives motor nerves from the sympathetic. These nerves to the heart from the sympathetic are known as the accelerators, since they quicken and augment the beating of the cardiac muscle. The heart receives also nerves from the cranial part of the autonomic system, and the influence of these nerves is antago- nistic to that of the sympathetic supply. The cranial autonomic nerves to the heart pass via the vagus nerves and lessen the beating of the heart both as to rate and force. These inhibitory nerves of the heart are analogous to the dilatator nerves to the blood vessels, which, as mentioned above, come not from the sympathetic, but from the cranial and sacral portions of the autonomic system.

Skin-glands. — In close connexion with the temperature regulating function of the sympathetic stands its influence on the sweat secreting glands of the skin. Secretory nerves to the sweat glands are furnished apparently exclusively by the sympathetic.

Pilomotor Nerves. — -The skin in many places contains muscle of the unstriped kind. Contraction of this cutaneous muscular tissue causes

knotting of the skin as in "goose-skin," and erection of the hairs as in the cat, or of the quills as in the hedgehog and porcupine. The efferent nerve-fibres to the unstriped muscles of the skin are always furnished by the sympa- thetic (pilomotor nerves, &c). In this case the sympathetic xxvi. 10

contributes to emotional reactions and perhaps further to the regulation of temperature, as by ruffling the fur or feathers in animals exposed to the cold.

The Respiratory Tube. — The windpipe and the air passages of the lungs contain in their walls much unstriped rhuscular tissue, arranged so as to control the calibre of the lumen. The nerve-supply to this muscular tissue is furnished by the cranial autonomic system via the vagus nerves.

Eyeball. — An important office of the sympathetic is the con- trolling of the brightness of the visual image by controlling the size of the pupil. The sympathetic sends efferent fibres to the dilatator muscle of the pupil. In this case, as in others noted above, the cranial part of the autonomic system sends nerves of antagonistic effect to those of the sympathetic, first through the third cranial nerves from the efferent fibres to the constrictor muscle of the pupil. This same part of the cranial autonomic system supplies also motor fibres to the ciliary muscle, thus effecting the accommodation of the lens for focusing clearly objects within the range of what is termed near-vision.

Of the afferent fibres of the sympathetic little is known save that they are, relatively to the efferent, few in number, and that they, like the afferents of the cerebro-spinal system, are axones of nerve-cells seated in the spinal ganglia. (C. S. S.)

SYMPHONIA (Gr. (rvntftcwia) , a much discussed word, applied at different times (1) to the bagpipe, (2) to the drum, (3) to the hurdy-gurdy, and finally (4) to a kind of clavichord. The sixth of the musical instruments enumerated in Dan. iii. 5, 10, 15, erroneously translated " dulcimer," in all proba- bility refers to the bagpipe (q.v.). Symphonia, signifying drum, occurs in the writings of Isidor of Seville. " Tym- panum est pellis vel corium ligno ex una parte extentum. Est enim pars media symphoniae in similitudinem cribri. Tympanum autem dictum quod medium est. Unde, et mar- garitum medium tympanum dicitur, et ipsum ut symphonia ad virgulam percutitur." The reference comparing the tympa-num (kettledrum) to half a pearl is borrowed from Pliny (Nat. hist. IX. 35, 23). Symphonia or Chifonie was applied during the 13th and 14th centuries, in the Latin countries more especially, to the hurdy-gurdy. Symphonia is applied by Praetorius 1 to an instrument which he classed with the clavichord, spinet, regals and virginal, but without giving any clue

to its distinctive characteristics. (K- S.)

SYMPHONIC POEM (Symphonische Dicktung, Tondichtung, Poeme symphonique, &c). This term covers the experiments in a new style of instrumental music which first showed a co- herent method in the twelve Symphonische Dichtungen of Liszt. The term at present implies a large orchestral composition which, whatever its length and changes of tempo, is not broken up into separate movements, and which, moreover, illustrates a definite poetic train of thought that can be expressed in litera- ture, whether it is actually so expressed or not. Thus the form of the symphonic poem is the form dictated by its written pro- gramme or unwritten poetic idea; and so it is not every piece of " programme music " that can be called a symphonic poem. Beethoven's sonata Les Adieux, and his Pastoral Symphony, are, for instance, works in which the poetic idea does not interfere with the normal development of sonata style required by the musical nature of Beethoven's material.

Great disturbances in musical art have always been accom- panied by constant appeals to external literary ideas; and there is nothing peculiarly modern in the present tendency to attack and defend the rising style of large indivisible schemes of instru- mental music by unprofitable metaphysical discussions as to the claims of " absolute music " against " music embodying poetic ideas." New art-forms are not born mature, and in their infancy their parent arts naturally invite other arts to stand godfather. If the rise of the sonata style was not accompanied by as much "programme music" as the new art of the present day (and as a matter of fact it was accompanied by a good deal), it at all events coincided with highly Wagnerian discussions

1 See " Syntagm. mus." pt. ii., De organographia, pp. 72, 7?,, 178 (Wolfenbiittel, 1618).

of dramatic music on literary grounds. What is certain is, firstly, that no amount of theorizing can prevent a musician from developing his musical ideas; secondly, that musical ideas are just as likely to be inspired by literature and other arts as by any other kind of experience; and lastly, that, as musicians attain greater mastery in the handling of their ideas, their musical readiness soon outstrips their powers or inclina- tion for literary analysis, at all events while they are working at the music. Hence

the frequent ability of great composers to set inferior words to music which is not only great but evidently based upon those words. Hence the digust of great composers at even the cleverest unauthorized literary inter- pretations of their works. Hence, on the other hand, the absence of any general classical attitude of vigorous protest against the use of music to convey external ideas. Be this as it may, we believe the importance of the symphonic poem to lie not in its illustrative capacity, but in its evident tendency towards a new kind of instrumental art.

It is not mere convention and prejudice that has delayed the ripening of this art. Every classical art-form is made by the greatest artists to be a natural thing in every individual case, no matter how artificial the conditions of the form become in ordinary hands. In the highest classical art not even a thousand examples identical in form would really be examples of an art-form set up like a mould for the material to be shovelled into it. In each case, however much the artist may have been helped by custom, his material would have taken that shape by its own nature. A sufficient number of sufficiently similar cases of this kind may conveniently, though dangerously, be regarded as establishing an art-form; and most art-forms coin- cide to a striking degree with practical and local limitations, for in these a great artist can almost always find suggestions for the character of his material instead of mere hindrances to its develop- ment. Thus art-forms become the vehicle for perfectly natural works in the hands of great artists, even when in the abstract they are highly artificial and conventional. But there is probably no case of an important art-form (and still less of a whole style of art) remaining productive in so artificial a condition when the facts which made that condition natural are changed. The great works in such forms remain, and are thoroughly natural, for they express their environment so perfectly as to recall it. It makes singularly little difference to the value of a great work of art, in the [long run, whether its vividness is in the light it throws on a remote and forgotten past, or on a living and actual present. When Alcinous welcomes Odysseus, on hearing that he is an honourable pirate and not one of those disreputable merchants, our pleasure at the realistic glimpse of Homeric social distinctions differs from the pleasure of the Homeric audience only in so far as our point of view is more romantic. But new art must, if it is to live, be produced, like the classics, on conditions which the artist himself understands; and it is improbable that these conditions (if they admit of healthy art at all) will be of a less common-sense character than those of older art.

In the absence of musical criteria for a future art, perhaps the analogy of drama may be useful here. The chorus of Greek tragedy can by no stretch of imagination be said to behave like a corresponding group of persons in real life. Yet the Greek chorus becomes natural enough when we realize the

necessary material circumstances of Greek drama; indeed in the best examples it becomes the only natural (or even, in a certain religious aspect, realistic) treatment of a natural set of materials. In the same way we are taught that Shakespeare's dramatic technique becomes perfectly natural when we realize his equally natural type of stage, whfch was so constructed and situated in regard to the audience that scenery would obstruct the view just as it would in a circus. But with the modern conception of a stage as a kind of magnified peep-show, with the audience looking into a painted box, realistic scenery is inevitable; and with realistic scenery comes speech so realistic that the use of verse and other classical resources is attended with dangers hitherto unknown. At the same time the condition of the modern stage obviously

approximates far more closely to such an idea of the art of imita- ting human life by human speech and action, as would most naturally occur to a common-sense mind at any period. And it is probable that the final condition of an art will always tend to approximate to such an idea. In the same way it cannot be doubted that the sonata form, with its subtle balance between independence of form and interdependence of contrast, is far too artificial to be such a final form of instrumental music as would commend itself in the abstract to ordinary common sense. And we may look forward to a time, perhaps by the middle of the century, when the new and single continuous forms now adumbrated by the symphonic poems shall be the greatest forms of instrumental music, and shall need no literary crutches to make them intelligible. The pioneers of these forms at the present day frequently and sometimes justifiably claim that their music is intelligible apart from its " programme," but this is far from being so constantly the case that the symphonic poem can as yet be regarded as a mature kind of art. But when the mature art it foreshadows shall appear, then critics will need to face the fact that its genuine achievements will outwardly resemble the immature efforts which led to them, while the spiritual resemblance to classical music will lie too deep for the recognition of any but those who have the courage to make the new art their own. The symphonies of Mozart are in texture and phraseology far more like those of Philipp Emanuel Bach than they are like the great works of John Sebastian Bach; and if we try the experiment of reading one of John Sebastian's motets after a long course of Palestrina, we may realize that a lover of the Palestrina style living during the monodic revolu- tion would really have had no means of telling the difference between Bach's art and the squalid sensational impressionism of Gesualdo, the prince of Venosa. Yet the impassable gulf is in all cases that between the great art and the crude efforts that foreshadow it, while the universal spirit of mature art remains the same whether the age or style be called " classical," " romantic," or " secessionist." See also Programme Music and Sonata Forms {ad fin.).

(D. F. T.)

SYMPHONY in music. 1 . The term aviA

2. In the 17th century the term is used, like " concerto," for certain vocal compositions accompanied by instruments, e.g. the Kleine geistlicke Concerte and Symphoniae sacrae of Schiitz. Most of Schiitz's works of this class are for from one to three solo voices in various combinations with instruments. The Geistliche Concerte are generally accompanied by figured bass and are to German texts; asnd the voices may in many cases be choral. The Symphoniae sacrae are to Latin texts and are written for various combinations of instruments, while the voice parts are evidently for solo singers. The word sym- phony is sometimes used for the instrumental ritornello of songs and vocal movements in aria form. In this sense it already appears in No. 28 of the second book of Schiitz's Geistliche Concerte.

3. The principal modern meaning of the word is a sonata for orchestra (see Sonata Forms). The orchestral symphony originated in the operatic overture (q.v.), which in the middle of the iSth century began to assimilate the essentials of the sonata style. At first such sonata-style overtures consisted of

three movements, viz. a moderately quick binary movement, a short slow movement, and a lively finale. Thus Mozart, at the age of twelve, used his 7th symphony as the overture to La Finta semplice, and Haydn's maturest symphonies are still called overtures in some early editions. La Finta giardiniera, written by Mozart in his eighteenth year, marks the differentia- tion of the opera overture from the independent symphony, since it contains the usual first movement and slow move- ment, but the curtain rises with what sounds like the beginning of the finale.

The sonata style was not at first invariably associated with what we now call sonata form, nor indeed was that form at first the most favourable to the dramatic expression desirable for operatic music. Hence the overtures of Gluck are generally in forms based on the contrast of loosely knit passages of various textures; forms which he probably learned from San Martini, and which may be found in the concertos of Vivaldi, so many of which were freely transcribed by Sebastian Bach. These methods are no less evident in the symphonies of Philipp Em- manuel Bach, which thus occupy an analogous place, away from the normal line of the sonata style.

The differentiation between symphony and overture was of immense importance in raising the dignity of the symphony; but the style was more essential than the form; and in Mozart's and Haydn's mature works we find the sonata form as firmly established in the overture as in the symphony, while nevertheless the styles and scope of the two forms are quite distinct. Mozart's most elaborate over- ture, that of Die Zauberflote, could not possibly be the first movement of one of his later symphonies; nor could the finale of his " Jupiter " symphony (which has often been compared with that overture because of its use of fugalo) conceivably be used as the prelude to an opera.

See also Music; Sonata Forms; Instrumentation; Overture; Scherzo; Variations. (D. F. T.)

SYMPHOSIUS, or Symposius, the name given to the author of a collection of 100 riddles of uncertain date, but probably composed in the 4th or 5th century a.d. They have been attributed to Lactantius, and identified with his Symposium, but this view is not generally accepted. The style and versifica- tion of the riddles, each of which consists of three hexameter lines, are good. They were written to form part of the enter- tainment at the Saturnalia.

Text in E. Bahrens, Poetae latini minores, vol. iv. ; there is a good French metrical version by E. F. Corpet (1868); monograph by W. T. Paul (Berlin, 1854) '• see ˆ so Teuffel, Hist, of Roman Literature, 449 (Eng. trans., 1900).

SYMPOSIUM (Gr. avpuroaiov, a drinking party, from avpvwlvtLV, to drink together, obv, with, and iriveiv, to drink, root to, cf. Lat. potare, to drink, poculum, cup), the convivial drinking which took place after a great banquet, accompanied by intel- lectual or witty conversation, and by music or dancing performed by slaves or attendants. The term has been applied in modern usage, due to Plato's Symposium, to a collection of opinions of different writers on a given subject.

SYNAGOGUE (owa-ywyˆ), literally " assemblage," is the term employed to denote either a congregation of Jews, i.e. a local circle accustomed to meet together for worship and religious instruction, or the building in which the congregation met. In the first sense the word is a translation of iidm, keneseth (assemblage), in the second of noan rra, beth hakkeneseth (house of assemblage). Further the term is often used to denote the system of Judaism, as when the " Synagogue " is contrasted to the " Church." The germ of the synagogue, that is, of religious assemblages dissociated from the ancient ritual of the altar, may be found in the circle of the prophets and their disciples (see especially Isa. viii. 16 seq.) ; but the synagogue as

an institution characteristic of Judaism arose after the work of Ezra, and is closely connected with the development of Judaism, to which his reformation gave definite shape. From the time of Ezra downwards it was the business of every Jew to know the law; the school (beth hammidrdsh) trained scholars, but the syna- gogue, where the law was read every Sabbath (Acts xv. 21), was

the means of popular instruction. Such synagogues existed in all parts of Judaea in the time of Ps. lxxiv. 8 (probably a psalm of the Persian period); in Acts xv. 21 it appears that they had existed for many generations " in every city." This held good not only for Palestine, but for the Dispersion; in post-Talmudic times the rule was that a synagogue must be built wherever there were ten Jews. In the Dispersion the synagogue filled a greater place in the communal life, for on Palestinian soil the Temple enjoyed a predominant position. In this sense the synagogue is a child of the Dispersion, but this does not imply that it was a product of the Hellenic diaspora. For the Aramaic papyri discovered at Assuan show that in the 5th century B.C. the Egyptian Jews had their place of worship in Syene long before Greek influences had begun to make them- selves felt. The fact that the Books of the Maccabees never refer to synagogues is not evidence that synagogues were un- known in Judaea in the Maccabean period. These books refer mostly to a time of war, when assemblages in the cities were impossible; their interest, moreover, is concentrated in the Temple and the restoration of its services. During the second Temple there is no doubt but that public worship was organized in the provinces as well as in the Jewish settlements outside the Holy Land. And though the name " synagogue " varies with irpoaevxv ("place of prayer"), it appears that everywhere the assemblage was primarily one for instruction in the law; the synagogue, as Philo puts it, was a SiSacrKaXeioi'. Prayer, in the more restricted sense, invariably accompanied the instruc- tion, and several parts of the extant liturgy go back to the 3rd century B.C. A formed institution of this sort required some organization: he general order of the service was directed by one or more "rulers of the synagogue" (apxˆcrvvdyoyyoi, Luke xiii. 14; Acts xiii. 15), who called on fit persons to read, pray and preach; alms were collected by two or more " collectors " (gabbae seddqa) ; and a " minister " (hazzan, wijperijs, Luke iv. 20) had charge of the. sacred books (preserved in an " ark ") and of other ministerial functions, including the teaching of children to read. The discipline of the congregation was enforced by excommunication {her em) or temporary exclusion (niddui), and also by the minor punishment of scourging (Matt. x. 17), inflicted by the hazzan. The disciplinary power was in the hands of a senate of elders (-Trpeo-pvrepoi, yepovcria.) , the chief members of which were apxovres. The principal service of the synagogue was held on Sabbath morning, and included, accord- ing to the Mishnah, the recitation of the shema' (Deut. vi.

4-9, xi. 13-21; Num. xv. 37-41), prayer, lessons from the law and prophets with Aramaic translation, a sermon (derashah) based on the lesson (Acts xiii. 15), and finally a blessing pronounced by the priest or invoked by a layman. On Sabbath afternoon and on Monday and Thursday there was a service without a lesson from the prophets; there were also services for all feast- days. Synagogues were built by preference beside water, in order to avoid proximity to the idol temples, rather than, as some think, for the convenience of the ceremonial ablutions (cf. Acts xvi. 13). Remains of very ancient buildings of this class exist in several parts of Galilee; they generally lie north and south, and seem to have had three doors to the south, and sometimes to have been divided by columns into a nave and two aisles.

Modern synagogues are mostly built of oblong shape, with a gallery for women. Since the middle ages, Renaissance and Moorish types of decoration have been generally favoured, but there is nowadays a great variety of types. The ancient syna- gogue of Alexandria (destroyed by Trajan) was a basilica. A number of recent synagogues have been built in octagonal form. The main interior features of the synagogue are the " ark " (a cupboard containing the scrolls of the law, &c.) and the almemar (or reading-desk, from the Arabic al-minbar, pulpit). This is sometimes in the centre, sometimes at the eastern end of the building. The Talmud prescribed an elevated site for the synagogue, but this rule has been impossible of fulfilment in modern times. The synagogues are theoretically " orientated " — i.e. the ark (which worshippers face during the principal prayer)

is on the eastern side. But this rule, too, is often ignored under the stress of architectural difficulties.

Jewish tradition has a great deal to say about a body called " the great synagogue," which is supposed to have been the supreme religious authority from the cessation of prophecy to the time of the high priest Simeon the Just, and is even said to have fixed the Old Testament canon (cf. v. 3 seq.). But Kuenen in his essay " Over de Mannen der Groote Synagoge " (Verslagen of the Amsterdam Academy, 1876) has powerfully argued that these traditions are fiction, and that the name keneselh haggadola originally denoted, not a standing authority, but the great convocation of Neh. viii.-x. Some more recent scholars are, however, more willing to attach credence to the older tradition.

Compare, in general, Schiirer, Geschichte des jiidischen Volkes, § 27,

where the older literature is catalogued. For some uncon- ventional views the reader may refer to M. Friedlander, Synagoge und Kirche in ihren Anfangen (Berlin, 1908). For the usages of the synagogue in more recent times, see Buxtorf, Synagoga judaica (Basel, 1641). On the history of synagogue services the works of Zunz are the chief authorities ; there is also a good article on Liturgy in the Jewish Encyclopedia. Useful summaries in English are to be found in Dembitz, Jewish Services in Synagogue and Home (Philadelphia, 1898) ; and Oesterley and Box, The Religion and Worship of the Synagogue (London, 1907). The article " Synagogue " in the Jewish Encyclopedia is illustrated with numerous pictures of buildings and plans.

SYNAGOGUE, UNITED, an organization of London Jews, founded, with the sanction of an act of parliament, in 1870. It is confined, in its direct work, to the metropolis, but it exer- cises, indirectly, considerable influence over the Jews of the British Empire. It is governed by an elected council represent- ing the constituent congregations. In religious and ritual matters it is under the jurisdiction of the chief rabbi, who is, to a certain extent, recognized throughout the empire. The president of the United Synagogue in 1910 was Lord Rothschild. Besides providing the worship of some twenty congregations, the United Synagogue directs and supports educational and charitable work. The title " chief rabbi " is not found in the pre-expulsion records, though, before the Jews were banished in 1290, there was an official named " presbyter omnium Judae- orum Angliae." The functions of this official cannot be proved to have been ecclesiastical. The title " chief rabbi " has become well known through the eminence of recent occupants of the position such as Solomon Hirschell (1762-1842). He was succeeded by Dr Nathan Marcus Adler (1 803-1 890), who was followed by his son, Hermann Adler, who raised the position to one of much dignity and importance. Dr Hermann Adler was born in Hanover in 1839, graduated at Leipzig, and received honorary degrees from Scotch and English universities, includ- ing Oxford. In 1909 he received the order of M.V.O. Dr Adler was elected chief rabbi in 1891. Besides several essays in the Nineteenth Century, Dr Adler has written extensively on topics of Anglo-Jewish History and published two volumes of sermons. (I. A.)

SYNANTHY (Gr. obv, with, and avdos, a flower), a botanical term for the adhesion of two or more flowers.

SYNAXARIUM (Gr. o-vva£apwv, from avvaytiv, to bring together), the name given in the Greek Church to a compilation corresponding very closely to the martyrology (q.v.) of the Roman Church. There are two kinds of synaxaria — simple synaxaria, which are merely lists of the saints arranged in the order of their anniversaries, e.g. the calendar of Morcelli; and historical synaxaria, which give biographical notices besides, e.g. the

menology of Basil and the synaxarium of Sirmond. The notices given in the historical synaxaria are summaries of thosje in the great menologies, or collections of lives of saints, for the twelve months of the year. The oldest historical synaxaria apparently go back to the tenth century. The heterodox Eastern churches also have their synaxaria.

The publication of the Arabic text of the synaxarium of the Church of Alexandria was started simultaneously by J. Forget in the Corp. script, orient, and by R. Basset in the Patrologia orient., and that of the Ethiopian synaxarium was begun by I. Guidi in the Patrologia orient. The Armenian synaxarium, called the

synaxarium of Ter Israel was published at Constantinople in

1834-

See S. A. Morcelli, Kalendarium ecclesiae Constantinopolitanae (Rome, 1788) ; H. Delehaye, " Le Synaxaire de Sirmond," in Analecta bollandiana, xiv. 396-434, where the terminology is explained; idem, Synaxarium ecclesiae Constantinopolitanae e codice Sirmondiano (Brussels, 1902), forming the volume Propylaeum ad acta sanctorum novembris. (H. De.)

SYNCELLUS, a hybrid word (Gr. avv, Lat. cello)? meaning literally " one who shares his cell with another." In ecclesiastical usage it refers to the very early custom of a priest or deacon living continually with a bishop, propter testimonium ecclesiasticum; thus Leo III. speaks of Augustine as having been the syncellus of Gregory the Great. The term came into use in the Eastern Church, where the syncelli were the chaplains of metropolitans and patriarchs. At Constantinople they formed a corporation, and the proto syncellus took precedence of metropolitans and ranked next to the patriarch, to whose office he generally succeeded.

SYNCOPE (Gr. ewvKom?, a cutting up or short, from dmrav, to cut), a term used in grammar for the elision of a letter or syllable in the middle of a word (e.g. " ne'er " for " never "); and in medicine for the condition of fainting or shock (q.v.); and so occasionally in a general sense for a suspension or cessation of function. " Syncopate " and " syncopation " are analogous derivatives; and in music a syncopation is the rhythmic method of tying Cˆ) two beats of the same note into one tone in such a way as to displace the accent.

SYNCRETISM (Gr. o-vynpriTioii&s, from cbv and Ktpkvvvpi, mingle or blend, or, according to Plutarch, from avv and KpijTifeie, to combine against a common enemy after the manner of the cities of Crete), the act or

system of blending, combining or reconciling inharmonious elements. The term is used technically in politics, as by Plutarch, of those who agree to forget dissensions and to unite in the face of common danger, as the Cretans were said to have done; in philosophy, of the efforts of Cardinal Bessarion and others in the 16th century to reconcile the philosophies of Plato and Aristotle; and in theology, of a plan to harmonize the hostile factions of the Church in the 17th century, advocated by Georg Calixtus, a Lutheran professor of theology at Helmstadt. Its most frequent use, however, is in connexion with the religious development of antiquity, when it denotes the tendency, especially prominent from the 2nd to the 4th centuries of the Christian era, to simplify and unify the various pagan religions. During this period, as a result of the intimate knowledge of the world's religions made possible by the gathering of every known cult of importance into the religious system of the Roman Empire, belief in the identity of many deities which resembled each other, and indeed in the essential identity of all, received a special impulse. Not only were various forms of the same deity, such as, for example, Jupiter Capitolinus and Jupiter Latiaris, recog- nized as being really the same under different aspects, but even the gods of different nations were seen to be manifestations of a single great being. Roman Jupiter, Greek Zeus, Persian Mithras and Phrygian Attis were one. The Great Mother, Isis, Ceres, Demeter, Ops, Rhea, Tellus, were the same great mother deity under different masks (see Great Mother of the Gods). Venus and Cupid, Aphrodite and Adonis, the Great Mother and Attis, Astarte and Baal, Demeter and Dionysus, Isis and Serapis, were essentially the same pair. Syncretism even went so far as to blend the deities of paganism and Christianity. Christ was compared with Attis and Mithras, Isis with the Virgin Mary, &c. Isis, perhaps more than any other deity, came to be regarded as the great maternal goddess of the universe whose essence was worshipped under many different names. This fact, with the spirit of syncretism in general, is well illustrated by Apuleius (Metamorph. xi. 2 and 5). Lucius invokes Isis: " Queen of Heaven, whether thou art the genial Ceres, the prime parent of fruits, who, joyous at the discovery of thy daughter, didst banish the savage nutriment of the ancient acorn, and, pointing out a better food, dost now till the Eleusinian soil; or whether thou art celestial Venus, who, in the first origin of things, didst 1 Apollinaris Sidonius uses the pure Latin term concellus.

associate the different sexes, through the creation of mutual love, and having propagated an eternal offspring in the human race, art now worshipped in the sea-girt shrine of Paphos; or whether thou art the sister

of Phoebus, who, by relieving the pangs of women in travail by soothing remedies, hast brought into the world multitudes so innumerable, and art now venerated in the far-famed shrines of Ephesus; or whether thou art Proserpine, terrific with midnight howlings … by whatever name, by whatever ceremonies, and under whatever form it is lawful to invoke thee; do thou graciously, &c. " The goddess replies: " Behold me … I, who am Nature, the parent of all things, the mistress of all the elements, the primordial offspring of time, the supreme among divinities, the queen of departed spirits, the first of the celestials, and the uniform manifestation of the gods and goddesses; who govern by my nod the luminous heights of heaven, the salubrious breezes of the ocean, and the anguished silent realms of the shades below; whose one sole divinity the whole orb of the earth venerates under a manifold form, with different rites, and under a variety of appellations. Hence the Phrygians, that primeval race, call me Pessinuntica, the Mother of the Gods; the Aborigines of Attica, Cecropian Minerva; the Cyprians, in their sea-girt isle, Paphian Venus; the arrow-bearing Cretans, Diana Dictynna; the three-tongued Sicilians, Stygian Proserpine; and the Eleusinians, the ancient goddess Ceres. Some call me Juno, others Bellona, others Hecate, others Rhamnusia. But those who are illumined by the earliest rays of that divinity, the Sun, when he rises, the Aethopians, the Arii, and the Egyptians, so skilled in ancient learning, worshipping me with ceremonies quite appropriate, call me by my true name, Queen Isis. Behold, then, &c. " (Trans. Bohn's Lib.).

Naturally, the influence of Greek philosophy was very pro- nounced in the growth of syncretism. Plutarch and Maximus of Tyre affirmed that the gods of the different nations were only different aspects of the same deity, a supreme intelligence and providence which ruled the world. The Neoplatonists, how- ever, were the first school to formulate the underlying philosophy of syncretism: " There is only one real God, the divine, and the subordinate deities are nothing else than abstractions personified, or celestial bodies with spirits; the traditional gods are only demons, that is, being intermediate between God and man . . . All, like every other created being, are emanations from the absolute God " (Jean Reville, La Religion A Rome sous les Severes). Care must be taken, however, not to place too much emphasis upon syncretism as a conscious system. The move- ment which it represented was not new in the 2nd century a.d. The identification of Latin with Etruscan gods in the earliest days of Rome, and then of Greek with Italian, and finally of Oriental with the Graeco-Roman, were all alike syncretistic movements, though not all conscious and reasoned. The ideal of the common people, who were unreflecting, as well as of philosophers who reflected, was " to grasp the religious verity, one and constant, under the multiplex forms with which legend and tradition had enveloped it " (Reville). The advent of Greek philosophy only hastened the movement by

conscious and systematic effort.

Syncretic, being a movement toward monotheism, was the converse of the tendency, so prominent in the early history of Rome, to increase the number of deities by worshipping the same god under special aspects according to special activities. In the hands of the Neoplatonists it was instrumental in retard- ing somewhat the fall of paganism for the time, but in the end contributed to the success of Christianity by familiarizing men with the belief in one supreme deity. The triumph of Christi- anity itself represented a result of syncretism, the Church being a blending of the beliefs and practices of both the new and old religions.

See Jean Reville, op. oil., especially pages 104-127, 159-174, 284-295. For other examples of syncretism, cf. that of Buddhism Zoroastrianism in the state religion of the Indo-Scythian king- dom of Kanishka (see Persia: Ancient History, vii. ; The Parthian Empire, § 2) ; see articles on almost all the religions of the East, e.g. Mithras; Zoroaster. (G. Sn.)

SYNDERESIS, a term in scholastic philosophy applied to the inborn moral consciousness which distinguishes between good and evil. The word is really synteresis (Gr. owrˆprjms, from avvTijpetv, to look after, take care of), but synderesis is the commoner form. Diogenes Laertius in his account of the Stoics (vii. 85, ttjv 8i irpwrrjV op/uije 4>acn to f <$ov laxˆ-v eirl to rrjpttv iavro) uses the phrase rr]peiv iavro to describe the instinct for self-preservation, the inward harmony of Chrysippus, the recog- nition of which is o-weiSijcris. The term synderesis, however, is not found till Jerome, who in dealing with Ezek. i. 4-15, says the fourth of the " living creatures " of the vision is what the Greeks call ovvTriprjais, i.e. scintilla conscientiae the " spark of conscience." Here apparently synderesis and conscience (

SYNDIC (Late Lat. syndicus, Gr. crvvdiKos, one who helps in a court of justice, an advocate, representative, cbv, with, and dUri, justice), a term applied in certain countries to an officer of govern- ment with varying powers, and secondly to a representative or delegate of a university, institution or other corporation, entrusted with special functions or powers. The meaning which underlies both applications is that of representative or delegate. Du Cange (Gloss, s.v. Syndicus), after defining the word as defensor, pair onus, advocatus, proceeds ” Syndici maxime appellantur Actores universitatum, collegiorum, societatum et aliorum corporum, per quos, tanquam in republica quod communiter agi fierive oportet, agitur et fit,” and gives several examples from the 13th century of the use of the term. The most familiar use of ” syndic ” in the first sense is that of the Italian sindico, who is the head of the administration of a commune, answering to a ” mayor “; he is a government official but is elected by the communal council from their own members by secret ballot.

Nearly all the companies, gilds, and the university of Paris had representative bodies the members of which were termed syndici. Similarly in England, the senate of the university of Cambridge, which is the legislative body, delegates certain functions to special committees of its members, appointed from time to time by Grace, i.e. a proposal offered to the senate and confirmed by it; these committees are termed " syndicates " and are permanent or occasional, and the members are styled " the syndics " of the particular committee or of the institution which they administer; thus there are the syndics of the FitzWilliam Museum, of the University Press, of the Observatory, or local examinations and lectures, of the Antiquarian Committee, &c.

SYNDICATE, a term originally meaning a body of syndics. In this sense it is still sometimes used, as at the university of Cambridge, for the body of members or committee responsible for the management of the University Press. In commerce, a syndicate is a body of persons who combine to carry through some financial transaction, or who undertake a common adventure. Syndicates are very often formed to acquire or take over some undertaking, held it for a short time, and then resell it to a company. The profits are then distributed and the syndicate dissolves. Sometimes syndicates are formed under agree- ments which constitute them mere partnerships, the members being therefore individually responsible, but they are now more generally incorporated under the Companies Acts.

The more usual cases in which syndicates are commonly formed will be found in F. B. Palmer's Company Precedents, 10th ed., vol. i. pp. 129 seq.

SYNECHISM (from Gr. crvvexys, continuous, from cbv, %x HV > to hold together), a philosophical term proposed by C. S. Peirce (Monist, ii. 534) to express the general theory that the essential feature in philosophic speculation is continuity. It is specially directed to the question of hypothesis, and holds that a hypothesis is justifiable only on the ground that it provides an explanation.

All understanding of facts consists in generalizing concerning them. The fact that some things are ultimate may be recognized by the synechist without abandoning his standpoint, since synechism is a normative or regulative principle, not a theory of existence. The adjective " synechological " is used in the same general sense; " synechology " is a theory of continuity or universal causation; "synechia" is a term in ophthalmology for a morbid union of parts.

SYNEDRIUM (avvtdpiov), a Greek word which means " assembly " and is especially used of judicial or representative assemblies, is the name by which (or by its Hebrew transcription, p-n.-iiD, sanhedrln, sanhedrim) that Jewish body is known which in its origin was the municipal council of Jerusalem, but acquired extended functions and no small authority and influence over the Jews at large (see xiii. 424 seq.). In the Mishnah it is called " the sanhedrin," " the great sanhedrin," " the sanhedrin of seventy-one [members] " and " the great court of justice " (beth din haggddol). The oldest testimony to the existence and constitution of the synedrium of Jerusalem is probably to be found in 2 Chron. xix. 8; for the priests, Levites and hereditary heads of houses there spoken of as sitting at Jerusalem as a court of appeal from the local judicatories does not correspond with anything mentioned in the old history, and it is the practice of the chronicler to refer the institutions of his own time to an origin in ancient Israel. And just such an aristocratic council is what seems to be meant by the gerousia or senate of " elders " repeatedly mentioned in the history of the Jews, both under the Greeks from the time of Antiochus the Great (Jos. Ant. xii. 3, 3) and under the Hasmonean high priests and princes. The high priest as the head of the state was doubtless also the head of the senate, which, according to Eastern usage, exercised both judicial and administrative or political functions (cf. 1 Mace. xii. 6, xiv. 20). The exact measure of its authority must have varied from time to time at first with the measure of autonomy left to the nation by its foreign lords and afterwards with the more or less autocratic power claimed by the native sovereigns.

The original aristocratic constitution of the senate began to be modified under the later Hasmoneans by the inevitable intro- duction of representatives of the rising party of the Pharisees, and this new element gained strength under Herod the Great, the bitter enemy of the priestly aristocracy. Finally under the Roman procurators the synedrium was left under the presidency of the chief priest as the highest native tribunal, though without the power of life and death (John xviii. 31). The aristocratic and Sadducean element now again preponderated, as appears from Josephus and from the New Testament, in which " chief priests " and " rulers " are synonymous expressions. But with these there sat also " scribes " or trained legal doctors of the Pharisees and other notables, who are simply called " elders " (Mark xv. 1). The Jewish tradition which regards the synedrium as entirely composed of rabbins sitting under the presidency and vice-presidency of a pair of chief doctors, the nasi and db beth din, is inconsistent with the evidence of Josephus and the New Testa- ment. It is generally held that it was after the fall of the state that a merely rabbinical beth din sat at Jabneh and afterwards at Tiberias, and gave legal responses to those who chose to admit a judicature not recognized by

the civil power. Dr A. Biichler has sought to reconcile the various accounts by the theory that there were two great tribunals in Jerusalem, one wielding religious, the other civil authority (Das Synedrion in Jerusalem, Vienna, 1902).

The council chamber (fiovhri) where the synedrium usually sat was between the Xystus and the Temple, probably on the Temple- hill, the Mishnah states that the meetings were held within the inner court. The meeting in the palace of the high priest which condemned Jesus -was exceptional. The proceedings also on this occasion were highly irregular, if measured by the rules of procedure which, according to Jewish tradition, were laid down to secure order and a fair trial for the accused.

Of the older literature of the subject it is enough to cite Selden, De synedriis. The most important critical discussion is that of Kuenen in the Verslagen, &c, of the Amsterdam Academy (1866), p. 131 seq. A good summary is given by Schurer, Geschichte des judischen Volkes, 4th ed., § 23. Cf. also G. A. Smith. Jerusalem (1907), vol. i. ch. 9.

SYNESIUS (c. 373-c. 414), bishop of Ptolemais in the Libyan Pentapolis after 410, was born of wealthy parents, who claimed descent from Spartan kings, at Cyrene between 370 and 375. While still a youth (393) he went with his brother Euoptius to Alexandria, where he became an enthusiastic Neoplatonist and disciple of Hypatia (q.v.). On returning to his native place about the year 397 he was chosen to head an embassy from the cities of the Pentapolis to the imperial court to ask for remission of taxation and other relief. His address to Arcadius (De regno) is full of advice as to the studies of a wise ruler in such perilous times. His three years' stay in Constantinople was wearisome and otherwise disagreeable; the leisure it forced upon him he devoted in part to literary composition. The Aegyplus she de providentia is an allegory in which the good Osiris and the evil Typhon, who represent Aurelian and the Goth Gainas (ministers under Arcadius), strive for mastery; and the question of the divine permission of evil is handled. After the successful Aure- lian had granted the petition of the embassy, Synesius returned to Cyrene in 400, and spent the next ten years partly in that city, when unavoidable business called him there, but chiefly on an estate in the interior of the province, where in his own words " books and the chase " made up his life. His marriage took place at Alexandria in 403 ; in the previous year he had visited Athens. In 409 or 410 Synesius, whose Christianity had until then been by no means very pronounced, was popularly chosen to be bishop of Ptolemais, and, after long hesitation on personal and doctrinal grounds, he ultimately accepted the office thus thrust upon him, being consecrated by Theopbilus at Alexandria. One personal difficulty at least was obviated by his being allowed to retain his wife, to whom he was much attached; but as regarded

orthodoxy he expressly stipulated for personal freedom to dissent on the questions of the soul's creation, a literal resurrection, and the final destruction of the world, while at the same time he agreed to make some concession to popular views in his public teaching (to. fj.lv oikoi, (j>i \ouiv, ra. 5′ tija) 4>CKoij.v6&v). His tenure of the bishopric was troubled not only by domestic bereave- ments but also by barbaric invasions of the country (in repelling which he proved himself a capable military organizer) and by conflicts with the prefect Andronicus, whom he excommunicated for interfering with the Church's right of asylum. The date of his death is unknown; it is usually given as c. 414. His many-sided activity, as shown especially in his letters, and his loosely mediating position between Neoplatonism and Christianity, make him a subject of fascinating interest. His scientific interests are attested by his letter to Hypatia in which occurs the earliest known reference to areometry, and by a work on alchemy in the form of a commentary on pseudo-Democritus. He was a man of the highest personal character.

His extant works are — (1) a speech before Arcadius, De regno; (2) Dio, sive de suo ipsius institute, in which he signifies his purpose to devote himself to true philosophy ; (3) Encomium calvitii (he was himself bald), a literary jeu d' esprit, suggested by Dio Chrysostom's Praise of Hair ; (4) De providentia, in two books ; (5) De insomniis ; (6) 157 Epistolae; (7) 12 Hymni, of a contemplative, Neoplatonic character; and several homilies and occasional speeches. The editio princeps is that of Turnebus (Paris, 1553) ; it was followed by that of Morell, with Latin translation by Petavius (1612 ; greatly enlarged and improved, 1633; reprinted, inaccurately, by Migne, 1859). The Epistolae, which for the modern reader greatly exceed his other works in interest, have been edited by Demetriades (Vienna, 1792) and by Glukus (Venice, 1812), the Calvitii encomium by Krabinger (Stuttgart, 1834), the De providentia by Krabinger (Sulzbach, 1835), the De regno by Krabinger (Munich, 1825), and the Hymns by Flach (Tubingen, 1875).

See Clausen, De Synesio philosopho (Copenhagen, 1831) ; R. Volkmann, Synesius von Cyrene (Berlin, 1869) ; A. Gardner's mono- graph in " The Fathers for English Readers " (London, 1886) ; and a life by W. S. Crawford (London, 1901).

SYNOD (Gr. (rvvodos), a term denoting an assembly of ecclesi- astical officials legally convoked to discuss and decide points of faith, discipline and morals. It is practically synonymous with the word council (q.v.) ; concilium is used in the same technical sense by Tertullian c. 200, and avvodos a century or so later in the Apostolic canons. In time, however, the word council came to be restricted to oecumenical gatherings, while synod was applied to meetings of the eastern or western branches of the Church

(the first council of Constantinople was originally a mere council or synod of the East), or to councils of the Reformed churches, e.g. the Synod of Dort. Provincial synods were held in the 2nd century, and were not completely organized before the advent of oecumenical councils. The two terms are still used side by side; thus there are patriarchal, national and primatial councils, as well as provincial councils (under the metropolitan of a province) and diocesan synods, consisting of the clergy of a diocese and presided over by the bishop (or the vicar-general). The supreme governing body in the Russian branch of the Orthodox Eastern Church (q.v.) is known as the Holy Synod. In the Pres- byterian churches (see Presbyterianism) a synod is an assembly containing representatives of several presbyteries and inter- mediate between these and the General Assembly; similarly in the Wesleyan and other Methodist churches the synod is the meeting of the district which links the circuits with the conference. The term is not in use in self-governing churches like the Congre- gationalists and Baptists, though these from time to time hold councils or assemblies (national and international), for conference and fellowship without any legislative power.

SYNODIC PERIOD, in astronomy, the apparent period of a planet or satellite when its revolution is referred to the line passing through the earth or the sun. In the case of the planets it is the period between successive conjunctions of the same kind, inferior or superior, with the sun. In the case of the satellites it is the period relative to the radius vector from the sun.

SYNTHESIS (Gr. avvdecris, from crvvridivai,, to put together), a term used both generally and technically, with the fundamental meaning of composition, opposed to analysis (q.v.), the breaking up of a whole into its component parts. In teaching, for example, when a new fact is brought into connexion with already acquired knowledge and the learner puts them together (" synthesizes "), the result is " synthetic " and the process is " synthesis." The reverse process is analysis, as in grammar when a child breaks up a sentence into subject, verb, object, &c. Thus all inductive reasoning is synthetic in character. The term " synthesis " is much used in philosophy. Thus Kant makes a distinction, fundamental to his theory of knowledge, between analytic and synthetic judgments, the latter being those judgments which are not derivable from the nature of the subject, but in which the predicate is obtained rather by experience or by the operation of the mind (the "synthetic judgment a priori"; see Kant). Perhaps the most famous use of the term is in Herbert Spencer's " Synthetic Philosophy," the

name given to the several treatises which contain his philosophic system — the " unification of knowledge " from the data of the separate sciences.

SYNTIPAS, the Greek form of Sindibad or Sendabar, an Indian philosopher supposed to have lived about 100 B.C., and the re- puted author of a collection of tales known generally in Europe as the story of the Seven Wise Masters. They enjoyed immense popularity, and appeared in many Oriental and Western languages. A Greek translation (probably from a Syriac version), the earliest specimen of Romaic prose (nth century), is extant under the title of The most pleasing Story of Syntipas the Philosopher. It is preceded by an introduction in iambic verse by a certain Michael Andreopulos, who states that it was executed by order of Michael, probably the duke of Melitene in Armenia. The translator is evidently a Christian, although he has generally preserved the Oriental colouring. The main outline is the same in the different versions, although they vary in detail and include different stories. A certain prince, who had taken a vow of silence for a time on the advice of his tutor, was tempted by his stepmother. Her advances having been rejected, she accused him to his father, who decided to put him to death. The device of the Arabian Nights is introduced by the wise men of the court, who in turn relate stories to dissuade the king from over-hasty punishment, each story being answered by the queen, who desires instant action to be taken. When the period of silence is over the prince speaks and establishes his innocence. In the Greek version the king is a king of Persia, named Cyrus, and Syntipas himself is the prince's tutor (text in A. Eberhard, Fabulae Romanenses, i., 1872, " Teubner Series").

For a discussion of the whole subject, see D. Comparetti, Ricerche intorno al libro di Sindibad (1869; Eng. trans, by H. C. Coote, Folk- Lore Society, 1882) ; W. A. Clouston, The Book of Sindibad (from the Persian and Arabic, 1884; from the Syriac, by H. Gollancz, 1897); J. C. Dunlop, Hist, of Prose Fiction (new ed., 1888), vol. ii.; C. Krumbacher, Geschichte der byzantinischen Litt. (2nd ed., 1897). Sixty-two Aesopic fables, also translated from Syriac into Greek, are attributed to this same Syntipas (ed. C. F. Matthai,

1781).

SYRA, or Syros (anc. 26pos, perhaps Homeric Suptij), a Greek island in the middle of the Cyclades, which in the 19th century became the commercial centre of the Archipelago, and is also the residence of the nomarch of the Cyclades and the seat of the central law courts. The length of the island is about 10 m., the breadth 5, and the area is estimated at 42J sq. m. The population rose to about 33,700, of whom about 20,500 were in the chief town, Hermoupolis, but that of the town had in 1907

declined again to 18,132. Syra is also a province of the depart- ment of the Cyclades (pop. 1907, 31,939). The importance of the island in prehistoric times is attested by considerable remains of early Aegean antiquities. In ancient times it was remarkably fertile, as is to be gathered not only from the Homeric description (Od. xv. 403), which might be of doubtful application, but also from the remains of olive presses and peculiarities in the local nomenclature. The destruction of its forests has led to the loss of all its alluvial soil, and now it is for the most part a brown and barren rock, covered at best with scanty aromatic scrub, pastured by sheep and goats.

Hermopolis (better Hermoupolis), the chief town, is built round the harbour on the east side of the island. It is governed by an active municipality, whose revenue and expenditure have rapidly increased. Among the public buildings are a spacious town-hall in the central square, a club-house, an opera-house and a Greek theatre. Old Syra, on a conical hill behind the port town, is an interesting place, with its old Roman Catholic church of St George's still crowning the summit. This was built by the Capuchins, who in the middle ages chose Syra as the head- quarters of a mission in the East. Louis XIII., hearing of the dangers to which the Syra priests were exposed, took the island under his especial protection, and since that time the Roman Catholic bishops of Syra have been elected by the pope. About the beginning of the 19th century the inhabitants of Syra numbered only about 1000; whenever a Turkish vessel appeared they made off to the interior and hid themselves. On the out- break of the war of Greek independence refugees from Chios, after being scattered throughout Tenos, Spezia, Hydra, &c, and rejected by the people of Ceos, took up their residence at Syra under the protection of the French flag. Altogether about 40,000 had sought this asylum before the freedom of Greece was achieved. The chief city was called Hermoupolis after the name of the ship which brought the earlier settlers. Most of the immigrants elected to stay, and, though they were long kept in alarm by pirates, they continued to prosper. In 1875 1568 sailing ships and 698 steamers (with a total of 740,731 tons) entered and 1588 sailing ships and 700 steamers (with a total of 756,807 tons) cleared this port; in 1883 3379 sailing and 1126 steam vessels (with a total of 1,056,201 tons) entered and 3276 sailing and 1 1 20 steam vessels (with a total of 960,229 tons) cleared. Most of the sailing vessels were Greek and Turkish, and most of the steamers were Austrian, French and Turkish.

But since the energetic development of Peiraeus, Syra has ceased to be the chief commercial entrepot and distributing centre of this part of the Levant, and consequently its trade has seriously declined. Whereas in 1890 the foreign commerce was valued at £ I i3 I 3)73°) in x 9°° it only amounted to £408,350. Coal, textiles and iron and steel goods figure prominently

amongst the imports, and emery, leather, lemons, sponges, flour, valonia and iron ore amongst the exports. Syra is the seat of several industries, ship-building, tanneries, flour and cotton mills, rope-walks, factories for confectionery (" Turkish delight"), hats, kerchiefs, furniture, pottery and distilleries. The harbour, which is pro- tected by a breakwater 273 yds. long, has a depth of 25 ft., diminishing to 12 ft.

SYRACUSE (Gr. 'EvpaKovaai; Lat. Syracusae, Ital. Siracusa), a city of Sicily, the capital of a province of the same name, situated on the east coast of the island, 54 m. by rail S. by E. of Catania, and about 32 m. direct. Pop. (1881), 21,739; (jooo), 23,250 (town), 35,000 (commune).

History. — Syracuse was the chief Greek city of ancient Sicily, and one of the earliest Greek settlements in the island. Accord- ing to Strabo (vi. 4, p. 269) Chersicrates and Archias of Corinth, both Heraclidae, left their native city together with a band of colonists, the former stopping with half the force at Corcyra, where he expelled the Liburnians and occupied the island, while Archias proceeded to Syracuse. 1 Thucydides (vi. 3) gives the

SYRACUSE

English Mile

Contours at intervals of' JO metres e 328 feet Railways..

C.S Pancgia

SYRACUSE

at the time of the Athenian Siege

date as the year after the foundation of Naxos (i.e. 734 b c), and mentions that Archias expelled the Sicel inhabitants from the island. Their presence there was definitely proved by the discovery in 1905 of a rock-cut tomb of the beginning of the second Sicel period (see Sicily) on the west side of the island (Orsi in Noiizie degli Scavi, 1905, 381), while similar tombs may be seen both on the north and south edges of the terrace of Epi- polae, and on the peninsula of Plemmyrium. There is, on the other hand, no conclusive evidence for the previous existence of a

1 Strabo goes on to say that Archias fell in with certain men who had come from the Sicilian Megara, and took them with him to share in his enterprise. But this version implies that Megara was founded before Syracuse, which is contrary to all other authorities. The whole question of the various tales relating to the foundation of Syracuse is discussed by E. A. Freeman, History of Sicily, i. 335 sqq-. 572 sqq.

Phoenician settlement on the island, 2 though it is certainly such a place as Thucydides (vi. 2) describes as occupied by them for purposes of trade with the Sicels. The name of the island, Ortygia (opn;£, a quail), has, again, been held to point to the possible existence of an Aetolian settlement on the island before Archias came. But it is more probable that the name was

given to the island owing to the establishment there by the first settlers of a special cult of Artemis (the name Ortygia appears in Homer, Odyssey, v. 123, as an island sacred to Artemis, though the identification with Delos (q.v.) is not certain), though why Corinthians should have worshipped Artemis in preference to any other deity is not clear.

Till the beginning of the 5th century B.C. our notices of Syracusan hist- ory are quite fragmentary. Almost the only question is whether, as some stray notices (see Freeman, History of Sicily, ii. 431) might suggest, the primi- tive kingship was retained or renewed at Syracuse, as it certainly was in some other Greek colonies. A king Pollis is spoken of; but nothing is known of his actions. It is far more certain that Syracuse went through the usual revolu- tions of a Greek city. The descendants of the original settlers kept the land in their own hands, and they gradually brought the Sicel inhabitants to a state not unlike villenage. Presently other settlers, perhaps not always Greek, gathered round the origi- nal Syracusan people; they formed a distinct body, drj/xos or plebs, per- sonally free, but with an inferior political franchise or none at all. The old citizens thus gradually grew into an exclusive or aristocratic body, called ya/wpot. or landowners. We hear incidentally of disputes, seditions and changes, among others the expulsion of the Gamori early in the 5th century B.C. (Thuc. v. 5; Arist. Pol. v. 3, 5; 4, 1). In its external development Syracuse differed somewhat from other Sicilian cities. Although it lagged in early times behind both Gela and Acragas (Agrigentum), it very soon began to aim at a combination of land and sea power. 3 In 663 it founded the settlement of Acrae, in 643 Casmenae, 4 and in 598 Camarina, of which the first was unusually far inland. The three together secured for Syracuse a continuous dominion to the south-east

2 The origin of the name Sup&rowrai is quite uncertain. It has been suggested that it may be Phoenician: and, again, the plural form has been thought to point perhaps to " the union of two originally distinct posts," one on the island, the other on the mainland on the hill where the ruins of the Olympieum stand, known as xoXix»'1 — the latter being the original Syracuse.

3 Netum (Noto) and Helorum, both to the S.S.W. of Syracuse, must have been among its earliest settlements (Freeman ii. 17).

- *The site of Casmenae is uncertain; it was to the south-west of Syracuse, and not improbably at Spaccaforno (Freeman ii. 25).*

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SYRACUSE

coast. They were not strictly colonies but outposts; Camarina indeed was destroyed after a revolt against the ruling city (Thuc. v. 1). Whether the inland Sicel town of Henna was ever a Syracusan settlement is doubtful. It is extremely pro- bable that Acrae was not founded until after two obvious out- posts had already been occupied — a post guarding the road to Acrae itself, and including the sacred enclosure of Apollo, which later, when it became a quarter of the city, acquired the name Temenites; and another post on the road to the north, in the upper part of the region known as Achradina. The latter was defended on the north and east by the sea, on the west by a long straight cutting of the rock serving as a scarp on which the wall stood (see below), and on the south by extensive quarries (Freeman ii. 43, 139, 144). About the middle of the 6th century B.C. 1 the island was connected with the mainland by a mole (Freeman ii. 140, 505). At the beginning of the 5th century B.C. Syracusan history becomes far more clear. Hippocrates, tyrant of Gela (498-491), threatened the independence of Syracuse as well as of other cities, and it was saved only by the joint intervention of Corinth and Corcyra and by the cession of the vacant territory of Camarina. In 485 the Gamori, who had been expelled by the Demos and the Sicel serfs, and had taken refuge at Casmenae, craved help of Gelo, the successor of Hippocrates, who took possession of Syracuse without opposition, and made it the seat of his power. He gave citizenship both to mercenaries and to settlers from Greece, and added to the population the inhabitants of other cities conquered by him, so that Syracuse became a city of mixed population, in which the new citizens had the advantage. He then extended the city by including within the fortifications the low ground (or at any rate the western portion of the low ground) between Upper Achradina and the island, and making the Agora there 2 ; at the same time (probably) he was able to shift the position of the crossing to the island by making a new isthmus in the position of the present one, the old mole being broken through so as to afford an outlet from the Little Harbour on the east (Lupus, p. 91). The island thus became the inner city, the stronghold of the ruler, so that, despite its low level, it is often spoken of as the " acropolis." Gelo's general rule was mild, and he won fame as the champion of Hellas by his great victory over the Carthaginians at Himera. He is said to have been greeted as king; but he does not seem to have taken the title in any formal way.

Gelo's brother and successor, Hiero(478~467), kept up the power of the city; he won himself a name by his encouragement of poets, especially Aeschylus and Simonides, and philosophers; and his Pythian and Olympian victories made him the special subject of the songs of' Pindar and Bacchylides; among the recently discovered works of the latter are three Odes (iii.-v.) written for him. He appeared also as a Hellenic champion in

the defence of Cumae against the Etruscans, and he attempted after the victory to found a Syracusan colony on the island of Aenaria, now Ischia.' But his internal government, unlike that of Gelo, was suspicious, greedy and cruel. After some family disputes the power passed to his brother Thrasybulus, who was driven out next year by a general rising. In this revolution Thrasybulus and his mercenaries held the fortified quarters of Ortygia and Achradina; the revolted people held the unwalled suburbs, already, it is plain, thickly inhabited. Thrasybulus yielded to the common action of Siceliots and Sicels. Syracuse thus became a democratic commonwealth. Renewed freedom was celebrated by a colossal statue of Zeus Eleutherius and by a yearly feast in his honour. But when the mercenaries and other new settlers were shut out from office 3 new struggles

1 Holm and Cavallari (cf. Lupus, Topographic von Syrakus, 91) make the construction of the mole and of the wall across it contem- porary with the fortification of Achradina in the middle of the 7th century B.C. They also consider that the original west boundary of Achradina ran down to the Little Harbour, so that the southern boundary of Achradina was the sea itself.

2 Hoim and Cavallari (see Lupus, p. 99) are inclined to attribute to him the addition of Tyche to the city.

- *Diod. xi. 72 ; cf . Arist. Pol. v. 3, 10.*

arose. The mercenaries again held Ortygia and Achradina. The people now walled in the suburb of Tyche to the west of Achradina (Freeman hi. 306, 312, 456). The mercenaries were at last got rid of in 461. Although we hear of attempts to seize the tyranny and of an institution called petalism, like the Athenian ostracism, designed to guard against such dangers, popular government was not seriously threatened for more than fifty years. The part of Syracuse in general Sicilian affairs has been traced in the article Sicily (q.v.) ; but one striking scene is wholly local, when the defeated Ducetius took refuge in the hostile city (451), and the common voice of the people bade " spare the suppliant." We hear of a naval expedition to the Etruscan coast and Corsica about 453 B.C. and of the great military and naval preparations of Syracuse in 439 (Diod. xii. 30). Yet all that we read of Syracusan military and naval action during the former part of the Athenian siege shows how Syracuse had lagged behind the cities of old Greece, constantly practised as they were in warfare both by land and sea.

The Athenian siege (415-13) is of the deepest importance for the topography of Syracuse, and it throws some light on the internal politics. At

first complete incredulity prevailed as to the Athenian expedition (Thuc, vi. 32). Hermocrates, the best of counsellors for external affairs, is suspected, and seemingly with reason, of dislovalty to the democratic constitu- tion. Yet he is, like Nicias and Phocion, the official man, head of a board of fifteen generals, which he persuades the people to cut down to three. Athenagoras, the demagogue or opposition speaker, has an excellent exposition of democratic principles put into his mouth by Thucydides (vi. 36-40). Through the whole siege 4 there was a treasonable party within the city, which — for what motives we are not told — kept up a correspond- ence with the besiegers. When the Athenian fleet under Nicias, Alcibiades and Lamachus was at Rhegium in Italy, after the discovery of the trick that had been played by the Segestans, the question for the commanders was whether they should seek to strengthen themselves by fresh alliances on the spot or strike the blow at once. Lamachus was for immediate action, and there can hardly be a doubt that Syracuse must have fallen before a sudden attack by so formidable an armament in the summer of 415. The Syracusans were neither united nor adequately prepared for effectual defence, and it is perfectly clear that they owed their final deliverance to extraordinary good fortune. Athens had the prize within her grasp, and she lost it wholly through the persistent dilatoriness and blundering of Nicias (q.v.). It was at his advice that the summer and autumn of 415 were frittered away, and the siege not begun till the spring of 414. By that time the Syracusans were both in better spirits and better prepared; their troops were better organized, and they had built a wall from north to south across Epipolae, taking in Tyche and Temenites, so as to screen them from attack on the side of Epipolae on the north-west. The effect of this was to bar the enemy's approach and push back his blockading lines, which had to be carried over an inconveni- ently large extent of ground. They did not, however, occupy Euryelus, at the western extremity , of the high ground of Epipolae, and this omission allowed the Athenians to obtain possession of the whole plateau, and to begin the investment of the city. The Syracusans had been at first thoroughly cowed; but they were cowed no longer, and they even plucked up courage to sally out and fight the enemy on the high ground of Epipolae. They were beaten and driven back; but at the suggestion of Hermocrates they carried a counter-work up the slope of Epipolae, which, if completed, would cut in two the Athenian lines and frustrate the blockade. At this point Nicias showed consider- able military skill. The Syracusans' work was destroyed by a prompt and well-executed attack; and a second counter -work carried across marshy ground some distance to the south of Epipolae and near to the Great Harbour was also demolished after a sharp action, in which Lamachus fell, an irretrievable loss. However, the blockade on the land side was now almost

4 The chief authorities for the siege are Thucydides (bks. vi. and vii.),

Diodorus (bk. xiii.) and Plutarch, Nicias.

complete, and the Athenian fleet had at the same time entered the Great Harbour. The citizens began to think of surrender, and Nicias was so confident that he neglected to push his advan- tages. He left a gap to the north of the circular fort which formed the centre of the Athenian lines, the point where Epipolae slopes down to the sea, and he omitted to occupy Euryelus.

The second act of the drama may be said to open with the irretrievable blunder of Nicias in letting the Spartan Gylippus first land in Sicily, and then march at the head of a small army, partly levied on the spot, across the island, and enter Syracuse by way of Epipolae, past Euryelus. Gylippus was felt to be the representative of Sparta, and of the Peloponnesian Greeks generally, and his arrival inspired the Syracusans with the fullest confidence. Just before his arrival a few ships from Corinth had made their way into the harbour with the news that a great fleet was already on its way to the relief of the city. The tables were now completely turned, and we hear of nothing but defeat and disaster for the besiegers till their final overthrow. The military skill of Gylippus enabled the Syracusan militia to meet the Athenian troops on equal terms, to wrest from them their fortified position on Plemmyrium, which Nicias had occupied as a naval station shortly after Gylippus's arrival, and thus to drive them to keep their ships on the low beach between their double walls, to take Labdalum, an Athenian fort on the northern edge of Epipolae, and make a third counter-work right along Epipolae in a westerly direction, to the north of the circular fort. The Athenians were thus reduced to such a plight that, as Nicias said in his despatch towards the close of 414, they were themselves besieged rather than besieging. The naval prepara- tions of the Syracusans, under the advice of Hermocrates, had led them, too, to confidence in their powers of giving battle to the Athenian fleet. In the first sea-fight, which took place simultaneously with the capture of Plemmyrium, they had been unsuccessful; but in the spring of 413 they actually won a victory over the Athenians in their own element.

On the very next day, however, a second Athenian fleet arrived under Demosthenes and Eurymedon, with seventy-three ships of war and a large force of heavy infantry and light troops. The despatch of this expedition seems to prove an almost blind confidence in Nicias, whose request to be superseded the Athenian people refused to grant. Demosthenes decided at once to make a grand attack on Epipolae, with a view to recovering the

Athenian blockading lines and driving the Syracusans back within the city walls. The assault was made by night by way of Euryelus under the uncertain light of the moon, and this circumstance turned what was very nearly a successful surprise into a ruinous defeat. The affair seems to have been well planned up to a certain point, and well executed; but the Athenian van, flushed with a first success, their ranks broken and dis- ordered by a pursuit of the enemy over rough ground, were repulsed with great loss by a body of heavy-armed Boeotians, and driven back in disorder. The confusion spread to the troops behind them, and the action ended in wild flight and slaughter. The army was now thoroughly out of heart, and Demosthenes was for at once breaking up the camp, embarking the troops, and sailing back to Athens. (It must be remembered that the Spartans were all this time in occupation of Deceleia; see Pelo- ponnesian War.) But Nicias could not bring himself to face the Athenian people at home, nor could he be prevailed on to retire promptly to some position on the coast, such as Catania or Thapsus. He dallied till the end of August, many weeks after the defeat, when the coming of Syracusan reinforcements decided him to depart; but on the 27th of that month was an eclipse of the moon, on the strength of which he insisted on a delay of almost another month. His fleet, too, lingered uselessly in the harbour, till after a defeat in which Eurymedon perished, though the simultaneous land attack was unsuccessful. The Syracusans now blocked the mouth of the Great Harbour, and the Athenian fleet, after a frantic effort to break out and a desperate conflict, was utterly defeated and half destroyed. The broken and demoralized army, its ranks thinned by fever and sickness, at last began its hopeless retreat, attempting to

reach Catania by a circuitous route; but, harassed by th» numer- ous Syracusan cavalry and darters, after a few days of dreadful suffering, it was forced to lay down its arms. The Syracusans sullied the glory of their triumph by putting Nicias and Demos- thenes to death, and huddling their prisoners into their stone- quarries — a living death, dragged out, for the allies from Greece proper to the space of seventy days, for the Athenians themselves and the Greeks of Sicily and Italy for six months longer. Games called Assinarian, from the name of the river at which the final surrender occurred, were instituted to commemorate it.

Her great deliverance and victory naturally stirred up the energies of Syracuse at home and abroad. Syracusan and Selinuntine ships under Hermocrates now play a distinguished part in the warfare between Sparta and Athens on the coast of Asia. Under the influence of Diodes the constitution became a still more confirmed democracy, some at least of the magistracies being filled by lot, as at Athens (Diod. xiii. 31, 35; Arist. Pol. v. 3-6). Diodes appears also as the author of a code of laws of great strictness, which was held in such esteem that later lawgivers were deemed

only its expounders. Under these influences Hermocrates was banished in 409; he submitted to the sentence, notwithstanding the wishes of his army. He went back to Sicily, warred with Carthage on his own account, and brought back the bones of the unburied Syracusans from Himera, but was still so dreaded that the people banished Diodes without restoring him. In 407 he was slain in an attempt to enter the city, and with him was wounded one who was presently to outstrip both rivals.

This was Dionysius (the " Elder ") , son of another Hermocrates and an adherent of the aristocratic party, but soon afterwards a demagogue, though supported by some men of rank, among them the historian Philistus (Diod. xiii. 91, 92). By accusing the generals engaged at Acragas in the war against Carthage, by obtaining the restoration of exiles (no doubt others of the partisans of Hermocrates), by high-handed proceedings at Gela, he secured his own election first as one of the generals, then as sole general (or with a nominal colleague), with special powers. He next, by another trick, procured from a military assembly at Leontini a vote of a bodyguard; he hired mercenaries and in 406-405 came back to Syracuse as tyrant of the city (Diod. xiii. 91-96). Dionysius kept his power till his death thirty- eight years later (367). But it was well-nigh overthrown before he had fully grasped it. His defeat before Gela and his conse- quent decision that both Gela and Camarina should be evacuated, and left for the Carthaginians to plunder, were no doubt due to previous arrangement with the latter. His enemies in the army, chiefly the horsemen, reached Syracuse before him, plundered his house, and horribly maltreated his wife. He came and took his vengeance, slaying and driving out his enemies, who established themselves at Aetna (Diod. xiii. 113). In 397 Syracuse had to stand a siege from the Carthaginians under Himilco, who took up his quarters at the Olympieum, but his troops in the marshes below suffered from pestilence, and a masterly combined attack by land and sea by Dionysius ended in his utter defeat. Dionysius, however, allowed him to depart without further pressing his advantage. This revolution and the peace with the Carthaginians confirmed Dionysius in the possession of Syracuse, but of no great territory beyond, as Leontini was again a separate city. It left Syracuse the one great Hellenic city of Sicily, which, however enslaved at home, was at least independent of the barbarian. Dionysius was able, like Gelo, though with less success and less honour, to take up the role of the champion of Hellas.

During the long tyranny of Dionysius the city grew greatly in size, population and grandeur. In fact the free Greek cities and communities, in both Sicily and southern Italy, were sacri- ficed to Syracuse; there the greatness and glory of the Greek world in the West were concentrated. The mass of the popula- tion of Gela and Camarina in the disastrous year 405 had, at the prompting of Dionysius, taken refuge at Syracuse. Gela had in

the previous year received the fugitive inhabitants of Acragas (Agrigentum), which had been sacked by the

Carthaginians. Syracuse thus absorbed three of the chief Greek cities of Sicily. It received large accessions from some of the Greek cities of southern Italy, from Hipponium on its west and Caulonia on its east coast, both of which Dionysius captured in 389 B.C. There had also been an influx of free citizens from Rhegium. At the time of the Athenian siege Syracuse consisted of two quarters — the island and the "outer city" of Thucydides, generally known as Achradina, and bounded by the sea on the north and east, with the adjoining suburbs of Apollo Temenites farther inland at the foot of the southern slopes of Epipolae and Tyche west of the north-west corner of Achradina. Diony- sius largely extended the fortifications. The island (Ortygia) had been provided with its own defences, converted, in fact, into a separate stronghold, with a fort to serve specially as a magazine of corn, and with a citadel or acropolis which stood apart and might be held as a last refuge. Dionysius, to make himself perfectly safe, drove out a number of the old inhabitants and turned the place into a barracks, he himself living in the citadel. For any unpopularity he may have thus incurred he seems to have made up by his great works for the defence of the city. Profiting by the experience gained during the Athenian siege, he included in his new lines the whole plateau of Epipolae, with a strong fortress at Euryelus, its apex on the west; the total length of the outer lines (excluding the fortifications of the island) has been calculated at about 12 m. The material (limestone) was quarried on the spot. Each quarter of the city had its own distinct defences, and Syracuse was now the most splendid and the best fortified of all Greek cities. Its naval power, too, was vastly increased; the docks were enlarged; and 200 new warships were built. Besides the triremes, or vessels with three banks of oars, we hear of quadriremes and quinqueremes with four and five banks of oars — larger and taller and more massive ships than had yet been used in Greek sea warfare. The fleet cf Dionysius was the most powerful in the Mediterranean. It was doubtless fear and hatred of Carthage, from which city the Greeks of Sicily had suffered so much, that urged the Syracusans to acquiesce in the enormous expenditure which they must have incurred under the rule of Dionysius. Much, too, was done for the beauty of the city as well as for its strength and defence. Several new temples were built, and gymnasia erected outside the walls near the banks of the Anapus (Diod. xv. 13).

" Fastened by chains of adamant " was the boastful phrase in which

Dionysius described his empire; but under his son, the younger Dionysius — an easy, good-natured, unpractical man — a reaction set in amongst the restless citizens of Syracuse, which, with its vast and mixed populations, must have been full of elements of turbulence and faction. But the burdensome expendi- ture of the late reign would be enough to account for a good deal of discontent. A remarkable man now comes to the front — Dion, the friend and disciple of Plato — and for a time the trusted political adviser of his nephew Dionysius. Dion's idea seems to have been to make Dionysius something like a constitutional sovereign, and with this view he brought him into contact with Plato. All went well for a time; but Dionysius had Philistus and others about him, who were opposed to any kind of liberal reform, and the result was the banishment of Dion from Syracuse as a dangerous innovator. Ten years afterwards, in 357, the exile entered Achradina a victor, welcomed by the citizens as a deliverer both of themselves and of the Greeks of Sicily generally. A siege and blockade, with confused fighting and alternate victory and defeat, and all the horrors of fire and slaughter, followed, till Dion made himself finally master of the mainland city. Ortygia, provisions failing, was also soon surrendered. Dion's rule lasted only three years, for he perished in 354 by the hand of a Syracusan assassin. It was, in fact, after all his professions, little better than a military despotism. The tyrant's stronghold in the island was left standing.

Of what took place in Syracuse during the next ten years we know but little. The younger Dionysius came back and from his island fortress again oppressed the citizens; the plight of the city, torn by faction and conflicts and plundered by foreign troops, was so utterly wretched that all Greek life seemed on the

verge of extinction (Plato, Epist. viii.). Sicily, too, was again menaced by Carthage. Syracuse, in its extremity, asked help from the mother-city, Corinth; and now appears on the scene one of the noblest figures in Greek history, Timoleon (q.v.). To him Syracuse owed her deliverance from the younger Dionysius and from Hicetas, who held the rest of Syracuse, and to him both Syracuse and the Sicilian Greeks owed a decisive triumph over Carthage and the safe possession of Sicily west of the river Halycus, the largest portion of the island. From 343 to 337 he was supreme at Syracuse, with the hearty good will of the citizens. The younger Dionysius had been allowed to retire to Corinth; his island fortress was destroyed and replaced by a court of justice. Syracuse rose again out of her desolation — grass, it is said, grew in her streets — and, with an influx of a multitude of new colonists from Greece and from towns of Sicily and Italy, once more became a prosperous city. Timoleon, having accomplished his work, accepted the position of a private citizen, though, practically, to the end of his life he was the ruler of the Syracusan people. After his death (337) a

splendid monument, with porticoes and gymnasia surrounding it, known as the Timoleonteum, was raised at the public cost to his honour.

In the interval of twenty years between the death of Timoleon and the rise of Agathocles (q.v.) to power another revolution at Syracuse transferred the government to an oligarchy of 600 leading citizens. All we know is the bare fact. It was shortly after this revolution, in 317, that Agathocles with a body of mercenaries from Campania and a host of exiles from the Greek cities, backed up by the Carthaginian Hamilcar, who was in friendly relations with the Syracusan oligarchy, became a tyrant or despot of the city, assuming subsequently, on the strength of his successes against Carthage, the title of king. Syracuse passed through another reign of terror; the new despot pro- claimed himself the champion of popular government, and had the senate and the heads of the oligarchical party massacred wholesale. He seems to have had popular manners, for a unanimous vote of the people gave him absolute control over the fortunes of Syracuse. His wars in Sicily and Africa left him time to do something for the relief of the poorer citizens at the expense of the rich, as well as to erect new fortifications and public buildings; and under his strong government Syracuse seems to have been at least quiet and orderly. After his death in 289 comes another miserable and obscure period of revolution and despotism, in which Greek life was dying out; and but for the brief intervention of Pyrrhus in 278 Syracuse, and indeed all Sicily, would have fallen a prey to the Carthaginians.

A better time began under Hiero II., who had fought under Pyrrhus and who rose from the rank of general of the Syracusan army to be tyrant — king, as he came to be soon styled — about 270. During his reign of over fifty years, ending probably in 216, Syracuse enjoyed tranquillity, and seems to have grown greatly in wealth and population. Hiero's rule was kindly and enlightened, combining good order with a fair share of liberty and self-government. His financial legislation was careful and considerate; his laws 1 as to the customs and the corn tithes were accepted and maintained under the Roman government, and one of the many bad acts of the notorious Verres, according to Cicero, was to set them aside (Cic. In Verr. ii. 13, iii. 8). It was a time, too, for great public works — works for defence at the entrance of the Lesser Harbour between the island and Achradina, and temples and gymnasia. Hiero through his long reign was the stanch friend and ally of Rome in her struggles with Carthage; but his paternal despotism, under which Greek life and civilization at Syracuse had greatly flourished, was unfortunately succeeded by the rule of a man who wholly reversed his policy.

Hieronymus, the grandson of Hiero, thought fit to ally himself with Carthage; he did not live, however, to see the mischief he had done, for he

fell in a conspiracy which he had wantonly provoked by his arrogance and cruelty. There was a fierce

1 The laws of Hiero are often mentioned with approval in Cicero's speeches against Verres.

popular outbreak and more bloodshed; the conspirators were put to death and Hiero's family was murdered; whilst the Carthaginian faction, under the pretence of delivering the city from its tyrants, got the upper hand and drew the citizens into open defiance of Rome. M. Claudius Marcellus was then in command of the Roman army in Sicily, and he threatened the Syracusans with attack unless they would get rid of Epicydes and Hippocrates, the heads of the anti-Roman faction. Epicydes did his best to stir up the citizens of Leontini against Rome and the Roman party at Syracuse. Marcellus, therefore, struck his first blow at Leontini, which was quickly stormed; and the tale of the horrors of the sack was at once carried to Syracuse and roused the anger of its population, who could not but sympathize with their near neighbours, Greeks like themselves. The general feeling was now against any negotiations with the Roman general, and, putting themselves under Epicydes and Hippocrates, they closed their gates on him. Marcellus, after an unsuccessful attempt to negotiate, began the siege in regular form (214 b.c.) by both land and sea, establishing a camp on Polichne, where stood the old temple of Olympian Zeus; but he made his chief assault on the northern side and on the defences of Tyche, particularly at the Hexapylum, the entrance facing Megara and Leontini. His assault seawards was made mainly on Achradina, 1 but the city was defended by a numerous soldiery and by what seems to have been still more formidable, the ingenious contrivances of Archimedes, whose engines dealt havoc among the Roman ships, and frustrated the attack on the fortifications on the northern slopes of Epipolae (Liv. xxiv. 34). Marcellus had recourse to a blockade, but Carthaginian vessels from time to time contrived to throw in supplies. At length treachery began to work within. Information was given him in the spring of 212 (two years from the commencement of the siege) that the Syracusans were celebrating a great festival to Artemis; making use of this opportunity, he forced the Hexapylum entrance by night and established himself in Tyche and on the heights of Epipolae. The strong fortress of Euryelus held out for a time, but, being now isolated, it soon had to surrender. The " outer " and the " inner " city of Thucydides still held out, whilst a Carthaginian fleet was moored off Achradina and Carthaginian troops were encamped on the spot. But a pesti- lence broke out in the autumn of 212, which swept them clean away,

and thinned the Roman ranks. The ships sailed away to Carthage; on their way back to Syracuse with supplies they could not get beyond Cape Pachynus owing to adverse winds, and they were confronted by a Roman fleet. All hope for the city being now at an end, the Syracusans threw themselves on the mercy of Marcellus; but Achradina and the island still held out for a brief space under the Syracusan mercenaries, till one of their officers, a Spaniard, betrayed the latter position to the enemy, and at the same time Achradina was carried and taken. Marcellus gave the city up to plunder (Liv. xxv. 31), and the art treasures in which it was so rich — many of the choicest of them, no doubt — were conveyed to Rome. Archimedes perished in the confusion of the sack while he was calmly pursuing his studies (Liv. xxv. 31).

Syracuse was now simply one of the provincial cities of Rome's empire, and its history is henceforward merged in that of Sicily. It retained much of its Greek character and many of its finest public buildings, even after the havoc wrought by Marcellus. Its importance and historic associations naturally marked it out as the residence of the Roman praetor or governor of Sicily. Cicero often speaks of it as a particularly splendid and beautiful city, as still in his own day the seat of art and culture (Tusc. v. 66; De deor. nat. iii. 81; De rep. i. 21), and in his speeches against Verres (iv. 52, 53) he gives an elaborate description of its four quarters (Achradina, Neapolis, Tyche, the island). It seems to have suffered in the civil wars at the hands of Sex.u's Pompeius, the son of the triumvir, who for a short time was master of Sicily; to repair the mischief, new settlers were sent

1 This statement made by Polybius (viii. 5) is almost incredible. Livy's account of the siege, too, is full of topographical difficulties (Lupus, 214 sqq.).

by Augustus in 21 B.C., and established in the island and in the immediately adjoining part of Achradina (Strabo vi. 270). It was he who probably constructed the amphitheatre. Tacitus, in a passing mention of it {Ann. xiii. 49), says that permission was granted to the Syracusans under Nero to exceed the pre- scribed number of gladiators in their shows. Caligula restored its decayed walls and some of its famous temples (Suetonius, Calig. 21). In the 4th century it is named by the poet Ausonius in his Ordo nobilium urbium, chiefly, perhaps, on the strength of its historic memories. In 665 Heraclius Constans fixed his capital here, but owing to his oppressive government was assassinated in 668. Syracuse has been a place of comparatively little importance since the year 878, when it was destroyed by the Saracens under Ibrahim ibn Ahmad.

Archaeology. — The medieval and modern town of Syracuse (with the exception of a new quarter which has sprung up since the construction of

the railway between the station and the island) is confined to the island. This contains the remains of two Doric temples. The older, belonging probably to the beginning of the 6th century B.C., appears, from an inscription on the uppermost step, to have been dedicated to Apollo. It was a peripteral hexastyle, and must have had at least nineteen columns at the sides; the portion excavated shows that its total width is 74! ft., the width of the cella 385 ft., the lower diameter of the columns 6| ft. The other temple, into which the cathedral was built in a.d. 640, is to be dated after 440 B.C. It was a peripteral hexastyle of thirty-six columns, with a total length of i6o| ft. and a total breadth of 72 ft.; the columns have a lower diameter of sf ft., and the inter-columniation is 13ˆ ft. It is generally regarded as the temple of Athena.

Near the west coast of the island is the famous fountain of Arethusa. 2 According to the legend, the nymph Arethusa was changed into the fountain by Artemis to deliver her from the pursuit of the river-god Alpheus (q.v.) ; and the spring, which was fresh until an earthquake broke the barrier and let in the salt water, was supposed to be actually connected with the river. There are interesting remains of medieval architecture in the closely built town with its narrow streets; the beautiful 14th- century windows of the Palazzo Montalto may be especially noticed, and also the 13th-century Castello Mainace at the southern extremity of the island. The town also contains the archaeological museum, which, under the direction of Pro- fessor Orsi, is now the best arranged in the island. The dis- coveries of recent years in the south-eastern portion of Sicily, including especially the objects found in Sicel and Greek ceme- teries, may be studied here. The isthmus connecting the island with the mainland, which was defended by strong fortifications erected by Charles V. and Philip II. (now demolished), does not occupy the site of the mole erected in the 6th or 7th century B.C., which may be recognized as having run due north from the north point of the island to the mainland near the ferry of S. Lucia. 3 The Little Harbour was thus in origin merely a recess of the Great Harbour; and it was probably Gelo who was responsible for making it an independent port, by establishing the crossing to the island in its present position. On the land- ward side of the new isthmus was the Agora, in which remains of a colonnade of the Roman period have been found. To the west are the remains of an extensive building of the Roman period, probably a palaestra with a small Odeum attached. To the W.N.W. is the so-called Piano del Fusco, an extensive necropolis, in which over six hundred tombs, mostly of the 7th and 6th centuries B.C., have been found. 4 This necropolis was included within the defensive wall of Dionysius, a portion of which, no less than i8| ft. thick, was found in 1886 running diagonally across the new cemetery, and in 1903 an outwork in front of it was discovered (P. Orsi, in Notizie degli scavi, 1903, 517). East of this point it probably followed the

edge

2 The name is a widespread Greek name for a spring.

3 Lupus, Topographie von Syrakus, 26, 88, 91. Near the ferry are a row of long parallel cuttings in the rock, which must be remains of the ancient docks, each being intended to take a ship.

4 It is remarkable that hardly any tombs of the 5th century B.C. have come to light.

of the low terrace above the marsh (the ancient Lysimeleia) , while in the other direction it ran N.N.W., making straight for the western edge of the gorge known as the Portella del Fusco, which was thus included within the fortifications, as it would otherwise have afforded a means of access to the enemy. Here the wall gained the top of the cliffs which mark the southern edge of the plateau of Epipolae, which from this point onwards it followed as far as Euryelus. The south wall of Epipolae, considerable remains of which exist, shows traces of different periods in its construction, and was probably often restored. 2 It is built of rectangular blocks of limestone generally quarried on the spot, about 5! ft. long, 2 ft. high and 2% ft. deep. The thickness of the wall averages 10 ft., but varies 3 or 4 ft. each way. The point where the terrace of Epipolae narrows down to a ridge about 60 yds. wide, which is its only link with the hills to the west, had thrice proved during the Athenian siege to be the key to Syracuse. It now bears the ruins of a mighty fortress, finer than that which defends the entrance to the acropolis of Selinus — the most imposing, indeed, that has come down to us from the Greek period — which there is no doubt is the work of Dionysius. The total length of the works is about 440 yds. In front of the castle proper are three ditches, the innermost of which can be reached from the interior of the castle by a complicated system of underground passages. The front of the castle is formed by five massive towers : behind it are two walled courtyards, to the north of the easternmost of which is the well-guarded main entrance to the plateau of Epipolae (narrower minor entrances are to be seen on both the north and the south sides) communicating by a long under- ground passage with the inner ditch in front of the castle proper. That this point is to be identified with Euryelus is now generally admitted (see Lupus, 125-127; Freeman, iii. 661). Earlier writers make this the site of Labdalum, and put Euryelus farther west; but Labdalum must be sought somewhat farther east, near the northern edge of the plateau, in a point not visible from the Athenian central fort (kukXos)

with a view over Megara — not therefore in the commanding position of Dionysius's fort, with an uninterrupted view on all sides. On the north side of Epipolae the cliffs are somewhat more abrupt; here the wall, of a similar construction to that on the south, is also traceable: but here it is apparently all of one period. It is, indeed, recorded by Diodorus that Dionysius built the north wall from Euryelus to the Hexapylon in twenty days for a length of 23 m., employing 60,000 peasants and 6000 , yoke of oxen for the transport of the blocks. Several smaller entrances are to be seen in it, as in the south wall: among them one with a series of inclined planes cut in the rock, which leads to an ancient road running south-east to the neighbourhood of the theatre. The Hexapylon plays an important part in the Roman siege of Syra- cuse. It was the main entrance on the north, and no doubt is to be identified with the so-called Scala Greca, where the modern highroad leaves the plateau. 3 This highroad, which probably follows an ancient line, may be reasonably held to mark the west boundary of Tyche. Five hundred yards to the east of it an interesting postern was discovered in 1895 (Orsi, in Notizie degli scavi, 1893, 168), at the point where the wall leaves the edge of the plateau and begins to follow the sea-coast ; and half a mile farther on we reach the deep gorge of S. Bonagia (more correctly Panagia), which here forms the boundary be- tween Tyche and Achradina. The west boundary of Achradina is marked farther south by a perpendicular cutting in the rock, on the top of which a wall must have run (see above). To the east of the gorge the wall still follows the edge of low cliffs of the coast, and continues to do so all along the east side of Achradina

1 The date of the fragment of city wall immediately to the north-east of the so-called palaestra is uncertain; it is therefore doubtful whether it can belong to this system of defences (Lupus, PP- 308, 331).

2 As to the question whether it was finished at the time of the Carthaginian invasion of 397 B.C., see Freeman, iv. 55. In any case it must have been completed by 385 B.C.

3 Hce are numerous caves in the rock, used for the worship of Artemis.

as far as the Little Harbour. On this side traces of it are very scanty, as the sea-spray has eaten away the stone.

The most important buildings of which we have any remains are to be found in the lower part of Achradina and in Neapolis.. a quarter of which we hear first in the time of Dionysius, and which at first was confined to the lower ground below Temenites, but in Roman times included it and the theatre also (Lupus, 1 68), though it did not extend beyond the theatre to the upper- most part of the plateau. In lower Achradina remains of Roman

private houses have been found, and it is in this district that the early Christians 4 constructed their catacombs. Those which are entered from near the 12th-century church of S. Giovanni, situated near an ancient temple, are extensive and important, and include the ancient crypt of S. Marcianus, and the type is different from that of the Roman catacombs, the galleries being far larger (partly owing to the hardness of the limestone in which they are excavated), and having circular chambers at the points of junction. In Neapolis, on the other hand, public buildings predominate. The temple of Apollo Temenites has entirely disappeared, but the theatre, entirely hewn in the rock, is still to be seen. It is the largest in Sicily, being about 146 yds. in diameter, and having about sixty rows of seats; the eleven lower tiers were originally covered with marble. Each of the nine cunei bore a name: the inscriptions of five of them, still preserved on the rock, are in honour of Zeus, Heracles, King Hiero II., his wife Philistis, and his daughter- in-law Nereis. Of the stage nothing but cuttings in the rock for foundations are visible. The situation is well chosen, com- manding a splendid view over the Great Harbour. Not far off to the south-east is the amphitheatre, probably erected ,by Augustus when he founded a colony at Syracuse; it is partly cut in the rock and partly built. It is inferior in size only to the Colosseum and the amphitheatres of Capua and Verona, measuring about 153 by 130 yds. over all: the arena is 76 by 43 yds. To the west of the amphitheatre is the foundation of the great altar erected by Hiero II. (Diod. xvi. 83), 217 yds. long by 24 wide, and about 6 yds. in height. To the north- west of the theatre a winding road ascends through the rock, with comparatively late tomb chambers on each side of it. In this district are seen hundreds of small niches cut in the rock, as a rule about 2 ft. square and a few inches deep, which served for containing inscriptions or reliefs, sometimes of a sepulchral character, but sometimes relating to the cult of a divinity. Many of them are also found in the quarries (Orsi, in Notizie degli scavi, 1904, 277). Both the districts just described also contain huge quarries, the famous Lautumiae (from Gr. Xaas, stone, and reixetv, to cut; hence AarOjUia, quarry) of Syracuse, over 100 ft. deep and of great extent (though through the collapse of the pillars supporting the undermined rock they have become still larger than they were in ancient times) . They are now overgrown with luxuriant vegetation. The upper plateau (Achradina, Tyche, Epipolae itself) is now largely cultivated at the east end, less so at the west end. It is traversed by the subterranean aqueducts by which the city was supplied 6 (see Aqueducts), and by a few ancient roads, but contains practically no remains of ancient buildings. Cuttings in the rock for the foundations of such are numerous round the south edge of Temenites and Achradina, and are to be seen at various points near the city wall. But otherwise the dis- appearance of the edifices of ancient Syracuse is most striking. We have already seen that immediately outside Lower Neapolis on the south the marshes of Lysimeleia

begin, which proved fatal to more than one besieging force. They are traversed by the Anapus, with its tributary the Cyane, the latter famous for the papyrus planted by the Arabs, which here alone in Europe grows wild in the stream. To the south of the Anapus is the hill of Polichne, on which stood the Olympieium, attributed on stylistic grounds to 581 B.C. Its monolithic

4 St Paul tarried at Syracuse three days on his way to Rome (Acts xxviii. 12).

6 A large reservoir of the Greek period exists under the present railway station {Notizie degli scavi, 1904, 280).

columns, of which two are still standing, are about 21 ft. in height and 6 ft. in lower diameter: its length is estimated at 197 ft., its breadth at 66f ft. (Orsi, in Monumenti dei Lincei, 1903, xiii. 369). The hill was frequently occupied in attacks on Syracuse by the besieging force. It is not, however, defensible in the rear: hence Dionysius's success against the Carthaginians. The hill of Dascon is to be sought a trifle to the south-east, to the south of the mouth of the Anapus, on the edge of the Great Harbour, at the Punta Caderini. From this point southwards the shore of the Great Harbour, previously low and marshy, begins to rise, until the rocky promontory of Plemmyrium is reached, which closes it on the south. Here Sicel tombs have been found, in some of which it appears that the Athenian dead were hastily buried (Freeman iii. 365, n. 1), while a colossal tomb, attributable also to the time of the Athenian invasion, was found there in 1899.

See A. Holm and F. S. and C. Cavallari, Topografia archeologica di Siracusa (Palermo, 1883), or the more handy German translation by B. Lupus, Topographic von Syrakus (Strassburg, 1887); P. Orsi, in Atti del congresso di scienze storiche, v. 181 (Rome, 1904), and in Notizie degli scavi, passim; E. Mauceri, Siracusa (Palermo, 1904) ; J. Fuhrerand V. Schultze, " DiealtchristlichenGrabstattenSiziliens," Jahrbuch des k. d. arch. Inst.; Erganzungsheft, vii. 17 sqq. (Berlin, 1907). In the hills to the west of Syracuse many Sicel villages must have existed ; cemeteries of the second and third period have been found at Pantalica 15 m. to the north-west, with the ruins of the habitation of the chief of the tribe, and of the second at Cassibile, 10 m. S.S.W. (see Orsi in Monumenti dei Lincei (1899) ix.33.146). (E.A.F. ;T.As.)

SYRACUSE, a city and the county-seat of Onondaga county, New York,

U.S.A., situated at the southern end of Onondaga Lake, about 75 m. E. of Rochester and about 150 m. W. of Albany. Pop. (1880), 51, 792; (1890), 88,143; (1900), 108,374, of whom 23,757 were foreign-born (including 7865 German, 5717 Irish, 2393 English Canadian and 2383 English) and 1034 were negroes; (1910, census), 137,249. Area (1906), 1662 sq. m. Syracuse is served by the New York Central & Hudson River, the West Shore, and the Delaware, Lackawanna & Western railways, by the Erie Canal and the Oswego Canal, which joins the Erie within the city limits, and by several electric inter-urban lines. The city is built on high ground in an amphitheatre of hills surrounding the lake, which is a beautiful body of clear water, 5 m. long by 15 m. broad at its widest point. Of the residential streets, James Street, in the north- eastern part of the city, is the most attractive. Salina Street is the principal business thoroughfare. The park system com- prises more than fifty parks and squares, with a total area of 278 acres. The largest and most noteworthy are Burnet park (about 100 acres), on high land in the western part of the city, Lincoln park, occupying a "heavily wooded ridge in the east, and Schiller, Kirk and Frazer parks. A boulevard runs along the shore of the lake. A fine water-supply controlled by the city is obtained from Skaneateles Lake, 18 m. distant, by a gravity system which cost $5,000,000; and the city has an intercepting sewer system.

Among the most noteworthy churches of Syracuse are the Roman Catholic cathedral of the Immaculate Conception — Syracuse became the see of a Roman Catholic bishop in 1887 — and St Paul's Protestant Episcopal, the first Presbyterian, first Methodist Episcopal, Dutch Reformed and May Memorial (Unitarian) churches, the last erected in memory of Samuel Joseph May (1797-1871), a famous anti-slavery leader, pastor of the church in 1845-1868, and author of Some Recollections of Our Anti-Slavery Conflict (1873). Among the public build- ings are the Federal Building, the Onondaga county court- house, costing $1,500,000 and containing a law library of 15,000 vols., the city-hall, the Central high school, a fine building erected at a cost of $400,000, the North high school ($300,000), and the public library (Carnegie) with 60,000 volumes in 1908 and housing the Museum of Fine Arts (1897), also.

Among the hospitals and charitable institutions are the Syracuse hospital (1872) for infectious diseases, the Hospital of the Good Shepherd (1873), the Syracuse homoeopathic hospital (1895), the Syracuse hospital for women and children (1887), St Mary's infant

and maternity hospital (1900) under the Sisters of Charity, St Joseph's hospital (1869) under Sisters of the Third Order of St Francis, the Syracuse home for aged women (1852), Onondaga county orphan asylum (private; 1841), and two other orphan asylums controlled by the Sisters of

Charity, and the state institu- tion for feeble-minded children (1896). The University block (an office building owned by Syracuse University), the Union Building, the Onondaga county savings bank and the Syracuse savings bank are among the most notable business structures; and the Onondaga, the Vanderbilt House and the Yates and St Cloud hotels are the principal hotels. In Jamesville, about 6 m. south, is the Onondaga penitentiary. Adjacent to the city is Oakwood cemetery, overlooking the lake ; and north-west of the city are the state fair grounds, with extensive exhibition halls and barns, where the annual fairs of the New York State Agricultural Society are held. Six miles south of the city is the Onondaga Indian reservation, the present capital of the " Six Nations." The city has an annual carnival and a musical festival.

Syracuse University, whose campus (of 100 acres) in the south-east part of the city commands a fine view of the lake, is a co-educational institution largely under Methodist Episcopal control, but not sectarian, which in 1908-1909 had 239 instruc- tors and 3205 students (1336 in the college of liberal arts; 189 in the summer school; 62 in the library school; 933 in the college of fine arts; 147 in the college of medicine; 179 in the college of law; 401 in the college of applied science; and 78 in the teachers' college). The university was opened in 1871, when the faculty and students of Genesee College (1850) removed from Lima (New York) to Syracuse — a court-ruling made it impossible for the corporation to remove; in 1872 the Geneva medical college (1835) removed to Syracuse and became a college of the university. The courses in library economy (college of liberal arts) are particularly well known. The university library (about 80,000 bound volumes and 40,000 pamphlets) includes (since 1887) the collection of the German historian, Leopold von Ranke. There are seventeen buildings, among which the Holden observatory, the John Crouse memorial college (of fine arts), the hall of languages, the Lyman Smith college of applied science, the Lyman hall of natural history, the Bowne hall of chemistry, and the Carnegie library, are the most notable. There are a large gymnasium and a stadium of re-enforced concrete for athletic contests, capable of seating 20,000 people and one of the largest athletic fields in the world. The plant of the university in 1909 was valued at $3,193,128, and in 1908-1909 its productive funds amounted to about $2,000,000 and its income from all sources was about $784,000.

Other educational institutions are the Syracuse Teachers' training school, Christian Brothers' academy (Roman Catho- lic), St John's Catholic academy, Travis preparatory school (non-sectarian), and at Manlius (pop. 1910, 1314), a suburb, St John's military academy (Protestant Episcopal, 1869). The Onondaga Historical Association was organized in 1862, and after 21 years of inactivity was reorganized in 1892; it occupies its own building; its committee on natural science developed (1896) into the

Onondaga academy of science. Several educational journals are published at Syracuse. There are three daily newspapers, the Post-Standard {Standard, 1829; Post, 1894; consolidated, 1899, Republican), Journal (1839; daily since 1844, Republican, and Evening Herald (1877), Independent).

The government is that of all cities of the second class in New York state, with an elective mayor and other important officers and a single-chambered city council.

Power from Niagara Falls is used by factories in the city, and the manufactures are extensive and greatly diversified. In 1905 the aggregate capital of the city's manufacturing industries was $38,740,651, and the value of its factory products was $34,823,751, 31-2% more than in 1900. The principal products in 1905 were: men's and women's clothing ($3,527,494, of which $3,082,052 represented men's clothing), foundry and machine-shop products, of which agricultural implements and machinery constituted the greater part ($2,415,466), iron and steel products ($2,117,585), chemicals, malt liquors ($1,960,466), typewriters and typewriting supplies ($1,553,113), and boots and shoes ($1,253,982). Other important products were automobiles and sewing machines, hosiery and knit goods, candles, furniture, flour, crockery, and canned goods (especially mince-meat).

Syracuse was long the principal seat of the salt industry in America.

The Onondaga salt deposits were mentioned in the journal of the French Jesuit Lemoyne as early as 1653, and before the War of Independence the Indians marketed Onondaga salt at Albany and Quebec. In 1788 the state undertook, by treaty with the Onondaga Indians, to care for the salt springs and manage them for the benefit of both the whites and the Indians. In 1795, by another treaty, the state acquired for $1000, to be supplemented by an annual payment of $700 and 150 bushels of salt, the salt springs and land about them covering about 10 sq. m. In 1797 the state leased the lands, the lessees paying a royalty of 4 cents per bushel and being forbidden to charge more than 60 cents per bushel. The state sank wells and built and maintained tanks from which brine was delivered to lessees. During 1812-1834 a royalty of I2§ cents was charged to raise funds for building canals (a rebate being granted in the last three years covering the entire amount of the royalty for these years) . During 1 834-1 846 the royalty was 6 cents, and between 1 846 and 1898 it remained stationary

at one cent. In 1898 the state ordered the sale of the salt lands, because the revenues were less than the expense of keeping up the works ; but state ownership was main- tained until 1908, when the last of the lands were sold and the office of superintendent of salt lands, created in 1797, was abolished. Until 1840 only boiled salt was manufactured; in that year the solar process was introduced. The annual production, which amounted to 100,000 bushels in 1804, reached its highest point in 1862 (9,053,874 bushels, of which 1,983,022 bushels were solar.and 7,076,852 boiled). The development of the Michigan salt deposits and (after 1880) of the deposits in Wyoming, Genesee and Livingston counties in New York caused a rapid decline in the Onondaga product. In 1876 both processes yielded together only 5,392,677 bushels, and in 1896 onjy 2,806,600 bushels. The salt deposits at Syracuse had, however, laid the basis for another industry, the manufacture of soda-ash, which has grown to important proportions. At the village of Solvay (pop. 1905, 5196), adjoining Syracuse on the lake shore, are the largest works for the production of soda-ash in the world, giving employment to more than 3000 hands.

The Syracuse region became known to Europeans through its salt deposits. Until several years after the close of the War of Independence, however, there was no settlement. Ephraim Webster, who built a trading-post near the mouth of Onondaga Creek in 1786, was the first white settler. About 1 788-1 789 small companies began to visit the place every summer to work the salt deposits. In 1796-1797 there was a permanent settlement known as Webster's Landing, and in 1797 a settlement was begun at Salina, a short distance to the north on the lake shore. Geddes, another " salt settlement," was founded in 1803. In 1800 " the landing " received the name " Bogardus's Corners," from the proprietor of a local inn. Between 1800 and 1805 a dozen families settled here, and in the latter year a grist mill, the first manufacturing establishment, was built on Onondaga Creek. A sawmill was built in the following year. In 1804 the state government, which had assumed control of the saltfields, sold to Abraham Walton of Albany, for $6550, some 250 acres, embracing the district now occupied by Syracuse's business centre, to secure money for the construction of a public road. During the succeeding years the name of the place was frequently changed. It was called Milan in 1809, South Salina in 1809-1814, Cossitt's Corners in 1814-1817, and Cossitt in 1817-1824. In 1824 a post office was established, and as there was another office of that same name in the state, the name was again changed, the present name being adopted. The village was incorporated in 1825, Salina being incorporated independently at the same time. In the meantime the settlement had been growing rapidly. In 18 18 Joshua Forman bought an interest in the Walton tract, had the village platted, and became the " founder " of the city. The first newspaper, the Onondaga Gazette, was

established in 1823; and in 1825 the completion of the Erie Canal opened a new era of prosperity. In 1827 Syracuse became the county- seat of Onondaga county. In 1847 Salina was united to Syracuse, and the city was chartered. Geddes was annexed in 1886. Syracuse has been the meeting-place of some historically important political conventions; that of 1847, in which occurred the split between the " Barnburner " and " Hunker " factions of the Democratic party, began the Free Soil movement in the state. The strong anti-slavery sentiment here manifested itself in 1851 in the famous "Jerry rescue," one of the most significant episodes following the enactment of the Fugitive Slave Law of 1850; Samuel J. May, pastor of the Unitarian

church, and seventeen others, arrested for assisting in the rescue, were never brought to trial, although May and two others publicly admitted that they had taken part in the rescue, and announced that they would contest the constitutionality of the Fugitive Slave Law, if they were tried.

See Carroll E. Smith, Pioneer Times in Onondaga County (Syracuse,

1904).

SYR-DARYA (Gr. and Lat. Jaxartes; Arab. Shash or Sihun), a river of Asia, flowing into the Sea of Aral, and having a length of 1500 m. and a drainage area of about 320,000 sq. m. Its headstream is the Naryn, which rises in the heart of the Tian- shan complex south of Lake Issyk-kul, on the southern slope (12,000 ft.) of the Terskei Ala-tau. After its union with another mountain stream, the Barskaun, it flows W.S.W. at 11,000 to 10,000 ft. above the sea, in a barren longitudinal valley between the Terskei Ala-tau and the foothills of the Kokshal-tau. On entering a wild narrow gorge in the south- west continuation of the Terskei Ala-tau it receives the name of Naryn. Within this gorge it descends some 4000 ft.; Fort Narynsk, 20 m. below the confluence of the Great and the Little Naryn, is only 6800 ft. above the sea. Here the river enters a broad valley — formerly the bottom of an alpine lake — and flows past the ruins of Fort Kurtka, for 90 m. westward, as a stream some 50 yds. wide and from 3 to 11 ft. deep. Its waters are utilized by the Kirghiz for irrigating their cornfields, which contrast strangely with the barren aspect of the lofty treeless mountains. The At-bash, a large mountain stream, joins the Naryn at the head of this valley and the Alabuga or Arpa at its lower end, both from the left. Before reaching the low- lands the Naryn cuts its way through three ridges which separate the valley of Kurtka from that of Ferghana, and does so by a series of wild gorges and open valleys (170 m.), representing the bottoms of old lakes; the valleys of the Toguz- torau, 2000 ft. lower than Kurtka, and the Ketmen-tube are both cultivated by the Kirghiz. Taking a wide sweep towards the north, the river enters Ferghana

— also the bottom of an immense lake — where, after receiving the Kara-darya (Black River) near Namangan, it assumes the name of Syr-darya. 1 The Kara-darya is a large stream rising on the northern spurs of the Alai Mountains. As it deflects the Naryn towards the west, the natives look upon it as the chief branch of the Syr- darya, but its volume is much smaller. At the confluence the Syr is 1440 ft. above sea-level.

The waters of the Syr-darya and its tributaries are in this part of its course largely drained away for irrigation. It is to the Syr that Ferghana is indebted for its high, if somewhat exaggerated, repute in Central Asia as a rich garden and granary; cities like Khokand, Marghilan and Namangan, and more than 800,000 inhabitants of the former khanate of Khokand, subsist by its waters. Notwithstanding. this drain upon it, the Syr could be easily navigated, were it not for the Bigovat rapids at Irjar, at the lower end of the valley, where the river pierces the Mogol-tau.

On issuing from this gorge the Syr enters the Aral depression, and flows for 850 m. in a north-westerly and northerly direction before reaching the Sea of Aral. On this section it is navigated by steamers. Between the Irjar rapids and Baildyr-turgai (where it bends north) the river flows along the base of the subsidiary ranges which flank the Chotkal Mountains on the north-west, and receives from the longitudinal valleys of these alpine tracts a series of tributaries (the Angren, the Chirchik, the Keles), which in their lower courses fertilize the wide plains of loess on the right bank of the Syr.

Some 50 m. below Chinaz (770 ft. above sea-level) the Syr bends northwards, but resumes its north-westerly course 150 m. farther down, following with remarkable persistency the edge of the loess. Its low banks, overgrown with reeds and rendered uninhabitable in summer by clouds of mosquitoes, are inundated for 20 m. on both sides when the snows begin to melt. These inundations prevent the moving sands of the Kyzyl-kum desert from approaching the Syr; below Perovsk, however, the steppe does gain the upper hand. Down to Perovsk the river rolls its muddy yellow waters, at the rate of 3 to 5 m. an hour, in a channel 300 to 600 yds. wide and 3 to 5 fathoms deep; at Perovsk its vertical section is 8220 sq. ft., and 312,500 cub. ft. of water are discharged per second. The Arys and the Bugun are the only tributaries worthy of notice along this part of its course; the other streams which descend from the Kara-tau fail to reach the river. The Kirghiz rear numerous herds of cattle and

ˆ x Syr and darya both signify " river," in two different dialects.

sheep in the valley of the Arys, while lower down, as far as Julek, the Iginchis carry on agriculture. All this applies of course only to the right bank ; on the left the moisture is absorbed by the hot winds which cross the Kyzyl-kum sands towards the river. The dryness of the atmosphere has a marked effect upon the Syr when it gets below Julek, the Kara-kum sands being then on its right. Ten miles below Perovsk the river traverses a marshy depression (the bottom of a lake not yet fully dried up), where it divides into two branches — the Jaman-darya and the Kara-uzyak. The latter spreads out into marshes and ponds, from which it again issues to join the former at Karamakchi, after a course of 80 m. The main arm, owing to its shallowness and sinuosity, is very difficult to navigate, and the difficulty is increased by the rapidity of the current and the want of fuel. Between Kazalinsk and the Sea of Aral (158 ft.) navigation becomes somewhat easier, except for the last 10 m., where the river divides into three shallow branches before entering the " Blue Sea." All three have at their mouths sandy bars with only 3 ft. of water.

Two former right-hand tributaries of the Syr — the Chu and the Sary-su — now disappear in the sands some 60 m. before reaching it. The Chu, which is 600 m. in length, rises in the Tian-shan south-west of Lake Issyk-kul, and as the Kashkar flows towardsLakelssyk-kul, but a few miles before reaching that lake turns suddenly to the north- west, enters under the name of Chu the narrow gorge of Buam, and, piercing the snow clad Kunghei Ala-tau, emerges on its northern slope, having descended from 5500 ft. to less than 2000 in a distance of not more than 50 m. In this part of its course it receives from the right the Kebin, whose high valley equals in size that of the upper Rhone. It then flows north-westwards through the valley of Pish- pek, and, avoiding the Muyun-kum sands, describes a wide curve to the north before finally taking a western direction. Numberless streams flow towards it from the snow-clad Alexander Mountains, but they are for the most part lost in the sands before reaching it. The Talas, 170 m. long, formerly an affluent of the Chu, which rises in the highest parts of that range, pierces the Cha-archa Mountains, and, flowing past Aulie-ata on the south border of the Muyun-kum, enters the salt lake of Kara-kul 60 m. from the Chu. The Chu ter- minates in the Saumal-kul group of lakes, 60 m. from the Syr. Another elongated group of lakes — the Uzun-kul — near the above, receives the Sary-su, which has a length of nearly 570 m. and flows rapidly in a narrow channel along the western edge of the northern Famine Steppe (Bekpak-dala).

The delta of the Syr begins at Perovsk, whence it sends a branch to the south-west, the Jany-darya (New River), which formerly reached the south-eastern corner of the Sea of Aral, very near to the mouth of the Amu-darya. The Kirghiz affirm that a canal dug for irrigation by the Kara-kalpaks gave origin to this river. It had, however, but a temporary

existence. A dam erected by the people of Khokand at Ak-mechet (Perovsk) caused its disappearance, and the Russians found nothing but a dry bed in 1820. When the dam was removed the Jany-darya again reappeared, but it failed to reach the Sea of Aral; in 1853 it terminated in Lake Kuchka-denghiz, after a course of 250 m.; all traces of its bed were then lost in the sand. Five centuries ago, in the time of Timur, the Mongol prince of Samarkand, the Jany-darya brought the waters of the Syr to the Daukara lakes, close by the present mouth of the Amu. The series of old river-beds in the Kyzyl-kum, which are still seen above Perovsk, indicates that the Syr had a constant tendency to seek a channel to the south-west, and that its present delta is but a vestige of what it was once. At a still more remote period this delta probably comprised all the space between the Kara-tau and the Nura-tau in Samarkand ; and the series of elongated lakes at the base of the Nura- tau — the Tuz-kaneh and Bogdan-ata lakes — represent an old branch of the delta of the Syr which probably joined the Zarafshan before reaching the Amu. The cause of this immense change is simply the rapid desiccation of all the northern and central parts of Asia, due to the fact that we are now living in the later phase of the Lacustrine period, which has followed the Glacial period. The extension of the Caspian Sea as far as the Sary-kamysh lakes during the post-Pliocene period and the extension of the Sea of Aral at least 100 m. to the east of its present position are both proved by the existence of postrPliocene marine deposits. (P. A. K. ; J. T. Be.)

SYR-DARYA, or Syr-Dariinsk, a province of Russian Turkestan, lying on both sides of the Syr-darya river, from its embouchure in the Sea of Aral up to Khojent, where it issues from the mountain region of the Tian-shan. The province is bounded N. by the provinces of Turgai, Akmolinsk and Semipalatinsk; E. by Semiryechensk ; S. by Ferghana, Zarafshan, Bokhara and Khiva; and W. by Khiva and the Sea of Aral. Its area (166,000 sq. m.), its population (over a million and a half) and the city of Tashkent make it the most important province of Russian Turkestan.

The south-eastern boundary runs along the Chotkal Mountains (14,000 ft.), which separate the river Chotkal from the river Naryn, and join the Alexander Mountains on the east. A series of short chains, such as the Talas-tau and Ala-tau, fringe the above

on the north-west, and occupy the south-east of the province. The snow-clad summits of the Talas-tau reach 14,000 to 15,000 ft. in altitude, and immense glaciers occur about Manas Mountain. This range seems to run from west-south-west to east- north-east; the other flanking chains have a decidedly south- westerly direction, and are much lower, the outlying ranges having rather the character of broad plateaus above 2000 ft. in altitude, where the Kirghiz find excellent pasture-grounds. Some of them,

such as the Kazyk-urt, rise isolated from the steppe. The Kara-tau is quite separate from the preceding and runs at right angles to them — that is, from north-west to south- east. It belongs therefore to another series of upheavals prevalent in western Asia, to which Richthofen has given the name of the " Kara-tau series." Its length is about 270 m., and its average altitude about 5000 ft., rising at some points to 6000 and 7000 ft. It separates the river Syr-darya from the river Chu, and its gentle south-western slope contains the sources of a multitude of streams which water the oasis around the town of Turkestan.

The mountainous tracts occupy, however, only a small part of Syr-darya, the rest is steppe. Three different areas must be dis- tinguished — the Kyzyl-kum, the Muyun-kum or Ak-kum, and the Kara-kum. The Kyzyl-kum (red sands) sands stretch between the Amu and the Syr, and have a gradual ascent from 160 ft. at the Sea of Aral to 1500 and 2000 ft. in the south-east. They are partly shifting, partly stationary (see Kara-Kum). In the west the sur- face is overlaid with remains of Aral-Caspian deposits. As the Tian-shan is approached the steppe assumes another character : a thick sheet of loess girdles the foothills and forms the fertile soil to which Turkestan is indebted for its productive fields and gardens. The Kara-kum sands, situated north-east of the Sea of Aral, are manifestly a former bottom of the lake.

In the east the steppe yields some vegetation and is visited by the Kirghiz. The barkhans do not shift, being covered with Calligonum, Tamarix, Holoxylon anemodendron. The Muyun-kum or Ak-kum steppe, between the Kara-tau Mountains and the Chu River, is quite uninhabited, except in the loess region at the northern base of the mountains. (For the geological history of the western Tian-shan ranges see Tian-Shan.) Throughout the Cretaceous and earlier Tertiary periods the lowlands of Syr-darya were under the sea. The character of the region during the post-Pliocene period remains unsettled. A girdle of loess, varying in width from 30 to 50 m., encircles all the mountain tracts, increasing in extent in Bokhara and at the lower end of the valley of Ferghana. It seems certain that during the Lacustrine period the Caspian was connected by a narrow gulf with the Aral basin, which was then much larger, while another inland sea of great dimensions covered the present Balkash basin, and at an earlier period may have been connected with the Aral basin. Recent traces of these basins are found in the steppes.

The chief river of the province is the Syr-darya (q.v.). The frontier touches the eastern shore of the Sea of Aral, and numerous small lakes, mostly salt, are scattered over the sandy plains. A few lakes of alpine character occur in the valleys of the hilly tracts.

The climate of the province varies greatly in its different parts. It is most severe in the mountain region; and in the lowlands it is very hot and dry. As a whole, the western parts of the Tian-shan receive but little precipitation, and are therefore very poor in forests. In the lowlands the heat of the dry summer is almost insupportable, the thermometer rising to 1 1 1 ° F. in the shade ; the winter is severe in the lower parts of the province, where the Syr remains frozen for three months. The average yearly temperature at Tashkent and Kazalinsk respectively is 58-3° and 46-4° (January, 29 and 12° ; July, 77-5° and 78).

The terraces of loess mentioned above are alone available for cultivation, and accordingly less than I % (o-8) of the total area of ‘ the province is under crops, the remainder being either quite barren (57 %) or pasture land (42 %). In the few cases where cultivation is possible, it is carried to great perfection owing to a highly developed system of irrigation — two crops being gathered every year. Wheat and barley come first, then peas, millet and lentils, which are grown in the autumn. Rye and oats are grown only about Kazalinsk. Cotton is cultivated. Gardening is greatly developed. Sericulture is an important source of income. Livestock breeding is largely pursued, not only by the nomads but by the settled population. Fishing is prosecuted to some extent on the lower Syr. Timber and firewood are exceedingly dear.

The population of the province was estimated in 1906 as 1 ,779,000. It is comparatively dense in certain parts. The Russians number barely 8500, if the military be left out of account. Kirghiz (50) and Sarts (9‘8) are the main elements of the population, with Uzbegs (4-3%), and a few Jews, Tajiks, Tatars, Persians and Hindus. The predominant occupations of the Sarts, Uzbegs, Tajiks and settled Kirghiz are agriculture and gardening, but the Kirghiz lead chiefly a nomadic pastoral life. Manufactures are represented by cotton mills, tanneries and distilleries ;. but a great variety of petty industries are practised in the towns and villages.

Syr-darya is divided into six districts, the chief towns of which are Tashkent, Aulie-ata, Kazalinsk, Perovsk, Chimkent and Amu-darya. (P. A. K. ; J. T. Be.)

SYRIA

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SYRIA, the name given generally to the land lying between the easternmost shore of the Levantine Gulf and a natural inland boundary formed in part by the Middle Euphrates and in part by the western edge of the Hamad or desert steppe. The northern limit is the Tauric system of mountains, and the

southern limit the edge of the Sinaitic desert. This long strip extends, therefore, for about 400 m. between 38° and 31° N. lat. with a mean breadth of about 150 m. Since, however, the steppe edge on the east is somewhat indefinite, some early Moslem and other geographers have included all the Hamad in Syria, making of the latter a blunt-headed triangle with a base some 700 m. long resting on the north Arabian Nefud. But Strabo, Pliny and Ptolemy, as well as the better Moslem geographers, drew the eastern

only under the Graeco-Roman administration that we find a definite district known as Syria, and that was at first restricted to the Orontes basin. Later, all that we understand by Syria came to be so known officially to the Romans and Byzantines; but the only province called simply Syria, without qualification, remained in the Orontes valley. Under the present Ottoman distribution " Syria " is the province of Sham or Damascus, exclusive of the vilayets of Aleppo and Beirut and the sanjaks of Lebanon and Jerusalem, which all fall in what is called Syria is the wider geographical sense.

Taking Syria as the strip limited by the sea, the edge of the Hamad, the Taurus and the Sinaitic desert, we have a remark- ably homogeneous geographical area with very obvious natural boundaries; but these, for various reasons, have proved very

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frontier obliquely from the Gulf of Akeba to Rakka (Raqqa) on Euphrates, and thus placed the Hamad in Arabia.

The name Syria is not found in the Hebrew original of the Scriptures; but it was used by the Septuagint to translate Aram. Homer knows only "Apiyuoi, but Herodotus speaks of " Syrians" as identical with Assyrians, the latter being, he thinks, a " bar-barian " form, and he applies the name very widely to include, e.g. north Cappadocians (" White Syrians " of Pteria). Syria, however, is probably the Babylonian Suri, used of a north Euphratean district, and a word distinct from Assyria. Generally the ethnic term, Syrians, came to mean in antiquity the Semiti peoples domiciled outside the Meso- potamian and Arabian areas: but neither in pre-Greek nor in Greek times had the word Syria any very precise geographical significance, various lands, which we include under it, retaining their distinctive status, e.g. Commagene (Kummukh), Cyrrhestica, Phoenicia, Palestine, &c. It is

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ineffective in history, especially on the south and east. Syria happens to lie on the line of least resistance for communication between the early subtropic seats of civilization in the Nile and Euphrates valleys and the civilizations of Europe. Its eastern boundary is in great part a steppe, which breeds popula- tion, but, unable to nourish increase, sends it over its boundaries in a constant stream of migration. Consequently south Palestine has been continuously " Arabized " ; and indeed the whole of Syria has been characterized by racial and religious fusions, and by civilization of a singularly syncretic and derived kind, of which the ancient Phoenician is a sufficient example.

The surface configuration of almost all the strip is remarkably uniform. With the exception of the extreme north (Commagene), which is shut off by a barrier of hills and belongs to foreign hydro- graphic systems, the whole country is roughly a gable-shaped plateau, falling north and south from a medial ridge, which crosses Syria at about its central point. This gable is tilted eastwards, and its two long slopes are defined by bordering mountain chains

which run across its medial ridge ; the main Syrian streams are those which follow those slopes between the chains, thus running either north or south for most of their courses, and only finding their way to the western sea by making sharp elbows at the last. Syrian orography, therefore, is simple, being composed of nothing but these two parallel systems. That on the west, which rises behind the Mediterranean littoral, springs from Taurus in the well-afforested Mt Amanus (Giaour Dagh), and is continued by Jebel Bereket and J. Akhma, iver the northern end of which runs a single easy pass (Beilan) to the north-east angle of the Levant coast (Alexandretta), while at the southern end is a gap through which the Orontes turns sharply to the sea.

South of this, with J. Akra (the Bald Mountain, anc. Casius) begins a further section, rounded and grassy, called J. Ansariya, which presently springs up into a high chain of Jurassic limestone with basaltic intrusions, whose peaks rise to 10,000 ft. and whose passes do not fall under 6000 ft. Here it is called J. al-Gharbi or Libnan (see Lebanon). Thereafter it broadens out and becomes the high table-land of Galilee, Samaria and Judaea, and gradually sinks into the plateau of north Sinai.

The eastern system springs from the Tauric offshoot (Kurd Dagh, &c), which shuts off the Commagenian basins, and as the triple chain of J. al Ala, it defines the Orontes valley on the east. Like its western parallel it springs up presently into a higher chain and is known as J. es-Sharki, or Anti-Libanus, which culminates in a knot on the south, to which is given the name J. es-Sheikh, or Hermon (8000 ft.). Thereafter it loses much of its distinctive character, but may be traced southwards in J. Hauran and the Moabite hills to Horeb and the Midianite Mountains of the Hebrews, which run into Arabia.

Hydrography. — Between these systems run the main rivers; and these naturally rise near the medial ridge, in the lacustrine district of el-Buka'a, or Coelesyria, and flow in opposite directions. That following the northern slope is the Nahr al-'Asi (see Orontes) into which, when it has turned sharply towards the sea, flow some tributary streams from the Commagenian divide on the north. The main stream flowing south is the Jordan, which fails to reach the sea, being absorbed into the great rift of the Ghor: but a smaller stream, the North Litani (called Kasimiya in its lower course), whose source lies very near that of Jordan, repeats the course of the Orontes on a minor scale and gets through the western mountain system to the sea near Sur (Tyre). Outside the basins of these rivers and their bordering mountain systems there only remain to be considered the following: (1) The Mediterranean littoral strip (the ancient Phoenicia), with a few torrent-like streams. (2) The shut-off district in

the extreme north, ancient Commagene, which consists of two basins divided by a low ridge running from south to north. These basins belong, one to the Cincian river-system, and the other to the Euphratean. In the first lay the ancient Germanicia (mod. Marash); in the second the ancient Samosata (mod. Samsat), whose importance has now passed to Adiaman. The southern boundary of both basins is a low chain which leaves the Euphrates near the mouth of the Sajur tributary, and runs west towards Mt Amanus, to which it is linked by a sill whereon stood the ancient fortified palace of Samal (Sinjerli; see Hittites). (3) A succession of oases lying east of the eastern mountain system on the edge of the steppe, and fed by short local streams. Of these the most important are, from north to south, (a) the Saltpan of Jebeil, fed by the North al-Dahab ;

(b) the oases of Kinnesrin and Aleppo, fed by the North Kuwaik; and

(c) that of Sham or Damascus, fed by streams from Hermon, of which the Barada (Abana) and the Awaj (Pharpar) are the chief.

Since these streams had in no case originally easy access to the sea, we naturally find lakes on their course, and several of them terminate in tracts of more or less permanent inundation. Those which occur on the" course of the principal rivers are described under Orontes and Jordan. The ethers, which terminate streams, are the Bahr el-Ateiba, which receives the waters of Damascus; the Mat, into which the Kuwaik flows below Kinnesrin; and the Ak Deniz, or Bahrat Antakia, the ancient Lake of Antioch, which collects the waters of the Kara Su and Afrin, the southward from the watershed which shuts off Commagene. The last-named lake has now been almost entirely dried up by the cutting of a channel, which conducts its feeders directly to the Orontes.

Geology. — Geologically, Syria belongs to two distinct regions of the earth's crust, the northern and smaller portion lying within the great belt of

folding of southern Europe and central Asia, and the southern and larger portion belonging to the Indo-African area, which, though often faulted, is usually free from crumpling. According to M. Blanckenhorn the boundary between the two regions runs from the Bay of Jebele along the Afrin River to Aintab, and thence to the Euphrates above Birejik. In the southern region, which is by far the better known, the oldest rocks are granites, crystalline schists and other rocks of Archean aspect. These are overlaid by conglomerates, tuffs, sandstones and arkoses, which perhaps do not all belong to the same period. In Palestine a lime- stone containing Carboniferous fossils is found in the midst of the sandstone series, and here the sandstone is immediately succeeded by limestones with Hippurites and other fossils belonging to the Upper Cretaceous. Farther north, however, Jurassic beds are met with, but of very limited extent. Cretaceous limestones cover the

greater part of Palestine and rocks of the same period form Mt Lebanon, the Casius Mons, &c, farther north. Nummulitic lime- stone (Eocene) overlies the Cretaceous in Philistia, and north of Lebanon Eocene and Miocene deposits cover the greater part of the country. The Pliocene deposits are not very widely spread and are generally of fresh-water origin excepting near the coast, but marine Pliocene beds have been found at el Forklus in the Palmyra desert. Jebel Hauran, east of the Jordan, is capped by a great sheet of basalt; and many other basalt flows are found, especially in the country north of Lebanon. They are mostly true felspar basalts, but a few contain nepheline in addition to the felspar. In most cases the eruptions appear to be of Pliocene or later date, but in the extreme north some of the basalt seems to belong to the Miocene period. There is historic evidence of mud eruptions in some of the volcanic areas. The most striking feature in the structure of Syria is the existence of long Graben, or narrow depressions formed by faulting. The best known of these Graben is that of the Jordan, but the upper part of the Orontes lies in a similar

depiession, which is, indeed, very probably the continuation of the Jordan-Araba trough. The faulting which formed the depressions is certainly later than the deposition of the Cretaceous beds and probably belongs to the later portion of the Tertiary era. Little is known of the part of Syria which lies within the folded belt, and includes the Amanus and Kurd mountains. The rocks do not appear to differ very markedly from those farther south, but the Devonian is believed to be represented. The folds are approximately parallel to those of the Taurus, and geologically these mountains may be said to belong to that range. 1

Climate. — Within historic times the climate, and with it the pro- ductivity of the country, cannot have greatly changed; at most the precipitation may have been greater, the area under wood having been more extensive. Except for Jerusalem, we have hardly any accurate meteorological observations; there the mean annual temperature is about 63° F. ; in Beirut it is about 68°. The rainfall in Jerusalem is 36-22 in., in Beirut 21-66. The heat at Damascus and Aleppo is great, the cooling winds being kept off by the moun- tains. Frost and snow are occasionally experienced among the mountains and on the inland plateaus, but never along the coast. Even the steppe exhibits great contrasts of temperature; there the rainfall is slight and the air exceedingly exhilarating and healthy. The sky is continuously cloudless from the beginning of May till about the end of October; during the summer months the nights as a rule are dewy, except in the desert. Rain is brought by the west wind; the north-west wind, which blows often, moderates the heat. On the other hand, an ozoneless east wind (sirocco) is occasionally experienced — especially during the second half of May and before the beginning of the rainy season — which has a prej udicial influence on both animal and vegetable life. On the whole the climate of Syria — if the Jordan valley and the moister districts are excepted — is not unhealthy, though intermittent fevers are not uncommon in some places.

The general character of the country, resultant on

these conditions, varies according to elevation and latitude. Owing to the high barrier which shuts off almost all Syria from the sea, and precipitates vapours mainly on the western slope, little of the land is highly productive without irrigation, except the narrow littoral strip which was the ancient Phoenicia, and the small deltas, such as that of Latakia (Laodicea). Palestine, being less shut in and enjoying a comparatively large general rainfall, would be still a land " flowing with milk and honey " had its forests not been destroyed, and the terracing, which used to hold up soil on the highlands, been main- tained. As it is, it has very fertile patches of lowland, such as the plains of Esdraelon and Jaffa ; and the high levels, largely composed of disintegrated igneous rock, west of Jordan, over which the sea- wind carries the rains, offer excellent corn-land. In the extreme south Palestine begins to be affected by the Arabian dryness. For the rest, Syria needs irrigation ; and since neither of its larger rivers, Orontes or Jordan, flowing as these do in deep beds, is of much use for this purpose, all Mid-Syria, except the lacustrine oases, is a region mainly occupied by pastures, and yielding only thin cereal crops. Commagene, where not rocky, and the district lying along the southward drains from its divide (anc. Cyrrhestica) , is in better case, enjoying perennial streams which can be utilized, and the fringe of the Tauric rainfall. The latter dies away over the plains east and south-east of Aleppo, making them afford good spring pasture, which has attracted the nomads from farther south : but below the latitude of Rakka-Homs thin steppe begins, and quickly degenerates into sheer desert broken only by a chain of poor oases, south of a low ridge running from Anti-Lebanon to Euphrates. Of these the principal are Karietein and Tadmor (Palmyra), through which passes the trade from Damascus to the east. In ancient times,

1 See O. Fraas, Aus dem Orient, pt. ii. (Stuttgart, 1878) ; C. Diener, Libanon (Vienna, 1886) ; M. Blanckenhorn, Beitrage zur Geologie Syriens (Cassel,

1890, &c), and Grundziige der Geologie und physikalischen Geographie von Nord-Syrien (Berlin, 1891). See also the references under Palestine. A summary by M. Blanckenhorn will be found in Monatsschr. f. wirtschaftl. Erschliessung Palastinas, pp. 289-301 (Berlin, 1904).

up to the Arab invasion, the northern part of the eastern plateau, between Orontes and Euphrates, was made habitable and even fertile by storage of rainfall. It supported a large number of villages and small towns, whose remains are remarkably well preserved, and still serve to shelter a sparse pastoral population.

Flora. — Two distinct floral regions meet in Syria, that of the Mediterranean and that of the west Asian steppe-land. The first, to be seen on the coast and the western slopes of the highlands, is characterized by a number of evergreen shrubs with small leathery leaves, and by quickly-flowering spring plants. On the lowest levels the southern forms, the Ficus sycomorus and the date-palm, appear, and increase in the direction of Egypt (see Lebanon and Palestine). The steppe region, whose flora begins to appear east of the western ridge, is distinguished by the variety of its species, the dry and thorny character of its shrubs, and great poverty in trees. Between these regions the greatly depressed valley of Jordan shows a subtropic vegetation. Among cultivated trees, the olive is at home throughout Syria, except on the steppe; the mulberry is planted extensively in the lower Lebanon; and all sorts of fruit- trees flourish in irrigated gardens, especially on the Phoenician coast, in the Palestinian plain, in the oasis of Damascus, and in the Buka'a, The main cereal regions are the Hauran, and the plains of Antioch and Commagene; and the lower western slopes of the coast range are largely devoted to the culture of tobacco. On the northern inland downs liquorice grows wild

and is collected by the peasants and sent down to Alexandretta.

Fauna. — The mammals of Syria are rather sharply to be distin- guished into those which range only north of Mt Carmel, and those which pass that limit. The first class includes the isabelline bear, badger, pole-cat, ermine, roe and fallow deer, wild ass, Syrian squirrel, pouched marmoset, gerbill and leopard. The second class will be found under Palestine; and it includes a sub-class which is not found outside Palestine at all. In the latter are the coney, jerboa, several small rodents and the ibex. Only in the Jordan valley do intrusions from the Ethiopic region appear. Elsewhere the forms are Palaearctic with intrusions from the east; but the length of the Syrian strip and the variety of its surface relief admit of considerable difference in the species inhabiting different districts. The Lebanon and the hills of north Galilee offer the greatest number of mammals.

Population. — The actual population of Syria is over 3,000,000, spread over a superficial area of about 600,000 sq. m,, i.e. about 55 persons to the square mile. But this poor average is largely accounted for by the inclusion of the almost uninhabited northern steppe-land; and those parts of Syria, which are settled, show a much higher rate. Phoenicia and the Lebanon have the densest population, over 70 to the square mile, while Palestine, the north part of the western plateau east of Jordan, the oases of Damascus and Aleppo, the Orontes valley, and parts of Com- magene, are well peopled. The bulk of the population, so far as race goes, is of the Semitic family, and at bottom Aramaean with a large admixture of immigrant Arabian blood, which is constantly being reinforced, and a comparatively small strain of Hebrew blood. The latter appears mainly in Palestine, and has of late been considerably strengthened by immigration of European Jews, who have almost doubled the population of Jerusalem, and settled upon several fertile spots throughout the Holy Land. But how far these, or the indigenous " Jews " are of Hebrew rather than of

Aramaean origin is impossible to say. We only know that as long ago as the 1st century b.C; true Hebrew blood was becoming rare, and that a vast propor- tion of the Jews of Roman times were Hebraized Aramaeans, whose assimilation into the Jewish community did not date much further back than the Maccabaean age.

Among this Semitic folk is to be observed a great variety of immigrant stocks, settled in isolated patches, which have done much to contaminate the masses about them. In the extreme north (Commagene) the highlands are almost entirely held by Kurds who entered from beyond Euphrates in comparatively recent times. Kurds live upon the Commagenian plains here and there, as also in the northern trans-Euphratean plains. Among them in the Tauras and Amanus, and outnumbering them on the plains, are Armenian communities, the remains of the Rupenian invasion of the 10th century a.d. (see Zeitun). These are found as far south as the plain of Antioch and the basin of the Sajur. To the north of Aleppo and Antioch live remnants of pre-Aramaean stocks, mixed with many half-settled and settled Turkomans (Yuruks, Avshars, &c.) who came in before the Mahommedan era, and here and there colonies of

recently imported Circassians. The latter are also settled numerously to the west of Jordan. Mid-Syria shows a medley of populations of more or less mixed origin, in large part alien, for which see Druses; Maronites and Lebanon. In the Phoenician coast towns are many Greeks (to be distinguished from Orthodox Syrians, called also Greeks on account of creed). In the steppe-land and in the southern trans-Jordanic districts are numbers of true Arabs, mostly belonging to the great Anazeh family, which has been coming northwards from Nejd in detach- ments since the 13th century. These are mainly nomadic, and include offshoots of the great tribes of Ruala, Walad Ali, B. Sokhr, Adwan and Bishr, the first two roaming mainly in the north, the last two in Moab and Ammon. Ottoman Turks, scattered gipsy communities, German settlers in north Pales- tine, and all sorts of Europeans make up a heterogeneous

and incompatible population.

Religion. — The religious types also are strongly divergent. The bulk of the population is Mahommedan; the Bedouins have not much religion of any kind, but they profess Islam. Besides orthodox Moslems there are also ShI'ite sects, as well as a number of religious communities whose doctrine is the out- come of the process of fermentation that characterized the first centuries of Islam. To this last class belong the Ismailites (Assassins), q.v., Metawali, Nosairis, Ansarieh, and especially the Druses (q.v.). In many cases it is obvious that the political antipathy of the natives to the Arabs has found expression in the formation of such sects. The Ansarieh, for instance, and no doubt the Druses also, were originally survivals of the Syrian population. The Jews are found mainly in the larger centres of population. The Christians are an important element, constituting probably as much as a fifth of the whole population; the majority of them belong to the Orthodox Greek Church, which has two patriarchs in Syria, at Antioch and Jerusalem. Catholics — United Greeks, United Syrians and Maronites — are numerous. The mission of the American Presbyterian Church, which has had its centre in Beirut for the last sixty years, has done much for Syria, especially in the spread of popular educa- tion; numerous publications issue from its press, and its medical school has been extremely beneficial. The Catholic mission has done very good work in what relates to schools, institutes and the diffusion of literature. The Christians constitute the educated portion of the Syrian people; but the spirit of rivalry has produced stimulative effects on the Mahommedans, who had greatly fallen away from that zeal for knowledge which charac- terized the earlier centuries of their faith.

Language. — The language throughout southern and middle Syria as high as Killis is Arabic, which has entirely ousted Aramaic and Hebrew from common use, and tends to prevail even over the speech of recent immigrants like the Circassians. The last survivals of Aramaic are to be sought in certain remote

villages of Anti-Lebanon, and in the Syriac known to the clergy. From the upper Sajur northwards Turkish prevails, even among the Armenians; but many Kurdish communities retain their own tongue.

Government. — The political status of the country is controlled by the Ottoman Empire, of which Syria makes part, divided into the vilayets of Aleppo, Sham or Syria (Damascus), the Lebanon (q.v.) and Beirut, and the separate sanjaks or mutessarifliks of Zor and Jerusalem. Ottoman control is imperfect in Lebanon, the Houran, and over the Armenian mountain region of Zeitun and over the eastern steppe-lands, whose nomadic populations can withdraw themselves out of reach. But considerable success has been achieved in inducing the Syrian Arabs to settle and in supplying a counteracting influence to their unrest by the establishment of agricultural colonies, e.g. those of the Circassians in Bashan, Ammon and Moab.

Communications are still very imperfect, but have been greatly improved of late years. Railways run from Beirut to Horns, Hamah, Aleppo and Damascus (French), and to the latter also from Haifa (Turkish). From the termination of the Damascus-Mzerib railway a line (the " Mecca railway ") has been laid by Ottoman enterprise east of Jordan to the southern limit of Syria and beyond. From Jaffa a short line runs to Jerusalem, and a

steam tramway connects Beirut with Tripoli. There are carriage roads radiating from Aleppo to the sea at Alexandretta, and to Aintab; and Antioch is also connected with Alexandretta; Beirut and Horns with Tripoli ; Damascus with Beirut ; and Nazareth with Haifa. But carriage roads in the Ottoman dominions are seldom completely made, and hardly ever kept in repair. The Lebanon district is well supplied with both roads and made mule-tracks.

Commerce. — From the Egyptian and Assyno-Babylonian monu- ments we learn that in ancient times one of the principal exports of Syria was timber; this has now entirely ceased. But it continues to export wheat. Other articles of export are silk cocoons, wool, hides, sponges, eggs and fruits (oranges, almonds, raisins and the like) ; the amounts of cotton, tobacco and wine sent out of the country are small. The only good harbours are those of Beirut and Alex- andretta (Iskanderun). The caravan trade with the East has almost entirely ceased, and the great trade routes from Damascus northwards to Aleppo and eastwards through the wilderness are quite abandoned. The traffic with Arabia has ceased to be impor- tant, being limited to the time of the going and returning of the great pilgrimage to Mecca, which continues to have its mustering- place at Damascus, but leaves mainly by rail. The native industries in silk, cotton and wool have been almost entirely destroyed by the import trade from Europe. The land is poor in minerals, including coal; water-power also is deficient, so that the introduction of European industries is attended with difficulties even apart from the insecurity of affairs, which forbids such experiments as the improvement of agriculture by means of European capital. As regards the cultivation of the soil Syria remains stable; but the soil is becoming relatively poorer, the value of the imports con- stantly gaining upon that of the exports. The latter are estimated at some 2 J millions sterling; the former at 4 millions.

History. — Rude stone monuments (circles and dolmens) and other prehistoric remains show that Syria must have been inhabited from a very early period. Within historic times a great number of different nationalities have fought and settled within its borders, the majority belonging to the Semitic stock. This last circumstance has rendered possible a considerable degree of fidelity in the tradition of the oldest local names. After the Aramaeans had absorbed what remained of the earlier population, they themselves were very powerfully influenced by Graeco-Roman civilization, but as a

people they still retained their Aramaean speech. Of the political relations of Syria in the most ancient times we know but little. Each town with its surrounding district seems to have constituted a small separate state; the conduct of affairs naturally devolved upon the noble families. In the latter part of the 16th century B.C. all north Syria fell under the Cappadocian Hatti domination. The south part of Syria was known to Sargon of Akkad (Agade) as Ammon and was visited by his armies. This is known as the Canaanite period, succeeded about 1000 B.C. by the Aramaean. At a very early period — as early probably as the 16th century B.C. — ■ Syria became the meeting-place of Egyptian and Babylonian elements, resulting in a type of western Asiatic culture peculiar to itself, which through the commerce of the Phoenicians was carried to the western lands of the Mediterranean basin. Indus- try especially attained a high state of development; rich garments were embroidered, and glass, pastes, faience, &c, were manufac- tured. The extant inventories of spoil carried off by the ancient conquerors include a variety of utensils and stuffs. The influence exercised at all times on Syrian art by the powerful neighbouring states is abundantly confirmed by all the recent finds which, in addition to our previous knowledge, show the action of the Aegean culture on Phoenicia and Palestine. The Syrians were more original in what related to religion; every place, every tribe, had its "lord" (Ba'al) and its "lady" (Ba'alat); the latter is generally called 'Ashtar or 'Ashtaret (i.e. Ishtar, Astarte). Besides the local Baal there were " the god of heaven " (El) and other deities; human sacrifices as a means of propitiat- ing the divine wrath were not uncommon. But in the Syrian mythology foreign influences frequently betray themselves. Over against its want of originality must be set the fact, not merely that Syrian culture ultimately spread extensively towards the West, but that the Syrians (as is shown by the inscriptions of Teima, &c.) long before the Christian era exercised over the northern Arabs a perceptible influence which afterwards, about the beginning of the 1st century,

became much stronger through the kingdom of the Nabataeans. The art of writing was derived by the Arabs from the Syrians.

Something about the ancient political and geographical rela- tions of Syria can be gleaned from Egyptian sources, especially in connexion with the campaigns of Tethmosis (Thothmes) III. in western Asia and the administration of Amenophis (Amen- hotep) IV. (the Tell el- Amarna Letters). The Egyptians desig- nated their eastern neighbours collectively as 'Amu. Syria up to and beyond the Euphrates is called more precisely Sahi (or Zahi), and is regarded as consisting of the following parts: (1) Rutenu, practically the same as Palestine (occasionally Palestine with Coelesyria is called Upper Rutenu, as distin- guished from Lower Rutenu extending to the Euphrates) ; (2) the land of the Kheta (sometimes reckoned as belonging to Rutenu with Kadesh on the Orontes as its capital in the Ramesside period; (3) Naharina, the land on both sides of the Euphrates (extending, strictly speaking, beyond the Syrian limits). The Canaanites in general are called Kharu. From these lands the Egyptian kings often derived rich booty, so that in those days Syria must have been civilized and prosperous. Moreover, we possess enumerations of towns in the geographical lists of the temple of Karnak and in a hieratic papyrus dating about 200 years after Tethmosis III. Some of these names can be readily identified, such as Aleppo, Kadesh, Sidon, and the like, as well as many in Palestine. The Tell el-Amarna Letters (15th century B.C.) show Syria held in part by Egyptian viceroys, who are much preoccupied with southward movements in the Buka'a and the rest of the interior beyond their control, due to pressure of Amorite peoples, and of the Mifanni and the Kheta, whose non-Semitic blood was mingled with that of the Aramaeans even in Palestine. On the latter in Syria, see' Hittites. It need only be said here that this people bulked most largely in the relations of Egypt with Syria from the 16th to the 14th cen- turies. During the reign of Rameses II. it was centred on the upper Orontes

(Kadesh) and had comparatively free access to Palestine and the Egyptian border. Later on we find Kheta focused farther north, on the middle Euphrates (Carchemish), and more or less cut off from Egypt by the Hebrew state. They or their confederacy remained, however, the most power- ful of the Syrian elements till the westward extension of Assyria about 1050 B.C., under Tiglath-Pileser I. Late in the 8th cen- tury Sargon III. took Carchemish and ended Hittite power.

With the fall of the Kheta the Aramaeans were the people who held the most important towns of Syria, gradually advancing until at last they occupied the whole country. Of the Aramaean stocks named in Gen. x. 23, xxii. 21 seq., very little is known, but it is certain that Aramaeans at an early period had their abode close on the northern border of Palestine (in Maachah). A great part was played in the history of Israel by the state of Aram Dammesek, i.e. the territory of the ancient city of Damascus; it was brought into subjection for a short time under David. The main object of the century-long dispute between the two kingdoms was the possession of the land to the east of the Jordan (Uauran, and especially Gilead). Another Aramaean state often mentioned in the Bible is that of Aram Zobah. That Zobah was situated within Syria is certain, though how far to the west or north of Damascus is not known; in any case it was not far from Hamath (IJamah). Hamath in the valley of the Orontes, at the mouth of the Buka'a valley, was from an early period one of the most important places in Syria; according to the Bible, its original inhabitants were Canaanites. The district belonging to it, including amongst other places Riblah (of importance on account of its situation), was not very extensive. In 733 B.C. Tiglath-Pileser II. compassed the overthrow of the kingdom of Damascus; he also took Arpad (Tel Arfad), an important place three hours to the north of Aleppo. Hamath was taken by Sargon in 720. Henceforward the petty states of Syria were at all times subject to one or other of the great world-empires, and were still in dispute

between Babylonia and Egypt as late as Necho. Thereafter the Mesopotamian powers prevailed, even if in some cases a certain degree of independence was preserved, as e.g. by the Phoenician cities. These, however, in spite of more than one revolt, continued to supply fleets to the Persians down to the time of the Macedonia invasion (332 B.C.), and

inland Syria remained comparatively peaceful first under its own local governors, and, alter Darius, as a satrapy, till its subjugation by Alexander. Alien domination alone has been able to correct the tendency of this long strip of land to break up into hostile belts.

The foundation of numerous Greek cities shortly after Alex- ander's time was of great importance for Syria (see e.g. Antioch). The Graeco-Syrian civilization extended far to the south down both sides of Jordan, and, but for the Maccabaean revival, would have absorbed the Jews. The Seleucidae had severe struggles with the Ptolemies for the possession of the southern part of Syria.

After having been reckoned for a short time (from 83 to 69 B.C.) among the dominions of Tigranes, king of Armenia, the country was conquered for the Romans by Pompey (64-63 B.C.). It is impossible here to follow in detail the numerous changes in the distribution of the territory and the gradual disappearance of particular dynasties which maintained a footing for some time longer in Chalcis, Abila, Emesa and Palestine; but it is of special interest to note that the kingdom of the Arab Nabataeans was able to keep its hold for a considerable period on the north as far as Damascus. In the year 40 B.C. Syria had to endure a sudden but brief invasion by the Parthians. The country soon became one of the most important provinces of the Roman Empire; its proconsulship was from the first regarded as the most desirable, and this eminence became still more marked after- wards.

Antioch, adorned with many sumptuous buildings, as the chief town of the provinces of Asia, became in point of size the third city of the empire and an eastern Rome. The high degree of civilization then prevailing in the country is proved by its architectural remains dating from the early Christian centuries; the investigations of De Vogue, Butler and others, have shown that from the 1st to the 7th century there prevailed in north Syria and the Hauran a special style of architecture —partly, no doubt, following Graeco-Roman models, but also showing a great deal of originality in details.

The administrative divisions of Syria during the Roman period varied greatly at different times. Hadrian made three provinces of it, Syria, Syria Phoenice and Syria Palestina. At the beginning of the 5th century we find the following: (1) Syria Euphratensis, which had for its capital Hierapolis (q.v.). (2) Syria I., or Coele- syria, having Antioch as its capital. The name Coelesyria (jj koiXj) Supicc), no doubt, was applied originally to the valley ("hollow") between Lebanon and Anti-Lebanon, but was afterwards ex- tended to the district stretching eastwards from the latter range. (3) Syria II., or Syria Salutaris, with Apamea as capital. (4) Phoenice Maritima; capital, Tyre. (5) Phoenice ad Libanum; capital, Emesa (Horns). To this division Damascus and Palmyra belonged; occasionally they were reckoned to Coelesyria, the middle strip of coast being designated Syrophoenicia. (6, 7, 8) Palestina I., II. and III. (9) Arabia (capital, Bostra), which embraced all the region from the Hauran to the Arnon, and skirted the Jordan valley, stretching southwards to Petrae. Through the kingdom of the Nabataeans Roman influence pene- trated from Syria far into northern Arabia.

In 616 Syria was subjugated for a brief period by the Persian Choroes II.; from 622 till 628 it was again Byzantine; 636 and the immediately following years saw its conquest by the Mahom- medans (see Caliphate). Moawiya, the first Omayyad caliph, chose Damascus for his residence; but in 750 the capital of the en\>ire was removed by the Abbasids to

Bagdad. Under the es.rly caliphs the Arabs divided Syria into the following military districts {gonds). (1) Filistin (Palestine), consisting of Judaea, Samaria and a portion of the territory east of Jordan; its capital was Ramleh, Jerusalem ranking next. (2) Urdun (Jordan), of which the capital was Tabaria (Tiberias); roughly speaking, it consisted of the rest of Palestine as far as Tyre. (3) Damas- cus, a district which included Baalbek, Tripoli and Beirut, and also the Hauran. (4) Hom%, including Hamath. (5) Kinnesrin, corresponding to northern Syria; the capital at first was Kin- nesrin (Qinnasrin) to the south of Haleb (Aleppo), by which it was afterwards superseded. (6) The sixth district was the

military frontier ('awdsim) bordering upon the Byzantine dominions in Asia Minor. During the struggles of the Mahom- medan dynasties for the possession of Syria the country still enjoyed a considerable degree of prosperity.

In the crusading period the kingdom of Jerusalem, whose rulers were never able to establish a foothold to the east of the Jordan, extended northwards to Beirut; next to it lay the countship of Tripoli on the coast; and beyond that in north Syria was the principality of Antioch. Syria suffered severely from the Mongol invasions (1260), and it never recovered its former prosperity. In 1 5 16 the Ottomans took it from the Egyptian Mamelukes. For its subsequent history, see Turkey: History. Its medieval importance as an intermediary of trade between Europe and the East was greatly impaired by the opening of the Red Sea route, and finally abolished by the Suez Canal; and Syria is at present important mainly for the sentimental reason that it contains the holiest places of Judaism and Christianity, and for the strategic reason that it lies on the flank of the greatest trade- route of the eastern hemisphere.

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SYRIAC LANGUAGE. Syriac is the eastern dialect of the Aramaic language which, during the early

centuries of the Christian era, prevailed in Mesopotamia and the adjoining regions. Its main centres were at Edessa and Nisibis, but it was the literary language of practically all the Christian writers in the region east of Antioch, as well as of the Christian subjects of the Persian empire.

All the Semitic languages 1 are built up from triliteral roots: that is, the great majority of the words are derived from a simple verbal form, of which the essential elements are three consonants. This form is seen in the 3rd pers. sing. perf. of the verb, e.g. Aram, q'tal or k'tal (" he killed "), which corresponds to Heb. qatal and Arab, qatala. The vowels play no part in differentiat- ing the roots, for the vowels are practically the same in the corresponding forms of every root. The form q'tal illustrates one main peculiarity of Aramaic, as opposed to the other Semitic languages, viz. its paucity of vowels: for where Hebrew has two full vowels — a long and a short — in qatal, and Arabic has three short vowels in qatala, Aramaic has only one short vowel, the sound ' between q and / being merely a half vowel which is not indicated in Syriac writing. Another chief characteristic of Aramaic appears in nouns, viz. the entire absence of a prefixed definite article. Aramaic gives to the noun instead an ending a,

1 On the place of Aramaic among the Semitic languages, and of Syriac among the various dialects, see Semitic Languages.

making the so-called " emphatic " state. In the older Aramaic dialects this is used exactly as the noun with prefixed article is used in other languages; but in Syriac the emphatic state has lost this special function of making the noun definite, and has become simply the normal state of the noun. The main grammatical distinction between Syriac and all the west Aramaic dialects is that in Syriac the

3rd person of the imperfect (singular and plural) of the verb begins with n, but in west Aramaic, as in the other Semitic languages, it begins with y.

When, in the 5th century a.d., owing to theological differences the Syriac-using Christians became divided into Nestorians or East Syrians and Jacobites (Monophysites) or West Syrians, certain differences of pronunciation, chiefly in the vowels, began to develop themselves. The East Syrians in most cases kept the more primitive pronunciation: e.g. the old Semitic a with them remained a, but with the Jacobites passed into 6. One very tangible difference appears in the fact that the name Jesus was by the East Syrians written and pronounced Isho', by the West Syrians Yeshil.

The Syriac alphabet, which derived its letters from forms ultimately akin to those of the Old Hebrew and Phoenician alphabets, has the same twenty-two 4etters as the Hebrew. And as in Hebrew, the six letters b g d k p t are aspirated when imme- diately preceded by any vowel sound. On the other hand, the guttural letters affect the vowels much less than in Hebrew: their chief effect is when final to change the preceding vowel, if other than a or a, into a, but even this is not always the case. 1 The vowels, which are ten in number (aaeeliioouu), were, as usual in the Semitic languages, indicated only partially by the use of consonants as vowel-letters 2 and by means of certain diacritical points, so long as Syriac remained a living language. But about the time when it began to be supplanted by Arabic, two systems of vowel-signs were invented, one for the West Syrians, who borrowed the forms of Greek vowels, and the other more elaborate for the East Syrians, who used combinations of dots. Neither system completely differentiates long and short vowels; the Nestorian scheme is the more satisfactory, though more cumbrous.

Where the same root exists in Arabic, Syriac and Hebrew, its fundamental consonants are usually the same in all three languages. But letters belonging to the same group occasionally interchange. As

regards the dentals and sibilants there are one or two rules which govern the interchange, in the manner of a Grimm's Law. (1) Where Arabic has an ordinary dental, Syriac and Hebrew have the same; but where Arabic has an aspirated dental (e.g. th), Syriac has an ordinary dental t, but Hebrew has a sibilant (sh). (2) Hebrew has one more sibilant than Arabic or Syriac: thus, as corresponding to 5 (samekh), s (sin) sh in Hebrew, Arabic has only s (sin) sh, while Syriac has a different pair s (samekh) sh. Hebrew samekh is represented by Ar. sin and Syr. samekh; but Heb. sin (Syr. samekh) is repre- sented by Ar. sh, while Heb. and Syr. sh is represented by Ar. sin. As regards this crossing of s and sh, Arabic has with it the other south Semitic language, Ethiopic: the evidence as to the other north Semitic language, Assyrian, is conflicting.

In vowel-sounds Syriac is clearly more primitive than Hebrew (as pointed by the Massoretes) , less so than Arabic. Thus Ar. and Syr. a is often thinned in Hebrew into i (e when accented), as in the first syllable of Ar. qatlala = Syr. qaitel — ~Keh. qittel. But the second syllable of the same word shows Syriac siding with Hebrew against Arabic. Again the primitive a of Arabic is in the older (Nestorian) pronunciation of Syriac maintained, while in Jacobite Syriac and in Hebrew it passes into o: thus Ar. qatil Nestorian qatel = Jacobite and Hebrew qotel. Again Syriac

1 It may indeed be remarked that Syriac, which is generally more primitive in its sounds than Hebrew, shows a more advanced stage of weakening as regards the gutturals: thus in a good many forms it has substituted alef for initial he, and often shows a dislike for the presence of two gutturals in the same word, weakening one of them to alef. A much more advanced stage of weakening is seen in some of the other dialects.

2 With regard to this, Syriac has one great difference from Hebrew, viz. that final a is indicated not by he, but by alef.

maintains the diphthongs ai and au, which in Hebrew have usually passed into e and 5.

The accent plays much less part in lengthening and altering the vowels in Syriac than in Hebrew, but there are well-marked cases of lengthening from this cause.

A few words may now be said about the three main parts of speech — pronouns, nouns and verbs.

1. Pronouns. — As in the other Semitic languages, these stand almost entirely outside the system of triliteral roots, being mainly derived from certain demonstrative letters or particles. Each of the personal pronouns (except the 3rd plur.) exists in a longer and a shorter form: the one is used as a nominative and is a separate word, the other is attached to verbs and (in a slightly different form) to nouns to express the accusative or genitive. These pronominal suffixes are of much the same form as in Hebrew, but produce less change in the vowels of the words to which they are attached. Demonstrative adjectives and adverbs are formed by prefixing the syllable ha (= ecce, "behold") to other pronominal elements, and interrogatives similarly by prefixing the interrogative syllable ay; but there are other interrogative pronouns. The relative consists only of the letter d (indeclinable) prefixed to words.

2. Nouns and Adjectives. — The Syriac noun has three states — the absolute (used chiefly in adjectival or participial predicates, but also with numerals and negatives, in adverbial phrases, &c), the construct (which, as in Hebrew, must be immediately followed by a genitive), and the emphatic (see above). There are only two genders and two numbers: the neuter gender is entirely wanting, and the dual number is not recognized in Syriac grammar, though there are plain traces of it in the language. The fern. sing, ending is absolute a, construct aih, emphatic la or 'tha: thus the fem. sing. abs. is always identical in form with the masc. sing. emph. The plural endings are — masc. abs. in, const, ai, emph. e;

fem. abs. an, const, aih, emph. atha. Syriac is not, like Arabic and Hebrew, confined to the use of the construct for the ordinary expression of the genitive or possessive relation: for it has a preposition (d) which expresses ” of,” ” belonging to.” The noun preceding this preposition may be in the emphatic state or may (as is usually the case when the noun is definite) have a pleonastic suffix. Thus ” the son of the king ” is more commonly expressed by b’ra dh’malka or b’reh d’malka than by bar malka, whereas the latter type would alone be permissible in Hebrew. And a genitive with prefixed d does not require the governing noun to precede it immediately, as must be the case when the construct is used. This is one of the many respects where Syriac has gained greater flexibility in syntax than Hebrew.

3. Verbs. — The Syriac verb is remarkable for having entirely lost the original passive forms, such as in Arabic can be formed in every conjugation and in Hebrew are represented by the Pual and Hophal. For these Syriac has substituted middle or reflexive forms with prefixed eih and a change in the last vowel. The simple active q’tal makes its passive etkq’fel; the intensive qatfel makes ethqa(tal; and the causative aqtel makes ettaqtal. The inflexion of the verbs is, on the whole, more regular than in Hebrew: thus, to take one instance, the 3rd plur. fem. impf. neqt’lan corresponds better to 3rd plur. masc. neqt’lun than does the equivalent Hebrew form tiqfolna to yiqt’lu. But the most important peculiarity of Syriac verbs is again in the sphere of syntax, and shows the same progress towards flexibility which we found in the nouns. Whereas the Hebrew verb is devoid of real tenses, and only expresses an action as completed or as in process without indicating time past, present or future, Syriac has by the help of an auxiliary verb constructed a set of tenses. Thus we have —

Pres. qafel, ” he kills,” ” he is killing ” (sometimes ” he is about to kill “).

Impf. qa{el wa, ” he was killing.” Fut. neqfdl, ” he

will kill." Pf. or Aor. q'tal " he has killed," " he killed." Plup. or Aor. q'tal wa, " he had killed," " he killed." The same progress towards flexibility in syntax is seen in the copious supply of conjunctions possessed by Syriac. No doubt the tendency towards a more flowing construction of sentences was helped by the influence of Greek, which has also supplied a large stock of words to the Syriac vocabulary. (N. M.)

SYRIAC LITERATURE. 3 By Syriac is denoted the dialect of Aramaic which, during the early centuries of the Christian era, prevailed in Mesopotamia and the adjoining regions. The literary use of Syriac by Christians had its first centre in Edessa (Syr. tjrhai, modern Urfa), where, in all probability, the chief Syriac versions of the Bible were made. The use of the same dialect appears in the earliest Christian literature connected

3 The sketch of the history of Synac literature here presented is based on Wright's great article in the 9th edition of the Ency. Brit., which was afterwards published separately under the title of A Short History of Syriac Literature (London, 1894).

with such Mesopotamian cities as Nisibis, Amid, Mardln, Tagh- rith and Seleucia-Ctesiphon, as well as west of the Euphrates at such centres as Mabbogh (Hierapolis) and Aleppo, northwards at Malatiah and Maiperkat and in the districts of Lake Van and Lake Urmia, and to the east and south-east of the Tigris in many places which from the 5th century onwards were centres of Nestorian Christianity within the Sasanian Empire. In Palestine and western Syria, the home of pre-Christian Aramaic dialects, the vernacular Semitic speech had under Roman dominion been replaced by Greek for official and literary pur- poses. Apparently this state of things lasted till after the Mahommedan conquest, for Barhebraeus 1 tells us that it was the caliph Walld I. (a.d.

705–715) who, out of hatred to Christianity, replaced Greek by Arabic as the language of official documents at Damascus. Probably (as Duval suggests) the use of Syriac in these regions went hand in hand with the spread of the monophysite doctrine, for the liturgies and formulas of the Jacobite Church were composed in Syriac. Similarly the spread of Nestorian doctrines throughout the western and south- western regions of the Persian Empire was accompanied by the ecclesiastical use of a form of Syriac which differed very slightly indeed from that employed farther west by the Jacobites.

So far we have spoken only of the Christian use of Syriac. Of the pagan Syriac literature which issued mainly from Harran, a city about one day's journey south of Edessa, not a single example appears to have survived. From Christian writers we learn that Harran continued to be a seat of pagan worship and culture down to and even later than the Mahommedan era. A native of the city, Thabit ibn Kurra, j n a passage from a Syriac work of his (now lost) quoted by Barhebraeus, 2 speaks of the paganism of Harran as distinguished by its steadfast resist- ance to Christian propaganda. " When many were subdued to error through persecution, our fathers through God were stead- fast and stood out manfully, and this blessed city has never been defiled by the error of Nazareth. " He goes on to attribute the world's science and civilization to pagan inventors; but it is not clear whether in this he is alluding specially to the culture of his own city. Anyhow, it is much to be regretted that no Syriac writing from Harran has survived. 3

Syriac literature continued in life from the 3rd to the 14th century a.d., but after the Arab conquest it became an increas- ingly artificial product, for Arabic gradually killed the vernacular use of Syriac.

In the literature as it survives many different branches of writing are represented — homilies in prose and verse, hymns, exposition and commentary, liturgy, apocryphal legends, historical romance,

hagiography and martyrology, monastic history and biography, general history, dogmatics, philosophy and science, ecclesiastical law, &c. But the whole is domi- nated by the theological and ecclesiastical interest. All chief writers were bishops, inferior clergy or monks, and their readers belonged to the same classes. When we put aside one or two exceptionally fine pieces, like the hymn of the soul in the apocryphal Acts of Thomas, the highest degree of excellence in style is perhaps attained in staightfor- ward historical narrative — such as the account of the Perso- Roman War at the beginning of the 6th century by the author who passes under the name of Joshua the Stylite, or by romancers like him who wrote the romance of Julian; by biographers like some of those who have written lives of saints, martyrs and eminent divines; and by some early writers of homilies such as Philoxenus (in prose) and Isaac of Antioch (in verse). Nearly all the best writers are characterized by a certain naive and earnest piety which is attractive, and not infrequently display a force of moral indignation which arrests attention. These

1 Chron. syr., ed. Bruns, p. 120, ed. Bedjan, p. 115; cited by Duval, Lilt, syr. 3 , p. 5.

2 Chron. syr., ed. Bruns, p. 176, ed. Bedjan, p. 168. Thabit was the author of about 16 Syriac works, of which the majority sur- vived in the 13th century, but all are now lost. Of his 150 Arabic treatises a few at least survive; see Brockelmann, Geschichte der arabischen Litteratur, i. 217 seq.

3 On this subject, see especially Chwolsen’s Ssabier und Ssabismus.

latter qualities are even more apparent in poetry than in prose. There are indeed but few specimens of Syriac verse which exhibit high poetic quality; except for a fairly copious and occasionally skilful use of simile and metaphor, there is little of soaring imagination in Syriac poets. On the other hand there is much effective rhetoric, and much skilful play of language. 4

As was to be expected, the better qualities of style were more often shown during the early centuries when the language was still a living speech. After it had been supplanted by Arabic in the ordinary intercourse of life its literary use was more and more affected by Arabic words and constructions, and its free- dom as a vehicle of thought was much impaired. Nevertheless, so late as the 13th century it was still an effective instrument in the hands of the most many-sided of Syriac authors, the eminent Barhebraeus.

For the general history of culture the work of Syriac writers as translators is, perhaps, as important as any of their original contributions to literature. Beginning with the earliest versions of the Bible, which seem to date from the 2nd century a.d., the series comprises a great mass of translations from Greek originals — theological, philosophical, legendary, historical and scientific. In a fair number of cases the Syriac version has preserved to us the substance of a lost original text. Often, moreover, the Syriac translation became in turn the parent of a later Arabic version. This was notably the case with some of the Aristotelian writings, so that in this field, as in some others, the Syriac writers handed on the torch of Greek thought to the Arabs, by whom it was in turn transmitted to medieval Europe. The early Syriac translations are in many cases so literal as to do violence to the idiom of their own language; but this makes them all the more valuable when we have to depend on them for reconstructing the original texts. The later translators use greater freedom. 5 It was not from Greek only that translations were made into Syriac. Of translations from Pahlavl we have such examples as the version of pseudo-Callisthenes' History oj Alexander, made in the 7th century from a Pahlavl version of the Greek original — that of Kalilah and Dimnah executed in the 6th century by the periodeutes Bodh — and that of Sindbad, which dates from the 8th century; and in the late period of Syriac literature, books were translated from Arabic into Syriac as well as vice

versa.

All our historical sources support the view taken above that Edessa, the capital of the kingdom which the Greeks and Romans called Osrhoene, was the earliest seat of Christianity in Mesopotamia and the cradle of Syriac literature. But as to the date and circumstances of its evangelization we have little reliable information. The well-known legend of the correspondence of Abgar Ukkama, king of Edessa, with Christ and the mission of Addai to Edessa immediately after the Ascension was accepted as true by the historian Eusebius (t34o) on the faith of a Syriac document pre- served in the official archives of the city. An amplified form of the same story is furnished by the Doctrine of Addai, an original Syriac work which survives complete in a St Petersburg MS. of the 6th century, and is also represented by fragments in other MSS. of the 5th and 6th centuries. This work was probably written at Edessa about the end of the 4th century. It adds many new features to the shorter form of the story as given by Eusebius, among which is the noteworthy promise of Christ about the impregnability of the city — " Thy city shall be blessed and no enemy shall ever henceforth obtain dominion over it. " This is probably a later addition made to the legend at a time when such facts as the capture of Edessa by Lusius Quietus in 116 and its second capture and the destruction of its kingdom by the Romans in 216 had faded from memory. 6

4 On the mechanism of Syriac verse, see Duval's admirable section on la poesie syriaque (Litt. syr. 3 , p. 10 sqq.).

*6 Cf. Duval, op. cit. p. 303 seq.^*

Cf. Tixeront, Origines de I'Eglise d'Jidesse, p. 93, and Duval, op. cit. p. 99. The above view is more probable than that taken by F. C. Burkitt {Early Eastern Christianity, p. 14), that Eusebius knew of Christ's promise as part of the letter to Abgar, and pur- posely suppressed it as inconsistent with historical facts.

But whether in its longer or its shorter form, the whole narrative must be pronounced unhistorical. In all probability the first king of Osrhoene to adopt Christianity was Abgar IX., son of Ma'nu, who reigned from a.d. 179 to 214 or 216, and the legend has confounded him with an earlier Abgar, also son of Ma'nii, who reigned first from B.C. 4 to a.d. 7 and again from a.d. 13 to so. 1 A contemporary of Abgar IX. at Edessa was the famous Bardaisan, himself a convert from heathenism, who was of noble birth and a habitue of the Edessene court. It was no doubt partly under his influence — also possibly in part through im- pressions received by Abgar during his visit to Rome about a.d. 202 — that the king's conversion took place. But Christianity must have reached Edessa some thirty to fifty years earlier. Our oldest native historical document in Syriac — the account of a severe flood which visited Edessa in Nov. a.d. 201 2 — mentions " the temple of the church of the Christians " as overthrown by the flood. The form of this notice shows, as von Gutschmid and others have remarked, that Christianity was not yet the religion of the state; but it must for some time have had a home in Edessa. The same thing is seen from the fact that the heresy of the Marcionites was already showing itself in this district, for (in Tixeront's words) " heresies, in the first centuries at least, only spread in already constituted Christian communities." And by a skilful piecing together of the date furnished by the oldest Syriac versions of the Bible- such as the derivation of the Old Testament version from the Jews, and the almost exclusive use of Tatian's Diatessaron as the gospel of the Syriac Church down to the beginning of the 5th century — F. C. Burkitt has shown it to be probable that the preaching of Christianity at Edessa reaches back to the middle of the 2nd century or even to about the year 13s. 3

The Syriac versions of the Bible are treated elsewhere (see Bible) and may here be dismissed with

a brief summary of facts and opinions. The received Syriac Bible or Vulgate (called the Peshitta or " simple " version from the 9th century onwards 4) contains all the canonical books of the Old Testa- ment. 5 In the New Testament, 2 Peter, 2 and 3 John, Jude and the Apocalypse were originally left out, but Syriac versions were made at a later time. The Peshitta version of the Old Testament must have been originally made mainly by Jews, of whom we know there were colonies in Mesopotamia in the 2nd century. The translation was executed entirely from the Hebrew, but underwent later revision which brought it more into conformity with the LXX — this to a greater degree in some books than in others. The Peshitta New Testament — according to the convincing theory which at present holds the field 6 — is not the oldest form of the Syriac version, at least as regards the Gospels. From the beginning of the 3rd to the beginning of the 5th century Tatian's Harmony or Diatessaron — whether originally compiled in Syriac, or compiled in Greek and translated into Syriac — was the current form of gospel in the Syriac Church. The text of the Gospels underlying it " represents the Greek text as read in Rome about a.d. 170." Slightly later was made the Old Syriac version of the separate Gospels, which survives in two MSS. — the Curetonian and the Sinaitic — in two differing forms: but this never obtained much currency. Its text " represents, where it differs from the Diatessaron, the Greek text as read in Antioch about a.d. 200." Then at the beginning of the 5th century, by the efforts of the

1 See especially Lipsius, Die edessenische Abgar-Sage (1880), and the brilliant analysis of the> legend by A. von Gutschmid in Mem. de I'acad. imper. des sciences de St PUersbourg, tome xxxv. No. 1. The above dates for the kings' reigns are taken from von Gutschmid.

2 Incorporated in the Chronicle of Edessa (Hallier's edition, p. 145 sqq.).

3 Early Eastern Christianity, Lecture II.

- *See the explanation in Burkitt, op. cit. p. 41 seq.*

6 The MSS. which contain the Syriac Massorah or tradition of the reading of the text pass over Chronicles, Ezra and Nehemiah, and in the case of the Nestorians also Esther. But all these books are quoted by Aphraates.

6 That of F. C. Burkitt. See especially his S. Ephraim's Quotations from the Gospel (Cambridge, 1901); Evangelion da-mepharreshe (Cambridge, 1904), and the above cited Lecture.

masterful Rabbula, who was bishop of Edessa from 411-412 to 435, a new version or recension of the Gospels was made and incorporated in the Peshitta or Vulgate, the use of the Diates- saron being henceforth proscribed. Rabbula's text of the Gospels " represents the Greek text as read in Antioch about a.d. 400." The history of the Peshitta rendering of the Acts and Epistles is less clear; apparently the earliest Syrian writers used a text somewhat different from that which afterwards became the standard. 7

Of the large number of Apocryphal books existing in Syriac 8 the majority have been translated from Greek, one or two (such as Bar Sira or Ecclesiasticus) from Hebrew, while some (like the Doctrine of Addai above referred to) are original Syriac documents. Special mention may be made here of the tale of Ahikar — the wise and virtuous secretary of Sennacherib, king of Assyria— and of his wicked nephew Nadhan. This is the Syriac version of a narrative which has had an extraordinary vogue in the world's literature. It is now known to have existed in Aramaic as far back as the 5th century B.C., appearing on Jewish papyri which were lately discovered by the German mission to Elephantine. 9 It appears to be traceable in its Greek dress in writings of the philosopher Democritus and the dramatist Menander; it was certainly known to the author of Tobit and perhaps to the author of Daniel; some would trace its influence in the New Testament,

in the parable of the wicked servant and elsewhere; it was known to Mahomet and is referred to in the Koran; it has been included among the tales in the Arabian Nights; and it survives in a good many versions ancient and modern. The old Syriac version, which is to be found in a number of MSS., was probably made from an early Aramaic version, if not from the original itself (which must surely have been Semitic) . The Syriac has in turn become the parent of the Arabic, Armenian and Ethiopic — possibly also of the Greek and Slavonic versions. 10

Another deeply interesting Syriac Apocryphon is the Acts of Judas Thomas (i.e. Judas the Twin), which is included in the collection of Apocryphal Acts of the Apostles. The Acts of Thomas is now generally recognized to be an original Syriac work (or "novel," as Burkitt calls it), although a Greek version also exists. It seems to have arisen in Gnostic circles, and its ten- dency is wholly in favour of asceticism and celibacy. Among its peculiarities is the fact that Judas Thomas is regarded as the twin brother of Christ. The author has incorporated in it the finest poem to be found in all Syriac literature, the famous Hymn of the Soul. This depicts the journey of the soul from heaven to earth, its life in the body, and its final return to the heavenly home, under the figure of a Parthian prince who is sent from the court of his parents to the land of Egypt to fetch the serpent-guarded pearl; after a time of sloth and forgetfulness he fulfils his quest, and returns triumphant and again puts on the heavenly robe. According to Burkitt, the hymn must have been composed before the fall of the Arsacids and the commencement of the Sasanian Empire in 224. It is plainly Gnostic and may perhaps have been composed by Bardaisan or his son Harmonius. 11

Among recent editions of Apocrypha in Syriac may be men- tioned those of the Apocalypse of Baruch, the Epistle of Baruch,

7 For the later Monophysite versions, none of which attained much popularity, see Wright's Syr. Lit. pp.

13-17, and for the single Nestorian attempt at revision, ibid. p. 19.

8 See the lists in Wright, op. cit. pp. 5 seq. 25-27, and Duval, Litt. Syr. 3 ch. viii.

9 See F. Nau, Histoire et sagesse d' Ahikar I'Assyrien (Paris. 1909), p. 288 sqq.

10 See especially The Story of Ahikar from the Syriac, Arabic, Armenian, Ethiopic, Greek and Slavonic Versions, by F. C. Cony- beare, J. R. Harris and A. S. Lewis (Cambridge, 1898); and Nau, op. cit. The latter has a very full bibliography.

11 Of the Apocryphal Acts of the Apostles there is the well-known edition and translation by Wright (London, 1 871) ; the Acts of Judas were re-edited by Bedjan in the 3rd volume of Acta martyrum et sanctorum (Paris, 1892); of the Hymn of the Soul there is a fresh edition and translation by A. A. Bevan (Cambridge, 1897). See also Lecture VI. in Burkitt's Early Eastern Christianity.

and the Testament of A dam by M. Kmosko (Graffin's Patrologia Syriaca, vol. ii.).

Lives of saints and martyrs form a large group among Syriac books. Among such documents connected with the early history of Edessa we have, besides the Doctrine of Addai, certain martyr- doms, those of Sharbel and Barsamya assigned to the reign of Trajan, and those of Gurya and Shamona and of the Deacon Habblbh under Diocletian and Licinius. All these documents, like Addai, belong probably to the 2nd half of the 4th century, and are quite unreliable in detail for the historian, 1 though they may throw some light on the conditions of life at Edessa under Roman government. There are also accounts of martyrdoms at Samosata (Assemani, Acta Mart. ii. 123-147), including that of St Azazail recently published by Macler (Paris, 1902). But the

great bulk of the Syriac martyrdoms have their scene farther east, within the Persian dominions.

The life and writings of Bardaisan, ” the last of the gnostics,” and in some sense the father of Syriac literature and especially of Syriac poetry, have been treated in a separate article. The Book of the Laws of the Countries, which embodies his teaching, was re-edited in 1907 by F. Nau (this also in the 2nd volume of Graffin’s Patrologia).

An early Syriac document, probably of the 2nd or 3rd century, is the Letter of Mara son of Serapion, which was edited by Cureton in his Spicilegium Syriacum. It is almost the only exception to the rule that all surviving Syriac literature is Christian. The author is in sympathy with Christianity, but is himself an ad- herent of the stoic philosophy. His home appears to have been at Samosata. 2

By the beginning of the 4th century much progress had been made with the organization of the Christian church not only within the Roman district of Mesopotamia, but also to the east and south-east within the Sasanian Empire, round such centres as Seleucia-Ctesiphon on the Tigris (near Baghdad), Karka de-Beth Selokh (modern Kerkuk) and Beth Lapat or Gundeshabhor (in the modern province of Luristan) . 3 The adoption of Christianity by Constantine as the official religion of the Roman Empire had an unfortunate effect! on the position of the Christians in Persia. They were naturally suspected of sympathizing with the Roman enemies rather than with their own Persian rulers. Accordingly when Sapor II. (310-379) declared war on Rome about 337, there ensued almost immediately a somewhat violent persecution of the Persian Christians, which continued in varying degrees for about 40 years. One result of this and later persecutions of the same kind has been to enrich Syriac literature with a long series of Acts of Persian Martyrs, which, although in their existing form intermixed with much legendary matter, nevertheless throw valuable light on the history and geography of western Persia under

Sasanian rule. 4 One of the earlier martyrs was Simeon bar Sabba'e, bishop (? catholicus) of Seleucia from about 326 to 341 in succession to Papa, who in the face of opposition from other bishops had organized the church of Persia under the primacy of Seleucia. The Martyrdom of Simeon exists in two recensions which have been separately edited by M. Kmosko. 5 Another early martyr was Milles, bishop of Susa, who had distinguished himself in the opposition to Papa. 6

1 Burkitt (op. cit. p. 21 seq.) endeavours to claim a higher value for the narratives about Gurya, Shamona and Habblbh, on the ground that these have left more trace in the later literature; but it is to be feared that all five martyrdoms are turned out in the same legendary mould.

2 Cf. Duval, Litt. Syr. 3 p. 241 seq.

3 On the origin and early history of Persian Christianity see especially J. Labourt, Le Chrislianisme dans I'empire Perse (Paris, 1904), chaps, i. and ii.

4 See many of the texts in Bedjan's Acta martyrum et sanctorum (Paris, 1890-1896). The valuable geographical results are ex- hibited in G. Hoffmann's Ausziige aus syrischen Akten persischer Martyrer (Leipzig, 1880).

5 Graffin's Patrologia, ii. 661-1045. Of the epistles, hymns, &c., attributed to Simeon nothing appears to survive but one or two hymns (ibid. 1048-1055). The Martyrdom had been previously edited by Assemani and by Bedjan.

6 His history is in Assemani, Acta mart. i. 66 sqq., and Bedjan, ii. 260 sqq.

The two most important 4th-century writers — Aphraates and Ephraim — are dealt with in separate articles. The importance of the former lies in the simple cast of his religious thought, his independence of theological formulas, his constant

adherence to the letter of Scripture, his quaint exegesis, and the light he throws on the circumstances of his time, especially (1) the feeling between Jews and Christians, and (2) the position and sympathies of the Christian subjects of Sapor II. The position and character of Ephraim are very different. He is the typical exponent in Syriac of unbending Catholic orthodoxy. He impressed his countrymen more than any other single writer, partly no doubt by his enormous fecundity in writing, but more by the stern piety and uncompromising dogmatism which pervade his works.

In the 2nd half of the 4th century lived the monk Gregory, who wrote a treatise on the monastic life. He spent part of his life in Cyprus, and was a friend of Epiphanius, bishop of Salamis. To the information given by Assemani (B.O. i. 170 seq.) we can now add the statements of Isho'-denah 7 that he was a Persian by birth, and after being a merchant was led by a series of visions to take monastic vows. After a training at Edessa, he lived for a long time at Mt Izla in Mesopotamia, whence he proceeded to Cyprus, but returned to Mt Izla shortly before his death. His book on the monastic life mentioned by 'Abhdisho' is not known to survive; but some discourses and a letter of his are still extant.

Before leaving the 4th century we may mention two other writers who probably both lived on into the 5th — Balai and Cyril- lona. The former was the author of a good many poems;' the longest — which is however by some attributed to Ephraim 8 — is the work in 1 2 books on the history of Joseph, of which a complete edition was published by Bedjan in 1901. Other poems of his were edited by Overbeck in 5. Ephraemi Syri, &c, opera selecta, pp. 251-336; and these have since been supplemented by Zettersteen's edition of a large number of his religious poems or metrical prayers (Beitrage zur Kenntniss der religiosen Dichtung Balais, Leipzig, 1902). His favourite metre was the pentasylla- bic. Cyrillona composed a poem on the invasion of the Huns in 39S, 9 and is by some regarded as identical with

Ephraim's nephew Abhsamya, who in 403-404 " composed hymns and dis- courses on the invasion of the Roman empire by the Huns." 10

The 5th century was a time of storm and conflict in the churches of Mesopotamia and Persia, as in other parts of the Christian world. The teaching of Apollinarius that in Christ the Divine Word took the place of the human rational soul, thus seeming to do away with his possession of a true humanity, had led to a reaction by Paul of Samosata, Diodore of Tarsus, Theodore of Mopsuestia, and Nestorius of Constantinople. Though with some points of difference, they agreed in emphasizing the perman- ence of the two separate natures in Christ, united but not mingled or confused, and laid stress on the reality of our Lord's human experience. One question on which great contention arose was as to the propriety of applying to the Divine nature attributes which belonged to the human nature — e.g. birth from a human mother — and vice versa. Hence the great dispute about the application to the Virgin Mary of. the epithet dtoroKos. It seems to have been the objection of Nestorius to the use of this expression which mainly led to his condemnation and deposition at the Council of Ephesus (431) under the influence of Cyril, when as patriarch of Constantinople (428-431) he had dis- tinguished himself by his zeal for Nicene orthodoxy. 11

At Edessa the result of the conflict between the Nestorians and their opponents was long doubtful. When Rabbula, the fierce anti-Nestorian and friend of Cyril, died in 435, he was succeeded in the bishopric by Ibas, who as head of the famous " Persian

7 Book of Chastity, par. 12.

8 ft is in Ephraim's favourite metre, the heptasyllabic, and all the MSS. but one attribute it to him.

9 Chron. Edess. par. 40.

10 Ibid. par. 47.

11 New light on the theological position of Nestorius is to be ob- tained from the long-lost Book of Heraclides, a work of his own which has turned up in a Syriac version and has just been published by Bedjan.

school " in the city had done much to inculcate on his pupils the doctrines of Theodore of Mopsuestia. But the feeling against the Nestorian party grew in strength, till on the death of Ibas in 457 the leading Nestorian teachers were driven out of Edessa. The Persian school continued to exist for another 32 years, but was finally closed and destroyed by order of the emperor Zeno in 489. The Nestorian teachers then started a great school at Nisibis (which had been under Persian rule since Jovian's humiliating treaty of 363). By the energetic efforts of Barsauma, bishop of that city, practically the whole church of Persia was won over to the Nestorian creed. Western Syria, on the contrary, had partaken with Alexandria in the reaction from Nestorianism which finally crystallized in the Monophysite doctrine, that spread so widely through Egypt and Western Asia towards the end of the 5th century.

At the beginning of this century one of the most able and influential men in the Syriac-speaking church was Marutha, bishop of Maiperkat or Martyropolis. Without entering on the details of his ecclesiastical activity, 1 we may note that he was twice associated with embassies from the Roman emperor to Yazde- gerd I. (390-420); that along with Isaac, patriarch of Seleucia (390-410), he obtained from the Persian monarch a concordat which secured a period of religious toleration; and that he arranged for and presided at the Council of Seleucia in 410, which adopted the full Nicene creed and organized the hierarchy of the Persian Church. As a writer he

is chiefly known as the reputed author of a collection of martyrologies which cover the reigns of Sapor II., Yazdegerd I. and Bahram V. 2 By his history of the Council of Nicaea he made a great contribution to the education of the Persian Church in the development of Christian doctrine.

Rabbula, the powerful and energetic bishop of Edessa who withstood the beginnings of Nestorianism, and who gave currency to the Peshitta text of the four Gospels, abolishing the use of the Diatessaron, is dealt with in a separate article.

The next bishop of Edessa, Ibas, who succeeded in 435 at the death of Rabbula, proved himself a follower of the Nestorian doctrine (see above) . As a teacher in the Persian school of Edessa he had translated, probably with the help of his pupils, certain works of " the Interpreter," i.e. Theodore of Mopsuestia. Among these may have been the commentary on St John of which the complete Syriac version was published by Chabot in 1897. He may possibly have translated a work of Aristotle. 3 To the Nes- torian movement in Persia he rendered useful service by his letter to Mar! of Beth Hardasher, in which he maintained the tenets of Diodore and Theodore, while allowing that Nestorius had erred. 4 On the ground of his writings he was condemned and deposed by the " robber synod " of Ephesus (449), but was restored by the Council of Chalcedon (451), after he had anathe- matized Nestorius. His death in 457 was followed by a strong anti-Nestorian reaction at Edessa, which led to the expulsion of many of the leading teachers.

On Isaac of Antioch, " one of the stars of Syriac literature," see the special article. In spite of his over-diffuseness, he is one of the most readable of Syriac authors.

A Nestorian contemporary of Isaac, Dadhlsho', who was catholicus of Seleucia from 421 to 456, composed commentaries on Daniel, Kings and Ecclesiasticus. His chief importance in the history of the Persian Church lies in his having induced a synod of bishops

to declare that church independent of the see of Antioch and of the " Western Fathers " (Labourt, p. 122 sqq.).

The most powerful missionary of Nestorianism during the 2nd half of the 5th century was Barsauma of Nisibis, whom his opponents called " the swimmer among the reeds," i.e. the wild boar. Born probably between 415 and 420 he imbibed Nestorian doctrine from Ibas at the Persian school of Edessa, but was driven out in 457 on the death of his master, and went to be bishop of Nisibis. In a succession of missionary journeys he succeeded, partly by persuasion and partly (if his enemies are to be believed)

1 See Labourt, op. cit., especially pp. 87-90, 92-99.

2 Some of these refer to events so late that they cannot be from his pen.

3 See Duval, Lift. syr. s , p. 247. 1 Labourt, op. cit. p. 254 sqq.

by violence, in attaching to Nestorianism nearly all the Christian communities of Persia, with the exception of Taghrith, which was always strongly Monophysite. He had many quarrels with his ecclesiastical superior the catholicus of Seleucia, but finally made peace with Acacius soon after the accession of the latter in 484. Among other severities towards the Monophysites, he persuaded the Persian king Peroz (457-484) to banish many of them into the Roman dominions. One of his great aims was to secure iot the Nestorian clergy freedom to marry, and this was finally sanctioned by a council at Seleucia in 486 (Labourt, op. cit , chap. vi.). Barsauma must have been bishop of Nisibis for nearly 40 years, but was dead by 496. His writings seem to have been chiefly liturgical: he gave the first set of statutes to the school of Nisibis, which was founded during his bishopric.

His fellow-worker Narsai, whom the Jacobites called

” the leper,” but the Nestorians ” the harp of the Holy Spirit,” apparently accompanied Barsauma from Edessa to Nisibis, where according to Barhebraeus he lived for 50 years. Barsauma appointed him head of the new school, where he taught rigidly Nestorian doctrine. He was a copious writer, especially in verse. Many of his poems have now been published. 5 His theological position is clearly defined in a homily on the three doctors — Diodore, Theodore and Nestorius — published by the Abbe Martin in the Journal asiatique for July 1900.

On the less important companions of Barsauma and Narsai- Mari, Acacius and MIkha, see Wright {op. cit. pp. 59 seq., 63 seq.). The M’ana who accompanied them and became bishop of Rewardasher in Persia was not, as Barhebraeus supposed, the catholicus of Seleucia who held office in 420, but a much younger man. Like Ibas he had been employed at Edessa in translating the commentaries of Theodore.

Among the early Monophysites were two of the best of Syriac writers — Jacob of Sertigh and Philoxenus of Mabbogh, who have been treated in special articles. The one wrote mainly in verse, the other in prose. See also Joshua the Stylite.

Another early Monophysite was Simeon of Beth Arsham, who by a series of journeys and disputations within the Persian empire did all he could to prevent the triumph of Nestorianism among the Persian Christians. He had considerable success at the time, but the ground he had won was soon reconquered by his opponents, except at Taghrith and the surrounding district. It was after a successful disputation in presence of the Nestorian catholicus Babhai (497-302/3) that Simeon was made bishop of Beth Arsham, a town near Seleucia. He made several journeys to Constantinople, where he enjoyed the favour of the empress Theodora. It was there he died, probably about 532-533. His biography was written by John of Asia in the collection of lives of eastern saints which has been edited by Land (A need. syr. vol. ii.). His literary productions consist only of a liturgy and two exceedingly

interesting letters. The one has for its subject Barsauma and the other Nestorian leaders in Persia, and gives a highly malicious account of their proceedings. The other, which has been often edited, 6 is an account of a severe persecution which the Himyarite Christians of Najran in south-west Arabia under- went in 523, at the hands of the king of Yemen. As Simeon had repeatedly visited al-Hirah and was in touch with the Arab kingdom which centred there, his letter is a document of first-rate historical importance.

Mention should be made of two other early Monophysite leaders who suffered persecution at the hands of the emperor Justin I. (518-527). The one is John of Telia, author of 538 canons, 7 answers to questions by the priest Sergius, a creed and an exposition of the Trisagion. His life was written by his disciple Elias, and also by John of Asia. The other, John bar Aphtonya, was the founder of the famous monastery of Kenneshre, opposite

5 See Feldmann, Syrische Wechsellieder von Narses (Leipzig, 1896); Mingana, Narsai, homiliae el carmina (2 vols., Mosul, 1905); and other editions of which a list is given by Duval, p. 344 seq. Four of the homilies which deal with liturgical matters have been given in an English translation, accompanied with valuable notes, by R. H. Connolly (Cambridge, 1909).

6 The best edition is Guidi's La Lettera di Simeone Vescovo di Beth-Arsam sopra i martiri omeriti (Rome, 1881).

7 Edited by Kuberczyk (Leipzig, 1901).

Jerabis on the Euphrates, and wrote a commentary on the Song of Songs, a number of hymns and a biography of Severus, the Monophysite patriarch of Antioch (512-519).

The life of the great missionary bishop Jacob Burde'ana 1 or Baradaeus, from whom the Monophysite Church took its name of Jacobite, belongs rather to ecclesiastical than to literary his- tory. A native of Telia in Mesopotamia, he obtained the favour of the empress Theodora while on a mission to Constantinople, and resided in that city for fifteen years (528-543). At the request of the Arab king of Ghassan he was sent on a mission to the East after being consecrated bishop of Edessa; and the rest of his life was spent in organizing the Monophysite Church of eastern Syria. We possess two lives of him — one by John of Asia in his collection of biographies, and another which may have been written by a priest of Jacob's original monastery of Pesllta. Both are to be found in the 2nd volume of Laud's Anecdota syriaca. An excellent modern biography and estimate of Jacob has been written by Kleyn. 2 A Syriac account of the removal of his remains from Alexandria, where he died in 578, to

his old monastery of Pesllta has been edited by Kugener in the Biblio- ih'eque hagiographique orientate, pp. 1-26 (Paris, 1902). The activity of his life left him little time for writing, but he was the author of " an anaphora, sundry letters, a creed or confession of faith, preserved in Arabic and a secondary Ethiopic trans- lation, and a homily for the Feast of the Annunciation, also extant only in an Arabic translation" (Wright).

A very different character from Jacob's was that of Sergius of Ras'ain, one of the best Greek scholars and ablest translators whom Syria has produced. Of his life little is known, and that little not wholly creditable. He wavered curiously in his ecclesiastical views, and ended by helping the persecutors of the Monophysite Church, to which he himself had belonged. He seems to have lived as a priest and physician at Ras'ain in Meso- potamia most of his life. About 535 he travelled on various ecclesiastical missions, and finally made a journey to Rome and thence to Constantinople (in this latter accompanied by the pope Agapetus). The result was to bring about the deposition and banishment of the Monophysites from the latter city. Sergius died almost immediately afterwards, in 536. Among the works which he translated into Syriac and of which his versions survive are treatises of Aristotle, Porphyry and Galen, 3 the Ars grammatica of Dionysius Thrax, the works of Dionysius the Areopagite,' and possibly two or three treatises of Plutarch. 4 His own original works are less important, but include a " treatise on logic, addressed to Theodore (of Merv), which is unfortunately imperfect, a tract on negation and affirmation; a treatise, likewise addressed to Theodore, On the Causes of the Universe, according to the Views of Aristotle, showing how it is a Circle; a tract On Genus, Species and Individuality; and a third tract addressed to Theodore, On the Action and Influence of the Moon, explanatory and illustrative of Galen's Hepl Kpioipxnv y)pxpuiv, bk. iii., with a short appendix ' On the Motion of the Sun ' " (Wright). Accord- ing to the historical

compilation which passes under the name of Zacharias Rhetor, he also wrote a treatise on the faith. 6 Some of his translations were revised at a later time by Honain ibn Ishak (t8 73).

Another translator from Greek was Paul, Monophysite bishop of Callinicus or ar-Rakkah, who, being expelled from his diocese in 519, retired to Edessa and there occupied himself in translating into Syriac the works of Severus, the Monophysite

1 So called " because his dress consisted of a barda'tha, or coarse horse-cloth, which he never changed till it became quite ragged " (Wright).

2 Jacobus Baradaeus, de Stichter der syrische monophysielische Kerk (Leiden, 1882).

3 See the details in Wright, pp. 90 sqq.; and cf. especially A. Baumstark, Aristoteles bei den Syrern vom V.-VIII. Jahrhundert (Leipzig, 1900); and V. Ryssel, Ober den textkritischen Werth der syrischen Uebersetzungen griechischer Klassiker (Leipzig, 1880-1881). The latter singles out the version of the pseudo-Aristotelian Ilepi ntxriwv as a model of excellence in translation.

1 On these last see Baumstark, Lucubrationes syro-graecae pp. 405 sqq. (Leipzig, 1894); and Duval, Litt. syr.- pp. 266 seq. 6 Land, Anecd. syr. iii. 289.

champion who was patriarch of Antioch from 512 to 519. This version appears to be quite distinct from that used by the compiler of the chronicle of Zacharias, 6 and also from the version of " the 6th book of the select letters of Severus " which was made by Athanasius " presbyter of Nislbis " in 669 and has been edited by E. W. Brooks (London, 1902-1904).

That important legal work, The Laws of the Emperors Con- slantine, Theodosius and Leo, which was composed in Greek about 475, and " which lies at the root of all subsequent Christian Oriental

legislation in ecclesiastical, judicial and private matters" (Wright), must have been repeatedly translated into Syriac. The oldest form is contained in a British Museum MS. which dates from the earlier part of the 6th century, and this was edited by Land {Anecd. syr. i. 30-64). A latter (probably Nestorian) recension is contained in a Paris MS., which was used along with the other by Bruns and Sachau in their exhaustive edition (Syrisch-romisches, Rechtsbuch, Leipzig, 1880). In Notulae syriacae (privately printed 1887) Wright edited the surviving fragment of a 3rd recension which is preserved in a 13th-century MS. at Cambridge. Finally Sachau has published three new redactions of the treatise from a MS. found at Rome in 1894 (Syrische Rechtsbucher, vol. i., Leipzig, 1907).

The last 5th-century author to be mentioned here is Ahudhem- meh, who was Jacobite metropolitan of Taghrlth from 559 till he was martyred by Khosrau Ahosharwan in 575. He wrote various philosophical works, also a treatise on grammar which is quoted by the later grammarian, John bar Zo'bi. A Syriac life of him has been published by F. Nau, who appends to it the surviving fragment of his treatise on the composition of man as consisting of soul and body. 7

We may here take note of three important anonymous works, of which the first probably and the other two certainly belong to the 6th century.

The MParrath gazze or Cave of Treasures, translated and edited by C. Bezold (Leipzig, 1883-1888), is akin (as Duval remarks) to the Book of Jubilees. It is an imaginary history of the patri- archs and their descendants. The work derives its name from the picturesque story of the cave where Adam deposited the treasure of gold, myrrh and incense which he had brought away from paradise: the cave was used as a burying-place by him and his descendants until the deluge. After the precious relics together with the bones of Adam had been saved in the ark, they were transported by Shem and Melchizedek to Golgotha under the guidance of an angel. 8

The tripartite narrative which is known as the Romance of Julian (the Apostate) has no claim to be regarded as an historical document. Its hero is Jovian, one of the feeblest of Roman emperors, and Julian is everywhere exhibited in flaming colours as the villain of the story. But as an example of Syriac prose style it is of the best, and the author at times shows considerable dramatic power.

A valuable historical source, though of small dimensions, is the Chronicle of Edessa, which gives a record of events from 132–131 B.C. to a.d. 540 — at first exceedingly brief, but becoming somewhat fuller for the later years. It appears to be thoroughly reliable wherever it can be tested. It has been three times edited — first by Assemani in the Bibliotheca orientalis (i. 388– 417), secondly by L. Hallier (Leipzig, 1892) with a translation, introduction and abundant notes, and thirdly by Guidi with a Latin version (in Chronica minora, Paris, 1903).

On John of Asia or Ephesus, the eminent Monophysite bishop and earliest Syriac church historian, see the separate article.

An historical work of somewhat similar character to John's is the compilation in 12 books which is generally known by the name of Zacharias Rhetor, 9 because the anonymous Syriac compiler has incorporated the Syriac version or epitome of a lost

6 See Brooks and Hamilton's translation of the latter, p. 234.

7 Patrologia orientalis, iii. I (Paris, 1906).

8 Bezold's edition contains also an Arabic version.

9 This author has hitherto been identified with Zacharias Scholas- ticus, who afterwards became bishop of Mitylene, but according to M. A. Kugener, La Compilation historique de pseudo-Zacharie le Rhiteur (Paris, 1900), this identification is a mistake.

Greek history written by that author. The Syriac work exists (not quite complete) in a British Museum MS, of about the begin- ning of the yth century: this can be in part supplemented by an 8th-century MS. at the Vatican. From the latter Guidi published the interesting chapter (X. 16) which contains the description of Rome. The entire text of the London MS. was published by Land in the third volume of his Anecdota syriaca; and there is now an English translation by Hamilton and Brooks (London, 1899), and a German one by Ahrens and Kriiger (Leipzig, 1899).

Of the other 6th-century Jacobite writers we need mention only Moses of Aggel (fl. c. 550-570) who translated into Syriac some of the writings of Cyril, and Peter of Callinicus, Jacobite patriarch ot Antioch 578-591, who wrote a huge controversial treatise in 4 books, each of 25 chapters, against Damian, patri- arch of Alexandria, as well as other less important works.

The Nestorian writers of the 6th century were numerous, but as yet we know little of their works, beyond what 'Abhdi- sho' tells us in his Catalogue. It will be sufficient to mention one or two. Joseph Huzaya {i.e. of al-Ahwaz or Klmzistan), who came third in succession to Narsai as head of the school of Nisibis, was the first Syriac grammarian and invented various signs of interpunction. Marutha, who was Nestorian catho- licus of Seleucia from about 540 to 552 1 and a man of exceptional energy, made the only known attempt, which was, however, unsuccessful, to provide the Nestorians with a Bible version of their own. He was the author of many commentaries, homilies, epistles, canons and hymns. Paul the Persian, a courtier of Khosrau Anosharwan, dedicated to the king a treatise on logic which has been published from a London MS. by Land in the 4th volume of his Anecdota. Bodh the periodeutes is credited with a philosophical work which has

perished, but is best known as the author of the old Syriac version of the col- lection of Indian tales called Kalilah and Dimnah. He made it doubtless from a Pahlavi version. His translation, which was edited by Bickell with an introduction by Benfey, must be distinguished from the much later Syriac translation made from the secondary Arabic version and edited by Wright in 1884. 2 Hannana of Hedhaiyabh, who nearly produced a dis- ruption of the Nestorian Church by his attempt to bridge over the interval which separated the Nestorians from Catholic ortho- doxy, was the author of many commentaries and other writ- ings, in some of which he attacked the teaching of Theodore of Mopsuestia. An account of his theological position, derived from the treatise of Babhai De unione, will be found in Labourt, op. cit. pp. 279 sqq. One of his followers, Joseph Hazzaya, was also a prolific writer.

" With the 7th century," as Wright remarks, " begins the slow decay of the native literature of the Syrians, to which the frightful sufferings of the people during the great war with the Persians in its first quarter largely contributed." The same process of decay was greatly promoted by the Arab conquest of Persia, achieved through the victory of Kadisiya in 636-637. The gradual replacement of Syriac by Arabic as the vernacular language of Mesopotamia by degrees transformed the Syriac from a living to a dead language. Apart from a few leading writers — such as Jacob of Edessa, the anonymous historian whose work has passed under the name of Dionysius of Tell- Mahre, Thomas of Marga, Dionysius Bar Salibi, and Barhe- braeus 3 — there are not enough names of interest to make it worth while to continue our chronological catalogue. It will be sufficient to group the more important contributors to each of the chief branches of literature.

1. Theology. — Here we may first mention George, Bishop of the Arabs (t724l, who wrote commentaries on Scripture, and tracts and homilies on church sacraments, and finished the Hexae- meron of Jacob of Edessa. 4 Babhai the Elder, a leading Nestorian

1 See a full account of his career in Labourt, Le Christianisme dans V empire perse, pp. 163-191.

2 Of this there is an English translation by Keith Falconer (Oxford, 1884).

8 These have all been dealt with in separate articles. 4 George's part has been translated into German by V. Ryssel (Leipzig, 1891).

in the beginning of the 7th century and a prolific^ author, wrote many commentaries and theological discourses. Isho'yabh III., Nestorian catholicus from 647 to 657/8, wrote controversial tracts, religious discourses and liturgical works. Elias of Merv, who belongs to the and half of the 7th century, compiled a Catena patrum on the Gospels and wrote many commentaries. Timothy I., catholicus 779-823, wrote synodical epistles and other works bearing on church law. 5 Moses bar Kepha (t903), one of the most fertile of 9th-century authors, wrote commentaries, theological treatises and many liturgical works. Other important contributors to this sphere of literature were Isho' bar Non (f827/8), John bar Zo'b'i (beginning of the 13th century), Jacob bar Shakko (•(•1241), and the great Nestorian scholar 'Abhdisho' (1"1318).

2. History. — Besides the important writers treated in separate articles, we need mention only four. Elias bar Shinaya, who in 1008 became Nestorian bishop of Nisibis, was the author of a valuable Chronicle, to which are prefixed numerous chronological tables, lists of popes, patriarchs, &c, and which covers by its narrative the period from A.D. 25 to 1018. Of this work, which exists in only one imperfect copy, the later portion was edited by Baethgen in 1884, and the earlier by Lamy in 1888. Another important Chronicle is that of Michael I., who was Jacobite patriarch from 1166 to 1 199. Its range extends from the Creation to the author's own day, and it was largely used by Barhebraeus in compiling his own Chronicle. Till recently it was known only in an abridged Armenian version which was translated into French by V.

Langlois (Venice, 1868). but the Syriac text has now been found in a MS. belonging to the library of the church at Edessa, and is in course of publica- tion by J. 6. Chabot. A work rather legendary than historical is the Book of the Bee, by Solomon of al-Basrah, who lived early in the 13th century. 6 Lastly, acknowledgment must be made of the great value of the Catalogue of Nestorian writers, by 'Abhdisho' of Nisibis, the latest important writer in Syriac. It was edited by Assemani in the 3rd part of his Bibliotheca orientalis, and has been translated into English by Badger.

3. Biography, Monastic History, &c. — Besides the important work by Thomas of Marga. (q.v.) the following deserve special mention. _ Sahdona, who was a monk in the Nestorian monastery of Beth 'Abhe (the same to which Thomas of Marga belonged two centuries later) and afterwards a bishop early in the 7th century, wrote a biography of and a funeral sermon on his superior Mar Jacob who founded the monastery, and also a long treatise in two parts on the monastic life, of which all that survives has been edited by P. Bedjan (Paris, 1902). Whilst accompanying the catholicus Isho'yabh II. (628-644) on a mission to Heraclius, Sahdona was converted, apparently to Catholicism, 7 and thereby caused much scandal in the East. The chief events in his life are narrated by Isho'denah. 8 Another, Nestorian who, a few years later, wrote ecclesiastical biographies and other theological works was Sabhrisho' Rustam, who lived at Mount Izla and other monasteries In the beginning of the 8th century David of Beth Rabban, also a Nestorian monk, wrote, besides a geographical work, " a monastic history, called The Little Paradise, which is frequently cited by Thomas of Marga." A more important work is The Book of Chastity, by Isho'denah, who according to 'Abhdisho' was bishop of Kasra — ■ but read Basra, — about the end of the 8th century. This work is a collection of lives of holy men who founded monasteries in the East, and is a valuable historical source. The work itself, or an abridgment of it, was discovered and published for the first

time by J. B. Chabot (Rome, 1896). 9 As the last under this head we may mention a late anonymous biography, that of the catholicus Yabhalaha III. (1281-1317), which throws much light on the relations of the early Mongol kings with the heads of the church in their dominions. Among other interesting features it contains information about the Nestorian Church of China in the 13th century — Yabhalaha was a native of Peking — an account of a journey through Central Asia, and a description of a visit to Europe by Rabban Sauma, the friend of the catholicus. 10

_4. Philosophy and Science. — Special mention may be made of 'Ananisho' of rledhaiyabh (middle of 7th century) well known as the author of a new recension of the Paradise of Palladius, and also the author of a volume on philosophical divisions and definitions; Romanus the physician (f896), who wrote a medical compilation, a commentary on the Book of Hierotheus, a collection of Pytha- gorean maxims and other works; Moses bar Kepha, the voluminous writer above referred to; the famous physician Honain ibn Ishak

6 See O. Braun's article in Oriens christianus, i. 138-152; and Labourt, De Timotheo I. Nestorianorum patriarcha (Paris, 1904). 6 Text and translation, by E. A. W. Budge (Oxford, 1886). ' See H. Goussen, Martyrius-Sahdonas Leben und Werke (Leipzig,

1897)-

8 Le Livre de la chastete (ed. Chabot, pp. 67 sqq.).

9 A fresh edition by Bedjan forms an appendix to his edition of Thomas of Marga (Paris, 1901).

10 The text has been twice edited by Bedjan (Paris, 1888 and 1895), and there is a French translation, with copious notes, by Chabot (Paris, 1895); cf. also Journ. As. (1889), pp. 313 sqq., and Eng. Hist. Rev. xiv. 299 sqq.

(t873), who wrote chiefly in Arabic, but deserves mention here by his services to Syriac grammar and lexicography, and still more by his translations of Greek philosophical and scientific works into Syriac l and from Syriac into Arabic, becoming in a sense the founder of a school of translators; and Jacob bar Shakko, whose work called the Dialogues treats of grammar, rhetoric, poetry, logic, philosophy and science.

5. Grammar and Lexicography. — Several of the authors in this department have already been mentioned. The more important, besides Jacob of Edessa and Barhebraeus, are 'Ananlsho' of Hed- haiyabh, rjlonain ibn Isljak, his pupil Bar 'All, Bar Saroshwai (early 10th century), Bar Bahlul (middle of 10th century), Elias of Tlrhan (fio49), Elias bar Shinaya (above), John Bar Zo'bi (beginning of 13th century) and Jacob bar Shakko.

Apart from the numerous editions of Syriac texts by M. Paul Bedjan, most of which have been cited above, nearly all the texts recently edited are included in one or other of three comprehensive series now running — viz. (1) Patrologia syriaca (Paris, 1894); (2) Corpus scriptorum christianorum orientalium — scriptores syriaci (Paris, 1907); (3) Patrologia orienlalis (Paris, 1907). (N. M.)

SYRIANUS, a Greek Neoplatonist philosopher, and head of the school at Athens in succession to Plutarch. He is im- portant as the teacher of Proclus, and, like Plutarch and Proclus, as a commentator on Plato and Aristotle. His best-known extant work is a commentary on the Metaphysics of Aristotle. He is said to have written also on the De coelo and the De inter pretalione of Aristotle and on Plato's Timaeus. A treatise on the Staseis of Hermogenes was published under his name by Walz in 1833. His views were identical with those of Proclus, who regarded him with great affection and left orders that he should be buried in the same tomb.

SYRINGE (Gr. avpiyt;, reed, pipe), a hydraulic instrument, based on the principle of the pump, for

the drawing up and ejecting of liquids. The ordinary form is that of a glass or metal tube ending in a pointed nozzle and fitted with an air- tight piston-rod and handle. The nozzle is inserted in the liquid, which enters the cylinder by atmospheric pressure when the piston-rod is drawn up. On pushing back the piston the fluid is ejected in a jet through the nozzle. In sizes varying from the needle-pointed hypodermic syringe to the abdominal syringe, it is a common surgical implement used for the injection of fluids into the body or for the washing of wounds and cavities. The smaller syringes are made of glass, the larger of metal; the most common medical syringes consist of a length of india- rubber tubing, one end terminating in a nozzle of ivory or other easily cleaned material, in the centre is a bulb or ball which under pressure draws up the liquid through the free end of the tube which is placed in the vessel containing it. There are a very large number of different types of syringe used in surgical practice. A larger syringe of metal, with a flat perforated nozzle is used as a garden implement for watering plants.

SYRINX {avpiyQ, the Greek name for the pan-pipes. The principle on which it works is that of the stopped pipe, but it is blown in the same manner as the ancient Egyptian nay or oblique flute. The pipes composing it were stopped at one end, so that the sound waves had to travel twice the length of the pipe, giving out a note nearly an octave lower than that produced by an open pipe of equal length. The breath directed horizontally across the open end, impinged against the sharp inner edge of the pipes, creating the regular series of pulses which generate the sound waves within the tubes. The syrinx consisted of a varying number of reeds, having their open ends or embouchures in a horizontal line and their stopped ends, formed by the knots in the reed, gradually decreasing in length from left to right. Each pipe gave out one note, but by overblowing, i.e. increased pressure of breath and tension of lips, harmonies could be obtained.

The syrinx or pan pipes owes its double name to

ancient Greek tradition, ascribing its invention to Pan in connection with a well-known legend of the Arcadian water-nymph "Syrinx." 2 The exact form of the instrument and the number of pipes (10) at the beginning of the third century B.C. is shown in one of

1 The Syriac versions made by him and his successors have un- fortunately perished (see Wright, p. 213).

1 See Serv. ad Virgil, Ecloga, ii. 31 ; and Ovid, Metam. i. 691, &c.

the Idyllia figurata, 3 in which the legend is repeated. The pan- dean pipes continued in favour with the rustic populations of the West long after the organ evolved from it had eclipsed this humble prototype. The syrinx was in use during the middle ages, and was known in France as frestel or fretiau, in medieval Latin as fistula panis, and in Germany as Pansflote or Hirten- pfeife (now Papagenoflole). At the beginning of the 19th century a revival of the popularity of this instrument took place, and quartets were played on four sets of pipes of different sizes and pitch. The modern mouth-organ is the representative of the syrinx, although blown by means of a free reed.

SYRUP (O. Fr. ysserop, mod. sirop, Span, xarope, for axarope, Arab, al, the, and sharab, drink; cf. " Sherbet " and " Shrub "), the name given to a thick, viscid liquid, containing much dis- solved (generally crystalline) matter, but showing little tendency to deposit crystals. The " syrup " employed for medicinal purposes consists of a concentrated or saturated solution of refined sugar in distilled water. The simple " syrup" of the British Pharmacopoeia is prepared by adding 1000 grams (or S lb) of refined sugar to 500 cubic centimetres (or two pints) of boiling distilled water, heating until it is dissolved and sub- sequently adding boiling distilled water until the weight of the whole is 1500 grams (or i\ lb). The specific gravity of the syrup should be i - 33. Flavoured syrups are made by adding flavouring matter to a simple syrup. For

instance, syruptis aromaticus is prepared by adding certain quantities of orange and cinnamon water to simple syrup. Similarly, medicated syrups are prepared by adding medicaments to, or dissolving them in, the simple syrup. Golden syrup is the uncrystallizable fluid drained off in the process of obtaining refined crystallized sugar. Treacle and molasses are syrups obtained in the earlier stages of refining. Technically and scientifically the term syrup is also employed to denote viscid, generally residual, liquids, containing substances other than sugar in solution.

SYRYENIANS (also Sirianian, Syrjenian, Zyrenian, Zirianian, Zyrian and Zirian), a tribe belonging to the Permian division of the eastern Finns. They are said to number about 85,000 on the west side of the Urals in the governments of Perm, Vologda and Archangel, and there are also about 1000 on the Siberian side of the lower Ob. Their headquarters are at Ust- Ishma, at the junction of the Ishma and Pechora. Formerly they spread farther to the west. They are of moderate stature, blond, and grey-eyed, and more energetic and inclined to trade than most of the allied tribes. They were converted to Christi- anity about 1350 and their language was reduced to writing. They call themselves Komi and are not sharply distinguished from the tribes known as Permian, the languages being mutually intelligible. The archaeological remains in the governments of Perm and Vatyka called Chudish by Russians are probably Syryenian. A grammar of the language was published by Castren, and linguistic and other notices of the tribe are contained in the Journal de la societt finno-ougrienne, especially for 1903. (See Finno-Ugrian.)

SYSTYLE (Gr. avv, together with, and crrDXos, a column), in architecture, a term meaning having columns rather thickly set — an intercolumniation to which two diameters are assigned.

SYZRA5J, a town of Russia, in the government of Simbirsk, 156 m. E. of the town of Penza, and a short distance from the Volga. Pop. (1882), 24,500;

(1900), 33,046. Syzran originated in a fort, erected in 1683, to protect the district from the Tatars and Circassians. Most of its inhabitants are engaged in garden- ing and tillage. In the large villages of the surrounding district various petty trades are carried on. The town has long been in repute for its tanneries and its manufactures of leather. Several floui-mills and other factories have recently sprung up. Much grain is exported; timber is brought from the upper Volga, and manufactured wares from Nizhniy Novgorod.

SYZYGY (Gr. cv^vyia, a yoking together, from avv, together, and root firy-, yoke), in astronomy, either of the points at which the moon is most nearly in a line with the sun. The moon passes her syzygies, or is in a syzygy, at new and full moon.

'Theocritus, Brunck, Analecta veto. poet, graec. i. 304.

SZABADKA (Ger. Maria-Theresiopel), a town of Hungary, in the county of Bacs-Bodrog, 109 m. S.S.E. of Budapest by rail. Pop. (,1900), 81,464. It is situated in the great Hungarian plain between the Danube and the Theiss, and is the centre of an immense agricultural district. To the town belongs a large territory (369 sq. m.) of the adjoining Puszta Telecska, where large herds of cattle are reared. In this territory is situated Lake Palics, a favourite watering-place and summer resort.

SZABO VON SZENTMIKLOS, JOZSEF (1822-1894), Hungarian geologist, was born at Kalocsa, on the 14th of March 1822. His first contribution to science was an essay on metallurgy, in which subject he had received special training. Afterwards he settled at Budapest and investigated the geology of the district, the results of which were published in a geological map (1858). In 1859 he joined the staff of the Austrian Geological Survey, as a volunteer member, and paid

attention to the economic as well as to the purely scientific aspects of the work. He also arranged for surveys having special reference to agricultural geology to be undertaken by the Hungarian Geological Institute. In 1862 he became professor of geology and mineralogy in the university of Budapest. In later years he devoted himself largely to petrology, and published memoirs on the trachytes of Hungary and Transylvania; on a new method of determining the species of felspars in rocks, depending on fusibility and flame- coloration; on the geology and petrology of the district of Schemnitz; and on Santorin Island. He died at Budapest on the 1 2th of April 1894.

He was author of Geologie mit besonderer Riicksicht auf die Petro- graphie, den Vulkanismus u. die Hydrographie (1883).

SZALAY, LADISLAS (1813-1864), Hungarian statesman and historian, was born at Buda on the 18th of April 1813. After the completion of his studies, he became a member of the Hungarian parliament, and in 1848 he represented Hungary in the German national parliament at Frankfort. He took part in the revolution of 1848-49, and was obliged to seek refuge in Switzerland, where he wrote his history of Hungary. This important work, published at Budapest (1856-1860), extends to 1707. Szalay also wrote remarkable studies on Pitt, Fox, Mirabeau and other statesmen, and contributed very con- siderably to the codification of Magyar law. In later life he returned to Hungary, but he died at Salzburg on the 17th of July 1864.

See Alexander Flegler, L. von Szalay (Leipzig, 1866).

SZECHENYI, ISTVAN, Count (1791-1860), Hungarian statesman, the son of Ferencz Szechenyi and the countess Juliana Festetics, was born at Vienna on the 21st of September 1 791. Very carefully educated at home till his seventeenth year, when he entered the army, he fought with distinction at the battle of Raab (June 14, 1809), and on the 19th of July

brought about the subsequent junction of the two Austrian armies by conveying a message across the Danube to General J. G. Chasteler at the risk of his life. Equally memorable was his famous ride, through the enemy's lines on the night of the i6th-i7th of October 1813, to convey to Bliicher and Bernadotte the wishes of the two emperors that they should participate in the battle of Leipzig on the following day, at a given time and place. In May 1815 he was transferred to Italy, and at the battle of Tolentino scattered Murat's bodyguard by a dashing cavalry charge. From September 1815 to 1821 he visited France, England, Italy, Greece and the Levant, carefully studying the institutions of the countries through which he passed, and every- where winning admirers and friends. A second — scientific — tour with his friend, Baron Miklos Wesselenyi, taught him much about trade and industry, which knowledge he subsequently applied to his country's needs. In 1825, when he went to France in the suite of Prince Pal Esterhazy, to attend the coronation of Charles X., the canal du Midi especially attracted his attention and suggested to him the idea of regulating the rivers Danube and Theiss. At the Diet of 1825, when the motion for founding a Hungarian academy was made by Pal Nagy, who bitterly reproached the Magyar nobles for so long neglecting their mother-tongue, Sz6chenyi offered to contribute a whole year's

income (60,000 florins) towards it. His example was followed by three other magnates who contributed between them 58,000 florins more. A commission was thereupon appointed to settle the details, and on the 18th of August the project received the royal assent. Another of his great projects was the opening up of the Danube for trade from Buda to the Black Sea. He satisfied himself of the practicability of the scheme by a person- ally conducted naval expedition from Pest to Constantinople. The Palatine Joseph was then won over, and on the 20th of June 1833 a Danube Navigation Committee was formed which completed its work in ten years. Szechenyi was also the first to

start steamboats on the Theiss, the Danube and the lake of Balaton. It was now, too, that he published his famous work Stadium, suggesting a whole series of useful and indeed indis- pensable reforms (1833), which was followed by Hunnia (1834), which advocated the extension and beautifying of Budapest so as to make it the worthy capital of a future great power. His A Few Words on Horse-racing, a sport which he did so much to introduce and ennoble, appeared in 1839.

All this time Szechenyi had been following, with some anxiety, the political course of Kossuth. He sincerely believed that the exaggeration and exaltation of the popular editor of the Pesti Hirlap would cast the nation back into the old evil conditions from which it had only just been raised, mainly by Szechenyi's own extraordinary efforts, and in Kelet nepe, which is also an autobiography, he prophetically hinted at an approaching revolution. " Trample on me without ceremony," he wrote to Kossuth on this occasion, " but for God's sake don't use the nimbus of your popularity to plunge Hungary into chaos." On this very point of reform the nation was already divided into two parties, though only the minority held with Sz6chenyi. But neither this fact nor the gradual loss of his popularity restrained Szechenyi, both in the Diet and at county meetings, from fulminating conscientiously against the extreme demands of Kossuth. His views at this period are expounded in the pamphlet Politikai programm toredekek (" Fragments of a Political Programme "). He held the portfolio of ways and communications in the first responsible Magyar administration (March 23, 1848) under Batthyany, but his increasing appre- hension of a revolution, with its inevitable corollaries of civil war and a rupture with the dynasty, finally affected his mind, and on the 5th of September he was removed to an asylum. Here he remained for many years, but recovered sufficiently to correspond with his friends and even to meditate writing fresh books. In 1859 he published the pamphlet Ein Blick in which he implored his countrymen to accept the Bach system as the best*

constitution attainable in the circumstances. The sudden death of his old friend Baron Samuel Josika and the once more darkening political horizon led him, in a moment cf despair, to take his own life (April 8, i860). He richly deserved the epithet " the greatest of the Magyars " bestowed upon him by his political antagonist Kossuth.

Most of his numerous works on political and economical subjects have been translated into German. The best complete edition of his writings has been published, in nine volumes, by the Hungarian Academy (Pest, 1884-1896). See Life of Szechenyi, by Zsigmond Kemeny (Hung.; Pest, 1870); Aurel Kecskemethy, The Last Years and Death of Count Szechenyi' (Hung.; Pest, 1866); Menyhert Lonyai, Count Szechenyi and his Posthumous Writings (Hung.; Budapest, 1875); Max Falk, " Der Graf Stephen Szechenyi und seine Zeit " (in the Oesterreichische Revue, Vienna, 1867); Antal Zichy, Count Szechenyi as a Pedagogue (Hung.; Budapest, 1876); Pal Gyulai, Szechenyi as a Writer (Hung. ; Budapest, 1892) ; Antal Zichy, Biographical Sketch of Count Stephen Szechenyi (Hung.; 2 vols., Budapest, 1896-1897). (R. N. B.)

SZE-CH'UEN (Four Rivers), a western province of China, bounded N. by Kokonor, Kan-suh and Shensi, E. by Hu-peh and Hu-nan, S. by Kwei-chow and Yun-nan, and W. by Tibet. Estimates of its population vary from 45,000,000 to 68,000,000; estimates of its area from 185,000 to 218,000 sq. m. It is considerably larger than any other province of China, Yun-nan, which comes next in size, covering less than 150,000 sq. m. Sze-ch'uen contains twelve prefectual cities, inclusive of Ch'eng- tu Fu, the provincial capital. The western portion forms part

of the mountain-lands of Central Asia and much of it is over 10,000 ft. high, while heights of 16,000 to 19,000 ft. occur. The northern portion is also

mountainous, but the east central part of Sze-ch'uen consists of a red sandstone table-land (see China, § 1). Towards the north-east end of this plateau, commonly known as " the red basin, " is Ch'eng-tu Fu (pop. 450,000- 500,000), the provincial capital. The plain in which the city stands is about 70 m. long and 30 wide, and is noted for the density of its population (about 5,000,000), its wealth, and its splendid irrigation works.

The fauna includes bears, yaks, various kinds of antelope, monkeys and parrots. The flora includes magnificent yews, a great variety of bamboos, tallow, varnish, soap, and wax trees, rhododendrons and giant azaleas. The ethnological and commercial boundaries are sharply defined by the physical features. The mountain districts are poorly cultivated, and are inhabited by Ijin or barbarians, who are distinguished under the tribal names of Si-fan, Lo-lo and Man-tsze, and who maintain a semi-independence. Tibetans are also scattered over the western region and are numerous in the district of Pa-tang. The table-land is inhabited by Chinese, and is one of the most thriving and populous regions in the empire. These Chinese exhibit great diversity of type, due in part to immigration from other provinces in the 17th century — three fourths of the inhabitants having, it is said, been exter- minated towards the close of the Ming dynasty.

Through the southern portion of Sze-ch'uen runs the Yangtsze- kiang, which is there navigable throughout the year, while the province is traversed by three large rivers, the Min-kiang, the Fu-sung-ho and the Kialing-kiang, all of which take their rise in the mountains on its north-west border, and empty into the Yangtsze-kiang at Su-chow Fu, Lu Chow and Chung-k'ing Fu respectively. A series of rapids disturb the waters of the Yangtsze-kiang between I-ch'ang and Chung-k'ing, a distance of about 500 m. According to the native authorities there are 13 big rapids and 72 smaller ones on these waters. In ordinary circumstances it takes about six weeks to traverse the distance. In 1898 Mr A. Little took a steamer, which had been built for the purpose, up

the rapids, and since then one or more of these boats have ascended them. The province is intersected by numerous but difficult roads. The Ta-pei-lu, or great north road, leads from Ch'eng-tu Fu to Peking. From the same centre there branch roads to Chung-k'ing Fu, to Pao- ning Fu and to Ya-chow Fu, while another road connects Chung-k'ing Fu with Kwei-chow Fu on the Yangtsze-kiang and beyond with I-ch'ang Fu in Hu-peh. From Ya-chow Fu, again, start two important roads, one leading into Tibet by way of Yung-king, Ts'ing-k'i Hien, Ta-chien-lu, Li-tang, Pa-tang and Chiamdo, and the other to Western Yun-nan via Ts'ing-k'i Hien, Ning-yuen Fu, and Yen-yuen Hien to Ta-li Fu. From Ta-li Fu this road continues through Momein to Bhamo in Burma. Another road connects Pa-tang and Li-kiang Fu with Ta-li Fu, and yet another crosses the southernmost corner of the province connecting Tung-ch'uen Fu in Yun-nan with Ta-li Fu in the same province. In 1910 a loan of £6,000,000 was arranged for the construction of a railway from Hankow through the provinces of Hu-peh and Sze-ch'uen to Ch'eng-tu Fu.

The products of Sze-ch'uen include silk, tea, rice, sugar, hemp, vegetable wax, tobacco, timber and oranges. A larger quantity of silk is produced in eastern Sze-ch'uen than in any other province of the empire. Large quantities are exported to Shen-si, Shan-si, Kan-suh, Peking, Yun-nan, Tibet, Kwei-chow, Kwang-si, Hu-nan and Hu-peh.

White wax is another valuable article of the Sze-ch'uen trade. It is made exclusively in the department of Kia-ting Fu, the climate of Wax , which appears to favour the propagation of the disease among the insects which is said by the natives to be the cause of the plentiful secretion of wax. This belief is borne out by the fact, that in the districts where the insects breed only a small quantity of wax is produced, and experience has taught the natives the advantage of breeding the insects in one district and producing the wax in another. The region of Kien-chang in the south of the province has been found most suitable for breeding purposes, and it is there, therefore, on

the insect trees, which are evergreens with large and

pointed ovate leaves, that the breeding processes are carried on. At the end of April the producers start each with a load of the eggs of the insects for the district of Kia-ting Fu, a journey which on foot occupies about a fortnight. The road between the two dis- tricts is very mountainous, and as exposure to the heat of the sun would hatch the eggs too rapidly, the travellers journey only during the night. At Kia-ting Fu the eggs are eagerly bought up, and are at once put upon the wax tree. Baron von Richthofen thus describes the subsequent process: —
•

" When the egg balls are procured they are folded up, six or seven together in a bag of palm leaf. These bags are suspended on the twigs of the trees. This is all the human labour required. After a few days the insects commence coming out. They spread as a brownish film over the twigs, but do not touch the leaves. The Chinese describe them as having neither shape, nor head, nor eyes, nor feet. It is known that the insect is a species of coccus. Gradu- ally, while the insect is growing, the surface of the twigs becomes encrustated with a white substance, this is the wax. No care whatever is required. The insect has no enemy, and is not even touched by ants. In the latter half of August the twigs are cut off and boiled in water, when the wax rises to the surface. It is then melted and poured into deep pans. It cools down to a trans- lucent and highly crystalline substance."

Tobacco is grown very generally throughout the province, and is exported in large quantites to Si-fan, Tibet, Yun-nan, Hu-nan, and the export to Hankow alone is estimated at 65 million lb annually. The best is grown in the district of P'i Hien; the next quality is said to come from Kin-t'ang Hien, and the third quality from Shih-fang Hien, all these districts being in the plain of Ch'eng-tu Fu. The habit, which is unknown in other provinces, of smoking the tobacco leaves rolled up in the shape of

cigars obtains largely in Sze-ch'uen. Salt is also produced in Sze-ch'uen in large quantities from brine, which is raised from wells. Tsze-liu-tsing, in Tsze Chow, Wu-tung-kiao, hear Kia-ting Fu, Pao-ning Fu, and T'ung- ch'uen Fu, are the districts where the wells are most abundant. The brine is raised from the well with long bamboo tubes and bamboo ropes, and is then led to large pans for evaporation. In the district of Tsze-liu-tsing petroleum is struck at a depth of from 1800 to 2000 ft., and is used for evaporating the brine. Coal, iron and copper are found in many parts. The only coal worked is of an inferior quality, and the iron is smelted with wood alone. Ning-yuen Fu is the principal district from which the copper is produced. Wheat, barley, beans, rice, Indian corn, potatoes, &c, are among the other products of Sze-ch'uen.

Chung-K'ing Fu (pop. about 600,000) is the principal treaty port. It imports textiles, aniline dyes, metals, soap, petroleum &c, and exports silk, wax, tobacco, sugar, oil, musk, medicinal plants, &c. By the terms of the Mackay Treaty, signed at Shanghai in 1902, the port of Wan Hien (pop. 140,000), which is situated on the Yangtsze-kiang, 200 m. below Chung-K'ing Fu, was opened to trade in 1905. Both Protestant and Roman Catholic missions are at work in the province; the Protestants opening their first mission station, at Chung-K'ing, in 1877.

See L. Richard, Comprehensive Geography of the Chinese Empire, pp. 104-119 and the authorities there cited (Shanghai, 1908); also " The Province of Sze-ch'uen," in The Chinese Empire (M. Broom- hall ed. ; London, 1907) ; and Colonel C. C. Manifold, " Recent Exploration and Economic Development in Central and Western China," in Geog. Journ. (1904), vol. xxiii.

SZEGED (Ger., Szegedin), the capital of the county of Csongrad in Hungary, 118 m. S.E. of Budapest by rail. Pop. (1900), 100,270. It is situated on both banks of the Theiss just below the confluence of the Maros, and contains the inner town and four suburbs.

It is the second town in Hungary as regards population, and since the disastrous inundation of the Theiss on the night of the nth of March 1879, which almost completely destroyed it, Szeged has been rebuilt. It is now one of the handsomest towns of Hungary, and has several large squares, broad avenues, boulevards and many palatial buildings. It has also been encircled with a strong dam in order to protect it from floods. Among the principal buildings are a Franciscan convent, with a rich library and an interesting collection of antiquities and ecclesiastical objects; a Piarist and a Minorite convent; a handsome new town-hall; and a natural history and historical museum to which is attached a public library. Szeged is the chief seat of the manufacture of paprica, a kind of

red pepper largely used in Hungary, and of a pastry called tarhonya; and has factories of soap, leather, boots, saw-mills and distilleries. Szeged is the centre of the commerce and in- dustry of the great Hungarian Alfold, being an important railway junction and the principal port on the Theiss.

Since the 15th century Szeged has been one of the most prominent cities in Hungary. From 1541 till 1686 it was in possession of the Turks, who fortified it. It is also notorious for its many witchcraft trials. In 1848 it sent strong detach- ments to the national Hungarian army. In July 1849 the seat of the government was transferred hither for a short time.

SZEKESFEHERVAR (Ger., Stuhlweissenburg, Lat., Alba Regalis or Alba Regia), a town of Hungary, capital of the county of Fejer, 41 m. S.W. of Budapest by rail. Pop. (1000), 30,451. It is situated in a marshy plain and is a well-built and prosperous town. Szekesfehervar is the seat of a Roman Catholic bishopric, one of the oldest in the country, and was formerly a town of great importance, being the

coronation and burial place of the Hungarian kings from the 10th to the 16th century. Amongst its principal buildings are the cathedral, the episcopal palace, several convents, of which the most noteworthy is the Jesuit convent, now a Cistercian secondary school with a handsome church, and the county hall. The town carries on a brisk trade in wine, fruit and horses, and is one of the principal centres of horse-breeding in Hungary. Sz6kesfehervar is one of the oldest towns of Hungary, in which St Stephen, the first king of Hungary, built a church, which served as the coronation church for the Hungarian kings. In the same church some fifteen kings were buried. In 1 543 it fell into the hands of the Turks, under whom it remained until 1686. Before evacuat- ing it, the Turks plundered the tombs of the kings, destroyed the old church and several other buildings, and burnt the archives. Several sarcophagi of the kings, and the foundations of the old church, have been found by excavation beneath the cathedral.

SZEKLERS, or Szekels (Szekely, Lat. Sicidi), a Finno-Ugrian people of Transylvania, akin to the Magyars. They form a compact mass of rather more than 450,000, extending from near Kronstadt on the south to Maros-Vasarhely and Gyergo St Miklos on the north. Their origin is unknown and has been the subject of much learned debate. Their own ancient tradi- tion affirms their descent from Attila's Huns. According to Procopius (De bello gothico, iv. 18) 3000 Huns entered Transyl- vania (Erdeleu, i.e. the Magyar ErdSly) after their defeat " calling themselves, not Hungarians, but Zekul," and the Szeklers were the descendants of the Huns who stayed in Transylvania till the return of their kinsmen under Arpad; the anonymous scribe of King Bela speaks of them as " formerly Attila's folk." Von Rethy (Ung. Rev. vii. 812) suggests that they were originally a band of Black Ugrians who sought refuge in Transylvania after their defeat by the Pechenegs. Timon, however (Magyar Alkotmdny is JogtbrUnet, p. 75), points out that their language proves that their separation from the main Magyar stock must

have taken place after the Magyar tongue had been fully deve- loped (see also Hunfalvy, Magyarorszdg Elhnographidja, 200). According to another theory they were Magyars transplanted by St Ladislaus to Transylvania in order to form a permanent frontier guard. Some such origin would, indeed, seem to be implied by the name Szekel, if this be derived, as Czetneki surmises (" Die Szeklerfrage," Ung. Rev. i. 411-428), from szek, seat, i.e. an administrative district (cf. the Stuhl of the Transylvanian Saxons); Szekely would thus mean simply " frontier-guards."

SZIGLIGETI, EDE (1814-1878), Hungarian dramatist, whose original name was Jozsef Szathmary, was born at Nagyvarad- Olaszi, on the 8th of March 1814. His parents would have made him a priest; he wanted to be a great doctor; finally he entered the office of an engineer. But his heart was already devoted to the drama and, on the 15th of August 1834, despite the prohibition of his tyrannical father, he actually appeared upon the stage at Budapest. His father thereupon forbade

him to bear his name in future, and the younger Szathmary henceforth adopted instead the name of Ede Szigligeti, the hero of one of Sandor Kisfaludy's romances. He supported himself for the next few years precariously enough, earning as he did little more than twelve florins a month, but at the same time he sedulously devoted himself to the theatre and sketched several plays, which differed so completely from the "original" plays then in vogue (The Played-out Trick actually appeared upon the boards) that they attracted the attention of such connoisseurs as Vorosmarty and Bajza,- who warmly encouraged the young writer. In 1840 the newly founded Hungarian Academy crowned his five-act drama Rosa, the title-r61e of which was brilliantly acted by Rosa Laborfalvy, the great actress, who subsequently married Maurus Jokai. Szigligeti was now a celebrity. In 1840 he was elected a member of the Academy and in 1845 a member of the Kisfaludy Society. He was now the leading Hungarian dramatist. Three of his plays were crowned by the National

Theatre and sixteen by the Academy. His verdict on all dramatic subjects was for years regarded as final, and he was the mentor of all the rising young dramatists of the 'sixties. During the half-century of his dramatic career Szigligeti wrote no fewer than a hundred original pieces, all of them remarkable for the inexhaustible ingenuity of their plots, their up-to-date technique and the consummate skill with which the author used striking and unexpected effects to produce his denouement. He wrote, perhaps, no work of genius, but he amused and enthralled the Magyar playgoing public for a generation and a half. Szigligeti's most successful tragedies were Gritti (1844), Paul Beldi (1856), Light's Shadows (1865), Struensee (1871), Valeria&nd The Pretender (1868). His tragedies, as a rule, lack pathos and sublimity. Much more remarkable are his comedies. He is a perfect master of the art of weaving complications, and he prefers to select his subjects from the daily life of the upper and upper-middle classes. The best of these comedies are The Three Commands of Matrimony (1850), Tuneful Stevey (1855), Mamma (1857), The Reign of Woman (1862), and especially the farce Young Lilly (1849). He also translated Goethe's Egmont and Shakespeare's Richard III., and wrote a dramaturgical work entitled The Drama and its Varieties. A few of his plays have appeared in German.

See P. Rakodczay, Edward Szigligeti's Life and Works (Hung.; Pressburg, 1901); Pal Gyulai, Memorial Speeches (Hung.; Buda- pest, 1879 and 1890). (R. N. B.)

SZOMBATHELY (Ger., Steinamanger) , the capital of the Hungarian county of Vas, 162 m. W. of Budapest by rail. Pop. (1900), 23,309. It is the seat of a Roman Catholic bishop, and possesses a beautiful cathedral (1797–1821) with two towers, 180 ft. high. Other buildings are the episcopal palace, to which is attached a museum of Roman antiquities, the county hall, the convent of the Dominicans and the seminary for Roman Catholic priests. Szombathely is an important railway and industrial centre, and has a state railway workshop, manu- factories for

agricultural machinery, foundries and steam mills.

About 5 m. south of Szombathely lies the small village of Jaik, with a Dominican convent from the nth century, which has a remarkably beautiful church, one of the best specimens of Romanesque architecture in the country. About 16 m. by rail south of the town is Kormend (pop. 6171), with a beautiful castle belonging to Count Bathyanyi. About 16 m. by rail, west of Kormend is the small town of Szent Gotthard (pop., 2055, mostly Germans), with a Cistercian abbey, founded by King Bela III. in 1183, where General Montecucculi gained a decisive victory over the Turks in 1664.

Szombathely occupies the site of the Roman town Sabaria Savaria) , which was the capital of Pannonia. Here in a.d. 193 Septimius Severus was proclaimed emperor by his legions. Many remains from the Roman period have been excavated, such as traces of an amphitheatre, a triumphal arch, the old fortifications, anaqueduct, &c. The remains are preserved partly in the museum at Budapest, and partly in the municipal museum. The bishopric was created in 1777.

T— TAAFFE

%2\

Tthe last letter in the Semitic alphabet, where, however, its form in the earliest inscriptions is that of a St Andrew’s Cross X. In both Greek and Latin, however, although the upright and cross stroke are frequently not exactly at right angles and the upright often projects beyond the cross stroke, the forms approach more nearly to the modern than to the Semitic shape. The name Taw was taken over in the Greek tom. The sound was that of the unvoiced dental stop. The English /, however, is not dental but alveolar, being pronounced, as d also, not by putting the tongue against the teeth but against their sockets. This difference is marked in the phonetic differentiation of the dental and the alveolar t by writing them respectively t and /. The

alveolar sound is frequent also in the languages of India, which possess both this and the dental sound. The Indian /, however, is probably produced still farther from the teeth than is the English sound. In the middle of words when t precedes a palatal sound like i (y) which is not syllabic, it coalesces with it into the sound of sh as in position, nation, &c. The change to a sibilant in these cases took place in late Latin, but in Middle English the i following the t was still pronounced as a separate syllable. A later change is that which is seen in the pronunciation of nature as neitf. This arises from the pronunciation of u as yu, and does not affect the English dialects which have not thus modified the u sound. Similar changes had taken place in some of the local dialects of Italy before the Christian era. At the end of words the English t is really aspirated, a breath being audible after the t in words like bit, hit, pit. This is the sound that in ancient Greek was represented by 6. In medieval and modern Greek, however, this has become the unvoiced sound represented in English by th in thin, thick, pith. Though represented in English by two symbols this is a single sound, which may be either interdental or, as frequently in English, produced " by keeping the tongue loosely behind the upper front teeth, so that the breath escapes partly between the tongue and the teeth, and partly, if the teeth are not very closely set, through the interstices between them " (Jespersen). In English th repre- sents both the unvoiced sound \ as in thin, &c, and the voiced sound 5, which is found initially only in pronominal words like this, that, there, then, those, is commonest medially as in father, bother, smother, either, and is found also finally in words like with (the preposition), both. Early English used b and 3 indiscriminately for both voiced and unvoiced sounds, in Middle English 5 disappeared and h was gradually assimilated in form to y, which is often found for it in early printing. It is, however, to be regretted that English has not kept the old symbols for sounds which are very characteristic of the language. In modern Greek the ancient S (d) has become the voiced spirant (8),

though it is still written S. Hence to represent D, Greek has now to resort to the clumsy device of writing NT instead.

(P. Gi.) TAAFFE, EDUARD FRANZ JOSEPH VON, Count [nth Viscount Taaffe and Baron of Ballymote, in the peerage of Ireland] (1833-1895), Austrian statesman, was born at Vienna on 24th February 1833. He was the second son of Count Ludwig Patrick Taaffe (1791-1855), a distinguished public man who was minister of justice in 1848 and president of the court of appeal. As a child Taaffe was one of the chosen companions of the young archduke, afterwards emperor, Francis Joseph. In 1852 he entered the public service; in 1867 he was Statthalter of Upper Austria, and the emperor offered him the post of minister of the interior in Beust's administration. In June he became vice-president of the ministry, and at the end of the year he entered the first ministry of the newly organized Austrian portion of the monarchy. For the next three years he took a very important part in the confused political changes, and probably more than any other politician represented the wishes of the emperor. He had entered the ministry as a

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German Liberal, but he soon took an intermediate position between the Liberal majority of the Berger ministry and the party which desired a federalistic amendment of the constitu- tion and which was strongly supported at court. From September 1868 to January 1870, after the retirement of Auer- sperg, he was president of the cabinet. In 1870 the government broke up on the question of the revision of the constitution: Taaffe with Potocki and Berger wished to make some concessions to the Federalists; the Liberal majority wished to preserve undiminished the authority of the Reichsrath. The two parties presented memoranda to the emperor, each defending their view, and offering their resignation: after some hesitation the emperor accepted the policy of the majority, and Taaffe with his friends resigned. The Liberals, however, failed to carry on the

government, as the representatives of most of the territories refused to appear in the Reichsrath: they resigned, and in the month of April Potocki and Taaffe returned to office. The latter failed, however, in the attempt to come to some understanding with the Czechs, and in their turn had to make way for the Clerical and Federalist cabinet of Hohenwart. Taaffe now became Statthalter of Tirol, but once more on the break- down of the Liberal government in 1879 he was called to office. At first he attempted to carry on the government without change of principles, but he soon found it necessary to come to an understanding with the Feudal and Federal parties, and he was responsible for the conduct of the negotiations which in the elections of this year gave a majority to the different groups of the National and Clerical opposition. In July he became minister president: at first he still continued to govern with the Liberals, but this was soon made impossible, and he was obliged to turn for support to the Conservatives. It was his great achievement that he persuaded the Czechs to abandon the policy of abstention and to take part in the parliament. It was on the support of them, the Poles, and the Clericals that his majority depended. His avowed intention was to unite the nationalities of Austria: Germans and Slavs were, as he said, equally integral parts of Austria; neither must be oppressed; both must unite to form an Austrian parliament. Notwithstanding the growing opposition of the German Liberals, who refused to accept the equality of the nationalities, he kept his position for thirteen years. Not a great creative statesman, he had singular capacity for managing men; a very poor orator, he had in private intercourse an urbanity and quickness of humour which showed his Irish ancestry. For the history of his administration see Austria-Hungary, History (Sec. II. "Austria Proper"). Beneath an apparent cynicism and frivolity Taaffe hid a strong feeling of patriotism to his country and loyalty to the emperor. It was no small service to both that for so long, during very critical years in European history, he maintained harmony between the two parts

of the monarchy and preserved constitutional government in Austria. The necessities of the parliamentary situation compelled him sometimes to go farther in meeting the demands of the Conservatives and Czechs than he would probably have wished, but he was essentially an opportunist:, in no way a party man, he recognized that the government must be carried on, and he cared little by the aid of what party the necessary majority was maintained. In 1893 he was defeated on a proposal for the revision of the franchise, and resigned. He retired into private life, and died two years later at his country residence, Ellerschau, in Bohemia, on 29th November 1895.

By the death of his elder brother Charles (1823-1873), a colonel in the Austrian army, Taaffe succeeded to the Austrian and Irish titles. He married in 1862 Countess Irma Tsaky, by whom he left four daughters and one son, Henry. The family history presents points of unusual interest. From the 13th century the Taaffes had been one of the leading families in the north of Ireland. In 1628 Sir John Taaffe was raised to the peerage as Baron Bally- mote and Viscount Taaffe of Corven. He 'eft fifteen children, of

whom the eldest, Theobald, took a prominent part in the Civil War, accompanied Charles II. in exile, and on the Restoration was created earl of Carlingford. He was sent on missions to the duke of Lorraine and to the emperor, by which was established the connexion of his family with the house of Habsburg and Lorraine, which has continued to this day. His eldest son was killed in' the Turkish wars. He was succeeded in the title by his second son Nicholas, who had served in the Spanish wars and was killed at the Boyne. The next brother, Francis, the third earl, was one of the most celebrated men of his

time: he was brought up at Olmtitz, at the imperial court, and in the service of Duke Charles of Lorraine, whose most intimate friend he became. He rose to the highest rank in the Austrian army, having greatly distinguished himself at the siege of Vienna and in the other Turkish campaigns, and was a member of the Order of the Golden Fleece. He was sent on many important diplomatic missions, and at the end of his life was chancellor and chief minister to the duke of Lorraine. Notwithstanding the Jacobite connexions of his family, his title to the earldom of Carlingford was confirmed by William III., and the attainder and forfeiture of the estates incurred by his brother was repealed. This favour he owed to his position at the court of the emperor, William's most important ally. On his death the title and estates went to his nephew Theobald, whose father had fallen during the siege of Derry, and who himself had served with distinction in the Austrian army, On his death the title of earl of Carlingford became extinct; both the Austrian and Irish estates as well as the Irish viscountcy went to a cousin Nicholas (1677–1769). Like so many of his family, he was brought up in Lorraine and passed into the Austrian army; he fought in the Silesian war, rose to be field-marshal, and was made a count of the Empire. His Irish estates were, however, claimed under the Act of 1703 by a Protestant heir; a lawsuit followed, which was ended by a compromise embodied in a private act of parlia- ment, by which the estates were sold and one-third of the value given to him. With the money he acquired the castle of Eller- schau, in Bohemia; he had also inherited other property in the Austrian dominions. He was naturalized in Bohemia, and left on record that the reason for this step was that he did not wish his descendants to be exposed to the temptation of becoming Pro- testants so as to avoid the operation of the penal laws. His great- grandson was the father of the subject of this article. A Com- mittee of Privileges of the House of Lords in i860 recognized the right of the family to hold the Irish title.

See Wurzbach, Biograph.isch.es Lexicon Oesterreichs. Memoirs of the Family of Taaffe (Vienna, 1856), privately printed; article in the Contemporary Review (1893), by E. B. Lanin. The Prague Politik published in December 1904 contains some interesting corre- spondence collected from Taaffe's papers. (J. W. He.)

TAAL, a town of the province of Batangas, Luzon, Philippine Islands, on the Pansipit river, opposite Lemery, with which it is connected by a bridge, and about 50 m. S. of Manila. Pop. of the municipality (1903) 17,525. Taal is built, chiefly of stone, on the summit and terraced slopes of a hill overlooking the Gulf of Balayan into which the Pansipit river flows. It has a cool and healthy climate, is an important military station, and a port for coastwise vessels. Extensive agricultural lands in the vicinity produce rice, Indian corn, sugar-cane, pepper, cacao, and cotton, but the great coffee plantations which were formerly to be seen in its vicinity have been destroyed by insects. The inhabitants are also engaged in raising horses and cattle, in fishing, and in carrying on a considerable trade in cotton goods, sugar, coffee, &c. Taal is the only town in the Philippines where effective efforts have been made to exclude the Chinese. The hostility of the inhabitants toward them was such that none succeeded in establishing a residence here until the latter days of the revolution against the American govern- ment. The town was founded in 1754 after the destruction by Taal volcano of an old town of the same name on Lake Taal. The language is Tagalog.

TABACO, a town and port of entry of the province of Albay, Luzon, Philippine Islands, on Tabaco bay, about 20 m. N. of the town of Albay. Pop. (1903) 21,946. The men of Tabaco are largely engaged in the cultivation of hemp; the women in weaving cloth, baskets and mats. The town has a deep and well-protected harbour,' and its shipping is extensive. The language is Bicol.

TABARD, a short coat, either sleeveless, or with

short sleeves or shoulder pieces, emblazoned on the front and back with the arms of the sovereign, and worn, as their distinctive gar- ment, by heralds and pursuivants. A similar garment with short sleeves or without sleeves was worn in the middle ages

by knights over their armour, and was also emblazoned with their arms or worn plain. The name was also given in earlier days to a much humbler similar garment of rough frieze worn by peasants; the ploughman wears a " tabard " in the Prologue to the Canterbury Tales. Similarly at Queen's College, Oxford, the scholars on the foundation were called " tabarders," from the tabard, obviously not an emblazoned garment, which they wore. The word itself appears in Fr. tabard or labart, &c, Ital. tabarro, Ger. taphart, Med. Lat. labbardus, tabardium, &c. It is of doubtful origin, but has usually been connected with "tippet," "tapestry," from Lat. tapete, hangings, painted cloths; Gr. ra7n7s, carpet.

TABARl [Abu Ja'far Mahommed ibn Jarir ut-Tabari] (838- 923), Arabian historian and theologian, was born at Amol in Tabaristan (south of the Caspian), and studied at Rei (Rai), Bagdad, and in Syria and Egypt. Cast upon his own resources after his father's death, he was reduced to great poverty until he was appointed tutor to the son of the vizier 'Ubaidallah ibn Yahya. He afterwards journeyed to Egypt, but soon returned to Bagdad, where he remained as a teacher of tradition and law until his death. His life was simple and dignified, and characterized by extreme diligence. He is said to have often refused valuable gifts. A Shafi'ite in law, he claimed the right to criticize all schools, and ended by establishing a school of his own, in which, however, he incurred the violent wrath of the Hanbalites.

His works are not numerous, but two of them are very exten- sive. The one is the Tarlkh ur-Rusul wal-Muluk (History of the Prophets and Kings), generally known as the Annals (cf. Arabia, Literature. " History "). This is a history from the Creation to

A.D. 915, and is renowned for its detail and accuracy. It has been published under the editorship of M. J. de Goeje in three series, comprising thirteen volumes, with two extra volumes containing indices, introduction and glossary (Leiden, 1879–1901). A Persian digest of this work, made in 963 by the Samanid vizier al-Bal'ami, has been translated into French by H. Zotenberg (vols, i.–iv., Paris, 1867–1874). A Turkish translation of this was published at Con- stantinople (1844). His second great work was the commentary on the Koran, which was marked by the same fullness of detail as the Annals. The size of the work and the independence of judg- ment in it seem to have prevented it from having a large circula- tion, but scholars such as Baghawi and Suyutl used it largely. It has been published in thirty vols, (with extra index volume) at Cairo, 1902–1903. An account of it, with brief extracts, has been given by O. Loth in the Zeitschrift der Deutschen Morgenldndischen Gesellschaft, vol. xxxv. (1881), pp. 588–628. Persian and Turkish translations of the commentary exist in manuscript. A third great work was projected by Tabarl. This was to be on the traditions of the Companions, &c, of Mahomet. It was not, however, completed. Other smaller works are mentioned in the Fihrist, pp. 234–235.

(G. W. T.)

TABARIN (Fr. tabard, Ital. tabarrino, a small cloak), the name assumed by Jean Salomon (c. 1 584–1633), a Parisian street charlatan, who amused his audiences in the Place Dauphine by farcical dialogue with his partner Mondor (Phillippe Girard), with whom he reaped a golden harvest by the sale of quack medicines. A contemporary portrait shows him in the dress of a clown, but with a moustache and pointed beard, carrying a wooden sword and wearing a soft grey felt hat capable of assuming countless amusing shapes in his deft fingers. His regular evening antics were varied by more elaborate weekly performances in which others appeared, notably his wife. In these he took the part of a fat old fool, but his jokes, while usually coarse, were frequently

clever, and his extemporized speeches were full of originality. He is said to have influ- enced both Moliere and La Fontaine. The latter praises him, and he is also well spoken of by Boileau and Voltaire. He retired about 1628, and died on the 16th of August 1633. Numerous farces and dialogues, partly or wholly his, or in his rSpertoire, were credited to him, and long series of cheap leaflets purporting to be his complete works began to appear as early as 1622. Two rival editions, in two volumes and one volume respectively, were published as late as 1858. The word Tabarin, spelt with a capital, has been adopted into the French language to designate the comic performer of a street booth.

TABASCO, a state of Mexico, bounded N. by the Gulf of Mexico, E. by the state of Campeche and Guatemala, S. by Guatemala and Chiapas, and W. by Vera Cruz. Area 10,072 sq. m. Pop. (igoo) 159,834. The surface is generally low and flat, largely covered with lagoons, watercourses and swamps. In the S. and S.E. there is an area belonging to the rough higher formation of Chiapas. Dense forests cover the whole region, and there are valuable fine woods and dye-woods. There are several large lagoons on the coast, two of which are called Sant' Ana and Tupilco bays. Two large rivers, the Grijalva and Usumacinta, traverse its territory. The Grijalva, also called Tabasco, the upper course of which is known as the Chiapas, has its most distant sources in western Guatemala and flows N.W. across Chiapas to the frontier of Oaxaca, thence N. to the frontier of Tabasco, and thence N.E. to the coast; it is navigable for 93 m. The Usumacinta likewise has its sources in western Guatemala. It forms the boundary between Guatemala and Chiapas until the frontier of Tabasco is reached, where its N.W. course turns to the N. and then N.W. to a junction with the Grijalva — the two rivers having a common outlet. The Usumacinta, including its head streams, is about 500 m. long; excluding them about 330 m. long; for about

270 m. it is navigable, for about 180 m. for large steamers. There are no railways and no good roads, and these rivers and the navigable channels of the Cuxcuchopa, Soledad, Cocohital, Tular, and Tortuguero, are the principal practical thoroughfares in the state. The capital is San Juan Bautista (pop., 1900, 10,548), formerly called Villa Hermosa, on the Grijalva river, about 70 m. above its mouth. The next most important town is Frontera (pop., 1895, 6794), a port 3 m. within the mouth of the Grijalva.

TABERNACLE (Lat. tabernaculum, a hut, tent), specifically the name given in the English Bible to the portable sanctuary which, according to the priestly sources of the Pentateuch, was erected by Moses in the wilderness as the place of worship of the Hebrew tribes (Exodus xxv. ff.).

(1) The Tabernacle and its Furniture. — The Tabernacle proper is represented as standing within a rectangular area, measuring 100 cubits by 50, approximately 150 feet by 75, which formed the centre of the camp in the wilderness. This area, termed the " court of the tabernacle," was fenced off from the rest of the encampment by a series of curtains suspended from 100 pillars standing at intervals of 5 cubits, and lay east and west with its entrance on the eastern side. Of the two squares, each measuring 50 cubits by 50, into which the court may be divided, the more easterly was that in which the worshippers assembled. In the centre of this square stood the altar of burnt-offering, a hollow chest of acacia wood overlaid with bronze. The tabernacle itself also stood east and west, with its entrance towards the east, on the edge of the second square. The essential part of the structure, to which everything else was subsidiary, was that termed in the original the mishkan, i.e. dwelling (Eng. Vers, tabernacle, but see Exod. xxv. 9, Rev. Vers, margin). It was formed of ten curtains, in two sets of five, of the finest linen with inwoven coloured figures of cherubim, the whole making an artistic covering measuring 40 cubits by 28. Instead of being suspended on poles after the manner of an

ordinary tent, the curtains of the dwelling were spread over a series of open frames of acacia wood overlaid with gold, each 10 cubits in height by ij in breadth. 1 These frames, 48 in all, were so arranged as to form the southern, western and northern sides of a rectangular structure, 30 cubits in length and 10 cubits in breadth and height. Over the frames, as has been said, were thrown the two sets of tapestry curtains above described, while the eastern end, forming the entrance, was closed by a special portiere suspended from five pillars. The dwelling was divided into two parts by a second hanging, the " veil," 10 cubits from the western end. These two parts were termed respectively

1 For the philological and other arguments in favour of open frames in place of the traditional solid beams — the " boards " of the English version — as supports of the curtains, see the writer's article " Tabernacle " in Hastings's Diet, of the Bible, iv. 659 f., with illustrative diagrams.

the holy place, and the most holy place or "holy of holies." Within the latter stood, in solitary majesty, the ark of God, in which were deposited the two stone tables of the decalogue or " testimony." On the ark lay a solid slab of the finest gold, the propitiatory or mercy-seat, from which rose the figures of two golden cherubim. The propitiatory with its over-arching cherubim formed the innermost shrine of the wilderness sanctuary, the earthly throne of the God of heaven.

The furniture of the holy place consisted of the table of shew- bread, the altar of incense — both, like the ark, of acacia wood overlaid with gold — and the golden " candlestick," the latter in reality a seven-branched lamp-stand. As a protection the delicate and artistic curtains of the dwelling were covered by two similar sets of goats'-hair curtains, which together measured 44 cubits by 30; these, in their turn, were protected by a double covering, the one of rams' skins dyed red, the other made of the skins of a Red Sea mammal, probably the dugong (Exod. xxvi. 14).

(2) The Religious Significance of the Tabernacle. — The aim of the priestly school, to whom we owe the conception of the tabernacle as above described, was to provide a sanctuary and a ritual worthy of the higher conceptions of the Deity, which had grown up as the fruit of the discipline of the exile. The ideal relation of Jehovah (Yahweh) to the theocratic com- munity of Israel had already been described by Ezekiel in the words " my dwelling shall be with them, and I will be their God, and they shall be my people " (xxxvii. 27). That this was the religious ideal in the mind of the author of Exodus xxv. ff. is evident from the characteristic name which he gives to the • essential part of the tabernacle, the dwelling (see above, and cf. Exod. xxv. 8). All the arrangements of the camp and of the tabernacle are intended to secure the presence of a holy God in the midst of a holy people. The thought of the almost un- approachable holiness of the Deity underlies not only the grada- tion of the parts of the tabernacle — court, holy place and holy of holies being each marked by an ascending degree of sanctity — but also the careful gradation of the materials employed in its construction. In the proportion and symmetry, which are strongly marked features of the tabernacle, we may further trace the earnest endeavour to reflect the harmony and perfec- tion of the Deity whose glory filled the dwelling (Exod. xl. 34).

(3) As regards the historicity of this elaborate sanctuary modern historical criticism has pronounced a negative judgment. This verdict is based not so much on the many difficulties pre- sented by the narrative itself, or suggested by the unexpected wealth of material and artistic skill, as on the impossibility of reconciling the picture of the tabernacle and its worship, which is found in the middle books of the Pentateuch, with the religious history of Israel as reflected in the older historical books. There is absolutely no place for the tabernacle of the Priests' Code in the history of the worship of the Hebrews before the exile. It cannot be reconciled with the account of the

historical ” tent of meeting ” (Auth. Vers, tabernacle of the congregation) of the oldest Pentateuch sources in any particular except the common designation, and in the later history of the ark, whether at Shiloh or at Jerusalem, the older records of Samuel and Kings are silent as to the tabernacle.

The sections of the Pentateuch devoted to the tabernacle and its worship, therefore, are not to be treated as history but as the expression of a religious ideal. Building on the traditions of the simple Mosaic ” tent of meeting ” (Exodus xxxiii. 7 ff. and elsewhere), and believing that the temple of Solomon was its replica on a larger scale and in more solid materials, the priestly idealists followed the example of Ezekiel, and elaborated an ideal sanctuary to serve as the model for the worship of the theocratic community of the future. ” Let them make me a sanctuary, that I may dwell among them ” (Exod. xxv. 8).

See ” Tabernacle ” in Hastings’s Dictionary of the Bible, vol. iv., with which may be compared the corresponding articles in Cheyne and Black’s Encycl. Biblica by Benzinger, and in the Jewish Encyclopedia by Konig. The views of the first-named article, summarised above, as to the framework of the Tabernacle, have been adopted and reinforced by A. H. M’Neile in his Commentary on The Book of Exodus (1908), pp. lxxiii. ff. (A. R. S. K.)

TABERNACLE, as a general term in architecture, a species of niche or recess in which an image may be placed. In Norman work there are but few remains, and these generally over door- ways. They are shallow and comparatively plain, and the figures are often only in low relief, and not detached statues. In Early English work they are deeper, and instead of simple arches there is often a canopy over the figure, which was placed on a small, low pedestal.

Later in the style the heads of the tabernacles became cusped, either as trefoils or cinquefoils, and they are often placed in pairs side by side, or in ranges, as at Wells cathedral. Decorated tabernacles are still deeper and more ornamented, the heads are sometimes richly cusped and surmounted with crocketed gables, as at York, or with projecting canopies, very much like the arcade at Lichfield. In this case the under side of the canopy is carved to imitate groined ribs, and the figures stand either on high pedestals, or on corbels. Perpendicular tabernacles possess much the same features, but the work is generally more elaborate (see Corbel, Canopy, Niche, &c). The word tabernacle is also often used for the receptacle for relics, which was often made in the form of a small house or church (see Shrine). The term " tabernacle work " is given, in architecture, to the richly sculptured tracery, similar to that employed on the upper part of a tabernacle, decorated with canopied niches which contain statues. The Eleanor crosses in England are enriched with tabernacle work over the niches, as also the chapels of Bishops Nicholas West (1461-1533), and John Alcock (1430-1500) in Ely cathedral, both dating from the beginning of the 16th century.

TABERNACLES, FEAST OF, the autumn festival of the Israelites, beginning on the 15th of Tishri and celebrated by residing for the seven succeeding days in rustic booths (Heb. Sukkoth, in the Vulgate Tabernacula, whence the English name of the feast). Among the Hebrews it was the third and chief of the three annual pilgrimage festivals connected respectively with the harvesting of thebarley (Passover), of wheat (Pentecost), and of the vine (Tabernacles). Hence it is referred to as " the Feast " par excellence (Heb. Hehag, cf. Arab. Hajj) even as late as 2 Chron. vii. 9. Being of the nature of a pilgrimage feast the booths were temporary erections for the accommodation of the pilgrims. But in early Jewish tradition, in both Yahvist and Elohist sources of the Pentateuch (Exod. xxxiv. 22, xxiii. 16) it is called simply the Harvest Feast

(A.V. ” Feast of Ingather- ing “) and is to be observed ” at the end of the year,” i.e. of the agricultural year. In Deut. xvi. 13 seq., it is termed the Feast of Tabernacles and is to be kept seven days after the produce of the threshing-floor and winepress has been gathered in. In the Holiness Code (Lev. xxiii. 39) it is to be kept for seven days after the first, the first of which is to be ” a sabbath,” and the eighth ” a sabbath ” (possibly originally a lunar quarter- day): branches of four trees are to be taken. In the Priestly Code (Lev. xxiii. 33 seq.; Num. xxix. 12-38) the first and eighth day are to be days of holy assembly, and in the latter passage elaborate details are given of the sacrifices to be presented, including a series of bullocks, thirteen on the first day, twelve on the next, and so on down to seven on the seventh day. Only one is to be sacrificed on the concluding feast (Heb. \^erelh) of the eighth day.

The higher criticism sees, in these successive enactments of the various codes included in the Pentateuch (q.v.), a develop- ment in the character of the festival. At first held at any of the local shrines, such as Gilgal, Bethel, Shiloh, as well as Jerusalem, it was held at an indefinite date during the harvest in the fall of the year. Then with the concentration of the cultus at Jerusalem represented by Deuteronomy, the celebra- tion was restricted to the Judean capital, and its duration fixed at seven days, though its date was still left indeterminate. This was fixed in the Priestly Code at the 1 5th of the seventh month, and an eighth day of solemn assembly added after the return from the exile.

Against this hypothetical reconstruction is the fact that Solomon appears to have selected the occasion of the feast for the dedication of the temple, and that it lasted, even in his

time, seven days (1 Kings viii. 2, 65). Jeroboam arranged for a similar feast in the northern kingdom on the 15th day of the eighth month, ” like unto the feast in Judah” (ibid. xii. 32). The determination of a fixed date must therefore have been much

earlier than Deuteronomy or the alleged period of the Priestly Code. A pilgrimage feast must be fixed in date to ensure the simultaneous presence of the pilgrims. There are, besides, seeming references to the feast in the early prophets, as Hosea xii. 9, Amos v. 21, as well as in Isaiah ix. 2 (Heb.). The concluding feast does not seem to refer to tabernacles per se, but to be distinct from it, as is shown by the break in the descending series of the sacrifices of bullocks as given in Numbers. In Jewish practice the concluding feast is not held in booths, and Maimonides (Moreh, iii. 42) suggests that its object was to give opportunity for final proceedings in assembly halls.

The existence, therefore, of much variation in the practice of the festival in historic times is scarcely proved by the seeming variations of the enactments concerning it in the Pentateuch. It is possible, however, that there may have been differences of custom in the carrying out of the feast. In Neh. xiii. 15 the trees whose branches were used for making the booths appear to differ from those mentioned in Lev. xxiii. 40, though in Jewish tradition the latter passage was taken to refer to the Lulab, or a combination of twigs of willow and myrtle, with a palm branch, which, together with a citron, are held in the hand during processions in the synagogue. The Sadducees and Karaites did not carry these in their hand, but used them as decorations of the booths. In the second temple there was a water libation every morning of the festival, and on the evening of the first day the great golden candelabrum was lit up and the men danced a torch dance around it (Mishnah, Sukkah, v. 2-4). It is reported by Josephus that, when Alexander Jannaeus, in the year 95 B.C., was acting as high-priest in the temple on the Feast of Tabernacles, instead of pouring the water libation on the altar, according to the Pharisaic custom, he poured it at his feet, giving rise to a riot in which 6000 men are said to have lost their lives (Ant. xii., xiii., 5; Talmud, Sukkah, 48 b).

The festival is certainly an agricultural one, and

is so termed in the Pentateuch. Whether it was derived from the Canaanites, who had similar festivals (Judges xxix. 27), is uncertain. All nations have similar harvest homes, especially with reference to the vintage feasts; as, for instance, the Athenian Oschophoria. The Syrians celebrated every three years a " Booth Festival." At the Hindu Festival of Dasara, which lasted nine days from the new moon of October, tents made of canvas or booths made of branches were erected in front of the temples. The Spartans had a nine days' festival termed Carnea, during which they dwelt in pavilions and tents in memory of their old camp life (Athenaeus, iv. 19). The Feast of Tabernacles is one of the few Jewish festivals described in classical writers. Plutarch (Symposium iv., vi. 2) compares Tabernacles with the Bacchic rites. It was pre-eminently the period of exultation in ancient Jewish rite, and the Mishnah declares that " He who has not seen the jcy of the libations of Tabernacles has never in his life witnessed joy." So much importance was attributed to this festival that it was chosen as the occasion on which the Law should be recited during the sabbatical year (Deut. xxxi. 9-12), and the Messianic vision of Zecbariah xiv. 16 sees the remnant of all the nations coming up to Jerusalem to worship the Lord of Hosts, and to keep the Feast of Tabernacles.

In later Jewish custom the one-year cycle of reading of sections from the Pentateuch ends on the concluding day of Tabernacles, which is therefore known as the Rejoicing of the Law (Simhat Torah). The custom of dwelling, for part of the day at least, in booths, is still kept up by orthodox Jews, who have temporary huts covered with branches erected in their courtyards, and those who are not in possession of a house with a backyard often go to pathetic extremes in order to fulfil the law by making holes in roofs, across which branches are placed. (J. J a.)

TABLE— TABLE, MATHEMATICAL

TABLE (Lat. tabula), a flat, oblong slab supported upon legs or pillars; originally anything flat. 1 As one of the few indis- pensable pieces of domestic furniture, the table is of great an- tiquity. It was known, in a small and rudimentary form, to the Egyptians, who used wood for its construction; the Assyrians certainly employed metal and possibly other materials in its manufacture. Grecian tables were also often of metal, with three or four legs and of considerable variety of form; they were small and low. By Roman times the table had apparently become somewhat more common. The favourite form was the tripod, but one and four legs were also used. Already the shape varied considerably, and in addition to wood, there were tables of marble, ivory, bronze and the precious metals. The more costly examples were carved, inlaid or otherwise ornamented; cedar and the finely marked or grained woods generally were much sought after. As in Greece the tables were low; they were intended for reclining, rather than sitting; their legs were those of wild beasts, or were formed of sphinxes, termini and other figures. Some of those which remain are of extreme grace and most delicate workmanship; to them the Empire style is enormously indebted. In antiquity tables of any kind can only have been the appanage of the rich. In the early middle ages, although there was variety of form — the circular, semi- circular, oval and oblong were all in use — tables appear, save in rare instances, to have been portable and supported upon trestles fixed or folding, which were cleared out of the way at the end of a meal. The custom of serving dinner at several small tables, which is often supposed to be a very modern refinement, was certainly followed in the French chateaux, and probably also in the English castles, as early as the 13th century. For persons of high degree, fixed tables were reserved. Even at a period when domestic furniture was of a very primitive character and few modern conveniences had been evolved, costly tables were by no means unknown — some dim traditions of Rome's refinements must necessarily have filtered through the centuries. Thus Charlemagne possessed three tables

of silver and one of gold — no doubt they were of wood covered with plates of the precious metals. Before the 16th century the number of tables properly so called was small; hence very few of earlier date than the middle of that century have come down to us. In the chapter-house of Salisbury cathedral is a restored 13th-century example which stands practically alone. In point of age it is most nearly approached by the famous pair of trestle tables in the great hall at Penshurst.

When the table became a fixed and permanent piece of furniture the word " board, " which had long connoted it, fell into disuse save in an allusive sense, and its place was taken by such phrases as " joyned table " and " framed table " — that is, jointed or framed together by a joiner; sometimes people spoke of a " standing " or " dormant " table. They were most frequently oblong, some two feet or two feet six inches wide, and the guests sat with their backs to the wall, the other side of the table being left free for service. Sometimes they were used as side-tables, or furnished with a cupboard beneath the board; they were supported on quadrangular legs or massive ends and feet full of Gothic feeling, and were* several inches higher than the dining-table of the 20th century. Heavy stretchers or foot-rails were fixed close to the floor — for the avoidance, no doubt, of draughts. Oak was the usual material, but elm, cherry and other woods were sometimes used. Soon the legs became bulbous, and were gadrooned or otherwise ornamented, and the frame began to be carved. The intro- duction, before the 16th century closed, of the "drawing table" marked the rapidity with which this piece of furniture was developed. This was the forerunner of the " extending dining- table." Of the three leaves of which these tables were com- posed two were below the other; they drew out and were supported by brackets, while the slab proper dropped to the same level. Somewhat later legs became excessively bulbous;

1 For mathematical tables see next article. This use of the word comes from the analogy of the laying out

of objects on an ordinary table.

this ugly form gave place soon after the middle of the 17th century to baluster-shaped legs. Hitherto tables had, generally speaking, been large and massive — little in the nature of what is now called the " occasional table " seems to have been provided until some years after the Restoration. About that time small tables of varying sizes and shapes, but still of substantial weight, began to be made; many of them were flap-tables, which took up little room when they were not in use. These, however, had been known at an earlier date. Charles II. had not long been on the throne when the idea of the flap-table was amplified in a peculiarly graceful fashion. Two flaps were provided instead of one, the result being the rather large oval table of the " gate-leg " variety that has remained in use ever since, in which the open " gate " supports the flap. Towards the end of the reign tables began to have the graceful twisted legs joined to the flat serpentine stretchers, which produced, almost for the first time in English furniture, a sense of lightness and gaiety. The walnut tables of the end of the Stuart period were often inlaid with marquetry of great excellence. The number and variety of the tables in well-to-do households were now increasing rapidly, and the console-table was imported from the Continent contemporaneously with the common use of the mahogany side-table.

As mahogany came into general use, about the beginning of the second quarter of the 18th century, an enormous number of card-tables were made with plain or cabriole legs and spade or claw and ball feet, often with lions' heads carved upon the knees; the top folded up to half its size when open. The Chippendale school introduced small tables with carved open- work " galleries " round the edges (to protect china and other small objects), and clustered legs; Gothic forms and Chinese frets were for a time fashionable. Later in this century, so prolific in new forms of furniture, tables were frequently made of rosewood and satinwood; side-tables, often highly elaborate, adorned with swags

and festoons and other classical motives, supported by termini or richly carved legs, were gilded and topped with marble slabs or inlaid wood. The Pembroke table, of oblong form, with two semi-circular or oblong leaves, with edgings of marquetry, was a characteristic feature of late 18th- century English furniture, and still retains its popularity. Then came the Empire period; the taper was replaced by the round leg, rosewood grew commoner, and brass mountings the rule. For illustrations see Furniture.

TABLE, MATHEMATICAL. In any table the results tabulated are termed the " tabular results " or " respondents, " and the corresponding numbers by which the table is entered are termed the " arguments." A table is said to be of single or double entry according as there are one or two arguments. For example, a table of logarithms is a table of single entry, the numbers being the arguments and the logarithms the tabular results; an ordinary multiplication table is a table of double entry, giving xy as tabular result for x and y as arguments. The intrinsic value of a table may be estimated by the actual amount of time saved by consulting it ; for example, a table of square roots to ten decimals is more valuable than a table of squares, as the extraction of the root would occupy more time than the multiplication of the number by itself. The value of a table does not depend upon the difficulty of calculating it; for, once made, it is made for ever, and as far as the user is concerned the amount of labour devoted to its original con- struction is immaterial. In some tables the labour required in the construction is the same as if all the tabular results had been calculated separately; but in the majority of instances a table can be formed by expeditious methods which are inap- plicable to the calculation of an individual result. This is the case with tables of a continuous quantity, which may frequently be constructed by differences. The most striking instance perhaps is afforded by a factor table or a table of primes; for, if it is required

to determine whether a given number is prime or not, the only universally available method (in the absence of tables) is to divide it by every prime less than its square root or until one is found that divides it without remainder. But

to form a table of prime numbers the process is theoretically simple and rapid, for we have only to range all the numbers in a line and strike out every second number beginning from 2, every third beginning from 3, and so on, those that remain being primes. Even when the tabular results are constructed separately, the method of differences or other methods con- necting together different tabular results may afford valuable verifications. By having recourse to tables not only does the computer save time and labour, but he also obtains the certainty of accuracy.

The invention of logarithms in 1614, followed immediately by the calculation of logarithmic tables, revolutionized all the methods of calculation; and the original work performed by Henry Briggs and Adrian Vlacq in calculating logarithms in the early part of the 17th century has in effect formed a portion of every arithmetical operation that has since been carried out by means of logarithms. And not only has an incredible amount of labour been saved, 1 but a vast number of calculations and researches have been rendered practicable which otherwise would have been beyond human reach. The mathematical process that underlies the tabular method of obtaining a result may be indirect and complicated; for example, the logarithmic method would be quite unsuitable for the multiplication of two numbers if the logarithms had to be calculated specially for the purpose and were not already tabulated for use. The arrange- ment of a table on the page and all typographical details — such as the shape of the figures, their spacing, the thickness and placing of the rules, the colour and

quality of the paper, &c. — are of the highest importance, as the computer has to spend hours with his eyes fixed upon the book; and the efforts of eye and brain required in finding the right numbers amidst a mass of figures on a page and in taking them out accurately, when the computer is tired as well as when he is fresh, are far more trying than the mechanical action of simple reading. Moreover, the trouble required by the computer to learn the use of a table need scarcely be considered; the important matter is the time and labour saved by it after he has learned its use.

In the following descriptions of tables an attempt is made to give an account of all those that a computer of the present day is likely to use in carrying out arithmetical calculations. Tables relating to ordinary arithmetical operations are first described, and afterwards an account is given of the most useful and least technical of the more strictly mathematical tables, such as factorials, gamma functions, integrals, Bessel's func- tions, &c. Nearly all modern tables are stereotyped, and in giving their titles the accompanying date is either that of the original stereotyping or of the tirage in question. In tables that have passed through many editions the date given is that of the edition described. A much fuller account of general tables published previously to 1872, by the present writer, is contained in the British Association Report for 1873, pp. 1-175.

Tables of Divisors {Factor Tables) and Tables of Primes. — The existing factor tables extend to 10,000,000. In 181 1 L. Chernac published at Deventer his Cribrum arithmeticum, which gives all the prime divisors of every number not divisible by 2, 3, or 5 up to 1,020,000. In 1814-1817 J. C. Burckhardt published at Paris his Tables des diviseurs, giving the least divisor of every number not divisible by 2, 3, or 5 up to 3,036,000. The second million was issued in 1814, the third in 1816, and the first in 1817. The corresponding tables for the seventh, eighth, and ninth millions were calculated by Z. Dase and issued at Hamburg in

1862, 1863, and 1865. Dase died suddenly in 1861 during the progress of the work, and it was completed by H. Rosenberg. Dase's calcula- tion was performed at the instigation of Gauss, and he began at 6,000,000 because the Berlin Academy was in possession of a manu- script presented by Crelle extending Burckhardt's tables from 3,000,000 to 6,000,000. This manuscript was found on examina- tion to be so inaccurate that the publication was not desirable, and accordingly the three intervening millions were calculated and published by James Glaisher, the Factor Table for the Fourth

1 Referring to factor tables, J. H. Lambert wrote (Supplementa tabularum, 1798, p. xv.) : "Universalis finis talium tabularum est ut semel pro semper computetur quod saepius de novo compu- tandum foret, et ut pro omni casu computetur quod in futurum pro quovis casu cdmputatum desiderabitur." This applies ti all tables.

Million appearing at London in 1879, and those for the fifth and sixth millions in 1880 and 1883 respectively (all three millions stereotyped). The tenth million, though calculated by Dase and Rosenberg, has not been published. The nine quarto volumes (Tables des diviseurs, Paris, 1814-1817; Factor Tables, London, 1879-1883; Factoren-Tafeln, Hamburg, 1862-1865) thus form one uniform table, giving the least divisor of every number not divisible by 2, 3, or 5, from unity to nine millions. The arrange- ment of the results on the page, which is due to Burckhardt, is admirable for its clearness and condensation, the least factors for 9000 numbers being given on each page. The tabular portion of each million occupies 112 pages. The first three millions were issued separately, and also bound in one volume, but the other six millions are all separate. Burckhardt began the publication of his tables with the second million instead of the first, as Chernac's factor table for the first million was already in existence. Burck- hardt's first million does not supersede Chernac's, as the latter gives all the prime divisors of numbers not divisible by 2,3, or 5 up to Ij020,ooo. It occupies

1020 pages, and Burckhardt found it very accurate; he detected only thirty-eight errors, of which nine were due to the author, the remaining twenty-nine having been caused by the slipping of type in the printing. The errata thus discovered are given in Burckhardt's first million. Other errata are contained in Allan Cunningham's paper referred to below.

Burckhardt gives but a very brief account of the method by which he constructed his table; and the introduction to Dase's millions merely consists of Gauss's letter suggesting their con- struction. The Introduction to the Fourth Million (pp. 52) con- tains a full account of the method of construction and a history of factor tables, with a bibliography of writings on the subject. The Introduction (pp. 103) to the Sixth Million contains an enumera- tion of primes and a great number of tables relating to the dis- tribution of primes in the whole nine millions, portions of which had been published in the Cambridge Philosophical Proceedings and elsewhere. A complete list of errors in the nine millions was published by J. P. Gram (Acta malhematica, 1893, 17, p. 310). These errors, 141 in number, and which affect principally the second, third, eighth, and ninth millions, should be carefully cor- rected in all the tables. In 1909 the Carnegie Institution of Wash- ington published a factor table by Prof. D. N. Lehmer which gives the least factor of all numbers not divisible by 2, 3, 5, or 7, up to ten millions. This table, which covers a range of 21,000 numbers on a single page, was reproduced by photography from a type- written copy of the author's original manuscript. The introduction contains a list of errata in the nine millions previously published, completely confirming Gram's list.

The factor tables which have just been described greatly exceed both in extent and accuracy any others of the same kind, the largest of which only reaches 408,000. This is the limit of Anton Felkel's Tafel alter einfachen Factoren (Vienna, 1776), a remark- able and extremely rare book, 2 nearly all

the copies having been destroyed. Georg Vega (Tabulae, 1797) gave a table showing all the divisors of numbers not divisible by 2, 3, or 5 up to 102,000, followed by a list of primes from 102,000 to 400,313. In the earlier editions of this work there are several errors in the list, but these are no doubt corrected in J. A. Hiilsse's edition (1840). J. Salomon (Vienna, 1827) gives the least divisor of all numbers not divisible by 2, 3, or 5, up to 102,011, and B. Goldberg (Primzahlen und Factoren-Tafeln, Leipzig, 1862) gives all factors of numbers not divisible by 2, 3, or 5 up to 251,650. H. G. Kohler (Logarithmisch-trigonometrisches Handbuch, 1848 and subsequent editions) gives all factors of numbers not prime or divisible by 2, 3, 5, or 11 up to 21,525. Peter Barlow (Tables, 1814) and F. Schaller (Primzahlen-Tafel, Weimar, 1855) give all factors of all numbers up to 10,000. Barlow's work also contains a list of primes up to 100,103. Both the factor table and the list of primes are omitted in the stereotyped (1840) reprint. Full lists of errata in Chernac (1811), Barlow (1814), Hiilsse's Vega (1840), Kohler (1848), Schaller (1855), and Goldberg (1862) are contained in a paper by Allan Cunningham (Mess, of Math., 1904, 34, p. 24; J 9°5> 35. P- 2 4)- V. A. Le Besgue (Tables diverses pour la decom- position des nombres, Paris, 1864) gives in a table of twenty pages, the least factor of numbers not divisible by 2, 3, or 5 up to 115,500. In Rees's Cyclopaedia (1819), article " Prime Numbers," there is a list of primes to 217,219 arranged in decades. The Fourth Million (1879) contains a list of primes up to 30,341. The fourth edition of the Logarithmic Tables (London, and Ithaca, N.Y., 1893) of G. W. Jones of Cornell University contains a table of ali the factors of numbers not divisible by 2 or 5 up to 20,000. In the case of primes the ten-place logarithm is given. This table does not occur in the third edition (Ithaca, N.Y., 1891). On the first page of the Second Million Burckhardt gives the first nine multiples of the primes to 1423; and a smaller table of the same kind, extending only to 313, occurs in Lambert's Supplementa (1798). Several

papers contain lists of high primes (i.e. beyond the range of the

2 For information about it, see a paper on " Factor Tables," in Camb. Phil. Proc. (1878), iii. 99-138, or the Introduction to the Fourth Million.

factor tables). Among these may be mentioned two, by Allan Cunningham and H. J. Woodall jointly, in the Mess, of Math., 1902, 31, p. 165; 1905, 34, p. 72. See also the papers on factoriza- tions of high numbers referred to under Tables relating to the Theory of Numbers. The Vienna Academy possesses the manuscript of an immense factor table extending to 100,000,000, constructed many years ago by J. P. Kulik (1793-1863) (see Ency. math. Wiss., 1900-1904, i. 952, and Lehmer's Factor Table, p. ix.).

Multiplication Tables. — A multiplication table is usually of double entry, the two arguments being the two factors; when so arranged it is frequently called a Pythagorean table. The largest and most useful work is A. L. Crelle's Rechentafeln (Bremiker's edition, 1857, stereotyped ; many subsequent editions with German, French, and English title-pages), which gives in one volume all the products up to 1000 X 1000, so arranged that all the multiples of any one number appear on the same page. The original edition was pub- lished in 1820 and consisted of two thick octavo volumes. The second (stereotyped) edition is a convenient folio volume of 450 pages. 1 In 1908 an entirely new edition, edited by O. Seeliger, was published in which the multiples of 10, 20, ..., 990 (omitted in previous editions) are included. This adds 50 pages to the volume, but removes what has been a great drawback to the use of the tables. Other improvements are that the tables are divided off horizontally and vertically by lines and spaces, and that, for calculations in which the last two figures are rejected, a mark has been placed to show when the

last figure retained should be increased. Two other tables of the same extent (1000X1000), but more condensed in arrangement, are H. C. Schmidt's Zahlenbuch (Aschersleben, 1896), and A. Henselin's Rechentafel (Berlin, 1897). An anonymous table, published at Oldenburg in i860, gives products up to 500X509, and M. Cordier, Le Multiplicateur de trois cents carres (Paris, 1872), gives a multiplication table to 300X300 (intended for commercial use). In both these works the product is printed in full. The four following tables are for the multiplica- tion of a number by a single digit. (1) A. L. Crelle, Erleichterungs- tafel jiir jeden, der zu rechnen hat (Berlin, 1836), a work extending to 1000 pages, gives the product of a number of seven figures by a single digit, by means of a double operation of entry. Each page is divided into two tables: for example, to multiply 9382477 by 7 we turn to page 825, and enter the right-hand table at line 77, column 7, where we find 77339; we then enter the left-hand table on the same page at line 93, column 7, and find 656, so that the product required is 65677339. (2) C. A. Bretschneider, Pro- duklenlafel (Hamburg and Gotha, 1841), is somewhat similar to Crelle's table, but smaller, the number of figures in the multi- plicand being five instead of seven. (3) In S. L. Laundy, A Table of Products (London, 1865), the product of any five-figure number by a single digit is given by a double arrangement. The extent of the table is the same as that of Bretschneider's, as also is the principle, but the arrangement is different, Laundy's table occupy- ing only 10 pages and Bretschneider's 99 pages. (4) G. Diakow's Multiplikations-Tabelle (St Petersburg, 1897) is of the same extent as Bretschneider's table but occupies 1000 pages. Among tables extending to 100 X 1000 {i.e. giving the products of two figures by three) may be mentioned C. A. Miiller's Multiplications-Tabellen (Karlsruhe, 1891). The tables of L. Zimmermann (Rechentafeln, Liebenwerda, 1896) and J. Riem (Rechentabellen fur Multiplica- tion, Basel, 1897) extend to 100X10,000. In a folio volume of 500 pages J. Peters {Rechentafeln fur Midtiplikation und Division mil e:n- bis

vierstelligen Zahlen, Berlin, 1909) gives products of four figures by two. The entry is by the last three figures of the multi- plicand, and there are 2000 products on each page. Among earlier tables, the interest of which is mainly historical, mention may be made of C. Hutton's Table of Products and Powers of Numbers (London, 1781), which contains a table up to 100X1000, and J. P. Gruson's Grosses Einmaleins von Eins bis Hunderttausend (Berlin, '799) — a table of products up to 9X10,000. The author's intention was to extend it to 100,000, but only the first part was published. In this book there is no condensation or double arrangement; the pages are very large, each containing 125 lines.

Quarter-Squares. — Multiplication may be performed by means of a table of single entry in the manner indicated by the formula — ab = i(a+bY~i(a-b)

1 Only one other multiplication table of the same extent as Crelle's had appeared previously, viz. Herwart von Hohenburg's Tabulae arithmetical irpoaipi

Thus with a table of quarter-squares we can multiply together any two numbers by subtracting the quarter-square of their difference from the quarter-square of their sum. The largest table of quarter-squares is J. Blater's Table of Quarter-Squares of all whole numbers from I to 200,000 (London, 1888), 2 which gives quarter-squares of every number up to 200,000 and thus yields directly the product of any two five-figure numbers. This fine table is well printed and arranged. Previous to its publication the largest table was S. L. Laundy's Table of Quarter-Squares of all numbers up to 100,000 (London, 1856), which is of only half the extent, and therefore is only directly available when the sum of the two numbers to be multiplied does not exceed 100,000.

Smaller works are J. J. Centnerschwer, Neuerfundene Multiplica- tions- und Quadrat- Tafeln (Berlin, 1825), which extends to 20,000, and J. M. Merpaut, Tables arithmonomiques (Vannes, 1832), which extends to 40,000. In Merpaut's work the quarter-square is

termed the " arithmone." L. J. Ludolf, who published in 1690 a table of squares to 100,000 (see next paragraph), explains in his introduction how his table may be used to effect multiplications by means of the above formula; but the earliest book on quarter- squares is A. Voisin, Tables des multiplications, ou logarilhmes des nombres entiers depuis 1 jusqu'i 20,000 (Paris, 1817). By a logarithm Voisin means a quarter-square, i.e. he calls a a root and \a % its logarithm. On the subject of quarter-squares, &c, see Phil. Mag. [v.] 6, p. 331.

Squares, Cubes, &c, and Square Roots and Cube Roots. — The most convenient table for general use is P. Barlow's Tables (Useful Know- ledge Society, London, from the stereotyped plates of 1840), which gives squares, cubes, square roots, cube roots, and reciprocals to 10,000. These tables also occur in the original edition of 1814. The largest table of squares and cubes is J. P. Kulik, Tafeln der Quadrat- und Kubik-Zahlen (Leipzig, 1848), which gives both as far as 100,000. Blater's table of quarter-squares already mentioned gives squares of numbers up to 100,000 by dividing the number by 2 ; and up to 200,000 by multiplying the tabular result by 4. Two early tables give squares as far as 100,000, viz. Maginus, Tabula tetragonica (Venice, 1592), and Ludolf, Tetragonometria tabularia (Amsterdam, 1690) ; G. A. Jahn, Tafel der Quadral- und Kubikwurzeln (Leipzig, 1839), gives squares to 27,000, cubes to 24,00c, and square and cube roots to 25,500, at first to fourteen decimals and above 1010 to five. E. G£lin (Recueil de tables numeriques, Huy, 1894) gives square roots (to 15 places) and cube roots (to 10 places) of numbers up to 100. C. Hutton, Tables of Products and Powers of Numbers (London, 1781), gives squares up to 25,400, cubes to 10,000, and the first ten powers of the first hundred numbers. P. Barlow, Mathematical Tables (original edition, 1814), gives the first ten powers of the first hundred numbers. The first nine or ten powers are given in Vega, Tabulae (1797), and in Hiilsse's edition of the same (1840), in Kohler,

Hand- buch (1848), and in other collections. C. F. Faa de Bruno, Calcul des erreurs (Paris, 1869), and J. H. T. Miiller, Vierstellige Loga- riihmen (1844), give squares for use in connexion with the method of least squares. Four-place tables of squares are frequently given in five- and four-figure collections of tables. Small tables often occur in books intended for engineers and practical men. S. M. Drach (Messenger of Math., 1878, 7, p. 87) has given to 33 places the cube roots (and the cube roots of the squares) of primes up to 127. Small tables of powers of 2, 3, 5, 7 occur in various collections. In Vega's Tabulae (1797, and the subsequent editions, including Hiilsse's) the powers of 2, 3, 5 as far as the 45th, 36th, and 27th respectively are given; they also occur in Kohler's Hand- buch (1848). The first 25 powers of 2, 3, 5, 7 are given in Salomon, Logarithmische Tafeln (1827). W. Shanks, Rectification of the Circle (!853), gives every 12th power of 2 up to 2 721 . A'very valuable paper (" Power-tables, Errata ") published by Allan Cunningham in the Messenger of Math., 1906, 35, p. 13, contains the results of a careful examination of 27 tables containing powers higher than the cube, with lists of errata found in each. Before using any power table this list should be consulted, not only in order to correct the errata, but for the sake of references and general information in regard to such tables. In an appendix (p. 23) Cunningham gives errata in the tables of squares and cubes of Barlow (1814), Jahn (1839), and Kulik (1848).

Triangular Numbers. — E. de Joncourt, De natura et praeclaro usu simplicissimae speciei numerorum trigonalium (The Hague, 1762), contains a table of triangular numbers up to 20,000: viz. \n(n--\) is given for all numbers from n = \ to 20,000. The table occupies 224 pages.

Reciprocals. — P. Barlow's Tables (18 14 and 1840) give reciprocals up to 10,000 to 9 or 10 places; and a table of ten times this extent is given by W. H. Oakes, Table of the Reciprocals of Numbers from 1 to 100,000 (London, 1865). This table gives seven figures of the reciprocal, and is arranged like a

table of seven-figure logarithms, differences being added at the side of the page. The reciprocal

2 The actual place of publication (with a German title, &c.) is Vienna. The copies with an English title, &c, were issued by Triibner; and those with a French title, &c, by Gauthier-Villars. All bear the date 1888.

of a number of five figures is therefore taken out at once, and two more figures may be interpolated for as in logarithms. R. Picarte, La Division reduite a une addition (Paris, 1861), gives to ten signi- ficant figures the reciprocals of the numbers from 10,000 to 100,000, and also the first nine multiples of these reciprocals. J. C. Houzeau gives the reciprocals of numbers up to 100 to 20 places and their first nine multiples to 12 places in the Bulletin of the Brussels Academy, 1875, 40, p. 107. E. Gelin (Recueil de tables numeriques, Huy, 1894) gives reciprocals of numbers to 1000 to 10 places.

Tables for the Expression of Vulgar Fractions as Decimals. — Tables of this kind have been given by Wucherer, Goodwyn and Gauss. W. F. Wucherer, Beytrdge zum allgemeinern Gebrauch der Decimalbriiche (Carlsruhe, 1796), gives the decimal fractions (to 5 places) for all vulgar fractions whose numerator and denominator are each less than 50 and prime to one another, arranged according to denominators. The most extensive and elaborate tables that have been published are contained in Henry Goodwyn's First Centenary of Tables of all Decimal Quotients (London, 1816), A Tabular Series of Decimal Quotients (1823), and A Table of the Circles arising from the Division of a Unit or any other Whole Number by all the Integers from 1 to 102.4 (T 8 2 3). The Tabular Series (1823), which occupies 153 pages, gives to 8 places the decimal corresponding to every vulgar fraction less than $- fa whose numerator and denomi- nator do not surpass

1000. The arguments are not arranged according to their numerators or denominators, but according to their magnitude, so that the tabular results exhibit a steady increase from -ooi (=jo 1 oo) to 09989909 (= jVi) The author intended the table to include all fractions whose numerator and denominator were each less than 1000, but no more was ever published. The Table of Circles (1823) gives all the periods of the circulating decimals that can arise from the division of any integer by another integer less than 1024. Thus for 13 we find -676923 and -153846, which are the only periods in which a fraction whose denominator is 13 can circulate. The table occupies 107 pages, some of the periods being of course very long {e.g., for 102 1 the period contains 1020 figures). The First Centenary (1816) gives the complete periods of the reciprocals of the numbers from 1 to 100. Goodwyn's tables are very scarce, but as they are nearly unique of their kind they deserve special notice. A second edition of the First Centenary was issued in 1818 with the addition of some of the Tabular Series, the numerator not exceeding 50 and the denominator not exceeding 100. A posthumous table of C. F. Gauss's, entitled " Tafel zur Verwandlung gemeiner Briiche mit Nennern aus dem ersten Tausend in Decimalbriiche," occurs in vol. ii. pp. 412-434 of his Gesammelte Werke (Gottingen, 1863), and resembles Goodwyn's Table of Circles. On this subject see a paper "On Circulating Decimals, with special reference to Henry Goodwyn's Table of Circles and Tabular Series of Decimal Quotients," in Camb. Phil. Proc, 1878, 3, p. 185, where is also given a table of the numbers of digits in the periods of fractions corresponding to denominators prime to 10 from 1 to 1024 obtained by counting from Goodwyn's table. See also under Circulating Decimals (below).

Sexagesimal and Sexcentenary Tables. — Originally all calculations were sexagesimal; and the relics of the system still exist in the division of the degree into 60 minutes and the minute into 60 seconds. To facilitate interpolation, therefore, in trigonometrical and other tables the following large

sexagesimal tables were con- structed. John Bernoulli, A Sexcentenary Table (London, 1779), gives at once the fourth term of any proportion of which the first term is 600" and each of the other two is less than 600”; the table is of double entry, and may be described as giving the value of xy/6oo correct to tenths of a second, x and y each containing a. number of seconds less than 600. Michael Taylor, A Sexagesimal Table (London, 1780), exhibits at sight the fourth term of any proportion where the first term is 60 minutes, the second any number of minutes less than 60, and the third any number of minutes and seconds under 60 minutes; there is also another table in which the third term is any absolute number under 1000. Not much use seems to have been made of these tables, both of which were published by the Commissioners of Longitude. Small tables for the conversion of sexagesimals into centesimals and vice versa are given in a few collections, such as Hulsse’s edition of Vega. H. Schubert’s Fiinfstellige Tafeln und Gegentafeln (Leipzig, 1897) contains a sexagesimal table giving xy/60 for x=i to 59 and y = 1 to 150.

Trigonometrical Tables (Natural). — Peter Apian published in 1533 a table of sines with the radius divided decimally. The first complete canon giving all the six ratios of the sides of a right- angled triangle is due to Rheticus (1551), who also introduced the semiquadrantal arrangement. Rheticus’s canon was calcu- lated for every ten minutes to 7 places, and Vieta extended it to every minute (1579). In 1554 Reinhold published a table of tangents to every minute. The first complete canon published in England was by Thomas Blundeville (1594), although a table of sines had appeared four years earlier. Regiomontanus called his table of tangents (or rather cotangents) tabula foecunda on account of its great use ; and till the introduction of the word ” tangent ” by Thomas Finck (Geometriae rolundi libri XIV., Basel, 1583) a table of tangents was called a tabula foecunda or

canon foecundus. Besides ” tangent,” Finck also introduced the word ” secant,” the table of secants

having previously been called tabula benefica by Maurolycus (1558) and tabula foecundissima by Vieta.

By far the greatest computer of pure trigonometrical tables is George Joachim Rheticus, whose work has never been superseded. His celebrated ten-decimal canon, the Opus palatinum, was pub- lished by Valentine Otho at Neustadt in 1596, and in 1613 his fifteen-decimal table of sines by Pitiscus at Frankfort under the title Thesaurus mathematicus. The Opus palatinum contains a complete ten-decimal trigonometrical canon for every ten seconds of the quadrant, semiquadrantally arranged, with differences for all the tabular results throughout. Sines, cosines, and secants are given on the left-hand pages in columns headed respectively "Per- pend.'culum," " Basis," " Hypotenusa," and on the right-hand pages appear tangents, cosecants, and cotangents in columns headed respectively " Perpendiculum," " Hypotenusa," " Basis." At his death Rheticus left the canon nearly complete, and the trigonometry was finished and the whole edited by Valentine Otho; it was named in honour of the elector palatine Frederick IV., who bore the expense of publication. The Thesaurus of 1613 gives natural sines for every ten seconds throughout the quadrant, to 15 places, semiquadrantally arranged, with first, second, and third differences. Natural sines are also given for every second from 0° to i° and from 89 to 90 °, to 15 places, with first and second differences. The rescue of the manuscript of this work by Pitiscus forms a striking episode in the history of mathematical tables. The alterations and emendations in the earlier part of the cor- rected edition of the Opus palatinum were made by Pitiscus, who had his suspicions that Rheticus had himself calculated a ten- second table of sines to 15 decimal places; but it could not be found. Eventually the lost canon was discovered amongst the papers of Rheticus which had passed from Otho to James Christ- mann on the death of the former. Amongst these Pitiscus found (1) the ten-second table of sines to 15 places, with first, second, and third differences (printed in the Thesaurus) ; (2)

sines for every second of the first and last degrees of the quadrant, also to 15 places, with first and second differences; (3) the commence- ment of a canon of tangents and secants, to the same number of decimal places, for every ten seconds, with first and second differ- ences; (4) a complete minute canon of sines, tangents, and secants, also to 15 decimal places. This list, taken in connexion with the Opus palatinum, gives an idea of the enormous labours under- taken by Rheticus; his tables not only remain to this day the ultimate authorities but formed the data from which Vlacq calcu- lated his logarithmic canon. Pitiscus says that for twelve years Rheticus constantly had computers at work.

A history of trigonometrical tables by Charles Hutton was pre- fixed to all the early editions of his Tables of Logarithms, and forms Tract xix. of his Mathematical Tracts, vol. i. p. 278, 1812. A good deal of bibliographical information about the Opus palatinum and earlier trigonometrical tables is given in A. De Morgan's article "Tables" in the English Cyclopaedia. The invention of log- arithms the year after the publication of Rheticus's volume by Pitiscus changed all the methods of calculation; and it is worthy of note that John Napier's original table of 1614 was a logarithmic canon of sines and not a table of the logarithms of numbers. The logarithmic canon at once superseded the natural canon; and since Pitiscus's time no really extensive table of pure trigono- metrical functions has appeared. In recent years the employment of calculating machines has revived the use of tables of natural trigonometrical functions, it being found convenient for some purposes to employ such a machine in connexion with a natural canon instead of using a logarithmic canon. A. Junge's Tafel der wirkhchen Ldnge der Sinus und Cosinus (Leipzig, 1864) was pub- lished with this object. It gives natural sines and cosines for every ten seconds of the quadrant to 6 places. F. M. Clouth, Tables pour le calcul des coordonnees goniometriques (Mainz, n.d.), gives natural sines and cosines (to 6 places) and their first nine multiples (to 4 places) for

every centesimal minute of the quadrant. Tables of natural functions occur in many collections, the natural and logarithmic values being sometimes given on opposite pages, sometimes side by side on the same page.

The following works contain tables of trigonometrical functions other than sines, cosines, and tangents. J. Pasquich, Tabulae logarithmico-trigonometricae (Leipzig, 1817), contains a table of sin 2 x, cos 2 x, tan 2 x, cot 2 * from x = i° to 45 at intervals of 1' to 5 places. J. Andrew, Astronomical and Nautical Tables (London, 1805), contains a table of ” squares of natural semichords,” i.e. of sin’Jx from x = o° to 120 at intervals of 10" to 7 places. This table was greatly extended by Major-General Hannyngton in his Haversines, Natural and Logarithmic, used in computing Lunar Distances for the Nautical Almanac (London, 1876). The name ” haversine,” frequently used in works upon navigation, is an abbreviation of ” half versed sine ” ; viz., the haversine of x is equal to J(t-cos x) t t h at is, to sin 2 ix. The table gives logarithmic haversines for every 15" from o° to 180°, and natural haversines for every 10" from 0° to 180 , to 7 places, except near the beginnng, where the logarithms are given to only 5 or 6 places. It occupies

327 folio pages, and was suggested by Andrew’s work, a copy of which by chance fell into Hannyngton’s hands Hannyng- ton recomputed the whole of it by a partly mechanical method, a combination of two arithmometers being employed. A table of haversines is useful for the solution of spherical triangles when two sides and the included angle are given, and in other problems in spherical trigonometry. Andrew’s original table seems to have attracted very little notice. Hannyngton’s was printed, on the recommendation of the superintendent of the Nautical Almanac office, at the public cost. Before the calculation of Hannyngton’s table R. Farley’s Natural Versed Sines (London, 1856) was used in the

Nautical Almanac office in computing lunar distances. This fine table contains natural versed sines from 0° to 125° at intervals of 10″ to 7 places, with proportional parts, and log versed sines from 0° to 135 at intervals of 15″ to 7 places. The argu- ments are also given in time. The manuscript was used in the office for twenty-five years before it was printed. Traverse tables, which occur in most collections of navigation tables, contain multiples of sines and cosines.

Common or Briggian Logarithms of Numbers and Trigono- metrical Ratios. — For an account of the invention and history of logarithms, see Logarithm. The following are the fundamental works which contain the results of the original calculations of logarithms of numbers and trigonometrical ratios: — Briggs, Arith- metica logarithmica (London, 1624), logarithms of numbers from 1 to 20,000 and from 90,000 to 100,000 to 14 places, with inter- script differences; Vlacq, Arithmetica logarithmica (Gouda, 1628, also an English edition, London, 1631, the tables being the same), ten-figure logarithms of numbers from 1 to 100,000, with differences, also log sines, tangents, and secants for every minute of the quad- rant to 10 places, with interscript differences; Vlacq, Trigono- metria artificialis (Gouda, 1633), log sines and tangents to every ten seconds of the quadrant to 10 places, with differences, and ten-figure logarithms of numbers up to 20,000, with differences; Briggs, Trigonometria Britannica (London, 1633), natural sines to 15 places, tangents and secants to 10 places, log sines to 14 places, and tangents to 10 places, at intervals of a hundredth of a degree from 0° to 45 , with interscript differences for all the functions. In 1794 Vega reprinted at Leipzig Vlacq's two works in a single folio volume, Thesaurus logarithmorum completus. The arrange- ment of the table of logarithms of numbers is more compendious than in Vlacq, being similar to that of an ordinary seven-figure table, but it is not so convenient, as mistakes in taking out the differences are more liable to occur. The trigonometrical canon gives log

sines, cosines, tangents, and cotangents, from 0° to 2° at intervals of one second, to 10 places, without differences, and for the rest of the quadrant at intervals of teii seconds. The trigonometrical canon is not wholly reprinted from the Trigono- metria artificialis, as the logarithms for every second of the first two degrees, which do not occur in Vlacq, were ealculated for the work by Lieutenant Dorfmund. Vega devoted great attention to the detection of errors in Vlacq's logarithms of numbers, and has given several important errata lists. F. Lefort {Annates de VObser- vatoire de Paris, vol. iv.) has given a full errata list in Vlacq's and Vega's logarithms of numbers, obtained by comparison with the great French manuscript Tables du cadastre (see Logarithm; comp. also Monthly Notices R.A.S., 32, pp. 255, 288; 33, p. 330; 34, p. 447). Vega seems not to have bestowed on the trigono- metrical canon anything like the care that he devoted to the log- arithms of numbers, as' Gauss 1 estimates the total number of last-figure errors at from 31,983 to 47,746, most of them only amounting to a unit, but some to as much as 3 or 4.

A copy of Vlacq's Arithmetica logarithmica (1628 or 1631), with the errors in numbers, logarithms, and differences corrected, is still the best table for a calculator who has to perform work requiring ten- figure logarithms of numbers, but the book is not easy to pro- cure, and Vega's Thesaurus has the advantage of having log sines, &c, in the same volume. The latter work also has been made more accessible by a photographic reproduction by the Italian govern- ment {Riproduzione fotozincografica dell' Istituto Geografico Mili- lare, Florence, 1896). In 1897 Max Edler von Leber published tables for facilitating interpolations in Vega's Thesaurus (Tabularum ad faciliorem et breviorem in Georgii Vegae " Thesauri logarith- morum " magnis canonibus interpolations computationem utilium Trias, Vienna, 1897). The object of these tables is to take account of second differences. Prefixed to the tables is a long list of errors in the Tliesaurus, occupying twelve pages. From an examination of the tabular

results in the trigonometrical canon corresponding to 1060 angles von Leber estimates that out of the 90,720 tabular results 40,396 are in error by ± I, 2793 by ±2, and 191 by =±=3. Thus his estimated value of the total number of last-figure errors is 43,326, which is in accordance with Gauss's estimate. A table of ten-figure logarithms of numbers up to 100,009, the result of a new calculation, was published in the Report of the U.S. Coast and Geodetic Survey for 1895-6 (appendix 12, pp. 395-722) by W. W. Duffield,

1 See his " Einige Bemerkungen zu Vega's Thesaurus logarith- morum," in AstronomiscJte Nachrichten for 1851 (reprinted in his Werke, vol. iii. pp. 257-64); also Monthly Notices R.A.S., 33, p. 440.

superintendent of the survey. The table was compared with Vega's Thesaurus before publication.

S. Pineto's Tables de logarithmes vulgaires a dix decimales, con- struites d'apres un nouveau mode (St Petersburg, 1.871), though a tract of only 80 pages, may be usefully employed when Vlacq and Vega are unprocurable. Pineto's work consists of three tables: the first, or auxiliary table, contains a series of factors by which the numbers whose logarithms are required are to be multiplied to bring them within the range of table 2 ; it also gives the log- arithms of the reciprocals of these factors to 12 places Table I merely gives logarithms to 1000 to 10 places. Table 2 gives logarithms from 1,000,000 to 1,011000, with proportional parts to hundredths. The mode of using these tables is as follows. If the logarithm cannot be taken out directly from table 2, a factor M is found from the auxiliary table by which the number must be multiplied to bring it within the range of table 2 Then the logarithm can be taken out, and, to neutralize the effect of the multiplication, so far as the result is concerned, log 1/M must be added; this quantity is therefore given in an adjoining column to M in the auxiliary table. A similar

procedure gives the number answering to any logarithm, another factor (approximately the reciprocal of M) being given, so that in both cases multiplication is used. The laborious part of the work is the multiplication by M; but this is somewhat compensated for by the ease with which, by means of the proportional parts, the logarithm is taken out. The factors are 300 in number, and are chosen so as to minimize the labour, only 25 of the 300 consisting of three figures all dif- ferent and not involving o or 1. The principle of multiplying by a factor which is subsequently cancelled by subtracting its log- arithm is used also in a tract, containing only ten pages, published by A. Namur and P. Mansion at Brussels in 1877 under the title Tables de logarithmes & 12 decimales jusqu'a 434 milliards. Here a table is given of logarithms of numbers near to 434,294, and other numbers are brought within the range of the table by multi- plication by one or two factors. The logarithms of the numbers near to 434,294 are selected for tabulation because their differ- ences commence with the figures 100 . . . and the presence of the zeros in the difference renders the interpolation easy.

The tables of S. Gundelfinger and A. Nell (Tafeln zur Berechnung neunstettiger Logarithmen, Darmstadt, 1891) afford an easy means of obtaining nine-figure logarithms, though of course they are far less convenient than a nine-figure table itself. The method in effect consists in the use of Gaussian logarithms, viz., if N = n--p, log N=log «+log (i--p/n) =log m + B where B is log (--pln) to argument A = log £-log n. The tables give log n from n = 1000 to n = 10,000, and values of B for argument A. 2

Until 1891, when the eight-decimal tables, referred to further on, were published by the French government, the computer who could not obtain sufficiently accurate results from seven-figure logarithms was obliged to have recourse to ten-figure tables, for, with only one exception, there existed no tables giving eight or nine figures. This exception is John Newton's Trigonometria Britannica (London, 1658), which gives logarithms of numbers to

100,000 to 8 places, and also log sines and tangents for every centesimal minute {i.e. the nine-thousandth part of a right angle), and also log sines and tangents for the first three degrees of the quadrant to 5 places, the interval being the one- thousandth part of a degree. This table is also remarkable for giving the logarithms of the differences instead of the actual differ- ences. The arrangement of the page now universal in seven-figure tables — with the fifth figures running horizontally along the top line of the page — is due to John Newton.

As a rule seven-figure logarithms of numbers are not published separately, most tables of logarithms containing both the logarithms of numbers and a trigonometrical canon. Babbage's and Sang's logarithms are exceptional and give logarithms of numbers only. C. Babbage, Table of the Logarithms of the Natural Numbers from I to 108,000 (London, stereotyped in 1827; there are many tirages of later dates), is the best for ordinary use. Great pains were taken to get the maximum of clearness. The change of figure in the middle of the block of numbers is marked by a change of type in the fourth figure, which (with the sole exception of the asterisk) is probably the best method that has been used. Copies of the book were printed on paper of different colours^ — yellow, brown, green, &c. — as it was considered that black on a white ground was a fatiguing combination for the eye. The tables were also issued with title-pages and introductions in other languages. In 1 87 1 E. Sang published A New Table of Seven-place Logarithms of all Numbers from 20,000 to 200,000 (London). In an ordinary table extending from 10,000 to 100,000 the differences near the beginning are so numerous that the proportional parts are either very crowded or some of them omitted; by making the table extend from 20,000 to 200,000 instead of from 10,000 to 100,000 the differences are halved in magnitude, while there are only one- fourth as many in a page. There is also greater accuracv. A

2 A seven-figure table of the same kind is contained

in S. Gundel- finger's Sechsstellige Gaussische und siebenstellige gemeine Logarithmen (Leipzig, 1902).

further peculiarity of this table is that multiples of the differences, instead of proportional parts, are given at the side of the page. Typographically the table is exceptional, as there are no rules, the numbers being separated from the logarithms by reversed commas — a doubtful advantage. This work was to a great extent the result of an original calculation; see Trans. Roy. Soc. Edin., 1871, 26. Sang proposed to publish a nine-figure table from 1 to 1,000,000, but the requisite support was not obtained. Various papers of Sang's relating to his logarithmic calculations will be found in the Proc. Roy. Soc. Edin. subsequent toji872. Reference should here be made to Abraham Sharp's table of logarithms of numbers from 1 to 100 and of primes from 100 to 1100 to 61 places, also of numbers from 999,990 to 1,000,010 to 63 places. These first appeared in Geometry Improv'd . . . by A. S. Philomath (London, 1717). They have been republished in Sherwin's, Callet's, and the earlier editions of Hutton's tables. H. M. Parkhurst, Astronomical Tables (New York, 1871), gives logarithms of numbers from I to 109 to 102 places. 1

In many seven-figure tables of logarithms of numbers the values of S and T are given at the top of the page, with V, the variation of each, for the purpose of deducing log sines and tangents. 5 and T denote log (sin xjx) and log (tan xjx) respectively, the argument being the number of seconds denoted by certain numbers (some- times only the first, sometimes every tenth) in the number column on each page. Thus, in Callet's tables, on the page on which the first number is 67200, 5 = log (sin 672o"/672o) and r = log (tan 672076720), while the V's are the variations of each for 10". To find, for example, log sin 1 ° $2 , i2"-'j, or log sin 6732"-7, we have 5 = 4-6854980 and log 6732-7 = 3,8281893, whence, by

addition, we obtain 8-5136873; but V for 10" is -2-29, whence the variation for i2"-7 is -3, and the log sine required is 8-5136870. Tables of 5 and T are frequently called, after their inventor, " Delambre's tables."

Some seven-figure tables extend to 100,000, and others to 108,000, the last 8000 logarithms, to 8 places, being given to ensure greater accuracy, as near the beginning of the numbers the differences are large and the interpolations more laborious and less exact than in the rest of the table. The eight-figure logarithms, however, at the end of a seven-figure table are liable to occasion error; for the computer who is accustomed to three leading figures, common to the block of figures, may fail to notice that in this part of the table there are four, and so a figure (the fourth) is sometimes omitted in taking out the logarithm. In the ordinary method of arranging a seven-figure table the change in the fourth figure, when it occurs in the course of the line, is a source of frequent error unless it is very clearly indicated. In the earlier tables the change was not marked at all, and the computer had to decide for himself, each time he took out a logarithm, whether the third figure had to be increased. In some tables the line is broken where the change occurs; but the dislocation of the figures and the corresponding irregularity in the lines are very awkward. Babbage printed the fourth figure in small type after a change; and Bremiker placed a bar over it. The best method seems to be that of prefixing an asterisk to the fourth figure of each logarithm after the change, as is done in Schron's and many other modern tables. This is beautifully clear and the asterisk at once catches the eye. Shortrede and Sang replace o after a change by a nokta (resembling a diamond in a pack of cards). This is very clear in the case of the o's, but leaves unmarked the cases in which the fourth figure is 1 or 2. A method which finds favour in some recent tables is to underline all the figures after the increase, or to place a line over them.

Babbage printed a subscript point under the last

figure of each logarithm that had been increased. Schron used a bar subscript, which, being more obtrusive, seems less satisfactory. In some tables the increase of the last figure is only marked when the figure is increased to a 5, and then a Roman five (v) is used in place of the Arabic figure.

Hereditary errors in logarithmic tables are considered in two papers " On the Progress to Accuracy of Logarithmic Tables " and " On Logarithmic Tables," in Monthly Notices R.A.S., 33, pp. 330, 440. See also vol. 34, p. 447 ; and a paper by Gernerth, Ztsch. f. d. osterr. Gynun., Heft vi. p. 407.

Passing now to the logarithmic trigonometrical canon, the first great advance after the publication of the Trigonometria artificialis in 1633 was made in Michael Taylor's Tables of Logarithms (London, 1792), which give log sines and tangents to every second of the quadrant to 7 places. This table contains about 450 pages with an average number of 7750 figures to the page, so that there are altogether nearly three millions and a half of figures. The change

1 Legendre [Traite des fonctions elliptiques, vol. ii., 1826) gives a table of natural sines to 15 places, and of log sines to 14 places, for every 15" of the quadrant, and also a table of logarithms of uneven numbers from 1163 to 1501, and of primes from 1501 to 10,000 to 19 places. The latter, which was extracted from the Tables du cadastre, is a continuation of a table in W. Gardiner's Tables of Logarithms (London, 1742; reprinted at Avignon, 1770), which gives logarithms of all numbers to 1000, and of uneven numbers from 1000 to 1 143. Legendre's tables also appeared in his Exercices de calcul integral, vol. iii. (1816).

in the leading figures, when it occurs in a column, is not marked at all; and the table must be used with very great caution. In fact it is advisable to go through the whole of it, and fill in with ink the first o after the change, as well as make some mark

that will catGh the eye at the head ofevery column containing a change. The table was calculated by interpolation from the Trigonometria artificialis to 10 places and then reduced to 7, so that the last figure should always be correct. Partly on account of the absence of a mark to denote the change of figure in the column and partly on account of the size of the table and a somewhat inconvenient arrangement, the work seems never to have come into general use. Computers have always preferred V. Bagay's Nouvelles Tables astronomiques et hydrographiques (Paris, 1829), which also contains a complete logarithmic canon to every second. The change in the column is very clearly marked by a large black nucleus, surrounded by a circle, printed instead of o. Bagay's work having become rare and costly was reprinted with the errors corrected. The reprint, how- ever, bears the original title-page and date 1829, and there appears to be no means of distinguishing it from the original work except by turning to one of the errata in the original edition and examining whether the correction has beeh made.

The only other canon to every second that has been published is contained in R. Shortrede's Logarithmic Tables (Edinburgh). This work was originally issued in 1844 in one volume, but being dis- satisfied with it Shortrede issued a new edition in 1849 in two volumes. The first volume contains logarithms of numbers, anti- logarithms, &c, and the second the trigonometrical canon to every second. The volumes are sold separately, and may be regarded as independent works; they are not even described on their title- pages as vol. i. and vol. ii. The trigonometrical canon is very com- plete in every respect, the arguments being given in time as well as in arc, full proportional parts being added, &c. The change of figure in the column is denoted by a nokta, printed instead of o where the change occurs. The page is crowded and the print not very clear, so that Bagay is to be preferred for regular use.

Previous to 1 89 1 the only important tables in which the quadrant is divided centesimally were J. P. Hobert and L. Ideler, Nouvelles tables

trigonometriques (Berlin, 1799), and C. Borda and J. B. J. Delambre, Tables trigonometriques decimates (Paris, 1801). The former give, among other tables, natural and log sines, cosines, tangents, and cotangents, to 7 places, the arguments proceeding to 3° at intervals of 10″ and thence to 50 at intervals of 1′ (centesimal), and also natural sines and tangents for the first hundred ten-thousandths of a right angle to 10 places. The latter gives long sines, cosines, tangents, cotangents, secants, and cosecants from 0° to 3°at intervals of 10″ (with full proportional parts for every second), and thence to 50 at intervals of 1′ (centesimal) to 7 places. There is also a table of log sines, cosines, tangents, and cotangents from o’ to 10′ at intervals of 10″ and from o to 50°at intervals of 10′ (centesimal) to 1 1 places. Hobe«t and Ideler give a natural as well as a logarithmic canon; but Borda and Delambre give only the latter. Borda and Delambre give seven-figure logarithms of numbers to 10,000, the line being broken when a change of figure takes place in it.

The tables of Borda and Delambre having become difficult to procure, and seven-figure tables being no longer sufficient for the accuracy required in astronomy and geodesy, the French govern- ment in 1 89 1 issued an eight-figure table containing (besides log- arithms of numbers to 120,000) log sines and tangents for every ten seconds (centesimal) of the quadrant, the latter being extracted from the Tables du cadastre of Prony (see Logarithm). The title of this fine and handsomely printed work is Service geographique de I’armee: Tables des logarithmes i huit decimates . . . publiees par ordre du ministre de la guerre (Paris, Imprimerie Nationale, 1891). These tables are now in common use where eight figures are required.

In Brigg’s Trigonometria Britannica of 1633 the degree is divided centesimally, and but for the appearance in the same year of Vlacq’s Trigonometria artificialis, in which the degree is divided sexagesi- mally, this reform might have been effected. It is clear that the most suitable time

for making such a change was when the natural canon was replaced by the logarithmic canon, and Briggs took advantage of this opportunity. He left the degree unaltered, but divided it centesimally instead of sexagesimally, thus ensuring the advantages of decimal division (a saving of work in interpolations, multiplications, &c.) with the minimum of change. The French mathematicians at the end of the 18th century divided the right angle centesimally, completely changing the whole system, with no appreciable advantages over Briggs's system. In .act the centesimal degree is as arbitrary a unit as the nonagesimal and it is only the non-centesimal subdivision of the degree that gives rise to incon- venience. Briggs's example was followed by Roe, Oughtred, and other 17th-century writers; but the centesmal division of the degree seemed to have entirely passed out of i.se, till it was revived by C. Bremiker in his Logarithmisch-trigonometrische Tafeln mil ftinf Decimalstellen (Berlin, 1872, 10th ed. revised by A. Kallius, 1906). This little book of 158 pages gives a five-figure canon to every hundredth Of a degree with proportional parts, besides logarithms of numbers, addition and subtraction logarithms, &c.

The eight-figure table of 1891 has now made the use of a cen- tesimal table compulsory, if this number of figures is required.

TABLE, MATHEMATICAL

The Astronomische Gesellschaft are, however, publishing an eight- figure table on the sexagesimal system, under the charge of Dr. J. Bauschinger, the director of the k. Recheninstitut at Berlin. The arrangement is to be in groups of three as in Bremiker's tables.

Collections of Tables. — For a computer who requires in one volume logarithms of numbers and a ten-second logarithmic canon, perhaps the two best books are L. Schron, Seven- Figure Logarithms (London, 1865, stereotyped, an English edition of the German work pub- lished at Brunswick), and C. Bruhns, A New

Manual of Logarithms to Seven Places of Decimals (Leipzig, 1870). Both these works (of which there have been numerous editions) give logarithms of numbers and a complete ten-second canon to 7 places; Bruhns also gives log sines, cosines, tangents, and cotangents to every second up to 6° with proportional parts. Schron contains an interpolation table, of 75 pages, giving the first 100 multiples of all numbers from 40 to 420. The logarithms of numbers extend to 108,000 in Schron and to 100,000 in Bruhns. Almost equally convenient is Bremiker's edition of Vega's Logarithmic Tables (Berlin, stereotyped; the English edition was translated from the fortieth edition of Bremiker's by W. L. F. Fischer). This book gives a canon to every ten seconds, and for the first five degrees to every second, with logarithms of numbers to 100,000. Schron, Bruhns, and Bremiker all give the proportional parts for all the differences in the logarithms of numbers. In Babbage's, Callet's, and many other tables only every other table of pro- portional parts is given near the beginning for want of space. Schron, Bruhns, and most modern tables published in Germany have title-pages and introductions in different languages. J. Dupuis, Tables de logarithmes d, sept decimales (stereotyped, third tirage, 1868, Paris), is also very convenient, containing a ten-second canon, besides logarithms of numbers to 100,000, hyperbolic log- arithms of numbers to 1000, to 7 places, &c. In this work negative characteristics are printed throughout in the tables of circular functions, the minus sign being placed above the figure; for the mathematical calculator these are preferable to the ordinary char- acteristics that are increased by 10. The edges of the pages con- taining the circular functions are red, the rest being grey. Dupuis also edited Callet's logarithms in 1862, with which this work must not be confounded. J. Salomon, Logarithmische Tafcln (Vienna, 1827), contains a ten-second canon (the intervals being one second for the first two degrees), logarithms of numbers to 108,000, squares, cubes, square roots, and cube roots to 1000, a factor table to 102,011, ten-place

Briggian and hyperbolic logarithms of numbers to 1000 and of primes to 10,333, an d many other useful tables. The work, which is scarce, is a well-printed small quarto volume.

Of collections of general tables among the most useful and accessible are Hutton, Callet, Vega, and Kohler. C. Hutton's well-known Mathematical Tables (London) was first issued in 1785, but considerable additions were made in the fifth edition (181 1). The tables contain seven-figure logarithms to 108,000, and to 1200 to 20 places, some antilogarithms to 20 places, hyperbolic logarithms from 1 to 10 at intervals of -oi and to 1200 at intervals of unity to 7 places, logistic logarithms, log sines and tangents to every second of the first two degrees, and natural and log sines, tangents, secants, and versed sines for every minute of the quadrant to 7 places. The natural functions occupy the left-hand pages and the logarithmic the right-hand. The first six editions, published in Hutton's lifetime (d. 1823), contain Abraham Sharp's 61-figure logarithms of numbers. Olinthus Gregory, who brought out the 1830 and succeeding editions, omitted these tables and Hutton's introduction, which contains a history of logarithms, the methods of constructing them, &c. F. Callet's Tables portatives de loga- rithmes (stereotyped, Paris) seems to have been first issued in 1783, and has since passed through a great many editions. In that of 1853 the contents are seven-figure logarithms to 108,000, Briggian and hyperbolic logarithms to 48 places of numbers to 100 and of primes to 1097, log sines and tangents for minutes (centesimal) throughout the quadrant to 7 places, natural and log sines to 15 places for every ten minutes (centesimal) of the quadrant, log sines and tangents for every second of the first five degrees (sexagesimal) and for every ten seconds of the quadrant (sexagesimal) to 7 places, besides logistic logarithms, the first hundred multiples of the modulus to 24 places and the first ten to 70 places, and other tables. This is one of the most complete and practically useful collections of logarithms

that have been published, and it is peculiar in giving a centesimally divided canon. The size of the page in the editions published in the 19th century is larger than that of the earlier editions, the type having been reset. G. Vega's Tabulae logariihmo-lrigonometricae was first pub- lished in 1797 in two volumes. The first contains seven-figure logarithms to 101,060, log sines, &c, for every tenth of a second to 1', for every second to 1° 30', for every 10" to 6° 3', and thence at intervals of a minute, also natural sines and tangents to every minute, all to 7 places. The second volume gives simple divisors of all numbers up to 102,000, a list of primes from 102,000 to 400,313, hyperbolic logarithms of numbers to 1000 and of primes to 10,000, to 8 places, e x and logiofi* to x = io at intervals of -oi to 7 figures and 7 places respectively, the first nine powers of the numbers from 1 to 100, squares and cubes to 1000, logistic

logarithms, binomial theorem coefficients, &c. Vega also published Manuale logarithmico-trigonometricum (Leipzig, 1800), the tables in which are identical with a portion of those contained in the first volume of the Tabulae. The Tabulae went through many editions, a stereotyped issue being brought out by J. A. Hiilsse {Sammlung mathematischer Tafeln, Leipzig) in one volume in 1840. The contents are nearly the same as those of the original work, the chief difference being that a large table of Gaussian logarithms is added. Vega differs from Hutton and Callet in giving so many useful non-logarithmic tables, and his collection is in many respects complementary to theirs. J. C. Schulze, Neue und erweiterte Sammlung logarithmischer , trigonometrischer , und anderer Tafeln (2 vols. Berlin, 1778), is a valuable collection, and contains seven- figure logarithms to 101,000, log sines and tangents to 2° at intervals of a second, and natural sines, tangents, and secants to 7 places, log sines and tangents and Napierian log sines and tangents to 8 places, all for every ten seconds to 4 and thence for every minute to 45 ,

besides squares, cubes, square roots, and cube roots to iooo, binomial theorem coefficients, powers of e, and other small tables. Wolfram's hyperbolic logarithms of numbers below 10,000 to 48 places first appeared in this work. J. H. Lambert's Supplementa tabularum logarithmicarum et trigonometricarum (Lisbon, 1798) contains a number of useful and curious non-logarithmic tables and bears a general resemblance to the second volume of Vega, but there are also other srrall tables of a more strictly mathematical character. A very useful collection of non-logarithmic tables is contained in Peter Barlow's New Mathematical Tables (London, 1814). It gives squares, cubes, square roots, and cube roots (to 7 places), reciprocals to 9 or 10 places, and resolutions into their prime factors of all numbers from 1 to 10,000, the first ten powers of numbers to 100, fourth and fifth powers of numbers from 100 to 1000, prime numbers from 1 to 100,103, eight-place hyperbolic logarithms to 10,000, tables for the solution of the irreducible case in cubic equations, &c. In the stereotyped reprint of 1840 only the squares, cubes, square roots, cube roots, and reciprocals are retained. The first volume of Shortrede's tables, in addition to the trigonometrical canon to every second, contains antilogarithms and Gaussian logarithms.

F. R. Hassler, Tabulae logarithmicae et trigonometricae (New York, 1830, stereotyped), gives seven-figure logarithms to 100,000, log sines and tangents for every second to 1°, and log sines, cosines, tangents, and cotangents from i° to 3 at intervals of 10" and thence to 45 at intervals of 30". Every effort has been made to reduce the size of the tables without loss of distinctness, the page being only about 3 by 5 inches. Copies of the work were published with the introduction and title-page in different languages. A. D. Stanley, Tables of Logarithms (New Haven, U.S., i860), gives seven-figure logarithms to 100,000, and log sines, cosines, tangents, cotangents, secants, and cosecants at intervals of ten seconds to 1 5 and thence at intervals of a minute to 45° to 7 places,

besides natural sines and cosines, antilogarithms, and other tables. This collection owed its origin to the fact that Hassler's tables were found to be inconvenient owing to the smallness of the type.

G. Luvini, Tables of Logarithms (London, 1866, stereotyped, printed at Turin), gives seven-figure logarithms to 20,040, Briggian and hyperbolic logarithms of primes to 1200 to 20 places, log sines and tangents for each second to 9', at intervals of 10" to 2°, of 30" to 9°, of 1 ' to 45° to 7 places, besides square and cube roots up to 625. The book, which is intended for schools, engineers, &c, has a peculiar arrangement of the logarithms and proportional parts on the pages. Mathematical Tables (W. & R. Chambers, Edinburgh), containing logarithms of numbers to 100,000, and a canon to every minute of log sines, tangents, and secants and of natural sines to 7 places, besides proportional logarithms and other small tables, is cheap and suitable for schools, though not to be compared as regards matter or typography to the best tables described above.

Of six-figure tables C. Bremiker's Logarithmorum VI. decimalium nova tabula Berolinensis (Berlin 1852) is probably one of the best. It gives logarithms of numbers to 100,000, with proportional parts, and log sines and tangents for every second to 5 , and beyond 5 for every ten seconds, with proportional parts. J. Hantschl, Logarithmisch-trigonometrisches Handbuch (Vienna, 1827), gives five- figure logarithms to 10,000, log sines and tangents for every ten seconds to 6 places, natural sines, tangents, secants, and versed sines for every minute to 7 places, logarithms of primes to 15,391, hyperbolic logarithms of numbers to 11 ,273 to 8 places, least divisors of numbers to 18,277, binomial theorem coefficients, &c. R. Farley's Six-Figure Logarithms (London, stereotyped, 1840), gives six-figure logarithms to 10,000 and log sines and tangents for every minute to 6 places.

Coming now to five-figure tables a very convenient little book is Tables of Logarithms (Useful Knowledge Society, London, from the stereotyped

plates of 1839), which was prepared by De Morgan, though it has no name on the title-page. It contains five-figure logarithms to 10,000, log sines and tangents to every minute to 5 places, besides a few smaller tables. J. de Lalande's Tables de logarithmes is a five-figure table with nearly the same contents as De Morgan's, first published in 1805. It has since passed through many editions, and, after being extended from 5 to 7 places, passed

through several more. J. Galbraith and S. Haughton, Manual of Mathematical Tables (London, i860), give five-figure logarithms to 10,000 and log sines and tangents for every minute, also a small table of Gaussian logarithms. J. Houel, Tables de logarithmes ct cinq decimates (Paris, 1 87 1 ; new edition 1907), is a very convenient collection of five-figure tables; besides logarithms of numbers and circular functions, there are Gaussian logarithms, least divisors of numbers to 10,841, antilogarithms, &c. The work (118 pp.) is printed on thin paper. A. Gernerth, Funfstellige gemeine Logarithmen (Vienna, 1866), gives logarithms to 10,800 and a ten-second canon. There are sixty lines on the page, so that the double page contains log sines, cosines, tangents, and cotangents extending over a minute. C. Bremiker, Logarithmisch-trigonometrische Tafeln mil fiinf Decimal- stellen (10th edition by A. Kallius, Berlin, 1906), which has been already referred to, gives logarithms to 10,009 an d a logarithmic canon to every hundredth of a degree (sexagesimal), in a handy volume; the lines are divided into groups of three, an arrangement about the convenience of which there is a difference of opinion. H. Gravelius, Funfstellige logarithmisch-trigonometrische Tafeln fur die Decimalteilung des Quadranten (Berlin, 1886), is a well-printed five-figure table giving logarithms to 10,009, a logarithmic canon to every centesimal minute (i.e. ten-thousandth part of a right angle), and an extensive table (40 pp.) for the conversion of centesimally expressed arcs into

sexagesimally expressed arcs and vice versa. Among the other tables is a four-place table of squares from o to 10 at intervals of ooi with proportional parts. E. Becker, Logarith misch-trigonometrisches Handbuch auf fiinf Decimalen (2nd stereo, ed., Leipzig, 1897), gives logarithms to 10,009 and a logarithmic canon for every tenth of a minute to 6° and thence to 45 for every minute. There are also Gaussian logarithms. V. E. Gamborg, Logaritmetabel (Copenhagen, 1897), is a well-printed collection of tables, which contains a five-figure logarithmic canon to every minute, five-figure logarithms of numbers to 10,000, and five-figure antilogarithms, viz., five-figure numbers answering to four-figure mantissae from •0000 to '9999 at intervals of -oooi. H. Schubert, Funfstellige Tafeln und Gegentafeln (Leipzig, 1896), is peculiar in giving, besides logarithms of numbers and a iogarithmic and natural canon, the three converse tables of numbers answering to logarithms, and angles answering to logarithmic and natural trigonometrical functions. The five-figure tables of F. G. Gauss (Berlin, 1870) have passed through very many editions, and mention should also be made of those of T. Wittstein (Hanover, 1859) and F. W. Rex (Stuttgart, 1884). S. W. Holman, Computation Rules and Logarithms (New York, 1896), contains a well-printed and convenient set of tables including five-figure logarithms of numbers to 10,000 and a five-figure logarithmic canon to every minute, the actual characteristics (with the negative sign above the number) being printed, as in the tables of Dupuis, 1868, referred to above. There is also a four-place trigonometrical canon and four-place anti- logarithms, reciprocals, square and cube roots, &c. G. W. Jones, Logarithmic Tables (4th ed., London, and Ithaca, N.Y., 1893), con- tains a five-place natural trigonometrical canon and a six-place logarithmic canon to every minute, six-place Gaussian and hyper- bolic logarithms, besides a variety of four-place tables, including squares, cubes, quarter-squares, reciprocals, &c. The factor table has been already noticed. It is to be observed that the fourth edition is quite a distinct work from the third,

which contained much fewer tables. J. B. Dale, Five-figure Tables of Mathematical Func- tions (London, 1903), is a book of 92 pages containing a number of small five-figure tables of functions which are not elsewhere to be found in one volume. Among the functions tabulated are elliptic functions of the first and second kind, the gamma function, Legendre's coefficients, Bessel's functions, sine, cosine, and exponential integrals, &c. J. Houel's Recueil de formules el de tables numeriques (Paris, 1868) contains 19 tables, occupying 62 pages, most of them giving results to 4 places; they relate to very varied subjects — anti- logarithms, Gaussian logarithms, logarithms of i+/i — x elliptic integrals, squares for use in the method of least squares, &c. C. Bremiker, Tafel vierstelliger Logarithmen (Berlin, 1874), gives four- figure logarithms, of numbers to 2009, log sines, cosines, tangents, and cotangents to 8° for every hundredth of a degree, and thence to 45° for every tenth of a degree, to 4 places. There are also Gaussian logarithms, squares from o-ooo to 13,500, antilogarithms, &c. The book contains 60 pages. It is not worth while to give a list of four- figure tables or other tables of small extent, which are very numerous, but mention may be made of J. M. Peirce, Mathematical Tables chiefly to Four Figures (Boston, U.S., 1879), 42 pp., containing also hyperbolic functions; W. Hall, Four-figure Tables and Constants (Cambridge, 1905), 60 pp., chiefly for nautical computation; A. du P. Denning, Five-figure Mathematical Tables for School and Laboratory Purposes (12 pp. of tables, large octavo); A. R. Hinks, Cambridge Four-figure Mathematical Tables (12 pp.). C. M. Willich, Popular Tables (London, 1853), is a useful book for an amateur; it gives Briggian and hyperbolic logarithms to 1200 to 7 places, squares, &c, to 343, &c.*

Hyperbolic or Napierian or Natural Logarithms. — The logarithms invented by Napier and explained by him in the Descriptio (1614) were not the same as those now called natural or hyperbolic (viz., to base e) , and very frequently also Napierian, logarithms.

Napierian

logarithms, strictly so called, have entirely passed out of use and are of purely historic interest; it is therefore sufficient to refer to the article Logarithm, where a full account is given. Apart from the inventor's own publications, the only strictly Napierian tables of importance are contained in Ursinus's Trigonometria (Cologne, 1624–1625) and Schulze's Sammlung (Berlin, 1778), the former being the largest that has been constructed. Logarithms to the base e, where e denotes 2–71828 . . ., were first published by J. Speidell, New Logarithmes (1619).

The most copious table of hyperbolic logarithms is Z. Dase, Tafel der natiirlichen Logarithmen (Vienna, 1850), which extends from I to 1000 at intervals of unity and from 1000 to 10,500 at intervals of –i to 7 places, with differences and proportional parts, arranged as in an ordinary seven-figure table. By adding log 10 to the results the range is from 10,000 to 105,000 at intervals of unity. The table formed part of the Annals of the Vienna Observatory for 1 851, but separate copies were printed. The most elaborate table of hyper- bolic logarithms is due to Wolfram, who calculated to 48 places the logarithms of all numbers up to 2200, and of all primes (also of a great many composite numbers) between this limit and 10,009. Wolfram's results first appeared in Schulze's Sammlung (1778). Six logarithms which Wolfram had been prevented from computing by a serious illness were supplied in the Berliner Jahrbuch, 1783, p. 191. The complete table was reproduced in Vega's Thesaurus (1794), where several errors were corrected. Tables of hyperbolic logarithms are contained in the following collections: — Callet, all numbers to 100 and primes to 1097 to 48 places; Borda and Delambre (1801), all numbers to 1200 to II places; Salomon (1827), all numbers^ to 1000 and primes to 10,333 to I0 places; Vega, Tabulae (including Hiilsse's edition, 1840), and Kohler (1848), all numbers to 1000 and primes to 10,000 to 8 places; Barlow (1814), all numbers to 10,000; Hutton, Mathematical Tables, and Willich

(1853), all numbers to 1200 to 7 places; Dupuis (1868), all numbers to 1000 to 7 places. Hutton also gives hyperbolic logarithms from I to 10 at intervals of -oi to 7 places. Rees's Cyclopaedia (1819), art, " Hyperbolic Logarithms," contains a table of hyperbolic logarithms of all numbers to 10,000 to 8 places.

Logarithms to base e are generally termed Napierian by English writers, and natural by foreign writers. There seems no objection to the former name, though the logarithms actually invented by Napier depended on the base e _1 , but it should be mentioned in text-books that so-called Napierian logarithms are not identical with those originally devised and calculated by Napier.

Tables to convert Briggian into Hyperbolic Logarithms, and vice versa. — Such tables merely consist of the first hundred (sometimes only the first ten) multiples of the modulus -43429 44819 . . . and its reciprocal 2-30258 50929 … to 5, 6, 8, 10, ormore places. They are generally to be found in collections of logarithmic tables, but rarely exceed a page in extent, and are very easy to construct. Schron and Bruhns both give the first hundred multiples of the modulus and its reciprocal to 10 places, and Bremiker (in his edition of Vega and in his six-figure tables) and Dupuis to 7 places. C. F. Degen, Tabularum Enneas (Copenhagen, 1824), gives the first hundred multiples of the modulus to 30 places.

Antilogarithms. — In the ordinary tables of logarithms the natural numbers are integers, while the logarithms are incommensurable. In an antilogarithmic canon the logarithms are exact quantities, such as -ooooi, -00002, &c, and the corresponding numbers are incommensurable. The largest and earliest work of this kind is J. Dodson's Antilogarithmic Canon (London, 1742), which gives numbers to 11 places corresponding to logarithms from O to I at intervals of -00001, arranged like a seven-figure logarithmic table, with interscript differences and proportional parts at

the bottom of the page. This work was the only large antilogarithmic canon for more than a century, till in 1844 Shortrede published the first edition of his tables; in 1849 he published the second edition, and in the same year Filipowski's tables appeared. Both these works contain seven-figure antilogarithms: Shortrede gives numbers to logarithms from o to I at intervals of -ooooi, with differences and multiples at the top of the page, and H. E. Filipowski, A Table of Antilogarithms (London, 1849), contains a table of the same extent, the proportional parts being given to hundredths.

Small tables of antilogarithms to 20 places occur in several collections of tables, as Gardiner (1742), Callet, and Hutton. Four- and five-place tables are not uncommon in recent works, as e.g. in Houel (1871), Gamborg (1897), Schubert (1896), Holman (1896).

Addition and Subtraction, or Gaussian Logarithms. — The object of such tables is to give log (a±b) by only one entry when log a and log b are given. Let

A=logx, B = log (1 +*-'), C = log(i+x).

Leaving out the specimen table in Z. Leonelli's Theorie des loga- rithmes additionnels et deductifs (Bordeaux, 1803), in which the first suggestion was made, 1 the principal tables are the following: Gauss, in Zach's Monatliche Correspondenz (1812), gives B and C for argument A from o to 2 at intervals of -ooi, thence to 3-40

1 Leonelli's original work of 1803, which is extremely scarce, was reprinted by J. Houel at Paris in 1875.

at intervals of -oi, and to 5 at intervals of i, all to 5 places. This table is reprinted in Gauss's Werke, vol. iii. p. 244. E. A. Matthies sen, Tafel zur bequemem Berechnung (Altona, 1818), gives B and C to 7 places for argument A from o to 2 at

intervals of -oooi, thence to 3 at intervals of -ooi, to 4 at intervals of -oi, and to 5 at intervals of -i; the table is not conveniently arranged. Peter Gray, Tables and Formulae (London, 1849, and " Addendum," 1870), gives C for argument A from —3 to —I at intervals of -ooi and from — I to 2 at intervals of oooi, to 6 places, with propor tional parts to hundredths, and log (1 — x) for argument A from — 3 to —1 at intervals of -ooi and from I to -18999 at intervals of oooi, to 6 places, with proportional parts. J. Zech, Tafeln der Additions und Subtractions-Logarithmen (Leipzig, 1849), gives B for argument A from o to 2 at intervals of -oooi, thence to 4 at intervals of •001 and to 6 at intervals of -oi ; also C for argument A from o to -0003 at intervals of -ooooooi, thence to -05 at intervals of ■000001 and to -303 at intervals of 00001, all to 7 places, with proportional parts. These tables are reprinted from Hulsse's edition of Vega (1849); the 1840 edition of Hulsse's Vega con tained a reprint of Gauss's original table. T. Wittstein, Loga- rithmes de Gauss d. sept decimates (Hanover, 1866), gives B for argument A from 3 to 4 at intervals of -i, from 4 to 6 at intervals of -01, from 6 to 8 at intervals of -ooi, from 8 to 10 at intervals of oooi, also from o to 4 at the same intervals. In this hand some work the arrangement is similar to that in a seven-figure logarithmic table. Gauss's original five-place table was reprinted in Pasquich, Tabulae (Leipzig, 1817); Kohler, Jerome de la Lande's Tafeln (Leipzig, 1832), and Handbuch (Leipzig, 1848) ; and Galbraith and Haughton, Manual (London, i860). Houel, Tables de loga- rithmes (1871), also gives a small five-place table of Gaussian logarithms, the addition and subtraction logarithms being separated as in Zech. Modified Gaussian logarithms are given by J. H. T. Miiller, Vierslellige Logarithmen (Gotha, 1844), viz., a four-place table of B and —log (1 — x- 1) from A =0 to -03 at intervals of -oooi, thence to -23 at intervals of -ooi, to 2 at intervals of -oi, and to 4 at intervals of -i; and by Shortrede, Logarithmic Tables (vol. i., 1849), viz., a five-place table of B and log (i+x) from ^4=5 to 3 at intervals of -i,

from A =3 to 2-7 at intervals of -oi, to 1-3 at intervals of -ooi, to 3 at intervals of -oi, and to 5 at intervals of i. Filipowski's Antilogarithms (1849) contains Gaussian log arithms arranged in a new way. The principal table gives log (x + 1) as tabular result for log x as argument from 8 to 14 at intervals of ooi to 5 places. Weidenbach, Tafel um den Logarith

men . . . (Copenhagen, 1829), gives log — — for argument A from

-382 to 2-002 at intervals of -ooi, to 36 at intervals of -oi, and to 5'5 a t intervals of -i to 5 places. J. Houel's Recueil de formules et de tables numeriques (2nd ed., Paris, 1868) contains tables of

logio(x-r-i), logioj^p and lo giojT^: Ir ° ra log x= — 5 to —3 at in- tervals of •!, from log x= — 3 to — 1 at intervals of -oi, from log x= —I to o at intervals of -ooi. F. W. Rex (Funfstellige Logarithmen-Tafeln, Stuttgart, 1884) gives also a five-figure table

r 1 l+x

of log ; >

6 I —x

and E. Hammer in his Sechsstellige Tafel der Werthe

fur jeden Wert des Arguments log x (Leipzig, 1902) gives a six- figure table of this function from log x = 7 to 1-99000, and thence to 1-999700 to 5 places. S. Gundelfinger's Sechsstellige Gaussische und siebenstellige gemeine Logarithmen (Leipzig, 1902) contains a table of logio (i+x) to 6 places from log x= —2 to 2 at intervals of -ooi. G. W. Jones's Logarithmic Tables (4th ed., London, and Ithaca, N.Y., 1893) contain 17 pages of Gaussian six-figure tables; the principal of which give log (1 +x) to argument log x from log x= —2 -8o to o at intervals of -ooi, and thence to -1999 at intervals of -oooi, and log (1 — x _1) to argument log x from

log x = -4 to -5 at intervals of -oooi, and thence to 2-8 at intervals of •001. Gaussian logarithms to 5 or 4 places occur in many collec- tions of five-figure or four-figure tables.

_ Quadratic Logarithms. — In a pamphlet Saggio di tavole dei loga- ritmi quadratici (Udjne, 1885) Conte A. di Prampero has described a method of obtaining fractional powers (positive or negative) of any number by means of tables contained in the work. If

h* vr j.t. log log N— log log a

a b = N, then x=— - — j 5 — — »

log b

and if the logarithms are taken to be Briggian and a = iotoVt and £> = 2, then x = logi logio/V/log 2 + 10.

This quantity the author defines as the quadratic logarithm of N and denotes by L„N. It follows from this definition that L«,iV r = LqiV-t-logior/logio2. Thus the quadratic logarithms of N and N' where s is any power (positive or negative) of 2 have the same mantissa.

A subsidiary table contains the values of the constant logi r/logio2 for 204 fractional values of r. The main table contains the values of 1000 mantissae corresponding to arguments N, Ni, Ni, . . . (which all have the same mantissae). Among the argu- ments are the quantities io-o, io-i, 10-2, . . . 99-9 (the interval being -i) and io-oo, io-oi, . . . 10-99 (the interval being -oi). As an example, to obtain the value of I2§ we take from the first table

the constant —0-584962, which belongs to f , and entering the main table with 12 we take out the quadratic logarithm 10-109937 which, by applying the constant, gives 9-524975 the quadratic logarithm of the quantity required.

An appendix (Tavola degli esponenti) gives the Briggian loga- rithms of the first 57 numbers to the first 50 numbers as base,

viz. log x iV for N = 2, 3 57 and x = 2, 3,;;. . ., 50. The results

are generally given to 6 places.

Logistic and Proportional Logarithms.— In most collections of tables of logarithms a five-place table of logistic logarithms for every second to i° is given. Logistic tables give log 3600 — log x at inter- vals of a second, x being expressed in degrees, minutes, and seconds. In Schulze (1778) and Vega (1797) the table extends to # = 3600″ and in Callet and Hutton to x = 528o”. Proportional logarithms for every second to 3° {i.e. log 10,800 — log x) form part of nearly all collections of tables relating to navigation, generally to 4 places, sometimes to 5. Bagay, Tables (1829), gives a five-place table, but such are not often to be found in collections of mathematical tables. The same remark applies to tables of proportional log- arithms for every minute to 24 h , which give to 4 or 5 places the values of log 1440 — log x. The object of a proportional or logistic table, or a table of log a— log x, is to facilitate the calculation of proportions in which the third term is a.

Interpolation Tables. — All tables of proportional parts may be regarded as interpolation tables. C. Bremiker, Tafel der Pro- portionalteile (Berlin, 1843), gives proportional parts to hundredths of all numbers from 70 to 699. Schron, Logarithms, contains an interpolation table giving the first hundred multiples of all numbers from 40 to 410. Sexagesimal tables, already described, are inter- polation tables where the denominator is 60 or 600. Tables of the values of binomial theorem coefficients, which are required when second and higher orders of differences are used, are described below. W. S. B. Woolhouse, On Interpolation, Summation, and the Adjustment of Numerical Tables (London, 1865), contains nine pages of interpolation tables. The

book consists of papers ex- tracted from vols. 11 and 12 of the Assurance Magazine.

Dual Logarithms. — This term was used by Oliver Byrne in his Dual Arithmetic, Young Dual Arithmetician, Tables of Dual Loga- rithms, &c. (London, 1863-67). A dual number of the ascending branch is a continued product of powers of i-i, i-oi, i-ooi, &c, taken in order, the powers only being expressed; thus J, 6,9,7,8 denotes (i-i) 6 (i-oi) 9 (i-ooi) 7 (i-oooi) 8 , the numbers following the J. being called dual digits. A dual number which has all but the last digit zeros is called a dual logarithm; the author uses dual logarithms in which there are seven ciphers between the J. and the logarithm. Thus since 1-00601502 is equal to J. 0,0,0,0,0,0,0,599702 the whole number 599702 is the dual logarithm of the natural number

1-00601502.

A dual number of the descending branch is a continued product of powers of -9, -99, &c. : for instance, (-9) 3 (99) 2 is denoted by '3 '2 |. The Tables, which occupy 112 pages, give dual numbers and log arithms, both of the ascending and descending branches, and the corresponding natural numbers. The author claimed that his tables were superior to those of common logarithms.

Constants. — In nearly all tables of logarithms' there is a page devoted to certain frequently used constants and their logarithms, such as ir, tv 1 , 7t 2 , Vir. A specially good collection is printed in W. Templeton's Millwright's and Engineer's Pocket Companion (cor- rected by S. Maynard, London, 1871), which gives 58 constants involving w and their logarithms, generally to 30 places, and 13 others that may be properly called mathematical. A good list of constants involving w is given in Salomon (1827). A paper by G. Paucker in Grunert's Archiv (vol. i. p. 9) has a number of constants involving x given to a great many places, and Gauss's memoir on the lemmscate function (Werke, vol. iii.) has e~, e~i", e-i", &c, calculated to about 50 places. The*

quantity x has been worked out to 707 places (Shanks, Proc. Roy. Soc, 21, p. 319).

J. C. Adams has calculated Euler's constant to 263 places (Proc. Roy. Soc, 27, p. 88) and the modulus -43429 … to 272 places (Id. 42, p. 22). The latter value is quoted in extenso under Logarithm. J. Burgess on p. 23 of his paper of 1888, referred to under Tables of e x , has given a number of constants involving jr and p (the constant -476936 . . . occurring in the Theory of Errors), and their Briggian logarithms, to 23 places.

Tables for the Solution of Cubic Equations. — Lambert, Supplementa (1798), gives ±(x-x 3) from x = -ooi to 1-155 as intervals of -ooi to 7 places, and Barlow (1814) gives x s —x from x=i to 1-1549 at intervals of -oooi to 8 places. Very extensive tables for the solution of cubic equations are contained in a memoir " Beitrage zur Auflosung hoherer Gleichungen " by J. P. Kulik in the Abh. der k. Bohm. Ges. der Wiss. (Prague, i860), 11, pp. 1-123. The principal tables (pp. 58-123) give to 7 (or 6) places the values of ± (x-x 3) from x = o to x = 3-28oo at intervals of -ooi. There are also tables of the even and uneven determinants of cubic equations, &c. Other tables for the solution of equations are by A. S. Guldberg in the Forhand. of the Videns-Selskab of Christiania for 1871 and 1872 (equations of the 3rd and 5th order), by S. Gundelfinger, Tafeln zur Berechnung der reellen Wurzeln samtlicher trinomischen Gleichungen (Leipzig, 1897), which depend on the use of Gaussian logarithms, and by R. Mehme, Schlbmilch's Zeitschrift, 1898, 43, p. 80 (quadratic equations).

Binominal Theorem Coefficients. — Tables of the values of .v(.r— I) , x{x — i)(x — 2) x(x — i) . . . (.r — 5)

12 1.2.3 ' 1 .2 … 6

from x = -oi to x = l at intervals of oi to 7 places

(which are useful in interpolation by second and higher orders of differences), occur inSchulze (1778), Barlow (1814), Vega (1797 and succeeding editions), Hantschl (1827), and Kbhler (1848). W. Rouse, Doctrine of Chances (London, n.d.), gives on a folding sheet (a-b) n for re = 1, 2,. . .20.

H. Gylden (Recueil des Tables, Stockholm, 1880) gives binomial coefficients to re = 40 and their logarithms to 7 places. Lambert, Supplementa (1798), has the coefficients of the first 16 terms in (1 +.r)* and (1 —x)l, their values being given accurately as decimals.

TABLE, MATHEMATICAL

Vega (1797) has a page of tables giving

2.4' 2.4.6'

i

2.3'

and

similar quantities to 10 places, with their logarithms to 7 places, and a page of this kind occurs in other collections. Kohler (1848) gives the values of 40 such quantities.

Figurate Numbers. — Denoting re(re-fi) . . . (n+i — i)/t! by [n]i, Lambert, Supplementa, 1798, gives [n]i from re = 1 to re = 30 and from i = i to 1 = 12; and G. W. Hill (Amer. Jour. Math., 1884, 6, p. 130) gives logi [»]» for n = \, $, f, }, f, and from i = \ to i = jo.

Trigonometrical Quadratic Surds. — The surd values of the sines of every third degree of the quadrant are given in some tables of logarithms; e.g., in Hutton’s (p. xxxix., ed. 1855), we find sin 3 =i{V(5 + V5) + W- + V$-V(i5+3V5)-Vi-Vil; and the numerical values of the surds V (5 + V5), V(-V), &c, are given to 10 places. These values were extended to 20 places by Peter Gray, Mess, of Math., 1877, 6, p.

Circulating Decimals. — Goodwyn's tables have been described already. Several others have been published giving the numbers of digits in the periods of the reciprocals of primes: Burckhardt, Tables des diviseurs du premier million (Paris, 1814–1817), gave one for all primes up to 2543 and for 22 primes exceeding that limit. E. Desmarest, Theorie des nombres (Paris, 1852), included all primes up to 10,000. C. G. Reuschle, Mathematische Abhandlung, enlhaltend neue zahlentheoretische Tabellen (1856), contains a similar table to 15,000. This W. Shanks extended to 60,000; the portion from 1 to 30,000 is printed in the Proc. Roy. Soc, 22, p. 200, and the remainder is preserved in the archives of the society (Id., 23, p. 260 and 24, p. 392). The number of digits in the decimal period of lip, is the same as the exponent to which 10 belongs for modulus p, so that, whenever the period has p — l digits, 10 is a primitive root of A. Tables of primes having a given number, re, of digits in their periods, i.e. tables of the resolutions of 10™ — I into factors and, as far as known, into prime factors, have been given by W. Looff (in Grunerts Archiv, 16, p. 54; reprinted in Nouv. annates, 14, p. 115) and by Shanks (Proc. Roy. Soc, 22, p. 381). The former extends to re = 60 and the latter to re = 100, but there are gaps in both. Reuschle's tract also contains resolutions of 10" — 1.

There is a similar table by C. E. Bickmore in Mess, of Math., 1896, 2 5> P- 43- A full account of all tables connecting re and p where io n = 1, mod p, 10™ being the least power for which this congruence holds good, is given by Allan Cunningham (Id., 1904, 33, p. 145). The paper by the same author, " Period-lengths of Circulates " (Id. 1900, 29, p. 145) relates to circulators in the scale of radix a. See also tables of the resolutions of a" — I into factors under Tables relating to the Theory of Numbers (below). Some further references on circulating decimals are given in Proc. Camb. Phil. Soc, 1878, 3, p. 185.

Pythagorean Triangles. — Right-angled triangles in which the sides and hypothenuse are all rational integers are frequently termed Pythagorean triangles, as, for example, the triangles 3, 4, 5, and 5, 12, 13. Schulze, Sammlung (1778), contains a table of such triangles subject to the condition tan \oiy £%(<> being one of the acute angles). About 100 triangles are given, but some occur twice. Large tables of right-angled rational triangles were given by C. A. Bretschneider, in Grunerts Archiv, 1841, I, p. 96, and by Sang, Trans. Roy. Soc. Edin., 1864, 33, p. 727. In these tables the triangles are arranged according to hypothenuses and extend to 1201, 1200, 49, and 1 105, 1073, 26 4 respectively. W. A. Whitworth, in a paper read before the Lit. and Phil. Society of Liverpool in 1875, carried his list as far as 2465, 2337, 784. See also H. Rath, " Die rationalen Dreiecke," in Grunert's Archiv, 1874, 56, p. 188. Sang's paper also contains a table of triangles having an angle of 120° and their sides integers.*

Powers of v. — G. Paucker, in Grunert's Archiv, p. 10, gives x -1 and jt5 to 140 places, and ir 2 ,!,^, x3 to about 50 places; J. Burgess (Trans. Roy. Soc. Edin., 1898, 39, II., No. 9, p. 23) gives (\w)-\, 2jji~5, and some other constants involving it as well as their Briggian logarithms to 23 places, and in Maynard's list of constants (see Constants, above) x 2 is given to 31 places. The first twelve powers of 7r and jr _1 to 22 or more places were given by Glaisher, in Proc. Lond. Math. Soc, 8, p. 140, and the first hundred multiples of t and r~ l to 12 places by J. P. Kulik, Tafel der Quadrat- und Kubik-Zahlen (Leipzig, 1848).*

The Series i _n +2 _ "+3 _ "l&c. — Let S'n, s„,

i~"+3~"+5 _n + &c. Legend re (Traite des fonctions elliptiques, vol. 2, p. 432) computed S n to 16 places from re = i to 35, and Glaisher (Proc. Lond. Math. Soc, 4, p. 48) deduced i„and

15 places (Compte rendu de I'Assoc. Francaise, 1878, p. 172).

C. W. Merrifield (Proc. Roy. Soc, 1881, 33, p. 4) gave the values of log,, S n and 2„ for re = 1,2,3,..., 35 to 15 places, and Glaisher (Quar. Jour. Math., 1891, 25, p. 347) gave the values of the same quantities for re = 2,4,6,. . . , 80 to 24 places (last figure uncertain). Merrifield's table was reprinted by J. P. Gram on p. 269 of the paper of 1884, referred to under Sine-integral, &c, who also added the values of logio S„ for the same arguments to 15 places. An error in S3 in Merrifield's table is pointed out in Quar. Jour. Math., 2 5» P- 373- This quantity is correctly given in Gram's reprint. T. J. Stieljes has greatly extended Legendre's table of S n . His table (Acta math., 1887, 10, p. 299) gives S n for all values of re up to re = 70 to 32 places. Except for six errors of a unit in the last figure he found Legendre's table to be correct. Legendre's table was re-printed in De Morgan's Diff. and Int. Calc (1842), p. 554. Various small tables of other series, involving inverse powers of prime numbers, suchas 3-" — 5 _ »+7 _ "ii" — 13™. .., are given in vols. 25 and 26 of the Quar. Jour. Math.

Tables of e x and e~ x , or Hyperbolic Antilogarithms. — The largest tables are the following: C. Gudermann, Theorie der potenzial- oder cyklisch-hyperbolischen Functionen (Berlin, 1833), which consists of papers reprinted from vols. 8 and 9 of Crelle's Journal, and gives logio sinh x, logio cosh x, and logio tanh x from x = 2 to 5 at intervals of -ooi to 9 places and from x = 5 to 12 at intervals of -oi to 10 places. Since sinh x = \(e x — er x) and cosh x = i(e x +er x), the values of e x and e~' are deducible at once by addition and subtraction. F. W. Newman, in Camb. Phil. Trans., 13, p. 145, gives values of e~ x from x=o to 15-349 at intervals of -ooi to 12 places, from

- = 'S^o to 17-298 at intervals of -002, and from x= 17-300 to 27-635 at intervals of -005, to 14 places. Glaisher, in Camb. Phil. Trans., 13, p. 243, gives four tables of e x , e' x , logio e x , logio er x , their ranges being from x = -ooi to -i at intervals of -ooi, from -oi to 2

at intervals of -oi, from -I to 10 at intervals of -I, from 1 to 500 at intervals of unity. Vega, Tabulae (1797 and later ed.), has logio e*to 7 places and «*to 7 figures from x = -oi to 10 at intervals of -oi. Kohler's Handbuch contains a small table of e x . In Schulze's Sammlung (1778) e x is given for x = l, 2, 3,. . . 24 to 28 or 29 figures and for

1. = 25, 30, and 60 to 32 or 33 figures; this tafjle is reprinted in Glaisher's paper (loc. cit.). In Salomon's Tafeln (1827) the values of e", 00 ", . . . e 000000 ", where re has the values I, 2, ...9, are given to 12 places. Bretschneider, in Grunert's Archiv, 3, p. 33, gavee* and e~ x and also sin x and cos x for x = i, 2,. . .10 to 20 places, and J. P. Gram (in his paper of 1884, referred to under Sine-integral, &c), gives e x for x = io, 11,. . .20 to 24 places, and from x = 7 to x = 20 at intervals of 0-2 to 10, 13, 14, or 15 places. J. Burgess (Trans. Roy. Soc. Edin., 1888, 39, II. No. 9) has given (p. 26)

the values of er x and ^j-e~ x for x = J and for x = i, 2,. . ., 10 to 30

places. In the same paper he also gives the values of y— e~ x2 from

x = to x = 1 -250 to 9 places, and from x = 1 -25 to x = I -50 at intervals of 01, and thence at various intervals to x = 6 to 15 places, and the

values of logio y-e -l! from x = i tc x = 3 at intervals of -ooi to

16 places.

Factorials. — The values of logio (re!), where re! denotes 1.2.3… re, from re = I to 1200 to 18 places, are given by C. F. Degen, Tabu- larum Enneas (Copenhagen, 1824), and reprinted, to 6 places, at the end of De Morgan's article " Probabilities " in the Encyclopaedia Metropolitana. Shortrede, Tables

(1849, vol. i.), gives log (re!) to re = 1000 to 5 places, and for the arguments ending in o to 8 places. Degen also gives the complements of the logarithms. The first 20 figures of the values of reXre! and the values of —log (reXre!) to 10 places are given by Glaisher as far as re = 71 in the Phil. Trans. for 1870 (p. 370), and the values of i/re! to 28 significant figures as far as re = 50 in Camb. Phil. Trans., 13, p. 246.

Bernoullian Numbers. — The first fifteen Bernoullian numbers were given by Euler, Inst. Calc. Diff., part ii. ch. v. Sixteen more were calculated by Rothe, and the first thirty-one were published by M. Ohm in Crelle's Journal, 20, p. II. J. C. Adams calculated the next thirty-one, and a table of the first sixty-two was published by him in the Brit. Ass. Report for 1877 and in Crelle's Journal, 85, p. 269. In the Brit. Ass. Report the numbers are given not only as vulgar fractions, but also expressed in integers and circulating decimals. The first nine figures of the values of the first 250 Ber- noullian numbers, and their Briggian logarithms to 10 places, have been published by Glaisher, Camb. Phil. Trans., 12, p. 384.

Tables of log tan (\ir-- %). — C. Gudermann, Theorie der potenzial- oder cyklisch-hyperbolischen Functionen (Berlin, 1833), gives (in 100 pages) log tan (iir+i) for every centesimal minute of the quadrant to 7 places. Another table contains the values of this function.

TABLE, MATHEMATICAL

»lso at intervals of a minute, from 88° to ioo° (centesimal) to II places. A. M. Legendre, Traite des fonctions elliptiques (vol. ii. P; 256), gives the same function for every half degree (sexagesimal) of the quadrant to 12 places.

The Gamma Function. — Legendre's great table appeared in vol. ii. of his Exercices de calcul integral (1816), p. 85, and in vol. ii. of his Traite des fonctions elliptiques (1826), p. 489. Log

i0 r(x) is given from x = i to 2 at intervals of -ooi to 12 places, with differences to the third order. This table is reprinted in full in O. Schlomilch Analyhsche Studien (1848), p. 183; an abridgment in which the arguments differ by -oi is given by De Morgan, Diff. and Int. Calc, p. 587. The last figures of the values omitted are also supplied, so that the full table can be reproduced. A seven-place abridgment (without differences) is published in J. Bertrand, Calcul integral (1870), p. 285, and a six-figure abridgment in B. Williamson, Integral Calculus (1884), p. 169. In vol. i. of his Exercices (181 1), Legendre had previously published a seven-place table of logio T(x), without differences.

Tables connected with Elliptic Functions. — Legendre published elaborate tables of the elliptic integrals in vol. ii. of his Traite des fonctions elliptiques (1826). Denoting the modular angle by the amplitude by 0, the incomplete integral of the first and second kind by F() and Fi(), and the complete integrals by K and E the tables are:— (1) logio-E and \og w K from 0=o° to 90° at intervals of o -i to 12 or 14 places, with differences to the third order; (2) /SiWO and F(), the modular angle being 45 , from =o" to 90 at intervals of o°-5 to 12 places, with differences to the fifth order- (3) ^1(45) and F (45) from 0=0° to 90° at intervals of i°, with differences to the sixth order, also E and K for the same arguments all to 12 places; (4) E,fo) and F(

Tables involving q.~ P. F. Verhulst, Traite des fonctions elliptiques (Brussels, 1841) contains a table of \og i

*Legendrian Coefficients (Zonal Harmonies). — The values of P»(x) J?, r \ =I '. 2 ' >: • •/ fr ° m * = o to 1 at intervals of -oi are given bv Glaisher m Brit Ass. Rep., 1879, pp. 54-57. The functions tabulated arei»**()=**, P 2 (x) = § 3* 2 -l), P 3 (x) =- J-(5 **»_-, 3c) l p l f x \ =i(.. x 4_ 3^+i),P^**) = t(6^- 7 o^ + i5x)>(i A (| 3I ; >_^ jei*

~5). Fix) =M^9× 7 -(>93x i +3i 5 × 3 - 35 x).

Ihe values of /""(cos 0) for m = i, 2,. . .7 for 0=0° i° 2° 90 ° to 4 places are given by J. Perry in the Proc. Ph'ys. Soc'.' 1892 11, p. 221, and in the Phil. Mag., 1891, ser. 6, 32, p 512 The functions P" occur in connexion with the theory of interpolation the attraction of spheroids, and other physical theories

Vessel's Functions. — F. W. Bessel's original table appeared at the end of his memoir, Untersuchung des planetarischen Teils der btorungen, welche aus der Bewegung der Sonne entstehen " (in Abh.d. Berl. Akad 1824; reprinted in vol. i. of his Abhandlungen, p. 84). It gives J (x) and Jjtx) from x = o to 3-2 at intervals of oi More extensive tables were calculated by P. A. Hansen in " Ermit telung der absoluten Storungen in Ellipsen von beliebiger Excen- tncitat und Neigung ' (in Schriften der Sternwarte Seeberg, part i Ootha, 1843). They include an extension of Bessel's original table to x = 20, besides smaller tables of /„(*) for certain values of n as ^ r c a l." = -, ,' ■ t°. 7 P laces - Hansen's table was reproduced by O Schlomilch in Zeitschr.fur Math., 2, p. 158, and by E. Lommel, Studien uber die Bessel schen Functionen (Leipzig 1868) p 127 Hansen s notation is slightly different from Bessel's; the change amounts to halving each argument. Schlomilch gives the table in Hansen s form ; Lommel expresses it in Bessel's

Lord Rayleigh's Theory of Sound (1894), 1, p. 321, gives /„(**) and -/,(**) from x = o to x = i 3 - 4 at intervals of 01 to 4 places, taken £°™ p° m J"? L ,^ large , table of the same functions was given by E. D. 1- . Meissel in the Abh. d. Berlin Akad. for 1888 (published also separately). It contains the values of /„(*) and /,(x) from x=o to fiT V>' 5 °. at '.ntervals of -oi. A. Lodge has calculated the values of the function I n (x) where

/.(*)

'J

' {ix ^=£]

i+;

T +

2 (2» +2) + 2 -4. (2M +2) (2» +4)

+ ...

*His tables give I„(x) for « = o, I, 2,. . ., n from x = o to * = 6 at intervals of 0-2 to n or 12 places {Brit. Ass. Rep., 1889, p. 29) I-Ax) and I (x) from x=o to x = 5-ioo at intervals of ooi to 9 places (Id. 1893, P 229, and 1896, p. 99), and of Uxyji) from x=o tc I x = 6 at intervals of 0-2 (Id., 1893, p. 228) to 9 places. In all the tables*

the last figure is uncertain. Subsidiary tables for the calculation of Bessel's functions are given by L. N. G. Filon and A. Lodge in Brit. Ass. Rep., 1907, p. 94. The work is being continued, the object being to obtain the values of J„(x) for n = o, J, 1, ij,. 6J. A table by E. Jahnke has been announced, which, besides tables of other mathematical functions, is to contain values of Bessel's functions of order i and roots of functions derived from Bessel's functions.

Sine, Cosine, Exponential, and Logarithm Integrals. — The func- tions so named are the integrals C” sm x dx, (cos x dx f” e ldx*

r dx U x J ” x ‘ J –° X ‘*

*J logic’ whlch are denoted b y the functional signs Si x, Ci x, Ei x, li * respectively, so that Ei x = li e*. J. von Soldner, Theorie et tables dune nouvelle fonction transcendante (Munich, 1809), gave the values of li x from x = o to 1 at intervals of –i to 7 places, and thence at various intervals to 1220 to 5 or more places. This table is reprinted in De Morgan’s Diff. and Int. Calc, p. 662. • Bretschneider in Grunert’s Archiv, 3, p. 33, calculated Ei (= z), Si x, Ci x for x = I 2' ... 10 to 20 places, and subsequently (in Schlomilch’s Zeitschrift ‘ 6) worked out the values of the same functions from 1 = to 1 at intervals of –01 and from I to 7–5 at intervals of –i to 10 places Two tracts by L. Stenberg, Tabulae logarithmi integralis (Malmo part i 1861 and part ii. 1867), give the values of li 10* from x = – 1 5 to 3–5 at intervals of –oi to 18 places. Glaisher, in Phil. Trans. 1870 p 367 gives Ei (=x), Si x, Ci x from * = oto 1 at intervals of –oi to 18 places, from x = i to 5 at intervals of i and thence to 15 at intervals of unity, and for x = 20 to 11 places, besides seven place tables of bi x and Ci x and tables of their maximum and minimum values. See also Bellavitis, ” Tavole numeriche logaritmo–integrale ” (a paper in. Memoirs of the Venetian Institute, 1874). F. W. Bessel calculated the values of li 1000, li 10,000, li 100,000, li 200 000 li 600,000, and li 1,000,000 (see Abhandlungen, 2 p 339) ‘in Glaisher, Factor Table for the Sixth Million (1883), § iii., the values of h x are given from x = o to 9,000,000 at intervals of 50 000 to the nearest integer. J. P. Gram in the publications of the Copenhagen Academy, 1884, 2, No. 6 (pp. 268–272), has given to 20 places the values of Ei * from * = io to * = 20 at intervals of a unit (thus carry- ing Bretschneider s table to this extent) and to 8, 9, or 10 places the values of the same function from x = 5 to x = 2 o at intervals of 0–2 (thus extending Glaisher s table in*

the Phil. Trans.).

Values of^e-^dx and e*> j~* er>*dx.— These'functions are em- ployed in researches connected with refractions, theory of errors, conduction of heat, &c. Letj"^ er*Hx and f" e^Hx be denoted by erf x and erfc * respectively, standing for ""error function " and error tunction complement," so that erf x+erfc x = \^j v (Phil Mag Dec. 1871; it has since been found convenient to transpose as above the definitions there given of erf and erfc). Th*> tables of the functions, and of the functions multiplied by e* 2 , are as follows C. Kramp, Analyse des Refractions (Strasbourg, 1798), has erfc x from x=o to 3 at intervals of -oi to 8 or more places, also log 10 (erfc x) and logio (e* 2 erfc *) for the same values to 7 places. F W Bessel Fundamenta astronomiae (Konigsberg, 1818), has logio (e l2 erfc x) from x=*o to I at intervals of -oi to 7 places, likewise for argument log 10 x the arguments increasing from o to 1 at intervals of -oi A m' Legendre Traite des fonctions elliptiques (1826), 2, p. 520, contains r(5 , e-x*), that is, 2 erfc * irom x = o to -5 at intervals of -oi to 10

places. J. F. Encke, Berliner ast. Jahrbuch for 1834, gives J- erf x

't from x =0 to 2 at intervals of -oi to 7 places and ~ erf (px) from

3C = o to 3-4 at intervals of -oi and thence to 5 at intervals of -i to 5, places, p being -4769360. Glaisher, in Phil. Mag., December 1871 gives erfc x from z = 3 to 4-5 at intervals of oi to 11, 13, or 14 places' Encke s tables and two of Kramp's were reprinted in the Encyclo paedia Metropolitan, art. " Probabilities." These tables have also been reprinted in many foreign works on probabilities, errors of observations, &c. In vol 2 (1880) of his Lehrbuch zur Bahnbestim- mung der Kometen und Planeten T. R. v. Oppolzer gives (p 587) a table of erf x from x = o to 4-52 at intervals of -oi to 10 places, and (p. 603) a table of ~ erf x from x = o to 2 at intervals of oi to 5 places. Both tables

were the result of original calculations. A verv large table of logio f 2 erfc * was calculated by R. Radau and published in the Annates de I observatoire de Paris (Memoires, 1888 18 B i 2 <^ It contains the values of logio e** erfc * from *= -0-120 to i'- 000 at intervals of -ooi to 7 places, with differences. A. Markoff in a

separate publication, Table des valeurs de Vintegrale f e~ l Ht (St

Petersburg, 1888), gives erfc x from x = o to 3 at intervals of -ooi and from x = 3 to 4-80 at intervals of -oi, with first, second, and third differences to 11 places. He also gives a table oi— erf x from x = o to x = 2-499 at intervals of -ooi and thence to 3-79 at intervals of -oi. J. Burgess, Trans. Roy. Soc. Edin., 1888, 39, II., No. y,

published very extensive tables of ^ erf x, which were entirely

the result of a new calculation. His tables give the values of this function from 1=0 to 1-250 at intervals of -ooi to 9 places with first and second differences, from jc = i to 3 at intervals of -ooi to 15 places with differences to the fourth order, and from # = 3 to 5 at intervals of -i to 15 places. He also gives erfc x fromx = oto x = 5 at intervals of -I to 15 places. B. Kampfe in Wundt's Phil.

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Stud., 1893, p. 147, gives r erf * from x = o to x = 1-509 at intervals

of -ooi, and from x = l-5o to x = 2-88 at intervals of -oi to 4 places. G. T. Fechner's Elemente der Psychophysik (Leipzig, i860) contains (pp. 108, no) some small four-place tables connecting rjn (as argu- ment) and hD where - = iH — 7— erf — -. A more detailed account of

tables of erf x, e 12 erf x, &c., is given in Mess, of Math. ,1908,, 38, p. 117.

Values

*f.'

^dx. — The values of this integral have been calcu-

lated by H. G. Dawson from 3C = oto3C = 2to7 places (last figure uncertain). The table is published in the Proc. Lond. Math. Soc, 1898, 29, p. 521.

Tables of Integrals, not Numerical. — Meyer Hirsch, Integral- tafeln (1810; Eng. trans., 1823), and Minding, Integraltafeln (Berlin, 1849), give values of indefinite integrals and formulae of reduction; both are useful and valuable works. De Haan, Nouvelles tables d'integrales definies (Leyden, 1867), is a quarto volume of 727 pages containing evaluations of definite integrals, arranged in 485 tables. The first edition appeared in vol. 4 of the Transactions of the Amsterdam Academy of Sciences. This edition, though not so full and accurate as the second, gives references to the original memoirs in which the different integrals are considered. B. O. Peirce's A Short Table of Integrals (Boston, U.S.A., 1899) contains integrals, formulae, expansions, &c, as well as some four- place numerical tables, including those of hyperbolic sines and cosines and their logarithms.

Tables relating to the Theory of Numbers. — These are of so technical a character and so numerous that a comprehensive account cannot be attempted here. The reader is referred to Cayl'ey's report in the Brit. Ass. Rep. for 1875, p. 305, where a full description with references is given. Three tables published before that date may, however, be briefly noticed on account of their importance and because they form separate volumes: (1) C. F. Degen, Canon Pellianus (Copen- hagen, 1817), relates to the indeterminate equation j> 2 — ax 2 = i for values of

a from 1 to 1000. It in fact gives the expression for Vo as a continued fraction; (2) C. G. J. Jacobi, Canon arithmeticus (Berlin, 1839), is a quarto work containing 240 pages of tables, where we find for each prime up to 1000 the numbers corresponding to given indices and the indices corresponding to given numbers, a certain primitive root (10 is taken whenever it is a primitive root) of the prime being selected as base; (3) C. G. Reuschle, Tafeln com- plexer Primzahlen, welche aus Wurzeln der Einheil gebildet sind (Berlin, 18, 5), includes an enormous mass of results relating to the higher complex theories.

*Passing now to tables published since the date of Cayley's report, the two most important works are (1) Col. Allan Cunningham's Binary Canon, (London, 1900), a quarto volume similar in construction, arrangement, purpose, and extent to Jacobi's Canon arithmeticus, but differing from it in using the base 2 throughout, i.e. in Jacobi's Canon the base of each table is always a primitive root of the modulus, while in Cunningham's it is always 2. The latter tables in fact give the residues R ot 2 1 (where x = o, 1, 2, . . .) for every prime p or power of a prime, p", up to 1000, and also the indices x of 2', which yield the residues R to the same moduli. This work contains a list of errors found in the Canon arithmeticus. (2) The same author's Quadratic Partitions (London, 1904). These tables give for every prime p up to 100,000 the values of a, b; c, d; A, B; and L, M where p=a 2 +V=c i +2d?=A i + i > B 2 = \{I?+2jM i). They also give e, f where p = e 2 — 2f i up to 25,000 and resolutions of p into the forms * 2 -5:y 2 . i(A' 2 5F 2), P+7« 2 , K" 2 + nw 2), A'^B' 2 , x'+sy' 1 , G>+6H 2 , G' 2 -6H'\ /' 2 -7m' 2 , ? + inw/ 2 up to 10,000; as well as the least solutions of t 2 — Z)d 2 ==i up to D = ioo and least solutions of other similar equations. A complete list of errata in the previous partition tables of Jacobi, Reuschle, Lloyd Tanner, and in this table is given by Allan Cunningham in Mess, of Math., 1904, 34, p. 132. The resolution of a n — 1 into its numerical factors is*

treated in detail by C. E. Bickmore in Mess. of Math., 1896, 25, p. I, and 1897, 26, p. 1. On p. 43 of the former volume he gives a table of the known factors of a” — I for = 2, 3, 5, 6, 7, 10, n, 12 and from » = i to w = 50. Other papers on the same subject contained in the same periodical are by Allan Cun ningham, 1900, 29, p. 145; 1904, 33, p. 95; and F. B. Escott, ibid., p. 49. These papers contain references to other writings. Tables of the resolutions of io n — 1 are referred to separately in this article under Circulating Decimals. If a 1 is the smallest power of a for which the congruence a x =.i (mod. p) is satisfied, then a is said to belong to the exponent x for modulus p, and x may be called the chief exponent (Haupt-exponent by Allan Cunningham) of the base a for the modulus p; so that (1) this exponent is the number of figures in the circulating period of the fraction \jp in the scale of radix a, and (2) when x = p — i, a is a primitive root of p. In Mess. of Math., 1904, 33, p. 145, Allan Cunningham has given a complete list of Haupt-exponent tables with lists of errata in them; and in

Quar. Jour. Math., 1906, 37, p. 122, he gives a table of Haupt- exponents of 2 for all primes up to 10,000. In Acta Math. (1893, : 7- P- 3 X 5; I 897, 20, p. 153; 1899, 22, p. 200) G. Wertheim has given the least primitive root of primes up to 5000. The follow- ing papers contain lists of high primes or factorizations of high numbers: Allan Cunningham, Mess, of Math., 1906, 35, p. 166 (Pellian factorizations); 1907, 36, p. 145 (Quartan factorizations); 1908, 37, p. 65 (Trinomial binary factorizations) ; 1909, 38, pp. 81, 145 (Diophantive factorization of quartans); 1910, 39, pp. 33, 97; 1911, 40, p. 1 (Sextan factorizations) ; 1902, 31, p. 165; I 9°5> 34> P- 7 2 (High primes). The last three are joint papers by Cunningham and H. J. Woodall. Tables relating to the distri- bution of primes are contained in the introduction to the Sixth Million (see under Factor Tables), in J. P. Gram’s paper on the number of primes inferior to a given limit in the Vidensk. Selsk. Skr., 1884, II. 6, Copenhagen, and in Mess, of Math., 1902, 31, p.

172. A table of x(n), the sum of the complex numbers having n for rorm, for primes and powers of primes up to n = 13,000 by Glaisher, was published in Quar. Jour. Math., 1885, 20, p. 152, and a seven-piace

table of f(x) and logio f(x), where f(x) denotes |-|-f • • — — > the

denominators being the series of prime numbers up to 10,000, in Mess, of Math., 1899, 28, p. I.

Bibliography. — Bibliographical and historical information re- lating to tables is collected in Brit. Ass. Rep. for 1873, p. 6. The prin- cipal works are: — J. C. Heilbronner, Historia Matheseos (Leipzig, 1742), the arithmetical portion being at the end . J. E. Scheibel,£inW- tung zur mathematischen Biicherkenntniss (Breslau, 1771-84); A. G. Kastner, Geschichte der Mathematik (Gottingen, 1 796-1 800), vol. iii. ; F. G. A. Murhard, Bibliotheca Maihematica (Leipzig, 1797-1804), vol. ii. ; J. Rogg, Bibliotheca Maihematica (Tubingen, 1830), and continuation from 1830 to 1854 by L. A. Sohnke (Leipzig and London, 1854); J. de Lalande, Bibliographic astronomique (Paris, 1803), a separate index on p. 960. A great deal of information upon early tables is given by J. B. J. Delambre, Histoire de V astronomie moderne (Paris, 1821), vol. i. ; and in Nos. xix. and xx. of C. Hutton's Mathematical Tracts (1812). For lists of logarithmic tables of all kinds see De Haan, Verslagen en Mededeelingen of the Amster- dam Academy of Sciences (Abt. Natuurkunde) 1862, xiv. 15, and Verhandelingen of the same academy, 1875, xv. separately paged.

De Morgan's article " Tables," which appeared first in the Penny Cyclopaedia, and afterwards with additions in the English Cyclo- paedia, gives not only a good deal of bibliographical information, but also an account of tables relating to life assurance and annuities, astronomical tables, commercial tables, &c.

Reference should also be made to R. Mehmke's valuable article " Numerisches Rechnen " in vol. i.

pt. ii. pp. 941–1079 of the Encyk. der math. Wiss. (Leipzig, 1900–4), which besides tables includes calcu- lating machines, graphical methods, &c. (J. W. L. G.)

TABLE MOUNTAIN (Dutch Tafelberg), a name frequently given in South Africa to flat-topped hills and mountains, there a characteristic feature of the scenery. Occasionally such hills are called plat, i.e. flat, bergen. Specifically Table Mountain is the mountain which arises behind Table Bay, in the Cape Peninsula, Cape Town lying at its seaward base and on its adjacent lower slopes. The mountain forms the northern end of a range of hills which terminates southward in the Cape of Good Hope. The northern face of the mountain, overlooking Table Bay, extends like a great wall some two miles in length, and rises precipitously to a height of over 3500 ft. The face is scored with ravines, a particularly deep cleft, known as The Gorge, affording the shortest means of access to the summit. East and west of the mountain and a little in advance of it are lesser hills, the Devil's Peak (3300 ft.) being to the east and Lion's Head (2100 ft.) to the west. Lion's Head ends seaward in Signal Hill (1100 ft.). The western side of Table Mountain faces the Atlantic, and is flanked by the hills known as The Twelve Apostles; to the south Hout's Bay Nek connects it with the remainder of the range; on the east the mountain overlooks the Cape Flats. On this side its slopes are less steep, and at its foot are Rondebosch, Newlands, Wynberg, and other residential suburbs of Cape Town. The ascent of the mountain from Wynberg by Hout's Bay Nek is practicable for horses. The surface of the summit (the highest point is variously stated at 3549, 3582 and 3850 ft.) is broken into small valleys and hills, and is covered with luxuriant vegetation, its flora including the superb orchid Disa grandiflora and the well-known silver tree. The Kasteel-Berg (Castle Mount), a northern buttress of the mountain, has its own peculiar flora. Table Mountain and its connected hills are famous for the magnificence of their scenery. The kloof between the mountain and

Lion's Head is of singular

beauty. The view from the summit overlooking Table Bay is also one of much grandeur.

The south-east winds which sweep over Table Mountain frequently cause the phenomenon known as " The Table-cloth." The summit of the mountain is then covered by a whitish-grey cloud, which is being constantly forced down the northern face towards Cape Town, but never reaches the lower slopes. The clouds (not always caused by the south-easter) form very suddenly, and the weather on the mountain is exceedingly changeable. The rainfall on the summit is heavy, 72-14 inches a year being the average of twelve years' observations. This compares with an average of 54-63 inches at Bishop's Court, Newlands, at the foot of the mountain on the east and with 25-43 inches at Cape Town at the northern foot of the mountain. The relative luxuriance of the vegetation on the upper part of the mountain, compared with that of its lower slopes, is due not only to the rainfall, but to the large additional moisture condensed from clouds. The result of experiments conducted by Dr Marloth (Trans. S. Afrn. Phil. Soc. for 1903 and 1905) goes to show that during cloudy weather the summit of the mountain resembles an immense sponge, and that this condensa- tion of moisture considerably influences the yield of the springs in the lower part of the mountain.

TABLE-TURNING. When the movement of modern spirit- ualism first reached Europe from America in the winter of 1852-3, the most popular method of consulting the " spirits " was for several persons to sit round a table, with their hands resting on it, and wait for the table to move. If the experiment was successful the table would rotate with considerable rapidity, and would occasionally rise in the air, or perform other move- ments. Whilst by many the movements were ascribed to the

agency of spirits, two investigators — count de Gasparin and Professor Thury of Geneva — conducted a careful series of experiments by which they claimed to have demonstrated that the movements of the table were due to a physical force ema- nating from the bodies of the sitters, for which they proposed the name " ectenic force." Their conclusion rested on the supposed elimination of all known physical causes for the movements; but it is doubtful from the description of the experiments whether the precautions taken were sufficient to exclude unconscious muscular action or even deliberate fraud.

In England table-turning became a fashionable diversion and was practised all over the country in the year 1853. Dr John Elliotson and his followers attributed the phenomena to mesmerism. The general public were content to find the explanation of the movements in spirits, animal magnetism, odic force, galvanism, electricity, or even the rotation of the earth. James Braid, W. B. Carpenter and others pointed out, however, that the phenomena obviously depended upon the expectation of the sitters, and could be stopped altogether by appropriate suggestion. And Faraday devised some simple apparatus which conclusively demonstrated that the move- ments were due to unconscious muscular action. The apparatus consisted of two small boards, with glass rollers between them, the whole fastened together by indiarubber bands in such a manner that the upper board could slide under lateral pressure to a limited extent over the lower one. The occurrence of such lateral movement was at once indicated by means of an upright haystalk fastened to the apparatus. When by this means it was made clear to the experimenters that it was the fingers which moved the table, not the table the fingers, the phenomena generally ceased. The movements were in fact simply an illustration of automatism. But Faraday's demonstration did little to stop the popular craze.

By believers the table was made to serve as a means of com- municating with the spirits; the alphabet

would be slowly called over and the table would tilt at the appropriate letter, thus spelling out words and sentences. Some Evangelical clergymen discovered by this means that the spirits who caused the movements were of a diabolic nature, and some amazing accounts were published in 1853 and 1854 of the revelations obtained from the talking tables.

Table-turning is still in vogue amongst spiritualist circles. The device was employed with success by Professor Charles Richet and others in thought-transference experiments.

See A. E. de Gasparin, Des Tables tournantes, du Surnaturel, &c. (Paris, 1854); Thury, Des Tables tournantes (Geneva, 1855); Faraday's letter on Table-turning in The Times, 30th June 1853. Quarterly Review, Sept. 1853 — article by Carpenter on Spiritualism, &c. ; Mrs De Morgan, From Matter to Spirit (London, 1863) ; Ch. Richet, Proceedings S.P.R., vol. v. F. Podmore, Modern Spirit- ualism (London, 1902), ii. 7-21, gives an account of the move- ment in 1853, with references to contemporary pamphlets and newspaper articles. - (F. P.)

TABLINUM (or tabulinum, from tabula, board, picture), in Roman architecture, the name given to an apartment generally situated on one side of the atrium and opposite to the entrance ; it opened in the rear on to the peristyle, with either a large window or only an anteroom or curtain. The walls were richly decorated with fresco pictures, and busts of the family were arranged on pedestals on the two sides of the room.

TABOO (also written tapu and tabu), the Polynesian name given to prohibitions enforced by religious or magical sanctions. As a verb it means to " prohibit," as an adjective " prohibited, sacred, dangerous, unclean."

1. The word "taboo" or its dialectical forms are found throughout Polynesia; in Melanesia the term is tambu; in various parts of Malaysia and the East Indies pantang, bobosso, pamalli, &c; in Madagascar

fadi includes taboo; in North America the Dakota term wakan bears a similar meaning. Taboo is perhaps derived from la, to mark, and pu, an adverb of intensity.

2. Fundamental Ideas. — In taboo proper are combined two notions which with the progress of civilization have become differentiated — (i) sacred and (ii.) impure, or unclean; it must be borne in mind that the impurity is sacred, and is not derived from contact with common things. It does not imply any moral quality; it has been defined as an indication of "a connexion with the gods, or a separation from ordinary pur- poses and exclusive appropriation to persons or things con- sidered sacred; sometimes it means devoted by a vow." This definition does not cover the whole connotation of taboo as it is employed at the present day, but it indicates clearly the non-moral character of the idea. The ordinary usage is perhaps best defined — the statement that taboo is " negative magic," i.e. abstinence from certain acts, in order that undesired magical results may not follow; in this sense a taboo is simply a ritual prohibition. Properly speaking taboo includes only (a) the sacred (or unclean) character of persons or things, (b) the kind of prohibition which results from this character, and © the sanctity (or uncleanness) which results from a violation of the prohibition. The converse of taboo in Polynesia is noa and allied forms, which mean " general " or " common " ; by a curious coincidence noa is the term used in Central Australia to express the relation of persons of opposite sexes on whose intercourse there is no restriction.

3. Classification. — Various classes of taboo in the wider sense may be distinguished : (i) natural or direct, the result of mana (mysterious power) inherent in a person or thing; (ii.) com- municated or indirect, equally the result of mana, but (a) acquired or (6) imposed by a priest, chief or other person; (iii.) intermediate, where both factors are present, as in the appro- priation of a wife to her husband. These three classes are those of taboo

proper. The term taboo is also applied to ritual pro- hibitions of a different nature; but its use in these senses is better avoided. It might be argued that the term should be extended to embrace cases in which the sanction of the pro- hibition is the creation of a god or spirit, i.e. to religious inter- dictions as distinguished from magical, but there is neither automatic action nor contagion in such a case, and a better term for it is Religious interdiction.

4. Objects. — The objects of taboo are many: (i.) direct taboos aim at (a) the protection of important persons — chiefs, priests, &c. — and things against harm; (b) the safeguarding

of the weak— women, children and common people generally — from the powerful mana (magical influence) of chiefs and priests ;

(c) the provision against the dangers incurred by handling or coming in contact with corpses, by eating certain foods, &c;

(d) the guarding the chief acts of life — birth, initiation, marriage and sexual functions, &c, against interference;

(e) the securing of human beings against the wrath or power of gods and spirits; (/) the securing of unborn infants and young children, who stand in a specially sympathetic relation with one or both parents, from the consequences of certain actions, and more especially from the communication of qualities sup- posed to be derived from certain foods, (ii.) Taboos are imposed in order to secure against thieves the property of an individual, his fields, tools, &c.

5. Sanctions. — The sanctions of taboo may be (i.) natural or direct ; (ii.) social or indirect. Natural sanctions are (a) automatic, where the

punishment of the offender results from the operation of natural laws without any element of volition, just as some kinds of magic are held to bring about their results without the intervention of a spirit; (b) animistic, where the penalty results from the wrath of a god, deceased human being, or other spirit. The motive of the social sanction is ultimately religious or magical, but the penalties incurred by the violator of a taboo are social; they are inflicted by other members of the community, firstly, as a means of averting the supernatural sanctions, which, not having fallen on the actual offender, may visit his innocent fellows; and secondly, as a means of discouraging other offenders; in these cases the criminal is not himself taboo, but, thanks to his mana, braves the supernatural consequences; the social penalty is also inflicted on those who, like mourners, are themselves taboo and refuse to take steps to seclude themselves, in defence of the community; in the first class the social penalty is at once repressive and prophylactic, saving the innocent by punishing the guilty, and thus averting by a piaculum the vengeance which would otherwise fall somewhere; in the second the penalty is purely repressive.

The violation of a taboo makes the offender himself taboo; other penalties are not unkown: thus a man who partakes of a forbidden animal will break out in sores or the animal will reproduce itself within him and devour his vitals. Sometimes it is thought that the penalty falls on the kinswomen of the offender and that they produce, instead of children, animals of the taboo species. In Melanesia burial-grounds are taboo, and if the shadow of a passer-by falls on one, this entails upon him the loss of his soul; sometimes misfortune is held to dog the footsteps of the offender in this life and the next. But in some of these cases the observer who reports them has prob- ably confused taboos proper with negative magic. The social sanctions range from the death penalty down to the infliction of a fine or exaction of money compensation; the Polynesian custom of despoiling a man who breaks a taboo is perhaps a

special case of this penalty, but the practice of ceremonial plundering cannot always be so explained, and may perhaps in this case too be capable of an entirely different explanation.

Possibly the savage is more susceptible to suggestion than civilized man; at any rate, cases are not unknown in which the violation of a taboo has been followed by illness or even death, when the offender discovers his error. Not unnaturally rites of purification act as counter suggestions and save the offender from the effects of his erroneous beliefs.

6. Mana. — In the case of automatic taboos, and to some extent of other ritual prohibitions, the penalties for violation are unequal; they may be regarded as varying with the relation between the mana of the person or object and the mana of the offender against the prohibition. In the words of Dr R. H. Codrington, mana " is a power or influence, not physical and in a way supernatural; but it shows itself in physical force or in any kind of power or excellence which a man possesses. This mana is not fixed in anything, and can be conveyed in almost anything; but spirits, whether disembodied souls or supernatural (i.e. non-human) beings, have it and can impart

it; and it essentially belongs to personal beings to originate it, though it may act through the medium of water, or a stone or a bone" (cf. the suhman of West Africa, in Fetishism). Persons or things which are regarded as taboo may be compared to objects charged with electricity; they are the seat of a tremendous power which is transmissible by contact, and may be liberated with destructive effect if the organisms which provoke its discharge are too weak to resist it; the result of a violation of a taboo depends partly on the strength of the magical influence inherent in the taboo object or person, partly on the strength of the opposing mana of the violator of the taboo. Thus, kings and chiefs are possessed of great power, and it is death for their subjects to address them directly; but a minister or

other person of greater mana than common can approach them unharmed, and can in turn be approached by their inferiors without risk. The burial-place is often taboo for the common people, save when they are actually engaged in funeral rites; but the sorcerer, thanks to his indwelling power, can resist the deadly influences which would destroy the common folk, and may enter a cemetery for ritual or other purposes. So too indirect taboos depend for their strength on the mana of him who imposes them; if it is a chief or a priest, they are more powerful than those imposed by a common person. The mana of the priest, or chief, does not depend on his position; on the contrary, it is thanks to his mana that he has risen above the common herd.

7. Transmissibility. — It is characteristic of taboo proper that it is transmissible; as a logical corollary of this idea, acquired taboo may be thrown off by suitable magical or puri- ficatory ceremonies; the mourner, or he who takes part in funeral ceremonies; was perhaps at the outset regarded as a person charged with death-dealing power, and fear of the spirit of the dead may well have been secondary; however this may be, we can distinguish taboos, the violation of which charges with supernatural power the human being who violates them, thus rendering him directly dangerous to the community, from ritual prohibitions the violation of which makes him an outcast, not as himself dangerous, but as a person obnoxious to the gods. The ritual prohibitions of pregnancy, and the restrictions im- posed on the parents during the early childhood of their offspring, are not taboos proper; though they are transmissible, they do not depend on the transmission of an undifferentiated mana; what the parents seek to avoid is often the transmission of specific qualities, conceived as inherent in certain animals, e.g. cowardice in the hare, slowness in the tortoise; the animal is not necessarily in any sense sacred, nor are the parents, if they disregard the prohibition, liable to any penalty, direct or indirect; neither they nor the child are rendered taboo by any violation;

finally, save that the child acquires its qualities by a sympathetic process, the abstinence of the parents is correlative to the converse operation of eating an animal or otherwise acquiring by a magical process the good qualities inherent in anything.

8. Duration of Taboos, Imposition, and Abrogation. — Taboo is properly sanctity and the kind of interdict which it entrains; by a transference of meaning it is sometimes used of a period of time during which ritual prohibitions of a religious nature are enforced; these periods were proclaimed in Polynesia on important occasions and sometimes lasted for many years; they may be termed interdicts. Many persons and things are per- manently taboo; among them may be mentioned kings and chiefs, the property of dead persons and, a fortiori, their bodies or anything in contact with them. Other taboos are temporary. Temporary direct taboos, whether natural or acquired, may be removed by a process of desacralization or of purification. Thus, new crops are frequently taboo till the chief has partaken of them; his mana enables him to run risks which would be fatal to ordinary people, and the crops thus desacralized become free to all; perhaps, however, we may regard the practice as a case of sacralization, in which the 'chief, like a sacrificing priest, acquires special sanctity, and in so doing fortifies his people by a sympathetic process against supernatural dangers. A

new-born child may also make the crops noa, just as it may remove the taboo from a temporarily affected person.

In the Tonga Islands a person who became taboo by touching a chief or his property had to put away his sacred character, before he was allowed to make use of his lands, by touching the soles of a higher chief's feet and washing in water. Strangers before penetrating into a village, priests after a

sacrifice, warriors, women after child-birth, at puberty, the menstrual period, &c, must submit to lustration. Sometimes the purification was effected by inhaling the sacred contagion; in New Zealand a chief who touched his own head had to apply his fingers to his nose and snuff up the sanctity abstracted from his head. In other cases mere lapse of time suffices to cause the removal of a taboo; in Melanesia, where taboos are largely animistic, mourners go away for some months cmd on their return are free from taboo, the explanation given being that the spirit has got tired of waiting for them.

Indirect taboos are imposed in various ways, and unless they are removed may be as permanent as direct taboos, save that the death of the persons by whom they are imposed must result in their abrogation. In Polynesia a general taboo was imposed by proclamation; a chief might also taboo particular objects to his own use by naming them after a part of his person; more permanent was the taboo imposed by touching an object, but this too could be removed by proper ceremonies. In Melanesia, corresponding to the animistic character of tambu, a method of imposing taboo is to mention the name of some spirit.

Taboo objects were marked in various ways: a piece of white cloth, a bunch of leaves, a bundle of branches (in Melanesia) painted red and white, a stick with dry leaves, are among the methods in common use; in Samoa one mark of a taboo was to set up the image of a shark; in New Zealand it sufficed to give a chop with an axe to make a tree taboo. Particular taboos thus imposed seem to be abrogated by the declaration of the person who imposes them; on the other hand, he, no less than others, is bound by the taboo until it is abrogated.

9. Taboo and the Evolution of Punishment. — Penal codes may be largely, if not wholly, traced to religious sources of which taboo is certainly one; the violation of any taboo may imperil the life or health of other members of the community besides the offender; it calls for measures intended to

discourage others, as well as for steps to avert the immediate evil; if a taboo imposed by a chief is disregarded, not only has his authority been set at nought, but he, and in the second place, other members of the community may suffer if the real offender gets off scot free, thanks to the mana which enables him to defy supernatural sanctions. The importance of this in the evolution of law and order is manifest; for whereas a chief would not intervene to protect the property of an individual simply to punish what we regard as a transgression, he is bound to do so when a taboo is broken. That the taboo may be of his own imposition does not affect the question, for he is bound to observe it himself, and conversely may suffer supernatural penalties when it is violated by another. Just as blood-guilti- ness may be wiped out by composition, the violation of a taboo may be atoned for by a money payment or similar consideration for the revocation of the taboo; this compensation seems to have a retrospective effect, and thereby removes the dangers brought into existence by the violation.

10. Taboo and Moral Obligation.- — In proportion as a taboo becomes a custom and its sanctions fall into the background and are forgotten, its obligations thus transformed are one source of the categorical imperative, the distinguishing feature of which is that it is non-rational and instinctive. We are ignorant of the origin of exogamy and the prohibition of incest, the sanctions of which in Australia and among other peoples of low culture seem to be purely social, for as a rule irregular marriages seem to be regarded simply as offences against tribal morality; if the rules were originally of the nature of taboos, the transformation into customs must have been very early, and the same may be said of the rules by which the relations of members of the same kin are regulated.

11. Royal and Priestly Taboos. — Among people of low culture the chief, and in higher cultures the king, is sometimes held responsible for the order of nature, the increase of the crops, and the welfare

of his people generally; it is therefore of the highest importance that nothing should diminish or perturb his influence, and, as a logical consequence, the life of the king, and to a less degree of the chief, is surrounded with a complicated system of taboos and ritual prohibitions. Even where this idea of the magician-king or chief is not found, his position is an expression of the more powerful mana dwelling within him ; consequently the king or chief may not come in contact with the common folk, for fear his touch should blast them, as lightning withers the life of the oak. We can usually see why a king or chief must hold aloof from those whom he might injure, but it is not always easy to see the basic idea of the taboos, if such they be, which aim at protecting the potentate, or ensuring his due regulation of the course of nature. Some African kings may not see the sea; another may not lie down to sleep; in the Mentawei Islands the chief will die who during an interdict eats at the same time as common people; it is frequently forbidden to see the king partake of food. At a further stage of evolution these taboos degenerate into mere rules of etiquette, the violation of which involves the punishment of the offender, but the punishment is justified on formal grounds only. In early society the king and the priest often stand very near together; just as we find a war chief and a peace chief, so we meet with political and religious sovereigns. Sometimes the political king is also the priest and therefore sacred; the web of ritual prohibition woven round him may result in the creation of a secular authority like the Tycoon in Japan, who can rule the state without reference to the ceremonial observances prescribed for the nominal sovereign. Sometimes, on the other hand, the priest bears the title of king, but has lost even the shadow of political power and is free to perform his priestly functions. In these, however, as we see by the example of the flamen dialis at Rome, or the kings of fire and water in Cam- bodia, he is still hedged round by manifold restrictions as a person who must be protected from doing harm to others or suffering harm himself. In the exercise of his

priestly functions he is called upon to offer sacrifice; before fulfilling his office he is often required to submit to additional ritual prohibitions; his personal sanctity, already great, is augmented, and his approach to the sanctuary facilitated. Conversely, the sacrifice over, he performs lustral rites, in part to free himself from the taint of errors of ritual, but also to desacralize himself.

12. Funerary and Allied Taboos. — Taboos of mourners, widows, and of the dead are common all the world over, but they are especially prominent in Melanesia. These are explained on an animistic hypothesis as due to the fear of the dead man's spirit, but we seem to see traces, e.g. in Madagascar, of the idea that the contagion of death and not the wrath of the dead is the underlying motive; for it is not clear why the soul of a dead kinsman should necessarily be hostile. With funerary taboos may be compared taboos of warriors both on and after an expedition, taboos of hunters during the chase and especially after killing a dangerous animal, taboos of cannibals, and on participants in all other ceremonies which involve contact with death or the dead. Temporary seclusion and lustration before return to ordinary life are commonly prescribed for all in this category, even though their connexion with the dead be no closer than is implied in consanguinity. The property of the dead man is commonly burnt or deposited with him in the grave, in part as a protective measure, in part under the influence of belief in the continuity of this and the future life, and the need of supplying him with necessaries. Burial grounds are avoided, animals or plants from the neighbourhood are not used as food. Finally the name of the dead is not used, partly for fear of summoning him by the power of the word, but partly also from a conviction that, like the name of a king or chief, it is too holy or too dangerous for common use.

13. Taboos of the Sick. — Both disease and death are unnatural in the eyes of the savage ; they are often the result of the magic

of some enemy; but they may also be the result of an infraction of a taboo. Some part of the funerary taboos may perhaps be referred to this belief; whatever be the case with taboos of the dead, there can be no question that the sick are secluded or even abandoned, subjected to rites of purification and to re- strictions of various sorts, not because their malady is con- tagious in our sense, but because they are temporarily taboo and dangerous to the health of the community. The sick have imposed on them curative as well as prophylactic taboos; in Madagascar the sun is said to ” die ” when it sets; therefore it is forbidden to a sick man to look upon it as it goes down.

14. Taboos of Women, Sexual Taboos, Avoidance. — The age of puberty is especially dangerous for both sexes; in the case of a woman the danger is not so much for herself as for others, and results from her physiological state ; this danger is renewed with each successive menstrual period, and the frequently long seclusion at puberty finds a parallel in the universal practice in lower stages of culture of separating adult females, not only from males, but from the whole of the community at such periods. At puberty girls are confined for months or even years; they may not see the sun nor touch the earth; many foods are for- bidden them, and special costumes are prescribed for them, as for mourners. The expectant mother is taboo for months before the birth of her child, and her disabilities are not removed for a long period after delivery. Women may not look upon the performance of rites of initiation nor of secret societies; they may not eat new crops in New Caledonia till long after the men have partaken of them; they may often not approach the men’s club- house. Both parents, but especially the mother, are subjected to restrictions, having for their object the pre- servation of the health of the unborn or newly born child. Women are often forbidden to eat with their husbands; nor may they share his labours,

especially at sea.

The relations of the sexes are regulated by complicated rules, but they are not necessarily taboos. In the first place, laws of exogamy and similar regulations limit the field of choice; even where no obstacle on this side is present the intercourse of the sexes is often, especially at first, hedged round with numberless interdictions and rites. Connected with the rules of exogamy are the customs of avoidance, which prescribe that a man may not speak to nor even look at his mother-in-law, sometimes also his father-in-law, daughter, and other relatives; in like manner the wife must avoid the husband's relatives, and the brother may often not speak to the sister.

15. Other Taboos. — Taboos of various kinds are imposed on strangers, on sorcerers, and on children. Certain places are taboo; taboos protect the crops and ensure that landmarks are not removed. In fact the number of taboos is so great that it is impossible to mention them in detail.

16. Distribution. — Although taboo is a Polynesian word the institution is far from being restricted to Oceania. Similar prohibitions, though they seldom reached the Polynesian level, are found in America, Africa, and especially Madagascar, North and Central Asia, and among the non-Aryan tribes of India. But taboo and its survivals are not confined to the uncivilized.

17. Developments of Taboo. — It would be remarkable if a feature which has taken such deep root in the custom and belief of savage and barbarous peoples did not leave a marked impress on the faiths of higher cultures. Just as the gods have become moral pari passu with mankind, so the ceremonially clean has become the physically and morally clean, the pure has become the moral, and taboo has changed its name to holiness. At a certain point in evolution the notion of unclean, sometimes positive and implying the possession of dangerous properties, sometimes negative and connoting no more than mere

absence of holiness, which is in this case indistinguishable from mana, becomes a prominent element in religion. At a later stage and as a result of the greater weight attached to morality, the positive uncleanness falls into the background, leaving only the negatively unclean, the unholy, which is not in itself death-dealing, but may, like its savage analogue, call down on the community, innocent and guilty alike, the wrath

of higher powers, the remedy being, not so much the punish- ment of the offender, still less mere physical purification, but their moralized analogues, prayer, fasting and repentance.

18. Among the Greeks. — The general word for taboo among the Greeks in 0.70s, which may bear the sense of " sacredness " or "pollution"; derivatives occur in the same meanings. Usually, however, the notions of sacred and unclean are dis- tinguished by the use of different terms from this root, ayvds for sacred, ivayris for unclean or accursed. The rules of the Greek ayvda (season of taboo) do not differ markedly from those of the Polynesian. Corresponding to the war-taboo of Oceania we find in Homer that the army (Od. xxiv. 81) and the sentinel (II. x. 56, xxiv. 681) are sacred; and we learn from Plato that warriors never eat fish, from which indeed there was a general custom of abstinence except under the pressure of famine. The epithets kpos, dios, &c, which may point to beliefs similar to those of Polynesia, are applied to chiefs and kings, and further to the swineherd, thus suggesting that the pig, which bore a mixed reputation for holiness and uncleanness (ceremonial) both in Egypt and west Asia, was similarly re- garded in Greece.

19. Among the Romans. — The term for taboo is sacer; any one who removed a landmark became sacer and was outlawed, any citizen having the right to kill him. Consecratio capitis et bonorum was the term for devotion to the nether gods. The fiamen dialis and his wife were hedged in by a perfect network of ritual prohibitions; he might not ride upon nor even touch a horse; his eyes might not fall on an army

under arms; he might not walk under a vine; he might not name a goat, raw meat, beans, ivy, a dog, and so on; his hair might be cut only by a freeman; he might not touch a corpse. The flaminica might not comb her hair at certain festivals; .she was taboo (feriata) after hearing thunder till she had purified herself by a sacrifice. The Roman feriae were periods of taboo.

20. Among the Jews. — The Hebrew for holy is v-fp which means ” separated, cut off,” while its correlative ^1 means ” open for common use “; another sense of sacer is conveyed by om ” accursed, devoted to destruction.” Holiness is transmissible by contact (Ezek. xliv. 19, xlvi. 20; Ex. xxix. 37; Lev. vi. 27). It is distinct from purity in the moral sense; the names of the hieroduli o’jni} and hierodula ri’shp are connected with ‘ the word zhp. Taboo among the Jews are: (1) things connected with Jehovah, his name is holy and terrible; his arm is holy; holy places are taboo (see Sanctuary); the ark is actively dangerous, and Uzzah, no less than the men of Bethshemesh, pays the penalty for too nearly approaching it; (2) the Nazarite might not partake of certain foods, nor touch a dead body nor shave his head, which was specially sacred; (3) in fact any one who touched a dead bod\ was unclean and could communicate his uncleanness to others; (4) the birth of a child made the mother taboo; she was required to purify herself; (5) leprosy, menstruation, and sexual functions generally occasioned longer or shorter periods of uncleanness; and warriors, who were taboo on a campaign, were required to observe continence; (6) certain foods were taboo, and the uncleanness might be communicated to an earthen vessel, which, under certain circumstances, would be broken, like a pot in Polynesia; (7) the use of iron was forbidden in the construction of the temple; (8) a field sown with different kinds of herbs ” becomes holy “; and (9) bystanders are warned not to approach a heathen rite, lest they be ” sanctified “; (10) to the Polynesian interdicts, often termed taboos, corresponded certain periods of time, such as the

Sabbath and the Jubilee year, but these are not connected with taboo proper.

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see Skeat, Malay Magic, pp. 33-42, 57-59, 191-193, 225-228, 254, 2 59> 263-265, 344-351, &c. On Madagascar see v. Gennep, Tabou et totemisme ; for the Jews see Hastings, Dictionary of the Bible, ii. 38, 394; iv. 825. For the Semites see Robertson Smith, Religion of the Semites, passim. For a general discussion of taboo see Marillier, loc. cit., v. Gennep, do. For sexual taboos see Crawley, Mystic Rose, and in Journ. Anth. Inst. xxiv. 116, 219, 430. For taboos of commensality see Crawley in Folklore, vi. 130. See also Hubert and Mauss in Annee Sociologique, ii. 29-138 on sacrifice; and vii. 108, on mana; Durkheim, ib. i. 38-70 on incest and exogamy; Mauss in Revue de I'histoire des religions, xxxv. 49-60 on taboo and penal law; J. G. Frazer, Golden Bough, i. 297-464 on royal and priestly taboos, also iii. 1-134, 201-236, 463-467; J. Tuchmann, articles on " La Fascination " in Melusine, 1881 , &c. ; J. G. Frazer, on burial rites, in Journ. Anth. Inst., xv. 64 sq. For purity and holiness in the Old Testament see Baudissin, Studien, ii. 3-142; for mana see Inter- nationales Archiv fur Ethnographie, vii. 232. (N. W. T.)

TABOR, a town in western Bohemia, on the Francis-Joseph railway, 104 kilometres from Prague. Pop. (1908) 10,703. It is the chief town of a government district and the seat of a provincial law-court, and also of an industrial school. The town was founded in 1420 by the more advanced party of the church-reformers or Hussites, who, as it became their centre, soon began to be known as the Taborites. The town is situated on the summit of an isolated hill separated from the surrounding country by the Luznice stream and by an extensive pond, to which the Hussites gave the biblical name of Jordan. The historical importance of the city of Tabor only ceased when it was captured by King George of Podebrad in 1452. Though a large part of the ancient fortifications has recently been demolished, Tabor — or Hradiste Hory Tabor, the castle of the Tabor Hill, as it was called in the Hussite period — has still preserved many memorials of its past fame. In the centre of the city is the market-place (rynk). Only very narrow streets lead to it, to render the approach to it more difficult in time of war. In the centre of the market-place is the statue of Zizka, the greatest of the Taborite leaders. Here also is the diaconal church, built in 1516 in the style of the Bohemian Renaissance, and the town hall, in connexion with which a museum has been founded, which contains interesting memorials of the Hussite period. Some parts of the ancient fortifications and the very ancient Kotnov tower also still exist.

See Thir, Hradiste Hory Tabor (1895).

TABRIZ, the capital of the province of Azerbaijan in Persia, situated in the valley of the Aji Chai, "Bitter River," at an elevation of 4400 ft. in 38° 4' N., 46 18' E. Based on a census taken in 1871 the population of Tabriz was in 1881 estimated at 165,000, and is now said to be about 200,000.

The popular etymology of the name Tabriz from tab = fever, riz = pourer away (verb, rikhtan = pour away, flow; German rieseln?), hence "fever-destroying," is erroneous and was invented in modern times. It is related that Zobeideh, the wife of Harun-al-Rashid,

founded the town in 791 after recovering there from fever, but the earlier chronicles give no support to this statement, and it is nowhere recorded that Zobeideh ever visited Azerbaijan, and the name Tabriz was known many centuries before her time. In 1842 Hammer-Purgstall correctly explained the name as meaning the ” warm-flowing ” {tab = warm, same root as tep in ” tepid “) from some warm mineral springs in the neighbourhood, and compared it with the synony- mous Teplitz in Bohemia. In old Armenian histories the name is Tavresh, which means the same. The popular pronunciation to and tau for tab has given rise to the spellings Toris and Tauris met with in older travellers and used even now.

Overlooking the valley on the N.E. and N. are bold bare rocks, while to the S. rises the majestic cone of Sahand (12,000 ft.). The town possesses few buildings of note, and of the extensive ruins few merit attention. The ark, or citadel, in the south-west extremity of the city, now used as an arsenal, is a noble building of burnt brick with mighty walls and a tower 120 ft. in height. Among the ruins of old Tabriz the sepulchre of the Mongol king, Ghazan Khan (1295-1304), in a quarter once known as Shanb (generally pronounced Sham and Sham) i Ghazan, is no longer to be distinguished except as part of a huge tumulus. The great shanb (cupola or dome) and other buildings erected

by Ghazan have also disappeared. They stood about 2 m. S.W. from the modern town, but far within the original boundaries. The ” spacious arches of stone and other vestiges of departed majesty,” with which Ker Porter found it surrounded in 1818, were possibly remains of the college (medresseh) and monastery (zavieh) where Ibn Batuta found shelter during his visit to the locality. On the eastern side of the city stand the ruins of the Masjed i Jehan Shah, commonly known as the Masjed i Kebud, or ” Blue Mosque,” from the blue glazed tiles which cover its walls. It was built by Jehan Shah of the Kara Kuyunli, or Black Sheep dynasty (1437-1467). 1 Tabriz is celebrated as one of the most healthy cities in Persia.

Tabriz was for a long period the emporium for the trade of Persia on the west, but since the opening of the railway through the Caucasus and greater facilities for transport on the Caspian, much of its trade with Russia has been diverted to Astara and Resht, while the insecurity on the Tabriz-Trebizond route since 1878 has diverted much commerce to the Bagdad road. Accord- ing to consular reports the value of the exports and imports which passed through the Tabriz custom-house during the years 1867-73 averaged £593,800 and £1,226,660 (total for the year, £1,820,460); the averages for the six years 1893-9 wer e £212,880 and £544,53°- There are reasons to believe that these values were considerably understated. For the year 1898-9 the present writer obtained figures directly from the books kept by the custom-house official at Tabriz, and although, as this official informed him, some important items had not been entered at all, the value of the exports and imports shown in the books exceeded that of the consular reports by about 10 per cent. Since that time the customs of Azerbaijan have been taken over by the central customs department under Belgian officials, and it is stated that the trade has not decreased. British, Russian, French, Turkish and Austrian consulates and a few European commercial firms are established at Tabriz; there are also post and telegraph offices. Tabriz has suffered much from earthquakes, notably in 858, 1042 and 1721, each time with almost complete destruction of the city. (A. H.-S.)

TABULARIUM (tabula, board, picture, also archives, records), the architectural term given to the Record office in ancient Rome, which was built by Q. Lutatius Catulus, the conqueror of the Cimbri. It was situated on the west side of the Forum Romanum, and its great corridor, 220 ft. long, raised 50 ft. above the forum on a massive substructure, is still partly preserved. This corridor was lighted through a series of arches divided by semi- detached columns of the Doric order, the earliest example of this class of decoration, which in the Theatre of Marcellus, the Colosseum, and all the great

amphitheatres throughout the Roman empire constituted the decorative treatment of the wall surface and gave scale to the structure. Traces of an upper cor- ridor with semi-detached columns of the Ionic order have been found in the Tabularium, but this structure was much changed in the 13th century, when the Palace of the Senators was built.

TACHEOMETRY (from Gr. Taxvs, quick; /xerpov, a measure), a system of rapid surveying, by which the positions, both horizontal and vertical, of points on the earth's surface relatively to one another are determined without using a chain or tape or a separate levelling instrument. The ordinary methods of surveying with a theodolite, chain, and levelling instrument (see Surveying) are fairly satisfactory when the ground is pretty clear of obstructions and not very precipitous, but it becomes extremely cumbrous when the ground is much covered with bush, or broken up by ravines. Chain measurements are then both slow and liable to considerable error; the levelling, too, is carried on at great disadvantage in point of speed, though without serious loss of accuracy. These difficulties led to the introduction of tacheometry, in which, instead of the pole formerly employed to mark a point, a staff similar to a level staff is used. This is marked with heights from the foot, and is gradu- ated according to the form of tacheometer in use. The azimuth angle is determined as formerly. The horizontal distance is

1 This mosque is popularly attributed to Ghazan Khan (end of 13th century).

inferred either from the vertical angle included between two well-defined points on the staff and the known distance between them, or by readings of the staff indicated by two fixed wires in the diaphragm of the telescope. The difference of height is computed from the angle of depression or elevation

of a fixed point on the staff and the horizontal distance already obtained. Thus all the measurements requisite to locate a point both verti- cally and horizontally with reference to the point where the tacheometer is centred are determined by an observer at the instrument without any assistance beyond that of a man to hold the staff.

The simplest system of tacheometry employs a theodolite with- out additions of any kind, and the horizontal and vertical distances

are obtained from the angles of depression or elevation of Subtense two well-defined points on a staff at known heights from method. the foot, the staff being held vertically. In fig. I let T

be the telescope of a theodolite centred over the point C, and let AB be the staff held truly vertical on the ground at A. Let P and P' be the two well-defined marks on the face of the staff,

Fig. i.

of them at known heights above A, and enclosing a distance s between them. Let a and j3 be the measured angles of

both PP' =

elevation of P and P', and let d be the horizontal distance TM of the staff from the theodolite, and h the height PM of P above T Then since

P'M =d tan /3 and PM = d tan a, we have s = P'M — PM =d(tan 0-tan a).

Therefore

d =

tan /3 — tan a

h =

s tan a tan /S— tan a'

If TC, the height of the rotation axis of the telescope above the ground, = q, and if AP = p, then the height of A above C is h-p--q. If, as is usually the case, a number of points are determined from one station of the theodolite, and hi, fe, hz, &c, be the values of h for the different points Ai, A2, A 3 , &c, then the difference of level of Ai and A2 will be kr-hi, that of Ai and A 3 will be hs-hi, and so on. To ensure the essential condition that the staff is held vertical, it is usually provided with a small circular spirit-level, and the staff-holder must always keep the bubble in the centre of its run. No graduation of the staff is required beyond two well-defined black lines across the white face at P and P', but the marks can be very usefully supplemented by wings fastened on the two sides of the staff, having their tops at right angles to the staff, at the same height as the points P and P', and forming a continuation of the black lines. A convenient length for the staff is 12 ft., with the point P 2 ft. from the foot, and the point P' at the top of the staff, so that 5 = 10 ft.

With the above arrangement the staff can easily be read with a 5-inch theodolite at half a mile distance. But while it is frequently very useful to determine approximately points a long way off, the determinations will not be nearly so accurate as those of near points. Thus suppose that the distance of the staff is d, and the intercept on the staff is s, and suppose that the personal and instrumental error is 5a (a being the angle subtended by 5 at the telescope) ; then since did) _ .5

for distant readings, and from the great simplicity of the observations there is little likelihood of errors in the field. But the reduction work is rather heavier than is the case with some of the tacheometers described below. Since the accuracy of the method depends entirely upon the accuracy with which the vertical angles are measured, it is advisable that the vertical circle should be as large as possible, very finely and accurately divided, and fitted with good verniers and microscopes.

In Eckhold's omnimeter the vertical circle of the theodolite is dis- pensed with, and a saving of reduction work is effected by reading, not the vertical angles themselves, but the tangents of the angles.

In the Ziegler-Hager tacheograph the tangents are read not horizontally but vertically, and the arrangement is as follows: — In fig. 2 O is the axis of rotation of the telescope; mn is the axial line of a steel bolt, which carries on its top a knife-edge, on which the telescope rests by means of an agate plate. The bolt is carried by a slide in which it can be raised or lowered by a micrometer screw fitted with a graduated head. The slide plays between the vertical cheeks of a standard rigidly attached to the frame of the instrument, and it can be raised or lowered by a rack and pinion. The telescope, which rests on the knife-edge, follows the movement of the bolt. The slide carries on one side a vernier by which to read the divisions on a scale fixed to one of the vertical legs of the standard, and the zero point of the scale is the point where the horizontal plane through O cuts the scale when the plane-table or upper plate of the theodolite is truly level. The scale is graduated in divisions, each of which is the xiiith part of the distance Oo, or h. The head of the micrometer screw which raises or lowers the steel bolt in the slide is graduated with a zero mark and with marks corresponding to a vertical movement of the knife-edge of T J

C

d =

tan a da

I +tan 2 a did)

■ s— — 5 > or-j-^ =

tan- a aa

x s 2 ld 2 s KS + >■

Therefore bd, the distance error, is given by the equation id=-oa{s 1 --d-)js. But at distances of 5 chains or more i 2 will be very small compared with a? and may be neglected, so that Sd=-t>a.d 1 /s. Since 8a may be considered as constant for all distances where the staff can he distinctly read, the distance error increases as the square of the distance. With small theodolites, where special care has not been given to the graduating and reading of the vertical circle, 8a will probably amount to about 20”. At a quarter of a mile excellent work can be done. In carrying on a traverse line by this method with stations 10 or 12 chains apart, the theodolite being set up at points about midway between the stations, the probable distance error in a mile is about 3I ft., and the probable level error about 4 in. In 25 miles these probable errors would correspond to about 18 ft. and 20 in. respectively. This system of tacheometry is well adapted

WW////w/M»7777m

Fig. 2.

parts of which Oo contains 100, the distance ^>M is readily obtained. If the difference of elevation of B and A be required, the height pM must be reduced by />B and increased by OA, both known quantities. By this arrangement the reduction work of the observa- tions is rendered extremely simple, and can readily be performed in the field. The instrument is well adapted for use with the plane- table.

Tacheometers in which the horizontal distance of the staff from the telescope is deduced from the readings of the staff indicated by two fixed wires in the diaphragm of the telescope will now be considered. In fig. 3 BC is a diaphragm fixed ‘tt^d

in a tube having fine horizontal wires at B and C. Let me ° ‘ the end E of the tube be closed by a disk which has a minute hole at E, to which the eye can be applied. If P and D be the points on a vertical staff at which the lines EB and EC are observed to cut the staff, so that the intercept PD is known,

then from similar triangles ED = (EC/BC)PD, and since EC and BC are constant, ED varies as PD. If, for instance, PD has a certain observed value when the staff is held at a certain distance ED, and has exactly half that value when the staff is held at another distance ED', then the distance

ED' is one-half of the distance ED, and so on in proportion. The distance ED can be instantly inferred from the readings of the staff, if the latter be suitably graduated. If, for example, it be desired to know the distance ED in yards, and by construction the pro- portion EC/BC = 50, then the intercept on the staff at I yard from E would be g^th of a yard, or -72 inch, the intercept at 2 yards from E would be 2X^2 inches, and so on. If therefore the staff be graduated with divisions of -72 inch, and the intercept be 45 of such divisions, it would be inferred that the distance of the staff from E was 45 yards. The constant proportion EC/BC can be checked by measuring 100 yards from E and observing whether

Fig. 3.

the intercept is exactly 100 divisions or not. If it is not, the wire diaphragm must be shifted in the tube until it is. In figs. 3, 4, 5 and 6 the distances are deduced from the readings of a central wire in the optical axis of the telescope and of a wire above it, for the sake of simplicity. The usual arrangement is to fit the diaphragm with a central wire and with one or two wires above and below it at equal distances from the central wire. The vertical angle of depression or elevation is fixed by directing the central wire to a well-defined division on the staff, and the distance of the staff is inferred from the readings given by the corresponding wires above and below the central wire.

The elementary form of tacheometer given above illustrates the general principle of the class of tacheometers now under con- sideration, and as leading up to the practical form, in which the staff is viewed with a telescope mounted in the manner of a theo- dolite. The simplest form is Reichenbach's tacheometer, which may be investigated as follows: — In fig. 4 let A be the object glass by which an image of the staff ST is formed at HK. The wire diaphragm is moved in the tube so as to coincide with the image,

and vertical distances of the staff from the axis of rotation of the telescope are found thus: — In fig. 5 let ST be the observed intercept on the staff when the telescope is inclined at an angle a to the horizontal. Draw TS' at right angles to OT. The angle TS'S will be very nearly a right angle, and STS' may be taken as equal to a. If there were n graduations (each corresponding to 1 yard in distance) in ST, there would be n cos a graduations in

,^d

J"—*

- c — >

mrrhn

•mmmnnHMMiMffl

Fig. 4.

and the image and wires are viewed with an eye-piece (not shown) in the usual way. Let O be the point where the vertical axis of the instrument cuts the axis of the telescope, the instrument being centred over a peg, from which the distance to the staff is required. The object glass (of focal length =/) is at a distance c from O. Let AT = « and AH=i>, and the angle SAT = HAK=0. Then if i be the height of the image HK, i=i> tan 0. Since i/t) + i/« = i//, we have v= —ufl(u—f), and hence i = uf tan B/(u— /). Let F be some point on AT such that AF = x and FT =

«'. And let the angle SFT=<#>. Then u = u'+x and tan = 2/ tan 4>j{u'--x), and therefore

• ('+)/ «' . +

fu'

/ , f tan ; and, if x=f, i=f tan 4>.

If therefore the point F be taken at a distance / from the object glass, every intercept of the staff for positions between T and F, such as S'T , S*T", &c, which are bounded by the line FS, and for which consequently is the same, will have the same height of image at the diaphragm. Conversely, if K be a wire in the diaphragm it will cut the image of the staff for all positions of the staff between T and F in points ft_ that lie on the line FS. Now the intercept S"T", half-way between F and T, will be one-half of ST, and therefore if the reading on the staff indicated by the wire in question be one-half of ST, it may be inferred that the position of the staff is half-way between F and T, and similarly for other distances. If the distance of ST from is required, as is usually the case, a quantity f+c must be added to every distance- from F determined as above.

It is very seldom that the line of sight AT of the telescope is at right angles to the staff. In general it is more or less inclined to the staff, which is almost always held vertical, and the horizontal

Fig. 5.

S'T, and therefore the distance of the staff from F, as inferred from the observed number of graduations in ST, must be multiplied by cos a to give the true distance FT. Again FN=FT cos o, so that the distance inferred from the observed number of graduations in ST must be multiplied by cos 2 a to give the horizontal distance of F from T. To this must be added the distance OL=OF cos a = (J+c) cos a to get the horizontal distance, OM, of O (the vertical axis

of the instrument) from T. This value of OM must be multi- plied by tan a to obtain the value of h, the vertical distance of T from O. Tables of the value of cos a, cos 2 a, and tan o are necessary to facilitate these calculations.

In this tacheometer the distances as inferred from the readings of the staff are the distances of the staff from F and not from O. This defect was remedied by Porro, who added a lens (called the anallattic lens) to the telescope. The arrangement of the telescope as manufactured by Messrs Troughton and Simms, is as follows: — In fig. 6 O is. the point where the vertical axis of the instrument cuts the axis of the telescope. The object glass is fixed at a distance c from 0, and the anallattic lens at a distance d from the object glass. The distances c and d are chosen to suit the constructive conveniences of the instrument. The diaphragm at K is movable so that it can be made to coincide with the image of the staff. The focal length /1 of the object glass is arbitrary, and the focal length % of the anallattic lens is determined from an equation of condition between c, d, /1, and fa. The image of the staff ST would be formed by the object glass at H, at a distance Vi from the object glass, were it not that the rays, after passing through the object glass, are received by the anallattic lens and the image of the staff is formed at K on the wire diaphragm, which is slid in the tube till it coincides with the position of the image. The image at K is viewed by an eye-piece in the usual way. Let T be the point where the image of the staff is cut by the central wire of the diaphragm, and S the point where the image is cut by one of the outer wires of the dia- phragm. If and be the angles subtended by ST at the object glass and at the point respectively, and if i be the height of the image at K, h the height of the virtual image at H, then by elementary geometry and from optical considerations, we obtain

*" = »'C/i-d+/,)-lef 1 - , (c+/i)Cd-/.)}" ten *

Let 72 be made such that c/i — (c+/i) id — / a)=o,

the equation of condition above mentioned. Then f t = {d(c--fi) — c/i)/(c-|-/i).

And i

Ifc-.C-jl

Fig. 6.

Therefore all the readings of the staff which would be given by the outer wire of the diaphragm will lie on the line OS (for all of

which is the same), and the distance from O along OT will be proportional to the reading on the staff. Thus if the staff be suitably graduated, the distance from O can be immediately deduced from the reading. Also, as before, if the telescope be inclined at an angle a to the horizontal, the distance OT inferred from the number of graduations in ST must be multiplied by cos 2 o to give the horizontal distance of O from T, and the horizontal distance so obtained must be multiplied by tan o to obtain the vertical distance of T from O.

The inconvenience of the reduction work necessary to obtain the horizontal and vertical distances produced the Wagner-Feu nel tacheometer, by which the distances can be read directly from the instrument. As is seen from fig. 7, three scales are provided, to measure the inclined distance, the horizontal distance, and the vertical distance respectively. All three are arranged in a plane parallel to the plane in which the telescope turns. The inclined scale is attached to the telescope exactly parallel to its line of collimation, and moves with it. The horizontal scale is fixed to the upper horizontal plate of the theodolite. The vertical scale is on the vertical edge of a right-angled triangle, which can be slid along on the top of the horizontal scale. The inclined scale carries a slide which is provided with two verniers. One of

these is parallel to the inclined scale, and is for the purpose of setting off on the scale (in terms of the divisions on the scale) the inclined distance of the staff from the axis of rotation of the telescope. The other turns on a pivot whose centre is accurately in the edge of the inclined scale at the point where the zero division of the inclined vernier

cuts the edge, and is for the purpose of reading the vertical scale; it can be turned on its pivot so as to be vertical whatever may be the inclination of the telescope. Moreover, since the distance from the centre of the pivot to the zero of the vernier is always constant and known, the vertical scale can be graduated so that the reading of the vernier gives the height (in terms of the division on the scale) of the staff above the axis of rotation of the telescope. The horizontal scale attached to the horizontal plate of the theodolite is read by means of a vernier carried by the triangle. To ascertain the horizontal and vertical distances of the point on the staff which is cut by the middle wire in the diaphragm of the telescope from the rotation axis of the telescope, the inclined distance of the point on the staff is read by means of the wires, as in Porro's tacheometer. This distance (in terms of the divisions) is then set off on the inclined scale by means of the inclined vernier, and the vertical scale on the triangle is moved up to the vertical vernier, which is adjusted to its edge. With proper graduation of the horizontal and vertical scales the horizontal and vertical distances can be at once read off on the scales. This method, however, requires that the staff be held so that its face is perpendicular to the line of sight, which is more troublesome than holding the staff vertical.

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TACHIENLU, a town of China, in the province of Sze-ch 'uen. It is the great tea mart for Tibet, and from Tachienlu the two trade-routes, the Gya lam and the Chang lam, diverge, the former to Ladakh and the latter to Kashgar.

TACHYLYTES, or Tachylites (from Gr. Taxi's, swift, Xteie, to dissolve, meaning " easily fused," though some have erroneously interpreted it as " easily soluble in acids "), in petrology, the vitreous forms of the basic igneous rocks; in other words, they are basaltic obsidians. They are black in colour, dark brown in the thinnest sections, with a resinous lustre and the appearance of pitch, often more or less vesicular and sometimes spherulitic. They are very brittle, and break down readily under the hammer. Small crystals of felspar or of olivine are sometimes visible in them with the unaided eye. All tachylytes weather rather easily, and by oxidation of their iron become dark brown or red. Three modes of occurrence characterize this rock. In all cases they are found under conditions which imply rapid cooling, but they are much less common than acid volcanic glasses (or obsidians) , the reason being apparently that the basic rocks have a stronger tendency to crystallize, partly because they are more liquid and the molecules have more freedom to arrange themselves in crystalline order.

The fine scoria ashes or " cinders " thrown out by basaltic volcanoes are often spongy masses of tachylyte with only a few larger crystals or phenocrysts imbedded in black glass. Such tachylyte bombs and scoria are frequent in Iceland, Auvergne, Stromboli, Etna, and are very common also in the ash beds or tuffs of older date, such as occur in Skye, Midlothian and Fife, Derbyshire, and elsewhere. Basic pumices of this kind are exceedingly wide-spread on the bottom of the sea, either dispersed in the " red clay" . and other deposits or forming

layers coated with oxides of man- ganese, precipitated on them from the sea water. These tachylyte fragments, which are usually much decomposed by the oxidation and hydration of their ferrous compounds, have taken on a dark red colour. This altered basic glass is known as " palagonite "; con- centric bands of it often surround kernels of unaltered tachylyte, and are so soft that they are easily cut with a knife. In the pala- gonite the minerals also are decomposed, and are represented only by pseudomorphs. The fresh tachylyte glass, however, often con- tains lozenge-shaped crystals of plagioclase felspar and small prisms of augite and olivine, but all these minerals very frequently occur mainly as microlites or as beautiful skeletal growths with sharply- pointed corners or ramifying processes. Palagonite tuffs are found also among the older volcanic rocks. In Iceland a broad stretch of these rocks, described as " the palagonite formation," is said to cross the island from south-west to north-east. Some of these tuffs are fossiliferous ; others are intercalated with glacial deposits. The lavas with which they occur are mostly olivine-basalts. Palagonite tuffs are found in Sicily, the Eifel, Hungary, Canary Islands, &c.

A second mode of occurrence of tachylyte is in the form of lava flows. Basaltic rocks often contain a small amount of glassy ground-mass, and in the limburgites this becomes more important and conspicuous, but vitreous types are far less common in these than in the acid lavas. In the Hawaiian Islands, however, the volcanoes have poured out vast floods of black basalt, containing felspar, augite, olivine, and iron ores in a black glassy base. They are highly liquid when discharged, and the rapid cooling which ensues on their emergence to the air prevents crystallization taking place completely. Many of them are spongy or vesicular, and their upper surfaces are often exceedingly rough and jagged, while at other times they assume rounded wave-like forms on solidification. Great caves are found where the crust has solidified and the liquid interior has subsequently flowed away, and

stalactites and stalag- mites of black tachylyte adorn the roofs and floors. On section these growths show usually a central cavity enclosed by walls of dark brown glass in which skeletons and microliths of augite, olivine and felspar lie imbedded. From the crater of Kilauea thin clouds of steam rise constantly, and as the bubbles of vapour are liberated from the molten rock they carry into the air with them thin fibres of basalt which solidify at once and assume the form of tachylyte threads. Under the microscope they prove to be nearly completely glassy with small circular air vesicles sometimes drawn out to long tubes. Only in the Hawaiian Islands are glassy basaltic lavas of this kind at all common.

A third mode of occurrence of tachylyte is as the margins and thin offshoots of dikes or sills of basalt, dolerite and diabase. They are sometimes only a fraction of an inch in thickness, resembling a thin layer of pitch or tar on the edge of a crystalline dolerite dike, but veins several inches thick are sometimes met with. In these situa- tions tachylyte is rarely vesicular, but it often shows very pronounced fluxion banding accentuated by the presence of rows of spherulites which are visible as dark brown rounded spots. The spherulites have a distinct radiate structure and sometimes exhibit zones of varying colour. The non-spherulitic glassy portion is sometimes perlitic and these rocks are always brittle. The commonest crystals are olivine, augite and felspar, with swarms of minute dusty black grains of magnetite. At the extreme edges the glass is often per- fectly free from crystalline products, but it merges rapidly into the

ordinary crystalline dolerite, which in a very short distance may contain no vitreous base whatever. The spherulites may form the greater part of the mass, they may be a quarter of an inch in diameter and are occasionally much larger than this. These coarsely

spherulitic rocks pass over into the variolites (q.v.) by increasing coarseness in the fibres of their spherulites, which soon become recognizable as needles of felspar or feathery growths of augite. The ultimate product of decomposition in this case also is a red palagonitic substance, but owing to the absence of steam cavities the tachylyte selvages of dikes are more often found in a fresh state than the basic lapilli in ash-beds. Many occurrences of basaltic pitchstones have been reported from Skye, Mull, and the western part of Scot- land; they are found also in connexion with the intrusive dolerite sills of the north of England and the centre of Scotland. In the Saar district of Germany similar rocks occur, some of which have been described as weisselbergites (from Weisselberg) .

Other localities for tachylytes of this group are Nassau, Silesia and Sweden.

The chemical composition of some of the rocks of this group is indicated by the analyses given below: —

passage of his Agricola, describing this as a "singularly blessed time," but the hideous reign of terror had stamped itself in- effaceably on his soul, and when he sat down to write his History he could see little but the darkest side of imperialism. To his friend the younger Pliny we are indebted for the little we know about his later life. He was advanced to the consulship in 07, in succession to a highly distinguished man, Verginius Rufus, on whom he delivered in the senate a funeral eulogy. In 99 he was associated with Pliny in the prosecution of a great political offender, Marius Priscus, under whom the provincials of Africa had suffered grievous wrongs. The prosecution was successful, and both Tacitus and Pliny received a special vote of thanks from the senate for their conduct of the case. It would seem that Tacitus lived to the close of Trajan's reign, as he seems 4 to hint at that emperor's extension of the empire by his successful Eastern campaigns from 115 to 117. Whether

Si0 2 .

A1 2 3 .

FeO.

Fe 2 3 .

CaO.

MgO.

Na 2 0.

K 2 0.

H 2 0.

I. Palagonite. Seljadalr, Iceland ….

II. Palagonite from deep-sea deposits, Pacific /

Ocean (with 2-89% Mn0 2) . \

III. Palagonite. Franz Joseph Land ….

IV. Tachylyte. Ardtiin, Mull, Scotland . .

V. Tachylyte. The Beal, Portree, Skye . • .

38-96 44-73 35-48

53-°3

52-59

11-62

16-28

8-30 20-09

17-33

14-60

14-75

14-57

12-30

9-53 11-14

9-13

1-88

1-04 6-05 6-47

6-29

2-23

7-10 2-63 2-62

o-68

4-50

3-92 4-52 4-24

0-72

4-02

tr.

1-27 2-40

17-85 9-56

16-80 2-64 3-27

TACITUS, CORNELIUS (c. 55-120), Roman historian. Tacitus, who ranks beyond dispute in the highest place among men of letters of all ages, lived through the reigns of the emperors Nero, Galba, Otho, Vitellius, Vespasian, Titus, Domitian, Nerva and Trajan. All we know of his personal history is from allusions to himself in his own works, and from eleven letters addressed to him by his very intimate friend, the younger Pliny. The exact year of his birth is a matter of inference, but it may be approximately fixed near the close of the reign of

Claudius. Pliny indeed, though himself born in 61 or 62, speaks of Tacitus and himself as being " much of an age," 1 but he must have been some years junior to his friend, who began, he tells us, his official life under Vespasian, 2 no doubt as quaestor, and presumably tribune or aedile under Titus (80 or 81), at which time he must have been twenty-five years of age at least. Of his family and birthplace we know nothing certain; we can infer nothing from his name Cornelius, which was then very widely extended; but the fact of his early promotion seems to point to respectable antecedents, and it may be that his father was one Cornelius Tacitus, who had been a procurator in one of the divisions of Gaul, to whom allusion is made by the elder Pliny in his Natural History (vii. 76). But it is all matter of pure conjecture, as it also is whether his " praenomen " was Publius or Gaius. The most interesting facts about him to us are that he was an eminent pleader at the Roman bar, that he was an eye-witness of the " reign of terror " during the last three years of Domitian, and that he was the son-in-law of Julius Agricola. This honour- able connexion, which testifies to his high moral character, may very possibly have accelerated his promotion, which he says 3 was begun by Vespasian, augmented by Titus, and still further advanced by Domitian, under whom we find him presiding as praetor at the celebration of the secular games in 88, and a member of one of the old priestly colleges, to which good family was an almost indispensable passport. Next year, it seems, he left Rome, and was absent till 93 on some provincial business, and it is possible that in these four years he may have made the acquaintance of Germany and its peoples. His father-in- law died in the year of his return to Rome. In the concluding passage of his Life of Agricola he tells us plainly that he witnessed the judicial murders of many of Rome's best citizens from 93 to 96, and that being himself a senator he felt almost a guilty complicity in them. With the emperor Nerva's accession his life became bright and prosperous, and so it continued through the reign of Nerva's successor, Trajan, he himself, in the opening

1 Pliny, Epp. vii. 20. * Hist. i. 1. 3 Ibid.

(J. S. F.)

he outlived Trajan is matter of conjecture. It is worth noticing that the emperor Tacitus in the 3rd century claimed descent from him, and directed that ten copies of his works should be made every year and deposited in the public libraries. He also had a tomb built to his memory, which was destroyed by order of Pope Pius V. in the latter part of the 16th century.

Pliny, as we see clearly from several passages in his letters, had the highest opinion of his friend's ability and worth. He consults him about a school which he thinks of establishing at Comum (Como), his birthplace, and asks hirn to look out for suitable teachers and professors. And he pays 5 him the high compliment, " I know that your Histories will be immortal, and this makes me the more anxious that may name should appear in them."

The following is a list of Tacitus's remaining works, arranged in their probable chronological order, which may be approxi- mately inferred from internal evidence: — (1) the Dialogue on Orators, about 76 or 77; (2) the Life of Agricola, 97 or 98; (3) the Germany, 98, published probably in 99; (4) the Histories (Historiae), completed probably by 115 or 116, the last years of Trajan's reign (he must have been at work on them for many years); (5) the Annals, his latest work probably, written in part perhaps along with the Histories, and completed sub- sequently to Trajan's reign, which he may very well have outlived.

The Dialogue on Orators discusses, in the form of a conversation which Tacitus professes to have heard (as a young man) between some eminent men at the Roman bar, the causes of the decay of eloquence under the empire. There are some interesting remarks in it on the change for the worse that had taken place in the education of Roman lads. The style of the Dialogue is far more Ciceronian than that of

Tacitus's later work, and critics have attributed it to Quintilian ; but its genuineness is now generally accepted. It is noticeable that the mannerisms of Tacitus appear to develop through his lifetime, and are most strongly marked in his latest books, the Annals.

The Life of Agricola, short as it is, has always been considered an admirable specimen of biography. The great man with all his grace and dignity is brought vividly before us, and the sketch we have of the history of our island under the Romans gives a special interest to this little work.

*The Germany, the full title of which is " Concerning the geography, the manners and customs, and the tribes of Germany," describes with many suggestive hints the general * Ann. ii. 61 ; iv. 4. 6 Epp. vii. 33.*

character of the German peoples, and dwells particularly on their fierce and independent spirit, which the author evidently felt to be a standing menace to the empire. The geography is its weak point; much of this was no doubt gathered from vague hearsay. Tacitus dwells on the contrast between barbarian freedom and simplicity on the one hand, and the servility and degeneracy of Roman life on the other.

The Histories, as originally composed in twelve books, brought the history of the empire from Galba in 69 down to the close of Domitian's reign in 97. The first four books, and a small fragment of the fifth, giving us a very minute account of the eventful year of revolution, 69, and the brief reigns of Galba, Otho and Vitellius, are all that remain to us. In the fragment of the fifth book we have a curious but entirely inaccurate account of the Jewish nation, of their character, customs and religion, from a cultivated Roman's point of view,

which we see at once was a strongly prejudiced one.

The Annals — a title for which there is no ancient authority, and which there is no reason for supposing Tacitus gave dis- tinctively to the work — record the history of the emperors of the Julian line from Tiberius to Nero, comprising thus a period from a.d. 14 to 68. Of these, nine books have come down to us entire; of books v., xi. and xvi. we have but fragments, and the whole of the reign of Gaius (Caligula), the first six years of Claudius, and the last three years of Nero are wanting. Out of a period of fifty-four years we thus have the history of forty years.

The principal MSS. of Tacitus are known as the "first "and " second " Medicean — both of the 10th or nth centuries. The first six books of the Annals exist nowhere but in the " first Medicean " MS., and an attempt was made in 1878 to prove that the Annals are a forgery by Poggio Bracciolini, an Italian scholar of the 15th century, but their genuineness is confirmed by their agreement 1 in various minute details with coins and in- scriptions discovered since that period. Moreover, Ruodolphus, a monk, writing in the 9th century, shows that he is acquainted with a MS. of Tacitus containing at least the two first books. Add to this the testimony of Jerome that Tacitus wrote in thirty books the lives of the Caesars and the evidence of style, and there can be no doubt that in the Annals we have a genuine work of Tacitus.

Much of the history of the period described by him, especially of the earlier Caesars, must have been obscure and locked up with the emperor's private papers and memoranda. As we should expect, there was a vast amount of floating gossip, which an historian would have to sift and utilize as best he might. Tacitus, as a man of good social position, no doubt had access to the best information, and must have talked matters over with the most eminent men of the day. There were several writers and chroniclers, whom he occasionally cites but not very often; there were memoirs of distinguished persons — those, for

example, of the younger Agrippina, of Thrasea, and Hel- vidius. There were several collections of letters, like those of the younger Pliny; a number, too, of funeral orations; and the " acta senatus " and the " acta populi " or " acta diurna," the first a record of proceedings in the senate, the latter a kind of gazette or journal. Thus there were the materials for history in considerable abundance, and Tacitus was certainly a man who knew how to turn them to good account. He has given us a striking, and on the whole doubtless a true, picture of the empire in the 1st century. The rhetorical tendency which characterizes the " silver age " of Roman literature, gives perhaps exaggerated expression to his undoubtedly strong sense of the badness of individual emperors, but he assuredly wrote with a high aim, and we may accept his own account of it: " I regard 2 it as history's highest function to rescue merit from oblivion, and to hold up as a terror to base words and actions the repro- bation of posterity." He is convinced of the degeneracy of the age, though it be relieved by the existence of truly noble virtues: and ha connects this degeneracy more or less directly with the

1 See Introduction to vol. i. of Furneaux's edition of the Annals of Tacitus, Clarendon Press Series, 1884. -Ann. iii. 65.

imperial regime. But it is difficult to dogmatize as to Tacitus's political ideals. He is primarily concerned rather with ethics than with politics; though he may feel that the world is out of joint — with whatever sentimental sympathy he may regard the age of "liberty," and admire the heroic epoch of the republic — yet he appears to realize that the empire is a practical necessity, and to the provinces even a benefit. Like the Stoics, with whom otherwise he has little in common, he censures rather individual rulers than the imperial system. But " the key to the interpretation of Tacitus," it has been well said, 3 " is to regard him as a moralist rather than a politician." Perhaps the strongest work in the Annals and Histories is the delineation of character.

Tacitus gives us no certain clue to his religious belief. His expressions of opinion about the government of the universe are difficult to reconcile with each other. There seems to have been a strange tinge of superstition about him, and he could not divest himself of some belief 4 in astrology and revelations of the future through omens and portents, though he held these were often misunderstood and misinterpreted by charlatans and impostors. On the whole he appears to have inclined to the philosophical theory of " necessitarianism," that every man's future is fixed from his birth; but we must not fasten on him any particular theory of the world cr of the universe. Some- times he speaks as a believer in a divine overruling Providence, and we may say confidently that with the Epicurean doctrine he had no sort of sympathy.

Tacitus's style is discussed in the article Latin Language. Whatever judgment may be passed on it, it is certainly that of a man of genius, and cannot fail to make a deep impression on the studious reader. Tacitean brevity has become proverbial, and with this are closely allied an occasional obscurity and a rhetorical affectation which his warmest admirers must admit. He has been compared to Carlyle: and both certainly affect singularity of expression. But they are alike only in the brevity of sentences; and the brevity of Carlyle is not that of an artist in epigram. Tacitus was probably never a popular author; to be understood and appreciated he must be read again and again, or the point of some of his acutest remarks will be quite missed.

Tacitus has been many times translated, in spite of the very great difficulty of the task; the number of versions of the whole or part is stated as 393.

Murphy's translation (we should call it a paraphrase) was for long one of the best known; it was published early in the 19th century. On this was based the so-called Oxford translation, published by Bohn in a revised edition. Messrs Church and Brodribb's transla- tion, and Professor Ramsay's (1904) (the latter of Annals i.-iv.) are much

better. The best known foreign translation is Davanzati's (Italian), printed about 1600 and frequently re-published. The French versions by Louandre and Burnouf (about the middle of the last century) are also good. Among the very numerous modern commentaries, the most important are Ruperti's (1839); Orelli's (1859: the Histories, Germania, Agricola, and Dialogues were revised and re-edited by Meiser and Andersen between 1877 and 1895); Ritter's (1864); Nipperdey's (1879); Heraus's (Histories, 1885); Furneaux's (Annals, i.-vi., 1884; xi.xvi., 1891; Germania, 1894); Spooner's (Histories, 1891). The last two editors' intro ductions are particularly useful. Of works relating to Tacitean Latinity, Draeger's Syntax und Stil des Tacitus is the best.

(W. J. B.; A. D. G.).

TACITUS, MARCUS CLAUDIUS, Roman emperor from the 25th of September a.d. 275 to April 276, was a native of Inter- am'na (Terni) in Umbria. In the course of his long life he held various civil offices, including that of consul in 273, with universal respect. Six months after the assassination of Aurelian he was chosen by the senate to succeed him, and the choice was cordially ratified by the army. During his brief reign he set on foot some domestic reforms, and sought to revive the authority of the senate, but, after a victory over the Goths in Cilicia, he succumbed to hardship and fatigue (or was slain by his own soldiers) at Tyana in Cappadocia. Tacitus, besides being a man of immense wealth (which he bequeathed to the state),

5 Dill, Roman Society from Nero to Marcus Aurelius, Bk. i. ch. i. I 4 Ann. vi. 21, 22. -

had considerable literary culture, and was proud to claim descent from the historian, whose works he caused to be transcribed at the public expense and

placed in the public libraries. Tacitus possessed man)' admirable qualities, but his gentle character and advanced age unfitted him for the throne in such lawless times.

See Life by Vopiscus in Hisloriae Augustae Scriplores; alsoEutro- pius, ix. 10; Aurelius Victor, Caesares, 36; Zonaras xii. 28; H. Schiller, Geschichte der romischen Kaiserzeit, i. 1883; Pauly-Wissowa, Realencyclopadie, iii. 2871 ff.

TACNA, a northern province of Chile, in dispute with Peru from 1893 onwards, bounded N. by Peru, E. by Bolivia, S. by Tarapaca, and W. by the Pacific. Area, 9251 sq. m. Pop. (1895) 24,160. It belongs to the desert region of the Pacific coast, and is valuable because of its deposits of nitrate of soda and some undeveloped mineral resources. There are a few fertile spots near the mountains, where mountain streams afford irrigation and potable water, and support small populations, but in general Tacna is occupied for mining purposes only. None cf its streams crosses the entire width of the province; they are all lost in its desert sands. The climate is hot, and earthquakes are frequent and sometimes violent. There is one railway in the province, running from the city of Tacna to Arica (q.v.), and in 1910 another from Arica to La Paz, Bolivia, was under construction by the Chilean government. The pro- vince consists of two departments, Tacna and Arica, which once formed part of the Peruvian department of Moquegua. Its capital is Tacna (pop. 1895, 9418; 1902, estimated 11,504), a small inland town 48 m. by rail from Arica, in a fertile valley among the foothills of the Andes. Existence is made possible in this oasis by a small mountain stream, also called Tacna, which supports a scanty vegetation. The town owes its existence to the Bolivian trade from La Paz and Oruro, and is the residence of a number of foreign merchants. Tacna was captured by a Chilean force under General Baquedano on the 27th of May 1880.

At the close of the war between Chile and Peru (1879-1883), the terms of the treaty of Ancon

(signed by representatives of the two countries on the 20th of October 1883) were practically dictated by Chile, and by one of the provisions the Peruvian provinces of Tacna and Arica were to be occupied and exploited by Chile for a period of ten years, when a plebiscite should be taken of their inhabitants to determine whether they would remain with Chile or return to Peru, the country acquiring the two provinces in this manner to pay the other $10,000,000. At the termination of the period Peru wished the plebiscite to be left to the original population, while Chile wanted it to include the large number of Chilean labourers sent into the province. Chile refused to submit the dispute to arbitration, and it remained unsettled. Meanwhile Chile expelled the Peruvian priests, and treated the province more like a conquered territory than a temporary pledge.

TACOMA, a city and sub-port of entry, and the county-seat of Pierce county, Washington, U.S.A., on Commencement Bay of Puget Sound, at the mouth of Puyallup river, about 80 m. from the Pacific coast, and about 23 m. S.S.W. of Seattle. Pop. (1890) 36,006; (1900) 37,714, of whom 11,032 were foreign-born (including 1603 Swedes, 1534 English-Canadians, 1474 Norwegians, 1424 Germans, and 1323 English; (1910, U.S. census) 83,743. Tacoma is served by the Northern Pacific, the Chicago, Milwaukee & Puget Sound, and the Tacoma Eastern railways; the Chicago, Burlington & Quincy railway operates through trains to and from Missouri river points and Tacoma, over the Northern Pacific tracks, which are also used by the Great Northern and Oregon & Washington railways. There is electric railway connexion with Seattle. Tacoma is the starting-point of steamship lines to Alaska, to San Francisco, and to Seattle, Port Townsend, Olympia, Victoria, and other ports on Puget Sound. There are trans-oceanic lines to Japan and China, to the Philippines and Hawaii, and to London, Liverpool and Glasgow, by way of the Suez Canal. The city is situated on an excellent harbour and has 25 m. of waterfront. From the tidelands the city site slopes gradually to a plateau

about 300 ft. high, commanding fine views of Puget Sound and its wooded islands, and parts of the Cascade and Olympic ranges. Tacoma is the seat of Whitworth College (1890, Presbyterian), the University of Puget Sound (19C3, Methodist Episcopal), the Annie Wright Seminary (1884), a boarding and day school for girls, and the Pacific Lutheran Academy and Business College. The Tacoma High School has an excellent stadium for athletic contests, seating 25,000. The city has a Carnegie library (1899), with about 51,000 volumes. Among other public buildings are the court house, the city hall, in which are the rooms of the State Historical Society (organized, 1891; incorporated, 1897); the Federal Building; an armoury; the Chamber of Commerce, and several fine churches. The Ferry Museum, founded by Clinton P. Ferry, has interesting historical and ethnological collections. In 1910 the city had seven public parks (1120 acres), including Point Defiance, a thickly wooded park (about 640 acres), and, in the centre of the city, Wright Park, in which is the Seymour Conservatory. Tacoma is a sub-port of entry in the Puget Sound Customs district (of which Port Townsend is the official port), which is second only to San Francisco on the Pacific coast in the volume of foreign trade. The city has a large jobbing trade, a coal supply from rich de- posits in Pierce county, and abundant water-power from swift mountain streams, which is used for generating electricity for municipal and industrial use. In 1900 and in 1905 Tacoma ranked second among the cities of the state in the value of factory products. Lead smelting and refining (by one establish- ment) was the most important industry in 1905; lumber, timber and planing mill products, valued at $3,407,951, were produced in that year, and flour and grist mill products, valued at $2,293,587. Other important manufactures were furniture, ships and boats, railway cars (the Chicago, Milwaukee & Puget Sound and the Northern Pacific systems having shops here), engines, machinery, shoes, water pipes, preserves and beer. In 1905 the total value of the factory products was $12,501,816, an increase of 121-4% since 1900. The

assessed property valuation of the city in 1909 was $54,226,261, being about 42 % of the actual valuation.

The site of Tacoma was visited by Captain George Vancouver in 1792; Commencement Bay was surveyed for the United States government by Lieutenant Charles Wilkes in 1841, and the present city was founded by General Morton Matthew McCarver in 1868 and was at first called Commencement City. That name was soon changed to Tacoma, said to be a corruption of Ta-ho-ma or Ta-ho-bet, Indian terms meaning " greatest white peak," the name of the peak (14,526 ft.), also called Mt. Rainier about 50 m. S.E. of the city. General McCarver's original plat included what is now the first ward of the city, and is called the Old Town. In 1873 the Northern Pacific railway (completed in 1887) established its terminal on Commencement Bay, and named it New Tacoma. A town government was formed in 1874, the place became the county-seat in 1880, and in 1883 the two " towns " were consolidated and incorporated as a city under the name Tacoma. In 1909 a new city charter was adopted under which the city government is vested in five commissioners (one of whom acts as mayor), each in charge of a city department.

TACTICS (Gr. tciktikij, sc. T'exyt), from raaoeiv, to arrange in order of battle). 1 It may perhaps seem superfluous at the present time to emphasize the distinction between strategy and tactics. Moreover, definitions are rarely quite satisfactory, for they can seldom be perfectly clear and at the same time perfectly comprehensive. Yet, since it is necessary that the parties to any discussion should have some common starting- point, it will be as well to begin by stating exactly what is meant to be included under the heading of this article.

Strategy (q.v.) is the art of bringing the enemy to battle on terms disadvantageous to him. Combined, or to use the phraseology of the Napoleonic era, " grand " tactics are the

1 Unlike the French tactique, the German Taktik, and

indeed all other forms, the English word is invariably treated as a plural

methods employed for his destruction by a force of all arms, that is, of infantry (q.v.), artillery (q.v.) and cavalry {q.v.). Each of these possesses a power peculiar to itself, the full development of which depends to a greater or less degree upon the aid and co-operation of the other two. Now it is quite evident that the only force which can ensure this co-operation, and can produce harmonious working between the various components of that complex machine, a modern army, is the will-power of the supreme commander. It is, then, the sphere of the higher commander on the day of battle which is generally expressed by the term " combined tactics," and which will be dealt with in this article. Yet it must not be understood that because the term higher, or supreme, commander is used that the theory of combined tactics may be safely neglected by those soldiers whose ambitions or opportunities do not seem to lead

to that position. In the British Army more than Necessity j n other, as the South African war showed, a

of study. J . ' . . _ • <• ,

comparatively junior officer may at any moment find

himself placed in command of a mixed force of all arms, without any previous practical knowledge of how it should be handled. It will not then be possible to make the best use of such opportunities by the uneducated light of nature, and such theoretical knowledge as may have been gleaned from books and matured by thought will be of great value.

It is of the first importance that the commander of a mixed force should know exactly the powers and limitations of the units under his control. Should

he not be a master of his profession, he will at times demand more from his subordinates than they can reasonably be expected to perform; at other times he will miss his chances by ignorance of their capabilities. An uneducated commander may indeed be likened to an in- different mechanic, who sometimes places an undue strain upon the engine he is supposed to control, and sometimes allows its precious powers to run to waste.

There is, however, a still stronger reason why all officers should study the art of grand tactics. In every battle situations arise of which the issue is decided by the promptitude and efficiency of the co-operation between the three arms. At such moments, an officer in charge of a battery of artillery, or of a squadron of cavalry, may find an opportunity of rendering valuable aid to his own infantry; and a knowledge of the tactics and training of the other arms may then be essential, for it will probably be necessary to act without instructions from superior authority.

But although the importance of studying tactics may be readily allowed, there would appear to be considerable diversity of opinion as to the best method of conducting that study. It is often confidently asserted that tactics cannot be learnt from books; and in support of this theory it is customary to adduce Napoleon's well-known statement that tactics change every ten years. But if we examine the matter more closely, it will become evident that the changes which the great captain had in his mind were those of formations, due principally to im- proved weapons, rather than of the principles upon which combined tactics are based. Indeed, it could hardly be other- wise, for military history furnishes many instances of great b.attles which have been fought out on exactly the same lines, although separated in point of time by many centuries. The great similarity between Rossbach (q.v.), Austerlitz (q.v.) and Salamanca (q.v.) has often been quoted since Napoleon first drew attention to it, but a great deal more remarkable and instructive is the similarity between

the battle on the Metaurus, which dealt the final blow to the hopes of Carthage in Italy, and Marlborough's masterpiece, the battle of Ramillies (q.v.). In both cases the battle was lost through faulty dispositions before it had been begun. In both cases the ultimate loser Continuity t ^ a p OS iti n behind a stream, thereby losing his of military , ... , , ., , . ,■....

history, mobility and voluntarily surrendering the initiative

to an enemy who was not slow to take advantage of it. Precisely the same error was committed time after time by the Austrian generals who fought against Frederick, notably at Leuthen (see Seven Years' War), a battle closely resembling

Fire power.

both Ramillies and the Metaurus. Coming to a later date, we find the same error committed, with of course precisely the same result, in Manchuria, where the Russian generals repeatedly surrendered the initiative to their enterprising opponents, and allowed them to dictate the course of battle. It must not, however, be understood from this that no commander should ever stand upon the defensive; rather it is meant that we should learn from history the proper method of doing so. This we cannot do better than by studying Wellington's battles in the Peninsula, for never have tactics been brought to higher perfection. Although frequently compelled to adopt the defensive, he never surrendered the conduct of the battle to his enemy. Even when surprised and taken at great disad- vantage by Soult at Maya (see Peninsular War), it can be seen how, while lesser men would have been content to reinforce the threatened points, Wellington's one thought was to discover where he could deal the most effective blow. Nearly a hundred years later and in a theatre of war many thousands of miles away, a very similar battle was fought out by Kuropatkin and Oyama, though on a vastly greater scale.

But history teaches us more than the methods of the great captains; for from it we may learn those changes which have been introduced into both organization and tactics by the improved weapons which science has placed in our hands, and thence the tactician may deduce the changes of the future. Just as the " Old Dessauer " foresaw the advantage which the iron ramrod would give to the Prussian infantry, and as Welling- ton perceived that improved firearms would render possible the extended lines he adopted, so may the great generals of the future learn those lessons which are only brought home to others through the dire ordeal of battle. From the days of the long-bow to those of the Lee-Metford rifle, the changes in tactics have been brought about by the development of fire. It is therefore only natural that the introduction of small-bore rifles, quick-firing artillery, and smokeless powder should have revolutionized many of our ideas. Before the invention of the breech-loader and the rifled cannon, the three arms of the service employed very different methods of combat. The infantry depended principally on the bayonet, the cavalry on the lance or sabre, the artillery on fire. Now there is practically but one method common to all arms whether in attack or defence. The bayonet and the sabre still have their part to play; but in almost every phase of the combat their importance is diminishing, and infantry and cavalry must depend more and more upon fire to compass the enemy's over- throw. All the preliminary movement and manoeuvres have but one end in view, the development of fire in greater volume and more effectively directed than that of the opposing force; for it is " superiority of fire " that prepares the ground for the final decision.

Side by side with the improvement in firearms there has come another great change which, on the continent of Europe at all events, has had a marked effect on modern tactics. This is the improvement in communications, which has alone made it possible to use the vast numbers with which great battles have recently been fought. Without railways the power

which universal service has placed in the hands of the generals of the 20th century could never have been fully developed, for the men could neither have been conveyed to the theatre of operations, nor could they have been fed even sup- Modern posing they had been got there. Now all this is con- altered, and the first step towards the attainment ditlons. of superiority of fire will be to bring as many men as possible on to the field of battle; the second step will be to place them in the position from which they can use their weapons to the very best advantage. From these premises it is not difficult to foresee the type of battle which will prevail, until some new discovery changes the military systems of the world. In the future, as in the past, it will be the duty of the strategist to mass superior numbers at the decisive point; but so soon as this has been effected there is only one method by which the tactician will be able to follow up the advantage. That is by bringing

more rifles into action than his opponent is able to do. From this it follows that the enveloping action will be the usual form of battle; and that although the extent of front may not always be so great, in proportion to the numbers engaged, as on the battlefields of South Africa or even of Manchuria, the general tendency of modern invention will undoubtedly be to increase the area of the battlefield.

If then we are right in supposing that the front of an army in action will cover many miles of country, it necessarily follows that in approaching the field many roads will be used. Here the duties of the cavalry will begin; for the commander who can discover earliest the approaches by which the flank detach- ments of his opponent are moving, is obviously in the best position to form his plans for envelopment. Here we are c . verging upon the strategic use of cavalry; but under modern

conditions the tactical use of that arm is almost merged in the strategical use. No doubt it has always been the object of the wise commander to attain his enemy's flank; yet, since, owing to the increased range of small-bore rifles, turning movements like those which formed such a marked feature of Frederick the Great's battles can no longer be made after the infantry troops have come into contact, they must be prepared as soon as the necessary information has been obtained. More- over nothing must be left to chance, for it can hardly be denied that if the battle of Gravelotte were to be fought again to-morrow, the failure to locate the right flank of the French army would have even more serious consequences than were actually the case (see Metz: Battles of 18/0). Such mistakes can only be avoided by obtaining good information, and thus it will be seen that the chances of bringing off a successful converging attack are greatly in favour of the commander who is best served by his cavalry. But, as the opposing forces draw near, a gradual change comes over the duties of the mounted arm, for it must then protect the troops in rear from observation, so that the preparations for envelopment may be concealed. To this end the occupation of points of tactical vantage, such as hills, woods and villages, behind which the main army can deploy or the outflanking columns march in security, becomes its chief aim. In the next stage, i.e., when one or other army is forced to stand on the defensive, reconnaissance of the position held will be the duty of the cavalry of the attack.

So far its functions are clear enough, but when the preparations for the infantry attack have been completed we have practically nothing to guide us. Unfortunately the two most recent wars, in South Africa and Manchuria, have taught us but little of the handling of cavalry in battle. In South Africa the peculiar characteristics of the Boers gave no scope for cavalry action; while in Manchuria the theatre of operations was practically a defile between the mountains and the Liao river, which afforded no room for manoeuvre. With regard to the

handling of cavalry in conjunction with the other arms there is, therefore, more room for diversity of opinion than is the case with either infantry or artillery. Time alone will show the real capabilities of the cavalry of to-day, and the opening battles of the next great campaign in Europe will bring about many changes. Meanwhile such experience as we have to guide us seems to indicate that the development of fire has rendered cavalry, even when highly trained in the use of the rifle, less capable of acting indepen- dently against infantry than it was formerly. Throughout the war in Manchuria, we constantly find the Russian cavalry reconnaissance checked by Japanese infantry; and on the other hand the weak Japanese cavalry closely supported by infantry was fairly effective. The circumstances were of course peculiar, but the inference appears to be that unsupported mounted troops cannot be expected to achieve important results except when acting against similar bodies of the enemy; that is to say, under conditions which fall outside the province of com- bined tactics. Moreover, since well-posted infantry can easily hold in check greatly superior numbers of cavalry, it would certainly seem that wide tactical movements, intended to threaten the enemy's line of retreat, are more likely than not to result in prodigal waste of strength. This being the case it

would seem that the best use of cavalry on the battlefield will be on the flanks of, and in close touch with, the infantry, where each arm can render support to the other. On the defensive the tactical action of cavalry is not less important than on the offensive. Accompanied and strengthened by horse artillery it may occupy tactical points either on the flanks of the main position or thrown out well to the front. Aided by smokeless powder, magazine rifles and quick-firing guns, numbers may be concealed and the attacking enemy may be induced to deploy his troops and to reveal his movements Drematurely. Should he do so, much of his advantage will be gone, for the defender will be greatly helped in his preparations for the counter-attack,

the most effective weapon at his command.

But when at last the slower moving bodies of infantry and artillery come into contact, the battle enters upon a new phase. It has long been recognized that the first step towards the attainment of fire superiority over a vigilant enemy is a vigorous artillery bombardment. For many years this action of the artillery was regarded merely as a preliminary to the infantry attack; and it was not until the rude awakening of the early battles of the Boer war, that it was realized in England that unless the infantry co-operate, the artillery is not likely to produce any result. If the attacking infantry is kept at such a distance from the position that it cannot action? pass quickly to the assault, the enemy will retain his troops under cover during the cannonade, perhaps even leaving his trenches unoccupied, and present no target to the guns. Indeed, a most instructive instance of this very line of action is furnished by the battle of Ta-shih-chiao. There the right of the Russian line was held by the infantry of the 1st Siberian army corps, supported throughout the greater part of the day by only two batteries of artillery. So heavy was the fire of the Japanese artillery in this portion of the field that General Stakelberg, the commander of the Russian corps, sent word to his superior officer that he had not considered it advisable to occupy his trenches, and that should he be compelled to do so his troops must suffer very heavy loss. As things turned out the Japanese infantry did not deliver any attack against the Russian right, the defenders remained under cover, and the losses inflicted by the bombardment were almost negligible. Other instances might be quoted, but enough has been said to prove that to render the artillery bombardment effective the infantry must co-operate; for by this means only will the enemy be compelled to man his defences, to show himself above his parapets, and to expose himself to shrapnel fire.

Here arises one of those questions which are the outcome of modern science, but which have not been finally answered by modern war. As a result of

improved ballistics, better methods of observation, and perfected methods of communication, it is now possible for field artillery to make use of indirect fire from behind cover. Against stationary objects, such as a battery in action, the results achieved by this method are as good as those which are obtained by firing directly over the sights. At the same time the control of indirect fire is slow, and it still remains to be proved whether it can be used satisfactorily against quickly moving targets. If it should be found that, in spite of scientific aids, the artillery of the defence can be made to leave its cover and to disclose its position by the advance of the infantry, the importance of the aid which one arm can render to the other needs no demonstration. After all, however, the silencing of the guns of the defence is but a means to an end, and the principal aim of the guns of the attack is to enable the infantry to get sufficiently close to the position to deliver an assault; for the infantry assault is the crowning act of battle. Similarly the gunners of the defence must never forget that their great object is to repel this same assault. The artillery duel, there- fore, is but a phase. Sooner or later one side will gain the upper hand. Then it must be decided whether the inferior artillery can best serve the interests of the infantry by continuing the duel, or by ceasing to fire until it can find some more vulner- able target.

Should the guns of the defence have proved inferior to those

of the attack, it will probably be wise for them to wait until the advancing columns of infantry have deployed; should the positions be reversed, it will be well for the gunners of the attack to leave their weapons and to remain under cover until such time as their opponent is compelled to turn his attention to repelling the infantry. So great is the power of the modern rifle and quick-firing gun that infantry,

unsupported by artillery, has but little chance of carrying a position held by determined men, and it is for this reason, and not with a view to saving their own lives, that the gunners must reserve themselves until the last moment. They must be ready and alert when their services are most required; moreover their final positions should be selected with a view to keeping up their fire until the last possible moment. Indeed they must often run the risk of injuring some of their own troops when firing over their heads. Sometimes a favourable position may be found for the artillery upon the flank of the attack. Such positions have a double advantage. Not only do they bring enfilade or oblique fire to bear upon the enemy's trenches, but they are able to continue the bombard- ment much longer than is possible when posted directly in rear of the assaulting columns. But whatever the position of the artillery may be, one thing is certain: namely, that the infantry of the attack can hardly hope to succeed if its own guns have been disabled while striving to maintain an unequal duel. Thus in the earlier stages of battle the action of the artillery will be characterized by a certain degree of prudence. The com- manders on either side will strive to conceal the numbers and positions of their batteries, and will not employ more guns than are absolutely necessary for the attainment of any particular object they may have in hand. But when the preliminary stages are over, and the infantry is finally committed to the assault, a change must come over the conduct of the artillery. In this final phase there is no longer room for prudence. In- direct fire is out of place, and the duty of the guns cannot be better described than in the words of the French text-books, " to follow the infantry in a series of rapid advances, by echelons, without hesitating to come into action within the shortest range of the hostile infantry." But when the time comes to follow up the infantry the skill and knowledge of the battery commander are most highly tried. Concealment is no longer his object, and he must trust all to his offensive power. To make the most of this power it is of the first importance

that his guns should be brought at once into positions whence they can be effectively used; for, quoting again from the French instructions, ” considerations of concealment lose their importance for artillery that is told off to follow up the movements of the infantry. In this case artillery must not fear to come into action in the open, although in this situation a battery usually forfeits its freedom of manoeuvre.”

Even the introduction of shielded guns will not affect this loss of mobility, for batteries which are brought to within effective rifle range of the defence must expect to lose a considerable proportion of their horses. Hence it follows that although the position into which they are brought in support of infantry may prove to be unsatisfactory it cannot be changed; their assist- ance will be lost at the most critical moment, with the result that the attack, deprived of their support, will probably fail. In France, where artillery tactics have perhaps received even more attention than in other countries, the necessity for this close support by guns has been so far recognized that the batteries of the attack have been divided into two distinct portions. The duties of one section have already been described. Those of the second are: — (i) To continue to shell the enemy’s position as long as possible without danger to the advancing infantry; (2) To engage the hostile infantry ” avec la derniere energie “; (3) To watch carefully for counter-attack.

It is perfectly clear that the performance of these duties, in fact, the application of the whole principle of co-operation between infantry and artillery, is intimately connected with the use of ground. The art of utilizing ground to the best advantage must therefore be deeply studied. If we look back upon history, we cannot but be struck by the important part that the apprecia-

tion or neglect of the capacities of the ground has played in almost every battle. The most brilliant victories have been won by manoeuvres which, if not

suggested by the physical features of the battlefield, were deprived by the nature of the ground of half their risk. What was true of Austerlitz and Leuthen is true of Liao-yang and Mukden. Now, as in the past, battles resolve themselves into a series of struggles for certain localities, a methodical progression from point to point, each successive capture weakening the enemy's position until at last an over- whelming fire can be brought to bear upon some vital point. This method of attack is most distinctly seen in siege operations, such as those round Port Arthur, where the attack closed gradually in upon the defence until the possession of one or two points rendered the capture of the place a matter of time alone. Now the difference between the attack of a fortress and of a defended position is, in the main, one of degree rather than of kind. But there is no doubt that the chief point of difference is often overlooked, both by the amateur and by the uneducated professional soldier.

In staff rides and in war games, occasionally even in peace manoeuvres, it is usually assumed that the party who starts upon the defensive must remain in that unenviable position throughout. This, however, is not the teaching of history. If there is one lesson in tactics which stands out more clearly than all the others which may be learnt from the campaigns of the great commanders, it is that a defensive attitude should never be assumed except as a means of passing to the offensive under more favourable conditions than those which present themselves at the moment. In siege operations the roles of the rival forces are more clearly defined; and until the guard action, this is not the case. There both generals, if they understand their duties, are always striving to secure the offensive, for no battle has ever yet been won by purely defensive tactics. The defensive attitude is, therefore, only a phase of that manoeuvring to secure the upper hand which begins with the strategic concentration, almost, one might say, with the peace organization.

In spite of Moltke's oft-quoted saying that the combination of the tactical defensive with the strategical offensive is the strongest form of war, the very fact of one side adopting the defensive proves, in at least ninety-nine cases out of every hundred, that in earlier stages of the campaign the enemy has gained an advantage, either by his numbers, his strategy, or his readiness to act, which can only be counterbalanced by success in battle. Other things being equal, the side which is numerically the weaker is naturally the first to be forced to relinquish the initiative. But, whatever the cause, the aim of the commander will be to retrieve his fortunes by a tactical success. Perhaps the most striking example in history of its accomplishment is furnished by the campaign and battle of Salamanca. There, after weeks of marching and counter-marching, Wellington was finally out-manoeuvred by Marmont and forced to stand and fight under circumstances by no means favourable to the defence. His line of communication was in danger, and his trains were already being hurried to the rear. Then Marmont made a mistake; and in a few hours the French army was in full re- treat. Never was the tactical genius of a commander more dramatically displayed; but we may well ask ourselves whether under modern conditions similar results would be possible. The point is, however, that to the true general the purely defensive battle is unknown; and in place of a single movement directed by a master mind we shall see in future a series of com- bats, each with its stroke and counter-stroke, taking place upon a front extending over many miles of country. Of this type of battle the Sha-ho is at present the best example. There the operations opened with an attack against the Japanese right, which was met by a similar attack delivered by the Japanese centre and left. A less able commander than Oyama might have attempted to check Kuropatkin's offensive movement by

reinforcing his own threatened flank; that is to say, that he would have conformed to the movements of his adversary and per- mitted him to dictate the course of events. This was not the Japanese system. .Oyama had no intention of fighting a purely defensive action. He knew that his opponent had massed his strength upon his left, and it was only reasonable to assume that if one portion of his line was strong, some other portion must be weak. The actual point first selected by Oyama for decisive attack was the centre of Kuropatkin's line. This effort failed, and the scales were ultimately turned by an almost unexpected success against the Russian right. The resulting victory was certainly less complete than would have been the case had the Japanese commander been able to carry through his original plan, but it is obvious that a force operating against the centre of a hostile line must itself be in danger of envelopment; and in this case it is interesting to note that the battle was really decided by an outflanking movement by a weak force, while the central attack in considerable strength achieved but little. Oyama's conduct of this battle has been much criticized. By some writers he has been blamed for leaving his own defensive line too weak; by others he has been accused of attempting too much. These are difficult questions, requiring detailed examination; for the present it is sufficient to note that, although inferior in numbers, he succeeded in accomplishing an enveloping movement which forced his enemy to retire. The fact is that by superior skill, although actually inferior in numbers, he succeeded in placing more rifles in the firing line than did his opponent. During a great part of this struggle, which lasted for five days, it would be difficult to say which side was on the defensive and which on the offensive, No doubt at the commencement Kuropatkin was the assailant; it is equally certain that in the end it was Oyama who attacked; yet it would be impossible to say, as at Austerlitz and Salamanca, exactly at what moment the roles were exchanged.

If then we are justified in assuming that in the

great battles of the future neither army will be acting entirely on the offensive or entirely on the defensive, it may seem idle to speculate as to whether the recent improvements in firearms and ballistics are in favour of one side or the other. In this connexion the lessons which may be learned from the South African and the Russo- Japanese wars are most instructive. After the former it was often urged that the conditions of modern battle are distinctly in favour of defensive tactics; in other words, that the force which awaits attack can develop the full power of each arm with greater facility than that which delivers it. This contention had much to support it, but it was not always realized that any- thing which gives new strength to the defence must at the same time add something to the advantages of the army which attacks. The outcome of the improvements in rifles, guns and powder is that far fewer men are required to hold a definite position than of old. To a certain extent this favours the defence. A much larger proportion of the available troops can be set free to act in reserve, and to deliver the counter-stroke, i.e. a much larger number than formerly can be employed by the defenders in attack. This is to the good. But the assailant profits in almost equal ratio. His strength has always lain in power of manoeuvring, of hiding his movements, and of massing suddenly against some weak point. To-day this power is greater than ever before. The increased power of the rifle renders it com- paratively easy for him to form an impenetrable barrier with part of his force, perhaps with his cavalry supported only by a small proportion of his infantry, behind which the remainder can move unobserved. Moreover, the object of the assailant's manoeuvres will be to place portions of his forces on the flank or flanks of the position he is attacking. If he can accomplish this, the effect, moral and physical, of the enfilade fire which is brought to bear upon the enemy's front will be far greater than that which attended a similar operation when fire was of less account. In addition to this increased facility for manoeuvre, the great strength of the local defensive confers upon the

assail- ant the power of denuding certain portions of his line of troops, in order that he may mass them for offensive action elsewhere.

Here again the study of ground and a true knowledge of the capabilities of the various arms are of supreme importance. Well- placed artillery, aided by machine guns, may enable a compara- tively weak force of infantry to hold a wide extent of front, provided that each arm is able to use its strength to the fullest extent. In this way the skilful commander can turn each feature of the battlefield to account and can release a greater number of his troops for the all-important enveloping move- ments. It was just this power which enabled Oyama to outflank the Russian XVII. Corps at the battle of Sha-ho, for he was able to weaken his own right to an extent which a very few years ago would have been impossible. In short, the process of envelopment is more easy than it used to be; and envelopment, which means that the enemy is under fire from several directions, is much more effective now than in the past.

In Germany this fact has long been recognized, and it was for this reason that German soldiers refused to accept the con- clusions at which many English military critics arrived after the South African war. Under the influence of their German teachers the Japanese never hesitated to attack, even with inferior numbers, and to make the envelopment of the enemy more certain they went into battle practically without reserves.

In this respect the war in Manchuria marks an epoch in the history of tactics; and for that reason, if for no other, it should be carefully studied. Moreover, it emphasizes an important difference in the handling of large and small armies which is of quite recent origin. Until a few years ago all continental armies were organized in army corps. These corps were com- posed of two or three infantry divisions with a large body of corps troops, principally artillery. Now the raison d'etre of this artillery was to form the nucleus of a reserve which could be retained under the hand of the corps commander to be used as required. That is to drive home the infantry attack, to deliver or repel a counter-attack, or, but very sparingly, to strengthen a weak point in the defensive line. With the development of the enveloping battle, it was soon realized in Germany that corps artillery was an anachronism, for the distances are now so great that reserve artillery can hardly C J! r ? s , a '"t be moved to the particular part of the battlefield ar tmeey. where its services are required in time to be of any use. Thus the corps artillery was first split up among the divisions, and soon a number of divisional reserves took the place of the great central body, while the corps commander retained a comparatively small number of troops under his own hand. In this way the control of the supreme commander over the course of the battle is greatly weakened and the chance of correcting any error in the original plan is diminished. It had long been realized that errors in the strategic deployment of troops were almost impossible to correct; and now it came to be seen that this was equally true of the tactical deployment. Just as under modern conditions even Napoleon could hardly have recovered from errors like those which marked the opening phases of the Eckmiihl campaign (see Napoleonic Campaigns), so the most brilliant genius will no longer be sufficient to win battles if the original plan is not correct. It was upon this theory that the Japanese commanders planned their battles, and it was very soon proved that they had the courage of

their convictions. For the first time it was seen that battles were no longer won by the general who husbanded his reserves, but by him who first got every available man into the firing line. But, while giving Oyama, Kuroki, Oku and the others every credit for the strength of mind which enabled them to divest them- selves of reserves when their battles were far from being won, we must also remember that they were fighting an enemy who, like the Boers, were incapable of organizing a really decisive counter-stroke. For English soldiers this point has a peculiar interest, as it has a very distinct bearing upon the tactics of our own army. From what has already been said it is, or should be, clear that the value of numbers upon the battlefield is greater now than formerly; for, granting that the leadership on either side is equally skilful, the chances of envelopment are in favour of him who commands the greater number of men. Owing

to our geographical position and to the conditions under which we live, the number of British troops available for employment in any war against a continental Power will almost certainly be inferior to that which can be employed against us. It is of course true that we should never engage in operations on the continent of Europe except in alliance with some other Power; but it is quite possible that the British army might be entrusted with the execution of some definite task which, while part of a general strategical scheme, would involve completely inde- pendent action. It is under such circumstances as these that we must be prepared to encounter troops which in leadership and training will be at least the equal of our own, and in numbers will probably be superior to them. In these circumstances our chances of envelopment will not be great, but this must by no means be taken to mean that our chances of success are to be despaired of. Far from it. In the first place strategy may induce the enemy temporarily to divide his forces, and thus

to afford favourable opportunity for an effective blow. Failing this, it remains to be considered how a general may best employ inferior numbers with a reasonable hope of gaining a tactical victory. To this the answer must be that his best, indeed his only, chance of victory lies in the counter-stroke.

In France this fact has received due recognition, and since that country is in the unfortunate position of having to be prepared to encounter superior numbers, the training and organization of her armies differ essentially from those of her most formidable neighbour. Acknowledging that at the outset of a war she must be placed at a grave disadvantage, she strives The to develop her power of manoeuvre and of delivering

counter- a strategic counter-stroke. With this object her stroke. armies move in deep formations on a comparatively narrow front, covered by strong advanced guards. Thus, in the earlier stages, they are much less committed to a definite line of action than are armies moving upon a widely extended front, and, provided intelligence is received in time, they can be massed quickly against the enemy's flanks. Similarly in the later stages she tTusts to the tactical counter-stroke, and hence the corps artillery, which has been abandoned in Germany for reasons which have already been given, is still retained in France.

In the foregoing pages the question was raised as to whether the great tactical counter-strokes of the past are still possible under modern conditions. Unfortunately the battles in Man- churia afford no instance of a successful counter-stroke, for the Sha-ho is more an example of an encounter action than of a carefully conceived counter-attack. In these circumstances we are forced to rely upon theory; but theory based upon a correct understanding of the past should form no uncertain guide to the practice of the future. What then are the principles upon which our theory is to be based? First, that the defensive battle is only a step towards assuming the offensive. Secondly, that the

only means of assuming the offensive with success is the counter-stroke. Thirdly, that the counter-stroke, in at least nine cases out of every ten, should aim at the envelopment of the attack. From these premises it follows that the most effective form of the defensive battle will be that which compels the enemy to deploy his forces and then uses the reserve to envelop one or both of his flanks. Since, however, modern battles are fought over a very wide extent of front, it necessarily follows that the possibility which the defence possesses of successfully enveloping the attack must depend to a very great extent upon the correct disposal of the reserves when drawing up the original line of battle. Just as the chances of making the best use of superior number in the attack depend upon a correct strategical deployment at the commencement of a campaign, so the chances of a successful counter-stroke depend upon a correct distribution of troops at the commencement of an action. Hence we see that the most important point which a general who finds himself compelled to take up a defensive position has to decide is where to place those troops by whose aid he hopes eventually to seize the offensive. One thing is clear, namely, that the worst place for men who are destined

to envelop one or other flank of the attack must be behind the centre of the defensive line. Time alone must render such a position unsuitable, for it must entail a march of many hours, if not of days, before the troops can reach the point from which they are to be launched to the attack. This being so, it would seem that the right place for the general reserve of the defending army under modern conditions must be on one or other of the flanks; and, always bearing in mind that the chief object to be attained is regaining the initiative, we are driven to the con- clusion that the best place is that flank from which an effective blow can be dealt at the assailant's most vulnerable point, that is to say, at the flank through which his line of communication may be most easily attained. If this theory be correct, yet another point has been

established, namely, that the main plan of the decisive counter-stroke must be decided before, and not after, the first shot in the general engagement has been fired. Under the conditions which obtain to-day it is no use waiting for the enemy to make a mistake, for the odds against it being detected are great. A hundred years ago armies manoeuvred in full view of one another, and mistakes could be perceived by every company officer on either side. Now all this is changed, and the difficulties of the defence are increased by the fact that although the attack may make many blunders, it will do so at such a distance from the defence as to render them comparatively secure from detection. Having prepared his counter-stroke, the chief point towards which the commander of the defence must direct his attention after battle has been joined, is the exact moment at which it should be delivered. Needless to say that the chances of success will be enormously increased if the counter-stroke is unexpected, for in war the demands which surprise makes upon moral are quite out of proportion with the physical danger which men are called upon to undergo. If then defence is ever to be converted into attack, it would appear: (i) That the counter-stroke must be carefully planned, and must form an integral part of the original scheme of defence. (2) That it must be properly directed. (3) That it must be correctly timed. (4) That if possible it must come as a surprise. Of these conditions, the first three are dependent for their fulfilment upon good information, careful preparation, and correct appreciation of the enemy's plans; but it is in the fourth that the inspiration of the really great commander will be most conspicuously displayed on the day of battle, and the greater the numbers under his command the more difficult his task must be.

When, as at the Sha-ho and Mukden, the troops on either side are numbered by hundreds of thousands, the commander- in-chief cannot hope to keep the direction of events in his own hands for very long; but when tens of thousands only are engaged, the whole battle can be controlled as well now as in the

past. The extent of front will certainly be greater than it was formerly, but against this may be set the fact that improved communications by telegraph and telephone enable the com- mander to keep in touch with events in a manner which until recently was quite impossible. It is for this reason that the earlier and smaller battles of the Russo-Japanese War contain many lessons which are of more use to British soldiers than are those which may be learned from the great struggles which took place later on. But in all battles, whether great or small, the first requirement is a commander who possesses sufficient stead- fastness of character to carry out on the day of battle the plans he has formed beforehand. War is like a game of bridge, for the most successful player is not he who best remembers the fall of the cards or who knows the correct leads by heart, but he who can decide upon and carry out the plan best suited to the strength of his hand. In both cases a bad plan is better than none, and vacillation even between two good plans is fatal. In both cases side issues are constantly arising which tend to obscure the main issue. On the battlefield ott^w! these side issues take the form of appeals for assist- ance from various quarters, all of which must tempt the supreme commander to weaken the general reserve which has been set aside for his decisive stroke. To such appeals he must tura

a deaf ear, confident in the knowledge that the best way of assisting his sorely-pressed troops is by a vigorous blow at his enemy's weakest spot. Hence it follows that the force which is to deliver the blow must be kept perfectly distinct from the local reserves under subordinate commanders, which are held in readiness to strengthen weak places in the defensive line, or to deliver local counter-attacks. It also follows that this force must comprise every man who can be spared from the passive portion of the defence, and that to produce the fullest results there must be complete co-operation between the

three arms.

It is here, in all probability, that cavalry will find its oppor- tunity. On the one hand, the cavalry of the attack will strive to locate the hostile reserve which is preparing to deliver a counter-attack ; failing this it will protect the flanks of its own infantry, ready to rnove to any threatened point and to assist with dismounted fire in repelling the advancing lines when the necessity arises. On the other hand, the cavalry of the defence will strive to conceal the movements of its own general reserve and will locate the flanks of the infantry against which the counter-attack is to be directed. The share of the artillery in this stage of the battle is sufficiently apparent, and it is obvious that the chances of success of one side or the other must depend largely upon the skill and self-sacrifice of the gunners. Should the commander of the defence, aided by his cavalry, have been successful in effecting a surprise, his chances of victory will be further increased if his infantry is supported closely by the artillery. Much also must depend upon the handling of the artillery which has suddenly been thrown upon the defensive. If the battery leaders are quick to realize the changed situation and to pick up new targets, perhaps leaving covered positions and firing ovei the sights, all may yet be well; but it is certain that if the surprise has really been complete the infantry will require all the assistance it can possibly derive from the other arms in order to avert defeat.

One more point remains to be noted. Since the object of tactics is to win battles, every effort should be directed to that single end. If certain formations are adopted with a view to avoiding losses, it must only be in order that more men may be brought up to the decisive point. The same principle holds good with regard to what are known as holding, or secondary, attacks whose role is frequently misunderstood. Indeed the names themselves are misleading, for they inevitably convey the impression that the duty of winning has been

entrusted to some other body. For this reason the commander is apt to consider that he has fulfilled his task if he succeeds in getting to within reasonably close range of the enemy's position, where he can remain without suffering undue loss. Far from this being the case, the fact is that against an able opponent an attack of this nature is useless, for he will very soon detect

which is the real and which is the secondary attack, attacks. an(^ urues s the two are pushed with equal vigour he

will disregard the one and turn all his attention to the other. It may even happen that he will be able to take troops from that portion of his line which is only threatened and place them where he is really pressed, or even utilize them in counter- attack. In such a case it may happen that the so-called " holding " attack may itself be held by less than its own numbers, while the main attack is suffering defeat in some other quarter of the field. Here again there is much to be learnt from the past; and for the true conduct of these feint attacks we need not go outside the history of our own army. Many instances might be quoted, but none are more to the point than that of the assaulting columns at the capture of Badajoz. On that memorable occasion the British troops were divided into five columns, three of which were vainly hurled against the great breaches which had been made in the walls. But what the main assaults failed to do was accomplished by the attacks from which least had been expected; and Philippon with his gallant defenders was forced to surrender by the loss of the San Vincente bastion and the castle of San Roque, which had been considered to be impregnable. This is the spirit which must imbue the infantryman, the cavalryman, and the artilleryman alike. For XXVI. 12

without the fighting spirit, neither generalship, formations, nor weapons can prevail. (N. M.)*

TADPOLE, a term often, but wrongly, applied indiscriminately to all Batrachian larvae. It is

absurd to call the larva of a newt or of a Caecilian a tadpole, nor is the free-swimming embryo of a frog as it leaves the egg a tadpole. A tadpole is the larva of a tailless Batrachian after the loss of the external gills and before the egress of the fore limbs (except in the aberrant Xenopus) and the resorption of the tail. What characterizes a tadpole is the conjoined globular head and body, so formed that it is practically impossible to discern the limit between the two, sharply set off from the more or less elongate com- pressed tail which is the organ of propulsion. In describing tadpoles, the term " body " is therefore used as meaning head and body. The tail consists of a fleshy muscular portion bordered above and below by membranous expansions, termed respectively the upper and lower crest, the former sometimes extending along the body.

Except in a few aberrant types, which are mentioned below, the mouth is surrounded by a much developed lip like a funnel directed downwards, and is armed with a horny beak not unlike that of a cuttle-fish. The characters offered by the circular lip are among the most important for the distinction of species. It may be entirely bordered by fleshy papillae, or these may be restricted to the sides, or to the sides and the lower border. Its inner surface is furnished with ridges beset with series of minute, bristle-like, erect, horny teeth, each of which, when strongly magnified, is seen to be formed of a column of super- posed cones, hollowed out at the base and capping each other; the summit or crown of each of these cones is expanded, spatu- late, hooked backwards, and often multicuspid. The number of these columns is very great. F. E. Schulze has counted as many as noo in the lip of Pelobaks fuscus. The beak is made up of horny elements, like the labial teeth, fused together; its edge, when sufficiently magnified, is seen to be denticulate, each denticle representing the cusp of a single tooth. The gills, borne on four arches, are internal and enclosed in the branchial chambers. The arches bear on the convex outer side the delicate arborescent gills, and on the concave inner side

develop a membranous septum with vermicular perforations, a special sifting or filtering contrivance through which the water absorbed by the mouth has to pass before reaching the respira- tory organs of the branchial apparatus.

The water is expelled from the branchial chambers by one or two tubes opening by one orifice in most Batrachians. This orifice is the spiraculum, which is lateral, on the left side of the body, in most tadpoles, but median, on the breast or belly, in those of the Discoglossidae and of some of the Engystomatidae. All tadpoles are provided with more or less distinct lines of muciferous sensory crypts or canals, which stand in immediate relation to the nerve branches and are regarded as organs of a special sense possessed by aquatic vertebrates, feeling, in its broadest sense, having been admitted as their possible use, and the function of determining waves of vibration in the aqueous medium having been suggested. In addition to these lines, all tadpoles show more or less distinctly a small whitish gland in the middle of the head between the eyes, the so-called frontal gland or pineal gland, which in early stages is connected with the brain. A glandular streak extending from the nostril towards the eye is the lachrymal canal. The eyes are devoid of lids.

Owing to more or less herbivorous habits, the intestine is exceedingly elongate and much convoluted, being several times larger and of a greater calibre than after the metamorphosis. Its opening, the vent, is situated either on the middle line at the base of the tail, or on the right side, as if to balance the sinistral position of the spiraculum. The tail varies much in length and shape according to the species; sometimes it is rounded at the end, sometimes more or less acutely pointed, or even terminating in a filament. The skeleton is cartilaginous, and the skull is remarkable for the very elongate suspensorium of the lower jaw; the tailremains in the notochordal condition,

no cartilages being formed in this organ, which is destined to disappear with the gills. The hind limbs appear as buds at the base of the tail, and gradually attain their full development during the tadpole life. The fore limbs grow simultaneously, and even more rapidly, but remain concealed within a diverti- culum of the branchial chambers until fully formed, when they burst through the skin (unless the left spiraculum be utilized for the egress of the corresponding limb).

The above description applies to all European and North American tadpoles, and to the great majority of those known from the tropics. The following types are exceptional.

The circular lip is extremely developed in Megalophrys Montana, and its funnel-shaped expansion, beset on the inner side with radiating series of horny teeth, acts as a surface-float, when the tadpole rests in a vertical position; the moment the tadpole sinks in the water the funnel collapses, taking on the form of a pair of horns, curling backwards along the side of the head; but, as they touch the surface again, it re-expands into a regular parachute.

In some species of Rana and Staurois inhabiting mountainous districts in south-eastern Asia, the larvae are adapted for life in torrents, being provided with a circular adhesive disk on the ventral surface behind the mouth, by means of which they are able to anchor themselves to stones.

In some Indian and Malay Engystomatids of the genera Callula and Microhyla, the tadpoles are remarkably transparent, and differ markedly in the structure of the buccal apparatus. There is no funnel-shaped lip, nc horny teeth, and no beak. The spiraculum is median and opens far back, in front of the vent.

In the Aglossal Xenopus, the tadpoles are likewise devoid of circular lip, horny teeth, and beak, and

they are further remarkable in the following respects: There is a long tentacle or barbel on each side of the mouth, which appears to represent the " balancer " of Urodele larvae; the spiraculum is paired, one on each side; the fore limbs develop externally, like the hind limbs.

Some tadpoles reach a very great size. The largest, that of Pseudis paradoxa, may measure a foot, the body being as large as a turkey's egg. The perfect frog, after transformation, is smaller than the larva. Pseudis was first described by Marie Sibylle de Merian (1647–1717), in her work on the fauna of Surinam (published first in 170s at Amsterdam, republished in Latin in 17 19), as a frog changing into a fish. Among European forms, some tadpoles of Pelobates attain a length of seven inches, the body being of the size of a hen's egg. The tadpole of the North American bull-frog measures six inches, and that of the Chilian Calyptocephalus gayi seven and a half inches.

Authorities. — L. F. Heron-Royer and C. Van Bambeke, " Le vestibule de la bouche chez les tdtards des batraciens anoures d'Europe," Arch. Biol., ix. 1889, p. 185; F. E. Schulze, " Ober die inneren Kiemen der Batrachierlarven," Abh. Ak. Berl., 1888 and 1892; G. A. Boulenger, "A Synopsis of the Tadpoles of the European Batrachians," P.Z.S., 1891, p. 593; F. E. Beddard, " Notes upon the Tadpole of Xenopus laevis," P.Z.S., 1894, p. 101 ; S. Flower, " Batrachians of the Malay Peninsula and Siam," P.Z.S., 1899, p. 885 ; H. S. Ferguson, " Travancore Batrachians," J. Bombay N.H. Soc, xv. 1904, p. 499. (G. A. B.)

TAEL (Malay tail, tahil, weight, probably connected with Hind, tola, weight), the name current in European usage for the Chinese Hang or ounce, the Hang of fine uncoined silver being the monetary unit throughout the Chinese empire. The tael is not a coin, the only silver currency, apart from imported dollars, being the ingots of silver known as "sycee"; the only other native currency is the copper " cash." As a money of account the tael is

divided into 10 mace (tsien), 100 conderin or candereen (fun), 1000 li. The value varies with the price of silver. The " Haikwan tael," i.e. the custom-house tael, that in which duties are paid to the Imperial Maritime Customs, is a weight of 58-77 grains Troy, the value of which varies; thus it was reckoned at 3s. y^d. in 1905, 3s. 3fd. in 1906, 3s. 3d. in 1907, and 2s. 8d. in 1908 (see China: § Finance).

TAENIA (Gr. raivia, ribbon, fillet), the term in architecture given to the projecting fillet which crowns the architrave of the Greek Doric order.

TAFILALT, or Tafilet (i.e. " The Country of the Filali," as its inhabitants are called, because descended from the Arabian tribe of Hilal, settled here in the nth century), the most impor- tant oasis of the Moroccan Sahara, ten days' journey south of Fez, across the Atlas. It is celebrated for its large and luscious dates, to the successful cultivation of which, soon after the

arrival of an ancestor of the reigning dynasty of Morocco (hence called the Filali Sharifs, i.e. descendants of Mahomet) circ. a.d. 1250, this dynasty owes its rise to power. Since 1648 it has been the custom of Moorish sultans to despatch superfluous sons and daughters to Tafil<, and as the males are all sharifs, the fanaticism against Europeans is comprehensible. Instead of living in towns its bellicose inhabitants occupy isolated fortified buildings, and are constantly at war. In Ifli, the central portion, formerly existed the town of Sagilmasa, founded by Miknasa Berbers in 757 B.C. It was on the direct caravan route from the Niger to Tangier, and attained a considerable degree of prosperity. It was destroyed at the end of the nth century, but its ruins still extend five miles along the river bank.

The first European to visit Tafilalt was Rene Caillie (1828), the next Gerhard Rohlfs (1864). A later visit to the oasis by W. B. Harris is described in his book Tafilet (London, 1895).

TAFT, LORADO (i860-), American sculptor, was born at Elmwood, Illinois, on the 29th of April i860. He graduated from the University of Illinois in 1879, and from 1880 to 1883 studied in the Ecole des Beaux Arts, Paris. In 1886 he became instructor at the Art Institute, Chicago, lecturing there, at the Chicago University, and elsewhere in the United States. He is the author of an exhaustive and authoritative work, The History of American Sculpture (1903). Among his works, in addition to much portraiture, are: " Sleep of the Flowers " and " Awakening of the Flowers," both made for the Columbian Exposition; "Despair" (1898); "Solitude of the Soul" (1900), and " Fountain of the Lakes " (1903).

TAFT, WILLIAM HOWARD (1857-), the twenty-seventh President of the United States, was born in Cincinnati, Ohio, on the 15th of September 1857. His father, Alphonso Taft (1810-1891), born in Townshend, Vermont, graduated at Yale College in 1833, became a tutor there, studied law at the Yale Law School, was admitted to the Connecticut bar in 1838, removed to Cincinnati in 1839, and became one of the most influential citizens of Ohio. He served as judge of the Superior Court (1865-72), as secretary of war (1876) and as attorney- general of the United States (1876-77) in President Grant's cabinet; and as minister to Austria-Hungary (1882-84) and to Russia (1884-85).

William Howard Taft attended the public schools of Cincinnati, graduated at the Woodward High School of that city in 1874, and in the autumn entered Yale College, where he took high rank as a student and was prominent in athletics and in the social life of the institution. He graduated second (salutatorian) in his class in 1878, and began to study law in Cincinnati College, where he graduated in 1880, dividing the first prize for scholar- ship. He was admitted to the Ohio bar in 1880. For a few months he worked as a legal reporter for the Cincinnati Times (owned by his brother C. P. Taft), and then for the Cincinnati Commercial. Early in 1881 he was appointed assistant prose- cuting attorney of Hamilton county (in which Cincinnati is situated),

but resigned in 1882 on being appointed collector of internal revenue of the United States for the first district of Ohio. The work was distasteful, however, and in 1883 he resigned to return to the law. From 1885 to 1887 he served as assistant solicitor of Hamilton county, and in the latter year was appointed judge of the Superior Court of Ohio to fill a vacancy. He was elected by the people in the next year and served until 1890, when he was appointed solicitor-general of the United States by President Benjamin Harrison. His work in connexion with the drafting of the Sherman Anti-Trust Act and with the Bering Sea controversy attracted attention. In 1892 he was appointed a judge of the Sixth Circuit. United States Court, and became known as a fearless administrator of the law. Several decisions were particularly objectionable to organized labour. The first of these, decided in 1890, upheld the verdict of a jury awarding damages to the Moores Lime Company, which had sustained a secondary boycott because it had sold material to a contractor who had been boycotted by Brickla} r ers' Union No. 1. The second decision grew out of the attempt of the Brotherhood of Locomotive Engineers to prevent

other roads from accepting freight from the Toledo, Ann Arbor & North Michigan railroad, against which a " legal " strike had been declared. Judge Taft granted an injunction (7th March 1893) against the Pennsylvania railroad, making P. M. Arthur, chief of the Brotherhood, a party, and called Rule 12, forbidding engineers to haul the freight, criminal. During the great railway strikes of 1 894 Eugene V. Debs, president of the American Railway Union, sent one Frank W. Phelan to tie up traffic in and around Cincinnati. The receiver of the Cincinnati, New Orleans & Texas Pacific railway applied for an injunction against Phelan and others, which was granted. Phelan disobeyed the injunction and on the 13th of July 1894 was sentenced to jail for six months for contempt. The doctrine that " the

starvation of a nation cannot be the lawful purpose of a combination " was announced, and Judge Taft said further that " if there is any power in the army cf the United States to run those trains, the trains will be run." In 1896-1900 Judge Taft was professor and dean of the law department of the University of Cincinnati.

A movement to elect Mr Taft president of Yale University gained some strength in 1898-99, but was promptly checked by him, on the ground that the head of a great university should be primarily an educationalist. In 1900 he was asked by President McKinley to accept the presidency of the Philippine Commission charged with the administration of the islands. Though he had been opposed to the acquisition of the Philippines, he did not believe that the inhabitants were capable of self-government, and he foresaw some of the difficulties of the position. Yielding, however, to the urgent request of the president and his cabinet, he accepted and served from the 13th of March 1900 to the 1st of February 1904. On the establishment of civil government in the islands, on the 4th of July 1 901 , he became governor, ex officio. The task of construct- ing a system of government from the bottom, of reconciling the conflicting and often jealously sensitive elements, called for tact, firmness, industry and deep insight into human nature, all of which Governor Taft displayed in a marked degree. (See Philippine Islands.) The religious orders had been driven out during the insurrection, but held title to large tracts of land which many Filipinos and some Americans wished to confiscate. This delicate matter was arranged by Mr Taft in a personal interview with Pope Leo XIII. in the summer of 1902. The pope sent a special delegate to appraise the lands, and the sum of $7,239,000 was paid in December 1903. Mr Taft gained great influence among the more conservative Filipinos, and their entreaties to him to remain influenced him to decline the offer of a place upon the Supreme bench offered by President Roosevelt in 1902.

Finally, feeling that his work was accomplished, Mr.

Taft returned to the United States to become secretary of war from the 1st of February 1904. With a party of congressmen he visited the Philippines on a tour of inspection July-September 1905, and in September 1906, on the downfall of the Cuban republic and the intervention of America, he took temporary charge of affairs in that island (September-October) . In the next year (March-April) he inspected the Panama Canal and also visited Cuba and Porto Rico. He again visited the Philippines to open the first legislative assembly (16th October 1907), and returned by way of the Trans-Siberian railway. On this tour he visited Japan, and on the 2nd of October, at Tokyo, made a speech which had an important effect in quieting the appre- hensions of the Japanese on the score of the treatment of their people on the Pacific coast.

With the approach of the presidential election of 1908, President Roosevelt reiterated his pledge not to accept another nomination, and threw his immense influence in favour of Mr Taft. At the Republican convention held in Chicago, in June, Mr Taft was nominated on the first ballot, receiving 702 out of 980 votes cast. James S. Sherman of New York was nominated for Vice-President. During the campaign many prominent labour leaders opposed the election of Mr Taft, on the ground that his decisions while on the bench had been unfriendly to organized labour. In the campaign Mr Taft boldly defended

his course from the platform, and apparently lost few votes on account of this opposition. At the ensuing election in November, Taft and Sherman received 321 electoral votes against 162 cast for William Jennings Bryan and John W. Kern, the Democratic candidates.

In his inaugural address (4th March 1909) President Taft' announced himself as favouring the maintenance and enforce- ment of the reforms initiated by President Roosevelt (including a strict enforcement of the Sherman Anti-Trust Act, an effective measure for railway rate regulation, and the policy of conserva- tion of natural resources) ; the revision

of the tariff on the basis of affording protection to American manufactures equal to the difference between home and foreign cost of production; a graduated inheritance tax; a strong navy as the best guarantee of peace; postal savings banks; free trade with the Philippine Islands; and mail subsidies for American ships. He also announced his hope to bring about a better understanding between the North and the South, and to aid in the solution of the negro problem. In accordance with his pre-election pledge, Congress was called to meet in extra session on the 15th of March to revise the tariff. Hearings had been previously held by the Ways and Means Committee of the House of Representatives, and a measure was promptly reported. After passing the House it was sent to the Senate, where it was much changed. The final Payne-Aldrich Act was approved by the President on the 5th of August 1909, though in many respects it was not the measure he desired. The wish to meet people of the different sections of the country and to explain his position upon the questions of the day led the President to begin (14th September 1909), a tour which included the Pacific coast, the South-west, the Mississippi Valley and the South Atlantic states, and during which he travelled 13,000 miles and made 266 speeches.

Mr Taft delivered the Dodge lectures at Yale University in 1906 on the Responsibilities of Citizenship,' published as Four Aspects of Civic Duty (1906). Some of his political speeches have been published under the titles Present Day Problems (1908), and Polticial Issues and Outlooks (1909).

TAGANROG, a seaport of southern Russia, on the N. shore of the Sea of Azov, in the Don Cossacks territory, some 170 m. S.E. of the town of Ekaterinoslav. It is built principally of wood, stands on a low cape, and has the aspect of an important commercial city. The imperial palace, where Alexander I. died in 1825, and the Greek monastery (under the patriarch of Jerusalem) are worthy of notice. Statues of Alexander I. (1830) and Peter the Great (1903) adorn the town. In the 13th

century Pisan merchants founded there a colony, Partus Pisanus, which, however, soon disappeared during the migra- tions of the Mongols and Turks. An attempt to obtain pos- session of the promontory was made by Peter the Great, but it was not definitely annexed by the Russians until seventy years afterwards (1769). The commercial importance of the town dates from the second half of the 19th century; in 1870 its population had risen to 38,000, and after it was brought into railway connexion with Kharkov and Voronezh, and thus with the fertile provinces of south and south-east Russia, the increase was still more rapid, the number reaching 56,047 in 1885, and 58,928 in 1900 — Greeks, Jews, Armenians and West-Europeans being important elements. The town was bombarded and in part destroyed by an Anglo-French fleet in May 1855. Taganrog is an episcopal see of the Orthodox Greek Church, and has tanneries, tallow works and tobacco manufactures. The road- stead is very shallow, and exposed to winds which cause great variations in the height of the water; it is, moreover, rapidly silting up. At the quay the depth of water is only 8 to 9 feet, and large ships have to lie 5 to 13 miles from the town. More- over, the port is closed by ice three to four months in the year. Notwithstanding the disadvantages of its open roadstead, the foreign trade has rapidly expanded, the annual value of the exports having increased from 65 millions sterling in 1899 to over 10 millions sterling in 1904. The chief article of export being corn, the trade of the city is subject to great fluctuations. Linseed and other oil-bearing grains are also important articles

of commerce, as well as wool and butter. The imports, which consist chiefly of machinery, fruits (dried and fresh), wine, oil and textiles, do not much exceed half a million sterling annually.

TAGES (T&ges) , a minor Etruscan deity, grandson of Jupiter, and founder of the art of divination in

Etruria. According to the story, during the ploughing of a field near Tarquinii a being of boyish appearance sprang out of the furrow. The shouts of the ploughman (Tarchon) brought to the spot all the people of Etruria, whom the boy proceeded to instruct in the art of divination. Having done this, he suddenly disappeared. His instructions were for some time handed down orally, but were subsequently committed to writing, and formed the twelve books of Tages, containing a complete system of Etruscan lore.

See Cicero, De Div. ii. 23; Ovid, Metam. xv. 553; Festus, s.v. ; Mommsen, Hist, of Rome (Eng. tr.), bk. i. ch. 12.

TAGLIACOZZI, GASPARO (1546-1599), Italian surgeon, was born at Bologna in 1546, and studied at that university under Cardan, taking his degree in philosophy and medicine at the age of twenty-four. He was appointed professor of surgery and afterwards of anatomy, and achieved notoriety at least, and the fame of a wonder-worker. He died at Bologna on the 7 th of November 1599.

His principal work is entitled De Curtorum Chirurgia per Insitionem Libri Duo (Venice, 1597, fol.,; it was reprinted in the following year under the title of Chirurgia Nova de Narium, Aurium, Labior- umque Defectu per Insitionem Cutis ex Humero, arte hactenus omnibus ignota, sarciendo (Frankfort, 1598, 8vo).

TAGLIACOZZO, a town of the Abruzzi, Italy, in the province of Aquila, 56 m. by rail E.N.E. of Rome, and 10 m. W. of Avezzano. Pop. (1901) 4517 (town); 9061 (commune). It lies 2428 ft, above sea-level, at the mouth of the deep ravine of the Imele. It contains several old churches, notably S. Fran- cesco, with a fine rose window in the facade, and medieval houses. The palace, built at the end of the 14th century by the Orsini, is fine. The place was given to the Colonna family in 1526. At the end of 1268 a battle took place here between Conradin of Hohenstaufen and Charles of Anjou, which resulted in

the defeat of Conradin and his execution.

TAGLIONI, MARIA (1804–1884), Italian ballet dancer, daughter of Filippo Taglioni (1777–1871), master of the ballet at Stockholm, Cassel, Vienna and Warsaw, was born at Stock- holm on the 23rd of April 1804. She was trained by her father, who is said to have been pitilessly severe. It was to his care and her own special talent for dancing that she owed her success, for she possessed no remarkable personal attraction. Her first appearance was at Vienna on the 10th of June 1822, in a ballet of which her father was the author, La Reception d'une jeune nymphe a la cour de Terpsichore. Her' success was immediate, and was repeated in the chief towns of Germany. On the 23rd of July 1827 she made her Paris debut at the Opera, in the Ballet de Sicilien, and aroused a furore of enthusiasm. Among her more remarkable performances were the dancing of the Tyrolienne in Guillaume Tell, of the pas de fascination in Meyer- beer's Robert le Diable, and in La Fille du Danube. At this period the ballet was an important feature in opera, but with her retirement in 1847 the era of grand ballets may be said to have closed. In 1832 she married Comte Gilbert de Voisins, by whom she had two children. Losing her savings in specula- tion, she afterwards supported herself in London as a teacher of deportment, especially in connexion with the ceremony of presentation at court. During the last two years of her life she lived with her son at Marseilles, where she died on the 23rd of April 1884. Taglioni is frequently mentioned in the novels of Balzac; and Thackeray, in The Newcomes, says that the young men of that epoch " will never see anything so graceful as Taglioni in La Sylphide."

TAGUS (Span. Tajo, Portug. Tejo), the longest river of the Iberian Peninsula. Its length is 565 m., of which 192 are on or within the frontier of Portugal, and the area of its basin is about 31,850 sq. m. The basin is comparatively narrow, and the Tagus, like the other rivers of the Iberian tableland, generally

flows in a rather confined valley, often at the

bottom of a locky gorge below the general level of the adjacent country. The river rises on the western slope of the Muela de San Juan (5225 ft.), a mountain which forms part of the Sierra de Albarracin, 88 m. E. of Madrid. Thence the Tagus flows at first north- westwards, but, after receiving the Gallo on the right, it flows west, and then south-west or west-south-west, which is its general direction for the rest of its course. Regular river navigation begins only at Abrantes, a few miles below which the Tagus is greatly widened by receiving on its right bank the impetuous Zezere from the Serra da Estrella. Passing San- tarem, the highest point to which the tide ascends, and the limit of navigation for large sailing vessels and steamers, the river divides below Salvaterra into two arms, called the Tejo Novo (the only one practicable for ships) and the Mar de Pedro. These branches enclose a deltaic formation, a low tract of marshy alluvium known as the Lezirias, traversed by several minor channels. Both branches terminate in a broad tidal lake immediately above Lisbon (q.v.). The Tagus estuary, though partly blocked by a bar of sand, is one of the chief harbours of south-western Europe.

The narrower part of the Tagus basin lies to the south, and the left-hand tributaries which drain it are almost all mere brooks, dry in summer. The principal exception is the Zatas or Sorraia, which, rising in the Serra d'Ossa, flows westwards across the plateau of Alemtejo, and joins the Mar de Pedro. The principal right-hand tributaries, besides the Gallo and Zezere, are the Jarama, descending from the tableland of New Castile a little below Aranjuez, the Alberche and the Tietar, which collect their head waters from opposite sides of the Sierra de Gredos, and the Alagon, from the rough and broken country between the Sierras de Gredos and Gata.

TAHITI, the largest and most important of the French Society Islands (q.v.) in the Pacific Ocean, in- 17 38' S., 149 30' W. Pop. about 10,300. The island, in shape not unlike the figure 8, has a length of 33 m., a coast-line of 120, and an area of 402 sq. m.

It is divided into two portions by a short isthmus (Isthmus of Taravao) about a mile in width, and nowhere more than 50 ft. above sea-level. The southern, the peninsula of Taiarapu, or Tahiti-iti (Little Tahiti) measures n m. in length by 6 m. in breadth; while the northern, the circular main island of Porionuu, or Tahiti-uni (Great Tahiti), has a length of 22 m. and a breadth of 20. The whole island is mountainous. A little to the north-west of the centre of Great Tahiti the double-peaked Orohena rises to 7349 ft., and the neighbouring Aorai is only a little lower. Little Tahiti has no such elevation, but its tower-like peaks are very striking. The flat land of the Tahitian coast, extending to a width of several miles — with its chain of villages, its fertile gardens, and its belt of palms, sometimes intersected by stream-fed valleys which open on the seashore — forms a most pleasing foreground to the grand mountain ranges. A good road surrounds the island, the extreme north of which is formed by Point Venus, W. of which lie the Bay of Matavai and Papeete, the European town and seat of government, on its beautiful harbour.

Climate. — The seasons are not well defined. Damp is excessive; there is little variation in the weather, which, though hot, is never- theless not depressing, and the climate for the tropics must be considered remarkably healthy. The rainfall is largest between December and April, but there is so much at other times of the year also that these months hardly deserve the name of the rainy season. During this period north-west winds are frequent, con- tinuing at times for weeks, and there are thunderstorms and hurri- canes. : These, while not generally destructive, are sometimes so, as notably the storm of the 13th of January 1903. During the eight drier and cooler months south-east trade winds prevail, but there are southerly winds which bring rain, and even westerly breezes are not infrequent. The mean temperature for the year on the coasts is 77 F. (maximum 84 , minimum 69°); and the average rainfall from December to March (4 months) is 29 inches; from April to November (8 months), 19 inches.

Fauna. — Mammals, as in other Polynesian islands, are restricted to a few species of bats (mostly of the genus Fleropus), rats and mice, none of them peculiar. Of domestic animals, the pig and the dog — the former a small breed which quickly disappeared before

the stronger European strains — were plentiful even in Wallis's days. The ornithology is very poor as compared with that of the Western Pacific; the Society Islands possess no peculiar genera and but few peculiar species. They claim, however, a thrush, several small parrots of great beauty, doves, pigeons, rails and a sandpiper (Tringa leucoptera). A jungle-fowl (var. of Callus bankiva) is found in the mountains, but as domesticated fowls were abundant, even when Tahiti was first discovered by Europeans, these wild birds are doubtless the offspring of tame birds. The lagoons swarm with fish of many species. Insects are poor in species, though some of them are indigenous. Crustaceans and molluscs, on the other hand, are well represented; worms, echinoderms, and corals com- paratively poorly. A noteworthy feature of Tahitian conchology is the number of peculiar species belonging to the genus Partula, almost every valley being the habitat of a distinct form. 1

Flora. — The flora, though luxuriant and greatly enhancing the beauty of the islands, is not very rich. It is, however, less poor in trees, shrubs and hardwood plants, than in the smaller under- growth. Orchids, including some beautiful species, and ferns are abundant; but, here as in Polynesia generally, Rubiaceae is the order best represented. Remarkable are the banana thickets, which grow at an altitude of from 3000 to 5000 ft. Along the shore — in some places almost to the extinction of all native growth — many exotics have established themselves; and a great variety of fruit-bearing and other useful trees have been introduced. 2

Inhabitants. — The Tahitians are a typical Polynesian race, closely connected physically with the Marquesans and Raro- tongans, but widely divided from them in many of their customs. The dialects, also, of the three groups are different, the Tahitian being perhaps the softest in all Oceania. The women rank with the most beautiful of the Pacific, though the accounts given of them by early voyagers are much exaggerated; and for general symmetry of form the people are unsurpassed by any race in the world. Even now in its decadence, after generations of drunkenness and European disease and vice, grafted on inborn indolence and licentiousness, many tall and robust people (6 ft. and even upwards in height) are to be found. Men and women of good birth can generally be distinguished by their height and fairness, and often, even in early age, by their enormous corpulence. The skin varies from a very light olive to a full dark brown. The wavy or curly hair and the expressive eyes are black, or nearly so; the mouth is large, but well-shaped and set with beautiful teeth; the nose broad (formerly flattened in infancy by artificial means); and the chin well developed.

The native costume was an oblong piece of bark-cloth with a hole in its centre for the head, and a plain piece of cloth round the loins was worn alike by men and women of the higher classes. Men of all ranks wore, with or without these, the T bandage. The women concealed their breasts except in the company of their superiors, when etiquette demanded that inferiors of both sexes should uncover the upper part of the body. The chiefs wore short feather cloaks, not unlike those of the Hawaiians, and beautiful semicircular breast- plates, dexterously interwoven with the black plumage of the frigate bird, with crimson feathers and with sharks' teeth; also most elaborate special dresses as a sign of mourning. The priests had strange cylindrical hats, made of wicker-work and over a yard in height. Circumcision, and in both sexes tattooing, were generally practised, and much significance was attached to some of the marks. The houses were long,

low, and open at the sides. Household utensils were few — plain round wooden dishes, sometimes on legs, coco-nut shells, baskets, &c. Low stools and head-rests were used. Pottery being unknown, all food was baked in a hole dug in the ground or roasted over the fire. Their chief musical instruments were the nose-flute — often used as the accompaniment of song — and the drum. Conch-shells were also used. Tahitian stone adzes, which are greatly inferior in finish to those of the Hervey Islands, are, like the adzes of Polynesia in general, distinguished from those of Melanesia by their triangular section and adaptation to a socket. Slings were favourite weapons of the Tahitians; they had also plain spears expanding into a wide blade, and clubs. The bow and arrow seem only to have been used in certain ceremonial games. Their canoes, from 20 to 70 ft. in length, were double or single, and provided with sail and outriggers. They were not well finished, but the high curved sterns, rising sometimes to a height of 20 ft., of those destined to carry the images of their gods, were carved with strange figures and hung with feathers. Cannibalism is unknown, though some ceremonies which were performed in connexion with human sacrifices may possibly be survivals of this practice. The staple food of the islanders consisted of the bread-fruit, the taro-root, the yam, the sweet potato, and in some districts the wild

1 Finsch and Hartlaub, Fauna Central-Polynesiens, Halle, 1867. - De Castillo, Illustrationes Florae Insularum Maris Pacifici, Paris, '886.

plantain; but they also ate much fish (the turtle was considered sacred food), as well as pigs and dogs, though of the latter, as pets, the women were so fond as to suckle the puppies sometimes even to the exclusion of their own children.

Tahitians were good fishermen and bold seamen. They steered by the stars, of which they distinguished many constellations. The land was carefully tended and the fields well irrigated. Three great classes were recognized: — (1) The sovereign, who bore a

semi- sacred as well as a political character, and the reigning chiefs of districts; (2) the proprietors and cultivators of inherited land, who also built canoes, made arms, &c. ; to these two classes also belonged the priests, who were medicine-men as well; (3) the fishers, artisans, &c, and slaves. As wars and infanticide depopulated the island this class gradually acquired land and with it certain privileges. Rank is hereditary and determined by primogeniture, not necessarily in the male line. The firstborn of a sovereign succeeded at once to titular sovereignty; the father, who was the first to pay homage to his child, then abdicated, and became regent. It is easy to see that, while this custom tended to keep honours within a family, it may have encouraged the practice of infanticide, which was common in all grades of society when Tahiti was first visited by Europeans. The age at which the child's authority became real varied according to his own abilities and the will of his subjects. Though arbitrary, the power of the king was limited by the power of his vassals, the district chiefs, who ruled absolutely over their respective districts, and who might be of as good blood as himself. The king had a councillor, but was alone responsible for any act. The bi-insular form of Tahiti promoted the independence of the chiefs, and war was rarely declared without their being first sum- moned to council. Their power over their own people was absolute. The form of government was thus strictly feudal in character, but it gradually centralized into a monarchy, which, in the person of Pomare II., the English missionaries greatly helped .to regulate and strengthen. The sovereign sent his commands by a messenger, whose credentials were a tuft of coco-nut film. This tuft was returned intact as a sign of assent or torn in token of refusal.

The temples were square tree-surrounded enclosures, with a single entrance and several small courts, within which were houses for the images and attendant priests. A pyramidal stone structure, on which were the actual altars, stood at the further end of the square. In the temples were buried the

chiefs, whose embalmed bodies, after being exposed for a time, were interred in a crouching position. Their skulls, however, were kept in the houses of their nearest relations. In the great temple at Atahura the stone structure was 270 ft. long, 94 ft. wide, and 50 ft. high, and its summit was reached by a flight of steps built of hewn coral and basalt. Sacrificial offerings, including human sacrifices, formed a prominent part of Tahitian worship. An eye of the victim was offered to the king, and placed within his mouth by the officiating priest. Every household possessed its own guardian spirits, but there were several superior divinities, of which, at the beginning of the 19th century, Oro was the most venerated. The images, which are less remarkable than those of Hawaii, were rough representations of the human form carved in wood. The Areoi, a licentious religious association, was a special feature of Tahitian society.

The Tahitians are light-hearted, frivolous, courteous and generous, but deceitful and cruel. They were always notorious for their immorality, one of their customs being a systematized exchange of wives. Besides dancing, the singing of songs, and the recitation of historical and mythical ballads, the natives had also a variety of sports and games. Wrestling, boxing, and spear-throwing matches, with foot and canoe races, were held; also sham fights and naval reviews. They had several ball games — one (played chiefly by women), a kind of football; but surf-swimming_ was perhaps the favourite sport, and cock-fighting was much practised.

Products, Trade, Administration. — Papeete, as the emporium for a widely scattered archipelago (including Paumotu, &c), has an export trade in mother-of-pearl, pearls (mainly from the Paumotu islands), oranges, trepang (for China), copra and vanilla. Many whalers formerly visited Papeete harbour. During the American Civil War, in the middle of the 19th century, Tahitian cotton was put upon the European market, but its cultivation had ceased by 1884, and it has been little grown since. This is also true of coffee and tobacco, among other

crops which have been tried. Sugar and rum are also produced.

The importation of " labour," chiefly for the plantations, from other Polynesian islands was placed under government control in 1862. The Tahitians themselves prefer handicrafts to agricultural work, and many are employed as artisans by European masters.

The total value of exports was £140,325 and of imports £127,600 in 1904. Papeete is the seat of government. The French establish- ments in the Eastern Pacific are administered by a governor, a privy council, and a council including the maire of Papeete and the presidents of the chambers of commerce and agriculture.

History. — The discovery and early exploration of the Society Islands is treated under that heading. In 1 788, when Lieutenant Bligh in the " Bounty " visited Tahiti, the leading chief was Pomare, whose family had been pre-eminent in the island for

more than a century. Aided by sixteen of the " Bounty " mutineers, and armed with guns procured from Bligh and a Swedish vessel, Pomare greatly strengthened his power and brought to a successful close a long struggle with Eimeo.

The attempt at colonization by the Spaniards in 1774 was followed by the settlement of thirty persons brought in 1797 by the missionary ship "Duff." Though befriended by Pomare I. (who lived till 1805), they had many difficulties, especially from the constant wars, and at length they fled with Pomare II. to Eimeo and ultimately to New South Wales, returning in 181 2, when Pomare renounced heathenism. In 1815 he regained his power in Tahiti. For a time the mis- sionaries made good progress — a printing press was established (1817), and coffee,

cotton and sugar were planted (1810); but soon there came a serious relapse into heathen practices and immorality. Pomare II. died of drink in 1824. His successor, Pomare III., died in 1827, and was succeeded by his half-sister Aimata, the unfortunate " Queen Pomare (IV.)." In 1828 a new fanatical sect, the " Mamaia," arose, which gave much trouble to the missions. The leader proclaimed that he was Jesus Christ, and promised to his followers a sensual paradise. In 1836 the French Catholic missionaries in Mangareva attempted to open a mission in Tahiti. Queen Pomare, advised by the English missionary and consul Pritchard, refused her consent, and removed by force two priests who had landed surreptitiously and to whom many of the opposition party in the state had rallied. In 1&3& a French frigate appeared, under the command of Abel Dupetit-Thouars, and extorted from Pomare the right of settlement for Frenchmen of every profession. Pritchard opposed this, and caused Pomare to apply for British protec- tion; but this was a failure, and the native chiefs compelled the queen, against her will, to turn to France. A convention was signed in 1843, placing the islands under French protection, the authority of the queen and chiefs being expressly reserved. Dupetit-Thouars now reappeared, and, alleging that the treaty had not been duly carried out, deposed the queen and took possession of the islands. His high-handed action was not countenanced by the French government; but while, on formal protest being made from England, it professed not to sanction the annexation, it did not retrace the steps taken. Two years were spent in reducing the party in the islands opposed to French rule; an attempt to conquer the western islands failed; and at length, by agreement with England, France promised to return to the plan of a protectorate and leave the western islands to their rightful owners. Pomare died in 1877, and her son Aiiane (Pomare V.) abdicated in 1880, handing over the administration to France, and in the same year Tahiti, in- cluding Eimeo, was proclaimed a French colony. In 1903 the whole of the French establishments in the Eastern Pacific were declared one colony, and the then

existing elective general council was superseded by the present administration.

Besides the narratives of early voyages, and general works covering the Society Islands (for which see Pacific), see Vincendon-Dumoulin, Les lies Tahiti, esquisses historiques et geographiques, Paris, 1844; A. Gonfil, " Tahiti," in La France coloniale, Paris, 1886; H. Le Chartier, Tahiti, Paris, 1887; Monchoisy, La Nouvelle Cythere, Paris, 1888; G. Collingridge, " Who discovered Tahiti? " in Journ. Polynesian Soc, xii., 1903. Among the narrative works of visitors to Tahiti may be mentioned Pierre Loti, Le Mariage de Loti, Paris, 1881; Dora Hort, Tahiti: the Garden of the Pacific, London, 1891.

TAHR, the native name of a shaggy-haired brown Himalayan wild goat characterized by its short, triangular and sharply keeled horns. Under the name of Hemitragus jemlaicus, it typifies a genus in which are included the wariatu, or Nilgiri ibex (H. hylocrius), from the Nilgiri and Anamalai hills of Southern India, and a small species, H. jayakeri, from South Arabia. Tahr frequent the worst ground of almost all ruminants.

TAILLANDIER, SAINT-RENE (1817-1879), French critic, whose original name was Rene Gaspard Ernest Taillandier, was born in Paris on the 16th of December 1817. He completed his studies at Heidelberg, and then became professor of literature successively at Strassburg, Montpellier and the Sorbonne, where he was nominated to the chair of French eloquence in 1868.

Most of the articles included in his published volumes first ap- peared in the Revue des deux monies. In January 1870 he became general secretary of the ministry of education, and continued in this office after the fall of the Empire. He became officer of the Legion of Honour in 1870, and was elected to the Academy in 1873. He died in Paris on the 22nd of February 1879.

His works include: — Allemagne et Russie, etudes

historiques et littiraires (1856), Le Poete du Caucase . . . Michel Lermontoff (1856), Maurice de Saxe (2 vols. 1865), Tchiques et Magyars (1869), Le General Philippe de Segur '(1875).

TAILLE (from Fr. tattler, to cut or divide; late Lat. taliare, said to come from talia, talea), the equivalent of the English tallage (q.v.), was in France the typical direct tax of the middle ages, just as the word tonlieu was the generic term for an indirect tax. Other words used in certain districts in the same sense as taille were queste (questa, quista) , fouage (Joragium) , cote. The essence of the tax denoted by these names was that the amount was fixed en bloc for a whole group of persons, and afterwards divided among them in various ways. In ancient French law we find three forms of taille: the taille servile, taille seigneuriale, and taille royale.

The taille servile can scarcely be termed a tax; it was rather a tax which had degenerated into a source of profit for certain in- dividuals. Every lord who possessed serfs could levy the taille on them, and originally this was done arbitrarily (a volonte) both as to frequency and amount. It always remained a characteristic feature of serfdom, but was limited and fixed, either by contracts or con- cessions from the lord {taille abonnee), or by the customs.

The taille seigneuriale was a true tax, levied by a lord on all his subjects who were neither nobles nor ecclesiastics. But, in our opinion, when feudalism was established, the right of levying it did not belong to every lord, but only to the lord having the haute justice. But he levied it by right, without the necessity for any contract between him and those who paid it. He fixed the sum to be paid by each group of inhabitants, who then had to see that it was assessed, collected, and paid to the lord, electing commissaries (preud hommes) from among themselves for this purpose. This was reducing the administration of taxation to its simplest form. Custom, however, or an order of the lord generally fixed the principle upon which the division was

made. It was often a ” hearth tax ” (fouage), when each fire, i.e. each head of a family, paid the same sum, arrived at by dividing the local contingent of the taille. by the number of fires. But this equality, which took no account of wealth or poverty, was felt to be unjust, and the assessment began to be made according to the resources of each family, ” the strong bearing the weak, and the weak relieving the strong.” The seigniorial taille, like the servile, had the character of a personal tax (taille personelle), a rudimentary tax on income, every man being taxed according to his wages or other income. The king originally had only the right of lev}‘ing the taille in places where he had retained the exercise of the haute justice. At that time there was no royal taille, strictly speaking; it was only the seigniorial taille transferred to the crown, but it was one of the first taxes his right to levy which upon all the inhabitants of the domain of the crown, whether serfs or roturiers, was recognized. In the course of the 13th century the idea began to prevail that it was fair for the king, in time of war, to levy a taille upon the subjects of the lords having the haute justice in various parts of the royal domain. Moreover, tattles were often granted him by the provincial estates or the states-general. Thus the general taille. raised for the benefit of the king, became more and more frequent, and naturally tended to become permanent. This transformation was confirmed, rather than effected, by the ordonnance of 1439. Its immediate object was, not the regulation of the taille, but the organization of the compagnies d’ ordonnance, i.e. the heavy cavalry which the king from that time on maintained on a permanent footing. Military expenses thus becoming per- manent, it was natural that the tattle, the tax which had long been devoted to meeting the expenses of the royal wars, should also become permanent. This was contained implicitly in the ordonnance of 1439, which at the same time suppressed the seigniorial taille, as competing too closely with the royal taille by imposing a double burden on the taxpayer. A kind of seigniorial taille continued to exist besides the servile taille, but

this kind presupposed a title, a contract between the taxable roturier and the lord, or else immemorial possession, which amounted to a title.

The royal taille naturally retained the distinctive characteristics of the seigniorial, as can be seen from an examination of the way in which it was assessed and collected; the chief characteristic being that ecclesiastics and nobles, who were exempt from the seigniorial taille, were also exempt from the royal. The royal taille, though levied by the king by right, did not fall upon the whole kingdom. The pays a" elections were subject to it, the pays d'etats were not (see France: Law and Institutions).

Throughout the pays d 'elections the taille was almost universally personal (taille personnelle), i.e. a tax on the whole income of the

taxpayer, whatever its source. It was also a distributory tax (impbt de repartition) ; every year the king in his council fixed the total sum which the laille was to produce in the following year; he drew up and signed the brevet de la taille (warrant), and the con- tribution of the individual taxpayer was arrived at in the last analysis by a series of subdivisions.

The conseil du roi first divided the total sum among the various generalites (the higher financial divisions), again dividing the amount due from each generalite among the elections of which it was composed. Then the elus in each election divided the contribution due from it among the parishes. The final division took place in the parish or community, among the inhabitants subject to the tax. So far the system remained the same as that of the old seigniorial taille. The assessment and collection of it were the business of the community; the crown, in principle, had nothing to do with them and did not bear the cost of a local administration

for the purpose. The community had to produce its contingent of the taille. In principle it was even held to be the debtor for the amount ; hence the inhabitants were jointly responsible, a state of affairs which was not suppressed till the time of Turgot, and even then not completely.

The inhabitants subject to the taille, summoned to a general assembly by the syndic, elected commissaries for the assessment (asseeurs) and collection (collecteurs) of the tax from among them- selves. Originally two series were elected, both assessors and collectors. But from 1600 onwards the same persons fulfilled both functions, the object being, by giving the assessors the duty of collecting the tax, to lead to a juster and more conscientious assess- ment. The system appeared to be admirable, forming in this respect a kind of self-government, but in practice it was frequently oppressive for the taxpayers. The assessors estimated the indivi- dual incomes arbitrarily, village quarrels and rivalries leading them to over-charge some and under-charge others, and complaints were numberless on this point. Control should no doubt have been exer- cised by the elus, but they do not seem to have taken this part of their duties very seriously. Payment was rigorously enforced, and thus for a variety of reasons the taille was a burdensome and hated tax. It had still further vices: not only were nobles and ecclesiastics exempt from it, but many other privileges had been introduced by law, total or partial exemption extending to a large number of civil and military officials and employes of the crown on the ferme generate. The towns in general were not subject to it, at least directly; some had been exempt from time immemorial, others {redimees) had purchased exemption for a sum of money, yet others (abonnees) had compounded for the tax, i.e. instead of paying the taille they paid into the royal treasury a sum fixed by contract, which they generally raised by octrois, or entrance dues.

Such was the administration of the taille until about the middle of the 17th century, after which time, although the broad lines remained the same,

important reforms were introduced. They came principally from the provincial intendants, or from the cours des aides, which were animated by a liberal spirit. The intendants, by an exercise of their general or special powers, took the place of the elus, and delegated commissaires aux tailles (commissaries of the taille) for the assessment of the parishes, who guided and super- vised the elected collectors — for the most part ignorant and partial peasants. They also endeavoured to distinguish between different kinds of income, in order to arrive at a more just estimate of the total income, and fixed by tariff the proportion in which each kind of income was to contribute. They sometimes settled officially and of their own authority the share of certain taxpayers, and, though this was sometimes done as a favour, it was often a measure of justice. They also tried to limit the scope of privileges. These efforts were inspired by a series of scientific studies and criticisms, chief among which were Vauban's Dime royale, and the Taille tarifee of the Abbe de St. Pierre.

In certain districts the taille was real {taille reelle) i.e. a tax on real property. It was not an equal tax falling on all landowners, but the question as to whether a certain estate was to be taxed or not was decided according to the quality of the property, and not that of the owner. The biens nobles (fiefs) and the biens ecclesiastiques were exempt ; tenures roturieres, however, by whomsoever held, were taxed. A small part of the pays d'elections was also pays de taille rcele. But it was the chief form of tax in the pays d'etats, and even there an attempt had generally been made to check the exemption of nobles' property. It has been shown that in these districts the taille had originally been personal, having become real by a curious evolution. In these districts there were cadastres, or compoix-

«riers (land registers), which allowed of a non-arbitrary assessment; d at the end of the ancien regime merely needed revision.

In certain provinces where the royal taille was levied there were neither elections nor generalites, and the whole administration of the tax was in the hands of the intendants. These were the provinces of the east and north, which were united to the crown at a period when the power of the intendants was already fully developed ; they were sometimes known as pays d' imposition.

See France: Law and Institutions; Henri See, Les Classes rurales et le regime domanial en France au Moyen Age (Paris, 1901); and Auger, Code des tailles (Paris, 1788). (J. P. E.)

TAILLEFER, the surname of a bard and warrior of the nth century, whose exact name and place of birth are unknown. He accompanied the Norman army to England in 1066, and obtained permission from William to strike the first blow at the battle of Hastings. He fought with spirit and determina- tion, and was killed in the battle. Mention of Taillefer is made by Guido, bishop of Amiens, in his Carmen de hello Hastingensi, v. 931-44 (in M on. Hist. Brit., 1848) and by Henry of Huntingdon in his Historia Anglorum (in Rer. Brit. med. aevi script., p. 763, ed. Arnold, London, 1879); and his prowess is depicted on the Bayeux tapestry. The statement of Wace in the Roman de Rou, 3rd part, v. 8035-62, ed. Andresen (Heilbronn, 1879), that Taillefer went before the Norman army singing of Charlemagne and of Roland and the vassals who died at Roncevaux, has been considered important in demonstrating the existence of a comparatively early tradition and song of Roland.

See W. Spatz, Die Schlacht von Hastings (Berlin, 1896); Freeman, History of the Norman Conquest.

TAILOR (Fr. tailleur, from tattler, to cut, Lat. lalea, a tiiin rod, a cutting for planting), one who cuts out and makes clothes. Formerly the tailor, or cissor, made apparel for both men and women, and not merely outer garments, but also articles of linen and the padding and lining of armour — whence the style " Taylors and Linen Armourers " applied to the

Merchant Taylors Com- pany of the City of London in their earliest charters. But the word is now generally limited to those who make the outer (cloth) garments for men, and less frequently for women, though a phrase such as ” shirt-tailor ” is occasionally met with. In modern usage, too, it commonly has the implication that the garments are made to the order, and to the measure, of the individual purchaser, as opposed to ready-made clothing, which means articles of apparel manufactured in’ large quantities in a series of stock or standard sizes, such that any purchaser may expect to find among them one that will fit him with more or less accuracy. The clothing trade was originally confined to goods of the poorest grades, but it has come, especially in America, to include articles of good, though not of the first, quality. It probably first came into existence at seaport towns, where, to meet the convenience of sailors returning from long voyages and requiring their wardrobes to be replenished at short notice, the “outfitters” kept stocks of ready-made garments on sale; but it made no considerable progress until after the middle of the 19th century, when the introduction of the sewing-machine brought about the possibility of manu- facturing in large quantities. Its development was attended with gradually increasing subdivision of labour and, to a large extent, with the disappearance of the tailor as a skilled craftsman. The first step was for a garment, such as a coat, to be com- pleted by the joint efforts of a family. Then followed the ” task system,” which in America was the result of the influx of Russian Jews that began about 1875. Under it a team of three men, with a ” presser ” and a girl to sew on the buttons, divided the work between them. Payment was made by the ” task,” i.e. a specified number of garments, the money being divided between the members of the team in certain proportions. Often several teams would be run by a contractor, who naturally selected the cheapest workshops he could find and packed them as full of workers as possible ; and when through stress of com- petition he had to accept lower prices the plan

he adopted was to increase the number of garments to a task, leaving the pay unaltered. The result was the introduction of many of the worst features of the ” sweating system,” the workers having to work excessively long hours in order to finish the task, which in some cases meant as many as twenty coats a day. In the ” factory ” or ” Boston ” system the subdivision is still more minute, and as many as one hundred persons may be concerned in the production of one coat. The amount of tailoring skill required in a worker is even further reduced, but the premises come under the regulation of the factory laws. The factory system has also cheapened production in a legitimate way, because it has enabled mechanical power for driving sewing-machines, and also expensive labour-saving machinery, to be

introduced to an extent not economically possible in small shops.

TAIN, a roval and police burgh of the county of Ross and Cromarty. Scotland. Pop. (iqoi) 2076. It is situated on rising ground within a mile of the southern shore of Dornoch Firth, 2S§ m. N.E. of Dingwall by the Highland Railway. The name, of which the Tene, Tayne and Thane are older forms, is derived from the Icelandic thing, ” assembly ” or ” court.” Among the principal buildings are the town hall, court house, public hall, Easter Ross combination poorhouse, and the academy (opened in 181 2). The industries include distilling, the making of aerated waters, and woollen manufactures, and the town is important as a market and ■ distributing centre. The rainfall is one of the lowest in the kingdom. Duthac (locally called Duthus), a saint of the nth century, is believed to have been a native, and the old ruined chapel near the station is supposed to have been his shrine. To the collegiate church of St Duthus, a Decorated building, founded by James III. in 1471, James IV.

made several pilgrimages in penance for his father's death. The building was used as the parish church till 181 5, when it fell into disrepair, but it was restored between 1871 and 1876. It has monuments to Patrick Hamilton, the martyr, and Thomas Hog (1628-1602), the Scottish divine, for some time a prisoner on the Bass. Three and a half miles S.E. are the remains of the Early English abbey of Fearn, founded at Edderton in 1230 by Farquhar, 1st earl of Ross, and transferred hither in 1338. The chancel, nave and two side chapels exist, and it still serves as the parish church. Patrick Hamilton became titular abbot in 1517, and after his martyr- dom the abbey was added to the bishopric of Ross.

TAINE, HIPPOLYTE ADOLPHE (1828-1893), French critic and historian, the soft of Jean Baptiste Taine, an attorney, was born at Vouziers on the 21st of April 1828. He remained with his father until his eleventh year, receiving instruction from him, and attending at the same time a small school which was under the direction of M. Pierson. In 1839, owing to the serious illness of his father, he was sent to an ecclesiastical pension at Rethel, where he remained eighteen months. J. B. Taine died on the 8th of September 1840, leaving a moderate competence to his widow, his two daughters, and his son. In the spring of 1841 Taine was sent to Paris, and entered as a boarder at the Institu- tion Mathe, where the pupils attended the classes of the College Bourbon. Madame Taine followed her son to Paris. Taine was not slow to distinguish himself at school. When he was but fourteen years old he had already drawn up a systematic scheme of study, from which he never deviated. He allowed himself twenty minutes' playtime in the afternoon and an hour's music after dinner; the rest of the day was spent in work. In 1847, as vetiran de rhUorique, he carried off six first prizes in the general competition, the prize of honour, and three accessits; he won all the first school prizes, the three science prizes, as well as two prizes for dissertation. It was at the College Bourbon that he formed lifelong friendships with several of his schoolfellows who afterwards were to

exercise a lasting influence upon him: among these were Pr6vost-Paradol, for many years his most intimate friend; Planat, the future " Marcelin " of the Vie Parisienne; and Cornelis de Witt, who introduced him to Guizot when the latter returned from England in 1846.

Public education was the career which seemed to lie open to Taine after his remarkable school successes. In 1848 he ac- cordingly took both his baccalaureat degrees, in science and letters, and passed first into the Ecole Normale; among his rivals, who passed in at the same time, were About, Sarcey, Libert, and Suckau. Among those of Taine's fellow-students who afterwards made a name in teaching, letters, journalism, the theatre and politics, &c, were Challemel-Lacour, Chassang, Aube, Perraud, Ferry, Weiss, Yung, Gaucher, Gr6ard, Prevost- Paradol and Levasseur. Taine made his influence felt among them at once; he amazed everybody not only by his erudition, but by his indefatigable energy; and not only by his prodigious industry, but by his facility both in French and Latin, in verse as well as in prose. He devoured Plato, Aristotle, the Fathers of

the Church, and he analysed and classified all that he read. He already knew English, and set himself to master German in order to read Hegel in the original. His brief leisure was devoted to music. The teachers of his second and third years, Deschanel, Geruzez, Berger, Havet, Filon, Saisset and Simon, were unanimous in praising the nobility of his character, the vigour and the fertility of his intellect, the distinction of style with which his work was always stamped; they were equally unanimous in finding fault with his unmeasured taste for classi- fication, abstraction and formula. The director of studies, M. Vacherot, gauged his capacity at the end of his second year ' with prophetic insight. He prophesied that Taine would be a great savant, adding that he was not of this world, and that Spinoza's motto, " Vivre pour penser," would also be his. In the month of August 1851 he came forward as a candidate for the fellowship in philosophy {agrigation de philosophie)

in com- pany with his friends Suckau and Cambier. Taine was declared to be admissible, together with five other candidates; but in the end only two candidates were admitted, his friend Suckau and Aube. This decision created almost a scandal. Taine's reputation had already spread beyond the college. Everybody had taken for granted that he would be admitted first. The fact was that his examiners sincerely considered his ideas to be absurd, his style and method of handling a subject dry and tiresome.

The Minister of Public Instruction, however, judged Taine less severely, and appointed him provisionally to the chair of philosophy at the college of Toulon on 6th October 1851; but he never entered upon his duties, as he did not wish to be so far from his mother, and on 13th October he was transferred to Nevers as a substitute. Two months later, on the 27th December, occurred the coup d'Uat, after which every university professor was regarded with suspicion; many were suspended, others resigned. In Taine's opinion it was the duty of every man, after the plebiscite of the 10th December, to accept the new state of affairs in silence; but the universities were not only asked for their submission, but also for their approbation. At Nevers they were requested to sign a declaration expressing their gratitude towards the President of the Republic for the measures he had taken. Taine was the only one to refuse his endorsement. He was at once marked down as a revolutionary, and in spite of his success as a teacher and of his popularity among his pupils, he was transferred on 29th March 1852 to the lycee of Poitiers as professor of rhetoric, with a sharp warning to be careful for the future. Here, in spite of an abject com- pliance with the stringent rules imposed upon him, he remained in disfavour, and on 25th September 1852 he was appointed assistant professor of the sixth class at the lycee of Besancon. This time he could bear it no longer, and he applied for leave, which was readily granted him on 9th October 1852, and renewed every year till his decennial appointment came to an

end. It was in this painful year, during which Taine worked harder than ever, that the fellowship of philosophy was abolished. As soon as Taine heard of this he at once began to prepare himself for the fellowship in letters, and to work hard at Latin and Greek themes. On 10th April 1852 a decree was published by which three years of preliminary study were necessary before a candi- date could compete for the fellowship, but by which a doctor's degree in letters counted as two years. Taine immediately set to work at his dissertations for the doctor's degree; on the 8th June (1852) they were finished, and 150 pages of French prose on the Sensations and a Latin essay were sent to Paris. On the 1 5th July he was informed that the tendency of his Essay on the Sensations made it impossible for the Sorbonne to accent it, so for the moment he laid this work aside, and on 1st Augult he began an essay on La Fontaine. He then started for Paris, where an appointment which was equivalent to a suspension awaited him. His university career was over, and he was obliged to devote himself to letters as a profession. In a few months his two dissertations, De personis Platonicis and the essay on La Fontaine's fables were finished, and on 30th May 1853 he took his doctor's degree. This was the last act of his

university career; his life as a man of letters was now to begin.

No sooner had he deposited his dissertations at the Sorbonne than he began to write an essay on Livy for one of the com- petitions set by the Academy. Here again the moral tendency of his work excited lively opposition, and after much discussion the competition was postponed till 1855; Taine toned down some of the censured passages, and the work was crowned by the Academy in 1855. The essay on Livy was published in 1856 with the addition of a preface setting forth determinist doctrines, much to the

disgust of the Academy. In the beginning of 1854 Taine, after six years of uninterrupted efforts, broke down and was obliged to rest: but he found a way of utilizing his enforced leisure; he let himself be read to, and for the first time his attention was attracted to the French Revolution; he acquired also a knowledge of physiology in following a course of medicine. In 1854 he was ordered for his health to the Pyrenees, and Hachette, the publisher, asked him to write a guide-book of the Pyrenees. Taine's book was a collection of vivid descriptions of nature, historical anecdotes, graphic sketches, satirical notes on the society which frequents watering- places, and underlying the whole book was a vein of stern philosophy; it was published in 1855.

The year 1854 was an important one in the life of Taine. His enforced leisure, the necessity of mixing with his fellow- men, and of travelling, tore him from his cloistered existence and brought him into more direct contact with reality. His method of expounding philosophy underwent a change. Instead of employing the method of deduction, of starting with the most abstract idea and following it step by step to its concrete realiza- tion, henceforward he starts from the concrete reality and pro- ceeds through a succession of facts until he arrives at the central idea. His style also became vivid and full of colour; he shows that he is acutely sensible to the outward manifestations of things and depicts them in all their relief. Simultaneously with this change in his works his life became less self-centred and solitary. He lived with his mother in the Isle Saint-Louis, and now he once more associated with his old friends, Planat, Pre- vost-Paradol and About. He made the acquaintance of Renan, and through Renan that of Sainte-Beuve, and he renewed friendly relations with M. Havet, who for three months had been his teacher at the Ecole Normale. These years (1855-56) were Taine's periods of greatest activity and happiness in pro- duction. On 1st February 1855 he published an article on La Bruyere in the Revue de I' Instruction Publique. In

the same year he published seventeen articles in this review and twenty in 1856 on the most diverse subjects, ranging from Menander to Macaulay. On 1st August 1855 he published a short article in the Revue des Deux Mondes on Jean Reynaud. On 3rd July 1856 appeared his first article in the Debats on Saint-Simon, and from 1857 onwards he was a constant contributor to that journal. But he was seeking a larger field. On 17th January 1856 his history of English literature was announced, and from 14th January 1855 to 9th October 1856 he published in the Revue de I' Instruction Publique a series of articles on the French philosophers of the 19th century, which appeared in a volume at the beginning of 1857. In this volume he energetically attacked the principles which underlie the philosophy of Victor Cousin and his school with an irony which amounts at times to irreverence. The book closes with the sketch of a system in which the methods of the exact sciences are applied to psycho- logical and metaphysical research. The work itself met with instantaneous success, and Taine became famous. Up till that moment the only important articles on his work were an article by About on the Voyage aux Pyrenees, 1 and two articles by Guizot on his Livy} After the publication of Les Philosophes Franqais, the articles of Sainte-Beuve in the Moniteur (9th and 1 6th March 1856), of Sherer 3 in the Bibliotheque Universelle (1858), and of Planche in the Revue des Deux Mondes (1st April

1 Revue de V Instruction Publique, 29th May 1856.

J Debats, 26th and 27th January 1857.

3 Reprinted in Melanges de Critique Religieuse.

1857) show that from this moment he had taken a place in the front rank of the new generation of men of letters. Caro published an attack on Taine and Renan, called " LTdee de Dieu dans une Jeune Ecole," in the Revue Contemporaine of 15th June 1857. Taine answered all attacks by publishing new books. In 1858 appeared a volume of Essais de Critique et d'Histoire; in i860 La Fontaine et ses Fables, and a

second edition of his Philosophes Franqais. During all this time he was persevering at his history of English literature up to the time of Byron. It was from that moment that Taine's influence began to be felt; he was in constant intercourse with Renan, Sainte-Beuve, Sherer, Gautier, Flaubert, Saint-Victor and the Goncourts, and gave up a little of his time to his friends and to the calls of society. In 1862 Taine came forward as a candidate for the chair of literature at the Polytechnic School, but M. de Lomenie was elected in his place. ,

The following year, however, in March, Marshal Randon, Minister of War, appointed him examiner in history and German to the military academy of Saint Cyr, and on 26th October 1864 he succeeded Viollet-le-Duc as professor of the history of art and aesthetics at the Ecole des Beaux Arts. Renan's appointment at the College de France and Taine's candidature for the Poly- technic School had alarmed Mgr. Dupanloup, who in 1863 issued an Avertissement a la Jeunesse et aux Peres de Famille, which consisted of a violent attack upon Taine, Renan and Littre: Renan was suspended, and Taine's appointment to Saint Cyr would have been cancelled but for the intervention of the Princess Mathilde. In December 1863 his Histoire de la Littira- ture Anglaise was published, prefaced by an introduction in which Taine's determinist views were developed in the most uncompromising fashion. In 1864 Taine sent this work to the Academy to compete for the Prix Bordin. M. de Falloux and Mgr. Dupanloup attacked Taine with violence; he was warmly defended by Guizot: finally, after three days of discussion, it was decided that as the prize could not be awarded to Taine, it should not be awarded at all. This was the last time Taine sought the suffrages of the Academy save as a candidate, in which quality he appeared once in 1874 and failed to be elected, Mezieres, Caro and Dumas being the rival candidates; and twice in 1878, when, after having failed in May, H. Martin being chosen, he was at last elected in November in place of M. Lomenie. In 1866 he received the Legion of Honour, and on the conclusion of his lectures in Oxford on

Corneille and Racine, the University conferred upon him (1871) its degree of D.C.L.

The period from 1864 to 1870 was perhaps the happiest of Taine's life. He derived pleasure from his employment at the Beaux Arts and Saint Cyr, which left ample leisure for travel and research. In 1864 he spent February to May in Italy, which furnished him with several articles for the Revue des Deux Mondes from December 1864 to May 1866. In 1865 appeared La Philosophie de V Art, in 1867 L 'Idiot dans I' Art, followed by essays on the philosophy of art in the Netherlands (1868), in Greece (1869), all of which short works were republished later (in 1880) as a work on the philosophy of art. In 1865 he published his Nouveaux Essais de Critique et d'Histoire; from 1863 to 1865 appeared in La Vie Parisienne the notes he had taken for the past two years on Paris and on French society under the sub-title of " Vie et Opinions de Thomas Frederic Graindorge," published in a volume in 1867, the most personal of his books, and an epitome of his ideas. In 1867 appeared a supplementary volume to his history of English literature, and in January 1870 his Theorie de V Intelligence. In 1868 he married Mademoiselle Denuelle, the daughter of a distinguished architect.

He had made a long stay in England in 1858, and had brought back copious notes, which, after a second journey in 1871, he published in 1872 under the title of Notes sur V ' Angleterre. On 28th June 1870 he started to visit Germany, but his journey was abruptly interrupted by the outbreak of the war; his project had to be abandoned, and Taine, deeply shaken by the events of 1870, felt that it was the duty of every Frenchman to work solely in the interests of France. On 9th October 1870 he

published an article on " L'Opinion en Allemagne et les Con- ditions de la Paix," and in 1871 a pamphlet

on Le Suffrage Univcrscl; and it was about this time also that the more or less vague ideas which he had entertained of writing on the French Revolution returned in a new and definite shape. He determined to trace in the Revolution of 1789 the reason of the political instability from which modern France was suffering. From the autumn of 187 1 to the end of his life his great work, Les Origines de la France Contemporaine, occupied all his time, and in 1884 he gave up his professorship in order to devote himself wholly to his task; but he succumbed before it was finished, dying in Paris on 5th March 1893. In the portion of the work which remained to be finished Taine had intended to draw a picture of French society and of the French family, and to trace the development of science in the 19th century. He had also planned a complementary volume to his Thiorie de I' Intelligence, to be entitled Un Traite de la Volenti.

The Origines de la France Contemporaine, Taine's monu- mental achievement, stands apart from the rest of his work. His object was to explain the existing constitution of France by studying the more immediate causes of the present state of affairs — the last years of what is called the Ancien Regime, the Revolution and the beginning of the 19th century, to each of which several volumes were assigned. He also had another object, although he was perhaps hardly conscious of it, which was to study man in one of his pathological crises; for Taine makes an investigation into human nature ; and the historian checks and endorses the pessimism and misanthropy of Grain- dorge. The problem which Taine set himself was to inquire why the centralization of modern France is so great that all individual initiative is practically non-existent, and why the central power, whether it be in the hands of a man or of an assembly, is the sole and only power ; also to expose the error underlying two prevalent ideas: — (1) That the Revolution destroyed absolutism and set up liberty; the Revolution, he. points out, merely caused absolutism to change hands. (2) That the Revolution destroyed liberty instead of

establishing it; that France was less centralized before 1789 than after 1800. This also he shows to be untrue. France was already a cen- tralized country before 1789, and grew rapidly more and more so from the time of Louis XIV. onwards. The Revolution merely gave it a new form.

The Origines differ from the rest of Taine's work in that, although he applies to a period of history the method which he had already applied to literature and the arts, he is unable to approach his subject in the same spirit; he loses his philosophic calm; he cannot help writing as a man and a Frenchman, and he lets his feelings have play; but what the work loses thus in impartiality it gains in life.

Taine was the philosopher of the epoch which succeeded the era of romanticism in France. The romantic era had lasted from 1820 to 1850. It had been the result of a reaction against the classical school, or rather against the conventionality and lifeless rules of this school in its decadence. The romantic school introduced the principle of individual liberty both as regards matter and style; it was a brilliant epoch, rich in men of genius and fruitful of beautiful work, but towards 1850 it had reached its decline, and a young generation, tired in turn of its conventions, its hollow rhetoric, its pose of melancholy, arose, armed with new principles and fresh ideals. Their ideal was truth; their watchword liberty; to get as near as possible to scientific truth became their object. Taine was the mouthpiece of this period, or rather one of its most authoritative spokesmen.

Many attempts have been made to apply one of Taine's favourite theories to himself, and to define his predominant and preponderant faculty. Some critics have held that it was the power of logic, a power which was at the same time the source of his weakness and of his strength. He had a passion for abstraction. " Every man and every book," he said, " can be summed up in three pages, and those three pages can be summed up in three lines." He considers everything as a mathematical problem, whether it be

the universe or a work

of art: ” C’est beau comme un syllogisme,” he said of a sonata of Beethoven. Taine’s theory of the universe, his doctrine, his method of writing criticism and history, his philosophical system, are all the result of this logical gift, this passion for reasoning; classification and abstraction. But Taine’s imagina- tive quality was as remarkable as his power of logic; hence the most satisfactory definition of Taine’s predominating faculty would be one which comprehended the two gifts. M. Lemaitre gave us this definition when he called Taine a po’ete-logicien; M. Bourget likewise when he spoke of Taine’s imagination philosophique, and M. Barres when he said that Taine had the power of dramatizing abstractions. Tor Taine was a poet as well as a logician; and it is possible that the portion of his work which is due to his poetic and imaginative gift may prove the most lasting.

Taine’s doctrine consisted in an inexorable determinism, a negation of metaphysics; as a philosopher he was a positivist. Enamoured as he was of the precise and the definite, the spiritualist philosophy in vogue in 1845 positively maddened him. He returned to the philosophy of the 18th century, especially to Condillac and to the theory of transformed sensa- tion. Taine presented this philosophy in a vivid, vigorous and polemical form, and in concrete and coloured language which made his works more accessible, and consequently more influential, than those of Auguste Comte. Hence to the men of i860 Taine was the true representative of positivism.

Taine’s critical work is considerable; but all his works of criticism are works of history. Hitherto history had been to criticism as the frame is to the picture; Taine reversed the process, and studied literary personages merely as specimens and productions of a certain epoch. He started with the axiom that the complete expression of a society is to be found in its literature, and that the way to obtain an idea of a society is to study its

literature. The great writer is not an isolated being; he is the result of a thousand causes; firstly, of his race; secondly, of his environment; thirdly, of the circumstances in which he was placed while his talents were developing. Hence Race, Environment, Time — these are the three things to be studied before the man is taken into consideration. Taine completed this theory by another, that of the predominating faculty, the faculty maltresse. This consists in believing that every man, and especially every great man, is dominated by one faculty so strong as to subordinate all others to it, which is the centre of the man's activity and leads him into one particular channel. It is this theory, obviously the result of his love of abstraction, which is the secret of Taine's power and of his deficiencies. He always looked for this salient quality, this particular channel, and when he had once made up his mind what it was, he massed up all the evidence which went to corroborate and to illustrate this one quality, and necessarily omitted all conflicting evidences. The result was an inclination to lay stress on one side of a character or a question to the exclusion of all others.

Taine served science unfalteringly, without looking forward to any possible fruits or result. In his work we find neither enthusiasm nor bitterness, neither hope nor yet despair; merely a hopeless resignation. The study of mankind was Taine's incessant preoccupation, and he followed the method already described. He made a searching investigation into humanity, and his verdict was one of unqualified condemnation. In " Thomas Graindorge " we see him aghast at the spectacle of man's brutality and woman's folly. In man he sees the primeval savage, the gorilla, the carnivorous and lascivious animal, or else the maniac with diseased body and disordered mind, to whom health, either of mind or body, is but an accident. Taine is appalled by the Mte humaine; and in all his works we are conscious, as in the case of Voltaire, of the terror with which the possibilities of human folly inspire him. It may be doubted whether Taine's system, to

which he attached so much import- ance, is really the most lasting part of his work, just as it may be doubted whether a sonata of Beethoven bears any resem- blance to a syllogism. For Taine was an artist as well as a

logician, an artist who saw and depicted what he saw in vital and glowing language. From the artist we get his essay on La Fontaine, his articles on Balzac and Racine, and the passages on Voltaire and Rousseau in the Ancien Regime. Moreover, not only was Taine an artist who had not escaped from the influence of the romantic tradition, but he was by his very method and style a romanticist. His emotions were deep if not violent, his vision at times almost lurid. He sees everything in startling relief and sometimes in exaggerated outline, as did Balzac and Victor Hugo. Hence his predilection for exuberance, strength and splendour; his love of Shakespeare, Titian and Rubens; his delight in bold, highly-coloured themes.

Taine's influence was great, and twofold. On his own genera- tion it was considerable; during the 'epoch in which he lived, while a wave of pessimism was sweeping over French literature, he was the high priest of the cult of misanthropy, in which even science was held to be but an idol, worthy of respect and de- votional service, but not of faith. In its turn came the reaction against positivism and pessimism, and an attempt at spiritual renascence. Around a man so remarkable as Taine a school is certain to form itself; Taine's school, which was one of positivist doctrines, rigid systems and resigned hopelessness, was equally certain to produce at some time or another a school of determined opponents to its doctrines and system. If, therefore, the tone which pervades the works of Zola, Bourget and Maupassant can be immediately attributed to the influence we call Taine's, it is also the influence of Taine which is one of the

ultimate causes of the protest embodied in the subsequent reaction.

(M. Ba.)

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TAIREN, or Dairen (Russian Dalny), a free port created by the Russian government and opened to foreign trade in 1901, situated on the Central Manchurian railway, and thus one of the Pacific termini of the Trans-Siberian railway. It stands at the head of Talien-wan Bay, on the east side of Liao-tung peninsula, in Manchuria, about 20 m. N.E. of Port Arthur. The harbour is roomy, easy of entrance, and free from ice all the year round. The town is situated along the front of the harbour and occupies the slope leading up to the hills at the rear. It is designed to accommodate 30,000 inhabitants and is separated from the Chinese quarter by a large natural park. The climate is

temperate and healthy. Tairen is provided with wharves to accommodate the largest ocean steamers, the wharves having a vertical face with 28 ft. depth at low water. The area of the port is 132 acres, and the inner harbour is protected by a stone and concrete breakwater 5950 ft. long. At an early period in the Russo-Japanese war (28th of May 1904), Dalny was occupied by the Japanese after slight resistance.

TAIT, ARCHIBALD CAMPBELL (1811-1882), Anglican divine, archbishop of Canterbury, was born at Edinburgh on the 21st of December 1811. His parents were Presbyterians, but he early turned towards the Scottish Episcopal Church, and was confirmed in his first year at Oxford, having entered Balliol College in October 1830 as a Snell exhibitioner from the Uni- versity of Glasgow. He won an open scholarship, took his degree with a first-class in Uteris humanioribus (1833), and became fellow and tutor of Balliol; he was also ordained deacon (1836) and priest (1838), and served the curacy of Baldon.

Rapid changes among the fellows found him at the age of twenty-six " the senior and most responsible of the four Balliol tutors." The experience gained during this period stood him in good stead afterwards as a member of the first Oxford University Commission (1850-52). He never sympathized with the principles of the Tractarian movement, and on the appear- ance of Tract XC. in 1841 he drafted the famous protest of the " Four Tutors " against it; but this was his only important contribution to the controversy. On the other hand, although his sympathies were on the whole with the liberal movement in the university, he never took a lead in the matter. In 1842 he became an undistinguished but useful successor to Arnold as headmaster of Rugby; and a serious illness in 1848, the first of many, led him to welcome the comparative leisure which followed upon his appointment to the deanery of Carlisle in 1849. His life there, however, was one of no little activity; he served on the University Commission, he restored his cathedral, and did much excellent pastoral work.

There too he suffered the great sorrow of his life. He had married Catharine Spooner at Rugby in 1843; in the spring of 1856, within five weeks, five of their children were carried off by virulent scarlet fever. Not long afterwards he was consecrated bishop of London on the 22nd of November 1856, as successor to C. J. Blomfield. His translation to Canterbury in 1868 (he had refused the archbishopric of York in 1862) constituted a recognition of his work, but made no break in it. His last years were interrupted by illness and saddened by the death in 1878 of his only son Craufurd, and of his wife.

If Blomfield had almost remodelled the idea of a bishop's work, his successor surpassed him. Tait had all Blomfield's earnestness and his powers of work, with far wider interests. Blomfield had given himself zealously to the work of church- building; Tait followed in his steps by inaugurating (1863) the Bishop of London's Fund. He devoted a very large part of his time at London in actual evangelistic work; and to the end his interest in the pastoral side of the work of the clergy was greater than anything else. With his wife, he was instru- mental in organizing women's work upon a sound basis, and he did not a little for the healthful regulation of Anglican sister- hoods during the formative period in which this was particularly necessary. Nor was he less successful in the larger matters of administration and organization, which brought into play his sound practical judgment and strong common-sense. He was constant in his attendance in parliament, and spared no pains in pressing on measures of practical utility. The modification of the terms of clerical subscription (1865), the new lectionary (1871), the Burials Act (1880) were largely owing to him; for all of them, and especially the last, he incurred much obloquy at the time. The Royal Commissions on Ritual (1867) and on the Ecclesiastical Courts (1881) were due to him, and he took a large part in the deliberations of both. Probably his successor (see Benson, E. W.) was brought into closer relations with the colonial churches than Tait was; but the healthy development

of the Lambeth Conferences on the lines of mutual counsel rather than of a hasty quasi-synodic action was largely due to him.

On the other hand, Tait was not successful in dealing with matters which called for the higher gifts of a ruler, and especially in his relations with (a) the liberal trend in modern thought, and (b) the Catholic revival, (a) As regards the former, he was himself not a little in sympathy with it. But although well- read, he was no scholar in the true sense, and had neither the knowledge to feel sure of his ground nor the theological insight to perceive the real point at issue. His object in dealing with questions of faith, as in dealing with the ritual question, was primarily a practical one: he wished to secure peace, and obedience to the law as he saw it. Consequently, after his sympathies had led him to express himself favourably towards some movement, he frequently found himself compelled to draw back. He expressed a qualified sympathy with some of the writers of Essays and Reviews, and then joined in the censure of it by the bishops (1861). The same kind of apparent vacillation was found in his action in other cases; e.g., in the Colenso case

(1863), and in the controversy as to the use or disuse of the Athanasian symbol (1872). It was naturally and widely mis- understood. Some who did not know him thought, or pre- tended to think, that he was a Socinian or a free-thinker. The world at large knew better; but even Temple warned him, in the case of Essays and Reviews, ” You will not keep friends if you compel them to feel that in every crisis of life they must be on their guard against trusting you.” (b) As regards the second point, Tait was concerned with it during the whole of his episcopate, and above all on the side of ritual, on which it naturally came into most direct conflict with the recognized ecclesiastical practice of the day. He had to deal with the St George’s -in-the-

East riots in 1859, and the troubles at St Alban's, Holborn, in their earlier stages (1867); he took part as assessor in the Privy Council judgment in the Ridsdale case (1877); he was more closely concerned than any other bishop with the agitation against confession in 1858, and again in 1877. His method throughout was the same: he endeavoured to obtain a compliance to the law as declared by the courts; failing this, he made the most earnest efforts to secure obedience to the ruling of the Ordinary for the sake of the peace of the Church; after this, he could do nothing. He did not perceive how much of reason the " ritualists " had on their side: that they were fighting for practices which, they contended, were covered by the letter of the rubric; and that, where rubrics were notoriously disregarded on all hands, it was not fair to proceed against one class of delinquent only. In fact, if others were inclined to ignore it altogether, Tait could hardly realize anything but the connexion between the English Church and the State. From such a position there seemed to be no escape but in legislation for the deprivation of the recalcitrant clergy; and the Public Worship Regulation Act (1874) was the result. For this Tait was by no means responsible as a whole: some of the provisions which proved most irksome were the result of amendments by Lord Shaftesbury which the bishops were unable to resist; and it must be borne in mind that the most disastrous results of the measure were not contemplated by those who were instru- mental in passing it. The results followed inevitably: clergy were cited before a new tribunal, and not only deprived but imprisoned. A widespread feeling of indignation spread not only among High Churchmen, but among many who cared little or nothing for the ritual practices involved; and it seemed impossible to foretell what the outcome would be. But the aged archbishop was moved as much as anybody, and tried hard to mitigate such a state of things. At length, when the Rev. A. H. Mackonochie was on the point of being deprived of his benefice of St. Alban's, Holborn, for contumacy, the arch- bishop, then on his deathbed at Addington, took steps which resulted

in the carrying out of an exchange of benefices (which had already been projected), which removed him from the juris- diction of the court. This proved to be the turning-point; and although the ritual difficulty by no means ceased, it was afterwards dealt with from a different point of view, and the Public Worship Regulation Act became practically obsolete. The archbishop died on the 3rd of December (Advent Sunday), 1882, leaving a legacy of peace to the Church.

Tait was a Churchman by conviction; but although the work of his life was all done in England, he remained a Scotsman to the end. It was the opinion of some that he never really under- stood the historical position of the English Church and took no pains to learn. John Tillotson, one of his predecessors in the archbishopric, was a favourite hero of his, and in some ways the two men resembled one another. But Tait had none of Tillotson's gentleness, and he rode roughshod over the obstacles in his way. He cannot be called a great ecclesiastical statesman, but he administered his office well and was un- doubtedly one of the foremost public men of his day.

See R. T. Davidson and D. Benham, Life of Archbishop Tait, 2 vols. (1891); A. C. Tait, Catharine and Craufurd Tait (1880).

(W. E. Co.)

TAIT, ARTHUR FITZWILLIAM (1819-1905), American artist, was born pear Liverpool, England, on the 5th of August

1819. He emigrated to the United States in 1850, and was identified with the art life of New York until his death. In 1858 he was elected to full membership in the National Academy of Design, New York. He died at Yonkers, New York, on the 28th of April 1905. He painted barnyard fowls and wild birds as well as sheep and deer, with great dexterity, and repro- ductions of his minute panels of chickens had an enormous vogue.

TAIT, PETER GUTHRIE (1831–1901), Scottish physicist, was born at Dalkeith on the 28th of April 1831. After attending the Academy at Edinburgh and spending a session at the University, he went up to Cambridge as a member of Peterhouse, and graduated as senior wrangler and first Smith's prizeman in 1852. As a fellow and lecturer of his college he remained in Cambridge for two years longer, and then left to take up the professorship of mathematics at Queen's College, Belfast. There he made the acquaintance of Thomas Andrews, whom he joined in researches on the density of ozone and the action of the electric discharge on oxygen and other gases, and by whom he was introduced to Sir W. R. Hamilton and quaternions. In i860 he was chosen to succeed his old master, J. D. Forbes, as professor of natural philosophy at Edinburgh, and this chair he occupied till within a few months of his death, which occurred on the 4th of July 1901, at Edinburgh. The first scientific paper that appears under Tait's name only was published in i860. His earliest work dealt mainly with mathematical subjects, and especially with quaternions (g.v.), of which he may be regarded as the leading exponent after their originator, Hamilton. He was the author of two text-books on them — one an Elementary Treatise on Quaternions (1867), written with the advice of Hamilton, though not published till after his death, and the other an Introduction to Quaternions (1873), in which he was aided by Professor Philip Kelland (1808–1879), who had been one of his teachers at Edinburgh. In addition, quaternions was one of the themes of his address as president of the mathematical section of the British Association in 1871. But he also produced original work in mathematical and ex- perimental physics. In 1864 he published a short paper on thermodynamics, and from that time his contributions to that and kindred departments of science became frequent and important. In 187 1 he emphasized the significance and promise of the principle of the dissipation of energy. In 1873 he took thermoelectricity for the subject of his discourse as Rede lecturer at Cambridge, and in the same year he presented the

first sketch of his well-known thermoelectric diagram before the Royal Society of Edinburgh. Two years later researches on " Charcoal Vacua " with J. Dewar led him to see the true dynamical explanation of the Crookes radiometer in the large- ness of the free path of the molecule of the highly rarefied air. From 1879 to 1888 he was engaged on difficult experimental investigations, which began with an inquiry into the corrections required, owing to the great pressures to which the instruments had been subjected, in the readings of the thermometers em- ployed by the " Challenger " expedition for observing deep-sea temperatures, and which were extended to include the com- pressibility of water, glass and mercury. Between 1886 and 1892 he published a series of papers on the foundations of the kinetic theory of gases, the fourth of which contained what was, according to Lord Kelvin, the first proof ever given of the Waterston-Maxwell theorem of the average equal partition of energy in a mixture of two different gases; and about the same time he carried out investigations into impact and its duration. Many other inquiries conducted by him might be mentioned, and some idea may be gained of his scientific activity from the fact that a selection only from his papers, published by the Cambridge University Press, fills three large volumes. This mass of work was done in the time he could spare from his professorial teaching in the university. In addition, he was the author of a number of books and articles. Of the former, the first, published in 1896, was on the dynamics of a particle; and afterwards there followed a number of concise treatises on thermodynamics, heat, light, properties of matter and dynamics,

together with an admirably lucid volume of popular lectures on Recent Advances in Physical Science. With Lord Kelvin he collaborated in writing the well-known Treatise on Natural Philosophy. " Thomson and Tait," as it is familiarly called (" T and T'"

was the authors' own formula) , was planned soon after Lord Kelvin became acquainted with Tait, on the latter's appointment to his professorship in Edinburgh, and it was intended to be an all-comprehensive treatise on physical science, the foundations being laid in kinematics and dynamics, and the structure completed with the properties of matter, heat, light, electricity and magnetism. But the literary partnership ceased in about eighteen years, when only the first portion of the plan had been completed, because each of the members felt he could work to better advantage separately than jointly. The friend- ship, however, endured for the twenty-three years which yet remained of Tait's life.

Tait collaborated with Balfour Stewart in the Unseen Universe, which was followed by Paradoxical Philosophy. Among his articles may be mentioned those which he wrote for the ninth edition of this Encyclopaedia on Light, Mechanics, Quaternions, Radiation and Thermodynamics, besides the biographical notices of Hamilton and Clerk Maxwell.

TAJIK, or Parsiwan, a subject race of Afghanistan. Underlying the predominant Pathan elements in the country, the Tajik (Tajak, or Tausik) represents the original Persian possessor of the soil, who still speaks his mother tongue and therefore calls himself Parsiwan. There are pure Persians in Afghanistan, such as the Kizilbashes of Kabul and the Naoshir-wanis of Kharan; but the name Tajik (= " stranger ") appears to be applied only to an admixture of original Arab and Persian stock, who are the slaves of the community — hewers of wood and drawers of water. Everywhere the Tajiks are the culti- vators in rural districts, and the shopkeepers and clerks in the towns. They are a fine, athletic people, generally fair in complexion, and assimilate in aspect, in dress, and much in manners to the Afghans, but they are never nomadic. The Tajik is as much the slave of the Pathan in Afghanistan as is the Hindki (whose origin is similar) in the plains of the Indus. Yet the Tajik population of the richly-cultivated districts north of Kabul proved

themselves to be of good fighting material in the Afghan war of 1879-80, and the few Kizilbashes that are to be found in the Indian army are brave soldiers. The number of the Tajiks in Afghanistan is estimated at 900,000.

The name itself originally occurs in the Pahlavi writings, and is explained to mean, first, the Arabs in general, then their descendants born in Persia and elsewhere out of Arabia, and, lastly, the Persians in general and their descendants born in Turkestan and elsewhere out of Persia. Tajik thus came to be the collective name of all communities of Iranian stock and Persian speech wherever found in Central Asia. These are co-extensive with the former eastward and northward limits of the Persian empire; but, after the ascendancy of the Turki races, they became the subject element in Turkestan, Afghanistan, Bokhara, Khiva, Kashgaria, while still politically dominant in Badakshan, Wakhan, Darwaz, Kost and Karateghin. In most of these places the Tajiks, with the kindred Galchas, seem to form the bulk of the population, the distinction being that " Tajik " is applied rather to the settled and more civilized low- landers of modern Persian speech, " Galcha " to the highlanders of Ferghana, Kohistan, Wakhan, &c, who speak either archaic forms of Persian or dialects intermediate between the Iranian and Sanskritic branches of the Indo-European linguistic family.

But, although mainly of Iranian stock, with light complexion and regular features, the Tajiks claim Arab descent, regarding the district about Bagdad as their primeval home, and considering themselves the descendants of the Arabs who overran Central Asia in the first century of the Hejira. At the same time, " it is evident that the inhabitants of the greater part of this region (Central Asia) must from an early period have come in contact with the successive waves of Turkish (Turki) and even Mongol population which broke over them ; accordingly we find that, although the type is essentially Iranian, it has undergone a certain modification " (Capt. J. M. Trotter, Bokhdra, p. 169). The term Tajik must be

distinguished (romSarte, the latter simply meaning" trader "or" shopkeeper," and being applied indiscriminately to the settled as opposed to the nomad element, and especially to the urban populations, of what- ever race, in Central Asia. The Tajiks are known as Tats on the west side of the Caspian (Baku, Lenkoran, &c).

TAKHTSINGJI (1858-1896), Maharaja of Bhaunagar, a Rajput chief of the Gohel clan, and the ruler of a state in

Kathiawar, was born on the 6th of January 1858, and succeeded to the throne of Bhaunagar on the death of his father, Jaswant- singji, in 1870. During his minority, which ended in 1878, he was educated at the Rajkot college and afterwards under an English officer, while the administration of the state was con- ducted jointly by Mr. E. H. Percival, a member of the Indian Civil Service, and Azam Gowrishankar Yodeyshankar, C.S.I., one of the foremost native statesmen of India, who had served the state in various capacities since 1822. At the age of twenty Takhtsingji found himself the ruler of a territory nearly 3000 square miles in extent. His first public act was to sanction a railway connecting his territory with one of the main trunk lines, which was the first enterprise of its kind on the part of a raja in western, if not in all, India. The commerce and trade, and the economic and even social development of the state, which came in the wake of this railway, confirmed Takhtsingji in a policy of progressive administration, under which educational establishments, hospitals and dispensaries, trunk roads, bridges , handsome edifices and other public works grew apace. In 1886 he inaugurated a system of constitutional rule, by placing several departments in the hands of four members of a council of state under his own presidency. This innovation, which had the warm support of the governor of Bombay, Lord Reay, provoked a virulent attack upon the chief, who brought his defamers to trial in the High Court of Bombay. The punish- ment of the ringleaders broke up a system of blackmailing to which rajas used to be regularly exposed, and the public spirit of

Takhtsingji in freeing his brother chiefs from this evil was widely acknowledged throughout India, as well as by the British authorities. In 1886 he was created G. C.S.I. ; and five years later his hereditary title of thakore was raised to that of maharaja. In 1893 he took the occasion of the opening of the Imperial Institute by Queen Victoria to visit England in order to pay personal homage to the sovereign of the British Empire, on which occasion the University of Cambridge conferred on him the degree of LL.D. He died in 1896. (M.M.Bh.)

TAKIN, the Mishmi name of a remarkable hollow-horned ruminant {Budorcas taxicolor), the typical representative of which inhabits the Mishmi Hills, in the south-east corner of Tibet, immediately north of the Assam Valley, while a second form is found further east, in the Moupin district. The takin, which may be compared in size to a Kerry cow, is a clumsily built brute with yellowish-brown hair and curiously curved horns, which recall those of the South African white-tailed gnu. Its nearest relatives appear to be the serows of the outer Himalaya and the Malay countries, which are in many respects intermediate between goats and antelopes, but it is not improb- ably also related to the musk-ox (q.v.). As it lacks the thick woolly coat of the two Tibetan antelopes known as the chiru and the goa, there can be little doubt that it inhabits a country with a less severe climate than that of the Central Tibetan plateau, and it is probably a native of the more or less wooded districts of comparatively low elevation forming the outskirts of Tibet. It is remarkable for the shortness of the cannon- bones of the legs, in which it resembles the Rocky Mountain goat.

TAKLA MAKAN, the Central Asian desert which lies between the N. foot of the Kuen-lun ranges and the wide curve of the Tarim river on the W., N., and E. It appears to be naturally divisible into two parts by the river Khotan-darya, and the name applied to the western part between that river and the Yarkand-darya (Tarim) is the desert of Takla Makan proper, while the part between the Khotan-darya and the line

of the lower Tarim and the Cherchen-darya is known as the desert of Cherchen. The former is occupied almost entirely by sand- dunes. Sand mountains range in altitude from 60 ft. up to as much as 300 ft. The only breaks in this " sea of sand-waves " are a few small patches of alluvial clay. Often two distinct systems of dunes can be distinguished; one system, consisting of the larger concatenations, stretches from E. to W., while the secondary or transverse dunes run from N. to S. or from N.E. to S.W. The steeper faces of the dunes and of the dune-accumulations are for the most part turned towards the S.,

the S.W. and the W., that is, invariably away from the direction of the prevailing winds; but in some parts the steep faces are those fronting the E. and the S. In the desert of Cherchen, however, where the general height of the dunes in the N.E. is uniformly greater than in the desert of Takla Makan proper, reaching up to 350 ft., the configuration is complicated by the appearance of elongated expanses of level clay called bayirs, varying in size from half a mile to a dozen miles in length, barren and tinged with saline deposits in the middle, with scanty vegetation around, and lofty sand-dunes overhanging them on both sides. These elliptical, cauldron-shaped basins all stretch from N.E. or E.N.E. to S.W. or W.S.W., and are arranged in long curving chains, the successive depressions being parted by transverse ridges of sand. They owe their configuration in great part, perhaps entirely, to the prevailing wind.

On perfectly level ground the dunes are crescentic in shape, have a steep face towards the W., are highest in the centre, and slope away in each direction towards the two horns or cusps of the crescent. On the windward side they have a convex, spoon-shaped slope, regularly formed, but crumpled by tiny sand-waves or ripple-marks. " With regard to

the large accumulations of sand (in the desert of Cherchen) we have ascertained the following laws — (1) In the N. of the desert they turn their steep faces towards the N.W., m the middle towards the W.N.W., and in the S. towards the W. and W.S.W. ; (2) their eastern slopes ascend rather slowly towards their crests; (3) on the other side their steep leeward faces go dov/n sheer at an angle of 33 °, or else in two or three steps; (4) their mass diminishes towards the S. ; (5) they are each built up of an innu- merable number of individual dunes; (6) although their relief is influenced by winds from other quarters than the predominant, their mass is unaffected by them; (7) it is their varying breadths which give rise originally to the thresholds, and consequently to the formation of the bayirs " (Sven Hedin, op. cit. i. 362).

The bayirs become progressively rarer, less distinct, and smaller in size as one advances from E. to W. At the same time the arrangement of the sand-dunes grows more and more irregular, and the dunes themselves plunge steeply down towards the W., the S., and the S.W., and are drawn out towards the N.N.E. and S.S.W., the N. and S. and the N.W. and S.E. In that part of the desert two systems of dunes are distinguish- able, intersecting or rather crossing over one another diagonally or at right angles. In the extreme west, at Ordan-Padshah, between Kashgar and Yarkand, the dunes travel annually some 13 ft. towards the S.E., not towards the S.W. The principal cause of the difference between the arrangement of the sand- dunes in the desert of Cherchen and the arrangement of the sand- dunes in the desert of Takla Makan proper in the W. is the wind. In the latter, winds from several quarters co- operate to mould the relief of the desert into capricious and changing outlines; but in the E. the wind blows not only with greater regularity from one settled direction, the N.E. or E.N.E., but also with much greater violence. Indeed, it is in the open Lop country, where the mountains, the Kuruk-tagh on the N., and the Astin-tagh on the S., are the nearest to each other, that the wind

develops its greatest and most concentrated energy. 1 In the E., where the sand waves are most exposed to the fiercest wind, they form elongated waves, distinctly out- lined, corresponding to the breakers of the ocean. They dis- seminate themselves westwards over the desert in ever-widening concentric circles. The curving courses of the Tarim and the Koncheh-darya are the only check upon the invasion of the Takla Makan by the sand which is generated in the desert of Lop or further E. and N. in the mountains which girdle the desert of Gobi. But the former river is itself encroaching upon the N.E. margin of the desert, and pressing more and more towards the S.W.

With regard to the origin of the stupendous masses of sand that fill the basin of the Tarim, K. Bogdanovich considers them to consist for the most part of the disintegrated products of the fine-grained alluvial clays of the desert itself. On the other hand, G. N. Potanin and V. A. Obruchev both seek for its origin in the hard rocks of the mountains which encircle the deserts ; and in this view, subject to certain modifications, Sven Hedin is disposed to agree. But he adds 2 that the masses of sand themselves "are

1 Sven Hedin, op. cit. i. 364. 8 Op. cit. if. 448.

derived from three separate sources, in part directly, in part in- directly — (1) the direct transportation by the wind of the products of disintegration from the adjacent mountains, whether sandstones or crystalline rocks; (2) through the activity of the wind operative amongst the arenaceous alluvia of the rivers and temporary lakes; (3) through the sand that was already present in the soil, and which became exposed in rings more or less concentric in proportion as the former (Central Asian Mediterranean) sea dried up." Of these agencies the river Tarim makes by comparison much the smallest contribution of disintegrated material to the volume of sand. The area covered by sands in the desert of Takla Makan proper is esti- mated at nearly 116,000 sq. m., and the area covered

by them in the desert of Cherchen at nearly 143,000 sq. m.

Vegetation and animal life are extremely scarce. The former is practically confined to various steppe plants, kamish (reeds), tamarisks (almost invariably growing on root-mounds), and poplars. The animals are hares, rats and one or two other rodents, foxes, and in a few places the wild camel.

The climate is one of extremes. At Merket on the W. verge of the desert of Takla Makan proper the winters are cold, though the snowfall is small, while the summers are hot. In the desert of Cherchen a temperature of 22 ° F. has been observed in the depth of winter, and there snow sometimes falls heavily. During the sand storms which sweep over the region in spring, the thermometer drops as much as 10° or 12 F. below zero. On the other hand, a temperature as high as 86° has been recorded in the end of April (cf. Gobi). It is only in winter that this appalling desert can be crossed with any degree of safety. It is destitute of water, but in winter it is possible to transport ice on the backs of camels. Some- times for days together the desert is enveloped in an impenetrable dust-haze, which chokes and smothers every living creature. In the second half of the 13th century Marco Polo left a vivid descrip- tion of this desert and related legends associated with it (see the edition of his travels in English by Sir II. Yule, ed. 1903). The fullest account by a modern writer is that given by Sven Hedin iri his Scientific Results of a Journey in Central Asia, 1899-1902 (Stock- holm, vols. i. and ii. 1905-6); see also his Through Asia (London, 1898), vol. i. For archaeology, see Turkestan. (J. T. Be.)

TALAING, more accurately called Mon, the name given to the remnant of the Peguan race, which for long strove with the Burmans for the ascendancy in what is now Burma. In the middle of the 18th century the Peguans were masters of the country from the Gulf of Martaban to far to the north of Mandalay. Now, however, the Taking population is practically

confined to the Tenasserim and Pegu divisions of Lower Burma, and even there it seems to be dying out. According to the census of iqoi they numbered only 321,898 persons, of whom 1 54,480 spoke the Talaing language. The Talaings are, histori- cally, the most important representatives in Burma of the Mon- Annam linguistic family, who have left tokens of their presence from the Khasia Hills in Assam to the Gulf of Siam. The origin of the name Talaing is disputed, but it is most commonly believed to be a term of reproach, meaning " downtrodden," given by the conquering Burmans. The people call themselves Mons. They are lighter in complexion and more sturdily built than the Burmans and the face is rounder.

TALAR, the architectural term given to the throne of the Persian monarchs which is carved on the rock-cut tomb of Darius at Nakst in Rustan, near Persepolis, and above the portico which was copied from his palace.

TALAVERA DE LA REINA, a town of central Spain, in the province of Toledo; on the right bank of the river Tagus, and on the Madrid-Caceres railway. Pop. (1900) 10,580. Talavera is of great antiquity, the Caesobriga of the Romans. Portions of the triple wall which surrounded it remain standing, and the Arco de San Pedro is one of its Roman gates restored. Among the ancient buildings are the Torres Albarranas, built by the Moors in the 10th century, the Gothic collegiate church, and three secularized convents, one of which dates from the 14th century, but has twice been partially restored, and is now a factory. The bridge of thirty-five arches across the Tagus dates from the 15th century. Talavera " of the queen " was so named because, from the reign of Alphonso XL (1312-50), it was the property of the queens of Castile.

For the operations which culminated in the famous battle of Talavera, between the English and the French, and those which followed that engagement, see Peninsular War. Sir Arthur Wellesley (afterwards Duke of Wellington), the British commander, acting

in co-operation with Lieutenant-General Cuesta's Spanish army, took position on the 27th of July 1809 on the Upper Tagus,

protected by his advanced guard. His line, facing due east, ran north from the right bank of the river to a ridge running parallel to the Tagus, beyond which ridge, also parallel to the river, lay the Sierra de Montalban. Cuesta's men with their right flank resting on the river held Talavera itself and the close country to the north- ward of it; Wellesley's right connected with Cuesta's left, and his line stretched away northwards to the ridge mentioned above. The Sierra was not, on the first day, occupied, and even on the inner ridge itself the division of General (afterwards Lord) Hill was from some misunderstanding very late in taking up its position. The whole front was covered by a rivulet running from the ridge to the Tagus. The battle was begun by the attack of two French divisions on the British advanced guard, which retired into the main position with severe loss and in some disorder. Marshal Victor's forces followed them up sharply, and soon came upon Wellesley's line of battle. For some time the possession of the ridge (owing to the delay of Hill's Division) was doubtful, and Rufane Donkin's brigade had a severe struggle, but in the end the arrival of Hill's troops secured this all-important point for the Allied left. Meanwhile the Spaniards (though there was at first a temporary panic amongst them) and the right divisions of the British repulsed an attack in the plain, and the day closed with the armies facing each other along the rivulet and on the ridge. The losses had been heavy on both sides. Early on the 28th the battle was renewed by a furious attack on Hill's troops, whose left was now prolonged to the Sierra by the Allied cavalry and a division borrowed from Cuesta. King Joseph Bonaparte and Jourdan his chief of staff, who were present, were averse from fighting on this present ground, wishing to wait for

Soult, whom they expected to come in on Wellesley's rear, and it was only after long discussion that the king gave a reluctant assent to Victor's plan of attack. That Marshal's divisions once more tried to oust Hill from the ridge, and once more failed before the steady volleys of the British line and the charge of the cavalry posted in this quarter (though, owing perhaps to defective ground-scouting, this nearly ended in disaster). At the same time General Sebastiani's 4th corps, after a heavy bombardment, assaulted the Allied centre in the plain. Here the British and Spanish battalions held their own firmly, and a counter attack by General Mackenzie's division hurled back the French in disorder. Yet another attack followed these failures, and came very near to achieving a great success. This time Lapisse's division of Victor's corps attacked the Allies' left centre, composed of the British Guards. The French columns were again checked by the British line, but here the counter-stroke, unlike Mackenzie's, was carried too far, and the troops in the ardour of incautious pursuit were very severely handled and pushed back to the position by the French reserves; when Wel- lesley decided the day by a counter attack with the 48th regiment, made with great intrepidity and steadiness. The Guards, with splendid discipline, resumed their positions, and eventually the French, with their leader Lapisse mortally wounded, fell back. Failure all along the line and heavy losses left King Joseph no alternative but to retire towards Madrid. The French lost 7268 men out of 46,138 present, the British 5363 out of 20,641 ; the Spanish losses were officially returned at 1201 out of some 36,000 present.

TALBOT (Family). Apart from its achievements, this is one of the few families in the English aristocracy which traces alike its descent and its surname from the Norman conquerors of England; and it may be said that there has hardly been a time during more than seven centuries in which the Talbots have not been of considerable account in public life. Yet in some periods they appear rather

as a potential influence, while at certain marked epochs they stand out among the most pro- minent actors in English history. The name of Richard Talbot occurs in Domesday Book as the holder of nine hides of land in Bedfordshire under Walter Giffard. There is no evidence that he came over to England with the Conqueror himself; and, as he did not hold of the king in capite, it is clear that he was not a leader. Talbot being a personal nickname and not derived from a place, those who bore it were not of necessity connected, and the early pedigree is obscure. But a Geoffrey Talbot took part with the empress Maud against King Stephen; and a Hugh Talbot held the castle of Plessis against Henry I. for Hugh de Gournay, and afterwards became a monk at Beaubec in Normandy. Richard Talbot, with whom the proved pedigree begins, obtained from Henry II. on his accession the lordship of Linton in Herefordshire, and from Richard I. the custody of Ludlow Castle; and his descendants for some generations appear to have been wardens of Various castles on the borders of Wales, and intermarried with the great families of this region. Under Edward II. a Gilbert Talbot was head of the house, and invaded Scotland in the king's company, but afterwards took part with Thomas of Lancaster against the king. He, however,

was pardoned, and obtained from Edward III. a confirmation of the grant of the manor of Linton and other lands, being also summoned to parliament as a baron (133 1).

His son Richard, who had married a daughter and co-heiress of John Comyn of Badenoch, laid claim to certain lands in Scotland in her right, and, when restrained from entering that country by land (Edward III. having then made an alliance with King David), he joined in a successful expedition which invaded it by sea in the interests of Edward Baliol. Three years later he was taken prisoner in Scotland, and redeemed for 2000 marks, after which the king made him governor of Berwick. He took part also in Edward's wars against France, as did like- wise his son Gilbert, who succeeded him. His wife had brought him the noble seat of Goodrich Castle on the Wye,

and at this time the family possessed lands in the counties of Oxford, Gloucester, Hereford and Kent. Gilbert's son Richard added to this inheritance by marrying the heiress of Lord Strange of Blackmere, and himself became under Richard II. one of the heirs of the earl of Pembroke, thus adding to his estates, lands in Berkshire, Wilts, Salop and Essex. Another Gilbert Talbot, grandson of the last, claimed to carry the great spurs at the coronation of Henry V., and had a commission to receive the submission of Owen Glendower and his adherents. He also distinguished himself in the invasion of Normandy. He was twice married, his second wife being a Portuguese lady, but he left no male issue, and was succeeded by his brother John.

Hitherto the head of the house had borne the name of Lord Talbot; but this John, after obtaining by marriage the title of Lord Furnival, was for his distinguished actions created earl of Shrewsbury (see Shrewsbury, John Talbot, 1st earl of).

Besides his martial exploits, this John claims some attention for his family alliances. His first wife Maud, a granddaughter of Thomas, Lord Furnival, brought him the castle of Sheffield as part of her inheritance, and he was accordingly summoned to parliament in the days of Henry IV. as John Talbot of Hallamshire, otherwise Lord Furnival, more than thirty years before he was made earl of Shrewsbury. The property became a favourite residence of the family during the Tudor era; and, but for the death in 1616 of Gilbert, 7th earl of Shrewsbury, without male issue, Sheffield might have remained much longer a centre of feudal magnificence rather than of commerce and manu- factures. The second wife of John, earl of Shrewsbury, was Margaret, the eldest of three daughters of Richard Beauchamp, earl of Warwick, by that earl's second wife, a daughter of Thomas, Lord Berkeley. By her he obtained a third part of the Berkeley property; and, though she did not become the mother of a line of earls, her eldest son, John Talbot, was created Viscount Lisle, and it was he who fell aldng with his father at the disastrous battle of Chatillon in Gascony. His son

Thomas, who inherited the title of Viscount Lisle, was slain at the early age of twenty-two in a feudal contest with Lord Berkeley, arising out of a dispute as to the possession of Berkeley castle, on the 20th of March 1470; and the title was afterwards conferred on Edward Grey, the husband of one of his two sisters.

John, the second earl of Shrewsbury, was the 1st earl's son by his first wife. He had been knighted at Leicester in 1426 along with the infant king Henry VI., had served in the wars of France, and been made chancellor of Ireland during his father's lifetime, when he was only Lord Talbot. Afterwards he was made lord high treasurer of England, and in 1459 was rewarded for his services to the house of Lancaster with a grant of 100 marks a year out of the lordship of Wakefield, forfeited by Richard, duke of York. But next year he and his brother Christopher were slain at the battle of Northampton, fighting in the cause of Henry VI. His son John succeeded him, and then his grandson George, who fought for Henry VII. at Stoke, and whom King Henry VIII. sent as his lieutenant against the rebels in the Pilgrimage of Grace. But perhaps the thing which most redounds to his credit is the humanity with which he received the fallen Cardinal Wolsey into his house at Sheffield when he was on his way up to London as a state prisoner.

Francis, the 5th earl, took a leading part in the invasions of

Scotland under Henry VIII. and Edward VI., and was one of the two peers who alone opposed the bill for abolishing the pope's jurisdiction under Elizabeth. His son George, who succeeded, was the earl to whom the custody of Mary Stuart was committed, his task being rendered all the more difficult for him by the intrigues of his second wife, Bess of Hardwick, the builder of Chatsworth, who had married three

husbands before her union with him. Two sons of this last earl succeeded one another, and the title then devolved, for want of male issue, on the lineal descendants of Sir Gilbert Talbot of Grafton in Worcestershire, third son of John, the 2nd earl. But the old baronies of Talbot, Strange of Blackmere, and Furnival had passed away in 1616 to the daughters of the 7th earl, of whom the youngest married Thomas (Howard) earl of Arundel, whose descendant, the duke of Norfolk, has the valuable Furnival estates. The above Sir Gilbert had fought for Henry VII. at Bosworth, where he was severely wounded, was knighted on the field, and was throughout one of the first Tudor's most trusted councillors. He fought also at Stoke against the insurgents with Lambert Simnel, was made a knight banneret, governor of Calais, and lord chamberlain.

The 9th earl, George, descended from this Gilbert, died un- married, and his nephew, who followed, was succeeded by his grandson Francis, chiefly memorable for his unhappy fate. His second wife, the " wanton Shrewsbury " of Pope, a daughter of the earl of Cardigan, was seduced by the duke of Buckingham, whom the outraged husband challenged to a duel. The countess, it is said, was present at the scene, and held Buckingham's horse in the disguise of a page, saw her husband killed, and then clasped her lover in her arms, receiving blood-stains upon her dress from the embrace. Charles, the 12th earl, son of this unfortunate nobleman, was raised by William III. to the dignity of a duke, but as he left no son this title died along with him in 1 718, and the earldom of Shrewsbury devolved on his cousin Gilbert, a Roman Catholic priest.

From this time the direct line of Sir Gilbert Talbot of Grafton began to fail. A nephew three times succeeded to an uncle, and then the title devolved upon a cousin, who died unmarried in 1856. On the death of this cousin the descent of the title was for a short time in dispute, and the lands were claimed for Lord Edmund Howard (now Talbot), an infant son of the duke of Norfolk, under the will of the last earl; but the courts decided that, under a

private act obtained by the duke of Shrewsbury shortly before his death, the title and bulk of the estates must go together, and the true successor to the earldom was found in Earl Talbot, the head of another line of the de- scendants of Sir Gilbert Talbot of Grafton, sprung from a second marriage of Sir Gilbert's son, Sir John Talbot of Albrighton. The head of this family in the beginning of the 18th century was a divine of some mark, William Talbot, who died bishop of Durham in 1730. His son Charles, who filled the office of lord chancellor, was created Baron Talbot of Hensol in Glamorgan- shire in 1733; and his son William was advanced to the dignity of Earl Talbot in 1761, to which was added Ingestre, the barony of Dynevor, with special remainder to his daughter, Lady Cecil Rice, in 1780. Then succeeded a nephew, who was created Viscount and Earl Talbot, and assumed by royal licence the surname of Chetwynd before Talbot, from his mother.

All the titles just mentioned have been united in the line of the Earl Talbot who successfully claimed the Shrewsbury title as the 18th earl, the earldom of Shrewsbury (1442) being now the oldest existing that is not merged in a higher title. The family seats (Alton Towers and Ingestre Hall) and the chief estates are in Staffordshire. The old badge of the family was a " talbot " or running hound. (J. Ga.; J. H. R.)

TALBOT, MARY ANNE (1778–1808), the "British Amazon," was born in London on the 2nd of February 1778. She believed herself to be the illegitimate child of the 1st Earl Talbot. Early in her career she eloped, in the disguise of a boy, with a captain. In 1792 she was a drummer in Flanders. In the capture of Valenciennes her lover was killed; and Mary Anne deserted and became cabin boy on a French lugger, which she asserted was

captured by the British, who transferred her to the " Bruns- wick," where she served as a powder monkey, being wounded in Lord Howe's victory of the 1st of June 1794. For this she later received a small pension. When the wound healed she again went to

sea, was captured by the French, and imprisoned for a year and a half. Her sex was not discovered until shortly afterwards she was seized by a pressgang. She finally became a household servant to Robert Kirby, a London publisher, who included an account of her adventures in his Wonderful Museum (1804) and in Life and Surprising Adventures of Mary Anne Talbot (1809). She died on the 4th of February 1808.

TALBOT, WILLIAM HENRY FOX (1800–1877), English discoverer in photography, was the only child of William Daven- port Talbot, of Lacock Abbey, Wilts, and of Lady Elizabeth Fox Strangways, daughter of the 2nd earl of Ilchester. He was born on the nth of February 1800, and was educated at Harrow and at Trinity College, Cambridge, where he gained the Porson prize in 1820, and graduated as twelfth wrangler in 1 82 1. From 1822 to 1872 he frequently communicated papers to the Royal Society, many of them on mathematical subjects. At an early period he had begun his optical researches, which were to have such important results in connexion with photography. To the Edinburgh Journal of Science in 1826 he con- tributed a paper on ” Some Experiments on Coloured Flame “; to the Quarterly Journal of Science in 1827 a paper on ” Mono- chromatic Light “; and to the Philosophical Magazine a number of papers on chemical subjects, including one on ” Chemical Changes of Colour.” Before L. J. M. Daguerre exhibited in 1839 pictures taken by the sun, Talbot had obtained similar success, and as soon as Daguerre’s discoveries became known communicated the results of his experiments to the Royal Society. In 1841 he made known his discovery of the calotype or talbotype process, and after the discovery of the collodion process by Frederick Scott Archer in 185 1 he devised a method of instantaneous photography. For his discoveries, which are detailed in his Pencil of Nature (1844), he received in 1842 the Rumford medal of the Royal Society. While engaged in his scientific researches he devoted much time to archaeology. He published Hermes, or Classical and Antiquarian Researches (1838–39), and Illustrations of the Antiquity of the

Book of Genesis (1839). With Sir Henry Rawlinson and Dr Edward Hincks he shares the honour of having been one of the first decipherers of the cuneiform inscriptions of Nineveh. He was also the author of English Etymologies (1846). He died at Lacock Abbey on the 17th of September 1877.

TALBOT OF HENSOL, CHARLES TALBOT, ist Baron (1685- 1 73 7)i lord chancellor of England, was the eldest son of William Talbot, bishop of Durham, a descendant of the ist earl of Shrewsbury. He was educated at Eton and Oriel College, Oxford, and became a fellow of All Souls College in 1704. He was called to the bar in 1711, and in 1717 was appointed solicitor-general to the prince of Wales. Having been elected a member of the House of Commons in 1720, he became solicitor-general in 1726, and in 1733 he was made lord chancellor and raised to the peerage with the title of Baron Talbot of Hensol. Talbot proved himself an equity judge of exceptional capacity and of the highest character during the three years of his occupancy of the Wool- sack. He died on the 14th of February 1737. Among his contemporaries Talbot enjoyed the reputation of a wit; he was a patron of the poet Thomson, who in The Seasons com- memorated a son of his to whom he acted as tutor; and Butler dedicated his famous Analogy to the lord chancellor. The title assumed by Talbot was derived from Hensol in Glamorganshire, which came to him through his wife.

See Lord Campbell, Lives of the Lord Chancellors and Keepers of the Great Seal (8 vols. London, 1845-69) : Edward Foss, The Judges of England (9 vols. London, 1848-64); Lord Hervey, Memoirs of the Reign of George II. (2 vols. London, 1848) ; G. E. C, Complete Peerage, vol. v:i. (London, 1896).

TALC, a mineral which in its compact forms is known as steatite, or soapstone. It was probably the fiaytnJTLs \Ldos of Theophrastus, described as a stone of silvery lustre, easily

cut. The word talc, sometimes written talk, is said to come from the Arabic tola, and not to be connected, as has been fancifully suggested, with the Swedish liilja, ” to cut.” Talc and mica were confused by the older writers, and even at the present day mica is sometimes known in trade as talc; whilst the term was formerly applied also to foliated gypsum.

Talc is found occasionally in small hexagonal and rhombic plates, with perfect basal cleavage, and they are supposed to be monoclinic. Talc often occurs in foliated masses, sometimes with a curved surface, readily separating into thin very flexible, non-elastic laminae. The plates give a six-rayed percussion-figure. Talc has a hardness of only about i, and a specific gravity of from 2-6 to 2-8. Its extreme softness and its greasy feel are characteristic. The lustre on the cleavage face is pearly, or sometimes silvery, and one of the old names of the mineral was stella terrae, while German writers sometimes called it Katsensilber. The colour is white, grey, yellow or frequently green. The mineral has strong bire- fringence and a small optic axial angle.

Talc is a magnesium silicate H 2 Mg 3 Si 4 0i2. It is generally regarded as a hydrous silicate, but the water is expelled only at a very strong heat, and may therefore be regarded as basic. By the action of heat the hardness of the mineral is greatly increased. Pseudomorphs are known after actinolite, pyr- oxene, &c, and the mineral has probably been generally formed by the alteration of ferro-magnesian silicates. Talc occurs chiefly in crystalline schists, usually associated with chlorite, serpentine and dolomite. Fine examples of apple-green colour are found at Mount Greiner, in the Zillerthal, Tirol. Talc-schist is a foliated rock composed chiefly of talc, generally associated with quartz and felspar; but all soapy schists are not neces- sarily talcose. The pearly micaceous constituent of the Alpine protogine is a muscovite.

The ” steatites ” of Pliny was a stone resembling fat, but other- wise undescribed. Being easily cut, steatite has always been a favourite material with the carver: it was used for Egyptian scarabs and other amulets, which were usually coated with a blue vitreous glaze; and it was employed for Assyrian cylinder- seals and for other ancient signets. By the Chinese steatite is largely used for ornamental carvings, but many of their ” soap- stone ” figures are wrought in a compact pyrophyllite (q.v.), which is essentially different from talc. The name agalmatolite is often applied to the material of these figures, and was sug- gested by M. H. Klaproth from the Greek ayaX/jia, ” an image.” Pagodite is an old name for Chinese figure-stone. Ancient steatite carvings are found among the ruins of Rhodesia.

Steatite is usually a white, grey, greenish or brown substance, occurring in veins or nodular masses or in lenticular bedded deposits. Pseudomorphs after quartz and dolomite occur near Wunsiedel m Bavaria. In some cases it is a product of the alteration of pyroxenic rocks, and the commercial mineral may be very impure. The ease with which steatite may be worked, coupled with its power of resisting heat, has led to its employment for vessels for h6usehold use, whence it is called ” potstone ” — the lapis ollaris of old writers. Among the uses of steatite may be mentioned its employment, especially in America, for sinks, stoves, firebricks, foot-warmers, tips for gas- burners and electric switchboards: when ground it is used as a filler for paper, for leather-dressing, for covering steam-pipes, as an ingredient in soap, for toilet-powder, for certain paints and as a lubricant. A fine granular steatite is used by tailors for mark- ing cloth under the name of ” French chalk ” or ” Spanish chalk.” Slate pencils are made of steatite and pyrophyllite; and in Burma steatite pencils are used for writing on black paper. In the oxyhydrogen flame, steatite has been fused and drawn out into threads, like quartz-fibres.

Steatite and talc-schists are widely distributed, and have occasion- ally been used as building

stones. When first raised the stone is soft, but hardens on exposure. Soapstone from Gudbrandsdal is used in the cathedral of Trondhjem in Norway. Veins of steatite occur in the serpentine of the Lizard district in Cornwall, and the mineral was used under the name of soap rock in the manufac- ture of the old Worcester porcelain. Among localities of steatite

in the British Isles mention may be made of Crohy Head and Gartan near Letterkenny in co. Donegal, Ireland; the Shetland isles, the Hebrides (Harris) and Shiness in Sutherland. In North America the distribution of the mineral is very extensive; localities of economic importance are near Gouverneur and elsewhere in St Lawrence co., New York; at Francestown in New Hampshire; Stockbridge, Windsor co., Vermont; Lynnfield, Massachusetts; near Lafayette, Pennsylvania; Albemarle, Amelia, Buckingham, Fairfax and Fluvanna cos., Virginia; Cherokee, Moore and Swain cos., North Carolina; and in Murray co., Georgia.

A fibrous steatite from New York state, used in the manufacture of paper, is known as agalite. Rensselaerite is a wax-like talcose substance, passing into serpentine, from St Lawrence co., New York, named by E. Emmons in 1837 after S. Van Rensselaer, of Albany, N.Y. Beaconite is an asbestiform talc from Michigan, named by L. W. Hubbard. The term pyrallolite was given by Nils G. Nordenskiold to a mineral from Finland, which appears to be talc pseudomorphous after pyroxene. Talcoid was K. F. Naumann's name for a white lamellar mineral from near Pressnitz in Bohemia. A blue earthy mineral from near Silver City, New Mexico, known locally as " native ultramarine," is a magnesium silicate.

See " TJilc and Soapstone " in vol. ii. of Mineral Resources of the U.S. (Washington, 1909), and J. H. Pratt, " Economic Papers," No. 3 of Geol. Surv. of N. Carolina (1900) ; also E. W. Parker in 19th Report of U.S. Geol. Surv. (1898); C. H. Smyth, junior, The Fibrous Talc Industry of St Lawrence

Co., N.Y., in " Mineral Industry," vol. ix., for 1900; and G. P. Merrill's Non-metallic Minerals (New York, 1904)- (F. W. R.)*

TALCA, a province of Chile, bounded N. by Curico, E. by Argentina, S. by Linares and Maule, and W. by the Pacific. Area 3840 sq. m. Pop. (1895) 128,961. In the E. the Andean slopes cover a considerable part of its territory, and in the W. another large area is covered by the coast range. Between these is the central valley of Chile in which the population and industries of the province are chiefly concentrated. The mountainous parts are well wooded. The intermediate plain, which is rolling and slopes gently to the S., is fertile and devoted to wheat and stock. The capital of the province is Talca (pop. I ^9S, 33, 2 32; 1902 estimated 42,766), on the Rio Claro, a tributary of the Maule, 156 m. by rail S. of Santiago. It is one of the most important provincial towns and commercial centres of central Chile. There are woollen factories, especially for the universally worn " poncho." Talca has railway con- nexion with Santiago on the N., with Conception on the S., and with Constitution at the mouth of the Maule.

TALCAHUANO, or Talcaguano, a seaport of the province of Conception, Chile, on the bay of Conception, 8 m. N.W. of the city and port of that name. Pop. (1895) 10,431; (1902, estimated) 13,499. It is sheltered by the island of Quinquina. It has the best harbour on the Pacific coast of South America, and is one of the most important ports of southern Chile, being connected by rail with Conception, Santiago and southern Chile. Its foreign trade is large and steadily increasing. The Chilean government has established its chief naval depot here.

TALE (O.Eng. talu, number, account, story; the word is common to many Teutonic languages; cf. Ger. Zahl, number, Erzahlung, narrative, Du. taal, speech, language), a general term, in the usual acceptance of the word, for fictitious narra- tives, long or short, ancient or modern (see Novel). In this article " tale " is used in a stricter sense, as

equivalent to the German " Volks-marchen " or the French " conte populaire." Thus understood, popular tales mean the stories handed down by oral tradition from an unknown antiquity, among savage and civilized peoples. So understood, popular tales are a subject in mythology, and indeed in the general study of the develop- ment of man, of which the full interest and importance was long unrecognized. Popular tales won their way into literature, it is true, at a very distant period. The Homeric epics, especially the Odyssey, contain adventures (those, for example, of the Cyclops and the husband who returns in disguise) which are manifestly parts of the general human stock of popular narrative. Other examples are found in the Rigveda, and in the myths which were handled by the Greek dramatists. Collections of popular tales, more or less subjected to conscious literary treatment, are found in Sanskrit, as in the work of Somadeva, whose Kdthd Sarit Sdgara, or " Ocean of the Streams of Story," has been translated by Mr Tawney (Calcutta, 1880). The Thousand

and One Nights (q.v.) are full of popular tales, and popular tales are the staple of the medieval Gesla Romanorum, and of the collections of Straparola and other Italian conteurs. In all these and similar gatherings the story, long circulated from mouth to mouth among the people, is handled with conscious art, and little but the general outline of plot and character of incident can be regarded as original. In the Histories ou Contes du Temps Passe of Perrault (Elzevir, Amsterdam, 1697; the Parisian edition is of the same date) we have one of the earliest gatherings of tales which were taken down in their nursery shape as they were told by nurses to children. This at least seems probable, though M. Alfred Maury thinks Perrault drew from literary sources. Perrault attributed the composition to his son, P. Darmancour, at that time a child, and this pretext enabled him to give his stories in a simple

and almost popular guise. It seems that popular tales in many cases probably owe their origin to the desire of enforcing a moral or practical lesson. It appears that their irrational and " infantile " dferacter — " depourvues de raison " — is derived from their origin, if not actually among children, at least among childlike peoples, who have not arrived at " raison," that is, at the scientific and modern conception of the world and of the nature of man.

The success of Perrault 's popular tales brought the genre into literary fashion, and the Comtesse d'Aulnoy invented, or in some cases adapted, " contes," which still retain a great popularity. But the precise and scientific collection of tales from the lips of the people is not much earlier than our century. The chief impulse to the study was given by the brothers Grimm. The first edition of their Kinder- und Haus-Marchen was published in 181 2. The English reader will find a very con- siderable bibliography of popular tales, as known to the Grimms, in Mrs Alfred Hunt's translation, Grimm's Household Tales, with Notes (London, 1884). " How unique was our collection when it first appeared," they exclaim, and now merely to enumerate the books of such traditions would occupy much space. In addition to the marchen of Indo-European peoples, the Grimms became acquainted with some Malay stories, some narratives of Bechuanas, Negroes, American Indians, and Finnish, Esthonian, and Magyar stories. Thus the Grimms' knowledge of non-European marchen was extremely slight. It enabled them, however, to observe the increase of refinement " in proportion as gentler and more humane manners develop themselves," the monstrosities of Finnish and Red-Indian fancy gradually fading in the narratives of Germans and Italians. The Grimms notice that the evolution of popular narrative resembles the evolution of the art of sculpture, from the South- Sea idol to the frieze of the Parthenon, " from the strongly marked, thin, even ugly, but highly expressive forms of its earliest stages to those which possess external beauty of

mould." Since the Grimms' time our knowledge of the popular tales of non-European races has been greatly enriched. We possess numbers of North-American, Brazilian, Zulu, Swahili, Eskimo, Samoan, Maori, Kaffir, Malagasy, Bushman, North African, Fiort, New Caledonian, and even Australian marchen, and can study them in comparison with the stories of Hesse, of the West Highlands of Scotland, of Scandinavia.

While the popular romances of races of all colours must be examined together, another element in this subject is not less important. It had probably been often observed before, as by Lord Fountainhall (1670), but the fact was brought out most vividly by J. G. von Hahn {Griechische und albanesische Marchen, Leipzig, 1864), that the popular tales of European races turn on the same incidents, and display the same succession of situations, the same characters, and the same plots, as are familiar in the ancient epic literature of Greece, India, Germany and Scandinavia. The epics are either fully-developed marchen evolved by the literary genius of poets and saga-men, or the marchen are degenerate and broken-down memories of the epics and sagas, or perhaps there may be examples of both processes. The second view, — namely, that the popular tales are, so to speak, the scattered grains of gold of which the epic is the original " pocket " or " placer," — the belief that the

marchen are the detritus of the saga, — was for a long time prevalent. But a variety of arguments enforce the opposite conclusion, namely, that the marchen are essentially earlier in character than the epic, the final form to which they have been wrought by the genius of Homer or of some other remote yet cultivated poet. If this view be accepted, the evolution of .marchen and of certain myths has passed through the following stages: —

(1) The popular tale, as current among the uncultivated peoples, such as Iroquois, Zulus, Bushmen, Samoans, Eskimo, and Samoyedes. This tale will reflect the mental condition of rude peoples, and will be full of monstrous and miraculous events,

with an absence of reason proper, as Perrault says, ” a ceux qui n’en ont pas encore.” At the same time the tale will very probably enforce some moral or practical lesson, often the sanction of a taboo, and may even appear to have been invented with this very purpose, for man is everywhere impressed with the importance of conduct.

(2) The same tale — or rather a series of incidents and a plot essentially the same — as it is discovered surviving in the oral traditions of the illiterate peasantry of European races. Among them the monstrous element, the ferocity of manners observed in the first stage, will be somewhat modified, but will be found most notable among the Slavonic tribes. Nowhere, even in German and Scottish marchen, is it extinct, cannibalism and cruel torture being favourite incidents.

(3) The same plots and incidents as they exist in the heroic epics and poetry of the cultivated races, such as the Homeric epics, the Greek tragedies, the Cyclic poets, the Kalewala of the Finns, certain hymns of the Rigveda, certain legends of the Brahmanas, the story of the Volsungs, — in these a local and almost historical character is given by the introduction of names of known places, and the adventures are attributed to national heroes, — Odysseus, Oedipus, Sigurd, Wainamoinen, Jason, Pururavas, and others. The whole tone and manners are nobler and more refined in proportion as the literary workman- ship is more elaborate.

This theory of the origin of popular tales in the fancy of peoples in the savage condition (see Mythology), of their survival as marchen among the peasantry of Indo-European and other civilized races, and of their transfiguration into epics, could only be worked out after the discovery that savage and civilized popular tales are full of close resemblances. These resemblances, when only known to exist among Indo-European peoples, were explained as part of a common Aryan inheritance, and as the result of a malady of language. This system, when applied to myths in general, has already been

examined (see Mythology). According to another view, marchen every- where resemble each other because they all arose in India, and have thence been borrowed and transmitted. For this theory consult Benfey's Panchatantra and M. Cosquin's Contes de Lorraine (Paris, 1886) In opposition to the Aryan theory, and the theory of borrowing from India, the sytem which is here advocated regards popular tales as kaleidoscopic arrange- ments of comparatively few situations and incidents, which again are naturally devised by the early fancy. Among these incidents may be mentioned, first, kinship and intermarriage between man and the lower animals and even inorganic pheno- mena. Thus a girl is wooed by a frog, pumpkin, goat, bear, or elephant, in Zulu, Scotch, Walachian, Eskimo, Ojibway, and German marchen. This incident is based on the lack of a sense of difference between man and the things in the world which is prevalent among savages (see' Mythology) . Other incidents familiar in our nursery tales (such as " Cinderella " and " Puss in Boots") turn on the early belief in metamorphosis, in magic, in friendly or protecting animals (totems or beast manitous). Others depend on the early prevalence of cannibalism (compare Grimm, 47, " The Juniper Tree "). This recurs in the mad song of Gretchen in Faust, concerning which a distinguished student writes, " This ghost of a ballad or rhyme is my earliest remem- brance, as crooned by an old East-Lothian nurse." (Compare Chambers's Popular Rhymes of Scotland, 1870, p. 49.) The

same legend occurs among the Bechuanas, and is published by Casalis. Yet another incident springs from the taboo on certain actions between husband and wife, producing the story of Cupid and Psyche (see Lang's Custom and Myth, 1884, p. 64). Once more, the custom which makes the youngest child the heir is illustrated in the marchen of the success, despite the jealousy of the elders, of Cinderella, of the Zulu prince (Calla- way's Tales from the

Amazulu, pp. 64, 65), and in countless other marchen. In other cases, as in the world-wide marchen corre- sponding to the Jason epic, we seem in presence of an early ^mantic invention, — how diffused it is difficult to imagine. Morai lessons, again, are inculcated by the numerous tales which turn on the duty of kindness, or on the impossibility of evading fate as announced in prophecy. In opposition to the philological explanation of the story of Oedipus as a nature myth, this theory of a collection of incidents illustrative of moral lessons is admirably set forth in Prof. Comparetti's Edipo e la Mitologia Comparala (Pisa, 1867).

On a general view, then, the stuff of popular tales is a certain number of incidents and a certain set of combinations of these incidents. Their strange and irrational character is due to their remote origin in the fancy of men in the savage condition; and their wide distribution is caused, partly perhaps by oral trans- mission from people to people, but more by the tendency of the early imagination to run everywhere in the same grooves. The narratives, in the ages of heroic poetry, are elevated into epic song, and in the middle ages they were even embodied in legends of the saints. This view is maintained at greater length, and with numerous illustrations, in the introduction to Mrs Hunt's translation of Grimm's Kinder- und Haus-Mdrchen, and in Custom and Myth, already referred to.

For savage popular tales see Theal's Kaffir Folk Lore (2nd ed., London, 1886); Callaway's Nursery Tales of the Amazulu (London, 1868); Schoolcraft's Algic Researches; Gill's Myths and Tales of the South Pacific; Petitot's Traditions Indiennes (1886) ; Shortland's Maori Religion and Mythology (London, 1882) ; the South African Folk Lore Record; the Folk Lore Record (London, 1879-85, Malagasy stories) ; Rink's Tales and Traditions of the Eskimo ; Bleek's Hottentot Tales and Fables (London, 1864); Castren's Samoyedische Marchen; Maspero's Conies Egyptiens (from ancient Egyptian MSS.) ; and Leland's

Algonquin Legends (London, 1884). For European tales, the bibliography in the translation of Grimm already referred to may be used, and the Maisonneuve collection, Les Litteratures populaires, may be recommended. The names of Liebrecht, Kohler, Dasent, Ralston, Nigra, Pitre, Cosquin, Afanasief, Gaidoz, S6billot, may serve as clues through the enchanted forest of the nursery tales of Europe. Miss Coxe's Cinderella (Folk-Lore Society) is an excellent work on the subject, as is Sidney Hartland's Legend of Perseus, mainly concerned with myths of miraculous births. For Australia see Mrs Langloh Parker's Australian Legendary Tales (2 vols.) and Howitt's Native Tribes of South-East Australia. M. Sebillot has edited French tales, and Mr Dennett has given Folk-Lore of the Fiort. There are abundant materials and discussions in Frazer's The Golden Bough. (A. L.)

TALENT (Lat. talentum, adaptation of Gr. rakavrov, balance, weight, from root raX-, to lift, as in rXrjfcu, to bear, rdXas, enduring, cf. Lat. tollere, to lift, Skt. tula, balance), the name of an ancient Greek unit of weight, the heaviest in use both for monetary purposes and for commodities (see Weights and Measures). The weight itself was originally Babylonian, and derivatives were in use in Palestine, Syria and Egypt. In medieval Latin and also in many Romanic languages the word was used figuratively, of will, inclination or desire, derived from the sense of balance, but the general figurative use for natural endowments or gifts, faculty, capacity or ability, is due to the parable of the talents in Matt. xxv.

TALFOURD, SIR THOMAS NOON (1795-1854), English judge and author, the son of a brewer in good circumstances, was born on the 26th of May 1795 at Reading (not, as is some- times stated, at Doxey, near Stafford). He received his early education at Hendon, and at the Reading grammar-school. At the age of eighteen he was sent to London to study law under Joseph Chitty, the special pleader. Early in 1821 he joined the Oxford circuit, having been called to the bar at the middle Teriple in the same

year. When, fourteen years later, he was created a serjeant-at-law, and when again he in 1849 succeeded

Mr. Justice Coltman as judge of the court of common pleas, he attained these distinctions more perhaps for his laborious care in the conduct of cases than on account of any forensic brilliance. At the general election in 1835 he was returned for Reading. This seat he retained for close upon six years, and he was again returned in 1847. In the House of Commons he introduced an International Copyright Bill; his speech on this subject was considered the most telling made in the House during that session. The bill met with strong opposition, but Talfourd had the satisfaction of seeing it pass into law in 1842, albeit in a greatly modified form. Dickens dedicated the Pickwick Papers to him.

In his early years in London Talfourd was dependent—in great measure, at least — upon his literary exertions. He was at this period on the staff of the London Magazine, and was an occasional contributor to the Edinburgh and Quarterly reviews, the New Monthly Magazine, and other periodicals ; while, on joining the Oxford circuit, he acted as law reporter to The Times. His legal writings on matters germane to literature are excellent expositions, animated by a lucid and telling, if not highly polished, style. Among the best of these are his article ” On the Principle of Advocacy in the Practice of the Bar ” (in the Law Magazine, January 1846); his Proposed New Law of Copyright of the Highest Importance to Authors (1838); Three Speeches delivered in the House of Commons in Favour of an Extension of Copyright (1840) ; and his famous Speech for the Defendant in the Prosecution, the Queen v. Moxon, for the Publication of Shelley’s Poetical Works (1841).

But Talfourd cannot be said to have gained any position among men of letters until the production of his tragedy Ion, which was privately printed in 1835, and produced in the follow- ing year at Covent Garden theatre. The tragedy was also well received in America, and was reproduced at Sadler’s Wells in

December 1861. This dramatic poem, its author's masterpiece, turns upon the voluntary sacrifice of Ion, king of Argos, in response to the Delphic oracle, which had declared that only with the extinction of the reigning family could the prevailing pestilence incurred by the deeds of that family be removed.

Two years later, at the Haymarket theatre, The Athenian Captive was acted with moderate success. In 1839 Glencoe, or the Fate of the Macdonalds, was privately printed, and in 1840 it was produced at the Haymarket; but this home drama is inferior to his two classic plays. The Castilian (1853) did not excite a tenth part of the interest called forth by Ion. Before this he had produced various other prose writings, among them his " History of Greek Literature," in the Encyclopaedia Metro- politan. Talfourd died in court during the performance of his judicial duties, at Stafford, on the 13th of March 1854.

In addition to the writings above-mentioned, Talfourd was the author of The Letters of Charles Lamb, with a Sketch of his Life (1837) ; Recollections of a First Visit to the Alps (1841); Vacation Rambles and Thoughts, comprising recollections of three Continental tours in the vacations of 1841, 1842, and 1843 (2 vols., 1844); and Final Memorials of Charles Lamb (1849-50).

TALGARTH, a decayed market town in Breconshire, South Wales, situated on the Ennig near its junction with the Llynfi (a tributary of the Wye), with a station on the joint line of the Cambrian and Midland companies from Brecon to Three Cocks Junction (2! m. N.N.E., but in Talgarth parish). The popu- lation of the whole parish (which measures 12,294 acres) was 1466 in 1901. The church of St Gwendoline, restored in 1873, is in Perpendicular style, with an embattled tower restored in 1898. The Baptists, Congregationalists and Calvinistic Metho- dists have each a chapel in the town, and there is also a Con- gregational church at Tredwestan, founded in 1662. About 1 m. S.W. is Trevecca, where

Howel Harris, one of the founders of Welsh Methodism, was born in 1713, and where in 1752 he established a communistic religious " family " of about a hundred persons; their representatives in 1842 handed over the property to the Welsh Calvinistic Methodist connexion, who in that year opened there a theological college, and in 1874 added to it a Harris memorial chapel. In 1906 the college was removed

to Aberystwyth, and the buildings are now used by the Con- nexion as a preparatory school for ministerial students.

The fortified station of Dinas occupies the summit of a hill about 25 m. S.E. of Talgarth, and commands the mountain pass to Crickhowell and the eastern part of the vale of Usk. Its castle, built on the site of an earlier British fortress, was destroyed (according to Leland) by the inhabitants to prevent its falling into the hands of Glendower. The town was in the manor of English Talgarth, there being also a manor of Welsh Talgarth, in which Welsh laws prevailed.

TALIENWAN, an open bay or roadstead on the east side of the Liaotung peninsula, Manchuria. It was leased to Russia by China in 1898 with the naval fortress of Port Arthur, from which it is distant 40 m., the lease being transferred to Japan in 1905. The Russian town of Dalny (now Tairen) was built upon the west side of the bay, known as Port Victoria. Being ice-free all the year round, it has an advantage over Niuchwang, which is frozen up for four months in the year. Niuchwang, however, lies much nearer to the great producing and consuming districts of Manchuria. Talienwan is in railway connexion with Niu- chwang and Peking and via the Siberian railway with Europe. It was the rendezvous of the British fleet during the Anglo-China war of i860, whence the names Port Arthur and Port

Victoria.

TALIESSIN, the name of a late 6th century British bard, of whom practically nothing is known except the attribution to him of the collection of poems known as the Book of Taliessin. See the article Celt, § Literature, IV.

TALISMAN, a magical charm. The word is often used as a term synonymous with amulet (q.v.), but strictly should be applied to an inanimate object which is supposed to possess a supernatural capacity of conferring benefits or powers, an amulet being that which protects or wards off evil (see Magic). The most common form which the talisman took in medieval or later times was that of a disk of metal or stone engraved with astrological figures, or with magical formulae, of which Abraxas (q.v.) and Abracadabra (q.v.) are the most familiar. The word is derived through the Spanish from Arab. tilsaman, plural of tilsam, an adaptation of Gr. Tehta/ia, pay- ment, outlay (from reXeiv, to accomplish), used in Late Gr. of an initiation or mystery and in Med. Gr. of a charm.

TALLADEGA, a city and the couty-seat of Talladega county, Alabama, U.S.A., 35 m. E. of Birmingham. Pop. (1900) 5056 (2687 negroes); (1910) 5854. It is served by the Southern, the Louisville & Nashville and other railways. Talladega is situated in the foothills of the Blue Ridge, about 560 ft. above sea level. It is the seat of the Alabama Synodical College for Women (Presbyterian, 1903), of Talladega College (Congrega- tional, opened 1867; chartered 1869 and 1889) for the higher education of negroes — the first college for negroes in the state, and of several institutions devoted to the care of the deaf, dumb and blind. Limestone and coal are found in the vicinity. Among the manufactures are cotton goods, cotton- seed oil, iron, hosiery, chemicals and fertilizers. There are several mineral springs near the city, and the municipal water supply is derived from a spring in the city. The electric lighting and power plant is operated by water power on Jackson Shoals. Talladega was originally an

Indian village. On the 9th of November 18 13, it was the scene of a decisive victory of the whites and their Indian allies, 2000 strong, led by Gen. Andrew Jackson, over 1000 ” Red Sticks,” or Creek Indians, who were hostile to the extension of white settlements in Indian territory.

TALLAGE (med. Lat. tallagium, Fr. tallage, from late Lat. talare, laleare, Fr. tailler, to cut, classical Lat. talea, a cutting, slip; cf. ” tally ” and the French taille, q.v.), a special tax in England paid by cities, boroughs and royal demesnes. The word, variously interpreted as a part ” cut off ” from the property taxed, or as derived from the tally (q.v.), first appears in the reign of Henry II. as a synonym for the auxlllum burgl, which was an occasional payment exacted by king and barons over and above the annual firma burgi from burgage tenants, since all boroughs after the Norman Conquest came to be re garded as in some lord’s demesne. The tax displaced the

Danegeld so far as the towns and demesne lands of the Crown were concerned in the second half of the 12th century, and gradually the barons were deprived of the right of tallaging their respective demesnes without royal authorization. The imposi- tion of tallage continued under the immediate successors of Henry II.; the barons failed to secure its prohibition or even limitation at Runnymede, and Henry III. levied it frequently. The amount to be paid was determined during this time by officials of the exchequer in special fiscal circuits through separate negotiations with the various tax-paying communities, the towns usually raising their quota by means of a capitation or poll tax. Its imposition practically ceased by 1283 in favour of a general grant made in parliament, and the king’s retention of tallage seemed particularly unnecessary and illogical after burgesses were summoned to parliament. The opinion used to be held that tallage was forbidden by the Conjirmatio car- tarum, but the Latin version of that document which bears the title De tallagio non concedendo, although cited as a statute in the preamble to the Petition of Right in

1627 and in a judicial decision of 1637, was merely a chronicler's summary of the purposes of the official French document, which did not mention tallage by name. After 1297, however, there were only three levies of the tax: one by Edward I. in 1304; again in 13 12 by Edward II. despite the protests of London and Bristol; and finally in 1332, when Edward III. encountered such opposition from parliament that he withdrew the commissions and accepted in its place a grant of a tenth-and-fifteenth. The last time that the king granted leave to the barons to tallage their demesnes was in 1305. The second statute of 1340 formally enacted that the nation should thenceforth not " make any common aid or sus- tain charge," including tallage, without consent of parliament.

See William Stubbs, Constitutional History of England, vol. i. sect. 161, vol. ii. sect. 275; D. J. Medley, English Constitutional History, 3rd ed. (London, 1902) ; Pollock and Maitland, History of English Law, vol. i., 2nd ed. ; S. J. Low and F. S. Pulling, Dictionary of English History.

TALLAHASSEE, the capital of Florida, U.S.A., and the county seat of Leon county, in the W. part of the state, about 40 m. E. of the Apalachicola river and 20 m. from the Gulf of Mexico, about midway by railway between Jacksonville and Pensacola. Pop. (1900) 2981 (175s negroes); (1910) 5018; in 1900 the population of the county was 19,887, of whom 16,000 were negroes. Tallahassee is served by the Seaboard Air Line and the Georgia, Florida & Alabama railways. The city is finely situated on a hill, about 300 ft. above sea-level, and the streets are wide and well-shaded. The principal build- ings are the State Capitol, Grecian in architecture, the Federal Building, and the County Court House. In the Episcopal cemetery two monuments mark the graves of Charles Louis Napoleon Achille Murat (1801-1847), the eldest son of Joachim Murat, and of his wife Catherine (1803-1867), the daughter of Col. Bird C. Willis of Virginia and a grand-niece of George Washington. 1 Tallahassee is the seat of the Florida Female College, co-ordinate with the State

University for men, and the State Normal and Industrial School (for negroes), an agricultural and mechanical college. About 17 m. S. of Tallahassee, in Wakulla county, is the Wakulla Spring, about 106 ft. deep, one of the largest of the remarkable springs of Florida.

Tallahassee's name is of Seminole origin, and means, it is said, " tribal land. " During a war with the Apalachee Indians in 1638 the Spaniards, according to tradition, fortified a hill W. of the city, where the Fort St Luis Place, a plantation

1 Murat settled here about 1821, became a naturalized American citizen, relinquishing his claim to the crown of Naples, and lived here for much of the time until his death, holding successively the office of alderman, mayor and postmaster of the city, and devoting sorre of his leisure to the preparation of three books, describing political and social conditions in America, the last of which, Ex- position des principes du gouvernement republicain tel qu'il a Hi perfcctionni en Amerique (1838), was translated into many languages and was very popular in Europe. After his death his wife lived in what is still known as the Murat Homestead, about 2 m. W. of Tallahassee, and after the American Civil War she received an annuity of 30,000 francs from Napoleon III.

mansion, now stands. About 1818 most of the Indians were expelled from the vicinity, and a settlement was made by the whites. In 1824 Tallahassee, then virtually uninhabited; was formally chosen by the United States Government as the capital of the Territory of Florida, and it continued as the capital after the admission of Florida into the Union as a state in 1845. It was a residential centre for well-to-do planters before the Civil War, and Bellair, 6 m. S., now in ruins, was a fashionable pleasure resort. On the 10th of January

1861 a state conven- tion adopted at Tallahassee an Ordinance of Secession.

TALLBOY (partly a translation and partly a corruption of the French hautbois), a double chest of drawers. Whereas the chest of drawers in its familiar form (sometimes in the 18th century called a " lowboy ") contains three long and two short drawers, the tallboy has five, six, or seven long drawers, and two short ones. It is a very late 17th-century development of the smaller chest. The early examples are of walnut, but by far the largest proportion of the many that have survived are of mahogany, that being the wood most frequently employed in the 18th century for the construction of furniture, especially the more massive pieces. Occasionally the walnut at the beginning of the vogue of the tallboy was inlaid, just as satin- wood varieties were inlaid, depending for relief upon carved cornice-mouldings or gadrooning, and upon handsome brass handles and escutcheons. The tallboy was the wardrobe of the 1 8th century, but it eventually gave place to the modern type of wardrobe, which, with its sliding drawers, was speedily found to be not only as capacious as its predecessor but more convenient of access. The topmost drawers of the tallboy could only be reached by the use of bed steps, and the dis- appearance of high beds and the consequent disuse of steps exercised a certain influence in displacing a characteristic piece of furniture which was popular for at least a century.

TALLEMANT, GEDEON, SIEUR DES REAUX (1619-1692), French author, was born at La Rochelle on the 7th of November 1619. He belonged to a wealthy middle-class family of Huguenot persuasion; the name des Reaux he derived from a small pro- perty purchased by him in 1650. When he was about eighteen years of age he was sent to Italy with his brother Francois, abbe Tallemant. On his return to Paris, Tallemant took his degrees in civil and canonical law, and his father secured for him the position of conseiller au parlement. The profession was dis- tasteful to him, and he decided to ensure himself a competence by

marriage with his cousin Elisabeth de Rambouillet. His half-brother had married a d'Angennes, and this connexion secured for Tallemant an introduction to the Hotel de Ram- bouillet. Madame de Rambouillet was no admirer of Louis XIII., and she gratified Tallemant's curiosity with stories of the reigns of Henry IV. and Louis XIII. of real historical value. But the society of the Hotel de Rambouillet itself opened a field for his acute and somewhat malicious observation. In the Historicttcs he gives finished portraits of Voiture, Balzac, Mal- herbe, Chapelain, Valentin Confart and many others; Blaise Pascal and Jean de la Fontaine appear in his pages; and he chronicles the scandals of which Ninon de l'Enclos and Angelique Paulet were centres. They are invaluable for the literary history of the time. It has been said that the malicious intention of his work may be partly attributed to his bourgeois extraction and that the consequent slights he received are avenged in his pages, but independent testimony has established the substantial correctness of his statements. In 1685 he was converted to Catholicism. It seems that the change was not entirely disinterested, for Tallemant, who had suffered con- siderable pecuniary losses, soon after received a pension of 2000 livres. He died in Paris on the 6th of November 1692.

Des Reaux was a poet of some merit and contributed to the Guirlande de Julie, but it is by his Historiettcs that he is remembered. The work remained in manuscript until it was edited in 1834—6 by MM. de Chateaugiron, Jules Taschereau and L. J. N. de Monmerque\ with a notice on Tallemant by Monmerque. A third edition (6 vols. 1872) contains a notice by Paulin Paris. Tallemant had begun Memoires pour la regence d'Anne d'Autriche, but the manuscript has not been found.

TALLEYRAND-PERIGORD, CHARLES MAURICE DE (1754-1838), French diplomatist and statesman, was born at Paris on the 13th of February 1754, though some accounts give the date as the 2nd of February. His father was Lieutenant-General Charles Daniel de Talleyrand-Perigord, and his mother was Alexandrine

(nee) de Damas Antigny. His parents, descended from ancient and powerful families, were in constant attendance at the court of Louis XV., and (as was generally the case then in their class) neglected the child. In his third or fourth year, while under the care of a nurse in Paris, he fell from a chest of drawers and injured his foot for life. This accident darkened his prospects; for though by the death of his elder brother he should have represented the family and entered the army, yet he forfeited the rights of primogeniture, and the profession of arms was thenceforth closed to him. Entrusted to the care of his grandmother at Chalais in Perigord, he there received the only kind treatment which he experienced in his early life, and was ever grateful for it. He was removed at the age of eight to the College d'Harcourt at Paris (now the Lycee St Louis), where his rich intellectual gifts enabled him to make good by private study the defects of the training there imparted. At the age of twelve he fell ill of smallpox, but his parents showed little or no interest in his recovery. Destined for the church by the family council which deprived him of his birthright, he was sent when about thirteen years of age to St Sulpice, where he conceived a dislike of the doctrines and discipline thrust upon him. After a visit to his uncle, the archbishop of Reims, he returned to St Sulpice to finish his preliminary training for the church, but in his spare time he read the works of Mon- tesquieu, Voltaire, and other writers who were beginning to undermine the authority of the ancien regime, both in church and state. As subdeacon he witnessed the coronation of Louis XVI. at Reims, but he did not take priest's orders until four years later. Recent researches into his early life discredit most of the stories that have been told respecting his profligacy and his contempt for the claims of the church; and it is ad- mitted that, while rejecting her authority in the sphere of dogma and intellect, he observed the proprieties of life (gambling being then scarcely looked on as a vice) and respected the outward observances of religion.

During his life at Paris he had opportunities of mixing in the circles of the philosophers and of others who frequented the salon of Madame de Genlis, and he there formed those ideas in favour of political and social reform which he retained through life. After taking his licentiate in theology in March 1778, he gave little more attention to theological studies. Nevertheless the acuteness of his powers, added no doubt to his social position, gained for him in the year 1780 the position of agent-general of the clergy of France, in which capacity he had to perform important administrative duties respecting the relations of the clergy to the civil power. The growing claims of the state on the exchequer of the clergy made his duties responsible, his colleague as agent-general being of little use. At the extra- ordinary assembly of the clergy in 1782 he made various pro- posals, by one of which he sought, though in vain, to redress the most glaring grievances of the underpaid cures. Though the excellence of his work as agent-general in the years 1780-86 was fully acknowledged, and earned him a special gift of 31,000 livres, yet he did not gain a bishopric until the beginning of the year 1789, probably because the king disliked him as a free- thinker. He now became bishop of Autun, with a stipend ^of 22,000 livres, and was installed on the 15th of March.

The first rumblings of the revolutionary storm were making themselves heard. The elections for the States General were soon to take place; and the first important act of the new bishop was to draw up a manifesto or programme of the reforms which he desired to see carried out by the States General of France. It comprised the following items: the formation of a constitution which would strengthen the monarchy by calling to it the support of the whole nation, the drafting of a scheme of local self-government on democratic lines, the reform of the administration of justice and of the criminal law, and the

abolition of the most burdensome of feudal and class privileges. This programme was adopted by the clergy of his diocese as their cahier, or book of instructions to their representative at the States General, namely Talleyrand himself.

His influence in the estate of the clergy, however, was cast against the union of the three estates in a single assembly, and he voted in the minority of his order which in the middle of June opposed the merging of the clergy in the National Assembly. The folly of the court, and the weakness of Louis XVI. at that crisis, probably convinced him that the cause of moderate reform and the framing of a bicameral constitution on the model of that of England were hopeless. Thereafter he inclined more and more to the democratic side, though for the present he concerned himself mainly with financial questions. In the middle of July he was chosen as one of the committee to prepare a draft of a constitution; and in the session of the Assembly which Mirabeau termed the orgie of the abolition of privileges (4th of August) he intervened in favour of discrimination and justice. On the 10th of October, that is, four days after the insurrection of women and the transference of the king and court to Paris, he proposed to the Assembly the confiscation of the lands of the church to the service of the nation, but on terms rather less rigorous than those in which Mirabeau (q.v.) carried the proposal into effect on the 2nd of November. He identified himself in general with the Left of the Assembly, and supported the pro- posed departmental system which replaced the old provincial system early in 1790. At the federation festival of the 14th of July 1790 (the ” Feast of Pikes “) he officiated at the altar reared in the middle of the Champ de Mars. This was his last public celebration of mass. For a brilliantly satirical but not wholly fair reference to the part then played by Talleyrand, the reader should consult Carlyle’s French Revolution, vol. ii., bk. i., ch. 12. The course of events harmonized with the anti- clerical

views of Talleyrand, and he gradually loosened the ties that bound him to the church. He took little part in, though he probably sympathized with, the debates on the measure known as the Civil Constitution of the Clergy, whereby the state enforced its authority over the church to the detriment of its allegiance to the pope. When the Assembly sought to impose on its members an oath of obedience to the new decree, Talleyrand and three other bishops complied out of the thirty who had seats in the Assembly. The others, followed by the greater number of the clergy throughout France, refused, and thence- forth looked on Talleyrand as a schismatic. He did not long continue to officiate, as many of the so-called " constitutional " clergy did; for, on the 21st of January 1791, he resigned the see of Autun, and in the month of March was placed under the ban of the church by the pope.

Just before his resignation he had been elected, with Mirabeau and Sieyes, a member of the department of Paris; and in that capacity did useful work for some eighteen months in seeking to support the cause of order in the turbulent capital. Though he was often on strained terms with Mirabeau, yet his views generally coincided with those of that statesman, who is said on his death-bed (2nd of April 1791) to have communicated to him his opinions on domestic and international affairs, especially advising a close understanding with England. Talleyrand's reputation for immorality, however, was as marked as that of Mirabeau. While excelling him in suppleness and dexterity, he lacked the force of character possessed by the great " tribune of the people"; and his influence was gradually eclipsed by that of the more ardent and determined champions of democ- racy, the Girondins and the Jacobins. In the closing days of the first or Constituent Assembly, Talleyrand set forth (10th of September 1791) his ideas on national education. Education was to be free, and to lead up to the university. In place of dogma, the elements of religion were alone to be taught.

Debarred from election to the second National Assembly (known as the Legislative) by the self-

denying ordinance passed by the " constituents," Talleyrand, at the close of 1791, sought to enter the sphere of diplomacy for which his mental qualities and his clerical training furnished him with an admirable

equipment. The condition of affairs on the continent seemed to French enthusiasts to presage an attack by the other Powers on France. In reality those Powers were far more occupied with the Polish and Eastern questions than with the affairs of France; and the declaration of Pilnitz, drawn up by the sovereigns of Austria and Prussia, which appeared to threaten France with intervention, was recognized by all well-informed persons to be " a loud-sounding nothing." The French foreign minister, Delessart, believed that he would checkmate all the efforts of the emigres at the continental courts provided that he could confirm Pitt in his intention of keeping England neutral. For that purpose Delessart sent Talleyrand, well known for his Anglophil tendencies, to London, but in the unofficial or semi- official capacity which was rendered necessary by the decree of the Constituent Assembly referred to above. Talleyrand arrived in London on the 24th of January 1792, and found public opinion so far friendly that he wrote off to Paris, " Believe me, a rapprochement with England is no chimera." Pitt received him cordially; and to Grenville the envoy stated his hope that the two free nations would enter into close and friendly relations, each guaranteeing the other in the possession of its existing territories, India and Ireland being included on the side of Britain. After some delay the British government decided to return no definite answer to this proposal, a result due, as Talleyrand thought, to the Gallophobe views of King George and of the ministers Camden and Thurlow. Talleyrand, however, was convinced that Great Britain would not intervene against France unless the latter attacked the Dutch Netherlands. He returned to Paris on the 10th of March to persuade the foreign minister (Dumouriez now held that post) of the need of having a fully accredited ambassador at London. The ex- Marquis

Chauvelin was appointed, with Talleyrand as adviser. The situation became more complex after the 19th of April, when France declared war against Austria and prepared to invade the Austrian or Belgic Netherlends. Owing to certain indiscretions of Chauvelin and the growing unpopularity of the French in England (especially after the disgraceful day of the 20th of June at the Tuileries), the mission was a failure; but Talleyrand had had some share in confirming Pitt in his policy of neutrality, even despite Prussia's overtures for an alliance against France. After Talleyrand's return to Paris early in July (probably in order to sound the situation there) matters went from bad to worse. The overthrow of the monarchy on the 10th of August and the September massacres rendered hopeless all attempts at an entente cordiale between the two peoples; and the provocative actions of Chauvelin, undertaken in order to curry favour with the extremists now in power at Paris, undid all the good accomplished by the tact and modera- tion of Talleyrand. The latter now sought to escape from France, where events were becoming intolerable; and after some unsuccessful attempts to obtain a passport to leave Paris, he succeeded on the 14th of September and landed in England on the 23rd, avowedly on private business, but still animated by the hope of averting a rupture between the two governments. In this he failed. The provocative actions of the French Con- vention, especially their setting aside of the rights of the Dutch over the estuary of the Scheldt, had brought the two nations to the brink of war, when the execution of Louis XVI. (21st of Jan. 1793) made it inevitable. Talleyrand was expelled from British soil and made his way to the United States. There he spent thirty months in a state of growing uneasiness and dis- content with his surroundings.

The course of events after the Thermidorian reaction of July 1794 favoured his return to France. Thanks to the efforts of Daunou and others his name was removed from the list of SmigrSs, and he set sail for Europe in November 1795. Landing at Hamburg in the January following, he spent some time there in

the company of his friends Madame de Genlis and Reinhard; and when party rancour continued to abate at Paris, he returned thither in September. After a time marked by some pecuniary embarrassment, he was recommended by Madame de Stael to the Director Barras for the post of minister of foreign affairs.

His claims on the attention of the Directors had been strengthened by his reading two papers before the French Institute, the first on the commercial relations between England and the United States (in the sense referred to above), and the second on the advantages to be derived from new colonies. In the latter there occurred the suggestive remarks that, whereas revolutions made men prematurely old and weary, the work of colonization tended to renew the youth of nations. France, he observed, needed the spur to practical energy which the Americans had at hand in the effort to subdue the difficulties placed in their way by nature. Similar efforts would tend to make Frenchmen forget the past, and would at the same time supply an outlet for the poor and discontented. The practical statesmanship contained in these papers raised Talleyrand in public estimation; and, thanks to the efforts above named, he gained the post of foreign minister, entering on his duties in July 1797.

Bonaparte by his victories over the Austrians in Italy and Styria had raised the French republic to heights of power never dreamed of, and now desired to impose on the emperor terms of peace, to which the Directors demurred. Talleyrand, despite the weakness of his own position (he was as yet little more than the chief clerk of his department), soon came to a good under- standing with the general, and secretly expressed to him his satisfaction at the terms which the latter dictated at Campo Formio (17th of October 1797). The coup d'etat of Fructidor (September 1797) had perpetuated the Directory and led to the exclusion of the two " moderate "

members, Carnot and Barthelemy; but Talleyrand saw that power belonged really to the general who had brought about the coup d'etat in favour of the Jacobinical Directors headed by Barras.

After the rupture of the peace negotiations with England, which resulted from the coup d'etat of Fructidor, the policy of France became more warlike and aggressive. The occupation of Rome and of Switzerland by the French troops and the events of Bonaparte's Egyptian expedition (see Napoleon I.) brought about a renewal of war on the continent, but with these new developments Talleyrand had little or no connexion. His powers as minister were limited, and he regretted the extension of the area of war. Moreover, in the autumn of 1797 his reputa- tion for political morality (never very bright) was overclouded by questionable dealings with the envoys of the United States sent to arrange a peaceful settlement of certain disputes with France. The investigations of the most recent of Talleyrand's biographers tend to show that the charges made against him of trafficking with the envoys have been overdrawn; but all his apologists admit that irregularities occurred. Talleyrand re- fused to clear himself of the charges made against him as his friends (especially Madame de Stael) urged him to do; and the incident probably told against his chances of admission into the Directory, which were discussed in the summer of 1798. A year later he resigned the portfolio for foreign affairs (20th of July 1799), probably because he foresaw the imminent collapse of the Directory. If so, his premonitions were correct. Their realization was assured by the return to France of the " Con- queror of the East " in October. The general and the diplo- matist soon came to an understanding, and Talleyrand tact- fully brought about the alliance between Bonaparte and Sieyes (q.v.) (then the most influential of the five Directors) which paved the way for the coup d'etat of Brumaire (see French Revolution and Napoleon I.).

Talleyrand's share in the actual events of the 18th, 19th Brumaire (9th, 10th of November) 1799 was limited to certain dealings with Barras on the

former of those days. About midday he took to Barras a letter, penned by Roederer, re- questing him to resign his post as Director, By what means Talleyrand brought him to do so, whether by persuasion, threats or bribes, is not known; but on that afternoon Barras left Paris under an escort of soldiers. With the more critical and exciting events of the 19th of Brumaire at St Cloud Talleyrand had no direct connexion; but he had made all his preparations for flight in case the blow failed. His reward for helping on the winning cause was the ministry for foreign affairs, which he

held from the close of December 1799 on to the summer of 1807. In the great work of reconstruction of France now begun by the First Consul, Talleyrand played no unimportant part. His great aim was to bring about peace, both international and internal. He had a hand in the pacific overtures which Bona- parte, early in the year 1800, sent to the court of London; and, whatever may have been the motives of the First Consul in sending them, it is certain that Talleyrand regretted their failure. After the battle of Marengo an Austrian envoy had come to Paris in response to a proposal of Bonaparte, and Talleyrand persuaded him to sign terms of peace. These were indignantly repudiated at Vienna, but peace was made between the two Powers at Luneville on the 9th of February 1801.

As regards French affairs, Talleyrand used his influence to help on the repeal of the vexatious laws against emigre's, non- juring priests, and the royalists of the west. He was also in full sympathy with the policy which led up to the signature of the Concordat of 1801-2 with the pope (see Concordat) ; but it is probable that he had a hand in the questionable intrigues which accompanied the closing parts of that complex and difficult negotiation. At the end of June 1802 the pope removed Talleyrand from the ban of excommunication and allowed him to revert to the secular state. On the 10th of September 1803, owing to pressure put on him by Bonaparte, he married Madame Grand, a divorcee with whom he had long been living.

During the meeting of Italian notables at Lyons early in 1802 Talleyrand was serviceable in manipulating affairs in the way desired by Bonaparte, and it is known that the foreign minister suggested to them the desirability of appointing Bonaparte president of the Cisalpine Republic, which was thenceforth to be called the Italian Republic. In the negotiations for peace with England which went on at Amiens during the winter of 1 801-2 Talleyrand had no direct share, these (like those at Luneville) being transacted by Napoleon's eldest brother, Joseph Bonaparte (q.v.). On the other hand he helped the First Consul in assuring French supremacy in Switzerland, Italy and Germany. In Germany the indemnification of the princes who lost all their lands west of the Rhine was found by secularizing and absorbing the ecclesiastical states of the empire. This unscrupulous proceeding, known as the Secularizations (February 1803), was carried out largely on lines laid down by Bonaparte and Talley- rand; and the latter is known to have made large sums of money by trafficking with the claimants of church lands.

While helping to establish French supremacy in neighbouring states and assisting Bonaparte in securing the title of First Consul for life, Talleyrand sought all means of securing the permanent welfare of France. He worked hard to prevent the rupture of the peace of Amiens which occurred in May 1803, and he did what he could to prevent the sale of Louisiana to the United States earlier in the year. These events, as he saw, told against the best interests of France and endangered the gains which she had secured by war and diplomacy. Thereafter he strove to moderate Napoleon's ambition and to preserve the European system as far as possible. The charges of duplicity or treachery made against the foreign minister by Napoleon's apologists are in nearly all cases unfounded. This is especially so in the case of the execution of the due d'Enghien (March 1804), which Talleyrand disapproved. The evidence against him rests on a document which is now known to have been

forged. On the assumption of the imperial title by Napoleon in May 1804, Talleyrand became grand chamberlain of the empire, and received close on 500,000 francs a year.

Talleyrand had rarely succeeded in bending the will of the First Consul. He altogether failed to do so with the Emperor Napoleon. His efforts to induce his master to accord lenient terms to Austria in November 1805 were futile; and he looked on helplessly while that Power was crushed, the Holy Roman Empire swept away, and the Confederation of the Rhine set up in central Europe. In the bargainings which accompanied this last event Talleyrand is believed to have reaped a rich harvest from the German princes most nearly concerned. On the 6th of July 1806 Napoleon conferred on his minister the

title of prince of Benevento, a papal fief in the Neapolitan territory.

In the negotiations with England which went on in the summer of 1806 Talleyrand had not a free hand; they came to nought, as did those with Russia which had led up to the signature of a Franco-Russian treaty at Paris by d'Oubril which was at once disavowed by the tsar. The war with Prussia and Russia was ended by the treaties of Tilsit (7th and 9th of July 1807). Talleyrand had a hand only in the later developments of these negotiations; and it has been shown that he cannot have been the means of revealing to the British government the secret arrangements made at Tilsit between France and Russia, though his private enemies, among them Fouche, have charged him with acting as traitor in this affair.

Talleyrand had long been weary of serving a master whose policy he more and more disapproved, and after the return from Tilsit to Paris he resigned office.

Nevertheless Napoleon retained him in the council and took him with him to the inter- view with the Emperor Alexander I. at Erfurt (September 1808). There Talleyrand secretly advised that potentate not to join Napoleon in putting pressure on Austria in the way desired by the French emperor; but it is well known that Alexander was of that opinion before Talleyrand tendered the advice. Talleyrand disapproved of the Spanish policy of Napoleon which culminated at Bayonne in May 1808; and the stories to the contrary may in all probability be dismissed as idle rumours. It is also hard to believe the statement in the Talleyrand Memoirs that the ex-foreign minister urged Napoleon to occupy Catalonia until a maritime peace could be arranged with England. On Talleyrand now fell the disagreeable task of entertaining at his new mansion at Valencay, in Touraine, the Spanish princes virtually kidnapped at Bayonne by the emperor. They remained there until March 1814. At the close of 1808, while Napoleon was in Spain, Talleyrand entered into certain relations with his former rival Fouche (q.v.), which aroused the solicitude of the emperor and hastened his return to Paris. He subjected Talleyrand to violent reproaches, which the ex-minister bore with his usual ironical calm.

After the Danubian campaign of 1809 and the divorce of Josephine, Talleyrand used the influence which he still possessed in the imperial council on behalf of the choice of an Austrian consort for his master, for, like Metternich (who is said first to have mooted the proposal), he saw that this would safeguard the interests of the Habsburgs, whose influence he felt to be essential to the welfare of Europe. He continued quietly to observe the course of events during the disastrous years 181 2-13; and even at the beginning of the Moscow campaign he summed up the situation in the words, " It is the beginning of the end." Early in 1814 he saw Napoleon for the last time; the emperor upbraided him with the words: " You are a coward, a traitor, a thief. You do not even believe in God. You have betrayed and deceived everybody. You would sell even your own

father." Talleyrand listened unmoved, but afterwards sent in his resigna- tion of his seat on the council. It was not accepted. He had no share in the negotiations of the congress of Chatillon in February-March 1814. On the surrender of Paris to the allies (30th of March 1814), the Emperor Alexander I. took up his abode at the hdtel Talleyrand, and there occurred the conference wherein the statesman persuaded the victorious potentate that the return of the Bourbons was the only possible solution of the French problem, and that the principle of legitimacy alone would guarantee Europe against the aggrandizement of any one state or house. As he phrased it in the Talleyrand Memoirs: " The house of Bourbon alone could cause France nobly to conform once more to the happy limits indicated by policy and by nature. With the house of Bourbon France ceased to be gigantic in order to be great." These arguments, reinforced by those of the royalist agent de Vitrolles, convinced the tsar; and Talleyrand, on the 1st of April, convened the French senate (only 64 members out of 140 attended), and that body pro- nounced that Napoleon had forfeited the crown. Ten days later the fallen emperor recognized the inevitable and signed

the Act of Abdication at Fontainebleau. The next effort of Talleyrand was to screen France under the principle of legitimacy and to prevent the scheme of partition on which several of the German statesmen were bent. Thanks mainly to the support of the tsar and of England these schemes were foiled; and France emerged from her disasters with frontiers which were practically those of 1792.

At the congress of Vienna (1814-15) for the settlement of European affairs, Talleyrand, as the representative of the restored house of Bourbon in France, managed adroitly to break up the league of the Powers (framed at Chaumont in February 1814) and assisted in forming a secret alliance between England, Austria and France in order to prevent the complete absorption of Poland by Russia and of Saxony by Prussia. The new triple alliance had the effect of lessening the demands of those Powers, and

of leading to the well-known territorial compromise of 181 5. Everything was brought into a state of uncertainty once more by the escape of Napoleon from Elba; but the events of the Hundred Days, in which Talleyrand had no share — he remained at Vienna until the 10th of June — brought in the Bourbons once more; and Talleyrand's plea for a magnanimous treatment of France under Louis XVIII. once more prevailed in all important matters. On the 9th of July 181 5 he became foreign minister and president of the council under Louis XVIII., but diplo- matic and other difficulties led him to resign his appointment on the 23rd of September 181 5, Louis„ however, naming him high chamberlain and according him an annuity of 100,000 francs. The rest of his life calls for little notice except that at the time of the July Revolution of 1830, which unseated the elder branch of the Bourbons, he urged Louis Philippe, duke of Orleans (q.v.), to take the throne offered to him by popular acclaim. The new sovereign offered him the portfolio for foreign affairs; but Talleyrand signified his preference for the embassy in London. In that capacity he took an important part in the negotiations respecting the founding of the new kingdom of Belgium. In April 1834 he crowned his diplomatic career by signing the treaty which brought together as allies France, Great Britain, Spain and Portugal; and in the autumn of that year he resigned his embassy. During his last days he signed a paper signifying his reconciliation with the Roman Catholic Church and his regret for many of his early actions. The king visited his death-bed. His death, on the 17th of May 1838, called forth widespread expressions of esteem for the statesman who had rendered such great and varied services to his country. He was buried at Valencay. He had been separated from the former Madame Grand in 18 15 and left no heir.

Under all the inconsistencies of Talleyrand's career there lies an aim as steadily consistent as that which inspired his contem- porary, Lafayette. They both loved France and the cause of constitutional liberty. Talleyrand believed that he served those

causes best by remaining in office whenever possible, and by guiding or moderating the actions of his chiefs. He lived to see the triumph of his principles; and no Frenchman of that age did so much to repair the mischief wrought by fanatics and autocrats. In the opinion of enlightened men this will mitigate the censures that must be passed on him for his laxity in matters financial. If he enriched himself, he also helped to save France from ruin at more crises than one. In private life his ease of bearing, friendliness, and, above all, his inexhaustible fund of humour and irony, won him a large circle of friends; and judges so exacting as Mmes de Stael and de Remusat and Lord Brougham avowed their delight in his society.

By a codicil added to his will on the 17th of March 1838 Talley- rand left his memoirs and papers to the duchess of Dino and to M. de Bacourt. The latter revised them with care, and added to them other pieces emanating from Talleyrand. They were not to be published until after the lapse of thirty years from the time of Talleyrand's death. For various reasons they did not see the light until 1891. This is not the place in which to discuss so large a question as that of the genuineness of the Memoires, which, indeed, is now generally admitted. There are, however, several suspicious circumstances which tell against them as documents of the first importance, notably these: first that Talleyrand is known to have destroyed many of his most important papers, and secondly that

M. de Bacourt almost certainly drew up the connected narrative which we now possess from notes which were in more or less of con- fusion. For this question see articles by M. Chuquet in Rev. critique d'histoire et de litteralure, 25th of May 1891 (Paris); also articles by others in the Rev. historique, vols, xlviii. and xlix. (Paris) ; also in the Quarterly Review, No. 345 (London, 1891), and

Edinburgh Review, vol. 174 (London, 1891) ; by P. Bailleu in the Historische Zeilschrift, vol. lxviii. (Munich, 1892), and by Albert Sorel in his Lectures historiques (pp. 70-112).

The Talleyrand Memoires were edited by the due de Broglie in 5 vols. (Paris, 1891-2). They have been translated into English by A. Hall, 5 vols. (London, 1891-2). Of his letters and despatches the following are the chief collections: — G. Pallain, La mission de Talleyrand & Londres en 1792 (Paris, 1889), and Le minislere de Talleyrand sous le Directoire (Paris, 1891); P. Bertrand, Lettres inedites de Talleyrand d Napoleon, 1800-9 (Paris, 1889); G. Pallain, Talleyrand et Louis XVIII. (Paris, 1881), and Ambassade de Talley- rand a Londres (1830-4), 2 vols. (Paris, 1891).

Among the biographies, or biographical notices, of Talleyrand the following are, on the whole, hostile to him : G. Touchard Lafosse, Talleyrand, histoire politique et vie intime (Paris, 1848) ; G. Michaud, Hist, politique et privee de Talleyrand (Paris, 1853); A. Pichot, Souvenirs intimes sur Talleyrand (Paris, 1870) ; Sainte-Beuve, " Tal- leyrand," in Nouveaux lundis, No. xii. ; and Villemarest, Talleyrand. The estimate of him of Sir H. L. E. Bulwer Lytton in his Historical Characters, 2 vols. (London, 1867) and that of Lord Brougham in Historical Sketches of Statesmen, 3 vols. (London, 1845, new edition), are better balanced, but brief. Of recent biographies of Talleyrand the best are Lady Blennerhasset's Talleyrand (Berlin, 1894, Eng. translation by F. Clarke, 2 vols. London, 1894); Talleyrand, a Bio- graphical Study, by Joseph McCabe (London, 1906); and Bernard de Lacombe, La vie privee de Talleyrand (1910). (J. Hl. R.)

TALLIEN, JEAN LAMBERT (1767-1820), French Revolu- tionist, was the son of the mailre d'hotel of the marquis de Bercy, and was born in Paris. The marquis, perceiving the boy's ability, had him well educated, and got him a place as a lawyer's clerk. Being much excited by the first events of the Revolu- tion, he gave up his desk to enter a

printer's office, and by 1791 he was overseer of the printing department of the Moniieur. While thus employed he conceived the idea of the journal-affiche, and after the arrest of the king at Varennes in June 1791 he placarded a large printed sheet on all the walls of Paris twice a week, under the title of the Ami de$ Citoyens, journal fraternel.

This enterprise, of which the expenses were defrayed by the Jacobin Club, made him well known to the revolutionary leaders; and he made himself still more conspicuous in or- ganizing the great " Fete de la Liberte " on the 15th of April 1792, in honour of the released soldiers of Chateau- Vieux, with Collot d'Herbois. On the 8th of July 1792, he was the spokes- man of a deputation of the section of the Place Royale which demanded from the legislative assembly the reinstatement of the mayor, Jerome Petion, and the procureur, P. L. Manuel, and he was one of the most active popular leaders in the attack upon the Tuileries on the 10th of August, on which day he was appointed secretary or clerk to the revolutionary commune of Paris. In this capacity he exhibited an almost feverish activity; he perpetually appeared at the bar of the assembly on behalf of the commune; he announced the massacres of September in the prisons in terms of apology and praise; and he sent off the famous circular of the 3rd of September to the provinces, recommending them to do likewise. He had several persons imprisoned in order to save them from the fury of the mob, and protected several suspects himself. At the close of the month he resigned his post on being elected, in spite of his youth, a deputy to the Convention by the department of Seine-et-Oise, and he began his legislative career by defending the conduct of the Commune during the massacres. He took his seat upon the Mountain, and showed himself one of the most vigorous Jacobins, particularly in his defence of Marat, on the 26th of February 1793; he voted for the execution of the king, and was elected a member of the Committee of General Security on the 21st of January 1793. After a short mission in the western

provinces he returned to Paris, and took an active part in the coups d'etat of the 31st of May and the 2nd of June, which re- sulted in the overthrow of the Girondists. For the next few months he remained comparatively quiet, but on the 23rd of September 1793, he was sent with Claude Alexandre Ysabeau (1754-1831) on his mission to Bordeaux. This was the month

in which the Terror was organized under the superintendence of the Committees of Public Safety and General Security.

Tallien showed himself one of the most vigorous of the pro- consuls sent over France to establish the Terror in the provinces; though with but few adherents, he soon awed the great city into quiet. It was at this moment that the romance of Tallien's life commenced. Among his prisoners was Therese, the divorced wife of the comte de Fontenay, and daughter of the Spanish banker, Francois Cabarrus, one of the most fascinating women of her time, and Tallien not only spared her life but fell in love with her. Suspected of " Moderatism " on account of this incident, especially when he was recalled to Paris, Tallien increased, in appearance, his revolutionary zeal, but Therese abated his revolutionary ardour, and from the lives she saved by her entreaties she received the name of " Our Lady of Ther- midor," after the 9th of Thermidor. Tallien was even elected president of the Convention or. the 24th of March 1794. But the Terror could not be maintained at the same pitch: Robes- pierre began to see that he must strike at many of his own colleagues in the committees if he was to carry out his theories, and Tallien was one of the men condemned with them. They determined to strike first, and on the great day of Thermidor it was Tallien who, urged on by the danger in which his beloved lay, opened the attack upon Robespierre. The movement was successful; Robespierre and his friends were guillotined; and Tallien, as the leading Thermidorian, was elected to the Com- mittee of Public Safety. He showed himself a vigorous Ther- midorian; he was instrumental in suppressing the Revolu- tionary Tribunal and the

Jacobin Club; he attacked J. B. Carrier and Joseph Lebon, the representants en mission of Nantes and Arras; and he fought bravely against the insurgents of Prairial. In all these months he was supported by Therese, whom he married on the 26th of December 1 794, and who became the leader of the social life of Paris. His last political achieve- ment was in July 1795, when he was present with Hoche at the destruction of the army of the imigres at Quiberon, and ordered the executions which followed. After the close of the Conven- tion Tallien's political importance came to an end, for, though he sat in the Council of Five Hundred, the moderates attacked him as terrorist, and the extreme party as a renegade. Madame Tallien also tired of him, and became the mistress of the rich banker Ouvrard. Bonaparte, however, who is said to have been introduced by him to Barras, took him to Egypt in his great expedition of June 1798, and after the capture of Cairo he edited the official journal there, the Dicade Egyplienne. But General J. F. Menou sent him away from Egypt, and on his passage he was captured by an English cruiser and taken to London, where he had a good reception among the Whigs and was well received by Fax. On returning to France in 1802 he obtained a divorce from his wife (who in 1805 married the comte de Caraman, later prince de Chimay), and was left for some time without employment. At last, through Fouche and Talleyrand, he got the appointment of consul at Alicante, and remained there until he lost the sight of one eye from yellow fever. On returning to Paris he lived on his half-pay until 1815, when he received the favour of not being exiled like the other regicides. His latter days were spent in poverty; he had to sell his books to get bread. He died in Paris on the 16th of November 1820.

Tallien left an interesting Discours sur les causes qui ont prqduit la Revolution francaise (Paris, 1791, in 8vo) and a Memoire sur I' administration de I'Ugypte d, I'arrivee des Francois. See Tallien et TExpedition d'Egypte, in La Revolution Francaise: Revue d'histoire moderne et contemporaine, t. iii. p. 269. On Madame Tallien see Arsene Houssaye, Notre

Dame de Thermidor (Paris, 1866); J. Turquan, Souveraines et grandes Dames: La citoyenne Tallien, temoignages des contemporains et documents inedits (Paris, 1898); and Louis Gastine, La belle Tallien (1909).

TALLIS (Taixys, Talys, or Tallisius), THOMAS (c. 1515– 1585), justly styled "the father of English cathedral music," was born about 1515. It has been conjectured that, after singing as a chorister at old Saint Paul's under Thomas Mulliner, he obtained a place among the children of the chapel royal. He is known to have become organist at Waltham abbey, where,

on the dissolution of the monastery in 1540, he received, in com- pensation for the loss of his preferment, 20s. for wages and 20s. for reward. In the library of the British Museum there is preserved a volume of MS. treatises on music, once belonging to the abbey, on the last page of which appears his autograph, " Thomas Tallys " — the only specimen known.

Not long after his dismissal from Waltham, Tallis was ap- pointed a gentleman of the chapel royal; and thenceforward he laboured so zealously for the advancement of his art that the English school owes more to him than to any other composer of the 16th century.

One of the earliest compositions by Tallis to which an approxi- mate date can be assigned is the well-known Service in the Dorian Mode, consisting of the Venite, Te Deum, Benediclus, Kyrie, Nicene Creed, Sanctus, Gloria in Excelsis, Magnificat and Nunc Dimittis, for four voices, together with the Preces, Responses, Paternoster and Litany, for five, all published for the first time, in the Rev. John Barnard's First Book of Selected Church Music, in 1641, and reprinted, with the exception of the Venite and Paternoster, in Boyce's Cathedral Music in 1760. 1 That this work was composed for the purpose of supplying a pressing need, after the publication of the second prayer-book of King Edward VI. in 1552, there can be no doubt. Written in the style known among Italian composers as lo stile famig- liare, i.e. in simple counterpoint of the first species, nota contra notam, with no attempt at learned complications of any kind — it adapts itself with equal dignity and clearness to the expression of the verbal text it is intended to illustrate, bringing out the sense of the words so plainly that the listener cannot fail to interpret them aright, while its pure rich harmonies tend far more surely

to the excitement of devotional feeling than the marvellous combinations by means of which too many of Tallis's contemporaries sought to astonish their hearers, while forgetting all the loftier attributes of their art. In self-restraint the Litany and Responses bear a close analogy to the Improperia and other similar works of Palestrina, wherein, addressing himself to the heart rather than to the ear, the princeps musicae produces the most thrilling effects by means which, to the superficial critic, appear almost puerile in their simplicity, while those who are able to look beneath the surface discern in them a subtlety of style such as none but a highly cultivated musician can appre- ciate. Of this profound learning Tallis possessed an inex- haustible store; and it enabled him to raise the English school to a height which it had never previously attained, and which it continued to maintain until the death of its last representative, Orlando Gibbons, in 1625. Though this school is generally said to have been founded by Dr Tye, there can be no doubt that Tallis was its greatest master, and that it was indebted to him alone for the infusion of new life and vigour which prevented it from degenerating, as some of the earlier Flemish schools had done, into a mere vehicle for the display of fruitless erudition. Tallis's ingenuity far surpassed that of his most erudite con- temporaries; and like every other great musician of the period, he produced occasionally works confessedly intended for no more exalted purpose than the exhibition of his stupendous skill. In his canon Miserere nostri (given in Hawkins's History of Music) the intricacy of the contrapuntal devices seems little short of miraculous; [yet the resulting harmony is smooth and normal, and only the irregular complexity of the rhythm betrays the artificiality of its structure. The famous forty-part motet, Spent in alium, written for eight five-part choirs, stands on a far higher plane, and the tour de force of handling freely and smoothly so many independent parts is the least remark- able of its qualities. An excellent modern edition of it was produced by Df A. H. Mann in 1888 (London, Weekes & Co.); and, when

the reader has overcome the difficulty of reading a score that runs across two pages, he finds himself in the presence of a living classic. The art with which the climaxes are built up shows that Tallis's object in writing for forty voices is indeed

1 Boyce's unaccountable omission of the very beautiful Venite is a misfortune which cannot be too deeply deplored, since it has led to its consignment to almost hopeless oblivion.

to produce an effect that could not be produced by thirty-nine.] These tours de force, however, though approachable only by the greatest contrapuntists living in an age in which counterpoint was cultivated with a success that has never since been equalled, serve to illustrate one phase only of Tallis's many-sided genius, which shines with equal brightness in the eight psalm-tunes (one in each of the first eight modes) and unpretending little Veni Creator, printed in 1567 at the end of Archbishop Parker's First Quinquagene of Metrical Psalms, and many other compo- sitions of like simplicity.

In 1575 Tallis and his pupil William Byrd — as great a contra- puntist as himself — obtained from Queen Elizabeth royal letters patent granting them the exclusive right of printing music and ruling music-paper for twenty-one years; and, in virtue of this privilege, they issued, in the same year, a joint work, entitled Cantiones quae ab argumento Sacrae vocantur, quinque et sex parlium, containing sixteen motets by Tallis and eighteen by Byrd, all of the highest degree of excellence. Some of these motets, adapted to English words, are now sung as anthems in the Anglican cathedral service. But no such translations appear to have been made during Tallis's lifetime; and there is strong reason for believing that, though both he and Byrd outwardly conformed to the new religion, and composed music expressly for its use, they remained Catholics at heart.

Tallis's contributions to the Cantiones Sacrae were the last of his compositions published during his

lifetime. He did not live to witness the expiration of the patent, though Byrd survived it and published two more books of Cantiones on his own account in 1589 and 1591, besides numerous other works. Tallis died November 23, 1585, and was buried .in the parish church at Greenwich, where a quaint rhymed epitaph, preserved by Strype, and reprinted by Burney and Hawkins, recorded the fact that he served in the chapel royal during the reigns of Henry VIII., Edward VI., Mary, and Elizabeth. This was destroyed with the old church about 17 10; but a copy has since been substituted. Portraits, professedly authentic, of Tallis and Byrd, were engraved by Vandergucht in 1730, for Nicolas Haym's projected History of Music, but never published. One copy only is known to exist.

Not many works besides those already mentioned were printed during Tallis's lifetime; but a great number are preserved in MS. It is to be feared that many more were destroyed, in the 17th century during the spoliation of the cathedral libraries by the Puritans. (W. S. R.)

TALLOW (M.E. talugh, talg, cf. Du. talk, L. Ger. talg ; the connexion with O.E. taelg, dye, or Goth, tulgus, firm, is doubt- ful), the solid oil or fat of ruminant animals, but commercially obtained almost exclusively from oxen and sheep. The various methods by which tallow and other animal fats are separated and purified are dealt with in the article Oils. Ox tallow occurs at ordinary temperatures as a solid hard fat having a yellowish white colour. The fat is insoluble in cold alcohol, but it dissolves in boiling alcohol, in chloroform, ether and the essential oils. The hardness of tallow and its melting-point are to some extent affected by the food, age, state of health, &c, of the animal yielding it, the firmest ox tallow being obtained in certain provinces of Russia, where for a great part of the year the oxen are fed on hay. New tallow melts at from 42-5° to 43 C, old tallow at 43-5°, and the melted fat remains liquid till its temperature falls to 33 or 34 C. Tallow consists of a mixture of two-thirds of the solid fats palmitin

and stearin, with one-third of the liquid fat olein.

Mutton tallow differs in several respects from that obtained from oxen. It is whiter in colour and harder, and contains only about 30 per cent, of olein. Newly rendered it has little taste or smell, but on exposure it quickly becomes rancid. Sweet mutton tallow melts at 46 and solidifies at 36 C; when old it does not melt under 49°, and becomes solid on reaching 44 or 45 C. It is sparingly soluble in cold ether and in boiling alcohol.

TALLOW TREE, in botany, the popular name of a small tree, Stillingia sebifera, belonging to the family Euphorbiaceae, a native of China, but cultivated in India and other warm countries. The seeds are thickly coated with a white greasy

substance — so-called vegetable tallow — from which candles are made, and which is also used in soap-making and dressing cloth. The butter tree or tallow tree of Sierra Leone is Penladesma bulyracea, a member of the family Guttiferae. The fruit, which is 4 to s in. long and about 3 in. in diameter, has a thick fleshy rind abounding in a yellow greasy juice.

TALLY, an old device, now obsolete, formerly used in the English exchequer for the purpose of keeping accounts. The tally was a willow or hazel stick about one inch in depth and thickness, and roughly shaped like a thick knife-blade (see Fig. 1). Notches (see Fig. 2) were cut on it showing the amount

^Bj-©3B?

stoves which warmed the houses of parliament. On the 16th of October 1834 the houses of parliament were burnt down by the overheating of the stoves through using too many of the tallies. The so-called tally-trade was an old system of dealing carried on in

London and in the manufacturing districts of England, by which shopkeepers furnished certain articles on credit to their customers, the latter paying the stipulated price for them by weekly or monthly instalments (see M' Culloch, Dictionary of Com- merce) — the precursor, in fact, of the modern instalment system.

See S. R. Scargill-Bird, Guide to the Public Records (Calendar of State Papers) ; H. Hall, Curiosities and Antiquities of the Exchequer.

Fig. 1. — A tally (not the same as that shown in Fig. 2).

paid, a gauged width of i£ inches representing £1000, 1 inch £100, f inch £10, half a notch of this size representing £1; i 3 - 6 inch is., and the smallest notch id.; half-pennies were rep- resented by small holes. The account of the transaction was written on the two opposite sides, the piece of wood being then split down the middle through the notches; one half, called the tally, being given as a form of receipt to the person making the payment, while the other half, called the counter-tally, was kept in the exchequei. Payments made into the exchequer were entered into an account-book, from which they were trans-

TALMA, FRANCOIS JOSEPH (1 763-1826), French actor, was born in Paris on the 15th of January 1763. His father, a dentist there, and afterwards in London, gave him a good English education, and he returned to Paris, where for a year and a half he practised dentistry. His predilection for the stage was culti- vated in private theatricals, and on the 21st of November 1787 he made his debut at the Comedie Francaise as Seide in Voltaire's Mahomet. His efforts from the first won approval, but for a considerable time he only obtained secondary parts. It was as the jeune premier that he first came prominently into notice,

i Tie. &<~ hn^Ue, <&J~t« &ti f) to^J*

\ftfUS. s^Ml- ** L fJU~~i ^-J»~C Q/.

Q/.tfi A-%. i**~^. fed*. Cm*

J%^y.

M*US #>/4f ^ Ot/rtti. a/! £■■/. '$i+# .<&&. £H -

Fig. 2. — Diagrammatic view, showing notches with facsimile of writing, of an Exchequer tally, acknowledging the receipt of £236, 4s. 3jd. on the 25th of October 1739, from Edward Ironside, Esq., as a loan to the king on £3 per cent, annuities payable out of the Sinking Fund, on account of £500,000 granted by Act 11 Geo. II., c. 27. The date is written upon the upper side of the tally, where the two notches denoting £200 are cut. The lower side, on which the smaller notches are cut, has only the word Sol written upon it.

ferred to a strip of parchment, or teller's bill; this was then thrown down a pipe into the tally-court, a large room directly under the teller's office. In the tally-court were officers of the clerk of the "pells" 1 and of the auditor as representing the chamberlain of the exchequer. The teller's bill was then entered in the introitus or receipt-book by the officer of the clerk of the pells, and in another book, called the bill of the day, by the auditor's clerk. A tally was then made of the teller's bill, and it was given on application, generally on the following day. to the person paying in the money. At the end of the day, the bill of the day was passed on to the clerk of the cash-book, by whom all the day's receipts were entered (see the " Great Account " of Public Income and Expenditure, part ii. app. 13, July 1869, by H. W. Chisholm).

The practice of issuing wooden tallies was ordered to be discontinued by an act of 1782; this act came into force on the death of the last of the chamberlains in 1826. The returned tallies were stored in the room which had formerly been the Star-chamber. This room was completely filled by them, so

that in 1S34, when it was desired to use the room, the tallies were ordered to be destroyed. They were used as fuel for the

1 So called from the pells or sheepskins (Lat. pellis, skin) on which the records were written. The clerk of the pells was originally the private clerk of the treasurer. His duty was to keep separate records of all monies entering and leaving the exchequer. These records were kept on two rolls, the pellis introitus, or pells receipt roll, and the pellis exitus, or pells issue roll. The office gradually became a sinecure, its duties being discharged by deputy. Previ- ously to 1783 the salary of the office was derived from fees and per- centages, but in that year parliament settled the salary at £1500 a year. The office was abolished in 1834.

and he attained only gradually to his unrivalled position as the exponent of strong and concentrated passion. Talma was among the earliest advocates of realism in scenery and costume, being aided by his friend the painter David. His first essay in this direction took the form of appearing in the small role of Proculus in Voltaire's Brutus, with a toga and Roman head- dress, much to the surprise of an audience accostomed to 18th century costume on the stage, and heedless whether or not it suited the part played. Talma possessed in perfection the physical gifts fitting him to excel in the highest tragedy, an admirably proportioned figure, a striking countenance, and a voice of great beauty and power, which, after he had conquered a certain thickness of utterance, enabled him to acquire a matchless elocution. At first somewhat stilted and monotonous in his manner, he became by perfection of art a model of sim- plicity. Talma married Julie Carreau, a rich and talented lady in whose salon were to be met the principal Girondists. The actor was an intimate friend of Napoleon, who delighted in his society, and even, on his return from Elba, forgave him for performing before Louis XVIII. In 1808 the emperor had taken him to Erfurt and made him play the Mort de Cisar to a company of crowned

heads. Five years later he took him also to Dresden. Talma was also a friend of Joseph Chenier, Danton, Camille Desmoulins and other revolutionists. It was in Chenier's anti-monarchical Charles IX., produced on the 4th of November 1789, that a prophetic couplet on the destruction of the Bastille made the house burst into a salvo of applause, led by Mirabeau. This play was responsible for the politi- cal dissensions in the Comedie Francaise which resulted in the establishment, under Talma, of a new theatre known for a time

as the Theatre de la Republique, on the site of the present Theatre Francais. Here he won his greatest triumphs. Further development in costume and make-up was shown in his stage portrait of Jean Jacques Rousseau (1790), pronounced a wonder- ful likeness in Le journaliste des ombres. In 1801 he divorced his wife, and in 1802 married Charlotte Vanbove, an actress of the Comedie Francaise. He made his last appearance on the nth of June 1826 as Charles VI. in Delaville's tragedy, and he died in Paris on the 19th of October of that year.

Talma was the author of Memotres de Lekain, precedes de reflexions sur cet acleur et sur Vart thedtral, contributed to the Collection des memotres sur Vart dramatique, and published separately (1856) as Reflexions de Talma sur Lekain et Vart thedtral.

See Memotres de F. J. Talma, ecrits par lui-meme, et recueillis et mis en ordre sur les papiers de safamille, by Alex. Dumas (1850).

TALMAGE, THOMAS DE WITT (1832-1902), American Presbyterian preacher, born at Bound Brook, New Jersey, on the 7th of January 1832. He was educated at the University of the City of New York (now New York University) and at the Reformed Dutch Theological Seminary at New Brunswick, N.J., from which he was graduated in 1856. Immediately after-

wards he became pastor of a Reformed church at Belleville, N.J. In 1859 he removed to Syracuse, N.Y.; in 1862 to Philadelphia, where he was pastor of the Second Reformed Dutch Church; and in 1869 to the Central Presbyterian Church in Brooklyn, where a large building known as the Tabernacle was erected for him in 1870. In 1872 this building was burned down. A larger one, holding 5000 persons, was built for him in 1873, but even this could not contain the crowds attracted by his eloquence and sensationalism. In 1889 this church also was burned to the ground, only to be succeeded by another and larger one, which in its turn was burned in 1894. Shortly afterwards he removed to Washington, where from 1895 to ^99 he was the associate pastor, with Dr Byron Sunderland (d. 1901), of the First Presbyterian Church. During the last years of his life Dr Talmage ceased to preach, and devoted himself to editing, writing and lecturing. At different periods he was editor of the Christian at Work (1873-76), New York; the Advance (1877-79), Chicago; Frank Leslie's Sunday Magazine (1.879-89), New York; and the Christian Herald (1890-1902), New York. For years his sermons were published regularly in more than 3000 journals, reaching, it is said, 25,000,000 readers. His books also have had large circulations; among them are The Almond Tree in Blossom (1870); Every Day Religion (1875); The Brooklyn Tabernacle (1884); From Manger to Throne (1895); and The Pathway of Life (1895). His eloquence, while sensa- tional, was real and striking, and his fluency and the picturesque- ness of his language and imagery were remarkable. He died at Washington on the 12th of April 1902.

TALMUD, the great Rabbinical thesaurus which grew up during the first four or six centuries of the Christian Era, and, with the Old Testament, became the " Bible " of the Jews, and the chief subject of their subsequent literary activity.

1. Contents— The Talmud (Hebrew " teaching, learning ") consists of the Mishndh (Heb. " [oral] repetition, teaching "), a systematic collection of religious-legal decisions developing the laws of the

Old Testament, and the Gemara (Aramaic "completion, decision," or perhaps also "teaching"), supple- mentary material, legal and otherwise. 1 The whole was in two great recensions, Palestinian and Babylonian. Other material related to the Mishnah is preserved in the Tosephtd (Aram. " addition ") and the Midrdshim, and since all these, together with the Targumim, represent the orthodox Rabbinical literature connecting the Old Testament with medieval and modern Judaism, the reader should also consult the articles Jews (parts ii. and iii), Midrash, Targum, and for more detailed and critical treatment the references given to the Jewish Encyclopedia.

1 Mishnah stands in contrast to Miqra ("reading, scripture"); its Aram, equivalent is Mathmtha, from tend, " to repeat," whence the appellation Tanna, "teacher" (§ 3 below). These and the terms Gemara, Talmud, &c, are more fully explained in H. L. Strack's invaluable Etnleilung in den Talmud (Leipzig, 1908), pp. 2 sqq.

The Mishnah is a more or less careful arrangement of the extant Oral Law (see § 2). It forms the foundation of the Gemara, and is divided into six SSdarim or Orders, each con- taining a number of Massektoth (" weavings," cf. the etymology of " text ") or Tractates. These are subdivided into Perdqim (" sections ") or chapters, and these again into paragraphs or sentences.

I. Zera'im (" seeds "), the first Order, on agriculture, is intro- duced by (i) Berakoth (" blessings "), on daily and other prayers and blessings. (2) Pe'ah (" corner "), deals with Lev. xix. 9 seq., xxiii. 22; Deut. xxiv. 19-22, and the rights of the poor. (3) Demai, or rather Dammai (" doubtful "), on doubtful cases relating to the tithing of fruit offerings. (4) Kil'ayim (" of two sorts "), on for- bidden mixtures (Lev. xix. 19; Deut. xxii. 9-1 1). (5) Shebi'ith (" seventh "), on the sabbatical year (Ex. xxiii. 11 ; Lev. xxv. 1-8; Deut. xv. I sqq.). (6) Terumoth (" heave offerings "), on the laws in Num. xviii. 8 sqq., 25 seq. ;

Deut. xviii. 4^. (7) Ma'asrolh (" tithes ") or Ma'aser Ri'shon (" first tithe "), with reference to the Levites, Num. xviii. 21-24. (8) Ma'aser Shenl (" second tithe "), with reference to the tithe eaten at Jerusalem, Deut. xiv. 22-26. (9) Hallah ("cake"), on Num. xv. 18-21. (10) 'Orlah ("foreskin" [of trees]), on Lev. xix. 23-25. (n) Bikkilrim ("first-fruits"), on Ex. xxiii. 19; Deut. xxvi. 1 sqq. The fourth chapter of this treatise, printed in most editions, is properly a Baraitha.

II. Mo ed (" festival "). (1) Shabbdth, on the Sabbath as a day of rest, Ex. xx. 10, xxiii. 12; Deut. v. 14, &c. (useful edition by Strack, 1890). (2) 'Erubin (" mixtures " or amalgamations), on legitimate methods of avoiding inconvenient restrictions on the Sabbath. (3) PZsdhim (" passovers " — sacrifices and meals), on Ex. xii , xiii. 6-8, xxiii. 15; Lev. xxiii. 5 sqq.; Num. xxviii. 16 sqq.; Deut. xvi. I sqq., &c. (4) SheqaUm (" shekels "), on the poll tax (Ex. xxx. 12 sqq.; Neh. x. 33). (5) Yoma (Aram. " the day "), or Kippurim (" atonement "), or Y. ha-k. (" the day of atonement "), on Lev. xvi., xxiii. 26-32 (useful edition by H. L. Strack, Leipzig, 1904). (6) Sukkah or Sukkoth (" booth[s] "), on Lev. xxiii. 34 sqq.; Num. xxix. 12 sqq.; Deut. xvi. 13-16. (7) Besah ("egg," the opening word) or Yom tob (" good [i.e. feast] day "), general rules for feast- days. (8) Rosh ha-Shdndh (" New Year festival "), on the services, the calendar, and more particularly on the first of the Seventh Month (cf. Num. x. 10, xxviii. II sqq., &c). (9) Ta'anith or Ta'aniyyoth, i.e. " fast[s]," special observances relating thereunto; in particular to public fasts appointed in time of drought. (10) Megillah,_ " roll " (of Esther), the reading of it at Purim, &c. (11) Mc'ed qalon (" the small M," to distinguish it from the name of this order), or Mashkin (the first word), regulations for the intermediate festi- vals at Passover and Tabernacles. (12) Haglgah (" festival "), on the three principal festivals, Deut. xvi. 16, the duty of pilgrims and the defilements to be avoided (transl. from Bab. Talm. by A. W. Streane, Camb.,

1891).

III. Nashlm (" women "). (1) Yebdmoth (" sisters-in-law "), on the levirate, &c. (2) Kethuboth (" marriage contracts "), rights and duties of husband and wife. (3) Ned&rim (" vows "), on Num. xxx. (4) Nazir (" Nazirite "), on Num. vi. (5) Gitpin ("documents "), on divorce and separation. (6) Sotdh (" the faithless woman"), on Num. v. n-31. (7) Qiddushtn (" sanctifications " of marriage), on the contraction of legal marriage.

IV. Neziqin (" damages "), also known as Yeshil'oth (" deeds of help "). (1) Babd qamma (Aram. " the first gate "), on injuries and compensation; civil law. (2) B. Mesi a (Aram. _" the middle gate "), on sales, leases, lost property. (3) B. Bathra (Aram. " the last gate "), on real estate, succession, &c. (4) Sanhedrln {avviSpuiv), on procedure and criminal law. (5) Makkoth, "blows," on the number to be inflicted (Deut. xxv. 1-3) and for what offence, &c. (6) Shebu'oth (" oaths "), on Lev. v. 4. sqq. (7) 'Eduyyoth, " testimonies," viz. of later teachers regarding their predecessors, on the schools of Hillel and Shammai, 'Aqiba, &c, important for the problem of the literary growth of the Mishnah. (8) 'Aboddh Zarah (" idolatrous worship "), regulations in reference to heathen idolatry (useful edition with Germ, transl. by Strack, 1909; and including that of the Gemara by F. C. Ewald, Nuremberg, 1856). (9) 'Aboth or Pirqe A. (" sayings of the fathers "), a famous collection of maxims; the sixth chapter on " the possession of the law " does not properly belong to the Mishnah (ed. with transl. by C. Taylor, Camb. 1897, and in German by H. L. Strack, 1901). (10) Horaydth (" decisions "), on judicial and other errors (Lev. iv. 1 sqq.).

V. Qoddshlm ("holy things"). (1) Zebdhtm ("sacrifices"), or shehi(ath qoddshlm ("the slaughter of holy things "), on the sacri- ficial laws, &c. (2) Mendhoth ("meat-offerings"), on Lev. h. 5, n-13, vi. 7-16, xiv. 10-20, &c. (3) Hullin or Shehtfath H. (" [the slaughter of] common things "), on non-sacrificial meat., (a) Bekoroth ("first-

born”), on firstlings (Ex. xiii. 12 seq.; Lev. xxvii. 26 seq.; Num. viii. 16–18, xviii. 15–17;’ Deut. xv. 19 sqq.). (5) ‘Ardkin (” valuations ” for ransom, &c.j, on Lev. xxv. 15–28, 29 sqq., xxvii. 2 sqq., 28 seq. (6) Temurdh (“exchange ot dedicated animals), cf. Lev. xxvii. 10, 33. (7) Kertthoth (‘ cutting off”), on excommunication, &c. (8) Me’ildh (“trespass), on

i Lev. v. 15 sqq.; Num. v. 6–8. (9) TdmU, on the ” continual or

perpetual (daily burnt offering),” Ex. xxix. 38–42 ; Num. xxviii. 2–8. (10) Middoth (” measures “), an important tractate on the temple (measurements, gates, halls, &c). (11) Qinnlm (” nests “), on sacrifices of doves by the poor (cf. Lev. i. 14–17, v. I sqq., xii. 8). VI. Tohorolh or Teh., ” purifications,” a euphemism for things which are ritually or ceremonially ” unclean.” (1) Kelim (“vessels”), their uncleanness (cf. Lev. xi. 32 sqq.; Num. xix. 14 sqq., xxxi. 20 sqq.). (2) Ohaloth (” tents “), on defilement through a corpse (Num. xix. 14–20), &c. (3) Nega’im (” plagues,” i.e. leprosy), on Lev. xiii. seq. (4) Parah (the [red] ” heifer “), on Num. xix. (5) Teharolh (euphemism for impurities), on minor defilements. (6) Migwa’oth (ritual baths), bathing for the defiled (cf. Lev. xiv. 8, xv. 5 sqq.; Num. xxxi. 23; also Mark vii. 4). (7) Niddah (female ” impurity “), on Lev. xv. 19–33. (8) Makshtrln (” predisposing “), or Mashqyn (” liquids “), on defilement caused by wet unclean things (cf. Lev. xi. 34, 37 seq.). (9) Zabim (” those with a discharge “), on Lev. xv. (10) Tebul Yom (” immersed for [or on] the day “), on those who have taken a ritual bath and must wait until sunset before becoming ritually pure (see Lev. xv. 5, xxii. 6 seq.; Num. xix. 19). (11) Yadayim, ” hands,“_their purification (cf. Matt. xv. 2, 20; Mark vii. 2–4, &c). (12) Vqiin (” stems “), on the relation between fruit and the stems and stalks as regards

defilement, &c.

To Order IV. the Babylonian recension of the Talmud adds seven treatises, which are of later origin and are regarded as more or less extra-canonical. (1) Aboih de Rabbi Nathan, an expansion of IV. 9, attributed to a second-century Rabbi, but post-Talmudic (ed. S. Schcchtcr, 1887). (2) Sopherlm (" scribes "), on the writing of the scrolls of the Pentateuch, grammatical (Massoretic) rules, and (a later addition) on the liturgy (ed. J. Miiller, Leipzig, 1878). (3) Ebel Rabbathi (" great weeping "), or, euphemistically, Semahoth (" joys "), on mourning customsand rules. (4) Kallah (" betrothed, bride "), on chastity in marriage, &c. Derek Ere? (5) Rabbah, and (6) Ziifd, a " large " and a "small " treatise on various rules of " conduct " and social life. (7) Perea ha-Shalom, a " chapter on peace " (peacefulness). In addition to these seven, other small Talmudic treatises are also reckoned (edited by R. Kirchheim, Frankfort-on-Main, 1850). These deal with (1) the writing of the rolls of the Law ; (2) Mezuzah (Deut. vi. 9, xi. 20) ; (3) Tephilln (prayers, phylacteries); (4) the fringes (Num. xv. 38); (5) slaves; (6) the Samaritans (see J. A. Montgomery, The Samaritans, pp. 196 sqq.) ; and (7) proselytes.

The Mishnah itself contains 63 tractates, or, since IV. 1-3 originally formed one (called Neziqln) and IV. 4, 5 were united, 60. The number is also given as 70 (cf. 2 Esd. xiv. 44-46), perhaps by in-cluding the seven smaller treatises appended to Iv. There are 523 chapters (or 525, see I. II, IV. 9).

2. The Origin of the Mishnah. — A careful distinction was drawn between the Written Law, the Mosaic Torah, and the rest of the Scriptures (wiif '"H^), and the Oral Law, or Torah by Mouth ("? te? ™). The origin of the latter, which has become codified in the Mishnah, has often been discussed. It was supposed that it had been handed down by Ezra; that it was indebted to Joshua, David or Solomon; that it was as old as Moses, to whom it had been communicated orally or in writing, complete or

in its essence. The traditional view is well illustrated in the words ascribed to R. Simeon Lakish, 3rd century a.d.: 1 ” What is that which is written, ‘ I will give thee the tables of stone, and the Law and the Command- ment, which I have written, that thou mayest teach them (Ex. xxiv. 12)’? ‘Tables,’ these are the Ten Words (the Decalogue); the ‘Law’ is the Scripture; ‘and the command- ment,’ that is the Mishnah: ‘ which I have written,’ these are the Prophets and Writings (i.e. The Hagiographa) , ‘ to teach them,’ that is the Gemara — thus instructing us that all these were given to Moses from Sinai. 1 ‘ Literary and historical criticism places the discussion on another basis when it treats the Mosaic Torah in its present form as a post-exilic compilation (about 5th century B.C.) from sources differing in date, origin and history. There is no a priori reason why other legal enactments should not have been current when the compilation was first made; the Pentateuchal legislation is incomplete, and covers only a small part of the affairs of life in which legal decisions

1 For the sake of convenience Ben (” son ‟) and Rabbi are, as usual, abbreviated to b. and R. For the quotation which follows, see Oesterley and Box, The Religion and Worship of the Synagogue (London, 1907) p. 51 ; and, on the subject, S. Schechter, Studies in Judaism (London, 1896), ch. vii. — ” the history of Jewish tradition ” ; E. Weber, Judische Theologie (Leipzig, 1897), pp. 91 seq. and 130 sqq. ; Strack, op. cit., p. 8 seq.; W. Bousset, Relig. d. Judentums (Berlin, 1906), pp. 176 sqq., and Jew. Ency., iv. 423 sqq.; see also G. B. Gray’s art. ” Law Literature ” in the Ency. Bib.

might be needed. There must have been a large body of usage to which Jewish society subscribed; customary usage is one of the most binding of laws even among modern Oriental com- munities where laws in writing are unknown, and one of the most interesting features is the persistence in the East of closely- related forms and principles of custom from the oldest times to the present day. Laws must be adjusted from time to time to meet changing

needs, and new necessities naturally arose in the Greek and Roman period for which the older codes and usages made no provision. Much in the same way as Roman law was derived from the Twelve Tables, the Jewish written laws [redacted] were used as the authority for subsequent modifications, and the continuity of the religious-legal system was secured by a skilful treatment of old precedents. 2 In the article Midrash it will be seen that new teaching could justify itself by a re- interpretation of the old writings, and that the traditions of former authoritative figures could become the framework of a teaching considerably later than their age. It is probable that this process was largely an unconscious one; and even if con- scious, the analogy of the conventional " legal fiction " and the usual anxiety to avoid the appearance of novelty is enough to show that it is not to be condemned. By the help of a tradition — a " haggadic " or " halakic " Midrash (q.v. § 1) — contemporary custom or ideals could appear to have ancient precedents, or by means of an exegetical process they could be directly con- nected with old models. In the Old Testament many laws in the Mosaic legislation are certainly post-Mosaic and the value of not a few narratives lies, not in their historical or biographical information, but in their treatment of law, ritual, custom, belief, &c. Later developments are exemplified in the pseud- epigraphical literature, notably in the Book of Jubilees, and when we reach the Mishnah and Talmud, we have only the first of a new series of stages which, it may be said, culmi- nate in the 16th-century Shullian 'Ariik, the great compendium of the then existing written and oral law. Thus, the problem of the origin or antiquity of the unwritten Oral Law, a living and fluid thing, lies outside the scope of criticism; of greater utility is the study of the particular forms the laws have taken in the written sources which from time to time embody the ever-changing legacy of the past.

The course of development between the recognition of the supre- macy of the Pentateuch and the actual

writing down of the Mishnah and Gemara can be traced only in broad lines. It is known that a great mass of oral tradition was current, and there are a number of early references to written collections, especially of haggadah. On the other hand, certain references indicate that there was a strong opposition to writing down the Oral Law. It is possible, therefore, that written works were in circulation among the learned, and that these contained varying interpretations which were likely to injure efforts to maintain a uniform Judaism. Philo speaks of fivpla a.ypa.(f>a Wt\ ko.1 vofiifia (ed. Mangey, ii. 629), and the oral esoteric traditions of the Pharisees are attested by Josephus (xiii. 10, 6, cf. 16, 2); cf. in the New Testament, Matt. xv. 1-9, Mark vii. 8, &c. ; and the Sevrepixreis " repetitions " (cf. the term Mishnah) of the Christian Fathers. For the written collections, see Strack, op. cit., pp. 10 sqq.; J. Theodor, Jew. Ency., viii. 552; J. Z. Lauter- bach, ib., p. 614; W. Bacher, ib., xii. 19; S. Schechter, Hastings' Diet. Bible, v. 62 ; and art. Midrash, § 5, in this work. The theory of an esoteric tradition is distinctly represented in 2 Esdras xiv., where Moses receives words which were not to be published, and Ezra re-writes seventy books which were to be delivered to the wise men of his people. Also the Book of Jubilees knows of secret written traditions containing regulations regarding sacrifices, &c, and Jacob hands over " all his books and the books of his fathers to Levi his son that he might preserve them and renew them for his children (i.e. the priestly caste) unto this day " (xiv. 16).

3. Growth of the Mishnah and Gemara. — According to the traditional view the canon of the Old Testament closed with the work of Ezra. He was followed by the SopMrlm, " scribes " (or the Men of the great Synagogue), to the Maccabaean age, and these again by the " Pairs " (zugoth, Gr. £vyov), the reputed heads of the Sanhedrin, down to the Herodian age (150-30 B.C.). The last culminate in Hillel (q.v.) and Shammai, the founders of two great rival schools, and to this famous pair the work

2 See W. R. Smith, Old Test, in the Jewish Church, p. 51 seq.,

160.

of collecting htildkoth (" legal decisions ") has been ascribed. The ensuing period of the Tannd'im, " teachers " (about a.d. 10-220), is that of the growth of the Mishnah. 1 Among the best known representatives of the schools are Rabban (a title given to Hillel's descendants) Gamaliel, the Phil-Hellene and teacher of the apostle Paul (Acts xxii. 3) and his son Simeon (Josephus, Life, § 38 seq., Wars, iv. 3, 9), and Rabban Johanan b. Zakkai, founder of the seat of learning at Jamnia (Jabneh). A little later (about 90-130 a.d.) are the famous Gamaliel II., Eliezer b. Hyrqanos (at Lydda), and Ishmael b. Elisha, the last of whom founded the school at Usha and is renowned for his development of the rules of exegesis framed by Hillel. With Rabbi Aqiba (q.v.) and the synods of Jamnia (about 90 and 118 a.d.) a definite epoch in Judaism begins. At Jamnia, under the presidency of Gamaliel II. and Eleazar b. Azariah, a collection of traditional halakoth was formed in the tractate ' Eduyydth (larger than and not to be identified with IV., 7 above). Here, too, was discussed the canonicity of the Song of Songs and of Ecclesiastes, and it is probable that here Aqiba and his colleagues fixed the official text of the canonical books. Aqiba had an important share in the early develop- ment of the Mishnah (Strack, pp. 19, 89); and, in the collecting of material, he was followed notably by the school of Ishmael (about 130-160 a.d.), which has left its mark upon the early halakic Midrashim (see Midrash, § 5, 1-3) • The more interesting names include R. Meir, a well-known haggadist, R. Simeon b. Yohai, R. Jose b. Halaphta and R. Jehudah b. 'El'ai. But, as collections of decisions were made by prominent teachers from time to time, confusion was caused by their differences as regards both contents and

teaching (Sotah, 22a; Shabb. 1386). Consequently, towards the close of the second century a thoroughly comprehensive effort was made to reduce the halakoth to order. Judah, grandson of Gamaliel II., known as the Prince or Patriarch (nasi'), as Rabbenu ("our teacher"), or simply as " Rabbi " par excellence, was the editor. He gathered together the material, using Meir's collection as a basis, and although he did not write the Mishnah as it now is, he brought it into essentially its present shape. His methods were not free from arbitrariness; he would attribute to " the wise " the opinion of a single authority which he regarded as correct; he would ignore conflicting opinions or those of scholars which they themselves had afterwards retracted, and he did not scruple to cite his own decisions. 2

The period of the 'Amora'im, " speakers, interpreters," (about 220-500 a.d.), witnessed the growth of the Gemara, when the now " canonical " Mishnah formed the basis for further ampli- fication and for the collecting of old and new material which bore upon it. In Palestine learning flourished at Caesarea, Sepphoris, Tiberias and Usha; Babylonia had famous schools at Nehardea (from the 2nd century a.d.), Sura, Pumbeditha and elsewhere. 3 Of their teachers (who were called Rabbi and Rab respectively) several hundreds are known. R. Hiyya was redactor of the Siphrd on Leviticus (Midrash, § 5, 2); to him and to R. Hoshaiah the compilation of the Tosephtd is also as- cribed. Abba Arlka or Rab, the nephew of the first mentioned, founded the school of Sura (219 a.d.). Rab and Shemuel (Samuel) " the astronomer " (died 254 a.d.) were pupils of " Rabbi " (i.e. Judah, above), and were famed for their know- ledge of law; so numerous were their points of difference that the Talmud will emphasize certain decisions by the statement that the two were agreed. The Gemara is much indebted to this pair and to Johanan b. Nappaha (199-279). The latter, founder of the great school of Tiberias, has indeed been

1 On the various teachers, especially the Haggadists, see W. Bacher, Agada der Babylon. Amoraer (Strassburg, 1879), 4 d. Tannaiten (1884,

new edition begun in 1903), A. d. Pal. Amoraer

(1892).

2 See the criticisms in Jew. Ency., viii. 612, and J. Bassfreund, Monatsschrift f. d. Gesch. u. Wissens. d. Judentums, 1907, pp. 427 sqq. On the earlier stages, see Jew. Ency., viii. 610, and Hastings' Did. Bible, v. 61, col. 2, with the references.

3 On these schools, see art. Jews, § 42 seq.; and Jew. Ency., i. 145-148.

venerated, on the authority of Maimonides, as the editor of th#, Palestinian Talmud; but the presence of later material and of later names, e.g. Man! b. Jona and Jose b. Abin (Abun), refute this view. The Babylonian Rabbah b. Nahmani (d. c. 330) had a dialectical ability which won him the title " uprooter of moun- tains." His controversies with R. Joseph b. Hiyya (known fos- his learning as " Sinai "), and those between their disciples Abayi and Raba are responsible for many of the minute discussions in the Babylonian Gemara. Meanwhile the persecutions of Constantine and Constantius brought about the decay of the Palestinian schools, and, probably in the 5th century, their recension of the Talmud was essentially complete. In Babylonia, however, learning still flourished, and with Rab Ashi (352-427) the arranging of the present framework of the Gemara may have been taken in hand. Under Rabba Tosepha'a (died 470) and Rabina, i.e. Rab Abina (died 499), heads of the academy of Sura, the Babylonian recension became practically complete.

Finally, the Sabord'e, " explainers, opiners " (about 500-540), made some additions of their own in the way of explanations and new decisions. They may be looked upon as the last editors of the now unwieldy thesaurus; less probable is the view, often maintained since Rashi (nth century), that it was first written down in their age. 4

4. The Two Talmuds. — The Palestinian recension of

the Mish- nah and Gemara is called ” the Talmud of the Land of Israel,” or ” T. of the West “; a popular but misleading name is ” the Jerusalem Talmud.” It is an extremely uneven compilation. ” What was reduced to writing does not give us a work carried out after a preconcerted plan, but rather represents a series of jottings answering to the needs of the various individual writers, and largely intended to strengthen the memory ” (Schechter). Political troubles and the unhappy condition of the Jews probably furnish the explanation; hence also the abundance of Palestinian haggadic literature in the Midrashim, whose ” words of blessing and consolation ” appealed more to their feelings than did the legal writings. The Pal. Talmud did not attain the eminence of the sister recension, and survives in a very incomplete form, although it was perhaps once fuller. It now extends only to Orders I.IV., with the omission of IV. 7 and 9, and with the addition of part of VI. 7 5 The Babylonian Talmud (or Tal. Babli) contains the Gemara to 365 tractates but the material is relatively very full, and it is about three times as large as the Pal., although the Gemara there extends to 39 tractates. In the latter the Gemara follows each paragraph of the Mishnah; in the former, references are usually made to the leaves (the two pages of which are called a and b) , the enumera- tion of the editio princeps being retained in subsequent editions. The Mishnah is written in a late literary form of Hebrew; but the Gemara is in Aramaic (except the Baraithas), that of the Bab. T. being an Eastern Aram, dialect (akin to Mandaitic), that of the Pal. T. being Western Aram, (akin to Biblical Aram, and the Targums). Greek was well understood in cultured Palestine; hence the latter recension uses many Greek terms which it does not explain; whereas in the Bab. T. they are much less common, and are sometimes punningly interpreted. 6 The Pal. Tal. is the more concise, but it is remarkable for the numerous repetitions of the same passages; these are useful for the criticism of the text, and for the light they throw upon the incompleteness of the work of compilation. The Bab. Tal., on the other hand, is*

diffuse and freer in its composition, and it is characterized by the exuberance of Halakah, which is usually rather subtle and far-fetched. Both Talmuds offer a good field for research (see below). Especially interesting are the Baraithas which are preserved in the Gemara in Hebrew; they are " external " decisions not included in the more authoritative

4 See Strack, p. 16 seq. The view has little in its favour, although memory played a more important part then than now. For early mnemonic aids to the Mishnah, see Strack, p. 68, Jew. Ency.,x\i. 19.

5 The Mishnah was first critically edited by W. H. Lowe (Cam- bridge, 1883).

6 The Greek words are treated by S. Krauss and I. Low, Griech. u. hat. Lehnworter (Berlin, 1898-9). For the Persian elements in the Bab. T., see Jew. Ency., vii. 313.

Mishnah, but they differ from and are sometimes older than the Mishnic material, with which they sometimes conflict (so in particular as regards the rejected decisions of the school of Shammai). They usually begin: "our Masters taught," "it is taught," or " he taught," the verb tend (cf. Tanna'im, " teachers ") being employed (see further Jew. Ency., ii. 513 seq.). Parallel to the Mishnah is the Tosephtd, an independent compila- tion associated with R. Nehemiah (a contemporary of Meir and Simeon b. Yohai), IJiyya b. Abba and others; it is arranged according to the Mishnic orders and tractates, but lacks IV. 9 and V. 9-1 1. The halakoth are fuller and sometimes older than the corresponding decisions in the Mishnah, and the treatment js generally more haggadic. 1 The method of making the dis- cussions part of an interpretation of the Old Testament (halakic Midrash), as exemplified in the Tosephtd, is apparently older than the abstract and

independent decisions of the Mishnah — which presuppose an acquaintance with the Pentateuchal basis — and, like the employment of narrative or historical Midrash (e.g. in the Pentateuch, Chronicles and Jubilees), was more suitable for popular exposition than for the academies. For other halakic literature which goes back to the period of the Tanna'im, see the Mekiltd, Siphrd and Siphre, art. Midrash, § 5, i~3-

The Palestinian Talmud, although used by the Qaraites in their controversies, fell into neglect, and the Babylonian recen- sion became, what it has since been, the authoritative guide. With the Gionim, the heads of Sura and Pumbeditha (about 589-1038), we enter upon another stage. The " canonical " Mishnah and Gemara were now the objects of study, and the scattered Jews appealed to the central bodies of Judaism in Babylonia for information and guidance. The Geonim in their " Responses " or " Questions and Answers " supplied authorita- tive interpretations of the Old Testament or of the Talmud, and regulated the application of the teaching of the past to the changed conditions under which their brethren now lived. The legal, religious and other decisions formulated in the pontifical communications of one generation usually became the venerated teaching of the next, and a new class of literature thus sprang into existence. (See Gaon.) Meanwhile, as the Babylonian schools decayed, Talmudic learning was assiduously pursued outside its oriental home, and some Babylonian Tal- mudists apparently reached the West. However, the fortunes of the Talmud in a hostile world now become part of the history of the Jews, and the many interesting vicissitudes cannot be recapitulated here. (See Jews, §§ 44 sqq.) To the use of the Pal. Talmud by the Qaraites in their controversies with the Rabbis we owe the preservation of this recension, incomplete though it is. To the intolerance of Christians are no doubt due the rarity of old MSS., and the impure state of the text of both Talmuds. At the same time, the polemics had useful results since the literary controversy in the 16th century (when

Johann Reuchlin took the part of the Jews) led to the editio princeps of the Babylonian Talmud (Vienna, 1520-23). A change shows itself in the second edition (Basel, 1578-81), when the 'Aboddh Zdrdh (above, § 1. IV. 8) was omitted, and passages which offended the Christians were cancelled or modified. 2

Owing to the nature of its contents the Talmud stood sorely in need of aids and guides, and a vast amount of labour (of varying value) has been devoted to it by Jewish scholars. Of the many commentaries the first place must be given to that of R. Solomon Izhaki of Troyes (see Rashi) ; his knowledge of contemporary tradition and his valuable notes make it a new starting point in the interpretation of the Talmud. To Rashi's disciples are due the Tosaphoth " additions," which, with the commentary of " the Commentator," as he was styled, are often reproduced in printed editions of the Talmud. This school (France and Germany, 12th to 13th century) developed a casuistical and over-ingenious interpre- tation — in contrast to the Spanish Talmudists who aimed at simpli- fication and codification — and it drew upon it the saying of Nahmanides (13th cent.) : " They try to force an elephant through

1 Lat. transl. of Orders I.-III., V., by Ugolinus, Thes., xvii.-xx., recent ed. by M. S. Zuckermandef (Pasewalk, 1880); see Jew. Ency., xii. 207 sqq.

2 On the censorship and burning of the Talmud, see Jew. Ency., iii. 642 sqq., xii. 22; Strack, 71 seq., 78 sqq.

the eye of a needle." Important also are the introduction to and commentary upon the Mishnah by Maimonides (q.v.), and the^ commentary of Rabbenu Obadiah di Bertinoro (died 1510). Both have often been printed; they were translated by Surenhusius (Amsterdam, 1698-1703). See Jew. Ency., xii. 27-30.

Systematic abstracts of the legal parts of the Talmud were made by Isaac Alfazi (or " Riph," 1013-1103), and by Maimonides (Mishneh Torah,

otherwise called Sepher ha- Ydd or YBdha-Hazakdh). The latter prepared a great summary of all Jewish religious and civil law, the standard work upon which Christian theologians from the 1 6th century onwards based their studies — and also their criticisms — of early Rabbinism. Jacob b. Asher b. Yebiel in his Turim (" rows ") presented a well-arranged collection of those laws which had not become obsolete together with the addition of new ones. Most important of all, however, is Joseph Caro's Shulhan 'Aruk (" prepared table "), which came in the age of printing (1565), leapt into popularity, and has been, in its turn, the subject of many commentaries and hand-books. This great work systematized Tal- mudic law in all its developments, ancient and modern, written and oral (I. Abrahams, Jew. Lit., London, 1906, p. 147 seq. ; see also Jew. Ency., iii., 584 sqq.). The lengthy history of the written and oral law thus reached its last stage in a work which grew out of the Talmud but had its roots in a more distant past. It was at the dawn of a period when the ancient codes which had been continu- ously reinterpreted or readjusted were to be re-examined under the influence of newer ideas and methods of study. 3

The haggadic portions of the Talmud were collected : (a) from the Bab. recension, in the Haggadoth ha-Talmud (Constantinople, 1511) and in Jacob ibn rlabib's 'En (eye, well of) Jacob (Salonika, 1516); and (b) from the Pal., by Samuel Yapheh (Venice, 1589), and in the Yalkut Shimeoni (see Midrash, § 5, 9). These are superseded by the recent translations made by A. Wiinsche (Jer. T., Zurich, 1880; Bab. T., Leipzig, 1886-9).

The standard lexicon was the 'Aruk(h) of Nathan b. Yehiel of Rome (c. 1 100) which underlies all subsequent works, notably the great Aruch Completum of A. Kohut (Vienna, 1878-1892; supple- ment, New York, 1892) ; see further Jew. Ency., iv. 580 seq. Modern dictionaries of the older Rabbinical writings have been made by J. Levy (Leipzig, 1876), M. Jastrow (London and New York, 1886), G. Dalman (Frankfort-on-Main, 1901). More technical is W.

Bacher's Exeget. Terminologie d. jiid. Traditions-lit. (Leipzig, 1905).

The grammatical aids are modern. For Mishnic Hebrew, see A. Geiger (Breslau, 1845), Strack and Siegfried (Leipzig, 1884), and M. H. Segal's essay on the relation between Mishnic and Biblical Hebrew (Jew. Quart. Rev., xx. 647-737); for Western Aramaic, especially G. Dalman, Jiid. Pal. Aram. (Leipzig, 1905) ; for Eastern Aram., S. D. Luzzatto (Eng. trans, by Goldammer, 1877), C. Levias (Cincinnati, 1900), M. L. Margolis (Munich, 1910), and also T. Noldeke's Manddische Gramm. (Halle, 1875).

The text of the Talmud has been badly preserved; much useful critical work has been done by R. Rabbinovicz, Variae Lectiones (Munich, 1876-86) for the Bab. T., and by B. Ratner, Ahavath Zion (in Heb., Wilna, 1901-2) for the Jer. T. As regards translations (a subject critically handled by E. Bischoff, Frankfort-on-Main, 1899) and texts, few are satisfactory; some have already been mentioned in § I ; for a full list see Strack's Einleitung, pp. 144-155. One may, however, mention the translations in English by D. A. de Sola and M. J. Raphall (18 Mishnic tractates; London 1843); J. Barclay (also a selection of 18; London, 1878), and the (abbreviated) edition of the Bab. Talm. with text and translation by M. L. Rodkinson (New York, 1869 sqq.). The Bab. text with a German translation has been edited by L. Goldschmidt (Berlin, 1897 sqq.). The Palest. Talm. has been translated into French by M. Schwab (Paris, 1871 sqq.).

5. Features of Interest and Value. — Although the Midrashim do not hold the authoritative position which the Talmud enjoys, the two groups cannot be kept apart in any consideration of the interesting or valuable features of the old Rabbinical writings. Viewed as a whole they have the characteristics of other Pales- tinian literature, the merits and defects of other oriental works. As regards the Talmud, neither the Mishnah nor the subsequent Gemara aimed at presenting a digested corpus of law. It is really a large collection of opinions and

views, a remarkably heterogeneous mixture of contents, for which the history of its growth is no doubt largely responsible. It appals the reader with its irregularity of treatment, its variations of style, and its abrupt transitions from the spiritual to the crude and trivial, and from, superstition to the purest insight. Like the Koran it is often concise to obscurity and cannot be translated literally;

3 It is interesting to compare the development of Jewish law with that of the Mahommedan, Roman and English systems, the points of resemblance and difference being extremely suggestive for other studies. On the Jewish codifiers generally, see S. Daiches in L. Simon's Aspects of Heb. Genius (London, 1910), pp. 87 sqq.

it presupposes a knowledge which made commentaries a necessity even, as we have seen, to the Jews themselves. The opening of Order II. 6, for example, would be unintelligible without a knowledge of the law in Levit. xxiii. 42: "A booth (the interior of which is) about 20 cubits high is disallowed. R. Judah allows it. One which is not ten hands high, one which has not three walls, or which has more sun than shade is disallowed. ' An old booth ? ' (marks of quotation and interrogation must be supplied). The school of Shammai disallows it; but the school of Hillel allows it," &c. In the Gemara, the decisions of the Mishnah are not only discussed, explained or developed, but all kinds of additional matter are suggested by them. Thus, in the Bab. Gem. to III. 5, the reference in the Mishnah to the Zealots (Sucdpioi) is the occasion for a long romantic account of the wars preceding the destruction of the Second Temple. In IV. 3 the incidental prohibition of the cutting up of a roll of Scripture leads to a most valuable discussion of the arrange- ment of the Canon of the Old Testament, and other details including some account of the

character and date of Job. There are numerous haggadic interpolations, some of consider- able interest. Prose mingles with poetry, wit with wisdom, the good with the bad, and as one thing goes on to suggest another, it makes the Talmud a somewhat rambling compilation. It is scarcely a law-book or a work of divinity; it is almost an encyclopaedia in its scope, a store-house reproducing the know- ledge and the thought, both unconscious and speculative, of the first few centuries of the Christian era.

A good idea of its heterogeneity is afforded by the English trans- lations of Talmudic and other commentaries by P. I. Hershon (London, 1880-5). For miscellaneous collections of excerpts, see H. Polano (in the Chandos Classics) ; Chenery, Legends from the Midrash; I. Myers, Gems from the Talmud; S. Rapoport, Tales and Maxims from the Midrash; E. R. Montague, Tales from the Talmud. A valuable general introduction to the Rabbinical literature (with numerous excerpts) is given by J. Winter and A. Wunsche, Gesch. d. Jiid.Hellen. u. Talm. Litteratur (Trier, 1894). The literature has not been fully explored for its contribution to the various branches of antiquarian research. On the animal fables, most of them found also in Indian and in classical collections, see J. Jacobs, Fables of Aesop (London, 1889); for myth, super stition and folk-lore, see D. Joel, Aberglaube (Breslau, 1881), and M. Griinbaum, Semit. Sagenkunde (Leiden, 1893), Ges. Aufsatze (Berlin, 1901); for mathematics, see B. Zuckermann (Breslau, 1878); for medicine, J. Bergel (Leipzig, 1885), &c. For these subjects, and for law, zoology, geography, &c. &c, see the full and classified bibliographies in M. L. Rodkinson, Hist, of Talmud (New York, 1903), vol. ii. ch. viii., and Strack' s Einleitung, pp. 164-175.

Ordinary estimates of the Talmud are often influenced by the attitude of Christianity to Judaism and Jewish legalism, and by the preponderating interest which has been taken in the religious-legal side of the Rabbinical writings. The canoniza- tion of oral tradition in the Mishnah

brought the advantages and the disadvantages of a legal religion, and controversialists have usually seen only one side. The excessive legalism which pervades the Talmud was the scholarship of the age, and the Talmud suffers to a certain extent because accepted opinions and isolated views are commingled. To those who have no patience with the minutiae of legislation, the prolix discussions are as irksome as the arguments appear arbitrary. 1 But the Talmudical discussions were often merely specialist and technical — they were academical and ecclesiastical debates which did not always touch every-day life; sometimes they were for the purpose of reconciling earlier conflicting views, or they even seem to be mere exhibitions of dialectic skill (cf ., perhaps, Mk. xii. 18-23). It may be supposed that this predilection for casuistry stimulated that spirit which impelled Jewish scholars of the middle ages to study or translate the learning of the Greeks. 2 Once again it was — from a modern point of view — old-fashioned

1 The whole subject of Jewish legalism should be compared with Islam, where again law and religion are one; as regards the legal aspect, see the extremely suggestive and instructive study, " The Relations of Lav. and Religion, the Mosque el-Azhar," by J. Bryce, Studies in History and Jurisprudence (1901), ii. No. xiii.

2 Some of the most influential of the Greek works in the middle ages had passed through Syriac, Arabic and Hebrew translations before they appeared in their more familiar Latin dress !

scholarship; yet one may now recognize that in the development of European science and philosophy it played a necessary part, and one can now realize that again the benefit was for common humanity rather than for the Jews alone. It may strike one as characteristically Jewish that extravagant and truly oriental encomiums were passed upon such legalists and Talmudists as Isaac Alfazi, Rashi or Maimonides; none the less the medieval Jews were able to produce and appreciate excellent literature of the most

varied description. In any case, the Talmud must be judged, like other authoritative religious literature, by its place in history and by its survival. From age to age groups of laws were codified and expanded — the Priestly law of the Old Testament, the Mishnah, the complete Talmud, the subsequent codifications of Alfazi, Maimonides, and finally Joseph Caro. Thus, the Talmud occupies an intermediate place between the older sources and its later developments. At each step disintegration was arrested, but not Jewish genius; and the domination of the Law in Judaism did not as a matter of fact have the petrifying results which might have been antici- pated. The explanation may be found partly in the intense feeling of solidarity uniting the Deity with his worshippers and his worshippers among themselves. No distinction was drawn between secular and religious duties, between ceremonial, ethical or spiritual requirements. Modern distinctions of moral and ceremonial being unknown, ancient systems must be judged in the light of those modes of thought which could not view religion apart from life. The Talmud discusses and formulates rules upon points which other religions leave to the individual; it inculcates both ceremonial and spiritual ideas, and often sets up most lofty ethical standards. The bonds, rigorous and strange as they often appear to others, were a sacrament en- shrined in the imagination of the lowliest follower of the Talmud. Some of the keenest legalists (e.g. the Babylonian Rab) are famous for their ethical teaching, and for their share in popular exposition; one of the best ethical systems of medieval Judaism (by Bahya ibn Pekuda) is founded upon the Talmud; the last exponent of Rabbinical legalism, Joseph Caro, was at the same time a mystic and a pietist ; and the combination of the poetical with the legal temperament is frequent. The Talmud outlived the reactionary tendencies of the Qaraites (q.v.) and of the Kabbalah (q.v.), and fortunately, since these movements, impor- tant though they undoubtedly were for the evolution of thought, had not within them the power to be of lasting benefit to the rank and file of the community. Finally, no religion has been

without exhibitions of fanaticism and excess on the part of its followers, and if the Old Testament itself was the authority for witch-burning among Christians, it is no longer profitable to ask whether the Talmud was responsible for offences committed by or alleged against those whose lives were regulated by it. On the other hand, Judaism has never been without its heroes, martyrs or saints, and the fact that it still lives is sufficient to prove that the mechanical legalism of the Talmud has not hindered the growth of Jewish religion.

Apart from the general interest of the literature for history and of its contents for various departments of research, the exegetical methods of the Talmud are especially instructive. There were rules of interpretation, and they give expression to one dominant idea: there is an infinite potentiality in the words of the Old Testament, none is fortuitous or meaningless or capable of only a single interpretation, they were said for all time, " for our sake also " and " for our learning " (cf. Paul, in Romans iv. 24, xv. 4). This was not conducive to critical inquiry; questions of the historical background of the biblical passage or of the trustworthiness of the text scarcely found a place. The interpretation itself is markedly subjective; by the side of much that is legitimate exegesis, there is much that appears arbitrary in the extreme. The endeavour was made to interpret, not necessarily according to the letter, but according to individual conceptions of the spirit and underlying motive. Thus, the same evidence could give rise to widely differing conflicting interpretations, which may not be directly deducible from or justified by the Scripture. Hence the value

of the teaching, whether halakic or haggadic, rests upon its intrinsic worth, and not upon the exegetical principles which were the tools common to the age. Moreover, it was also con- sidered

necessary that teaching should be authenticated, as it were, by its association with older authority whose standing guaranteed its genuineness. For this reason anonymous writings were attributed to famous names, and traditions were judged (as in Islam), not so much upon their merits, as by the chain of authorities which traced them back to their sources.

To supplement what has already been pointed out in the article Midrash, it may be noticed that the familiar penalty of the " forty stripes save one " (2 Cor. xi. 24; Josephus, Ant., iv. 8, 23) is discussed in the Mishnah (Makkoth, iv. 5), and is subsequently explained by an extremely artificial interpretation of Deut. xxv. 2-3 (as though " to the number 40 "). But the penalty is obviously older than, and entirely independent of, the arbitrary explanation by which it is supported. Again, the rending of clothes on the occasion of a charge of blasphemy (Matt. xxvi. 65) is actually connected with Joseph b. Qorha of the 2nd century a.d. (Sanhed., vii. 5), although elsewhere this halakah is anonymous. Here the effort was made to sub- stantiate a practice, but the tradition was not unanimous; and it often happens that the Talmud preserves different tradi- tions regarding the same teaching, different versions of it, or it is ascribed to different authorities (see Jew. Ency., xii. p. 15, col. 2). The fact that certain teaching is associated with a name may have no real significance for its antiquity, even as a law ascribed to the age of Moses — the recognized law- giver — may prove to be of much earlier or of much later inception. This feature naturally complicates all questions affecting origin and originality, and cannot be ignored in any study of the Talmud in its bearing upon the New Testament. 1 Similar or related forms of interpretation and teaching are found in the Talmud, in Hellenistic Judaism, in the New Testament, in early Church Fathers and in Syriac writers. As regards the New Testament itself, the points of similarity are many and often important. It has been asserted that " the writings of recent Jewish critics have tended on the whole to confirm

the Gospel picture of external Jewish life, and where there is discrepancy these critics tend to prove that the blame lies not with the New Testament originals, but with their interpreters." The Talmud also makes " credible details which many Christian expositors have been rather inclined to dispute. Most remark- able of all has been the cumulative strength of the arguments adduced by Jewish writers favourable to the authenticity of the discourses in the Fourth Gospel . . ." 2 The points of contact between the phraseology in the Gospel of John and the early Midrashim are especially interesting. 3 The popularity of the parable as a form of didactic teaching finds many examples in the Rabbinical writings, and some have noteworthy parallels in the New testament. 4 It is known that there were theological controversies between Jews and Christians, and in the Midrash Bcreshith Rabbah (Midrash, § 5, s) is a passage (translated in Jew. Ency., viii. 558) directed against the Christian view which found support for the doctrine of the Trinity in Gen. i. 26. But it is uncertain how far the doctrines of Judaism were influ- enced by Christianity, and it is even disputed whether the Talmud and Midrashim may be used to estimate Jewish thought

1 There are many details in the Talmud which cannot be dated ; if some are obviously contemporary, others find parallels in Ancient Babylonia, for example in the code of Hammurabi. See L. N. Denibitz, Jew. Quart. Rev., xix. 109-126, and the literature on the code (see Babylonian Law). Numerous miscellaneous ex- amples of the intimate relationship between the Rabbinical and older oriental material will be found in H. Pick, Assyrisches u. Talmudisches (Berlin, 1903) ; A. Jeremias, Bab. im N. Test. (Leipzig, 1905), Alte Test, im Lichte d. Alten Orients (ib., 1906); E. Bischoff, Bab. astrales im Weltbilde d. Thalmud u. Midrasch {ib., 1907).

1 1. Abrahams, on " Rabbinic Aids to Exegesis," in Swete's Camb. Bibl. Essays (1909), p. 181.

3 See the essay of Schlatter, Sprache u. Heimat d. vierten Evan- Ifllisten (1902).

4 See P. Fiebig, Alt-jiid. Gleichnisse u. d. Gleichnisse Jesu (.Leipzig, 1904); Lauterbach, Jew. Ency., ix. 512 sqq. ; Oesterley and Box, p. 96 seq.

of the 1st or 2nd century A.D. Much valuable work has been done by modern Jewish scholars on the " higher criticism " of these writings, which, it must be remembered, range over several centuries, but it still remains difficult to date their contents. Moreover, in endeavouring to sketch the theology of early Judaism it has been easy to find in the heterogeneous and con- flicting ideas a system which agreed with preconceived views, and to reject as late or exceptional whatever told against them. In considering the evidence it is a delicate task to avoid con- fusing its meaning for its age with that which has appeared the only natural or appropriate one to subsequent interpreters (whether Jewish or Christian) who have been necessarily influ- enced by their environment and by contemporary thought. At all events, if these writings have many old elements and may be used to illustrate the background of the New Testament, they illustrate not only the excessive legalism and ritualism against which early Christianity contended, but also the more spiritual and ethical side of Judaism. Upon this latter phase the pseudepigraphical and apocalyptical writings have shed much unexpected light in linking the Old Testament with both Christian and Rabbinical theology. The various problems which arise are still under discussion, and are of great importance for the study of Palestinian thought at the age of the parting of the ways. They touch, on the one hand, the absolute originality of Christianity and its attitude to Jewish legalism, and, on the other, the true place of the pseudepigrapha in Jewish thought and the antiquity of the Judaism which dominates the Talmud. They do not, however, exclude the possibility that by the side of the scholasticism of the early Jewish academical circles was the more popular thought which, forming a link between Jews and Christians, ultimately fell into neglect as

Judaism and Christianity formulated their theologies.

On the close relation between the thought . of the age, see B. Ritter, Philo u. d. Halacha (Leipzig, 1879) ; M. Griinwald in Konigsberger's Monatsbldlter (Berlin, 1890) ; N. I. Weinstein, Zur Genesis d. Agada (Frankfort-on-Main, 1901); W. Bousset, Relig. d. Judentums, pp. 50 sqq. ; R. Graffin's ed. of Aphraates (q.v.) (Paris, 1894), p. xlix. seq.; S. Funk on the haggadic elements in Aphraates (Vienna, 1891); and art. Midrash, § 4. In this respect the pseudcpigraphic lit. is frequently of the greatest interest; thus Mark. iv. 24 finds a close parallel in " the Testament of Zebulun," viii. 3 (R. H. Charles, Test, of xii. Patriarchs, p. 117), and does not differ essentially from the saying ascribed to Gamaliel II. (Shabb. 51&) and others. A close parallel to Matt. vii. 3 is ascribed to R. Tarpon, latter half of 1st century A.D. (Arak. 16b: " If one says, take the mote from thy eye, he answers, take the beam from thy eye ") ; it seems to have been a popular saying (see Baba Bathra, 156). See further, for the Talmud and Midrashim in relation to the New Testament generally, the literature in Strack, pp. 165 sqq. ; also A. Wunsche, Neue Beitrdge z. Erlaut. d. Evangelien (Gottingen, 1878) ; C. H. Toy, Judaism and Christianity (London, 1890; with Schechter's essay in his Studies [1896], pp. 283—305); H. Laible, Jesus Christus im Talmud (Berlin, 1891); R. T. Herford, Christianity in Talmud and Midrash (London, 1903 ; with W. Bacher's review in Jew. Quart. Rev., xvii. 171-183); Bousset, op. cit. ; Oesterley and Box, op. cit. (with C. G. Montefiore's review in Jew. Quart. Rev., 1908, pp. 347-357); I. Abrahams in Swete's Camb. Bibl. Essays (1909), pp. 163-192; C. G. Montefiore, Synoptic Gospels (1909) ; H. L.Strack, Jesus, die Hdretiker u. die Christen (1910).

The Talmud itself is still the authoritative and practical guide of the great mass of the Jews, and is too closely connected with contemporary and e-irlier Palestinian history to be neglected by Christians. With the progress of criticism. modern

research the value of this and of the other old Rabbinical writings is being re-estimated, and criticism has forced a modification of many old views. 6 Thus, an early refer- ence to the title of a work does not prove that it is that which is_now current; this applies, for example, to the tractate ' Eduyyoth (see Jew. Ency., viii. 611), and to the Midrash Siphre, which frequently differs from that as known to the Talmud (ib., xi. 331). It has been found that a tradition, however

6 The " higher criticism " of these writings affords many useful hints and suggestions for that of other composite works, e.g. the Old Testament. It may be noticed also that the references to the Old Testament sometimes represent a slightly divergent text; see V. A. Aptowitzer, Schriflwort in d. Rabb. Lit. (1906) ; I. Abrahams, Camb. Bibl. Essays, pp. 172 sqq.

tenacious or circumstantial, is not necessarily genuine, and that too in spite of the chain of authorities by which its antiquity or genuineness appeared to be confirmed. Implicit reliance can no longer be necessarily placed upon the reputed authorship or editorship of a work; yet, although many of the views of medieval Jews in this respect prove to be erroneous (e.g. on the authorship of the Zohar; see Kabbalah), they may sometimes preserve the recollection of a fact which only needs restatement (e.g. R. Johanan as the editor of the Pal. Talmud).

Finally, the Talmud comes at the end of a very lengthy development of Palestinian thought (see Palestine: History). It is in the direct line of descent from the Old Testa- Judalsm. me nt — intervening literature having been lost — the essence of which it makes its own. Forced by the

events of history, this legacy of the past was subjected to suc- cessive processes and adapted to the needs of successive genera- tions and of widely different historical and social conditions. Legal compendiums and systems of philosophy served their age and gave place to later developments; and the elasticity of interpretation which characterizes it enabled it to outlive Karaites and Kabbalists. It also escaped the classicism of the Renaissance with its insistence upon the test— either fact or fiction. As an oriental work among an oriental people the moral and spiritual influence of the Talmud has rested upon its connexion with a history which appealed to the imagination and the feelings, upon its heterogeneity of contents suitable for all moods and minds, and upon the unifying and regulative effects of its legalism. The relationship of Talmudism to the Old Testament has been likened to that of Christian theology to the Gospels; the comparison, whether fitting or not, may at least enable one to understand the varying attitudes of Jewish thinkers to their ancient sources. With closer contact to the un-oriental West and with the inevitable tendencies of modern western scholarship the Talmud has entered upon a new period, one which, though it may be said to date from the time of Moses Mendelssohn (see Jews, § 48), has reached a more distinctive stage at the present day. In the weakening of that authority which had been ascribed almost unanimously to the Talmud, and invariably to the Old Testament, a new and greater strain has been laid upon Judaism to reinterpret its spirit once more to answer the diverse wants of its adherents. This is part of that larger and pressing psychological problem of adjusting the " authority " ascribed to past writings to that of the collective human experience; it does not confront Judaism alone, and it must suffice to refer to the writings of " Reformed Judaism "; see, e.g. C. G. Montefiore, Liberal Judaism (London, 1903); Truth in Religion (1906); I. Abrahams, Judaism (1907), and the essays of S. Schechter.

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in the Quarterly Review, Oct. 1867 (reprinted in his Literary Remains), is noteworthy for the great interest it aroused. For ether intro- ductions, see S. Schiller-Szinessy, articles " Midrash," " Mishnah," and " Talmud," in Ency. Brit., 9th ed. ; J. Z. Lauterbach, " Mish- nah," and W. Bacher, " Talmud " in the Jew. Ency.; S. Schechter, "Talmud," in Hastings' Diet. Bib., vol. v.; and also S. Funk, Entstehung des Talmuds (Leipzig, 1910). More comprehensive are the handbooks of M. Mielziner, Introd. to the Talmud (Cincinnati, 1894), M. L. Rodkinson, History of the Talmud (New York, 1903), and especially H. L. Strack, Einleitung in den Talmud (Leipzig, 1908, very concise, but replete with bibliographical and other information). The works already cited in this article or in the art. Midrash, cover the most important departments of the Rab- binical literature, and may be supplemented from the critical Jewish journals, e.g. the Jewish Quarterly Review, Revue des £tudes Juives (Paris), and especially the Monatsschrift f. Gesch. u. Wissen- schaft des Judentums (Rreslau).

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TALUKDAR (Hind, from taluk, district, and dar, holding), the name of (1) an official in the state of Hyderabad, India, equivalent to magistrate and collector, and (2) a landholder with peculiar tenures in various parts of India, particularly in Oude (see United Provinces).

TALUS (Lat. for the " ankle-bone "), in architecture, the slope of an embankment wall, which is thicker at the bottom than at the top, to resist the pressure of the earth behind it.

TAM, JACOB BEN MEIR (1100-1171), a grandson of Rashi (q.v.), was the most famous French glossator (tosafist) on the text of the Talmud. In 1147 he was attacked and injured by a disorderly band who had attached themselves to the Crusaders. He escaped to the neighbouring Troyes, where about 1160 was held

the first of the Jewish Synods, for which the Rhinelands became celebrated. At this meeting it was laid down that disputes between Jew and Jew were not to be carried to a Christian court, but were to be settled by fraternal arbitration. New conditions of life had arisen owing to the closer terms on which Jews and Christians lived, and Jacob Tarn was foremost in settling the terms which were to govern the relations, from the Jewish side. Many others of his practical ordinances (Tak- kanoth), connected with marriage and divorce, trade and proselytism, as well as with synagogue ritual, had abiding influence, and bear invariably the stamp of enlightened independence within the limits of recognized authoritative tradition and law. Of his legal work the most important was collected in his Sefer ha-yashar. He was also a poet and grammarian.

See Gross, Gallia Judaica (index) ; M. Schloessinger in Jewish Encyclopedia, vii. 36-39. (I. A.)

TAMAQUA, a borough of Schuylkill county, Pennsylvania, U.S.A., on the Tamaqua (Little Schuylkill) river, about 20 m. above its junction with the Schuylkill, about 17 m. E.N.E. of Pottsville, and about 98 m. N. of Philadelphia. Pop. (1890) 60545(1900) 7267, (625 foreign-born); (1910) 9462. Tamaqua is served by the Central railroad of New Jersey, by the Philadelphia and Reading railway and by an electric line connecting with Mauch Chunk, Pottsville, and other places. Tamaqua is in a rich anthracite coal district, and coal-mining is its chief industry. Among manufactures are foundry and machine-shop products, powder, stoves, furniture, hosiery, &c. The borough owns the water- works. The first settlement here was made in 1799 and anthracite coal was discovered in 1817. In 1829 Tamaqua was laid out and received its present name, an Indian word meaning " running water. " It was incorporated as a borough in 1833. Between 1869 and 1875 the Molly Maguires were active here.

TAMARIND. This name is popularly applied to the pods of a leguminous tree, which are hard externally, but within filled with an acid juicy pulp containing

sugar and various acids, such as citric and tartaric, in combination with potash. The acid pulp is used as a laxative and a refrigerant, the pods being largely imported both from the East and the West Indies. The tree is now widely distributed in tropical countries, but it is generally considered that its native country is in eastern tropical Africa, from Abyssinia southward to the Zambezi. The name (meaning in Arabic " Indian date ") shows that it entered medieval commerce from India, where it is used, not only for its pulp, but for its seeds, which are astringent, its leaves, which furnish a yellow or a red dye, and its timber. The tree (Tama- rindus indica) attains a height of 70 to 80 ft., and bears elegant pinnate foliage and purplish or orange veined flowers arranged in terminal racemes. The flower-tube bears at its summit four sepals, but only three petals and three perfect stamens, with indications of six others. The stamens, with the stalked ovary, are curved away from the petals at their base, but are directed towards them at their apices. The anthers and the stigmas are thus brought into such a position as to obstruct the passage of an insect attracted by the brilliantly-coloured petal, the inference of course being that insect visits are necessary for transference of pollen and the fertilization of the flower.

TAMARISK. The genus Tamarix gives its name to a small group of shrubs or low trees constituting the tamarisk family Tamaricaceae. The species of tamarisk and of the very closely allied genus Myricaria grow in salt-deserts, by the sea-shore, or in other more or less sterile localities in warm, temperate, subtropical, and tropical regions of the eastern hemisphere. Their long slender branches bear very numerous small appressed leaves, in which the evaporating surface is reduced to a minimum. The flowers are minute and numerous, in long clusters at the

ends of the branches or from the trunk. Each has 4-5 free sepals, and as many petals springing with the 4-10 stamens from a fleshy disk. In Tamarix the stamens are free, while in Myricaria they are united into one parcel. The free ovary is one-celled, with basal placentas, and surmounted by 3-5 styles. The fruit is capsular, and contains numerous seeds, each usually with a long tuft of hairs at one end. The great value of these shrubs or trees lies in their ability to withstand the effects of drought and a saline soil, in consequence of which they grow where little else can flourish. On this account the common tamarisk, T. gallica, is planted on sea-coasts, and affords shelter where none other could be provided. Some species produce galls, valued for their tannin, while the astringent bark of others has occasionally been used for medicinal purposes. The ashes of the plant, when grown near the sea, are said to contain soda. For tamarisk manna, see Manna.

TAMATAVE (called by the natives Tbamasina), the chief seaport of Madagascar, situated nearly on the centre of the eastern coast in 18 10' S., 49° 32' E. It owes its importance to the existence of a coral reef, which forms a spacious and fairly commodious harbour, entered by two openings. The town is built on a sandy peninsula which projects at right angles from the general coast-line. On this are crowded together a con- siderable number of houses, with good shops and merchants' offices in the main thoroughfares. Tamatave is the seat of several foreign consuls, as well as of numerous French officials, and is the chief port for the capital and the interior. Imports consist principally of piece-goods, farinaceous foods, and iron and steel goods, and exports of gold dust, raffia, hides, caoutchouc and live animals. Communication with Europe is maintained by steamers of the Messageries Maritimes and the Havraise companies, and also with Mauritius, and from thence to Ceylon, by the British Union-Castle line. Of the whole foreign trade of Madagascar, 46 per cent, is through Tamatave. Owing to the character of the soil and the formerly crowded native population, the town has often been

attacked by epidemics: the plague broke out in 1898, and again in 1900; but since the draining of the neighbouring marshes, there has been improve- ment. Since 1895 the native population has been removed from the town and settled in a new village to the north-west. A telegraph, 180 miles in length, connects Tamatave with the capital. There is also a service, partly by railway and partly by steamer, along the coast lagoons, connecting the port with Antananarivo. Pop. about 4600.

TAMAULIPAS, a northern Gulf-coast state of Mexico, bounded N. by Texas, U.S.A., E. by the Gulf of Mexico, S.E. by Vera Cruz, S. by San Luis Potosi, W. by Nuevo Leon, and NiW. by Coahuila. Area 32,128 sq. m. Pop. (1900) 218,948. The central and southern parts of the state are mountainous, but there are extensive fertile plains in the N. sloping gently N.E. toward the Rio Grande, and the coastal zone is sandy, much broken by lagoons and uninhabited. Except in the N. this coastal zone is only 5 to 7 m. wide, but the foothills region back of this is usually well wooded and fertile, and the low alluvial river valleys penetrate deeply into the sierras. There are four navigable rivers in the state — the Rio Grande del Norte, or Rio Bravo, which forms the boundary line with the United States, the Conchas or Presas, the Soto da Marina, and the Tamesi. The Panuco forms the southern boundary for a short distance. A peculiar feature of the hydrography of Tamaulipas is the series of coastal lagoons formed by the building of new beaches across the indentations of the coast. The largest of these is the Laguna de la Madre, 125 m. long, which receives the waters of the Rio Conchas, and is separated in places from the Gulf by only a narrow ridge of sand dunes. The climate is hot, humid and malarial on the coast, but is pleasant on the more elevated lands of the interior. On the plains bordering the Rio Grande frosts are frequent. The rainfall is abundant, especially on the mountain slopes of the south. The principal industry is agriculture. Sugar, cereals, tobacco, cotton and coffee are produced, and probably fruit may be

raised successfully. Stock-raising receives some attention and hides and cattle

are exported. The preparation of ixtle fibre for export is be- coming an important industry. Copper is mined and extensive deposits of petroleum and asphalt are being exploited. Railway communication is provided by the Mexican National which crosses the northern end of the state, the Belgian line from Monterrey to Tampico, and a branch of the Mexican Central from San Luis Potosi to Tampico.

The capital of Tamaulipas is Ciudad Victoria (pop. in 1900, 10,086), a small sierra town on the Monterrey and Tampico railway about 120 m. from Tampico. Its public buildings are good and it has the improvements of a modern town. It has a fine climate, a good trade, and is a summer resort for residents of the coast. The city is near the Rio Santander, and was once called Nuevo Santander. Among other towns in the state may be men- tioned: Matamoros (q.v.), on the Rio Grande; Tampico (q.v.), on the Panuco, the principal port of the state; Tula (6935 in 1900) ; Jaumave (about 10,000 in 1900, chiefly Indians), 38 m. S.W. of Ciudad Victoria, in the heart of a prominent ixtle-producing region ; Mier (71 14 in 1895), on the Rio Grande, 95 m. E.N.E. of Monterrey; San Carlos (6871 in 1895), 57 m. N.E. of the capital; Camargo (6815 in 1895), on the San Juan near the Rio Grande, once the old Spanish mission of San Augustin Laredo; and Reynosa (6137 in 1895), 54 «n. W.N.W. of Matamoros.

TAMAYO Y BAUS, MANUEL (1829-1898), Spanish dramatist, was born at Madrid on the 15th of September 1829. He came of a family connected with the theatre, his mother being the eminent actress Joaquina Baus. It is interesting to note that she appeared as Genevieve de Brabant in an arrangement from the French made by Tamayo when he was in his twelfth year. Through the influence of his uncle, Antonio Gil y Zarate, minister of education, Tamayo's independence was secured by his nomina- tion to a post in a government office. The earliest of his printed pieces, Juana de Arco (1847), is an

arrangement from Schiller, and Una Aventura de Richelieu, which the author has not cared to preserve, is said to be an imitation of Alexandre DuvaL The general idea of bis Angela (1852) was derived from Schiller's Kabale und Liebe, but the atmosphere is Spanish, the situations are original, and the phrasing is Tamayo's own. His first great success was Virginia (1853), a dramatic essay in Alfieri's manner, remarkable for its ingenuity and noble diction.' In 1854 Tamayo was expelled from his post by the new Liberal government, but was restored before long by Candido Nocedal, a minister who had been struck by the young man's talent. He collaborated with Aureliano Fernandez-Guerra y Orbe in writing La Rica- hembra (1854), a historical drama which recalls the vigour of Lope de Vega. La Locura de Amor (1855), in which Juana la loca, the passionate, love-sick daughter of Isabel the Catholic, figures as the chief personage, established Tamayo's reputation as Spain's leading playwright. Hija y Madre (1855) is a failure, and La Bola de Nieve (1856) is notable solely for its excellent workmanship. It is unfortunate that Tamayo's straitened means forced him to put original work aside and to adapt pieces from the French. Examples of this sort are fairly numerous. Lo Positivo (1862), imitated from Adrien-Augustin-L6on Laya's Due Job, is well-nigh forgotten, though the Spanish version is a dexterous piece of stagecraft and contains some elements of original value. Del dicho al hecho (1864) is from La Pierre de touche of Jules Sandeau and Emile Augier, and a pleasing proverb, Mds vale Mafia que Fuerza (1866) is a great improvement upon Mme Caroline Berton's Diplomatic du Menage. The revolution of 1868, which cost Tamayo his post at the San Isidro Library, is indirectly responsible for No hay mal que por bien no venga (1868), a clever arrangement of Le Feu au Couvent, by Henri Murger's friend, Theodore Barriere. During these seven years Tamayo produced only one original piece, Lances de Honor (1863), which turned upon the immorality of duelling, and led to a warm discussion among the public. Written in prose, the piece is inspired by a breath of medieval piety which had not

been felt in the Spanish theatre since the 17th century. This renascence of an old-world motive has induced many critics to consider Lances de Honor as Tamayo's best work, but that distinction should be accorded rather to Un Drama nuevo (1867), a play in which the author has ventured to place Shakespeare and Yorick upon the scene. Los Hombres de bien (1870) was

Tamayo's final contribution to the Spanish stage. His last years were spent in recasting his Virginia, and the result of his efforts may be read in the posthumous edition of his Obras (Madrid, 1898-99). In 1858 Tamayo was elected a member of the Spanish Academy, to which he afterwards became permanent secretary; and in 1884 the Conservative minister, Alejandro Pidal y Mon, appointed him director of the National Library. He died on the 20th of June 1898. (J. F.-K.)

TAMBOUR (Fr. for " drum "), the term in architecture given to the inverted bell of a Corinthian capital round which were carved the acanthus leaves decorating it: applied also to the wall of a circular structure, whether on the ground or raised aloft on pendentives and carrying a dome; and to the drum of a column which is built in several courses.

TAMBOURINE (Fr. tambour de Basque; Ger. baskische Trommel, Tambourin, or Schellen-trommel) , a popular instrument of percussion of indefinite musical pitch, used for marking the rhythm in dance or bacchanalian music. The tambourine con- sists of a flat wooden or metal ring, over one end of which is stretched a parchment or vellum head; in the circumference of the ring are fixed nine or ten metal disks or small bells which jingle as the tambourine is struck by the hand, or merely waved through the air. A tremolo effect is obtained by stroking the head with the finger-tips. In a 14th-

century MS. (Brit. Mus. Sloane 3983, fol. 13) a tambourine of modern appearance with a snare bears the inscription " Tympanum." The tambourine is of the highest antiquity, and was known at different times under the names of timbrel or tabret, tympanon or tympanum, and symphonia. (K. S.)

TAMBOV, one of the largest and most fertile governments of central Russia, extending from N. to S. between the basins of the Oka and the Don, and having the governments of Vladimir and Nizhniy-Novgorod on the N., Penza and Saratov on the E., Voronezh on the S., and Orel, Tula and Ryazan on the W. It has an area of 25,703 sq. m., and consists of an undulating plain intersected by deep ravines and broad valleys, ranging 450 to 800 ft. above sea-level. Cretaceous and Jurassic deposits, thickly covered with boulder-clay and loess, are widely spread over its surface, concealing the underlying Devonian and Car- boniferous strata. These last crop out in the deeper ravines, and seams of coal have been noticed at several places. Iron ore (in the north-west), limestone, clay and gypsum are obtained, and traces of petroleum have been discovered. The mineral waters of Lipetsk, similar to those of Franzensbad in their alkaline elements, and chalybeate like those of Pyrmont and Spa, are well known in Russia. The Oka touches the north-west corner of the government, but its tributaries, the Moksha and the Tsna, are important channels of traffic. The Don also merely touches Tambov, and of its affluents none except the Voronezh and the Khoper and the Vorona, a tributary of the Khoper, are at all navigable. As a whole, it is only in the north that Tambov is well drained; in the south, which is- exposed to the dry south-east winds, the want of moisture is much felt, especially in the district of Borisoglyebsk. The climate is continental, and, although the average temperature at Tam- bov is 42 F., the winter is comparatively cold (January, 13°; July, 68°). The rivers remain frozen for four months and a half. Forests occupy about 7! per cent, of the total area, and occur chiefly in the west; in the south-east wood is

scarce, and straw is used for fuel. The soil is fertile throughout; in the north it is clayey and sometimes sandy, but the rest of the government is covered with a sheet, 2 to 3 feet thick, of black earth, of such richness that in Borisoglyebsk cornfields which have not been manured for eighty years still yield good crops.

The estimated population in 1906 was 3,205,200. The government is divided into twelve districts, the chief towns of which are Tambov, Borisoglyebsk, Yelatma, Kirsanov, Kozlov, Lebedyan, Lipetsk, Morshansk, Shatsk, Spask, Temnikov and Usman. The inhabitants are Great Russians in the centre, but there is a notable admixture of Mordvinians and Meshcheryaks in the west and north-west, as also of Tatars. The Mordvinians are rapidly becoming Russified. Nonconformity has a relatively

strong hold in the government. Notwithstanding a high birth- rate (45 in the thousand), the annual increase of population k but slow (0-5 per cent, annually). The prevailing occupation is agriculture, modern machinery being used on the steppe farms. More than two-thirds of the area is arable, and of this proportion 53 per cent, belongs to the peasant communities, 36 per cent, to private individuals, and n per cent, to the crown. The principal crops are rye, wheat, oats, barley and potatoes. Grain is exported to a considerable extent from the south, although the yield is deficient in the north. Hemp and linseed are also cultivated, and the production of tobacco is yearly increasing. Beetroot is extensively grown for sugar. Live- stock breeding, though less extensively carried on than formerly, is still important. Excellent breeds of horses are met with, not only on the larger estates, but also in the hands of the wealthier peasants, those of the Bityug river being most esteemed. Manufacturers are represented chiefly by distilleries, tallow- melting works, sugar factories, flour-mills and woollen-cloth mills. Commerce is brisk, owing to the large grain export — Kozlov, Morshansk, Tambov and Borisoglyebsk being the chief centres for this traffic, and Lebedyan for the trade in horses and

cattle. This government is backward educationally. A distinc- tive feature is its large villages of crown peasants.

The region now included in the north of the government was settled by Russians during the earliest centuries of the princi- pality of Moscow, but until the end of the 17 th century the fertile tracts in the south remained too insecure for settlers. In the following century a few immigrants began to come in from the steppe, and landowners who had received large grants of land from the tsars began to bring their serfs from central Russia. (P. A. K.; J. T. Be.)

TAMBOV, a town of Russia, capital of the government of the same name, 300 m. by rail S.E. from Moscow, on the Tsna river, and on the railway to Saratov. Pop. (1884) 34,000; (1900) 49,208. The town is almost entirely built of wood, with broad unpaved streets, lined with low houses surrounded by gardens; but it is an archiepiscopal see of the Orthodox Greek Church. Woollens, tobacco, oil and various other com- modities are manufactured. The trade in grain, and in cattle purchased in the south and sent to Moscow, is far less important than that of Morshansk and Kozlov.

TAMBURELLO (called in Piedmont Tabasso), a court game popular in Italy, particularly in the northern provinces. It is a modification of the ancient game of Pallone (q.v.), bearing the same general relation to it as Squash does to Racquets. A full- sized Tamburello Court, which need not be as true and even as that for Pallone, is 90 to 100 yards long and half as wide, divided laterally through the middle by a line (cordino) into two equal spaces, the battuta and the rimessa. Three players regularly form a side, each carrying in one hand an implement called tamburello, resembling a tambourine (whence the name), which is a round frame of wood upon which is tightly stretched a cover of horse-hide. A rubber ball about the size of a lawn-tennis ball is used. One of the players opens the service (battuta), which is made from a small square called the

trampolino, situated at one corner of the battuta but outside the court. The service must be over the middle line. The ball must then be hit from side to side over the line, the side failing to return it or sending it out of court losing a point. The game is scored like lawn- tennis, four points constituting a game, counting 15+15+10+10. Tamburello, a less expensive game than Pallone, is popular with the lower classes, who use it as a medium for betting.

TAMILS. The word Tamil (properly Tamil.) has been iden- tified with Dravida, the Sanskrit generic appellation for the south Indian peoples and their languages; and the various stages through which the word has passed — Dramida, Dramila, Damila — have been finally discussed by Bishop Caldwell in his Ccm- parative Grammar of the Dravidian Languages (2d ed., 1875, p. 10 seq.). The identification was first suggested by Dr Graul (Reise nach Ostindien, vol. iii., 1854, p. 349), and then adverted to by Dr G. U. Pope (Tamil Handbook, 1859, Introduction) and Dr Gundert (Malaydlma Dictionary. 1872, s.v.). Dr Pope,

however, believed Tamil to be a corruption of tenmoli, southern speech, in contradistinction to vadugu, the northern, i.e., Telugu language. As in the case of the Kafir, Turkish, Tagala and other typical languages, the term Tamulic or Tamulian has occasionally been employed as the designation of the whole class of Dravidian peoples and languages, of which it is only tfie most prominent member. The present article deals with Tamil in its restricted sense only. The Tamils proper are smaller and of weaker build than Europeans, though graceful in shape. Their physical appearance is described as follows: — a pointed and frequently hooked pyramidal nose, with conspicuous nares, more long than round; a marked sinking in of the orbital line, producing a strongly defined orbital ridge; hair and eyes black; the latter, varying from small to middle-sized, have a peculiar sparkle and a look of calculation; mouth

large, lips thick, lower jaw not heavy; forehead well-formed, but receding, inclining to flattish, and seldom high; beard considerable, and often strong; colour of skin very dark, frequently approaching to black (Manual of the Administration of the Madras Presidency, Madras, 1885, vol. i., Introd., p. 36; see also Caldwell, Com- parative Grammar of the Dravidian Languages, 1875, pp. 558-79). The Tamils have many good qualities — frugality, patience, endurance, politeness — and they are credited with astounding memories; their worst vices are said to be lying and lascivious- ness. Of all the South-Indian tribes they are the least sedentary and the most enterprising. Wherever money is to be earned, there will Tamils be found, either as merchants or in the lower capacity of domestic servants and labourers. The tea and coffee districts of Ceylon are peopled by about 950,000; Tamils serve as coolies in the Mauritius and the West Indies; in Burma, the Straits, and Siam the so-called Klings are all Tamils (Graul, Reise nach Ostindien, Leipzig, 1855, vol. iv. pp. 113-212).

Language. — The area over which Tamil is spoken extends from a few miles north of the city of Madras to the extreme south of the eastern side of the peninsula, throughout the country below the Eastern Ghats, from Pulicat to Cape Comorin, and from the Ghats to the Bay of Bengal, including also the southern portion of Travancore on the western side of the Ghats and the northern part of Ceylon. According to the census of 1901, the total number of Tamil-speaking people in all India was 16,525,500. To these should be added about 160,000 in the French posses- sions. But as of all the Dravidian languages the Tamil shows the greatest tendency to spread, its area becomes ever larger, encroaching on that of the contiguous languages. Tamil is a sister of Malayalam, Telugu, Kanarese, Tulu; and, as it is the oldest, richest, and most highly organized of the Dravidian languages, it may be looked upon as typical of the family to which it belongs. The one nearest akin to it is Malayalam, which originally appears to have been simply a dialect of Tamil, but

differs from it now both in pronunciation and in idiom, in the retention of old Tamil forms obsolete in the modern language, and in having discarded all personal terminations in the verb, the person being always indicated by the pronoun (F. W. Ellis, Dissertation on the Malaydlam Language, p. 2; Gundert, Malay- dtya Dictionary, Introd.; Caldwell, Comparative Gr., Introd., p. 23; Burnell, Specimens of South Indian Dialects, No. 2, p. 13). Also, the proportion of Sanskrit words in Malayalam is greater, while in Tamil it is less, than in any other Dravidian tongue. This divergence between the two languages cannot be traced farther back than about the 10th century; for, as it appears from the Cochin and Travancore inscriptions, previous to that period both languages were still substantially identical; whereas in the Rdmacharitam, the oldest poem in Malayalam, composed probably in the 13th century, at any rate long before the arrival of the Portuguese and the introduction of the modern character, we see that language already formed. The modern Tamil characters originated " in a Brahmanical adaptation of the old Grantha letters corresponding to the so-called Vattehittu," or round-hand, an alphabet once in vogue throughout the whole of the Pandyan kingdom, as well as in the South Malabar and Coimbatore districts, and still sparsely used for drawing up con- veyances and other legal instruments (F. W. Ellis, Dissertation,

3). It is also used by the Moplahs in Tellicherry. The origin of the Vattel.uttu itself is still a controverted question. Dr Burnell, the greatest authority on the subject, stated his reasons for tracing that character through the Pahlavi to a Semitic source {Elements of South Indian Palaeography, 2nd ed., 1878, pp. 47-52, and plates xvii. and xxxii.). In the 8th century the Vattel.uttu existed side by side and together with the Grantha, an ancient alphabet still used throughout the Tamil country in writing Sanskrit. During the four or five centuries after the conquest of Madura by the Cholas in the nth it was gradually superseded in the Tamil country by the modern Tamil,

while in Malabar it continued in general use down to the end of the 17 th century. But the earliest works of Tamil literature, such as the Tolkdppiyam and the Kural, were still written in it. The modern Tamil characters, which have but little changed for the last 500 years, differ from all the other modern Dravidian alphabets both in shape and in their phonetic value. Their angular form is said to be due to the widespread practice of writing with the style resting on the end of the left thumb-nail, while the other alphabets are written with the style resting on the left side of the thumb.

The Tamil alphabet is sufficiently well adapted for the expression of the twelve vowels of the language (a, d, i, i, u, A, e, e, 0, 0, ei, au), — the occasional sounds of 6 and ii, both short and long, being covered by the signs for e, e, i, i; but it is utterly inadequate for the proper expression of the consonants, inasmuch as the one character k has to do duty also for kh, g, gh, and similarly each of the other surd consonants ch, t, t, p represents also the remaining three letters of its respective class. The letter k has, besides, occasionally the sound of h, and ch that of s. Each of the five consonants k, ch, {, t, p has its own nasal. In addition to the four semivowels, the Tamil possesses a cerebral r and /, and has, in common with the Malayalam, retained a liquid /, once peculiar to all the Dravidian languages, the sound of which is so difficult to fix graphically, and varies so much in different districts, that it has been rendered in a dozen different ways {Manual of the Administration of the Madras Presidency, vol. ii. pp. 20 seq.). Fr. Miiller is probably correct in approximating it to that of the Bohemian f. There is, lastly, a peculiar «, differing in function but not in pronunciation from the dental n. The three sibilants and h of Sanskrit have no place in the Tamil alphabet; but ch often does duty as a sibilant in writing foreign words, and the four corresponding letters as well as j and ksh of the Grantha alphabet are now frequently called to aid. It is obvious that many of the Sanskrit words imported into Tamil at various

periods (Caldwell, loc. cit., Introd., pp. 86 seq.) have, in consequence of the incongruity of the Sanskrit and Tamil notation of their respective phonetic systems, assumed disguises under which the original is scarcely recognizable: examples are ulagu (loka), uruvam (rupa), arukken_ (arka), arputam (adbhutam), nalchattiram (nakshatram), irtidi (rishi), tirkam (dirgha), arasen (rajan). Besides the Sanskrit ingredients, which appear but sparsely in the old poetry, Tamil has borrowed from Hindustani, Arabic, and Persian a large number of revenue, political, and judicial terms, and more recently a good many English words have crept in, such as tiratti, treaty, patlar, butler, dk(, act, ktddh, club, kavarnar, governor, pinnalkodu, penal code, sikku, sick, mejastira({u, magistrate. But, as compared with its literary sister languages, it has preserved its Dravidian character singularly free from foreign influence. Of Tamil words which have found a permanent home in English may be mentioned curry, (kari), mulligatawny (milagu, pepper, and tannir, cool water), cheroot {suruttu), pariah (pareiyan).

The laws of euphony (avoiding of hiatus, softening of initial consonants, contact of final with initial consonants) are far more complicated in Tamil than in Sanskrit. But, while they were rigidly adhered to in the old poetical language (Sen-Tamil, or " Perfect " Tamil), there is a growing tendency to neglect them in the language of the present day (Kodun-Tamtl). It is true the Tamil rules totally differ from the prevailing Sanskrit; still the probability is in favour of a Sanskrit influence, inasmuch as they appear to follow Sanskrit models. Thus, irul ntkkindn becomes irunikkindn; pon pdttiram, porpdttiram; vii(pil hanitn, vupfir kanden; vdlsirumei, vdfsirumei; palan tanddn, palanrdndan. Nouns are divided into high-caste or personal and low-caste or impersonal,- — the former comprising words for rational beings, the latter all the rest. Only in high-caste nouns a distinction between masculine and feminine is observed in the 'singular; both have a common plural, which is

indicated by change of a final n (feminine I) into r; but the neuter plural termination kal (gal) may be super- added in every case. Certain nouns change their base termination before receiving the case affixes, the latter being the same both for singular and plural. They are for the ace. ei, instr. &l, social odu (ofu, udan), dat. ku, loc. il (idattil, in), abl. ilirundu (ininru), gen. udeiya (adu). There is, besides, a general oblique affix in, which

is not only frequently used for the genitive, but may be inserted before any of the above affixes, to some of which the emphatic particle e may also be superadded. In the old poetry there is a still greater variety of affixes, while there is an option of dispensing with all. Adjectives, when attributive, precede the noun and are unchangeable; when predicative they follow it and receive verbal affixes. The pronouns of the 1st person are sing, nan {ydn), in- flexional base en, plural ndm {yam), infl. nam, including, ndnga(, infl. engal, excluding the person addressed; of the 2nd person ni, infl. un {nin, nun), plural nir {niyir, nivir), ntngal, infl. urn, ungal {num.). To each of those forms, inclusive also of the reflexive pro- nouns tdn, tdm, tdngal, a place is assigned in the scale of honorific pronouns. As in the demonstrative pronouns the forms beginning with i indicate nearness, those with a distance, and (in the old poatry) those with u what is between the two, so the same forms beginning with e (or yd, as in ydr, dr, who?) express the interro- gative. The verb consists of three elements — the root (generally reducible to one syllable), the tense characteristic, and the personal affix. There are three original moods, the indicative, imperative, and infinitive (the 2nd singular imperative is generally identical with the root), as well as three original tenses, the present, past, and future. The personal affixes are — sing, (j) -in; (2) -ay, honorific -ir; (3) masc. -an, fem. -dl, honor, -dr, neuter -adu; plural (1) -dm {-dm, -em); (2) -irkal; (3) masc. fem. -drkal, neut. -ana. These affixes serve for all verbs and for each of the

three tenses, except that, in the future, -adu and -ana are replaced by -um {kkum). It is only in the formation of the tenses that verbs differ, intransitive verbs generally indicating the present by kir {-kinr-), the past by d, nd, or in, and the future by v {-b-), and transitive verbs by the corresponding infixes, kkir {-kkinr-), tt {-nd-), and pp; but there are numerous exceptions and seemingly anomalous forma- tions. Other tenses and moods are expressed with the aid of special affixes or auxiliary verbs. Causal verbs are formed by various infixes {-ppi-, vi, Uu), and the passive by the auxiliary padu, to fall, or by un, to eat, with a noun. The following four peculi- arities are characteristic of Tamil: — first, the tenseless negative form of the verb, expressed by the infix a, which is elided before dissimilar vowels; second, the predicative employment of two negative particles illei and alia, the one denying the existence or presence, the other denying the quality or essence; third, the use of two sets of participles, — one, called adjective or relative participle, which supplies the place of a relative clause, the language possessing no relative pronouns, and an ordinary adverbial participle or gerund; and, fourth, the practice of giving adjectives a verbal form by means of personal affixes, which form may again be treated as a noun by attaching to it the declensional terminations, thus: periya, great; periydm, we are great; periydmukku, to us who are great. The old poetry abounds in verbal forms now obsolete. Adjectives, adverbs and abstract nouns are derived from verbs by certain affixes. All post-positions were originally either nouns or verbal forms. Oratio indirecta is unknown in Tamil, as it is in all the other Indian languages, the gerund enru being used, like iti in Sanskrit, to indicate quotation. The structure of sentences is an exact counterpart of the structure of words, inasmuch as that which qualifies always precedes that which is qualified. Thus the attributive precedes the substantive, the substantive precedes the preposition, the adverb precedes the verb, the secondary clause the primary one, and the verb

closes the sentence. The sentence, ” Having called the woman who had killed the child, he asked why she had committed such infanticide,” runs in Tamil as follows: — KnJandeiyei kkonrupottavalei aleippittu nl in ippadi

The child her who had killed having ‘caused to be called, “Thou why thus

ppa£(a sisu-v-atti seyday enru kettan.

xoade child-murder didst?” having said he asked.

Much as the similarity of the structure of the Tamil and its sister languages to that of the Ugro-Tartar class may have proved suggestive of the assumption of a family affinity between the two classes, such an affinity, if it exist, must be held to be at least very distant, inasmuch as the assumption receives but the faintest shade of support from an intercomparison of the radical and least variable portion of the respective languages.

Literature. — The early existence, in southern India, of peoples, localities, animals and products the names of which, as men- tioned in the Old Testament and in Greek and Roman writers, have been identified with corresponding Dravidian terms, goes far to prove the high antiquity, if not of the Tamil language, at least of some form of Dravidian speech (Caldwell, loc. cit., Introd., pp. 81-106; Madras District Manual, i., Introd., pp. 134 seq.). But practically the earliest extant records of the Tamil language do not ascend higher than the middle of the 8th century of the Christian era, the grant in possession of the Israelites at Cochin being assigned by the late Dr Burnell to about 750 a.d., a period when Malayalam did not exist yet as a separate language. There is every probability that about the same time a number of Tamil works sprung up, which are mentioned by a writer in the nth century as representing the

old literature (Burnell, loc. cit., p. 127, note). The earlier of these may have been Saiva books; the more prominent of the others were decidedly Jain. Though traces of a north Indian influence are palpable in all of them that have come down to us (see,e.g.,F.W. Ellis's notes to the Kural), we can at the same time perceive, as we must certainly appreciate, the desire of the authors to oppose the influence of Brahmanical writing, and create a literature that should rival Sanskrit books and appeal to the sentiments of the people at large. But the refine- ment of the poetical language, as adapted to the genius of Tamil, has been carried to greater excess than in Sanskrit; and this artificial character of the so-called Sen-Tamil is evident from a comparison with the old inscriptions, which are a reflex of the language of the people, and clearly show that Tamil has not undergone any essential change (Burnell, loc, cit., p. 142).*

The rules of Sen-Tamil appear to have been fixed at a very early date. The Tolkdppiyam, the oldest extant Tamil grammar, is assigned by Dr Burnell {On the Aindra School of Sanskrit Gram- marians, pp. 8, 55) to the 8th century (best edition by C. Y. Tamo- daram Pillei, Madras, 1885). The Viraso(iyam, another grammar, is of the nth century. Both have been superseded by the Nannul, of the 15th century, which has exercised the skill of numerous commentators, and continues to be the leading native authority (English editions in Pope's Third Tamil Grammar, and an abridg- ment by Lazarus, 1884). The period of the prevalence of the Jains in the Pandya kingdom, from the 9th or 10th to the 13th century, is justly termed the Augustan age of Tamil literature. To its earlier days is assigned the Ndladiydr, an ethical poem on the three objects of existence, which is supposed to have preceded the Kur.al of TiruvaJJuvan, the finest poetical production in the whole range of Tamil composition. Tradition, in keeping with the spirit of antagonism to Brahmanical influence, says that its author was a pariah. It consists of 1330 stanzas on virtue, wealth and pleasure. It has often been edited,

translated and commented upon; see the introduction to the excellent edition published by the Rev. Dr Pope, in which also a comprehensive account of the peculiarities of Sen-Tamil will be found. To the Avvei, or Matron, a reputed sister of TiruvaUuvan, but probably of a later date, two shorter moral poems, called Attisudi and Konreiveyndan, are ascribed, which are' still read in all Tamil schools. Chintdmani, an epic of upwards of 3000 stanzas, which celebrates the exploits of a king Jivakan, also belongs to that early Jain period, and so does the Divdkaram, the oldest dictionary of classical Tamil. The former is one of the finest poems in the language; but no more than the first and part of the third of its thirteen books have been edited and translated. Kamban's Rdmdyanam (about 1 100 a.d.) is the only other Tamil epic which comes up to the Chintdmani in poetical beauty. The most brilliant of the poetical productions which appeared in the period of the Saiva revival (13th and 14th centuries) are two collections of hymns addressed to Siva, the one called Tiruvdsakam, by Manikka-Vasakan, and a later and larger one called Tivdram, by Sambandhan and two other devotees, Sundaran and Appan. Both these collections have been printed, the former in one, the latter in five volumes. They are rivalled both in religious fervour and in poetical merit by a contemporaneous collection of Vaishnava hymns, the Ndldyira-prabandkam (also printed at Madras). The third section of it, called Tiruvdymoli, or " Words of the Sacred Mouth," has been published in Telugu characters, with ample commentaries, in ten quartos (Madras, 1875—76). After a period of literary torpor, which lasted nearly two centuries, King Vallabha Deva, better known by his assumed name Ativirarama Pandyan (second half of the 16th century), endeavoured to revive the love of poetry by compositions of his own, the most celebrated of which are the Neidadam, a somewlUtt extravagant imitation of Sri Harsha's Sanskrit Naishadham, and the Verriverkei, a collection of sententious maxims. Though he had numerous followers, who made this revival the most prolific in the whole history of

Tamil literature, none of the compositions of any kind, mainly translations and bombastic imitations of Sanskrit models, have attained to any fame. An exceptional place, however, is occupied by certain Tamil sectarians called Uttar {i.e. siddhas or sages), whose mystical poems, especially those contained in the Sivavdkyam, are said to be of singular beauty. Two poems of high merit, composed at the end of the 1 7th century, also deserve favourable notice — the Nitinerivilakkam, an ethical treatise by Kumaragurupara Desikan, and the Prabhulingalilei, a translation from the Kanarese of a famous text-book of the Vira-Saiva sect. See the analysis in W. Taylor's Catalogue, vol. ii. pp. 837-47.

The modern period, which may be said to date from the beginning of the last century, is ushered in by two great poets, one native and the other foreign. Tayumanavan, a philosopher of the pantheistic school, composed 1453 stanzas {pddal) which have a high reputation for sublimity both of sentiment and style; and the Italian Jesuit Joseph Beschi (d-1742), under the name Viramamuni, elaborated, on the model of the Chintdmani, a religious epic Tembdvani, which!

though marred by blemishes of taste, is classed by native critics among the best productions of their literature. It treats of the history of St Joseph, and has been printed at Pondicherry in three volumes, with a full analysis. English influence has here, as in Bengal and elsewhere in India, greatly tended to create a healthier tone in literature both as to style and sentiment. As one of the best Tamil translations of English books in respect of diction and idiom may be mentioned the Bdlavydparikal, or ' Little Merchants," published by the Vernacular Text Society, Madras. P. Percival's collection of Tamil Proverbs (3rd ed., 1875) should also be mentioned. The copper-plate grants, commonly called sasanams,

and stone inscriptions in Tamil, many of which have been copied and translated {Archaeological Survey of Southern India, vol. iv. ; R. Sewell, Lists of the Antiquarian Remains in the Presidency of Madras, vols, i., ii.), are the only authentic historical records. (See also Sir Walter Elliot's contribution to the International Numis- mata Orientalia, vol. iii. pt. 2.) As early as the time of the Chinese traveller Hsiian Tsang, books were written in southern India on talipot leaves, and Albiruni mentions this custom as quite prevalent in his time (1031). It has not died out even at the present day, though paper imported from Portugal has, during the last three centuries, occasionally been used. Madras is now the largest depository of Tamil palm-leaf MSS., which have been described in Wilson's Catalogue of the Mackenzie Collection (Calcutta, 1828, 2 vols.), W. Taylor's Catalogue (Madras, 1857, 3 vols.), and Condaswamy Iyer's Catalogue (vol. i., Madras, 1861). The art of printing, however, which was introduced in southern India at an early date, while it has tended to the preservation of many valuable productions of the ancient literature, has also been the means of perpetuating and circulating a deal of literary rubbish and lasciviousness which would much better have remained in the obscurity of manuscript. Dr Burnell has a note in his Elements of South Indian Paleography (2nd ed., p. 44), from which it appears that in 1578 Tamil types were cut by Father Joao de Faria, and that a hundred years later a Tamil and Portuguese dictionary was published at Ambalakkadu. At present the number of Tamil books (inclusive of newspapers) printed annually far exceeds that of all the other Dravidian verna- culars put together. The earliest Tamil version of the New Testa- ment was commenced by the Dutch in Ceylon in 1688; Fabricius's translation appeared at Tranquebar in 1715. Since then many new translations of the whole Bible have been printed, and some of them have passed through several editions. The German missionary B. Ziegenbalg was the first to make the study of Tamil possible in Europe by the publication of his Grammatica Damulica, which appeared at Halle in 1716. Some time

later the Jesuit father Beschi devoted much time and labour to the composition of grammars both of the vulgar and the poetical dialect. The former is treated in his Grammatica Latino-Tamulica, which was written in 1728, but was not printed till eleven years later (Tranquebar, I739)- It was twice reprinted, and two English translations have been published (1831, 1848). His Sen-Tamil Grammar, accessible since 1822 in an English translation by Dr Babington, was printed from his own MS. (Clavis humaniorum literarum sublimioris Tamulici idiomatis) at Tranquebar in 1876. This work is especially valuable, as the greater portion of it consists of a learned and exhaustive treatise on Tamil prosody and rhetoric. (See, on his other works, Graul's Reise, vol. iv. p. 327.) There are also grammars by Anderson, Rhenius, Graul (in vol. ii. of his Bibliotheca Tamulica, Leipzig, 1855), Lazarus (Madras, 1878), Pope (4th edition in three parts, London, 1883-85), and Grammaire Francaise-Tamoule, by the Abbe Dupuis (Pondicherry, 1863). The last two are by far the best. The India Office library possesses a MS. dictionary and grammar " par le Rev. Pere Dominique " (Pondicherry, 1843), and a copy of a MS. Tamil-Latin dictionary by the celebrated missionary Schwarz, in which 9000 words are explained. About the like number of words are given in the dictionary of Fabricius and Breithaupt (Madras, 1779 and 1809). Rottler's dictionary, the publication of which was commenced in 1834, is a far more ambitious work. But neither it nor Winslow's (1862) come up to the standard of Tamil scholar-ship; the Dictionnaire Tamoul- Francois, which appeared at Pondi- cherry in 2 vols. (1855-62), is superior to both, just as the Diction- arium Latino-Gallico-Tamulicum (ibid., 1846) excels the various English-Tamil dictionaries which have been published at Madras.

See A. T. Mondiere and J. Vinson in Dictionnaire des Sciences Anthropologiques, s.v. " Dravidiens " ; S. C. Chitty, The Tamil- Plutarch, Jaffna, 1859; J. Murdoch, Classified Catalogue of Tamil Printed Books, Madras, 1865; C. E. Gover, Folk-Songs of

Southern India, Madras, 1871; Bishop Caldwell's Comparative Grammar of the Dravidian Languages, 2nd ed., London, 1875; Graul's Reise nach Ostindien, vols. iv. and v. ; the quarterly Lists of Books registered in the Madras Presidency; [Dr. Maclean's] Manual of the Adminis- tration of the Madras Presidency, vols. i. and ii., Madras, 1885, folio; F. Miilier, Grundriss der Sprachwissenschaft, Vienna, 1884, iii. i. 162-246; G. U. Pope, First Lessons in Tamil, 7th ed., Oxford, 1904, and The Ndladiyar, Oxford, 1893; and J. Vinson, Manuel de la Langue Tamoule, Paris, 1903. (R. R.)

TAMLUK, an ancient town of British India, in the Midnapore district of Bengal, on the river Rupnarayan. Pop. (1901) 8805. Under the name of Tamralipta was the capital of the

Peacock dynasty, and a seaport at which the Chinese Buddhist pilgrims embarked. It is now 60 m. from the sea, and the ruins of the old city lie deep beneath river silt. It contains the palace of a local raja, and some temples of peculiar construction.

TAMMANY HALL, a political organization in New York City, U.S.A., claiming to be the regular representative of the Democratic party in that city. It takes its name from a sachem or chief of the Delaware Indians, Tamanend or Tammany, the name itself meaning " the Affable." Before the War of Inde- pendence there were Whig societies called " Sons of St Tam- many " and " Sons of Liberty," with rituals in which Indian words were used to suggest the American character of the lodges. On the 12th of May 1789 William Mooney (d. 1832), an upholsterer, of Irish birth, who had probably been a member of an earlier Tammany society, founded in New York City the " Society of St Tammany" or " Columbian Order" as a patriotic, benevolent and non-political organization, with the intent to counteract the influence of what was believed to be the aristocratic Order of the Cincinnati. A few short- lived societies of a similar kind were founded in other states. In 1805 the New York Society was incorporated as a benevolent society, in 181 1 it

built its first wigwam, or hall, in Frankfort Street near the City Hall, and in 1867 it moved to its present hall in Fourteenth Street. The society was a secret organiza- tion, divided into tribes, with sachems (the most important being the Grand Sachem) as the chief officials, a sagamore, or master of ceremonies, and a winskinskie, or door-keeper, and with a ritual of supposedly Indian character. This " Tammany Society" is not itself the well-known political organization, but rents its hall to the Tammany Hall General Committee, the " Tammany Hall " of political notoriety; the leading members, however, of the "Society" and of the "Hall" are identical, and the " Society " controls the meeting-place of the " Hall," so that the difference between the two is little more than nominal. Almost from the beginning Tammany has been actively engaged in politics, being part of, and during the greater period of its existence actually representing in New York City, the Demo- cratic party, though always subordinating the interests of the party as a whole to its own selfish interests. It has had local rivals at different times, but these, though successful for a while, have not lived long; on the other hand, the Hall has not generally been regarded with favour by the Democratic party throughout the country at large.

Soon after its founding, Tammany came under the influence of Aaron Burr. In 1800 it worked for the election of Jefferson as President. It bitterly opposed De Witt Clinton for many years and was hostile to his large Irish constituency; but, after it secured in 1822 the constitutional amendments providing for manhood suffrage and for the abolition of imprisonment of debtors, and especially after 1827 when Tammany first tried to reduce the five-year period of residence necessary for naturali- zation, the foreign-born element gradually came into control of the " Society " and of the " Hall." About 1842 Irish " gangs," which used physical violence at election time, became a source of Tammany strength. It reached its height of power about 1870, under the leadership of William Marcy Tweed (1823-78), who

used his popularity as a volunteer fireman to advance himself in Tammany and who was the first " boss " of the organization, which had formerly been controlled by committees. In the mayoralty and the other administrative offices and in the common council of the city, in the chief executive office of the state, in the state legislature, and even in some of the judges' seats, Tweed had placed (or had secured the election of) accomplices or tools, or else controlled votes by- purchase. In April 1870 Tweed secured the passage of a city charter which put the control of the city into the hands of the mayor, the comptroller, and the commissioners of parks and public works. A system of official plunder then began that has had few parrallels in modern times. How much was actually stolen can never be known; but the bonded debt of the city, which was $36,000,000 at the beginning of 1869, was $97,000,000 in September 1871, an increase of $61,000,000 in two years and

eight months; and within the same period a floating debt of $20,000,000 was incurred, making a total of $81,000,000. For this vast sum the city had little to show. The method of plunder was the presentation of excessive bills for work done, especially in connexion with the new court-house then being erected. The- bills were ostensibly paid in full, but in reality only in part, the rest being retained by Tweed, and divided amongst his followers in proportion to their importance. The total cost of the court-house to the city was about $13,000,000 — many times the actual cost of construction. The amount paid i.i these two years for the city printing and stationery was nearly $3,000,000. The end came through a petty quarrel over the division of the spoils. One of the plunderers, dissatisfied with the office he had received, gave to the New York Times a copy of certain swollen accounts which showed conclusively the stealing that had been going on. When Tweed was inter- viewed about the frauds

his only reply was, ” What are you going to do about it?” The better classes, however, were now thoroughly aroused, and with Samuel J. Tilden, afterwards governor of the state, at their head, and with the assistance of the Times and of Harper’s Weekly, in the latter of which the powerful cartoons of Thomas Nast appeared, completely over- threw the ring and rescued the city. Tweed was tried and con- victed, but was afterwards released on a technicality of law; he was re-arrested, but managed to escape and fled to Spain; he was identified and was brought back to gaol, where he died. The rest of the gang fared little better. Within a few years and under a new leader, John Kelly, Tammany was again in control of the city. Kelly was succeeded by Richard Croker, whose reign as “boss” continued until 1901. Since 1881 Tammany has been in virtual control of the city government about one- half the time, a Tammany and a reform mayor often alternating. There were elaborate investigations of Tammany’s control of the city by committees of the legislature in 1890, 1894, and 1899. The most conspicuous overthrows of Tammany since the days of Tweed were in 1894, in 1901, when practically the whole reform ticket from mayor to alderman was elected, and in 1909, when the mayor (not a member of Tammany) was the only Tammany nominee on the general ticket elected. The grosser forms of corruption that prevailed under Tweed did not as a rule prevail in later years. Instead, the money raised by and for the Hall and its leaders has come from the blackmailing of corporations, which find it easier to buy peace than to fight for their rights; from corporations which desire concessions from the city, or which do not wish to be interfered with in encroachments on public rights; from liquor-dealers, whose licences are more or less at the mercy of an unscrupulous party in power; from other dealers, especially in the poorer parts of the city, whose business can be hampered by the police; from office- holders and candidates for office; and, lastly, in- directly through corrupt police officials, from the criminal classes and gambling establishments in return for non-intervention on the part of the

police. The power of Tammany Hall is the natural result of the well-regulated machine which it has built up throughout the city, directed by an omnipotent " boss." Each of the " assembly districts " into which the city is divided sends a certain number of representatives to the General Com- mittee of Tammany Hall. Each district also has a " boss " or leader and a committee, and these leaders form the Executive Committee of the Hall. There is also a " captain " for each of the voting precincts, over 1000 in number, into which the city is divided. The patronage of the city Alters down from the real " boss " of the Hall to the local precinct leader, the latter often having one or more small municipal offices at his disposal; he also handles the election money spent in his precinct. The party headquarters in the different assembly districts are largely in the nature of social clubs, and it is in considerable degree through social means that the control of the Hall over the poorer classes is maintained. The headquarters are generally Over or near a saloon, and the saloon-keepers throughout Manhattan belong as a rule to the Hall — in fact, are its most effective allies or members. It should be remembered too that the Hall is

not subject to divided counsels, but is ruled by one man, a " boss " who has risen to his position by sheer force of ability, and in whose hands rest the finances of the Hall, for which he is accountable to no one. When the " Greater New York " was incorporated the power of Tammany seemed likely to grow less because it was confined to the old city (Boroughs of Manhattan and the Bronx), and the Democratic organiza- tions in the other boroughs were hostile to it. The power of the organization in the state and in the nation is due to its frequent combination with the Republican organization, which controls the state almost as completely as Tammany does the city.

See Gustavus Myers, The History of Tammany Hall (New York, 1901). (F. H. H.)

TAMMERFORS (Finnish Tampere), the chief industrial

city of Finland, capital of the province of Tavastehus, on the rapids connecting Lakes Nasi-jarvi and Pyha-jarvi, 125 m. by rail N.W. of Helsingfors. Pop. (1904) 40,261. Tammerfors is an important centre for the manufacture of cotton, linen, and woollen goods, leather and paper. The town owes its existence as a manufacturing centre to the tsar Alexander I.

TAMPA, a city and the county seat of Hillsboro county, Florida, U.S.A., in the western part of the state, at the head of Hillsborough Bay (the E. branch of Tampa Bay), at the mouth of the Hillsborough river. Pop. (1880) 720; (1890) 5532; (1900) 15,839, of whom 5085 were foreign-born and 4382 were negroes; (1910, U.S. census) 37,782. It is served by the Tampa Northern, the Atlantic Coast Line and the Seaboard Air Line railways, and by lines of steamers to the West Indies and to the Gulf and Atlantic ports of the United States. The larger vessels enter at Port Tampa (pop. in 1905, 1049), 9 m - from the city, on the W. side of the peninsula separating Hillsborough Bay from Old Tampa Bay, the W. branch of Tampa Bay. In order to reach water sufficiently deep for the steamers, the railway tracks have been carried by earth filling about seven-eighths of a mile into the bay. The United States government has greatly improved the harbour, and in 1899 adopted a project (modified in 1905) for constructing a channel 26 ft. deep and 300 ft. wide (500 ft. across the bar) from Port Tampa to the Gulf of Mexico; in July 1909 80 per cent, of this work had been completed. In 1 905-1 908 the channel of Hillsborough Bay was made 20 ft. deep at mean low water and 1 50 ft. wide from the lower bay to the mouth of Hillsborough river, with a turning basin at the inner end 450 ft. wide and 1050 ft. long. Tampa Bay has permanent sea-coast defences. Tampa is the principal gateway for trade and travel between the United States and the West Indies. Owing to its delightful climate and its attractive situa- tion it has become a favourite health resort. Many visitors are attracted by the fishing (especially for tarpon) and shooting in the vicinity, water-fowl being

plentiful in the Bay, and deer, quail and wild turkeys being found in the vicinity inland. There are large prehistoric shell-mounds at Indian Hill, about 20 m. S.E. Tampa is an important shipping point for naval stores and phosphate rock, for vegetables, citrus fruit and pineapples, raised in the vicinity, and for lumber, cattle and fuller's earth. The Florida Citrus Exchange has its head-quarters here. After the Spanish-American War (1898) a large trade with the West Indies developed. Cattle and pine lumber are sent to Cuba, and Havana tobacco and fine grades of Cuban timber are imported. There is a large trade with Honduras also. The imports increased from $755,316 in 1897 a nd $490,093 in 1898 (an extremely unfavourable year owing to the Spanish- American War) to $4,179,464 in 1909; the exports from $820,792 in 1897 and $521,792 in 1898 to $1,344,786 in 1899 and $4,492,498 in 1909; a part of the custom-house clearings of Key West are actually shipped from Tampa. In 1905 the value of the factory product was $11,264,123, an increase of 59 per cent, since 1900. The principal product is cigars; most of the tobacco used is imported from Cuba, and the manufacturing is done chiefly by Cubans who live in a district known as Ybor City. It is said that more clear Havana cigars are manufactured in Tampa than in Havana. Other

manufactures are boilers, foundry products, lumber and fer- tilizers; and there are two shipyards.

Tampa Bay was the landing-place of the expeditions of the Spanish explorers, Pamfilo de Narvaez and Hernando de Soto. (See Florida.) In January 1824 the United States govern- ment established here a fort, Fort Brooke, which was an im- portant base of supplies during the second Seminole War, and around it a settlement gradually developed. The fort was abandoned in i860, and its site is now a public park. During the early part of the Civil War a small Confederate force was in possession, but in November

1862 it was driven out by United States gunboats. Tampa grew rapidly after the completion of the first railway thither in 1884, and in 1886 it was chartered as a city and became a port of entry. During the Spanish- Ameiican War United States troops were encamped in De Soto Park in Tampa, and Port Tampa was the point of embarkation for the United States army that invaded Cuba.

TAMPICO, a city and port of Mexico, in the state of Tamauli- pas, on the N. bank of the Panuco river, about 6 m. from the Gulf of Mexico. Pop. (1906) 17,569, including the neighbouring settlements connected with the port works. The climate is hot, humid and unhealthy, and the city has suffered frequently from epidemics of yellow fever. A modern sewer system and water- works, constructed in 1903–1906, have improved its sanitary condition and will in time reduce its heavy death-rate — about 78 per 1000 in 1903, when an epidemic of yellow fever caused 327 deaths, and the births numbered 512 against 1335 deaths. The eastern and poorer part of the town stands on low ground only 2 or 3 ft. above the river, and is subject to inundations. The western part rises about 150 ft., consists largely of private residences, and is provided with water and good drainage. The business section is well built, largely of stone and brick, and its streets are well paved and provided with gas and electric light. The neighbourhood is swampy and malarial. Tampico has two important railway connexions: the Monterrey and Gulf line running N.N.W. to Ciudad, Victoria and Monterrey, and a branch of the Mexican Central running westward to San Luis Potosi. There is also a line of river boats on the Panuco running up to the mouth of the Tamazunchale about 135 m., and another running to Tamiahua on the lagoon of that name by way of the Tuxpam canal, about 77 m. Industries include an electric light and power plant, factories for making ice, clothing, and fruit conserves, saw-mill, oil refinery, and a shipyard for small river boats. The modern port works, which have made Tampico accessible to a larger class of steamers, include two stone jetties at the mouth of

the Panuco, which have increased the depth of water on the bar to 23 ft. at low water and 26 ft. at high wa^er; seven wharves on the N. bank of the river to accommodate fourteen steamers at a time; steel sheds with railway tracks, and railway connexions at the wharves. The depth of water at the wharves varies from 18 to 25 ft. The exports include silver bullion (from San Luis Potosi, Aguascalientes, Torreon and Monterrey), ixtle fibre, sugar, hides, live cattle, cotton-seed cake, deer skins, honey, fustic, sarsaparilla, coffee, rubber, broom-root, copper ores and asphalt.

TAMWORTH, a municipality of Inglis county, New South Wales, Australia, on the Peel and Cockburn rivers, 285 m. by rail N. of Sydney. Pop. (1901) 5799. It is an attractive town in a pleasant situation, with fine broad streets lined with shady trees, and was the first town in Australia to be lighted by electricity. Tamworth is the centre of several goldfields, at one of which, Bingera, diamonds are found. It is also the market of a pastoral and agricultural district. Brewing, malting, steam, saw and flour milling, coach building and the manufac-ture of boots and galvanized iron are its principal industries.

TAMWORTH, a market town and municipal borough of England, in the Lichfield parliamentary division of Staffordshire and the Tamworth division of Warwickshire, on the river Tame, a southern tributary of the Trent. Pop. (1901) 7271. It is no m. N.E. from London by the London and North-Western railway, and is also served by the west and north line of the Midland railway (Bristol-Birmingham-Derby). The castle, xxvi. 13 a

situated on a height above the Anker near its junction with the Tame, is chiefly of the Jacobean period, but is enclosed by massive ancient walls. Here was a residence of the Mercian kings, and, after being bestowed on the Marmions by William the Conqueror, the castle remained for many years an important fortress. Formerly the town was surrounded by a ditch called the King’s Dyke, of which some

trace remains. The church of St Editha, originally founded in the 8th century, was rebuilt, after being burned by the Danes, by Edgar, who made it collegiate, but the existing Decorated building, was erected after a fire in 1345. The free grammar school, refounded by Edward IV., was rebuilt in 1677, and again in 1867. The charities include Guy's almshous.es, endowed in 1678 by Thomas Guy, founder of Guy's Hospital, London. On the commons or moors burgesses have rights of pasture. Coal, fireclay and blue and red brick clay are dug in the neighbourhood; and there are also market gardens. In the town are a clothing factory, paper-mills, and manufactures of small wares. The town is governed by a mayor, 4 aldermen, and 12 councillors. Area, 285 acres. >.

Tamworth (Tamwurda, Tkamworlh, Tomworth) is situated near the Roman Watling Street. It was burned by the Danes and restored in 913 by Aethelflead, lady of the Mercians, who built the fort which was the origin of the later castle. The town was again destroyed by the Danes in 943. There is no description of Tamworth in Domesday, but its burgesses are incidentally mentioned several times. In Anglo-Saxon and Norman times it possessed a mint, and it is called a borough in the Pipe Rolls of Henry II., but it was not then in a flourishing condition. Tamworth was incorporated by Elizabeth in 1560 by letters patent, which state that it is an " ancient mercate town," and suggest that the charters have been lost or burned. The governing charter in 1835 was that of Charles II., incorpo- rating it under the title of the bailiffs and commonalty of the borough of Tamworth in the counties of Stafford and Warwick. Edward III. granted two fairs, still kept up in 1792, tobe held respectively on St George's day and the day of the Translation of St Edward; another ancient fair, in honour of St Swithin, or perhaps originally of St Editha, is still held (July 26). Tamworth sent two members to parliament from 1562 to 1885, when its representation was merged in that of the county.

TANA, a river of British East Africa, which gives

its name to the Tanaland province of that protectorate. It has a course, following the main windings only, of over 500 m. Its sources are along the watershed close to the eastern wall of the eastern rift -valley, and it enters the Indian Ocean in 2° 40' S., about no m. N. by E. of Mombasa. One series of its numerous headstreams traverses the Kikuyu plateau north of the Athi, while others flow down the southern and eastern slopes of Kenya. The main stream, from about 37° E. 1° S., where it runs close to the upper waters of the. Athi, flows in a wide curve N.E., nearly reaching the equator. About 39° E. it turns S., and from this point is not known to receive any tributary of importance. Its course is very tortuous, the current rapid, and the channel much obstructed by snags. Its width varies, as a general rule, between 100 and 200 yds. The banks are usually low, in part forested and inundated at high water, but away from the river the country appears to consist of dry plains covered with mimosa scrub. Adjoining the lower Tana are many backwaters, which seem to show that the course has been subject to great changes. In 2° 20' S. the river again turns east, but during the last 10 m. it flows south-west, parallel to the coast, entering the sea across a dangerous bar. The Tana has been navigated in a steam-launch for some 300 m. from the mouth. North of the Tana is the Ozi, a small river con- nected with the Tana by the Belazoni canal.

TANAGER, a word adapted from the quasi-Latin Tanagra of Linnaeus, which again is an adaptation, perhaps with a classical allusion, of Tangara, used by M. J. Brisson and G. L. L. Buffon, and said by G. de L. Marcgrave (Hist. Rer. Nat. Brasiliae , p. 214) to be the Brazilian name of certain birds found in that country. From them it has since been extended to a great

many others mostly belonging to the southern portion of the New World, now recognized by ornithologists

as forming a distinct family Tanagridae of the Oscines division of Passerine birds allied to the Fringillidae (see Finch); and distinguished from them chiefly by their feebler conformation and more exposed nostrils. They are confined to the New World, and are specially characteristic of the tropical forests of Central and South America.

The tanagers have been examined systematically by P. L. Sclater, and in the British Museum Catalogue (xi. pp. 49–307) he admits the existence of 375 species, which he arranges in 59 genera, forming six subfamilies, Procniatinae, Euphoniinae, Tanagrinae, Lamprotinae, Phoenicophilinae, and Pitylinae. These are of very unequal extent, for, while the first of them consists of but a single species, Procnias tersa — the position of which may be for several reasons still open to doubt — the third includes more than 200. Nearly all are birds of small size, the largest barely exceeding a song-thrush. Most of them are remarkable for their gaudy colouring, and this is especially the case in those forming the genus called by Sclater, as by most other authors, Calliste, a term inadmissible through preoccupation, to which the name of Tanagra of right seems to belong, while that which he names Tanagra should probably be known as Thraupis. The whole family is almost confined to the Neotropical region, and there are several forms peculiar to the Antilles; but not a tenth of the species reach even southern Mexico, and not a dozen appear in the northern part of that country. Of the genus Pyranga, which has the most northern range of all, three if not four species are common summer immigrants to some part or other of tne United States, and two of them, P. rubra and P. aestiva, known as the scarlet tanager and the summer redbird, reach Canada and Bermuda. P. aestiva has a western representative, P. cooperi, which by some authors is not recognized as a distinct species. The males of all these are clad in glowing red, P. rubra having, however, the wings and tail black. The remaining species, P. ludoviciana, the males of which are mostly yellow and black, with the head only red, does not appear eastward of the Missouri

plains, and has not so northerly a range. Another species, P. hepatica, has shown itself within the limits of the United States. In all these the females are plainly attired; but generally among the Tanagers, however bright may be their coloration, both sexes are nearly alike in plumage. Little has been recorded of the habits of the species of Central or South America, but those of the north have been as closely observed as the rather retiring nature of the birds renders possible, and it is known that insects, especially in the larval condition, and berries afford the greater part of their food. They have a pleasing song, and build a shallow nest, in which the eggs, generally three in number and of a greenish-blue marked with brown and purple, are laid. A few species are regularly but sparingly imported into Europe alive, and do well as cage birds.

On the whole the Tanagridae may perhaps be considered to hold the same relation to the Fringillidae as the Icteridae do to the Sturnidae and the Mnioiiltidae to the Sylviinae or Turdinae, in each case the purely New-World Family being the " feebler " type.

(A. N.)

TANAQUIL, the Etruscan name of the wife of Tarquinius Priscus, or of one of his sons. After her immigration to Rome she is said to have received the name Gaia Caecilia. She was famous for her shrewdness and prophetic gifts, which enabled her to foretell the future greatness of her husband and of Servius Tullius. There was a statue of her as Gaia Caecilia in the temple of Sancus, which possessed magical powers. She was celebrated as a spinner of wool, and was supposed to exercise influence over Roman brides. Tanaquil and Gaia Caecilia are, however, really distinct personalities. The anecdotes told of Gaia Caecilia are aetiological myths intended to explain .certain usages at Roman marriages.

See Livy, i. 34, 41; Pliny, Nat. Hist., viii. 74,

xxxvi. 70; Schwegler, Romische Ceschichte, bk. xv. 8.

TANAUAN, a town of the province of Batangas, Luzon, Philippine Islands, about 38 m. S.S.E. of Manila. Pop. (1903) 18,263. Tanauan is situated on a rolling upland plain. It formerly produced much sugar, but its inhabitants are now engaged chiefly in the cultivation of rice, Indian corn and fruit. Oranges and hogs are sent from Tanauan to the Manila market. The language is Tagalog.

TANCRED (d. 1112), nephew of Bohemund and a grandson of Robert Guiscard on the female side, was the son of a certain Marchisus, in whom some have seen a marquis, and some an Arab (Makrizi). He took the Cross with Bohemund in 1096, and marched with him to Constantinople. Here he refused to take an oath to Alexius, escaping across the Bosphorus in

the disguise of a peasant; but after the capture of Nicaea he consented to follow the example of the other princes, and became the man of Alexius. At Heraclea, in the centre of Asia Minor, he left the main body of the Crusaders, and struck into Cilicia, closely followed by Baldwin of Lorraine. He may have been intending, in this expedition, to prepare a basis for Bohemund's eastern principality; in any case, he made himself master of Tarsus, and when he was evicted from it by the superior forces of Baldwin, he pushed further onwards, and took the towns of Adana and Mamistra. He joined the main army before Antioch, and took a great part in the siege. When, in the spring of 1098, two castles were erected by the crusaders, it was Tancred who undertook the defence of the more exposed castle, which lay by St George's Gate, on the west of the city. In the beginning of 1099 he was serving in the ranks of Ray- mund's army, whether to observe his movements in the interests of Bohemund, or only (as is more probable) to be in the front of the fighting and the march to Jerusalem. But he soon left the count, like so many of the other pilgrims (see under Ray- mund); and he joined himself to Godfrey of Lorraine in the final march. In June 1099 he helped

Baldwin de Burg (his future rival) in the capture of Bethlehem; and he played his part in the siege of Jerusalem, gaining much booty when the city was captured, and falling into a passion because the security he had given to the fugitives on the roof of Solomon's temple was not observed by the crusaders. After the capture of Jerusalem he went to Naplous, and began to found a principality of his own. He took part in the battle of Ascalon in August; and after it he was invested by Godfrey with Tiberias and the principality of Galilee, to the north of Naplous. In 1100 he attempted, without success, to prevent Baldwin of Lorraine (his old enemy in Cilicia) from acquiring the throne of Jerusalem, possibly having ambitions himself, and in any case fearing the foundation of a strong non-Norman power in Palestine. Failing in this attempt, and being urgently summoned from the North to succeed Bohemund (now a prisoner with Danishmend) in the government of Antioch, he surrendered his smaller possessions to Baldwin, on condition that they should be restored if he returned in a year and three months, and finally left the kingdom of Jerusalem. He acted as regent in Antioch from 1100 to 1103, when Bohemund regained his liberty. During these years he succeeded in regaining the Cilician towns for Antioch (1101), and in recapturing Laodicea (1103); he imprisoned Raymund of Toulouse, and only gave him his liberty on stringent condi- tions; and he caused the restoration of the deposed patriarch of Jerusalem, Dagobert, if only for a brief season, by refusing to aid Baldwin I. on any other terms. When Bohemund was set free, Tancred had to surrender Antioch to him; but he soon found fresh work for his busy hands. In n 04 he joined with Bohemund and Baldwin de Burg (now count of Edessa in succession to Baldwin of Lorraine) in an expedition against Harran, in which they were heavily defeated, and Baldwin was taken prisoner. Tancred, however, profited doubly by the defeat. He took over the government of Edessa in Baldwin's place; and in 1105 Bohemund surrendered to him the govern- ment of Antioch, while he himself went to Europe to seek reinforcements. Ruler of the two northern

principalities, Tancred carried on vigorous hostilities against his Mahommedan neighbours, especially Rid wan of Aleppo; and in n 06 he succeeded in capturing Apamea. In 1107, while Bohemund was beginning his last expedition against Alexius, he wrested the whole of Cilicia from the Greeks; and he steadfastly refused, after Bohemund's humiliating treaty at Durazzo in nc8, to agree to any of its stipulations with regard to Antioch and Cilicia. To the hostility of the Mahommedans and the Greeks, Tancred also added that of his own fellow Latins- When Baldwin de Burg regained his liberty in 1108, it was only with difficulty that he was induced to restore Edessa to him, and the two continued unfriendly for some time; while in 1109 he also interfered in the civil war in Tripoli between the nephew and the eldest son of Raymund of Toulouse. But it was against the emirs of Northern Syria that his arms were chiefly directed;

and he became the hammer of the Turks, restlessly attacking the emirs on every side, but especially in Aleppo, and exacting tribute from them all. He died in in 2, leaving the govern- ment to his brother-in-law, Roger de Priricipatu, until such time as Bohemund II. should come to his inheritance.

Bibliography.— Tancred's Gesta were recorded by Ralph of Caen, who drew his information from Tancred's own conversation and reminiscences. Kugler has written a work on Bohemund und Tancred (Tubingen, 1862); and Tancred's career is also described by Rey, in the Revue de I'Orient Latin, iv. 334-340. (E. Br.)

TANCRED (d. 1194), King of Sicily, an illegitimate son of Roger, the eldest son of King Roger II., was crowned in January iiqo in succession to William II. (q.v.). He was supported by the chancellor Matthew d'Ajello and the official class, while the rival claims of Roger II. 's daughter Constance and her

husband, Henry VI., king of the Romans and emperor, were supported by most of the nobles. Tancred was a good soldier, though his tiny stature earns from Peter of Eboli the nick- name " Tancredulus." But he was ill-supported in his task of maintaining the Norman kingdom, faced with general apathy, and threatened by a baronial revolt, and, in addition, Richard Coeur-de-Lion, at Messina, iiqo, threatened him with war. Henry, skilfully winning over Pisa, Genoa and the Roman Commune, isolated Tancred and intimidated Celestine III., who, on the 14th of April 1191, crowned him emperor at Rome. He, however, failed to capture Naples in August and retired north, leaving garrisons along the frontiers of the Regno. Tancred now sought to win over the towns by extensive grants of privi- leges, and at Gravina (June 1192) was recoenized by the pope, whose ineffectual support he gained by surrendering the royal legateship over Sicily. In 1192 and 1193 he commanded per- sonally and with success against the Apulian barons, but his death at Palermo (20th of February 1194) a. few days after that of Roger, his son and joint-king, made Henry's path clear. His wife Sibilla indeed maintained a regency for her second son William III., but on Henry's final descent, Naples surrendered almost without a blow in May 1194, and the rest of the Regno followed. Sibilla and the loyal Margarito prepared to defend Palermo, but the citizens admitted the emperor on the 20th of November 1194. Tancred's family fell into Henry's hands, and William III. seems to have died in Germany in 1198.

TANDY, JAMES NAPPER (1740-1803), Irish rebel, son of a Dublin ironmonger, was born in Dublin in 1740. He started life as a small tradesman; but turning to politics, he became a member of the corporation of Dublin, and made himself popular by his denunciation of municipal corruption and by his proposal of a boycott of English goods in Ireland, in retaliation for the restrictions imposed by the government on Irish commerce. In April 1780 Tandy was expelled from the Dublin volunteers (see Flood, Henry) for proposing the expulsion of the duke of Leinster,

whose moderation had offended the extremists. He was one of the most conspicuous of the small revolutionary party, chiefly of the shopkeeper class, who formed a permanent committee in June 1784 to agitate for reform, and called a con- vention of delegates from all parts of Ireland, which met in October 1784. Tandy persuaded the corporation of Dublin to condemn by resolution Pitt's amended commercial resolutions in 1785. He became a member of the Whig club founded by Grattan; and he actively co-operated with Theobald Wolfe Tone in founding the Society of the United Irishmen in 1791, •of which he became the first secretary. The violence of his opinions, strongly influenced by French revolutionary ideas, now brought Tandy prominently under the notice of the govern- ment. In February 1792 an allusion in debate by Toler (after- wards earl of Norbury) , the attorney-general, to Tandy's personal ugliness, provoked him into sending a challenge; this was treated by the House of Commons as a breach of privilege, and a Speaker's warrant was issued for his arrest, which however hemanaged to elude till its validity expired on the prorogation of parliament. Tandy then took proceedings against the lord lieutenant for issuing a proclamation for his arrest; and although the action failed, it increased Tandy's popularity, and his

expenses were paid by the Society of the United Irishmen. Sympathy with the French Revolution was at this time rapidly spreading in Ireland. A meeting of some 6000 persons in Belfast voted a congratulatory address to the French nation in July 1791. In the following year Napper Tandy took a leading part in organizing a new military association in Ireland modelled after the French National Guards; they professed republican principles, and on their uniform the cap of liberty instead of the crown surmounted the Irish harp. Tandy also, with the purpose of bringing about a fusion between the Defenders and the United Irishmen, took the oath of the Defenders, a Roman Catholic society whose agrarian and political violence had been increasing

for several years; but being threatened with prose- cution for this step, and also for libel, he fled to America, where he remained till 1798. In February 1798 he went to Paris, where at this time a number of Irish refugees, the most prominent of whom was Wolfe Tone, were assembled, planning rebellion in Ireland to be supported by a French invasion, and quarrelling among themselves. None of these was more quarrelsome than Napper Tandy, who was exceedingly conceited, and habitually drunken; his vanity was wounded to find himself of less account than Tone in the councils of the conspirators.

Wolfe Tone, who a few months before had patronizingly described him to Talleyrand as ” a respectable old man whose patriotism has been known for thirty years,” was now disgusted by the lying braggadocio with which Tandy persuaded the French authorities that he was a personage of great wealth and influence in Ireland, at whose appearance 30,000 men would rise in arms. Tandy was not, however, lacking in courage. He accepted the charge of a corvette, the ” Anacreon,” placed at his disposal by the French government, in which, accom- panied by a few leading United Irishmen, and supplied with a small force of men and a considerable quantity of arms and ammunition for distribution in Ireland, be sailed from Dunkirk and arrived at the isle of Aran, off the coast of Donegal, on the 1 6th of September 1798. The populace showed no disposition to welcome the invaders. Napper Tandy, who was drunk during most of the expedition, took possession of the village of Rutland, where he hoisted an Irish flag and issued a bombastic proclamation; but learning the complete failure of Humbert’s expedition, and that Connaught instead of being in open rebellion was perfectly quiet, the futility of the enterprise was apparent to the French if not to Tandy himself; and the latter having been carried on board the ” Anacreon ” in a state of intoxica- tion, the vessel sailed round the north of Scotland to avoid the English fleet, and reached Bergen in safety, whence Tandy made his way to Hamburg with three or four companions. In compliance with a peremptory demand

from the English govern- ment, and in spite of a counter-threat from the French Directory, the refugees were surrendered. Tandy remained in prison till April 1801, when he was tried, pleaded guilty, and was sentenced to death; he was, however, reprieved and allowed to go to France. This leniency may have been partly due to doubts as to the legality of the demand for his surrender by the Hamburg authorities; but the government was probably more influenced by Cornwallis's opinion that Tandy was " a fellow of so very contemptible a character that no person in this country (Ireland) seems to care the smallest degree about him." Moreover, Bonaparte vigorously intervened on his behalf, and is even said to have made Tandy's release a condition of signing the treaty of Amiens. Notwithstanding his vices and his lack of all solid capacity, there is no reason to suppose that Napper Tandy was dishonest or insincere; and the manner in which his name was introduced in the well-known ballad, "The Wearing of the Green," proves that he succeeded in impressing the popular imagination of the rebel party in Ireland. In France, where his release was regarded as a French diplomatic victory, he was received, in March 1802, as a person of distinction; and when he died on the 24th of August 1803 his funeral was attended by the military and an immense number of the civil population.

See R. R. Madden, The Lives of the United Irishmen, 7 vols. (Dublin, 1842-46); W. J. MacNeven, Pieces of Irish History (New

York, 1807); T. Wolfe Tone, Autobiography, ed. by R. Barry O'Brien, 2 vols. (London, 1893); W. J. Fitzpatrick, Secret Service under Pitt (London, 1892); Sir Richard Musgrave, Memoirs of Rebellions in Ireland, 2 vols. (Dublin, 1802); J. A. Froude, The English in Ireland in the Eighteenth Century, 3

vols. (London, 1872–74); Castlereagh Correspondence, i., ii. ; Cornwallis Corre- spondence, ii., iii. (R. J. M.)

TANEGA-SHIMA, an island lying to the south of Kiushiu, Japan, in 30° 50' N. and 131 E., 36 J m. long and "]\ m. broad at its widest part. It is a long low stretch of land, carefully culti- vated, and celebrated as the place where Mendez Pinto landed when he found his way to Japan in 1543. Until modern times firearms were colloquially known in Japan as " Tanega-shima," in allusion to the fact that they were introduced by Pinto.

TANEY, ROGER BROOKE (1777–1864), American jurist, was born in Calvert county, Maryland, on the 17th of March 1777, of Roman Catholic parentage. He graduated from Dickinson College, Carlisle, Pennsylvania, in 1795, began the study of law at Annapolis in 1796, and was admitted to the bar in 1799. In 1806 he married Anne Phebe Key, sister of Francis Scott Key. He entered politics as a Federalist, and was a member of the Maryland House of Delegates in 1 799–80. His faith in Federalism was weakened by the party's opposition to the War of 18:2, and he gradually became associated with the Jacksonian wing of the Republican party. He served in the state Senate in 1816–21, was attorney-general of Maryland in 1827–31; and in July 1831 entered President Jackson's cabinet as attorney-general of the United States. He was the President's chief adviser in the attack on the United States Bank, and was transferred to the treasury department in September 1833 for the special purpose of removing the govern- ment deposits. This conduct brought him into conflict with the Senate, which passed a vote of censure, and (in June 1834) refused to confirm his appointment as secretary of the treasury. He returned to his law practice in Baltimore, but on the 28th of December 1835 was nominated Chief - Justice of the United States Supreme Court to succeed John Marshall. After strong opposition the nomination was confirmed, on the 15th of March 1836, by the Senate. Under the guidance of Judges John Jay, Marshall, and Joseph Story, the judiciary from

1790 to 1835 had followed the Federalist loose construction methods of interpreting the constitution. The personnel of the supreme bench was almost entirely changed during President Jackson's administration (1829–37). Five of the seven judges in 1837 were his appointees, and the majority of them were Southerners who had been educated under Democratic influences at a time when the slavery controversy was forcing the party to return to its original strict construction views. In consequence, although the high judicial character of the men appointed and the lawyers' regard for precedent served to keep the court in the path marked out by Marshall and Story, the state sovereignty influence was occasionally manifest, as, for example, in the opinion (written by Taney) in the Dred Scott case (1857, 19 Howard, 393) that Congress had no power to abolish slavery in territory acquired after the formation of the national govern- ment. During the Civil War, Judge Taney struggled unsuc- cessfully to protect individual liberty from the encroachments of the military authorities. In the case of ex parte John Merryman (1861, Campbell's Reports, 646), he protested against the assumption of power by the President to suspend the privileges of the writ of habeas corpus or to confer that power upon a military officer without the authorization of Congress. The delivering of this opinion, on circuit, in Baltimore, in May 1861, was one of the judge's last public acts. He died on the 12th of October 1864.

An authoritative biography is Samuel Tyler's Memoir of Roger Brooke Taney (Baltimore, 1872).

TANGA (" the sail "), a seaport of German East Africa, lying opposite the island of Pemba in 5 6' S., 39° 7' E. The town is regularly laid out on elevated ground on the southern shore of Tanga Bay, and has a population of about 6000. Among the public buildings are the administrator's residence, the hospital, the boma (barracks), Protestant and Catholic churches and the

government and mission schools. Tanga is the port of

the Usambara district, where are many thriving plantations. The harbour is entered by a broad channel five to eight fathoms deep. It is a port of call for the German mail steamers, and the starting-point of a railway to the Usambara highlands.

TANGANYIKA (a name said by V. L. Cameron to signify a " mixing-place "), a vast lake in East-Central Africa, the longest freshwater lake in the world, measuring just over 400 m., with a general breadth varying from 30 to 45 m., and an area of about 12,700 sq. m. It lies at an altitude of about 2600 ft. above the sea, and occupies the southern end of the great central rift-valley, which terminates suddenly at its southern point, the line of depression being represented farther south by the more easterly trough of Lakes Nyasa and Rukwa, from which Tanganyika is separated by the Fipa plateau, composed of old granitoid rocks; though even here traces of old valley-walls are said by Dr Kohlschiitter to exist. North of Tanganyika the valley is suddenly interrupted by a line of ancient eruptive ridges, which dam back the waters of Lake Kivu (q.v.), but have been recently cut through by the outlet of that lake, the Rusizi, which enters Tanganyika by several mouths at its northern end. The flat plain traversed by the lower Rusizi was evidently once a portion of the lake floor. Tanganyika has been formed by the subsidence of a long narrow tract of country relatively to the surrounding plateaus, which fall to the lake in abrupt cliffs, some thousands of feet high in places. The geological forma- tions thus exposed show that the plateaus are composed of a base of eruptive material, overlaid by enormous deposits of reddish sandstones, conglomerates and quartzites, exposed in parts to a depth of 2000 feet. Besides the plain to the north, a considerable area to the west, near the Lukuga outlet (see below), shows signs of having been once covered by the lake, and it is the opinion of Mr J. E.S.Moore that the sandstone ridges which here bound the trough have been recently elevated, and have been cut through by the Lukuga during the process.

The past history of the lake has long been a disputed question, and Mr Moore's view that it represents an old Jurassic arm of the sea is contested by other writers. This idea originated in the discovery of a jelly-fish, gasteropods, and other organisms of a more or less marine type, and presenting some affinity with forms of Jurassic age. This fauna, to which the term " halo- limnic " has been applied, was known to exist from specimens obtained by Mr E. C. Hore and other early travellers, but has been more systematically studied by Mr Moore (during expedi- tions of 1896 and 1898-99) and Dr W. A. Cunnington (1904-5). Various considerations throw doubt on Mr Moore's theory, especially the almost entire absence of marine fossiliferous beds in the whole of equatorial Africa at a distance from the sea, of any remains of Jurassic faunas which might link the Tanganyika forms with those of undoubted Jurassic age in neighbouring regions. The formation of the existing rift-valley seems in any case to date from Tertiary times only.

Although drinkable, the water of the lake seems at times at least to be very slightly brackish, and it was supposed by some that no outlet existed until, in 1874, Lieutenant Cameron showed that the surplus water was discharged towards the upper Congo by the Lukuga river, about the middle of the west coast. The outlet was further examined in 1876 by Mr (afterwards Sir Henry) Stanley, who found that a bar had formed across the outlet, and it has since been proved that the outflow is intermittent, ceasing almost entirely after a period of scanty rainfall, and becoming again established when the lake-level has been raised by a series, of rainy years. About 1880 it was running strongly, but about this time a gradual fall in the lake-level set in, and was continued, with occasional pauses, for some twenty years, the amount being estimated by Wissmann at 2 feet annually. In 1896 Captain H. Ramsay found that a wide level plain, which had before been covered by water, intervened between Ujiji and the lake, but stated that no further sinking had taken place

during the two previous years. Near Tembwe Head Mr L. A. Wallace found recent beaches 16 feet above the existing level. The Lukuga was reported blocked by a bar about 1897, but a certain amount of water was found flowing down by Mr Moore in 1899; while in 1901 Mr Codrington found the level 4 or 5 feet higher than in 1900, the outlet having again silted up. A continued rise was also reported in 1907. In any case, the alterations in level appear

to be merely periodic, and due to fluctuations in rainfall, and do not point, as some have supposed, to a secular drying up of the lake.

The lake is fed by a number of rivers and small streams which descend from the surrounding highlands. The Mlagarazi (or Malagarasi), perhaps the largest feeder, derives most of its water from the rainy districts east of the strip of high ground which shuts in the lake on the north-east. The main stream, in fact, has a nearly circular course, rising in 4° 40' S., only some 10 miles from the lake shore and less than 40 miles from its mouth, though its length is at least 220 miles. The other branches of the Mlagarazi, which traverse the somewhat arid granite plateaus between the lake and 33° E., bring comparatively little water to the main stream. In its lower course the river is a rapid stream flowing between steep jungle-clad hills, with one fall of 50 feet, and is of little use for navigation. The various channels of its delta are also obstructed with sand-banks in the dry season. The Rusizi, the next (or perhaps equal) in importance among the feeders of the lake, has already been spoken of. It receives many tributaries from the sides of the rift-valley, and is navigable for canoes. The remaining feeders are of distinctly less importance, the Lofu, which enters in the south-west, being probably the largest.

Tanganyika has never been sounded systematically,

but the whole configuration of its valley points to its being generally deep, and this has been confirmed by a few actual measurements. Dr Livingstone obtained a depth of 326 fathoms opposite Mount Kabogo, south of Ujiji. Mr Hore often failed to find bottom with a line of 168 fathoms. The French explorer, Victor Giraud, re- ported 647 metres (about 350 fathoms) off Mrumbi on the west coast, and Moore depths of 200 fathoms and upwards near the south end. The shores fall rapidly as a rule, and there is a marked scarcity of islands, none occurring of any size or at a distance from the coast line. The lake is subject to occasional storms, especially from the south-south-east and south-west, which leave a heavy swell and impede navigation. The cloud and thunder and light- ning effects are spoken of as very impressive, and the scenery of the lake and its shores has been much extolled by travellers.

Vegetation is generally luxuriant, and forest clothes portions of the mountain slopes. The lake lies on the dividing line between the floral regions of East and West Africa, and the oil-palm characteristic of the latter is found on its shores. The largest timber tree is the mvule, which attains vast dimensions, its trunk supplying the natives with the dug-out canoes with which they navigate the lake. The more level parts of the shores have a fertile soil and produce a variety of crops, including rice, maize, manioc, sweet potatoes, sugar-cane, &c, &c. The waters display an abundance of animal life, crocodiles and hippopotami occurring in the bays and river mouths, which are also the haunts of water- fowl of many kinds. Fish are also plentiful. Various sections of the Bantu division of the Negro race dwell around the lake, those on the west and south-west showing the most pronounced Negro type, while the tribes on the east exhibit some intermixture with representatives of the Hamitic stock, and (towards the south) some traces of Zulu influence. The surrounding region has been overrun by Arabs and Swahili from the East African coast.

Though rumours of the existence of the lake had previously reached the east coast, Tanganyika was not visited by any European until, in 1858, the famous expedition of Burton and Speke reached the Arab settlement of Ujiji and partially ex- plored the northern portion. Ujiji became famous some years later as the spot where Dr Livingstone was found by Stanley in 1 87 1, after being lost to sight for some time in the centre of the continent. The southern half of the lake was first circum- navigated by Lieutenant V. L. Cameron in 1874, and the whole lake by Stanley in 1876. The mapping of Tanganyika, which long rested on the surveys of Mr E. C. Hore, published in 1882, received considerable modification, about 1899-1900, from the work of Fergusson, Lemaire, Kohlschutter and others, who showed that while the general outline of the coasts had been drawn fairly correctly, the whole central portion, and to a lesser degree the northern, must be shifted a considerable distance to the west. At Mtowa, in 5 43' S., the amount of shifting of the west coast was about 30 miles. At Ujiji, on the east coast, the longitude was given by Kohlschutter as 29° 40' 2" E. as compared with 30 4' 30" E. of Cameron, a difference of some 25 miles.

In the partition of Africa among the European Powers, the shores of Tanganyika have been shared by Belgium, Great Britain and Germany, Great Britain holding the southern extremity, Germany the east, and Belgium the west. Stations have been established on the lake by all three Powers, the principal being — German: Bismarckburg in the south and Ujiji in the north; British: Sumbu and Kasakalawe, on

Cameron Bay; Belgian: Mtowa or Albertville in 6° S. Mis- sionaries, especially the Catholic " White Fathers," are also active on its shores. A small steamer, the " Good News," was placed on the lake by the London Missionary Society in 1884, but afterwards became the property of the African Lakes Corpo- ration; a larger steamer, the " Hedwig von Wissmann," carrying a quick-firing Krupp gun, was launched in 1900 by a German expedition under Lieutenant Schloifer; and others are owned by the "

Tanganyika Concessions ” and Katanga companies. The greater part of the trade with Tanganyika is done by the African Lakes Corporation by the Shire-Nyasa route, but the Germans have opened up overland routes from Dar-es-Salaam.

Authorities. — The narratives of Burton, Livingstone, Cameron and Stanley; E. C. Hore, Lake Tanganyika (London, 1892); J. E. S. Moore, in Geogr. Journal, September 1897 and January 1 90 1 ; To the Mountains of the Moon (London, 1901); The Tangan-yika Problem (London, 1903); L. A. Wallace, Geogr. Journal, June 1899; H. Ramsay, in Verhandl. d. Gesell. fur Erdkunde Berlin, No. 7, 1898; H. Glauning and E. Kohlschutter, in Mitt, aus den Deutschen Schutzgebieten, Nos. 1 and 2, 1900; E. Kohlschutter, in Verhandl. 13 Deutsch. Geographentages, 1901 ; M. Fergusson, in Geol. Mag., August 1901 ; E. Stromer, in Petermanns Mitteil., December 1901 ; R. Codrington, in Geogr. Journal, May 1902; W. H. Hudleston, in Transactions Victoria Inst., 1904; also papers on the results of Dr W. A. Cunnington’s expedition in Proceedings of the Zoological Society, 1906, &c. ; Journal of the Linnean Society, 1907. (E. He.)

TANGERMUNDE, a town of Germany, in the Prussian province of Saxony, on the Elbe, 43 m. N.E. from Magdeburg by rail via Stendal. Pop. (1905) 12,829. It contains iron foundries, shipbuilding yards, refineries, and other industrial establishments, and enjoys a considerable river trade in grain and coal. It is ornamented by numerous brick buildings of the 14th and 15th centuries, including the turreted walls, the church of St Stephen (1376), and the late Gothic town hall. The castle, built in the 14th century, was the chief residence of the margraves of Brandenburg.

See Gotze, Geschichte der Burg Tangermunde (Stendal, 1871).

TANGIER (locally Tanjah), a seaport of Morocco, on the Straits of Gibraltar, about 14 m. E. of Cape Spartel, nestles between two eminences at the N.W.

extremity of a spacious bay. . The town, which has a population of about 40,000, presents a picturesque appearance from the sea, rising gradually in the form of an amphitheatre, with the citadel, the remainder of the English mole and York Castle to the right : in the central valley is the commercial quarter, while to the left along the beach runs the track to Tetuan. Though rivalry between European Powers led to many public works being delayed, through the action of the public Sanitary Association the streets, which are narrow and crooked, have been re-paved as well as cleaned and partially lighted, and several new roads have been made outside the town. In some of the older streets European shops have replaced the picturesque native cupboards ; drinking dens have sprung up at many of the corners, while telephones and electric light have been introduced by private companies, and European machinery is used in many of the corn-mills, &c. The main thoroughfare leads from Bab el Marsa (Gate of the Port) to the Bab el Sok (Gate of the Market-place) known to the English as Port Catherine. The sok presents a lively spectacle, espe- cially upon Thursdays and Sundays.

Tangier is almost destitute of manufactures, and while the trade, about £750,000 a year, is considerable for Morocco, it is confined chiefly to imports, about two-fifths of which come from Great Britain and Gibraltar, and one quarter from France. The exports are chiefly oxen, meat, fowls and eggs for Gibraltar and sometimes for Spain, with occasional shipments of slippers and blankets to Egypt. Most of the trade, both wholesale and retail, is in the hands of the Jews (see further Morocco).

The harbour formed by the Bay of Tangier is an extensive one, the best Morocco possesses, and good in all weathers except during a strong east wind, but vessels of any size have to anchor a mile or so out as the shore to the west is shallow and sandy, and to the east, rocky and shingly. Since 1907 a basin with an outer and inner mole has been built. It does not, however,

accommodate large vessels. The climate is temperate and healthy, and good for consumptives.

As the seaport nearest to Europe, Tangier is the town in the empire in which the effects of progress are most marked, and since the end of the 18th century it has' been the diplomatic headquarters. The nucleus of a cosmopolitan society thus formed has expanded into a powerful community enjoying privileges and immunities unknown to natives not receiving its protection. The steadily increasing number of visitors has induced the opening of first-class hotels, and necessitated extensive building operations, resulting in the immigration of some thousands of artisans, chiefly Spanish. The number of European inhabitants (1905) was about 9000 (7500 Spaniards); of Jews about 10,000.

The Roman Tingis, which stood in the immediate vicinity of the site of Tangier, was of great antiquity; under Augustus it became a free city, and when Otho placed the western half of Mauretania under a procurator, he called it Mauretania Tingitana after its capital Tingis. It was held by Vandals, Byzantines and Arabs, and when Mulai Idris passed from Tlemcen to Fez in 788, Tangier was " the oldest and most beautiful city " of the Maghrib. After »iany futile attempts the Portuguese obtained possession of it in 1471, but it passed to Spain in 1580, returning again to the Portuguese in 1656. In 1662 as part of the dowry of Catherine of Braganza on her marriage to Charles II., it came into the possession of the English, and they defended it against Mulai Ismail in 1680, but in 1684 it was decided, on account of expense, to abandon the place to the Moors. El Ufrani writes that " it was besieged so closely that the Christians had to flee on their vessels and escape by sea, leaving the place ruined from bottom to top." It was bombarded in 1844 by the French, then at war with Morocco. In the early years of the 20th century the sharlf

Raisuli terrorized the district round Tangier and made captive several Europeans. As one result of the Algeciras conference of 1906 a regular police force was organized, and the control of the customs passed into European hands (see Morocco: § History).

See A. Cousin, Tanger (Paris, 1902) ; Archives Marocaines (Paris,

1904-6).

TANGYE, SIR RICHARD (1833-1906), British manufacturer, was born at Illogan, near Redruth, Cornwall, on the 24th of November 1833, the son of a small farmer. As a young boy he worked in the fields, but when he was eight years old he was incapacitated from further manual labour by a fracture of the right arm. His father then determined to give him the best education he could afford, and young Tangye was sent to the Friends' School at Sidcot, Somersetshire, where he progressed rapidly and became a pupil-teacher. Tangye was not long con- tented with this position, and through an advertisement in The Friend obtained a clerkship in a small engineering firm in Birmingham, where two of his brothers, skilled mechanics, subsequently joined him. Here Richard Tangye remained four years, obtaining a complete mastery of the details of an engineer- ing business, and introducing the system of a Saturday half- holiday which was subsequently adopted in all English industrial works. In 1856 he started business in a small way in Birming- ham as a hardware factor and commission agent. His first customers were the Cornish mine-owners in the Redruth district, and, the business prospering, he was able before long to start manufacturing hardware goods on his own account, his two brothers joining him in the enterprise. The speciality of the brothers Tangye was the manufacture of machinery, and their hydraulic lifting jacks were successfully employed in the launch- ing of the steamship " Great Eastern." In 1858 the firm, who now confined themselves to making machinery, built their own works, and shortly afterwards secured the sole right of manu- facturing the newly invented differential

pulley-block, thereby materially adding to their business, which came to include every kind of power-machine — hydraulic, steam, gas, oil and electricity. The business was subsequently turned into a limited company, and in 1894 Richard Tangye was knighted. He died on the 14th of October 1906.

TANISTRY (from Gaelic tana, lordship), a custom among various Celtic tribes, by which the king or chief of the. clan was chosen from among the heads of the septs and elected by them in full assembly. He held office for life and was required by custom to be of full age, in possession of all his faculties and without any remarkable blemish of mind or body. At the same time, and subject to the same conditions, a tanist or next heir to the chieftaincy was elected, who if the king died or became disqualified, at once became king. Usually the king's son became tanist, but not because the system of primogeniture was in any way recognized; indeed, the only principle adopted was that the dignity of chieftainship should descend to the eldest and most worthy of the same blood. These epithets, as Hallam says, were not necessarily synonymous, but merely indicated that the preference given to seniority was to be controlled by a due regard to desert (Conslit. Hist., vol. iii. c. xviii.). This system of succession left the headship open to the ambitious, and was -a frequent source of strife both in families and.between the clans. Tanistry was abolished by a legal decision in the reign of James I. and the English land system substituted.

TANJORE, a city and district of British India in the Madras presidency. The city is situated on the right bank of the river Cauvery, and is an important junction on the South Indian railway, 218 m. S. of Madras. Pop. (1901) 57,870. As the last capital of the ancient Hindu dynasty of the Cholas, and in all ages one of the chief political, literary and religious centres of the south, the city is full of interesting associations. It was the scene of the earliest labours of Protestant missionaries in India. The modern history of Tanjore begins with its conquest by the Mahrattas in 1674 under Venkaji, the

brother of Sivaji the Great. The British first came into contact with Tanjore by their expedition in 1749 with a view to the restoration of a deposed raja. , In this they failed, and a subsequent expedition was bought off. The Mahrattas practically held Tanjore until 1799. In October of that year the district was ceded to the East India Company in absolute sovereignty by Raja Sharab- hoji, pupil of the missionary Schwarz. The raja retained only the capita] and a small tract of country round. He died in 1833 and was succeeded by his son Sivaji, on whose death in 1855 without an heir the house became extinct. The mission at Tanjore was founded in 1778 by the Rev. Christian F. Schwarz or Schwartz (1726-1798). The mission establishments were taken over in 1826 by the Society for the Propagation of the Gospel, which subsequently founded new stations in several parts of the district. Roman Catholic missions date from the first half of the 17th century. St Peter's College, founded by Schwarz as a school, is now a first-grade college affiliated to the university of Madras. His church dates from 1779. Among interesting ancient buildings may be mentioned the palace within the fort, containing an armoury and fine library; and the Brihadiswaraswami temple, of the nth century, enclosed in two courts, surmounted by a lofty tower and including the exquisitely decorated shrine of Subrahmanya. Though the city has specialities of jewelry, carpets, modelling in pith, &c, there are no large industries.

The District of Tanjore has an area of 3710 sq. m. On account of its fertility it has been called the " Gaiden of Southern India." It is irrigated by an elaborate system of dams, cuts and canals in connexion with the rivers Cauvery and Colcroon, and the soil is exceedingly productive. The delta of the Cauvery occupies the flat northern part, which is highly cultivated, dotted over with groves of coco-nut trees, and is one of the most densely populated tracts in India. The staple crop is rice, which is grown on 77 per cent, of the cultivated area. Tanjore is a land of temples, many of them being of

very early date. The district is traversed by the main line and several branches of the South Indian railway, some of which have been constructed by the district board. The chief seaport is Nega- patam, and the principal export is rice to Ceylon. The popula- tion in 1901 was 2,245,029.

See Tanjore District Gazetteer (Madras, 1906).

TANKARD, a type of drinking vessel. The word was formerly- used loosely of many sizes, usually large, of vessels for holding liquids; thus it was applied to such as held two or more gallons and were used to carry water from the conduits in London in the 16th and early 17th centuries. The word is now generally applied to a straight, flat-bottomed drinking vessel of silver, pewter or other metal, or of glass or pottery mounted on metal, with a hinged cover and handle, holding from a pint to a quart of liquor (see Drinking Vessels). The derivation is obscure. It appears in O. Fr. as tanquart and in O. Du. as tanckaert. It may have been, as is suggested, metathesized from Gr. KavOapos, Lat. cantharus, a large vessel or pot. It is used to gloss amphora in the Promptorium Parvulorum (c. 1440). It is not connected with " tank," a cistern or reservoir for water, which was formerly " stank," and is from Port, tanque, O. Fr. estang, mod. Hang, pool; Lat. stagnum, whence Eng. " stagnant."

TANNA (Aramaic, "teacher"). The .root teni or tena cor- responds philologically to the Hebrew shana, from which comes the word Mishnah (see Midrash and Talmud), the great Rabbinic code which (with certain parts of the Midrash and other Rabbinic books) was the main literary product of the activity of the tannaim (plural of tanna). The term tanna is used in the Talmud of those teachers who flourished in the first two centuries of the Christian era. The tannaim from the date of the destruction of the Temple may be grouped: (1) 70-100, representative

name Johanan ben Zaqqai (q.v .) ; (2) 100–130, representative name Aqiba (q.v.); (3) 130–160, representative name Judah the Prince, compiler of the Mishnah. The suc- cessors of the tannaim were called ‘amor aim (see ‘Amora).

See W. Bacher, Die Agada der Tannaiten. An alphabetical list of tannaim and ‘amoraim is given in the Jewish Encyclopedia, xii. 49–54- (I. A.)

TANNAHILL, ROBERT (1774–1810), Scottish song-writer, son of a Paisley silk-weaver, was born on the 3rd of June 1774. He was apprenticed to his father’s trade at the age of twelve, and, inspired by the poetry of Robert Burns, he wrote verses as he drove the shuttle to and fro, with shelf and ink-bottle rigged up on his loom-post. He was shy and reserved, of small and delicate physique, and took little part in the social life of the town. The steady routine of his trade was broken only by occasional excursions to Glasgow and the land of Burns, and a year’s trial of work at Bolton. He began in 1805 to contribute verses to Glasgow and Paisley periodicals, and published an edition of his poems by subscription in 1807. Three years later, on the 17th of May 1810, the life of the quiet, gentle, diffident and despondent poet was brought by his own act to a tragic end. TannahilPs claims to remembrance rest upon half a dozen songs, full of an exquisite feeling for nature, and so happily set to music that they have retained their popularity. ” Loudon’s Bonnie Woods and Braes,” ” Jessie, the Flower o’ Dunblane,” and ” Gloomy Winter’s Noo Awa ” are the best of them. “Jessie, the Flower o’* Dunblane” and “The Farewell” tell the story of the poet’s own unhappy love for Janet Tennant.

Tannahill’s centenary was celebrated at Paisley in 1874. See edition by D. Semple (1876) for details of his life.

TANNER, HENRY OSSAWA (1850-), American artist, of negro descent, was born at Pittsburg, Pennsylvania, on the 21st of June 1859. He was the son of Benjamin Tucker Tanner (b. 1835), who became bishop of the

African Methodist Episcopal Church in 1888, edited the Christian Recorder, the organ of his church, from 1867 to 1883, founded, and from 1884 to 1888 edited, the African Methodist Episcopal Church Review, and published several pamphlets, poems and hymns, and an Apology for African Methodism (1867). The son was a pupil of Thomas Eakins, in Philadelphia, and of J. P. Laurens and Benjamin Constant in Paris. He first exhibited at the Salon in 1805. His " Daniel in the Lions' Den " received an honourable mention at the Salon of 1896. " The Raising of Lazarus," which received a third-class medal in 1897, was purchased by the French govern- ment for the permanent collection of the Luxembourg. Other pictures are, "The Annunciation" (Salon, 1898), "Nicodemus

Coming to Christ " (1899), " The Jews' Wailing Place," and " Christ in the Temple."

TANNER, THOMAS (1674-1735), English antiquary and pre- late, was born at Market Lavington in Wiltshire on the 25th of January 1674, and was educated at Queen's College, Oxford, taking holy orders in 1694. Next year he became chaplain and then fellow of All Souls College, and a few years later private chaplain to John Moore (1646-17 14), bishop of Norwich and afterwards of Ely, who appointed him chancellor of the diocese of Norwich. In 1706 he became rector of Thorpe, near Norwich, in 1713 a canon of Ely, in 1724 a canon of Christ Church, Oxford, and in 1732 bishop of St Asaph. He died in Oxford, where he had passed most of his life, on the 14th of December 1735.

Tanner's chief work is his Notitia Monastica, a short account of all the religious houses in England and Wales. This was pub- lished at Oxford in 1695; it was reprinted with additions by the author's brother, John Tanner, in 1744; and was reprinted again with further additions by James Nasmith (1740-1808) in 1787. He also wrote Bibliotheca Britannico-Hibernica, a dictionary of all the authors who flourished in England, Scotland and Ireland before the opening of the 17th century, at

which he laboured for forty years. This was not published until 1748, thirteen years after the author's death. The bishop collected materials for a history of Wiltshire and worked for some time on a new edition of the works of John Leland. His valuable collection of books and manuscripts is in the Bodleian library at Oxford.

Another writer of this name was Thomas Tanner (1630–1682), the author of The Entrance of Mazzarini (Oxford, 1657–58). Educated at St Paul's School, London, and at Pembroke Hall, Cambridge, he became a barrister and later a clergyman, being vicar of Colyton, Devon, and afterwards of Winchfield, Hants.

TANNHAUSER, or Tanhuser, German Minnesinger of the 13th century, who lived for a time at the court of Frederick II., duke of Austria. After Duke Frederick's death he was received at the court of Otto II., duke of Bavaria; but, being of a restless disposition, and having wasted his fortune, he spent much time in wandering about Germany. He also went as a Crusader to the Holy Land. His poems belong to the decadence of the Minnesang, and combine a didactic display of learning with descriptions of peasant-life in a somewhat coarse tone. His adventurous life led him to be identified, in the popular imagina- tion, with the knight Tannhauser who, after many wanderings, comes to the Venusberg, or Horselberg, near Eisenach. He enters the cave where the Lady Venus — the Frau Hulda of German folk-lore — holds her court, and abandons himself to a life of sensual pleasure. By and by he is overcome by remorse, and, invoking the aid of the Virgin Mary, he obtains permission to return for a while to the outer world. He then goes as a pilgrim to Rome, and entreats Pope Urban to secure for him the forgiveness of his sins. The pope declares it is as impossible for him to be pardoned as for the staff he has in his hand to blossom. Tannhauser departs in despair, and returns to the Venusberg. In three days the staff begins to put forth green leaves, and the pope sends messengers in all directions in search of the penitent, but he is never seen again. This legend was at one time widely known in Germany, and

as late as 1830 it survived in a popular song at Entlebuch in Switzerland, a version of which was given by Uhland in his Alte hoch- und niederdeutsche Volkslieder. Among the attendants of Hulda was the faithful Eckhart, and in the preface to the Heldenbuch he is said to sit before the Venusberg, and to warn passers-by of the dangers to which they may be exposed if they linger in the neighbourhood. The legend has been reproduced by several modern German poets, and by R. Wagner in an opera.

For Tannhauser's lyric poetry, see F. H. von der Hagen's Minne- singer, ii. (1838); K. Bartsch, Deutsche Liederdichter des 12. bis 14. Jahrhunderls (3rd ed. 1893), No. 47. See also F. Zander, Die Tannhdusersage und der Minnesinger Tannhauser (1858); J. G. T. Grasse, Die Sage von Tannhauser (1846; 2nd ed. 1861); A'. Ohlke Zu Tannhauser s Lcben und Dichten (1890); J. Siebert, Tannhauser, Inhalt und Form seiner Gedichte (1894).

TANNIN, or Tannic Acid, the generic name for a widely disseminated group of vegetable products, so named from their property of converting raw hide into leather (q.v.). They

are soluble in water, their solutions having an acid reaction and an astringent taste; the solutions are coloured dark b.ue or green by ferrous salts, a property utilized in the manufacture of ink (q.v.). Their chemistry is little known. Some appear to be glucosides of gallic acid, since they yield this acid and a sugar on hydrolysis, e.g. oak tannin; whilst others yield proto- catechuic acid and phloroglucin, e.g. moringa-tannin; common tannin, however, is a digallic acid.

Common tannin, or tannic acid, C14II10CV2H2O, occurs to the extent of 50% in gall-nuts, and also in tea, sumach and in other plants. It may be obtained by extracting powdered gall-nuts with a mixture of

ether and alcohol, whereupon the tannin is taken up in the lower layer, which on separation and evaporation yields the acid. When pure the acid forms a colourless, amorphous mass, very soluble in water, less so in alcohol, and practically insoluble in ether. Common salt precipitates it from aqueous solutions. It forms a penta-acetate. It may be obtained artificially by heating gallic acid with phosphorus oxychloride or dilute arsenic acid (cf. P. Biginelli, Gazetta, 1909, 39, ii. pp. 268 et seq.) ; and con- verseiy on boiling with dilute acids or alkalis it takes up a molecule of water and yields two molecules of gallic acid, C7H6O5. It is optically active — a fact taken account of in J. Dekker's formula (Ber., 1906, 39, p. 2497). The chemistry has also been investigated by M. Nierenstein and L. F. Iljin (see papers in the Ber., 1908, et seq.).

The tannin of oak, C19H16O10, which is found, mixed with gallic acid, ellagic acid and quercite, in oak bark, is a red powder; its aqueous solution is coloured dark blue by ferric chloride, and boiling with dilute sulphuric acid gives oak red or phlobaphene. The tannin of coffee, CsoH^Oio, found in coffee beans, is not pre- cipitated from its solutions by gelatin. Hydrolysis by alkaline solutions gives a sugar and caffeic acid ; whilst fusion with potassium hydroxide gives protocatechuic acid. Moringa-tannin or maclurin, CnHioOeHsO, found in Morus tinctoria, hydrolyses on fusion with caustic potash to phloroglucin and protocatechuic acid. Catechu-tannin occurs in the extract of Mimosa catechu; and kino-tannin is the chief ingredient of kino (q.v.).

Medicine. — Tannic acid is official in both the British and United States Pharmacopoeias. It is incompatible with mineral acids, alkalis, salts of iron, antimony, lead and silver, alkaloids and gelatin. The British pharmacopoeial preparations are (1) glycerinum acidi tannici; (2) suppositoria acidi tannici; (3) trochiscus acidi tannici. The United States also has a collodium stypticum and an ointment. From tannic acid is also made gallic,

acid, which re- sembles tannic acid but has no astringent taste. When applied to broken skin or exposed surfaces it coagulates the albumen in the discharges, forming a protecting layer or coat. It is moreover an astringent to the tissues, hindering the further discharge of fluid. It is a powerful local haemostatic, but it only checks haemorrhage when brought directly in contact with the bleeding point. It is used in the treatment of haemoptysis in the form of a fine spray, or taken internally it will check gastric haemorrhage. In large doses, however, it greatly disorders the digestion. In the intestine tannic acid controls intestinal bleeding, acting as a power- ful astringent and causing constipation; for this reason it has been recommended to check diarrhoea.

Tannic acid is largely used in the treatment of various ulcers, sores and moist eruptions. The glycerin is used in tonsillitis and the lozenges in pharyngitis. For bleeding haemorrhoids tannic acid suppositories are useful, or tannic acid can be dusted on directly. The collodium stypticum is a valuable external remedy. Tannic acid is absorbed as gallic acid into the blood and eliminated as gallic and pyrogallic acids, darkening the urine. Gallic acid does not coagulate albumen when used externally. It has been used internally in haemoptysis and haematuria. Combined with opium it is an efficient remedy in diabetes insipidus.

TANN-RATHSAMHAUSEN, LUDWIG SAMSON ARTHUR,

Freiherr von und zu der (1815-1881), Bavarian general, was born at Darmstadt on the 18th of June 1815, the day of Waterloo. He was descended from the old family of von der Tann, which had representatives in Bavaria, Alsace and the Rhine countries, and assumed his mother’s name (she being the daughter of an Alsatian, Freiherr von Rathsamhausen) in 1868 by licence of the k ; ng of Bavaria. Ludwig, the first king of Bavaria, stood spons.or for the child, who received his name and in addition that of Arthur, in honour of the duke of Wellington. He received a careful education, and in

1827 became a page at the Bavarian court, where a great future was predicted for him. Entering the artillery in 1833, he was after some years placed on the general staff. He attended the manoeuvres of the Austrian army in Italy under Radetzky {q.v.) and, in the spirit of adventure, joined a French military

expedition operating in Algiers against the Tunisian frontier. On his return he became a close personal friend of the Crown Prince Maximilian Joseph (afterwards King Maximilian). In 1848 he was made a major, and in that year he distinguished himself greatly as the leader of a Schleswig-Holstein light corps in the Danish war. At the close of the first campaign he was given the order of the Red Eagle by the king of Prussia, and his own sovereign gave him the military order of Max-Joseph without his asking for it, and also made him a lieutenant-colonel. In 1849 he served as chief of staff to the Bavarian contingent at the front, and distinguished himself at the lines of Diippel, after which he visited Haynau's headquarters in the Hungarian war, and returned to Schleswig-Holstein to serve as v. Willisen's chief of staff in the Idstedt campaign. Then came the threat of war between Prussia and Austria, and von der Tann was recalled to Bavaria. But the affair ended with the " surrender of Olmiitz," and he saw no further active service until 1866, rising in the usual way of promotion to colonel (1851), major- general (1855), and lieutenant-general (1861). In the earlier years of this period he was the aide-de-camp and constant com- panion of the king. In the war of 1866 he was chief of the staff to Prince Charles of Bavaria, who commanded the South German contingents. The almost entirely unfortunate issue of the military operations led to his being vehemently attacked in the press, but the unreadiness and unequal efficiency of the troops and the general lack of interest in the war on the part of the soldiers foredoomed the South Germans to failure in any case. He continued to enjoy the favour of the king and received promotion to the. rank of general of infantry (1869), but the bitterness of his

disappointment of 1866 never left him. He was grey-haired at forty-two, and his health was impaired. In 1869 von der Tann-Rathsamhausen, as he was now called, was appointed commander of the I. Bavarian corps. This corps he commanded in the Franco-German War, and therein he retrieved his place as one of the foremost of German soldiers. His gallantry was conspicuous at Worth and Sedan. Transferred in the autumn to an independent command on the Loire, he conducted the operations against d'Aurelle de Paladines, at first with marked success, and forced the surrender of Orleans. He had, however, at Coulmiers to give way before a numerically larger French force; but reinforced, he fought several successful engagements under the Grand Duke of Mecklenburg near Orleans. On the termination of the war he was reappointed commander-in-chief of the I. Bavarian corps, a post which he held until his death at Meran on the 26th of April 1881. He had the grand cross of the Bavarian military orders, and the first class of the Iron Cross and the pour le merite from the king of Prussia. In 1878 the emperor named von der Tann chief of a Prussian infantry regiment, decreed him a grant, and named one of the new Strassburg forts after him.

See Life by Lieutenant-colonel Hugo von Helvig in Mil. Wochen- blatt, Supplement, 1882.

TANSA, a small river in Salsett island, in the Thana district of Bombay, which provides the city of Bombay with its water- supply. It is embanked by one of the largest masonry dams in the world, built in 1892. The embankment is nearly 2 m. long, 118 ft. high, and no ft. thick at the base.

TANTA, a town of Lower Egypt, in a central position nearly midway between the two main branches of the Nile, and con- verging-point of several railways traversing the Delta in all directions. It has a population (1907) of 54,437, is the capital of the rich province of Gharbia, and is noted for its fairs and Moslem festivals, which are held three times a year in honour of Seyyid el-Bedawi, and are sometimes attended by 200,000 pilgrims and traders.

There are a large railway station, a very fine mosque (restored), and a palace of the khedive. Seyyid el-Bedawi, who lived in the 13th century a.d., was a native of Fez who, after a pilgrimage to Mecca, settled in Tanta. He is one of the most popular saints in Egypt.

TANTALUM [symbol Ta, atomic ' weight 181-0 (0=i6)], a metallic chemical element, sparingly distributed in nature and then almost invariably associated with columbium. Its history

is intermixed with that of columbium. In 1801 C. Hatchett detected a new element, which he named columbium, in a mineral from Massachusetts, and in 1802 A. G. Ekeberg discovered an element, tantalum, in some Swedish yttrium minerals. In 1809 W. H. Wollaston unsuccessfully endeavoured to show that columbium and tantalum were identical. In 1844 H. Rose detected two new elements in the columbites of the Bodenmais, which he named niobium and pelopium; dianium was discovered by W. X. F. von Kobell in various columbites; and ilmenium and neptunium were discovered by R. Hermann. The researches of C. W. Blomstrand, and others, especially of Marignac, proved the identity of columbium, dianium and niobium, and that ilmenium was a mixture of columbium and tantalum. It is very probable that neptunium is a similar mixture. Berzelius, who prepared tantalic acid from the mineral tantalite in 1820, ob- tained an impure metal by heating potassium tantalofluoride with potassium. In 1902 H. Moissan obtained a carbon-bearing metal by fusing the pentoxide with carbon in the electric furnace. The preparation of the pure metal was successfully effected by Werner von Bolton in 1905, who fused the compressed product obtained in the Berzelius process in the electric furnace, air being excluded. An alternative method consisted in passing an electric current through a filament of the tetroxide in a vacuum. The metal is manufactured, for use as

filaments in electric lamps, by the action of sodium on sodium tantalofluoride.

The pure metal is silver-white in colour, is very ductile, and becomes remarkably hard when hammered, a diamond drill making little impression upon it. Its tensile strength is higher than that of steel. It melts between 2250° and 2300 , its specific heat is 0-0365, coefficient of expansion 0-0000079, ar >d specific gravity 1664. When heated in air the metal burns if in the form of thin wire, and is superficially oxidized if more compact. At a red heat it absorbs large volumes of hydrogen and nitrogen, the last traces of which can only be removed by fusion in the electric furnace. These substances, and also carbon, sulphur, selenium and tellurium, render the metal very brittle. Tantalum is not affected by alkaline solutions, but is disintegrated when fused with potash. Hydrofluoric acid is the only acid which attacks it. It alloys with iron, molybdenum and tungsten, but not with silver or mercury.

In its chemical relationships tantalum is associated with vanadium, columbium and didymium in a sub-group of the periodic classification. In general it is pentavalent, but divalent compounds are known.

Tantalum tetroxide, Ta 2 Oa, is a porous dark grey mass harder than glass, and is obtained by reducing the pentoxide with magnesium. It is unaffected by any acid or mixture of acids, but burns to the pentoxide when heated

Tantalum pentoxide, Ta 2 5 , is a white amorphous infusible powder, or it may be crystallized by strongly heating, or by fusing with boron trioxide or microcosmic salt. It is insoluble in all acids. It is obtained from potassimn tantalofluoride by heating with sulphuric acid to 400 °, boiling out with water, and decom- posing the residual compound of the oxide and sulphuric acid by ignition, preferably with the addition of ammonium carbonate.

Tantalic acid, HTaOa, is a gelatinous mass obtained

by mixing the chloride with water. It gives rise to salts, termed the tanta- lates. The normal salts are all insoluble in water; the complex acid, hexatantalic acid, HsTacOu (which does not exist in the free state), forms soluble salts with the alkaline metals. Pertantalic acid, HTaC>4, is obtained in the hydrated form as a white precipitate by- adding sulphuric acid to potassium pertantalate, KaTaOs- jH 2 0, which is formed when hydrogen peroxide is added to a solution of potassium hexatantalatc.

Tantalum pentafluoride, TaF 5 , for a long time only known in solution, may be obtained by passing fluorine over an alloy of tantalum and aluminium, and purifying by distillation in a vacuum. It forms colourless, very hygroscopic prisms, which attack glass, slowly at ordinary temperatures, more rapidly when heated (Ber., 1909, 42, p. 492). Its double salts with the alkaline fluorides are very important, and serve for the separation of the metal from columbium and titanium. Tantalum pentachloride, TaCU, is ob- tained as light yellow needles by heating a mixture of the pent- oxide and carbon in a current of chlorine. By heating with sodium amalgam and separating with hydrochloric acid, the dichloride, TaCl>-2H 2 0, is obtained as emerald grt-en hexagonal crystals. The pentabromide exists, but. tantalum and iodine apparently do

not combine. Tantalum forms a sulphide, TaS 2 , and two nitrides, TaN 2 and TasNs, have been described.

Marignac determined the atomic weight to be 181, but Henrichsen and N. Sahlbom (Ber., 1906, 39, p. 2600) obtained 179-8 (H = i) by converting the metal into pentoxide at a dull red heat.

TANTALUS, in Greek legend, son of Zeus (or Tmolus) and Pluto (Wealth), daughter of Himantes, the father of Pelops and Niobe. He was the traditional king of Sipylus in Lydia (or of Phrygia), and was the intimate friend of Zeus and the other gods, to whose table he was admitted. But he abused the divine favour by revealing to mankind the secrets he had

learned in heaven (Diod. Sic. iv. 74), or by killing his son Pelops (g.v.) and serving him up to the gods at table, in order to test their powers of observation (Ovid, Metam. vi. 401). Another story was that he stole nectar and ambrosia from heaven and gave them to men (Pindar, 01. i. 60). According to others, Pan- dareus stole a golden dog which guarded the temple of Zeus in Crete, and gave it to Tantalus to take care of. But, when Pandareus demanded the dog back, Tantalus denied that he had received it. Therefore Zeus turned Pandareus into a stone, and flung down Tantalus with Mount Sipylus on the top of him (Antoninus Liberalis, 36). The punishment of Tantalus in the lower world was famous. He stood up to his neck in water, which flowed from him when he tried to drink of it ; and over his head hung fruits which the wind wafted away whenever he tried to grasp them (Odyssey, xi. 582). This myth is the origin of the English word " tantalize," and also of the common name " tantalus " for a set of spirit decanters kept under lock and key. Another story is that a rock hung over his head ready to fall and crush him (Euripides, Orestes, 5). The sins of Tantalus were visited upon his descendants, the Pelopidae. Ancient historical reminiscences and natural phenomena, especially volcanic catastrophes, are at the bottom of the legend. The tomb of Tantalus on Mount Sipylus was pointed out in antiquity, and has been in modern times identified by C. F. Texier with the great cairn beneath Old Magnesia; but Sir W. M. Ramsay inclines to a remarkable rock-cut tomb beside Magnesia.

The story of Tantalus is an echo of a semi-Greek kingdom, which had its seat at Sipylus, the oldest and holiest city of Lydia, the remains of which are still visible. There was a tradition in antiquity that the city of Tantalus had been swallowed up in a lake on the mountain; but the legend may, as Ramsay thinks, have been suggested by the vast ravine which yawns beneath the acropolis. According to S. Reinach (Revue archeologique, 1903), Tantalus was represented in a picture standing in a lake and

clinging to the branches of a tree, which gave rise to the idea that he was endeavouring to pluck its fruit. The punishment of the overhanging rock refers to the dangerous position of the town of Tantalis below the summit of Mount Sipylus.

See Pelops, Phrygia; Sir W. M. Ramsay in Journal oj Hellenic Studies, iii.; Frazer's Pausanias, iii. p. 555, v., p. 392; J. Hylen, De Tantalo (Upsala, 1896), who considers the story of the thirst of Tantalus in the underworld to be due to the Orphic interpolator in the N4kuio. of the Odyssey, and the Pandareus story to be an innovation of the Alexandrine poets. The essay contains a copious list of authorities and a history of the Hgend. According to V. Henry (Revue des Etudes grecques, 1892), Tantalus is the sun: the fruits which elude his grasp are the stars suspended on the tree of heaven, which disappear at the rising of the sun; the water into which the sun descends without drinking, is the sea. Tantalus's betrayal of the secrets of the gods refers to the sun unveiling the secrets of heaven; the slaying of Pelops denotes the going-down of the sun, Pelops meaning the " gray one," an epithet of the gloomy sky in which the last rays of the sun are extinguished.

TANTIA TOPI (c. 1819-1859), rebel leader during the Indian Mutiny, was a Mahratta Brahman in the service of Nana Sahib. He instigated the massacre of Cawnpore, and commanded at the battle of Bithur, where he was defeated by General Havelock. With the aid of the Gwalior contingent he pressed General Windham hard at Cawnpore on the 27th and 28th of November 1857, but was defeated by Sir Colin Campbell on the 6th of December. Together with the Rani of Jhansi he was besieged by Sir Hugh Rose in the Jhansi fort, but escaped and collected a force of 20,000 men which Sir Hugh defeated without relaxing

the siege. This was the decisive action of the campaign in Central India, and Tantia Topi was obliged to seek refuge in the jungles of Rajputana and Bundelkhand, where he was taken by Major Meade, condemned, and executed on the 18th of April 1859. He was the only rebel leader in the Mutiny who showed any conspicuous military talent.

TAOISM, a form of religion in China, the name of which is taken from the ancient treatise called Tdo Teh King, supposed to be the work of the sage Lao-tsze (q.v.). The later charac- teristics of Taoism as a form of worship represent a corruption of the earlier doctrines of Lao-tsze, and the infusion of Buddhist and other ideas.

TAORMINA (ancient Tauromenium), a town on the E. coast of Sicily, in the province of Messina, from which town it is 30 m. S.S.W. by rail. Pop. (1901) 41 10. It has come into great favour as a winter resort, especially with British and German visitors, chiefly on account of its fine situation and beautiful views. It lies on an abrupt hill 650 ft. above the railway station, and was founded by the Carthaginian Himilco in 397 B.C. for a friendly tribe of Sicels, after the destruction, by Dionysius the Elder of Syracuse, of the neighbouring city of Naxos. In 395 Dionysius failed to take it by assault on a winter's night, but in 392 he occupied it and settled his mercenaries there. In 358 the exiles from Naxos, after wandering up and down Sicily, at last found a home there. Its commanding site gave it con- siderable importance. It was the city at which both Timoleon and Pyrrhus first landed. During the First Punic War it belonged to the kingdom of Hiero, and after his death it enjoyed an exceptionally favoured position with regard to Rome, being like Messana and Netum, a civitas foederata. During the first Servile War it was occupied by Eunous and some of his followers, but was at length taken by the consul Publius Rupilius in 132. It was one of the strongholds of Sextus Pompeius, and after defeating him Augustus made it into a colonia as a measure of precaution, expelling some of the older inhabitants. In the time of Strabo it was inferior in population,

as we should expect, to Messana and Catana; its marble, wine and mullets were highly esteemed. In a.d. 902 it was taken and burnt by the Saracens; it was retaken in 962, and in 1078 fell into the hands of the Normans.

The ancient town seems to have had two citadels; one of these was probably the hill above the town to the W. now crowned by a medieval castle, while the other was the hill upon which the theatre was afterwards constructed (E. A. Free- man, History of Sicily, iv. 506). There are some remains of the city walls, belonging to more than one period. It is indeed possible that one fragment of wall belongs to a period, before the foundation of the city, when the Naxians had a fortified port here (Evans in Freeman, op. cit., iv. 109 n. 1). The church of San Pancrazio, just outside the modern town, is built into a temple of the 3rd century B.C., the S. wall of the cella of which is alone preserved. Inscriptions prove that it was dedicated to Serapis. The other ruins belong in the main to the Roman period. The most famous of them is the theatre, largely hewn in the rock, which, though of Greek origin, was entirely reconstructed. The seats are almost entirely gone, but the stage and its adjacent buildings, especially the wall, in two storeys, at the back, are well preserved: some of its marble decorative details were removed for building material in the middle ages, but those that remained have been re-erected. The view from the theatre is of exceptional beauty, Mount Etna being clearly seen from the summit to the base on the S.W., while to the N. the rugged outlines of the coast immediately below, and the mountains of Calabria across the sea to the N.E. make up one of the -most famous views in the world. There are also remains of a much smaller theatre (the so-called Odeum), and some large cisterns; a large bath or tank which was ap- parently open, known as the Naumachia, measures 4265 ft. in length and 39! in width: only one of its long sides is now visible, and serves as a foundation for several houses in the main street of the modern town. The aqueducts which supplied these cisterns

may be traced above the town. There are remains

of houses, tombs, &c, of the Roman period, and fine speci- mens of Romanesque and Gothic architecture in the modern town. See Rizzo, Guida di Taormina e dintorni, Catania, 1902. (T. As.) TAPACULO, the name l given in Chile to a bird of singular appearance — the Pteroptochus albicollis of ornithology, and applied in an extended sense to its allied forms, which constitute a small family, Pteroptochidae, belonging to the Clamatores division of Passeres, peculiar to South America. About 20

species, disposed by P. L. Sclater (Ibis, 1874, pp. 189-206) in 8 genera, are believed to belong to this group.

The species of the Family first made known is Scytalopus magellanicus, originally described in 1783 by J. Latham (Synopsis, iv. p. 464) as a Warbler. Even in 1836 J. Gould not unnaturally took it for a Wren, when establishing the genus to which it is now referred; but some ten years after Johannes Miiller found that Scytalopus, together with the true Tapaculo, which was first described by Kittlitz in 1830, possessed anatomical characters that removed them far from any position previously assigned to them, and determined their true place as above given. In the meanwhile a kindred form, Hylactes, also first described in 1830, had been shown by T. C. Eyton to have some very exceptional osteological features, and these were found to be also common to Pteroptochus and Scytalopus. In i860 J. Cabanis recognized the Pteroptochidae as a distinct Family, but made it also include Menura (see Lyre- bird), and in 1874 P. L. Sclater (ut supra) thought that Atrichia (see Scrub-bird) might belong here. It was A. Garrod in 1876 and 1877 who finally divested the Family of these aliens, but until examples of some of the other genera have been anatomically examined it may not be safe to say that they all belong to the Pteroptochidae.

The true Tapaculo (P. albicollis) has a general resemblance in plumage to the females of some of the smaller Shrikes (Lanius^), and to a cursory observer its skin might pass for that of one; but its shortened wings and powerful feet would on closer inspection at once reveal the difference. In life, however, its appearance must be wholly unlike, for it rarely flies, hops actively on the ground or among bushes, with its tail erect or turned towards its head, and continually utters various and strange notes, — some, says Darwin, are ” like the cooing of doves, others like the bubbling of water, and many defy all similes.” The ” Turco,” Hylactes megapodius, is larger, with greatly developed feet and claws, but is very similar in colour and habits. Two more species of Hylactes are known, and

1 Of Spanish origin, it is intended as a reproof to the bird for the shameless way in which, by erecting its tail, it exposes its hinder parts. It has been sometimes misspelt ” Tapacolo,” as by C. Darwin, who gave (Journal of Researches, chap, xii.) a brief but entertaining account of the habits of this bird and its relative, Hylactes mega- podius, called by the Chilenos ” El Turco.”

one other of Pteroptochus, all of which are peculiar to Chile or Patagonia. The species of Scytalopus are as small as Wrens, mostly of a dark colour, and inhabit parts of Brazil and Colombia, one of them occurring so far northward as Bogota. (A. N.)

TAPER (probably of Celtic origin, cf. Irish tapar, Welsh tampr, taper, torch), a small thin candle of tallow or wax (see Candle) ; from its’ early shape, in which the circumference of the top was smaller than that of the base, the word came to be used in the sense_ of ” slender,” particularly of something diminishing in size at one end. In architecture the word is used of the gradual diminishing of a spire or column as it rises. The spire tapers almost to a point, where it is terminated by a finial or vane: the column tapers only to a less diameter at the top, and as a general rule the more ancient the column the greater its diminution or taper; thus in one of the early temples at Selinus in Sicily the upper diameter is about half the lower diameter, while in the Parthenon it is about one-fifth.

TAPESTRY. The Gr. rajriyj-and Lat. tapesium, from which our word ” tapestry ” is descended, implied a covering to both furniture and floors, as well as curtains or wall hangings, and neither of them really defines the particular way in which such articles were made. The decorations on these Greek and

Fig. 1. — Gobelins high-warp tapestry frame, with weaver (18th century), holding in right hand (a) bobbin with weft thread wound round its thick end, and with his left hand taking (e) some of the lisses or strings with a loop at one end of each of them, through which a warp thread is passed, and thus pulling forward those warp threads in between which he will pass his weft, mm is the tapestry he has woven, which has been wound round (p) the cylinder. The other letters in this diagram relate to details in the frame which are of subsidiary interest. The description of them would not further elucidate the act of weaving which is here in question.

Roman coverings were effected by painting, printing, embroidery, or a method of weaving with coloured threads; and specimens and other conclusive evidence show that early Egyptians, Babylonians, Chinese, Indians, Greeks and Romans employed some at least of the means above-named.

Process The purpose of this article is to give some account

of tapes- of those decorated stuffs which are produced by tf y weaving coloured threads on to warp threads in a

weavug. manner t nat differs from shuttle-weaving, and at the present day is called tapestry-weaving, such for instance as is practised at the famous Gobelins and Beauvais tapestry manufactories in France. At the Gobelins, the warp threads are stretched in frames standing vertically (high warp or haute lisse) : at Beauvais in frames placed horizontally with the ground

*(low warp or basse lisse). In the one case the worker sits up to his work, in the other he bends over it. In each he is supplied with the design according to which he weaves, and notwithstand- ing the varied positions the method of weaving is the nigh and same. The thread-supply of each separate colour re- low warp quired in the design is wound upon its appointed peg *■««*• or bobbin, which is a*

simpler implement or tool than a loom weaver's shuttle. Fig. 1 shows a Gobelins high-warp tapestry weaver of the 18th century at work. With his left hand he is pulling above his head a few of the looped strings (lices or lisses) through which the warp threads (chaine) pass, so as to bring forward the particular warp threads, in between and around which he has to place the weft threads of the selected colour. In fig. 2 the workman's left hand pulls forward groups of warp threads upon the lower part of which the weaving has been finished; and with a comb-like implement in his right hand he presses down and compacts the weaving. In the story of the competition between Minerva and Arachne (Metamorphoses, vi. 55-69), Ovid appears to be- describing this very process, and a great number of specimens of 2nd to 5th century Egypto- Roman workmanship corroborate the presumption of its existence in Ovid's time. The absence of evidence to show that loom and shuttle weaving was capable at that period of pro- ducing elaborate figured fabrics is remarkable, and supports the probability that the tapestry-weaving process was that

Fig. 2. — Gobelins tapestry-weaving, showing (a) the left hand of the weaver pulling forward © a group of warp threads, into which with (b) the comb in his right hand he is compressing at point (d) the weft threads which have been passed around and in between the warp threads; (e) are various bobbins, hanging at rest, suspended by their weft threads; and (/) is the tapestry as woven and compressed.

commonly known and practised for most if not all woven decora- tion and ornament. It was certainly as freely used for costumes as for hangings, couch and cushion covers and the like (see Carpet). The frames in which the work was done varied ac- cording to size from small and easily handled ones to large and substantially constructed frames. As mentioned in the article Embroidery, ornament of tapestry-weaving occurs in a frag- ment of Egyptian work 1450 B.C., and Greeks in the 3rd or 4th century B.C. also worked in this method, as is demonstrated by specimens, now in the Hermitage at St Petersburg,

which were found in the tomb of the Seven Brothers at Temriouck, formerly a Greek settlement in the province of Kouban on the north- eastern shore of the Black Sea. 1 The simplicity of the process is so obvious that it is found to be widely employed in expressing a variety of primitive textile decoration of which pieces from Borneo, Central Asia, Tibet, the Red Indians of America, and the ancient inhabitants of Peru 2 (see fig. 10) are to be seen in museums.

1 See Compte rendu. Com. Arch., 1878-79.

2 See Account of Graves at Ancon, Asher & Co. ; see also specimens from Graves at Lima in the Victoria and Albert Museum, London.

As regards the antiquity of the two sorts of frames (the low and high warp) the Beni Hassan wall paintings (1600 B.C.) include diagrams of horizontal (low warp) frames, with weavers squatting on the ground at work on them; while a vertical or high warp frame is represented on a Greek vase of the 5th century B.C. found at Chiusi (fig. 3), and corresponds with frames used in Scandinavian countries. 1 In both these last-named the lower ends of the warp threads are merely weighted, thus presenting

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Fig. 3. — Penelope's tapestry-weaving frame, from a Greek vase of the 5th century B.C. The standing figure is that of Telemachus.

some difficulty to the act of weaving, and of subsequently com- pacting the weft upwards, the warp not being taut and fastened to a beam, according to more ordinary usage, as, for instance, in the high warp frame illustrated in the codex of Rabanus Maurus, gth century a.d., preserved at Monte Cassino (fig. 4). The words " de Geneceo " in this

illustration point to a medieval survival of the earlier gunaikonites of the Greeks and the gynaecea of the Romans, which were the quarters set apart in the house of the well-to-do for the spinning, weaving and embroidery done by women for the household. From such ancient frames to similar haute and basse lisse frames of the French tapissiers nostrez and tapissiers sarrasinois governed under edicts (1226-70) of Louis IX., and so on to present-day Gobelins and Beauvais frames, the transition can be easily realized. The texture of all tapestry weavings presents no radical difference in appearance, no matter when or where produced.

Within reasonable limits it is not practicable to sketch in a complete form the history, from the middle ages onwards, of the prosecution of the art by each of the many European towns that have become engaged in tapestry weaving. But the foregoing remarks will suggest, what seems to have been the fact, that a continuity in the knowledge of the art was kept up so that as

favourable conditions occurred it would be called Roman into practice. Artificers (male and female) such as tapestry the Roman plumarii wove tapestries with figures of weaving. Britons (Virgil, Georg., iii. 25) — "Purpurea inlexti tollant

aulaea Britanni," — others with scenes from the story of Theseus and Ariadne (Catullus, Argon., xlvi. 267), besides many more for emperors and the wealthy. The demand for such pro- duction of the textrinae or trade workshops, and of the more private gynaecea, as well as the organization of workmen's societies, collegia opificum, are evidence of circumstances lasting for some centuries in Rome that were favourable to tapestry-weaving there. Sug- gestive of Roman designs are the illustrations of part of a curtain or wall hanging (fig. 5), and of a hanging or couch cover (fig. 6); whilst the daintiest quality of tapestry-weaving for theornamenta- tion of a tunic is displayed in fig. 7. The ornamentation in fig. 5 — a hanging 5 ft. 3 in. by 19J in. — consists of a series of horizontal

leafy bands or garlands and other devices: between the upper bands on a red ground is a bird on a leafy twig. This is Egypto- Roraan work of about the 3rd century a.d. A portion of a linen cloth or couch cover ornamented with tapestry woven in coloured

'See modern Faroese frame figured by Worsaae. Afbildinger fra det K. Museum for Nordiske Old Sager. Copenhagen, 1854, p. 123.

wools and linen thread is shown in fig. 6. At the top there is a fragment of a horizontal border of floral and leaf ornament be- neath which, and enclosed by festoons of leaves, are two boys floating in the air and holding ducks; elsewhere are figures of boys running and carrying baskets of fruit, and large and small blossom forms or rosettes. This also is Egypto-Roman work, about the 4th century, and is 4 ft. 5 in. by 4 ft. I in. Fig. 7 presents a square (from a small tunic) of very fine warp and weft tapestry-weaving, with a child mounted on a white horse: in the border about him are ducks, fish and (?) peaches. This too is Egypto-Roman work of about the 2nd or 3rd century and is about 4 inches square. The square in fig. 8 is from a tunic or robe and is of tapestry-weaving in bright-coloured wools, with a representation of Hermes holding the caduceus in one hand and a purse in the other. About his head is a nimbus and his name in Greek characters. This again is Egypto-Roman work of about the 1st or 2nd century and is 6J inches square. The panel of tapestry-weaving in fig. 9 is from a couch or bed covering, and is wrought in purple wools and linen threads. The design recalls the description of the toralia or couch- covering alluded to in Petronius Arbiter's account of Trimalchio's banquet, " on which were depicted men in ambush with hunting poles, and all the apparatus of the chase." This piece is also of Egypto-Roman work about the 2nd or 3rd century, about 12 in. by 10 in.

The well-known 6th-century Ravenna mosaics of the Emperor Justinian and the Empress Theodora are rich with hangings and costumes decorated presumably with

tapestry weavings similar to those just described. From the 5th century and for many centuries later, monasteries, 2 nunneries and Tapestry the like, under ecclesiastical control or influence, weaving In became centres of activity in this and cognate arts, monas- stimulated by the patronage of the Church and terles, courts ; and in the 8th and 9th centuries the Em- 5th to 9th peror Charlemagne's body of travelling inspectors, century. missi dominici, appears to have exercised for a time a helpful influence upon such centres throughout France and in parts of Germany. Two centuries later, free, as distinct from bond, handicraftsmen were forming local associations for their industries, and in this movement the weavers took the lead throughout England, Flanders and Brabant, France being a little later. 3 The gilds of weavers in London and Oxford were granted charters by Henry I. In the nth century Olldsof gilds of wool weavers existed at Cologne and Mainz, weavers. and in the following century there was a similar gild at Spires : it is quite probable that some of their weaving would be of tapestry. 4 The fragment in fig. 11 is con- sidered by authorities to be of 12th-century north European work, possibly from some Rhenish place. At one time the whole piece

be^*«ft:?c."

Fig. 4. — High warp frame from MS. Codex by Rabanus Maurus (9th century).

2 See Recherches sur Vusage et I'origine des tapisseries a personnages, by A. Jubinal, 1840, p. 13.

3 See L. Brentano's History and Development of Guilds, § IV. " The Craft Guilds."

4 Eugene Miintz quotes a deed (between 1 164 and 1200) witnessed by " Meginwart of Welt in burch," a tapetiarius, as well as another (1177) in which mention is made of Fredericus, tapifex de familia ecclesiae.

FiGS. 5-9.— Specimens of Egypto-Roman tapestry weaving of about the 2nd to 5th century a.d. Victoria and Albert Mu XX VI. 404.

Plate II.

TAPESTRY

Fig. io. — Fragment of coarse linen material with a large diamond panel_ of tapestry weaving in coloured threads — Peruvian-made, before the conquest of Peru by Pizarro. About 3 ft. by 2 ft. 6 in.

Fig.

1 1.— Portion of wall-hanging from the church of St Gereon, Cologne. North French or German manufacture of the nth or 12th century About 2 ft. by 2 ft. 6 in.

Fig. 12. — An antependium, or altar hanging of tapestry woven in coloured wools, with the Adoration of the Magi, probably from a design by Wohlgemuth (1434-1510), The tapestry is reputed to have been executed in a convent at Bamberg; below the folds of the Virgin's cloak, to the right, the "tapissiere" has woven a figure of herself at work. German, 15th century. This inters is in the museum at Munich. About 5 ft. 6 in. by 2 ft.

i interesting piece

TAPESTRY

Plate III.

Fig. 13.— One of a series of designs (the Trojan War) by Jean Foucquet (1415-1485) from which tapestry hangings were woven, probably at Arras in the middle of the 15th century-

Fig. 14. — Part of the tapestry (13 ft. high) woven from the design in Fig. 13. Arrival of Queen Penthesilea at the court of King Priam.

Fig.

15.— Part of the tapestry (10 ft. high) woven from the design in Fig. 13. Queen Penthesilea overcoming Diomedes.

Fig. 16. — Long and narrow tapestry (8 ft. 10 in. by 22 in.), German wprk of the 15th century. Field labours, &c.

PLATE IV.

TAPESTRY

Fig. 17. — Part of a wall hanging of tapestry woven (probably at Brussels early in the 16th century) with coloured wools and silks, which is one of a series designed, probably by some member of the school of Roger van der Weyden, to illustrate the Triumphs written by Petrarch. The episode represented is the Triumph of Chastity over Love. Falling from a triumphal car fitted with flaming altars or torches of love, and drawn by four winged white horses, is Cupid, whose left arm is grasped by Chastity mounted on a unicorn and carrying the column symbolizing Strength or Constancy. Foremost in the multitude about the car of Love are Cleopatra and Julius Caesar. In another part of this hanging is the date 1507. The height of this piece is 14 ft. This, with tapestries of the Triumph of Death and Fame, is in the Victoria and Albert Museum : one hanging of the Triumph of Time is at Hampton Court.

belonged to the church of St. Gereon at Cologne; a large bit of it is now in the museum at Lyons; another at Nuremberg; whilst a small part of the border only is in the Victoria and Albert Museum, South Kensington. The pattern consists of repeated roundels within each of which is a chimerical bird and bull (? St. Luke), elsewhere is a small eagle (? St. John). The style of design, strong in oriental and Byzantine character, is frequently found in

shuttle- woven silks of the period.

The renaissance of literature in the 12th century, infused with romantic, mystical and religious tendencies, supplied subjects for wall decoration by fresco painting, the practice of Tapestries which was revived then and came into vogue in Italy from the and the south, whilst its analogue in the northern and I3thcen- more weather-wearing countries is to be found chiefly tury in decorative tapestry weavings. Much tapestry is

onwards, certainly indebted for its cartoons to wall painting, but illustrations in MSS. also furnished subjects from which tapestry was made by the tapissiers nostrez and tapissiers de la haute lisse in France, Germany and Flanders. 1 The earlier tapestries usually seem to have been narrow and long, e.g. the " toile a broderie " of Bayeux (see Embroidery) and the 12th-century tapestries of Halberstadt cathedral. Although the making such narrow, long tapestries survived into the 14th and 15th centuries (see fig. 16), larger shapes (see figs. 14 and 15) suitable as curtains and as hang- ings to cover large wall-spaces became the more frequent. From this time forward the output from many European towns of big pieces, mostly woven with coloured wools, was continuous and considerable. The more sumptuous examples from the 14th to the 17th century were enriched with gleaming silks and metallic threads. 2

The subjects of the cartoons from which tapestries were woven varied of course with the tastes of the times, the more frequent of the earlier ones being religious (see fig. 12) or illus- Variety of trative of moralities. Types of romantic, legendary designs in subjects are displayed in figs. 14 and 15 of the Siege tapestries, of Troy, and fig. 23 of Dido and_ Aeneas. Historical design occurs in fig. 20, which is one of a set of tapestries woven possibly at the royal factory of Fontainebleau about 1540, to commemorate the fetes on the occasion of the marriage of Henri II. with Catherine de Medicis; and again in fig. 25, of the " Glorious Defence of

Londonderry." Pastoral incidents are shown in fig. 16, and social life episodes and incidents in fig. 22, which was woven at the celebrated Medici factory, Florence, in 1639 by a French weaver — Pierre Fevre — from a design in the style of F. d'Albertino (il Bacchiaca), 16th century, entitled " L'inverno " (winter). Less human in interest are tapestries, mostly of the late 15th century, wrought from leafy designs, usually termed " verdures," of which several were made at Brussels during the 16th century. Heraldic and floral devices were also frequently used, see fig. 19, from a piece of the late 15th century in Winchester College, and fig. 18, which is at Haddon Hall and was woven early in the 16th century. It is very similar to hangings which are at Bern and are said to have been captured from Charles the Bold at the battle of Granson._ Many curiously designed tapestries of German 15th-century origin are to be seen in the museum at Basel — one of them (fig. 21) displays strange beasts, unicorns, stags in the midst of Gothic foliage, and labels with legends. Other tapestries, worked from still later phases of ornamental design, are fantastic with schemes of abstract orna- ment into which are introduced as subsidiary details figure subjects set in panels and medallions.

The treatment of the compositions in cartoons for tapestry follows that adopted by painters. Thus examples from the nth to the end of the 15th century are formal in the drawing of the forms introduced into them, and comparatively limited in range of colours, lights and shades, in accordance with the mannerisms of the earlier painters whether illuminators of MSS. or wall and panel painters. It has been argued from this that the designers of such early tapestry work possessed a sense of the limitations imposed by the process and materials. But in their day the relatively small number of dyes available involved conventionality in colour, quite as much as the earlier styles of drawing involved conven- tionality in form.

Fig. 13 is from an interesting design by Jehan Foucquet (141 5-1485): and is one of a set, made by

him to illustrate the

1 Guiffrey's Nicolas Bataille contains particulars of the loan by Charles V. of France to his brother Louis, duke of Anjou, of an illuminated MS. from which Hennequin or Jean of Bruges, painter in ordinary and valet de chambre to the king, made the cartoons used by Nicolas Bataille {tapissier de Paris) in weaving two hangings representing the Apocalypse (1377).

2 " Tapis de haute lice de fin fil d' arras ouvre a or de Chipre " (a.d. 1395). One of the largest and most delicately wrought tapestry hangings in which gold and silver threads are freely used is that of the Adoration of the Eternal Father: on the left of this is the story of the Emperor Augustus and the Tiburtine Sibyl : on the right the story of Esther and Ahasuerus. It was bought by Mr Pierpont Morgan.

Trojan War, now in the Louvre. From these drawings tapestries were woven at Arras probably in the middle of the 15th century. One of these hangings in the Victoria and Albert _ Museum (see figs. 14 and 15) is from Foucquet's design, representing the arrival of Queen Penthesilea and her warrior women at Troy and the part she took in a fight in which she vanquished Diomedes. This episode was introduced by Quintus Calaber (or Smyrnaeus) , a 4th- century writer, in his version of the Homeric story. A tapestry from another of Foucquet's designs displaying King Priam in the midst of his court is in the Palais de Justice at Issoire,.

When Raphael, master of a freer and more realistic style in rendering form and colour, produced his cartoons of the Acts of the Apostles for a set of hangings for Pope Leo X., a new con- dition naturally came into play, and practically became Inirodac- a principal source of the contrast which is observable Hon of between the designs of tapestries made before his time and realism in those made after the early part of the 1 6th century, designs for The provision of a bigger scale of dyes for the wools and tapestries. silks was stimulated

to secure success in weaving these more realistic representations of forms and greater subtleties in colour, as well as the developed effects of perspective : compare, for instance, the treatment in fig. 14 with that in fig. 22. The re- straint or limitations of the earlier styles were thus gradually supplanted by the comparative complexities of the later; and it is a point of interest to note that provision for still further inventing and improving dyes and so helping tapestry to assimilate to paint- ing is specially included in the regulations (1667) of the state manufactory of the Gobelins, where under M. Chevreul (director of the dye-works for more than fifty years during the 19th century) 14,400 tones of colour have been used.

A chronological succession of styles may also be traced in the borders enclosing such varieties of design as those just referred to. As a rule borders consisting of a selvage or plain band come first (see fig. 12), followed by those in which Sizes of labels with block-letter legends (figs. 14 and 15 and borders fig. 17) are features; after them are narrow borders Indications filled in with closely and well-arranged floral forms (see of date. lower border in fig. 1 7) , to which succeed borders of greater width containing elaborate detail (fig. 20). Such as these date from soon after the beginning of the 16th century, and those rather wider and more extravagant in ornament follow on somewhat later (see figs. 22 and 23). In the 18th century massive rococo proscenium frames, as in fig. 25, are sometimes adopted.

Of the notable centres where the industry of tapestry-weaving has been in considerable practice, Arras in the 14th and 15th centuries, Brussels in the 15th and 16th, Middelburg and Delft in the late 16th and early 17th centuries, 3 Paris in the 16th Notable and 17th centuries and down to the present time, with centres Mortlake in the 17th century, probably stand foremost; of the and from them the services of experienced workmen industry. equipped with frames and implements were" requisitioned and secured at most of the short-lived contemporaneous

centres in almost all parts of Europe. Several names of tapestry-weavers working during the first half of the 14th century in Arras, Paris, Valenciennes, St. Omer and Reims, for Burgundian, Flemish and French nobles, have been recorded. 4 Throughout that century a few weavers and many tapestries came from Arras into England, where the term " arras " became the generic name for woven wall- hangings. Arras tapestries also went in quantities into Italy where they were called " Arazzi," and into Spain where they bore the name " pannos de raz." The tapicers of London received their statutes in 1 33 1, and Edward III. caused an inquiry to be held into the mistera tapiciarorum. h The industry at Arras began to decline soon after 1460, and was succeeded about this date by works at Bruges, Ghent, Tournai, Lille, Oudenarde, but more especially at Brussels, at which last city the industry grew to an importance even greater than it had enjoyed previously at Arras or elsewhere. The regulations of the Brussels corporation of tapissiers were framed in 1451. Under them tapissiers might draw for one another the stuffs of hangings or of costumes in their figure compositions, trees, animals, boats, grasses, &c, in their " verdures," or leafy

3 Only one or two of the tapestries representing the several engagements between the English and Spanish fleets in 1588 which used to hang in the House of Lords (see Pine, Tapestry of the House of Lords, London, 1739) were saved from the fire (1835), and are now at Hampton Court. They closely correspond with a set com- memorating engagements between the Dutch and Spanish fleets (1572 and 1576) which are in the great Assembly Hall of the Pro- vincial States of Zeeland. These latter were woven chiefly at the tapestry works at Middelburg, 1 595-1 629; the former were woven at Francis Spiring's works (or Spierincx) at Delft. Both, it appears, were designed by H. Cornelius Vroom of Harlem. For interesting details of the Middelburg works see van der Graft's De Tapijt- Fabrieken (Middelburg, 1869), and supplementary documents by De Waard (Oud-Holland, xv., 65, 1897).

4 See lists in W. G. Thomson's History of Tapestry.

6 Rot. Pat. 38 Ed. III., Hardy's Record Rymer, vol. 3, part 2, P. 736.

compositions, and the flowers, &c, as in the ground of Fig. 18, and might complete or correct their cartoons with charcoal or shalk, but for every other style of work they were bound to apply to professional painters under pain of fine. 1

In 1528 the Brussels tapissiers and dealers in tapestries were required to mark their weavings, and Charles V. ordered all tapestry- makers in the Low Countries to do the same. 2 This Tapestry practice was followed in other countries into which makers' emigrant Flemish or French weavers had carried the marks. industry, making their tapestries very often from

copies they took with them of cartoons designed by noted Italian and Flemish painters. Makers' marks have in so many cases been cut from tapestries that it becomes practically impossible to identify the places where they were made, and the dates of their production can only be conjectured from the styles of designs, supplied for instance by such artists (or their Artists followers) as the Van Eycks, Roger van der Weyden, whode- Mantegna, Leonardo da Vinci, Raphael, Bernard van signed Orley, Lancelot Blondeel and John van der Straaten or

cartoons Stradanus; this last-named was for many years em- tor tapes- ployed in connexion with the important " Arrazeria lt y- Medici" foundedinFlorencebyCdSmo I., dukeof Tuscany

(i537)i which lasted until the beginning of the 18th century; Strad- anus's style of design is similar to that of episodes in the story of Dido and Aeneas shown in fig. 23 from an Oudenarde tapestry of the early 17th century. Reverting to the 16th century,

reference must be made to Cardinal Wolsey and Henry VIII. , who possessed enormous quantities of the best Flemish tapestries of their time and earlier, and a fair number of them are still preserved at Hampton Court Palace. 3 The king had in his service not only agents especially in Brussels to buy hangings, but also a considerable staff of "Arras-makers." In Ireland, the taste for tapestry was evidenced by a manufactory at Kilkenny of " tapestry, Turkey carpets and diapers," founded early in the 16th century at the instance of Piers, 8th earl of Ormond and his ladv, Margaret FitzGerald, and giving employment to workmen introduced by him from Flanders. At a rather later date tapestry works were established by William Sheldon at Weston and Barcheston in Warwickshire, with a view to which he previously sent Richard Hickes to the Low Countries to learn tapestry- weaving. A few Flemings were probably brought over by him and set to work at Barcheston and Weston, where he . was appointed " master weaver." In his will (1569) Sheldon calls Hickes, somewhat erroneously perhaps, " the only auter and be- ginner of tapestry and Arras within this realm." His son, Francis Hickes, was educated at St Mary Hall, Oxford (1579-83), and about 1640 he caused some tapestry maps to be woven. 6 Made before them are a set of hangings of the " Four Seasons," now preserved at Hatfield. These are most probably from designs by Francis Hickes. They were bought by the marquis of Salisbury very shortly before the first visit of Queen Victoria to Hatfield. The borders of these pieces with small medallions and Latin mottoes are attractively amusing and interesting. In the lower border (fig. 24) one may read " via. virtuti. encyclopedia"; in the upper border a date, " 161 1," occurs in one medallion. In the upper border of each hanging is an important coat of arms with several quarterings, chief of which are those of Tracey of Toddington in Gloucestershire impaling those of Shirley of Wiston in Sussex. The designer's inventiveness and fancy in illustrating attributes, &c, of the " Seasons " are almost exuberant, however restricted and quaint his graphic power seems to be.*

Philip II. is mentioned as having encouraged a manufacture of tapestry by Flemings in Madrid in 1582. In 1539, Francis I. started a royal factory for tapestry at Fontainebleau (see fig. 20), and employed Primaticcio amongst other artists to furnish the necessary designs. Henry II., whilst continuing work at Fontaine- bleau, caused a second factory to be set going in Paris at the HSpital de la Trinite. Henry IV. continued this royal patronage in lavish fashion and added yet another factory, that in the Faubourg St. Antoine, which in 1603 was transferred to workrooms in the Louvre. As Paris thus came to the fore, so Brussels gradually declined. Upon the death of Henry IV. in 1610 Paris tapestry-making suffered a check, Which may perhaps have contributed somewhat favourably to the start made by James I. to organize the Mortlake works, where several foreign workmen were employed under the direction of Sir Francis Crane. 6 Both James I. and Charles I.

1 Bulletin des commissions royales d'art et d'archeologie. Wauters, Les tapissiers de haute et basse lisse d Bruxelles.

2 See list of tapestry marks, pp. 472-81 in Thomson's History of Tapestry.

3 See Law's Hampton Court Palace, 1885.

'See Transactions of the Kilkenny Archaeological Society, 1852, " Ancient Tapestry at Kilkenny Castle," by the Rev. James Graves.

6 See " Tapestry Maps in the Museum at York " (paper read before Royal Geographical Society by Rev. W. K. R. Bedford, printed 10th Dec. 1896, and included in vol. i. of the society's Transactions for 1897), also in Bodleian Library.

6 A half-length portrait by Van Dyck of Sir Francis Crane worked in tapestry, and one or two small fine-warp tapestry panels

supplied considerable sums of money for the Mortlake

works, and tapestries were made there, as fine as any comtemporaneously at Paris or Brussels, e.g. those from Raphael's cartoons of " the Acts of the Apostles," 7 Rubens's "Story of Achilles," and portraits by Van Dyck. After the execution of Charles I., Mortlake declined, and new life was infused into the industry at Paris under the influence of Colbert, to whose strong personal interest in the arts is due the organization in 1667 of the Hfitel des Gobelins under the painter Charles le Brun as the Manufacture Royale des Meubles de la Couronne, which for large hangings became the premier tapestry-weaving centre in Europe. Three years previously Colbert had initiated a similar manufactory, chiefly with low-warp frames, at Beauvais, which is noted for sofa and chair seats and backs, screens and small panels.

Efforts to establish the industry in Rome were made during the 17th century, but it is only since the pontificate of Clement XI. in 1702 that a papal factory has been successfully conducted and is still carried on in the Vatican. The manufactory of Santa Barbara in Madrid was founded by Philip V. in 1720, and although it was closed in 1808 it re-opened in 1815 and is still at work.

Tapestry-weaving during the 18th century under private enter- prise was pursued with success and still continues at Aubusson, Felletin; it was carried on for a short time only at Fulham, Soho, Exeter, and for rather longer periods at 18th and Lille, Cambrai, Gisors, Nancy, Naples, Turin, Venice, 19th cen- Seville, Munich, Berlin, Dresden, Heidelberg and St tury Petersburg, maintaining, however, no very prolonged tapestry- existence at any of these latter places. In more modern wearing. times English tapestries woven after 1878 at the Merton works from designs by William Morris (see fig. 26), as well as by Sir Edward Burne-Jones 8 and Mr Walter Crane, have great dis- tinction in vigorous style reminiscent of virile medieval work. In mere technique of weaving with fine warp and weft they are outdone by the comparatively effeminate and delicate pair.ting- like fabrics now made at the

Gobelins and Aubusson.

Towards the end of the 17th century as well as early in the 1 8th century some tapestry-weaving was carried on in Ireland. For about twenty years at Chapelizod, near Dublin, tapestry frames were worked by Christopher and John Lovett, the latter of whom had to leave Dublin, bringing with him into England some thirty- eight pieces 01 tapestry of " Their Majesties' Manufacture of Ireland." In the Bank of Ireland, in College Green, Dublin, are two large hangings which were executed by Robert Baillie, who is said to have held the appointment of upholsterer to the Irish government in 1716. 9 One of them represents the Battle of the Boyne, the other the " Glorious Defence of Londonderry " (see fig. 25). Lough Foyle and the hill surmounted by the city of Londonderry are represented in the landscape: to the left in the foreground is James II., by whom is the Commander Hamilton with his hat off, and near at hand cavalry: on the right are mortars, cannon and foot soldiers. The border of this tapestry is fantastic in design and rather in the style of an over-elaborated theatre proscenium, upon which hang medallions containing portraits of Captain Baker, the Rev. Dr Walker and the captain of the frigate " Dartmouth," in which the supplies were brought to the be- sieged which led to the relief of the city and the defeat of the in- vesting army. The designs for these Dublin tapestries are credited to John Vanbeaver, a Flemish weaver, who seems to have been a moderate draughtsman. They are clearly adaptations of designs of historical events, by Le Brun and van der Meulen, from which tapestries were woven at the Gobelins factory to the order of Louis XIV. at the end of the 17th century. These Dublin hangings were woven about 1735, and Baillie was commissioned to make four others representing the landing of the prince of Orange, his army at Carrickfergus, the Battle of Aughrim, and the taking of Cork and Kinsale by Marlborough. 10 These, however, were not completed, and Baillie was paid £200 as compensation.

Tapestry-weaving as a possible cottage or home

industry is practised in a few places in Ireland and England. In the Far East, China and Japan, the art, adopted presumably from western Asia, is sometimes resorted to in making silken robes and intricately figured hangings. The Japanese call their tapestry-weaving tsu- zu-re-ori.

of the Virgin Mary and Jesus Christ, hang at Lord Petre's, Thorndon Hall, Brentwood. Ancestors of the late Lady Petre were related to the Crane family, as well as to the Markham family with which Edward Sheldon by his marriage early in the 17th century became connected. The Sheldon and Markham arms occur in the border of one of the map tapestries in the Bodleian Library.

7 The original cartoons, the property of the Crown, are exhibited in the Victoria and Albert Museum.

8 A very fine set of Merton tapestries made from Burne-Jones's designs are in the Municipal Museum at Birmingham.

9 References to his employment in making tapestries occur in the Journal of the Irish House of Lords.

10 See Gilbert's History of Dublin, vol. iii. p. 79,

TAPESTRY

Plate V.

-Brussels, early 16th century, hanging, covered Now at Haddon Hall.

with masses of flowers, on which are shields bearing the royal arms. The property of the duke of Rutland.

Plate VI.

TAPESTRY

-Tapestry hanging (about 10 ft. high) possibly of inebleau manufacture about 1540. F£tes in honour of II. and Catherine de Medicis.

FlG. 19. — Brussels tapestry (about 6 ft. high), late 15th century, with a shield bearing three crowns, red and white roses, and the monogram I.H.S. repeated three times. From

Winchester College.

Fig. 21. — German tapestry hanging (about 4 ft. 6 in. long by 3 ft. high) for a sideboard or buffet, middle of the 15th century. In the museum at Basel.

Fig. 22. — Tapestry hanging (about 10 ft. high) made at the Medici factory in Florence, 1639. Domestic scene, I'lnvemo, winter.

TAPESTRY

Plate VIL

FlG. 24 — One of the four tapestry hangings of the "Seasons," of Winter with Aeolus in the centre, probably woven under the direction of Francis Hickes at William Sheldon's manufactory at Barcheston, in Warwickshire, early in the 17th century, and now at Hatfield House,

Plate VIII

TAPESTRY

25. — Defence of Londonderry. Irish (Dublin) tapestry, early 1 8th century.

Fig. 25- — Tapestry woven at Merton Abbey, from a design by William Morris (1834-1896). The subject is from his poem

" The Orchard." Victoria and Albert Museum.

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TAPEWORMS

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Fine examples of early and later European tapestries are to be seen in the cathedrals of Reims, Bruges,

Tournai, Angers, Beauvais, Aix. Sens, in the Victoria and Albert Museum, London, Places Windsor Castle, Hampton Court, StMary'sHall Coventry,

where floe the Louvre and Cluny Museums in Paris, at Chantilly, tapestries Chartres, Amiens, Dijon, Orleans, Auxerre, Nancy, Bern, arc now Brussels, Basel, Munich, Berlin, Dresden, Vienna and preserved. Nuremberg. In Italy the largest collections (mostly of 1 6th and 17th century work) are those of the Vatican at Rome, and the Reale Galleria degli Arazzi at Florence. Many fine pieces are in the royal palace at Turin, the Palazzo del Te at Mantua, the royal palace at Milan, in the cathedral of Corao, and the museum at Naples. The collection at the palace of Madrid is one of the largest in Europe, and comprises more than one thousand examples, the older of which, of splendid Flemish design and weaving, be- longed to Ferdinand and Isabella, Philippe le Bel and the Emperor Charles V. 1 The principal cathedrals of Spain also possess im- portant tapestries; those preserved at the cathedral of Toledo are more than enough to supply hangings for the outside and inside of that building on the feast of Corpus Christi. Throughout the European continent, in the United States of America, and in Great Britain almost uncountable tapestries are displayed or stored in mansions, castles, chdteaux and palazzi, belonging to noble and wealthy families. A large number of books have been written and published on the subject generally, and many of them, contain- ing good illustrations, are of recent date.

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(A. S. C.)

1 See Report of Seiior I. F. Riano to the Director of the South Kensington Museum, 1875.

TAPEWORMS. The Cestodes or Tapeworms form a class of purely endoparasitic Platyelniia, characterized by their elongate shape, segmented bodies, and the absence of a digestive system. With few exceptions they are composed (1) of a minute organ of fixation (the scolex) , which marks the proximal attached end of the body; (2) of a narrow neck from which (3) a number of segments varying from three to several thousands are budded off distally. These segments, or " proglottides," become detached in groups, and if kept moist retain their powers of movement and vitality for a considerable time. This fact gave

rise in ancient times to the false idea that the tapeworm originated from the union of these segments; and in modern times it has led to the view that the tapeworm is not a seg- mented organism (the monozoic view), but is a colony composed of the scolex which arises from the embryo and of the pro- glottides, which are asexually produced buds that, upon or before attaining their full size and maturity, become separated, grow, and, in some cases, live freely for a time, just as the segments of a strobilating jelly-fish grow, separate and become sexual individuals (the polyzoic view). Whether this view is soundly based is discussed below; the fact remains, however, that a tapeworm is, with few and rare exceptions, not directly comparable at all points with a liver-fluke or indeed with any other organism. The influence of parasitism has so profoundly influenced its structure that its affinities are obscured by the development of specialized and adaptive features.

In contrast to these segmented or " merozoic " Cestodes, a few primitive forms have preserved a unisegmental character and form the Monozoa or Cestodaria. We may therefore divide Cestodes into the Monozoa and the Merozoa.

Order I. — Monozoa This order comprises a few heterogeneous forms which probably constitute at least three families.

Family I. Amphilinidae. — Oval or leaf-shaped animals found in the sturgeon and certain other fish.

Amphilina foliacea (fig. 1) is in many ways closely allied to the Trematoda, from which, however, it is distinguished by the want of a digestive system. One end of the body (usually designated anterior) is provided with a glandular pit (fig. I, Aa) which is regarded as a sucker or as re- lated to the uterine opening (birth-pore). The excretory system consists of peculiar cells, each of which I bears several"flames" or bunches of syn- chronously vibrating cilia. These cells are J- imbedded in the

peri- pheral parenchyma, £ and lead into convo- luted excretory tubes that form an anasto- mosis opening to the 9 '

exterior by a pore at Fig. 1.— A, reproductive system of Amphilina the ' hinder ' end of foliacea : a, glandular pit ; b, opening of uterus; b', uterus (black) ; c, yolk-gland and its duct; d, ovary; e, e', opening and duct of vagina; /, spermotheca; g, male genital opening (gonopore) ; h, penis ;i, vas deferens; j, testes; k, shell-gland. B, Amphiptyches (Gyrocotyle) urna. Outline of the ventral surface to show the external apertures and nervous system ; a, rosette-organ ; 6, uterine pore; c, terminal sucker; e, vaginal pore; g, male gonopore ; n, 0, p, nervous system. (From Lankester's Treatise- on Zoology, part iv.)

the body. The epi dermis consists _ of pyriform cells, which send richly branched processes to the super- ficial cuticle. The pa- renchyma is made up of stellate cells the processes of which formareticulum. The reproductive organs consist of the parts shown in fig. 1, A, and it will be seen that, in addition to the openings of the male

and of the female (vaginal) ducts, there is a distinct uterine opening at the opposite end of the .body (b). Moreover, in Amphilina liguloidea a fourth duct (the anterior vagina) begins close to the origin of the female duct, and after running forward a short distance ends blindly (see fig. 7, C). The egg gives rise to an oval larva, one half of which is ciliated and bears gland-cells, the opposite end carrying ten hooks. The fate of the larva is unknown.

Family II. Gyrocotylidae. — Leaf-shaped animals with crenate margins. One extremity carries a pedunculate rosette-organ. It is traversed by a canal from which a peculiar proboscis-like structure can be exserted.

The opposite end is pointed and provided with a terminal sucker. Amphiptyches (= Gyrocotyle) urna (fig. I, B) is found in the intestine of Chimaera and Callorhynchus, and has been almost fully described by Spencer (7). The embryo is pro- vided with ten hooks, and appears to select Lamellibranchs (Mactra) for its intermediate host.

Family III. Caryophyllaeidae. — Elongated cylindrical animals either with a single subterminal sucker at the proximal end, or with the corresponding end of the body converted into a mobile undulatory fold. Caryophyllaeus mutabilis occurs in the roach and other fresh-water fish, and passes its earlier stages of develop- ment in fresh-water Oligochaets {Tubifex). Archigetes appendi- culatus lives throughout life in the coelom of Tubifex and of Limnodrilus.

Archigetes and Caryophyllaeus are the only Cestodes that become fully differentiated in an invertebrate host. The former indeed

Fig. 2. — Various Forms of Tapeworms. A, Taenia echinococcus; (from Leuckart). B, Archigetes sieboldi; (from Leuckart). C, Echinobothrium typus; (from Van Beneden). D, Caryophyllaeus mutabilis; X about 5 (from Carus).

is said to produce fully developed gonads, and if kept in aquaria with Tubifex, the number of infected worms steadily increases, a fact pointing to the whole cycle being passed through, without the intermediation of a vertebrate host. Conclusive evidence, however, has not yet been adduced to prove this point. The two genera agree closely in form and structure and may possibly belong to the cycle of the same or of allied species. Archigetes (3 mm. long) consists of a subcylindrical body and a caudal appendage. The former bears two terminal suckers on the flattened dorsal and ventral surfaces, the latter six hooks near the tip of the tail. The finer structure of the animal has been investigated by Mrazek (10), whose account, however, is published in the Hungarian lan- guage. It shows a close agreement

with that of Caryophyllaeus. A well-developed cellular parenchyma forms a matrix in which the muscular, excretory and generative organs are imbedded. The nervous system consists of a ring below the suckers and of a large number of radially arranged tracts running forwards and backwards. Caryophyllaeus is an elongated, flattened worm provided with one extremely mobile extremity, the other being drawn out during the animal's sojourn in Tubifex into a short hexacanth tail. It becomes fully developed in its invertebrate host, but apparently cannot produce eggs until transferred into the intestine of a fish.

Order 1 1 .— Me rozoa

The Merozoa, to which the ordinary tapeworms of man and domestic animals belong, includes the great majority of the Cestodes. They occur in vertebrate animals throughout the globe, though

varying in abundance in different districts and at different times. With few exceptions tapeworms select the small intestine for their station, and in this situation execute active movements of extension and contraction. The body, or " strobila," consists of a usually minute organ of attachment (scolex or its representative) which is imbedded in the intestinal membrane, and of a series of segments that arise from the base of the scolex and increase in size distally. In one family (Ligulidae) the segmentation is only expressed in the metameric distribution of the generative organs and the worm is externally unisegmental. In the remainder the segmentation involves primarily the genitalia and includes the integument, muscles and part of the excretory system. The nervous system is, however, not segmented, and the excretory system is continuous throughout the worm.

Scolex. — The scolex is biradially constructed, the proglottides flattened, quadrangular and bilaterally symmetrical. In them a ventral surface containing the usually median male and female genital apertures is generally distinguishable from the smooth

Fig. 3. — Anatomy of Taenia (from Leuckart). A, portions of Taenia saginata. B, head of the same. C, head of T. solium, show- ing the crown of hooks. D, a segment of T. saginata, showing the generative organs: n., nervous system; ex., longi- tudinal' excretory tubes; tr., transverse vessel; g.p., genital papilla; cl., cloaca; c.p., cirrus pouch; v.d., vas deferens; t.t., testes; v., vagina; ov. ov., ovaries; sh.g., shell gland; y.g., yolk gland; r.s., receptaculum seminis; ut.,. uterus. E., the connections of the generative organs, lettering as above: o.d., o.d., oviducts; /., fertilizing canal. F, detached segment of T. saginata, showing ripe uterus. G, six-hooked embryo, highly magnified.

dorsal surface, but in those Cestodes which possess marginal gono- pores this distinction of surface is obscured. In such cases the male organs are regarded as indicating the dorsal surface, the female organs as belonging to the ventral surface.

The scolex is usually a conical muscular structure. It bears adhesive organs that are either suckers or hooks, and may develop into the most varied outgrowths in order to give increased firmness of attachment to its host. Thus, starting from the two shallow pits, one dorsal and the other central, in the simplest forms, we find them becoming two elongated suckers (bothria) in the large family Bothriocephalidac (fig. 8): and by fusion of the lips they

arc transferred into two tubes (Solenophoridae) • and by the closure of the lower aperture reconstituted into two suckers, the margins of which are produced and folded so as to resemble the leaf- like outgrowths of the next group. In this division (Tetraphyllidea) four suckers or bothria are developed on the scolex, but their cavities are extremely shallow and their lips extremely mobile and variable in shape. Hence they are called

phylhdia (fig. 4). These organs

may be raised on a short stalk, their cavity subdivided into loculi, and provided in some cases with hooks. A peculiar modification of this type of scolex occurs in the Echinobothridae, in which the axial part of the organ (the rostellum) is elongated and provided with several rows of hooks, whilst the phyllidia have partially fused. This elaborate type of scolex appears to be an adaptation to grasp the spiral intestinal valve of sharks and rays. But perhaps the most elaborate scolex is that of the Tetrarhyncha (fig. 5), which r r, , , „ , . . . are also parasitic in Selachians.

Fig. 4.— Scolex of Calyptobo- The four suckers are here united thrium nggii from the Tor- to form two ; rs or fused int0 pedo, magnified to show the a s ; le ; r< Internal to the

u-u P h y llldla ; ea ^ of suckers are the four complex which has a sucker (From hooked pro boscides. Each con- Braun, in Bronn , s Klassen u. sists of an eV ersible hollow tentacle Ordnungen d Thierretchs by provided with hooklets and capable permission of C.S Winter sche of i ntr0 version within a mem- ^ Verlagshandlung). ^ branous sheath filled with fluid.

The sheath terminates in an elongated muscular bulb. The muscles are arranged in ten or more layers, and are transversely striated. These complex organs have apparently arisen by the increase in depth and differentiation of an accessory sucker such as is borne on the phyllidia of the former group. Lastly, the scolex of the more familiar Taeniidae (Tetracotylea) carries a rostellum en- circled with hooks and four cup-shaped suckers the margins of which do not project beyond the surface of the body. It seems probable that these suckers are not the true ” bothria ” but are developed from accessory suckers, the bases of which have dis- appeared almost completely. In one genus (Polypocephalus) the place of a rostellum is taken by a crown of retractile tentacles. This order is almost

exclusively parasitic in warm-blooded animals. The extraordinary variety of form and complication of structure exhibited by the appendages of the scolex are adaptations to fix

Fig. s.—Tetrarhynchus. A, general view of the worm. B, head showing the suckers, proboscides and excretory canals. C, portion of a proboscis showing the two forms of hooks; highly magnified. (All from Pintner.)

the worm and to resist the peristaltic action of the intestine in which it lives, and are not connected directly with the absorption of food.

Proglottides. — The segments into which the body is divided vary considerably in number, size and form. Taenia echinococcus has only three, Echinobothrium four, Bothriocephalic three thousand. In every species the segments develop from the scolex distally and increase in size with the maturation of the contained female genital organs. When this is reached, growth of the proglottides ceases. As a general rule the ripe proglottides are detached in chains and replaced by others which in their turn become detached, the process being repeated for a year or so until the worm weakens and is cast

out. In special cases, however, a proglottis may be detached before attaining full growth, and with its generative organs in an imperfectly developed condition. The minute Taenia {Davainea) proglottina {■$ to I mm. in length) from the common fowl detaches its four or five segments into the intestine, where they attain a length of 2 mm., and a breadth of 1-25; that is, more than twice the size of the parent. The Cestodes of Elasmobranch fish offer more convincing examples of independent growth of the pro- glottides, for these are often set free with only the male organs developed, and each attains twice the size of the parental strobila.

The form of the proglottides is most generally a rhombic or trapezoidal figure. The hinder border is often drawn out into mobile processes and hollowed

out around the insertion of the next

Fig. 6. — Diagram of a transverse section through the body-wall of a young Ligula, illustrating the microscopic structure of tape- worms, a. cuticle; b, basal membrane; c, outer circular muscles; d, epidermal cells depressed below the surface usually occupied by them in other animals; e, gland cell; /, ” flame- cell ” (the reference line stops a little short); g, outer longitu- dinal muscles; h, a calcareous corpuscle; i, dorso- ventral muscles ;j, a ” parenchyma ” cell (probably nervous); k, nerve-plexus ; /, excretory vessel giving off capillaries ending in flame- cells; m, a sense-cell; n, a muscle-cell; 0, ending of the same; p, ending of sense-cell; 3, opening of gland-cell; r, superficial cuticle. (From Lankester’s Treatise on Zoology, part iv.)

segment. At this neck-like zone the muscles are absent, and across it falls the line of fracture when the proglottis separates from its fellows.

Structure. — The anatomy of the Cestoda differs in only two ‘or three important features from that of Trematodes. In both classes the body is encased by a thick non-cellular cuticle, the deepest layer of which — the subcuticle or basal membrane (fig. 6 b) — is perforated by the branched free ends of the isolated epidermal cells, which have sunk into the body, and by the endings of gland-cells and nerve-cells (fig. 6). The mass of the body consists of richly branched stellate cells — the mesenchyma — and imbedded in this plasmic tissue are the nervous, excretory, muscular and .generative organs.

The excretory organs consist of flame-cells, richly convoluted canali- culi, and a pair of longitudinal canals leading to the exterior by one or more pores. The muscles are composed of outer circular and inner longitudinal layers, and of branched dorso-ventral

fibres The generative organs are of the complex hermaphroditic type described in Trematoda (q.v.). In these broad anatomical features both classes agree. But whilst in Trematoda a digestive sac is invariably present except in the sporocyst larval stage, the Cestodes possess no trace of this organ at any stage of their development. They obtain food entirely by osmosis through the striated cuticle, and this food consists not of blood, as in flukes, but of chyle, by which they are bathed in their favourite site, the small intestine

The second point of difference between tapeworms and Tre- matodes lies in the absence of a definitely demonstrable " brain." The concentration of nervous matter and ganglionic substance at the oral end of Trematodes is equivalent to the " brain " of the Planarians, but the similar thickening in the scolex of Cestodes is by no means so certainly to be called by that name. It appears to be primarily related to the organs of attachment and to have attained greater elaboration than the rest of the nervous system because the proximal end is the most specialized and most stimulated portion of the worm. Those Cestodes which possess no very distinct organ of attachment (such, for example, as Gyrocotyle) have no distinct ganglionic thickening more pronounced at one end of the body than at the other; and as these are forms which have retained more primitive features than the rest, and show closer affinity to the Trematodes, it seems highly probable that the complicated nervous thickening found in the scolex, and often compared with the " brain " of other Platyelmia, is a structure sui generis developed within the limits of the sub-class. In the opinion of several zoologists it marks the tail-end and not the head-end of the worm.

The third important contrast in structural features has also been acquired by the Cestoda Merozoa, namely, the repetition of certain organs in a metameric fashion. The Monozoa are unseg- mented ; the Ligulidce have segmented gonads and gonopores without any trace of somatic metamerization except secondary excretory pores in addition to the usual

terminal one; the remain- ing Cestodes are unisegmental only in their larval stage, and all of them show in their later stages repetition of the reproductive organs and of the musculature. In addition, some show duplication of the gonads and of their ducts, so that we find both transverse and longitudinal repetition of these organs, without corresponding multiplication of the nervous ganglia mesenehyma, or excretory opening.

The last structural peculiarity of the group is the absence of the functions of regulation and reparation which are so highly developed in the mere primitive Planarians. This statement is quite consistent with the continuous production of new segments at the neck of the scolex, for such a process is analogous to the development of the segments in a Chaetopod. which is a perfectly distinct phenomenon from the regeneration of new segments to supply the place of a head or tail-end or some other portion that has been lesioned. The replacement of detached mature proglottides at the distal end of the Cestode-body by others is not regeneration, for the replacing set has already developed, and in certain cases they can complete their development quite independently after being detached from the parent. More convincing evidence of the absence of true regeneration, however, is the argument from malformation and the phenomenon known as " pseudo-scolex. " It has long been known that proglottides of the same species often exhibit sporadic mal- formation from the normal shape, and the evidence goes to show that the variation was due to arrested growth or some unusual stress or pressure which, acting upon the young strobila, produced a deformation, and that the proglottides so affected could not regain their normal form. The power of reparation, so conspicuous a feature of Turbellarians, is slight or absent in Cestodes. Moreover, injury to the scolex, or amputation of that organ, reveals the con- comitant absence of a regulative mechanism such as that which generally controls the form and fitness of regenerated organs. In such an event, a Cestode cannot replace the

injured or severed portion. The first two or three proglottides merely become deformed and produce an appearance known as the pseudo-scolex. The absence of these functions of regeneration and of regulation affords, therefore, corroborative evidence of the highly specialized nature of the Cestode organization.

Reproduction. — The reproductive organs are usually repeated in each proglottis, and in some families two complete sets of such organs occur in each segment; in a few cases, parts only of the system are duplicated. The structure of these organs is seen in n S s - 3. 6 and 7, and, as we have said, agrees closely with that of Trematodes. The chief difference between the reproductive organs of the two classes is the presence in Cestodes of a separate vagina and uterus, each of which opens in some families to the exterior by an independent pore. The vagina of Cestodes is undoubtedly comparable with the so-called "uterus" of Trematodes, but the nature of the Cestode uterus is not so clear. It has been compared with the canal of Laurer of Trematodes (the vitello-intestinal duct of the ectoparasitic flukes), but if we take the more primitive Cestodes, and especially Amphilina, into consideration we find that

they possess, in addition to the uterus, an anterior vagina (usually present in Cestodes) and a posterior one. This last tube is probably the homologue of Laurer's canal (Goto, 8). The single anterior vagina is then comparable with the similarly named duct of ecto- parasitic Trematodes, in which group it is either single or double. The accompanying figure will assist this description.

Life-histories. — The life-history of Cestodes consists of larval and adult stages, which are usually passed through in different hosts. The egg gives rise in the uterus to a six-hooked embryo, which reaches the first host in a variety of way. It may hatch out as a ciliated organism (fig. 8, D) capable of living freely in water for at least a week {Bothriocephalus) , which then, if eaten by a*

stickleback, throws off its ciliated envelope, and creeps by the aid of the hooks through the intestinal wall into the body-cavity of the fish. Here it develops into a larval, or rather an adolescent form. In other cases the infection of the first host is brought about by the ingestion

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Fig. 7. — Diagrammatic projections to exhibit the relations of the female genital ducts in Trematodes with those in Cestodes. A, in endoparasitic Trematodes (Malacotylea). B, in ectoparasitic Trematodes (Heterocotylea). C, in Cestoda. (The ovary (a) leads into (bb) the oviduct, which is joined at (g) by the duct of the yolk-glands (h, h, Y). In B it is also joined by a paired vagina ki k, and by the " vitello-intestina! duct " (Laurer's canal, /). In the Cestodes the vagina is present (V) ; the canal of Laurer (LC) is now vestigial (present in Caryophyllaeus as the posterior vagina). The uterus (X in figure C) begins in all cases at the shell gland (c, d) and may exhibit a swelling (R S) for the retention of the spermatozoa, ii are sections of the intestine. (A and B from Lankester's Treatise on Zoology, part iv.C original.) w of proglottides or of eggs which are disseminated along with the faeces of the final host and subsequently eaten by herbivorous or Omnivorous mammals, insects, worms, molluscs or fish. Man himself, as well as other mammals, is the intermediate host of the dangerous parasite, Taenia echinococcus , in countries where cleanli- ness is neglected; the pig is the host of Taenia solium, and other cases may be seen from the table at the end of this article. The transition of the larva from the intermediate to the final host is accomplished by the habits of carnivorous animals. The Elasmo- branchs swallow infected molluscs or fish; pike and trout devour

smaller fry ; birds pick up sticklebacks, insects and worms which contain Cestode larvae; and man lays himself open to infection by eating the uncooked or partially prepared flesh of many animals. The peculiar feature of the larval history of Cestodes is the de- velopment in most cases of a cyst or hydatid on the inner wall of which the scolex is formed by invagination. The cyst is filled with a toxic fluid and may bud off new or daughter scolices. In this way bladders as large as an orangeand containing secondary bladders.

each with a scolex, may arise from a single embryo. We have, in fact, a form of larval multiplication that recalls the development of digenetic Trematodes.

The eggs of Cestodes consist of oval or spherical .shells (s ^ a in.

v.o.-c Cp.

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Fig. 8. — Bothriocephalidae. A, a segment of Bothriocephalus latus, showing the generative organs from the ventral surface; ex., excretory vessels; c, cirrus; cp., cirrus pouch; v.d., vas deferens; v.o., vaginal opening; v., vagina; sh.g., shell-gland; od., oviduct; ov., ovary; y.g., yolk-gland; y.d., its duct; ut., uterus; u.o., uterine opening; the testes are not visible from this side; (from Sommer and Landois). B, C, marginal and lateral views of the anterior part of B. cordatus, showing the bothria; (from l.euckart). D, ciliated embryo of B. latus; (from l.euckart).

diameter), containing a fertilized ovum surrounded usually by many yolk-cells. The shell is thick, and operculate in some forms; thin, and provided with

filaments, in others; in the latter cases it may contain only a few yolk-granules suspended in an albumen-like substance. The development of the six-hooked embryo or ” oncho-

FlG. 9. — Development of Taenia (from Leuckart). A, Cysticercus boms in beef; nat. size. B, invaginated head of a Cysticercus before the formation of the suckers. C, invaginated head of Cysticercus cellulosae, showing the bent neck and recep- tacle r. _ D, stages in the development of the brood-capsules in Echinococcus : a, the thickening of the parenchyma of the bladder; b, subsequent formation of a cavity in it; c, development of the suckers; d, a capsule with one head inverted into its cavity ; e, a capsule with two heads .

sphere ” takes place in the uterus. The ovum first divides into (a) a granular cell, and (b) a cell full of refringent spherules. The former divides into © small cells or micromeres, and (d) large cells or megameres. (c) forms the body of the embryo, (b) and (d) enclose it and form a covering. The embryo undergoes differen- tiation into an outer layer of cells that produce a chitinoid coat,

a middle layer of cells, and a central spherical hexacanth body closely enveloped by the middle coat. In a few genera the place of the chitinoid coat is taken by a ciliary investment and in most families the structure of the layers is characteristic.

Arrived in the intestine of the intermediate host, the hooked embryo is set free and works its way to some distant site. Here it undergoes a change into a cystic or ” metacestode ” state. A cavity appears in its centre and it acquires a pyriform shape. The thicker portion develops a terminal muscular rostellum and two or four suckers, the thinner end (” tail “) is vesicular, more or less elongated, and contains the six embryonic hooks. By a process of infolding, the thicker end is partially invaginated, the middle portion or “hind-body” and the organism may now present a superficial likeness to a cercaria. An excretory system develops, opening at

Fig. 10. — The development of a Cestode from a cysticercus (bladder- worm or hydatid). A, the six-hooked embryo. B, portion of the bladder (hind-body and tail), showing the invaginated por- tion (scolex) and traces of the excretory system. C, further stage in the development of the scolex. D, the entire bladder- worm with scolex everted (drawn from Cysticercus pisiformis, common in the rabbit): a, scolex; b, fore-body; c, hind-body and tail. E, F, result of digestion of cysticercus in the stomach of the dog. G shows formation of proglottides. (From Lan- kester's Treatise on Zoology, part iv.)

the base of the tail; nervous and muscular systems arise; and finally the rostellum and suckers become completely enclosed in the sac formed by the lateral extension of the " hind-body." When swallowed by the final host such a " cysticercoid " larva evaginates its scolex, throws off its hooked vesicular tail, and begins to bud off proglottides at its free end (fig. 10).

Such is the general history of Cestodes whose intermediate host is an Invertebrate. In most other cases the tail is not distinguish- able, and the body of the larva is separable only into a scolex in- vaginated with a bladder (= hind-body and tad). This form of larva is known as a cysticercus. In some genera a " urocyst " is formed, the tail of which gives rise to a new cyst and a fresh scolex.

The most remarkable feature of this cystic development is the formation in many genera of several internal buds within a common cyst, each of which forms an independent inverted scolex (Coenurus.

Polycercus) ; or these internal vesicles may bud off a large number of scolices on their external surface (Staphylocystis).

Morphology of the Cestodes. — With regard to the vexed ques- tions of the morphological nature and of the affinities of the Cestodes, divergent views are still held. One view, the monozoic, regards the whole development as a prolonged metamorphosis; another, the polyzoic view, considers that not only is the Cestode a colony, the proglottides being produced asexually, but that the scolex which buds off these individuals is itself a bud produced by the spherical embryo or onchosphere. On this view, therefore, at least two asexual generations (embryo and scolex) alternate with a sexual one (proglottides) ; and in the case of Staphylocystis the cyst contains two asexually produced generations, so that in such forms three stages (embryo, primary scolex-buds, secondary scolices) intervene between the proglottis of a Cestode and that of its off- spring. The polyzoic view is ably championed by Braun (2) and (3).

The more valuable point of view is undoubtedly the monozoic one In accordance with this we can regard the development as an adaptive one and the scolex as invaginated for protective

Fig. 11. — A, a Coenurus from the brain of the sheep; the numerous scolices arise by invaginations of the bladder. B, Echinococcus, showing at a and b the formation of secondary bladders, which at c are forming scolices. At m the ideal mode of origin is shown in order to illustrate the fact that the daughter cyst is comparable to the fore-body of a cysticercus. (From Lankester's Treatise on Zoology, part iv.)

purposes inside the cyst, which is itself an organ comparable to an amnion. On this view, multiple scolices are, therefore, not buds, but an example of the unlegalized organization of the embryo such as occurs in other groups of animals, and is demonstrated by experiment. The evolution of the cysticercoid, cysticercus and other forms of larvae is a varied adaptive phenomenon. With regard to the adult worm we have to remember that its two ex- tremities, scolex and terminal proglottis, are

different from the intervening region. The terminal or first-formed proglottis is sterile, and contains the primitive and (except in a few genera) the only excretory pore. The excretory tubes, the nervous system, and the parenchyma and integument are continuous from one end of the worm to the other. The repetition of the genitalia is the real mark of the Cestodes, and we can trace the independence of the somatic from the gonidial metamerism in such forms as Triaenophorus and others In fact, the whole history of the Platyelmia is marked by a great specialization of the reproductive evolutionary history, accompanied by a simple somatic line of evolution. We therefore regard the body of a Cestode as a single organism within which the gonads have become segmented, and the segmentation of the body as a secondary phenomenon associated

with diffuse osmotic feeding in the narrow intestinal canal. The origin of the repetition of the gonads has yet to be investigated.

The Effects of Cestodes on their Hosts (Shipley and Fearnsides [4].) — 1. By their presence. This depends largely on the station adopted by the parasite. Cysticercus cellulosae may be comparatively innocuous in a muscle or subcutaneous tissue, but most hurtful in the eye or brain. Of all parasites the one which by its mere presence is the most dangerous is the larva of Taenia echinococcus. Its bulk alone (equal to that of an orange) causes serious disturb- ances, and its choice of the liver, kidneys, lungs, cranial cavity and other deep-seated recesses, gives rise to profound alterations.

2. By their migrations. The migration of the Cestode-larvae through the walls of the intestine into the blood of their host is the cause of grave disturbances, due largely to the perforation of the tissues, inflammation of the vessels and peritoneum, and other effects of these immigrants.

3. By feeding in their host. The loss of nutrient fluid caused by the presence of intestinal Cestodes is probably slight, indeed, the sharper appetite

that accompanies their presence may be the means of fully compensating for it. The tapeworm, Taenia saginata, throws off eleven proglottides a day during its mature stage, and if this rate of increase were maintained for a year the total weight of its progeny would be about 550 grammes. The broad worm, Dibothriocephalus lalus, is similarly estimated to discharge 15 to 20 metres of proglottides, weighing 140 grammes. The loss of substance represented by this growth is probably only of serious account when the host is a young growing animal that needs all available nourishment.

4. By producing Toxins. It is generally admitted that Cestodes, both adult and larval, contain toxins of great virulence, though in what way and in what organs these substances are produced is uncertain. Injection of the fluid-extract of such worms into the blood or coelom of their host causes grave disturbance. Thus Echinococci contains a leucomaine which sets up an urticaria; Cysticercus lenuicollis occasions anaemia and death if injected into rabbits; and the cystic fluid of the common Coenurus serialis is said to be used by Kirghizes to poison wolves. But the evidence in favour of the view that tapeworms normally excrete toxin into the body of their host in such amount as to occasion disease is not generally accepted as conclusive. This evidence is, however, strengthened by the results of recent work on changes in the blood of patients suffering from helminthiasis. The occurrence of the broad tapeworm in man is often associated with anaemia of a most severe type. The coloured constituents of the blood are most affected. New elements appear in addition to degenerative changes in the normal red corpuscles. Large nucleated red blood-cells make their appearance. The white blood-cells, or leucocytes, undergo other changes. In hydatid disease there is, as a rule, a marked increase in the number of those white corpuscles which possess a specially staining affinity with the dye eosin, and are therefore known as eosinophile cells. This change, which is called eosinophilia, indicates the production of a noxious substance in the blood. The

fact of this increased leucocytic activity during the early stages, or the whole course of infection by Cestodes, is indirect proof that these parasites do normally discharge toxic substances into their hosts.

Classification of the Cestoda Merozoa

Order I. — Dibothridiata. Scolex with two " bothria," or modi- fication thereof, usually devoid of hooks. Male and female copu- latory ducts open by a common pore. Uterine pore present. The majority parasitic in fish. Selected forms: Dibothriocephalus lalus in man; Russia, Switzerland, southern France, North America. Ligula, unsegmented externally, occurs in birds. Schistocephalus becomes fully segmented in Gasterosteus and mature in aquatic birds (ducks, &c). Triaenophorus, indistinctly segmented, occurs in the pike.

Order II. — Tetraphyllidea (Tetrabothridiata). Scolex with four outgrowths forming organs of adhesion and probably also of loco- motion. Uterine pore absent. Almost exclusively parasitic in the intestine of Elasmobranch fish. The metacestode- larva occurs free in the intestine of fish, Cephaiopods and crabs, and is known as Scolex polymorphus.

Order III. — Diphyllidea. Scolex with a long head- stalk armed with several rows of hooklets. A rostellum and four phyllidia united to form a pair. Few proglottides are developed. Selected form: Echinobothrium affine in the intestine of Elasmobranchs. It occurs immature in the gastropod Nassa.

Order IV. — Tetrarhyncha (Trypanorhyncha). Scolex with four complex eversible proboscides. The adults occur in Elasmobranch fish, the metacestode encysted in Teleosts.

Order V. — Tetracotylea (Taeniidae). Scolex with four suckers, rarely hooked, and with a rostellum. Mostly parasitic in homoio- thermic (warm-blooded)

vertebrates. Selected forms: Taenia solium, intestine of man (fig. 3, C). T. saginata (fig. 3) without hooklets on the rostellum; intestine of man. T. murina, in the rat and mouse, the adult in the lumen of the intestine, the larvae in the villi. .This species therefore undergoes no change of host. Cysto- taenia coenurus, intestine of dog and wolf, larva (a coenurus, fig. 11)

in the brain of sheep; allied forms occur mature in the dog and larval in the rabbit. Echinococcifer echinococcus, a minute form with only three to five proglottides, in dog, wolf, jackal. Larval stage a multilocular Gac (fig. n B) with many scolices; found in man, ungulates, carnivores, rodents and monkeys.

Table of Cestodes found in Man

Species.	Larva.	Intermediate Host.
Dibothriocephalus latus (L.)	Plerocercoid	Pike, perch, trout, &c.
Dibothriocephalus cordalus	Unknown	
(Leuck.)		
Diplogonoporus grandis		
(Blanch.) Dipylidium caninum (L.) .		

”

Cysticercoid

Trichodectes canis;

Pulex serraticeps;

P. irritans

Ilymenolepis diminuata

Cysticercus

Asopiafar-

(Rud.)

inalis A nisolabis

annulipes

■Insecta

Acisspinosa

Seaurus

striatus j

H. nana (v. Sieb.) .

Cysticercus

Insects and myria- pods

Drepanidotaenia lanceolata

Cysticercoid

Cyclops, Diaptomus

(Blqch)

Davainea madagascarensis

Unknown

(Dav.)

Davainea (?) asiatica .

,,

Taenia solium (L.) .

Cysticercus cellu- losae

Sus scrofa

T. saginata (Gotze)

Cysticercus bovis

Bos taurus

T. africana (v. Linst.) .

Unknown

T. confusa (Ward) .

,,

T. echinococcus (v. Sieb.) .

Echinococcus

Man and domestic

veterinorum

cattle, sheep, pig

E. multilocularis

T. hominis (v. Linst.) .

Unknown

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Medicine. — For practical purposes we have only three varie- ties of tapeworms to deal with as inhabitants of the human alimentary canal: Taenia saginata, the beef tapeworm; Taenia solium, the pork tapeworm; and Dibothriocephalus latus, the fish tapeworm. The first of these is prevalent in countries where much and imperfectly cooked beef is eaten, and where cattle in their turn are exposed to the infection of the tapeworm ova. Comparatively uncommon in Western Europe, the Taenia saginata is common in Eastern Europe, Asia and South America. It is calculated that in the North- west Provinces of India 5 per cent, of the cattle are affected with cysticerci owing to the filthy habits of the people. Measly beef (that infected with the Cysticercus bovis) is easily recognized. In Berlin the proportion of cattle said to be found infected on inspection in 1893 was 1 in 672. Cold storage for a period of over three weeks is said to kill the cysticercus.

The tapeworm most frequently found in man in Western Europe is the Taenia solium, which is constant wherever pork is consumed, and is more common in parts where raw or im- perfectly cooked pork is eaten. In North Germany the mature tapeworm was found on post-mortem examination once in every 200 bodies examined, while its embryo, the Cysticercus cellulosae, was found in 1 in every 76 bodies. In France, Great Britain and the United States the prevalence is not so great. The

Dibothriocephalus latus is not generally found except in districts bordering the Baltic Sea, the

districts round the Franco-Swiss lakes and Japan. In St Petersburg 15 per cent, of the in- habitants are said to be affected. The eggs are free in fresh-water lakes and rivers, where they enter the bo'dies of pike, turbot and other fishes, and are thus eaten by man.

In many instances the existence of a tapeworm may not cause any inconvenience to its host, and its presence may be only made known by the presence of the proglottides or mature segments in the stools. In the Taenia solium it takes 3 to 3! months from the time of ingestion of the embryo to the passage of the matured segments, but in the Taenia saginata the time is only about 60 days. The segments of the Taenia solium are usually given off in chains, those of the Taenia saginata singly. In a number of cases there are colicky pains in the abdomen, with diarrhoea or constipation and more or less anaemia, while the Dibothriocephalus latus is capable of producing a profound and severe anaemia closely resembling perni- cious anaemia. The knowledge of the presence of the parasite adversely affects nervous people and may lead to mental depression and hypochondria. Nervous phenomena, such as chorea and epileptic seizures, have been attributed to the presence of the tapeworm.

The prophylaxis is important in order to limit the spread of the parasites. All segments passed should be burnt, and they should never be thrown where the embryos may become scattered. Atten- tion should be paid to the careful cooking of meat, so that any parasite present should be killed. Efficient inspection of meat in the abat- toirs should eliminate a large proportion of the diseased animals.

In the treatment of a case where the parasite is already present, for two days previous to the employment of a vermifuge a light diet should be given and the bowels moved by a purgative. For twelve hours previously to its administration no food should be given, in order that the intestinal tract should be empty so as to expose the tapeworm

to the full action of the drug. The vermifuge is given in the early morning, and should consist of the liquid extract of felix mas, male fern, one drachm in emulsion or in capsules to be followed in half an hour by a calomel purgative. Castor-oil should not be used as a purgative. Pomegranate root, or, better, the sulphate of pelletierine in dose of 5 grains with an equal quantity of tannic acid, may be used to replace the male fern. In from 50 to 80 per cent, of cases the entire tapeworm is expelled. The head must be carefully searched for by the physician, as should it fail to be brought "away the parasite continues to grow, and within a few months the segments again begin to appear.

TAPIOCA (a native Brazilian word), a farinaceous food sub- stance prepared from cassava starch, the product of the large tuberous roots of the cassava or manioc plant (see Cassava). Cassava starch, separated from the fibrous and nitrogenous constituents of the roots, is spread, while in a moist condition, upon iron plates, and with constant stirring exposed to such heat as causes a partial rupture of the starch granules, which agglomerate into irregular pellets, becoming hard and trans- lucent when cooled. In this condition the starch forms the tapioca of commerce, a light, pleasant and digestible food, much used in puddings and as a thickener for soups.

TAPIR, any existing representative of the perissodactyle section of ungulate mammals with five front and three hind toes, and no horn. Tapirs are an ancient group with many of the original characters of the primitive Ungulates of the Oligocene period, and have undergone but little change since the Miocene. On the fore-feet the four toes correspond to the second, third, fourth and fifth fingers of the human hand. The toes are enclosed in hoofs, and the under surface of the foot rests on a large pad. Tapirs are massively built, with short stout limbs, elongated head, and the nose and upper lip produced to form a short flexible trunk.

The five existing species may be grouped into two sections, the distinctive characters of which are only recognizable in the skull. (A) With a great anterior prolongation of the ossifica- tion of the nasal partition, extending in the adult far beyond the nasal bones, and supported and embraced at the base by ascending plates from the upper jaw, forming the genus or sub-genus Tapirella. To this division belong two species, both from Central America, Tapirus bairdi and T. dowi. The former is found in Mexico, Honduras, Nicaragua, Costa Rica and Panama; the latter in Guatemala, Nicaragua and Costa Rica. (B) With the bony partition not extending farther forward than the nasal bones {Tapirus proper). This includes three species, T. indicus, the largest of the genus, from the Malay Peninsula (as far north as Tavoy and Mergui), Sumatra

and Borneo, distinguished by its peculiar coloration, the head, neck, fore and hind limbs being glossy black, and the inter- mediate part of the body white, the height at the shoulder from 3 ft. to 3 ft. 6 ins., and 4 ins. higher at the rump; T. terrestris, the common tapir of the forests and lowlands of Brazil and Paraguay; and T. roulini, the Pinchaque tapir of the high regions of the Andes. All the American species are of a nearly uniform dark brown or blackish colour when adult; but it is a curious circumstance that when young (and in this the Malay species conforms with the others) they are con- spicuously marked with spots and longitudinal stripes of white or fawn colour on a darker ground.

In habits all tapirs appear to be very similar. They are solitary, nocturnal, shy and inoffensive, chiefly frequenting the depths of shady forests and the neighbourhood of water, to which they frequently resort for the purpose of bathing, and in which they often take refuge when pursued. They feed on various vegetable substances, as shoots of trees and bushes,

buds and leaves, and are hunted by the natives of the lands in which they live for the sake of their hides and flesh.

The singular fact of the existence of animals so closely allied as the Malayan and the American tapirs in such distant regions of the earth and in no intervening places is accounted for by the geological history of the race, for the tapirs once had a very wide distribution. There is no proof of their having lived in the Oligocene epoch, but in deposits of Miocene and Pliocene date remains undistinguishable generically and perhaps specifically from the modern tapirs (though named T. prisons, T. arvernensis, &c.) have been found in France, Germany and in the Red Crag of Suffolk. Tapirs appear, however, to have become extinct in Europe before the Pleistocene period, as none of their bones or teeth have been found in any of the caves or alluvial deposits in which those of elephants, rhino- ceroses and hippopotamuses occur in abundance; but in other regions their distribution at this age was far wider than at present, as they are known to have extended eastward to China (T. sinensis) and westwards over the greater part of the southern United States of America, from South Carolina to California. Thus there is no difficulty in tracing the common origin in the Miocene tapirs of Europe of the now widely separated American and Asiatic species. It is, moreover, interesting to observe how slight an amount of variation has taken place in forms isolated during such an enormous time. See Perissodactyla. (W. H. F.; R. L.*)

TAPTI, a river of western India. It rises in Betul district of the Central Provinces, flows between two spurs of the Satpura Hills, across the plateau of Khandesh, and thence through the plain of Surat to the sea. It has a total length of 450 m. and drains an area of 30,000 sq. m. For the last 32 m. of its course

it is a tidal river, but is only navigable by vessels of small tonnage; and the port of Swally at its mouth, famous in Anglo- Portuguese history, is now deserted, owing to silting at the outflow of the river. The waters of the Tapti are nowhere used for irrigation.

TAR, a product of the destructive distillation of organic sub- stances. It is a highly complex material, varying in its com- position according to the nature of the body from which it is distilled, — different products, moreover, being obtained ac- cording to the temperature at which the process of distillation is carried on. As commercial products there are two principal classes of tar in use — (1) wood tar, the product of the special distillation of several varieties of wood, and (2) coal tar (q.v.), which is primarily a by-product of the distillation of coal during the manufacture of gas for illuminating purposes. These tars are intimately related to bitumen, asphalt, mineral pitch and petroleum.

Wood Tar.- — Wood tar, known also as Stockholm and as Archangel tar, is principally prepared in the great pine forests of central and northern Russia, Finland and Sweden. The material chiefly employed is the resinous stools and roots of the Scotch fir {Pinus sylvestris) and the Siberian larch (Larix sibirica), with other less common fir-tree roots. A large amount of tar is also prepared from the roots of the swamp pine (P. australis) in North and South Carolina, Georgia and Alabama, in the United States. In the distillation of wood a series of products, including gas, tar, pyroligneous acid, acetone, wood spirit (see Methyl Alcohol) and charcoal may be ob- tained, and any of these may be the primary object of the operation.

The carbonization of wood can be effected in two ways: (1) by stacking and firing as in the manufacture of charcoal : this method is very wasteful as it is impossible to recover the valuable by- products; and (2) by distilling from retorts, ovens or kilns (after the manner of coke production

from coal) : this method is more economical as it leads to the isolation of all the by-products. The retorts may be horizontal or vertical and the heating effected by any available fuel, or by the inflammable gases and less valuable grades of tar obtained in previous operations. The condensing plant is also of variable design; a common pattern consists of a connected series of slightly inclined copper pipes contained in a rectangular tank of water (see Coal Tar). After settling the distillate separates into three layers: the lowest consists chiefly of tar and creosote oils with a little acetic acid; the middle layer consists of water, containing pyroligneous acid, wood spirit, acetone with a little tarry matter ; whilst the upper consists of light hydro- carbons. The tarry layer is run off by means of a cock near the base of the tank, and is then distilled from retorts resembling coal tar stills. At first, between no" and 120° C, water and acetic, acid comes over; then, between 120 — 230 " C, the heavy or creosote oils; the residue in the still is wood pitch, which finds application in making briquettes, artificial asphalts, certain varnishes, &c. The crude tar and pitch are also largely used as protective coatings for woodwork exposed to atmospheric conditions. The heavy oils on further fractional distillation yield more acetic acid, and then mix- tures of carbolic acid, creosols, &c.

Wood tar is a semi-fluid substance, of a dark brown or black colour, with a strong pungent odour and a sharp taste. Owing to the presence of acetic acid, it has an acid reaction; it is soluble in that acid, as well as in alcohol and the fixed and essential oils, &c. Some varieties of tar have a granular appearance, from the presence of minute crystals of pyrocatechin, which dissolve and disappear on heating the substance.

See P Dumesny and J. Noyer,' Wood Products, Distillates and Extracts (Engl, trans. 1908).

Medicine. — Wood tar is used in medicine under the name of Pix liquida. Its preparation unguentum picis

liquidae is composed of wood tar and yellow beeswax. Externally tar is a valuable stimu- lating dressing in scaly skin diseases, such as psoriasis and chronic eczema. Internally wood tar is a popular remedy as an expectorant in subacute and chronic bronchitis. It is usually given as tar water, 1 part of wood tar being stirred into 4 parts of water and filtered. Given internally tar is likely to upset the digest ion ; taken in large quantities it causes pain and vomiting and dark urine, symptoms similar to carbolic acid poisoning.

Coal tar is used in medicine as Pix liquida preparata. From it is made Liquor picis carbonis, prepared with tincture of quillaia. Coal tar is rarely prescribed for internal use. Its external use is similar to that of wood tar: the Liquor carbonis detergens, a pro- prietary preparation, owes its properties chiefly to the contained phenol. It is used in water as a lotion for skin diseases, and also in an inhaler in the treatment of whooping-cough, croup and bronchitis.

TARA, VISCOUNTS AND BARONS— TARANTO

TARA, VISCOUNTS AND BARONS. The ist Viscount Tara was Thomas Preston (1585-1655), a descendant of Sir Robert de Preston, who in 1363 purchased the lands of Gormanston, Co. Meath, and who was keeper of the Great Seal in Ireland some years later. Sir Robert's great-grandson, Robert Preston, was created Viscount Gormanston in 1478; and the latter's great-grandson was Christopher, 4th Viscount Gormanston (d. 1599), whose second son was Thomas Preston, Viscount Tara. The latter was in the same Irish regiment in the Spanish service as Owen Roe O'Neill, and distinguished himself in the defence of Louvain against the French and Dutch in 1635. Between him and Owen Roe O'Neill there was from the first intense jealousy. Preston, who was appointed general of Leinster, took a prominent and not unsuccessful part in the war of factions that raged intermittently in Ireland from 1642 to 1652. In 1650 Charles II. while in exile created him Viscount Tara; and after his departure from Ireland in 1652

he offered his services to Charles in Paris, where he died in October 1655. His wife was a Flemish lady of rank, by whom he had several children, one of his daughters being the second wife of Sir Phelim O'Neill. His son Anthony succeeded him as 2nd Viscount Tara, a title that became ex- tinct on the death of Thomas, 3rd Viscount, in 1674.

In 1691 Meinhart de Schomberg, 3rd duke of Schomberg, second son of William III.'s famous general, was created Baron Tara, earl of Bangor, and duke of Leinster, in the peerage of Ireland, all of which titles became extinct at his death without sons in 17 19. The title of Baron Tara was again revived in 1800 in favour of John Preston of Bellinter, Co. Meath, as a reward for his vote in favour of the Union in the Irish House of Commons, in which he sat as member for Navan. At his death without issue in 182 1, the peerage became extinct.

TARA, a village of Co. Meath, Ireland. It is celebrated for the Hill of Tara, well known through Thomas Moore's ballad, and for many centuries a royal residence and the scene of great meetings of the people. The hill, upon which five highroads converged from different parts of Ireland, is about 510 ft. in height, and stands isolated. On its summit or flanks are six raths or circular earthworks, the largest of which, called the king's rath (ralh-na-riogh) encloses other works, among which is the forradh or meeting-place, a flat-topped mound. On this (but not in its original position) stands a pillar stone, which has been held to be the stone of destiny on which the Irish kings were crowned. An oblong enclosure, 759 ft. in length by 46 ft. in breadth, formed of earthworks, with entrances at intervals on each side, represents the banquet- ing hall. In the middle of the 3rd century a.d. King Cormac Mac Art, about whom there are many records in connexion with Tara, is said to have founded here schools of military science, law and literature. In the time of St Patrick Tara is in- dicated as the chief seat of druidism and idolatry, and in or about 560 it was abandoned as a royal residence, having fallen under the curse of St

Ruadan. In 980 the Danish power of Meath was overthrown in battle here; in 1798 a severe defeat of the insurgents took place here (26th of May); and in 1843 the hill of Tara, as a site sacred to Irish traditions, was the scene of one of Daniel O'Connell's mass meetings in support of the repeal of the legislative union (15th of August).

TARAFA ['Amr ibn ul- 'Abd ul-Bakri] (6th cent.), Arabian poet, who, after a wild and dissipated youth spent in Bahrein, left his native land after peace had been established between the tribes of Bakr and Taghlib and went with his uncle Muta- lammis (also a poet) to the court of the king of Hira, 'Amr ibn Hind (died 568-9), and there became companion to the king's brother. Having ridiculed the king in some verses he was sent with a letter to the ruler of Bahrein, and, in accordance with the instructions contained in the letter, was buried alive. One of hk- poems is contained in the Moallakat (q.v.).

His diwan has been published in W. Ahlwardt's The Diivans of the Six Ancient Arabic Poets (London, 1870). Some of his poems have been translated into Latin with notes by B. Vandenhoff (Berlin, 1895). (G. W. T.)

TARAI, or Term (i.e. " moist land "), the name of the sub- montane strip of marshy jungle stretching beneath the lower ranges of the Himalaya in northern India. This strip may be said to extend roughly from the Jumna river on the west to the Brahmaputra on the east, though the term is now officially confined to a subdivision of Naini Tal district in the United Provinces; area, 776 sq. in.; population (1901) 118,422. At its northern edge, where the waterless forest tract of the Bhabar ends, a series of springs burst from the surface, and these, increasing and uniting in their progress, form the numerous streams that intersect the Tarai. The Deoha is the great river of the Tarai proper, and is navigable at Pilibhit. Elephants, tigers, bears, leopards and other wild animals are found. Every- where it is

most unhealthy, and inhabited only by tribes who seem proof against malaria. A large portion lies within Nepal.

TARANTO (anc. Tarentum, q.v.), a seaport of Apulia, Italy, in the province of Lecce, 50 m. from that town W. by N. by road, and 68 m. by rail (44 m. W. by S. from Brindisi). Pop. (1901) 50,592 (town); 60,331 (commune). The city proper is situated on a rocky island 56 ft. above sea-level, which in ancient times was a peninsula, the isthmus on the west having been cut through by Ferdinand I. of Aragon. This island separates the Gulf of Taranto from the deep inlet of the Mare Piccolo, and is sheltered by two other flat islands, San Pietro and San Paolo; the latter is occupied by a lighthouse. This rock is the site of the citadel of the ancient town; its popula- tion is confined within small houses and narrow streets. The Strada Garibaldi along the Mare Piccolo is inhabited by fisher- men whose language retains traces of Greek. The cathedral, dedicated to San Cataldo, an Irish bishop, dating from the nth century, has externally some remains of Saracenic Gothic: internally it has been completely modernized, and the shrine of the patron saint has been termed " an orgy of rococo.'" Below it is an early Christian basilica excavated in 1901. There is a fine museum in the former convent of San Pasquale con- taining antiquities unearthed in the neighbourhood. Adjacent is the Palazzo degli Uffizi, completed in 1896, containing various public offices. To the south, outside the Porta di Lecce, is the Citta Nuova, on the site of the main part of the ancient town. The chief industry is the cultivation of oysters in four large beds in the Mare Piccolo; besides oysters, Taranto carries on a large trade in cozze, a species of large black mussel, which is packed in barrels with a special sauce. The other trades are olive-oil refining, barrel-making and soap-boiling; corn, honey and fruit are largely exported. Excellent fish abound in the Mare Piccolo, ninety-three different species being found. The ebb and flow of the tide is distinctly visible here, Taranto being one of the

few places in the Mediterranean where it is perceptible. In 1861 the strategic importance of Taranto was recognized by the Italian government, and in 1864 a Naval Commission designated it as third maritime arsenal after Spezia and Venice. Work was begun on the arsenal in 1883 and continued as the finances of the state per- mitted; it is capable of turning out new warships and of exe- cuting repairs of all kinds for the Mediterranean squadron. The arsenal extends for a mile and a half along the southern coast of the Mare Piccolo, which constitutes its chief basin. The receiving-dock and the anchorage for torpedo boats, with its wide landing-stage, form dependencies. The dock, 655 ft. long, 130 ft. wide and 37 ft. deep, is divided into two compart- ments, each capable of containing a full-sized battleship, and can be pumped dry in eight hours by two 600 h.p. steam pumps. The Mare Grande is connected with the Mare Piccolo by a channel 875 yds. long, large enough to permit the passage of the largest battleship; the channel was bridged in 1887 by an iron swivel bridge, which when open leaves a passage way 196 ft. broad. In its present form the Mare Piccolo provides a well-sheltered anchorage, 36 ft. deep and 6325 acres in extent. The com- mercial harbour lies S. of the railway station outside the Mare Piccolo. In 1905 nearly 180,000 tons of shipping cleared the port.

In 927 Taranto was entirely destroyed by the Saracens, but rebuilt in 967 by Nicephorus Phocas, to whom is due the

construction of the bridge over the channel to the N.W. of the town, and of the aqueduct which passes over it. The town was taken by Robert Guiscard in 1063. His son Bohemond became prince of the Terra d'Otranto, with his capital here. After his death Roger II. of Sicily gave it to his son William the Bad. The emperor Frederick II. erected a castle (Rocca Imperiale) at the highest point of the city. In 1301 Philip, the son of Charles II. of Anjou, became prince of Taranto. The castle dates from the Aragonese period. The tarantula (see below), inhabits the neighbourhood of Taranto. The wild dance, called tarantella, was supposed, by causing perspiration, to drive out the poison of the bite. (T. As.)

TARANTULA, strictly speaking, a large spider {Lycosa tarantula), which takes its name from the town of Taranto (Tarentum) in Apulia, near which it occurs and where it was

formerly believed to be the cause of the malady known as " tarantism." This spider belongs to the family Lycosidae, and has numerous allies, equalling or surpassing it in size, in various parts of the world, the genus Lycosa being almost cosmopolitan in distribution. The tarantula, like all its allies, spins no web as a snare but catches its prey by activity and speed of foot. It lives on dry, well-drained ground, and digs a deep burrow lined with silk to pre- vent the infall of loose particles of soil. In the winter it covers the orifice of this burrow with a layer of silk, and lies dormant underground until the return of spring. It also uses the burrow as a safe retreat during moulting and guards its cocoon and young in its depths. It lives for several years. The male is approxi- mately the same size as the female, but in neither sex does the length of the body surpass three-quarters of an inch. Like all spiders, the tarantula possesses poison glands in its jaws, but there is not a particle of trustworthy evidence that the secretion

of these glands is more virulent than that of other spiders of the same size, and the medieval belief that the bite of the spider gave rise to tarantism has long been abandoned. According to traditional accounts the first symptom of this disorder was usually a state of depression and lethargy. From this the sufferer could only be roused by music, which excited an overpowering desire to dance until the performer fell to the ground bathed in profuse perspiration, when the cure, at all events for the time, was supposed to be effected. This mania attacked both men and women, young and old alike, women being more susceptible than men. It was also con- sidered to be highly infectious and to spread rapidly from person to person until whole areas were affected. The name tarantella, in use at the present time, applies both to a dance still in vogue in Southern Italy and also to musical pieces resembling in their stimulating measures those that were necessary to rouse to activity the sufferer from tarantism in the middle ages. In recent times the term tarantula has been applied indiscriminately to many different kinds of large spiders in no way related to Lycosa tarantula; and to at least one Arachnid belonging to a distinct order. In most parts of America, for example, where English is spoken, species of Avieulariidac, or " Bird-eating " spiders of various genera, are

Galeodes lucasii, an Arachnid of the order Solifugae, commonly but wrongly called tarantula in Egypt.

invariably called tarantulas. These spiders are very much larger and more venomous than the largest of the Lycosidae, and in the Southern states of North America the species of wasps that destroy them have been called tarantula hawks. In Queensland one of the largest local spiders, known as Holconia immanis, a member of the family Clubionidae, bears the name tarantula; and in Egypt it was a common practice of the British soldiers to put together scorpions and tarantulas, the latter in this instance being specimens of the large and formidable desert-haunting Arachnid, Galeodes lucasii, a member

of the order Solifugae. Similarly in South Africa species of the genus Solpuga, another member of the Solifugae, were em- ployed for the same purpose under the name tarantula. Finally the name Tarantula, in a scientific and systematic sense, was first given by Fabricius to a Ceylonese species of amblypygous Pedipalpi, still sometimes quoted as Phrynus lunatus. (R. I. P.)

TARAPACA, a northern province of Chile, bounded N. by Tacna, E. by Bolivia, S. by Antofagasta, and W. by the Pacific. Area 18,131 sq. m. Pop. (1895) 89,751; (1902, estimated) 101,105. It is part of the rainless desert region of the Pacific coast of South America, and is absolutely without water except at the base of the Andes where streams flow down into the sands and are lost. In some of these places there is vegetation and water enough to support small settlements. The wealth of Tarapaca is in its immense deposits of nitrate of soda (found on the Pampa de Tamarugal, a broad desert plateau between the coast range and the Andes, which has an elevation of about 3000 ft.). The mining and preparation of nitrate of soda for export maintain a large population and engage an immense amount of capital. Silver is mined in the vicinity of Iquique, the capital. The ports of the province are Pisagua, Iquique and Patillos, from which " nitrate railways " run inland to the deposits. Tarapaca was ceded to Chile by Peru after the war of 1879-1883, and was organized as a province in 1884.

TARARE, a town of east-central France, in the department of Rhone, on the Turdine, 28 m. W.N.W. of Lyons by rail. Pop. (1906) 11,643. It is the centre of a region engaged in the production of muslins, tarletans, embroidery and silk-plush, and in printing, bleaching and other subsidiary processes. Till 1756, when the manufacture of muslins was introduced from Switzerland, the town lay unknown among the Beaujolais mountains. The manufacture of Swiss cotton yarns and crochet embroideries was introduced at the end of the 18th century; at the beginning of the 10th figured stuffs, open- works and zephyrs were first produced. The manufacture of

silk-plush for hats and machine-made velvets was set up towards the end of the 19th century. A busy trade is carried on in corn, cattle, linen, hemp, thread and leather.

TARASCON, a town of south-eastern France, in the depart- ment of Bouches-du-Rhone, 62 m. N.W. of Marseilles by rail. Pop. (1906) town, 5447; commune, 8972. Tarascon is situated on the left bank of the Rhone opposite Beaucaire, with which it is connected by a railway bridge and a suspension bridge. The church of St Martha, built in 1187-97 on the ruins of a Roman temple and rebuilt in 1379-1449, has a Gothic spire, and many interesting pictures in the interior. Of the original building there remain a porch, and a side portal flanked by marble columns with capitals like those of St Trophimus at Aries. The former leads to the crypt, where are the tombs of St Martha (1658), Jean de Gossa, governor of Provence under King Rene, and Louis II., king of Provence. The castle, picturesquely situated on a rock, was begun by Count Louis II. in the 14th century and finished by King Rene in the 15th. It contains a turret stair and a chapel entrance, which are charm- ing examples of 15th-century architecture, and fine wooden ceilings. The building is now used as a prison. The hotel-de- ville dates from the 17th century. The civil court of the arrondissement of Aries is situated at Tarascon, which also possesses a commercial court, and fine cavalry barracks. The so-called Aries sausages are made here, and there is trade in fruit and early vegetables. In Tartarin de Tarascon Alphonse Daudet has satirized the provincial life of Tarascon. Its uueventfulness

is varied by the fair of Beaucaire, and it used to be the 1 scene of the two fetes of La Tarasque, the latter in celebration of St Martha's deliverance of the town from a legendary monster of that name. King Rene presided in 1469, and grand exhibitions of

costume and strange ceremonies take place during the two days of the festival. Tarascon was originally a settlement of the Massaliots, built on an island of the Rhone. The medieval castle, where Pope Urban II. lived in 1096, was built on the ruins of a Roman camp. The inhabitants of Tarascon preserved the municipal institutions granted them by the Romans, and of the absolute power claimed by the counts of Provence they only recognized the rights of sovereignty. Tarascon played a bloody part in the White Terror of 181 5,

TARAXACUM, the name usually applied in medical practice to the common dandelion (q.v.).

TARBELL, EDMUND C. (1862-), American artist, was born at West Groton, Mass., on the 26th of April 1862. He was a pupil of the schools of the Boston Museum of Fine Arts and of Boulanger and Lefebvre, Paris, and became a distin- guished painter of the landscape, of the figure, and of portraits, winning various important prizes and medals at exhibitions. In 1906 he was elected a National Academician, besides being a member of the Ten American Painters, and he became in- structor of painting in the Boston Museum of Fine Arts.

TARBERT, a fishing village at the head of East Loch Tar- bert, an arm of the sea on the west shore of the mouth of Loch Fyne, Argyllshire, Scotland. Pop. (1901) 1697. The harbour, though it has a narrow entrance, is absolutely safe and can shelter the whole of the Loch Fyne fishing fleet. The pier for the passenger steamers that call here is about J m. from the village. The coast of the bay is rocky and the cliffs are fringed with young firs, the village itself being quite a pretty place. The herring fishery- -including a large trade in curing — forms the only industry. The parish church occupies a fine situation. Overlooking the harbour are the ruins of a castle built by Robert Bruce in 1326. The isthmus connecting the districts of Knapdale and Kintyre is little more than one mile wide, and boats used once to be dragged across to the head of West Loch Tarbert, a narrow sea loch nearly ten miles long. A

proposal to cut a canal across to shorten the sail to Islay and Jura has never progressed further.

TARBES, a town of south-western France, capital of the department of Hautes-Pyrenees, 98 m. W.S.W. of Toulouse on the Southern railway. Pop. (1906) town, 20,866; commune, 25,869. Tarbes is situated in a beautiful and fertile plain, in full view of the Pyrenees, on the left bank of the Adour, streams from which are conducted through all parts of the tow 7 n. The lines of the Southern railway from Morcenx to Bagneres-de- Bigorre and Lourdes and from Toulouse to Bayonne cross here. Chief among the many open spaces is the Jardin Massey ■ (35 acres), given to his native town by a director of the gardens of Versailles and containing a museum of sculptures, paintings and antiquities. Near a small lake stands a cloister (15th century) transferred from the abbey of St Sevei-de-Rustan, 14 m. N.E. of Tarbes, and a bust of Theophile Gautier, a native of Tarbes. The architecture of the cathedral, Notre Dame de la Sede, is heavy and unpleasing, but the cupola of the transept (14th century), the modern glass in the 12th-century apse, and a rose window of the 13th century, in the north transept, are worthy of notice. There is also a modernized Carmelite church originally built in the 13th century. Tarbes is a well-known centre for the breeding of Anglo-Arabian horses, much used by light cavalry; and its stud is the most important in the south of France. The industrial establishments include tanneries, tile-works, saw-mills and turners' shops. There are important fairs and markets. Well-known race-meetings are held on the Laloubere course.

Under the Roman dominion Turba, which was about n m. S.E. of the present town of Tarbes, was the capital of the Bigerriones, one of the states of Novempopulania. The bishopric of Tarbes dates from the 5th century, and in feudal times its bishops held the chief temporal authority, that of xxvi. 14

the counts of Bigorre, of which Tarbes was capital, being limited to the quarter of the town where their castle was built. The English held the town from

1360 to 1406. In 1569 Tarbes was burnt by Gabriel, count of Montgomery, and the inhabitants were driven out. This happened a second time, but in August 1570 the peace of St Germain allowed them to return. Subse- quently Tarbes was several times taken and re-taken, and a number of the inhabitants of Bigorre were forced to take refuge in Spain, but in 1594 the members of the League were finally expelled. The English, under Wellington, gained a victory over the French near Tarbes in 1814.

TARBUSH (Arab tarbush), the close-fitting, flat-topped and brimless cap, in shape like a truncated cone, made of felt or cloth, worn by Mahommedan men throughout the East either as a separate headgear or forming the inner part of the turban. It is worn as the badge of a Turkish subject in Turkey and Egypt, where it is red in colour with a black or blue silk tassel. It is the same as the ” fez ” (see the plate illustrations to India: § Indian Costume).

TARDE, GABRIEL (1843-1904), French sociologist, was born at Sarlat (Dordogne) in 1843. Entering the legal profession, he was for some time a juge d’instruction in his native town, becoming afterwards head of the statistical department of the ministry of justice. He also held the professorship of modern philosophy at the College de France in Paris, and was elected a member of the Academie des sciences morales et politiques in 1900. Attracted to the study of criminology by the oppor- tunities of his profession, he gradually built up for himself a reputation as an acute observer of the phenomena of the subject, while at the same time he made striking and original deductions of his own. Special reference may be made to his theory of ” imitation ” as outlined in Les Lois de I’imitation (1890), and further elaborated in Logique sociale (1895). He also wrote L’Opinion et la Joule (1901); Les Transformations du droit (1894); Les Transformations du pouvoir (1899); L’Op- position universelle (1897) and Psychologie iconomique (1902; Eng. trans., Social Laws, 1899). He died in Paris in 1904.

See bibliography of the sociological writings of

Tarde in M. M Davis, Psychological Interpretations of Society (Columbia University Press, 1909) ; also A. Matagrin, La Psychologie sociale de Gabriel Tarde (Paris ; 1910). •

TARDIGRADA, apparently Arthropodous animals whose re- lationship to the great classes of this sub-kingdom is masked by degenerative modification. They are microscopical in size and live in damp moss or water. The body is elongated and furnished with four pairs of short, unjointed, stump-like legs, each terminated by a pair of claws. The legs of the posterior pair project from the hinder extremity of the body and the anus opens between them. The mouth, situated at the op- posite end and armed with a pair of stylets, leads into an oesophagus, into which the ducts of a pair of so-called salivary glands open. Behind this point there is a muscular pharynx or gizzard, which communicates with the wide intestinal tract. No organs of circulation or respiration are known; but the nervous system is well de- veloped, and consists of a pair of ganglia corresponding with the limbs and connected by longitudinal commis- sural chords. Anteriorly these chords embrace the oesophagus and unite with the cerebral mass which innervates the pair of eyes when present. The sexes are not distinct, the sexual organs being represented by a pair of testes and a single ovary, which open together into the posterior end of the alimentary canal. The Tardigrada have been regarded as degenerate Acari largely on account of their possessing four pairs of ambulatory limbs, which is considered

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«■•...*

Milnesium lardigra- dum, Schrank. a, ovary; b, oval Btylite (?); c, mouth; d., alimentary canal; e…e, legs.

to be an Arachnidan characteristic. But they cannot be affiliated with this order on account of the total suppression of the ab- domen, of their hermaphroditism and of the communication that exists between the generative organs and the alimentary tract. These last characteristics also separate them essentially from the Pycnogonida, some members of which resemble them to a certain extent in having only four pairs of limbs, no gnathites, no respiratory organs, a ganglionated ventral nervous system, and the abdomen reduced to a mere rudiment projecting between the last pair of legs.

Several genera and species of Tardigrada have been described, perhaps the best known being Macrobiotits schultzii and Mil- nesium tardigradum. (R. I. P.)

TARE AND TRET, in commerce, allowances or deductions. Tare is an allowance made from the gross weight of goods for the box, bag or other wrapping in which the goods are packed. It may be real, i.e. representing the actual weight of the wrap- ping; customary, when a uniform or established rate is allowed; average, when one or two packages among several are weighed, and the mean or average of the whole taken; ot super-tare, an additional allowance when the package exceeds a certain weight. Tret is an allowance of 4 lb. in every 104 lb. of weight, made as compensation for loss by waste. " Tare " comes through the Fr. tare, cf. Sp. tara, from Arab, tarha, tarh, throwing, casting — the word meant originally loss, that which is thrown away; " tret " is an adaptation of Fr. traite, Lat. trahere, to draw, and meant a draught, transportation, also a payment on ex- ports, an allowance on exportation.

TARENTUM (Gr. rdpas), a Greek city of southern Italy (mod. Taranto, q.v.), situated on the N. coast of the gulf of the same name, on a rocky islet at the entrance to the only secure harbour in it. It was a Spartan colony founded about the close of the 8th century B.C. (Jerome gives the date 708) to relieve the parent state of a part of its population which did not possess, but claimed to enjoy, full civic rights. Legend repre- sents these Partheniae (so

they are called) as Spartans with a stain on their birth, but the accounts are neither clear nor con- sistent, and the facts that underlie them have not been cleared up. The Greeks were not the first settlers on the peninsula: excavations have brought to light signs of a pre-Hellenic settle- ment. To the Greeks Taras was a mythical hero, son of Neptune, and he is sometimes confounded with the oecist (official founder) of the colony, Phalanthus. Situated in a fertile district, especially famous for olives and sheep, with an admirable harbour, great fisheries and prosperous manufactures of wool, purple ' and pottery, Tarentum grew in power and wealth and extended its domain inland. Even a great defeat by the natives in 473 B.C., when more Greeks fell than in any battle known to Herodotus, did not break its prosperity, though it led to a change of government from aristocracy to democracy. A feud with the Thurians for the district of the Siris was settled in 432 by the joint foundation of Heraclea, which, however, was regarded as a Tarentine colony. In the 4th century Tarentum was the first city of Magna Graecia, and its wealth and artistic culture at this time are amply attested by its rich and splendid coins; the gold pieces in particular (mainly later than 360) are perhaps the most beautiful ever struck by Greeks (see Numismatics). In the second half of the century Tarentum was in constant war with the Lucanians, and did not hold its ground without the aid of Spartan and Epirote condottieri. Then followed war with Rome (281) in consequence of the injudicious attack of the mob on the Roman fleet in the harbour of Tarentum and on the Roman garrison at Thurii, the expedi- tion of Pyrrhus, whom Tarentum summoned to its aid, and at length, in 272, the surrender of the city by its Epirote garrison. Tarentum retained nominal liberty as an ally of Rome. In the Second Punic War it went over to Hannibal in 212, and suffered severely when it was retaken and plundered by Fabius (209), who sold thirty thousand citizens as slaves. After this it fell into decay, but revived again after receiving a colony in 123 B.C.,

1 Large heaps of the shells of the murex, or purple-yielding mussel, were visible on the shore before the extension of the arsenal.

which received the name of Neptunia. In the time of Augustus it was essentially Greek and a favourite place of resort (Horace, Od., iii. 5, 53), but it declined afterwards. Belisarius ordered it to be re-fortified, but it was soon taken by Totila, who made it his treasure store. After his defeat by Narses, it was sold to the Byzantine Empire by its Gothic governor.

One of the most interesting discoveries of recent years has been that of a terramara on the so-called Scoglio del Tonno on the N.W. of the town, which in its type and in the character of the objects found there, is exactly identical with the terremare of the Po valley. It seems, however, to be an isolated colony, and not to prove a parallel development in north and south Italy (T. E. Peet in Papers of the British School at Rome, iv., 1907, 285). Almost the only relic of any building of the Greek city is a part of a Doric temple on the island — which the modern town occupies — two fluted columns, with a lower diameter of 61 ft., and a height of 28 ft., and some fragments of the entablature, belonging probably to the beginning of the 6th century B.C., so that this is one of the earliest extant Doric temples. The condition of the site was, however, different in ancient times; the rock occupied by the modern town was, it is true, the citadel, but was connected with the land to the west by an isthmus, which was only cut through by Ferdinand I. of Aragon; and it was also a good deal less extensive. The line of the walls which defended the city on the east (land) side has been traced, and a few remains of well-cut blocks, with Greek masons' marks, still exist. In the centre of the Agora was the huge bronze Zeus by Lysippus, and facing on to it the HoiKiXrj, or painted portico, with pictorial representations of the life of Phalanthus, and the foundation of the city, and the museum. There was also a fine gymnasium and other buildings mentioned by classical writers. Strabo's description of the

site (vi. 3, 1) is a good one. Of all these structures no traces remain. The Roman amphitheatre, on the other hand, and remains of Roman baths by the seashore, have been found; the former perhaps occupies the site of the ancient theatre, in which the Roman ambassador was received in 281 B.C.

Three fine mosaics of the Roman period were found in the remains of a house in 1899, and transported to the museum (A. Avena, Monumenti deW Italia Meridionale, Naples, 1903, 239). A fine silver jug and drinking-horn, found in Tarentum in 1889 (now in Triest) are illustrated by A. Puschi' and F. Winter in Jahreshefte des Osterr. Arch. Instituts, v. (1902) 112. Other silver vessels found in 1896 are in the important local museum (G. Patroni in Notizie degli scavi,i8g6, 376), and at Bari (M. Mayer, ibid., 1896, 547). All seem to belong to the 4th century B.C. To the N.W. of the town along the Massafia road, neolithic tombs and a fine Greek hypogaeum in masonry were discovered in 1900. (T. As.)

TARENTUM, a borough of Allegheny county, Pennsylvania, U.S.A., on the Allegheny river, about 20 m. N.E. of Pittsburg.- Pop. (1890) 4627; (1900) 5472 (1173 being foreign-born) ; (1910) 7414. Tarentum is served by the Pennsylvania railway and by an electric line connecting with Pittsburg. Among manu- factures are plate glass and bottles, table ware, paper, bricks, iron and steel articles, and steel sheets and billets. Coal mining is an important industry, and the borough is supplied with natural gas. Tarentum was first settled in 1796, was laid out in 1829 at the direction of Henry Marie Brackenridge (1786-1871), 2 who by marriage had come into possession of the site, and it was incorporated as a borough in 1842. The first glass manufactory was established in 1872.

TARGET, GUI JEAN BAPTISTE (1733-1807), French lawyer and politician, was born in Paris on the 17th of December 1733.

2 Brackenridge was a prominent lawyer, a native of

Pittsburg, who practised in Maryland, Missouri and Louisiana, wasa district judge in Louisiana in 1812–1814, secretary of the U.S. commis- sion sent to South America in 1817, U.S. judge for the western district of Florida from 182 1 to 1832, when he returned to Penn- sylvania, and the author of a Voyage to South America in 1817–1818 (1820), a History of the Late War between the United States and Great Britain (1817), Recollections of Persons and Places in the West (1834), and a History of the Western Insurrection (1859).

He acquired a great reputation as a lawyer, less by practice in the courts than in a consultative capacity. He strenuously opposed the " parlement Maupeou," devised by the Chancellor Maupeou to replace the old judiciary bodies, and refused to plead before it. He was counsel for the cardinal de Rohan in the affair of the Diamond Necklace (q.v.). In 1785 he was elected to the French Academy. In 1789 he was returned as one of the deputies of the Third Estate in Paris to the states- general, where he supported all such revolutionary measures as the union of the orders, the suspensive veto, the civil constitu- tion of the clergy, &c. His excessive obesity, which in the Constituent Assembly made him the butt of the Royalists, had prevented him from practising at the bar for some years before 1789, and when Louis XVI. invited him to undertake his de- fence he excused himself on this ground. At the same time he published in 1792 some Observations in extenuation of the action of the king, from the constitutional point of view, which in the circumstances of the time argued much courage. For the rest, he took no part in public affairs during the Terror. Under the Directory he was made a member of the Institute (1796) and of the Court of Cassation (1798). He lived to colla- borate in the earlier stages of the new criminal code. Among his writings may be mentioned a paper on the grain trade (1776) and a Memoire stir Vitat des Protestants en

France (1787), in which he pleaded for the restoration of civil rights to the Pro- testants.

See Victor du Bled, ” Les avocats et 1’Academie Francaise,” in the Grand Revue (vol. ii. 1899); H. Moulin, Le Palais d 1’Academie: Target et son fauteuil (Paris, 1884); P. Boulloche, Un avocat an 1$™’ siecle (Paris, 1893).

TARGET, a mark to shoot at, so called from its resemblance in shape to the ” targe ” or small round shield, particularly the round wood and leather buckler, with metal bosses, and long spike protruding from the central boss, which was carried by the Highland clans; at the back was a leathern sleeve in which the left arm was inserted. In the 17th century, as body armour ceased to be used, the infantry soldier often carried a light shield of various forms which was known as a ” target,” which is a diminutive of targe; such soldiers were known as ” targeteers.” ” Targe ” is a word that has been the subject of much etymological discussion. On the one hand is found the O.E. targe, with hard g, a shield, cf. Icel. targa, shield, target, and O.H. Ger. zarga, frame, side, border; on the other is Fr. targe, Sp. and Port, tarja, Ital. targa, buckler, shield. The soft and hard g’s point to two distinct words. In Sp. and Port., is found adarga, a square target or buckler, which is an Arabic word, al darkat or darakat, a leather shield. The O.E. and Icel. words can hardly have come from an Arab, source, and the relation between the two words is an etymological puzzle (see Skeat, Etym. Diet., 1910). The target as a mark to shoot at is, for archery, a circular canvas-covered frame stuffed with straw and marked with concentric lings surrounding the centre or bull’s-eye. For shooting with the rifle the target is usually square.

In the days of the smooth-bore musket, and for many years after the introduction of small arms of precision, the targets used in musketry training were of a ” match ” and not a ” service ” character. The target was white with a black bull’s-eye (counting 5 points) and two rings, invisible to the

firer, called the " inner " and the "magpie," and scoring 4 and 3; the rest of the target was called the "outer" and counted 2 points. This system was the basis of all match shooting, whether with match or service rifles, and (with the trifling difference that the bull counted 4, the inner 3 and the magpie and outer alike 2) it was followed in military range practice. For collective fire regular rows of black silhouettes on white screens were employed. These were a compromise between bull's-eye and service targets which possessed the virtues of neither. But after the S. African war bull's-eye practices were eliminated from the musketry course of the British army, and in the musketry regulations of 1909 they were restricted to the earliest stages of recruits' training and trained soldiers'

" refresher " courses. The use of the bull's-eye to-day is to teach the soldier to shoot uniformly, that is, to " group " his shots closely. The position of his shot group with reference to the bull's-eye does not matter; if his group is comprised within a 6 or 12-inch ring (at 100 yards range) he is passed on to more advanced practices at service targets. The latter are no longer coloured black-and-white, but are of the dull colours which are met with in the field, either brown head-and-shoulders painted on a green-grey canvas background or brown silhouettes held up against the face of the stop-butt. The National Rifle Association in 1910 followed the lead of the War Office to some extent as regards the targets used at the Bisley meeting in " service-rifle " competitions. For collective practices at the more important military stations large areas of ground are prepared with silhouettes in entrenchments, dummy guns, &c. Mechanical " running-man " and " disappearing " targets are also used for training in snap-shooting and rapid fire. The target used in naval gunnery is a large floating frame of timber either fixed by buoys or anchors or towed at a distance by a vessel (see Ordnance: § Naval Gunnery).

TARGUM. The Targums are the Aramaic translations — or rather paraphrases — of the books of the Old

Testament, and, in their earliest form, date from the time when Aramaic superseded Hebrew as the spoken language of the Jews (see Hebrew Language). In their origin they were designed to meet the needs of the unlearned among the people who had ceased to understand the Hebrew of the Old Testament. In the absence of • any precise evidence on the point it is impossible to give more than a rough estimate as to the period at which Hebrew, as a spoken language, was finally displaced by Aramaic. It is, however, certain that the latter language was firmly established in Palestine in the 1st century a.d. By that time, as we know from many sources, Aramaic was not only the language in common use, but had also received official recognition, 1 despite the fact that Hebrew still remained the learned and sacred tongue. Hence we may reasonably infer that the mass of the people had adopted Aramaic at a considerably earlier period, probably, as early as the 2nd century B.C., and that the need of Aramaic translations of the sacred text made itself felt but little later. By the Jews 2 the introduction of Targums is ascribed to Ezra; but this tradition, which probably owes its origin to the Talmudic explanation of Neh. viii. 8, 3 is incon- sistent with the linguistic evidence furnished by the post-exilic literature of the Old Testament, and must be rejected as unhistorical, if only because the process by which Aramaic took the place of Hebrew was admittedly a very gradual one. The Talmudic tradition, however, is, doubtless, correct in con- necting the origin of Targums with the custom of reading sections from the Law at the weekly services in the synagogues, since the need for a translation into the vernacular must first have arisen on such occasions. As we know from the New Testament, the custom of reading in the synagogues both from the Law 4 and from the Prophets 6 was well established in the 1st century a.d.: its introduction, therefore, will date from a much earlier period. The practice of accompanying these readings with a translation into Aramaic is, further, so generally recognized by the 2nd century a.d. that the Mishna 6 takes it for granted, and merely inculcates certain

regulations to be observed by the Meturgemdn (translator), who had by this time acquired a definite status. From it we learn that the Meturge-mdn, who was distinct from the reader, translated each verse of the Law into Aramaic as soon as it had been read in Hebrew: in the readings from ” the Prophets ” three verses might be read at a time. Later regulations are also laid down in the Talmuds in order to prevent any appearance of authority attaching to the translation, and also to ensure reverential

1 Cf . Dalman, Die Worte Jesu, p. 2 f. ; Grammatih des jiid.- palast. Aramdisch, 2nd ed., p. 9 f.

2 Sanhedrin, 21b.; Jer. Meg., i.

3 Nedarim, 376; Jer. Meg., iv. — “and they read in the book, in the law of God, this is the Scripture, ehied (R.V. distinctly), this is the Targum.” 4 Acts xv. 21.

6 Luke iv. 16 f. ; Acts xiii. 14, 27. 6 Meg. iv. 4-6, 10.

treatment on the part of the translator. 1 Elsewhere, 2 we only find references to certain passages of Scripture, viz., the stories of Reuben and Tamar (Gen. xxxv. 22 and xxxviii.), the two accounts of the golden calf (Exod. xxxii.), the blessing of the priests (Num. vi. 22 f.), the stories of David and Amnon (2 Sam. xi., xii. and xiii.), which might be either read and translated, or only read and not translated, or (according to a different tradition) neither read nor translated. It is noticeable that none of the passages cited conveys any rules or information as to the character of the translation to be employed. Judging by the contents of our existing Targums, and the Targumic renderings given in Jewish literature, it is improbable that any definite system of

interpretation was ever formally adopted, the rendering into the vernacular being left to the discretion of the individual Meturgeman. At first, no doubt, the translator endeavoured to reproduce the original as closely as possible, but, inasmuch as his object was to give an intelligible rendering, a merely literal rendering would soon be found to be insufficient, and he would be forced, especially in the more difficult passages, to take a more elastic view of his obligations. To prevent misconception he must expand and explain what was obscure, adjust the incidents of the past to the ideas of later times, emphasize the moral lessons to be learned from the national history, and, finally, adapt the rules and regulations of the Old Covenant to the conditions and requirements of his own age. As time went on the practice of introducing additional matter of an edifying character grew in popular favour, and was gradually extended. Thus, by degrees, the reproduction of the original text became of secondary importance, and merely served as a pretext for the discussion of topics that had little or no bearing on the context. The method, by which the text was thus utilized as a vehicle for conveying homiletic discourses, traditional sayings, legends and allegories, is abundantly illustrated by the Palestinian and later Targums, as opposed to the more sober translations of Onkelos and the Targum to the Prophets.

It would, however, be incorrect to suppose that the transla- tion of the text was left entirely to the individual taste of the translator. The latter is rather to be regarded as the repre- sentative of the age in which he lived, and his interpretation is to be taken as reflecting the exegesis of that period. That there were certain limits beyond which the translator might not venture, without incurring the censure of the authorities, may be inferred from the few instances of translation which are mentioned with disapproval in the Mishna and elsewhere. Thus the rendering of Lev. xviii. 21 ” by ” Thou shalt not give any of thy seed to an Aramean woman to make her conceive ” is censured, presumably because the

prohibition of Molech worship is thereby ignored. 3 In the same Mishnic passage it is forbidden to render Lev. xviii. 7 as if the text had ” his father ” and ” his mother.” 4 Yet another translation (that of Lev. xxii. 28) is mentioned with disapproval in the Jerusalem Talmud, 6 though it has been preserved in the Targum Pseudo- Jonathan ad loc. 6 A definite rule for guidance in translating is apparently preserved in the Tosefta, 7 where it is stated that ” be who translates quite literally is a liar, while he who adds anything is a blasphemer,” Exod. xxiv. 10, ” and they saw the God of Israel ” is cited as an example. It is argued that the literal rendering of this passage is inadmissible, because no man has ever seen God; on the other hand, the insertion of the word ” angel ” before God would be blasphemous. The correct rendering is stated to be ” and they saw the glory of God.” But it is doubtful if the rule here given was ever intended to

1 Tos. Meg., 3: Jer. Meg., iv. 1-3; Sota, 396; Sopherim, xi. 1, xii. 7, xiv. 2.

2 Meg., 25, 25ft; cf. Ginsburger, M.G.W.J., xliv. 1 f.

‘Meg., iv. 9; cf. Jer. Meg., iv. 9; Sanhed., ix. 1, where the meaning is given as — ” He who marries an Aramean woman and raiseth up children by her raiseth up enemies to God "; for another explanation, see Ginsburger, M.G.W.J., xliv. 5 f.

4 Cf. Berliner, Targum Onkelos, ii. p. 85 f.

6 Meg., iv. 10. 6 Cf. Ginsburger, I.e.

1 Tos. Meg., end.

apply to more than the particular type of passage exemplified: if it had been applied generally, it would have clashed with the whole trend of Midrashic and Targumic paraphrase.

There can be little doubt that the Targums existed for a long time in oral form. They belonged to the class of tradi- tional literature which it was

forbidden to write down, and, so long at least as the Targum tradition remained active, there would be little temptation to commit it to writing. But it is highly probable that this prohibition, in the case of the Targums, was mainly enforced with respect to those parts of the Old Testament which were read in the synagogal services, e.g. the Law and the Prophets, and that it was less rigidly observed in regard to the other portions of Scripture: a written trans- lation of the latter would be of special value for the purpose of private study. Hence there is no need to reject the tradition as to the existence of a written Targum on Job in the time of Gamaliel I. 8 (1st century a.d.), especially as references to Targum MSS. occur in the Mishna and elsewhere. 9 But, as Dalman has pointed out, 10 it was not these manuscripts, but the living tradition of the learned which was recognized as authoritative throughout the period which closes with the compilation of the Talmud. . . . The official recognition of a written Targum, and therefore the final fixing of its text belongs to the post-Talmudic period, and is not to be placed earlier than the 5th century.

I. Targums on the Pentateuch

(1) The so-called Targum of Onkelos admittedly owes its name to a mistaken reference in the Babylonian Talmud. 11 In its original context, that of the Jerusalem Talmud, 12 the passage refers to the Greek translation of Aquila. With the exception of this one reference, the Targum is always intro- duced in the Babylonian Talmud by the phrase "as we trans- late " (p'Mnnm^), or "our Targum" (pn oirm) : it is pro- bable, therefore, that the name of the author, or authors, was unknown to the Babylonian Jews. It is first quoted under the title of the Targum of Onkelos by Gaon Sar Shalom (d. a.d. 859). According to Dalman, 13 its language differs in many material par- ticulars from the Aramaic dialects of the Palestinian and Babylonian Talmuds, and is more closely allied to the biblical Aramaic. On the linguistic side, therefore, we may regard Onkelos " as a faithful representative of a Targum which had

its rise in Judaea, the old seat of Palestinian literary activity." It is not, however, to be regarded as a reproduction in written form of a Palestinian trans- lation, but rather as an official translation of the Law, in the Judaean dialect, which was carried out in Babylon, probably about the 4th century A.D. : in its final form, according to Dalman (I.e.) it cannot be earlier than the 5th century. The translation, as a whole, is good, and adheres very closely to the Hebrew text, which has not been without its influence on the Aramaic idiom; at times, especially in the poetical passages, a freer and more paraphrastic method is employed, and the version shows evident traces of Halakhic and Haggadic expansion. The Hebrew text used by the translators appears to have been practi- cally identical with the Massoretic. The version was held in high esteem in Babylon, and, later, in Palestine, and a special Massora was made for it. The latest edition is Berliner's reprint (1884) of the Editio Sabbiotteta (1557).

Of all the extartt Targums that of Onkelos affords perhaps the most characteristic and consistent example of the exegetical methods employed in these works. Two principles may be said to have guided the translators. On the one hand, they had, as their primary object, to produce a faithful rendering of the original which at the same time would be intelligible to the people : for this purpose a purely literal translation would be insufficient. On the other hand, they regarded it as necessary to present the sacred text in such a manner as best to convey the particular form of interpretation then current. But later Jewish exegesis was espe- cially concerned to eliminate everything in the sacred writings that might, give rise to misconception with respect to God on the part of the unlearned. Hence we find various expedients adopted in the Targums for avoiding any reference to the Deity, which might be misunderstood by the people, or which involved apparent irreverence. Examples of this peculiarly Targumic method are: (1) the insertion of " word " (nid'd), " glory " (mp'). " presence " (mw) before

the divine name, when God is referred to in his

8 Tos. Shabb.; cf. Jer. Shabb., xvi. ; Bab. Shabb., 1 150; Sopherim, v. xv.

9 Jad. iv. 5, and see the preceding references.

10 Grammatik des jildisch-palastinisehen Aramaisch, p. 12 f.

11 Meg. 3a. 12 Meg. i. 9. 13 Gramm. p. 12 f.

dealings with men; (2) the insertion of the preposition "before" (Dip) when God is the object of any action ; (3) the use of the passive

for the active voice, e.g. tnp 'hi for yr or nm; "p ye» for iw;

'Sanx for i2V, k*\ "", Kin; Yn for oi; (4) the use of periphrasis for the more pronounced anthropomorphisms, such as " to smell," " to taste," or when the use of the status constructus might seem to bring God into too close connexion with men or things; (5) the use of different expressions, or the insertion of a preposition before the divine name, when God is compared to man, or the same action is predicated of God and man; (6) the use of " for mx and dtiSk, and the rendering xhm or Niyo when dmSn denotes heathen gods. Instances of this endeavour to maintain, as it were, a respectful distance in speaking of God occur on every page of the Targums, but cases also occur, by no means infrequently, where human actions and passions are ascribed to God. The explana tion of this phenomenon is to be found in the fact that anthropo- morphisms, as such, were not necessarily avoided, but only in those cases where they might be misunderstood by the people.

(2) In addition to the Targum of Onkelos two other Targums to the Pentateuch are cited by Jewish

authorities, under the titles of the Targum Jerushalmi and the Targum of Jonathan ben Uzziel. Of these the former contains only portions of the Pentateuch, 1 and is therefore usually designated the Fragmentary (Jerusalem) Targum. In a large number of cases this Targum gives merely a variant rendering of single words: where longer passages are given it presents a very paraphrastic translation, and bears all the marks of a late Haggadic composition. Its fragmentary character arises from the fact that it is simply a collection of variae lectiones and additions to the version of Onkelos, intended possibly for use at public services. 2 That this Targum was really intended to supple- ment that of Onkelos is shown by comparing the two texts. For the former is frequently unintelligible without the latter, since it offers no translation of those words, or clauses, for which it gave the same rendering as Onkelos. On the other hand, the version of Onkelos affords just the supplementary material that is required to restore sense to the shorter text. Moreover, in not a few cases the Fragmentary Targum itself attaches to its variant rendering the succeeding word from Onkelos, thus indicating that from this point onwards the latter version is to be followed. More con- clusive still is the fact that in a number of old Mahzor MSS. we find Targums to the Song of Moses and to the Decalogue, in which this process has been fully carried out, the text of Onkelos being given as well as the variants of the Fragmentary Targum.

The second Jerusalem Targum, or the so-called pseudo-Jonathan, admittedly owes its ascription to Jonathan ben Uzziel to the incorrect solution of the abbreviated form by which it was fre- quently cited, viz. "n, or Targum Jerushalmi ('dWit main). This Targum represents a later and more successful attempt to correct and supplement the Targum of Onkelos by the aid of variants derived from another source. It is not, however, a revision of the Fragmentary Targum — for it is clearly independent of that version — but is rather a parallel, if somewhat later, pro duction, in which the text of

Onkelos is already combined with a number of variants and additions. It is noticeable that this Tar- gum has been considerably influenced by the Targum of Onkelos, and in this respect, as in others, is far less trustworthy than the Fragmentary Targum, as a witness to the linguistic and other peculiarities of the source from which they were both derived. It exhibits, to a marked degree, that tendency to expand the text by additions of every kind, which has been already noted as char- acteristic of the later stages of Targumic composition. Homilies, legends, traditional sayings and explanations, in fact every form of Haggadic expansion are utilized by the Targumist, so that at times his works convey the impression more of a late Midrash than of a translation. This impression is fully confirmed by (a) a comparison of the Talmud and later Midrashic works with which it has obvious points of contact, and (b) the historical allusions, Euch as the mention of Constantinople (Num. xxiv. 19), of a wife and daughter of Mahomet (Gen. xxi. 21), and the references to Esau and Ishmael as representative world-powers (Gen. xlix. 26; Deut. xxxiii. 2; cf. Fragm. Tg. to Gen. xlix. 2; Deut. xxxiii. 2). 3 In its translation of the Hebrew pseudo-Jonathan is careful to avoid anthropomorphisms and to give the sense of all but the most simple metaphors, though his method is not so thorough as that of Onkelos. Every endeavour is made to gloss over, or modify, expressions which seemed' derogatory to the ancestors of

1 According to Zunz, Gottesdienstliche Vortrage, 2nd ed., p, 80, its contents bear the following proportions: — jj to Genesis, £(, to Exodus, about j \| to Leviticus, | to Numbers, and \ to Deuteronomy.

2 Seligsohn, De duabus Hier. Pent, paraphrasibus (1858): for a fuller discussion see Bassfreund, " Das Fraementen Targum " in M.G.W.J. A.

3 'I he view that Deut. xxxiii. 1 1 could only have been written by a contemporary of John Hyrcanus cannot be maintained; cf. Dalman, Gramm. p. 30 f., and, more fully, Bassfreund, M.G.W.J. xliv. (1900),

pp. 481 f.

Israel, and to amplify everything which redounded to their credit. On the other hand, pseudo-Jonathan shows a tendency to condense those additions which it has in common with the Fragmentary Targum : in particular he omits all quotations from Scripture.

In regard to the source of the two Palestinian Targums to the Pentateuch, we must accept the conclusion of Bassfreund 4 that they both derived their variants from a complete Targum Jeru- shalmi. This conclusion is based on the following grounds: (1) Various Jewish works dating from the nth to the 14th century contain a large number of quotations under the heading '"n, i.e. Targum Jerushalmi. Of these rather less than a quarter are found in the Fragmentary Targum, the remainder being mostly taken from passages for which no translation of that Targum exists. This completer work, however, cannot be identified with the pseudo-Jonathan, for more than half of these quotations are missing from the latter; and further, in passages for which we possess both the Targums, the' text of the Fragmentary Targum agrees much more closely with the quotations: the iinguistic evi- dence also shows that the Fragmentary Targum is a more faithful representative of the original source; (2) the pseudo-Jonathan displays a curious inconsistency in its rendering of particular words and phrases, at one time following Onkelos, at another a different source. That this latter source is the Targum Jerushalmi is proved, in the majority of cases, by a comparison with the Fragmentary Targum; (3) quotations from Scripture preserved in the Frag- mentary Targum point to a completer version than our present Fragmentary Targum. But though the existence of an older Targum Jerushalmi cannot be denied, it is clear that the form in which it was utilized by the two Palestinian Targums cannot be of an early date, for many of the latest elements in the Fragmentary and pseudo-Jonathan Targums were undoubtedly derived from their common source. Moreover, the existence of a written Pales- tinian Targum at an early date is expressly excluded by the

evidence at our disposal. In the middle .of the 2nd century a.d. R. Simon ben Gamaliel forbade the translation of the Pentateuch in any language but Greek; 5 and this command was upheld by R. Johanan in the 3rd century. Even in the time of the later Amoraim there is no mention of a written Palestinian Targum, though the official Babylonian Targum is repeatedly referred to in the Babylonian Talmud, in the Midrashim, and at times also by Palestinian Amoraim. These considerations are sufficient to dis- prove the theory of Geiger, 6 which has for so long been accepted in one form or another, that the Targum of Onkelos was merely a reproduction of the old Targum Jerushalmi revised in accordance with the " new Halakha" introduced by R. Aqiba. Yet it is impossible to hold that the Targum of Onkelos was the only repre- sentative of Targum tradition that existed among the Jews down to the 7th century A.D., the period to which the internal evidence compels us to assign the Targum Jerushalmi as used by the Frag- mentary Targum and the pseudo-Jonathan. We must rather assume that a tolerably fixed Targum tradition existed in Palestine from quite early times. The language employed in the Tarjjum of Onkelos is, admittedly, Palestinian or Judaean, and since language and thought are ever closely allied, we may conjecture that the current Judaean exegesis, which, in part at least, must go back to the and century A.D., was not without its influence on the Babylonian translation. This old Targum tradition, however, never received official recognition in Palestine, and was unable, therefore, to hold its own when the new Babylonian version was introduced. We may infer that, as time went on, a reaction in favour of the older renderings made itself felt, with the result that these were collected in the form of variants and appended to Onkelos. But the authority enjoyed by the latter rendered it secure against any encroachments; hence any later expansions, especially those of a popular Haggadic character, naturally found their way into the less stereotyped Targum Jerushalmi. Unfortunately, we possess but little material for controlling the texts either of the Frag- mentary Targum or of the

pseudo-Jonathan. Of the latter only one manuscript (Brit. Museum Add. 27031) is known to exist, and this has been utilized by Ginsburger in his Pseudo-Jonathan^ (Berlin, 1903). The same scholar has also edited the Paris manuscript (no) of the Fragmentary Targum (Das Fragmenlenthargum, Berlin, 1899), to which he has added the variants from Cod. Vat. 440 and the manuscripts at Nuremberg and Leipzig. In the same edition are collected the various fragments of the Targum Jerushalmi, which are to be found in the early editions of the Pentateuch and in part also in various manuscripts.

II., Targums on the Prophets

The official Targum on the Prophets is stated by the Babylonian Talmud 7 to have been "said" by Jonathan ben Uzziel, the disciple of Hillel, and is usually known, therefore, as the Targum Jonathan. Elsewhere in the Talmud, however, the quotations from this Targum are given under the name of Joseph bar Chijah, head of

4 M.G.W.J. xl. '■Meg. i. 11.

6 Urschrift (1857), pp. 162 ff., 451 ff.; Nachgelassene Schriften, iv. p. 98 f. ; Jildische Zeitschrift (1871), ix. p. 85 f.

7 Meg. 30.

the school at Pumbadita in the 4th century a.d. Both in language — though naturally there is some variation of vocabulary — and style it closely resembles the Targum of Onkelos, and appears to have been modelled on that translation: in certain passages, indeed, it appears to have made use of it. 1 Probably, like Onkelos, it did not assume its final form in Babylon before the 5th century A.D. It naturally follows from the character of the original that the rendering of this Targum is less literal than that of Onkelos, espe- cially in the prophetic

books, but, when due allowance is made for the difficulty of the Hebrew, it may be described on the whole as a faithful reproduction of the original text. Its peculiarities of rendering are due to the same principles which were noted as underlying the translation of the Pentateuch. Anthropomorphisms, as a rule, are avoided by means of the same expedients as those employed by Onkelos, expressions derogatory to the dignity of God, or of the heroes of the nation, are softened down, while figurative language is either boldly transposed, or its character clearly shown by the introduction of the particle " as " or " like." There is, further, a tendency to narrow down the scope of the prophetic utterances, and to limit their application to Israel and its immediate enemies. Lastly, in the obscurer passages the Haggadic method of interpretation is employed to its fullest extent, while the translation throughout shows a marked tendency to explanatory additions.

*Of a Targum Jerushalmi to the Prophets but little is known, though it is hardly doubtful that such a Targum existed, if only in oral form. Traces of this version have been discovered by Bacher 2 in the variants attached to the margin of the Codex Reuchlinianus, and printed by Lagarde in his edition of Prophetae Chaldaice (1872). These fragments, which have been preserved under the headings trrv , "iv, "v *m, exhibit certain features in common with the Jerusalem Targums to the Pentateuch, and are demonstrably of post-Talmudic date. According to Kohut's list of Targum quotations in 'Aruk, a Jerusalem Targum existed also for the Psalms, Proverbs, Job, Canticles, Lamentations, Ecclesiastes and Esther, but this list is scarcely reliable, and, as Dalman has pointed out, 3 the quotations in 'Aruk to Kings, Ezekiel, Proverbs and Lamentations are the only ones that point with certainty to the existence of a Targum Jerushalmi.*

III. Targums to the Hagiographa

These Targums possess but little interest for the student of Jewish literature as they are almost entirely the work of indi- viduals, made in

imitation of the older Targums. Despite the reference to a Targum of Job in the 1st century (see above), all the extant Targums to the Hagiographa are later in date than the Targums to the Law and the Prophets.

(1) Targums to the Psalms and Job.— These Targums present certain features in common and may therefore be treated under the same heading. Like all the later Targums they exhibit a large amount of explanatory addition, chiefly Haggadic in character. At the same time the translation of the original is not neglected; and, when separated from the later accretions, this is found to follow the Hebrew tolerably closely. Peculiar to these Targums are the double translations, which they give to many verses, one of which is usually Haggadic in character, while the other is more literal. Bacher 4 would assign these Targums to the 4th or 5th century, but, as Dalman has pointed out, 6 they exhibit linguistic features in common with the Jerusalem Targums to the Pentateuch. They cannot be earlier than the 7th century A.D., and possibly are of a considerably later date.

(2) The Targum to the Proverbs stands apart owing to the peculiarity of the language in which it is written. The influence of the Peshitta version is so clearly marked, 6 that Dalman (I.e.) de- scribes it as a Jewish revision of that version. But setting aside the Syriasms due to the use of the Peshitta, the Targum shows affinity to the Targums to the Psalms and Job. The translation is literal and almost entirely free from Haggadic additions. 7

(3) The Targums to the Megilloth. — The chief characteristic of these Targums is their exaggerated use of paraphrase. They mark the final stage in the development of Haggadic interpretation, in which the translation of the text has practically disappeared in a mass of fantastic and irrelevant matter. The Targum of Esther is known to us in three recensions (1) that of the Antwerp Polyglot, almost a literal translation; (2) that of the London Polyglot, which gives practically the same text with many additions

of a Haggadic char- acter; (3) the so-called second (sheni) Targum, a much larger work, containing a collection of later Midrashim to this book. According

1 Berliner, Targum Onkelos, ii. p. 124 f.

2 Z.D.M.G. xxviii. and xxix. 3 Gramm. p. 29. * Judische Monatschrift, xx. 208 f., xxi. 408 f., 462 f.

B Gramm. p. 34.

6 Dathe, De ratione consensus versionis chaldaicae et syriacae, proverbiorum Salomonis, ed. Rosenmiiller, 1814; cf. Maybaum and Noldeke in Merx Archiv., 1871, and Baumgartner, Elude critique sur Vitat du texte du livre des Proverbs, 1890.

7 Cf. Pinkuss, Die syrische Uebersetzung der Proverbien, Z.A.T.W.,

1894.

to Zunz 8 this " second " Targum is quoted by Rashi (to Deut. iii. 4) as a Jerusalem Targum, and also (1 Kings x. 19) as the " Haggada " of the Megilloth Esther. The Targum to Canticles is of a similar character to that of the " second " Esther. Dalman assigns these Targums to a date half-way between the Babylonian Targums (Onkelos and that to the Prophets) and the Jerusalem Targums to the Pentateuch and those to the greater Hagiographa. The British Museum possesses three important Yemen manuscripts for the five Megilloth and the " second " Esther Targum in MSS. Or. 1302, 1476, and 2375.

(4) The Targum to the Chronicles was first edited from an Erfurt manuscript by M. F. Beck, 1680-1683. A more complete and accurate edition from a Cambridge manuscript was edited by D. Wilkins in 1715. In the translation, which at times is fairly literal, use appears to have been made of the Jerusalem Targums to the Pentateuch, and of the Targums to the books of Samuel and Kings. The text represented by the Erfurt manuscript is assigned to

the 8th, that of the Cambridge manuscript to the 9th century a.d. 9

No Targums have so far been discovered to Daniel and Ezra and Nehemiah. (J. F. St.)

TARIFA, a seaport of Spain, in the province of Cadiz, at the extreme south point of the Peninsula, 21 m. by rail W.S.W. of Gibraltar. Pop. (1900) 11,723. The town is nearly quad- rangular, with narrow, crooked streets, and is still surrounded by its old Moorish walls. On its east side, just within these, stands the citadel. The rocky island in front of the town, connected with the mainland by a causeway, is strongly fortified; on the south side there is a modern lighthouse. Anchovy and tunny fishing is carried on, and there is some coasting trade, chiefly in live stock, salt fish and fruit. The manufactures (leather and earthenware) are unimportant. The oranges of Tarifa are famed for their sweetness.

Tarifa is the Julia Joza of Strabo, between Gades and Belon. According to that writer, it was colonized by Romans and the removed inhabitants of Zelis in Mauretania Tingitana. The Julia Transducta or Traducta of coins and of Ptolemy appears to be the same place. Its present name, dating from early in the 8th century, is derived from Tarif, whom Tariq sent to Spain in command of the advance-guard of the Moorish invaders (see Caliphate and Spain: History). In 1292 Tarifa was taken by Sancho IV. of Castile from the Moors, who made several subsequent attempts to recapture it. In the defence of Tarifa Alphonso XI. gained the battle of Salado, a short distance to the westward, in 1340. In 181 2 a French force of 10,000 men under Generals Victor and Laval vainly endeavoured to capture Tarifa, which was garrisoned by 2500 troops (mostly British) under General Gough.

TARIFF (adapted in English from the French; the word comes through the Spanish tarifa, a list or schedule of prices, from the Arabic, ta'rifa, information, an inventory, 'arf, know- ledge), a table or list of

articles on which import or export duties are levied, with the amount of the duty specified, hence often used as a collective term for the duties imposed, or for the law or code of regulations imposing such duties or varying the scale of charges. The word is also used quite widely of any schedule of prices or charges, and, particularly in America, of the freight or other charges of a railway or steamship line.

Resort is made to tariffs, or duties on imports, partly to secure revenue, partly to affect the course of industry within a country. Strictly speaking, these two objects are inconsistent with each other; since a customs duty, in so far as it causes a domestic in- dustry rather than a foreign to supply the market, ceases to be a source of revenue. But in a great number of cases the imposi- tion of a duty causes only a partial displacement of the foreign supply, and hence brings some revenue from that which remains. This circumstance strengthens the hold of the protective system, especially in countries where customs duties are an important source of revenue, the combination of fiscal convenience and of protection to home industry being a highly attractive one. Where tariff duties are imposed solely for revenue, an equivalent excise tax is imposed within the country, so as to put the domestic producer precisely on the footing of his foreign

8 G. V. p. 83.

5 Rosenberg and Kohler in Geiger's Judische Zeitschrift, 1870.

competitor; and tariffs so maintained are in complete con- formity with the principle of free trade.

Great Britain. — Between the close of the Napoleonic

wars of 1815 and the year i860, the tariff system of Great Britain was changed from elaborate protection to practically complete free trade. An attempt had indeed been made in 1786 to modify the rigidly protective legislation of the 18th century. In that year Pitt concluded a commercial treaty with France, providing for large reductions of duties in both countries. But the treaty was swept away with the outbreak of the wars with France, and accordingly the old system was still in force in 181 5. The first important step, and in some respects the decisive step, towards modifying it was taken in 1824, under the policy of Huskisson. In that year, and again in 1825, great reductions were made in the duties on raw materials, especially on wool, raw silk, flax and iron, while considerable reductions were also made in the duties on manufactured goods. The most sharply contested of the changes was in regard to silks, which had been completely prohibited, and were now admitted at a duty of 30 per cent. A considerable breach was thus made in the protective system; and some further changes in the same direction were made in the next decade, especially under Lord Althorp in 1833. But in the decade from 1830 to 1840 the Corn Laws were the chief subject of contention. The great increase in population since the middle of the 18th century had made England a corn- importing country, especially with the rapid growth of manu- factures in the early years of the 19th century. The first syste- matic Corn Laws imposing duties on grain had been passed in 1773. From 1816 onwards a series of measures were passed, all designed to maintain the high price of grain. The Act of 1816 prohibited the importation of wheat when the price was less than 80s. a quarter (= $2.50 a bushel). In 1822 the prohibitive point was lowered to 70s. In 1828 the sliding scale was intro- duced, under which the duty went up and down as the price of grain went down and up; and it was against this form of the Corn Law that the great agitation led by Cobden and Bright was directed after 1830. For a long time the anti-Corn Law agitation seemed to have no effect, although conducted with extraordi- nary skill and enthusiasm. In 1842,

however, Sir Robert Peel made the first important concession, by modifying the sliding scale, his opponent, Lord John Russell, having proposed in the previous year a fixed duty of 8s. a quarter. In view of the bad harvest of 1845-46, and the famine in Ireland in 1846, Peel sur- Cora rendered, and proposed in 1846 the admission of

Laws re- grain with only a fixed duty of is. a quarter as a pealed, registration fee. This change was carried, but Peel, ,846 ' being able to carry only a fraction of his party with

him, was compelled shortly afterwards to resign. The Corn Laws had great political strength, serving as they did the interests of the landowners, whose hold on parliament was still very strong; but the general economic situation in Great Britain, from the rapid growth of the manufacturing population and the imperative need of more food, made the abolition inevi- table. After having been maintained till the middle of the century, apparently with irresistible support, they suddenly collapsed under the strain of a season of exceptionally short crops. Both their continued maintenance and their final sudden abolition are in some respects divergent from the general course of British tariff history.

The remodelling of the tariff system in the direction of free trade went on, little retarded by the maintenance of the Corn Laws and not much accelerated by their abolition. In 1842 great reductions of duty were made on a large number of articles; in 1846 still further reductions of duty were made; another series of changes came in 1853; and finally, in i860, General tne ^ ast remnant OI protective duties disappeared. changes The four acts of 1842, 1846, 1853, i860 — the first two '" under Peel's leadership, the second two under Glad-

1842-60. stone's guidance— thus carried out gradually the policy of free trade in regard to other articles than grain. The first of them, in 1842, was signalized by the introduc- tion of the Income Tax as a means of raising revenue to replace

that lost by the diminished import duties. The last of them, in i860, was largely influenced by the great commercial treaty with France. In that treaty the concessions made to France were the reduction by Great Britain of duties on wines and spirits, and the admission, free of duty, of some important French products, notably silk manufactures, gloves, and other products in which the French had superiority. Great Britain, instead of limiting the concessions to France, in i860 made them applicable to all the world. The silk manufacture, as to which the first great changes had been made in 1824, and on whose products the duties had been kept higher in previous acts than on other manufactures, was thus compelled, notwithstanding violent opposition, to face unfettered foreign competition.

Two general features should be noted in regard to the tariff history of Great Britain. In the first place, most of the reduc- tions of duty on manufactured articles were of little practical significance. The great mass of manufactured commodities were produced in the United Kingdom more cheaply than in foreign countries, and would not have been imported, with duty or without, except in sporadic amounts for some special qualities. The changes hence involved little real readjustment of industry. There is thus some ground for the assertion that the policy of free trade was not adopted by the United Kingdom until its industries had reached the stage of being independent of pro- tection. But this does not hold good of some manufactures; especially not of the silk industry, and some parts of the woollen and linen trades. Still less does it hold good of raw materials, many of which, had been really affected by the duties, and were largely imported after their abolition. Such was the case not only with some metals, such as lead, zinc, copper, but still more strikingly with textile materials such as wool, flax, and the like, and most of all with agricultural products such as grain, meat and meat products, timber. In regard to all these, the abolition of protection meant a real sacrifice to domestic industries. The second feature

to be noted is the simplification which resulted in the administrative features of the English tariff. A great number of articles had been enumerated in the earlier tariff acts, each of which was imported in very small quantity and yielded an insignificant revenue. The nature of the changes made between 1842 and i860 is indicated by the following tabular statement : —

Duties reduced.

Duties abolished.

1842-46

1846 ….

1853 ….

i860 ….

503 112

390

54

123

371

After i860 only forty-eight articles remained subject to duty, a number which has been still further reduced, the most notable change having been free admission of sugar in 1872. Since that date the English customs tariff has been simplicity itself. A very few articles (spirits, beer, wine, tobacco, tea, coffee, cocoa) yield practically all of the customs revenue, and, so far as these articles are produced within the country, they are subject to an excise duty, an internal tax precisely equal to the import duty. In 1 901, to aid in meeting the expenses of the South African war, a moderate revenue duty was again imposed on sugar; and in 1902 the shilling duty on corn and flour (abolished in 1869) was restored, but again taken off in 1903. In

this year began the ” Tariff Reform ” movement initiated by Mr Joseph Chamberlain (q.v.), but Free Trade retained a strong hold on the British electorate, and the return of the overwhelming Radical majority to parliament in 1906 involved its retention under the fiscal policy of that party. In January 1910 the Liberal government was again returned to power ; but the Unionist party was now committed to Tariff Reform, which had made great strides in obtaining popular support.

France.— The tariff history of France in the 19th century divides itself into three periods: one of complete prohibition,

Treaty of I860.

lasting till i860; second, of liberal legislation, from i860 to 1881 ; third, of reversion to protection after 1881.

(1) During the first period the prohibitive legislation of the 1 8th century was retained, largely in consequence of the Napo- leonic wars. The commercial treaty of 1786 between Great Britain and France has already been referred to as making a breach in the restrictive system of the 18th century; and in the early years of the French Revolution a similar wave of liberal policy is to be seen. But the great wars led to the complete prohibition ot the importation of manufactures, reaching its climax in Napoleon’s Continental system. The system of pro- hibition thus instituted, while aimed at Great Britain, was made general in its terms. Hence the importation into France of virtually all manufactured articles from foreign countries was completely interdicted; and such was the legislation in force when peace came in 181 5. This system doubtless was not ex- pected to last after the wars had ceased, but, as it happened, it did last until i860. Successive governments in

France made endeavours to break with the prohibitive system, but naturally met with strong opposition from the manufacturing interests, not prepared to meet the competition of Great Britain, whose industries had made, and were continually making, rapid strides. The political position of the governments of the Restoration and of Louis Philippe was such that they were unwilling to forfeit support by pushing measures in which, after all, they were not themselves deeply interested.

(2) It was not until Napoleon III. believed it to be to his political advantage to strengthen friendly relations with Great

Britain by the moderation of the import duties that the change was finally made; while the despotic character of his government enabled him, when once the new policy was entered on, to bring about a radical change. After some secret negotiations, in which the English Corn Law agitator, Cobden, and the French economist, Cherbuliez, took an active part, Napoleon was persuaded to enter on the famous commercial treaty of i860, and virtually to force its acceptance by the French legislature. In the treaty as finally framed duties on most manufactured commodities were reduced to a range of 10 or 15 per cent., some iron manufactures, however, being left at slightly higher rates. Before the treaty, all woollen and cotton manufactures, all manufactures of leather, of hardware, pottery, all glass ware, had been prohibited, while raw materials and such manufactures as were not prohibited had been sub- jected to heavy duties. The treaty thus made a radical change, revolutionizing the tariff system of France. It did so with rela- tion not only to the United Kingdom, but, in its after effects, to the world at large. The French government at once set to work to enter into similar arrangements with other countries, and treaties were successively concluded in 1860-66 with Belgium, with the Zollverein (Germany), Italy, Switzerland, Sweden and Norway, Holland, Spain, Austria. All these countries made reductions of duty on French products, while France admitted other products at the rates of the British

treaty tariff. Thus a network of treaties was spread over Europe, leading to much great freedom of trade and opening an era of freer international exchange.

(3) This more liberal policy, however, probably never had deep root in French public opinion. It received a check from

the Franco-German War of 1870-71. The treaty of Reaction Frankfort in 187 1 contained, in place of the previous detailed commercial treaty with Germany, the simple ” most favoured nation ” proviso. The guarantee which each country thus gave to the other of treatment as favourable as that given elsewhere became irksome to France, sore after her defeat in the war. More important, however, in undermining the liberal system, was the change in agricultural conditions which began to set in in the decade of 1878-88. Then the great improvements in transportation caused compe- tition in agricultural products to be felt, especially from the United States. Agricultural prices declined; agricultural de- pression set in. The agricultural interest in France, hitherto indifferent about duties, now began to demand protection

S’ace Id80.

against competition from beyond the sea. To this factor was added the revival of national feeling and prejudice, with grow- ing political complications and jealousies. Hence, by gradual steps, the customs policy of France has become more and more strongly restrictive. The first important step was taken in 1 88 1, when a new general tariff was established, in which specific duties replaced the ad valorem duties chiefly applied in the treaty tariffs of 1860-66. The new rates were supposed to be no more than equivalent to those replaced by them, but in fact were in some cases higher. New treaty tariffs, less liberal than the earlier ones, were concluded with Belgium, Switzerland and Spain; while with other countries (e.g. Great Britain) a ” most favoured nation ” arrangement was substituted for the previous treaty regime. These new treaty

arrangements expired in 1892: even before that date, duties had been raised on grain and meats; and finally, in 1892, a new and more highly protective general tariff was established on of 1892 the recommendation of M. Meline, with high duties on agricultural products and raw materials as well as on manu- factures, and with provisions for limited domestic bounties on silk, hemp and flax. Nevertheless, some provision was made for negotiations with foreign countries by establishing a mini- mum tariff, with rates lower than those of the general or maximum tariff, the rates of this minimum tariff being appli- cable to countries which might make concessions to France. As a rule the minimum tariff has been applied, after negotia- tion, and thus is the tariff in practical effect; yet its rates are still high, and, most significant of all, agricultural products are granted no reductions whatever as compared with the maxi- mum tariff, there being heavy and unrelaxed duties upon grain, animals, meats and the like.

Germany. — The tariff history of Germany, up to the founda- tion of the German Empire, is the history of the Zollverein or German customs union; and this in turn is closely connected with the tariff history of Prussia. In 1818 TaeZoV- Prussia adopted a tariff with much reduced duties, ^s34,"' under the influence of the Liberal statesmen then still powerful in the Prussian government. The excitement and opposition in Germany to the Prussian tariff led to customs legislation by the other German states, some smaller states joining Prussia, while the southern states endeavoured to form independent customs unions. Finally, by gradual steps be- tween 1831 and 1834, the complete Zollverein was formed, notwithstanding popular opposition. All the German states formed a customs union, with free trade between them, except so far as differing internal taxes in the several states, made some modifications necessary. The customs revenue was divided among the several states in proportion to population. The tariff of the Zollverein was, in essentials, the Prussian tariff of 1 81 8, and was moderate as

compared with most of the separate tariffs previously existing. Within the Zollverein, after 1834, there was an almost unceasing struggle between the Protec- tionist and Free Trade parties, Prussia supporting in the main a Liberal policy, while the South German states supported a Protectionist policy. The trend of the tariff policy of the Zollverein for some time after 1834 was towards protection; partly because the specific duties of 18 18 became proportionately heavier as manufactured commodities fell in price, partly be- cause some actual changes in rates were made in response to the demands of the Protectionist states. In 1853 a treaty between the Zollverein and Austria brought about reciprocal reductions of duty between these two parties. After i860 a change towards a more liberal policy was brought about by the efforts of Prussia, which concluded independently a com- mercial treaty with France, forcing on the other members of the Zollverein the alternative of either parting company p reocb with Prussia or of joining her in her relations with treaty France. The second alternative was accepted, largely and low because Austria did not vigorously support the South j^Jj?*' German states, and in 1865 the Zollverein as a whole concluded a commercial treaty with France, bringing about im- portant reductions of duty. The regime of comparatively free

trade thus established lasted for about fifteen years. After the foundation of the German Empire, the duties of the Zollverein became those of Germany, and for a time the liberal regime was maintained and extended, with respect to the tariff as with respect to other matters. But in Germany, as in France, a combination of political and of economic forces led before long to a reaction towards protection. Bismarck broke with the National Liberals, who were the champions of free trade; at the same time the agricultural depression set in, and the agri- cultural interest demanded protection

against American and other foreign competition. The "manufacturers, especially of iron, also manceuvred for protection. The reaction came in 1879, when duties were increased on manufactured articles as Protec- weul as on agricultural articles. Other advances of tion tela- duty were made in later years, especially on grain ;

S isVo d ' an ^ tnus t ^ le P°h cv °f Germany has become dis- tinctly Protectionist, though not to the same degree as in France. In 1892, however, the precise year in which France gave up her system of commercial treaties, some modera- tion was brought about in Germany's protective system by commercial treaties with Austria, Italy, Belgium, Switzerland, and shortly afterwards with Russia. These treaties provided for reductions of duties in all directions, the most important concessions being on certain agricultural products. Thus the duty on wheat, which had been gradually raised as high as 5 marks per hundred kilogrammes (roughly is. 3d., or about 30 c. a bushel) was reduced to 3-50 marks by the treaties. The rates of these treaties were extended to a number of other countries having " most favoured nation " relations with Germany. The tariff system of Germany, however, at the beginning of the 20th century, remained definitely Protectionist. In other important countries changes in policy have taken place similar to those noted in Germany and in France. The era of moderated tariffs, which began with the great treaty of i860, lasted for about twenty years, and was followed in Italy, Austria, Belgium, Switzerland and Spain by a reversion to protection, although usually to a less high system of protection than had prevailed before i860. The United Kingdom and Holland alone held con- sistently and unfalteringly to the principle of free trade. The factors which have brought about this reaction have been, as was already noted, partly economic, partly political: on the one hand, the pressure of competition from distant countries in agricultural products, a consequence chiefly of improved transportation; on the other hand, the revival of national sentiment and prejudice.

The United States. — The tariff history of the United States, like that of European countries, divides itself into two great periods, before and after the year i860. But it is no more than an accident that this year constitutes the dividing line in both cases, the change in the United States being due to the Civil War, which so profoundly influenced the fiscal, economic and political history of the country in all directions. The period before i860 may again be divided into three sub-periods, the first extending from 1789 to 1816, the second from 1816 to about 1846, the third from 1846 to i860.

(1) The Tariff Act of 1789 was the first legislative measure passed by the United States. The Protectionists have pointed to it as showing the disposition of the first Congress to adopt at once a policy of protection ; the Free Traders have pointed to it similarly as showing a predilection for their policy. Each had some ground for the claim. The duties of the act of 1789 were very moderate, and, as compared with those which the United States has had under any subse- quent legislation, may be described as free trade duties. On the other hand, the spirit of the act of 1789 was protective. It had been the design of Madison, and of other firm supporters of the new constitution, to adopt in 1789 a very simple measure, designed solely to secure revenue. But the pressure from the representatives of some of the states, notably Pennsylvania and Massachusetts, compelled him to incorporate in the Tariff Act certain specific duties borrowed from the Tariff Acts then in force in these states, which had a distinctly protective aim. Thus the act of 1789, although the duties levied by it were moderate, yet had a protective intent. Such in the main re- mained the situation until 1816, duties being indeed raised from

1789- 1816.

time to time in order to secure more revenue, but the arrange- ment and the general rate of the duties not being sensibly modified. There was not at this

time any considerable public feeling on the subject of protection, chiefly because during most of the years of this period the Eastern states, and especially New England, where manufactures might be expected to develop first, were profitably engaged in an extensive export and carrying trade.

(2) After the close of the War of 181 2, however, a new spirit and a new policy developed. With the end of the Napoleonic wars, the opportunities for American commerce be- ...^ came less, while at the same time the expanding population necessarily led to diversified interests at home. A demand arose for two closely connected measures: protection to domestic manufactures, and internal improvements. Pro- tection was demanded as a means both of aiding young industries and of fostering a home market for agricultural pro- ducts. The chief spokesman of the new movement was Henry Clay, who remained throughout his life the constant advocate of this so-called " American system." Some disposition in this direction showed itself as early as 1816, when tariff duties were raised. Still greater changes were made in 1824, 1828, and 1832. In 1824 duties were considerably raised; and thereafter the New England states, which so far had been lukewarm in supporting the movement, joined in it unreservedly. The tariff of 1828 was affected by some political manipulation, which caused it to contain objectionable provisions, and to be dubbed " the tariff of abominations." But the so-called abominations were removed in 1832, when the protective system was deliberately and carefully rearranged. By this time, however, the opposition to it in the South had reached a pitch so intense that concessions had to be made. As a planting and slave-owning region, the South inevitably had no manu- factures: it felt that its cotton was sure to find a foreign market, and would gain little from the establishment of a domestic cotton manufacture within the country; and it judged, rightly, that the protective system brought it only burden and no benefit. The extent of the burden was greatly exaggerated by the leaders of the South, especially in the heat of partisan con-

troversy; and the subject was closely connected with the con- troversy as to the rights of the states, and the endeavour of South Carolina, under the influence of Calhoun, to nullify the Tariff Act of 1832. The nullification movement led in 1833 to the well-known compromise, by which the rates of duty as established by the Act of 1832 were to be gradually reduced, reaching in 1842 a general level of 20 per cent. The compromise served its turn in allaying political bitterness and staving off a direct conflict between the United States and South Carolina. But the reductions of duty made under it were never effectively carried out. In 1842, when the final 20 per cent, rate was to have gone into effect, the Protectionists again had control of Congress, and after a brief period of two months, during which this 20 per cent, rate was in force, passed the Tariff Act of 1842, which once more restored the protective system in a form not much less extreme than that of 1832.

(3) Four years later, however, in 1846, a very considerable change was secured by the South, and a new era was entered on. The Democratic party now was in control of 1846-60 legislation, and in the Tariff Act of 1846 established

a system of moderate and purely ad valorem duties, in which the protected articles were subjected, as a rule, to a rate of 30 per cent., in some cases to rates of 25 and 20 per cent. The system then established has often been spoken of as a free trade system, but was in reality only a system of moderated protection. In 1857 duties were still further reduced, the rate on most pro- tected commodities going down to 24 per cent., and remaining at this comparatively low level until the outbreak of the Civil War. The second great period in the tariff history of the United States opens with the Civil War. It is true that the first steps towards a policy of higher protection were taken just before the war began. In the session of 1860-61, immediately pre- ceding the outbreak of the conflict, the Morrill Tariff Act was

passed by the Republican party, then in control because the defection of Southern members of Congress had already begun. It substituted specific duties for the ad valorem duties of 1846 and 1857, and made some other changes of significance, as in the higher duties upon iron and steel. Nevertheless, the ad- vances then made were of little importance as compared with the far-reaching increases of duty during the Civil War. These

formed part of the general resort to every possible lariff^"" nsca l device. The great struggle compelled every 1&62-64. resource to be strained to the utmost: the issue of

long-time bonds, continual borrowing in very large amounts on short-time inconvertible paper money, an elaborate and all-pervading system of internal taxes, and, finally, heavy import duties. The internal taxes of the war were applied not only in the form of income taxes, stamp taxes, licence and gross receipts taxes, but also as direct excise taxes on many com- modities. The import duties were correspondingly raised, partly by way of off-set to the internal taxes, partly as a means of getting additional revenue, and finally in some degree be- cause of a disposition to protect domestic industries. The most important acts were the great revenue acts of 1862 and 1864. Some further changes were made in 1865, and the close of the war thus left the United States with a complicated system of very high taxes both on imported duties and on domestic products

The main features of the tariff history of the United States since the Civil War have been that the internal taxes have been almost entirely swept away, the import duties on purely re- venue articles similarly abolished, while those import duties that operated to protect domestic industries have been main- tained, and indeed in many cases increased.

*The situation has had some analogy to that of France from 181 5 to i860, when similarly a highly restrictive system established during a period of war was unexpectedly retained long after peace had been established. This result in the United States came about by gradual steps and without premeditation. After the close of the war efforts were first directed to clearing the financial situa- tion by funding the floating debt, and taking steps (never fully consummated) towards contracting the currency. Next the internal taxes were gradually done away with, until nothing was left except the excise on beer, spirits and tobacco. No further resort was made to internal taxes until the revenue act of 1898 was passed, at the outbreak of the Spanish War. Efforts were made also to reduce the tariff duties, but these naturally came last: they met with strong opposition, and in the end they were almost completely frustrated, thus leaving as the basis of the tariff the rates which had been levied in the course Gradual °^ t ^ le war ' * n I ^7° some rearrangements were made, consoli- the duties on iron and on some other articles being re- dation duced. In 187 2 a more general reduction was carried "JTi** out ' stron gly resisted by the Protectionists, and finally*

ending in a uniform cutting off of 10 per cent, from all the import protective duties. In 1875, however, when the revenue had become deficient after the crisis of 1873, the 10 per cent, reduction was repealed, and duties restored to their previous amounts. It deserves to be noted that in 1872 an important step was also taken towards removing entirely the duties on purely revenue articles, tea and coffee being then admitted free of duty. On the other hand, the maintenance of the protective duties, and the gradual consolidation of feeling in favour of a permanent policy of strong protection, led to other revisions and rearrangements in the direction of pro- tection. In 1867 an important act on wool and woollens was passed, largely increasing the duties on both. In 1869 the duty on copper was raised. In 1870, while some duties were lowered,

others were raised, as, for instance, those on steel rails and on marble. Thus the ten years immediately following the close of the war brought about the gradual transformation of the high duties levied on all commodities for revenue purposes into a system of high duties almost wholly on protective commodities. This transformation met with much opposition, not less in the Republican party than in the Democratic party. While the

feeling in the Republican party had been from the outset in favour of protection, so high a range of duties met with much opposition. This opposition led to an important general re- vision in 1883, largely influenced by the recommendations of a special Tariff Commission which Congress created in 1882. The act of 1883 was passed in the main as a party measure by the Republicans, and on the whole served rather onssji? to put in order the protective system as it stood than to make any change of policy. Certain duties were reduced (though in no case greatly reduced) such as those upon wool, some woollens, cheaper grades of cotton cloths, iron, steel rails, copper. On the other hand, on many articles duties already high, but believed to be insufficient for the effective protection of the domestic producer, were raised; e.g., on finer woollens and cottons, on some iron and steel manufactures.

The tariff system as revised and codified in 1883 would pro- bably have remained unchanged for many years had it not been for the turn taken by political and financial history. The decade from 1880 to 1890 was one of great prosperity, consequently of rising imports, consequently of swelling customs revenue. In the second half of the decade a continuous large surplus in the Treasury necessarily directed attention to the state of the revenue, and gave strength to the protests against excessive taxation. In addition, the Democratic party, which had long been ' committed, though in a half-hearted way, against the policy of high protection, was brought to a vigorous and un- compromising attack on it through the leadership of

President Cleveland. In his Presidential Message of December 1887 he attacked the protective system in unqualified terms; and in the session of 1887–88 the Democratic majority in the House of Representatives prepared a bill providing for great reduc- tions. The control of the Senate by the Republicans prevented any legislation. But the Republicans, as is almost inevitable under a party system, championed the policy opposed by the other side, and declared themselves not only in favour of the maintenance of existing duties, but of the consistent and un- qualified further application of protection. The protection question thus became the main issue in the Presidential election of 1888, which resulted in the defeat of the Democrats. In the next ensuing session of Congress, in 1889–90, the Republicans passed a new tariff act, known as the McKinley Tariff Act, because Mr McKinley was then chairman of f^Ir'f the House Committee in charge of the bill. It ad- i890. vanced duties materially on a considerable number of commodities, both raw materials and manufactured articles. The duties on wool were raised, corresponding changes made on woollen goods, the duties on cottons, linens, some silks, and velvets considerably raised. A further step towards consolidat- ing the protective system was taken by abolishing the duty on sugar, mainly a revenue duty. The necessity for reducing the revenue and cutting down the continued surplus was met in this way rather than by lowering the protective duties. For consistency in maintaining the protective principle a direct bounty was given to the domestic producers of sugar in Louisiana. A turn in the political wheel brought an abrupt change four years later, in 1894. The tariff question was again the issue in 1892: President Cleveland, defeated four years before, was now again elected, and the Democratic party came into power, pledged to change the tariff system. Accordingly in the first ensuing session of the Congress elected in 1892 the tariff act of 1894 was passed, known as the

textile goods. The House had proposed to remove also the duties on coal and on iron ore, but the Senate permitted only a reduction in these. A duty was reimposed on sugar, chiefly as a means of securing needed revenue, but at a less rate than had existed before 1890. At the same time the differential duty on refined sugar, which operated as protection to the sugar trust, was not abolished, as the ardent tariff reformers had proposed, but kept in substance not greatly changed. This circumstance, as well as the failure to make other desired re- ductions, caused the ardent tariff reformers to be greatly dis- appointed with the act of 1894 as finally passed, and led President Cleveland to permit it to become law without its endorsement by his signature. The next election in 1896 brought still another turn in the political wheel, the Republicans being once more brought into power under the leadership of President McKinley. The currency issue had been foremost in the campaign, but the Republicans had also proclaimed them- selves in favour of a return to the unqualified protective system. At the extra session which President McKinley called in 1897, almost the sole measure considered was the tariff act, known (again from the name of the chairman of the House Com- mittee) as the Dingley Act. This reimposed the tariff ot duties upon wool, on most qualities at the precise rates 1897. of 1890, on some qualities at even higher rates. Neces-

sarily the duties on woollens were correspondingly raised, and here again made even higher than they had been in 1890. On other textiles, particularly on silks and linens, similar advances were made. As a rule, the duties of 1890 were either retained or somewhat advanced. To this policy, however, there was a significant exception in the iron and steel schedule, where the reduced duties of 1894 were left mainly unchanged. The iron industry in the United States had made extraordinary advances, and confessedly was not in need of greater protection than had been given in 1894. Some provisions for reciprocity arrangements with other countries, opening the way for possible reductions of duty by

treaty arrangements, were also incor- porated in the act of 1897, though with limitations which made it improbable that any considerable changes would ensue from this policy. Some such provisions had also been contained in the act of 1890, but here also without important results. The tariff system of the United States at the beginning of the 20th century thus remained rigidly and unqualifiedly protective, with rates higher than those of even the most restrictive tariffs of the countries of the European continent.

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TARIJA, or Tarixa, a department and town of south-eastern Bolivia. The department lies on the northern frontier of Argentina, and is bounded W. by Potosi,

N. by Chuquisaca, and E. by Paraguay. Pop. (1900) 102,887. Area, 33,036 sq. m. The eastern and larger part of the department belongs to the great Chaco region. The Chaco districts are inhabited by small nomadic tribes of Indians, and the grassy Llanos de Manzo by the Chiriguanos, one of the strong Indian nations of South America. They are considered a branch of the

Guarany race, and live in permanent villages, breed horses, cattle and sheep, and till the soil. Near the Argentine frontier are the less civilized tribes of the Tobas, and in the mountainous districts are remnants of the Quichuas, once masters of an empire.

The capital, San Bernardo de Tarija (pop. 1900, 6980; 1906, estimate, 7817), is the only town of importance in the department. It is situated on the Rio Grande de Tarija, about 100 m. E. of Tupiza. It is about 5800 ft. above sea level and its climate is mild and healthy. The town was founded in 1577 by Luiz de Fuertes, by orders of the Viceroy of Peru, as a military post to hold the Chiriguanos in check. About the same time the Jesuits established themselves here, and the most important building in the town is their convent, afterwards occupied by the Franciscans.

TARIM, the principal river of Chinese or Eastern Turkestan, in the middle of Asia. It rises in two head-streams, (1) the Kashgar-darya, which springs as the Kyzyl-su on the N. versant of the Pamir plateau, not far from another Kyzyl-su or the Vakhsh, which flows down the Alai valley to join eventually the Amu-darya, and (2) the Yarkand-darya, which gushes out under the name of the Raskan-darya, on the N. slope of the Karakorum Mountains, just under the Karakorum pass. The fo.mer stream flows almost due E. past the city of Kashgar until it joins the Yarkand or Yarkent-darya. The latter, after skirting, in a deep gorge and in a north-western direction, the S. foot of the Sughet Mountains and then of the Raskem Mountains, both constituent members of the western Kuen-lun, forces its way out into the lowlands of Eastern Turkestan

and flows N. past the city of Yarkand, then turns N.E. and traverses in a gigantic arc the N.W., N., and E. margins of the vast desert of Takla-makan. Of these two streams Dr Sven Hedin concedes the honour of being the mother river to the Yarkand-darya, on the ground both of its length and of its Volume; indeed for some months in the year the Kashgar-darya, mainly owing to the drain made upon it for irrigation purposes after it debouches upon the lowlands, fails to get through to the Yarkand-darya, whereas the Yarkand-darya, on the other hand, never dries up.

The Kashgar-darya enters the Yarkand-darya by a wide delta of anastomosing arms, beginning in the vicinity of Maral-bashi (39° 49' N. and 78 33' E.). The conjoint river, bearing the name of the Yarkand-darya, flows for some 230 m. N.E. until it encounters the Ak-su-darya from the N. Along this part of its course the river is full of minor sinuosities, with a deep, narrow channel, a sluggish current, and high steep banks, bordered by forests of poplars and thickets of reeds. The Ak-su-darya, which rises at an altitude of 11,000 ft. as the Ak-sai near the S.W. extremity, but on the W. side, of the Kokshal-tau range of the Tian-shan Mountains, soon breaks through that range and proceeds to flow E.N.E. along its southern foot, but under the name of the Taushkan-darya, until it reaches the town of Ak-su in 80° 41' E. and 40 28' N. Thence it flows S. and S.E. and effects a junction with the Yarkand-darya (Tarim) in about 81 ° E. The Ak-su, which is swift and brings down large quantities of sediment, infuses new vigour into the main river, giving it an impulse which carries it all the way down to the Kara-koshun.

About 20 m. farther down, the Yumalak-darya or Tarim, as the river then begins to be called, is joined on the right or S. by the Khotan-darya, a stream which rises in the N. ranges of the Kuen-lun Mountains, and fights its way across the all-engulfing sands of the desert of Takla-makan, but with such poor results that it is only about forty days in the year that it makes any contribution to

the volume of the Tarim. Some 180 to 190 m. below the confluence of the Ak-su-darya, the river begins to come into direct conflict with the sand-dunes of the great desert, which it has thus far successfully skirted. At the same time it begins to waste its strength in filling marginal or lateral lakes, formed in the hollows between the big sand-dunes (they reach elevations of as much as 300 ft.).

In about 86° 30' E., near the station of Karaul, the river begins to break up in deltaic fashion, and in a long secular process, using Karaul as a sort of pivot, appears to oscillate backwards and forwards like a pendulum from N. to S., and from S. back again to N. between the lake of Kara-koshun (N. M. Przhevalsky's Lop-nor) at the N. foot of the Astin-tagh (see Lop-nor), and the basin at the S. foot of the Kuruk-tagh (see Gobi), which Baron von Richthofen and Dr Sven Hedin identify with the ancient Lop-nor of the old Chinese geographers. From Karaul down to Ayrilghan or Arghan, a distance of over 200 m., the Tarim skirts the N.E. front of the high sand-dunes of the great desert, spending itself in numerous marginal lakes all the way down, while on the opposite bank (left)

it leaves numerous interlacing branches behind it, like the Kunche- kish-tarim, Lashin-darya, Yatim-tarim, Uek, and Tokuz-tarim. None of its marginal lakes is round in shape, but all are elongated, from N. to S. or from N.W. to S.E. This is the general rule, but there is a second series of lakes beside the river which are drawn out from N.E. to S.W. These owe their existence primarily to the action of the wind. Here too, in its delta, the Tarim overflows into more than one chain of a third category of lakes (e.g. Avullu- kol, Kara-kol, Tayek-kol, and Arka-kol), strung on one or other of its anastomosing deltaic arms. These generally act as regulators and clarifiers, the river emerging from them with crystal-bright water.

Near the head of its delta the Tarim is joined from the N. by the Koncheh-darya, a stream which issues from the lake of Bagrash-kul, its ultimate source being the Khaidu-gol or Khaidyk-gol, which drains the Yulduz valleys of the eastern Tian-shan Mountains. This river, which measures 290 m. from the Bagrash-kul to the Kara-koshun, serves, with the help of the poplar forest which grows along its left bank, as a dam to check the westward movement of the desert sands. Finally the Tarim enters, by a number of arms, the series of shallow, dwindling lakes of Kara-buran, which serve as a sort of lacustrine ante-room to the real terminal basin of the river, the Kara-koshun, which lies a little farther to the E., in 40° N., 89 30' E., at an altitude of 2675 feet above sea-level. In 1900-01 Dr Sven Hedin discovered several fresh desert lakes forming to the N. of Kara-koshun, and branches of the deltaic arms of the Tarim, or overflows of such branches, straining out in the same direction, facts which he interpreted as a tendency of the river to revert to its former more northerly terminal basin of the old (Chinese) Lop-nor.

The river not only dwindles vastly between the confluence of the Ak-su (e.g. 16,780 cub. ft. in the second in June) and its embouchure in the Kara-koshun (5650 cub. ft. in the second), but keeps on lifting its bed and its current, like the Po and the Hwang-ho, above the level of the adjacent country. The total fall from the con- fluence of the Ak-su-darya (3380 fit.) to the Kara-koshun (2675 ft.), a distance of some 665 m., is only 705 ft., giving an average of very little more than a foot per mile. The total length of the river is probably somewhere near 1000 m. On the whole the Tarim is step by step and year by year steadily but slowly working its way towards the S.W., for all along its lower course it is accom- panied by a belt, some 50 m. wide, which lies at a lower level or altitude than itself. In its actual delta this tendency is counter- balanced by its incipient oscillation backwards towards the N., towards the desiccated lake basin of the old Lop-nor. Although the river drains the vast area of

354,000 sq. m., it is only from 172,000 sq. m. of this (48-8 per cent.) that it derives any augmentation of volume. The remaining 182,000 sq. m. (51-2 per cent.) of the potential catchment area fails to contribute one drop of water, being nothing but arid, rainless desert. Throughout the catchment-basin of the Tarim the precipitation is governed by the general law, that it increases from N. to S. and from E. to W. Hence, in con- formity with this, the largest affluents are in the west. In general shape the basin of the Tarim is elliptical, but the lowest part lies near the extreme E. end of the ellipse. " If the deepest part of the basin lay beyond the long axis of the ellipse the symmetry would be ideal; but, situated as it is at the southern foot of the Tian-shan, it has occasioned a dislocation towards the N. of the main stream of the system. ... If we compare the northern peripheral zone from the catchment area of the Kashgar-darya to the catchment area of the Kuruk-tagh, both inclusive, with the southern peripheral zone from the catchment area of the Yarkand-darya to the catchment area of the Astin-tagh, both again inclusive, we find that the former has an area of 82,990 sq. m., and the latter an area of 89,550 sq. m., or, in other words, that they are approximately of the same size. In the case of both the breadth decreases on the whole towards the E., until they each terminate in a narrow strip, the domain of the Kuruk-tagh on the one hand and that of the Astin-tagh on the other. But before they contract in this way the zones swell out into the Khaidu-gol and the Cherchen-darya and Kara-muran respectively. ... A corresponding symmetry can also be seen in the rivers which gather off the encircling mountains into the de- pression," 1 the Kashgar-darya balancing the Yarkand-darya, the Ak-su-darya balancing the Khotan-darya, the Koncheh-darya balancing the Cherchen-darya, and so on.

The Tarim begins to freeze about the end of November and the freezing advances upwards against the current. When the ice of the river thaws in the beginning of March it sets up a spring flood, which in magnitude and volume falls little short of the

flood caused by the melting of the snows on the mountains about the head- streams and feeders of the river, and the course of which can be traced all down the Tarim during the summer and autumn. The river abounds in fish, especially in the lower part of its course. Fish forms the staple food of a large part of the riverine population.

See Sven Hedin, Scientific Results of a Journey in Central Asia, 1899–1902 (vols. i. and ii., Stockholm, 1905–06), and Central Asia and Tibet (2 vols., London, 1903). (J. T. Be.)

1 Sven Hedin, Scientific Results, ii. 524–25.

TARKANI, or Tarkalanri, a Pathan tribe inhabiting the whole of Bajour (q.v.), on the border of the North-West Frontier Province of India. Subdivided into Mamunds, Isazai and Ismailzai, the tribe numbers some 100,000 persons.

TARLETON, SIR BANASTRE (1754–1833), English soldier, was the son of John Tarleton (1719–1773), a Liverpool merchant, and was born in Liverpool on the 21st of August 1754- Educated at Oxford he entered the army, and in December 1775 he sailed as a volunteer to America with Earl, afterwards Marquess, Cornwallis, and his services during the American War of Inde- pendence in the year 1776 gained for him the position of a brigade major of cavalry. He was present at the battle of Brandywine and at other engagements in 1777 and 1778, and as the commander of the British legion, a mixed force of cavalry and light infantry, he proceeded at the beginning of 1780 to South Carolina, rendering valuable services to Sir Henry Clinton in the operations which culminated in the capture of Charleston. He was responsible for a British victory at Waxhaw in May 1780, and he materially helped Cornwallis to win the battle of Camden in the succeeding August. He was completely victorious in an engagement with Thomas Sumter at Fishing Creek, or Catawba Fords, but was not equally successful when he encountered the same general at Blackstock Hill in November 1780; then in January 1781, in spite of much personal valour, he

was defeated with heavy loss at Cowpens. Having been successful in a skirmish at Tarrants House, and having taken part in the battle of Guilford in March 1781, he marched with Cornwallis into Virginia, and after affording much assistance to his commander-in-chief he was instructed to hold Gloucester. This post, however, was surrendered to the Americans with Yorktown in October 1781, and Tarleton returned to England on parole. In 1790 he entered parliament as member for Liverpool, and with the exception of a single year he remained in the House of Commons until 1812. In 1794 he became a major-general; in 1812 a general; and he held a military command in Ireland and another in England. In 181 5 he was made a baronet. He died without issue at Leintwardine in Shropshire on the 25th of January 1833.

For some time Tarleton lived with the actress Mary Robinson (Perdita), and his portrait was painted both by Reynolds and by Gainsborough. Sir Banastre wrote a History of the Campaigns of 1780 and 1781 in the Southern Provinces of North America (London, 1781), which, although of some value, is marred by the author's vanity and by his attacks on Cornwallis. It was criticized by Colonel Roderick Mackenzie in his Strictures on Lieutenant-Colonel Tarleton's History (1781) and in the Cornwallis Correspondence.

TARLTON, RICHARD (d. 1588), English actor, was probably at one time an inn-keeper, but in 1583, when he is mentioned as one of the original company of queen's players, was already an experienced actor. He was Elizabeth's favourite clown, and his talent for impromptu doggerel on subjects suggested by his audience has given his name to that form of verse. To obtain the advantage of his popularity a great number of songs and witticisms of the day were attributed to him, and after his death Tarlton's Jests, many of them older than he, made several volumes. Other books, and several ballads, coupled his name with their titles. He is said to have been the Yorick of Hamlet's soliloquy.

TARN, a river of southern France, tributary to the

Garonne, watering the departments of Lozere, Aveyron, Tarn, Haute- Garonne and Tarn-et- Garonne. Length, 234 m. Area of basin, 5733 sq. m. Rising on the southern slope of Mt. Lozere at a height of 5249 ft., the Tarn flows westward and, having received the Tarnon, enters the gorge, famed for its beauty, which separates the Causse de Sauveterre from the Causse Mejan. Emerging from this canon after a course of 37 m. it receives the Jonte on the left and, still flowing through gorges, passes between the Causse Noir, the Larzac plateau and the Causse de St Affrique (at the foot of which it receives the Dourdou de Vabre) on the left and the Levezou range and the Plateau of Segala on the right. In this part of its course the most impor- tant town is Millau, where it receives the Dourbie. At the cascade of Sabo, above Albi, the river enters the plains and,

flowing in a deep bed, passes Albi and Gaillac, some distance below which, at the confluence of the Agotit, it exchanges a west-south-westeriy for a north-westerly course. At Mont- auban the Tarn receives the Tescou and 6 m. farther on unites with the Aveyron. It then reaches Moissac, 2$ m. below which it flows into the Garonne.

TARN, a department of south-western France, formed in 1790 of the three dioceses of Albi, Castres and Lavaur, belong- ing to the province of Languedoc. Pop. (1906) 33°,533- Area, 2231 sq. m. Tarn is bounded N. and E. by Aveyron, S.E. by Herault, S. by Aude, S.W. and W. by Haute-Garonne, N.W. by Tarn-et-Garonne. The slope of the department is from east to west, and its general character is mountainous or hilly; its three principal ranges, the Mountains of Lacaune, the Sidobre, and the Montagne Noire, belonging to the Cevennes, lie on the south-east. The stony and wind-blown slopes of the first- named are used for pasturage. The highest point of the range and of the department is the Pic de Montalet (about 4150 ft.); several other summits are not much

short of this. The granite- strewn plateaus of the Sidobre, from 1600 to 2000 ft. high, separate the valley of the Agotit from that of its left-hand affluent the Thore. The Montagne Noire, on the southern border of the department, derives its name from the forests on its northern slope, and some of its peaks are from 3000 to 3500 ft. high. The limestone and sandstone foot-hills are clothed with vines and fruit trees, and are broken by deep alluvial valleys of extraordinary fertility. With the exception of a small portion of the Montagne Noire, which drains into the Aude, the whole department belongs to the basin of the Garonne. The eastern portion of the department has the climate of Auvergne, the severest in France, but that of the plain is Girondin. At Albi the mean temperature is 55°. The rainfall, 29 or 30 ins. at that place, exceeds 40 ins. on the Lacaune and Montagne Noire.

The most noteworthy places in the department are Albi, the capital, Castres, Gaillac, Lavaur, Mazamet and Cordes, which are separately treated. Other places of interest are Burlats, which has ruins of an old church and chateau; Lisle dAlbi, a bastide with a church of the 14th century; and Penne, which has ruins of a fine medieval chateau.

TARN (0. Eng. tame, Scand. tjarn, tjarn, tjorn, &c), a name applied in England (especially in the Lake District) and in Scotland to small lakes or pools in mountainous districts, especially to such as have no visible affluent streams. The term is sometimes used also of a marsh or bog.

TARN-ET-GARONNE, a department of south-western France, formed in 1808 of districts formerly belonging to Guienne and Gascony (Quercy, Lomagne, Armagnac, Rouergue, Agenais), with the addition of a small piece of Languedoc. From 1790 to 1808 its territory was divided between the departments of Lot, Haute-Garonne, Tarn, Aveyron, Gers and Lot-et-Garonne. It is bounded N. by Lot, E. by Aveyron, S. by Tarn and Haute- Garonne, and W. by Gers and Lot-et-Garonne. Area, 1440 sq. m. Pop. (1906) 188,553. The department is watered by three rivers, the

Garonne, the Tarn, which joins the Garonne below Moissac, and the Aveyron, which flows into the Tarn between Moissac and Montauban, dividing it into three dis- tinct regions of hills. Those to the south-west of the Garonne are a continuation of the plateau of Lannemezan; ramifications of the Cevennes extend between the Garonne and the Tarn, and between the Tarn and the Aveyron; the region to the north of the continuous valley formed by the courses of the three rivers belongs to the Central Plateau. The causse or limestone plateau of Quercy occupies the north-east corner of the department and includes its highest point (1634 ft.). The lowest point (164 ft.) is at the exit of the Garonne. The climate is mild and agreeable; the mean annual temperature being about 56 F. Rain falls seldom, but heavily, especially in spring, the annual rainfall being 28 or 30 ins.

The wide alluvial valleys of the three large rivers are most pro- ductive. Cereals, especially wheat, maize and oats, occupy more than two-thirds of the arable land of the department. The vine

is everywhere cultivated and large quantities of grapes are exported as table fruit. Potatoes are also grown. Plums and apricots are abundant. The breeding of horses, especially for cavalry purposes, is actively carried on; and the rearing of horned cattle, both for draught and for fattening, is also important. Sheep, pigs, poultry and, in a minor degree, silk- worms, are also sources of profit. The manufacturing industry is represented by flour- mills, metal- foundries, tanneries, various kinds of silk-mills, and manufactories of linen, wool and paper. The principal exports are fruit, wine, flour, truffles from the Rouergue, poultry, phosphates and litho- graphic stone. Imports include raw materials for textile industries, timber, iron, wood-pulp, coal and agricultural produce. The canai of the Garonne traverses the department for 48 m. and the Garonne and the Tarn furnish 82 m. of navigable waterway. The department is served by the Orleans and the Southern railways. The department forms the diocese of Montauban, and belongs to the

jurisdiction of the Toulouse court of appeal, to the acaiemie (educational division) of Toulouse, and to the district of the XVII. corps d'armee (Toulouse). It has 3 arrondissements (Montauban, Moissac and Castelsarrasin), 24 cantons and 195 communes.

Montauban, Moissac and Castelsarrasin are the principal places. Other towns of interest are St Antonin, which has tanneries and manufactures of rough fabrics and is archaeologically important for its possession of a massive h6tel de ville of the 12th century, the oldest in France; Bruniquel, which is splendidly situated over- looking the valleys of the Aveyron and the Vere, and is dominated by a medieval castle with a donjon of the nth century; Beaumont- de-Lomagne, a curious bastide of the 13th century with a fortified church of the 14th century; Montpezat-de-Quercy, which has a church of the same period, containing many precious antiquities; Varen, an ancient town of narrow streets and old houses with a remarkable Romanesque church and the ruins of a castle of the 14th and 15th centuries; and Ginals, where remains of the Cistercian abbey of Beaulieu, founded in 1141, are still to be seen.

TARNOPOL, a town in Galicia, Austria, 87 m. E.S.E. of Lemberg by rail. Pop. (1900) 30,368, half of which are Jews. Industry consists chiefly in corn-milling and the preparation of wax and honey. The principal trade is in horses, corn and other agricultural produce, and spirits. Tarnopol was formerly a fortress, and rendered valuable services to Polish kings, who in their turn conferred upon it important privileges.

TARNOW, a town in Galicia, Austria, 164 m. W.N.W. of Lemberg by rail. Pop. (1900) 31,691, about 40 per cent. Jews. It is situated on the river Biala, not far from its junction with the Dunajec, and is the seat of a Roman Catholic bishop. It possesses a cathedral in Gothic style, built in the 1 5th century, with monuments of the Tarnowski and Ostrogski families, to which the town formerly belonged, and another church built in 1454. On the Martinsberg, an eminence near the town, stands the

ruins of the old castle of the Tarnowski family, and a small church over 800 years old. Worth mentioning also is the town hall, an old and interesting building. Agricultural implements, glass and chicory are manufactured.

TARNOWSKI, JAN [called Magnus] (1488-1561), Polish general. After a careful education beneath the eye of an ex- cellent mother and subsequently at the palace of Matthew Drzewicki, bishop of Przemysl, he occupied a conspicuous position at court in the reigns of John Albert, Alexander and Sigismund I. As early as 1509 Tarnowski brilliantly distin- guished himself in Moldavia, and took a leading part in the great victories of Wisniowiec (1512) and Orsza (1514), where he commanded the flower of the Polish chivalry. To complete his education he then travelled in Palestine, Syria, Arabia, Egypt, and northern and western Europe. While in Portugal he received from King Emanuel the chief command in the war against the Moors, and Charles V. rewarded his services in the Christian cause with the dignity of a count of the Empire. Indeed, the emperor had such a high regard for Tarnowski that he offered him the leadership of all the forces of Europe in a grand expedition against the Turks. On the death of Nicholas Firlej in 1526 Tarnowski became grand hetman of the crown, or Polish commander-in-chief, and in that capacity won his greatest victory at Obertyn (22nd August 1531) over the Moldavians, Turks and Tatars, for which he received a hand- some subsidy and an ovation similar to that of an ancient Roman triumphator. Heartily attached to King Sigismund I. and his son Sigismund Augustus, Tarnowski took the royal side during the so-called Kokosza wojna, or Poultry War, of 1537;

and also in 1548 when the turbulent szlachta tried to annul by force the marriage of Sigismund Augustus with Barbara Radziwill. In 1553, however, we find him in opposition to the court and thwarting as much

as possible the designs of the young king. Nevertheless Tarnowski was emphatically an aristocrat and an oligarch, proud of his ancient lineage and intensely opposed to the democratic tendencies of the szlachta. A firm alliance between the king and the magnates was his ideal of government. On the other hand, though a devout Catholic, he was opposed to the exclusive jurisdiction of the bishops and would even have limited the authority of Rome in Poland. As a soldier Tarnowski invented a new system of tactics which greatly increased the mobility and the security of the armed camps within which the Poles had so often to encounter the Tatars. He also improved discipline by adding to the authority of the commanders. His principles are set forth in his Con- silium Rationis Bellicae (best edition, Posen, 1879), which was long regarded as authoritative. As an administrator he did much to populate the vast south-eastern steppes of Poland.

See Stanislaw Orzechowski, Life and Death of Jan Tarnowski (Pol.) (Cracow, 1855). (R. N. B.)

TAROK, a game of cards very popular in Austria and Germany, and played to a limited extent in some parts of France. Special cards are used, and the rules are complicated. The name Tarot was originally given by the Italians to a certain card in the pack as early as the 13th century, but was afterwards applied to the game itself.

TAROM, a district of Persia, situated on the borders of Gilan, north-west of Kazvin. It is divided into upper and lower Tarom; the former, on the right bank of the Kizil Uzain (Send Rud) river, is a crown domain; the latter, on the left bank, forms part of the province of Kazvin. It produces much cotton and fruit, and derives a considerable revenue from its alum mines at Zajkanin. Most of the alum is exported to Russia. It also has a few olive groves. The inhabitants are Turks.

TARPAULIN, or Tarpauling (as if tarpalling, from tar, and palling, a covering, Lat. palla, a mantle),

a heavy, well- made, double warp plain fabric, of various materials, used chiefly in the manufacture of covers for railway and other waggons and for protecting goods on wharves, quays, &c. To make it proof against rain and other atmospheric influences it is generally treated with tar, though various compositions of different kinds are also employed, especially for the finer fabrics such as are used for covering motor-cars. These covers are generally made of flax, hemp and cotton, and are very similar to canvas — indeed, large quantities of canvas are made water- proof, and then called tarpaulin. A very large quantity of tarpaulin is made entirely of jute. The chief seats of manu- facture are Dundee, Arbroath and Kirkcaldy. Formerly the word was used as a sort of nickname for a sailor, the modern " tar " in the same sense being an abbreviation of it.

TARPEIA, in Roman legend, daughter of the commander of the Capitol during the war with the Sabines caused by the rape of the Sabine women. According to the common story, she offered to betray the citadel, if the Sabines would give her what they wore on their left arms, meaning their bracelets; instead of this, keeping to the letter of their promise, they threw their shields upon her and crushed her to death. Simylus, a Greek elegiac poet, makes Tarpeia betray the Capitol to a king of the Gauls. The story may be an attempt to account for the Tar- peian rock being chosen as the place of execution of traitors. According to S. Reinach, however, in Revue archiologique, xi. (1908), the story had its origin in a rite — the taboo of military spoils, which led to their being heaped up on consecrated ground that they might not be touched. Tarpeia herself is a local divinity, the manner of whose death was suggested by the tumulus or shields on the spot devoted to her cult, a crime being invented to account for the supposed punishment.

Authorities. — Sir George C. Lewis, Credibility of early Roman- History; A. Schwegler, Rbmische Geschichte, bk. ix. 10; Livy, i. 11 ; Dion. Halic, ii. 38-40; Plutarch, Romulus, 17; Propertius, iv. 4; Ovid, Fasti, i. 261 ; C. W. Miiller, Frag. Hist.

Graec, iv. p. 367.

TARQUINII (mod. Corneto Tarquinia, q.v.), an ancient city of Etruria, Italy, situated on a hill overlooking the S.W. coast of Italy, about 5 m. N.W. of it. The site of the Roman town is now deserted, its last remains having been destroyed by the inhabitants of Corneto in 1307. Scanty remains of walling and of buildings of the Roman period exist above ground; traces of a large rectangular platform were found in 1876, and part of the thermae in 1829; it occupied the summit of a hill defended by ravines, called Piano di Civita. It seems probable, however, that the original settlement occupied the site of the medieval town of Corneto, to the W.S.W., on the further side of a deep valley. Some authorities indeed consider, and very likely with good reason, that this was the site of the Etruscan city, and that the Piano di Civita, which lies further inland and commands but little view of the sea, was only occupied in Roman times. The case would be parallel to others in Etruria, e.g. Civita Castellana (anc. Falerii) which also occupies the site of the Etruscan city, while the Roman site, some distance away, is now abandoned. The importance of Tarquinii to archaeo- logists lies mainly in its necropolis, situated to the S.E. of the medieval town, on the hill which, from the tumuli raised above the tombs, bears the name of Monterozzi. The tombs them- selves are of various kinds. The oldest are tombe a pozzo, or shaft graves, containing the ashes of the dead in an urn, of the Villanova period, the oldest of them probably pre-Etruscan; in some of these' tombs hut urns, like those of Latium, are found, Next come the various kinds of inhumation graves, the most important of which are rock-hewn chambers, many of which contain well-preserved paintings of various periods; some show close kinship to archaic Greek art, while others are more recent, and one, the Grotta del Tifone (so called from the typhons, or winged genii of death, represented) in which Latin as well as Etruscan inscriptions appear, belongs perhaps to the middle of the 4th century B.C. Fine sarcophagi from these

tombs, some showing traces of painting, are preserved in the municipal museum, and also numerous fine Greek vases, bronzes and other objects.

Tarquinii is said to have been already a flourishing city when Demaratus of Corinth brought in Greek workmen. It was the chief of the twelve cities of Etruria, and appears in the earliest history of Rome as the home of two of its kings, Tar- quinius Priscus and Tarquinius Superbus. From it many of the religious rites and ceremonies of Rome are said to have been derived, and even in imperial times a collegium of sixty harus- pices continued to exist there. The people of Tarquinii and Veii attempted to restore Tarquinius Superbus to the throne after his expulsion. In 358 B.C. the citizens of Tarquinii captured and put to death 307 Roman soldiers; the resulting war ended in 351 with a forty years' truce, renewed for a similar period in 308. When Tarquinii came under Roman domination is uncertain, as is also the date at which it became a munici- pality; in 181 B.C. its port, Graviscae (mod. Porto Clementino), in an unhealthy position on the low coast, became a Roman colony. It exported wine and carried on coral fisheries. Nor do we hear much of it in Roman times; it lay on the hills above the coast road. The flax and forests of its extensive territory are mentioned by classical authors, and we find Tarquinii offering to furnish Scipio with sailcloth in 195 B.C. A bishop of Tarquinii is mentioned in a.d. 456.

See L. Dasti, Notizie Storiche archeologiche di Tarquinia e Corneto (Rome, 1878) ; G. Dennis, Cities and Cemeteries of Etruria (London, 1883), i. 301 sqq. ; Notizie degli Scavi, passim, especially 1885, 513 sqq.; E. Bormann in Corp. Inscr. Lai., xi. (Berlin, 1888), p. 510 sqq.; G. Korte, s.v. " Etrusker " in Pauly-Wissowa, Realencyklo- pddie, vi. 730 sqq. (T. As.)

TARQUINIUS PRISCUS, LUCIUS, fifth legendary king of Rome (616-578 B.C.). He is represented as the son of a Greek refugee, who removed from Tarquinii in Etruria to Rome, by the advice of his wife, the

prophetess Tanaquil. Appointed guardian to the sons of Ancus Marcius, he succeeded in sup- planting them on the throne on their father's death. He laid out the Circus Maximus, instituted the " great " games, built

the great sewers {cloacae), and began the construction of the temple of Jupiter on the Capitol. He carried on war success- fully against the Sabines and subjugated Latium. He is said to have raised the number of the senators to 300, and to have doubled the number of the knights (see Navius, Attus). The introduction of many of the insignia both of war and of civil office is assigned to his reign, and he was the first to celebrate a Roman triumph, after the Etruscan fashion, in a robe of purple and gold, and borne on a chariot drawn by four horses. He was assassinated at the instigation of the sons of Ancus Marcius. The legend of Tarquinius Priscus is in the main a reproduc- tion of those of Romulus and Tullus Hostilius. His Corinthian descent, invented by the Greeks to establish a close connexion with Rome, is impossible for chronological reasons; further, according to the genuine Roman tradition, the Tarquinii were of Etruscan, not Greek, origin. There seems to have been originally only one Tarquinius; later, when a connected story of the legendary period was constructed, two (distinguished as the " Elder " and the " Proud ") were introduced, separated by the reign of Servius Tullius, and the name of both was con- nected with the same events. Thus, certain public works were said to have been begun by the earlier and finished by the later king; both instituted games, acquired the Sibylline books, and reorganized the army.

For the constitutional reforms attributed to Tarquinius, see Rome: Ancient History; for a critical examination of the story, Schwegler, Romische Geschichte, bk. xv. ; Sir George Cornewall

Lewis, Credibility of early Roman History, ch. n; W. Ihne, History of Rome, i. ; E. Pais, Storia di Roma, i. (1898), who identifies Tarquinius with Tarpeius, the eponymus of the Tarpeian rock, subsequently developed into the wicked king Tarquinius Superbus. Ancient authorities: — Livy i. 34-41; Dion. Hal. iii. 46-73; Cic. de Repub., ii. 200.

TARQUINIUS SUPERBUS, LUCIUS, son of Lucius Tarquinius Priscus and son-in-law of Servius Tullius, the seventh and last legendary king of Rome (534-510 B.C.). On his accession he proceeded at once to repeal the recent reforms in the constitution, and attempted to set up a pure despotism. Many senators were put to death, and their places remained unfilled; the lower classes were deprived of their arms and employed in erecting splendid monuments, while the army was recruited from the king's own retainers and from the forces of foreign allies. The completion of the fortress-temple on the Capitoline confirmed his authority over the city, and a fortunate marriage of his son to the daughter of Octavius Mamilius of Tusculum secured him powerful assistance in the field. His reign was characterized by bloodshed and violence; the outrage of his son Sextus upon Lucretia {q.v.) precipitated a revolt, which led to the expulsion of the entire family. All Tarquinius's efforts to force his way back to the throne were vain (see Porsena), and he died in exile at Cumae.

In the story certain Greek elements, probably later additions, may easily be distinguished. Tarquinius appears as a Greek " tyrant " of the ordinary kind, who surrounds himself with a bodyguard and erects magnificent buildings to keep the people employed; on the other hand, an older tradition represents him as more like Romulus. This twofold aspect of his character perhaps accounts for the making of two Tarquinii out of one (see Tarquinius Priscus). The stratagem by which Tar- quinius obtained possession of the town of Gabii is a mere fiction, derived from Greek and Oriental sources. According to arrangement, his son Sextus requested the protection of the inhabitants against his father. Having

obtained their confidence, he sent a messenger to Tarquinius to inquire the next step. His father made no reply to the messenger, but walked up and down his garden, striking off the heads of the tallest poppies. Sextus thereupon put to death all the chief men of the town, and thus obtained the mastery. The stratagem of Sextus is that practised by Zopyrus is the case of Babylon, while the episode of the poppy-heads is borrowed from the advice given by Thrasybulus to Periander (Herodotus iii. 154, v. 02). On the other hand, the existence in the time of Dionysius of Halicarnassus of a treaty concluded between

Tarquinius and the inhabitants of Gabii, shows that the town came under his dominion by formal agreement, not, as the tradition states, by treachery and violence. The embassy to Delphi (see Brutus, Lucius Junius) cannot be historical, since at the time there was no communication between Rome and the mainland of Greece. The well-known story of Tar- quinius's repeated refusal and final consent to purchase the Sibylline books has its origin in the fact that the building of the temple of Jupiter Capitolinus, in which they were kept, was ascribed to him. The traditional account of his expulsion can hardly be historical. A constitutional revolution, involv- ing such far-reaching changes, is not likely to have been carried out in primitive times with so little disturbance by a simple resolution of the people, and it probably points to a rising of Romans and Sabines against the dominion of an Etruscan family (Tarquinii, Tarchna) at that time established at Rome.

For a critical examination of the story see Schwegler, Romische Geschichte, bk. xviii. ; Sir G. Cornewall Lewis, Credibility of early Roman History, ch. 11; E. Pais, Storia di Roma, i. (1898); and, for the political character of his reign, Rome: Ancient History. Ancient authorities: — Livy i. 21 ; Dion. Hal. v. i-vi. 21.

TARRAGONA, a maritime province in the north-east of Spain, formed in 1833 from the southern part of the

province of Catalonia, and bounded on the S.E. by the Mediterranean, N.E. by Barcelona, N. by Lerida, W. by Saragossa and Teruel, and S.W. by Castellon de la Plana. Pop. (1900) 337,964; area, 2505 sq. m. The Ebro flows through the southern portion of the province, and the other chief streams are the Gaya and the Francoli. These three rivers flow south into the Medi- terranean. Below Tortosa, the Ebro forms a conspicuous marshy delta jutting out into the sea, but elsewhere the even south-westward curve of the coast-line is unbroken by any noteworthy headland or indentation. The province, although mountainous, is naturally fertile. The hills are clothed with vineyards, which produce excellent wines, and in the valleys are cultivated all kinds of grain, vegetables, rice, hemp, flax and silk. Olive, orange, filbert and almond trees reach great perfection, and the mountains yield rich pastures and timber trees of various kinds. The climate is temperate on the coast and in the centre, cold in the highlands, very warm and damp in the valleys and on the banks of the rivers as they near the sea. Manufactures are well advanced, and comprise silk, cotton, linen and woollen fabrics, velvet, felt, soap, leather and spirits. There are also many potteries and cooperages, and flour, paper and oil mills. Silver, copper, lead and other minerals have been found, and quarries of marble and jasper are worked in the hills. The fisheries produce more than £20,000 yearly. There are upwards of 250 m. of railways, which link together all the large towns, and include the im- portant main lines along the coast and up the Ebro valley. The cities of Tarragona (pop., 1900, 23,423) and Tortosa (24,452), which are the principal seaports, and the towns of Reus (26,681) and Vails (12,625) are described in separate articles. Mont- blanch (5243) is the only other town with a population ex- ceeding 5000. The people of Tarragona are, like almost all the inhabitants of Catalonia (q.v.), hardy, enterprising and in- dustrious. Although the birth-rate considerably exceeds the death-rate, the population tends to decrease slightly, as many families emigrate.

TARRAGONA (anc. Tarraco), the capital of the Spanish pro- vince of Tarragona, a flourishing seaport, and the seat of an archbishop; at the mouth of the river Francoli, 63 m. by rail W.S.W. of Barcelona, in 41 10' N. and o° 20' E. Pop. (1900) 23,423. Tarragona is on the coast railway from Barcelona to Valencia, and is connected with the Ebro Valley Railway by i. branch line to Reus. The picturesque old town, with its dark and steep alleys, occupies a rugged hill which rises abruptly from the sea to an altitude of about 550 ft. Its highest point, where the ancient citadel stood, is crowned by the cathedral, the seminary for priests, and the palace of the archbishop, who shares the title primate of Spain with the archbishop of Toledo. Many of the houses in this quarter are very old, and are built

partly of Roman masonry; one such fragment, immured in the palace wall, is inscribed with the epitaph of a charioteer (auriga) who, it says, would rather have died in the circus than of fever. Massive ruined walls encircle the old town. Their lowest course is " Cyclopean," consisting of unhewn blocks about 12 ft. long and 6 ft. wide; Roman masonry of the Augustan age is superimposed. The six gates and the square towers are also, to a great extent, " Cyclopean." The palace, itself a building of the early 19th century, has an old fortified tower, and there are barracks and forts in the city; but Tarra- gona can no longer be regarded as a fortress capable of with- standing modern artillery, although it is officially classed as such.

The new town, divided from the old by one broad and shady avenue, the Rambla de San Carlos, and intersected by another, the more modern Rambla de San Juan, extends to the west and south along a low promontory which juts out into the Mediter- ranean. Its outlying districts merge into the Camp de Tarra- gona, a plain planted with vines and walnut, almond and olive groves. Tarragona cathedral is one of the

noblest examples of early Spanish art. It is 320 ft. long and 103 ft. broad, and con- sisted originally of a nave, aisles, transepts with an octagonal lantern at the crossing, and an apsidal chancel. Several exterior chapels were added in later times, and on the south-east stands a 14th-century steeple raised on a Romanesque tower. The east end was probably begun in 1131 on the ruins of an earlier church, but the main body of the building dates from the end of the 1 2th century and the first half of the 13th, and is of transitional character, — the exuberant richness of the sculptured capitals being admirably kept in subordination by the Romanesque sim- plicity of the general design. Considerable changes were intro- duced at a later date; and the present west end of the nave cannot have been completed till late in the 14th century. On the north-east side is a cloister contemporary with the church, with which it communicates by a very fine doorway. The cloister contains much remarkable work, and the tracery of the windows bears interesting marks of Moorish influence. Two other noteworthy churches in the city are San Pablo and Santa Tecla la Vieja, both of the 12th century. There is a fine Roman aqueduct; the Roman amphitheatre was dismantled in 1491 to furnish stone for the eastern mole, though a few rows of seats are left near the sea-shore; and the museum contains a large collection of Roman antiquities. The Torreon de Pilatos is said to have been the palace of the Emperor Augustus; it was partly destroyed by the French in 181 1 and now serves as a prison. Its name is connected with an old tradition that Pontius Pilate was a native of the city. Tarragona has also many public buildings, including the law courts, several hospitals, a provincial institute, training schools for teachers, and offices of the provincial and municipal governments. When the monks of the Grande Chartreuse were compelled to leave France, they settled at Tarragona in 1903, and established a liqueur factory; 20,000 cases of liqueur were exported in 1904 and 39,000 in 1905. A characteristic feature of Tarragona is the number of its underground storehouses for wine (bodegas) ;

wine is exported in large quantities. There is a British steel file factory; chocolate, soap, flour, ironware, paper, pipes and salted fish are also manufactured. The harbour is at the ex- treme south-west of the new town. It was originally protected by a Roman breakwater, which was destroyed in the 19th century. The eastern mole, founded in 1491 and frequently enlarged, terminates in a lighthouse. Its length was 1400 yards in 1904, when the construction of a new section was begun. In each of the five years 1901-5 about 870 ships of 580,000 tons entered the port. Wine, oil, nuts, almonds and small quantities of lead and pig iron are exported; the imports include coal from Great Britain, grain from the Black Sea, staves and petroleum from the United States, dried codfish from Norway and Iceland, guano and phosphates. Close to the harbour and at the mouth of the Francoli is the fishermen's quarter (barrio de Pescadores) , in which most of the houses are coloured Dale blue.

History.^-Ta.rra,co, the capital of the Iberian Cessetani, many of whose coins are extant, was one of the earliest Roman strong- holds in Spain. It was captured in 218 B.C. by Gnaeus and Publius Cornelius Scipio, who improved its harbours and en- larged its walls. A Roman monument on a hill 3 m. E. is known as the Sepulcro de los Escipiones, and locally believed to be the tomb of the Scipios, who were defeated and slain by the Carthaginians under Hasdrubal Barca in 212 B.C. The battle took place at Antiorgis, the modern Alcaniz in the province of Teruel; there is no good reason to believe that the bodies of the Scipios were conveyed to Tarragona for burial, nor is the monument older than the 1st century a.d. As the Colonia Triumphalis, so called to commemorate the victories of Julius Caesar, Tarraco was made the seat of one of the four assize courts (conventus juridici) established in Hispania Citerior. Augustus spent the winter of 26 b.c. here, and made Tarraco the capital of the whole province, which received the name of Hispania Tarraconensis. A temple was built in his honour. It was afterwards restored by Hadrian (a.d. 1 17-138), and the city

became the Spanish headquarters of the worship of the goddess Roma and the deified emperors. Its flax trade and other industries made it one of the richest seaports of the empire; Martial and Pliny celebrated its climate and its wines, and the fragmentary remains of temples, baths, amphitheatre and other Roman buildings bear witness to its prosperity. It became an archbishopric in the 5th century.

To the Romans the Visigoths under Euric succeeded in 467, but on their expulsion by the Moors in 711 the city was plundered and burned. It was long before the ruins were again inhabited, but by 1089, when the Moors were driven out by Raymond IV. of Barcelona, there must have been a certain revival of prosperity, for the primacy, which had been removed to Vich, was in that year restored to Tarragona. In n 18 a grant of the fief was made to the Norman Robert Burdet, who converted the town into a frontier fortress against the Moors. In 1705 the city was taken and burned by the British; in 1811, after being partly fortified, it was captured and sacked by the French.

TARRASA, a town of north-eastern Spain, in the province of Barcelona, 6 m. W.N.W. of Sabadell on the Barcelona- Lerida railway, and in the midst of a narrow plain surrounded by mountains. Pop. (1900) 15,956. Tarrasa was a Roman municipality, and a bishopric from the 5th century to the Moorish invasion in the 8th. It was razed by the Moors and rebuilt later by the Christians. There are three ancient Romanesque churches, in one of which, San Miguel, some Roman pillars are incorporated. Tarrasa is now mostly a modern industrial town, with fine public buildings, including the royal college, built in 1864 for 450 students besides day scholars, the school of arts and handicrafts, the industrial institute, chamber of commerce, hospitals, town hall, clubs, theatres and many large textile factories. Grain, wine, oil and fruit are produced in the district, and there is a municipal farm, founded in 1885, for experiments in viticulture.

TARRING AND FEATHERING, a method of punishment at least as old as the Crusades. The head of the culprit was shaved and hot tar poured over it, a bag of feathers being after- wards shaken over him. The earliest mention of the punish- ment occurs in the orders of Richard Cceur de Lion, issued to his navy on starting for the Holy Land in n 91. ” Concerning the lawes and ordinances appointed by King Richard for his navie the forme thereof was this . . . item, a thiefe or felon that hath stolen, being lawfully convicted, shal have his head shorne, and boyling pitch poured upon his head, and feathers or downe strawed upon the same whereby he may be knowen, and so at the first landing-place they shall come to, there to be cast up ” (trans, of original statute in Hakluyt’s Voyages, ii. 21). A later instance of this penalty being inflicted is given in Notes and Queries (series 4, vol. v.), which quotes one James Howell writing from Madrid, in 1623, of the ” boisterous Bishop of Halverstadt,” who, ” having taken a place where there were two monasteries of nuns and friars, he caused divers feather

beds to be ripped, and all the feathers thrown into a great hall, whither the nuns and friars were thrust naked with their bodies oiled and pitched and to tumble among these feathers, which makes them here (Madrid) presage him an ill-death.” In 1696 a London bailiff, who attempted to serve process on a debtor who had taken refuge within the precincts of the Savoy, was tarred and feathered and taken in a wheelbarrow to the Strand, where he was tied to the Maypole which stood by what is now Somerset House. It is probable that the punishment was never regarded as legalized, but was always a type of mob ven- geance.

TARRYTOWN, a village of Westchester county, New York, on the E. bank of the Hudson river, opposite Nyack, with which it is connected by ferry, and about 25 m. N. of New York City. Pop. (1890) 3562;

(1900) 4770, of whom 984 were foreign-born and 191 were negroes; (1910, U.S. census) 5600. Tarrytown is served by the New York Central and Hudson River railway, and by interurban electric lines connecting it, via White Plains, with New York City. It is situated on a sloping hill that rises to a considerable height above Tappan Zee, a large expansion of the Hudson river, and is built principally along either side of a broad and winding country high- way (laid out in 1723) from New York to Albany, called the King's Highway until the War of Independence, then called the Albany Post Road, and now known (in Tarrytown) as Broadway. South of the village is " Lyndhurst," the estate of Miss Helen Miller Gould, and to the N.E. is Kaakout (originally " Kijkuit," that is, " lookout," the name of a high promontory), the estate of John D. Rockefeller. In the village are the Hackley School (1899), Irving School (1837), Repton School and the " Castle " School for girls; a Young Men's Lyceum (1899), with a public library (8000 volumes in 1910) and the Tarrytown Hospital (1892). In the vicinity there are large nurseries and market-gardens, and automobiles are manu- factured in the village. Tarrytown stands on the site of a Wecquaesgeek Indian village, Alipconk (the place of elms), burned by the Dutch in 1644. The first settlement of whites was made about 1645. There were perhaps a dozen Dutch families here in 1680, when Frederick Philipse (formerly known as Vredryk Flypse) acquired title to several thousand acres in Westchester county, called Philipse Manor. He built, partly of brick brought from Holland, a manor-house (on a point of land now known as Kingsland's Point, a short distance above the present village), a mill and a church, at the mouth of Sleepy Hollow, some three-quarters of a mile above the village; Dr Hamilton Wright Mabie has written: " There is probably no other locality in America, taking into account history, tradition, the old church, the manor-house and the mill, which so entirely conserves the form and spirit of Dutch civilization in the New World." During the War of Independence Tarrytown was the centre of the " Neutral Territory " between the lines of the British

and Continental forces, and was the scene of numerous conflicts between the " cowboys " and " skinners," bands of unorganized partisans, the former acting in the name of the colonies, and the latter in that of the king. On the post road, on the 24th of September 1780, Major John Andre was captured by three Continentals, John Paulding, David Williams and Isaac Van Wert; to commemorate the capture a marble shaft surmounted by a bronze statue of a Continental soldier has been erected on the spot. Tarrytown is described in the Sketch Book of Washington Irving, who lived and died at " Sunnyside," within the limits of Tarrytown, was long warden of old Christ Church, and is buried in the Old Sleepy Hollow burying-ground, which adjoins the Dutch Church, and in which Carl Schurz also is buried. Tarrytown was incorporated as a village in 1870. Its name is probably a corrupt form of the Dutch " Tarwen dorp " (wheat town).

See H. B. Dawson, Westchester County in the American Revolu- tion (New York, 1886); and an article by H. W. Mabie in L. P. Powell's Historic Towns of the Middle States (New York, 1899).

TARSIER, the Anglicized form of the scientific name of a small and aberrant lemur-like animal, Tarsius spectrum,

inhabiting the Malay Peninsula and islands, and typifying a family. The name tarsier refers to the great elongation of two of the bones of the tarsus, or ank'e, and spectrum to the huge goggle-like eyes and attenuated form which constitute two of the most distinctive features of this weird little creature. In organization the tarsier departs markedly from other lemurs as regards several particulars, and thereby approximates to monkeys and apes. Rather smaller than a squirrel, with dusky brown fur, the tarsier has immense eyes, large ears, a long thin tail, tufted at the end, a greatly elongated tarsal portion of the foot, and disk-like adhesive surfaces on the fingers, which doubtless assist the animal in maintaining its position on the boughs. Four species of the genus are now recognized, whose range

includes the Malay Peninsula, Java, Sumatra, Borneo, Celebes and some of the Philippines. The tarsier feeds chiefly on insects and lizards, sleeps during the day, but is tolerably active at night, moving chiefly by jumping from place to place; an action for which the structure of its hind-legs seems particularly well adapted. It is rare, not more than two being generally found together, and only brings forth one young at a time. (See Primates.) (R. L.)*

TARSUS (mod. Tersous), an ancient city in the fertile plain of Cilicia. The small river Cydnus flowed through the centre of the town, and its cool swift waters were the boast of the city (though visitors like Dion Chrysostom thought it far inferioi to the rivers of many Greek cities). The harbour, Rhegma, below the city, was originally a lagoon, though it is said also to be supplied by springs of its own. The Cydnus flowed into the lake (where were the arsenals) and thence into the sea, about 10 m. from Tarsus. The city is first mentioned on the Black Obelisk, as captured by the Assyrians along with the rest of Cilicia about 850 B.C. It was probably an old Ionian colony, settled (like Mallus) under the direction of Clarian Apollo. Its importance was due (1) to its excellent and safe harbour, (2) to its possession of a fertile territory, and (3) to its command of the first waggon-road made across Mount Taurus, which was cut through the Cilician Gates, a narrow gorge 100 yards in length, originally only wide enough to carry the waters of a small affluent of the Cydnus. The greatness of Tarsus rested therefore mainly on the two great engineering works, the harbour and the road. That the latter was due to Greek influence is shown by the village Mopsucrene on the southern approach to the Gates: Mopsus was the prophet of Clarian Apollo. Few mountain passes have been so important in history as this road (seventy miles in length) over Taurus. Many armies have marched over it; those of Cyrus the Younger, Alexander the Great, Cicero, Septimius Severus and the First Crusade may specially be mentioned.

Tarsus is most accessible from the sea or from the

east. Even after the " Cilician Gates " were cut, the crossing of Taurus was a difficult operation for an invading army (as Xenophon and Arrian show). Hence Tarsian history (where not determined by Greek maritime relations) has been strongly affected by Semitic influence, and Dion Chrysostom, about a.d. 112, says it was more like a Phoenician than a Hellenic city (which it claimed to be). After the Assyrian power decayed, princes, several of whom bore the name or title Syennesis, ruled Tarsus before and under Persian power. Persian satraps governed it in the 4th century B.C.; and struck coins with Aramaic legends there. The Seleucid kings of Syria for a time kept it in a state of servitude; but it was made an autonomous city with addi- tional citizens (probably Argive Greeks and Jews) by Antiochus IV. Epiphanes in 171 B.C.; and then it began to strike its own coins. It became one of the richest and greatest cities of the East under the Romans after 104 B.C., and was favoured by both Antony and Augustus: the reception there by the former of Cleopatra, who sailed up to the city in a magnificent vessel, was a striking historic event. In spite of its oriental character, it maintained a university where Greek philosophy was taught by a series of famous Tarsians, who influenced Roman history. Chief among them was Athenodorus Cananites (q.v.), teacher and friend of Augustus for many years, a man of courage and

power, who remodelled the Tarsian constitution (making it timocratic and oligarchic). The picture which Philostratus, in his biography of Apollonius Tyanensis, draws of the Tarsians as vain, luxurious and illiterate, represents the general Graeco- Roman conception of the city. The legend which was believed to be graven on the statue of Sardanapalus at Anchiale (12 m. S.W. from Tarsus) might have been the motto of most Tarsians: " Eat, drink, play, for nothing else is worth this (gesture)" (referred to by St Paul, 1 Cor. xv. 32). The statue was pro-

bably an archaic work, with Hittite or cuneiform inscription, representing a figure with right hand raised: the letters and the attitude were misunderstood; the figure was supposed to be snapping the fingers and uttering this expression of effeminate and weary sensualism.

Tarsus depended for its gTeatness on commerce, peace and orderly government. It was not a strong fortress, and could not be defended during the decay of the empire against bar- barian invasion. The Arabs captured the whole of Cilicia shortly after a.d. 660; and Tarsus seems to have been a ruin for more than a century after the conquest. But Harun al- Rashid rebuilt its walls in 787, and made it the north-western capital of the Arab power in the long wars against the Byzantine empire. All the raids, which were made in Asia Minor re- gularly, year by year, sometimes twice in one year, through the Cilician Gates and past the fortress Loulon, issued through the north gate of Tarsus, which was called the " Gate of the Holy War." The western gate is still standing, and is mis- named " St Paul's Gate." The caliph Mamun died on such a foray in a.d. 833, having caught a chill at a great spring north of the Cilician Gates beside Ak-Keupreu. He was brought to Tarsus where (like the emperor Tacitus) he died, and (like the emperor Julian) was buried. His illness recalls the fever which Alexander the Great contracted from bathing in the Cydnus. Nicephorus Phocas reconquered Tarsus and all Cilicia for the empire in a.d. 965. In the First Crusade Baldwin and Tancred captured Tarsus a.d. 1099, and there the two leaders had a serious quarrel. It formed part of the kingdom of Lesser Armenia fcr great part of the three centuries after a.d. 1180, and it was fortified by Leo II. and Hethoum I. But Turkoman and Egyptian invaders disputed its possession with the Greek emperors and Armenian kings and with one another. Finally it passed into Ottoman hands about the beginning of the 16th century.

Most of the successive masters of Tarsus had their own legends about its origin, usually with a religious character justifying and explaining their

possession of the city. The Assyrian Sardanapalus, the native gcd Sandan, the Greek hero Perseus, the Greek god Heracles, are all called founder of Tarsus. Iapetus, i.e. Japhet, father of Javan "the Ionian," was called the grandfather of Cydnus, who gave name to the river. A curious ceremony was practised in honour of Sandan (identified with the Greek Heracles): a pyre was periodically erected and the god was burned on it. It is said that the original name of the city was Parthenia, which suggests that a virgin goddess was worshipped here as in so many shrines of Asia Minor and Syria: the virgin goddess Athena appears on Tarsian coins. The Baal of Tarsus is named in Aramaic letters on many of its coins in the Persian period.

The ruins of the ancient city are very extensive, but they are deeply buried, and make little or no appearance above the surface except in the Dunuk Tash (popularly identified as the " Tomb of Sardanapalus," a monument which, however, was at Anchiale, not at Tarsus). This shapeless mass of concrete was probably the substructure of a Graeco-Roman temple, from which the marble coating has been removed. The modern town has considerable bazaars and trade ; but the climate is very oppressive, owing to the proximity of vast marshes which occupy the site of the harbour and the lower part of the original Cyndus course. The river was diverted from its former course by Justinian in the 6th century. The emperor's intention was only to carry off the surplus waters in time of flood and prevent inundations in the city, not to deprive Tarsus of what was its

chief pride and boast; but gradually the neglect of subsequent centuries allowed the channel in the city to become blocked by accumulation of soil, and now the whole body of water flows in the new channel east of the city, except what is drawn off by an artificial irrigation course to water the gardens on the western side of the city. The population is about 25,000, including, besides Turks and Syrian Moslems, alsc Armenians, Greeks, Syrian Christians, Persians, Afghans, Ansaria (mostly gardeners) and

even Hindus. There is a large American mission school called St Paul's Institute, giving a very comprehensive edu- cation to Armenians and Greeks drawn from an extensive district.

The literature regarding Tarsus is scanty, and few ancient in- scriptions have been published. See W. B. Barker, Lares and Penates; G. F. Hill in the British Museum Catalogue of Coins; Six in Numismatic Chronicle, 1884, pp. 152 ff., 1894, pp. 329 ff. ; E. Babelon in the Catalogue Bibl. Nat., " Perses Achemenides "; the numismatic works of B. V. Head, F. Imhoof Blumer, &c. ; Waddington in Bulletin de Corr. Hell., vii. pp. 282 ff. ; Ramsay, Cities of St Paul (1907), pp. 85-245, and " Cilicia, Tarsus and the Great Taurus Pass" in Geographical Journal (1903), pp. 357-410; R. Heberdey and A. Wilhelm, " Reisen in Kilikien " (in the Denkschriflen d. kais. Akademie Wien, 1896, xliv.), with works of other travellers, especially V. Langlois and Macdonald Kinneir. Callander in Journal of Hellenic Studies, 1904, pp. 58 ff., studied Dion Chrysostom's two Tarsian Orations. (W. M. Ra.)

TART, a dish of baked pastry containing fruit, a fruit pie; also a small open piece of baked pastry with jam placed upon it. The word was adapted from the O.Fr. tarte; the older form must have been torte, as is seen in the mod. Fr. tourte and the diminutive tortel or torteau; the origin is the Lat. torta, twisted {torquere, to twist), used of a cake in Med. Lat., the paste or dough of cakes or tarts being rolled or twisted. The alteration of the vowel is also seen in Ital. tartera. In English there is some confusion with " tart," sharp, acid, bitter, which comes from O.E. teart, sharp, severe, properly " tearing," from teran, to tear; cf. " bitter," from " to bite."

TARTAGLIA, or Tartalea, NICCOLO (c. 1506-1559), Italian mathematician, was born at Brescia. His childhood was passed in dire poverty. During the sack of Brescia in 151 2, he was horribly mutilated by some French soldiers. From these injuries he slowly recovered, but he long continued to stammer

in his speech, whence the nickname, adopted by himself, of ” Tartaglia.” Save for the barest rudiments of reading and writing, he tells us that he had no master; yet we find him at Verona in 1521 an esteemed teacher of mathe- matics. In 1534 he went to Venice. For Tartaglia’s discovery of the solution of cubic equations, and his contests with Antonio Marie Floridas, see Algebra {History). In 1548 Tartaglia accepted a situation as professor of Euclid at Brescia, but returned to Venice at the end of eighteen months. He died at Venice in 1559.

*Tartaglia’s first printed work, entitled Nuova scienzia (Venice, !537)’ dealt with the theory and practice of gunnery. He found the elevation giving the greatest range to be 45°, but failed to demonstrate the correctness of his intuition. Indeed, he never shook off the erroneous ideas of his time regarding the paths of projectiles, further than to see. that no part of them could be a straight line. He nevertheless inaugurated the scientific treatment of the subject. His Quesiti et invenzioni diverse, a collection of the author’s replies to questions addressed to him by persons of the most varied conditions, was published in 1546, with a dedication to Henry VIII. of England. Problems in artillery occupy two out of nine books ; the sixth treats of fortification ; the ninth gives several examples of the solution of cubic equations. He published in 1 55 1 Regola generate per sollevare ogni affondata nave, intitolala la Travagliata Invenzione (an allusion to his personal troubles at Brescia), setting forth a method for raising sunken ships, and describing the diving-bell, then little known in western Europe. He pursued the subject in Ragionamenti sopra la Travagliata Invenzione (May 1 551). His largest work,Trattato generate di numeri e misure, is a comprehensive mathematical treatise, including arithmetic, geometry, mensuration, and algebra as far as quadratic equations (Venice, 1556, 1560). He published the first Italian translation of Euclid (1543), anc * tne earliest version from the Greek of some of the principal works of Archimedes (1543). These included the tract Be insid-entibus*

aquae, of which his Latin now holds the place of the lost Greek text. Tartaglia claimed the invention of the gunner's quadrant.

Tartaglia's own account of his early life is contained in his Quesiti, lib. vi. p. 74. See also Buoncompagni, Intorno ad un testamento inedito di N. Tartaglia (Milan, 1881); Rossi, Elogi di Bresciana illuslri, p. 386. Tartaglia's writings on gunnery were translated into English by Lucar in 1588, and into French by Rieffel in 1845.

TARTAN (from F. tiretaine, " linsie-wolsie," Sp. tiritana, a kind of woollen cloth, perhaps so called from its thinness and lightness, cf. Sp. tiritar, to tremble with cold), a worsted cloth woven with alternate stripes or bands of coloured warp and weft, so as to form a chequered pattern in which the colours alternate in " sets " of definite width and sequence. The weaving of particoloured and striped cloth cannot be claimed as peculiar to any special race or country, for indeed such checks are the simplest ornamental form into which dyed yarns can be combined in the loom. But the term tartan is specially applied to the variegated cloth used for the prin- cipal portions of the distinctive costume of the Highlanders of Scotland. For this costume, and the tartan of which it is composed, great antiquity is claimed, and it is asserted that the numerous clans into which the Highland population were divided had each from time to time a special tartan by which it was distinguished. After the rebellion of 1745 various acts of parliament were passed for disarming the Scottish Highlanders and for prohibiting the use of the Highland dress in Scotland, under severe penalties. These acts remained nominally in force till 1782, when they were formally repealed, and since that time clan tartan has, with varying fluctuations of fashion, been a popular article of dress, by no means confined in its use to Scotland alone; and many new

and imaginary " sets " have been invented by manufacturers, with the result of introducing confusion in the heraldry of tartans, and of throwing doubt on the reality of the distinctive " sets " which at one time undoubtedly were more or less recognized as the badge of various clans.

Undoubtedly the term tartan was known, and the material was woven, " of one or two colours for the poor and more varied for the rich," as early as the middle of the 15th century. In the accounts of John, bishop of Glasgow, treasurer to King James III., in 1471, there occurs, with other mention of the material, the following: — " Ane elne and ane halve of blue Tartane to lyne his gowne of cloth of Gold." It is here obvious that the term is not restricted to particoloured chequered textures. In 1538 accounts were incurred for a Highland dress for King James V. on the occasion of a hunting excursion in the Highlands, in which there are charges for " variant cullorit velvet," for " ane schort Heland coit," and for " Heland tartane to be hose to the kinge's grace." Bishop John Lesley, in his De origine, moribus, et rebus gestis Scotorum, published in 1578, says of the ancient and still-used dress of the Highlanders and Islanders, " all, both noble and common people, wore mantles of one sort (except that the nobles preferred those of several colours)." George Buchanan, in his Rerum Scoti- carum historia (1582), as translated by Monypenny (1612), says of the Highlanders, "They delight in marled clothes, specially that have any long stripes of sundry colours; they love chiefly purple and blue. Their predecessors used short mantles or plaids of divers colours sundry ways divided; and amongst some the same custom is observed to this day." A hint of clan tartan distinctions is given by Martin Martin in his Western Isles of Scotland (1703), which work also contains a minute description of the dress of the High- landers and the manufacture of tartan. " Every isle," he observes, " differs from each other in their fancy of making plaids, as to the stripes in breadth and colours. This humour is as different

through the mainland of the Highlands, in so far that they who have seen those places are able at the first view of a man's plaid to guess the place of his residence."

The following lines give a brief description of the colours of the tartans of the principal clans. The kilt-tartan colour is given in each case; the plaid-tartans vary in slight particulars.

Campbell of Breadalbane, light green, crossed with darker green, the stripes broad with narrow edging of yellow. Campbell of Argyll, light green crossed with dark green, narrow independent cross lines of white. Cameron, brick-red with broad chequered cross of same colour, edged white and with broad centre of ground colour, two independent cross lines of green. Forbes, yellow green, crossed with broad dark-green lines, centred black, independent cross lines yellow. Fraser, red ground, main cross lines red with deeper red centre edged with blue, independent cross lines blue. Cordon, dark blue-green ground, with broad cross lines of lighter green, narrow centre line yellow. Graeme, light green ground, crossed with, darker green in small chequer, independent cross

lines dark green. Grant, scarlet, with broad black-edged scarlet crossings, black independent cross lines. Macdonald of Glengarry and Keppoch, red, with open broad blue cross lines, and two inde- pendent blue crossings. Macdonald of Glencoe, green with broad dark-green crossing, the whole covered with fine red lines. Mac- donald of Clanranald, light green with broad dark-green crossing, covered with fine red lines. Macgregor, scarlet, with harrow scarlet cross lines, edged and centred blue, widely spaced. Mackintosh, red with blue-edged and centred crossings of red, and independent blue cross lines. Mackenzie, blue-green, broad crossing of same colour with darker edges, independent cross lines, alternately red and white, over the main crossings. Macleod, green, with dark- green crossings, over crossings, every other square, a red line. Macpherson, pale grey, four darker grey bars at

crossings, the whole covered with red double independent lines. Munro, red with broad green stripe and narrow lines forming a check of black and yellow. Murray, green, close crossings of darker green, inde- pendent lines red. Stewart, scarlet, deep coloured crossings with scarlet centre, fine widely spaced dark independent lines.

See W. and A. Smith, Tartans of the Clans of Scotland (1850); J. Sobieski Stuart, Vestiarium Scoticum (1842); R. R. M'lan, Clans of the Scottish Highlands (1845-46) ; J. Grant, Tartans of the Clans of Scotland (Edinburgh, 1885).

TARTAR, the name commonly applied to crude acid potassium tartrate or " bitartrate of potash," HK^CJ-WDe). During the process of fermentation wines deposit a crystalline crust of argol; this, after being roughly purified by recrystal- lization, is known as tartar, and when further purified and freed from colouring matters becomes " cream of tartar," also called technically " cream." With the iatrochemists tartar was a generic term which included both this tartarus vini and various substances obtained from it, and even salts, such as salt of sorrel (potassium oxalate), that resembled it. Thus sal fixum tartari was potassium carbonate, which on exposure to the air deliquesces to oleum tartari per deliquium-; neutral potassium tartrate was called tartarus tartarisatus, because it was prepared by neutralizing ordinary tartar with the sal fixum; tartarus chalybeatus was a preparation with iron; and spiritus tartari, used by Paracelsus, was prepared by dry distillation of tartar. Paracelsus also used the term in a still wider sense to signify abnormal precipitates or sediments deposited from animal secretions; the same idea is apparent in the popular applica- tion of the word to the salivary calculus which forms on the teeth.

Cream of tartar is prepared by dissolving granulated argol in boiling water and allowing the solution to stand. The clear liquid is then drawn off and crystallized. The slightly coloured crystals thus obtained are redissolved in hot water, the colouring

matters got rid of by means of pipeclay or egg-albumen, and the solution filtered and crystallized, the name " crean of tartar " being originally applied to the crust of minute crystals that form on its surface as it cools. The salt crystallizes in masses of small, hard, colourless, trans- parent, rhombic prisms. It is precipitated when an excess of a potassium salt is added to a solution of tartaric acid, but it dissolves in mineral acids, and in alkalis and alkaline carbonates. Solutions of boric acid or borax dissolve it freely, forming soluble cream of tartar, which is a white powder permanent in the air when made with the acid, but deliquescent when borax is employed. Its slight solu- bility in alcohol explains why it is deposited by wines as they mature. One part by weight of the salt dissolves in 15 parts of boiling water, but at lower temperatures the solubility is greatly diminished, and at o° C. about 416 parts of water are required. When heated it is decomposed with formation of potassium car- bonate and carbon, inflammable gases having an odour of burnt bread being evolved. The salt is used for the manufacture of tartaric acid ; it is also employed in the mordant bath for wool-dyeing, with powdered chalk and alum for cleaning silver, and for the preparation of effervescing drinks and baking-powder. In medicine as potassii tartras acidus it is of some slight importance as a diuretic and purgative. The more soluble normal salt, K 2 (C4H40e), is used for the same purposes; it is formed by dissolving powdered cream of tartar in a hot solution of potassium carbonate. If sodium carbonate is substituted the result is KNa(C4H 4 0e), or Rochelle salt.

Tartar emetic (potassium antimonyl tartrate)K-(SbGOC^^CVIHzO. This substance has been known for a long period, being mentioned by Basil Valentine. It may be prepared by warming 3 parts of antimonious oxide with 4 parts of cream of tartar, in the presence of water, replacing the water as it evaporates; after digestion is complete, the solution is filtered hot. Powder of algaroth (q.v.) may be used in place of the antimony oxide. Tartar

emetic crystal- lizes in small octahedra, which lose their water of crystallization gradually on exposure to air, and become opaque. It is soluble in 14-5 parts of cold water and 1-9 parts of hot, the solution showing

an acid reaction to litmus. It possesses a nauseous metallic taste and produces vomiting when taken internally, whilst in large doses it is poisonous. It is used medicinally, and also as a mordant in dyeing and calico-printing.

TARTARIC ACID (dihydroxy-succinic acid), $C_4H_6O_6$, or $HO_2C-CH(OH).CH(OH)-CO_2H$. Four acids of this composi- tion are known, namely dextro- and laevo-tartaric acids, racemic acid and mesotartaric acid, the two last being optically inactive (see Stereo-Isomerism). Their constitution follows from their formation from dibromosuccinic acid and from their synthesis from glyoxal cyanhydrin, these two methods pro- ducing the inactive racemic form which may then be split into the active components. Dextro-tartaric acid occurs in the free state or as the potassium or calcium salt in grape juice and in various unripe fruits. During the alcoholic fermentation of grape juice it is deposited in the form of an impure acid potassium tartrate which is known as argol, and when purified as cream of tartar. For the preparation of the acid the crude argol is boiled with hydrochloric acid and afterwards precipi- tated as calcium tartrate by boiling with milk of lime, the calcium salt being afterwards decomposed by sulphuric acid. It may also be obtained (together with racemic acid) by oxidiz- ing milk sugar, saccharic acid, &c, with nitric acid, and by the reduction of oxalic ester with sodium amalgam (H. Debus, Ann., 1873, 166, p. 109). It crystallizes from water in large prisms which melt at 168-170° C, and on further heating gives an anhydride and finally chars, emitting a characteristic odour and forming pyroracemic and pyrotartaric acids. It behaves as a reducing agent.

Chromic acid and potassium permanganate oxidize it to formic and carbonic acids, whilst hydrogen peroxide in the presence of ferrous salts gives dihydroxymaleic acid (H. J. H. Fenton, Jour. Chcm. Soc, 1894, p. 899; 1895, pp. 48, 774; 1896, p. 546). Hydriodic acid and phosphorus reduce it to malic acid and finally to succinic acid. Calcium chloride gives a white precipitate of calcium tartrate in neutral solutions, the precipitate being soluble in cold solutions of caustic potash but re-precipitated on boiling. It prevents the precipitation of many metallic hydroxides by caustic alkalis. It carbonizes when heated with strong sulphuric acid, giving, among other pro- ducts, carbon monoxide and carbon dioxide. A small crystal of oxalic acid added to concentrated sulphuric acid containing about 1 per cent, of resorcin gives a characteristic violet red' coloration.

Laevo-tartaric acid is identical in its chemical and in most of its physical properties with the dextro-acid, differing chiefly in its action on polarized light, the plane of polarization being rotated to the left. By mixing equal quantities of the two forms in aqueous solution heat is evolved and racemic acid, (C4H6O6V2H2O, is obtained. This variety is also formed by the hydrolysis of glyoxal cyanhydrin (F. Pollak, Monats., 1894, 15, p. 469); by heating a solution of desoxalic acid; by the oxidation of fumaric acid with potassium permanganate; by the action of silver oxide on dibromosuccinic acid, and by the oxidation of mannite, dulcite, inulin, &c, with nitric acid. In the anhydrous state it melts at 205-206° C. Mesotartaric acid is formed when cin- chonine tartrate is heated for some time at 170° C. (L. Pasteur, Ann., 1853, 88, p. 212); by heating tartaric or racemic acid for some time with water to 165° C. ; by the oxidation of laevulose; and by the oxidation of phenol or maleic acid with an alkaline solution of potassium permanganate (O. Doebner, Ber., 1891, 24, p. 1755; A. Kekule and R. Anschutz, ibid., 1881, 14, p. 714). It crystallizes in prisms, and in the anhydrous state melts at 140° C. On pro-

longed boiling with aqueous hydrochloric acid it yields racemic acid. The sodium ammonium salt is not capable of decomposition into its optical antipodes, as is sodium ammonium racemate.

Tartaric acid as used in medicine is derived from potassium acid tartrate. Its impurities are lead, oxalic acid, lime and potassium tartrate. It is incompatible with potassium, calcium, mercury and vegetable astringents. Tartaric acid is rarely used alone, but is contained in pUula quininae sulphatis and in Seidlitz powder (see Sodium), and is a constituent of many proprietary granular effervescent preparations. If taken in overdose or in a concentrated form tartaric acid produces severe gastro-enteritis. In these cases lime-water, alkalis and magnesia should be used as antidotes, and opium may be required.

TARTARUS, in Greek mythology, the son of Aether and Gaea, father of Typhoeus and the giants. In the Iliad the word denotes an underground prison, as far below Hades as earth is

below heaven, in which those who rebelled against the will of Zeus were confined. In later writers Tartarus is the place of punishment of the wicked after death, and is used for the underworld generally. Cf. Abyss.

TARTINI, GIUSEPPE (1692-1770), Italian violinist, com- poser and musical theorist, was born at Tirano in Istria on the 1 2th of April 1692. In early life he studied, with equal want of success, for the church, the law courts, and the profession of arms. As a young man he was wild and irregular, and he crowned his improprieties by clandestinely marrying the niece of Cardinal Cornaro, archbishop of Padua. The cardinal re- sented the marriage as a disgraceful mesalliance, and denounced it so violently that the unhappy bridegroom, thinking his life in danger, fled for safety to a monastery at Assisi, where his character underwent a complete change. He studied the theory of music under Padre Boemo, the organist of the monastery, and, without

any assistance whatever, taught himself to play the violin in so masterly a style that his performances in the church became the wonder of the neighbourhood. For more than two years his identity remained undiscovered, but one day the wind blew aside a curtain behind which he was playing, and one of his hearers recognized him and betrayed his retreat to the cardinal, who, hearing of his changed character, readmitted him to favour and restored him to his wife.

Tartini next removed to Venice, where the fine violin-playing of Veracini excited his admiration and prompted him to repair, by the aid of good instruction, the shortcomings of his own self-taught method. He left his wife with relations and returned to Ancona, where he studied for a time. In 1721 he returned to Padua, where he was appointed solo violinist at the church of San Antonio. From 1723 to 1725 he acted as conductor of Count Kinsky's private band in Prague. In 1728 he founded a school for violin in Padua. The date of his presence in Rome does not seem to be clearly established, but he was in Bologna in 1 739. Afterwards he returned to his old post in Padua, Where he died on the 16th of February 1770.

Tartini's compositions are very numerous, and faithfully illustrate his passionate and masterly style of execution, which surpassed in brilliancy and refined taste that of all his contem- poraries. He frequently headed his pieces with an explana- tory poetical motto, such as " Ombra cara," or " Volgete il riso in pianto o mie pupille." Concerning that known as II Trillo del Diavolo, or The Devil's Sonata, he told a curious story to Lalande, in 1766. He dreamed that the devil had become his slave, and that he one day asked him if he could play the violin. The devil replied that he believed he could pick out a tune, and thereupon he played a sonata so exquisite that Tartini thought he had never heard any music to equal it. On awaking he tried to note down the composition, but succeeded very impeifectly, though the Devil's Sonata is one of his best productions.

Tartini is historically important as having contributed to the science of acoustics as well as to musical art by his discovery (inde- pendently of Sorge, 1740, to whom the primary credit is now given) of what are still called ” Tartini’s tones ” (see Sound and Hearing), or differential tones.

The phenomenon is this: — when any two notes are produced

steadily and with great intensity, a third note is heard, whose

vibration number is the difference of those of the two primary notes.

It follows from this that any two consecutive members of a harmonic

series have the fundamental of that series for their difference tone

E — thus, ,,, the fourth and fifth harmonic, produce C, the prime or

generator, at the interval of two octaves under the lower of those

two notes; A, the third and fifth harmonic, produce C, the second

harmonic, at the interval of a 5th under the lower of those two notes. The discoverer was wont to tell his pupils that their double- stopping was not in tune unless they could hear the third note; and Henry Blagrove (1811-1872) gave the same admonition. The phenomenon has other than technical significance; an experiment by Sir F. A. G. Ouseley showed that two pipes, tuned by measure- ment to so acute a pitch as to render the notes of both inaudible by human ears, when blown together produce the difference of tone of the inaudible primaries, and this verifies the fact of the infinite upward range of sound which transcends the perceptive power of human organs. The obverse of this fact is that of any sound being deepened by an 8th if the length of

the string or pipe which

produces it be doubled. The law is without exception throughout the compass in which our ears can distinguish pitch, and so, of necessity, a string of twice the length of that whose vibrations induce the deepest perceivable sound must stir the air at such a rate as to cause a tone at an 8th below that lowest audible note. It is hence manifest that, however limited our sense of the range of musical sound, this range extends upward and downward to infinity. Tartini made his observations the basis of a theoretical system which he set forth in his Trattato di Musica, secondo la vera scienzia dell' Armonia (Padua, 1754) and Dei Principij dell' Armenia Musi- cale (Padua, 1767). He also wrote a Trattato delle Appogiature, posthumously printed in French, and an unpublished work, Delle Ragioni e delle Proporzioni, the MS. of which has been lost.

TAS-DE-CHARGE, a French term in architecture, for which there is no equivalent in English, given to the lower courses of a Gothic vault, which are laid in horizontal courses and bonded into the wall, forming a solid mass; they generally rise about one-third of the height of the vault, and as they project forwards they lessen the span to be vaulted over.

TASHKENT, or Tashkend, one of the largest and most important cities of Russian Central Asia, and capital of Russian Turkestan, situated in the valley of the Chirchik, some 50 m. above its confluence with the Syr-darya, in 40 20' N., 6o° 18' E. It is connected by rail with Krasnovodsk (1085 m.) on the Caspian, and since 1905 with Orenburg (1150 m.). The city, formerly enclosed by walls (now ruinous), is surrounded by luxuriant gardens, and its houses are buried among the fruit and other trees which grow alongside of the irrigation canals. The buildings, which are of stone and sun-dried bricks, are mostly

low, on account of the earthquakes which frequently disturb the region. The native city in 1871 had 78,130 in- habitants, and in 1897 156,414, mostly Sarts, with Uzbegs, Kirghiz, Jews, Russians and Germans. The Russian city, to the south-east, dating from 1865, has clean, broad streets lined with poplars, and canals, the low/IJteasant-looking houses being surrounded by gardens. In /87V its population, ex- clusive of the military, was 4860, mospV/fltussians, and in 1900 about 25,000. Tashkent has a pubttq library containing a valuable collection of works on Central Asia, an astronomical observatory and a museum.

TASHKURGHAN, or Khulm, a khanate and town of Afghan Turkestan. The khanate lies between Kunduz and Balkh. The ancient town of Khulm stood in the Oxus plain, surrounded by orchards of famous productiveness; but it was destroyed by Ahmad Shah Abdali, who founded Tashkurghan in the middle of the 18th century, and took all the inhabitants away from Khulm to populate it. Ancient Khulm is now only a mass of ruins, but Tashkurghan, lying two or three miles to the south of it, has become the great trade-mart of Afghan Turkestan and second only in importance to Mazar-i-Sharif, the military centre of the province; while it is much larger and more prosperous than the latter place. At Tashkurghan the caravans from India and Bokhara meet, and from here the merchandise is distributed all over the country. A hill fortress dominates the town and overlooks the debouchment of the road from Haibak and Kabul into the plains of the Oxus.

TASMAN, ABEL JANSZOON (c. 1603-1659), the greatest of Dutch navigators, the discoverer of Tasmania, New Zealand, the Tonga and the Fiji Islands, and the first circumnavigator of Australia, was born at Lutjegast in Groningen, about 1603. In 1634 we first meet with him in the East Indies, sailing from Batavia (Feb. 18) to Amboyna. On the 30th of December 1636 he sailed from Batavia for home; reached Holland August 1, 1637; started on his return to the East April 15, 1638; and reappeared at Batavia October 11, 1638. On the 2nd of June 1639

Tasman, along with Matthew (Matthijs Hendricxsen) Quast, was despatched by Antony Van Diemen, governor- general of the Dutch East Indies (1636-45), on a voyage to the north-western Pacific, in quest of certain " islands of gold and silver," supposed to lie in the ocean east of Japan. On this voyage Tasman and Quast visited the Philippines and im- proved Dutch knowledge of the east coast of Luzon; they also discovered and mapped various islands to the north, apparently the Bonin archipelago. Sailing on to N. and E. in search of

the isles of precious metals, they ranged about fruitlessly in the northern Pacific, at one time believing themselves to be 600 Dutch miles east of Japan. After this the voyage was continued almost constantly westward, but in varying latitudes, reaching as high as 42 N., always without success. On the 15th of October the navigators decided to return, and, after touching at Japan, anchored at the Dutch fortress-station of Zeelandia in Formosa on the 24th of November 1639. After this Tasman was engaged in operations in the Indian seas (sailing to Formosa, Japan, Cambodia, Palembang, &c, as a merchant captain in the service of the Dutch East India Com- pany) until 1642, when he set out on his first great " South Land " expedition. This was planned and organized by Governor Van Diemen, who cherished great schemes for the extension of the Dutch colonial empire. Several Dutch navi- gators had already discovered various portions of the north and west coasts of Australia (as in 1605-06, 1616, 1618-19, 1622, 1627-28, &c), but Tasman now first showed that this great South Land did not stretch away to the southern pole, but was entirely encircled by sea within comparatively moderate limits. Sailing from Batavia on the 14th of August 1642 with two vessels, the " Heemskerk " and " Zeehaen," and calling at Mauritius (September 5 to October 8), Tasman sailed first S., then E., almost seven weeks, and on the 24th of November sighted (in 42 25' S., as he made it) the land which he named Anthoonij van Diemen's landt after Van Diemen, now called Tasmania. He doubled the land, which he

evidently did not perceive was an island, coasting its southern shores, and, running up Storm Bay, anchored on the 1st of December in Frederick Henry's Bay, on the east coast of Tasmania (in 43 10' S., according to his reckoning) — so named after Prince Frederick Henry of Nassau, then the head of the Dutch republic. There he set up a post on which he hoisted the Dutch flag. Quitting Van Diemen's Land on the 5th of December, Tasman steered' E. for the Solomon Islands, and on the 13th of December discovered (in 42° 10' S., as he reckoned) a " high mountainous country," which he called Staten landt (" Land of the States," i.e., of Holland, now New Zealand). Tasman and his company believed the newly discovered land to form part of the same great antarctic continent as the other Stolen landt which Schouten and Lemaire had sighted and named to the east of Tierra del Fuego. Cruising up N.E. along the west coast of the South Island, he anchored on the 18th of December in 40 50' S., at the entrance of a " wide opening," which he took to be a "fine bay" (Cook's Strait). He gave the name of Moordenaars (Murderers, now softened to Massacre) Bay to this spot, where several of his men were killed by the natives (December 19). From Murderers' Bay Tasman sailed S.E. along the south shore of Cook'? Strait, apparently getting into Blind or Tasman Bay, but not dis- covering the full extent of the strait here dividing New Zealand into two main islands. Returning westward he then coasted the west side of the North Island, till, on the 4th of January 1643, he came to the northern extremity of New Zealand, in 34° 35' S. (in his reckoning). Thence he bore away to N.N.E., at first intending to keep that course for 30° of longitude from North Cape, New Zealand. On the 19th to 25th of January, in 22° 35', 21° 20', and 20 15' S. (Tasman's reckonings), he discovered various islands of the Tonga or Friendly group, especially Amsterdam (Tongatabu), Middelburg (Eva), and Rotterdam. Here the ships took in water and provisions, which they had not done since leaving Mauritius, and the crews went on shore for the first time since leaving Van Diemen's Land. Rotterdam Island they explored with some care. Thence Tasman

steered N. and W., reaching on the 6th of February the eastern part of the Fiji archipelago (in 17 29' S., by his reckoning), which he called Prince William's Islands and Heemskerk's Shoals; on the 22nd of March he sighted the islands of Ontong Java (in 5 2' S., according to Tasman, and in 1 59 30' E., Greenwich). On the 1st of April he was near the north-eastern extremity of New Ireland (Neu Mecklenburg) , mistaken by him for a part of New Guinea, in 40 30' S., off a

point known to the Spaniards as Cabo S. Maria. Thence he passed westward along the north of New Ireland, New Hanover, New Britain (Neu Pommern) and New Guinea. He reached the western extremity of New Guinea on the 18th of May; Schouten's Islands were noted to the south of the vessels' course on the 12th of May. Tasman's track, lying between New Guinea and Halmahera (Gilolo), then brought him south to Ceram; he passed through the narrow strait between Celebes and Buton on the 27th of May, and arrived at Batavia on the 15th of June 1643 after a ten months' voyage. The materials for an account of Tasman's important second voyage in 1644 are scanty, but we know he was instructed to obtain a thorough knowledge of Staten Land and Van Diemen's Land, and to find out " whether New Guinea is a continent with the great Zuidland, or separated by channels and islands," and also " whether the new Van Diemen's Land is the same continent with these two great countries or with one of them." In this voyage Tasman had three ships under his command, the "Lim-men," " Zeemeeuw " (or " Meeuw "), and " Brak " (or " Bracq "). His course lay along the south-west coast of New Guinea; he mistook the western opening of Torres Straits for a bay, but explored (and perhaps named) the Gulf of Carpentaria: for the first time the coast-line of this great bay was mapped with fair accuracy. Though preceded by Jansz (1606) and Carstensz (1623) on the east shore of the gulf as fai as 17 S., Tasman first made known the

south, and most of the west, coast. Be- yond this he explored the north and west coasts of Australia as far as 22 S., and established the absolute continuity, of all this shore-line of the ” Great Known South Continent “; his chart gives soundings for the whole of this coast. Tasman’s achievements were coldly received by the Dutch colonial authorities; but on the 4th of October 1644 they rewarded him with the rank of commander (he had frequently enjoyed the use of the title already). On the 2nd of November 1644 he was also made a member of the Council of Justice of Batavia. He was a member of the committee appointed on the 18th of April 1645 to declare a truce between the Dutch East India Company and the viceroy of Portuguese India. In 1647 he commanded a trading fleet to Siam, and in 1648 a war-fleet sent against the Spaniards of the Philippines (May 15, 1648, to January 1649). By 1653 he had quitted the company’s service, but still lived, apparently as one of its wealthiest citizens, in and near Batavia. His will, made the 10th of April 1657, seems to have but slightly preceded his death, which probably happened before October 22, 1659, and certainly before February 5, 1661.

See Siebold’s paper in Le Moniteur des Indes-Orientales et Occi- dentales, 184.8-49, pt. i. p. 390; the paper on Tasman by C. M. Dozy in Bijdragen tot de Tool-, Land-, en Volkenkunde van Nederlandsch-Indie, 5th series, vol. ii. p. 308; R. H. Major, Early Voyages to ._. . Australia (London, Hakluyt Society, 1859), especially pp. xciii.-ciii., 43-58 (here are printed the instructions for Tasman and his colleagues on the voyage of 1644) ; G. Collingridge, Discovery of Australia (Sydney, 1895), especially pp. 238-40, 279- 80; and, above all, J. £. Heeres and others, Tasman’s Journal . . .

facsimiles of the original MS with . . . -life … .0/ ... .

Tasman, &c. (Amsterdam, 1898)— here the Life of Tasman, with its appendices, is separately paged (163 pp.). See also Aandeel der Nederlanders in de Ontdekking van Australia, 1606-1765 (in Dutch and

English, Leiden and London, 1899), especially pp. vi., viii., xii.-xv., 72; the valuable summary of the voyage of 1642-43 in the anonymous Account of several late Voyages and Discoveries (beginning with Sir John Narborough's), London, 1711, with sub-title, Relation of a Voyage . . . of Captain Abel Jansen Tasman (originally extracted from his journals by Dirk Rembrantse in Dutch, published in English in Dr Hook's collections); also The Discovery of Van Diemen's Land in 1642, by James Backhouse Walker (Hobart, 1891). A draft journal of the voyage of 1642-43, probably made by a sailor on the expedition, is in the state archives at The Hague. There are also several copies made from Tasman's official journal; the best of these (the original fair copy) is repro- duced in Heeres' Tasman's Journal, 1898, noticed above.

An original chart of Tasman's, made after the voyage of 1644, has been discovered and is in the possession of Prince Roland Bonaparte. Before this discovery reliance was placed on an ex- cellent copy, probably made about 1687, by Captain Thomas Bowrey (art. 12 in the miscell. MS. collection marked 5222 in the British Museum London). This gives the tracks of both the voyages

1642-43 and 1644, and the soundings of the latter. Burgomaster Witsen, of Noord en Oost Tartarye fame (1705), preserved a brief record of certain observations made in Tasman's voyage of 1644, between 13 8' and 19 35' S. (and approximately between 129 30' and 120 E., Greenwich). This was translated by A. Dalrymple in his Papua (reprinted in R. H. Major, Early Voyages to . , . Australia, xcviii.-xcix.). Basil Thomson, Diversions of a Prime Minister (Edinburgh, 1894), p. 311, &c, records that the remembrance of Tasman's visit to the Tonga Islands still remains " fresh to the smallest details " among the natives. (c R. B.)

TASMANIA, a British colonial state, forming part of the Australian Commonwealth. It is composed of the island of Tasmania and its adjoining islands, and is separated from the Australian continent on the

south-east by Bass Strait. The

island of Tasmania is triangular in shape, area 24,331 sq. m. (with the other islands 26,215 S(3- m.), 200 m. from N. to S., and 245 m. fiom E. to W.

Coastal Features. — The southern portion of the eastern shore of Tasmania is remarkable for its picturesque inlets and bold headlands. The principal inlet is Storm Bay, which has three well-defined arms. The most easterly is Norfolk Bay, enclosed between Forestier's Peninsula and Tasman Peninsula. The middle arm is Frederick Henry Bay, and the western the estuary of the Derwent. It is on this estuary that Hobart, the capital of the island, is situated. Besides the main entrance to Storm Bay, between Cape Raoul and Tasman Head, there is D'Entre- casteaux Channel, which divides North and South Bruni Island from the mainland. This channel has two branches, the easterly forming the entrance into Storm Bay, and the western being the estuary of the Huon river. On the east coast lies the peculiarly-shaped Maria Island, almost severed by deep indentations on the east and west. Above this island is Oyster Bay, formed by the projection, Freycinet Peninsula. On the south are some very prominent headlands. In the south-west lies the fine harbour of Port Davey, which receives several small rivers. Proceeding northward along the west coast the most conspicuous headlands are Rocky Point, Point Hibbs and Cape Sorell, which stands at the entrance of Macquari

and several smaller streams. North of this there are several prominent headlands. The west coast terminates at Cape Grim, opposite which are the group known by the name of Hunter's Islands. Going eastward along the north coast Circular Head is met with, a narrow peninsula running out for six miles and terminating in a rocky bluff 400 ft. high.

Further east are Emu Bay, Port Frederick, Port Sorell and Port Dalrymple, into which flows the Tamar river, on which Launceston is situated. In Bass Strait are several large islands belonging to Tasmania; King's, Flinders, Cape Barren and Clarke Islands are the largest. Flinders Island has an area of 513,000 acres. Among the rivers flowing northward to Bass Strait are the Tamar, Inglis, Cam, Emu, Blyth, Forth, Don, Mersey, Piper and Ringarooma. The Macquarie, receiving the Elizabeth and Lake, falls into the South Esk, which unites with the North Esk to form the Tamar at Launceston. Westward, falling into the ocean, are the Hellyer, Arthur and Pieman. The King and Gordon gain Macquarie Harbour; the Davey and Spring, Port Davey. The central and southern districts are drained by the Derwent from Lake St Clair — its tributaries being the Nive, Dee, Clyde, Ouse and Jordan. The Huon falls into D'Entrecasteaux Channel. The main axis of the Great Cordillera — so termed originally by Sir Roderick Murchison — bordering the eastern coast-line of Australia, may be traced across Bass Strait in the chain of islands forming the Furneaux and Kent group, which almost continually link Tasmania with Wilson's Promontory, the nearest and most southerly part of the Australian mainland. Tasmania is wholly occupied by the ramifications of this chain, and in itself may be said to embrace one and all of its characteristic features.

Taking a stand near Lake Fergus, to the east of Lake St Clair, the observer will find himself nearly in the centre of an ex- tensive plateau, with an elevation, especially on the northern side, of between three and five thousand feet above the sea-level. This elevated plateau extends from Dry's Bluff in the north to the Denison Range in the south-west, and although often receding at points adjacent to the sources of the principal rivers, invariably presents a bold crested front to the north, west and east. At its greatest elevation it is comparatively level, and contains many extensive freshwater basins, such as Lake Augusta, Lake St Clair, Lake Sorell, Lake Echo, Lake Crescent,

Arthur's Lake and the Great Lake. The marginal crests of this mountain tableland, together with its upper surface, are known locally as " Tiers," and have a very com- manding aspect in the neighbourhood of Longford, Westbury, Delo- raine and Chudlcigh. The extent of the principal elevated plateau is best appreciated when we consider that it maintains its general altitude in a westerly direction from Dry's Bluff (4257 feet) on the north to Cradle Mountain (5069 feet) in the north-west, a distance of nearly 50 miles; from Dry's Bluff in a south-westerly direction to Denison Range, a distance of ' over 60 miles; and from Dry's Bluff to Table Mountain in a southerly direction, a distance of above 43 miles. This plateau itself again rests upon a more extended tableland, stretching westwards, and, with the Middlesex Plains, the Hampshire Hills and the Emu Plains, maintaining an altitude of 1200 to 2000 feet. Its limits follow the coast-line more or less closely, the space between it and the sea often broadening out into low-lying tracts not much raised above the sea-level. Here and there, rising abruptly from its surface, are to be seen isolated peaks, the most characteristic of which are Valentine's Peak (3637 feet) and Mount Pearse. Ridges and plateaus of a similar character, but more or less isolated, such as Ben Lomond (5010 feet) and Mount Wellington (4166 feet), are to be found in the north-east and south-west of the island. Towards the extreme west and south, anticlinal and synclinal ridges trend north and south, the most characteristic being the Huxley, Owen, Sedgwick, Franklin and Arthur Ranges. Settlement of population has taken place princi- pally among the plains and lower levels of the north-western, midland and south-eastern parts of the island, following in the main the rocks of Tertiary and Mesozoic age. In the Recent Tertiary period the soils of these plains and valleys have been greatly enriched by extensive outbursts of basalt with accompanying tuffs. These basalts produce a very rich chocolate soil, and were it not for their influence, the greater part of what is now the most fertile part of the island would have been comparatively poor or altogether sterile.

The appearance of the island throughout is wonderfully beautiful, with its open plains, bordered by far-extending precipitous moun- tain tiers, its isolated shaggy peaks and wooded ranges, and its many noble rivers and lakes. Its coasts for the most part, especially towards the south, a«3 bold, and frequently indented with splendid bays and harbours, aftord.ng ample shelter and safe anchorage for ships. On the western side onp is reminded of scenes in the highlands

of Ross-shire and Inverness-shire in Scotland, from the picturesque character of the blue, white, and pinkish crystalline peaks and the fantastic outlines of the mountain ranges which rise abruptly to a height of from 2000 to nearly 3000 feet above the Button Grass Plains. (T. A. C.)

Geology. — Tasmania is, geologically, an outlier of the Australian continent. It is most intimately connected with Victoria, from which it was only separated by the foundering of Bass's Strait in late Pliocene or early Pleistocene times. The precise date of the separation is fixed as later than the Miocene, since the fringe of the marine Miocene deposits along the southern coast of Victoria is broken, from Flinders to Alberton ; and this gap was no doubt due to the subsidence of the land, of which the islands in the Bass Strait are remnants, which then connected Tasmania with the continent. The latest date for the existence of this connexion is given by the absence from Tasmania of the dingo, the lyre-bird and the giant marsupials; so that the isolation of Tasmania was earlier than the arrival of those animals in south-eastern Australia. That it was not much earlier is shown by the fact that some still living species of mammals, such as the thylacine, existed before the separation.

The geological sequence in Tasmania is full, and the island contains a better series of Carboniferous rocks than is found in Victoria. The nucleus of the island is a block of Archean rocks, which are not, so far as is known, extensively exposed. The most certain repre- sentatives of the Archean are the

gneiss and schists of the Dove river and the upper Forth, and the hornblende-schists, which are exposed in the river valleys on the margins of the central plateau. The Mount Lyell schists which underlie the West Coast Range, and the quartzites of Port Davey on the western coast, have also been regarded as Archean. The Lower Palaeozoic systems begin with the Cambrian, which are found in northern Tasmania near Latrobe, and contain Cambrian fossils as Dikelocephalus Tasmanicus and Conocephalites stephensi. The Ordovician system has not been certainly identified ; but probably many of the slates and quartzites in north-western Tasmania and of the mining field of Beaconsfield on the estuary of the Tamar, are Ordovician. The Silurian system, however, is well developed in north-western Tasmania, and is represented by slates, limestones and sandstones yielding a dis- tinctively Silurian fauna. The rocks are best known by the lime- stones in the lead mining field at Zeehan, and the slates, including the tin mine of Mount Bischoff.

The Devonian system is best represented by the massive con- glomerates and quartzites, which form the West Coast Range extending from Mount Lyell on Macquarie Harbour, through Mounts Jukes, Owen, Lyell, Murchison and Geikie, to Mount Black. These mountains consist of detached remnants of a sheet of quartz con- glomerates, interbedded with sandstones, containing crinoid stems and obscure brachiopods. They rest unconformably on the Silurian rocks on the King river and to the west are faulted against the schists by a powerful overthrust fault, traversing the Mount Lyell copper field. A northern extension of these conglomerates forms the Dial Range near Burnie. The Devonian period, as in Victoria, was marked by a series of granitic intrusions, which altered the older beds on the contact, while the quartz-porphyry dikes, which are intrusive in the Silurian rocks at the Mount Bischoff tin mine, doubtless belong to this period. The Carboniferous system begins with a series of marine limestones, shales and grits, including a rich Lower Carboniferous fauna. The Carboniferous rocks occupy

the whole of the south-eastern corner of Tasmania; and one outlier occurs on the northern coast in the Mersey Valley. This formation helps to build up the central plateau, and a band outcrops around its edge. The Upper Carboniferous includes beds of shale and coal; but though the coal is good, the seams are thin and have not been much worked. The Coal Measures are covered by marine shales with numerous bryozoa; and, on the horizon of the Greta Coal Measures of New South Wales, is a bed of Carboniferous glacial deposits.

The Mesozoic system is not well developed. It is usually regarded as beginning with a fresh-water series containing the remains of fish and labyrinthodonts; but as it also contains Vertebraria it is probably Palaeozoic; and this series is covered by sandstones and shales which are probably of Triassic age. The most conspicuous member of the Mesozoic group is the sheet of diabase and dolerite, made up of laccolites and sills, which covers most of the central plateau of Tasmania. These rocks form the prominent scarps, known as the Tiers, on the edge of the plateau, and its outliers, such at Mount Wellington near Hobart, and the Eldon Range. This sheet of diabase has been regarded as Carboniferous ; but, according to W. H. Twelvetrees, it is probably Cretaceous. The Cainozoic system includes at Table Cape an outcrop of marine beds probably of Oligocene age. Lower Cainozoic lacustrine beds with fossil plants, of the same age as those which underlie the older basalts of Victoria, occur in the valleys of northern Tasmania. The Cainozoic series includes many igneous rocks. The tinguaites and solvsbergites of Port Cygnet, south of Hobart, may be of this age; they are intrusive in Carboniferous rocks, and there is no evidence of their precise date; but their resemblance to the rocks associated with the geburite-dacite of Victoria suggests that they may belong to the beginning of the Cainozoic volcanic period of south-eastern Australia. North-western Tasmania in Pleistocene times had an

extensive series of glaciers, of which the lower moraines were de- posited only about 400 feet above sea level.

The information as to the geology of Tasmania up to 1888 is collected in R. M. Johnston's Systematic Account of the Geology of Tasmania, which gives a bibliography up to that date. A later sketch of the island is by W. H. Twel vetrees, ' ' Outlines of the Geology of Tasmania," Proc. R. Soc. Tasmania, 1900–1901, pp. 58–74. The mining literature is given in the reports of the Mines Depart- ment, and special reports issued in the Parliamentary Papers; and the economic and general geology are described in reports issued periodically by the Geological Survey, under W. H. Twelvetrees, and in papers published in the Proceedings of the Royal Society of Tasmania. The Mount Lyell mining field is described, with some account of the neighbouring districts of Western Tasmania, in J. W. Gregory, The Mount Lyell Mining Field (Melbourne, 1904). The glacial geology, with a summary of the literature thereon, is described by the same writer in the Quarterly Journal of the Geo- logical Society, 1904, vol. lx., pp. 7–8, 37–53. (J- W. G.)

Climate. — Tasmania possesses a very temperate and healthy climate. The mean temperature of the year, as estimated from observations extending back to 1841, is about 50–10°. The mean at Hobart was 54–4°, at Launceston 56–6° and at Oatlands, which is in the centre of the island and 1400 ft. above sea-level, 51–76°. Snow is rarely seen except in the mountains. The average tem- perature at Hobart of January, the hottest month, is 63°, and of July, which is mid-winter, 45°. The western prevailing winds — particularly the north-western — carry the rain-bearing clouds. The elevation-divide between the western and eastern parts of the island rises generally to a height of between 3000 and 5000 ft., and consequently the parts to the east of such heights receive much less precipitation than those to the westward. The general average for the eastern

district over a period of years was 22-07 inches; for the western, 37-55 inches; and for Tasmania 26-69 inches.

Flora. — The vegetation which prevails among the older schistose rocks of the west and extreme south presents a totally different appearance to that which occurs in the more settled districts of the east. The western vegetation, as compared with that of the east, presents as marked a contrast as do the prevailing rocks upon which it flourishes. The characteristic trees and shrubs of the west include the following genera, viz. : Fagus, Cenarrhenes, Anodopetalum, Eiicryphia, Bauera, Boronia, Agastachys, Richea, Telopea, Grevillea, Oriles, Athrotaxis, Dacrydium, Phyttocladus. On the eastern side the plains and rocky ridges, where not artificially cleared, are occupied by shaggy and often sombre forests mainly composed of the following genera : Eucalyptus (gum tree), Casuarina, Bursaria, Acacia, Leptospermum, Drimys, Melaleuca, Dodonaea, Notolea, Exocarpus, Hakea, Epacris, Xanthorrhoea, Frenela. The mountain slopes and ravines of the east have a well-marked vegetation. In character it is more akin to, and in many cases identical with, that of the west. The tree fern {Dicksonia antarctica) in the mountain ravines is especially remarkable. The following genera are also found in such positions in great luxuriance, viz.: Fagus, Anopterus, Phebalium, Eucalyptus, Richea, Cyathodes, Pomaderris, Prostan- thera, Boronia, Gaultheria, Correa, Bedfordia, Aster, Archeria, Atherosperma, &c. In the extreme west the trees and larger shrubs do not appear to ascend the schistose rocky mountain slopes of the central and eastern parts.

Fauna. — Animal life in Tasmania is similar to that in Australia. The dingo or dog of the latter is wanting; and the Tasmanian devil and tiger, or wolf, are peculiar to the island. The Marsupials include the Macropus or kangaroo; the opossums, Phalangisla vulpina and P. Cookii; the opossum-mouse, Dromicia nana; Perameles or bandi- coot; Hypsiprymnus or kangaroo rat; Phascolomys or wombat; while of

Monotremata there are the Echidna or porcupine ant-eater and the duck-billed platypus. The marsupial tiger or Tasmanian wolf (Thylacinus cynocephalus), 5 ft. long, is yellowish brown, with several stripes across the back, having short stiff hair and very short legs. Very few of these nocturnal carnivores are now alive to trouble flocks. The tiger-cat of the colonists, with weasel legs, white spots and nocturnal habits, is a large species of the untameable native cats. The devil (Dasyurus or Sarcophilus ursinus) is black, with white bands on neck and haunches. The covering of this savage but cowardly little night-prowler is a sort of short hair, not fur. The tail is thick, and the bull-dog mouth is formidable. Among the birds of the island are the eagle, hawk, petrel, owl, finch, peewit, diamond bird, fire-tail, robin, emu-wren, crow, swallow, magpie, blackcap, goatsucker, quail, ground dove, parrot, lark, mountain thrush, cuckoo, wattlebird, whistling duck, honey- bird, Cape Barren goose, penguin duck, waterhen, snipe, albatross and laughing jackass. Snakes are pretty plentiful in scrubs; the lizards are harmless. Insects, though similar to Australian ones, are far less troublesome; many are to be admired for their great beauty.

Population. — At the beginning of 1905, the state contained 181,100 people, giving a density of 6-9 persons per square mile. The population in 1870 was 100,765. The discovery of Mount Bischoff one year later, though it greatly stimulated speculation and induced a large influx of immigrants, did not put a stop to

the outflow, for in 1880 the population was still below 115,000. During the next two decades there was a substantial advance; in 1890 it had reached 145,200, and in 1900, 172,980. Like all the Australian states, Tasmania shows a decline in the birth- rate; in 1905 the births were 5256 — 36 less than in 1904 — which gives a rate of 29-32 per 1000 of mean population.

The climate is probably more healthy than that of

any of the Australian states, although, owing to the large number of old people in the colony, the death-rate would appear to put Tasmania on a par with New South Wales and South Australia. The death-rate per 1000 of population, which was 16-52 in the period 1876-80, had fallen to It-oi in the period 1901-5. There has therefore been a gradual and substantial improvement in the health conditions of the state. The annual marriage-rate was for many years consider- ably below the average of Australia generally, a condition sufficiently accounted for by the continued emigration of men unmarried and of marriageable ages; this emigration had ceased in 1900, and the marriage-rate may be taken as 7-8 per thousand. The chief towns are Hobart (pop. 35,000) and Launceston (pop. 22,500).

Administration. — As one of the states of Australia, Tasmania returns six senators and five representatives to the federal parliament. The local constitution resembles that of the other Australian states inasmuch as the executive government of four ministers is responsible to the legislature, which consists of a legislative council and a house of assembly. The former is composed of eighteen members elected for six years. Electors of the council must be natural-born or naturalized subjects of the king, twenty-one years of age, resident in Tasmania for twelve months, and possessing a freehold of the annual value of £10 or a leasehold of the annual value of £30 within the electoral district; the property qualification being waived in the case of persons with university degrees or belonging to certain professions. Members of the council must be not less than thirty years of age. The house of assembly consists of 35 members elected for three years. Every resident of Tasmania for a period of twelve months who is twenty-one years of age, natural-born or naturalized, is entitled to have his name placed on the electoral roll, and to vote for the district in which he resides. The franchise has been conferred on women.

Education. — Half the population are adherents of the Church of England, and about 18 per cent. Roman

Catholics; Wesleyans number nearly 16 per cent., and Presbyterians about 6-£ per cent. Instruction is compulsory upon children over seven years of age and under thirteen years in the towns of Hobart and Launceston, but not in the rural districts. Special religious instruction is allowed to be given after school hours by teachers duly authorized by the various religious denominations, and this privilege is some- what extensively used by the Church of England. The schools are not free, as small fees are charged ; but these are not enforced where parents can reasonably plead poverty. In 1905 there were 343 state schools, with 19,000 pupils on the roll, and administered by 600 teachers; there were also 180 private schools, with 310 teachers and 9000 scholars. The net expenditure averages £3, 15s. 2d. per child in average attendance, inclusive of what is spent in the up- keep of school buildings and on new schools. The university of Tasmania has an endowment of £4000 and a revenue from other sources (chiefly fees) of from £1100 to £2000. The students attend- ing lectures in 1904 were 62, of whom 51 matriculated, and the number of degrees conferred to the close of that year was 180, the great majority of these degrees being granted ad eundem gradum.

Finance. — The revenue is chiefly obtained through the custom- house, but the federal tariff has had the effect of considerably reducing the receipts from this source. In 1905 the state raised £852,681 on account of the public revenue, which is equal to £4, 13s. 3d. per inhabitant; of this sum £259,099 was the excess of Commonwealth collections over expenditure, and £216,953 from other taxation; the railways returned £245,049, while from public lands was obtained £63,088, and from other sources £43,504. The expenditure was £840,185, thus distributed: railway working expenses, £171,619; public instruction, £67,403; interest and charges upon debt, including sinking funds, £349,090; and other services £252,075. The interest and other debt charges come to £1, 18s. 9d. per inhabitant, and represent 41-55 per cent, of the expenditure of the state. The public debt in the year 1906 stood at

£9,471,971, of which £7,830,250 was held in London; this represents £52, 6s. per inhabitant. In 1871 it was £1,315,200, in 1881 £2,003,000, and in 1891 £7,110,290, representing respectively £12, 18s., £16, 16s. iod., and £a6, iis. lod. per inhabitant, the great increase in recent years being due to the rapid extension of railway and other public works. The expenditure upon works may be

divided into that on revenue-yielding works, viz. railways, ^'.'j 2 - 2 ' 589 ' and tele 6 ra P hs , £142,410; and that on works not yielding revenue, £4,970,018. For local government purposes Tasmania is divided into municipalities, town boards, and road trusts. The rates are assessed on an assumed annual value, which in 1900 was £1,417,547, corresponding to a capital value of|upwards of £28,000,000. The bulk of the revenue of the local government bodies is obtained from rates. The sources of revenue in 1905 were: government endowment, £5355; local rates, £71,920; and other sources, £83,187. The outstanding loans of municipalities amount to £697,133, of which the greater portion is represented by the indebtedness of the two chief cities, Hobart and Launceston.

Defence.— Tasmania being a portion of the Commonwealth of Australia, its defence is undertaken by the federal government. The strength of the local forces is about 1500 officers and men.

Mining. — Mining is now the foremost industry, the gross pro- duction in 1905 being valued at £1,858,218 as compared with £1,500,000, the value of agricultural production, which is next in importance. Tasmania produces gold, tin, silver, copper and coal, and in 1905 the production of these minerals was valued at: gold, £312,380; silver and silver-lead, £465,094; copper, £672,010; tin, £346,092 ; and coal, £44,194. Beaconsfield is the chief goldfield, 26 miles north-west of Launceston. There are about 1500 persons employed mining for gold on the various fields. The Mount Zeehan and

Dundas districts produce almost the whole of the silver at the present time, and most of the ore is sold to agents of the Australian and German smelting works. Tasmania is the largest producer of tin in Australasia, and a very large proportion of the tin hitherto produced has been obtained from alluvial deposits, the lodes, except at Mount Bischoff, having, comparatively speaking, been neglected. The Mount Bischoff mine, which is worked as an open quarry, is the largest producer of tin, and (with an original capital of £30,000) has paid over two millions sterling in dividends. The number of tin miners in the state is about 1 1 70. Tasmania also takes the lead amongst the states in copper production: in 1896 there was a small production of £1659; in 1897 it grew to £317,437, in 1898 to £378,565, in 1899 to £761,880, and in 1900 to £901,660; and although the production has since been considerably reduced it is still a great industry. This expansion was chiefly due to the enterprise of the Mount Lyell Mining and Railway Company, whose mine is situated at Gormanston. Coal-mining is carried on in various districts of the island, but the principal mines are at Mount Nicholas and Cornwall, in the Mount Nicholas Range; the output of the field is increasing, but no export trade is at present possible, the mines being situated too far from the sea- board. The number of men employed in coal-mining is 150, and the output about 52,000 tons per annum.

Manufactures are on a small scale, the number of establishments being about 440, and the hands employed 9000.

Agriculture. — After being much neglected, agriculture received renewed attention in 1892 and the following years up to 1904, when the area under crop reached a total of 259,611 acres; since the year named there has been no increase, and the area cultivated may be placed at about 250,000 acres. The area under crop, at intervals of ten years, was as follows: 1861, 163,385 acres; 1871, 155,046 acres; 1887, 148,494 acres; 1891, 168,121 acres; and 1901, 224,352 acres. Wheat is the principal crop, and the

yield is larger per acre and less variable than that of the Australian states : for the fifteen years ending with 1905 the average yield was 18,9 bushels per acre, ranging between 15 bushels in 1894 and 27 bushed in 1899. The oat crop is also much above the Australian average, and may be set down at 30 bushels an acre, but an average of 5 bushels higher is not infrequent. Tasmania is renowned for its fruit crops, and now that this fruit has found an opening in the British market, re- newed attention is being devoted to the industry. In 1905 there were 12,683 acres of apples, 2098 acres of pears, mi acres of apricots, 1 123 acres of plums, 426 acres of cherries, 498 acres of peaches, 2000 acres of strawberries, gooseberries and raspberries, and 1 107 acres of currants. The crop for the same year included 1,100,000 bushels of apples, 75,000 bushels of pears, and nearly 170,000 bushels of other fruit. Tasmania finds its best markets for fruits in New South Wales and in Great Britain. The total value of the produce of Tasmanian farms now exceeds £1,250,000, which is equivalent to £4, 17s. 5d. per acre cultivated.

Tasmania shows a decline in sheep-breeding, yet the state is singularly well adapted for sheep-raising, and its stud flocks are well known and annually drawn upon to improve the breed in the other states. Nor have the other branches of the pastoral industry shown much expansion, as the following table will show: —

Year.

Sheep.

Horned Cattle.

Horses.

Swine.

1861

1,714,498

87,114

22,I18

40,841

1871

1,305,489

101,540

23,054

52,863

1881

1,847,479

130,526

25,607

49,660

1891

I,662,8oi

167,666

31,262

73,520

1901

1,683,956

165,516

31,607

68,291

1905

1,583,561

206,2II

37,ioi

72,8lO

Commerce. — The shipping increased considerably after 1896. Hobart is now a place of call for several of the European steamship lines, and the state is becoming increasingly popular as a summer resort for the residents of Melbourne and Sydney. The growth of the shipping trade will be seen in the following table, which also gives the imports and exports at ten-yearly intervals : —

Year.

Shipping entered.

Imports.

Exports .

I86l

1871

I88l

1891 1900 1905

Tons.

113,610 107,271 192,024

5i4,7o6

618,963 1,056,256

£

954,517 778,087

1,431,144 2,051,964 2,073,657 2,651,754

£

905,463 740,638 1,555,576 1,440,818 2,610,617 3,711,616

Tasmania does a large trade with Victoria and New South Wales as well as with Great Britain. The principal exports in 1905 and their values were: wool, £401,958; gold, £187,873; tin and ore, £257,256; silver and ore, £318,971; copper, £569,052; farm, fruit and vegetable products, £477,866; timber, £78,380. The imports represent £14, 15s. iod. and the exports £20, 14s. per inhabitant. The chief ports of the state are Hobart, where the shipping entered in 1905 amounted to 645,000 tons, and Launceston, 223,000 tons; Strahan on the west coast has also a considerable trade.

Railways. — The railways open for traffic in 1905 had a length of 619 miles, of which 463 were government and 156 private lines. The progress of railway construction will be seen from the following figures: open for traffic, 1871, 45 miles; 1881, 168 miles; 1891, 425 miles ; and 1905, 619 miles. The railways, both state and private, are of 3 ft. 6 in. gauge. The capital expended on government lines up to 1905 was £3,920,500; the gross earnings in that year were £243,566, and the working expenses £171,630; leaving £71,936 as the net earnings. This last-mentioned sum is equal to 1-83 per cent, on the capital expenditure; and as the average interest upon outstanding loans is 3-73 per cent., the railways are carried on at a loss of 1 -9 per cent. The private railways show somewhat better returns; the Emu Bay and Mount Bischoff line, 103 miles in length, constructed at a cost of £565,365, returned in 1904 about 3-22 per cent., and the Mount Lyell Company's railway, 22 miles long, costing £220,333, returned nearly 6 per cent.

The roads maintained by the road trusts and boards of the colony extend over 7695 miles, of which 4146 were macadamized; the annual expenditure thereon is over £35,768.

Posts and Telegraphs.— -There were 379 post offices and receiving offices in 1905, and 327 telegraphic stations; 12,616,000 postcards and letters, 2,800,000 packets, and 7,200,000 newspapers were received and despatched. The postal revenue amounted to £116,132, and the expenditure to £109,389; these sums include telegraph and telephone business. The telegraph messages sent numbered 496,000. The telephone system is being rapidly extended, and at the beginning of 1906, 137.1 miles of line were being worked.

Banking. — There are four banks of issue, of which two are local institutions; their united assets average £3,576,700. The note circulation is about £150,000, and the deposits £3,520,000, about half bearing interest.

' History. — Tasmania, or, as it was originally called, Van Diemen's Land, was discovered in 1642 by the Dutch navigator Tasman (q.v.) who named the territory after his patron, Van Diemen. The island was subsequently visited in 1772 by a French naval officer, Captain Marion du Fresne; in 1773 by Captain Furneaux, of the British man-of-war " Adventure "; in 1777 by the great circumnavigator Captain Cook; by Bligh in 1788, and again in 1792, when he planted fruit trees. In the same year the French navigator D'Entrecasteaux visited the south portion of the island and surveyed the coast. In 1798 Bass sailed through the strait which now bears his name, and discovered Van Diemen's Land was an island. In 1800 the French explorer Baudin, in command of the ships " Geographe " and " Naturaliste," surveyed the south of the island, and reports of his proceedings having reached the British officials at Sydney, they determined to forestall the French and take possession of Van Diemen's Land.

In 1802 the " Cumberland," a small schooner, landed at King's Island in Bass Strait, and in 1803 Lieutenant Bowen was sent by Governor King of New South Wales to form a settlement on the south coast of Van Diemen's Land. He had aboard his two ships,

the ” Lady Nelson “of 60 tons and the whaler ” Albion ” of 306 tons, three officials, a lance-corporal and seven privates of the New South Wales Corps, six free men and twenty-five convicts, together with an adequate supply of live stock, and

landed at Risdon, near Hobart, where he was joined shortly afterwards by fifteen soldiers and forty-two convicts. In 1807, Colonel Paterson occupied Port Dalrymple on the north side of the island. During the same year Colonel Collins, who had failed in an attempt to colonize the shores of Port Phillip, trans- ferred his soldiers, convicts and officials to the neighbourhood of Hobart, and was appointed commandant of the infant settle- ment. Provisions were scarce and dear, communication with the rest of the world was infrequent, and in 1807 the community was threatened with starvation, and flour was sold at £200 per ton. The difficulties of the settlers were increased by the hostility of the blacks. The first collision took place at Risdon, a few days after the landing of Lieutenant Bowen’s expedition, and for this the white settlers were entirely responsible. Hostilities between the races were incessant from 1802 till 1830. An attempt was made in the year 1830 to drive the natives to one corner of the island, but without success. In the following year, however, Mr George Robinson induced the remnant of the blacks to leave the mainland and take refuge, first in South Bruni and subsequently in Flinders Island, their numbers having then diminished from 5000, the original estimate of the aboriginal population, to 203. In 1842 there were only 44, in 1854 they had diminished to 16, and the last pure-blooded Tasmanian died in 1876, at the age of seventy-six. There are, however, a few persons possessing more or less aboriginal blood in some of the islands of the Bass Strait.

Some persons who had settled at Norfolk Island when that island became a penal depot were transferred to

Van Diemen's Land in 1805. But the growth of population was extremely slow, and in 1808 a census showed that there were only 3240 people on the island, including officials, military and convicts, and whatever measure of prosperity was enjoyed by the free inhabitants arose from the expenditure by the imperial govern- ment upon the convict settlement. In the year named settlers began to arrive. To every free immigrant was given a tract of land in proportion to the amount of capital brought by him to the colony — the possession of £500 entitling the holder to 640 acres, and so in proportion, a very liberal view being taken as to what constituted capital. To every free settler was assigned, if desired, the services of a number of convicts proportionate to the size of his holding. These were fed and clothed by the settler in return for their labour, and the government was re- lieved of the expense of their support and supervision. The assignment system was eventually abandoned in consequence of its moral and economic evils, but it cannot be denied that while it lasted the colony made substantial progress. In 182 1 the population had grown to 7400; the sheep numbered 128,468; the cattle, 34,790; horses, 550; and 14,940 acres of land were under crops. As the number of free settlers in the colony increased an agitation arose for more political freedom and improved administration; especially was there a demand for a free press and for trial by jury. These requests were gradually granted. Courts of justice were substituted in 1822 for courts-martial; and in 1825 the colony was made independent of New South Wales, Colonel Arthur being ap- pointed governor. In 1828 the Van Diemen's Land Company commenced sheep-farming on a large scale in the north-west district of the island under a charter granted three years before, and in 1829 the Van Diemen's Land Establishment obtained a grant of 40,000 acres at Norfolk Plains for agriculture and grazing. In 1834 Portland Bay, on the mainland of Australia, was occupied by settlers from Van Diemen's Land, and in 1835 there was a migration, large when compared with the popula- tion of the island, to the shores of

Port Phillip, now Victoria. At that date the population was 40,172, a large proportion being convicts, for in four years 15,000 prisoners had been landed. The colony was prosperous, but the free settlers were not at all satisfied with the system of government, and an agitation commenced in Van Diemen's Land, as well as in New South Wales, for the introduction of representative institutions and the abolition of transportation. This system was abolished in New South Wales in 1840, after which date the island was

the receptacle for all convicts not only from the United Kingdom, but from India and the colonies, and it was not until

1853 that transportation to Van Diemen's Land finally ceased; in the same year ■representative institutions were introduced, the name of the colony was changed to Tasmania, and three years later the colony was granted responsible government.

The discovery of gold in Victoria produced a very remark- able effect upon Tasmania. All kinds of produce brought fabulous prices, and were exported to Victoria in such quantities that the exports rose from a value of £665,790 in 1851 to £1,509,883 in 1852, and £1,756,316 in 1853, while the popula- tion diminished in almost equal ratio. It was estimated that in 1842 there were 38,000 adult males in the colony, but in

1854 their numbers had diminished to 22,261. For many years the island was inhabited by greybeards and children; the young men and women of all classes, so soon as they had reached manhood and womanhood, crossed Bass Strait, and entered upon the wider life and the more brilliant prospects which first Victoria, and subsequently New South Wales and Queensland, afforded them. It was not till the sixties that Tasmania em- barked upon a new period of prosperity. In the early days little was known about the western half of the island. Its mineral wealth was not suspected, although as far back as 1850 coal of fair quality had been found between the

Dee and the Mersey rivers, and gold had been discovered in two or three localities during 1852. In i860 two expeditions were equipped by the government for a search for gold and other minerals, and although it was some years before there was any important result, the discoveries of these explorers directed attention to the mineral wealth of the island.

The political history of the colony after the inauguration of responsible government, until it became in 1901 one of the states of Federated Australasia, was not important. State aid to religion, which was given to any denomination which would receive it, was abolished; local self-government was extended to the rural as well as to the urban districts; a policy of semi- protection was introduced; the island was connected by a submarine cable to the mainland of Australia, and thence to the rest of the civilized world; and the population, which was only 99,328 in 1870, was nearly doubled. Like her neighbours, Tasmania organized a defence force, and was able to send a contingent to South Africa in 1900. (T. A. C.)

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. TASSIE, JAMES (1735-1799), Scottish gem-engraver

and modeller, was born of humble parentage at Pollokshaws, near Glasgow, in 1735. During his earlier years he worked as a stone- mason, but, having seen the collection of paintings brought together in Glasgow by Robert and Andrew Foulis, the printers, he removed to Glasgow, attended the academy which had been established there by the brothers Foulis, and became one of the most distinguished pupils of the school. Subsequently he visited Dublin in search of commissions, and there became acquainted with Dr Quin, who had been experimenting, as an amateur, in imitating antique engraved gems in coloured pastes. He engaged Tassie as an assistant, and together thej perfected the discovery of an '' enamel," admirably adapted by its hardness and beauty of texture for the formation of gems and medallions. Dr Quin encouraged his assistant to try his fortune in London, and thither he repaired in 1766. At first h< had a hard struggle to make his way. But he worked on steadily with the greatest care and accuracy, scrupulously destroying al

impressions of his gems which were in the slightest degree inferior or defective. Gradually the beauty and artistic character of his productions came to be known. He received a commission from the empress of Russia for a collection of about 15,000 examples; all the richest cabinets in Europe were thrown open to him for purposes of study and reproduction; and his copies were frequently sold by fraudulent dealers as the original gems. He exhibited in the Royal Academy from 1769 to 1701. In 1775 he published the first catalogue of his works, a thin pamphlet detailing 2856 items. This was followed in 1701 by a large catalogue, in two volumes quarto, with illustrations etched by David Allan, and descriptive text in English and French by Rudolph Eric Raspe, enumerating nearly 16,000 pieces.

In addition to his impressions from antique gems,

Tassie executed many large profile medallion portraits of his con- temporaries, and these form the most original and definitely artistic class of his works. They were modelled in wax from the life or from drawings done from the life, and — when this was impossible — from other authentic sources. They were then cast in white enamel paste, the whole medallion being sometimes executed in this material; while in other cases the head only appears in enamel, relieved against a background of ground-glass tinted of a subdued colour by paper placed behind. His first large enamel portrait was that of John Dolbon, son of Sir William Dolbon, Bart., modelled in 1793 or 1794; and the series possesses great historic interest, as well as artistic value, including as it does portraits of Adam Smith, Sir Henry Raeburn, Drs James Beattie, Blair, Black and Cullen, and many other celebrated men of the latter half of the 18th century. At the time of his death, in 1799, the collection of Tassie's works numbered about 20,000 pieces.

His nephew, William Tassie (1777–1860), also a gem-engraver and modeller, succeeded to James Tassie's business and added largely to his collection of casts and medallions. His portrait of Pitt, in particular, was very popular, and cir- culated widely. When the Shakespeare Gallery, formed by Alderman Boydell, was disposed of by lottery in 1805, William Tassie was the winner of the prize, and in the same year he sold the pictures by auction for a sum of over £6000. He be- queathed to the Board of Manufactures, Edinburgh, an extensive and valuable collection of casts and medallions by his uncle and himself, along with portraits of James Tassie and his wife by David Allan, and a series of water-colour studies by George Sanders from pictures of the Dutch and Flemish schools.

(J. M. G.)

TASSO, TORQUATO (1544–1595), Italian poet, was the son of Bernardo Tasso (1493–1569), a nobleman of Bergamo, and his wife Porzia de' Rossi. He was born at Sorrento on the nth of March 1544. His father had

for many years been secretary in the service of the prince of Salerno, and his mother was closely connected with the most illustrious Neapolitan families. The prince of Salerno came into collision with the Spanish government of Naples, was outlawed, and was de- prived of his hereditary fiefs. In this disaster of his patron Tasso's father shared. He was proclaimed a rebel to the state, together with his son Torquato, and his patrimony was sequestered. These things happened during the boy's child- hood. In 1552 he was living with his mother and his only sister Cornelia at Naples, pursuing his education under the Jesuits, who had recently opened a school there. The precocity of intellect and the religious fervour of the boy attracted general admiration. At the age of eight he was already famous. Soon after this date he joined his father, who then resided in great indigence, an exile and without occupation, in Rome. News reached them in 1556 that Porzia Tasso had died suddenly and mysteriously at Naples. Her husband was firmly convinced that she had been poisoned by her brother with the object of getting control over her property. As it subsequently happened, Porzia's estate never descended to her son; and the daughter Cornelia married below her birth, at the instigation of her maternal relatives. Tasso's father was a poet by predilection

and a professional courtier. When, therefore, an opening at the court of Urbino offered in 1557, Bernardo Tasso gladly accepted it. The young Torquato, a handsome and brilliant lad, became the companion in sports and studies of Francesco Maria della Rovere, heir to the dukedom of Urbino. At Urbino a society of cultivated men pursued the aesthetical and literary studies which were then in vogue. Bernardo Tasso read cantos of his Amadigi to the duchess and her ladies, or discussed the merits of Homer and Virgil, Trissino and Ariosto, with the duke's librarians and secretaries. Torquato grew up in an atmosphere of refined luxury and somewhat pedantic criticism, both of which gave a permanent tone to his character. At Venice, whither his father went to superintend the printing of the Amadigi

(1560), these influences continued. He found himself the pet and prodigy of a distinguished literary circle. But Bernardo had suffered in his own career so seriously from addic- tion to the Muses and a prince that he now determined on a lucrative profession for his son. Torquato was sent to study law at Padua. Instead of applying himself to law, the young man bestowed all his attention upon philosophy and poetry. Before the end of 1562 he had produced a narrative poem called Rinaldo, which was meant to combine the regularity of the Virgilian with the attractions of the romantic epic. In the attainment of this object, and in all the minor qualities of style and handling, Rinaldo showed such marked originality that its author was proclaimed the most promising poet of his time. The flattered father allowed it to be printed; and, after a short period of study at Bologna, he consented to his son's entering the service of Cardinal Luigi d'Este. In 1565, then, Torquato for the first time set foot in that castle at Ferrara which was destined for him to be the scene of so many glories, and such cruel sufferings. After the publication of Rinaldo he had expressed his views upon the epic in some Discourses on the Art of Poetry, which committed him to a distinct theory and gained for him the additional celebrity of a philosophical critic. The age was nothing if not critical; but it may be esteemed a misfortune for the future author of the Gerusalemme that he should have started with pronounced opinions upon art. Essentially a poet of impulse and instinct, he was hampered in production by his own rules.

The five years between 1565 and 1570 seem to have been the happiest of Tasso's life, although his father's death in 1569 caused his affectionate nature profound pain. Young, hand- some, accomplished in all the exercises of a well-bred gentleman, accustomed to the society of the great and learned, illustrious by his published works in verse and prose, he became the idol of the most brilliant court in Italy. The princesses Lucrezia and Leonora d'Este, both unmarried, both his seniors

by about ten years, took him under their protection. He was admitted to their familiarity, and there is some reason to think that neither of them was indifferent to him personally. Of the cele- brated story of his love for Leonora this is not the place to speak. It is enough at present to observe that he owed much to the constant kindness of both sisters. In 1570 he travelled to Paris with the cardinal. Frankness of speech and a certain habitual want of tact caused a disagreement with his worldly patron. He left France next year, and took service under Duke Alfonso II. of Ferrara. The most important events in Tasso's biography during the following four years are the publi- cation of the Aminta in 1573 and the completion of the Gerusa- lemme Liber ata in 1574. The Aminta is a pastoral drama of very simple plot, but of exquisite lyrical charm. It appeared at the critical moment when modern music, under Palestrina's impulse, was becoming the main art of Italy. The honeyed melodies and sensuous melancholy of Aminta exactly suited and interpreted the spirit of its age. We may regard it as the most decisively important of Tasso's compositions, for its influ- ence, in opera and cantata, was felt through two successive centuries. The Gerusalemme Liberata occupies a larger space in the history of European literature, and is a more considerable work. Yet the commanding qualities of this epic poem, those which revealed Tasso's individuality, and which made it

immediately pass into the rank of classics, beloved by the people no less than by persons of culture, are akin to the lyrical graces of Aminia. It was finished in Tasso's thirty-first year; and when the MS. lay before him the best part of his life was over, his best work had been already accomplished. Troubles imme- diately began to gather round him. Instead of having the courage to obey his own instinct, and to publish the Gerusa- lemme as he had conceived it, he yielded to the critical scrupu-

losity which formed a secondary feature of his character. The poem was sent in manuscript to several literary men of eminence, Tasso expressing his willingness to hear their strictures and to adopt their suggestions unless he could convert them to his own views. The result was that each of these candid friends, while expressing in general high admiration for the epic, took some exception to its plot, its title, its moral tone, its episodes or its diction, in detail. One wished it to be more regularly classical; another wanted more romance. One hinted that the Inquisition would not tolerate its supernatural machi- nery; another demanded the excision of its most charming passages— the loves of Armida, Clorinda and Erminia. Tasso had to defend himself against all these ineptitudes and pedan- tries, and to accommodate his practice to the theories he had rashly expressed. As in the Rinaldo, so also in the Jerusalem Delivered, he aimed at ennobling the Italian epic style by pre- serving strict unity of plot and heightening poetic diction. He chose Virgil for his model, took the first crusade for subject, infused the fervour of religion into his conception of the hero Godfrey. But his own natural bias was for romance. In spite of the poet's ingenuity and industry the stately main theme evinced less spontaneity of genius than the romantic episodes with which, as also in Rinaldo, he adorned it. Godfrey, a mixture of pious Aeneas and Tridentine Catholicism, is not the real hero of the Gerusalemme. Fieiy and passionate Rinaldo, Ruggiero, melancholy impulsive Tancredi, and the chivalrous Saracens with whom they clash in love and war, divide our interest and divert it from Goffredo. On Armida, beautiful witch, sent forth by the infernal senate to sow discord in the Christian camp, turns the action of the epic. She is converted to the true faith by her adoration for a crusading knight, and quits the scene with a phrase of the Virgin Mary on her lips. Brave Clorinda, donning armour like Marfisa, fighting in duel with her devoted lover, and receiving baptism from his hands in her pathetic death; Erminia seeking refuge in the shepherd's hut — these lovely pagan women, so touching in their

sorrows, so romantic in their adventures, so tender in their emotions, rivet our attention, while we skip the battles, religious cere- monies, conclaves and stratagems of the campaign. The truth is that Tasso’s great invention as an artist was the poetry of sentiment. Sentiment, not sentimentality, gives value to what is immortal in the Gerusalemme. It was a new thing in the 1 6th century, something concordant with a growing feeling for woman and with the ascendant art of music. This sentiment, refined, noble, natural, steeped in melancholy, exquisitely grace- ful, pathetically touching, breathes throughout the episodes of the Gerusalemme, finds metrical expression in the languishing cadence of its mellifluous verse, and sustains the ideal life of those seductive heroines whose names were familiar as house- hold words to all Europe in the 17th and 18th centuries. <:. Tasso's self-chosen critics were not men to admit what the public has since accepted as incontrovertible. They vaguely felt that a great and beautiful romantic poem was imbedded in a dull and not very correct epic. In their uneasiness they suggested every course but the right one, which was to publish the Gerusalemme without further dispute. Tasso, already over- worked by his precocious studies, by exciting court-life and exhausting literary industry, now grew almost mad with worry. His health began to fail him. He complained of headache, suffered from malarious fevers, and wished to leave Ferrara. The Gerusalemme was laid in manuscript upon a shelf. He opened negotiations with the court of Florence for an exchange of service. This irritated the duke of Ferrara. Alfonso hated nothing more than his courtiers leaving him for a rival duchy.

He thought, moreover, that, if Tasso were allowed to go, the Medici would get the coveted dedication of that already famous epic. Therefore he bore with the poet’s humours, and so contrived that the latter should have no excuse for quitting Ferrara. Meanwhile, through the years 1575, 1376; 1577, Tasso’s health grew worse. Jealousy inspired the courtiers to calumniate and insult him. His

irritable and suspicious temper, vain and sensitive to slights, rendered him only too easy a prey to their malevolence. He became the subject of delusions, — thought that his servants betrayed his confidence, fancied he had been denounced to the Inquisition, expected daily to be poisoned. In the autumn of 1576 he quarrelled with a Ferrarese gentleman, Maddalo, who had talked too freely about some love affair; in the summer of 1577 he drew his knife upon a servant in the presence of Lucrezia d'Este, duchess of Urbino. For this excess he was arrested; but the duke released him, and took him for change of air to his country seat of Belriguardo. What happened there is not known. Some biographers have surmised that a compromising liaison with Leonora d'Este came to light, and that Tasso agreed to feign madness in order to cover her honour. But of this there is no proof. It is only certain that from Belriguardo he returned to a Franciscan convent at Ferrara, for the express purpose of attending to his health. There the dread of being murdered by the duke took firm hold on his mind. He escaped at the end of July, disguised himself as a peasant, and went on foot to his sister at Sorrento.

The truth seems to be that Tasso, after the beginning of 1575, became the victim of a mental malady, which, without amounting to actual insanity, rendered him fantastical and insupportable, a misery to himself and a cause of anxiety to his patrons. There is no evidence whatsoever that this state of things was due to an overwhelming passion for Leonora. The duke, instead of acting like a tyrant, showed considerable forbearance. He was a rigid and not sympathetic man, as egotistical as a princeling of that age was wont to be. But to Tasso he was never cruel — hard and unintelligent perhaps, but far from being that monster of ferocity which has been painted. The subsequent history of his connexion with the poet, over which we may pass rapidly, will corroborate this view. While at Sorrento, Tasso hankered after Ferrara. The court-made man could not breathe freely outside its

charmed circle. He wrote humbly requesting to be taken back. Alfonso consented, provided Tasso would agree to undergo a medical course of treatment for his melancholy. When he returned, which he did with alacrity under those conditions, he was well received by the ducal family. All might have gone well if his old maladies had not revived. Scene followed scene of irritability, moodiness, suspicion, wounded vanity and violent outbursts. In the summer of 1578 he ran away again; travelled through Mantua, Padua, Venice, Urbino, Lombardy. In September he reached the gates of Turin on foot, and was courteously enter- tained by the duke of Savoy. Wherever he went, " wandering like the world's rejected guest," he met with the honour due to his illustrious name. Great folk opened their houses to him gladly, partly in compassion, partly in admiration of his genius. But he soon wearied of their society, and wore their kindness out by his querulous peevishness. It seemed, moreover, that life was intolerable to him outside Ferrara. Accordingly he once more opened negotiations with the duke; and in February 1579 he again set foot in the castle. Alfonso was about to contract his third marriage, this time with a princess of the house of Mantua. He had no children; and, unless he got an heir, there was a probability that his state would fall, as it did subsequently, to the Holy See. The nuptial festivals, on the eve of which Tasso arrived, were not therefore the occasion of great rejoicing to the elderly bridegroom. As a forlorn hope he had to wed a third wife; but his heart was not engaged and his expectations were far from sanguine. Tasso, preoccupied as always with his own sorrows and his own sense of dignity, made no allowance for the troubles of his master. Rooms below his rank, he thought, had been assigned him.

The princesses did not want to see him. The duke was engaged. Without exercising common patience, or giving his old friends the benefit of a doubt, he

broke into terms of open abuse, behaved like a lunatic, and was sent off without ceremony to the madhouse of St Anna. This happened in March 1579; and there he remained until July 1586. Duke Alfonso's long- sufferance at last had given way. He firmly believed that Tasso was insane, and he felt that if he were so St Anna was the safest place for him. Tasso had put himself in the wrong by his intemperate conduct, but far more by that incompre- hensible yearning after the Ferrarese court which made him return to it again and yet again. It would be pleasant to assume that an unconquerable love for Leonora led him back. Unfortunately, there is no proof of this. His relations to her sister Lucrezia were not less intimate and affectionate than to Leonora. The lyrics he addressed to numerous ladies are not less respectful and less passionate than those which bear her name. Had he compromised her honour, the duke would certainly have had him murdered. Custom demanded this retaliation, and society approved of it. If therefore Tasso really cherished a secret lifelong devotion to Leonora, it remains buried in impenetrable mystery. He did certainly not behave like a loyal lover, for both when he returned to Ferrara in 1578 and in 1579 he showed no capacity for curbing his peevish humours in the hope of access to her society.

It was no doubt very irksome for a man of Tasso's pleasure- loving, restless and self-conscious spirit to be kept for more than seven years in confinement. Yet we must weigh the facts of the case rather than the fancies which have been indulged regarding them. After the first few months of his incarceration he obtained spacious apartments, received the visits of friends, went abroad attended by responsible persons of his acquaint- ance, and corresponded freely with whomsoever he chose to address. The letters written from St Anna to the princes and cities of Italy, to warm well-wishers, and to men of the highest reputation in the world of art and learning, form our most valuable source of information, not only on his then condition, but also on his temperament at large. It is singular that he spoke always

respectfully, even affectionately, of the duke. Some critics have attempted to make it appear that he was hypocritically kissing the hand which had chastised him, with the view of being released from prison. But no one who has impartially considered the whole tone and tenor of his epistles will adopt this opinion. What emerges clearly from them is that he laboured under a serious mental disease, and that he was conscious of it.

Meanwhile he occupied his uneasy leisure with copious com- positions. The mass of his prose dialogues on philosophical and ethical themes, which is very considerable, we owe to the years of imprisonment in St Anna. Except for occasional odes or sonnets — some written at request and only rhetorically interesting, a few inspired by his keen sense of suffering and therefore poignant — he neglected poetry. But everything which fell from his pen during this period was carefully pre- served by the Italians, who, while they regarded him as a lunatic, somewhat illogically scrambled for the very offscourings of his wit. Nor can it be said that society was wrong. Tasso had proved himself an impracticable human being; but he remained a man of genius, the most interesting personality in Italy. Long ago his papers had been sequestered. Now, in the year 1580, he heard that part of the Gerusalemme was being published without his permission and without his corrections. Next year the whole poem was given to the world, and in the following six months seven editions issued from the press. The prisoner of St Anna had no control over his editors; and from the masterpiece which placed him on the level of Petrarch and Ariosto he never derived one penny of pecuniary profit. A rival poet at the court of Ferrara undertook to revise and -e-edit his lyrics in 1582. This was Battista Guarini; and Tasso, in his cell, had to allow odes and sonnets, poems of personal feeling, occasional pieces of compliment, to be collected and emended, without lifting a voice in the matter. A few

years later, in 1585, two Florentine pedants of the Delia Crusca academy declared war against the

Gerusalemme. They loaded it with insults, which seem to those who read their pamphlets now mere parodies of criticism. Yet Tasso felt bound to reply; and he did so with a moderation and urbanity which prove him to have been not only in full possession of his reasoning faculties, but a gentleman of noble manners also. Certainly the history of Tasso's incarceration at St Anna is one to make us pause and wonder. The man, like Hamlet, was distraught through ill-accommodation to his circumstances and his age; brain-sick he was undoubtedly; and this is the duke of Ferrara's justification for the treatment he endured. In the prison he bore himself pathetically, peevishly, but never ignobly. He showed a singular indifference to the fate of his great poem, a rare magnanimity in dealing with its detractors. His own personal distress, that terrible malaise of imperfect insanity, absorbed him. What remained over, untouched by the malady, unoppressed by his consciousness thereof, displayed a sweet and gravely-toned humanity. The oddest thing about his life in prispn is that he was always trying to place his two nephews, the sons of his sister Cornelia, in court-service. One of them he attached to the duke of Mantua, the other to the duke of Parma. After all his father's and his own lessons of life, he had not learned that the court was to be shunned like Circe by an honest man. In estimating Duke Alfonso's share of blame, this wilful idealization of the court by Tasso must be taken into account. That man is not a tyrant's victim who moves heaven and earth to place his sister's sons with tyrants. In 1586 Tasso left St Anna at the solicitation of Vincenzo Gonzaga, prince of Mantua. He followed his young deliverer to the city by the Mincio, basked awhile in liberty and courtly pleasures, enjoyed a splendid reception from his paternal town of Bergamo, and produced a meritorious tragedy called Torris- mondo. But only a few months had passed when he grew discontented. Vincenzo Gonzaga, succeeding to his father's dukedom of Mantua, had scanty leisure to bestow upon the poet. Tasso felt neglected. In the autumn of 1587 we find him journeying through Bologna and Loreto to Rome, and taking up his quarters there with an old

friend, Scipione Gonzaga, now patriarch of Jerusalem. Next year he wandered off to Naples, where he wrote a dull poem on Monte Oliveto. In- 1589 he returned to Rome, and took up his quarters again with the patriarch of Jerusalem. The servants found him insufferable, and turned him out of doors. He fell ill, and went to a hospital. The patriarch in 1590 again received him. But Tasso's restless spirit drove him forth to Florence. The Floren- tines said, " Actum est de eo." Rome once more, then Mantua, then Florence, then Rome, then Naples, then Rome, then Naples — such is the weary record of the years 1590-94. We have to study a veritable Odyssey of malady, indigence and misfortune. To Tasso everything came amiss. He had the palaces of princes, cardinals, patriarchs, nay popes, always open to him. Yet he could rest in none. Gradually, in spite of all veneration for the sacer vales, he made himself the laughing- stock and bore of Italy.

His health grew ever feebler and his genius dimmer. In 1592 he gave to the public a revised version of the Gerusalemme. It was called the Gerusalemme Conquistata. All that made the poem of his early manhood charming he rigidly erased. The versification was degraded; the heavier elements of the plot underwent a dull rhetorical development. During the same year a prosaic composition in Italian blank verse, called Le Sette Giornate, saw the light. Nobody reads it now. We only mention it as one of Tasso's dotages— a dreary amplification of the first chapter of Genesis.

It is singular that just in these years, when mental disorder, physical weakness, and decay of inspiration seemed dooming Tasso to oblivion, his old age was cheered with brighter rays of hope. Clement VIII. ascended the papal chair in 1592. He and his nephew, Cardinal Aldobrandini of St Giorgio, deter- mined to befriend our poet. In 1594 they invited him to Rome. There he was to assume the crown of bays, as Petrarch

had assumed it, on the Capitol. Worn out with illness, Tasso reached Rome in November. The ceremony of his coronation was deferred because Cardinal Aldobrandini had fallen ill. But the pope assigned him a pension; and, under the pressure of pontifical remonstrance. Prince Avellino, who held Tasso's maternal estate, agreed to discharge a portion of his claims by payment of a yearly rent-charge. At no time since Tasso left St Anna had the heavens apparently so smiled upon him. Capitolian honours and money were now at his disposal. Yet fortune came too late. Before the crown was worn or the pensions paid he ascended to the convent of St Onofrio, on a stormy ist of April in 1595. Seeing a cardinal's coach toil up the steep Trasteverine Hill, the monks came to the door to greet it. From the carriage stepped Tasso, the Odysseus of many wanderings and miseries, the singer of sweetest strains still vocal, and told the prior he was come to die with him.

In St Onofrio he died, on the 25th of April 1595. He was just past fifty-one; and the last twenty years of his exist- ence had been practically and artistically ineffectual. At the age of thirty-one the Gerusalemme,' as we have it, was accom- plished. The world too was already ringing with the music of Aminta. More than this Tasso had not to give to literature. But those succeeding years of derangement, exile, imprison- ment, poverty and hope deferred endear the man to us. Elegiac and querulous as he must always appear, we yet love Tasso better because he suffered through nearly a quarter of a century of slow decline and unexplained misfortune. (J. A. S.)

Taken altogether, the best complete edition of Tasso's writings is that oA Rosini (Pisa), in 33 vols. The prose works (in 2 vols., FlorencaC t* Monnier, 1875) and the letters (in 5 vols., same pub- lisher, 1853) were admirably edited by Cesare Guasti. This edition of Tasso's Letters forms by far the most valuable source for his biography. No

student can, however, omit to use the romantic memoir attributed to Tasso's friend, Marchese Manso (printed in Rosini's edition of Tasso's works above cited), and the important Vita di Torquato Tasso by Serassi (Bergamo, 1790). See also Solerti's Life (1895), his editions of the Opere Minori in versi (1891 et seq.), and Gerusalemme (1895), an d his bibliography, in the Rivisla biblioteehe e archivi (1895), on the occasion of the celebration of the tercentenary of Tasso's death.

TASSONI, ALESSANDRO (1565-1635), Italian poet, was a native of Modena, where he was born and died. From 1599 till 1608 he was secretary to Cardinal Ascanio Colonna, and in this capacity saw some diplomatic service; he was afterwards employed for some time in similar occupations by Charles Emmanuel, duke of Savoy. His best-known literary work is a burlesque epic entitled La Secchia Rapita, or " The Rape of the Bucket " (1622), the reference being to a raid of the Modenese upon the people of Bologna in 1325, when a bucket was carried off as a trophy. As in Butler's Hudibras, many of the personal and local allusions in this poem are now very obscure, and are apt to seem somewhat pcintless to the general reader, but, in spite of Voltaire's contempt, it cannot be neglected by any systematic student of Italian literature (see Carducci's edition, 1861). Other characteristic works of Tassoni are his Pensieri Diversi (161 2), in which he treats philosophical, literary, his- torical and scientific questions with unusual freedom, and his Consider - azioni sopra il Pelrarcha (1609), a piece of criticism showing great independence of traditional views.

TASTE (from Lat. taxare, to touch sharply; tangere, to touch), in physiology, the sensation referred to the mouth when certain soluble substances are brought into contact with the mucous membrane of that cavity. By analogy, the word " taste "is used also of aesthetic appreciation (see Aesthetics) and a sense of beauty — commonly with the qualifications " good taste " and " bad taste."

The physiological sense is located almost entirely in the tongue. Three distinct sensations are referable to the tongue — (1) taste, (2) touch, and (3) temperature. The posterior part of its surface, where there is a A-shaped group of large papillae, called circumvallate papillae, supplied by the glosso-pharyngeal nerve, and the tip and margins of the tongue, covered with filiform (touch) papillae and fungiform papillae, are the chief localities where taste is manifested, but it also exists in the

glosso-palatine arch and the lateral part of the soft palate. The middle of the tongue and the surface of the hard palate are devoid of taste. The terminal organs of taste consist of peculiar bodies named taste-bulbs or taste-goblets, discovered by Schwalbe and S. L. Loven in 1867. They can be most easily demonstrated in the papillae foliatae, large oval prominences found on each side near the base of the tongue in the rabbit. Each papilla consists of a series of laminae or folds, in the sides of which the taste-bodies are readily displayed in a transverse section. Taste-bodies are also found on the lateral aspects of the circumvallate papillae (see Fig. 1), in the fungiform papillae,

Fig. 1. — Transverse section of a circumvallate papilla: W, the papilla; v, v, the wall in section; R, R, the circular slit or fossa; K, K, the taste-bulbs in position; N, N, the nerves.

in the papillae of the soft palate and uvula, the under surface of the epiglottis, the upper part of the posterior surface of the epiglottis, the inner sides of the arytenoid cartilages, and even in the vocal cords.

The taste-bulbs are minute oval bodies, somewhat like an old-fashioned Florence flask, about 3 J U inch in length by ifo in breadth. Each consists of two sets of cells — an outer set, nucleated, fusiform, bent like the staves of a barrel, and arranged side by side so as to leave a small opening at the apex (the mouth of the barrel), called the gustatory pore; and an inner set, five to ten in

number, lying in the centre, pointed at the end next the gustatory pore, and branched at the other extremity. The branched ends are continuous with non-medul- lated nerve fibres from the gustatory nerve. These taste- bodies are found in immense numbers: as many as 1760 have been counted on one circumvallate papilla in the ox. The proofs that these are the terminal organs of taste rest on careful observations g, supporting or protective cells; wnich. have shown ® that ^fht^rojec^p^ o?^ taste is only experienced when taste-cells.

the sapid substance is allowed Fig. 3. — d, Isolated protective to come into contact with the cel1 : e > taste-cell, taste-body, and that the sense

is absent or much weakened in those areas of mucous membrane where these are deficient; (2) that they are most abundant where the sense is most acute; and (3) that section of the glosso-pharyngeal nerve which is known to be distributed to the areas of mucous membrane where taste is present is followed by degeneration of the taste-bodies. At the same time it cannot be asserted that they are absolutely essential to taste, as we can hardly suppose that those animals which have no special taste-bodies are devoid of the sense.

Evidence is accumulating that taste depends on nervous impulses excited by chemical change. Substances that hav* taste must be soluble. Chemical changes are in all probability set up in the taste-cells, or in the processes connected with them. Some progress has been made in the attempt to establish a

Fig.

K

Fig. 2. Fig. 3.

2. — Isolated taste-bulb :

connexion between the chemical composition of sapid substances and the different kinds of taste to which they may give rise. Thus acids are usually sour; alkaloids have a peculiar soapy taste; salts may be sweet, like sugar of lead, or bitter, like sulphate of magnesia; soluble alkaloids, such as quinine or strychnine, are usually bitter; and the higher alcohols are more or less sweet. Substances which taste sweet or bitter often contain definite groups in the molecule, especially in the hydroxyl (HO) and amido (NH 2) groups. By altering the chemical composition of a substance having a characteristic taste (changing the position or relations of the radicles), the substance may become tasteless or intensely bitter. The sensation of taste may also be excited mechanically, as by smartly tapping the tongue, or by the stimulus of a continuous current. In the latter case electrolytic change may be the exciting cause; but that the sense organs may be stimulated electrically is proved by the fact that rapidly interrupted in- duced currents, which produce little or no electrolysis, may also excite taste. Sensations of taste are heightened by increasing the area of the tongue affected, and by mechanical stimulation, as when the tongue is pressed against the lips, cheeks or palate. A temperature of about 40 C. is most favourable, either ex- treme heat or cold apparently benumbing the sense for a time. Gustatory sensations affect each other: that is to say, a strong taste will affect the taste of another body taken immediately after it. Thus sweetness will modify bitterness, and sourness will modify both. Moreover, the application of a sapid sub- stance to the tongue will affect taste in other parts. If the same taste is excited on each side of the tongue, although there are two sets of gustatory nerves, one for each lateral half, the sensations are blended into one; while if two different sub- stances, say one sweet and the other bitter, are simultaneously applied, one to each side, the observer can distinctly differen- tiate the one from the other.

Tastes have been variously classified. One of the

most useful classifications is into sweet, bitter, acid and saline tastes. Insoluble substances, when brought into contact with the tongue, give rise to feelings of touch or of temperature, but excite no taste. If solutions of various substances are gradually diluted with water until no taste is experienced, G. G. Valentin found that the sensations of taste disappeared in the following order — syrup, sugar, common salt, aloes, quinine, sulphuric acid; and Camerer found that the taste of quinine still continued although diluted with twenty times more water than common salt. The time required to excite taste after the sapid substance was placed on the tongue varies. Thus saline matters are tasted most rapidly (-17 second), then sweet, acid and bitter (-258 second). There are many curious examples of substances of very different chemical constitutions having similar tastes. For example, sugar, acetate of lead and the vapour of chloroform have all a sweetish taste. A temperature of from 50 to qo° F. is the most favourable to the sense, water above or below this temperature either masking or temporarily paralysing it.

As a general rule, bitter tastes are most acute at the back of the tongue, near the circumvallate papillae, and sweet tastes at the tip, but there are considerable individual variations. Some persons taste both bitter and sweet substances best at the back, while others taste bitter things at the tip. Many experience salt tastes best at the tip, and acid tastes at the sides of the tongue. When we consider that there are three kinds of papillae on the surface of the tongue, one would expect to meet with different degrees of sensitiveness to different tastes, even while we admit that the papillae may also have to do with sensations of touch and of temperature. By experimenting with fine capillary tubes containing sapid substances, observations have been made with individual papillae. Some are found to be sensitive to many tastes, others to two or three, others to only one, while others are insensitive to taste altogether. Again, it has been found that a mixture of sapid substances, say of

quinine and sugar, may taste sweet when applied to one papilla and bitter when applied to another. The inference must be

that there are special terminal organs for different tastes. Assuming that there are different kinds of taste-cells, it might be possible to paralyse some without affecting others, and thus different sensations of taste might be discriminated. This has been done by the use of the leaves of a common Indian plant, Gymnema sylvestre. If some of these be chewed, it has been found that bitters and sweets are paralysed (neither quinine nor sugar giving rise to sensation), while acids and salines are unaffected. Again, certain strengths of decoctions of the leaves appear to paralyse sweets sooner than bitters. These observations show the existence of different taste-cells for sweets, bitters, acids and salines; and it is clear that the region of the tongue most richly supplied with taste-cells sensitive to sweets will respond best to sweet substances, while another region, supplied by taste-cells sensitive to bitters, will respond best to bitter substances. In like manner the argu- ment may be applied to other tastes. Suppose, again, a set of taste-cells sensitive to bitter substances: it is conceivable that in whatever way these were irritated, a bitter taste would result. If so, a substance which, applied to one part of the tongue, would cause a sweet sensation, might cause a bitter if applied to a part of the tongue richly supplied with taste-cells sensitive to bitters. This may explain why sulphate of magnesia excites at the root of the tongue a bitter taste, while applied to the tip it causes a sweet or an acid taste. Saccharine, a peculiar toluene derivative, in like manner is sweet to the tip and bitter to the back of the tongue. It has also been found that if the sweet and bitter taste-cells are paralysed by Gymnema, electrical irritation of the tip by a weak interrupted current does not give rise to an acid taste mixed with sweet, as it usually does, but to sensations somewhat different, which may be described as metallic or salt or acid. This

experiment indicates that the action of the interrupted current on the terminal organ is analogous to the action of sweet or bitter substances (Shore). No direct observations of importance have yet been made on single circumvallate papillae. Further experiments with capillary tubes show that fungiform papillae destitute of taste buds, and areas of the surface of the tongue having neither papillae nor taste buds, may still, when stimulated by sapid substances, give rise to tastes. Taste is often associated with smell (q.v.), giving rise to a sensation of flavour, and we are frequently in the habit of confounding the one sensation with the other. Chloroform excites taste alone, whilst garlic, asa- foetida and vanilla excite only smell. This is illustrated by the familiar experiment of blindfolding a person and touch- ing the tongue successively with slices of an apple and ofj an onion. In these circumstances the one cannot be distinguished from the other when the nose is firmly closed. Taste may be educated to a remarkable extent; and careful observation — along with the practice of avoiding all substances having a very pronounced taste or having an irritating effect — enables tea- tasters and wine-tasters to detect slight differences of taste, more especially when combined with odour so as to produce flavour, which would be quite inappreciable to an ordinary palate. As to the action of electrical currents on taste, observers have arrived at uncertain results. So long ago as 1752 J. G. Sulzer stated that a constant current caused, more especially at the moments of opening and of closing the current, a sensation of acidity at the anode (+ pole) and of alkalinity at the katode (—pole). This is in all probability due to electro- lysis, the decomposition products exciting the taste-bodies. Rapidly interrupted currents fail to excite the sense.

Disease of the tongue causing unnatural dryness may interfere with taste. Substances circulating in the blood may give rise to subjective sensations of taste. Thus santonine, morphia and biliary products (as in jaundice) usually cause a bitter sensation,

whilst the sufferer from diabetes is distressed by a persistent sweetish taste. The insane frequently have sub- jective tastes, which are real to the patient, and frequently cause much distress. In such cases, the sensation is excited by changes in the taste-centres of the brain. Increase in the sense of taste is called hypergeusia, diminution of it hypogeusia, and

its entire loss ageusia. Rare cases occur where there is a sub- jective taste not associated with insanity nor with the circula- tion of any known sweetish matters in the blood, possibly caused by irritation of the gustatory nerves or by changes in the nerve centres.

For the anatomy of the organs of taste, see the articles Mouth and Tongue. (J. G. M.)

TATA, JAMSETJI NASARWANJI (1839-1904), Parsee merchant and philanthropist, was born at Nosari, in the state of Baroda, in 1839, and went as a boy to Bombay, where he was educated at the Elphinstone College. In 1858 he entered his father's office, and began a commercial career of the highest eminence, beginning with cotton mills at Bombay and also at Nagpur, and ending with the formation of a company to work the iron ores of the Central Provinces on modern principles. One of his best-known achievements was the lowering of the freights on Indian goods to China and Japan, as the result of a long struggle with the Nippon Yusen Kaisha Co. He also intro- duced a silk industry after Japanese methods into Mysore, and built the Taj Mahal hotel in Bombay. But his greatest bene- faction is the endowment of a research institute at Bangalore. He died at Nauheim, in Germany, on the 19th of May 1904.

TATAR PAZARJIK, or Tatar Bazakdjik, a town of Bul- garia in Eastern Rumelia; on the river Maritza, and

on the Sofia-Constantinople railway, 74 m. E.S.E. of Sofia and 23 m. W. of Philippopolis. Pop. (1906) 17,549. Situated at the junction of several roads, Tatar Pazarjik began to acquire commercial importance in the 15th century. Rice, millet and tobacco are largely cultivated in the surrounding lowlands, and there is some trade in cocoons and wool.

TATARS (the common form Tartars is less correct), a name given to nearly three million inhabitants of the Russian empire, chiefly Moslem and of Turkish origin. The majority — in European Russia — are remnants of. the Mongol invasion of the 13th century (see Mongols), while those who inhabit Siberia are survivals of the once much more numerous Turkish population of the Ural-Altaic region, mixed to some extent with Finnish and Samoyedic stems, as also with Mongols. The name is derived from that of the Ta-ta Mongols, who in the 5th century inhabited the north-eastern Gobi, and, after subjugation in the 9th century by the Khitans, migrated south- ward, there founding the Mongol empire under Jenghiz Khan (q.v.). Under the leadership of his grandson (Bat u) they moved westwards, driving with them many stems of the Turkish Ural-Altaians towards the plains of Russia. The ethnographical features of the present Tatar inhabitants of European Russia, as well as their language, show that they contain no admixture (or very little) of Mongolian blood, but belong to the Turkish branch of the Ural-Altaic stock, necessitating the conclusion that only Batu, his warriors, and a limited number of his followers were Mongols, while the great bulk of the 13th century invaders were Turks. On the Volga they mingled with remnants of the old Bulgarian empire, and elsewhere with Finnish stems, as well as with remnants of the ancient Italian and Greek colonies in Crimea and Caucasians in Caucasus. The name of Tatars, or Tartars, given to the invaders, was afterwards ex- tended so as to include different stems of the same Turkish branch in Siberia, and even the bulk of the inhabitants of the high plateau of Asia and its N.W. slopes, described under the general name of Tartary.

This last name has almost dis- appeared from geographical literature, but the name Tatars, in the above limited sense, remains in full use.

The present Tatar inhabitants of the Russian empire form three large groups — those of European Russia and Poland, those of Caucasus, and those of Siberia. The discrimination of the separate stems included under the name is still far from completion. The following subdivisions, however, may be regarded as established. (1) The Kazafi Tatars, descendants of the Kipchaks settled on the Volga in the 13th century, where they mingled with survivors of the old Bulgarians and partly with Finnish stems. They number about half a million in the government of Kazafi, about 100,000 in each of the governments of Ufa, Samara and Simbirsk, and about 300,000 in Vyatka, Saratov, Tambov, Penza, Nizhniy-Novgorod, Perm and Orenburg; some 15,000 belonging to the same stem have

migrated to Ryazan, or have been settled as prisoners in the 16th and 17th centuries in Lithuania (Vilna, Grodno and Podolia) ; and there are some 2000 in St Petersburg, where they pursue the callings of coachmen and waiters in restaurants. In Poland they constitute I per cent, of the population of the district of Plock. The Kazan Tatars speak a pure Turkish dialect; they are middle-sized, broad- shouldered and strong, and mostly have black eyes, a straight nose and salient cheek bones. They are Mahommedans; polygamy is practised only by the wealthier classes and is a waning institution. Excellent agriculturists and gardeners, very laborious, and having a good reputation for honesty, they live on the best terms with their Russian peasant neighbours. The Bashkirs who live between the Kama, Ural and Volga are possibly of Finnish origin, but now speak a Tatar language and have become Mahommedans. (2) The Astrakhan Tatars (about 10,000) are, with the Mongol Kalmucks, all that now remains of the once so powerful Astrakhan empire. They also are agriculturists and gardeners; while some 12,000 Kundrovsk Tatars still continue the nomadic life of

their ancestors. (3) The Crimean Tatars, who occupied the Crimea in the 13th century, have preserved the name of their leader, Nogai. During the 15th, 16th and 17th centuries they constituted a rich empire, which prospered until it fell under Turkish rule, when it had to suffer much from the wars fought between Turkey and Russia for the possession of the peninsula. The war of 1853 and the laws of 1860-63 and 1874 caused an exodus of the Crimean Tatars; they abandoned their admirably irrigated fields and gardens and moved to Turkey, so that now their number falls below 100,000. Those of the south coast, mixed with Greeks and Italians, are well known for their skill in gardening, their honesty and their laborious habits, as well as for their fine features, presenting the Tatar type at it- best. The mountain Tatars closely resemble those of Caucasus, while those of the steppes — the Nogais — are decidedly of a mixed origin from Turks and Mongols.

The Tatars of Caucasia, who inhabit the upper Kuban, the steppes of the lower Kuma and the Kura, and the Aras, number about 1,350,000. Of these (4) the Nogais on the Kuma show traces of an intimate mixture with Kalmucks. They are nomads, support- ing themselves by cattle-breeding and fishing; few are agricul- turists. (5) The Karachais (18,500) in the upper valleys about Elburz live by agricultur^. (6) The mountain Tatars (about 850,000), divided into many tribes and of an origin still undeter- mined, are scattered throughout the provinces of Baku, Erivan, Tiflis, Kutais, Daghestan, and partly also of Batum. They are certainly of a mixed origin, and present a variety of ethnological types, all the more so as all who are neither Armenians nor Russians, nor belong to any distinct Caucasian tribe, are often called Tatars As a rule they are well built and little behind their Caucasian brethren. _ They are celebrated for their excellence as gardeners, agriculturists, cattle-tenders and artisans. Although most fervent Shi'ites, they are on very good terms both with their Sunnite and with their Russian neighbours. Polygamy is rare with*

them, and their women go to work unveiled.

The Siberian Tatars are estimated (1895) at 80,000 of Turki stock and about 40,000 of mixed Finnic stock. They occupy three distinct regions — a strip running west to east from Tobolsk to Tomsk, the Altai and its spurs, and South Yeniseisk. They originated in the agglomerations of Turkish stems which in the region north of the Altai reached some degree of culture between the 4th and the 8th centuries, but were subdued and enslaved by the Mongols. They are difficult to classify, for they are the result of somewhat recent minglings of races and customs, and they are all more or less in process of being assimilated by the Russians, but the following subdivisions may be accepted provisionally. (7) The Baraba Tatars, who take their name from one of their stems (Barama), number about 50,000 in the government of Tobolsk and about 5000 in Tomsk. _ After a strenuous resistance to Russian con- quest, and much suffering at a later period from Kirghiz and Kalmuck raids, they now live by agriculture, either in separate villages or along with Russians. (8) The Cholym or Chulym Tatars on the Cholym and both the rivers Yus speak a Turkish language with many Mongol and Yakut words, and are more like Mongols than Turks. In last century they paid a tribute for 2550 arbaletes, but they now are rapidly becoming fused with Russians. (9) The Abakan or Minusinsk Tatars occupied the steppes on the Abakan and Yus in the 17th century, after the withdrawal of the Kirghizes, and represent a mixture with Kaibals (whom Castrtn considers as partly of Ostiak and partly Samoyedic origin) and Beltirs — also of Finnish origin. Their language is also mixed. They are known under the name of Sagais, who numbered 11,720 in 1864, and are the purer Turkish stem of the Minusinsk Tatars, Kaibals, and Kizil or Red Tatars. Formerly Shamanists, they now are, nominally at least, adherents of the Greek Orthodox Church, and support themselves mostly by cattle- breeding. Agriculture is spreading but slowly among them; they still prefer to plunder the stores of bulbs of Lilium Martagon, Paeonia, and Erythronium

Dens cams laid up by the steppe mouse (Mus socialis). The Soyotes, or Soyons, of the Sayan mountains (estimated at 8000), who are Finns mixed with Turks the Uryankhes of north-west Mongolia, who are of Turkish origin but follow Buddhism, and the Karagasses, also of Turkish

origin and much like the Kirghizes, but reduced now to a few hundreds, are akin to the above. (10) The Tatars of the northern slopes of the Altai (nearly 20,000 in number) are of Finnish origin. They comprise some hundreds of Kumandintses, the Lebed Tatars, the Chernevyie or Black- Forest Tatars and the Shors (11,000), descendants of the Kuznetsk or Iron-Smith Tatars. They are chiefly hunters, passionately loving their taiga, or wild forests, and have maintained their Shaman religion and tribal organization into suoks. They live partly also on cedar-nuts and honey collected in the forests. Their dress is that of their former ru'ers, the Kalmucks, and their language contains many Mongol words. (11) The Altai Tatars, or " Altaians," comprise — (a) the Mountain Kalmucks (12,000), to whom this name has been given by mistake, and who have nothing in common with the Kalmucks except their dress and mode of life, while they speak a Turkish dialect, and (b) the Teleutes, or Telenghites (5800), a remainder of a formerly numerous and warlike nation who have migrated from the mountains to the lowlands, where they now live along with Russian peasants. Although Turkestan and Central Asia were formerly known as Inde- pendent Tartary, it is not now usual to call the Sarts, Kirghiz and other inhabitants of those countries Tatars, nor is the name usually given to the Yakuts of Eastern Siberia.

It is evident from the above that the name Tatars was originally applied to both the Turkish and Mongol stems which invaded Europe six centuries ago, and gradually extended to the Turkish stems mixed with Mongol or Finnish blood in Siberia. It is used

at present in two senses: (a) Quite loosely to designate any of the Ural-Altaic tribes, except perhaps Osmanlis, Finns and Magyars, to whom it is not generally applied. Thus some writers talk of the Manchu Tatars. (6) In a more restricted sense to designate Mahommedan Turkish-speaking tribes, especially in Russia, who never formed part of the Seljuk or Ottoman Empire, but made independent settlements and remained more or less cut off from the politics and civilization of the rest of the Mahommedan world.

Authorities. — The literature of the subject is very extensive, and bibliographical indexes may be found in the Geographical Dictionary of P. Semenov, appended to the articles devoted re- spectively to the names given above, as also in the yearly Indexes by M. Mezhov and the Oriental Bibliography of Lucian Scherman. Besides the well-known works of Castren, which are a very rich source of information on the subject, Schiefner (St Petersburg academy of science), Donner, Ahlqvist and other explorers of the Ural-Altaians, as also those of the Russian historians Soloviev, Kostomarov, Bestuzhev-Ryumin, Schapov, and Ilovaiskiy, the following containing valuable information may be mentioned : the publications of the Russian Geographical Society and its branches ; the Russian Etnographicheskiy Sbornik; the Izvestia of the Moscow society of the amateurs of natural science; the works of the Russian ethnographical congresses; Kostrov's researches on the Siberian Tatars in the memoirs of the Siberian branch of the geographical society; Radlov's Reise durch den Altai, Aus Sibirien', "Picturesque Russia" (Zhivopisnaya Rossiya); Semenov's and Potanin's " Supplements " to Ritter's Asien; Harkavi's report to the congress at Kazan; Hartakhai's "Hist, of Crimean Tatars," in Vyestnik Evropy, 1866 and 1867; " Katchinsk Tatars," in Izvestia Russ. Geogr. Soc, xx., 1884. Various scattered articles on Tatars will be found in the Revue orientate pour les Etudes Oural-Altaiques, and in the publications of the university of Kazan. See also E. H. Parker, A Thousand Years of the Tartars,

1895 (chiefly a summary of Chinese accounts of the early Turkish and Tatar tribes), and Skrine and Ross, Heart of Asia (1899). (P. A. K. ; C. El.)

TATE, SIR HENRY, Bart. (1819–1899), English merchant and founder of the National Gallery of British Art, was born at Chorley, Lancashire, in 1819. His father, a minister of religion, put him into business – in Liverpool. He became a prosperous sugar-broker, and about 1874 removed to London, where he greatly increased the operations of his firm and made " Tate's Cube Sugar " known all over the world. He had early in his career begun to devote large sums of money to philan- thropic and educational purposes. He gave £42,000 to the Liverpool University College, founded in 1881; and a still larger sum to the Liverpool hospitals. Then, when he came to London, he presented four free public libraries to the parish of Lambeth. His interest in art came with later years. He was at first merely a regular buyer of pictures, for which he built a large private gallery in his house at Streatham. Gradually his gallery came to contain one of the best private collections of modern pictures in England, and the owner naturally began to consider what should be done with it after his death. It had always been his intention to leave it to the nation, but in the way of carrying out this generous desire there stood several obstacles. The National Gallery could not have accepted more than a selection from Tate's pictures, which were not all up to the standard of Trafalgar Square; and even

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when he offered to build a new gallery for them, it was found difficult to secure a suitable site. What Tate offered was to spend £80,000 upon a building if the government would pro- vide the ground; and in 1892 this offer was accepted. A new gallery, controlled by the Trustees of the National Gallery, was built on the site of Millbank Prison. The gallery was opened on 21st July 1897, and a large addition to it was completed just before the donor died. It contained sixty-five pictures presented by him; nearly all the English pictures from the

National Gallery painted within the previous eighty years; the pictures purchased by the Royal Academy under the Chantrey Bequest, which had previously hung in South Kensington Museum; and seventeen large works given to the nation by Mr G. F. Watts, R.A. Mr Tate was created a baronet in the year after the Tate Gallery had been opened. He died at Streatham on the 5th of December 1899.

TATE, JAMES (1771–1843), English classical scholar and schoolmaster, was born at Richmond in Yorkshire on the nth of June 1771. He was educated at Richmond school and Sidney Sussex College, Cambridge (fellow, 1795). From 1796 to 1833 he held the headmastership of his old school, being then appointed canon of St Paul's and vicar of Edmonton. He died on the 2nd of September 1843. The work by which he is chiefly known is his Horatius Restitutus (1832).

TATE, NAHUM (1652–1715), English poet laureate and playwright, was born in Dublin in 1652. He was the son of Faithful Teate (as the name was spelt), who wrote a quaint poem on the Trinity entitled Ter Tria. Nahum Tate was edu- cated at Trinity College, Dublin, graduating B.A. in 1672. He published a volume of poems in London in 1677, and became a regular writer for the stage. Brutus of Alba, or The En- chanted Lovers (1678), a tragedy dealing with Dido and Aeneas, and The Loyal General (1680), were followed by a series of adaptations from Elizabethan dramas. In Shakespeare's Richard II. he altered the names of the personages, and changed the text so that every scene, to use his own words, was " full of respect to Majesty and the dignity of courts"; but in spite of these precautions The Sicilian Usurper (1681) was suppressed on the third representation on account of a possible political interpretation. King Lear (1687) was fitted with a happy ending in a marriage between Cordelia and Edgar; and Corio- lanus became the Ingratitude of a Commonwealth (1682). From John Fletcher he adapted The Island Princess (1687); from Chapman and Marston's Eastward Ho he derived the Cuckold's Haven (1685); from John Webster's White Devil he took Injured Love, or The Cruel Husband (pr. 1707); and

Sir Aston Cockayne's Trappolin suppos'd a Prince he imitated in Duke and no Duke (1685). Tate's name is chiefly connected with these mangled versions of other men's plays and wich the famous New Version of the Psalms of David (1696), in which he collaborated with Nicholas Brady. A supplement was licensed in 1703. Some of these hymns, notably " While Shepherds watched," and " As pants the hart," rise above the general dull level, and are said to be Tate's work.

Tate was commissioned by Dryden to write the Second Part of Absalom and Achitophel. The portraits of Elkanah Settle and Thomas Shadwell, however, are attributed to Dryden, who probably also put the finishing touches to the poem. Of his numerous poems the most original is Panacea, a poem on Tea {1700). In spite of his consistent Toryism, he succeeded Shadwell as poet laureate in 1692. He died within the precincts of the Mint, Southwark, where he had taken refuge from his creditors, on the 12th of August 171 5.

TATE, RALPH (1840-1901), British geologist, was born at Alnwick in Northumberland in 1840. He was a nephew of George Tate (1805-1871), naturalist and archaeologist, an active member of the Berwickshire Naturalists' Club. He was educated at the Cheltenham Training College and at the Royal School of Mines, and in 1861 he was appointed teacher of natural science at the Philosophical Institution in Belfast. He there studied botany, and published his Flora Belfastinesis (1863); and he also investigated the Cretaceous and Liassic rocks of Antrim,

bringing his results before the Geological Society of London. In 1864 he was appointed assistant in the museum of that society. In 1867 he went on an exploring expedition to Nicaragua and Venezuela. In 1871 he was appointed to the mining school

established by the Cleveland ironmasters first at Darlington and then at Redcar. Here he made a special study of the Lias and its fossils, in conjunction with the Rev. J. F. Blake, and the results were published in an important work, The Yorkshire Lias (1876), in which the life-history of the strata was first worked out in detail. In 1875 Tate was appointed professor of natural science in the university of Adelaide, South Australia. He now gave especial attention to the recent and tertiary mollusca of Australia. He was the chief founder of the Royal Society of South Australia, and was in 1803 president of the Australian Association for the Advancement of Science. He died at Adelaide on the 20th of September 1901.

TATI, a district of British South Africa forming, geographi- cally, the S.W. corner of Matabeleland, but attached administra- tively to the Bechuanaland Protectorate. Area about 2 500 sq. m. The railway from Cape Town to Bulawayo crosses the territory with a station at Francistown, the principal settlement. Francis- town stands 3254 ft. above the sea and is 126 m. S.W. of Bulawayo by rail. The town of Tati, on the river of that name, is 18 m. S.E. of Shashi river railway station.

Tati owes its importance to the presence of gold, first dis- covered by the German traveller, Karl Mauch, in 1864. Mining began in 1868, but it was not until 1895 that work on a large scale was undertaken, and it has been frequently interrupted since that date. The chief mine is the Monarch, situated by the railway. A concession to work the gold-mines, and for other purposes, was obtained in 1887 by Mr S. H. Edwards from Lobengula, the Matabele chief, and the mining rights are vested in a company, thereafter formed, called the Tati Conces- sions Company. (See Bechuanaland and Rhodesia.)

TATIAN (2nd cent, a.d.), Christian apologist, missionary and heretic. Such knowledge as we have of his life is derived from (1) his own Oratio ad Graecos (see § 3); (2) Irenaeus, Adv. Haereses, i.

28, i.; (3) Rhodon, quoted in Eusebius's Hist. Eccl. v. 13, 1; (4) Clement of Alexandria, Strom, i. 1, n; (5) Euse- bius, Chronicon anno a.d. 171; (6) Epiphanius, Panarion, i. 3, 46. Convenient collections of these passages may be found in E. Schwartz's Tatiani Oratio ad Graecos, Texte und Unter- suchnngen, iv. 1, pp. 51—55 ; and in A. Harnack's Geschichte der altchristlichen Litteratur, i. pp. 485-96. From these data the following outline of his life can be reconstructed. He was a Syrian 1 (Clem. Alex, and Epiphanius) born in Mesopotamia (Or. 42) and educated in Greek learning, in which he became proficient (Or. i. and 42). He was initiated into the Mysteries, though into which is not stated (Or. 29), but after this became acquainted with the Old Testament, and was converted to Christianity. He then went to Rome, where he was a hearer of Justin, and together with the latter incurred the enmity of a certain philosopher Crescens. As this fact is mentioned both in Justin's Apology and in Tatian's Oratio ad Graecos, and the Apology can be dated with fair security about a.d. 152 (see Justin Martyr), the conversion of Tatian must have been before this date. After the death of Justin he became a heretic — according to Eusebius's Chronicon in 173. Among his pupils were Rhodon, and perhaps Apelles (see Victorinus Reat. schol. 44, in Ep. Hieronymi ad Avitum, ep. 1 24) and Clement of- Alexandria (Storm, i. 1, 11). He made a missionary journey to the East and worked in Cilicia and Pisidia, using the Syrian Antioch as the centre of his efforts (Epiphan.).

According to. Epiphanius, Tatian went to the East after the death of Justin (c 165), and then became heretical, and Eusebius states that he was recognized as heretical in 173. Zahn (Forschungen zur Geschichte des Kanons, i.) and most writers

1 Tatian describes himself as an "Assyrian," and though the terms " Assyrian " and " Syrian " are used very loosely by ancient writers, it is probable that he was born E. of the Tigris, i.e. not in Syria as we understand it. Epiphanius, in another passage, calls him an Assyrian.

accept this as in the main correct; it is generally thought that his heresy was recognized in Rome, and it is suggested that this was the reason why he returned to the East. The state- ment in Epiphanius is capable of being interpreted in this sense, and whereas Tatian was always regarded as heretical in the West, he seems to have been unsuspected in the East. This fact, however, does more than support the suggestion that Tatian's heresy was recognized before he left Rome: it throws some doubt on the theory that after being turned out of the Church in Rome he worked as a missionary in the East without being suspected. Harnack (Texte und Untersuchungen, i. 1, pp. 196 ff.) once suggested that the missionary work in the East belongs to an earlier period, and that Tatian left Rome and re- turned to it between his first arrival and the death of Justin Martyr. But in his Chronologic, i. pp. 284 ff., he has with- drawn this, and it is probably too hypothetical; it is, however, the only serious effort to deal with the difficulty, which if not insoluble is at least unsolved.

The Heresy of Tatian. — As in the case of most heresies, we have only the partisan statements of opponents. Everything is therefore open to some doubt, but the following points seem fairly certain. The heresy which Tatian either founded or adopted was that of the Encratites. Their main doctrines were the evil nature of matter, an absolute forbidding of marriage, abstinence from wine and perhaps from meat. It would also seem that Tatian believed in the existence of aeons, one of whom was the Demiurge of the world. He denied the salvation of Adam. It is also stated that in his celebration of the Mysteries (i.e. the Eucharist) he used only water (see Tertullian, De Jejun. 15; Hippolytus, Philos., 8, 4, 16 and 10, 18; Jerome in Amos ii. 12 and Iren., Adv. Haer., i. 28, iii. 23).

Writings. — According to Eusebius, Tatian wrote many books (Hist. Eccl., iv. 29); of these the- names of the following have survived: — (1) Htpl tipov (mentioned in' Or., 15); (2) Ilepi Scuiiovuv (mentioned in Or., 16) ; (3) A670S irpbs tovs

"EXXtjpcw; (4) UpoffXruxaruv fiifiklov (Eus., v. 13, 1 — a quotation from Rhodon) an attempt to deal with the contradictions to be found in the Bible; (? 5) Upos Axo- T\va)i.kvovs ra wp&s 0eoO (mentioned in Or., 40 as a book which Tatian intended to write, but there is no evidence that he carried his plan into effect ; (6) Htpl toO Kara t6v Surijpa KarapTiafiov (Clem. Alex., Strom., iii. 12, 80) ; (7) The Diatessaron; (? 8) a recension of the Pauline epistles (Eus., Hist. Eccl., iv. 29) says that he was accused of producing a p.tTatt>pacris of the epistles so as to smooth the grammar, and in Jerome's preface to St Paul's Epistle to Titus it is stated that he rejected some of the epistles, but not that to Titus. Of these books only two — the Diatessaron and the irpis tous "EXXijpos are still extant.

The Aotos irp&s robs "EXXrjvos (Oratio ad Graecos) belongs to Tatian's Catholic period. He has the double purpose in view of exposing the weakness of the pagan view of the universe and of commending the Christian explanation. For the former purpose he seems to have made use of an already existent book, perhaps the Toiirav pa of Oenomaus of Gadara, a Syrian who wrote in the time of Hadrian. The same source seems to have been used by Minucius Felix and Tertullian, and Eusebius in his Praep. Evan., v. 19, quotes some other fragments of the work of Oenomaus. The main argument employed is an exposition of the contradic- tions, absurdities and immoralities of Greek mythology. A special attack is made on the doctrine of Fate or Necessity. Tatian insists that man is a free agent: that his sins and the consequent evils in the world are the result of free choice, and that the same free choice can remedy the evil.

His positive explanation of the universe is rather difficult to follow. He lays great stress on the Logos doctrine; all good is to be found in union with the Logos; all evil is in matter or in "spirits of a material nature"; the origin of evil in the world seems to be the choice of the latter rather than of the former; and redemption consists in the

reverse process. But the choice of evil was not made only by man but by angels, who by their evil choice became the demons, that is, the gods of the heathen world. Both men and angels will be judged at the end of the world, when the good will receive again the immortality which was lost through sin, and the wicked will receive death through punishment with immortality ($avarov &ta TipMpiav iv iBavaalq.). Tatian does not deny the stories of the Greek mythology — indeed he protests against any attempt to allegorize it — but he insists that these stories are the record of the deeds of demons and have no religious value. The truth of his views he rests, rather strangely, on the argument that Moses, the writer of the Pentateuch, lived long before Homer, whom he regards as the earliest Greek religious writer, and to prove this he quotes a series of synchronisms, which were made use of by

many subsequent chronologers, including probably Julius Africanus, who in turn was used by Eusebius.

The omissions in the Oratio are even more remarkable than its statements. There is at the most not more than an allusion to Christ, who is never mentioned by name, and though there are frequent allusions to the regaining of life, which is accomplished by union with the Logos, there is no reference to the doctrines of the incarnation or of the atonement.

The date of the writing of the Oratio cannot be fixed more accurately than that it was before 165 and probably about A.D. 150. On the hypothesis that Tatian remained in Rome until the death of Justin it must have been written there: but on internal evidence Harnack thinks, probably correctly, that it was written in Greece,

gerhaps in Athens, and Tatian made at least one journey outside Lome before Justin’s death (cf. Texle und Untersuchungen, I.e., and Gesch. d.

altchr. Lilt., I.e.). (K. L.)

TATRA MOUNTAINS (Hungarian Tarczal) or the High Tatra, the highest group in the central Carpathians, and the central group of the whole Carpathian system. They extend between the rivers Waag, Arva, Dunajec and Poprad, and form a sharply defined and isolated group, rising abruptly like a gigantic wall to an altitude of over 8400 ft. in the midst of a high plateau situated 2600 ft. above sea-level. The Tatra Mountains extend through the Hungarian counties of Lipto and Szepes, and with their northern extremities also through the Austrian crownland of Galicia, and have a length of 40 m. and a width varying between 9 and 15 m. The mean altitude is between 6000 and 7500 ft. The principal peaks are: — the Franz- Josef or Gerls- ford (Hung. Gerlachfalri-Csucs, 8737 ft.), the highest in the Carpathian system; the Lomnitz {Lomniczi-Csucs, 8642 ft.); the Eisthal (Jigvolgyi-Csucs, 8630 ft.); the Tatraspitze or Hohe Visoka (8415 ft.); the Kesmark (8226 ft.); the Meerau- genspitze (Tengerszem-Csucs, 8210 ft.); the Schlagendorf (Szaldki-Csucs, 8050 ft.); and the Krivan (8190 ft.). The principal valleys, which lie at an altitude of 2600 to 3250 ft. above sea-level, and present some of the wildest scenery, are: — the Kohlbach Valley, the Felka Valley, the Valley of Mengsdorf, the Javorina Valley, the Kotlina Valley, in which is the stalactite cavern of Bela, and the Bielka Valley. One of the character- istics of the Tatra are the numerous mountain lakes (112 in number), called by the people ” eyes of the sea.” The largest of them are the Lake of Csorba, in the southern part of the group, which has an area of 50 acres; the Grosser Fischsee in the Bielka Valley; and the Wielki Staw, with an area of 85 acres, the largest of the Five Polish Lakes, which lie in the Roztoka Valley.

There are many summer resorts in the Tatra Mountains, the most frequented being Tatraf tired (German, Schmecks), three small villages situated at an altitude of 3250 ft., at the foot of the Schlagendorf peak; and the environs of the Lake of Csorba, which is called the ” Pearl of the Tatra.”

TATTA, or Thato, an ancient town of British India, in the Sind province of Bombay, 7 m. from the right bank of the main channel of the Indus and 13 m. from a station on the North-Western railway: pop. (1901) 10,783. Tatta was the capital of the Samma dynasty in Lower Sind in the 16th century, and long continued to be the centre of trade in the country, to which it sometimes gave its name in early European travels. An English factory was established here in 1758, but with- drawn after a few years. There are two old mosques, decorated with the coloured tiles characteristic of Sind.

TATTERSALL'S, the London horse auction mart, founded in 1766 by Richard Tattersall (1724-1795), who had been stud groom to the second duke of Kingston. The first premises occupied were near Hyde Park Corner, in what was then the outskirts of London. Two " Subscription rooms " were re- served for members of the Jockey Club, and they became the rendezvous for sporting and betting men. Among the famous dispersal sales conducted by " Old Tatt" were those of the duke of Kingston's stud in 1774 and of the stud of the Prince of Wales (afterwards George IV.) in 1786. The prince often visited Richard Tattersall, and was joint proprietor with him of the Morning Post for several years. He was succeeded by his son, Edmund Tattersall (1758-1810), who extended tlie business of the firm to France. _ The third of the dynasty,

Richard Tattersall (1 785-1859), the eldest of Edmund's three sons, became head of the firm at his father's death. He had his grandfather's ability and tact, and was the intimate of the best sporting men of his time. Another Richard Tattersall (1812-1870), son of the last, then took command of the busi- ness. His great-grandfather's 99-year lease having expired, he moved the business to Knightsbridge. Richard was followed by his cousin, Edmund Tattersall (1816-1898), and he by his eldest son, Edmund Somerville Tattersall (b. 1863).

A son of the second Richard Tattersall, George Tattersall (1817-1849), was a well-known sporting artist. In 1836 he compiled a guide to The Lakes of

England illustrated with forty- three charming line drawings, and he showed skill as an architect by building the Tattersall stud stables at Willesden. His experience in this and similar undertakings led him to publish Sporting Architecture (1841). In the same year, under the pseudonym " Wildrake," he published Cracks of the Day, describing and illustrating sixty-five race-horses. He also con- tributed illustrations to the Hunting Reminiscences of Nimrod (Charles J. Apperley), the Book of Sports (1843), and the New Sporting Almanack.

TATTNALL, JOSIAH (1 795-1871), American naval officer, was born near Savannah, and was educated in England. He entered the United States navy in 1812, and was actively employed till the beginning of the Civil War. He may be said to have gained a world- wide reputation by his use of the phrase " blood is thicker than water " to justify his interven- tion on behalf of the British squadron engaged in the operations against the Peiho Forts. Tattnall's flagship the Toeywan had grounded shortly before, and had been helped off by the British squadron. He was in the Peiho river when the unsuc- cessful attack of the 25th of June 1859 was made. Tattnall not only brought the Toeywan under fire, but lent the aid of his boats to land detachments to turn the Chinese defences. When the Civil War began he took the side of the Con- federacy. He was put in command of its naval forces when Franklin Buchanan resigned after he was wounded in the action with the Federal squadron in Hampton Roads. The Confederate States were never able to form a sea-going squadron, and Tattnall had no chance to do more than make a struggle with insufficient resources on its rivers. He died on the 14th of June 1871.

TATTOO, a signal given by beat of drum and call of bugle at nightfall for soldiers to go to quarters when in garrison or to tents when in the field. The earlier word is taptoo or taptow, and was borrowed from Du. taptoe; the phrase de taptoe slaan, to close the taps, and the parallel Ger. Zapfenstreich, literally " tap-stroke " (Zapf, a tap of a cask), show that it meant originally a signal that the "

taps ” or public-houses Were closed for the night.

TATTOOING (Tahitian, tatu, from to, mark), the practice of decorating the skin, by cutting or puncturing, with various patterns into which a colouring matter is introduced. Though the word is Polynesian, the custom appears to have been almost universal, but tends to disappear before the spread of civiliza- tion. The prohibition to the Jews (Lev. xix. 28) under the Mosaic Law to ” print any marks ” upon themselves is believed to have reference to tattooing, which is still common in Arabia. The North and South American Indians, the Chinese, Japanese, Burmese, all tattoo. The origin of the custom is disputed. It was probably at first for purely ornamental purposes and with the idea of attracting the opposite sex. The discovery in the caves of Western Europe of hollowed stones which had been apparently used for grinding up ochre and other coloured clays is thought evidence that prehistoric man painted himself, and tattooing for decorative reasons may easily date back to the cave-dwellers. The modern savage paints himself as a protec- tion against cold, against the bites of insects or the sun’s rays, and most of all to give himself a ferocious appearance in battle, as Caesar relates of the ancient Britons. Any of these motives may have shared in originating tattooing. Subsequently the practice assumed religious and social significance, varying with the country and according to the age at which it was

performed. Thus in Polynesia it is begun in or about the twelfth year, and becomes thus a mark of puberty; while imong the Arabs and the Kabyles of Algeria infants are tattooed by their mothers for simple ornament or as a means of recog- nizing them. The American Indians bore from their initiation at puberty the mark of the personal or tribal totem, which at once represented the religious side of their life, and served the practical purpose of

enabling them to be known by friendly tribes. Among the Australians tattooing served as a mark of adoption into the family or tribe, the distinctive emblem or kobong being scarred on the thighs.

Tattooing is regarded, too, as a mark of courage. A Kaffir who has been a successful warrior has the privilege of making a long incision in his thigh, which is rubbed with cinders until sufficiently discoloured. Elsewhere tattooing is a sign of mourn- ing, deep and numerous cuts being made on face, breast and limbs. Among the Fijians and Eskimos the untattooed were regarded as risking their happiness in the future world. Some of the most remarkable examples of tattooing are those to be found among the Laos, whose stomachs, thighs, legs and breasts are often completely covered with fantastic animal figures like those on Buddhistic monuments.

The rudest form of tattooing is that practised specially by the Australians and some tribes of negroes. It consists in cutting gashes, arranged in patterns, on the skin and filling the wounds with clay so as to form raised scars. This tattooing by scarring as compared with the more common mode of prick- ing is, as a general rule, confined to the black races. Light- skinned races tattoo, while dark practise scarring. In Poly- nesia the art of tattooing reached its highest perfection. In the Marquesas group of islands, for example, the men were tattooed all over, even to the fingers and toes and crown of the head, and as each operation took from] three to six months, beginning at virility, a man must have been nearly thirty before his body was completely covered. In New Zealand the face was the part most tattooed, and Maori heads so decorated were at one time in much request for European museums, but they are no longer obtainable in the colony. In Japan, where it became a high art, tattooing was neither ceremonial nor sym- bolical. It was in lieu of clothing, and only on those parts of the body usually covered in civilized countries, and in the case of those only who, like the jinrikisha-men, work half naked. The colours used are black, which appears blue, made from Indian ink,

and different tints of red obtained from cinnabar. Fine sewing-needles, eight, twelve, twenty or more, fixed together in a piece of wood, are used. A clever tattooer can cover the stomach or back in a day. As soon as the picture is complete, the patient is bathed in hot water. The Ainus, on the other hand, tattoo only the exposed parts of the body, the women, unlike the Japanese, being frequently patients. The tattooing instruments used in Polynesia consisted of pieces of sharpened bone fastened into a handle, with their edges cut into teeth. These were dipped into a solution of charcoal and then driven into the skin by smart blows with a mallet. During the opera- tion, assistants, usually female relatives, drowned the cries of the sufferer with songs and the beating of drums.

Under the influence of civilization tattooing is losing its ethnological character, and has become, in Europe at least, an eccentricity of soldiers and sailors and of many among the lower and often criminal classes of the great cities. Among eight hundred convicted French soldiers Lacassagne found 40 per cent, tattooed. In the British army till 1879 tr) e letters D. and B. C. for Deserter and Bad Character were tattooed with needles and Indian ink; and tattooing has often been used to identify criminals and slaves.

See Lacassagne, Les Tatouages (Paris, 1881); General Robley, Moko or Maori Tattooing (1896).

TAUCHNITZ, the name of a family of German printers and publishers. Karl Christoph Traugott Tauchnitz (1761–1836), born at Grossbardau near Grimma, Saxony, established a print- ing business in Leipzig in 1796 and a publishing house in 1798. He specialized on the publication of dictionaries, Bibles and

stereotyped editions of the Greek and Roman classics. The business was carried on by his son, Karl Christian Phillipp Tauchnitz (1798–1884), until 1865, when the business was sold to O. Holtze. He left large sums to the city of Leipzig for philan-

thropic purposes. Christian Bernhard, Freiherr von Tauchnitz (1816–1895), the founder of the existing firm of Bernhard Tauchnitz, was the nephew of the first-mentioned. His printing and publishing firm was started at Leipzig in 1837. The Library of British and American Authors, so familiar to travellers on the continent of Europe, was begun in 1841. In 1908 the collection numbered over 4000 volumes. In 1868 he began the Collection of German Authors, followed in 1886 by the Students' Tauchnitz editions. In i860 he was ennobled with the title of Freiherr (Baron), and in 1877 was made a life member of the Saxon Upper Chamber. From 1866 to 1895 he was British Consul- General for the kingdom and duchies of Saxony. He was succeeded in the business by his son, Christian Karl Bernhard, Freiherr von Tauchnitz.

TAULANTII, in ancient geography, an Illyrian people in the neighbourhood of Epidamnus (Thuc. i. 24). They were origin- ally powerful and independent, under their own kings. One of these was Glaucias, who fought against Alexander the Great, and placed Pyrrhus, the infant king of Epirus, whom he had refused to surrender to Cassander, upon the throne (Plutarch, Pyrrhus, 3). Later the Taulantii fell under the sway of the kings of Illyria, and when the Romans were carrying on war against the Illyrian queen, Teuta, they were unimportant.

TADLER, JOHANN (c. 1300–1361), German mystic, was born about the year 1300 in Strassburg, and was educated at the Dominican convent in that city, where Meister Eckhart, who greatly influenced him, was professor of theology (1312–1320) in the monastery school. From Strassburg he went to the Dominican college of Cologne, and perhaps to St James's College, Paris, ultimately returning to Strassburg. In 1324 Strassburg with other cities was placed under a papal interdict. Legend says that Tauler nevertheless continued to perform religious services for the people, but though there may be a germ of historical truth in this story, it is probably due to the desire of the 16th-century Reformers to enroll the famous preachers of the

middle ages among their forerunners. In !338-i339 Tauler was in Basel, then the headquarters of the "Friends of God" (see Mysticism), and was brought into intimate relations with the members of that pious mystical fellowship. Strassburg, however, remained his headquarters. The Black Death came to that city in 1348, and it is said that, when the city was deserted by all who could leave it, Tauler remained at his post, encouraging by sermons and personal visitations his terror-stricken fellow-citizens. His cor- respondence With distinguished members of the Gottesfreunde, especially with Margaretha Ebner, and the fame of his preach- ing and other work in Strassburg, had made him known throughout a wide circle. He died on the 16th of June 1361.

The well-known story of Tauler's conversion and discipline by " the Friend of God from the Oberland " (see Nicholas of Basel) cannot be regarded as historical. Tauler's sermons are among the noblest in the German language. They are not so emotional as Suso's, nor so speculative as Eckhart's, but they are intensely practical, and touch on all sides the deeper problems of the moral and spiritual life.

Tauler's sermons were printed first at Leipzig in 1498, and re- printed wi)h additions from Eckhart and others at Basel (1522) and at Cologne (i543). There is a modern edition by Julius Bamberger (Frankfort, 1864), and R. H. Hutton published Tauler's Sermons l^r Festivals under the title of The Inner Way. See Denifle, Das Buck von geistlicher Armuth (Strassburg, 1877); Carl Schmidt, lohann Tauler von Strassburg (Hamburg, 1841); S. Wink- worth, Tauter 's Life and Sermons (London, 1857); R. A. Vaughan, Hours with the Mystics, 3rd ed., vol. i. pp. 214-307; Preger's Gesch. der deutschen Mystik im Mittelalter, vol. iii. ; W. R. Inge, Christian Mysticism: R. M. Jones, Studies in Mystical Religion (1909).

TAUNG-GYI, the headquarters of the superintendent and political officer, southern Shan States, Burma. It is situated in 96 58' E. and 20 47' N., at an

altitude of about 5000 ft., in a depressed plateau on the crest of the Sintaung hills. It is in

the state of Yawnghwe, 105 m. from Thazi railway station on the Rangoon-Mandalay railway, with which it is connected by a cart-road. The civil station dates from 1894, when there were only a few Taungthu huts on the site. There were in 1906 upwards of a thousand houses, many of them substantially built of brick. Since 1906 the southern Shan States have been garrisoned by military police, whose headquarters are in Taung- gyi. The station is to a considerable extent a commercial depot for the country behind, and there are many universal supply shops of most nationalities (except British) — Austrian, Chinese and Indian. The five-day bazaar is the trading place of the natives of the country. A special quarter contains the tem- porary residences of the chiefs when they visit headquarters, and there is a school for their sons. An orchard for experi- mental cultivation has met with considerable success. The average shade maximum temperature is 84° ; the minimum 39°.

TAUNTON, HENRY LABOUCHERE, Baron (1 798-1869), English politician, came of a French Huguenot family, which, on leaving France, settled in Holland. His father, Peter Caesar Labouchere, merchant, was a partner in the wealthy Amsterdam banking firm of Hope & Company; 1 be went to live in England, and married a daughter of Sir Francis Baring. Henry was his elder son, while a younger son, John, was the father of the later well-known Radical member of parliament and proprietor of Truth, Henry Labouchere (b. 1831). He was educated at Winchester and Christ Church, Oxford, and entered the House of Commons as a Whig in 1826. From 1830 to 1858 he sat for Taunton, Somerset. After filling various minor offices, he became president of the Board of Trade in 1839-41 ; and in 1846 he was chief secretary for Ireland. In 1847-52 he was again

president of the Board of Trade, and from 1855 to 1858 secretary of state for the colonies. In 1859 he was created Baron Taunton, but on his death, on the 13th of July 1869, the title became extinct.

TAUNTON, a municipal and parliamentary borough and market town of Somersetshire, England, on the river Tone, 163 m. W. by S. of London by the Great Western railway. Pop. (1901) 21,087. Standing in the beautiful valley of Taunton Dene, the town is chiefly built on the south side of the river. Its three main streets, broad and regular, converge upon a triangular space called the Parade, where there is a market cross. The parish church of St Mary Magdalene is one of the finest and largest Perpendicular churches in England. Remnants of Norman work are preserved in the chancel arch, and of Early English work in the north aisles and transepts. The tower, noteworthy for its union of elaborate ornament and lightness of effect, exceeds 150 ft. in height. There are double aisles on each side of the nave, and the whole interior is admirable in its harmony of design and colour. Little is left of an Austin priory established in the reign of Henry I. by William Giffard, bishop of Winchester, who also built the castle, now a museum for prehistoric, Roman and medieval antiquities. Taunton castle, though largely rebuilt in 1496, embodies the remains of a very early fortress, while its walls and keep date from the 12th century, its towers and gatehouses from the 13th or 14th. At the Restoration it was dismantled and its moat filled in. Among the schools is a grammar school founded in 1522 by Richard Fox, bishop of Winchester. There are also public gardens, assembly rooms, almshouses, a town hall, market hall, a hospital founded in 1819 to commemorate the jubilee of George III., and a shire hall containing a series of marble busts representing, among other Somerset worthies, Admiral Blake, John Locke the philosopher, the Puritan leader Pym, Bishop Ken, and Speke the African explorer. The local industries are silk, linen and glove manufactures, iron and brass founding, coachbuilding, cabinetmaking, malting and brewing;

while Taunton Dene is famous as a rich agricultural district.

1 The Amsterdam Hopes were descended from Henry Hope, son of a Scottish merchant, and younger brother of Sir Thomas Hope (d. 1646), the famous Scottish lord-advocate, ancestor of the earls of Hopetoun (marquess of Linlithgow, q.v.). Among his descen- dants was Thomas Hope (1770-1831), father of A. J. B. Beresford- Hope (1820-1887), politician and author.

The parliamentary borough of Taunton returns one member. The town is governed by a mayor, six aldermen and eighteen councillors. Area, 1393 acres.

There was perhaps a Romano-British village near the suburb of Holway, and Taunton (Tantun, Tantone, Tauntone) was a place of considerable importance in Saxon times. King Ine threw up an earthen castle here about 700, and a monastery was founded before 904. The bishops of Winchester owned the manor, and obtained the first charter for their " men of Taunton " from King Edward in 904, freeing them from all royal and county tribute. At some time before the Domesday Survey Taunton had become a borough with very considerable privileges, governed by a portreeve appointed by the bishops. It did not obtain a charter of incorporation until that of 1627, which was renewed in 1677. The corporation existed until 1792, when the charter lapsed owing to vacancies in the number of the corporate body, and Taunton was not reincorporated until 1877. Parliamentary representation began in 1299, and two members were returned until 1885. A fair on the 7th of July was held under a charter of 1256, and there are now two fairs yearly, on the 17th of June and the 7th of July. The Saturday market for the sale of corn, cattle and provisions dates from before the Conquest. There is also a smaller market on Wednesdays. The medieval fairs and markets of Taunton were celebrated for the sale of woollen cloth called "Tauntons" made in the town. On the decline of the west of England woollen indus- try, silk-weaving was introduced at the end of the 18th

century.

See Victoria County History, Somerset; Toulmen's History of Taunton, edited by James Savage (1830).

TAUNTON, a city and one of the county-seats of Bristol county, Massachusetts, U.S.A., at the head of ocean navigation on the Taunton river, 17 m. above its mouth, about 35 m. S. of Boston, and about 14 m. N. of Fall River. Pop. (1800) 25,448; (1900) 31,036, of whom 9140 were foreign-born, 2844 being Irish, 2366 French-Canadians, 1144 English, and 801 English- Canadians; (1910, U.S. census) 34,259. Taunton is served by the New York, New Haven & Hartford railroad (Old Colony Branch) and by interurban electric railways connecting with Fall River, New Bedford, Providence and Boston. The channel of the Taunton river has been deepened and widened by the Federal government, and in 19 10 vessels of 11 ft. draft could reach the city at high water (mean range of tide at Taunton, 3-4 ft.). Within the corporate limits of the city, which has a land area of 44-25 sq. m., there are six villages — Hopewell, Britanniaville, Oakland, Whittenton, East Taunton and the Weir. Taunton Green, a rectangular stretch of land fringed with lofty elms, the " common " of the New England town, about which is the business portion of the modern city, is 1 m. from the Weir, the port of the city.

The city contains interesting specimens of colonial or early 19th-century architecture. Among the modern public buildings are the handsome granite County Court House (1895), facing the Green, the Public Library building (given by Andrew Carnegie), the registry building, the county gaol, the city hall, the post office, an old ladies' home, an emergency hospital, the Morton Hospital, occupying the fine old residence of Governor Marcus Morton, and the Y.M.C.A. building. The Bristol County Law Library and Old Colony Historical Society (incorporated in 1853 and organized in 1854) possess valuable collections of books, and the latter has a collection of portraits and antiquities. Bristol Academy (1792; non-sectarian) is a well-known pre-

paratory school, and there is also a commercial school — the Bristol County Business College. At Norton (pop. in< 1910, 2544), directly N. of Taunton, and formerly within its boundaries, is Wheaton Seminary (1834) for girls. Among social clubs are the Winthrop Club, the Bristol Club, the Taunton Boat Club, the Yacht Club, and the Country Club. A good water-supply, owned by the city, is obtained from neighbouring lakes and ponds, along the shores of which are many summer cottages. Taunton was one of the first cities in the United States to own and operate its own electric lighting plant, which it acquired from a private corporation in 1897. Its industrial importance

began with the establishment of ironworks in 1656; the plant then opened continued in active operation for about 225 years. Brick-making and shipbuilding were two of the early industries; the latter, formerly very important, has now been abandoned. The manufactures to-day are extensive and varied. The aggregate value of the factory product in 1905 was $13,644,586, an increase of 18-2 per cent, over that of 1900. Of this amount the value of the cotton manufactured was $6,141,598, or 45 per cent, of the whole. Herring fisheries give occupation during a part of the year to a considerable number of workers. Taunton has a prosperous jobbing trade, and large shipping interests, the coastwise trade being particularly important.

Taunton was founded in 1638, when the territory was pur- chased from Massasoit by settlers from the Massachusetts Bay Colony, and became the frontier town of Plymouth Colony. Myles Standish was engaged on the original survey. But there had been earlier settlers in the region — at " Tecticutt " (Titicut), which later became part of Taunton. The settlement at Taunton was at first known as Cohannet, but the present name — from Taunton, Somerset, England, the home of many of the settlers — was soon adopted. The

town was incorporated in 1639. In 167 1 it was the scene of a meeting between Gov. Thomas Prince and King Philip, at which a treaty was drawn up. During King Philip's War, Taunton was a base of opera- tions for Plymouth Colony troops under Gov. Josiah Winslow. In 1686 Taunton was one of the towns which refused to comply with Sir Edmund Andros's demands for a tax levy. For some years Thomas Coram, the philanthropist and founder of the London Foundling Hospital, was engaged in the shipbuilding industry here. In 1774, after the passage of the Boston Port Bill, the people of Taunton showed their sympathy for Boston by raising on the Green a red flag on which were inscribed the words " Liberty and Union." The leader of the patriotic party at this time was Robert Treat Paine, to whose memory a bronze statue has been erected. During Shays's rebellion the Taunton court-house was twice besieged by insurgents, who were each time dispersed through the resolute action and firmness of Gen. David Cobb, one of the judges. The event is commemo- rated by a tablet on Taunton Green. In Berkley, which until 1735 was a part of Dighton (Taunton South Purchase, separated from Taunton in 1712), is the famous Dighton Rock, with in- scriptions long erroneously supposed to have been made by Norse discoverers of America, but now known to be the work of Indians. Taunton was chartered as a city in 1864. In 1909 a new city charter was adopted, under which the mayor and nine councilmen (elected at large) were the only city officers elected at any city election; candidates for these offices are nominated by petition; the mayor appoints, subject to the approval of the council, a chief of police and a city solicitor.

See S. H. Emery, History of Taunton from its Settlement to the Present Time (Syracuse, N.Y., 1893) ; D. H. Hurd, History of Bristol County (Philadelphia, 1883) ; Quarter Millennial Celebration (Taunton,

1889).

TAUNUS, a wooded mountain range of Germany in the

Prussian province of Hesse-Nassau and the grand-duchy of Hesse-Darmstadt. It lies between the Rhine and the Main on the S. and the Lahn on the N., and stretches some 55 m. E. and W. Its southern slopes stand 5 to 10 m. back from the Main, but leave only a very narrow strip of low ground alongside the Rhine, and from Bingen downwards they overhang it with precipitous crags, many of which are crowned with picturesque ruins. It has an average elevation of 1500 ft. The loftiest peaks occur in the east, where the imposing cluster of Grosser Feldberg (2887 ft.), Kleiner Feldberg (2714 ft.) and Altkonig (2618 ft.) dominate the Wetterau and the valley of the Main. Above the Rheingau, or the slopes which stretch down to the Rhine between Biebrich and Bingen, the altitude averages 1500 to 1700 ft. The geological core of the system consists of primitive argillaceous schists, capped by quartzite and broken through in places by basalt. On the northern side, which sinks on the whole gently towards the Lahn, the greywacke formation attains a considerable development. The hills are almost

everywhere well wooded, the predominant trees being firs and beeches. The lower slopes are, wherever possible, planted with vineyards, orchards and chestnut and almond groves. The vineyards of the Rheingau are specially famous, and yield brands of wine — e.g. Johannisberger, Steinberger, Rudesheimer, Marcobrunner, Hochheimer, Rauenthaler, Assmannshauser, and others — which enjoy the highest reputation amongst the vintages of Germany. The Taunus is also famous for the number and efficacy of its mineral springs, which annually attract thousands of visitors to the celebrated spas of Wiesbaden, Homburg, Ems, Schlangenbad, Schwalbach, Soden and Nauheim, while the waters of Selters and other springs are exported in large quantity. The sheltered position and warm climate have led also to the establishment of the health resorts of Falkenstein (1875) and Schmitten, and of tourist centres at Konigstein, Cronberg and Ober Ursel.

Above Falkenstein stand the ruins of the ancestral castle of Kuno, the powerful archbishop of Trier;

above Konigstein are the remains of a fortress of like name, formerly belonging to the electors of Mainz, and destroyed by the French in 1796; on Altkonig are two concentric lines of pre-Roman fortifications, 4557 and 2982 ft. in circumference. Interest also attaches to the once celebrated Cistercian abbey of Eberbach, founded in n 16; to Eltville, a favourite residence of the archbishops of Mainz in the 14th and 15th centuries; and to the family seats of Ep'pstein, Katzenelnbogen and Scharfenstein.

The chief historical monument of this region is the Saalburg, an ancient Roman fort serving as a centre of communications along the limes or fortified frontier-line drawn from Rhine to Main by Domitian (see Limes Germanicus). The excavations, which were begun in 1868, have revealed four different encampments, the earliest of which perhaps dates back to the time of the earliest Roman conquest. The remains now visible are an excellent type of the solidly constructed permanent camps of the middle imperial period (about A.D. 200). Elaborate restorations have been under- taken, and the minor remains have been housed since 1904 in the reconstructed praetorium or headquarters. An electric tram con- nects the Saalburg with Homburg (distance 4 m.).-

Forty miles to the west of the Saalburg there is a modern national monument, the colossal figure of Germania, which stands on a bold spur of the Taunus 740 ft. above the Rhine. It was erected in 1883 to commemorate the War of 1870-71 and the re-creation of the German empire in the latter year. The steep crags of the western end of the Taunus, where they abut upon the Rhine, are rich in the romantic associations of the great river. Here are the rock of the siren Lurlei or Lorelei; the old castles of Stahleck and Pfalz, which belonged to the Counts Palatine of the Rhine; and the quaint medieval towns of Caub and St Goarshausen. Schloss Friedrichshof, at the foot of the Feldberg and Altkonig, immediately north of Kronberg, was built in 1889-97 by the widowed empress Frederick, and is the place

where she died in 1901. The railway from Frankfort-on-Main to Oberlahnstein skirts the south and west foot of the range, that from Frankfort to Cassel the eastern side, while the line from Wiesbaden and Hochst to Limburg intersects it from south to north.

See Vie Heilquellen des Taunus (published by Grossmann, Wies- baden, 1887); Sievers, Zur Kenntnis des Taunus (Stuttgart, 1891), and the Taunus Club's Guide (4th ed. Frankfort-on-Main, 1905). For the Saalburg see L. Jacobi, Das Romerhastell Saalburg (2 vols., Homburg, 1897); also a small guide by the same author (3rd ed. Homburg, 1907).

TAUPO, a township of East Taupo county, New Zealand, in the south-west of the Hot Spring district of North Island. It attracts many visitors both as a health resort and on account of the magnificent scenery and remarkable volcanic phenomena of the surrounding district. It lies on the north-east shore of lake Taupo, the largest lake in the island, having an extreme length of 26 m. and a shore-line, not counting minor indenta- tions, of about 100 m., and lying 1200 ft. above sea-level. The river Waikato, which reaches the west coast not far from Manukau Harbour near Auckland, here leaves the lake. The district abounds in geysers, springs, mud volcanoes and other phenomena; some of the waters have petrifying powers, and some of the springs are vividly coloured. On the road running N.E. to Rotorua (56 m.) are the resorts of Weirakei (7 m.) and Ateamuri (31 m.). Lake Taupo is finely situated, hills rising over 2000 ft. immediately from the shores, while the mountains of Tongariro, Ngauruhoe, an active volcano, and Ruapehu, a snow-clad peak, back the view to the south and mark the limit of the great volcanic line which extends 160 m. north-westward

to White Island in the Bay of Plenty. The upper Waikato enters the lake from the south near Tokaano,

where there is another collection of springs, &c. The river forms several fine falls and rapids below the lake.

TAURELLUS, NICOLAUS (1547–1606), German philosopher and theologian, was born at Mompelgard. He read theology at Tubingen and medicine at Basel, where he lectured on physical science. He subsequently became professor of medicine at Altdorf, where he died in 1606. He attacked the dominant Aristotelianism of the time, and endeavoured to construct a philosophy which should harmonize faith and knowledge, and bridge over the chasm made by the first Renaissance writers who followed Pomponazzi. Scholasticism he condemned on account of its unquestioning submission to Aristotle. Taurellus maintained the necessity of going back to Christianity itself, as at once the superstructure and the justification of philosophy.

His chief works were Philosophiae Triumphus (1573) ; Synopsis Metaphy sitae Aristotelis (1596); De Rerum Aelernitate (1604); and a treatise written in criticism of Caesalpinus entitled Caesae Alpes (1597). See Schmid–Schwarzenburg, Nicolaus Taurellus (i860 and

1864).

TAURI, the earliest known inhabitants of the mountainous south coast of the Crimea (Herodotus iv. 103). Nothing is certain as to their affinities. They probably represent an old population perhaps connected with some Caucasus stock; in spite of the resemblance of the name Taurisci they are not likely to be Celts. They were famous in the ancient world for their maiden goddess, identified by the Greeks with Artemis Tauropolos or Iphigeneia, whom the goddess was said to have brought to her shrine at the moment when she was to have been sacrificed at Aulis. Orestes sought his sister, and almost fell a victim to the Tauric custom of sacrificing to the maiden shipwrecked strangers, a real custom which was the ground of the whole myth. His adventures were the subject of plays by Euripides and Goethe. Towards the end of the 2nd century B.C. we find the

Tauri dependent allies of the Scythian king Scilurus, who from their harbour of Symbolon Portus or Palacium (Balaclava) harassed Chersonese (q.v.). Their later history is unknown. (E. H. M.)

TAUR1DA, a government of southern Russia, including the peninsula of Crimea and a tract of mainland situated between the lower Dnieper and the coasts of the Black Sea and the Sea of Azov. It is bounded by these two seas on the S., while it has on the N. the governments of Kherson and Ekaterinoslav. The area is 24,532 sq. m., of which 9704 sq. m. belong to the Crimea. The continental part consists of a gently undulating steppe (from sea-level up to 400 ft. in the north-east) of black earth, with only a few patches of saline clay on the shores of the Sivash or Putrid Sea, and sand along the lower Dnieper. The government is drained by the Dnieper, which flows along the frontier for 180 m., and by two minor streams, the Moloch- naya and Berda. Many small lakes and ponds occur in the north, as well as on the Kinburn peninsula, at the mouth of the Dnieper, where salt is made. There are no forests. The climate is continental, and resembles that of central Crimea and Kherson. The population in 1906 was estimated at 1,634,700. The continental portion, although less mixed than that of the peninsula, consists of Great and Little Russians, who constitute 83 per cent, of the whole, Germans (5-4 per cent.), Bulgarians (2-8 per cent.), Jews (3-8 per cent.), and Armenians. The chief occupation of the people is agriculture, and every available patch of land has been brought under the plough. In 1900 no less than 43 per cent, of its area was under cereal crops alone. The principal crops are rye, wheat, oats, barley and potatoes. Tobacco is also grown, and over 32,000 acres are under vineyards, while gardens extend to some 15,500 acres in Crimea. Live-stock breeding is extensively engaged in. Salt is the only mineral raised, but the iron industry, and especially the manufacture of agricultural machinery (e.g. at Berdyansk), has greatly developed. The export trade is con- siderable, the chief ports being Sevastopol, Eupatoria, Theo-

dosia, and Yalta on the Black Sea, and Azov and Berdyansk

on the Sea of Azov. The fisheries along the coast are active. Manufactures are insignificant, but there is a brisk export trade in grain, salt, fish, wool and tallow. The government is divided into eight districts, the chief towns of which are Sim- feropol, capital of the government, Eupatoria and Theodosia, in Crimea, and Aleshki, Berdyansk, Melitopol, Perekop and Yalta on the continent.

TAURINI, an ancient Ligurian people, although the name may be of Celtic origin, who occupied the upper valley of the Padus (Po) in the centre of the modern Piedmont. In 218 B.C. they were attacked by Hannibal, with whose friends the Tnsubres they had a long-standing feud, and their chief town (Taurasia) was captured after a three days' siege (Polybius iii. 60, 8). As a people they are rarely mentioned in history. It is not known when they definitely became subject to the Romans, nor when the colony of (Julia) Augusta Taurinorum (Torino, Turin) was founded in their territory (probably by Augustus after the battle of Actium). Both Livy (v. 34) and Strabo (iv. p. 209) speak of the country of the Taurini as includ- ing one of the passes of the Alps, which points to a wider use of the name in earlier times.

See H. Nissen, Italische Landeskunde, ii. (1902), p. 163; and ancient authorities quoted in A. Holder, Altceltischer Sprachschatz, ii. (1904).

TAUROBOLIUM, the sacrifice of a bull, usually in con- nexion with the worship of the Great Mother of the Gods, though not limited to it. Of oriental origin, its first known performance in Italy occurred in a.d. 134, at Puteoli, in honour of Venus Caelestis. Prudentius describes it in Peristephanon (x., 1066 ff.): the priest of the Mother, clad in a toga worn cinctu Gabino, with golden crown and fillets on his head, takes his place in a trench covered by a platform of planks pierced with fine holes, on which a bull, magnificent with flowers and

gold, is slain. The blood rains through the platform on to the priest below, who receives it on his face, and even on his tongue and palate, and after the baptism presents himself before his fellow-worshippers purified and regenerated, and receives their salutations and reverence.

The taurobolium in the 2nd and 3rd centuries was usually performed as a measure for the welfare of the Emperor, Empire, or community, its date frequently being the 24th of March, the Dies Sanguinis of the annual festival of the Great Mother and Attis. In the late 3rd and the 4th centuries its usual motive was the purification or regeneration of an individual, who was spoken of as renatus in aeternum, reborn for eternity, in consequence of the ceremony (Corp. Insc. Lat. vi. 510-512). When its efficacy was not eternal, its effect was considered to endure for twenty years. It was also performed as the ful- filment of a vow, or by command of the goddess herself, and the privilege was limited to no sex nor class. The place of its performance at Rome was near the site of St Peter's, in the excavations of which several altars and inscriptions com- memorative of taurobolia were discovered.

The taurobolium was probably a sacred drama symbolizing the relations of the Mother and Attis (q.v.). The descent of the priest into the sacrificial foss symbolized the death of Attis, the withering of the vegetation of Mother Earth; his bath of blood and emergence the restoration of Attis, the rebirth of vegetation. The ceremony may be the spiritualized descent of the primitive oriental practice of drinking or being baptized in the blood of an animal, based upon a belief that the strength of brute creation could be acquired by consumption of its sub- stance or contact with its blood. In spite of the phrase renatus in aeternum, there is no reason to suppose that the ceremony was in any way borrowed from Christianity.

See Esperandieu, Inscriptions de Lectoure (1892), pp. 94 ff.; Zippel, Festschrift zum Doctorjubilaeum, Ludwig Friedlander, 1895, p. 489 f . ; Showerman,

The Great Mother of the Gods, Bulletin of the University of Wisconsin, No. 43, pp. 280-84 (Madison, 1901); Hepding, Attis, Seine Mythen una" Sein Kult (Giessen, 1903), pp. 168 ff., 201; Cumont, Le Taurobole et le Culte de Bellone, Revue d'histoire et de literature religieuses, vi., No. 2, 1901. (G. Sn.)

TAURUS (" the Bull "), in astronomy, the second sign of the zodiac iq.v.), denoted by the symbol **tf. It is also a con- stellation of very great antiquity, the Pleiades and Hyades, two star clusters, being possibly referred to in the Old Testa- ment; Aldebaran, a star, is mentioned by Hesiod and Homer. Ptolemy catalogued 44 stars, Tycho Brahe 43, Hevelius 51. The Greeks fabled this constellation to be the bull which bore Europa across the seas to Crete, and was afterwards raised to the heavens by Jupiter, a Tauri, or Aldebaran, is a brilliant star of a reddish colour and magnitude 1-2; this star is the principal object of the group named the Hyades, named after the seven daughters of Atlas and Aethra — Ambrosia, Coronis** Eudora, Pasithoe, Plexaris, Pytho and Tycho — fabled by the Greeks to have been transformed into stars by Jupiter for bewailing the death of their brother Hyas. Another star group in this constellation is the Pleiades. X Tauri is an " Algol " variable, varying in magnitude from 3-4 to 4-2. Nebula M.i Tauri is a famous " crab " nebula, so named by Lord Rosse from its clawlike protuberances; it is the first of the series of nebula on the enumeration of Messier.

TAUSEN, HANS (1494-1561), the protagonist of the Danish Reformation, was born at Birkende in Funen in 1494. The quick-witted peasant lad ran away from the plough at an early age, finally settling down as a friar in the Johannite cloister of Antvorskov near Slagelse. After studying at Rostock and teaching there for a time and also at Copenhagen, he was again sent abroad by his prior, visiting, among

other places, the newly founded university of Leyden and making the acquaint- ance of the Dutch humanists. He was already a good linguist, understanding both Latin and Hebrew. Subsequently he translated the books of Moses from the original. In May 1523 Tausen went to Wittenberg, where he studied for a year and a half, when he was recalled to Antvorskov. In consequence of his professed attachment to the doctrines of Luther he was first imprisoned in the dungeons of Antvorskov and thence transferred, in the spring of 1525, to the Grey Friars' cloister at Viborg in Jutland, where he preached from his prison to the people assembled outside, till his prior, whom he won over to his views, permitted him to use the pulpit of the priory church. At Viborg the seed sown by Tausen fell upon good soil. Several young men in the town had studied at Wittenberg, and the burghers, in their Lutheran zeal, had already expelled their youthful Bishop Jorgen Friis. Tausen's preaching was so revolutionary that he no longer felt safe among the Franciscans, so he boldly discarded his monastic habit and placed himself under the protection of the burgesses of Viborg. At first he preached in the parish church of St John, but this soon growing too small for him he addressed the people in the market-place from the church tower. When the Franciscans refused to allow him to preach in their large church, the mob broke in by force. A compromise was at last arranged, whereby the friars were to preach in the forenoon and Tausen in the afternoon. The bishop, very naturally averse to these high-handed pro- ceedings, sent armed men to the church to arrest Tausen, but the burghers, who had brought their weapons with them, drove back" the bishop's swains." In October 1526 King Frederick I., during his visit to Aalborg, took Hans Tausen under his pro- tection, appointed him one of his chaplains, and charged him to continue for a time " to preach the holy Gospel" to the citizens of Viborg, who were to be responsible for his safety, thus identify- ing himself with the new doctrines in direct contravention of the plain letter of his coronation oath. Tausen found a diligent fellow-worker in

Jorgen Viberg, better known as Sadolin, whose sister, Dorothea, he married, to the great scandal of the Catholics. He was indeed the first Danish priest who took unto himself a wife. He was also the first of the reformers who used Danish instead of Latin in the church services, the " Even song " he introduced at Viborg being of great beauty. Tausen was cer- tainly the most practically gifted of all the new native teachers. But he was stronger as a preacher and an agitator than as a writer, the pamphlets which he now issued from the press of his colleague the ex-priest Hans Vingaard, who settled down

at Viborg as a printer, being little more than adaptations of Luther's opuscula. He continued to preach in the Grey Friars' church, while Sadolin, whom he had " consecrated " a priest, officiated at the church of the Dominicans, who had already fled from the town. The stouter-hearted Franciscans only yielded to violence persistently applied by the soldiers whom their opponents quartered upon them. In 1529 Tausen's " mission " at Viborg came to an end. King Frederick now recommended him to Copenhagen to preach heresy at the church of St Nicholas, but here he found an able and intrepid opponent in Bishop Ronne. Serious disturbances thereupon ensued; and the Protestants, getting the worst of the argu- ment, silenced their gainsayers by insulting the bishops and priests in the streets and profaning and devastating the Catholic churches. A Herredag, or Assembly of. Nobles, was held at Copenhagen on the 2nd of July 1530, ostensibly to mediate between the two conflicting confessions, but the king, from policy, and the nobility, from covetousness of the estates of the prelates, made no attempt to prevent the excesses of the Protestant rabble, openly encouraged by Tausen. On the other hand, the preachers failed to obtain the repeal of the Odense recess of 1527 which had subjected them to the spiritual jurisdiction of the prelates. On the death of King Frederick, Tausen, at the instance of Ronne, was, at the Herredag of 1533, convicted of blasphemy and condemned to expulsion from the

diocese of Sjaelland, whereupon the mob rose in arms against the bishop, who would have been murdered but for the courageous intervention of Tausen, who conducted him home in safety. The noble-minded Ronne thereupon, from gratitude, permitted Tausen to preach in all his churches on condition that he' moderated his tone. On the final triumph of the Reformation Tausen was appointed bishop of Ribe (1542), an office he held with great zeal and fidelity for twenty years.

See Suhr, Tausens Levnet (Ribe, 1836) ; Danmarks Riges Historie, vol. iii. (Copenhagen, 1897-1905). (R. N. B.)

TAUSSIG, FRANK WILLIAM (1859- ")> American economist, was born at St Louis, Missouri, on the 28th of December 1859. He was educated in his native city and at Harvard University, where he became professor of political economy in 1892. He has made a particular study of finance, and has written Tariff History of the United States (1888); The Silver Situation in the United States (1892); Wages and Capital (1896). He was for some time editor of the American Quarterly Journal of Economics.

TAUTPHOEUS, JEMIMA, Baroness von (1807-1893), British novelist, was born at Seaview, Co. Donegal, on the 23rd of October 1807, her maiden name being Montgomery. In 1838 she married the Baron von Tautphoeus of Marquartsteirt (1805-1885), chamberlain to the king of Bavaria, and in Bavaria she passed most of the rest of her life. She was the author of several novels, written in English, describing South German life, manners and history. The Initials (1850), Quits (1857), and At Odds (1863) are the best known of these. She died on the 12th of November 1893.

TAVASTEHUS, a province of Finland, bounded by the provinces of Nyland, Viborg, Vasa and St Michel. Pop. (1904) 317,326. The province is largely unproductive, much of the surface being composed of hills and lakes, but in favourable districts agriculture is sucessfully pursued, and there is a

school of agriculture and an institute of forestry.

TAVERN, the old name for an inn, a public house where liquor is sold and food is supplied to travellers. It is, however, now usually applied to a small ale-house where liquor only is supplied. The word comes through Fr. from Lat. taberna, a booth, shop, inn. It is usually connected with the root seen in " tabula," board, whence Eng. " table," and thus meant originally a hut or booth made of planks or boards of wood.

TAVERNIER, JEAN BAPTISTE (1605-1689), French traveller and pioneer of trade with India, was born in 1605 at Paris, where his father Gabriel and uncle Melchior, Pro- testants from Antwerp, pursued the profession of geographers and engravers. The conversations he heard in his father's

house inspired Tavernier with an early desire to travel, and in his sixteenth year he had already visited England, the Low Countries and Germany, and seen something of war with the imperialist Colonel Hans Brenner, whom he met at Nuremberg. Four and a half years in the household of Brenner's uncle, the viceroy of Hungary (1624-29), and a briefer connexion in 1629 with the duke of Rethel and his father the duke of Nevers, prince of Mantua, gave him the habit of courts, which was invaluable to him in later years; and at the defence of Mantua in 1629, and in Germany in the following year with Colonel Walter Butler (afterwards notorious through the death of Wallenstein), he gained some military experience. When he left Butler to view the diet of Ratisbon in 1630, he had seen Italy, Switzerland, Germany, Poland and Hungary, as well as France, England and the Low Countries, and spoke the prin- cipal languages of these countries. He was now eager to visit the East; and at Ratisbon he found the opportunity to join two French fathers, M. de Chapes and M. de St Liebau, who had received a mission to

the Levant. In their company he reached Constantinople early in 1631, where he spent eleven months, and then proceeded by Tokat, Erzerum and Erivan to Persia. His farthest point in this first journey was Ispahan ; he returned by Bagdad, Aleppo, Alexandretta, Malta and Italy, and was again in Paris in 1633. Of the next five years of his life nothing is known with certainty, but it was probably during this period that he became controller of the household of the duke of Orleans. In September 1638 he began a second journey (1638-43) by Aleppo to Persia, and thence to India as far as Agra and Golconda. His visit to the court of the Great Mogul and to the diamond mines was connected with the plans realized more fully in his later voyages, in which Tavernier travelled as a merchant of the highest rank, trading in costly jewels and other precious wares, and finding his chief customers among the greatest princes of the East. The second journey was followed by four others. In his third (1643-49) he went as far as Java, and returned by the Cape; but his relations with the Dutch proved not wholly satisfactory, and a long lawsuit on his return yielded but imperfect redress. In his last three journeys (1651-55, 1657-62, 1664-68) he did not proceed beyond India. The details of these voyages are often obscure; but they completed an extraordinary knowledge of the routes of overland Eastern trade, and brought the now famous merchant into close and friendly communication with the greatest Oriental potentates. They also secured for him a large fortune and great reputation at home. He was presented to Louis XIV., " in whose service he had travelled sixty thousand leagues by land," received letters of nobility (on the 16th of February 1669), and in the following year purchased the barony of Aubonne, near Geneva. In 1662 he had married Madeleine Goisse, daughter of a Parisian jeweller.

Thus settled in ease and affluence, Tavernier occupied him- self, as it would seem at the desire of the king, in publishing the account of his journeys. He had neither the equipment nor the

tastes of a scientific traveller, but in all that referred to commerce his knowledge was vast and could not fail to be of much public service. He set to work therefore with the aid of Samuel Chappuzeau, a French Protestant litterateur, and produced a Nouvelle Relation de I'Interieur du Serail du Grand Seigneur (410, Paris, 1675), based on two visits to Constanti- nople in his first and sixth journeys. This was followed by Le Six Voyages de J . B. Tavernier (2 vols. 4to, Paris, 1676) and by a supplementary Recueil de Plusieurs Relations (4to, Paris, 1679), in which he was assisted by a certain La Chapelle. This last contains an account of Japan, gathered from merchants and others, and one of Tongking, derived from the observations of his brother Daniel, who had shared his second voyage and settled at Batavia; it contained also a violent attack on the agents of the Dutch East India Company, at whose hands Tavernier had suffered more than one wrong. This attack was elaborately answered in Dutch by H. van Quellenburgh (Vindicim Batavicaz, Amst., 1684), but made more noise because Arnauld drew from it some material unfavourable to

Protestantism for his Apologie pour les Catholiques (1681), and so brought on the traveller a ferocious onslaught in Jurieu's Esprit de M. Arnauld (1684). Tavernier made no reply tOiJurieu; he was in fact engaged in weightier matters, for in 1684 he travelled to Berlin at the invitation of the Great Elector, who commis- sioned him to organize an Eastern trading company — a project never realized. The closing years of Tavernier's life are obscure; the time was not favourable for a Protestant, and it has even been supposed that he passed some time in the Bastille. What is certain is that he left Paris for Switzerland in 1687, that in 1689 he passed through Copenhagen on his way to Persia through Muscovy, and that in the same year he died at Moscow. It appears that he had still business relations in the East, and that the neglect of these by his nephew, to whom they were intrusted, had determined the indefatigable old man to a fresh journey.

Tavernier's travels, though often reprinted and translated, have two defects: the author uses other men's material without dis- tinguishing it from his own observations; and the narrative is much confused by his plan of often deserting the chronological order and giving instead notes from various journeys about certain routes. The latter defect, it is true, while it embarrasses the bio- grapher, is hardly a blemish in view of the object of the writer, who sought mainly to furnish a guide to other merchants. A careful attempt to disentangle the thread of a life still in many parts obscure has been made by Charles Joret, Jean Baptiste Tavernier d'aprhs des Documents Nouveaux, 8vo, Paris, 1886, where the literature of the subject is fully given

See also an English translation of Tavernier's account of his travels so far as relating to India, by V. Ball, 2 vols. (i£

TAVIRA, a seaport of southern Portugal, in the district of Faro (formerly the province of Algarve); at the mouth of the river Seca, 21 m. E.N.E. of Faro. Pop. (1900) 12,175. The harbour is protected by two forts, and the public buildings include a Moorish citadel, a Renaissance church, and a ruined nunnery founded by King Emanuel (149 5-1 521). Tavira has sardine and tunny fisheries, and carries on a considerable coasting trade. Excellent fruit is grown in the neighbourhood.

TAVISTOCK, a market town in the Tavistock parliamentary division of Devonshire, England, in the valley of the Tavy, on the western border of Dartmoor; 165 m. N. of Plymouth, on the Great Western and the London and South Western railways. Pop. of urban district (1901), 4728. There are some remains (including a portion in the square, now used as a public library established in 1799) of the magnificent abbey of St Mary and St Rumon, founded in 961 by Orgar, earl of Devon. After destruction by the Danes in 997 it was restored, and among its famous abbots were Lyfing, friend of Canute, and Aldred, who crowned Harold II. and William, and died archbishop of York. The abbey church was rebuilt in

1285, and the greater part of the abbey in 1457-58. The church of St Eustachius dates from 13 18, and possesses a lofty tower supported on four open arches. Within are monuments to the Glanville and Bourchier families, besides some good stained glass, one window being the work of William Morris. Kelly College, near the town, was founded by Admiral Benedictus Marwood Kelly, and opened in 1877 for the education of his descendants and the orphan sons of naval officers. Mines of copper, manganese, lead, silver and tin are in the neighbourhood, and the town possesses a considerable trade in cattle and corn, and industries in brewing and iron-founding. The mining industry generally has declined, but there is a trade in arsenic, extracted from the copper ore.

The early history of Tavistock (Tavistoke) centres round the abbey of St Rumon. Both town and abbey were sacked by the Danes in 997, but were shortly afterwards rebuilt, and the latter at the time of the Conquest ranked as the wealthiest house in Devon, including the hundred and manor of Tavistock among its possessions. Tavistock was governed from before the Conquest by a portreeve, who in the 14th century was assisted by a select council of burgesses, styled in 1660 ” the Masters of the Toune and Parish of Tavistock.” It returned two members to parliament as a borough from 1295 until de- prived of one member by the act of 1867, and finally disfranchised

by that of 1885, but no charter of corporation was granted until 1683, when Charles II. instituted a governing body of a mayor, twelve aldermen and twelve assistants; with a recorder, deputy recorder, common clerk and two sergeants-at-mace. A market on Friday and a three days’ fair at the feast of St Rumon were granted by Henry I. to the monks of Tavistock; and in 1552 two fairs on April 23 and November 28 were granted by Edward VI. to the earl

of Bedford, then lord of the manor. In the 17 th century great quantities of cloth were sold at the Friday market, and four fairs were held at the feasts of St Michael, the Epiphany, St Mark, and the Decollation of St John the Baptist. The charter of Charles II. instituted a Tuesday market and fairs on the Thursday after Whitsunday and at the feast of St Swithin. In 1822 the old fairs were abolished in favour of six fairs on the second Wednesdays in May, July, September, October, November and December. The Friday market is still held. Tavistock was one of the four stannary towns appointed by charter of Edward I., at which tin was stamped and weighed, and monthly courts were held for the regulation of mining affairs. It was also the site of one of the earliest printing-presses, and copies of the stannary laws and of a translation of Boethius issued from the Tavistock press in the reign of Henry VIII. are preserved in Exeter College library. The decay of the woollen industry at Tavistock was attributed by the inhabitants in 1641 to the dread of the Turks at sea and of popish plots at home. The trade is now extinct. The copper-mining industry has much declined. The Royalist troops were quartered here in 1643 after the defeat of the Parliamentary forces at Bradock Down.

See Victoria County History, Devonshire; A. J. Kempe, Notices of Tavistock and its Abbey (London, 1830); R. N. Worth, Calendar of Tavistock Parish Records (Plymouth, 1887).

TAVOY, a town and district in the Tenasserim division of Lower Burma. The town is on the left bank of the river of the same name, 30 m. from the sea. Pop. (1901) 22,371. It carries on a considerable coasting trade with other ports of Burma, and with the Straits Settlements. The chief industry is silk-weaving, but there are also rice and timber mills.

The district has an area of 5308 sq. m. It lies between Siam and the Bay of Bengal, enclosed by mountains on three sides, viz., the main chain of the Bilauktaung on the east, rising in places to

5000 feet, which, with its densely wooded spurs, forms an almost impassable barrier between British and Siamese territory; the Nwahlabo in the centre, which takes its name from its loftiest peak (5000 ft.); and a third range, under the name of Thinmaw, between the Nwahlabo and the sea-coast. The chief rivers are the Tenasserim and Tavoy, the former being formed by the junction of two streams which unite near Met-ta; for the greater part of its course it is dangerous to navigation. The Tavoy is navigable for vessels of any burden. It is interspersed with many islands, and with its numerous smaller tributaries affords easy and rapid communication. The climate is on the whole pleasant. The annual rainfall averages 228 inches. Pop. (1901) 109,979, showing an increase of 16 per cent, in the decade. The staple crop is rice. Forests cover an area of nearly 5000 sq. m., of which 960 sq. m. are " reserved. "

Tavoy, with the rest of Tenasserim, was handed over to the British at the end of the first Burmese war in 1824. A revolt broke out in 1829, headed by the former governor, which was at once quelled, and since then the district has remained un- disturbed.

TAWDRY, an adjective used to characterize cheap finery, and especially things which imitate in a cheap way that which is rich or costly, or adornments of which the freshness and elegance have worn off. The word is first used in combination in the phrase " tawdry lace," a shortened form or corruption of St Audrey's or St Awdrey's lace. St Audrey was St Etheldreda, who founded Ely cathedral, and it is generally accepted that tawdry-laces or tawdries were necklaces bought at St Audrey's Fair on the 17th of October. Nares (Glossary to the Works of English Authors, 1859) gives as an alternative

the story that the saint died of a swelling in the throat, which she took as a judgment for having worn fine necklaces in her youth.

TAXATION (from " tax," derived, through the French, from Lat. taxare, to appraise, which again is

connected with the same root as tangere, to touch), that part of the revenue of a state which is obtained by compulsory dues and charges upon its subjects. The state may have revenue from property of its own. In past times one of the principal sources of the revenue of the sovereign was in fact property of some sort, of which the crown lands in Great Britain, still administered by the government, are a remnant. In other countries, even at the present time, there is a large public domain yielding revenue. Local authorities also largely own property from which a re- venue is obtained. But as a rule, and in spite of what has often been the practice in the past, and of exceptions which may still exist in some countries, a government obtains the money re- quired for its expenses by means of taxation. Some of the apparent exceptions, moreover, appear to be only exceptions in name. It is contended, for instance, that the revenue from land obtained by the government of India is in reality of the nature of a land rent — a species of property owned by the government. But the fact of a government levying so general a charge may be held ipso facto to convert the charge into a tax, having much the same economic effects and consequences as a tax. When, moreover, a state receives a revenue from property, some of the economic consequences may be the same as if it received the money by means of a tax. In both cases there is absorption and administration by the state of so much of the income of the community, and it may be a question whether the private ownership of the property would not be more expedient both for the state and its subjects than state ownership is, in spite of the apparent advantage to all concerned in the state getting so much of its income without the com- pulsion of a tax.

The Different Kinds of Taxes. — In the economic development of states taxes have come to be grouped in different ways, according to variations in the method of levying them or the means of enforcing compulsion or other differences. One of the most usual divisions is into direct and indirect taxes.

Taxes are distinguished as direct, because they are charged directly upon the tax-payer from whose income they are supposed to be taken. Indirect taxes are those where it is recognized from the beginning that the individual who pays in the first instance usually passes on the charge to some one else, who may again pass it on until it finally reaches the subject who bears the burden. The income tax, a direct charge upon all incomes above a certain limit, is the principal type in the United Kingdom of a direct tax. In France there is a group of taxes known by that name — a land tax, a personal and furniture tax, a door and window tax, and a trade licence tax. In the United States there are mainly assessments of the capital value of property, always for state and local purposes only, and not for the central government. Among the indirect taxes the most important are excise and customs duties upon articles of general consumption, the principal articles almost everywhere being spirits, beer and tobacco. Sugar, tea, coffee and cocoa are also among the articles commonly selected. In essential character there is no difference between excise and customs duties, except that excise duties are levied upon articles of home production, and customs upon articles imported from abroad, or brought into one part of a country or empire from another part; but excise duties on the whole are considered more likely to interfere with trade, in consequence of the necessity of super- vising the production of the articles affected. Next in import- ance to excise and customs we have duties levied by means of stamps upon documents or by charges at the time of registering deeds to which registration is necessary for the purpose of being valid. The charge in one case upon the article at a certain stage of its production, and in the other upon a trans- action, is supposed to be passed on by the first payer to others. With these have been usually classed in the United Kingdom

certain licence taxes upon traders, although such licences in France are reckoned direct taxes.

This division into direct and indirect is, however, far from logical. To take first the direct taxes. The income tax itself is not, in all cases, really paid to the state directly by the person out of whose income it comes. It is paid, in the first instance, in the case of land or houses, by the occupier, and where the occupier is a tenant it is recovered by him from the owner, In the case of joint-stock companies the company pays the state, and deducts the amount from the individual owners of stocks and shares out of whose incomes the amount comes. The ultimate payer in these cases is no doubt reached without delay or many steps, but the process is not quite direct. It is the same with rates. A householder is assessed as occupier, but he may be " compounded for," and really know nothing of the payment, though it is supposed to come out of his income. In the case, again, of a long-established land tax or rate many questions may arise as to whether the person who is considered to bear the burden in the first instance really bears it in the end. It is contended by some that the tax becomes in the nature of a rent-charge upon the property affected, and that the state really acts as landowner in levying the charge just as it does in receiving the rent of crown lands, and with similar economic incidents and consequences. Thus the direct taxes so called may frequently be no more direct than any others.

As regards indirect taxes, again, there appear to be some cases at least where it is by no means certain that the charge is passed on; stamp duties, for instance, especially where moderate in amount, may have the effect of diminishing pro tanto the profits in business of the person paying them, or the income which he enjoys. Where they are heavy, as, for instance, with the French registration duties on the transfer of property, there appears to be little doubt that they constitute a deduc- tion from the price which a seller receives, and thus they are direct enough. Sometimes also, when a charge upon a

com- modity is not of such a figure as to be easily divisible among the ordinary units of retail consumption, so that it can be passed on to a consumer of the articles in the form of an increased price, it may remain fixed upon those who first pay it, at least for a time. This is supposed to have actually happened with the increase of the beer duty in the British budget of 1894 by 6d. per barrel — a sum which would not when divided by the pints in a barrel amount to the smallest coin of the realm. When the multure tax, a tax upon milling grain, was imposed in Italy many years ago, it was found that no corresponding increase tcok place in the price of flour and bread. The trade fell into the hands of the millers on a large scale, who paid the tax out of their increased profits from larger business, while the smaller millers were crushed out; so that this was mani- festly the case of a tax, so called indirect, where the whole burden really fell on those who paid the charge in the first instance, and who in theory were supposed to pass it on to others. Even in the case of indirect taxes, therefore, there are important exceptions to the rule that they are indirect.

The division of taxes into direct and indirect is thus based on no real intrinsic difference. It is a classification for con- venience' sake, adopted upon a rough observation of conspicuous, or apparently conspicuous, differences in the mode of levying taxes, and nothing more. The division, nevertheless, cannot be passed over without mention, as it is not only a common one in economic writing, but it figures largely in budget statements, financial accounts, and finance ministers' speeches — especially in the United Kingdom and France. In the United Kingdom the distinction has been made familiar by free-trade discussions. Direct taxation in the shape of income tax was substituted for indirect taxation previously levied, in order to relieve tiade from the shackles of duties and charges which had become all- emDracing. In France the direct taxes above referred to are described officially as direct, having been originally, there

is little doubt, the main sources of government income; and there is equally an official designation of certain heads of revenue as " contributions et taxes indirectes." Recently in budget debates in

England there has been much comparison of the amounts yielded at different times by direct and indirect taxes respectively.

Other general classifications of taxes have also been attempted, as, for instance, taxes upon real property, and taxes upon personal property, and so on. Classification is indeed only too easy. Applying a characteristic common to some taxes, we can make a group of them, and set them against a group of all the other taxes lumped together. Such classifications are, however, uninstructive, and it has been found practically necessary in financial writing to take the principal taxes by name, or by such a general grouping as that of import or stamp duties, and then describe their nature, characteristics and incidence. In this way each country has a grouping of its own, though there is a common likeness, and the experience and practice of one country assist the financial study of another. As Adam Smith remarks, there is nothing in which govern- ments have been so ready to learn of one another as in the matter of new taxes.

Descriptions of Taxes. — Following the practice of authors on finance, we may give a short account of the principal taxes in the United Kingdom, with references in passing to points of comparison or contrast with the taxes of other countries. See, however, also the article on English Finance.

The income tax (q.v.) for many years has been the most prominent, and latterly it has been the most productive, single tax. Its technical name is the property and income tax, but it is essentially a charge upon all incomes or profits, whether arising from property, or from the remuneration of personal services, or from annuities, income being applied with the widest possible meaning. , As originally instituted in April 1798, during the great war with

France, under the name of a " tripli- cate assessment," it was rather a consolidation of various assessed taxes levied upon the luxuries of the rich and upon property, than a wholly new tax. In December of the same year this impost was repealed, and a true income tax of 10 per cent, established on all incomes over £60, with abatements between £60 and £200. It was intended as a temporary tax for war purposes only, and was repealed in 1802, but was re- imposed when the war recommenced in 1803, with the limit of abatement reduced to £150. So odious was it that parlia- ment in 1815, when the war came to an end, ordered the destruc- tion of the documents relating to it. Its efficiency as an instru- ment of producing revenue was, however, so great as to lead to its revival in 1842, when Sir Robert Peel inaugurated his great free-trade reform and swept away duties on exports, duties on imported raw material, and other imposts hampering the trade of the country. The intention again was that the tax should be temporary, but although the free-trade work was practi- cally completed in the early 'sixties, and Mr Gladstone went so far as to dissolve parliament in 1874 with a promise that he would abolish the tax if his party were returned to power, it has become a permanent impost. The reasons are that with the tax at a low rate it has been found much less intolerable than during the Napoleonic War, when it was at the rate of 10 per cent., while the pressure of the tax has also been greatly mitigated by placing very high the minimum income subject to it, and giving abatements upon the lower taxable incomes. These expedients have since been carried much farther. The tax, if kept at a low rate, undoubtedly fulfils a useful function as a revenue reserve for emergencies, on account of the ease with which it can be put up and down without disturbing trade. But in recent years, by rising to the rate of is. 2d. per £, it has been felt more heavily, and at this height is decidedly less elastic. As regards this tax at least there is no question of its " directness " in a sense, as it is so contrived that it can hardly be passed on by those who are struck at, though they are not always

the same as those who pay in the first instance, as has already been pointed out. There have been great complaints also of injustice by the possessors of temporary and precarious incomes, who have to pay the same rate of tax as the owners of permanent incomes from property, although these complaints have been diminished to some small extent by the raising of

the minimum limit of the income assessed and the increase of the principle of abatements.

The varieties of income charged being very great, and special claims for consideration having been set up at different times, the result has been the formation of an income tax code, denning the methods and rules for assessing the different classes of profits and income, and prescribing the way in which abate- ments and exemptions are to be obtained. A leading peculiarity is the avoidance of special inquisition into the aggregate of individual incomes. Although it is called a direct tax, the method of levy, as far as property is concerned, is upon the profits at their source, and not as they are distributed among the receivers. The question of the amount of individual incomes only comes before the authorities when claims for exemption and abatement are made. The character of the tax is accordingly much less odious than it would be if an account of individual incomes were invariably demanded, as was the case in the United States during the Civil War, when an income tax existed for a short time.

Other taxes grouped with the income tax by the authorities are house duty and land tax, but they are unimportant by comparison. The house duty replaced a window tax and other charges which were formerly not unimportant, especially in the interval between 181 5 and 1843, when there was no income tax. It is a charge upon the occupiers of houses,

mainly dwelling-houses, according to the amount of rent, the rate upon dwelling-houses ranging from 3d. to oA in the £, and the yield being about £1,750,000 per annum. The incidence is probably much the same as that of the income tax itself, though there are curious questions as to the ultimate incidence as between owners and occupiers of houses. The land tax is quite un- important, being an ancient tax upon an old assessment which has long become obsolete, and it interests economists most of all by the illustration it furnishes of what may be called a rent- charge tax — a tax, that is, which has been so long in existence and so fixed in its basis that it becomes in reality a charge upon the property, and not a direct burden upon the person who pays it, as the income tax is upon the person who pays it or for whom it is paid. In 1897 the basis of the tax was varied, but not in any way to affect the principle just stated.

The next great group of taxes is that of the excise (q.v.) and customs duties upon commodities. Excise duties are charges upon commodities produced at home on their way to the consumer, and customs duties in the United Kingdom are charges upon commodities brought into the country from abroad; and they are of essentially the same nature. Not only so, but excise duties and customs duties are in some cases supplementary to each other, like articles being produced at home and imported from abroad, so that for the sake of the revenue they have both to be taxed alike. Of this in the British system spirits are the best instance.

Export duties, it may be observed, are not important in systems of taxation generally, as there are few articles where the charge will not really fall on the wages of labour and profits of capital within the country imposing them; but opium grown in India is a well-known exception, and in the West Indies export duties on principal articles of production, in spite of their incidence, have been found a convenient source of revenue.

The list of commodities selected for taxation in the English fiscal system, under Free Trade, is very small. Few countries have so short a list of import duties, but this is in consequence of their design to give protection, which raises totally different questions from those of revenue.

The next large group of taxes is that of the stamp duties (q.v.). The principal items are those derived from a stamp of id. upon each cheque or receipt for money paid, and from a variety of charges on deeds and other instruments, and prin- cipally on the price paid for the transfer of real property and of stocks and shares, and on mortgages. Included are various charges on foreign bonds to bearer, to compensate for the advantage they have in escaping the transfer duty on deeds,

through their passing on sale or mortgage from hand to hand. The essence of the compulsion in the case

of stamp duties is the invalidity of the documents in courts of law unless the stamp is affixed, besides liability to penalties for not affixing the proper stamps. As things go in matters of taxation, English stamp duties are low. In France, besides the stamp duties, there are charges on the transfer of real property amount- ing to about 6 per cent, on the official registration of the transfer which is necessary to make it effective.

We come next, in dealing with taxation, to a group of charges about which the question has been raised as to whether they are, properly speaking, taxes or not. These are the post office charges, and the charges for telegraph service, including tele- phones. In the classification of the revenue in English budgets and in official returns these charges are deliberately separated from the above sources of the revenue described as taxes, and classed with " revenue derived from other sources." The correctness of this procedure is questionable. According to old usage, the post office was made a state monopoly for the express purpose of levying taxation by means of it. In France the postage on letters is still called the laxe des lettres. There is no doubt also, that when postage on letters is charged at the rate of id. each, where the cost of collection and delivery, as in the metropolis, is perhaps not more than a tenth of a penny, it is difficult to distinguish the levy from that of any other tax. The excuse, as a rule, may hold good, that the postal charge is only a reasonable one for service rendered, so that the net income of the post office really resembles the profit of a business, but the element of taxation appears undoubtedly to enter. The same remark would apply to the charges for passenger conveyance and goods freight made by governments which carry on railway business, as in Prussia, India and the Aus- tralian states. In strict theory, where the government makes a charge, it levies a tax. The reasonableness of the charge in a given case is to its credit, but the features of monopoly and compulsion on the tax-payer make the charges difficult to distinguish logically from

other taxes. The facts are not in dispute, however they may be described. If the govern- ment derived a large income from post office and telegraph service in excess of the amount expended, the whole income would be generally, and not improperly, described as taxation; but consideration, of course, must be given to the difference made by the working of the service generally for the public advantage rather than for purposes of revenue.

Another source of revenue in British imperial finance is that from fees in courts of justice, patent stamps and the like, which is usually classified, like the income of the post office, as revenue derived from other sources than taxes. The amount is not large, though unfortunately it is not exactly known, owing to the fees being treated in many cases as extra receipts, and deducted from the expenditure of the departments by which they are received, so that this part of the national expenditure is not shown in the accounts at all. The proceeding appears to be quite incorrect, whatever excuse there may be for treating revenue like that of the post office as non-tax revenue. Fees levied on proceedings in courts of justice are not only taxes, but taxes of the worst sort. They received the special con- demnation of Jeremy Bentham. It is a blot on British finance, therefore, that this part of the taxation is treated as if it were not taxation at all, and largely concealed from view in the way described.

Last of all, we have to notice among the imperial taxes the estate (q.v.) or death duties, as they are called — the charges made by government on the transfer of property from the dead to the living. These have been considerably increased in amount. Various interesting questions arise regarding them. Logically they are apparently taxes upon the dead, as they limit the area of bequest, but they are felt by the living who receive the estate as if the burden of taxation fell on them. Practically, when a stranger receives the estate of a deceased man, the proper way of viewing the tax would appear to be that it is a share of property claimed by the state

against a

stranger who has no right in the matter except that which the state gives him, so that it is hardly a tax at all, as the word is usually understood; but when the estate is received by the near relatives of the deceased who were subsisting upon it even before his death, it is undoubtedly felt as a tax by them, and operates as a tax. It is even at times a very burdensome tax, falling upon a family when its sources of income are other- wise diminished, while it has the demerit of striking a small number annually instead of being diffused equally. Death duties also raise the question as to their being taxes upon capital. They are of large amount, even at the lowest rates of 1 to 4 per cent, upon the capital charged, and they have to be paid at such times as to cause their being paid out of capital and not out of income, so that their tendency is to diminish the capital available for productive enterprises.

Local Taxation. — Besides the above revenue from taxation for imperial purposes, large amounts are raised for local pur- poses. The local authorities derive a large income from private property, and from monopolies such as water, gas, electric light, telephones and tramway service, which they carry on, and on which the same observations may be made as on the post office and telegraph services; but in addition there is a large amount of taxation. The principal portion of this taxa- tion consists of rates, that is, a direct charge upon the income or rental of real property, such as lands, houses, railways and mines, but mainly lands and houses. Rates are even a more important factor in direct taxation than the income tax, and they have given rise to even greater complaints and discussion. In 1896 a special royal commission was appointed, under the chairmanship of Lord Balfour of Burleigh, to consider the problems of the rates; it made several

elaborate reports, the final one appearing in 1901. The most important questions raised in a scientific view appear to be the misconception of the whole problem of local taxation by governments. Rates were originally imposed, there is little question, when the intention was to tax all local incomes equally, and this is still the intention in the local taxation of the United States as well as the United Kingdom. Rates were imposed, therefore, on all kinds of property and the income arising from them, just as they are imposed in the United States on the capital of the property itself. But it has been found in practice that for various reasons only real property, which is visibly local and cannot be moved away, can be assessed and made to pay. The owners of real property, however, continually urge that they are unfairly treated, and that other property should be rated. Next there has been misconception, arising from the same cause, in the constant attempt to charge the occupier of lands and houses with rates, although the real effect of the rates must be, as a rule, to diminish the value of the property affected like an old-established land tax, so that rates, properly speaking, do not fall upon either owner or occupier. I.t would be hard, however, to persuade the mass of occupiers in England that they do not pay the rates, so that the expedient of dividing the rates between owner and occupier, though it cannot affect their real incidence to a substantial extent, constantly finds favour. The confusion has been further increased of late years by attempts, as far as towns are concerned, to find a new sub- ject of taxation in what are called site values, as if rates them- selves were not in reality an appropriation by the state of a portion of the whole value of the property, subject to which all the other interests exist. It would be impossible here even to state all the questions that have arisen about rates; but the essential confusion caused by the neglect of practical men to study the natural history of taxation, as it may be called, must be obvious to every- student. The frank recognition that local income taxes are impossible, and that taxation on property for local purposes can only be applied to

real property, where it becomes, usually or frequently, in the nature of a rent-charge, would have saved the legislature and the public an infinity of laborious discussion.

Other taxes for local purposes comprise dues and tolls, such as harbour dues, where the money is required for such a definite

purpose as a harbour, maintained at the expense of the traffic accommodated. Here again the question arises as to whether the tax is a mere compulsory charge or payment for a service rendered. Among these tolls may perhaps be included some charges in the nature of octroi dues, imposed on commodities entering a town, but not to a great extent. Such dues, in the nature of customs, are very common in continental cities, and yield large revenue to the local authorities, although they have been very generally, if not quite universally, abolished in the United Kingdom. They have been regarded with much dislike by most economists, and some dues of the kind which existed in London, viz., dues on coal and wine imported, and metage dues on grain, were much imposed until their final abolition in recent years. When of moderate account, however, dues of this sort appear no more objectionable than harbour dues already mentioned, or any other moderate charges on transac- tions. If of large amount and very numerous, they hamper trade, as all taxation tends to do, but that is no reason for condemning them specially when the choice lies between them and other forms of taxation.

In addition, we have to notice certain taxes which up to 1910-11 were levied by the British government and distributed to the local authorities, just as in France the government levies certain direct taxes, or centimes additionnelles , added to its own direct taxes for the benefit of the local authorities. These taxes were additional beer and spirit dues (customs and excise), excise licences, and share of probate and estate duty. The remarks already made on the corresponding taxes levied for imperial purposes of course apply to these. Exceptionally, it may be

added, as regards the licence taxes, which occupy quite an inferior place in the British system of taxation for imperial purposes, that the question whether some of them are not really direct in their incidence on the first person charged may also be raised, although they are classed with indirect taxes. Many of the licences are those of brewers, distillers and publicans, and others in trade, and are paid out of the general profits of the business, so that they can hardly be passed on to the consumers, while other licences are for shooting, for employ- ing carriages and men-servants, and for similar objects, where the charge on the payer is direct. This may be the place to mention that in other countries, as in France, the licence duties on traders are more general than in the United Kingdom, and are levied on an elaborate scale, according to the size of popula- tion of the town where the business is carried on, and the rent paid for the premises. They take the place, to some extent, of the income tax, and are usually classed with the direct taxes.

The peculiarity of taxes which are levied by the imperial authority and distributed among the local authorities for dis- bursement deserves notice. There must be a general cause for such an arrangement when we find it to have been in existence in France and other countries, and to have been introduced into the United Kingdom. And this cause no doubt is the need of the local authorities, and the difficulty of letting them have taxes of their own to levy which do not interfere with the imperial monopoly. The arrangement is obviously objec- tionable on the score of its conducing to local extravagance, as local authorities are not likely to be so economical with money that comes to them from the outside, as it were, as they would be with money directly taken from their own pockets. Local authorities receive other subventions and aids from the central government besides the proceeds of these taxes, so that their appropriation for local needs is related to a large question which belongs, however, to the general subject of local government,

and not so much to the special subject of taxation.

Incidence of Taxation. — In describing the principal taxes which are employed in the United Kingdom to provide for the national expenditure, observations have necessarily been made upon the incidence, probable or assumed, upon the tax- payer, and on the question how far they may fall equally on the whole community without any special incidence being traceable. The incidence of taxation is, however, a special subject for discussion, and is connected with various large

issues, such as that of Free Trade, which are of deep interest to economic students.

The starting-point of discussions as to incidence of taxation is a classical passage in Adam Smith's Wealth of Nations (book v. chap, ii.), where he lays down the following maxims with regard to taxes in general: 1. The subjects of every state ought to contribute towards the support of the government, as nearly as possible, in proportion to their respective abilities; that is, in proportion to the revenue which they respectively enjoy under the protection of the state. 2. The tax which each individual is bound to pay ought to be certain and not arbitrary. 3. Every tax ought to be levied at the time or in the manner in which it is most likely to be convenient for the contributor to pay it. [Adam Smith specially praises indirect taxes on com- modities under this head, because the consumer " pays them by little and little as he buys the goods," and " it must be his own fault if he ever suffers any considerable inconveniency from such taxes."] 4. Every tax ought to be so contrived as both to take out and keep out of the pockets of the people as little as possible over and above what it brings into the public treasury of the state. [This last passage is specially directed against taxes which are expensive to collect, or dis- courage

trade, or offer temptation to smuggling, or subject people to frequent visits of the tax-gatherer.] These maxims have commanded universal assent, as they are obviously the common sense of the subject.

It may be observed, however, that while general maxims are easy, trie application presents difficulties, and since Adam Smith wrote, and especially in modern times, new questions of some interest have been raised. Adam Smith does not go minutely into the incidence of taxation. Taxes in his view must come out of rent, or profit, or the wages of labour; and he observes that every tax which falls finally upon one only of the three sorts of revenue " is necessarily unequal in so far as it does not affect the other two," and in examining different taxes he disregards as a rule this sort of inequality, and con- fines his observations " to that inequality which is occasioned by a particular tax falling unequally upon that particular sort of private revenue which is affected by it." Recent discussion, however, has gone rather to the point which Adam Smith neglected, that of inequality generally, not merely as between different sorts of income, but as between individuals and classes. The whole burden of taxation, it is maintained, should fall equally upon classes and individuals as far as possible, and, if necessary, taxes falling equally upon special sources of private revenue should be balanced against each other in order to obtain the desired result. Along with this view has arisen the question whether the burden of taxation should not be progressive — the proportion of the sum taken by the state from the tax-payers increasing with the wealth of the individual; because ability to pay taxes is assumed to be not in proportion to, but to increase with the size of, the income.

What opinion should be held regarding this modern view as to equality in taxation, which differs so widely from any- thing countenanced by Adam Smith, though his language is echoed in it? The answer must be that, however sound, the view is for the most part far too ambitious. One difficulty is caused by the large proportion of the taxes in almost every

system of taxation, and at any rate in the British system, where the exact incidence is in no way traceable, or where there is no sort of general agreement as to the incidence. The whole of the British revenue from post office and telegraph service, and the whole of the stamp revenue, are derived from charges whose exact incidence cannot be traced. We have seen, indeed, that doubt is even felt as to whether post office and telegraph charges can be treated as taxes at all. Again, the death duties are in a distinct category, these duties falling each year not on a particular class of the community, or a particular kind of property, but on a few individuals only, who are in some cases treated severely, while others may have no cause of complaint. In the course of fifty years, it may be said, the balance will be rectified, and the whole class to

which the individuals belong, and the property they own, will be visited in turn, so that this taxation should be credited to them in an account of the incidence of taxes generally; but fifty years is altogether too long a period for such adjustments to be made. Thus a very large proportion of the total revenue cannot be made available tor an account showing the incidence of taxation. There remain principally the income tax and one or two minor " direct " taxes, and the customs and excise duties. These, it is said, can be distributed among different classes of tax-payers, because the income tax falls on the owners of incomes of all kinds of property subject to the duty, if their incomes are above a certain limit, while the incidence of customs and excise duties can be ascertained by inquiries as to the consumption of dutiable articles by different classes. Even here, however, formidable difficulties are presented. The payers of income tax, unfortunately, are not one class but many, and although the rate of duty is the same, the defini-tion of income seems imperfect, so that many pay on a much larger assessment of income than seems fair in comparison with other incomes of nominally the same amount, but really of much greater value when

all deductions from the gross sum are fairly reckoned. If all who pay income tax are lumped together and contrasted with those who do not pay, then there is a false division to begin with, and there is so far no means of establishing equality Dr inequality. As regards indirect taxes, again, there appears no small difficulty in ascertaining the relative consumption of different classes, for the simple reason that in the same class so called the habits of consump- tion differ widely. It is only by a wide extension of the term " working man," for instance, that a class which includes a steady mechanic earning 30s. to £2 a week, who is frequently a total abstainer, and a labourer of inferior capacity and character earn- ing 15s. to 20s. a week, and who is not a total abstainer, can be spoken of as one, and credit given to the one class for so much taxation on spirits, beer, tobacco, wine, tea and sugar. There are also geographical differences of a serious kind. On the other hand, the consumption by the income tax paying classes of customs and excise articles must vary indefinitely amongst themselves, according to personal habits, size of families, and even their geographical distribution. A further difficulty is furnished by a question as to whether the employer of domestic servants who gives them their board does or does not bear the burden of the duties on the articles which they consume, and which he buys for their use. Theoretically the burden falls on them as consumers. They would have more real wages, it is said, if the price of the articles they consume was not raised by taxation. But practically most employers are convinced that they pay the taxes for their servants. To establish, therefore, any fair account of the incidence of indirect taxes on different classes of the community, real classes being dis- tinguished, and not a mere rough grouping into so-called classes of units who are altogether heterogeneous, is probably beyond the skill of man.

All this is evident on a view of imperial taxation alone. In studying equality, moreover, local taxation must be brought into view, with even more

impracticable differences of opinion as to the real incidence of the taxation. The moment rates are brought into question it is seen at once how impossible it would be to establish equality among tax-payers, when owners on one side and occupiers on the other claim that they each bear the burden of the same taxes, and economists favour the opinion that much of the burden is in the nature of a rent-charge on the property, and in any case is equally diffused over the whole commuiitj

Adam Smith \vj,s thus not altogether badly advised in not carrying his investigations into the equality of taxation farther than he did. There was another reason for his so doing in the heaviness of the burden of taxation at the time he wrote, governments exacting us much as they could, and being only desirous of finding the easiest means of doing so. It is the very lightness of taxation in recent years which has suggested the possibility of comparing the relative burdens of different

classes, which would have seemed quite hopeless with a high taxation and an immense variety of high taxes. The conclusion that with good taxes long established the burden of taxation tends to become equal over the whole community was certainly not ill founded in the circumstances of former times, and may be accepted as true even in the present day.

As to progressive taxation based on the assumption that equality requires a larger proportionate charge upon a big income than on one of a smaller amount, the practical applica- tion of the principle, if true, would be impossible. A great deal more would need to be known than is now known as to the effect of taxes on different classes, and the aggregate amount of different incomes, before such a task could be undertaken. If there is a greater proportionate charge already on the larger incomes, nothing more need be done, and we cannot know that

there is not. As to the justice of such a progressive tax, there is a common opinion in its favour among economists, at least to the extent of exempting a certain minimum of subsistence from taxation; but the present writer, after accepting this view in early life on the authority of Mill, must now express the greatest doubt. The ideal is equality, and no measure of a minimum of subsistence can really be devised.

Of course there may be single taxes which are progressive in form, such as the licence tax in France, or the income tax in Great Britain, where progression is established by abate- ments, or the death duties, where progression by scale is very common. But such progression may arise in a different way and on different principles from those proposed in defence of a general system of progressive taxation. It may be expedient for balancing taxation and roughly redressing palpable in- equalities, and may be adopted for that purpose and no other.

Statistical inquiries as to the incidence of taxation or of particular taxes, though ideal or even approximate equality of a palpable arithmetical kind is practically unattainable by governments, are not altogether to be put aside. The informa- tion thus obtainable may be useful as far as it goes, indicating the directions in which the burden of taxation may press, and forming a guide of some utility when changes of taxation are contemplated. Calculations, for instance, as to what people at the lower levels of the income tax must pay because they happen to be struck by every sort of tax as no other class is, and calculations as to the freedom from taxation of large numbers of other classes whose habits of consumption and living enable them to escape the tax-gatherer as the class to which they belong cannot generally do, may help a finance minister in the selection of taxes to be repealed or reduced or to be newly imposed. With every effort after equality he must fail to satisfy all, but friction may be diminished and the work of carrying on government quietly and steadily facilitated.

Taxes and Free Trade. — Taxation ought not to interfere with trade if possible, and the object of Adam Smith's maxims, as we have seen, was largely to erect sign-posts warning finance ministers against the kind of taxes likely to harass traders. There has been much discussion, however, on free trade since Adam Smith's time, and the far-reaching nature of his warnings is not even yet generally understood. There will probably be general agreement as to the wisdom of avoiding taxes which are uncertain and arbitrary, or which involve frequent visits of the tax-gatherer; but so far from there being a general assent in all countries to his maxims as to the expediency of avoiding taxation, which takes more from the tax-payer than what comes into the hands of the government, this is the very characteristic of duties deliberately imposed by most govern- ments for the purpose of interfering with trade, and frequently called for even in the United Kingdom with a similar object. In a question of taxation, however, for the purpose of meeting the expenses of the government, all such duties must be ruled out. Taxes, as instruments for advancing the prosperity of a country, are things unknown to the study of "taxation" in the proper sense of the word. The only proper object of taxa- tion is to meet the expenses of the state, and when taxes are used primarily or mainly for some other object they can only

be justified by political and economic reasons of a different order from anything that has been under discussion.

On this ground, in an account of taxation proper, one might avoid discussing altogether the question of irregular or illegiti- mate taxation. But the subject is of too much popular interest, perhaps, to be passed over altogether. Generally, then, it may be affirmed that taxation in its essential nature cannot be thought of as a good instrument for promoting trade and the advancement of a country. So far as it operates at all, it operates by diverting trade from the channels in which it would naturally flow into other channels, and this diversion of in-

dustry, so far as it goes, must involve loss. People are induced to do things they would otherwise leave alone, or to leave alone what they would otherwise do, because money is given to them out of the pockets of the tax-payers to make it worth their while to do so; but there is palpably loss and not profit in the proceeding. It is urged that in time industries are set up that would not otherwise have existed, and population thereby attracted, this being especially the argument for protective duties in new countries; but even so, there is loss to set against the final gain, if any, and we have not yet had an account in which a balance of loss and gain is attempted. The presump- tion is that on balance there is loss. In new countries especially the diversion of industry from its natural development cannot but be mischievous, wrong manufactures and industries being set up at the expense of the whole community, instead of those manufactures and industries which would be most profitable.

There is more to be said for the political argument which induced Adam Smith to favour navigation laws, giving a pre- ference to national shipping in national waters, and for a similar political argument in favour of duties on agricultural produce imported into the country, on the ground, as regards navigation, that the prosperity of the shipping industry in particular was essential to the safety of the country, and on the ground, as regards duties on agricultural produce, that the maintenance of a larger rural population and of a larger agri- cultural production than would exist under natural conditions of perfect free trade was essential to the welfare of the state and even to its very existence in the possible event of a temporary defeat at sea and a partial blockade of the coasts. This is not the place to discuss such political problems, but there is no question of free trade theory involved if the cost to the com- munity of any such taxation is frankly acknowledged.

Sir John A. Macdonald, the great protectionist prime minister of Canada, in a conversation with the present writer in 1882, avowed without hesitation

that protectionist taxation in Canada was indefensible on economic grounds, and he defended it exclusively for political reasons. Politically one might differ from him, but economists as such must either be silent when political reasons are alleged for taxes that are against funda- mental maxims, or must be content to point out the cost of the taxes in order that the communities concerned may decide whether the object in view is obtainable by means of the taxa- tion, and is worth the price.

A great deal has been said as to taxes termed " counter- vailing duties," which are called for in order to defend free trade itself against the protectionist bounties of foreign govern- ments. Such duties are obviously taxes outside the limits to be considered in a question of taxation proper. They are to be imposed for other purposes than revenue. As to the claim for them that they will restore free trade conditions by nullify- ing the foreign bounties which have caused a disturbance of trade, this is really in the nature of a political reason. A country which is so devoted to free trade that it not only practises free trade itself but endeavours to convert others by nullifying their protectionist measures as far as it can, even with immediate loss to itself, departs from the guidance of self- interest so far; but its political action may be justifiable in the long run by other considerations. It seems right to point out, however, that countervailing duties, which are really differential duties of a special kind, are not the good expedient they are supposed to be for nullifying foreign bounties; that

experience of differential duties in former times is altogether against them; and that they cannot be enforced without certificates of origin and other causes of harassment and con- fusion in the conduct of trade.

The extent of the interference with trade, in regard to par- ticular taxes, is also a matter of importance. A particular tax is not necessarily to be condemned because it takes a little more out of the pockets of the people than what the government receives. Such a defect is a ground for consideration in weighing a particular tax against others, but it is only one inconvenience among many incidental to all taxes.

Some English applications of free trade theory in recent times in the matter of import duties have been pedantic — the abolition of the shilling corn duty in 1869 by Robert Lowe (Lord Sher- brooke) being typical of this pedantry, though it is not the only instance. No doubt, in theory, this duty, being levied on the import only and not on the home production of corn, took from the tax-payer a shilling on every quarter of grain produced at home which did not go into the exchequer. Per contra the tax was wholly unfelt, a shilling a quarter only affecting an average family of four persons to the extent of three shillings per annum, or about three farthings a week, while it was paid little by little, as Adam Smith explains with regard to indirect taxes in general. The amount yielded, moreover, was considerable, being equal to a penny on the income tax, which it is desirable to maintain as a reserve of taxation. When we balance advantages and disadvantages, therefore, the repeal of the corn duty and similar measures would appear to have been sacrifices of revenue without adequate reason.

Rates of Taxation. — Apart from the merits or demerits of particular taxes or groups of taxes, and the questions as to inequality, injury to trade, and the like already discussed, the aggregate of taxation, or rather revenue, of a state may be con- sidered in the most general way, having regard to the propor- tion appropriated by the state of the total income of the com- munity, and the return made by the state therefor. Here there are the greatest variations. At one time, for instance, during the great wars at the beginning of the 19th century, it was calculated that the British government

expenditure, and the corresponding revenue, mostly raised by taxation, were each equal to about one-third of the aggregate of individual incomes — that is, as £90,000,000 to about £270,000,000. Proportions even higher have not been unknown in history, and it is probable that in Russia, India, Egypt, and in other countries at this moment, in time of peace, the proportion may amount to one-fourth or one-fifth. On the other hand, some years ago in the United Kingdom, before the high expenditure on army and navy began, and before the South African war of 1899-1902, it is probable that with an outlay of less than £100,000,000 by the central government, the proportion of this outlay to the aggregate income of the people was not higher than one- fourteenth. At the beginning of 1902, when the South African war was closing, the normal peace expenditure, even reckoned at £160,000,000, did not exceed one-tenth, while even peace and war expenditure together in 1901, taking them as close on £200,000,000, did not exceed one-eighth. These varying pro- portions, however, mean different things economically, and it is of obvious interest that, besides questions as to particular taxes, the broad effect of the whole burden of taxation should also be discussed.

The important points in this connexion appear to be: (1) Very large appropriations can be made by the state from the revenue of its subjects without permanent injury. The com- munity thereby suffers, but the land and fixed capital remain, and when the high government expenditure ceases individuals at once have the benefit, subject to possible disturbance at the moment of transition, when many persons employed by the state return to private employment. (2) A state which in ordinary times appropriates one-tenth or some less proportion of aggregate individual incomes is much stronger relatively than a state absorbing one-fourth, one-third, or even a higher proportion. It has much larger resources, which would be

available if time were given to develop them. (3) When the proportion becomes one-tenth or less it is

doubtful whether the state can do best for its subjects by making the proportion still lower, that is, by abandoning one tax after another, or whether equal or greater advantage would not be gained by using the revenue for wise purposes under the direction of the state, such as great works of sanitation, or water supply, or public defence. In other words, when taxes are very moderate and the revenue appropriated by the state is a small part only of the aggregate of individual incomes, it seems possible that individuals in a rich country may waste individually resources which the state could apply to very profitable purposes. The state, for instance, could perhaps more usefully engage in some great works, such as establishing reservoirs of water for the use of town populations on a systematic plan, or making a tunnel under one of the channels between Ireland and Great Britain, or a sea-canal across Scotland between the Clyde and the Forth, or purchasing land from Irish landlords and transferring it to tenants, than allow money to fructify or not fructify, as the case may be, in the pockets of individuals. Probably there are no works more beneficial to a community in the long run than those like a tunnel between Ireland and Great Britain, which open an entirely new means of communication of strategical as well as commercial value, but are not likely to pay the individual entrepreneur within a short period of time.

Authorities. — See also, for taxation and taxes in different countries, the separate articles on the finance under the heading of each country; and the articles on Free Trade, Protection and Tariffs. The following short list of authors may be useful to the student: — Adam Smith, Wealth of Nations; Ricardo-M'Culloch, Principles of Taxation; Mill, Principles of Political Economy; Bastable, Public Finance; E. R. A. Seligman, Shifting and Incidence of Taxation (2nd ed., 1899); Gamier, Traite de Finances; Cohn, System der National-Okonomie ; Wagner, Finanzwissenschaft; Roscher, System der Finanzwissenschaft. (R. Gn.)

TAXIDERMY, the art of preserving the integument,

together with the scales, feathers or fur, of animals. Little is known of the beginnings of the practice of the ” stuffing ” or ” setting up ” of animals for ornament or for scientific purposes; and it is highly probable, from what we gather from old works of travel or natural history, that the art is not more than some three hundred years old. It was practised in England towards the end of the 17 th century, as is proved by the Sloane collec- tion, which in 1725 formed the nucleus of the collection of natural history now lodged in the galleries at South Kensington.

It was not until the middle of last century that any treatise devoted to the principles of the then little understood art was published in France, R. A. F. Reaumur’s treatise (1749) being probably the first. This was followed at intervals by others in France and Germany, until the beginning of the 19th century, when the English began to move in the matter, and several works were published, notably those by E. Donovan, 1 W. Swainson, 2 Capt. Thomas Brown 3 and others. These works, however, are long since inadequate; and at the Great Ex- hibition of 1851, the Germans and French taught British taxi- dermists the rudiments of scientific treatment of natural objects. The demands of sportsmen for the due preservation of their trophies, and the requirements of the great museums in every civilized country, have rapidly transformed a crude handicraft into an elaborate art, and the finest modern results, as produced by a private firm like Rowland Ward in England, or the expert staff of the American Museum of Natural History in New York, leave almost nothing to be desired. The rapidly recurring editions of Rowland Ward’s handbook 4 supply a guide to the amateur specially useful as indicating what may be done in the field; John Rowley’s little manual 5 supplies

1 Instructions for Collecting and Preserving Various Subjects of Natural History (London, 1794).

2 The Naturalist’s Guide for Collecting and Preserving Subjects of Natural History and Botany

(London, 1822).

3 Taxidermist's Manual (Glasgow, 1833).

4 The Sportsman's Handbook to Practical Collecting, Preserving and Artistic Setting up of Trophies and Specimens (London, many editions). 6 The Art of Taxidermy (New York, 1898).

more detail as to what may be done in the workshop; Montague Browne's elaborate treatise 1 remains a standard work, whilst William T. Hornaday 2 has supplied a very full account of the excellent American methods which he has done so much to develop.

The first principle governing the art is that, after the specimen has been procured, in as fresh and clean a state as may be, it should have the skin stripped from the body in such a manner as not to disturb the scales if a fish or a reptile, the feathers if a bird, or the fur or hair if a mammal. To do this correctly requires a small stock of tools, as well as a great amount of patience and perseverance. The appliances comprise several sharp knives (some pointed and some obtuse), a pair of scissors, a pair of pliers, a pair of nippers or "cutting-pliers," some tow, wadding, needles and thread, also a " stuffing-iron," some crooked awls, a pair of fine long flat-nosed pliers, and a camel-hair brush. The preservative compound is often the original (Becoeur's) " arsenical soap," made by cutting up and boiling 2 lb of white soap, to which 12 oz. of salt of tartar and 40Z. of powdered lime (or whiting) are added when dissolved; to this mixture, when nearly cold, 2 lb of powdered arsenic and S oz. of camphor (the latter previously triturated in a moitar with spirits of wine) are added. The mixture is put away in small jars or pots for use. Like all arsenical preparations, this is exceedingly dangerous in the hands of unskilled

persons, often causing shortness of breath, sores, brittleness of the nails and other symptoms; and, as arsenic is really no protection against the attacks of insects, an efficient substitute has been invented by Browne, composed of 1 lb of white curd soap and 3 lb of whiting boiled together, to which is added, whilst hot, i^ oz. of chloride of lime, and, when cold, 1 oz. of tincture of musk. This mixture is perfectly safe to use when cold (although when hot the fumes should not be inhaled, owing to the chlorine given off), and is spoken of as doing its work efficiently. Solutions of corrosive sublimate, often recom- mended, are, even if efficient, dangerous in the extreme. Powders consisting of tannin, pepper, camphor, and burnt alum are sometimes used for " making skins," but they dry them too rapidly for the purposes of " mounting." Mammals are best preserved by a mixture of 1 lb of burnt alum to J lb of salt- petre; this, when intimately mixed, should be well rubbed into the skin. Fishes and reptiles, when not cast and modelled, are best preserved in rectified spirits of wine; but this, when economy is desired, can be replaced by "Miiller's solution" (bichromate of potash 2 oz., sulphate of soda 1 oz., distilled water 3 pints) or by a nearly saturated solution of chloride of zinc. The cleaning of feathers and furs is performed by rubbing them lightly with wadding soaked in benzoline, afterwards dusting on plaster of Paris, which is beaten out, when dry, with a bunch of feathers.

The preparation and mounting of bird specimens, the objects most usually selected by the amateur, are performed in the follow- ing manner. The specimen to be operated upon should have its nostrils and throat closed by plugs of cotton-wool or tow; both wing-bones should be broken close to the body, and the bird laid upon a table on its back; and, as birds — especially white-breasted ones — should seldom, if ever, be opened on the breast, an incision should be made in the skin under the wing on the side most damaged, from which the thigh protrudes when pushed up slightly; this is cut through at its junction

with the body, when the knife is gently used to separate the skin from this, until the wing-bone is seen on the open side. This is then cut through by scissors, and by careful manipulation the skin is further freed from the back and breast until the neck can be cut off. The other side now remains to be dealt with; from this the wing is cut by travelling downwards, the remaining leg is cut away, and very careful skinning over the stomach and upon the lower back brings the operator to the tail, which is cut off, leaving a small portion of the bone (the coccyx) in the skin. The body now falls off, and nothing remains in the skin but the neck and head. To skin these out properly without unduly stretching the integument, is a task trying to the patience, but it can be accomplished by gradually working the skin away from the back of the head forward, taking care to avoid

1 Artistic and Scientific Taxidermy and Modelling (London, 1896). 8 Taxidermy and Zoological Collecting (London, seventh edition,

1901).

cutting the eyes or the eyelids, but by cautious management, to cut the membranous skin over those parts, so that the eyes are easily extracted from the orbits without bursting. The skin should be freed down nearly to the beak, and then the back of the head, with neck attached, should be cut oft, the brains extracted, all the flesh cleared from the skull and from the bones of the wings, legs and tail, the skin painted with the preservative, and ultimately turned into its proper position. When " skins " only are to be made for the cabinet, it is sufficient to fill the head and neck with chopped tow, the body with a false one made of tow, tightly packed or loose according to the genius of the preparer, to sew up the skin of the stomach, and to place a band of paper lightly pinned around the body over the breast and wings, and allow it to remain in a warm position, free from dust, for several days or weeks, according to the size of the specimen. It should then be labelled with name, sex, locality and

date, and put away with insect powder around it.

When, however, the specimen is to be " mounted," the opera- tions should be carried up to the point of returning the skin, and then a false body of tightly wrapped tow is made upon a wire pointed at its upper end. This is inserted through the incision under the wing, the pointed end going up the neck and through the skull to the outside. When the imitation body rests within the skin, pointed wires are thrust through the soles of the feet, up the skin of the back of the legs, and are finally clenched in the body. Wires are also thrust into the butts of the wings, following the skin of the under surface, and also clenched through into the body. A stand or perch is provided, and the bird, being fixed upon this, is, after the eyes have been inserted, arranged in the most natural attitude which the skill of the taxidermist can give it.

Mammals are cut along the stomach from nearly the middle to the breast, and are skinned by working out the hind legs first, cutting them off under the skin at the junction of the femur with the tibia, and carefully stripping the skin off the lower back and front until the tail is reached, the flesh and bones of which are pulled out of tke skin, leaving the operator free to follow on up the back and chest until the fore legs are reached, which are cut off in like manner. The neck and head are skinned out down to the inner edges of the lips and nose, great care being exercised not to cut the outer portions of the ears, the eyelids, the nose or the lips. The flesh being cleared off, and the brain and eyes extracted, the skull should adhere to the skin by the inner edges of the lips. All the flesh should be trimmed from the bones of the legs. The head, being shaped, where the flesh was removed, by tow and clay, is returned into the skin. A long wire of sufficient strength is tightly bound with tow, making a long, narrow body, through which wires are thrust by the skin of the soles of the feet. The leg wires and bones being wrapped with tow and clay into shape, the points of the wires are pushed through the tow body and clenched. They and the body are

then bent into the desired position, and modelled up by the addition of more tow and clay, until the contours of the natural body are imitated, when the stomach is sewn up. A board is provided upon which to fix the specimen, artificial eyes are inserted, the lips, nose and eyelids fixed by means of pins or " needle-points," and the specimen is then placed in a warm situation to dry.

Reptiles, when small, have their skin removed by cutting away the attachment of the skull to the cervical vertebrae, and by turn- ing the decapitated trunk out at the mouth by delicate manipula- tion. When large , they are cut along their median line, and treated, in the same manner as mammals.

Fishes, after being covered on their best side with paper or muslin to protect the scales, are cut along the other side from the tail to the gills, and are skinned out by removing " cutlets," as large as is possible without cracking the skin, which, indeed, should be kept damp during work. After being cured with a preservative, they are filled with sawdust or dry plaster of Paris, sewn up, turned over on a board, the fins pinned out, and the mouth adjusted, and, when perfectly dry, the plaster may be shaken out.

The new school of taxidermists, with new methods, whose aim is to combine knowledge of anatomy and modelling with taxidermic technique, has now come to the front, all processes of " stuffing " have been discarded in favour of modelling. Within the limits of an article like the present it is impossible to do more than glance at the intricate processes involved in this. In the case of mammals, after the skin has been com- pletely removed, even to the toes, a copy is made of the body, posed as in life, and from this an accurate representation of form, including delineation of muscles, &c, is built up in light materials, and known as the " manikin "; the model is then covered with skin, which is damped, and moulded to follow every depression and prominence, the manikin, before having the skin put on it, frequently being covered completely with a

thin layer of clay; the study is then suffered to dry; and, models having been made, in the case of large animals, of the

mucous membrane of the jaws, palate, tongue and lips, these are truthfully reproduced in a plastic material. The ordinary- glass eyes are discarded, and hollow globes, specially made, are hand-painted from nature, and are fixed in the head so as to convey the exact expression which the pose of the body demands. Birds, if of any size, can be modelled in like manner, and fishes are treated by a nearly identical process, being finally coloured as in a " still life " painting.

To give a life-like representation, attention is also paid to artistic " mounting." By this is meant the surrounding of specimens with appropriate accessories, and it is well exemplified by the work shown in the natural history museum at South Kensington, where, for example, birds are arranged as in a state of nature.

The great American museums have extended a similar method to the mounting of even large mammals, whilst they have made bird groups naturally still more life-like by panoramic back- grounds and top and side lighting of the cases. (M. B.)

TAY, the longest river in Scotland. From its source in Ben Lui (3708 ft.), a mountain on the borders of Perthshire and Argyllshire, it pursues a mainly north-easterly direction to Logierait, where it curves to the south by east as far as Dunkeld; there its course turns to the south-east to the mouth of the Isla, where it bends towards the south by west to the vicinity of Scone. From this point it makes a sharp descent to the south by east beyond the county town, when it sweeps south- east to near Newburgh in Fifeshire, where it again faces the north-east as far as Broughty Ferry, whence it. flows straight

eastwards into the North Sea, off Buddon Ness in Forfarshire, after a total run of 117 miles. During the first n miles it is known as the Fillan and discharges into Loch Dochart. From the lake it emerges as the Dochart (13 m.), which enters Loch Tay arKillin. Flowing through the loch for 145 m., it issues at Kenmore under its proper name of Tay. From hence to the sea its course measures 785 m., from which we may deduct 25 m. as the length of the Firth of Tay (which begins at Cairnie- pier Ferry) , leaving 535 m. as the length of the stream between Kenmore and the mouth of the Earn. Its principal affluents on the right are the Bran, Almond and Earn, and on the left the Lyon, Tummel and Isla. Along with its tributaries, therefore, it drains all Perthshire and portions of Forfarshire and Argyll- shire, having a catchment basin of 2400 sq. m. In many parts the current is impetuous, and in flood has occasionally wrought much havoc, certain of the inundations being historically important. Its mean discharge of water every minute is estimated to amount to 273,000 cubic ft., a larger outpour than that of any other stream in the United Kingdom. Vessels make Dundee at all stages of the tide, and the estuary is navig- able to Newburgh by vessels of 500 tons, and as far as Perth by ships of 200 tons. The navigation, however, is seriously obstructed by shifting sandbanks. The estuary varies in width from 5 m. at Cairniepier Ferry to fully 3 m. at its mouth. The principal points on the river are Crianlarich on the Fillan (with stations on the West Highland and Callander to Oban railways), Luib and Killin on the Dochart, Kenmore, Aberfeldy, Dunkeld, Birnam, Stanley, Scone, Perth and, on the north shore of the firth, Errol, Dundee, Broughty Ferry and Monifieth, and, on the south shore, Newburgh, Newport and Tayport. It is bridged at Kenmore, Aberfeldy, Logierait, Dunkeld, Caputh and Perth (3). The first railway viaduct across the firth at Dundee was nearly two miles long and had been in use for some eighteen months from the date of its opening in 1877. During the night of the 28th of December 1879, however, while a great gale was at the height of its fury, the passing of a train over the central

section gave purchase to the tempest and that portion of the structure was blown down along with the train and the unfortunate travellers. Some 75 to 90 persons are supposed to have perished. The second bridges of somewhat lower height, 2 m. and 73 yds. in length, was erected 60 ft. higher up stream and opened in 1887. The Tay is famous for salmon, the annual catch- in the river and estuary being the most valuable in Scotland. There is a hatchery at Hormontfield,

close to Luncarty station, 4 m. N. of Perth, for the artificial breeding of salmon, the fish being liberated from the ponds about the age of three years. In respect of riparian scenery the Tay as a whole is the most beautiful river in Scotland, the stretch between Logierait and Cargill, particularly the reaches above and below Dunkeld, being universally admired.

TAY, LOCH, the largest lake in Perthshire, Scotland. It is situated about the middle of the county and has a flattened ogee form, with a general trend from N.E. to S.W. It is 145 m. long from Killin at the head to Kenmore at the foot, from | m. to fully 1 m. wide. The maximum depth is 508 ft., the mean depth 200 ft. The lake lies 355 ft. above the sea, covers an area of 6550 acres, or over 10 sq. m., and has a drainage basin of 232 sq. m., including the overflow from Lochs Dochart and Tubhair. It receives at Killin the rivers Lochay and Dochart and discharges by the Tay at Kenmore. Ben Lawers (3984 ft.) rises near the left bank. There are piers at Killin, Ardeonaig, Lawers, Fernan and Kenmore, at which the steamers call during the tourist season; ferries at Ardeonaig and Lawers; and a coaching road on the left shore and a somewhat longer and more hilly road on the right. At the foot of the lake is an island containing the ruins of the priory which was founded in 11 21 by Alexander I. in memory of his wife Sibylla, daughter of Henry I. She was buried here. Loch Tay enjoys great repute for its salmon-fishing.

TAYABAS, a town of the province of Tayabas, Luzon, Philippine Islands, 8 m. N. of Lucena, the capital.

Pop. of the municipality (1903) 14,740. Tayabas is picturesquely situated on the slopes of the extinct volcano Banajao, and commands a magnificent view of the surrounding country, which is extremely fertile, and is planted in rice and coco-nuts. Its climate, although cool, is very unhealthy, malignant malarial fevers causing a high death-rate. It has a church and convent of large size and massive construction. During the revolt of 1896 a Spanish garrison occupying these buildings withstood a siege of fifty-eight days, at the end of which time it was forced to surrender by lack of food. Tagalog and Bicol are the languages spoken. Until 1901 Tayabas was the capital of the province.

TAYGETUS (Tavyeros or Tavytrov, mod. St Elias or Pente- daktylon), the highest mountain ridge in the Peloponnese, separating Laconia from Messenia. Height 7900 ft. The highest point is H. Elias; here horses are said to have been sacrificed to Helios.

TAYLOR, ANN (1782-1866), afterwards Mrs. Gilbert, and TAYLOR, JANE (1783-1824), English writers for children, daughters of Isaac Taylor (1759-1829), were born in London on the 30th of January 1782 and the 23rd of September 1783 respectively. In 1786 the Taylors went to live at Lavenham in Suffolk, and ten years later removed to Colchester. Jane was a lively and entertaining child, and composed plays and poems at a very early age. Their father and mother held advanced views on education, and under their guidance the girls were instructed not only in their father's art of engraving, but in the principles of fortification. Their poems were written in short intervals in the round of each day's occupations. Ann introduced herself to the publishers Darton and Harvey by a rhymed answer to a puzzle in the Minor's Pocket Book for 1799, and Jane made her first appearance in print in the same periodical with v The Beggar Boy." The publishers then wrote to Isaac Taylor asking for more verses for children from his family, and the result was Original Poems for Infant Minds (2 vols., 1804-5), by "several young persons," of whom Ann and Jane were the largest contributors. The book had an immediate and lasting success. It

went through numerous editions, and was translated into German, Dutch and Russian. Ann and Jane Taylor wrote directly for children, and viewed events and morals from the nursery standpoint. They had many imitators, but few serious rivals in their own kind, except perhaps Mrs Elizabeth Turner. They followed up this success with Rhymes for the Nursery (1806), Hymns for Infant Minds (1808, 2nd ed. 1810), a less-known collection, Signor Topsy

Turvy's Wonderful Magic Lantern; or, The World Turned Upside Down (1810), and Original Hymns for Sunday School (181 2). In 1813 Ann married a Congregational minister, the Rev. Josiah Gilbert, and Jane went to live at Ilfracombe with her brother Isaac. In 1816 Jane returned to Ongar, where the family had been settled for some years, and died there on the 13th of April 1824. Mrs Gilbert died at Nottingham on the 20th of December 1866. Both sisters wrote after their separa- tion, but none of their later works had the same vogue. Jane showed more wit and vivacity than her sister, notably in the Contributions of Q. Q. (2 vols., 1824), and in Display, a Tale for Young People (1815); but, though she was generally supposed to be the chief writer of the two, some of the most famous pieces in their joint works, such as " I thank the goodness and the grace," " Meddlesome Matty," " The Notorious Glutton," &c, are by Ann.

The best edition of the Poetical Works of the sisters is that of 1877. There is an excellent edition (1903) of the Original Poems and Otliers, by Ann and Jane Taylor and Adelaide O'Keeffe, edited by E. V. Lucas, with illustrations by F. D. Bedford.

Abundant information about Ann and Jane Taylor is to be found in: Autobiography and Other Memorials of Mrs Gilbert (2 vols., 1874), edited by her son Josiah Gilbert; Isaac Taylor, Memoirs . . . of Jane Taylor (2 vols., 1825), and the collection by the

same editor entitled The Family Pen: Memorials . . . of the Taylor Family of Ongar, vol. ii. (1867).

TAYLOR, BAYARD (1825–1878), American author, was born at Kennett Square in Chester county, Pennsylvania, on the nth of January 1823. The son of a well-to-do farmer, he re- ceived his early instruction in an academy at West Chester, and later at Unionville. At the age of seventeen he was ap- prenticed to a printer in West Chester. A little volume, pub- lished at Philadelphia in 1844 under the title Ximena, or the Battle of the Sierra Morena, and other Poems, brought its author a little cash; and indirectly it did him better service as the means of his introduction to The New York Tribune. With the money thus obtained, and with an advance made to him on account of some journalistic work to be done in Europe, "J. B. Taylor " (as he had up to this time signed himself, though he bore no other Christian name than Bayard) set sail for the East. The young poet spent a happy time in roaming through certain districts of England, France, Germany and Italy; that he was a born traveller is evident from the fact that this pedestrian tour of almost two years cost him only £100. The graphic accounts which he sent from Europe to The New York Tribune, The Saturday Evening Post, and The United States Gazette were so highly appreciated that on Taylor's return to America he was advised to throw his articles into book form. In 1846, accordingly, appeared his Views Afoot, or Europe seen with Knapsack and Staff (2 vols., New York). This pleasant book had considerable popularity, and its author now found himself a recognized man of letters; moreover, Horace Greeley, then editor of the Tribune, placed Taylor on the Tribune staff (1848) thus securing him a certain if a moderate income. His next journey, made when the gold-fever was at its height, was to California, as correspondent for the Tribune; from this ex- pedition he returned by way of Mexico, and, seeing his oppor- tunity, published (2 vols., New York, 1850) a highly successful book of travels, entitled El Dorado; or, Adventures in the Path of Empire. Ten

thousand copies were said to have been sold in America, and thirty thousand in Great Britain, within a fortnight from the date of issue. Bayard Taylor always con- sidered himself native to the East, and it was with great delight that in 185 1 he found himself on the banks of the Nile. He ascended as far as 12° 30' N., and stored his memory with countless sights and delights, to many of which he afterwards gave expression in metrical form. From England, towards the end of 1852, he sailed for Calcutta, proceeding thence to China, where he joined the expedition of Commodore Perry to Japan. The results of these journeys (besides his poetical memorials) were A Journey to Central Africa; or, Life and Landscapes from Egypt to the Negro Kingdoms of the White Nile (New York, 1854); The Lands of the Saracen; or, Pictures of

Palestine, Asia Minor, Sicily and Spain (1854); and A Visit to India, China and Japan in the Year 1853 (1855). O n his return (December 20, 1853) from these various journeyings he entered, with marked success, upon the career of a public lecturer, delivering addresses in every town of importance from Maine to Wisconsin. After two years' experience of this lucrative profession, he again started on his travels, on this occasion for northern Europe, his special object being the study of Swedish life, language and literature. The most noteworthy result was the long narrative poem Lars, but his " Swedish Letters " to the Tribune were also republished, under the title Northern Travel: Summer and Winter Pictures (London, 1857). His first wife, May Agnew, died (1850) within a year of her marriage, and in October 1857 he married Maria Hansen, the daughter of Peter Hansen, the German astronomer. The ensuing winter was spent in Greece. In 1859 Taylor once more traversed the whole extent of the western American gold region, the primary cause of the journey lying in an invitation to lecture at San Francisco. About three years later he entered the diplomatic service as secretary of legation at St Petersburg, and the following year (1863) became charge d'affaires at the Russian capital. In 1864 he returned to the

United States and resumed his active literary labours, and rt was at this period that Hannah Thurston (New York, 1863), the first of his four novels, was published. This book had a moderate success, but neither in it nor in its successors did Bayard Taylor betray any special talent as a novelist. In 1874 he. went to Iceland, to report for the Tribune the one thousandth anniversary of the first settlement there. In June 1878 he was accredited United States minister at Berlin. Notwithstanding the resistless passion for travel which had always possessed him, Bayard Taylor was (when not actually en route) sedentary in his habits, especially in the later years of his life. His death occurred on the 19th of December, only a few months after his arrival in' Berlin.

Taylor's most ambitious productions in poetry — his Masque of the Gods (Boston, 1872), Prince Deukalion; a lyrical drama (Boston, 1878), The Picture of St John (Boston, 1866), Lars; a Pastoral of Norway (Boston, 1873), and The Prophet; a tragedy (Boston, 1874) — are marred by a ceaseless effort to overstrain his power. But he will be remembered by his poetic and excellent translation of Faust (2 vols., Boston, 1870-71) in the original metres. Taylor felt, in all truth, " the torment and the ecstasy of verse "; but, as a critical friend has written of him, " his nature was so ardent, so full-blooded, that slight and common sensations intoxicated him, and he estimated their effect, and his power to transmit it to others, beyond the true value." He had, from the earliest period at which he began to compose, a distinct lyrical faculty: so keen indeed was his ear that he became too insistently haunted by the music of others, pre-eminently of Tennyson. But he had often a true and fine note of his own. His best short poems are " The Metem- psychosis of the Pine " and the well-known Bedouin love-song. In his critical essays Bayard Taylor had himself in no inconsiderable degree what he wrote of as " that pure poetic insight which is the vital spirit of criticism." The most valuable of these prose disser- tations are the Studies in

German Literature (New York, 1879). Collected editions of his Poetical Works and his Dramatic Works were published at Boston in 1888; his Life and Letters (Boston, 2 vols., 1884) were edited by his wife and Horace E. Scudder.

See also Albert H. Smyth, Bayard Taylor (Boston, 1896), in the " American Men of Letters " series; and W. D. Howells's Literary Friends and Acquaintances (1900).

TAYLOR, BROOK (1685–1731), English mathematician, was the son of John Taylor, of Bifrons House, Kent, by Olivia, daughter of Sir Nicholas Tempest, Bart., of Durham, and was born at Edmonton in Middlesex on the 18th of August 1685. He entered St John's College, Cambridge, as a fellow-commoner in 1701, and took degrees of LL.B. and LL.D. respectively in 1709 and 17 14. Having studied mathematics under John Machin and John Keill, he obtained in 1708 a remarkable solution of the problem of the " centre of oscillation," which, however, remaining unpublished until May 17 14 {Phil. Trans., vol. xxviii. p. n), his claim to priority was unjustly disputed by John Bernoulli. Taylor's Methodus Incrementorum Directa et Inversa (London, 1715) added a new branch to the higher mathematics, now designated the " calculus of finite differences." Among other ingenious applications, he used it to determine

the form oi movement of a vibrating string, by him first suc- cessfully reduced to mechanical principles. The same work contained the celebrated formula known as " Taylor's theorem " (see Infinitesimal Calculus), the importance of which re- mained unrecognized until 1772, when J. L. Lagrange realized its powers and termed it " le principal fondement du calcul diffSrentiel."

In his essay on Linear Perspective (London, 1715)

Taylor set forth the true principles of the art in an original and more general form than any of his predecessors; but the work suffered from the brevity and obscurity which affected most of his writings, and needed the elucidation bestowed on it in the treatises of Joshua Kirby (1754) and Daniel Fournier (1761).

Taylor was elected a fellow of the Royal Society early in 171 2, sat in the same year on the committee for adjudicating the claims of Sir Isaac Newton and Gottfried Wilhelm Leibnitz, and acted as secretary to the society from the 13th of January 1714 to the 21st of October 1718. From 1715 his studies took a philosophical and religious bent. He corresponded, in that year, with the Comte de Montmort on the subject of Nicolas Malebranche's tenets; and unfinished treatises, " On the Jewish Sacrifices " and " On the Lawfulness of Eating Blood," written on his return from Aix-la-Chapelle in 17 19, were after- wards found among his papers. His marriage in 1721 with Miss Brydges of Wallington, Surrey, led to an estrangement from his father, a person of somewhat morose temper, which terminated in 1723 after the death of the lady in giving birth to a son. The ensuing two years were spent by him with his family at Bifrons, and in 1725 he married, with the paternal approbation, Sabetta, daughter of Mr Sawbridge of Olantigh, Kent, who, by a strange fatality, died also in childbed in 1730; in this case, however, the infant, a daughter, survived. Taylor's fragile health gave way; he fell into a decline, died on the 29th of December 1731, at Somerset House, and was buried at St Ann's, Soho. By his father's death in 1729 he had inherited the Bifrons estate. As a mathematician, he was the only Englishman after Sir Isaac Newton and Roger Cotes capable of holding his own with the Bernoullis; but a great part of the effect of his demonstrations was lost through his failure to express his ideas fully and clearly.

A posthumous work entitled Contemplatio Philosophica was printed for private circulation in 1793 by his grandson, Sir William Young, Bart., prefaced by a

life of the author, and with an appendix containing letters addressed to him by Bolingbroke, Bossuet, &c. Several short papers by him were published in Phil. Trans., vols, xxvii. to xxxii., including accounts of some interesting experiments in magnetism and capillary attraction. He issued in 1 7 19 an im- proved version of his work on perspective, with the title New Principles of Linear Perspective, revised by Colson in 1749, and printed again, with portrait and life of the author, in 181 1. A French translation appeared in 1753 at Lyons. Taylor gave (Methodus Incrementorum, p. 108) the first satisfactory investigation of astronomical refraction.

See Watt, Bibliotheca Britannica; Hutton, Phil, and Math. Dictionary; F6tis, Biog. des Musiciens; Th. Thomson, Hist, of the R. Society, p. 302; Grant, Hist. Phys. Astronomy, p. 377; Marie, Hist, des Sciences, vii. p. 231; M. Cantor, Geschichte der Mathe- matik.

TAYLOR, SIR HENRY (1800–1886), English poet and political official, was born on the 18th of October 1800, at Bishop- Middleham, Durham, where his ancestors had been small landowners for some generations. His mother died while he was yet an infant, and he was chiefly educated by his father, a man of studious tastes, who, finding him less quick than his two elder brothers, allowed him to enter the navy as a midship- man. Finding the life uncongenial, he only remained eight months at sea, and after obtaining his discharge was appointed to a clerkship in the storekeeper's office. He had scarcely entered upon his duties when he was attacked by typhus fever, which carried off both his brothers, then living with him in London. In three or four years more his office was abolished while he was on duty in the West Indies. On his return he found his father happily married to a lady whose interest and sympathy proved of priceless value to him. Through her he became acquainted with hex cousin, Isabella feiwrkk, the

neighbour and intimate friend of Wordsworth, who

introduced him to Wordsworth and Southey. Under these influences he lost his early admiration for Byron, whose school, whatever its merits, he at least was in no way calculated to adorn, and his intellectual powers developed rapidly. In October 1822 he published an article on Moore's Irish Melodies in the Quarterly Review. A year later he went to London to seek his fortune as a man of letters, and met with rapid success, though not precisely in this capacity. He became editor of the London Magazine, to which he had already contributed, and in January 1824 obtained, through the influence of Sir Henry Holland, a good appointment in the Colonial Office. He was immediately entrusted with the preparation of confidential state papers, and his opinion soon exercised an important influence on the decisions of the secretary of state. He visited Wordsworth and Southey, travelled on the Continent with the latter, and at the same time, mainly through his friend and official colleague, the Hon. Hyde Villiers, became intimate with a very different set, the younger followers of Bentham, without, however, adopting their opinions — " young men," he afterwards reminded Stuart Mill, " who every one said would be ruined by their independ- ence, but who ended by obtaining all their hearts' desires, except one who fell by the way." The reference is to Hyde Villiers, who died prematurely. Taylor actively promoted the emancipation of the slaves in 1833, and became an intimate ally of Sir James Stephen, then counsel to the Colonial Office, afterwards under-secretary, by whom the Act of Emancipation was principally framed. His duties at the Colonial Office were soon afterwards lightened by the appointment of James Sped- ding, with whom he began a friendship that lasted till the end of his life. . • . .'

His first drama, Isaac Comnenus, Elizabethan in tone, and giving a lively picture of the Byzantine court and people, was published anonymously in 1828. Though highly praised by Southey, it made little impression on the public. Philip van Artevelde, an elaborate poetic drama, the subject of which had

been recommended to him by Southey, was begun in 1828, published in 1834, and, aided by a laudatory criticism from Lockhart's pen in the Quarterly, achieved extraordinary success. Its great superiority to Taylor's other works may be explained by its being to a great extent the vehicle of his own ideas and feelings. Artevelde's early love experiences reproduce and transfigure his own. Edwin the Fair (1842) was less warmly received; but his character of Dunstan, the ecclesiastical statesman, is a fine psychological study, and the play is full of historical interest. Meanwhile he had married (1839) Theodosia Spring-Rice, the daughter of his former chief Lord Monteagle, and, in conjunction with Sir James Stephen, had taken a leading part in the abolition of negro apprenticeship in the West Indies. The Statesman, a volume of essays suggested by his official position, had been published in 1836, and about the same time he had written in the Quarterly the friendly notices of Words- worth and Southey which did much to dispel the conventional prejudices of the day, and which were published in 1849 under the somewhat misleading title of Notes from Books.

In 1847 he was offered the under-secretaryship of state foi the colonies, which he declined. Notes from Life and The Eve of the Conquest appeared in this year; and an experiment in romantic comedy, The Virgin Widow, afterwards entitled A Sicilian Summer, was published in 1850. " The pleasantest play I had written," says the author; " and I never could tell why people would not be pleased with it." His last dramatic work was St Clement's Eve, published in 1862. In 1869 he was made K.C.M.G. He retired from the Colonial Office in 1872, though continuing to be consulted by government. His last days were spent at Bournemouth in the enjoyment of universal respect; and the public, to whom he had hitherto been an almost impersonal existence, became familiarized with the extreme picturesqueness of his appearance in old age, as represented in the photographs of his friend Julia Margaret Cameron. He died on the 27th of March 1886. His Auto- \ biogra.'jjH^, published a

-jeai before bis death, while sinning a

little by the egotism pardonable in a poet and the garrulity- natural to a veteran, is in the main a pleasing and faithful picture of an aspiring youth, an active maturity, and a happy and honoured old age.

Taylor's Artevelde cannot fail to impress those who read it as the work of a poet of considerable distinction; but, perhaps for the very reason that he was so prominent as a state official, he has not been accepted by the world as more than a very accomplished man of letters. His lyrical work is in general laboriously artificial, but he produced two well-known songs — " Quoth tongue of neither maid nor wife " and " If I had the wings of a dove."

Taylor's Autobiography (2 vols. 1885) should be supplemented by his Correspondence (1888), edited by Edward Dowden. His Works were collected in five volumes in 1877-78.

TAYLOR, ISAAC (1787-1865), English author, son of Isaac Taylor (175 9- 182 9), engraver and author, was born at Laven- ham, Suffolk, on the 17th of August 1787. He was trained by his father to be an engraver, but early adopted literature as a profession. From 1824, the year of his marriage, he lived a busy but uneventful life at Stanford Rivers, near Ongar, Essex, where he died on the 28th of June 1865. His attention was drawn to the study of the fathers of the church through reading the works of Sulpicius Severus, which he had picked up at a bookstall. . He published a History of the Transmission of Ancient Books to Modern Times (1827), a study in biblical criticism, and some other works, but he attracted little notice until, in 1829, he published anonymously a book bearing upon the religious and political problems of the day, entitled The Natural History of Enthusiasm,

which speedily ran through eight or nine editions. Fanaticism (1833), Spiritual Despotism (1835), Saturday Evening (1832), and The Physical Theory of Another Life (1836), all commanded a large circulation. In his Ancient Christianity (1839-46), a series of dissertations in reply to the " Tracts for the Times," Taylor maintained that the Christian church of the 4th century should not be regarded as embodying the doctrine and practice of the apostles because it was then already corrupted by contact with pagan super- stition. The book met with great opposition, but Taylor did not follow up the controversy.

Among his other works may be mentioned biographies of Ignatius Loyola (1849) and John Wesley (1851); a volume entitled The Restoration of Belief (1855); and a course of lectures on The Spirit of Hebrew Poetry (1861).

TAYLOR, ISAAC (1829-1901), English philologist, eldest son of the preceding, was born at Stanford Rivers, 2nd May 1829. He was educated at Trinity College, Cambridge, and took the mathematical tripos in 1853. His interests, however, were linguistic rather than mathematical, and his earliest publication was a translation from the German of W. A. Becker's Charicles. Though of Nonconformist stock, Isaac Taylor joined the Church of England, and in 1857 was ordained to a country curacy. In i860 he published The Liturgy of the Dissenters, an appeal for the revision of the Book of Common Prayer " on Protestant lines," " as expedient for the material interests of the Church, and as an act of plain justice to the Dissenters." His studies in local etymology bore fruit in Words and Places in Etymological Illustration of History, Ethnology and Geography (1864). Be- tween 1865 and 1869, when he was in charge of a Bethnal Green parish, his philological studies were laid aside, and he published only The Burden of the Poor and The Family Pen, a record of the literary work of his own family, the Taylors of Ongar. In 1869 he became incumbent of a church at Twicken- ham, and used his comparative leisure to produce his Etruscan

Researches (1874), in which he contended for the Ugrian origin of the Etruscan language. In 1875 he was presented to the rectory of Settrington, Yorkshire, and began his systematic researches into the origin of the alphabet. His Greeks and Goths; a Study on the Runes (1879), in which he suggested that the runes were of Greek origin, led to a good deal of controversy. His most important work is The Alphabet, an Account of the Origin and Development of Letters (1883; new and revised

edition 1899). Taylor points out that alphabetical changes are the result of evolution taking place in accordance with fixed laws. " Epigraphy and palaeography may claim, no less than philology or biology, to be ranked among the inductive sciences." He was largely indebted to the Egyptian researches of Rouge, which it has since become necessary to reconsider in the light of discoveries in Crete. In 1885 Taylor became canon of York, and two years later dean. His paper on the Origin of the Aryans, read at the British Association in 1887, was after- wards expanded into a book. In the following winter he visited Egypt, and his letters from there, collected under the title Leaves from an Egyptian Notebook, aroused considerable controversy from the extremely favourable view he took of the Mahommedan religion. For the last few years of his life Dean Taylor suffered from ill health, and was laid aside from active work for some time before his death in October 1901.

TAYLOR, JEREMY (1613–1667), English divine and author, was baptized at Cambridge on the 15th of August 16 13. His father, Nathaniel, though a barber, was a man of some educa- tion, for Jeremy was " solely grounded in grammar and mathe- matics " by him. The tradition that he was descended from Dr Rowland Taylor, Cranmer's chaplain, who suffered martyr- dom under Mary, is grounded on the untrustworthy evidence of a certain Lady Wray, said to have been a granddaughter of Jeremy Taylor. She supplied Bishop Heber in 1732 with other biographical data of doubtful authenticity. Jeremy Taylor was a pupil of Thomas Lovering, at the newly

founded Perse grammar school. Lovering is first mentioned as master in 161 9, so that Taylor probably spent seven years at the school before he was entered at Gonville and Caius College as a sizar in 1626, 1 eighteen months after Milton had entered Christ's, and while George Herbert was public orator and Edmund Waller and Thomas Fuller were undergraduates of the university. He was elected a Perse scholar in 1628, and fellow of his college in 1633, but the best evidence of his diligence as a student is the enormous learning of which he showed so easy a command in after years. In 1633, although still below the canonical age, he took holy orders, and, accepting the invitation of Thomas Risden, a former fellow-student, to supply his place for a short time as lecturer in St Paul's, he at once attracted attention by his eloquence and by his handsome face. Archbishop Laud sent for Taylor to preach before him at Lambeth, and took the young man under his special protection. Taylor did not vacate his fellowship at Cambridge before 1636, but he spent, appa- rently, much of his time in London, for Laud desired that his " mighty parts should be afforded better opportunities of study and improvement than a course of constant preaching would allow of." In November 1635 he had been nominated by Laud to a fellowship at All Souls, Oxford, where, says Wood (Athen. Oxon., Ed. Bliss, iii. 781), love and admiration still waited on him. He seems, however, to have spent little time there. He became chaplain to his patron the archbishop, and chaplain in ordinary to Charles I. At Oxford William Chilling- worth was then busy with his great work, The Religion of Pro- testants, and it is possible that by intercourse with him Taylor's mind may have been turned towards the liberal movement of his age. After two years in Oxford, he was presented, in March 1638, by Juxon, bishop of London, to the rectory of Uppingham, in Rutlandshire. In the next year he married Phoebe Langs- dale, by whom he had six children, the eldest of whom died at Uppingham in 1642. In the autumn of the same year he was appointed to preach in St Mary's on the anniversary of the Gunpowder Plot, and apparently used the

occasion to clear himself of a suspicion, which, however, haunted him through life, of a secret leaning to the Romish communion. This suspicion seems to have arisen chiefly from his intimacy with Christopher Davenport, better known as Francis a Sancta Clara, a learned Franciscan friar who became chaplain to Queen

1 An obviously erroneous entry in the Admission Book states that he had been at school under Mr. Lovering for ten years, and was in his fifteenth year. Admissions to GonvUle and Caius College (ed. J. Venn, 1887).

Henrietta; but it may have been strengthened by his known connexion with Laud, as well as by his ascetic habits. More serious consequences followed his attachment to the Royalist cause. The author of The Sacred Order and Offices of Episcopacy or Episcopacy Asserted against the Aerians and Acephali New arid Old (1642), could scarcely hope to retain his parish, which was not, however, sequestrated until 1644. Taylor probably accompanied the king to Oxford. In 1643 he was presented to the rectory of Overstone, Northamptonshire, by Charles I. There he would be in close connexion with his friend and patron Spencer Compton, 2nd earl of Northampton.

During the next fifteen years Taylor's movements are not easily traced. He seems to have been in London during the last weeks of Charles I., from whom he is said to have received his watch and some jewels which had ornamented the ebony case in which he kept his Bible. He had been taken prisoner with other Royalists while besieging Cardigan castle on the 4th of February 1645. In 1646 he is found in partnership with two other deprived clergymen, keeping a school at Newton Hall, in the parish of Llanvihangel-Aberbythych, Carmarthen- shire. Here he became private chaplain to Richard Vaughan, 2nd earl of Carbery (1600- 1686), whose hospitable mansion,

Golden Grove, is immortalized in the title of Taylor's still popular manual of devotion, and whose first wife was a constant friend of Taylor. The second Lady Carbery was the original of the " Lady " in Milton's Comus. Mrs Taylor had died early in 165 1. He second wife was Joanna Bridges, said on very doubtful authority to have been a natural daughter of Charles I. She owned a good estate, though probably impoverished by Parliamentarian exactions, at Mandinam, in Carmarthenshire.

From time to time Jeremy Taylor appears in London in the company of his friend Evelyn, in whose diary and correspond- ence his name repeatedly occurs. He was three times im- prisoned: in 1654-5 for an injudicious preface to his Golden Grove; again in Chepstow castle, from May to October 1655, on what charge does not appear; and a third time in the Tower in 1657-8, on account of the indiscretion of his publisher, Richard Royston, who had adorned his " Collection of Offices " with a print representing Christ in the attitude of prayer.

Much of his best work was produced at Golden Grove. In 1646 appeared his famous plea for toleration, QeoKoryia 'E/cXeKTuo), A Discourse of the Liberty of Prophesying. In 1649 he pub- lished the complete edition of his Apology for authorized and set forms of Liturgy against the Pretence of the Spirit, as well as his Great Exemplar … a History of . . . Jesus Christ, a book which was inspired, its author tells us, by his earlier intercourse with the earl of Northampton. Then followed in rapid succession the Twenty-seven Sermons (1651), " for the summer half-year," and the Twenty-five (1653), " for the winter half-year," The Rule and Exercises of Holy Living (1650), The Rule and Exercises of Holy Dying (1651), a controversial treatise on The Real Presence . . . (1654), the Golden Grove; or a Manuall of daily prayers and tetanies . . . (1655), and the Unum Necessarium (1655), which by its Pelagianism gave great offence. 1 The Rule and Exercises of Holy Living provided a manual of Christian practice, which has retained its place with devout readers. The scope of the work is

described on the title-page. It deals with ” the means and instruments of obtaining every virtue, and the remedies against every vice, and considerations serving to the resisting all temptations, together with prayers containing the whole Duty of a Christian.” Holy Dying was perhaps even more popular. A very charming piece of work of a lighter kind was inspired by a question from his friend, Mrs Katherine Phillips (the” matchless Orinda”), asking ” How far is a dear and perfect friendship authorized by the principles of Christianity?” In answer to this he dedicated to the ” most ingenious and excellent Mrs Katherine Phillips ” his Discourse of the Nature, Offices and Measures of

1 See an angry letter by Brian Duppa, bishop of Salisbury, on ihe subject (Eden i. xlii.).

Friendship (1657). His Ductor Dubitantium, or the Rule of Conscience . . . (1660) was intended to be the standard manual of casuistry and ethics for the Christian people.

He probably left Wales in 1657, and his immediate connexion with Golden Grove seems to have ceased two years earlier. In 1658, through the kind offices of his friend John Evelyn, Taylor was offered a lectureship in Lisburn, Ireland, by Edward Conway, second Viscount Conway. At first he declined a post in which the duty was to be shared with a Presbyterian, or, as he expressed it, ” where a Presbyterian and myself shall be like Castor and Pollux, the one up and the other down,” and to which also a very meagre salary was attached. He was, however, induced to take it, and found in his patron’s mansion at Portmore, on Lough Neagh, a congenial retreat.

At the Restoration, instead of being recalled to England, as he probably expected and certainly desired, he was appointed to the see of Down and Connor, to which was shortly added the small adjacent diocese of Dromore. He was also made a member of the Irish privy council and vice-chancellor of the university of Dublin. None of

these honours were sinecures. Of the university he writes, ” I found all things in a perfect disorder …. a heap of men and boys, but no body of a college, no one member, either fellow or scholar, having any legal title to his place, but thrust in by tyranny or chance.” Accordingly he set himself vigorously to the task of framing and enforcing regulations for the admission and conduct of members of the university, and also of establishing lectureships. His episcopal labours were still more arduous. There were, at the date of the Restoration, about seventy Presbyterian ministers in the north of Ireland, and most of these were from the west of Scotland, and were imbued with the dislike of Episcopacy which distinguished the Covenanting party. No wonder that Taylor, writing to the duke of Ormonde shortly after his consecration, should have said, ” I perceive myself thrown into a place of torment.” His letters perhaps somewhat exaggerate the danger in which he lived, but there is no doubt that his authority was resisted and his overtures rejected. His writings also were ransacked for matter of accusation against him, “a committee of Scotch spiders being appointed to see if they can gather or make poison out of them.” Here, then, was Taylor’s opportunity for exemplifying the wise toleration he had in other days inculcated, but the new bishop had nothing to offer the Presbyterian clergy but the bare alternative — sub- mission to episcopal ordination and jurisdiction or deprivation. Consequently, in his first visitation, he declared thirty-six churches vacant; and of these forcible possesssion was taken by his orders. At the same time many of the gentry were won by his undoubted sincerity and devotedness as well as by his eloquence. With the Roman Catholic element of the popula- tion he was less successful. Ignorant of the English language, and firmly attached to their ancestral forms of worship, they were yet compelled to attend a service they considered profane, conducted in a language they could not understand. As Heber says, ” No part of the administration of Ireland by the English crown has been more extraordinary and more un- fortunate than the system pursued for the

introduction of the Reformed religion. ” At the instance of the Irish bishops Taylor undertook his last great work, the Dissuasive from Popery (in two parts, 1664 and 1667), but, as he himself seemed partly conscious, he might have more effectually gained his end by adopting the methods of Ussher and Bedell, and inducing his clergy to acquire the Irish tongue,

The troubles of his episcopate no doubt shortened his life. Nor were domestic sorrows wanting in these later years. In 1 661 he buried, at Lisburn, Edward, the only surviving son of his second marriage. His eldest son, an officer in the army, was killed in a duel; and his second son, Charles, intended for the church, left Trinity College and became companion and secretary to the duke of Buckingham, at whose house he died. The day after his son’s funeral Taylor caught fever from a patient whom he visited, and, after a ten days’ illness, he died at Lisburn on the 13th of August 1667, in the fifty-fifth year of

his life and the seventh of his episcopate, and was buried in the cathedral of Dromore.

Taylor’s fame has been maintained by the popularity of his sermons and devotional writings rather than by his influence as a theologian or his importance as an ecclesiastic. His mind was neither scientific nor speculative, and he was attracted rather to questions of casuistry than to the problems of pure theology. His wide reading and capacious memory enabled him to carry in his mind the materials of a sound historical theology, but these materials were unsifted by criticism. His immense learning served him rather as a storehouse of illustrations, or as an armoury out of which he could choose the fittest weapon for discomfiting on opponent, than as a quarry furnishing him with material for building up a completely designed and endur- ing edifice of

systematized truth. Indeed, he had very limited faith in the human mind as an instrument of truth. ” Theo- logy,” he says, ” is rather a divine life than a divine knowledge.” His great plea for toleration is based on the impossibility of erecting theology into a demonstrable science. “It is im- possible all should be of one mind. And what is impossible to be done is not necessary it should be done.” Differences of opinion there must be; but ” heresy is not an error of the understanding but an error of the will.” He would submit all minor questions to the reason of the individual member, but he set certain limits to toleration, excluding ” whatsoever is against the foundation of faith, or contrary to good life and the laws of obedience, or destructive to human society, and the public and just interests of bodies politic.” Peace, he thought, might be made ” if men would not call all opinions by the name of religion, and superstructures by the name of fundamental articles.” Of the propositions of sectarian theologians he said that confidence was the first, and the second, and the third part. Of a genuine poetic temperament, fervid and mobile in feeling, and of a prolific fancy, he had also the sense and wit that come of varied contact with men. All his gifts were made available for influencing other men by his easy command of a style rarely matched in dignity and colour. With all the majesty and stately elaboration and musical rhythm of Milton’s finest prose, Taylor’s style is relieved and brightened by an astonishing variety of felicitous illustrations, ranging from the most homely and terse to the most dignified and elaborate. His sermons especially abound in quotations and allusions, which have the air of spontaneously suggesting themselves, but which must sometimes have baffled his hearers. This seeming pedantry is, however, atoned for by the clear practical aim of his sermons, the noble ideal he keeps before his hearers, and the skill with which he handles spiritual experience and urges incentives to virtue.

The whole works of . . . Jeremy Taylor with a life

of the author and a critical examination of his writings was published by Bishop Reginald Heber in 1822, reissued after careful revision by Charles Page Eden (1847–54). His most popular works, The Liberty of Prophesying, Holy Living, and Holy Dying have been often reprinted. The Poems and Verse-translations of Jeremy Taylor were edited by Dr. A. B. Grosart in vol. i. of the Miscellanies of the Fuller Worthies Library (1870). The first biographer of Jeremy Taylor was his friend and successor, George Rust, who preached a funeral sermon (in 1668) which remains a valuable document. His life has been written by John Wheeldon (1793), H. K. Bonney (1815), T. S. Hughes (1831), R. H. Willmott (1847), George L. Duyckinck (New York, i860). The chief authority is still Eden's revision of Bishop Heber's memoir, which includes much valuable correspondence. See also E. W. Gosse's Jeremy Taylor (1904) in the English Men of Letters series. A bibliography of works dealing witn the subject is included in the article by the Rev. Alexander Gordon in the Dictionary of National Biography. S. T. Coleridge was a diligent student and a warm admirer of Jeremy Taylor, whom he regarded as one of the great masters of English style. A series of comments by Coleridge are collected in his Literary Remains (1838, vol. iii. pp. 2O3–390).

TAYLOR, JOHN (1580–1653), English pamphleteer, commonly called the " Water-Poet," was born at Gloucester on the 24th of August 1580. After fulfilling his apprenticeship to a waterman, he served (1596) in Essex's fleet, and was present at Flores in 1597 and at the siege of Cadiz. On his return to England he became a Thames waterman, and was at one time

collector of the perquisites exacted by the lieutenant of the Tower. He was an expert in the art of self-advertisement, and achieved notoriety by a series of eccentric journeys. With a companion as feather-brained as himself he journeyed from London to Queenborough in a paper boat, with two stockfish tied to canes for oars. The Pennyles Pilgrimage, or the Money- lesse Perambulation of John Taylor . . .

how he travailed on foot from London to Edenborough in Scotland . . . 1618, contains the account of a journey perhaps suggested by Ben Jonson's celebrated undertaking, though Taylor emphatically denies any intention of burlesque. He went as far as Aberdeen. At Leith he met Jonson, who good-naturedly gave him twenty- two shillings to drink his health in England. Other travels undertaken for a wager were a journey to Prague, where he is said to have been entertained (1620) by the queen of Bohemia, and those described respectively in A very merry, wherry ferry voyage, or Yorke for my money, and A New Discovery by sea ■with a Wherry from London to Salisbury (1623). At the out- break of the civil war Taylor began to keep a public-house at Oxford, but when his friends the Royalists were obliged to surrender the city he returned to London, where he set up a similar business at the sign of " The Crown " in Phoenix Alley, Long 'Acre. At the time of the king's execution he changed his sign to the Mourning Crown, but the authorities objected, and he substituted his own portrait. He was buried in the churchyard of St Martin's-in-the-Fields on the 5th of December

1653- .

Taylor gave himself the title of " the king's water-poet and the queen's water-man." He was no poet, though he could string rhymes together on occasion. His gifts lay in a coarse, rough and ready wit, a talent for narrative, and a considerable command of repartee, which made him a dangerous enemy. Thomas Coryate, the author of the Crudities, was one of his favourite butts, and he roused Taylor's special anger because he persuaded the authorities to have burnt one of Taylor's pamphlets directed against him. This was Laugh and be Fat (1615?), a parody of the Odcombian Banquet.

Sixty-three of Taylor's " works " appeared in one volume in 1630. This was reprinted by the Spenser Society in 1868-9, being followed by other tracts not included in the collection (1870-8). Some of his more amusing productions were edited (1872) by

Charles Hindley as The Works of John Taylor. They provide some very entertaining reading, but in spite of the legend on one of his title-pages, " Lastly that (which is Rare in a Travailer) all is true," it is permissible to exercise some mental reservations in accepting his statements. Mr Hindley edited other tracts of Taylor's in his Miscellanea Antiqua Anglicana (1873).

TAYLOR, JOHN (1 704-1 766), English classical scholar, was born at Shrewsbury on the 22nd of June 1704. His father was a barber, and, by the generosity of one of his customers, the son, having received his early education at the grammar school of his native town, was sent to St John's College, Cam- bridge. In 1732 he was appointed librarian, in 1734 registrar of the university. Somewhat late in life he took orders, became rector of Lawford in Essex in 1751, and canon of St Paul's in 1757. He died in London on the 4th of April 176,6. Taylor is best known for his editions of some of the Greek orators, chiefly valuable for the notes on Attic law, e.g. Lysias (1739); Demosthenes Contra Leptinem (1741) and Contra Midiam (1743, with Lycurgus Contra Leocratem), intended as specimens of a proposed edition, in five volumes, of the orations of Demos- thenes, Aeschines, Dinarchus and Demades, of which only vols. ii. and iii. were published. Taylor also published (under the title of Marmor Sandvicense) a commentary on the inscrip- tion on an ancient marble brought from Greece by Lord Sand- wich, containing particulars of the receipts and expenditure of the Athenian magistrates appointed to celebrate the festival of Apollo at Delos in 374 B.C. His Elements of Civil Law (i7S5) also deserves notice. It was severely attacked by Warburton in his Divine Legation, professedly owing to a difference of opinion in regard to the persecution of the early Christians, in reality because Taylor had spoken disparagingly of his scholarship.

TAYLOR, JOSEPH (c. 1586–c. 1653), English actor, is men- tioned in the folio Shakespeare of 1623 as one of the twenty-six who took principal parts in all of these plays. There is a legend that he was trained by Shakespeare to play Hamlet, and that he succeeded Burbage in this and other parts. Certain it is that in many of Beaumont and Fletcher's plays he had a leading role, and he is one of the ten actors who signed the dedication of the first folio of these dramatists (1647).

TAYLOR, MICHAEL ANGELO (1757–1834), English politi- cian, was a son of Sir Robert Taylor (17 14–1788), the architect, and was educated at Corpus Christi College, Oxford, becoming a barrister at Lincoln's Inn in 1774. He entered the House of Commons as member for Poole in 1784, and, with the excep- tion of the short period from 1802 to 1806, remained a member of parliament- until 1834, although not as the representative of the same constituency. In parliament Taylor showed himself anxious to curtail the delays in the Court of Chancery, and to improve the lighting and paving of the London streets; and he was largely instrumental in bringing about the abolition of the pillory. At first a supporter of the younger Pitt, he soon veered round to the side of Fox and the Whigs, favoured parlia- mentary reform, and was a personal friend of the regent, after- wards George IV. He was on the committee which managed the impeachment of Warren Hastings; was made a privy councillor in 1831; and died in London on the 16th of July 1834. Taylor is chiefly known in connexion with the Metro- politan Paving Act of 1817, which is still referred to as " Michael AngeloTaylor's Act." Often called " Chicken Taylor " because of his reference to himself as a " mere chicken in the law," he is described by Sir Spencer Walpole as " a pompous barrister, with a little body and a loud voice." Taylor's father, Sir Robert, was the founder of the Taylorian Institution at Oxford.

TAYLOR, NATHANIEL WILLIAM (1786–1858), American Congregational theologian, was born in New Milford, Con- necticut, on the 23rd of June 1786, grandson of Nathaniel Taylor (1722–1800), pastor at New Milford.

He graduated at Yale College in 1807, studied theology under Timothy Dwight, and in 18 12 became pastor of the First Church of New Haven. From 1822 until his death in New Haven on the 10th of March 1858 he was Dwight professor of didactic theology at Yale. He was the last notable representative of the New England School, in which his predecessors were the younger Edwards, John Smalley (1734–1820) and Nathaniel Emmons. In the Yale Divinity School his influence was powerful, and in 1833 one of his foremost opponents, Bennet Tyler (1783–1858), founded in East Windsor a Theological Institute to offset Taylor's teaching at Yale.

Taylorism, sometimes called the " New Haven " theology, was an attempt to defend Calvinism from Arminian attacks, and the defence itself was accused of Arminianism and Pelagianism by A. A. Hodge of Princeton and Leonard Woods of Andover. Taylor's theology was distinctively infra-lapsarian ; it disagreed with Samuel Hopkins and Emmons in rejecting the theory of " divine efficiency " and in arguing that man can choose the right " even if he won't " ^—distinguishing like Edwards between natural ability and moral inability; it distinguished sensibility or susceptibility as something different from will or understanding, without moral qualities, to which the appeal for right choice may be made; and it made self- love (a term borrowed from Dugald Stewart, connoting the innocent love of happiness and distinct from selfishness) the particular feeling appealed to by the influences of the law and gospel.

He wrote Practical Sermons (1858; edited by Noah Porter); Lectures on the Moral Government of God (2 vols., 1859), and Essays and Lectures upon Select Topics in Revealed Theology (1859), a ^ published posthumously.

TAYLOR, PHILIP MEADOWS (1808–1876), Anglo-Indian administrator and novelist, was born at Liverpool on the 25th of September 1808. At the age of fifteen he was sent out to India to become a clerk to a Bombay merchant. On his arrival the house was in financial

difficulties, and he was glad to accept in 1824 a commission in the service of his highness the nizam, to which service he remained devotedly attached throughout his long career. He was speedily transferred from military duty to a civil appointment, and in this capacity he acquired a knowledge of the languages and the people of Southern India

which has seldom been equalled. He studied the laws, the geology, the antiquities of the country; he was alternately judge, engineer, artist and man of letters, for on his return to England in 1840 on furlough he published the first of his Indian novels, Confesssions of a Thug, in which he reproduced, with singular vivacity and truth, the scenes which he had heard described by the chief actors in them. This book was followed by a series of tales, Tippoo Sultaun (1840), Tara (1863), Ralph Darnell (1865), Seeta (1872), and A Noble Queen (1878), all illustrating periods of Indian history and society, and giving a prominent place to the native character, for which and the native institutions and traditions he had a great regard and respect. Returning to India he acted from 1840 to 1853 as correspondent for The Times. He also wrote a Student's Manual of the History of India (1870). About 1850, Meadows Taylor was appointed by the nizam's government to administer, during a long minority, the principality of the young raja of Shorapore. He succeeded without any European assistance in raising this small territory to a high degree of prosperity, and such was his influence with the natives that on the occur- rence of the mutiny in Bengal he held his ground without military support. Colonel Taylor, whose merits were now recognized and acknowledged by the British government of India — although he had never been in the service of the Com- pany—was subsequently appointed to the deputy commissioner- ship of the Western ceded districts, where he succeeded in establishing a new assessment of revenues at once more equitable to the cultivators and more productive to the government. By indefatigable

perseverance he had raised himself from the con- dition of a half-educated lad, without patronage, and without even the support of the Company, to the successful government of some of the most important provinces of India, 36,000 square miles in extent and with a population of more than five millions. On his retirement from service in i860 he was, made a C.S.I, and given a pension. Taylor died at Mentone on the 13th of May 1876.

See Meadows Taylor's The Story of My Life (1877).

TAYLOR, ROWLAND (d. 1555), English Protestant martyr, was born at Rothbury, Northumberland; he took minor orders at Norwich in 1528 and graduated LL.B. at Cambridge in 1530 and LL.D. in 1534. Adopting reformed views he was made chaplain by Cranmer in 1540 and presented to the living of Hadleigh, Suffolk, in 1544. In Whitsun week, 1547, he preached a " notable sermon " at St Paul's Cross, and was given the third stall in Rochester cathedral. In 1549 he was placed on a com- mission to examine Anabaptists, and in 1551 he was appointed chancellor to Bishop Ridley, select preacher at Canterbury, and a commissioner for the reform of the canon law; in 1552 Coverdale made him archdeacon of Exeter. Apparently he advocated the cause of Lady Jane Grey, for on the 25th of July 1553, only six days after Mary's proclamation as queen, he was committed to the custody of the sheriff of Essex. He was released not long afterwards, and with the support of his parishioners offered strenuous resistance to the restoration of the Mass. He was consequently imprisoned in the King's Bench prison on the 26th of March 1554. The sturdy pro- testantism of Taylor and his flock, who seem to have caused various commotions, marked him out for the special enmity of Mary's government; and he was one of the first to suffer when in January 1555 parliament had once more given the clerical courts liberty of jurisdiction. He was sentenced on the 22nd, excommunicated on the 29th, degraded by Bonner on the 4th of February, and burnt on the 9th at Aldham Common near Hadleigh. His blameless character had made a great impression on his age, and he was

commemorated in many popular ballads. He was regarded as the ideal of a Protestant parish priest; he was married and had nine children. The alleged descent of Jeremy Taylor from him has not been proved.

See Thomas Quinton Stow's Memoirs of Rowland Taylor (1833); Diet, of Nat. Biogr. lv. 463-4, and authorities there cited.

(A. F. P.)

TAYLOR, THOMAS— TAYLOR, ZACHARY

TAYLOR, THOMAS (1758-1835), English writer, generally called " the Platonist," was born in London on the 15th of May 1758, and lived there till his death on the 1st of November 1835. He was sent to St Paul's school, but was soon removed to Sheerness, where he spent several years with a relative who was engaged in the dockyard. He then began to study for the dissenting ministry, but an imprudent marriage and pecuniary difficulties compelled him to abandon the idea. He became a schoolmaster, a clerk in Lubbock's banking-house, and from 1 798-1806 was assistant secretary to the society for the en- couragement of arts, manufactures and commerce, which post he resigned to devote himself to the study of philosophy. He had the good fortune to obtain the patronage of the duke of Norfolk and of a Mr Meredith, a retired tradesman of literary tastes, who assisted him to publish several of his works. These mainly consisted of translations of the whole or part of the writings of Aristotle, Plato, Plotinus, Proclus, Pausanias, Porphyry, Ocellus Lucanus, and the Orphic hymns. His efforts were unfavourably — almost contemptuously — received, but, in spite of defects of scholarship and lack of critical faculty, due recognition must be awarded to the indomitable industry with which he overcame early difficulties. He figures as the " modern Pletho " in Isaac Disraeli's Curiosities of Literature and in his novel Vaurien, and as " England's gentile priest " iu Mathias's Pursuits of Literature.

TAYLOR, TOM (1817–1880), English dramatist and editor of Punch, was born at Bishop Wearmouth, near Sunderland, on the 19th of October 1817. After attending school there, and studying for two sessions at Glasgow University, he in 1837 entered Trinity College, Cambridge, of which he became a fellow. Subsequently he held for two years the professorship of English literature at University College, London. He was called to the bar (Middle Temple) in November 1846, and went on the northern circuit until, in 1850, he became assistant secretary of the Board of Health. On the reconstruction of the Board in 1854 he was made secretary, and on its abolition his services were transferred to a department of the Home Office, retiring on a pension in 1876. In his very early years Tom Taylor had shown a predilection for the drama, and had been in the habit of performing dramatic pieces with a number of children in a loft over a brewer's stable. Four burlesques of his were produced at the Lyceum in 1844. He made his first hit with To Parents and Guardians, brought out at the Lyceum in 1845. He also wrote some burlesques in conjunction with Albert Smith and Charles Kenny, and collaborated with Charles Reade in Masks and Faces (1852). Before the close of his life his dramatic pieces numbered over 100, amongst the best known of which are Our American Cousin (1858), produced by Laura Keene in New York, in which Sothern created the part of Lord Dundreary; Still Waters Run Deep (1855); Victims (1857); the Contested Election (1859); the Overland Route (i860); the Ticket of Leave Man (1863); Anne Boleyn (1875); and Joan of Arc (187 1). He was perhaps the most popular dramatist of his time; but, if his chief concern was the con- struction of a popular acting play, the characters in his dramas are clearly and consistently drawn, and the dialogue is natural, nervous and pointed. In his blank verse historical dramas, Anne Boleyn and Joan of Arc, he was not so successful.

Taylor had begun his career as a journalist when he first came to London. He very soon became connected

with the Morning Chronicle and the Daily News, for which he wrote leaders. He was on the staff of Punch until 1874, when he succeeded Shirley Brooks as editor. He occasionally appeared with success in amateur theatricals, more especially in the character of Adam in As You Like It and of Jasper in A Sheep in Wolf's Clothing. He had some talent for painting, and for many years was art critic to The Times and the Graphic. He died at Lavender Sweep, Wandsworth, on the 12th of July 1880.

Apart from the drama, Tom Taylor's chief contributions to literature are his biographies of painters, viz., Autobiography of B. R. Haydon (1853); Autobiography and Correspondence of C. R. Leslie, R.A. (i860); and Life and Times of Sir Joshua Reynolds

(1865), which had been left in a very incomplete state by Leslie. His Historical Dramas appeared in one volume in 1877. He also edited, with a memorial preface, Pen Sketches from a Vanished Hand, selected from Papers of the late Mortimer Collins.

TAYLOR, WILLIAM (1 765-1836), English man of letters, son of a Norwich manufacturer, was born in that city on the 7th of November 1765. He belonged to the Unitarian com- munity, and went to a school kept at Palgrave, Suffolk, by Rochemont Barbauld, husband of Anna Letitia Barbauld, where Frank Sayers (1763-1817) was among his schoolmates. He travelled on the Continent for some years to perfect himself in foreign languages. William Taylor and his father were both in sympathy with the French Revolution, and belonged to a " revolution society " at Norwich. In 1791 the disturbed con- dition of affairs induced the elder Taylor to wind up his busi- ness, and from this time William devoted himself to letters. He was an enthusiast for German poetry, and did great service to English literature by translations of Burger's Lenore (1790, printed 1796), of Lessing's Nathan the Wise (1790, printed 1805), of Goethe's Iphigenia in Tauris (1790, printed 1793), and of

four of Wieland's Dialogues of the Gods (1795). He was a prolific writer of review articles, in which his knowledge of foreign literature served as a useful standard of criticism. Much of this material was made use of in his most important work, his Historic Survey of German Poetry (3 vols., 1828-30). He also edited the works of his friend Sayers with a memoir (1823). He died at Norwich on the 5th of March 1836.

See a Memoir of the Life and Writings of the late W. Taylor of Norwich, by John Warden Robberds (2 vols., 1843); Georg Herzfeld, William Taylor von Norwich (1897). Taylor is well known to readers of George Borrow Jjy the portrait of him as the ' ' elder individual " in the 23rd chapter of Lavengro.

TAYLOR, ZACHARY (1784-1850), twelfth president of the United States, was born in Orange county, Virginia, on the 24th of September 1784. During the following year his father, Colonel Richard Taylor, a veteran of the War of Independence, migrated to Kentucky, settling near Louisville, and thereafter played an important part in the wars and politics of his adopted state. The boyhood and youth of Zachary Taylor were thus passed in the midst of the stirring frontier scenes of early Kentucky, and from this experience he acquired the hardihood and resoluteness that characterized his later life, although he inevitably lacked the advantages of a thorough education. In May 1808 Taylor received a commission as first lieutenant in the 7th United States Infantry, and for the next few years was employed in routine duties. Early in 181 2 he was made captain, and during the ensuing hostilities with Great Britain distinguished himself by his gallant defence against the Indians of Fort Harrison, a stockade in central Indiana. For this he was breveted major, and in May 1814 received a regular major's commission, but being reduced at the conclusion of the war to the rank of captain, temporarily left the service. In May 1 81 6 he was reinstated as major, and in 181 9 was promoted to be a lieutenant-colonel; and in the routine discharge of his duties he was stationed at various posts on

the western frontier. In 1832, as colonel, he took part in the Black Hawk War, and was the officer to whom Black Hawk surrendered; later he occasionally acted as Indian agent along the upper Mississippi.

In 1836 Taylor was ordered from Wisconsin to take com- mand against the Seminoles in Florida. On the 25th of December 1837, after a difficult campaign, he inflicted a severe defeat upon the Indians at the battle of Okeechobee, and for this was breveted brigadier-general. Then followed four years of harassing service in the Florida Everglades, whence he passed to the command of the First Department of the army, with headquarters at Fort Jesup, Louisiana.

While at New Orleans in 1845, Taylor received orders from President Polk to march his troops into Texas, as soon as that state should accept the terms of annexation proposed by the Joint Resolution of Congress of March 2, 1845. Later in June Polk, who assumed that the Rio Grande rather than the Nueces was the south-western boundary of Texas, ordered him to take up a position at the mouth of. the Sabine, or at some other

point best suited for an advance to the former river. By the middle of August Taylor had selected a position at Corpus Christi, on the west bank of the Nueces and within the disputed territory, and here he remained until the following spring. Upon the definite refusal of the Mexican government under Paredes to resume with the United States the diplomatic relations broken off by the annexation of Texas, Taylor was ordered to advance to the Rio Grande for the purpose of anti- cipating any hostile incursion from Mexico. He himself favoured such a movement if the United States was to main- tain its claim as regards the boundary. In obedience to his instructions he left Corpus Christi on the 12th of March 1846, fortified Point Isabel as a base of

supplies, and took up his position on the disputed river, opposite the Mexican town of Matamoras. Here he began to construct Fort Texas, after- wards called Fort Brown, upon the present site of Brownsville. The commander of the Mexican Army of the North, Ampudia, immediately summoned him to retire behind the Nueces under the threat of interpreting his advance as an invasion of Mexican territory. Taylor not only disregarded this summons, but within the following week proceeded to blockade the Rio Grande. Hostilities were then unavoidable, and the first passage at arms occurred on the 24th of April 1846, when a large force of Mexicans on the east bank of the Rio Grande ambushed and captured a small party of American dragoons under Captain Seth B. Thornton (1814–1847). The news of this event led President Polk, on the nth of May, to recom- mend a formal declaration of war on the ground that it existed " by the act of Mexico herself," for that power " has passed the boundary of the United States, has invaded our territory and shed American blood upon American soil." This state- ment was incorporated in the bill declaring war, and although severely criticized during the Senate debate, passed both houses of Congress by overwhelming majorities.

Meanwhile Taylor had strengthened his base of supplies at Point Isabel, where he was reinforced by militia from Texas and Louisiana, and during the return march from this post was fiercely attacked at Palo Alto (about 8 m. N.E. of Browns- ville, Texas) on May 8th, by the Mexicans under Arista. The latter was easily driven from the field, but on the following day threatened Taylor's advance in a much stronger position, Resaca de la Palma (about 4 m. N. of Brownsville). A brilliant charge by the dragoons under Captain May decided this contest, which Taylor followed up by a pursuit of the Mexican general to the Rio Grande. After relieving Fort Brown, which had been besieged since the 3rd of May, Taylor himself crossed the river, and on the 18th of May occupied Matamoras, from which Arista had already retreated to Monterrey.

As it was the intention of the administration to

wage war for the purpose merely of bringing Mexico to negotiate, Taylor did not immediately advance southward from the Rio Grande. When, however, Mexico persisted in her refusal to treat, Polk decided to conquer her northern provinces. Taylor formed a new base of operations at Camargo, farther up the river, and from this point, in August began an advance towards Monterrey, the capital of Nuevo Leon. After hard fighting he occupied this city in the latter part of September (see Monterrey). The truce with which he followed up this success was unaccept- able to the administration, and upon receiving notice to resume hostilities, he occupied Saltillo, the capital of Coahuila, and Victoria, the capital of Tamaulipas, thus completing the con- quest of the north-eastern states of Mexico. By this time Taylor had been reinforced by some 3000 troops which had marched under Gen. John E. Wool from San Antonio directly towards Chihuahua, but which had been deflected at Monclova to join his ." army of occupation." During the war he was breveted major-general (May 1846), and Congress thrice passed votes of thanks and ordered the presentation of commemorative gold medals. President Polk distrusted Taylor because of his supposed . Whig views, and now began to express his dissatis- faction with the general's failure to take full advantage of his victories and his hesitancy to suggest a plan for the future

conduct of the war. Taylor was unwilling to lead his own army farther into the desert interior of Mexico and remained non-committal upon the projected attempt from Vera Cruz. When Polk finally determined upon the latter campaign, he selected Gen. Winfield Scott, although the latter was personally unacceptable to himself, as its leader, and despite Taylor's vigorous protests detached most of his experienced troops to join Scott's command. Meanwhile through the connivance of the American authorities, Santa Anna returned from his Cuban exile, and, as the newly elected Mexican president, disregarding his pledges to aid Polk in bringing about a satisfactory peace, prepared to wage a more

effective war against the American invaders. Learning of the weakened condition of Taylor's force he made a sudden advance to the northward, with some 20,000 troops, and on the 22nd of February 1847 encountered Taylor with one-fourth that number at Buena Vista, a few miles beyond Saltillo. The all-day battle in the narrow mountain pass was the most stubbornly contested of the whole war, and the brilliant victory of Taylor over such odds made " Old Rough and Ready," as he- was called by his troops, the hero of the hour. With this encounter the serious work of his " army of occupation " ended, although he was later joined by Gen. Alexander W. Doniphan's troops, who had marched from New Mexico via Chihuahua. Taylor's brilliant victory, won when he was so greatly handicapped by Polk, emphasized the popular discontent which that president's policy had already aroused, and suggested him to the political leaders as a pre-sidential possibility. The general, however, had passed his mature years wholly in military service and had never voted, much less strongly allied himself, with any political party. Nevertheless when Taylor meetings became the fashion and newspapers began to advocate his nomination, party lines threatened to disappear despite the frantic efforts of the old- time chiefs of the two leading organizations to stem the tide against the popular favourite. The Democratic party with its more efficient machinery prevented a stampede of its rank and file, but the Whigs were less successful. Within a month after his victory over Santa Anna a Whig convention in Iowa nomi- nated him for the presidency, and public meetings in Kentucky, Ohio, Virginia, Pennsylvania and elsewhere quickly took similar action, in many cases without regard to party lines. Taylor first adopted a course of discouraging these suggestions and emphasized his non-partisan attitude, but later gave way to the pressure, and issued a statement that proved satisfactory to the majority of the Whig politicians. Yet it required four ballots in the national convention to overcome the reluctance of Webster's, Clay's and Scott's followers and secure

the party nomination. The disaffection of these leaders was more than counterbalanced, however, by the split of the New York Democrats over the slavery question, which assured Taylor of the vote of that state. His residence in Louisiana, his ownership of a large plantation with its slaves, and his family connexion with Jefferson Davis (who had married his daughter), rendered him more acceptable to many of the Southern Demo- crats than their party candidate, Lewis Cass, an advocate of " squatter sovereignty " and the representative of the demo- cracy of the free North-west. As a result Taylor carried eight slave states while his opponent secured seven, but in the free states the conditions were exactly reversed. He received a majority of electoral votes on each side of the Mason and Dixon line and was confirmed in his preconceived opinion that he was to be the president of the whole people. Both parties had attempted to avoid the burning slavery issue, — the Whigs by adopting no platform whatever and the Democrats by trusting to the well-known views of their candidate, but the political leaders in Congress could not escape the many definite questions presented by the possession of the territory newly acquired from Mexico. The Wilmot Proviso and the bill to organize the territory of Oregon had already aroused both sections and had given occasion for Webster and Calhoun to state their respective views upon the constitutional questions involved. The three weeks' contest over the election of a

speaker in the House of Representatives, in December 1840, emphasized the sectional passions already engendered. Under the circumstances the first message from President Taylor was awaited with great interest. While advising Congress to " abstain from the introduction of those exciting topics of sectional character which have hitherto produced painful apprehensions in the public mind," he favoured the admission of California as a free

state, and counselled the legislators to await the action of the people of New Mexico and Utah upon the slavery question. As he had already encouraged California to form the state government it desired, and later took a strong position against the efforts of Texas to possess itself of part of New Mexico, it was apparent that he was less inclined to favour the radical pro-slavery programme than his previous career had seemed to promise. This was still further empha- sized by his marked friendship for William H. Seward and his contemptuous reference to the territorial portion of Clay's compromise measures as the " Omnibus Bill." This situation militated greatly against that leader's cherished policy, and led him to a bitter criticism of the president on the floor of the Senate. Such was the situation when the president, early in July 1850, was stricken by the disease to which he succumbed on the 9th. His remains were temporarily interred at Wash- ington, but afterwards removed to the family cemetery near Louisville.

The only son that survived him, Richard Taylor (1826- 1879), popularly known as " General Dick," graduated at Yale in 1845, entered the Confederate army at the beginning of the Civil War, was commanding officer in Louisiana, and under Kirby Smith helped to administer the western half of the Confederacy, after the fall of Vicksburg. He won the victory of Sabine Cross Roads over the Union expedition under Gen. N. P. Banks on the 8th of April 1864. He finally surrendered to Gen. E. R. S. Canby on the 4th of May 1865. He wrote Destruction dnd Reconstruction (1879).

H. Montgomery's Life (Auburn, 1850) and John Frost's Life (New York and Philadelphia, 1847) are almost wholly devoted to President Taylor's military career, and are excessively laudatory in character. A better biography is that (New York, 1892) by Maj.- Gen. O. O. Howard, in the " Great Commanders " series. There is much material about Taylor in the general histories of M'Master, Von Hoist, and Rhodes. (I. J. C.)

TAYLOR, a town in Williamson county, Texas, U.S.A., about 35 m. N.E. of Austin. Pop. (1890) 2584; (1900) 421 1 (1260 negroes); (1910)5314. It is served by the International & Great Northern and the Missouri, Kansas & Texas rail- ways. It is in a region especially devoted to the growing of cotton and grain and to poultry raising, and an annual county fair is held here. In the city are machine and car shops of the International & Great Northern railway, and cotton- compresses, and there are manufactures of cotton-seed oil, &c. Taylor, named in honour of Gen. Zachary Taylor, was founded in 1876, and was incorporated in 1882.

TAYPORT, a police burgh of Fifeshire, Scotland. Pop. (1901) 3325. It is situated on the Firth of Tay, here about 1 m. wide, opposite to Broughty Ferry, with which there is com- munication by means of a ferry, 55 m. N. of Leuchars Junction by the North British railway. Its older alternative name of Ferry Port on Craig has reference both to its uses and its site. Its industries include manufactures of linen and jute, spinning mills, engineering works, timber- yard and salmon fishery. In other respects it is a residential quarter for Dundee. A mile S.W. is the estate of Scotscraig, which belonged to Archbishop Sharp (1613-1679), of whose mansion there are still some traces. Two miles and a half W. by S. is the police burgh of Newport (pop. 2869), with stations at Easter and Wester Newport, on the North British Railway Company's loop line from Leuchars Junction to Wormit. It lies on the Firth of Tay opposite to Dundee, with which there is communication by means of a ferry, as well as by rail via the Tay Bridge. Even to a greater extent than has Tayport, it has practically become a suburb of Dundee. Its small harbour was designed by Telford. Two and a quarter miles S.W. of Wormit, the

nearest railway station, close to the southern terminus of the Tay Bridge, is the village of Balmerino (Gaelic, " Town on the seashore "). Its once considerable shipping trade has declined, but some fishery is still carried on. In 1227 Ermen- garde, widow of William the Lion, and her son

Alexander II. founded a Cistercian Abbey here, but in 1604 the Abbey estates were converted into a temporal lordship in favour of James Elphinstone, created Lord Balmerino.

TAYUG, a town of the province of Pangasinan, Luzon, Philippine Islands, near the Agno river, 33 m. E. of Lingayen, the capital. Pop. (1903) 10,400. The river furnishes water for irrigating the low fields in the vicinity. The town's in- habitants are farmers, and rice is the principal crop. Pan- gasinan and Ilocano are the languages spoken.

TAZZA (Ital., cf. Fr. tasse, Ger. Tasse, cup; all from Persian tas, goblet), a word generally adopted by archaeologists and con- noisseurs for a type of drinking vessel. It is a shallow saucer- like dish either mounted on a stem and foot or on a foot alone.

TCHERNAIEV, MIKHAIL GREGORJOVICH (1828-1898), Russian general, a member of a noble family, was born on the 24th of October 1828. Educated at the Nicholas Staff College, he entered the army in 1847, and distinguished himself in the Crimean war and in the Caucasus. After serving as divisional chief of the staff in Poland, he went to Orenburg in 1858 as assistant to the commander of the line of the Syr-Darya, and the following year commanded an expedition to support the Kirghiz tribes on the borders of the Sea of Aral against the Khivans. He did duty on the staff of the army of the Caucasus for a time, and returned to Orenburg as chief of the staff. In 1864, having reached the rank of major-general, he made his famous march with 1000 men across the steppes of Turkestan to Chimkent in Khokand, to meet another Russian column from Semipalatinsk, in Siberia, in conjunction with which he successfully stormed Chimkent, and then unsuccessfully attacked Tashkent, 80 miles farther south. Wintering at Chimkent, he captured Tashkent the following year. This was contrary to his instructions, and although he was received in St Petersburg with enthusiasm, and presented with a sword of honour by the emperor, he was not again

employed in the military service, and retired from it in July 1874. He bought, and edited with great success, the Russkiy Mir in Slavonic interests, devoting himself to the Panslavic idea. In the summer of 1876 he was appointed commander-in-chief of the Servian army, but on entering Turkey was driven back by Osman Pasha, who followed him into Servia, defeating him at Zayechar and Yavor in July, and the campaign in Servia proved disastrous. He rashly proclaimed Milan king of Servia in September, and in October Aleksinats and Deligrad were in the hands of the Turks, and the road open to Belgrade. An armistice was concluded, and Tchernaiev resigned his command. In 1877 he visited Austria in connexion with his propaganda, but was expelled, and lived for a time in France. In 1879 he organized a Bulgarian rising, but was arrested at Adrianople and sent back to Russia. He succeeded Kaufmann'(g.i>.) as governor of Turkestan in 1882, but his aggressive policy led to his recall two years later, when he was appointed a member of the council of war at St Peters- burg. In 1886 his opposition to the Central Asian Military railway caused him to lose his seat in the council. He died on the 16th of August 1898, at his country seat in the province of Mogilev.

TCHIHATCHEFF, PIERRE ALEXANDROWITSCH DE (1812-1890), Russian naturalist and geologist, was born at Gatchina, near St Petersburg, in 181 2. He entered the diplomatic service and was (1842-44) attached to the embassy at Constantinople; whence he visited Asia Minor, Syria and Egypt. In 1844, he was charged with a scientific mission to the Altai mountains. He died at Florence on the 13th of October 1890 (N.S.).

His publications include: Voyage scientifique dans V Altai oriental et les parties adjacentes de la frontiere de Chine (with atlas, 1845); Asie Mineure; description physique, statistique et archeologique de cette contree (4 vols, with 3 atlases, 1853-69) ; Le Bosphore et Con- stantinople (1864, another ed. 1877) ; Considerations geologiques sur les lies OcSaniques (1878) ; and Espagne, Algerie et Tunisie (1880).

TEA (Chinese cha, Amoy dialect ti), the name given to the leaves of the tea bush (see below) prepared by decoction as a beverage The term is by analogy also used for an infusion or decoction of other leaves, e g. camomile tea; and similarly for the afternoon meal at which tea is served.

Historical. — The early history of tea as a beverage is mainly traditional. The lack of accurate knowledge regarding the past of the Chinese Empire may possibly some day be supplied, as European scholars become more able to explore the unstudied stores in the great Chinese libraries, or as Chinese students ran- sack the records of their country for the facts of earlier periods. It may then be learnt who made the first cup of tea, who planted the earliest bushes, and how the primitive methods of manufacture were evolved. In the meantime knowledge on the subject is mingled with much that is obviously mythical and with gleanings from the casual references of travellers and authors.

According to Chinese legend, the virtues of tea were dis- covered by the Emperor Chinnung, 2737 B.C., to whom all agricultural and medicinal knowledge is traced. It is doubt- fully referred to in the book of ancient poems edited by Con- fucius, all of which are previous in date to 550 B.C. A tradition exists in China that a knowledge of tea travelled eastward to and in China, having been introduced 543 a.d. by Bodhidharma, an ascetic who came from India on a missionary expedition, but that legend is also mixed with supernatural details. But it is quite certain, from the historical narrative of Lo Yu, who lived in the Tang dynasty (618-906 a.d.), that tea was already used as a beverage in the 6th century, and that during the 8th century its use had become so common that a tax was levied on its consumption in the 14th year of Tih Tsung (793). The use of tea in China in the middle of the 9th century is known from Arab sources (Reinaud, Relation des Voyages, 1845,

P- 4°)- From China a knowledge of tea was carried into Japan, and there the cultivation was established during the 9th century. Seed was brought from China by the priest Miyoye, and planted first in the south island, Kiushiu, whence the cultivation spread northwards till it reached the high limit of 39 N.

It is somewhat curious that although many of the products of China were known and used in Europe at much earlier times, no reference to tea has yet been traced in European literature prior to 1 588. No mention of it is made by Marco Polo, and no knowledge of the substance appears to have reached Europe till after the establishment of intercourse between Portugal and China in 1517- The Portuguese, however, did little to- wards the introduction of it into Europe, and it was not till the Dutch established themselves at Bantam early in the 17th century that these adventurers learned from the Chinese the habit of tea drinking and brought it into Europe.

The earliest mention of tea by an Englishman is probably that contained in a letter from Mr Wickham, an agent of the East India Company, written from Firando in Japan, on the 27th June 161 5, to Mr Eaton, another officer of the company, resident at Macao, and asking for " a pot of the best sort of chaw." How the commission was executed does not appear, but in Mr Eaton's subsequent accounts of expenditure occurs this item — " three silver porringers to drink chaw in."

It was not till the middle of the century that the English began to use tea, and they also received their supplies from Java till in 1686 they were driven out of the island by the Dutch. At first the price of tea in England ranged from £6 to £10 per lb. In the Mercurius Politicus, No. 435, of September 1658, the following advertisement occurs: — " That excellent and by all Physitians approved China Drink called by the Chineans Tcha, by other nations Tay, alias Tee, is sold at the Sultaness Head, a cophee-house in Sweetings Rents, by the

Royal Exchange, London." Thomas Garway, the first English tea dealer, and founder of the well-known coffee-house, " Garraway's," in a curious broadsheet, An Exact Description of the Growth, Quality and Virtues oj the Leaf Tea, issued in 1659 or 1660, writes, " in respect of its scarceness and dearness, it hath been only used as a regalia in high treatments and entertainments, and presents

made thereof to princes and grandees." In that year he pur- chased a quantity of the rare and much-prized commodity, and offered it to the public, in the leaf, at fixed prices varying from 15s to 50s. the lb, according to quality, and also in the in- fusion, "made according to the directions of the most knowing merchants and travellers into those eastern countries." In 1660 an Act of the first parliament of the Restoration imposed a tax on " every gallon of chocolate, sherbet and tea, made and sold, to be paid by the maker thereof, eightpence " (12 Car. II. c. 23).

Pepys's often-quoted mention of the fact that on the 25th September 1660, " I did send for a cup of tee, a China drink, of which I never had drunk before," proves the novelty of tea in England at that date. In 1664 we find that the East India Company presented the king with 2 lb and 2 oz. of " thea," which cost 40s. per lb, and two years afterwards with another parcel containing 221 lb, for which the directors paid 50s per lb. Both parcels appear to have been purchased on the Continent. Not until 1677 is the Company recorded to have taken any steps for the importation of tea. The order then given to their agents was for " teas of the best kind to the amount of 100 dollars." But their instructions were con- siderably exceeded, for the quantity imported in 1678 was 4713 lb, a quantity which seems to have glutted the market for several years. The annals of the Company record that, in February 1684, the directors wrote thus to Madras: — " In regard thea is grown to be a commodity here, and we have occasion to make presents therein to our great friends at court, we would have you to send us yearly five or six canisters of the very best and

freshest thea." Until the Revolution no duty was laid on tea other than that levied on the infusion as sold in the coffee-houses. By 1 William and Mary, c. 6, a duty of 5s. per lb and 5 per cent, on the value was imposed. For several years the quantities imported were very small, and consisted ex- clusively of the finer sorts. The first direct purchase in China was made at Amoy, the teas previously obtained by the Com- pany's factors having been purchased in Madras and Surat, whither it was brought by Chinese junks after the expulsion of the British from Java. During the closing years of the century the amount brought over seems to have been, on the average, about 20,000 lb a year. The instructions of 1700 directed the supercargoes to send home 300 tubs of the finer green teas and 80 tubs of bohea. In 1703 orders were given for "75, 000 lb Singlo (green), 10,000 lb imperial, and 20,000 lb bohea." The average price of tea at this period was 16s. per lb.

As the 1 8th century progressed the use of tea in England rapidly increased, and by the close of the century the rate of consumption exceeded an average of 2 lb per person per annum, a rate in excess of that of to-day of all people except those of Mongol and Anglo-Saxon origin. The business being a mono- poly of the East India Company, and a very profitable one, the company at an early stage of its development endeavoured to ascertain whether tea could not be grown within its own dominions. Difficulties with China doubtless showed the ad- visability of having an independent source of supply. In 1788 Sir Joseph Banks, at the request of the directors, drew up a memoir on the cultivation of economic plants in Bengal, in which he gave special prominence to tea, pointing out the regions most favourable for its cultivation. About the year 1820 Mr David Scott, the first commissioner of Assam, sent to Calcutta from Kuch Behar and Rangpur — the very districts indicated by Sir Joseph Banks as favourable for tea-growing — certain leaves, with a statement that they were said to belong to the wild ,tea-plant. The leaves were submitted to Dr

Wallich, government botanist at Calcutta, who pronounced them to belong to a species of Camellia, and no result followed on Mr Scott's communication. These very leaves ultimately came into the herbarium of the Linnean Society of London, and have authoritatively been pronounced to belong to the indigenous Assam tea-plant. Dr Wallich's attribution of this and other specimens subsequently sent in to the genus Camellia, although scientifically defensible, ^ unfortunately

diverted attention from the significance of the discovery. It was not till 1834 that, overcome by the insistence of Captain Francis Jenkins, who maintained and proved that, called by the name Camellia or not, the leaves belonged to a tea-plant, Dr Wallich admitted " the fact of the genuine tea-plant being a native of our territories in Upper Assam as incontrovertibly proved." In the meantime a committee had been formed by Lord William Bentinck, the governor-general, for the intro- duction of tea culture into India, and an official had already been sent to the tea districts of China to procure seed and skilled Chinese workmen to conduct operations in the Himalayan regions. The discovery and reports of Captain Jenkins led to the investigation of the capacities of Assam as a tea-growing country by Lord William Bentinck's committee. Evidence of the abundant existence of the indigenous tea-tree was ob- tained; and the directors of the East India Company resolved to institute an experimental establishment in Assam for cultivat- ing and manufacturing tea, leaving the industry to be developed by private enterprise should its practicability be demonstrated.

In 1834 the monopoly of the East India Company was abolished and an era of rapid progress in the new industry began. In 1836 there was sent to London 1 lb of tea made from indigenous leaves; in 1837 5' lb of Assam tea were sent; in 1838 the quantity sent

was 12 small boxes, and 95 boxes reached London in 1839. In 1840 there were grown, and offered at public auction in Calcutta early the following year, 35 packages, chiefly green teas, stated to have been manu- factured by a chief of the Singpho tribe aided by the govern- ment establishment. In the same auction catalogue were included 95 packages, " the produce of the Government Tea Plantation in Assam," many of which bore the Chubwa mark, on"; well known to this day. This auction is most interesting as being the first of British-grown tea, and it included about 6000 lb. It is of interest also for the reference to the Singpho tribe, who are even now in small numbers in the same district, where they still produce in a primitive manner tea plucked from the indigenous trees growing in their jungles.

In January 1840 the Assam Company was formed to take over the early tea garden of the East India Company, and this, the premier company, is still in existence, having pro- duced up to 1907 no less than 117,000,000 lb of tea and paid in dividends £1,360,000 or 730 per cent, on capital. It 'is no longer the first company in extent of yield, as the Consolidated Tea and Lands Company produced in 1907 about 15,000,000 lb of tea, besides other products. The introduction of Chinese seed and Chinese methods was a mistake, and there seems little reason to doubt that, in clearing jungle for tea planting, fine indigenous tea was frequently destroyed unwittingly in order to plant the inferior China variety. The period of unlearning the Chinese methods, and replacing the Chinese plants, had to be lived through. Vicissitudes of over-production and inflation came to interfere with an even course of success, but the industry developed and has increased enormously. From its point of origin in Assam, it has gradually spread to other districts with varying commercial success. The aggregate total of capital of the tea-producing companies in India and Ceylon now amounts to about £25,000,000.

The Dutch were rather earlier than the English in attempt- ing to establish tea growing in their eastern possessions. A beginning was made in Java in

1826, but probably because of the even more marked influence of Chinese methods and Chinese plant, the progress was slow and the results indifferent. Of late years, however, by the introduction of fine Assam seed and the adoption of methods similar to those in use in India, a marked improvement has taken place, and there seems little reason to doubt that, with the very rich soil and abundant cheap labour that the island of Java possesses, the relative progress there may be greater in future than in any other producing land.

Somewhere about i860 the practical commercial growing of tea was introduced into the island of Formosa. The methods jf cultivation and manufacture followed there differ in many

ways from those of the other large producing countries, but the industry has been fairly successful throughout its history.

Attempts were repeatedly made to introduce tea culture in Ceylon, under both Dutch and British authority. No per- manent success was attained till about 1876, when the dis- astrous effects of the coffee-leaf disease forced planters to give serious attention to tea. Since that period the tea industry has developed with marvellous rapidity, and now takes first rank in the commerce of the island.

Several plantations have been successfully put out both by the Russian government and private enterprise in the Caucasus, but it is doubtful whether they could exist long but for the high rate of duty on tea entering Russia from foreign countries. Natal has now about 5000 acres under tea giving a fairly large yield, but of quality not highly esteemed outside of South Africa, where it benefits to the extent of 4d. per pound of protection in the tariff. A small plantation exists in South Carolina under circumstances not conducive to financial success on a large scale of production. Attempts at tea growing have been made in the West Indies, Brazil, Australia, Nyassaland, Mauritius, the Straits Settlements, Johore, Fiji and at San

Miguel in the Azores without marked success. In addition to favourable conditions of soil and climate, abundant cheap labour is an absolute necessity if satisfactory commercial results are to be obtained.

Botany. — The tea bush or tree is a member of the natural order Ternstroemiaceae and is closely allied to the well-known ornamental shrub the camellia. As cultivated in China it is an evergreen shrub growing to a height of from 3 to 5 ft. The stem is bushy, with numerous and very leafy branches; the leaves are alternate, leathery in texture, elliptical, obtusely serrated, strongly veined and placed on short channelled foot- stalks. The flowers are white, axillary and ilightly fragrant, — often two or three together on separate pedicels. The calyx is small, smooth and divided into five obtuse sepals. The corolla has from five to nine petals, cohering at the base. The stamens are short, numerous and inserted at the base of the corolla; the anthers are large and yellow, and the long style ends in three branches. The fruit is a woody capsule of three cells, each containing one large nearly spherical seed, which consists mainly of two large hemispherical cotyledons.

As is commonly the case with plants which have been long under cultivation, there has been some doubt as to specific distinctions among the varieties of tea. The plant was origin- ally described by Linnaeus as one species, Thea sinensis. Later Linnaeus established two species, viz. Thea Bohea and Thea viridis, and it was erroneously assumed that the former was the source of black teas, while Thea viridis was held to yield the green varieties. In 1843, however, Mr Robert Fortune found that, although the two varieties of the plant existed in different parts of China, black and green tea were produced from the leaves of the same plant by varying the manufacturing processes.

Sir George Watt {Journal of the Royal Horticultural Society, vol. xxxii.) describes with ample illustrations the recognized varieties, placing all

of them under Camellia Thea, with the following subdivision : —

1. Assam Indigenous.

A. Variety Viridis: — races –

2. Lushai.

3. Naga Hills.

4. Manipur.

5. Burma and Shan.

6. Yunnan and Chinese.

B. „ Bohea.

C. ,, Stricta.

D. ,, Lasiocalyx.

Of the foregoing, the teas of commerce are derived almost entirely from the varieties Viridis and Bohea. The Assam Indigenous, in its two sub-races of Singlo and Bazalona, and the Manipur, originally found wild in the jungles of the native state of that name, have, with various intermixtures and crossings, been used to cover the greatest areas of all the more modern planting in India, Ceylon and Java. The great size

of leaf when fully developed (4 to o ins. in length and 2 to 35 in breadth) has made them in demand because of the heavy yields. From the variety Bohea, or from hybrids of descent from it, came the China teas of former days and the earlier plantings in India grown from imported China stock. The

Fig. 1. — Bohea variety. • leaves of this variety are generally, roughly speaking, about half the size of those of the Assam Indigenous and Manipur sorts.

The bush is in every way smaller than the Assam types. The latter is a tree attaining in its natural conditions, or where allowed to grow unpruned in a seed garden, a height of from 30 to 40 ft. and prospering in the midst of dense moist jungle and in shady sheltered situations.

The Bohea variety is hardy, and capable of thriving under many differ- ent conditions of climate and situation, while the indigenous plant is tender and difficult of cultivation, requiring for its success a close, hot, moist and equable climate. In minute structure it presents highly characteristic appear- ances.

The under side of the young leaf is densely covered with fine one-celled thick-walled hairs, about 1 mm. in length and -015 mm. in thickness. These hairs entirely disappear with increasing age. The structure of the epidermis of the under side of the leaf, with its contorted cells, is represented in fig. 3.

A further characteristic feature of the cellular structure of the tea-leaf is the abundance, especially in grown leaves, of large, branching, thick-walled, smooth cells (idioblasts), which, although they occur in other leaves, are not found in such as are likely to be confounded with or substituted fiT tea. The minute structure of the leaf in section is illustrated in fig. 4.

Constant controversy has existed as to what is the actual original home of the tea-plant, and probably no one has given to the subject more careful study than Professor Andreas Krassnow, of Kharkoff University. By order of the Russian government, he visited each of the great tea-growing countries,

Fig. 2. — Bohea Tea- leaf, full size.

and the results of his observations were published in a book entitled On the Tea-producing Districts of Asia. He holds the opinion that the tea-plant is indigenous, not to Assam only, but to the whole

monsoon region of eastern Asia, where he found it growing wild as far north as the islands of southern Japan. He considers that the tea-plant had, from the remotest times, two distinct varieties, the Assam and Chinese, as he thinks that the period of known cultivation has been too short to produce the differences that exist between them.

Chemistry. — What may be termed the chemistry of production, viz., that relating to soils, manures, manufacturing processes, &c, has of recent years received great attention from the scientific

Fig. 3. — Epidermis of Tea-leaf (under side).

experts appointed in India and Ceylon to assist and guide the tea planters. The chemistry of the completed teas of commerce does not appear to have been subjected to adequate scientific study. There cannot be said to be any standard or recognized analysis. Many such have been made, and they may be found in chemical text-books of high authority, but they are defective because of the lack of commercial knowledge in association with the chemical skill. More attention seems to have been given to the matter in the United States of America and in Germany and Russia than in England, but the infinite variety of samples known to the commercial expert, and the impossibility of standardizing those in such a manner as to make readily recognizable what the chemist has treated, renders most of the recorded analyses of uncertain value. There seems to be no relationship between the commercial value and the analysis, the arbitrary personal methods of the expert tea-taster being controlled by factors that chemistry does not appear to deal with. One reason may be that analyses are generally made of tea liquors pro- duced by distilled water, which is the very worst possible from the point of view of the commercial expert or in domestic usage.

The principal chemical constituents of tea of practical interest are : caffeine, tannin and essen- tial oil, on which depend respectively the physio- logical effects, the strength and the flavour. The

commercial value appears to depend on the essential oil and aroma, not on the amount of caffeine, tannin or extract.

The following is suggested as a typical analysis of an average sample of black tea : — p er ceDt

Albuminous matters Gummy matters Cellulose

Fig. 4. — Section through Tea-leaf.

Chlorophyll and wax

Caffeine .

Tannin .

Essential oil

Resin

Mineral matter (ash)

Moisture

Extractive matter .

24

4 20

2

3 10

o-75

3

6

7

20-25 100

Alsoatrace (1 to 2 per cent.) of boheic acid, a vegetable acid peculiar to tea. The amount of tannin found in green teas appears to be

about half as much again as in black, and the former always yield i less moisture, doubtless because of the harder fibre produced by the | method of manufacture and the frequent use of a facing medium. A large percentage of moisture found in any sample would indicate improper condition. At the stage of final firing, tea is supposed to be desiccated as completely as possible, and it is then sealed up to exclude air entirely. It is, however, most liable to absorb moisture upon subsequent exposure. Caffeine (formerly known as theine) is the alkaloid of tea, and is identical with that of coffee, guarana, mate and kola nut. It is closely allied to theobromine, the alkaloid of cocoa, and also to uric acid. In large quantities it is a poison, but in smaller quantities it acts as a stimulant. It exists in greater percentage in Indian and Ceylon teas than in those from Java, and is lowest in China and Japan teas. Tannin is a hardening and astringent substance, and in large quantities impairs digestion. Prolonged infusion increases the amount extracted. The essential oil of tea is of a citron yellow colour; it is lighter than water and possesses the distinctive odour of tea. Extract varies from 26 to 40 per cent., and is no guide to quality. Ash averages 5,7 per cent., about half of which is soluble in water. About 8 per cent. of ash is proof of adulteration.

Commercial. — There is probably no article of large consumption the commerce in which has been so revolutionized during a single generation. In 1877, except to the initiated, tea meant China tea. India and Java were producing a little, but practically for use only in Great Britain and Holland. Formosa and Japan were beginning to attract attention in America, but China supplied the world, and almost entirely through the medium of the London market. The days of sailing ships from China had not entirely passed, and the steamers of the period were built for rapidity of transit to London. The

Australasian colonies got their supplies direct, and part of the Russian supplies went by the caravan routes.

By 1907, however, the greatly increased production in India and Ceylon, with the willingness of many nations to drink such teas, in preference to those of China, had left to her Russia as a customer for nearly half her export of the article, a proportion rapidly diminish- ing, as that country too turned in the direction of using the stronger varieties.

China and Japan have hitherto been regarded as the chief pro- ducers of tea, and the reputed large domestic consumption of those Mongolian peoples has led to assumptions of vast internal pro- ductions. There exist absolutely no data, and it is doubtful whether such can ever be gathered, for forming trustworthy esti- mates. In both of those countries tea is grown principally in a retail manner, and much of it simply for family consumption. The country cultivator has, as a rule, only a small area — perhaps a corner of his farm or garden — planted with tea, the produce of which is roughly sun-dried and cured in a primitive manner. Any surplus not needed for the family is sold in its sun-dried state to the collector, who takes it to the hong, where it is fired, blended and packed for exportation. Excluding therefore from any record the quantities produced for internal consumption in China and Japan (that from the former alone has been estimated at a total of 2,000,000,000 lb), the following are the acreage and production of the world as taken from the latest recorded statistics available in 1908 : —

Acreage under tea. Production.

lb

188,371,000-1 auant : t : es 19,000,000 I ^™5 S

39,778,000 h ej 23£ ed 20,300,000 j ”“*.>•

240,411,000

3,249,000 16,000,000 170,527,000 26,215,000

2,750,000

China

Japan . Formosa India

„ (Burma) Shan States Ceylon . Java Natal . . .

(Brick tea for Tibet) 1

121,202 2

79,858

531,808

i,498 2

(mostly pickled tea) 1

390,000

45,000

5,000

726,601,000

The quantity from China includes about 16,000,000 ft> im- ported from India, Ceylon and Java, and worked up with China teas into bricks and tablets.

The modern developments of production and consumption have rendered the subject of China tea one of subordinate interest, except to students of commercial evolution. In several of the earlier editions of this work very ample details are fur- nished regarding the same, with many interesting pictorial illustra- tions of the processes of production. The conservative tendencies of the Chinese people have prevented them adopting the modern methods of extensive cultivation based on scientific principles, and the manipulation of crops by machinery in place of hand labour. Consequently, their export trade has been tor many years a _. , diminishing one. Of the exported quantity referred to

black tea aDove , on ‘y 8 1, ooo.ooo lb were the ordinary black tea ‘ known to the English consumer (collectively described in the United States of America and Canada as ” English Breakfast

1 Areas unascertained. 2 Official figure, but accuracy doubtful.

Tea "). Out of that total, Great Britain consumed only about 5,000,000 lb, against a consumption of 126,000,000 lb of China tea in 1879. Green tea is represented by 28,000,000 lb, and this went chiefly to the United States of America, to Central Asia and to North Africa. The remainder, 80,000,000 lb, is brick and tablet tea sent entirely to Asiatic and European

China green tea.

Russia. The method of compressing tea into tablets or bricks is unfamiliar in western Europe. It doubtless arose from the necessity of reducing bulk to a minimum for conveyance by caravan across the great trade routes of Asia, and now Brtfct d that the railway and the steamship have supplemented lab , e f s ° more primitive methods of transit, the system is still continued to meet the wants of the consumer who would not recog- nize his tea in any other shape. The preparation of the tea in the requisite form has, however, largely left Chinese hands. The Russians have themselves established several important factories at Hankow, which is the chief seat of this industry, and to which place they import in large quantities tea-dust and small broken tea from India, Ceylon and Java. Those are freely used in the pre- paration of small tablets, compressed to such a condition of hardness as to resemble wood or stone, and commonly passed round as currency in certain districts of Russia. Of a somewhat different nature is the brick tea prepared chiefly at Ya-chou in Brfc t/ e - the province of Ssu-chuan for overland transit to Tibet, . Tibet to investigate the commerce in which Mr James Hutchi- ° ■ ‘ son, M.A., was sent in 1906 as a special commissioner for the Indian Tea Cess Committee. This

tea is mostly prepared from exceedingly rough leaf, including even bush prunings, which would not be plucked for manufacturing purposes in India or Ceylon. It is ” panned,” rolled, fermented and divided into various classes or qualities. It is then steamed and placed in a moulding frame of wood to compress it into the size and shape of brick wanted. The bricks are wrapped in paper bearing hong marks, or some writing in Tibetan. For transit they are packed twelve together in hides sewn up while moist, which contract to make a strong tight package of 60 to 70 lb weight. These bale? are carried on the backs of coolies for great distances across very high passes into Tibet, and the trade is estimated at an average of 19,000,000 lb per annum, of which 8,000,000 is a subsidy from the emperor of China to the Tibetan monasteries.*

The Japanese production is almost entirely green tea for North American use. It is prepared in two distinctive classes named by the final process of manufacture applied in each in- .

stance, viz. basket-fired, i.e. dried over a hot stove in Jspno. a basket, and pan-fired, i.e. in machine-made pans. The industry is a declining one, because of change in the American taste, and the area under cultivation has diminished by nearly 20 per cent, in the ten years since 1896. The mulberry leaf for the more profitable silk trade has taken its place. The export production of the island of Formosa is limited to a particular class of tea termed „ Oolong, practically all produced for the United States ™™ osa of America. It is scarcely known in England save by O0 ‘ 01 W> experts. The Tea Cess Committees of India and Ceylon have both sent representatives in recent years to study the manner of growth and production, but in neither country has there been so far any successful attempt to produce commercially tea of the class. A radical difference exists in connexion with the method of growth, in that the plants are never grown from seed, but are always propa- gated from layerings. Soil, situation and climatic conditions have doubtless much influence on the peculiar character of the tea pro-*

duced. The manufacturing methods are elaborate and careful, and the produce has in its choicest qualities a particular delicacy and bouquet possessed by no other variety of tea.

As the planting, productive and manufacturing processes of India may be taken to be generally representative of . .. Ceylon and Java also, and therefore of the tea of modern J™** tea commerce in most lands outside of China and Japan, the tra,te ' methods followed will be described with some fullness.

A rich and exuberant growth of the plants is a first essential of successful tea cultivation. This is only obtainable in warm and moist localities where rains are frequent and copious. „.. The climate indeed which favours tropical profusion of »>*»*•

jungle growth — still steaming heat — is that most favourable for the cultivation of tea, and such climate, unfortunately, is often trying to the health of Europeans. It was formerly supposed that com- paratively temperate latitudes and steep sloping ground afforded the most favourable situations for planting, and much of the disaster which attended the early stages of the tea enterprise in India is traceable to this erroneous conception. Tea thrives best in light friable soils of good depth, through which water percolates freely, the plant being specially impatient of marshy situations and stagnant water. Undulating well-watered tracts, where the rain escapes freely, yet without washing away the soil, are the most valuable for tea gardens. Many of the original Indian plantations were established on hill-sides, after the example of known districts in China, where hill slopes and odd corners are commonly occupied with tea-plants.

The methods described hereafter are those generally followed in India and Ceylon in the manner of the most modern application.

but variations must take place according to district and elevation. Propagation is from seed only. The seed is rather larger than a hazel nut, with a thicker and darker shell and per- u< fectly spherical shape. When ripe (about the month of

' November) the seeds are placed a few inches apart in

carefully prepared nurseries, which are watered, shaded and weeded till the regular rains of May and June admit of the shading being removed. The seedlings should then be 6 ins. to 8 ins. high and ready to plant out in the fields. These are prepared by cutting down and burning the jungle, which is afterwards hoed, lined and staked in parallel rows running both ways. The intervals of planting vary, but 4i ft. by 4j ft. is a very common distance. Pits 15 ins. to 18 ins. deep are dug for each plant, and refilled loosely — then the seed- lings are carefully placed in them. With favourable weather they should be 15 ins. to 18 ins. high by the end of the first year. Some- times the plants are grown in the nursery for a whole year or more and put out during the cold weather. After two years' grov/th the bushes should be 4 to 6 ft. high. They are then cut down to about 8 ins. and are allowed to grow again up to 2 or 3 ft. before, towards the end of their third year, being plucked regularly. The object of this cutting down is to cause the bushes to spread out and cover the ground area usually allowed to each plant, i.e. about 20 sq. ft. The yield in the third year is small, probably less than I oz. finished tea per bush. At 7 to 10 years old, when in full bearing, 4 to 5 oz. would be considered a good return. The annual production per acre from matured plants was in 1906 in the prin- cipal producing districts of India : —

Darjeeling 317 H)

Assam 402 „

Travancore 452 „

Sylhet 515 ..

Cachar 542 „

Dooars 569 „

Individual estates of large area gave as much as 1280 lb per acre. In Ceylon the average yield per acre was 440 lb, but there are verified records of 996 lb per acre within the year from an estate of 458 acres. On the same property an area of 100 acres gave 1 100 lb per acre on the average over a period of 18 years.

Cultivation in the northern parts of India is done by digging over the soil — locally termed hoeing — once in the winter quarter and six times in the nine months of the harvesting season. Cultlva- p Q keep an es tate clean and in good cultivation it re t/on. quires to be gone over every six weeks. The labourers being barefooted, a spade is useless, so a ” khodalee ” or hoe (much like a very heavy and long-bladed garden Dutch hoe) is used. It is raised well over the head and dropped forcibly into the ground, then pulled towards the wielder to turn over the soil. In southern India and Ceylon clean hand-weeding is the method of cultivation, almost no hoeing being done. In northern India the plucking season begins in April. During the first flush (i.e. the breaking out of young green shoots after pruning and the rest of winter) the bush is encouraged to grow by leaving 3 or 4 fully developed leaves after removing the tip of the shoot. It takes about 6 weeks to remove entirely the whole of the first and succeeding flushes, going round the estate once a week. In the second flush two leaves only are left. In the third and fourth flushes only one large leaf, and after that— say during October, November and part of December — no soft leaf growth is left that can be harvested in good order. In northern India, where the weather in the winter months is cold and dry, growth practically ceases, and then the whole area is pruned and cut down to about 16 ins. high

all over, but in Travancore and Ceylon it grows continuously and is only pruned when found expedient at intervals of 15 months to 2 years. In certain cases of high- lying estates, where the growth is slow, it is allowed to run 3 years from pruning. The finest teas are produced at high elevations in Darjeeling and Ceylon and in the plains of Assam, but the quality from individual estates varies much from season to season, and even from week to week. There are at times marked differences between the produce of adjoining estates, with apparently identical con- ditions of soil and situation. Tea grows and thrives from about sea-level in the tropics to 7000 ft. in more temperate conditions. The life of a well-cared-for bush has been estimated at 50 years, in spite of its numerous enemies. Those include mites, termites (or white ants), thread blight, grey blight, caterpillars (naked or in bags) and caterpillars armed with stinging hairs to protect them, and borers, red and black, some of which eat the core out of the wood, while others content themselves with eating only the bark.

During recent years in India a new development has taken place in planting tea upon what are termed " bheels," — lands resembling to a great extent the peat bogs of Ireland and Scotland. When opened up by an elaborate and complete system of drainage, they have been found to possess the power of producing enormously heavy yields, and it is from such estates that the greatest yields in India have come.

In Ceylon, and to some extent in India, the careful and syste- matic application of chemical manures, compounded on scientific lines, has been found to increase largely the yield of leaf, and much

interplanting of nitrogen-producing growths has been done with a view to restoring to the soil the most necessary constituents.

In the early days an attempt was made to copy the Chinese methods, and the various processes were manual. Now, from the plucking stage onwards, almost everything is done by machinery. During the season

of yield the flushes are j Wanu ' a < > plucked every 7 to 10 days, and, as a rule, in India the e ' opening bud and two leaves below it are plucked. To take more than this would be considered coarse and less would be fine plucking. These are of course quite immature, the longest rarely being one inch in length. The lower leaves on the young shoots are too old and hard to manufacture into tea. The plucking is done by women and children, and is now practically the only part of the work where the tea is touched by hand. The plucking season continues in some districts of India till December. As they are plucked, the green leaves are thrown into baskets, and twice daily the pluckings are taken into the factory. They are then spread out thinly on trays or racks made of bamboo, canvas or wire netting, under cover, for some 18 or 30 hours (according to the temporary weather con- ditions) to wither, after which they are in a soft, flaccid condition ready for rolling. On a successful wither the amount of the tea ferment or enzyme is dependent. The object of rolling is to crush the leaves and to break their cells so as to liberate the juices. The leaves are passed repeatedly through a machine driven by steam or other power giving a rotary motion, the operation occupying about 40 to 60 minutes. The next process is familiarly termed fermentation, but is really an oxidation of the leaves. Should the leaf be intended to be cured as green tea, the fermenting process is omitted and some other processes applied, but in India very little green tea is manufactured. Many people still cherish the antiquated belief that black and green teas are grown upon different varieties of the tea-plant, which is quite a mistake, the difference being merely one of preparation. After being rolled, the leaves are spread out in layers of I to 2 ins. thick in a cool house, and left to undergo the chemical action resulting from their condition. This process is checked after from 2 to 3 hours, according to climatic conditions. A further brief rolling to close up the open leaves is followed by the first firing, which is effected by subjecting the leaves to the gradual action of hot air up to a temperature

of 240 F. Various applica- tions of the same system are in use, but the most popular is to place the leaves on trays of wire network in a high temperature for about twenty minutes, after which they are firm and crisp. Up to this point of the manufacture the leaf has been in the stalk, the leaves and bud being unseparated. They are now broken apart and sorted by mechanical sifters into the various grades or qualities, which are described as Orange Pekoe, Pekoe, Pekoe Souchong and Souchong, each of which names represents approximately the leaf -bud and the three lower leaves. In addition to these four classes, out of each are sifted all the smaller fragments of leaf broken in the process of manufacture, which are termed Broken Orange Pekoe, &c. These broken grades are frequently objected to by the consumer, under the impression that they are inferior in quality, but in the opinion of experts, the more the leaf is broken up, the better is the liquor upon infusion. Upon completion of the sifting, the tea is again fired, and while warm it is packed tightly into lead-lined chests, and the lead covers completely soldered over it, so that it may be kept perfectly air-tight until required for use.

The machinery in use is very varied in character, and it has been evolved principally by practical planters of a mechanical turn. Many estate superintendents have begun their careers „ . . as engineers, and it is not unusual for a large estate, or macBlner y- group of estates, to have one member of the European staff who is a qualified engineer. The motive power is generally a steam engine, but the greater economy and facility of oil engines have led to their fairly wide adoption. Where water power is available, turbines of a variety of types are in use. The machines to be driven are air- fans, rollers, roll-breakers, sifters, cutters and packers, and there are besides numerous types of driers or desiccators. The names associated with the most successful and widely used machines are those of the Messrs Jackson (makers, Marshalls of Gainsborough) and Mr S. C. Davidson, of the Sirocco

Works, Belfast. The pro- duction of the empty boxes for packing, called chests or half-chests, is in itself a large industry. The heavy old-fashioned country -made packages are rapidly being replaced by light-tared boxes made from several thicknesses of veneer pressed closely together, most of which come from Russia.

A production temporarily in excess of the world's demand of several years ago, led to the offering of bonuses for the production in India and Ceylon of green teas, with a view to lessening the black tea output. The methods adopted were successful, and - . after some vicissitudes a satisfactory business has been established, especially with the United States of America and Canada. The methods of producing this tea are not so complicated as those followed in China and Japan. The principal difference from the manner described of making black tea lies in the omission of the withering and fermenting, and the substitution for those of a steaming or panning process. The effect of either is to destroy the possibility of fermentation by subjecting the leaf, as soon as it is plucked, to a brief period of great heat. This completely destroys

the ferment or enzyme, and renders it possible to conserve the tea in what is really nearer its natural form than the black tea that is so well known to the consumer.

Tea Consumption. — The following table gives particulars relative to the principal consuming countries, from which it will be seen that Great Britain and its English-speaking dependencies are the great consumers : —

Tea Consumption of Chief Consuming Countries in 1906.

China Unknown

Japan ,,

Total per Annum.

Rate per Person

of Popu- lation.

Rate of Duty per lb.

United Kingdom . . .

United States of America Dominion of Canada. . Commonwealth of Aus-

Dominion ofNewZealand

Holland

South Africa

Argentine Republic . . Tibet

lb

269,503,000 135,400,000

84,842,000 23,969,000

27.959,000 6,141,000 6,354.000

2,428,000

7,874,000 7,572,000 2,870,000

19,000,000 7,240,000

19,000,000 6,000,000

6-17 0-94

0-89 4-34

6-88 6-5

Oil

0-06

i-45

1-4

0-49

13I lb ?

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.5d-.

Certain kinds free for Asiatic Rus- sia or over Asiatic frontier — others 2jd. to is. nfd. Free.

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(If British grown)

i'35d. 9d. (surtax 2fd. if not direct im- port). 2| d. 4d. (Natal tea free)

4-|d.

High.but uncertain.

Free.

4|d. to 7d.

India (estimated) . . . Burma (average about) . Persia (average about) .

626,152,000

The countries of smallerconsumption absorbed about 25,000,000 lb, but there is a considerable excess in the returns of production over those of consumption. This arises partly from the latter relating in certain instances to an earlier period, and partly from the fact

Sierra Leone Spain

British

Guiana . . . .8d.

Bulgaria 4|d. plus 4Jd. ex- cise and octroi I |d.

Chile 9d.

Cyprus 4d.

Denmark …. 4d.

Ecuador 2jd.

Egypt 8 % ad val.

Fiji 6d.

Gibraltar …. Free.

Greece 1 Jd.

Grenada 6d.

Honduras. . . . 2jd.

Italy lid.

Jamaica is.

Lagos id.

Malta Free.

Mauritius. . . .3d.

Mexico 6d.

Morocco ….. 10 % ad val.

Newfoundland 33 % ad val.

Nigeria iod.

Norway is.

The rate per head of population within the United Kingdom has not increased much during recent years, and in the Australasian colonies it has apparently fallen greatly as compared with recorded averages of 12 lb per head in Victoria and 9 lb in New South Wales in 1884. The modern statistics of the commonwealth may be more accurately kept, and there may be less waste in use, but it is not supposed that there is any diminution in the free use of the beverage which has always characterized the antipodean colonist. One important factor in keeping down the amount per person is the substitution in use, which for a generation has been in progress, of the stronger teas of India and Ceylon for the old-fashioned weaker produce of China. The progressive increase in the consumption of tea in Great Britain and Ireland during 50 years from 1836 to 1886 is shown in the table below. The dotted line represents the average monthly consumption in each year; the fluctuations in price of good sound China congou are traced by the black line; and the years in which reduced customs duty came into operation are indicated along the base. From i860 onwards, the amount of Indian tea entered for home consumption is shown in monthly average by a black column. This column brings out the remarkable fact that the

Indian tea alone consumed in 1886 equalled the consumption of all kinds in i860, and was double the quantity of all kinds in 1836. The table, however, shows merely the general development of con-

Peru 65 % ad val. and

10%.

Portugal 2s. o Jd.

Rumania . . . 3id. and 4jd. ex cise. 10% ad val. 6| d. (if tran- shipped in a European port is. 7jd. cwt. ad- ditional).

St Helena …. Free.

Straits Settle- ments Free.

Sweden 3d.

Switzerland . .In receptacles weighing less than 5 kilos, ifd. over i-iod.

Tobago and Trinidad. . .6d.

Turkey 11%.

Uganda 10%.

Uruguay 5Jd.

Venezuela . . . 6d.

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Fig. 5.

that much of the yield of 1906 was afloat or undespatched at the close of that year.

The following table gives the approximate rates of duty per English lb during 1907 in places not referred to above :-

\ 9|d. imported by I sea, by land -i id.

Austria and Hungary

Bahamas 6d.

Barbados 3d. and 20% ad

val.

Belgium Free.

Bermuda . . . .6\% ad val.

Brazil 50 % ad val.

British E. Africa 10 % ad val.

XXVI. 16

sumption, but a similar one on next page, bringing the figures up to 1907, shows the gradual and almost total displacement of China tea by that grown in the English dependencies. In both, the price fluctua- tions and fiscal changes are shown that their effect upon consump- tion may be judged. The prices below are the annual averages for all Indian teas sold in the London public auction market during the years stated. Lowness of price has not been the only factor in increasing the rate of consumption. The

lean years and the fat years of the general labour market always tell, and the low range

ot prices for sugar during recent times has undoubtedly assisted in increasing the amount available for expenditure on tea. In Russia tea costs more to the consumer than in any country where modern transit by railway and steamer exists. The reason is the enormous proportion of the retail selling price which is exacted by the govern- ment by way of duty. But in return the government, with a paternal care for its people, makes absolutely certain that the tea reaches their hands as pure and unadulterated as when it first entered the country. Russian tea has always had a high reputa- tion — largely a sentimental one, however. The quantity taken by the country is very large, but when spread over the enormous population the rate of consumption per person is not great. The extreme poverty of the great body of the people and the high price doubtless explain this. The method of use differs much from that followed in England. The samovar, or urn for boiling the water, is always much in evidence. Tea that makes a dark, strong liquor is preferred — not that such liquor is used, but that the greatest possible quantity of tea-coloured water may be drained from the teapot by refilling it over and over again from the samovar. _ The tea is generally drunk from glasses and while very hot, with a liberal addition of sugar and a flavouring of lemon. The method of use is

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Indian Tea 1

1 Ceylon Tea <=

1 China Tea .a/imaa. Java ‘lea ■

FtG. 6. — Diagram showing the alterations in the relative propor- tions of different growths of tea consumed during the 21 years ended the 31st of December 1907; the variations in the London average prices for Indian teas, and the changes in the English rate of duty. Vertical lines show the average monthly con- sumption in Great Britain and Ireland in millions of pounds. The diagonal line shows the average price per lb of all Indian tea sold in the London public auctions.

probably a more healthy one than that followed in many parts of the United Kingdom, where strong infusions of powerful teas are indulged in too frequently.

The United States of America and the great colonial dependencies follow generally the English way of using the beverage.

France, considering that it is England’s nearest neighbour, has a remarkably small tea consumption: -06 lb per person per annum, or about j-£ 5 th only of the English rate. The increase in con- sumption there has been so small that it probably arises

mainly from the increasing number of English and English-colonial visitors that spend portions of each year in the country.

Germany, and the Germanic peoples, take slightly more per person, but the statistics are rather indefinite. Holland, in Europe, comes next to England, and uses principally the product of her dependency Java. The other nations of Europe are very small consumers. Some of the peoples of eastern Europe take their tea with an admixture- of rum. In Morocco and generally throughout North Africa there is a considerable demand for green tea, which is drunk hot out of glasses, the liquor being almost saturated with sugar and strongly flavoured with mint.

In China and Japan tea is generally drunk without any other qualifying or flavouring addition. Exceedingly delicate teas can therefore be used unimpaired. In Japan the ceremony of serving tea has, among the better classes, been raised to a high art, which the girls have to study at school for protracted periods.

In Mongolia and other parts of Central Asia tea is made into a

kind of soup, somewhat on the lines of the following written regard- ing tea in Tibet by Colonel Waddell in his book Lhasa and its Mysteries. Writing of the Tibetan he states: "As a beverage he drinks, all day long, cupfuls of hot buttered tea, which is really a soup or broth made by boiling tea-leaves with rancid butter and balls of dough, and adding a little salt, and straining— a decoction which was invariably nasty to our taste, though no doubt it is wholesome; for it is not merely a stimulating hot drink in the cold, but overcomes the danger of drinking unboiled water in a country where the water supply is dangerously polluted."

Geography of Tea. — The successful commercial production of tea on a large scale is confined to a strictly limited area enclosed by about 40 of

latitude (5 S. to 35° N.) and about 73° of longitude (67 ° to 140 E.), while the consumption shows itself to a large extent to have strictly geographical limitations. The southern hemisphere ranks lightly in the matter of consumption, the only other country worth mentioning there besides the Australasian and Cape dependencies being Argentina. A straight line of latitude runs through all of these. In the northern hemisphere (excluding the races who consume their own produce) the material consumption of tea is in regions lying 40° N. and above it, but here there is an interesting subdivision to be made. In the United States of America and Canada, in some portions of Europe and of Asia, and along the north of Africa, there is a free use made of green or unfermented teas with pale, pungent infusions. The demand for such, as a general rule, lies principally in lower latitudes, while the farther north the consumer lives he seems to require more of the black or fermented tea of India, Ceylon or China, with the dark, thick, heavy liquor its infusion produces.

Transportation. — In the early part of the 19th century the tea shipped to England was destined to supply many countries, as London was then, and until comparatively recent times, the common warehouse and central market for the world, and England the common carrier. Throughout that century fairly steady and rapid progress was shown — especially in its earlier periods — in the trade from China, which reached its maximum in 1879. And it is here that some of the romance of commerce comes in. As the trade grew in importance, the advantages of rapid transit for the tea of new season's production began to be appeciated, and the slow and stately progress of the old East Indiaman became out of date. A type of vessel, specially designed for the rapid carrying of tea from China to England via the Cape of Good Hope, was introduced, known as the " China Clipper," and the competition was always keen as to which ship should make the most rapid passage. This culminated in the year 1866, when nine ships sailed almost simultaneously from Foochow, three of them crossing the bar in company. These three were all built by

the same builders in Greenock, and came in ahead of all the others, making the long voyage of fully 16,000 m. in 99 days. They each docked in a separate dock in London upon the same day, and all within two hours of each other. The two leading ships had not seen each other for 70 days and met off the Lizard, from which point they ran a neck-and-neck race before a strong westerly wind, with every rag of canvas set.

The opening of the Suez Canal in 1869 soon changed the course of all trade with the East, and in a few years the sending of tea per sailing ship round the Cape of Good Hope was a thing of the I past. Romance was no more, although there was extreme compe- tition in building steamers with great power and speed to land their cargoes rapidly by the new route. This reached its height in 1882, when the s.s. " Stirling Castle " made the phenomenal run, for those times, of 28 days from Woosung to London.

But England, which formerly supplied almost everything to her own colonies and to many foreign countries besides, has, under the modified conditions of abundant steam tonnage everywhere, become less and less of a distributive country. Consequently, direct ship- ments are made now from the countries of production to those of consumption. America gets its tea largely through its western seaboard from China, Japan, Ceylon and India, while not a little is reaching it of recent years by steamers running direct from those countries via the Suez Canal to New York. The Australian demand is fed by steamers from Calcutta and Colombo, with some additions direct from China and Java.

The extensive Russian trade is now largely conducted over the Siberian railroad, and this, next to the transit to London, repre- sents the largest volume of tea traffic passing in one channel. This route has displaced much of the protracted caravan business through Manchuria and Mongolia. A most interesting and adventurous episode in connexion with Russian trade was the effort repeated over several successive years by the late Captain Wiggins

to convey tea entirely by sea from Chinese ports around the North Cape and through the Kara Sea to the Obi and Yenisei rivers. When successful, the journey, although about seven times the mileage of the old direct caravan route, took four months instead of eighteen., and was of course much less expensive.

The only protracted camel or mule caravan journeys remaining in connexion with the tea trade are those in Persia and Morocco, where the conservatism of race delays the introduction of even wheel roads, not to mention railways.

Tea Adulteration. — In the earlier days of the tea trade, adultera- I tion, especially prior to importation, was frequent, because the prices obtainable made it remunerative. Now, intentional adultera- tion is practically non-existent, chiefly because of the fact that in the places of production the price obtainable is so low that any possible adulterant would be too costly to collect. Most countries have a close check upon this at the time of importation, and the customs authorities in Great Britain submit to analysis all samples of a doubtful character. Impure teas are not permitted to pass into consumption, but the quantity condemned after analysis as unfit for food in the year 1906 was 41 packages, out of a total of 317,000,000 lb.

Effect on Health. — The effect of the use of tea upon health has been much discussed. In the days when China green teas were more used than now, the risks to a professional tea-taster were serious, because of the objectionable facing materials so often used. In the modern days of machine-made black tea, produced under British supervision, both the tea-taster and the ordinary consumer have to deal with a product which, if carefully converted into a beverage and used in moderation, should be harmless to all normal human beings. There has been constant

controversy as to whether China tea is better than that of other growths, but the verdict first of all of Great Britain, and subsequently of all the other large consuming countries, has relegated the produce of the Celestial Empire to a very subordinate position. A limited section of medical opinion has recommended China tea for reasons of health, and undoubtedly the inferior strength it possesses reduces the risk arising from improper use, but it also reduces the stimulating and comforting effects the ordinary tea-drinker hopes to experience. Next to water, tea is the beverage most widely in use throughout the world as regards the number of its votaries as well as the total liquid quantity consumed.

Bibliography. — The statistics given are taken as far as possible from official returns, and where such are unavailable they have been carefully compiled from reliable data.

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Royal Asiatic Society, Journal of the Society of Arts, Geographical Journal, Tea and Coffee Trade Journal (New York), &c. For practical planting details, see Tea; its Cultivation and Manufacture, by David Crole (1897), with a full bibliography; also Rutherford's Planter's Handbook. For scientific aspects see Chemistry and Agri culture of Tea, by M. Kelway Bamber (1893). (J- McE.)

TEA-CADDY, a box, jar, canister or other receptacle for tea. The word is believed to be derived from catty, the Chinese pound, equal to about a pound and a third avoirdupois. The earliest examples that came to Europe were of Chinese porcelain, and approximated in shape to the ginger-jar. They had lids or stoppers likewise of china, and were most frequently blue and white. The English kilns at first imitated them, but speedily devised forms and ornament of their own, and there was hardly a ceramic factory in the country which did not compete for the supply of the new fashion. But tea-caddies were not for long confined to procelain or faience. They were presently made in a great variety of materials, and in an equal variety of shapes. Wood, pewter, tortoise-shell, brass, copper and even silver were employed, but in the end the material most frequently used was wood, and there still survive vast numbers of Georgian box-shaped caddies in mahogany, rosewood, satin- wood and other choice timbers, often mounted in brass and delicately inlaid, with knobs of ivory, ebony or silver. Although many examples were made in Holland, principally of the earthen- war of Delft, the finer varieties enamelled, enriched with ciphers, and emblazoned with heraldry, the tea-caddy was a typically English product. As the use of the jar waned and that of the box increased, the provision of different receptacles for green and black tea was abandoned, and the wooden caddy,

with a lid and a lock, was made with two and often three divisions, the centre portion being reserved for sugar. Chippen- dale's caddies in Louis Quinze fashion were delightful, with their claw and ball feet and exquisite finish. On the whole the mahogany

or rosewood caddy of the latter part of the 18th and the early years of the 19th century was, from the artistic point of view, the most elegant and satisfying. The wood was rich and well-marked, the inlay simple and delicate, the form graceful and unobtrusive. Even when it took the shape of a miniature sarcophagus, imitated from the massive wine- coolers of the Empire period, with little claw feet and brass rings, it was a decidedly pleasing object. The larger varieties were known as tea-chests. As tea grew cheaper it became less important that it should be kept constantly under the mistress's eye, and the tea-caddy gradually fell into desuetude. It has, however, never gone entirely out of use, though handsome examples are now most commonly regarded as ornaments or preserved in collections.

TEACH [Thatch or Thach], EDWARD (d. 17 18), English pirate, popularly known as Blackbeard, is believed to have been born at Bristol. He is said to have gone out to the West Indies during the war of the Spanish Succession, to have engaged in privateering, and after the declaration of peace (17 13) to have turned pirate, but he is not actually heard of in this capacity till the end of 17 16. The following year he captured a large French merchantman, rechristened her " Queen Anne's Revenge," and converted her into a warship of forty guns. His robberies and outrages in the Spanish main, the West Indies, and on the coasts of Carolina and Virginia, quickly earned him an infamous notoriety. He made his winter quarters in a convenient inlet in North Carolina, the governor of which colony was not above sharing in the proceeds of his crimes, but the governor of Virginia at last despatched two sloops, manned from the British warships on the station, to cut him out. On the 22nd of November 1718 Lieutenant Maynard, commanding the attacking forces, boarded Teach's sloop, after a sharp fight, and himself shot the pirate dead. Teach seems to have been an ignorant ruffian. His personal appearance was remarkable. His nickname was due to his habit of tying up the ends of his long and bushy black beard

with ribbon and curling them back over his ears. Johnson in his General History of the Pyrates gives his name as Teach, but according to the official records it was really Thatch or Thach.

TEAK, 1 the most valuable of all known timbers; For use in tropical countries it has no equal, and for certain purposes it is preferable to other woods in temperate climates also. Its price is higher than that cf any other timber, except mahogany. 2 Great efforts have been made to find substitutes, but no timber has been brought to market in sufficient quantities combining the many valuable qualities which teak possesses.

The first good figure and description of the tree was given by Rheede, 3 the best modern picture being that given by Brandis. 4 The younger Linnaeus called it Tectona grandis. It is a large deciduous tree, of the natural order Verbenaceae, with a tall, straight but often buttressed stem, a spreading crown, and the branchlets four-sided with large quadrangular pith. It is a native of the Indian peninsula, Burma and Siam, and is also found in the Philippine Islands, in Java and else- where in the Malay Archipelago. In India proper its northern limit is 24 40' on the west side of the Aravalli Hills, and in the centre, near Jhansi, in 25 30' N. lat. In Burma it extends

1 The Sanskrit name of teak is saka, and it is certain that in India teak has been known and used largely for considerably more than 2000 years. In Persia teak was used nearly 2000 years ago, and the town of Siraf on the Persian Gulf was entirely built of it. Saj is the name in Arabic and Persian; and in Hindi, Mahratti and the other modern languages derived from Sanskrit the tree is called sag, sagwan. In the Dravidian languages the name is teha, and the Portuguese, adopting this, called it teke, teca, whence the English name.

2 The rate in the London market since i860 has fluctuated be- tween £10 and £20 per load of 50 cub. ft.

3 Hortus Malabaricus, vol. iv. tab. 27, 1683.

4 Forest Flora of North-West and Central India, 111. t. 44.

to near Myitkyina, in lat. 25° 30′. In Bengal or Assam it is not indigenous, but plantations have been formed in Assam as far as the 27th parallel. In the Punjab it is grown in gardens to the 32nd.

Teak requires a dry tropical climate, and the most important forests are found in those districts of India where, during the summer months, heavy rains are brought by the south-west monsoon, the winter months being nearly rainless. In the interior of the Indian peninsula, where the mean annual rain- fall is less than 30 in., teak is more scarce, and it thrives best with a mean annual fall of more than 50 in. The mean annual temperature which suits it best lies between 75° and 8i° Fahr. Near the coast the tree is absent, and inland the most valuable forests are on low hills up to 3000 ft. It grows on a great variety of soils, but there is one indispensable condition — perfect drainage or a dry subsoil. On level ground, with deep alluvial soil, teak does not always form regularly shaped stems, probably because the subsoil drainage is imperfect.

During the dry season the tree is leafless; in hot localities the leaves fall in January, but in moist places the tree remains green till March. At the end of the dry season, when the first monsoon rains fall, the fresh foliage comes out. The leaves, which stand opposite, or only whorled in very young specimens, are from 1 to 2 ft. in length and from 6 to 12 in. in breadth. On coppice shoots the leaves are much larger, and not rarely from 2 to 3 ft. long. In shape they somewhat resemble those of the tobacco plant, but their substance is hard and the surface rough. The small white flowers are very numerous, on large erect cross-branched panicles,

which terminate the branches. They appear during the rains, generally in July and August, and the seed ripens in the succeeding January and February. On the east side of the Indian peninsula, the teak flowers during the rains in October and November. In Java the plantations are leafless in September, while during March and April, after the rains have commenced, they are clothed with foliage and the flowers open. During the rainy season the tree is readily recognized at a considerable distance by the whitish flower panicles, which overtop the green foliage, and during the dry season the feathery seed-bearing panicles distinguish it from its associates. The small oily seeds are enclosed in a hard, bony, 1-4-celled nut, which is surrounded by a thick covering, consisting of a dense felt of matted hairs. The fruit thus formed is further enclosed in the enlarged membranous calyx, in appearance like an irregularly plaited or crumpled bladder. The tree seeds freely every year, but its spread by means of self-sown seed is impeded by the forest fires of the dry season, which in India generally occur in March and April, after the seeds have ripened and have partly fallen. Of the seeds which escape, numbers are washed down the hills by the first heavy rains of the monsoon. These collect in the valleys, and it is here that groups of seedlings and young trees are frequently found. A portion of the seed remains on the tree; this falls gradually after the rains have commenced, and thus escapes the fires of the hot season. The germination of the seed is slow and uncertain; a large amount of moisture is needed to saturate the spongy covering; many seeds do not germinate until the second or third year, and many do not germinate at all. Where the teak tree is associated with dense clumps of bamboo, natural reproduction is almost absent, except when the bamboo flowers and dies, and even then, if the dry bamboos and the resultant bamboo seedlings are not burnt, such young teak as may germinate are likely to be smothered at once.

The bark of the stem is about half an inch thick, grey or brownish grey, the sapwood white; the

heartwood of the green tree has a pleasant and strong aromatic fragrance and a beautiful golden-yellow colour, which on seasoning soon darkens into brown, mottled with darker streaks. The timber retains its aromatic fragrance to a great age. On a transverse section the wood is marked by large pores, which are more numerous and larger in the spring wood, or the inner belt of each annual ring, while they are less numerous and smaller in the autumn wood or outer belt. In this manner the growth of

each successive year is marked in the wood, and the age of s tree may be determined by counting the annual rings.

The principal value of teak timber for use in warm countries is its extraordinary durability. In India and in Burma beams of the wood in good preservation are often found in buildings several centuries old, and instances are known of teak beams having lasted more than a thousand years. 1 Being one of the most 'durable of Indian timbers, teak has always been used for buildings, particu- larly for temples, and in India it has been the chief timber employed for shipbuilding. When iron commenced to be extensively used for the last-named purpose, it was supposed that the demand for teak would decrease. This, however, was not the case, for the wood was for long very largely used in shipbuilding, and though its employment in war-vessels has diminished, it is still in very great demand for " liners " and similar ships. It is also used for furni- ture, for door and window frames, for the construction of railway carriages, and for many other purposes. White ants eat the sap- wood, but rarely attack the heartwood of teak. It is not, however,

Teak (Tectona grandis).

proof against the borings of the teredo, from whose attacks the teak piles of the wharves in the Rangoon river have to be protected by a sheathing of metal.

Once seasoned, teak timber does not split, crack,

shrink, or alter its shape. In these qualities it is superior to most timbers. In contact with iron, neither the iron nor the teak suffers, and in this respect it is far superior to oak. It is not very hard, is easily worked, and takes a beautiful polish. It has great elasticity and strength, and is not very heavy. The average weight of perfectly seasoned wood fluctuates between 38 and 46 lb per cub. ft. 2 Its weight, therefore, is a little less than that of English oak. Green teak timber, however, is heavier than water, so that,

1 In one of the oldest buildings among the ruins of the old city of Vijayanagar, on the banks of the Tungabhadra in southern India, the superstructure is supported by planks of teakwood 1| in. thick. These planks were examined in 1881; they were in a good state of preservation and showed the peculiar structure of teak timber in a very marked manner. They had been in the build- ing for 500 years {Indian Forester, vii. 260). In the wall of a palace of the Persian kings near Bagdad, which was pillaged in the 7th century, two Americans found in 181 1 pieces of Indian teak which were perfectly sound (Ouseley, Travels in Various Countries of the East, ii. 280, n. 67). In the old cave temples of Sal- sette and elsewhere in western India pieces of teak have been found in good preservation which must have been more than 2000 years old.

2 At 44-8 lb per cub. ft. a load of 50 cub. ft. weighs a ton (2240 lb), hence in the Burma ports a ton of teak timber is taken as equivalent to a load of 50 cub. ft.

unless thoroughly seasoned, the wood cannot be floated. In Burma, therefore, where the rivers are used to float the timber to the sea- ports, the method of seasoning teak by girdling has been practised from time immemorial. Girdling consists in making a deep circular cut through bark and sap into

the heartwood, so as completely to sever communication between bark and sapwood above and below the cut. In teak, as in oak and other trees with well-marked heartwood, the circulation of the sap only takes place in the sap- wood, and the girdled tree therefore dies after a few days if the operation has been effectually performed. But if even the smallest band of sapwood is left connecting the outer layers of wood above and below the girdle, the tree is not killed, and often recovers completely. The girdled tree is allowed to stand one or two years, and longer if a very large-sized tree. Being exposed to the wind and to the action of the sun, the timber of a girdled tree seasons more rapidly and more completely than that of a tree felled green. The teak produced in the presidencies of Madras and Bombay and in the Central Provinces is as a rule felled green, and even when dry it generally is a little heavier than the timber from Burma. 1 For a long time to come, the rivers of Burma and Siam will continue to afford the most convenient and most economical routes for the extraction of teak timber from those countries. Indeed, the forests drained by the Salwin and its feeders are not likely ever to be worked otherwise than on the present plan, under which the logs are floated singly over the rapids and are caught and rafted lower down, at the kyodan or rope station, 70 miles above Moulmein.

As already mentioned, teakwood contains an aromatic oil, which gives it a peculiarly pleasant smell and an oily surface when fresh cut. To this oil may probably; with justice be ascribed its great durability. In Burma the oil is extracted from the timber on a small scale, to be used for medicinal purposes, by filling an earthen pot, which is placed inverted upon another, with chips of wood, and putting fire round it, upon which the oil runs down into the lower vessel.

According to the colour and texture of the wood, several varieties of teak are distinguished in India, Burma and Java; in the timber trade, however, these distinctions are of no importance. Teak, as

well as other trees, when standing isolated, forms side branches far down the stem, and the wood of such trees is more knotty and wavy, and generally heavier and darker-coloured than that of trees which have grown close together in a dense forest. Apart from the manner in which the tree had grown up in the forest, soil, elevation and climate have a great influence upon the grain and the mechanical qualities of teak as of other timbers. Most of the larger logs brought to market have an irregular crack or hollow in the centre, which commences at the butt and often runs up a long way. There is little doubt that this is generally due to the action of the fires, which scorch and often destroy the bark of young trees. Such external injuries are apt to induce decay in the wood. Moreover, most teak seedlings which come up naturally are cut down to the ground by the fires of the hot season; some are killed, but many sprout again during the rains, and this is generally repeated year after year, until a sapling is produced strong enough to outlive the fire. Such saplings have a very large pith, which dries up, causing a hollow in the heart; or a piece of the old shoot killed by the fire is enclosed by the new wood, and this also is apt to give rise to a hollow.

The leaves of the teak tree contain a red dye, which in Malabar was formerly used to dye silk and cotton. Natives of Burma use the leaves as plates, to wrap up parcels, and for thatching.

In its youth the tree grows with extreme rapidity. _Two-year- old seedlings on good soil are 5 to 10 ft. high, and instances of more rapid growth are not uncommon. In the plantations which have been made since 1856 in Burma, the teak has on good soil attained an average height of 60 ft. in 15 years, with a girth, breast high, of 19 in. This is between 16° and 18 _N. lat., with a mean annual temperature of 78° F. and a rainfall of 100 in. In the Burma plantations it is estimated that the tree will, under favourable circumstances, attain a diameter of 24 in. (girth 72 in.) at the age of 80. Timber of that size is market- able, but the timber of the

natural forests which is at present brought to market in Burma has grown much more slowly, the chief reason being the annual forest fires, which harden and im- poverish the soil. In the natural forests of Burma and India teak timber with a diameter of '24 in. is never less than 100 and often more than 200 years old. In future, the timber grown in plantations and in forests under regular management may be ex- pected to be much faster grown; and there is no ground for antici- pating that rapidly grown timber will be less valuable than that of slow growth, which is at present brought to market.

Like the other trees of the dry deciduous forest, teak does not attain any extraordinary size. The trees are not generally more than 100 to 150 ft. high, even under the most favourable circum- stances, and stems more than 100 ft. to the first branch are not often found. Exceptionally tall trees were measured in 1861 in the Gwaythay forest in Pegu, east of the Sitang river, on gneiss.

1 It has been erroneously stated that the tree in Burma is tapped for its oil before fellinp-

The stems had 106 to 1 14 ft. to the first branch, with a girth, at 6 ft. off the ground, from 7 to 16 ft. Larger girths, up to 25 ft., are not uncommon.

The teak tree does not usually form pure forests. It is associated with bamboos and with a great variety of other trees, which have little market value, and, as a rule, thrives best in such company. Hence in the plantations established in Burma the object has been to raise forests of teak mixed with bamboos and other trees.

Most of the teak timber produced in India is used in the country. The produce of the forests of Travancore, Cochin, the Madras presidency, Coorg, Mysore, Bombay, Berar and the Central Pro- vinces is all so consumed. Formerly there was a considerable export from the ports of the western coast — Malabar, Kanara, Surat and Broach — but the country

at present requires all the teak which its forests can produce; indeed the demand is in excess of the supply, and considerable quantities are imported from Burma to Calcutta, Madras, Bombay and other Indian ports. Small quantities are still exported from the ports of the western coast to Arabia and the coast of Africa. The chief export is from Burma, principally from Rangoon and Moulmein. Of the other teak- producing countries, Java exports a little; there have also been exports from Saigon; and since 1882 Bangkok has sent con- siderable quantities to Europe. But the Burma coast is the chief source of supply at present. Rangoon was for a long time an important place for shipbuilding, teak being the chief timber used: between 1786 and 1825 11 1 European vessels were built at Rangoon, aggregating 35,000 tons. At the same time timber was exported, and, when the country was taken by the British in 1852, teak was the chief article of export. Moulmein became British territory at the close of the first Burmese war in 1826. At that time the place was a large fishing village, and it was mainly through the export of teak timber and the shipbuilding trade that it attained its present importance. From 1829 to 1841 upwards of 50,000 loads of teak timber were exported, and, in addition, 68 vessels were built during that period, aggregating 15,680 tons, and estimated to have required for their construction 24,000 loads of teak timber. The forests from which Moulmein first derived its supplies are situated on the Attaran river, a feeder of the Salwin. In 1836, however, timber began to come down from more distant forests, and in 1841 one-fourth only of the supply was brought from the Attaran forests.

The increase in the export of timber from the Burma ports was slow at first, but has gone on rapidly since Rangoon became a British port. Since that time the timber brought to the Burma ports has come from the following sources: — (1) from the forests in the British coast provinces, Pegu and Tenasserim; (2) from the forests in the former kingdom of Burma, floated to Rangoon down the Sitang and Irrawaddy rivers; (3) from the forests in the Shan states

formerly tributary to Burma, from the Karenni country, and from western Siam, whence it is floated to Moulmein by the Salwin river.

The following table shows the figures of the imports and exports of British India for the years 1901-2 to 1905-6: —

Imports.

Exports.

Cub. Tons.

Value Rs.

Cub. Tons.

Value Rs.

1901-2. . . .

1902-3 —

1903-4….

1904-5 — 1905-6 —

1906-7. . . .

17,842 32,081 34,588

46,915 71,676 61,696

13,03,968 24,96,317 30,55,695 42,46,190 62,17,331

6o,7I,557

60,671

57,5OO

73,913 46,912

52,768 44,202

71,53,855 68,67,879 91,45,605 60,05,383 70,41,660 61,48,291

• Average. . 44, I 33

38,98,483

= £259,899

55,994

70,60,445

= £470,696

Nearly the whole of the imports came from Siam, and of the ex- ports four-fifths were from Burma. The balance of the imports consisted of timber from Java, that of the exports of supplies sent from peninsular ports. Two-thirds of -the exports went to the United Kingdom, the other chief markets being ordinarily Germany, Ceylon and Australia. The recent great increase in the general teakwood trade is evidenced by the fact that the imports increased in six years from 17,842 tons to 61,696 tons. But it is noticeable that, whereas in 1901-2 the timber exported very largely exceeded the imports, in 1905-6 and 1906-7 the imports were larger than the exports, evidence of the great increase in Indian demand for teak timber; and, in all probability, of the steady regular outturn of the Indian forests, in comparison with increased imports from Siam, where the forests are not, like those in Burma, under regular working plan, designed to give a permanent annual yield and avoid any danger of exhaustion of the forests.

In British India, including Burma, a large portion of the teak- producing tracts have since 1856 been placed under conservancy management with the object of preventing overcutting and main- taining a permanent and gradually increasing supply. This is the object of the working plans referred to The area of teak forest

available in India and Burma is considerable, and every endeavour is made to conserve it and increase its production. Similar measures have been taken in Siam under the advice of officers borrowed from British India; and in the teak-producing native states in the peninsula the necessity for careful management is now well under- stood. The teak plantations in Java had come into bearing by 1908 and it was expected that the teak areas in the Philippine Islands would be similarly developed. (D. Br. ; J. S. Ga.)

TEAL (O.E. tele), a variety of duck, whose name is of un- certain origin, but doubtless cognate with the Dutch Taling (formerly Talingh and Telingh), and this apparently with the Scandinavian Atteling-And (Briinnich, Ornithol. Borealis, p. 18) and Atling. It seems impossible not to connect the latter with the Scottish Atteile or Atteal, to be found in many old records, though this last word (however it be spelt) is generally used in conjunction with teal, as if to mean a different kind of bird; and commentators have shown a marvellous ineptitude in surmising what that bird was.

The Teal is the Anas crecca of Linnaeus, Nettion crecca of modern ornithology, and the smallest of the European Anatidae, as well as one of the most abundant and highly esteemed for the table. It breeds in many parts of the British Islands, making its nest in places very like those chosen by the Wild Duck, A. boscas; but there is no doubt that by far the greater number of those that are taken in decoys, or are shot, during the autumn and winter are of foreign origin. While the female presents the usual inconspicuous mottled plumage of the same sex in most species of Anatinae, the male is one of the hand- somest of his kind. His deep chestnut head and throat are diversified on either side by a line of buff, which, springing from the gape, runs upward to the eye, in front of which it forms a fork, one prong passing backward above and the other below, enclosing a dark glossy-green patch, and both losing themselves in the elongated feathers of the hind-head and nape. The back and sides of the body appear

to be grey, an effect produced by delicate transverse pencillings of black on a dull white ground. The outer lanceolate scapulars have one-half of their webs pure white, forming a conspicuous stripe along the side of the back. The breast is of a pale salmon or peach-blossom colour, each feather in front bearing a roundish dark spot, but these spots lessen in number and size lower down, and the warm tint passes into white on the belly. The tail coverts above and below are velvety black, but those at the side are pale orange.

The teal inhabits almost the whole of Europe and Asia, — from Iceland to Japan, — in winter visiting Northern Africa and India. It occasionally occurs on the western shores of the Atlantic; but its place in North America is taken by its repre- sentative, A. carolinensis, the male of which is easily to be recognized by the absence of the upper buff line on the side of the head and of the white scapular stripe, while he presents a whitish crescentic bar on the sides of the lower neck just in front of the wings.

Species ihore or less allied to these two are found in most other parts of the world, and among such species are some (for instance, the N. gibberifrons of the Australian region) in which the male wears the same inconspicuous plumage as the female. But the determination of the birds which should be technically considered " Teals," and belong to the genus Nettion, as distin- guished from other groups of Anatinae, is a task not yet success- fully attempted, and much confusion has been caused by associating with them such species as the Garganey (q.v.) and its allies of the group Querquedula. Others again have not yet been discriminated from the Wigeons (q.v.), the Pintail-Ducks, Dafila, or even from the typical form of Anas (see Duck), into each of which genera the Teals seem to pass without any great break. In ordinary talk " Teal " seems to stand for any Duck- like bird of small size, and in that sense the word is often applied to the members of the genus Nettopus, though some systematists will have it that they are properly Geese. In the same

loose sense the word is often applied to the two most beautiful of the family Anatidae, belonging to the genus A ex (commonly misspelt A ix) — the Carolina Duck of North America, Ae. sponsa (not to be confounded with the above-named Anas carolinensis

or Nettion carolinense) , and the Mandarin-Duck of China, Ae. galericulata. Hardly less showy than these are the two species of the subgenus Eunetta, — the Falcated Duck, E. falcata, and the Baikal Teal, E. formosa, — both from Eastern Asia, but occasionally appearing in Europe. Some British authors have referred to the latter of these well-marked species certain Ducks that from time to time occur, but they are doubtless hybrids, though the secret of their parentage may be un- known; and in this way a so-called Bimaculated Duck, Anas bimaculata, was for many years erroneously admitted as a good species to the British list, but of late this has been properly discarded. (A. N.)

TEANO (anc. Teanum Sidicinum), a town of Campania, Italy, in the province of Caserta, 21 m. N.W. of that town on the main line to Rome from Naples, forming conjointly with Calvi an episcopal see. Pop. (1901) 6067 (town); 13,505 (commune). It stands at the S.E. foot of an extinct volcano, Rocca Monfina (3297 ft.), 643 ft. above sea-level. The cathedral dates from 1530, but has many columns obtained from the ruins of the ancient town. There is a feudal castle built by the dukes of Sessa in the 15th century. Below the town on the S.E. is the old church of S. Paride.

The ancient Teanum Sidicinum (there is a Teanum Apulum, q.v., in Apulia) was the capital of the Oscan tribe of the Sidicini which drove the Aurunci from Rocca Monfina. They probably submitted to Rome in 334 B.C. and their troops were grouped with those of Campania in the Roman army. Thus the garrison of Regium, which in 280 attacked the citizens, consisted of one cohort of Sidicini and two of Campanians. Like Cales, Teanum continued to have the right of coinage, and, like Suessa and Cales, remained faithful to Rome in both the Hannibalic and

the Social wars. Its position gave it some military importance, and it was apparently made a colony by Claudius, not by Augustus. Strabo speaks of it as the most important town on the Via Latina, and only coming after Capua among the towns in the interior of Campania. It lay on the Via Latina, here joined by a branch road from Suessa, of which remains still exist, and which continued E. to Allifae. Remains of a theatre and an amphitheatre still exist, and some extensive baths, containing several statues, and some Roman dwellings, both some way below the modern town, were excavated in 1908. A tomb with a Christian mosaic representing the visit of the three kings to Bethlehem was found in 1907 (V. Spin- azzola in Notizie degli Scavi, 1907, 697; E. Gabrici, ibid..

ia° 8 , 399)-

TEANUM APULUM, an ancient town of Apulia, Italy, on the road between Larinum and Sipontum, 18 m. E. of the former, at the crossing of the Fortore near the modern village of S. Paolo di Civitate. It was called Teate in earlier times, as appears from its numerous coins, which have Oscan legends. It submitted to Rome in 318 B.C., being then the chief town of Apulia. It was afterwards known as Teanum Apulum, and was a municipium. Some ruins and an old bridge over the Fortore still exist.

TEA-POY (Hindustani tepdi), a small table, supported upon a tripod, or even upon four legs, for holding a tea-service or an urn. The word was also sometimes applied to a large porce- lain or earthenware tea- caddy, and more frequently to the small bottles, often of Battersea enamel, which fitted into receptacles in the caddy and actually contained the tea.

TEAR, a drop of the liquid secretion of the lachrymal gland, constantly produced in a certain quantity and flowing through the nasal duct without notice, but, when stimulated by pain, emotion or artificial excitation, increasing so that it flows over the eyelids and runs down the cheeks and is the

visible result of crying or weeping (see Eye). The O.E tear, taer, is represented in other Teutonic languages by Dan. taar; Swed. tar; Goth, tagr, &c. The O.H.G. was zahar; the mod. Ger. Zahre was formed from the M.H.G. plural Zahere. The com- moner word in Ger. Tkrane, cf. Du. traan, is closely allied. The original root is seen in Gr. d&Kpv, Lat. lacrima, lacruma, for dacruma, whence Fr. larme, and It., Sp., and Port, lagrima.

The generally accepted Indo-Germ. root is dak-, to bite, cf. Gr. Saicveiv, and Skt. dac , to bite, tears being " biting " or " bitter " things. The Du. traan, in the sense of tear-drop, was parti- cularly applied to the blubber of whales reduced to oil by boiling, whence has come the tautological English " train-oil," often identified with the lubricant used for the wheels of rail- way trains. For the so-called " tear-vessels," which are pro- perly small vases containing unguents, see Lacrymatory.

" Tear " (O.E. teran), to pull apart violently, to rend, is, of course, a distinct word; it is cognate with Gr. depav, to flay, pull off, and the root is seen in Gr. bkpua, skin, whence "dermatology," "epi- dermis," &c.

TEASEL. Wild teasel is a common plant of the English copses and hedges, with a tall, stout, rigid, prickly stem, bearing large spreading opposite leaves, the midrib of which is prickly, and conspicuous oblong heads, the purplish flowers in which are subtended by very long, narrow, stiff, upright bracts. The plant is known botanically as Dipsacus sylvestris. Fuller's teasel, D. Fullonum, in which the bracts are hooked, is probably a cultivated form of the wild species; the dry heads are used to comb up the nap on cloth. The genus Dipsacus gives its name to the family Dipsaceae, to which also belongs the Scabious (Scabiosa), represented in Britain by several species.

TEATE MARRUCINORUM [mod. Chieti, g.v.], the chief town of the Marrucini, the whole of whose territory was placed under its municipal jurisdiction by the Romans, after the " Social War." It was thus a town of some importance. Under the church of SS. Pietro e Paolo and the adjoining houses are extensive substructures (in opus reticulatum and brickwork) of the 1st century a.d., belonging to a building erected by M. Vectius Marcellus (probably mentioned by Pliny, H.N., II., 199) and Helvidia Priscilla. There are also remains of large reservoirs and of a theatre.

TEBESSA (the Roman Theveste), a town of Algeria in the department of Constantine, 146 m. S.E. of Bona by rail and 12 m. W. of the Tunisian frontier, on a plateau 2950 ft. above the sea. Pop. (1906) 5722. The modern town, which is within the walls of the Byzantine citadel, boasts nothing of interest save a church built out of the ancient ruins. The Byzantine walls, pierced by three gates, are in tolerable pre- servation. They are strengthened by numerous square towers. One of the gates is formed by the quadrifrontal arch of Cara- calla, a rare form of construction. The arch, erected about a.d. 212, is in good preservation. A pair of monolithic columns, disengaged, flank each fagade. An inscription on the frieze gives the history ^pf its construction; it was built by two brothers as a condition of inheriting the property of a third brother. The most important ruins are those of the great basilica. This building, one of the finest Roman monuments in Algeria, bears evidence of having been built at various epochs; the earlier portions probably date from not later than the beginning of the 2nd century a.d. The basilica was partially destroyed by the Berbers in the 5th century, and was rebuilt in a.d. 535 by the Byzantine general Solomon, who surrounded it with a wall about 25 feet high, still standing. The main building, consisting of a nave with apsidal end and two aisles, was approached through a peristyle, which was surrounded by an arcade. Many of the columns of the basilica have fallen, but the bases of all are in their original positions. A

quatrefoil chapel on the east side of the basilica is a Byzantine addition. The tessellated pavement which covers the basilica proper is in almost perfect condition. It is kept covered, for purposes of preservation, by a layer of earth. Next the basilica (and within the same enclosing walls) are the ruins of the forum, converted into a monastery in the 4th or 5th century, and regarded by Sir R. Lambert Playfair as the oldest known example of the monasteria clericorum. The whole of the basilica and its dependencies have been cleared and are kept in order by the Service des Monuments historiques, the principal work having been accomplished by Heron de Villefosse. Note- worthy among the buildings within the ancient citadel is a small tetrastyle temple' variously ascribed to Jupiter and

Minerva, the portico supported by six monolithic columns of cippolino, four being in front. After the French occupation in 1842, the building was used successively as a soap factory, a prison, a canteen, a parish church, and, lastly, as a museum.

Theveste was founded towards the close of the 1st century a.d. In the succeeding century it was connected with Carthage by a great highway. In the 5th century, under Vandal dominion, it declined in importance. Refounded by the Byzantines in the 6th century, the city disappeared from history at the time of the Arab conquest of the country in the 7 th century. In the 16th century the Turks placed a small garrison of janissaries in the place, but Tebessa continued to be but a small village until the establishment of French rule.

Nine miles from Tebessa are the extensive phosphate quarries of Jebel Dyr, where is also an interesting megalithic village.

See Sir R. Lambert Playfair, Handbook for Travellers in Algeria and Tunis (London, 1895), pp. 233-40, Guides- Joanne, Algerie et Tunisie (Paris, 1906).

TECHNICAL EDUCATION. The term now generally adopted to designate the special training of persons in the

arts and sciences that underlie the practice of some trade or profession, is called ” technical education.” Schools theory. in which this training is provided are known as technical schools. In its widest sense, technical education embraces all kinds of instruction that have direct reference to the career a person is following or preparing to follow; but it is usual and convenient to restrict the term to the special training which helps to qualify a person to engage in some branch of productive industry, and the instruction so provided is generally known as ” techno- logical instruction.” This specialized education may consist of the explanation of the processes concerned in production, or of instruction in art or science in its relation to industry, but it may also include the acquisition of the manual skill which production necessitates.

The terms ” technical ” and ” technological ” (Gr. rtxvr}, art or craft’i as applied to education, arose from the necessity of finding words to indicate the special training which was needed in consequence of the altered conditions of production during the 19th century. Whilst the changed conditions of production, consequent mainly on the application of steam power to machinery, demanded a special training for those who were to be engaged in productive industry, the prevalent system of education was not adapted to the requirements of these persons, and schools were wanted in which the necessary instruction could be obtained. Other circumstances resulting mainly from the application of steam power to ctianeed machinery rendered technical education necessary, condi- Production on a large scale led to a great extension Uoas of of the principle of the division of labour, in conse- P roeuc ‘ quence of which it was found economical to keep a man constantly engaged at the same kind of work, since the more he practised it the quicker and more skilful he became. Thus employed, the workman learned little or nothing of the process of the manufacture at which he assisted, or of other departments of the work than the particular one in

which he was engaged, and his only opportunity of acquiring such knowledge was outside the workshop or factory in a technical school. The economy effected by the division of labour led to the exten- sion of the principle to other industries than those in which machinery is largely employed. There are many trades in which manual skill is as necessary now as ever, but even in these the methods of instruction prevailing under the old system of apprenticeship are now almost obsolete.

In many industries, including trades in which machinery is not as yet extensively employed, production on a large scale has increased the demand for unskilled labour, numbers of hands being required to prepare the work J^g^f^ to be finished by a few skilled artisans. Rapidity of execution is attained by keeping a workman at the same work, which after a time he succeeds in mechanically performing and continues to do until some machine is invented to take his place. In most trades, as formerly practised, the master

employed a few apprentices who assisted him in his work, and who learnt from him to understand the details of their craft, so that, when the term of their apprenticeship was over, they were competent to practise as journeymen. But now the master frequently has neither time nor opportunity to instruct young lads, and the old relation of master and apprentice is changed into that of manufacturer and workman. In conse- quence of these altered relations between employer and em- ployed, there has arisen an acknowledged want of properly trained workmen in a number of trades in which skilful hand work is still needed; and in these trades a demand has arisen for technical schools, or some other substitute for what was formerly done by apprenticeship, as a means of suitably train- ing workmen and foremen. The ever-increasing competition in production has led to the employment, in many

trades, of children to do work of a mechanical kind requiring little skill; but, whilst thus employed, these young people have little oppor- tunity of learning those parts of their trade in which skill and special knowledge are needed; and when they are grown up, and seek higher wages, they are dismissed to make room for other children. Numbers of young people are thus thrown upon the labour market, swelling the percentage of the un- employed, who are competent to do nothing more than children's work, and to earn children's wages, and who know no trade to which they can apply their hands. To remedy this, by creating some substitute for the old apprenticeship, is one of the objects of a system of technical education; though in suitable trades an independent movement for reviving ap- prenticeship (q.v.) under improved conditions has also made some way.

A comDlete system of technical education should provide the necessary instruction for the different classes of persons engaged in productive industry. It is usual to divide these persons into three classes: — (i) workmen or journeymen; (2) foremen or overseers; (3) managers or masters.

The industries in which they are employed may be grouped under four heads: — (1) those involving the use of extensive machinery, such as iron and steel manufacture, machine-making, the textile industries, and some of the chemical trades; (2) those which mainly require the use of hand tools, as cabinet-making, brick-work, plumbing, and tailoring; (3) those depending on artistic skill, as wood and stone carving, metal-chasing, enamelling, de- corative work, and industrial designing generally; (4) agri- culture in all its branches, and forestry. These industries will be referred to as manufactures, handicrafts, art industries and agriculture. The foregoing classification comprises groups which necessarily, to some extent, overlap one another. Every factory contains a carpenter's and smith's shop, and handi- craftsmen of group (2) are required in every manufacturing concern. Whilst the industries in which hand labour is ex- clusively

employed are becoming fewer and fewer, there are many trades which, owing to the frequent invention of labour- saving appliances, are passing gradually from the class of handicrafts to that of manufactures. In these trades, of which watch- and clock-making and boot- and shoe-making may be taken as examples, there is still a demand for goods largely if not entirely produced by hand work. In such trades, owing to the absence of facilities for instruction in the ordinary shops, there is a want of skilled hand labour which there is an increasing difficulty in satisfying, and to supply this want technical schools of different kinds have been established. Then, again, there are many branches of manufacturing in- dustry which greatly depend for their success upon the de- signer's art, and it is necessary that the industrial designer should possess a knowledge of the processes of the manufacture in which his designs will be utilized, as well as of the properties and capabilities of the material to which they will be applied. Indeed, it is the possession of this knowledge which mainly distinguishes the industrial designer from the ordinary artist. To determine the best training for such designers is one of the problems of technical education. There are many trades,

Classes of workers.

too, in which the handicraftsman and the designer should be united. This is the case in such industries as silversmith's and goldsmith's work. In these and other trades the true artisan is the artist and handicraftsman combined.

In order to reconcile some of the different views which are held as to the objects of technical education, it is necessary to keep in mind the broad distinction, above referred to, Manufac- between the conditions of production on a large scale, tures and as in those industries in which goods are manufac- haadi- tured by the use of extensive labour-saving machinery, cra s ' and in those trades in which hand work is chiefly employed. Much of the diversity of opinion regarding the objects of tech- nical

education is due to the difference of standpoint from which the problem is regarded. The volume of the trade and commerce of Britain depends mainly on the progress of its manufacturing industries. It is these which chiefly affect the exports and im- ports. The aim of manufacturers is to produce cheaper and better goods than can be produced by other manufacturers at home or abroad; and technical education is valuable to them, in so far as it enables them to do so. It also helps to widen the area of productive industry, and to encourage varieties of activity which the free and unfettered conditions of competition tend un- duly to restrict. On the other hand, the artisan engaged in hand industries looks to technical education for self- improvement, and for the means of acquiring that general knowledge of the principles and practice of his trade, which he is unable to obtain in the commercial shop. Hence the artisan and the manu- facturer approach the consideration of the question from different sides. To the spinner or weaver who almost ex- clusively employs women to tend his machinery, or to the manufacturing chemist whose workpeople are little more than labourers employed in carrying to and fro materials, knowing little or nothing of the scientific principles underlying the com- plicated processes in which they are engaged) the technical education of the workpeople may seem to be a matter of little moment. What such manufacturers require are the services of a few skilled engineers, artistic designers or scientific chemists. From the manufacturer's point of view, therefore, technical instruction is not so much needed for the hands he employs in his work as for the heads that direct it. But in trades in which machinery plays a subsidiary part, technical teaching supplies the place of that instruction which, in former times, the master gave to his apprentice, and the workman is encouraged to attend technical classes with a view to acquiring that know- ledge of the theory and practice of his trade, on the acquisition of which his individual success greatly depends. In the former class of industries, technical education is needed mainly for the

training of managers; in the latter, for the training of workmen. Hence has arisen a double cry, — for the teaching of art and of the higher branches of science, with a view to their application to manufacturing industry, and for the specialized instruction in drawing, and in the scientific facts which help to explain the processes and methods connected with the practice of different crafts and trades. This double cry has led to the establishment of technical universities and of trade schools.

Owing to the conditions under which manufacturing industry is now carried on, it is difficult to select competent foremen from the rank and file of the workmen. The ordinary Foremen hands gain a very limited and circumscribed ac- and quaintance with the details of the manufacture in '"^"agers. which they are engaged, and have little opportunity of acquiring that general knowledge of various departments of work, and of the structure and uses of the machinery em- ployed, which is essential to the foreman or overseer. It is in evening technical classes that this supplementary instruction, which it is the workman's interest to acquire and the master's to encourage, can be obtained; and it is from the more in- telligent workmen who attend these classes that masters and employers will select as foremen those students who are found to possess the essential qualifications. The history of invention shows how frequently important improvements in machinery

educa- tion.

are made by the workman or minder in charge of it, and adds weight to the arguments already adduced for giving technical instruction to persons of all grades employed in manufacturing industry. To these advantages of technical education, as affecting the workmen themselves as well as the progress of the industry in which they are engaged, must be added

the general improvement in the character of the work produced, resulting from the superior and better-trained intelligence of those who have had the benefit of such instruction.

It will be seen from the foregoing that a complete system of technical education must make provision for the training of those who are to be occupied as journeymen or foremen in different branches of trade or industry, and also for those who aim at becoming managers or masters or heads of manufacturing firms, scientific advisers or professional engineers. As technical Profes- education necessarily implies specialized teaching, the sioaaiand curriculum and methods of instruction adopted in general the elementary and secondary schools, where students receive their preliminary training, are matters closely related to any scheme of technical instruction, and the trend of educational opinion is in favour of associating the gene- ral instruction given in those schools with the specialized teaching of the technical institutions. Indeed, it is daily becoming more difficult to draw any hard-and-fast line between professional and general education. It is now universally recognized that the foundations of technical instruction must be laid in the elementary and the secondary schools, and many of the changes which have been made in the organization of those schools had their origin in the requirements of technical institutions.

A short survey of the methods adopted in different countries to provide the specialized teaching applicable to different pursuits, and of its relation to the general school system of those countries, will serve as a fitting introduction to the con- sideration of the legislative and other changes which have Study of gradually been made in the British school system foreign with a view to modern industrial conditions. The systems. s t u(jy f foreign systems of education is serviceable, as showing the relation of such systems (to f the indus- trial needs of each country and to the genius and character of the people. In the organization of technical education in England, full advantage has

been taken of foreign experience, although no attempt has been made to imitate too closely foreign methods. Detailed information as to what has been done abroad is found in the published reports of the several English commissions which have been appointed to inquire into the subject, and in the valuable series of special reports issued from the Board of Education. From these reports, which show how varied have been the attempts to adapt school training to modern industrial requirements, certain general principles may be inferred, which are equally applicable to the conditions under which the trade and commerce of different countries is now carried on.

These general principles may be briefly enunciated as follows : —

1 . The education of all persons who may expect to be occupied General in some form of productive industry may be con- prin- sidered as consisting of two parts, (a) general, (b) dpies. special.

2. The general education is the preliminary training pro- vided in elementary and secondary schools, and the curriculum of those schools should be varied so as to have some reference to the future pursuits of the pupils.

3. The special or supplementary instruction should be adapted to the requirements of different grades and classes of workers, and to different trades or occupations as practised in different localities.

A complete system of technical education would afford facilities of training adapted to every kind and grade of in- dustry; but, owing to the complexity of the problem, such a system is nowhere to be found. In every country the scheme of education and method of instruction have varied from time >to time, as the conditions regulating trade and industry have

changed. But recently in all civilized countries, the effort has been made to provide a general and

specialized education adapted to different pursuits for each of these great classes of workers: (1) operatives, (2) foremen and overseers, (3) masters and managers.

1. Workmen. — Many attempts have been made to provide a substitute for apprenticeship, but hitherto with no great success. Two classes of workpeople have to be considered — (1) those engaged in manufacturing industries, and (2) those engaged in handicraft industries. The education of all classes of workpeople begins in the public elementary schools; and, in view of the future occupation of the children, it may be taken for granted that primary instruction should be practical, and should include drawing and elementary science. It should indeed be closely associated with manual training, consisting of workshop exercises and field work in the case of boys in urban and rural schools respectively, and of instruction in the domestic arts in the case of girls. The lessons in drawing and in elementary science should form part of the manual training, and the school curriculum should be unified Blement- so that all the subjects of instruction should be grouped ar ^. e

In Germany and Switzerland, there exists an excellent system of evening continuation schools, known as Fortbildungs- or Ergdnz- ungs-Schulen, in which the instruction of the children who leave school before fourteen, and of those who leave at that age, is con- tinued. In all these schools drawing is taught with special reference to local industries. In England great progress has been made in recent years in developing evening classes in which the pupils' elementary instruction is continued with a view to the specialized teaching provided in the technical school. The teaching in these continuation schools is generally . . varied according as the pupil is occupied in trade or office c °° s ' work, and the practice is becoming general of requiring him to pass a qualifying examination to secure admission to classes in technology. It will be seen, therefore, that the

training of most workpeople, and of nearly all those who are engaged in manufacturing industry, consists of: — (1) primary teaching in elementary schools; (2) practice in the factory or shop, supplemented by further elementary teaching; (3) evening instruction in technology.

In all the principal towns throughout Europe evening classes have been established for teaching drawing, painting and designing, and the elements of science in their application to special industries. The instruction, however, is less practical than that provided in the corresponding schools in England. The classes abroad are mainly supported by the municipalities, by the chambers of com- merce, by industrial or trade societies, by county boards, and in some cases by the fees of the pupils. They receive little or no support from the state. They are well attended by workpeople of all grades, who are encouraged by their employers to profit by these oppor- tunities of instruction. In England evening technical instruction is more systematically organized than in any other country. It is under the general direction of the Board of Education, and of the City and Guilds of London Institute.

*The Board of Education prescribe the conditions under which grants are paid to schools providing technical instruction. In former years these grants were paid on the results of the examination of individual students; but this method of apportioning state aid has been almost entirely abandoned. The Board t^lfi still hold annual examinations in science and art and in cer- t^nnioal tain branches of applied science; but 'the more specialized <******• examinations in technology and trade subjects are held annually by the City and Guilds of London Institute, through its department of technology. These latter examinations are utilized by the Board, and the certificates granted on the results are recognized in the appointment of teachers. The technical schools in which these classes are held are under the direct control of the local educa- tional authorities, and are largely supported by grants from local rates. Year by year a*

larger share of responsibility is being thrown upon the local authorities, with a view to encouraging greater variety of instruction and further adaptation of the teaching to local needs. The Board continue, however, to indicate the range of subjects to be taught in preparation for their annual examinations, and the City and Guilds of London Institute issues each year a programme containing suggested courses of training in nearly a hundred trade subjects.

Con- tinuation

TECHNICAL EDUCATION

In the evening classes in science, art and technology, which have been established throughout the United Kingdom, the workman or foreman engaged in any manufacturing industry has the opportunity, by payment of a very small fee, of studying art in all its branches, science theoretically and practically., and the technology of any particular industry. Provided his early education enables him to take advantage of this instruction, no better system has been ■ suggested of enabling workmen, whilst earning wages at an early age, to acquire manual skill by continuous practice, and at the same time to gain a knowledge of the principles of science connected with their work and explanatory of the processes of the manufacture in which they are engaged.

For those engaged in handicraft trades this evening instruction is equally valuable, and not only in England, but equally in other parts of Europe, there exist evening trade schools in which the workman is able to supplement the ” sectional ” practice he acquires in the shop by more general practice in other branches of his trade. In Vienna, for example, and elsewhere in Austria, there are found practical evening classes for carpenters, turners, joiners, metal- workers and others. Throughout Europe schools for weaving, with practical work at the loom and

pattern-designing, have existed for many years.

To provide a training more like the old system of apprentice- ship, schools have been established in many parts of Europe and Trade m t ' le United States which are known as professional,

schools tra de or apprenticeship schools (ecoles professionelles, ecoles des apprentis, Fachschulen). The object is to train workmen; and the pupils, after completing their course of instruc- tion in such a school, are supposed to have learnt a trade. The school is the substitute for the shop. In such a school the pupils have the advantage of being taught their trade systematically and leisurely, and production is made subsidiary to instruction. Under such an artificial system of production, the pupil is less likely to acquire excellence of workmanship and smartness of habit than in the mercantile shop, under the strain of severe competition. More- over, the cost of maintenance of these schools renders it impossible to look to them as a general substitute for apprenticeship. By sending into the labour market, however, a few highly trained workmen, who are absorbed in various works and exert a bene- ficial influence on other workmen, these schools serve a useful purpose. Schools of this kind have been tried with more or less success in different countries. In Paris there is the well-known Ecole_ Diderot for the training of mechanics, fitters, smiths, &c. ; and similar schools have been established in other parts of France. For many years a society of Christian Brethren has directed a large school situated in the Rue Vaugirard, Paris, in which different trades are taught. All the secular and general instruction is given gratuitously by the brothers, and in the several shops attached to the school skilled workmen are employed, who instruct the pupil apprentices, and utilize their labour. This system combines many of the advantages of shop work and school work, but it depends financially for its success upon the religious spirit which actuates its promoters and supporters. The Artane school, near Dublin, is conducted on somewhat similar principles, but is intended for a lower class of

children. In Austria, particularly in the rural dis- tricts, there are numerous day schools for the training of carpenters, joiners, turners, cabinetmakers, workers in stone and marble, in silver and other metals, &c. Schools of the same class are found in Germany, Italy and Holland, and schools very similar in char- acter have been organized to a limited extent in England. The demand that called them into existence in other parts of Europe and in America has been felt in the United Kingdom. The diffi- culty of securing for apprentices in a commercial shop systematic training in handicraft has led to the establishment of a few trade schools which receive children from the elementary school about the age of thirteen for a three years' course of instruction. In these schools the time is about equally divided between ordinary school subjects and the practice of some handicraft, such as cabinet-making, upholstery, waistcoat-making, millinery. Parents are encouraged to allow their children to receive this further education by the offer of free teaching and maintenance grants. Such schools, how- ever, must be regarded as educational experiments, to be superseded if found necessary by reason of changes in the conditions under which the trade is practised. Any system of technical education, however, should be sufficiently elastic to permit of such experi- ments and of the introduction of types of instruction to meet special and even temporary needs. It is only in certain cases that appren- ticeship schools can be said to answer satisfactorily the purpose for which they have been established. Where a new industry, especially in rural, districts, has to be created ; where decaying industries need to be revived ; where machinery is superseding hand work, and, owing to the demands for ordinary hands, there is a dearth of skilled workmen; where through the effects of compe- tition and other causes the trade is carried on under conditions in which competent workmen cannot be properly trained in the ordinary shop, — in these cases, and in various art industries, an apprenticeship school may prove to be the best means of train- ing workmen and of advancing particular

trades. Generally, an apprenticeship school should be looked upon as a temporary

expedient, as a form of relief applied at the birth of a new industry or to meet some special conditions under which a trade is practised. The proper training school for workmen is the factory or shop.

In the United States there are only a few schools which have been specially organized with a view to the training of workmen for special trades. The line between technical and general educa- tion is not very clearly defined in any of the states' schools. It is also difficult to give any such general review of the system of education in America as can be presented in connexion with France or Germany or Italy, owing to the fact that each separate state has its own organization, over which the Federal government exercises no direct control. In none of the states is technical education differentiated by class distinctions to the same extent as in continental countries. The ambition of every workman is to become a master, and this general ambition gives rise to an enthusiasm for education among all classes, which does not exist to the same extent in any other country. In the United States are found evening technical schools and schools of design for those who have passed from the common schools into commercial work; but the desire for further instruction is so marked that many of those who have received only an elementary education endeavour, by working during the vacations, or by other means, to save enough money to attend the higher technical schools, and so acquire the necessary skill and knowledge to improve their position in the factory or workshop.

2. Foremen. — The foreman must be familiar with the various branches of work he is to overlook; and the training which the workman receives in the factory or shop affords him but _, . . scanty opportunities of obtaining this general knowledge. JJ " a f The foreman needs also a generally superior education. How then are foremen to be trained? The problem is somewhat easier than that of training workmen,

because the number required is fewer. The variety of schools in Europe devoted to this purpose is very great. There are three distinct ways in which foremen are being trained.

(a) The evening technical classes in Britain and on the continent offer to ambitious workmen an opportunity of acquiring a know- ledge of other departments of the trade than those in which they are engaged, as well as of the scientific principles underlying their work. These classes serve the double purpose of improving the workpeople and of affording a means of discovering those who are best fitted to occupy higher posts.

(b) Special schools have been established for the training of fore- men. There are many schools of this kind in which selected boys are received after leaving the higher elementary or secondary school. The best known are those at Chttlons, Aix, Nevers, Angers and Lille in France. These schools are intended for the training of foremen in engineering trades. They are state institutions, in which practical mechanical work in the shops is supplemented by theo- retical instruction. The first of these schools was founded in 1803. The course lasts three years, and the students spend from six to seven hours a day in the workshop, and are trained as fitters, founders, smiths and pattern- makers. As in all such schools, saleable goods are produced, but, as production is subordinated to instruction, the school does not bind itself to deliver work at a given date, and therefore does not compete with any manufacturing establishment. The students on leaving these schools are com- petent at once to undertake the duties of foremen and draughts- men. At Komotau, Steyr, Klagenfurt, Ferlach and many other places schools have been established on somewhat similar prin- ciples. In Germany there are special schools for the training of foremen in the building trade, which are chiefly frequented in the winter, and numerous schools are found in all parts of the continent for the training of weavers. At Winterthur in Switzerland a school has been established the main purpose of which is

the training of foremen. In Italy there are numerous technical institutes, the object of which is to train young men for intermediate posts in industrial works. In London, the Finsbury technical college of the City and Guilds of London Institute has a day department, the main purpose of which is the training of youths as foremen, works managers, &c. ; but in this school the character of the instruction deviates considerably from that given in French schools, and aims rather at preparing youths to learn, than at teaching them their trade.

(c) A third method adopted for the training of foremen is by encouraging selected children of the ordinary elementary schools to continue their education in schools of a higher grade of a technical character. It is thought that, by developing to a higher degree the intelligence and skill of those children who show aptitude for scientific and practical work, they will be able, when they enter the shop, to learn their trade more quickly and more thoroughly, and to acquire that general knowledge of their work, and to exhibit those special aptitudes, which may qualify them for the position of foreman or overseer. The education given in these |chools, although having some bias towards the future career of the pupil, is disciplinary in character, and consists of the subjects of primary instruction further pursued, — of drawing, modelling, science, mathematics and manual exercises. The curriculum is varied according to local requirements, the technology of the staple in- dustries forming in many cases part of the instruction. Such

schools, under varied forms, have been established in most European countries, some of the best examples of them being found in Paris, Lyons, Reims, Rouen, and in other towns of France. One of the oldest of these schools is the Ecole Martiniere at Lyons. The school was founded in 1820 by a bequest

from Major-General Martin, who had fought against the English under Tippoo Sahib. In this school, in which the education is gratuitous, as in nearly all the higher elementary schools of France, instruction is given in draw- ing, modelling, chemistry, mechanics and physics, in the working of wood and iron, and in German and English in addition to the subjects of an ordinary school education. Surveying is also taught to some of the pupils, and the instruction generally is of a very practical character. The students visit factories under the guidance of the masters, and on their return write out full descriptions of their visits. The school hours are from seven till eleven in the morning and from one till seven in the afternoon. The boys from this school rapidly obtain places in the commerical and industrial houses of Lyons, and many of them, after a time, succeed in obtaining high positions. A very similar school, on more modern lines, has been established at Reims, and is accommodated in a building especially adapted to the purpose. In this school instruc- tion is directed towards the staple industries of the district, namely, weaving, dyeing and engineering. Tflere are many other similar schools in France, the object of which is to give the children of artisans and small shopkeepers a higher practical education in order to fit them to occupy the posts of foremen, overseers and superior clerks in manufacturing and commercial firms. In Germany the real schools, in which Latin is not taught, known as Ohnelatein Realschuien, have very nearly the same objects as the higher ele- mentary schools of France. The instruction in these German schools is not so practical as in the schools of France. Drawing is always well taught, and the schools generally contain good chemical laboratories, as well as collections of physical apparatus and museums. From the pupils of these schools the ranks of foremen are largely recruited. They receive no special trade instruction, but the general training is so arranged as to qualify them for higher posts in industrial works. The cost of this higher education seldom exceeds £3 per annum. In Bavaria there is found a type of school called

Industrie-Schule, which serves very well for the training of engineers and industrial chemists, who aim at occupying inter- mediate posts, and desire to enter upon commercial work at an earlier age than students attending a university or technical college. The instruction in these Industrieschulen is largely practical, but is combined with some amount of literary and linguistic training. Some of the students proceed to the technical university, but the majority find posts as foremen or overseers soon after completing their school course. In most of these schools, as well as in the chief intermediate commercial schools, the exit certificate exempts a lad from two of the three years' compulsory military service, and this regulation, to which nothing corresponds in England, is an incentive to parents to allow their children to receive higher instruc- tion, which operates very forcibly in largely increasing the number of well-educated youths in Germany.

*A special feature of the education provided in the United States is what i3 known as the " manual training " school. This is a school admirably adapted for the training of foremen, although Manual not especially intended for any particular industrial class. tr h 1 T ne manua ' training school is a secondary school in which * c °° s a large part of the time is given to workshop exercises. " ' ' The whole subject of manual training is more scientifi- cally developed in some of the states of America chan in any Euro- pean country. The school is pervaded by the kindergarten spirit, and leads up, without break of continuity, to courses of instruction given in the higher technical colleges. The movement in favour of manual training in the United States is general and extends even to the private schools where , youths are prepared for the university. At the same time, the purely practical teaching is invariably combined with scientific and literary instruction. In these, as in other schools, the principle is fully recognized that the primary aim of education is to make citizens and not tradesmen. It is difficult to*

take any one manual training school as typical of others, seeing how the curriculum varies in different states. The practical work includes exercises in carpentry, joinery, wood-turn- ing, wood-carving, forging, foundry-work, machine fitting, stone- work, and weaving and appropriate exercises for girls. The general idea underlying the scheme of instruction in these schools is that the teaching must be educative till the age of fifteen, and should then, and only then, develop into specialized and profes- sional training.

3. Masters. — Some of the best schools for the training of future masters, managers, engineers, manufacturers and industrial chemists _ are found in Germany and Switzerland, and are known

ra a ag ag j-echnical high schools. Schools of a similar character

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*of man- masters ' n *^ erm any the lechnische Hochschule or Polytechnicum is an institution of university type in which the education has special reference to industrial purposes. In many respects the teaching coincides with that given in the universities. The chief dis- tinction consists in the arrangement of courses of instruction in the*

several departments, in the admission of students having a non- classical preliminary training, and in

the absence of certain faculties found in the university and the addition of others. It is not correct to say that the technical high school is a professional school as distin- guished from the university; for the faculties of law, medicine and theology give to the university as distinctly a professional character as the faculty of engineering gives to the technical high school. Nor can it be said that the scientific studies at the universities are less practical than at the technical high school. For, whilst work- shops for instruction in the use of tools are found in very few of the German high schools, the laboratories for the practical study of chemistry and physics are as well equipped at some of the German universities as at the technical high schools. At the same time, engineers of every description, architects and builders, besides a great number of manufacturing chemists, 1 find in the technical high school the scientific and special training which the future lawyer or physician, and in many cases the industrial chemist, seeks in the university.

In some of the large cities — in Berlin, Vienna and Munich, for instance — the two institutions co-exist; and in certain cases, which a very special training is required to fit a youth for his career, the German student, after spending three or four years at a technical high school, passes on to another institution, such as a dyeing school, in which his studies are further specialized with a view to his future work.

Taking the technical high school of Munich as a type of other similar institutions, we find that it consists of seven depart- ments: — (1) the general; (2) the civil engineering; (3) the building; (4) the mechanical engineering ; (5) the industrial chemical ; (6) the agricultural, and (7) electrical technology. In other institutions there are architectural, pharmaceutical and mining schools. The programme of the Munich school gives a list of about 200 different courses of instruction distributed over the several departments. A separate professor is engaged to lecture on that particular

subject with which he is specially conversant, and the number of such pro- fessors attached to a technical high school is very large. In the engineering department there are several distinct courses of lectures under the direction of professors who are experts in their special subject. The largest of all these institutions is that of Berlin, which was completed in 1884 at a cost of about £450,000. It is situated in what was a suburb of Berlin, and is generally known as the Charlottenburg Institution. It includes departments for the highest specialized instruction in nearly all branches of technology. Other schools in Germany are less complete, but most of them have one or more departments which are specially organized with a view to the highest grade of technical instruction. Both in the univer- sities and in the technical high schools facilities for scientific re- search are provided, and the students are encouraged to undertake original investigations. The technical high schools are now placed on the same educational platform as the universities and have the power to confer the degree of Doctor of Engineering on students fulfilling the required conditions.

In France, the institutions in which the highest technical instruc- tion is given are concentrated in the capital. There are a large number of provincial colleges such as the Ecole Centrale at Lyons, the Ecole des Mineurs at St Etienne and the Institut du Nord at Lille, where the education is some- what more practical, but where the mathematical and tr p scientific teaching is not carried to so high a point. Several ” raace ‘ of the French provincial colleges in which the higher forms of technical instruction are well developed became in 1898, under the law of 1896, separate universities. The Ecole Centrale of Paris, in which the majority of French engineers who are not employed in the government service are trained, is a rare instance of an institu- tion for higher technical instruction which is self-supporting and independent of government aid. Other special institutions in Paris, some of which are associated with the university of Paris,

are the Ecole des. Mines, the Ecole des Ponts et Chaussees, and the College de France, an old foundation in which facilities are afforded for the highest scientific research.

In Switzerland the federal polytechnic of Zurich is in many ways similar to the schools of Germany and Austria. Italy has three superior technical institutes — one at Milan, one at Turin and one at Naples, in which technical education is given on the same lines as in German polytechnic schools. Holland has an excellent institution at Delft, which was openedin 1864. Ineachof the state universities of Belgium there is a faculty of applied science, and degrees are granted on a course of training in science and technology; and in Russia the imperial technical school at Moscow is a high-class engineering school in which the theoretical studies are supplemented, to a greater extent than in the German schools, by workshop practice. It will be seen, therefore, that in nearly all European countries, instruction in engineering in all its branches and in chemical technology has become a recognized part of a university course, and that the faculty of applied science has been so enlarged as to provide technical education of the highest grade.

Some of the best schools for the higher technical instruction — for the training of masters and of those who are to occupy the position

Higher technical

In Swit- zerland and else- where.

of managers in engineering and industrial works — are found in the United States. On leaving the secondary school, the American student may go at once into business : or he may proceed * h e £ i to a co ” e £ e > with a four years’ course of general mstruc- technkM t\ on . or he may enter a

*professional or technical school. f'uaffd Some students prolong their education by taking the States * general course before proceeding to the technical institu- tion. As in the lower, so in the higher grades of instruction, the distinction between general and technical education is not very clearly defined. There are some institutions devoted almost ex- clusively to professional training; whilst in others the engineering faculty exists side by side with other faculties of university rank. The general interest in higher education which is shown by the desire of students of all classes to obtain it, in many cases at considerable individual sacrifice, and by the value which masters and employers attach to a college-trained youth, is partly due to the large proportion of pupils from the ordinary schools who proceed to the secondary or high schools. It is estimated that the pupils between the ages of fourteen and eighteen in attendance at these schools constitute at least one per cent, of the entire population of the United States. In several of the American institutions known as colleges, but not easily distinguishable from the universities, courses of general or technical instruction are provided of all intermediate grades, but above that given in the high schools. In addition to these there are some well-known institutions which provide courses of pro- fessional and general instruction of the highest grade under pro- fessors of eminence and distinction, and facilities for research which are not surpassed in any German university or technical high school. To the foundation and maintenance of these schools wealthy citizens have given or bequeathed enormous sums of money, and they further enjoy the proceeds of the sale of lands which were set apart under the Morrill Act of 1862 to give assistance to institutions providing instruction in agriculture and the mechanical arts. Several colleges whose work was mainly literary took advantage of this act to establish scientific and technical courses in order to secure the income to be obtained by compliance with its provisions.*

Without entering into great detail, it may be said that the schools providing advanced technical instruction may be grouped under three headings: (1) those which are free from state or government control and are maintained from funds arising out of endowments and students' fees, such as the Massachusetts Institute of Technology and the Stevens Institute of Technology, Hoboken; (2) schools which form part of, or are affiliated to, the universities, which are equally independent of public control, such as Columbia University, New York, and the Sibley College of Mechanical Arts, Cornell Uni- versity; (3) schools and colleges attached to state universities, receiving grants from the state, such as the universities of Illinois and Michigan.

Contributions from private sources towards the establishment and equipment of these institutions are far in excess of those in any other part of the world. Between the years 1890 and 1901 these contributions amounted to about £23,000,000.

The American universities, with which the technical institutions are in many cases closely associated, differ from those in the United Kingdom in their examinations for degrees. In this respect they have adopted the practice of the German and other continental universities. The examinations are almost uniformly conducted by the teachers. The external examiner is practically unknown. This system allows considerable freedom to the teacher, and is said by competent judges to be attended with excellent results. In many of the states, particularly in the east, even the matriculation, or entrance examination, is being superseded by a system known as the " accrediting " system of the secondary or high schools, where the students receive their general education. According to this system, the schools are inspected by the professors of the university, and those in which the equipment, the courses of instruction, and the method of teaching are found to be satisfactory, are included in a list of " accredited " or approved schools, and the pupils of such schools, who produce a

certificate of having satisfactorily attended the prescribed course of study, are admitted to the university with- out passing any entrance examination. An advantage of this system is that it brings the professors of the university into direct relationship with the schools in which the students receive their preliminary training, and closely connects the instruction provided in the school with the higher and more specialized teaching of the university.

The widespread appreciation of the advantages of the higher education among all classes of the American people, and the general recognition among manufacturers, engineers and employers of labour, of the value to them, in their own work, of the services of college-trained men, has largely helped to increase the number of students in attendance at the universities and technical institutions, and to encourage in every state the foundation of schools for advanced professional training.

The institutions in which the highest technical instruction is provided are those devoted to the teaching of engineering in all its branches, including mining engineering, and of chemistry, in its application to manufacturing industry; besides schools of agri- culture and forestry and schools of design.

Of these the Massachusetts Institute of Technology at Boston is

the most typical. It was founded in 1859 with a view to supplying a complete system of industrial education, supplementary to the general training of other institutions. In 1861 an act was passed incorporating a body of persons for the purpose, inter alia, of aiding in the advancement of science in its application to the arts, agri- culture, manufactures and commerce. The institute offers thirteen distinct courses. Of these, eight are devoted to engineering, in- cluding naval architecture; four to chemistry, physics, biology and geology, and one to preparation for professional

teaching. In 1904 there were 183 instructors on the permanent staff of this institution. As indicating the practical character of the teaching in this and in other similar schools, it should be noted that the railway companies co-operate in making provision for tests on a large scale, and in permitting the use of locomotives on their line for the purpose of giving practical training to the students.

At Columbia University, New York, the school of applied science was established in 1864, and consists of a fairly complete school of technology with a four years' course of instruction. An interesting department at Columbia is the professorial school for the study of education and the training of teachers. The importance of manual training is recognized by the fact that the professor of this subject has a seat in the faculty of applied science. Two schools of observa- tion and practice are maintained — the Horace Mann School and the Experimental School. The former comprises three departments, a kindergarten, an elementary and a high school. The experimental school is under the immediate direction of the professor of the theory and practice of teaching. The facilities provided for the professorial and technical training of teachers are one of the most valuable features in the educational system of the United States.

In England there is a growing tendency to associate technical with secondary education. The central technical college of the City and Guilds of London Institute, was an institution established exclusively for the purpose of providing the tlf^th- a highest grade of engineering education. In this respect

technical instruct

it compared more nearly than any other institution with ,. . the technical high schools of Germany. The Royal Britain School of Mines,connected with the RoyalCollege of Science, was a similar institution, providing the highest teaching for mining engineers. In Birmingham, Leeds and Sheffield, schools of

applied science were established under the names respectively of the Mason College, the Yorkshire College of Science, and Firth College, which gradually developed into technical colleges to which a literary side was attached with provision for advanced humanistic studies. The oldest of these colleges was the Owens College, Manchester, which combined the curriculum of a university with that of a technical high school. Its school of applied chemistry was, for many years, one of the most flourishing in the country. In 1882 a somewhat similar school was founded in Liverpool as a university college, and the Yorkshire College of Science similarly widened its curriculum. To this college, a textile school, including a department for dyeing and design for textiles, was added by the munificence of the Cloth- workers' Company of London. This department soon developed into one of the best-equipped institutions in the country for the study of the technology of textile manufacture. The three colleges at Manchester, Liverpool and Leeds were incorporated in the year 1885 into the federal Victoria University. Other textile schools for day students, providing a full course of advanced instruction, were founded at Bradford, Huddersfield, Halifax, Bolton, and in other parts of Yorkshire and Lancashire. In 1903 University College, Manchester, received a royal charter as the Victoria University of Manchester, and the University College of Liverpool became a separate university. In the following year the Yorkshire College received a charter of incorporation as the University of Leeds. These three universities provide full courses of instruction in en- gineering and in the industrial applications of science. Charters of incorporation as universities were also granted to the colleges at Birmingham and Sheffield. The Birmingham University, covering an area of over twenty-five acres, contains blocks of buildings devoted to the teaching of mining and engineering, and at Sheffield there is a special school dealing with the metallurgy of iron and steel.

The University of Manchester soon after its

incorporation entered into arrangements with the municipal school of technology in that city, by which the faculty of technology was in part carried on in the well-equipped buildings of the municipal school, the largest institu- tion of the kind in Great Britain. It was publicly opened in the year 1902. In these new universities ample provision is made for the teaching of electrical engineering and electro-technics generally, and the laboratories provided for this purpose are well equipped with machinery and apparatus, and compare nor unfavourably with some of the most recently erected in Germany. Schools for mining engineers have been established at Wigan and Camborne and Red- ruth. In Wales, at different times, local colleges of university rank were opened in Cardiff, Bangor and Aberystwith, and those three colleges were subsequently united in the University of Wales. In all these local universities the technical instruction forms part of the ordinary university courses in which degrees are granted.

Other colleges outside London, besides those named, which par- ticipate in the government grant allocated to universities and colleges, giving higher grade instruction of a technical character,

are University College, Bristol; Armstrong College, Newcastle-on- Tyne; and the university colleges at Nottingham, Reading and Southampton.

The University of Cambridge has a school of engineering with well-equipped laboratories for the teaching of pure and applied sciences. The universities of Edinburgh and Glasgow recognized at an early date, as part of a university course, the teaching of science in its application to engineering; and at University College, Dundee, there is a good school for the teaching of the technology of spinning and weaving, more particularly with reference to the manu- facture of

jute and linen.

In London, University College and King'sCollege fulfilled for many years the function of a university and technical high school. Soon after the reorganization of the University of London in 1901, by which that institution was changed from an

The Uni- versity of

. .' examining body into a teaching university, University Collegeand King'sCollege, which were named inthecharter as schools of the university, transferred their funds, buildings, &c, to the university and became incorporated therein. The East London College, originally founded as a technical school in connexion with the People's Palace at Mile End, was admitted in 1907 as a school of the university, and under the statutes of the university certain teachers in the Polytechnic institutes became recognized teachers, and their students were admitted to graduation as internal students. Most of the students so admitted graduate in the faculty of engineering. For several years it was apparent that the work of the City Guilds Central College and that of the Royal College of Science and School of Mines overlapped to some extent, and that the teaching in each separate institution was incomplete and needed to be supplemented by that provided in the others. A departmental committee was accordingly appointed by the president of the Board of Education in the year 1904 to consider the working of the govern ment College of Science and the School of Mines and their relation to other similar schools, and as a result of the report of that committee, published in 1906, a charter of incorporation was granted in 1907 to a new institution under the name of the Imperial College of Science and Technology, in which the teaching given in the three schools would be co-ordinated under a new governing body, consisting of members appointed by the Crown, the Board of Education, the City and Guilds of London Institute, the University of London and the principal engineering societies, with power to negotiate with the university for the transfer to the new

institution of the engineering departments of University College and of King's College. The Exhibition Commissioners of 1851 agreed to grant unoccupied sites of land at South Kensington for the extension of, and the addition of new departments to, the existing colleges, and large annual endowments were promised by the government and the London County Council in addition to sums of money from private sources. The new Imperial College of Science and Technology is constituted by charter a school of the university, and is intended to provide the highest instruction in engineering and applied science, with facilities for advanced research work. The scheme was intended, when complete, to supply the metropolis with a technical school of the highest grade, similar to some extent to the well-known institutions in Berlin (Charlottenburg) and Massachusetts, but adapted to the special industrial needs of the British empire.

Legislative Enactments. — The state organization of technical education in the United Kingdom is mainly the result of enact- State ments passed in and after the year 1890. Before

organlza- that date, however, as early as 1877, the Livery technical Companies of London, with a view to fulfilling the education purposes for which by charter they were originally In United incorporated, began to consider how best they could Kingdom, initiate a national scheme of technical education, for which, owing to the depression of trade and the changed conditions under which British industries were con- ducted, a strong demand had arisen. They consulted leading manufacturers and some of the best-known scientific autho- rities, and in 1880 an association was formed of the City corpora- tion and some of the wealthier City companies under the name of the City and Guilds of London Institute for the advancement of technical education. The scheme of the institute was to establish a central institution at South Kensington, somewhat on the lines of the high schools of Germany, and one or more technical schools of intermediate grade in London, and to encourage by means of grants of money and by

examinations for certificates technical classes and trade schools in different parts of the United Kingdom. In March 1880, an organizing director and secretary was appointed to develop and give effect to the scheme. As indicating the importance of the movement King Edward VII., then prince of, Wales, accepted the office of president of the institute, which thus led the way

to the establishment, under the direction of the government and under the control of local authorities, of a national system of technical education. The successive steps by which the system was evolved, and how it was gradually Livery" incorporated into the general scheme of education, Com- are matters of interest in the history of education, paniesof A definition of " technical instruction " applicable to London. the varied teaching of the United Kingdom was, in the first in- stance, fixed by act of parliament. The term included instruction in science, art, and technology, and also in manual training; and by " technology " was understood the practical application of different kinds of knowledge to a particular trade, or industry, or employment.

The progress of technical education was very much helped by the formation of the " National Association for the Promo- tion of Technical Education," which was inaugurated at a meeting held on the 1st of July 1887 and dissolved . when its objects had been fulfilled, in June 1907, after National twenty years of useful work. The general objects Associa of the association were to promote and watch legis- tion ' lation, to spread information, and to discuss and assist in giving effect to the recommendations of royal commissions appointed to inquire into educational methods and organization. To its activity the development of technical education in England had been largely due. The first legislative effort to give effect to the recommendations of the Royal Commission on Technical Instruction, whose report was published in 1884, was a bill introduced into parliament in July 1887. The purpose of this bill was to enable school boards and

local authorities to provide out of the rates technical schools, or to contribute to their support. A special provision of the bill was that a poll might be demanded by fifty ratepayers before any action could be taken under the powers it conferred. Technical instruction was so defined as to include subjects aided or sanctioned by the Science and Art Department. The bill was read a second time on 9th of August 1887, but never reached the committee stage. In the following March a new bill was introduced on behalf of the " National Association." It empowered school boards to provide technical instruction in schools under their management, and to contribute to the maintenance of higher technical institutes. The definition of technical instruction was widened so as to include the use of tools, commercial subjects, modern languages, and any subjects sanctioned jointly by the Education Department at Whitehall and the Science and Art Department at South Kensington, which at that time were practically separate government departments. The bill gave very extensive powers to school boards. It was with- drawn without a second reading, in view of the avowed inten- tion of the government to deal with the subject. On the 17th of May 1888 the government bill was introduced. It contained several new features which pointed in the direction of subsequent legislation. Whilst school boards were again empowered to provide technical instruction in their own schools, they were also required, under certain ?JL 0/ conditions, to aid in the supply of technical and manual training in voluntary schools. At the same time the local control of secondary technical instruction was placed in the hands of a separate authority, viz., the " authority empowered to carry out the Public Libraries Acts." Additional rates, limited in each case to id. in the £, might be levied. The bill bristled with difficulties. It aimed at placing the voluntary schools, as regards technical instruction, under the contiol of school boards, but set up a new authority for the control of technical instruction higher than elementary. There was a growing belief, however, that school boards were not the most

suitable bodies for the direction or control of technical education. This belief arose from the difficulty of devising means for securing equal advantages to both classes of elementary schools, and from the general unwillingness to extend school board authority beyond the limits of elementary instruction.

No reference was made to technical education in the Queen's Speech in opening the parliamentary session of 1889, but the

subject had been fully discussed during the recess. The diffi- culties in the way of legislation on the lines previously attempted were now clearly understood, and it was recognized that separate and distinct measures would have to be adopted for providing technical instruction in elementary schools and in schools of a higher grade. During the year 1889 three bills were introduced by private members. Two only of these bills were considered: the one dealing with elementary education, and enabling school boards to give technical teaching in schools under their manage- ment; the other enabling local authorities to establish or con- tribute to technical schools and classes. The former bill was fully discussed, but in the absence of any practical settlement of the voluntary school difficulty the government withdrew its support, and the bill was dropped. About this time the passing of another legislative measure helped very considerably towards the solution of the difficulty. The Local Government bill, which became law in 1888, enacted that " a council shall be established in every administrative county . . . and be entrusted with the management of the administrative and financial busi- ness of that county." A number of new representative bodies Local known as county councils were thus created, with

Govern- powers similar in character to those possessed by meat Ad, the old boroughs. To these

newly constituted 1888. bodies were transferred all business previously con-

ducted by the quarter sessions. The act conferred similar powers on certain boroughs, according to their population, which were known as county boroughs. By utilizing these county municipal bodies for educational purposes the necessity of entrusting technical instruction to school boards was avoided; and accordingly, on the 24th of July 1889, the government introduced into the House of Commons a bill conferring upon county and county borough councils, and also upon urban sanitary authorities, the power to levy a rate not exceeding id. in the £ for the purpose of promoting technical and manual instruction in their district. This bill met with serious opposi- tion from school board authorities and their friends, who resented the limitations it imposed on their educational aspira- tions; but the government was resolved to pass it, and after much obstruction it became law on the 19th of August .1889, having passed through all its stages in the House of Lords in a single sitting. The bill marked an epoch in the history of education, being the first legislative enactment dealing with technical instruction in England.

The act (Technical Instruction Act, 1889) provided that:

The expression " technical instruction " shall mean instruction in the principles of science and art applicable to industries, and in the application of special branches of science and art to specific industries or employments. It shall not include teaching the practice of any trade or industry or employment, but, save as aforesaid, shall include instruction in the branches of science and art with respect to which grants are for the time being made by the Department of Science and Art, and any other form of instruc- tion (including modern languages and commercial and agricultural subjects), which may for the time being be sanctioned by that department by a minute laid before parliament, and made on the representation of a local authority that such a form

of instruction is required by the circumstances of its district.

Although at first received with no great favour, the act proved useful, and is important as representing the outcome of a number of abortive attempts at legislation, occupying three years, and intended to give practical effect to some of the recommendations of the Royal Commission of 1884. The act definitely settled the question as to the local authority for technical instruction, and decided it against the school board. It contained no provision, however, for the supply of technical instruction to children in either voluntary or board schools, and even expressly excluded from any share in its benefits all scholars receiving instruction in the obligatory or standard subjects. A way was soon found, however, of pro- viding for technical instruction in elementary schools without any fresh act of parliament, and the difficulty of reconciling the interests of voluntary and board schools, which had im- peded, previous attempts at legislation, was thus avoided.

Com' mil tee.

Early in 1886 the School Board for London, finding that it was unable to expend on technical instruction any part of the school board rate, applied to the City and Guilds of London Institute for financial help. The application school" was favourably received, and in the following year a Board joint-committee was formed, consisting of represen- Joint tatives of the Board, of the Institute and of the Drapers' Company. With the funds supplied by the Company and the Institute the committee were enabled to try some interesting educational experiments. Six centres for workshop instruction were equipped, and children were received into the classes from voluntary and board school. A scheme of instruction was prepared with the object of bringing into prominence the disciplinary character of the teaching, and of distinguishing it from the rule-of-thumb methods adopted in the workshop of commerce; and the

experience of foreign schools, especially those in France, was utilized. The fears of trade unions lest the action of the school board would have the effect of increasing the number of trade carpenters were minimized, and the real value of manual training as a part of general education was for the first time illustrated. The experiment proved so successful that H.M. inspectors reported most favourably on the usefulness of the teaching, and on the value of the instruction in improving the general intelligence of the pupils, and particularly in rendering them more skilful and observant. Indeed, it was found that their progress in ordinary school studies wa.s quickened by the practical training of the shop.. As the result of these experiments the " use of tools " was recognized in the government code of 1890 as a subject of school instruction on which grants were to be paid, and towards the cost of which the school board rate was applic- able. Later, following further experiments by the joint-com- mittee, laundry-work and housewifery were included in the curriculum, and the problem of introducing so-called technical teaching into elementary schools was solved without any special legislation. Since 1890 manual training has formed a part of the elementary school system. The instruction includes the use of wood-working and metal-working tools, but stops short cf teaching any particular trade, and is thus differentiated from the teaching given in the municipal schools of Paris. The new code also provided for a more rational system of object-lessons and of rudimentary science teaching, encouraging practical exercises and experiments to be worked by the pupils themselves. The joint-committee having completed its work, ceased to exist in 1900.

The act of 1889 and the code of 1890 enabled local authorities and school boards to provide out of the rates technical instruc- tion for the working classes. The rate available under the act was limited to one penny in the pound, and very giadually, and with some hesitation, certain local authorities put the act in force. The motive power

required for promoting technical instruction, other than that in elementary schools, was, how- ever, still wanting, and might have remained so for some time longer if it had not been for the accident that in the following year, during the discussion in parliament of the question of compensation relating to public-houses, the residue of the beer and spirit duty was found to be unappropriated, and was allocated to county and county borough councils and made available for the purposes of technical education. The Local Taxation (Customs and Excise) Act, which became law on the 18th of August 1890, was " an act for the distribution £ 0C a/ and application of certain duties of customs and Taxation excise," and it provided that the residue of the Act ' ,890 ' English share of these duties should be distributed between county and county borough funds, and made applicable " for the purposes of technical education within the mean- ing of the Technical Instruction Act, 1889." By the express terms of this act this disposition of the residue, which then amounted to £743,000 for England and Wales, was revocable by parliament, and the allocation of the fund to education was left to the discretion of the local authorities. The grant accordingly was not generally regarded as permanent, and local

authorities hesitated to commit themselves to any definite educa- tional schemes. Indeed, it was seriously doubted whether such a windfall was likely to be made a permanent annual contribution from the state to the purposes of technical education. But gradually small sums were provisionally voted in aid of existing schools; and when the then Chancellor of the Exchequer declared that, if the " whisky " money (as it was commonly called) were found to be well and carefully expended, no future Chancellor would be able to divert it to any other purpose, local authorities began to consider how the money that had fallen into their hands might be best employed to

*meet local educational needs. Special committees were accordingly formed, consisting in many cases not only of members of the county or county borough council, but also of other persons Technical verse d in educational matters, to whom the prepara- instruc- tion of schemes of instruction suitable to the several Hon com- districts was referred. The committees so con- m ees * stituted, known as technical instruction committees, were established in different parts of the country, and to these bodies was delegated, subject to periodic reports to the council, the responsibility of dealing with the moneys at their disposal. The technical instruction committees proceeded in nearly all cases to elect as secretary a gentleman of scholarly attainments and educational experience, capable of advising as to the organization of schools and classes in accordance with the terms of the act and the special requirements of the district. As a result of the acts of 1889 and 1890 local educational authorities altogether distinct from school boards came into existence, each with an organizing secretary acting as educational officer for the district. The creation of these educational authorities, with functions, however, limited to technical instruction, marks the most important step in the organization of education since the est ablishment of school boards.*

By special minutes of the Science and Art Department new subjects were from time to time included under the term Curri- ” technical,” and the definition of technical education ”’’”’” was gradually widened. Among the subjects first added to the list were those included in the ” programme of technological examinations ” of the City and Guilds of London Institute, and the teaching of technology, as distinct from science, was thus for the first time officially recognized and aided by grants from public funds. Later, commercial subjects and modern languages, the theory and practice of agriculture, and the arts and crafts underlying various cottage industries were accepted as branches of technical instruction; and whilst, on the one hand, the

definition was so widened as to include nearly all that is comprised in the curriculum of a secondary school, the teaching of certain technological subjects approached so near to trade teaching that the provision ex- cluding " the practice of any trade or industry or employment " from the teaching sanctioned by the act appeared likely to be overlooked. Practical instruction in engineering, weaving, printing, photography, plumbing, carpentry, brickwork, book- binding and other subjects was encouraged by the City and Guilds Institute, acting as a central authority for education of a distinctly technological character; but notwithstanding the continued increase in the number of practical classes in different branches of technology, the teaching of technology as distinct from that of science and art received at this time no direct support by means of grants in aid from the state. Under the new conditions, however, of assessing the government grant, introduced into the Directory of 1901-02, instruction in technology received some form of recognition.

The county of London remained for some time behind other counties in utilizing the provisions to the Technical Instruction Schemes Act of 1889, by devoting to educational purposes the London iunds Placed at its disposal by the Local Taxation (Customs and Excise) Act, 1890. The funds applic- able to London, which in the first instance amounted to about £163,000, but soon reached a total of about £200,000, were wholly employed for a period of two years in relief of the rates. The wants of London were not at first understood;

and it was thought that sufficient funds for educational purposes might be obtained from other sources. A scheme for the utilization of a fairly large income arising from the City parochial charities had been under the consideration of the Charity Commissioners. It was first published in 1888, and, after some discussion and modification, was sanctioned by parlia- ment. According to that scheme a capital sum of about £150,000, supplemented by a like amount obtained from the City companies

and other sources, was made available for the building of technical and recreative institutions for the poorer classes of the working population of London, similar to the Polytechnic in Regent Street and the People's Palace in Mile End Road. The scheme created a central governing body for the general supervision of these institutions, and placed at its disposal an income of about £50,000 available for educational purposes, which, with the falling-in of leases, was certain to increase. Provision for the endowment of eight polytechnics and of other educational institutions was made in the scheme, and the Goldsmiths' Company undertook to erect and maintain from its corporate funds a ninth, which has since been presented by the Company to the University of London, and under the name of the Goldsmiths' College is used mainly as a school for the training of teachers. Since then other similar but some- what smaller institutions have been established.

Before the erection of these new institutions was completed it was ascertained that the annual income at the disposal of the trustees for the purposes of maintenance and equipment was altogether inadequate; and a committee of inquiry having been appointed by the London County Council, an exhaustive report on the educational needs of the metropolis was prepared, which led to the formation of a Technical Education Board for London, consisting of members of the County Council, who formed the majority of the board, and also of representatives of the City Parochial Trustees, of the City and Guilds Institute, of the School Board, and of other bodies; and to the board so constituted the council entrusted the spending of the funds available under the Local Taxation Act, 1890. The board held its first meeting on the 28th of April 1893, but ceased to have a separate existence in 1903 on the passing of the London Educa- tion Bill. During those eleven years the board, with the assistance of its organizing secretary, succeeded tne Tech- in arranging a comprehensive and varied scheme of nkal Edu- scholarships, which, among other benefits,

*enabled cation children from the elementary schools to continue their * oa "f' education in intermediate schools, and to pass on to the higher technical institutes and universities. It supplemented by large grants the income of the polytechnic institutions; it established or assisted in establishing new trade schools; it provided laboratories, and aided in the teaching of practical science in a large number of secondary schools; it encouraged the teaching of modern languages and commercial subjects; it assisted in founding a school of economics, which has become a constituent part of the new University of London, and utilized in nearly all instances with the best possible results the large annual income allocated by the County Council to technical education.*

The close connexion between technical and secondary education was clearly indicated in the comprehensive definition of the former term given in the act. But it soon became manifest that no great progress could be made in technical educa- J'"'"' tion unless further provision were made for secondary J 1*

education and unless some improvement could be effected l^ n ?f°' in the methods adopted in secondary schools. The cry auon.

of Matthew Arnold for the better organization of secondary educa- tion had, so far, met with no adequate response. There was still an insufficient supply of secondary schools, and a complete absence of advice or control by any central authority. The urgency of this need was recognized by the " National Association for the Pro- motion of Technical Education," which at a meeting held in July 1889 resolved to alter its title by the addition of the words " and Secondary " after " Technical." This verbal alteration represented a widespread conviction that technical and secondary education are of necessity closely associated, and that future efforts should be directed towards the improvement and organization of secondary education and the union of different grades and branches of educa- tion under a single government department.

That the Technical

Instruction Act would need to be followed by a Secondary Educa- tion Act was generally recognized. Accordingly, after much dis- cussion, the government in the year 1896 introduced into parliament a comprehensive measure dealing with education as a whole and embodying the principal recommendation of the Royal Commission on Secondary Education. The bill was well received, and, if the government had persevered with it, would have passed into law, and the question would have been settled for a generation. It was wrecked owing to the difficulty of satisfying the aspirations of the smaller boroughs to be constituted as local education authorities. No further action was taken till 1898, when a new bill was intro- duced by the government, creating a Board of Education, and combining under one department the functions of the Education Department at Whitehall and of the Science and Art

fB °"d Department at South Kensington, with certain powers "of Educa- re ' atm S to _ tne educational work of the Charity Commis- iioa.

sioners. The bill was fully discussed during the recess, and in a slightly altered form it became law in the early part of the year 1899, and came into operation in April 1900. The Board of Education called into existence by the act thus became the central authority for elementary, secondary and technological instruction. Provision was made in the act for the creation of a consultative committee of educational experts to be appointed by the president, whose special duty was to prepare and keep a register of all qualified teachers. As then constituted, the board consisted of the secretary, responsible to the president for the administration of both primary and secondary education, of two principal assistant secretaries, and of subordinate officers. An assistant secretary for secondary and

another for technological instruction were appointed, both under the direction of the principal assistant secretary at the South Kensington branch. With a view to co-ordinating the technological instruction to be carried on by the board with that undertaken by the City and Guilds of London Institute and other bodies, a departmental committee was appointed in November 1900 on which those bodies were represented. As a result of the recommendations of that committee arrangements were made for co-ordinating to some extent the work of the City and Guilds Institute with that of the Board of Education. In the regulations issued in 1902 for assessing the amount of state aid to be given by way of grants to technical schools it was provided tnat the whole instruction given in any school, in technology as well as in science and art, should be considered ; formal recognition was given to the certificates issued by the Institute, and the Examination Board of the Technological Department of the Institute was strengthened by the addition of four members nominated by the Board of Educa- tion. The teaching of science and art, as applied to specific trades and industries, was thus brought under the direct supervision of the central educational authority.

It was, however, the Education Act of 1902 which freed technical education from the restriction which had prevented its natural development. For some time the opinion had been gaining strength that all grades of education should be controlled by the same local authorities. The distinction between elementary and secondary education had been bridged over by various types of higher grade schools, and the difficulty cf assign- ing to school boards the control of elementary schools, and to municipal bodies, also popularly elected, the control of education other than elementary, was found to be almost insuperable. A comprehensive measure of reform was regarded as indispensable. This necessity was emphasized by the fact that the managers of many voluntary schools, notwithstanding the state aid which they received as government grants, found the

strain almost intolerable of meeting the ever-increasing requirements of the government as regards elementary education by means of private subscriptions. The new Education Act transferred to the local authorities, acting through education committees to be con- stituted by schemes to be approved by the authorities at White- hall, the functions and duties of school boards, the separate exist- ence of which, after a life of thirty-two years, was thus terminated. The same act threw upon the rates the burden of contributing to the support of voluntary schools, which, under certain conditions of management, were placed, as regards secular instruction, entirely under the control of the local authorities. School education of all grades was thus brought under the control of the same bodies, both as regards central and local administration, and the govern- ment and local authorities were free, under certain limitations imposed by the act, to prepare schemes for elementary, secondary and technical instruction, and for the award of scholarships enabling children to proceed from the elementary schools to the universities. By this act a national and unified system of education was effected for England and Wales.

In accordance with the act, which did not apply to London, municipal bodies were expected to appoint education committees from among their members and to co-opt a certain number of persons, including some women, versed in educational matters or representing educational interest. The London County Council, which had not regarded with favour the abolition of the school boards, showed no disposition to accept the aid of persons from outside who were not directly elected to represent the ratepayers, and although in 190s an act was passed for the direction of

Unifica- tion of education under Act of 1902.

The

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education in London, the Board of Education reluctantly assented to a scheme prepared by the London County Council which vested the control of education in the hands of a committee con- sisting exclusively of members of the council with the addition of some women. At the municipal elections of 1907 the Progressives, who had hitherto formed the majority of the council, were defeated, and the Municipal Reformers reversed in this respect the policy of the previous council.

The Act of 1902 was strongly opposed by Nonconformists and by the Liberal party generally, and at the general election of 1906 a parliament was returned pledged to effect such changes in it as would give to the local authorities a more direct control over voluntary schools. Accordingly, one of the first measures introduced was a new Education Bill, which, after a protracted discussion, was passed by the House of Commons and amended in several particulars by the Upper Chamber. The amendments of the Lords were rejected en bloc and the bill was withdrawn. In the following year some of the less contentious clauses were embodied in the Education (Administrative Provisions) Bill, which received the royal assent, and among its clauses was one which widened the definition of education, so as to include any kind of training which might be pronounced by the board to be educational in character. By an administrative act of the board, a new department under a separate secretary, but responsible to the Minister of Education, was created for Wales, which thus, without any act of parliament, practically acquired independent control of its educational machinery.

The foregoing statements refer more particularly to England and Wales, to which prior to 1907 all acts of parliament dealing with education subjects were

generally applicable. In Scotland and in Ireland the organization of technical instruction pro- _ ceeded on different lines. A Technical Schools Act, Scot,an < 1 - applicable to Scotland only, was passed in 1887. This act enabled school boards by means of the school funds to provide and maintain technical schools. The act has proved to be practically inopera- tive. In Scotland, however, school boards have been entrusted with much larger powers, and possess greater influence, than in England. Many of the secondary schools of Scotland are under the direction and control of school board authorities. The residue of the beer and spirit duties under the Local Taxation Act applicable to Scotland was much less, even relatively to the population, than in England, and was, moreover, divided directly among so many different authorities as to be in most cases of little or no real value for educational purposes. Recently attempts have been made to combine the funds distributed among different neighbouring autho- rities, so as to bring them under the control of a single body for the benefit of a larger area. In the year 1896-97 the Education De- partment of Scotland was entirely separated from that of England, and there was a consequent transfer of functions and grants from the latter to the former. By the passing of the Local Taxation (Scotland) Act, 1898, the residue grant was relieved of certain charges, and additional funds thus became available for technical education. No grants for science or art instruction are made to Scottish schools from the English Board of Education; but several of the technical schools avail themselves of the examinations of the board, and also of those of the City and Guilds of London Institute. Among the equipped technical colleges in Scotland may be mentioned the Heriot-Watt College of Edinburgh, the Glasgow and West of Scotland Technical College, Glasgow, the Robert Gordon College, Aberdeen, and the Technical College, Dundee. These do not differ in any essential points from corresponding schools in England. The system of instruction is very similar, and among the subjects taught will be found most of those included in the Regulations of the

Board of Education and in the programme of the City and Guilds of London Institute. Special attention is given in some of these schools to the teaching of the principles and practice of the different branches of textile manufacture. Manual training forms an important part of the curriculum of primary and secondary schools, and the instructions to inspectors on science teaching issued by the Scottish Education Department show a just recognition by the department of the proper methods to be adopted in the teaching of science as a part of general education. Under the Scottish system leaving certificates are awarded on the results of examinations held at the close of the ordinary school course. These examinations cause the minimum of interference with the ordinary school work. At the universities of Edinburgh, Glasgow and Aberdeen the higher technical instruction in such subjects as engineering and naval architecture is well developed.

Ireland remained behind Great Britain as regards facilities for technical education. Although the Technical Instruction Act (1889) applied to Ireland as well as to England and Wales, very little use was at first made of its provisions. Moreover, Ireland. the Irish share of the funds available under the Local Taxation Act is definitely allocated to intermediate education. A committee known as the Recess Committee published in 1896 some valuable and important recommendations, which led to the passing of the Agriculture and Technical Instruction (Ireland) Act of 1899. The reports of two commissions, one on manual and practical instruc- tion in primary schools; and the other on intermediate education, contained suggestions which gave encouragement to the practical

teaching of technology and helped to promote a better system of instruction in Irish schools.

The work was successfully commenced under the direction of ' the newly constituted Department of Agriculture and Technical Instruction, consisting of an Agricultural Board, a Board of Technical Instruction, a Council of Agriculture, and a Consultative Committee of Education. The department had an endowment of £166,000 a year, which was distributed among the several branches. It took over the duties of several other administrative bodies, and the grant for science and art for Ireland, and the grant in aid of technical instruction in Ireland as defined by the Technical Instruction Act of 1889, previously administered from South Kensington, was transferred to the new department. Among the industries for which the department is now occupied in organizing courses of instruction are engineering, textiles (particularly linen manufac- ture), shipbuilding, agriculture and the fisheries. The operations of the department extend to all grades of schools, from the Royal College of Science, Dublin, organized as a Central Technical College, to the elementary and secondary schools which the department enters for the administration of the science and art grants to the evening technical classes conducted by local authorities. The first annual report of the department, published November 1901, showed that successful efforts had been made to improve science teaching as a part of general education, and to develop on correct lines manual training and technological instruction. _ The municipal school of technology at Belfast, opened in 1907, is an institution similar in many respects to those of Manchester and Birmingham, and providing technical instruction in connexion with a great variety of industries. There is also a large school at Dublin, and schools have been established in Cork, Limerick and elsewhere.

Results of Experience. — Experience has helped to establish certain principles as applicable to technical education. It is Changes now generally admitted that whilst the age at which to the the ordinary school training should cease, and technical concep- or professional education should commence,

must 'what var y f° r different classes of workers, the teaching

technical special to any industry or employment should supple- education ment, and not form part of, general education. The should be. SUD j ects entering into the school curriculum may be, and in certain cases should be, selected with reference to their applicability to certain callings, but they should be so taught as to become instrumental in the formation of mental habits and the development of character, the mere knowledge or skill acquired being of secondary importance. In the teach- ing of science there has been a marked change in method. Formerly the usefulness of the knowledge to be derived from the study of nature gave to physical science its chief claim to a place in the school curriculum, but it is now held that the real value of the study consists in the opportunities it affords of exercising the pupil in accurate observation, and of developing resourcefulness and powers of independent thought and reason- ing. Whilst the opinion in favour of postponing as long as circumstances permit all specialized instruction has become of late years more pronounced, there has been a growing tendency, not only in England but also on the Continent and in the United States, to associate technical teaching more closely with work- shop practice. The professional or trade teaching, which is supplementary to primary or secondary education, is more practical and less easily distinguishable by the ordinary ob- server from the training of the factory or workshop. This tendency is shown in all grades of technical education. The technical institutes established in London and in the large English manufacturing towns, attended mainly by evening students, are provided not only with expensive laboratory apparatus for the teaching of applied science, but also with tools and machines for the teaching of technology; and some of the departments of these schools are equipped so as to resemble a small factory. This is the case in the departments devoted to the teaching of mechanical and electrical engineer- ing, weaving, and spinning,

watch- and clock-making, boot and shoe manufacture, and the different branches of the building and printing trades.

So far, however, no attempt has been made, except in very special cases, to teach the practice of any special trade. The teaching of technology is distinct from trade teaching. In all the technical institutes of London, and in most of those of other towns, none but persons actually engaged in the industry, the

technology of which they are desirous of studying, are admitted to the workshop classes. The instruction given in such classes is very different as regards method, and« also in its aims and objects, from the training of apprentices in the factory or trade shop. The tools and appliances are the same, but they are used rather as a help to the teachers in illustrating principles than as a means of enabling the student to acquire that dexterity and skill which constant practice can alone secure. With the general cessation of apprenticeship, as formerly under- stood, it is only in the school workshop that the young artisan has any opportunity of learning the use, and the principles underlying the use, of the instruments and appliances connected with his trade; and in those industries in which automatic machinery is gradually displacing hand labour he is altogether dependent upon school teaching for any knowledge he may wish to acquire of the processes involved in the particular manufacture, in some small section of which he is exclusively engaged. Modern technological teaching is essentially practical, but it is nevertheless different in kind from the mechanical and sectional practice of the factory of commerce; and except in some few, mainly artistic, crafts, there is no a e i atl0BS entrance to a trade through the door of the school with workshop. In other countries, particularly in France, practical the case is different. The school, in many branches e '

of industry, is accepted as a substitute for the shop, and the lad is so trained that he acquires in

the school not only a know- ledge of the principles of the trade, but sufficient dexterity and skill to enable him, on leaving school, to take his place among wage-earning operatives. It is only in day schools, in which the pupils spend the greater part of their time in work- shop exercises, that trade teaching can be so developed. There are schools in England in which manual training in wood and metal work is carried beyond the limits of mere educational discipline; but even in those schools no special trades are taught, and the experience of recent years has only tended to emphasize the principle, that the education given in the ordinary day schools, whether primary or secondary, should be formative and general, rather than technical or professional.

Owing partly to climatic conditions, and partly to the fact that the hours of labour are somewhat shorter in England than abroad, evening schools of technology are likely to occupy a permanent place in the English system of technical education. In these schools all grades of workmen will continue to receive their special supplementary instruction; and it is from among the workmen so trained that foremen and works managers will generally be selected. Some intermediate teaching, however, is necessary between that of the elementary school and the technical class as a preparation for technological instruction. A knowledge of workshop arithmetic and geometrical drawing is indispensable, and it is in the evening continuation classes that such knowledge may be best acquired. These classes supply the teaching which may be regarded as the connecting link between elementary and technological instruction, and attendance at such classes will gradually become a necessary condition of entry to a technological course.

By means of scholarships a large number of children from the elementary schools are now enabled to continue and complete their general education in day schools of a higher grade. Nearly every county has its scheme of scholarships, providing facilities for the further education of children who show special

abilities and aptitudes. These scholarships are awarded under con- ditions which differ very widely in different localities. Pupils from the higher- grade schools enter industrial life at a later age than those from the elementary schools, and, by reason of the more advanced instruction they have received, are at once qualified to enter classes in technology. In these schools practical teaching is further developed, both in the laboratory and workshop, but as a part only of the ordinary school course; and it would be incorrect to describe such schools as technical in the strict sense of the term. The position of these higher- grade schools in the general educational scheme was the subject of an important action (Rex v. Cockerton, 1901) in which it was

decided by the law courts that the school boards were unable to apply the rates to the support of such schools. They were accordingly withdrawn from the sphere of elementary educa- tion, and have since been treated as schools of a secondary type. The judgment on appeal was conclusive, that the school board rates could be employed only for the provision of ele- mentary education for children, whether in the day or evening, and this decision paved the way for the dissolution of school boards, and to the transfer of their duties and functions to the county and borough councils under the Act of 1902.

As regards secondary schools proper, in their relation to technical education, it is important that the curriculum of _ - such schools should be sufficiently varied to afford a

second- sound liberal and preparatory training for the "y different branches of professional work. It is

schools. generally admitted that at least three types or de- partments of schools are needed — (a)

the classical, (6) the mathematical, and © the modern language type; and that each of these divisions should contain sub-departments. The first of these varieties would be available for the general training of students wishing to enter the legal, theological or literary professions; the second for those preparing for engineering, manufacturing or agricultural pursuits; and the third would be found best fitted as a preparation for a commercial calling. These schools would correspond to some extent to the three kinds of secondary schools found in Germany, and would be available for students preparing to enter one or other of the faculties of a modern university. The organization of different types of secondary schools, and the curriculum appropriate to each, are matters which continue to occupy the attention of educational experts. In accordance with the regulations for secondary schools issued by the Board of Education in 1907, substantial grants were made to secondary schools which con- formed to certain conditions as regards local control and un-denominational religious instruction, or the directive influence of the board as regards curriculum and management over all such schools was strengthened. At the same time, manual training and domestic science were made, essential parts of the curriculum in boys' and girls' schools respectively.

The demand for technical education, which originally led to the formation of the City and Guilds of London Institute, directed attention to the methods of teaching science, drawing and other subjects, and to the necessity of including science in the curriculum of all grades of schools. The methods of science teaching have been greatly improved. Experimental work has become essential, and methods of investigation and research have been applied to the teaching of a number of subjects to which formerly they would have seemed inapplic- able. A close connexion has thus been established between the workshop and the classroom, and practical instruction is now regarded as a necessary part of general education both ele- mentary and secondary,

and as no less disciplinary than the merely literary and oral teaching it has partly superseded. This change in the school curriculum and in the methods of instruction has narrowed the true significance of the term " technical " as applied to education. By the term " technical " as commonly used is now understood " technological " or " professional," and whilst technological instruction may supplement either primary or secondary education, it is necessarily distinct from either.

The conviction has been steadily gaining ground that success in manufacturing industry, in the higher walks of commerce, and in every pursuit requiring technical knowledge, depends very largely upon the thorough and complete training of those who are charged with the control of the different kinds of work in which the army of operatives are engaged. Intelligent and highly skilled workers are indispensable; but unless they are properly directed by efficient and expert officers they can effect but little. It is undoubtedly due to the careful training of German the masters and leaders of industry that the Ger- txampie. ma ns have achieved so large a measure of success in different technical pursuits. The recognition of this

fact is slowly but surely influencing educational thought and action in Great Britain; but Germany is still ahead in the facilities afforded for higher education, and in the ad— vantage taken of the facilities that exist. The number of students in her universities and technical high schools is still in excess of those receiving a similar training in Great Britain. The establishment, however, of local universities and the schemes for the award of scholarships adopted by local educa- tion authorities, will tend year by year to lessen this disparity. Meanwhile, Germany has relaxed none of her former efforts, but is steadily occupied in the enlargement and improvement of her educational institutions. New schools have been erected, wherever and for whatever purpose they are needed, equipped with every modern appliance for scientific investigation and research. Each professional career

has its corresponding high school or university department. The economy of a wise and liberal expenditure on higher education is a recognized fact in German statecraft.

For those who are intended to occupy the highest posts in industrial life, a sound secondary education, supplemented by appropriate university training, is the best preparation. It is only in the university or tertiary grade of education that specialized or technological training for the higher industrial posts should commence. At this stage of education, general and professional teaching are more closely associated, and the names of the faculties of the new universities in the United Kingdom will in future indicate the several branches of pro- fessional work to which the different courses of university study are intended to lead. Of late there has been a marked develop- ment of distinctly technical instruction in connexion with the colleges of university rank. The error of restricting university studies to a certain limited range of subjects, which led in Germany to the establishment of technical high schools as institutions distinct from the universities, has been avoided. Engineering, in the broadest sense of the term, has been recog- nized as a branch of university education of the same order as medicine or law. Laboratories and workshops have for many years formed part of the equipment of the principal university colleges. In the statutes of the University of London a separate faculty is assigned to engineering, and part of the work of the polytechnic institutes is correlated with that of the reconstituted university. A survey of the field of education shows that whilst the difference between technical and general education is well marked in the primary and secondary stages, it is the function of the university to liberalize professional teaching, and to afford opportunities for specialized study and research in the higher branches of knowledge applicable to the practical work of industrial life.

Authorities. — See Sir Philip Magnus, Industrial

Education, 1888, and presidential address to education section of British Association, 1907; Schonhof, Industrial Education in Franc., 1888; Holzapfel, Die technischen Schulen, &c. (1897) ; Report of British Royal Commission on Technical Instruction, 1884, and later special reports issued by the Board of Education; annual Reports of the United States Commissioner of Education and of the United States Commissioner of Labour; Report of English Departmental Com- mittee on the Royal College of Science and School of Mines.

(P. M.)*

TECK, a ducal castle in the kingdom of Wurttemberg, immediately to the N. of the Swabian Jura and S. of the town of Kirchheim, crowning a ridge (2544 ft.) of the same name. It was destroyed in the Peasants' War (1525).

The duchy of Teck was acquired early in the nth century by Berthold, count of Zahringen, whose great-grandson Albert, or Adalbert, styled himself duke of Teck. In 1381 it passed both by conquest and purchase to Wurttemberg. The title, which had lapsed with the extinction of the Zahringen line in 1439, was revived in 1495 by the German King Maximilian I., who bestowed it upon the dukes of Wurttemberg. The dignity was renounced by Duke Frederick William Charles upon his elevation to the rank of king in 1806. In 1863 the title " prince of Teck " was conferred by King William I. of Wurt- temberg upon the children of Duke Alexander of Wurttemberg

(1804-1885) by his morganatic marriage with Claudine, countess Rhedey, ennobled as countess of Hohenstein; in 1871 Prince Francis, the eldest son of Duke Alexander, was created duke of Teck. His eldest son Adolphus (b. 1868) was in 1910 the holder of the title.

TECUCI (Tecuciu), the capital of the Tecuci department of Rumania, picturesquely situated among wooded hills, on the right bank of the river Bfirlad, and at the junction of railways from Bacau, Berlad and Galatz. Pop. (1900) 13,401. Tecuci has a large transit trade in grain, timber, cattle and horses, on their way from northern and eastern Moldavia to the Danubian ports. The neighbourhood of Tecuci was the scene of a fierce battle in 1476 between Stephen the Great and the Turks.

TECUMSEH, Tecumthe, or Tecumtha 1 (c. 1768–1813), American Shawnee chief, was probably born in the old Shawnee village of Piqua, near the site of Springfield, Ohio, between 1768 and 1780. While still a youth he took part in attacks on settlers passing down the Ohio and in widely extended hunting expeditions or predatory forays to the west and south; and he served in the Indian wars preceding the Treaty of Green- ville in 1795. About 1800 his eloquence and his self-control made him a leader in conferences between the Indians and whites. After 1805 the Indians of the North- West became aroused by a series of treaties calling for new cessions of their territory and by the prospect of war between Great Britain and the United States. This presented to Tecumseh and to his brother Tenskwatawa (i.e. the Open Door), popularly called " the Prophet," the opportunity to put into operation a scheme which followed the ambitious dream of Pontiac. With some scattered Shawnee clans as a nucleus, the brothers proceeded to organize, first near Greenville, Ohio, and later on the White and Tippecanoe rivers in Indiana, " the Prophet's town," which was based on a sort of communism and was apparently devoted to peace, industry and sobriety, but their actual plan was to combine all of the Indians from Canada to Florida in a great democratic confederacy to resist the encroachment of the whites. Tribal organizations were to be disregarded, but all warriors were to be represented at periodical assemblages where matters of interest to all Indians were to be definitely decided. The twofold influence that was to dominate this league was the eloquence and political

ingenuity of Tecumseh and the superstitious reverence aroused by ” the Prophet.” This programme alarmed the whites along the north-western border. In the course of the next three years Governor William Henry Harrison of Indiana held interviews with each of the brothers, and during one of these, at Vincennes in 1810, the respective leaders narrowly avoided a hostile encounter. Nevertheless ” the Prophet ” and Tecumseh re- iterated their determination to remain at peace with the United States if the Indians were unmolested in their territory, and if all cessions beyond the Ohio were given up by the whites. The treaty of Fort Wayne in 1809, which called for the cession to the whites of some three million acres of land in central Indiana, was a direct challenge to this programme, and when, during Tecumseh’s absence in the South, Harrison made a hostile move against “the Prophet’s” town, the latter ventured to meet him, but was defeated on the 17th of November 181 1 in the famous battle of Tippecanoe, which broke the personal influence of ” the Prophet ” and largely destroyed the confede- racy built up by Tecumseh. Tecumseh still professed to be friendly toward the United States, probably because his British advisers were not ready to open hostilities, but a series of border outrages indicated that the fatal moment could not long be postponed. When, in June 1812, war broke out Tecumseh joined the British, was commissioned a brigadier- general in the British army, and participated in the skirmishes which preceded General William Hull’s surrender at Detroit. He took an active part in the sieges of Fort Meigs, where he displayed his usual clemency toward his prisoners. After the

1 The name is said to mean ” meteor,” or ” flying panther.”

battle of Put-in-Bay, when Colonel Henry Proctor began to retreat from Maiden, Tecumseh bitterly reproached him for his cowardice and finally forced him to join battle with Harrison on the Thames river on the 5th of October 1813. In this battle Tecumseh was killed, as traditionally reported, by Colonel

Richard M. Johnson- of Kentucky, although this has never been fully substantiated. Like Pontiac, whom he doubtless imitated consciously, he had a wonderful eloquence and a power of organization rare among the Indians. His brother, " the Prophet," remained with a small band of Shawnees and died west of the Mississippi in 1834.

See Benjamin Drake, The Life of Tecumseh and of his Brother the Prophet (Cincinnati, 1841); and Homer J Webster, Harrison's Administration of Indiana Territory (Indianapolis, 1907).

TEDDIN6T0N, an urban district in the Uxbridge parlia- mentary division of Middlesex, England, close to the Thames, 13 m. W.S.W. of St Paul's Cathedral, London, on the London and South-Western railway. Pop. (1901) 14,037. The dis- trict is residential and the town is a resort of visitors both to the river and to Bushey Park, which lies immediately south (see Hampton). The National Physical Laboratory, for making scientific investigations of industrial importance, and for mechanical testing, was opened in Bushey House in 1902.

TEES, a river of England, rising on the eastward slope of Cross Fell in the Pennine Chain, and traversing a valley about 85 m. in length to the North Sea. In the earliest part of its course it forms the boundary between the counties of West- morland and Durham. The head of the valley, of which the upper portion is known as Teesdale, is not without desolate grandeur, the hills, exceeding 2500 ft. in height at some points, consisting of bleak moorland. A succession of falls or rapids, where the river traverses a hard series of black basaltic rocks, is known as Caldron Snout; and from a point immediately below this to its mouth the Tees forms the boundary between Durham and Yorkshire almost without a break. The dale becomes bolder below Caldron Snout, and trees appear, con- trasting with the broken rocks where the water dashes over High Force, one of the finest falls in England. The scenery becomes gentler but more picturesque as the

river descends past Middleton-in-Teesdale (Durham) , the terminus of a branch of the North-Eastern railway from Darlington. In this locality lead and ironstone are worked. The ancient town of Barnard Castle, Eggleston Abbey, and Rokeby Hall, well known through Sir Walter Scott's poem, are passed; and then the valley begins to open out, and the river traverses in sweeping curves the rich plain east and south of Darlington. The course of the valley hitherto has been generally E.S.E., but it now turns N.E. and, nearing the sea, becomes an important commercial waterway, having on its banks the ports of Stockton-on-Tees, Thornaby-on-Tees and Middlesbrough, and forming an outlet, for the rich ironworking district of Cleveland in the North Riding of Yorkshire. It is also navigable for barges up to High Worsall, n m. above Stockton. For the last five miles the course, below Middlesbrough, is estuarine. The drainage area is 708 sq. m. No important tributary is received.

TEETH (O.E. te]>; plural of tooth, O.E. to\), the modified papillae or elevations of the mucous membrane of the mouth, impregnated with lime salts. Each tooth has a biting part or crown covered by enamel, a neck where the gum surrounds it, and one or more roots or fangs fitting into sockets (alveoli) in the jaw bone. For surgery of the teeth see Dentistry.

There are thirty-two permanent teeth in man, sixteen in the upper and sixteen in the lower jaw; they are also arranged in symmetrical sets of eight teeth on each side. The two teeth on each side of the mid-line in front are " incisors " and have chisel-shaped crowns. The mesial or central incisor of the upper jaw is broader than any of the others, consequently it bites against the central and lateral incisors of the lower jaw, and the same want of exact adaptation continues throughout the series, so that every tooth in the upper jaw except the last molar bites against its corresponding tooth of the lower jaw and the tooth behind that.

Next to the incisors comes the ” canine tooth,” the crown of which is somewhat peg-shaped, while behind this are the two ” premolars ” or ” bicuspids,” whose crowns are flattened from before backward and bear two cusps, the larger of which

.Central incisor

Canine

and premorar

and molar I

yd molar

ninth month, or even later; then, after a few months, come the central and lateral upper incisors; again a few months’ rest and the lower lateral incisors appear, followed closely by the first molars. After another rest of four or five months come the canines, the eruption of which is a slow process, while by about the end of the second year the second molars have appeared, and the milk dentition is complete. It will be seen from the above that the milk teeth are cut in batches with resting intervals between.

As C. S. Tomes points out, we do not know what causes the eruption of the teeth; the growth of the roots is not of itself enough to account for it. It is possible, however, that blood-pressure may be the determining cause. The first permanent tooth to be cut is the first molar, and this happens during or soon after the sixth year. It does not displace any of the milk teeth, but comes down behind the second milk molar. During the seventh year the central milk incisors fall out and their place is taken by the per- manent ones; the shed teeth are mere shells of the crown, all the root having been absorbed, though not, as might be thought, owing to direct pressure of the succeeding tooth.

The lateral incisors succeed their milk predecessors

at about eight years old, the first premolar takes the place of the first temporary molar about nine, the second pre- molar that of the second temporary molar about ten, the canine about eleven, while the second molar comes down behind the first about twelve, and so is known as

, . , , , „, the ” twelve-year-old tooth.” The third molar, or wisdom

The upper row shows the upper teeth, the lower row the lower teeth. The . ., „n„ „„ !,„<.„,„„„ „;„i, t „„„ „„^i +,„^„t„ v,,,*.

r;n^„l„m u Hi.rWt nn tV „nn f inrisnrs and hnth raninps. the linm.nl t00th > usually appears between eighteen and twenty, but

Lateral incisor ist premolar

Central incisor Canine and premolar 2nd molar

From Ambrose Birmingham, in Cunningham’s Text-Book of Anatomy.

3rd molar

Fig. 1. — The Permanent Teeth of the Right Side, Inner or Lingual Aspect.

cingulum is distinct on the upper incisors and both canines, the lingual

cusp on the upper lateral incisor and the upper canine

is the external or labial cusp, while the smaller is the internal or lingual. As a rule there is a single root, though sometimes in the first upper premolar it is double.

The three ” molars ” are placed behind the premolars, and the upper and lower sets can be easily distinguished because the upper have three roots • while the lower have only two. Of the three roots which the upper molars bear two are lateral or

external and one mesial (see fig. 1), so that it is easy to tell the outer from the inner side of an upper molar. The front can, as a rule, be identified by the fact that the roots are gene- rally bent a little backward at their tips, and this applies to other teeth than the upper molars. In the lower jaw, owing to the two fangs being anteroposterior, it is not possible to tell the lateral from the mesial surface of the molars by them, although the backward inclination of their tips shows the front from the back. When it is remembered that the upper teeth overlap the lower externally it is reasonable to expect that the lower molars would show some rounding due to wearing away of the edge of the crown on the outer side, and this is the case. The grinding surface of the crowns of the upper molars shows three or four cusps, while on that of the lower four or five are found.

Of the three molars the first is the largest, and the third, or wisdom tooth, the smallest, while the upper wisdom tooth is smaller than the lower.

In the " milk teeth " or temporary dentition of the child there are only twenty teeth, ten in each jaw and five in each segment. They are two incisors, one canine, and two so-called molars. These molars occupy the position which the permanent premolars later on take, and it is held by many that the adult molars really belong to the milk dentition, although they cannot appear until the jaw has grown backward sufficiently far to make room for them. The temporary teeth differ from the permanent in their smaller size, their whiter colour, the greater constriction of their necks, and in the fact that the roots of the molars are widely splayed.

The dates at which the milk teeth are cut are very variable. The lower central incisors corne first between the sixth and

may be much later, indeed it is sometimes never cut at all, and when it is, it often does not come down to a level with the other teeth. It is believed that man is gradually undergoing a suppression of his

last molar teeth, which, if the process continue, will lead to our successors having a different dental formula from our own. It is interesting to notice that ist molar

Lateral incisor Central incisor I

Central incisor Lateral incisor

Canine

/

ist molar

CS vBP

2nd molar

and molar crown

From Ambrose Birmingham, in Cunningham's Text-Book of Anatomy. Fig. 2.— The Milk Teeth of the Left Side.

The masticating surfaces of the two upper molars are shown above. In the second row the upper teeth are viewed from the outer or labial side. In the third row the lower teeth are shown in a similar manner; and below are the masticating surfaces of the two lower molars. In the specimen from which the first upper molar was drawn the two outer or buccal cusps were not distinctly separated, as is often the case.

in some of the lower races of mankind the last molar tooth is nearly as large as those in front of it, and this is the case in the anthropoid apes. A. Keith and D. Braden Kyle have pointed out that the second and third molar teeth are suc- cessively formed in the posterior wall of the maxillary antrum

5°*

and their crowns look backward. It is owing to the gradual growth backward of this antrum and the

maxilla that they are rotated round a quarter of a circle and so at last look down- ward (see A. Keith, British Journal of Dental Science, vol. xlv., June 16, 1902).

Extra teeth are occasionally met with in the incisor, premolar and molar regions; their significance will be better realized after the embryology and comparative anatomy of the subject have been sketched.

For an accurate and detailed description of man's teeth see A Manual of Dental Anatomy, by C. S. Tomes, London, 1904.

Histology. If a section be made vertically through a tooth all the exposed part or crown is seen to be covered with enamel, which, microscopi- cally, is composed of a number of fine hexagonal prisms arranged at right angles to the surface of the tooth, and formed chiefly of

Enamel

Crown

Dentine

Pulp cavity

Neck

Root

Bone Cement or Alveolar periosteum

crustapetrosa or root-membrane From Ambrose Birmingham, in Cunningham's Text-Book 0/ Anatomy.

Fig. 3. — Vertical Section of Canine Tooth, to illustrate its various parts, and its structure.

calcium phosphate with small amounts of calcium carbonate, mag- nesium phosphate and calcium fluoride, but containing practically no organic matter. The enamel rests on the " dentine," of which

hard yet elastic substance by far the greater part of the tooth is composed. It is made of the same salts as the enamel, but contains in addition a good deal of organic matter and forms a structureless mass through which the fine "dentinal tubes" run from the pulp cavity to the periphery.

Surrounded by the dentine is the " pulp cavity," which is filled by the tooth pulp, a highly vascular and nervous mass of branched connective tissue cells, which, in a young tooth, has a layer of epithelial cells, the " odontoblasts, " lying close against the wall of the cavity and forming new dentine. Slender processes (" Tomes's fibrils ") project from these cells into the dentinal tubes, and are probably sensory. A nerve and artery enter the apex of the root of the tooth, but it is not understood how the nerve ends.

Surrounding the dentine where it is not covered by enamel is the " cement " or " crusta petrosa," a thin layer of bone which is only separated from the bony socket by the alveolar periosteum.

Embryology. The lip is marked off from the rest of the mouth region by a " lip groove," which, in the case of the lower jaw, grows obliquely down- ward and backward, and the mass of ectodermal cells bounding it

penetrates for some distance into the surrounding mesoderm below the bottom of the groove. This is known as the " tooth band."

On the under surface of this oblique tooth band (still taking the lower jaw), and close to its edge, appear ten thickenings, below each of which the mesoderm rises up into a " dental papilla," and so moulds the thickening into a cap for itself — the " enamel organ." The superficial cells of the dental papilla become the " odontoblasts " and manufacture the dentine, while those cells of the cap (enamel organ) which are on its concave surface and therefore nearest the dental papilla are called " ameloblasts, " and form the enamel. The cutting or

grinding part of the tooth is first formed, and the crown gradually closes round the dental papilla, so that at last, when the root is formed, the central part of the papilla remains as the pulp cavity surrounded by dentine except at the apex of the root. The roots, however, are formed slowly, and as a rule are not complete until some time after the tooth is cut. The mesoblastic connective tissue surrounding the developing tooth becomes condensed into a fibrous bag which is called the tooth-sac, and round this the lower jaw grows to form the alveolus. The crusta petrosa which covers the root is developed from the tooth-sac. It will therefore be seen that, of the various structures which make up a tooth, the enamel is derived from the ectoderm, while the dentine, pulp and crusta petrosa or cement are mesodermal.

So far only the milk dentition of the lower jaw has been accounted for.

Returning to the tooth band, it was noticed that the enamel organs were formed not at the extreme edge but a little way from it. From the extreme edge, which, it will be remembered, points inward toward the tongue, the permanent tooth germs are derived, and it is therefore clear that the permanent teeth must come up on the lingual side of their milk predecessors.

For further details and literature see Dental Anatomy, by C. S. Tomes, London, 1904; and Development of the Human Body, by J. P. McMurrich, London, 1906.

Comparative Anatomy.

The details of the teeth vary so greatly in different animals and groups of animals, and, on account of their being the most durable tissues of the body, are so important for classificatory purposes, that they are dealt with freely in the various zoological articles. All that can be done here is to give a broad general survey of the subject, taking the details of man's dentition,

already set forth, as a point of departure.

In some fishes the teeth are continuous over the edges of the jaws with the scales on the surface of the body, and there is no doubt that teeth should be regarded as modified scales which have migrated into the mouth.

In the Cyclostomata (lampreys and hags) the teeth are horny cones, but beneath them there are papillae of the mesoderm covered with ectoderm which resemble the dental papillae and enamel organs although no calcification occurs except in Bdellostoma. In the Elasmobranchii (cartilaginous fishes) the teeth are arranged in several rows, and as those of the front row fall out the hinder row take their place ; sometimes they are triangular and very sharp as in the sharks, sometimes flattened and arranged like a pavement for crushing as in rays. These teeth only represent the crowns of man's teeth, and they are not embedded in sockets except in the case of the teeth in the saw of the saw-fish (Pristis) ; moreover the dentine of which they are largely composed resembles bone and fills up the whole pulp cavity. From its structure it is known as osteodentine.

In the Teleostomi (teleostean and ganoid fishes) there is great variability; sometimes, as in the sturgeon, there are no teeth at all, while at others every bone bounding the mouth, including the branchial arches, bears teeth. As an example of a very full tooth armature the pike's mouth and pharynx may be instanced. Both in the pike and the hake hinged teeth occur; these bend backward during the passage of prey down the throat, but are re-erected by elastic ligaments. As a rule, the dentine of the Teleostomi is of the variety already described as osteodentine, but sometimes, as in the hake, it is vascular and is known as vasodentine.

In the Amphibia teeth are not so numerous- as in the fishes, though like them they are not confined to the jaws, since vomerine teeth are very constant. The toad is edentulous, while the frog has no teeth

in the lower jaw. An extinct order of tailed amphibians, the Stegocephali, are often called labyrinthodonts on account of the complex way in which the enamel is involuted into the interior of the teeth. Amphibians' teeth are usually anchylosed to the jaw, that is to say, directly united by bone.

In the Reptilia many and various arrangements of the teeth are found. In the Chelonia (turtles) there are no teeth, although the ectodermal ingrowth (dental band) from which they are developed in other animals is present in the embryo. The place of the teeth in these reptiles is taken by horny jaw-cases.

In the Ophidia the non-poisonous snakes have two rows of teeth in the upper jaw, one on the maxillae and another on the palatine and pterygoid bones, while in the lower jaw there is only one row. These teeth are sharp pegs anchylosed to the bones and so strongly recurved that one of these snakes would be unable, even if it wished

to do so, to let any prey which had once entered its mouth escape. The poisonous snakes have a special poison fang in the maxilla of each side; these have a deep groove or canal running down them which transmits the poison from the poison gland. In the colu- brine snakes, such as the cobra, the poison fang is always erect, but in the viperine, such as our own adder and the rattlesnake, there is a mechanism by which the tooth is only erected when the jaws are opened for striking. At other times the teeth lie fiat in the roof of the mouth.

In the lizards or Lacertilia the teeth usually consist of a series of pegs in the upper and lower jaw, each resembling the one in front of it; sometimes, as in the chameleon, they are anchylosed by their bases to the bone, but at others, as in the iguana, they are fused by their sides to a ridge of bone which forms a low wall on their lateral

surface. In the former case the dentition is spoken of as " acrodont," in the latter as " pleurodont."

In the Crocodilia the teeth are fitted into definite sockets as in mammals and are not anchylosed with the jaws. This arrange- ment is spoken of as " thecodont."

Existing birds are toothless, but palaeontology shows that they originally had teeth of a reptilian character.

In all these lower vertebrates, then, the teeth are similar or nearly similar in character; at least they are not divided into definite incisor, canine, premolar and molar regions. Their dentition is therefore known as " homodont." Another characteristic is that in almost all of them there is an arrangement for a continuous succession of teeth, so that when one is lost another from behind takes its place, and to this arrangement the term " polyphyodont " is applied. With a few exceptions a "homodont dentition is also polyphyodont.

In the Mammalia the different groups of teeth (incisor, canine, &c.) already noticed in man are found, and these animals are character- ized, with some exceptions, by having a " heterodont " as opposed to a homodont dentition. In the mammals too the polyphyodont or continuous succession of teeth is reduced to a " diphyodont " dentition, which means that there is only one relay of teeth to replace the first set. In the marsupials the reduction of the suc- cession is carried still further, for only one premolar in each segment of the jaw is replaced, while in the toothed whales there is no succession at all. When one set has to do duty throughout life the dentition is called " monophyodont." There is a great deal of discussion as to how the complex back teeth of mammals with their numerous cusps were derived from the simple conical teeth which are generally assumed, though not by all, to have been the primitive arrangement. One simple way of accounting for the change is by the concrescence theory, namely that several conical

homodont teeth have fused and so formed a single multitubercular tooth ; but, although this process may be partly true, it does not account for all the facts at our disposal. Another theory, which is more favoured at the present time, is known as the " tritubercular," and is largely based on the researches of E. D. Cope and H. F. Osborn, two American palaeontologists. According to this theory a simple peg-like, or. as it is called, " haplodont," tooth develops two addi- tional smaller pegs or cones, one in front and one behind the original main cone, possibly owing to the irritation of the teeth against which it bites in the other jaw. This is known as the triconodont stage, and it is found in some of the oldest extinct mammals. As a later adaptation it is found that the two small cones, the anterior of which is called the " paracone " and the posterior the " metacone," become external to the original " proto- cone " in the upper jaw and internal in the lower.

The surface of the tooth has now a triangular shape with a cone at each angle, and this is the " tritubercular tooth " which is of very common occurrence among the ancestral mammals. Other cusps may be developed later, and so the quadricuspid and quinque- cuspid molar teeth of man and other mammals are accounted for. This theory, although in a brief outline it sounds feasible enough, has really many points of difficulty, and those who are interested in the subject will find a fuller account in C. S. Tomes' Dental Ana- tomy (London, 1904), and in W. L. H. Duckworth's Morphology and Anthropology (Cambridge, 1904), in both of which references to the original literature, which is now very voluminous, are given. Marett Tims (J. Anat. and Phys., vol. xxxvii. p. 131) suggests that the evolution of the mammalian teeth is to be explained partly by the tritubercular and partly by the concrescence theory.

It is impossible, in the space assigned, to give even a brief review of mammalian odontology, but it may clear the ground for the special zoological articles if an attempt is made to define what is

meant by the different classes of teeth.

Incisor teeth are those which in the upper jaw have their sockets in the premaxillary bone; they are generally chisel-shaped, and with their opponents of the lower jaw act like scissors. They are specially well marked in the rodents, and in these animals the pulp throughout life continues to form fresh dentine, so that the teeth are ever growing, and it is absolutely necessary for their owners to be continually gnawing in order to wear them away at their cutting edges. The tusks of the elephant and the single tusk of the male narwhal are modified incisors, while in the ruminants the incisor teeth are wanting in the upper jaw.

Th? canine tooth is the first tooth behind the premaxillo-maxillary

suture, provided it be not far behind it; it is almost always the first of the premaxillary series, speaking accurately, which is elon> gated and sharply pointed. As its name implies it is well marked in dogs and other Carnivora, but is found in many other orders. It is the special offensive and defensive weapon of many mammals, and is greatly developed in some of the ungulates which are without horns, e.g., the musk deer. The tusks of the walrus and wild boar are canines. In many of the Insectivora, especially the mole, the canine is very hard to identify, as in these animals an incisor or a premolar may take on caniniform characters, or there may be no tooth at all with these characters.

The premolar teeth are those in the maxillary bone which are preceded by milk teeth. This definition, of course, includes the canine as a modified premolar, and so it should no doubt be con- sidered, though, if it is desired to keep it distinct, ” behind the canine ” must be added.

Unfortunately for an accurate definition the first premolar behind the canine is not always preceded by another tooth, and so it becomes an unsettled question whether, in these cases, the tooth is a

retained milk tooth or a permanent one which has had no predecessor; it is probable, however, that the latter is the right interpretation.

The molar teeth are those, behind the premolars, _ which are not preceded by temporary teeth. As was pointed out, in man's denti- tion they are probably teeth of the first or milk dentition which appear late.

In front of the premolar teeth, and between them and the canine, if it be present, or the incisors, if it be absent, there is often a space called the " diastema." It is best marked in the orders of Rodentia and Ungulata, and in the horse is familiar as the place where the bit lies.

In recording the teeth of any particular mammal it saves time and space if a dental formula be used. This simply means setting down the number of each kind of tooth in one side of the upperand lower jaw in their order from before backward. Thus man's formula

*would be, incisors-, canines -, premolars , molars *. This is con densed into '3 -*

2.1.2.3

Some other types of dental formulae are — Catarrhine (old world) monkeys

Platyrhine (new world) monkeys

Marmosets …..

Most lemurs …..

Insectivorous bats (full series)

(The upper incisors and both premolars may be reduced by one)

Frugiverous bats …...

(The molars may be reduced) Insectivora (teeth

variable and somewhat uncertain)

Hedgehog …...

Mole

(Five different dental formulae have been assigned to this animal) Carnivora —

2-1-3-3

2.I-3-2

2.1.3.2

2.1.2.3 2.1.2.3

2.I-3-3

2-1-3-3 2 -!-3-3 3- 1 -3-3

Dog family (Canidae)) Bear family (Ursidae)) Civet family (Viverridae)) Racoon family (Procyonidae) $

• 3.1.2.1

3.1.4.2

' 3-I-4-3

3.1.4.2 3.1.4.2

Hyaena family (Hyaenidae)

3. 1. 4. 1

3-I-3-I

Weasel family (Mustelidae)

3.1.4.1 3- 1 -4-2

Eared seal family (Otariidae)

3. 1. 4. 1 of

' 2. 1. 4.1

Seal family (Phocidae)

3.1.4.1 3. 1. 4. 1

Walrus family (Trichechidae), adult

1. 1.3.0 0.1.3.0

In a young animal (probably)

3-I.3.2 ' 3-I-3-I

2.1.2.3

2-1-3-3

3-1-3-3 2.1.2.3

3- 1 -4-3 3-1-4-3

3-I-3-

TEETOTALISM-*-TEETOTUM

503

Ungulata —

2 -*-4-3 2.1.4-3 3- 1-4-3 3-1-4-3

^^

3.1.2.3

°-'-3-3

3. 1 -3-3

o.(oon).3.3

3-!-3-3

o.Q-3-3

3-1-3-3

3-I-4-3

3-1-3-3

3-I-3-3 , 3-I-3-3 (o-2).o.4.3

(0-1). (0-1)4.3

(i-2).o.4.3

. , 2-04.3

l.c.o.d.m.(3-4)m.3

° o (3-4) 3

In this animal there are no premolars, but the milk molars (d.m) and true molars gradually replace one another from before back- ward throughout life, so that there are never more than two back teeth in each segment of the jaw at any one time.

Rodentia —

Typical rodents (Simplicidentata)

Hippopotamus

Pig family (Suidae)

Camel

Chevrotain (Tragulidae)

Deer family (Cervidae)

Hollow-horned ruminants (Bovidae)

Tapir .

Horse (Equidae) .

Rhinoceros

Procavia (Hyrax)

Elephant . . . d.i. i.i

Hares and rabbits (Duplicidentata)

i.o.(o-i).3 i.o.(o-i). 3

2-Q-3-3

1.0.2.3

Cetacea. — In the living toothed whales (Odontoceti) the denti- tion is homodont and may be as great as — There is

every reason to believe, however, that they are derived from heterodont ancestors. In the whalebone whales (Mystacoceti) the teeth are replaced by the whalebone in the adult, but in the embryo slightly calcined teeth are present which are afterwards absorbed. The homodont dentition of the whales is a retrograde process,

and is therefore not comparable to the homodont dentition of the

vertebrates below mammals.

Sirenia.— The dentition is monophyodont. The manatee

has

i. -1 c. -, back teeth — .

20 11

In the Edentata the ant-eaters (Myrmecophagidae) and pangolins (Manidae) are toothless, though the latter have foetal tooth germs. The aard varks (Orycteropodidae) are somewhat heterodont, while the armadillos (Dasypodidae) and sloths (Bradypodidae) have a homodont dentition, which, like that of the whales, is retrogres- sive. In the giant armadillo (Priodon gigas) the formula is 25-

This animal therefore has a hundred teeth. In none of the Edentata are the teeth covered with enamel.

In the Marsupialia the typical formula is 3 - T -3-4- They are

divided into diprotodonl, in which there are not more than - incisors,

3 • ^

often - as in kangaroos, and polyprotodont, in which the incisors

are more than -, as in the Tasmanian wolf (Thylacinus) and Tas^

manian devil (Sarcophilus). The marsupial teeth are often re- garded as all milk teeth, yet the order is not really monophyodont because the germs of the permanent teeth are formed and aborted Modern research, however, casts grave doubt on the accuracy of this view.

In the Monotremata the Echidna or spiny ant-eater is quite edentulous, while the duck-mole (Omithorhynchus) has functional molar teeth in youth, though in the adult these are lost, and their place is taken by horny plates.

_ Reviewing the various tooth lormulae o> mammals

the following is usually regarded as typical : —

3-I-4-3

3-M-3 This, it will be noticed, is the formula of the pig, and it is also that of almost all the Eocene Ungulata. Although the majority of mammals are diphyodont, or, in other words, the working teeth belong to two dentitions, evidences have lately been submitted of

vestiges of two other series, one on the labial side of the milk teeth and one on the lingual side of the permanent series. If these are substantiated there would be four dentitions — (1) pre- milk; (2) milk; (3) permanent; (4) post-permanent. The theory, though it bridges over the gap between the polyphyodont lower vertebrates and the apparently diphyodont mammals, is not by any means established. As the teeth are of such importance in the classification of animals, it will save continually repeated explanations in other articles if some of the chief terms by which they are described are recapitulated and briefly defined here.

1. Acrodont, a tooth which is anchylosed by its base to the summit of a parapet on the jaw.

2. Bilophodont, a molar tooth having two transverse ridges on its grinding surface, as in the tapir.

3. Brachyodont, a low-crowned molar tooth — the opposite of hypsodont.

4. Bunodont, a tooth bearing conical cusps.

5. Diphyodont, having two series of teeth (milk and permanent).

6. Diprotodont, a marsupial with not more than * incisors, often only one on each side of the mandible.

7. Haplodont, a tooth having a simple conical crown with a single root.

8. Heterodont, a dentition in which the teeth are not all alike, chiefly characteristic of the Mammalia.

9. Homodont, a dentition in which the teeth are all alike as in many of the lower vertebrates and some mammals.

10. Hypsodont, a high-crowned molar tooth, such as that of the horse, — the opposite to brachydont.

11. Lophodont, a transversely ridged molar tooth; cf. bilopho- dont.

12. Monophyodont, having only one dentition (cf. diphy- and poly phy-odont) .

13. Multituberculate, a tooth, the crown of which bears numerous conical cusps; held by some to be the primitive condition of the mammalian teeth.

14. Pleurodont, a tooth anchylosed to the inner side of a parapet on the jaw.

15. Polybunodont, a synonym for multituberculate.

16. Polyphyodont, having an endless succession of teeth, as in most vertebrates below the mammals.

17. Polyprotodont, a marsupial having an incisor formula of more

than 2.

3

18. Protodont, a stage met with in fossil mammals which is an advance on the haplodont tooth in that two small cusps are added to the main cone.

19. Secodont, a back tooth adapted to cutting as in many of the Carnivora.

20. Selenodont, a molar tooth with crescentic ridges on its grind- ing surface as in most ruminants.

21. Thecodont, a tooth embedded in a socket or

alveolus, as in mammals.

22. Triconodont, a fossil stage in advance of the protodont, There are three well-marked cones in an antero-posterior line.

23. Tritubercular, a fossil stage succeeding the triconodont. The main cone is external in the lower teeth and internal in the upper. A very common form of back tooth in fossil forms and one which gives its name to the " tritubercular theory." (F. G. P.)

TEETOTALISM, the practice of total abstinence from all intoxicating liquors, hence that form of the temperance move- ment of which the basis is the " pledge " to abstain from all intoxicating liquors (see Temperance). There seems no doubt that the word, whatever its actual origin, is a strengthened form of " total," probably influenced by " teetotum " (q.v.). Ac- cording to the Century Dictionary, the secretary of a New York temperance society introduced a total abstinence pledge among its members, who were thus divided into those who had taken the old pledge, the O.P.'s, to abstain from spirituous liquors, and the T.'s, who had taken the new or total pledge. The English version, taken from the account by Joseph Livesey in the Staunch Teetotaler, January 1867, is that one Richard Turner, a Preston artisan and popular temperance speaker, declared at a meeting about 1833, that " nothing but tee-tee- total would do." This repetition of the initial letter does not appear to have been due to his stammering but to have been a mere emphasis on the word. The expression seems to have obtained instant recognition and popularity. Both versions are apparently authentic, and there seems no reason to suppose that they are not independent.

TEETOTUM, a form of top, used in various games of chance; the body is of polygonal shape, marked with letters or numbers, which decide the result of the game, according to the side which

remains uppermost on the fall of the top after spinning. Strutt, who was born in 1749, mentions {Sports and Pastimes) the teetotum as used in games when he was a boy. It seems that in its earliest form the body was square, marked on the four sides by the letters A. (Lat. aufer, take up or away), indicating that the player takes one from the pool, D. (Lat. depone, put down), when a fine has to be paid, N. (Lat. nihil, nothing), and T. (Lat. totum), when the whole pool is taken. Other accounts give such letters as P.N.D. (dimidium, half), or H. and T. or other combinations of letters.

TEGEA, an ancient Greek city of Arcadia, situated on a plateau which is enclosed by Mts. Parthenium and Maenalus on E. and W., and by two transverse ranges which separate it from the plateau of Orchomenus and the Eurotas valley respectively. The Tegean territory occupied the southern part of this space; the northern half, sundered by projecting spurs from the parallel ranges, belonged to Mantineia. The entire plain was well adapted for pasturage and corn-growing, but was liable to floods owing to the lack of free outlets for its water-courses. Hence the regulation of the zerelhra or sub- terranean conduits which drained away the overflow southward was a matter of vital importance both to Tegea and to Mantineia, and a cause of frequent quarrels. By its vicinity to the water- sheds of the Eurotas and Alpheus, and its command over the main roads from Laconia to Argos and the Isthmus, Tegea like- wise was brought into conflict with Sparta.

Tegea was one of the most ancient cities of Peloponnesus; tradition ascribed its concentration (synoecism) out of eight or nine primitive cantons to a mythical king Aleus. From the fact that several Cretan townships passed for colonies of Tegea, it may be inferred that this city had oversea connexions in pre- historic days. The prominence which legend assigns to its king Echemus in opposing the Heraclid invasion shows that it was one of the chief Peloponnesian communities in the pre- Dorian

epoch. For several centuries Tegea served as a bulwark of Arcadia against the expanding power of Sparta; though ultimately subdued about 550 B.C. it was allowed to retain its independence and its Arcadian nationality. During the Persian invasion the Tegeans displayed a readiness unusual among Peloponnesian cities; in the battle of Plataea they were the first to enter the enemy's camp. A few years later they headed an Arcadian and Argive league against Sparta, but by the loss of two pitched battles (Tegea and Dipaea) were induced to resume their former loyalty (about 468–467). In 423 they broke out into open war with the Mantineians, and when the latter rebelled against Sparta and allied themselves with Argos and Athens, the Tegeans stood firmly by Sparta's side: in the decisive battle of Mantineia (418) their troops had a large share in the overthrow of the coalition. During the early 4th century before Christ Tegea continued to support Sparta against the Mantineians and other malcontents. After the battle of Leuctra the philo-Laconian party was expelled with Mantineian help. Tegea henceforth took an active part in the revival of the Arcadian League and the prosecution of the war in alliance with Thebes against Sparta (371–362), and the ultimate defection of Mantineia confirmed it in its federalist tendencies. The foundation of the new federal capital Megalopolis threw Tegea somewhat into the shade. It showed itself hostile to the Macedonians, and in 266 joined the Chremonidean League against Antigonus Gonatas. To the incorporation of Mantineia into the Achaean League (233) Tegea replied by allying itself with the Aetolians, who in turn made it over to Cleomenes III. of Sparta (228). From the latter it was transferred by Anti- gonus Doson to the Achaean League (222); in 218 it was again occupied by the Spartans but reconquered in 207 by the Achaean general Philopoemen. In Augustus' time Tegea was the only important town of Arcadia, but its history throughout the Roman and Byzantine periods is obscure; it ceased to exist as a Greek city after the Gothic invasion of 395. During the Frankish occupation its place was taken by the fortress of

Nikli. At the time of the Turkish conquest (1458) Nikli had been superseded by a fair-sized town called Mouchli, which in

turn disappeared when the new city of Tripolitsa was founded about 3 m. N.W. The site is now occupied by the small village of Piali.

Authorities. — Strabo pp. 337, 388; Pausanias viii. 44-49, 53-54; Herodotus i. 65 ff., ix. 35, 70; Thucydides v. 32-73; Xenophon, Hellenica, vi., vii. ; Polybius ii. 46, 54 ff., v. 17, xi. 18; W. M. Leake, Travels in the Morea (London, 1830), i. pp. 88-100, ii. 328-334; E. Curtius, Peloponnesos (Gotha, 1851), i. pp. 247- 264; W. Loring in Journal of Hellenic Studies, xix. (1899) pp. 25-89; Schwedler, De Rebus Tegeaticis (Leipzig, 1886); 'laropia rrjs Teykas. 'EkS. wro tov TeyeariKov Xwdkcr/wv (Athens, 1896); for coins: B. V. Head, Historia Numorum (Oxford, 1887), pp. 350-351; and art. Numismatics, section Greek, § " Arcadia."

(M. O. B. C.)

Archaeology. — The temple of Athena Alea at Tegea is described by Pausanias as excelling all others in the Pelopcnnese both in size and in beauty of construction. The original temple was said to have been built by Aleus, the founder of the city; it was superseded by a larger one which was destroyed by fire in 395 B.C. The rebuilding was entrusted to Scopas, the great sculptor; and it is probable that he not only acted as architect, but also provided the sculptural groups which ornamented the pediments. Like the temple at Phigalia, it combined the forms of all three orders — Doric, Ionic and Corinthian. Pausanias asserts that the outer order was Ionic; but excavations have proved that it was Doric. The pedimental groups of the temple represented at the front, the hunt of the Calydonian boar, and, at the back, the battle of Achilles and Telephus. Both subjects were intimately associated with the temple, for Atalanta had dedicated in it the face and tusks of the boar, which had been awarded to her as the first to wound it; and

Telephus was the son of Heracles and the priestess Auge. Two heads of heroes and that of the boar were found before 1880; later excavation, in 1883, showed the plan of the temple, which had six columns at front and back, and thirteen at the sides. In 1900 the French school at Athens recovered more fragments of sculpture, including a head of Heracles and the torso and possibly the head of Atalanta, these last two of Parian marble. The other heads are badly damaged owing to the fact that the white marble from Doliana, of which they are made, does not resist damp. But they still show in the intensity of their expression the power of expressing passion for which Scopas was famous beyond all other ancient sculptors. See Greek Art, fig. 63.

See G. Treu, Mittheil. d. deutsch. Inst. Athen., vi. 1881 ; W. Dorpfeld, ibid., viii. 1883; G. Mendel, Bulletin de correspondance hellenique, xxv. 1901 ; Pausanias viii. 45-47. (E. Gr.)

TEGERNSEE, a lake of Germany, in the province of Upper Bavaria, situated in a beautiful mountain country, 2382 ft. above the sea, 34 m. S. from Munich by rail to Gmund, a village with a station on the north shore. The lake is 4 m. long, averages ij m. broad, and is about- 235 ft. deep. Its waters discharge through the Mangfall into the Inn. The southern part is environed by high and well-wooded hills, while on the northern side, where it debouches on the plain, the banks are flat and less attractive. Prosperous villages and handsome villas stud its shores, and it is one of the most frequented summer resorts in the vicinity of Munich.

The village of Tegernsee (pop. 1742 in 1905), on the east bank, has a parish church dating from the 15th century, a ducal castle which was formerly a Benedictine monastery, and a hospital, founded in connexion with the large ophthalmic practice of the late Duke Charles Theodore of Bavaria.

See Freyberg, Aelteste Geschichte von Tegernsee (Munich, 1822); Hack, Tegernsee (Munich, 1888) ; Breu, Der Tegernsee, limnologische Studie (Munich,

1906).

TEGETTHOFF, WILHELM VON, Baron (1827-1871), Austrian admiral, son of Lieutenant-Colonel Karl von Tegett-hoff, was born at Marburg, in Styria, on the 23rd of December 1827. After passing through the naval college at Venice, he first served afloat in 1845, and in 1848 was made an ensign. In 1849 he was present at the blockade of Venice, resulting in its surrender. In 1852 he was promoted to be a lieutenant, and during the Crimean war was employed on a sort of police

duty at the Sulina mouth of the Danube, which brought him to the favourable notice of the Archduke Maximilian, who in 1854 had been appointed head of the navy with the style of rear-admiral. After some time in a semi-official scientific expedition in Egypt, Arabia, and the Red Sea down to the island of Socotra, Tegetthoff was promoted to the rank of captain of the third class, and in 1858 he commanded the corvette " Erzherzog Friedrich " on the coast of Morocco, then in a very disturbed state. The corvette returned to Trieste on the imminence of the war with France; but during 1859 the French fleet commanded the Adriatic in vastly superior force, against which the Austrians were powerless. After the peace Tegetthoff made a voyage to Brazil as aide-de-camp to Maximilian, and in 1860-63 commanded a large frigate in the Levant during the disturbances in Syria, and on the coast of Greece or in the Piraeus at the time of the Greek revolution. Towards the end of 1863 he was sent to the North Sea as com- modore in command of two frigates, with which, together with three small Prussian gunboats, he fought an action with the Danish squadron, and though without any decisive success, succeeded in raising the blockade of the mouths of the Elbe and Weser. The Austrian emperor answered Tegetthoff's tele- graphic despatch by another promoting him to be rear-admiral, and conferring on him the Order of

the Iron Crown. In 1865 he commanded a small squadron in the Mediterranean, and in the war of 1866 was placed in command of the whole effective force of the Austrian navy. With all his efforts, however, this was markedly inferior to the Italian force opposed to it, and when the two fleets met off Lissa on the 20th of July, the decisive victory of the Austrians was entirely due to the personal superiority of Tegetthoff and the officers whom he in great measure had trained. In numbers, in ships, and in armament the Italians were much the more powerful, but they had neither a capable chief nor efficient officers. Tegetthoff was immedi- ately promoted, by telegraph, to the rank of vice-admiral, and among the many decorations conferred on him was one from his former commander, the unfortunate Maximilian, at this time emperor of Mexico, whose body was in the following year brought home by Tegetthoff. In March 1868 he was appointed head of the naval section of the War Office and commander- in- chief of the navy, which offices he held till his death at Vienna, after a very short illness, on the 7th of April 187 1 — in the words of the semi- official notice — ” zu friih fiir Osterreich.”

(J. K. L.)

TEGGIANO (anc. Tegianum, formerly called Diano), a town in Campania, Italy, in the province of Salerno, 45 m. S.E. of that town. Pop. (1901) 5095. It is situated 2090 ft. above sea-level on an isolated eminence above the upper part of the valley of the Negro (anc. Tanager), to which it gives the name of Val di Diano. It represents the ancient Tegianum a muni- cipal town of Lucania, made into a colony by Nero, of which the ruins can be traced at the foot of the hill, with an ancient Roman bridge. An Oscan sepulchral inscription in Greek letters has been found here (cf. W. Corssen in Ephemeris Epi- grafica, ii. 153). It possesses a castle, several churches of some interest, and three conventual buildings. In 1497 it was strong enough to resist, under Antonio Sanseverino of Salerno, the siege undertaken by Frederick of Aragon. (T. As.)

TEGltfJR, ESAIAS (1782-1846), Swedish writer, was born on the 13th of November 1782, at Kyrkerud in Wermland. His father was a pastor, and his grandparents on both sides were peasants. His father, whose name had been Esaias Lucasson, took the surname of Tegnerus — altered by his fifth son, the poet, to Tegner — from the hamlet of Tegnaby in Smaland, where he was born. In 1792 Tegnerus died. In 1799 Esaias Tegner, hitherto educated in the country, entered the university of Lund, where he graduated in philosophy in 1802, and con- tinued as tutor until 1810, when he was elected Greek lecturer. In 1806 he married Anna Maria Gustava Myhrman, to whom he had been attached since his earliest youth. In 181 2 he was named professor, and continued to work as a lecturer in Lund until 1824, when he was made bishop of Vexio. At Vexio he

remained until his death, twenty-two years later. Tegner's early poems have little merit. He was comparatively slow in development. His first great success was a dithyrambic war- song for the army of 1808, which stirred every Swedish heart. In 18 1 1 his patriotic poem Svea won the great prize of the Swedish Academy, and made him famous. In the same year was founded in Stockholm the Gothic League (Gotiska fbrbun- det), a sort of club of young and patriotic men of letters, of whom Tegner quickly became the chief. The club published a magazine, entitled Iduna, in which it printed a great deal of excellent poetry, and ventilated its views, particularly as regards the study of old Icelandic literature and history. Tegner, Geijer, Afzelius, and Nicander became the most famous members of the Gothic League. Of the very numerous poems written by Tegner in the little room at Lund which is now shown to visitors as the Tegner museum, the majority are short, and even occasional lyrics. His celebrated Song to the Sun dates from 181 7. He completed three poems of a more ambitious character, on which his fame chiefly rests. Of these, two, the romance of Axel (1822) and the delicately-chiselled idyl of Natlvardsbarnen (" The First Communion," 1820), translated by Longfellow, take a secondary place in

comparison with Tegner's masterpiece, of world-wide fame. In 1820 he pub- lished in Iduna certain fragments of an epic or cycle of epical pieces, on which he was then working, Frithjofs saga or the Story of Frithiof. In 1822 he published five more cantos, and in 1825 the entire poem. Before it was completed it was famous throughout Europe; the aged Goethe took up his pen to commend to his countrymen this " alte, kraftige, gigantisch- barbarische Dichtart," and desired Amalie von Imhoff to translate it into German. This romantic paraphrase of an ancient saga was composed in twenty-four cantos, all differing in verse form, modelled somewhat, it is only fair to say, on an earlier Danish masterpiece, the Helge of Ohlenschlager. Frithjofs saga is the best known of all Swedish productions; it is said to have been translated twenty-two times into English, twenty times into German, and once at least into every European language. It is far from satisfying the demands of more recent antiquarian research, but it still is allowed to give the freshest existing impression, in imaginative form, of life in early Scandinavia. In later years Tegner began, but left un- finished, two important epical poems, Gerda and Kronbruden. The period of the publication of Frithjofs saga (1825) was the critical epoch of his career. It made him one of the most famous poets in Europe; it transferred him from his study in Lund to the bishop's palace in Vexio; it marked the first breakdown of his health, which had hitherto been excellent; and it witnessed a singular moral crisis in the inner history of the poet, about which much has been written, but of which little is known. Tegner was at this time passionately in love with a certain beautiful Euphrosyne Palm, the wife of a town councillor in Lund, and this unfortunate passion, while it in- spired much of his finest poetry, turned the poet's blood to gall. From this time forward the heartlessness of woman is one of Tegner's principal themes. It is a remarkable sign of the condition of Sweden at that time that a man not in holy orders, and so little in possession of the religious temperament as Tegner, should be

offered and should accept a bishop's crosier. He did not hesitate in accepting it: it was a great honour; he was poor; and he was anxious to get away from Lund. No sooner, however, had he begun to study for his new duties than he began to regret the step he had taken. It was nevertheless too late to go back, and Tegner made a respectable bishop as long as his health lasted. But he became moody and melancholy; as early as 1833 he complained of fiery heats in his brain, and in 1840, during a visit to Stockholm, he suddenly became insane. He was sent to an asylum in Schleswig, and early in 1841 he was cured, and able to return to Vexio. It was during his convalescence in Schleswig that he composed Kron- bruden. He wrote no more of importance; in 1843 he had a stroke of apoplexy, and on the 2nd of November 1846 he died in Vexio. From 1819 he had been a member of the Swedish

Academy, where he was succeeded by his biographer and best imitator Bottiger.

See Bottiger, Teckning af Tegners Lefnad; Georg Brandes, Esaias Tegner; Thommander, Tankar och Lojen. (E. G.)

TEGUCIGALPA, the capital of Honduras and of the depart- ment of Tegucigalpa; situated 3200 ft. above sea-level, on the river Choluteca, and at the head of a railway to the port of San Lorenzo on Fonseca Bay. Pop. (1905) about 35,000. Teguci- galpa is the largest and finest city in the republic. The majority of its houses are of one storey, built round a central court; the windows are usually unglazed but protected by iron bars which project into the narrow cobble-paved streets. The focus of civic life is near the central park, in which stands a bronze equestrian statue of Francisco Morazan (1792-1842), the Hondurian statesman and soldier. Fronting the park is a domed cathedral, one of the largest and most ornate churches in Honduras. Other noteworthy buildings are the government offices,

university, school of industry and art, national printing works, and law courts. A lofty ten-arched bridge over the Choluteca connects the city with its principal suburb, Con- ception or Comayaguela. Tegucigalpa became capital of Honduras, a status it had previously shared with Comayagua, in 1880. During the 18th century the neighbourhood was famous for its gold, silver and marble, but in modern times the mines and quarries have greatly declined in value, and farming is the chief local industry. In 1907 Tegucigalpa was occupied by the Nicaraguan invaders.

TEGULA, the Latin term for the convex covering tile of a roof, as distinguished from the imbrex, the concave tile (see Tiles).

TEHERAN (more properly Tehran), a province of Persia, with capital -of the same name (which is also the capital of the Persian empire). It pays a yearly revenue of about £100,000, and comprises the districts of Saujbulagh, Shahriar, Feshaviyeh, Shimran, Kasran and Veramin. The first three, situated north-west, west and south of the city of Teheran, are very fertile, and supply the capital with grain, grapes and melons. Shimran, the district north of the city, and on the slopes of the Elburz (rising to an elevation of 12,600 ft.) has 63 villages (one, Tajrish, the seat of the governor, with a population of over 3000), which are much frequented during the summer months by the inhabitants of the city seeking relief from the great heat. One of the villages, Gulhek or Gulahek, but correctly Kulhek (with a guttural K, and meaning a small, reedy mere), situated 800 ft. above the city of Teheran and 6^ m. from it, was given in fief to the British government by Fath AH Shah about 1830 for the summer quarters of the British legation. Zergendeh, a village adjoining Gulhek, is held in a similar manner by the Russian government, and the Russian legation stays there during the summer. Kasran is a hilly district north-east of Teheran, with numerous coal mines (inferior coal of the Jurassic period) and streams abounding with salmon trout. The Veramin district, south-east of Teheran

city, has 123 villages, and sup- plies the city and surrounding districts with wheat, barley and rice. It is watered by the Jajrud river, and is considered one of the most fertile districts of Persia.

TEHERAN, the capital of Persia and of the province of the same name, 70 m. S. of the southern shore of the Caspian Sea. It is situated on an immense gravel deposit which slopes down from the foot of the Elburz mountain (rising to an alti- tude of 12,600 ft.) 8 or 9 m. N. of the city, and extends for 16 m. to near Shah-abdul-Azim, 5! m. S. of it. Teheran was formerly a kind of polygon about 4 m. in circumference, with a mud wall and towers, a dry ditch and six gates, but in 1869 Nasr-ud-din Shah decided upon enlarging the city; the old wall and towers were demolished, the ditch was filled up and used for building sites, and an enceinte consisting of a ditch and 58 unequal bastions according to Vauban's first system was constructed and completed in 1874. The city then took the shape of an irregular octagon, and its circumference (a line through the salient angles of the bastions) measures 19,596 metres, cr 12-18 m. The area within the bastions is about

75 sq. m. There are twelve gates, which are closed from two hours after sunset to an hour before sunrise. According to observations taken in 1895 by British officers in connexion with determining the longitude of Madras, the longitude of Teheran (pillar at the north-western corner of the British legation grounds) is 51 25' 2-8" E. The latitude of the old telegraph office, which was situated almost due S., is 35 41' 6-83" N., and its elevation 3810 ft. The northern gates of the city are 282 ft. above the southern ones. Teheran has little to distinguish it in general outward appearance from other cities of the country, though in recent years (since the above-mentioned extension) many broad and straight streets and a number of buildings of western architecture, shops with show windows, electric lamps, cabs, &c, have been introduced. " We are in a city which was born and nurtured in the East, but is beginning to clothe itself at a West -End tailor's "

(Curzon). Most of the innovations are to be seen only in the northern part of the town where the Europeans and many well-to-do natives reside. The ark or citadel, situated nearly in the centre of the town, contains the shah 's palace and a number - of modern buildings of respectable appearance, for instance the foreign office, the war office, customs, telegraph station, arsenal, &c. Immediately north of the ark are the Maidan Tupkhaneh (Artillery Square), 270 yds. by 120, and the great Maidan i Mashk (Maidan of drill), the military parade ground, 550 yds. by 350. South of the ark are the bazaars, the central arcade and caravanserai built c. 1850 by the prime minister Mirza Taki Khan, commonly known as the amir, and beyond them, as well as on the east and west, are the quarters of the old town, with narrow, crooked and mostly unpaved and unclean streets. Teheran has 65 m. of tramways (single lines) and is connected with Shah-abdul-Azim by a single line of railway of one-metre gauge and 55 m. long (the only railway in Persia). Water is freely supplied to the town by means of about thirty underground canals (kanats), led from the slope of the northern hills and running 5 to 10 m. at considerable depths below the surface. The water supply would be ample for the requirements of the population if it could be regularly and equally distributed; but the supply in the months of October and November is only about one-half of that during March, and much water is lost through open ditches and by leakage. The distribution therefore is irregular: in winter and early spring, when the gardens require very little water from the canals, the supply is too great, and in summer it is too little. It has been calculated that the mean water supply amounts to the enormous quantity of 921,00c gallons per hour all the year round, but that, after deducting the quantity wasted in distribution, irrigation of gardens, filling tanks and baths, watering streets. &c, there remain forty-two gallons per head daily during the month of April, seventeen during July, August and September, and ten during October and November. Even the last quantity would suffice if evenly distributed, but as most of the

canals are private property and independent of government or municipal control, the distribution is unequal, and it frequently happens that when some parts of the city have water in abundance others have hardly any. Teheran has many mosques, all of recent date, the finest being the one called Masjed i Sipahsalar, built by Mirza Husain Khan Sipah- salar Azam, who was prime minister for ten years until 1884. It is situated in the new part of the city and adjoining it is the Baharistan palace, once the residence of Sipahsalar, after- wards occupied by the national assembly. Another notable mosque is the Masjed i Shah, completed c. 1840. There are also many colleges and schools, some of them with European teachers, including the " German School " (1907) with a yearly subsidy of £2200 from the shah. Before Nasr-ud-din's first voyage to Europe in 1873 only four western states had legations and consulates at Teheran; now twelve states are represented. The present population of Teheran is about 280,000, including 600 Europeans, 4000 Jews, the same number of Armenians, 200 Zoroastrians, and a garrison of 3000, to 4000. The climate is considered unhealthy, particularly in the summer and early

autumn, when typhoid, ague and other fevers ate prevalent, but something in the way of sanitation has been effected and there is a distinct improvement. The author of the Zinat el majdlis, writing in 1596, states that cholera frequently visited the city, and, the north being shut off by high moun- tains, the air was hot and evil-smelling and the water un- wholesome, in fact the climate was so bad that even the Angel of Death ran away from it. The mean yearly temperature calculated from observations taken for a number of years ending 1002 was 62-6° F., the highest temperature observed was m °, the lowest 3 , giving a difference of 108° between ' extremes. The hottest month is July, with a mean of 85-2°, the coldest January, with a mean of

34-25°. The mean annual rainfall during a period of 15 years ending 31st December 1907, was 10 ins.

In the Jehankusha i Juvaini, a Persian history written in the 13th century, the name of the town is written Tiran, while other works have the name as it is now written, viz. Tehran. The latter spelling is due to Arab influence, old Persian names being frequently Arabicized and sometimes becoming unrecog- nizable. Two villages in the neighbourhood of Isfahan appear as Tiran in old documents, while in modern revenue accounts and lists they are written Tehran. The Mujem el Buldan, a geographical dictionary written in 1224, describes Teheran as a village 4 m. distant from Rai (Rhages). Pietro della Valle, who passed a night (June 6-7, 1618) at Teheran, writes

Taheran " (perhaps thinking it to be a plural of taker, " the pure "), and Sir Thomas Herbert, who visited it on the 14th of June 1627, calls it " Tyroan," and states that it contained 3000 houses built of sun-dried bricks and had its water supply from a little river which flowed through it in two branches. Almost the whole of the city was destroyed by the Afghans in 1723, and Teheran did not regain any importance until the close of the century when Agha Mahommed Khan, the founder of the Kajar dynasty, made it his capital and residence. Dr Olivier, who visited Teheran in 1796, says, " In spite of Agha Mohammed Khan's efforts to induce people to settle and mer- chants and manufacturers to establish themselves there, the population of Teheran does not amount to 15,000 souls, includ- ing a garrison of 3000." (A. H.-S.)

TEHRI, a native state in Northern India, in political sub- ordination to the United Provinces: area, 4200 sq. m.; popu- lation (1901) 268,885; estimated revenue, £28,000. It lies entirely amid the Himalayas, containing ranges from 20,000 to 23,000 ft. above sea-level, and also the sources of both the Ganges and the Jumna, with the places of pilgrimage associated with them. The forests, which have been leased to the British government, are very

valuable, yielding several kinds of pine, oak and cedar. The crops are rice, small millets, wheat, potatoes and a little tea. The chief, whose title is raja, is descended from a Rajput family which formerly ruled over all Garhwal. The existing state was created by the British after the war with Nepal in 181 5. The town of Tehri, on the river Bhagirathi (as the Ganges is here called) has a pop. (1901) of

3387-

TEHUANTEPEC (from iecuani-tepec—" jaguar-hill "), the town which gives its name to the isthmus, gulf and railway, stands on the Tehuantepec river about 15 m. from its mouth and 13 m. by rail from Salina Cruz. Pop. (1904, estimated) 10,000. It is a typical, straggling Indian town, occupying the slope of a hill on the Pacific side of the divide, with a beautiful view of the river valley and the distant sierras to the N. The streets are little more than crooked paths up the hillside, and the habitations are for the most part thatched, mud-walled huts. The population of the town and of the surrounding district is composed almost wholly of Indians of the great Zapoteca family. The Tehuanas of Tehuantepec are noted for the beauty and graceful carriage of their women, who are reputed to be the finest-looking among the native races of Mexico. The women are the traders in Tehuantepec and do little menial work — a result, apparently, of the influence of beauty. The local industries include the making of " caiia," a

cane spirit, and the weaving of cotton fabrics,- dyed with the juice of a marine shell-fish (Purpura patula) found on the neighbouring coast. Indigo was formerly grown in the vicinity and cochineal gathered for export, but both of these industries have declined.

TEHUANTEPEC, an isthmus of Mexico lying between the Gulfs of Campeche (Campeachy) and Tehuantepec, with the Mexican states of Tabasco and Chiapas on the E., and Vera Cruz and Oaxaca on the W. It includes that part of Mexico lying between the 94th and 96th

meridians of W. longitude, or the south-eastern parts of Vera Cruz and Oaxaca, with perhaps small districts of Chiapas and Tabasco. It is 125 m. across at its narrowest part from gulf to gulf, or 120 m. to the head of Laguna Superior on the Pacific coast. The Sierra Madre breaks down at this point into a broad, plateau-like ridge, whose elevation, at the highest point reached by the Tehuan- tepec railway (Chivela Pass) is 735 ft. The northern side of the isthmus is swampy and densely covered with jungle, which has been a greater obstacle to railway construction than the grades in crossing the sierra. The whole region is hot and malarial, except the open elevations where the winds from the Pacific render it comparatively cool and healthful. The annual rainfall on the Atlantic or northern slope is 1 56 in. (Enock) and the maximum temperature about 95° in the shade. The Pacific slope has a light rainfall and dryer climate.

Since the days of Cortes, the Tehuantepec isthmus has been considered a favourable route, first for an interoceanic canal, and then for an interoceanic railway. Its proximity to the axis of international trade gives it some advantage over the Panama route, which is counterbalanced by the narrower width of the latter. When the great cost of a canal across the isthmus compelled engineers and capitalists to give it up as impracticable, James B. Eads proposed to construct a quadruple track ship-railway, and the scheme received serious attention for some time. Then came projects for an ordinary railway, and several concessions were granted by the Mexican govern- ment for this purpose from 1857 to 1882. In the last-named year the Mexican government resolved to undertake the enter- prise on its own account, and entered into contracts with a prominent Mexican contractor for the work. In 1888 this contract was rescinded, after 67 m. of road had been completed. The next contract was fruitless through the death of the contractor, and the third failed to complete the work within the sum specified (£2,700,000). This was in 1893, and 37 m. remained to be built. A fourth contract resulted in the com- pletion of the line

from coast to coast in 1894, when it was found that the terminal ports were deficient in facilities and the road too light for heavy traffic. The government then entered into a contract with the London firm of contractors of S. Pearson & Son, Ltd., who had constructed the drainage works of the valley of Mexico and the new port works of Vera Cruz, to rebuild the line and construct terminal ports at Coatzacoalcos, on the Gulf coast, and Salina Cruz, on the Pacific side. The work was done for account of the Mexican govern- ment. Work began on the 16th of December 1899, and was finished to a point where its formal opening for traffic was possible in January 1907.

The railway is 192 m. long, with a branch of 18 m. between Juile and San Juan Evangelista. The minimum depth at low water in both ports is 33 ft., and an extensive system of quays and railway tracks at both terminals affords ample facilities for the expeditious handling of heavy cargoes. The general offices, shops, hospital, &c, are located at Rincon Antonio, at the entrance to the Chivela Pass, where the temperature is cool and healthful conditions prevail. At Santa Lucrecia, 109 m, from Salina Cruz, connexion is made with the Vera Cruz & Pacific railway (a government line), 213 m. to Cordova and 311 m. to Mexico city.

TEHUELCHE, Chuelche, or Huilliche (" Southern People "), the generic name given by the whites of Argentina to the Indian tribes of Patagonia (q.v.).

TEIGNMOUTH, JOHN SHORE, ist Baron (1 751-1834), governor-general of India, was born on the 8th of October 1751, the son of Thomas Shore, a supercargo in the service of the

East India Company. He was educated at Harrow, and went out to India as a writer in the Bengal Civil Service in 1769. He became a member of the Supreme

Council (1787–89), in which capacity he assisted Lord Cornwallis in introducing many reforms, but did not approve his permanent settlement of Bengal. On the retirement of Cornwallis, he was appointed governor- general (1793–98), adopting a policy of non-interference, but deposed Wazir AH, for whom he substituted Saadat Ali as nawab of Oudh. His term of office was also signalized by a mutiny of the officers of the Indian army, which he met with concessions. He was created a baronet in 1792, and Baron Teignmouth in the peerage of Ireland in 1798. On his retire- ment from India he was appointed member of the board of control (1807–28), and was for many years president of the British and Foreign Bible Society. He died on the 14th of February 1834.

See Memoirs of Lord Teignmouth, by his son (1843).

TEIGNMOUTH, a seaport and market town in the Ashburton parliamentary division of Devonshire, England, at the mouth of the river Teign, on the English Channel, 15 m. S. by E. of Exeter, by the Great Western railway. Pop. of urban district (1901) 8636. Two parishes, East and West Teignmouth, form the town. It lies partly on a peninsula between the river and the sea, partly on the wooded uplands which enclose the valley and rise gradually to the high moors beneath Heytor. The Den, or Dene, forms a promenade along the sea-front, with a small lighthouse and a pier. St Michael's church in East Teign- mouth was rebuilt in 1824 in Decorated style, but retains a Norman doorway and other ancient portions; of St James', in West Teignmouth, the south porch and tower are Norman. There are a theological college for Redemptorists, and a Bene- dictine convent, dedicated to St Scholastica. The entrance to the harbour has been improved by dredging, and the two quays accommodate vessels drawing 13 ft. at neap tides. Pipeclay and china clay, from Kingsteignton, are shipped for the Stafford- shire potteries, while coal and general goods are imported. Pilchard, herrings, whiting and mackerel are taken, and salmon in the Teign. Malting, brewing and boatbuilding are also carried on. East Teignmouth was formerly called Teignmouth

Regis, and West Teignmouth, Teignmouth Episcopi.

Teignmouth (Teinemue, Tengemue) possessed a church of St Michael as early as 1044, when what is now East Teign- mouth was granted by Edward the Confessor to Leofric, bishop of Exeter, and an allusion to salterers in the same grant proves the existence of the salt industry at that date. Teignmouth is not mentioned in the Domesday Survey, but in 1276 what is now West Teignmouth appears as a mesne borough held by the dean and chapter of Exeter; what is now East Teign- mouth continuing with the bishop, who was accused in that year of holding in his manor a market which should be held in the borough. The bishop's manor was alienated in 1550 to Sir Andrew Dudley, but West Teignmouth remained with the dean and chapter until early in the 19th century. In the middle ages Teignmouth was a flourishing port, able to furnish 7 ships and 120 mariners to the Calais expedition of 1347, and depending chiefly on the fishing and salt industries. In the early part of the 17 th century the town had fallen into decay, but it speedily recovered, and in 1744 could contribute twenty vessels to the Newfoundland shipping trade. The borough was never represented in parliament, nor incorporated by charter. The Saturday market, which was held up to the 19th century, is mentioned in 1220, and was confirmed by royal charter in 1253, together with a fair at Michaelmas. Teignmouth was burned by French pirates in 1340, and was again devastated by the French on the 26th of June 1690.

See Victoria County History, Devonshire; The Teignmouth Guide and Complete Handbook to the Town and Neighbourhood (Teignmouth,

1875)-

TEIRESIAS, in Greek legend, a famous Theban seer, son of Eueres and Chariclo. He was a descendant of Udaeus, one of the men who had sprung up from the serpent's teeth sown by Cadmus. He was blind from his seventh year, for which

*various causes were alleged. Some said that the gods had blinded him because he had revealed to men what they ought not to know. Others said that Athena (or Artemis) blinded him because he had seen her naked in the bath; when his mother prayed Athena to restore his sight, the goddess, being unable to do so, purged his ears so that he could understand the speech of birds, and gave him a staff wherewith to guide his steps (Apollodorus iii. 6). According to Sostratus, author of an elegiac poem called Teiresias, he was originally a girl, but had been changed into a boy by Apollo at the age of seven; after undergoing several more transformations from one sex to the other, she (for the final sex was feminine) was turned into * a mouse and her lover Arachnus into a weasel (Eustathius on Odyssey, p. 1665). Teiresias' grave was at the Tilphusian spring; but there was a cenotaph of him at Thebes, and also in later times his " observatory," or place for watching for omens from birds, was pointed out (Pausanias ix 16; Sophocles, Antigone, 999). He had an oracle at Orchomenus, but during a plague it became silent and remained so in Plutarch's time (De Defectu Oraculorum, 44). According to Homer (Od. x. 492, xi. 90), Teiresias was the only person in the world of the dead whom Proserpine allowed to retain his memory and intellect unimpaired, and Circe sends Odysseus to consult him concerning his return home. He figured in the great paintings by Polygnotus in the Lesche at Delphi.*

TEISSERENC DE BORT, PIERRE EDMOND (1814-1892), French writer and politician, was born at Chateauroux on the 17th of September 1814, and entered the civil service after the completion of his education at the ficole Polytechnique. He was a railway expert, becoming secretary-general of the Rail- way Commission established in 1842, government commissioner to the authorized railway companies, administrator of the Lyons-Mediterranean railway, and commissioner to examine foreign railways. In 1846 he was returned to the Chamber of Deputies for Herault, but the revolution of 1848 drove him into private life, from which he only emerged after the

down- fall of the Empire, when in February 187 1 he was returned to the National Assembly. He supported the government of Thiers and was minister of agriculture and commerce in 1872-73. He sat in the Left Centre, and steadily supported republican principles. He entered the Senate in 1876, and was minister of agriculture in the Dufaure-Ricard cabinet of that year, retaining his portfolio in the Jules Simon ministry which fell on the 16th of May 1877. In 1878, when he joined the new Dufaure cabinet, he opened the Paris exhibition of agriculture and manufactures, the original suggestion of which had been made by him during his 1876 ministry. In 1879 he was sent as ambassador to Vienna, whence he was next year recalled on the score of health. Two years later he re-entered the Senate, where he did good service to the cause of " Republican Defence " during the Boulangist agitation. He died in Paris on the 29th of July 1892. His works consist of discussions of railway policy from the technical and economic side.

TELAMONES (Gr. reXa/Koc, supporter, from rXrjvm, to bear), in architecture the term used by the Romans as equivalent to Atlantes (the Greek term) for male figures employed to carry architraves and cornices. The best-known examples are those in the tepidarium of the baths of Pompeii, which consist of small figures in terra-cotta, 2 ft. high, placed between niches and carrying a cornice.

TELANG, KASHINATH TRIMBAK (1850-1893), Indian judge and oriental scholar, was born at Bombay on the 30th of August 1850. By profession an advocate of the high court, he also took a vigorous share in literary, social, municipal and political work, as well as in the affairs of the university of Bombay, over which he presided as vice-chancellor from 1892 till his death. At the age of five Telang was sent to the Amarchaud Wadi vernacular school, and in 1859 entered the high school in Bombay which bears the name of Mountstuart Elphinstone. Here he came under the influence of Narayan Mahadev Purmanand, a teacher of fine intellect and force of character, afterwards one of Telang's most intimate friends.

From this school he passed to the Elphinstone College, of which he became a fellow, and after taking the degree of M.A. and LL.B., decided to follow the example of Bal Mangesh Wagle, the first Indian admitted by the judges to practise on the original side of the high court, a position more like the status of a barrister than a vakil or pleader. He passed the examination and was enrolled in 1872. His learning and other gifts soon brought him an extensive practice. He had complete com- mand of the English language, and his intimacy with Sanskrit enabled him to study and quote the Hindu law-books with an ease not readily attained by European counsel. Telang, finding his career assured, declined an offer of official employment. But in 1889 he accepted a seat on the high court bench, where his judgments are recognized as authoritative, especially on the Hindu law. He was syndic of the university from 1881, and vice-chancellor from 1892 till his death. In that year also he was elected president of the local branch of the Royal Asiatic Society. These two offices had never been held by a native of India before. The decoration of CLE. conferred on him in 1882 was a recognition of his services as a member of a mixed commission appointed by the government to deal with the educational system of the whole of India. He was nominated to the local legislative council in 1884, but declined a similar position on the viceroy's council. Along with P.M. Metha, he was the originator of the Bombay Presidency Associa- tion. When a student he had won the Bhugwandas scholarship in Sanskrit, and in this language his later studies were profound. His translation of the Bhagwadgita into English prose and verse is a standard work; and he criticized Professor Weber's hypo- thesis that the story of the Ramayana was influenced by the Homeric epics. While devoted to the sacred classics of the Hindus, Telang did not neglect his own vernacular, Mahratti literature being enriched by his translation of Lessing's Nathan the Wise, and an

essay on Social Compromise. He died at Bombay on the 1st of September 1893.

TELAV, a town of Russian Transcaucasia, in the government of Tiflis, 63 m. N.E. of the town of Tiflis, on the river Alazan and at an altitude of 2420 ft. Pop. (1897) 11,810, chiefly Armenians (9000) and Georgians (2000). Telav is a very old town, founded in 893, and until 1797 it was the capital of Kakhetia, and has ruins of old forts. In the neighbourhood are the Ikaltoi monastery (6th century), the Shuanty monastery (16th century), and the originally 10th century Alaverdi church, visited by many pilgrims. Wine is exported.

TELEGONY (Gr. r^Xe, far, and yovos, offspring), the name now given to the hypothesis that offspring sometimes inherit characters from a previous mate of their dam. Until recent years the supposed inheritance of characters acquired by a dam from one or more of her former mates was usually designated by breeders ” throwing back “; by physiologists, ” infection of the germ,” er simply ” infection.” The doctrine of ” in- fection,” like the somewhat allied doctrine of ” maternal impressions,” seems to be alike ancient and widespread. Evidence of the antiquity of the belief in ” maternal impressions ” we have in Jacob placing peeled rods before Laban’s cattle to induce them to bring forth ” ring-straked speckled and spotted ” offspring; evidence of the antiquity of the ” infection ” doctrine we have, according to some writers, in the practice amongst the Israelites of requiring the childless widow to marry her deceased husband’s brother, that he might ” raise up seed to his brother.” Whatever may have been the views of stock- owners in the remote past, it is certain that during the middle ages the belief in ” infection ” was common amongst breeders, and that during the last two centuries it met with the general approval of naturalists, English breeders being especially satisfied of the fact that the offspring frequently inherited some of their characters from a former mate of the dam, while both English and Continental naturalists (apparently without putting the assertions of breeders to the

test of experiment) accounted for the " throwing back " by saying the germ cells of the dam had been directly or indirectly " infected " by a former mate. It is noteworthy that L. Agassiz, C. Darwin,

W. B. Carpenter, and G. J. Romanes were all more or less firm believers in the doctrine of infection, and that a few years ago, with the exception of Professor A. Weismann, all the leading biologists had either subscribed to the telegony doctrine or admitted that " infection of the germ " was well within the bounds of possibilities. Even Professor Weismann did not deny the possibility of the offspring throwing back to a previous mate. The widespread belief, he admitted, " may be justifiable and founded on fact," but he was careful to add that " only the confirmation of the tradition by methodical investigation, in this case by experiment, could raise telegony to the rank of a fact." In assuming this attitude Professor Weismann de- cidedly differed from Herbert Spencer, who some years ago mentioned that he had evidence " enough to prove the fact of a previous sire asserting his influence on a subsequent progeny."

The importance of determining whether there is such a thing as telegony is sufficiently evident. If a mare or other female animal is liable to be " infected " by her first or by subsequent mates, telegony will rank as a cause of variation, and breeders will be justified in believing (1) that pure-bred females are liable to be " corrupted " when mated with sires of a different breed; and (2) that inferior or cross-bred females, if first mated with a high-class sire, will thereafter produce superior offspring, how- ever inferior or cross-bred her subsequent mates. If, on the other hand, " infection of the germ " is impossible, telegony will not count as a factor in variation, and breeders will no longer be either justified in regarding mares and other female animals as liable to be " corrupted " by ill-assorted unions, or benefited by first having offspring to a high-class, or it may be more vigorous, mate. Though, according to breeders, evidence of telegony has been found in nearly all

the different kinds of domestic mammals and birds, most stress has been laid on instances of " infection " in the horse and dog families.

Telegony in the Horse Family. — Beecher at the end of the 17th century pointed out that " when a mare has had a mule by an ass and afterwards a foal by a horse, there are evident marks on the foal of the mother having retained some ideas of her former paramour, the ass." That mares used in mule breeding are liable to be infected is still widely believed, but irrefragable evidence of the influence of the ass persisting, as Agassiz assumed, is conspicuous by its absence. Darwin says, " It is worth notice that farmers in south Brazil . . . are convinced that mares which have once borne mules when subsequently put to horses are extremely liable to produce colts striped like a mule " (Animals and Plants, vol. i. p. 436). Baron de Parana, on the other hand, says, " I have many relatives and friends who have large establishments for the rearing of mules, where they obtain from 400 to 1000 mules in a year. In all these establishments, after two or three crossings of the mare and ass, the breeders cause the mare to be put to a horse; yet a pure-bred foal has never been produced resembling either an ass or a mule."

The prevalence of the belief in telegony at the present day is largely due to a case of supposed infection reported to the Royal Society in 1820 by Lord Morton. A chestnut mare, after having a hybrid by a quagga, produced to a black Arabian horse three foals showing a number of stripes — in one more stripes were present than in the quagga hybrid. The more, however, the case so intimately associated with the name of Lord Morton is considered,, the less convincing is the evidence it affords in favour of "infection." Stripes are frequently seen in high-caste Arab horses, and cross-bred colts out of Arab mares sometimes present far more distinct bars across the legs and other zebra-like markings than characterized the subse- quent offspring of Lord Morton's seven-eighths Arabian mare. In the absence of control experiments there is therefore no reason

for assuming Lord Morton's chestnut mare would have produced less striped offspring had she been mated with the black Arabian before giving birth to a quagga hybrid. To account for the stripes on the subsequent foals, it is only necessary (now that the principles of cross-breeding are better understood) to assume that in the cross-bred chestnut mare there lay latent the characteristics of the Kattiawar or other

Indian breeds, in which stripes commonly occur. Darwin and others having regarded Lord Morton's mare as affording very strong evidence in support of the infection hypothesis, it was considered some years ago desirable to repeat Lord Morton's experiment as accurately as possible. The quagga having become extinct, a number of mares were put to a richly striped Burchell zebra, and subsequently bred with Arab, thorough- bred and cross-bred sires. Other mares were used for control experiments. Thirty mares put to a Burchell zebra produced seventeen hybrids, and subsequently twenty pure-bred foals. The mares used for control experiments produced ten pure- bred foals. Unlike Lord Morton's quagga hybrids, all the zebra hybrids were richly, and sometimes very distinctly, striped, some of them having far more stripes than their zebra parent. Of the subsequent foals, three out of Highland mares presented indistinct markings at birth. But as equally dis- tinct markings occurred on two pure-bred Highland foals out of mares which had never seen a zebra, it was impossible to ascribe the stripes on the foals born after zebra hybrids to infection of their respective dams. Further, the subsequent foals afforded no evidence of infection, either in the mane, tail, hoofs or disposition. Of the pure-bred foals, i.e. the foals by pure-bred sires out of mares which had never been mated with a zebra, two were striped at birth and one acquired stripes later — they were revealed as the foal's coat was shed. More- over, while the faint markings

on the foals born after hybrids completely disappeared with the foals' coat, the stripes on the three pure-bred colts persisted. One of the permanently striped colts, a bay, was out of a black Shetland mare by a black Shetland sire, one was by a dun Norwegian pony out of a roan-coloured Arab mare, while the third was by a Norwegian pony out of a half-bred bay Arab mare. It has been asserted by believers in telegony that evidence of infection may. appear in the second though not present in the first generation. By way of testing this assumption, a bay filly, the half-sister of a richly striped hybrid, was put to a cross-bred Highland pony, and a Highland mare, while nursing her hybrid foal, was put to a colt the half-brother of a hybrid. The result was two fillies which in no single point either suggest a zebra or a zebra hybrid. Similar results having been obtained with horses and asses, there is no escape from the conclusion that the telegony tradition is not confirmed by such methodical investigations as were suggested some years ago by Professor Weismann (see CossarEwart, The Penycuik Experiments, 1899).

Telegony in Dogs. — Breeders of dogs are, if possible, more thoroughly convinced of the fact of telegony than breeders of horses. Nevertheless, Sir Everett Millais, a recognized authority, has boldly asserted that after nearly thirty years' experience, during which he made all sorts of experiments, he had never seen a case of telegony. Recent experiments support Millais's conclusion. Two of the purest breeds at the present day are the Scottish deerhound and the Dalmatian (spotted carriage-dog), A deerhound after having seven pups to a Dalmatian was put to a dog of her own breed. The result was five pups, which have grown into handsome hounds without the remotest suggestion of the previous Dalmatian mate of their dam. A similar result was obtained with a deerhound first mated with a retriever. Many accidental experiments on telegony are made annually with dogs. Two such experi- ments may be mentioned. A black-brindled Scottish terrier belonging to a famous breed had first a litter of

pups to a curly-haired liver-and-white cocker-spaniel. The pups were spaniel-like in build, and of a brown-and-white colour. Sub- sequently this terrier had pups to a black-brindled terrier. All the pure-bred pups were typical terriers, and evidence of their dam having escaped infection is the fact that three of them proved noted prize-winners. The subject of the second undesigned experiment was a wire-haired fox-terrier. In this case the first sire was a white Pomeranian, the second a cross- bred Irish terrier. Having had ample opportunity of being " corrupted," the fox-terrier was mated with a prize dog of her own strain. The result was three pups, all in make and

markings pure terriers, and one of the three was regarded as an unusually good specimen of the breed.

Experiments with cats, rabbits, mice, with sheep and cattle, with fowls and pigeons, like the experiments with horses and dogs, fail to afford any evidence that offspring inherit any of their characters from previous mates of the dam; i.e. they entirely fail to prove that a female animal is liable to be so influenced by her first mate that, however subsequently mated, the offspring will either in structure or disposition give some hint of the previous mate. In considering telegony it should perhaps be mentioned that some breeders not only believe the dam is liable to be " infected " by the sire, but also that the sire may acquire some of the characteristics of his mates. This belief seems to be especially prevalent amongst breeders of cattle; but how, for example, a long-horned Highland bull, used for crossing with black hornless Galloway cows, could subsequently get Galloway-like calves out of pure Highland heifers it is impossible to imagine.

In conclusion, it may be pointed out that it was only natural for breeders and physiologists in bygone days to account for some of their results by the " infection " hypothesis. Even now we know surprisingly little about the causes of variation, and not many years ago it was frequently asserted that there was no such thing as reversion or

throwing back to an ancestor. But even were the laws of heredity and variation better under- stood, the fact remains that we know little of the origin of the majority of our domestic animals. On the other hand, from the experiments of Mendel and others, we now know that cross- bred animals and plants may present all the characters of one of their pure-bred parents, and we also know that the offspring of what are regarded as pure-bred parents sometimes revert to remote, it may be quite different, ancestors. The better we understand the laws of heredity and variation, and the more we learn of the history of the germ cells, the less need will there be to seek for explanations from telegony and other like doctrines. (J.C.E.)

TELEGRAPH (Gr. rijXe, far, and ypaeiv, to write), the name given to an apparatus for the transmission of intelligence to a distance. Etymologically the word implies that the messages are written, but its earliest use was of appliances that depended on visual signals, such as the semaphore or optical telegraph of Claude Chappe. The word is still some- times employed in this sense, as of the ship's telegraph, by means of which orders are mechanically transmitted from the navigating bridge to the engine room, but when used without qualification it usually denotes telegraphic apparatus worked by electricity, whether the signals that express the words of the message are visual, auditory or written.

Land and Submarine Telegraphy will be considered in Part I., with a section on the commercial aspects. In Part II. Wireless Telegraphy is dealt with.

Part I. — Land and Submarine Telegraphy Historical Sketch. — Although the history of practical electric telegraphy does not date much further back than the middle of the 19th century, the idea of using electricity for telegraphic purposes is much older. It was suggested again and again as each new discovery in electricity and magnetism seemed to render it more feasible. Thus the discovery of Stephen Gray and of Granville Wheeler that the electrical influence of a charged Leyden jar may be

conveyed to a distance by means of an insulated wire gave rise to various proposals, of which perhaps the earliest was that in an anonymous letter 1 to the Scots Magazine (vol. xv. p. 73, 1753), in which the use of as many insulated conductors as there are letters in the alphabet was suggested. Each wire was to be used for the transmission of one letter only, and the message was to be sent by charging the proper wires in succession, and received by observing the

1 From correspondence found among Sir David Brewster's papers after his death it seems highly probable that the writer of this letter, which was signed " C. M.," was Charles Morrison, a surgeon arid a native of Greenock, but at that time resident in Renfrew.

movements of small pieces of paper marked with the letters of the alphabet and placed under the ends of the wires. A very interesting modification was also proposed in the same letter, viz. to attach to the end of each wire a small light ball which when charged would be attracted towards an adjacent bell and strike it. Some twenty years later G. L. Le Sage proposed a similar method, in which each conductor was to be attached to a pith ball electroscope. An important advance on this was proposed in 1797 by Lomond, 1 who used only one line of wire and an alphabet of motions. Besides these we have in the same period the spark telegraph of Reiser, of Don Silva, and of Cavallo, the pith ball telegraph of Francis Ronalds (a model of which is in the collection of telegraph apparatus in the Victoria and Albert Museum), and several others.

Next came the discovery of Galvani and of Volta, and as a consequence a fresh set of proposals, in which voltaic electricity was to be used. The discovery by

Nicholson and Carlisle of the decomposition of water, and the subsequent researches of Sir H. Davy on the decomposition of the solutions of salts by the voltaic current were turned to account in the water volta- meter telegraph of Sommering and the modification of it pro- posed by Schweigger, and in a similar method proposed by Coxe, in which a solution of salts was substituted for water. Then came the discovery by G. C. Romagnosi and by H. C. Oersted, of the action of the galvanic current on a magnet. The application of this to telegraphic purposed was suggested by Laplace and taken up by Ampere, and afterwards by Tri- boaillet and by Schilling, whose work forms the foundation of much of modern telegraphy. Faraday's discovery of the induced current produced by passing a magnet through a helix of wire forming part of a closed circuit was laid hold of in the telegraph of Gauss and Weber, and this application was at the request of Gauss taken up by Steinheil, who brought it to considerable perfection. Steinheil communicated to the Gottingen Academy of Sciences in September 1838 an account of his telegraph, which had been constructed about the middle of the preceding year. The currents were produced by a magneto-electric machine resembling that of Clarke. The receiving apparatus consisted of a multiplier, in the centre of which were pivoted one or two magnetic needles, which either indicated the message by the movement of an index or by striking two bells of different tone, or recorded it by making ink dots on a ribbon of paper.

Steinheil appears to have been anticipated in the matter of a recording telegraph by Morse of America, who in 1835 con- structed a rude working model of an instrument; this within a few years was so perfected that with some modification in detail it has been largely used ever since (see below). In 1836 Cooke, to whom the idea appears to have been suggested by Schilling's method, invented a. telegraph in which an alphabet was worked out by the single and combined movement of three needles. Subsequently, in conjunction with Wheatstone, he introduced another

form, in which five vertical index needles, each worked by a separate multiplier, were made to point out the letters on a dial. Two needles (for some letters, one only) were acted upon at the same time, and the letter at the point of intersection of the direction of the indexes was read. This telegraph required six wires, and was shortly afterwards displaced by the single-needle system, still to a large extent used on railway and other less important circuits. The single- needle instrument is a vertical needle galvanoscope worked by a battery and reversing handle, or two " tapper " keys, the motions to right and left of one end of the index corre- sponding to the dashes and dots of the Morse alphabet. To increase the speed of working, two single-needle instruments were sometimes used (double-needle telegraph). This system required two line wires, and, although a remarkably serviceable apparatus and in use for many years, is no longer employed. Similar instruments to the single and double needle apparatus of Cooke and Wheatstone were about the same time invented by the Rev. H. Highton and his brother Edward Highton, and 1 See Arthur Young, Travels in France, p. 3.

were used for a considerable time on some of the railway lines in England. Another series of instruments, introduced by Cooke and Wheatstone in 1840, and generally known as " Wheat- stone's step-by-step letter-showing " or " ABC instruments," were worked out with great ingenuity of detail by Wheatstone in Great Britain and by Breguet and others in France. The Wheatstone instrument in the form devised by Stroh is still largely used in the British Postal Telegraph Department. Wheatstone also described and to some extent worked out an interesting modification of his step-by-step instrument, the object of which was to produce a letter-printing telegraph.- But it never came into use; some years later,, however, an instrument embodying the same principle, although differing greatly in mechanical detail, was brought into use by Royal E. House, of Vermont, U.S., and was very successfully worked on some of the American

telegraph lines till i860, after which it was gradually displaced by other forms. Various modifications of the instrument are still employed for stock telegraph purposes.

Construction of Telegraph Circuits. — The first requisite for electro-telegraphic communication between two localities is an insulated conductor extending from one to the other. This, with proper apparatus for originating electric currents at one end and for discovering the effects produced by them at the other end, constitutes an electric telegraph. Faraday's term " electrode," literally " a way (680s) for electricity to travel along," might be well applied to designate the insulated con- ductor along which the electric messenger is despatched. It is, however, more commonly and familiarly called " the wire " or " the line." The apparatus for generating the electric action at one end is commonly called the transmitting apparatus or instrument, or the sending apparatus or instrument, or some- times simply the transmitter or sender. The apparatus used at the other end of the line to render the effects of this action perceptible to the eye or ear, is called the receiving apparatus or instrument.

In the aerial or overground system of land telegraphs the use of copper wire has become very general. The advantage of the high conducting power which copper possesses Over- is of especial value in moist climates (like that of ground the United Kingdom), since the effect of leakage over lines. the surface of the damp insulators is much less notice- able when the conducting power of the wire is high than when it is low, especially when the line is a long one. Copper is not yet universally employed, price being the governing factor in its employment; moreover, the conducting quality of the iron used for telegraphic purposes has of late years been very greatly improved.

In the British Postal Telegraph system five sizes of iron wire are in general use, weighing respectively 200, 400, 450, 600 and 3oo lb per statute mile, and

having electrical resistances (at 60° F.) of 26-64, 13-32, 11-84, 8-88 and 6-66 standard ohms per statute mile respectively. The sizes of copper wire employed have weights of 100, 150, 200 and 400 lb' per statute mile, and have electrical resistances (at 6o° F.) of 8-782, 5-855, 4-391 and 2-195 standard ohms respectively. Copper wire weighing 600 and 800 lb per mile has also been used to some extent. The copper is " hard drawn," and has a breaking strain as high as 28 tons per sq. in.; the test strain required for the iron wire is about 22 1 tons. The particular sizes and descriptions of wires used are dependent upon the character of the " circuits " the longer and more important circuits requiring the heavier wire.

The lines are carried on poles, at a sufficient height above the ground, by means of insulators. These vary in form, but essentially they consist of a stem of porcelain, coarse earthen- ware, glass or other non-conducting substance, protected by an overhanging roof or screen. The form in general use on the British postal lines is the " Cordeaux screw," but the " Varley dolible cup " is still employed, especially by the railway companies.

The latter form consists (fig. 1) of two distinct cups (c, C), which are moulded and fired separately, and afterwards cemented together. The double cup gives great security against loss of insulation due to cracks extending through the insulator, and also gives a high surface insulation. An iron bolt (6) cemented into the centre of the inner cup is used for fixing the insulator to the pole or bracket.

This form of insulator is still largely used and is a very serviceable pattern, though possessing the defect that the porcelain cup is not removable from the iron bolt on which it is mounted. The Cordeaux

insulator (fig. 2) is made in one piece. A coarse screw-thread is formed in the upper part of the inner cup, and this screws on to the end of the iron bolt by which it is supported. Between a shoulder, a, in the iron bolt and a shoulder in the porcelain cup, c, is placed an indiarubber ring, which forms a yielding washer and enables the cup to be screwed firmly to the bolt, while preventing

Fig. 1. — Varley's Double Cup Insulator, one- fourth full size.

Fig. 2. — Cordeaux Insulator.

the abrasion of the porcelain against the iron. The advantage of the arrangement is that the cup can at any time be readily removed from the bolt. At the termination of a line a large insulator (fig- 3)1 mounted on a strong steel bolt having a broad base flange, is employed. Connexion is made into the office (or to the under- ground system, as is often the case) from the aerial wire by means of a copper conductor, insulated with gutta-percha, which passes through a " leading in " cup, whereby leakage is prevented between the wire and the pole. The insulators are planted on creosoted oak arms, 2J in. sq. and varying in length from 24 to 48 ins., the 24 and 33 in. arms taking two, and the 48 in. four, insulators. The

Fig. 3.— Terminal Insulator.

unequal lengths of the 24 and 33 in. arms are adopted for the pur- pose of allowing one wire to fall clear of that beneath it, in the case of an insulator breaking or the securing binder giving way. The poles are of red fir, creosoted, this method of preservation being the only one now used for this purpose in the United Kingdom. The number of poles varies from about 15 to 22 per m. of line; they are planted to a depth of from 2 to 4 ft. in the ground. For protection from lightning each pole has an " earth wire " running from the top, down to the base.

Gutta-percha-covered copper wires were formerly largely used for the purpose of underground lines, the copper conductor Under- weighing 40 lb per statute mile, and the gutta-percha ground covering 50 lb (90 lb total). The introduction of lines ' paper cables, i.e. copper wires insulated with carefully

dried paper of a special quality, has practically entirely super- seded the use of wires insulated with gutta-percha. The paper cables consist of a number of wires, each enveloped in a loose covering of well-dried paper, and loosely laid up together with

a slight spiral " lay " in a bundle, the whole being enclosed in a stout lead pipe. It is essential that the paper covering be loose, so as to ensure that each wire is enclosed in a coating not of paper only, but also of air; the wires in fact are really insulated from each other by the dry air, the loose paper acting merely as a separator to prevent them from coming into con- tact. The great advantage of this air insulation is that the electrostatic capacity of the wires is low (about one-third of that which would be obtained with gutta-percha insulation), which is of the utmost importance for high-speed working or for long- distance telephonic communication. As many as 1200 wires are sometimes enclosed in one lead pipe.

Between London and Birmingham a paper cable 116 m long and consisting of 72 copper conductors, each weighing 150 ft) per statute mile, was laid in 1900. The conductors are enclosed in a lead pipe, 2\ in. in outside diameter and J in. thick, which itself is enclosed in cast iron spigot-ended pipes, 3 in. in internal diameter, and buried 2 ft. below the surface of the roadway. At intervals of 2 m. " test pillars " are placed for the purpose of enabling possible faults to be accurately located. Each conductor has a resistance (at 6o° F.) of 5-74 ohms per statute mile, and an average electro- static capacity per mile between adjacent wires of 0-06 microfarad, or between wire and earth of o-l

microfarad; the insulation resist- ance of each wire is about 5000 megohms per mile. The under- ground system of paper cables has been very largely extended. Cables between London, Glasgow, Edinburgh, Liverpool Leeds, Bristol, Exeter and other important towns have been laid, and eventually telegraphic communication between every important town in the United Kingdom will be rendered safe from interruptions caused by gales or snowstorms.

The one disadvantage of paper cables is the fact that any injury to the lead covering which allows moisture to penetrate causes telegraphic interruption to the whole of the enclosed wires, whereas if the wires are each individually coated with gutta-percha, the presence of moisture can only affect those wires whose covering is defective There is no reason for doubting, however, that, provided the lead covering remains intact, the paper insulation is imperishable; this is not the case with gutta-percha-covered wires.

In order to maintain a system of telegraph lines in good working condition, daily tests are essential. In the British Postal Telegraph Department all the most important Testing wires are tested every morning between 7.30 and 7.45 a.m., in sections of about 200 miles. The method adopted consists in looping the wires in pairs between two testing offices, A and B (fig. 4) ; a current is sent from a battery, E, through

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Fig. 4. — Method of testing Circuits.

one coil of a galvanometer, g, through a high resistance, r, through one of the wires, 1, and thence back from office B (at which the wires are looped), through wire 2, through another high resistance, r' , through a second coil on the

galvanometer, g, and thence to earth. If the looped lines are both in good condition and free from leakage, the current sent out on line 1 will be exactly equal to the current received back on line 2; and as these currents will have equal but opposite effects on the galvanometer needle, no deflection of the latter will be pro- duced. If, however, there is leakage, the current received on the galvanometer will be less than the current sent out, and the result will be a deflection of the needle proportional to the amount of leakage.

The galvanometer being so adjusted that a current of definite strength through one of the coils gives a definite deflection of the needle, the amount of leakage expressed in terms of the insulation resistance of the wires is given by the formula

Total insulation resistance of looped lines = §R(D/ rf — f) ; in which R is the total resistance of the looped wires, including the resistance of the two coils of the galvanometer, of the battery, and of the two resistance coils r and r′ (inserted for the purpose of causing the leakage on the lines to have a maximum effect on the galvanometer deflections). In practice the resistances r, r′ are

Batteries.

of 10,000 ohms each. The deflection observed on the galvanometer when the line's are leaky is d, while D is the deflection obtained through one coil of the galvanometer with all the other resistances in circuit; and assuming that no leakage exists on the lines, this deflection is calculated from the " constant " of the instrument, i.e., from the known deflection obtained with a definite current. For the purpose of avoiding calculation, tables are provided show- ing the values of the total insulation

according to the formula, corresponding to various values of d. If the insulation per mile, i.e., the total insulation multiplied by the mileage of the wire loop, is found to be less -than 200,000 ohms, the wire is considered to be faulty. The climatic conditions in the British Islands are such that it is not possible to maintain, in unfavourable weather, a higher standard than that named, which is the insulation obtained when all the insulators are in perfect condition and only the normal leakage, due to moisture, is present.

There are three kinds of primary batteries in general use in the British Postal Telegraph Department, viz., the Daniell, the bichromate, and the Leclanche. The Daniell type consists of a teak trough divided into five cells by slate partitions coated with marine glue. Each cell contains a zinc plate, immersed in a solution of zinc sulphate, and also a porous chamber containing crystals of copper sulphate and a copper plate. The electromotive force of each cell is 1 07 volts and the resistance 3 ohms. The Fuller bichromate battery consists of an outer jar containing a solution of bichromate of potash and sulphuric acid, in which a plate of hard carbon is immersed; in the jar there is also a porous pot containing dilute sulphuric acid and a small quantity (2 oz.) of mercury, in which stands a stout zinc rod. The electromotive force of each cell is 2 14 volts, and the resistance 4 ohms. The Leclanche is of the ordinary type, and each cell has an electromotive force of 1 64 volts and a resistance of 3 to 5 ohms (according to the size of the complete cell, of which there are three sizes in use). Dry cells, i.e. cells containing no free liquid, but a chemical paste, are also largely employed; they have the advantage of great portability.

Primary batteries have, in the case of all large offices, been displaced by accumulators. The force of the set of accumu- Accumu- lator cells provided is such as to give sufficient power lators. f or t ne longest circuit to be worked, the shorter circuits being brought up approximately to a level,

as regards resistance, by the insertion of resistance coils in the circuit of the transmitting apparatus of each shorter line. A spare set of accumulators is provided for every group of instruments in case of the failure of the working set. For working " double current," two sets of accumulators are provided, one set to send the positive and the other set the negative currents; that is to say, when, for example, a double current Morse key is pressed down it sends, say, a positive current from one set, but when it is allowed to rise to its normal position then a negative current is transmitted from the second set of accumulators. It is not possible to work double current from one set alone, as in this case, if one key of a group of instruments is up and another is down, the battery would be short-circuited and no current would flow to line. The size of the accumulators employed varies from a cell capable of an output of 8 ampere-hours, to a size giving 750 ampere-hours.

1 Submarine Cables. — A submarine cable (figs. 5-7), as usually manufactured, consists of a core a in the centre of which is a strand of copper wires varying in weight for different cables between 70 and 650 lb to the nautical mile. The stranded form was suggested by W. Thomson (Lord Kelvin) at a meeting of the Philosophical Society of Glasgow in 1854, because its greater flexibility renders it less likely to damage the insulating envelope during the manipulation of the cable. The central conductor is covered with several continuous coatings of gutta-percha, the total weight of which varies between 70 and 650 lb 10 the mile. Theoretically for a given outside diameter of core the greatest speed of signalling through a cable is obtained when the diameter of the conductor is 606 (i/V) the diameter of the core, but this ratio makes the thickness of the gutta percha covering insufficient for mechanical strength. Owing to the high price of gutta-percha the tendency, of recent years, has been to approximate more closely to the theoretical dimensions,*

and a thickness of insulating material which

formerly would have been considered quite insufficient is now very generally adopted with complete success. Of two transatlantic cables laid in 1894, the core of one consisted of 500 lb copper and 320 lb gutta-percha per mile, and that of the other of 650 lb copper and 400 lb gutta-percha; whereas for the similarly situated cable laid in 1866 the figures were 300 lb copper and 400 lb gutta-percha. The core is served with a thick coating of wet jute, yarn or hemp (h), forming a soft bed for the sheath, and, to secure immunity from the ravages of submarine boring animals, e.g. Teredo navalis, it has been found necessary, for depths not exceeding 300 fathoms, to protect the core with a thin layer of brass tape. The deep sea portion is sheathed with galvanized iron or steel wires (in the latter case offering a breaking strain of over 80 tons per sq. in., with an elongation of at least 5 per cent.), the separate wires being first covered with a firm coating of tape and Chatterton's compound (a

Fig. 6.

Figs. 5-7. — Sections of three types of Submarine Cables, full size. Fig. 5. — Type of shore end. Fig. 6. — Intermediate type. F'g 7- — Deep sea type.

mixture of gutta-percha, rosin and Stockholm tar). Sometimes the wires are covered with the compound alone, and the whole cable after being sheathed is finally covered with tarred tape. The weight of the iron sheath varies greatly according to the depth of the water, the nature of the sea bottom, the prevalence of currents, and so on. Fig. 5 shows the intermediate type again sheathed with a heavy armour to resist wear in the shallow water near shore. In many cases a still heavier type is used for the first mile or two from shore, and several intermediate types are often introduced, tapering gradually to the thin deep-water type.

The cost of the cable before laying depends on the dimensions of its core, ihe gutta-percha, which still forms the only trust- worthy insulator known,

constituting the principal item of the expense; for an Atlantic cable of the most approved construction the cost may be taken at £250 to £300 per nautical mile.

In manufacturing a aable (fig. 8) the copper strand te passed through a vessel A containing melted Chatterton's compound, then through the cylinder C, in which a quantity of gutta- „ percha, purified by repeated washing in hot water, by f s °"" mastication, and by filtering through wire-gauze filters, is c " e '

kept warm by a steam-jacket. As the wire is pulled through, a coating of gutta-percha, the thickness of which is regulated by the die D, is pressed out of the cylinder by applying the requisite pressure

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TELEGRAPH

[SUBMARINE CABLES

to the piston P. The newly coated wire is passed through a long trough T, containing cold water, until it is sufficiently cold to allow it to be safely wound on a bobbin B' This operation completed, the wire is wound from the bobbin B' on to another, and at the same time carefully examined for air-holes or other flaws, all of which are eliminated. The coated wire is treated in the same way as the copper strand — the die D, or another of the same size, being placed at the back of the cylinder and a larger one substituted at the front. A second coating is then laid on, and after it passes through a similar process of examination a third coating is applied, and so on until the requisite number is completed. The finished core changes rapidly in its electric qualities at first, and is generally kept for a stated interval of time before being subjected to the specified tests. It is then placed in a tank of water and kept at a certain

fixed temperature, usually 75 F., until it assumes approxi- mately a constant electrical state. Its conductor and dielectric

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Fig. 8.

resistance and its electrostatic capacity are then measured. These tests are in some cases repeated at another temperature, say 50 F., for the purpose of obtaining at the same time greater certainty of the soundness of the core and the rate of variation of the conductor and dielectric resistances with temperature. The subjection of the core to a hydraulic pressure of four tons to the square inch and an electric pressure of 5000 volts from an alternating-current trans- former has been adopted, by one manufacturer at least, to secure the detection of masked faults which might develop themselves after submergence. Should these tests prove satisfactory the core is served with jute yarn, coiled in water-tight tanks, and surrounded with salt water. The insulation is again tested, and if no fault is discovered the served core is passed through the sheathing machine, and the iron sheath and the outer covering are laid on. As the cable is sheathed it is stored in large water-tight tanks and kept at a nearly uniform temperature by means of water.

When the cable is to be laid it is transferred to a cable ship, provided with water-tight tanks similar to those used in the factory La lotr ^ or storm 8 '*• The tanks are nearly cylindrical in form

y g ' and have a truncated cone fixed in the centre, as shown at C, fig. 9. The cable is carefully coiled into the tanks in horizontal flakes, each of which is begun at the outside of the tank

Fig. 9. — Diagram of Cable Tank and Paying-out

and coiled towards the centre. The different coils are prevented from adhering by a coating of whitewash, and the end of each nautical mile is carefully marked for future reference. After the cable has been again subjected to the proper electrical tests and found to be in perfect condition, the ship is taken to the place where the shore end is to be landed. A sufficient length of cable to reach the shore or the cable-house is paid overboard and coiled on a raft or rafts, or on the deck of a steam-launch, in order to be connected with the shore. The end is taken into the testing room in the cable-house and the conductor connected with the testing instruments, and, should the electrical tests continue satis- factory, the ship is put on the proper course and steams slowly ahead, paying out the cable over her stern. The cable must not be overstrained in the process of submersion, and must be paid out at the proper rate to give the requisite slack. This involves the introduction of machinery for measuring and controlling the speed at which it leaves the ship and for measuring the pull on the cable. The essential parts of this apparatus are shown in fig. 9. The lower end e of the cable in the tank T is taken to the testing room, so that continuous tests for electrical condition can be made. The upper end is passed over a guiding quadrant Q to a set of wheels or fixed quadrants 1, 2, 3, . . . then to the paying-out drum P, from it to the dynamometer D, and finally to the stern pulley, over which it passes into the sea. The wheels 1, 2, 3, . . . are so arranged that 2, 4, 6, . . . can be raised or lowered so as to give the cable less or more bend as it passes between them, while 1, 3. 5, • • • are furnished with brakes. The whole system provides the means of giving sufficient back-pull to the cable to make it

grip the drum P, round which it passes several times to prevent slipping. On the same shaft with P is fixed a brake- wheel furnished with a powerful brake B, by the proper manipulation of which the speed of paying out is regulated, the pull on the cable being

at the same time observed by means of D. The shaft of P can be readily put in gear with a powerful engine for the purpose of hauling back the cable should it be found necessary to do so. The length paid out and the rate of paying out are obtained approximately from the number of turns made by the drum P and its rate of turning. This is cheeked by the mile marks, the known position of the joints, &c, as they pass. The speed of the ship can be-roughly estimated from the speed of the engines; it is more accurately obtained by one or other of the various forms of log, or it may be measured by paying out continuously a steel wire over a measuring wheel. The average speed is obtained very accurately from solar and stellar observations for' the position of the ship. The difference between the speed of the ship and the rate of paying out gives the amount of slack. The amount of slack varies in different cases between 3 and 10 per cent., but some is always allowed, so that the cable may easily adapt itself to inequalities of the bottom and may be more readily lifted for repairs. But the mere paying out of sufficient slack is not a guarantee that the cable will always lie closely along the bottom or be free from spans. Whilst it is being paid out the portion between the surface of the water and the bottom of the sea lies along a straight line, the component of the weight at right angles to its length being supported by the frictional resistance to sinking in the water. If, then, the speed of the ship be v, the rate of paying out u, the angle of immersion i, the depth of the water h, the weight per unit length of the cable w, the pull on the cable at the surface P, and A, B constants, we have —

P = h\w-(A/sin i)f{u-v cos t)) (a)

and iv cos * = B/(z> sin i) (/S),

where f stand for " function." The factors A/ iu-v cos i) and B/ (v sin i) give the frictional resistance to sinking, per unit length of the cable, in the direction of the length and transverse to the length respectively. 1 It is evident from equation

(0) that the angle of immersion depends solely on the speed of the ship; hence in laying a cable on an irregular bottom it is of great importance that the speed should be sufficiently low. This may be illustrated very simply as follows: suppose a a (fig. 10) to be the surface of the sea, b c the bottom, and c c the straight line made by the cable; then, if a hill H, which is at any part steeper than the inclination of the cable, is passed over, the cable touches it at some point / before it touches the part immediately below t, and if the friction between the cable and the ground is sufficient the cable will either break or be left in a long span ready to break at some future time. It is important to observe that the risk is in no way obviated by the increasing slack paid out, except in so far as the amount of sliding which the strength of the cable is able to produce at the points of contact with the ground may be thereby increased. The speed of the ship must therefore be so regulated that the angle of immersion is as great as the inclination of the steepest slope passed over. In ordinary-circumstances the angle of immersion i varies between six and nine degrees.

The " slack indicator " of Messrs Siemens Brothers & Co. yields a con- tinuous indication and record of the actual slack paid out. It consists of a long screw spindle, coupled by suitable gearing with the cable drum, and thus rotating at the speed of the outgoing cable; on this screw works a nut which forms the centre of a thin circular disk, the edge of which is pressed against the surface of a right circular cone, the line of contact, as the nut moves along the screw, being parallel to the axis of the latter. This cone is driven by gearing from the wire drum, so that it rotates at the speed of the outgoing wire, the direction of rotation being such as to cause the nut to travel towards the smaller end of the cone. If both

Fig. 10.

nut and screw are rotating at the same speed, the positionof the former will remain fixed ; and as the

nut is driven by friction from the surface of the cone, this equality of speed will obtain only when the product of the diameter (a) of the cone at that position multi- plied into its speed of rotation («) equals the product of the diameter (a) of the disk multiplied into the speed of rotation (N) of the screw, or N/n = d/a, and thus the ratio of cable paid out to that of wire paid out is continuously given by a pointer controlled

1 See Sir W. Thomson (Lord Kelvin) Mathematical and Physical Papers, vol. ii. p. 165.

by the disk, for any difference in speed between nut and screw will cause the nut to move along the screw until the diameter of the cone is reached which fulfils the above conditions for equality in speed. In fig. 1 1 the edge of the disk serves as the pointer and the scale gives the percentage of slack, or (N—n)/n. The wire being paid out without slack measures the actual distance and speed over the ground, and the engineer in charge is relieved of all anxiety in estimating the depth from the scattered soundings of the pre- liminary survey, or in calculating the retarding strain required to produce the specified slack, since the brakesman merely has to follow the indications of the instrument and regulate the strain so as to keep the pointer at the figure required — an easy task, seeing that the ratio of speed of wire and cable is not affected by the motion of the ship, whatever be the state ot the sea, whereas the

c^ msmmmmmM

Fig. ii. — Slack Indicator

strain will in heavy weather be varying 50 per cent, or more on each side of the mean value. Further, the preliminary survey over the proposed route,

necessary for deciding the length and types of cable required, can afford merely an approximation to the depth in which the cable actually lies, since accidents of wind and weather, or lack of observations for determining the position, cause deviations, often of considerable importance, from the proposed route. From the continuous records of slack and strain combined with the weight of the cable it is a simple matter to calculate and plot the depths along the whole route of the cable as actually laid. Fig. 12, compiled from the actual records obtained during the laying of the Canso-Fayal section of the Commercial Cable Company's system, shows by the full line the actual strain recorded which secured the even distribution of 8 per cent, of slack, and by the dotted line the strain that would have been applied if the soundings taken during the preliminary survey had been the only source available, although the conditions of sea and weather favoured

y>t>

,

Fig. 12. — Records of Strain and Depths.

close adherence to the proposed route. The ordinates of the curve give the strain in cwts., and the abscissae the distance in miles measured from the Canso end ; as the strain is proportional to the depth, 18 cwts. corresponding to 1000 fathoms, the black line represents to an exaggerated scale the contour of the sea bed.

Owing to the experience gained with many thousands of miles of cable in all depths and under varying conditions of weather and climate, the risk, and consequently the cost, of laying Repairing. nas tj een greatly reduced. But the cost of effecting a repair still remains a very uncertain quantity, success being de- pendent on quiet conditions of sea and weather. The modus operandi is briefly as follows: The position of the fracture is determined by electrical tests from both ends, with more or

less accuracy, depending on the nature of the fracture, but with a probable error not exceeding a few miles. The steamer on reach- ing the given position lowers one, or perhaps two, mark buoys, mooring them by mushroom anchor, chain and rope. Using these buoys to guide the direction of tow, a grapnel, a species of five- pronged anchor, attached to a strong compound rope formed of strands of steel and manila, is lowered to the bottom and dragged at a slow speed, as it were ploughing a furrow in the sea bottom, in a line at right angles to the cable route, until the behaviour of the dynamometer shows that the cable is hooked. The ship is then stopped, and the cable gradually hove up towards the surface; but in deep water, unless it has been caught near a loose end, the

cable will break on the grapnel before it reaches the surface, as the catenary strain on the bight will be greater than it will stand. Another buoy is put down marking this position, fixing at the same time the actual line of the cable. Grappling will be recommenced so as to hook the cable near enough to the end to allow of its being hove to the surface. When this has been done an electrical test is applied, and if the original fracture is between ship and shore the heaving in of cable will continue until the end comes on board. Another buoy is then lowered to mark this spot, and the cable on the other side of the fracture grappled for, brought to the surface, and, if communication is found perfect with the shore, buoyed with sufficient chain and rope attached to allow of the cable itself reaching the bottom. The ship now returns to the position of original attack, and by similar operations brings on board the end which secures communication with the other shore. The gap be- tween the two ends has now to be closed by splicing on new cable and paying out until the buoyed end is reached, which is then hove up and brought on board. After the " final splice," as it is termed, between these ends has been made, the bight, made fast to a slip rope, is lowered overboard, the slip rope cut, and the cable allowed to sink by its own weight to its resting-place on

the sea bed. The repair being thus completed, the various mark buoys are picked up, and the ship returns to her usual station.

The grappling of the cable and raising it to the surface from a depth of 2000 fathoms seldom occupy less than twenty-four hours, and since any extra strain due to the pitching of the vessel must be avoided, it is clear that the state of the sea and weather is the predominating factor in the time necessaiy for effecting the long series of operations which, in the most favourable circumstances, are required for a repair. In addition, the intervention of very heavy weather may mar all the work already accomplished, and require the whole series of operations to be undertaken de novo. As to cost, one transatlantic cable repair cost £75,000; the repair of the- Aden-Bombay cable, broken in a depth of 1900 fathoms, was effected with the expenditure of 176 miles of new cable, and after a lapse of 251 days, 103 being spent in actual work, which for the remainder of the time was interrupted by the monsoon ; a repair of the Lisbon-Porthcurnow cable, broken in the Bay of Biscay in 2700 fathoms, eleven years after the cable was laid, took 215 days, with an expenditure of 300 miles of cable. All inter- ruptions are not so costly, for in shallower waters, with favourable conditions of weather, a repair may be only a mattet of a few hours, and it is in such waters that the majority of breaks occur, but still a large reserve fund must be laid aside for this purpose. As an ordinary instance, it has been stated that the cost of repairing the Direct United States cable up to 1900 from its submergence in 1874 averaged £8000 per annum. Nearly all the cable companies possess their own steamers, of sufficient dimensions and specially equipped for making ordinary repairs; but for exceptional cases, where a considerable quantity of new cable may have to be inserted, it may be necessary to charter the services of one of the larger vessels owned by a cable-manufacturing company, at a certain sum per day, which may well reach £200 to £300. This fleet of cable ships now numbers over forty, ranging in

size from vessels of 300 tons to 10,000 tons carrying capacity.

The life of a cable is usually considered to continue until it is no longer capable of being lifted for repair, but in some cases the duration and frequency of interruptions as affecting public convenience, with the loss of revenue and cost of ■

repairs, must together decide the question of either making very extensive renewals or even abandoning the whole cable. The possibility of repair is affected by so many circumstances due to the environment of the cable, that not even an approximate term of years has yet been authoritatively fixed. It is a well-ascertained fact that the insulator, gutta-percha, is, when kept under water, practically imperishable, so that it is only the original strength of the sheathing wires and the deterioration allowable in them that have to be considered. Cables have frequently been picked up showing after many years of submergence no appreciable deteriora- tion in this respect, while in other cases ends have been picked up which in the course of twelve years had been corroded to needle points, the result probably of metalliferous deposits in the locality. It is scarcely possible from the preliminary survey, with soundings several miles apart, to obtain more than a general idea as to the average depth along the route, while the nature of the constituents of the sea bed can only be revealed by a few small specimens brought up at isolated spots, though fortunately the globigerine ooze which covers the bottom at all the greater ocean depths forms an ideal bed for the cable. The experience gained in the earlier days of ocean telegraphy, from the failure and_ abandonment of nearly 50 per cent, of the deep-sea cables within the first twelve years, placed the probable life of a cable as low as fifteen years, but the weeding out of unserviceable types of construction, and the general improvement in materials, have by degrees extended that first estimate, until now the limit may be safely placed at not less than forty years. In depths beyond the reach of wave motion, and apart

from suspension across a submarine gully, which will sooner or later result in a rupture of the cable, the most frequent cause of interruption is seismic or other shifting of the ocean bed, while in shallower waters and near the shore the dragging of anchors or

fishing trawls has been mostly responsible. Since by international agreement the wilful damage of a cable has been constituted a criminal offence, and the cable companies have avoided crossing the fishing banks, or have adopted the wise policy of refunding the value of anchors lost on their cables, the number of such fractures has greatly diminished.

Instruments for Land Telegraphy. — At small country towns or villages, where the message traffic is light, the Wheatstone " A B C " instrument is used. In this apparatus electric ABC currents are generated by turning a handle (placed in instru- front of the instrument), which is geared, in the instru- ment ments of the most recent pattern, to a Siemens shuttle armature placed between the two arms of a powerful horse- shoe permanent magnet. When one of a series of keys (each corresponding to a letter) arranged round a pointer is depressed, the motion of the pointer, which is geared to the shuttle arma- ture, is arrested on coming opposite that particular key, and the transmission of the currents to line is stopped, though the armature itself can continue to rotate. The depression of a second key causes the first key to be raised. The currents actuate a ratchet-wheel mechanism at the receiving station, whereby the hand on a small dial is moved on letter by letter. A noticeable feature in the modern ABC indicator, as well as in all modern forms of telegraph instruments, is the adoption of " induced " magnets in the moving portion of the apparatus. A small permanent magnet is always liable to become

demagnet- ized, or have its polarity reversed by the action of lightning. This liability is overcome by making such movable parts as require to be magnetic of soft iron, and magnetizing them by the inducing action of a strong permanent magnet. Although formerly in very extensive employment, this instrument is dropping out of use and the " sounder " (and in many cases the telephone) is being used in its place.

At offices where the work is heavier than can be dealt with by the ABC apparatus, the " Single Needle " instrument has been very largely employed ; it has the advantage of slight liability to derangement, and of requiring very little adjustment. A fairly skilled operator can signal with it at the rate of 20 words per minute. The needle (in the modern pattern) is of soft iron, and is kept magnetized in- ductively by the action of two permanent steel magnets. The coils are wound with copper wire (covered with silk), 10 mils, in diameter, to a total resistance of 200 ohms. The actual current required to work the instrument is 3-3 milliamperes (equivalent approximately to the current given by I Daniell cell through 3300 ohms), but in practice a current of 10 milliamperes is allowed. A simple, but important, addition to enable the reading from the instrument to be effected by sound is shown in fig. 13; in this arrangement the needle strikes against small tubes formed of tin-plate. Although a most serviceable instrument and cheap as regards main- tenance, the " single needle " has (except for railway telegraph purposes) been discarded in favour of the " sounder," to secure the advantage of using one general pattern of apparatus, as far as possible, and to avoid the necessity of two different types of instrument being learnt by the telegraphist.

The well-known code of signals (fig. 14) introduced by Morse is still employed in

Fir- 1 1— Single Needle the United States and Canada, and the Hg. 13.— Single JNeedle international code in vogue in Eur0 p e with

sounding arrange- d;ffers Qmy 8 ,. ght , y from £

m ■ The instruments used for land tele-

graphs on this system are of two types — ” sounders,” which indi- cate by sound, and ” recorders,” which record the signals.

Recorders vary in details of construction, but all have the same object, namely, to record the intervals during which the current is applied to the line. In the earlier forms of instrument the record was made by embossing lines on a ribbon of paper by means of a sharp style fixed to one end of a lever, which carried at the other end the armature of an electromagnet. The form of Morse recorder almost universally used in Europe makes the record in ink, and hence is sometimes called the “ink-writer.” This method has the advantage of distinctness, and so is less trying to the eyes of the operators. Although the ” ink-writer ” is still in use it is practically an obsolete instrument, and has been displaced by the ” sounder.”

Operators who used the recorder soon learned to read the message by the click of the armature against its stop, and as this left the hands and eyes free to write, reading by sound was usually

Single needle Instru- ment.

Morse Ink- writer.

preferred. Thus, when it is not necessary to keep a copy, a much simpler instrument may be employed and the message read sounder by sound. The earliest successful form was ” Bright’s bell ” sounder, which consisted, of two bells of distinct tone or pitch, one of which was sounded when the current was sent in one

International Code

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American Code

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Fig. 14. — Morse Alphabets.

direction and the other when it was reversed. This instrument was capable of giving very considerable speed, but it was more complicated than that now in use, which consists only of an electro- magnet, with its armature lever arranged to stop against an anvil or screw in such a way as to give a distinct and somewhat loud sound. Dots and dashes are distinguished by the interval between the sounds of the instrument in precisely the same way as they are distinguished when reading from the recorder by sound. Fig. 15 shows the modern pattern of " sounder" as used by the

r ■ ,|W

Fig. 15. — Modern

Sounder."

British Post Office. The magnet is wound to a resistance of 40 ohms (or 900 ohms when worked from accumulators), and the instrument is worked with a current of 400 milliamperes (25 milli- amperes with accumulators).

Methods of Working Land Circuits. — The arrangement on the " open-circuit " system for single-current working is shown in fig. 16, in which Li represents the line, G a galvanometer, used simply to show that the currents are going to line when the message is being transmitted, K the trans- mitting key, B the battery, I the receiving instrument, and E the earth-plate. The complete circuit is from the plate E through the instrument I, the key K, and the galvanoscope G to the line Li, then through the corresponding instruments to the earth-plate E at the other end, and back through the earth to the plate E. The earth is always, except for some special reason, used as a return, because it offers little resistance and saves the expense and the risk of failure of the return wire. The earth-plate h

ought to be buried in moist earth or in water. In towns the water and gas pipe systems form excellent earth

Open circuit, single- current system.

LAND WORKING]

TELEGRAPH

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Fig.

plates. It will be observed that the circuit is not in this case actually open; the meaning of the expression "open circuit" is " no battery to line." In normal circumstances the instruments at both ends are ready to receive, both ends of the line being to earth through the receiving instruments. A signal is sent by de- pressing the key K, and so changing the contact from a to b, and

thus putting the battery

to line. On circuits

where the traffic is small

it is usual to make one

wire serve several sta-

'" tions. At an intermediate

or wayside station W, a

" switch " S, consisting

of three blocks of brass

■ - fixed to an insulating

[E I I c) base, is sometimes used

16.— Open Circuit, Single- $>* in G K reat B , ritai ">-

current System. W «»? be made the

terminal station of Li by inserting plug 3, and of L 2 by inserting plug 2, or the instruments may be cut out of circuit by inserting plug I. In ordinary circum- stances the messages from all stations are sent through the whole line, and thus the operator at any station may transmit, if the line is free, by manipulating his key.

The connexions for single-current working on the ” closed-cir- cuit ” system are shown in fig. 17. It differs from the open circuit in only requiring one battery (although, as in the figure, half of it is often placed at each end), in having the re- ceiving instrument between the line and the key, and in having the battery continuously to the line. The battery is kept to the line by the bar c, which short-circuits the keys. When signals are to be sent from either station the operator turns the switch c out of contact with the stop b, and then operates

precisely as in open circuit send- ing. This system is more expen- sive than the open-circuit system, as the battery is always at work; but it offers some advantages on circuits where there are a number 1 of intermediate stations, as the circuit is under a constant electro- motive force and has the same resistance no matter which station is sending or receiving. The arrangement at a wayside station is shown at W. When the circuit is long and contains a large number of stations, the sending battery is sometimes divided among them in order to give greater uniformity of current along the line. When only one battery is used the current at the distant end may be considerably affected by the leakage to earth along the line. If long circuits were worked direct with ordinary instruments, high battery power would be required in order to send- sufficient Single- current to actuate the apparatus. In such cases it is current U3u al to employ a local battery to produce the signals, relay a . n(^ J-° c '°. se the local battery circuit by means of a

working, circuit-closing apparatus called a relay,

which is practi- cally an electromagnetic key which has its lever attached to the armature of the magnet and which can be worked by a very

Closed’

circuit

system,

rl

&

Fig. 17. — Closed Circuit, Single- current System.

weak current. The

arrangement

8.

Fig. 18.-

a station worked by relay on the ” single-current ” system is shown in fig. 18, where L is the line wire, joined through the key K to one end of the coil of the relay magnet R, the other end of which is put to earth. When a current passes through R the armature A is attracted and the local circuit is closed through the arma- ture at b. The local battery Bi then sends a current through the in- strument I and records the signal. In the fori

-Single-current Relay Working.

of relay indicated in the figure the armature”is held against the stop a by a spring S.

” Single-current ” working by means of a non- polarized relay (fig. 18), although general in America, is not adopted in England. Double- ‘ n tne latter country, when such working is resorted to, current a ” Polarized relay ” (fig. 20) with a bias is used, but on system. a ” important lines worked by sounders the ” double- current ” system is employed. In this the tongue of the relay is kept

over to the spacing side by means of a current flowing in one direction, but on the depression of the signalling key the cur- rent is reversed, moving the relay tongue over to the marking side.

The Siemens polarized relay, shown in fig. 19, consists of an armature o, pivoted at one end h in a slot at one end N of a permanent magnet m, the other pole s of which is fixed to the yoke y of a horse-shoe electromagnet M. The armature is placed between the poles of the electromagnet, and being magnetized by the magnet m it will oscillate to the ™jarlzea right or left under the action of the poles of the electro- re,a y s - magnet M according as the current passes through M in one direction or the other. This form of relay is largely used, but in Great Britain it has been entirely displaced by the form shown in fig. 20, which is the most modern pattern of relay used by the British Post Office, known as the " Post Office Standard Relay." In this instrument

Fig. 19. — Siemens Polarized Relay.

Fig. 20. — Post Office Standard Relay.

there are two soft iron tongues, n, s, fixed upon and at right angles to an axle o, which works on pivots at its ends. These tongues are magnetized by the inducing action of a strong horse-shoe permanent magnet, S N, which is made in a curved shape for the sake of com- pactness. The tongue plays between the poles of two straight electromagnets. The coils of the electromagnets are differentially wound with silk-covered wire, 4 mils (= 004 inch) in diameter, to a total resistance of 400 ohms. This differential winding enables the instrument to be used for " duplex " working, but the connexions of the wires to the terminal screws are such that the relay can be used for ordinary single working. Although the relay is a " polarized " one, so that it can be used for "double-current" working, it is equally suitable for " single-current " purposes, as the tongue can be given a bias over to the " spacing " side, i.e. to

fw

B

Fig. 21. — Connexions for Double-current Working.

the side on which no current passes through the local circuit. The standard relay will work single current with a current of 3 milliam- peres, though in practice about 10 would be used. Worked double current — that is, with the tongue set neutral, having no bias either to the spacing or marking side — the relay will give good signals with I § milliampere of current, though in practice 10 milliamperes are provided. The lightness of the moving part enables great rapidity of action to be obtained, which for fast speed working is very essential. The relay tongue, being perfectly free to move, can be actuated by a comparatively weak current. Normally a switch attached to the key cuts the battery off, and connects the line direct through the receiving relay ; this switch is turned to " send " when transmission commences, and is moved back to " receive " when it ceases: this movement is done quite mechani- cally by the telegraphist, and as it is practically never forgotten, automatic devices (which have often been suggested) to effect the turning are wholly unnecessary.

Fig. 21 shows the general arrangement of the connexions for double- current working; the galvanometer G is used for the purpose of

indicating whether a station is calling, in case the relay sticks or is out of adjustment. The key K (shown in general plan), when worked, sends reversed currents from the battery B. In cases where " universal battery " working, i.e. the working of several instru- ments from one set of batteries or

accumulators, is adopted, the positive and negative currents have to be sent from independent batteries, as shown by fig. 22. The stop a of the key K is connected through a switch S with one pole of the battery B, and the stop b in the usual way with the other pole. Suppose the arm c of the switch S to be in contact with 2; then when the key is manipulated it sends alternately positive and negative currents into the line. If the positive is called the signalling current, the line will be charged positively each time a signal is sent ; but as soon as the signal is completed a negative charge is communicated

r^^i

Fig. 22. — Universal Battery Working.

to the line, thus hastening the discharge and the return of the relay tongue to its insulated stop.

When a local instrument such as a sounder (fig. 15) is worked from a relay, the dying away of the magnetism in the iron cores of the electromagnet, when the relay tongue moves from the Spark marking to the spacing side, i.e. when the local battery is

coils. CU £ Q j^ se ^ s U p an i nc j UC ed current of high tension, which

causes a spark to jump across the contact points of the relay, and by oxidizing them makes it necessary for them to be frequently cleaned. In order to avoid this sparking, every local instrument in the British Postal Telegraph Department has a " spark " coil connected across the terminals of the electromagnet. The spark coil has a resistance about ten times as great as that of the electro- magnet it shunts, and the wire of which it is composed is double wound so as to have no retarding effect on the induced current, which circulates through the spark coil instead of jumping in the form of a spark across the contact points. The device is a most effectual one.

On long circuits wcrked by the Wheatstone fast-speed

apparatus, and especially on those in which a submarine cable is included, it „ . is found necessary to introduce ” repeaters ” half-way, epea ere. - n or(j er to enable a high speed to be maintained. The speed at which a circuit can be worked depends upon what is known as the ” KR ” of the line, i.e. the product of the total capacity and the total resistance, both the capacity and the resistance having a retarding effect on the signals. By dividing a line into two halves the working speed will be dependent upon the KR of the longest half, and as both K and R are directly proportional to the length of the line, the KR product for the half of a circuit is but one quarter that of the whole length of the circuit, and the retardation is correspondingly small. Thus the speed on a line at which the repeater is situated exactly midway will be four times that of the line worked direct. Repeaters (or translators, as they are some- times termed) are in Great Britain only used on fast-speed circuits; they are in no case found necessary on circuits worked by hand, or at ” key speed ” as it is called.

Duplex telegraphy consists in the simultaneous transmission of two messages, one in each direction, over the same wire. Duplex The solution of this problem was attempted by J. W. tele- Gintl of Vienna in 1853 and in the following year by

grapby. Frischen and by Siemens and Halske. Within a few years several methods had been proposed by different inventors, but none was at first very successful, not from any fault in the principle, but because the effect of electrostatic capacity of the line was left out of account in the early arrangements. The first to introduce a really good practical system of duplex telegraphy, in which this difficulty was sufficiently overcome for land line purposes, was J. B. Stearns of Boston (Mass.). In order that the line between two stations may be worked on the duplex system it is essential that the receiving instru- ment shall not be acted on by the outgoing currents, but shall respond to incoming currents. The two methods most commonly employed are

the differential and bridge methods.

Differ- ential method.

In fig. 23, representing the ” differential ” method, B is the sending battery, Bi a resistance equal to that of the battery, R a rheostat and C an adjustable condenser. Suppose the key to be depressed, then a current flows through one winding of the differential relay to line and through the other winding and rheostat to earth. Now if the values of the rheostat and condenser are adjusted so as to make the rise and fall of the outgoing current through both windings of the relay exactly equal, then no effect is produced on the armature of the relay, as the two currents neutralize each other’s magnetizing effect.

Incoming currents pass from line through one coil of the relay, the key, and either the battery or battery resistance, according as whether the key is raised or depressed. The result is that the arma- ture of the relay is attracted, and currents are sent through the sounder from the local battery, producing the signals from the distant station. When the key is in the middle position, that is, not making connexion with either the front or back contacts, the received currents pass through both coils of the relay and the rheostat; no interference is, however, felt from this extra resistance because, although the current is halved, it has double the effect on the relay, because it passes through two coils instead of one.

Earth,

Fig. 23. — Duplex Working : differential method.

In the ” bridge ” method (fig. 24), instead of sending the currents through the two coils of a differentially wound relay or receiving instrument as in Frischen’s method, two resistances a and b are inserted, and the receiving instrument is "v^j joined between P and Q. The currents thus divide at met boa. the point D, and it is clear that if the

difference of potential be- tween P and Q is unaffected by closing the sending key, then no change of current will take place in the instrument circuit. The

Fig. 24..— Duplex Working : bridge method.

relative potential of P and Q is not affected by the manipulation of the sending key if the resistance of a bears the same proportion to that of b as the resistance of the line does to that of the resistance R; hence that is the arrangement used. One very great advantage in this method is that the instrument used between P and Q may be of any ordinary form, i.e. relay, Hughes, siphon re- corder, &c.

Most important cables, such as those of the Eastern Telegraph Company and the various Atlantic cables, are worked duplex on Muirhead's plan. What may be called a mechanical metnod of duplexing a cable was described by Lord Kelvin in a patent taken out by him in 1 858. In this, as in the ordinary methods, a differentially wound receiving instrument was used, one coil being connected with the cable and the other with the earth; but it differed from other methods in requiring no " artificial " or balancing cable. The compensation was to be obtained by working a slide resistance included in the circuit of the compensating coil, either by the sending key or by clockwork released by the key, so as to vary the resistance in that

Duplex working on cables.

circuit according to any law which might be required to prevent the receiving instrument being affected by the outgoing current. Four years later Varley patented his artificial cable, which was the first near approach to a successful solution of the duplex

problem on the principle now adopted. It was not, however, a sufficiently perfect representation of a laid cable to serve for duplexing cables of more than a few hundred miles in length. By a modification of the bridge method, applied with excellent results by Dr Muirhead to submarine work, condensers are substituted for a and b, one being also placed in the circuit between P and Q. In this case no current flows from the battery through the line or instruments, the whole action being inductive. As we have already stated, the distri- bution of the capacity along the resistance R must in submarine cable work be made to correspond very accurately with the distri- bution of the capacity along the resistance of the cable. This is accomplished by Dr Muirhead in the following manner. One side of a sheet of paraffined paper is covered with a sheet of conducting substance, say tinfoil, and over the other side narrow strips of the same substance are arranged gridironwise to form a continuous circuit along the strip. The breadth and thickness of the strip and the thickness of the paraffined paper are adjusted so that the relative resistance and capacity of this arrangement are the same as those of the cable with which it is intended to be used. A large number of such sheets are prepared and placed together, one over the other, the end of the strip of the first sheet being connected with the beginning of the strip of the second, and so on to the last sheet, the whole representing the conductor of the cable. In the same way all the conducting sheets on the other side of the paper are connected together and form the earth- plate of this artificial cable, thus representing the sea. The leakage through the insulator of the cable is compensated for by connecting high resistances be- tween different points of the strip conductor and the earth coating. Faults or any other irregularity in the cable may be represented by putting resistances of the proper kind into the artificial line. This system of duplexing cables has proved remarkably successful.

Quadruplex telegraphy consists in the simultaneous

trans- mission of two messages from each end of the line. The only new problem introduced is the simultaneous transmission of Quad- two messages in the same direction; this is sometimes ruptex called ” diplex transmission.” The solution of this te,e ‘ problem was attempted by Dr J. B. Stark of Vienna

grap y- in 1855, and during the next ten years it was worked at by Bosscha, Kramer, Maron, Schaak, Schreder, Wartmann and others. The first to attain practical success was Edison, and his method with some modifications is still the one in most general use.

The arrangement is shown in fig. 25, and indicates the general principle involved. K t and K 2 are two transmitting keys; the former reverses the direction of the line current, the latter increases the strength irrespective of direction, by joining on another battery when the key is depressed. Ri and R? are relays for receiving the

Fig. 25. — Quadruplex Working.

currents; the former is polarized and .responds to reversals of current, while the latter is non-polarized and responds only to the increased current from K2 irrespective of the direction of that current. This arrangement can be duplexed in the way already explained, by providing differential relays and arranging for the outgoing currents to divide differentially through the two relays at each end. The ” multiplex ” system devised by Patrick B. Delany (which was adopted to a limited extent in Great Britain, but has now been M HI I entirely discarded) had for its object the working of a num- t’1. PeX ber of instruments simultaneously on one wire. Thcgeneral “. principle of the arrangement of the apparatus is shown by

fig. 26. Arms a and 6, one at each station A and B, are connected to the line wire, and are made to rotate simultaneously over metallic segments, I, 2, 3, 4, and 1’, 2’, 3’, 4’, at the two stations, so that when the arm a is on segment 1 at A, then b is

on segment 1' at B, and so on. At each station sets of telegraph apparatus are connected to the segments, so that when the arms are kept rotating the set connected to 1 becomes periodically con- nected to the set connected to 1′, the set connected to 2 to the set connected to 2′, and so on. In practice the number of segments actually employed is much greater than that indicated on the figure, and the segments are arranged in a number of groups, as shown

by fig. 27, all the segments 1 being connected together, all the segments 2, all the segments 3, and all the segments 4. To each group is connected a set of apparatus; hence during a complete revolution of the arms a pair of instruments (at station A and station B) will be in communication four times, and the intervals during which any particular set of instruments at the two stations are not in connexion with each other become much smaller than in the case of fig. 26. In practice this subdivision of the segments is so far extended that the intervals of disconnexion become extremely A B

Fig. 26. — Multiplex Working.

small, and each set of apparatus works as if it were alone connected to the line. As many as 162 segments in eight groups are practi- cally used. The arm which moves round over the segments rotates at the rate of three revolutions per second, and is kept in motion by means of an iron toothed wheel, the rim of which is set in close proximity to the poles of an electromagnet. Through this electro- magnet pass impulses of current regulated in frequency by a tuning- fork contact breaker; these impulses, acting on the teeth of the iron wheel, by a series of pulls keep it in uniform rotation. If the rates of vibration of the two tuning-forks at the two stations could be maintained precisely the same, the two arms would rotate in synchronism, but as this uniform vibration cannot be exactly

.41

A

i-

A

Zj-^3

VI3

4 '

JJnj *l _

T-T "'■

4

w

13

Fig. 27. — Grouping of Segments in Multiplex System.

preserved for any length of time, a means is provided whereby the rate of vibration of either of the forks can be slowed down, so as to retard the rate of rotation of one or other of the arms. This is effected by means of " correcting " segments, of which there are six sets containing three each. Should the rotating arms fail to pass over these correcting segments at their synchronous positions, correcting currents pass to a relay which cuts off momentarily the current actuating the tuning-fork, thereby altering the rate of vibration of the latter until the arms once more run together uni- formly. The actual number of sets of apparatus it was possible to work multiplex depended upon the length of the line, for if the latter were long, retardation effects modified the working conditions. Thus between London and Manchester only four sets of apparatus could be worked, but between London,,and Birmingham, a shorter distance, six sets (the maximum for wfiich the system is adapted) were used.

Chemical Telegraphs. — A method of recording signals in the Morse code, formerly used to a considerable extent, was to tise a chemically prepared ribbon of paper. Suppose, for instance, the paper ribbon to be soaked in a solution of iodide of potassium and a light contact spring made to press con- tinuously on its surface as it is pulled forward by the mechanism. Then, if a current is sent from the spring to the roller through the paper, a brown mark will be made by the spring due to the liberation of iodine. This was the principle of the chemical telegraph proposed by Edward Davy in 1838 and of that proposed by Bain in 1846. Several ingenious applications of his method were proposed and practically worked, as, for example, the copying telegraph of Bakewell and of Cros, by means of which a telegram may be transmitted in the sender's own handwriting; the pantelegraph of Caselli; the auto- graphic telegraphs of Meyer, Lenoir, Sawyer and others; and the autographic typo-telegraph of Bonelli; all forms of the apparatus have, however, fallen into disuse.

Automatic Telegraphs. — It was found impossible to make the Morse ink writer so sensitive that it could record signals sent over land lines of several hundred miles in length, if the speed of transmission was very much faster than that which could be effected by hand, and this led to the adoption of automatic methods of transmission. One was proposed by Bain as early as 1846, but it did not come into use. That now employed is, however, practically a development of his

means of " a puncher," a in such a way that, when

idea. It consists in punching, by series of holes in a strip of paper

the strip is sent through another instrument, called the ” trans- mitter,” the holes cause the circuit to be closed at the proper times and for the proper proportionate intervals for the message to be correctly printed by the receiving instrument or recorder. The most successful apparatus of this kind is that devised by When tst one; others were devised by Siemens and Halske, Gamier, Humaston, Siemens, and Little.

In the Wheatstone automatic apparatus three levers are placed side by side, each acting on a set of small punches and Wheat- on mechanism for feeding the paper forward a step stone after each operation of the levers. The punches are

system. arranged as shown in fig. 28, and the levers are adjusted so that the left-hand one moves a, b, c and punches a row of holes across the paper (group 1 in the figure), the middle one moves b only and punches a centre hole (2 in the figure), while the right-hand one moves a, b, d, e and punches

^>

q

0*

<; d

0'

0'

0*

Oi Od

1 °

Fig. 28. — Wheatstone Punching Apparatus.

four holes (3 and 4 in the figure). The whole of this operation represents a dot and a dash or the letter ” a.” The side rows of holes only are used

for transmitting the message, the centre row being required for feeding forward the paper in the transmitter. The perforation of the paper when done by hand is usually performed by means of small mallets, but at the central telegraph office in London, and at other large offices, the keys are only used for opening air-valves, the actual punching being done by pneumatic pressure. In this way several thicknesses of paper can be perforated at the same time, which is a great convenience for press work, since copies of the same message have often to be transmitted to several newspapers at the same time.

The mode of using the paper ribbon for the transmission of the message is illustrated in fig. 29. An ebonite beam B is rocked up and down rapidly by a train of mechanism, and moves the cranks

Perforated Slip

Fig. 29. — Wheatstone Automatic Transmitter.

A and A′ by means of two metal pins P, P′. A and A′ carry two light vertical rods S, M, the one as much in front of the other as there is space between two successive holes in the perforated ribbon. To the other ends of A, A′, rods H, H′ are loosely hinged, their ends passing loosely through holes in the end of the bar L. _ By means of two collars K, K′, the lever L is made to oscillate in unison with the beam B. The operation is as follows : the paper ribbon or perforated slip is moved forward by its centre row of holes at the proper speed above the upper ends of the rods S, M ; should there be no holes in the ribbon then the cranks A, A′ will remain stationary, although the beam B continues to rock, since the rods S, M are pressing′ against the ribbon and cannot rise. Should, however, a row of holes, like group 1, fig. 28, be in the ribbon, the rod M will first be allowed to pass through the paper, and the corresponding movement of crank A′ will, through the agency of collet K, throw over lever L, and the battery zinc will be put to the line; at the next half stroke of the beam, S will pass through, and crank A by its movement will, through the agency of

collet K', throw over lever L in the reverse direction, so that the battery copper will be put to the line. Thus for a dot, first a negative

and then a positive current is sent to the line, the effect of the current continuing during the time required for the paper to travel the space between two holes. Again, suppose groups 3 and 4 to be punched. The first part will be, as before, zinc to the line; at the next half stroke of the beam M will not pass through, as there is no hole in the paper; but at the third half stroke it passes through and copper is put to the line. Thus for a dash the interval between the positive and the negative current is equal to the time the paper takes to travel over twice the space between two suc- cessive holes. Hence for sending both a dot and a dash, reverse currents of short duration are sent through the line, but the interval between the reversal is three times as great for the dash as for the dot.

In the receiving instrument the electromagnet is constructed in precisely a similar way to the relay (fig. 20), so that the armature, if pulled into any position by either current, remains in that posi- tion, whether the current continues to flow or not, until a reverse current is made to act on the magnet. For the dot the armature is deflected by the first current, the ink-wheel being brought into contact with the paper and after a short interval pulled back by the reverse current. In the case of the dash the ink-wheel is brought into contact with the paper by the first current as before and is pulled back by the reverse current after three times the interval. The armature acts on an inking disk on the principle described above, save only that the disk is supplied with ink from a groove in a second wheel, on which it rolls: the grooved wheel is kept turning with one edge in contact with ink in an ink- well. By this method of transmission the battery is always to the line for the same interval of time, and alternately with opposite poles, so that the effect of electrostatic induction is reduced to a minimum.

Although it is quite possible to obtain good signals at a rate corresponding to 600 letters per minute, in practice it is found that such a high speed is not advisable, as it is difficult or im- possible for even the most skilled operators properly to handle and transcribe from the ” slip” on which the signals are recorded.

In Squier and Crehore’s ” Synchronograph ” system ” sine waves ” of current, instead of sharp ” makes and breaks,” or sharp reversals, are employed for transmitting signals, the waves being produced by an alternating-current dynamo, and regu- cft^ne lated by means of a perforated paper ribbon, as in the s ™jJL Wheatstone automatic system. The arrangement has been found under certain conditions to give better results than those obtained with sharp reversals.

In the undulator apparatus, which is similar in general principle to the ” siphon recorder ” used in submarine telegraphy, a spring or falling weight moves a paper strip beneath one end of _.. a fine silver tube, the other end of which dips into a . . „,” vessel containing ink. The siphon is supported on a vertical axle carrying two armatures which are acted upon by two electromagnets. It is in fact the electromagnet and spindle of a telegraph relay with a siphon in place of the tongue. Screw adjust- ments are provided for closing or opening the air gap between the electromagnets and armatures, for raising or lowering the siphon, and for adjusting the point of the siphon to the centre or side of the paper strip. The received signals are recorded on the paper strip in an undulating continuous line of ink, and are distinguished by the length of deviation from zero. The amplitude of the signals can be varied in several ways, either by a shunt across the electro- magnet, or by altering the tension of the controlling springs or by altering the air gap between electromagnets and armatures. Up to 100 words per minute the signals are easily readable, but beyond that speed they are more difficult to translate, although experts can read them when received at 200 words per minute.

Pollak- Virag System. — In the improved Pollak-Virag system the received signals are recorded in characters similar to ordinary hand- writing. The operator actuates a typewriter form of perforator which punches varying groups of holes, representing the different characters, in a paper strip about one inch wide. This slip is then passed through a transmitter fitted with brush contacts and con- nected to the two line wires of a metallic loop. One circuit is formed by the loop itself, and a second, quite independent, by the two wires in parallel, earthed at each end. At the receiving end there are two telephone receivers, one joined in the loop circuit, the other in the earth return circuit. The diaphragms of these are mechani- cally connected to a small mirror and control its movement in accordance with the strength and direction of the received currents. One diaphragm gives the mirror a movement in a vertical direction while the other gives it a horizontal motion. The two acting to- gether can thus give the mirror any desired movement within limits. A ray of light is directed upon the mirror, and the motion of the latter, due to the varying strengths and direction of the received currents, is made to write the transmitted signals upon a strip of bromide photographic paper about three inches wide.

The line of writing is of course continuous, there being no break, although there is a space between words. The writing, although not well formed, is sufficiently distinct for ordinary messages; the figures 3, 5, and 8 are, however, liable to be mistaken for each

lastru meat,

other, being very similar in appearance. The bromide paper is automatically passed through a developing

bath, a fixing bath, and drying rollers. This operation occupies about twelve seconds, giving a message written in column form ready for delivery. It is not a system likely to have general application.

Type Printing Telegraphs. — The first considerable improvement in type printing telegraphs was made by D. E. Hughes in 1855. In the Hughes instrument two trains of clockwork Hughes mechanism, one at each end of the line, are kept moving at the same speed. Each instrument is provided with a keyboard, resembling that of a small piano, the key levers of which communicate with a circular row of vertical pins. A horizontal arm fixed to a vertical shaft in gear with the mechanism sweeps over these pins at the rate of about two revolutions per second. When a key is depressed, slightly raising one of the pins, the horizontal arm will pass over it and in doing so will momentarily join the battery to the line. The current thus sent to the line may be made either to act directly on the printing instrument or to close a local circuit by means of a relay For simplicity we will suppose direct action. The current then passes through the coils of an electromagnet, which releases the printing mechanism. The electromagnet consists of two coils, each wound on a soft iron core fixed to the poles of a strong permanent horse-shoe magnet. The armature of the electromagnet is normally attracted by the effect of the permanent magnet, but it is furnished with two antagonistic springs tending to throw it upwards. These springs are so adjusted that they are not quite able to release the armature. When a current comes in from line it passes through the electromagnet in such a direction as to weaken the effect of the permanent magnet; hence the springs are able to release the armature, which rises smartly and in its turn releases the printing mechanism. Either a weight or a motor is used for making the movements of the mechanism required to effect the printing of the signals. The type- wheel is carried round continuously by the mechanism to which it is attached by a friction disk and ratchet drive. An

axle carrying four cams is normally at rest, but it is thrown into gear with the mechanism when the armature rises, makes one complete revolution, and comes to rest ready for the next signal. In its revolution one of its cams engages with the correcting wheel attached to the type- wheel in order to ensure that the latter is in the correct position for printing a complete letter; the second cam lifts the paper against the type- wheel and prints the letter; the third moves forward the paper tape one space to be ready for the printing of the next letter; and the last cam replaces the armature on the cores of the electromagnet. This complete operation occu- pies about one-twelfth of a second. It is of course necessary that two instruments working together should have the same speed. This is obtained by causing one of them to send a series of signals from one particular key, while the operator at the other station adjusts his speed until he receives the same signal after short- circuiting his electromagnet for ten revolutions. Both type-wheels are then set to zero by the lever provided for that purpose, and released by the current from the letter-blank key; then all subse- quent signals will be recorded similarly at the sending and re- ceiving ends. If by any chance wrong signals are printed or the instruments get out of phase, the sender is stopped by the receiver sending a few signals, after which both type-wheels are again set to zero and correspondence continued. This system of telegraphic printing has a great advantage over the step-by-step system in avoiding the necessity for the rapidly acting electric escapement, which, however skilfully planned and executed, is always liable to failure when worked too rapidly. In Hughes's instrument almost perfect accuracy and certainty have been attained ; and in actual practice it has proved to be decidedly superior to all previous type-printing telegraphs, not only in speed and accuracy, but in less liability to mechanical derangement from wear and tear and from accident. It involves many novel features: the receiving electromagnet is of peculiar construction and remarkable efficiency and the transmitting apparatus has a contrivance to prevent

unin- tentional repetitions of a letter through the operator holding his finger too long on a key. This instrument was for some years extensively used in the United States, until superseded by G. M. Phelps's modification of it, known as the " American combination printing telegraph," because it embodied part of Hughes's and part of House's instruments. With this modified form somewhat greater speed was obtained, but it was found difficult to drive, requiring the use of steam or some such motive-power. In a subse- quent modification introduced in 1875 an electromotor was applied to drive the printing mechanism. This allowed a shorter train and stronger wheelwork to be used, securing more certain action, and involving less risk of derangement. Hughes's form was taken up by the French government in i860, and is very largely in use not only in France but in all European countries, including Great Britain.

The system brought out in 1874 by Emile Baudot and since considerably developed is a multiplex system giving from two to _ . . six channels on one wire, each channel giving a working system speed of thirty words per minute. The channels can be worked in either direction according to the traffic require- ments. The line is joined at each end to distributors which are

arranged to maintain uniform speed and to control their respective receivers. Each channel consists of a keyboard and receiver both electrically connected to certain parts of the distributor. The keyboard has five keys similar to those of a piano, and the letters and figures are obtained by the different combinations which can be formed by the raised and depressed keys. In the raised position a negative battery is connected to the distributor and in the de- pressed position a positive battery. At regular intervals a rotating arm on the distributor connects the five keys of each keyboard to line, thus passing the signals to the distant station, where they pass through the distributor and certain relays which repeat the currents corresponding to the depressed keys and actuate electro- magnets in the receivers.

Each receiver is provided with five electromagnets corresponding to the five keys of the keyboard, and the armatures of the electromagnets can thus repeat the various combinations for all the signals allocated to the different combina- tions of the keys. When a combination of signals ha9 been received and the armatures have taken up their respective positions corre- sponding to the transmitting keyboard, certain mechanism in the receiver translates the position of the five armatures into a mechani- cal movement which lifts the paper tape against a type-wheel and prints the corresponding letter. The movement for any particular combination of armatures can only take place once per revolution of the type-wheel and at one particular place. The signals must therefore be sent at regular intervals, and to ensure this being done correctly a telephone or time-tapper is provided at each key- board to warn the operator of the correct moment to depress his keys. The Baudot apparatus can have certain channels extended so as to form a means of continuous communication between one station and two or three others by means of one line. It can also be duplexed or repeated similar to any other telegraph system.

In the Murray system the messages are first prepared in the form of a strip of perforated paper about half an inch wide. Per- forating machines equipped with typewriter keyboards Murray are used for the preparation of the messages, two or system. three keyboard perforators being employed at each end of the telegraph lines on which the Murray system is used. The messages in the form of perforated tape are then passed through an automatic transmitter, something like a Wheatstone transmitter, at a speed of about 100 words a minute. At the receiving station electrical mechanisms record the signals once more as perforations in a paper strip forming an exact replica of the transmitting tape. This received perforated tape is then used to control what is known as the printer or automatic typewriter, a machine that translates the tape perforations into letters and prints the messages in

Roman type in page form. This printer is purely mechanical, and its speed is very high. An experimental printer constructed about the middle of 1908 by the British Post Office, operated successfully at the rate of 210 words (1260 letters) per minute. The usual working speed is from 100 to 120 words per minute. The Murray auto- matic system was designed specially for dealing with heavy traffic on long lines. As it uses the Baudot telegraph alphabet it has an advantage in theory over the Wheatstone using the Morse alphabet in regard to the speed that can be obtained on a long telegraph line in the ratio of eight to five, and this theoretical advantage is more or less realized in practice. The Murray automatic system is not regarded as suitable for short telegraph lines or moderate traffic, printing telegraphs on the multiplex principle being con- sidered preferable in such circumstances. One of the longest circuits upon which it has been successfully worked is that between St Petersburg and Omsk, a distance of approximately 2400 miles of iron wire, with three repeating stations. As in some other systems retransmission is effected from the received - perforated tape.

The Creed system is a development of the Morse-Wheatstone system, and provides a keyboard perforator which punches Moise letters or figures on a paper strip by depressing type- writer keys. The slips are passed through an ordinary Wheatstone transmitter and actuate Wheatstone receiving apparatus which in turn controls a " Creed receiving perforator." This machine reproduces a copy of the original transmitting slip, which can be passed on to any other Wheatstone circuit or can be run through a " Creed printer," which is a pneumatic machine actuating a typewriter by means of valves. Messages are thus typed upon a slip which is gummed to the telegraph form. The speed of the receiving perforator ranges from 20 to 150 words per minute.

In the Rowland multiple method of telegraphic working, the transmitter consists of a mechanical keyboard provided with a series of levers, which

effect certain combinations of _ positive and negative currents for each letter. These Rowlaaa currents are furnished by an alternator which transmits sys em ' sine currents over the line and operates a motor at the distant end of the line, both machines running in synchronism. At the re- ceiving end of the circuit a shaft is coupled to the motor; this is provided with gearing which rotates four combining commutators and four type-wheels, which print the letters on the band of paper. There are four transmitters and four receivers, which are operated independently by means of an adaptation of the multiplex system of working, and each circuit is provided with a number of segments set apart for its own use. Each transmitter is therefore able to

Creed system.

transmit a separate series of positive and negative currents in diffe- rent combinations; these are distributed, by suitably arranged distributors and relays at the receiving end of the line, into their respective receivers. The function of the " combiner " in each receiving instrument is so to group the received combination of positive and negative currents that they operate polarized relays in such a manner that the position of the tongues corresponds with the operation of the levers on the transmitter. Since each letter is represented by a specific combination of positive and negative currents, it is possible, by means of the combinations, to close a local circuit at any given interval, and so cause the paper to be pressed against the periphery of the type-wheel at the time when the letter required is opposite. The paper is also caused to ad- vance automatically for each letter, start a fresh line, and also to commence a fresh form at the completion of each message.

Telautograph. — Instruments such as the telautograph and telewriter are apparatus for transmitting a facsimile of hand- writing inscribed on a paper at one end of a line, the reproduc- tion being made automatically at the other end of the line at the same time that the message is being written.

A successful apparatus for effecting this was devised by Cowper and was known as the writing telegraph. The telautograph is on a similar principle to the Cowper apparatus, the motion of the transmitting pencil or stylus used in writing being resolved by a system of levers into two component rectilinear motions, which are used to control and vary the currents in two distinct electrical circuits. By the action of the two variable currents on the electro- magnetic mechanism in the receiver, the two component motions are reproduced and by their combined action on a second system of levers the receiving pen is caused to duplicate the motions of the transmitting pencil. The motion communicated to rollers by the pencil serves to cut resistance in or out of the two line circuits which are connected to the rollers, and thus two independent variable line currents are obtained. In the receiver there is a strong electromagnet, excited by a local current, which has in its circuit two annular air gaps, across which the magnetic field is practically uniform and constant. In these annular spaces there are suspended by springs two light coils of fine copper wirej capable of being moved vertically, and connected in such a manner as to be traversed by the two variable line currents from the transmitter. These coils are drawn down, by the magnetic action of the field on the currents in the coils, into the annular spaces, against the pull of the springs, more or less strongly, according to the strengths of the two line currents. Each coil is attached to a shaft by a bell crank arrangement, and to these shafts there is secured a system of levers similar to that at the transmitter carrying the receiving pencil at the junction. The shafts are turned by the pull of the magnet upon the coils, and the motions of the transmitting pencil are thus reproduced.

The Korn telephotographic apparatus is based on the principle

of an apparatus devised by Shelford Bidwell in 1881 for the

electrical transmission of pictures to a distance, in which

.”’. . use was made of the change in electrical resistance which teltphoto- se i en ; um undergoes when acted upon by light. In the * r ‘t Kom apparatus the light from a Nernst electric lamp is

ys em. conce ntrated to a point by means of a lens on the original picture, which is wound on a glass cylinder in the shape of a trans- parent photographic film. A totally reflecting prism placed inside the glass cylinder projects the light which penetrates the film upon a selenium cell situated at the end of the cylinder. An illumination of variable intensity (according to the deeper or lighter shades of the portion of the picture on which the light falls) thus takes place on the selenium cell. As the glass cylinder, driven by a motor, revolves upon its axis while also advancing (by means of a screw thread on the axis), all portions of the picture are successively brought under the beam or pencil of light and cause a beam of varying intensity to fall on the selenium cell. Owing to the variable illumination of the selenium thus produced, the resistance of the latter, and therefore the intensity of the current sent through the line to the receiving station by the battery, will be altered accord- ingly. At the receiving station a cylinder — which revolves syn- chronously with the transmitting cylinder — is covered with a photographic film or paper, upon a point of which a pencil of light from a Nernst lamp is concentrated. Before reaching the paper the light passes through perforations in two iron plates which are in fact, the pole pieces of a strong electromagnet ; between these is an aluminium shutter which is attached to two parallel wires or thin strips. When there is no current the shutter covers the per- forations and no

light passes, but when a current traverses the wires they are depressed by electromagnetic action, carrying the shutter with them, and a quantity of light proportional to the current strength is admitted through the perforations. By means of this " light-relay " the intensity of the light acting at any moment upon the sensitized paper is made proportional to the illumination of the selenium in the transmitter. To eliminate the sluggish action of the selenium transmitter a selenium cell similar to that at the transmitting station is arranged at the receiving apparatus, and exposed to precisely similar variations of light, the arrangement

being such that the lag of this cell counteracts the lag of the trans- mitting cell. The synchronous revolutions of the transmitting cylinders are effected by making one cylinder revolve slightly faster than the other; after each revolution the cylinder which is acceler- ated is arrested for a moment by means of a special relay until the difference of speed is accurately compensated for. This device was originally adopted in the d'Arlincourt copying telegraph.

Submarine Telegraphy. — For working long submarine cables the apparatus ordinarily employed on land lines cannot be used, as the retarding effect of the electrostatic capacity of the cable is so marked that signals fail to be recorded except at a very slow speed of working. The transmitted signals or electric impulses, which on a land line are sharply defined when re- ceived, become attenuated and prolonged in the case of a long cable, and are unable to actuate the comparatively heavy moving parts of which the land line instruments are formed. Other patterns of apparatus are therefore necessary.

The arrangement of the apparatus for working some of the most recent cables is shown in Fig. 30. The cable is supposed to be worked duplex; but, if S, Ci, C2, and AC are removed and the key connected directly with C3, the arrangement for simplex working is obtained. The apparatus consists of a sending battery B, a reversing transmitting key K, a

slide of small resistance S, three condensers Ci, C2, C3, an artificial cable" AC, the receiving instru- ments I and G, and one or more resistances R for adjusting the leakage current. The peculiar construction of AC has been already referred to. The conductor of the cable is practically insulated, as the condensers in the bridge have a very high resistance; hence no appreciable current ever flows into or out of the line. Two re- ceiving instruments, a siphon recorder and a mirror galvanometer, are shown; one only is absolutely necessary, but it is convenient

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Fig. 30. — Cable Working.

to have the galvanometer ready, so that in case of accident to the recorder it may be at once switched into circuit by the switch s. When one of the levers of K is depressed, the condenser Ci and the cable, and the condenser C 2 and the artificial cable, are simultane- ously charged in series; but, if the capacity of Ci bears the same proportion to the capacity of the cable as the capacity of C2 bears to the capacity of the artificial cable, and if the other adjustments are properly made, no charge will be communicated to C 3 . After a very short interval of time, the length of which depends on the inductive retardation of the cable, the condensers corresponding to Ci and C3 at the other end begin to be charged from the cable, and since the charge of C3 passes through the receiving instrument I or G the signal is recorded. The charging of C3 at the receiving end will take place, no matter what is the absolute potential of the condensers, consequently the incoming signals are not affected by those which are being transmitted from that end. In actual prac- tice the receiving instrument is so sensitive that the difference of potential between the two coatings of the condenser C3 produced by the incoming signal is only a very small fraction of the potential of the battery B. When the key is released the

condensers and cables at once begin to return to zero potential, and if the key is depressed and released several times in rapid succession the cable is divided into sections of varying potential, which travel rapidly towards the receiving end, and indicate their arrival there by pro- ducing corresponding fluctuations in the charge of the condenser C». All cables of any great length are worked by reverse currents. A modification (known as the cable code) of the ordinary single needle alphabet is used; that is to say, currents in one direction indicate dots and in the other direction dashes.

The general principle on which the instruments for working long submarine cables are based is that of making the moving parts very light and perfectly free to follow the comparatively slow rise and fall of the electric impulses or waves. The simplest form of re- ceiving instrument (formerly much used) is known as the ” mirror.” In this instrument a small and very light mirror, about „.

f in. in diameter, attached to a stretched fibre and having a talru- small magnetic needle fixed to its back, is arranged within a meats. galvanometer coil so that the influence of the latter causes the mirror (through the action of the magnetic needle) to be turned through a small angle in one direction or the other according to the direction of the current through the coil. A ray of light from a lamp is thrown on the mirror, whence it is reflected upon a white

surface or scale set at a distance of about 3 ft., forming a bright spot on the surface; the slightest angular deflexion of the mirror, owing to its distance from the scale, moves the spot of light a very appreciable distance to the right or left

according to the direction of the angular movement. These indications form the telegraph alphabet and are read in the same manner as in the case of the " single needle " instrument used on land.

Fig. 31. — Lord Kelvin's early Siphon Recorder.

The spark recorder in some respects foreshadowed the more perfect instrument — the siphon recorder — which was introduced some years later. Its action was as follows. To an Sp "*, indicator, suitably supported, a to-and-fro motion was

recorder. gj ven jjy tne electromagnetic actions due to the electric currents constituting the signals. The indicator was connected with a Ruhmkorff coil or other equivalent apparatus, designed to cause a continual succession of sparks to pass between the indicator and a metal plate situated beneath it and having a plane surface parallel to its line of motion. Over the sur- face of the plate and between it and the indicator there was passed, at a regularly uniform speed, in a direc- tion perpendicular to the line of motion of the indicator, a material capable of being acted on physically by the sparks, through either their chemical action, their heat, or their perforating force. The record of the signals given by this instrument was an undulating line of fine perforations or spots, and the character and succes- sion of the undulations were used to interpret the signals desired to be sent.

In the original form of the siphon recorder (fie. 31), for which Lord Kelvin obtained his first s 'P ho " patent in 1867, the indi- rwo ' cator consisted of a light rectangular signal-coil of fine wire, suspended between the poles of two powerful electromagnets M, M so as to be free to move about its longer axis, which is vertical, and so joined that the electric signal currents through the cable pass through it. A fine glass siphon tube is sus- pended with freedom to move in only one degree, and is connected with the signal-coil and moves with it. The short leg of the siphon tube dips into an

insulated ink-bottle, so

that the ink it contains becomes electrified, while the long leg has its open end at a very small distance from a brass table, placed with its surface parallel to the plane in which the mouth of the leg moves, and over which a slip of paper may be passed at a uniform rate, as in the spark recorder. The ink is electrified by a small induction electrical machine E placed on the top of the instrument; this causes it to fall in very minute drops from the open end of the siphon tube upon the brass table or the paper slip passing over it. When therefore the signal- coil moves in obedience to the electric signal-currents passed through it, the motion communicated to the siphon is recorded on the

moving slip of paper by a wavy line of ink-marks very close together. The interpretation of the signals is according to the Morse code,— the dot and dash being represented by deflexions of the line of dots to one side or other of the centre line of the paper. A very much simpler form of siphon recorder, constructed by Dr Muirhead, is now in general use. The magnet between the poles of which the rectangular signal coil moves is built up of a number of thin flat horseshoe-shaped permanent magnets of a special quality of steel, and is provided with adjustable pole pieces. The signal coil is suspended by fibres and is mounted together with a fixed soft iron core on a brass plate affixed to a rack, with which a pinion operated by a milled head screw engages. To the brass plate is attached an arm carrying the bridge piece. A wire or fibre carrying the aluminium siphon cradle is stretched across this bridge piece, and on it is also mounted the small electromagnet, forming part of the " vibrator " arrangement with its hinged armature, to which one end of the stretched wire carrying the siphon is fastened. The ink-box is made adjustable, being carried by an arm attached to a pillar provided with a rack with which a pinion operated by a milled head screw engages. The motor is usually supported on a platform at the back of the instrument, its driving- wheel being connected to

the shaft of the paper roller by means of a spirally wound steel band. In what is known as the ” hybrid ” form of recorder the permanent magnets are provided with windings of insulated copper wire; the object of these windings is to pro- vide a means of ” refreshing ” the magnets by means of a strong current temporarily sent through the coils when required, as it has been found that, owing to magnetic leakage and other causes, the magnets tend to lose their power, especially in hot climates. Instruments of the siphon recorder type have been made to work both with and without electrification of the ink. In the latter case, which is the standard practice, mechanical vibration of the siphon is substituted in the place of electrification of the ink, so as to eliminate the effect of atmospheric conditions which frequently caused discontinuity in the flow of ink.

Fig. 33 shows a facsimile of part of a message received and re- corded by a siphon recorder, such as that of fig. 31, from one of the Eastern Telegraph Company’s cables about 830 miles long. As the earth is used for completing the electric circuit, the signals received on such sensitive instruments as these are liable to be disturbed by the return currents of other systems in their immediate neighbourhood, which also use the earth as return, when such are of the magnitude generated by the working of electric tramways

FlG. 32, — Muirhead’s Siphon Recorder.

or similar undertakings, and to obviate this it is necessary to form the ” earth ” for the cable a few miles out at sea and make connexion thereto by an insulated return wire, which is enclosed in the same sheathing as the core of the main cable.

The heavier cores, with the consequent advance in speed of work- ing attainable, have necessitated the introduction of automatic sending, the instruments adopted being in general a modification of the Wheatstone transmitter adapted to the form of cable signals, while the regularity of transmission thus

secured has caused its introduction even on circuits where the speed cannot exceed that of the ordinary operator's hand signalling.

The automatic curb sender was originally designed by Lord

Kelvin for the purpose of diminishing the effect of inductive re-

tardation in long cables. In ordinary hand-sending the

malic curb en(^ °^ tne ca ' :, ' e ' s P ut to one or tne other pole of the sender battery and to earth alternately, the relative time during which it is to battery and to earth depending to a great extent on the operator. By the automatic curb sender the cable is put to one or the other pole of the battery and then to the reverse pole for definite proportionate times during

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Fig. 33. — Facsimile of Siphon Recorder Message.

each signal. The cable is thus charged first positively and then negatively, or vice versa, for each signal. Owing to the difficulty of maintaining perfect balance on duplexed cables, curb sending is not now used, but the signals are transmitted by means of an apparatus similar to the Wheatstone automatic transmitter used on land lines and differing from the latter only in regard to the alphabet employed; the signals from the transmitter actuate a relay having heavy armatures which in turn transmit the signals to the cable; this arrangement gives very firm signals, a point of great importance

for good working. The actual speed or rate of signalling is given approximately by the formula, S = i2o/ (KR), where S is the number of words per minute, R the total resistance of the conductor in ohms, and K the total capacity in farads. The speed of a cable is given in words per minute, the conventional number of five letters per word being understood, though in actual practice, owing to the extensive use of special codes, the number of letters per word is really between eight and nine; and this forms a considerable factor in lowering the earning capacity of a cable.

A relay capable of working at the end of a long cable has long been a desideratum. The difficulty experienced is that of securing a good electrical contact under the very slight pressure obtainable from an instrument excited by attenuated arrival-currents. In an „ . instrument invented by S. G. Brown (Brit. Pat. 1434 of

- *‘ 1899) it is sought to overcome this difficulty by causing the point of a contact-arm, representing the siphon in the ordinary form of recorder, to traverse the cylindrical surface of a rapidly rotating drum. This surface is divided into two parallel halves by a short insulating space on which the arm normally rests, so that two separate conducting surfaces are provided, with either one of which the arm will make contact in its excursions in one direction or the other from the central position, the direction and duration of contact being governed by the motion of the suspended coil. The great reduction in friction and in electrical resistance of the contact thus effected between the recurved end of the arm and the rotating surface secures the transmission of signals at such a high rate of speed that the combination of this relay with a special form of curb sender allows of the re-transmission of signals into a second cable at a speed not less than that of the siphon recorder worked in the usual way. The special form of curb sender mentioned, termed the ”*

Interpolator," has been devised so as to secure the correct re-transmission of any given number of consecutive ele- ments of a letter which are of the same sign, for when signals are received at the end of a long cable the relay arm will not return to its zero position between consecutive elements of the same sign, but will remain on the respective contact surface during the whole time occupied by such consecutive elements. The instrument consists of two cams, the form of which regulates the components of the curbed signal, one cam being for the dot element and the other for the dash element, which by their sequence give the letter signals; these cams, by means of clutches controlled by the relay, are mechanically rotated by clockwork, the speed of rotation being approximately adjusted to the rate of transmission of a single element, so that the requisite number of consecutive elements is transmitted corresponding to the duration of contact of the relay arm with the side controlling that particular element. By a modi- fication of this apparatus the message, instead of being immedi- ately re-transmitted into the second cable, can be punched on a paper slip, which can be inserted in the usual way into an auto- matic transmitter, so as to send either cable or Morse signals. Fig. 34 shows the effect of the interpolator in dissecting the con- secutive elements of any letter combination. Another instrument (see Brit. Pat. No. 18,261 of 1898) is what may be termed a magnifier, since signals so small as to be almost unreadable on direct record are rendered perfectly legible. The recorder coil is connected mechanically to a second similar coil, which is suspended between

the poles of a laminated magnet, so that the motions of the two are similar. This magnet is excited by an alternating current, and the current induced in the second coil is after rectification sent through an ordinary siphon recorder. As the direction and

intensity of this induced current are a function of the position of the second coil in its field, and as this position is determined by its mechanical connexion with the recorder coil, it is evident that, by a suitable choice of the electrical elements of the second coil and its alter- nating field, the indications on the siphon recorder can be magnified to any reasonable extent.

By means of a ” magnetic shunt ” Brown succeeded in increasing the working speed of long submarine cables to the extent of 10 to 15 per cent. The magnetic shunt (which is connected „ .

across the receiving instrument) consists of a low resist- Jn ^g”f* lc ance coil of some 2000 turns of insulated copper wire, s un enclosed in a laminated iron circuit, and connected at intervals to a number of terminals so that equal increments of inductance may be obtained. The use of the iron core renders it possible to produce a high inductive effect with a low resistance coil, and thus obtain the necessary slow time constant to which is due the success of this type of magnetic shunt on cable signals. The shunts usually em- ployed with the drum relay (referred to above) have each a resistance of about 30 ohms and an inductance of 20, 30 and 40 henrys re- spectively. The explanation of the action of the shunt is that all slowly varying currents affect the coil of the receiving instrument and its shunt in inverse proportion to their respective resistances; whereas with the comparatively rapid variations of current used in signalling the coil is forced at the beginning of each element of

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Fig. 34. — Taylor and Dearlove's Interpolator with Brown's Improvements.

A, slip as received on recorder, using ordinary relays for translating on to second cable; B, slip as received on recorder, when interpolator is used at intermediate station, for sending on to second cable; C (four cells through a line, KR = 3-6), signals with recorder under ordinary conditions; D, all conditions the same as in C, but magnifying relay inserted between the end of the line and the recorder.

a signal to take more, and at the end of the element less of the total arrival current from the cable than would traverse it if the shunt were non-inductive.

For duplex working a " magnetic bridge " is used. This con- sists of a low resistance coil of copper wire enclosed in a laminated iron circuit similar to the magnetic shunt already de- ^f ajnle< fc scribed. The coil, however, is arranged so that the ^,/J™. sending current enters an adjustable mid-point in the "

coil and passes through the two halves of the winding to the ends connected to the cable and artificial line respectively. The receiving instrument is joined up across these ends in the usual manner. The action of this bridge resembles the magnetic shunt in its effect on the received signals, as the direction of the winding is the same throughout its length, and thus the full inductive action is pro- duced for curbing purposes. To the sending currents, however, the bridge offers only apparent ohmic resistance due to the fact that the current entering the mid-point of the winding flows through the two halves or arms in opposite direction, and, owing to the winding being on the same iron core, the mutual inductive effect of the two arms on one another neutralizes the self-induction to the sending currents. The average total

inductive value of these bridges to received signals is about 40 henrys, and the coil is so arranged that the arms contain three sections or blocks of winding each, two of which are joined up to strap connexions, and the

third divided into small subdivisions to any terminals of which the cross circuit connexions may be affixed. By this arrangement of the coil winding, similar sections can be thrown in or out of circuit with both arms, and also so combined that any amount of inductance suitable to every class of cable may be obtained. The bridge is provided with two adjustments: — (i) a variable ” apex.‘having several turns of the winding between each stud to permit of the arms being thrown slightly out of balance as a rough compensa- tion for the differences in the cable and artificial line; and (2) an additional ” fine ” adjustment in one of the arms by which the small daily balance variations may be corrected. As with other duplex systems it is possible to obtain several approximately correct adjust- ments with the bridge and its accessories, but only one gives a true balance, and careful experiment is required to make sure that this is obtained. The advantage of using the magnetic bridge duplex method is that the maximum current is sent to line or cable, and the receiving system benefits accordingly. (H. R. K.)

Commercial Aspects.

The earliest practical trial of electrical telegraphy was made in 1837 on the London and North Western Railway, and the first public line under the patent of Wheatstone and Cooke was laid from Paddington to Slough on the Great Western Railway in 1843. At first the use of the telegraph was almost entirely confined to railways. The Electric Telegraph Company, formed to undertake the business

of transmitting telegrams, was incorporated in 1846. For some time it restricted its operations to constructing and maintaining railway telegraphs and was not commercially successful. Its tariff was is. for 20 words within a radius of 50 miles, is. 6d. within 100 miles, 5s. if exceeding 100 miles. After about five years great improvements were made in the working of the telegraphs and the industry began to make progress. Telegraphic money orders were established in 1850; a cable was laid between Dover and Calais, and in November 1851 the stock exchanges of London and Paris were able for the first time to compare prices during business hours of the same day; numerous companies were formed, some of which were independent of the railways, and keen competition led to considerable extensions of wires and reduction of tariffs, with the result that a large increase in the volume of business look place. In the period from 1855 to 1868 the number of messages carried annually by all the telegraph companies of the United Kingdom increased from 1,017,529 to 5,781,989, or an average annual increase of 1636 per cent. During this period the Electric Telegraph Company's average receipts per message fell from 4s. ijd. to 2s. of d., or just over half, while the number of messages increased nearly fourfold. The working expenses were reduced in a progressively larger ratio, e.g. in 1859 the average working expenses were 2s. 7d. per message or more than 65 per cent, of the receipts, while in 1869 they were is. o^d. per message or only 51 per cent, of the receipts. Much dissatis- faction was felt because the larger towns where competition had been most keen were unduly benefited to the neglect of smaller towns where the business was comparatively less profit- able, but it must be remembered that the telegraph lines followed the railways and that many towns were not served owing to their opposition to the railways.

In 1856 the Edinburgh Chamber of Commerce began an agitation for the purchase by the government of the telegraphs, and other chambers of commerce in Great Britain joined the agitation, which was strongly

supported by the Press. In 1865 the Postmaster-General (Lord Stanley) commissioned Mr F. T. Scudamore, second secretary to the Post Office, to inquire and report whether the electric telegraph service could be bene- ficially worked by the Post Office, and whether it would entail any very large expenditure on the Post Office beyond the purchase of the rights. At that time the total number of places supplied with telegraphic communication by all the companies collectively, including railway stations, was 2500, whereas the number of places having postal communications was over 10,000. Under the then existing telegraphic tariff the charge in Great Britain was a shilling for a twenty-word message over a distance not exceeding 100 miles ; is. 6d. for a like message over distances from 100 to 200 miles; 2s. when exceeding 500 miles. For a message between Great Britain and Ireland the

charge ranged from 3s. to 6s.; to Jersey or Guernsey it was 7s. 8d. There were also extra charges under contingent re- gulations of great complexity, which commonly added 50 per cent, to the primary charge, and frequently doubled it. Mr Scudamore, who was regarded as the author of the bill for the acquisition of the telegraph systems, reported that the charges made by the telegraph companies were too high and tended to check the growth of telegraphy; that there were frequent delays of messages; that many important districts were unprovided with facilities; that in many places the telegraph office was inconveniently remote from the centre of business and was open for too small a portion of the day; that little or no improvement could be expected so long as the working of the telegraphs was conducted by commercial companies striving chiefly to earn a dividend and engaged in wasteful competition with each other; that the growth of telegraphy had been greatly stimulated in Belgium and Switzer- land by the annexation of the telegraphs to the Post Offices of those countries and the consequent adoption of a low scale of charges; that in Great Britain like results would follow the adoption of like means, and that the

association of the tele- graphs with the Post Office would produce great advantage to the public and ultimately a large revenue to the state.

In support of these views he reported that in Belgium in 1863 a reduction of 33 per cent, in the charge had been followed by an increase of 80 per cent, in the number of telegrams, and that in 1886 a reduction of 50 per cent, in the charge had been followed by an increase of 85 per cent, in the traffic; and similar statistics pointing to increase of business consequent on reduc- , tion of rates were produced in regard to France, Switzerland and Prussia. The relative backwardness of telegraphy in Great Britain was attributed to high charges made by the companies and to restricted facilities. Some of the complaints against the companies, however, were exaggerated, and the estimates formed of the possible commercial development of telegraphy were optimistic. The basis for these estimates was the experi- ence of other countries, which, however, did not justify the expectation that a large increase of business consequent on reduction of rates could be obtained without serious diminution of profit. The Belgian state telegraphs were started in 1850 and were at first very profitable, but for the years 1 866-9 they yielded an average profit of only 2-8 per cent., and subsequently failed to earn operating expenses, the reasons for the steady decline of the profits being the opening of relatively unpro- fitable lines and offices, increases in wages, and a diminution in growth of the foreign and transit messages which had con- stituted the most profitable part of the whole business. The Belgian government endeavoured by reducing rates and increas- ing facilities to stimulate inland telegraphy in the hope of thereby increasing the profits of the department. But these expectations were not realized. Upwards of 100 telegraph offices in Belgium despatched on the average less than one telegram per day, and some offices despatched less than one a month. Similar experience was adduced by the working of the state telegraphs in Switzerland and in France. The profits when earned were derived

mainly from foreign messages and transit messages between foreign countries, while the receipts from inland messages did not always cover expenses. In 1868 there were in France over 300 telegraph offices whose average receipts did not exceed £8 per annum. In that year the Swiss government reduced the rate for inland telegrams by one-half, and the traffic immediately doubled, but the cost of carrying on the service increased in a larger ratio.

The experience of the telegraph companies in the United Kingdom, moreover, showed that a uniform rate, irrespective of distance, of is. for 20 words, addressed free, was not remunera- tive in the then state of telegraphy, which made it necessary for messages to be re-transmitted at intervals of about 300 miles. In 1861 the United Kingdom Telegraph Company began a competition with the other companies on the basis of a is rate, and the old-established companies were forced to adopt this rate between all points served by the United Kingdom

Company; but after a trial of four years it was found that a uniform is. rate irrespective of distance had not justified itself, and that for any but very short distances the tariff was " utterly unremunerative " notwithstanding a very large increase in volume of business. Even the London District Telegraph Company, which was formed in 1859 for the pur- pose of transmitting telegraph messages between points in metropolitan London, found that a low uniform rate was not financially practicable. The company began with a tariff of 4d. per 10 words; it soon increased the rate to 6d. for 15 words with an additional porterage charge for delivery beyond a certain distance, and in 1866 the tariff was raised to is. The company had 123 m. of line and 83 offices, and in 1865 con- veyed over 316,000 messages, but it was not financially suc- cessful.

Both the telegraph companies and the railway companies had incurred heavy commercial risks in developing the telegraph services of the country and only moderate profits were earned. It cannot justly be said that the companies made large profits while neglecting to develop the services adequately, but it is true that they were not able commercially to comply with many of the demands made upon them by the public. Until speculation took place in anticipation of govern- ment purchase, the market prices of the telegraph securities were mostly below par. The stock of the Electric and Inter- national Company, the return on which had reached 10 per cent, per annum, however, was valued at about 14 years' purchase of the annual profits. Very little new capital was invested by the telegraph companies about 1865 because of the natural reluctance of the companies to extend the systems under their control so long as a proposal for their acquisition by the state was under consideration. In 1868 the length of electric telegraph lines belonging to the companies was 16,643 m., and of those belonging to the railway companies 4872 m., or a total of 21,515. With regard to the statement that the companies had installed competitive systems and had expended capital needlessly, it was found by the Post Office authorities that in 1865 less than 2000 m. of telegraph lines, and 350 offices out of a total of over 2000, were redundant. The telegraph companies proposed to effect an amalgamation so as to enable the services to be consolidated and extended, and they proposed to submit to various conditions for the protection of the public, such as maximum rates and limita- tion of dividends, with the provision that new issues of capital should be offered by auction, but public opinion was averse to the proposal. By 1868 both political parties in the House of Commons had committed themselves to the policy of state purchase of the telegraphs.

After much negotiation the basis finally agreed upon between the government and the companies was 20 years' purchase of the profits of the year ended 30th June 1868. The Chancellor of the Exchequer

described the terms as " very liberal but not more liberal than they should be under the circumstances," and stated that Mr Scudamore had estimated that £6,000,000 was the maximum price which the government would have to pay, and that the Postmaster-General would obtain from the telegraphs a net annual revenue of £203,000 at least. In addition to the undertakings of the telegraph companies the government had to purchase the reversionary rights of the railway companies which arose out of the circumstance that the telegraph companies for the most part had erected their poles and wires along the permanent way of the railways under leases which in 1868 had still many years to run. The price awarded to the six telegraph companies was £5,733,000. A further £100,000 was paid for the Jersey, Guernsey, Isle of Man and other undertakings, and about £2,000,000 was paid to the railway companies for their reversionary rights, the cost of which had been estimated at £700,000.

The government acquired the perpetual and exclusive way- leaves for telegraph lines over the railways, but the monopoly of the Postmaster-General does not apply to those numerous wires which are required for the protection of life on railways. The telegraphs were transferred to the Post Office on the 5th of

February 1870. During the following three years the govern- ment spent £500,000 in making good the depreciation suffered by the plant in the transition years of 1868 and 1869, for which allowance had been made in the purchase price, and about £1,700,000 was expended on new plant. During that period 8000 m. of posts, 46,000 m. of wire and about 200 m. of underground pipes were added. The cost of these works had been underestimated, and the report of the Select Com- mittee of the Post Office (Telegraph Department), 1876, states that " the committee have not received any full and satis- factory explanation of the great differences between the esti- mated expenditure of 1869 and the actual expenditure incurred up to 1876."

The excess expenditure caused the Post Office during

two or three years to make temporary application of Savings Banks' balances to telegraph expenditure, an expedient which was disapproved of by both the Treasury and the House of Commons. Probably no more arduous task was ever thrown upon a public department than that imposed on the Post Office by the transfer. The reforms which it was to bring about were eagerly and im- patiently demanded by the public. This great operation had to be effected without interrupting the public service, and the department had immediately to reduce and to simplify the charges for transmission throughout the kingdom. It had to extend the hours of business at all the offices; it had to extend the wires from railway stations lying outside of town populations to post offices in the centre of those populations and throughout their suburbs; it had also to extend the wires from towns into rural districts previously devoid of telegraphic communication; it had to effect a complete severance of commercial and domestic telegraphy from that of mere railway traffic, and in order to effect this severance it had to provide the railways with .some 6000 m. of wires in substitution for those of which they had been joint users. It had further to provide at low charges for the distribution of news to the Press; it had. to facilitate the transmission of money orders by telegram; finally, it had to amalgamate into one staff bodies of men who had formerly worked as rivals upon opposite plans and with different instru- ments, and to combine the amalgamated telegraph staff with that of the postal service. So zealously was the work of im- provement pursued that within little more than six years of the transfer the aggregate extent of road wires in the United Kingdom was already 63,000 m. and that of railway wires 45,000, in all 108,000 m. The number of instruments in the telegraph offices was 12,000. At that date the superintending and managing staffs of the Post Office comprised 590 persons, the staff of the old companies with only about one-third of the traffic having been 534 persons.

The anticipations as to the increase of messages

that would result from the reduction of rates were fully realized. The number of messages increased from about 6,500,000 in 1869 to nearly 10,000,000 in 1871 and to 20,000,000 in 1875, but the expectations as to net revenue were not justified by the results. In 1869 Mr Scudamore estimated the operating expenses at 51 to 56 per cent, of the gross revenue. In 1870-1 they were 57 per cent, and in 1871-2, 78 per cent. Since 1873 the capital account has been closed with a total expenditure of £10,867,644, and all subsequent expenditure for extensions, purchase of sites and erection of buildings has been charged against revenue.

There are several reasons for the unsatisfactory financial results apart from the high price paid for the acquisition of the telegraphs. The unprofitable extension of the telegraphs has largely contri- buted to the loss. Moreover, since 1 88 1 the wages and salaries of the telegraph employees have been increased on several occasions in consequence of political pressure brought to bear on members of parliament; and notwithstanding the protest of the government of the day, the House of Commons in 1883 carried a resolution that the minimum rate for inland telegrams should be reduced to 6d. This involved a large extension of wires to cope with increased traffic. The reduced rate took effect as from the 1st of October

1886.

Another reason assigned by the committee appointed by the Treasury in 1875 " to investigate the causes of the increased cost of the telegraphic service since the acquisition of the telegraphs by the state " is the loss on the business of transmitting Press

messages, which has been estimated as at least

£300,000 a year. A further cause has been competition offered by the telephone service, but against this the Post Office has received royalties from telephone companies and revenue from trunk telephone lines. These amounted in 1887 to £26,170 and £1312 respectively; in 1897 to £85,289 and £113,294, and in 1907 to £240,331 and £479,639 respectively.

The following table shows the financial results of the business in the year immediately following the purchase of the telegraphs by the state, in the two years preceding and the two years following the introduction of the 6d. tariff, and in the seven financial years from 1900-1907 : —

the British ship ” Agamemnon,” both being war-ships lent for the purpose by their respective governments. The shore end was landed in Valentia Harbour on the 5th of August, and next morning paying out was started by the ” Niagara,” to which tht laying of the first half had been entrusted. For the first few days the operation proceeded satisfactorily, though slowly, but on the afternoon of the nth, when 380 m. had been laid, the cable snapped, owing to a mistake in the manipulation of the brake, and the ships returned to Plymouth with what remained. Next year, 700 m. of new cable having been made, the attempt was renewed, with the same ships, but on this occasion it wa»

Net Revenue

Percentage

after omitting from Total

Interest on

Number of

Total

of Total

Net Revenue or

Expenditure the

Stock created

Year.

Messages.

Gross Receipts.

Expenditure.

Expenditure to Gross Receipts.

Deficiency.

cost of Sites,

Buildings and

Telegraph

Extensions.

for Purchase of Telegraphs.

£

£

£

£

£

1870-71 *

9,850,I77

801,262

462,762

57-75

338,500

342,618

214,500

1883-84 . .

32,843,120

1,789,223

1,808,920

IOI-IO

19,697

Deficiency

36,350

Deficiency

45..I37 Deficiency

1 45 ..473

Deficiency

337.641

330,835

326,417

1 884-85 f .

33.278,459

1,784.414

1,820,764

102-03

274,271

326,417

1885–86 . .

39,146,283

1,787,264

1,832,401

102–52

167,915

326,417

1886–87 . .

50,243,639

1,887,159

2,032,632

107–70

88,484

326,417

1900–01

89,576,961

3.459.353

3,796,994

109–76

6,861

298,860

Deficiency

Deficit

1901-02 .

90,432,041

3,570,046

4,221,927

118-26

651,881

Deficiency

169,772

Deficit

298,860

1902-03 .

92,471,000

3,723,866

4.325.577

116-16

601,711

Deficiency

109,760

Deficit

298,860

1903-04 . .

89,997,000

3,736,n5

4,693,898

125–64

957,783

Deficiency

306,108

Deficit

278,483

1904–05 . .

88,969,000

3,920,023

4.839.459

123–45

919,436

Deficiency

160,989

Deficit

271,691

1 905–06 .

89,478,000

4. 1 5 1. 38o

4,892,199

117–85

740,819

Deficiency

652,055

12,693

271,691

1906-07 .

89,493,000

4,369,230

5,021,285

114-92

214,982

271,691

(Estimated)

Deficiency

: 5th February 1870. — Transfer of telegraphs to the state. ' 1st October 1885. — Introduction of sixpenny tariff.

Submarine Telegraphs. — The first commercially successful cable was that laid across the straits of Dover from the South Foreland to Sangatte by T. R. Crampton in 1851, and two years later, after several futile attempts, another was laid between Port Patrick in the south of Scotland and Donaghadee in Ireland. This was followed by various other cables between England and the neighbouring countries, and their success naturally revived the idea which had been suggested in 1845 of establishing telegraphic communication between England and America, though this enterprise, on account of the distance and the greater depth of water, was of a much more formidable char- acter. On the American side Cyrus W. Field acquired a con- cession which had been granted to F. N. Gisborne for a land line connecting St John's, Newfoundland, and Cape Ray, in the Gulf of St Lawrence, and proceeded himself to get control

of the points on the American coast most suitable as landing places for a cable. On the British side the question of con- structing an Atlantic cable was engaging the attention of the Magnetic Telegraph Company and its engineer Mr (afterwards Sir) Charles Bright. Visiting England in 1856, Field entered into an agreement with Bright and with John Watkins Brett, who with his brother Jacob had proposed the constructing of an Atlantic cable eleven years previously, with the object of form- ing a company for establishing and working electric telegraphic communication between Newfoundland and Ireland. The Atlantic Telegraph Company was duly registered in 1856, with a capital of £350,000, the great bulk of which was subscribed in England. The manufacture of the cable, begun early in the following year, was finished in June, and before the end of July it was stowed partly in the American ship " Niagara " and partly in

decided to begin paying out in mid-ocean, the two vessels, after splicing together the ends of the cable they had on board, sailing away from each other in opposite directions. They left Plymouth on the 10th of June, but owing to a terrific storm it was not till the 25th that they met at the rendezvous. A splice having been made they started on the 26th, but the cable broke almost immediately. Another splice was made, to be followed, after the " Agamemnon " had paid out about 40 m., by another break. Again the ships returned to the rendezvous and made another splice, and again there was a break after the " Agamem- non " had paid out 146 m., and then the " Agamemnon," after again returning to the meeting-place in the vain hope that the " Niagara " might have returned there also, made for Queens- town, where she found her consort had arrived nearly a week previously.

Although a good deal of cable had been lost, enough remained to connect the British and American shores, and accordingly it was determined to make another attempt immediately. To this end the ships sailed from Queenstown on the 17th of July, and having spliced the cable in mid-ocean, started to pay it

out on the 29th. The " Niagara " landed her end in Trinity Bay, Newfoundland, on the 5th of August, while on the same day the " Agamemnon" landed hers at Valentia. The electrical con- dition of the cable was then excellent, but unfortunately the electrician in charge, Wildman Whitehouse, conceived the wrong idea that it should be worked by currents of high potential. For nearly a week futile attempts were made to send messages by his methods, and then a return was made to the weak currents and the mirror galvanometers of Sir William Thomson (Lord Kelvin) which had been employed for testing purposes

while the cable was being laid. In this way communication was established from both sides on the 16th of August, but it did not continue long, for the insulation had been ruined by Whitehouse's treatment, and after the 20th of October no signals could be got through.

The next attempt at laying an Atlantic cable was made in 1865, the necessary capital being again raised in England. It was determined that the work should be done by a single ship, and accordingly the " Great Eastern " was chartered. She started from Valentia at the end of July, but fault after fault was dis- covered in the cable and the final misfortune was that on the 2nd of August, when nearly 1200 m. had been paid out, there was a break, and all the efforts made to pick up the lost portion proved unavailing. Next year the attempt was renewed. The Atlantic Telegraph Company was reconstituted as the Anglo- American Telegraph Company with a capital of £600,000 and sufficient cable was ordered not only to lay a line across the ocean but also to complete the 1865 cable. The " Great Eastern " was again employed, and leaving the south-west coast of Ireland on the 13th of July she reached Trinity Bay a fortnight later, without

serious mishap. She then steamed eastwards again, and on the 13th of August made her first attempt to recover the lost cable. This, like many subsequent ones, was a failure, but finally she succeeded on the 2nd of September, and having made a splice completed the laying of the cable on the 8th of September. These two cables did not have a very long life, that of 1865 breaking down in 1877 and that of 1866 in 1872, but by the later of these dates four other cables had been laid across the Atlantic, including one from Brest to Duxbury, Mass. It was stated by Sir Charles Bright in 1887 that by that date 107,000 m. of submarine cable had been laid, while ten years later it was computed that 162,000 nautical miles of cable were in existence, representing a capital of £40,000,000, 75 per cent of which had been provided by the United Kingdom. Among the men of business it was undoubtedly Sir John Pender (1815-1896) who contributed most to the development of this colossal industry, and to his unfailing faith in their ultimate realization must be ascribed the completion of the first successful Atlantic cables. The submarine cables of the world now have a length exceeding 200,000 nautical miles, and most of them have been manu- factured on the Thames.

The monopoly conferred upon the Postmaster-General by the Telegraph Act 1869 was subsequently extended to telephony and wireless telegraphy, but it does not extend to submarine telegraphy. The submarine telegraphs are mainly controlled by companies, the amount of issued capital of the existing British telegraph companies (twenty-four in number) being £30,447,191, but a certain number of lines are in government hands. Thus on the 31st of March 1889 the undertaking of the Submarine Telegraph Company was purchased by the governments concerned. France and Great Britain jointly ac- quired the cables between Calais and Dover, Boulogne and Folkestone, Dieppe and Beachy Head, Havre and Beachy Head, Piron, near Coutances, and Vieux Chateaux (St Heliers, Jersey). Belgium and Great Britain became joint-proprietors of the cables between Ramsgate and Ostend and Dover

and De la Panne (near Furnes). The two cables to Holland and one of the cables to Germany were already the property of Great Britain, and the German Union Company's cable to Germany was purchased by the German government. The offices of the Submarine Company in London, Dover, Ramsgate, East Dean and Jersey were purchased by the Post Office, as well as the cable ship; and the staff, 370 in number, was taken over by the government. The capital amount laid out by Great Britain was £67,163, and on'ist April the new business was begun with a uniform rate to France, Germany, Holland and Belgium of 2d. a word, with a minimum of iod.

In 1890 Liverpool was placed in direct telegraphic communi- cation with Hamburg and Havre, and London with Rome. The following year an additional cable was laid from Bacton, in Norfolk, to Borkum, in Germany, at the joint expense of the British and German governments. Direct telegraphic com-

munication was thus afforded between London and Vienna. In 1893 a contract was made with the Eastern and South Africa Telegraph Company for the construction, laying and mainten- ance of a cable from Zanzibar to the Seychelles and Mau- ritius, a distance of 2210 m., for a subsidy of £28,000 a year for twenty years. In 1894 the Eastern Extension Telegraph Company laid a cable from Singapore to Labuan and Hong Kong, thus duplicating the route and making it an all-British line. The following year the rates to and from East and South Africa were reduced, by negotiation, from charges varying from 7s. 9d. to 8s. nd. a word to 5s. 2d. or 5s. Government messages were accorded a rate of 2s. 6d., and Press telegrams one of from is. 5d. to is. 73d. a word. In 1896 it was arranged to lay two new cables to France and one (for duplex working) to Germany. On the 1st of February 1898 a new cable was laid between Bermuda and Jamaica (via Turks Islands), giving an all-British line to the West Indies, with reduced charges. In 1900 direct telegraph working was established between London and Genoa, and a third cable was laid to South Africa via St Helena and Ascension. In 1896 a committee was

appointed to consider the proposal for laying a telegraph cable between British North America and Australasia. The report of the committee, which is dated January 1897, was presented to parlia- ment in April 1899, and dealt with the practicability of the project, the route, the cost and the revenue. The committee was of opinion that the cable should be owned and worked by the governments interested, and that the general direction should be in the hands of a manager in London under the control of a small board at which the associated governments should be represented. The English cable companies urged that state interference with private enterprise was neither justifi- able nor necessary, as the rates could be reduced and an alternative cable route to Australia arranged on reasonable terms without it, and that the Cape route would be the best alternative route. The government policy would, they alleged, create an absolute and objectionable monopoly. In the corre- spondence (Blue Book, Ed. 46, 1900) between the Eastern Telegraph Company and the Colonial Office, the company pointed out that Mr Raikes, when Postmaster-General, had stated that " it would be without precedent for the English government itself to become interested in such a scheme in such a way as to constitute itself a competitor with existing commercial enterprises carried on by citizens of the British empire. There would be a very serious question raised, and it would probably extend to other forms of British enterprise." The company further pointed out that Mr L. Courtney (after- wards Lord Courtney), when Secretary of the Treasury, had stated that " it would be highly inexpedient to encourage upon light grounds competition against a company in the position of the Eastern Telegraph Company which has embarked much capital in existing lines"; and that . the permanent officials representing the Post Office before the Pacific Cable committee had stated " that there was no precedent for the Imperial Government alone or in association with the Colonies managing or seeking business for a line of this kind." The reply of the Colonial Office contained the following statements of general policy: — " With the

progressive development of society the tendency is to enlarge the functions and widen the sphere of action of the central government as well as of the local autho- rities, and to claim for them a more or less exclusive use of powers, and the performance of services where the desired result is difficult to attain through private enterprise, or where the result of entrusting such powers or services to private enterprise would be detrimental to the public interest, through their being in that event necessarily conducted primarily for the benefit of the undertakers rather than of the public. This tendency is specially manifested in cases where from the magnitude or other conditions of the enterprise the public is deprived of the important safeguard of unrestricted com- petition. ... In the case of inland telegraphs and of cable communication with the continent of Europe government control has entirely superseded private companies. Closely

analogous to the action of the state in the cases referred to is the action taken by municipal authorities with the authority of the legislature in competing with or superseding private companies for the supply of electric light, gas, water, tramways and other public services. . . . The service which the govern- ment and the colonies desire is one which neither the Eastern Telegraph Company nor any other private enterprise is prepared to undertake on terms which can be considered in comparison with the terms upon which it can be provided by the associated governments."

In November 1899 a committee was appointed by the Colonial Office for the further examination of the scheme, and towards the end of 1900 a tender was accepted for the manufacture and laying of a submarine cable between the Island of Vancouver and Queensland and New Zealand for the sum of

£1,795,000, the work to be completed by the 31st of December 1002. A board was constituted to supervise the construction and working of the cable, composed of representatives of the several govern- ments, with offices at Westminster. Under the Pacific Cable Act 1901 the capital sum of £2,000,000 was provided in the following proportions: —

United Kingdom, 5/i8ths with 3 representatives including the chairman.

Canada, 5/i8ths with 2 representatives.

Australia, 6/i8ths with 2 representatives.

New Zealand, 2/i8ths with 1 representative. In these proportions the respective contributing governments are responsible for the losses made in the working of the under- taking. The annual expenses of the board include £35,000 for cable repairs and reserve and a fixed payment to the National Debt Commissioners of £77,544 as sinking fund to amortise capital expenditure in fifty years. The deficiency on the working for the year ended 31st March 1907 was £54,924, and the approximate number of messages transmitted during the year was 96,783 with 1,126,940 words. There was in addition a considerable inter-colonial traffic between Australia, New Zealand and the Fijis.

Since the early days of international telegraphy, conferences of representatives of government telegraph departments and companies have been held from time to time (Paris 1865, Vienna 1868, Rome 1871 and 1878, St Petersburg 1875, London 1879, Berlin 1885, Paris 1891, Buda Pesth 1896, London 1903). In 1868 the International Bureau of Telegraphic Administra- tions was constituted at Berne, and a convention was formulated by which a central office was appointed to collect and publish information and generally to promote the interests of inter- national telegraphy. International service regulations have been drawn up which possess equal authority with the con- vention and constitute what may be regarded as the law relating to international

telegraphy. The total lengths of the land lines of the telegraphs throughout the world in 1907 were 1,015,894 m. aerial, and 11,454 m - underground, and the total lengths of submarine cables of the world were 39,072 nautical miles under government administration and 194,751 nautical miles under the administration of private companies.

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Canal

Fig. 35. — Morse's Con- duction Method.

Part II. — Wireless Telegraphy

The early attempts to achieve electric telegraphy involved the use of a complete metallic circuit, but K. A. Steinheil of Munich, however, acting on a suggestion given by Gauss, made in 1838 the important discovery that half of the circuit might be formed of the conducting earth, and so discovered the use of the earth return, since then an essential feature of nearly every telegraphic circuit. Encouraged by this success, he even made the further suggestion that the remaining metallic portion of the circuit might perhaps some day be abolished and a system of wireless telegraphy established. 1

Morse showed, by experiments made in 1842 on a canal at Washington, that it was possible to interrupt the metallic electric circuit in two places and yet retain power of electric Morse. communication (see Fahie, loc. cit., p. 10). His plan, which has been imitated by numerous other experimentalists, was as follows: — On each side of the' canal, at a considerable distance apart, metal plates e e (fig. 35) were sunk in the water; the pair on one side were connected by a battery B, and the pair on the other by a galvanometer or telegraphic receiver R. Under these circumstances a small portion of the current from the battery is shunted through the gal- . vanometer circuit, and can be used to make electric signals. Morse and Gale, who assisted him, found, how- ever, that the distance of the plates' up and down the canal must be at least three or four times the width of the canal to obtain successful results. Numerous investigators followed in Morse's footsteps. James Bowman

Lindsay of Dundee, between 1845 and 1854, reinvented and even patented Morse's method, and practically put the plan into operation for experimental purposes across the river Tay. J. W. Wilkiiis in 1849, and H. Highton in experiments described in

1872, also revived the same suggestion for wireless telegraphy.

The invention of the magneto-telephone put into the hands of electricians a new instrument of extraordinary sensitiveness for the detection of feeble interrupted, or alternating, cur- Trow- rents, and by its aid J. Trowbridge in 1880, in the bridge. United States, made a very elaborate investigation of the propagation of electric currents through the earth, either soil or water (see " The Earth as a Conductor of Electricity," Amer. Acad. Arts and Sci., 1880). He found, as others have done, that if a battery, dynamo or induction coil has its terminals connected to the earth at two distant places, a system of electric currents flows between these points through the crust of the earth. If the current is interrupted or alternating, and if a telephone receiver has its terminals connected to a separate metallic circuit joined by earth plates at two other places to the earth, not on the same equipotential surface of the first circuit, sounds will be heard in the telephone due to a current passing through it. Hence, by inserting a break-and-make key in the circuit of the battery, coil or dynamo, the uniform noise or hum in the telephone can be cut up into periods of long and short noises, which can be made to yield the signals of the Morse alphabet. In this manner Trowbridge showed that signalling might be carried on over considerable distances by electric conduction through the earth or water between places not metallically connected. He also repeated the suggestion which Lindsay had already made that it might be possible to signal in this manner by conduction currents through the Atlantic Ocean from the United States to Europe. He and others also suggested the applicability of the method to the inter-communication of ships at sea. He proposed that one ship should be provided with the means of making an interrupted current in a circuit formed partly of an insulated metallic wire connected with the sea at both ends by plates, and partly of the unlimited ocean. Such an arrangement would

distribute a

1 For a history of the discovery of the earth return, see Fahie, History of Electric Telegraphy to the Year 18^7, pp. 343-348.

Fig. 36.

-Magneto-Induction Method.

system of flow lines of current through the sea, and these might be detected by any other ships furnished with two plates dipping into the sea at stem and stern, and connected by a wire having a telephone in its circuit, provided that the two plates were not placed on the same equipotential surface of the original current flow lines. Experiments of this kind were actually tried by Graham Bell in 1882, with boats on the Potomac river, and signals were detected at a distance of a mile and a half.

At a later date, 1801, Trowbridge discussed another method of effecting communication at a distance, viz., by means of magnetic induction between two separate and completely insulated circuits. If a primary circuit, consisting of a large coil of wire P (fig. 36), has in circuit a battery B and an interrupter I, and at some distance and parallel to this primary circuit is placed a secondary circuit S, having a telephone T included in it, the interruptions or reversals of the current in the primary circuit will give rise to a varying magnetic field round that circuit which will induce secondary currents in the >* S/ other circuit and affect the

T f| telephone receiver. Willoughby

I gT Smith found that it was not

necessary even to connect the telephone to a

secondary circuit, but that it would be affected and give out sounds merely by being held in the variable magnetic field of a primary circuit. By the use of a key in the battery circuit as well as an interrupter or current reverser, signals can be given by breaking up the continuous hum in the telephone into long and short periods. This method of communication by magnetic induction through space establishes, therefore, a second method of wireless telegraphy which is quite independent of and different from that due to conduction through earth or water.

Sir W. H. Preece, who took up the subject about the same time as Prof. Trowbridge, obtained improved practical results by combining together methods of induction and con- duction. His first publication of results was in 1882 {Brit. Assoc. Report), when he drew attention to the considerable distance over which inductive effects occurred between parallel wires forming portions of telephonic and telegraphic circuits. Following on this he made an interesting experiment, using Morse's method, to connect the Isle of Wight telegraphically with the mainland, by conduction across the Solent in two places, during a temporary failure of the submarine cable in 1882 in that channel. In subsequent years numerous experi- ments were carried out by him in various parts of Great Britain, in some cases with circuits earthed at both ends, and in other cases with completely insulated circuits, which showed that conductive effects could be detected at distances of many miles, and also that inductive effects could take place even between circuits separated by solid earth and by considerable distances. A. W. Heaviside in 1887 succeeded in communicating by tele- phonic speech between the surface of the earth and the sub- terranean galleries of the Broomhill collieries, 350 feet deep, by laying above and below ground two complete metallic circuits, each about 2 \ m. in length and parallel to each other. At a later date other experimentalists found, however, that an equal thickness of sea-water interposed between a primary and secondary circuit completely prevented similar inductive inter- communication. In 1885 Preece and

Heaviside proved by experiments made at Newcastle that if two completely insulated circuits of square form, each side being 440 yds., were placed a quarter of a mile apart, telephonic speech was conveyed from one to the other by induction, and signals could be perceived even when they were separated by 1000 yds. The method of induction between insulated primary and secondary circuits laid out flat on the surface of the earth proves to be of limited application, and in his later experiments Preece returned to a

method which unites both conduction and induction as the means of affecting one circuit- by a current in another. In 1892, on the Bristol Channel, he established communication between Lavernock Point and an island called Flat Holme in that channel by placing at these positions insulated single-wire circuits, earthed at both ends and laid as far as possible parallel to each other, the distance between them being 3-3 m. The shore wire was 1267 yds. long, and that on the island 600 yds. An interrupted current having a frequency of about 400 was used in the primary circuit, and a telephone was employed as a receiver in the secondary circuit. Other experiments in in- ductive telegraphy were made by Preece, aided by the officials of the British Postal Telegraph Service, in Glamorganshire in 1 887; at Loch Ness in Scotland in 1892; on Conway Sands in 1893; and at F'rodsham, on the Dee, in 1894. (See Jour. Inst. Elec. Eng., 27, p. 869.) In 1899 experiments were made atMenai Straits to put the lighthouse at the Skerries into communication with the coastguard station at Cemlyn. A wire 750 yds. in length was erected along the Skerries, and on the mainland one of- 3} m. long, starting from a point opposite the Skerries, to Cemlyn. Each line terminated in an earth plate placed in the sea. The average perpendicular distance between the two lines, which are roughly parallel, is 28 m. Telephonic speech between these two circuits was found possible and good, the communication between the circuits taking place partly by induction, and no doubt partly by conduction. On the ques- tion of

how far the effects are due to conduction between the earth plates, and how far to true electromagnetic induction, authorities differ, some being of opinion that the two effects are in operation together. A similar installation of inductive telephony, in which telephone currents in one line were made to create others in a nearly parallel and distant line, was estab- lished in 1899 between Rathlin Island on the north coast of Ireland and the mainland. The shortest distance between the two places is 4 m. By stretching on the island and mainland parallel wire circuits earthed at each end, good tele- phonic communication over an average distance of 6J m. was established between these independent circuits.

The difficulty of connecting lightships and isolated lighthouses to the mainland by submarine cables, owing to the destructive action of the tides and waves on rocky coasts on the wiu shore ends, led many inventors to look for a way out of loughby the difficulty by the adoption of some form of inductive Smith. or conductive telegraphy not necessitating a continuous cable. Willoughby S. Smith and W. P. Granville put into practice between Alum Bay in the Isle of Wight and the Needles light- house a method which depends upon conduction through sea water. (See Jour. Inst. Elec. Eng., 27, p. 938.) It may be ex- plained as follows: — Suppose a battery on shore to have one pole earthed and the other connected to an insulated submarine cable, the distant end of which was also earthed; if now a galvanometer is inserted anywhere in the cable, a current will be found flowing through the cable and returning by various paths through .the sea. If we suppose the cable interrupted at any place, and both sides of the gap earthed by connexion to plates, then the same conditions will still hold. Communication was established by this method in the year 1895 with the light- house on the Fastnet. 1 A cable is carried out from the mainland at Crookhaven for 7 m., and the outer end earthed by connexion with a copper mushroom anchor. Another earthed cable starts from a similar anchor about 100 ft. away near the shore

line of the Fastnet rock, crosses the rock, and is again earthed in the sea at the distant end. If a battery on the main- land is connected through a key with the shore end of the main cable, and a speaking galvanometer is in circuit with the short cable crossing the Fastnet rock, then closing or opening the battery connexion will create a deflection of the galvanometer. A very ingenious call-bell arrangement was devised, capable of responding only to regularly reversed battery currents, but not

1 See Fahie, History of Wireless Telegraphy, p. 170; also 5th Report (1897) of the Royal Commission on Electrical Communicatioc with Lightships and Lighthouses.

to stray " earth currents," and very good signalling was estab lished between the mainland and the rock. Owing to the rough seas sweeping over the Fastnet, the conditions are such that any ordinary submarine cable would be broken by the wearing action of the waves at the rock boundary in a very short time. Another worker in this department of research was C. A. Stevenson, who in 1892 advocated the use of the inductive system pure and simple for communication between the main- land and isolated lighthouses or islands. He proposed to employ two large flat coils of wire laid horizontally on the ground, that on the mainland having in circuit a battery, interrupter and key, and that on the island a telephone. His proposals had special reference to the necessity for connecting a lighthouse oh Muckle Flugga, in the Shetlands, and the main- land, but were not carried into effect. Professor E. Rathenau of Berlin made many experiments in 1894 in which, by means of a conductive system of wireless telegraphy, he signalled through 3 m. of water.

Sir Oliver Lodge in 1898 theoretically examined the inductive system of space telegraphy. (See Jour. Inst. Elec. Eng., 27, p. 799.) He advocated and put in practice experimentally a system by which the primary and secondary circuits were " turned " or syntonized by including condensers in the circuits. He proved that when so syntonized the circuits are inductively respondent to each other with a much less power expenditure in the primary circuit than without the syntony. He also devised a " call " or arrangement for actuating an ordinary electric bell by the accumulated effect of the properly tuned inductive impulses falling on the secondary circuit. A very ingenious call-bell or annunciator for use with inductive or conductive systems of wireless telegraphy was invented and described in 1898 by S. Evershed, and has been practically adopted at Lavernock and Flat Holme. (Id., 27, p. 852.)

In addition to the systems of wireless or space telegraphy de- pending upon conduction through earth or water, and the in- ductive system based upon the power of a magnetic field created round one circuit to induce, when varied, a secondary current in another circuit, there have been certain attempts to utilize what may best be described as electrostatic induction. In 1885 Edison, in conjunction with Gilliland, Phelps, and W. Smith, worked out a system of communicating between railway stations and moving trains. At each signalling station was erected an insulated metallic surface facing and near to the ordinary telegraph wires. On one or more of the carriages of the trains were placed also insulated metallic sheets, which were in connexion through a telephone and the secondary circuit of an induction coil with the earth or rails. In the primary circuit of the induction coil was an arrangement for rapidly intermitting the current and a key for short-circuiting this primary circuit. The telephone used was Edison's chalk cylinder or electromotograph type of telephone. Hence, when the coil at one fixed station was in action it generated high frequency alternating currents, which were propagated across the air gap between the ordinary telegraph wires and

the metallic surfaces attached to one secondary terminal of the induction coil, and conveyed along the ordinary telegraph wires between station and moving train. Thus, in the case of one station, and one moving railway carriage, there is a circuit consisting partly of the earth, partly of the ordinary telegraph wires at the side of the track, and partly of the circuits of the telephone receiver at one place and the secondary of the in- duction coil at the other, two air gaps existing in this circuit. The electromotive force of the con is, however, great enough to create in these air gaps displacement currents which are of magnitude sufficient to be equivalent to the conduction current required to actuate a telephone. This current may be taken to be of the order of two or three micro-amperes. The signals were sent by cutting up the continuous hum in the telephone into long and short periods in accordance with the Morse code by manipulating the key in the primary circuit. The system was put into practical operation in 1887 on the Lehigh Valley railroad in the United States, and worked well,

Edison.

but was abandoned because it apparently fulfilled no real public want. Edison also patented (U.S.A. Pat. Spec, No. 465971, 14th May 1885) a plan for establishing at distant place? two insulated elevated plates. One of these was to be connected to the earth through a telephone receiver, and the other through the secondary circuit of an induction coil in the primary circuit of which was a key. The idea was that variations of the primary current would create electromotive force in the secondary circuit which would act through the air condenser formed by the two plates. It has sometimes been claimed that Edison's proposed elevated plates anticipated the subsequent invention by Marconi of the aerial wire or antenna, but it is particularly to be noticed that Edison employed no spark gap or means for creating electrical high frequency oscillations in these wires. There is no evidence that this plan of Edison's was practically operative

as a system of telegraphy.

A very similar system of wireless telegraphy was patented by Professor A. E. Dolbear in 1886 (U.S.A. Pat. Spec, No. 350299), in which he proposed to employ two batteries at two places to affect the potential of the earth at those places. At the sending station one battery was to have its positive pole connected to the earth and its negative pole to an insulated condenser. In circuit with this battery was placed the second- ary circuit of an induction coil, the primary circuit of which contained a telephone transmitter or microphone interrupter. At the receiving station a telephone receiver was placed in series with another insulated battery, the negative terminal of which was to be in connexion with the earth. There is no evidence, however, that the method proposed could or did effect the transmission of speech or signals between stations separated by any distance. Many other more or less imperfect devices- — such as those of Mahlon Loomis, put forward in 1872 and 1877, and Kitsee in 1895— for wireless telegraphy were not within the region of practically realizable schemes.

Space or Radio- Telegraphy by Hertzian Waves.- — Up to 1895 or 1896 the suggestions for wireless telegraphy which had been publicly announced or tried can thus be classified under three or four divisions, based respectively upon electrical conduction through the soil or sea, magnetic induction through space, combinations of the two foregoing, and lastly, electrostatic induction. All these older methods have, however, been thrown into the background and rendered antiquated by inven- tions which have grown out of He: tz's scientific investigations on the production of electric waves. Before the classical researches of Hertz in 1886 and 1887, many observers had noticed curious effects due to electric sparks produced at a distance which were commonly ascribed to ordinary electro- static or electro-magnetic induction. Thus Joseph Henry (Scientific Writings, vol. i. p. 203) noticed that a single electric spark about an inch long thrown on to a circuit of wire in an upper room could

magnetize steel needles included in a parallel circuit of wire "placed in a cellar 30 ft. below with two floors intervening. Some curious distance-phenomena connected with electric sparks were observed in 1875 by Edison (who referred them to a supposed new " aetheric force "), and confirmed by Beard, S. P. Thompson, E. J. Houston and others. 1 D. E Hughes made some remarkable observations and experiments in or between the years 1879 and 1886 though he did not describe them till some twenty years afterwards. He dis- covered a fact subsequently rediscovered by others, that a tube of metallic filings, loosely packed, was sensitive to electric sparks made in its vicinity, its electrical resistance being re- duced, and he was able to detect effects on such a tube con- nected to a battery and telephone at a distance of 500 yds. 2

These distance effects were not understood at the time , or else were referred simply to ordinary induction. Hertz, however, made known in 1887 the experimental proofs that the discharge

1 See Telegraphic Journal of London, vol. iv. pp. 29, 46, 61 ; Proc. Phys. Soc. Lond., vol. ii. p. 103.

- See Fahie, History of Wireless Telegraphy, p. 289 ; also an im- portant letter by D. E. Hughes in The Electrician, London, 1899, 43, 4°-

of a condenser produces an electric spark which under proper conditions creates an effect propagated out into space as an electric wave. He employed as a detector of this wave a simple, nearly closed circuit of wire called a Hertz resonator, but it was subsequently discovered that the metallic microphone of D. E. Hughes was a far more sensitive detector.

The peculiar action of electric sparks and waves in reducing the resistance of discontinuous conductors was rediscovered and investigated by Calzecchi Onesti, 1 by Branly, 2 Dawson Turner, 3 Minchin, Lodge, 4 and many others. Branly was the first to investigate and describe in 1890 the fact that an electric spark at a distance had the power of changing loose aggregations of metallic powders from poor to good electric conductors, and he also found that in some cases the reverse action was produced. Lodge parti- cularly studied the action of electric waves in reducing the resistance of the contact between two metallic surfaces such as a plate and a point, or two balls, and named the device a '' coherer." He constructed one form of his coherer of a glass tube a few inches long filled with iron borings or brass filings, having contact plates or pins at the end. When such a tube is inserted in series with a single voltaic cell and galvanometer it is found that the resistance of the tube is nearly infinite, provided the filings are not too tightly squeezed. On creating an electric spark or wave in the neighbourhood of the tube the resistance suddenly falls to a few ohms and the cell sends a current through it. By shaking or tapping the tube the original high resistance is restored. In 1894 he exhibited apparatus of this kind in which the tapping back of the tube of filings was effected automatically. He ascribed the reduc- tion of resistance of the mass to a welding or cohering action taking place between the metallic particles, hence the name " coherer." But, as Branly showed, it is not universally true that the action of an electric wave is to reduce the resistance of a tube of powdered metal or cause the particles to cohere. In some cases, such as that of peroxide of lead, an increase of resistance takes place.

Between 1894 and 1896 G. Marconi gave great attention to the improvement of devices for the detection of electric waves. Marconi ^ e ma ^ e ^ s sensitive tube, or improved coherer, as follows: — A glass tube having an internal diameter of about 4 millimetres has sealed into it two silver plugs PP

by means of platinum wires WW (fig. 37); the opposed faces of these plugs are perfectly smooth, and are placed within a millimetre of each other. The interspace is filled with a very small quantity of nickel and silver filings, about 95 per cent, nickel and 5 per cent, silver, sufficient to fill loosely about half the cavity between the plugs, which fit tightly into the tube. 5 The tube is then exhausted of its air, and attached to a bone or glass rod as a holder. This form of electric wave detector proved itself to be far more certain in operation and sensitive

A

W

°-C

3£

B-o

w

Fig. 37. — Marconi Sensitive Metallic Filings Tube or Electric Wave Detector.

than anything previously invented. The object which Marconi had in view was not merely the detection of electric waves, but their utilization in practical wireless telegraphy. Sir William Crookes had already suggested in 1892 in the Fortnightly Review (February 1892) that such an application might be

1 Nuovo cimento, series iii. vol. xvii.

2 Comptes rendus, vols, cxi., cxii.; see also The Electrician, xl. 87, 91, 166, 235, 333 and 397; xli. 487; xlii. 46 and 527; and xliii. 277.

3 Report Brit. Assoc, 1892.

4 Lodge, Signalling through Space without Wires, 3rd ed., p. 73,

1809.

6 See G. Marcont, Brit. Pat. Spec, 12039 of 1896.

made, but no one had overcome the practical difficulties or actually shown how to do it.

G. Marconi, however, made the important discovery that if his sensitive tube or coherer had one terminal attached to a metal plate lying on the earth, or buried in it, and the other to an insulated plate elevated at a height above the ground, it could detect the presence of very feeble electric waves of a certain kind originating at a great distance. In conjunction with the above receiver he employed a transmitter, which consisted of a large induction or spark coil S having its spark balls placed a few millimetres apart; one of these balls was connected to an earth

El

Fig. 38.

plate E and the other to a plate or wire insulated at the upper end and elevated above the surface of the earth. In the primary circuit of the induction coil I he placed an ordinary signalling key K, and when this was pressed for a longer or shorter time a torrent of electric sparks passed between the balls, alternately charging and discharging the elevated con- ductor Ai and creating electrical oscillations (see Electro- Kinetics) in the wire. This elevated conductor is now called the antenna, aerial wire, or air wire. At the receiving station Marconi connected a single voltaic cell Bi and a sensitive tele- graphic relay R in series with his tube of metallic filings C, and interposed certain little coils called choking coils. The relay was employed to actuate through a local battery B 2 an ordinary Morse printing telegraphic instrument M. One end of the sensitive tube was then connected to the earth and the other end to an antenna or insulated elevated conductor A2. Assum- ing the transmitting and receiving apparatus to be set up at distant

stations (see fig. 38 6), the insulated wires or plates being upheld by masts, its operation is as follows .—When the key in the primary circuit of the induction coil is pressed the transmitting antenna wire is alternately charged to a high potential and discharged with the production of high frequency oscillations in it. This process creates in the space around electric waves or periodic changes in electric and magnetic force round the antenna wire. The antenna wire, connected to one spark ball of the induction coil, must be considered to form with the earth, connected to the other spark ball, a condenser. Before the spark happens lines of electrostatic force stretch from one to the other in curved lines. When the discharge takes place the ends of the lines of electric force abutting on the wire run down it and are detached in the form of semi loops of electric force which move outwards with their ends on the surface of the earth. As they travel they are accompanied by lines of magnetic force, which expand outwards in ever- widening circles. 7 The magnetic and electric forces are directed alternately in one direction and the other, and at distances which are called multiples of a wave length the force is in the same direction at the same time, but in the case of damped waves has not quite the same intensity. The force at any one point also varies cyclically, that is, is varying at any one point

6 Figures 38, 39, 41, 42, 44, 45, 46, 47, 48 and 49 are drawn from Professor J. A. Fleming's Electric Wave Telegraphy, by per- mission of Longmans, Green & Co.

' For a more complete account of the nature of an electric wave the reader is referred to Hertz's Electric Waves, and to the article Electric Wave. See also The Principles of Electric Wave Tele- graphy, by J. A. Fleming.

and varying from point to point. This periodic distribution in time and space constitutes an electric wave proceeding out- wards in all directions from the sending antenna. If we con- sider the lines of magnetic force in the neighbourhood of the receiving antenna wire we shall see that they move across it, and thus create in it an electromotive force which acts upon the coherer or other sensitive device associated with it.

Marconi's System of Wireless Telegraphy. — Marconi's system of electric wave telegraphy consists therefore in setting up at the transmitting station the devices just described for sending out groups of damped electric waves of the above kind in long or short trains corresponding to the dash or dot signals of the Morse alphabet. These trains are produced by pressing the key in the primary circuit of the induction coil for a longer or shorter time and generating a long or short series of oscillatory electric sparks between the spark balls with a corresponding creation of trains of electric waves. At the receiving station he connected, as stated, one end of the sensitive tube to earth and the other to the antenna, and improved and applied a device of Popoff for automatically tapping the tube after each electric impact had rendered it conductive. He caused the relay in series with the sensitive tube to set in action not only a telegraphic instrument but also the electromagnetic tapper, which was arranged so as to administer light blows on the under side of the sensitive tube when the latter passed into the conductive con- dition. The effect was to print a dash or dot on a strip of telegraphic paper, according as the incident electric wave train lasted a longer or shorter time. In addition he added certain spark-generating coils across the contacts of the relay and tapper. He thus pro- duced in 1896 for the first time an operative apparatus of electric wave telegraphy. Its simplicity and compactness recommended it immediately for communication between ship and shore and for intermarine communication generally. Marconi's

earliest experi- ments with this apparatus were made in Italy. In 1896 he came to England and gave demonstrations to the British postal telegraph department and other officials. Some of these experiments were made on Salisbury Plain and others in the Bristol Channel between Lavernock and Flat Holm and Bream Down in 1897. Early in 1898 permanent stations were established between Alum Bay and Bournemouth, a distance of 14! m., where successful results were obtained. Later the Bournemouth station was removed to Poole Harbour, and the Alum Bay station to Niton in the Isle of Wight, the distance being thus increased to 30 m. In December 1898 communication was established by the Marconi method be- tween the East Goodwin lightship and the South Foreland light- house; and this installation was maintained for upwards of a year, during which it was the means of saving both life and property. In March 1899 communication was effected by his system between England (South Foreland lighthouse) and France (Wimereux, near Boulogne), a distance of 30 m. He kept up the communication for six months, in all weathers, and found that ordinary commercial messages could be transmitted at the rate of 15 to 20 words a minute. In January 1901 he established communication by his system between the Lizard in Cornwall and Niton in the Isle of Wight, a distance of 200 m. A full account of the development of his system was given by him in an article published in the Fortnightly Review for June 1902 ; see also a paper by him in the Journ. Inst. Elec. Eng., 1899, 28, p. 273. About this time he intro- duced various improvements into the receiving apparatus. Instead of inserting the sensitive tube between the receiving antenna and the earth, he inserted the primary coil of a peculiar form of oscilla- tion transformer and connected the terminals of the tube to the secondary circuit of the transformer. Lodge had previously sug- gested the use of transformed oscillations for acting on the coherer (see British Patent Spec., No. 1 1 575 of 1897), but it is not every form of oscillation transformer which is suitable for this purpose.

Marconi's successes and the demonstrations he had given of the thoroughly practical character of this system of electric wave telegraphy stimulated other inventors to enter the same field of labour, whilst theorists began to study carefully the nature of the physical operations involved. It was seen that the effect of the impact of the incident electric waves upon the vertical receiving wire was to create in it electrical oscillations, or in other words, high frequency alternating electric currents, such that whilst the potential variations were a maximum at the top or insulated end of the antenna the current at that point was zero and at the base the potential variation was zero and the current amplitude a maximum. Hence devices for detecting the oscillations in the antenna are merely very sensitive forms of ammeter and voltmeter. It was also recognized that what is required at the transmitting end is the establishment of powerful electric oscillations in the sending antenna, which create and radiate their energy in the form of electric waves having their magnetic force component parallel to the earth's surface and their electric component perpendicular to it.

Transmitting Apparatus. — We now consider the more recent appliances for electric wave telegraphy under the two divisions of transmitting and receiving apparatus. First as regards the

transmitting part, one essential element is the antenna, aerial, or air wire, which may take a variety of forms. It may consist of a single plain or stranded copper wire upheld at the top by an insulator from a mast, chimney or building. The wire may have at the upper end a plate called a " capacity area," electrically equivalent to an extension of the wire, cr part of the wire may be bent over and carried horizontally. In many cases multiple antennae are used consisting of many wires arranged in cone or umbrella-rib fashion, or a metal roof or metallic chimney may be employed (see fig. 39). In any case the antenna serves as one surface of a condenser, the other surface of which is the earth. This condenser is charged elec- trically and

then suddenly discharged and violent electrical oscillations are set up in it, that is to say, electricity rushes to and fro between the antenna and the earth. This creates rapid variations in electric and magnetic force round the antenna and detaches energy from it in the form of an electric wave. The antenna has at one moment a static electrical charge dis- tributed upon it, and lines of electric force stretch from it to the surrounding earth. At the next instant it is the seat of an electric current and is surrounded by closed lines of magnetic force. These static and kinetic conditions succeed each other rapidly, and the result is to detach or throw off from the antenna semi-loops of electric force, which move outwards in all direc- tions and are accompanied by expanding circular lines of magnetic force. The whole process is exactly analogous to

the operation by which a violin string or organ pipe creates an air or sound wave. The violin string is first drawn on one side. This strain corresponds to the electrical charging of the antenna. The string is then suddenly released. This corresponds to the electrical discharge of the antenna, and the subsequent string vibrations to the electrical vibrations. These communicate their energy to the surrounding air, and this energy is conveyed away in the form of air waves.

There are three ways in which the antenna may be charged:— (i) It may be separated from the earth by a pair of spark balls which are connected respectively to the terminals of an induction coil or transformer, or other high tension generator. If these spark balls are set at the right distance, then when the potential difference accumulates the antenna will be charged and at some stage suddenly discharged by the discharge leaping across the spark gap. This was Marconi's original method, and the plan is still used under the name of the direct method of excitation or the plain antenna.

(ii) The antenna may have oscillations excited in it inductively. F. Braun suggested in 1898 that the

oscillatory discharge of a Leyden jar should be sent through the primary coil of a transformer and the secondary coil should be interposed between the antenna and an earth connexion. 1 Marconi 2 imparted practical utility to this idea by tuning the two circuits together, and the arrangement now employed is as follows: — ■ A suitable condenser C, or battery of Leyden jars, has one coating connected to one spark ball and the other through a coil of one turn with the other spark ball of a discharger S. These spark balls are connected either to the secondary circuit of an induction coil I, or to that of an alternating current transformer having a secondary voltage of 20,000 to 100,000 volts. Over the coil of one turn is wound a secondary circuit of 5 or 10 turns, of which one end is connected to the earth through a variable inductance and the other end to an antenna or radiating wire A (see fig. 40). These two circuits are so adjusted that the closed oscillation circuit, consisting of the condenser, primary coil

1 See German Patent oi F. Braun, No. n 1578 of 1898, or British Specification, No. 1862 of 1899. 1 See British Pat. Spec, G. Marconi, No. 7777 of 1900.

and spark gap, has the same natural time period of oscillation as the open circuit consisting of the antenna, secondary coil and adjustable inductance. When this is the case, if discharges are made across the spark gap oscillations are excited in the closed circuit, and these induce other syntonic oscillations in the antenna circuit. J. A. Fleming devised an arrangement in which a multiple transformation takes place, two oscillation circuits being inter- linked inductively, and the last one acting inductively on the open or antenna circuit. J. S. Stone similarly devised a multiple in- ductive oscillation circuit with the object of forcing on

the antenna circuit a single oscillation of definite frequency. 1 In the case of the inductive mode of exciting the oscillations an important quantity is the coefficient of coupling of the two oscillation circuits. If L and N are the inductances of any two circuits which have a co- efficient of mutual inductance M, then M/V(LN) is called the coefficient of coupling of the circuits and is generally expressed as a percentage. Two circuits are said to be closely coupled when this coefficient is near unity and to be loosely coupled if it is very small. It can be shown that if two circuits, both having capacity © and inductance (L), are coupled together inductively, then, when oscillations are set up in one circuit, oscillations of two periods are excited in the other differing in frequency from each other and from the natural frequency of the circuit. If the two circuits are in tune so that the numerical product of capacity and inductance of each circuit is the same or CiLi = C2Lj+CL and if k is the coefficient of coupling then the natural frequency of each circuit is n = i/2jtV(CL), and when coupled two oscillations are set up in the secondary circuit having frequencies n\ and ni such that »i=n/V(i-fc) and n 2 = tt/V(l+£). Since in all cases of

,C,

1 ^wm^mw i

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Fig. 40.

wave motion the wave-length X is connected with the frequency » and the velocity of propagation v by the relation zi = mX, it follows that from such an inductively coupled tuned antenna electric waves of two wave-lengths are sent out having lengths Xi and X 2 such that Xi = X V (1 — k) and X 2 = X V (1 +k) , where X is the natural wave-length. It is seen that as the coupling k becomes small these two wave-lengths coalesce into one single wave length. Hence there are advantages in employing a very loose

coupling.

(iii) The antenna may be direct-coupled to the closed oscillatory circuit in the manner suggested by F. Braun, A. Slaby and O. Lodge. In this case a closed condenser circuit is formed with a battery of Leyden jars, an inductance coil and a spark gap, and oscillations are excited in it by discharges created across the spark gap by an induction coil or transformer. One end of the inductance coil is connected to the earth, and some other point on the closed con- denser circuit to an antenna of appropriate length. When oscilla- tions are created in the closed circuit syntonic oscillations are created in the antenna and electiic waves radiated from it (fig. 41). In many cases additional condensers or inductance coils are inserted in various places so that the arrangement is somewhat disguised, but by far the larger part of the electric wave wireless telegraphy in 1907 was effected by transmitters having antennae either in- ductively or directly coupled to a closed condenser circuit containing a spark gap.

In practical wireless telegraphy the antenna is generally a collec- tion of wires in fan shape upheld from one or more masts or wooden towers. Sometimes the prolongations of these wires are carried horizontally or dipped down so as to form an umbrella antenna (fig. 42). The lower ends of these wires are connected through the secondary coil of an oscillation transformer to an earth plate, or to a large conductor placed on or near the earth called a ” balancing capacity.” If the direct coupling is adopted then the lower end of the antenna is connected directly to the condenser circuit. The main capacity in this last circuit consists of a battery of Leyden

1 See J. S. Stone, U.S.A. Pat Spec, N06. 7i4756.and 714831.

jars or of Leyden panes immersed in oil or some form of air con- denser, and the inductance coil or primary circuit of the oscillation transformer

consists of a few turns of highly insulated wire wound on a frame and immersed in oil. The oscillations are controlled either by a key inserted in the primary circuit of the exciting in- duction coil or transformer, or by a key cutting in and out of the primary condensers or throwing inductance in and out of the closed oscillation circuit. In one of these ways the oscillations can be created or stopped at pleasure in the radiating antenna, and hence groups of electric waves thrown off at will.

&rjt>^ i

Fig. 41.

Production of Electric Waves of Large Amplitude. — In creating powerful electric waves for communication over long distances it is necessary to employ an alternating current transformer (see Transformers) supplied with alternating currents from a low frequency alternator D driven by an engine to charge the condenser (fig. 43). The transformer Ti has its secondary or high-pressure terminals connected to spark balls Si, which are also connected by a circuit consisting of a large glass plate condenser Ci and the primary circuit of an air-core trans- former T 2 , called an oscillation transformer. The secondary circuit of this last is either connected between an aerial A and the earth E, or it may be again in turn connected to a second pair of spark balls S2, and these again to a second con- denser C2, oscillation transformer T 2 , and the aerial A. In order to produce electric oscillations in the system, the first or alternating current transformer must charge the condenser con- nected to its secondary terminals, but must not produce a permanent electric arc between the balls. Various devices have been suggested for extinguishing the arc and yet allowing the condenser oscillatory discharge to take place. Tesla effected this purpose by placing the spark balls transversely in a powerful magnetic field. *Elihu Thomson blows on the spark balls with a powerful jet of air. Marconi causes the spark balls to move rapidly past each other or causes a studded

disk to move between the spark balls. J. A. Fleming devised a method which has prac- tical advantages in both preventing the arc and permitting the oscillatory currents to be controlled so as to make electric wave signals. He inserts in the primary circuit of the alternating

Fig. 42.

current transformers one or more choking or impedance coils Ri, R 2 (fig. 43), called " chokers," which are capable, one or all, of being short-circuited by keys Ki, K2. The impedance of the primary or alternator circuit is so adjusted that when both the chokers are in circuit the current flowing is not sufficient to charge the condensers; but when one choker is short-circuited the impedance is reduced so that the condenser is charged, but the alternating arc is not formed. In addition it is necessary to

adjust the frequency so that it has the value of the normal time period of the circuit formed of the condenser and trans- former secondary circuit, and thus it is possible to obtain condenser oscillatory discharges free from any admixture with alternating current arc. In this manner the condenser dis- charge can be started or stopped at pleasure, and long and short discharges made in accordance with the signals of the Morse

Fig. 43.— Alternate Current Transformer System. (Fleming.)

alphabet by manipulating the short-circuiting key of one of the choking coils (see British Patent Specs., Nos. 18865, 20576 and 22126 of 1900, and 3481 of 1901).

In the case of transmitters constructed as above

described, in which the effective agent in producing the electric waves radiated is the sudden discharge of a condenser, it should be noticed that what is really sent out is a train of damped or decadent electric waves. When electric oscillations are set up in an open or closed electric circuit having capacity and inductance, and left to them- selves, they die away in amplitude, either because they dissipate their energy as heat in overcoming the resistance of the circuit, or because they radiate it by imparting wave motion to the surround- ing ether. In both cases the amplitude of the oscillations decreases more or less rapidly. Such a sequence of decreasing electric oscilla- tions and corresponding set of waves is called a damped train. In the case of the plain or directly excited antenna the oscillations are highly damped, and each train probably only consists at most of halfa dozen oscillations. The reason for this is that the capacity of a simple antenna is very small — it may be something of the order of 00002 of a microfarad — and hence the energy stored up in it even under a high voltage is also small. Accordingly this energy is rapidly dissipated and but few oscillations can take place. If, however, the antenna is inductively or directly coupled to a con- denser circuit of large capacity then the amount of energy which can be stored up before discharge takes place is very much greater, and hence can be drawn upon to create prolonged or slightly damped trains of waves. Allusion is made below to recent work on the production of undamped trains of electric waves.

Receiving Arrangements. — Before explaining the advantages of such small damping it will be necessary to consider the usual forms of the receiving appliance. This consists of a receiving antenna similar to the sending antenna, and in any wireless telegraph station it is usual to make the one and the same antenna do duty as a receiver or sender by switching it over from one apparatus to the other. The electric waves coming through space from the sending station strike against the receiving antenna and set up in it high frequency

alter- nating electromotive forces. To detect these currents some device has to be inserted in the antenna circuit or else inductively connected with it which is sensitive to high frequency currents. These wave-detecting devices may be divided into two classes: (i) potential operated detectors, and (ii) current operated detectors. The oldest of the class (i) is that generically known as a coherer, the construction of which we have already described. The ordinary forms of metallic filings coherer of the Branly type require tapping to bring them back to the high resistance or sensitive condition. Lodge arranged a mechanical tapper for the purpose which continually administered the small blow to the tube sufficient to keep the filings in a sensitive condi- tion. Popoff employed an electromagnetic tapper, in fact the mechanism of an electric bell with the gong removed, for this purpose. Marconi, by giving great attention to details, im- proved the electromagnetic tapper, and, combining it with his improved form of sensitive tube, made a telegraphic instru- ment as follows: the small glass tube, containing nickel and silver filings between two silver plugs, was attached to a bone

holder, and under this was arranged a small electromagnet having a vibrating armature like an electric bell carrying on it a stem and hammer. This hammer is arranged so that when the armature vibrates it gives little blows to the underside of the tube and shakes up the filings. By means of several adjusting screws the force and frequency of these blows can be exactly regulated. In series with the tube is placed a single voltaic cell and a telegraphic relay, and Marconi added certain coils placed across the spark contacts of the relay to prevent the local sparks affecting the coherer. The relay itself served to actuate a Morse printing telegraph by means of a local battery. This receiving apparatus, with the exception of the Morse printer, was contained in a sheet-iron box, so as to exclude it from the action of the sparks of the neighbouring transmitter. In the early experiments Marconi connected the sensitive tube in between the

receiving antenna and the earth plate, but, as already mentioned, in subsequent forms of apparatus he introduced the primary coil of a peculiar form of oscillation transformer into the antenna circuit and connected the ends of the sensitive tube to the terminals of the secondary circuit of this " jigger " (fig. 44). In later improvements the secondary circuit of this jigger was interrupted by a small condenser, and the terminals of the relay and local cell were connected to the plates of this condenser, whilst the sensitive tube was attached to the outer ends of the secondary circuit. Also another condenser was added in parallel with the sensitive tube.

With this apparatus some of Marconi's earliest successes, such as telegraphing across the English Channel, were achieved, and telegraphic communication at the rate of fifteen words or so a minute established Wa between the East Goodwin lightship and the South Foreland lighthouse, also be- tween the Isle of Wight and the Lizard in Cornwall. It was found to be peculiarly adapted for communication between ships at sea and between ship and shore, and a system of regular supermarine com- munication was put into operation by two limited companies, Marconi's Wire- less Telegraph Company and the Marconi International Marine Communication Company. Stations were established on various coast positions and ships supplied with the above- described apparatus to communicate with each other and with these stations. By the end of 1901 this radio-telegraphy had been established by Marconi and his associates on a secure industrial basis.

Various Forms of Wave Detectors or Receivers. — The numerous adjustments required by the tapper and the inertia of the apparatus prompted inventors to seek for a self-restoring coherer which should not need tapping. Castelli, a petty officer in the Italian navy, found that, if a small drop of mercury was contained in a glass tube between a plug of iron and carbon, with certain adjustments, the arrangement was non-conductive to the current from a single cell but became conductive when electric oscillations

passed through it. 1 Hence the following appliance was worked out by Lieutenant Solari and officers in the Italian navy. The tube provided with certain screw adjustments had a single cell and a telephone placed in series with it, and one end of the tube was connected to the earth and the other end to a receiving antenna. It was then found that when electric waves fell on the antenna a sound was heard in the telephone as each wave train passed over it, so that if the wave trains endured for a longer or shorter time the sound in the telephone was of corresponding duration. In this manner it was possible to hear a Morse code dash or dot in the telephone. This method of receiving soon came to be known as the telephonic method. Lodge, Muirhead and Robinson also devised a self-restoring coherer as follows : 3 — A small steel wheel with a sharp edge was kept rotating by clockwork so that its edge continually cut through a globule of mercury covered with paraffin oil. The oil film prevented*

1 See Electrical Review, 1902, 51, p. 968.

2 See " A Royal Institution Discourse," by G. Marconi, The Electrician, 1902, 49, p. 490; also British Pat. Spec, No. 18105 of

1901.

3 See British Pat. Spec, Lodge and others, No. 13521 of 1902.

Fig. 44.

perfect electrical contact between vhe steel and mercury for low voltage currents, but when electric oscillations were passed through the junction it was pierced and good electrical contact established as long as the oscillations continued. This device was converted into an electric wave detector as follows

: — The mercury-steel junction was acted upon by the electromotive force of a shunted single cell and a siphon recorder was inserted in series. The wheel was con- nected to a receiving antenna and the mercury to earth or to an equivalent balancing capacity. When electric waves fell on the antenna they caused the mercury-steel junction to become con- ductive during the time they endured, and the siphon recorder therefore to write signals consisting of short or long deflexions of its pen and therefore notches of various length on the ink line drawn on the strip of telegraphic tape.

An innumerable number of forms of coherer or wave detector depending upon the change in resistance produced at a loose or imperfect contact have been devised. A. Popoff, 1 E. Branly, 2 A. Blondel, 3 O. Lodge 4 and J. A. Fleming 5 invented special forms of the metallic contact or metallic filings sensitive tube. Brown and Neilson, 6 F. J. Jervis-Smith 7 and T. Tommasina 8 tried carbon in various forms. The theory of the action of the coherer has occu- pied the attention of T. Sundorp, 9 T. Tommasina, 8 K. E. Guthe, 10 J. C. Bose, 11 W. H. Eccles, 12 and Schafer. 13 For details see J. A. Fleming, The Principles of Electric Wave Telegraphy and Telephony, p. 416, 2nd ed. 1910.

The next class of wave or oscillation detector is the magnetic detector depending upon the power of electric oscillations to affect the magnetic state of iron. It had long been known that the discharges from a Leyden jar could magnetize or demagnetize steel needles. J. Henry in the United States in 1842 and 1850 investi- gated the effect. In 1895 E. Rutherford examined it very care- fully, and produced a magnetic detector for electric waves depending upon the power of electric oscillations in a coil to demagnetize a saturated bundle of steel wires placed in it (see Phil. Trans., 1897, 189 A, p. 1). Rutherford used this detector to make evident the passage of an electric or Hertzian wave for half a mile across Cambridge, England. In 1897 E. Wilson constructed various forms of electric wave detector depending on this same principle. In 1902 Marconi

invented two forms of magnetic detector, one of which he developed into an electric wave detector of extraordinary delicacy and utility (see Proc. Roy. Soc, 1902, 70, p. 341, or British Pat. Spec, No. 10245 of 1902). In this last form an endless band of hard iron wires passes slowly round two wooden pulleys driven by clockwork. In its course it passes through a glass tube wound over with two coils of wire; one of these is an oscillation coil through which the oscillations to be detected pass, and the other is in connexion with a telephone. Two horse- shoe magnets are so placed (fig. 45) that they magnetize the part of the iron band pass- ing through the coil. Owing to hysteresis the part of the band

magnetized is not symmetrically placed A with regard to the magnetic poles, but

advanced in the direction of motion /p-\/^\ °f tne band. When the oscillations

(ill 11 pass through the coil they annul

■\ the hysteresis and cause a change of Sv e) magnetism within the coil connected J to the telephone. This creates a short ^ sound in the telephone. Hence accord- ling as the trains of oscillations are long or short so is the sound heard in the telephone, and these sounds can be arranged on the Morse code into alpha- betic audible signals. When used as a receiver for wireless telegraphy Marconi inserted the oscillation coil of this detector in between the earth and a receiving antenna, and this produced one of the most sensitive receivers yet made for wireless telegraphy. Other forms of magnetic detector have been devised by J. A. Fleming, 14 L. H. Walter and J. A. Ewing, 16 H. T. Simon and M. Reich, 16 R. A. Fessenden 17 and others.

1 A. Popoff, The Electrician, 1897, 40, p. 235.

2 E. Branly, Comptes rendus, 1890, 111, p. 785, and The Electrician, 1891, 27, p. 221.

s A. Blondel, The Electrician, 1899, 43> P- 2 77-

4 O. Lodge, The Electrician, 1897, 40, p. 90.

5 J. A. Fleming, Journ. Inst. Elec. Eng. Lond., 1899, 2 §> P- 2 9 2 -

6 Brown and Neilson, Brit. Patent Spec, No. 28958, 1896.

7 F. J. Jervis-Smith, The Electrician, 1897, 40, p. 85.

8 T. Tommasina, Comptes rendus, 1899, 128, p. 666. * T. Sundorp, Wied. Ann., 1899, 60, p. 594.

10 K. E. Guthe, The Electrician, 1904, 54, p. 92.

11 J. C. Bose, Proc. Roy. Soc. Lond., 1900, 66, p. 450.

12 W. H. Eccles, The Electrician, 1901, 47, p. 682.

13 Schafer, Science Abstracts, 1901, 4, p. 471.

14 See J. A. Fleming, " A Note on a Form of Magnetic Detector for Hertzian Waves adapted for Quantitative Work," Proc. Roy. Soc, 1903, 74, p. 398.

15 L. H. Walter and J. A. Ewing, Proc. Roy. Soc, 1904, 73, p. 120.

16 Simon and Reich, Elektrotech. Zeits., 1904, 22, p. 180.

17 R. A. Fessenden, U.S.A. Pat. Spec, No. 715043 of 1902.

Fig. 45.

A third class of electric wave detector depends upon the power of electric oscillations to annul the electrolytic polarization of electrodes of small surface immersed in an electrolyte. If in a vessel of nitric acid are placed a large platinum plate and a platinum electrode of very small surface such as that produced when an extremely fine platinum wire

is slightly immersed in the liquid, and if a current from a single voltaic cell is passed through the electrolytic cell so that the fine wire is the anode or positive pole, then the small surface will be polarized or covered with a film of gas due to electrolysis (fig. 46). This increases the resistance of the electrolytic cell. If, however, one electrode of this cell is con- nected to the earth and the other to a receiving antenna and electric waves allowed to fall on the an- tenna, the oscillations passing through the electrolytic cell will remove the polarization and temporarily decrease the resistance of the cell. This may be detected by putting a telephone in series with the electrolytic cell, and then on the impact of the electric waves a sound is heard in the telephone due to the sudden increase in the current through it. Such receivers

*were devised by R. A. Fessenden, 18 p JG .^*

W. Schloemilch 19 and others, and

are known as electrolytic detectors. Discussions have taken place as to the theory of the operations in them, in which some have advocated a thermal explanation and others a chemical ex- planation (see V. Rothmund and A. Lessing, Ann. der Physik, 1904, 15, p. 193, and J. E. Ives, Electrical World of New York, December 1904).

A fourth class of electric wave detector comprises the thermal detectors which operate in virtue of the fact that electric oscilla- tions create heat in a fine wire through which they pass. One form such a detector takes is the bolometer. If a loop of verv fine platinum wire, prepared by the Wollaston process, is included in an exhausted glass bulb like an incandescent lamp, then when electric oscillations are sent through it its resistance is increased. This increase may be made evident by making the loop of wire one arm of a Wheatstone's bridge and so arranging the circuits that the oscillations pass through the fine wire. H. Rubens and Ritter in 1890 {Wied. Ann., 1890, 40, p. 56)

employed an arrangement as follows: Four fine platinum or iron wires were joined in lozenge shape, and two sets of these R and S were connected up with two resistances P and Q to form a bridge with a galvanometer G and battery B. To one of these sets of fine wires an antenna A and earth connexion E is added (fig. 47) and when electric waves fall on A they excite oscillations in the fine wire resistance R and increase the resistance, and so upset the balance of the bridge and cause the galvanometer to deflect. Such a bolometer receiver has been used by C. Tissot {Comptes rendus, 1904, 137, p. 846) and others as a receiver in electric wave telegraphy.

Fessenden employed a simple fine loop of Wollas- ton platinum wire in series with a telephone and shunted voltaic cell, so that when electric oscillations passed through the fine wire its resistance was increased and the current through the telephone suddenly diminished (R. A. Fessenden, U.S.A. Pat. Spec, No. 706742 and No. 706744 of 1902). I. Klemencic devised a form of thermal receiver depending on thermoelectricity. A pair of fine wires of iron and constantan are twisted together in the middle, and one pair of unlike ends are connected to a galvanometer. If then oscilla- tions are sent through the other pair heat is produced at the junction and the galvanometer indicates a thermoelectric current {Wied. Ann., 1892, 45, p. 78). This thermoelectric receiver was made vastly more sensitive by W. Duddell {Phil. Mag., 1904, 8, p. 91). He passed the oscillations to be detected through a fine wire or strip of gold leaf, and over this, but just not touching, suspended a loop of bismuth-antimony wire by a quartz fibre. This loop hung in a very strong magnetic field, and when one junction was heated by radiation and convection from the heating wire the loop was

18 See R. A. Fessenden, U.S.A. Pat. Spec, No. 731029, and re- issue No. 121 15 of 1903.

19 W. Schloemilch, Elektrotech. Zeits., 1903, 24, p. 959, or The Electrician, 1903, 52, p. 250.

traversed by a current and deflected in the field. Its deflexion was observed by an attached mirror in the usual way.

Another form of thermoelectric receiver has been devised by J. A. Fleming (Phil. Mag., December 1906) as follows:— It consists of two glass vessels like test tubes one inside the other, the space between the two being exhausted. Down the inner test tube pass four copper strips having platinum wires at their ends sealed through the glass. In the inner space between the test tubes one pair of these platinum wires are connected by a fine constantan wire about -02 mm. in diameter. The other pair of platinum wires are connected by a tellurium-bismuth thermo-couple, the junction of which just makes contact with the centre of the fine wire. The outer terminals of this junction are connected to a galvanometer, and when electric oscillations are sent through the fine wire they cause a deflexion of this galvanometer (fig. 48). The thermal detectors are especially useful for the purpose of quantitative measurements, because they indicate the true effective or square root of mean square value of the current or train of oscillations passing through the hot wire On the other hand, the coherer or loose contact de- tectors are chiefly affected by the initial value of the electromotive force acting on the junction during the train of oscillations, and the magnetic detectors by the initial value of the current and also to a considerable extent by the number of oscillations during the train. FlG. 48. — Tellurium- Hence the coherer type of detectors are bismuth Vacuum Ther- called potential detectors whilst the mal Detector for Elec- thermal are called integral current de- tric Oscillations, a b tectors, the current detectors depending constantan wire; c

*d, entirely or to some extent upon the thermojunction; G G damping of the train of oscillations, that galvanometer terminals'; is to sa y- u P on the number of oscillations O 0, antenna and earth for JJJ ln S * F aln -*

terminals. The fifth type of wave detector de-

pends upon the peculiar property of rarefied gases or vapours which under some circumstances ^possess a unilateral conductivity. Thus J. A. Fleming invented in 1904 a detector called an oscillation valve or glow lamp detector made as follows : l A small carbon filament incandescent lamp has a platinum plate or cylinder placed in it surrounding or close to the filament. This plate is supported by a platinum wire sealed through the glass. Fleming discovered that if the filament is made incandescent by the current from an insulated battery there is a unilateral conductivity of the rarefied gas between the hot filament and the metal plate, such that if the negative terminal of the filament is connected outside the lamp through a coil in which electric oscillations are created with the platinum plate, only one half of the oscillations are permitted to pass, viz., those which carry negative electricity from the hot filament to the cooled plate through the vacuous space. This phenomenon is connected with the fact that incandescent bodies, especially in rarefied gases, throw off or emit electrons or gaseous negative ions.

Such an oscillation valve was first used by Fleming as a receiver for wireless telegraph purposes in 1904 as follows: — In between the receiving antenna and the earth is placed the primary coil of an oscillation transformer; the secondary circuit of this trans- former contains a galvanometer in series with it, and the two together are joined between the external negative terminal of the carbon filament of the above-described lamp and the insulated platinum plate. When this is the case oscillations set up in the antenna will cause a continuous current to flow through the galvano- meter, the lamp acting as a valve to stop all those electric oscilla- tions in

one direction and only permit the opposite ones to pass (fig. 49). Wehnelt discovered that the same effect could be pro- duced by using instead of a carbon filament a platinum wire covered with the oxides of calcium or barium, which when incandescent have the property of copiously emitting negative ions. Another form of receive can be made depending on the properties of mercury vapour. A highly insulated tube contains a little mercury, which is used as a negative electrode, and the tube also has sealed through the glass a platinum wire carrying an iron plate as an anode. A battery with a sufficient number of cells is connected to these two electrodes so as to pass a current through the mercury vapour, negative electricity proceeding from the mercury cathode to the iron anode. The mercury vapour then possesses a unilateral con- ductivity, and can be used to filter off all those oscillations in a train which pass in one direction and make them readable on an ordinary galvanometer. In addition to the above gaseous rectifiers of oscillations it has been found that several crystals, such as car- borundum (carbide of silicon), hessite, anastase and many others possess a unilateral conductivity and enable us to rectify trains of oscillations into continuous currents which can affect a telephone. Also several contacts, such as that of galena (sulphide of lead) and

1 See J. A. Fleming, Proc. Roy. Soc, 1905, 74, p. 746. Also British Pal. Spec, No. 2.1580 of 1904.

plumbago, and molybdenite and copper possess similar powers, and can be used as detectors in radio-telegraphy. See G. W. Pierce, The Physical Review, July 1907, March 1909, on crystal rectifiers for electric oscillations.

Syntonic Electric Wave Telegraphy. — If a simple receiving antenna as above described is set up with an oscillation-detect- ing device attached to it, we find that it responds to incident electric waves of almost any frequency or damping provided that the magnetic force of the wave is perpendicular to the antenna, and of sufficient intensity. This

arrangement is called a non-syntonic receiver. On the other hand, if a closed oscilla- tion circuit is constructed having capacity and considerable inductance, then oscillations can be set up in it by very small periodic electromotive forces provided these have a frequency exactly agreeing with that of the condenser circuit. This last circuit has a natural frequency of its own which is numerically measured by i/2irV(CL), where C is the capacity of the con- denser and L is the inductance of the circuit. The problem of syntonic electric wave telegraphy is then to construct a transmitter and a receiver of such kind that the receiver will be affected by the waves emitted by the corresponding or syntonic transmitter, but not by waves of any other wave- length or by irregular electric impulses due to atmospheric electricity. It was found that to achieve this result the trans- mitter must be so constructed as to send out prolonged trains of slightly damped waves. Electric-radiative circuits like thermal radiators are divided into two broad classes, good radiators and bad radiators. The good electric radiators may be compared with good thermal radiators, such as a vessel coated with lamp black on the outside, and the bad electric radiators to poor thermal radiators, such as a silver vessel highly polished on its exterior. When electric oscillations are set up in these two classes of electric radiators, the first class send out a highly damped wave train and the second a feeble damped wave train provided that they have sufficient capacity or energy storage and low resistance. A radiator of this last class can be constructed by connecting inductively or directly

Fig. 49. — A, antenna; PS, jigger or oscillation transformer; C, condenser; 0, Fleming oscillation valve; B, working battery; T, telephone ; R, rheostat ; E, earth-plate.

an antenna of suitable capacity and inductance to a nearly- closed electric circuit consisting of a condenser of large capacity, a spark gap and an inductance of low resistance. When oscillations are excited in this last circuit they communicate them

to the antenna provided this last circuit is tuned or syntonized to the closed circuit, and the radiating antenna has thus a large store of energy to draw upon and can therefore radiate prolonged trains of electric waves. The above state- ments, though correct as far as they go, are an imperfect account of the nature of the radiation from a coupled antenna, but a mathematical treatment is required for a fuller explanation.

The success so far achieved in isolating electric wave telegraphic stations has been based upon the principles of electric resonance and the fact that electric oscillations can be set up in a circuit having capacity and considerable inductance by feeble electro- motive impulses, provided they are of exactly the natural frequency of the said circuit. We may illustrate the matter as follows: A heavy pendulum possesses inertia and the property of being displaced from a position of rest but tending to return to it. These mechanical qualities correspond to inductance and capacity in electric circuits. Such a pendulum can be set in vigorous vibration even by feeble puffs of air directed against it, provided these are administered exactly in time with the natural period of vibration of the pendulum.

Although inventors had more or less clearly grasped these prin- ciples they were first embodied in practice in 1900 by G. Marconi in an operative system of syntonic wireless telegraphy. His trans- mitter consists of a nearly closed oscillating circuit comprising a condenser or battery of Leyden jars, a spark gap, and the primary coil of an oscillation transformer consisting of one turn of thick wire wound on a wooden frame.- Over this primary is wound a secondary circuit of five to ten turns which has one end connected to the earth

through a variable inductance coil and the other end to an antenna. These two circuits are syntonized so that the closed or condenser circuit and the open or antenna circuit are adjusted to have, when separate, the same natural electrical time of vibration. The re- ceiving arrangement consists of an antenna which is connected to earth through the primary coil of an oscillation transformer and a variable inductance. The secondary circuit of this transformer is cut in the middle and has a condenser inserted in it, and its ends are connected to the sensitive metallic filings tube or coherer as shown in fig. 50. This receiver therefore, like the transmitter,

consists of an open and a closed electric oscillation circuit induc- tively connected together; also the two circuits of the receiver must be syntonized or tuned both to each other and to those of the transmitter. 1 When this is done we have a syntonic system which is not easily affected by electric waves of other than the right period or approximating thereto. Marconi exhibited in October 1900 this apparatus in action, and showed that two or more receivers of different tunes could be connected to the same antenna and made to respond separately and simultaneously to the action of separate but tuned transmitters.

A. Slaby in Berlin shortly afterwards made a similar exhibition of syntonic electric wave telegraphy. 2 O. Lodge had previously described in 1897 a syntonic system of electric wave telegraphy, but it had not been publicly seen in operation prior to the exhibi- tions of Marconi and Slaby.* Lodge was, however, fully aware that it was necessary for syntonic telegraphy to provide a radiator capable of emitting sustained trains of waves. His proposed radiator and absorber consisted of two wing-shaped plates of copper, the transmitter plates being interrupted in the centre by a spark gap, and the receiver plates by an inductance coil from the ends of which connexions were made to a coherer. At a later date a syntonic system comprising, as above stated, an antenna directly coupled to a resonant closed circuit was put into operation by Lodge and

Muirhead, and much the same methods have been followed in the system known as the Telefunken system employed in Germany.

A method of syntonic telegraphy proposed by A. Blondel {Comptes rendus, 1900, 130, p. 1383) consisted in creating a syntony not between the frequency of the oscillations in the sender and receiver circuits but between the groups of oscillations constituting the

'See G. Marconi, Brit. Pat. Spec, No. 7777 of 1900; also Jonrn. Soc. Arts, 1901, 49, p. 505.

2 See A. Slaby, The Electrician, 1901, 46, p. 475.

3 See O. Lodge, Brit. Pat. Spec, No. 11575 of 1897.

wave trains; but, although other patentees have suggested the same plan, the author is not aware that any success has attended its use in practice. The only other suggested solution of the problem of isolation in connexion with wireless telegraph stations was given by Anders Bull {Electrician, 1901, 46, p. 573). Very briefly stated, his method consists in sending out a group of wave trains at certain irregular but assigned intervals of time to constitute the simplest signal equivalent to a dot in the Morse code, and a sequence of such trains, say three following one another, to consti- tute the dash on the Morse code. The apparatus is exceedingly complicated and can only be understood by reference to very detailed diagrams. (See Principles of Electric Wave Telegraphy, by J. A. Fleming, 1906, sect. 13, chap, viii.) By means of the Anders Bull apparatus several messages can be sent out simultaneously from different transmitters and received independently and simul- taneously upon corresponding receivers, while no ordinary non-syntonic or other receiver is able either to obscure the messages being sent to the Anders Bull receivers or to interpret those that may be picked up. Although complicated the apparatus seems to work fairly well.

Practical Electric Wave Telegraphy. — At this stage it may be convenient to outline the progress of electric wave telegraphy since 1899. Marconi's success in bridging the English Channel at Easter in 1899 with electric waves and establishing practical wireless telegraphy between ships and the shore by this means drew public attention to the value of the new means of com- munication. Many investigators were thus attracted into this field of research and invention. In Germany A. Slaby and F. Braun were the most active. Slaby paid considerable attention to the study of the phenomena connected with the production of the oscillations in the antenna. He showed that in a simple Marconi antenna the variations of potential are a maximum at the insulated top and a minimum at the base, whilst the current amplitudes are a maximum at the top earthed end and zero at the top end. He therefore saw that it was a mistake to insert a potential-affected detector such as a coherer in between the base of the antenna and the earth because it was then subject to very small variations of potential between its ends. He overcame the difficulty by erecting a vertical earthed receiving antenna like a lightning rod and attached a lateral extension to it at a yard or two above the earthed end. To the outer end of this lateral wire a condenser was attached and the coherer inserted between the condenser and the earth. The oscillations set up in the vertical antenna excited sym- pathetic ones in the lateral circuit provided this was of the proper length; and the coherer was acted upon by the maximum potential variations possible. Passing over numerous inter- mediate stages of development we find that in 1898 Professor F. Braun showed that oscillations suitable for the purposes of electric wave creation in wireless telegraphy could be set up in a circuit consisting of a Leyden jar or jars, a spark gap and an inductive circuit, and communicated to an antenna either by inductive or direct coupling {Brit. Pat. Spec, No. 1862 of 1899). When the methods for effecting this had been worked out practically it finally led to the inventions of Slaby, Braun and others being united into a system called the

Telefunken system, which, as regards the transmitter, consisted in forming a closed oscillation circuit comprising a condenser, spark gap and in- ductance which at one point was attached either directly or through a condenser to the earth or to an equivalent balancing capacity, and at some other point to a suitably tuned antenna. The receiving arrangements comprised also an open or antenna circuit connected directly with a closed condenser-inductance circuit, but in place of the spark gap in the transmitter an electrolytic receiver was inserted, having in connexion with it as indicator a voltaic cell and telephone. In this manner the signals are read by ear. In the same way the arrange- ments finally elaborated by Lodge and Muirhead consisted of a direct coupled antenna and nearly closed condenser circuit, and a similar receiving circuit containing as a detector the steel wheel revolving on oily mercury which actuated a siphon recorder writing signals on paper tape. Arrangements not very different in general principle were put into practice in the United States by Fessenden, de Forest and others.

Hence it will be seen that the difference between various forms of the so-called spark systems of wireless telegraphy is not very

great. All of them make use of Marconi's antenna in some form both at the transmitting and at the receiving end, all of them make use of an earth connexion, or its equivalent in the form of a balancing capacity or large surface having capacity with respect to the earth, which merely means that they insert a condenser of large capacity in the earth connexion. All of them couple the transmitting antenna directly or inductively to a capacity-inductive circuit serving as a storage of energy, and all of them create thereby electric waves of the

same type moving over the earth's surface with the magnetic force of the wave parallel to it. At the receiving station the differences in these systems depend chiefly upon varia- tions in the actual form of the oscillation detector used, whether it be a loose contact or a thermal, electrolytic or magnetic detector.

In July and August 1899 the Marconi system of wireless telegraphy was tried for the first time during British naval manoeuvres, and the two cruisers, " Juno " and " Europa," were fitted with the new means of communication. The important results obtained showed that a weapon of great power had been provided for assisting naval warfare. From and after that time the British Admiralty and the navies of other countries began to give great attention to the development of electric wave telegraphy.

Transatlantic Wireless Telegraphy. — Having found that the principles of resonance could be successfully applied so as to isolate wireless telegraph receivers, Marconi turned his attention to the accomplishment of his great ambition, viz. Transatlantic wireless telegraphy. In January 1001 he telegraphed without difficulty by electric waves from the Isle of Wight to the Lizard, viz. 200 m., and he considered that the time had come for a serious attempt to be made to communicate across the Atlantic. A site for a first Transatlantic electric wave power station was secured at Poldhu, near Mullion in south Cornwall, by the Marconi Company, and plans arranged for an installa- tion. Up to that time an induction coil known as a 10-inch coil had sufficed for spark production, but it was evident that much more power would be required to send electric waves across the Atlantic. Transformers were therefore employed taking alternating electric current from an alternator driven by an oil or steam engine, and these high tension transformers were used to charge condensers and set up powerful oscilla- tions in a multiple antenna. The special electrical engineering arrangements employed at the outset for this first electric wave power station

required to create the oscillations of the desired power were designed for Marconi by J. A. Fleming, but the arrangements were subsequently altered and improved by Marconi, one of the most important additions being a form of high-speed rotating disk discharger devised by Marconi by which he was able to immensely increase the speed of signalling. The first antenna employed consisted of 50 bare copper wires 200 ft. long, arranged in fan-shape and upheld between two masts. Subsequently this antenna was enlarged, and four wooden lattice towers were built, 215 ft. high and 200 ft. apart, sustaining a conical antenna comprised of 400 wires (see G. Marconi, Proc. Roy. Inst., 1902, 17, p. 208). This transmitting plant was completed in December 1901, and Marconi then crossed the Atlantic to Newfoundland and began to make experiments to ascertain if he could detect the waves emitted by it. At St John's in Newfoundland he erected a temporary receiving antenna consisting of a wire 400 ft. long upheld by a box kite, and, employing a sensitive coherer and telephone as a receiver, he was able, on December 12, 1001, to hear "S " signals on the Morse code, consisting of three dots, which he had arranged should be sent out from Poldhu at stated hours, according to a preconcerted programme, so as to leave no doubt they were electric wave signals sent across the Atlantic and net accidental atmospheric electric disturbances. This result created a great sensation, and proved that Transatlantic electric wave telegraphy was quite feasible and not inhibited by distance, or by the earth's curvature even over an arc of a great circle 3000 m. in length. In a repetition of this experi- ment at the end of February 1902 Marconi, on board the s.s. " Philadelphia," received wireless messages printed on the ordi- nary Morse tape at a distance of 1557 m, from the sending station at Poldhu, and also received the letter " S " at a distance

of 2099 m. from the same place. In the course of this voyage he noticed that the signals were received better during the night than the daytime, legible messages being received on a Morse printer

only 700 m. by day but 1500 by night.

The appliances in the Poldhu station were subsequently enlarged and improved by Marconi, and corresponding power stations erected at Cape Cod, Massachusetts, U.S.A., and at Cape Breton in Nova Scotia. In 1002 Marconi was able to transmit a large number of messages across the Atlantic, receiving them by means of his magnetic detector. In the same year numerous experiments were tried with the assistance of an Italian battleship, the " Carlo Alberto," lent by the Italian government, and messages were transmitted from Poldhu to Kronstadt, to Spezia, and also to Sydney in Nova Scotia. Doubts having been raised whether the powerful electric waves sent out from these stations would not interfere with the ordinary ship to shore communication, special demonstrations were made by Marconi before the writer, and later before British naval officers, to demonstrate that this was not the case. 1 In 1904 a regular system of communication of press news and private messages from the Poldhu and Cape Breton stations to Atlantic liners in mid-Atlantic was inaugurated, and daily newspapers were thenceforth printed on board these vessels, news being supplied to them daily by electric wave telegraphy. By the middle of 1905 a very large number of vessels had been equipped with the Marconi short distance and long distance wireless telegraph apparatus for intercom- munication and reception of messages from power stations on both sides of the Atlantic, and the chief na ies of the world had adopted the apparatus. In 1904, during the Russo-Japanese war, war news was transmitted for The Times by wireless telegraphy, the enormous importance of which in naval strategy was abundantly demonstrated.

As the power station at Poldhu was then fully occupied with the business of long distance transmission to ships, the Marconi Company began to erect another large power station to Mar- coni's designs at Clifden in Connemara on the west coast of Ireland. This station was intended for the Transatlantic service in correspondence with a similar station at Glace Bay in Nova Scotia. It was

completed in the summer of 1907, and on the 17th of October 1907 press messages and private messages were sent across the Atlantic in both directions. The station was opened shortly afterwards for public service, the rates being greatly below that then current for the cable service.

The service was, however, interrupted in August 1909 by a fire, which destroyed part of the Glace Bay station, but was re-established in April 1910.

Meanwhile other competitors were not idle. The inventions of Slaby, Braun and others were put into practice by a German wireless telegraph company., and very much work done in erecting land stations and equipping ships. In France the scientific study of the subject was advanced by the work of Blondel,Tissot, Ducretet and others, and systems called tne Ducretet and Rochefort set in operation. In the United States the most active workers and

yatentees at this period were R. A. Fessenden, Lee de Forest, . S. Stone, H. Shoemaker and a few others. In England, in addition to the Marconi Company, the Lodge-Muirhead Syndicate was formed to operate the inventions of Sir Oliver Lodge and Dr Muirhead.

Directive Telegraphy. — A problem of great importance in connexion with electric wave telegraphy is that of limiting the radiation to certain directions. A vertical transmitting antenna sends out its waves equally in all directions, and these can be equally detected by a suitable syntonic 01 other receiver at all points on the circumference of a circle described round the transmitter. This, however, is a disadvantage. What is required is some means for localizing and directing a beam of radiation. The first attempts involved the use of mirrors. Hertz had shown that the electric radiation from an oscillator

1 See J, A. Fleming, The Principles of Electric Wave Telegraphy (London, 1906), chap, vii.; also Cantor Lectures on Hertzian wave telegraphy, Lecture iv.,

Journ. Soc. Arts, 1903, or letter to The Times, April 14, 1903

could be reflected and converged by cylindrical parabolic mirrors. He operated with electric waves two or three feet in wave-length. Experiments precisely analogous to optical ones can be performed with somewhat shorter waves. Marconi in his first British patent (No. 12039 of 1896) brought forward the idea of focusing a beam of electric radiation for telegraphic purposes on a distant station by means of parabolic mirrors, and tried this method successfully on Salisbury Plain up to a distance of about a couple of miles. As, however, the wave-length necessary to cover any considerable distance must be at least 200 or 300 ft., it becomes impracticable to employ mirrors for reflection. The process of reflection in the case of a wave motion involves the condition that the wave-length shall be small compared with the dimensions of the mirror, and hence the attempt to reflect and converge electric waves 1000 ft. in length by any mirrors which can be practically constructed would be like attempting optical experiments with mirrors one-hundred-thousandth of an inch in diameter.

Another closely connected problem is that of locating or ascertaining the direction of the sending station. To deal with the latter question first, one of the earliest suggestions was that of J. S. Stone (U.S.A. Pat. Spec, Nos. 716134 and 716135, also reissue No. 12 148), who proposed to place two receiving antennae at a distance of half a wave-length apart. If these two were broadside on to the direction of the sending station oscillations in the same phase would be produced in them both, but if they were in line with it then the oscillations would be in opposite phases. It was then proposed to arrange a detector so that it was affected by the

algebraic sum of the two oscilla- tions, and by swivelling round the double receiving antennae to locate the direction of the sending station by finding out when the detector gave the best signal. Even if the proposal had been practicable with waves 1000 or 2000 ft. in length, which it is not, it is essentially based upon the supposition that the damping of the waves is negligible. A proposal was made by L. de Forest (U.S.A. Pat. Spec., No. 771818) to employ a receiving antenna consisting of vertical wires held in a frame which could be swivelled round into various positions and used to locate the position of the sending station by ascertaining the position in which the frame must be placed to create in it the maximum oscillatory current. Other inventors had pro- fessed to find a solution of the problem by the use of looped receiving antennae or antennae inclined in various directions.

G. Marconi, however, gave in 1906 the first really practical solu- tion of the problem by the use of bent transmitting and receiving antennae. He showed that if an antenna were constructed with a short part of its length vertical and the greater part horizontal, the lower end of the vertical part being earthed, and if oscillations were created in it, electric waves were sent out most powerfully in the plane of the antenna and in the direction opposite to that in which the free end pointed. Also he showed that if such an antenna had its horizontal part swivelled round into various directions the current created in a distant receiver antenna varied with the azimuth, and when plotted out in the form of a polar curve gave a curve of a peculiar figure-of-8 shape. 1 The mathematical theory of this antenna was given by J. A. Fleming (Proc. Roy. Soc, May 1906, also Phil. Mag., December 1906). Marconi also showed that if such a bent receiving antenna was used the greatest oscillations were created in it when its insulated end pointed directly away from the sending station. In this manner he was able to provide means for locating an invisible sending station. F. Braun also gave an interesting solution of the problem of directive telegraphy. 2 In his

method three vertical antennae are employed, placed at equi- distant distances, and oscillations are created in the three with a certain relative difference of phase. The radiations interfere in an optical sense of the word, and in some directions reinforce each other and in other directions neutralize each other, so making the resultant radiation greater in some directions than others. Very valuable work in devising forms of antennae for directive radio-tele- graphy has been done by MM. Bellini and Tosi, who have devised instruments, called radiogonimeters, for projecting radiation in required directions and locating the azimuth of a transmitting station.

Improvements in the Production of Continuous Trains of Elec- tric Waves. — All the above-described apparatus employed in

1 See G. Marconi, Proc. Roy. Soc, 1906, A 77, p. 413. ! F. Braun, The Electrician, May 25 and June I, 1906.

connexion with wireless telegraph transmitters, in which the oscillatory discharge of a condenser is used to create oscillations in an antenna, labours under the disadvantage that the time occupied by the oscillations is a very small fraction of the total time of actuation. Thus, for instance, when using an induction coil or transformer to charge a condenser, it is not generally convenient to make more than 50 discharges per second, but each of these may create a train of oscillations consisting of, say, 20 to 50 waves. Supposing, then, that these waves are 1000 ft. in wave-length, the frequency of the oscillations would by 1,000,000 per second, and accordingly 50 of these waves would be emitted in i/2o,oooth part of a second; and if there are 50 groups of waves per second, the total time occupied by the oscillations in a second would only be 1 /400th part of a second. In other words, the intervals of silence are nearly 400 times as long as the intervals of activity. It very soon, therefore, be- came clear to inventors that a very great advantage would be gained if some means could be

discovered of creating high frequency oscillations which were not intermittent but con- tinuous. The condenser method of making oscillations is analogous to the production of air vibrations by twanging a harp string at short intervals. What is required, however, is something analogous to an organ pipe which produces a con- tinuous sound.

A method of producing these oscillations devised by Valdemar Poulsen is based upon the employment of what is called a musical arc. W- Duddell discovered in 1900 that if a continuous current carbon, arc had its carbon electrodes connected by a condenser in series with an inductance, then under certain conditions oscillations were excited in this condenser circuit which appeared to be con- tinuous. Poulsen immensely improved this process by placing the arc in an atmosphere of hydrogen, coal-gas or some other non- oxidizing gas, and,at the same time arranging it in a strong magnetic field. 3 In this way he was able to produce an apparatus which created continuous trains of oscillations suitable for the purposes of wireless telegraphy. The so-called musical arc of Duddell has been the subject of considerable investigation, and physicists are not entirely in accordance as to the true explanation of the mode of production of the oscillations. It appears, however, to depend upon the fact that an electric arc is not like a solid conductor. Increase in the voltage acting upon a solid conductor increases the current through it, but in the case of the electric arc an increase in current is accompanied by a fall in the difference of potential of the carbons, within certain limits, and the arc has therefore been said to possess a negative resistance. 4

Poulsen's method of producing continuous or undamped electrical waves has been applied by him in radio-telegraphy. The electric arc is formed between cooled copper (positive) and carbon (negative) electrodes in an atmosphere of hydrogen or coal-gas. In recent apparatus, to enable it to be used on board ship, a hydrogeneous spirit is used which is fed drop by drop into the chamber in which the arc

is worked. Across the arc is a transverse or radial magnetic field, and the electrodes are connected by an oscillatory circuit consisting of a condenser and inductance. The antenna is con- nected either directively or inductively with the circuit. At the receiving end are a similar antenna and resonant circuit, and a telephone is connected across one part of the latter through an automatic interrupting device called by Poulsen a " ticker." To send signals the continuous or nearly continuous train of waves must be cut up into Morse signals by a key, and these are then heard as audible signals in the telephone. An important modification of this method enables not only audible signals but articulated words to be transmitted, and gives thus a system of wireless telephony. This has been achieved by employing a microphone transmitter at the sending end to vary the amplitude but not the wave-length of the emitted waves, and at the receiving end using an electrolytic receiver, which proves to be not merely a qualitative but also a quantitative instrument, to make these variations audible on a telephone. The system has already been put into practice in Germany by the Gesellschafi fur drahtlose Telegraphie, and in the United States by R. A. Fessenden. This last-named inventor has

'See V. Poulsen, Brit. Pat. Spec, No. 15599 of 1903; also a lecture given in London, November 27, 1906, " On a Method of producing undamped Electrical Oscillations and their employment in Wireless Telegraphy," Electrician, 1906, 58, p. 166.

- *Reference .may be made to W. Duddell, " On Rapid Variations in the Current through the Direct Current Arc," Journ. Inst. Elec. Eng., 1900, 30, p. 232; P. Janet, "On Duddell's Musical Arc." Comptes renins, 1902, 134, p. 821; S. Maisel, Physik. Zeits., September I, 1904, and January 15, 1905, or L ' Aclairage electrique, 190.4, 41, p. 186; J. A. Fleming, The Principles of Elettric Wave Telegraphy, 1906, p. 73.*

employed tor rne production of the continuous trains of waves a high frequency alternator of his own invention (see The Electrician, 1907. 58, pp. 675, 701). Much work has been done on this matter by E. Ruhmer, for which the reader must be referred to his work, Drahtlose Telephonie, Berlin, 1907. There is no doubt that the transmission of articulate sounds and speech over long distances without wires by means of electric waves is not only possible as an experimental feat but may perhaps come to be commercially em- ployed. In connexion with this part of the subject a brief reference should also be made to M. Wien's method of impact excitation by employing a form of spark gap which quenches the primary discharge instantly and excites the free oscillations in the antenna by impact or shock.

Instruments and Appliances for making Measurements in Con- nexion with Wireless Telegraphy. — The scientific study of electric wave telegraphy has necessitated the introduction of many new processes and methods of electrical measurement. One im- portant measurement is that of the wave-length emitted from an antenna. In all Cases of wave motion the wave-length is connected with the velocity of propagation of the radiation by the relation v — n\, where n is the frequency of the oscilla- tions and X is the wave-length. The velocity of propagation of electric waves is the same as that of light, viz., about 1000 million feet, or 300 million metres, per second. If therefore we can measure the frequency of the oscillations in an antenna we are able to tell the wave-length emitted. Instruments for doing this are called wave meters and are of two kinds, open circuit and closed circuit. Forms of open circuit wave meter have been devised by Slaby and by Fleming. Slaby's wave meter consists of a helix of non-insulated wire wound on a glass tube. This helix is presented or held near to the antenna, and the length of it shortened until oscillations of the greatest intensity are produced in the helix as indicated by the use of an indicator of fluorescent paper.

Closed circuit wave meters have been also devised by J. Donitz 1 and by Fleming. 2 In Donitz's wave meter a condenser of variable capacity is associated with inductance coils of various sizes, and the wave meter is placed near the antenna so that its inductance coils have induced currents created in them. The capacity of the condenser is then altered until the maximum current, as indicated by a hot wire ammeter, is produced in the circuit. From the known value of the capacity in that position and the inductance the frequency can be calculated. The Fleming closed circuit wave meter, called by him a cymometer, consists of a sliding tube con- denser and a long 1 helix of wire forming an inductance; these are connected together and to a copper bar in such a manner that by one movement of a handle the capacity of the tubular condenser is altered in the same proportion as the amount of the spiral inductance which is included in the circuit. If, then, a long copper bar which forms part of this circuit is placed in proximity to the transmitting antenna and the handle moved, some position can be found in which the natural time period of the cymometer circuit is made equal to the actual time period of the telegraphic antenna. When this is the case the amplitude of the potential difference of the surfaces of the tubular condenser becomes a maximum, and this is indicated by connecting a vacuum tube filled with neon to the surfaces of the condenser. The neon tube glows with a bright orange light when the adjustments of the cymometer circuit are such that it is in resonance with the wireless telegraph antenna. The scale on the cymometer then shows directly the wave-length and frequency of the oscillations. 3

An immense mass of information has been gathered on the scientific processes which are involved in electric wave telegraphy. Even on fundamental questions such as the function of the earth interconnexion with it physicists differ in opinion to a considerable extent. Starting from an observation of Marconi's, a number of interesting facts have been accumulated on the absorbing effect

of sunlight on the propagation of long Hertzian waves through space, and on the disturbing effects of atmospheric electricity as well as upon the influence of earth curvature and obstacles of various kinds interposed in the line between the sending and transmitting stations. 4

Electric wave telegraphy has revolutionized our means of communication from place to place on the surface of the earth, making it possible to communicate instantly and certainly between places separated by several thousand miles, whilst

1 The Electrician, 1904, 52, p. 407, or German Pat. Spec, No.

*14935°- * Brit Pat. Spec, No. 27683 of 1904.*

3 J. A. Fleming, Phil. Mag., 1905 [6], 9, p. 758.

4 See Admiral Sir H. B. Jackson, F.R.S., Proc. Roy. Soc, 1902, 70, p. 254: G. Marconi, ib., 1902, 70, p. 344.

at the same time it has taken a position of the greatest import- ance in connexion with naval strategy and communication between ships and ships and the shore in time of peace. It is now generally recognized that Hertzian wave telegraphy, or radio-telegraphy, as it is sometimes called, has a special field of operations of its own, and that the anticipations which were at one time excited by uninformed persons that it would speedily annihilate all telegraphy conducted with wires have been dispersed by experience. Nevertheless, transoceanic wireless telegraphy over long distances, such as those across the Atlantic and Pacific oceans, is a matter to be reckoned with in the future, but it remains to be seen whether the present means are suffi- cient to gender possible communication to the antipodes. The fact that it has become necessary to introduce regulations for its control by national legislation and international conferences shows the supremely important position which it has taken in the short interval of one decade as a means of

communicating human intelligence from place to place over the surface of the globe. An important International Conference on radio- telegraphy was held in Berlin in 1906, and as a result of its de- liberations international regulations have been adopted by the chief Powers of the world. The decisions of the Conference were ratified for Great Britain by the British government on July 1, 1908.

Authorities.— M. Abraham, " Wireless Telegraphy and Electro- dynamics," Physik. Zeits., 1901, 2, 329; J. A. Fleming, " Electric Oscillations and Electric Waves," Cantor Lectures, Journ. Soc. Arts, 1901, and " Measurement of High Frequency Currents," Cantor Lectures, ib., 1905; G. W. Pierce, "Experiments in Reso- nance in Wireless Telegraphy," Physical Review, September 1904, April 1905, March 1906; G. Marconi, " Wireless Telegraphy," Journ. Inst. Elec. Eng. Lona., 1899, 28, p. 273; id., " Wireless Telegraphy, " Proc. Roy. Inst., 16, p. 247; id., "Syntonic Wireless Telegraphy," Journ. Soc. Arts, 1901, 49, p. 505; id., " Progress of Electric Space Telegraphy," Proc. Roy. Inst., 1902, 17, p. 195; F. Braun, Drahtlose Telegraphie durch Wasser und Luft (Leipzig, 1900) ; A. Broca, La Telegraphie sans fits (Paris, 1899) ; A. F. Collins, Wireless Telegraphy (New York, 1905) ; G. Eichhorn, Wireless Telegraphy (1906); J. Erskine-Murray, A Handbook of Wireless Telegraphy (1907) ; J. J. Fahie, A History of Wireless Telegraphy (Edinburgh, 1899); J. A. Fleming, Hertzian Wave Telegraphy (1905); id., The Principles of Electric Wave Telegraphy and Telephony (2nd ed., 1910); J. A Fleming, An Elementary Manual of Radio- telegraphy and Radio-telephony (1908) ; H. Hertz, Electric Waves (1893); O. Jentsch, Telegraphie und Telepkonie ohne Draht (Berlin, 1904); O. Lodge, Signalling across Space without Wires (3rd ed. 1899); D. Mazotto, Wireless Telegraphy and Telephony, Eng. trans, by S. R. Bottone (1906); H. M. Macdonald, Electric Waves (Cam- bridge, 1901); H. Poincare, Les Oscillations ilectriques (Paris, 1894); Poincare and Vreeland, Maxwell's Theory and Wireless Telegraphy (1904) ; A. Rhigi and B. Dessau, Die Telegraphie ohne Draht

(Bruns- wick, 1903); G. Seibt, Elektrische Draktwellen (Berlin, 1902); C. H. Sewall, Wireless Telegraphy (New York, 1903) ; A. Slaby, Die Funkentelegraphie (Berlin, 1897); T. A. Story, The Story of Wi/eless Telegraphy (1905); C. Tissot, Resonance des systemes d'antennes (Paris, 1906) ; J. Zenneck, Elektromagnetische Schwingungen und drahtlose Telegraphie (Stuttgart, 1906) ; J. Zenneck, Leitfaden der drahtlosen Telegraphie (1909). (J. A. F.)

TELEMACHUS, in Greek legend (Odyssey i.-iv., xv.-xxiv.; Hyginus, Fab. 127), son of Odysseus and Penelope. When he reached manhood, he visited Pylos and Sparta to make inquiries about his father, who had been absent for nearly twenty years. On his return, he found that Odysseus had reached home before him. Then father and son, aided by Eumaeus and Philoetius, slew or drove out the suitors of Penelope (see Odysseus). According to later tradition, Telemachus became the husband of Circe and by her the father of Latinus and of a daughter Roma, afterwards the wife of Aeneas. In another story, he married a daughter of Circe, named Cassiphone; having slain his mother-in-law in a quarrel, he was himself killed by his wife. This is the only notice of the death of Telemachus. The foundation of Clusium in Etruria was attributed to him.

TELEMARK, or Thelemark, a district of southern Norway, wholly comprised in the amt (county) of Bratsberg. It covers the uplands and fjelds ©f the southward projection of the country, having its highest point in the Gaustafjeld (6200 ft.); and contains several large and beautiful lakes, as Nordsjo, Bandaksvand, Tinsjo, MjSsvand and Totakvand. The two

first are connected by the Bandaks canal, a fine engineering work giving access from the port of

Skien to Dalen at the head of Bandaksvand. From Dalen, which may be reached by road from the railway at Kongsberg (38 miles) a driving road much frequented by travellers runs north-west. It traverses a pre- cipitous wooded gorge, its course in parts hewn out of the rock, and skirts the Borte and Grungedal lakes, follows the Flaathyl river, passes the Vafos and Little Rjukanfos (waterfalls), and Lake Voxli, and culminates at Haukelidsaeter, a station grandly situated among the fjelds at a height of 3085 ft. It rises to the watershed (3715 ft.) and then, leaving the district, descends abruptly with a remarkable winding course to Roldal (58 miles from Dalen), and soon divides, one branch surmounting the Horrebraekke pass and continuing to Odde, the other traversing the beautiful Bratlandsdal. On the Kongsberg-Dalen road is Hitterdal. with a good specimen of the Stavekirke or medieval timber-built church. A divergence from this route may be made by way of Tinsjo to Fosso, where the Maan river forms a fine fall (Rjukanfos) of 415 ft.

TELEOLOGY (Gr. -reXos, end), in philosophy and theology, strictly that branch of study which considers " final causes " as real principles of explanation, i.e. which explains things as existing solely as pre-requisites of the results which they produce. More commonly the term is applied to the doctrine that the universe as a whole has been planned on a definite design, or at least that it tends towards some end. The term has been used very loosely, and its meaning has changed con- siderably. The root idea arises from the analogy of the acts of human beings which are observed to have certain purposes: hence it was natural to assume that the whole sum of existence with its amazing complexity and its orderly progress can be explained only on the assumption of a similar plan devised by a conscious agent. Such a view is essential to any theistic view of the universe which postulates God as the Creator, omniscient and all-good. The modern theory of evolution, on the other hand, has reintroduced a scientific teleology of another type.

This is discussed, from the biologist's point of view, in the article Zoology. Teleology, in this narrower sense, as the study of the adaptation of organic structures to the service of the organisms in which they occur, was completely revolutionized by Darwinism and the research founded on it.

TELEOSTOMES, members of the third sub-class of the class Fishes, being all the fishes in which the skull is invested with membrane bones, viz., the Crossopterygians, the Dipnoans, the Ganoids and the Teleosteans. They may be further defined as fishes with an ossified or cartilaginous skeleton, a lower jaw, gills inserted on the gill-arches, a single gill-opening on each side (exceptionally fused with its fellow on the ventral side), an opercle formed of one or several bones, the body usually covered with scales or bony plates, an air-bladder or lung, at least in the primitive forms, and without copulatory paired organs or " claspers."

The term which designates this sub-class has been adopted by Sir R. Owen, E. D. Cope, and A. S. Woodward in a less comprehensive sense, the Dipneusti being regarded by them as constituting a separate sirb-class, and its inventor, C. L. Bona-parte (1838) had proposed it in a more restricted sense, the sturgeons, lophobranchs and plectognaths being excluded. T. Gill (1872) was the first to use it in the acceptation taken in the present article. Whether the Ostracophores should be included among the Teleostomes, as recently proposed by C. T. Regan, is still open to doubt. The sub-class is here divided into four orders, but it is difficult to decide whether, in an ascending series, the Crossopterygians or the Ganoids should be placed first. From the point of view of the evolution of the paired fins, accepting the lateral fin-fold theory as the better supported by the evidence at hand, there is much to say in favour of regarding the Chondrostean Ganoids as the more primitive type. From another point of view the con- dition of the air-bladder in the existing Crossopterygians appears to represent the earliest form assumed by this important organ, which it seems rational to conclude

was originally evolved as

an accessory breathing organ and later became transformed into a hydrostatic apparatus (Ganoids and Teleosteans) on the one hand, into a true lung (Dipnoans and Batrachians) on the other. Guided by the second consideration, assuming that the air-bladder of the fossil Crossopterygians conformed to the type known in their recent representatives, and also in deference to palaeontological chronology, whatever it be worth in the present state of our knowledge, we shall begin the series with the Crossopterygians, which pass into the Dipnoans, and then take up the Ganoids, which lead up very gradually to the Teleosteans, the dominant group at the present day. But we do not deny the force of the arguments adduced by Regan in attempting to show that the paired fins of the Chondrostean Ganoids are a nearer approach to the primitive condition than are those of the Crossopterygians. No doubt some day we shall become acquainted with still older Teleostomes, .which we may expect to establish the connexion between the two types which in Palaeozoic times have evolved on parallel lines.

Order I.— CROSSOPTERYGII

Paired fins, at least the pectorals, lobate, having an endo-skeletal axis more or less fringed with dermal rays. Mandibular arch suspended from the upper segment of the hyoid arch (hyostylic skull). Splenial bone present. No supraoccipital bone. A pair of large jugular plates, sometimes with small lateral plates and an anterior azygous element, developed in the branchiostegal mem- brane between the mandibular rami. Heart with a ' contractile, multivalvular conus arteriosus; intestine with a spiral valve; air- bladder with pneumatic duct communicating with the ventral side of the oesophagus.

Maxillary bone large, toothed, bordering the mouth. Bones of the upper surface of the skull mostly paired. Pectoral arch with both clavicle (so-called infra-clavicle) and cleithrum. Ventral fins inserted

far back. With few exceptions (tail of Coelacanthidae, dorsal and caudal fins of Polypteridae) the dermal rays of the unpaired fins more numerous than their endo-skeletal supports, a primitive character also found in the lower Ganoids, but disappearing in the higher.

Sub-order I.— OSTEOLEPIDA

(Including the Haplistia, Rhipidistia and Actinistia.) Pectoral fins obtusely or acutely lobate, articulating with the pectoral girdle by a single basal endo-skeletal element. Nostrils on the lower side of the snout. Two dorsal fins.

Families: Osteolepidae, Rhizodontidae, Holoptychidae, Coel- acanthidae.

The scales may be rhombic and thickly coated with ganoine (Osteolepidae) or cycloid. The vertebral axis is strongly hetero- cercal in the Osteolepidae and Holoptychidae, and diphycercal or intermediate between the heterocercal and the diphycercal types in the other families; usually acentrous, sometimes with ring-like calcifications (some of the Rhizodontidae). In the Holoptychidae the pectoral fin is extremely similar to that of the Dipneusti of the family Dipteridae, which they resemble closely in form and scaling. Their teeth are remarkable for their complicated structure, resem- bling that of the Labyrinthodont Batrachians. A pineal foramen is present between the frontal bones in most of the Rhizodontidae.

The Osteolepidae were mostly moderate-sized fishes, the largest (Megalichthys) measuring about 4 ft. in length.

These Crossopterygians first appear in the Lower Devonian, are abundant in the Upper Devonian, Carboniferous and Permian; in later periods they are represented only by the more specialized Coelacanthidae, which appear in the Lower Carboniferous, and persist as late as the Upper Chalk.

Sub-order II.— CLADISTIA

Pectoral fin obtusely lobate, with three basal endo- skeletal ele- ments. Nostrils on the upper side of the snout. A single dorsal fin, formed of a series of detached rays.

A single family : Polypteridae.

The existing Crossopterygians which form this sub- order differ very considerably from the extinct Osteolepida, perhaps quite as much as these differ from the Dipneusti. The ventral fins are not lobate, the vertebral column is well ossified and its termination is of the diphycercal type. Spiracles, covered by bony valves, are present on the upper surface of the head. The dorsal fin is unique among fishes, being formed of detached rays consisting of a spine- like f ulcral scale supporting the fringes of the ray ; these rays have been regarded, erroneously, as representing so many distinct fins, or " finlets." The scales are bony, rhombic and thickly coated with ganoine.

The Polypteridae are confined to tropical Africa and the Nile, and represented by two genera: Polypterus and Calamichthys, the former moderately elongate and provided with ventral fins, the

latter serpentiform and devoid of ventrals. We now know ten species of Polypterus, from the Nile, the Congo, the rivers of West Africa, and lakes Chad, Rudolf and Tanganyika, and one of Cala- michthys, which inhabits West Africa from the Niger delta to the Chiloango. The largest species of Polypterus reach a length of nearly 4 ft. The young are provided with an external opercular gill very similar to the gills of larval salamanders. The air- bladder acts as an accessory breathing organ, although these fishes are not known ever to leave the water. The development is stated by the late J.

S. Budgett to be even more Batrachian-like than that of the Dipneusti, but the results of the study of the material collected by him shortly before his death have not yet been published.

Order II.— DIPNEUSTI

Often called Dipnoi, a term proposed for this order by J. Miiller in 1845, but which had already been used for the Batrachians (F. Leuckart, 1821) before the discovery of Lepidosiren. The sub- stitute Dipneusti (E. Haeckel, 1866) is, therefore, preferable.

Paired fins lobate, or reduced to a jointed endo-skeletal axis. Upper segment of the mandibular arch confluent with the skull (autostylic skull). Praemaxillary and maxillary bones absent, dentary absent or small and toothless; teeth on the palato-ptery- goid and splenial bones, sometimes also on the vomers. No supraoccipital bone. Heart trilocular, with a contractile, multi- valvular conus arteriosus; intestine with a spiral valve; air-bladder transformed into a single or double lung, opening at the glottis on the ventral side of the pharynx.

The cranial roof-bones include median as well as paired plates, which cannot easily be homologized with those of other Teleo- stomes; in the older forms, these bones are small and numerous, and, coated with ganoine, appear on the surface of the head, whilst in the later forms they are reduced in number as well as in the degree of ossification, and have sunk below the skin. Pectoral arch with both clavicle and cleithrum. Ventral fins inserted far back. Vertebrae acentrous. Dermal rays of vertical fins much more numerous than their supports, which correspond in number to the neural and haemal arches. Nostrils on the lower side of the snout, the posterior within the mouth. Scales cycloid (almost quadrate in Sagenodus, a genus of Ctenodontidae).

Families: Dipteridae, Ctenodontidae, Uronemidae, Ceratodon- tidae, Lepidosirenidae.

The Dipteridae are heterocercal and have two dorsal fins, as in the Crossopterygian Holoptychidae; in the other families the dorsal fin is elongate and single, and extends to the extremity of the tail, which belongs to the diphycercal type. In the three first families, which are entirely Palaeozoic, ranging from the Devonian to the Permian, the dental plates nearly always exhibit more or less clearly the points of the separate denticles of which, as shown by the development of Neoceratodus, they were originally composed, but vomerine teeth, such as exist in the Ceratodontidae and Lepido- sirenidae, do not appear to have existed. In the Dipteridae alone the scales were covered with dense, punctate ganoine, which has become much reduced or disappeared entirely in the other members ofj this order. The two first families had well-developed gular plates.

In the Ceratodontidae, which first appeared in the Trias and have persisted to the present day, the skull is more feebly ossified than in the earlier forms, and this may well be looked upon as a degen- eration, since the head of the Triassic Ceratodus sluri, whilst exhibit- ing the same arrangement of bones as in the living form, differs in its higher degree of ossification; and as the dermal rays of the caudal fin also exhibit distinctive features in a fossil of the same period, it is advisable to refer the existing Ceratodus forsteri to a distinct genus, which has been named Neoceratodus by Castelnau (1876) and Epiceratodus by Teller (1891). But there can be no question that Neoceratodus is very closely related to Ceratodus. Its only known species, N. forsteri, variously known as the barra- munda, flat-head, and Dawson or Burnett salmon, inhabits the Burnett, Dawson and Mary rivers in Queensland, and was first discovered in 1870. Its anatomy was made known by the memoir of A. Giinther, and numerous contributions by T. H. Huxley, E. R. Lankester, J. E. V. Boas, W. B. Spencer and others, whilst its development has been elaborately worked out by R. Semon. This fish, which grows to a length of 6 ft., has the body moderately elongate and

compressed, covered with large thin scales, and the paired fins are acutely lobate, consisting of a median jointed axis fringed on each side by a series of radialia supporting fine dermal rays (archipterygium of C. Gegenbaur). Although provided with a lung, which is single, Neoceratodus never leaves the water. It feeds on both animal and vegetable matter, the specimens kept in the London Zoological Gardens readily eating lettuce in addition to frogs and bits of raw meat. The early development resembles very closely that of Batrachians, but there are no metamorphoses properly speaking, and at no period does the young possess external gills or a holder or cement organ.

.The South American Lepidosiren and the tropical African Pro- topterus, which constitute together the family Lepidosirenidae, were discovered long before Neoceratodus, the former in 1836, the latter in 1839. These fishes are much more specialized than are

the Ceratodontidae; the body is more or less eel-shaped, the scales are thinner, the paired fins are reduced to slender styliform append- ages formed of a jointed axis with or without a unilateral fringe of cartilaginous rays bearing fine dermal rays, and the lung is paired. The development is even more Batrachian-like than that of Neoceratodus, and the larvae are provided with a cement organ and four (Lepidosiren) or five (Protopterus) fringed external gills, traces of which may persist throughout life in Protopterus. The habits and development of Lepidosiren have been investigated by J. Graham Kerr, and those of Protopterus by J. S. Budgett. In both the eggs are deposited in nests in the water and the male keeps guard over the eggs and young. The food is both animal and vegetable, as in Neoceratodus. During the dry season, Pro- topterus burrows in the mud of drying marshes and, surrounded by a cocoon formed of hardened mucus secreted by glands of the skin, it spends weeks or months in a dormant condition, breathing exclusively by its lungs; dry clay balls containing such cocoons have often been brought over to Europe, and when soaked

in water, the Protopterus is released in a most lively condition. Three species of Protopterus are known from different parts of Africa, the type species being P. annectens, an inhabitant of West Africa, from the Senegal to the Niger, and Lake Chad. Of Lepidosiren only one species is known, L. paradoxa, living in the Amazon and Paraguay basins.

Great uncertainty, and much difference of opinion among palaeichthyologists, still prevail as to the position in the system of a group of Devonian fishes, of which Coccosteus and Dinichthys are the best-known representatives. Long placed with the Ostra- cophores is a group instituted by Sir F. McCoy in 1848 under the name of Placodermi; they were removed from their vicinity by A. S. Woodward in 1889, and referred to the Dipnoans as an order which he proposed to call Arthrodira. This view was based mainly on the assumption that the skull was autostylic and that maxil- lary bones were not developed, and also on the resemblance, pre- viously noticed by J. S. Newberry, between the dentition of Dinichthys and that of Protopterus. Woodward's proposal has not met with general acceptance, but it is strongly supported by the recent investigations of C. R. Eastman, who has added fresh argu- ments in favour of the autostylic condition of the skull and the homology of the cranial roof-plates with those of the Dipnoans, the Ceratodontidae in particular. On the other side, B. Dean and L. Hussakof deny such homologies, and even regard the dental mechanism of the Arthrodira as something quite different from the jaws and teeth of other vertebrates, and revert to the view of McCoy in placing the Arthrodira in a group Placodermata, which they regard as a class co-ordinate in rank with such divisions as Cyclostomi and Pisces.

In the present state of our knowledge it is perhaps best to leave the Arthrodira with or near the Dipneusti. They are thus defined by Woodward: — Fishes with both head and trunk armoured, in the more specialized genera the shield of the abdominal region articulating with the head-shield in ginglymoid facettes (Gr. yiyyXviJios, a hinge) which

admit of free motion (hence the name Arthrodira, joint-neck). No trace of a hyomandibular bone. Jaws paralleled by those of the existing Dipneusti. Notochprd per- sistent. Pectoral fins unknown; ventral fins rudimentary.

Two families: Coccosteidae and Dinichthyidae, from the Devonian of Europe and North America.

Some of the species of Dinichythys reached a great size, the head sometimes measuring a metre across.

Order III— GANOIDEI

Paired fins not lobate. Mandibular arch suspended from the upper segment of the hyoid arch (hyostylic skull). Splenial bone present. No supraoccipitai bone. Unpaired fins often with fulcra. Heart with a contractile, multivalvular conus arteriosus; intestim, with a spiral valve; air-bladder with pneumatic duct communi eating with the dorsal side of the oesophagus.

Sub-order I.— CHONDROSTEI

Pectoral arch with both clavicle and cleithrum. Ventral fin; inserted far back, with well-developed endo-skeletal rays (base^ osts) ; dermal rays of the dorsal and anal fins more numerous than their endo-skeletal supports. Heterocercal. Vertebrae acentrous.

Families: Palaeoniscidae, Platysomidae, Catopteridae, Belono- rhynchidae, Chondrosteidae, Polyodontidae, Acipenseridae.

In the three first families (Devonian to Jura), the mouth is toothed, praemaxillary bones are present, and the maxillaries are large, the bones of the upper surface of the head are paired, branchiostegal rays are present, and the body is covered with rhomboidal, typically ganoid bony scales. In the fourth family (Trias to Lias), the snout is much elongate, and longitudinal series of scutes extend along the body, one on the back, one on the belly, and one on each side. The Liassic Chondrosteidae

show an approach to the sturgeons, and form a sort of connecting link between them and the Palaeoniscidae. The mouth was edentulous, praemaxillary bones were absent, but the maxillary bone was well developed, though small; the membrane bones of the skull were paired;

branchiostegal rays were present; scales were absent, except on the caudal lobe.

In the modern Polyodontidae and Acipenseridae, whose first representatives appear in the Eocene, praemaxillaries are absent and the mouth is edentulous (Acipenseridae) or beset with minute teeth (Polyodontidae), the membrane bones of the skull are more irregular and comprise azygous elements, branchiostegal rays are absent, and the body is naked or covered with small ossifications and longitudinal series of bony scutes, whilst the caudal fin is scaled exactly as in the Palaeoniscidae. Barbels are absent in the Polyodontidae.

In the Polyodontidae, represented by one species, the paddle- fish or spoon-bill (Polyodon folium), in the Mississippi, Ohio and Missouri rivers of North America, and by another (Psephurus gladius) in the Yang-tse-kiang and Hoang Ho rivers of China, the snout is produced into a very long, spatulate (Polydon) or sub-conical (Psephurus) appendage, apparently useful in stirring up the mud of the thick waters in which these fishes live, and perhaps a tactile organ compensating the very reduced size of the eyes. Psephurus gladius is said to grow to a length of 20 ft. The sturgeons (Acipen- seridae) are divided into two genera: Acipenser, distributed over the coasts and fresh waters of the temperate parts of the northern hemisphere, and Scaphirhynchus, inhabiting North America and Central Asia. About twenty species of Acipenser and five of Scaphirhynchus are known. The sturgeons are of great

value for their flesh, their eggs (caviare) and the isinglass from the air-bladder; several species are migratory, ascending rivers to spawn. The largest species attain a length of 10 to 18 ft.

Sub-order II.— HOLOSTEI

Clavicle proper absent. Ventral fins inserted more or less far back, without or with mere rudiments of endo-skeletal rays; dermal rays of the dorsal and anal fins corresponding to their endo- skeletal supports. Caudal fin of an abbreviate-heterocercal or homocercal type.

Families: Semionotidae, Macrosemiidae, Pycnodontidae, Eugna- thidae, Pachycormidae, Lepidosteidae, Aspidorhynchidae, Amiidae.

First appear in the Permian with the Semionotidae, become abundant in the Trias, dominant in the Jurassic, begin to decline in the Cretaceous, and from the Eocene to the present day are reduced to the two families Lepidosteidae and Amiidae, the modern representatives of which inhabit the fresh waters of North America.

In most of the Holostei the scales are bony, rhombic and covered with an enamel-like (ganoine) coating, but there is every gradation between this so-called ganoid type of scaling and the cycloid type exemplified by the Amiidae. Fulcra also disappear in some of the more specialized types. The mouth is always large and toothed, and branchiostegal rays are invariably present; a single gular plate is often present. In the earlier groups the notochord was persistent, with or without annular centra, or with each centrum composed of two elements — pleurocentrum and hypocentrum ; these elements remain distinct and alternate in the caudal region of the Amiidae, whilst in the Lepidosteidae the centra are as fully developed as in most Teleosteans, and opisthocoelous or convexo-concave.

The pike-like genus Lepidosteus was abundant in Europe in Eocene and Miocene times, and is now

represented by three species in eastern North America, Mexico and Cuba. The largest species reaches a length of 10 ft. Amia, the bowfin, of similar geological age, is a much smaller fish, not exceeding 2 ft., from the eastern parts of North America. Its air-bladder is cellular and acts as an accessory breathing organ. It deposits its eggs in a sort of nest, which is protected by the male, who for some time accompanies the swarm of young fry and defends them with great courage.

Leedsia problematica, one of the Pachycormidae from the Oxford clay, probably reached a length of 30 ft., and is the largest known Teleostome.

Order IV.— TELEOSTEI

Paired fins non-lobate, the ventrals without baseosts. Mandible suspended from the upper segment of the hyoid arch. Splenial bone absent. Supraoccipital bone present. Heart without muscular conus arteriosus, or with much reduced conus, with one, excep- tionally two, rows of valves. Air-bladder, if present, communi- cating with the dorsal side of the oesophagus or digestive tract, or completely closed.

Sub-order I.— MALACOPTERYGII

Air bladder, if. present, with a duct. Opercle well developed. Pectoral arch suspended from the skull ; mesocoracoid bone present. Fine without spines, the ventrals abdominal (rarely absent). An- terior vertebrae distinct, without Weberian ossicles.

Families: Pholidophoridae, Archaeomenidae, Oligopleuridae, Leptolepidae, Elopidae, Albulidae, Mormyridae, Hyodontidae, Notopteridae, Osteoglossidae, Pantodontidae, Ctenothrissidae, Phractolaemidae, Saurodontidae, Chirocentridae, Clupeidae, Chani- dae, Salmonidae, Alepoeephalidae, Stomiatidae, Gonorhynchidae, Cromeriidae.

Unquestionably the most generalized sub-order, having most in

common with the Holostean ganoids. The first four families, of Triassic to Cretaceous age, are so closely connected with these Ganoids that their allocation to the Teleosteans must be regarded as provisional. Some of the Pholidophoridae were flying fishes. The Elopidae and Albulidae are also low forms, traced back to the Cretaceous seas, having points in common with the Ganoids (gular plate in the former, conus arteriosus with two rows of valves in the latter). The Mormyridae are among the most extraordinary fishes, and, like the four families which follow in the above list, confined to fresh waters. Other families, like the Chirocentridae, Clupeidae and Salmonidae, are entirely or partly marine, the two last being of great economic importance. The Alepoeephalidae and Stomiatidae are restricted to the deep sea.

See Anchovy, Herring, Menhaden, Mormyr, Pilchard, Salmonidae, Shad and Sprat.

Sub-order II.— OSTARIOPHYSI

Air-bladder, if well developed, with a duct. Pectoral arch sus- pended from the skull; mesocoracoid bone present. Fins without spines, or dorsal and pectoral with a single spine formed by the co-ossification of the segments of an articulated ray. The anterior four vertebrae strongly modified, often co-ossified, and bearing a chain of small bones (so-called Weberian ossicles) connecting the air-bladder with the ear.

Families: Characinidae, Gymnotidae, Cyprinidae, Siluridae, Loricariidae, Aspredinidae.

One of the most natural groups of the class Pisces, as demon- strated by M. Sagemehl in 1885. The Characinidae are the most generalized, although perhaps not directly derived from the Amiid Ganoids, as believed by Sagemehl ; they show great variety of form and dentition, and are confined to Central and South America and Africa. The Gymnotidae, which include the so-called electric eel, are closely related to the Characinidae, and occur only in South

America. The largest families are the Cyprinidae and Siluridae. With the exception of a few Siluridae, the Ostariophysi are all fresh-water fishes.

Sub-order III.— SYMBRANCHII

Eel-shaped fishes without paired fins, with the pectoral arch free or suspended from the skull, without mesocoracoid bone, and with the anterior vertebrae distinct, without Weberian ossicles. Gill-openings confluent into a single, ventral slit. Air-bladder absent.

Families: Symbranchidae and Amphipnoidae.

Like the Apodes, which they resemble in general appearance, these fishes are no doubt derived from some low type with abdominal ventral fins, but whether from the Malacopterygii or the Haplomi we have as yet no data from which to conclude. Inhabitants of the fresh or brackish waters of south-eastern Asia, tropical America, Australia and Tasmania.

In the cuchia, Amphipnous cuchia, the gills are much reduced, and a respiratory air-sac extends on each side of the body behind the head, communicating with the gill-cavity.

Sub-order IV.— APODES

Air-bladder, if present, with a duct. Praemaxillary bones absent; the maxillaries, if present, separated on the median line in front by the coalescent ethmoid and vomer. Pectoral arch, if present, not connected with and remote from the skull ; mesocoracoid bone absent. . Fins without spines, the ventrals absent. Anterior vertebrae distinct, without Weberian ossicles.

Elongate, serpentiform fishes with naked skin, or with minute scales imbedded in the skin.

Families: Anguillidae, Nemichthyidae, Synaphobranchidae, Sac- copharyngidae, Muraenidae.

A large group of aberrant, degraded fishes, heralded by the Cretaceous genus Urenchelys, the most generalized of eels. Mostly marine, many bathybial; some living principally in fresh water, but breeding in the sea, like the common eel (see articles Eel and Muraena).

Sub-order V.— HAPLOMI

Air-bladder, if present, with a duct. Opercle well developed. Pectoral arch suspended from the skull ; no mesocoracoid bone. Fins usually without, rarely with a few spines; ventrals abdominal, if present. Anterior vertebrae distinct, without Weberian ossicles.

Families: Galaxiidae, Haplochitonidae, Enchodontidae, Esocidae, Dalliidae, Scopelidae, Alepidosauridae, Cetomimidae, Chirothricidae, Kneriidae, Cyprinodontidae, Amblyopsidae, Stephanoberycidae, Percopsidae.

The absence of the mesocoracoid bone distinguishes these fishes from the Malacopterygii, and the presence of a duct to the air- bladder separates them from the Percesoces, to some of which, the Scombresocidae and the Atherinidae, they are linked by the Cypri- nodontidae ; whilst the Scopelidae are connected with the Berycidae by the Stephanoberycidae.

The tyjje family of this sub-order is that of the Esocidae or pike, inhabitants of the fresh waters of Europe, northern Ask, and North

America. The Galaxiidae are mostly fresh-water fishes and have a wide distribution in the southern hemisphere (southern parts of South America, New Zealand, South Australia and Tasmania, Cape of Good Hope), one species being identical in South America, the Falkland Islands, New Zealand and Tasmania. Their dis- tribution has been regarded as affording

support to the theory of an Antarctic continent in Tertiary times. However, several of the species spend part of their life, and even breed, in the sea, whilst others may be regarded as having become more recently adapted to fresh water, so that the argument derived from their range is not so strong as if we had to deal with exclusively fresh- water fishes. The Cyprinodontidae are partly brackish, partly fresh-water fishes, whilst the Scopelidae, which are traced back to the Chalk, are all marine, many being inhabitants of great depths.

Sub-order VI.— HETEROMI

Air-bladder without duct. Opercle well developed, parietal bones separating the frontals from the supraoccipital. Pectoral arch sus- pended from the supraoccipital or the epiotic, the post-temporal small and simple or replaced by a ligament; no mesocoracoid bone. Ventral fins abdominal, if present.

Families: Dercetidae, Halosauridae, Lipogenyidae, Notacan- thidae, Fierasferidae.

Closely related to the Haplomi.but separated chiefly on account of the closed air-bladder. Mostly deep-sea fishes, some of which appeared as early as the Cretaceous period. The genus Fierasfer comprises small degraded fishes commensals of Holothurians and bivalve molluscs.

Sub-order VII.— SELENICHTHYES

Air-bladder without duct. Opercle well developed. Pectoral arch suspended from the skull ; no mesocoracoid bone. Fins with- out spines. Ventral fins abdominal, with very numerous (15 to 17) rays.

A very aberrant type, of uncertain affinities. Its only repre- sentative is the opah, Lampris luna, a large pelagic fish of wide distribution.

Sub-order VIII.— THORACOSTEI

Embracing the Hemibranchii and Lophobranchii, but

excluding the Hypostomides (Pegasidae), which the investigations of F. E. Jungersen show to be aberrant mail-cheeked Acanthopterygians.

Air-bladder without duct. Pectoral arch suspended from the skull ; no mesocoracoid bone. Ventral fins abdominal, if present. Branchial arches more or less reduced.

Families: Gastrosteidae, Aulorhynchidae, Protosyngnathidae, Aulostomatidae, Fistulariidae, Centriscidae, Amphisilidae, Soleno- stomidae, Syngnathidae. The two latter families institute the division Lophobranchii, in which the gill-lamellae are enlarged and 'orm rounded lobes.

See articles Sea-Horse, Stickleback, and Pipe-Fishes.

Sub-order IX.— PERCESOCES

Air-bladder, if present, without duct. Parietal bones separated by the supraoccipital. Pectoral arch suspended from the skull ; no mesocoracoid bone. Ventral fins, if present, abdominal, or at least with the pelvic bones not solidly attached to the clavicular arch.

Families: Scombresocidae, Ammodytidae, Atherinidae, Mugil- idae, Polynemidae, Chiasmodontidae, Sphyraenidae, Tetragonuridae, Stromateidae, Icosteidae, Ophiocephalidae, Anabantidae.

This series of families connects the Haplomi with the Acanthop- terygii. The Percesoces are mostly marine, but the two last families are exclusively fresh-water. Some are inhabitants of great depths, others are pelagic, like the flying-fish (Exocoetus).

Sub-order X.— ANACANTHINI

Air-bladder without duct. Parietal bones separated by the supraoccipital; prootic and exoccipital separated by the enlarged opisthotic. Pectoral arch suspended from the skull; no mesoco- racoid bone.

Ventral fins below or in front of the pectorals, the pelvic bones posterior to the clavicular symphysis and only loosely attached to it by ligament. Fins without spines.

Families: Macruridae, Gadidae, Muraenolepididae.

Nearly all marine. The Macruridae are among the most char- acteristic fishes of the great depths. The Gadidae include some of the most valuable food-fishes.

Sub-order XI.— ACANTHOPTERYGII

Air-bladder usually without duct. Opercle well developed ; supraoccipital in contact with the frontals. Pectoral arch sus- pended from the skull; no mesocoracoid bone. Ventral fins thoracic or jugular, more or less firmly attached to the clavicular arch. Gill-opening usually large, in front of the base of the pectoral fin. The character from which this sub-order, the most comprehensive of the whole class, derives its name, viz., the presence of non-

articulated, spiny rays in the dorsal and anal fins, is by no means universal, exceptions to the rule being numerous.

Division I. Beryciformes. — Families: Berycidae, Monocentridae, Polymixiidae.

The most primitive of the Acanthopterygians, already well repre- sented in the Chalk. A duct has been observed to be sometimes present between the air-bladder and the digestive tract. All marine, several bathybial.

Division II. Perciformes. — Families: Pempheridae, Serranidae, Anomalopidae, Pseudochromididae, Cepolidae, Hoplognathidae, Sillaginidae, Sciaenidae, Scorpididae, Caproidae, Centrarchidae, Cyphosidae, Lobotidae, Toxotidae, Nandidae, Percidae, Acropo- matidae, Gerridae, Lactariidae, Trichodontidae,

Pristipomatidae, Sparidae, Mullidae, Latrididae, Haplodactylidae, Chaetodontidae, Drepanidae, Osphromenidae, Acanthuridae, Teuthididae, Embio- tocidae, Cichlidae, Pomacentridae, Labridae, Scaridae.

The Percidae, Centrarchidae, Toxotidae, Nandidae, Osphro- menidae, Embiotocidae, and Cichlidae are fresh-water fishes, the others are all or nearly all marine. Aipichthys, which is included among the Scorpididae, is one of the few Acanthopterygian types known to have existed as early as the Cretaceous period.

See articles Cichlids, Mullet, Murray Cod, Parrot-Fishes, Perch, Pike-Perch, Sheepshead, Wrasse.

Division III. Scombriformes. — Families: Carangidae, Rhachi- centridae, Scombridae, Trichiuridae, Histiophoridae, Xiphiidae, Luvaridae, Coryphaenidae, Bramidae.

Marine fishes, several being pelagic and. among the largest Teleos- teans and swiftest swimmers. See articles Hair-Tail, Mackerel, Pilot-Fish, Sword-Fish, Tunny.

Division IV. Zeorhombi. — Families : Zeidae, Amphistiidae, Pleuro- nectidae.

Division V. Kurtiformes. — A single family, Kurtidae, with a single genus and species from the Indian and Pacific oceans.

Division VI. Gobiiformes. — A single family, Gobiidae.

Division VII. Discocephali. — A single family, Echeneididae.

The remarkable remoras attach themselves by means of a cephalic disk to boats or to sharks, turtles, cetaceans, and other large swift- swimming animals. They form an isolated group, and have no real affinity with the Scombridae, with which they have long been associated.

Division VIII. Scleroparei. — Families: Scorpaenidae, Hexa- grammidae, Comephoridae, Rhamphocottidae, Cottidae, Cyclop- teridae, Platycephalidae, Hoplichthyidae, Agonidae, Pegasidae, Triglidae, Dactylopteridae.

The " Mail-cheeked " Acanthopterygians include a great variety of forms, mostly living in the sea, the best known being referred to in the articles Flying-Fish, Gurnard, Lump-Sucker, and Miller's-Thumb.

Division IX. Jugulares. — Families: Trachinidae, Percophiidae, Leptoscopidae, Nototheniidae, Uranoscopidae, Trichodontidae, Callionymidae, Gobiesocidae, Blenniidae, Batrachidae, Pholididae, Zoarcidae, Congrogadidae, Ophidiidae, Podatelidae.

Nearly all marine, some deep-sea. Macrius amissus, which probably belongs to the Leptoscopidae, measures 5 ft. and is the largest known deep-sea Teleostean. The other members of this division are mostly small, Anarrhichas being another exception. The weevers {Trachinus) are dangerous stinging fishes.

Division X. Taeniosomi.— Families: Trachypteridae, Lopho- tidae.

Deep-sea or pelagic fishes, some attaining a large size.

Sub-order XII.— OPISTHOMI

Air-bladder without duct. Opercle well developed, hidden under the skin ; supraoccipital in contact with the frontals. Pectoral arch suspended from the vertebral column, far behind the skull; no mesocoracoid bone. Vertical fins with spines. Ventral fins absent.

Eel-shaped fishes standing in the same relation to the A can thop- terygii as do the Apodes to the Malacopterygii. The single family, Mastacembelidae, is possibly derived from the Blenniidae.

Fresh and brackish waters of southern Asia and tropical Africa.

Sub-order XIII.— PEDICULATI

Air-bladder without duct. Opercle well developed, hidden under the skin; supraoccipital in contact with the frontals. Pectoral arch suspended from the skull; no mesocoracoid bone. Ventral fins, if present, jugular. Gill-opening reduced to a foramen situated in or near the axil more or less posterior to the base of the pectoral fin. Body naked or covered with spines or bony tubercles.

Connected with the Acanthopterygii Jugulares through the Batra- chidae.

Families: Lophiidae, Ceratiidae, Antennariidae, Gigantactinidae, Malthidae.

Curiously aberrant marine fishes, many bathybial. The best known are the fishing-frog or angler, Lophius, and the A ntennj-rius , which lives in coral groves or is carried about in mid-ocean among the Sargassum weeds.

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TELEPATHY

Sub-order XIV.— PLECTOGNATHI

Air-bladder without duct. Opercular bones more or less reduced ; supraoccipital in contact with the frontals; maxillary and prae- maxillary bones often firmly united. Pectoral arch suspended from the skull. No ribs. Ventral fins thoracic and much reduced if present; the pelvic bones, if present, more or less co-ossified. Gill- opening much reduced. Body covered with more or less osseous scales, bony scutes, or spines, or naked.

A highly aberrant group, closely connected with the Acanthop- terygii through the Acanthuridae.

Division I. Scleroderma — Families: Triacanthidae, Triodontidae, Balistidae, Ostraciontidae.

Division II. Gymnodontes. — Families: Tetrodontidae, Diodon- tidae, Molidae.

The Plectognaths are all marine; the recently discovered Tri- acanthid Halimochirurgus, remarkable for- its long, tube-like snout, from the Gulf of Manaar, is the only form of this sub-order which is confined to the deep sea. Although so highly specialized, several forms, such as Ostracion (the coffer-fish), Tetrodon and Diodon, were already represented in the upper Eocene. See File-Fish, Globe-Fish and Sun-Fish.

For bibliographical references to the Teleostomi, see Ichthy- ology. (G. A. B.)

TELEPATHY (Gr. ri?Xe, far, iradr), feelings), or Thought Transference, the conveyance of thoughts and feelings from mind to mind by other than the ordinary channels of sense. Although the word " telepathy " was first suggested by F. W. H. Myers in 1882, the suggestion had long before been made that the transmission of ideas, images and sensations could be brought about by other than the normally operative motor and sensory apparatus of the body. More than one writer had explained wraiths at the moment of death, clairvoyance and the phenomena of spiritualism by the theory of " brain waves." But it was not until the advent of the Society for Psychical Research that the hypothesis attracted much notice or was backed by carefully collected evidence. As used by the society the term is a mere designation, and implies no hypothesis as to " action at a distance " or the operation of any force not recog- nized by physical science.

The earliest recorded systematic experiments in thought transference were made in 1871 by the Rev. P. H. and Mrs. Newnham, and were continued for a period of some eight months with marked success; subsequent attempts showed no results of an evidential nature. A few years later the attention

of the British Association was called to the subject by Prof. W. F. Barrett, and from 1881 onwards many experiments were made by members of the S.P.R. and others; in fact, the so-called " willing game " was at one time exceedingly popular; the successes, however, depended largely, if not entirely, upon muscle-reading, and usually ceased when there was no contact between agent (the sender of the idea) and percipient (the receiver;. The systematic investigation has followed two main lines: (A) experiments on persons, often in the hypnotic state, in which the aim was to transfer selected images, &c, and compare the guesses with the results which chance would give; (B) the collection and examination of records of phenomena such as apparitions at the moment of death and other spon- taneous cases in which there is a correspondence between the psychical states of two individuals, usually remote in space from one another. The problems raised by the two cases are entirely different: (1) in A there is seldom any hallucinatory element (see Hallucinations), in B, though not essential, it is present in a high percentage of cases; (2) what is trans- ferred is in A an image kept before the mind, in B the phantasm of the dying person when that person has prima facie neither endeavoured to transfer this image nor, it may be, even thought of the percipient; (3) the desideratum in A has usually been to exclude normal methods of perception, in B the problem is to show that coincidence will not account for the facts; for, whereas in A the relation of successes to failures is known, in B it is difficult to get statistics and to be sure that an abnormal number of successful cases do not figure in a census. Side by side with direct experimentation, the S.P.R. collected first- hand records of apparitions at or within twelve hours of the moment of death. These, together with a discussion of the experimental evidence, were issued in 1885 under the title of

Phantasms of the Living. In order to provide a statistical basis for discussion of coincidental apparitions, a census of hallu- cinations was

undertaken by Edmund Gumej', and replies were obtained from over 5000 persons. A defect of the collection in Phantasms is that the progressive deterioration of evidence with age is neglected. No narratives are regarded as evidential by the society unless they were reduced to writing less than three years after the event or are based on notes made at the time.

The second systematic attempt to collect material was the census of hallucinations, initiated at the congress of experi- mental psychology of 1889, and entrusted to Professor Henry Sidgwick. The total number of persons who made returns was 17,000, of whom 1684 asserted that they had once or oftener experienced an hallucination. Analysis of the answers showed that in 350 cases the apparition was recognized; the probability that any person will die on a given day is roughly 1 in 10,000: if therefore chance alone operated, one apparition in 10,000 would coincide with a death; after making all allow- ances for error, the census committee found that 30 of the 350 recognized apparitions coincided with a death — in other words, cases prima facie telepathic were 440 times more numerous than chance coincidence would give. The committee reported that between deaths and apparitions of dying persons there exists a connexion which is not due to chance alone.

The experimental evidence for telepathy is made up partly of the results of trials where direct transference of thoughts, images or sensations was attempted, partly of successes in hypnotization at a distance; dreams (q.v.) also provide some material; and in a small but important class of cases, transi- tional between wraiths and ordinary experimental cases, the agent has caused his phantasm to appear to the percipient.

Among the chief experimenters may be mentioned Prof. M. Dessoir, Mr Guthrie, Sir Oliver Lodge and Prof. Sidgwick. In experiments conducted by the latter and Mrs Sidgwick at Brighton with numbers as the objects to be guessed, 617 trials were made with the agent and percipients in the same room: the numbers were

between ten and ninety, and ninety successes were recorded, the probable total, if chance alone had operated, being eight. In a later series, conducted by Mrs Sidgwick, a similarly high proportion of successes was recorded; but when agent and percipients were in different rooms the results were not above what chance would give. These results were criticised by Prof. Lehmann and others, but were not seriously shaken; it was pointed out that the failure of experiments at a distance might be due to psychological causes rather than to the fact that the increase of distance eliminated the possibility of communication by normal means. In subsequent experiments, however, the successes in no series of any length were so far above chance as to give substantial support to a belief in telepathy.

Experiments in hypnotization at a distance provide some of the most conclusive evidence for telepathy. In 1885 trials were made both by Dr Janet and by Prof. Richet with the same subject. Out of twenty-five experiments the former held that nineteen were complete successes; Prof. Richet secured two successes and four partial successes in nine trials. The most striking point was that the hypnotic trance always coincided with or followed at an interval the attempt to hypnotize tne patient; this is a feature of much importance in considering the possibility of coincidence or of auto-suggestion.

It is usually impossible to prove that a dying person has been thinking of the percipient; much less can we show that there was any idea of causing his phantasm to appear. There are, however, a small number of cases in which apparitions, of the agent or some other person, prima facie telepathic, have been produced experimentally. A singularly interesting instance is recorded by Wesermann, who tried the experiment in the early part of the 19th century; he wished to make the phantasm of a lady appear to a Eeutenant, who was residing some miles away; at the time of the experiment he was, owing to an un- foreseen visit, not alone, and his visitor is said to have seen the apparition also. More recently, in cases recorded in Phantasms

and the Census, the figure of the agent himself has been seen by the percipient.

The so-called reciprocal cases are evidentially of much im- portance. Each of the two persons concerned appears to receive a telepathic impulse from the other, so that each receives information about the other, or sees his phantasm.

Occasionally telepathic impressions from animals to human beings are reported, but the facts are usually far from well estab- lished. Telepathic communication has also been suggested as the explanation of the simultaneous movements of large flocks of birds.

Various theories have been put forward to account for telepathy, but they only agree in the total lack of an experi- mental basis. Broadly speaking, they are divisible into physical and psychical. Sir W. Crookes suggests that transmission is effected by means of waves of smaller magnitude and greater frequency than those which constitute X rays. Undulations starting from nervous centres are adopted as the explanation by Prof. Flournoy and others. But Myers and others regard the case against a physical explanation as complete. The main difficulty in the way of it is that the strength of the impulse does not seem, in the spontaneous cases, to vary with the distance, as by all physical laws it should. On the other hand, a curious phenomenon has been noted in experiments; if the percipient gaze at an arrow with its head turned to the right, there is a tendency, disproportionately strong if we suppose that chance alone operates, for the arrow to be seen reversed. This fact is, however, more important in all proba- bility for the light which it throws on the mechanism of hallu- cinations (q.v.) than on that of transmission. Telepathy is often invoked as an explanation of the facts of mediumship (see Medium, and Possession); but it

seems insufficient to explain them unless we assume for the medium a far greater power of reading other people's minds than experimental evidence has so far shown to exist.

Bibliography. — Gurney, Myers and Podmore, Phantasms of the Living; Report on the Census of Hallucinations in Proc. S.P.R., x. ; Podmore, Apparitions and Thought Transference; Mrs Sidgwick in J. M. Baldwin's Dictionary of Philosophy s.v. Telepathy; N. W. Thomas, Thought Transference (1905), containing a list of the im- portant articles in the Journal and Proceedings of the S.P.R. and other publications. See also Crystal Gazing. (N. W. T.)

TELEPHONE (Gr. ■rij'Ke, far, and (fcovrj, voice). Telephony is the art of reproducing sounds at a distance from their source, and a telephone is the instrument employed in sending or receiving such sounds. The term " telephony " was first used by Philipp Reis of Friedrichsdorf, in a lecture delivered before the Physical Society of Frankfort in 1861. 1 But, although this lecture and Reis's subsequent work received considerable notice, little progress was made until the subject was taken up between 1874 and 1876 by Alexander Graham Bell, a native of Edinburgh, then resident in Boston, Mass., U.S.A. Bell, like Reis, employed electricity for the reproduction of sounds; but he attacked the problem in a totally different manner. This will be better understood if we consider shortly on what the chief characteristics of sound depend.

The sensation of sound is produced by rapid fluctuation in the pressure of the atmosphere on the tympanum of the Charac- ear. If the fluctuations are irregular and non-periodic, terlstks the sound is called a noise; if they are cyclic and of sound. f o n 0W a regular and sufficiently rapid periodic law, the sound is musical. In connexion with the present subject it is important to notice the three characteristics of a musical sound, namely, pitch, loudness and quality. The pitch of a musical sound depends on the number of cycles passed through by

the fluctuations of the pressure per unit of time ; the loud- ness depends on the amount or the amplitude of the fluctuation in each cycle; the quality depends on the form or the nature of the fluctuation in each cycle. The necessary condition for a successful system of telephony is the ability to reproduce these characteristics.

1 ” 1’ber Telephonie durch den galvanischen Strom,” in Jahresber. d. physikalischen Vereins zu Frankfurt am Main, 1860-61, p. 57.

In 183 1 Wheatstone by his ” magic lyre” experiment showed 2 that, when the sounding-boards of two musical instruments are connected together by a rod of pine wood, a tune played on one will be faithfully reproduced by the other. This only answers, however, for telephoning musical sounds to short distances. Another and somewhat similar example is furnished by what has been variously designated as the ” string,” Mechaa- “toy,” “lovers,” and “mechanical” telephone, kai tele- Two disks of thin metal, or two stretched membranes, P h “ne. each furnished with a mouthpiece, are connected together by a thin string or wire attached at each end to the centres of the membranes. A good example may be made with two cylindrical tin cups; the bottoms form the membranes and the cups the mouthpieces. When the connecting string is held taut and sounds, such as those of ordinary speech, are produced in front of one of the membranes, pulses corresponding to the fluctua- tions of the atmospheric pressure are transmitted along the string and communicated to the other membrane, which in its turn communicates them to the air, thus reproducing the sound. In both these examples all the three characteristics — pitch, relative intensity, and quality — of sound are reproduced.

In July 1837 Dr C. G. Page of Salem, Mass., drew attention to the sound given out by an electromagnet at the instant when the electric circuit is closed or broken, and in October Page’s of the same year he discussed, in a short article 3 dis- entitled ” Galvanic Music,” the musical note pro- covery. duced

by rapidly revolving the armature of an electromagnet in front of the poles. Experiments bearing on this subject were subsequently made by a great number of investigators.' 1 Page's discovery is of considerable importance in connexion with the theory of action of various forms of telephone, and was a very important feature in the early attempts by Reis to transit music and speech. On the 26th of August 1854 there appeared in L 1 Illustration (Paris) an interesting article by Charles Bourseul on the electric transmission of Bour . speech. 6 The writer recommended the use of a seui's flexible plate at the source of sound, which would sugges- vibrate in response to the varying pressure of the tlons - air, and thus open and close an electric circuit, and of a similar plate at the receiving station, which would be acted on electro- magnetically and thus give out as many pulsations as there are breaks in the current. These suggestions were to some extent an anticipation of the work of Reis; but the conditions to be fulfilled before the sounds given out at the receiving station can be similar in pitch, quality and relative intensity to those produced at the transmitting station are not stated, and do not seem to have been appreciated.

In Reis's lecture an apparatus was described which has given rise to much discussion as to priority in the invention of the telephone. The instrument was described in over Reis's fifty publications 6 in various countries, and was well

2 See his Scientific Papers, p. 47.

3 See Silliman's Jour., xxxii. 396, and xxxiii. 118.

- *Marrian, Phil. Mag., 3rd ser., vol. xxv. p. 382; Beatson, Arch, de V Elect., v. 197; De la Rive, Treatise on Electricity, i. 306, also Phil. Mag., 3rd ser., vol. xxxv. p. 422, and Comp. Rend., xx. 1287, xxii. 432; Matteucci, Arch, de I' Elect., v. 389; Guillemin, Comp. Rend., xxii. 264; Wertheim, Comp. Rend., xxii. 336, 544, xxvi. 505, also Ann. de Chim. et de Phys., xxiii. 302, and Phil. Mag., 3rd ser.,*

vol. xxviii. p. 544; Jannair, Comp. Rend., xxiii. 319; Joule, Phil. Mag., 3rd ser., vol. xxv. pp. 76, 225; Laborde, Comp. Rend., 1. 692; Poggendorff, Pogg. Ann., lxxxvii. 139, xcviii. 198; Du Moncel, Exp. de V Elect., ii. 125, iii. 83; and Delesenre, Bibl. Univ. (1841), xvi. 406.

6 See also Didaskalia: Blatter fur Geist, Gemiith, u. Publicitdt, Frankfort, No. 232, 28th September 1854; Du Moncel, Expose des Applications de VEUctricite (Paris), ii. 25, ed. 1854; iii. no, ed. 1856, and Comp. Rend., 26th November 1877.

• The English reader may consult — Jour. Soc. Tel. Eng., March 1883; British Assoc. Rep., 1863; Civ. Eng. and Arch. Jour., xxvi. 307; R. M. Ferguson, Electricity (London, 1866), p. 257; S. P. Thompson, Philipp Reis, the Inventor of the Telephone (London,

1883).

circuit at each vibration, thus transmitting as many electric pulses through the circuit as there were vibrations in the sound. These electric pulses were made to act on an electromagnet at the receiving station, which, in accordance with Page's dis- covery, gave out a sound of a pitch corresponding to the number of times it was magnetized or demagnetized per second.

Reis's object was to reproduce at a distance not only music but also human speech; but that he did not wholly succeed is clear from the following extract from his lecture: — " Hitherto it has not been possible to reproduce human speech with sufficient distinct- ness. The consonants are for the most part reproduced pretty distinctly, but not the vowels as yet in an equal degree." Con- sidering the time at which he wrote, Reis seems to have understood very well the nature of the vibrations he

had to reproduce, but he failed to comprehend how they could be reproduced by electricity. His fundamental idea — the interruption of the current — was a fatal mistake, which was not at the time properly understood. The suggestion of Bourseul and the experiments of Reis are founded on the idea that a succession of currents, corresponding in number to the successive undulations of the pressure on the membrane of the transmitting instrument, could reproduce at the receiving station sounds of the same character as those produced at the sending station. Neither of them seemed to recognize anything as import- ant except pitch and amplitude, and Reis thought the amplitude was to some extent obtained by the varying length of contact in the transmitting instrument. This might possibly be true to a small extent; but," considering the small capacity of the circuits he used and the nature of his receiving instrument, it is hardly probable that duration of contact sensibly influenced the result. The quality of the sounds was to some extent also reproduced ; but, judging from the results of later telephone investigation, it is highly probable that this was due, not to the varying duration, but to the varying firmness of the contact.

The next worker at the telephone, and the one to whom the present great commercial importance of the instrument is due, Beirsre- was Bell. His aim was the production, by means searches. { the undulations of pressure on a membrane caused by sound, of an electric current the strength of which should at every instant vary directly as the pressure varied. 1 His first idea seems to have been to employ the vibrations of the current in an electric circuit, produced by moving the armature of an electromagnet included in the circuit nearer to or farther from the poles of the magnet. He proposed to make the armature partake of the vibrations of the atmosphere either by converting it into a suitable vibrator or by controlling its vibrations by a stretched membrane of parchment

In the early trials the armature had the form of a hinged lever of iron carrying a stud at one end,

which pressed against the centre of a stretched membrane. Fig. I shows the arrangement. M was

a membrane stretched by a ring R over the end of a tube T fixed at one side of the frame F. To the oppo- site side of the frame an electromagnet I was fixed with its axis in line with the tube T, and between the end of the electromagnet and the membrane a hinged armature A was arranged in such a way that its motion could be controlled by the membrane. The instrument was joined in circuit with a battery and another similar instru- ment placed at a distance; and a continuous current was made to flow through the circuit, keeping the electromagnets energized. The ex- periments with this form were not successful, and, with the view of making the moving parts as light as possible, he substituted for the comparatively heavy lever armature a small piece of clock spring, about the size of a sixpence, glued to the centre of the diaphragm. The magnet was mounted with its end carrying the coil opposite, and very close to, the centre of the piece of clock spring. This answered sufficiently well to prove the feasibility of the plan, and subsequent experiments were directed to the discovery of the best form and arrangement of the parts. An increase in the size of the iron disk attached to the membrane augmented both the loudness and the distinctness of the sounds, and this finally led to the adopt'on of a thin iron disk supported round its edge, acting as both membrane and armature (fig. 2). Again, the form of the opening or mouthpiece in front of the membrane exercised considerable

1 See A. G. Bell, " Telephone Researches," in Journ. Soc Tel. Eng., 31st October 1877.

Fig. I. — Bell's First Tele- phone (1875); one-fifth full size.

influence on the efficiency of the instrument, and it was ultimately ascertained that a small central opening, with a thin air space extending across the face of the membrane, was best. It was also found that comparatively small magnets were sufficient,

and that there was no particular virtue in the closed circuit and electromagnet, but that a small permanent magnet having one pole in contact with

Fig. 2. — Bell's Telephone (1877). M, permanent magnet; E, electromagnet; C, diaphragm; t t u terminals.

the end of the core of a short electromagnet, the coil of which was in circuit with the line, but which had no permanent current flowing through it, answered the purpose quite as well. 2 The apparatus thus acted as both a transmitter and a receiver ; indeed it is essenti- ally the magneto-receiver which has come into universal use in practical telephony, though for transmission it was soon superseded by forms of microphonic transmitters. One of the latest forms of

Double Pole Receiver.

receiver, known as the double pole, is shown in fig. 3. M and M' are two permanent magnets; P a^id P' are soft iron pole-pieces upon which are placed the electromagnet coils C and C ; D is the diaphragm; I is a soft iron distance piece placed between the magnets at the end remote from the diaphragm; B is the brass body of the instrument, over which is placed a thin ebonite shell S. E is the ear-piece made of ebonite ; F is a cap of the same material enclosing the receiver terminals, which are mounted upon the ebonite block G, attached to the distance piece I.

A telephone transmitter and a receiver on a novel plan were patented in July 1877 by Edison, shortly after the introduction of Bell's instruments. The receiver was based on Edison's the change of friction produced by the passage of an lastm- electric current through the point of contact of certain "tents. substances in relative motion. In one form a drum, mounted on an axis and covered by a band of paper soaked in a solution of caustic potash, was turned under a spring the end of which was in contact through a platinum point with the

paper. The spring was attached to the centre of a diaphragm in such a way that, when the drum was turned, the friction between the point of the spring and the paper deflected the diaphragm. The current from the line was made to pass through the spring and paper to the cylinder. Now it had been previously shown by Edison that, when a current was made to pass through an arrangement like that just described, the friction between the paper and the spring was greatly diminished. Hence, when the undulating telephonic currents were made to pass through the apparatus, the constant variation of the friction of the spring caused the deflexions of the dia- phragm to vary in unison with the variation of the electric

- The extreme smallness of the magnets which might be success- fully employed was first demonstrated by Professor Peirce of Brown University, Providence, R.I.

Fig. 4. — Edison's Micro- phone Transmitter.

currents, and sounds were given out corresponding in pitch, and also to some extent in quality, with the sounds produced at the transmitting station. A cylinder of chalk was used in some of Edison's later experiments with this receiver.

The transmitter (fig. 4), in an early form, consisted of a cell of insulating material having at its bottom a flat-headed platinum screw G; on the top of G was a layer of carbon powder C, on the top of that a platinum disk D, and above that again, forming the cover of the cell, a disk of ivory B, held in position by a ring E. Resting on the centre of the ivory disk was a small piece of rubber tubing, and this was lightly pressed by the diaphragm A, which was held in place by the mouthpiece M. The varying pressure on A, when a sound was produced near it, caused corresponding

variations in the pressure on the carbon powder, and this produced similar variations in its electric resistance.

Experiments very similar to these of Edison were made by Elisha Gray of Boston, Mass., and described by him in papers BUsha communicated to the American Electrical Society in Gray's 1875 and 1878. In these experiments the electric expert- current passed through the fingers of the operator's men ' hand, which thus took the place of the spring in Edison's apparatus. The diaphragm was itself used as the rubbing surface, and it was either mounted and rotated or the fingers were moved over it. When the' current passed, the friction was felt to increase, and the effect of striding a, rapidly undulating current through the arrangement was to produce a sound. The application of this apparatus to the transmission of music was described by Gray. 1

In another form of telephone, brought prominently forward by Professor A. E. Dolbear, 2 the effects were produced by _ .. . electrostatic instead of electromagnetic forces, as in con . the Bell telephone. Sir W. Thomson (Lord Kelvin)

denser observed in 1863 3 that when a condenser is charged tele- or discharged, a sharp click is heard, and a similar

P "'"' observation was made by Cromwell F. Varley, who proposed to make use of it in a telegraphic receiving instrument. 4 In Dolbear's instrument one plate of a condenser was a flexible diaphragm, connected with the telephone line in such a way that the varying electric potential produced by the action of the transmitting telephone caused an increased or diminished charge in the condenser. This alteration of charge caused a corresponding change in the mutual attraction of the plates of the condenser; hence the flexible plate was made to copy the vibrations of the diaphragm of the transmitter. It is obvious that this apparatus might be used either as a transmitter or as a receiver, but that the effects must under ordinary circumstances be in*

either case extremely feeble.

It was very early recognized — and, indeed, is mentioned in the first patents of Bell, and in a caveat filed by Elisha Gray . in the United States patent office only some two trans- hours after Bell's application for a patent — that mitters sounds and spoken words might be transmitted to a of Bell distance by causing the vibrations of a diaphragm to and B. vary the resistance in the circuit. Both Bell and Gray proposed to do this by introducing a column of liquid into the circuit, the length or the resistance of which could be varied by causing the Vibrations of the diaphragm to vary the depth of immersion of a light rod fixed to it and dipping into' the liquid.

On the 4th of April 1877 fimile Berliner filed a caveat in the

United States patent office, in which he stated that, on the

principle of the variation with pressure of the resist-

Uner's ance at tne contact of two conductors, he had made

micro- an instrument which could be used as a telephone

phone transmitter, and that, in consequence of the mutual

ra 1 BS ' forces between the two parts of the current on the mltter. . , . r , . , , .

two sides of the point of contact, the instrument was capable of acting as a receiver. The caveat was illustrated by a sketch showing a diaphragm with a metal patch in the

1 See George B. Prescott, The Speaking Telephone (London, 1879), pp. 151-205. 2 Scientific American, 18th June 1881.

3 Electrostatics and Magnetism, p. 236.

4 See Tel. Journ., 1st August 1877, p. 178; also Adams, Journ. Soc. Tel. Eng., 1877, p. 476.

centre, against which a metal knob was lightly pressed by an adjusting screw. This seems to have been the first transmitter in which it was proposed to use the resistance at the contact of two conductors.

Almost simultaneously with Berliner, Edison conceived the idea of using a variable resistance transmitter. 5 He proposed to introduce into the circuit a cell containing carbon „ „ , powder, the pressure on which could be varied by the micro-vibrations of a diaphragm. He sometimes held the phone carbon powder against the diaphragm in a small tr ? t f s ‘ shallow cell (from a quarter to half an inch in diameter and about an eighth of an inch deep), and sometimes he used what he describes as a fluff, that is, a little brush of silk fibre with plumbago rubbed into it. In another form the plumbago powder was worked into a button cemented together with syrup and other substances. In the specification of the patent applied for on the 21st of July 1877 he showed a sketch of an instrument which consisted of a diaphragm, with a small platinum patch in the centre for an electrode, against which a hard point, made of plumbago powder cemented together with india-rubber and vulcanized, was pressed by a long spring, the pressure of the carbon against the platinum disk being adjusted by a straining screw near the base of the spring. Subsequently he filed an application for a patent in which various forms of springs and weights assisted in maintaining the contacts and otherwise improved the instrument.

In the early part of 1878 Professor D. E. Hughes, while en- gaged in experiments upon a Bell telephone in an electric circuit, discovered that a peculiar noise was produced when- Hughes’s ever two hard electrodes, such as two wires, were micro- drawn across each other, or were made to touch each P boae

- other with a variable degree of firmness. Acting upon this discovery, he constructed an instrument which he called a "microphone," 6 and which consisted essentially of two hard carbon electrodes placed in contact, with a current passing through the point of contact and a telephone included in the same circuit. One of the electrodes was attached to a sounding board capable of being vibrated by sound-waves and the other was held either by springs or weights in delicate contact with it. When the sounding board was spoken to or subjected to sound-waves, the mechanical resistance of the loose electrode, due to its weight, or the spring, or both, served to vary the pressure at the contact, and this gave to the current a form corresponding to the sound-waves, and it was therefore capable of being used as a speaking-telephone transmitter. 7

The next transmitter of note was that introduced by Francis Blake, which came into wide use in the United States of America and other countries. In it the electrodes were of platinum and carbon.

To a frame F (fig. 5) was attached a diaphragm D of thin sheet iron; in front of, this was a cover M, M provided with a suitable cavity for directing the sound-waves against the diaphragm. The microphonic arrangement consisted of a spring S, about the hundredth of an inch thick and the eighth of an inch broad, fixed at one end to a lever L, and carrying at its free extremity a brass block W. In one side of W a small disk C of gas carbon was in. serted, resting on the hemispherical end of a small platinum pin K, about the twentieth of an inch in diameter, held in position by a thin spring A. The pressure of the carbon on the platinum point could be adjusted by the screw N, which turned the lever about the flexible joint G. The electrical connexions of the instrument as arranged for actual use are also illustrated in the figure. The current circuit went through S, W, C, K, A, and the primary circuit of the induction coil I to the battery B, and thence to S again. This formed a local circuit at the transmitting station. The line of circuit passed through the secondary of the induction coil I to the

line, from that to the telephone T at the receiving station,

5 See Journal of the Telegraph, New York, April 1877; Phila- delphia 'Times, 9th July 1877; and Scientific American, August

1877-

6 This term was used by Wheatstone in 1827 for an acoustic apparatus intended to convert very feeble into audible sounds; see his Scientific Papers, p. 32.

'See Proc. .Roy. Soc., xxvii. 362; Proc. Phys. Soc, ii. 255; Phil. Mag., 5th ser., vol. vi. p. 44; W. H. Preece, Journ. Soc. Tel. Eng., vii. 270.

and then either to earth or back to the induction coil by a return line of wire.

Another type of microphone which was used in Europe much more than in the United States was the multiple-contact instru- ment. In this several microphonic joints were employed.

Fig. 5. — Blake's Transmitter. Thus, in the Crossley transmitter four hard carbon pencils were arranged in a lozenge-shaped figure, the ends of each pencil resting loosely in a small carbon block. These blocks were fastened to a diaphragm of wood. The circuit connexions weie such that two adjacent sides of the lozenge were in parallel and two in series. In the Ader transmitter as many as twelve carbon pencils were employed, arranged in a series of two groups with six pencils in parallel in each group. These were supported at their ends in parallel carbon bars, which were carried by a nearly horizontal wooden diaphragm. Such multiple-electrode transmitters give a loud although somewhat harsh sound, and will bear being spoken to very strongly without breaking the circuit.

A type of transmitter which has come to be invaluable in connexion with long-distance telephony, and which has prac- tically superseded all other forms, is the granular carbon trans- mitter. The earliest instrument of this kind was the Hunnings transmitter, patented in 1878. This was constructed of a shallow box placed in a vertical position, with metallic front and back and insulating sides. The front face was of thin metal, and served as a diaphragm. The box was filled nearly, but not quite full, of granulated hard carbon. The current from the battery used passed from the diaphragm through the granulated carbon to the metallic back of the box. When spoken to the diaphragm vibrated, and thus set the carbon granules into vigorous vibration. The vast number of micro- phonic contacts present give rise to very strong electrical un- dulations, and hence to a loud sound.

The chief difficulty with this transmitter, and with various others of later date based upon it, has been the frequent pack- ing of the carbon granules, which renders the instrument in- operative. The difficulty was first satisfactorily overcome in the long-distance transmitter, invented by A. C. White in the laboratory of the American Bell Telephone Company, and commonly known as the " solid back transmitter " (fig. 6).

The microphonic portion of the transmitter is contained in a thin cylindrical box or case of brass A, the inner curved surface of which is covered with an insulating layer of paper. The case is firmly fixed to a " bridge " B with its back or bottom in a vertical position. To the brass bottom of the case is attached a thin disk of polished hard carbon C, which is slightly less in diameter than the brass bottom, so that the carbon disk almost entirely covers this brass back, leaving only a slight annular space around its edge. The front or cover of the case is a similar button of hard polished carbon D, also slightly smaller in diameter than the cylin- drical wall of the box. It is attached to a brass disk E, which is fastened to the centre of the diaphragm F by means of a rivet,

and is capable of moving to and fro like a plunger when the dia- phragm vibrates. A washer of thin flexible mica G concentric with the carbon button is carried by the brass disk, and projecting over the edge of this is held firmly against the rim of the cylin- drical wall ofthe case by an annular brass collar H, which is screwed upon the outer curved surface of this wall. The box is thus entirely closed at the front,, while the front carbon disk, which constitutes an electrode, is perfectly free to follow the motions of the diaphragm.

Fig. 6. — Solid Back Transmitter.

The space enclosed between the front and rear faces of the box is filled about three-quarters full of finely granulated hard carbon, which therefore lies in contact with the front and rear carbon disks of the apparatus, and also fills up the space lying between the lower edge of these disks and the curved surface of the case. The current from the battery passes from one of the carbon disks to the other through the particles of granulated carbon which fill the space between them.

The disks and granules constitute a very powerful microphone. The motions impressed upon the carbon granules are very vigorous, and this together with the particular arrangement of the parts of the instrument is effectual in obviating the difficulty from packing which attended the use of earlier forms of granulated carbon trans- mitters. This instrument has almost entirely displaced all other forms of transmitter.

Subscribers' Organization. — The employment of the telephone as one of the great means of communication requires a definite organization of the subscribers. It is not practicable to connect each subscriber directly to all the others, hence a system of exchanges has been adopted. The territory in which a tele- phone administration operates is usually divided into a number of local areas, in each of which one or more exchanges are placed. An exchange is a central station to which wires are brought from

the various subscribers in its neighbourhood, any two of whom can be put in telephonic communication with each other when the proper pairs of wires are joined together in the exchange.

When the subscribers in a local area exceed a certain number, or when for some other reason it is not convenient or economical to connect all the subscribers in the area to one exchange, it is usual to divide the area into a number of districts in each of which an exchange is placed, and to connect these district exchanges together by means of " junction circuits." In some cases the exchanges are connected together directly; but when the volume of traffic is not sufficient to warrant the adoption of such a course connexions between two exchanges are made through junction centres to which both are connected.

A system of wires, similar to that which connects the district exchanges in an area, links together the various local areas in the territory, and sometimes the territory of one administration with that of another. These inter-area or long-distance lines, called trunk circuits in England, terminate at one exchange in each local area, and between that exchange and the various

district exchanges junction circuits are provided for the purpose of connecting subscribers to the trunk lines.

Circuit and Working Arrangements. — The method first em- ployed for working a telephone line was extremely simple. A single line of wire, like an ordinary telegraph line, had a Bell telephone included in it at each end, and the ends were put to earth. Words spoken to the telephone at one end could be heard by holding the telephone to the ear at the other. To obviate the inconvenience of placing the telephone to the mouth and the ear

alternately, two telephones were commonly used at each end, joined either parallel to each other or in series. The contrivance most generally adopted for calling attention was a call-bell rung either by a small magneto-electric machine (magneto-generator) or by a battery. The telephone was switched out of circuit when not in use and the bell put in its place, a key being used for throwing the battery into circuit to make the signal. This arrangement is still employed, a hook being attached to the switch lever so that the mere hanging up of the telephone puts the bell in circuit. In some cases when a magneto-generator is employed for calling purposes the coil of the machine is automatically cut out of circuit when it is not in action, and is brought into circuit when the handle is turned by the operation of a centri- fugal or other arrangement.

At first it was usual to join the microphone transmitter in the direct circuit. It was soon found that it could only be used to advantage in this way when the total resistance of the circuit, exclusive of the microphone, was small compared with the resist- ance of the microphone — that is, on very short lines worked with

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Fig. 7. — Telephone Set with Transmitter in a Local Circuit.

low resistance telephones. The transmitter on long and high resistance lines worked better by joining, in the manner shown in fig. 7, the microphone, a battery and the primary of an induction coil in a local circuit, and putting the line in circuit with the secon- dary of the induction coil, which acted as the transmitter. The resistance of the microphone can thus be made a large fraction of the total resistance of the circuit in which it is placed; hence by using considerable currents, small variations in its resistance can be made to induce somewhat powerful currents in the line wire. The requisite energy is derived from the battery.

In the earliest telephone switchboards the lines were connected to vertical conducting strips, across which were placed a series of similar horizontal strips in such a manner that any horizontal could be connected to any line strip by the insertion of a plug into holes provided in the strips for the purpose. Any two lines could be connected together by connecting both to the same horizontal strip.

The next step of importance was the introduction of what was termed the "Standard board." This board was equipped with spring-jacks and annunciators (calling-drops) for the subscribers' lines, and with flexible cords terminating in plugs for connecting purposes. The spring-jack used was a form of switch with two contact springs which pressed against each other, one being con- nected to the subscriber's line wire and the other to the annun- ciator, which was also earthed. When a plug was inserted in the spring-jack the connexion between the springs was opened, dis- connecting the calling-drop from the line. Each connecting-cord circuit had associated with it a clearing-out drop connected between the cord and earth and a key by means of which the operator's speaking and ringing apparatus could be brought into circuit. Vvhen a subscriber called (by turning the handle of his magneto- generator), the shutter of the annunciator associated with his line dropped. This attracted the attention of the attendant, who in response to the call inserted a plug into the spring-jack and con- nected the speaking apparatus to the circuit by means of the key. Then, having obtained particulars of the subscriber's requirement, the operator connected the second plug to the spring-jack of the wanted subscriber, whom she rang up. When the conversation was finished either of the subscribers could release the shutter of the clearing-out drop by turning his generator handle, and the

operator thus notified of the fact removed the plugs and discon- tinued the connexion.

The single-wire earthed circuits used in the early days of tele- phony were subject to serious

disturbances from the induction caused by currents in neighbouring telegraph and electric light wires, and from the varying potential of the earth due to natural or artificial causes. The introduction of electric tramways caused an enormous increase in disturbances of this class It was early recognized that a complete metallic circuit would obviate troubles from varying earth potentials, and that if the outgoing and in- coming branches of the circuit were parallel and kept, by trans- position spiralling, or otherwise, at equal average distances from the disturbing wire, induction effects would likewise be removed. These advantages led to the gradual supersession of the single-wire system until at the present day the all-metallic system is employed almost universally. Since the time when the system first became prominent all switchboards have been arranged for metallic circuits.*

Though many types of manually operated switchboards have been brought into use, differing from each other in respect of cir- cuit and working arrangements, yet each of them may be placed in one or other of three main classes according as the system ol working is magneto, call-wire, or common battery. The funda- mental principle of the magneto system has been described in con- nexion with the " Standard board."

In a large exchange a number of operators are necessary to attend to calls. Several single switchboards like that described may be employed, each devoted to a certain section of the sub- scribers, and placed in care of an operator. In these circumstances, when, as frequently will be the case, the person calling desires to be put in communication with a subscriber who belongs to another section, connexions must be established in the office between the two sections; this necessitates additional switchboard arrange- ments, and also increases the time required to put subscribers in communication with one another. The difficulty was obviated by the introduction of the " multiple switchboard." This board is built up in sections of one or more operators' positions each.

All the subscribers' lines are connected in order to jacks on the first two or three or four operators' positions, and these connexions are repeated or " multipled " upon each succeeding similar group of positions. Each subscriber's circuit is further connected to another spring-jack directly associated with the calling-drop. These sprihg- iacks, known as answering jacks, are distributed along the switch-board, a certain number being terminated upon each position and placed in the care of the operator assigned to that position. Hence this operator, when signalled in the ordinary way, can put any one of these subscribers in connexion with any subscriber whatever, without the necessity of calling upon another operator to make connexions.

Two methods of " multipling " have been much used. In the arrangement first introduced the line wire is connected in series through the various spring-jacks, the circuit finally passing through the answering jack to the calling-drop. This arrangement is liable to give trouble, as disconnexions may arise in the spring-jacks in consequence of the failures of the springs to make contact. Operat- ing mistakes also cause interruptions to conversations, as it is possible, by the insertion of a plug in a multiple jack, to disconnect the circuit between two talking subscribers. To overcome these difficulties the " branching multiple " was introduced. In this arrangement, instead of the circuit being made through the jacks in series, each jack is connected to an independent branch from the main circuit. With the "" branching multiple " the " self- restoring drop " was introduced. This apparatus has two coils, one of which, Connected across the line, is provided for the purpose of projecting the shutter, while the other is intended for its restora- tion and is joined in a local circuit arranged to be closed when a plug is inserted in any one of the associated jacks.

It is necessary that the operators working at a multiple board shall be able to ascertain without entering a subscriber's circuit whether the circuit be disengaged. This requirement is usually met by

connecting a third or ” test ” wire to each of the jacks associated with a subscriber’s line, and by making the circuit arrangements such that this wire is either disconnected or at earth potential when the line is not in use, and at some potential above or below that of the earth, when the circuit is engaged. With a

E roper arrangement of the operator’s speaking set it is possible, y touching the socket of a jack with the tip of a peg or a special ” test ” thimble, to determine whether the circuit connected to the jack is in use.

Both the series and the branching methods of multipling are recognized at the present time as standard methods, although the former is only employed in comparatively small exchanges. The magneto system itself is dying out. There are still many magneto exchanges in existence, but when new exchanges are erected only the very smallest are equipped for magneto working, that system having succumbed to the common battery one in the case of all equipments of moderate and large dimensions.

The ” call- wire ” system has been used to some extent, but it is now obsolete. The feature of the system was the provision of special service circuits, termed call-wires, for purposes of communication

between the subscribers and the exchange operators. Each sub- scriber was given the exclusive use of a circuit as in other systems, and shared a call-wire with a number of other sub- scribers. Each telephone set was equipped with a special key or switch by means of which the telephone could be transferred from an exclusive line to the call-wire at will. A subscriber desiring a connexion pressed the key and communicated his own number and that of the wanted subscriber to the operator in attendance on the

call-wire. Then, when the connexion was made, the originating subscriber rang up the other. At the close of a conversation the originating subscriber again entered the call-wire and requested the operator to take down the connexion. The call-wires were usually equipped with drops in order that the exchange might be called at night when the operators were not listening continuously.

One of the greatest advances made in the development of the art of telephony was the introduction of the " common battery relay system." This advance did not merely remove the primary batteries from the subscribers' stations; it removed also the magneto-generator, and at the same time it modified consider- ably the conditions governing the exchange operating. The calling- drop of the magneto system was displaced by a relay and a small electric incandescent lamp, and whereas in the older system the calling-drop and the answering jack with which it was associated were some distance apart, the calling-lamp and the answering jack of the newer system were placed in juxtaposition. This alteration improved the operating conditions in three ways. In the first place it increased the visibility of the signalling instrument; in the second place it brought that instrument into the position in which it could most readily catch the operator's eye; and finally it eliminated the effort involved in associating one piece of appa- ratus with another and in finding that other. Moreover the clear- ing-out drop of the cord circuit was replaced by an arrangement which included the provision of one signal to be controlled through the agency of a relay by the calling subscriber, and another to be controlled by the person wanted. These supervisory signals took the form of lamps and were placed on the keyboard in positions immediately adjacent to the associated cords. With the adbption of relays the signalling between the subscribers and the exchange became automatic, and, with the introduction of the principle of double and automatic supervision on the cord circuits, it became possible for the operators to tell at any

instant the state of a con- nexion. As a result the time occupied by an operator per call was reduced from 50-77 seconds to 16-63 seconds.

Threefundamental common battery transmission systems have been devised and are shown in figs. 8, 9 and 10. In the Hayes system (fig. 8) a repeating coil is placed in the cord circuit, and when two sub- scribers are connected together the winding connected to the line of the subscriber who is talking for the time being acts as primary, and the other, which is in the line of the listening subscriber, as secondary.

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causing the reproduction of the speech in the latter's receiver. The Stone system, compared with that of Hayes, possesses the

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FlG. 10. — Dean Common Battery System.

disadvantage that one of the conditions affecting the supply of current to any particular subscriber's circuit is the resistance of the

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From the Post Office Electrical Engineers’ Journal.

Fig. 8. — Hayes Common Battery System.

The Stone system (fig. 9) is characterized by the use of imped- ance coils between the battery and the line wires. When one of two subscribers connected together by this arrangement talks, the

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From the Post Office Electrical Engineers’ Journal.

Fig. 9. — Stone Common Battery System.

variation in resistance of the transmitter spoken into causes a variation of the pressure at the line terminals of the impedance coils, and since those terminals are common to the two circuits the variable E.M.F. operates in the line of the listening subscriber,

Fig. 11. — Subscriber’s Circuit, Common Battery System.

other circuit to which it is connected for the time being. An

improvement in this respect has been effected by the insertion of

condensers in the cord circuits, coupled with the use of two

sets of impedance coils, one set- on each side of the

condensers.

Dean's method (fig. 10) embodies the idea of supplying current to the transmitters over the line wires in parallel instead of round the loop circuit, as in the other systems referred to. An earth return is used. The transmitter is placed in multiple with the primary winding of an induction coil whose secondary operates in the loop circuit, and con- sequently when the transmitter is spoken into, a variable E.M.F. is impressed upon the circuit through the medium of the induction coil. The impedance coils shown connected between the battery and the lines and between the latter and the transmitters are joined up non-inductively as regards the transmitter circuits, but inductively as regards the secondary circuits. Figs. II and 12 indicate typical subscriber's and con- necting-cord circuits as equipped by the Western Electric Company. At the subscriber's station when the receiver is on the hook switch the circuit is through the call-bell and a condenser. The conditions permit of the circulation of the alternating currents of low periodicity, which are used for operating the bells, but in respect of the battery the circuit is open until the subscriber lifts the receiver, when the hook switch, thus released, joins the transmitter with one winding of an induc- tion coil in series across the circuit. A current then flows and in passing round the circuit operates the line relay, with the result that the calling-lamp is lighted. The operator, whose attention is thus attracted, inserts a peg in the jack, then throws over the speaking key of the cord circuit, and having ascertained particulars ofthe requirement places the other peg of the pair in the nearest multiple jack of the wanted subscriber, whom she proceeds to ring up. In the meantime the

calling- lamp has darkened ; and each subscriber's line being equipped with a cut-off relay whose function it is to disconnect the calling apparatus while the circuit is in use, the insertion of a peg is im mediately followed by the disappearance of the calling signal. The supervisory lamp associated with the peg in the wanted sub- scriber's jack glows from the time that the peg is inserted until

the subccriber responds, when it darkens, in which condition it remains until the subscriber restores the receiver to the hook and causes the lamp to light up again. The other supervisory lamp on the cord circuit is controlled in a similar manner by the sub- scriber who originated the call, and as that subscriber's telephone is off the hook when the peg is inserted, the lamp is not lighted at all until the subscriber replaces the receiver. When both lamps glow, the operator, who thereby knows that both subscribers have restored their instruments, discontinues the connexion.

A cord circuit, similar in many respects, including the method

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Fig. 12. — Typical Cord Circuit, Western Electric Co.'s System, No. I Exchanges.

of operation, but equipped with condensers and impedance coils, in place of the repeating coil, is shown in fig. 13.

In fig. 11 a meter or counter is shown associated with the sub- scriber's line, and in both figs. 12 and 13 position meters are shown connected to the cord circuits. The operation of these meters is

controlled by the operators. The subscriber's meter is joined in multiple with the cut-off relay, and whenever a peg is connected to the circuit a current flows through the meter. This current is small, however, and the meter is not operated until a much larger current is passed through it. Calls are registered by pressing a key, which connects a battery through a position meter of very low resistance to the socket of the line jack, thereby furnishing the necessary energy to the meter. The position meter just mentioned is common to all the cords on one position and records all com- pleted calls handled at the position. Some administrations, in addition to employing the ordinary position meter, use a second one for registering ineffective calls.

In large towns served by a number of exchanges the junction equipment is an important feature. In many cases from 60 to 80 per cent, of the calls originated at an exchange are for subscribers con- nected to other exchanges, and in these cases the junction plant forms a considerable fraction of the whole equipment. Moreover each call junctioned is dealt with by at least two operators. The junction circuits connecting two exchanges are invariably divided into two groups, one for traffic from exchange A to exchange B, the other for traffic from B to A. At the outgoing end the circuits are multipled on the subscribers' switch- board, while at the incoming end they terminate in plugs on a special incoming junction switchboard upon which the subscribers' lines are multipled in the usual way.

When a subscriber at exchange A asks for a connexion to a subscriber at B, the operator at A, to whom the request is made, passes the particulars over an order wire to an operator at B. The latter names a disengaged junction circuit, then " tests " the line of the wanted subscriber, and if she finds it free, finally completes the con- nexion and rings the subscriber. During the progress of these operations the A operator connects the originating subscriber to the junction circuit named by the B operator. There is only one signal on the cord circuit at B,

and that signal is controlled by exchange A. Each of the subscribers controls a signal at A, and when either or both of the telephones are replaced, the action is indicated by the lamps there. Control of the call is thus vested in the operator at the originating exchange, at which point the connexion must be severed before a clearing signal can appear at B.

Party Lines. — A circuit which serves more than one subscriber is termed a "party line." It was originally tne practice to place the calling apparatus in series in the line circuit, but the effect of the large impedance introduced by the electromagnets of the call-

bells was such that not more than two or three persons could be connected without seriously impairing the efficiency of the circuit for speech transmission. An improvement was effected in this respect by the introduction of the " bridging " system, in which the bells possessing high inductance are placed in parallel between the two wires of the circuit. Although the bells are constantly in circuit their high impedance prevents any appreciable interference with the telephonic currents. In America, on farmers' circuits, ten or more stations are frequently connected to one line ; but in England ten is practically the maximum. In city districts the modern practice is to restrict the number to four stations per line, and to equip the exchanges and stations for selective ringing. In one arrangement, now in extensive use, each telephone set is fitted with a relay of high inductance which is bridged across the circuit in series with a condenser. When the relay is operated it connects a bell between one of the wires of the circuit and earth, while the bell itself is arranged to respond to current pulsations in one direction only. The four tele- phones on a circuit are so wired that the relays connect two of the bells between each wire and earth, and further that one of each pair of bells responds to positive and the other to negative pulsations. This system of course requires that the exchange equipment shall include

machines capable of delivering a positive pulsating current and a negative pulsating current, besides the usual alternations required for the ringing of ordinary subscribers.

In another party line system a harmonic prin- ciple is employed: the ringing machines deliver alternating currents of four frequencies, while each bell is constructed to operate at a particular frequency only. Of the four bells connected to a circuit each responds to a different frequency.

Trunk Line Working. — Trunk or long-distance working is com- plicated by the necessity for recording all calls. The system of the British Post Office is worked as follows : A subscriber desiring a long-distance connexion calls up his local exchange in the ordinary way, and the operator there, being informed that a trunk connexion is desired, extends the subscriber's line to the Post Office by means of a record circuit. At the Post Office a record operator replies and takes particulars of the connexion, and these are entered upon a ticket. The record operator then removes her speaking apparatus from the circuit, and the local operator, receiving a disconnect signal, severs the connexion at the local exchange. Meanwhile the ticket is conveyed to the position where the lines to the town wanted are terminated. If there be a line free, or when the turn of the call is reached, particulars of the connexion wanted are passed to the distant end, and the trunk operators request the local exchanges to connect the subscribers by means of junction

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Fig. 13. — Typical Cord Circuit, British Insulated Co.'s System.

circuits to the trunk exchanges where the necessary connexions are made between the trunk line and the junctions. The call is controlled by the trunk operators, the junction circuits being equipped in such a manner that the subscribers' signals appear at the trunk exchanges, from which point disconnecting signals are sent automatically to the local exchanges, when the connexions between the trunk and the junction circuits are removed.

The large modern trunk exchanges are equipped with relays and lamps for signalling purposes. " Calculographs " are employed for stamping the time upon the tickets, and there is associated with each trunk circuit a device which lights a lamp as soon as the scheduled limit of the period of conversation is reached.

Particulars of calls are now passed between trunk centres to a great extent over telegraph circuits superposed upon the trunk

lines. This arrangement permits particulars of calls to be passed over lines while conversations are in progress.

Automatic Systems.— The idea of automatic telephony is to substitute for the operator of the manual exchange an electro- mechanical or other switching system, which, controlled in its movement by the action of the subscriber, will automatically select, connect and disconnect circuits as desired. Several schemes em- bodying this idea have been developed, and one of them has been put into extensive operation. Each subscriber's circuit on this system

terminates upon the incoming portion of a selector switch, called a first selector, and is multipled upon the outgoing portions of a number of similar switches called connector switches. Only calls originated by a subscriber pass through the selector switch (first selector) provided for his sole use; the calls incoming to him pass through one or other of the various connector switches upon which his circuit is multipled. Each connexion involves the use of three switches, viz., a first selector, a connector switch, and a second selector which is brought into operation between the other two.

The subscribers' lines in an exchange are arranged in groups of iooo, which are divided in turn into sub-groups of ioo each. By means of his first selector the circuit of a calling subscriber is connected to the outgoing end of a junction whose other end terminates upon the incoming portion of a second selector in the thousand group to which the wanted subscriber belongs. The second selector in turn extends the connexion by means of another junction circuit to one of the connector switches in the hundred group wanted, while finally the connector switch completes the connexion. One hundred circuits are connected to the outgoing portion of each switch, and the contacts upon which they terminate are arranged in a number of horizontal rows upon the face of a curved surface, at whose axis a vertical shaft is placed. This shaft, which carries a set of " wipers " connected to the incoming circuit, is susceptible of a vertical and a rotational movement, so that the wipers may be brought, first opposite any particular horizontal series of contacts, and then into actual contact with any particular set in the series. The movements of the shaft are con- trolled by relays and electro-magnets which operate in response to the action of the subscriber whose telephone is fitted with a calling mechanism which, when the subscriber calls, earths the line a certain number of times for each figure in the number of the wanted subscriber.

Wire Plant. — In suburban and rural districts subscribers are usually served by means of bare

wires erected upon wooden or iron poles. As subscribers' lines are invariably short, the smallest gauge of wire possessing the mechanical strength necessary to with- stand the stresses to which it may be subjected can be employed, and bronze wire weighing 40 lb per mile is commonly used. In large towns telephone distribution by means of open wires is prac- tically impossible, and the employment of cables either laid in the ground or suspended from poles or other overhead supports is necessary.

In the types of cable that were first used, the wires, usually with a cotton insulation, were drawn into lead tubes, and the tubes filled with paraffin or other similar compound, which kept the wires from the injurious effects of any moisture which might penetrate the lead tube. This form of cable has been superseded by a type with paper insulation. The separate wires are surrounded only with a loose covering of specially prepared paper, which furnishes abundant insulation. In the manufacture of the cable the wires are first enclosed in the paper, which is applied sometimes longitudinally and sometimes spirally. The conductors are then twisted in pairs with definite lays. These pairs are laid up symmetrically into cables, each layer being protected with an additional covering of paper and all adjacent layers revolving with an opposite twist. The cable is then placed in an oven, and, after all moisture has been driven off, it is passed through a lead press whence it emerges protected by a continuous lead pipe. The electrostatic capacity of a cable of this type is low, and its dimensions are small, the external diameter of a cable containing 1600 ten-lb conductors being only 2f in. The conductors used for subscribers' circuits are of copper weighing from 10 to 20 ft per mile. Junction circuits are usually made up of 20 or 40 lb conductors.

When a number of cables follow the same route, they are gene- rally laid in conduits made up of earthenware or cement ducts; iron pipes are used when the number of cables is small. Manholes are

placed at intervals in the line of ducts to facilitate the drawing in and jointing of the cables, and surface boxes are placed in the footways for distributing purposes. Various methods of making the connexions between the large main cables and the subscribers are in use. In one system the main cables terminate in large air- tight iron boxes placed in the manholes. There, the large cables divide into a number of small cables, which are carried along the footways in pipes and are tapped at suitable points to serve sub- scribers. Another method of distribution, largely adopted, is to run the lead cables into the interior of blocks of buildings, and to terminate them there in iron boxes from which the circuits are distributed to the surrounding buildings by means of rubber-covered wires run along the walls. Aerial distribution from distributing

poles is a method frequently adopted. In this case the cables terminate upon the poles, the connexions between the cable wires and the open wires being made with rubber-covered leads.

The introduction in 1 883 of the hard-drawn copper wire of high conductivity invented in 1877' by T. B. Doolittle was of the greatest importance in rendering the use of long lines practicable, and it is universally employed for such service. Wire weighing between' 150 and 400 lb per mile is generally used. The New York-Chicago line, built in 1892, is of wire 165 millimetres in diameter (No. 8 Birmingham), weighing 435 lb per mile and having a resistance of 2-05 ohms per mile. Speech has been habitually transmitted for business purposes over a distance of 1542-3 m., viz., over the lines of the American Telegraph and Telephone Company from Omaha to Boston. Conversation has been carried on over 2200 m. of No. 8 line.

As no practical process of telephone relaying has been devised, it is extremely important that the character of the line should be such as to favour the preservation of the strength and form of the telephone current. In circuits possessing high

resistance and capacity and low inductance per mile, telephonic currents are rapidly attenuated, and the higher the frequency the more rapid is the attenuation. Moreover, as the velocity of propagation is a function of the frequency, there is distortion of the complex waves. Oliver Heaviside showed mathematically that uniformly-distributed inductance in a telephone line would diminish both attenuation and distortion, and that if the inductance were great enough and the insulation resistance not too high the circuit would be distortionless, while currents of all frequencies would be equally attenuated. Following up this idea, Professor M. I. Pupin showed that by placing inductance coils in circuit, at distances apart of less than half the length of the shortest component wave to be transmitted, a non-uniform conductor could be made approxi- mately equal to a uniform conductor. Many circuits have been " loaded " in the manner proposed by Pupin during recent years, especially in underground cables, and it has been found in practice that the transmission value of these when loaded is approximately from three to four times their value unloaded. Open aerial long-distance lines have also been loaded, but not to the same extent. The introduction of inductance coils into such circuits renders them more susceptible to trouble from atmospheric electricity and more sensitive to leakage variations.

In consequence of their high capacity, the attenuation constant of submarine cables is high, and only a small number of cables, of comparatively short length, are in use for telephonic purposes. Attempts have been made to improve submarine cables in this respect, and in 1906 a short cable " loaded " with Pupin coils was laid across Lake Constance. The problem, however, of construct- ing a deep-sea cable satisfactorily, with suitable inductance coils inserted at short distances apart, is a difficult one, and one which it cannot be said has been solved. (H. R. K.)

Commercial Aspects. — The records of the telephone industry in Great Britain during the thirty years

from 1877 to 1907 form an instructive chapter in the industrial history of the country. The aspects which stand out most prominently in this history are: (a) The vacillation of successive governments due to the conflicting policies adopted from time to time to protect the telegraph revenues of the Post Office and to avoid the suppression of an enterprise which was becoming a public necessity and yielding substantial royalties to the Postmaster- General, (b) The obstructive use made by the local authorities of their power to veto underground wayleaves. (c) The remark- able success achieved by the National Telephone Company, despite these obstacles, in developing an extensive organization and a profitable business.

The chief events in chronological order are:—

1876. Graham Bell's telephone patent was granted for the United Kingdom.

1877. Edison's telephone patent was granted for the United Kingdom.

1878. Professor D. E. Hughes invented the microphone, but did not apply for letters patent. The Telephone Company, Limited, was formed to acquire Bell's patent. During the passage of the Telegraph Bill 1878 through parliament the Postmaster-General endeavoured, without success, to insert a clause declaring that the term " telegraph " included " any apparatus for transmitting messages or other communications with the aid of electricity, magnetism, or any other like agency."

1879. The Edison Telephone Company of London was formed. Both the Bell and the Edison Companies opened negotiations with the Post Office for the sale of their patents to the govern- ment, but without success. The Edison Company announced its intention to start telephone business in London, and the Postmaster-General instituted proceedings against the company

for infringement of his monopoly rights under the Telegraph Act 1869.

1880. The two companies amalgamated as the United Telephone Company Ltd. Mr Justice Stephen decided (Attorney-General v. Edison Telephone Company, 6 Q.B.D., 244) that the tele- phone was a telegraph, and that telephone exchange business could not legally be carried on except by the Postmaster-General or with his consent. The decision covered also future invention in regard to " every organized system of communi- cation by means of wires according to any preconcerted system of signals."

1 88 1. The company's appeal against the decision was withdrawn, the Postmaster-General agreeing to grant licences for restricted areas of about 5 m. in London and about 2 m. in the provinces. The licences merely condoned the infringement of the Tele- graph Act 1869, and did not confer powers to erect poles and wires on, or to place wires under, any highway or private property. The licensee was precluded from opening public call offices and from laying trunk lines from one town to another. The licences were for 31 years, expiring in 1922, without any provision for purchase or compensation, and were subject to the payment of a minimum royalty to the Post Office of 10 per cent, of the gross revenues. The United Telephone Company confined its operations to London; sub- sidiary companies were formed to operate in the provinces. The Post Office at the same time established several telephone exchanges in provincial towns so as to enable the Postmaster-General " to negotiate with the telephone companies in a satisfactory manner for licences."

1882. The Postmaster-General (Mr Fawcett) declared that he would issue no more licences unless the licensees agreed to sell telephones to the Post Office. As a result only eight companies out of over seventy that had applied obtained or accepted licences.

1883. The Post Office proposed to engage in active competition with the telephone companies, but the Treasury at that time opposed this policy on the ground that the state should at most be ready to supplement and not to supersede private enterprise.

1884. The licences within restricted areas having proved unsuit- able for the growing business, public opinion appealed to the Post Office to issue new licences applicable to the whole country. All limitations of areas were removed and licensees were allowed to open public call offices but not to receive or deliver written messages, and they were allowed to erect trunk wires. The royalty of 10 per cent, was continued. The Post Office reserved the right to compete either directly or by granting other licences, and it was under no obligation to grant way- leaves. The new licences were to terminate in 191 1 without any provision for purchase or compensation in that year, but with the option to the government to purchase the plant of the licensees in 1890, 1897, or 1904 at a price to be deter- mined by arbitration. The United Telephone Company asked parliament for rights of way in streets but was refused, and its only right to place overhead wires was obtained by private wayleaves.

1885. The United Telephone Company again applied unsuccess- fully for right to lay wires underground.

1888. The application of the company for permission to lay wires in streets was again refused.

1889. After the withdrawal of the restriction against the com- panies erecting trunk wires it became evident that the develop- ment of the telephone services throughout the country would be facilitated by complete intercommunication and uniformity of systems, and that economies could be effected by concen- tration of management. The various companies therefore amalgamated as the National Telephone Company.

1890. The government had the option to buy out the companies under the licences of 1884, but did not

exercise it. The Bell telephone patents expired. The National Telephone Company applied to the London County Council for permission to lay wires underground and continued efforts till 1899 to obtain this power, but without success.

1 89 1. The duke of Marlborough, in the name of the New Tele- phone Company, inaugurated a campaign for cheaper telephone services, but the New Telephone Company was subsequently merged in the National Telephone Company.

1892. The National Telephone Company again applied to parlia- ment for powers to lay wires underground; public discontent with inadequate telephone services was expressed, and at the same time the competition of the telephone with the Post Office telegraph became more manifest. The government again changed its policy. It compelled the companies to sell their trunk wires to the Post Office, leaving the local exchanges in the hands of the companies. It also expressed willingness that the companies should have rights of way in the streets.

1893. The National Telephone Company again applied to parlia- ment for power to lay wire9 underground, but was refused.

1894. The draft agreement between the government and the

National Telephone Company to carry out the policy of 1892 was submitted to parliament and led to much discussion. Local authorities (particularly London and Glasgow) refused to permit the company to lay wires underground.

1895. A select committee of the House of Commons (with Mr Arnold Morley, Postmaster-General, as chairman) was ap- pointed " to consider and report whether the provision now made for the telephone service in local areas is adequate, and whether it is expedient to supplement or improve this pro- vision either by the granting of licences to local authorities or otherwise." The committee was not

unanimous and made no report, but merely submitted to the House the evidence it had taken.

1896. The trunk wires were transferred to the Post Office in pursuance of the policy of 1892, but for all practical purposes the local authorities had vetoed the permission of the govern- ment to the company to lay wires underground.

1897. The government had an option to purchase the plant of the company under the licences of 1884, but did not exercise it. The corporation of Glasgow having persisted in its efforts to obtain a licence, the Treasury appointed Sheriff Andrew Jameson (afterwards Lord Ardwall) a special commissioner to hold a iocal inquiry in Glasgow to report whether the tele- phone service in that city was adequate and efficient and whether it was expedient to grant the corporation a licence. The commissioner reported that the service was adequate but not efficient; that the rates were reasonable but that the corporation was responsible for unreasonably withholding facilities, thus rendering the service inefficient; that it was inexpedient to grant the corporation a licence because the funds of a city ought not to be applied for the benefit of a limited class of citizens; that delay and waste would result from two systems in one area and would increase the difficulties of the government in 191 1; and that the corporation had not proved it could work the licence without placing a burden on the rates.

1898. The policy of the government was again changed; Mr R. W. Hanbury, Financial Secretary to the Treasury and representative in the House of Commons of the Postmaster- General, advocated the granting of licences to local autho- rities. A select committee was appointed with Mr Hanbury as chairman to consider " whether the telephone service is calculated to become of such general benefit as to justify its being undertaken by municipal and other local authorities, and if so under what conditions." The committee reported (9th August) that the telephone service was not likely to become of general benefit " so long as the present

practical monopoly in the hands of a private company shall continue." The committee considered that the Post Office was not prevented either by legal agreement or by good faith from limiting or ending the monopoly of the company, and that competition appeared to be both expedient and necessary in order to extend and popu- larize the service and to avoid the danger that a purchase of the company's undertaking at an inflated price might be forced upon the government. While considering that a really efficient Post Office service would afford the best means for securing such competition, it recommended that general, imme- diate and effective competition should at once be undertaken either by the Post Office or by local authorities. The Associa- tion of Municipal Corporations passed resolutions on the 28th of April that " the subject of telephonic supply should be treated as an imperial and not as a local one, and that the Postmaster- General should have the sole control of the telephone system," and " that in the event of the Postmaster-General not taking over the telephone service it should be competent for municipal and other local authorities to undertake such services within areas composed of their own districts or combination of such districts."

1899. In pursuance of the report of the select committee, 1898, the Telegraph Act 1899 was passed to enable the Post Office to develop its telephone exchange business, for which a loan of £2,000,000 was sanctioned, and to empower local authorities, subject to certain conditions, to enter upon telephone business. The licence of the National Telephone Company was extended so as to be co-extensive with that of a competitive licence for any locality on condition that the company should afford intercommunication with the telephone systems of the new licensees. In short, all-round competition was authorized, and the Post Office decided to establish a telephone system in London in competition with the company.

1900. The Telegraph Act 1899, while providing for intercom- munication between the telephone systems

of the local autho- rities and the company, did not give the Post Office the right to demand intercommunication between its exchanges and those of the company, The Post Office co-operated with the London County Council to put difficulties in the way of the company which had placed wires underground in London with the consent of the local road authorities. In February the Postmaster-General applied for an injunction to restrain the

company from opening any street or public road within the county of London without the consent of the Postmaster- General and the London County Council, which injunction was granted in July. 1901. The government policy of 1899 was abandoned in London, the Post Office making an agreement with the company in regard to the London business. The company consented to free intercommunication between its subscribers and those of the Post Office, and undertook to charge rates identical with those charged by the Post Office. The Postmaster-General on the other hand agreed to provide underground wires for the company on a rental, and agreed to buy in 191 1 the company's plant in London at the cost of construction less allowance for repairs and depreciation.

1904. The government had option to purchase the company's provincial plant under the licence of 1884. Negotiations took place, but no agreement was reached.

1905. The government contracted to buy the company's plant in 191 1, thus in effect annulling the act of 1899 which had failed to accomplish its object of establishing all-round competition.

By 1907 altogether 59 local authorities had examined the proposition of establishing telephone systems after 1899, and licences were granted to local authorities at Brighton, Belfast, Chard, Glasgow,

Grantham, Huddersfield, Hull, Portsmouth, Swansea, Tunbridge Wells, Oldham, Scarborough and Hartlepool, but only six municipalities proceeded with the business. Glasgow opened its exchange in March 1901, Tunbridge Wells in May 1901, Portsmouth in March 1903, Brighton in October 1903, Swansea in November 1903 and Hull in October 1904. The Tunbridge Wells and Swansea municipal undertakings were subsequently sold to the National Telephone Company, and the Glasgow and Brighton undertakings to the Post Office. Hull and Portsmouth were the only municipal telephone systems working in 1907.

The effect of the unsettled policy of the Post Office until 1905 and of the difficulties created by the local authorities was that the National Telephone Company was never able to do its best to develop the enterprise on the most efficient lines. In 1885 there were only 3800 telephone subscribers in London and less than 10,000 in the rest of the United Kingdom, and telephonic services were available in only about 75 towns, while in the same year the American Bell Telephone Company had over 134,000 subscribers. The removal in 1884 of the prohibition against the erection of trunk lines at once enabled considerable expansion to take place. Within six years the services had been extended to 400 towns with about 55,000 subscribers. Large as this progress was it would have been much greater if the Telephone Company had been granted adequate powers to put wires underground and thus instal a complete metallic circuit in place of the single wire, earth-return, circuit which it was constrained to employ. Subse- quently the progress was still greater. In 1906 there were 30,551, equal to 7-2 per cent., more telephone stations in the United Kingdom than in the ten European countries of Austria, Hungary, Belgium, Denmark, Holland, Italy, Norway, Portugal, Russia, Sweden and Switzerland, having a combined population of 288 millions as against a population of 42 millions in the United Kingdom. Apart from France, Germany and Switzerland, there was no European country that had as many telephones working as London. That city, with a population of 6 millions,

had nearly as many telephones as the whole of Sweden with about the same population, or as the whole of France, with a population of 39 millions. The only European country which can be compared with the United Kingdom in telephone development is Germany. With a population of 58 millions there are 102 telephones per 1000 of the population in that country compared with 10-15 in Great Britain and Ireland. The development of telephony in the United States of America is much greater than anywhere else; on the 1st of January 1907, 5 per cent, of the population were telephone subscribers.

Tariffs. — Telephone business is characterized by two features: (1) that the capital account is never closed, and (2) that the costli- ness of the service increases with the size of the undertaking. The original method of charging adopted in Great Britain took the telephone instrument as the unit, charging a fixed annual rental independent of the amount of use to which the instrument was

Cut. The study of telephone economics showed that the proper asis for charging was the " message-mile," on the theory that the

user should pay according to the facilities offered and the extent to which he made use of them. In a large city, where several inter- connected exchanges have to be built and thousands of subscribers are put into communication with each other, the service is at once more costly and more valuable than in a small town with a few hundred subscribers accommodated in one exchange. Differences not only in the size of towns, but in the arrangement and char- acter of the population, make each district a telephone problem by itself, and nullify close comparisons between telephone rates and telephone efficiencies in different areas and different countries. But the tendency is towards a system of charging a moderate sum to cover the rent of the instrument and an additional fee per message. For instance, in the county of London, the telephone tariff is £5 per annum plus id. per call within the county and 2d. per call outside the county.

Subscribers outside the county of London pay only £4 in annual subscription and id. per call to sub- scribers on the same exchange and 2d. per call to subscribers on other exchanges. In each case the minimum annual amount for message fees is £1, 10s. The alternative is given of an unlimited service (" flat rate ") at £17 per annum. In the provinces the unlimited service costs only £7, 10s. for subscribers within half a mile of the exchange, £1, 5s. being charged for every additional quarter of a mile or fraction thereof. The toll or message rates are £3, with id. per call, with a minimum of £1, 10s. As the cost of the service varies in proportion to the amount of use, the toll rate is more scientific, and it has the further advantage of discouraging the unnecessary use of the instrument, which causes congestion of traffic at busy hours and also results in lines being " engaged " when serious business calls are made. The tariff for unlimited use has to be made very high to cover the cost of the additional burdens thrown upon the service, and it only works economically to the individual subscriber who has an exceptionally large number of calls originating from his instrument. The message- rate system equalizes the charges according to the service rendered. Another method of charge, known as the " measured service rate," is de- signed to make the subscriber pay in proportion to the quality and quantity of the service he takes. It is widely used in America, and was introduced into Great Britain in 1907. The subscriber pays a fixed annual rent which covers a certain number of free out- ward calls, say 500; additional calls he purchases in advance in blocks of several hundred at so much per hundred, the price being reduced as the number increases.

For subscribers who desire the telephone for occasional use, the party-line system has been devised, whereby several telephones are connected to one line leading to the exchange. In London a two- line party service costs £3 per annum, the message fees being id. per call to subscribers within the county and 2d. per call to those outside it, with a minimum of £3. The fee charged for the use of public

telephone call offices is 2d. per message.

The trunk line service is charged for on rates which vary from 3d. (for 25 m.) up to is. (for 100 m.) for a three minutes' conversa- tion between 6 a.m. and 8 p.m. For every 40 m. above 100 m. an additional 6d. per conversation is charged. A reduction has been made in the charges for trunk calls at night, and calls for single periods of three minutes are allowed at half the ordinary rates between 7 p.m. and 7 a.m. A call between London and Liverpool, which ordinarily costs 2s., can be made for is. between those hours. The growth of traffic on this basis has been considerable, and the arrangement has proved of advantage to the public, as it provides cheap facilities at times which are convenient for social conversation.

Telephone subscribers may telephone ordinary messages to any post office which may be reached through the local exchange system, or by means of the trunk wires, in order that the messages may be written down and forwarded as telegrams or express letters or ordinary letters. Subscribers to exchanges may also make arrangements to have all telegrams (except Press telegrams) ad- dressed to them delivered by telephone instead of messenger. Telephone subscribers may also obtain the services of an express messenger by telephoning to the nearest post office connected with the exchange.

National Telephone Company. — The issued share and debenture capital of the company on the 31st of December 1907 was: —

15,000 6% 1st preference shares of £10 each.

15,000 6% 2nd preference shares of £10 each 250,000 5 % 3rd preference shares of £5 each . 6 % preferred stock …..

Deferred stock …...

71,715 new shares of £5 each

3! % debenture stock 4 % debenture stock

. £150,000

150,000

1,250,000

2,225,000

. 3.366.425

358,575

£7,500,000

. 2,000,000

- L716,593

£11,216,593

The’ company has a reserve fund of £2,467,707, the major part of which is invested in the business. The gross income for the year 1907 amounted to £2,702,228, of which £257,920 was paid to the Post Office in respect of royalties. The working expenses amounted

to £1,530,093 or 62-6 per cent, of the net income, leaving a profit for the year of £914,216.

At the time of the formation of the various telephone companies the enterprises were regarded as speculative, and much of the capital was raised at a discount. The business subsequently proved profitable, good dividends were paid, and the securities for the most part commanded ,a premium in the market. After the consolidation of the companies in 1889-1890 the profits declined, patent rights had expired, material reductions were made in the rates for telephone services, and considerable replacements of plant became necessary, the cost of which was charged to revenue.

Agreement of 1905. — By this agreement the Post master- General agreed to purchase all plant, land and buildings of the National Telephone Company in use at the date of the agreement or con- structed after that date in accordance with the specification and rules contained in the agreement, subject to the right of the Post- master-General to object to take over any plant not suited to his requirements. The price is to be fixed by the Railway and Canal Commissioners as arbitrators on the basis of the " then value," exclusive of any allowance for past or future profits or any com- pensation for compulsory sale or other consideration. In those cases in which the company's licence has been extended beyond 191 1 (Glasgow to 1913, Swansea to 1926, Brighton to 1926 and Portsmouth to 1926) the Postmaster-General will buy the unex- pired licence with allowance for goodwill. The Postmaster-General agreed also to buy the private wire plant of the company at a value based upon three years' purchase of the net profits on the average of the three years ending 31st of December 191 1. The Postmaster-General also agreed to lay underground wires for the company at an annual rental of £1 per mile of double wire in any local area in which the company was operating, but not in areas in which the municipalities had established exchanges. Free inter- communication was established by the agreement between the subscribers of the company and those of the Post Office, and a scale of charges was adopted or arranged to be agreed as binding on both the Post Office and the company. The late Mr W. E. L. Gaine, general manager of the company, stated before the Select Committee that in the view of the directors the bargain was a hard one, because it gave no consideration in respect of the goodwill of the great business, with its gross income of over £2,000,000 per annum and its net revenue of over £750,000, which the company had built up. The company had had to pay for all the experiments and mistakes which are inherent in the launching and development of any new industry. It had paid the Post Office in royalties already £1,848,000, and the Post Office under the agreement would step into the business in 191 1 by merely

paying for the plant employed. The Association of Municipal Corporations and the London County Council, on the other hand, considered the terms of purchase to be too favourable to the company. The London County Council, according to the statement of its comptroller, was disturbed by the hope expressed by the manager of the company, that the holders of the company's ordinary shares would obtain the par value of their shares in 191 1. Inasmuch as the debenture stocks and pre- ference shares would have to be redeemed in 191 1 at premiums ranging from 3 to 5 per cent., the state would have to pay the company £253,000 in excess of the total of the outstanding securities in order to enable the ordinary shares to receive par, and in the touncil's view this payment would diminish the probability of the Post Office being able to afford a substantial reduction in the telephone charges.

Post Office Telephones. — The number of trunk wire centres open on the 31st of March 1907 was 533, and the total number of trunk circuits was 2043, containing about 73,000 m. of double wire. The capital expenditure on the purchase and development of the trunk wire system amounted to £3,376,252. The total number of con- versations which took place over the trunk wires during the year 1906-1907 was 19,803,300. The gross revenue derived from the trunk services was £480,658, being an average of 5-82d. per conversation. The total number of subscribers to the Post Office provincial ex- changes on the 31st of March 1907 (excluding those in Glasgow snd Brighton) was 10,010, and the number of telephones rented was 12, 006. The Glasgow system included 11,103 subscribers' lines with 12,964 telephones, and the Brighton system contained 1542 subscribers' lines with 1884 telephones. The sum received by the Post Office as rental in respect of private wires was £183,000. The years' working of the whole telephone system of the Post Office showed a balance of £451,787 after payment of the working expenses, while the estimated amount required to provide for depreciation of plant and interest at 3 per cent, on the total expenditure of £7,252,000 was £432,726.

The number of telephones connected with the Post Office system in the metropolitan area on the 31st of March 1907 was 41,236, and additional subscribers were being connected at the rate of about 150 a week. There were 425 post office call-offices in the London area. The length of underground pipes which had been laid in the metropolitan area for telephone purposes was 2030 m. Cables containing 317,789 m. of wire had been laid, including 69,066 m. rented by the National Telephone Company. The average cost of constructing an exchange circuit in the metropolitan area (including

the installation of telephone instruments and of exchange apparatus, but excluding the provision of spare plant) has been £33. Taking into account the whole system (including spare plant of all kinds,), the capital expenditure per station {i.e. per telephone connected with an exchange) stands at less than £50.

International Telephone Lines. — The Anglo-French telephone service, which was opened between London and Paris in April 1 89 1, was extended to the principal towns in England and France on the nth of April 1904. The service has since been extended to certain other English provincial towns; and the Anglo-Belgian telephone service has similarly been extended. There are now four circuits between London and Paris, one between London and Lille, and two between London and Brussels, the last carrying an increasing amount of traffic. Experiments have been made in telephonic communication between London and Rome by way of Paris. It was found possible to exchange speech when the con- ditions were exceptionally favourable; but in spite of the partial success of the experiment, a public service between the two capitals is not at present practicable.

References. — Reports of Select Committee on Telephone and Tele- graph Wires (1885), of Select Committee on Telegraph Bill (1892), of Joint Committee of the House of Lords and the House of Commons on Electric Powers (Protective Clauses)

(1893), of Select Committee on Telephone Service (1895), of Select Committee on Telephones (1898), and of Select Committee on Post Office (Telephone) Agreement (1905); Treasury Minutes (1892 and 1899); Annual Reports of the Post- master-General; Report to the Treasury by Sheriff Andrew Jameson on Glasgow Telephone Enquiry (1897); H. R. Meyer, Public Owner- ship and the Telephone in Great Britain (London, 1907) ; E. Garcke, Manual of Electrical Undertakings (1896-1908). (E. Ga.)

TELESCOPE, an optical instrument employed to view dis- tant objects. The term " photographic telescope " has been applied to instruments employed to record the appearance of celestial objects by photography. The word was coined by Demiscianus, a Greek scholar, at the request of Federigo Cesi, founder of the Accademia dei Lincei, from the Greek rijXe, far, and anoireov, to see. It was used by Galileo as early as 161 2, and came into English use much later, when it supplanted trunk and cylinder, the terms hitherto used to denote the telescope.

History

The credit of the discovery of the telescope has been a fruit- ful subject of discussion. Thus, because Democritus announced that the Milky Way is composed of vast multitudes of stars, it has been maintained that he could only have been led to form such an opinion from actual examination of the heavens with a telescope. Other passages from the Greek and Latin authors have similarly been cited to prove that the telescope was known to the ancients. But, as has been remarked by Dr Robert Grant (History 0} Physical Astronomy, p. 515), we are no more warranted in drawing so important a conclusion from casual remarks, however sagacious, than we should be justified in stating that Seneca was in possession of the dis- coveries of Newton because he predicted that comets would one day be found to revolve in periodic orbits. William Molyneux, in his Dioptrica Nova (1692), p. 256, declares his opinion that Roger Bacon (who died c. 1294) " did perfectly well understand all kinds of optic glasses, and knew

likewise the method of combining them so as to compose some such instrument as our telescope." He cites a passage from Bacon's Opus Majus, p. 377 of Jebb's edition, 1733, translated as follows: —

" Greater things than these may be performed by refracted vision. For it is easy to understand by the canons above mentioned that the greatest objects may appear exceedingly small, and the contrary, also that the most remote objects may appear just at hand, and the converse; for we can give such figures to transparent bodies, and dispose them in such order with respect to the eye and the objects, that the rays shall be refracted and bent towards any place we please, so that we shall see the object near at hand or at any dis- tance under any angle we please. And thus from an incredible distance we may read the smallest letters, and may number the smallest particles of dust and sand, by reason of the greatness of the angle under which we see them. . . . Thus also the sun, moon and stars may be made to descend hither in appearance, and to be visible over the heads of our enemies, and many things of the like sort, which persons unacquainted with such things would refuse to believe."

Molyneux also cites from Bacon's Epistola ad Parisiensem, " Of the Secrets of Art and Nature," chap. 5: —

" Glasses or diaphanous bodies may be so formed that the most remote objects may appear just at hand, and the contrary, so that

we may read the smallest letters at an incredible distance, and may number things, though never so small, and may make the stars also appear as near as we please."

These passages certainly prove that Bacon had very nearly, if not perfectly, arrived at theoretical

proof of the possibility of constructing a telescope and a microscope; but his writings give no account of the trial of an actual telescope, nor any detailed results of the application of a telescope to an examina- tion of the heavens. It has been pointed out by Dr Robert Smith, in his Complete System of Opticks, that Bacon imagines some effects of telescopes which cannot be performed by them, and his conclusion is that Bacon never actually looked through a telescope.

Giambattista della Porta, in his Magia Naturalis, printed in 1558, makes the following remarkable statement: —

" If you do but know how to join the two (viz.,' the concave and the convex glasses) rightly together, you will see both remote and near objects larger than they otherwise appear, and withal very distinct."

Wolfius infers from this passage that its author was the first actual constructor of a telescope, and it appears not improbable that by happy accident Porta really did make some primitive form of telescope which excited the wonder of his friends. Here, however, his interest in the matter appears to have ceased, and he was unable either to appreciate the importance of his discovery or to describe the means by which the object was attained. Kepler, who examined Porta's account of his concave and convex lenses by desire of his patron the emperor Rudolph, declared that it was perfectly unintelligible. Poggen- dorff {Gesck. der Physik, p. 134) throws considerable doubt on the originality of Porta's statement.

Thomas Digges, in his Stratioticus, p. 359, published in 1579, States that his father, Leonard Digges,

" among other curious practices had a method of discovering by perspective glasses set at due angles all objects pretty far distant that the sun shone upon, which lay in the country round about,"

and that this was by the help of a manuscript book of Roger Bacon of Oxford, who he conceived was the only man besides his father who knew it. There is also the following passage in the Pantometria (bk. i. chap. 21) of Leonard Digges 1 (originally published by his son Thomas in 1571, and again in 1591): —

" Marvellous are the conclusions that may be performed by glasses concave and convex, of circular and parabolic forms, using for multiplication of beams sometime the aid of glasses transparent, which, by fraction, should unite or dissipate the images or figures presented by the reflection of other."

He then describes the effects of magnification from a combina- tion of lenses or mirrors, adding: — •

" But of these conclusions I minde not here to intreate, having at large in a volume 2 by itselfe opened the miraculous effects of per- spective glasses."

It is impossible to discredit the significance of these quotations, for the works in which they occur were published more than twenty years before the original date claimed for the discovery of the telescope in Holland.

But it is quite certain that previous to 1600 the telescope was unknown, except possibly to individuals who failed to see its practical importance, and who confined its use to " curious practices " or to demonstrations of " natural magic." The practical discovery of the instrument was certainly made in Holland about 1608, but the credit of the original invention has been claimed on behalf of three individuals, Hans Lippershey and Zacharias Jansen, spectacle-makers in Middelburg, and James Metius of Alkmaar (brother of Adrian Metius the mathe- matician) .

Descartes, in his treatise on Dioptrics (1637), attributes the dis- covery to Metius " about thirty

years ago," whilst Schyraelus de Rheita, a Capuchin friar, in his Oculus Enoch el Eliae (Antwerp, •645), gives the credit to Lippershey about 1609. Peter Borel,

1 He died about 1570. His son alludes to his untimely death in the preface to the Pantometria. • There is no further trace of this volume.

physician to the king of France, published at The Hague, in 1655, a work De Vero Telescopii Inventore. He was assisted in its pre- paration by William Borel, Dutch envoy at the court of France, and the latter declares, as the result of patient investigation, that Jansen and his father were the real inventors of the telescope in 1610, and that Lippershey only made a telescope after hints acci- dentally communicated to him of the details of Jansen's invention. But the most trustworthy information on the subject is to be got from the researches of J. H. van Swinden. 3 Briefly summarized, this evidence is as follows. In the library of the university of Leyden, amongst the MSS. of Huygens there is an original copy of a document (dated 17th October 1608) addressed to the states-

feneral by Jacob Andrianzoon (the same individual who is called antes Metius by Descartes), petitioning for the exclusive right of selling an instrument of his invention by which distant objects appear larger and more distinct. He states that he had discovered the instrument by accident when engaged in making experiments, and had so far perfected it that distant objects were made as visible and distinct by his instrument as could be done with the one which had been lately offered to the states by a citizen and spectacle- maker of Middelburg. Among the acts of the states-general pre- served in the government archives at The Hague, Van Swinden found that on 2nd October 1608 the assembly of the states took into consideration the petition of Hans Lippershey, spectacle-maker, a native of Wesel and an inhabitant of Middelburg, inventor of an instrument for seeing at a distance.

On 4th October a committee was appointed to test the instrument, and on the 6th of the same month the assembly agreed to give Lippershey 900 florins for his instrument. Further, on the 15th December of the same year they examined an instrument invented by Lippershey at their request to see with both eyes, and gave him orders to execute two similar instruments at 900 florins each; but, as many other persons had knowledge of this new invention to see at a distance, they did not deem it expedient to grant him an exclusive privilege to sell such instruments. The dates of these documents dispose effectually of Borel's statement that Lippershey borrowed the ideas of Jansen in 1610. They also prove that, whilst Metius was in possession of a telescope, with which he may have experimented, about the time when Lippershey presented his application for patent rights, yet he makes no pretension that Lippershey borrowed the invention from him. The conclusion is that Lippershey was the first person who independently invented the telescope, and at the same time made the instrument known to the world. The common story is that Lippershey, happening one day, whilst holding a spectacle-lens in either hand, to direct them towards the steeple of a neighbouring church, was astonished, on looking through the nearer lens, to find that the weathercock appeared nearer and more distinct. He fitted the lenses in a tube, in order to adjust and preserve their relative distances, and thus constructed his first telescope. But doubt may be thrown on this traditional account owing to the further statement that the image of the weathercock so viewed was seen turned upside down. All the original Dutch telescopes were composed of a convex and a concave lens, and telescopes so con- structed do not invert. The inverting telescope, composed of two convex lenses, was a later invention; still it is not impossible that the original experiment was made with two convex lenses.

Telescopes seem to have been made in Holland in consider- able numbers soon after the date of their invention, and rapidly found their way over Europe.

*Sirturus, in his De Telescopio (1618), states that " a Frenchman proceeded to Milan in the month of May 1609 and offered a telescope for sale to Count di Fuentes "; and Lorenzi Pigorna writes, 4 under date 31st August 1609, that " Galileo had been appointed lecturer at Padua for life on account of a perspective like the one which was sent from Flanders to Cardinal Borghese." Simon Marius, the German astronomer, appears to have made astronomical observations in 1609 with a telescope which he procured from Holland, and Professor S. P. Rigaud of Oxford found from the MSS. of Harriot, the mathematician, that he had been making astronomical observations with a Dutch telescope as early as July 1609. Galileo, in his Nuncius Sidereus, states that, happening to be in Venice about the month of May 1609, he heard that a Belgian had invented a perspective instrument by means of which distant objects appeared nearer and larger, and that he discovered its construction by considering the effects of refraction. In his Saggiatore Galileo states that he solved the problem of the construction of a telescope the first night after his return to Padua from Venice, and made his first tele- scope next day by fitting a convex lens in one extremity of a leaden tube and a concave lens in the other one. A few days afterwards, having succeeded in making a better telescope than ' See Dr G. Moll of Utrecht, in Journ. Roy. Inst., vol. i., 1831. * Lettre d' Uomini Illustri, p. 112 (Venice, 1744).*

the first, he took it to Venice, where he communicated the details of his invention to the public, and presented the instrument itself to the doge Leonardo Donato, sitting in full council. The senate, in return, settled him for life in his lectureship at Padua and doubled his salary, which was previously 500 florins and which then became treble that which any of his predecessors had enjoyed. Galileo may thus claim to have invented the telescope independently, but not till he had heard

that others had done so. In fact the time was ripe; and, as often happens in similar circumstances, only a hint was necessary to complete the latent chain of thought. Galileo devoted all his time to improving and perfecting the telescope. Knowing the theory of his instrument, and possessed of much practical skill, coupled with unwearied patience, he conquered the difficulties of grind- ing and polishing the lenses, and soon succeeded in producing telescopes of greatly increased power. His first telescope magnified three diameters; but he soon made instruments which magnified eight diameters, and finally one that magnified thirty-three diameters. 1 With this last instrument he dis- covered in 1 6 10 the satellites of Jupiter, and soon afterwards the spots on the sun, the phases of Venus, and the hills and valleys on the moon. He demonstrated the rotation of the satellites of Jupiter round the planet, and gave rough predictions of their configurations, proved the rotation of the sun on its axis, established the general truth of the Copernican system as compared with that of Ptolemy, and fairly routed the fanciful dogmas of the philosophers. These brilliant achievements, together with the immense improvement of the instrument under the hands of Galileo, overshadowed in a great degree the credit due to the original discoverer, and led to the universal adoption of the name of the Galilean telescope for the form of the instrument invented by Lippershey.

Kepler first explained the theory and some of the practical advantages of a telescope constructed of two convex lenses in his Catoptrics (161 1). The first person who actually constructed a telescope of this form was the Jesuit Christoph Scheiner, who gives a description of it in his Rosa Ursina (1630). William Gascoigne was the first who practically appreciated the chief advantages of the form of telescope suggested by Kepler, viz., the visibility of the image of a distant object simultaneously with that of a small material object placed in the common focus of the two lenses. This led to his invention of the micrometer and his application of telescopic

sights to astronomical instru- ments of precision (see Micrometer). But it was not till about the middle of the 17th century that Kepler's telescope came into general use, and then, not so much because of the advantages pointed out by Gascoigne, but because its field of view was much larger than in the Galilean telescope. The first powerful tele- scopes of this construction were made by Huygens, after much labour, in which he was assisted by his brother. With one of these, of 12-ft. focal length, he discovered the brightest of Saturn's satellites (Titan) in 1655, and in 1659 he published his Systema Satiirnium, in which was given for the first time a true explanation of Saturn's ring, founded on observations made with the same instrument. The sharpness of image in Kepler's telescope is very inferior to that of the Galilean instrument, so that when a high magnifying power is required it becomes essential to increase the focal length. G. D. Cassini discovered Saturn's fifth satellite (Rhea) in 1672 with a telescope of 35 ft., and the third and fourth satellites in 1684 with telescopes made by Campani of 100- and 136-ft. focal length. Huygens states that he and his brother made object-glasses of 170 and 210 ft. focal length, and he presented one of 123 ft. to the Royal Society of London. Adrien Auzout (d. 1691) and others are said to have made telescopes of from 300 to 600 ft. focus, but it does not appear that they were ever able to use them in practical observations. James Bradley, on 27th December 1722, actually measured the diameter of Venus with a telescope whose object- glass had a focal length of 212I ft. In these very long telescopes

1 This last power could not be exceeded with advantage in this form of telescope till after the invention of the achromatic object- glass.

no tube was employed, and they were consequently termed aerial telescopes. Huygens contrived some ingenious arrange- ments for directing such telescopes towards any object visible in the heavens — the focal adjustment and centring of the eye- piece being preserved by a braced rod connecting the

object- glass and eye-piece. Other contrivances for the same purpose are described by Philippe de la Hire (Mem. de I'Acad., 171 5) and by Nicolaus Hartsoeker (Miscel. Berol., 1710, vol. i. p. 261). Telescopes of such great length were naturally difficult to use, and must have taxed to the utmost the skill and patience of the observers. One cannot but pay a passing tribute of admiration to the men who, with such troublesome tools, achieved such results.

Reflecting Telescopes. — Until Newton's discovery of the dif- ferent refrangibility of light of different colours, it was generally supposed that object-glasses of telescopes were subject to no other errors than those which arose from the spherical figure of their surfaces, and the efforts of opticians were chiefly directed to the construction of lenses of other forms of curvature. James Gregory, in his Optica Promota (1663), discusses the forms of images and objects produced by lenses and mirrors, and shows that when the surfaces of the lenses or mirrors are portions of spheres the images are curves concave towards the objective, but if the curves of the surfaces are conic sections the spherical aberration is corrected. He was well aware of the failures of all attempts to perfect telescopes by employing lenses of various forms of curvature, and accordingly proposed the form of reflecting telescope which bears his name. But Gregory, according to his own confession, had no practical skill; he could find no optician capable of realizing his ideas, and after some fruitless attempts was obliged to abandon all hope of bringing his telescope into practical use. Newton was the first to construct a reflecting telescope. When in 1666 he made his discovery of the different refrangi- bility of light of different colours, he soon perceived that the faults of the refracting telescope were due much more to this cause than to the spherical figure of the lenses. He over- hastily concluded from some rough experiments {Optics, bk. i. pt. ii. prop. 3) " that all refracting substances diverged the prismatic colours in a constant

proportion to their mean refrac- tion"; and he drew the natural conclusion "that refraction could not be produced without colour," and therefore " that no improvement could be expected from the refracting tele- scope " (Treatise on Optics, p. 112). But, having ascertained by experiment that for all colours of light the angle of incidence is equal to the angle of reflexion, he turned his attention to the construction of reflecting telescopes. After much experi- ment he selected an alloy of tin and copper as the most suitable material for his specula, and he devised means for grinding and polishing them. He did not attempt the formation of a parabolic figure on account of the probable mechanical diffi- culties, and he had besides satisfied himself that the chromatic and not the spherical aberration formed the chief faults of previous telescopes. Newton's first telescope so far realized his expectations that he could see with its aid the satellites of Jupiter and the horns of Venus. Encouraged by this success, he made a second telescope of 6|-in. focal length, with a magnifying power of 38 diameters, which he presented to the Royal Society of London in December 1671. A third form of reflecting telescope was devised in 1672 by Cassegrain (Journal des Sc.avans, 1672). No further practical advance appears to have been made in the design or construction of the instrument till the year 1723, when John Hadley (best known as the inventor of the sextant) presented to the Royal Society a reflecting telescope of the Newtonian construction, with a metallic speculum of 6-in. aperture and 62§-in. focal length, having eye-pieces magnifying up to 230 diameters. The instrument was examined by Pound and Bradley, the former of whom reported upon it in Phil. Trans., 1723, No. 378, p. 382. After remarking that Newton's telescope " had lain neglected these fifty years," they stated that Hadley had sufficiently shown " that this noble invention does not consist

in bare theory." They compared its performance with that of the object-glass of 123-ft. focal length presented to the Royal Society by Huygens, and found that Hadley's reflector " will bear such a charge as to make it magnify the object as many times as the latter with its due charge, and that it represents objects as distinct, though not altogether so clear and bright. . . . Notwithstanding this difference in the brightness of the objects, we were able with this reflecting telescope to see whatever we have hitherto discovered with the Huygenian, particularly the transits of Jupiter's satellites and their shadows over his disk, the black list in Saturn's ring, and the edge of his shadow cast on his ring. We have also seen with it several times the five satellites of Saturn, in viewing of which this telescope had the advantage of the Huygenian at the time when we compared them; for, being in summer, and the Huygenian telescope being managed without a tube, the twilight prevented us from seeing in this some of these small objects which at the same time we could discern with the reflecting telescope."

Bradley and Molyneux, having been instructed by Hadley in his methods of polishing specula, succeeded in producing some telescopes of considerable power, one of which had a focal length of 8 ft.; and, Molyneux having communicated these methods to Scarlet and Hearn, two London opticians, the manufacture of telescopes as a matter of business was com- menced by them (Smith's Opticks, bk. iii. ch. 1). But it was reserved for James Short of Edinburgh to give practical effect to Gregory's original idea. Born at Edinburgh in 17 10 and originally educated for the church, Short attracted the atten- tion of Maclaurin, professor of mathematics at the university, who permitted him about 1732 to make use of his rooms in the college buildings for experiments in the construction of telescopes. In Short's first telescopes the specula were of glass, as suggested by Gregory, but he afterwards used metallic specula only, and succeeded in giving to them true parabolic and elliptic figures. Short then adopted telescope-making as his

profession, which he practised first in Edinburgh and after- wards in London. All Short's telescopes were of the Gregorian form, and some of them retain even to the present day their original high polish and sharp definition. Short died in London in 1768, having realized a considerable fortune by the exercise of his profession.

Achromatic Telescope. — The historical sequence of events now brings us to the discovery of the achromatic telescope. The first person who succeeded in making achromatic refracting telescopes seems to have been Chester Moor Hall, a gentleman of Essex. He argued that the different humours of the human eye so refract rays of light as to produce an image on the retina which is free from colour, and he reasonably argued that it might be possible to produce a like result by combining lenses composed of different refracting media. 1 After devoting some time to the inquiry he found that by combining lenses formed of different kinds of glass the effect of the unequal refrangi- bility of light was corrected, and in 1733 he succeeded in con- structing telescopes which exhibited objects free from colour. One of these instruments of only 20-in. focal length had an aperture of 2j in. Hall was a man of independent means, and seems to have been careless of fame; at least he took no trouble to communicate his invention to the world. At a trial in Westminster Hall about the patent rights granted to John Dollond (Watkin v. Dollond), 2 Hall was admitted to be

1 The same argument was employed by Gregory more than fifty years previously, but had been followed by no practical result. The lens of the human eye is not achromatic.

2 At a meeting of the Royal Astronomical Society held on 9th May 1 886 a legal document, signed by Chester Moor Hall, was presented by R. B. Prosser of the Patent Office to the society. On the same occasion A. C. Ranyard made the following interesting statement respecting Hall : —

” Some years ago very little was known about Moor Hall. It was known that, about seven years after the patent for making achromatic object-glasses was granted to Dollond, his claim to the invention was disputed by other instrument-makers, amongst them by a Mr Champness, an instrument-maker of Cornhill, who began to infringe the patent, alleging- that John Dollond was not the real inventor, and that such telescopes had been made twenty- five years before the granting of his patent by Mr Moor Hall. John Dollond, to whom the Copley medal of the Royal Society had been

the first inventor of the achromatic telescope; but it was ruled by Lord Mansfield that ” it was not the person who locked his invention in his scrutoire that ought to profit for such invention, but he who brought it forth for the benefit of mankind.” 3 In 1747 Leonhard Euler communicated to the Berlin Academy of Sciences a memoir in which he endeavoured to prove the possibility of correcting both the chromatic and the spherical aberration of an object-glass. Like Gregory and Hall, he argued that, since the various humours of the human eye were so combined as to produce a perfect image, it should be possible by suitable combinations of lenses of different refracting media to construct a perfect object-glass. Adopting a hypothetical law of the dispersion of differently coloured rays of light, he proved analytically the possibility of con- structing an achromatic object-glass composed of lenses of glass and water. But all his efforts to produce an actual object- glass of this construction were fruitless — a failure which he attributed solely to the difficulty of procuring lenses worked precisely to the requisite curves (Mem. Acad. Berlin, 1753). Dollond admitted the accuracy of Euler’s analysis, but dis- puted his hypothesis on the grounds that it was purely a theo- retical assumption, that the theory was opposed to the results of Newton’s experiments on the refrangibility of light, and that it was impossible to determine a physical law from analytical reasoning alone (Phil. Trans., 1753, p. 289). In

1754 Euler communicated to the Berlin Academy a further memoir, in which, starting from the hypothesis that light consists of vibrations excited in an elastic fluid by luminous bodies, and that the difference of colour of light is due to the greater or less frequency of these vibrations in a given time, he deduced his previous results. He did not doubt the accuracy of Newton's experiments quoted by Dollond, because he asserted that the difference between the law deduced by Newton and that which he assumed would not be rendered sensible by such an experi- ment. 4 Dollond did not reply to this memoir, but soon after- wards he received an abstract of a memoir by Samuel Klingen- stierna, the Swedish mathematician and astronomer, which led him to doubt the accuracy of the results deduced by Newton on the dispersion of refracted light. Klingenstierna showed from purely geometrical considerations, fully appreciated by Dollond, that the results of Newton's experiments could not be brought into harmony with other universally accepted facts of refraction. Like a practical man, Dollond at once put his doubts to the test of experiment, confirmed the conclusions of Klingenstierna, discovered " a difference far beyond his hopes in the refractive qualities of different kinds of glass with respect to their divergency of colours," and was thus rapidly led to the construction of object-glasses in which first the chromatic and afterwards the spherical aberration were corrected (Phil. Trans., 1758, p. 733).

We have thus followed somewhat minutely the history of the gradual process by which Dollond arrived independently at his invention of the refracting telescope, because it has been asserted that he borrowed the idea from others. Montucla,

given for his invention, was the dead, and his son brought an action for infringing the patent against Champness. There is no report of the case, but the facts are referred to in the reports of subsequent cases. It appears that workmen who had been employed by Mr Moor Hall were examined, and proved that they had made achromatic object-glasses as early as 1733.

Dollond's patent was not set aside, though the evidence with regard to the prior manu- facture was accepted by Lord Mansfield, who tried the case, as having been satisfactorily proved . . . Mr Hall was a bencher of the Inner Temple, and was alive at the time of the action. He was a man of some property, and is spoken of on hh tombstone as an excellent lawyer and mathematician. He was not a fellow of the Royal Society, but must certainly have known of the gift of the Copley medal to Dollond. It is very curious the conflicting evi- dence we have to reconcile, but I think the balance of evidence is in favour of there having been a prior invention of achromatic object-glasses before the date of Dollond's patent" (Astron. Register, May 1886; see also the Observatory for same date).

3 Gentleman' s Magazine, 1790, part ii. p. 890.

4 For a good account of this controversy, see Dr H. Servus, Geschichte des Fernrohrs, p. 77 seq. (Berlin, 1886).

in his Histoire des Mathimatiques (pp. 448-449), gives the following footnote, communicated to him by Lalande: —

" Co fut Chestermonhall " (an obvious misprint for Chester Moor Hall) " qui, vers 1750, eut l'idec des lunettes achromatiques. II s'adressoit a Ayscough ' qui faisoit travaillir Bass. Dollond ayant cu besoin de Bass pour un verre que demandoit le due d'Yorck, Bass lui fit voir du crown-glass et du flint-glass. Hall donna une lunette a Ayscough, qui la montra a plusieurs personnes; il en donna la construction a Bird, qui n'en tint pas compte. Dollond en profita. Dans le proces qu'il y eut entre Dollond et Watkin, au banc du roi, cela fut prouve; mais Dollond gagna, parce qu'il etoit le premier qui eut fait connoitre les lunettes achromatiques."

It is clearly established that Hall was the first inventor of the achromatic telescope; but Dollond did not borrow the inven- tion from Hall without acknowledgment in the manner sug- gested by Lalande. His discovery was beyond question an independent one. The whole history of his researches proves how fully he was aware of the conditions necessary for the attainment of achromatism in refracting telescopes, and he may be well excused if he so long placed implicit reliance on the accuracy of experiments made by so illustrious a philosopher as Newton. His writings sufficiently show that but for this confidence he would have arrived sooner at a discovery for which his mind was fully prepared. It is, besides, impossible to read Dollond's memoir {Phil. Trans., 1758, p. 733) without being impressed with the fact that it is a truthful account, not only of the successive steps by which he independently arrived at his discovery, but also of the logical processes by which these steps were successively suggested to his mind.

The triple object-glass, consisting of a combination of two convex lenses of crown glass with a concave flint lens between them, was introduced in 1765 by Peter, son of John Dollond, and many excellent telescopes of this kind were made by him.

The limits of this article do not permit a further detailed historical statement of the various steps by which the powers of the telescope were developed. Indeed, in its practical form the principle of the instrument has remained unchanged from the time of the Dollonds to the present day; and the history of its development may be summed up as consisting not in new optical discoveries but in utilizing new appliances for figuring and polishing, improved material for specula and lenses, more refined means of testing, and more perfect and convenient methods of mounting.

About the year 1774 William Herschel, then a teacher of music in Bath, began to occupy his leisure hours with the construction of specula, and finally devoted himself entirely to their construction and

use. In 1778 he had selected the chef-d'oeuvre of some 400 specula which he made for the cele- brated instrument of 7-ft. focal length with which his early brilliant astronomical discoveries were made. In 1783 he com- pleted his reflector of 18 A in. aperture and 20-ft. focus, and in 1780 his great reflector of 4-ft. aperture and 40-ft. focal length. The fame of these instruments was rapidly spread by the brilliant discoveries which their maker's genius and per- severance accomplished by their aid. The reflecting telescope became the only available tool of the astronomer when great light grasp was requisite, as the difficulty of procuring disks of glass (especially of flint glass) of suitable purity and homo- geneity limited the dimensions of the achromatic telescope. It was in vain that the French Academy of Sciences offered prizes for perfect disks of optical flint glass. Some of the best chemists and most enterprising glass-manufacturers exerted their utmost efforts without succeeding in producing perfect disks of more than 35 in. in diameter. All the large disks were crossed by striae, or were otherwise deficient in the neces- sary homogeneity and purity. The subsequent history of the development of the art of manufacturing glass disks for telescopic objectives will be found in the article Glass: § Optical.

Instruments, &c. We proceed to give an account of the methods and prin- ciples of construction of the various kinds of telescopes, and 1 Ayscough was an optician in Ludgate Hill, London.

to describe in detail special typical instruments, which, owing to the work accomplished by their aid or the practical advances exemplified in their construction, appear most worthy of record or study.

Refracting Telescope

In its simplest form the telescope consists of a convex objective capable of forming an image of a distant object and of an eye-lens, concave or convex, by which the image so formed is magnified. When the axis of the eye-lens coincides with that of

the object-glass, and the focal point of the eye-lens is coin- cident with the principal focus of the object-lens, parallel rays incident upon the object-glass will emerge from the eye-piece as parallel rays. These, falling in turn on the lens of the human eye, are converged by it and form an image on the retina.

Fig. 1 shows the course of the rays when the eye-lens is convex (or positive), fig. 2 when the eye-lens is concave (or negative). The former represents Kepler's, the latter Lippershey's or the Galilean telescope. The magnifying power obviously depends on the proportion of the focal length of the object-lens to that of the eye-lens, that is,

magnifying power =F/e, where F is the focal length of the object-lens and e that of the eye-lens. Also the diameter of the pencil or parallel rays emerging from the eye-lens is to the diameter of the object-lens inversely as the magnifying power of the telescope. Hence one of the best methods of determining the magnifying power of a telescope is to measure the diameter of the emergent pencil of rays, after the telescope has been adjusted to focus upon a star, and to divide the diameter of the object- glass by the diameter of the emergent pencil. If we desire to utilize all the parallel rays which fall upon an object-glass it is necessary that the full pencil of emerging rays should enter the observer's eye. Assuming with Sir William Herschel that the normal pupil of the eye distends to one-fifth of an inch in diameter when viewing faint objects, we obtain the rule that the minimum magnifying power which can be efficiently employed is five times the diameter of the object-glass expressed in inches. 2 The defects of the Galilean and Kepler telescopes are due to the chromatic and spherical aberration of the simple lenses of which they are composed. The substi- tution of a positive or negative eye-piece for the simple convex or concave eye-lens, and of an achromatic object-glass for the simple object-lens, transforms these early forms into the modern achromatic telescope. The Galilean telescope with a concave eye-lens instead

of an eye-piece still sur- vives as the modern opera-glass, on account of its shorter length, but the object-glass and eye-lens are achromatic combinations.

(D. Gl.)

Telescope Objectives. 3 — In spite of the improvements in the manufacture of optical glass (see Glass) practically the same crown and flint glasses as used by John Dollond in 1758 for achromatic objectives are still used for all the largest of the modern refracting telescopes.

It has long been known that the spectra of white or solar light yielded by ordinary crown and flint glasses are different: that while two prisms of such glasses may be arranged to give exactly the same angular dispersion between two Fraunhofer

2 In the case of short-sighted persons the image for very distant objects (that is, for parallel rays) is formed in front of the retina; therefore, to enable such persons to see distinctly, the rays emerging from the eye-piece must be slightly divergent; that is, they must enter the eye as if they proceeded from a comparatively near object. For normal eyes the natural adaptation is not to focus for quite parallel rays, but on objects at a moderate distance, and practi- cally, therefore, most persons do adjust the focus of a telescope, for most distinct and easy vision, so that the rays emerge from the eye-piece very slightly divergent. Abnormally short-sighted per- sons require to push in the eye-lens nearer to the object-glass, and long-sighted persons to withdraw it from the adjustment employed by those of normal sight. It is usual, however, in computations of the magnifying power of telescopes, for the rays emerging from the eye-piece when adjusted for distinct vision to be parallel.

3 For the methods of grinding, polishing and testing lenses, see

Fig. 2.

lines, such as C and F, yet the flint glass prism will show a relative drawing out of the blue end and a crowding together of the red end of the spectrum, while the crown prism shows an opposite tendency. This want of proportion in the dis- persion for different regions of the spectrum is called the " irrationality of dispersion "; and it is as a direct consequence of this irrationality, that there exists a secondary spectrum or residual colour dispersion, showing itself at the focus of all such telescopes, and roughly in proportion to their size. These glasses, however, still hold the field, although glasses are now produced whose irrationality of dispersion has been reduced to a very slight amount. The primary reason for this retention is that nothing approaching the difference in dispersive power between ordinary crown glass and ordinary dense flint glass (a difference of 1 to if) has yet been obtained between any pair of the newer glasses. Consequently, for a certain focal length, much deeper curves must be resorted to if the new glasses are to be employed; this means not only greater diffi- culties in workmanship, but also greater thickness of glass, which militates against the chance of obtaining large disks quite free from striae and perfect in their state of annealing. In fact, superfine disks of over 15 in. aperture are scarcely possible in most of the newer telescope glasses. Moreover the greater depths of the curves (or " curvature powers ") in itself neutralize more or less the advantages obtained from the reduced irrationality of dispersion. When all is taken into consideration it is scarcely possible to reduce the secondary colour aberration at the focus of such a double object-glass to less than a fourth part of that prevailing at the focus of a double objective of the same aperture and focus, but made of the

ordinary crown and flint glasses.

The only way in which the secondary speptrum can be reduced still further is by the employment of three lenses of three different sorts of glass, by which arrangement the secondary spectrum has been reduced in the case of the Cooke photo visual ob- jective to about 1 /20th part of the usual amount, if the whole region of the visible spectrum is taken into account. It is possible to construct a triple objective of two positive lenses enclosing between them one negative lens, the two former being made of the same glass. For relatively short focal lengths a triple construction such as this is almost necessary in order to obtain an objective free from aberration of the 3rd order, and it might be thought at first that, given the closest attainable degree of rationality between the colour dispersions of the two glasses employed, which we will call crown and flint, it would be impossible to devise another form of triple objective, by retaining the same flint glass, but adopting two sorts of crown instead of only one, which would have its secondary spectrum very much further reduced. Yet such is the rather surprising fact. But it can be well illustrated in the case of the older glasses, as the following case will show.

The figures given are the partial dispersions for ordinary crown and ordinary extra dense flint glasses, styled in Messrs Schott's catalogue of optical glasses as o - 6o and 0-102 re- spectively, having refractive indices of 1-5179 and 1-6489 for the D ray respectively, and (md-i)/(Mf-Mc) = 6o-2 and 33-8 respectively to indicate their dispersive powers (inverted), — v.

CtoF

A to D

D toF 1

FtoG

o-6o

0-IO2

•00860 •01919

•

I-OOO I-OOO

•00533 •01 152

•643 ■600

•00605 •01372

■7*03

■7H

•00487 •01 180

■5*66 •615

•02779

I-OOO

•01685

•613

■01977

•711 |

■01667

•600

The A/u from C to F being taken as unity in each case, then the Aju's for the other regions of the spectrum are expressed in fractions A/i (C to F) and are given under the asterisks. Let it be supposed that two positive lenses of equal curvature powers are made out of these two glasses, then in order to represent the combined dispersion of the two together the two Aju's for each spectral region may

be added together to form AV as in the line below, and then, on again expressing the partial A'ju'

in terms of A'ju (C to F) we get the new figures in the bottom row beneath the asterisks. We find that we have now got a course of dispersion or degree of rationality which very closely corresponds to that of an ordinary light flint glass, styled 0-569 in Schott's catalogue, and having /m d 1-5738 and (/x d -i)/(Mf-Mc) =41 •4 = p, the figures of whose course of dis- persion are as below: —

Light Flint Glass 0-569.

CtoF

A' to D

D toF 1

FtoG

■01385

I-OOO

■00583

•615

•00987

•713

•00831

•600

Hence it is clear that if the two positive lenses of equal curvature power of o-6o and 0-102 respectively are combined with a negative lens of light flint 0-569, then a triple objective, having no secondary spectrum (at any rate with respect to the blue rays), may be obtained.

But while an achromatic combination of o-6o and 0-102 alone will yield an objective whose focal

length is only 1-28 times the focal length of the negative or extra dense flint lens, the triple combination will be found to yield an objective whose focal length is 73 times as great as the focal length of the negative light flint lens. Hence impossibly deep curvatures would be required for such a triple objective of any normal focal length. This case well illustrates the much closer approach to strict rationality of dispersion which is obtainable by using two different sorts of glass for the two positive lenses, even when one of them has a higher dispersive power than the glass used for the negative lens.

It is largely to this principle that the Cooke photo visual ob- jective of three lenses (fig. 3) owes its high degree of achromatism. This form of objective has been successfully made up to I2$ in. clear aperture. The front lens is made of baryta light flint glass

Fig. 3.

(°'543 °f Schott's catalogue) and the back lens of a crown glass, styled 0-374 in Schott's older lists.

The table gives their partial dispersions for six different regions of the spectrum also expressed (in brackets below) as fractional parts of the dispersion from C to F.

CtoF

A to C

DtoF

E toF

FtoG'

F toH

o-543 ai d = 1-564 « =50-7

•01 1 15 (i-oooo)

•00374

(-3354)

•00790

(•7085)

•00369 (•3309)

•00650 (•5830)

•01322

(1-1857)

o-374 Md= 1-511 v =*6o-8

■00844 (i-oooo)

•00296

(•3507)

•00593

(•7026)

■00274 (•3247)

•00479

(-5675)

•00976

(1-1564)

Since the curvature powers of the positive lenses are equal, the partial dispersions of the two glasses may be simply added together, and we then have : —

[0-543+0-374]

CtoF

A toC

DtoF

E toF

FtoG’

FtoH

•01959 (i-oooo)

■00670 (•3420)

•01383

(•7059)

•00643

(•3282)

•01129

(•5763)

•02298

(1-1730)

The proportions given on the lower line may now be compared with the corresponding proportional dispersions for borosilicate flint glass 0-658, closely resembling the type 0-164 of Schott’s list,

[0-658 (md = 1-546) ”

= 50-1]

CtoF

j A to C

D to F

E to F

FtoG’

FtoH

I-OOOO

I -3425

•7052

•3278

•5767

II745

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A slight increase in the relative power of the first lens of 0-543 would bring about a stiil closer correspondence in the rationality, but with the curves required to produce an object-glass of this type of 6 in. aperture and 108 in. focal length a discrepancy of 1 unit in the 3rd decimal place in the above proportional figures would cause a linear error in the focus for that colour of only about •025 in., so that the largest deviation implied by the tables would be a focus for the extreme violet H ray about -037 longer than the normal. It will be seen, then, that the visual and photographic foci are now merged in one, and the image is practically as achromatic as that yielded by a reflector.

Other types of triple object-glasses with reduced secondary spectra have recently been introduced. The extension of the image away from the axis or size of field available for covering a photographic plate with fair definition is a function in the first place of the ratio between focal length and aperture, the longer focus having the greater relative or angular covering power, and in the second a function of the curvatures of the lenses, in the sense that the objective must be free from coma at the foci of oblique pencils or must fulfil the sine condition (see Aberration).

Eye-pieces. — The eye-pieces or oculars through which, in case of visual observations, the primary

images formed by the ob- jective are viewed, are of quite secondary importance as re- gards definition in the central portion of the field of view. If an eye-piece blurs the definition in any degree in the centre of the field it must be very badly- figured indeed, but the defini- tion towards the edge of the field, say at 20 away from the centre of the apparent field of view, depends very in- timately upon the construction of the eye-piece. It must be so designed as to give as flat an image as is possible consistently with freedom from astigmatism of oblique pencils. The mere size of the apparent field of view depends upon obtaining the oblique pencils of light emerging from it to cross the axis at the great possible angle, and to this end the presence of a field-lens is indispensable, which is separated from the eye-lens by a con- siderable interval.

The earlier arrange- ment of two lenses of the Huygenian eye-piece (see Microscope) having foci with ratio of 3 to 1, gives a fairly large flat field of view approxim- ately free from distortion of tangential lines and from coma, while the Mittenzw°y variety of it (fig. 4) in which the field-lens is changed into a meniscus having radii in about the ratio of +1 to - 9 gives still better results, but still not quite so good as the results obtained by using the combination of two convexo-plane lenses of the focal ratio 2 to 1.

In the Ramsden eye- piece (see Microscope) the focal lengths of the two plano-convex lenses are equal, and their convexities are turned towards one another. The field-lens is thus in the principal focal plane of the eye-lens, if the separation be equal to \(j--ft). This is such a practical drawback that the separation is generally fths or fths of the theoretical, and then the primary image viewed by the eye- piece may be rather outside the field-lens, which is a great practical advantage, especially when a reticule has to be mounted in the primary focal plane, although the edge of the field is not quite achromatic under these conditions.

Kellner Eye-piece. — In order to secure the advantage of the principal focal plane of the eye-piece being well outside of the field-lens and at the same time to obtain a large flat field of

view with oblique achromatism and freedom from coma and distortion, there is no better construction than the modified Kellner eye-piece (fig. 5) such as is generally used for prismatic binoculars. It consists of a plano-convex field-lens of crown, glass and an approximately achromatic eye-lens, some distance behind it, consisting of an equi-convex crown lens cemented to a concavo- plane flint lens, the latter being next to the eye.

There are also other eye-pieces having the field-lens double or achromatic as well as the eye-lens.

In cases where it is important to get the maximum quantity of light into the eye, the field-lens is discarded and an achromatic eye-lens alone employed. This yields a very much smaller field of view, but it is very valuable for viewing feeble telescopic objects and very delicate planetary or lunar details. Zeiss and Steinheil's monocentric eye-pieces and the Cooke single achromatic eye-piece (fig. 6) are examples of this class of oculars. (H. D. T.)

Reflecting Telescope. The following are the various forms of reflecting telescopes:—

The Gregorian telescope is represented in fig. 7, A A and B B are concave mirrors having a common axis and their concavities facing each other. The focus of A for parallel rays is at F, that of B for parallel rays at / — between B and F. Ore " Parallel rays falling on A A converge at F, where an image »"■ is formed ; the rays are then reflected from B and converge at P, where a second and more enlarged image's formed. Gregory himself

Fig. 7. — Gregorian Telescope.

showed that, if the large mirror were a segment of a

paraboloid of revolution whose focus is F, and the small mirror an ellipsoid of revolution whose foci are F and P respectively, the resulting image will be plane and undistorted. The image formed at P is viewed through the eye-piece at E, which may be of the Huygenian or Ramsden type. The focal adjustment is accomplished by the screw S, which acts on a slide carrying an arm to which the mirror B is attached. The practical difficulty of constructing Gregorian telescopes of good denning quality is very considerable, because if spherical mirrors are employed their aberrations tend to increase each other, and it is extremely difficult to give a true elliptic figure to the necessarily deep concavity of the small speculum. Short appears to have systematically conquered this difficulty, and his Gregorian telescopes attained great celebrity. The use • of the Gregorian form is, however, practically abandoned in the present day. The magnifying power of the telescope is = F//«c, where F and / are respectively the focal lengths of the large and the small mirror, e the focal length of the eye-piece, and x the distance between the principal foci of the two mirrors (= F/ in the diagram) when the instrument is in adjustment for viewing distant objects. The images are erect.

*The Cassegrain telescope differs from the Gregorian only in the substitution of a convex hyperboloidal mirror for a concave ellip- soidal mirror as the small speculum. This form has two distinct advantages: (1) if spherical mirrors are employed Casse- their aberrations have a tendency to correct each other; *™"» (2) the instrument is shorter than the Gregorian, caeteris paribus, by twice the focal length of the small mirror. Fewer telescopes have been made of this than perhaps of any other form of reflector; but in comparatively recent_ years the Cassegrain has acquired importance from the fact of its adoption for the great Melbourne telescope, and from its employment in the 60-in. reflector of the Mount Wilson Solar Observatory (see below). For spectroscopic purposes the Cassegrain form has peculiar advantages, because in consequence of the*

less rapid convergence of the rays after reflection from the convex hyperboloidal mirror, the equivalent focus can be made very great in comparison with the length of the tube. This permits the employment of a spectroscope furnished with a collimator of long focus. The magnifying power is computed by the same formula as in the case of the Gregorian telescope.

The Newtonian telescope is represented in Fig. 8. A A is a con- cave mirror whose axis is a a. Parallel rays falling on A A converge on the plane mirror B B, and are thence reflected at „ right angles to the axis, forming an image in the focus of » eVm the eye-piece E. The surface of the large mirror should «""«*»• be a paraboloid of revolution, that of the small mirror a true optical plane. The magnifying power is = Fje. This form is employed in the

construction of most modern reflecting telescopes. A glass prism of total reflection is sometimes substituted for the plane mirror.

Newtonian Telescope.

The Herschelian or front view reflector is represented in fig. 9. A A is a concave parabolic mirror, whose axis a c is inclined to the axis of the tube a b so that the image of an object in the focus of the mirror may be viewed by an eye-piece at E, the angle b ac being

equal to the angle c a K. This form was adopted by the "h'cllsn e 'der Herschel to avoid the loss of light from reflection in

the small mirror of the Newtonian telescope. The front view telescope, however, has hardly been at all employed except by the Herschels. But at the same time none but the Herschels have swept the whole sky for the discovery of faint nebulae; and

Fig. 9. — Herschelian Reflector.

probably no other astronomers have worked for so many hours on end for so many nights as they did, and they emphasize the easy position of the observer in using this form of instrument.

Construction of Specula.

The composition of metallic specula in the present day differs very little from that used by Sir Isaac Newton. Many different alloys have been suggested, some including silver, nickel, zinc or arsenic; but that which has practically been found best is an alloy of four equivalents of copper to one of tin, or the following pro- portions by weight: copper 252, tin 117-8. Such speculum metal is exceedingly hard and brittle, takes a fine white polish, and when protected from damp has little liability to tarnish. The process of casting and annealing, in the case of the specula of the great Melbourne telescope, was admirably described by Dr Robinson in Phil. Trans., 1869, 159, p. 135. Shaping, polishing and figuring of specula are accomplished by methods and tools very similar to those employed in the construction of lenses. The reflecting surface is first ground to a spherical form, the parabolic figure being given in the final process by regulating the size of the pitch squares and the stroke of the polishing machine.

Soon after Liebig's discovery of a process for depositing a film of pure metallic silver upon glass from a salt of silver in solution, Steinheil {Gaz. Univ. d'Augsburg, 24th March 1856), and later, in- dependently, Foucault (Comptes Rendus, vol. xliv., February 1857), proposed to employ glass for the specula of telescopes, the reflect- ing surface of the glass speculum to be covered with silver by Liebig's process. Those silver-on-glass specula are now the rivals of the achromatic telescope, and it is not probable that many tele- scopes with metal specula will be made in the future. The best speculum metal and the greatest care are no guarantee of freedom from tarnish, and, if such a mirror is much exposed, as it must be in the hands of an active observer, frequent repolishing will

probably be necessary. This involves refiguring, which is the most delicate and costly process of all. Every time, therefore, that a speculum is repolished, the future quality of the instrument is at stake; its focal length will probably be altered, and thus the value of the constants of the micrometer also have to be redetermined. Partly for these reasons the reflecting telescope with metallic mirror has never been a favourite with the professional astronomer, and has found little employment out of England.' In England, in the hands of the Herschels, Rosse, Lassell and De la Rue it has done

1 There is a noteworthy exception in the case of the 18-in. speculum- metal mirror employed by Sir William Huggins at Tulse Hill, with which a large part of his remarkable and important series of astro- spectroscopic results have been obtained. So far as we know, this mirror has never been repolished since its first installation in 1870, and still retains its admirable surface. One of Short's mirrors, made about 1760 or 1770, of 6-in. aperture, now in the possession of Sir William Huggins, has surfaces which still retain their original perfection although they have never been repolished.

splendid service, but in all these cases the astronomer and the instrument-maker were one. The silver-on-glass mirror has the enormous advantage that it can be resilvered with little trouble, at small expense, and without danger of changing the figure. Glass is lighter, stiffer, less costly and easier to work than speculum metal. Silvered mirrors have also some advantage in light grasp over those of speculum metal, though, aperture for aperture, the former are inferior to the modern object-glass. Comparisons of light grasp derived from small, fresh, carefully silvered surfaces are sometimes given which lead to illusory results, and from such experiments Foucault claimed superiority for the silvered speculum over the object-glass. But Sir David Gill found from experience and careful comparison that a silvered mirror of 12-in. aperture, mounted as a Newtonian telescope (with a

silvered plane for the small mirror), when the surfaces are in fair average condition, is equal in light grasp to a first-rate refractor of 10-in. aperture, or area for area as 2 : 3. This ratio will become more equal for larger sizes on account of the additional thickness of larger object-glasses and the consequent additional absorption of light in transmission.

Mounting of Telescopes.

The proper mounting of a telescope is hardly of less import- ance than its optical perfection. Freedom from tremor, ease and delicacy of movement and facility of directing the instrument to any desired object in the heavens are the primary qualifica- tions. Where accurate differential observations or photographs involving other than instantaneous exposures have to be made, the additional condition is required that the optical axis of the telescope shall accurately and automatically follow the object under observation in spite of the apparent diurnal motion of the heavens, or in some cases even of the apparent motion of the object relative to neighbouring fixed stars.

Our limits forbid a historical account of the earlier endeavours to fulfil these ends by means of motions in altitude and azimuth, nor can we do more than refer to mountings such as those em- ployed by the Herschels or those designed by Lord Rosse to over- come the engineering difficulties of mounting his huge telescope of 6 ft. aperture.- Both are abundantly illustrated in most popular works on astronomy, and it seems sufficient to refer the reader to the original descriptions. 2

We pass, therefore, directly to the equatorial telescope, the instrument par excellence of the modern extra-meridian astronomer. The article Transit Circle describes one form of mounting in which the telescope is simply a refined sub- stitute for the sights or pinules of the old astronomers. The present article contains a description of the mounting of the various forms of the so-called

zenith telescope. In its simplest form the mounting of an equatorial telescope consists of an axis parallel to the earth's axis, called "the polar axis"; a second axis at right angles to the polar axis called " the declination axis "; and the telescope tube fixed at right angles to the declination axis.

In Fig. 10 A A is the polar axis; the telescope is attached to the end of the declination axis; the latter rotates in bearings which are attached to the polar axis and concealed by the telescope itself. The telescope is counterpoised by a weight attached to the opposite end of the declination axis. The lower pivot of the polar axis rests in a cup-bearing at C, the upper bearing upon a strong metal casting M M attached to a stone pier S. A vertical plane passing through A A is therefore in the meri- dian, and the polar axis is inclined to the horizon at an angle equal to that of the latitude of the place of observation. Thus, when the de- clination axis is hori- zontal the telescope moves in the plane of the meridian by rota- tion on the declination axis only. Now, if a

graduated circle B B is attached to the declination axis, together with the necessary verniers or microscopes V V for reading it (see Transit Circle), so arranged that when the telescope is turned on the declina- tion axis till its optical axis is parallel to A A the vernier reads o° and when at right angles to A A 90 , then we can employ the readings of

Fig. 10.-

-Equatorial Telescope. English form.

2 Herschel, Phil. Trans. 1840, p. 503; 1861, p. 681.

1795. 85, p. 347; Rosse, Phil. Trans.

this circle to measure the polar distance of any

star seen in the tele- scope, and these readings will also be true (apart from the effects of atmospheric refraction) if we rotate the instrument through any angle on the axis A A. Thus one important attribute of an equatorially mounted telescope that, if it is directed to any fixed star, it will follow the diurnal motion of that star from rising to setting by rotation of the polar axis only. If we now attach to the polar axis a graduated circle D D, called the " hour circle," of which the microscope or vernier R reads o h when the declination axis is horizontal, we can obviously read off the hour angle from the meri- dian of any star to which the telescope may be directed at the instant of observation. If the local sidereal time of the observation is known, the right ascension of the star becomes known by adding the observed hour angle to the sidereal time if the star is west of the meridian, or subtracting it if east of the meridian. Since the transit circle is preferable to the equatorial for such observations therein great accuracy is required, the declination and hour circles .->(an equatorial are employed, not for the determination of the right ascensions and declinations of celestial objects, but for directing the telescope with ease and certainty to any object situated in an approximately known position, and which may or may not be visible to the naked eye, or to define approximately the position of an unknown object. Further, by causing the hour circle, and with it the polar axis, to rotate by clockwork or some equivalent mechanical contrivance, at the same angular velocity as the earth on its axis, but in the opposite direction, the telescope will, apart from the effects of refraction, automatically follow a star from rising to setting.

Types of Equatorials. — Equatorial mountings may be divided into six types. (A) The pivots or bearings of the polar axis are placed at its extremities. The declination axis rests on bearings attached to opposite sides of the polar axis. The telescope is attached to one end of the declination axis, and counterpoised by a weight at the other end, as in

fig. 10. (B) The polar axis is supported as in type A; the telescope is placed between the bearings of the declina- tion axis and is mounted symmetrically with respect to the polar axis ; no counterpoise is therefore requisite. (C) The declination axis is mounted on the prolongation of the upper pivot of the polar axis ; the telescope is placed at one end of the declination axis and counter- poised by a weight at the other end. (D) The declination axis is mounted on a forked piece or other similar contrivance attached to a prolongation of the upper pivot of the polar axis; the tele- scope is mounted between the pivots of the declination axis. (E) The eye-piece of the telescope is placed in the pivot of the polar axis; a portion or the whole of the axis of the telescope tube co- incides with the polar axis. (F) The telescope is fixed and the rays are reflected along its axis from an external mirror or mirrors. Mountings of types A and B— that is, with a long polar axis sup- ported at both ends — are often called the " English mounting," and type C, in which the declination axis is placed on the extension of the upper pivot of the polar axis, is called the " German mounting," from the first employment of type C by Fraunhofer. A description of some of the best examples of each type will illustrate their relative advantages or peculiarities.

Type A. — Fig. 10 may be taken as a practical example of the earlier equatorials as made by Troughton in England and afterwards

by Gambey for various Continental observatories. In the Phil. Trans. for 1824 (part 3, pp. 1-412) will be found a description by Sir John Herschel and Sir James South of the equatorial telescope which they employed in their measurements of double stars. The polar axis was similar in shape to that of fig. 10 and was composed of sheets of tinned iron. In Smyth's celebrated Bedford telescope the polar axis was of mahogany. Probably the best example of this type of mounting applied to a refractor is that made

, , ,, „ a ' by the elder Cooke of York for Flet-

Melbourne Reflector. c £ er of Tarnbank; the polar axis is

Great Mel- bourne telescope.

Fig. 11

of cast iron and the mounting very satisfactory and convenient, but unfortunately no detailed description has been published. In recent years no noteworthy refractors have been mounted on this plan; but type A has been chosen by Grubb for the great Melbourne reflector, of 48-in. aperture, with marked ingenuity of adaptation to the peculiar requirements of the case. Fig. 1 1 shows the whole instrument on a small scale with the telescope directed to the pole, and the hour circle set & from the meridian.

Type B. — The most important examples of type B are Airy's equatorial at Greenwich (originally made to carry a telescope of 13-in. aperture, but now fitted with a telescope by Grubb of 28-in. aperture), and the photographic equatorials of 13-in. aperture employed at Paris and other French observatories, of which the object-glasses were made by the brothers Henry and the mountings by Gamier of Paris. These instruments have done admirable work in connexion with

the great international undertaking, the Carte du Ciel. The general construction will be understood from fig. 12. The double polar axis is composed of hollow metal beams of triangular section. The hour circle has two toothed circles cut upon it, one acted upon by a worm screw mounted on the pier and driven by clockwork, the other by a second worm screw attached to the polar axis, which can be turned by a handle in the observer's hand and thus a slow movement can be given to the telescope in right ascension inde-

Fig. 12. — Paris Observatory Instrument. • After an illustration in La Nature, by permission of Masson et Cie.

pendently of the clock. Slow motion in declination can be com- municated by a screw acting on a long arm, which latter can be clamped at pleasure to the polar axis. An oblong metallic box fitted with pivots, whose bearings are attached to the triangular beams, forms the tube for two parallel telescopes; these are separated throughout their length by a metallic diaphragm. The chromatic aberration of the object-glass of one of these telescopes is corrected for photographic rays, and the image formed by it is received on a highly sensitive photographic plate. The other telescope is corrected for visual rays and its image is formed on the plane of the spider-lines of a filar micrometer. The peculiar form of the tube is eminently suited for rigid preservation of the relative parallelism of the axes of the two telescopes, so that, it the image ot a certain selected star is retained on the intersection of two wires of the micrometer, by means of the driving clock, aided by small corrections given by the observer in right ascension and declination (required on account of irregularity in the clock movement, error in astronomical adjustment of the polar axis, or changes in the star's apparent place produced by refraction), the image of a star will continue on the same spot of the photographic film during the whole time of exposure. In these telescopes the photographic object- glass has an aperture of 13 in. and the visual object-glass of 10 in. Both telescopes have the same focal length, viz. 11-25 ft., so that, in the image produced, 1 mm. is = i' of arc. An excellent mounting of type B, made by T. Cooke & Sons of York, has been employed by Franklin Adams for making his maps of the sky.

Type C. — Many more telescopes have been made of type C than of any other, and this form of mounting is still most generally employed for the mounting of modern refractors. Fraunhofer's chef-d'oeuvre, the great Dorpat refractor, made for Otto Struve about 1820, had a mounting of this type, and was the first equatorial of any importance to be provided with clockwork. The instrument, shown in fig. 13, is

described in detail by Struve {Beschreibung des auf der Sternwarte zu Dorpat befindlichen grossen Refractors von

Fraunhofer, Dorpat, 1825), and was an enormous advance upon all previous telescopes for micrometric research. In the hands of Struve results were obtained by it which in combined quality and quantity had never before been reached. Its success was such that the type of Fraunhofer's telescope became stereotyped for many years not only by Fraunhofer's successors but throughout Germany. When, twelve years afterwards, Struve ordered the 15-in. refractor for the new observatory at Pulkovo, the only important change made by Fraunhofer's successors was, at Struve's suggestion, the substitution of a stone pier for the wooden stand in the original instru- ment.

Both the Dorpat and the Pulkovo refractors are defective in rigidity, especially in right ascension. The declination circle is most incon- venient of access, and slow motion in declination can only be effected when the instru- ment is clamped by a long and inconvenient handle ; so that, practically, clamping in declination was not employed. The slow motion in right defec- tive, being accom- plished in the Dorpat refractor by changing the rate of the clock, and in the Pulkovo

Fig. 13. — Dorpat Refractor.

refractor by a handle which, when used, affects very injuriously the rate of the clock for the time being. Struve's skill as an observer was such that he used to complete the bisection on the fixed wire of the micrometer by a pressure of the finger on the side of the tube — a method of proved efficiency in such hands, but plainly indicative of the want of rigidity in the instrument and of the imperfection of the slow motions (see Micrometer).

The driving circle is also much too small, so that a very slight mechanical freedom of the screw in the teeth involves a large angular freedom of the telescope in right ascension, while its position at the lower end of a too weak polar axis tends to create instability from torsion of that axis. Strange to say, the wooden tube long retained its place in German telescope-mountings.

About 1840 a great advance was made by the Repsolds of Hamburg in the equatorial mounting of the Oxford heliometer. The driving circle was greatly increased in diameter and placed at the upper end of the polar axis : and both the polar and declination axes were made much stronger in proportion to the mass of the instrument they were designed to carry. (A figure of the instrument is given in the Oxford Observations for 1850.) About 1850 Thomas Cooke of York began his career as a maker of equatorial telescopes. The largest example of his work is the refractor of 24-in. aperture, originally made for the private observatory of Robert Stirling Newall at Gateshead, Northumberland, and afterwards presented by him to the University Observatory, Cambridge. Cooke's mount- ing is admirable for its symmetry and simplicity of design, its just apportioning of strength, and a general suitability of means to ends.

It is not a little curious that the obvious improvement of trans-

ferring'the declination axis as well as the declination-clamp to thn telescope end of the declination axis was so long delayed ; we can explain the delay only by the desire to retain the declination circle as a part of the counterpoise. We believe the first important equatorials in which the declination was read from the eye-end were the 15-in. by Grubb and the 6-in. by Cooke, made for the observatory of Lord Crawford (Lord Lindsay) at Dun Echt, Aberdeenshire, about 1873. The plan is now universally adopted. Telescopes of such dimensions can be conveniently directed to any object by the circles without the observer being under the

necessity to climb a special ladder. But when much larger instruments are required the hour circle becomes inaccessible from the floor, and means have to be devised for reading both circles from the eye-end. This was first accomplished by Grubb in the great refractor of 27-in. aperture which he constructed for the Vienna observatory, represented in section in fig. 14. The observer's eye is applied to the small telescope E. which (by means of prisms numbered I, 2 3, 4) views the vernier attached to the cross-head simultaneously with the hour circle at- tached to the upper end of the polar axis. Light to illuminate the vernier and circle is thrown from the lamp L upon prism 4 by the prisms 6 and 5. Prism I is in the axis of the declination circle and always reflects rays along that axis, whatever the position of the telescope may be, whilst the prisms 2, 3, 4, 5 and 6 are attached to the cross - head and therefore

Fig. 14. — Grubb's 27-in. Refractor (Vienna).

preserve their relative positions to each other. Through the eye- piece of the bent ' telescope E' another hour circle attached to the lower end of the polar axis can be seen; thus an assistant is able to direct the telescope by a handle at H to any desired hour angle. A slight rotatory motion of the telescope E on its axis enables the vernier of the declination circle to be read through prism I. The leading features of this fine instrument represent those of all Grubb's large telescopes. The mode of relieving the friction of the declination axis is similar to that employed in the Melbourne telescope and in the account of the Vienna telescope published by Grubb. The end friction of the polar axis is relieved by a ring of conical rollers shown in section beside the principal figure.

From this point we must condense farther description into critical remarks on a few typical modern instruments.

(1) Telescopes of Moderate Size for Micrometric Research Only. — Fig. 15 shows the mounting of the

8-in. refractor, of 9-ft. focal length, at the private observatory of Dr Engelmann, Leipzig. The object-glass is by Messrs Clark of Cambridge, Mass., the mounting by the Repsolds of Hamburg. The declination circle reads from the eye-end, and four handles for clamping and slow motion in right ascension and declination are situated near the observer's hands. The tube is of sheet steel, light, stiff, and free from tremor. The eye-end carries the micrometer with an illuminating apparatus similar to that described under Micrometer. The lamp near the eye-end illuminates the field or the wires at pleasure, as well as the position circle of the micrometer and the declination circle; a separate lamp illuminates the hour circle. An excellent feature is the short distance between the eye-piece and the declination axis, so that

1 In the bent telescope refracting prisms are employed at the corners to change the direction of the rays.

Repsolds' small equa- torial.

the observer has to follow the eye-end in a comparatively small circle; another good point is the flattening of the cast-iron centre- piece of the tube so that the flange of the declination axis is attached as near to the axis of the telescope tube as is consistent with free passage of the cone of rays from the object-glass. The substitution of small incandes cent electric lamps is an improvement now uni- versally adopted.

(2) Telescopes for General Purposes.— -The modern equatorial should, for general purposes, be capable of carrying spectroscopes of considerable weight so that the proportional strength of the axes and the rigidity of the instrument have to be considerably increased. The original mounting of the Washington refractor of 26-in. aperture and 32^-ft. focal

length (described in Washington Observations, 1874, App. 1) was in these respects very defective, the polar and declina- tion axes being only 7 in. in diameter.

The great Pulkovo refractor (fig. 16) erected in 1885 is of 30-in. aperture and 45- ft. focal length. The object-glass is by Clark, the mounting by the Repsolds. The tube is cylindri- cal, of riveted steel plate, gradu- ated in thickness from the centre to its extremities, and bolted by very powerful flanges to a strong short cast-iron central tube, in which, as in Dr Engelmann's telescope (fig. 15), the attachment to the flange of the declination axis is placed as close as it can be to the axis of the tube without interfering with rays converging from the object-glass to any point in the field of view. A new feature in this instrument is the platform at the lower end of the polar axis, where an assistant can view the hour circle by one eye-piece and the declination circle by another (looking up the per- forated polar axis), and where he can also set the telescope to any hour angle by one wheel, or to any declination by a second, with the greatest ease. The observer at the eye-end can also read off the hour and declination circles and communicate quick or slow motions to the telescope both in right _ .. ascension and declination by conveniently

retractor P' ace d handles. The eye end presents an

appearance too complicated to be figured here; it has a micrometer and its illumination for the position circle, a micrometer head, and a bright or dark field, clamps in right ascension and declination and quick and slow motion in the same, a finder, micro- scopes for reading the hour and declination circles, an illuminated dial showing sidereal time and driven by an electric current from the sidereal clock, and counter weights which can be re- moved when a spectroscope or other heavy appliance is added. All these, although making up an apparently complicated ap- paratus, are conveniently

Fig.

15. — Dr Engelmann's 8-in. Refractor.

Fig. 16. — Pulkovo Refractor, arranged, and are all necessary for the quick and easy working

of so large an instrument. We have the authority of Otto Struve for stating that in practice they are all that can be desired. There is in this instrument a remarkably elegant method of relieving the friction of the polar axis. Let A A (fig. 17) be a section of the polar axis; it is then easy to adjust the weight P attached to its lower end so that the centre of gravity X of the whole moving parts of the instrument shall be in the vertical (V V) of a line passing through the apex of the hollowed flange p q at q, which flange forms part of the polar axis. If now a wheel W is forced up against q \vith a pressure equal to the weight of the moving part of the instrument, the whole weight of the moving part would rest upon W in unstable equilibrium; or if a pressure R, less than W, is employed, we have the end friction on the lower bearing removed to an extent = R sin $, and the friction on the bearings of the upper pivot removed to the extent of F cos , — where is the latitude of the place. The wheel W is therefore mounted on a guided rod, which is forced upwards by suitable levers and weights, and this relief of pressure is precisely proportional to the pressure on the respective bearings. The Repsolds find it unnecessary to relieve the friction of the declination axis.

In such large telescopes it becomes a matter of the first import- ance to provide means of convenient access to the eye-end of the instrument. This the Repsolds have done in the Pulkovo telescope by means of two platforms, as shown in fig. 16. These platforms are capable of easy motion so that the astronomer may be con- veniently situated for observing an object at any azimuth or altitude to which the telescope may be directed. For the great refractor more recently erected at Potsdam, Messrs Repsold arranged a large platform mounted on a

framework which is moved in azimuth by the dome, so that the observer on the platform is always opposite the dome-opening. This framework is provided with guides on which the platform, whilst preserving its horizontality, is y raised and lowered nearly in an arc of a circle of which I

the point of intersection of the polar and declination^ I

axes is the centre. The rotation of the dome, and p Sk JtSr with it the platform-framework, is accomplished ^^»- /<

by means of electric motors, as also is the raising and lowering of the platform on its framework. The current is supplied by accumulators, and the switch-board is _____w

attached to the platform in a position UlSIil ' JW

convenient for use by the astronomer or his assistant.

In the original design sup- plied for the 36-in. telescope of the Lick Observatory at Mount Hamilton, Cali- fornia, Grubb suggested that the whole floor, 70 _____

ft. in diameter, should H_, V

be raised and lowered by water power, under

control of the ob- ^^^ Fig. 17.

server by means of electric keys which act on secondary mechanism that in turn works the valves and reversing gear of the water engines. Other water engines, similarly connected, with keys at the observer's hands, rotate the dome and perform the quick motions in right ascension and declination. (An illustration showing these arrangements appeared in The Engineer of July 9, 1886.) Grubb's suggestion of the " rising floor " was adopted, although his original plans for the mounting were not carried out; the construction of the mounting, dome, floor,

&c, having been entrusted to Messrs Warner & Swasey of Cleveland, Ohio, U.S.A. It has been contended that it is un- desirable to move so great a mass as a floor when a platform alone is required to carry the observer. But a floor, however heavy, suspended by three wire ropes and properly balanced over large, well-mounted pulleys, requires an amount of energy to work it which does not exceed that required to operate a platform of moderate dimensions, and there is a freedom, a safety and a facility of working with a complete floor which no partial platform can give. A floor can be most satisfactorily operated by hydraulic means, a platform cannot be so well worked in this way. The be6t floor mounting we know of is that designed by O. Chadwick for the Vic- toria Telescope of the Cape Observatory. An account of it will be found in the History and Description of the Cape Observatory. This floor can be raised at the rate of 1 ft. per second or as slowly as the ob- server desires—whilst in all the large platforms we have seen (Pots- dam and Paris), the rate of shift is tedious and time-consuming.

The largest refracting telescope in active use is the Yerkes tele- scope, with an object-glass of 40-in. diameter by Alvan Clark & Son of Cambridge, U.S.A., and with a mounting, dome and rising floor by Warner & Swasey of Cleveland, Ohio, U.S.A. The reader will gather a good general idea of the design from fig. 16. The eye-end is shown on the plate, fig. 25.

The chief defect in equatorial mountings of type C is that in general they are not capable of continued observing much past the meridian without reversal. This is an unquestionable draw- back when long ex|
>osures near the meridian are required. By the

VkRNER & SWASEY

Cloelams Owo. USA.

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Fig. i 8.

(MIOinch TELESCOPE 90rr DOME «» 75rx EIXWINC FLOOR

FOR THE YERKES OBSERVATORY

TELESCOPE

Plate

Fig. 25.— EYE END OF 40" YERKES TELESCOPE.

xxvi. 56s.

TELESCOPE

569

use of an overhanging polar axis the difficulty can be overcome; it has been successfully adopted by Repsolds for their astrographic equatorials of 13-in. aperture and li-25-ft. focus, and on a much smaller scale by Warner & Swasey for the Bruce telescope of 10-in. aperture and 50-in. focus, made for the Yerkes Observatory. The

Fig. 19. — Bruce Telescope, made for the Yerkes Observatory.

From Professor Hale's The Study of Stellar Evolution, by permission of the University of Chicago Press.

latter is shown in fig. 19. Stability in this method of mounting can only be secured by excessive weight and rigidity in the support of the overhanging axis. In the case of the Victoria telescope (24-in. aperture and 22^-ft. focus) mounted at the Cape of Good Hope on this plan, it has been found necessary to add supporting stays where great rigidity is required, and thus to sacrifice continuous circum-

meridian motion for stars between the zenith and the elevated pole.

Type D. — The first important equatorial of type D was the 4-ft. effecting telescope of Lassell (Mem. R.A.S., xxxvi. 1-4); and later Lord Rosse's 36-in. reflecting telescope at Birr Castle (Phil. Trans., clxxi. 153), and A. Common's 36-in. reflecting telescope mounted by him at Ealing (Mem. R.A.S., xlvi. 173-182). In Lassell's instrument (a reflector of the Newtonian type) the observer is mounted in the open air on a supplementary tower capable of motion in any azimuth about the centre of motion of the telescope, whilst an observing platform can be raised and lowered on the side of the tower. In Lord Rosse's instrument (also of the Newtonian type) the observer is suspended in a cage near the eye-piece, and the instrument is used in the open air. Common's telescope presents many ingenious features, especially the relief-friction by flotation of the polar axis in mercury, and in the arrangements of the observatory for giving ready access to the eye-piece of the telescope.

Type C seems indeed to be the type of mounting most suitable for reflecting telescopes, and this form has been adopted for the 60-in. reflector completed by G. W. Ritchey, under the direction of Professor G. E. Hale, for the Mount Wilson Solar Observatory. The instrument is shown in fig. 20, and its design is unquestion-

ably the most perfect yet proposed for modern astrophysical re- search.

The declination axis is here represented by what are practically the trunnions or pivots of the tube, resting in bearings which are supported by the arms of a very massive cast-iron fork bolted to the upper end of the polar axis. This axis is a hollow forging of nickel steel, of which the accurately turned pivots rest on bearings attached to cast-iron uprights bolted upon a massive cast-iron base plate. The base plate rests upon levelling screws which permit the adjustment of the polar axis to be made

with great precision. The combined overhanging weight of the cast-iron fork, the mirror and tube is so great, that without a very perfect reiief-friction system the instrument could not be moved in r%ht ascension with any approach to practical ease. But a hollow steel float, 10 ft. in diameter, is bolted to the upper end of the polar axis just below the fork. This float dips into a tank filled with mercury so that practically the entire instrument is floated by the mercury, leaving only sufficient pressure on the bearings to ensure that the pivots will remain in contact with them. The 60-in. silver-on-glass mirror (weighing about one ton) rests at the lower end of the tube on a support-system consisting of a large number of weighted levers which press against the back of the glass and distribute the load. Similar weighted levers around the circumference of the mirror provide the edge support. The telescope is moved in right ascension and declination by electric motors controlled from positions con- venient for the observer. The driving clock moves the telescope in right ascension by means of a worm-gear wheel, 10 ft. in diameter, mounted on the polar axis.

The 60-in. mirror is of 25-ft. focus, but for certain classes of work it is desirable to have the advantage of greater focal length. For this purpose the telescope can be used in the four different ways shown in fig. 21.

(1) As a Newtonian reflector, fig. 21 (a), the converging rays from the 60-in. mirror being reflected to the side of the tube where

Fig. 21.

From Professor Hale's The Study of Stellar Evolution, by permission of the University of Chicago Press.

the image is formed, and where it may be photographed or viewed with an eye-piece. In this case the image is formed without second- ary magnification and the focal length is 25 ft.

(2) As a Cassegrain reflector, fig. 21 (b), in which case the upper sec- tion of the tube bearing the plane mirror is removed and a shorter section substituted for it. This latter carries a hyperboloidal

i>7°

TELESCOPE

60 inch Reflecting Telescope

Dome and Building,

Solar Observatory

Mount Wilson.Calif.

Designed G-W.Ritchey

■Canvas son protection for Oomo

Airtight liquid Joint betatut Dome and Building

Fig. 20.

From Professor Hale's The Study 0/ Stettw Evolution, by permission of the University of Chicago Press.

mirror, which returns the rays towards the centre of the large mirror and causes them to converge less rapidly. They then meet a small plane mirror supported at the point of intersection of the polar and declination axes, whence they are reflected down through the hollow polar axis as shown in tig. 2, and come to focus on the slit of the powerful spectroscope that is mounted on a pier in the chamber of constant temperature as shown in fig. 20. In this case the equivalent focal length is 150 ft.

(3) As a Cassegrain reflector, for photographing the moon, planets or vers- bright nebulae on a large scale, as shown in fig. 21 ©, with an equivalent focal length of 100 ft.

(4) As a Cassegrain reflector, for use with a spectroscope mounted in place of the photographic

plate, fig. 21 (d) ; in this case a convex mirror of different curvature is employed, the equivalent focus of the combination being 80 ft.

Type E. — In the Comptes Renins for the year 1883, vol. 96, pp. 735-741, Loewy gives an account of an instrument which he calls an "equatorial coudeV' designed (1) to attain Loewy's g rea t e r stability and so to measure larger angles than is equator- g enera iiy possible with the ordinary equatorial; (2) to ial coude. enab] e a sm gi e astronomer to point the telescope and make observations in any part of the sky without changing his position; (3) to abolish the usual expensive dome, and to substi- tute a covered shed on wheels (which can be run back at pleasure), leaving the telescope in the open air, the observer alone being sheltered. These conditions are fulfilled in the manner shown in fig. 22. E P is the polar axis, rotating on bearings at F. and P. The object-glass is at O, the eye-piece at E. There is a plane mirror at M, which reflects rays converging from the object-glass to the eye-piece at E. A second mirror N, placed at 45° to the optical axis of the object-glass, reflects rays from a star at the jxile; but by rotating the box which contains this mirror on the axis of its supporting tube T a star of any declination can be observed,

and by combining this motion with rotation of the polar axis the astronomer seated at E is able to view any object whatever in the visible heavens, except ' circumpolar stars near lower transit. An hour circle attached to E P and a declination circle attached to the box containing the mirror N, both of which can be read or set from E, complete the essentials of the instrument. There must be a certain loss of light from two additional reflections; but that could be tolerated x \ for the sake of other advantages, provided that \ \ the mirrors could be made sufficiently perfect \ V optical planes. By making the mirrors of \ silvered glass, one-fourth of their diameter \„\ in thickness, the Henrys have not only N_\ succeeded in mounting them with all N. necessary rigidity free from flexure ,\ but have given them optically '*- •■

true plane surfaces, notwith-

standing their large dia- meters, viz., nand i5-7in. Sir David Gill tested the equatorial coude on double stars at the Paris Observa- tory in 1884, and his last doubts as to the practical value of the instrument were dispelled. He has never seen more perfect optical definition in any and certainly never

Fig.

22. — Loewy's Coude Equatorial.

of the many telescopes he has employed, _

measured a celestial object in such favourable conditions of physical comfort. The easy position of the observer, the convenient position of the handles for quick and slow motion, and the absolute rigidity of the mounting leave little to be desired. In a much larger

The Orubb

instrument of the same type subsequently mounted at Paris, and in like instruments of intermediate size mounted at other French observatories, the object-glass is placed outside the mirror N, so that both the silvered mirrors are protected from exposure to the outer air.

A modification of Loewy's equatorial coude has been suggested by Lindemann (Astr. Nachr., No. 3935); it consists in placing both the mirrors of Loewy's " equatorial coude " at the top of the. polar axis instead of the. lower end of it. By this arrangement the long cross tube becomes unnecessary, and neither the pier nor the observatory obstruct the view of objects above the horizon near lower transit as is the case in Loewy's form. The reflected rays pass down the tube from the direction of the elevated

pole instead of upward towards that pole. The observer is, therefore, at the bottom of the tube instead of the top and looks upward instead of downward. The drawbacks to this plan are (1) the necessarily large size of the upper pivot (viz. the diameter of the tube) and of the lower pivot (which must be perforated by a hole at least equal in diameter to the photographic field of the telescope), conditions which involve very refined arrangements for relief of friction, and (2) the less comfortable attitude of looking upward instead of down- ward. The plan, however, would be a very favourable one for spectroscopic work and for the convenient installation of an under- ground room of constant temperature. The difficulties of relief friction could probably be best overcome by a large hollow cylinder concentric with the polar axis fixed near the centre of gravity of the whole instrument and floated in mercury, on the plan adopted in the Mount Wilson 60-in. reflector already described, but in this case the floating cylinder would be below and not above the upper bearing.

In 1884 Sir Howard Grubb {Phil. Trans. R. Dub. Soc, vol. iii. series 2, p. 61) proposed a form of equatorial telescope of which an excellent example was erected at Cambridge (Eng). in 1898. The instrument in some respects resembles the . . equatorial coude of Loewy, but instead of two mirrors "t "c . there is only one. A flanged cast- iron box, strongly "bridge' ribbed and open on one side, forms the centre of the ' polar axis. ' One pivot of the polar axis is attached to the lower end of this box, and a strong hollow metal cone, terminating in the other pivot, forms the upper part of the polar axis. The declination axis passes through the two opposite sides of the central box. Upon an axis concentric with the declination axis is carried a plane mirror, which is geared so as always to bisect the angle between the polar axis and the optical axis of the telescope. If then the objective tube is directed to any star, the convergent beam from the object-glass is received by the plane mirror from which it is reflected upwards along the

polar axis and viewed through the hollow upper pivot. Thus, as in the equatorial coude, the observer remains in a fixed position looking down the polar tube from above. He is provided with quick and slow motions in right ascension and declination, which can be operated from the eye-end, and he can work in a closed and comfortably heated room. A large slot has to be cut in the cone which forms the upper part of the polar axis, in order to allow the telescope to be pointed nearer to the pole than would otherwise be possible; even so stars within 1 5 of the pole cannot be observed. An illustrated preliminary description of the instrument is given by Sir Robert Ball (Mon. Not. R.A.S., lix. 152). The instrument has a triple photo-visual Taylor object-glass of 12J in. aperture and ig-3-ft. focal length.

Type F. — In all the previously described types of telescope mounting the axis of the instrument is either pointed directly at the object or to the pole; in the latter case the rays from the star under observation are reflected along the polar axis by a mirror or mirrors attached to or revolving with it. Equatorials of types A, B, C and D have the advantage of avoiding interposed reflecting surfaces, but they involve inconveniences from the continual motion of the eye-piece and the consequent necessity for providing elaborate observing stages or rising floors. In those of type E the eye-piece has a fixed position and the observer may even occupy a room maintained at uniform temperature, but he must submit to a certain loss of light from one or more reflecting surfaces, and from possible loss of definition from optical imperfection or flexure of the mirror or mirrors. In all these types the longer the telescope and the greater its diameter (or weight) the more massive must be the mounting and the greater the mechanical difficulties both in construction and management.

But if it be possible to mount a fixed telescope by which a solar or stellar image can be formed within a laboratory we give the following advantages: — (1) There is no mechanical limit to the length of the telescope; (2) the clockwork and other appliances to

move the mirror, which reflects the starlight along the axis, are much lighter and smaller than those required to move a large telescope ; (3) the observer remains in a fixed position, and spectro-scopes of any weight can be used on piers within the laboratory; and (4) the angular value of any linear distance on a photographic plate can be determined by direct measurement of the distance of the photographic plate from the optical centre of the object-glass. The difficulty is that the automatic motion of a single mirror capable of reflecting the rays of any star continuously along the axis of a

fixed horizontal telescope, requires a rather complex mechanism owing to the variation of the angle of reflexion with the diurnal motion.

*Foucault appears to have been the first to appreciate these advantages and to face the difficulty of designing a siderostat which, theoretically at least, fulfils the above-mentioned conditions. A large siderostat, constructed by Eichens after Foucault's design, was completed in 1868 — the year of Foucault's death. It remained at the Paris Observatory, where it was subsequently employed by Deslandres for solar photography. The largest refracting telescope yet made, viz., that constructed by Gautier for the Paris ._. „ . exhibition of 1900, was arranged on this plan (type F), * e ^ s the stars' rays being reflected along the horizontal axis ■ffaath'"' of a telescope provided with visual and with photo- ^ graphic object-glasses of 49-in. diameter and nearly 200-ft. focal length. Up to 1908 neither the optical qualities of the images given by the object-glasses and reflecting plane nor the practical working of the instrument, have, so far as we know, been sub-mitted to any severe test. It is, however, certain that the Foucault siderostat is not capable, in practice, of maintaining the reflected image in a constant direction with perfect uniformity on account of the sliding action on the arm that regulates the motion of the mirror; such an action must, more or less, take place by jerks. There are farther inconveniences in the use of such a*

telescope, viz., that the image undergoes a diurnal rotation about the axis of the horizontal telescope, sothat, unless the sensitive plate is also rotated by clockwork, it is impossible to obtain sharp photographs with any but instantaneous exposures. In the spectroscopic observa- tion of a single star with a slit-spectroscope, this rotation of the image presents no inconvenience, and the irregular action of a siderostat on Foucault's plan might be overcome by the following arrangement : —

A B (fig. 23) is a polar axis, like that of an equatorial telescope, rotating in twenty-four hours by clockwork. Its lower extremity terminates in a fork on which is . c

mounted a mirror C D, capable of turning about A on an axis at right angles to A B, the plane of the mirror being parallel to this latter axis. The mirror C D is set at such an angle as to reflect rays from the star S in the direction of the polar axis to the mirror R and thence to the horizontal telescope T.

The mirrors of Lindemann's equatorial coude reflecting light r\ downwards upon the mirror R would furnish an ideal siderostat for stellar spectroscopy in conjunction with a fixed horizontal telescope.

Coelostat. — If a mirror is mounted on a truly adjusted polar axis, the plane of the mirror being parallel to that axis, the normal to that mirror will always be directed to some point tin the celestial equator through whatever angle the axis is turned. Also, if the axis is made to revolve at half the apparent diurnal motion of the stars, the image of the celestial sphere, viewed by reflection from such a moving rnirror, will appear at rest at every point — hence the name coelostat applied to the apparatus. Thus, any fixed telescope directed towards the mirror of a properly adjusted coelo- stat in motion will show all the stars in the field of view at rest; or, by rotating the polar axis independently of the clockwork, the observer can

pass in review all the stars visible above the horizon whose declinations come within the limits of his original field of view. Therefore, to observe stars of a different declination it will be necessary either to shift the direction of the fixed telescope, keeping its axis still pointed to the coelostat mirror, or to employ a second mirror to reflect the rays from the coelostat mirror along the axis of a fixed telescope. In the latter case it will be necessary to provide means to mount the coelostat on a carriage by which it can be moved east and west without changing the altitude or azimuth of its polar axis, and also to shift the second mirror so that it may receive all the light from the reflected beam. Besides these complications there is another drawback to the use of the coelostat for general astronomical work, viz., the obliquity of the angle of reflection, which can never be less than that of the declination of the star, and may be greater to any extent. For these reasons the coelostat is never likely to be largely employed in general astrono- mical work, but it is admirably adapted for spectroscopic and bolometric observations of the sun, and for use in eclipse expedi- tions. For details of the coelostat applied to the Snow telescope — the most perfect installation for spectroheliograph and bolometer work yet erected — see The Study of Stellar Evolution by Prof. G. E. Hale, p. 131.

The Zenith Telescope The zenith telescope is an instrument generally employed to measure the difference between two nearly equal and opposite zenith distances. Its original use was the determination of geo- graphical latitudes in the field work of geodetic operations; more recently it has been extensively employed for the determination

of variation of latitude, at fixed stations, under the auspices of the International Geodetic Bureau, and for the astronomical deter- mination of the

constant of aberration. The instrument is shown in its most recent form in fig. 24. A is a sleeve that revolves very freely and without shake on a vertical steel cone. This cone is mounted on a circular base b which rests on three levelling screws, two of which are visible in the figure. The sleeve carries a cross- piece on its upper extremity to which the bearings of the horizontal axis c are attached. A reversible level d rests on the accurately turned pivots of this axis. The telescope is attached to one end of this axis and a counterpoise e to the other. The long arm f serves to clamp the telescope in zenith distance and to communi- cate slow motion in zenith distance when so clamped. On the side of the telescope opposite to the horizontal axis is attached a graduated circle g, and, turning concentrically with this circle, is a framework h, to which the readers and verniers of the circle are fixed. This frame carries two very sensitive levels, k and /, and the whole frame can be clamped to the circle g by means of the clamping screw m.

The object-glass of the telescope is, of course, attached by its cell to the upper end of the telescope tube. Within the focus of the

Fig. 24. — Zenith Telescope (by Warner & Swasey).

object-glass is a right-angled prism of total reflection, which diverts the converging rays from the object-glass at right angles to the axis of the telescope, and permits the observing micrometer n to be mounted in the very convenient position shown in the figure. A small graduated circle * concentric with A is attached to the circular base b and read by the microscopes a r, attached to a. The instrument is thus a theodolite, although, compared with its other dimensions, feeble as an apparatus for the measurement of absolute altitudes and azimuths, although capable of determining these co-ordinates with considerable precision.

In practice the vertical circle is adjusted once for all, so that when the levels k and I are in the centre of their run, the verniers read true zenith

distances. When the instrument has been set up and levelled (either with aid of the cross level d, or the levels k and I), the reading of the circle p for the meridional position of the telescope is determined either by the method of transits in the meridian (see Transit Circle), or by the observation of the azimuth of a known star at a known hour angle. This done, the stops s and t are clamped and adjusted so that when arm r comes in contact with the screw of stop / the telescope will point due north, and when in contact with s, it will point due south, or vice versa. A pair of stars of known declination are selected such that their zenith distances, when on the meridian, are nearly equal and opposite, and whose right ascensions differ by five or ten minutes

of time. Assuming, for example, that the northern star has the smaller right ascension, the instrument is first, with the aid of the stop, placed in the meridian towards the north; the verniers of the graduated circle g are set to read to the reading is the approximate latitude of the place and S„, 6 S the declinations of the northern and southern star respectively; then the level frame h is turned till the levels k and I are in the middle of their run, and there clamped by the screw m, aided in the final adjustment by the adjoining slow motion screw shown in the figure. The telescope is now turned on the horizontal axis till the levels read near the centres of these scales and the telescope is clamped to the arm /. When the star enters the field of view its image is approximately bisected by the spider web of the micrometer n, the exact bisection being completed in the immediate neighbour- hood of the meridian. The readings of the levels k and / and the reading of the micrometer-drum are then entered, and the observa- tion of the northern star is complete. Now the instrument is slowly turned towards the south, till the azimuth arm is gently brought into contact with the corresponding stop s, care being taken not to touch any part of the instrument except the azimuth arm itself. When the southern star enters the field the same process is repeated.

Suppose now, for the moment, that the readings of the levels k and / are identical in both observations, we have then, in the differ- ence between the micrometer readings north and south, a measure of the difference of the two zenith distances expressed in terms of the micrometer screw; and, if the ” value of one revolution of the micrometer screw ” is known in seconds of arc we have for the resulting latitude

- = IKf»-f.) + («»+8.)}. where f„ - f s is the difference of the micrometer readings converted into arc — it being assumed that increased micrometer readings correspond with increased zenith distance of the star.

If between the north and south observation there is a change in the level readings of the levels k and I, this indicates a change in the zenith distance of the axis of the telescope. By directing the telescope to a distant object, or to the intersection of the webs of a fixed collimating telescope (seeTRANSiT Circle), it is easy tomeasure the effect of a small change of zenith distance of the axis oi the telescope in terms both of the level and of the micrometer screw, and thus, if the levels are perfectly sensitive and uniform in curvature and graduation, to determine the value of one division of each level in terms of the micrometer screw. The value of ” one revolution of the screw in seconds of arc ” can be determined either by observing at transit the difference of zenith distance of two stars of known declination in terms of the micrometer screw, the instru- ment remaining at rest between their transits; or by measuring at known instants in terms of the screw, the change of zenith distance of a standard star of small polar distance near the time of its greatest elongation.

The reason why two levels are employed is that sometimes crystals are formed by the decomposition of the glass which cause the bubble to stick at different points and so give false readings. Two levels are hardly likely to have such causes of error arise at exactly corresponding points in their

run, and thus two levels furnish an independent control the one on the other. Also it is impossible to make levels that are in every respect perfect, nor even to deter- mine these errors for different lengths of bubble and at different readings with the highest precision. The mean of two levels there- fore adds to the accuracy of the result.

Attempts have been made to overcome the difficulties connected with levels by adopting the principle of Kater's floating collimator {Phil. Trans., 1825 and 1828). On this principle the use of the level is abolished, the telescope is mounted on a metallic _ float, and it is assumed that, in course of the rotation of this float, the zenith distance of the axis of the telescope will remain undisturbed, that is, of course, after the undulations, induced by the disturbance of the mercury, have ceased.

S. C. Chandler in 1884 constructed an equal altitude instrument on this principle, which he called the almucantar, and he found that after disturbance the telescope recovered its original zenith distance within ^ of a second of arc. R. A. Sampson at Durham {Monthly Notices R. A. S. lx. 572) and H. A. Howe (Ast. Jahrb. xxi. 57) have had instruments constructed on the same general principle. It is, however, obviously impossible to apply a micrometer with advantage to such instruments, because to touch such an instru- ment, in order to turn a micrometer screw, would obviously set it into motion. The almucantar was therefore used only to observe the vertical transits of stars in different azimuths over fixed hori- zontal webs, without touching the telescope.

By the use of photography, however, it is possible to photograph the trail of a star as it transits the meridian when the telescope is directed towards the north, and another trail be similarly photo- graphed when the telescope is directed towards the south. The interval between the true trails, measured at right angles to the direction of the trails, obviously corresponds to the difference of zenith distance of the two stars. This principle has been

applied with great completeness and ingenuity of detail by Bryan Cookson to the construction of a " photographic floating zenith telescope,"

which he has erected at Cambridge (Eng.) and applied to an investi- gation of the change of latitude and a determination of the constant of refraction. A description of the instrument, and some preliminary results obtained by it, is given by him (Monthly Notices R.A.S., lxi. 314). [D. Gi.]

TELESIA [mod. Telese], a town of the Samnites, 24 m. N.W. from Beneventum. It possesses remains of walls in opus reticulatum, of a total length of over a mile; two inscriptions of the Republican period record the erection of towers. The remains of baths (Thermae Sabinianae) and of an amphitheatre still exist : and the city was supplied with water by an aqueduct. There are sulphur springs in the vicinity, which may have sup- plied the baths.

TELESILLA, Greek poetess, a native of Argos, one of the so-called nine lyric muses. According to the traditional story, when Cleomenes, king of Sparta, invaded the land of the Argives in 510 B.C., and slew all the males capable of bearing arms, TelesUla, dressed in men's clothes, put herself at the head of the women and repelled an attack upon the city of Argos. To commemorate this exploit, a statue of the poetess, in the act of putting on a helmet, with books lying at her feet, was set up in the temple of Aphrodite at Argos. The festival Hybristica or Endymatia, in which men and women exchanged clothes, also celebrated the heroism of her female compatriots. Herodotus (vi. 76) does not refer to the intervention of Tele- silla, but mentions an oracle which predicted that the female should conquer the male, whence the tradition itself may have been derived. Further, the statue seen by Pausanias may not have been intended for Telesilla; it would equally represent Aphrodite, in her

character as wife of Ares and a warlike god- dess (the books, however, seem out of place). The Hybristica, again, was most probably a religious festival connected with the worship of some androgynous divinity. Of Telesilla's poems only two lines remain, quoted by the grammarian Hephaestion, apparently from a Parthenion, or song for a chorus of maidens.

See Pausanias ii. 20, 8 ; Plutarch, Be Virtut. Mulierum, 8 ; Clement of Alexandria, Stromata, iv. 19, p. 522; Bergk, Poetae Lyrici Graeci, iii. ; and especially Macan, Herodotus iv.-vi., i. 336 foil, and notes.

TELESIO, BERNARDINO (1500-1588), Italian philosopher and natural scientist, was born of noble parentage at Cosenza near Naples in 1509. He was educated at Milan by his uncle, Antonio, himself a scholar and a poet of eminence, and after- wards at Rome and Padua. His studies included all the wide range of subjects, classics, science and philosophy, which con- stituted the curriculum of the Renaissance savants. Thus equipped, he began his attack upon the medieval Aristotelianism which then flourished in Padua and Bologna. Resigning to his brother the archbishopric of Cosenza, offered to him by Pope Pius IV., he began to lecture at Naples and finally founded the academy of Cosenza. In 1563, or perhaps two years later, appeared his great work De Rerum Natura, which was followed by a large number of scientific and philosophical works of sub- sidiary importance. The heterodox views which he maintained aroused the anger of the Church on behalf of its cherished Aristotelianism, and a short time after his death his books were placed on the Index,

Telesio was the head of the great South Italian movement which protested against the accepted authority of abstract reason, and sowed the seeds from which sprang the scientific methods of Campanella and Bruno, of Bacon and Descartes, with their widely divergent results. He, therefore, abandoned the purely intellectual sphere and proposed an inquiry into the data given by the

senses, from which he held that all true knowledge really comes. Instead of postulating matter and form, he bases existence on matter and force. This force has two opposing elements: heat, which expands, and cold, which contracts. These two processes account for all the diverse forms and types of existence, while the mass on which the force operates remains the same. The harmony of the whole con- sists in this, that each separate thing develops in and for itself in accordance with its own nature while at the same time its motion benefits the rest. The obvious defects of this theory, (1) that the senses alone cannot apprehend matter itself, (2) that it is not clear how the multiplicity of phenomena could result from these two forces, and (3) that he adduced no evidence to substantiate the

existence of these two forces, were pointed out at the time by his pupil, Patrizzi (see article on Patrizzi, Francesco). Moreover his theory of the cold earth at rest and the hot sun in motion was doomed to disproof at the hands of Copernicus. At the same time, the theory was sufficiently coherent to make a great impression on Italian thought. When Telesio went on to explain the relation of mind and matter, he was still more heterodox. Material forces are, by hypothesis, capable of feeling; matter also must have been from the first endowed with consciousness. For consciousness exists, and could not have been developed out of nothing. Again, the soul is influenced by material conditions ; consequently the squl must have a material existence He further held that all knowledge is sensation (" non ratione sed sensu ") and that intelli- gence is, therefore, an agglomeration of isolated data, given by the senses. He does not, however, succeed in explaining how the senses alone can perceive difference and identity. At the end of his scheme, probably in deference to theological prejudices, he added an element which was utterly alien, namely, a higher impulse, a soul superim- posed by God, in virtue of which we strive beyond the world of sense. The whole system of Telesio*

shows lacunae in argument, and ignorance of essential facts, but at the same time it is a fore- runner of all subsequent empiricism, scientific and philosophical, and marks clearly the period of transition from authority and reason to experiment and individual responsibility. Beside the De Rerum Natura, he wrote De Somno, De his quae in aere fiunt, De Mari, De Cometis et Circulo Lacteo, De usu respirationis, &c.

TELESPHORUS, bishop of Rome from about 126 till about 137. St Irenaeus says that he suffered martyrdom.

TELFORD, THOMAS (1757–1834), British civil engineer, was the son of a shepherd, and was born at Westerkirk in Eskdale, Dumfriesshire, on the 9th of August 1757. From early childhood he was employed as a herd, occasionally attend- ing the parish school of Westerkirk, where his quickness and diligence helped to make up for his lack of opportunity. On being apprenticed, at the age of fifteen, to a stonemason- at Langholm, he found leisure not only to gain an acquaintance with Latin, French and German, but to gratify his literary tastes by a wide variety of reading. In his early manhood he was much given to the writing of verse: a poem of some length on Eskdale appeared in 1784 in the Poetical Museum, published at Hawick; under the signature of ” Eskdale Tam ” he con- tributed verses to Ruddiman’s Weekly Magazine; and he addressed an epistle in rhyme to Burns, which was published in James Currie’s Life of the poet. In 1780 Telford went to Edinburgh, where he was employed in the erection of houses in the ” new” town, and occupied much of his spare time in learning architectural drawing. Proceeding to London two years later, he found employment in the erection of Somerset House. Having in 1784 superintended the erection of a house for the commissioner at Portsmouth dockyard, he next repaired the castle of Sir W. Pulteney, member for Shrewsbury, who conceived such a high opinion of his talents that he got him made surveyor of public works for the county of Salop. In 1793 he was appointed engineer of the Ellesmere canal, for which

he built the Chirk and Pont-y-Cysyllte aqueducts, and this work established his reputation as a canal engineer. He was consulted in 1806 by the king of Sweden regarding the construction of the Gota Canal, and, his plans having been adopted, he visited the country in 1810 to superintend some of the more important excavations. In the early years of the 19th century the question of improving the communications in the Highlands of Scotland engaged the attention of the government, and Telford was commissioned to report on the matter. In consequence of his recommendations, he was appointed engineer for the Caledonian Canal, which was begun in 1804 and forms one of the largest but by no means the most useful of his undertakings, and also for the construction of 920 miles of roads, a great part through very difficult country. Of the numerous bridges built in this line of roads mention may be specially made of that across the Tay at Dunkeld. Subsequently he was employed on the improvement of the road between Carlisle and Glasgow, 'which was undertaken as a result of a parliamentary inquiry in 1814, and he was then entrusted with the execution of another scheme, of equal magnitude and importance with that in the Highlands of Scot- land, for a system of roads through the more inaccessible parts of Wales, which involved the erection of the magnificent

suspension bridge across the Menai Straits, begun in 1820, and the Conway Bridge, begun in 1822. While his fame rests chiefly on his road and canal engineering, and the erection of the numerous bridges and aqueducts which this involved, he also did good work in harbour construction. The fisheries and industries of Scotland benefited by the improvements he effected at many of the harbours on the east coast; he con- structed the St Katherine's Docks, London (finished in 1828); and his last piece of professional work was a plan for the im- provement of Dover harbour. Other achievements of

his later years were the drainage of the north level of the eastern Fen district, an area of 48,000 acres, and erection of the Dean Bridge, Edinburgh, and of the Broomielaw Bridge, Glasgow. He died on the 2nd of September 1834 in London, and was buried in Westminster Abbey.

Telford was never married. For twenty-one years he lived at the Salopian coffee-house, afterwards the Ship Hotel, Charing Cross, whence he removed to 24 Abingdon Street. He was a fellow of the Royal Societies of London and of Edinburgh, and was annually elected president of the Institution of Civil Engineers from its foundation. He received the Swedish order of knighthood of Gustavus Vasa.

See Telford's Memoirs, written by himself and edited by John Rickman (1838) ; also Smiles's Lives of the Engineers.

TELIGNY, CHARLES DE (c. 153 5-1572), French soldier and diplomat, belonged to a respected Huguenot family of Rouerque, and received an excellent training in letters and arms at the house of Coligny. He was employed on several peace missions; he represented the Protestants before the king, and was entrusted by Conde with the presentation of his terms to the queen-mother in 1567, and in the following year he assisted at the conference at Chalons and signed the peace of Longjumeau, which was destined to be of short duration. On the outbreak of war, he took part in the siege of Poitiers, directed an unsuccessful attack on Nantes, fought bravely under Coligny at Moncontour, and participated in the negotia- tions ending in the treaty of Saint-Germain (8th of August 1570). In 1571 he retired to La Rochelle and married Louise de Coligny, but was speedily recalled to Paris to serve on the bi-partisan commission of adjustment. Although he won the special favour of Charles IX., he was one of the first victims in the massacre of St Bartholomew's Day (24th of August 1572). His remains were taken to the Castle of Teligny in 161 7, but eight years later were thrown into the river by the bishop of Castres.

TELL, WILLIAM. The story of William Tell's skill in shoot- ing at and striking the apple which had been placed on the head of his little son by order of Gessler, the tyrannical Austrian bailiff of Uri, is so closely bound up with the legendary history of the origin of the Swiss Confederation that they must be con- sidered together. Both appear first in the 15th century, pro- bably as results of the war for the Toggenburg inheritance (1436-50); for the intense hatred of Austria, greatly increased by her support of the claims of Zurich, favoured the circulation of stories which assumed that Swiss freedom was of immemorial antiquity, while, as the war was largely a struggle between the civic and rural elements in the Confederation, the notion that the (rural) Schwyzers were of Scandinavian descent at once separated them from and raised them above the German in- habitants of the towns.

The Tell story is first found in a ballad the first nine stanzas of which (containing the story) were certainly written before 1474. There is no mention made of the names of the bailiff or of his master, or of the hat placed on a pole. Tell is called " the first Confederate," and his feat is treated as the real and only reason why the Confederation was formed and the tyrants driven out of the land. It is probably to this ballad that Melchior Russ of Lucerne (who began his Chronicle in 1482) refers when, in his account (from Justinger) of the evil deeds of the bailiffs in the Forest districts, he excuses himself from giving the story. He goes on to narrate how Tell, irritated by his treatment, stirred up his friends against the governor, who

seized and bound him and was conveying him by boat to his castle on the lake of Lucerne, when a storm arose, and Tell, by reason of his great bodily strength, was, after heing un- bound, given charge of the rudder on his promise to bring the boat safely to land. He steers it towards a shelf of rock, called in Russ's time Tell's Platte, springs on shore, shoots the bailiff dead with his crossbow, and goes back to Uri, where he stirs up the great strife which ended in the battle of Morgarten. In

these two accounts, which form the basis of the Uri version of the origin of the Confederation, it is Tell and Tell only who is the actor and the leader. We first hear of the cruelties of Austrian bailiffs in the Forest districts in the Bernese Chronicle of Conrad Justinger (1420). No names or details are given, and the dates are different in the two recensions of the Chronicle as "olden days before Bern was founded" (i.e. before 1191) and 1260. Several details, but only one name, are added in the De Nobilitate et Rusticitate Dialogus (cap. 33) of Felix Hemmerli, a canon of Zurich, who wrote it after 1451 and before 1454; in this last year he was imprisoned by the Schwyzers, whom he had repeatedly insulted and attacked in his books. According to him the men of Schwyz and of Unterwalden were the first to rise, those of Uri following suit much later But neither Justinger nor Hemmerli makes any allusion to Tell or his feat.

The Tell story and the " atrocities " story are first found

combined in a MS. known as the White Book of Sarnen. They

are contained in a short chronicle written between 1467 and

1476, probably about 1470, and based on oral tradition. Many

details are given of the oppressions of the bailiffs: we hear of

Gessler, of the meeting of Stoupacher of Schwyz, Fiirst of Uri,

and a man of Nidwalden at the Rutli,- -in fact, the usual version

of the legend. To give an instance of tyranny in Uri, the author

tells us the story of the refusal of " der Thall " to do reverence

to the hat placed on a pole, of his feat of skill, and of his shooting

the bailiff, Gessler, from behind a bush in the ” hollow way ”

near Kussnacht. Tell is represented as being one of those who

swore at the Rutli to drive out the oppressors ; but the narrative

of his doings is merely one incident in the general movement

which began quite independently of him. The chronology is

very confused, but the events are placed after Rudolf’s election

to the empire in 1273. This is the only account in which Tell

is called” der Thall,” which name he himself explains by saying,

” If I were sharp (witzig) I should be called something else and

not der Tall,” i.e. the simpleton or slow-witted man. (It is

worthy of notice that the same meaning is attributed to the

name of Tokko, the hero of a similar legend in Gheysmer’s

abridgment of the Historia Danica of Saxo Grammaticus,

which may, somehow, have influenced the Swiss version.)

The only other known instances of the Uri version of the legend

relating to the origin of the Confederation are the Latin hexa- '

meters of Glareanus (15 15), in which Tell is compared to Brutus

as " assertor patriae, vindex ultorque tyrannum," and the

Urnerspiel (composed in 1511-12), a play acted in Uri, in which

Russ's version is followed, though the bailiff, who is unnamed,

but announces that he has been sent by Albert of Austria, is

slain in the " hollow way." Tell is the chief of the Rutli leaguers,

and it is his deed which is the immediate occasion of the rising

against the oppressors, which is dated in 1296. Mutius (1540)

is the latest writer who, in his description of the origin of the

Confederation, does not mention Tell and his act. The two

stories are now firmly bound together; the version contained

in the White Book is the accepted one, though small additions

in names and dates are often made.

The task of filling up gaps, smoothing away inconsistencies, rounding off the tale, was accomplished by Giles Tschudi (q.v.), whose recension was adopted, with a few alterations, by Johannes von Miiller in his History of the Confederation (1780). In the final recension of

Tschudi's Chronicle (1734-36), which, however, differs in many particulars from the original draft still preserved at Zurich, we are told how Albert of Austria, with the view of depriving the Forest lands of their ancient freedom, sent bailiffs (among them Gessler) to Uri and Schwyz, who committed many tyrannical acts, so that finally on

8th November 1307, at the Riitli, Werner von Stauffacher of Schwyz, Walter Fiirat of Uri, Arnold von Melchthal in Unter- walden, each with ten companions, among whom was William Tell, resolved on a rising to expel the oppressors, which was fixed for New Year's Day 1308. A few days later (November 18) the Tell incident takes place (described according to the White Book version), and on the appointed date the general rising. Tschudi thus finally settled the date, which had before varied from 1260 to 1334. He utterly distorts the real historical relations of the Three Lands, though he brings in many real historical names, their owners being made to perform historically impossible acts, and introduces many small additions and corrections into the story as he had received it. In particular, while in his first draft he speaks of the bailiff as Gryssler — -the usual name up to his time, except in the White Book and in Stumpff's Chronicle of 1548— in his final recension he calls him Gessler, knowing that this was a real name. Later writers added a few more particulars, — that Tell lived at Biirglen and fought at Morgarten (1598), that he was the son-in-law of Fiirst and had two sons (early 18th century), &c. Johannes von Miiller (1780) gave a vivid description of the oath at the Riitli by the three (Tell not being counted in), and threw Tschudi's version into a literary form, adding one or two names and adopting that of Hermann for Gessler, calling him of " Bruneck." Schiller's play (1804) gave the tale a world-wide renown.

The story was, on the ground of want of evidence,

regarded as suspicious by Guilliman in a private letter of 1607, and doubts were expressed by the brothers Iselin (1727 and 1754) and by Voltaire (1754); but it was not till 1760 that the legend was definitely attacked, on the ground of its similarity to the story of Tokko (see below), in an anonymous pamphlet by Freudenberger, a Bernese pastor. This caused great stir; it was publicly burnt by order of the government of Uri, and many more or less forged proofs and documents were produced in favour of Tell. The researches of J. E. Kopp (Urkunden zur Geschichte d. eidgenbssischen Biinde, 2 parts, 1835 and i85r, and Geschichte der eidgenbssischen Biinde, vol. ii., 1847), first cleared up the real early history of the league, and overthrew the legends of the White Book and Tschudi. Since then many writers have worked in the same direction. Vischer (1867) has carefully traced out the successive steps in the growth of the legend, and Rochholz (1877) has worked out the real history of Gessler as shown in authentic documents. The general result has been to show that a mythological marksman and an impossible bailiff bearing the name of a real family have been joined with con- fused and distorted reminiscences of the events of 1245-47, in which the names of many real persons have been inserted and many unauthenticated acts attributed to them. Th. von Liebenau has, however, shown (in an article reprinted from the Katholische Schweizerbldtter in the Bollcttino Storico delta Svizzera Italiana for 1899) that in 1283 the Emperor Rudolf of Habsburg gave the right of receiving the tolls for escort over the St Gotthard Pass to his sons, the dukes of Austria. The levying of these tolls gave rise to various disputes between the men of Uri and the bailiffs of the dukes of Austria, and by 13 19 (if not already in 1309) the claim to levy them was silently given up. These facts show (what could not hitherto be proved) that at the time when legend places the rising of Uri, Tell exploit, &c, the dukes of Austria really had disputes with Uri.

The story of the skilful marksman who succeeds in striking some small object placed on the head of a

man or child is very widely spread: we find it in Denmark (Tokko), Norway (two versions), Iceland, Holstein, on the Rhine, and in England (William of Cloudesley). How it came to be localized in Uri we do not know; possibly, through the story of the Scandinavian colonization of Schwyz, the tale was fitted to some real local hero.

The alleged proofs of the existence of a real William Tell in Uri in the 14th century break down hopelessly. (1) The entries in the parish registers are forged. (2) As to the Tell chapels — (a) that in the " hollow way " near Kiissnacht was not known to Melchior Russ and is first mentioned by Tschudi (1572).

(b) That on Tell's Platte is first mentioned in 1504. The docu- ment which alleges that this chapel was built by order of a " landsgemeinde " held in 1388, at which ir4 men were present who had been personally acquainted with Tell, was never heard of till 1759. The procession in boats to the place where the chapel stands may be very old, but is not connected with Tell till about 1582. (c) The chapel at Biirglen is known to have been founded in 1582. Other documents and statements in support of the Tell story have even less claim to credit. It has been pointed out above that with two exceptions the bailiff is always called Gryssler or Grissler, and it was Tschudi who popularized the name of Gessler, though Grissler occurs as late as 1765. Now Gessler is the name of a real family, the history of which from 1250 to 15 13 has been worked out by Rochholz, who shows in detail that no member ever played the part attributed to the bailiff in the legend, or could have done so, and that the Gesslers could not have owned or dwelt at the castle of Kiissnacht; nor could they have been called Von Bruneck.

In the Urnerspiel the name of the bailiff's servant who guarded the hat on the pole is given as Beintz Vogely, and we know that Friedrich Vogeli was the name of one of the chief military officers of Peter von Hagenbach, who from 1469 to 1474 ad- ministered for Charles the Bold, duke of Burgundy, the lands

(Alsace, &c.) pledged to him by Sigismund of Habsburg. Now Hagenbach is known to have committed many cruelties like those attributed to the bailiffs in the legend, and it has been plausibly conjectured that his case has really given rise to these stories, especially when we find that the Confederates had a hand in his capture and execution, that in a document of 1358 Hagenbachs and Gesslers appear side by side as witnesses, and that the Hagenbachs had frequent transactions with the Habs- burgs and their vassals.

In general see two excellent works by Franz Heinemann, Tell- Iconographie, Lucerne, 1902 (reproductions, with text, of the chief representations of Tell in art from 1507 onwards), and Tell-Biblio- graphie (including that of Schiller's play), published in 1908 at Bern.

Among the vast number of books and pamphlets on the Tell story, the two most to be recommended are W. Vischer, Die Sage von der Befreiung der Waldst<e (Leipzig, 1867), and E. L. Rochholz, Tell und Gessler, with a volume of documents 1250-1513 (Heilbronn, 1877). Convenient summaries of the controversy will be found in any modern book on Swiss history, and more particularly in G. von Wyss, Uber d. Gesch. d. drei Lander — Uri, Schwyz, u. Unterwalden —in den Jahren 1212-1315 (Zurich, 1858) ; Alf. Huber, Die Waldstdtte bis zur festen Begrundung ihrer Eidgenosse1lschafl,mit einem Anhange uber die geschichtliche Stellung des With. Tell (Innsbruck, 1861); Albert Rilliet, Les Origines de la Confederation Suisse, histoire et legende (Geneva, 2nd edition, 1869); and S. Baring-Gould, Curious Myths of the Middle Ages, ch. v. (new edition, London, 1884).

The setting up in 1895 in the market-place in Altdorf of a fine statue (by the Swiss sculptor Richard Kissling) of Tell and his son, and the opening in 1899, just outside Altdorf of a permanent theatre, wherein Schiller's play is to be represented every Sunday during the summer months, show that the popular belief in the Tell legend is

still strong, despite its utter demolition at the hands of a succession of scientific Swiss historians during the 19th century. A. Gisler of Altdorf (in his book, Die Tellfrage, Bern, 1895) has also made an attempt to rehabilitate it from the purely historical point of view. He is well acquainted with all the researches that have been made, but tries to save Tell's refusal to do reverence to the hat, his leap from the boat in the lake, and his slaying of the bailiff in the " hollow way." To effect the rescue of these incidents, he boldly admits the forgeries in the registers, abandons all the traditional dates, throws over Tschudi's account, and regards the shooting by Tell of the apple from his son's head as an " ornamental addition " to the tale. Save a mention of the Tell chapel on " Tellsplatte " in 1 504 (the first known before was that by Tschudi in 1572), and a proof that the pilgrimages to Biirglen and Steinen had nothing to do with " St Kiimmerniss," as her images are preserved in the parish churches of those villages, whereas the pilgrims go to the chapels therein, he brings forward no new evidence. , His book is a striking proof that the popular Tell legend cannot

claim the support of authentic history, while his attempt to find room for the atrocities of the wicked bailiffs elsewhere than at Altdorf consists only in suggesting an intricate series of possibilities, none of which are supported by any positive evidence.

In his pamphlet Die Sagen v. Tell u. Slauffacher (Basel, 1899) August Bernoulli, and in his elaborate Geschichte d. Schweiz. Politik (vol. i. Frauenfeld, 1906) J. Schollenberger, have applied the same sort of method, but without attaining any greater degree of his- torical success. (W. A. B. C.)

TELL EL AMARNA, the name now given to a collection of ruins and rock tombs in Upper Egypt near the east

bank of the Nile, 58 m. by river below Assiut and 190 m. above Cairo. The ruins are those of Ekhaton (Akhet-Aton), a city built c. 1360 B.C. by Akhenaton (Amenophis IV.) as the new capital of his empire (in place of Thebes) when he abandoned the worship of Ammon and devoted himself to that of Aton, i.e. the sun (see Egypt: History, § Ancient). Shortly after the death of Akhenaton the court returned to Thebes, and the city, after an existence of perhaps only twenty years — of fifty years at the utmost — was abandoned. Not having been inhabited since, the lines of the streets and the ground-plans of many buildings can still be traced. The chief ruins are those of the royal palace and of the House of the Rolls; there are scanty remains of the great temple. In the palace are four pavements of painted stucco work in fair preservation. They were discovered in 1891-92 by Prof. Flinders Petrie (see his Tell el Amarna, 1894). In the Rolls House were discovered in 1887 by the fellahin some 300 clay tablets inscribed with cuneiform characters. They are letters and state documents addressed to Amenophis IV. and his father, from the kings of Babylon, Assyria, &c, and from the Egyptian governors in Syria and neighbouring districts; The greater part of them were purchased for the Berlin Museum, but a large number were secured for the British Museum. Their contents proved invaluable for the reconstruction of the history, social and political, of Egypt and Western Asia during that period.

Hewn out of the sides of the hills which close in on the east the plain on which Ekhaton stood are two groups of tombs; one group lies 15 m. N.E., and the other 3 m. S. of the city. The tombs, all of which belong to the time of Akhenaton, are full of interesting scenes in the peculiar style of the period, accompanied by hymns to the sun god. The most important tomb is, perhaps, that of Meri-Ra, high priest of the sun, which has a facade nearly 100 ft. long and two large chambers. On one of the walls of the main chamber is depicted the scene, now well known, in which a blind choir of harpists and singers celebrate the arrival of the court at the

temple. In the early centuries of Moslem rule in Egypt the northern tombs were inhabited by Copts, one tomb, that of Pa-Nehesi, being turned into a church. In a ravine opening into the plain between the north and south tombs, and some seven miles from the city, is a tomb supposed to be that of Akhenaton.

The tombs and the great stelae sculptured on the cliffs which mark the bounds of the city of Akhet-Aton have been the object of special study by N. de G. Davies on behalf of the Archaeological Survey of Egypt. The results, with numerous plates and plans, are embodied in a series of memoirs, Rock Tombs of El Amarna (six parts, 1903-8).

For the tablets see Tell el Amarna Tablets in the British Museum (1892); C. Bezold, Oriental Diplomacy; the transliterated text of tlie Cuneiform Despatches discovered at Tell el Amarna (1893) ; The Tel el Amarna Letters (English translation by M. Winckler, Berlin, 1896); J. A. Knudtzon, Die El-Amarna Tafeln (Leipzig, 1907-9); \V. M. F. Petrie, Syria and Egypt from the Tell el Amarna Letters

(1898).

TELLER, W1LHELM ABRAHAM (1734-1804), German Protestant divine, was born at Leipzig on the 9th of January 1734. His father, Romanus Teller ^703-1750), was a pastor at Leipzig, and afterwards became professor of theology in the university. He edited the earlier volumes of a Bibelwerk (19 vols., 1740-70) which was designed as an adaptation for German readers of the exegetical works of Andrew Willet, Henry Ainsworth, Symon Patrick, Matthew Poole, Matthew

Henry and others. Wilhelm Abraham studied philosophy and theology in the university of his native town. Amongst the men whose influence mainly determined his theological position and line of work was J. A. Ernesti. Teller's writings present rationalism in its course of development from biblical supernaturalism to the borders of deistical

naturalism. His first learned production was a Latin translation of Benjamin Kennicott's Dissertation on the State of the Printed Hebrew Text of the Old Testament (1756), which was followed the next year by an essay in which he expounded his own critical principles. In 1 761 he was appointed pastor, professor of theology and general superintendent in the university of Helmstedt. Here he pur- sued his exegetical, theological and histoiical researches, the results of which appeared in his Lehrbuch des christlichen Glaubens (1764). This work caused some commotion, as much by the novelty of its method as by the heterodoxy of its matter, and more by its omissions than by its positive teaching, though everywhere the author seeks to put theological doctrines in a decidedly modern form. In 1767 Teller, whose attitude had made his position at Helmstedt intolerable, was glad to accept an invitation from the Prussian minister for ecclesiastical affairs to the post of provost of Kblln, with a seat in the supreme consistory of Berlin. Here he found himself in the company of the rationalistic theologians of Prussia— F. S. G. Sack (1738-1817), Johann Joachim Spalding (1714-1804) and others — and became one of the leaders of the rationalistic party, and one of the chief contributors to C. F. Nicolai's Allgemeine Deutsche Bibliothek. Teller was not long in making use of his freer position in Berlin. In 1 7 7 2 appeared the most popular of his books, Worterbuch des Neuen Testamenteszur Erkldrung der christ- lichen Lehre (6th ed., 1805). The object of this work was to recast the language and ideas of the New Testament and give them the form of 18th-century illuminism. The author maintains that the Graeco-Hebraic expressions must not be interpreted literally, but explained in terms intelligible to the modern mind. By this lexicon Teller had put himself amongst the most advanced rationalists, and his opponents charged him with the design of overthrowing positive Christianity altogether. In 1786 the author became a member of the Berlin Academy of Sciences. The " Wollner edict " of July 9, 1788, for the enforcement of Lutheran orthodoxy, and Teller's manly action, as

member o: the consistorial council, in defiance of it (cf. his W ohlgemeinte Erinnerungen, 1788), led the Prussian government to pass upcn him the sentence of suspension for three months, with forfeiture of his stipend. He was not, however, to be moved by such means, and (1792) issued his work Die Religion der Vollkom- meneren, an exposition of his theological position, in which he advocated at length the idea, subsequently often urged, of " the perfectibility of Christianity," — that is, of the ultimate transformation of Christianity into a scheme of simple morality, with a complete rejection of all specifically Christian ideas and methods. This book represents the culminating point of German illuminism, and is separated by a long process of development from the author's Lehrbuch. In the same year he published his Anleitung zur Religion iiberhaupt und zum Allgemeinen des Christenlhums besonders; filr die Jugend hdherer und gebildeter Stdnde oiler Religionsparteien. Teller died on the 9th of December 1804. Besides his contributions to the Allgemeine Deutsche Bibliothek, he edited a popular and practi- cally useful Magazin filr Prediger (1792-1801).

See W. Gass, Geschichte der protestantischen Dogmatik, iv. pp. 206- 222; P. Wolff, art. in Herzog-Hauck, Realencyklopadie (ed. 1907); Heinrich Doring, Deutsche Kanzelredner des j8ten und iqten Jahrh., p. 506 seq. ; Edward Pusey, Causes of the Late Rationalistic Character of German Theology (1828), p. 150; and cf. the article in the Allgemeine Deutsche Biographie.

TELLICHERRY, a seaport of British India, in the Malabar district of Madras, between Cannanore and the French settle- ment of Mahe. Pop. (1901) 27,883. It is a healthy and picturesque town, built upon a group of wooded hills running down to the sea, and is protected by a natural breakwater of rock. The town with its suburbs occupies about 5 sq. rn., and was at one time defended by a strong mud wall. The old fort

still stands to the north of the town. The East India Company established a factory here in 1683 for the pepper and cardamom trade. For two years (1780–82) the town withstood a siege by Hyder's general, and in the subsequent wars with Mysore Tellicherry was the base of operations for the ascent of the Ghats from the west coast. The town is a busy centre of export trade in coffee, coco-nut produce, spices and sandal-wood. The Basel Protestant mission has a station here. The municipality manages the Brennen college founded in 1862.

TELLURIUM [Symbol Te, atomic weight 127-5 (0 = i6)], a chemical element, found to a certain extent in nature in the uncombined condition, but chiefly in combination with other metals in the form of tellurides, such, for example, as sylvanite, black tellurium, and tetradymite. Small quantities are occasionally met with in iron pyrites, and hence tellurium is found with selenium in the flue dust, or chamber deposits of sulphuric acid works. Tellurium was first recognized as a distinct element in 1708 by M. H. Klaproth. It may be obtained by heating tellurium bismuth with sodium carbonate, lixiviating the fused mass with water, filtering, and exposing the filtrate to air, when the tellurium is gradually precipitated as a grey powder (J. J. Berzelius). J. Farbaky {Zeit. angew. Chem., 1897, p. 11) extracts the element from black tellurium as follows: — The ore is boiled with concentrated sulphuric acid, the solution diluted, hydrochloric acid added and the tellurium (together with selenium) precipitated by sulphur dioxide and the process repeated when a purer tellurium is obtained. B. Brauner (Monats., 1889, 10, p. 414) recommends the following method for the purification. The crude element is treated with aqua regia and then evaporated with an excess of hydrochloric acid, the solution diluted and the tellurium precipitated by a current of sulphur dioxide. The precipitated tellurium is then fused with potassium cyanide, the melt extracted with water and the element

precipitated by drawing a current of air through the solution and finally distilled in a current of hydrogen.

Tellurium is a brittle silvery-white element of specific gravity 6-27. It melts at 452 C. and boils at 478 C. (F. Krafft, Ber., 1903, 36, p. 4344). When heated in a current of hydrogen it sublimes in the form of brilliant prismatic crystals. An amor- phous form is obtained when tellurium is precipitated from its solutions by sulphur dioxide, this variety having a specific gravity 601 5. When heated in air, tellurium burns, forming the dioxide TeOv. The element is insoluble in water, but dissolves in concentrated sulphuric acid forming a deep red solution.

Like sulphur and selenium, tellurium combines directly with hydrogen to form lelluretted hydrogen, TeH_2, an extremely objection- able smelling and highly poisonous gas, which was first prepared by Sir H. Davy in 1810. It is best obtained by decomposing metallic tellurides with mineral acids. It is soluble in water, the solution gradually decomposing with deposition of tellurium; it also decomposes on exposure to light. It burns, and also, like sulphuretted hydrogen, precipitates many metals from solutions of their salts. It may be liquefied, the liquid boiling at 0° C, and on further cooling, it solidifies, the solid melting at 48° C. Many tellu rides of metals have been examined by C. A. Tibbals {Jour. Amer. Chem. Soc, 1909, 31, p. 902) who obtained the sodium and potassium tellurides by the direct union of their component elements and others from these by precipitation. The tellurides of the alkali metals immediately decompose on exposure to air, with libera- tion of tellurium. Two chlorides are known, the dichloride, $TeCl_2$, and the tetrachloride, $TeCl_4$. They are both obtained by passing chlorine over tellurium, the product being separated by distilla- tion (the tetrachloride is the less volatile). The dichloride is an amorphous, readily fusible, almost black solid. It is decomposed by water with formation of tellurium and tellurous acid: $2TeCl_2 + 3H_2O = Te + H_2TeO_3$

+4HCl. The tetrachloride is a white crystalline solid which is formed by the action of chlorine on the dichloride or by sulphur chloride on the element. It melts at 224 C. and is exceedingly hygroscopic. Water decomposes it with formation of tellurous acid and other products. It combines directly with sulphur trioxide to form a complex of composi- tion TeClc2S0 3 . The tetrabromide similarly gives TeOBr 2 -2S0 3 (W. Prandtl, Zeit. anorg. Chem., 1909, 62, p. 237). Iodides are also known.

Two oxides of the element are definitely known, viz., the dioxide, Te0 2 , and the trioxide. Te0 3 , whilst a monoxide, TeO, has also been described. The dioxide is formed by burning tellurium in air or JCXVI. Iv

by warming it with nitric acid. It is a colourless crystalline solid which readily fuses to a yellow liquid. The trioxide is an orange- coloured solid which is formed when telluric acid is strongly heated. Tellurous acid, H 2 Te0 3 , is obtained when the tetrachloride is de- composed by water, or on dissolving tellurium in nitric acid and pouring the solution into water. It is a colourless solid and behaves as a dibasic acid. The alkaline tellurites are soluble in water. It also gives rise to super- acid salts, such as KHTeCVH 2 TeC) 3 ; K 2 Te0 3 -3TeOj. Telluric acid, H 2 TeC>4, is obtained in the form of its salts when tellurium is fused with potassium carbonate and nitre, or by the oxidizing action of chlorine on a tellurite in alkaline solution. The free acid may be obtained by decomposing the barium salt with sulphuric acid and concentrating the solution, when a crystalline mass of composition H 2 Te04-2H 2 separates. It is also formed when the dioxide is oxidized by hydrogen per- oxide in caustic potash solution (A. Gutbier, Zeit. anorg. Chem., 1904, 40, p. 260), and perhaps best of all by oxidizing tellurium with a mixture of nitric and chromic acids. It crystallizes in prisms, which lose their water of crystallization at 160 C. The tellurates of the alkali metals are more or less soluble in water, those of the other metals being

very sparingly or almost insoluble in water. Some tellurates exist in two forms, a colourless form soluble in water and acids, and a yellow form insoluble in water and acids. An oxychloride of tellurium has been described, but the investigations of V. Lenher {Jour. Amer. Chem. Soc, 1909, 31, p. 20) seem to negative its existence.

A considerable amount of work has been done on determinations of the atomic weight of tellurium, the earlier results giving the value 128. According to its position in the periodic classification of the elements one would expect its atomic weight to be less than that of iodine, instead of approximately equal, and on this account many efforts have been made to isolate another element from tellurium compounds, but none have as yet been successful. Recent investigations of the atomic weight are due to G. Gallo {A tti. R. Acad. Lincei, 1905 (iv.), 14, pp. I, 23, 104), who, by a determination of the electrochemical equivalent of the element, arrived at the value 127-61; A. Gutbier {Ann., 1905, 342, p. 266) by reduction of the dioxide obtained 127-6; Marckwald, by determining the ratio of telluric acid to tellurium dioxide, obtained 126-85; H. B. Baker {Jour. Chem. Soc, 1907, 91, p. 1849), by determining the ratio of tellurium dioxide to oxygen and by analysis of tellurium tetrabromide, obtained 127-60, and V. Lenher {Jour. Amer. Chem. Soc, 1909, 31, p. 20), by heating the double salt, TeBr 4 -2KBr, first in chlorine and finally in a current of hydrochloric acid to convert it into potassium chloride, obtained the value 127-55. P. E. Browning and W. R. Flint {Amer. J. Sci., 1909 (iv.), 28, p. 347) claim to have separated two substances (of atomic weights 126-49 and 128-85 respectively) from tellurium, by fractional precipitation of tellurium chloride with water, but in the opinion of H. B. Baker this would seem to point to the fact that the tellurium used was insufficiently purified, since his work showed that there was no difference between the first and last fractions (see Chem. Soc. Ann. Rep., 1909, 6, p. 39). Marckwald {Ber., 1903, 36, p. 2662) showed

that the Joachimsthal pitchblende yields tellurium and a minute quantity of the strongly radioactive polonium which is precipitated by bismuth (see Radioactivity).

TELUGU, one of the five great Dravidian languages. The word is probably derived from Trilinga (= the three lingas of Siva), a name for the old Hindu kingdom of Andhra. It was at one time called by Europeans " Gentoo," from a Portuguese word meaning Gentile. The Telugu-speaking peoples are partly subjects of the nizam of Hyderabad and partly under British rule, beginning north of Madras city and extending N.W. to Bellary, where Telugu meets Kanarese, and N.E to near Orissa. They are taller and fairer than the Tamils, other- wise they are of typical Dravidian features. They are an enter- prising people, good farmers and skilful seamen. They formed the greater part of the early Madras or " coast " army, whence sepoys even in Bengal were formerly called telingas. In 1901 the number of speakers of Telugu in all India was nearly twenty- one millions.

TEMBU (Ama-Tembu), popularly called Tambookies; one of the most powerful of Kaffir tribes, who have given their name to Tembuland, a division of Cape Colony which lies south-west of Griqualand East. In Kaffir genealogy they hold an honour- able position, being traditionally descended from Tembu, elder brother of Xosa, from whom most " Kaffirs " claim descent (see Kaffirs).

TEMENOS (Gr. Te/ueeos, rkuvew, to cut), the Greek term in archaeology given to a piece of land which forms the enclosure of a temple, or sanctuary.

TEMESVAR, the capital of the county of Temes, Hungary, 188 m. S.E. of Budapest by rail. Pop. (1900) 53,033. It lies

on the navigable B6ga canal and on the river Bega, and consists of the inner town, formerly strongly fortified, and of four out- lying suburbs. Several parks have been laid out on the site of the broad glacis which formerly separated Temesvar from its suburbs, which are now united with it by broad avenues. Temesvar is the seat of a Roman Catholic and a Greek Orthodox bishop. Amongst its, principal buildings are the Roman Catholic cathedral, built (1735-57) by Maria Theresa; the Greek Orthodox cathedral; a castle built by Hunyady Janos in 1442, now used as an arsenal; the town and county hall, the museum and large barracks. In the principal square rises a Gothic column, 40 ft. high, erected by the Emperor. Francis Joseph in 1851 to commemorate the successful resistance of the town to the siege of 107 days laid by the Hungarian revolutionary army in 1849. Temesvar is the most important centre of commerce and industry of south Hungary, and carries on a brisk trade in grain, flour, spirits and horses. Its industrial establishments include factories for tobacco, cloth, matches, leather, artificial manure, besides breweries and distilleries.

Temesvar is an old town, and although destroyed by the Tatars in 1242, it was a populous place at the beginning of the 14th century, and was strongly fortified by King Charles Robert of Anjou, who resided here several years. The Hunyady family had also their residence here. In 1514 the peasant leader, Stephan Dozsa, was defeated by the Transylvanian voivod, John Zapolya, near Temesvar, captured and executed. Unsuccess- fully besieged by the Turks in 1552, it was captured by them in the following year after a heroic resistance. It remained in their hands until 17 16, when it was liberated by Prince Eugene of Savoy. New strong fortifications were erected, and the town grew steadily in importance, serving as the capital of the whole Banat. It endured another siege in 1849, when it re- sisted successfully the attacks of a Hungarian revolutionary army.

TEMPE, VALE OF* the ancient name (i.e. ” cleft,”

from Gr. rkuvuv, to cut) of a narrow valley in N. Thessaly, through which the river Peneus (mod. Salambria) reaches the sea. The valley, which the Greeks were accustomed to associate with rural delights, is a chasm, cloven in, the rocks, the fable tells us, by the trident of Poseidon, between Olympus and Ossa; but though it possesses every element of the sublime, yet its features are soft and beautiful', from the broad, winding river, the luxuriant vegetation, and the glades that at intervals open out at the foot of the cliffs. It is about four miles and a half long, and towards the middle of the pass, where the rocks are highest, the precipices in the direction of Olympus fall so steeply as to bar the passage on, that side; but those which descend from Ossa are the loftiest, for they rise in many places not less than 1500 ft. from the valley. Owing to the length and narrow- ness of the ravine, it was a position easily defended, but still it offered a practicable entrance to an invading force; a number of castles (of which the ruins still exist) were built at different times at the strongest points. Tempe was sacred to Apollo, to whom a temple was ejected on the right bank. Every ninth year a sacred mission proceeded to the valley to pluck the laurel for the chaplets for, the Pythian games. Owing to its wide^ spread fame, the name Tempe was given also to the valley of the Velinus near Re^te (Jtaly) and that of the Helprus in Sicily.

TEMPER (from Lat. temperate, to mingle or compound in due proportion, to qualify, rule, regulate, to be mpderate, formed from tempus, time, fit or. due season), to blend, modify, or qualify by mixing, to combine ia due proportions, hence to restrain, calm: A specific application of the word is to the bringing of steel or other metal to a proper hardness and elasticity (see Metal and Iron and Steel). The word is also used as a substantive, especially in the transferred sense of disposition or frame of mind, generally with some qualifying epithet, but when used absolutely signifying a hasty, passionate temper, or display of such.

TEMPERA (the Italian term), or Distemper, a method of painting in which solid pigments are empleyed, mixed with a

water medium, 1 in which some kind of gum or gelatinous sub stance is dissolved to prevent the colours from scaling off. Tempera is also called in Italy fresco a secco, as distinguished from fresco bv.ono, or true fresco, painted on freshly laid patches of stucco. Various media have been used for tempera work, such as the glutinous sap of the fig and other trees, various gums which are soluble in water, and size made by boiling down fish-bones, parchment and animals' hoofs. A mixture of egg and vinegar has also been found to make a good medium, especially when it is desirable to apply the colours in consider- able body or impasto. For the nature and history of painting in tempera and fresco, see Painting.

TEMPERANCE. The word " temperance," which strictly means moderation, has acquired a particular meaning in con- nexion with intoxicating liquor, and it is here used in that limited sense. The " temperance question " is the equivalent in English of I'alcoolisme and Alkoholismus in French and German-speaking countries respectively; it embraces all the problems that arise in connexion with the use or abuse of alcoholic drink. This usage has arisen from the practice of societies formed for the purpose of suppressing or reducing the consumption of such liquors, and calling themselves Temperance Societies. Their activity is often spoken of as the Temperance Movement, though that term; properly covers very much wider ground.

Historical. — Ever since man in some distant age first dis- covered that process of fermentation by which sugar is converted into alcohol and carbonic acid, and experienced the intoxicating effects of the liquor so produced, there has been, in a sense, a temperance question. The records of the ancient Oriental civilizations contain many references to it, and from very remote times efforts were made by priests, sages or law-givers in India, Persia,

China, Palestine, Egypt, Greece and Carthage to combat the vice of drunkenness. But the evil appears never to have been so great or the object of so much attention in the ancient world as in Western countries and our own era. Two circumstances mainly differentiate the modern problem; one is the use of distilled waters or spirits as a beverage, and the other the climatic conditions prevailing in the more northern latitudes which are the home of Western civilization. The intoxicating drinks used by the ancients were wines obtained from grapes or other fruits and beers from various kinds of grain. These products were not confined to the East, but were known to the ancient civilizations of Mexico and Peru and even to primitive peoples who used the sugar-containing juices and other substances indigenous in their country. In the time of the Romans the barbarians in the north of Europe used fermented liquors made from honey (mead), barley (beer) and apples (cider) in place of grape-wine. AH such drinks produce intoxi- cation if taken in sufficient quantity; but their action is so much slower and less violent than that of distilled spirits that even their abuse did not give rise to any opposition that can properly be called a movement, and the distinction has re- peatedly formed the basis of legislation in several countries down to this day. Extremists now place all alcohol-containing drinks under the same ban, but fermented liquors are still generally held to be comparatively innocuous; nor can any one deny that there is a difference. It is safe to say that if spirits had never been discovered the history of the question would have been entirely different. The distillation of essences from various substances seems to have been known to the ancients and to have been carried on by the Arabians in the dark ages; but potable spirits were not known until the 13th century. The distilled essence of wine or aqua vitae (brandy) is mentioned then as a new discovery by Arnoldus de Villa Nova, a chemist and physician, who regarded it, from the chemical or medical point of view, as a divine product. It probably came into use very gradually, but once the art of distillation had been

mastered it was extended to other alcoholic substances in countries where wine was not grown. Malt, from which beer had been made from time immemorial, was naturally used for the

1 Hence it used to be called ” water- work ’’; see Shakespeare, Hen. IV., part ii. act ii. sc. 1.

purpose, and then gin or Geneva spirits and whisky or usque- bagh (Irish for ” water of life “) were added to grape brandy; then came corn brandy in the north and east of Europe, rum from sugar canes in the Indies, potato spirit, and eventually, as the process was perfected, rectified ethyl alcohol from almost anything containing sugar or starch.

The concentrated form of alcohol, thus evolved, for a long time carried with it the prestige of a divine essence from the middle ages when chemistry was a mysterious art allied to all sorts of superstitions. It had potent properties and was held to possess great virtue. This view is embodied in the name ” water of life,” and was at one time universally held; traces of it still linger among the very ignorant. Ardent spirit seemed particularly desirable to the habitants of the cold and damp regions of northern Europe, where the people took to it with avidity and imbibed it without restraint when it became cheap and accessible. That happened in England, as related in the article on Liquor Laws, in the early part of the 18th century; and out of the frightful results which followed there eventually arose the modern Temperance Movement. The legislature had been busy with the liquor traffic for more than two centuries previously, but its task had been the repression of disorder; the thing was a nuisance and had to be checked in the interests of public order. It is significant that though drunkenness had been prevalent from the earliest times, the disorder which forced legislative control did not make its ap- pearance until after the

introduction of spirits; but they were not cheap enough to be generally accessible until the home manufacture of gin was encouraged towards the end of the 17th century, and consequently their use did not cause visible demoralization on a large scale until then. When, however, the spirit bars in London put up signboards, as related by Smollett, inviting people to be " drunk for one penny " and " dead drunk for 2d.," with " straw for nothing " on which to sleep off the effects, the full significance of unlimited indulgence in spirits became visible. Speaking in the House of Lords in 1743 Lord Lonsdale said:—

" In every part of this great metropolis whoever shall pass along the streets will find wretchedness stretched upon the pavement, insensible and motionless, and only removed by the charity of passengers from the danger of being crushed by carriages or trampled by horses or strangled with filth in the common sewers. . . . These liquors not only infatuate the mind but poison the body; they not only fill our streets with madness and our prisons with criminals, but our hospitals with cripples. . . . Those women who riot in this poisonous debauchery are quickly disabled from bearing children, or produce children diseased from their birth."

The latter part of this quotation is particularly interesting because it proves the participation of women in public drunken- ness at this period and shows that the physical ruin caused by excess and its national consequences were then for the first time recognized. It was the first step towards the inauguration of the Temperance Movement in the sense of a spontaneous and conscious effort on the part of the community as distin- guished from the action of authority responsible for public decency. The need was only realized by degrees. Intemper- ance was one of many questions which we can now see were struggling into existence during the latter half of the 18th century, to become the subject matter of " social reform " in the 19th. Like the majority of them it was a question of bodily welfare, of health.

A breach had been made in the unthinking traditional belief in the ' virtue of alcoholic liquor by the experiences referred to; and medical thought, as soon as it began to busy itself with health as distinguished from the treatment of disease, took the matter up. In 1804 Dr Trotter of Edinburgh published a book on the subject, which was an expansion of his academic thesis written in 1788; Dr Benjamin Rush of Philadelphia, a distinguished American physician and politician, who had studied in Edinburgh and London, wrote a striking paper on the same subject in the same year; and very soon after this the organized Temperance Movement was set on foot in the United States, where the habit of spirit-drinking had been transplanted from the British Islands.

Temperance Organization.-^la 1808 a temperance society was founded at Saratoga in the state of New York, and in .1813 the Massachusetts Society for the Suppression of Intemperance made its appearance. These seem to have been the earliest organizations, though the device of a pledge of abstinence had been introduced in 1800. The movement made rapid progress mainly under the influence of the Churches. In 1826 the American Society for the Promotion of Temperance was founded in Boston, and by 1633 /there were 6000 local societies in several states with more than a million members. The. campaign was for the most part directed against , the use of spirits only, and the proposal to include all alcoholic drinks in the pledge of abstinence, though adopted by a few societies, was rejected in 1833 by the American Society, but accepted in 1836 and retained ever since.

In Europe the earliest organizations were formed in Ireland. A temperance club is said to have been started at Skibbereen in 1818, and others followed; but it was in 1829 that the organized movement began to make effectual progress with the formation of the Ulster Temperance Society. By the end of that year there were twenty-five societies in Ireland and two or three in Scotland. In 1830 the movement spread to York- shire and Lancashire, and supported a

newspaper called the Temperance Societies' Record, according to which there were then 127 societies with 23,000 paying members and 60,000 associated abstainers. In 1831 the British and Foreign Temperance Society was founded in London with the Bishop of London (Blomfield) for president and Archbishop Sumner for one of the vice-presidents. This important society, of which Queen Victoria became patron on her accession in 1837, came to an end in 1850, when the whole cause was under an eclipse. At the time it was formed temperance meant abstinence from spirits, as at first in the United States; but very soon afterwards the more drastic form of total abstinence began to be urged in the north of England and acquired the name of teetotalism from " teetotal," a local intensive for " total." It led to strife in the societies and damaged the cause, which suffered in public estimation from the intemperance of some of its advocates. The early promise of the movement Was not fulfilled; it ceased to grow after a few years and then declined, both in the United Kingdom and in the United States. The most remarkable episode in the temperance campaign at this period was the mission of the Rev. Theobald Mathew of Cork, commonly known as Father Mathew, the greatest of all temper- ance missionaries. He travelled through Ireland in the years 1838-42 and everywhere excited intense enthusiasm. People flocked to hear him and took the pledge in crowds. In 1841 the number of abstainers in Ireland was estimated to be 4,647,000, which is more than the entire population to-day. In three years the consumption of spirits fell from 10,815,000 to 5,290,000 gallons. This was not all due to Father Mathew, because great depression and distress prevailed at the same time, but he unquestionably exercised an extraordinary in- fluence. In 1843 he went to England, where he had less, though still great, success, and in 1850 to America. He died in 1856, by which time the cause had fallen into a depressed state in both countries. In the United States a flash of enthusiasm of a similar character, but on a smaller scale, known as the Washingtonian movement, had appeared about the same time. It was

started in Baltimore by a knot of reformed drunkards in 1840 and was carried on by means of public meetings; many societies were formed and some half-million persons took the pledge, including many reformed drunkards. But the public grew weary of the agitation and enthusiasm died down. The decline of moral suasion and of the societies was followed by a tendency to have recourse to compulsion and to secure by legislation that abstinence from alcoholic drinks which the public would not voluntarily adopt or would not maintain when adopted. In 1845 a law prohibiting the public sale of liquor was passed in New York State but repealed in 1847; in 1851 state prohibition was adopted in Maine (see Liquor Laws). The same tendency was manifested in England by the formation

in 1853 of the United Kingdom Alliance " to procure the total and immediate legislative suppression of the traffic in intoxi- cating liquors as beverages."

Since that time the organized movement has embraced both elements, the voluntary and the compulsory, and has combined the inculcation of individual abstinence with the promotion ai legislation for the reduction or suppression of the traffic. On the whole the latter has predominated, particularly in the United States, where organized agitation has for more than half a century made temperance a political question and has pro- duced the various experiments in legislation of which an account is given in the article on Liquor Laws. In 1869 a National Prohibition Party was formed. In Great Britain the political element has been less predominant but sufficiently pronounced to form a distinguishing feature between the early and more en- thusiastic stage of temperance agitation, which after lasting some twenty years suffered a reaction, and the later one, which began between i860 and 1870 and made way more gradually. In addi- tion to combining the moral and the political elements the modern movement is

characterized by the following features : (1) international organization, (2) organized co-operation of women, (3) juvenile temperance, (4) teaching -of temperance in schools and elsewhere, (5) scientific study of alcohol and inebriety.

(1) International organization appears to have been started by the Order of Good Templars, a society of abstainers formed in 1 85 1 at Utica in New York State. It spread over the United States and Canada, and in 1868 was introduced into Great Britain. Some years later it was extended to Scandinavia, where it is very strong. Temperance societies had previously existed in Norway from 1836 and in Sweden from 1837; these seem to be the earliest examples on the continent of Europe. The Good Templar organiza- tion has spread to several other European countries, to Australasia, India, South and West Africa and South America. There are several other international societies, and international congresses have been held, the first in 1885 at Antwerp. A World's Prohibition Conference was held in London in 1909. It was attended by about 300 delegates from temperance societies in nearly all parts of the world, and resulted in the foundation of an International Prohibition Federation, which embraces every country in Europe with three or four minor exceptions, the United States, Mexico, Argentina, the British self-governing Dominions, India, China, Japan, Palestine, Tunisia and Hawaii. The formation of this body indicates the growth of the most uncompromising form of antagonism to the liquor traffic. Its object is the total abolition of the legalized traffic throughout the world.

(2) The organization of women, which has also become inter- national, dates from 1874, when the National Women's Christian Temperance Union was founded at Cleveland in the United States. In 1007 it had branches in every state in the Union and in about 10,000 towns and villages with an aggregate membership of 350,000. It employs all means, educational and social as well as political, but it has exercised great influence in promoting that drastic legis- lation which characterizes the United

States. It has also taken up many other questions relating to women, in addition to temper- ance, and has adopted the badge of a white ribbon. About the year 1883 Miss Frances Willard, who had been the moving spirit of the Union, carried the organization of women into other lands and formed the World's Woman's Christian Temperance Union, which now possesses branches in some fifty countries with a total membership of half a million. It has held several conventions in America and Europe and circulated a polyglot petition, said to be the largest on record, which has been presented to a large number of sovereigns and other heads of states. There are several other female organizations in the United Kingdom.

(3) The inclusion of children in temperance organization goes back to 1847, when a society was formed at Leeds, in Yorkshire, of juvenile abstainers who had taken the pledge; it took the name of Band of Hope. The practice spread, and in 1851 a Band of Hope Union was formed. There are now a number of such unions, for the United Kingdom, Scotland, Ireland and separate counties in England; the Bands of Hope are said to number 15,000 in all. There are also several other juvenile organizations, some of which are branches of the adult societies. By far the largest is the juvenile section of the Church of England Temperance Society, which has 485,888 members (1910). Children's societies in the United States are usually called the Loyal Temperance Legion, but there are some Bands of Hope also. On the continent of Europe juvenile organizations exist in several countries and notably in Sweden and Belgium (sociitis scolaires).

(4) The teaching of temperance in schools, which has become a great feature of the moral propaganda, was begun by private effort in 1852, when the late Mr John Hope inaugurated a regular weekly

visitation of day-schools in Edinburgh. In 1875, at the invitation of the National Temperance League, the late Sir Benjamin Richard- son wrote his Temperance Lesson Book, which was adopted by many

schools as a primer. In 1889 school- teaching by travelling lecturers was taken up by the United Kingdom Band of Hope Union, and the example was followed by many other societies. The Band of Hope Unions in England alone have spent over £3000 a year for the last twenty years in itinerant lectures; object-lessons on the nature and effects of alcoholic drinks are given to children in the higher standards. The Church of England Temperance Society carries on similar work in diocesan schools, and examines the children in the subject of temperance; in 1909 it had in use 6000 lantern slides for lectures, and set 7598 examination papers. The voluntary temperance teaching having grown continuously and become very extensive, has led to action by central education authorities. In 1906 the Board of Education in Ireland made " Hygiene and Temperance " a compulsory subject in the public schools. In 1909 the Board of Education for England issued a syllabus of temperance teaching, the adoption of which in elementary schools is optional. In Scotland also courses of teaching in hygiene and temperance are permissive and have been adopted by many local educational authorities. In the United States compulsory teaching is of much longer standing and more advanced. The question was first taken up by the Women's Christian Temperance Union (see above) in 1879; it was believed that by teaching the physiological effects of alcohol to all children the problem of in- temperance would be effectually " solved," and a systematic political campaign was planned and carried out for the purpose of obtaining compulsory legislation to give effect to this idea. The campaign was successful in New York in 1884, in Pennsylvania in 1885 and subsequently in other states. Laws have now been passed in every state and territory, making anti-alcohol teaching part of the curri- culum in the public schools, and tobacco is usually included. The manner of teaching has given rise to much controversy and opposi- tion. Temperance is taught in connexion with physiology and hygiene, but the promoters of the movement insisted that promi- nence should be given to it and that the text-books should

be adapted accordingly. Consequently a class of text-books came into use which were offensive to men of science and well-educated teachers because they contained false statements and absolute nonsense. The effect of forcing teachers to teach what they knew to be untrue was very unfortunate, and in some states the laws have undergone revision. With regard to other countries the practice varies greatly. School- teaching is compulsory in Canada, except in Quebec and Prince Edward Island, where it is permissive; in France since 1902; in Sweden since 1892, and in Iceland. It is recognized by authority but optional in Australia, South Africa, some provinces of India, Belgium, Finland, Denmark, Norway, Germany, Austria-Hungary and Switzerland. The movement in favour of school-teaching is continuously and generally advancing.

(5) The scientific study of the physiology and pathology of alcohol is a very large subject in itself. As has been shown above, the pioneers of the temperance movement were medical men; and though the Churches soon became the chief moving force, doctors have always exercised an influence, and in more recent times since people learnt to bow down to the name of Science there has been a marked tendency to have recourse to scientific authority for arguments and support, of which the teaching of temperance as a branch of physiology or hygiene is an illustration. At the same time the increasing interest taken in all questions relating to health has directed the attention of scientific investigators to this subject, while advancing knowledge of physiology, pathology and chemistry in general and improved means of investigation have enabled them to pursue it in various directions. Consequently a large amount of research has been devoted to alcohol and its effects both by experimentation on animals and plants and by observation of the morbid conditions set up in human beings by excessive and long- continued indulgence in alcoholic drinks. Another field of inquiry which has been actively worked is the statistical study of drink in relation to nationality, occupation,

disease, insanity, mortality, longevity, crime, pauperism and other aspects of social life. In London there is a society, consisting chiefly of medical men, for the scientific study of inebriety; it holds periodical meetings at which papers are read and discussed. But the subject is being worked at in every country, and a vast mass of information has been accu- mulated. An attempt will be made later on to summarize the more important results of this activity. There is no doubt that it has exercised a strong influence on public opinion and on the whole in the direction of temperance. A great change of attitude has taken place and is still going on. The ill-effects of excessive drinking, especially of distilled spirits, have long been recognized, but the tendency now is to question whether any alcohol-containing drinks are of any value at all and to deny any valid distinction between distilled and fermented liquors. Medical abstinence societies have been formed in England, Germany, Belgium, Holland, Norway, Sweden and Denmark.

Present State of the Movement. — No comprehensive data are available for estimating the numerical strength of the temperance organizations or the number of abstainers at the present time; but

the Alliance Year Book contains a directory of societies, which at least give some idea of the wide distribution of the movement. The following summary figures are extracted from the list; they relate to distinct organizations, exclusive of branches and sub-sections, having for their object the promotion of individual abstinence or of legislation : The United Kingdom, 62 ; Australasia, 1 1 ; Canada, 2; South Africa, 3; India, 2; United States, 10; Austria-Hungary, 8; Belgium, 2; Denmark, 5; France, 4; Germany, 12; Holland, 6; Sweden, 6 ; Switzerland, II. The figures are no doubt very imperfect and must not be taken in any way to represent the relative

strength of temperance organizations in the several countries. The list for the United Kingdom is much more complete than for the other countries. The Alliance Year Book indeed gives the names of 130 organizations in the United Kingdom connected in some way with temperance work; but these include local branches, juvenile sections, insurance companies, orphanages and so on. An attempt has been made to pick out the temperance societies as ordinarily understood; but some of those included are merely committees

for promoting particular pieces of legislation, and on the other hand bodies like the Salvation Army and the Church Army, which do a great deal of temperance work but are not primarily and principally engaged in it, have been omitted. Altogether the subject is full of confusion and not susceptible of exact statement. The number of societies is no guide to the number of individuals, for many persons belong to several organizations. There can be little doubt that the organized movement is numerically strongest in the United States and next strongest in the United Kingdom, but no reliable estimates can be made.

Some of the British societies call for particular notice. The two principal ones are the Church of England Temperance Society and the United Kingdom Alliance. The latter, founded in 1853, is the chief fighting political organization, having total prohibition of the liquor traffic for its object; its income is about £12,000 a year. The Church of England Temperance Society is much the largest of the British societies. It was founded in 1862 and re- constituted in 1873 on a dual basis of total abstinence and general

Consumption per Head of Population

Countries.

Wine in Gallons.

1891

1892

1893

1894

1895

1896

1897

1898

1899

1900

1901

1902

1903

1904

1905

United Kingdom

o-39

0-38

o-37

o-35

o-37

0-40

0-39

0-41

0-41

0-38

0-37

0-36

0-33

0-28

0-27

Russia

Norway .

Sweden .

Denmark

Germany-

o-57

I-OI

1-89

i-43

i-o6

2-29

1-34

o-77

1-03

i-45

1-14

1-14

i-6i

1-74

i-6i

France

23-0

21-0

31-0

24-0

18-0

29-0

22-0

22-0

31-0

40-0

34-0

24-0

22-0

40-0

33-9

Belgium .

0-90

0-84

o-75

0-86

0-90

1-03

o-86

o-88

0-90

I-OI

1-03

I-OI

1-08

o-95

1-03

Holland .

0-44

0-44

0-44

0-42

0-42

0-42

0-40

0-40

0-40

o-37

0-37

0-37

o-35

o-35

0-40

Switzerland

16-0

14-0

17-0

i5-o

14–0

14–0

21–0

i5–o

15–0

H–3

9‘5

Italy .

26–0

23–0

21–0

17–0

16–0

19–0

18–0

21–0

20–0

22–0

29–0

27–0

24–6

26–2

18–5

Austria

2–2

2–4

3–5

3–1

3–3

2–9

2–6

3–3

3–3

4–0

4–0

4–0

3–5

4–0

4–2

United States

0–36

0–40

0–27

0–25

0–22

0–44

0–23

0–30

0-32

0-31

0-52

0-40

0-44

o-35

Canada .

O-II

O-IO

O-IO

0-09

0-09

0-09

0-09

0-08

0-09

0-09

0-09

0-09

0-09

O-IO

O-IO

Australia

1-09

I-OI

o-95

1-14

1-26

1-42

I-2I

I-OO

0-74

1-22

1-38

i-ii

1-48

1-24

1-27

New Zealand

0-17

0-17

0-17

0-14

0-13

0-14

0-15

0-15

0-15

0–15

0–16

0–16

0–15

0–14

013

Beer in Gallons.

United Kingdom

30–2

29–8

29–6

29–5

29–6

30–8

3i–3

3i–8

32–6

31–6

30–8

30–3

29–7

28–8

27–7

Russia

0–70

0–70

0–62

0–67

0–84

0–92

0–94

0–89

0–97

0–94

0–92

0–89

1–05

1–03

Norway .

4–8

4–5

4–6

4–4

3–9

3–6

39

4–8

5–1

5-0

4.4

3-9

3-i

2-9

3-o

Sweden .

6-8

6-8

7-0

7-3

7-8

9-3

99

II-O

12-8

12-4

13-3

12-5

12-9

n-6

Denmark

17-9

18-5

19-1

19-1

20-2

20-8

20-8

22-0

21-7

2I-I

20-8

20-2

20-5

20-5

Germany

23-2

23-7

23-9

23-5

25-5

25-5

27-1

27-3

27-5

27-5

27-3

25-5

25-7

25-7

263

France

4-8

5-3

5-3

4-8

5-i

5-3

53

5-5

5-7

5-9

8-i

8-1

7-7

8-1

7-5

Belgium .

39-2

39-8

40-0

4°-3

42-2

43-6

44.4

45-5

46-9

48-2

48-2

47-1

47-7

48-2

48-8

Holland .

Switzerland

io-6

II-O

n-4

1 1 -2

12-5

13-9

H-7

15-4

15-4

14-7

13–4

13–6

14–3

14–3

Italy .

0–18

0–13

0–12

O–IO

O–II

O–IO

O–II

0–12

0–13

0–14

0–15

0–16

0–17

0–20

0–22

Austria

7–5

8–4

8–8

9–0

9–2

9–9

9–9

9–9

9–9

9–9

9–9

9–5

9–2

9–5

9–0

United States

12–6

13–5

12–8

12–6

13–2

12–4

13–3

12–7

13–3

13–5

14–6

15–0

15–2

15–4

16–8

Canada .

3–8

3–6

3–5

3–5

3–4

3.6

3–5

39

4–1

4.4

4–7

51

4–8

5–0

5–4

Australia

117

106

9–i

9–0

IO–2

II–O

n–4

n–7

n–8

12–6

12–4

12–4

n–8

n–3

1 1 –3

New Zealand

7–8

7–6

7–7

7–4

7–4

7–9

8–2

8–4

8–6

9–1

9–4

9-2

9-5

9-5

9-2

Spirits in Gallons.

United Kingdom

1-03

1-03

0-98

0-97

I-OO

1-02

1-03

1-04

1-09

i-ii

1-09

1-05

0-99

o-95

0-91

Russia

0-89

0-89

0-89

o-95

0-92

0-89

0-92

0-92

1-00

0-97

0-92

0-92

I-OO

o-95

Norway .

0-70

0-62

o-68

o-73

0-66

0-44

0-42

0-48

0-62

0-64

0-64

0-64

0-62

C-62

0-51

Sweden

1-28

1-30

1-30

1-34

1-34

i-39

1-45

1-56

1-63

1-67

1-65

1-52

1-43

1-34

1-36

Denmark

2-67

2-79

2-90

2–71

2–79

2–86

2–71

2–60

2–77

2–58

2–69

2–69

2–50

2–44

2–42

Germany

1–67

1–67

1–69

1–69

1–63

1–67

1–63

1–63

1–69

1–67

1–63

161

1-54

1-54

i-43

France

1-68

1-74

1-65

1-54

1-55

1-59

1-63

1-79

i-75

1-77

1-33

1-24

i-35

1-50

1-37

Belgium .

1-87

1-85

1 -83

1-83

1-94

1-63

1-72

1-63

163

i-8o

1-89

i-6i

I-OI

1-14

I-IO

Holland .

1-72

1-72

1-69

1-69

1-65

1-65

i-6i

1-58

i-54

1-58

1-56

1-54

1 -50

i-5°

1-43

Switzerland

1-19

I-2I

' 1-19

1-08

i-o8

I-I2

1-14

1-17

I-I2

i- 06

0-92

o-95

099

I-OI

Italy .

0-28

0-29

0-21

0-24

0–19

0–21

0–23

0–21

0–22

0–24

0–24

0–24

0–25

0–28

0–29

Austria

1–98

2–20

1–98

1–98

1–98

1–98

1–98

1–98

2–20

1–98

1–98

1–98

1-98

1-98

1-98

United State

1-24

1-27

I-I2

o-95

0-84

0-85

o-93

0-98

1-04

1-09

I-I3

1-22

1 23

I-2I

1-26

Canada

0-74

0-7I

0-76

0-76

0-69

0-65

o-75

0-56

0-69

0-71

0-76

o-8o

0-83

o-95

0-94

Australia

I-I3

0-97

o-68

o-75

o-73

0-82

0-78

0-79

0-83

0-89

0-97

0-84

0-79

0-87

0-96

New Zealand

0-70

0-71

0-70

0-65

0-63

064

o-66

o-66

0-69

0-72

0-76

o-75

o-75

0-76

0-73

5 82

TEMPERANCE

anti-intemperance, its objects are (.1) the promotion of habits of temperance, (2) the reformation of the intemperate; (3) the removal of the causes which lead to intemperance. Thus it embraces both the moral and the legislative spheres, but the former takes first place; and this wa<

emphasized in 1909 by the inauguration of a forward movement " in spiritual activity. On the legislative side the society supports measures of reform rather than pro- hibition, and particularly reduction of licences and popular control of the traffic. Its activity is many-sided ; it carries on an extensive publication department and educational courses, police court and prison gate missions, missions to seamen, travelling vans, and in- ebriate homes, of which there are 4 for women and 1 for men. It works locally through 36 diocesan branches, of which the aggregate expenditure in 1909 was £41,353, exclusive of the central office. It has Church temperance societies in Scotland and Ireland affiliated to it, as are the missions to seamen, and it has given birth to a temperance mission for railway workers and a Church benefit society. Its comparative moderation contrasts strongly with the extreme views of many temperance bodies. One of its departments is a semi-teetotal association, which was founded separately in 1903, but came under the society in 1904; the members pledge themselves to abstain from alcoholic liquor between meals. This department, which revives an old form of pledge, has been very successful; it is found that members frequently go on to take the full pledge. The total membership of the Church of England Temperance Society in 1909 was 636,233, thus distributed: — General section, 35,901 ; total abstainers, 114,444; juvenile members, 485,888. The enormous number of juvenile members is significant. The numerical strength of the temperance societies in general, which is often greatly ex- aggerated, seems to be largely made up by the juvenile contingents, so far as information is available. Other noteworthy British societies are the Royal Army Temperance Association and the Royal Naval Temperance Society. The special liability of soldiers and sailors to intemperance makes the work of these bodies parti- cularly valuable, and it is strongly supported by the king and many officers of the greatest distinction. Very striking results have been obtained in the army. Twenty-five per cent of the Home Forces and 42 per cent, of the Indian army belong to the association; and the movement is

growing. In the navy 25,000 men have joined the Temperance Society.

Like other propagandist causes of the day the temperance move- ment is supported by an enormous output of literature, including books, pamphlets, leaflets and periodicals. The Alliance Year Book gives a list of the latter. It names over 40 in the United Kingdom ; the great majority are penny monthly magazines, but three societies conduct weekly journals — namely, the Church of England Temper- ance Society (Temperance Chronicle), United Kingdom Alliance (Alliance News) and the International Order of Good Templars (Good Templars' Watchword). Several Nonconformist churches have weekly papers in which temperance work is specially noted, as in the War Cry, the journal of the Salvation Army. For other countries the number of journals is given as follows: — Australasia, 10 (one weekly); Canada, 7 (3 weekly); India, 5; South Africa, 2; U.S.A. 15 (2 weekly) ; Austria, 2 ; Belgium, 2 ; Denmark, I ; France, 2 ; Germany, 8; Holland, 2; Italy, 1; Norway, 2; Russia, 1; Sweden, 7; Switzerland, 3. The list is no doubt imperfect. In the United States newspapers of all lands are many times more numerous than in the United Kingdom, and the American Prohibition Year Book names 21 " leading " prohibition papers, of which 16 are weekly and I daily. There are probably hundreds of temperance journals in the United States.

Effect of the Temperance Movement. — The organized agitation against the abuse and even the use of alcoholic liquors thus briefly described is a very interesting feature of social life in the present state of civilization; but when a serious attempt is made to ascertain its results the inquiry is found to be beset with difficulty. It has no doubt been largely instrumental in procuring the varied mass of legislation described in the article on Liquor Laws, particularly in the United States, the United Kingdom and Scandinavia; and these laws are in a sense results. Ardent advocates of legislation, who are always apt to substitute the means for the end, point to them with satisfaction. Those who demand

prohibition regard its adoption by this or that community as an end in itself and a proof ol "progress"; more moderate reformers view the reduction of public-houses in the same light. Facts of this kind can be stated with precision, but they go a very little way. The real point is not the law or the number of houses, but the habits of the people, and what we want to know is the effect on them of legislation, of organization, moral persuasion and the other influences that go to make up the Temperance Movement. To this question no clear or general answer can be given. There is a good deal of information about the United Kingdom, where the subject has been much more fully studied than anywhere else, and about Norway and Sweden, but for other countries valid data are lacking to show whether intemperance has increased or diminished. The fullest statistical evidence available relates to the consumption of drink.

Consumption of Drink. International Statistics. — In 1906 a return was published by the British Board of Trade giving the production and consumption of

alcoholic beverages in different countries for the years 1891-1905. The table on p. 581 is compiled from it. Information is also given in the returns for Spain, Portugal, the Balkan States, and South Africa, but it is very imperfect and has therefore been omitted.

The only considerable movement during the 15 years covered by the table is a marked increase in the consumption of beer. It has occurred in some measure in the following countries: — Russia, Sweden, Denmark, France, Belgium, Switzerland, Italy, Austria, United States, Canada, Australia, New Zealand. The rise is notably large in Sweden, France, Switzerland, United States and Canada; and the upward movement has been particularly steady since 1898 in the United States, Canada and New Zealand. Exceptions are the United Kingdom and Norway, in both of which the consumption has fallen largely and steadily since 1899. In Germany it has also fallen somewhat since 1900, but not so

steadily, and over the whole period it has risen in that country. It is impossible to connect these various movements either with legislation or with temperance organization. If the fall in Norway is ascribed to them, it must be pointed out that they are much more directed against spirits than against beer in that country, and the consumption of spirits shows no such movement, having risen since 1897. No one who has studied the subject in the different countries affected can doubt that the general rise is due to the introduction and growing popu- larity of the light beers originally brewed in Germany and Austria, and commonly called " lager." This is notably the case in France, Belgium, Sweden and North America. It is an instance of the force of popular taste. The increase in beer has not been accom- panied by a corresponding reduction of other alcoholic liquor. Wine might be left out of account in this connexion. It is largely con- sumed only in countries where it is extensively grown, namely, in France, Italy and Switzerland, out of the countries enumerated. The consumption is very irregular and dependent mainly on the abundance of the crop. But the tendency of wine has also been to rise; it has risen in France, Belgium, Italy, Austria, the United States and Australia. With regard to spirits, the only general movement is that consumption has fallen in most European countries since 1900. But this does not appear to be compensatory to the rise of beer, which extends over the whole period and went on when spirits were rising too. Exceptions to the downward movement of spirits since 1900 are offered by the United States and Canada, and to a less extent by Russia, Italy and Norway. The only country in which all classes of drink have steadily fallen is the United Kingdom ; this singular fact will be discussed presently, but its peculiarity should be noted here in connexion with other countries.

Attempts have been made to express the total consumption of each country in terms of alcohol by allowing a certain percentage of spirit for wine and beer and reducing all three to a common denominator. The calculation yields a simple and uniform measure

of comparison and permits the classification of the countries in the order of their alcoholic consumption; but it must be regarded as a somewhat arbitrary estimate, because the strength of both wine and beer varies considerably. The Brewers' Almanack gives the following table based on the returns quoted above : —

Consumption of Alcohol at Proof Strength in Gallons. Annual Average per Head, 1901-5.

France . Italy. . . . Belgium . Switzerland . Spain Portugal . Austria . Germany Denmark United Kingdom Hungary ' . United States . Sweden . Australia Holland . . . New Zealand . Canada . Russia . Cape. . . . Norway . Natal . . . Newfoundland .

Wine.

7-70 6-27 0-25

3-35 4-62 4-27 0-97 0-36

0-08 0-97

0-32 0-09

Beer.

0-63

3-84

i-ii

1-23 2-08 1-64 2-35

0-12

1-23

I-OO

0-94

0-74 0-40

0-12 0-25

0-05

0-02

Spirits.

i-36

0-26

1-35 0-96

2-06

i-75

2-54 0-99 1-89

I-2I

1-46

o-88

1 -50 0-69 0-85

°:95 o-75 o-6o

o-37 o-34

Total.

9.69 6-53 5-44 5-42 4-62 4-27 4-26 4-19 4-18

3-42 2-98

2-55 2-46 2-14

i-59

1-43 1-25

o-95

0-87 0-85 0-42 0-36

Apart from the gaps in the information, which speak for them- selves, allowance must be made for other defects. In no case is the nominal consumption per head a valid index to the relative temperateness of different peoples unless other conditions are fairly equal. The distribution of the drinking has to be taken into account, and this is conditioned by the age and sex constitution of the population and by the habits of the people. A country in

which every person except infants takes a minute quantity of drink at every meal every day will have a far larger consumption per head and yet may be far more temperate than one in which a large pro- portion of the population takes none at all and the drinking is concentrated in regard to both time and person. The Portuguese and Spaniards, for instance, are more temperate than any of the nations below them on the list ; drunkenness is never seen in Portugal and in the south of Spain (the bishop of Birmingham has publicly borne testimony to the sobriety even of such a large seaport as Barcelona). The aggregate consumption is brought up to a com- paratively high level by the national practice of drinking a little wine freely diluted with water, a beverage which contains less alcohol than many " temperance " drinks. In like manner the French and Italians, whose high place is due to wine, are more sober than most of the nations ranged below them. The writer has made extensive inquiries on this head in France. There is drunkenness, to which Zola's V Assommoir bears testimony, but outside Paris and the seaports it is rare. Employers of labour in all the principal industrial centres, including the mining districts of the north, agree on this point. The very high position of Belgium is mainly due to a prodigious consumption of beer, which is explained by the general practice of giving it to children. On the other hand, drunkenness is exceedingly prevalent in Russia, which is near the bottom of the list, and is due to the consumption of vodka. The compara-

tively small amount per head put down in the returns may, if it is correct, be explained by the very large proportion of children in the population. The opposite condition is illustrated by Western Australia, which has a consumption per head nearly thrice that of any other Australian province. These instances will show the conditions that must be taken into account in making international comparisons and the fallacy of measuring national sobriety by consumption per head.

Consumption in United Kingdom. — Statistics of consumption for a longer period of time than that covered by the table given above are available for the United Kingdom, the United States and Scandinavia, and they are of particular interest because these are the countries in which the Temperance Movement has been most active and productive of most legislation. The United Kingdom is distinguished by being the only country in the list which shows a distinct fall in the consumption of all three kinds of liquor since 1899. To estimate the significance of this interesting fact it must be placed in historical perspective. The following table, compiled from the official returns, gives the annual average consumption per head in decennial periods from 1831 to 1890, and subsequently for each year to 1909. No continuous record of beer was kept until after 1856.

United Kingdom:

Average Annual Consumption per head in Gallons.

Year.

1831-40 1841-50 1851-60 1861-70 1871-80 1881-90

1891 .

1892 .

1893 ■

1894 .

1895 •

1896 .

1897 .

1898 .

1899 •

1900 . 1901

1902 .

1903 .

1904 .

1905 ■

1906 .

1907 .

1908 .

1909 .

Wine.

0-26 0-23 0-23 0-42 0-51 0-38

o-39

0-38 0-36

o-35 o-37

0-40 0-40 0-41 0-41 0-42 0-36

o-35 o-37

0-31 0-27 0-27

0-28

0-27 0-25

Beer.

23-5 27-5

3i-5

27-7 30-1 29-7 29-5 29-4 29-6 30-8

3i-4

31-9 32-7

32'2

3i-4

30-6 30-2

29-5 28-4

27-9 27-8 27-6 26-4

Spirits.

i-ii

0-94

I-OI

094 1-17 0-99 1-03 1 03 0-98 096

i-oo

1-02 1-03 1-04 1-08 1-18

I-IO I-OI

I 03

o-99 o-93

0-91 0-91 0-90 0-87

It will be observed that the consumption has oscillated up and down during the whole period of 79 years. More spirits were drunk in 1831-40 than in the three following decades, and more wine than in

the two following decades. The decennial period of greatest consumption was 1871-80; and the highest points reached were: wine, 0-56 gal. in 1876; beer, 34-0 gals, in 1874; spirits, 1-29 gals, in 1875. Since then the consumption has always been lower, though with fluctuations. The up and down movement is always associated with the state of trade, and the connexion is well marked in the last ten years. The progressive fall is striking, particularly in

regard to beer, which is the staple drink of the people; but the period is too short to warrant the inference that it represents a permanent movement which will continue. The fluctuations shown by the decennial table given above suggest the probability of a subsequent rise with a revival of trade. Chronic depression and unemployment have prevailed in many industries since 1900, and these conditions always cause a diminished consumption. Never-theless they do not fully account for the movement here shown, because the fall in consumption has been progressive, whereas the state of trade has fluctuated considerably; the curves do not coincide. Some other factor has been at work, and there is reason to think that it is a gradual change in the habits of the people. The facts of consumption agree with much other evidence in pointing to this conclusion. The expenditure in drink is not so high as it used to be in the past, whether periods ot prosperity or adversity are taken. The calculation of annual expenditure prepared for the United Kingdom Alliance, and commonly called the National Drink Bill, points to that conclusion. It is based on an arbitrary estimate of the cost of drink to the consumer and must not be taken to represent established facts; but it has some comparative value. The following table gives this calculation for the last 26 years : —

National Drink Bill, United Kingdom.

Expendi-

Expendi-

Year.

Total

ture

ner

Year.

Total

ture oer

Expenditure.

head.

Expenditure

lead.

£

£ s.

d.

£

£

s. d.

1884

144.734.214

4 1

oi

1897

174,365,372

4

7 6 f

1885

141,039,141

3 18

3*

1898

176,967,349

4

8 of

1886

140,550,126

3 17

4*

1899

185,927,227

4

11 8

1887

142,784,438

3 18

oi

1900

184881,196

4

10 4I

1888

142,426,153

3 17

2i

1901

181,788,245

4

7 8J

1899

151,064,035

4 1

M

1902

179,499,817

4

5 6f

1890

159.542,700

4 5

ii

1903

174,445,271

4

2 4 „

1891

161,765,291

4 5

7*

1904

168,987,165

3

18 nf

1892

161,527,717

4 4

9 t

1905

164,167,941

3

15 Hi

l«93

159,020,709

4 2

H

1906

166,425,911

3

16 3

1894

158,932,134

4 1

11*

1907

167,016,200;

3

15 9,

1895

163,133,935

4 3

4*

1908

161,050,482

3

12 3!

1896

170,426,467

4 6

4i

1909

155,162,485

3

The table begins and ends in two periods of marked depression, with one of marked prosperity in between ; but it is to be noted that in the earlier term of depression, although it was very acute, the expenditure never sank so low as in the later one. During the four lowest years (1885-88) the mean expenditure was nearly 4s. a head more than in the five lowest years (1905-9). At the other end of the scale the high-water mark in the table, which is the year 1899, shows an expenditure of £4, us. 8d. ; but the previous high^ water mark comparable with it, namely 1876, showed an expenditure °f £5, is- 9d-> when calculated on the same basis. The figures, there- fore, rather confirm than contradict the general belief that the people have grown more temperate during the last 30 or 40 years. With regard to the expression " national drink bill," which tacitly sug- gests so much money thrown away on drink, it must be remembered that a large proportion is devoted to public purposes and would have to be found in some other way. In the year ending March 1909 the trade paid a direct_ contribution of £37,404,575 to the national exchequer in excise and customs duties, in addition to income-tax and local taxation; all this comes back to the public pocket. Then it also maintains directly and indirectly a population reckoned at 2,000,000. The net amount spent on drink which might have been saved and spent on other things is not more than a third of the total sum.

The United States. — The movement in the United States has been totally different. The figures below are taken from the statistical abstract of the U.S. government as quoted in the American Prohibition Year Booh. The figures, it may be noticed, differ widely throughout from those given for the same years in the Board of Trade returns of international consumption quoted on p. 581. The discrepancy is too great and too constant to admit of any explanation, but that the two sets of returns are calculated from different bases. It illustrates the defects of these statistics and the need of caution in using them.

The American figures show a far larger consumption in the United States than the English.

The most noticeable fact here shown is the continuous and large increase in the consumption of beer. Every year shows a rise down to 1908, when for the first time in 70 years a fall was recorded._ It was continued in 1909, and being accompanied by a fall in spirits and wine also is no doubt mainly attributable to the financial state of the country- Down to 1880 beer was to a considerable extent taking the place of spirits, the consumption of which had previously been very high; but after that the steady increase in beer was not accompanied by a reverse movement in spirits; and from 1896 to 1907 all three kinds of liquor rose together, though not with equal steadiness. The rising consumption of beer has been accompanied

by an enormous increase in home production, the capital invested in breweries having risen from 4 million dollars in 1850 to 515 million dollars in 1905. The consumption of spirits is at a much higher level than in the United Kingdom, and two considerations add greatly to the significance of the fact— one is that drinking takes place more between meals and less at them, and the other that it is more confined to men. Women, other than prostitutes,

Consumption per head in Gallons, United States.

Year ending June 30.

Spirits.

Wine.

Malt.

Total.

1840 ….

2–52

0–29

1–36

4–17

I850 ….

2–23

0–27

1–58

4–08

i860 ….

2–86

o–35

3–22

6–43

1870 ….

2–07

0–32

5–3i

7–70

1880 ….

1–27

0–56

8–26

10-08

1882 ….

1-40

0-49

10-03

11-92

1884 ….

1-48

o-37

1074

12-60

1886 ….

1-28

o-45

II-20

12-92

1888 ….

1-26

o-6i

12-80

14-67

1890 ….

1-40

0-46

13-66

15-53

1892 ….

1-49

o-43

15-17

17-10

1894 ….

1-34

0-32

15-32

16-96

1896 ….

I-OI

0-27

15-84

17-12

1898 ….

I-I2

0-28

15-96

I7-36

1900 ….

1-28

o-39

16-01

17-68

I9OI ….

1-33

o-37

16-20

17-90

1902 ….

1-36

0-63

17-49

19-48

1903 ….

1-46

0-48

18-04

19-98

1904 ….

1-48

o-53

18-28

20-35

IO05 ….

1-45

0-42

18-50

20-38

I906 ….

1-52

o-55

20-19

22-26

1907 ….

1-63

0-67

21-24

23-53

I908 ….

1-44

o-6o

20-98

23-02

1909 ….

i-37

1 19-79

do not frequent the bar as they do in the United Kingdom, and children not at all. The expenditure in drink, so far as it can be calculated, has fluctuated somewhat, but shows a general tendency to

rise. The following table has been prepared by Mr G. B. Waldron, an American statistician. It is taken from the Prohibition Year Book, with the American currency converted into English on the basis of 4s. to the dollar, omitting fractions of a penny, for purposes of comparison with the British statistics given above.

Annual Drink Bill, United States.

Expendi- |

Total

Expendi-

Year.

Expenditure.

ture per head. 1

Year.

Expenditure.

ture per head.

£

£ s. d.

£

£

s. d.

1878

90,655,754

1 18 1

1898

208,312,573

2

17 1

1888

163,617,545

2 14 7

1899

214,137,995

2

17 8

1889

168,176,169

2 14 11

1900

234.445.322

i

1 5

1890

180,529,173

2 17 8

1901

243.999.598

3

2 10

1891

195.916,560

3 1 4

1902

269,556,728

3

8 3

1892

202,978,872

324

1903

282,122,043

3

10 2

1893

215.896,634

3 5 1

1904

292,735.706

3

11 7

1894

204,924,298 j 3 7

1905

293,180,332

3

10 6

1895

194,189,466 2 16 4

1906

321,604,383

3

16 4

1896

192,418,995 2 14 9

1907

351,461,570

4

1 11

1897

198,640,711 j 2 15 6

1908

335.167.639

16 11

Comparison with the British table shows at a glance an opposite movement in the two countries. While expenditure has steadily fallen in the United Kingdom since 1899, it has as steadily risen in the United States; and whereas in 1888 the expenditure in the former was 41 per cent, higher than in the latter, the two had drawn equal in 1906 and since then have changed places. Moreover the different system of taxation brings back a much larger

proportion of the whole expenditure into the exchequer in the United Kingdom (see Liquor Laws). The comparison is of much interest in view of the very different laws and regulations under which the trade is conducted in the two countries. It may be objected that the statistics are merely estimates, but both sets are put forward by the advocates of prohibition and are of equal authority, so that they hold good for comparison.

Norway and Sweden. — The statistics for these countries are im- perfect, because there is no record of wine, and in recent years the use of spirits has been supplemented or replaced to a considerable extent by artificial wines heavily loaded with spirits. But, as they stand, the statistics derive special interest from the peculiar con- ditions under which the traffic is conducted. The Scandinavian companv svstem was started in Sweden in 1865 and in Norway in 1 87 1 (see Liquor Laws;.

Consumption per head in Litres,

Norway.

Year.

Branvin.

*Beer, *

1851-60

5-9

1861-70

4-6

1871-80

5-2

18-2

1881-90

3–2

16–0

1891

3–7

21–7

1892

3–2

20–6

1893 • ■ ■

3–5

20–8

1894

3–8

19–8

1895

3–5

17–7

1896

2–3

16–2

1897 ■ •

2–2

17–8

1898

2-6

21-6

1899

3-3

23-2

1900

3-4

22-7

1901

3-4

20-O

1902

3-4

17-8

1903

3-2

14-1

1904

3-3

I3-I

1905

2-7

| 13-7

Consumption per head in Litres, Sweden.

Y’ear.

Branvin.

Beer, 1

1856-60

9-5

1861-70

9-7

10-9

1871-80

10-9

16-1

I881-90

7-5

21-9

189I

6-4

30-9

1892

6-5

30-8

1893

6-7

31-6

1894

6-9

33-o

1895

6-9

35-5

1896

7-2

42-4

1897

7'5

45-o

1898

8-o

50-0

1899

8-3

58-1

1900

8-5

56-4

1901

8-4

60-4

1902

7-8

56-6

1903

7-4

58-7

1904

6-9

52-8

The difference between these contiguous countries is remarkable. The consumption of spirits has always been much higher in Sweden than in Norway. In the old days before any legislation the estimated consumption was in Sweden 46 litres (1829) and in Norway 16 litres (1833) a head. In recent years, under the company system, the figures for both countries are vastly less, but the Swedish consumption has hardly ever been less than double the Norwegian and sometimes three times as great. This difference, observed over a long period before regulation and after, points to different conditions and national habits; but such constant differentiating factors hardly explain the strikingly dissimilar movements shown by the tables. Both countries are obviously affected by the state of trade. The high-water mark of spirit-drinking in modern times for both was the same period, 1874-76, as noted above for the United King- dom; Sweden then averaged 12-4 litres a head and Norway 6-6. Both show also the influence of the 1900 boom in trade and the subsequent decline. But in Sweden the increase of beer-drinking, which in 1871-80 was less than in Norway, has been enormous. If the two drinks are put together it cannot be said that the consumption in Sweden was appreciably less in 1896-1905 than in 1871-80, whereas in Norway it was distinctly less. This may in part be explained by the substitution of the made wine, called laddevin, to which reference has already been made. The marked fall in the consumption of spirits which occurred in _ 1 896-g8_ is attributed to this cause (Rowntree and Sherwell) ; the importation of wine rose from 2,320,300 litres in 1891-94 to 5,876,750 litres in 1898. Subsequently importation was checked by heavier duties and reduced consumption followed. In 1886-90 the quantity consumed per head in litres averaged o-88; in 1896-1900 it was 2-49, with a maximum of 2-75 in 1898; in 1905 it had fallen again to o-88 (Pratt).

A careful study of the foregoing statistics of consumption in the three countries — United Kingdom, United States and the Scandinavian peninsula — which have paid most attention to the problem and have for a long period applied forcible but widely different methods of control, does not permit any confident con- clusion upon the comparative merits of any particular system. The United States, in whose multitudinous liquor laws prohibition plays the most prominent part, has most conspicuously failed to check consumption. Norway and Sweden, both of which combine the

principle of disinterested management, though not in the same form, with a certain amount of prohibition, show markedly different results. The British licensing system has been at least as successful as any of the others. The most probable conclusion to be drawn from the facts is that the movement in each country has been mainly determined by other forces; the rise of consumption in the United States by the rapid and progressive urbanization of the people and the great increase of wealth; the diminution of con- sumption in the United Kingdom by a change in the habits of the people due to many causes, to which further reference is made below; while the difference between Norway and Sweden is largely due to differences of national character and habits already noted, though some influence must be attributed to the superior system and greater stringency of control in Norway. But if we go back to earlier periods there is no doubt at all that an incomparably worse state of things existed in the United Kingdom and in Scandinavia when the spirit traffic was under little control or none at all.

Intemperance. — Police statistics are the best evidence we have of the prevalence of drunkenness, which is the most visible and direct result of intemperance. Like othei statistics, they must be used with due regard to the circumstances ot origin

and compilation. They vary according to (1) the laws relating to drunkenness; (2) the administration by police and justices; (3) the method of com- piling returns All these vary in different countries and towns and at different times, so that the statistics must not be used for minute comparisons. But properly handled they are of great value, and the discrepancies are less than might be supposed, because it is found on inquiry that the actual behaviour of the police towards drunken persons does not greatly differ. Neither exceptional zeal nor exceptional laxity lasts very long. The general practice is only to interfere with those persons whose violence causes dis- turbance or whose helplessness creates obstruction or annoyance. The mode of compiling returns is the most serious cause of error. Many countries have no returns, and in others they are incomplete. Those available, however, throw considerable light on the subject. The following quinquennial table shows the movement in England and Wales since the drunken period 1874-78. The important act of 1872, which increased the number of offences, vitiates comparison with the earliest returns, which are, however, given in the article on Drunkenness.

Drunkenness, England and Wales.

Number of Persons proceeded against per 10,000.

1874-78 . . . 81-2 1894-98 .

1879-83 . . . 69-7 1899-1903

1884-88 . . . 63-6 1904-08 .

1889-93 . . . 61-4

60-4

65-5 62-4

63-4

1905 . .

. 64-2

64-5

1906 .

• ". 61 -3

63-6

1907 . .

. 6o-i

69-0

1908 .

• • 59-3

67-4

1909 . .

• • 53'2

There has been a marked improvement since 1874-78, and on the whole a progressive one, though interrupted by a moderate rise in the period of prosperity about 1900. The figures for the most recent years would be considerably lower but for the Licensing Act of 1902, which altered the police procedure and caused a sudden rise, as shown by the following table, for the last 10 years : —

1900 1901 1902

1903 • • •

1904 . . .

When allowance is made for the act of 1902 it is seen that the movement of drunkenness corresponds broadly with that of consump- tion, but the decline of drunkenness is more marked; the level is lower than it used to be whether good or bad times be taken. This plainly shows a large change in the

habits of the people, which is further emphasized by the fact that police procedure has become more stringent and the returns more complete. The exceptional figure for 1909 (estimated) is ascribed to the heavy increase of spirit duties in that year. The change has been accompanied by a continuous fall in the number of public-houses in proportion to population. Between 1870 and 1909 the number of " on " licences was reduced from 53-3 to 26-3 per 10,000 of the population; but the correspondence between the two movements is not exact. The number of public-houses has fallen steadily from year to year, whereas drunkenness, like consumption, has fluctuated with the state of trade. The facts, therefore, demonstrate a connexion, but hardly establish one of cause and effect. The principal causes which have brought about the general decline of drunkenness are wider and deeper. The standard of behaviour has gradually changed with education and the provision of alternative recreations in many forms, among which the chief are games, theatres, locomotion, public libraries, institutes, tea shops and eating houses. At the same time great social changes have taken effect and have tended to remove class barriers and foster the aspirations of the working classes, who have more and more adopted the standard of conduct prevalent among the more highly educated sections of society. The old drinking habits of the latter, which were notorious at the end of the 18th century, began to give way to greater sobriety early

in the 19th century; and the movement was greatly promoted, as a feature of social life, by the influence of Queen Victoria's reign. Drunkenness went " out of fashion," and the social standard has gradually permeated downwards. All this has no doubt been stimulated by temperance organization and teaching, which has constantly kept the question before the public and exercised an educational influence in spite of ridicule and abuse. The change has been very gradual, but far greater than can be shown in figures. It can be better realized by contrasting the present state of things with that

described in the past, as in the evidence given before a select committee of the House of Commons in 1834, when witnesses described the scenes that regularly occurred on Sunday morning in London — the crowd round the public-houses, women with babies to which they gave gin, and people lying dead drunk in the streets. The evidence given at this inquiry and by contemporary writers reveals a condition of things to which modern times afford no parallel; and in particular it disposes of the current belief that female drunkenness is a comparatively new thing and increasing. The practice of frequenting public-houses and drinking to excess in England has been noted for centuries and repeatedly denounced. It was described at a meeting of the Middlesex magistrates in 1830, when the chairman said that of 72 cases of drunkenness brought up at Bow Street on the previous Monday the majority were women " who had been picked up in the streets where they had fallen dead drunk." At the inquiry of 1834 Mr Mark Moore gave the number of customers counted entering 14 public-houses in a week; out of a total of 269,437 there were 108,593 women and 18,391 children. Of late years the proportion of female drunkards to the whole has been perceptibly diminishing. In 1870 the proportion of females to the total number proceeded against for drunkenness was 25-9 per cent. ; in 1890 it was 23-4 per cent. The percentage of con- victions credited to women in the last few years is: 1905, 20-42; 1906, 20-60; 1907, 20-26; 1908, 20-13; I909> I9'79'

The foregoing observations on drunkenness apply only to England and Wales. The returns for Scotland and Ireland are less complete, but they show the movement in those parts of the kingdom. In Ireland a diminution has taken place in recent years, but in Scotland an increase.

Number of Charges of Drunkenness.

Year.

Scotland.

Ireland.

1890

36,293

100,202

I9O0

43.943

97.457

1901

88,295

1902

91,276

1903 –

36,930

85,502

1904 .

41,852

81,775

I905 •

43,5i8

79,968

I906

55.408

77,262

1907

58,900

76,860

1908

55,104

It is worthy of note that police drunkenness is higher in Wales, Scotland and Ireland than in England. The respective number of proceedings per 10,000 in the year 1907 was: England, 59-8; Wales, 65-2; Scotland, 123-3; Ireland, 175-6. The figures for Wales are strictly comparable, those for Scotland and Ireland less so; but the coincidence is striking. The greater prevalence of spirit drinking as a national habit, particularly in Scotland and Ireland, may account in part for the discrepancy. Other points which distinguish the three countries from England are their Celtic blood and Sunday closing. No connexion can be shown between the number of licensed houses and the prevalence of drunkenness; they are fewer in Scotland than in England and Wales, but more numerous in Ireland, though there has been a diminution there since 1902, which may have something to do with the fall of drunkenness. The same lack of correspondence is shown more fully by the de- tailed figures for England and Wales published in the official volume of licensing statistics. Taking the county boroughs in groups according to the number of licences in proportion to the population we get the following :—

Licences and Drunkenness, County Boroughs, 1905.

Licences

per 10,000 Convictions per 10,000

under 20

71-05

20 to 30

55-89

30 to 40

62-4

40 to 50

36-6

over 60

35-27

The corresponding figures for the counties are as follows: Licences and Drunkenness, Counties, 1905.

Licences per 10,000 Convictions per 10,000

under 30

57-39

30 to 40

36-74

40 to 50

40-0

over 50

33-2

If any other year be taken similar discrepancies are shown. In 1909 the six counties with the highest and the six with the lowest number of licences exclusive of county boroughs, gave the following results : —

County.

Li- cences

per xo.ooo.

Convic- tions per

10,000.

County.

Li- cences

per

10,000.

Convic- tions per

10,000.

Huntingdon Cambridge . Oxford . . . Brecon . Rutland . . . Buckingham

Mean

91-51 74-04 63-68 63-28 6179 59-72

69-00

20-6o

11-18

956

54-34 14-14 15-76

20-93

Middlesex . . Northumberland Essex

Glamorgan . Lancaster . Durham

Mean

11-84 19-09

19-13 20-56

21-43 21-67

18-95

33-32

133-12

16-95

75-34 38-45 80-49

62-94

It is curious that the mean figures for these two groups at oppo- site ends of the scale almost exactly reverse the number of licences and convictions; but the individual discrepancies show that other factors really determine the results. The chief of these is unquestion- ably occupation. All the counties with the highest number of convictions are pre-eminently mining counties. Year after year Northumberland, Durham and Glamorgan occupy the same place at the head of the convictions, and other mining counties are always high up. These areas are not drunken because the public-houses are few, but vice versa; the licences are kept down because of the drunkenness. The influence of occupation and character is further revealed by a broader survey. The following table from the judicial statistics for 1894 brings out these elements very clearly : —

Persons Proceeded Against for Drunkenness per 10,000.

Seaports . . 126-07

Mining counties 113-67

Metropolis ■ 63-74

Manufacturing towns 47 - oo

Pleasure towns 28-93

Agricultural counties —

(1) Home counties … . 24-50

(2) South-Western 20-94

(3) Eastern 10-99

In other countries the same distribution is observed; drunken- ness is most prevalent in seaports and mining districts. It is further fostered by a northerly situation, and these three factors go far to explain the condition of Scotland, as of Northumberland and Durham.

The United States. — The Census Bureau at Washington issues from time to time statistics of cities, which contain a good deal of information concerning drunkenness. The last return, published in 1910, contains details of 158 cities having a population of over 30,000 in the year 1907, to which the statistics relate. It appears From these returns that drunkenness is exceedingly prevalent in American towns. The figures are not comparable with the English ones, because they relate to arrests, which are more numerous than " proceedings " and still more than convictions. The number of women included is very considerable, but the data are too imperfect to permit the calculation of a general percentage. In New York the proportion of women arrested for drunkenness and disorder was 24-3 per cent, of the whole number. The cities are divided into four groups according to population: — (1) over 300,000,

(2) 100,000 to 300,000, (3) 50,000 to 100,000, (4) 30,000 to 50,000. The average number of arrests per 10,000 inhabitants in each group and in all cities together is — (1) 191-0, (2) 193-6, (3) 245-8, (4) 244-8; mean of all cities, 205-1. The comparatively small range of differ- ence between the groups is remarkable, and indicates a general prevalence of police drunkenness. The higher figures for groups

(3) and (4) are explained by the excessive number of cases in certain manufacturing, mining and Southern coloured towns of small and medium size. These figures are for drunkenness alone, so that they cannot be confused with other offences; but on examining the details of individual cities it becomes clear that the practice varies considerably

in making up the returns, and that in some places nearly all the arrests of drunken persons are charged to drunken- ness whereas in others a large proportion are returned under the head of disorderly conduct. In considering the relation between drunkenness and the number of licenced houses, therefore, it seems desirable to put both sets of figures, as in the following table. It will be seen that there is no correspondence between the number of licensed houses and the amount of drunkenness alone or of drunkenness and disorderly conduct together, except that the fourth group has the largest number of licences and the most disorder.

Arrests and Licences per 10,000.

Cities.

Arrests, Drunkenness.

Arrests. Disorderly Conduct.

Retail Liquor Dealers.

Group 1

Over 300,000

Group 2

100,000 to 300,000

Group 3

50,000 to 100,000

Group 4

30,000 to 50,000

Mean

I9I-0

193-6

245-8

244-8 205-1

108-8

II2-8

78-7

121-4 106-8

30-3

27-7

28-4

3i'5

29-6

There are large discrepancies between different cities, but not greater than among British towns. The following table gives the figures corresponding to the above for each of the great cities in- cluded in group I, with the exception of San Francisco, the popula- tion of which could not be estimated : —

Arrests and Licences per 10,000.

Cities.

Arrests, Drunkenness.

Arrests, Disorderly Conduct.

Retail Liquor Dealers.

New York ….

105-9

120-2

25-5

Chicago. Philadelphia

169-1

5'3

34-2

287-5

81 -0

131

St Louis

106-3

173-7

33-5

Boston . .

614-9

16-9

J 3-5

Baltimore .

75-'

302-5

41-3

Pittsburg .

331-4

2369

15-3

Cleveland .

355-2

34-9

404

Buffalo . . .

318–9

153–3

38–4

Detroit . . .

87–2

82–5

46–9

Cincinnati .

82–4

66–4

44–8

Milwaukee .

100–5

53–1

70–4

New Orleans .

239–5

220–7

50–0 1

Washington

130–6

338–4

1

To a certain extent the same inverse relation appears here as in England; the places with the smallest proportion of licences — namely, Philadelphia, Boston, Pittsburg and Washington — are con- spicuous for drunkenness and disorder, while those with the largest proportion of licences — namely, Detroit, Cincinnati, Milwaukee and New Orleans — are distinguished by the lowest amount, with the exception of New Orleans, which is a special case by reason of the large coloured and Creole population. The exceptional position of Boston is obviously due to exceptional police activity and that of Chicago to. the opposite. At Boston and Cleveland, it will be noticed, the police prefer the charge of drunkenness ; at Baltimore the opposite. The position of Washington is explained by the very large coloured population and the strength of the police, force, which is greater in the capital than elsewhere and very strict in regard to order in the streets. Philadelphia, Pittsburg and Cleve- land are great manufacturing centres with a large population of foreign workmen; the vast_ influx of European immigrants, con- sisting of men disposed to drink by age, occupation, race and habits, and receiving higher wages than they have been used to, must always be borne in mind with regard to drunkenness in the United States. It is interesting to note the condition of those cities in which there is no licensed trade. There are none such in the first two groups, but 14 in the third and fourth groups. The following are the figures: —

Arrests for Drunkenness and Disorder per 10,000.

Group 3

Cambridge (Mass.) . . 218-5

Kansas City (Kansas) . 178-0

Somerville (Mass.) . . 130-5

Charleston (S. Carolina) 342-7

Portland (Maine) . . 605

Brockton (Mass.) . . 240-9

Group 4 Topeka (Kansas) Maiden (Mass.) . Chelsea (Mass.). Salem (Mass.) . Newton (Mass.) . Wichita (Kansas) Fitchburg (Mass.) Everett (Mass.).

227-1

ioo-8 336-o

329-0

I68-I

392-7

161-5

99-6

The majority are prohibition cities in Massachusetts, the only state in which this measure was applied to any place of considerable size in 1907. In all of them the drunkenness is below the mean for the group and considerably below that of similar and neighbour- ing towns. For instance, Brockton is a boot-manufacturing town,

comparable with Lynn in the same state ; the respective figures are 240-9 and 561- 1. The evidence here, so far as it goes, is in favour of local prohibition. On the other hand there are a number of licensed cities with lower figures, and two of those on the list — Chelsea and Salem— are very high up. State prohibition does not make such a good showing. Portland is one of the most drunken places in America— a fact confirmed by many observers — and Wichita in Kansas is above the mean. Kansas City is better. This place is peculiarly

situated, being continuous with Kansas City in Missouri; the boundary between the two states passes through the town. Consequently the inhabitants have only to go into the Missouri half to obtain drink. Cambridge is very similarly situated in relation to Boston. Charleston, which is above the mean for the group, was under the state dispensary system. In sum, these police figures furnish some argument for prohibition and some against; but they clearly demonstrate the limits of compulsion. Altogether the statistical evidence from the United States, whether of consumption, expenditure or drunkenness, offers no inducement to the United Kingdom to adopt any of the American methods of control in place of its own system.

Norway and Sweden.— Police statistics for some of the principal towns in Norway and Sweden, which are the seats of the company system or disinterested management applied to spirit bars, are frequently quoted and we will therefore give them here. When all allowances have been made they show that drunkenness is very prevalent in these seaport towns, and that it fluctuates as in England but exhibits no general tendency to improvement.

Convictions per 1000 in Gothenburg.

1865 1866 1867 1868 1869 1870 1871 1872

1873 1874

1875 1876

1877 1878 1879 1880 1881 1882 1883 1884 1885

46

1886

30

1887

29

1888

26

1889

28

1890

26

1891

28

1892

28

1893

32

1894

38

1895

42

1896

39

1897

40

1898

32

1899

31

1900

31

1901

32

1902

29

1903

30

1904

29

1905

29

31 32 31

34 40

44 42 38 34

3i

35 44 54 54

5i

42 45 47 45 52

The principal feature of this table is the much higher level in the second 20 years than in the first, though the police procedure has been the same. Several times in recent years the figure has exceeded that of 1865, which was practically the year before the company system was introduced, as it did not begin operations until October. Once more the influence of trade oscillations is well marked, particularly in the prosperous period of 1 897-1900.

To convert convictions into arrests for comparison with the following tables about 3 per 1000 should be added; this difference is very evenly maintained in Gothenburg.

Arrests per 1000 in Bergen.

1877 1878 1879 1880 1881 1882 1883 1884 1885 1886 1887 1888 1889 1890 189 1

1890 1891 1892

1893 1894

1895 1896

1897

26 21

19 21

17 13

18

15 17

H

13

H

14 21

19

1892

1893 1894

1895 1896 1897 1898 1899 1900 1901 1902 1903 1904 1905

A rrests per 1000 in Christiania.

70

1898

77

1899

74

1900

80

1901

75

1902

77

1903

05

1904

11

1905

12

14 16

22 29

27 27 26

31 29

27 24 20 23

94 101 90 75 59 58 52 43

Use and Abuse of Alcohol.

The evils caused by the abuse of alcoholic liquors have always been recognized by mankind ; they are

too obvious to be ignored. Intoxication produces imbecility, bestiality, violence and crime; continued excess produces incapacity, poverty, misery, disease, delirium, insanity and death. But all these effects are produced by other causes and it is very difficult to estimate the precise share of this particular agent. In modern times scientific investigation has attempted to do this and to give precision to the conclusions drawn from ordinary observation. We will briefly summarize some of the results.

Crime. — Drink is associated with crimes against the person, but not with crimes against property, which form in England nine- tenths of the whole (Judicial Statistics, 1901). Dr W. C. Sullivan, medical officer in the prison service, calculates that ” alcoholic intoxication is answerable for about 60 per cent, of indictable crimes of violence and for a rather higher proportion of minor offences of the same class “; and further that ” it is probably the cause of nearly half the crimes of lust,” but it ” makes no appreciable con- tribution to crimes of acquisitiveness.” He gives the following table: —

Annual Average per 100,000 — 1891-1900.

Areas.

Drunkenness.

Homicides and Assaults.

Attempted Suicide.

Agricultural , . .

Mining

Manufacturing . Seaports

226-3

I09I-2

479-8

990-6

1 16-33 237-34 265-73 409-73

3-46

2-43

6-42

10-56

This does not show a regular connexion. The mining areas, which have the most drunkenness, are only second in violence and lowest of all in suicide. Dr Sullivan explains this discrepancy by the theory that chronic alcoholism is less prevalent among miners, and that this form is chiefly responsible for the crimes in question. It is impossible, however, to establish any constant relation between drink and violent crime; the two do not vary together. It was pointed out in the Judicial Statistics for 1901 that whereas in the drunken year 1899 consumption of drink was 8 per cent, higher and the police records of prosecutions for drunkenness 15 per cent, higher than in the previous quinquennial period, crimes of violence were 1 62 per cent, lower. These statistics apply only to England. When other countries are taken it becomes still clearer that other factors are more important. Mr W. D. Morrison gives the following table of homicides in proportion to population in different countries (Crime and its Causes) :

Italy . Spain . Austria Ireland Belgium

Persons Tried for Homicide per 100,000.

”” ”” France

15-40 11-91

4-01

3-35 302

Scotland . Germany . England . Holland .

2-73

2-II I-&I

1-6o I -10

Except that England, Scotland and Ireland are in the order of relative drunkenness, the table shows no correspondence between drink and homicide. National character and climate are evidently more important determining factors. Some calculations of the proportion of crime associated with drink have been made in different countries. In Germany 36-5 per cent, of the prisoners in one gaol were found to be drunkards (Baer) ; assaults, 51-3 per cent.; resist- ance to the police, 70-1 per cent.; offences against morality, 66 per cent. (Aschaffenburg). In Italy 50, 60, and 75 per cent, of crimes against the person have been attributed to drink. In Switzerland 40 percent, of male criminals in 1892 were found to have been under the influence of drink when their offences were committed. In Denmark 43 per cent, of the men convicted in 1903 were drunkards. These estimates, some of which are official, suffice to confirm the connexion between drink and a great deal of crime, but the basis of investigation is too narrow to permit more than a general con- clusion. There is, however, one form of crime for which drink is almost wholly responsible, and this furnishes the blackest of all indictments against it. The intensity of suffering and injury inflicted on children by the atrocious cruelty and neglect of drunken parents cannot be overstated. The Society for the Prevention of Cruelty to Children finds that 90 per cent, of the cases which come under its notice are due to drink.

Poverty. — Much poverty is undoubtedly caused by drink, but it is even less possible to establish any constant connexion between the two than in the case of crime. Pauperism and drink stand to a great extent in inverse relation; in good times the first diminishes and the second increases, in bad times

the reverse takes place. For instance, pauperism in England, which has had a general tendency to fall for many years, rose rapidly in the period of low consumption after i860, fell still more rapidly in the great drinking years 1870-77, and rose again when they gave place to depression. With falling consumption after 1891 (see the table above) it rose till 1894, when

the opposite movement began; and during the steady fall of drink since 1900 pauperism has been rising again. The only exception to this regular inverse movement is the very depressed period 1884- 1888, when pauperism was stationary. The conclusion to be drawn is that while drink is a chief cause of poverty in many cases and the sole cause in some, it is swamped in the aggregate by the larger influence of work and wages. Mr Charles Booth's statistical investigation in East London resulted in the following estimates of the percentage of poverty caused by drink: " great poverty " (the two lowest classes) — drink, 9 per cent., drunken or thriftless wife, 5 per cent.; " poverty " (the two next classes) the figures were — drink, 7 per cent., drunken or thriftless wife, 6 per cent. These results can hardly be said to confirm the opinion that drink is the chief cause of poverty; they rather agree with the conclusions drawn from the movement of pauperism. Mr Rowntree's investi- gation of poverty in York did not enable him to make any numerical estimate; drink was not among the chief causes of primary " poverty (the lowest class), but he thought it the " predominant factor" in producing " secondary " poverty. Alderman McDougall's inquiry in Manchester (1883) resulted in the following proportions of drink-pauperism : — Male drunkenness, 24-32 per cent. ; female, 440 per cent.; widows and children of drunkards, 21-84 per cent. An inquiry conducted in 1894-95 by the Massachusetts Bureau of Statistics of Labour found that 39-44 per cent, of paupers attributed their position to their own

intemperance and about 5 per cent, to that of their parents. All these inquiries are on a very small basis, and the last is particularly deceptive. Drink is commonly confessed by criminals and paupers, as a venial offence to serve as a plausible excuse for a condition really due to dislike of work. When poverty is examined by local distribution it is found to have very little connexion with drink. In 1901 the average proportion of pauperism to population in England was 5-3 per cent. The exceptionally drunken districts of Northumberland and Durham were all below it, the sober eastern counties all above it (Blue-book on Public Health and Social Conditions, Col. 4671).

Insanity. — Dr Robert Jones finds that 16 per cent, of all the persons (7182 out of 43,694) admitted into the London asylums during the twelve years 1893-1905 " were definitely ascertained to owe their insanity to drink or intemperance." The proportion in Claybury Asylum during the same period was 17 per cent., being 22 per cent, of the men and 12 per cent, of the women. Dr R. rL Crowley says: — " One may safely assert that from 20 to 25 per cent, of all cases of insanity under the poor law are directly due to intemperance." Dr T. B. Hyslop says: — "With regard to insanity there is some difference in experience as to the relative frequency of alcohol in its causation. This difference ranges from between 10 and 30 per cent. . . . My own experience leads me to believe that alcohol is either a direct or an indirect factor in the causation of at least 50 per cent, of the cases of insanity." Dr T S. Clouston estimates that alcoholic excess is the cause of about 20 per cent, of all the insanity in Great Britain and Ireland. These are the opinions of experienced medical men in charge of the insane. On the other hand, those in charge of inebriates are inclined to attribute inebriety to a great extent to mental deficiency of some kind. Dr Branthwaite, government inspector under the Inebriates Acts, observes in his Report for 1908, published in 1910, " There is no doubt whatever in detaining and treating persons sent to us under the

Inebriates Acts that "we are dealing to a large extent with a class known as ' feeble-minded.' ... It would be difficult to find many more than about a third of all persons under detention capable of passing muster as of average mental capacity." In support of this statement he gives the following classification of 3032 cases: —

Classification. Number. Percentage.

(1) Insane; persons since admission certified

and sent to asylums 63"*

(2) Very defective; persons more or less con- >

genitally imbecile, degenerate.or epileptic 377)

(3) Defective; eccentric, silly, dull, senile, or

subject to periodical paroxysms of un- governable temper 1487

(4) Of average mental capacity, on admission or

after six months' detention 11 05

14-51

49-04

36-45

Insanity is therefore a cause as well as a consequence of excessive drinking, and the estimates given about it must be qualified accord- ingly. The following are given for foreign countries. In Italy a report from 26 asylums returned 18-6 per cent, as directly or in- directly (by heredity) due to alcoholism. Professor Seppili reports from the Brescia asylum the following: 1894-98, 15-7 per cent.; 1899-1903, 19-8 per cent.; 1904-08, 27-6 per cent. Experts in such statistics will recognize at once in this enormous rise a change in the method of classification. In Switzerland, of the admissions in 1900-04, 2 1 ■ 1 per cent, among males and 4-37 per

cent, among females were alcoholics. In Denmark, of the admissions in 1899- 1903, 21-37 per cent, were alcoholics. In Austria, of the admissions in 1903, 14-0 per cent, were alcoholics. In France the proportion of all persons in asylums in 1007 with an alcoholic history was 12-5 percent.

Mortality. — The influence of drink on mortality is an unascer- tainable quantity, because it may be associated with other causes

to an extent which varies in an infinite series of gradations. All attempts to estimate it are more or less plausible guesses. We have, however, some positive data. The Registrar-General's Returns contain the heading " alcoholism, delirium tremens," as a cause of death. The following are the rates per million recorded in quinquennial periods from 1870 to 1905: 37-6, 42-4, 48-2, 56-0, 67-8, 85-8, 78-2. This is unsatisfactory for two reasons: the first is, that alcoholism does not nearly cover all the mortality directly caused by drink; and the second is that, being a very vague term, its use in certifying the cause of death depends largely on the views of the practitioner and current opinion in the medical profession. The attention paid to the subject has led to a growing recognition of alcoholism, which, indeed, does not appear at all in the older text- books. This accounts for the steady increase of deaths ascribed to it, which is otherwise inexplicable, being quite at variance with the consumption of drink during the same period. The Seventy-first Annual Report of the Registrar-General states that the mortality from alcoholism in the years 1900 and 1901 was materially increased by the transference of deaths that had been originally certified as from neuritis. It is now usual to classify alcoholism and cirrhosis of the liver together, since the latter is most frequently caused by intemperance. The following are the crude death-rates for twenty years : —

Death-Rates to a Million Living — England and Wales.

Alcoholism.

Cirrhosis. ,

Year.

Male.

Female.

Persons.

Male.

Female.

Persons.

1889

72

39

55

140

103

121

1890

94

50

70

144

105

124

1891

94

49

71

148

104

125

1892

86

49

67

142

IO4

122

1893

93

55

73

139

103

I20

1894

76

47

61

136

96

115

1895

84

51

67

133

I04

I18

1896

9i

52

7i

I40

106

122

1897

97

58

77

151

115

133

1898

98

59

78

152

112

132

1899

"3

69

90

167

119

142

1900

132

95

"3

162

127

I44

1901

113

80

96

151

115

132

1902

105

65

84

144

IO4

123

1903

9i

62

76

136

100

117

1904

85

55

70

135

101

117

1905

79

52

65

131

104

117

1906

80

53

66

127

98

112

1907

79

48

63

123

101

112

1908

65

45

55

120

88

104

These figures dispose of the current belief in an enormous increase of female intemperance based on the progressive rise of the death- rates. Discussing this question some years ago the present writer pointed out the defects of the statistics and said that the returns of the next few years might upset the whole argument. They have done so.

The statistics of alcoholism and cirrhosis, however, are very far from covering all the mortality due to drink. Dr Newsholme calculates by inference from the returns of Denmark and Switzerland that the deaths directly attributed to alcohol in England and Wales should be some six times higher than they appear in the returns, and that they would then amount to 5 per cent, of the total deaths of adults instead of about o-8 per cent. He adds: " This percentage probably greatly understates the real facts." It may be so, but the calculation is based on too many assumptions to be accepted with confidence. In addition to the direct mortality there is an unknown score against alcohol in predisposing to other diseases and in accelerating death. Consumption is one of the diseases thought to be particularly associated with alcohol, but there are several others. The following table shows the comparative mor- tality of males aged 25 to 65 from certain classes of disease in different groups of occupations. They include those with the highest and those with the lowest mortality. The heading " diseases of the circulatory system " includes heart disease and aneurism; diseases of respiratory system include bronchitis, pneumonia and pleurisy, but not phthisis, which is separately given; diseases of urinary system include Bright's disease. The table is compiled from the supplement to the Sixty-fifth Annual Report of the Registrar- General, published

1908. No other country has similar statistics. There are some partial ones for Switzerland, which attribute 2-47 per cent, of the deaths of males over 20 years directly or indirectly to alcohol, and for Denmark, where the corresponding figure is 42 per cent.

The association of a high degree of alcoholic mortality with weakness of all the organs is clearly shown by the figures for unoc- cupied males, general labourers, dockers, costermongers, innkeepers and inn-servants. Potters and file-makers, with a comparatively low degree of alcoholic mortality, alone show a similar condition,

Comparative

Mortality — England and Wales.

>

3

3

O t

0%

2

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Q

3

O

a

All males ….

1,000

16

27

186

ios

144

‘74

52

Occupied and retired

males ….

1,004

16

27

187

103

146

177

52

Unoccupied males

2,884

42

68

583

879

294

310

112

Clergy ….

524

2

14

55

64

88

53

38

Agriculturists

602

7

13

85

62

96

86

29

Railway engine-drivers

610

4

18

65

74

107

84

36

Civil Service .

723

5

40

129

80

102

78

51

Navvies, &c. .

740

6

9

95

63

113

154

29

Shopkeepers .

872

19

34

161

96

124

139

51

Coal-miners .

885

5

17

89

87

!34

196

35

Building trades .

934

H

21

190

94

134

163

54

Metals

1,027

n

23

189

109

151

2H

56

Textiles ….

1.055

10

21

190

12^

16S

193

61

Dockers ….

1,481

50

22

308

112

198

36.5

64

Potters ….

1.493

8

21

285

131

219

473

53

Seamen ….

1,646

26

34

262

I70

2^8

220

«3

File-makers

1,700

H

15

387

22,S

198

325

160

Innkeepers

1,781

III

201

271

188

207

252

127

Inn-servants .

1,883

I.3I

49

541

I46

211

224

IOO

Costermongers

2,007

59

40

554

I67

276

3Q2

86

General labourers

2.235

40

37

491

233

324

444

96

and it is no doubt due to the inhalation or absorption of irritating or poisonous particles

through the nature of their occupation. The clergy, who have the lowest alcoholic mortality, show a remark- ably low level of organic disease of all kinds; railway engine-drivers, who come next, suffer more from circulatory and respiratory diseases, navvies and coal-miners still more, while civil servants are more susceptible to phthisis. Agriculturists, though with a higher alcoholic mortality, nearly equal the clergy in general healthi- ness, which must be attributed to the open-air life. The low alcoholic level of coal-miners and navvies is striking, because both are hard-drinking classes; their position can only be explained by the fact that they drink beer, and it goes far to prove the inno- cuousness of beer when combined with hard work. The enormous and absurdly disproportionate mortality from diseases of the liver among innkeepers, and in a lesser degree among unoccupied males, is obviously due to a preference for stating that cause on certificates in place of alcoholism. The condition of unoccupied males revealed by this table is worth a volume of sermons. The mortality among them between the ages of 25 and 65 is higher than that of any other class of the community. It is also worth noting that poverty is good for health. The clergy are the poorest of the educated and professional classes; and agricultural labourers, who are the poorest of the manual working classes, are nearly as healthy all round except that they are somewhat more liable to phthisis; their com- parative mortality figure from all causes is only 621.

Longevity. — A great deal of statistical information with regard to the comparative longevity or expectation of life at different ages among abstainers and non-abstainers has been collected by life-insurance companies and friendly societies. The following table is given in the syllabus of temperance teaching in elementary schools issued in 1909: —

Expectancy of Life.

General

General

Ercpectancy

Expectancy

United

Age.

of Total Male

based on

Odd-

Kingdom

Population

Experience of

fellows.

Temperance

(Registrar-

Insurance

Institution

General).

Offices.

(abstainers).

1

20

41-0

43-2

41-4

48–8

46–9

25

37–o

39–1

37–6

44–3

43–0

3°

33–1

35–i

34–o

39–7

38–8

35

29–2

31–2

30–3

35–1

34–6

40

25–6

27–4

26–8

30–6

3°'3

45

22–2

23–7

23–3

26–1

26–1

50

18–9

20–1

19–9

21–8

22–0

55

15–8

16–7

16–6

17–7

18–1

60

12–9

13–6

13–6

13-8

14-6

Similar statistics have been prepared showing the relative mortality experience among insured persons. Mr R. M. Moore gives the

following proportional figures at different ages for all the societies embraced in the Institute of Actuaries tables, as compared with the abstaining section of the United Kingdom Temperance and Provident Institution, which is taken as 100: — ■

Mortality Experience of Non-Abstainers to Abstainers as 100.

Age.

Mortality Experience.

Age.

Mortality Experience.

15-19

67

55-59

144

20-24

21

60-64

132

25-29

172

65-69

I20

30–34

194

70–74

116

35–39

190

75–79

91

40–44

181

80–84

107

45–49

179

85–89

107

50–54

165

90–94

127

The United Kingdom Temperance Institution has a general as well as an abstaining section. The experience of the twenty-two years 1 884–1 905 gives the following result: percentage of actual to expected deaths— general section, 79–53; temperance section, 54–25. Other offices having abstaining sections show similar results, thus : —

General. Temperance. Sceptre Life Association (25 years) . . 79-67 53'05

Scottish Temperance Life Assurance Co.

(25 years) 64 46

Pathology. — Dr Sims Woodhead thus summarizes the results of ex- perimental investigation into the direct action of alcohol upon living cells and tissues.

Alcohol plays a prominent part in bringing about degeneration of nerves, muscles and epithelial cells; it determines the accumula- tion of waste products in the tissues by paralysing the tissue cells, interfering with oxidation, with secretion and with excretion; it induces the proliferation of the lower forms of tissue, often at the expense of the more highly developed tissues, which in its presence undergo marked degenerative changes; it interferes directly with the production of immunity against specific infective diseases, and reasoning from analogy it may be assumed that it plays an equally important part in impairing the resistance of tissue to the advance of the active agents in the production of disease that may have already obtained a foothold in the body.

With regard to this aspect of the subject it must be remembered that laboratory experiments by which alcohol is placed in direct contact with cells and tissues are an entirely different thing from the dietetic use of beverages containing dilute alcohol with other things. It would be interesting to know how the tissues would behave when similarly treated with common salt, lemon juice, vinegar, theine, caffeine or other substances in general dietetic use, or with ordinary tonics such as quinine, quassia and dilute acids.

Inebriety. — Much study has been devoted to inebriety as a diseased condition. It generally results from long-continued and excessive indulgence in alcohol and is characterized by dipsomania or a

craving for alcohol, which is chronic or periodical and which the subject cannot resist. It is accompanied by organic changes in the nervous system, which probably begin in the stomach, but end in disintegration of the brain cells with the" development of alcoholic insanity. The only chance of cure lies in complete abstinence from liquors with, at first, suitable medical treatment. The recognition of this fact has led to the establishment of special institutions for this purpose, both of a voluntary and a compulsory character. An account of the laws relating to the subject is given under the heading of Inebriety. In accordance with the law- three classes of institutions have been established in the United Kingdom:— (1) Certified inebriate reformatories, to which patients are committed by the courts for various periods of detention. They are 11 in number, and during 1908— the last year reported — the committals to them numbered 262 (218 women and 44 men). The total number committed since their establishment in 1897 is 3002 (2548 women and 484 men) ; the highest number in any one year was 493 (428 women and 65 men) in 1907. (2) State Inebriate Reformatories, more of a penal character, for persons committed but too refractory for the previous class. There are two, one for women and one for men; the average number under detention in 1908 was 74 women and 42 men; the admissions were 27 women and 10 men. (3) Licensed retreats, for voluntary patients. In 1908 they numbered 20, and had under treatment 493 patients (288 women and 205 men). In all about 800 habitual inebriates are thus treated. The results cannot be stated with any precision, but they are certainly disappointing. The Inebriates After-Cure Association gives the following analysis of 407 cases discharged from reformatories and looked after in the years 1903-8:-— Satis- factory result, 82 (50 women, 32 men); unsatisfactory, 114 (78 women, 36 men); not known, 221 (162 women, 49 men). One explanation of the failure of treatment and the frequency of relapses

which has been revealed by longer and closer study of the problem is that many inebriates are really mental defectives, as already noted in connexion with insanity. Such cases constantly reappear in the police courts after discharge.

Heredity. — It has long been generally assumed that the children of alcoholics suffer in body and mind for the sins of their parents, that they are weak, diseased and defective; and it is very often assumed that they inherit an alcoholic craving. The latter assumption is not admitted by scientific students of the question, but the former has been generally held, though without any proof. It has been made the subject of a statistical investigation (1910) in the Eugenics laboratory of London University by Miss E. M. Elderton and Professor Karl Pearson. The object was to " measure the effect of alcoholism in the parents on the health, physique and intelligence of their offspring, " whether by toxic or environ- mental influence, but not by the transmission of original defective characters, which is omitted from the inquiry. The material used is a report by the Edinburgh Charity Organization Society on the children in one of the Edinburgh schools and one by Miss Mary Dendy on those in the special schools of Manchester. The number of children is not stated, but so far as can be gathered from the tables the Edinburgh inquiry covered about IOOO and the Man- chester inquiry about 2000. The ages were from 5 to 14 (Edin- burgh report), and both sexes are included in approximately equal numbers. The general conclusion reached is that " no marked relation has been found between the intelligence, physique or disease of the offspring and parental alcoholism in any of the categories investigated. " The principal particular conclusions reached are as follows: — Higher death-rate in alcoholic than in sober families, more marked in the case of mother than of father, but alcoholic parents more fertile, and therefore nett family about equal; height and weight of alcoholic children slightly greater, but when corrected for age slightly less; general health of

alcoholic children slightly better, markedly so in regard to tuberculosis and epilepsy; parental alcoholism not the source of mental defect in children ; no per- ceptible relation between parental alcoholism and filial intelligence.

These conclusions, which run counter to current opinions, have been much criticized, and it is true that the scope of the inquiry is inadequate to establish them as general propositions. Moreover, the chronological relation of parental intemperance to the birth of the children is not stated. But so far as it goes the investigation is sound and it is the first attempt to treat the subject in a scientific way. Nor is there anything in the conclusions to surprise careful and unbiassed observers. The existence of a broad relation between superior vigour and an inclination for alcoholic drinks was pointed out years ago by the writer; drinking peoples are noticeably more energetic and progressive than non-drinking ones. It is the uni- versal experience of shipmasters that British seamen, whose in- temperance causes trouble and therefore induces a preference for more sober foreigners, exhibit an energy and endurance in emergency of which the latter are incapable. Similar testimony has repeatedly been borne by engineers and contractors engaged in large works in the south of Europe. And that acute observer, Miss Loane, has related a particular and striking case in regard to offspring from her own experience, which is curiously in keeping with the conclusions of the Eugenics laboratory. The question, however, needs much more elucidation.

The whole subject has, in truth, got somewhat out of perspective. The tendency of the statistical and experimental investigations, summarized above into the relations of alcohol with crime, mortality, disease &c, has been to obliterate the distinction be- tween the use and abuse of alcohol, between moderate and excessive drinking, and to bring into relief all the evils associated with excess, while ignoring the other side of the question. It is legitimate and desirable to emphasize the evils, but*

not by the one-sided and fallacious handling of facts. Alcoholic excess produces the evils alleged, though not to the extent alleged, but there is no evidence to show that its moderate use produces any of them. Yet they are all put down to " alcohol," and the inference is freely drawn that its abolition would practically put an end to crime, vice, poverty and disease without any counterbalancing loss whatever. The facts do not warrant that inference, nor has mankind at large ever accepted it. Both the statistical and experimental evidence is full of fallacies, and especially the latter. The pathological investiga- tions on the action of alcohol referred to above elucidate the organic changes which the tissues undergo in the chronic inebriate who is saturated with spirit, but to draw the inference that alcoholic liquors taken in moderation and consumed in the body have any such action is wholly fallacious. In point of fact we know that they have not. But there is more than that. These experiments only take cognizance of alcohol; they ignore the other substances actually consumed along with it. Some of these, and notably sugar, are recognized foods; the balance of opinion on the vexed question whether alcohol itself is a food — which really depends on what is meant by a food — is now on the side of alcohol. But in addition to the principal constituents, easily separable by analysis, are many other substances of which science takes no cognizance at all; they are not identified. They may be in minute quantities yet extremely powerful, as are many other vegetable extractives.

We know that they exist by their taste arid their effect; they make the difference between port and sherry, between claret and Burgundy, between one vintage and another, between brandy and whisky, differences unknown to chemistry — which only recognizes alcohol, and knows very little about that — but vastly important to the human organism. Another group of experiments are equally fallacious in a different way. The effect of alcohol in mental operations is tested by the comparative speed and

ease with which work is done after a dose and without it. The effect has been found to be diminished speed and ease; but these experimenters do not apply the same test to a good meal or a sound sleep or hard exercise. The writer finds in concentrated mental work that the immediate effect of even a small dose of alcohol is to impair efficiency, but the other three do so in a much higher degree. The inference is not that these are injurious, but that the proper time for each is not just before work; after work he finds them all, alcohol in- cluded, beneficial. The mortality statistics are treated in a similar one-sided way. They clearly show the injury done by the abuse of alcohol, but what of its moderate use? Agricultural labourers are the most typical moderate drinking class, and they are one of the healthiest in spite of exposure, bad housing and poverty. If all the unhealthiness of those who drink hard is referred to their drink, then the healthiness of those who drink moderately should be referred to it too.

The absolute condemnation of alcoholic drinks has never been endorsed by public opinion or by the medical profession, because it is contradicted by their general experience. That many persons are better without any alcohol, and that many more would be better if they took less than they do is undeniable; but it is equally undeniable that many derive benefit from a moderate amount of it. Sir James Paget, than whom no man was more completely master of his appetites or better qualified to judge, drank port wine himself because he found that it did him good. He represents the attitude of the medical profession as a whole and of temperate men in general. Attempts to support the case for abolishing the use of alcoholic liquors by denying them any value and by attributing to them effects which spring from many other causes, do not carry conviction or advance the cause of temperance. A much stronger argument lies in the difficulty of drawing a definite line between use and abuse ; they tend to merge into one another, and it may be urged that the evils of the latter aire sufficiently great

to justify the abandon- ment of the former. But the use of most things is open to the same objection, and mankind at large has never consented to forego the gratification of a natural appetite because it is liable to abuse. Nor is there any sign of an intention to make an exception in favour of alcohol. On the other hand, moderation is attainable by every sane individual. It is in fact observed by the great majority and to an increasing extent. There is a line between use and abuse, and every one really knows where it is in his own case. If he cannot draw it let him abstain, as Dr Johnson did for that reason. But society can do much to assist the individual by inculcating moderation, setting a standard, promoting its main- tenance by helpful environment, discouraging excess and diminish- ing temptation. All the evidence points to those means as the effective agents in securing the improvement which has taken place in Great Britain.

This article should be read in conjunction with that on Liquor Laws, and it will therefore be in place here to give some additional information regarding the latter. The policy of prohibition has recently gained ground in several countries. In 1910 nine American states had adopted it- — namely: Maine, Kansas, N. Dakota, Georgia, Oklahoma, Alabama, Mississippi, N. Carolina and Tennessee; and it was estimated that nearly half the popula- tion of the United States were living under state or local prohibition. In Canada the province of Prince Edward Island has adopted complete prohibition. In 1908 Iceland by a popular vote resolved to prohibit the manufacture, importation and sale of intoxicating liquor. In Norway nearly half the towns have adopted prohibition under the law of 1906. In Belgium and Switzerland the manu- facture, importation and sale of absinthe was forbidden in 1908. In New Zealand the principle of prohibition has gained ground, and in 1910 was in force over one-seventh of the colony.

Authorities. — Licensing Statistics Home Office (annual) ; Statistical Tables of Alcoholic Beverages, Board of Trade, 1905; Report of Inspector under Inebriates Acts (annual); Judicial Statistics

(annual) ; Registrar-General's Annual Report ; Statistics of Cities, United States Census Bureau; Alliance Year Book; Church of England Temperance Society Annual Report; American Prohibition Year Book; Brewers' Almanack; New Encyclopaedia, of Social Reform; " The Drink Problem " (New Library of Medi- cine); Eugenics Laboratory Memoirs; Morrison, Crime and its Causes; Pratt, Licensing and Temperance in Sweden, Norway and Denmark; Rowntree and Sherwell, The Temperance Problem and Social Reform; A. Shadwell, Drink, Temperance and Legislation.

(A. Si..)

TEMPEST, MARIE (1866-), the stage name of the English actress,' n6e Marie Susan Etherington, who in 1898 maried Cosmo Gordon-Lennox (' Cosmo Stuart "), a grandson

of the 5th duke of Richmond, and himself an actor and play- wright. She had a charming soprano voice and was educated for the operatic and concert stage, but at first appeared in light comic opera, in which she became very popular. Abandoning music, however, for the comedy stage, she made an even greater success as an actress, notably in Becky Sharp (1001); and under her own management in later years she produced a succession of modern comedies, in which her capacity for rivalling in London the triumphs of Rejane in Paris was conspicuously displayed.

TEMPIO PAUSANIA, a town of Sardinia, in the province of Sassari, from which town it is 52 m. E.N.E. by road. It is also reached by rail by a branch line (25 m.) N.W. from the main line from Terranova to Cagliari, leaving the latter at Monti, 14 m. S.W. of Terranova. Pop. (1901) 6511 (town), '4.573 (commune). It lies in a mountainous district 1856 ft. above sea-level, to the N.N.W. of the Monte

Limbara. It is the chief town of the Gallura, and has been an episcopal see since the 19th century (with Ampurias). The cathedral is a modern building. The district is agricultural and pastoral. The costumes are picturesque, especially those of the women. For the name Pausania see Terranova Paxjsania.

TEMPLARS. The Knights Templars, or Poor Knights of Christ and of the Temple of Solomon (pauperes commilitones Christi templique Salomonici), formed one of the three great military orders, founded in the 12th century. Unlike the Hospitallers and the Teutonic Knights it was a military order from its very origin. Its founders were a Burgundian knight named Hugues de Payns 1 (Hugo de Paganis) and Godeffroi de St Omer, a knight from northern France, who in 11 19 undertook the pious task of protecting the pilgrims who, after the first crusade, flocked to Jerusalem and the other sacred spots in the Holy Land. They were quickly joined by six other knights and soon afterwards organized themselves as a religious com- munity, taking an oath to the patriarch of Jerusalem to guard the public roads, to forsake worldly chivalry, "of which human favour and not Jesus Christ was the cause," and, living in chastity, obedience and poverty, according to the rule of St Benedict, " to fight with a pure mind for the supreme and true King."

To this nascent order of warrior monks Baldwin L, king of Jerusalem, handed over a part of his royal palace lying next to the former mosque of al-Aksa, the so-called " Temple of Solomon," whence they took their name. They had at first no distinctive habit, wearing any old clothes that might be given to them. Nor was their community exclusive. Their primitive rule seems to have enjoined them especially to seek out excom- municated knights, and to admit them, after absolution by the bishop, to their order, and they thus served a useful purpose in at once disciplining and converting the unruly rabble of " rogues and impious men, robbers and committers of sacrilege, murderers, perjurers and adulterers " 2 who streamed to the Holy Land in hope of plunder and

salvation. It was this rule which led later to the most important privilege of the order, the immunity from sentences of excommunication pronounced by bishops and parish priests. 3

This practice, as Prutz points out, might have brought them at once under the suspicion of the Church, and it soon became

1 A fief in Champagne, near Troyes.

% Bernard of Clairvaux, De laude novae militae, cap. v. (in Migne, Patrol, lat. 182, p. 928).

' Prutz, Templerherrenorden, p. 12. The Latin copy of the Rule (Bibliotheque Nationale) reads " Milites non excommunicato* " for " chevaliers escomenies" ; which means, according to Prutz, that when the Latin version was made the original significance of the rule had been forgotten. M. de Curzon (Regie du Temple, p. iv.), on the other hand, assumes that the Latin text represents the original rules drawn up in 1 128 and that the French version is a corrupt copy. That Prutz is right would seem to be shown not only by the reasonableness of the rule in itself (why should the Templars be instructed to look out for gatherings of wo«-excom- municated knights?) but by the language of cap. v. of the De laude novae militae, in which Bernard extols the knights for turning the enemies of Christ into his soldiers (ut quos diu pertulit oppugnatores magisjam propugnalores habere incipiat; faciatque de hostemilitem).

expedient to obtain the highest sanction for the new order and its rules. In the autumn of 11 27 accordingly Hugues de Payns, with certain companions, appeared in Europe, where he was fortunate enough to secure the enthusiastic support of the all- powerful abbot of Clairvaux. Grateful pilgrims had already begun to enrich the order; the De laude novae militae, a glowing panegyric of this new and holy conception of knighthood, ad- dressed by Bernard to Hugues de Payns by name, insured the success of his mission. In n 28 the council Of

Troyes discussed and sanctioned the rule of the order which, if not drawn up by Bernard, was undoubtedly largely inspired by him. 4

Rule of the Temple. — No MS. of the original French Rule of the Temple (Regie du Temple) exists. Of the three extant MSS. repre- senting later recensions, one is preserved at the Accademia dei Lincei at Rome (Cod. 44, A 14), one at the Bibliotheque Nationale (fonds francais 1977), the third in the departmental archives at Dijon (H. m). The last of these, probably intended for the use of the master of a subordinate house, is much abbreviated; it dates, however, from the early part of the 13th century, whereas the others are of the end of the century at earliest. In essentials these copies preserve the matter and spirit of the primitive Rule, and they prove that to the end the order was, in principle at least, submitted to the same strict discipline as at the beginning. 6

The Regie du Temple in its final form as we now possess it con- tains the rules for the constitution and administration of the order; the duties and privileges of the various classes of its personnel; the monastic rules, regulations as to costume and as to religious services; rules for the holding of chapters, and a summary of offences and their punishment; the procedure at the election of a grand master and at receptions into the order; a definition of the relations of the order to the pope, and to other religious orders. It must be borne in mind, however, that the organization of the order as described below was only gradually developed, not having been fixed at Troyes. At first the master of the Temple at Jerusalem was only one among many; the seneschal and marshal appear not to have existed; and it was not till the bull Omne datum optimum of Pope Alexander III. (1163), the great charter of the order, that its organization was definitively centralized.

Constitution. — As finally constituted, the order consisted of (1) knights (fratres milites), (2) chaplains (fratres capellani), (3) Ser- jeants or

esquires (fratres servientes armigeri), (4) menials and crafts- men (fratres servientes famuli and officii). All were bound by the rules of the order and enjoyed its privileges. Women were not admitted to the order. 6

I. At the head of the order was the master of the Temple at Jerusalem (in Cyprus after the fall of the Latin Kingdom), known as the grand master. His authority was very great — except in certain reserved cases his word was law — but he was not absolute. Thus in matters of special importance — alienation of the estates of the order, attack on a fortress, declaration of war, conclusion of an armistice, reception of a new brother — he had to consult the chapter, and was bound by the vote of the majority; nor could he modify or abrogate a decree of the council of the order without their consent. He had to obtain the consent of the chapter also to the nomination of the grand commanders of the provinces of the order; the lesser offices were absolutely in his gift. He was elected by a complicated process, a chapter summoned ad hoc electing a " com- mander of the election " and one other brother who, after vigil and prayer, co-opted two more, these four choosing another two, and so on till the number of the twelve apostles had been reached. A chaplain, representing Jesus Christ, was then added to complete the electoral college (see Curzon, Regie du Temple, p. xxxv). 7

The grand master was allowed four horses for his ordinary use. His household consisted of a frater capellanus, a cleric, a frater serviens with two horses, a Saracen secretary (ecrivain sarrazinois)

4 Bernard was not present at the council. But the " humble escrivain " of the R6gle du Temple, Johan Michiel, writes " par le comandement dou concile et dou venerable pere Bgrnart abbe's de Clerevaus." Compare the rule also with the chapter (iii.) of the De laude: De militibus Christi.

6 Of a secret Rule, in spite of the most diligent research, no trace has ever been found. It is now

generally held that none ever existed. The legend of its existence, so fatal to the order, is pro- bably traceable to the fact that the complete Rule was jealously guarded by the chief office-bearers of the order, only excerpts being given to the heads of the lesser houses (e.g. the Dijon MS.) and known generally to the knights.

6 Rule 70. Perillouse chose est compaignie de feme, que le deable ancien par compaignie de feme a degett pluisors dou droit sentier ds paradis. It is interesting to compare this with the more wholesome view of the best of the contemporary chivalrous poets, e.g. Walther von der Vogelweide or Wolfram von Eschenbach (Parzival), who hold up true love as the highest earthly incentive to noble deeds.

7 The bull Omne datum optimum (1163) decreed that the master must be a knight of the order who had taken the vows, and vested the election exclusively in the knights.

as interpreter, a turcople, i.e. a soldier belonging to the light-horse attached to the order, a farrier and a cook, two footmen {garcons A pied) to look after his special Turcoman horse, only used in war time. He was further attended by two knights of the order of high rank. The ensigns of his presence on campaign were the large round tent and the gonfanon baucent, the black and white pennant, charged with the red cross of the order.

2. The second officer of the Temple was the seneschal. He had a right to attend all chapters, even the most secret. His equipage, tent, banner and seal were the same as the master's. Attached to his person were two squires, a knight companion, a frater serviens, a secretary in deacon's orders to say the hours, a turcople, a Saracen secretary and two foot servants.

3. Third in order was the marshal, who was supreme military authority, and had under his charge the horses and arms. In the absence of master and seneschal he acted as locum tenens. His equipage and suite were much the same as those of master and seneschal.

The provincial marshals were absolute in their provinces, but subordinate to the marshal of the order.

The commander of the land and realm of Jerusalem was grand treasurer of the order, administered its estates in the province of Jerusalem, and was responsible for the lodging of the brethren. He also had charge of the fleet, the commander of the port of Acre being his subordinate. His equipage and suite were much the same as those of seneschal and marshal.

The commander of the city of Jerusalem was the hospitaller of the order. He was charged with the defence of pilgrims visiting the Holy Land, and with the duty of supplying them with food and horses. Ten knights were specially attached to him for this purpose, and to act as guard to the relics of the True Cross. Subordinate to him was a second commander for the city itself.

The commanders of Tripoli and Antioch enjoyed all the rights of the grand master within their provinces, except when he was present. They too had the round tent and the gonfanon.

Besides these, the rule mentions the commanders of France, England, Poitou, Portugal, Apulia and Hungary, whose rights and privileges are analogous to those of the commanders above men- tioned. 1

Lastly, of the great officers of the order must be mentioned the drapier, who was charged with the supervision of the clothing of the brethren. He was closely associated with the commander of the kingdom of Jerusalem, his equipage was that of the com- manders, but his suite included a number of tailors.

Below the great dignitaries there were in the provinces commanders of houses, under the provincial commanders, and the commanders of the knights, who acted as lieutenants of the marshals.

Turning to the general body of the order: the knights (milites) were entitled to three horses and a squire, or by special favour to four horses and two squires. They had two tents.

Of the serjeants (servientes) five occupied an exceptional position : the deputy-marshals (souz-mareschau) , who looked after the arms and armour, the gonfanonier, who was responsible for the discipline and catering of the squires, the kitchener (cuisinier) and the farrier. These had two horses, a squire and a tent. All the others, even if commanders of houses, had but one horse. At the head of all the serjeants in time of war was the turcoplier, the chief of the tur- coples. He had four horses in his equipage and certain special prerogatives; in battle he took his orders only from the master or seneschal.

Of peculiar importance were the chaplains (fratres capellani). These did not originally form part of the order, which was served by priests from outside. The bull Omne datum optimum of 1163 imposed on clerics attaching themselves to the order an oath of life- long obedience to the grand master; by the middle of the 13th century the chaplains took the same oath as the other brothers and were distinguished from them only by their orders and the privileges these implied (e.g. they were spared the more humiliating punish- ments, shaved the face, and had a separate cup to drink out of). The order thus had its own clergy, exempt from the jurisdiction of diocesan bishops and parish priests, owing obedience to the grand master and the pope alone. By the rules, no Templar was allowed to confess to any save a priest attached to the order, if one were available, and such priest was formally declared to have re- ceived from the pope more power to absolve than an archbishop. 2

It remains to be said that the brethren were admitted either for life or for a term of years. Married men were also received, but on condition of bequeathing one half of their property to the order (rule 69).

The chapters of, the order were either secret, composed of such brothers as the master might esteem ” wise and profitable for

1 The titles varied. The provincial commander is ” Master ” or ” Grand Prior ” or ” Grand Preceptor ” under him are ” priors ” over large estates, and under them ” preceptors ” of houses. Pre- ceptors took their name from the mandate of the master issued to them: ” Praecipimus tibi. ”

2 Rule 269 . . . Car il en ont greignor povir de Vapostoile (i.e. the pope) d’eausassoudtc que unarcevesque (Curzon, p. 165).

giving advice, ” or general assemblies of the order, at the discretion of the master, who was to listen to the counsel given and do what seemed best to him (rule 36).

Habit of the Order. — The characteristic habit of the order was the white mantle, symbolic of purity, with the red cross, the ensign of the champions of the Church, first granted by Pope Eugenius III. (1145-53). Only the unmarried knights bound by life-long vows, however, were privileged to wear the white mantle, which was also given to chaplains in episcopal orders. The rest wore a black or brown mantle, the red cross being common to all. The chaplains were distinguished by wearing the mantle closed.

Conduct and Discipline.— The brethren were to attend daily services; but the soldier outwearied with his nightly duties might on certain conditions absent himself from matins with the master’s consent. Two regular meals were allowed for each day; but to these might be added, at the master’s discretion, a light collation towards sunset. Meat might be eaten

thrice a week; and on other days there was to be a choice of vegetable fare so as to suit the tenderest stomach. Brethren were to eat by couples, each keeping an eye on his fellow to see that he did not practise an undue austerity. Wine was served at every meal, and at those times silence was strictly enjoined that the words of Holy Writ might be heard with the closest attention. 3 Special care was to be taken of aged and ailing members. Every brother owed the most absolute obedience to the master of the order, and was to go wherever his superior bade him without delay, " as if commanded by God." All undue display in arms or harness was forbidden. Parti-coloured garments were forbidden. All garments were to be made of wool ; but from Easter to All Souls a linen shirt might be substituted for one of wool. The hair was to be worn short, and a rough beard became one of the distinguishing marks of the order. Hunting and hawking were unlawful; and the very allusion to the follies or secular achieve- ments of earlier life was forbidden. A lion, however, being the type of the evil one, was legitimate prey. Strict watch was kept on the incomings and outgoings of every brother, except when he went out by night to visit the Sepulchre of our Lord. No letter, even from the nearest relative, might be opened except in the master's presence; nor was any member to feel annoyance if he saw his relative's gift transferred at the master's bidding to some other brother. The brethren were to sleep in separate beds in shirts and breeches, with a light always burning in the dormitory. Those who lacked a mattress might place a piece of carpet on the floor; but all luxury was discouraged.

A term of probation was assigned to each candidate before ad- mission; and a special clause discouraged the reception of boys before they were of an age to bear arms. 4 Lastly, the brethren of the Temple were exhorted to shun the kiss of every woman, whether maid or widow, mother, aunt or sister.

For grievous offences, such as desertion to the Saracens, heresy, losing the gonfalon, murdering a Christian, or failing to account for all the

property of the order in his possession, a Templar might be expelled (perdre la maison); for minor offences, such as dis- obedience, lowering the banner in battle, or killing a slave or a horse, he suffered a temporary degradation {perdre son abit). No member of another religious order was received by the Templars, and no Templar could leave the order without permission of the master, and then only on condition of joining a stricter monastic com- munity. By mutual agreement the Templars and Hospitallers, despite their long and deadly feud, were bound not to receive ejected members of the rival order; and the Templar cut off in battle and defeat from all hope of rejoining his own ranks might rally to the cross of St John.

History. — Long before St Bernard's death (11 53) the new order was established in almost every kingdom of Latin Christendom. Henry I. granted them lands in Normandy. They seemed to have been settled in Castile by 11 29, in Rochelle by 1131, in Languedoc by 1136, at Rome by 1138, in Brittany by 1 141, and in Germany at perhaps a still earlier date. Al- phonso I. of Aragon and Navarre, if we may trust the Spanish historians, bequeathed them the third of his kingdom Spread (Mariana, x. c. 9). Raymond Berengar IV., count of of the Barcelona, and Alphonso's successor in Aragon, whose order. father had been admitted to the order, granted them the strong castle of Monzon (1143), and established a new chivalry in imitation of theirs. Louis VII. in the latter years of his reign gave them a piece of marsh land outside Paris, which in later times became known as the Temple, and was the headquarters

3 The Bjble was read in a French translation. A MS. of a Templar Bible, exhibiting curious touches of the critical spirit, is now in the Bibliotheque Nationale in Paris. See Prutz, Templer- herrencrden, p. 116.

4 This rule was not observed later on, postulants being admitted without any period of noviciate, and among the Templars arrested in 1307 were many young boys.

»f the order in Europe. 1 Stephen of England granted them the manors of Cressing and Witham in Essex, and his wife Matilda that of Cowley, near Oxford. Eugenius III., Louis VII., and 130 brethren were present at the Paris chapter (1147) when Bernard de Balliol granted the order 15 librates of land near Hitchin; and the list of English benefactors under Stephen and Henry II. includes the noble names of Ferrers, Harcourt, Hastings, Lacy, Clare, Vere and Mowbray. Spiritual privileges were granted to them by the popes as lavishly as temporal pos- sessions by the princes and people. Pope Adrian IV. allowed them to have their own churches; Eugenius III. added to these the right to have churchyards; and churches and churchyards, as in the case of the order generally, were exempted from the operation of ordinary excommunications and interdicts. Thus a person dying excommunicated, refused burial elsewhere, sometimes — like Geoffrey de Mandeville 2 — found a resting- place in the consecrated ground of the Templars. Eugenius III. also granted the Templars the right to have interdicted churches opened twice a year for the purpose of making their collections. They were, moreover, as defenders of the Church, exempted from the payment of tithes. Finally, they were exempted from the action even of general censures and decrees of the popes, unless mentioned in them by name. Very soon the order refused to submit in any way to the ordinary juris- diction of the diocesan bishops and formed in effect a separate ecclesiastical organization under the pope as supreme bishop. The result was that, scarce twenty-five years after its founda- tion, the order was at open feud with bishops and parish priests, and the popes found it necessary to issue decree after decree to protect it from violence and spoliation. The complaints of the secular clergy, on the other hand, came to a head in n 70 at the Lateran Council, when even Pope Alexander III. had to consent to a series of decrees directed against the abuse of its privileges by the order (Prutz, p.

41).

So long, however, as the attention of the papacy and of Christendom was fixed on the problem of recovering and safe- guarding the Holy Land, the position of the Templars was unassailable and all efforts to curb the growth of their power vain. The order as such had no European policy; 3 the whole of its vast organization was maintained for the purpose of feeding the holy war against the infidels with recruits and with money; and its ultimate fate depended on its success or failure in the East. (W. A. P.)

After the council of Troyes Hugues de Payns came to England and induced a number of knights to follow him to the Holy Land. Among these was Fulk, count of Anjou, who would thus seem to have been a Templar before assuming the crown of Jerusalem in 1131. Hugues de Payns died about the year Early 1 136 and was succeeded by Robert de Craon, who is

grand said to have been Anselm's nephew. Everard de masters. g arr ; s> the third master, was conspicuous in the second crusade. In the disastrous march from Laodicea to Attalia his troops alone kept up even the show of discipline; and their

1 In August 1279, Philip IV. ceded to the Templars within the precincts of the Temple at Paris (vieus Templi), i.e. the whole fortified quarter on the right bank of the Seine, the right to exercise higher and lower justice (olta et bassa justicia), to retain all property usually escheated to the crown, and to guard their fortress " night and day " by means of their own Servientes without interference. The king undertook, for himself and his successors, not to endeavour to levy any taille or other tax nor to exact any of the customary feudal services within the Temple. Text in Prutz, Templerherren- orden, p. 298.

2 Illo autem, in discrimine mortis, ultimum trahente spiritum, quidam supervenere Templarii qui religionis sacre habitum cruce rubea signatum ei

imposuerunt (Mori. Ang., iv. 142). There must be a slight error here on the part of the chronicler; for Geoffrey died in 11 44 and the red cross was not granted to the Templars until the following year. This does not, however, affect the main fact that Geoffrey, though excommunicated, was buried in consecrated ground at the New Temple in London. This was in 1 163, twenty- two years before the consecration of the Temple Church now standing. See Round, Geoffrey de Mandeville, p. 224.

3 Finke, p. 42. Individual Templars, of course, acted from time to time as diplomats or as royal advisers; but they in no sense represented the order.

success prompted Louis VII. to regulate his whole army after the model of the Templar knights. In the French king's distress for money the Templars lent him large sums, ranging from 2000 silver marks to 30,000 solidi. When Conrad III. of Germany reached Jerusalem he was entertained at their palace (Easter n 48); and in the summer of the same year they took part in the unsuccessful siege of Damascus. The failure of this expedition was ascribed by a contemporary writer to their treachery — a charge to which Conrad would not assent. This is the first note of the accusations which from this time were of constant recurrence. 4

Henceforward for 140 years the history of the Templars is the history of the Crusades (VII., who brought back (1167) to Jerusalem the glowing accounts of the splendour of the caliph's court at Cairo with which Gibbon has enlivened his great work. Nor was the order less active at the northern limits of the Latin kingdom. Two English Templars, Gilbert de Lacy and Robert Mansel, " qui Galensibus praeerat," starting from Antioch, surprised Nur al-Din in the neighbourhood of Tripoli and put him barefooted to flight. But jealousy or honour led the Templars to oppose Amalric's Egyptian expedition of n 68; and the wisdom of their advice became apparent when the re- newed discord on the Nile led to the conquest of Egypt by Asad al-DIn Shirkuh, and thus

indirectly to the accession Relations of Saladin,in 1165. In n 70 they beat Saladin back with' from their frontier fortress of Gaza; and seven years SaI adin. later they shared in Baldwin IV. 's great victory at Ascalon.

Meanwhile Saladin had possessed himself of Emesa and Damascus (1174-75), and, as he was already lord of Egypt, his power hemmed in the Latin kingdom on every side. In July 1 1 73 Arnalric was succeeded by his son Baldwin IV., a boy of twelve. Raymond III., count of Tripoli, a man sus- pected of being in league with the Saracens, was appointed regent, although in 1176 the masters of the Templars and the Hospitallers united in offering this office to the newly arrived Phiiip of Flanders. The construction of the Templar fortress at Jacob's ford on the upper Jordan led to a fresh Saracen in- vasion and the disastrous battle of Paneas (1179), from which the young king and the Holy Cross escaped with difficulty, while Odo de St Amand, the grand master, was carried away captive and never returned.

During Odo's mastership the Old Man of the Mountains sent to Arnalric offering to accept the Christian faith if released from the tribute he had paid 1o the Templars since (according to the 4 Hist. Pontific., ap. Pertz, xx. 535-53°-

reckoning of M. Defremery) somewhere about 1140. The Templars murdered the envoys on their return (c. 1172). Amalric demanded that the offenders should be given up to justice. Odo refused to yield the chief culprit, though he was well known, and invoked the protection of the pope. Amalric had to vin- dicate his right by force of arms at Sidon, and died while prepar- ing to take stronger measures. The connexion between the Templars and the Old Man was still vital eighty years later when the two grand masters rebuked the insolence of the Assassin envoys in the presence of Louis IX. Odo de St Amand was suc-

ceeded by Arnold de Torroge, who died at Verona on his way to implore European succour for the Holy Land. The power of Saladin was now (n 84) increasing daily; Baldwin IV. was a leper, and his realm was a prey to rival factions. There were two claimants for the guardianship of the state — Raymond III. of Tripoli and Guy de Lusignan, who in n 80 had married Sibylla, sister of the young king. Baldwin inclined to the former, against the patriarch and Arnold de Torroge.

There is something Homeric in the story of the fall of the Latin kingdom as related by the historians of the next century. Fallot A French knight, Gerard de Riderfort or Bideford, Latin coming to the East in quest of fortune, attached

kingdom, mmse if to t h e service of Raymond of Tripoli, looking for the hand of some wealthy widow in reward. But on his claiming the hand of the lady of Botron he was met with a refusal. Angered at this, Gerard enrolled himself among the Templars, biding his time for revenge, and was elected grand master on the death of Arnold. Baldwin IV. died (1185), leaving the throne to his young nephew Baldwin V., the son of Sibylla, under the guardianship of Raymond, whose office was not of bng duration, as the little king died in September 1 186. This was Gerard's opportunity. The Templars carried the body of their dead sovereign to Jerusalem for burial; and then, unknown to the barons of the realm, Gerard and the patriarch crowned Sibylla and her husband Guy. The corona- tion of Guy was the triumph of Raynald of Chatillon, once prince of Antioch, and Saladin's deadliest foe. It was at the same time the overthrow of Raymond's ambition; and both Latin and Arabic writers are agreed that the Christian count and the Mahommedan sultan now entered into an alliance. To break this friendship and so save the kingdom, the two grand masters were sent north to make terms with Raymond. But the rash valour of the Templars provoked a hopeless contest with 7000 Saracens. The grand master of the Hospitallers was slain; but Gerard made his escape with three knights to Nazareth (1st

May n 87). In this emergency Raymond be- came reconciled with Guy; and Gerard placed the Temple treasures of Henry II. at his king's disposal. Once more it was the Templars' rashness that led to the disastrous battle of Hittin (4th July). Gerard and the king fell into the hands of Saladin, but were released about a year later; Raymond of Tripoli made his escape through treachery or fortune; and 230 Templars fell in or after the battle, for the fight was scarcely over before Saladin ordered all the Templars and Hospitallers to be murdered in cold blood. One after another the Christian fortresses of Palestine fell into the hands of Saladin. Jerusalem Fall of surrendered on 2nd-3rd October 1 187, and the treasures Jen- of the Temple coffers were used to purchase the re-

salem. demption of the poorer Christians, part of whom the Templar warriors guarded on their sad march from the Holy City to Tripoli. Part of their wealth was expended by Conrad of Montferrat in the defence of Tyre; but, when this prince refused to admit Guy to his city, both the Templars and the Hospitallers from the neighbouring parts flocked to the banner siege of of their released king and accompanied him to the Acre - siege of Acre (22nd August ti8o). In his company

they bore their part in the two years' siege and the terrible famine of 1 190-91; and their grand master died in the great battle of 4th October 1189, refusing to survive the slaughter of his brethren.

On the fall of Acre Philip Augustus established himself in the palace of the Templars, who are, however, stated to have

sympathized with Richard. This king sold them the island of Cyprus for 100,000 besants; but, unable to pay the purchase money, they transferred the debt and the principality to Guy of Lusignan. The English king consulted them before deciding on any great military movement; and in June 1192 they ad- vocated the bold plan of an advance on Egypt rather than on Jerusalem. In the disputes for the Latin kingdom of

the East the Templars seem to have supported Guy, and, like Richard, were credited with having had a hand in the murder of Conrad of Montferrat (April n 92). It was in the disguise of a Templar and in a Templar galley that Richard left the Holy Land. When Acre was recovered, the Templars, like the Hospitallers, received their own quarters in the town, which from this time became the centre of the order. On the death of Henry of Champagne (1197) they vetoed the election of Raoul de Tabarie; after the death of his successor Amalric they refused to renew the truce with Saladin's brother, Saif al-Din, and led an expedi- tion against the Saracens before the arrival of the John de new king, John de Brienne, at whose coronation in Btlenne. 1210 William de Chartres, the grand master, was present. Seven years later, with the aid of Walter de Avenriis and of the Teutonic Knights, they commenced the building of their fortress of Castle Pilgrim, near Acre, on a rocky promontory washed by the Mediterranean on every side except the east. This wonderful structure, whose ruins are still to be seen, was fortified with a strong wall, founded on the substructure of a yet more extensive one running from sea to sea, and was flanked by lofty towers of huge squared stones. Within was a spring of pure water, besides fishponds, salt-mines, woods, pastures, orchards, and all things fitted to furnish an abode in which the Templars might await the day of their restoration to Jerusalem.

It was from this castle that in May 1218 the fifth. crusade started for the expedition against Egypt. The Templars were the heroes of the siege of Damietta, at which William Fifth de Chartres was slain. " First to attack and last to crusade. retreat," they saved the Christian army from annihilation on 29th August 1 2 19; and when the city surrendered (5th November) the only one of its twenty-eight towers that had begun to give way had been shaken by their engines. On the other hand, it was largely owing to their objections that John de Brienne refused the sultan's offer to restore Jerusalem and Palestine.

From the very first the Templars seem to have been opposed to Frederick II., and when he landed at Acre (7th September 1228) they refused to march under the banners of an excom- municated man, and would only accompany his host from Acre to Joppa in a separate body. They were accused of notifying Frederick's intended pilgrimage to the Jordan to the sultan, and they were certainly opposed to Frederick's ten years' peace with Al-Kamil, the sultan of Egypt, and refused to be present at his coronation in Jerusalem. Frederick was not slow to avenge himself: he left Jerusalem abruptly, publicly insulted the grand master, demanded the surrender of their fortresses, and even laid siege to Castle Pilgrim^ He left Acre on the 3rd of May 1229, and on landing in Apulia gave orders to seize the estates of the order and chase all its members from the land.

Long before the expiration of Frederick's peace Europe was preparing for a fresh crusade against the now divided realm of the Ayyubids. Theobald of Navarre and his crusaders Seventh reached Palestine about August 1239. The Templars crusade. shared in the great defeat near Jaffa, an engagement which their temerity had done much to provoke (13th November 1239). If the king ever accepted the overtures of Salih of Damascus, he was supporting the policy of Hermann of Perigord, the grand master, who towards the summer of 1244 wrote a triumphant letter to England, telling how he had engaged this sultan and Nasir of Kerak to make an alliance against the sultan of Egypt and restore the whole of Palestine from the Jordan to the sea. Theobald, however, before leaving the Holy Land (27th September 1240), signed a ten years' truce with Salih of Egypt. The Hospitallers seem to have been won over to his view', and

when Richard of Cornwall arrived (nth October) he had to decide between the two rival orders and their opposing policies. After some hesitation he

concluded a treaty with the sultan of Egypt, much to the annoyance of the Templars, who openly mocked his efforts. On his departure the three orders came to open discord: the Templars laid siege to the Hospitallers in Acre and drove out the Teutonic Knights " in contumeliam imperatoris." They were successful on all sides. The negotia- tions with Damascus and Kerak were reopened, and in 1244 Hermann of Perigord wrote to the princes of Europe that after a " silence of fifty -six years the divine mysteries would once more be celebrated in the Holy City."

It was in this moment of danger that the sultan of Babylon called in the barbarous Kharizmians, whom the Mongol in- Khariz- vasions had driven from their native lands. These mianin- savages, entering from the north, flowed like a tide vaaioa, p ast the newly built and impregnable Templar fortress of Safed, swept down on Jerusalem, and annihilated the Christian army near Gaza on St Luke's day (18th October) 1244. From this blow the Latin kingdom of the East never recovered; 600 knights took part in the battle; the whole force of the Templars, 300 in number, was present, but only 18 survived, and of 200 Hospitallers only 16. The masters cf both orders were slain or taken prisoners. Despite the admir- able valour of the Templars, their policy had proved the ruin of the land. Jerusalem was lost to Christendom for ever; and, though the Kharizmians melted away in the course of the next three years, they left the country so weak that all the acquisi- tions of Theobald and Richard fell an easy prey to the sultan of Babylon.

Recognizing the fact that the true way to Jerusalem lay through Egypt, Louis IX. led his host to the banks of the Nile, Louis being accompanied by the Templars. Their master,

ix.'s William de Sonnac, attempted in vain to restrain

crusade, the rash advance of the count of Artois at the battle of Mansura (8th February 1250), which

only three Templars survived. St Louis, when captured a few weeks later, owed his speedy release to the generosity with which the order ad- vanced his ransom-money. Shortly after his departure from Acre (April 1254) they consented to an eleven years' truce with the sultans of Egypt and Damascus.

A new enemy was now threatening Mahommedan and Christian alike. For a time the Mongol advance may have been welcomed by the Christian cities, as one after another the Mahommedan principalities of the north fell before the new invaders. But this new danger stimulated the energies of Sue- Egypt, which under the Mameluke Bibars encroached

cesses year after year on the scanty remains of the Latin 0/ Bibars. yugdom. The great Frankish lords, fearing that all was lost, made haste to sell their lands to the Templars and Hospitallers before quitting Palestine for ever. In 1260 the former purchased Sidon and Beaufort; next year the Hos- pitallers purchased Arsuf. In 1267, by a skilful adaptation of the banners of both orders, Bibars nearly surprised Antioch. The Templar fortress of Safed surrendered with its garrison of 600 knights, all of whom preferred death to apostasy (June 1266). Beaufort fell in 1268, Antioch six weeks later; and, though the two orders still made occasional brilliant dashes from their Acre stronghold, such as that to Ascalon in 1264 and that with Prince Edward of England to destroy Kakun in 1 271, they became so enfeebled as to welcome the treaty which secured them the plain of Acre and a free road to Nazareth as the result of the English crusade of 1272.

But, though weak against external foes, the Templars were strong enough for internal warfare. In 1277 they espoused the quarrel of the bishop of Tripoli, formerly a member of the order, against his nephew Bohemond, prince of Antioch and Tripoli, and began a war which lasted three years. In 1276 their conduct drove Hugh III., king of Cyprus and Jerusalem, from Acre to Tyre. In the ensuing year, when Mary of Antioch had sold her claim to the crown to Charles of Anjou, they wel- comed this prince's lieutenant

to Acre and succeeded for the

moment in forcing the knights of that city to do homage to the new king. Thirteen years later (26th April 1290) Tripoli fell, and next year Acre, after a siege of six weeks, at the Abandon- close of which (16th May) William de Beaujeu, the ment 0/ grand master, was slain. The few surviving Templars Pales- elected a new master, and, forcing their way to the tme ' seashore, sailed for Cyprus, which now became the headquarters of the order. A futile attempt against Alexandria in 1300 and an unsuccessful effort to form a new settlement at Tortosa about the same time (1300-2) are the closing acts of their long career in the western parts of Asia.

*For more than a hundred years the Templars had been one of the wealthiest and most influential factors in European politics. If we confine our attention to the East, we p ower realize but a small part of their enormous power. and in- Two Templars were appointed guardians of the dis- fiuence puted castles on the betrothal of Prince Henry of oJi*f England and the French princess in 1161. Other Templars were almoners of Henry III. of England and of Philip IV. of France. One grand master was godfather to a daughter of Louis IX.; another, despite the prohibition of the order, is said to have been godfather to a child of Philip IV. They were summoned to the great councils of the Church, such as the Lateran of 1215 and the Lyons council of 1274. Frederick II. 's persecution of their order was one of the main causes of his excommunication in 1230; and his last will en- joined the restoration of their estates. Their property was scattered over every country of Christendom, from Denmark to Spain, from Ireland to Cyprus. Before the middle of the 13th century Matthew Paris reckons their manors at 9000, Alberic of Trois-Fontaines at 7050, whereas the rival order of St John had barely half the latter number. Some fifty years earlier their income from Armenia alone was 20,000 besants. Both in Paris and in London their houses were used as strongholds for the royal treasure. In the Temple in London Hubert de Burgh and the Poitevin favourites of Henry*

III. stored their wealth; and the same building was used as a bank into which the debtors of the foreign usurers paid their dues. From the English Templars Henry III. borrowed the purchase money of Oleron in 1235; from the French Templars Philip IV. exacted the dowry of his daughter Isabella on her marriage with Edward II. To Louis IX. they lent a great part of his ransom, and to Edward I. of England no less than 25,000 livres Tournois, of which they remitted four-fifths. Jacques de Molay, the last grand master, came to France in 1306 with 150,000 gold florins and ten horse-loads of silver. 1 In the Spanish peninsula they occupied a peculiar position, and more than one king of Aragon is said to have been brought up under their discipline. 2

1 The wealth of the Templars was due not so much to their territorial possessions as to the fact that they were the great inter- national financiers and bankers of the age. The Paris Temple was the centre of the world's money market. In it popes and kings deposited their revenues, and these vast sums were not hoarded but issued as loans on adequate security. Above all, it was the Templars who made the exchange of money with the East possible. It is easy, indeed, to see how they were the ideal bankers of the age; their strongholds were scattered from Armenia to Ireland, their military power and strict discipline ensured the safe transmission of treasure, while their reputation as monks guaranteed their integ- rity. Thus they became the predecessors, and later the rivals, of the great Italian banking companies. See L. Delisle, " Memoire sur les operations financieres des Templiers " in Memoires de I'lnstitut national de France, t. xxxii. To take interest (usury) was of course unlawful. The method of circumventing this seems to have been that the mortgages paid to the mortgagors a nominal rent which was used towards the reduction of the debt. The difference between this and the real rent represented the interest. See Ancient Charters, Pt. i. (Pipe Roll Soc, London, 1888), edited by J. H. Round, p. 94 note. A document throwing a vivid light on the banking methods of the Templars and

Hospitallers is a charter of Margaret, queen of the English, a.d. 1 186, from the abbey of Fontevrault, printed in Calendar of Documents, France (London, 1899), vol. i., ed. J. H. Round, No. 1084. (W. A. P.)

2 The Templars in Aragon and the other kingdoms of the Spanish peninsula were far more subordinate to the crown than elsewhere. None but natives were admitted to their ranks, and there were very few exchanges of knights with foreign commanderies. They were

Such were the power and wealth of the Templars at the time when Philip IV. of France accused them of heresy and worse offences, had them arrested (13th October 1307), and forced them to confess by tortures of the most excruciating kinds. Five years later (26th May 1312) the order was suppressed by decree of the council of Vienne and its goods transferred to the hospital of St John. (T. A. A.)

Never had the order of the Temple been to all appearance more powerful than immediately before its ruin. Sovereign Suppres- power, in the sense of that of the Teutonic Knights in sioa of Prussia or the Knights of St John in Rhodes and later in tbe Malta, it had never possessed; but its privileges and

on,er ' immunities constituted it a church within the church and — in France at least — a state within the state. Philip IV., indeed, in pursuance of his policy of centralizing power in the crown, had from 1287 onwards made tentative efforts to curtail the power and wealth of the order; in 1287 he commanded the sequestration of all its property acquired since the confirmation of its privileges by Louis IX. in 1258; in 1289 the ordinance of Ferrieres in Gatinais was directed against its illegal acquisitions and its interference with the jurisdiction of the king and his vassals; in 1290 the parlement decided that

the privileges of the order could only be enjoyed by those who actually wore its habit. Soon, however, the king's necessities forced him to change his policy. In January 1293 the privileges of the order in and about Paris were confirmed and extended, and in 1297 Philip borrowed 5200 livres toumoises from the Paris Temple. Then came the great quarrel with Pope Boniface VIII., and on the 10th of August 1303 the king signed with Hugues de Peraud, the general visitor of the French Templars, a formal treaty of alliance against the pope. On the 6th of February 1304 Boniface's successor, Benedict XI., once more confirmed all the Templars' privileges; while Philip, for his part, appointed Hugues de Peraud receiver of the royal revenues and, under pressure of the disastrous campaign in Flanders, in June granted a charter exempting the order from all hindrances to the acquisi- tion of property. Two years later the king took refuge in the Temple from the violence of the Paris mob, 1 and so late as the spring of 1307 was present at the reception of a new Templar. 2

Yet for some two years past the king had been plotting a treacherous attack on the order. His motives are clear: he had used every expedient to raise money, had robbed and ex- pelled the Jews and the Lombard bankers, had debased the coinage; the suppression of the Templars would at once rescue him from their unwelcome tutelage and replenish his coffers. He cherished also another ambition. The question of an amal- gamation of the great military orders had often been mooted; the project had been approved by successive popes in the in- terests of the Holy Land; it had been formally proposed at the Lyons council of 1274, only to be rejected by the opposition of the Templars and Hospitallers themselves. To Philip this scheme commended itself as an opportunity for bringing the orders under the control of the French crown; there was to be but one order, that of the " Knights of Jerusalem," of which the grand master was always to be a prince of the royal house of France. 3 Clearly, it only needed an excuse and a favourable opportunity to make him

attack the Templars; and, once having attacked them, nothing short of their entire destruction would have been consistent with his safety. The excuse was found in the denunciation of the order for heresy and unspeak-

bound to- respond to demands of the grand master for consignments of men and money, but their main duty was to assist the king in his wars against the Moors at home {ad Sarracenorum Yspanie ofensionem), a duty they fulfilled with conspicuous success and courage to the last.- See Finke i. 3, Papsttum und Untergang des Templerordens (p. 27), " Die Sonderstellung der aragonesischen {und spanischen) Tempter." See also Prutz, Templerherrenorden, p. 61 seq. In Portugal the Templars were practically feudatories of the crown, the master taking an oath of fealty to the king and his heir (ib. p. 59)- . .(w - A - p -)

1 For details see Lavocat, p. 120. 2 Finke i. 119.

- *He himself was to be its first head, with the title of " King of Jerusalem." See the letter (No. 75) from Leget F. to Bernart F. in Finke ii. liv-*

able immoralities by a venal informer; the opportunity was the election of a pope, Clement V., wholly devoted to the in- terests of the king of France.

For perhaps half a century there had been strange stories circulating as to the secret rites practised by the order at its midnight meetings, stories which probably had their Accusa- origin in the extreme precautions taken by the #<"•«• Templars, originally perhaps for military reasons, to secure the secrecy of their proceedings, which excited popular curiosity and suspicion. Among the Templars alone of the religious orders the ceremonies of reception were conducted in strict privacy; chapters were held at daybreak with closely guarded doors, and no one participating was allowed to reveal what had passed, even to a fellow-member of the order, under pain of expulsion. It was inevitable that, considering the

*temper of the age, all this should lead to stories of rites too repulsive to bear the light. It was said that on his initiation each member had to disavow his belief in Christ, to spit upon the crucifix, to submit to indecent ceremonies. When the mass was cele- brated the consecrating words Hoc est corpus were omitted; on Good Friday the holy cross was trampled under foot; and the Christian duty of almsgiving had ceased to be observed. Even the vaunted chastity of the order towards women had, it was said, been turned into the formal obligation to commit more horrible offences. These evil practices were part of the secret statute law of an order which in its nightly assemblies wor- shipped an idol named Baphomet * or the devil in the shape of a black cat. Devils, too, appeared in the form of beautiful women (succubi) , with whom the brothers had carnal intercourse. In England the very children at their play bade one another beware of a Templar's kisses. Stranger stories yet were rife in England and gravely reported before bishops and priests — of children slain by their fathers because they chanced to witness the nightly orgies of the society; of one prior's being spirited away at every meeting of the general chapter; of the great preceptor's declaring that a single hair of a Saracen's beard was worth more than the whole body of a Christian man. In France they were said to roast their illegitimate children and smear their idols with the burning fat.*

In the spring of 1304 or 1305 a certain Esquiu de Floyran of Beziers pretended to betray the ” secret of the Templars ” {factum Templariorum) to James II. of Aragon. The Denuacl- pious king, who had every reason to think well of the atloaol order, did not affect to be convinced; but the prospect tbe order. of spoils was alluring, and he seems to have promised the in- former a share of the booty if he could make good his charges. s Esquiu now turned to Philip of France, with more immediate success. For the purpose of collecting additional evidence the king caused twelve spies to find admission to the order, and in the meantime sought to win over the pope to his views. Ber- trand de Got, archbishop of

Bordeaux, who on the 5th of June 1305 became pope as Clement V., owed the tiara to the diplomacy of Philip's agents, perhaps to their gold; but though a weak man, and moreover a martyr to ill health, he was not so immediately accommodating as the king might have wished,

4 Two of the- Templars examined at Carcassonne spoke of an idol named Baphomet or a piece of wood on which was represented a figure of Baphomet. A Templar at Florence called the idol Mahomet or Magomet. Baphomet was a common medieval cor- ruption of Mahomet (Maphomet, Mahom, &c), who was regarded, not as a false prophet only, but as a demon, a false god to whom human sacrifices were offered. Hence any unholy or fantastic rites came to be called baffumerie, mahomerie, momerie, i.e. " mummery." Hammer-Purgstall's derivation from '/3a<^ MtjtoOs, i.e. the baptism of Metis (the supreme wisdom), has no trustworthy evidence to support it. See Loiseleur, Doctrine secrete, p. 97 seq.

6 Finke ii. 83, No. 57, publishes a letter of Esquiu to the king, dated 21st January 1308, claiming his reward. Esquiu is the Squin de Florian of Villani; the other informer mentioned by him, Noffo Dei (Deghi) of Florence, had, however, nothing to do with the matter; he was in financial relations with the Temple at Paris, and was hanged for swindling. Nor was Esquiu's motive to save himself from execution, but purely mercenary. The exist- ence of an informer, doubted by Lea {Inquisition iii. 255) and others, is now proved.

expressing his disbelief in the charges against the order, and, though promising an inquiry, doing his best to procrastinate. Philip determined to force his hand. All France was at this time under the jurisdiction of the Inquisition, and the Inquisi- tion could act without consulting the pope. The grand in- quisitor of France, William of Paris, was

Philip's confessor and creature. The way was thus open for the king to carry out his plan by a perfectly legal method. His informers denounced the Templars to the Inquisition, and the grand inquisitor — as was the customary procedure in the case of persons accused of heresy — demanded their arrest by the civil power. On the 14th of September 1307, accordingly, Philip issued writs to his baillis and seneschals throughout the kingdom, directing them to make preparations to arrest the members of the order on the following 13th of October.

The Templars had for some time past been aware of the charges against them. On the 6th of June 1306 Pope Clement had summoned Jacques de Molay, the grand master, from Cyprus to France, in order to consult him on the projected crusade. He had obeyed the call, and, in an interview with the pope, had taken the opportunity to demand a full inquiry. They had, however, taken no measures to defend themselves; the sudden action of the king took them wholly by surprise; Arrest and on the night of Friday, the 13th of October 1307, of the their arrest was effected without difficulty, Jacques Templars. j e jyf i av himself with sixty of his brethren being seized in Paris. Next day they were haled before the university of Paris, to hear the recital of their crimes; on Sunday the populace was collected in the royal gardens, where preachers inveighed against the iniquities of the order.

The Templars were caught in toils from which there was no escape. To force them to confess, they were first tortured by the royal officials, before being handed over to the in- quisitors to be, if need were, tortured again. In Paris alone thirty-six died under the process. 1 The result was, at the outset, all that the king could desire. Of 138 Templars examined in Paris between the 19th of October and the 24th of November, some of them old men who had been in the order the greater part of their lives, 123 confessed to spitting on (or "near") the crucifix at their reception. Many of the prisoners, on the other hand, confessed to all the charges,

however grotesque. But the most damning confession was that of the grand master himself, publicly made with tears and protestations of contrition and embodied in a letter (October 25) sent to all the Templars in France. He had been guilty, he said, of denying Christ and spitting on the cross; the grosser charges he indignantly re- pudiated. 2

To the pope, meanwhile, the proceedings in France were to the highest degree unwelcome. He had, indeed, become con- vinced, if not of the general guilt of the order, at least of the guilt of some of its members. But the affair was one which he desired to reserve for his own judgment; Philip's action he interpreted, rightly, as an encroachment of the civil power on the privileges and property of the Church, and his fears were increased when the French king, without consulting him, sent letters to King James of Aragon, Edward II. of England, the German king Albert and other princes, calling upon them to imitate his example. On the 27th of October Clement issued letters suspending the powers of the Inquisition in France. What followed is not clear, for the documentary evidence for these months is very defective. On the 17th of November James of Aragon wrote to Philip, in answer to his letter and the report of the proceedings in Paris forwarded to him, 3 expressing

1 Michelet, Prods, i. 36.

' Jacques de Molay's confession was partly due to fear of torture, partly to secure the withdrawal of a specific charge of unnatural Time brought against him by the Templar Guillaume de Giac (Gmelin ii., Tab. i. No. 12). But he continued to demand access to the pope, declaring that he could satisfactorily explain the practices of the order. •(:.'.

1 Text in Finke ii. The writer, Romeus ■'>. de Brugaria, of the "diversity of Paris, boldly declares that the proceedings were taken 4«mini papae asscnsu precedents. ■■>, ; .,.,

his surprise at the charges against the Templars,

who had done himself and his forefathers great service against the infidel, but promising to proceed against them since required to do so ‘ by the Church.” 4 In Portugal no action was taken at all. Edward II. of England replied that he must first receive in- formation as to the charges from his officials in Agen (whence the charges had originated), and on the 5th of December he wrote to the kings of Aragon, Castile, Portugal and Sicily begging them not to believe the evil reports against the order (Prutz, p. 159). But meanwhile, on the 22nd of November, Pope Clement had issued a bull calling on all kings and princes to arrest the Templars everywhere, his motive probably being (according to Finke) to forestall the probable action of the secular powers and keep the affair in his own hands. All scruples and hesitations now vanished. In England the Templars were arrested on the 10th of January 1308, in Sicily on the 24th of the same month, in Cyprus on the 27th of May; in Aragon and Castile the process was less easy, for the knights, fore- warned, had put their fortresses into a state of defence, notably their strong castle of Monzon, which was only taken after a long siege on the 17th of May, while the last of the Templars’ strongholds, Castellat, did not fall until the 2nd of November/

Meanwhile, on the 26th of May, Philip had made his solemn entry into Poitiers, where the pope and cardinals had already assembled for the purpose of conferring with the king on the matter. The debates that followed were protracted and stormy; but Philip was in a positon to back his argument for the suppression of the order by pressing other and more dangerous claims: the canonization of Celestine V., the con- demnation of Boniface VIII. for heresy, the absolution of Guillaume de Nogaret, the executer of the outrage at Anagni, the summoning of a general council, the settlement of the papacy at Avignon. At last, on the 27th of June, an arrange- ment was come to. The king agreed to hand over to the papal commissioners the property 6 and persons of the Templars; Clement, for his part, withdrew the

sentence of suspension against the grand inquisitor of France (July 5) and ordered an inquisition into the charges against individual Templars by the diocesan bishops with assessors nominated by himself. The examination of the grand master, of the grand visitor of France, and of the grand preceptors of Cyprus, Normandy and Aquitaine he reserved to himself. Inquisition was to be made into the conduct of the order in each country by special papal commissions; and the fate of the order as a whole was to be decided by a general council. 7

These decisions were at once acted on. At Poitiers Clement had already heard the confessions of seventy-two Templars, carefully selected from the royal prisons (June 29 to July i). 8 The grand master and the three preceptors were re-examined at Chinon, and renewed their old confessions (20th August). Lastly, the bull Regnans in Coelo summoned a great council at Vienne for the 1st of October 131 1, when the question of the guilt of the order might be considered. Meanwhile the pope and cardinals had elaborated the organization of the new inquisition. In this the actual inquisitors, though admitted, played a quite subordinate part: the commissions centred round the diocesan bishops, who had as assessors prelates, abbots, priors and canonists. These commissions were two- fold, usually — though erroneously — distinguished as papal and episcopal (both were in fact papal) ; the first were charged with the inquisition into the accusations against the order itself and the grand preceptors of the various countries, the second with

4 Text in Finke ii. 55.

6 Finke i, 302 ff. Some ■ of the Spanish Templars turned Mahommedan and joined the king of Granada in an invasion of Aragon (Finke ii. 188, No.,105).

• This was to be devoted to the cause of the Holy Land. In fact its administration fell into the hands of Philip s confidants and the greater part remained in his possession (Finke i. 227).

7 For a detailed account of the negotiations see Finke i. 200 ff. He holds that Clement, though now convinced of the Templars' guilt, was anxious to treat them leniently and, if possible, to save the order (p. 215).

- See Gmelin ii., Tab. vii. and viii.

that into the accusations against individual Templars. The papal commission in Paris began its sessions on the 9th of August 1300; on the 12th; citations were issued to those Templars who " of their own free will " were prepared to come and defend the order. There was much confusion and delay, however, and the actual public trial did not begin till the nth of April 13 ro. 1 Many Templars, trusting in the assurance implied in their citation, had volunteered to defend the order and withdrew their previous confessions. They were soon un- deceived; the commission, presided over by the garde des sceaux of the king, the archbishop of Narbonne, was packed with creatures of the crown. The evidence given in Paris for or against the order was, it was soon found, used against the individual Templars on their return to the provinces; the re- tractation of a confession, under the rules set up for the diocesan inquisition, was punished with death by fire. On Tuesday The the 12th of May, fifty-four Templars who had re-

trial. tracted their confessions before the commission were

burnt in Paris by order of the archbishop of Sens; 2 a few days later four were burnt at Senlis, and towards the end of May nine more, by order of the archbishop of Reims. Forty-six Templars now withdrew their defence, and the commissioners in Paris decided (30th May) to adjourn till November. The second examination lasted from the 17th of December 13 10 to the 16th of May r3ri. Meanwhile (c. April

1311) Clement and Philip had come to terms. The pope condemned the Templars. The council of Vienne met in October 131-1. A discussion arose as to whether the Templars should be heard in their own de- fence. Clement, it is said, broke up the session to avoid com- pliance; and when seven Templars offered themselves as deputies for the defence he had them cast into prison. Towards the beginning of March Philip came to Vienne, and he was seated at the pope's right hand when that pontiff delivered his sermon against the Templars (3rd April 13 12), whose order had just been abolished, not at the general council, but in private con- sistory (22nd March). On 2nd May 13 12 he published the bull Ad Providatn, transferring the goods of the society, except for the kingdoms of Castile, Aragon, Portugal and Majorca, to the Knights of St John. The order was never formally pronounced guilty of the crimes laid to its charge; its abolition was dis^ tinctly, in the terms of Clement's bull Consid'eranUs Dudum, " non per modum definitivae sententiae, cum earn super hoc secundum inquisitiones et processus super his habitos non possemus ferre de jure sed per viam provisionis et ordinationis apostolicae " (6th May 1312).

The final act of the stupendous tragedy came early in 1314. Jacques de Molay, the grand master, had not hitherto risen' to the height of his great position; the fear of torture alone had been enough to make him confess, and this confession had been used to extract avowals from his brethren, subject as they were to unspeakable sufferings and accustomed to yield to the military chief. Humiliation on humiliation had been heaped on the wretched man, public recantations, reiterated confessions. Before the papal commission he had flamed into anger, protested, equivocated — only in the end to repeat his confession once more. The same had happened before the commission of cardinals at Chinon; the audience with the pope, which he demanded, he had never obtained. On the 6th of May 13 12 Pope Clement issued his final decision as to the fate of the Templars in general; that of the five great offices

of the order he reserved in his own hand. With this a silence falls over the history of the Templars;' the fate of the order had been de-

1 This was, of course, only one of some twenty-five separate com- missions in different countries. It was, however, the most important and is the best known.

2 Philippe de Marigny, brother of Enguerrand de Marigny, the king's minister, had been appointed archbishop of Sens at Philip IV.'s instance in April, and was naturally full of zeal for the royal cause. The condemned Templars appealed to the papal commission, which was sympathetic, but replied that it had no authority to interfere with the archbishop's ordinary jurisdiction. (Raynouard, p. 92.)

5 Finke devotes an interesting chapter to tracing what became of the property of the order and of the individual Templars. The

cided, that of the individuals still under trial was of little interest to contemporary chroniclers. Then the veil is suddenly lifted. Jacques de Molay has found his wonted courage at last, and with him Gaufrid de Charney, the preceptor of Normandy; on the 14th of March 13 14 they were brought out on to a scaffold erected in front of Notre Dame, there in the presence of the papal legates and of the people to repeat their confessions and to receive their sentence of perpetual imprisonment. Instead, they seized the opportunity to withdraw their confessions and to protest to the assembled thousands the innocence of the order. King Philip the Fair did not wait to consult the Church as to what he should do; he had them burnt "in the little island " of the Seine " between the Augustinians and the royal garden "; with them perished Guy (the Guido Delphini of the trials), the youthful son of the dauphin of Auvergne. After the deaths of the pope and king, which followed shortly, the people remembered that the grand master had summoned them with his dying breath before the judgment seat of God; but the sole

recorded contemporary protest is that of the Augustinians against the trespass committed by the royal officers on their land!

On the question of the guilt or innocence of the Templars in respect of the specific charges on which the order was condemned opinion has long been divided. Their innocence was maintained by the greatest of all their contemporaries, Dante, 4 and among others by the historian Villani and by the sainted Antoninus, archbishop of Padua. In more recent times a certain heat was introduced into the discussion of the question owing to its having been for centuries brought into the arena of party controversy, between Protestants and Catholics, Gallicans and Ultramontanes, Freemasons and the Church. Thus in 1654 Pierre Du Puy, librarian of the BibliotWque Royale, published his work on the Templars to confute those who sought to establish their innocence in order to discredit a king of France. On the other hand, Nicolas Gurtler published his Historia Templariorum (Amsterdam, 1691, 2nd ed. '7°3) to show, as a good Protestant, that the Templars had the usual vices of Roman Catholics, while, according to Loiseleur, the later editors of Du Puy (especially of the 1751 edition, 5 ostensibly printed at Brussels) were Freemasons who, under false names, garbled the old material and inserted new in the interests of the supposed origin of their own order in that of the Templars. 6 Several Roman Catholic champions of the order now entered the field, e.g. the Benedictine historian of Languedoc, Dom Dominique Joseph Vaissete, and notably the Premonstratensian canon R. P. M. Jeune, prior of Etival, who in 1789 published at Paris his Histoire critique et apologStique de Vordre des chevaliers . . . dits Templiers, a valuable work directed specifically against Gurtler and Du Puy. In the 19th century a fresh impetus was given to the discussion by the publication in 1813 of Raynouard's brilliant defence of the

property was nominally handed over to the Hospitallers, but most of it actually remained in the hands of the sovereigns or their followers

(Philip, e.g., claimed a vast sum for the expenses incurred in suppressing the order and torturing its members). In the Spanish peninsula the Temple castles and estates were in some cases handed over to other military orders; in Portugal to the new order of Christ, 1 3 19; in Castile to those of Ucles and Calatrava; in Aragon one frontier castle with its domain, Montasia, was given to the knights of Calatrava ; the rest— so far as they had not been annexed by the king and the ricos hombres — to the Hospitallers. As to the Templars: they were granted in most cases generous pensions; some continued to live in groups, though without organization, on their old property; others joined various orders; many married, on the plea that the suppression of the order had released them from their vows; while others, again, took service with the Moors in Africa. (Finke, i. cap. x.)

4 Veggio il nuovo, Pilato si crudele,

Che clo nol sazia, ma, senza decreto,

Porta nel tempio le cupide vele. — {Purg. xx. 92.)

6 Histoire de Vordre militaire des templiers, &c. The titles of the various editions differ.

6 There is, of course, no foundation whatever for this claim. It is examined and refuted, inter alios, by Wilcke, iii. 383 seq. A delightfully absurd attempt to assert the continuity of the modern Order of Knights Templars, which stillhas a considerable organization in the United States, with the suppressed order, is made by Jeremy L. Cross in The Templars' Chart (New York, 1845) ; he actually gives a complete list of grand masters from Hugues de Payns to Sir Sidney Smith (1838), and asserts that " the Encamp- ment of Baldwin which was established at Bristol by the Templars who returned with Richard I. from Palestine, still continues to hold its regular meetings, and is believed to have preserved the ancient costume and ceremonies of the order."

order. 1 The challenge was taken up, among others, by the famous orientalist Friedrich von Hammer-Purgstall, who in 1818 published his Mysterium Baphometis revclatum, 1 an attempt to prove that the Templars followed the doctrines and rites of the Gnostic Ophites, the argument being fortified with reproductions of obscene represen- tations of supposed Gnostic ceremonies and of mystic symbols said to have been found in the Templars' buildings. Wilcke, while rejecting Hammer's main conclusions as unproved, argued in favour of the existence of a secret doctrine based, not on Gnosticism, but on the unitarianism of Islam, of which Baphomet (Mahomet) was the symbol. 3 On the other hand, Wilhelm Havemann (Geschichte des Ausganges des Tempelherrenordens, Stuttgart and Tubingen, 1846) decided in favour of the innocence of the order. This view was also taken by a succession of German scholars, in England by C. G. Addison, and in France by a whole series of conspicuous writers: e.g. Mignet, Guizot, Renan, Lavocat. Others, like Boutaric, 4 while rejecting the charge of heresy, accepted the evi- dence for the spuitio and the indecent kisses, explaining the former as a formula of forgotten meaning and the latter as a sign of fraternitel Michelet, who in his history of France had expressed himself favourably to the order, announced his conversion to the opposite opinion in the prefaces to his edition of the Prods. This view was reinforced by the work in which Loiseleur endeavoured to prove that the order had secretly rejected Christianity in favour of an heretical religion based on Gnostic dualism as taught by the Cathari ; 5 it was crowned with the high authority of Ranke in the great Wellgeschichle (8 Theil, 1887, p. 621 ff.) ; it has been adopted in the later Weltgeschichte of Weber (8 Theil, 1887, p. 521 ff.). The greatest impulse to this view was, however, given by the brilliant contributions of Hans Prutz. The first of these, the Geheimlehre, in the main an expansion of Loiseleur's argument, at once raised up a host of critics; and, as a result of five years'

study of the archives at Rome and elsewhere, Konrad Schott- mtiller published in 1887 his Untergang des Templerordens , in which he claimed to have crushed Prutz's conclusions under the weight of a mass of new evidence. The work was, however, uncritical and full of conspicuous errors, and Prutz had little difficulty in turning many of its author's arguments against himself. This was done in the Entwicklung und Untergang des Tempelherrenordens (1888), in which, however, Prutz modifies his earlier views so far as to withdraw his contention that the Templars had a " formally developed secret doctrine," while maintaining that the custom of denying Christ and spitting on the cross was often, and in some provinces universally, practised at the reception of the brethren, " as a coarse test of obedience, of which the original sense had partly been forgotten, partly heretically interpreted under the influence of later heresies." 6 This view was maintained by Mr T. A. Archer in the 9th ed. of the Encyclopaedia Britannica. It was criticized and rejected by Dollinger in the last of his university lectures (19th Nov. 1889), and by Karl Wenck in several articles in the Gbtiinger Gelehrte Anzeigen; and it was further attacked by J. Gmelin (Schuld oder Unschuld, 2 Bd. 1893), whose work,, in spite of its somewhat ponderous polemic, is valuable as a mine of learn- ing and by reason of the sources (notably the tables of the evidence taken at the trials) which it publishes. H. C. Lea, in his History of the Inquisition (1888, vol. lii.), had already come independently to the conclusion that the Templars were innocent. Lastly appeared the fascinatingly interesting and closely reasoned book of Professor H. Finke (1907) which, based partly on a mass of new material drawn from the Aragonese archives, had for its object to supple- ment the work of Gmelin and to establish the innocence of the order on an incontrovertible basis.

1 F. J. M. Raynouard, Monuments historioues, relatifs d. la con- damnation des chevaliers du Temple, &c. (Pans, 1813).

! In vol. vi. of Fundgruben des Orients (Vienna,

1818). In reply to his critics Hammer published in 1855 his " Die Schuld der Templer " (K. Akad. zu Wien Denkschrift., vi.), in which he repro- duced drawings of two remarkable caskets, sculptured with Gnostic pictures, from the former collection of the due de Blacas, said to have been found on the sites of Temples. To the present writer the evidence that any of these objects had been connected with the Templars seemed singularly unconvincing even before he had seen the trenchant criticisms of Wilcke (ii. 290, ed. 1862, Beilage 22) and Loiseleur {Doctrine secrete, 4me partie, p. $7 seq.). If such objects existed, why were none brought up as evidence against the Templars at their trial ?

- Wilhelm Ferdinand Wilcke, Geschichte des Tempelherrenordens (3 vols. Leipzig, 1826 ff., 2nd ed., enlarged and revised i860).

4 Edgard Boutaric, La France sous Philippe le Bel (Paris, 1861), pp. 140 seq.

6 J. Loiseleur, La Doctrine secrete des fempliers (Orleans, 1872).

6 Prutz points out, with much truth, that the failure of the Crusades had weakened men's absolute belief in Christianity, at least as represented by the medieval Church (Kulturgeschichte der Kreuzziige, p. 268 ff.). Walther von der Vogelweide had merely accused the archangels of neglecting their duty (Pfeiffer's ed. 1880, p. 288); a Templar minstrel complained that God Himself had fallen asleep ! (Prutz, Tempelherrenarden, 126.)

In the opinion of the present writer, the defenders of the order have proved their case. Even the late Mr Archer, who took the contrary view, was inclined to restrict it to the Templars in France. " The opinion that the monstrous charges brought against the Templars were false," he wrote (Ency. Brit., 9th ed. xiii. 164), "and that the confessions were only extracted by torture is supported by the general results of the investigation (in almost every country outside France), as we have them collected

in Raynouard, Labbe, and Du Puy. In Castile, where the king flung tnem into prison, they were acquitted at the council at Salamanca. In Aragon, where they held out for a time in their fortresses against the royal power, the council of Tarragona proclaimed in their favour (4th November 1312). In Portugal the commissioners reported that there were no grounds for accusation. At Mainz the council pronounced the order blameless. At Treves, at Messina, and at Bologna, in Romagna and in Cyprus, they were either acquitted or no evidence was forthcoming against them. At the council of Ravenna the question as to whether torture should be used was answered in the negative except by two Dominicans; all the Templars were absolved — even those who had confessed through fear of torture being pronounced innocent (18th June 1310). Six Templars were examined at Florence, and their evidence is for its length the most remarkable of all that is still extant. Roughly speaking, they confess with the most elaborate detail to every charge, — even the most loathsome; and the perusal of their evi- dence induces a constant suspicion that their answers were practi- cally dictated to them in the process of the examination or invented by the witnesses themselves. In England, where perhaps torture was not used, out of eighty Templars examined only four confessed to the charge of denying Christ, and of these four two were apos- tate knights. But some English Templars would only guarantee the purity of their own country. That in England as elsewhere the charges were held to be not absolutely proved seems evident from the form of confession to be used before absolution, in which the Templars acknowledge themselves to be defamed in the matter of certain articles that they cannot purge themselves. In England nearly all the worst evidence comes at second or third hand or through the depositions of Franciscans and Dominicans," i.e. the rivals and enemies of the order. But what is the nature of the evidence " too strong to be explained away " on which Mr Archer bases his opinion that certain of the charges were proved " at least in France "? The modern practice of the English courts tends to discount altogether the value as evidence

of confessions, even freely made. What is the value of these confessions of the Templars which lie before us in the Tables published by Gmelin? The pro- cedure of the Inquisition left no alternative to those accused on ” vehement suspicion ” of heresy, but confession or death under lingering torture; to withdraw a confession meant instant death by fire. The Templars, for the most part simple and illiterate men, were suddenly arrested, cast separately into dark dungeons, loaded with chains, starved, terrorized, and tortured. They were told the charges to which their leaders had confessed, or were said to have confessed : to repeat the monotonous formula admitting the spuitio super crucem and the like was to obtain their freedom at the cost of a comparatively mild penance. The wonder is not that so many confessed, but that so many persisted in their denial. The evidence, in short, is, from the modern point of view, wholly worthless, as even some contemporaries suspected it to be.

A word must be added as to the significance of the work of the Templars and of the manner of their fall in the history of the world. Two great things the order had done for Euro- pean civilization: in the East and in Spain it had successfully checked the advance of Islam; it had deepened , and given a religious sanction to the idea of the chivalrous man, the homo legalis, and so opened up, to a class of people who for centuries to come were to exercise enormous influence, spheres of activity the beneficent effects of which are still recognizable in the world. 8 On the other hand, the destruction of the Templars had three consequences fateful for Christian civilization: (1) It facilitated the conquests of the Turks by preventing the Templars from playing in Cyprus the part which the Knights of St John played in Malta. 9 (2) It partly set a precedent for, partly confirmed, the cruel criminal procedure of France, which lasted to the Revolution. (3) It set the seal of the highest authority on the

"See the evidence in full, ap. Loiseleur, pp. 172-212.

- G. Schnurer, quoted in Finke, i. I.

  - In his essay on the Templars (The Spanish Story ef the Armada and otlter Essays, 1892) Froude says that the order lacked ” the only support that never fails — some legitimate place among the useful agencies of the time.” Was there no use for them against the advancing tide of Turkish conquest in the East? Or in Spain against the Moorish powers? If not, why did the Hospitallers survive? Froude’s contribution is but a popular lecture, however, and, for all its beauty of style, characteristically careless (e.g. such mistakes as Hugh von Peyraud, Esquin von Fksrian).

popular belief in witchcraft and personal intercourse with the devil, sanctioned the expedient of wringing confessions of such intercourse from the accused by unspeakable tortures, and so made possible the hideous witch-persecutions which darkened the later middle ages and, even in Protestant countries, long survived the Reformation. ” If I were to name a day in the whole history of the world,” said Dollinger at the conclusion of his last public lecture, ” which appears to me in the truest sense as a dies nefastus, I should be able to name no other than the 13th of October 1307.” *

Authorities. — A great mass of original sources has now been published. Those given by Du Puy, though often valuable, were selected and edited with a purpose, as Jeune pointed out. A new departure was made with the publication of Michelet’s Proces des Templiers (t. i. 1851, t. ii. 186 1), an edition of the original minutes of the trial preserved at the Bibliotheque Nationale (it is specially interesting as the earliest complete and detailed record of a criminal trial in existence). This is elaborately analysed and the results tabulated in vol. ii. of Gmelin. Of documents published in other works the

most important collections are those in Schottmuller (mainly from the Vatican Archives) and Finke (Aragonese Archives). The Rule of the Temple has been several times published; the most accessible edition, giving the various Rules with critical commentary, is that of H. de Curzon, La Regie du Temple (Paris, 1886) ; see also Maillard de Chambure, Regie et statuts secrets des Templiers, prec. de I'hist. de cetle ordre (Dijon — Paris, 1840).

A comprehensive bibliography of works is given by Ulysse Chevalier in his Repertoire des sources hist. Topo-biblio-graphie, s.v. " Templiers." Of the works not fully indicated in the text must be mentioned M. Lavocat, Proces des freres et de V ordre du Temple (Paris, 1888); G. Schniirer, Die urspriingliche Templerregel (1903); H. Finke, Papsttum und Untergang des Templerordens (Munster,i. W., 1907); C. G. Addison, The Knights Templars (London, 3rd ed. 1854), which contains a valuable account of the suppression of the order in England. For the order and its suppression in Ireland see Herbert Wood, " The Templars in Ireland, ' in Proceedings of the Royal Irish Academy, vol. xxvi. Section c. p. 327 (Dublin, 1906-1907). (W. A. P.)

TEMPLE, FREDERICK (1821-1902), English divine, archbishop of Canterbury, was born in Santa Maura, one of the Ionian Islands, being the son of Major Octavius Temple, who was subsequently appointed lieutenant-governor of Sierra Leone. On his retirement he settled in Devonshire as a small landowner, and contemplated a farming life for his son Frederick, giving him a practical training to that end. But the boy was sent to Blundell's School, Tiverton, and soon ex- hibited abilities which marked him out for a different career. He retained through life a warm affection for the school, where he did well both in the classes and the games, and was famous as a walker. His father's means were narrow, and the boy knew that he must win his own way in life. He took the first important step in that way by winning a scholarship at Balliol College, Oxford, before he was quite seventeen years old. The " Tractarian Movement " had set in five

years earlier' but the memorable tract, No. 00, had not yet been written, and Temple entered a university which was vibrating with intellectual and religious excitement. After much discussion and reflection he drew closer to the camp of " the Oxford Liberal Movement." In 1842 he took a " double-first " and was elected fellow of Balliol, and lecturer in mathematics and logic. Four years later he took orders, and with the aim of helping forward the education of the very poor, he accepted the headship of Kneller Hall, a college which the government formed for the training of masters of workhouse and penal schools. But the experiment was not altogether successful, and Temple himself advised its abandonment in 1855. He then accepted a school-inspector- ship, which he held until he went to Rugby in 1858. In the meantime he had attracted the admiration of the prince consort, and in 1856 he was appointed chaplain-in-ordinary to the queen. In 1857 he was select preacher at his university.

At Rugby Dr Arnold had died in 1842 and had been succeeded by Dr Tait, who again was followed by Dr Goulburn. Upon the resignation of the latter the trustees appointed Temple, who in that year (1858) had taken the degrees of B.D. and D.D. His life at Rugby was marked by great energy and bold initiative.

1 Dollinger, Akademische Vortrage (Munich, 1891), ix. " Der Unter- °ang des TempUrordens."

Whilst making the school a strong one on the classical side, he instituted scholarships in natural science, built a laboratory, and gave importance to that side of the school work. He had the courage also to reform the games, in spite of all the traditions of the playing fields. His own tremendous powers of work and his rugged manner somewhat alarmed his boys at first, but his popularity was soon undisputed, and he brought up the school to a very high level. His school sermons were deeply impressive: they rooted religion in the loyalties of the heart and the conscience, and taught that faith might dwell secure amid all the

bewilderments of the intellect, if only the life remained rooted, in pure affections and a loyalty to the sense of duty. It was two years after he had taken up his work at Rugby that the volume entitled Essays and Reviews gave rise to an extraordinary storm. The first essay in the book, " The Education of the World," was by Dr Temple. It was declared in a prefatory note to the volume that the authors were responsible only for their respective articles, but some of these were deemed so destructive that many people banned the whole book, and a noisy demand, led by Samuel Wilberforce, then bishop of Oxford, called on the headmaster of Rugby to dissociate himself from his comrades. Temple's essay had treated of the intellectual and spiritual growth of the race, and had pointed out the contributions made respectively by the Hebrews, the Egyptians, the Greeks, the Romans, and others. It was generally declared by the critics of the volume to be in itself harmless, but was blamed as being found in bad company. Temple refused, so long as the storm lasted, to comply with the request that he would repudiate his associates, and it was only at a much later date (1870) that he saw fit quietly to withdraw his essay. In the meantime, however, he printed a volume of his Rugby sermons, to show definitely what his own religious positions were.

In politics Temple was a follower of Mr Gladstone, and he approved of the disestablishment of the Irish Church. He also wrote and spoke in favour of Mr Forster's Education Act, and was an active member of the Endowed Schools Commission. In 1869 Mr Gladstone offered him the deanery of Durham, but this he declined on the ground of his strong interest in Rugby. When later in the same year, however, Henry Phillpotts, bishop of Exeter, died, the prime minister turned again to Temple, and he accepted the bishopric of that city so dear to him from boy-hood, and left Rugby for a home amongst his own people. The appointment, however, raised a fresh storm.

G. A. Denison, archdeacon of Taunton, Lord Shaftesbury, and others formed a strong committee of

protest, whilst Pusey declared that ” the choice was the most frightful enormity ever perpetrated by a prime minister.” At the confirmation of his election counsel was instructed to object to it, and in the voting the chapter was divided. But Gladstone stood firm, and Temple was duly consecrated on the 21st of December 1869. There were at first murmurings among his clergy against what they deemed his harsh control, but his real kindness soon made itself felt, and, during the sixteen years of his tenure of the see, his sound and vigorous rule dissipated the prejudices against him, so that when, on the death of Dr John Jackson in 1885, he was translated to London, the appointment gave general satis- faction. In 1884 he was Bampton Lecturer, taking for his subject ” The Relations between Religion and Science.” In 1885 he was elected honorary fellow of Exeter College, Oxford.

Dr Temple’s tenancy of the bishopric of London was marked, if possible, by more strenuous labours than ever. Flis normal working day at this time was one of fourteen or fifteen hours, and he refused to spare himself one hour of toil, though under the strain blindness was rapidly coming on. He was still felt by many of his clergy and by candidates for ordination to be a rather terrifying person, and to enforce almost impossible standards of diligence, accuracy and preaching efficiency, but his manifest devotion to his work and his zeal for the good of the people rooted him deeply in the general confidence. In London he was not less conspicuous as a temperance worker than he had been in Exeter, and the artisan classes instinctively

recognized him as their friend. When, in view of his growing blindness, he offered to resign the bishopric, he was induced to reconsider his proposal, and on the sudden death of Archbishop Benson in 1896, though now seventy-six years of age, he accepted the see of Canterbury.

As archbishop he presided in 1897 over the decennial Lambeth Conference. In the same year Dr Temple and his brother archbishop issued an able reply to an encyclical of the pope which denied the validity of Anglican orders. In 1900 the archbishops again acted together, when an appeal was ad- dressed to them by the united episcopate, to decide the vexed questions of the use of incense in divine service and of the reservation of the elements. After full hearing of arguments they gave their decision against both the practices in question. During his archbishopric Dr Temple was deeply distressed by the divisions which were weakening the Anglican Church, and many of his most memorable sermons were calls for unity. His first charge as primate on ” Disputes in the Church ” was felt to be a most powerful plea for a more catholic and a more charitable temper, and again and again during the closing years of his life he came back to this same theme. He was zealous also in the cause of foreign missions, and in a sermon preached at the opening of the new century he urged that a supreme obligation rested upon Britain at this epoch in the world’s history to seek to evangelize all nations. In 1900 he presided over the World Temperance Congress in London, and on one occasion preached in the interests of women’s education. In 1902 he discharged the important duties of his office at the coronation of King Edward VII., but the strain at his advanced age told upon his health. During a speech which he delivered in the House of Lords on the 2nd of December 1902 on the Education Bill of that year, he was seized with sudden illness, and, though he revived sufficiently to finish his speech, he never fully recovered, and died on the 23rd of December 1902. He was interred in Canterbury cathedral four days later. His second son, William Temple (b. 1881), who had a distinguished career at Oxford, was in 1910 appointed headmaster of Repton.

See Archdeacon E. G. Sandford, Frederick Temple: an Appre- ciation (1907), with biographical introduction by William Temple; Memoirs of Archbishop Temple, by ” Seven Friends,” ed. E. G.

Sandford (1906).

TEMPLE, SIR RICHARD, Bart. (1826–1902), English administrator, a descendant in the female line of the Temples of Stowe, was born on the 8th of March 1826, and after being educated at Rugby and Haileybury, joined the Bengal Civil Service. His industry and ready pen soon obtained apprecia- tion, and after acting as private secretary for some years to John Lawrence in the Punjab, and gaining useful financial experience under James Wilson, he was appointed Resident at Haidarabad. In 1867 he was made K.C.S.I. In 1868 he be- came a member of the supreme government, first as foreign secretary and then as finance minister; and he did admirable work during the famine of 1874, in the course of which he was made lieutenant-governor of Bengal. His services were re- cognized by the bestowal of a baronetcy in 1876. In 1877 he was made governor of Bombay, and his activity during the Afghan War of 1878–80 was untiring. In 1880 he left India to enter on a political career in England, but it was not till 1885 that he was returned as a conservative for the Evesham division of Worcestershire. Meanwhile he produced several books on Indian subjects. In parliament he was assiduous in his attend- ance, and he spoke on Indian subjects with admitted authority; but he was not otherwise a parliamentary success, and to the public he was best known by the caricatures in Punch, which exaggerated his physical peculiarities and made him look like a lean and hungry tiger. In 1885 he became vice-chairman of the London School Board, and as chairman of its finance com- mittee he did useful and congenial work. In 1892 he changed his constituency for the Kingston division, but in 1895 he retired from parliament, being in 1896 made a Privy Councillor. He had kept a careful journal of his parliamentary experiences, intended for posthumous publication; and he himself published

a short volume of reminiscences. He died at Hampstead on the 15th of March 1902. He was twice married, and left a daughter and three sons, all of the latter distinguishing themselves in the public

service.

TEMPLE, RICHARD GRENVILLE-TEMPLE, ist Earl (1711-1779), English statesman, eldest son of Richard Grenville (d. 1727) of Wootton, Buckinghamshire, was born on the 26th of September 1711. His mother was Hester (c. 1690-1752), daughter, and ultimately heiress, of Sir Richard Temple, Bart. (1634-1697), of Stowe, Buckinghamshire, 1 and sister of Richard Temple, Viscount Cobham, whose title she inherited under a special remainder in 1749; in the same year, her husband having been long dead, she was created Countess Temple. Her son, Richard Grenville, was educated at Eton, and in 1734 was returned to parliament as member for the borough of Buckingham. In 1752, on the death of his mother, he inherited her titles together with the rich estates of Stowe and Wootton; and he then took the name of Temple in addition to his own surname of Grenville. The turning point in his political fortunes was the marriage of his sister Hester in 1754 to William Pitt, afterwards earl of Chatham. Although Lord Temple was a man of little ability and indifferent character, Pitt persistently linked his own career with that of his brother-in-law. In November 1756 Temple became first lord of the admiralty in the ministry of Devonshire and Pitt. He was intensely disliked by George II., who dismissed both him and Pitt from office in April 1757. But when the memorable coalition cabinet of Newcastle and Pitt was formed in June of the same year, Temple received the office of privy seal. He alone in the cabinet supported Pitt's proposal to declare .var with Spain in 1 761, and they resigned together on the 5th of October. From this time Temple became one of the most violent and factious of politicians, and it is difficult to account for the influence, wholly evil, which he exerted over his illustrious brother-in-law. He himself is said to have avowed that " he loved faction, and had a great deal of money to spare." He was at variance with his younger brother, George Grenville, when the latter became first lord of the treasury in April 1763, and he had no place iii that ministry; but the brothers were reconciled

before 1765, when Temple, who probably aimed at forming a ministry mainly confined to his own family connexions, refused to join the government, and persuaded Pitt to refuse likewise. A few weeks later the king offered the most liberal terms to induce Pitt to form or join an administration; and " a ministry directed by that great statesman," says Lecky, " would have been beyond all comparison the most advantageous to the country; it had no serious difficulty to encounter, and Pitt himself was now ready to undertake the task, but the evil genius of Lord Temple again prevailed. Without his co-operation Pitt could not, or would not proceed, and Temple absolutely refused to take office even in the foremost place." Pitt's continued refusal to join the first Rockingham administration was no doubt partly due to the same disastrous influence, though before the close of 1765 the old friendship between the brothers-in-law was dis- solving; and when at last in July 1766 Pitt consented to form a government, Temple refused to join; being bitterly offended because, although offered the head of the treasury, he was not to be allowed an equal share with Pitt in nominating to other offices. Temple forthwith began to inspire the most virulent libels against Pitt; and in conjunction with his brother George he concentrated the whole Grenville connexion in hostility to the government. After George Grenville's death in 1770 Lord Temple retired almost completely from public life. He died on the 1 2th of September 1779.

1 The Temple family belonged originally to Leicestershire, where, at Temple Hall, the elder line had resided since the 14th century. Peter Temple (1600-1663), the regicide, was a member of this elder line; a younger branch had settled in Oxfordshire and passed thence to Buckinghamshire, where John Temple purchased Stowe in 1589. This John was brother of Anthony, who was great- grandfather of Sir William Temple, the famous statesman. John Temple's son Thomas, who was created a baronet in 1611, was the great-grandfather of Earl Temple.

Lord Temple was entirely without statesmanship; he possessed an insatiable appetite for intrigue, and is said to have been the author of several anonymous libels, and the inspirer of many more. Macaulay's well-known comparison of him with a mole working below " in some foul, crooked labyrinth whenever a heap of dirt was flung up," which perpetuates the spleen of Horace Walpole, perhaps exceeds the justice of the case; but there can be no question that Temple's character as a public man was rated very low by his contemporaries. In private life he used his great wealth with generosity to his relations, friends and dependents. Pitt was under pecuniary obligation to him. He paid the costs incurred by Wilkes in litigation, and he provided the agitator with the freehold qualification which enabled him to stand for Middlesex in the famous election of 1768.

In addition to the estates he inherited, Temple gained a considerable fortune by his marriage in 1737 with Anne, daughter and co-heiress of Thomas Chambers of Hanworth, Middlesex; a volume of poems by her was printed at the Strawberry Hill press in 1764. The only issue of the marriage being a daughter who died in infancy, Temple was succeeded in the earldom by his nephew George (1753-1813), second son of George Grenvifle the prime minister, who then assumed in addition to the name of Grenville not only the name of Temple, but also that of Nugent, his wife being daughter and co-heiress of Robert, Viscount Clare, afterwards Earl Nugent. The 2nd Earl Temple was lord-lieutenant of Ireland in 1782-3; in 1784 was created marquess of Buckingham; and was again lord-lieutenant of Ireland in 1787-9.

His son and successor, Richard Temple-Nugent-Brydges- Chandos-Grenville (1 776-1839), was created duke of Buckingham and Chandos in 1822, his wife being only daughter of the 3rd duke of Chandos; he was in the same patent created Earl Temple of Stowe, with special remainder as regards this title, in virtue of which, on the death without male issue in

1889 of the 3rd duke of Buckingham and Chandos and the consequent extinction of the original earldom of Temple, the title of Earl Temple of Stowe devolved upon William Stephen Gore-Laftgton (1847-1902), whose mother was granddaughter of the 1st duke of Buckingham, grantee of this earldom. In 1902 Algernon William Stephen Temple-Gore-Langton (b. 187 1) became 5th Earl Temple.

See The Grenville Papers (London, 1852), a considerable portion of which consists of Earl Temple's correspondence ; Horace Walpole, Memoirs of the Reign of George II., 3 vols. (London, 1847) ; Memoirs of the Reign of George III., 4 vols. (London, 1845 and 1894); Earl Waldegrave, Memoirs 1754-8 (London, 1821); Sir N. W. Wraxall, Historical Memoirs, edited by H. B. Wheatley, 5 vols. (London, 1884); Correspondence of Chatham, edited by W. S. Taylor and J. H. Pringle, 4 vols. (London, 1838-40); W. E. H. Lecky, History of England in the Eighteenth Century, vols. ii. and iii. (7 vols., London, 1892). (R. J. M.)

TEMPLE, SIR WILLIAM, Bart. (1628-1699), English states- man, diplomatist, and author, was born in London, and came of an old English family, but of the younger branch of it, which had for some time been settled in Ireland. He was the eldest son of Sir John Temple (1600-1677), Irish master of the rolls, whose father was Sir William Temple (1355-1627), provost of Trinity College, Dublin. His mother was Mary Hammond. Temple received a liberal education, calculated to produce that moderation of judgment for which he was afterwards remark- able. He was first a pupil of his uncle Dr Henry Hammond, the divine, after which he went to the grammar-school at Bishop Stortford, and then to the Puritan college of Emmanuel at Cambridge, where he came under the influence of Cudworth. At the commencement of the civil troubles his father embraced the popular cause and was deprived of his office. Coming to England, he sat in the Long Parliament as member for Chichester, and was one of the recalcitrant members turned out by Colonel Pride. Before this event happened his son had left Cambridge, without

taking a degree, and in 1647 started to travel abroad. In the Isle ©f Wight, while on his way to France, he fell in with Dorothy Osborne, and won her affections. Her father, Sir

Peter Osborne, was governor of Guernsey and a Royalist. Her family were opposed to the match, and threw difficulties in the way, which hindered its consummation for seven years. During this period Temple travelled in France, Spain, Holland, and other countries, gaining knowledge of the world and keeping up a constant correspondence with his betrothed. At length, apparently in 1654, the difficulties were surmounted and the marriage took place. In 1655 Temple and his wife went to Ireland. The next five years were spent in the house of Sir John Temple, who had made his peace with Cromwell, and had resumed his official position. His son took no part in politics, but lived the life of a student and a country gentleman.

The accession of Charles II. rescued Temple, like many others, from obscurity. In 1660 he sat in the convention parliament at Dublin as member for Carlow, and he represented the same county along with his father in the regular parliament that followed. After a short visit to England in 1661, as com- missioner from the Irish parliament, he finally removed thither in 1663. There he attached himself to Arlington, secretary of state, and two years later received his first employment abroad. It was in March 1665 that the disastrous war with the United Netherlands began. Charles II. was anxious to obtain allies, especially as Louis XIV. was taking up a hostile attitude. At this juncture Christoph Bernhard van Galen, bishop of Minister, sent an envoy to England, offering to attack the Dutch if the English government would supply the means. Temple was sent over to negotiate a treaty, and in this business gave evidence not only of the diplomatic skill but of the peculiar candour and frankness for which he was afterwards so distinguished. He was successful in making the treaty, but it was rendered ineffectual by the declaration of war by France, the threats of Louis,

and the double-dealing of the prelate, who, after receiving a great part of the subsidy, made a separate peace with the Netherlands. As a reward for his services Temple was created a baronet, and in October 1665 became the English representative at the viceregal court at Brussels. While the war continued, Temple's duties consisted chiefly in cultivating good relations with Spain, which was a neutral in the quarrel between England and the Dutch, but was threatened by the claims of Louis XIV. on the Spanish Netherlands. Louis's designs became apparent in the spring of 1667, when he marched an army into Flanders. This event was one of those which led to the peace of Breda, and to the subsequent negotiations, which are Temple's chief title to fame. The French conquests were made at the expense of Spain, but were almost equally dangerous to the United Netherlands, whose independence would have been forfeited had Louis suc- ceeded in annexing Flanders. While the French were taking town after town, Temple made a journey into Holland and visited De Witt. The friendship established and the com- munity of views discovered during this interview facilitated the subsequent negotiations. Temple had for some time pressed on his government the necessity of stopping the French advance, and had pointed out the way to do so, but it was not till December 1667 that he received instructions to act as he had suggested. He at once set out for The Hague, and in January 1668 a treaty was made between England and the United Netherlands, which, being joined shortly afterwards by Sweden, became known as the Triple Alliance. It was a defensive treaty, made against the encroachments of France. Whether we regard the skill and celerity with which the negotiations were conducted or the results of the treaty, the transaction reflects great credit on Temple. The French king was checked in mid- career, and, without a blow being struck, was obliged to sur- render almost all his conquests. Pepys records public opinion on the treaty by saying that it was " the only good public thing that hath been done since the king came into England."

Unfortunately the policy thus indicated was but short-lived. In taking up a hostile attitude towards France Charles's object had apparently been only to raise his price. Louis took the hint, increased his offers, and two years later the secret treaty of Dover reversed the policy of the Triple Alliance. Meanwhile Temple had developed the good understanding with the Dutch

by contracting a commercial treaty with them (February 1668), and had acted as English plenipotentiary at Aix-la-Chapelle, where peace between France and Spain was made in May 1668. Shortly afterwards he was appointed ambassador at The Hague. Here he lived for two years on good terms both with De Witt and with the young prince of Orange, afterwards William III. The treaty of Dover led to Temple's recall; but the plot was not yet ripe, and Temple nominally held his post for another year. He perceived, however, that his day was over and retired to his house at Sheen. In June 1671 he received his formal dismissal. The war with the Netherlands broke out next year, and was almost as discreditable to England as that of 1665. Want of success and the growing strength of the opposition in parliament forced Charles to make peace, and Temple was brought out of his retirement to carry through the change of front. After a negotiation of three days, carried on through the medium of the Spanish ambassador, the treaty of West- minster was made (February 1674). As a recognition of his services Temple was now offered the embassy to Spain. This he declined, as well as the offer of a far more important post, that of secretary of state, but accepted instead a renewal of his embassy to The Hague, whither he went in July 1674. In the March following he was nominated ambassador to the congress at Nijmwegen; but, owing to the tortuousness of Charles's dealings, it was not till July 1676 that he entered that town. The negotiations dragged on for two years longer, for

Charles was still receiving money from France, and English mediation was no more than a ruse. In the summer of 1677 Temple was summoned to England and received a second offer of the secretaryship of state, which he again declined. In the autumn of the same year he had the satisfaction of removing the last difficulties which hindered the marriage of William and Mary, an event which seemed to complete the work of 1668 and 1674. Louis still remaining obstinate in his demands, Temple was commissioned in July 1678 to make an alliance with the states, with the object of compelling France to come to terms. This treaty was instrumental in bringing about the general pacifica- tion which was concluded in January 1679.

This was Temple's last appearance in the field of diplomacy; but his public life was not yet over. A third offer of the secretaryship was made to him; but, unwilling as ever to mix himself up with faction and intrigue, he again declined. He did not, however, withdraw from politics; on the contrary, he was for a short time more prominent than ever. The state was passing through a grave crisis. Political passion was em- bittered by religious fanaticism. Parliament was agitated by the popish plot, and was pressing on the Exclusion Bill. The root of all the mischief lay in the irresponsibility of the cabihet to parliament and its complete subservience to the crown. To remedy this, Temple brought forward his plan for a reform of the privy council. This body was to consist of thirty members, half of whom were to be the chief officers of the crown, the other half being persons of importance, lords and commoners, chosen without reference to party. Special care was taken to select men of wealth, which Temple considered as the chief source of political influence. By the advice of this council the king promised to act. The parliament, it was supposed, would trust such a body, and would cease to dictate to the crown. The scheme was accepted by the king, but was a failure from the outset. Intended to combine the advantages of a parliament and a council, it created a board which was neither

the one nor the other. The conduct of affairs fell at once into the hands of a junta of four, of whom Temple was at first one, and the king violated his promise by dissolving parliament without asking the advice of the council. Temple retired in disgust to his villa at Sheen, and appeared only occasionally at the council, where he soon ceased to exercise any influence. In 1680 he was nominated ambassador to Spain, but stayed in England in order to take his seat in parliament as member for the university of Cambridge. He took no part in the debates on the great question of the day, and acting on the king's advice declined to sit in the parliament of 1681. Early in that year his name

was struck off the list of the council, and henceforward he dis- appeared from public life. He continued to live at Sheen till 1686, when he handed over his estate there to his son, the only survivor of seven children, and retired to Moor Park in Surrey. When William III. came to the throne Temple was pressed to take office, but refused. His son became secretary at war, but committed suicide immediately afterwards. Sir William, though occasionally consulted by the king, took no further part in public affairs, but occupied himself in literature, gardening and other pursuits. It should not be omitted that Swift lived with him as secretary during the last ten years (with one short interval) of his life. Temple died at Moor Park on the 27th of January 1699.

Temple's literary works are mostly political, and are of consider- able importance. Among them may be mentioned An Essay an the Present State and Settlement of Ireland (1668); The Empire, Sweden, &c, a survey of the different Governments of Europe and their relations to England (1671); Observations upon the United Provinces (1672) ; Essay upon the Original and Nature of Govern- ment (1672); Essay upon t)w Advancement of Trade in Ireland (1673). Some of these were published in the first part of his Miscel- lanea (1679). In the same year apparently his Poems were privately printed. In 1683 he began to write his Memoirs. The first part,

extending from 1665 to 1671, he destroyed unpublished; the second, from 1672 to 1679, was published without his authority in 1691 ; the third, from 1679 to 1681, was published by Swift in 1709. In 1692 he published the second part of his Miscellanea, containing among other subjects the essay Upon the Ancient and Modern Learning, which is remarkable only as having given rise to the famous controversy on the " Letters of Phalaris." His Intro- duction to the History of England, a short sketch of English history to 1087, was published in 1695. Several collections of his letters were published by Swift and others after his death.

His fame rests, however, far more on his diplomatic triumphs than on his literary work. His connexion with domestic affairs was slight and unsuccessful. He was debarred both by his virtues and his defects — by his impartiality, his honesty, and his want of ambition — from taking an active part in the disgraceful politics of his time. But in the foreign relations of his country he was intimately concerned for a period of fourteen years, and in all that is praiseworthy in them he had a principal hand. He cannot be called great, but he will be remembered as one of the ablest negotiators that England has produced, and as a public servant who, in an unprincipled age and in circumstances peculiarly open to corruption, preserved a blameless record.

See Life and Works of Sir William Temple (2 vols., 1720; 2nd ed., with Life by Lady Giffard, 1731) ; a more complete edition, including the Letters, was published in 4 vols, in 18 14; Burnet, History of his own Time; T. P. Courtenay, Memoirs of the Life, &c, of Sir William Temple (2 vols., 1836); Macaulay, Essay on Sir William Temple; A. F. Sieveking, Sir W. Temple and other Carolean Garden Essays, (1908) ; and E. S. Lyttel, Sir William Temple (Stanhope Prize Essay, Oxford, 1908). (G. W. P.)

TEMPLE, a city of Bell county, Texas, U.S.A., about 35 m. S.S.W. of Waco. Pop. (1890) 4047; (1900) 7065 (1423 being negroes and 360 foreign-born): (1910) 10,993. It is served by the Gulf, Colorado & Santa

Fe, and the Missouri, Kansas & Texas railways (the former has repair shops here), and is con- nected with Belton (pop. in 1910, 4164), the county seat, about 10 m. W., by an electric railway. In the city are a Carnegie library, a King's Daughters' Hospital, the Temple Sanitarium, and a . hospital of the Gulf, Colorado & Santa F6 railway. Temple is situated in a rich farming country; cotton is ginned and baled here, and there are various manufactures. The city owns the water supply. Temple was founded in 1881-82 by the Gulf, Colorado & Santa F6 railway, and was chartered as a city in 1884.

TEMPLE, a term derived from the Lat. templum (Gr. Tk/ievos), which originally denoted a space marked off by the augurs for the purpose of observing the flight of birds or other ceremonies; later it was applied to the dwelling-place, the aedes sacrae, of the gods. In this latter sense it is the equivalent of the native Hebrew expression blth 'ilohim, literally " a god- house," and of the foreign Mkal, palace, temple, a loan-word from Sumerian through the medium of the Babylonian e-kallu (lit. great house). A temple or "god-house," however, repre- sents a comparatively advanced stage in the development of Semitic religion. At first the Semite recognized the abodes of his deities in certain outstanding and impressive natural

objects, a spreading tree, a bubbling spring, a conspicuous rock or stone, a lofty mountain peak and the like. Beside these he met and held converse with his gods. The native rock was the first altar.

It was a distinct step in advance when it was recognized that a deity might take up his abode elsewhere than in such natural sanctuaries, as in the massebah or stone pillar and the asherah or sacred post of wood, reared not by nature but by the hand of man (cf. Gen. xxviii. 18, 22, the origin of the sacred pillar at Beth-el).

The further advance to a real house or temple may be traced to the influence of at least two factors in the social and religious life of a people. One such factor came into play when men began to represent the deity by means of an image, or even when some object, whether natural, like the black stone of Mecca, or manufactured, like the ark of the Hebrews, came to be regarded as specially sacred from its association with the deity. Such objects or images required a house to shelter and guard them. Another factor is to be found in the advance in material comfort which follows the transition from the nomadic to the agricultural mode of life. Among the settled Semites there arose the feeling that the gods of the community ought also to share in this advance (cf. 2 Sam. vii. 2). Accordingly they were invited to take up their abode in a bUh 'ilohim or temple. The dignity and comfort of the gods advance pari passu with those of their worshippers.

It must be kept in mind, however, that the altar remained as before the centre of the sacrificial worship. Around it or before it, under the open sky, the worshippers assembled. To the temple the priests alone, or the head of the sacral community in his priestly capacity, had access. In this respect the worship associated with altar and temple offers a striking contrast to the more spiritual worship of the Jewish synagogue and the Christian Church.

At the date of the Hebrew invasion of Canaan its numerous city-states had reached a fairly high level of civilization. Alongside of the typical Canaanite sanctuary, as known to us from the Old Testament references and from recent excavations, with its altar of earth or stone and its stately massebahs, a temple was probably to be found in all the more important centres. In an early Hebrew document there is a reference to the temple of El-berith at Shechem, which was large enough and strong enough to serve as a place of refuge in time of war (Judges ix. 46 ff.). The Philistines also had their temples in this period: thus we hear of a " house " of Dagon at Gaza (ib. xvi. 23 ff.) and also at Ashdod (1 Sam. v. 2), while a temple of Ashtart (Ishtar-Astarte) is

mentioned in 1 Sam. xxxi. 10, probably at Ashkelon (Herod, i. 105).

The earliest reference to a temple built by Hebrew hands is to " an house of gods " reared by Micah to shelter an ephod and other sacred images which he had made (Judges xvii. 5). Micah's images were soon transported to Dan, where doubtless another house was built for their protection (xviii. 18, 30 f.). Somewhat later we find the ark of Yahweh installed in " the house of Yahweh " at Shiloh, which house was not a mere tent but a real temple (hikal, 1 Sam. i. 0, iii. 3) with doors (iii. 15) and doorposts (i. 9), and a hall in which the worshippers partook of the sacrificial meals (i. 18, Greek text; cf. ix. 22 " the guest- chamber," Heb. UshkS-h). After the destruction of Shiloh at the hands of the Philistines, its priesthood migrated to Nob, where also the incidents recorded in 1 Sam. xxi. — note especially the presence of the shew-bread and the ephod — imply the existence of a temple.

The Temple of Solomon. — The primary source of our informa- tion regarding the erection of Solomon's temple is the account contained in 1 Kings vi.-vii., the details of which must have been derived ultimately from the temple archives. On this earlier narrative the chronicler (2 Chron. iii.-iv.) and Josephus (Antiq., VIII. iii. 1 ff.) are alike dependent.

Unfortunately these two chapters of Kings are among the most difficult in the Old Testament, partly by reason of our ignorance of the precise meaning of several of the technical terms employed,

partly owing to the unsatisfactory state of the received text, which has been overlaid with later additions and glosses. As regards both text and interpretation, most recent writers have adopted in the main the results of Stade's epoch-making essay in his Zeitsch. f. d. alltest. Wissenschafl, iii. (1883), 129-177, reprinted in his A kade- mische Reden, Sec., with which is now to be compared Stade and Schwally's critical edition of Kings in Haupt's

Sacred Books of the Old Test. See also, in addition to the standard commentaries, Burney, Notes on the Heb. Text of . . . Kings, Vincent's critical and exegetical study, Rev. biblique (Oct. 1 907), and the literature cited at the end of this article.

(a) The Site of the Temple. — On this important point our earliest authority is silent. It is now universally acknowledged, however, that the whole complex of buildings erected by Solomon stood along the crest of the eastern hill, crowned by the temple at the highest point, as Josephus expressly testifies (Bell. Jud.; V. v. 1, with which compare the letter of (Pseudo) Aristeas, sect. 84). This at once brings the site of the temple into proximity to the world-famous sacred rock, the sakhra, over which now stands the building known as the Mosque of Omar, and, more correctly, as the Dome of the Rock. Here another important consideration comes to our aid. From the recognized persistence of sacred sites in the East through all the changes in the dominant religion, it is well-nigh certain that the sanctity of the sakhra rock goes back to the days of David and Solomon, or even, it may be, to prehistoric times. On it, or over it, the angel was believed to have been seen by David, and there David built his altar (2 Sam. xxiv. 18-25; cf. Judges vi. 20 f., 24; xiii. 19 ff.). This is undoubtedly the site assigned to the temple by the oldest extant tradition (see 1 Chron. xxii. 1; cf. 2 Sam. xxiv.). By every token, then, Solomon's altar of burnt-offering, if it was not identical with the sakhri (see below), at least stood upon it. Since the altar necessarily stood in front, i.e. to the east, of the temple, the site 0} the latter was a short distance to the west of, and in line with, the sacred rock (see Jerusalem).

The alternative view, associated in recent times with the names of Schick and Conder, which places the most holy place, or inner- most shrine of the temple, over the sakhra, has now few advocates (e.g. Col. Watson in the Quarterly Statement of the Palestine Explo- ration Fund for 1896 and 1910). Apart from difficulties of space towards the east, which this location involves, it cannot be accepted

in face of the fact that the sakhra still bears the marks of its former use as a rock-altar (see esp. Kittel, Studien zur hebr. Archaologie, 12 ff.). Moreover the rock, measuring as it does some 55 ft. by 40, could not have been contained within the " holy of holies, which was less than 30 ft. square (see below).

A third site, still within the present Haram area, but towards its south-west angle, favoured by Fergusson (The Temples of the Jews), Robertson Smith (Ency. Brit., 9th ed., art. " Temple ") and others is open to even more serious objection, and has no pro- minent advocate at the present day.

(b) The Temple Building. — In the fourth year of his reign Solomon " began to build the house of the Lord " with the laying of a massive foundation of " great stones," as required by the rapid fall of the ground to the west of the sakhra. Archi- tecturally the temple consisted of three distinct parts: (1) the naos or temple proper, (2) a porch or pylon in front of the naos, and (3) a lower and narrower building which surrounded the naos on its other three sides (see fig. 1).

(1) The first of these, " the house of the Lord " in the strict sense, in which alone He was worshipped, was oblong in plan, and was divided into two compartments in the proportion of 2:1 by a partition wall. The room next the porch was 40 cubits in length by 20 in breadth, with a height of 30 cubits, 1

1 The length of the cubit at this period cannot be determined with absolute certainty. From the fact that Herod's naos was an exact replica of Zerubbabel's as regards inside measurements, coupled with the presumption that Zerubbabel built upon Solomon's foundations, it is permissible to suppose that one and the same standard of length was 'used throughout. Now the present writer has shown from an inductive study of the height of the courses in the walls of the Haram and of other existing remains of the Herodian period that the cubit used by Herod's

builders was exactly 17-6 in. or 447 millimetres (see Expository Times, xx. [1908-09] 24 ff.). There is therefore good reason for believing that this was also the cubit Of Solomon's temple, notwithstanding the statement of 2 Chron. iii. 3 that the latter was a cubit " after

all inside measurements, and is termed in our oldesc source the hekal or palace; later it was known as " the holy place." It was dimly lighted by a row of latticed windows, which must necessarily have been placed in the upper third of the side walls, as will presently be seen. Adjoining the hekal on the west lay the dibir or sanctuary, later termed " the most holy place " (lit. " holy of holies "). The inside space formed a perfect cube of 20 cubits, say 30 ft., in length, breadth and height (vi. 20), symbolizing the perfection of the Deity, for whose abode this part of the naos was specially designed. The d6bir, !« has been said, was separated from the hekal by a transverse wall, whose existence we are left to infer from the obscure de- scription of the door between the two compartments (vi. 31, see next section). 1

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Fig. 1 . — Ground Plan of Solomon's Temple.

Fig. 2. — Section of Temple along a-b of Ground Plan.

(2) In front of the hekal and facing eastwards rose the porch, its inside " length " 20 cubits " according to the breadth of the house " (vi. 3), and its inside depth from east to west 10 cubits. The more precise character and elevation of this ele- ment will fall to be considered at a later stage.

(3) The third architectural element was a lateral building enclosing the naos on the other three sides, and consisting of three storeys, each 5 cubits in height from floor to ceiling. Each storey contained a number of small storage chambers, probably thirty in all (Ezek. xli. 6). A peculiarity in the architecture of this part of the temple is noteworthy. Instead

the former measure." For this statement is probably a mere inference from Ezek. xl. 5, where the divine messenger uses a cubit of seven handbreadths or 20j in., the royal cubit of Egypt. For the smaller measurements the cubit of 17-6 in. may for greater convenience be reckoned at I J ft.

1 If the view presented below as to the height of the various parts of the temple is accepted, this wall becomes a structural necessity, being required to support the back wall of the h$kal.

of the beams forming the floors and ceilings of tht several storeys being let into the wall of the hfikal, three successive rebatements of one cubit each were made in the latter for their support (see fig. 2), consequently the width of the chambers was 5, 6 and 7 cubits in the three storeys respectively (vi. 6). The total height, allowing for floors and

roof, of the lateral building cannot have been less than 17 cubits. Entrance to the side-chambers was provided by a single door on the south side (see ground-plan, fig. 1).

So far there is no difficulty as regards the general plan and dimensions of the temple, provided it is kept in mind that the figures given in the text of Kings are all inside measurements. It is otherwise when one endeavours to calculate the area covered by the temple, and to determine the elevation of the several parts and the general architectural style of the whole. As to the area much depends upon the thickness of the walls. Here our only clue is furnished by the figures for the corresponding walls of Ezekiel's temple, but the necessary caution has not hitherto been observed in applying them to the proportions of the actual temple of Solomon. It cannot be too strongly emphasized that in the dimensions of his temple of the future and its courts Ezekiel is dominated by a passion for symmetry and for the number 50 and its multiples, 5 which there is no ground for importing into the dimensions of the older temple. Nevertheless the walls of the naos may be taken at Ezekiel's figure of 6 cubits (xli. 5), with succes- sive rebatements of one cubit (fig. 2) until the thickness is reduced to 3 cubits (4J ft.) above the side-chambers, as explained above If one cubit is allowed for the partition wall corresponding to the space in Herod's temple, where a curtain took the place of tht wall, we obtain a total of 73 cubits for the length of the naos and of 32 for the outside width, or 107 ft. by 47. If 3 cubits — equal to the thickness of the wall of the naos above the side-chambers, — be allowed for the outer wall of the latter, the extreme width of the temple works out at 48 cubits, or 70J ft. Adopting Ezekiel's thickness of 5 cubits for the front wall of the porch, we reach a total of 96 cubits or 141 ft. for the extreme length from east to west (see the accompanying ground-plan). The proportion ol length to breadth is thus 2:1, precisely as Ezekiel's temple with its artificial numbers of 100 and 50 respectively. The area of the

platform on which Solomon's temple stood probably measured 100 cubits by 60, as in the plan annexed.

As regards the height of the various parts even fewer data are available. Our primary source gives the height of " the house " as 30 cubits (1 Kings vi. 2). By the great majority of previous students this has been understood to mean that a single flat roof, at this height from the floor, covered the three parts — porch, h6kal and debir — leaving an empty space of 10 cubits above the last of these. But the Hebrew document, as has been repeatedly pointed out, is concerned only with inside dimensions, and in vi. 2 has probably in view the inside height of the hekal, as the largest of the three compartments. On the other hand, a characteristic feature of the contemporary Egyptian temples is the gradual diminution in the height of their component parts from front to back (Maspero, L'Archio- logie egyptienne (1007), p. 77; Erman, Handbk. of Egyptn. Religion, 41; cf. the restoration of a typical temple in Perrot and Chipiez, And. Egypt. Art. i. 373, and in Erman, Life in And. Egypt, 280).

In this respect the present writer believes that Solomon's temple followed the Egyptian model, the height decreasing as one proceeded from the porch to the hfikal, debir and side-chambers respectively. The porch, for instance, was probably modelled on the pylons which flank the principal entrance to an Egyptian temple, tall and narrow, with a sloping front wall surmounted by a cornice with its characteristic cavetto moulding. The 120 cubits which 2 Chron. iii. 4 gives as the height of the porch, followed by Josephus, Ant. XV. xi. 1 and elsewhere, seem to be out of proportion to the prob- able height of the rest of the building. But this objection does not apply to the 60 cubits given as the extreme height for the second temple in the trustworthy document, Ezra vi. 3.' This,

2 This has led Ezekiel certainly to increase the depth of his porch from 10 cubits to 12 (original text of Ezek. xl. 49), and probably to add a cubit

to the thickness of the partition wall (xli. 3), in order to bring up the total length of his temple to 100 cubits.

3 The numbers of this passage have been unnecessarily called in question by recent critics. The figures given are naturally those of the two extremes, which were not to be exceeoed, viz. 60 cubits for the extreme height, that of the porch, and the same figure for the extreme width, that of the raised platform.

it may reasonably be inferred, was the height of the porch in the first temple, from which, in that case, the figure was derived. The probable outside measurements for the porch are thus 32 cubits for the breadth across " the house," 15 for the depth including the front wall, and 60 cubits or 88 ft. for the height.

Still following the Egyptian model, the he"kal will have had its separate roof of massive cedar beams, covered probably by heavy limestone slabs, lor which 1J-2 cubits may be allowed, giving a total of 32 cubits (47 ft.), equal to the outside width of this part ot the temple. In the same way the roof of the dfiblr will have been 10 cubits lower, or circa 32 ft. in all, that of the lateral building about 4 cubits lower still, say 26 ft. (cf. the section through the temple from W. to E. in fig. 2). While the measurements above given are, as they must necessarily be, in part conjectural, it is claimed for them that they introduce the element of proportion between the parts to an extent not attempted hitherto.

(c) The Interior of the Temple and its Furniture. — The entrance to the temple was through a wide and lofty opening in the front wall of the porch. Crossing the vestibule one entered the hekal by a large folding-door of cypress wood (vi. 34) —

probably 10 cubits wide as in Ezekiel's temple — each of its four leaves ornamented with carved figures of cherubim, palms and flowers, all overlaid with gold. The inner walls of the hikal and the debir were lined with boards of cedar from floor to ceiling, while the floor was covered with planks of cypress wood. 1 From the hekal a door in the partition wall gave entrance to the debir. The doorway was not rectangular but apparently pentagonal in form (see the commentaries on vi. 31), the lintel consisting of two blocks of stone meeting at an angle, a feature " intro- duced to distribute the pressure of the superincumbent wall " (W. R. Smith)." 2 The walls of the dSbir were overlaid with "pure gold" according to our present text (vi. 20); this enhancement of the dignity of the adytum as the earthly dwelling-place of the heavenly King is not so incredible as the profuse application of gold decoration to other and inferior parts of the house, even, as we have seen, to its floor (on this question see the critical works cited above).

As regards the furniture of the house, it is probable that the original text of 1 Kings introduced only the altar of cedar now found in the corrupt text of vi. 20, and to be identified with the table of shewbread, as the sole furniture of the holy place. The ten golden candlesticks, properly lampstands, of vii. 49 are generally believed to have been introduced at a later, date (cf. Jer. Hi. 18 f.). In the most holy place stood the palladium of Israel's religion, the sacred ark of Yahweh. On either side of this venerable relic of the past were two cherubim, sculptured from olive wood and overlaid with gold, each 10 cubits high, their outstretched wings reaching right across the dfebir, and forming a baldachin over the ark (vi. 23-28).

Although forming no part pf the interior furniture of the temple, the remarkable twin pillars which stood on either side of the entrance to the porch may be mentioned here, since they belonged rather to the temple than to its court. These pillars, which in the received text bear the enigmatical names of " Jachin and Boaz," 3 were hollow columns — the bronze

metal being about 3 in. in thickness — over 26 ft. in height and 6 ft. in diameter, surmounted by elaborate capitals about 7J ft. high. The latter were globular in form, ornamented _ by a specially cast network of bronze, over which were hung festoon- wise two wreaths of bronze pomegranates, each row containing a hundred pomegranates. As the pillars doubtless stood on plinths, the total height of each will have been at least 35 ft. Such free-standing pillars were a feature of temple architecture in Phoenicia and elsewhere in western Asia, as later reproduc- tions on local coins attest, and would appear to Solomon's

1 The overlaying t?f the floor with gold (1 Kings vi. 30) is a later interpolation^ the same is probably true of the gilding of the sculptures on the walls, which may have been added at a later date (cf. Ezek. xli. 18).

2 This partition wall, it will be remembered, had to support the back wall of the h£kal according to the view of the temple archi- tecture advocated above.

' The various forms which the latter name assumes, in the Greek text, suggest that Boaz is an intentional disguise of an original Baal, applied of course to Yahweh (Barnes, Jour, of Theol. Studies, v. 447 ff.).

Phoenician architects as a natural adjunct of his temple Jachin and Boaz, therefore, may be regarded as conventional symbols of the Deity for whose worship the temple was de- signed. 4

(d) The Temple Court, Altar and other Apparatus of the Cult. — The temple stood within the western half of " the court of the house of the Lord," also known as " the inner court " to dis- tinguish it from " the other court " round the adjoining palace and from " the great court "which surrounded the whole com- plex of Solomon's buildings. All three had walls in which three courses of hewn stone alternated with a course of cedar beams (see next section). To the "court of the house" laymen as well

as priests had access (Jer, xxxv. 1 ff., xxxvi. 10). Several gates gave entrance to it, but their precise position is uncertain. The principal entrance from "the great court" was doubtless in the east wall. Another was in the south wall and communi- cated with " the other court" and the royal palace. There were also one or more gates on the north side of the court.

In our present text of 1 Kings vi.-vii., there is no mention of so indispensable a part of the apparatus of the cult as the altar of burnt-offering. This silence has been explained in two ways. The majority of critics believe that the original accdunt did contain a reference to the making of a bronze altar (cf. 2 Chron. iv. 1), but that it was excised by a later editor, who assumed that the bronze altar of the tabernacle accompanied the ark to the new sanctuary. Others, with greater probability, maintain that the silence of our oldest source is due to the fact that Solomon followed the primitive Semitic custom and used the bare sakhra rock as his great altar. In this case the altar, which was removed by order of Ahaz to make way for his new altar after a Damascus model (2 Kings xvi. 10-16), must have been introduced by one of Solomon's successors. 6

In the court, to the south of the line between the altar and the temple, stood one of the most striking of: the creations of Solomon's Phoenician artist, Huram-abi of Tyre. This was the "brazen sea," a large circular tank of bronze with the enormous capacity of over 16,000 gallons (1 Kings vii. 23-26), resting on the backs of twelve bronze bulls, which, in groups of three,, faced the four cardinal points.

It is doubtful if this strange ” sea ” served any practical purpose (see 2 Ghron. iv, 6). Most recent writers agree in assigning to it a purely symbolical significance, like the twin pillars above described. Babylonian temples are now known to have had a similar apparatus, termed

Associated with the ” brazen sea ” were ten la vers of bronze, also the work of Huram-abi (vii. 27-39). Each laver consisted of a circular basin holding over 300 gallons, and borne upon a wheeled carrier or “base.” 6 The sides of the carriers were open frames composed of uprights of bronze joined together by transverse bars or rails of the same material, the whole richly ornamented with palm trees, Hons, oxen and cherubim in relief. Underneath each stand were four wheels of bronze, while on the top was fitted a ring or cylinder on which the basin rested. According to Kittel, “it is highly improbable that these la vers served any practical purpose. They were rather like the great ‘ sea,’ the embodiment of a religious idea; they were symbols of the rain-giving Deity ” (op. cit.. p. 242).

The Relation of the Temple to Contemporary Art.—Oi the many problems raised by the description of the temple in 1 Kings none is of greater interest than the question of its relation to

4 Robertson Smith’s theory that they were huge cressets in which ” the suet of the sacrifices ” was burned (Rel. Sent., 2nd ed., 488) has found no support. For recent attempts to explain the symbolism of the pillars in terms of the ” early oriental Weltan- schauung,” see A. Jer«mias, Das alte Test., &c, 2nd ed., 494; Benzinger, Heb. Archaol., 2nd ed., 323, 331.

6 For a detailed study of the successive altars that stood upon the sakhra and their relation thereto, see Kittel, Studien zur hebr. Archaologie, pp. 1-85; with illustrations and diagrams.

8 This section of Kings is peculiarly difficult, and

has been made the subject of a special study by Stade in his Zeitschnft (1901), 145 ff. (cf. ” Kings ” in Haupt’s critical edition), and more recently by Kittel, op. cit., pp. 189-242, with illustrations of similar appa- ratus found in Cyprus and Crete.

contemporary art. Where, it has often been asked, shall we look for the model or prototype of the temple edifice? Whence were derived the motifs to be seen in its decoration? What influences can be detected in the elaborate apparatus above described? Now it has for long been recognized that Syria, including Phoenicia and Palestine, was from the earliest times the meeting-place of streams of influence, religious, artistic and other, issuing from the two great fountains of civilization and culture in the ancient world, Egypt and Babylonia. To these must now be added the early civilization of the Aegean as revealed by the excavations in Crete, and the later but highly developed culture of the Hittites. As a result the art of Phoenicia and Syria, originally borrowed from Egypt mainly, had by the 10th century become thoroughly eclectic. Of this syncretism the best illustration is furnished by the masterpieces of contemporary art, for which Solomon was indebted to Phoenician architects and Phoenician artists. Thus the general disposition of the temple with its walled court, porch or vestibule and naos has been shown by modern excavation, and by later representations on coins, to be characteristic of Phoenician and North Syrian temple architecture. Here, however, we have an adaptation of the earlier temple architecture of Egypt. Egyptian influence is most clearly seen in the gradual decrease in the illumination of the several parts. In the temple court, as in its Egyptian counterpart, men worshipped under the bright eastern sky; in the covered porch there was still no door to exclude the light which streamed in through the lofty entrance. But in the holy place only a dim light was admitted through latticed windows high up in the side walls,

while the holy of holies, like the Egyptian cella, was completely dark. 1

The sculptured panels of the interior were shown by Robertson Smith (Ency. Brit., 9th ed., art. ” Temple “) to reveal familiar Phoenician motives, although Babylonia is probably the ultimate home of the cherubim. Excavations at Sinjirli in Northern Syria and at Megiddo have, further, solved the prob- lem of the ” three rows of hewn stones and a row of cedar beams ” which was the architectural feature of the walls of the various courts (1 Kings vii. 12).’ The use of wooden beams alternately with courses of stone was a familiar expedient in early times. The practice of building walls with recurring rebatements has also been illustrated by the recent excavations.

While the prototype of the temple itself is to be sought, as has been said, in Egypt, Babylonian influence is clearly traceable in the symbolical ” brazen sea,” the apsu of contemporary Babylonian, and doubtless also Phoenician, temples. The bronze lavers, finally, have been found to be dependent, both in their construction and in the motifs and execution of their reliefs, on the art of the Aegean. From Crete and Cyprus they passed through Phoenician intermediaries to Syria and Palestine. The temple of Solomon, in short, is a product of the best Syro-Phoenician art of the period, itself the product of ideas which had their source in other lands.

The Temple of Zerubbabel.— hv the year 586 B.C. the temple of Solomon was committed to the flames by order of Nebuchad- rezzar (2 Kings xxv. 8; Jer. lii. 12 f.). Seventy years later its successor was finished and dedicated, the foundation having been laid in the second year of Darius Hystaspes (520) during the governorship of Zerubbabel (Hag. ii. 18). There is every reason for assuming that the massive foundation courses of the earlier temple were still in situ, and available for the new build- ing. 3 The latter’s inferiority, attested by Hag. ii. 3, was rather in respect of its decoration and equipment,

as compared with the magnificence of the first temple, than as regards the size

1 This feature gives valuable support to the view presented above that Solomon's temple resembled its Egyptian contemporaries in an equally striking characteristic, the decrease in height with the de- crease in illumination.

2 This description possibly applies to all the buildings (note verse 9), including the temple itself, and was so understood by the writer of Ezra vi. 4.

3 From Hag. i. 8. Driver indeed infers that " there would probably he almost sufficient stonework remaining [for all pur- poses] from Solomon's temple " (Cent. Bible in he).

of the building. The dimensions given in the royal decree (Ezra vi. 3) — 60 cubits for height and the same for breadth — probably refer, as was pointed out in a previous section, to the extremes of height and breadth applicable to the porch and platform respectively. In these and most other respects it may be supposed that Zerubbabel's builders followed the lines of Solomon's temple. It is probable, however, that the walls of the naos, including both the holy and the most holy place, were now raised to a uniform height, the separate back wall of the former having been abolished and the naos covered by a single roof. This seems a legitimate inference from the absence in the second and third temples of a supporting partition wall within the naos. Its place, as separating the two compartments, was taken by a magnificent curtain or " veil," which is men- tioned among the spoils carried off by Antiochus Epiphanes (1 Mace. i. 22). 4

In the matter of the sacred furniture, the holy place con- tained from the first the table of shewbread, and one golden " candlestick " or lampstand in place of the ten which illumi- nated the hekal in the later days, at least, of the first temple (Jer. lii. 19). The golden altar of incense,

which fell a prey with the rest of the furniture to Antiochus (1 Mace, i. xxi. f.) was probably introduced later than the time of Zerubbabel, since a Jewish author, writing in the 3rd century B„c. under the name of Hecataeus of Abdera, mentions only ” an altar and a candlestick both of gold,” and it is natural to identify the former with the gold-plated table of shewbread. 5 In one important respect the glory of the second house was less than that of the first. The holy of holies was now an empty shrine, for ho one had dared to construct a second ark.

The second temple also differed from the first in having two courts, an outer and an inner, as prescribed by Ezekiel for his temple of the future. The outer court formed a square, each side of which was 500 cubits in length, also as prescribed by Ezekiel, with the sakhra rock in the centre (see Exp. Times, xx. 1-82). Within the inner court stood the altar and the temple. The former, as described by Hecataeus, was composed of white unhewn stones (cf. Exod. xx. 25), "having each side 20 cubits long, and its height 10 cubits ” (Josephus, Cpntra Apion. i. § 198), dimensions which agree with those assigned by the chronicler to the earlier altar of bronze (2 Chron. iv. 1).

In 165 B.C., three years after the spoliation of the temple and the desecration of its altar by Antiochus IV., Judas. Maccafcaeus rededicated the holy house, made new sacred furniture, and erected a new ajtar of burnt-offering (1 Mace. iv. 41 ff.). But long before this date the temple had assumed a character which it retained to the end of the Jewish state. It had become a fortress as well as a place of public worship, and existing records tell of the repeated strengthening of its defences. ” At the time of Pompey’s siege (63 B.C.) it constituted an almost impregnable fastness, strengthened on its weakest or northern side by great towers and a deep ditch (Ant., xiv. 4, § 2). Twenty-six years later the temple was again besieged by Herod, who, attacking like Pompey from the north, had to force three lines of defence — the city wall, and the outer and inner

temple," i.e. the walls of the outer and inner 'courts (W. R. Smith).

The Temple of Herod.— In the r8thyearof his reign (20-19 B.C.) Herod obtained the reluctant consent of his subjects to his ambitious scheme for rebuilding the temple and for enlarging and beautifying its courts. The former was finished in eighteen months by a thousand priests trained for this special purpose; the courts in eight years, but the complete reconstruction occupied more than eighty years, lasting almost till the final breach with Rome, which culminated in the destruction of the sacred edifice by the soldiers of Titus in a.d. 70.

4 M. Clermont-Ganneau has put forward the interesting conjec- ture that the veil presented by Antiochus to the temple of Zeus at Olympia (Pausanias, V. xii. 4) was that taken from the temple at Jerusalem (see " Le Dieu sa.tro.pe," &c, in the Journ. asiatique,

1878).

6 The witness of the Pseudo-Hecataeus and of another Jewish Hellenist, the Pseudo-Aristeas, regarding the second temple has recently been examined by G. A. Smith in his volumes on Jeru- salem (see esp. index to vol. ii., and cf. Vincent, " Jerusalem d'apriis la lettre d'Aristee," Rev. biblique (1908), 520 ff. (1909), 555 ff.).

(a) The Outer Court, its Gates and Colonnades. — The outer court of Zerubbabel's temple (500X500 cubits) was doubled in area according to Josephus (Bell. Jud. I. xxi. 1). The extension was principally on the south, which involved enormous sub- structions on both sides of the hill, in order to secure the necessary level surface. There can be little doubt that this part of the present Haram area with its containing walls is essentially the work of Herod.

The northern boundary of this great court, termed " the mountain of the house " in the Mishnah, and now generally known as " the court of the Gentiles," remained as before, and is represented by a line of scarped rock immediately to the north of the present inner platform of the Haram. This line of scarp, when prolonged east and west for about 1000 ft. in all, meets the east wall of the Haram a little to the north of

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Fig. 3. — Plan of Herod's Temple and Courts.

From the Dictionary of the Bible (igoo), 1 by kind permission of T. & T. Clark.

the Golden Gate, at a point 390 yds. (800 cubits) from the S.E. angle, and the west wall at the same distance from the S.W. angle. 2

The principal entrance to the temple enclosure, and the only one on a level with it, was on its western side by a bridge or viaduct which spanned the Tyropoeon at the spot marked by Wilson's arch. It is first mentioned in connexion with the siege of Pompey in 63 b.c, and according to the Mishnah it bore the name of the Gate of Kiponos (probably Coponius, the first procurator of Judea). Of the other three gates which Josephus assigns to this side (Ant. XV. xi. 5), the two leading

1 Which see for key to the several parts.

2 The area of the " court of the Gentiles," including the walls, was thus 800 cubits in length from N. to S., with an average width of circa 650 cubits of 17-6 in. — the present south wall measures 922 ft. — i.e., circa 520,000 sq. cubits as compared with the former area of 250,000, a remarkable confirmation of Josephus' statement as to the doubling of the temple courts. For the statements and measurements in this and the following sections differing from those of previous writers, reference may be made to the series of (jreliminary studies

entitled ” Some Problems of Herod’s Temple,” bv the present writer, which appeared in The Expository Times, ■■‘61. xx (1908-1909), pp. 24 ft., 66 if., 181 ff.. ^70 ff.

to ” the suburb ” necessarily lay further north; one is repre- sented by the old entrance now named Warren’s gate, the other has not been identified. Josephus’ third gate which led to the ” other ” or lower city was undoubtedly Barclay’s gate, and not, as is usually maintained, an entrance from Robinson’s arch. In the south wall were two gates — the Huldah or ” mole ” gates of the Mishnah (Middoth, i. 3) — represented by the present ” double ” and ” triple ” gates. Like the three last mentioned they had to be placed at the foot of the lofty retaining wall. From either gate a double ramp, which passed under the royal porch, led into the court in the direction shown on the accom- panying plan. The Mishnah also names the ” Shushan gate ” on the east and the ” Tadi gate ” on the north.

Round the four sides of the great, court ran a succession of magnificent porticoes in the style of contemporary Hellenistic architecture (Ant. XV. xi. 5). Those on the E., N. and W. sides had each three rows of columns forming a double walk or aisle; the eastern colonnade bore the old name of ” Solomon’s Porch ” (John- x. 23; Acts iii. n). The southern portico was still more imposing and magnificent.

It had three aisles formed by four rows of monolithic marble columns of the Corinthian order, 3 the first row engaged in the south wall of the court. The two side aisles were 30 ft. in width, the central aisle half as wide again (45 ft.) ; the height of the former may be estimated at circa 60 ft., that of the latter at 100 ft. (Exp. Times, xx. 68 f.). The roofs were formed of deeply coffered cedar beams, that of the centre aisle being supported on pillars partly engaged in an ornamental stone balustrade. The ” royal porch,” as it was termed, worthily represents the high-water mark of Herod’s architectural achievements in connexion with

the recon- struction of the temple.

(b) The Inner Courts and Gates. — To the outer court Jew and Gentile, under certain conditions, had alike access. The sanctuary proper, from which the Gentile was rigidly excluded, began when one reached the series of walls, courts and buildings which rose on successive terraces in the northern half of the great enclosure. Its limits were distinguished by an artistic stone balustrade, named the soreg, which bore at intervals notices in the Greek tongue warning all Gentiles against advancing further on pain of death. Beyond the soreg a narrow stone terrace, approached by flights of steps, was carried round all sides of the sanctuary save the west (see Bell. Jud. V. i. 5 [§ 38]), and extended to the foot of the lofty fortified walls of the temple enclosure (see X Y Z on plan, fig. 3).

The walls, over 35 ft. in height (25 cubits), were pierced by nine gateways, marked Hi to H9 on the accompanying plan, of which four were in the north and south walls respectively, and one in the east wall. These nine gates opened into massive two-storeyed towers, each 30 cubits deep (Bell. Jud. V. v. 3). Eight were " covered over with gold and silver, as were also the jambs and lintels" (ibid.), while the ninth, the principal entrance to the sanctuary, in the east wall (H5) was composed entirely of Corinthian brass, the gift of a certain Nicanor. Hence it was variously named " the Corinthian gate," " the gate of Nicanor " and " the beautiful gate " (Acts iii. 2, io). 4

Entering the sacrosanct area by this gate one found oneself in a colonnaded court, known as the court of the women (A) since women as well as men were admitted to this court, which indeed was the regular place of assembly for public worship. The four corners of the women's court were occupied by large chambers for various ceremonial purposes, while be- tween these and the gate-houses were smaller chambers, one set being known as" the treasury " (Mark xii. 42). The western side was bounded by a high wall, beyond which, on a higher level, lay the

inner or priests' court. The entrance to the latter was by an enormous gateway, 50 cubits by 40, through which an uninterrupted view was obtained of the altar and of the temple beyond it. To this " upper ga.te "

3 One such gigantic monolith was discovered a few years ago in a disused quarry (see Exp. Times, xx. 69).

4 For this triple identification see Schiirer's essay, Zeits. f. neutest. Wiss. (1906), 51-58; Rerto, Rev. des etudes juives, lix. (1910), 30 f.; also Exp. Times, xx. 270 f.

(Hio) a flight of fifteen semicircular steps led up from the court of the women.

On a level with the entrance and running round three sides of the inner court (so Josephus) was a narrow strip (B), about 18 ft. broad, called the " court of the men of Israel." The rest of the oblong area, however, was reserved for the priests and such of the laity as might require admission for the offering of their sacrifices. As in the lower court, the spaces between the gates were occupied by chambers, as to the purpose of which details are given in the Mishnah.

With regard to the more precise location of these temple courts, the present writer in the series of essays above referred to (see esp. Exp. Times, xx. 181 ff.), 1 has endeavoured to prove that the whole fortress-sanctuary within the great walls stood on what is now the inner platform of the Haram, the present extended area of which is indicated by the double dotted line on the plan.

According to the Mishnah (Middoth, ii. 5, 6) the upper and lower courts together formed a rectangle measuring 322 cubits from west to east by 135 cubits from north to south, the upper court 187 by 135, the

lower 135 by 135. But, on the one hand, no account is taken of the gate-towers and priests' chambers which lined the courts, and on the other, the frequent recurrence of the number 11 and its multiples in the details which make up the above totals awakens suspicion as to their accuracy. The measurements of the accompanying plan are based on a critical comparison of the data of the Mishnah and those of Josephus with the relation of the whole to the altar on the sakhra (see next section). The total area covered by the sanctuary, including the terrace or khel, is entered as 315 cubits (462 ft.) across the rock from west to east, and 250 cubits (367 ft.) from north. to south (for the detailed measurements see Exp. Times, xx. 181 ff., 271 ff.). The upper court shows an area of 170 cubits by 160, the lower court has a free space between the colonnades of 135 cubits (the Mishnah figure) by an average width of no cubits.

(c) The Altar of Burnt-offering. — Herod's great altar (D on the plan) was formed of unhewn stones, like that which preceded it. Its size, however, was increased till it formed a square, each side of which measured 32 cubits or 47 ft. at the base, thus occupying almost the whole of the exposed surface of the sakhra. The sides of the square decreased upwards by three stages until the altar-hearth was only 24 cubits square. The priests went up by an inclined approach on the south side (cf. Exod. xx. 26). To the north was the place where the sacrificial victims were slaughtered and prepared for the altar (cf. Levit. i. n). It was provided with rings, pillars, hooks and tables. A laver (O on the plan) for the priests' ablutions stood on the west of the altar ramp.

(d) The Temple Building. — A few yards to the west of the altar rose the temple itself, a glittering mass of white marble

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Fig. 4. — Diagrammatic Section of Herod's Temple and Porch.

and gold. Twelve steps, corresponding to the height (12 half- cubits) of the platform, led up to the entrance to the porch. In the disposition of its parts Herod's temple was in all essential

1 A summary of the results is given in the article " Temple " in Hastings' Diet, of the Bible (1909).

respects a replica of its two predecessors. But there were differences in details. Thus the porch was increased in width and height until its front elevation measured, according to our authorities, Josephus and the Mishnah, 100 cubits by 100. This, however, probably includes the platform, as the principles of proportion in relation to the other dimensions suggest 06 cubits by 96 (over 140 ft.) as the actual measurements. In shape the porch may be supposed to have retained its original likeness to an Egyptian pylon, as suggested in the accompanying diagram (fig. 4).

The holy place (F) retained its former area (40X20 cubits), but was raised in height to 40 cubits. A magnificent double curtain, embroidered in colours, screened off the most holy place, which remained a perfect cube of 20 cubits each way. By intro- ducing a passage-way giving access to the side-chambers and requiring an extra outer wall, Herod increased the width of the temple building to at least 60 cubits (70 according to the Mishnah).

The problem of the height of the naos remains almost as per- plexing as before. Josephus, it is true, agrees with the Mishnah {Middoth, iv. 6) in giving it a height of 100 cubits. It may be that Herod, " if he was forbidden to extend the House, would at least make it soar!" (G. A. Smith). But the details given by the Jewish doctors do not inspire confidence, for, as Fergusson long ago perceived, " one storey is merely an ill-urraerstood duplication

of the other." A more modest height of 60 cubits (88 ft.), equal to the extreme width, gives at least an element of proportion to the edifice which is altogether wanting in the traditional figures (compare the accompanying cross section, fig. 4).

The open entrance to the porch now measured 40 cubits by 20, equal to the section of the holy place. The " great door of the house," 20 cubits high and 10 wide, was covered with gold; in front was suspended a richly embroidered Babylonian veil, while above the lintel was fixed a huge golden vine.

(e) The Temple Furniture. — This remained as before. In the holy place in front of the holy of holies, still a dark and empty shrine, stood the altar of incense, against the south wall the seven-branched golden lampstand, and opposite to it the table of shewbread. The two latter, as every one knows, were carried to Rome by Titus, and representations of them may still be seen among the sculptures adorning the arch which bears his name.

When one considers the extraordinary height and strength of the outer walls of the temple area, parts of which excite the wonder of every visitor to the holy city, the wealth of art lavished upon the wide-extended cloisters, the imposing character of the temple facade, and the impression produced by the marble-paved terraces and courts rising in succession, each above and within the other, one is not surprised that the temple of Herod was reckoned among the architectural wonders of the ancient world. There is for once no exaggeration in the words of Josephus when he records that from a distance the whole resembled a snow-covered mountain, and that the light reflected from the gilded porch dazzled the spectator like " the sun's own rays " (Bell. Jud. V. v. 6).

Literature. — In addition to the primary sources, the Bible, Josephus, and the Mishnah treatise Middoth (ed. Surenhusius with commentaries), the commentaries and notes on Kings by Benzinger, Kittel, Stade, Burney and Skinner, the articles on

the temples in the recent Bible Dictionaries and the " Archaeologies " of Benzinger and Nowack, the following should be consulted: De Vogii6, Le Temple de Jerusalem (1864); Jas. Fergusson, The Temples of the Jews (1878); Perrot et Chipiez, Le Temple de Jerusalem (1889); C. Schick, Die Stiftshiitte, der Tempel, &c. (1896); W. Shaw Calde- cott, Solomon's Temple (1906), and The Second Temple, &c. (1908); R. Kittel, "Tempel" and " Tempel gerdte " in Herzog-Hauck, Realencyklopddie, 3rd ed. (1907), vol. xix. ; G. A. Smith, Jeru- salem, 2 vols. (1908, see index to each vol.) ; also W. R. Smith's art. " Temple " in Ency. Brit., 9th ed. For Herod's temple more especially see Maimonides' treatise Beth Ha-bekhira (the chosen house), trans, in Quart. Statement of Pal. Explor. Fund (1885); and the recent studies by Watson, ibid. (1896 and 1910); Water- house in Sanday's Sacred Sites of the Gospels (1903); A. R. S. Kennedy, " Some Problems of Herod's Temple," Expository Times, vol. xx. (i9o8-i909);G. Dalman, " Der zweite Tempel zu Jerusalem," in the Paldstinajahrbuch (1909) ; P. Berto, " Le Temple de Jeru- salem," Rev. des itudes juives, lix.-lx. (Jan.-July 1910), and the articles in the Jewish Encyclopaedia. For the study of the sit? the works of the English surveyors (see Jerusalem), including Sir C. Wilson's large-scale map of the Haram, are indispensable.

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Fig. 5. — Plan of M am m e i s i Temple, Philae.

Egyptian Temples. — In the architectural sense the earliest temples in Egypt probably consisted only of a small cella, or sanctuary, with a portico, such as are represented in the models of soul-houses found in 1907 by Flinders Petrie at Rifeh; in front of these various additions were made, so that

eventually the temple assumed far greater importance than was at first contemplated. This custom is at variance with that which takes place in the development of other architectural styles, where the older buildings are constantly taken down and rebuilt in accordance with the in- creased knowledge acquired in construction and design. It follows from this that although the Egyptian temples vary in their dimensions and extent, as a rule they present the same dis- position of plan. The principal exceptions to this rule are the sepulchral temples, such as those of Deir el Bahri, and the more ancient example adjoining it, discovered in 1906, in which there are no enclosed halls of columns or sanctuary, and the Mammeisi temples (fig. 5), which in plan resemble the Greek peristylar temples and might have been sug- gested by them, had not the example at Elephantine (destroyed in 1822) been of much earlier date, having been built by Amenophis III. (1414-1379).

The earliest example of which remains have been found is the temple built by Cephren in front of his pyramid at Memphis, and this consisted only of a sanctuary of small size without any archi- tectural pretensions. The next in date would be the sepulchral temple built by Mentuhotep (2832-2796) adjoining Deir el Bahri at Thebes; then follows the sanctuary of Karnak, built by Senwosri (Usertesen) I. (2758-2714), which formed the nucleus of that immense temple, which covered an area of 400,000 sq. ft. This temple may be taken as an extreme type of the accumulation which is found in nearly all the Egyptian temples, owing to the additions made to the original structure by successive monarchs, instead of rebuilding, as was the general custom in all other styles. To a certain extent the same conservative principle seems to have governed the design of all other temples, and even tne temple at Edfu, which was set out on a plan conceived from the first, has the appearance of having been added to at various periods, the fronts of the inner halls showing inside those built in front. It is not only in the plan that the close resemblance of one

building to another is shown; the architectural design is repeated in the earliest and latest temples; the raking sides of the pylons and walls with the torus-moulding of the quoins and the cavetto cornice are identical, so that it is only by the inscriptions that one is able to ascribe the buildings to the kings of the 18th or following dynasties and distinguish them from those erected by the Ptolemies, or even under Roman rule. The only differences are those exhibited in the great halls of columns, which, in the earlier temples, were built in between the pylons and side walls, receiving their light through clerestory windows, as at Karnak (fig. 6), the other temples in its vicinity and the Ramesseum; whereas in the later temples

Fig* 6.- — Hall of Columns, Karnak.

on one side of the walls a screen was built between the columns, over which the interior was lighted. The second change was that made in the capitals of the columns, which are of wonderful diver- sity of design, even in the same hall, including every variety of river plant, in addition to the papyrus and lotus flowers; in the later temples also the columns are more slender in their propor- tions and not set so closely one to the other. Although generally the temples are built symmetrically on a

central axis, with walls at right angles to one another, there are some special exceptions; thus the axial line of the great entrance court of the temple at Luxor is at an angle of about 15 with that of the temple in its rear, and in the island of Philae no two buildings are on the same axis or are parallel to or at right angles to one another, thus conforming to the irregular site on which they were built.

Assyrian. — The temple in Chaldaea or Assyria (known as a ziggurat) was of an entirely different class, and took the form of a many-storeyed structure, of which the typical example is the Birs Nimrud. This originally consisted of six storeys, each one set

behind the other, so as to admit of a terrace round each, the upper storey being crowned by a shrine.

_ Access to the several storeys was obtained by flights of steps, either lying parallel with the front or in one continuous flight in centre of same, or again as at Khorsabad by a ramp winding round the tower; the architectural design consisted of sunk panels on the various storeys with battlement parapets, and, like the Birs Nimrud, the several storeys were dedicated to the seven planets, the walls being enriched with the colours sacred to each.

Greek and Roman. — In Greece the earliest example of a temple is that of the Heraeum at Olympia, ascribed by Dr Dorpfeld to the 10th century B.C. The Heraeum (fig. 7) consisted of

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Fig. 7. — The Heraeum. From Curthis and Adler'3 Olympia, by permission of Behrend & Co.

a central naos or sanctuary with pronaos in front and opis- thodomus in the rear, the whole enclosed by a peristyle, thus presenting the characteristics of the fully developed temple of the 5th century. As, however, the description of the several types would be rendered clearer if they were taken from the simplest plan to the more elaborate, adopting to a certain extent the definitions given by Vitruvius, they are as follows: —

Distyle-in-antis, a cella or naos preceded by a portico of two columns placed between the prolongation of the cella wall. Fig. 8. The Temple of Themis Rhamnus.

Fig. 8.

Fig. 9.

Fig. 10.

Amphidistyle-in-antis, similar to the foregoing but with a second portico in the rear. Fig. 9. The Temple of Diana Propyloea, Eleusis.

Tetrastyle prostyle, with a portico of four columns in front. Fig. 10. The Temple B. Selinus, Sicily.

Tetrastyle amphiprostyle, with an additional portico of four columns in the rear. Fig. 1 1 . The Temple of Nike Apteros, Athens.

Hexastyle peripteral, six columns in front and rear and a peristyle round the cella form- ing a covered passage round. Fig. 12. The Temple of Theseus, Athens.

OctostyU peripteral, eight col- umns in front and rear and a peristyle round. Fig. 13. The Parthenon, Athens.

Octostyle dipteral, eight columns in front and rear and a double row in the peristyle. Fig. 14. The Temple of Jupiter Olympius, Athens.

Octostyle pseudo-dipteral, similar to the last, except that the inner row of columns is omitted, thus giving a passage round of twice the ordinary width. Fig. 15. The Temple of Apollo (Smin- theus), Troad.

Decastyle dipteral, ten columns in front and rear and a double row in the peristyle. Fig. 16.

Fig. 11.

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Fig. 12.

Fig.

The Temple of Apollo Didymaeus, at Branchidae, near Mil- etus.

To these there are a few exceptions :—

Heptastyle pseudo-peripteral, seven columns in front and rear with walls built in between the outer range of columns, so that they were only semi-detached, as in the temple of Jupiter Olympius at Girgenti.

Enneastyle peripteral, nine columns in front and rear and a peristyle round as in the so-called Basilica at Paestum. Of circular temples there were two varieties :—

Monopteral, a series of columns built in a circle, but without any cella in the centre ; and

Peripteral, with a circular cella in the centre. 17. The Philippeion, Olympia.

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Fig. 15.

Fig. 16.

The above definitions apply to Greek temples, whether of the Doric, Ionic or Corinthian orders. The Romans in some of their temples adopted the same disposition, but with this important difference, that, instead of the temple resting on a

Fig. 17.

stylobate of three steps, it was raised on a podium with a flight of steps in front. In some of their temples, requiring a larger cella wherein to store their works of art, it occupied in the rear the full width of the portico in front; they retained, however, the semblance of the peristyle, the columns of which became semi-attached to the cella wall. If the portico had four columns, the temple was known as tetrastyle pseudo- peripteral, of which the so-called temple of Fortuna Virilis at Rome is an example; and if six columns, hexastyle pseudo-peripteral, as in the Maison Carree at Nimes.

In front of the naos or cella of the Greek temple there was always a pronaos, viz. a vestibule with two or more columns in antis, and in the rear a similar feature known as the opisthodomus or treasury ; in a few cases, as in the Parthenon, this formed a separate chamber, which was entered through a similar vestibule to that in front of the naos; this same vestibule in the absence of the separate chamber was sometimes enclosed with bronze grilles and used as the opisthodomus; the Latin term posticum is frequently given to this rear vestibule,

for which the Germans and Americans have adopted the term epinaos when speaking of Greek temples. In Roman temples the posticum is rarely found; the portico, on the other hand, was increased in importance, being frequently the depth of three bays or columniations. In most of the early Greek temples the cellas were comparatively narrow, owing to the difficulty of roofing them over, as the Greeks do not seem to have been acquainted with the principle of the trussed beam. When therefore more than the usual width was required it became necessary to introduce columns on each side within the cella to carry the ceiling and roof, the earliest example of which existed in the Heraeum at Olympia. There are two other temples in which some of these internal columns still exist, as in the temples at Aegina and Paestum. At Aegina there were five columns on each side, carrying an archi- trave with five smaller columns superposed; in the temple of Neptune at Paestum there were seven on each side; and in the Parthenon nine columns and a square pier at the end with three columns in the rear, thus constituting an aisle on three sides, round which privileged visitors, like Pausanias, -were allowed to pass, there being bronze rails between the columns. In the temple of Zeus at Olympia traces of the barriers have been found, as also of an upper gallery, access to which was given by a wooden staircase. The question of the lighting of these temples has never

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Fig. 18.

Fig. 19. — Temple of Aphaea at Aegina. West Front.

been definitely settled; it is probable that as a rule the only direct light received was that through the open doorway (see Hyfaethros). In the earliest temples, those of the Heraeum at Olympia, of Apollo at Thermon, and the archaic temple at Argos, the columns of the peristyle were in wood and carried a wooden architrave ; in the Heraeum the wooden columns were replaced by columns in stone when they showed signs of deterioration ; the earliest stone columns which were introduced date from the 6th century, and Pausanias in the 2nd century saw one wood column still in situ in the opisthodomus. From about the middle of the 7th century

the columns were always in stone, and were generally built in several courses with drums or frusta, there being very few instances of monolith columns in Greek temples; the Romans, on the other hand, in their principal columns considered the monolith to be more monumental, and not only employed the finest Greek marbles to that end, but used granite and porphyry.

The favourite type of Greek temple was that known as hexa- style peripteral, of which the temple of Aphaea at Aegina, of the

Fig. 20.

Doric order, is one of the best-preserved examples; on account of the width of its naos it was necessary to provide columns inside it to carry the ceiling and the roof, so that it represents the fully developed type of a Greek temple. The plan of the temple is shown in fig. 18; the elevation is given in fig. 19, representing the west front, the columns of which rest on a stylobate of three steps, and carry the entablature and pediment. Fig. 20 shows

the three first columns of the flank elevation, the entablature carried by them, and the tiled roof with antefixa and crested ridge.

Fig. 21.

Fig. 21 gives the section through the stylobate, peristyle and pronaos, and half of the naos, showing the superposed columns, ceiling and roof, all based on the conjectural restoration by Cockerell. The temple of Aegina is supposed to have been erected about 500 B.C., the magnificent sculpture with which it is enriched being added c. 480 B.C. The temple was built of a fine calcareous stone from quarries close by, which was coated over with a thin layer of stucco of lime and marble dust; this enabled the masons to give finer profiles to the mouldings, and afforded a field for colour, of which the restoration is shown in Cockerell's Temple of Aegina, from which the illustrations are taken; the cymatium and the tiles covering the roof were in Parian marble.

The Greek Temples were always enclosed in a temcnos, in which

were other shrines, altars and treasuries; in Athens the temenos was the Acropolis, on which the temples were built; at Delphi it was in a valley on inclined ground ; and in Girgenti the temples were raised on the ridge of a hill ; in all these cases the Greeks accepted the inequalities of the site, and, adding art to nature,

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Fig. 22.

united their work with that of the Creator, so that it seemed to form part of the same design. Some of the sites of the temples, such as those at Olympia, Epidaurus and Delos, were practically level, but even in those the temples and other structures were arranged in groups, thus producing a much more picturesque effect than in those of the Romans,

which, when enclosed, were always

planned on axial lines and raised on artificial platforms or terraces, as at Baalbek, Palmyra and Aizani, with peristyles round the raised court. The best-preserved Roman temple is that known as the Maison Carree at Nimes in the south of France, a hexastyle pseudo-peripteral temple, of which the elevation is given in fig. 22 and. the plan in fig. 23. It was of the Corinthian order, and instead of a stylobate of three steps was raised on a podium 11 ft. high with a flight of steps in front. For further descriptions of both the Greek and Roman temples see Architecture.

(R. P. S.)

TEMPLE BAR, an historic site in London, England. In more than one of the main roads converging upon the city of London a bar or chain marked the extra-mural jurisdiction of the Corporation. Temple Bar stood at the junction of the present Strand and Fleet Street, over against the Law Courts. A bar is first mentioned here in 1301, but the name is most familiar in its application to the gateway designed by Sir Christopher Wren, which replaced an older structure on this spot in 1672. This was removed in 1878, and set up in 1888 at the entrance to Theobalds Park near Cheshunt, Hertfordshire. A pedestal surmounted by a dragon or " griffin " marks the old site. When the sovereign is about to enter the city in state, whether by Temple Bar or elsewhere, the Lord Mayor, in accordance with ancient custom, presents the sword of the city to him, and he at once returns it. Formerly the bar or gate was closed against the sovereign until this ceremony was carried out.

TEMRYUK, a seaport of Russia, in northern Caucasia, and in the government of Kuban, on the Sea of Azov, 81 m. W.N.W. of Ekaterinodar. Pop. (1897) 14,476.

Here was a Turkish fortress, Abas, till 1774. The place is now a growing seaport for the export of grain, and has many flour-mills.

TENANT (from Lat. tenere r to hold), one who holds real property by some form of title from a landlord. For the forms of tenancy, &c, see Landlord and Tenant.

TENANT-RIGHT, in law, a term expressing the right which a tenant has, either by custom or by law, against his landlord for compensation for improvements at the determination of his tenancy. In England it is governed for the most part by the Agricultural Holdings Acts and the Allotments and Small Holdings Acts (see Landlord and Tenant). In Ireland, tenant-right was a custom, prevailing particularly in Ulster, by which the tenant acquired a right not to have his rent raised arbitrarily at the expiration of his term. This resulted in Ulster in considerable fixity of tenure and, in case of a desire on the part of the tenant to sell his farm, made the tenant-right of considerable capital value, amounting often to many years' rent.

TENASSERIM, a division of Lower Burma, bordering on Siam. Area, 36,076 sq. m. Pop. (1001) 1,159,558, including 38,269 Christians, the great majority of whom are Karens. The headquarters of the commissioner are at Moulmein. It is divided into six districts: Toungoo, Salween, That6n, Amherst, Tavoy and Mergui. It formed the tract south of Pegu conquered from Burma in 1826, which was for many years known as the Tenasserim province. The southern extremity of the division approaches the insular region of Malaysia, and it is fringed along its entire western coast by a number of islands, forming in the north the Moscos and in the south the Mergui Archipelago. The eastern frontier is formed by a mountain range 5000 ft. high, which acts as a water-parting between the Tenasserim and the Siamese river systems.

TEN BRINK, BERNHARD EGIDIUS KONRAD (1841-1892), German philologist, of Dutch origin, was born at

Amsterdam on the 1 2th of January 1841, but was sent to school at Diisseldorf, and afterwards studied at Mtinster, and later under Diez and Delius at Bonn. In 1866 he began to lecture at the Mtinster Academy on the philology of the English and Romance languages. In 1870 he became professor of modern languages at Marburg, and after the reconstitution of Strassburg University was ap- pointed professor of English there in 1873. In 1874 he began to edit, in conjunction with W. Scherer, E. Martin and E. Schmidt, Quellen und Forschungen zur Sprache und Kullur- geschichte der germanischen Volker. He devoted himself for many years to the study of Chaucer. In 1877 he published Chaucer: Studien zur GeschicMe seiner Entwickelung und zur Chronologic seiner Schriften; in 1884, Chaucers Sprache und Verskunst. He also published critical editions of the Prologue and the Com- pleynte to Pitt. Ten Brink's work in this diiection stimulated a revival of Chaucer study in the United Kingdom as well as in Germany, and to him was indirectly due the foundation of the English Chaucer Society. His Beowulf-Untersuchungen (1888) proved a hardly less valuable contribution to the study

of Early English literature. His best known work is his Geschichte dcr englischen Literatur (1889-93), (English by H. Kennedy in Bohn's Standard Library), which was unfortunately never completed, and broke off just before the Elizabethan period. It was his intense admiration of Shakespeare that first attracted him to the study of English, and five lectures on Shakespeare delivered at Frankfort were published after his death (1893). Ten Brink died at Strassburg on the 29th of January 1892. He was a great teacher as well as an accurate and brilliant writer, and from many countries students flocked to his lecture-room.

TENBURY, a market town in the Bewdley parliamentary division of Worcestershire, England, on the Kidderminster- Wooferton branch of the Great Western railway, 1 53 m. W.N.W. of London. Pop. (1901) 2080. It is pleasantly situated on the right bank of the Teme, here the boundary with Shropshire. The town

has a spa, whose waters are efficacious in rheumatic affections and diseases of the skin. The church of St Mary the Virgin has Norman remains in the tower and chancel. The district produces hops and fruit, and there is trade in cider. The Teme abounds in trout and grayling, and Tenbury is in favour with anglers. At Old Wood, 2 m. S.W. of Tenbury, are St Michael's church and college (1858), founded and partially endowed by the Rev. Sir Frederick Gore Ouseley, in which the ordinary preparatory education of boys is combined with a school for choristers and instruction in ecclesiastical music.

TENBY, a market town, seaside resort, a municipal and contributory parliamentary borough of Pembrokeshire, Wales, finely situated on a long narrow promontory of limestone rock washed on three sides by the sea on the west shore of Carmarthen Bay. Pop. (1901) 4400. Tenby is a station on the Whitland- Pembroke Dock branch of the South Wales system of the Great Western railway. Its chief attractions as a watering-place are its picturesque appearance and surroundings; its extensive antiquarian remains, its mild climate and its two excellent beaches known as the North and South Sands. The ancient town walls survive almost intact on the north and west sides, and retain the fine St George's gateway, locally called the " Five Arches." These walls, which were largely rebuilt by Jasper Tudor, earl of Pembroke, during the Wars of the Roses, were again repaired under Elizabeth during the alarm of the Spanish invasion, as is shown by a contemporary tablet bearing the queen's cipher and the date 1588. The inconsiderable ruins of the castle, presenting a portion of the keep and outer walls, occupy a rocky peninsula to the S.E. of the town known as the Castle Hill, which also contains the Welsh national monu- ment to Albert, prince consort, an immense statue and pedestal of "white marble erected in 1865. Upon the Castle Hill is a Small museum, containing some antiquities and good collections of the local flora and marine fauna, for which last Tenby has long been celebrated. Opposite the Castle Hill, about 100 yds. distant, but only

accessible to foot passengers at low tide, is St Catherine's Rock with a fort constructed in 1865. Facing the Esplanade and South Sands, about 25 m. from the shore, stretches Caldy Island, 1 m. in length and f rd m. in breadth, with a population of seventy persons and containing a ruined priory, which was a subsidiary house to St Dogmell's Abbey. To the west, between Caldy Island and Giltar Point on the mainland, lies St Margaret's Rock. The parish church of St Mary, situated at the northern end of Tudor Square, the principal open space in the town, is one of the largest churches in South Wales, and exhibits all varieties of architecture from the 12th to the 16th centuries. Its massive tower, crowned with a spire, is 152 ft. high, and forms a prominent object in all views of the town. The handsome interior is remarkably rich in early tombs and monuments, the most important of them being the elaborate altar-tomb of John and Thomas White (c. 1482), members of an opulent family of merchants long seated in Tenby. In the adjoining churchyard are some remains of the Carmelite friary founded by John de Swynemore in 1399. The harbour on the northern beach is protected by an ancient stone pier, and in 1895 ar> iron pier was erected below

the Castle Hill for the convenience of the steamboats which ply between the town and Bristol, Ufracombe, &c. The trade of Tenby is inconsiderable, but the fisheries, for which the place was noted at an early period and which gave it its Welsh name of Dinbych y Pysgod, are of great value.

The name of Tenby is undoubtedly a corrupted form of Daneby, recalling the Scandinavian origin of the place. The real importance of Tenby dates from the 12 th century, when walls, castle and church were erected for the convenience of the Flemish colonists, who were then being planted in Dyfed. On more than one occasion the newly-founded town was captured, sacked and destroyed by marauding bands of

Welshmen, notably in 1152; but on each occasion the place was rebuilt and refortified by the earls-palatine of Pembroke, who greatly favoured this important settlement. The first earl of Pembroke to grant a charter of incorporation was William de Valence, 9th earl (temp. Henry III.), and these privileges were extended by his successor, Earl Aylmer. Henry IV., by a charter ob- tained in 1402, vested the government of the town in a mayor and two bailiffs to be elected annually. Elizabeth in 1580 confirmed all previous charters and incorporated the freeholders under the designation of " the mayor, bailiffs and burgesses of the borough of Tenby." During the 15th century and under the Tudors the town grew extremely prosperous, and contained many wealthy mercantile families, of which that of White offers the most striking example. A member of this house, Thomas White, whilst mayor of Tenby, did signal service to the Lan- castrian cause in 147 1 by harbouring Jasper Tudor, earl of Pembroke, and his nephew Henry Tudor, earl of Richmond (afterwards King Henry VII.), prior to their escape to France. John Leland (c. 1 540) described Tenby as being " very wealthy by merchandise," and noted its stone pier and well-built walls. The town suffered severely during the Civil Wars, undergoing two sieges, firstly in 1644 when the parliamentarian, Colonel Laugharne, took the place by storm, and secondly in 1648 when it capitulated to Colonel Horton. After the Restoration the importance and wealth of Tenby showed a constant tendency to decline, but towards the close of the 18th century it rose into great popularity as a watering-place, and it has since maintained its reputation as the most picturesque seaside resort of South Wales. Since 1536 Tenby has been a contributory borough to the Pembroke (now Pembroke and Haverfordwest) parlia- mentary district.

TENCH (Tinea vulgaris), a small fish of the Cyprinid family, which is one of the commonest and most widely spread fresh- water fishes of Europe. It is generally distributed in all suitable localities throughout England, but is limited to a few lakes

and ponds in the south of Scotland and in Ireland. As the tench is of comparatively uncommon occurrence in unenclosed waters, its place among the indigenous fishes of Great Britain has been denied, and it has been supposed to have been introduced

Tench.

from the Continent; a view which, however, is not supported by any evidence, and is practically disposed of by the fact that fossil remains of the fish are found in the Pleistocene deposits of Great Britain. In central Europe it thrives best in enclosed, preserved waters, with a clayey or muddy bottom and with an abundant vegetation; it avoids clear waters with stony ground, and is altogether absent from rapid streams. The tench is distinguished by its very small scales, which are deeply imbedded in a thick skin, whose surface is as slippery as that of an eel.

All the fins have a rounded outline; the short dorsal fin is without a spine, but the males possess a very thick and flattened outer ray in the ventral fins. The mouth is rather narrow and provided at each corner with a very small barbel. Tench if kept in suitable waters are extremely prolific, and as they grow within a few years to a weight of 3 or 4 lb, and are then fit for the table, they may be profitably introduced into ponds which are already stocked with other fishes, such as carp and pike. They live on small animals or soft vegetable substances, which they root up from the bottom. The albino variety especially, which is known as the ” golden tench,” can be recommended for orna- mental waters, as its bright orange colours render it visible for some distance below the surface of the water. This variety, which seems to have been originally bred in Silesia, is not less well- flavoured than the normally coloured tench, and grows to the same size, viz., to 6 and even 8 lb.

The tench is really an excellent fish for the table, if kept in cool, clear water for a few days, as it is the custom to do in Germany, in order to rid it

of the muddy flavour imparted to it by its favourite abode.

TENCIN, CLAUDINE ALEXANDRINE GUERIN DE (1681- 1749), French courtesan and author, was born at Grenoble. Her father, Antoine Gu6rin, sieur de Tencin, was president of the parlement of Grenoble. Claudine was brought up at a convent near Grenoble and, at the wish of her parents, took the veil, but broke her vows and succeeded, in 1714, in gaining formal permission from the pope for her secularization. She joined her sister Mme. de Ferriol in Paris, where she soon estab- lished a salon, frequented by wits and roues. Among her numerous lovers were the Chevalier Le Camus Destouches, the due de Richelieu, and according to her biographer many other persons of distinction. The last of her liaisons had a tragic ending. M. de la Fresnaye committed suicide in her house, and Mme. de Tencin spent some time in the Chatelet in conse- quence, but was soon liberated as the result of a declaration of her innocence by the Grand Conseil. From this time she devoted herself to political intrigue, especially for the prefer- ment of her brother the abb6 Tencin, who became archbishop of Embrun and received a cardinal's hat. Eventually she formed a literary salon, which had among its habitue's Fontenelle, Montesquieu, the abb6 de Saint Pierre, Pierre Marivaux, Alexis Piron and others. Hers was the first of the Parisian literary salons to which distinguished foreigners were admitted, and among her English guests were Bolingbroke and Chesterfield. By the good sense with which she conducted what she called her " menagerie," she almost succeeded in effacing the record of her early disgrace. She was a novelist of considerable merit. Her novels have been highly praised for their simplicity and charm, the last qualities the circumstances of the writer's life would lead one to expect in her work. The best of them is M&moires du comte de Comminges (173s), which appeared, as did the other two, under the name of her nephews, MM. d'Ar- gental and Pont de Veyle, the real authorship being carefully concealed. Mme. de Tencin died on

the 4th of December 1749.

Her works, with those of Mme. de la Fayette, were edited by fitienne and Jay (Paris, 1825); her novels were reprinted, with introductory matter by Lescure, in 1885; and her correspondence in the Lettres de Mmes. de Villars, de La Fayette et de Tencin (Paris, 1805-1832). See P. Masson, Madame de Tencin (Paris, 1909).

TENCIN, PIERRE GUERIN DE (1679-1758), French ecclesi- astic, archbishop of Embrun and Lyons, and cardinal, was born at Grenoble on the 22nd of August 1679. He owed his quick advance to power to his sister Claudine (see above). He was a strong opponent of the Jansenists, and in 1742 was appointed a minister of state to Louis XV., though he held no portfolio. He died on the 2nd of March 1758.

TENDER. (1) An adjective meaning soft, either physically or figuratively, derived from Fr. tendre, Lat. tener, soft, allied to tenuis, thin, and ultimately to be referred to the root, tan-, to stretch out, as in Lat. tendere. (2) A legal term meaning an offer for acceptance, particularly an offer in money for the satisfaction of a debt or liability or an offer to pay or deliver

according to the terms of a contract; for " legal tender," the currency which can legally be offered and must be accepted in payment, see Payment. The term is also applied specifically to an offer to do a specified piece of work or to supply certain goods for a certain sum or at a certain rate or to purchase goods at a certain rate. Contracts for large or important works or for the supply of large amounts of goods are usually put out to tender in order to secure the lowest price. In this sense the word is from " to tender," to offer, Fr. tendre, Lat. tendere, to stretch out. (3) A " tender " is

also one who " attends " (Lat. attendere, to stretch towards, to give heed to), and so is applied particularly to a small vessel which brings supplies, pas- sengers, &c, to a larger vessel, or which is used to take or bring messages from or to her, and similarly to a carriage attached to a locomotive engine on a railway which carries coal or other fuel and water.

TENEBRAE (Lat. for "shadows," "darkness"), the name for an office sung in Roman Catholic churches on the afternoon or evening of Wednesday, Thursday, and Friday of Holy Week. The name is derived, according to Durandus (Ration., lib. vi. cap. 72, n. 2), from the fact that " the church on these days cultivates darkness (tenebras colit): firstly because it is in sorrow and grief on account of the Lord's Passion, and because for three days it celebrates his exequies since for three days he was dead; secondly, the office of Tenebrae symbolizes the darkness that fell on the face of the earth while the Sun of justice was hung upon the cross," &c. The falling darkness is symbolized by a peculiar and singularly impressive ceremony (see Lights, Ceremonial).

TENEMENT (Med. Lat. tenementum, from tenere, to hold), in law, a term which, according to Coke, " includes not only all corporate inheritances which are or may be holden, but also all inheritances issuing out of those inheritances, or concerning, or annexed to, or exercisable within the same " (Co. Litt. 20a). In its more general legal sense it is applied to realty, as opposed to personalty. In its popular sense tenement is used as mean- ing a house or dwelling, and, more particularly in large cities, tenement houses are buildings occupied by several families living independently of one another, but having a common right in the hall, staircases and outhouses. In the heart of great towns the problem of housing is a difficult one, and it is only of recent years that attention has been directed to the un- suitable and insanitary condition of many houses occupied on the tenement system as defined above, but in many cases never built with the conveniences necessary for joint occupation. In most of the large

cities in Great Britain and the United States tenement houses are now built on the most modern plans (see Housing), and it is to be noted that the municipality of New York has a special Tenement-house Department, under charge of a commissioner, with wide authority to supervise the structure of tenement houses and their occupancy in the interest of health and general welfare.

TENERIFFE [Tenerife], the largest of the Canary Islands; in the Atlantic Ocean, and belonging to Spain. Pop. (1900) 138,008; area, 782 sq. m. Teneriffe lies a little west of the centre of the archipelago, between the islands of Grand Canary and Gomera. It is of irregular shape, 60 m. long, with an extreme breadth of 30 m. A chain of mountains traverses the island in the direction of its greatest length (east to west), and in the middle of the broadest part rises the celebrated peak, locally known as the Pico de Teyde (or Teide), which, with its supports and spurs, occupies nearly two-thirds of the whole island. It has a double top; the highest point, El Piton, is 12,200 ft. above the sea; the other, Chahorra, connected with the first by a short narrow ridge, has a height of 9880 ft. They are both orifices in the same grand dome of trachyte. Neither reaches the line of perpetual snow. There is, however, a natural cavern, 11,050 ft. above the sea, where snow is preserved all the year. Snow remains for about four months on the upper part of the peak.

For more than one-half of its circumference the base of the true peak rises from an elevated but comparatively level tract, called

by the Spaniards El Llano de la Retama (relama being the name of the Cytisus nubigenus which abounds there), and by the English the Pumice-Stone Plains. On the south-east, south and south-west there is a high curved ridge overlooking the Pumice-Stone Plains, and presenting a very steep face to the peak. Between the ridge and the sea the slope is more gradual, and there are intervening table-lands. Peaks rise from the ridge, one of which

(Guajara) attains the height of 8900 ft. This ridge (the Llano) and the modern volcanic cone resemble in aspect a fortress with circular ramparts and a fosse. The ramparts are about 8 m. in diameter, and tower in some places more than 1500 ft. above the fosse. On the north- west comparatively late eruptions have filled up the fosse. The modern cone is a pile of lava, pumice and ashes, thrown up in an ancient crater which had become greatly enlarged either by a falling in of the upper part of the cone, or by a series of violent explosions. Both El Piton and Chahorra have craters on their summits, from which issue steam and a little sulphurous vapour. The crater on El Piton is partly surrounded by a wall of lava, which has been made white by the action of sulphurous vapours, and every crevice contains small crystals of sulphur. The thermometer rises con- siderably when thrust into the ground. The crater is about 300 ft. across, with a depth of 70 ft. The crater on Chahorra has a diameter of 4000 ft. ; its depth is scarcely 150 ft. The view from the highest point, when no clouds intervene, is very extensive. All the islands of the archipelago are visible, and the horizon is 140 m. distant. Neither the coast of Africa nor the island of Madeira is within the range of vision.

The ascent of the peak is usually made from Orotava, on the northern side of the island. After the cultivated grounds are left, the region of arborescent heaths is crossed. Above this is a belt covered with codeso (Adenocarpus frankenioides) , and this extends to the region of retama, the first bushes of which are found at the pass which admits the traveller into the Llano de la Retama. The scenery here is in striking contrast with what it has previously been. Instead of a steep and rugged ascent among black basaltic rocks, the traveller enters upon gently sloping ground, covered to a con- siderable depth with white pumice gravel, amongst which spring bushes of retama. The tender shoots of this shrub serve the wild goats for food, and the flowers yield a rich honey. The entrance to the Llano at a sort of natural gateway (called Portillo)

between two basaltic hills, is about 7000 ft. above the sea. Between two and three hours are consumed in crossing the Llano to the base of the cone, the lower part of which (Monton de Trigo) is ascended to a point 9750 ft. above the sea, called Estancia de los Ingleses, where the mules are usually left, and travellers frequently pass the night. Then comes the Malpays, 1000 ft. in altitude, consisting of rough black lava streams broken up into blocks and stones. These cease at the Rambleta, the lip of an older crater over which the lava poured before the sugar-loaf cone of pumice and ashes was thrown up. The pumice is in such quantity that at a distance it has the appearance of snow coating the peak. From twenty to twenty-four hours are consumed in ascending the peak and returning to Orotava.

To the north-west of the grand cone, some thousands of feet below Chahorra, there are many small cones of eruption, showing that the intensity of volcanic action was greatest on this side. East- ward from the ridge bounding the Pumice-Stone Plains extends a chain of mountains to the north-eastern extremity of the island. The highest peaks are Izana (7374 ft.), Perejil (6027), and Cuchillo

(54°7).

There is no record of eruptions from either crater of the peak. In 1795 a great quantity of lava was poured out from three vents on the eastern side; and in the same year lava streams issued from a crater near Guimar, half-way between Santa Cruz and the peak. In the year 1706 a vent on the north-western side of the peak dis- charged a copious stream, which flowed down to the sea, and nearly filled up the harbour of Garachico. For three months in 1798 much lava and other volcanic matter were ejected from orifices to the west of Chahorra.

Santa Cruz, the capital of Teneriffe and of the Canaries (pop. 1900, 38,419), and La Laguna (13,074), the former capital, are described in separate articles. A good road connects Santa Cruz and Orotava, a town on the north coast 25 m. W.N.W.

It passes through Laguna and Matanza — a place deriving its name from the overthrow of the invading Spaniards by the Guanches in 1494. All travellers speak in terms of warm ad- miration of the scenery in this part of the island. Date-palms form a striking feature in the landscapes. The town of Orotava (pop. 9192) is 1040 ft. above the sea. The houses are solidly built, but it has a deserted aspect. A stream of water is con- ducted through every street. The famous dragon-tree, which so many travellers have described, no longer exists. Port Orotava, 3 m. N. of the town, is a clean place, with about 4500 inhabitants. The streets are broad and the houses well built. The roadstead, protected by a fort and some batteries, affords little or no shelter against wind. At Icod de los Vinos, a pretty town of

4000 inhabitants, farther to the west, in a fertile district, is a dragon-tree, the largest now existing in the island. The stem near the ground has a circumference of 38 ft. and its height is upwards of 60 ft. Near the town is an immense cavern, in which many Guanche bones were found. There are several other towns of less importance, principally in the north-west, not far from the coast. The highest inhabited place is Chasna, on a plain more than 4000 ft. above the sea, to the south of the peak. See also Canary Islands.

TENIERS, the name of a family of Flemish artists who flourished at Antwerp and Brussels during the 17th century.

David Teniers, the elder (1 582-1649), was born at Antwerp. Having received his first training in the painter's art from his brother Juliaen, he studied under Rubens in Antwerp, and subse- quently under Elsheimer in Rome; he became a member of the Antwerp gild of painters in 1606. Though his ambition led him at times to try his skill in large religious,

historical and mythological compositions, his claim to fame depends chiefly on his landscapes and paintings of peasants carousing, of kermesse scenes and the like, which are marked by a healthy sense of humour, and which are not infrequently confused with the early works of his son David. There is a large painting by the elder Teniers at St Paul's church in Antwerp, representing the " Works of Charity." At the Vienna Gallery are four landscapes painted by Teniers under the influence of Elsheimer, and four small mythological subjects, among them " Vertumnus and Pomona," and "Juno, Jupiter and Io." The National Gallery has a characteristic scene of village life, " Playing at Bowls," a " Conversation " of three men and a woman, and a large " Rocky Landscape." Other examples of his work are to be found at the galleries of St Petersburg, Madrid, Brussels, Munich, Dresden and Berlin (" The Temptation of St Anthony "). Teniers also achieved success as a picture dealer, and is known to have attended the fair of St Germain in Paris in 1635, with a large number of paintings by himself and by his four sons. He died at Antwerp in 1649.

David Teniers, the younger (1610-1690), the more cele- brated son of the last-named, almost ranking in celebrity with Rubens and Van Dyck, was born in Antwerp on the 15th of December 1610. Through his father, he was indirectly in- fluenced by Elsheimer and by Rubens. We can also trace the influence of Adrian Brouwer at the outset of his career. There is no evidence, however, that either Rubens or Brouwer inter- fered in any way with Teniers's education, and Smith {Catalogue Raisonne) may be correct in supposing that the admiration which Brouwer's pictures at one time excited alone suggested to the younger artist his imitation of them. The only trace of personal relations having existed between Teniers and Rubens is the fact that the ward of the latter, Anne Breughel, the daughter of John (Velvet) Breughel, married Teniers in 1637. Admitted as a " master " in the gild of St Luke in 1632, Teniers had even before this made the public acquainted with his works. The Berlin Museum possesses a group of ladies

and gentlemen dated 1630. No special signature positively distin- guishes these first productions from those of his father, and we do not think it correct to admit with some writers that he first painted religious subjects. Dr Bode, in a remarkable study of Brouwer and his works, expresses the opinion that Teniers's earliest pictures are those found under the signature " Tenier." Tenier is a Flemish version of a thoroughly Walloon name, " Taisnier," which the painter's grandfather, a mercer, brought with him when he came from Ath in 1558; and Dr Bode's supposition is greatly strengthened by the circumstance that not only David the elder but his brother Abraham and his four sons were all inscribed as " Tenier " in the ledgers of the Antwerp gild of St Luke. Some really first-rate works— the " Prodigal Son " and a group of " Topers " in the Munich Gallery, as well as a party of gentlemen and ladies at dinner, termed the. " Five Senses," in the Brussels Museum — with the above signature are remarkable instances of the perfection attained by the artist when he may be supposed to have been scarcely twenty. His touch is of the rarest delicacy, his colour at once gay and

harmonious. Waagen and Smith agree that the works painted from 1645 to 1650 testify most highly to the master's abilities; there is no doubt that a considerable number of earlier produc- tions would have been sufficient to immortalize his name. He was little over thirty when the Antwerp gild of St George enabled him to paint the marvellous picture which ultimately found its way to the Hermitage Gallery in St Petersburg — the " Meeting of the Civic Guards." Correct to the minutest detail, yet striking in effect, the scene, under the rays of glorious sunshine, displays an astonishing amount of acquired knowledge and natural good taste. This painting leads us to mention another work of the same year (1643), now in the National Gallery, London, " The Village Fete " (or " La fete aux chaudrons ") (No. 952), an equally beautiful repetition of which, dated 1646, belongs to the duke of Bedford. Truth in physiognomy, distribution of

groups, the beautiful effect of light and shade, command our warmest admiration. A work like this, says Waagen, stamps its author as the greatest among painters of his class. Frankness in expression and freedom in attitude guided his preference in the choice of a model, but we may suppose him occasionally to have exaggerated both. He seems anxious to have it known that, far from indulging in the coarse amusements of the boors he is fond of painting, he himself lives in good style, looks like a gentleman, and behaves as such. He never seems tired 01 showing the turrets of his chateau of Perck, and in the midst of rustic merry-makings we often see his family and himself received cap in hand by the joyous peasants. We may also observe that he has a certain number of favourite models, the constant recurrence of whom is a special feature of his works. We have even met them in a series of life-size portrait-like figures in the Doria Pamphili Gallery in Rome. 1

Teniers was chosen by the common council of Antwerp to preside over the gild of painters in 1644. The archduke Leopold William, who had assumed the government of the Spanish Netherlands, being a great lover of art, employed Teniers not only as a painter but as keeper of the collection of pictures he was then forming. With the rank and title of " ayuda de camara," Teniers took up his abode in Brussels shortly after 1647. Immense sums were spent in the acquisition of paintings for the archduke. A number of valuable works of the Italian masters, now in the Vienna Museum, came from Leopold's gallery after having belonged to Charles I. and the duke of Buckingham. De Bie (1661) states that Teniers was some time in London, collecting pictures for the duke of Fuensaldafia, then acting as Leopold's lieutenant in the Netherlands. Paint- ings in Madrid, Munich, Vienna and Brussels have enabled art critics to form an opinion of what the imperial residence was at the time of Leopold, who is represented as conducted by Teniers and admiring some recent acquisition. No picture in the gallery is omitted, every one being inscribed with a number

and the name of its author, so that the ensemble of these paint- ings might serve as an illustrated inventory of the collection. 2 Still more interesting is a canvas, now in the Munich Gallery, where we see Teniers at work in a room of the palace, with an old peasant as a model and several gentlemen looking on. When Leopold returned to Vienna, Teniers's task ceased; in fact, the pictures also travelled to Austria, and a Flemish priest, himself a first-rate flower painter, Van der Baren, became keeper of the archducal gallery. Teniers nevertheless remained in high favour with the new governor-general, Don Juan, a natural son of Philip IV. The prince was his pupil, and de Bie tells us he painted the likeness of the painter's son. Honoured as one of the greatest painters in Europe, Teniers seems to have made himself extremely miserable through his aristocratic

1 Under" the name of Weenix.

2 It was not until recent years that the MS. inventory of this col- lection was discovered among the papers of Prince Schwartzenberg in Vienna. It was published in 1883 by Adolf Berger. In 1658 Teniers published 243 etchings after the best Italian works of Leopold William's collection, which, with the portraits of the archduke and Teniers, were brought together as a volume in 1660, under the title El Teatro de Pinturas.

leanings. Shortly after the death of his wife in 1656 he married Isabella de Fren, daughter of the secretary of the council of Brabant, and strove his utmost to prove his right to armorial bearings. In a petition to the king he reminded him that the honour of knighthood had been bestowed upon Rubens and Van Dyck. The king at last declared his readiness to grant the request, but on the express condition that Teniers should give up selling his pictures. The condition was not complied with; but it may perhaps

account for the master's activity in favour of the foundation in Antwerp of an academy of fine arts to which only painters and sculptors should be admitted, whereas the venerable gild of St Luke made no difference between art and handicraft: carvers, gilders, bookbinders, stood on an even footing with painters and sculptors: the separation was not obtained till 1773. There were great rejoicings in Antwerp when, on the 26th of January 1663, Teniers came from Brussels with the royal charter of the academy, the existence of which was due entirely to his personal initiative.

Teniers died in Brussels on the 25th of April 1690. The date is often wrongly given as 1694 or 1695. A picture in the Munich Gallery (No. 906), dated 1680, represents him as an alchemist, oppressed with a burden of age beyond his years. From this date we hear more of his doings as a picture-dealer than as a painter, which most probably gave birth to the legend of his having given himself out as deceased in order to get higher prices for his works. David, his eldest son, a painter of talent and reputation, died in 1685. One of this third Teniers's pictures — " St Dominic Kneeling before the Blessed Virgin," dated 1666 — is still to be found in the church at Perck. As well as his father, he contributed many patterns to the celebrated Brussels tapestry looms.

Smith's Catalogue Raisonne gives descriptions of over 900 paint- ings accepted as original productions of Teniers. Few artists ever worked with greater ease, and some of his smaller pictures — land- scapes with figures — have been termed " afternoons," not from their subjects, but from the time spent in producing them. The museums in Madrid, St Petersburg, Vienna, Munich, Dresden, Paris, London and Brussels have more than 200 pictures by Teniers. In the United Kingdom 150 may be found in private hands, and many other examples are to be met with in private collections throughout Europe. Although the spirit of many of these works is as a whole marvellous, their conscientiousness must be regarded as questionable. Especially in the later productions, from 1654 onwards we often detect a

lack of earnestness and of the calm and concentrated study of nature which alone prevent expression from degenerating into grimace in situations like those generally depicted by Teniers. His education, and still more his real and assumed position in society, to a great degree account for this. Brouwer knew more of taverns; Ostade was more thoroughly at home in cottages and humble dwell- ings; Teniers, throughout, triumphs in broad daylight, and, though many of his interiors may be justly termed masterpieces, they seldom equal his open-air scenes, where he has, without constraint, given full play to the bright resources of his luminous palette. In this respect he often suggests comparisons with Watteau. But his subjects taken from the Gospels or sacred legend are absurd. An admirable picture in the Louvre shows " Peter Denying his Master " next to a table where soldiers are smoking and having a game at cards. A similar example is the " Deliverance of St Peter from Prison " of which two versions, curiously altered, are in the Dresden Gallery and the Wallace Collection. He likes going back to subjects illustrated two centuries before by Jerome Bosch — the " Temptation of St Anthony," the " Rich Man in Hell," incantations and witches — for the simple purpose of assembling the most comic apparitions. His villagers drink, play bowls, dance and sing; they seldom quarrel or fight, and, if they do, seem to be shamming. This much may be said of Teniers, that no painter shows a more enviable ability to render a conception to his own and other people's satis- faction. His works have a technical freshness, a straightforward- ness in means and intent, which make the study of them most delightful; as Sir Joshua Reynolds says, they are worthy of the closest attention of any painter who desires to excel in the mechani- cal knowledge of his art.

As an etcher Teniers compares very unfavourably with Ostade, Cornells, Bega and Dusart. More than 500 plates were made from his pictures ; and, if it be true that Louis XIV. judged his " baboons " (magots) unworthy of a place in the royal collections, they

found admirable engravers in France — Le Bas and his scholars — and passionate admirers. The duke of Bedford's admirable specimen was sold for 18,030 livres (£1860) in 1768. The "Prodigal Son," now in the Louvre, fetched 30.000 livros (£3095) in 1776. Smith's highest estimates have long since been greatly exceeded. The

" Archers " in St Petersburg he gives as worth £2000. The Belgian government gave £5000 in 1867.for the " Village Pastoral " of 1652, which is now in the Brussels Museum; and a picture of the " Prodigal Son," scarcely 16 by 28 inches, fetched £5280 in

1876.

Although van Tilborgh, who was a scholar of Teniers in Brussels, followed his style with some success, and later painters often ex- celled in figure-painting on a small scale, Teniers cannot be said to have formed a school. Properly speaking, he is the last repre- sentative of the great Flemish traditions of the 17th century.

See T. Smith, A Catalogue RaisonnS of the Works of the most Eminent Dutch, Flemish and French Painters; John Vermoelen, Notice historique sur David Teniers el sa famille; L. Galesloot, Quelques renseignements sur la famille de P. P. Rubens et le deces de David Teniers and Un proces de David Teniers et la corporation des peintres d, Bruxelles; Alph. Wauters, Histoire des environs de Bruxelles and Les tapisseries bruxelloises ; F. T. Van der Brandern, Geschiedenis der Antiverpsche Schilderschool; Max Rooses, Geschichte der Malerschule Antwerpens; W. Bode, Adriaen Brouwer, ein Bild seines Lebens und seines Schaffens. (H. H. ; P. G. K.)

TENISON, THOMAS (1636-1715), English archbishop, was born at Cottenham, Cambridgeshire, on the 29th of September 1636. He was educated at the free school, Norwich, whence he entered Corpus Christi College, Cambridge, as a scholar on Archbishop Parker's foundation. He graduated in 1657, and was chosen fellow in 1659. For a short time he studied

medicine, but in 1659 was privately ordained. As vicar of St Andrew- the-Great, Cambridge, he was conspicuous for his devoted attention to the sufferers from the plague. In 1667 he was presented to the living of Holywell-cum-Needingworth, Hunting-donshire, by the earl of Manchester, to whose son he had been tutor, and in 1670 to that of St Peter's Mancroft, Norwich. In 1680 he received the degree of D.D., and was presented by Charles II. to the important cure of St Martin's-in-the-Fields. Tenison, according to Gilbert Burnet, " endowed schools, set up a public library, and kept many curates to assist him in his indefatigable labours." Being a strenuous opponent of the Church of Rome, and " Whitehall lying within that parish, he stood as in the front of the battle all King James's reign." In 1678, in a Discourse of Idolatry, he had endeavoured to fasten the practices of heathenish idolatry on the Church of Rome, and in a sermon which he published in 1681 on Discretion in Giving Alms was attacked by Andrew Pulton, head of the Jesuits in the Savoy. Tenison's reputation as an enemy of Romanism led the duke of Monmouth to send for him before his execution in 1685, when Bishops Ken and Turner refused to administer the Eucharist; but, although Tenison spoke to him in " a softer and less peremptory manner " than the two bishops, he was, like them, not satisfied with the sufficiency of Monmouth's penitence. LTnder William III., Tenison was in 1689 named a member of the ecclesiastical commission appointed to prepare matters towards a reconciliation of the Dissenters, the revision of the liturgy being specially entrusted to him. A sermon which he preached on the commission was published the same year. He preached a funeral sermon on Nell Gwyn (d. 1687) in which he represented her as truly penitent — a charitable judgment which did not meet with universal approval. The general liberality of Tenison's religious views commended him to the royal favour, and, after being made bishop of Lincoln in 1691, he was promoted to the primacy in December 1694. He attended Queen Mary during her last illness and preached her funeral sermon in Westminster Abbey. When William in 1695

went to take command of the army in the Netherlands, Tenison was appointed one of the seven lords justices to whom his authority was delegated. Along with Burnet he attended the king on his death-bed. He crowned Queen Anne, but during her reign was not in much favour at court. He was a commissioner for the Union with Scotland in 1706. A strong supporter of the Hanoverian succession, he was one of the three officers of state to whom on the death of Anne was entrusted the duty of appointing a regent till the arrival of George I., whom he crowned on the 31st of October 1714. Tenison died at London on the 14th of December 1715.

Besides the sermons and tracts above mentioned, and various others on the " Popish " controversy, Tenison was the author of The Creed of Mr Hobbes Examined (1670) and Baconia, or Certain

Genuine Remains of Lord Bacon (1679). He was one of the founders of the Society for the Propagation of the Gospel.

The Memoirs of the Life and Times of the Most Rev. Father in God, Dr Thomas Tenison, late Archbishop of Canterbury, appeared without date not long after his death. See also Gilbert Burnet's History of his own Time and Macaulay's History of England.

TEN KATE, JAN JACOB LODEWIJK (1819–1889), Dutch divine, prose writer and poet, was born at The Hague on the 23rd of December 1819. He started in life as a lawyer's clerk. It was his friend, Dr Heldring, pastor at Hemmen, in Gelder- land, who, discovering in Ten Kate the germs of poetical genius, enabled him to study theology at the university of Utrecht (1838–43). Having completed his studies, Ten Kate became pastor at Middelburg, Amsterdam, and other places, meanwhile developing well-nigh ceaseless activity, both in prose and lyric poetry. Among his prose works may be mentioned the travel papers (Rhine, 1861; Italy, 1857–62), Christelijke Overdenkingen (" Thoughts of a Christian," 1849–52), and other religious studies. His early poetry was in the main original. The best known of his poems were— Ahasverus op de Grimsel (" Ahasuerus on the Grimsel," 1840) ; Zangen des Tijds (" Songs of the Times," 1841); Legenden en Mengelpoezie ("Legends and Detached Poems," 1846); In den Bloemhof ("In the Flower Garden," 1851); De Schepping ("The Creation," 1866); De Planelen ("The Planets," 1869); De Jaargetijden ("The Seasons," 1871); De Psalmen ("The Psalms," 1874); De Vrouw in hct N ederlandsch Lied ("Woman in Dutch Song," 1882); Palm- takken en Dichtbloemen (" Palm-branches and Flowers of Poesy," 1884). Ten Kate reached the pinnacle of his poetic fame in The Creation, The Planets, and The Seasons. These poems certainly show a masterly grasp of his mother tongtie and a wonderful facility of expression, coupled with graceful vigour and fertile fancy. These qualities he also plentifully displayed

in the innumerable translations he made of many of the master- pieces of foreign poetry in nearly every European language. He had not only an extraordinary aptitude for learning alien idioms, but also the gift of translating foreign lyrics into clear, fluent and beautiful Dutch verse. Ten Kate's versatility in this respect has never been equalled; it extended from Tasso and Andersen to Dante, Schiller, Victor Hugo, Milton, Tennyson and Longfellow. Ten Kate died at Amsterdam on the 24th of December 1889.

His complete Poetic Works were published after his death in 12 volumes (Leiden, 1891).

TENNANT, CHARLES (1768-1838), Scottish industrial chemist, was born at Ochiltree, Ayrshire, on the 3rd of May 1768. He started in business as a bleacher at Darnley, and in 1798 took out a patent for a bleach liquor formed by passing chlorine into a mixture of lime and water. This product had the advantage, as compared with the Eau de Javelles, then generally used, that a cheaper base, lime, was substituted for potash in its preparation; but when he attempted to protect his rights against infringement his patent was held invalid on the double ground that the specification was incomplete and that the invention had been anticipated at some bleach-works near Nottingham. In 1799 he patented a more convenient material in bleaching powder or " chloride of lime," formed by the action of chlorine on slaked lime, and for its manufacture founded at Glasgow in 1800 the well-known St Rollox chemical works, now merged in the United Alkali Company. He died at Glasgow on the 1st of October 1838.

His grandson the iron-master, Sir Charles Tennant (1823- 1906), was M.P. for Glasgow from 1878 to 1880 and for Peebles and Selkirk from 1880 to 1886; he was created a baronet in

1885.

TENNANT, SMITHSON (1761-1815), English chemist, was born at Selby, Yorkshire, on the 30th of November

1761. He began to study medicine at Edinburgh in 1781, but inc& few months moved to Cambridge, where he devoted himself to botany and chemistry. He graduated M.D. at Cambridge in 1790, and about the same time purchased an estate near Cheddar, where he carried out agricultural experiments. He was ap- pointed professor of chemistry at Cambridge in 18 13, but lived

to deliver only one course of lectures, being killed near Boulogne on the 22nd of February 1815 by the fall of a bridge over which he was riding. He was a man of more promise than perform- ance, and his chief achievement was the discovery of the ele- ments iridium and osmium, which he found in the residues from the solution of platinum ores (1804). He also contributed to the proof of the identity of diamond and charcoal.

TENNANT, WILLIAM (1784-1848), Scottish scholar and poet, was born on the 15th of May 1784 at Anstruther Easter, Fife- shire. He was lame from childhood. His father sent him to the university of St Andrews, where he remained for two years, and on his return he became clerk to one of his brothers, a corn factor. In his leisure time he mastered Hebrew as well as German and Italian. His study of Italian verse bore fruit in the mock-heroic poem of Anster Fair (1812), which gave an amusing account of the marriage of " Maggie Lauder," the heroine of the popular Scottish ballad. It was written in the oltava rima adopted a few years later by " the ingenious brothers Whistlecraft " (John Hookham Frere), and turned to such brilliant account by Byron in Don Juan. The poem, un- hackneyed in form, full of fantastic classical allusions applied to the simple story, and brimming over with humour, had an immediate success. Tennant's brother, meanwhile, had failed in business, and the poet became in 181 2 schoolmaster of the parish of Dunino, near St Andrews. From this he was pro- moted (1816) to the school of Lasswade, near Edinburgh; from that (1819) to a mastership in Dollar academy; from that (1834), by Lord Jeffrey, to the professorship of oriental languages in St Andrews. The Thane of Fife (1822),

shows the same humorous imagination as Anster Fair, but the subject was more remote from general interest, and the poem fell flat. He also wrote a poem in the Scottish dialect, Papistry Stormed (1827); two historical dramas, Cardinal Beaton (1823) and John Baliol (1825); and a series of Hebrew Dramas (1845), founded on incidents in Bible history. He died at Devon Grove, on the 14th of February 1848.

A Memoir of Tennant by M. F. Connolly was published in 1861.

TENNEMANN, WILHELM GOTTLIEB (1761–1819), German historian of philosophy, was born at Erfurt. Educated at his native town, he became lecturer on the history of philosophy at Jena in 1788. Ten years later he became professor at the same university, where he remained till 1804. His great work is an eleven-volume history of philosophy, which he began at Jena and finished at Marburg, where he was professor of philo- sophy from 1804 till his death. He was one of the numerous German philosophers who accepted the Kantian theory as a revelation.

In 1812 he published a shorter history of philosophy, which was translated into English in 1852 under the title Manual of the History of Philosophy.

TENNENT, SIR JAMES EMERSON, Bart. (1804–1869), English politician and traveller, the third son of William Emerson, a merchant of Belfast, was born there on the 7th of April 1804. He was educated at Trinity College, Dublin, of which he afterwards became LL.D. He took up the cause of Greek independence, and travelled in Greece, publishing a Picture of Greece (1826), Letters from the Aegean (1829), and a History of Modem Greece (1830) ; and he was called to the English bar at Lincoln's Inn in 183 1. In this year he married the daughter and co-heiress (with her cousin, Robert James Tennent, M.P. for Belfast, 1848–52) of William Tennent, a wealthy merchant at Belfast, who died of cholera in 1832, and he adopted by royal licence the name of his wife

in addition to his own. He entered parliament in 1832 as member for Belfast. In 1841 he became secretary to the India Board, and in 1845 he was knighted and appointed colonial secretary of Ceylon, where he remained till 1850. The result of his residence there ap- peared in Christianity in Ceylon (1850) and Ceylon, Physical, Historical and Topographical (2 vols., 1859). On his return, he became member for Lisburn, and under Lord Derby was secretary to the Poor Law Board in 1852. From 1852 till 1867 he was permanent secretary to the Board of Trade, and on his

retirement he received a baronetcy from Lord Palmerston. In his early years his political views had a Radical tinge, and, although he subsequently joined the Tories, his Conservatism was of a mild type. He withdrew from the Whigs along with Lord Stanley and Sir James Graham, and afterwards adhered to Peel. He died in London on the 6th of March 1869. His family consisted of two daughters and a son, Sir William Emerson Tennent, 2nd baronet (1835-1876), who was an official in the Board of Trade, and at whose death the baronetcy be- came extinct.

Besides the books above mentioned, Emerson Tennent wrote Belgium in 1S40 (1841), and Wine; its Duties and Taxation (1855), and was a contributor to magazines and a frequent correspondent of Notes and Queries. (H. Ch.)

TENNESSEE, a South Central state of the United States of North America, lying between latitude 35° and latitude 36° 40' N. and between longitude 8i° 37' and longitude 90 28' W. It is bounded on the N. by Kentucky and Virginia along a line which, because of erroneous surveys, varies considerably, east of the Tennessee river, from the intended boundary — the line of latitude 36° 30' N. — the variations all being measured to the north of that parallel; on the E. by North Carolina along the line of the crest of

the culminating ridge of the Unaka Mountains till within 26 m. of the Georgia frontier, where it turns due south, giving to Tennessee a triangular piece of territory which should have belonged to North Carolina; on the S. by Georgia, Alabama and Mississippi along the 35th parallel of N. lat. ; on the W. by the Mississippi river which separates it from Arkansas and Missouri. The extreme length of the state from E. to W. is 432 m., and the extreme breadth is 109 m. its area being 42,022 sq. m., of which 335 sq. m. is water surface.

Physical Features. — Tennessee is traversed in the east by the Unaka Ridges of the Older Appalachian Mountains and by the Great Appalachian Valley; in the middle by the Cumberland Plateau, the Highland Rim Plateau, and the Nashville Basin of the Appalachian Plateau; and in the west by the Gulf Coastal Plains and a narrow strip of the Mississippi Flood Plain. From a maximum elevation of 6636 ft. at Mount Guyot on the North Carolina border, in Sevier county, the surface descends to 117 ft. or less on the Mississippi Flood Plain in the S.W. corner of the state. The general slope, however, is west by north. About 1 700 sq. m. are at least 2000 ft. above the sea, but 28,200 sq. m. are less than 1000 ft. above the sea, and the mean elevation of the state is approximately 900 ft. The Unaka Mountains, which occupy a belt 8 to 10 m. wide along its E. border, are a series of somewhat irregular ridges developed on complexly folded and faulted crystalline rocks. Sixteen peaks exceed 6000 ft. in height. They are Mount Guyot (6636 ft.), Clingman Dome (6619 ft.), Mount Le Conte (6612 ft.), Mount Curtis (6568 ft.), Mount Safford (6535 ft.), Mount Love (6443 ft.), Mount Henry (6373 ft.), Roan Mountain (6313 ft.), Luftee Knob (6232 ft.), Peck Peak (6232 ft.), Raven Knob (6230 ft.), Mount Collins (6188 ft.), Tricorner Knob (6188 ft.), Thermometer Knob (6157 ft.), Oconee Mountain (6135 ft.), and Master Knob (6013 ft.). That part of the Great Appalachian Valley which traverses Tennessee is commonly known as the Valley of East Tennessee. It consists of parallel ridges and valleys de-

veloped by erosion on folded sandstones, shales and limestones, the valley quality predominating because the weak limestones were of great thickness. The valley areas vary in height from 600 ft. in the south-west to 1000 ft. in the north-east. In the north- east the ridges are more numerous and higher than in the south- west, where White Oak Ridge and Taylor's Mountain are among the highest, although Missionary and Chickamauga Ridges are better known, because of their association with battles of the Civil War. Along the north-west border of the valley a steep escarpment, known as the Cumberland Scarp, rises to the Cumberland Plateau. This plateau has a mean elevation of about 2000 ft., is only slightly rolling, and slopes gently toward the north-west. The W. edge of the plateau is much broken by deep indentations of stream valleys, and drops suddenly downward about 1000 ft. to the Highland Rim Plateau, so named from the scarp formed by its western rim about the Nashville and (farther north) Louisville basins. It is generally level except where it is cut by river valleys. The Nashville Basin, with a more rolling surface, lies for the most part 400 to 600 ft. below the Rim; a few hills or ridges, however, rise to the level of the Rim. The Basin is elliptical in form, extending nearly across the state from N.E. to S.W., with an extreme width of about 60 m. ; near its centre is thecity of Murfreesboro, and Nashville lies in the north-west. Westward from the Lower Tennessee river the surface of the East Gulf Coastal Plain rises rapidly to the summit of a broken cuesta or ridge and then descends gently and terminates

abruptly in a bluff overlooking the Mississippi Flood Plain. The E. slope, about one-fourth the length of the W. slope, is steep and rocky, and the W. slope is broken by the valleys of numerous streams. The bluff, 150 to 200 ft. in height, traverses the state in a rather straight course and between it and the meandering Mississippi, except at a few points where the latter touches it, lie low bottom lands varying in width according to the bends of the river and containing numerous swamps and

ponds. In the northern portion, principally in Lake county, is Reelfoot Lake, which occupies a depression formed during an earthquake in 181 1. It is 18 m long, has a maximum width of 3 m., and is the only large lake in the state.

The whole of the Appalachian Province of Tennessee and the southern portion of the Cumberland Plateau, the Highland Rim, and the Lowland Basin are drained southward and westward by the Tennessee river and its tributaries. The valley of the Lower Tennessee is drained northward by the same river. The northern portion of the Cumberland Plateau, Highland Rim, and Lowland Basin are drained northward and westward by the Cumberland river and its tributaries. The western slope of the East Gulf Plains is drained directly into the Mississippi by several small streams.

Fauna. — A few black bears inhabit the Unaka Mountain region. Deer are quite numerous in the forests of the east half of the state. The wolf, fox, lynx ("wildcat"), otter, mink and beaver have become rare. Squirrels, rabbits, wood-chucks, skunks, muskrats and opossums are common. Among game-birds there are a few wild turkeys, wild geese and bob-white (locally " partridge "), and greater numbers of grouse and various ducks ; among song-birds the robin, bluebird and mocking-bird are common; and there are also woodpeckers, whippoorwiils, blackbirds, hawks, owls, crows and buzzards. There are a few speckled trout in the mountain streams, but the commoner fish are bass, perch, catfish, crappies, pike, drum buffalo, carp, suckers and eels. Rattlesnakes and moccasins, or cottqnmouths, both venomous, are occasionally seen.

Flora. — Originally the state was well covered with forests, and about one- half of it is still woodland containing a large variety of trees. On the mountains the trees are chiefly pines, fir's, spruce and hemlock. In the swamps of the western part of the state, especially on the Mississippi Flood Plain, the cypress is dominant. In the Lowland Basin small groves of what was once an extensive forest of

red cedar remain. Poplar and larch are much more abun dant in the western than in the eastern half of the state, and pine is much more abundant in the eastern than in the western half. But in most parts of the state there are mixed forests of white oak, red oak, ash, red gum, black gum, maple, hickory, chestnut, syca- more, magnolia, tulip tree, cherry, pecan, walnut, elm, beech, locust and persimmon. Birch, mulberry, linden, willow, bass-wood, dogwood, the sorrel tree, pawpaw and wild plum are common! There are a few varieties of the rare shittimwopd tree (Butnelia lanuginosa). Among indigenous shrubs and vines are the hazel, blackberry, gooseberry, whortleberry; huckleberry, grape and cranberry. Blue grass is indigenous in the Lowland Basin. Of numerous medicinal herbs ginseng is the most important

Climate. — Tennessee is noted for its delightful climate. The mean summer temperature ranges according to elevation from 62 ° F. on the Unaka Mountains to 72° on the Cumberland Plateau, to 75° in the Valley of East Tennessee and on the Highland Rim, to 77 in the Lowland Basin, and to about 78° on the East Gulf Plains. But the mean winter temperature for each of these divisions varies little from 38 °, and the mean annual temperature ranges only from 57 in East Tennessee to 58° in Middle Tennessee and to 60° in West Tennessee. The altitude being the same, the mean annual temperature on the south border of the state is about 2° higher than that on the north border. Usually the highest temperatures of the year are in July and the lowest in January. In some regions there is no record of a temperature as high as 100 ; in others there is none as low as -10°; and the average absolute range is about 90 . However, during a period of fifty-four years (1854-1908) the records show a range of extremes from 30 at Erasmus, Cumber land county, in February 1899, to 107 at several places in July 1901. Rarely there are killing frosts, especially in the southern and western parts of the state from the third week in April to the middle of October. An average annual precipitation of about 50 in. is

quite equally distributed over the state and a little more than one-half of it is well distributed through the spring and summer months. The average annual snowfall is about 8 in., and the snowfalls are usually light and melt within a few days. The average number of clear, fair, or only partly cloudy days during a year in Tennessee is 260. The warm, moisture-bearing winds blow low from the south or south-west with a free sweep across the state in a direction nearly parallel with the trend of the mountains. Above these are upper currents from the north or north-west. The com- mingling of the two currents gives rise frequently to westerly and occasionally to easterly winds. The average velocity of the winds is comparatively low and violent storms'are rare. ,

Soil. — The Lowland Basin, the less elevated parts of the Valley of East Tennessee, and parts of the outer portion of the Highland Rim have a fertile limestone soil. The deep deposit of silt on the Mississippi Flood Plain is even more fertile. There are narrow strips of rich alluvium along many other rivers. The soils on the

mountains, on the ridges of the Valley of East Tennessee, and on the E. slope of the East Gulf Plains vary greatly according to the rocks from which they are derived. In the Cumberland Plateau, in the inner portion of the Highland Rim, and in the W. slope of the East Gulf Plains there is for the most part a light sandy soil, much of it too poor for cultivation.

Agriculture.— The total area of farms in the state in 1900 was 20,342,058 acres, of which about one-half was classed as " improved." The average size was 90-6 acres, and the average number of acres of improved land per farm was 45-6. Of the total farm acreage 68-8 per cent, was held or operated by owners or part owners, 9-4 per cent, by cash

tenants, 17-4 per cent, by share tenants, and the remainder under miscellaneous tenure. Some 15-1 per cent, of all the farms were operated by coloured farmers, who in 1899 produced 22-2 per cent, of the agricultural products of the state, not fed to live stock. The total value of farms, including buildings, was $265,150,750 (the value of buildings being 23-8 per cent, of the total); in addition implements and machinery valued at $1 5,232,670 were employed. The principal products and their values in 1909 were: wheat, 8,320,000 bushels ($9,568,000); Indian corn, 78,650,000 bushels ($55,055,000) ; oats, 4,000,000 bushels ($2,120,000); cotton, 240,000 bales; tobacco, 53,290,000 lb, ($4,156,620). The average yield per acre in 1909 was, of wheat 10-4 bushels, of Indian corn 22 bushels, of cotton (1908) 218 lb, of tobacco 730 lb. Cotton is not raised to any extent except in the rich alluvial land of the Mississippi Valley. Tennessee ranked fifth among the tobacco-growing states in 1899 and fourth in 1909. Considerable areas in the central part of the state are admirably adapted for grazing and the raising of fine horses and cattle. The value of live stock on farms and ranges on the 1st of January 1910 was as follows: horses, $36,288,000; mules, $35,670,000; milch cows, $8,828,000; other cattle, $7,797,000; swine, $8,216,000.

Mining. — Previous to the close of the Civil War (1865) mining had been carried on upon a comparatively small scale, but im- mediately thereafter attention was attracted to the extensive and valuable deposits of coal and iron ore, and their development was begun on a large scale. The minerals of most commercial im- portance are coal, iron ores, copper ores, marble and phosphate rock.

About 5000 sq. m., or almost one-eighth of the area of the state, is underlaid by the coal measures, which occupy a belt in the Cumber- land Plateau from 50 to 70 m. wide extending entirely across the easterly part of the state in a north-easterly, south-westerly direction. The coal is of the soft or " bituminous " kind, generally of excellent quality, and much of it suitable for conversion into gas and

coke, of which latter 468,092 long tons were produced in 1905. The mining of coal in the state has developed rapidly in connexion with the notable expansion of the iron and steel industries of the South. In 1908 the product was 6,199,171 tons, valued at $7,118,499.

Iron ore is found and has been mined in many places in the state. The deposits of most commercial importance are the limonites and brown hematites found west of the Cumberland Plateau, and the fossiliferous red hematite which crops out along the eastern base of that plateau. In the early history of Tennessee iron of superior quality was produced, in small charcoal furnaces, from the brown hematites of the central part of the state. A little later, considerable quantities of this iron were shipped and marketed at Pittsburg. After the close of the Civil War (1865) the iron resources of the state attracted renewed attention, particularly the brown and red hematites, and large and modern furnaces were erected in the Chattanooga district to reduce these ores. The output of iron ore was 874,542 tons (valued at $1,123,527) in 1902, when Tennessee ranked fifth among the iron ore producing states. Owing to the industrial depression following 1907 the output was only 635,343 tons, valued at $876,007, in 1908.

The only copper mines of industrial importance are the Ducktown mines in the extreme south-eastern corner of the state. Copper has been mined here since 1847, and notwithstanding the difficulties of transportation through a rough mountain region, mines were rapidly developed, and in 1855 over 14,000 tons of ore, worth more than a million dollars, were marketed. These mines were the principal source of the supply of copper for the Confederate States during the Civil War. The opening, in 1869, of a railway passing directly through the mining - territory, made it possible to work the mines more profitably, and operations were developed on a large scale. In 1908, 618,806 short tons of ore were mined, producing, from the smelters on the ground, 19,710,103 lb of metallic copper. The

ore is a sulphide, and in 1898 an extensive plant was erected to manufacture sulphuric acid as a by-product.

In 1892-1893 large deposits of phosphate rock of high quality were discovered in the central-southern part of the state about 60 m. south-west of Nashville, and the rapid development of quarries was begun. The output increased from 19,188 tons in 1894 to 638,612 tons (valued at $3,047,836) in 1907, when Tennessee ranked second among the states of the Union in the production of phosphate- rock. The introduction of this new supply had a marked effect on the fertilizer business of the country.

Inexhaustible deposits of marble are found in Eastern Tennessee in an area about 100 m. long by 20 m. ^ide, the centre of which

is Knox county, the deposits extending southward into Georgia. These marbles are of a distinctive character, being usually mottled in bright shades of red, pink, chocolate and grey. They are em- ployed principally for interior decoration, and were thus largely used in the capitol at Nashville and in the National Capitol at Washington. Systematic quarrying of these marbles was begun as early as 1838, and the output of the quarries has constantly increased since the Civil War.

In 1908 Tennessee produced 179 ozs. of fine gold and 57,696 ozs. of fine silver, a part of each coming, as a by-product, from the copper refineries. Zinc ore is mined on a small scale in the eastern part of the state, the product in 1908 being 341 short tons of metallic zinc valued at $32,054. Among the other minerals found and mined to a limited extent are lead, manganese, barytes, fluorspar, slate, granite and petroleum. The total value of all minerals was $19,277,031 in 1908.

Manufactures. — To an unusual degree the natural resources of the state supply the raw material for its manufactures. The ownership of industrial establishments is largely in the hands of

individuals, firms, and comparatively small corporations, rather than of large combinations, the average capital per establishment in 1905 being about $32,000. The amount of capital invested in manufacturing in 1880 was $20,092,845, and the value of the products was $37>°74.886. In 1905 capitalization (under the factory system) had increased to $102,439,481, and value of products to $137,960,476. This rapid industrial growth has been due in no small degree to the great natural resources of the state and its excellent transportation facilities. Judged by the value of products, regardless of cost of materials used, the flour and grist mill industry ranked first in 1905 ($25,350,758). Second in importance was the timber and lumber industry and lumber products ($21,580,120.)

The state has always held an important place in the iron and steel industry. The capital invested in blast furnaces in 1905 was $5.939>783> they employed i486 persons, and the value of their products was $3,428,049. The foundries and machine shops of the state had a capital of $5,516,453, they gave employment to over 4000 persons, and the value of their products was $6,946,567. These figures are exclusive of the numerous and large railway repair shops, the value of whose products was $5,839,445.

The manufacture of leather is another important industry. Large tanneries were attracted to the state, soon after the Civil War, by the abundance of tan bark in the forests, and the cheapness of labour. In 1905 $4,013,289 was invested in the manufacture of leather, and the products were valued at $3,583,871.

In 1905 the textile industry had an invested capital of $8,583,133, and a product valued at $6,895,203. The manufacture of cotton goods was the chief sub-division of the industry, employing 153,375 spindles, 3008 looms and 1787 knitting machines.

The printing and publishing industry of the state had an invested capital of $4,408,584 and products

valued at $5,063,580. The manu- facture of malt and distilled liquors employed (1905) a capital of $3,220,899, and the value of the product was $2,400,256. Among the other important manufacturing industries of the state and the value of their products in 1905 are: men's clothing, $2,961,581; patent medicines, $2,680,610; cotton-seed oil and oil cake, $3,743,927; tobacco, $404,241; artificial ice, $727,263; agricultural implements, $768,895; and coke, $809,801.

Transportation. — The railway mileage of Tennessee increased from 1253 m. in i860 to 3184 in 1900, and 3480 on the 1st of January 1909. The principal railways operating in the state in 1910 were the Louisville & Nashville, the Nashville, Chatta nooga & St Louis, the Cincinnati Southern and the Southern. The navigable water- ways include the Mississippi river (which forms the western boundary of the state) ; the Tennessee river, navigable throughout its length, from Knoxville; and the Cumberland river, navigable throughout its length in the state. Chattanooga, Knoxville, Memphis and Nashville are ports of entry.

Population.— The total population in 1880 was 1,542,359; in 1890, 1,767,518; in 1900, 2,020,616; and in 1910, 2,184,789.! Of the total population in 1900, 1,522,600 were native whites, 17,746 were foreign-born, 480,243 were negroes, 108 were Indians, 75 were Chinese and 4 were Japanese. Of the in- habitants born in the United States 38,561 were born in Georgia, 36,052 in Kentucky, 28,405 in North Carolina, 27,709 in Ala- bama, and 25,953 in Virginia. Of the foreign-born 4569 were Germans, 3372 were Irish and 2207 were English. Of the total population 59,032 were of foreign parentage — i.e. either one or both parents were foreign-born— and 11,164 were of German, 9268 of Irish and 3532 of English parentage on both the father's and the mother's side. Of the total population of the state in 1906, 697,570 were members of religious denominations. There

'The populations in other census years were as

follows: (1790), 35,691; (1800), 105,602; (1810), 261^727; (1820), 422,823; (1830), 681,904; (1840), 829,210; (1850), 1,002,717; (i860), 1,109,801;

(1870), 1,258,520.

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were 277,170 Baptists, 241,396 Methodists, 79,337 Presby- terians, 56,315 Disciples of Christ, 17,252 Roman Catholics, 7874 Protestant Episcopalians, 3225 Lutherans, 2875 United Brethren and 2426 Congregationalists. From 1890 to 1900 the urban population (i.e. the population of places having 4000 inhabitants or more) increased from 219,792 to 285,886, or 30-1 per cent., the semi-urban

population (i.e. the population of incorporated places, or the approximate equivalent, having less than 4000 inhabitants) increased from 87,351 to 114,837, 1 09 per cent, of the total increase in population; while the rural population (i.e. population outside of incorporated places) increased from 1,460,375 to 1,619,893, 63 per cent, of the total. The principal cities of the state, with population for 1910, are Memphis, 131,105; Nashville, 110,364; Chattanooga, 44,604 and Knoxville, 36,346.

Government. — Tennessee has had three constitutions, but the present one, adopted in 1870, is a reproduction of the second (1834) with only a few changes. Amendments may be proposed not oftener than once in six years by a majority of the members elected to each house of the legislature, but before they can be adopted they must be agreed to first by two-thirds of the members elected to each house of the next succeeding legis- lature, and later by a majority of all the citizens of the state voting for representatives at the next regular election. The legislature may, also, submit to the people the question of call- ing a convention to amend or revise the constitution, and such a convention must be called whenever, upon the submission of this proposition, a majority of the votes are cast in favour of it. Every attempt to amend or revise the present constitution has, however, been unsuccessful. The right of suffrage is given to every male citizen of the United States who has attained the age of twenty-one years and has been a resident of the state for one year, provided he has paid his poll tax and has not been con- victed of bribery, larceny or other infamous crime. The elec- tion of the governor, members of the General Assembly and congressmen is held biennially, in even numbered years, on the first Tuesday after the first Monday in November, but the election of judicial and county officers is held on the first Thursday in August.

The governor is the only state executive officer who is elected by the people. He is elected for a term

of two years and is not eligible for more than three consecutive terms. He must be at least thirty years of age and have been a citizen of the state for the last seven years before election. Although commander-in-chief of the state forces, he may call the militia into service only when there is a rebellion or an invasion and the General Assembly declares that the public safety requires it. The officers of the penitentiary and of the reforma- tory for boys are authorized to advise the governor with respect to an application for the pardon ot an inmate of their institution, but he is not bound by their advice and there is no real restriction on his power to pardon except that he is not permitted to pardon in cases of impeachment. Among the more important officers ap- pointed by the governor are the superintendent of public instruc- tion, the commissioner of agriculture, statistics and mines, an assayer, state entomologist, and officers of the penitentiary. The governor may veto bills passed by the General Assembly, but to override his veto the vote of only a bare majority of the members elected to each house is required. The governor's salary is $4000 a year. There is no lieutenant-governor; in case of a vacancy in the office of governor the speaker of the Senate becomes acting governor. The secretary of state, the comptroller, and the treasurer are elected by a joint ballot of the Senate and the House of Representatives each for a term of two years; the attorney-general is appointed by the judges of the supreme court for a term of eight years.

Both senators and representatives are elected for a term of two years by counties or by districts having approximately the same population. The number of representatives is limited by the con- stitution to 99, and the number of senators to one-third the number of representatives. The qualifications prescribed for senators and representatives are that they shall have been citizens of the state for three years and residents of the county or district they are to repre- sent for one year immediately preceding the election, and that senators shall be

at least thirty years of age. The legislature meets biennially, in odd numbered years, on the first Monday in January, and the length of the session is limited by a provision that the ■ members shall be paid four dollars a day, besides an allowance tor travelling expenses, not to exceed 75 days; whenever the governor calls an extra session they are not paid for more than 20 days. Bills of- whatever character may originate in either house, but no bill can become a law until it has passed both houses by a majority of all

the members to which the house is entitled under the constitution and if the governor vetoes a bill it cannot become a law until it has again passed both houses by such a majority. Only the more customary restrictions are placed upon the legislature by the con- stitution ; such, for example, as that it shall pass no laws impairing the obligation of contracts, no ex post facto laws, no law authorizing imprisonment for debt, no law restraining the freedom of the press or freedom of speech, and that it shall not lend the credit of the state or make the state " owner in whole or in part of any bank or a stockholder with others in any association, company, corpora- tion or municipality."

The administration of justice is vested in a supreme court, a court of civil appeals, chancery courts, circuit courts, county courts, justice of the peace courts, and, in certain cities and towns, a recorder's court. The supreme court consists of five judges elected by the state at large for a term of eight years, one for each of three grand divisions (eastern, middle and western) and two for the state at large. Each judge must be at least thirty-five years of age and have been a resident of the state for five years before his election. The judges designate one of their number to preside as chief justice. The court has appellate jurisdiction only. For the eastern district it sits at Knoxville ; for the middle district at Nashville ; and for the western district at Jackson. The concurrence of three judges is necessary to a decision. The court of civil appeals, which in 1907 was substituted for

the court of chancery appeals, is also composed of five judges not more than two of whom shall reside in the same grand division. They are elected for a term of eight years, and each of them must be at least thirty years of age and have resided in the state for five years before election. This court has jurisdiction of appeals from equity courts in which the amount in controversy does not exceed $1000, except in cases involving the constitutionality of a Tennessee statute, contested election or state revenue, and ejectment suits; it has jurisdiction also of civil cases tried in the circuit and common law courts in which writs of error or appeals in the nature of writs of error are applied for. It may transfer any case to the supreme court or the supreme court may assume jurisdic- tion of any of its cases by issuing a writ of certiorari, but otherwise its decrees are final. The state is divided into twelve chancery districts in each of which a chancellor is elected for a term of eight years, and at every county-seat in each district a court of chancery is held. The court has exclusive original jurisdiction in equity cases in which the amount in controversy exceeds fifty dollars, concurrent jurisdiction with the county court in such matters as the administration of estates, the appointment and removal of guardians, and concurrent jurisdiction with the circuit courts in proceedings for divorce. The state is also divided into nineteen circuits, in each of which a circuit judge is elected for a term of eight years, and at every county-seat in each circuit a circuit court is held. The original jurisdiction of the circuit courts extends to all cases both civil and criminal not exclusively conferred upon some other court, and they have appellate jurisdiction in all suits and actions begun in the lower courts. In several of the counties the county court is composed of a county judge, elected for a term of eight years, together with the justices of the peace in the county, and in the other counties it consists of the justices of the peace alone. Its judicial business is principally the probate of wills and matters relating to the administration of estates. Each

county is divided into civil districts varying in number according to population, and each district elects at least two justices of the peace for a term of six years; each county town or incorporated town also elects one justice of the peace. The jurisdiction of a justice of the peace, usually coextensive with the county, extends to the col- lection of notes of hand not exceeding JS1000; to the settle- ment of accounts not exceeding $500; to suits for the recovery of property or suits demanding payment for damages, except for libel or slander, not exceeding $500; to equity cases in which the amount in controversy does not exceed $50; and to various other small cases. A recorder has concurrent jurisdiction with a justice of the peace.

Local Government. — The government of each county is vested principally in the county court. This body represents and acts for the county as a corporation ; has charge ot the erection and repair of county buildings; levies the county taxes,: which are limited by law, however, to three mills on the dollar exclusive of those for schools, public highways, interest on the county debt, and other special purposes; divides the county into highway districts, and chooses a highway corhmissioner for each district for a term of two years; and chooses a superintendent of schools, a surveyor, a public administrator and public guardian, a board for the equaliza- tion of taxes, a coroner, a ranger, and a jail physician or health officer each for a term of two years, three commissioners of the poor for a term of three years (one each year), and a keeper and sealer of weights and measures to serve during its pleasure. A county trustee, whose duty it is to collect state and county taxes, and a sheriff are elected by the county for a term of two years; a clerk of the county court and a register are also elected by the county for a term of four years; and the county judge or chairman of the county court, the clerk of the county court, and the county health officer constitute a county board of health. In each civil district

of a county which contains the county seat there are two constables, and in other civil districts of the county one constable elected for a term of two years. The general law for the incorporation of cities and towns vests the government of each municipality accepting its provisions principally in a mayor and two aldermen from each ward. All are elected for a term of two years, but one-half of the aldermen retire annually. The mayor and aldermen may appoint such officers as they consider necessary. The mayor may veto any action of the aldermen, and to override his veto a two-thirds majority is required.

Miscellaneous Laws. — For the protection of the property rights of married women the code of Tennessee provides that the wife's real estate shall be exempt from her husband's debts; that the proceeds of her real or personal property shall not be paid to any other person except by her consent certified upon privy examination of her by the court or a commissioner appointed by the court; and that she may mortgage or convey her real estate without the concurrence ' of her husband provided she be privately examined regarding the matter by a chancellor, circuit judge, or the clerk of the county court. When a husband dies his widow is entitled to a dower in one-third of his real estate, and, if there be not more than two children, to one-third of his personal estate; if there are more than two children her share of the personal estate is the same as that of each child. If a husband die intestate and leave no other heirs the widow is entitled to all his real estate in fee simple. When a wife dies leaving a husband of whom there has been issue born alive, he has by the courtesy a life interest in all her real estate and all her personal estate; if the wife die intestate and leave no other heirs the husband is entitled to all her real estate in fee simple. The causes for divorce are impotency, bigamy, adultery, desertion for two years, conviction of an infamous crime, the attempt of one of the parties to take the life of the other, the

husband's cruel and inhuman treatment of his wife, refusal of the wife to remove with her husband into the state without a reasonable cause, pregnancy of the wife at the time of the marriage by another person without the knowledge of the husband, and habitual drunkenness, provided the habit has been contracted subsequent to the marriage. The plaintiff must be a resident of the state for two years before filing a petition for a divorce. If the husband is the plaintiff his interest in his wife's property is not impaired by the dissolution of the marriage, but the defendant wife forfeits all her interest in his property. Either party may marry again, but a defendant who has been found guilty of adultery is not permitted to marry the co-respondent during the life of the plaintiff. A homestead of a head of a family to the value of $1000 is exempt from forced sale except for the collection of taxes, debts contracted for its purchase or in making improvements upon it, or fines for voting out of the election district, for carrying concealed weapons, or for giving away or selling intoxicating liquors on election days. If the owner is married the homestead cannot be sold without the joint consent of husband and wife, and the wife's consent, as in other conveyances by married women, must be certified before the court or a com- missioner appointed by the court. The homestead inures for the benefit of the widow and minor children. Ninety per cent, of the salary, wages or income of each person eighteen years of age or over is also exempt from attachment provided such salary, wages or income does not exceed $40 per month, and in anycase $36 per month of the salary, wages or income of a person eighteen years of age or over cannot be attached. The employment of children under 14 years of age in any workshop, factory or mine within the state is forbidden by a law of 1901, and the employment of women or of boys under 16 years of age in any manufacturing establishment is limited to 60 hours a week by a law of 1907. Both the sale and the manufacture of intoxicating drinks are prohibited by law.

Charities, &c. — The charitable and penal institutions of the state consist of the Central Hospital for the Insane near Nashville; the Eastern Hospital for the Insane near Knoxville; the Western Hospital for the Insane near Bolivar; the Tennessee School for the blind at Nashville; the Tennessee Deaf and Dumb School at Knox- ville; the Confederate Soldiers' Home near Nashville, on the " Hermitage," the estate formerly belonging to Andrew Jackson; and the Penitentiary and the Tennessee Industrial School, both at Nashville; and in 1907 the legislature passed an Act for the estab- lishment in Davidson county of the Tennessee Reformatory for boys. Each hospital for the insane is governed by a board of five trustees appointed by the governor, with the consent of the senate, for a term of six years, and for the immediate supervision of each the trustees appoint a superintendent for a term of eight years. The Schools for the Blind and the Deaf and Dumb are each managed by a board of trustees, vacancies in which are filled by the remaining trustees with the concurrence of the legislature. The Confederate Soldiers' Home is managed by a board of fifteen trustees, of whom six are women, each serving until death or resignation, when his or her successor is appointed by the governor upon the recommendation of the corporation known as the Association of Confederate Soldiers. The Penitentiary is governed by a board of three prison commis- sioners, a superintendent, a warden, an assistant or deputy warden, a matron, a physician, and a chaplain, all appointed by the governor, the Commissioners for a term of four years, the other officers for

a term of two years. The prisoners are kept at labour principally in the state coal-mines, in manufacturing coke, on farms, or at contract labour within the prison walls; not more than 199 prisoners are to be leased to any one firm or corporation, or to be employed in any one business within the walls. The income to the state from the prison is greater than the disbursements for its maintenance. By good conduct a convict may shorten his term of service

one month the first year, two months the second year, three months each year from the third to the tenth inclusive, and four months each subsequent year. The Industrial School, which is for orphan, helpless, wayward and abandoned children, is governed by a board of directors consisting of the governor, comptroller, secretary of state, and treasurer as ex officio members, and seven other members, a portion retiring every two years, and their successors being ap- pointed by the remaining directors with the concurrence of the senate. The act for establishing the Tennessee Reformatory for Boys provides that the institution shall be governed by a board of trustees consisting of the governor and five other members, one retiring each year; that boys under eighteen years of age who are convicted of a penitentiary offence shall be sent to it ; that the trustees may transfer incorrigible boys to the penitentiary, put others out in; the service of citizens on probation, or recommend them to the governor for pardon. A general control of all public charities and correctional institutions is exercised by an unsalaried Board of State Charities consisting of the governor and six members appointed by him for a term of three years, two retiring every two years. The principal duties of this board are to examine the condition and the management of such institutions and report to the governor; and county and city authorities must submit to it for criticism all plans for new jails, public infirmaries, and hospitals.

Education. — For the administration of the common school system each county having five or more civil districts is divided into five school districts, and in counties having five or less than five civil districts each civil district constitutes a school district. Each school district elects one member of the county board of education, and in counties having less than five school districts one or more members of the county board, the number of which is always five, besides the county superintendent who is ex officio its secretary, are elected by the county at large, and to this county board of

education together with district advisory boards is entrusted the management and control of the common schools. By the general education law enacted in 1909, 25 per cent, of the gross state revenue is paid into the general education fund, 61 per cent, of this fund is apportioned among the several counties according to their school population, and 10 per cent, of it constitutes a special fund to be apportioned among eligible counties in proportion to their school population but in inverse ratio to their taxable property; to have the use of any portion of this special fund a county must levy for the maintenance of common schools a tax not less than forty cents on each $100 of taxable property, a tax of $2 on each taxable poll, and such privilege taxes as the state permits it to levy for school purposes. Each county court may provide for one or more county high schools to be maintained in part by additional county taxes and miscellaneous funds, and 8 per cent, of the state school fund is set apart for the encouragement of counties in this matter. In 1908 there was a county high school in each of 23 counties, and in 1910 in each of 50 counties. The high schools are largely under the control of the state board of education, consisting of the governor (president), state superintendent of public instruction (secretary and treasurer), and six other members appointed by the governor. When the general education law was enacted in 1909 Tennessee had no state normal schools, but by the law 13 per cent, of the state educational fund is set apart for the establishment and maintenance of schools solely for the education and professional training of teachers for the elementary schools; one for white teachers in each of three grand divisions of the state, and one agricultural and industrial normal school for the industrial education of negroes and for preparing negro teachers for the common schools, and the management of these schools is vested in the state board of education. At the head of the state educational system is the University of Tennessee, which embraces a college of liberal arts, a graduate department; a college of engineering, a college of agriculture, a school of pharmacy, an industrial

department, and a law department at Knoxville, and medical and dental departments at Nashville. The institution is governed by a board of trustees consisting of the governor, the state superintendent of public instruction, the commissioner of agriculture, the president of the university and twelve other members; two from the city of Knoxville and one from each congressional district, two elected each year. Seven per cent, of the general school fund is set apart for its maintenance; it was founded in 1794. For the higher education of teachers Tennessee has the Peabody College for Teachers, at Nashville, founded (1875) and maintained chiefly with proceeds from the George Peabody Fund for the improvement of education in the South. Other institutions of higher learning, not under the control of the state, are: the University of Nashville (non-sect., 1785) ; Washington and Tusculum College (non-sect., 1794), at Greenville; Maryville College (Presby- terian, 1819), at Maryville; Cumberland University (Presbyterian, 1842), at Lebanon; Burritt College (non-sect., 1848), at Spencer;

Hiwassee College (non-sect., 1849), at Sweetwater; Bethel College (Presbyterian 1850), at McKenzie; Carson and Newman College (Baptist, 1851), at Jefferson City; Walden University (Methodist, 1866), at Nashville; Fisk University (Congregational, 1866), at Nashville; University of Chattanooga (Methodist, 1867), at Chat- tanooga; University of the South (Protestant Episcopal, 1868), at Sewanee; King College (Presbyterian, 1869), at Bristol; Christian Brothers College (Roman Catholic, 1871), at Memphis; Knoxville College (United Presbyterian, 1875), at Knoxville; Milligan College (Christian, 1882), at Milligan; South-western Presbyterian College (1885), at Clarkville; and Lincoln Memorial University (non-sect., 1895), at Cumberland Gap.

Finance. — The state revenue is derived from a

general property tax, a poll tax, an income tax, a tax on transfers of realty, an ad- valorem tax on the average capital invested by merchants in their business, a privilege tax on merchants and many other occupations and businesses; a tax on litigation, levied on the unsuccessful party, a collateral inheritance tax, and fines and forfeitures. State, county and municipal taxes are assessed by a county assessor, who is elected for a term of four years, and one or more deputies whom the assessor is authorized to appoint. The law requires that all property shall be assessed at its full cash value, but personal property to the value of $1000 is exempt from taxation. Real estate is assessed biennially ; personal property, privileges and polls annually. Assessments are examined and revised both by a county board of equalization and a state board of equalization. The county board consists of five members elected annually by the county court; justices of the peace are ineligible to election on this board, as are also all persons who have served on it within five years. The state board consists of the secretary of state, treasurer and comptroller. The clerk of the county court collects all taxes of persons, companies or corporations subject to a privilege tax; the county trustee the taxes of other persons. Three revenue commissioners, one of whom is an expert accountant, are elected biennially by each county court to examine the books and reports of the collectors, and three state revenue agents are appointed biennially by the comptroller to examine the records of all officials charged with the collection or disbursement of state or county revenue. The state revenue for the two years ending the 19th of December 1906 amounted to $3,804,740, and the cost of conducting the state government for these two years was $3,568,977., The bonded debt of the state grew from $16,643,666 on the 1st of October 1859 to $37,080,666 on the 1st of October 1869, but by the 19th of December 1906 it had been reduced to $14,236,766.

History. — The present site of Memphis may be the

point where the Spanish explorer, Hernando de Soto, reached the Mississippi river, but this cannot be determined with certainty. Father Marquette in his voyage down the Mississippi camped upon the western border, and La Salle built Fort Prud'homme upon the Chickasaw Bluffs, probably on the site of Memphis, in 1682, but it was abandoned, then rebuilt, and again aban- doned. The territory was included in the English grant to Sir Walter Raleigh in 1584 and in the later Stuart grants, including that of Carolina, in 1663. No permanent settlement, however, was made until 1769, though wandering explorers and fur traders visited the eastern portion much earlier. A party of Virginians led by Dr Thomas Walker (1715-1794), in 1750 reached and named the Cumberland river and mountains in honour of the royal duke. In 1756 or 1757, Fort Loudon, named in honour of John Campbell, earl of Loudon, was built on the Little Tennessee river, about 30 m. N. of the present site of Knoxville, as an outpost against the French, who were now active in the whole Mississippi Valley, and was garrisoned by royal troops. The fort was captured, however, by the Cherokee Indians in 1760, and both the garrison and the neighbouring settlers were massacred.

Eastern Tennessee was recognized as a common hunting ground by the Cherokees, Creeks, Miamis and other Indian tribes, and the Iroquois of New York also claimed a considerable portion by right of conquest. In 1768 the Iroquois ceded what- ever claim they had to the English, and in 1769 several cabins were built along the Watauga and Holston rivers upon what was thought to be Virginian soil. A settlement near the present Rogersville was made in 1771 and in the next year another sprang up on the Nollichucky. After the failure of the Re- gulator insurrection in North Carolina in 1771, hundreds of the Regulators made their way into the wilderness. When the settlements were found to be within the limits of North Carolina, that colony made no effort to assert jurisdiction or to protect the settlers from Indian 'depredations. Therefore in 1772 the

residents of the first two settlements met in

general convention to establish a form of government since known as the Watauga Association. A general committee of thirteen was elected to exercise legislative powers. This committee elected from its members a committee of five in whom executive and judicial powers were lodged. The smaller committee elected a chair- man, who was also chairman of the committee of thirteen. A sheriff, an attorney and a clerk were elected, and regulations for recording deeds and wills were made. Courts were held, but any conflict of jurisdiction with Virginia or North Carolina was avoided. In 1775 the settlement on the Nollichucky was forced to join the association, and in the same year the land was bought from the Indians in the hope of averting war. With the approach of the War of Independence, the dream of be- coming a separate colony with a royal governor was abandoned, and on petition of the inhabitants the territory was annexed to North Carolina in 1776 as the Washington District, which in 1777 became Washington county, with the Mississippi river as the western boundary. The population increased rapidly and soon several new counties were created.

During the War of Independence the hardy mountaineers under John Sevier and Evan Shelby did valiant service against both the royal troops and the Loyalists in South Carolina, chiefly as partisan rangers under Charles McDowell (1 743-181 5). Major Patrick Ferguson with several hundred Loyalists and a small body of regulars, made a demonstration against the western settlements, but at King's Mountain in South Carolina he was completely defeated by the Americans, among whom Colonel Sevier and the troops led by him were conspicuous (see King's Mountain).

After the War of Independence the legislature of North Carolina in 1784 offered to cede her western territory to the general government, provided the cession should be accepted within two years. The Watauga settlers, indignant at this transfer without their consent, and fearing to be left without any form of government whatever, called a convention which met at Jonesborough on the 23rd of August

1784, and by which delegates to another convention to form a new state were ap- pointed. Meanwhile North Carolina repealed the act of cession and created the western counties into a new judicial district. A second convention, in November, broke up in confusion without accomplishing anything; but a third adopted a con- stitution, which was submitted to the people, and ordered the election of a legislature. This body met early in 1785, elected Sevier governor of the new state of Franklin (at first Frankland), filled a number of offices, and passed several other acts looking to separate existence. Four new counties were created, and taxes were levied. 1 Later in the year another convention, to which the proposed constitution had been re- ferred, adopted instead the constitution of North Carolina with a few trifling changes, and William Cocke was chosen to present to Congress a memorial requesting recognition as a state. Con- gress, however, ignored the request, and the diplomacy of the North Carolina authorities caused a reaction. For a time two sets of officials claimed recognition, but when the North Carolina legislature a second time passed an act of oblivion and remitted the taxes unpaid since 1784, the tide was turned. No successor to Sevier was elected, and he was arrested on a charge of treason, but was allowed to escape, and soon afterwards was again ap- pointed brigadier-general of militia.

Meanwhile, settlers had pushed on further into the wilderness. On the 17th of March 1775 Colonel Richard Henderson and his associates extinguished the Indian title to an immense tract of land in the valleys of the Cumberland, the Kentucky and the Ohio rivers (see Kentucky) . In 1778, James Robertson (1 742-1814), a native of Virginia, who had been prominent in the Watauga settlement, set out with a small party to prepare the way for permanent occupation. He arrived at French

1 On account of the scarcity of a circulating medium more than twenty articles were valued and declared legal tender. Among them were fox skins, is. 6d. : beaver skins, os. ; bacon, 6d. the pound; rye

whisky, 2s. 6d. the gallon.

Lick (so called from a French trading post established there) early in 1779, and in the same year a number of settlers from Virginia and South Carolina arrived. Another party led by John Donelson arrived in 1780, and after the close of the War of Independence, the immigrants came in a steady stream. A form of government similar to the Watauga Association was devised, and block-houses were built for defence against the Indians. Robertson was sent as a delegate to the North Carolina legislature in 1783 and through his instrumentality the settlements became Davidson county. Nashville, which had been founded as Nashborough in 1780, became the county seat. Finally, in 1843, it became the state capital. Robertson, the dominant figure in the early years, struggled to counteract the efforts of Spanish intriguers among the Indians, and when diplomacy failed led the settlers against the Indian towns.

On the 25th of February 1790 North Carolina again ceded the territory to the general government, stipulating that all the general provisions of the Ordinance of 1787 should apply except that forbidding slavery. Congress accepted the cession and, on the 26th of May 1790, passed an act for the government of the " Territory south of the River Ohio." William Blount was appointed the first governor, and in 1792 Knoxville became the seat of government. The chief events of Blount's administration were the contests with the Indians, the purchase of their lands, and the struggle against Spanish influence. A census ordered by the Territorial legislature in 1795 showed more than 60,000 free inhabitants (the number prescribed before the Territory could become a state), and accordingly a convention to draft a state constitution met in Knoxville on the nth of January 1796. The instrument, which closely followed the constitution of North Carolina, was proclaimed

without sub- mission to popular vote. John Sevier was elected governor, and William Blount and William Cocke United States senators. In spite of the opposition of the Federalist party, whose leaders foresaw that Tennessee would be Republican, it was admitted to the Union as the sixteenth state on the 1st of June 1796.

With the rapid increase of population, the dread of Indian and Spaniard declined. Churches and schools were built, and soon many of the comforts and some of the luxuries of life made their appearance. The public school system was inaugurated in 1830, but not until 1845 was the principle of taxation for support fully recognized. As in all new states, the question of a circulating medium was acute during the first half of the 19th century, and state banks were organized, which suspended specie payments in times of financial stringency. The Bank of Tennessee, organized in 1838, had behind it the credit of the state, and it was hoped that money for education and for in- ternal improvements might be secured from its profits. The management became a question of party politics, and during the Civil War its funds were used to advance the Confederate cause. The development of the western section along the Mississippi was rapid after the beginning of the century. Memphis, founded in 1819, was thought as late as 1832 to be in Mississippi, and not until 1837 was the southern boundary, which according to the North Carolina cession was 35°, finally established. 1 In common with other river towns, the dis- orderly element in Memphis was large, and the gamblers, robbers and horse thieves were only suppressed by local vigilance com- mittees. The peculiar topographical conditions made the three sections of the state almost separate commonwealths, and demand for better means of communication was insistent.

The policy of state aid to internal improvements found ad- vocates very early in spite of the Republican affiliations of the state, but a definite programme was not laid out until 1829, when commissioners for internal improvements were

appointed and an expenditure of $150,000 was authorized. In 1835 the state agreed to subscribe one-third to the capital stock of com- panies organized to lay out turnpikes, railways, &c, and four years later the proportion became one-half. Though these

1 For account of the settlement of the dispute over the northern boundary, see Kentucky.

agreements were soon repealed, the general policy was con- tinued, and in 1861 more than $17,000,000 of the state debt was due to these subscriptions, from which there was little return.

Though President Andrew Jackson was for many years practically a dictator in Tennessee politics, his arbitrary methods and his intolerance of any sort of independence on the part of his followers led to a revolt in 1836, when the electoral vote of the state was given to Hugh Lawson White, then United States senator from Tennessee, who had been one of Jackson's most devoted adherents. White's followers called themselves Anti- Van Buren Democrats, but the proscription which they suffered drove most of them into the Whig party, which carried the state in presidential elections until 1856, when the vote was cast for James Buchanan, the Democratic candidate. The Whig party was so strong that James K. Polk (Democrat), a resident of the state, lost its electoral vote in 1844. With the disintegra- tion of the Whig party, the state again became nominally Democratic, though Union sentiment was strong, particularly in East Tennessee. There were few large plantations and fewer slaves in that mountainous region, while the middle and western sections were more in harmony with the sentiment in Mississippi and Alabama. In 1850 representatives of nine Southern states met in a convention at Nashville (q.v.) to consider the questions at issue between the North and the South. The vote of the state was given for Bell and Everett in i860, and the people as a whole were opposed to secession.

The proposition to call a convention to vote on the

question of secession was voted down on the 9th of February 1861, but after President Lincoln's call for troops the legislature sub- mitted the question of secession directly to the people, and meanwhile, on the 7th of May 186 1, entered into a " Military League " with the Confederacy. An overwhelming vote was cast on the 8th of June in favour of secession, and on the 24th Governor I. G. Harris (1818-1897) issued a proclamation de- claring Tennessee out of the Union. Andrew Johnson, then a United States senator from Tennessee, refused to resign his seat, and was supported by a large element in East Tennessee. A Union convention, including representatives from all the eastern and a few of the middle counties, met on the 17 th of June 1 86 1 and petitioned Congress to be admitted as a separate state. The request was ignored, but the section was strongly Unionist in sentiment during the war, and has since been strongly Republican.

The state was, next to Virginia, the chief battleground during the Civil War, and one historian has counted 454 battles and skirmishes which took place within its borders. In February 1862, General U.S. Grant and Commodore A. H. Foote captured Fort Henry on the Tennessee river, and Fort Donelson on the Cumberland. The Confederate line of defence was broken and General D. C. Buell occupied Nashville. Grant next ascended the Tennessee river to Pittsburg Landing with the intention of capturing the Memphis & Charleston railway, and on the 6th-7th of April defeated the Confederates in the battle of Shiloh. The capture of Island No. 10 in the Mississippi on the 7th of April opened the river as far south as Memphis, which was captured in June. On the 31st of December and the 2nd of January General William S. Rosecrans (Federal) fought with General Braxton Bragg (Confederate) the bloody but indecisive battle of Stone River (Murfreesboro). In June 1863 Rosecrans forced Bragg to evacuate Chattanooga. Bragg, however, turned upon his pursuer, and on the 19th and 20th of September one of the bloodiest battles of the war was fought at Chickamauga. General Grant now assumed command, and on the 24th

and 25th of November defeated Bragg at Chattanooga, thus opening the way into East Tennessee. There General A. E. Burnside at first met with success, but was shut Up in Knoxville by General James Longstreet, who was not able, however, to capture the city, and on the approach of General W. T. Sherman retired into Virginia. Almost the whole state was now held by Federal troops, and no considerable military movement oc- curred until after the fall of Atlanta in September 1864. Then General J. K. Hood moved into Tennessee, expecting Sherman

to follow him. Sherman, however, sent reinforcements to Thomas and continued his march to the sea. Hood fought with General John M. Schofield at Franklin, and on the i5th-i6th of December was utterly defeated by Thomas at Nashville, the Federals thus securing virtually undisputed control of the state. 1

After the occupation of the state by the Federal armies in 1862 Andrew Johnson was appointed military governor by the president (confirmed March 3, 1862), and held the office until inaugurated vice-president on the 4th of March 1865. Re- publican electors attempted to cast the vote of the state in 1864, but were not recognized by Congress. Tennessee was the first of the Confederate states to be readmitted to the Union (July 24, 1866), after ratifying the Constitution of the United States with amendments, declaring the ordinance of secession void, voting to abolish slavery, and declaring the war debt void. The state escaped " carpet bag " government, but the native whites in control under the leadership of William G. Brownlow (1805-1877) confined the franchise to those who had always been uncompromisingly Union in sentiment and conferred suffrage upon the negroes (February 25, 1867). The Ku Klux Klan, originating in 1865 as a youthful prank at Pulaski, Tennessee, spread over the state

and the entire South, and in i860 nine counties in the middle and western sections were placed under martial law. At the elections in 1869 the Republican party split into two factions. The conservative candidate was elected by the aid of the Democrats, who also secured a majority of the legislature, which has never been lost since that time. The constitution was revised in 1870. For a considerable time after the war the state seemed to make little material progress, but since 1880 it has made rapid strides. The principal occurrences have been the final compounding of the old state debt at fifty cents on the dollar in 1882, the rapid growth of cities, and the increased importance of mining and manufacturing.

Governors of Tennessee

State of Franklin. John Sevier 1 785-1 788

Territory South of the Ohio William Blount 1 790-1796

State of Tennessee.' 1

John Sevier, Democratic-Republican

Archibald Roane, ,,

John Sevier, „

Willie Blount,

Joseph M'Minn, „

William Carroll, ,,

Sam Houston, 3 ,,

William Hall (acting) ....

William Carroll, Democrat

Newton Cannon, Anti-Jackson Democrat

James K. Polk, Democrat ….

James C. Jones, Whig ….

Aaron V. Brown, Democrat

Neil S. Brown, Whig ….

William Trousdale, Democrat .

William B. Campbell, Whig

Andrew Johnson, Democrat

Isham G. Harris, 4 ,, ...

Andrew Johnson, Military ….

Interregnum, 6 4th March-5th April William G. Brownlow, Republican De Witt C. Senter, Conservative Republican John C. Brown, Democrat …. James D. Porter, ,, ...

Albert S. Marks, ,, ...

Alvin Hawkins, Republican William B. Bate, Democrat

1796-1801

1801-1803

1 803-1 809

1809-18 15

1815-1821

1821-1827

1 82 7-1 829

1829

1 829-1 835

1 835-1 839 1 839-1 841 1841-1845 1845-1847 1 847-1 849 1 849-1 85 1 1851-1853 1853-1857

I 857-1 862

1 862-1 865 1865.

1 865-1 869 1869-1871 1871-1875

1 875-1 879 1879-1881 1881-1883 1 883-1 887

•The state furnished 115,000 soldiers to the Confederate and 31,000 to the Union Army.

1 The Constitutions of 1796, 1834 a "d 1870 all provided that the governor shall not serve more than six years in succession.

3 Resigned.

4 Forced to leave capital by invasion of Federal troops.

' Andrew Johnson, the governor, was inaugurated as Vice- President, March 4, 1865, thereby vacating the office.

Robert L. Taylor, „

John P. Buchanan, ,, Peter Tuiney, „

Robert L. Taylor, ,,

Benton McMillin, James B. Frazier, 6 ,,

John I. Cox, ,,

Malcolm R. Patterson, ,, B. W. Hooper, Republican

1887-1891 1891-1893 1893-1897

I 897-1 899

1899-1903 1903-1005 1905-1007 1907-1911 191 1-

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(Washington, 1893), and J. W. Caldwell, Studies in the Constitutional History of Tennessee (Cincinnati, 1895; new ed.,

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TENNESSEE RIVER,, the largest tributary of the Ohio river, U.S.A. It is formed by the confluence of the Holston and the French Broad rivers 4-5 m. above Knoxville, Tennessee, flows S.S.W. to Chattanooga, there turns W. through the Cumberland Plateau and into the N.E. corner of Alabama, continues W. across the northern part of Alabama, turns N. on the boundary between Alabama and Mississippi, and continuing N. across Tennessee and Kentucky unites with the Ohio at Paducah. Its principal tributaries rise in the Appalachian Mountains; the Holston and the Clinch on the mountain slopes that flank the Appalachian Valley in western Virginia; and the French Broad, the Little Tennessee, and the Hiwassee in the mountains of western North Carolina. The Tennessee itself is 652 m. long, and with the Holston and the North Fork of the Holston forms a channel about 900 m. long. Its drainage basin covers about 44,000 sq. m., and its low water discharge at Paducah is 10,000 cu. ft. per second. Its average fall is 0-79 ft. per mile: 0-956 ft. from Knoxville to Chattanooga; 1-19 ft. from Chattanooga to

Florence, Alabama; and 0-39 ft. from Florence to its mouth. The banks are everywhere easily accessible except at Knoxville and Chattanooga, where, for short distances, high elevations rise precipitously from the water; and as the banks are mostly of clay or rock the channel is permanent and the river is unusually free from silt.

The Tennessee is navigable by steamboats throughout its entire course of 652 m, for several months of the year; its tributaries have a nearly equal navigable mileage, and the main river and its tributaries together have a navigable mileage for rafts and flat- boats of 2400 m. At low water there are three obstructions to steamboat navigation in the main stream: the Colbert and Bee Tree shoals, just below Florence; the Muscle shoals just above Florence; and Hales Bar, 33 m. below Chattanooga. The state of Alabama, aided by the Federal government, constructed a lock canal, affording a depth of 5 ft., around the Muscle shoals in 1831-1836, but because of the obstructions above and below the canal was little used and was soon abandoned. The Federal government, beginning in 1868, completed the reconstruction of the Muscle Shoals Canal in two divisions (one 3-5 m. long with two locks, the other 14-5 m. long with nine locks, and both providing a depth of 5 ft.) in 1890, began in 1893 the construction of a canal, about 8 m. long and with one lock, around Colbert and Bee Tree shoals, and in 1904 authorized the construction with private capital of a lock and dam at Hales Bar to provide a channel 6 ft. deep at low water between it and Chattanooga, the water power to be used by the persons furnishing the capital. In 1905 a committee of the United States Senate recommended that future improvements of the river be made with a view of obtaining ultimately a channel having a minimum depth of 12 ft. at low water; and in 1907 Con- gress adopted a project for deepening to 5 ft. at low water the channel (145 m. long) between Hales Bar and the Muscle Shoals Canal. In 1908 the com merce carried on the Tennessee between

e Resigned to enter the U.S. Senate.

Chattanooga and Paducah amounted to 755,010 tons, valued at $18,752,180; it consisted chiefly of general merchandise, farm products, forest products and iron ore in the upper section, of general merchandise, cotton, timber products and grain in the middle section, and of general merchandise, farm products and timber products in the lower section.

During the Civil War Fort Henry was erected by the Confederates on the Tennessee river, in Tennessee just below the Kentucky state line, and on the 6th of February 1862 was captured by Com. A. H. Foote; Fort Donelson on the Cumberland, several miles east, was captured on the 16th by General U. S. Grant, and the two rivers were thus opened for the advance of the Federals far into Confederate territory.

TENNIEL, SIR JOHN (1820-), English humorous and satirical artist— specially identified with Punch — was born in London in 1820. He educated himself for his career, and although he became a probationer, and then a student, of the Royal Academy, he soon left the schools, where at that time there was little teaching. In 1836 he sent his first picture to the exhibition of the Society of British Artists, and in 1845 contributed a 16-ft. cartoon, ” An Allegory of Justice,” to the competition, held in that year, of designs for the mural decora- tion of the new Palace of Westminster. For this he received a £200 premium and a commission to paint a fresco in the Upper Waiting Hall (or ” Hall of Poets “) in the House of Lords. In spite of his tendency towards ” high art,” he was already known and appreciated as a humorist, and his early companionship with Charles Keene fostered and developed his talent for scholarly caricature. At Christmas time 1850 he was invited by Mark Lemon to fill the position of joint cartoonist (with John Leech) on Punch, from which Richard Doyle, offended by the attitude adopted by the paper towards the Papal see at the time of the so-called ” aggression,” had suddenly resigned. On

the strength of his remarkable illustrations to Aesop's Fables, in which artistic power, humour of observation, and knowledge of animal life were equally apparent, Tenniel was selected, on Douglas Jerrold's initiative, to fill the breach, and he contributed his first drawing in the initial letter appearing on p. 224, vol. xix. His first " cartoon " was " Lord Jack the Giant Killer": it showed Lord John Russell, whose letter on the " aggression " had recently been published, valiantly assail- ing with the sword of truth and liberty Cardinal Wiseman armed with a crozier. In 1852 we find Tenniel's first superb lion, and his first obituary cartoon. Gradually he took over altogether the weekly drawing of the political " big cut," which John Leech was happy to resign into his hands in order to restrict himself to. his pictures of life and character. Leech's work consisted for the most part of farce; Tenniel's was high comedy, and not infrequently tragedy; and the freedom of the humorist heightened the severer beauties of the satirist. When Leech died his friend continued his work alone, and except in 1864, 1868, and 1875-6-7-8, during short spells of illness or holiday, he did not miss a single week. About 2300 cartoons, innumerable minor drawings, double-page cartoons for Punch's Almanac and other special numbers, and 250 designs for Punch's Pocket-books, comprise the sum of Sir John Tenniel's work for the periodical in the service of which he spent the greater portion of his life. When Tenniel retired from the service of Punch in January 1901 he received the honour of a farewell banquet (12th June), at which Mr A. J. Balfour, then leader of the House of Commons, presided, and was supported by distinguished representatives of all that was best in English life. On that occasion Mr Balfour's description of Tenniel as " a great artist and a great gentleman " was applauded by the press of the whole country.

The main quality of Sir John Tenniel's work is accuracy of drawing, precision of touch, grace and dignity of conception, and — so far as such things can be compatible — geniality of satire. Tenniel

raised the political cartoon into a classic composition, from which a sense of nobility is rarely absent. The beauty and statuesqueness of his ideal figures recall the influence, perhaps, of Cornelius and Over- beck— that German manner which was characteristic of many of our finer draughtsmen upon wood at the middle of the 19th century. But Tenniel's work is always original, unforced and fresh; and it never suggests, what is the fact, that the artist's work is drawn exclusively from memory, and never from the model. It may be

mentioned that Tenniel's wonderful observation has been conducted, and his knowledge accumulated, literally through a single eye, the other having been lost during a fencing bout in his youth. It was in recognition not only of his ability as an artist in black and white, but of his service in infusing good humour and good taste into one phase of political life, that a knighthood was conferred upon him on Mr Gladstone's recommendation in 1893. Without pronounced political opinions of his own, Sir John Tenniel adopted in his work those of his paper, of which the Whig proclivities were to some degree softened by his pencil. The political history not of England only, but to some extent of the world, of half a century appears in Sir John Tenniel's weekly cartoons, which are dignified by a number of types invented by the artist, the classic beauty of which may be looked for in vain in kindred work by any previous cartoonist. (Take, for example, Sir John's famous picture of " Dropping the Pilot," which appeared in Punch on 20th March 1890, xcviii. 150-51.) Public exhibitions of Sir John Tenniel's work were held in 1895 and in 1900. Sir John Tenniel is also the author of one of the mosaics, " Leonardo da Vinci," in the South Court in the Victoria and Albert Museum; while his highly stippled water-colour drawings appeared from time to tirpp in the exhibitions of the Royal Institute of Painters in Water Colours, of which society he was elected a member in 1874. As an illustrator on the wood-block he stands very high; his " Lalla Rookh " is perhaps the finest of all his work in point of conception,

refinement, power and technical excellence.

Works Illustrated. — (1) Juvenile Verse and Picture Book, (1846); (2) Undine (1846); (3) Aesop's Fables, 100 drawings (1848); (4) Blair's Grave (1858); (5) Shirley Brooks's The Gordian Knot (i860), and (6) The Silver Cord (1861); (7) Moore's Lalla Rookh, 69 drawings (1861); (8) Lewis Carroll's Alice's Adventures in Wonder- land (1866); (9) The Mirage of Life, 1867; (10) Carroll's Through the Looking-Glass (1870); and the following in collaboration: (11) Pollok's Course of Time (1857); (12) Poets of the Nineteenth Century (1857); (13) Poe's Works (1857); (14) Home Affections (1858); (15) Cholmondeley Pennell's Puck on Pegasus (1863); (16) The Arabian Nights (1863); (17) English Sacred Poetry (1864); (18) Legends and Lyrics (1865); (19) Tupper's Proverbial Philosophy; (20) Barry Cornwall's Poems, and other books. He also contributed to Once a Week, the Art Union publications, &c.

TENNIS (sometimes called royal tennis, and, in America, court tennis), one of the oldest of ball-games, and one of the most difficult to learn. It is now played in a walled and roofed court, no ft. by 38 ft. 8 in., the floor, however, measuring but 96 ft. by 3 1 ft. 8 in., the difference being the width of a roofed corridor, the " penthouse," which' runs along the two end walls and one of the side walls. Across the middle of the court a net is stretched, and the first object of the game is to strike the ball over this with a bat or racquet. The net is 5 ft. high at the ends, 3 ft. 6 in. at the middle, and divides the floor into two equal parts, the " service " side and the " hazard " side. The floor and walls are made cf cement and should be smooth but not polished.

The court is lighted from the roof and sides. The height of the court to the tie-beam is 30 ft., the height of the play-line, above which the ball must not go, 18 ft. at the sides and 23 ft. at the ends. The roof of the penthouse, which is made of wood, slopes downwards towards the court, the lower edge being 7 ft. I§ in. from the floor, the upper 10 ft.

7 in., the width 7 ft. The illustrations show that each of the walls has its own peculiarities. The ” dedans ” is an opening in the end wall on the service side, under the penthouse, where provision is made for spectators, who are protected by a net. It is 21 ft. 8 in. in width; the upper edge is 6 ft. 10 in. from the floor, the lower edge 3 ft. 3 in. The opening of the dedans is 4 ft. 6 in. from the main wall, 5 ft. 6 in. from the other side wall. Looking from the dedans (i.e. from the service side), the right-hand or main wall has one peculiarity, the ” tambour,” a sloping buttress to form which the wall is built inward, reducing the breadth of that part of the court to 30 ft. 2 in. In the right-hand corner of the hazard side end wall (as viewed from the dedans) is the “grille,” an opening lined with wood, 3 ft. I in. square; and on this wall is painted a continuation of the ” pass-line.” The left-hand wall, along which runs the pent-house, is not continuous, being broken by a long open- ing between the floor and the penthouse similar to the dedans, and at the same height from the ground. The low walls under this opening and the dedans are called the ” batteries.” There is no wall in front of the ” marker’s box,” through which the court is entered on either side of the net-post. This long opening in the left-hand wall is divided into ” galleries ” and ” doors,” the latter situated where the entrances to the court used to be in early times. The measurements in order from the dedans are as follows, the numbers of the galleries being counted from the net : Service side — last gallery, 9 ft. 6 in. ; second gallery, 9 ft. 6 in. ; door, 3 ft. 6 in. ; first gallery, 5 ft. 8 in. ; marker’s box or line-opening, 7 ft. 10 in. ; hazard side — first gallery, 5 ft. 8 in. ; door, 3 ft. 6 in. ; second gallery, 9 ft. 6 in. ;

last gallery (also called ” winning ” gallery), 9 ft. 6 in. The last galleries are 15 ft. 11 in. each from their respective end walls. The galleries are

marked by ” posts ” which also serve to support the penthouse. The galleries, dedans and grille are known as the “openings”; three of these — the grille, dedans and winning gallery — are ” winning-in openings “; for if a ball in play is struck into one of these, the striker scores a point. In the earlier French courts were other ” winning openings,’ I’ais (the board), an upright board 9 ft. by I ft. in the left-hand corner of the dedans-wall, le petit trou or le trou, a hole 16 in. square at the bottom of the other side of that wall, and la lune, a round opening high up by the play-line, one at each end of the court. In the illustrations are shown certain lines painted on the floor, which are also continued perpendicularly on the walls. On the hazard side is the ” half-court line,” the ” pass-line ” and the ” service-line.” The first is only required when one player gives the other the odds of ” half the court ” (vide infra, ” Scoring and Handicapping “). The pass-line is drawn 7 ft. 8 in. from the main wall; the service-line 21 ft. 1 in. from the grille- wall. The rectangle contained by the pass and service lines forms the ” service-court.” The other lines, both on the hazard side and service side, mark the ” chases,” which will be explained below. The cost of a tennis-court is about £2000.

The Implements. — The balls, for which there are no regulation dimensions, weigh 2 J oz. and are i\ in. in diameter. They are made of strips of cloth, no twine being used except to keep the outside layer

floor, and away from’ him if it is allowed to strike the end wall; the reverse being the effect of twist from a back-hand stroke. ” Rest “: a series of strokes between the two players. ” Service “: the first stroke of a ” rest.” The server may serve from any part of the court on the service side. The ball must strike the roof of the side penthouse, and fall within the service-court. “Fault”: a ball so served that it either does not touch the side penthouse, or falls outside the service-court. “Pass”: a service in which the ball drops beyond the pass-line; the service in this case does not count, but a ” pass ”

does not annul a previous fault, as was once the case. "Force": to strike the ball hard; a hard- hit stroke. "Volley": to strike a ball in its flight (a la volSe) before it has touched the floor. " Half-volley ": to strike a ball immediately after it touches, and before it rises from, the floor. " Nick ": the angle where the floor and walls meet. " Marker ": the attendant who marks and calls the chases and other points scored in the game.

Scoring and Handicapping. — A match consists of three or five "sets "; a "set" of eleven games. The winner of six games wins the set. If a player wins six games consecutively he wins a " love set," even though his opponent may have won several games. The loser of a love set, by an old custom, gives the marker a shilling. Should the score be called " Five games all,"« the players may arrange to play a " vantage game," the set in that case not being won till one or other has won two games in succession. A game

From the Hazard Side. From the Service Side.

Tennis-court at Crabbett Park, Sussex, belonging to the Hon. Neville Lytton.

in place, and are covered with white Melton cloth. The American balls, made of layers of cotton and cloth alternately, are somewhat lighter and slower than the English. A set of balls consists of six or seven dozen ; the same set should not be used twice in a day. The racquet is usually about 27 in. long and weighs about 16 oz. The head is about 9 in. long and 6 in. broad, but there are no restric- tions as to size or weight. The head is somewhat pear-shaped, but its centre line does not correspond with the centre-line of the handle, as it is curved upwards to facilitate the stroke when the ball is taken close to the floor. The earliest racquets were strung diagonally, i.e. in diamonds; later the present vertical-horizontal stringing was adopted, then followed knotting at the points of intersection; but now the knotting hap disappeared. The name racquet (or racket) appears in French as

racquette and in Italian as racchetta. It is variously derived from Latin reticulata (netted), Dutch racken (to stretch), later Latin racha (palm of the hand or wrist), or the Arabian rdhat (palm of the hand) : in favour of the two last derivations is the fact that tennis is a development of a game originally played with the hand, protected by a leather glove, and later on strings were stretched violin-fashion across the palm, to give more power to the stroke. Then followed a wooden bat (battoir), and then a short-handled racquet, either strung or covered with parchment, and finally the modern implement.

Technical Terms. — Some of these have already been explained, but the following may be added. ” Bisque ” : the privilege, given as a form of odds, of scoring a stroke during any part of the game, except after the delivery of ” service ” or after a ” fault.” ” Boast ” : to hit the ball on to the side wall first. ” Cut “: to strike the ball with the head of the racquet held at an angle to the ball’s course instead of meeting it with the full face, thus causing backward rotation of the ball (similar to- the ” screw ” in billiards), which alters its natural rebound from the wall. “Twist”: analogous to ” cut,” but the strings are drawn across the ball at the moment of impact, so as to make it rotate sideways. A ball so struck with a fore-hand stroke twists inwards towards the other player off the

consists ordinarily of four winning strokes, called by the marker as ” Fifteen,” ” Thirty,” “Forty,” “Game”; if the score is ” forty-all,” the marker calls ” Deuce,” and two strokes have to be won in succession by one of the players. When one has won a stroke his score is called ” Vantage “; if he wins the next, he wins the game; if he loses it, the score reverts to deuce. The score of the player who won the last stroke or made the last chase is ealled first. In handicapping the usual odds are (1) bisques, which may also be given in addition to other odds, or to balance odds received ; (2) half-fifteen, or one point to be taken at the beginning of the second and every alternate game; (3) fifteen,

or one point in every game; (4) half -thirty, or one point in every odd game and two points in every even game; (5) thirty, or two points in every game; (6) half-forty, or two points in every odd game and three in every even game; (7) forty, or three points in every game. Other handicaps are: — " Round services," the giver of odds having to serve so that the ball hits both the side and end penthouse; " half the court, " the giver of the odds confining his strokes, except service, to one side of the court as divided by the half-court line, a stroke played into the other half counting to his adversary; " touch no walls," the giver of odds confining his play except service to the floor; " bar the openings," the giver of odds losing a point if his ball goes into a gallery or into the dedans or grille; " bar winning openings," which are closed to the giver of odds, who loses a point if the ball enters them; " side walls," the giver of odds losing a point if he plays the ball on to any side wall, the end penthouses being open to him, and the dedans and grille. In these " cramped " odds the rules do not apply if the ball goes out of limits after the second bound.

The Game and Hints on Play. — The players decide who shall serve by spinning a racquet on its head. One spins and the other calls " rough " or " smooth," the " rough " side of the head of the racquet showing the knots of some of the lower

strings. The winner takes the service side, service being an advantage. He serves from any part of the court, and in any way he thinks best, and the ball must go over the net, strike the side penthouse, and fall into the service-court (see " Fault " and " Pass "). His opponent (" striker-out ") tries to return the ball over the net before it has touched the ground a second time; he may volley or half - volley it. For a stroke to be " good " it must be made before the second bound of the ball, and the

ball must go over the net (even if it touches it), and must not strike the wall above the play-line, nor touch the roof or rafters. The first point to be attained is to be sure of getting the ball over the net, the next to do so in such a way as to defeat the opposing player's attempt to make a "good" stroke in return.

It often happens that a player, either intentionally or from inability, does not take or touch a ball returned to him over the net. In this event, chiefly on the service side, a " chase " (in Italian caccia, in French chasse) is made, the goodness or the badness of which 'depends upon the spot on the floor which the ball touches next after its first bound. The nearer this spot is to the end wall the better the chase. The chase lines are numbered, being one yard apart, the shorter lines representing the half-distance. The chases are noted and called by the marker. Thus if a ball fell on the line marked 4, he would call " chase four "; if between 4 and 3, he would call " Better than four " if it fell nearer to 4 than the short line, and " Worse than three " if it fell on the short line or between the short line and 3; for if the ball fall on a line the striker is credited with the. better stroke. Strokes into the galleries and doors, with the exception of the winning gallery (last gallery, hazard side) count as chases. The making, or, in technical language, the " laying down" of a chase docs not immediately affect the score: it has to be won first, i.e. the other player tries to make a better chase; if he fails, the original maker wins. For this purpose after two chases have been laid down (or one, if either player's score is at 40) the players change sides, e.g. if X has been serving and Y has laid down two chases, Y becomes the server and tries to defend them, X to win them by making the ball fall nearer to the back wall after its first bound than Y did. Either player wins the chase if he " finds " (i.e. hits the ball into) one of the winning openings, or if his opponent fails to make a good return. The winner of the chase scores a point. The chases are played off in the order in which they are made.

Should X in trying to win a chase make the same chase as Y originally laid down, the chase is off and neither side scores. In France the chase is played again. The " rest " goes on till one of the players fails to make a good return, or deliberately leaves the ball alone in order that his opponent may lay down a chase (a procedure to be followed at the discretion of a player in whose judgment the chase will be a bad one), or lose a chase already laid down and in the course of being played off. Either player can score, there being no " hand-in " or " hand-out " as at racquets. A point is scored by that player whose opponent fails to make a good return stroke in a rest, or who strikes the ball into a winning opening, or wins a chase, or to whom two faults are served in succession. A player loses a stroke who strikes the ball twice, or allows it to touch himself or his clothes.

" He who would excel as a tennis-player must learn to serve," is the dictum of an amateur champion, but the necessary variations, the difference between the " railroad " and the " giraffe," &c, can only be explained by an experienced player and in the court. Variety is all-important, as is the knowledge of what sort of service is most valuable in defending a particular chase. All service should be heavily " cut." For the winning of hazard-side chases, indeed for all purposes, the " nick " service is useful, the endeavour being to make the service drop at the nick of the grille-wall and the floor. In attempting this service it should be remembered that it is better for the ball to hit the floor first than the wall, as this allows the cut to act. It is wise to cultivate one sort of service to perfection, if possible, with a reserve of others to suit the occa- sion. Again, the tennis " stroke," differing essentially as it does from the racquet stroke, can only be learnt in the court from a good teacher ; but it is an axiom that tennis is not a game in which hard hitting necessarily tells, though force may be usefully em- ploy ed in trying to " find " the winning openings. This, however,

is an important point of etiquette — it is not "

correct ” to force for the dedans when the striker is close to the net, unless the force is ” boasted ” or there is no danger of hitting his opponent. In some clubs such a stroke is forbidden by a by-law. Some modern players play a faster and harder game than their predecessors, who considered strokes ” on the floor,” i.e. carefully judged chases, to be the true feature of the game; but in any case the beginner should remember that it is better to save his breath and to trust to winning an easy chase by-and-by than to run after a hard-hit stroke, which if left alone would leave ” chase the door ” or ” second gallery ” to be played for afterwards. Similarly in defending a chase, he should remember during the rest what that chase is, and not endeavour to return a stroke which would have lost it. Chases act as breathing-spaces, especially to the player who can trust to his skill ” on the floor,” and these, together with good service, form the reason why men can play tennis, and play it well, at a time of life when cricket, racquets and other active games have to be abandoned.

History. — Tennis may well be called a royal game, having been popular with various kings of England and France, though it is fanciful to connect it with Homer’s Nausicaa, princess of Phaeacia (Odyss. vi. 115), who is represented by him as throw- ing, and not as hitting the ball to her maids of honour. In the ball-games of the Greeks and Romans we may see the rudiments of the French jeu de paume, which is undoubtedly the ancestor of modern tennis in a direct line. The origin of the name is quite obscure. Some give a numerical derivation from the fact that la longue paume was played by ten players, five on each side; others regard it as a corruption of tamis (sieve), for in a form of la paume the server bounced the ball on a sieve and then struck it: there is no possible reason for connecting ” tennis ” with the term Tenois, or Senois; most probable is the derivation from Tenezl (Take it! Play!), especially when we remember the large number of French terms that adhere to the game, e.g., grille, tambour (drum, from the sound on the board

that formed the face of that buttress) and dedans. Further, a poem dealing with the game, written in Latin elegiacs by R. Frissart, makes the striker cry " Excipe!" (Take it after each stroke: this seems to correspond with the custom which enjoins the racquet-marker to call " Play " when- ever a legitimate stroke has been made. In the " Alexiad " of Anna Comnena (about a.d. ii 20) is a reference to a game played on horseback in which a staff, curved at the end and strung with strings of plaited gut, was used. This game was played in a court called " a court for goff (sic)" (according to the Lexicon of Alexandrine Greek), and some similar game, corrupted through tchangan into chicane, was played in France. In a.d. 1300 the game was also known as La boude. Throughout the century indeed it was played in France and by the highest in the land: thus - Louis X. died from a chill contracted after playing; Charles V. was devoted to the game, though he vainly tried to stop it as a pastime for the lower classes; Charles VI. watched the game from the room where he was confined during his attack of insanity, and Du Guesclin amused himself with it during the siege of Dinan. In England the game, or some form of it, was known, Chaucer possibly alluding to it in the words " But canstow playen racket to and fro "; and hand-ball, which may have been either tennis or cricket, was proscribed with other games by Edward III. in 1365. In France the game was pro- hibited to priests in a.d. 1245, and also in 1485, 1512 and 1673. In 1427 we hear of a woman named Margot, who was a skilful player, both her forehanded and backhanded strokes being commended; hence we may infer that the racquet had now been introduced. Tennis was at this time frequently played in some crude form in the moats of castles, where Charles VIII. used to watch the game. Henri II. is described as the best

Tennis Racquet.

player in France, and worthy of the silver ball

given to the finest players. Later, Henri IV. and Louis XIV. (who kept a regular staff to look after his court) were patrons and players of tennis; indeed, in Henri IV. 's reign so popular was the sport that it was said that there were " more tennis-players in Paris than drunkards in England" ; in the 16th century Paris alone could boast of 250 courts, yet it is stated that in 1879 there were only six courts in the whole of France. The word " tennis " — the game having hitherto been described as luens pilae — is first found in Gower's "Balade unto the worthy and noble kynge Henry the fourth " (1400), but Shakespeare's allusion to tennis as known to Henry V. must not be omitted. In reply to messengers from the dauphin, who had sent him a present of tennis-balls by their hands, Henry says: —

" When we have match'd our rackets to these balls We will, in France, by God's grace, play a set Shall strike his father's crown into the hazard. Tell him he hath made a match with such a wrangler That all the courts of France will be disturb'd With chases."

— {Henry V., Act i., sc. 2.)

Even if it be an anachronism that the poet should put these technical terms into the king's mouth, yet the fact is estab- lished that the terms were familiar in Elizabeth's time. Henry VII. indeed both played the game and revoked the edicts that forbade it; there was a court at Windsor Castle in his time, an open court with four bare walls, no penthouse, &c, being visible, and connected with the palace by a covered way. This court still existed in 1607. It was in that reign, possibly in that court, that the king of Castile played a match with the marquis of Dorset, the king, who used a racquet, conceding " fifteen " to the marquis, who played with his hand. The king won the set. Henry VIII. probably built the court at Hampton Court Palace. In 1615 there were further courts in London of various sizes, and a picture of James II. as a boy represents him standing in a tennis-court holding a short- handled racquet, strung diagonally. Pepys frequently alludes

to tennis at a time when there were two courts at Oxford and five at Cambridge. Though the game nourished in the 19th century, it lost some of its popularity, mainly through the demolition of courts as building operations increased; more- over, courts complete in every detail alone were built, the play being consequently confined to the members of the clubs that could afford the expense. The last of the old courts to dis- appear stood in Windmill Street, at the top of the Haymarket, London. King Edward VII., when prince of Wales, frequently played tennis at " Prince's " Court.

The evolution of the court as now built is not easily traced, but courts undoubtedly existed side by side which differed from each other both in detail and in dimensions. It is generally assumed that such details as the penthouse, grille, galleries, &c, were deliberately planned to elaborate the game, but it is not unreasonable to suggest that the game, played , as it must often have been, in extemporized courts, took some of its modifications from them: it is at least significant that in an old illustration of la paume a miniature penthouse appears (from which the ball is rolling) , apparently a shelter' for a bell. The net does not appear till the 17th century, a rope, fringed or tasselled, being stretched across the court: further, the racquet was not in universal use in 1527, since Erasmus in his Colloquies says, '' Reticulum (net, or racquet) piscatoribus relinquamus: ele- gantius est palma uti." An Italian, Antonio Scanio de Salo, is the first bibliographer of tennis. In his Trattato della Palla (treatise on the Ball) he mentions a large court for the game as played with a racquet, and a small court for the hand-game. The large court was 121 ft. long; it was entered by two doors, one between the first and second galleries on either side of the net; there were four galleries on each side; the dedans ex- tended across the whole width of the court: the tambour was there and two grilles. He also mentioned chases, but these were decided by the place where the ball finally stopped, the spot being marked by a

small movable standard.' In another kind of court he says that there was no tambour, but two grilles.

The penthouse was sometimes confined to two walls, sometimes to one, the end wall service side. In the hand-court one side was open all its length, with the exception of the battery and some pillars that perhaps gave variety to the stroke. The Latin poem to which allusion has been made shows the similarity of the 17th-century game to the modern: the racquet is spun"; the marker (signator) is there to mark the chases (metae) with the movable standard; there is the grille (fenestra); the scoring by "15, 30, 40, game"; the volley (volatu ludere); the nick (pedi ludere, French au pied) ; the appeal to the spectators; the board (tatella, French I'ais); deuce and vantage, and the penthouse. In the 15th and 16th centuries tennis- balls were so largely imported from France that the Iron- mongers' Company, who were the English manufactures, twice petitioned — the last time in 1591 — for "protection" in the matter of balls. The term " bisk " (bisque, originally bisquaye) does not appear in English tennis till 1697 (Shadwell's True Widow), nor is the winning gallery mentioned before 1767. In the 17th century tennis became a spectacle in France, and the professional player came into existence, the most famous of that time being Le Pape, Clerg6 and Servo, and about the same time was formed the gild of Paulmiers-racquetiers (manu- facturers of tennis material) with its arms, " Sable, a tennis- racquet proper; in a cross four tennis-balls of the same." De Garsault, writing in 1797, says, " La Paume is the only game that can take rank in the list of Arts and Crafts," and his book, L'art du Paumier-Racquetier, was adopted by the Academie Royale. In France very large sums of money were wagered on the game, especially at the end of the 16th century, the stakes being deposited under the cord or net, while in England, about 1750, there was so much betting and swindling, especially by professional players, that the game as played in the public courts fell into disrepute. In the middle of the 19th century, tennis-courts were rare indeed in England, the best

known being those of the Marylebone Cricket Club (built in 1838), of the Messrs Prince in Hans Place, S.W., besides one at Brighton, one at Hampton Court, two at Cambridge, and one at Oxford; but the game progressed so fast that in 1910 there were between thirty and forty courts in England, one each in Ireland and Scotland, five in America, six in France, one in Melbourne (Australia) and one in Tasmania. The game has disappeared in Italy, Germany, Austria and Spain, though in Spain it was popular in the days of Philip III. (1578-1621) who was himself fond of playing.

The great French players mentioned above were followed by others — Cabasse (who invented the " boasted force " known as the coup de Cabasse), Barcellon, Farolais and Barneon, and in the 18th century the Charniers, Bergeron and Masson, the last-named a really great player who could give fifteen to any of his contemporaries. One of his feats was to stand in a barrel before receiving the service, spring out of it and into it before and after each stroke. Other good players of later date were C. A. Delahaye, and greatest of all, J. E. Barre, who in 1855 re-opened the Versailles court, famous for the meeting of the Tiers £tal on the 20th of June 1789, which body there assembled and took the celebrated " Oath of the tennis-court." Masson is supposed to have visited England in 1792 and to have played against Messrs Hawkins and Price, and a professional called Pillet (or Pilet); but of Barre's visit there can be no doubt, as he played on the new court of the Marylebone Club in 1839, meeting " Peter " Tompkins, the English champion, and beating him so severely that when they met again next year Tompkins received the odds of thirty and a bisque. As an in- stance of the meagre interest taken in tennis at the time, Julian Marshall in his Annals of Tennis states that in Bell's Life, the leading sporting paper, Barre is reported as playing Cox and Tompkins " giving 7! for a bisque," the tennis term " half fifteen " being arithmetically rendered. C. G. Taylor, the great cricketer, was one of the best amateurs, about this time. Barre

eventually resigned the championship in favour of George Lambert, who was beaten in 1885 by T. Pettitt, of Boston U.S.A. Athletic Association, an Englishman by birth, who

learnt all his tennis in America. Charles Saunders beat Lambert in 1886, thereby becoming champion of England. Pettitt and Saunders met for the championship of the world at Dublin, Pettitt winning by seven sets to five. The match took place in May 1890, and during the autumn, Pettitt declining to defend the title, Saunders assumed it, but five years later he was challenged by Peter Latham and beaten, Latham thus becoming the champion of the world both at racquets and tennis. An American, George Standing, challenged him in 1897 for the racquets championship, but was beaten, and next year Pettitt challenged Latham at tennis. In 1904 C. Fairs (" Punch ") challenged Latham for the championship, but was beaten; but in 1908 Latham resigned his title, and Fairs then issued a challenge to any other player in the world to contest his right to the position of champion. The challenge was taken up in 1910 by G. F. Covey, the match for the championship, played at Brighton in the summer of 1910, being won by Fairs after a close contest, in which the younger player secured six sets to his opponent's seven, and fifty-three games to fifty-nine won by the champion. Among amateurs a formal championship was not established till 1889, the recognized champion being the winner of the gold prize annually given by the Marylebone Cricket Club to its members, the competition not being made " open " till 1896. For fifteen years, from 1867 to 1881, J. M. Heathcote held the title, among those whom he defeated during that period being such fine tennis-players as Julian Marshall, G. B. Crawley, the Hon. C. G. Lyttelton (afterwards Lord Cobham), R. D. Walker, C. E. Boyle, and the Hon. Alfred Lyttelton. In 1882 A. Lyttelton defeated Heathcote, only to be beaten next year by him, and to beat him

in turn in 1884 and 1885; but in 1886 Heathcote (then fifty-three years of age) was again champion. From 1887 to 1895 inclusive the Hon. A. Lyttelton was champion, defeating during that time (besides Heathcote) A. J. Webbe, Sir Edward Grey and H. E. Crawley. Grey's perseverance — he won the silver prize on six occasions — was rewarded with the gold prize in 1896, but he was dispossessed in 1897 by E. H. Miles, who won for the next ten years, with the exception of 1900 when he was beaten by J. B. Gribble. On six occasions during this series Sir Edward Grey was second to the winner.

In-1889 the amateur championship, open to all amateurs, was instituted at Queen's Club, West Kensington. The following list shows the winners : —

1889.

Sir E. Grey.

1890.

E. B. Curtis.

1891.

Sir E. Grey.

1892.

H. E. Crawley.

1893-

H. E. Crawley.

1894-

H. E. Crawley.

1895-

Sir E. Grey.

1896.

Sir E. Grey. J. B. Gribble.

1897.

1898.

Sir E. Grey.

1899.

E. H. Miles.

I

1900. 1901. 1902.

1903. 1904. 1905.

1906.

1907.

1908.

1909.

1910.

E. H. Miles. E. H. Miles. E. H. Miles. E. H. Miles. V. Pennell. E. H. Miles. E. H. Miles. Jay Gould. Jay Gould. E. H. Miles. E. H. Miles.

It may be mentioned that Heathcote and Lyttelton, who mono- polized the Marylebone Club's gold prize for twenty-nine years, were strict adherents to the old-fashioned classical game, the winning and defending of chases and the clever placing of the ball being the leading feature of their game. A different and less attractive style of play, consisting of harder hitting, asserted itself in Miles's first success, which was followed by many others; but Jay Gould, an American amateur, who beat Miles for the champion- ship in 1907 and again in 1908, owed his success to the perfection of his style in the older and more scientific tennis. He did not defend his title in 1909, when Miles again became amateur champion in his absence, a title

which Miles again retained in 1910.

The universities of Oxford and Cambridge have played two matches, two-handed and four-handed, ever since 1859, with the exception of 1864 when neither match was played. The games are played at the court of the Marylebone Club.

Tennis in America. — Few tennis-courts existed in America before 1880, about which time the buildings of the Boston Athletic Association and the New York Racquet and Tennis Club were built. There are now also courts at Chicago, Tuxedo, Lakewood and several other places, but the game is naturally played by comparatively few persons. Tom Pettitt, mentioned

above as for several years champion of the world, was for many years in charge of the Boston courts. Other first-class men are Alfred Tompkins of New York, Boakes of Chicago, and Forester. Richard Sears first won the American championship in 1892, and it has been won since by F. Warren, B. S. de Garmendia, L. M. Stockton (four times), Eusta.ce Miles (champion of Great Britain), Joshua Crane, and Jay Gould (amateur champion 1907 and 1908). The older courts at Boston and New York are rather low and small, but the newer ones are perfect.*

See J. M. Heathcote, Tennis, Lawn Tennis, Rochets, Fives, in " The Badminton Library," new and revised edition (London, 1903); Racquets, Tennis and Squash, by Eustace Miles (London,

1902).

TENNYSON, ALFRED TENNYSON, 1st Baron (1809-1892), English poet, was born at Somersby, Lincolnshire, on the 6th of August 1809. He was the fourth of the twelve children of the Rev. George Clayton Tennyson (1 778-1831) and his wife Elizabeth Fytche (1781-1865). The Tennysons were an old Lincolnshire family settled at Bayon's Manor. The poet's grandfather, George Tennyson, M.P., had disinherited the poet's father, who was settled hard by in the rectory of Somersby, in favour of the younger son,

Charles Tennyson D'Eyncourt. The rich pastoral scenery of this part of Lincolnshire influenced the imagination of the boy, and is plainly reflected in all his early poetry, although it has now been stated with authority that the localities of his subject-poems, which had been ingeniously identified with real brooks and granges, were wholly imaginary. At a very early age he began to write in prose and verse. At Christmas 1815 he was sent to the grammar school at Louth, his mother having kept up a connexion with this typical Lincoln- shire borough, of which her father, the Rev. Stephen Fytche, had been vicar. Tennyson was at this school for five years, and then returned to Somersby to be trained by his father. In the rectory the boys had the run of an excellent library, and here the young poet based his wide knowledge of the English classics. The news of Byron's death (19th' April 1824) made a deep impression on him: it was a day, he said, " when the whole world seemed to be darkened for me"; he went out into the woods and carved " Byron is dead " upon a rock. Tennyson was already writing copiously — " an epic of 6000 lines " at twelve, a drama in blank verse at fourteen, and so on: these exercises have, very properly, not been printed, but the poet said of them at the close of his life, " It seems to me, I wrote them all in perfect metre." The family was in the habit of spending the summer holidays at the coast of the county, commonly at Mablethorpe, and here Tennyson gained his im- pressions of the vastness of the sea. FitzGerald very justly attributed the landscape character of Tennyson's genius to the impress left on his imagination by " old Lincolnshire, where there were not only such good seas, but also such fine hill and dale among the wolds."

In 1827 Frederick Tennyson (1807-1898), the eldest surviving brother, uniting with his younger brothers Charles and Alfred, published at Louth an anonymous collection of Poems by Two Brothers. The " two " were Charles and Alfred (whose con- tributions predominated), and who shared the surprising profits, £20. On the 20th February 1828 Charles and

Alfred matriculated at Trinity College, Cambridge, where Frederick was already a student. The poet subsequently told Mr Edmund Gosse that his father would not let him leave Somersby till, on successive days, he had recited from memory the whole of the odes of Horace. The brothers took rooms at 12 Rose Crescent, and afterwards moved into Trumpington Street (now 157 Corpus Buildings). They were shy, and made at first few friends; but they gradually gathered selected associates around them, and Alfred grew to be looked up to in Cambridge " as to a great poet and an elder brother " by a group which in- cluded Richard Chenevix Trench, Monckton Milnes (Lord Houghton), James Spedding, W. H. Thompson, Edward FitzGerald, W. H. Brookfield, and, above all, A. H. Hallam (1811-1833). Charles Tennyson (1808-1879) afterwards took the additional name of Turner. He published four volumes

of sonnets which have been highly praised. In June 1829 Alfred Tennyson won the Chancellor's prize medal for his poem called " Timbuctoo." With great imperfections, this study in Miltonic blank verse displays the genius of a poet, in spite of a curious obscurity both of thought and style. Here are already both richness and power, although their expression is not yet clarified by taste. But by this time Tennyson was writing lyrics of still higher promise, and, as Arthur Hallam early perceived, with an extraordinary earnestness in the worship of beauty. The results of this enthusiasm and this labour of the artist appeared in the volume of Poems, chiefly Lyrical, pub- lished in 1830. This book would have been astonishing as the production of a youth of twenty-one, even if, since the death of Byron six years before, there had not been a singular dearth of good poetry in England. Here at least, in the slender volume of 1830, was a new writer revealed, and in " Mariana," " The Poet," "Love and Death," and " Oriana," a singer of wonderful though still unchastened melody. Through

these, and through less perfect examples, was exhibited an amazing magnificence of fancy, at present insufficiently under control, and a voluptuous pomp of imagery, tending to an over-sweetness. The veteran S. T. Coleridge, praising the genius in the book, blamed the metrical imperfection of it. For this criticism he has himself constantly been reproved, and Tennyson (whose impatience of anything like censure was phenomenal) continued to resent it to the end of his life. Yet Coleridge was perfectly just in his remark; and the metrical anarchy of the "Madelines" and " Adelines " of the 1830 volume showed that Tennyson, with all his delicacy of modulation, had not yet mastered the arts of verse.

In the summer of 1830 Tennyson and Hallam volunteered in the army of the Spanish insurgent Torrijos, and marched about a little in the Pyrenees, without meeting with an enemy. He came back to find his father ailing, and in February 183 1 he left Cambridge for Somersby, where a few days later Dr George Tennyson died. The new incumbent was willing that the Tennysons should continue to live in the rectory, which they did not leave until six years later. Arthur Hallam was now betrothed to Emily Tennyson (afterwards Mrs Jesse, 1811-1889), and stayed frequently at Somersby. This was a very happy time, and one of great physical development on Alfred's part. He took his share in all kinds of athletic exercises, and it was now that Brookfield said, " It is not fair that you should be Hercules as well as Apollo." This high physical zest in life seems to have declined after 1831, when his eyes began to trouble him, and he became liable to depression. The poetical work of these three years, mainly spent at Somersby, was given to the world in the volume of Poems which (dated 1833) appeared at the end of 1832. This was certainly one of the most astonishing re- velations of finished genius ever produced by a young man of less than four-and-twenty. Here were to be read " The Lady of Shalott," " The Dream of Fair Women," " Oenone," " The Lotos-Eaters," "The Palace of Art," and "The Miller's

Daughter," with a score of other lyrics, delicious and divine. The advance in craftsmanship and command over the materiel of verse shown since the volume of 1830 is absolutely astound- ing. If Tennyson had died of the savage article which presently appeared in the Quarterly Review, literature would have sus- tained terrible losses, but his name would have lived for ever among those of the great English poets. Indeed, it may be doubted whether, in several directions, he ever surpassed the glorious things to be found in this most exquisite and most precious book. It was well that its publication was completed before the blow fell upon Tennyson which took for a while all the light out of him. In August 1833 Arthur Hallam started with his father, the great historian, for Tirol. They went no farther than Vienna, where Mr Hallam, returning to the hotel on the 15th of September 1833, found his son lying dead on a sofa: a blood-vessel had broken in his brain. His body was brought back to England, and buried at Clevedon on the 3rd of January 1834. These events affected Tennyson extremely. He grew less than ever willing to come forward and face the

world; his health became " variable and his spirits indifferent." The earliest effect of Hallam 's death upon his friend's art was the composition, in the summer of 1834, of The Two Voices; and to the same period belong the beginnings of the Idylls of the King and of In Memoriam, over both of which he meditated long. In 1835 he visited the Lakes, and saw much of Hartley Coleridge, but would not " obtrude on the great man at Rydal," although " Wordsworth was hospitably disposed." : Careless alike of fame and of influence, Tennyson spent these years mainly at Somersby, in a uniform devotion of his whole soul to the art of poetry. In 1837, to their great distress, the Tennysons were turned out of the Lincolnshire rectory where they had lived so long. They moved to High Beech, in Epping Forest, which was their home until 1840. The poet was already engaged^ or "quasi-betrothed," to Emily Sellwood, but ten years more had to pass before they could afford to marry. At Torquay, in 1838, he wrote

Audley Court on one of his rare ex- cursions, for he had no money for touring, nor did he wish for change: he wrote at this time, "I require quiet, and myself to myself, more than any man when I write." In 1840 the Tennysons moved to Tunbridge Wells, and a year later to Boxley, near Maidstone, to be close to Edmund Lushington, who had now married Cecilia Tennyson. Alfred was from this time more and more frequently a visitor in London.

In 1842 the two-volume edition of his Poems broke the ten years' silence which he had enforced himself to keep. Here, with many pieces already known to all lovers of modern verse, were found rich and copious additions to his work. These he had originally intended to publish alone, and an earlier privately printed Morie d' Arthur, Dora, and other Idylls, of 1842, is the despair of book -collectors. Most of those studies of home-life in England, which formed so highly popular a section of Tennyson's work — such as " The Gardener's Daughter," "Walking to the Mail," and " The Lord of Burleigh "—were now first issued, and, in what we have grown to consider a much higher order, " Locksley Hall," " Ulysses," and "Sir Galahad." To the older and more luxurious lyrics, as reprinted in 1842, Tennyson did not spare the curbing and pruning hand, and in some cases went too far in restraining the wanton spirit of beauty in its youthful impulse. It is from 1842 that the universal fame of Tennyson must be dated; from the time of the publication of the two volumes he ceased to be a curiosity, or the darling of an advanced clique, and took his place as the leading poet of his age in England. Among the friends whom he now made, or for the first time cultivated, were Carlyle, Rogers, Dickens, and Elizabeth Barrett. Material difficulties now, however, for the first time intruded on his path. He became the victim of a certain " earnest-frothy " speculator, who in- duced him to sell his little Lincolnshire estate at Grasbj^ and to invest the proceeds, with all his other money, and part of that of his brothers arid sisters, in a " Patent Decorative Carving Company": in a few months the whole scheme collapsed, and

Tennyson was left penniless. He was attacked by so overwhelming a hypochondria that his life was despaired of, and he was placed for some time under the charge of a hydro- pathic physician at Cheltenham, where absolute rest and isolation gradually brought him round to health again. The state of utter indigence to which Tennyson was reduced, greatly exercised his friends, and in September 1845, at the suggestion of Henry Hallam, Sir Robert Peel was induced to bestow on the poet a pension of £200 a year. Never was public money expended in a more patriotic fashion. Tennyson's health slowly became restored, and in 1846 he was hard at work on The Princess; in the autumn of this year he took a tour in Switzerland, and saw great mountains and such "stateliest bits of landskip " for the first time. In 1847 nervous prostra- tion again obliged him to undergo treatment at Prestbury: " They tell me not to read, not to think; but they might as well tell me not to live." Dr Gully's water-cure was tried, with success. The Princess was now published, in a form after- wards considerably modified and added to. Carlyle and Fitz- Gerald "gave up all hopes of him after The Princess," ox

pretended that they did. It was true that the bent of his I genius was slightly altered, in a direction which seemed less 1 purely and austerely that of the highest art ; but his concessions to public taste vastly added to the width of the circle he now addressed. The home of the Tennysons was now at Cheltenham: on his occasional visits to London he was in the habit of seeing Thackeray, Coventry Patmore, Browning and Macready, as well as older friends, but he avoided " society." In 1848, while making a tour in Cornwall, Tennyson met Robert Stephen Hawker of Morwenstow, with whom he seems — but the evidence is uncertain — to have talked about King Arthur, and to have resumed his intention of writing an epic on that theme. In his absent-minded way Tennyson was very apt to mislay objects; in

earlier life he had lost the MS. of Poems, chiefly Lyrical, and had been obliged to restore the whole from scraps and memory. Now a worse thing befell him, for in February 1850, having collected into one ” long ledger-like book ” all the elegies on Arthur Hallam which he had been composing at intervals since 1833, he left this only MS. in the cupboard of some lodgings in Mornington Place, Hampstead Road. By extraordinary good chance it had been overlooked by the landlady, and Coventry Patmore was able to recover it. In this way In Memoriam was dragged back from the very verge of destruction, and could be published, in its original anonymous form, in May 1850. The public was at first greatly mystified by the nature and object of this poem, which was not merely a chronicle of Tennyson’s emotions under bereavement, nor even a statement of his philosophical and religious beliefs, but, as he long after- wards explained, a sort of Divina Commedia, ending with happiness in the marriage of his youngest sister, Cecilia Lushington. In fact, the great blemishes of In Memoriam, its redundancy and the dislocation of its parts, were largely due to the desultory manner of its composition. The poet wrote the sections as they occurred to him, and did not think of weaving them together into a single poem until it was too late to give them real coherency. The metre, which by a curious naivete Tennyson long believed that he had invented, served by its happy peculiarity to bind the sections together, and even to give an illusion of connected movement to the thought.

The sale of Tennyson’s poems now made it safe for him to settle, and on the 13th of June 1850 he was married at Shiplake to Emily Sarah Sell wood (1 813-1896). Of this union no more need be said than was recorded long afterwards by the poet himself, ” The peace of God came into my life before the altar when I wedded her.” Every species of good fortune was now to descend on the path of the man who had struggled against ill luck so long. Wordsworth died, and on the 19th of November 1850 Queen Victoria appointed Tennyson poet laureate. The salary

connected with the post was very small, but it had a secondary value in greatly stimulating the sale of his books, which was his main source of income. The young couple took a house at Warninglid, in Sussex, which did not suit them, and then one in Montpelier Row, Twickenham, which did better. In April 1851 their first child was born dead. At this time Tennyson was brooding much upon the ancient world, and reading little but Milton, Homer and Virgil. This condition was elegantly defined by Carlyle as " sitting on a dungheap among innumerable dead dogs." In the summer of 1851 was made the tour in Italy, of which The Daisy is the immortal record. Of 1852 the principal events were the birth of his eldest son Hallam, the second Lord Tennyson, in August, and in November the publication of the Ode on the Death of the Duke of Wellington. In the winter of 1853 Tennyson entered into possession of a little house and farm called Farringford, near Freshwater, in the Isle of Wight, which he leased at first, and afterwards bought: this beautiful place, ringed round with ilexes and cedars, entered into his life and coloured it with its delicate enchantment. In 1854 he published The Charge of the Light Brigade, and was busy composing Maud and its accom- panying lyrics; and this volume was published in July 1855, just after he was made D.C.L. at Oxford: he was received on

this occasion, which may be considered his first public appear- ance, with a " tremendous ovation." The reception of Maud from the critics, however, was the worst trial to his equanimity which Tennyson had ever had to endure, nor had the future anything like it in store for him. He had risen in Maud far above his ordinary serenity of style, to ecstasies of passion and audacities of expression which were scarcely intelligible to his readers, and certainly not welcome. It is odd that this irregular poem, with its copious and varied music, its splendid sweep of emotion, its unfailing richness of texture — this poem in which Tennyson rises to heights of human sympathy and intuition which he reached nowhere else, should have been received with bitter

hostility, have been styled ” the dead level of prose run mad,” and have been reproved more absurdly still for its ” rampant and rabid bloodthirstiness of soul.” There came a reaction of taste and sense, but the delicate spirit of Tennyson had been wounded. For some years the world heard nothing from him; he was at Farringford, busying himself with the Arthurian traditions. He had now become an object of boundless personal curiosity, being already difficult to find, and the centre of amusing legends. It was in 1857 that Bayard Taylor saw him, and carried away the impression of a man ” tall and broad-shouldered as a son of Anak, with hair, beard and eyes of southern darkness.” This period of somewhat mysterious withdrawal from the world embraced a tour in Wales in 1857, a visit to Norway in 1858, and a journey through Portugal in 1859. In 1857 two Arthurian poems had been tentatively and privately printed, as Enid and Nimue, or the True and the False, to see how the idyllic form would be liked by the inner circle of Tennyson’s friends. In the summer of 1859 the first series of Idylls of the King was at length given to the world, and achieved a popular success far beyond anything experienced before by any English poets, save perhaps Byron and Scott. Within a month of publication, 10,000 copies had been sold. The idyls were four in number, ” Enid,” ” Vivien ” (no longer called ” Nimue “), ” Elaine ” and ” Guinevere.” These were fragments of the epic of the fall of King Arthur and the Table Round which Tennyson was so long preparing, and which he can hardly be said to have ever completed, although nearly thirty years later he closed it. The public and the critics alike were entranced with the ” sweetness ” and the ” purity ” of the treatment. A few, like Ruskin, were doubtful about ” that increased quietness of style “; one or two already suspected that the ” sweetness ” was obtained at some sacrifice of force, and that the ” purity ” involved a con- cession to Victorian conventionality. It was not perceived at the time that the four idyls were parts of a great historical or mystical poem, and they were welcomed as four polished studies of typical women: it must be

confessed that in this light their even perfection of workmanship appeared to greater advantage than it eventually did in the general texture of the so-called " epic." In 1859 " Boadicea " was written, and " Riflemen, Form ! " published in The Times. Urged by the duke of Argyll, Tennyson now turned his attention to the theme of the Holy Grail, though he progressed with it but fitfully and slowly. In 1 86 1 he travelled in Auvergne and the Pyrenees, with Clough, who was to die a few months later; to this year belong " Helen's Tower " and the " Dedication " of the Idylls to the prince consort, " These to his Memory." The latter led to Tennyson's presentation in April 1862 to the queen, who " stood pale and statue-like before him, in a kind of stately innocence," which greatly moved his admiring homage. From this time forth the poet enjoyed the constant favour of the sovereign, though he could never be moulded into a conven- tional courtier. He now put the Arthurian legends aside for a time, and devoted himself to the composition, in 1862, of " Enoch Arden," which, however, did not appear until 1864, and then in a volume which also contained "Sea Dreams," " Aylmer's Field " and, above all, " The Northern Farmer," the first and finest of Tennyson's remarkable studies in dialect. In April of this year Garibaldi visited Farringford; in February 1865 Tennyson's mother died at Hampstead in her eighty-fifth

year; in the ensuing summer he travelled in Germany. The time slipped by with incidents but few and slight, Tennyson's popularity in Great Britain growing all the time to an extent unparalleled in the whole annals of English poetry. This universality of fame led to considerable practical discomfort; he was besieged by sightseers, and his nervous trepidation led him perhaps to exaggerate the intensity of the infliction. In 1867 he determined to make for himself a haven of refuge against the invading Philistine, and bought some

land on Blackdown, above Haslemere, then a secluded corner of England; here Mr (afterwards Sir) James Knowles began to build him a house, ultimately named Aldworth. This is the time of two of his rare, privately printed pamphlets, The Window; or, the Loves of the Wrens (1867), and The Victim (1868). The noble poem Lucretius, one of the greatest of Tennyson's versified monographs, appeared in May 1868, and in this year The Holy Grail was at last finished; it was published in 1869, together with three other idyls belonging to the Arthurian epic, and various miscellaneous lyrics, besides Lucretius. The reception of this volume was cordial, but not so universally respectful as that which Tennyson had grown to expect from his adoring public. The fact was that the heightened reputation of Browning, and still more the sudden vogue of Swinburne, Morris and Rossetti (1866-1870), considerably disturbed the minds of Tennyson's most ardent readers, and exposed himself to a severer criticism than he had lately been accustomed to endure. He went on quite calmly, however, sure of his mission and of his music. His next volume (1872), Gareth and Lynette and The Last Tournament, continued, and, as he then supposed, concluded The Idylls of the King, to the great satisfaction of the poet, who had found much difficulty in rounding off the last sections of the poem. Nor, as he was to find, was the poem yet completed, but for the time being he dismissed it from his mind. In 1873 he was offered a baronetcy by Gladstone, and again by Disraeli in 1874; in each case the honour was gracefully de- clined. Believing that his work with the romantic Arthurian epics was concluded, Tennyson now turned his attention to a department of poetry which had long attracted him, but which he had never seriously attempted — the drama. He put before him a scheme, which he cannot be said to have carried far, that of illustrating " the making of England " by a series of great historical tragedies. His Queen Mary, the first of these chronicle-plays was published in 1875, and played by Sir Henry Irving at the Lyceum in 1876. Although it was full of admir- ably dramatic writing, it was not theatrically well composed, and

it failed on the stage. Extremely pertinacious in this respect, the poet went on attempting to storm the theatre, with assault upon assault, all practically failures until the seventh and last, which was unfortunately posthumous. To have really succeeded on the stage would have given Tennyson more gratification than anything else, but he was not permitted to live long enough to see this blossom also added to the heavy garland of his glory. Meanwhile Harold, a tragedy of doom, was published in 1876; but, though perhaps the finest of its author's dramas, it has never been acted. During these years Tennyson's thoughts were largely occupied with the building of Aldworth. His few lyrics were spirited ballads of adventure, inspired by an exalted patriotism — " The Revenge " (1878), " The Defence of Lucknow " (1879) — but he reprinted and finally published his old suppressed poem, The Lover's Tale, and a little play of his, The Falcon, versified out of Boccaccio, was produced by the Kendals at their theatre in the last days of 1879. Tennyson had reached the limits of the threescore years and ten, and it was tacitly taken for granted that he would now retire into dignified repose. In point of fact, he now started on a new lease of poetical activity. In 1880 he published the earliest of six important collections of lyrics, this being entitled Ballads and other Poems, and containing the sombre and magnificent " Rizpah." In 1881 The Cup and in 1882 The Promise of May, two little plays, were produced without substantial success in London theatres: the second of these is perhaps the least successful of all the poet's longer

writings, but its failure annoyed him unreasonably. This determination to be a working playwright, pushed on in the face of critical hostility and popular indifference, is a very curious trait in the character of Tennyson. In September 1883 Tenny- son and Gladstone set out on a voyage round the north of Scotland, to Orkney, and across the ocean to Norway and Denmark. At Copenhagen they were entertained by the king and queen, and after much feting, returned to Gravesend: this adventure served to cheer the

poet, who had been in low spirits since the death of his favourite brother Charles, and who now entered upon a phase of admirable vigour. During the voyage Gladstone had determined to offer Tennyson a peerage. After some demur, the poet consented to accept it, but added, ” For my own part, I shall regret my simple name all my life.” On the nth of March 1884 he took his seat in the House of Lords as Baron Tennyson of Aldworth and Farringford. He voted twice, but never spoke in the House. In the autumn of this year his tragedy of Becket was published, but the poet at last despaired of the stage, and disclaimed any hope of ” meeting the exigencies of our modern theatre.” Curiously enough, after his death Becket was the one of all his plays which enjoyed a great success on the boards. In 1885 was published another interesting miscellany, Tiresias and other Poems, with a post- humous dedication to Edward FitzGerald. In this volume, it should be noted, The Idylls of the King was completed at last by the publication of ” Balin and Balan “; it contained also the superb address ” To Virgil.” In April 1886 Tennyson suffered the loss of his second son, Lionel, who died in the Red Sea on his return from India. The untiring old poet was steadily writing on, and by 1886 he had another collection of lyrics ready, Locksley Hall Sixty Years After, &c; his eyes troubled him, but his memory and his intellectual curiosity were as vivid as ever. Late in 1888 he had a dangerous attack of rheumatic gout, from which it seemed in December that he could scarcely hope to rally, but his magnificent constitution pulled him through. He was past eighty when he published the collection of new verses entitled Demeter and other Poems (1889), which appeared almost simultaneously with the death of Browning, an event which left Tennyson a solitary figure indeed in poetic literature. In 1891 it was observed that he had wonderfully recovered the high spirits of youth, and even a remarkable portion of physical strength. His latest drama, The Foresters, now received his attention, and in March 1892 it was produced at New York, with Miss Ada Rehan as Maid Marian. During this year Tennyson was steadily

engaged on poetical composition, finishing ” Akbar’s Dream,” ” Kapiolani ” and other contents of the posthumous volume called The Death of Oenone, 1892. In the summer he took a voyage to the Channel Islands and Devonshire; and even this was not his latest excursion from home, for in July 1892 he went up for a visit to London. Soon after entering his eighty- fourth year, however, symptoms of weakness set in, and early in September his condition began to give alarm. He retained his intellectual lucidity and an absolute command of his faculties to the last, reading Shakespeare with obvious appreciation until within a few hours of his death. With the splendour of the full moon falling upon him, his hand clasping his Shakespeare, and looking, as we are told, almost unearthly in the majestic beauty of his old age, Tennyson passed away at Aldworth on the night of the 6th of October 1892. Cymbeline, the play he had been reading on the last afternoon, was laid in his coffin, and on the 1 2th he was publicly buried with great solemnity in Westminster Abbey. Lady Tennyson survived until August 1896.

The physical appearance of Tennyson was very remarkable. Of his figure at the age of thirty-three Carlyle has left a superb portrait: ” One of the finest-looking men in the world. A great shock of rough, dusky, dark hair; bright, laughing, hazel eyes; massive aquiline face, most massive yet most delicate; of sallow brown complexion, almost Indian-looking, clothes cynic- ally loose, free-and-easy, smokes infinite tobacco. His voice is musical, metallic, fit for leud laughter and piercing wail, and all that may lie between; speech and speculation free and

plenteous; I do not meet in these late decades such company over a pipe.” He was unusually tall, and possessed in advanced years a strange and rather terrifying air of sombre majesty. But he was, in fact, of a great simplicity in temperament,

affectionate, shy, still exquisitely sensitive in extreme old age to the influences of beauty, melancholy and sweetness. Al- though exceedingly near-sighted, Tennyson was a very close observer of nature, and at the age of eighty his dark and glowing eyes, which were still strong, continued to permit him to enjoy the delicate features of country life around him, both at Aid- worth and in the Isle of Wight. His Life, written with admirable piety and taste by his son, Hallam, second Lord Tennyson, was published in two volumes in 1897.

At the time of his death, and for some time after it, the enthusiastic recognition of the genius of Tennyson was too extravagant to be permanent. A reaction against this extrava- gance was perhaps inevitable, and criticism has of late been little occupied with the poet. The reason of this is easy to find. For an unusually long period this particular poetry had occupied public and professional opinion, and all the commonplace things about it had been said and re-said to satiety. It lacks for the moment the interest of freshness; it is like a wonderful picture seen so constantly that it fails any longer to concentrate attention. No living poet has ever held England — no poet but Victor Hugo has probably ever held any country — quite so long under his unbroken sway as Tennyson did. As he recedes from us, however, we begin to see that he has a much closer relation to the great Georgian writers than we used to be willing to admit. The distance between the generation of Wordsworth and Coleridge and that of Byron and Shelley is not less— it is even probably greater — than that which divides Keats from Tenny- son, and he is more the last of that great school than the first of any new one. The qualities in which he seems to surpass his immediate predecessors are exactly those which should be the gift of one who sums up the labours of a mighty line of artists. He is remarkable among them for the breadth, the richness, the substantial accomplishment of his touch; he has something of all these his elders, and goes farther along the road of technical perfection

than any of them. We still look to the earlier masters for supreme excellence in particular directions: to Wordsworth for sublime philosophy, to Coleridge for ethereal magic, to Byron for passion, to Shelley for lyric intensity, to Keats for richness. Tennyson does not excel each of these in his own special field, but he is often nearer to the particular man in his particular mastery than any one else can be said to be, and he has in addition his own field of supremacy. What this is cannot easily be defined; it consists, perhaps, in the beauty of the atmosphere which Tennyson contrives to cast around his work, moulding it in the blue mystery of twilight, in the opaline haze of sunset: this atmosphere, suffused over his poetry with inestimable skill and with a tact very rarely at fault, produces an almost unfailing illusion or mirage of loveli- ness, so that, even where (as must sometimes be the case with every poet) the thought and the imagery have little value in themselves, the fictive aura of beauty broods over the otherwise undistinguished verse. Hence, among all the English poets, it is Tennyson who presents the least percentage of entirely un- attractive poetry. In his luminous subtlety and his broad undulating sweetness, his relationship with Virgil has long been manifest; he was himself aware of it. But he was also con- scious that his exquisite devotion to mere lucidity and beauty might be a snare to him, and a happy instinct was always driving him to a study of mankind as well as of inanimate nature. Few English writers have known so adroitly as Tenny- son how to bend the study of Shakespeare to the enrichment of their personal style. It should be added that he was a very deep and original student of literature of every description, and that the comparatively few specimens which have been pre^ served of his conversation contain some of the finest fragments of modem appreciation of the great poets which we possess. This is worthy of consideration in any attempt made to sketch the mind of a man who was above all other masters of recent

literature an artist, and who must be studied in the

vast and orbic fullness of his accomplishment in order to be appreciated at all. (E. G.)

Alfred, Lord Tennyson: a Memoir (1897), by Hallam, second Baron Tennyson, is the authoritative source for the poet's bio- graphy. Mr R. H. Shepherd in his Tennysoniana (1866), supplied a list of criticisms on his work, and a bibliography issued separately in 1896. Among the numerous books on the subject of his life and writings may be mentioned: A Commentary on Tennyson's In Memoriam (1901), by Prof. A. C. Bradley, Canon Rawnsley's Memories of the Tennysons (1900); Alfred Tennyson (1901), by Mr Andrew Lang; an essay on "The Mission of Tennyson" in Mr W. S. Lilly's Studies in Religion and Literature (1904); and The Life of Lord Tennyson (1904), by Mr A. C. Benson, who gives a more critical estimate of the poet than was possible in the Memoir by his son.

TENOR (through Fr. and It. from Lat. tenor, holding on, course, sense of a law, tone), a general course or direction, the drift or general meaning of a statement or discourse, hence, in law, the true purport and effect of a deed or instrument. The most general use of the word is, in music, for the highest kind of the natural adult male voice. This use descends from the Medieval Latin tenor, which was applied first to the chief melody, the cantus firmus, and then to the male voice to which the singing of this was assigned.

TENREC {Centetes ecandatus), one of the largest representatives of the mammalian order Insectivora, the length being from 12 in. to 16 in.; called also the tailless ground-hog of Mada- gascar, to which island it is restricted. The coat consists chiefly of bristles and hairs, with an admixture of flexible spines, which in the young form longitudinal lines down the back; but in the adult they are limited to the back of the neck. The general hue is brown tinged with yellow. From twelve to sixteen young are produced at a birth, and twenty-one have been recorded. In habits the tenrec is fossorial and nocturnal; its home is in the brush in the mountain regions, and in the cool season, from May or June

till December, it hibernates in deep burrows. The long flexible snout is used to root up worms and grubs, and ground-insects form part of its nourishment. These animals are very fat when hibernation begins, and are then much valued for food by the natives (see also Insectivoka).

TENT. A tent is a portable habitation or place of shelter, consisting in its simplest form of a covering of some textile substance stretched over a framework of cords and poles, or of wooden rods, and fastened tightly to the ground by pegs. Throughout the greater part of the interior of Asia the pastoral tribes have of necessity ever been dwellers in tents — the scanti- ness of water, the consequent frequent failure of herbage, and the violent extremes of seasons compelling a wandering life. Tents have also been used in all ages by armies in campaign. In ancient Assyrian sculptures discovered by Layard at Nineveh the forms of tent and tent-furnishings are similar to those which still prevail in the East, and it appears that then as now it was a custom to pitch tents within the walls of a city. The ordinary family tent of the Arab nomads of modern times is a com- paratively spacious ridged structure, averaging from 20 to 25 ft. in length, but sometimes reaching as much as 40 ft. Its covering consists of a thick felt of black goat hair (cp. Cant. i. 5 — ” black as the tents of Kedar “), or sometimes of alternate stripes of black and white disposed horizontally. The ridge or roof is supported by nine poles disposed in sets of three, the central set being loftier than those at each end, whereby a slope outward is formed which helps to carry off rain. The average height inside at the centre is 7 ft. and at the sides 5 ft., and the cloths at the side are so attached that they can easily be removed, the sheltered end being always kept open. Internally the tent is separated by a partition into two sections, that reserved for the women containing the cooking utensils and food. The jourt or tent of the Kirghiz of Central Asia is a very capacious and substantial structure, consisting of a wooden frame for sides, radiating ribs for

roof, and a wooden door. The sides are made up of sections of laths, which expand arid contract in lozenges, on the principle of lazy tongs, and to their upper extremities ribs are lashed at regular intervals. Over this

framework a heavy covering of felt is thrown, which is either weighted down with stones or, when necessary, stitched together. In Western countries tents are used chiefly in military en- campments, by travellers and explorers, and for temporary ceremonial occasions and public gatherings. The material of which they are composed is commonly a light linen canvas or navy duck; but for tents of small size stout cotton canvas is employed, being light, strong, elastic, and sufficiently water-proof. These tents vary in size irom a low-pitched covering, under which a couple of men can with difficulty creep, up to spacious marquees, in which horticultural and agricultural shows are held, and which can accommodate thousands of persons.

The marquee is distinguished from the tent by being a ridged structure, devoted to show and social uses; but the humblest tent made — the tenle d'abri or shelter tent of the French army — is also ridged in form. The tente d'abri affords sleeping accommodation for six men, and consists of a rope stretched over three low poles and fixed into the ground. Four separate squares of canvas buttoned together are thrown over the rope and pegged to the ground on each side so as to form a low ridge. Two other squares are used for covering the ends, being thrown over the slanting rope ends by which the poles are pegged to the ground. Each of the six men using the tent carries one of the squares of canvas besides his quota of the poles, rope and pegs. In the British service tentes d'abri are often improvised by fastening together blankets or waterproof sheets over a stick. The gipsies and travel- ling tinkers of England have an equally

unpretentious tent, which consists of a framework, of hazel rods bent so as to, form a series of low ridges, the ends being stuck into the ground, and over this frame blankets or other coverings are thrown and pegged down. The simplest, but at the same time the least convenient, of ordinary tents is the conical, consisting of a central pole with ropes and canvas radiating from it in an unbroken slope to the ground. The common army bell tent is of this type, but the conical roof ter- minates at about I ft. 9 in. from the ground, and from it there hangs vertically a curtain which is loosely pegged to the ground or looped up to allow of the free circulation of air when the tent is unoccu- pied or the weather is favourable. This form, however, covers much ground in proportion to the accommodation it affords, as the space round the circumference is of little value. A tent, therefore, which has sides or a fall is a much more convenient structure. The counterpart of the conical is the pyramidal tent, the four equal sides sloping to the ground; and this form with a fall or sides makes the square tent, which is both convenient in shape and firm in structure. Small tents are also made, modified from the Arab form, with a central pole and two lower lateral poles. In the umbrella tent the roof is supported by a set of ribs which radiate from the pole, precisely as the ribs of an umbrella spread out from the stick.

The tents and marquees in use in the British army are the follow- ing: The bell tents (single or double thickness) 16 ft. in circum- ference, accommodating in active service 3 officers, 7 sergeants or 15 men each; the Indian general service tents, of various sizes, square with pyramidal roofs, the Indian " E.P." and " Staff- sergeants' " tents, which are much roomier than the tents used in India on active service, " hospital marquees " and " operating tents. "

In former wars, when small professional armies were employed and it was customary to pay extraordinary attention to the soldier's comforts, the train of an army included a full tent equipment, which helped to

diminish the already small degree of mobility of which it was capable. Under the Revolution and Napoleon, and generally in the 19th century, the system of housing armies in the field under canvas was practically abolished (except as regards more or less rough tentes d'abri) and replaced by that of billets and bivouacs. The strain entailed upon the transport by complete tentage may be judged from the fact that a single battalion on the minimum scale would require four waggons, each with one ton load of poles and canvas, that is, the regimental transport would be doubled.

A tent equipment (of the tente d'abri type) was introduced into the German army about 1888, and the troops of Austria and Switzer- land also possess tents. In the Russian army cavalry and engineer troops are excepted from the otherwise universal issue of canvas shelter.

TENTERDEN, CHARLES ABBOTT, ist Baron (1762-1832), lord chief justice of England, was born at Canterbury on the 7th of October 1762, his father having been a hairdresser and wigmaker of the town. He was educated at Canterbury King's School and Corpus Christi College, Oxford, of which he after- wards became fellow and tutor. On the advice of Mr Justice Buller (1746-1800), to whose son he had been tutor, he deter- mined on the legal profession, and entered at the Middle Temple

in 1787. For several years he practised as a special pleader under the bar, and was finally called at the Inner Temple in 1796. He joined the Oxford circuit and soon made rapid head- way. In 1 80 1 he was appointed recorder of Oxford. In 1802 appeared his Law relative to Merchant Ships and Seamen, a concise and excellent treatise, which has maintained its position as an authoritative work. Its publication brought to him so much commercial and other work that in 1808 he was in a position to refuse a seat on the bench; this, however, he ac- cepted in 1816, being made a judge of the court of common pleas. On the resignation of Lord Ellenborough in 1818 he was promoted to the chief justiceship of the king's

bench. In his capacity as chief justice he presided over several important state trials, notably that of Arthur Thistlewood and the Cato Street conspirators (1820). He was raised to the peerage in 1827 as Baron Tenterden of Hendon. Never a great lawyer and with no pretence to eloquence, Tenterden made his way by sound common sense and steady hard. work. He was an un- compromising Tory, and had no sympathy with the reform of the criminal law carried out by Romilly; while he strongly opposed the Catholic Relief Bill and the Reform Bill. He died on the 4th of November 1832, and was buried, by his own desire, in the Foundling Hospital, London, of which he was a governor.

Tenterden was succeeded in his title by his son, John Henry Abbott (1796–1870), then by his grandson, Charles Stuart Aubrey Abbott (1834–1882), permanent under-secretary for foreign affairs, who was made a K.C.B. in 1878. In 1882 the latter's son, Charles Stuart Henry Abbott (b. 1865) became the 4th Baron.'

TENTERDEN, a market town and municipal borough in the Ashford parliamentary division of Kent, England, 62 m. S.E. by E. of London by the South-Eastern and Chatham railway. Pop. (1901) 3243. It lies on an elevation above the Newnill Channel, a tributary of the Rother, whose flat valley, called the Rother Levels, was an estuary within historic times; and even as late as the 18th century the sea was within 2 m. of Tenterden, which is a member of the affiliated Cinque Port of Rye. The church of St Mildred is Early English and later, and its tall, massive Perpendicular tower is well known for the legend connecting it with Goodwin Sands. The story is that the Abbot of St Augustine, Canterbury, diverted the funds by which the sea-wall protecting Earl Godwin's island was kept up, for the purpose of building Tenterden steeple, the conse- quence being that in 1099 an inundation took place and " Ten- terden steeple was the cause of the Goodwin Sands." Attached to the church is a penitentiary used in the reign of Queen Mary for the confinement of persons awaiting trial on a charge of heresy. The church of High Halden, in the neighbourhood, is remarkable for its octagonal wooden tower constructed of huge timbers, with a belfry of wooden tiles (shingles), of the time of Henry VI. Tenterden has a considerable trade in agricultural produce and stock. It is governed by a mayor, four aldermen and twelve councillors. Area, 8946 acres.

Tenterden (Tenlerdenne, Tentyrden) figures frequently in contemporary records from 1300 onwards. In 1449 Henry VI. incorporated it by the name of a " Bailiff and Commonalty," and united it to Rye. In return for these and other privileges it was to contribute towards the services due from the latter as one of the Cinque Ports. The troubles of

1449 apparently hindered the issue of the charter, since in 1463 Edward IV. brought it into operation. In 1600 it was incorporated under the title of the " Mayor, Jurats and Commons " of the town and hundred of Tenterden, in the county of Kent, the members of the corporation ranking henceforward as barons of the Cinque Ports. A weekly corn market on Friday and a yearly fair on the first Monday in May were granted, both of which are held at the present day. In 1790 a contemporary writer mentions the market as being little frequented, whilst the fair was large and resorted to by all the neighbourhood. This charter was ex- emplified by that of the year 1700. The size and importance of Tenterden can be estimated from a receipt of 1635 for £90

ship-money, as compared with £70 contributed by Faversham, and £60 by Hythe. Under Edward III. several refugee Flemings settled in the town and established the woollen manufacture. An old waste book, still preserved, contains entries of amounts of cloth sent from Tenterden to London. By 1835 this trade had completely died out, and Tenterden was suffering from the depression of agricultural interests.

TENURE (Fr. tenure, from Lat. tenere, to hold), in law, the holding or possession of land. The holding of land in England was originally either allodial or feudal. Allodial land was land held not of a superior lord, but of the king and people. Such ownership was absolute. It possibly took its origin from the view that the land was the possession of the clan; that the chief was the leader but not the owner, and was no doubt strengthened by the temporary and partial occupation by the Romans. Their withdrawal, followed by the Saxon invasion, tended, without doubt, to re-establish the principle of common village ownership which formed the basis of both Celtic and German tenure. In the later Saxon period, however, private ownership became gradually

more extended. Then the feudal idea began to make progress in England, much as it did about the same time on the continent of Europe, and it received a great impetus from the Norman conquest. When English law began to settle down into a system, the principle of feudalism was taken as the basis, and it gradually became the undisputed maxim of English law that the sovereign was the supreme lord of all the land and that every one held under him as tenant, that there was no such thing as an absolute private right of property in land, but that the state alone as personified by the sovereign was vested with that right, and conceded to the individual possessor only a strictly defined subordinate right, subject to conditions from time to time enacted by the com- munity (see also Feudalism). Feudal tenure was divided into free and non-free. Free tenures were frankalmoign, knight service, serjeanty and free socage. These tenures are dealt with under their separate headings. Base or non-free tenure was tenure in villenage (q.v.) and copyhold (q.v.), and see also Manor.

TEPIC, a territory of Mexico facing on the Pacific Ocean and bounded N., E. and S. by Sinaloa, Durango and Jalisco. Area 11,275 sq. m. Pop. (1900) 150,098. The active volcano of Ceboruco rises in the western part of the territory. The slopes and valleys are densely wooded, the lower regions being very fertile and adapted to tropical agriculture. The rainfall is abundant, and the climate hot, damp and malarial. The Rio Grande de Lerma, or Santiago, is the principal river, whose sources are to be found on the high plateau in the state of Mexico. The next largest river is the Mezquital, which has its sources in the state of Durango, not far from the city of that name. The products of the territorial coast lands are sugar, cotton, tobacco, maize, palm oil, coffee, fine woods and medi- cinal plants. Mining attracts much attention in the sierras, and its mineral deposits are rich. There are cotton and cigarette factories at the town of Tepic, besides sugar works and dis- tilleries on the plantations. The capital of the territory is Tepic (pop. 1900,

15,488), attractively situated on a small plateau 2950 ft. above sea level, 26 m. E. by S. of its port, San Bias, with which it is connected by rail.

The territory of Tepic was detached from the State of Jalisco in 1889 on account of the belligerent attitude of its population, chiefly composed of Indians. A territorial form of government places it more directly under the control of the national executive.

TEPIDARIUM, the term given to the warm (tepidus) bath- room of the Roman baths. There is an interesting example at Pompeii; this was covered with a semicircular barrel vault, decorated with reliefs in stucco, and round the room a series of square recesses or niches divided from one another by Telamones. The tepidarium in the Roman thermae was the great central hall round which all the other halls were grouped, and which gave the key to the plans of the thermae: it was probably the hall where the bathers first assembled prior to taking the cold bath or passing through the various hot baths,

and was decorated with the richest marbles and mosaics: it received its light through clerestory windows, on the sides, the front and the rear, and would seem to have been the hall in which the finest treasures of art were placed; thus in the thermae of Caracalla, the Farnese Hercules, and the Toro Farnese, the two gladiators, the sarcophagi of green basalt now in the Vatican, and numerous other treasures, were found during the excavations by Paul III. in 1546, and transported to the Vatican and the museum at Naples.

TEPLITZ (Czech, Teplice), or Teplitz-Schonau, as it is officially called since the incorporation of the village of Schonau in 1895, a town of Bohemia, Austria, 80 m. N.N.W. of Prague by rail. Pop. (1900) 24,420. It is picturesquely situated in the plain of the Biela, which separates the Erzgebirge from the Bohemian Mittelgebirge, and is a favourite watering-place, containing a large Kurhaus and numerous handsome bath- houses. The environs are laid out in

pretty and shady gardens and promenades, the finest being in the park which surrounds the chateau of Prince Clary-Aldringen, built in 17 51. The other chief buildings are the Roman Catholic Schlosskirche, built in 1568 and altered to its present form in 1790, the Pro- testant church, the Jewish synagogue with a conspicuous dome, and the theatre. In the garden of the chateau are two ancient towers, probably the remains of the Benedictine con- vent, but ascribed by local tradition to the knight Kolostuj, .the legendary discoverer of the springs. The saline-alkaline springs of Teplitz, ten to twelve in number, ranging in temperature from 90 to 117 Fahr., are classed among what are called " indifferent " waters. Used almost exclusively for bathing, they are prescribed for gout, rheumatism, and some scrofulous affections, and their reputed efficacy in alleviating the effects of gun-shot wounds had gained for Teplitz the sobriquet of " the warriors' bath." Military baths are maintained in the town by the governments of Austria, Prussia and Saxony, and there are also bath-houses for the poor. Teplitz is much visited for the after-cure, after Carlsbad and similar spas. The number of patients is about 6000 and the passing visitors about 25,000. The presence of a bed of lignite in the neighbourhood has encouraged the industrial development of Teplitz, which carries on manufactures of machinery and metal goods, cotton and woollen goods, chemicals, hardware, sugar, dyeing and calico- printing.

The thermal springs are fabled to have been discovered as early as 762, but the first authentic mention of the baths occurs in the 16th century. The town is mentioned in the 12th century, when Judith, queen of Ladislaus I. of Bohemia, founded here a convent for Benedictine nuns, which was destroyed in the Hussite wars. In the 17th century Teplitz belonged to the Kinskys, and after Kinsky's murder (25th February 1634) the lordship was granted by Ferdinand II. to Johann Count Aldringen. His sister Anna, who inherited it, married Freiherr Hieronymus von Clary, who assumed the additional name and arms

of Aldringen. The family, which was raised to the rank of count in 1666 and of prince of the Empire in 1767, still retains the property. Teplitz figures in the history of Wallenstein, and is also interesting as the spot where the monarchs of Austria, Russia and Prussia first signed the triple alliance against Napoleon in 18 13. It is a curious fact that on the day of the earthquake at Lisbon (1st November 1775) the main spring at Teplitz ceased to flow for some minutes.

TERAMO, an episcopal see of the Abruzzi, Italy, the capital of the province of Teramo, 16 m. by rail W.S.W. of Giulianova, a junction on the Ancona-Brindisi railway. Pop. (1901) 10,508 (town); 24,091 (commune). The town stands on the left bank of the Tordino, where it is joined by the Vezzola, at an altitude of 876 ft. above sea-level. The picturesque valley of the Tordino is here dominated by the peaks of the Gran Sasso d'ltalia. The town is traversed by one straight wide street with large houses, but for the most part it consists of narrow lanes. The cathedral has a Romanesque Gothic portal of 1332 by a Roman marble worker named Deodatus, and the interior is decorated in the Baroque style, but still retains the pointed vaulting of 1154, introduced into Italy by French Benedictines; it contains a splendid silver antependium by the 15th-century goldsmith Nicolo di Guardiagrele (1433-48). The tower is fine. The church of S. Antonio is also in the Romanesque Gothic

style. Under the church of S. Anna dei Pompetti remains of Roman houses and of the original cathedral have been dis- covered (F. Savini in Notizie degli scavi, 1898, 137). In the Communal Gallery is an altarpiece from the cathedral by the Venetian Jacobello del Fiore (1400-1439). The antiquities in- clude remains of a gateway, a theatre and baths, as well as numerous inscriptions. There are manufactures of wool and silk, and of

straw hats and pottery.

The ancient Interamna Praetuttiorum (so called to distin- guish it from Interamna Lirenas and Interamna Nahars) was the chief town of the tribe of the Praetuttii. Its pre-Roman necropolis was discovered in 1905 (F. Savini in Notizie degli scavi, 1905, 267). Of its municipal constitution little is known, indeed in an inscription of the end of the Republic it is spoken of both as a colonia and a municipium. It was situated on a branch of the Via Caecilia (q.v.). Remains of an amphitheatre still exist. In the valley of the Vomano near Monterio was a Roman village, probably dependent on Interamna, with a temple of Hercules (Corp. inscr. Lat., ix. p. 484).

See V. Bindi, Afonumenli degli Abruzzi (Naples, 1889), I sqq.

TERAPHIM (A.V. sometimes transcribes, e.g. Judges xvii. 5; xviii. 14 seq.; Hosea iii. 4; sometimes translates "image," 1 Sam. xix. 13; " idols," Zech. x. 2; " idolatry," 1 Sam. xv. 23: R.V. renders consistently " teraphim "), a Hebrew word, found only in the plural, of uncertain etymology. The name appears to be applied to some form of idol (cf. Gen. xxxi. 19 and 30), but details as to its precise configuration, &c, are lacking. From 1 Sam. xix. 13, 16 it would seem that in the early monarchical period a regular place in every household was still reserved for the teraphim; while in the 8th century Hosea (iii. 4) speaks of " ephod and teraphim " as essential elements in the national worship. Later the teraphim with other ad- juncts of heathenish worship were banned by the prophets. The meaning of the Elohistic story in Gen. xxxv. 2-4 clearly is that the employment of teraphim and of other heathen practices of Aramean paganism was given up by Israel in order that they might serve Jehovah alone at Bethel. In Judges and Hosea the teraphim are closely associated with the ephod; both are mentioned in connexion with divination (cf. 2 Kings xxiii. 24; Ezek. xxi. 21 [26]; Zech. x. 2). Whether the teraphim were " consulted " by lot or not is

uncertain. In view of Ezek. xxi. 21 and Hosea iii. 4 it is difficult to suppose that the teraphim were purely household idols. The Rabbinical con- jectures on the subject can be found in Buxtorf, Lex. Talm. (ed. Fischer), 13 15 seq. One of the most curious is that the teraphim consisted of a mummified human head (see also Ephod). (W. R. S.; G. H. Bo.)

TERBIUM [symbol Tb, atomic weight 159-2 (0 = i6)], a metallic chemical element belonging to the rare earth group; it was originally called erbia by its discoverer Mosander (see Rare Earth). Pure terbium compounds were obtained by G. Urbain (Compt. rend., 1904 seq.) by fractional crystalliza- tion of the nickel double nitrates, the ethyl sulphates, and the bismuth double nitrates of the terbium earths. Terbium appears to be trivalent. The oxide is a black or brown powder according as it is prepared from the exalate or sulphate, and when pure it is non-fluorescent, but mixed with gadolinia or alumina it possesses this property. It yields colourless salts; the crystal- lized sulphate has the formula Tb 2 (S04)3-8H 2 0.

TER BORCH (or Terburg), GERARD (1617-1681), Dutch subject painter, was born in 161 7 at Zwolle, in the province of Overyssel, Holland. He received an excellent education from his father, also an artist, and developed his talent very early. The inscription on a study of a head proves that Ter Borch was at Amsterdam in 1632, where he studied possibly under C. Duyster or P. Codde. Duyster's influence can be traced in a picture bearing the date 1638, in the Ionides Bequest (Victoria and Albert Museum). In 1634 he studied under Pieter Molyn in Haarlem. A record of this Haarlem period is the " Con- sultation " (1635) at the Berlin Gallery. In 1635 he was in London, and subsequently he travelled in Germany, France, Spain and Italy. It is certain that he was in Rome in 1641,

when he painted the small portraits on copper of " Jan Six '" and " A Young Lady " (Six Collection, Amsterdam). In 1648 he was at Munster during the meeting of the congress which ratified the treaty of

peace between the Spaniards and the Dutch, and executed his celebrated little picture, painted upon copper, of the assembled plenipotentiaries — a work which, along with the " Guitar Lesson " and a portrait of a " Man Standing," now represents the master in the national collection in London. The picture was bought by the marquess of Hertford at the Demidoff sale for £7280, and presented to the National Gallery by Sir Richard Wallace, at the suggestion of his secretary, Sir John Murray Scott. At this time Ter Borch was invited to visit Madrid, where he received employment and the honour of knighthood from Philip IV., but, in conse- quence of an intrigue, it is said, he was obliged to return to Holland. He seems to have resided for a time in Haarlem; but he finally settled in Deventer, where he became a member of the town council, as which he appears in the portrait now in the gallery of the Hague. He died at Deventer in 1681.

Ter Borch is excellent as a portrait painter, but still greater as a painter of genre subjects. He depicts with admirable truth the life of the wealthy and cultured classes of his time, and his work is free from any touch of the grossness which finds so large a place in Dutch art. His figures are well drawn and expressive in attitude; his colouring is clear and rich, but his best skill lies in his unequalled rendering of texture in draperies, which is seen to advantage in such pictures as the "Letter" in the Dutch royal collection, and in the " Paternal Advice " (known as the " Satin Gown ") — engraved by Wille — which exists in various repetitions at Berlin and Amsterdam, and in the Bridgewater Gallery. Ter Borch's works are comparatively rare; only about eighty have been catalogued. Six of these are at the Hermitage, six at the Berlin Museum, five at the Louvre; four at the Dresden Museum, and two at the Wallace Collection.

See Gerard Terburg {Ter Borch) el sa famille, by Emile Michel (Paris, 1887) ; Der kiinstlerische Entwickelungsgang des G. Ter Borch, by Dr W. Bode; Maitres d' autrefois, by E. Fromentin (4th ed.,

Paris, 1882).

TERCEIRA, an island in the Atlantic Ocean, belonging to Portugal, and forming part of the Azores archipelago. Pop. (1900) 48,770; area, 224 sq. m. Terceira, i.e. ” the third,” was so called as being the third island of the archipelago to be discovered by the Portuguese. From its central position it was long the seat of administration, but its capital, Angra (q.v.) or Angra do Heroismo (pop. 10,788), has lost much of its com- mercial importance. The other chief towns are Ribeirinha (3090), and Praia da Victoria (3236). Unlike the neighbouring islands, Terceira exhibits few extensive traces of volcanic action; and the summits of its mountains are generally level. It abounds in grain and cattle; but the wines are inferior, and fruits are raised merely for internal consumption. (See also Azores.)

TEREBINTH, botanical name Pistacia Terebinthus, a member of the natural order Anacardiaceae, usually a small tree common in the south of Europe and the whole Mediterranean area. It has a purplish grey bark and compound leaves with two to four pairs, and an odd terminal one, of smooth dark green oval blunt leaflets, which when young are thin, translucent and strongly tinged with reddish purple. The very small numerous unisexual flowers are borne on panicles which spring from just above the scars of last year’s leaves. The fruit is a small roundish bright red drupe with a scanty pulp. The plant has been long known in English gardens. A liquid oleo-resinous exudation, known as Chian, Scio or Cyprus turpentine, is obtained by cutting the stem. The Chian turpentine of commerce is obtained ex- clusively from the island of Scio; the produce is very small, a large tree yielding only 10 or n ounces in one year. An allied species, P. Lenliscus, is the mastich tree.

TEREDO, a genus of Lamellibranchiate Mollusca, ” of the order Eulamellibranchia, sub-order Adesmacea, family Tere- dinidae. The animals included in this genus are commonly

known as " ship-worms," and are notorious for the destruction which they cause in ships' timbers, the woodwork of harbours, and piles or other wood immersed for a long period in the sea. They inhabit long cylindrical holes, which they excavate in the wood, and usually occur in great numbers, crowded together so that often only a very thin film remains between the adjacent burrows. Each burrow is lined with a layer of calcareous substance secreted by the mollusc; this lining is not usually complete, but stops short a little distance from the inner end of the burrow, where the boring process continues to take place. In some burrows, however, the lining is complete, either because the animal has reached its full size or because some cause pre- vents it continuing its tunnel; in such cases the calcareous tube has a hemispherical termination. The burrows are usually driven in the direction of the grain of the wood, but not in- variably so. When a knot or nail or the tube of a neighbour is reached, the course of the burrow is altered so as to bend round the obstruction. One burrow is never found to break into another.

The adult Teredo, when removed from its burrow and calcareous tube, is from a few inches to 3 ft. in length, according to the species to which it belongs, and is cylindrical and worm-like in appearance. The anterior end, which lies at the bottom of the burrow, is some- what enlarged and bears a pair of shells or valves, which are not connected by the usual ligament, but are widely separated dorsally. The valves are triangular in shape and very concave on the side which is in contact with the animal. In front their edges are widely separated, and the mantle tube, which is elsewhere closed, has here a slight median aperture, through which the short sucker-like foot can be protruded. The next portion of the body behind the shell-bearing part is naked, except for the shelly lining of the burrow, which is secreted by this

part. Anteriorly this portion contains part of the body proper; posteriorly it forms a tube divided internally by a horizontal partition into two chambers and representing the two tubular outgrowths of the mantle called siphons, here united together. In the lower chamber are the elongated gill plates, which have the typical lamelli- Fig. I. — Sagittal median section of Teredo, a., anus; a.a., anterior adductor branchiate structure. In the upper chamber anteriorly muscle; a.s., anal siphon; br.s., branchial siphon; e.g., cerebral ganglion; g., gill; is the rectum. A thick muscular ring terminates this h., heart; m., mouth; p.a., posterior adductor; p.g., pedal ganglion; r.o., renal region of the body, and bears two calcareous plates opening; r.p., reno-pericardial orifice; v.g., visceral ganglion. (Partly after shaped like spades or battledores. The expanded Grobben and Beuck, from Lankester's Treatise on Zoology.) parts of these plates are free and project backwards;

hemispherical in shape, so that the whole larva when its organs are retracted is contained in a globular case.

Concerning the later changes of the larva and the method by which it bores into wood little or nothing is known from direct observation. Much has been written about the boring of this and other marine animals, but even yet the matter cannot be said to be satisfactorily elucidated. Osier, in a paper in Phil. Trans., 1826, argued that the Teredo bores by means of its shells, fixing itself by the surface of the foot, which it uses as a sucker, and then rasping the wood with the rough front edges of the shell-valves. This view was founded on the similarity of the arrangement of the shells and muscles in Teredo to those occurring in Pholas, in which the method of boring described was actually observed. W. Thompson, in a paper in the Edinb. New Phil. J own., 1835, supported the view that the excavation is due to the action of a solvent secreted from the surface of the animal. Albany Hancock, again {Ann. and Mag. Nat. Hist., vol. xv.), thinks that the excavating power of Teredo is due to

silicious particles imbedded in the anterior portion of the integument, in front of the valves. But the actual existence of either silicious particles or acid secretion has been denied by others. Jeffreys believes that the foot is the organ by which the animal burrows. In the larger number of Lamellibranchs the foot is doubt- less a burrowing organ, and it is difficult to see how the limpet hollows out the rock to which it is attached if not by means of the surface of its foot. At the same time it is difficult to explain how the soft muscular foot can penetrate into hard wood. The process is of course slow, and Jeffreys supposes that particles are detached one by one from the moistened surface to which the foot is applied. In any case the valves are covered by an epidermis, which could scarcely be there if they were used in burrowing.

Teredo grows and burrows at an extremely rapid rate: spawning takes place in the spring and summer, and before the end of the year the animals are adult and their burrows of large size. Quatre-

the handle is "fixed in a deep socket or pit lined by epidermis. These calcareous plates are called pallets (Fr. palmules). Behind the pallets the tubular body bifurcates, forming two siphons similar to those of other Lamellibranchs; the siphons can be con- tracted or expanded within wide limits of length. The principal organs of the body — stomach, heart, generative organs and neph- ridia — are situated in the anterior part of the body, forming a visceral mass, which extends some distance behind the valves. The heart is above the intestine and not perforated by it. There are two adductor muscles of which the anterior is rudimentary and situated just above the mouth, while the posterior is large and passes between the middle parts of the shell-valves. The visceral mass extends some distance behind the posterior adductor, and behind the rectum, and the visceral ganglia, which in most Lamellibranchs are attached to the ventral surface of the posterior adductor, are in this case at the end of the visceral mass and at the anterior end of the gills.

Besides the visceral ganglia a cerebral and a pedal pair are present. The stomach is provided with a large crystalline style. The function of the pallets is to form an operculum to the calcareous tube when the siphons are with- drawn into it. In some species the external or narrower end of the calcareous tube is provided with transverse laminae projecting into the lumen; and in some the external aperture is divided by a horizontal partition into two, one for each siphon.

The Teredo is dioecious, and the males are only in the proportion of 1 : 500 of he females. As in the case of the oyster, the ova are retained in the branchial chamber during the early stages of their development The segmentation of the ovum is unequal, and leads to the formation of a gastrula by epibole. By the growth of a preoral lobe provided with a ring of cilia, and by the formation of a mouth and an anus, the trochosphere stage is reached. A pair of thin shells then appear on the sides of the larva, connected by a hinge on the dorsal median line, and the foot grows out between mouth and anus. By the time the larvae ” swarm,” or leave the branchial cavity of the parent to live for a time as free-swimming pelagic larvae, the valves of the shell have grown so large as to cover the whole of the body when the velum is retracted; the foot is also long, cylindrical and flexible, and can be protruded far beyond the shell. The valves of the shell at this stage are

fages relates that at Guipuzcoa (N. Spain) a ferry-boat was sunk accidentally in the spring, and was raised four months afterwards, when its timbers were already rendered useless by T. pedicellata. How long the animals live is not accurately known, but Quatre- fages found that they nearly all perished in the winter. This cannot be generally the case, as the size of the tubes varies so greatly. In Holland their greatest ravages are made in July arid August. Iron ships have nothing to fear from their attacks, and the copper sheathing now almost universally used protects wooden hulls. A great deal of loss is, however, caused by Teredo in harbour works and

shipping stages, and the embankments in Holland are con- tinually injured by it. The most efficient protection is afforded by large-headed nails driven in in close proximity. Soaking wood in creosote is not a certain safeguard ; Jeffreys found at Christiania in 1863 that a large number of harbour piles previously soaked in creosote had been completely destroyed by T. navalis. Coal tar and the silicate of lime used for coating stonework have been suggested as protective coverings, but they do not seem to have been adequately tested.

Species of Teredo occur in all seas. The animal was known to the ancients and is mentioned by Theophrastus, Pliny and Ovid. In 1715 it is mentioned by Valisnieri, in 1720 by Deslandes. In 1733 great attention was drawn to it on account of the discovery that the wooden dikes of Holland were being rapidly destroyed by ship-worms, and that the country was in danger of inundation. Three treatises were published concerning the animal, by P. Massuet, J. Rousset and Godfrey Sellius. The work of the last-named, which was the best, described the anatomy of the creature and showed that its affinities were with bivalve molluscs. The truth of Sellius's view was not grasped by Linnaeus, who placed Teredo together with Serpula in the genus Dentalium; but its proper position was re-established by Cuvier and Lamarck. Adanson, un-aware of the work of Sellius, in 1757 believed himself to be the first to discover the molluscan affinities of T redo. It will not be necessary to give here a definition of the genus taken from any systematist; it will be sufficient to point out that the long cylin- drical body with its two small anterior polygonal valves, the absence of a ligament and accessory valves, the muscular ring into which are inserted the calcareous pallets, and the continuous calcareous tube lining the hole bored by the animal are the diagnostic features.

Jeffreys, in his British Conchology, gives the following species as British: Teredo norvegica, Spengler; T. navalis, Linn. ; T. pedi- cellata, Quatrefages; T. megotara, Hanley. T. norvegica occurs chiefly on the west coast of Great Britain. It was taken by Thompson at Portpatrick in Wigtownshire, and occurred in Jeffreys s time in abundance at Milford Haven. This species has been de- scribed by Gmelin and a number of British authors as T. navalis, Linn. It is distinguished by having the base of the pallets simple, not forked, and the tube semi-concamerated at its narrower pos- terior end. The length does not usually exceed a foot. It is the T. navium of Sellius. T. navalis has been identified from the figures of Sellius, to which Linnaeus referred; Sellius called it T. marina. It occurs on all the western and southern coasts of Europe, from Christiania to the Black Sea, and is the species which causes so much damage to the Dutch embankments. The pallets of this species are small and forked, and the stalk is cylindrical. The tube is simple and not chambered at its narrow end. T. pedi- cellata was originally discovered by Quatrefages in the Bay of Los Pasages on the north coast of Spain ; it has also been found in the Channel Islands, at Toulon, in Provence and in Algeria. In T. megotara the tube is simple and the pallets like those of T. norvegica; it occurs at Shetland and Wick, and also on the western shore of the Atlantic, where its range extends from Massachusetts to South Carolina. T. malleolus, Turton, and T. bipinnata, Turton, belong to the West Indies, but are often drifted in floating timber to the coasts of Europe. Other occasional visitants to the British shores are T. excavata, bipartita,. spatha, fusticulus, cucullata, and fimbriata. These were described by Gwyn Jeffreys in Ann. and Mag. Nat. Hist., i860. T. fimbriata is stated to be a native of Vancouver's Island. A kind of ship-worm, the Nausitora dunlopei of Perceval Wright, has been discovered in India, 70 m. from the sea, in a stream of perfectly fresh water, namely, the river Kumar, one of the branches of the Ganges. T. corniformis, Lam., is found burrowing in the husks of coco-nuts

and other woody fruits float- ing in the tropical seas; its tubes are extremely crooked and contorted for want of space. Fossil wood and palm-fruits of Sheppey and Brabant are pierced in the same way.

Twenty-four fossil species have been recognized in the Lias and succeeding beds of Europe and the United States. The sub-genus Teredina, Lam., is a fossil of the Eocene of Great Britain and France.

Literature. — See, besides the works already mentioned, Godfrey Sellius, Historia naturalis teredinis seu xylophagi marini (1733); Adanson, Histoire naturelle du Senegal (Paris, 1757); Quatrefages, Annales des Sci. Nat. (1848-50); Forbes and Hanley, Brit. Mollusca ('853); B. Hatschek, Entwicklung v. Teredo: Arbeiten aus dem Zool. Inst. Wien (1880); Deshayes, Mollusques d'Algerie; Sir E. Home, "Anatomy of Teredo," in Phil. Trans., vol. xcvi. ; Frey and Leuckart, Beitrdge zur Kenntniss wirbelloser Thiere (1847); Woodward, Manual of Mollusca (London, 1851); Sigerfoos, " Note on the Organization of the Larva and the Post-larval Development of Shipworms." Johns Hopkins Univ. Circul., xv. 1896; Keer, Bijdrage tot de kennis van den Paalworm (Leiden, 1903).

(J. T.C.)

TEREK, a river of Russian Caucasia. It rises in the Caucasus, on the slopes of Mount Kasbek, in several head-streams, and flows north as far as Vladikavkaz, just above which it emerges from the mountains. Then it flows N.W. and N. as far as approximately 43 45' N., whereupon it swings round to the E. and pursues that direction as far as 46 30' E. Finally, after a comparatively short run towards the N.N.E., it branches out into a large delta on the west side of the Caspian Sea. This river, the ancient Alutas, is at first an impetuous mountain torrent, as are also all its chief tributaries — the Zunzha on the right, and the Ardon, Urukh, Cherek, Urvan, Chegem, Baksan and Malka on the left. All these streams, except the first- named, rise at altitudes of 8000 to 9000 ft. between Mount Kasbek and Mount Elbruz. In its lower

course the Terek becomes very sinuous and sluggish, and frequently overflows its banks with disastrous results. Opposite its mouth it forms large sand-banks in the Caspian, and is nowhere navigable. Its length is 300 m., and the area of its drainage basin extends to 22,800 sq. m.

TEREK, a province of Russian Caucasia, situated N. of the Caucasus chain. It is bounded by the government of Stavropol on the N., by the Caspian Sea and Daghestan on the E., by Tiflis and Kutais on the S., and by the Black Sea district and the province of Kuban on the W., and has an area of 23,531 sq. m. From Mount Elbruz to Kasbek the southern boundary coincides with the main range of the Caucasus, and thus includes some of its highest peaks; further east it follows a sinuous line so as to enclose the secondary chains and their ramifications.

Nearly one-third of the area is occupied by hilly tracts, the remainder being undulating and flat land belonging to the de- pression of the Terek; one-half of this last, on the left bank of the river, is occupied by sandy deserts, salt clay steppes, and arid stretches unsuited for cultivation. The Caucasus Mountains are described under that heading. Tertiary formations, over- lain by Quaternary deposits, cover a wide area in the prairies and steppes. Mineral springs occur near Pyatigorsk.

The climate is continental. The mean annual temperatures are 49-6° Fahr. at Pyatigorsk (1680 ft. above the sea; January 39°, July 70 °) and 47-7° at Vladikavkaz (2345 ft.; January 23 , July 69°), but frosts a few degrees below zero are not uncommon. The mountain slopes receive an abundance of rain (37 in.), but the steppes suffer much from drought (rainfall between 10 and 20 in.). Nearly the whole of the government belongs to the drainage area of the river Terek, but the north-west corner is drained by the upper tributaries of the Kuma. In the lower part of its course the Terek flows at a higher level than that of the neighbouring plains, and is kept in its bed by embankments. Nevertheless

inundations are frequent and cause great destruction.

The estimated population in 1906 was 1,044,800. The province is divided into seven districts, the chief towns of which are Vladikavkaz, Groznyi, Kizlyar, Nalchik, Pyatigorsk, Sunzhinsk and Khasavyurt, the last two being nomad centres of administra- tion. Agriculture has developed greatly on the prairies, the area under crops being 9 per cent, of the total. Rye, wheat, oats, barley and potatoes are the principal crops. The vine is very extensively cultivated, especially in the districts of Kizlyar and Pyatigorsk, where 1,500,000 gallons of wine are made annually. Live-stock breeding is widely engaged in, and fishing is an im- portant source of income, especially at the mouth of the Terek. Bees are generally kept, and yield every year nearly half a million sterling worth of honey and wax. Melons, cucumbers and sun- flowers are extensively grown. The railway, which formerly stopped at Vladikavkaz, has been continued from the Beslan station, near Vladikavkaz, to Petrovsk on the Caspian Sea, and thence to Baku.

TERENCE. Our knowledge of the life of the celebrated Latin playwright, Publius Terentius Afer, is derived chiefly from a fragment of the lost work of Suetonius, De viris illustrious, preserved in the commentary of Donatus, who adds a few words of his own. The prologues to the comedies were among the original sources of Suetonius; but he quotes or refers to the works of various grammarians and antiquaries — Porcius Licinus, Volcacius Sedigitus, Q. Cosconius, Nepos, Santra, Fenestella. There is uncertainty as to both the date of the poet's birth and the manner of his death. His last play was exhibited in 160 B.C., and shortly after its production he went abroad, " when he had not yet completed his twenty-fifth year." Cornelius Nepos is quoted for the statement that he was about the same age as Scipio Africanus the younger (born in 185 or 184 B.C.) and Laelius; while Fenestella, an antiquary of the later Augustan period, represented him as older than either. If Terence was born in

185, he published his six plays between the ages of eighteen and twenty-five. Even in an imitative artist such precocity of talent is remarkable, and the date is therefore open to legitimate doubt.

He is said to have been born in Carthage, and brought to Rome as a slave. At Rome he was educated like a free man in the house of Terentius Lucanus, a senator, by whom he was soon emancipated; whereupon he took his master's nomen Terentius, and thenceforward his name was Publius Terentius Afer, of which the last member seems to imply that he was not a Phoenician (Poenus) by blood. He was admitted into the intimacy of young men of the best families, such as Scipio, Laelius and Furius Philus; and he enjoyed the favour of older men of literary distinction and official position. In the circle of Scipio he doubtless met the historian Polybius, who was brought to Italy in 167. He is said to have owed the favour of the great as much to his personal gifts and graces as to his literary eminence; and in one of his prologues he declares it to be his ambition, while not offending the many, to please the " boni."

Terence's earliest play was the Andria, exhibited in 166 B.C. A pretty, but perhaps apocryphal, story is told of his having read the play, before its exhibition, to Caecilius (who, after the death of Plautus, ranked as the foremost comic poet), and of

the generous admiration of it manifested by Caecilius. A similar instance of the recognition of rising genius by a poet whose own day was past is found in the account given of the visit of Accius to the veteran Pacuvius. The next play was the Hecyra, first produced in 165, but withdrawn in consequence of its bad reception, and reproduced in 160. The Heauton Timorumenos appeared in 163, the Eunuchus in 161, the Phormio in 161, and the Adelphoe in 160 at the funeral games of L. Aemi- lius Paullus. Of these

six plays the Phormio and probably the Hecyra were drawn from Apollodorus, the rest from Menander. After bringing out these plays Terence sailed from Greek parts, either to escape from the suspicion of publishing the works of others as his own, or from the desire to obtain a more intimate knowledge of that Greek life which had hitherto been known to him only in literature and which it was his professed aim to reproduce in his comedies. The latter is the more probable motive, and we recognize in this the first instance of that im- pulse to visit the scenes familiar to them through literature which afterwards acted on many of the great writers of Rome. From this voyage Terence never returned. According to one account he was lost at sea, according to another he died at Stymphalus in Arcadia, and according to a third at Leucas, from grief at the loss by shipwreck of his baggage, containing a number of new plays which he had translated from Menander. An old poet quoted by Suetonius states that he was ruined in fortune through his intimacy with his noble friends. Another account speaks of him as having left behind him gardens, to the extent of about twelve acres, close to the Appian Way. It is further stated that his daughter married a Roman knight.

No writer in any literature, who has contented himself with so limited a function, has gained so great a reputation as Terence. He lays no claim to the position of an original artist painting from life or commenting on the results of his own observation. His art has no relation to his own time or to the country in which he lived. The chief source of interest in the fragmentary remains of Naevius, Ennius, Pacuvius, Accius and Lucilius is their relation to the national and moral spirit of the age in which they were written. Plautus, though, like Terence, he takes the first sketch of his plots, scenes and char- acters, from the Attic stage, is yet a true representative of his time, a genuine Italian, writing before the genius of Italy had learned the restraints of Greek art. The whole aim of Terence was to present a faithful copy of the life, manners, modes of thought and expression which

had been drawn from reality a century before his time by the writers of the New Comedy of Athens. The nearest parallel to his literary position may be found in the aim which Virgil puts before himself in his Bucolics. He does not seek in that poem to draw Italian peasants from the life, but to bring back the shepherds of Theocritus on Italian scenes. Yet the result obtained by Virgil is different. The charm of his pastorals is the Italian sentiment which pervades them. His shepherds are not the shepherds of Theo- critus, nor are they in any sense true to life. The extraordinary result obtained by Terence is that, while he has left no trace in any of his comedies of one sketching from the life by which he was surrounded, there is perhaps no more truthful, natural and delicate delineator of human nature, in its ordinary and more level moods, within the whole range of classical literature. His permanent position in literature is due, no doubt, to the art and genius of Menander, whose creations he has perpetuated, as a fine engraver may perpetuate the spirit of a great painter whose works have perished. But no mere copyist or verbal translator could have attained that result. Though without claims to creative originality, Terence must have had not only critical genius, to enable him fully to appreciate and identify himself with his originals, but artistic genius of a high and pure type. The importance of his position in Roman literature consists in this, that he was the first writer who set before him- self a high ideal of artistic perfection, and was the first to realize that perfection in style, form, and consistency of conception and execution. Living in the interval between Ennius and Lucilius, whose original force and genius survive only in rude

and inartistic fragments, he produced six plays, which have not only reached our time in the form in which they were given to the world, but have been read in the most critical and exacting literary epochs, and still may be read without any feeling of the need of making allowance for the rudeness of a new and un- developed art.

While his great gift to Roman literature is that he first made it artistic, that he imparted to " rude Latium " the sense of elegance, consistency and moderation, his gift to the world is that through him it possesses a living image of the Greek society in the 3rd century B.C., presented in the purest Latin idiom. Yet Terence had no affinity by birth either with the Greek race or with the people of Latium. He was more dis- tinctly a foreigner than any of the great, classical writers of Rome. He lived at the meeting-point of three distinct civiliza- tions — the mature, or rather decaying, civilization of Greece, of which Athens was still the centre; that of Carthage, which was so soon to pass away and leave scarcely any vestige of itself; and the nascent civilization of Italy, in which all other modes were soon to be absorbed. Terence was by birth an African, and was thus perhaps a fitter medium of connexion between the genius of Greece and that of Italy than if he had been a pure Greek or a pure Italian; just as in modern times the Jewish type of genius is sometimes found more detached from national peculiarities, and thus mere capable of repro- ducing a cosmopolitan type of character than the genius of men belonging to other races.

The prologues to Terence's plays are of high interest. Their tone is for the most part apologetic, and indicates a great sensitiveness to criticism. He constantly speaks of the malevo- lence and detraction of an older poet, whose name is. said to have been Luscius Lavinius or Lanuvinus. The chief charge which his detractor brings against him is that of contaminatio, the combining in one play of scenes out of different Greek plays. Terence justifies this practice by that of the older poets, Naevius, Plautus, Ennius, whose careless freedom he follows in preference to the " obscura diligentia " of his detractor. He recriminates upon his adversary as one who, by his close adherence to his original, had turned good Greek plays into bad Latin ones. He clears himself of the charge of plagiarizing from Plautus and Naevius. In another prologue he contrasts his own treatment of .his subjects with

the sensational extravagance of others. He meets the charge of receiving assistance in the composition of his plays by claiming as a great honour the favour which he enjoyed with those who were the favourites of the Roman people. But the gossip, not discouraged by Terence, lived and throve; it crops up in Cicero and Quintilian, and the ascription of the plays to Scipio had the honour to be accepted by Mon- taigne and rejected by Diderot.

We learn from these prologues that the best Roman literature was ceasing to be popular, and had come to rely on the patronage of the great. A consequence of this change of circumstances was that comedy was no longer national in character and senti- ment, but had become imitative and artistic. The life which Terence represents is that of the well-to-do citizen class whose interests are commonplace, but whose modes of thought and speech are refined, humane and intelligent. His characters are finely delineated and discriminated rather than, like those of Plautus, boldly conceived. Delicate irony and pointed epigram take the place of broad humour. Love, in the form of pathetic sentiment rather than of irregular passion, is the chief motive of his pieces. His great characteristics are humanity and urbanity, and to this may be attributed the attraction which he had for the two chief representatives of these qualities in Roman literature — Cicero and Horace.

Terence's pre-eminence in art was recognized in the Augustan age; and Horace expresses this opinion, though not as his own, in these words (Epistles II. i. 59): —

" Vincere Caecilius gravitate, Terentius arte."

The art of his comedies consists in the clearness and simplicity with which the situation is presented and developed, and in the

consistency and moderation with which his various characters play their parts. But his greatest attraction to both ancient and modern writers has been the purity and charm of his style. He makes no claim to the creative exuberance of Plautus, but he is entirely free from his extravagance and mannerisms. The superiority of his style over that of Lucilius, who wrote his satires a generation later, is immeasurable. The best judges and the greatest masters of style in the best period of Roman literature were his chief admirers in ancient times. Cicero frequently reproduces his expressions, applies passages in his plays to his own circumstances, and refers to his personages as typical representations of character. 1 Julius Caesar's lines on Terence, the " dimidiatus Menander," while they complain of lack of comic power, characterize him as " puri sermonis amator." Horace, so depreciatory in general of the older literature, shows his appreciation of Terence by the frequent reproduction in his Satires and Odes of his language and his philosophy of life. Quintilian applies to his writings the word eleganiissima. His works were studied and learned by heart by the great Latin writers of the Renaissance, such as Erasmus and Melanchthon; and Casaubon, in his anxiety that his son should write a pure Latin style, inculcates on him the constant study of Terence. Montaigne 2 applies to him the phrase of Horace: " Liquidus puroque simillimus amni." He speaks of " his fine expression, elegancy and quaintness, " and adds, " he does so possess the soul with his graces that we forget those of his fable." Sainte-Beuve devotes to him two papers of delicate and admiring criticism. He quotes Fenelon and Addison, " deux esprits polis et doux, de la meme famille litteraire," as expressing their admiration for the inimitable beauty and naturalness of one of his scenes. Fenelon is said to have preferred him even to Moliere. Sainte-Beuve calls Terence the bond of union between Roman urbanity and the Atticism of the Greeks, and adds that it was in the 17th century, when French literature was most truly Attic, that he was most ap- preciated. M. Joubert 3 applies to him the

words, ” Le miel attique est sur ses levres; on croirait aisement qu’il naquit sur le mont Hymette.”

The chief manuscript of Terence is the famous Codex Bembinus, of the 4th or 5th century, in the Vatican. Another Vatican MS. of the 10th century contains illustrations based on an old tradi- tion. Each play has an argument in metre by Sulpicius Apollinaris (2nd century of our era). We have also a valuable commentary (newly edited by P. Wessner) on five of the plays, derived chiefly from Euanthius and Donatus (both of the 4th century), and another of less importance by one Eugraphius.

The editio princeps was published at Strassburg in 1470. The most famous edition is that of Bentley, published at Cambridge in 1726. At present the best texts are those by K. Dziatzko (Leipzig, 1884), and A. Fleckeisen (Teubner, 2nd ed., 1898). Each of the plays has recently been edited with English notes.

For a conspectus of Terentian studies see TeufTel-Schwabe-Warr, History of Roman Literature, and Schanz’s Geschichte der romischen Litteratur (3rd ed., 1907). Among critical estimates of Terence may be mentioned Sainte-Beuve’s in Nouveaux lundis (3rd and loth of August 1863), and Mommsen’s in the History of Rome, book iv., chapter xiii.

Moliere made large use of the Phormio in Les Fourberies de scapin, and the subject of I’Ecole des maris is taken from the Adelphoe. Terence was translated into English verse by George Colman (1765).

(W. Y. S.; E. H.*)

TERENTIANUS, surnamed Matjrus (a native of Mauretania), Latin grammarian and writer on prosody, flourished probably at the end of the 2nd century a.d. His references to Septimius Serenus and Alfius Avitus, who belonged to the school of ” new poets ” (poetae neoterici or novelli) of the reign of Hadrian and later, seem to show that he was a near contemporary of those writers. He was the author of

a treatise (incomplete) in four books (written chiefly in hexameters), on letters, syllables, feet and metres, of which considerable use was made by later writers on similar subjects. The most important part of it is that which deals with metres, based on the work of Caesius Bassus,

1 See Ep. ad Fam. I. ix. 15, Pro Caecina 27, Philippic II. 15.

2 Essays (trans, by C. Cotton), chap, lxvii.

1 Ouoted bv E. Nee-rette in his Histoire de la litteratur c latine.

the friend of Persius. By some authorities Terentianus has been identified with the prefect of Syene mentioned in Martial (i. 86), which would make his date about a century earlier; others, again, who placed Petronius at the end of the 3rd century (a date no longer held), assigned Terentianus to the same period, from his frequent references to that author.

Best edition, by H. Keil, Grammatici Latini, vi.; with commen- tary by L. Santen (1825); see also Teuffel-Schwabe, Hist, of Roman Literature (Eng. tr.), 373a.

TERGESTE (mod. Trieste, q.v.), an ancient city of Istria, 26 m. by road E.S.E. of Aquileia, at the northern extremity of the peninsula of Istria, in a bay at the head of the Adriatic Sea. Its importance was in ancient days, as now, mainly due to its commerce as the outlet of Pannonia and Dalmatia. It is first mentioned about 100 B.C. as a village. In 52 B.C. it was attacked by barbarian tribes from the interior. In 33 B.C. Augustus during his Dalmatian wars built a wall and towers there, as an inscription records; in a medieval copy of it the emperor Frederick III. mentions his own restoration of the city walls for the fourth time in 1470. At this time it probably became a colony, as it certainly was in Pliny’s days. It appears to have had an extensive territory assigned to it. The

loftily situated cathedral of S. Giusto occupies the site of a Roman temple, some of the walls and columns of which may be seen in the tower Into the facade are built fragments of sepulchral reliefs. The church itself has a curious plan which is due to its having been formed out of two distinct churches standing side by side, which were united in the 14th century. Each of these is a basilica with ancient columns and mosaics in the apse. The southern church, S. Giusto, has a central dome. The so-called Arco di Riccardo is a half-buried Roman arch with Corinthian pilasters, possibly a triumphal arch, possibly con- nected with an aqueduct.

The museum contains inscriptions, mosaic pavements, &c, from the ancient town, of which no remains beyond those mentioned now exist above ground.

See Th. Mommsen in Corp. inscr. Latin. V. (1883), p. 53 sqq. ; T. G. Jackson, Dalmatia, Istria and the Quarnero (Oxford, 1887), III., 343; G. Caprini, Trieste (Bergamo, 1906). (T. As.)

TERLIZZI, a town in Apulia, Italy, in the province of Bari, and iS m. by steam tramway W. from that town, situated in the midst of a fertile plain, 627 ft. above sea-level. Pop. (1901) 23,394. It has a castle which at one time was very strong, and occasionally resorted to by the Emperor Frederick II. and afterwards by. the Aragonese sovereigns. The walls and towers of the town remain, but the fosse has been turned into boule- vards. Terlizzi has some trade in the wine and fruit of the district. Near it, in an ancient tomb, was found in 1745 a fine inkstand inlaid in silver.

TERM, an English word which has various meanings, all arising from its etymology (Lat. terminus), and the idea of limiting or defining.

A term of years, in English law, is the time during which an interest in an estate for life or for years is enjoyed, also the interest itself, because such an interest must determine at a definite time. If the interest be for life, it is an estate of free-

hold; if for years, only a personal interest in real estate, and so personalty, even though the length of the term — for instance, 1000 years — may far exceed in duration any possible life estate. A term of years is of two kinds — the first that created by an ordinary lease reserving a rent, as of a house or a building lease; the second that created by a settlement or a will, usually without rent reserved, for the purpose of securing payment of money, such as portions to younger children, by the owner of the land. Both kinds have been considerably affected by the Conveyancing Acts of 1881 and 1882, which enable a mortgagor or mortgagee in possession to make certain leases. Before 1845 provision was always made in conveyances for keeping on foot a term to attend the inheritance, as it was called — that is, for assigning the remainder of a term to trustees for the protection of the owner of the property against rent- charges or other incumbrances created subsequently to the term

although the term had been satisfied — that is, the purpose for which the term has been created had been fulfilled. By the Assignment of Satisfied Terms Act 1845 the assignment of satisfied terms was rendered unnecessary. The Conveyancing Acts 1881 and 1882 give power to enlarge the unexpired residue of a long term in certain cases into the fee simple.

Terms, in the sense of a limited and certain period of time during which the law courts are open, used to affect only what were called in England the superior courts — that is, the king's bench, common pleas and exchequer. They were originally the leisure seasons of the year which were not occupied by great feasts or fasts of the Church or by agriculture. Their origin is no doubt to be traced back to the legislation of the early Christian emperors, the principle being adopted in England through the influence of ecclesiastical judges. Terms were regulated by many acts of parliament, the

effect of which was to confine to a comparatively short period the time during which the courts could sit in banco — that is, for the decision of questions of law as distinguished from the decision of ques- tions of fact. There were four terms, Hilary, Easter, Trinity and Michaelmas, the average duration of each being about three weeks. All legislation on the subject previous to 1873 is now merely of historical interest, for by the Judicature Act of that year terms were abolished so far as related to the ad- ministration of justice and sittings substituted. The previous subdivisions of the legal year were, however, retained, the dates of commencement and termination being somewhat changed. The Michaelmas sittings of the high court and court of appeal are now held from the 24th of October to the 21st of December, the Hilary sittings from the nth of January to the Wednesday before Easter, the Easter sittings from the Tuesday after Easter week to the Friday before Whitsunday, and the Trinity sittings from the Tuesday after Whitsun week to the 12th of August, all dates inclusive. The old terms, with their duration as fixed by statute, are now kept alive only for the purpose of reference in all cases in which they are used as a measure of time. In the United States the terms or sittings of the courts are not limited to any fixed period of time, but vary according to the judges available and the amount of judicial business which is likely to come before the courts. The dining-terms at the Inns of Court also correspond in point of time with the old terms and not with the sittings.

In universities and schools the word term is used for the period during which instruction is given to the students or pupils. University and school terms differ from law terms and from each other both in period and duration. At the university of Cambridge the academic year is divided into three terms, Michaelmas, Lent and Easter; while at the university of Oxford there are four terms in the year, Michaelmas, Hilary, Easter and Trinity. School years now generally consist of three terms, divided by Christmas, Easter and Summer holidays, the old half-

years having gradually been abolished. In higher educational institutions in the United States the university or college year is generally divided into three terms called either the Fall, Winter and Spring terms, or much less frequently the first, second and third terms. In some institutions, however, the so-called semester system has been adopted, the year being divided into two terms, so far as instruction is concerned, though even in these cases vacations at Christmas time and in the early spring divide the year into three parts, which are sometimes, though not in the usual or proper sense, called terms.

In Scotland terms are the days at which rent or interest is payable. They are either legal or conventional: the legal are Whitsunday and Martinmas; the conventional are fixed by agreement between the parties. Terms as times of court sittings were defined by 6 Anne c. 53, which fixed four terms- Martinmas, Candlemas, Whitsuntide and Lammas — for the now obsolete court of exchequer, to which the winter and summer sittings of the court of session now correspond. , TERMINAL FIGURES, also called " termini " or " terms," in architecture, figures of which the upper parts only, or perhaps the head and shoulders alone, are carved, the rest running into

a parallelopiped, and sometimes into a diminishing pedestal, with feet indicated below, or even without them (see Hermae).

TERMINATOR (from the Latin terminare, to limit), in astronomy, the bounding line beween light and darkness on the apparent disk of the moon or of a planet.

TERMINI IMERESE (anc. Thermae Himeraeae), a seaport town of Sicily, in the province of Palermo, 23 m. E.S.E. of it by rail. Pop. (1901) 20,633. It is finely situated on a pro- montory above its harbour, and it is possible that it was occupied by an early Phoenician settlement; as a town, however, it was not founded until 407 b.c. by the Carthaginians,

after their destruction of Himera, in the vicinity of hot springs mentioned by Pindar (Od. xii. 19) which are still resorted to and are well fitted up (temp. 110° F.). It remained a Carthaginian colony, though thoroughly Greek 1 in character, until it was taken by Rome in the First Punic war. In the time of Cicero it was flourishing; though not of great importance. Augustus sent a Roman colony to it, and a Roman road ran from it to Catana. Its medieval castle was destroyed in i860. The modern town presents no features of interest; there is a collection of anti- quities and pictures, with a considerable number of Roman inscriptions. Scanty remains of buildings of Roman times (an amphitheatre and a so-called basilica) exist in the upper part of the town; and outside it on the S. are considerable remains of two aqueducts of the same period crossing a deep ravine. The surrounding district is fertile.

Four m. E. of Termini, about 1 m. W. of the railway station of Cerda, on an E. spur of the Monte S. Calogera, called Monte Castellaccio, is a Cyclopean wall, about 66 ft. long, 10 ft. thick, and 30 ft. high in the middle, blocking the only access to the summit of the spur, on the N.E. Fortifications in this style are very rare in Sicily.

See B. Romano, Antichiti Termitane (Palermo, 1838); Mauceri, Acropoli Pelaseica nei dintorni di Termini Imerese (Palermo, 1896).

TERMINUS, in Roman mythology, the god of boundaries, the protector of the limits both of private property and of the public territory of Rome. He was represented by a stone or post, set up in the ground with the following religious ceremonies. A trench was dug, in which a fire was lighted; a victim was sacrificed, and its blood poured into the trench; the body, upon which incense and fruits, honey and wine were thrown, was then cast into the fire. When it was entirely consumed, the boundary stone, which had been previously anointed and crowned with garlands, was placed upon the hot ashes and fixed in the ground. Any one who removed a boundary stone was

accursed (sacer) and might be slain with impunity; a fine was afterwards substituted for the death penalty. On the 23rd of February (the end of the old Roman year) the festival called Terminalia, according to Wissowa a festival not of the god but of the boundary stones {termini), was held. The owners of adjacent lands assembled at the common boundary stone, and crowned their own side of the stone with garlands; an altar was set up and offerings of cakes, corn, honey and wine were made (later, a lamb or a sucking pig was sacrificed). The proceedings closed with songs to the god and a general merry- making, in which all the members of the family and the servants took part. A similar festival was also held at the old boundary of the Roman territory between the fifth and sixth milestones on the road to Laurentum. The custom of fixing the boundaries of property and the institution of the yearly festival were both ascribed to Numa. Another Sabine prince, Titus Tatius, had dedicated a stone to Terminus on the Capitoline hill. When Tarquinius Superbus desired to build a temple to Jupiter, the auguries forbade its removal, and it was enclosed within the walls of the new sanctuary, an indication of the immovability of such stones and of the permanence of the Roman territory. Terminus was probably in its origin only an epithet of Jupiter. The fact of the inclusion of his statue in the temple of Jupiter Capitolinus; the hole cut in the temple roof so that he might be worshipped in the open air as being, like Jupiter, a god of 1 Agathocles was a native of Thermae.

the sky; and the later assumption of a Jupiter Terminus or Terminalis (cf. the Greek Zei)s opios) support this view.

See Dion. Halic. ii. 74; Plutarch, Numa, 16, Quaest. Rom., 15; Livy i. 55; Horace, Epodes, ii. 59; Ovid, Fasti, ii. 637, 677; Siculus Flaccus in Gromatici veteres, ed. Lachmann (1848); G. Wissowa, Religion

und Kultus der Romer (1902) ; W. W. Fowler, The Roman Festivals (1899); G. Jourde, Le Culte du dieu Terme (Paris, 1886).

TERMITE, the name applied to a group of insects with four wings which are developed outside the body (a large proportion of the individuals become adult, however, without wings appear- ing at all). The wings are of nearly one size, of long, narrow form, of paper-like consistence, and in repose are placed flat on the back of the insect so that only one wing shows. After a short time the wings are shed, and only small stumps remain as evidence of the individual being a winged form. The mouth has strong mandibles. Formerly termites were classed as a part of the order Neuroptera, but more recently they have been separated by certain zoologists from the true Neuroptera, and associated with some other forms as an order Corrodentia. By Packard they have been associated with Mallophaga, and called Platyptera. They now constitute with the Embiidae — a small and obscure family — the order Isoptera, of which about 300 species are known. Termites are more widely known as white ants, but as they are extremely different from true ants, and as they are rarely white, this designation is very deceptive, and should be abandoned.

Termites are found only in warm climates, where they are sometimes very destructive. They are vegetarian, but oc- casionally eat, or destroy, dry animal matter. The basis of their alimentary regimen is woody matter. Some of them make use of fungi growing in their abodes as food; some cut and store grass; others prepare a peculiar kind of food, which is stored in a tough, dry form, so that it has to be moistened before it can be eaten. Termites are social insects; many of them construct large edifices called termitaria ancj often spoken of as nests. A termitarium frequently contains an enormous number of in- dividuals forming the society or colony. Termites are totally different in structure and development from all other social insects, but their social existence exhibits numerous analogies with that of the ants and other social Hymenoptera.

The most remarkable of these analogies is that the reproduction of the species in each community is confined to a single pair, or to a

very limited number of individuals. The mem- bers of one society or colony, however numerous or dissimilar they may be, are the descendants of a single pair. The colony is — so far as is known, and on this, as well as on many other points, authentic in- formation is scanty — first started by a pair of winged individuals that cast their wings, secrete themselves in a suitable place, and produce young; the colony, however huge, being subsequently deve- loped by the extreme fer- tility of the reproductive pair. Very little is known as to how long a colony endures, and, as there is great variety in the social conditions of different kinds of termites, it is probable that there is con- siderable difference as to the point in question. As a rule a family or colony has only a single termitarium, but theie are cases in which a single family has several separate abodes, though usually only one Of them is a real home containing reproductive individuals. The social life in termites, as well as

Fig. 1. — A, newly hatched termite; B, worker termite; Termes nemorosus.

in all other social insects, is clearly a development of the family life. It is accompanied by extraordinary modifications of the forms of the individuals constituting the society, and by a great division of labour. As regards the forms, or castes, termites differ totally from other social insects; in the latter case there are great differences between the males and females, and the whole of the castes are of the female sex, whereas in termites the males and females are extremely similar, and the castes are in no way cor- relative with sex. As the termite life is a family life, and as there is normally only a single pair of re- productive individuals in each community, it is easily comprehensible that if any- thing goes wrong with this pair, the community is at once thrown into a state of complete disorganization. But this

misfortune is miti- gated by a method which termites have of keeping individuals in an undiffer- entiated state, and of turn- ing some of them speedily into reproductive indi- viduals, whereby the com- munity is restored to something like a natural condition of activity and growth.

Apart from the forms that are merely juvenile, the following kinds of adults are normally present

in a colony: (1) workers, (2) soldiers, (3) winged individuals ready to leave the nest, (4) king and queen.

(1) The worker termite resembles the young in general appear- ance, and, like the young, has no trace of wings (fig. 1). The two segments behind the head are more contracted, so that head, thorax and abdomen are more differentiated than they are in the young. The colour too is different, the young being milky-white, whereas the adult worker is variously pigmented according to its species, but is never milky-white. The worker is generally blind, and in only a few species does it possess rudimentary eyes. The species of the group Calotermitides have no workers. In the other species the workers look after the eggs and young, and perform most, if not all, of the industrial work of the community. They are also, in some cases, effective combatants, though quite destitute of any special structures to suit them for this purpose. The sexual organs do not undergo development, but it has been satisfactorily ascertained that both sexes are represented amongst the workers. In certain species the workers seem to be dimorphic, so far as size is concerned, but this point has apparently been only very in- adequately considered. Workers form a very large but variable proportion of the members of a community.

(2) The soldier termite is the most extraordinary feature of termite biology It is more varied than any of the other castes, so that most of the species of termites can be best distinguished by their soldiers. The chief feature of the soldier is an extraordinary development of the head, or of the

head and mandibles. There are two very distinct kinds of soldiers: (a) the flat-headed or mandibulate soldier, and (b) the nasute or rostrate soldier (fig. 2). In the first kind the head is usually developed out of all proportion to the rest of the body; the mandibles are frequently enormous, and, being in many cases asymmetric, give the appearance of de- formity. In the nasute soldier the head is thick or convex, and may be described as unicorn — that is to say, it is prolonged in the middle so as to form a single pointed horn; the mandibles are never largely developed. No species of termite has both mandibu- late and nasute soldiers, although the reverse is sometimes stitl

Fig. 2. — A, mandibulate soldier of Termes nemorosus; B, nasute soldier of T. hospitalis.

stated in books. The soldiers of some species are, however, dimorphic to the extent that larger and smaller forms occur in the same nest without intermediates. In other cases soldiers of simply variable size exist. The soldier is blind and wingless, though in a few soldiers minute wing-rudiments can be detected. As in the worker, the development of the sex organs is arrested, but both sexes are represented. The function of the soldiers is probably, as stated by Haviland, defence. The mandibulate soldiers use their heads as blocks to stop gaps in the nests, and employ terrifying but somewhat theatrical devices, making threatening motions and producing noises by movements of the head and thorax. The nasute soldiers emit a fluid from the tip of the rostrum, and dab it upon their enemies with some skill. Soldiers are present in all species of termites except the South American genus Anoplotermes. It is a remarkable fact that in the group Calotermitides soldiers exist although there are no workers, but in this case the function of the soldier seems to be very much that of a worker. Grassi says that in Calotermes flavicollis all the

individuals of a community work for the common welfare. Moreover, in the Calotermitides no very great development of the heads or mandibles occurs.

(3) Adult or Winged Termite. — Such of the young as do not become workers or soldiers grow and develop after the fashion usual in exopterygote insects. Moults take place, the wing-pads gradually increase in size, eyes appear, and finally pigmentation takes place, and the winged insect is perfected at the last moult (hg- 3)- In prosperous colonies these winged insects are produced in large numbers and emerge at intervals as swarms. They have extremely feeble powers of flight, and apparently scarcely any other capability. They are a favourite food of a large number of animals,

including even man. They have well- developed eyes and ocelli, and differ from all the other forms by their greater pigmentation. The function of these adults is to diffuse the species, and to favour crossing outside the family circle. Attainment of this second end is, in some cases, favoured by the fact that the whole of the indi- Fig. 3. — Adult Winged viduals constituting a swarm consist Termite : T. nemorosus; of one sex only. This extraordinary wings of the right-hand fact is attested by Grassi, but has not side expanded. yet received the attention it merits. If

a termite colony be compared with a tree or plant, the winged forms, it is clear, functionally correspond to the flowers and seeds of the tree; indeed, Fritz M tiller and Grassi go further, and conclude that the modes of diffusion and repro- duction of termites are analogous to the modes of plants of con- tinuing the species by means of cleistogamic as well as ordinary flowers. The force of this comparison will be better appreciated after the reader has made himself acquainted with the facts con- nected with the neoteinic forms of termites.

(4) King and Queen. — As a rule each community includes only a single pair of individuals apt for

reproduction; these are the royal pair, or king and queen (fig. 4). They are adult termites that have shed the wings they formerly possessed. The queen usually undergoes an extraordinary increase in the size of the abdomen, which may be distended to many hundred times its original capacity (fig. 4, A). In many species the king and queen are confined in a royal cell, out of which they cannot move, though the workers, owing to their smaller size, can get in and out to tend them. In other cases the queen only is so imprisoned, the king being able to leave the cell. In still other cases neither king nor queen is effectually imprisoned. Much discrepancy of opinion exists as to the invariable presence of a king in each nest; this, however, is explained by Haviland's observation that the king is active and timid, and when a nest is opened seeks safety by running away and concealing himself, so that he is sometimes only discovered when the very last fragment of the nest is brought under scrutiny. Another point on which extremely diverse opinions are expressed is the copula of the sexes. It is usually stated that the swarming of termites is analogous to that of bees and ants, in which groups of insects the conjunction of the sexes takes place at this period,

and at this period only. In the termites the reverse is the case. The swarming is not at all a nuptial flight; indeed, at that time the sexes are not apt for reproduction. Copulation only takes place after a pair have cast their wings and have established them- selves together. It is repeated at intervals, and is thus quite dis- similar from the corresponding phenomenon in Hymenoptera. The male has no intromittent organs, so that copula during flight is impossible. Grassi has actually witnessed the act in subsequent life. Haviland is of opinion that in some cases the male fertilizes the eggs without connexion with the female.

(5) Neoteinic and Substitution Forms. — When a colony of termites is deprived of king and queen it can replace them by forms speci- ally prepared. These substitution forms are of two kinds — (a) nor- mal adult individuals, and (b) neoteinic forms. The

latter may be described as unnatural kings and queens possessing reproductive powers, though the wings have never been developed and some other parts of the body have not taken on the fully adult state. Haviland removed the royal pairs from nests of Termes malayanus, and after three or four months again examined the nests: in three out of the five cases substitution pairs exactly resembling the original ones, with well-formed wing-stumps, were present; in the other two cases he failed to find the royal cell, and believes that the loss had not been repaired. In other species the bereavement is made good by means of neoteinic instead of normal individuals, and in certain species neoteinic forms are abundantly found. In the case of substitution forms there is usually more than one pair present in a colony, and sometimes numerous pairs exist. Grassi says that in Sicily the colonies of Termes lucifugus are kept up entirely by neoteinic kings and queens; in other words, the swarms are nearly or quite useless. The neoteinic forms are compared to cleistogamous flowers; and this curious case is parallel with that of a species of plant whose reproduction should be accomplished entirely by its cleistogamous flowers, though at the same time it produced perfect flowers in abundance. The con- dition recorded by Grassi is probably extremely ex- ceptional. Fritz Muller found once a colony in which a true king was act- ing as consort to a con- siderable number of neo- teinic queens, no true queen being present.

In order to understand the curious phenomena pre- sented by the castes and variety of forms of a single species of termite, it is necessary to become ac- quainted with their food habits, which are very peculiar and may be described as communistic. Termites have the habit of eating their cast skins and even their dead companions, and in fact their system of keeping the nest clean seems to be that of eating the refuse of their own bodies till it no longer contains any digestible matter. This cannibalism is the more remarkable, as they will not eat other termites. The most curious part of their

dietary is their complex system of feeding from the matters contained in the alimentary systems of their fellows. When a termite wishes food it strokes the body of another individual with its antennae, and the specimen thus caressed exudes from the posterior or from the anterior part of the body a drop of matter, which is eaten by the hungry one. The matter exuded from the posterior part of the body appears to be very different from that yielded by the mouth, so that there are at least two kinds cf this excretory food. The proctodaeal food (that which comes from the

Costerior part of the body) is in great favour with adult termites, ut so far as is known it is not used for feeding the newly born young, which are believed to be fed on matter elaborated in the bodies of the adult workers and communicated by their mouths. Subsequently the young take also proctodaeal food, and triturated vegetable matter.

Origin of the Castes. — When termites are hatched from the eggs none of the remarkable differences that are manifested in the individuals in subsequent life can be detected. The sexes are in termites extremely similar in external characters. When the young are hatched they all appear nearly exactly alike, though on careful examination the sexes can be distinguished.

Fig. 4. — A, queen; B, king: T. nemorosus.

But no other difference than that of sex can be detected. In the article Ant in the ninth edition of the Encyclopaedia Britannica it was stated that "the distinction between sol- dier and worker can be easily seen in the egg." This is contradicted by all modern observations, and is certainly erroneous. It is true that considerable difference of opinion exists as to when the distinction between soldier and worker first becomes evident, but all are agreed

that it is not till after the growth is to some extent accomplished. The discrepancy that exists in opinions on this point is due to the facts: (1) that different species have been under observation; and (2) that the modification of the larva to form a soldier may begin at more than one period of the development even in the same species. It being ascertained that all termites begin as undifferentiated larvae, the question arises as to what causes the differentiation into castes. This question is the more important as two of the castes (the worker and soldier) do not at all resemble their parents. Grassi, from an examination of the individuals of a large number of nests of Termes lucifugus, arrived at the con- clusion that all start as undifferentiated larvae, and that the regular development of Termes up to the perfect insect may undergo a deviation at various periods of life leading to the

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Fig. 5. — Termitarium of Termes malayanus: /, fungus-chamber; c, royal cell

formation of workers, of neoteinic forms, or of soldiers, the last passing through the stage of the young worker. He attributes this deviation, which may take place at various periods, to the influence of food, and attaches special importance to the salivary food. The soldiers have no wings; nevertheless a larva, or young nymph that has the rudiments of wings, can be made into a soldier. Grassi has found juvenile specimens that have already assumed the soldier form, although they possess the rudiments of wings. It appears from his observations that the worker may be considered as a form with aTrested develop- ment, and the soldier as a form with arrested and much diverted development, while the neoteinic forms are individuals in which the reproductive organs are perfectly developed, while some of the bodily structures have suffered arrest of development and even some amount of

atrophy.

The soldier form of termite presents most difficult questions to the biologist, its special structures bearing no approximation to any characters possessed by the parents. Various theories have been proposed to account for this fact, but they are mere guesses. We may, however, mention that it is possible that soldiers and workers occasionally produce young. This has never been actually observed, but specimens have been found with the sexual organs partially developed, and F. Silvestri has recorded the occurrence of workers with some of the characters of the females, in South America, in a nest of Termes st'itnchii.

Termitaria.- — There is nothing in which termites display more variety than in their dwellings. These are sometimes not constructions at all. The primitive Calotermes flavicollis — in which there is no worker — frequently inhabits rotten places in trees; at most it increases these a little by excavation, and modifies the passages by slight and imperfect barricades. In the case of this species the community never attains a greater number than one thousand individuals, and even this is comparatively rare. On the other hand, we have the huge solid structures, 10 or 20 ft. high, delineated by Smeathman with cattle standing on their summits. Saville Kent has observed termitaria in Australia 18 ft. high. In equatorial Africa termitaria are frequently 12 to 25 ft. high and sharp-pointed. As a rule large termitaria do not occur in considerable numbers in a restricted area, but there are exceptions even to this. At Somerset, Cape York, there is one of the most remarkable termite cities of the world. Viewed from the sea, it appears as if the plain for a mile or more in extent were covered with pointed pillars, varying, according to different accounts, from 6 to 13 ft. in height, broad at the base and tapering to the summit, forming regular symmetrical pyramids. In this part of Australia there is also found the "compass," "magnetic," or "meridian" termite, the mounds of which have somewhat the shape of a tombstone, and

have always the same orientation, the wider face of the structure always extending north to south. It has been suggested that this is connected with the necessity of regulating the temperature or the amount of desiccation of the nest, but there is no evidence whatever on the point. A termitarium on being opened displays a vast number of irregular chambers separated by thin partitions (fig. 5, /), the royal cell being placed in the middle (fig. 5, c). The material used is of an earthy nature, but the interiors of many earthy termitaria are largely composed of woody fibre, the refuse proceeding from the alimentary canals of the insects being used for this purpose. A considerable number of the larger termites use fungi for their foodstuff. There are special cham- bers where these are cultivated, the matter on which the fungus is grown being of a woody nature and sponge-like in its structure. The fungi make their appearance as small globules. Probably the spores or mycelium are placed in the mass when it is formed by the termites; but very little is yet known as to this fungus and its mode of treatment by them. Authorities. — H. Smeathman, " Termites," Phil. Trans. (1781), pt. i. lxxi., pp. 139-192; H. Hagen, "Monograph of Termites," Linnaea Entomologica, 1855 and i860, x. and xiv.; G. D. Haviland, " Observations on Termites," J. Linn. Soc. Zool. (1898), xxvi., 358-442 ; B. Grassi and A. Sandias, " The Constitution and Development of the Society of Termites," Atti Ace. Cioenia (4), 1893 and 1894, vi. and vii. ; translated by W. F. H. Blandford' in Q. J. M. S. (1897), xxxix. and xl. ; Y. Sjostedt, " Monographie der Termiten Afrikas," K. Svenska Vet.-Ak. Handl. (1900), xxxiv., No. 4; W. W. Froggatt, " Australian Termitidae " (three parts), P. Linn. Soc. N.S. Wales, 1895, 1896, 1897; W. S. Kent, The Naturalist in Australia (London, 1897), iv. Extensive bibliographies are given by Hagen and Sjostedt. (D. S.)*

TERMONDE (Flemish Dendermonde) , a town of Belgium in the province of East Flanders, situated 25 m. S.W. of Antwerp at the junction of the Dender and the Scheldt. Pop. (1904) 10,141. It is still one of

the five fortified places in Belgium, although its defences are not modernized. It was before Termonde that Louis XIV. in 1667 was compelled to beat an ignominious retreat through its defenders opening the dikes and flooding the country. The church of Notre Dame contains two fine pictures by Van Dyck, and one masterpiece of Crayer's. The fonts are of the 1 2th century.

TERN (Norsk taerne, tenne or tende; Swedish tdrna; Dutch Stem 1), the name now applied generally to a group of sea-birds,

1 " Starn " was used in Norfolk in the 19th century as a name for the bird commonly known as the black tern, thus confirming Turner, who, in 1544, describes what seems to have been the same

the sub family Sterninae of the gulls or Laridae, but, according to P. J. Selby, properly belonging, at least in the Fame Islands, to the species known by the book-name of Sandwich tern, all the others being those called sea-swallows— a name still most commonly given to the whole group throughout Britain from their long wings, forked tail and marine habit. In F. Willughby's Ornithologia (1676), however, the word tern is used for more than one species, and, though it does not appear in the older English dictionaries, it may well have been from early times as general a name as it is now.

Setting aside those which are but occasional visitors to the British Islands, six species of terns may be regarded as in- digenous, though of them one has ceased from ordinarily breeding in the United Kingdom, while a second has become so rare and regularly appears in so few places that mention of them must for prudence sake be avoided. This last is the beautiful roseate tern, Sterna dougalli; the other is the black tern, Hydrochelidon nigra, belonging to a genus in which the toes are only

half- webbed, of small size and dark leaden-grey plumage. It is without doubt the Sterna of Turner, and in former days was abundant in many parts of the fen country, 1 to say nothing of other districts. Though nearly all its ancient abodes have been drained, and for its purposes sterilized these many years past, not a spring comes but it shows itself in small companies in the eastern counties of England, evidently seeking a breeding- place. All around the coast the diminution in the numbers of the remaining species of terns is no less deplorable than de- monstrable.

The Sandwich tern, S. cantiaca — named from the place of its discovery, though it has long since ceased to inhabit that neighbourhood — is the largest of the British species, equalling in size the smaller gulls and having a dark-coloured bill tipped with yellow, and dark legs. Through persecution it has been exterminated in all its southern haunts, and is become much scarcer in those to which it still resorts. It was, however, never so abundant as its smaller congeners, the so-called common and the arctic tern — two species that are so nearly alike as to be beyond discrimination on the wing by an ordinary observer, and even in the hand require a somewhat close exa- mination. 2 The former of these has the more southern range, and often affects inland situations, while the latter, though by no means limited to the Arctic circle, is widely distributed over the north and mostly resorts to the sea-coast. Yet there are localities where, as on the Fame Islands, both meet and breed, without occupying stations apart. The minute diagnosis of these two species cannot be briefly given. It must suffice here to state that the most certain difference, as it is the most easily recognizable, is to be found in the tarsus, which in the arctic tern is a quarter of an inch shorter than in its kinsman. The remaining native species is the lesser tern, 5. minuta, one of the smallest of the genus and readily to be distinguished by its permanently white forehead. All the species already mentioned, except the black tern, have much the same general

coloration- species as ” nostrati lingua sterna appellata.” In at least one instance the word has been confounded with one of the old forms of the modern Starling (q.v.). To Turner’s name, repeated by Gesner and other authors, we owe the introduction by Linnaeus of Sterna into scientific nomenclature. ” Ikstern ” is another Dutch form of the word.

1 It was known there as carr-swallow, carr-crow (corrupted into ” scarecrow “), and blue dar (gw. = daw?j.

2 Linnaeus’s diagnosis of his Sterna hirundo points to his having had an ” arctic ” tern before him; but it is certain that he did not suspect that specific appellation (already used by other writers for the ” common ” tern) to cover a second species. Some modern authorities disregard his name as being insufficiently definite, and much is to be said for this view of the case. Undoubtedly ” hirundo ” has now been used so indiscriminately for one species or the other as to cause confusion, which is perhaps best avoided by adopting the epithets of Naumann (Isis, 1819, pp. 1847, T848), who, acting on and confirming the discovery of Nitzsch (who first detected the specific differences), called the southern species 5. fluviatilis and the northern S. macrura. Temminck’s name S. arctica, applied to the latter a year afterwards, has, however, been most generally used for it.

the adults in summer plumage wearing a black cap and having the upper parts of the body and wings of a more or less pale grey, while they are mostly lighter beneath. They generally breed in association, often in the closest proximity — their nests, containing three eggs at most, being made on the shingle or among herbage. The young are hatched clothed in variegated down, and remain in the nest for some time. At this season the parents are almost regardless of human presence and expose themselves freely.

At least half-a-dozen other species have been recorded as occurring in British waters, and among

them the Caspian tern, 5. caspia, which is one of the largest of the genus and of wide distribution, though not breeding nearer to the shores of England than on Sylt and its neighbouring islands, which still afford lodgings for a few pairs. Another, the gulUbilled tern, S. anglica, has also been not infrequently shot in England. All these species are now recognized — though the contrary was once maintained — as inhabitants of North America, and many go much farther. S. forsteri is the North American, and S. melanogaster the Indian tern.

Terns are found all over the world, and among exotic forms may be particularly mentioned the various species of noddy (q.v.). Often confounded with these last are the two species called in books sooty terns (S. fuliginosa and S. anaestheta), but by sailors " egg-birds " or " wide-awakes " from their cry. These crowd at certain seasons in innumerable multitude to certain islands within the tropics, where they breed, and the wonderful assemblage known as " wide-awake fair " on the island of Ascension has been more or less fully described from very ancient times. W. Dampier in his voyage to New Holland in 1699 particularly described and figured the sooty tern {Voyages, iii. p. 142), discriminating it from the noddy, from which it had not before been distinguished. (A. N.)

TERNATE, a small island in the Malay Archipelago, off the west coast of Halmahera, in 0° 48' N., 127° 19' E. It is nearly circular in form, with an area of about 25 sq. m., and consists almost entirely of a remarkable volcano (5400 ft.) formed of three superimposed cones. Frequent destructive eruptions have occurred. On the island is the Small town of Ternate, which, in spite of its good harbour, carried on no considerable trade or shipping, and has only 3000 inhabitants. But it is the headquarters of the Dutch residency of Ternate, which exercises authority over the area of the ancient kingdoms of Ternate and Tidore. The residency consists of the following groups of islands: the Halmahera group, the Bachian and the Obi group, the Sula Islands, the islands near the

western half of New Guinea (Gebeh, Vaigeu, Salawati, Misol, collectively called the Papuan Islands), the western half of New Guinea as far as 141° E., with the islands in Geelvink Gulf on the north coast of New Guinea (Schouten Islands, Yapen, &c), along with others on the south coast. To this residency also belong the state of Banggai in East Celebes, and the Banggai Islands. The residency stretches from 2° 43' N. to 5° 45' S., and 121 to 141° E., with an area of 155,800 sq. m. The Dutch government exercises direct authority only over parts of Ternate, Halmahera, Bachian and Obi islands. Its rule over the other groups it carries on through the sultans of Ternate and Tidore (q.v.). Both the island and town of Ternate suffer from their isolation, and have never regained the importance they had in former centuries. Pop. of the whole residency (1905) 108,415. The inhabitants are of Malay race and Mahommedans in religion. The breaking up of the old government of the Moluccas tended to make Ternate perhaps the most important Dutch-Indian political centre of the archipelago east of Celebes. Nominally the sultan is still ruler, but virtually his powers were greatly curtailed by his conventions with the Dutch-Indian government, under which he surrendered, with the concurrence of his grandees, many of his former rights to the Dutch resident, who became the de facto governor of the easternmost colonial possessions of Holland, especially since the transfer of Dutch New Guinea in 1901. Among the rights surrendered by the sultan of Ternate to the Dutch were those of granting monopolies and mining concessions, now vested in the Dutch resident. The island of Bachian is worked by a kind of chartered company. For surrendered rights and privileges the sultan and his grandees

received monetary compensations in the shape of annual sub- ventions, and these also have been paid for the losses formerly incurred by the wilful destruction of the nutmeg plantations, carried out

in order to enhance the value of this commodity and monopolize its cultivation. The restrictions on nutmeg- growing have long since been removed, and many plantations, with free labour, have been started in Ternate since 1885. It is a curious fact that Christianity has declined in Temate in modern times, though it was an early stronghold and the number of Europeans settled there has materially increased.

TERNI (anc. Inter amna Nahars), a town, episcopal see, and the seat of a sub-prefecture of the province of Perugia, Italy, situated among the Apennines, but only 426 ft. above sea- level, in the valley of the Nera (anc. Nar), from which the town took its distinguishing epithet, 5 m. below its junction with the Velino, and 70 m. N. by E. of Rome by rail. Pop. (1906) 20,230 (town), 33,256 (commune). It has important iron and steel works and iron foundries, at which armour-plates, guns and projectiles are made for the Italian navy, also steel castings, machinery and rails, a royal arms factory, and lignite mining. Temi lies on the main railway line from Rome to Foligno and Ancona, and is the junction for Rieti and Sulmona. Its most interesting buildings are the cathedral (17th century, with remains of the earlier 13th century facade), the church of S. Francesco (partly dating from the 13th century, with some frescoes of the 14th), and other old churches. Its antiquities include traces of the city walls of rectangular blocks of tra- vertine, remains of an amphitheatre of the time of Tiberius, a temple, theatre and baths (?), and numerous inscriptions. Remains have also been found of a pre-Roman necropolis. The excavations and the objects found are described by A. Pasqui and L. Lanzi in Notizie degli scavi, 1907, 595 seq. Five miles to the east are the falls of the Velino (Cascale delle Marmore) . Alike in volume and in beauty these take a very high place among European waterfalls; the cataract has a total descent of about 650 ft., in three leaps of 65, 330 and 190 ft. respectively. They owe their origin to M’. Curius Dentatus, who in 272 B.C. first opened an

artificial channel by which the greater part of the Lacus Velinus in the valley below Reate was drained. They supply the motive power for the factories of the town.

Terni is the ancient Interamna (inter amnes, ” between the rivers, ” i.e. the Nar and one of its branches), originally belonging to Umbria, and founded, according to a local tradition preserved in an inscrip- tion, in the year 672 B.C. It is first mentioned in history as being, along with Spoletium, Praeneste and Florentia, portioned out among his soldiers by Sulla. Its inhabitants had frequent litiga- tions and disputes with their neighbours at Reate in connexion with the regulation of the Velinus, the waters of which are so strongly impregnated with carbonate of lime that by their deposits they tend to block up their own channel. The first interference with its natural course was that of M’. Curius Dentatus already referred to. In 54 B.C. the people of Reate appealed to Cicero to plead their cause in an arbitration which had been appointed by the Roman senate to settle disputes about the river, and in connexion with this he made a personal inspection of Lake Velinus and its outlets. In the time of Tiberius there was a project for regulating the river and its outlets from the lake, against which the citizens of Interamna and Reate energetically and successfully protested (Tac. Ann. i. 79). Similar questions arose as the river formed fresh deposits during the middle ages and during the 15th and 1 6th centuries. A branch of the Via Flaminia passed from Narnia to Forum Flaminii, and is given instead of the direct line in the Antonine and Jerusalem itineraries. A road led from here to the Via Salaria at Reate. Interamna is also mentioned in Cicero’s time as being the place where Clodius wished to prove that he was on the night when he was caught in Caesar’s house at the celebration of the rites of the Bona Dea. The Emperor Tacitus and his brother Florianus were probably natives of Inter- amna, which also has been claimed as the birthplace of Tacitus the historian, but with less reason. During most of the middle ages

and up till i860 Terni was subject to the popes. It was the scene of the defeat of the Neapolitans by the French on the 27th of November 1798.

TERPANDER, of Antissa in Lesbos, Greek poet and musician. About the time of the Second Messenian war, he settled in Sparta, whither, according to some accounts, he had been summoned by command of the Delphian oracle, to compose the differences which had arisen between different classes in

the state. Here he gained the prize in the musical contests at the festival Carnea (676-2 B.C.; Athenaeus, 635 e.). He is regarded as the real founder of Greek classical music, and of lyric poetry; but as to his innovations in music our information is imperfect. According to Strabo (xiii. p. 618) he increased the number of strings in the lyre from four to seven; others take the fragment cf Terpander on which Strabo bases his statement (Bergk, 5) to mean that he developed the citharoedic nomos (sung to the accompaniment of the cithara or lyre) by making the divisions of the ode seven instead of four. The seven-stringed lyre was probably already in existence. Ter- pander is also said to have introduced several new rhythms in addition to the dactylic, and to have been famous as a composer of drinking-songs.

Fragments (the genuineness of which is doubtful) in T. Bergk, Poetae Lyrici Graeci, iii.; see also O. Lowe, De Terpandri Lesbii aetate (1869), who places him about 676 B.C.

TERPENES, in organic chemistry, the generic name of a group of hydrocarbons of the general formula (C_5H_8)$_n$, and the more important oxygen derivatives, mainly alcohols, aldehydes and ketones, derived frcm them. They may be classified into several distinct groups: hemiterpenes, C_5H_8.; ter penes proper, $C_{10}H_{16}$; sesquiterpenes, $C_{15}H_{24}$; and polyterpenes (C_5H_8)$_n$- In addition to these, a series of open-chain olefine terpenes is known.

The chief sources of the terpenes and their

derivatives are the essential oils obtained by the distillation or extraction by pressure of various plants, chiefly of the Coniferae and different species of Citrus. Certain of these oils consist very largely of hydrocarbons; for example, those of turpentine, citron, thyme, orange, pine-needle, goldenrod (from Solidago canadensis) and cypress, while others contain as their chief constituents various alcoholic and ketonic substances. With the exception of camphene, all the terpenes are liquids, boiling approximately between 160° and 190 C, so that it is almost impossible to separate them from the various essential oils by fractional distillation. In order to prepare the individual members pure, advantage is taken of the different physical properties of their derivatives. The terpenes all possess a characteristic odour and are fairly stable to alkalis, but are easily decomposed by acids or by heating to a sufficiently high temperature. Many polymerize readily, or are transformed into isomers by boiling with dilute alcoholic sulphuric acid. Some oxidize rapidly on exposure to air, passing into resinous substances. The forma- tion of addition compounds with the halogens, halogen hydrides, and with nitrosyl chloride, is characteristic of many, whilst others unite readily with nitrogen peroxide. According to A. v. Baeyer (Ber., 1895, 28, p. 648; 1896, 29, p. 10) the nitrosochlorides are not simple addition products, but bi- molecular compounds or bisnitrosochlorides.

Hemiterpenes

The best known is Isoprene, CsHs, which is obtained on distilling caoutchouc or gutta-percha. It was synthesized by W. Euler {Ber., 1897, 30, p. 1989) by distilling the addition compound of methyl iodide and 2 • 3 • 5-trimethylpyrollidine with caustic potash. It is an unstable liquid which boils at 33-5° C, and on heating rapidly polymerizes to dipentene, the same change being effected by hydrochloric acid. In ethereal solution it combines with bromine to form an unstable liquid dibromide; it also unites with one molecule of hydrobromie acid

to form the same tertiary bromide as dimethylallylene; this points to its being /8-methyldivinyl, CH 2 :C(CH„)-CH:CH 2 (V. A. Mokiewsky, Jour. Soc. Phys. Chim. Russ., 1900, 32, p. 207).

Terpenes Proper The terpenes proper may be subdivided into the simple mono- cyclic terpenes and the more complex (usually bicyclic) terpenes. The monocyclic terpenes are hydro derivatives of paracymene. A. v. Baeyer proposed the following nomenclature: the dihydro- paracymenes are called terpadienes, the tetrahydrocymenes be- coming terpenes and the hexahydrocymene terpan, the carbon atoms being numbered as shown in the inset formula :

In the more complex terpenes the name

camphene is retained, and camphane is h] r /^ 2 3 ^\

\C

V

J 4 /”

\C (10)

used for the dihydrocamphene. G.

Wagner (Ber., 1894, 27, p. 1636 Anm.)

designates the hexahydrocymenes menthans, the tetrahydrocymenes

menthenes, and the dihydrocymenes menthadienes. The position

of the double linking in the molecule is shown by the use of the symbol A followed by the number of the carbon atom immediately preceding it.

Monocyclic Terpene Group Limonene, Al: 8(g)

terpadiene, Ci Hi 6 , is known in three forms, namely d-limonene, /-limonene, and i-limonene or dipentene. d- Limonene is the chief constituent of oil of orange-rind, and is also found in oil of lemon and oil of bergamot. /-Limonene is found in oil of fir-cones and in Russian peppermint oil. Both are ! Menthol (terpan-ol-3), C10H20O. The laevo variety is the chief pleasant-smelling liquids, which boil at 175-176° C. They differ , portion of oil of peppermint; it may be prepared by redVing the from each other only in rotatory power. Dry hydrochloric acid i menthone obtained by E. Beckmann and M. Pleissner c *nn., 1891, gas converts them into optically active limonene hydrochloride, ' 262, p. 21) from pulegone hydrobromide with sodium and alcohol.

dioxide yields l-methyl-4-isopropyldiketohexamethylene. This ketone is then reduced to the secondary alcohol, the hydroxyl groups replaced by bromine, and hydrobromic acid is then removed from the bromo-compound by boiling it with quinoline, leaving the ter- pene. It is a liquid which boils at 174° C. and shows a complete terpene character.

Alcohol and Ketone Derivatives

while in the moist condition it gives dipentene dihydrochloride. When heated to a sufficiently high temperature they are con- verted into dipentene. Four optically active nitrosochlorides are known, two corresponding to each of the active limorienes, and these on heating with alcoholic potash are converted into d- and /-carvoxime. Dipentene (t'limonene) is found widely distributed in many essential oils, e.g. of camphor, Russian turpentine, cubebs, bergamot, cardamom, &c, and is also a product of the dry dis tillation of many vegetable resins. It may be produced by heating many terpenes (pinene, camphene, sylvestrene, limonene) for several hours at 250-270 C. ; or by the polymerization of isoprene at 300° C. To obtain pure dipentene it is best to heat dipentene hydrochloride with anhydrous sodium acetate and glacial acetic

acid (O. Wallach, Ann. Chem. Pharm., 1887, 239, p. 3). It is a pleasant-smelling liquid, which boils at 175-176° C, and poly- merizes on heating to high temperatures. When warmed with alcoholic sulphuric acid it yields terpinene, whilst concentrated sulphuric acid or phosphorus pentasulphide convert it into para- cymene. Dipentene dihydrochloride, CioH]6-2HCl, ber>t prepared by passing a current of hydrochloric acid gas over the surface of a glacial acetic acid solution of dipentene, crystallizes in rhombic tables which melt at 50 C. and boil at 118-120 C. (10 mm.). It is apparently a /raws-compound, for A. v. Baeyer (Ber., 1893, 26, p. 2863) has obtained a cis-dihydrochloride of melting-point 25° {circa), by the action of hydrochloric acid on cineol. Terpinolene, Ai:4(8) terpadiene, has not as yet been observed in essential oils. It is formed by the action of hot dilute sulphuric acid on terpineol, terpin hydrate and cineol. It is an inactive liquid boiling at 1 83-1 85 ° C, and is readily converted into terpinene by acids.

Terpinene, Ai : 4(8) terpadiene (?), is found in cardamom oil and in oil of marjoram. It is formed by the action of alcoholic sul- phuric acid on dipentene, terpin hydrate, cineol phellandrene or terpineol ; or by the action of formic acid on linalool.

Phellandrene is a mixture of Ai : 5 terpadiene and A2: 1(7) terpadiene (pseudo-phellandrene) (F. W. Semmler, Ber., 1903, 36, p. 1749). It is found as (/-phellandrene in oil of water-fennel and oil of elemi, and as /-phellandrene in Australian eucalyptus oil and oil of bay. It is an exceedingly unstable compound, and must be extracted from the oils by distillation in vacuo. The hydrocarbons obtained from elemi oil and eucalyptus oil correspond to Al-5 terpadiene. A similar hydrocarbon was obtained by C. Harries and M. Johnson (Ber., 1905, 38, p. 1832) by converting carvone hydro- bromide into A6 terpenone-2, then, by phosphorus pentachlcride, into chlor-2-phellandrene, which is finally reduced.

Sylvestrene, Ai : 8(9) meta-terpadiene, is found in Swedish and Russian oil of turpentine and in various pine oils. It boils at '75 _I 76° C. and is dextro-rotatory. It is one of the most stable of the terpenes and gives a characteristic deep blue colour on the addition of a drop of sulphuric acid to its solution in acetic an- hydride. On treating the hydrobromide with bromine in the presence of iodine, a product is obtained which on reduction yields meta-cymene (A. v. Baeyerand V. Villiger, Ber., 1898, 31, p. 2067). Carvestrene is obtained by the distillation of carylamine or vestry- lamine hydrochloride (A. v Baeyer, Ber., 1894, 27, pp. 3485 seq.). It is regarded by Baeyer as j-sylvestrene. It was synthesized by W. H. Perkin and G. Tattersall (Proc. Chem. Soc, 1907, 22, p. 268) by the application of the Grignard reaction to the ethyl ester of 7-ketohexahydrobenzoic acid (1). By the action of magnesium methyl iodide this ester yields the lactone of Y-hydroxy-hexahydro- meta-toluic acid, which is transformed by hydrobromic acid into the corresponding v-bromo-hexahydro-meta-toluic acid. This latter substance by the action of pyridine yields tetrahydro-meta- toluic acid, the ester of which by magnesium methyl iodide is con-verted into A-i-meta menthenol-8 (2). The meta-menthenol on dehydration by potassium bisulphate yields carvestrene (3) of boiling-point 179-180 C.

It crystallizes in prisms which melt at 43° C. and boil at 212° C. It is readily oxidized by chromic acid to the corresponding ketone menthone. By the action of phosphorus pentoxide, or zinc chloride, it is converted into menthene, CioHis, and when heated with anhydrous copper sulphate to 250° C. it yields para-cymene. It is reduced by hydriodic acid and phosphorus to hexahydrocymene. The phosphorus haloids yield haloid esters of composition C10H19CI, which, according to I. L. Kondakow (Jour, prakt. Chem., 1899 [2], 60, p. 257) are to be regarded as tertiary esters; a similar type oi reaction is found in the case of carvomenthol. A d-menthol has been prepared from the i-mixture obtained by reducing menthone w-ith sodium. The mixture is benzoylated,

and the liquid ^-menthol benzoate separated and hydrolysed.

Tertiary menthol (terpan-ol-4), a liquid boiling at 97-101° C. (20 mm.), has been obtained by the hydrolysis of the ester prepared by heating menthene with trichloracetic acid (A. Reychler and L. Masson, Ber., 1896, 29, p. 1844). It possesses a faint pepper- mint odour. W. H. Perkin, junr. (Proc. Chem. Soc., 1905, 21, p. 255) synthesized it from 1-4 methylcye/ohexanone : sodium carbonate converts o-bromhexahydro-para-toluic acid (1) into A-l-tetrahydro-para-toluic acid and o-oxyhexahydro-para-toluic acid, and the latter on treatment with dilute sulphuric acid yields 1 ^-methylcyrfohexanone (2), which by the action of magnesium isopropyl iodide and subsequent hydrolysis is converted into tertiary menthol (3).

CH» • CH Jx

,CH 2 • Cftis

,CH 2 • CH<*

>C BrCCWH -^CH S CH< >C0 -> CHs • CH< >C<

cm ■ ch/

(I)

(2)

(3)

OH C3H7.

Terpin (terpan-diol i-8), CioHi 8 (OH) 2 , is known in two stereo- isomeric forms, m-terpin and trans-terp'm. The trans- form is obtained by adding silver acetate to a glacial acetic acid solution of dipentene dihydrochloride, filtering and neutralizing the filtrate by caustic soda. It is then extracted with ether, and the acetyl derivative so obtained is hydrolysed by alcoholic potash. It crystallizes in prisms, which melt at 156-158 C, and

boil at 263-265 ° C. It is converted into terpineol by dilute sulphuric acid. The m-compound melts at 104-105° C. and may be pre- pared by heating its hydrate. Terpin hydrate, CioHi8(OH)2-H20, crystallizes in prisms which melt at n6° C. It is prepared by acting with dilute mineral acids on limonene or dipentene. When boiled with glacial acetic acid it is converted into terpineol, while concentrated hydriodic acid at 210° C. reduces it to hexahydro- cymene. When heated with dilute sulphuric acid it gives a number of compounds, which may be considered as arising from the loss of one or two molecules of water from one molecule of terpin.

Cineol, CioHisO, is an inner oxide of terpin. It is found in the oils of wormseed, cajaput, eucalyptus, laurel, galanga, camphor and of lavender. It may be prepared by passing a current of dry hydrochloric acid gas into wormseed oil, the precipitated hydro- chloride being then distilled in a current of steam (O. Wallach and W. Brass, Ann., 1884, 225, p. 297). It is an inactive liquid, which boils at 1 76° C. The oxygen atom in the molecule does not appear to possess either an alcoholic, ketonic, aldehydic or acid function.

Terpineol (Ai-terpen-ol-8), Ci Hi7(OH). The term "terpineol " has been used to denote what is now known to be a mixture of various isomeric alcohols. Liquid terpineols have been isolated from the oils of Erigeron canadense, of marjoram and of camphor. Liquid terpineol is generally prepared by the action of dilute sul- phuric acid on terpin hydrate. It consists of a mixture of various isomers, from which a solid terpineol melting at 35° C. and an isomeric A-8(9) terpen-ol-i, melting at 32° C, have been isolated (K. Stephan and J. Halle, Ber., 1902, 35, p. 2147. See also G. Bouchardat, Comptes rendus, 1887, 104, p. 996; 1895, 121, p. 141; Schimmel & Co., Semi-annual Reports, Oct. 1897, p. n; J. Godlewsky, Chem. Centralhlatt, 1899 (I.), p. 1241). Solid ter- pineol exists in active and racemic forms. The

N CH 2 CH/

,COCH !x ,C(CH 3):CH, ,C(CH3):CH X XH3 active form was obtained by F. W. Semmler (Ber.,

H.C( )CHC0OH ^H.C<(r ^ rti])fH-C(CH*OH H.C _ >CH • C<(1895 , 28, p. 2190) by replacing the halogen atoms

' ,) * 2 " in the active monohydrobromide of limonene bj

the hydroxyl group; it has also been obtained by

the action of acetic acid on linalool. The racemic variety has been

N CH 2 -CH/

u)

A synthetical monocyclic terpene, viz. l-methyl-4-isopropyl dihydrocymene was prepared by A. v-. Baeyer (Ber., 1893, 26, p. 232). Succino-succinic ester is converted into the methyl iso- propyl derivative, which on hydrolysis and elimination of carbon

prepared by the action of formic acid on geraniol, and was synthesized by the following method (W. H. Perkin, junr., Jour. Chem. Soc, 1904, 85, P- 654). 7 -Cyanpentane tricarboxylic ester (1) (prepared by the

action of cyanacctic ester on /3-iodopropionic ester) is hydrolysed to pentane-aYe-tricarboxylic acid (2), which when boiled with acetic anhydride and distilled gives 6-ketohexahydrobenzoic acid (3). The ester of this acid, when treated with the Grignard reagent, yields a-oxyhexahydrotoluic acid (4), which is converted into the corresponding brom-compound by fuming hydrobromic acid. This latter compound on treatment with dilute alkali or pyridine yields A-3-tetrahydro-para-toluic acid (5), the_

ester of which with mag- nesium and methyl iodide furnishes terpineol (6) : —

.CH2-CH2. (R02C-CH2.CHs)2C(CN)COiR -> (HOsOCHrCTfeteCH-COsH^CCXf ^CH-CChH

N CH2 • CH2

(1) (2) /|\ (3)

CH2.

xCH- CH2 X X CH2-CH 2 /

si/ CH 3n . .CH2-CH2. CH-COiH <- >C< >CH-C0 2 H

n

(4)

CHs-C^ >OH(CH 3)20H <- CHs-O

X CH2-CH2 X

16; (S)

This svnthesis determines the constitution of terpin (7) and of dipentene (8), since the former is produced by the action of 5 per cent, sulphuric acid on terpineol, and the latter by heating terpineol with acid sodium sulphate.

CHs. y CH2-CH 2 ^ XH

a x >*-H2 *-xiZv ,y

>C< >CH-C(CH3)20H, CH 3 'C

HCK X CH2-CH2 X x '

CHi. ..CH2

>CH-C

(8) Dipentene.

(7; Terpin

Terpineol adds on nitrosyl chloride to form a nitrosochloride, which on elimination of hydrochloric acid yields the oxime of an unsaturated oxy ketone; this on boiling with acids is converted into inactive carvone. When reduced by the method of Sabatier and Senderens it forms hexahydrocymene (A. Haller, Comptes rendus, 1905, 140, p. 1303); when oxidized with Caro's reagent it yields trioxyhexahydrocymene (A. v. Baeyer and V. Villiger, Ber., 1899, 32, p. 3625). For an isomeric terpineol (A -8(9) terpenol-i) see A. v. Baeyer, Ber., 1894, 27, pp. 443, 815.

Menthone (terpan-one-3), CioHisO, occurs with menthol in oil of peppermint. It was first obtained by M. Moriya {Jour. Chem. Soc., 1881, 39, p. 77) by oxidizing menthol with chromic acid mixture at 120 C., and was described as an inactive compound; but R. W. Atkinson (ibid., 1882, 41, p. 50) showed that when menthol was oxidized at 135 C. a strongly dextro-rotatory menthone was pro- duced. For the preparation of /-menthone and d-isomenthone (Beckmann's (/-menthone) see E. Beckmann, Ann., 1889, 250, p. 325; 1891, 262, pp. 21 seq. The menthone obtained by Beckmann by the reduction of pulegone hydrobromide was shown by C. Martine (Ann. chim. phys., 1904 (8), 3, p. 49) to be not com- pletely identical with /-menthone; it is consequently designated P-menthone. An inactive menthone has been synthesized as follows. 0-Methyl pimelic ester is converted by sodium ethylate into methyl- 1 -cyc/ohexanon-3-carboxylic ester-4, into which the iso- propyl group is introduced (also in position 4) by the action of isopropyl iodide and sodium ethylate. The ester is then hydrolysed, and carbon dioxide eliminated from the carboxyl group, when inactive menthone is obtained (A. Einhorn and L. Klages, Ber., 1901, 34, p. 3793). It boils at 204-206° C, whereas Beckmann's menthones boil at 208° C. A. Haller and C. Martine (Comptes rendus, 1905, 140, p. 130) synthesized natural menthone from isopropyl iodide and the sodium derivative of methyl-l-cyc/o- hexanone-3. It has also been prepared by condensing methyl- hexanone with ethyl

acetate, the resulting methyl- i-acetyl-4-c yclo-hexanone-3 being converted into the isopropyl derivative, yielding icetylmenthone, which is then hydrolysed to menthone (G. Leser, Comptes rendus, 1902, 134, p. 1 1 15). A. Koltz and L. Hesse (Ann., 1905, 342, p. 306) convert methylhexanone (1) by means of ethyl oxalate and subsequent hydrolysis into methylhexanone oxalic acid (2), the isopropyl ester of which on treatment with a methyl alcohol solution of caustic potash yields (/-menthone (3).

XH2-C0 . .CHrCO s, XHrCO . Sabinene, CioH I6 , also a bicyclo-(o ■ I

CHs-CH< >CH 2 -> CH 3 -CH< >CH-C0-C02R -> CHs-CH< >CH-C 3 H7. - - - - - ....-■.

VHo.ru/ Nrwo-m./ >r~ —

from citronellal by converting this compound into isopulegol acetate by acetic anhydride; this ester is hydrolysed, and the isopulegol oxidized to isopulegone, which on treatment with baryta yields pulegone. Pulegone reduces ammoniacal silver nitrate on long boiling. It is reduced by hydrogen to /-menthol. When heated with water to 250° C. it yields methyl- 1 -cyc/ohexanone-3 and acetone. When methylcyc/ohexanone and acetone are condensed together in the presence of sodium methylate, an isomer of pulegone boiling at 215-216° C. is obtained. Pulegone combines with hydrobromic acid to form a hydrobromide, which on heating in methyl alcohol solution with basic lead nitrate is converted into isopulegone (A 8(9)-terpenone-3) (C. Harries and G. Roder, Ber., 1899, 32, P- 336l). It is a laevo-rotatory liquid. A dextro- form (a mixture) is also obtained by the oxida- tion of isopulegol with chromic acid. On reduction it yields isopulegol and no menthol (cf. pulegone).

Carvone (A 6 : 8(9)-terpadiene-one-2), CioHi4,0, is an unsaturated optically active ketone which is found very widely distributed in nature. The dextro-form is the chief constituent of oil of caraway, and is also found in oil of dill; the laevo-form is

found in oil of spearmint and kuromoji oil. The dextro-form is obtained practically pure by the fractional distillation of caraway oil; the laevo-form from the oils containing it, by first forming its addition com- pound with sulphuretted hydrogen, decomposing this by alcoholic potash, and distilling the product in a current of steam. It may be synthetically prepared from limonene nitrosochloride, alcoholic potash converting this compound into /-carvoxime, which on boiling with dilute sulphuric acid yields /-carvone; similarly terpineol nitrosochloride by the action of sodium ethylate yields oxydihydro- carvoxime, which on hydrolysis yields 4-carvone. On heating with phosphoric acid carvone is converted into carvacrol (i-methyl-2- oxy-4-isopropylbenzene). Carvone is closely related to phellandrene, for C. Harries and M. Johnson (Ber., 1905, 38, p. 1832), by reduction of carvone hydrobromide, obtained A 6-terpenone-2, which with phosphorus pentachloride gives chlor-2-o-phellandrene.

Bi-Cyclic Terpene Group A nomenclature for the bicyclic hydrocarbons was devised by A. v. Baeyer (Ber., 1900, 33, p. 3771). According to this system each hydrocarbon contains two tertiary carbon atoms, which are combined with each other three times, either directly or by means of other intervening carbon atoms, the combination forming a series of ” bridges.” These bridges are distinguished by numbers, denoting the number of carbon atoms contained in them, the direct union of the two tertiary carbon atoms being designated as o; if one carbon atom intervenes, then the number I is used, and so on. Thus three numbers serve as the ” characteristic ” for the compound. Hydrocarbons of this class with five atoms of carbon are. termed ” Wc yc/opentanes, ” with six atoms of carbon ” Wcyc/ ohexanes,” &c. Thus, for example, the compound (1) would be called ” bicyclo-(\ • 1 • 3)- H2C-CH v H2C-CH2

heptane,” and (2) would be , . „ L 1 \„ , . „ 1 J,„\

, , Jf. , / „ .(1 „^.„ „ m (1) H2C CH2 >CH2 (2) H2C

CH_ T _

bicyclo-(o • 1 • 4)-heptane. ' ' / I ' / CH2

Thujene (tanacetene), HsC-CH ' H2C-CH/

C10H10, is a derivative of bicyclo-(o ■ 1 • 3)-hexane. The name was first given to the hydrocarbon obtained by F. W. Semmler (Ber., 1892, 25, p. 3345) on the dry distillation of thujylamine hydrochloride. It is a liquid which boils at 60-63° (14 mm.), and has been shown by L. Tschugaeff to be a monocyclic hydrocarbon, for which he proposes the name " isothujene." The true thujene was prepared by L. Tschugaeff (Ber., 1900, 33, p. 31 18; by heating the methyl xanthogenic ester obtained from thujyl alcohol. It is exceedingly unstable. The isomeric /3-thujene was also obtained by the same investigator by the dry distillation of trimethylthujyl ammonium hydroxide. It boils at 150-151° C, and possesses a djfferent rotatory power.

3)-hexane

v CH2-CHi-

(1)

CH2-CH2 X

(2)

X CH2-CH/

derivative, is found in oil of savine, from which

O. Wallach (Ann., 1900, 312, p. 171) showed that the oximes of cyclic ketones are converted by phosphorus pentoxide into iso- oximes, which are readily decomposed by concentrated hydro- chloric acid to yield aliphatic amino-acids; in this way menthone may be converted into e-amido-decylic acid,

(CH 8) 2 CH-CH(NH 2 HCH 2) 2 -CH(CH 2)-CH a -C0 2 H.

Diosphenol, CioHuOs, which occurs in the essential oil of bucco leaves (Bo-osma betulina) may be synthesized by oxidizing oxy- methylene menthone. Sodium in alcoholic solution reduces it to paraterpane-di-ol (2-3).

Pulegone (A 4(8)-terpenone-3), QoHi 6 0, is an unsaturated ketone found in pennyroyal oil, from which it may be obtained by dis- tillation in vacuo. It is a dextro-rotatory liquid which boils at 221-222° C. F. Tiemann (Ber., 1897, 30, p. 22) synthesized it

(3) it was first obtained by F. W. Semmler (Ber., 1900,

33, p. 1455). On shaking with dilute sulphuric acid it yields terpinenol (Ai-terpen-ol-4) (O. Wallach, Ber., 1907, 40, p. 592)

Pinene, C10H16, derived from bicyclo-(i • 1 • 3)-heptane, is found in many essential oils, and is the chief constituent of oil of tur- pentine; the /-variety is found in French oil of turpentine, the (/-variety in Russian, American and Swedish oil of turpentine. Pinene is also a constituent of the oils of sage, lemon, eucalyptus, olibanum, bay, fennel, sassafras, rosemary and of valerian. The active varieties are obtained by the fractional distillation of the various oils of turpentine. The inactive variety is obtained by heating pinene nitrosochloride with an excess of aniline (O. Wallach ; Ann., 1889, 252, p. 132; 1890, 258, p. 243), or better with methyl- aniline (W. A. Tilden). The three varieties boil at I55-I5 6 °.C Pinene readily absorbs oxygen from the air, resinous products being formed, together with small quantities of formic and acetic acids.

Acid oxidizing agents convert it into terephthalic and terebic acids, ■whilst alkaline potassium

permanganate in dilute solution oxidizes it to pinene glycol, CioHi 6 (OH) 2 , pinonic acid, Ci H 16 O 3 , pinic acid, C»HhO<, &c, the products of the reaction varying according to the temperature (G. Wagner, Ber., 1894, 27, p. 2270; F. Tiemann and F. W. Semmler, Ber., 1895, 28, pp. 1344, 1778). Concentrated sulphuric acid converts it into camphene; and an alcoholic solution of sulphuric acid gives terpinene and terpinolene. When heated to 250-270 C. it yields dipentene; the moist halogen acids at ordinary temperature convert it into the dihalogen halides of dipentene. Dry hydrochloric acid gives pinene hydrochloride (artificial camphor), CicHnCl, a white crystalline solid identical with bornyl chloride which melts at 131 ° C. Elimination of halogen hydride by means of a weak alkali (e.g. soap, silver acetate, &c.) converts it into camphene. Thus the conversion of pinene into its hydrochloride is probably accompanied by an intramolecular rearrangement—

HiC • C • CH-

HC C(CH.,)2 HaC'

L .ch-

CHi-

(H 3 C)C1 • C ■ CH ,

H2C C(CH3)j C H;C-CH

Hi

H2C : C(CHa)— CHC1 C(CHj)« CH-

H 2 C

-CHj

Pinene.

Bornyl chloride.

Nitric acid in aqueous alcoholic solution converts

it into terpin hydrate. Pinene nitrosochloride, Ci Hi 6 NOCl, was first obtained in 1874 by W. A. Tilden (Jahresb., 1874 P- 2I 4) from nitrosyl chloride and a mixture of pinene and chloroform. 0. Wallach {Ann., 1889, 253, p. 251) prepared it by the action of acetic acid and ethyl nitrite on oil of turpentine in presence of fuming hydro- chloric acid. W. A. Tilden (Jour. Chem. Soc, 1904, 85, p. 759) showed that strongly active pinene gives bad yields of the nitroso- chloride, since, being bimolecular, its formation is retarded by the inversion of half of the terpene. The nitrosochloride melts at 1 1 5° C. (circa) and is a white pleasant-smelling powder. Alcoholic potash converts it into nitrosopinene, CicHieNO.

Bornylene, G0H15, derived from bicyclo-(1 ■ 2 ■ 2)-heptane, is pre- pared by heating bornyl iodide to 170° C. for several hours with a concentrated solution of alcoholic potash (G. Wagner, Ber., 1900, 33, p. 2121), or by decomposition of the methyl esters of the /- and 3-bornyl xanthates, the former yielding rf-bornylene and the latter Abornylene (L. Tschugaeff, Chem. Centralblatt, 19×15, i., p. 94).

Camphene, GoHu, also a bicyclo-(\ ■ 2 • 2)-heptane derivative, is a constituent of the oils of citronella, camphor, ginger and of rosemary, and also of French and American oil of turpentine. It may be obtained by the action of sulphuric acid on pinene; by heating pinene hydrobromide or hydrochloride with sodium acetate or glacial acetic acid to 200 C. ; or by heating bornyl chloride with aniline (0. Wallach, Ber., 1892, 25, p. 916). According to Konowalow it is best prepared by heating borneol with a diluted sulphuric acid (1 • 2) for about 6-8 hours, between 60-100 C., with continual snaking, a yield of about 90 per cent, being obtained. The melting- and boiling-points of camphene vary slightly according to the sources from which it is obtained, the former being about 50 C. and the latter about 159-161° C. It is known in d-, I- and i- forms. It combines with hydrochloric acid to form a hydro- chloride, which on reduction with sodium and alcohol yields cam- phene. Many different

oxidation products may be obtained from camphene by varying the conditions of experiment (J. Bredt and W. Jagelki, Ann., 1900, 310, p. 114; G. Wagner, Ber., 1890, 23, p. 2311; S. Moycho and F. Zienkowski, Ann., 1905, 340, p. 17; J. E. Marsh and J. A. Gardner, Jour. Chem. Soc, 1891, 59, p. 648; 1896, 69, p. 74).

Fenchene, CjoHi 6 , a bicyclo-(l ■ 2 ■ 2)-heptane derivative, is not found in any naturally occurring products. The hydrocarbon may be obtained by the reduction of fenchone and elimination of water from the resulting fenchyl alcohol, or by the elimination of halogen hydride from the fenchyl halogen compounds (O. Wallach, Ann., 1892, 263, p. 145; 1898, 302, pp. 371 seq.).

The above bicyclo-terpene hydrocarbons are most probably best represented by the following formulae (pinene is given above) : —

XHC

aC <4.CH>*

QH; a-Thujene

CHiC(CHj)CH

fc(CHi). I

CHi CH 1

Bornylene

-CHCH

' C-CH 011 CsH 7 P-Thujene

CHi ■ CH ■ C : CH 2

CH,

CHi-CH-C(CHa). Camphene

CHi

J- W 1

CHiCH-C(CHa). CHi

/CH-C-CH*

Sabinene CH C : CHi

C(CHj)j|

ch — c:

Fenchene

H.

Alcohol and Ketone Derivatives

Borneol (Borneo camphor), G0H17OH occurs in the pith cavities of Dryobalanops camphora, and in the oils of spike and rosemary; esters are found in many fir and pine oils. It may be prepared by heating camphor with alcoholic potash (M. Berthelot, Ann., 1859, 12, p. 363); or by reducing camphor in alcoholic solution

with sodium (O. Wallach, Ann., 1885, 230, p. 225; J. Bertram and H. Walbaum, Jour. prak. Chem. 1894 (2), 49, p. 12). L. Tschu- gaeff (Chem. Centralblatt. 1905 i , p 94) obtains pure d-borneol as follows. — Impure <2-borneol (containing isoborneol) obtained in the reduction of camphor is- dissolved in xylene and converted into the sodium salt by metallic sodium. This salt is then turned into the xanthate, CioHnOCSaNa, which with methyl sulphate yields the corresponding methyl ester. The unchanged isoborneol is removed by steam distillation, which also decomposes any methyl, xanthate of isoborneol that may have been formed. The residue is crystal- lized and hydrolysed, when pure borneol is obtained. It behaves as a secondary alcohol. Nitric acid oxidises it to camphor and when heated with potassium bisulphate, it gives camphene. With phosphorus pentachloride it forms a bornyl chloride, identical with pinene hydrochloride.

Isoborneol is a tertiary alcohol which may be obtained by dis- solving camphene in glacial acetic acid, adding dilute sulphuric acid and heating to 50-60° C. fcr a few minutes, the isobornyl acetate so formed being then hydrolysed (J. Bertram and H. Wal- baum, he. «/.). It crystallizes in leaflets, which readily sublime. Chromic acid oxidizes it to camphor.

Thujcne (tanacetone), GoHisO, is found in many essential oils. Oil of thuja contains chiefly a-thujone, and oil of tansy chiefly /S-thujone. Oil of artemisia and oil of sage contain a mixture of the two, whilst oil of absinthe contains principally the /3-variety. The two forms may be obtained by fractional distillation of the oils, followed by a fractional, crystallization of their semicarbazones from methyl alcohol. a-Thujone is laevo-rotatory and when warmed with alcoholic potash it is partially converted into /3-thujone. Sodium in the presence of alcohol reduces it to thujyl alcohol, which on re-oxidation is converted into /3-thujone. The /8-form is dextro-rotatory and is partially converted into the o-variety by alcoholic potash. When heated to 280° thujone is transformed into the isomeric carvotanacetone (A6-terpenone-2). On boiling with ferric chloride it yields carvacrol. Hot dilute sulphuric acid converts it into isothujone (dimethyl- 1 • 2-isopropyl- 3-cyc/opentene-l-one-5). Thujone behaves as a saturated compound and forms a characteristic tribromide. When heated with zinc chloride it yields hydropseudocumene. According to F. W. Semmler (Ber., 1900, 33, p. 275; 1903, 36, p. 4367) it is to be considered as a methyl-2-isopropyl-5-6«:;yc/o-(o • 1 • 3)-hexanone-3.

Carone, GoHi 6 0, is a trimethyl-3 • 7 ■ 7-bicyclo-(o • 1 • 4)-hepta- none-2, obtained by acting with alcoholic potash on dihydrocarvone hydrobromide (A. v. Baeyer, Ber., 1896, 29, pp. 5, 2796; 1898,

31, pp. 1401, 2067). It is a colourless oil, having the odour of camphor and peppermint, and boiling at 210° C. It is known in <7>, /-, and t-forms. It does not combine with sodium bisulphite. When heated it

is transformed into carvenone. It is stable to cold potassium permanganate solution, but on heating gives a dibasic acid, caronic acid, C 6 H 8 (C0 2 H)2, which Baeyer suggested was a gera- dimethyltrimethylene-l • 2-dicarboxylic acid. This was confirmed by W. H. Perkin, junr. (Jour. Chem. Soc, 1899, 75. p. 48) who synthesized the acid from dimethylacylic ethyl ester. This ester with ethyl malonate yields ethyldimethylpropane- tricarboxylic ester, which on hydrolysis and subsequent heating is converted into /3/3-dimethyl glutaric acid. The a- brorr.dirrethyl ester of this acid when heated with alcoholic potash yields cis-, and /ro«j-caronic acids. Eucarvone, GoHmO, is a trimethyl- 37-7-6i'cyc/o-(o-l-4)-heptene-3-one-2. O. Wallach (Ann., 1905, 339. P- 94) suggests that the ketone possesses the structure of a trimethyl-l • 4 • 4- cyc/oheptadiene-5 • 7-one-2. Phosphorus penta- chloride converts it into 2-chlorcymene (A. Klages, Ber., 1899

32, p. 2558).

Camphor, GoHi 6 0, is a_trimethyl-i • 7 • y-bicyclo- (i ■ 2 ■ 2)-hepta- none-2. The d-variety is fourtd in the camphor tree (Laurus camphora), from which it may be obtained by distillation in steam. The /- variety is found in the oil of Matricaria parthenium. It crystallizes in transparent prisms which possess a characteristic odour, sublimes readily and is easily soluble in the usual organic solvents. It boils at 209° C. and melts at 176° C. (circa). The J-form may also be obtained by the distillation of calcium homo- camphorate (A. Haller, Bull. Soc. Chim., 1896 (3), 15, p. 324). When heated with phosphorus pentoxide it yields cyrriene, and with iodine, carvacrol. Nitric acid oxidizes it to camphoric acid, C 8 Hn(C0 2 H) 2 , camphoronic acid, C 9 H 14 06, and other products. It forms an oxime with hydroxylamine which on dehydration yields a nitrile, from which by hydrolysis campholenic acid, CsHhCOjH, is obtained It combines with aldehydes to form alkylidene com- pounds, and yields oxymethylene compounds when subjected to the " Claisen " reaction. It does not combine with the alkaline

bisulphites. It is readily substituted by chlorine and bromine; and with fuming sulphuric acid forms a camphor sulphonic acid. Sodium reduces it, in alcoholic solution, to borneol. When heated with sodium formate to 120° C. it is converted into bornylamine. Caro's acid converts it into campholid, and a compound CioH«0« (A. v. Baeyer and V. Villiger, Ber., 1899, 32, p. 3630). When heated with concentrated sulphuric acid to 105–110 C. it yields carvenone and 4-aceto-i • 2-xylol (J. Bredt, Ann., 1901, 314, P- 371)-

A vast amount of work has been done on the constitution of the camphor molecule. The earlier investigations on the ready formation of benzene derivatives by the breaking down of camphor led to the view that the molecule was a simple six-membered carbon ring. Subsequent research, however, showed that the formula proposed by J. Bredt (Ber., 1893, 26, p. 3047), in which camphor is to be regarded as a bicyclo-heptane derivative, is correct. This formula is based on the fact that camphoronic acid yields

trimethylsuccinic, isobutyric, and carbonic acids, and carbon rrt.-rn. r> _l rvr mr-a -rn.p _^rw \ rvrv.xn ■ rvnwvr-TT -rvt ■ m.t

on dry distillation, and Bredt suggested that it was an 00,8- < CI tt° CBr CftR+C&COCH. CO*R -XCILWCftR) C(OH)(CHa) CH 2 CO*R

trimethylcarballylic acid, 1

H0 2 C-CH2-C(CH 3)(C0 2 H)C(CH 3)jC0 2 H, (Ctt^acftH) • CfCftHHCH.) • ch 8 ccmi< (C&jjCfCOjR) • qcnkch.) • Ok-cosR

(3) (2)

was an act|8-trimethylcarballylic acid, a conclusion which was confirmed by its synthesis by W. H. Perkin, junr., and J. F. Thorpe (Jour. Chem. Soc, 1897, 71, 1169): — Aceto-acetic ester is con- densed with a-bromisobutyric ester, the resulting hydroxytrimethyl glutarate (1) converted into the chlor- and then into the corre- sponding cyan-trimethyl glutarate (2), which on hydrolysis with hydrochloric acid yields camphoronic acid (3) and some trimethyl glutaconic acid : —

a conclusion confirmed by its synthesis (see below). The Bredt _ formula is also supported by the

synthesis of r-camphoric acid by G. Komppa (Ber., 1901, 34, p. 2472; 1903, 36, p. 4332). In this synthesis ethyl oxalate is condensed with /3/S-dimethyl glutaric ester, and '.he resulting diketoapocamphoric ester (1) is then methylated to diketocamphoric ester (2). The keto groups in (2) are converted in CH 2 groups as follows: — Sodium amalgam converts this ester into dioxycamphoric ester (3), which with hydriodic acid and phosphorus yields r-dihydrocamphoric acid At 125° C. this compound combines with hydrobromic acid to form /S-bromcamphoric acid, which on reduction with zinc and acetic acid yields r-camphoric acid (4) : —

ROjC ■ gH- C(CHj) 2 - CH- CO2R _* CO — CO

(1)

HOjC ■ CH ' C(CHj)j ■ C(CHi) ■ COiH^ CH; CH2

(4)

R&c-cH-ccc&y cxcho-cojR

co CO

(»>

i

RQiC • CH • C(CHj)i ' C(CH 3) • COaR

HC(OH) CH(OH)

(3)

This series of reactions leads to a complete synthesis of camphor, since A. Haller (Comptes rendus, 1896, 122, p. 446) has shown that camphoric anhydride (1) on reduction yields campholid (2), which by the action of potassium cyanide and subsequent hydrolysis of the nitrile formed is converted into homocamphoric acid (3), the calcium salt of which yields camphor (4) on distillation: —

/CO v GHuC >0-

(1)

>C 8 H»

/C H N

0— >C 8 Hw

^CHj-COiH

s CO a H

(3)

/CH 2 ■+C 8 Hm< I

Vo.

(4)

Thus camphor and its oxidation products are to be represented as

CHi-CH — — — CH*(«) CH 2 -CH-CO.,H C0 2 H COiH

J C(CHa)s (") j j C(CHa) 2 I C(CHj)2

CHiCICHc) CO (8), CHs'CtCaO-COiH, CH2 " C(CH 3)-C0 8 H

Camphor, Camphoric acid, Camphoronic acid.

Camphor yields three classes of halogen substitution derivatives known respectively as o, (3 and x compounds, the positions being shown in the formula above. The a compounds result by direct substitution, the 8 and it derivatives being formed in an indirect manner. Cyancamphcr, CioHuO-CN, is formed by passing cyanogen gas into sodium camphor, or by digesting sodium oxymethylene camphor with hydroxylamine hydrochloride (L. Claisen, Ann., 1894, 281, p. 351).

7r-Camphor sulphonic acid results from the action of fuming sulphuric acid on camphor (F. S. Kipping and W. J. Pope, Jour. Chcm. Soc, 1893, 63, p. 573). Camphoroxime, CioHi 6 0:NOH, was first prepared by

E. Nageli (Ber., 1883, 16, p. 497).

/-Camphor is formed by the action of nitric acid on /-borneol (W. J. Pope and A. W. Harvey, Jour. Chem. Soc, 1901, 79, p. 76). r-Camphor mcits at 178-179 C. (for its preparation see A. Debierne, Comptes rendus, 1899, 128, p. I no; VV. A. Noyes, Amer. Chem. Jour., 1905, 27, p. 430).

Camphoric acid. Four optically active and two inactive forms of this acid are known- The most important is the

CHfCH-COaH

) CtCttl)!

CHiC(Ctti)-COiR

(1)

CHjCHCOiR I C(CH,)i CH:-C(CH3rC0aH (a)

/-Camphoric acid results on oxidizing /-borneol or matricaria camphor. It melts at 187 C. r-Camphoric acid is formed on mixing alcoholic solutions of equimolecular quantities of the d- and /-acids, or by oxidizing i-camphor. It melts at 202-203° C.

Camphoronic acid, CgHuOj. From a study of its distillation products J. Bredt (Ber., 1893, 26, p. 3049) concluded that this acid

Fenchone, CioHicO, is trimethyl -(2 • 7 • 7) - bicyclo - (1 ■ 2 2) hepta- none-3. It occurs in d- and /-forms, the former in oil of fennel and the latter in oil of thuja. It may be obtained from these oils by treating the fraction boiling between 190-195° C. with nitric acid and distilling the product in a current of steam. The fenchpnes are pleasant-smelling oils which boil at 192-193° C, and on solidification melt at 5-6 C. They do not combine with sodium bisulphite. They dissolve unchanged in cold concentrated hydrochloric and sulphuric acids, and are very stable; thus the monobromfenchone is only formed by heating the ketone >vith bromine to

ioo° C. under pressure (H. Czerny, Ber., 1900, 33, p. 2287). On oxidation with potassium permanganate it yields acetic and oxalic acids together with dimethylmalonic acid. By the action of hot concentrated sulphuric acid it yields acetyl-ortho-xylene,

CH 3 CO(4)C 6 H 3 (CH 3) 2 (i-2)

(J. E. Marsh, Jour. Chem. Soc, 1899, 75, p. 1058). When heated with phosphorus pentoxide to 115-130° C. it forms metacymene. Since it does not yield any oxymethylene compounds, it cannot contain the grouping — CH 2 -CO— in the molecule.

Hydrocarbons, Ci Hi 8 , of the Terpene Series

Menthene, C 6 H 8 (CH 3) (C 3 H 7), is methyl-i - isopropyl-4-cyc/ohexene-3. It is obtained by the action of anhydrous zinc chloride or copper sulphate on menthol (J. W. Briihl, Ber., 1892/ 25, p. 142), by boiling menthyl chloride with aniline (G. Wagner, Ber., 1894, 27, p. 1636), by heating menthyl chloride with potassium phenolate (L. Masson, Ber., 1896, 29, p. 1843), and by the dry distillation of the methyl ester of menthyl xanthate (L. Tschugaeff, Ber., 1899, 32, P- 3333)- It ' s a colourless liquid which boils at 167-168° C. When strongly heated with copper sulphate it yields cymene. According to Tschugaef, the xanthate method alone gives a pure menthene of the above constitution, the menthene obtained from the dehydration of menthol being a tyc/ohexene-4 ; and the one obtained by O. Wallach (Ann., 1898, 300, p. 278) from Z-menthyl- amine being a cyc/ohexene-2,

Carvomenthene, C 6 H 8 (CH 3)(C 3 Hr), is probably methyl- 1 isopropyl 4-ryc/ohexene-i. It is prepared by heating carvomenthyl bromide with quinoline, or by heating carvomenthol with potassium bisul- phate to 200° C. It is a liquid which boils at 1 75-176° C.

Camphane, CjH^CHsK is i-7-7-trimethyl-J/cyc/o-(l-2-i.)-heptane. It is prepared by the action of sodium

and alcohol on pinene hydrio- dide, or by reducing the hydriodide with zinc in acetic acid solution. It is a crystalline solid which melts at 153″ C. and boils at 160° C.

Olefine Terpenes

Myrcene, Ci Hi G , was first isolated by F. B. Power and C. Klebet from oil of bay (Schimmel & Co., Bulletin, April 1895, p. II); it is also found in oil of sassafras leaves. It is obtained from bay oil by shaking the oil with a 5 per cent, solution of caustic soda, followed by fractionation in vacuo. It boils at 67–68° C. (20 mm.), and polymerizes when heated for some time. When oxidized by potassium permanganate it yields succinic acid. By the action of glacial acetic acid in the presence of dilute sulphuric acid, a liquid is produced, which on hydrolysis yields myrcenol, CioHisO, an alcohol which is probably an isomer of linalool (P. Barbier, Comptes rendus, 1901, 132, p. 1048). The hydrocarbon is probably to be considered as being (CH 3) 2 C : CH • (CH 2) 2 • C(: CH 2) • CH : CH 2 (Enklaar, Bul- letin of Rouse-Bertrandftls, Nov., 1906, p. 92). Ocymene is an isomer which can be extracted from the leaves of the basil. Enklaar (loc cil.) represents it as (CH 3) 2 C: CH • CH 2 • CH ; C(CH 3) • CH : CH. Anhydro-geraniol, CioH w , the first olefine terpene isolated, was pre- pared in 1 891 by F. W. Semmler; it is formed when geraniol is heated with potassium bisulphate to 170′′ C.*

Alcohols, Aldehydes and Ketones

d-a>o»e/fo/,C,oHi,OHorCH,C(:CH,)(CH !),CH(CH»)(CH 2 WH, or 2-6 dimethyl-octene-l-ol-8 occurs in Reunion geranium oil and was first prepared by F. D. Dodge (Amer. Chem. Jour., 1889, II, p. 463) by reducing the corresponding aldehyde (d-citronellal). It is an odorous oil which boils at 117–118° C. (17 mm.). Oxida- tion by chromic acid mixture converts it into ckronellal, whilst

a more drastic oxidation with potassium permanganate yields acetone and #-methyladipic acid.

-Rhodinol,C 10 H ltt OH or(CH 3) 2 C : CH-(CH 2) 2 CH(CH 3)(CH 2) 2 -OH, or 2-6 dimethyl-octene-2-ol-8, occurs in the essence of geranium and of rose. It is a structural isomer of citronellol (P. Barbier and L. Bouveault, Comptes rendus, 1896, 122, pp. 529, 673; Bull. Soc. Chim., 1900, [3], 23, p. 459), and its inactive form has been synthesized from ethyl heptenone. It is an oil of strong rose odour, which boils at 110° C. (10 mm.). Chromic acid mixture oxidizes it to rhodinal and rhodinic acid, whilst by drastic oxida- tion it vields acetone and /3-methyladipic acid.

Geraniol, C,„H n OH, or (CH 3) 2 C:CH-(CH 2) 2 - C(CH 3) :CH-CH 2 OH, 2-6 dimethyl-octadiene-2-6-ol-8, is found in the oils of geranium, citronella, neroli, petit-grain, spike, ylang-ylang, and in Turkish and German rose oil. It is prepared from the oils by treating them with alcoholic potash and then fractionating in vacuo. The geraniol fraction is then mixed with freshly dried calcium chloride and the mixture allowed to stand in vacuo at a low temperature, when the compound CioHi 8 0-CaCl 2 separates out. This is washed with absolute ether and finally decomposed by water, when pure geraniol is liberated (O. Jacobsen, Ann., 1871, 157, p. 232; J. Bertram and E. Gildemeister, Jour. prak. Client., 1897 (2), 56, p. 507). It may also be prepared by reducing the corresponding aldehyde (citral) with sodium amalgam. It is a colourless, pleasant-smelling oil, which boils at 230 C. Oxidation converts it into citral and eeranic acid, (CH 5) 2 C:CH-(CH 2) 2 -C(CH 3):CH-C0 2 H. By shaking it with 5 per cent, sulphuric acid it yields terpin hydrate, and when heated with concentrated alcoholic potash to 150 C. it is con- verted into dimethylheptenol (P. Barbier, Comptes rendus, 1899, 128, p. no). Geraniol may be converted into linalool by distilling a faintly alkaline solution of acid geranyl phthalate with steam.

Nerol, G0H17OH, was obtained in 1902 from neroli oil by A. Hesse and O. Zeitschel (Jour. prak. Chem., 1902 (2), 66, p. 481); it also is found in petit-grain oil. It boils at 226-227 C. (755 mm.), and has a distinctive rose odour. It is inactive and is to be regarded as a stereo-isomer of geraniol. It does not form a compound with calcium chloride. It combines with four atoms of bromine to form a characteristic tetrabromide. It is formed (along with other products) by the action of acetic acid on linalool (O. Zeitschel, Ber., 1906, 39, p. 1780) and also by the reduction of citral-6.

Z.ma/oo/,C 10 H 17 OH,or(CH 3) 2 C:CH-(CH 2) 2 -C(CH,)(OH)-CH:CH 2 , is 2-6-dimethyloctadiene-2-7-ol-6. d-Linalool was first found in coriander oil, and Winalool in oil of linaloe. It is also found in oil of bergamot, petit-grain, lavender, neroli, spike, sassafras leaves and lemon, either in the free condition or as esters. It is a pleasant-smelling liquid which boils at 197-199 C. (according to its source). The inactive variety can be prepared from geraniol, this alcohol on treatment with hydrochloric acid yielding a mixture of chlorides, which when digested with alcoholic potash are transformed into i-linalool (F. Tiemann and F. W. Semmler, Ber., 1898, 31, p. 832). It is oxidized by chromic acid to citral. When shaken for some time with dilute sulphuric acid it yields terpin hydrate.

dtronellal, Ci Hi 8 O, is the aldehyde of citronellol. It is a con- stituent of many essential oils, and was first discovered in citronella oil by F. D. Dodge {Amer. Chem. Jour., 1889, n, p. 456); it is also found in eucalyptus oil and in lemon-grass oil. It is a dextro- rotatory liquid which boils at 203-204° C. It is readily reduced by sodium amalgam to citronellol, and oxidized by ammoniacal silver oxide to citronellic acid. Potassium permanganate oxidizes it to acetone and /3-methyladipic acid. It forms a dimethyl acetal, GoH 18 (OCH 3) 2 , which on oxidation with potassium perman- ganate yields a dioxydihydro-citronellaldimethyl acetal,

CH 3 C(CH 2 OH)(OH)(CH 2) 3 -CH(CH 3)-CH 2 -CHO,

which must possess the above composition, since on further oxida- tion by chromic acid it yields a keto-aldehyde of the constitution CH 3 CO(CH 2) 3 - CH(CH 3)-CH 2 CHO (C. D. Harries and 0. Schau wecker, Ber., 1901, 34, p. 2981); this reaction leads to the formu- lation of citronella! as a dimethyl-2-6-octene-l-al-8. Citronellal is readily converted into an isomeric cyclic alcohol isopulegol (A8(9)- terpenol-3) by acids or acetic anhydride (F. Tiemann, Ber., 1896, 29, p. 913). It combines with sodium bisulphite, giving a normal bisulphite and also a mono- and dihydrosulphonic acid.

Geraniol (citral), Ci H u O, is the aldehyde corresponding to geraniol. It occurs in the oils of lemon, orange, lemon-grass, citronella, bay, verbena, and in various eucalyptus oils. It may be obtained from the oils by means of its bisulphite compound, provided the operation is carried out at low temperature, other- wise loss occurs owing to the formation of sulphonic acids. Syn- thetically it may be produced by the oxidation of geraniol with chromic acid mixture, or by distilling a mixture of calcium formate and calcium geraniate. Its aldehydic nature is shown by the facts that it forms an alcohol on reduction, and that on oxidation it yields an acid (geranic acid) of the same carbon content. The position of the ethylene linkages in the molecule is proved by the formation of addition compounds, by its products of oxidation (acetone, laevulinic acid), and by the fact that on warming with potassium carbonate solution it yields methyl heptenone and acetaldehyde (F. Tiemann, Ber., 1899, 32, p. 107). On fusion

with potassium bisulphate it forms para-cymene. It combines with /S-naphthylamine and pyruric acid, in alcoholic solution, to form the characteristic citryl-0-naphthocinchonic acid, C 23 H 23 N0 2 iH 2 0, which is useful for identifying citral. The crude citral ob tained from essential oils is a mixture of two ethylene stereo- isomers which are designated as citral-a and citral-6 (F. Tiemann and M. Kerschbaum, Ber., 1900, 33, p. 877). Citral-a boils at 110-112° C. (12 mm.) and citral-6 at 102-104° C. The

structural identity of the two forms has been confirmed by C. Harries (Ber., 1907, 40, p. 2823), who has shown that their ozonides (prepared from the citrals by the action of ozone on their solution in carbon tetrachloride) are quantitatively decomposed in both cases into acetone, laevulinic aldehyde and glyoxal. Lemon-grass oil contains 73 per cent, of citral-a and 8 per cent, of citral-i. Citral combines with sodium bisulphite to form a normal bisulphite compound, a stable dihydrosulphonate, an unstable dihydrosulphonate and a hydromonosulphonate (F. Tiemann, Revue gen. de chim. pure el appl., 1, 16, p. 150). Citral condenses readily with acetone, in the presence of alkalis, to form pseudo-ionone (see Ionone, below).

The _ compounds of the citral series are readily converted into cyclic isomers by acids, the ring closing between the first and sixth carbon atoms in the chain. Two series of such compounds exist, namely the a and series, differing from each other in the position of the double linkage in the molecule. The constitution of the a-series is determined by the fact that on oxidation they yield isogeronic acid, which can be further oxidized to / S/3-dimethyladipic acid; the /J-series in the same way yielding geronic acid and aa-dimcthyladipic acid. The cyclocitrals themselves cannot be obtained direct from citral by the action of acids, since under these conditions para-cymene results, but they are prepared by boiling citrylidenecyanacetic ester with dilute sulphuric acid and subsequent hydrolysis of the cyclic ester with caustic potash (F. Tiemann, Ber., 1900, 33, p. 3719), or citral may be condensed with primary amines to the corresponding aldehydeimino com- pounds, which are then isomerized by concentrated acids, the amine group being hydrolysed at the same time (German Patent,

123747 (1901)).

Ionone, CuN^O. By condensing citral with acetone F. Tiemann (Ber., 1893, 26, p. 2691) obtained pseudo-ionone (1), an oil of boiling-point 143-145° C. (12 mm.), which on boiling with sulphuric acid is

converted into a mixture of the isomeric a- and /3-iononcs (2 and 3)

(1) (CH 3 >,C:CH-(CH 2) 2 -C(CH3):CH-CH:CHCO-CHa C(CH 3), C(CH a),

H,c/"\c • CH : CH • CO • CHi

(3)

HjCi V-CHs

ca

HsC,

*«v, f \CHCH:CHCOCHj HiO. //C-CHa

CH

o-Ionone is an oil which boils at 127-128° C. (12 mm.) and possesses a characteristic violet odour. The /3-compound boils at 128-129° C. (10 mm.) and possesses a similar odour. They are largely used in perfumery. An isomer of ionone is irone, the odoriferous principle of the iris root. It boils at 144° C. (16 mm.). When heated with hydriodic acid and phosphorus it yields the hydrocarbon irene, Ci 3 Hig (F. Tiemann, loc. cit.).

Sesquiterpenes

Cadinene, Ci 5 H 24 , is found in the oils of cade (from the wood of Juniperus oxyeldrus), cubeb, patchouli, galbanum, cedar-wood and juniper. It may be obtained by fractionating oil of cade, con- verting the crude hydrocarbon into its dihydrochlori.de and decom- posing this by boiling with aniline. It is an oil which boils at 2 74" 2 75° C. and decomposes on exposure. Caryophyllene is found in oil of cloves and in oil of copaiba balsam. Various other sesqui- terpenes have been described, e.g. zingiberene (from essence of ginger), cedrene (from oil of cedar-wood), santalene (from oil of sandal- wood), humulene and clovene.

Of the sesquiterpene alcohols pure santalol, Ci^eO, has been obtained from essence of sandal-wood by conversion into the acid phthalic esters and saponification of these by potash (Schimmel &Co., Bulletin, April 1899, p 41). A mixture of two alcohols is thus ob- tained, one boiling at 165-167° C. (13 mm.) and the other at 173° C. They are distinguished by their different optical activities, one being practically inactive, the other strongly laevo-rotatory (see also M. Guerbet, Comptes rendus, 1900, 130, p. 417; Bull. Soc. Chim., 1900 (3), 23, p. 540). Caryophyllene alcohol is obtained from oil of cloves; by elimination of water it yields clovene, G5H24, a liquid which boils at 261-263° C.

Many di- and tri-terpenes have been described, but as yet are not thoroughly characterized.

References. — Gildemeister and Hoffman, The Volatile Oils (Mil- waukee, 1900); R. Meldola, The Chemical Synthesis of Vital Pro- ducts (London, 1904) ; F. W. Semmler, Die aetherischen Oele (Leipzig, 1906); G. Cohn, Die Riechstoffe (Brunswick, 1904); J. M. Klimont, Die synthetischen und isolirten Aromatica (Leipzig, 1899); and F. Heusler, Die Terpene (Brunswick, 1896). For camphor see A. Lapworth, Brit. Assoc. Rep. for 1900, and O. Aschan, Die Kon- shtution des Kamphers (Brunswick, 1903). (F. G. P.*)

TERRACE (Fr. terrace, terrasse, from It. terraccia, terrazza, Lat. terra, earth), a raised platform of earth; in geology the term is used of level horizontal ridges on the side of a slope, formed by volcanic action, or more usually by the action of water; they are thus frequent along the shores of lakes or by rivers; on the sea-shore they are generally known as ” raised beaches. ” The term is used in architecture of an artificial platform in front of a building, which is utilized as a promenade; sometimes, when the building is erected on an elevation, there may be a series of terraces

rising one above the other, with flights of steps leading from one to the other, as in the Villa D'Este at Tivoli; or there may be a single terrace raised high above the ground and supported on arches, as the terrace to the Adelphi buildings in the Strand, or the river front at Somerset House, or in France at the castles at Amboise and St Germain-en-laye, or again a low terrace like that in front of tb? Houses of Parliament at Westminster overlooking the Thames, which is 670 ft. long and 35 ft. wide. The terraces of the gardens at Isola Bella on the Lago Maggiore are known as hanging gardens (Hortus pensilis), and were similar to those which were built by the Assyrian king at Babylon. Though properly applied to a row of buildings on a raised level, the word is often used of any row of houses.

TERRACINA (Lat. Tarracina, Volsc. Anxur), a town and episcopal see of the province of Rome, Italy, 76 m, S.E. of Rome by rail (56 by the Via Appia), 40 ft. above sea-level. Pop. (1901) 7597 (town), 10,995 (commune). Its position, at the point where the Volscian Hills reach the coast, leaving no space for passage between them and the sea, commanding the Pomptine Marshes (urbs prona in paludes, as Livy calls it) and possessing a small harbour, was one of great strategic importance; and it thus appears very early in Roman history. It appears in 509 b. c. as under Roman supremacy, but is not included in the list of the Latin league of 499 B.C. In 406 it was stormed by the Romans, lost in 402, recovered in 400, unsuccessfully attacked by the Volscians in 397, and finally secured by the establishment of a colony of Roman citizens in 329 B.C. As such it frequently appears in history. The construction of the Via Appia in 312 B.C. added to its importance: the road at first crossed the hill at the back of the promontory by a steep ascent and descent. An attempt was made in 184 B.C. to get round it by an embank- ment thrown out into the sea: but it was probably not until early in the imperial period that a cutting in the rocks at the foot of the promontory (Pisco Montano) finally solved the problem. The depth of the cutting is indicated by marks on the

vertical wall at intervals of 10 Roman ft.— figures enclosed in large swallow-tail tablets — the lowest mark, 3 or 4 ft. above the present road, is CXX. Not far off are mineral springs by the coast (Nepluniae aquae), known to the Romans and still in use — except one containing arsenic which was blocked up both by the ancients and again in 1839 as a precaution. The two roads met some few miles E. of Tarracina, and the Via Appia then traversed the pass of Lautulae, between the mountains and the Lake of Fondi, where the Samnites defeated the Romans with loss in 315 B.C. This pass, the frontier be- tween the Papal States and the kingdom of Naples, was also fortified in modern days. It was probably in consequence of the cutting just mentioned that some of the more important buildings of the imperial period were erected in the low ground by the shore, and near the small harbour. The construction of the coast road, the Via Severiana, from Ostia to Tarracina, added to the importance of the place; and the beauty of the promontory with its luxuriant flora and attractive view had made it frequented by the Romans as early as 200 B.C. Galba and Domitian possessed country houses here. It appears -in the history of the Gothic wars, and Theodoric is said to have had a palace here. It was sacked in 409 and 595. In 872 John VIII. brought it under the domination of the Holy See.

The picturesque modern town occupies the site of the old; the present piazza is the ancient Forum, and its pavement of slabs of travertine with the inscription " A. Aemilius A. F.," in letters once filled in with bronze, is well preserved. It is

supported by massive arched substructures, which extend under the surrounding houses. The cathedral of SS. Pietro e Cesareo, fronting upon it, is ensconced in a temple of Rome and Augustus, part of the side wall of which, with engaged columns, is still visible. The vestibule, in the Cosmatesque style, is supported by ten ancient columns resting upon recumbent lions, with a mosaic frieze upon them. The brick campanile has small columns with little pointed arches. The interior has a fine

Cosmatesque pulpit supported by ancient columns resting on lions, a Paschal candlestick of 1245, and a good pavement of the same period with beasts and dragons. The sacristy contains a carved wooden nuptial chest of the 10th or nth century. There are also remains of the town wall in the ” polygonal ” style, and above the town are several massive platforms for supporting buildings, in a more archaistic form of this style; these may well belong to the Roman period, and the latter even to the empire. The summit of the promontory (748 ft.) is reached by the old line of the Via Appia, which is flanked by tombs and by remains of an ancient defensive wall with circular towers (currently attributed to Theodoric, but probably a good deal earlier in date). The summit is occupied by a massive terrace, supported by arcades of fine opus incertum (traditionally, but wrongly, called the palace of Theodoric) on all sides except the E., and commanding a magnificent view seaward over the coast and over the Pomptine Marshes. On the terrace, as was ascertained in 1894, stood a Corinthian temple of the early imperial period, no by 65 ft.; the cella was decorated in- ternally with engaged half-columns, and contained the pedestal for the statue of the deity, according to some authorities Venus, but more probably Jupiter Anxur worshipped as a child — a theory confirmed by the discovery of many curious leaden toys, like those made for dolls’ houses at the present day, in the favissae on the E. of the temple. Of the lower town by the harbour, which had buildings of some importance of the imperial period (amphitheatre, baths, &c), little is now visible, and its site is mainly occupied by a new quarter built by Pope Pius VI., who restored the Via Appia through the Pomptine Marshes. Close by it in the S.W. is a group of huts inhabited in winter by labourers from the Abruzzi, as is the case in many other parts of the Campagna. Of the ancient harbour constructed by Antoninus Pius (M. R. de la Blanchere in Melanges de Vtcole francaise de Rome, i. 322; 1881) insignificant remains exist, and it is largely silted up. Close to it is the small modern port. Near the amphitheatre was found in 1838 the

famous statue of Sophocles now in the Lateran museum. The commune of Terracina includes a considerable extension of territory towards the N.W. with much undergrowth (macchia) valuable for charcoal burning, and a considerable extent of pasture and arable land. The ancient aqueduct, bringing water some 35 m. from the slopes of the Volscian Hills, has been repaired and is in use. Three miles to the N.W., at the foot of the Monte Leano, was the shrine of the nymph Feronia, where the canal following the Via Appia through the marshes ended. Along these 3m. of the Via Appia are numerous ancient tombs, and the fertile valley to the N.E. was thickly populated in Roman days. See M. R. de la Blanchere, Terracine (Paris, 1884). (T. As.)

TERRACOTTA. Greek. — The use of clay amongst the Greeks was very varied and extensive, but we are here only concerned with one aspect of it, that in which the clay was baked without any glaze, whether employed for utilitarian or ornamental purposes. The Greek term for this is 777 orrri, ” baked earth “; the word 7rr)X6s when applied to worked clay signifies ” sun-dried ” only. Among the manifold purposes to which terracotta was put by the Greeks may be mentioned parts of public and private buildings, such as bricks, roof tiles, drain and flue tiles, and architectural ornaments; tombs and coffins; statues and statuettes, for votive or sepulchral purposes or for the decoration of houses; imitations of metal vases and jewelry; and such everyday objects as spindle whorls, theatre tickets, lamps, braziers and domestic utensils. It also supplied the potter with moulds and the sculptor with models of works of art, especially in bronze.

&54

TERRACOTTA

Use in Architecture. — In architecture terracotta was ex- tensively employed for roof tiles and other decorative details, as has been shown by many recent discoveries, especially at Olympia. In the Heraion

we have the oldest example of a terracotta roof. A 6th-century temple at Thermonin Acarnania is also constructed of wood and terracotta, with painted terra- cotta slabs in wooden frames for metopes. The generic term for a roof tile was Kepafws, and these are classified as flat square tiles (oreya}pes or ffu\rjves) and semi-cylindrical covering tiles (KakoTTrjpes) . Other varieties of ornamental tiles used in buildings are (i) the covering slabs along the raking-cornice (ytloov) of the pediment; (2) the Kvpariov or cornice above the yelaov; (3) the cornice along the sides with lions' head spouts to carry off rain-water; (4) the axpojrqpia or antefixal ornaments surmounting the side-tiles. These latter varieties were usually enriched with decoration in colour, the Kv/xanov being painted with elaborate patterns of lotos- and-honeysuckle or Greek key-pattern, in red, blue, brown and yellow, curvilinear patterns being restricted to curved, recti- linear to flat surfaces. The antefixal ornaments were usually modelled in the form of an anthemion or palmette, but were sometimes adorned with reliefs or sculptured groups, as in the case of the temple of Zeus at Olympia, which has figures of Victory along the cornice. The British Museum has an interest- ing series of 6th-century date from Capua, with gorgons' heads, female busts, and other subjects in relief, and others come from an early 5th-century temple at Civita Lavinia. Many coloured roof tiles have been found at Olympia.

In Sicily and southern Italy a fashion prevailed of nailing slabs of terracotta over the surface of the stonework (a legacy from the epoch of wooden buildings which required protection from the weather). These were ornamented with lotos-and-honeysuckle and other patterns, sometimes in relief but always richly coloured. They occur at Olympia in the Treasury of Gela, by a Sicilian architect, and also in a temple at Selinus. The best example of this practice is the temple at Civita Lavinia already cited, the remains of which belong partly to the 6th, partly to the 4th century B.C.

Sculpture. — The subject of Greek sculpture in

terracotta is a large one, and only its brief outlines can be given here. Of large or life-size statues comparatively few examples are known, and they can only be said to be common in Cyprus, where marble was difficult to procure; they are also more frequent in Italy, as will be seen later. But the use of clay for the reproduction of the human figure was one of the earliest in- stincts of the race, and may be traced back as far as archaeo- logical records exist, to the days of the Minoan and Aegean supremacies. Terracotta figures of a very primitive character have been found in Crete, in Melos and at Olympia, and one series of figures from Petsofa in Crete is remarkable for the very modern fashions of head-dress and costumes. Terracotta figures of more advanced style have also been found in Rhodes and other places dating from the Mycenaean period.

Greek traditions on the subject go back to one Butades of Sikyon, a potter who was credited with the invention of model- ling clay in relief; and the Samian sculptors Theodorus and Rhoikos, who lived about the end of the 7th century B.C., were said to have been the first to use clay models for statues. As they were supposed to have introduced hollow casting in bronze, it was obviously for this purpose that they employed clay. But this material was later superseded by wax, and for marble statues was not used until Roman times.

The small terracotta figures used as ornaments or household gods, buried in tombs or dedicated in temples, trace their pedigree from the prehistoric examples already mentioned. They have been found in large numbers on nearly all the well- known sites of antiquity, the most fruitful being Tanagra in Boeotia, Myrina in Asia Minor, Rhodes, the Cyrenaica, Athens, Sicily, and some of the towns of southern Italy. They are also found in Cyprus and Sardinia, where, as to some extent in Rhodes, they follow a peculiar development, under the domina- tion of Phoenician influence, and many of the earlier types

have a markedly oriental character. But in the Greek

terra- cottas we may trace a steady development from the primitive types which correspond to the £6

Manufacture.— -The processes employed in the manufacture of terracottas are five in number: (1) the preparation of the clay; (2) moulding; (3) retouching; (4) baking; and (5) colouring and gilding. The last named, though not essential, was almost universal in some form or another. 1

The clay used for the statuettes varies greatly in different localities, and this is an important criterion for distinguishing the different sites of manufacture. It ranges in colour from a deep red (as in the brick-like terracottas of Naukratis) to a pale buff or drab a* in Cyprus, and the fired product is generally softer than that 01 the painted vases. It was prepared by washing the local clay free from all granular substances and then kneading it with the aid of water. The modelling was done by hand in the case of the earlier figures, and small objects such as toys and dolls, which are solid; the clay was worked up into a mass with the fingers, the marks of which may often be seen. Subsequently the use of moulds became universal, the final touches being given to the figure either with the fingers or with a graving tool. The finer statuettes, such as those of Tanagra, are invariably moulded, and the better examples show traces of very careful retouching. The advantage of moulding was that the ” walls ” of the figure could be reduced to a very regular thickness, obviating the danger of shrinkage in the baking; it also rendered them very light, and permitted great accuracy in detail. A model (irpdrvros) was first made in terracotta with modelling tools, from which the mould (tvttos) was taken, also in terracotta and usually in two pieces, which were then baked to a considerable hardness. From this mould the figure was made by smearing it with layers of clay until a sufficient thickness was reached, leaving the figure hollow. The back was made separately, either from a mould or by hand, and then fitted carefully to the front, the seam or join being run up with soft clay. The base was usually left open, and a vent hole was left in the back,

which aided the clay to dry and to be re-fired without cracking, and was also used sometimes for suspending the figure when finished. The heads and arms were usually moulded separately, and attached or luted to the body with soft clay. Greek moulds for statuettes are somewhat rare, but there are examples known from Kertch, Smyrna, Girgenti and Tarentum; the British Museum has a series from the last- named site (PI. I. fig. 3). Most of these are for small figures only.

The shrinkage of the clay as it dried permitted the figure to be drawn easily from the mould, and the reproduction was then ready for retouching. It is obvious, from a glance at any collection of terracottas, that there is a great similarity between the various examples of any one type, and that many are virtually, if not actually, replicas of one another. This of course was due to the fact that only a limited number of moulds were used, corresponding to the various types. The minute differences between them, which constitute the charming variety found amongst these figures, and prevent monotony even where the type is constant, were obtained by the process of retouching, as well as by varying the pose of the head or limbs, or by differences of attributes and colourings. Actual retouching by a skilled modeller is seldom found except in the finer examples.

The process of baking required great care and attention, for if no allowance were made for the evaporation of moisture, or if too great a degree of temperature were reached, the result was disastrous. The clay was ensured against drying too rapidly by pre- liminary exposure to air and 'sunshine, while the temperature em- ployed in firing was low even lower than that used for painted vases.

The colouring of the baked statuettes was fairly universal, the chief exceptions being some of the more archaic examples, and many of the Roman period. The surface on which the colours was laid was formed by a white slip or engobe of a creamy colour and consistency, with which the whole front of the

figure was coated. This when dry became very flaky and has often fallen off, carrying the colours with it, though most statuettes retain at least traces of this treatment with slip. It is very unlikely that this slip-coating was fired at all. On the white slip-facing opaque

1 Clever forgeries of Greek terracotta figures are now being pro- duced both in France and Italy. Admitted copies are also made in Berlin and Vienna, but these are generally so inferior in artistic merit as not to deceive any one who knows the genuine article.

TERRACOTTA

Plate I.

ETRUSCAN SARCOPHAGUS, 2nd century B.C.

Fig. 2.— ARCHAIC RELIEF FROM RHODES,

about 480 B.C.

XXVL«S4.

Fig. 3.— MOULD FOR TERRACOTTA FIGURE, FROM TARENTUM.

Plate II.

TERRACOTTA

Fig. 4.— GREEK TERRACOTTA STATUETTES. -3,. from Tanagra (3rd century B.C.), 4-7, from Rhodes and Sicily (Archaic period).

-VASE WITH TERRACOTTA FIGURES FROM SOUTHERN ITALY, 2nd century B.C.

Fig. 6.— ROMAN BAS-RELIEF FOR MURAL DECORATION.

TERRACOTTA

colours were painted in tempera colours. The. colouring was usually conventional, and only aimed

at imparting a pleasing appearance to the figure. It was necessarily applied after the firing, as many of the pigments used would have been altered or destroyed at the firing temperature of the body. The tints were body-colours, applied without shading, and red, blue, yellow and black are those most commonly employed, the white slip serving for the nude parts and generally also for the ground-work. Blue and red were especi- ally favoured for drapery, as in many of the Tanagra figures; the red ranging from scarlet to pink or rose purple. Black was only used for the eyes or details of features; yellow (varying to deep brown) for the hair, and also for jewelry. Gilding is rare but was frequently employed in later times for terracotta imitations of jewelry. In the primitive terracottas and those of Cyprus or other centres which adhered to primitive methods, the decoration is in stripes of matt black and red paint applied in a conventional manner to human figures and animals alike. True glazes or enamels are occasionally found, as for instance in the later terracottas of Sicily, where they are employed both for drapery and for flesh colours.

Greek terracotta statuettes have been discovered in tombs, on the sites of sanctuaries, and in private houses. The tomb-finds are scattered all over the Mediterranean littoral, and the chief sites have already been noted; among the sanctuaries we may cite Olympia, the Acropolis at Athens, the temenos of Demeter at Knidos, the temples at Naukratis in the Egyptian Delta, many sites in Cyprus, and temples at Selinus in Sicily and Tarentum. The purposes for which these statuettes were used, (a) lor religious rites, (i) in daily life, (c) in funeral ceremonies, have been the subject of much debate. Since the same types and subjects are common to each of these classes of discoveries it is obvious that the terracottas cannot have been intended for one purpose alone even if their primary significance was religious. Numerous theories have been advanced on this subject, some authorities having main- tained that their meaning was exclusively religious or mythological, that they

originally corresponded to the Egyptian ushabti, and that these religious types were afterwards adopted for ordinary human figures symbolizing the life of the deceased beyond the tomb. The gradual change in popular taste from figures of deities to figures of a genre type is unquestionably a feature of the develop- ment of this branch of art, but that the development was affected by religious ideas is more open to doubt. It is more probable that it followed the lines of artistic evolution, and that the continued use of terracottas as votive or funeral offerings became more or less a convention. In fact, the identity of the types, under what- ever circumstances they are found, seems to indicate that the significance was given to them by the purchaser, who would decide for himself whether he offered them to some appropriate deity, deposited them in the tomb of some relative, or kept them for use and decoration in his own house.

Subjects and Types. — The earliest beginnings of the statuettes proper show, as might be expected in primitive Greek art, a very limited range of subjects. As in other materials, so also in clay, the female deity reigns supreme. The primitive Hellenic type of goddess adopts two forms, both derived from an original in wood, the board-form owis, and the column form kIuv or %ba.vov, both of which we find also in sculpture. The limbs are wanting, or are at best rudimentary, the figure terminating below in a spreading base. Both types are found in Rhodes, but on the mainland of Greece the columnar type died out after the Mycenaean period, and only the board-type remained, this being specially popular in Boeotia, where both standing and sitting figures occur, painted in the same style as the local vases. This type was adhered to for the bodies of figures even when the head was modelled in a more advanced style of art. The column-type is also well exemplified in Cyprus. The standing and seated goddesses are the two principal types in archaic Greek art (PI. II. fig. 4) , and are widely distributed and of universal popularity; though the conception of the goddess may vary with the

locality, the types are almost identical, and the attributes are but slightly varied. A certain proportion of these deities are differentiated as nature-goddesses, either as a nude goddess in a shrine or a seated figure with a child in her lap who may be described as the Earth-Mother. Both types are of oriental origin. Another common archaic type is the funeral mask or bust, hollow at the back, which is found both in central Greece and Rhodes. Being almost always feminine it seems probable that these are not images of the deceased, but the Chthonian goddesses Demeter and Persephone, playing in the tombs the role of pro- tectress against evil influences. We may also mention here the little figures of animals, women and children variously occupied, and jointed dolls (vevpfoircuTTa) which can only have served the purpose of children's toys. In Athens, Melos and Rhodes, many of these have been found in children's graves. The evidence of finds and other indications seems to show that these archaic types were not affected by the rapid development of Greek art in the 5th century, but continued in vogue until the end of that period. Certainly there are very few terracottas of developed style which can be assigned to an earlier period than the 4th century, and many figures of archaic type can be shown from the contents of the tombs in which they are found not to be earlier than the

5th century B.C. The reason for this is probably hieratic._ Owing to their religious associations old conventional types continued in use, whereas painted vases and the majority of sculptures of a higher class were not affected by such considerations. Therefore we are not surprised When we come to the later terracottas of the fine period, or 4th century, to find the standing and seated feminine types still prominent. But the change in style is also accompanied by a change in conception, and in place of the goddess we now have the Greek lady — in place of the mythological the genre. The transformation was quite a simple one, and it needed little change to convert a nursing goddess into a

mother with her little one, or a Persephone holding a flower into a girl of Tanagra. The change in fact was artistic rather than religious; an evolution rather than a revolution. The figures were still placed in tombs and shrines, though the old associations were less strongly felt.

In order to know what were the characteristics of the best Greek work in terracotta we must turn our attention to its most typical pro- ducts, the Tanagra statuettes (PI. II. fig. 4). Here we haveanalmost unlimited variety of feminine figures illustrating the daily life of Greek women. In most cases the arms are more or less concealed by the mantle which is drawn closely across the figure, even covering the hands; but many hold a fan, a mirror, a wreath, or a theatrical mask in one hand, while with the other they gather together the folds of their draperies. The long tunic or chiton and the mantle or himation, which all without exception wear, formed the typical dress of the Greek matron and girl ; and to this was added for out- door wear a large shady hat. The seated types follow on the same lines, but are not so common. These figures range in date from about 350 to 200 B.C., and their inspiration is probably drawn rather from the painting than the sculpture of the period. The terracottas of Eretria in Euboea and of Myrina in Asia Minor stand next in artistic merit, but are of more markedly Hellenistic character; they are freer from ancient tradition, but tend to de- generate into exaggeration of pose and conception. Here the types of divinities so conspicuously absent at Tanagra reappear; in par- ticular Eros or Cupid, the one deity who universally caught the popular taste in the Hellenistic age, and in the many representa- tions of whom we see the prototypes of the Pompeian Amoretti; Aphrodite, Dionysos and Victory are also popular themes. At , some times the Tanagra types are repeated here, as, with varying artistic success, in other parts of the Mediterranean littoral.

Though no other Greek site has produced terracottas of such artistic merit as the two just discussed,

there are others where the art enjoyed great popularity, either for a comparatively brief period or through the whole history of Greek art. Some of these centres of manufacture have already received mention or at least allusion, but we may briefly call attention- to a few others. From Sicily we possess a complete series, from archaic to later times, the earlier being best represented at Selinus, where a great variety of richly coloured figures have been found; there are also many fine heads of 5th century style, and later figures of Aphrodite, Eros and other deities imitating the later types of Hellenistic art. At Naukratis in the Egyptian Delta the later terracottas are strongly influenced by Egyptian ideas, and figures like Bes and Horus are found in conjunction with orientalized Aphrodite-types. In the Cyrenaica on the north coast of Africa the influence of Tanagra is apparent, but the style is for the most part degenerate. The terracottas of Tarentum stand apart from those of other sites, being markedly funereal in character; many represent Dionysos reclining at a banquet. Elsewhere in Southern Italy the types correspond to those of Sicily and other Mediterranean sites.

Terracotta work in relief, apart from definitely architectural examples, is almost limited to two small classes, both belonging to the beginning of the 5th century. These groups, known respectively as " Melian " and " Locrian ' reliefs, consist of small plaques, possibly intended to be inserted in the walls of temples or shrines. The subjects of the Locrian reliefs, which mostly relate to the myth and cult of Persephone, seem to indicate that they at least were of a votive character. They occur at Locri in Southern Italy, and similar examples dedicated to Athena have been found on the Acropolis at Athens. The Melian reliefs exhibit a wider scope of subjects, mainly mythological; the work is exceedingly delicate and refined in character. Some are simple plaques; others have the figures cut out without background, or only the outer con- tours. They have been found on various Greek sites, the majority in Melos (PI. I. fig. 2).

There is a class of vases which comes rather under the heading of terracotta than of pottery, from its technical character and general appearance. These are found at Canosa, Calvi, Cumae and elsewhere inSouthern Italy, and belong to the Hellenistic period (PI. II. fig. 5). They combine in a marked degree the characteristics of the vase and the statuette, some being vases with moulded reliefs or small figures in the round attached; others actual figures or colossal heads modelled in vase form, with the addition of mouth, handle and base. They are often of gigantic size, and do not appear to have served any practical purpose; probably they were made specially for the tomb. They are covered with a white slip like the statuettes, and are often richly coloured. Some even have subjects painted in some permanent process like encaustic. The

form usually adopted is that of a spherical vase with a flat handle on the top and three tall mouths.

Etruscan Terracotta Work. — Some features of terracotta work are peculiar to the people of Etruria, who employed this material both for finer works of art and for more utilitarian purposes. Several ancient writers speak of their preference for clay and their skill in its use. Pliny attributes its introduction to Corinthian refugees in the 7th century, and states that the art of modelling in clay was brought to perfection in Italy, and especially in Etruria. Cer- tainly for their statues the Etruscans appear to have preferred clay to other materials (except perhaps bronze), and also for use in architecture. The Romans employed Etruscan artists to decorate their temples, and the statue of Jupiter on the Capitol was made by Volca of Veii about 500 B.C., in clay painted vermilion, as was also the chariot on the pediment of the temple. For the decora- tion of temples terracotta remained in use even down to Roman times; these buildings being usually of wood covered with slabs

of terracotta, like the early Greek buildings discussed in the pre- ceding section. Remains of temples with terracotta decoration of this kind have been found at Cervetri (Caere), at Alatri, and at Civita Castellana (Falerii), as well as at Civita Lavinia (v. supra). Other remains of terracotta decorations come from Conca (Satricum), Orvieto, Pitigliano and Luni, where the pediment of the temple has the figures of Olympian deities, muses and the slaughter of Niobids, all executed in terracotta on a large scale. The date of these sculptures is about 200 B.C. At Alatri and Falerii the decora- tion consists of a complete system of terracotta plating pver the woodwork of the roofs and architraves, ornamented with patterns in relief or painted and surmounted with carved antefixal ornaments. Some of the antefixae from Cervetri are very effective examples of sculpture and exhibit in a marked degree the influence of Ionic Greek art, due to the Hellenic elements with which the civilization of Caere and the Campanian cities was permeated.

The form of monument which best exhibits the Etruscan fond- ness for terracotta as a material for sculpture is the sarcophagus, of which some remarkable archaic examples exist, and a considerable number of later date. Among the former the most conspicuous example is the well-known Castellani sarcophagus in the British Museum, dating from the end of the 6th century B.C. The sides are decorated with friezes of figures in relief, and on the cover is a group of a man and a woman reclining, executed in the round life-size. These figures are undoubtedly genuine native work, and in the obvious inability of the sculptor to achieve success in work- ing in the round they contrast strongly with the reliefs, which are truly Hellenic in style if not in subject. There are similar examples in the Louvre, and in the Museo Papa Giulio at Rome.

The later sarcophagi which belong to the 3rd century B.C. follow on the same lines. They invariably consist of a rectangular body or coffer with sculptured reliefs on the front and sides, and a

flat cover on which reclines a figure representing the deceased person. They were used for holding the ashes of the dead. Usually they are of small size, measuring not more than 18 by 12 by 12 in., but some are large enough for a body to lie in at full length. The reliefs freely modelled in the style of later Etruscan art are often of a funerary character, representing the last farewell to the dead in the presence of Charon and other deathrdeities; others have mythological subjects, such as the combat of Eteokles and Poly- neikes; the slaying of the dragon by Kadmos; or the parting of Admetos and Alkestis. They are usually painted in tempera on a white ground, the bright colouring having a very vivid effect.

By far the finest examples of this class are one from Cervetri, now in the British Museum, and another very similar in the Archaeo- logical Museum at Florence, with which were found coins of about 150 B.C. The former (PI. I. fig. 1) is shown by its inscription to be the tomb of one Seianti Thanunia, whose life-size effigy adorns its cover; a most realistic example of Etruscan portrait-sculpture in perfect preservation, richly coloured, and adorned with jewelry. The dimensions of this sarcophagus are 6 ft. by 2 ft. by I ft. 4 in.; it has no reliefs on the front but a simple pattern of pilasters and quatrefoils. Owing to its great size the figure of the lady was shaped in two halves, the joint being below the hips. The Florence sarco- phagus represents a lady of the name of Larthia Seianti.

Roman Terracotta Work. — The uses of clay among the Romans were much the same as amongst the Greeks and Etruscans, in architecture and sculpture, as well as for other purposes; the main differences were that in some cases its use was more extensive in Rome, in others less; and generally that the products of Roman workshops are inferior to those of earlier times. But the technical processes are in the main those previously employed. The Romans divided the manufacture of objects in clay into two classes: opus ftgulinum for fine ware made from argilla or creta figularis and opus doliare for tiles and

common earthenware. Of their use of tiles and bricks in architecture this is not the place to speak, except for the ornamental architectural details which come strictly under the heading of terracotta.

Ornamental tiles followed much on the lines of those used in Greece, whether roof-tiles or antefixal ornaments, though the latter are both simpler and inferior in design. Terracotta was largely used at Pompeii for this purpose, and also for gutters and well

mouths. A characteristic feature of Pompeian houses is the trough- like gutter which formed an ornamental cornice to the compluvium or open skylight of the atrium and peristyle ; these were adorned with spouts in the form of masks or animals' heads, through which the rain-water fell from the gutters into the impluvium. Some good examples of roof-tiles and antefixal ornaments have also been found at Ostia.

Terracotta mural decoration was also largely employed by the Romans for the interior and exterior of their buildings; in the form of slabs Ornamented with reliefs hung on the Walls or round the cornices. Cicero speaks of fixing the bas-reliefs (typos) " on the cornice of his little atrium." These slabs usually measure about 18 by 9 to 12 in., and have nearly all been found in Rome, though isolated examples occur in other places. There is a series of 160 in the British Museum (PI. II. fig. 6), whole or fragmentary — nearly all of which were collected at Rome by Charles Towneley— and there is another large collection in the Louvre. Others from the Baths of Caracalla are in various museums at Rome.

These reliefs were pressed in moulds, as is shown by the frequent repetition of certain subjects with at most pnly slight differences; moreover the relief is low, with sharp and definite outlines such as a mould would produce. They were sometimes retouched before baking, hence the variations. Reliefs entirely modelled are much rarer, but some examples

exist, of considerable artistic feeling and freedom. Circular holes are left in the slabs for the plugs by which they were attached in their places. The clay varies in quality and appearance, and in tone ranges from a pale buff to a dark reddish-brown. Traces of colouring are sometimes found; backgrounds of a light blue, and figures or more commonly details such as hair being painted red, yellow, purple or white. These colours are painted in tempera, and their use is purely conventional. The slabs are usually ornamental, with cornices of egg-pattern and palmettes, or with an edging of open-work.

The figures are mostly in low relief, grouped with large, flat surfaces between in the manner of contemporary Roman art ; in some cases the whole groundwork is composed of patterns of scroll- work or foliage, more or less conventionalized. The compositions consist either of narrow friezes with rows of Cupids or masks, or groups of two or three figures resembling temple-metopes. The style is in general bold and vigorous, and being essentially archi- tectural it is not devoid of dignity and beauty. The known examples fall into two groups according to their treatment : (a) The naturalistic style, corresponding to the so-called " Hellenistic " reliefs of Augustan art; (b) the conventional, not to say archaistic, corresponding to the classicist tendencies of another school of Augustan artists represented by the " New Attic " reliefs. Both groups find close parallels in the metal-work and pottery of this period, to which date they may therefore be assigned.

The subjects cover a very wide field. Many are no doubt in- spired by well-known works of art; others are closely related to the " New Attic " types, including dancing and frenzied maenads or the seasons. Others again, reflecting the spirit of the time, reproduce Egyptian landscapes. Scenes from the circus or arena, or quasi-historical subjects, such as triumphs over barbarians, again illustrate favourite themes of Roman Imperial art. Of mythological subjects, the most popular are

Dionysiac scenes, Satyrs gathering and pressing grapes, and Victory slaying a bull; while heroic legends are also represented. Of a more conventional type are figures of Cupids carrying wreaths, priestesses sacrificing, or single figures surrounded by elaborate scrolls.

Roman Sculpture in Terracotta. — Frequent allusions in classical writers indicate that the ancient statues of the Romans were mostly of terracotta, and Pliny notes that even in his day statuettes of clay were still preferred for temples. There are also references to signa fictilia placed on pediments of buildings such as the Capi- toline temple. As noted in the previous section, during the greater part of the Republic, Rome was indebted for these to Etruscan artists, but the style of the figures was probably more Greek than Etruscan. In 493 B.C. Gorgasus and Damophilus of Himera in Sicily ornamented with terracotta reliefs and figures the temple of Ceres (now Santa Maria in Cosmedin). Towards the end of the Republic modellers in clay are mentioned, such as Possis, who imitated grapes and other fruit, and the sculptor Arcesilaus. But their work in this material appears to have been confined to models for sculpture or metal work, and the invasion of the masterpieces of Greek art and the general adoption of marble by sculptors led to the neglect of terracotta as a medium of the glyptic arts. Few statues of any size in this material now exist, but there is an interest- ing series in the British Museum, found in a well near Porta Latina at Rome in 1767, restored by Nollekens, and acquired by Charles Towneley. Some terracotta figures of considerable size were found at Pompeii, having formed the cult-statues of a temple; others were employed for adorning gardens, like the series from Rome just mentioned. Terracotta figures were also employed as archi- tectural members of the caryatid type. All these belong to the Augustan and succeeding period, or at least are not later than the reign of Nero.

Terracotta statuettes similar in style to those of Greece are also found in houses and tombs of the

Roman period or as votive

offerings on sacred sites. They were known to the Romans as Sigilla, and were used as presents, or placed in the lararia or domestic shrines. Some 200 were found in the poorer quarters of Pompeii, implying that they took the place of the marble and bronze figures which the wealthier inhabitants alone could afford. At the festival of Sigillaria, part of the December Saturnalia, terracotta figures and masks were in great demand. Originally these were votive offerings to Saturn, but later the custom degenerated into that of giving them as presents to friends or children, a practice indulged in by the Emperors Hadrian and Caracalla.

The makers of these figures were known as sigillarii or figuli sigillatores, and they lived in the Via Sigillaria. Their social position appears to have been very low; but it must be remem- bered that they were chiefly patronized by the poorer classes; pro- bably many of them were slaves. The technical processes which they employed were practically those of the Greek craftsmen. Large figures were made from models (proplasmata) and built up on a wooden frame- work known as crux or stipes; but the smaller ones were made from moulds. The range of subjects is much the same as in the later Greek terracottas. At Pompeii genre figures predominate, such as gladiators, athletes and slaves, and in general there is a preference for portraits and grotesques. On the whole these late works have little artistic merit. Votive figures have been found at Praeneste on the site of the temple of Fortune, and also at Nemi and Gabii.

This industry also extended from Rome to the provinces, and terracotta statuettes of local make have been found even jn Britain, as at Richborough, Colchester and London. In Gaul in particular, and in the Rhine district, there wer? very extensive

manufactures of terracottas after the conquest of Julius Caesar in 58 B.C. They were made by local craftsmen for the Roman colonists, who intro- duced their own types of design. The principal centre of manu- facture was the district of the Allier in Central France. Potteries have been found at Moulins, as well as in other parts of France, in Belgium and Alsace, and along the Rhine. The figures found in the Allier district are made of a peculiar white clay, the technique resembling that of Roman work, but the modelling is heavy and often barbaric. Numerous moulds have also come to light which show that the figures were made in two pieces; on the exterior of these moulds the potters' names have frequently been scratched (to indicate ownership). Names appear on the figures as well as on the moulds, and many of these are of Gaulish origin. The com- monest names are those of Pistillus of Autun, Rextugenus, a potter of north-west France, and Vindex of Cologne. The subjects in- clude divinities, genre figures, and animals ; among the former the pre-eminent type is that of a Nature-Goddess, characterized either as Venus Genetrix or as a Mother with a Child (koupotpo<^os) . Both in subject and in artistic character these statuettes appear to have been largely influenced by the Graeco-Egyptian art of Alexandria during the Hellenistic period. They appear to have been used for domestic and funerary purposes and as votive offerings.

After the downfall of the Roman Empire in the west, the artistic use of terracotta was abandoned for many centuries, though, here and there, both in Italy and in the districts that had been once Roman provinces, decorated terracotta work was carried on sporadi- cally both in parts of France and of Germany. The true renaissance of its use came during the 14th and 15th centuries, when it was adapted once more to architectural service in the Gothic buildings of northern Italy and of Germany. In Germany the mark of Brandenburg is especially rich in buildings enriched with modelled terracotta. The church of St Catherine in the town of Brandenburg is

decorated in the most lavish way with delicate tracery and elaborate string-courses and cornices enriched with foliage all modelled in clay; the town-hall of Brandenburg is another instance of the same use of terracotta. At Tangermiinde, the church of St Stephen and other buildings of the beginning of the 15th century are wonderful examples of this method of decoration; the north door of St Stephen's especially being a masterpiece of rich and effective moulding. In northern Italy this use of terracotta was carried to an equally high pitch of perfection. The western facade of the cathedral of Crema, the communal buildings of Piacenza, and S. Maria delle Grazie in Milan are all striking examples of the extreme splendour of effect that can be obtained by terracotta work. The Certosa near Pavia is a gorgeous specimen of the early work of the 16th century; the two cloisters are especially magnificent. Pavia itself is very rich in terracotta decoration, especially the ducal palace and the churches of S. Francesco and S. Maria del Carmine. Some delicate work exists among the medieval buildings of Rome, dating from the 14th and 16th centuries, as, for example, the rich cornices of the south aisle of S. Maria in Ara Coeli, c. 1300; the front of S. Cosimato in Trastevere, built c. 1490; and a once very magnificent house, near the Via di Tordinone, which dates from the 14th century.

With the revival of terracotta as an adjunct to medieval archi- tecture we find the sculptors of the Italian renaissance turning to this material, as a medium for the production of reliefs, busts, and even groups of many life-sized figures — again following the practice or classic times. Much of the Florentine terracotta

sculpture of the 15th century is among the most beautiful plastic work the world has ever seen, especially that by Jacopo della Quercia, Donatello, and the sculptors of the next generation. 1 For life, spirit, and realistic truth, combined with sculpturesque breadth, these pieces are masterpieces of invention and manipulation. The portrait busts are perfect models of iconic sculpture. In some

respects the use of burnt clay for sculpture has great advan- tages over that of marble; the soft clay is easily and rapidly moulded into form while the sculptor's thought is fresh in his mind, and thus works in terracotta often possess a spirit and vigour which can hardly be reproduced in laboriously finished marble. In the 1 6th century a more realistic style was introduced, and this was heightened by the custom of painting the figures in oil colours. Many very clever groups of this kind were produced by Ambrogio Foppa (Caradosso) for S. Satiro at Milan and by Guido Mazzoni and Begarelli (1479-1565) for churches in Modena. These terra-cotta sculptures are unpleasing in colour and far too pictorial in style; but those of Begarelli were enthusiastically admired by Michelangelo. The introduction of enamelled reliefs in terracotta which is so closely associated with the Florentine sculptor Luca della Robbia and his descendants, is specially treated in the article Della Robbia (q.v.).

From these two centres the development of architectural terra- cotta gradually spread over western Europe. The German school influenced the work done in the Low Countries and finally in England, where it also met the direct influence of the Italian school due to the invasion of England by Italian artists such as Torrigiano and others who were invited to England during the reigns of Henry VII. and Henry VIII. It is only in the eastern and southern counties of England that we find instances of the terracotta work of this period, and much of it is so un-English in style that most autho- rities consider it was not made in England at all but was imported from Holland or Flanders. Essex possesses the finest examples; such as those to be found in the Manor House at Layer Marney, and a richly-decorated terracotta tomb in the church at the same place, both dating from the reign of Henry VIII.

In the Collegiate Church at Wymondham in Norfolk there are very large and elaborate sedilia with canopied niches all of terra- cotta of the same period and apparently of the same manufacture. The

unsettlement which followed the Reformation in England and continued during the Stuart period seems to have put an end to this imported art, and it is only in modern times that we find a revival of architectural terracotta work in England.

France. — Another offshoot from the fertile plains of northern Italy was implanted in France during the 16th century. Many sculptors from northern and central Italy were attracted to France by Francis I. and his successors, and, among other arts, they intro- duced the making of artistic terracottas. The most famous name in the lists of these Italian artists is that of Girolamo della Robbia (see article Della Robbia), who executed, in 1529, the enamelled terracotta for the decoration of the " Petit Chateau de Madrid " in the Bois de Boulogne, Paris, for Francis I. 2 Many other Italian artists of lesser repute imported their arts into France, and the British Museum possesses an embossed tile bearing the head of St John the Baptist, encircled by a Gothic inscription, which was evidently made at Lyons during the 16th century. The very mould of this tile, together with other subjects of similar type, was excavated at Lyons and, while it is probable that the workmanship was Italian, the style of the modelling is entirely French in char- acter.

Spain. — At about the same period the Italian modellers or sculptors carried the art into Spain, and many extraordinary works are still extant in" various Spanish churches remarkable for their vivid realism and for a too pictorial style which degrades them from their true rank as architectural decoration.

During the 17th and 18th centuries the architectural use of terracotta again fell away owing to the increasing use of marble, but that the art still survived in other forms is shown by the por- trait busts of Dwight (17th century), though they were made in stoneware and not in unglazed terracotta ; and the charming little statuettes and groups made in Lorraine and the adjacent parts of France by Guibal, Cyffle and Lemire, sculptors employed at

some of the pottery factories of the period.

It should be mentioned that during the 1 8th century ordinary clay had fallen into disrepute, but the porcelain figures made at Meissen, Sevres and other continental factories show how persistent the vogue of figure-modelling in clay had become — though the clay was porcelain clay and not ordinary terracotta (see Ceramics).

Modern. — During the last fifty years there has been throughout Europe a great revival in the manufacture of terracotta, both glazed and unglazed. We have in England, for example, some very im- portant buildings, such as the Natural History Museum, the Albert

1 The Victoria and Albert Museum has a splendid and repre- sentative collection of these Italian terracottas.

2 This last and most extensive of the works in terracotta exe- cuted by the Robbia family was destroyed during the French Revolution in 1792, but exact drawings of it are still in existence showing al? the necessary details.

Hall, and the Royal College of Science, all in South Kensington, London, which illustrate to perfection the English terracotta work of the mid-Victorian period. The Rijks Museum at Amsterdam, and many important buildings in the north of Germany, in Belgium and in France, display the increasing use of baked clay for archi- tectural purposes.

The effort of all terracotta makers during recent times has been to produce a building material capable of resisting the acids and soot contained in the atmosphere of our great towns. Technically many of the leading manufacturers in England and the continental countries have been very successful in this effort, as they are able to produce building

materials of pleasant colour and texture which are practically acid-resisting. Critics of this modern development of terracotta as a building material frequently complain of the want of truth in the lines of cornices, door or window jambs, &c. For this default the manufacturer is not so much to blame as are those modern architects who design a building for stone construc- tion and then decide to have it executed in terracotta. The shrink- age of clay both in drying and firing is well known, and it is this shrinkage which causes large pieces of terracotta to twist or become crooked. When our modern architects shall have realized that the details of a building must be designed specially for the material that is to be used in its construction, terracotta will come into its own again as a decorative building material. The present method of constructing buildings in reinforced concrete, faced with glazed or unglazed terracotta, will afford the architects of the 20th century an unrivalled opportunity for the use of this material.

Collections. — The Louvre, British Museum, and the museums of Berlin and Athens have remarkably fine collections of the Greek and Roman terracottas, and many provincial museums, such as those of Florence, Perugia, Rome, Naples, Nimes and Aries, have also collections of importance. The best collections of Greek terra- cotta figures are in the British Museum, the Louvre and the museums of Berlin and Athens; but a large number of the finest Greek terracotta figures are in private collections. In the Victoria and Albert Museum there is a remarkable collection of fine Floren- tine terracottas of the best periods.

*Literature.— Leon Heuzey, ” Recherches sur les figurines de femmes voilees,” in Mon. assoc. des etudes grecques (Paris, 1874); id., ” Rech. sur un groupe de Praxitele, ... en terre cuite,” in Gaz. des B.-Arts (September 1875); id., “Rech. sur les terres cuites grecques,” in Mon. assoc. des Stud. grec. (1876); id., Les Origines des terres cuites (Paris, 1882); id., Catalogue des figurines antiques du Louvre (Paris, 1882-83) ! *^-> ” Papposilene et*

le dieu Bes," in Bull. Cor. Hell. (1884), pp. 161-167; Frohner, Les Terres cuites & Asie-Mineure (Paris, 1879-81); id., Cat. de la Coll. Lecuyer (Paris, 1883), and Cat. de la Coll. Barre (Paris, 1878); Kekule, Griechische Tonfiguren aus Tanagra (Berlin, 1878) ; id., Griechische Terracotten vom Berliner Museum (Berlin, 1878); id.. Die antiken Terracotlen von Pompeii (Stuttgart, 1880); Rayet, Monuments de fart antique (Paris, 1884), ii. 74-90; id., " Sur une plaque estampee," in Bull. Cor. Hell. (1879), pp. 329-333; id., Cat. de la Coll. Rayet (1880); id., "Les Figurines de Tanagra (Louvre)," in Gaz. des B.-Arts (1875); id., " L'Art grec au Trocadero," in Gaz. des B.-Arts (1878); Furtwaengler, La Coll. Sabouroff (Paris, 1882-85), splendidly illustrated in colours; Martha, Cat. des figurines du musee d Alhenes (1880); id., "Figurines corinthiennes en terre cuite," in Bull. Cor. Hell. (1879), pp. 29-42; id., " Figurines de Tanagra," ibid. (1880), pp. 71-75; Pottier, "Terres cuites Chypriotes," ibid. (1879), PP- 86-94; Pottier and Reinach, " Fouilles de Myrina," ibid., various articles in vols, for 1882-83; Paul Girard, " Necropoles de la Grece du Nord," ibid. (1879), pp. 211-221; Max. Collignon, "Plaque estampee de Santorin," ibid. (1881), pp. 436-438; Cesnola, Cyprus (London, 1877) ; Schlie- mann, Troy, Mycenae, and Tiryns; E. Curtius, Giebelgruppen aus Tanagra (Berlin, 1878); Delauney, "Terres cuites de Tanagra," in Revue de France (May and June 1878). An account of the first discovery of the Tanagra figures is given by Otto Luders in Bull. Inst. Cor. Arch. (1874), p. 120; see also various articles in Gaz. Archeol., Archdol. Zeitung, and Mon. Inst. Arch. Rom. (especially vol. vi.). For the earlier known terracottas, see Panofka, Terra- cotten des k. Museums zu Berlin (1842) ; Combe, Terracottas in the British Museum (London, 1810); and Gerhard, Monumenti figulini di Sicilia (Berlin, 1835) ; A. Baumeister, Denkmaler des klassischen Altertums, 3 vols. (Munich and Leipzig, 1884-89); E. T. Cook, Handbook to the Department of Greek and Roman Antiquities, British Museum (London, 1903); A. S. Murray, Handbook of Greek Archaeo- logy (London,

1892); S. Reinach, The Story of Art through the Ages, chaps, iv.x. (Eng. trans., 1904); H. R. Hall, The Oldest Civiliza tion of Greece (London, 1901); Annual of British School at Athens, vols, vii.-x. (1900-4) (for excavations in Crete). See also Quarterly Review (October 1904), p. 374; W. J. Anderson and P. Spiers, The Architecture of Greece and Rome (London, 1902) ; H. B. Walters, Ancient Pottery, 2 vols. (London, 1905); British Museum Catalogue of Terracottas (1903) ; C. A. Hutton, Greek Terracottas (Portfolio Monograph, No. 48) (London, 1889); H. B. Walters, The Art of the Greeks (London, 1906); G. E. Street, R.A., Brick and Marble Architecture in North Italy (London, 1855, second edition 1874).

(W. B.*; H. B. Wa.)

TERRAMARA (from Ital. terra mama, ” marl “), the name given by archaeologists l to a type of primitive culture mainly of the early bronze age, but stretching back into the later stone age. This civilization is represented by a number of mounds, formerly thought (e.g. by Venturi) to be sepulchral, but really the remains of human habitations, analogous to shell heaps (q.v.) or kitchen middens. They are found chiefly in north Italy, in the valley of the Po, round Modena, Mantua and Parma. A summary of early results as to these mounds was published by Munro (Lake Dwellings) in 1890, but scientific investigation really began only with the excavation of the terramara at Castellazzo di Fontanellato (province of Parma) in 1889. From this and succeeding investigations certain general conclusions have been reached. The terramara, in spite of local differences, is of typical form; it is a settlement, trapezoidal in form, built upon piles on dry land protected by an earthwork strengthened on the inside by buttresses, and en-circled by a wide moat supplied with running water. The east and west sides are parallel, and two roads, at right angles divide the settlement into four quarters. Outside are one or two cemeteries. Traces of burning which have been found render it probable that, when the refuse thrown down among the piles

had filled the space, the settlement was burned and a new one built upon the remains. The origin of the terramara type is not definitely ascertained. The most probable inference, however, is that these settlements were not built to avoid the danger of inundation, but represent a survival of the ordinary lake dwelling.

The remains discovered may be briefly summarized. Stone objects are few. Of bronze (the chief material) axes, daggers, swords, razors and knives are found, as also minor imple- ments, such as sickles, needles, pins, brooches, &c. There are also objects of bone and wood, besides pottery (both coarse and fine: see Ceramics), amber and glass-paste. Small clay figures, chiefly of animals (though human figures are found at Castellazzo), are interesting as being practically the earliest specimens of plastic art found in Italy.

The occupations of the terramara people as compared with their neolithic predecessors may be inferred with comparative certainty. They were still hunters, but had domesticated animals; they were fairly skilful metallurgists, casting bronze in moulds of stone and clay; they were also agriculturists, cultivating beans, the vine, wheat and flax. According to Prof. W. Ridgeway (Who were the Romans? p. 16; and Early Age of Greece, i. 496) burial was by inhumation: investigation, however, of the cemeteries shows that the bodies were burned and the ashes placed in ossuaries; practically no objects were found in the urns.

Great differences of opinion have arisen as to the origin and ethnographical relations of the terramara folk. Brizio in his Epoca Preistorica advances the theory that they were the original Ibero-Ligurians who at some early period took to erecting pile-dwellings. Why they should have done so is difficult to see. Some of the terremare are clearly not built with a view to avoiding inundation, inasmuch as they stand upon hills. The rampart and the moat are for defence against enemies, not against floods, and as Brizio brings in no new invading people till long

after the terramara period, it is difficult to see why the Ibero-Ligurians should have abandoned their unprotected hut-settlements and taken to elaborate fortifica- tion. There are other difficulties of a similar character. Hence Pigorini regards the terramara people as an Aryan lake-dwelling people who invaded the north of Italy in two waves from Central Europe (the Danube valley) in the end of the stone age and the beginning of the bronze age, bringing with them the building tradition which led them to erect pile dwellings on dry land. These people he calls the Italici, to whom he attri- butes also the culture known as Villanova (q.v.). This view

1 Since the International Congress of Prehistoric Archaeology at Bologna in 1871, when the shortened form terramara (plur. terre- mare) was adopted.

is regarded as falling in with discoveries (somewhat incomplete, it is true) in Hungary and Bosnia.

Authorities. — AH the evidence is collected by T. E. Peet, The Stone and Bronze Ages in Italy and Sicily (Oxford, 1909), xiv. and xviii., which gives illustrations and references to the more im- portant literature ; this work supersedes all previous works on the terremare. Prof. Pigorini's article, '' Le pill antiche civiltA dell' Italia," in Bulletlino di palelnologia itatiana, xxix., is classical. See aiso the works of Montelius, Modestov, and Ridgeway (Early Age of Greece, vol. i.). (J. M. M.)

TERRANOVA, a town of Sicily, on the S. coast, in the pro- vince of Caltanisetta, 74 m. by rail and 41 m. direct E.S.E. of Girgenti. Pop. (1001) 22,019. The poorly built modern town contains no buildings of interest or importance; it stands on a sand-hill near the sea, with a fertile plain (the ancient Campi Geloi) to the N. of it. It has some trade but no port, only an open roadstead. It almost certainly

occupies the site of the ancient Gela (q.v.). Outside it on the E. are scanty remains of a Doric temple (480-440 B.C.?) of which a single pillar only remains, which was still standing in the 18th century (height about 26^ ft., lower diameter sf ft.); here some painted decorative terracottas have been found (see Orsi in Atti del Congresso di Scienze Sloriche, Rome, 1904, v. 188). Between it and the modern town the stylobate of a large temple was found in 1906. This seems to have been constructed towards the end of the 7th century B.C. on the site of a still earlier edifice. The stylobate measures 115 by 58 ft. A large number of decorative terracottas were found, among them a small helmeted head of Athena: her name recurs upon the lip of a large pitkos, and it is probable that the temple was dedicated to her. There is no trace of any object that can be dated after the end of the 6th century B.C., and it is therefore probable that this temple was destroyed when the other was constructed, and that the latter also was dedicated to Athena. On the W. of the town, on the Capo Soprano, was the ancient necropolis, where many tombs of the Greek period have been discovered; the objects found, including many fine Attic vases, are partly in private collec- tions at Terranova itself, partly in foreign museums, while the results of later excavations, including some large terracotta sarcophagi, are in the museum at Syracuse.

See Orsi in Notizie degli scavi, 1901, 307; 1902, 408; 1907, 38.

TERRANOVA PAUSANIA, a seaport of Sardinia, in the province of Sassari, situated on the E. coast, 14 m. S.W. of Golfo Aranci, and 72 m. E. of Sassari by rail, and in the inner- most recess of the sheltered gulf of Terranova. Pop. (1901) 4348. It occupies the site of the ancient Olbia (q.v.), and until the traffic was transferred to Golfo Aranci, was the port of embarkation for Italy, as in ancient times. There is some trade in cork and charcoal. The place is low-lying and malarious. The only building of interest is the Romanesque church of S. Simplicio, once the cathedral, which as it stands dates pro-

bably from the nth century. It was the seat of the giudici of Gallura, sent here by the Pisans in the nth century (but probably the native giudici resided at Tempio) , and of an episcopal see, united in 1506 with that of Ampurias. The name Pausania is the consequence of an error; it is a corruption of Fausiana, a town and episcopal see of Sardinia mentioned by Gregory the Great, the site of which is in reality uncertain.

TERRE HAUTE, a city and the county-seat of Vigo county, Indiana, U.S.A., on the eastern bank of the Wabash river, about 186 m. S. by E. of Chicago and about 73 m. W. by S. of Indianapolis. Pop. (1800) 30,217; (1900) 36,673, of whom 1520 were negroes and 2952 foreign-born; (1910, census) 58,157. Land area (1906), 8-25 sq. m., of which nearly one-third had been annexed since 1890 and a considerable part since 1900. It is served by the Chicago & Eastern Illinois, the Cleveland, Cincinnati, Chicago & St Louis, the Evansville & Indiana- polis, the Evansville & Terre Haute, the Southern Indiana, the Vandalia and several electric interurban railways. It is finely situated on high ground 60 ft. above the river level, and has wide, well-paved streets shaded by oaks and elms. It is

the seat of the Indiana State Normal School (1870), which had in 1909 a library of about 50,000 volumes, 52 instructors and an average term enrolment of 988 students, and of the Rose Polytechnic Institute, which was founded in 1874 by Chauncey Rose (1794-1877), was opened in 1883, offers courses in me- chanical, electrical, civil and chemical engineering and in architecture, and in 1909 had 22 instructors and 214 students. About 4 m. W. of Terre Haute is St Mary-of-the- Woods (founded in 1840 by the Sisters of Providence, and chartered in 1846), a school for girls. The Emeline Fairbanks Memorial Library (1882) contained 30,000 volumes in 1910, housed in a building erected in 1903 by Mr Crawford Fairbanks in memory of his mother. Terre Haute's industrial and commercial importance is largely due to its proximity to the valuable coal-fields of Clay, Sullivan, Park, Vermilion, Greene and Vigo

counties. The total value of its factory product in 1905 was $29,291,654; both in 1900 and in 1905 it ranked second among the manufacturing cities of the state. It is the largest distilling centre in the state and one of the largest in the country, the value of the output of this industry in 1905 being more than half the total value of the city's factory product for the year. The value of the glass product in 1905 was 4-4 per cent, of the value of all factory products of the city, and i-6 per cent, of the value of all glass manufactured in the United States.

The first settlers at Terre Haute built their cabins near Fort Harrison, which was erected by command of Governor William Henry Harrison in the winter of 1810-n. In 1812 the fort was successfully defended against an attack of the Indians by its commandant Captain Zachary Taylor, and in 181 7 was abandoned. After the close of the War of 1812 the town grew rapidly and became an important commercial centre, owing to its river connexions and to the fact that the National (or Cumberland) Road crossed the Wabash here. Terre Haute was incorporated as a town in 1838, became a city in 1853 (Under a general state law of June 1852), received a special city charter in 1899, in 1905 was organized as a city cf the third class, and became a city of the second class in 1909.

TERRELL, a city of Kaufman county, Texas, U.S.A., about 32 m. E. of Dallas. Pop. (1890) 2988; (1900) 6330 (1517 negroes); (19 10) 7050. Terrell is served by the Texas & Pacific and the Texas Midland railways. The city is the seat of Wesley College (Methodist Episcopal, South), until 1909 the North Texas University School, and of the North Texas Hospital for the Insane (1885), and has a Carnegie library. It is situated in a rich farming region. The city has a cotton compress and cotton-gins, and various manufactures. The Texas Midland railway has shops and general offices here. Terrell, named in honour of Robert A. Terrell, an early settler, was founded in 1872 and was chartered as a city in 1874.

TERRISS, WILLIAM (1847–1897), English actor, whose real name was William Charles James Lewin, was born in London on the 20th of February 1847. After trying the merchant service, medicine, sheep-farming in the Falkland Isles, and tea-planting in Bengal, in 1867 he took to the stage, for which his handsome presence, fine voice and gallant bearing eminently fitted him. His first appearance in London was as Lord Cloudrays in Robertson's Society, at the old Prince of Wales's theatre. He quickly came into favour in " hero " parts, and appeared at the principal London theatres from 1868 onwards. In 1880 he joined Irving's company at the Lyceum, playing such parts as Cassio and Mercutio, and in 1885 he acted there with Mary Anderson, as Romeo to her Juliet, &c. He was then engaged to take the leading parts in Adelphi melodrama, and it was in this capacity that for the rest of his career he was best known, though he occasionally acted elsewhere, notably with Irving at the Lyceum. His last appearance was in Secret Service. On the 16th of December 1897, as he was entering the Adelphi theatre, he was stabbed to death by a madman, Richard Arthur Prince. Terriss married Miss Isabel Lewis, and his daughter Ellaline Terriss (Mrs Seymour Hicks) became a well-known actress in musical comedy, in association with

her husband Edward Seymour Hicks (b. 187 1), proprietor of the Aldwych and Hicks theatres in London.

Sec Arthur J. Smythe, Tlte Life of William Terriss (London,

1898).

TERRY, EDWARD O'CONNOR (1844-), English actor, was born in London, and began his stage career in a small and struggling way in the provinces. Between 1868 and 1875 he was the leading comedian at the

Strand theatre, London, but it was not till he joined Hollingshead's company at the Gaiety in 1876 that he became a public favourite in the burlesques produced there during the next eight years. With Nellie Farren, Kate Vaughan and Royce, he made the fortune of this house, his eccentric acting and singing creating a style which had many imitators. In 1887 he went into management, opening Terry's theatre, where his production of Pinero's Sweet Lavender was a great success. But in subsequent years he was only occasionally seen at his own theatre, and made many tours in the provinces and in Australia, America and South Africa. Off the stage he was well known as an ardent Free- mason, and an indefatigable member of the councils of many charities and of public bodies.

TERRY, ELLEN ALICIA (1848-), English actress, was born at Coventry on the 27th of February 1848. Her parents were well-known provincial actors, and her sisters Kate, Marion and Florence, and her brother Fred, all joined the theatrical profession, and her own first appearance on the stage was made on the 28th of April 1856, under the Keans' manage- ment, as the boy Mamilius in The Winter's Tale, at the Princess's theatre, London. Two years later she played Prince Arthur in King John with such grace as to win high praise. From i860 to 1863 and again from 1867 to 1868 she acted with various stock companies. During this period she played, on the 26th of December 1867, for the first time with Henry Irving, being cast as Katharine to his Petruchio in Garrick's version of The Taming of the Shrew at the Queen's theatre. When quite a girl she married G. F. Watts the painter, but the marriage was soon dissolved. Between 1868 and 1874, having married E. A. Wardell, an actor whose professional name was Charles Kelly, she was again absent from the stage, but she reappeared in leading parts at the Queen's theatre under Charles Reade's management. On the 17th of April 1875 she played Portia for the first time in an elaborate revival of The Merchant of Venice under the Bancrofts' management at the old Prince of Wales's theatre. This was followed by a

succession of smaller triumphs at the Court theatre, culminating in her beautiful impersonation of Olivia in W. G. Wills's dramatic version of Goldsmith's Vicar of Wakefield, in 1878, the result of which was her engage- ment by Henry Irving as his leading lady for the Lyceum theatre, and the beginning of a long artistic partnership, in the success of which Miss Terry's attractive personality played a large part. Her Shakespearean impersonations at the Lyceum were Ophelia in 1878, Portia in 1879, Desdemona in 1881, Juliet and Beatrice in 1882, Viola in 1884, Lady Macbeth in 1888, Katherine, in Henry VIII., and Cordelia in 1892, Imogen in 1896, and Volumnia, in Coriolanus, in 1901. Other notable performances were those of the Queen in Wills's Charles I. in 1879, Camma in Tennyson's The Cup in 1881, Margaret in Wills's Faust in 1885, and the title-part in Charles Reade's one-act play Nance Oldfieli (1893), Rosamund in Tennyson's Becket (1893), Madame Sans-Gene in Sardou's play (1897), and Clarisse in Robespierre (1899). With the Lyceum company she several times visited the United States. In 1902, while still acting with Sir Henry Irving, she appeared with Mrs Kendal in Beerbohm Tree's revival of The Merry Wives of Windsor, at His Majesty's theatre, and she continued, after Sir Henry Irving's death, to act at different theatres, notably at the Court theatre (1905) in some of G. Bernard Shaw's plays. In 1906 her stage-jubilee was celebrated in London with much enthusiasm, a popular subscription in England and America resulting in some £8000 being raised. In 1907 Miss Terry married James Carew, an American actor. Her sister Marion Terry (b. 1856) became only less distin-

guished on the English stage than herself ; and her brothei Fred Terry (b. 1865) also became a leading actor, and a success- ful manager in association with his wife, the actress Julia Neilson.

See Charles Hiatt, Ellen Terry and her Impersonations (1898); Clement Scott, Ellen Terry.

TERSTEEGEN, GERHARD (1697-1769), German religious writer, was born on the 25th of November 1697, at

Mors, at that time the capital of a countship belonging to the house of Orange-Nassau (it fell to Prussia in 1702), which formed a Protestant enclave in the midst of a Catholic country. After being educated at the gymnasium of his native town, Tersteegen was for some years apprenticed to a merchant. He soon came under the influence of Wilhelm Hoffman, a pietistic revivalist, and devoted himself to writing and public speaking, with- drawing in 1728 from all secular pursuits and giving himself entirely to religious work. His writings include a collection of hymns (Das geistliche Blumengartlein, 1729; new edition, Stuttgart, 1868), a volume of Gebete, and another of Brief e, besides translations of the writings of the French mystics. He died at Miihlheim in Westphalia on the 3rd of April 1769.

See Hymns, and the article by Eduard Simons in Herzog-Hauck, Realencyklopadie, vol. xix. (ed. 1907).

TERTIARIES (Lat. tertiarii, from tertius, third), associations of lay folk in connexion with the Mendicant Orders. The old monastic orders had had attached to their abbeys confrater- nities of lay men and women, going back in some cases to the 8th century. The Confraternity Book of Durham is extant and embraces some 20,000 names in the course of eight centuries. Emperors and kings and the most illustrious men in church and state were commonly confraters of one or other of the great Benedictine abbeys. (On this subject see article by Edmund Bishop in Downside Review, 1885.) The confraters and con- sorors were made partakers in all the religious exercises and other good works of the community to which they were affiliated, and they were expected in return to protect and forward its interests; but they were not called upon to follow any special rule of life.

Although something of the kind existed among the Humiliati in the 12th century, the institution of Tertiaries arose out of the Franciscan movement. It seems to be certain that St Francis at the beginning

had no intention of forming his disciples into an Order, but only of making a great brotherhood of all those who were prepared to carry out in their lives certain of the greater and more arduous of the maxims of the Gospeli The formation of the Franciscan Order was necessitated by the success of the movement and the wonderful rapidity with which it spread. When the immediate disciples of the saint had become an order bound by the religious vows, it became necessary to provide for the great body of laity, married men and women, who could not leave the world or abandon their avocations, but still were part of the Franciscan movement and desired to carry out in their lives its spirit and teaching. And so, probably in 1221, St Francis drew up a Rule for those of his followers who were debarred from being members of the order of Friars Minor. At first they were called " Brothers and Sisters of the Order of Penance "; but later on, when the Friars were called the " First Order " and the nuns the "Second Order," the Order of Penance became the " Third Order of St Francis " — whence the name Tertiaries: this threefold division already existed among the Humiliati.

In 1 901 Paul Sabatier published a " Rule of Life of the Brothers and Sisters of Penance," which probably contains, with additions, the substance of the original Rule of 122 1. It prescribes severe simplicity of dress and of life, and certain abstinences and prayers and other religious exercises, and forbids the frequentation of the theatre, the bearing of arms and the taking of oaths except when administered by magis- trates. In 1289 Nicholas IV. approved the Third Order by a Bull, but made some alterations in the Rule, and this form of the Rule remained in force until our own day. Immediately on its establishment in 1221 the Third Order

spread with incredible rapidity all over Italy and

throughout western Europe, and embraced multitudes of men and women of all ranks from highest to lowest. Everywhere it was con- nected closely with the First Order, and was under the control of the Friars Minor.

In time a tendency set in for members of the Third Order to live together in community, and in this way congregations were formed who took the usual religious vows and lived a fully organized religious life based on the Rule of the Third Order with supplementary regulations. These congregations are the " Regular Tertiaries " as distinguished from the " Secular Tertiaries," who lived in the world, according to the original idea. The Regular Tertiaries are in the full technical sense " religious," and there have been, and are, many con- gregations of them, both of men and of women.

There can be little doubt, whatever counter claims may be set up, that the Third Order was one of St Francis' creations, and that his Third Order was the exemplar after which the others were fashioned; but at an early date the other Mendicant Orders formed Third Orders on the same lines, and so there came into being Dominican Tertiaries, and Carmelite, and Augustinian, and Servite, and also Premonstratensian and many others. These followed the same lines of development as trie Franciscan Tertiaries, and for the most part divided into the two branches of regular and secular Tertiaries. The Rules of the various Third Orders have proved very adaptable to the needs of modern congregations devoted to active works of charity; and so a great number of teaching and nursing con- gregations of women belong to one or other of the Third Orders.

The Franciscan Third Order has always been the principal one, and it received a great impetus and a renewed vogue from Leo XIII., who in 1883 caused the Rule to be recast and made more suitable for the requirements of devout men and women at the present day. In consequence it is estimated that the number of lay Franciscan Tertiaries now exceeds two millions.

Bibliography. — The most serviceable authority on the Franciscan Tertiaries is probably Max Heimbucher, Orden und Kongregationen (1907), ii. §§ 103, 104, 105, where an ample bibliography is supplied. The same work gives information on the other Tertiaries at the end of the sections on the various Orders. Similarly information will be found in Helyot, Histoire des Ordres religieux (17 14), after the chapters on the different Orders. Heimbucher names Tachy, Les Tiers Ordres (1897), and Adderley and Marson, Third Orders (1902). (E. C. B.)

TERTIARY, in geology, the time-division which includes the Eocene, Oligocene, Miocene and Pliocene periods, in other words, it is the earlier portion of the Cainozoic era. By some authorities the term Tertiary is made to embrace in addition to the foregoing periods those of the Quaternary (Pleistocene and Holocene), i.e. "Tertiary" is made the equivalent of Cainozoic. On logical grounds there is much in favour of this interpretation; but having in view the state of geological literature, it is certainly better to restrict the use of the term in the manner indicated above. Tertiary rocks were among the latest to receive the careful attention of geologists, and the name was introduced by G. Cuvier and H. Brongniart in 1810 (Essai sur la geographie miner alogique des environs de Paris, 1810-11, 1st ed.).

Deshayes (1830) worked out the percentages of recent fossils found at several horizons in those strata, and upon this Sir C. Lyell (1852) founded the main periods, viz. the Eocene with 3? per cent, of recent forms, Miocene 17 per cent., Pliocene 35 to 50 per cent. Subsequent investigations naturally modified the numerical values upon which this nomenclature was based, but without altering the order of the periods. Later, E. Beyrich introduced the Oligocene period, and some geologists recognize a Palaeocene or early Eocene period. European geologists very generally use the grouping adopted by R. Homes: —

Younger Tertiary = Neogene (Miocene, Pliocene).

Older Tertiary = Palaeogene (Palaeocene, Eocene, Oligocene).

The great number and variety of mammalian remains has made it possible for the Tertiary rocks to be classified by their means: see A. Gaundry, Les enchainements du monde animal — mammiferes Tertiaires (1878); W. B. Dawkins, Q. J. Geol. Soc. Land. (1880); Forsyth Maior, Geol. Mag. (London, 1899); and H. F. Osborn, J. L. Wortman, G. F. Matthew, for western North America, Bull. Am. Mus. Nat. Hist., xii. (1899).

During the Tertiary era the geographical configuration of the globe was steadily approaching that of the present day; but in the earlier part of the time there still existed the great equatorial ocean " Tethys," and there is evidence that East India and Africa, Australia and Asia, north Europe and North America were prob- ably severally united by land connexions. As the period advanced, along the very line that had been occupied by the nummulitic sea (Tethys) the crust began to be folded up, giving rise to the Alps, Carpathians, Caucasus, Himalayas and other mountains, some of the early Tertiary marine formations being now found raised more than 16,000 ft. above the present level of the sea. Associated with these crustal movements were enormous outpourings of vol- canic materials.

The faunal aspect of the Tertiary periods differs strikingly from that of preceding Secondary or Mesozoic; in place of the great saurian reptiles we find the rapid development and finally the maximum expansion of mammals. Snakes and true birds advanced rapidly towards their modern position. In the seas, bony fish and crab-like decapods increased in numbers and variety, while pelecy- pods and gasteropods took the prominent place previously occupied by ammonites and belemnites, and, leaving behind such forms as Rudistes, Inoceramus, &c, they gradually developed in the direction of the modern regional groups. In the plant world, the dicotyle- donous angiosperms gradually assumed the leading r61e which they occupy to-day.

The climate in northern latitudes seems to have passed from temperate to sub-tropical, with minor fluctuations, until at the close a rapid lowering of temperature ushered in the glacial period. (J. A. H.)

TERTULLIAN (c. 155-c. 222), whose full name was Quintus Septimus Florens Tertullianus, is the earliest and after Augustine the greatest of the ancient church writers of the West. Before him the whole Christian literature in the Latin language consisted of a translation of the Bible, the Octavius of Minucius Felix (q.v.) — an apologetic treatise written in the Ciceronian style for the higher circles of society, and with no evident effect for the church as a whole, the brief Acts of the Scillitan martyrs, and a list of the books recognized as canonical (the so-called Muratorian fragment). Whether Victor the Roman bishop and Apollonius the Roman senator ever really made an appearance as Latin authors is quite uncertain. Tertullian in fact created Christian Latin literature; one might almost say that that literature sprang from him full-grown, alike in form and substance, as Athena from the head of Zeus. Cyprian polished the language that Tertullian had made, sifted the thoughts he had given out, rounded them off, and turned them into current coin, but he never ceased to be aware of his dependence on Tertullian, whom he designated as /car' k&xw, his master (Jer., De vir.-ill. 53). Augustine, again, stood on the shoulders of Tertullian and Cyprian; and these three North Africans are the fathers of the Western churches.

Tertullian's place in universal history is determined by (1) his intellectual and spiritual endowments, (2) his moral force and evangelical fervour, (3) the course of his personal development, (4) the circumstances of the time in the midst of which he worked.

(1) Tertullian was a man of great originality and genius characterized by the deepest pathos, the liveliest fancy, and the most penetrating keenness,*

and was endowed with ability to appropriate and make use of all the methods of observation and speculation, and with the readiest wit. His writings in tone and character are always alike " rich in thought and destitute of form, passionate and hair-splitting, eloquent and pithy in expression, energetic and condensed to the point of obscurity." His style has been characterized with justice as dark and resplendent like ebony. His eloquence was of the vehement order; but it wins hearers and readers by the strength of its passion, the energy of its truth, the pregnancy and elegance of its expression, just as much as it repels them by its heat without light, its sophistical argumentations, and its elaborate hair-splittings. Though he is wanting in moderation and in luminous warmth, his tones are by no means always harsh; and as an author he ever aspired with longing after humility and love and patience, though his whole life was lived in the atmosphere of conflict. Tertullian both as a man and as' a writer had much in common with the apostle Paul.

(2) In spite of all the contradictions in which he involved

himself as a thinker and as a teacher, Tertullian was a compact ethical personality. What he was he was with his whole being. Once a Christian, he was determined to be so with all his soul, and to shake himself free of all half measures and compromises with the world. It is not difficult to lay one's finger upon very many obliquities, self-deceptions and sophisms in Tertullian in matters of detail, for he struggled for years to reconcile things that were in themselves irreconcilable; yet in each case the perversities and sophisms were rather the outcome of the peculiarly difficult circumstances in which he stood. It is easy to convict him of having failed to control the glowing passion that was in him. He is often outrageously unjust in the substance of what

he says, and in manner harsh to cynicism, scornful to gruesomeness ; but in no battle that he fought was he ever actuated by selfish interests. What he did was really done for the Gospel, as he understood it, with all the faculties of his soul. But he understood the Gospel as being primarily an assured hope and a holy law, as fear of the Judge who can cast into hell and as an inflexible rule of faith and of discipline. Of the glorious liberty of the children of God he had nothing but a mere presentiment; he looked for it only in the world beyond the grave, and under the power of the Gospel he counted as loss all the world could give. He well understood ihe meaning of Christ's saying that He came not into the world to bring peace, but a sword: in a period when a lax spirit of conformity to the world had seized the churches he maintained the " vigor evangelicus " not merely against the Gnostics but against opportunists and a worldly-wise clergy. Among all the fathers of the first three centuries Tertullian has given the most powerful expression to the terrible earnestness of the Gospel.

(3) The course of Tertullian's personal development fitted him in an altogether remarkable degree to be a teacher of the Church. Born at Carthage of good family — his father was a " centurio pro consularis "—he received a first-rate education both in Latin and in Greek. He was able to speak and write Greek, and gives evidence of familiarity alike with its prose and with its poetry; and his excellent memory—though he himself complains about it — enabled him always to bring in at the right place an appropriate, often brilliant, quotation or some historical allusion. The old historians, from Herodotus to Tacitus, were familiar to him, and the accuracy of his historical knowledge is astonishing. He studied with earnest zeal the Greek philo-sophers; Plato in particular, and the writings of the Stoics, he had fully at command, and his treatise De Anima shows that he himself was able to investigate and discuss philosophical problems. From the philosophers he had been led to the medical writers, whose treatises plainly had a place in his

working library. But no portion of this rich store of mis- cellaneous knowledge has left its characteristic impress on his writings; this influence was reserved for his legal training. His father, whose military spirit reveals itself in the whole bearing of Tertullian, to whom Christianity was above every- thing a " militia," had intended him for the law. He studied in Carthage, probably also in Rome, where, according to Eusebius, he enjoyed the reputation of being one of the most eminent jurists. This statement derives confirmation from the Digest, where references are made to two works, De Castrensi Peculio and Quaestionum Libri VIII., of a Roman jurist named Tertullian, who must have flourished about 180 a.d. In point of fact the quondam advocate never disappeared in the Christian presbyter. This was at once his strength and his weakness: his strength, for as a professional pleader he had learned how lo deal with an adversary according to the rules of the art— to pull to pieces his theses, to reduce him ad absurdum, and to show the defects and contradictions of his statements,— and was specially qualified to expose the irregularities in the proceedings taken by the state against the Christians; but it was also his weakness, for it was responsible for his litigiousness, his often doubtful shifts and artifices, his sophisms and argumentationes ad hominem, his fallacies and surprises. At Rome in mature manhood Tertullian became a Christian, under what Circum- stances we do not know, and forthwith he bent himself with all

his energy to the study of Scripture and of Christian literature. Not only was he master of the contents of the Bible: he also read carefully the works of Hermas, Justin, Tatian, Miltiades, Melito, Irenaeus, Proculus, Clement, as well as many Gnostic treatises, the writings of Marcion in particular. In apologetics his principal master was Justin, and in theology proper and in the controversy with the Gnostics, Irenaeus. As a thinker he was not original, and even as a theologian he has produced but few schemes of doctrine, except his doctrine of

sin. His special gift lay in the power to make what had been traditionally received impressive, to give to it its proper form, and to gain for it new currency. From Rome Tertullian visited Greece and perhaps also Asia Minor; at any rate we know that he had temporary relations with the churches there. He was conse- quently placed in a position in which he could check the doc- trine and practice of the Roman church. Thus equipped with knowledge and experience, he returned to Carthage and there laid the foundation of Latin Christian literature. At first, after his conversion, he wrote Greek, but by and by Latin almost exclusively. The elements of this Christian Latin language may be enumerated as follows: — (i.)it had its origin, not in the literary language of Rome as developed by Cicero, but in the language of the people as we find it in Plautus and Terence; (ii.) it has an African complexion; (iii.) it is strongly influenced by Greek, particularly through the Latin translation of the Septuagint and of the New Testament, besides being sprinkled with a large number of Greek words derived from the Scriptures or from the Greek liturgies; (iv.) it bears the stamp of the Gnostic style and contains also some military expressions; (v.) it owes something to the original creative power of Tertullian. As for his theology, its leading factors were — (i.) the teachings of the apologists; (ii.) the philosophy of the Stoics; (iii.) the rule of faith, interpreted in an anti-Gnostic sense, as he had received it from the Church of Rome; (iv.) the Soteriological theology of Melito and Irenaeus; (v.) the substance of the utterances of the Montanist prophets (in the closing decades of his life). This ana- lysis does not disclose, nor indeed is it possible to discover, what was the determining element for Tertullian; in fact he was under the dominion of more than one ruling principle, and he felt him- self bound by several mutually opposing authorities. It was his desire to unite the enthusiasm of primitive Christianity with intelligent thought, the original demands of the Gospel with every letter of the Scriptures and with the practice of the Roman church, the sayings of the

Paraclete with the authority of the bishops, the law of the churches with the freedom of the inspired, the rigid discipline of the Montanist with all the utterances of the New Testament and with the arrangements of a church seeking to set itself up within the world. • At this task he toiled for years, involved in contradictions which it took all the finished skill of the jurist to conceal from him for a time. At last he felt compelled to break off from the church for which he had lived and fought; but the breach could not clear him from the contradictions in which he found himself entangled. Not only did the great chasm between the old Christianity, to which his soul clung, and the Christianity of the Scriptures as juristically and philosophically interpreted remain unbridged; he also clung fast, in spite of his separation from the Catholic church, to his position that the church possesses the true doctrine, that the bishops per successionem are the repositories of the grace of the teaching office, and so forth. The growing violence of his latest works is to be accounted for, not only by his burn- ing indignation against the ever-advancing secularization of the Catholic church, but also by the incompatibility between the authorities which he recognized and yet was not able to reconcile. After having done battle with heathens, Jews, Marcionites, Gnostics, Monarchians, and the Catholics, he died an old man, carrying with him to the grave the last remains of primitive Christianity in the West, but at the same time in conflict with himself.

(4) What has just been said brings out very clearly how im- portant in their bearing on Tertullian's development were the circumstances of the age in which he laboured. His activity

as a Christian falls between 190 and 220, a period of very great moment in the history of the Catholic church ; for within it the struggle with Gnosticism

was brought to a victorious close, the New Testament established a firm footing within the churches, the " apostolic " rules which thenceforward regulated all the affairs of the church were called into existence, and the ecclesiastical priesthood came to be developed. Within this period also falls that evangelical and legal reaction against the political and secular tendencies of the church which is known as Montanism. The same Tertullian who had fortified the Catholic church against Gnosticism was none the less anxious to protect it from becoming a political organization. Being unable to reconcile incompatibles, he broke with the church and became the most powerful representative of Montanism in the West.

Although Tertullian's extant works are both numerous and copious, our knowledge of his life is very vague. He cannot have been born much later than about 150. His activity as a jurist in Rome must fall within the period of Commodus; for there is no indication in his writings that he was in Rome in the time of Marcus Aurelius, and many passages seem to preclude the supposition. The date of his conversion to Christianity is quite uncertain; there is much in favour of the years between 190 and 195. How long he remained in Rome after becoming a Christian, whether he had attained any office in the church before leaving Rome, what was the date of his visit to Greece — on these points also we remain in ignorance. It is certain that he was settled in Carthage in the second half of 197, the date of his writing his Apologeticus and (shortly afterwards) his two books Ad nationes; we also know that he became a presbyter in Carthage and was married. His recognition of the Montanistic prophecy in Phrygia as a work of God took place in 202-203, at the time when a new persecution broke out. For the next five years it was his constant endeavour to secure the victory for Montanism within the church ; but in this he became involved more and more deeply in controversy with the majority of the church in Carthage and especially with its clergy, which had the support of the clergy of Rome. As Jerome writes

(De vir. ill. 53): "Usque ad mediam aetatem presbyter fuit ecclesiae Af ricanae, invidia postea et contumeliis clericorum Romanae ecclesiae ad Montani dogma delapsus." On his breach with the Catholic church, probably in 207–208, he became the head of a small Montanist community in Carthage. In this position he con- tinued to labour, to write, and to assail the lax Catholics and their clergy until at least the time of Bishop Calixtus in the reign of Elagabalus. The year of his death is uncertain. Jerome (ut sup.) says: " Fertur vixisse usque ad decrepitam aetatem." That he returned at last to the bosom of the Catholic church is a mere legend, the motive of which is obvious; his adherents after his death continued to maintain themselves as a small community in Carthage. Although he had left the church, his earlier writings continued to be extensively read; and in the 4th century his works, along with those of Cyprian, were the principal reading of Western Christians, until they were superseded by those of Jerome, Ambrose, Augustine and Gregory. Jerome has included him in his catalogue of Christian " viri illustres," but only as a Catholic to whom reference should be made with caution. 1

The works of Tertullian, on the chronology of which a great deal has been written, and which for the most part do not admit of being dated with perfect certainty, fall into three classes — the apologetic, defending Christianity against paganism and Judaism; the polemical dogmatic, refuting heresies and heretics; and the ascetic or practical, dealing with points of morality and church discipline. In point of time also three periods can be readily distin- guished, the years 202–203 an d 207–208 constituting the divisions. Some of the books he wrote have unfortunately disappeared — in particular the De spectaculis, De baptismo, and De virginibus velandis in Greek; his works in Latin on the same subjects have survived.

I. Works dating from before 202–203. — To this class belong the Apologeticus (197) and the two books Ad nationes, De spectaculis, De idololalria, De cultu

feminarum Libri II., De teslimonio animae (written soon after the Apoiogeticus), Ad martyres (perhaps the earliest of all), De baptismo haereticorum (now lost), De baptismo, De poenitentia, De oratione (the last three written for catechumens), De patiehtia, Ad uxoretn Libri II., De praescriptione haereticorum, and Adv. Marcionem (in its first form). The Apologeticus, which in the 3rd century was translated into Greek, is the weightiest work in defence of Christianity of the first two centuries. It disposes of the charges brought against Christians for secret crimes (in- cest, &c.) and public offences (contempt of the State religion and high treason), and asserts the absolute superiority of Christianity as a revealed religion beyond the rivalry of all human systems.

1 Compare also the judgment of Hilary and of Vincent of Lerins, Commonit., 24.

Respecting its relation to the Octavius of Minucius Felix much has been written; to the present writer it seems unquestionable that Tertullian's work was the later. Of great moment also is the De praescriptione haereticorum, in which the jurist is more clearly heard than the Christian. It is the chief of the dogmatic or polemical works, and rules the accuser out of court at the very opening of the case. The De spectaculis and De idololatria show that Tertullian was already in a certain sense a Montanist before he formally went over to that creed; on the other hand, his De poenitentia proves that his earlier views on church discipline were much more tolerant than his later. To learn something of his Christian temper we must read the De oratione and the De patientia. The De baptismo is of special interest from the archaeological point of view.

II. Works written between 202-203 and 207-208. — De virginibus velandis, De corona militis, De fuga in persecutione, De exhorta- tione castitatis, De scorpiace (a booklet against the Gnostics, whom he compares to scorpions; it is written' in praise of martyrdom), Adversus Hermogenem, De censu animae

adv. Hermogenem (lost), Adv. Valentinianos, Adv. Apelleiacos (lost), De paradiso (lost), De falo (lost), De anima (the first book on Christian psychology), De came Christi, De resurrectione carnis, and De spe fidelium (lost), were all written after Tertullian had recognized the prophetic claims of the Montanists, but before he had left the church.

III. Works later than 207-208. — To this period belong the five books Adv. Marcionem, his main anti-Gnostic work (in the third form — the first of the five was written in 207-208), Ad Scapulam (an admonition to the persecuting proconsul of Africa, written soon after 212), De pallia (a defence of his wearing the pallium instead of the toga), Adv. Praxean (his principal work against the Mon- archians), and Adv. Judaeos, chaps, ix.xiv. of which are a com pletion by another and less skilful hand. The latest extant works of Tertullian (all after 217) are his controversial writings against the laxity of the Catholics, full of the bitterest attacks, especially upon Calixtus, the bishop of Rome; these are De monogamia, De jejunio, De pudicitia, and De ecstasi Libri VII. (lost). The arguments against the genuineness of some of the above writings do not seem to the present writer to have weight. It is quite possible that Tertullian was the author of the Acta perpetuae el felicitatis, but he did not write the Libellus adv omnes haereses often appended to De praescriptione; or the poems Adv. Mar- cionem, De Sodoma, De Jona, De Genesi, De judicio Domini; or the fragment De execrandis gentium diis; or the De Trinitate and De cibis Judaicis of Novatian.

Editions. — For the MSS. see E. Preuschen in A. Harnack, Geschichte der altchristl, Literatur, i. 675-7. Of printed collections the chief are the editio princeps by Beatus Rhenanus (Basel, 1521), Migne, Pair. Lat. i.-ii. (Paris, 1844); Fr. Oehler (3 vols., Leipzig, 1851-4) ; and A. Reifferscheid and G. Wissowa in the Corpus scriptorum eccl. Lat. (Pars i., Vienna, 1890). Editions of the separate books are almost innumerable.

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Literature. — Fr. Oehler's third volume contains a collection of early dissertations. See also A. Hauck, Tertullian's Leben und Schriften (Erlangen, 1877); J. M. Fuller in Diet. Chr. Biog., iv. 818-864; E. Nolldechen, Tertullian (Gotha, 1890); P. Monceaux, Histoire litteraire ,de I Afrique chretienne, vol. i. (Paris, 1901); T. R. Glover, The Conflict of Religions in the Early Roman Empire, chap. x. (London, 1909) ; and the various Histories of Dogma and Church Histories.

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TERUEL, a province of north-eastern Spain, formed in 1833 from part of the ancient kingdom of Aragon; bounded on the N. by Saragossa, E. by Tarragona, S.E. and S. by Castellon de la Plana and Valencia, S.W. by Cuenca, and W. by Guadalajara. Pop. (1900) 246,001; area 5720 sq. m. In the centre of the province rise the Sierras of Gudar and San Just; in the south- west and west are the lofty Albarracin range, the Montes Universales, and the isolated ridges of Palomera and Cucalon. Outliers of the Castellon and Tarragona highlands extend along the eastern border. The northern districts belong to the Ebro basin. In the west there are a few peaks, such as the Cerro de San Felipe and Muela de San Juan, which exceed 5000 ft. in altitude and are covered with snow for many months; but the highest point is Javalambre (6568 ft.) in the south. The sierras give rise to several large rivers, the principal being

the Tagus (g.v.); the Guadalaviar, which rises in the Montes Universales and flows south-east to enter the Mediterranean at Valencia; the Jiloca, which flows north from the lake of Cella to join the Jalon at Calatayud; the Guadalope, Martin and Matarrafia, tributaries of the Ebro.

Notwithstanding the fertile character of the plains and the abundance of mineral wealth, the trade of the province is un- important and civilization in a backward state, owing to the lack of means of transport, want of enterprise and imperfect com- munication with the outer world. Much land is devoted to pasture that could be cultivated. Extensive forests with fine timber are neglected, as are some important coal beds in the eastern districts. The chief products are corn, wine, oil, cheese, fruits, timber, flax, hemp, silk, wool and saffron, together with cattle, sheep and swine; while in the busier centres some slight manufacture of coarse cloth, paper, leather, soap, pottery and esparto goods is carried on. The only railway is the line from Murviedro, on the Gulf of Valencia, to Calatayud.

TERUEL, the capital of the Spanish province of Teruel; on the left bank of the river Guadalaviar, at its confluence with the Alfambra, and on the Murviedro-Calatayud railway. Pop. C1900) 10,797. The older part of Teruel is a walled city with narrow gloomy streets and crumbling medieval houses, but modern suburbs have been built outside the walls. Some of the numerous churches are worth seeing, with their paintings by the 17th-century artist Antonio Visquert. In the cloisters of San Pedro lie the remains of the celebrated ” lovers of Teruel,” Juan de Marcilla and Isabella de Segura, who lived in the 13th century and whose pathetic story has formed the subject of numerous dramas and poems by Perez de Montalban, Yaque de Salas, Hartzenbusch and others. The cathedral dates from the 16th century. The great

aqueduct of 140 arches was erected in 1555-60 by Pierre Bedel, a French architect. Teruel has several good hospitals and asylums for the aged and children, an institute, a training school for teachers, primary schools, a public library, an athenaeum, a meteoro- logical station, and a large prison. The see was created in 1577, and forms part of the archiepiscopal province of Saragossa.

TERVUEREN, a small town of Belgium in the province of Brabant, midway between Brussels and Louvain. Pop. (1904) 4017. It contained an ancient abbey and a hunting chateau belonging to the dukes of Brabant. The fine park of Tervueren is really part of the forest of Soignies. The Colonial Museum and World's Colonial School are established here, and Tervueren is connected with Brussels by a fine broad avenue, traversed by an electric tramway as well as by carriage and other roads, and between 6 and 7 m. in length.

TERZA RIMA, or " third rhyme," a form of verse adapted from the Italian poets of the 13th century. Its origin has been attributed by some to the three-lined ritourhel, which was an early Italian form of popular poetry, and by others to the sirventes of the Provencal troubadours. The serventese in-catenato of the latter was an arrangement of triple rhymes, and unquestionably appears to have a relation with terza rima; this connexion becomes almost a certainty when we consider the admiration expressed by the Tuscan poets of the 13th century for the metrical inventions of their forerunners, the Provencals. In Italian, a stanza of terza rima consists of three lines of eleven syllables, linked with the next stanza, and with the next, and so on, by a recurrence of rhymes: thus aba, bcb, cdc, ded, &c, so that, however long the poem is, it can be divided nowhere without severing the continuity of the rhyme. Schuchardt has developed an ingenious theor^^hat these suc- cessive terzinas are really chains of ritourneH^ust as ottava rima, according to the same theory, is a chain of rispetti. There were, unquestionably, chains of interwoven triple rhymed lines before the days of Dante, but it was certainly

he who raised terza rima from the category of folk-verse, and gave it artistic character. What this character is may best be seen by an examination of the austere and majestic lines with which the Inferno opens, no more perfect example of terza rima having ever been composed : —

" Nel mezzo del cammin di nostra vita

Mi retrovai per una selva obscura, Che la diritta via era smarrita.

Ahi quanto a dir qual'era e cosa dura Quests selva selvaggia ed aspra e forte,

Che nel pensier rinnova la paura!"

It is impossible, however, to break off here, since there is no rhyme to forte, which has to be supplied twice in the succeeding terzina, where, however, a fresh rhyme, Irovai, is introduced, linking the whole to a still further terzina, and so on, indefinitely. The only way in which a poem in terza rima can be closed is by abandoning a rhyme, as at the end of Canto 1 of the Inferno, where no third rhyme is supplied to Pietro and Metro. Boccaccio wrote terza rima in close following of Dante, but it has not been a form very frequently adopted by Italian poets. Nor has the extreme difficulty of sustaining dignity and force in these complicated chains of verse made writers in other languages very anxious to adventure on terza rima. In the age of Elizabeth, Samuel Daniel employed it in his " Epistle to the Countess of Bedford," but he found no followers. Probably the most successfully sustained poem in terza rima in the English language is Mrs Browning's Casa Guidi Windows (1851). The Germans have always had an ambition to write in terza rima. It was used by Paul Schede, a writer of whom little is known, before the close of the 16th century, and repeatedly by Martin Opitz (1 597-1639), who called the form drittreime. Two centuries and a half later, W. Schlegel had the courage to translate Dante in the metre of the Italian; and it was used for original poems by Chamisso and Riickert. Goethe, in

1826, addressed a poem in terza rima to the praise of Schiller, and there is a passage in this metre at the beginning of the second part of Faust.

See Hugo Schuchardt, Ritournell und Terzine (Halle, 1875).

(E. G.)

TESCHEN (Czech, Tesin; Polish, Cieszyn), a town of Austria, in Silesia, 50 m. S.E. of Troppau by rail. Pop. (1900) 19,142, of which over half is German, 43 per cent. Polish and the re- mainder Czech. It is situated on the Olsa, a tributary of the Oder, and combines both Polish and German peculiarities in the style of its buildings. The only relic of the ancient castle is a square tower, dating from the 12th century. There are several furniture factories and large saw-mills.

Teschen is an old town and was the capital of the duchy of Teschen. It was at Teschen that Maria Theresa and Frederick II. signed, in May 1779, the Peace, which put an end to the war of Bavarian succession. The duchy of Teschen belonged to the dukes of Upper Silesia, and since 1298 it stood under the suzerainty of Bohemia. It became a direct apanage of the Bohemian crown in 1625 at the extinction of the male line of its dukes, and since 1766 it bore the name of Saxe-Teschen, owing to the fact that Prince Albert of Saxony, who married a daughter of Maria Theresa, re- ceived it as part of his wife's dowry. In 1822, it was bestowed on the Archduke Charles, the victor of Aspern; it was inherited by his eldest son, and, at his death, in 1895 it passed into the hands of his nephew, the Archduke Frederick.

TESSELLATED (Lat. lessellatus,), formed of tessellae, or small tesserae, cubes from half an inch to an inch square like dice, of pottery, stone, marble, enamel, &c. (See Pavement and Mosaic.)

TESSIN, CARL GUSTAF, Count (1695-1770), Swedish statesman, son of a great architect, Nicodemus

Tessin, began his public career in 1723, at which time he was a member of the Holstein faction. In 1725 he was appointed ambassador at Vienna, and in that capacity counteracted the plans of the Swedish chancellor, Count Arvid Horn, who was for acceding to the Hanoverian Alliance. During the riksdags 1726-27 and 1731 he fiercely opposed the government, and his wit, eloquence and imposing presence made him one of the foremost pro- tagonists of the party subsequently known as " The Hats " (see Sweden: History). From 1735 to 1736 he was again Swedish ambassador at Vienna. During the riksdag of 1738 he was elected marshal of the diet and contributed more than anyone else to overthrow the Horn administration the same year. On the division of the spoil of patronage he chose for himself the post of ambassador extraordinary at Paris, and from 1739 to

1742 delighted Versailles with his brilliant qualities of grand seigneur, at the same time renewing the traditional alliance between France and Sweden which had been interrupted for more than sixty years. His political ability, however, was by no means commensurate with his splendid social qualities. It was his sanguine credulity which committed the " Hats " to their rash and unconsidered war with Russia in 1741-42, though in fairness it must be added that Tessin helped them out of their difficulties again by his adroitness as a party leader and his stirring eloquence. He gained his arm-chair in the senate as a reward for his services on this occasion. In 1743 Tessin composed the long outstanding differences between Sweden and Denmark in a special mission to Copenhagen. In 1744 he was sent at the head of an extraordinary embassade to Berlin to escort to Stockholm Frederick the Great's sister, Louisa Ulrica, the chosen bride of the Swedish crown-prince, Adolphus Frederick. As over hof mar skalk of the young court, Tessin speedily captivated the royal pair. He also succeeded in withdrawing the crown-prince from

beneath the influence of the Russian empress Elizabeth, to whom Adolphus Frederick owed his throne when he became king of Sweden in 1751, thereby essentially contributing to the maintenance of the independence of Sweden. From 1746 to 1752 Tessin was president of the chancellery, as the Swedish prime minister was called in those days. His " system " aimed at a rapproche- ment with Denmark with the view of counterbalancing the influence of Russia in the north. It was a dignified and prudent policy, but his endeavour to consolidate it by promoting a matrimonial alliance between the two courts alienated the Swedish crown-prince, who, as a Holsteiner, nourished an ineradicable hatred of everything Danish. As, moreover, on the accession of Adolphus Frederick in 1751, Tessin refused to countenance any extension of the royal prerogative, the rupture between him and the court became final. On the occasion of the coronation (1752) he resigned the premiership, and in 1754 the governorship of the young crown-prince Gustavus also, spending the rest of his days at his estate at Akerb. Tessin was one of the most brilliant personages of his day, and the most prominent representative of French culture in Sweden. He was also a fine orator, and his literary style is excellent.

His principal works are his autobiographical fragments (1st ed. Stockholm, 1819), Tessin och Tessiniana; K. G. Tessin's Dagbok (Stockholm, 1824), both of them extracts from his voluminous MS. memoirs in 29 volumes; and his famous En gammal mans bref til en ung Prins (Stockholm, 1753; English editions, 1755 and 1756), addressed to his pupil, afterwards Gustavus III., one of the most delightful books for the young that ever saw the light.

See R. Nisbet Bain, Gustavus III. and his Contemporaries (London, 1895), vol. i; Bernhard von Beskow, Minne af Grefve K. G. Tessin (Stockholm, 1864); Bernhard Elis Malmstrom, Sveriges politiska historia frdn Konung Karl XII.'s dod till statshvdlfningen, 1772 (Stockholm, 1893-1901). (R. N. B.)

TEST ACTS. The principle that none but persons professing the established religion were eligible for public employment was adopted by the legislatures of both England and Scotland soon after the Reformation. In England the Acts of Supremacy and Uniformity and the severe penalties denounced against recusants, whether Roman Catholic or Nonconformist, were affirmations of this principle. The Act of 7 Jac. I. c. 2 provided that all such as were naturalized or restored in blood should receive the sacrament of the Lord's Supper. It was not, how- ever, until the reign of Charles II. that actual receiving of the communion of the Church of England was made a condition precedent to the holding of public offices. The earliest imposi- tion of this test was by the Corporation Act of 1661 (13 Car. II. st. 2, c. 1), enacting that, besides taking the oath of allegiance and supremacy and subscribing a declaration against the Solemn League and Covenant, all members of corporations were within one year after election to receive the sacrament of the Lord's Supper according to the rites of the Church of Eng- land. This act was followed by the Test Act of 1672 (25 Car. II. c. 2). The immediate cause of the Test Act (the full title of which is " An act for preventing dangers which may happen

from popish recusants ") was the king's declaration of indulgence, dispensing with laws inflicting disabilities on Nonconformists. This act enforced upon all persons filling any office, civil or military, the obligation of taking the oaths of supremacy and allegiance and subscribing a declaration against transubstantia- tion, and also of receiving the sacrament within three months after admittance to office. The act did not extend to peers; but in 1678 30 Car. II. st. 2 enacted that all peers and members of the House of Commons should make a declaration against transubstantiation, invocation of saints, and the sacrifice of the mass — a special exception being made in favour of the duke of York. The provisions of the Test Act were violated by both Charles II. and James II. on the ground of the dispens- ing power claimed by the

Stuart kings. In the well-known case of Godden v. Hales (n State Trials, 1166), an action for penalties under the Test Act brought against an officer in the army, the judges decided in favour of the dispensing power — a power finally abolished by the Bill of Rights. After a considerable number of amendments and partial repeals by the legislature of the acts of 1661, 1672 and 1678, and of acts of indemnity to protect persons under certain circumstances from penalties incurred under the Test Act, the necessity of receiving the sacrament as a qualification for office was abolished by 9 Geo. IV. c. 17, and all acts requiring the taking of oaths and declarations against transubstantiation, &c, were repealed by the Roman Catholic Relief Act of 1829 (10 Geo. IV. c. 7). This general repeal has been followed by the special repeal of the Corporation Act by the Promissory Oaths Act 187 1, of the Test Act by the Statute Law Revision Act 1863, and of the act of 1678 by an act of 1866 (29 & 30 Vict. c. 19). Religious tests remained in the English universities until 1871, in Dublin University until 1873, and the Scottish universities until 1889. To be a member of the Church of England was a necessary condition precedent for holding most university or college offices by the Act of Uniformity of 1662, and such offices were not affected by the Toleration Act of 1688 and the Roman Catholic Relief Act of 1829. In 1871 the University Tests Act abolished sub- scriptions to the articles of the Church of England, all declara- tions and oaths respecting religious belief, and all compulsory attendance at public worship in the universities of Oxford, Cambridge and Durham. There is an exception confining to persons in holy orders of the Church of England degrees in divinity and positions restricted to persons in holy orders, such as the divinity and Hebrew professorships.

Scotland. — A religious test was imposed immediately after the Reformation. By 1567, c. 9, no one was to be appointed to a public office or to be a notary who did not profess the Reformed religion. The Scottish Test Act was 1681, c. 6, rescinded by 1690,

c. 7. Re- nunciation of popery was to be made by persons employed in education (1700, c. 3). A motion to add, after the 18th article of union, an exemption of Scotsmen from the sacramental test in the United Kingdom was negatived by the Scottish parliament. A similar fate awaited a proposal that while a sacramental test was in force in England all persons in public office in Scotland should subscribe their adhesion to the Presbyterian Church government. By 1707, c. 6, all professors, principals, regents, masters or others bearing office in any university, college or school in Scotland were to profess and subscribe to the Confession of Faith. All persons were to be free of any oath or test contrary- to or inconsistent with the Protestant religion and Presbyterian Church government. The reception of the communion was never a part of the test in Scotland as in England and Ireland. The necessity for subscription to the Confession of Faith by persons holding a university office (other than that of principal or professor of theology) was removed by 16 & 17 Vict. c. 89. The act provided that in place of subscription every person appointed to a university office was to subscribe a declaration according to the form in the act, promising not to teach any opinions opposed to the divine authority of Scripture or to the Confession of Faith, and to do nothing to the prejudice of the Church of Scotland or its doctrines and privileges. All tests were finally abolished by an act of 1889 (52 & 53 Vict. c. 55).

Ireland. — An oath of allegiance was required by the Irish Act of Supremacy (2 Eliz. c. 1). The English Act of 3 Will. & M. c. 2 substituted other oaths and enforced in addition from peers, members of the House of Commons, bishops, barristers, attorneys and others a declaration against transubstantiation, invocation of the Virgin Mary and the saints, and the sacrifice of the mass. By the Irish Act of 2 Anne, c. 6, every person admitted to any office.

civil or military, was to take and subscribe the oaths of allegiance, supremacy, and abjuration, to subscribe the declaration against transubstantiation, &c, and to receive the Lord's Supper according to the usage of the Church of Ireland. English legislation on the subject of oaths and declarations was adopted in Ireland by Yelverton's Act, 21 & 22 Geo. III. c. 48, § 3 (Ir.). These provisions were all repealed by the Promissory Oaths Act 1871. The Roman Catholic Relief Act of 1793 (33 Geo. III. c. 21, Ir.) excepted Trinity College, Dublin, from its provisions, and tests existed in Dublin university until 1873. They were abolished as far as regarded certain scientific professorships in 1867 by 30 Vict. c. 9, and were finally abolished for the whole university by the University of Dublin Tests Act 1873, except as to professors of and lecturers in divinity.

United States. — By art. 6 of the constitution, " no religious test shall ever be required as a qualification to any office or public trust under the United States." A similar provision is generally included in the state constitutions.

TESTAMENTS OF THE THREE PATRIARCHS. This apo- cryphal work of the Hebrew Scriptures was first published by M. R. James {The Testament of Abraham, the Greek Text now first edited with an Introduction and Notes. With an appendix containing extracts from the Arabic Version of the Testaments of Abraham, Isaac and Jacob, by Barnes, Texts and Studies, ii. 2: Cambridge). The Greek testament of Abraham is preserved in two recensions from six and three MSS. respectively. This testament is also edited by Vassiliev in his Anecdota Graeco- Byzantina, 1893, i. 292-308 from a Vienna MS. already used by James. According to James, it was written, in Egypt in the 2nd century A.D., and was translated subsequently into Slavonic (Tichonrawow, Pamjatniki otretschennoi russkoi Lite- raturi, 1863, i. 79-90), Rumanian (Gaster, Proceedings of the Society of Biblical Archaeology, 1887, ix. 195-226), Ethiopic and Arabic.

This testament deals with Abraham's reluctance to die and the means by which his death was brought about. As regards its origin James writes {op. cit., p. 55): " The Testament was originally put together in the second century by a Jewish Christian: for the narrative portions he employed existing Jewish legends, and for the apocalyptic, he drew largely on his imagination." He holds that the book is referred to by Origen, Horn, in Luc. xxxv. With the exception of x.-xi. the work is really a legend and not an apocalypse.

To the above conclusions Schiirer, Gesch. des jiid. Volkes, 3rd ed., iii. 252, takes objection. He denies the reference in Origen, and asserts that there are no grounds for the assumption of a partial Jewish origin. But the present writer cannot agree with Schiirer in these criticisms, but is convinced that a large body of Jewish tradition lies behind the book. Indeed, Kohler {Jewish Quarterly Review, 1895, v. 581-606) has given adequate grounds for regarding this apocryph as in the main an inde- pendent work of Jewish origin subsequently enlarged by a few Christian additions.

An English translation of James's texts will be found in the Ante-Nicene Christian Library (Clark, 1897), pp. 185-201. The testaments of Isaac and Jacob are in part still preserved in Arabic and Ethiopic (see James, op. cit., 140-161). (R. H. C.)

TESTAMENTS OF THE TWELVE PATRIARCHS. The

Testaments of the Twelve Patriarchs (see Apocalyptic Lite- rature: II. Old Testament), are an important constituent of the apocryphal scriptures connected with the Old Testa- ment, comprising the dying commands of the twelve sons of Jacob.

They " were written in Hebrew in the later years of John Hyrcanus — in all probability after his final victory over the Syrian power and before his breach with the Pharisees — in other words, between 109 and 106. Their author was a Pharisee who combined loyalty to the best traditions of his party with the

most unbounded admiration of Hyrcanus. The Maccabean dynasty had now reached the zenith of its prosperity, and in its reigning representative, who alone in the history of Judaism possessed the triple offices of prophet, priest and king, the Pharisaic party had come to recognize the actual Messiah. To this John Hyrcanus, in whom had culminated all the glories and gifts of this great family, our

author addresses two Messianic hymns. The writer already sees the Messianic kingdom established, under the sway of which the Gentiles will in due course be saved, Beliar overthrown, sin disappear from the earth, and the righteous dead rise to share in the blessedness of the living. Alas for the vanity of man's judgment and man's prescience! Our book had hardly been published, when Hyrcanus, owing to an injury done him by the Pharisees, broke with their party, and, joining the Sadducees, died a year or two later. His successors proved themselves the basest of men. Their infamy is painted in lurid colours by contemporary writers of the 1st century B.C., and by a strange irony the work, or, rather, fragments of the work of one of these assailants of the later Maccabees, has achieved immortality by finding a covert in the chief manifesto that was issued on behalf of one of the earlier members of that dynasty. This second writer singles out three of the Maccabean priest kings for attack, the first of whom he charges with every abomination; the people itself, he declares, is apostate, and chastisement will follow speedily — the temple will be laid waste, the nation carried afresh into captivity, whence, on their re- pentance, God will restore them again to their own land, where they shall enjoy the blessedness of God's presence and be ruled by a Messiah sprung from Judah. When we contrast the expectations of the original writer and the actual events that followed, it would seem that the chief value of his work would consist in the light that it throws on this obscure and temporary revolution in the Messianic expectations of Judaism towards the close of the 2nd century. But this is not so. The main, the overwhelming value of the book

lies not in this province, but in its ethical teaching, which has achieved a real im- mortality by influencing the thought and diction of the writers of the New Testament, and even those of our Lord. This ethical teaching, which is indefinitely higher and purer than that of the Old Testament, is yet its true spiritual child, and helps to bridge the chasm that divides the ethics of the Old and New Testaments." 1

In the early decades of the Christian era the text was current in two forms, which are denoted by H" and H 3 in this article and in the edition of the text published by the Oxford Uni- versity Press. " The former of these was translated not later than a.d. 50 into Greek, and this translation was used by the scholar who rendered the second Hebrew recension into Greek. The first Greek translation was used by our Lord, by St Paul, and other New Testament writers. In the second and following centuries it was interpolated by Christian scribes, and finally condemned undiscriminatingly along with other apocryphs. For several centuries it was wholly lost sight of, and it was not till the 13th century that it was rediscovered through the agency of Robert Grosseteste, bishop of Lincoln, who translated it into Latin, under the misconception that it was a genuine work of the twelve sons of Jacob, and that the Christian inter- polations were a genuine product of Jewish prophecy. The advent of the Reformation brought in critical methods, and the book was unjustly disparaged as a mere Christian forgery for nearly four centuries. The time has at last arrived for this book, so noble in its ethical side, to come into its own." 2*

Versions and MSS. — The two recensions s of the Hebrew original, to which we have already referred, were translated into Greek, the former being attested by the Greek MSS. chi and the latter by a b d e f g, which groups for the sake of brevity we designate as a and /?. The Greek version was in turn rendered into Armenian in the 5th or 6th century. The rendering was made, except in a limited number of passages, from /3. Of this version there are at

least eleven MSS. known. Here again two types of text, A « and A3, are represented, but for the most part the differences originated within the Armenian. Finally about the 13th century the Slavonic Version was made from the /8 form of the Greek Version. Here

1 From § 1 of the Introduction to R. H. Charles's The Testaments of the Twelve Patriarchs, translated from the Editor's Greek Text (A. &C. Black, 1908).

2 From § 1 of the Introduction to R. H. Charles's The Greek Versions of the Testament of the XII. Patriarchs (Oxford University Press, 1908).

3 Some of the evidence for this conclusion will be given later.

again we have two recensions S 1 and S J , but the one may be on the whole reasonably described as an abbreviation of the other.

The relations of the above authorities are too complicated to be treated of here in detail, but they are represented on the subjoined diagram.

H(= Hebrew Archetype)

J_

H*(ist.Hebrew Recension) I

H*(ind.Hebrew Recension) P

Original Language. — Apart from Grabe, till within the last fifteen years no notable scholar has advqpated a Hebrew original. Nitzsch, Dillmann, Ritschl and Sinker are convinced that the book was not a translation but was written originally in Greek. To Kohler and Gaster belongs the honour of re-opening the question of the Hebrew original of the Testaments. Only the latter, however, offered any linguistic evidence. In his article 1 on the

question he sought to establish a Hebrew original of all the Testaments and to prove that the Hebrew text of Naphtali which he had discovered was the original testament, and that the Greek Naphtali was a late and corrupt reproduction of it with extensive additions from other sources. But he failed in establishing either thesis. The subject was next taken in hand by R. H. Charles, who in a pre- liminary form in the Encyclopaedia Biblica (i. 241, 1899), and later, with considerable fullness, in his edition of the Greek text of the Testaments (1908), brought to light a number of facts that put the question of a Hebrew original beyond the range of doubt. We will now place a few of the grounds before the reader.

(a) Hebrew constructions and expressions are to be found in every page. Though the vocabulary is Greek the idiom is frequently Hebraic and foreign to the genius of the Greek language. Thus in T. Reub. vi. II, iv almS e£eX«i;aTO = "im 13. In T. Jud. xx. 4, iv arlfiti izriuiv aiiToO — an utterly unmeaning phrase — becomes intelligible on retroversion — msy ibi, " on his very- heart." In T. Benj. x. 11 KaT0LKr)7(Te iw' i\wlhi. iv l/xoi = " ye shall dwell securely with me"; for here i cXirlht, as several times in the Septuagint, is a wrong rendering of no3*

(b) Dittographic renderings in the Greek of the same Hebrew ex- pression; also dittographic expressions in the Greek implying ditto- graphs in the Hebrew. See Introduction to R. H. Charles s Text, § 1 1.

(c) Paronomasiae which are lost in the Greek can be restored by retranslation into Hebrew. There are over a dozen of such instances.

(d) Many passages which are obscure or wholly unintelligible in the Greek become clear on retranslation into Hebrew. Of the large body of such passages (see op. cit. § 12) we will give only one. In T. Jud. ix. 3, we have the following impossible sentence, where Esau is referred to:

In all the above cases there is no divergence among the MSS. and Versions. Yet the restorations are so many and so obvious that our contention might be taken for proven. But there is stronger evidence still, and this is to be found where the MSS. and Versions attest different texts, a standing generally in opposition to /3, A (= Armenian Version), and S (= Slavonic Version). By means of this evidence we are able to prove not only that our book is from a Hebrew original, but that also the Hebrew existed in two recensions, H" and H3, which are the parents respectively of a and /3 (see diagram above).

1 " The Hebrew Text of one of the Testaments of the XII. Patriarchs " (Proceedings of the Soc. of Bibl. Archaeology, December 1893, January 1894).

*o and /3 are not, strictly speaking, Greek recensions; for their chief variations go back to diverse forms of text already existing in the Hebrew H« and W. For the considerable body of evidence supporting this conclusion see the Introduction to R. H. Charles's Text, § 12. A couple of the many passages in which the variations in a and /3 are due to variations in H» and H0 will now be given. In T. Benj. xii. 2 a reads iKoipeiidi) virvq koX<2 and & A S 1 airWavt ... iv vnpti xaXcj). Here koip.ij0r; and airiBavt may be taken as render- ings of the same Hebrew word, but virvq k=-qiei nys/2, an un- doubted corruption of naia ni'tt/2 =" at a good old age." The same corruption invaded both Hebrew recensions in T. Zeb. x. 6; T. Dan. vii. 1; T. Ash. viii. I; T. Jos. xx. 4, whereas in T. Iss. vii. 9 both recensions were right. In the late Hebrew text of Naph. i. I the correct Hebrew phrase is found. Again in T. Ash. vi. 6 a reads tiafyiptt. aCiToi/ ds gorr/ v ai&vwv and (3 A S l Trapapudelrai airrdv iv C*o&. Here ■wapap.vdtiTai = Dnr, a corruption of nny = ti(T(j>;pa. It is the soul of the righteous that is here spoken of, and a rightly says that the angel of peace. " leads him into eternal life." The Tightness of H" is confirmed by T. Benj. vi. I, which reads 6 tap &yye\os rrjs tipr)vrjs ddriytt ri/v ipvxliv aiiTov.*

H a and W, however, differed mainly from each other in words and phrases, as we infer from a and /3. In some passages, however, the divergence is on a larger scale, as in T. Lev. ii. 7-iii. Not- withstanding these divergences, however, the great similarities be- tween o and /3 oblige us to assume that the translator of W used the Greek version of H a , or vice versa. That the former is the more likely we shall see presently. To the above we have a good parallel in the Book of Daniel; for the variations of its two chief Greek Versions — that of the Septuagint and of Theodotion — go back to variations in the Semitic.

Date of the Original Hebrew. — " The date of the groundwork of the Testaments is not difficult to determine. Thus Reuben (T. Reub. vi. IO-Il) admonishes his sons: Ilpds rbv Atvl iyyiaart iv Ta.Treiv<)*

Date of the Greek Version. — The o Version seems to have been translated first, indeed before A.D. 50; for it is twice quoted by St Paul. The first passage is in Rom. i. 32 ci p.6vov avra iroiovai-v 4XXd Kal crvvtvhoKovoiv tois Tpaaaovaiv which is taken almosl; verbally from T. Ash. vi. 2, on ol hurpbawvoi. Sicro-ffis \Ko\aaovre.i (rd. ilp.apT6.vomi) hri Kal Tvpaaaovai to kokov Kal awevhoKOvffi Toti Trpao-aovaw. Since bg, A omit the words irt … irpaaaovatv, we conclude that, though it is now found in o, adef, S 1 , it was originally wanting in /3 and probably also in Hp. For as we have already seen (see diagram above) aef were early influenced by o, and d is conflate in character. Hence in reality the gassage was pre- served only by a originally.

The second passage is the well-known one in I Thess. ii. 16, lDEFG it, Vulg. go) as t&os, which is borrowed from T. Lev. vi. 1 1 , tiAaaev hi (+&r'/3) airois ij dpyfj tov deov els TiXos.

Here reads Kvplov for tov dtov. The iirl is omitted by a through a simple scribal error.

On the ground of the above quotations we assume, therefore, that o was used by St Paul, and that H« was therefore translated into Greek at latest before a.d. 50.

>8

TESTAMENTUM DOMINI

When H8 was translated we have no definite means of deter- mining. It was in all likelihood done subsequently to H«. The translator of HS appears to have had the translation of H« before him, and to have followed it generally unless where there were manifest divergencies between H" and HP. 1

Jewish Additions to the Text. — (a) A large body of these additions can be classed under one head as written with a well-defined object and at a definite period. This period was about 70-40 B.C., and the object of the additions was the overthrow of the Maccabean high-priesthood, which in the 1st century B.C. had become guilty of every lewdness. T. Lev. x., xiv.-xvi. ; T. Jud. xvii. 2-xviii. I (?), xxi. 6-xxiii., xxiv. 4-6; T. Zeb. ix.; T. Dan. v. 6-7, vii. 3 (?) ; T. Naph. iv. ; T. Gad. viii. 2; T. Ash. vii. 4-7. These additions are identical in object and closely related in character and diction with the Psalms of Solomon.

(b) Other additions are of various dates and cannot be more than mentioned here, i.e., T. Reub. ii. 3-iii. 2; T. Lev. xvii. 1-9; T. Zeb. vi. 4-6, vii.-viii. 3 ; T. Jos. x. 5-xviii.

Christian Additions to the Text. — These additions are to be found in most of the Testaments and were made at different periods. The existence of these Christian elements in the text misled nearly every scholar for the past four hundred years into believing that the book itself was a Christian apocryph. To Grabe, Schnapp and Conybeare belongs the credit of showing that the Christian elements were interpolations — to Conybeare especially of the three, since, whereas the two others showed the high

probability of their contention on internal evidence, Conybeare proved by means of the Armenian Version that when it was made many of the interpolations had not yet found their way into the text. For a full treatment of these passages see R. H. Charles's Testaments of the Twelve Patriarchs (1908), Introd. § 20.

Influence on the New Testament. — We have already shown that St Paul twice quoted from the Greek text of the Testaments. These two passages in Rom. and I Thess. give but the very faintest idea of the degree of his indebtedness in thought and phraseology in several of his Epistles, especially that to the Romans. But of still greater interest are the passages in the Gospels which show the influence of the Testaments, and these belong mainly to the sayings and discourses of our Lord. We may mention two of the most notable of these. Thus Matt, xviii. 15, 35, which deal with the great question of forgiveness, are clearly dependent on our text.

Matt, xviii. 15. 'Edx U &iiap- T. Gad. vi. 3. 'Ed t« &vap-*

ttj(7-j] 6 dStX^os gov Kara aov, Tjjtrei tis at tiici aur£ kv eipjiVQ

viraye Z\tyt;oi> abrdv juera£i» aov . . . ko.1 tav . . . ner avoTjaji

Kal avrov tiovou. a<^>es avrip.

35- 'Ed fir) aTJTe enaaros t<£ vi. 6. Havxacrov ni) i\ey£ns.*

hfre

bjiwv. V. 7- "A0es ai/Tcp inro Kaphias.

Next, the duty of loving God and our neighbour is already found in T. Dan. v. 3, which is the oldest literary authority which enjoins these two great commands. The form is infinitely finer in Matt, xxii- 37 - 39> but the matter is already in the Test. Dan. See Introd. § 26 to R. H. Charles's

Testaments of the Twelve Patriarchs.

Literature. — (a) Texts. — Sinker, Testamenta XII Patriarcharum (1869); [this work gives b in the text and a in the footnotes; sub- sequently (1879) Sinker issued an Appendix with variations from eg] ; Charles, The Greek Versions of the Testaments of the XII. Patriarchs from nine MSS., with the Variants from the Armenian and Slavonic Versions and the Hebrew Fragments (1908). Com- mentary. — Charles, The Testaments of the Twelve Patriarchs trans- lated from the Editor's Greek Text (1908). Critical Inquiries. — See Schurer, G. J. V. iii. 261-262: Charles, The Test. XII. Patriarchs, pp. xxxvi.-xli. (R. H. C.)

TESTAMENTUM DOMINI ("Testament of our Lord"). Extracts from the book which bears this title, contained in an 8th-century MS. at Paris, were published by Lagarde in 1856 (Reliquiae iuris ecclesiastici antiquissimae 8o-8g); and a Latin fragment, edited by Dr Montague James, appeared in 1893 (Texts and Studies, i. 154). The whole book was first published in Syriac in 1899, with a Latin translation by Mgr Rahmani, the Uniat Syrian Patriarch of Antioch. His text is that of a 17th-century MS. at Mosul, the colophon of which says that the Syriac text was translated from the original Greek " a Jacobo paupere, " evidently- James of Edessa, in a.d. 687; but he makes use of other material, including an Arabic version made from a Coptic copy written in a.d. 927. The Mosul MS. contains the whole Bible in the Peshitto version, followed by the Syrian " Clementine Octateuch, " i.e., the collection of ecclesiastical law, in eight books, which was used by the Nestorians and

1 § 14 of the Introduction to R. H. Charles's The Greek Versions of the Testaments of the XII. Patriarchs.

Jacobites. Of this the Testament forms the first two books; and according to the title (which, apparently by an error, is made to apply to the whole eight

books) it contains the " testa- ment, or words which Our Lord spake to His holy Apostles when He rose from the dead. " Plainly, it is one of that series of writings, claiming to embody the fundamental rules of the Church, which culminates in the Apostolical Constitutions (q.v.). It falls into three distinct parts: an apocalyptic introduction (book i. chapters 1-18; the division into books, however, is clearly not original) ; a " church order " proper (i. 19— ii. 24) ; and a conclusion (ii. 25-27) of the same apocalyptic character as the introduction, (a) The Introduction professes to contain the record of the revelation of Himself by the Lord to His Apostles, with whom are Martha, Mary and Salome, on the evening after His resurrection. He is represented as unfolding to them, at their request, the signs of the end, and giving them instruction on various other topics. Incidentally, the fact becomes plain that this section is composed from the standpoint of Asia Minor and Syria, that it dates from soon after the time of Maximin (235-38) and Decius (249-51), and that it springs from a Christian community of a strictly puritan type, (b) The Church Order follows the general lines of the Canons of Hippolytus and similar documents. It describes the Church and its buildings (i. 19) ; the office of the bishop and his functions (i. 19-27) : the mystagogic instruction (i. 28) common to this and the Arabic Didascalia, where it occurs in an earlier form, and based in part upon the Gnostic " Acts of Peter"; the presbyter (i. 29-32) ; the deacon (i. 33-38) ; con- fessors (i. 39); the "widows who have precedence in sitting" (i. 40-43), apparently the same persons who are spoken of else- where as " presbyteresses " (i. 35, ii. 19) ; the subdeacon (i. 44) and the reader (1. 45), the order of whose offices seems to have been inverted ; virgins of both sexes (i. 46) ; and those who possess charismata or spiritual gifts (i. 47). Next come the regulations for the laity, including the whole course of preparation for and admission to baptism (ii. 1-8), confirmation (ii. 9), and the eucharist (ii. 10) ; after which there follows a series of miscellaneous regula- tions for Easter and

Pentecost (ii. 11–12), the agape (ii. 13), the funds of the Church (ii. 17–20), the visitation of the sick (ii. 21), the use of psalmody (ii. 22), the burial of the dead (ii. 23), and the hours of prayer (ii. 24). (c) The Conclusion (ii. 25–27) brings us back to the injunctions of the Lord as to the keeping of these pre- cepts, a special charge to John, Andrew and Peter, and a state- ment that copies of the Testament were made by John, Peter and Matthew, and sent to Jerusalem by the hands of Dosithaeus, Sillas, Magnus and Aquila.

In all this there is much that is peculiar to or characteristic of the Testament. First and foremost is its ascription to the Lord Himself, which we can hardly be mistaken in regarding as an attempt to claim yet higher sanction than was claimed by the various compilations which were styled " apostolic. " This fact alone would lead us to infer the pre-existence of certain of the latter. Again, the whole tone of the Testamentum is one of highly strung asceticism, and the regulations are such as point by their severity to a small and strictly organized body. They are " the wise," " the perfect," " sons of light "; but this somewhat Gnostic phraseology is not accompanied with any signs of Gnostic doctrine, and the work as a whole is orthodox in tone. They are set in the midst of " wolves," despised and slighted by the careless and worldly: there is frequent mention of " the persecuted," and of the duty of " bearing the cross." There appears to be no locus poenitentiae for serious sins ex- cepting in the case of catechumens, and there is a notable "perfectionist " tone in many of the prayers. Charismata, and above all exorcisms, occupy a very important place: there is a vivid realization of the ministry of angels, and the angelic hierarchy is very complete. Great stress is laid upon virginity (although there is not a sign of monasticism), upon fasting (especially for the bishop), upon the regular attendance of the whole clerical body and the " more perfect " of the laity at the hours of prayer. The church buildings are very elaborate, and the baptistery is oblong, a form found apparently

only here and in the Arabic Didascalia. Amongst the festivals mentioned are the Epiphany, Easter and Pentecost. With regard to the prayers, they are based upon forms common to this and other Church orders, but have many lengthy interpolations of an inflated and rhapsodic kind. The bishop appears to rank far above the presbyters (more conspicuously so, for example, than in the Canons of Hippolytus), and the presbyters are still divided into two classes, those who are more learned and those

who are of mature age. The deacons have functions in the Eucharist and about the altar which point to an early date; they have also much administrative work of an important kind, and especial provisions are made for the care of the sick and the dead, and the burial of those who perish by shipwreck. One of the deacons is to be chosen as " chief deacon " (protodiaconus, i. 19, cf. i. 34), and is charged with the care of pilgrims. There are no doorkeepers or singers, who begin to appear circ. a.d. 340. The honour given to confessors is very conspicuous, and points back to an early date. But remarkable above all is the position given to women. We have " widows having precedence " or presbyteresses, three in number, deaconesses, virgins, and widows who are in receipt of the alms of the Church; and the first-named occupy a place of very great dignity, which is almost unequalled elsewhere (excepting in the earlier form of the apocryphal and Montanistic Acts and Martyrdom of Matthew, where the relation of the irptafivT). and deaconess corresponds with that of the Testament), and which was formally condemned by the Council of Laodicea in Phrygia.

What conclusion is to be drawn, then, as to the age and character of the Testament? Mgr Rahmani's view, that it is a work of the 2nd century, is universally discredited; nor has Funk's contention found acceptance, that it and the Canons of Hippolytus are alike derived ultimately from the eighth book of the

Apostolic Constitutions. Some scholars think that the Apocalypse at the beginning is pre-Nicene (a.d. 250-325), and that it originates from Asia Minor, probably from Mon- tanistic circles. Harnack formerly contended that this was an independent work, upon which the Church Order had been grafted, and that as a whole it dated from circ A.d. 400. But the unity of thought and atmosphere is such as to show that the work is one whole (subject no doubt to a certain amount of redaction and interpolation), and that the apocalyptic part was composed as an introduction to the rest. As to the central portion (i. 10-ii. 24) it is a Church Order of the same kind as the Canons of Hippolytus (c. 220) and the Egyptian (c. 310) and Ethiopic (c. 335) Church Orders, standing nearer to the two latter than to the former, and especially to the Verona Latin Fragments, part iii. (c. 340), published in 1900 by Dr Hauler. The precise relation in which these documents stand to one another still remains in a measure doubtful, but it seems pro- bable that they are based upon a lost Church Order, to which the Canons of Hippolytus stands nearest. [The Greek original of the Testamentum -would seem to date from the middle of the 4th century, not long after 350. This is the view of T. Zahn and Dom Morin and also of Profs. Cooper and Maclean. It is possible that about 400 a later, editor added a few paragraphs.]*

Such redaction was indeed inevitable in the case of a work which has had a living history as part of a codex of Church law. It may be discerned in the interpolations in the prayers; possibly in the reference to the chief deacon, for elsewhere no single deacon is distinguished by name until the close of the 4th century; in the reference to the Epiphany, which is first heard of elsewhere at the beginning of the 4th century. The sugges- tion has been hazarded that this revision was due to the school of Apollinaris of Laodicea (died circ. a.d. 390).

Authorities. — Ign. Ephr. Rahmani, Testamentum Domini nostri Jesu Christi (Moguntiae, 1899); E. Hauler, Didascaliae Aposto- lorum Fragmenta

Ueronensia Latina (Lipsiae, 1900) ; A. Harnack in Sitzungsberichte der K. Preuss. Akad. der Wissenschaften, xlix. (Berlin, 1899); Bishop J. Wordsworth in Church Quarterly Review (London, April 1900) ; and Revue Internationale de theologie (Bern, July 1900); R. B. Rackham in Indian Church Quarterly Review (Calcutta, January and April 1901); F. X. Funk, Das Testament des Herrn und die verwandten Schriften (Mainz, 1901); James Cooper and A. J. Maclean, The Testament of Our Lord, an English translation, with introduction and notes (Edinburgh, 1902). Cf. also A. J. Maclean, Recent Discoveries illustrating Early Christian Life and Worship (London, 1904). (W. E. Co.)

TESTAMUR, Latin for "we testify" or "certify" (testari). The name given in English universities to a certificate given to a student signifying that he has passed an examination, so called from the word with which the certificate begins.

TESTER (Fr. tttiere, head-covering, from lite), anything placed horizontally over the head, as the sound-board of a pulpit, the flat boards over an old-fashioned bed, &c.

TETANUS (from Gr. reiva, I stretch, on account of the tension of the fibres of the affected muscles), or Lockjaw, a disease caused by the bacilli Tetani (see Parasitic Diseases). The home of these bacilli is the earth, and so it comes about that if a man is thrown off his bicycle and grazes his ungloved hand upon the road, or running without shoes cuts his foot, there is a considerable chance of the bacilli entering the wound and giving him lockjaw. It is popularly thought that wounds in the region of the thumb are most often followed by the disease, but this is not a fact. Wounds about the thumb are of common occurrence, but they are not, in proportion, more often the starting point of tetanus.

Acute traumatic tetanus is very deadly, and up to the present time nothing has been discovered to check or guide its almost certainly fatal course. It often picks out the young and vigorous as its

victims — the athlete, for instance, who meets with some mishap in the field or on the road, the gardener who pricks his hand, the swimmer who cuts his foot, the wounded soldier on the field of battle. The violent muscular contractions are distressingly painful; and the brain remaining perfectly clear throughout, the unhappy individual feels that the vice- like gripping of his muscles is steadily exhausting him and bringing him down. The spasms of tetanus differ from those caused by the administration of strychnine in that the muscles are all the time hard from- rigid contraction, the acute spasmodic attacks being superadded, as it were. In poisoning by strychnine the muscles are quite relaxed between the spasmodic attacks.

Tetanus may follow a mere prick or scratch or a severe surgical operation. It not seldom complicates burns, gunshot wounds and injuries caused by the untimely explosion of fire- works. It may be met with in the woman in child-bed or in the newly-born infant. But wherever it occurs it is due to the one cause — to the reception into some wounded surface of the specific germs.

In hot countries tetanus is more common and more acute than it is in temperate climes, and a case has been recorded in which a man in the West Indies cut his hand on a broken plate at dinner and was dead of tetanus before the day was out. It is easy to see that the germs are more likely to undergo virulent cultivation in warm earth than in cold. It was formerly the custom to speak of idiopathic tetanus—that is to say, of the disease occurring without any wound having been received. But modern teaching is to the effect that there must have been some wound, however slight, by which the germs found entrance. Rheumatic tetanus is as unreal a disease as that just mentioned. The germs themselves do not wander from the wound to multiply in the blood as in infecting diseases, but remaining at the wound elaborate a terribly poisonous substance (a toxin) which makes its way along the nerve-trunks to the spinal cord. Even prompt amputation, however, is likely to prove ineffectual as regards cure, for the

germs in the wound have in this growth set free so virulent a poison (toxin) that the nerves of the voluntary muscles all over the body are hopelessly under its influence.

The first symptom of the disease is discomfort in the back of the neck; the man waking up in the morning, for instance, complains of " stiff neck " and of obscure pains, and wonders if he has been lying in a draught. Then the muscles of the jaw and of the face become affected, there being a difficulty in opening the mouth, and the corners of the mouth are drawn downwards and backwards, and fixed in that position (risus sdrdonicus). The jaw is so firmly set that it is impossible to pass anything between the teeth. All food, therefore, has to be fluid, and being poured into the pouch of the cheek, finds its way into the mouth by the serviceable gap which exists behind the wisdom-teeth. Soon, however, a difficulty in swallowing comes on because of the muscles of the throat being involved. The muscles of the abdomen becoming contracted are rigidly fixed, and on laying the hand upon the front of the abdomen

they feel as " hard as a board." The muscles of the limbs are also attacked with fearful cramps, and, last of all, the muscles of the chest are involved. Though all these muscles are in a continuous state of contraction, spasmodic contractions, as already remarked, come on in addition, and occasionally with such distressing energy that the patient is doubled up forwards, backwards, or sideways, and, may be, some of the muscles tear across. The patient is bathed in perspiration, and sinks worn out and exhausted, or, perchance, slowly suffocated by the locking of the muscles of respiration.

As regards the prospect of recovery in tetanus it may be said that when the symptoms break out acutely within a week of the reception of an injury the

prospect of recovery is ex- tremely remote. If they occur within ten days the prospects are bad. But if there is an interval of three weeks or a fortnight before their occurrence the case may be regarded more hope- fully.

In the treatment of tetanus the first thing to do is to try to make the wound by which infection has taken place surgically clean. For though a wound free from the germs of suppuration may be the incubating place of the bacilli of tetanus, still in most cases there is also an invasion of septic germs, and the double infection makes the action of the tetanic poison the more virulent. If the local conditions are such that it is impossible to cleanse the wound, the free use of the knife or of the cautery or of pure car- bolic acid may be resorted to, or an amputation may be performed. But even the early amputation of the infected part may not avail for the reason that the germs in the wound have already set free a lethal dose of their toxin.

The wound having been cleansed the further treatment of the disease demands absolute quiet in a darkened room. There must be no slamming of the door, shaking of the bed, or the sudden bringing in of a light, for any act such as this might cause the outbreak of a violent spasm. Morphia may be given by the hypo- dermic syringe, and if the spasms are causing great distress chloro- form may be administered; indeed, in certain severe cases it may be necessary to keep the patient almost continuously under its influence. If there is difficulty in swallowing fluid, rectal feeding must be resorted to. Though at present one is unable to speak enthusiastically or with confidence about the antitoxin treatment of lockjaw, still it is a method which should certainly be given trial — and that early. The tetano-antitoxin is prepared from the blood of animals which have been rendered immune to repeated injections of the poison elaborated by the cultivation of the tetanus bacilli. The bacilli themselves are not injected, the injections being rendered steril°. By passing the sterile injections into one of the lower animals the blood of that animal prepares an antidote to

them known as an antitoxin.

The antitoxin may be injected into the nerve trunks or into the sheath of the spinal cord or of the brain. But inasmuch as the nerves and the nerve-cells are under the influence of the toxin before the antitoxin is administered — as evidenced by the occur- rence of the symptoms — the injection-treatment has but a poor chance of producing a good effect. (E. O.*)

TETRADYMITE, a mineral consisting of bismuth telluride and sulphide, Bi 2 Te2S, also known as " telluric bismuth." Sometimes sulphur is absent and the formula is then Bi 2 Tej; traces of selenium are usually present. Crystals are rhom- bohedral, but are rarely distinctly developed; they are twinned together in groups of four; hence the name of the mineral, from the Greek, TtTpa&vnos, fourfold. There is a perfect cleavage parallel to the basal plane; and the mineral usually occurs in foliated masses of irregular outline. The colour is steel-grey, and the lustre metallic and brilliant. The mineral is very soft (H=i$) and marks paper; the specific gravity is 7-2 to 7-6. It was first found, in 1815, at Telemarken in Norway; crystals are from Schubkau near Schemnitz in Hungary. It often occurs in quartz associated with native gold. Other species very similar to tetradymite, but with different formulae, are: joseile, from San Jose near Marianna in Brazil; griinlingite (Bi 4 SaTe), from Caldbeck Fells in Cumber- land; and wehrlite, from Hungary. (L. J. S.)

TETRAGRAMMATON (rtTTapa, four; ypanfia, letter), a Greek compound, found in Philo and Josephus, which designates the divine name composed of the four Hebrew letters J H V H (ro.v). The derivation and pronunciation of the Tetra- grammaton is still doubtful. The form " Jehovah " (q.v.) used in some of the English Versions is an error which arose

in the 16th century. It is now generally assumed that the word is the causative form {hiph'il) and should be pronounced Yahveh or Yahweh (accent on second syllable). The Jews quite early ceased to

pronounce the Tetragrammaton, substituting (as the Books of Chronicles and the LXX translation already indicate) the word Lord ('Adonai), The priests continued to use the name in the Benediction of the People (Numbers vi. 22-27), and on the Day of Atonement the High Priest pro- nounced it (Leviticus xvi. 30) amidst the prostrations of the assembled multitude. It is recorded in the Talmud that Rabbis communicated the true pronunciation to their disciples once in seven years (Qiddushin, 71a). The Jews called the Tetra- grammaton by a Hebrew denomination, Shem Hammephorash (itniBBg op), i.e. the distinctive excellent name. It was con- sidered an act of blasphemy for a layman to pronounce the Tetragrammaton. This avoidance of the original name was due on the one hand to reverence and on the other to fear lest the name be desecrated by heathens. Partly in consequence of this mystery and partly in accord with widespread super- stitions, the Tetragrammaton figures in magical formulae from the time of the Gnostics, and on amulets. Many a medieval miracle-worker was supposed to derive his competence from his knowledge of the secret of the Name.

TETRAHEDRITE, a mineral consisting typically of copper sulph-antimonite, Cu 3 SbS 3 , but often of complex composition. The copper is usually isomorphously replaced by variable amounts of silver, iron, zinc, mercury, lead or cobalt, and the antimony by arsenic or bismuth. In general, the formula is R'eXjSn-f-xR'eXA, where R' = Cu, Ag; X = Sb, As, Bi; R' = Fe, Zn, and x is a small fraction, often ^ or £. Numerous special names have been applied to varieties differing in chemical composition; the arsenic compound, CU3ASS3, is known as tennantite (after Smithson Tennant). The old German name Fahlerz includes both tetrahedrite and tennantite, and so does the term "grey copper ore "of miners. Tetrahedrite is an important ore of copper, the formula Cu 3 SbS 3 , cor responding with 57-5 per cent. Of this metal; it is also largely worked as an ore of silver, of which element it sometimes contains as much as 30 per cent. Well-

developed crystals are of frequent occur- rence;- they belong to the tetrahedral class of the cubic system, and their tetrahedral form is a very characteristic feature of the mineral, which for this reason was named tetrahedrite. Fig. 1

Fig. 1.

Fig. 2.

Crystals of Tetrahedrite.

shows a combination of a tetrahedron and a triakis-tetrahedron (211), and fig. 2 a tetrahedron with the rhombic dodecahedron. Interpenetrating twinned crystals sometimes occur. The colour is steel-grey to iron-black, and the lustre metallic and brilliant. The streak is usually black; sometimes, however, it is dark cherry-red, and very thin splinters of the mineral then transmit a small amount of blood-red light. The hardness is 4j„ and the specific gravity varies with the composition from 4-4 to 5- 1. There is no cleavage, and the fracture is conchoidal. The material is often very impure owing to intimate inter- mixture with chalcopyrite.

Tetrahedrite occurs in metalliferous veins associated with chal- copyrite, pyrites, blende, galena, &c. Fine groups of crystals, coated on their surface with brassy or brilliantly tarnished chal-copyrite, were formerly found at Herodsfoot mine, near Liskeard in Cornwall. Good crystals are also met with at Kapnik-Banya in Hungary, in the Harz, Peru, and other places. Tennantite occurs as small crystals of cubic or dodecahedral habit in many

Cornish copper mines, especially in the neighbourhood of Re

TETRAHEDRON (Gr. rirpa-, four, iSpa, face or base), in geometry, a solid bounded by four triangular

faces. It conse- quently has four vertices and six edges. If the faces be all equal equilateral triangles the solid is termed the ” regular ” tetrahedron. This is one of the Platonic solids, and is treated in the article Polyhedron, as is also the derived Archimedean solid named the ” truncated tetrahedron “; in addition, the regular tetrahedron has important crystallographic relations, being the hemihedral form of the regular octahedron and conse- quently a form of the cubic system. The bisphenoids (the hemihedral forms of the tetragonal and rhombic bipyramids), and the trigonal pyramid of the hexagonal system, are examples of non-regular tetrahedra (see Crystallography). ” Tetra- hedral co-ordinates ” are a system of quadriplanar co-ordinates, the fundamental planes being the faces of a tetrahedron, and the co-ordinates the perpendicular distances of the point from the faces, a positive sign being given if the point be between the face and the opposite vertex, and a negative sign if not. If («, v, w, t) be the co-ordinates of any point, then the relation u+v+w+t = R, where R is a constant, invariably holds. This system is of much service in following out mathematical, physical and chemical problems in which it is necessary to represent four variables.

Related to the tetrahedron are two spheres which have received much attention. The ” twelve-point sphere,” dis- covered by P. M. E. Prouhet {1817-1867) in 1863, is somewhat analogous to the nine-point circle of a triangle. If the per- pendiculars from the vertices to the opposite faces of a tetrahedron be concurrent, then a sphere passes through the four feet of the perpendiculars, and consequently through the centre of gravity of each of the four faces, and through the mid-points of the segments of the perpendiculars between the vertices and their common point of intersection. This theorem has been generalized for any tetrahedron; a sphere can be drawn through the four feet of the perpendiculars, and conse- quently through the mid-points of the lines from the vertices to the centre of the hyperboloid having these perpendiculars as

generators, and through the orthogonal projections of these points on the opposite faces.

TETRARCH (rtTpapxqs), the ruler of a tetrarchy, that is, in the original sense of the word, of one quarter of a region. Such were the tetrarchies of Thessaly as reconstructed by Philip of Macedon and of Galatia before its conquest by the Romans (169 B.C.). In later times the title of tetrarch is familiar from the New Testament as borne by certain princes of the petty dynasties which the Romans allowed to exercise a de- pendent sovereignty within the province of Syria. In this application it has lost its original precise sense, and means only the ruler of part of a divided kingdom, or of a district too un- important to justify a higher title. After the death of Herod the Great (4 B.C.) his realm was shared among his three sons: the chief part, including Judaea, Samaria and: Idumaea, fell to Archelaus (Matt. ii. 22), with the title of ethnarch (Josephus, Antiq., xvii. 11, 4); Philip received the north-east of the realm and was called tetrarch; and Galilee was given to Herod Antipas, who bore the same title (Luke iii. 1). These three sovereignties were reunited under Herod Agrippa from a.d. 41 to 44. In the same passage of Luke mention is made of Ly- sanias, tetrarch of Abilene near Damascus, in the valley of the Barada.

TETRASTO6N (Gr. rirpa-, four, and aroa, a portico), the term in architecture given to a rectangular court round which on all four sides is carried a covered portico or colonnade; the same as peristyle (g.v.).

TETRASTTLE (Gr. rirpa-, four, and

TET RAZINES, in organic chemistry, a group of compounds containing the ring system

C-N-N C-N-N C-NC

CNN, ° r N-N-C, or N-N-N; only derivatives of the first two types are known. The mem- bers of the first series may be prepared by oxidizing osazones

(i.e. dihydrazones of a-diketones), dihydrotetrazines resulting. Dihydro-derivatives of the second type are formed from hydrazine and imirio-ethers (A. Pinner, Ber., 1893, 26, p. 2126; 1894, 27, p. 984); these easily oxidize to the corresponding tetrazines, which are stable towards acids; their dihydro-derivatives, however, are decomposed, the group — NH-NH — being elimi- nated as hydrazine and replaced by oxygen, with consequent formation of the five membered oxybiazole ring. Concentrated acids convert the dihydro-tetrazines into isodihydrotetrazines, thus: —

R-C-NH-NH R-C-NH-N

N-N :C-R ~* N-NH-C-R, the N-alkyl derivatives of which type may be prepared by the action of alcoholic potash and chloroform on aromatic hydrar zines.

Much discussion has circulated about the decomposition of diazo-acetic ester, from which A. Hantzsch and O. Silberrad (Ber., 1900, 33, p. 58) obtained what they considered to be a dihydro-tetrazirte, thus: —

HC-NH-N N-NH-CH.

CH-C0 2 R H0 2 C-CH-N:N

£Sj "* N:N -CH-C0 2 H ~>

C. Biilow (Ber., 1906, 39, pp. 2618, 4106), however, showed this substance to be an N-armnotriazole, which necessitates _ the first decomposition product being an acid (I.), the conversion into the (I.) HOsC-C-NH-NH . ,„ , H0 2 C-C—N-NH 2

N-N: C-C0 2 H ~~> U1J N-N:C-C0 2 H

triazole derivative (II.) being due .to the ring opening on the addition of the elements of water and then closing again to the nve-membered ring with elimination of water again. The decompositions of diazo- acetic ester were then again examined by T. Curtius and his students (Ber., 1907, 40, pp. 262,

350, 450, &c), who showed that both triazole and tetrazine derivatives could be obtained from the bisdiazo-acetic acid which is formed by the action of alkali on diazo-acetic ester.

TETRAZOLES, in organic chemistry, a group of heterocyclic compounds, capable of existing in two isomeric series (formulae 1 and 2), although the methods Of preparation do not always permit discrimination between the possible isomers. They are prepared by the action of nitrous acid on cyanamidrazone (dicyanophenylhydrazine) and hydrolysis of the resulting nitrile, from which J. A. Bladin by elimination of the phenyl group (by nitration, reduction, &c.) and of carbon dioxide obtained free tetrazole, CH 4 N 2 ; from amidines by the action of nitrous acid, followed by the reduction of the intermediately formed dioxytetrazotic acids with sodium amalgam; from amidoguanidine by diazdtization, the diazonium nitrate on treatment with acetates or carbonates yielding aminotetrazole (J. Thiele, Ann., 1892, 270, p. 1); from the action of nitrous acid on phenylthiosemicarbazide; and by the action of aryl-azoimides on aldehyde hydrazones (O. Dimroth, Ber., 1907, 40, p. 2402). The tetrazoles behave as strong monobasic acids, and are exceedingly stable. A series of tetrazolium bases (formula 3) have been obtained by H. V. Pechmann (Ber,, 1894, 27, p. 2920) starting from formazyl compounds (formula 4), which are oxidized by means of amyl nitrite and hydrochloric acid. They are strong bases, which in aqueous solution absorb carbon dioxide readily. The free bases have not been isolated, but their salts are well-crystallized solids.

/N:N M /N-NH /N:CH RHN— N:CH

HIN \N:CH 0r W \N:CH K ^\N:N RN:N

(1)

(2)

HOR

(3)

(4)–

TETSCHEN, a town of Bohemia, Austria, 83 m. N.N.E. of Prague by rail. Pop (1900) 9692, exclusively German. It is situated at the confluence of the Polzen with the Elbe, on the right bank of the latter river opposite Bodenbach (g.v.), with

which it is connected by a chain bridge (1855) and two railway bridges. The handsome chateau of the counts of Thun (built in 1667–73 an d restored in 1788), which occupies a rocky height above the town, was at one time fortified, and was a place of some importance during the Seven Years' War. It contains a magnificent library, with many valuable MSS. and fne collec- tions of coins and armour. In addition to being the principal emporium for the Austrian traffic on the Elbe, Tetschen has a considerable industry, its products comprising chemicals, oil, soap, cotton stuffs, plaster of Paris, glazed and coloured paper, cellulose, beer, flour and preserved fish.

The town of Tetschen originally lay on the south side of the castle rock, but after its destruction by a flood, it was moved in 1059 to its present site. In 1305 it came into the hands of the knights of Wartenberg, who held it for two hundred years. In 1534 the Saxon lords of Biinau obtained it and introduced the Protestant religion, which was exterminated when, after the battle of the White Hill (1620) the Bunau family was driven out. The lordship was bought from them in 1628 by the Freiherr von Thun, by whose descendants, the Counts Thun, it is still held.

TETUAN (Tettawan), the only open port of Morocco on the Mediterranean, a few miles S. of the Strait of Gibraltar, and about 40 m. E.S.E. of Tangier.

Population about 25,000, of whom a fifth are Jews. It is picturesquely situated on the northern slope of a fertile valley down which flows the W. Martil, with the harbour of Tetuan, Martil, at its mouth. Behind rise rugged masses of rock, the southern wall of the Anjera country, practically closed to Europeans, and across the valley are the hills which form the northern limit of the still more impenetrable Rif. In point of cleanliness Tetuan compares favourably with most Moorish towns. The streets are fairly wide and straight, and several of the houses belonging to aristocratic Moors, descendants of those expelled from Spain, have fine courts surrounded by arcades, some with marble fountains and planted with orange trees. Within the houses the ceilings are often exquisitely carved and painted in Mauresque designs, such as are found in the Alhambra, and the tile-work for which Tetuan is known may be seen on floors, pillars and dados. The principal industries are tilework, inlaying with silver wire, and the manufacture of thick-soled yellow slippers, much-esteemed flintlocks, and artistic " towels " used as cape and skirt by Moorish country girls. The Jews live in a mellah, separated from the rest of the town by gates which are closed at night. The harbour of Tetuan is obstructed by a bar, over which only small vessels can pass, and the roadstead, sheltered to the N., N.W. and S., is exposed to the E., and is at times unsafe in consequence of the strong Levanter.

The present town of Tetuan dates from 1492, when the Andalusian Moors first reared the walls and then filled the enclosure with houses. It had a reputation for piracy at various times in its history. It was taken on the 4th of February i860 by the Spaniards under O'Donnell, and almost transformed by them into a European city before its evacuation on the 2nd of May 1862, but so hateful were the changes to the Moors that they completely destroyed all vestiges of alteration and reduced the city to its former state. (K. A. M.)*

TETZEL, JOHANN (c. 1460-15 19), preacher and salesman of papal indulgences, the son of Hans

Tetzel, a goldsmith of Leipzig, was born there about 1460. He matriculated at the university in 1482, graduated B.A. in 1487, and in 1489 entered the Dominican convent at Leipzig. He early discovered his vocation as a preacher of indulgences; he combined the elocu- tionary gifts of a revivalist orator with the shrewdness of an auctioneer. He painted in lurid colours the terrors of pur- gatory, while he dwelt on the cheapness of the indulgence which would purchase remission and his prices were lowered as each sale approached its end. He began in 1502 in the service of the Cardinal-legate Raymond Peraudi; and in the next few years he visited Freiberg (where he extracted 2000 gulden in two days), Dresden, Pirna, Leipzig, Zwickau and Gorlitz. Later on he was at Nuremberg, Ulm and Innsbruck, where he is said to have been condemned to imprisonment for adultery, but released at the intercession of the elector of Saxony. This

charge is denied by his apologists; and though his methods were attacked by good Catholics like Johann Hass, he was elected prior of the Dominicans in Glogau in 1 505.

Fresh scope was given to his activity in 151 7 by archbishop Albrecht of Mainz. Albrecht had been elected at the age of twenty-four to a see already impoverished by frequent suc- cessions and payments of annates to Rome. He had agreed with Pope Leo X. to pay his first-fruits in cash, on condition that he were allowed to recoup himself by the sale of indulgences. Half the proceeds in his province were to go to him, half to Leo X. for building the basilica of St Peter's at Rome. Tetzel was selected as the most efficient salesman; he was appointed general sub-commissioner for indulgences, and was accompanied by a clerk of the Fuggers from whom Albrecht had borrowed the money to pay his first-fruits. Tetzel's efforts irretrievably damaged the complicated and abstruse Catholic doctrine on the subject of indulgences; as soon as the coin clinks in the chest, he cried, the soul is freed from purgatory. In June he was at Magdeburg, Halle and Naumburg; the elector of Saxony excluded him from

his dominions, but Albrecht 's brother, the elector Joachim of Brandenburg, encouraged him at Berlin in the hope of sharing the spoils, and by the connivance of Duke George of Saxony he was permitted to pursue his opera- tions within a few miles of the electoral territory at Wittenberg. Luther was thus roused to publish his momentous ninety-five theses on the subject of indulgences on October 31, 151 7 (see Luther).

Even Albrecht was shamed by Luther's attack, but he could not afford to relinquish his profits already pledged for the re- payment of his debts; and Tetzel was encouraged to defend himself and indulgences. Through the influence of Conrad Wimpina, rector of Frankfurt, Tetzel was created D.D. of that university, and with Wimpina's assistance he drew up, in January 1518, a hundred and six theses in answer to Luther's. But the storm overwhelmed him: sober Catholics felt that his vulgar extravagances had prejudiced Catholic doctrine, and Miltitz, who was sent from Rome to deal with the situation, administered to him a severe castigation. He hid himself in the Dominican convent at Leipzig in fear of popular violence, and died there on the 4th of July 1519, just as Luther was beginning his famous disputation with Eck.

Many lives of Tetzel have been published on the Protestant and on the Catholic side, the most recent being Korner's (1880), K. W. Hermann's (2nd ed. 1883), and N. Paulus' (1899). See also Allge- meine deutsche Biographie; Gess's Akten und Brief e zur Kirchen- politik HerzogGeorgs von Sachsen, vol. i. (1905), Introd. pp. 76-8, &c; H. Barge's Andreas Bodenstein von Carlstadt (2 vols. 1905); J. Jan- ssen's Hist, of the German People, and An meine Kritiker; M. Creighton's Hist, of the Papacy, vol. vi.; and H. C. Lea's Hist, of Auricular Confession and Indulgences (3 vols., 1896). All the his- tories of the Reformation in Germany and all the lives of Luther deal at greater or shorter length with Tetzel ; in the index to vol. ii. of the Cambridge Mod. History he is confused with a later Tetzel of Nuremberg. (A. F. P.)

TEUFFEL, WILHELM SIEGMUND (1820-1878), German classical scholar, was born at Ludwigsburg in the kingdom of Wtirttemberg on the 27th of September 1820. In 1849 he was appointed extraordinary, in 1857 ordinary professor in the university of Tubingen, which post he held till his death on the 8th of March 1878. His most important work was hi° Geschichte der romischen Litteralur (1870; 5th ed. by L. Schwabt, 1890; Eng. tr. by G. C. Warr, 1900), which, although written in an unattractive style, is indispensable to the student, the bibliographical information being especially valuable. After the death of A. Pauly, the editor of the well-known Real Encyclopadie der classischen Altertumswissenschaft, Teuffel, at first assisted by E. C. Walz, undertook the completion of the work, to which he also contributed numerous articles.

He was also the author of " Prolegomena zur Chronologie der

horazischen Gedichte " (in Zeitschrift filr die Altertumswissen- schaft, 1842); Charakteristik des Horaz (Leipzig, 1842); Horaz, eine litterar-historische Ubersicht (Tubingen, 1843), and of editions of the Clouds of Aristophanes (1856) and the Persae of Aeschylus (1866). His Studien und Charakteristiken (1871; 2nd ed., 1889)

contain valuable contributions to the history of Greek and Roman literature. See S. Teuffel, Wilhelm Teuffel (1889); C. Bursian in Biographisches Jahrbuch (1878); F. Koldewey in Allgemeine deutsche Biographic, xxxvii.

TEUTOBURGER WALD, a mountain range of Germany, stretching N.W. to S.E., along the borders of the Prussian provinces of Hanover and Westphalia and through the princi- pality of Lippe, for a distance of 70 m., with a width of 2 to 6 m. It consists of a well-marked main chain, accompanied in its central

part by subsidiary ridges. It slopes up gradually to- wards the E., where it culminates in the Volmerstod (1536 ft.). The greater part of the range is densely wooded. The main chain is pierced by several deep gaps or " doors," through some of which important railways have been carried; e.g., the line connecting Paderborn and Hanover, and that connecting Herford and Hamm. The chief geological formations belong to the Cretaceous system, backed towards the north and east by Jurassic and Triassic formations. The Teutoburger Wald was the scene of a famous battle in which Arminius at the head of the Cherusci destroyed three Roman legions under Quintilius Varus (a.d. 9). Mommsen has located the battle near the source of the Hunte, north of Osnabruck, and outside the range of hills; but most scholars efer some site in the central part of the mountain-chain. In accordance with these latter views the Grotenburg (1 .63 ft.), 2$ m. S.W. from Detmold, has been crowned with a gigantic monument to Arminius Hermann, erected in 1838-41 and 1871-75, at a cost of £13,500. The work, which was designed by E. von Bandel, consists of a gigantic statue of the chieftain, 56^ ft. high, standing on an arched pediment 08 ft. high.

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For authorities see Cimbri; also Pliny, xxxvii. 35.

(F. G. M. B.)

TEUTONIC (GERMANIC) LANGUAGES, 1 a comprehensive term for a number of languages most of which are still spoken at the present time, namely English, Frisian, Dutch, Flemish, German (both High and Low) and the various Scandinavian languages (Swedish, Danish, Icelandic and the Norwegian dia- lects). The course of time hr.s tended very largely to obscure the affinities between these lan t r ;uaces, and in several cases they have been mutually unintelligible for many centuries. In their earliest known forms, however, they betray the most unmistak- able traces of a common origin. To the languages enumerated above we have to add the now extinct Gothic, which in the 5th and 6th centuries was spcl.en over a large part of Europe.

Detailed accounts of the various Teutonic languages will be found in articles under the respective headings. Here it is

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generally known as Grimm's Law, is due to sound-changes peculiar to Teutonic, though somewhat similar changes may be traced both in Armenian and Celtic. The most noteworthy phenomena are as follows: —

(1) The Indo-European voiced aspirates, bh, dh, gh (Lat. /, /, h; Gk. , 9, x) became voiced spirants, b, d, 3. After nasals these spirants became explosives ib, d, g) ; and in the first two cases the same change took place initially, though hardly during the early centuries of our era, e.g. A.S. beran, O.N. bera : Lat fero, Gk. tf>epo>; A.S. stigan : Gk. oreixw; O.N. mioftr (A.S. mean) : Gk. ni0v.

(2) The I. -Eur. voiceless explosives, p, t, k, were preserved only after s (t also in the I. Eur. groups pt and kt) ; e.g. A.S. stede, Goth, stops:' Gk. araai.%; Goth, nahts: Lat. noctem. In all other cases they became voiceless spirants, /, p, x> W These new sounds remained (i.) initially, e.g. A.S. hwaet, O.N. hvat: Lat. quod; A.S. faeder, O.N. fa&ir : Lat. pater; (ii.) in combination with other voiceless sounds, e.g. Goth, saihs, O.H.G. sehs: Lat. sex; Goth. nahts: Lat. noctem; (iii.) immediately after the (original) accent, e.g. Goth, bropar, A.S. brodor : Lat. f rater, Gk. parrif>; Goth. taihun, O.H.G. zehan: Lat. decern, Gk. hixa. In all other cases they became voiced spirants (" Verner's Law "), identical with those arising from I.-Eur. bh, dh, gh (see abpve); e.g. A.S. faeder: Lat. pater, Gk. mvriip; A.S. sweger, O.H.G. swigar (mother-in-law): Gk. iiivpa.

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Among other consonantal changes we may note especially the following: —

(4) Zw arising from I.-Eur. ghw or kw (see above) was reduced (except after nasals) before « (perhaps

also before I.-Eur. o) to 3, and in all other cases to w; e.g. A.S. g«3 (war), O.H.G. gund : Gk. -<#>otos (cf. (fibvm) ; A.S. sniweS (snows) : Lat. niuit, Gk. vtUj>ei.

(5) The I.-Eur. cons, group arising from combination of dental sound +t became «, as in Celtic and Latin, e.g. A.S. sess (seat) : sittan, Lat. sedere (cf. Sanscr. pp. sattas, Lat. obsessus).

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otoois; Goth, nahts: Lat. noctem. In all other cases they became voiceless spirants,/, p, x, (h). These new sounds remained (i.) initially, e.g. A.S. hwaet, O.N. hvat: Lax. quod; A.S. foeder, O.N. fa&ir : Lat. pater; (ii.) in combination with other voiceless sounds, e.g. Goth, saihs, O.H.G. sehs: Lat. sex; Goth. nahts: Lat. noctem; (iii.) immediately after the (original) accent, e.g. Goth, bropar, A.S. bro&or : Lat. f rater, Gk. ^parijp; Goth. taihun, O.H.G. zehan: Lat. decern, Gk. 54/co. In all other cases they became voiced spirants (" Verner's Law "), identical with those arising from I.-Eur. bh, dh, gh (see above); e.g. A.S. faeder: Lat. pater, Gk. irwrijp; A.S. sweger, O.H.G. swigar (mother-in-law):

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*(6) The treatment of I. -Eur. * was precisely parallel to that of the voiceless spirants/, p, x arising from I.Eur. p, t, *(see above). It was preserved (i) initially, (ii) in combination with*

voiceless sounds, (iii) immediately after the (original) accent. In all other cases it became voiced (z). This voiced spirant subsequently became r in all Teutonic languages except Gothic, where however the distinction between voiced and voiceless spirants is not well preserved; e.g. A.S. ceosan, pp. coren (geuso guseno) : Gk. f ytimnai (cf. Lat. gustus); A.S. snoru, O.H.G. snura (daughter-in-law): Sanscr. snusd, Gk. vv6s. . '

Most of the other consonantal changes are in the nature of assimilation. , ,, ...

(7) bn, in, in before the accent became pp, tt, kk (probably through the intermediate stage 66, dd, gg) ; e.g. A.S. Itcctan, O.H.G. leckon (from Hina-) : Gk. Xt X «fa> (cf. Goth, bi-laigon).

(8) In became //; e.g. A.S. full, Goth, fulls : Lith. pilnas. _

(0) nw became n»; e.g. A.S. pynne, O.N. punnr :ha.t. tenuis.

(10) <*/ became //; e.g. A.S. ri(«)a#. O.N. fto//r: Lat. stabulum (from stadhlom).

(11) In some combinations consonants are lost or new con- Sonants developed; e.g. Goth, sunja (truth): Lat. praesenha (sntid); O.H.G. hunno (centurion) from hundn, cf. Goth, tend: Lat. centum; A.S. stream, O.N. straumr from sroum-, cf. Gk. ptO^a, Old Irish sruaim. .

The following changes are found in all Teutonic languages, but took place apparently later than those enumerated above:—

(i) n was lost before x (*). with compensatory lengthening of the vowel; e.g. A.S. polite, Goth, pahta beside A.S. pencean, Goth.

(ii) Final explosives and nasals were lost; e.g. A.S. wile, Goth. wili: Lat. uelit; A.S. ea, Goth, ataa: Lat. aquam; Goth, tetfw: Lat. gustum. . „ . ,. ,

In its vowel-system the earliest known form of leutonic did not differ greatly from the other I.-Eur. languages. Its chief peculiarities seem to have been as follows : —

(1) It had one vowel (a) corresponding to the two vowels a, found in the other I.Eur. languages; e.g. Goth, akrs, O.N. akr: Lat. oger, Gk. 4tp6s; Goth, ahtau, O.H.G ahto: Lat. octo, Ok.

KT {2) It had also one vowel (0) corresponding to the two vowels &, o, found in the other I.-Eur. languages, e.g. A.S. brobor, Goth. bro par: Lat. fritter, Gk.

Gk. lpw(f)ri. , • .1 i- ' ■ ,.

The other I.-Eur. vowels, e, t, w, were preserved in the earliest Teutonic. Soon after the beginning of our era, however, e began to change to * before a nasal followed by a consonant, e.g: t^ol. *twoi (A.S. Finnas, O.N. Finnar) against Tac. Fenm. The diphthong et became i; e.g. A.S., O.H.G. siigan, O.N. sttga: Gk. ffTtix" (the ei of Goth, s/eigan is merely graphic). . .

The reduced nasal sounds generally written n. tn, arising from e*j, ne, em, me, &c, in unaccented syllables, became «n, mm (rare y nw, m«), e.g. A.S., Goth., &c. un- (negative prefix): Lat, tn-, , Gk. 4-, 4k-; A.S., Goth, tend: Lat. centum, Gk. i- Kurii/. ■ Similarly the reduced liquid sounds r, I became ur, ul (rarely ru, lu) ; e.g. A.S. furh: Lat. porca; Goth, pulan: Lat. toWo, Gk. TerXA*ia>.

Accent.— In the I.Eur. languages the position of the accent was originally free— i.e., any syllable in the word could bear the chief accent— variation occurring very frequently/ e.g. between different cases of the same noun. This freedom of position must have been retained in Teutonic at the time when voiceless spirants (J, p, X, s) became voiced (see above). Eventually, however, as in Gaelic (Irish) and at one time also in the Italic languages, the first syllable of every word came to bear the chief

accent, the only noteworthy exceptions being certain compound words, more especially verbs compounded with prepositions, which were probably long regarded _ as more or less independent words. This system of accentuation was inti mately connected with the principle of alliteration, the essen- tial characteristic of early Teutonic poetry and the dominant factor in family nomenclature. Alliteration in family names certainly dates from the very beginning of the Christian era, e.g. the S-names in one of the princely families of the Cher- usci frequently mentioned by Tacitus, and there is also some evidence that Teutonic poetry was alliterative by this time. It is probable, therefore, that the change in the system of accen- tuation took place not later than the 1st century B.C.

The description of the phonetic characteristics given above applies in general to the Teutonic group of languages as a whole. So far as one can judge from the proper names, &c, which occur in Latin works, the description would probably be true for the time about the beginning of the Christian era. Dialectical differences no doubt already existed, but few of them were so

clearly marked that they can now be traced with anything like certainty. The language of the earliest Runic inscriptions does not differ very markedly from this type. The principal changes which we can now detect are as follows:—

(1) e became i, (i) in the unaccented syllable of dissyllabic and in the least accented syllables of polysyllabic Words ; e.g. aohiriz (inscr.), O.N. doetr: Gk. 0ut<"-*p«; (ii) in accented syllables when the following syllable contained i,j, or u; e.g. A.S. mid{d), O.N. tnfor; Lat. medius.

(2) i became e when the following syllable contained a, e, 0; e.g. A.S., O.H.G. wer, O.N. verr (stem wera-) : Lat. uir.

(3) u became when the following syllable contained a, I, o; e.g. (1 sing, pret.) ivorahto (inscr.),

A.S. wor{o)hte, O.H.G. wor{a)hta: A.S. wyrcean, O.H.G. wurehen.

(4) e became a always; e.g. -mariz (inscr.) : Goth. -mers.

(5) final a, e, were lost; e.g. (1, 3 sing, pret.) was (inscr.); cf. Gk. XiXonr-a, -«. . _ .

(6) final long vowels were (in general) shortened (t=-*, =».«); e.g. liudu (inscr.). N. sing. fern. (cf. Gk- «x0p*)-

(7) final nasals and explosives were lost; e.g. ivorahto, 1 sing, pret. (cf. Gk. iriBtiv).

These changes appear to have operated in all the northern and western Teutonic languages during the first four centuries of our era, except the change e^a, which in the extreme west (Frankish) seems not to have taken place until the latter part of the 6th century. Several of them can be traced more or less clearly in Latin writings of the 1st century. The Gothic language, however, seems to have developed on quite different lines. The more important of its changes are as follows: —

(1) e became i always; e.g: wigs (road): A.S. weg. But i later became e (written ai in Ulfilas' orthography) before r, h; e.g. hairdets (herdsman) : O.H.G. hirti.

(2) u became (written au) before r, h; e.g. baurgs: A.S. burg. (In Ulfilas' orthography the letters transcribed e, are used for long vowels only.)

(3) ai, au became e, 0; but the digraphs were still written.

(4) short vowels (except «) in final syllables were lost ; e.g. dags, gasts: (N. inscr.) daiaz, -lastiz. .

(5) final nasals and explosives were lost ; e.g. sunu (Ace. sing.) : Sanscr. sunum. ,.,,,, c ,

(6) final long vowels (including those which had become hnal through the last change) were (in general) shortened (?==.*, 6=>a, e=»a); e.g. waurhta (1 sing, pret.): (N. inscr.) worahto; Uuba (N. sing, fem.): (N. inscr.) HuBu. : .

(7) voiced spirants when final (also before s) became voiceless; e.g. bap (3 sing. pret. of bidjan).

All these changes appear to have taken place before or during the 4th century. The effect of them must have been to render the Gothic language hardly intelligible to a person who spoke a .northern or western language, whereas during the same period there is little evidence for differences among the latter languages themselves. At a later date Gothic underwent further changes which do not appear in Ulfilas' version, or only to a slight extent.

(1) i became a close e- sound; e.g. Venethae (Jordanes), for

Winid-. , ,t» • -. d -

(2) u became a close sound: e.g. Poroi (Procopius) : Kugn; later became a in unaccented syllables; e.g. uraz (for -us).

(3) e became I; e.g. leikeis for lekeis (not unfrequently in the MSS.). (4.) became ii; e.g. sunjus for sunjos.

The chief sound-changes in the northern and western languages seem to have taken place in the 6th and 7th centuries. Some of these changes were common to all the languages in question, some to English and Scandinavian, some to English and German, while others again occurred in only, one of these languages or a portion of it.

I. Among the chief changes common to English, Scandinavian and German we may reckon (1) the loss of final o (in Scand. also before final consonants); e.g. A.S., O.N., O.H.G. horn (N. inscr. horna) ; (2) the loss of unaccented i, u after long syllables,

e.g. A.S. hond, O.N. hand, O.H.G. hant: Goth, handus; (3) the change 2 =-r before vowels or g; e.g. A.S. deor, O.N. dfr, O.H.G. hor: Goth, (plur.)

II. Among the most important of the changes common to fc-nglish and Scandinavian must be classed (i),the affection {umlaut) 'of vowels by the vowels (generally i, «) of following syllables; e^. A.S. eyn(n), O.N. kyn: O.H.G. kunm; A.S. geefu, O.N. gwf: O.H.G. eeba. In early German the only case of this kind was the affection Of o by a following *' and even this seems to have taken place much later. To the same category we must reckon (2) the early loss ot ft

between sonants, e.g. A.S. seon, slan, O.N. sid: O.H.G. sehan; (3) the loss of n before s, e.g. A.S. 6s, O.N. ass: O.H.G. Ans-.

III. Among the chief changes common to English and German were the following: (1) The loss of final z; e.g. A.S. daeg, O.H.G. tag: O.N. dagr (N. inscr. dazaz). In short monosyllables, however, z became r in High German, as in Scandinavian; e.g. tnir (Dat.): A.S. me, O.-Sax. ml, O.N. mer, Goth. mis. (2) The change *»-r before d (whereas assimilation took place in Scand.), e.g. A.S. hord, O.H.G. hort: O.N. hodd, Goth. huzd. (3) The change d^d in all positions (in Scand. only initially and after /), e.g. A.S. faeder, O.-Sax. fader (O.H.G. fater) : O.N. fatSir. (4) The lengthening of all consonants (except r) before j (in Scand. only gutturals), e.g. A.S. iutaan, O.H.G. bitten: O.N. 6&a.

The sound-changes peculiar to English, Scandinavian and German are treated in the articles dealing with these languages. It should be noted that the Frisian dialects agree with English not only in the phenomena enumerated above, but also in a number of changes peculiar to these languages. Such are (1) the change a^o before nasals, e.g._A.S. monaS, O.Fr.

monath: O.H.G. manod; (2) the change d^ae (later e) in other positions, e.g. A.S. riled, O.Fr. red: O.H.G. rat; (3) the labialization of o before nasals, e.g. A.S. mon, man, O.Fr. mon, man: O.H.G. man; (4) the change a^-ae (e in Fris.) in close syllables (also in open syllables before front vowels), e.g. A.S. staef, O.Fr. stef: O.H.G. slap; (5) the diphthongization of vowels before h, e.g. A.S. cneoht, O.Fr. kniucht: O.H.G. kneht;

(6) the loss of n before p, e.g. A.S. ffSer, O.Fr. other: O.H.G. ander;

(7) the palatalization of gutturals before front vowels, e.g. A.S. geldan, gieldan (Engl, yield), O.Fr. ielda: O.H.G. geltan. The noteworthy differences between the two languages in early times seem to have been very few: (1) a, e, i, are diphthongized before r followed by a consonant in English, but not in Frisian, e.g. A.S. earm: O.Fr. erm (cf. Goth, arms); (2) the diphthong ai became a in English everywhere, but in Frisian only in open syllables (e in close syllables); e.g. A.S. 08: O.Fr. eth (Goth, aips), but A.S., O.Fr. tigun (Goth, aigun); (3) the diphthong au became (aeu, then) la in English, but 6 in Frisian, e.g. A.S. eage (ege) : O.Fr. age (Goth. augo); (4) i was labialized in Frisian, but not in English, before (original) w in the following syllable; e.g. O.Fr. siunga: A.S. singan (cf. Goth, siggwan). Frisian texts of the 13th and 14th centuries show many characteristic changes which must have rendered the language almost, if not wholly, unintelligible to an Englishman of the same period ; but it is hardly probable that these changes were for the most part of any great antiquity.

Declension. — The I.Eur. languages seem originally to have had three numbers and eight cases, though it is by no means clear that each of the latter had a distinct form in every class of stems. In Teutonic there is scarcely any trace of the dual in nouns. Of the cases all the early Teutonic languages pre served four, viz. the Nominative, Accusative, Genitive and Dative. The Vocative also was kept in

Gothic and the Instru- mental to a considerable extent in early German, while the earliest Anglo-Saxon preserved many traces of the locative.

The case endings are best preserved in the earliest Northern inscriptions and in Gothic. As an illustration we may take those of the I.-Eur. o-declension : —

G. -is D. -a N. plur. -di A. -am G. i D. -am

-as ~e -3

v -ovs (-ous) -iav

As examples of the forms found in the inscriptions may be given N. erilaz, A. staina, G. A (n) sirjsalas, D. Woduride. In the other classes of stems also the declension conforms to the general I.Eur. types. Whatever changes have taken place have usually tended towards simplification; thus there are but few traces of stem variation {ablaut) between different cases of the same noun.

The treatment of adjectives was somewhat more peculiar. In addition to the old type of declension which conformed to that of Adiec- the demonstrative pronoun and not, as in Greek and

tfves Latin, to that of substantives, almost every adjective

was inflected also after the model of »-stems. This type of inflection occurs chiefly in conjunction with the demonstrative pronoun (definite article) and it is thought that its origin is to be found in substantival (appositional) sage.

The comparative’ of adjectives is formed partly by a suffix izan (e.g. Goth, sutiza, A.S. lengra), which is apparently extended from the suffix ios, is found in the other I.Eur. languagts and pro bably to be compared with Gk. jfiUiy (from swddison), and partly by a suffix ozan (e.g. Goth, swinpoza) which is peculiar to Teutonic. Similarly the superlative is formed partly by a suffix ista (e.g. Goth. hauhists,

A.S. lengest) corresponding to isto in other I.-Eur. languages (e.g. Gk. .jJioros), and partly by a new formation osta (e.g. Goth, armosts).

Most of the I.-Eur. demonstrative pronouns are found in Teutonic, and the peculiarities of their inflection are in general well preserved. Pronouns T he most important are Goth, ts, O.H.G. er: Lat. is; A.S. he: Lith. szis; Goth, sa, so, pata: Gk. 4, i>, t4. The last of these (as in Greek) has become a definite article in all except the Scandinavian languages. The interrogative pronouns

Goth. N. sing, -s A. N. inscr. -az

cf. Greet -os

are Goth, htoas, A.S. hwd: Sanscr. kas, and O.H.G. hwer: Lat. quis. The place of the relative pronoun is supplied by the demon- strative or by indeclinable forms. The inflection of the personal and reflexive pronouns is for the most part peculiar to Teutonic, e.g. Goth. 1 sing. N. ik, A. mik, G. meina, D. mis; 1 plur. N. weis, A.D. uns (unsis), G. unsara. The majority of these forms are common to all the Teutonic languages, though there is a variation betweeri -e and -i which is probably due to accentual causes; e.g. A.S. ic, mec, me; O.N. ek, mik, mer; O.H.G. ih, mih, mir.

Conjugation. — The Teutonic verb-system is simpler than that of most of the I.-Eur. languages. The old Middle Voice is preserved only in Gothic, where it is used as a passive. In the other Teutonic languages only one or two isolated forms remain. In place of the two old moods, Conjunctive and Optative, there is but one, which is generally called Conjunctive, though its forms are mostly of Optative origin. Again, there are only two tenses, Present and Preterite, the latter of which is derived partly from the I.-Eur. Perfect, partly from Aorist or Imperfect formations. A few old Perfects, however, which have no Presents, retain their original meaning and are generally known as Preterite-presents, e.g. Goth, wait, A.S. wdt, "1

know": Gk. olSa. In place of the Future the Teutonic languages use either perfective verbs (generally compounded with a prepo- sition) or a periphrasis consisting of the Infinitive with an auxiliary verb.

The conjugation of the Pres. Indie. Act. corresponds in general to that of most of the I.Eur. languages, e.g. Goth. I sing, baira, 2 bairis, 3 bairip, I p]ur. bairam, 2 bairip, 3 bairand, cf. Gk. 4>ipu, Sanscr. bharasi, bharati, Gk. Qepo/nev, kptTt, QipovTi (kpovai). Gothic had also forms for the 1, 2 dual, bairos, bairats, which have not been satisfactorily explained. In the other languages there is scarcely any trace of the dual. The conjugation of verbs corre sponding to the Greek verbs in -iu is preserved best in Old High German; e.g. I sing, habe-m (-n), 2 habes, 3 habet, 1 plur. habemes, 2 habet, 3 habenl, cf. Gk. 1 sing. rlBrnu, Lat. 2 sing, habes, 3 habet,

1 plur. habemus, 2 habetis, 3 habent. A number of archaic forms are preserved in the " verb substantive," e.g. Goth. 1 singi im,

2 is, 3 ist, 3 plur. sind.; O.N. I plur. erum; cf. Gk. 1 sing, tljil, 2 icrcrl, tl, 3 iarl, I plur. kvpikv, 3 elol. The forms of the Con- junctive (Optative) correspond in general to those of the other I.Eur. languages; e.g. Goth. 2 sing, bairais, 3 sing, bairai; Gk. 2 sing. cpo(s, 3 sing, tpipau So also the Imperative, e.g. 2 sing. bair: Gk. tpipe; but the origin of the 3 sing, and 3 plur. forms in Gothic (bairadau, bairandau) is not quite clear. The Gothic Passive is conjugated as follows in the Pres. Indie: I, 3 sing. bairada, 2 sing, bairaza, I, 2, 3 plur. bairanda; cf. Gk. 3 sing, aikperai., 2 sing. q>ipy (from tt>ipe(o)

The Preterite formations are of two types, usually termed " strong " and " weak." The latter belong to verbs whose past participle has a stem da (I.-Eur. to; see below), the former to the remaining verbs. The singular of the strong Preterite is de- rived from the I.-Eur. Perfect, while the plural, which in most verbs has a different stem, may come either

from the Perfect or from Aorist formations. In the plural the endings were originally accented; hence many verbs show differences not only in the stem vowel but also in the consonants (by Verner's Law, see above) between the two numbers; e.g. A.S. sing, waes, wear®, plur. waeron, wurdon. Reduplication is preserved in Gothic only in a limited number of verbs (e.g. haldan, pret. haihald); in the other languages it is rare. The inflection is as follows: Goth. 1 sing, -baup,

2 -baust, 3 -baup, 1 dual -budu, 2 -buduts, 1 plur. -budum, 2 -budup,

3 -budun; cf. Gk. I sing. oUa, yiyova, 2 olaOa, 3 oUe, 7€70»e,

1 plur. laixtv, ykyantv. Except in Gothic and Scandinavian the

2 sing, has generally a form (originally Aorist) similar to the plur., e.g. A.S. bude. The stem of the Conjunctive also agrees with that of the plur., e.g. Goth. 1 sing, -budjau, 3 sing. -budi.

The " weak " Preterite seems originally to have arisen out of a periphrastic formation of which the second part consisted of Im- perfect or Aorist forms of the verb seen in A.S. don, O.H.G. tuon (related to Gk. tWtj/u), and probably identical with the Pret. A.S. sing, dede (dyde), plur. dMdon; O.H.G. sing, tela, plur. tatun. The short reduplication-syllable, however, is lost in the sing., while the long syllable of the plur. (and dual) is preserved only in Gothic. The inflection of the Indie, is as follows: —

sing. Goth. 1 nasida, 2 -des, 3 -da; A.S. nerede, -des(t), -de, O.H.G. nerita, -tos, -ta. O.N. lagSa (early inscr. -6),-ir, -i.

plur. 3 Goth, nasidednn, A.S. neredon; O.H.G. neritun; O.N.

J3«.

It is to be observed that the stem of the weak Preterite almost always conforms to that of the past participle. Such forms as Goth. pret. waurhta are probably derived from the past part. waurhts (stem waurhta-) on the analogy of pret. nasida beside past part, nasips (stem nasida-), where the resemblance betweeri the two formations is due to the regular operation of the sound laws.

The inflection of the Conjunctive agrees with that of the strong Preterite, e.g. Goth, nasidedjau.

The Infinitive is formed from the present stem with an ending -an (e.g. A.S. beran), and probably was originally a case-form of a verbal noun. In the western languages we find also the Dative of a stem anja used after a preposition; e.g. A.S. to ciosenne, O.H.G. zi nemanne.

The Present Participle has a stem and (I.-Eur. ont) identical with the ending of the 3 plur. Indie, as in the other I.-Eur. languages; but the Participles in actual use were declined as all ot ja stems, e.g. G. bairanda, A.S. berendc. The unextended stem survives only in substantives, e.g. A.S. vngend, " warriors." The stem of the Past Participle (Passive) is formed by the suffixes to and no (Teut. da, na), as in the other I.-Eur. languages. The former occars as a living formation only in connexion with the verbs whose Present stem ends in ja, 0, e (in Gothic also na ; e.g. Goth, nasips, salbo ps (-.nasjan, salbon). The Past Participle in use with other classes of Verbs has a stem ena or ana, the former in English and Scandinavian, the latter in Gothic and German; e.g. A.S. borenn, O.N. borinn, Goth, baurans, O.H.G. (gi)boran. Remains of old Participles in to, no formed otherwise than those in living use may be found in adjectives; e.g. A.S. (c)ald : alan (cf. Lat. altus),full : Lat. pleo (cf. Lith. pilnas).

The above sketch will suffice to show that in regard to morphology the Teutonic group of languages has many char- acteristic features which distinguish it from other languages of the same stock. On the other hand the morphological differ- ences which exist among the Teutonic languages themselves are on the whole comparatively slight and due mainly to the operation of syncretism and other simplifying processes. In more recent times these processes have been carried still further, so that e.g. the Danish verb has lost all inflection of person and number, while distinction of gender has wholly disappeared in English. In the earlier stages of the Teutonic languages differences of phonology are more marked than those of morphology, and afford surer criteria for determining the relations of these languages to one another. It is customary among scholars to classify the whole group in three main divisions, an eastern or Gothic, a northern or Scandinavian, and a western which includes English, Frisian and German. We have noticed above that Gothic began at an early date to show marked divergences from the other languages. The Scandinavian languages also certainly underwent a considerable number of peculiar changes before the beginning of their literatures. But it is to be remembered that from the 6th century to the 9th the Scandinavian peoples were practically cut off from communication with other Teutonic nations by the Slavonic occupation of Mecklenburg and eastern Holstein. The earliest of the more striking sound-changes peculiar to Scandinavian, viz. the loss of initial j-, is not thought to have taken place before the 7th century, while the most characteristic fea'ures in its morphology, i.e. the development of the post- positive article and of the new medio-passive, ! Jong in all probability to a later period. If we confine our attention to changes which probably took place before the middle of the 7th century it will be seen that the English and Frisian lan- guages may fairly be described as lying about midway between Scandinavian and German, though they had already developed well-marked characteristics of their own. They are doubtless to be regarded as the representatives of the old

language of the maritime districts, and it is probable that languages of this type were at one time spoken along the whole of ths coast between the present frontiers of Belgium and Denmark. On the other hand the special characteristics of German in all pro- bability developed in the interior and those of Scandinavian round the Baltic and the Cattegat. From the 8th century onwards the High German (southern) dialects of German differed greatly from those spoken further north owing to the operation of the changes generally known as the " second sound-shifting." The northern dialects, however (Old Saxon and Low Frankish), were essentially German, though both were more or less affected by Frisian influence.

The Gothic and Scandinavian languages have one or two characteristics in common, the most important of which is the treatment of intervocalic j and w in a number of words. In the former case we find Goth, ddj and O.N. -ggi^,

whereas in German a diphthong developed; e.g. Goth, twaddje (Gen. oitviai. "two"), O.N. tveggia: O.H.G. zweio. In the latter case both Goth, and Scand. had ggw (O.N. ggv), while a diphthong appears both in English and German, e.g. Goth. triggws ("true"), O.N. tryggr: A.S. getrlowe, getriewe, O.H.G gitriuwi. It may also be noted that Gothic and Scandinavian preserved the ending -I in the .2 sing, of the strong Preterite, while English and German had a different form with the stem of the plur. (see above). On the ground of these common characteristics some scholars hold that Gothic and Scandinavian are more closely related to one another than to the other Teutonic languages.. But, whatever may have been the case originally— and the evidence is far from conclusive — it is clear that by the 4th or 5th century the Scandinavian languages had far more resemblance to English and German than to Gothic,

The languages of the Vandals, Gepidae and other eastern tribes seem to have been practically identical with Gothic. That of the Burgundians, so

far as we can judge from the slight evidence at our disposal, had at least 3s much in common with southern German as with Gothic, which may be duo to the fact that this tribe, though originally located in the basin of the Oder, had moved westwards by the 4th century. The early divergence of the eastern languages in general from those of the north and west is perhaps to be ascribed in part to the great extension southwards of the territories of the eastern tribes in the 3rd and 4th centuries. Yet it is not to be overlooked that all dialectical divergences within the Teutonic group seem to be of relatively recent origin, as compared, e.g., with the special characteristics of some of the Greek dialects. Indeed there is scarcely one of them of which we can say with certainty that it dates from before the beginning of our era.

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(H. M.C.)

TEUTONIC ORDER, THE, or Teutonic Knights of St Mary's Hospital at Jerusalem {Der deutsche Orden, Deutsche Rilter) was one of the three great military and religious orders which sprang from the Crusades (q.v.). Later in birth than the Templars and Hospitallers, the Teutonic Order traces its first beginnings from the third Crusade. Already, indeed, in 1143 we hear of a hospital of Germans at Jerusalem, which Celestine II. places under the control of the Hospitallers, with the stipulation that the prior and servants alone shall necessarily be of German birth. 1 But it is amidst the privations and plague which attended the siege of Acre, during the third Crusade, that the first certain beginnings of the Order appear. In the winter of 1 190-91 certain pious merchants from Bremen and Liibeck (towns with which the Order was still to be connected in the days of its later history) laid the foundations of a hospital in a 1 Rohricht, Geschichte des Konigreichs Jerusalem, p. 242.

vessel which they had drawn ashore. 1 Within a few years the foundation apparently became attached to the German Church of St Mary the Virgin at Jerusalem; and in March 1108 (there being present in the Holy Land a number of Germans, the relics of

Henry M.'s projected crusade), the great men of the army and the kingdom raised the brethren of the German Hospital of St Mary to the rank of an order of knights. The original members were thus ennobled; and henceforth it was the rule that only Germans of noble birth could join the Order. The Order was from the first, therefore, of a national character, unlike the cosmopolitan orders of the Templars and Hospitallers; but in other respects it was modelled upon the same lines, and shared in the same development. Like the knights of other orders, the Teutonic knights lived a semi-monastic life under the Augustinian rule; and in the same way they admitted priests and half-brothers (servientes) into their ranks. Like the other two orders, the Teutonic Order began as a charitable society, de- veloped into a military club, and ended as something of a chartered company, exercising rights of sovereignty on the troubled confines of Christendom. Even in its last phase, the Order did not forget its original purpose: it maintained several great hospitals in its new home on the south-east shore of the Baltic, in addition to an hdtel des invalides at Marienburg for its sick or aged brethren.

For a hundred years (1191-1291) the headquarters of the Order were at Acre; nor was it until 1309 that, after a brief sojourn at Venice, the seat of government was transferred to Marienburg on the Vistula. But long before that date the Order had begun to find that its true work lay on the eastern frontiers of Germany. Perhaps it was Hermann von Salza, the first great grand master of the Order (1210-1239), who originally conceived the idea of transplanting the Order to the west. At any rate it was he who accepted the invitation of Andrew of Hungary that the Order should aid him with its resources against the Comans by whom he was threatened. In 1 21 1 the Order received from the king the district of Burzen- land in Transylvania. Towns arose and agriculture began to flourish; but seeking to make itself independent, the Order lost its lands, and disappeared from Transylvania. A new opportunity almost immediately arose on the banks of

the Vistula. Here Christian, bishop of Prussia, who had received from the Polish duke of Masovia a part of Kulmerland as a fief, had founded the knightly Order of Dobrzin, and was attempting with its aid to subdue the heathens of Prussia. Unsuccessful in his attempt, he invited the Teutonic Order to come to the rescue, and bestowed on the Order Kulm and some of the frontier towns in his territory, with such lands as it should conquer (1228). Thus the Order took its place as the founder of one of the marks on the eastern frontier of Germany, and began to play its part in that Drang nach Osten, which is perhaps the vitally important thing in the history of Germany from the 12th to the 14th century. Since the days of Adolf of Holstein and Henry the Lion, a movement of German coloni- zation, in which farmers from the Low Countries, merchants from Liibeck, and monks of the Cistercian Order all played their parts, had been spreading German influence from the Oder to the Vistula, from the Vistula to the Dwina — to Prague, to Gnesen, and even to Novgorod the Great. Of this movement the Teutonic Order became, along with the Hanse, the chosen representative. It was not, indeed, the first knightly Order to gird itself for the task. Besides the knightly Order founded by Christian, there was already another still farther east, which had served as Christian's model, the Knights of the Sword of Livonia. This was an order founded by Albert, 3rd bishop of Riga, in 1201, to serve as an instrument, under his control, for the conquest of the land. But in 1237 the Knights of the Sword were merged into the Teutonic Order, and Livonia became a province of the Order, with a master of its own under the grand master's control, just as, two years before, the Order had also absorbed the Knights of Dobrzin.

1 Rohricht, Geschichte des Konigreichs Jerusalem, p. 542. The relations of this new foundation to the German hospital mentioned in 1 1 43 cannot be traced.

In 1229 the Order began the conquest of Prussia, founding fortresses at each step to rivet its conquests (for instance, at Thorn, named after Toron

in Palestine), much as the Anglo- Normans had done in their conquest of Wales. Frederic II. gave the Order the rights of a prince of the Empire in its terri- tories: Conrad of Masovia gave it the whole of Kulmerland in 1230; while in 1234 the Order established its independence of all authorities except the Papacy, by surrendering its territories to the Holy See and receiving them back again as a fief. The pope gave to those who joined in the work of the Order the privileges of Crusaders; and the knights, supported by numerous donations and large accessions to their ranks, rapidly increased their territories. By 1260 they ruled the eastern bank of the Vistula from Kulm to its mouth, and the northern shore of the Baltic from the mouth of the Vistula to Konigsberg. Livonia they held after 1237; and during the. 14th century they gained the Lithuanian territory of Samogitia, which lay between Livonia and their Prussian dominions, while they also added, to the west of the Vistula, Pomerellen and the Neumark (see under Prussia). Already by the beginning of the 14th century these conquests had fundamentally changed the character of the Order. It lost any connexion with the East: after the fall of Acre in 1291, the grand master (whose seat had been at Acre, while the German master (Deutsckmeister) had controlled the Order in Germany) moved first to Venice, and then, in 1308, to Marienburg on the Vistula. Again, with the accession of large territories, the Order became a governing aristocracy; the original care for the sick, and evem the later crusading zeal of the period of conquest, gave way, when conquests were gained and administration was needed, to the problem, half military, half political, of governing a frontier state. The statutes of the Order were altered to suit the new conditions, and a whole system of administration arose. At Marienburg the grand master maintained a magnificent court; round him were the five great dignitaries of the Order, the Grand Com- mander, the Marshal, the Hospitaller, the Treasurer (Tressler) and the Keeper of the Wardrobe (Trapier) to see to the clothing of the Order. There was a Landmeister for Livonia, and another (the

Deutsckmeister) for the German province, with his seat at Mergentheim in Swabia. Over each of the twenty districts of the Order was set a commander (Komtur), with the brethren of his house at his side as advisers. The commander was bound by the advice of his brethren; and in the same way the general chapter of the Order, consisting of the landmeisters and the great dignitaries, formed an advisory board to the grand master in matters such as treaties and internal legislation. It was government by an aristocracy almost Venetian in character. The individual was merged in the Order: each brother must pray four times in the day, and four times at night, and he must at all times pay an unquestioning obedience to his superiors. The Order was at once supreme ecclesiastical and political authority. There were no struggles of Church and State in its dominions: the state was also the church: the bishops and the canons of the four bishoprics (with the exception of Ermeland) were priests of the Order. The lay subjects of the Order con- sisted of two classes; on the one hand there were the conquered Prussians, in a position of serfdom, bound in time of war to serve with the brethren in foreign expeditions; on the other hand there were the German immigrants, both urban and rural, along with the free Prussians who had voluntarily sub- mitted and remained faithful. The towns were large and flourishing; as many as sixty arose in the period between 1233 and 1416, including Thorn and Elbing, Danzig and Konigsberg (named after Ottocar of Bohemia, who took part in the campaign during which it was founded). The towns possessed the rights of Magdeburg, or (like Elbing) those of Liibeck; the most important of them soon came to join the Hanseatic League. The Order only imposed customs duties: it levied no tolls within the land; and though its consent was necessary Pit any change in municipal ordinances, it allowed the towns a large amount of self-government. The concord of the Order witV the towns and the Hanse was one great cause of its prosperi>»

until the dose of the 14th century; and the rupture of that concord in the 15th century was largely responsible for its fall.

This political and material strength enabled the Order to weather the storm by which the Templars were destroyed at the beginning of the 14th century. For a time, indeed, the Order lay under papal sentence of excommunication; but the transference of his seat to Marienburg at this time (1308) gave the grand master a basis from which he was able to make easy terms with the pope. Nor was the Order, during the 14th century, at all unfaithful to its original calling. Particularly under the grand master Winrich of Kniprode (1351-1382) it was the school of northern chivalry, engaged in unceasing struggle to defend and extend Christianity against the heathen Lithuanian. To the brilliant court of Marienburg, not only a school of chivalry, but under Winrich's predecessor Luther of Brunswick, a literary centre, 1 men came from all over Europe to win their spurs. John of Bohemia had fought by the Vistula: Henry of Bolingbroke was of the goodly company; Chaucer's perfect knight had travelled in " Pruce and Lettowe." The neo-chivalry of the 14th century, in which a fantastic love of adventure had displaced the finer and more ideal motives of the old chivalry, looked towards the Vistula and Marienburg.

At the height of its glory sudden and irretrievable ruin fell upon the Order. The conditions which had made possible its prosperity now disappeared. Externally, a Slavonic reaction camp, and dealt heavy blows to the eastward advance Of German civilization. The Hussite movement, a victorious expression of Czech nationality, is contemporaneous with the loss of German dominion in Prussia; the exodus of German students from Prague takes place a year before the defeat of the Order at Tannenburg. The particular danger from the Slavs of the north-east arose from the conversion of Lithuania, and the union of converted Lithuania to Poland. The conversion of Lithuania deprived the Order of its

mission: the union of Lithuania to Poland robbed it of the security which it enjoyed while they were disunited, and gave new strength to Poland, a constant enemy to the Order which had deprived it of any outlet on the Baltic. Internally, too, the Order suffered. The Hussite wars, the feuds of Burgundian and Armagnac, the renewal of the Hundred Years' War, all prevented it from drawing new blood from the west. But above all it lost touch with its subjects. A religious order, largely composed of immi- grants from abroad, could not permanently rule a state which had developed a national feeling of its own; and the native aristocracy, both of the towns and the country, revolted against its dominion. The rebellious elements allied themselves in- stinctively with the Poles, who thus found the absorption of the greater part of the lands of the Order an easy task. Com- mercial jealousy aided the process: the Order had alienated the towns by entering into competition with their trade; it had established a monopoly of amber and even, occasionally, of corn; and its agents were spread as far afield as Bruges. This commercial policy had indeed a deeper and more fatal effect than the alienation of the towns; it secularized still further the brethren of the Order, and made them financiers instead of soldiers. Their finances were indeed excellent; they kept regular accounts, and had already developed the modern principle of separating the civil list from the expenses of the government; but when they brought the tables of money- changers into the temple, they were doing as the Templars had done before them, and were likely to suffer as the Templars had suffered.

The first blow struck at the Order, if it did not destroy its power immediately, ruined its prestige for ever. The defeat which the Polish king Ladislaus inflicted upon the knights at Tannenberg in 1410 was crushing. It brought Ladislaus little immediate gain; but it stimulated the elements of unrest in Prussia to fresh activity. The discontented clergy, especiaEy

1 Every house of the Order had two learned brethren,

one learned in the law, one in theology. There were also elementary schools, and municipal foundations in which Latin was taught, in the dominions of the Order.

in Livonia; the towns, such as Danzig; the native aristocracy, organized in a league (the Eidechsenbund, or League of the Lizard) , all sought to use their Opportunity. It was in vain that the heroic grand master, Henry of Plauen (1410-1413) sought to stem the tide of disaster; he was deposed by the chapter of the Order for bis pains. The success of the Hussite raids in Germany gave fresh confidence to the Slavs of Poland. The Order was at variance within itself; some of the bouses of the brethren refused to obey the marshal, and the grand master quarrelled with the German master. Above all, there arose in 1440 the Prussian League (Preussischer Bund), in which the nobles and towns joined together, nominally for common pro- tection of their rights, but really against the Order. The League naturally sympathized with Poland, not only because Poland was the enemy of the knights, but also because under Poland it hoped to enjoy the practical liberty which Polish anarchy already seemed to offer. The ultimate result was that in 1454 an embassy of the League offered Prussia to the Polish king, and that, after many years of war, the Peace of Thorn (1466) gave to Poland West Prussia, with Marienburg, Thorn, Danzig and other towns, in full possession, and, while leaving East Prussia to the Order, made the Order the vassals of Poland for the territory which it retained. Henceforth the grand master was to sit in the Polish diet on the left of the king, and half of the knights of the Order were to be Polish.

From 1466 to 1526 grand masters of the Order ruled in East Prussia as vassals of Poland. But the master of the Livonian province and the German master would not obey a Polish vassal, and went their own way; the German master took the grand master's place as a prince of the Empire. The brethren of East Prussia, however, still sighed for independence; and they pursued the policy of choosing German princes to be

grand masters of the Order, in the hope of regaining liberty by their aid. Frederick of Saxony held the office from ,1498 to 151 1; and he was succeeded by the Hohenzollern Albert of Brandenburg- Anspach. When Lutheranism arose, it spread rapidly in Prussia; Albert himself came into contact with Luther, and turning Protestant he secularized his territories, and (1526) made them into an hereditary duchy, still held as a fief of the king of Poland. Few of the brethren resisted; and the Order quietly ceased from the land where for three hundred years it had had its being.

Henceforth the Teutonic Order lived in Germany and in Livonia. The master of the latter province had beaten off an attack of the Russians in 1502, and secured a fifty years' peace. But in 1561 another master followed the example of Albert, and received Courland as an hereditary fief from Poland. Henceforth the Order was confined to Germany alone. Th« German master — now grand master and German master in one —had his headquarters at Mergentheim in Swabia; the revenues of the states scattered throughout the twelve bailitvicks of Ger- many sustained him and his Order. The Order, clinging to its rights with the conservatism of an ecclesiastical corporation, still maintained its claims to East Prussia, and pressed them tenaciously even against the electors of Brandenburg them- selves, when they inherited the land on the failure of Albert's descendants in 1618. The French Revolution finally deprived the Order of all its estates, and for a while of its existence. In 1801 the bailiwicks to the west of the Rhine were absorbed by France; in 1809 the Order was entirely suppressed, and its lands went to the secular principalities in which they lay. But in 1840 the Order was resuscitated in Austria, where it now exists as a semi-religious knighthood, closely connected with the Habsburgs.

It has remembered its earliest objects, and has ef late years engaged during war in the ambulance service. " At the foot of sunny vineyards," says Treitschke, " the house of the Teutonic Order now

stands at Botzen; on its door is still emblazoned the black cross — in the middle cf the shield of the Habsburg-Lorrainers." Whatever its connexion with the Habsburgs, the Order has its real heirs in the Hohenzollems of Prussia. When Frederic the Great gained West Prussia by

the first partition of Poland (17 f 2), he was uniting together once more the dominions of the Order, sundered since 1466; and it is the kings of Prussia who 1 have inherited the Order's task of maintaining German influence on the banks of the Vistula.

Literature. — The article is chiefly based on H. von Treitschke's Das deutsche Ordensland Preussens, in Historische und politische Aufsdtze, vol. ii. (Leipzig, 1871), and. on J. Loserth, Geschichte des spdleren Mittelalters (Munich and Berlin 1903). Loserth gives a bibliography of authorities dealing with the history of the Order on pp. 131, 365 and 567-8. The original evidence is to be found in E. Strehlke, Tabulae Ordinis Teutonici (Berlin, 1869), and in Scriplores rerum Prussicarum (Leipzig, 1861-1870). J. Voigt has traced the history of the Order previous to 1526 in his Geschichte Preussens (Konigsberg, 1 827-1 839), and he has dealt with the organization of the Order, and with its history in Germany from 1525 to 1858, in his Geschichte des deutschen Ritterorden in seinen zwijlf Balleien in Deutschland (Berlin, 1857-1859). More recent writers are Lohmeier, Geschichte Ost- und Westpreussens (Gotha, 1880), and Prutz, Geschichte Preussens (Stuttgart, 1900). For monographs on the grand masters, the various territories, and the different epochs in the history of the Order see the references in Loserth's work. (E. Br.)

TEUTONIC PEOPLES, a comprehensive term for those popu- lations of Europe which speak one or other of the various Teutonic languages, viz., the English-

speaking inhabitants of the British Isles, the German-speaking inhabitants of Germany, Austria-Hungary and Switzerland, the Flemish-speaking inhabitants of Belgium, the Scandinavian-speaking inhabitants of Sweden and Norway and practically all the inhabitants of Holland and Denmark. To these we have to add small German and Flemish-speaking communities in Italy and France and somewhat larger German and Swedish populations in Russia. Outside Europe we have to include also the very numerous populations in America, Africa, Australasia, &c, which have emigrated from the same countries. The statement that the Teutonic peoples are those which speak Teutonic languages requires a certain amount of qualification on one side. In the British Isles, especially Ireland, there is (in addition to the Celtic-speaking elements) a considerable population which claims Celtic nationality though it uses no language but English; and further all Teutonic communities contain to a greater or less degree certain immigrant (especially Semitic) elements which have adopted the languages of their neighbours. On the other hand there does not appear to be any considerable population anywhere which claims Teutonic nationality without using a Teutonic language. We know indeed that France, Spain, Italy, &c, contained within historical times large populations which were Teutonic both by origin and by language, but these have now been completely absorbed. Similarly, there is no doubt that the inhabitants of England and of the German-speaking regions of the Continent are descended very largely from peoples which two thousand years ago spoke non-Teutonic languages. Yet on the whole the definition given above may be accepted as generally true for the present time.

It is to be observed that the term " Teutonic " is of scholastic and not of popular origin, and this is true also of the other terms (" Germanic," " Gothic," &c.) which are or have been used in the same sense. There is no generic term now in popular use either for the languages or for the peoples, for the reason that their common origin has been

forgotten. In Tacitus's time, however, when the area occupied by the Teutonic peoples was, of course, considerably less than now, a consciousness of their relationship to one another was fully retained. He cites native poems which declared that the Inguaeones, Hermiones and Istaeuones— the three main branches of the Germani (see below) — were sprung from three sons of a certain Mannus (perhaps " Man "), who was himself the son of the god Tuisto the son of Earth; and in a Frankish document at least four centuries later we hear again of three brothers named Erminus, Inguo and Istio, from whom many ■ nations were descended. In English documents also we find eponymous national ancestors grouped together in genealogical trees, and there is reason to believe that the common origin of the various Teutonic peoples was remembered to a certain extent until comparatively late in the middle ages.

The linguistic characteristics of the various Teutonic peoples have been dealt with under Teutonic Languages. In regard to physical features they present at the present time very many varieties both of stature and of pigmentation, though on the whole they are probably the tallest and fairest of European peoples. These characteristics are noted by a number of ancient writers in language which seems to show that they must at that time have been at least as pronounced as among any of the pre- sent Teutonic peoples. Moreover, the tallness and dolichocephaly which now specially mark the more northern peoples of the group appear very prominently in cemeteries of the migration period in Switzerland and other neighbouring countries. On the whole, however, the skeletons found in German and Scandinavian tombs dating even from the earliest period do not show any very remarkable differences from those of the present day. But whether we are justified in speaking of a Teutonic race in the anthropological sense is at least doubtful, for the most striking characteristics of these peoples occur also to a con- siderable extent among their eastern and western neighbours, where they can hardly be ascribed altogether to Teutonic admixture. The only

result of anthropological investigation which so far can be regarded as definitely established is that the old Teutonic lands in northern Germany, Denmark and southern Sweden have been inhabited by people of the same type since the neolithic age, if not earlier.

The results of investigations in prehistoric archaeology are treated in the articles Germany and Scandinavian Civiliza- tion. As no Teutonic inscriptions are extant from before the 3rd or 4th centuries, it cannot be stated with absolute certainty what types of objects are characteristic of Teutonic civilization in the bronze and earliest iron ages. Yet throughout the bronze age it is possible to trace a fairly well-defined group of antiquities covering the basin of the Elbe, Mecklenburg, Hol- stein, Jutland, southern Sweden and the islands of the Belt, and archaeologists have conjectured with much probability that these antiquities represent the early civilization of the Teutonic peoples. The civilization was, of course, not wholly of native growth. Strong foreign influence, first Aegean and later Etruscan, can be distinguished; but the types introduced from the south have generally undergone considerable modifi- cation and expansion. The somewhat surprising degree of wealth and artistic skill of which many of even the earliest antiquities give evidence is probably to be explained by the importance of the amber trade. Both in eastern and in western Germany the objects found are of somewhat different types and seem to point to a lower standard of civilization. What peoples inhabited these regions can only be conjectured, but there is a certain amount of evidence from place-names— not altogether satisfactory — that the Celtic peoples at one time extended eastwards throughout the basin of the Weser. With the beginning of the iron age (perhaps c. 500-400 B.C.) Celtic influence becomes apparent everywhere. By this time, however; the great Celtic movement towards the south-east had probably begun, so that the Teutonic peoples were no\r cut off from direct communication with the centres of southern

civilization.

1. History. — The first recognition that the inhabitants of Germany, Holland, &c, were a people distinct from their Celtic neighbours dates from about the middle of the 1st century B.C., when Caesar's conquest of Gaul rendered a knowledge of northern Europe more generally accessible to the Romans. Certain notices relating to individual Teutonic tribes come down from still earlier times. Thus there can be little doubt that the Cimbri (q.v.) and their allies, who invaded Illyricum, Gaul and Italy in the last years of the preceding century, were for the most part of Teutonic nationality. The Bastarnae also, who in the 3rd century B.C. invaded and settled in the regions between the Carpathians and the Black Sea, are said by several ancient writers to have been Teutonic by origin, though they had largely intermarried with the native inhabitants. Again, individual travellers from the time of Pytheas onwards had visited Teutonic countries in the north. In none of the early records, however, do we get any clear indication that the

Teutonic peoples were distinguished from the Celts. From the time of Caesar onwards the former were known to the Romans as " Germani," a name of uncertain but probably Gaulish origin. It is said to have been first applied to certain Belgic tribes in the basin of the Meuse, who may formerly have come from beyond the Rhine.

At the beginning of our era the Teutonic peoples stretched from the Rhine to the Vistula. Before Caesar's arrival in Gaul they had advanced beyond the former river, but their further progress in this direction was checked by his campaigns, and, though both banks of the river were occupied by Teutonic tribes throughout the greater part of its course, most of these remained in definite subjection to the

Romans. The eastern- most Teutonic tribe was probably that of the Goths, in the basin of ihe Vistula, while the farthest to the south were the Mar- comanni and Quadi, in Bohemia and Moravia. These latter districts, however, had been conquered from the Boii, a Celtic people, shortly before the beginning of our era. Towards both the south and west the Teutonic peoples seem to have been pressing the Celts for some considerable time, since we are told that the Helvetii had formerly extended as far as the Main, while another important Celtic tribe, the Volcae Tectosages, had occupied a still more remote position, which it is impossible now to identify. How far the Teutonic peoples extended north- wards at this time cannot be determined with certainty, but it is clear that they occupied at least a considerable part of the Scandinavian peninsula.

It has already been mentioned that the Teutonic peoples of this period seem to have been fully conscious of their common origin. What exactly the grouping into Inguaeones, Hermiones and Istaeuones was based upon can only be conjectured, though probably its origin is to be sought rather in religion than in political union. The name of the Hermiones, who are defined as " central " or " interior " peoples, is probably connected with that of the Irminsul, the sacred pillar of the Old Saxons. The Inguaeones again are defined as being "- next to the ocean "; but the name can be traced only in Denmark and Sweden, where we find the eponymous hero Ing and the god Yngvi (Frey) respectively. It is likely that the name really belonged only to the peoples of the southern Baltic. Very probably there were many tribes which did not regard themselves as belonging to any of these groups. Tacitus himself records a variant form of the genealogy (see above), according to which Mannus had a larger number of sons, who were regarded as the ancestors of the Suebi, Vandilii, Marsi and others (see Suebi, Vandals). In two at least of these cases we hear of sanctuaries which were resorted to by a number of tribes. It is not to be doubted that such religious

confederations were favourable to the existence of political unions. Generally speaking, however, each tribe formed a political unit in itself, and the combinations brought together from time to time in the hands of powerful kings were liable to fall to pieces after the first disaster.

For a few years at the beginning of the Christian era the part of Germany which lies west of the Elbe was under Roman government; but after the defeat of Varus (a.d. 9) the Rhine and the Danube formed in general the frontiers of the empire. Roman influence, however, made itself felt both by way of trade and especially by the employment of German soldiers in the auxiliary forces. In the age of national migrations — from the 4th to the 6th century — the territories of the Teutonic peoples were vastly extended, partly by conquest and partly by arrangement with the Romans. These movements began in the east, where we find the Goths ravaging Dacia, Moesia and the coast regions- as early as the 3rd century. In the following century the Vandals settled in Pannonia (western Hungary), while the Goths occupied Dacia, which had now been given up by the Romans, and subsequently took possession also of large territories to the south of the lower Danube.

The 5th century was the time of the greatest national move- ments. In 406-9 the Vandals and other tribes invaded Gaul from the east and subsequently took possession of Spain and north-western Africa. Immediately afterwards the Visigoths

invaded Italy and captured Rome; then turning westwards they occupied southern Gaul and Spain. The southern Suebic peoples, the Alamanni and Bavarians, extended their frontiers as far as the Alps probably about the same time. Not much later a considerable portion of northern Gaul fell into the hands of the Franks, and before the middle of the century the eastern part was occupied by the Burgundians. Several of these move- ments were due, without doubt, to pressure from the Huns, an eastern people who had conquered many Teutonic tribes and established the centre of their power in Hungary.

Their empire, however, speedily broke up after the death of their king Attila in 453. The chief events of the latter part of the century were the conquest of the eastern part of Britain by the Angli, the invasion of Italy by the Ostrogoths and the complete subjuga- tion of northern Gaul by the Franks. By this time, with the exception of Brittany and the southern part of the Balkan peninsula, practically the whole of southern and western Europe was under Teutonic government.

It is customary to attribute this great expansion partly to the increasing weakness of the Romans and partly to pressure of population in Germany. Both explanations may contain a certain amount of truth; but there is no doubt that the military strength of the Teutonic nations was far more formid- able now than it had been in the time of the early empire. Not only is it clear, both from literary and archaeological evidence, that they were better armed (see below), but also their power was much more concentrated. Thus during the 1st century we hear of about a dozen different tribes in and around the lower part of the basin of the Rhine. In later times, with one or two possible exceptions, these were all included under the general term Franci, and by the end of the 5th century all had become subject to one king. Similar processes can be traced elsewhere, e.g. among the Alamanni and in the northern kingdoms. Their effect, of course, must have been to provide the kings with greater wealth and with larger permanent bodies of armed men. The motive force towards extension of territories was supplied by military ambition; especially we have to take account of the growth of a warlike spirit in the North, which was constantly driving young warriors to seek their fortunes in the service of continental princes. Where the movement was really of a migratory character it may generally be ascribed to external pressure, in particular from the Huns and the Avars.

The first half of the 6th century saw the subjugation of the Burgundian and Visigothic portions of Gaul by the Franks and the recovery of

Africa by the Romans. This latter event was soon followed by the overthrow of the Ostrogothic kingdom; but not many years later Italy was again invaded by tie Langobardi (Lombards), the last of the great Teutonic migra- tions. By this time the extension of Teutonic dominion towards the south and west had brought about its natural sequel in the occupation of the old Teutonic lands in eastern Germany, in- cluding even the basin of the Elbe, by Slavonic peoples. Before the end of the century Bohemia also and Lower Austria, together with the whole of the basins of the Drave and the Save, had become Slavonic countries.

The story of the succeeding centuries may briefly be de- scribed as in general a process of return to the ethnographical conditions which prevailed before the migration period. The Franks and the Langobardi remained in Gaul and Italy, but they gradually became denationalized and absorbed in the native populations, while in Spain Teutonic nationality came to an end with the overthrow of the Visigothic kingdom by the Moors, if not before. Yet throughout the west and south-west the Teutonic frontier remained from fifty to two hundred miles in advance of its position in Roman times. In south-eastern Europe also the Teutonic elements were swallowed up by the native and Slavonic populations, though a small remnant lingered in the Crimea until probably the 17th century. On the other hand the political consolidation of the various continental Teutonic peoples (apart from the Danes) in the 8th century led to the gradual recovery of eastern Germany together with Lower Austria and the greater part of Styria and Carinthia, though

Kingship,

Bohemia, Mcavia and the basins of the Vistula and the Warthe have always remained mainly Slavonic. In the British Isles the Teutonic element, in spite of

temporary checks, eventually became dominant everywhere. Lastly, from the very beginning of the 9th century bodies of Scandinavian warriors began to found kingdoms and principalities in all parts of Europe. The settlers, hov°ver, were not sufficiently numerous to preserve their nationality, and in almost all cases they were soon ab- sorbed by tne populations (Teutonic, Celtic, Latin or Slavonic) which they had conquered. Their settlements in Greenland and Canada likewise came to an end, but Iceland, which was formerly uninhabited, remained a Scandinavian colony. The permanent expansion of the Teutonic peoples outside Europe did not begin till the 16th century.*

2. Form of Government. — From the evidence at our disposal it is difficult to determine how far the Teutonic peoples were under kingly government in early times. Tacitus speaks of tribes which had kings and tribes which had not, the latter apparently being under a number of principes. On nearer examination, however, it appears that kingship was intermittent in some tribes, while in others, which had no kings, we find mention of royal families. All such cases were perhaps peculiar to the western peoples; in the east, north and centre we have no evidence for kingless government. Further, while Tacitus represents the power of Teutonic kings in general, with reference no doubt primarily to the western tribes, as being of the slightest, he states that among the Goths, an eastern people, they had somewhat more authority, while for the Swedes he gives a picture of absolutism. It is quite in harmony with these statements that many Northern and probably all the Anglo-Saxon kingly families traced their origin to the gods. The Swedes, indeed, and some of the eastern peoples seem to have regarded their kings themselves as at least semi-divine (see below, § Religion). As the west was the side most open to foreign influence during the Roman period, it is likely that the form of government which prevailed here was less primitive than the other, especially as we know that kingship had by this time died out

among the Gauls. In later times we very fre- quently find a number of " kings," generally belonging to one family, within the same tribe; and it is not improbable that the early principes were persons of similar position. The kingless state may therefore have arisen out of kingship through divisions of the royal power or through failure on the part of the leading men to agree on a head acceptable to all. On the other hand the conditions ot the migration period were doubtless favourable to monarchical government, and from this time onwards kingship appears to have been universal, except among the Old Saxons and in Iceland.

The concilium or tribal assembly figures largely in Tacitus's account of the Germani, and he represents it as the final authority on all matters of first-rate importance. Further, Tribal it was here that the principes were chosen, serious Assembly, charges brought against members of the tribe and youths admitted to the rights of warriors. The duties of opening the proceedings and maintaining order belonged not to the king but to the priests, from which we may probably infer that the gathering itself was primarily of a religious character and that it met, as among the Swedes in later times, in the immediate neighbourhood of the tribal sanctuary. Such religious gatherings were no doubt common to all Teutonic peoples in early times, but it may be questioned whether among the eastern and northern tribes they were invested with all the powers ascribed to them by Tacitus. After his time tribal assemblies are seldom mentioned, and though we hear oc- casionally, both in England and elsewhere, of a concourse of people being present when a king holds court on high days or religious festivals, there is no evidence that such concourses took part in the discussion of state affairs. Indeed, consider- ing the greatly increased size of the kingdoms in later times, it is improbable that they were drawn from any except the immediately adjacent districts. When we hear of deliberations now they are those of the king's council or court, a body con-

sisting partly of members of the royal family and

partly of warriors old and young in the personal service of the king. Such bodies of course had always existed (see below) and exer- cised at all times a powerful influence upon the kings, frequently even forcing them into war against their own wishes. That they appear more prominently now than in earlier times is due to the fact that owing to the increased size of the kingdoms, they had become both more numerous and more wealthy. The principle of representation for the unofficial classes, i.e. for those not under the immediate lordship of the king, scarcely begins before the 13th century.

Of all the institutions of the Teutonic peoples probably none exercised a greater influence on their history than the comilalus. From Caesar we learn that it was customary at tribal assemblies for one or other of the chiefs to propose an expedition. He had generally no difficulty in gathering a following, and those who embraced his service were held bound to accompany him to the end, any who drew back being regarded as traitors. Incidents illustrative of this custom are of frequent occurrence in early history and tradition. Moreover, kings and other distinguished persons kept standing bodies of young warriors, an honour to them in time of peace, as Tacitus says, as well as a protection in war. Chiefs of known prowess and liberality attracted large retinues, and their influence within the tribe, and even beyond, increased proportionately. The followers (called by Tacitus comites, in England ” thegns,” among the Franks antrustiones, &c.) were expected to remain faithful to their lord even to death; indeed so close was the relationship between the two that it seems to have reckoned as equivalent to that of father and son. According to Tacitus it was regarded as a disgrace for a comes to survive his lord, and we know that in later times they frequently shared his exile. Perhaps the most striking instance of such devotion was that displayed at the battle of Strassburg in 357, when the Alamannic king Chonodomarius was taken prisoner by the Romans, and his two hundred comites

gave themselves up voluntarily to share his captivity. In return for their services the chief was expected to reward his followers with treasure, arms and horses. If he were a king the reward might take the form of a grant of land, or of jurisdiction over a section of the population subject to him — in early times a village, in later, perhaps, a considerable district. Further, since the grantees as a rule naturally sent their sons into the service of their own lords, such grants tended to become hereditary, and in them we have the origin of the baronage of the middle ages. The origin of the earls or counts, on the other hand, is to be found in the governors of large dis- tricts (Tacitus's principes), who seem at first generally to have been members of the royal family, though later they were drawn from the highest barons.

3. Social Organization. — As far back as the time of Tacitus we hear of three social classes, viz. nobles, freemen and freed- men. The same classes are met with in later times, though occasionally one of them disappears, e.g. the nobility among the Franks and the freedmen (as a distinct class) in the Anglo-Saxon kingdoms, except Kent. Each of these classes was, to a large extent at least, hereditary and had separate rights and privileges of its own. Among the chief of these must be reckoned the wergeld o"r "man-price." When homicide took place vengeance was regarded as a sacred duty incumbent on the relatives, and sometimes at least the lord also, of the slain man; 1 but, as in the case of any other injury, compensation could be made by a fixed payment. From the evidence of later custom it is probable that the normal payment for a freeman was a hundred head of cattle. The sums paid for members of the other classes were more variable; for the freedman, however, they were always lower, and for the noble higher, sometimes apparently three or four times as high. Similar gradations occur in the compensations paid for various injuries and insults, in fines and, atnong some tribes, in the value attached to a man's oath. There is a good deal of uncertainty in regard to both the exact position and

the numbers of the nobles and freedmen of Tacitus's age. It is probable, however, that the latter, like

the lili or lati of later times, consisted not only of manumitted slaves but also of whole communities which had forfeited their liberty through unsuccessful warfare or other causes. In addition to these classes there was also a considerable popula- tion of slaves, who had no legal status or wergeld and were regarded as the property of their masters. In general, however, their lot seems to have struck the Romans as favourable, since they were not attached to their masters' households but lived in homes of their own, subject to fixed payments in corn, live stock and clothing.

Groups of family and kindred occupy a prominent position in the accounts of Teutonic society given by Caesar and Tacitus. It was regarded as a universal duty to afford protection to one's kinsmen, to assist them in the redress of wrongs and to exact vengeance or compensation in case of death, Hence to have a numerous kindred was a guarantee of security and influence. The large amounts fixed for the wergelds of nobles and even of freemen were paid no doubt, as in later times, not only by the slayer himself, but by every member of his kindred in propor- tion to the nearness or remoteness of his relationship; and in like manner they were distributed among the kindred of the slain. The importance of the kindred, however, was not limited to purposes of mutual protection. It appears also in the tenure of land, and according to Tacitus the tribal armies were drawn up by kindreds. As to the nature of these organiza- tions the evidence is not altogether consistent. It is clear that agnatic succession prevailed among the princely families of the Cherusci, and the general account given in the Germania seems to imply that this type of organization was normal. On the other hand there are distinct traces of cognation not only in Tacitus's

works but also in Northern traditions and more especially in the Salic law. On the whole it seems not unlikely that at the beginning of the Christian era the Teutonic peoples of the continent were in a state of transition from cognatic to agnatic organization.

All the usual forms of marriage were known, including marriage by capture and marriage by purchase. The latter M _j appears most prominently in Kent and among the Old Saxons, Langobardi and Burgundians. In other nations, e.g. the Franks, we find the payment of a very small sum, which is often regarded as symbolic and as a relic of real purchase. Yet this explanation is open to question owing to the very early date at which the regulation appears, and to the fact that in the case of widows the sum specified had to be paid to relatives of the widow herself on the female side, and by preference to those of a younger generation. Again, Tacitus states that the presents of arms and oxen given by the bride- groom at marriage were made to the bride herself and not to her guardian, and such appears to have been the case in the North also from early times. It is not certain, therefore, that marriage by purchase was a universal and primitive Teutonic custom. Of the actual ceremonies practised at marriage not very much is known. It was preceded, however, by a formal betrothal and accompanied by a feast. Moreover, even among those peoples with whom purchase prevailed it was customary for the bridegroom to present the bride with a " morning-gift," which in the case of queens and princesses often took the form of considerable estates. There is no doubt that the marriages of heathen times were often of a kind which could not be per- mitted after the adoption of Christianity. Among these may be mentioned marriages with brothers' widows and stepmothers, the latter especially in England. Polygamy was known, but limited, both in early and late times, to persons of exceptionally high position, while of polyandry there is hardly any trace. Indeed, the sanctity attached to marriage seems to have struck the Romans as remarkable. On

the other hand strife between persons connected by marriage appears to have been of ex- tremely frequent occurrence, and no motive plays a more prominent part in Teutonic traditions.

4. State of Civilization.— -It is a much disputed question whether the Teutonic peoples were really settled agricultural communities at the time when they first came into contact

with the Romans, shortly before the beginning of our era. That agriculture of some kind was practised is clear enough from Caesar's account, and Strabo's statement to the contrary must be attributed to ignorance or exaggeration. But Caesar himself seems to have regarded the Germani as essentially pastoral peoples and their agriculture as of quite secondary importance, while from Tacitus we gather that even in his time it was of a somewhat primitive character. For not only was the husbandry co-operative, as in much later times, but apparently the ploughlands were changed from year to year without any recognition of a two-course or three-course system. Caesar, moreover, says that the clans or kindreds to whom the lands were allotted changed their abodes also from year to year — a statement which gives a certain amount of colour to Strabo's description of the Germani as quasi-nomadic. Yet there is good reason for believing that this representation of early Teutonic life was by no means universally true. We have evidence, both archaeological and linguistic, that the cultivation of cereals in Teutonic lands goes back to a very remote period, while the antiquity even of the ox-plough is attested by the rock-carvings at Tegneby in Bohuslan (Sweden), which are believed to date from early in the bronze age. Further, that the tribes were not normally of a migratory character, as Straba seems to imply, is shown by the existence of sanctuaries of immemorial age and by frontier ramparts such as that raised by the Angrivarii against the Cherusci. It would seem that Julius Caesar encountered the Germani under somewhat ab-normal conditions. Several of the tribes with which he came into collision had been expelled from their

own territories by other tribes, and we are expressly told that Ariovistus's troops had not entered a house for fourteen years. Further, there is satisfactory evidence that the basin of the Rhine, perhaps also a considerable area beyond, had been conquered from Celtic peoples not very long before — from which it is probable that western Germany was still in a more or less unsettled condition. Indeed Caesar himself seems to have regarded the prevalence of the military spirit as the chief hindrance to the development of agriculture. From this time onwards it was from the west mainly that Roman civilization made its way into Germany, but in earlier ages, as we have already noticed, there are more abundant traces of civilization in the basin of the Elbe than in the districts farther to the west. Hence it is not so surprising as might at first sight appear that the remote Aestii, a non-Teutonic people settled about the mouth of the Vistula, are represented by Tacitus as keener agriculturists than any of the other inhabitants of Germany.

All ancient writers emphasize the essentially warlike character of the Germani. Yet Tacitus seems to represent their military equipment as being of a somewhat primitive type. Swords, helmets and coats of mail, he says, were seldom to be seen; in general they were armed only with huge shields, unwieldy spears and darts. Here again he appears to be thinking of the western tribes; for elsewhere he states that some of the eastern peoples were armed with short swords and round shields — which probably were of comparatively small size, like those used in later times. This latter type of equipment prevailed also in the North, as may be seen, e.g. from the figures of warriors on the inscribed golden horn found at Gallehus (Jutland) in 1734. The favourite method of attack was by a wedge formation (known later in the North as svinfylking) , the point being formed by a chosen band of young warriors. Certain tribes, such as the Tencteri, were famous for their horsemen, but the Germani in general preferred to fight on foot. Sometimes also we hear of specially trained forces in which the two

arms were combined. Naval warfare is seldom mentioned. The art of sailing seems to have been unknown, and it is probable that down to the 3rd century the only peoples which could truly be described as seafaring were those of the Baltic and the Cattegat.

There is no doubt that Roman influence brought about a

considerable advance in civilization during the early centuries

of our era. The cultivation of vegetables and fruit trees seemf

I to have been practically unknown before this period, and almost

all their names testify to the source from which they were de- rived. We may notice also the introduction of the mill in place of the quern which hitherto had been in universal use. In all such cases the tribes subject to the Romans, in the neighbourhood of the Rhine, were probably the chief channel by which Roman influence made its way, though account must also be taken of the fact that considerable numbers of warriors from remoter districts were attracted to serve in the Roman armies. Great improvements took place likewise in armour and weapons; the equipment of the warriors whose relics have been found in the Schleswig bog-deposits, dating from the 4th and 5th centuries, appears to have been vastly superior to that which Tacitus represents as normal among the Germani of his day. Yet the types, both in armour and dress, remained essentially Teutonic — or rather Celtic-Teutonic. Indeed, when in the course of time uniformity came to prevail over the greater part of Europe, it was the Teutonic rather than the Roman fashions which were generalized.

The antiquity of the art of writing among the Teutonic peoples is a question which has been much debated. Tacitus Writinr savs tnat certam marks were inscribed on the divining chips, but it cannot be determined with certainty whether these were really letters or not. The national type of writing, generally known as Runic, must have been fully developed by the 4th century, when some of its letters were borrowed by Ulfilas (Wulfila) for his new alphabet (see Goths: § C.) . Indeed, by this time it was probably known to most of the Teutonic peoples, for several of the inscriptions found in Jutland and the islands of the Belt can hardly be of later date. As to the source from which it was derived opinions still differ, some thinking that it was borrowed from the Romans a century or two before this time, while others place its origin much farther back and trace it to one of the ancient Greek alphabets. Many of the earliest inscriptions read from right to left, and the floueTpcHJrridov type is also met with occasionally. It is clear both from literary and linguistic evidence that the character was chiefly used for writing on wood, but the inscriptions which have survived are naturally for the most part on metal objects — in Sweden, Norway and England also on monumental stones. In Germany very few Runic inscriptions have been found, and there is nothing to show that the alphabet was used after the 8th century. In England also it seems not to have lasted much longer, but inscriptions are far more numerous. On the other hand, in Scandinavian countries it continued in use through the greater part of the middle ages— in Gotland till the 1 6th century; indeed, the knowledge of it seems never to have wholly died out. In the course of time, however, it under- went many changes, and the earliest inscriptions must have been unintelligible for over a thousand years until they were deciphered by scholars within the last half century. The Roman alphabet first came into use among the western and northern Teutonic peoples after their adoption of Christianity.

5. Funeral Customs.— Icelandic writers of the 12th

and 13th centuries distinguished between an earlier " age of burning " and a later " age of barrows," and the investigations of modern archaeologists have tended in general to confirm the distinction, though they have revealed also the burial-places of times antecedent to the age of burning. Throughout the stone age inhumation appears to have been universal, many of the neo- lithic tombs being chambers of considerable size and constructed with massive blocks of stone. Cremation makes its appearance first in the earlier part of the bronze age, and in the latter part of that age practically displaces the older rite. In the early iron age there is less uniformity, some districts apparently favouring cremation and others inhumation. The former practice is the one recognized by Tacitus. In the national migration period, however, it fell into disuse among most of the continental Teutonic peoples, even before their conversion, though it seems to have been still practised by the Heruli in the sth century and by the Old Saxons probably till a much later period. It came into Britain with the Anglo-Saxon invaders and continued in use in certain districts perhaps until

nearly the close of the 6th century. In Scandinavian lands the change noted by Icelandic writers may be dated about the 5th and 6th centuries, though inhumation was certainly not alto- gether unknown before that time. After the 6th century cremation seems not to have been common, if we may trust the sagas, but isolated instances occur as late as the 10th century. It is to be observed that cremation and the use of the barrow are not mutually exclusive, for cremated remains, generally in urns, are often found in barrows. On the other hand inhuma- tion below the surface of the ground, without perceptible trace of a barrow, seems to have been the most usual practice during the national migration period, both in England and on the continent. A special form of funeral rite peculiar to the North was that of cremation on a ship. Generally the ship was drawn up on land; but occasionally we hear, in legendary sagas, of the

burning ship being sent out to sea. Large ships containing human remains have sometimes been found in barrows of the viking age. Arms and ornaments are frequently met with, sometimes also horses and human remains which may be those of slaves, the belief being that the dead would have all that was buried with him at his service in the life beyond. Usage, however, seems to have varied a good deal in this respect at different times and in different districts.

6. Religion. — The conversion of the Teutonic peoples to Christianity was a gradual process, covering some seven cen- turies. The first to accept the new religion seem to have been the Goths, beginning about the middle of the 4th century, and the Vandals must have followed their example very quickly. In the course of the 5th century it spread to several other nations, including the Gepidae, Burgundians, Rugii and Langobardi. In all these cases the Arian form of Christianity was the one first adopted. The first conversion to the Catholic form was that of the Franks at the end of the sth century. The ex- tension of Frankish supremacy over the neighbouring Teutonic peoples brought about the adoption of Christianity by them also, partly under compulsion, the last to be converted being the Old Saxons, in the latter half of the 8th century. The conversion of England began in 597 and was complete in less than a century. In the north, after several attempts during the 9th century which met with only temporary success, Christianity was established in Denmark under Harold Bluetooth, about 940-960, and in Norway and Sweden before the end of the century, while in Iceland it obtained public recognition in the year 1000. Many districts in Norway, however, remained heathen until the reign of St Olaf (1014-1028), and in Sweden for half a century later.

The subsequent religious history of the various Teutonic peoples will be found elsewhere. Here we are concerned only with the beliefs and forms of worship which prevailed before the adoption of Christianity. For our knowledge of this subject we are indebted chiefly to Icelandic literary men of

the 12th and 13th centuries, who gave accounts of many legends which had come down to them by oral tradition, besides committing to writing a number of ancient poems. Unfortunately Icelandic history is quite unique in this respect. In the literatures of other Teutonic countries we have only occasional references to the religious rites of heathen times, and these are generally in no way comparable to the detailed accounts given in Icelandic writings. Hence it is often difficult to decide whether a given rite or legend which is mentioned only in Icelandic literature was really peculiar to that country alone or to the North generally, or whether it was once the common property of all Teutonic peoples.

A number of gods were certainly known both in England and among many, if not all, the Teutonic peoples of the con- tinent, as well as in the North. Among these were Odin (Woden) , Thor (Thunor) and Tyr (Ti); so also Frigg (Frig), the wife of Odin (see Frigg, Odin, Woden, Thor, Tyr). Some scholars have thought that Balder, the son of Odin, was once known in Germany, but the evidence is at least doubtful. Heimdallr, the watchman of the gods and UUr, the stepson of Thor, as well as Hoenir, Bragi and most of the other less prominent gods.

were also probably peculiar to the North, though Ullr at least was known in Denmark. Some of these deities may originally have been quite local. Indeed, such may very well have been the case with Frey, the chief god of the North after Thorand Odin. Tradition at all events uniformly points to Upsala as the original home of his cult. But it is probable that both he and his sister Freyia were really specialized forms of a divinity which had once been more widely known. Their father, Nior8r, the god of wealth, who is a somewhat less important figure, corresponds in name to the goddess Nerthus (Hertha), who in ancient times was worshipped by a number of tribes, including the Angli, round the coasts of the

southern Baltic. Tacitus de- scribes her as ” Mother Earth,” and the account which he gives of her cult bears a somewhat remarkable resemblance to the ceremonies associated in later times with Frey. This family of deities were collectively known as Vanir, and are said to have once been hostile to the Aesir, to whom Odin belonged. Their worship was generally connected with peace and plenty, just as that of Odin was chiefly bound up with war. Gefion was another goddess who may represent a later form of Nerthus. In her case tradition points distinctly to a connexion with Denmark (Sjaelland). On the other hand, the portraiture of Skaoi, the wife of Nior3r, seems to point to a Finnish or Lappish origin. The rest of the northern goddesses are comparatively unimportant, and only one of them, Fulla, the handmaid of Frigg, seems to have been known on the continent.

Some of the deities known to us from German and English sources seem also to have been of a local or tribal character. Such doubtless was Fosite, to whom Heligoland was sacred. Saxnot (Seaxneat), from whom the kings of Essex claimed descent, was probably a god of the Saxons. Holda, who is known only from the folklore of later times, appears to have been a German counterpart of Nerthus. Ing, who is connected with Denmark in Anglo-Saxon tradition, was in all probability the eponymous ancestor of the Inguaeones (see above). His name connects him, too, with the god Frey, who was also called Yngvi- freyr and Ingunarfreyr, and he must at one time have been closely associated with Nerthus. The relationship of Ing to the Inguaeones is paralleled by that of Irmin to the Hermiones (see above). He may be the deity whom Tacitus called ” Her- cules.”

Some of these eponymous ancestors may be regarded as heroes rather than gods, and classed with such persons, as Skibldr, the eponymous ancestor of the Danish royal family, who is not generally included in the Northern pantheon. But the line of division between the human and the divine is not very definite. The royal family of Norway claimed descent from Frey, and many royal families, both English and

Northern, from Woden (Odin). Indeed, several legendary kings are described as sons of the latter. Sometimes, again, the relationship is of a conjugal character. Skioldr, though hardly a god himself, is the husband of the goddess Gefion. So we find Freyia's priest described as her husband and Frey's priestess as his wife, and there is no reason for regarding such cases as exceptional.

If it is not always easy to distinguish between gods and heroes, there is still greater difficulty in drawing a line between the former and other classes of supernatural beings, such as the " giants " (O.N. iotnar, A.S. eotenas). Here again we have intermarriage. Ska3i, the wife of Nior9r, and Ger3r, the wife of Frey, were the daughters of the giants Thiazi and Gymir re- spectively, though Ska3i is always reckoned as a goddess. Loki also was of giant birth; but he is always reckoned among the gods, and we find him constantly in their company, in spite of his malevolent disposition. In general it may be said that the giants were regarded as hostile to both gods and men. Often they are represented as living a primitive life in caves and desolate places, and their character is usually ferocious. But there are exceptions even among the male giants, such as Aegir, whom we find on friendly terms with the gods. It is worth noting also that some of the leading families of Norway are said to have claimed descent from giants, especially from Thrymr, the chief opponent of Thor. In such cases there may be some

connexion between the giants and the semi-civilized (Finnish or Lappish) communities of the mountainous districts. This connexion is more clear in the case of Thorger5r Holgabru3r, who is known chiefly from the extreme veneration paid to her by Haakon, earl of Lade (+995). According to one story she was the daughter of Holgi, the eponymous king of Halogaland (northern Norway); according to another she was the wife of Holgi and daughter of Gusi, king of the Fins. She ought perhaps to be regarded rather as a goddess than as a giantess, but she is never associated with the other deities.

Another class of supernatural beings was that of the dwarfs. They were distinguished chiefly for their cunning and for skill in working metals. More important than these from a religious point of view were the elves (O.N. alfar, A.S. ylfe), who certainly received worship, at all events in the North. They are almost always spoken of collectively and generally represented as beneficent. In some respects, e.g. in the fact that they are often said to inhabit barrows, they seem to be connected with the souls of the dead. In other cases, however, they are hardly to be distinguished from spirits (the Icel. landvaettir, &c), which may be regarded as genii locorum.

In addition to the above there were yet other classes of super- natural beings (see Norns and Valkyries). Mention, however, must be made here of the fylgiur and hamingiur of Northern belief. These are of two kinds, though the names seem not always to be clearly distinguished. Sometimes the fylgia is represented as a kind of attendant spirit, belonging to each individual person. It may be seen, generally in animal form, in visions or by persons of second sight, but to see one's own fylgia is a sign of impending death. In other cases the fylgiur (or perhaps more correctly the hamingiur} apparently belong to the whole family. These generally appear in the form of maidens.

Human beings, especially kings and other distinguished persons, were not infrequently honoured with worship after death. In Sweden during the 9th century we have trustworthy record of the formal deification of a dead king and of the erection of a temple in his honour. In general the dead were believed to retain their faculties to a certain extent in or near the place where they were buried, and stories are told of the resistance offered by them to tomb-robbers. It would seem, moreover, that they were credited with the power of helping their friends (and likewise of injuring other people) very much in the same way as they had done in life. Hence the possession of the remains of

a chief who had been both popular and prosperous was regarded as highly desirable.

The blessings which kings were expected to bestow upon their subjects, in life as well as after death, were partly of a supernatural character. Chief among them was that of securing the fertility of the crops. The prevalence of famine among the Swedes was attributed to the king's remissness in performing sacrificial functions; and on more than one occasion kings are said to have been put to death for this reason. Under similar circumstances Burgundian kings were deposed.^ In connexion with this attribution of superhuman powers, we may mention also the widespread belief that certain persons had the faculty of " changing shape," and especially of assuming the forms of animals.

Besides the various classes of beings to the worship of which we have already referred, we hear occasionally also of sacred animals. Tacitus tells of horses consecrated to the service of the gods, and of omens drawn from them, and we meet again with such horses in Norway nearly a thousand years later. In the same country we find the legend of a king who worshipped a cow. Besides the anthropomorphic " giants, " mentioned above, Northern mythology speaks also of theriomorphic demons, the chief of which were MidgarSsormr, the " world- serpent," and Fenrisulfr, a monster wolf, the enemies of Thor and Odin respectively. These beings ate doubtless due in part to poetic imagination, but underlying this there may be a substratum of primitive religious belief. In contrast with later Scandinavian usage Tacitus states that the ancient Germans

had no images of the gods. But he does speak of certain sacred symbols which he defines elsewhere as figures of wild beasts. One of the chief objects of veneration among the Cimbri is said to have been a brazen bull.

Figures of animals, however, were not the only inanimate things regarded in this way. The Quadi are said to have considered their swords divine. More important than this was the worship paid, especially in the North, to rocks and stone cairns, while springs and pools also were frequently regarded as sacred in all Teutonic lands. But, on the whole, there is perhaps no characteristic of Teutonic religion, both in early and later times, more prominent than the sanctity attached to certain trees and groves, though it is true that in such cases there is often a doubt as to whether the tree itself was wor- shipped or whether it was regarded as the abode of a god or spirit. The sanctuaries mentioned by Tacitus seem always to have been groves, and in later times we have references to such places in all Teutonic lands. One of the most famous was that in or beside which stood the great temple of Upsala. Here also must be mentioned the Swedish Vardtrad or " guardian tree," which down to our own time is supposed to grant pro- tection and prosperity to the household to which it belongs. One of the most striking conceptions of Northern mythology is that of the " world-tree," Yggdrasil's Ash, which sheltered all living beings (see Yggdrasil). The description given of it recalls in many respects that of a particularly holy tree which stood beside the temple at Upsala. For the idea we may com- pare the Irminsul, a great wooden pillar which appears to have been the chief object of worship among the Old Saxons, and which is described as " universalis columna quasi sustinens omnia."

The Northern sanctuaries of later times were generally build- ings constructed of wood or other materials. A space apparently partitioned off contained figures of Thor or Frey and perhaps other gods, together with an altar on which burned a perpetual fire. In the main body of the temple were held the sacrificial feasts. The presiding priest seems always to have been the chief to whom the temple belonged, for there is no evidence for the existence of a special priestly class in the North. In England, however, the case was otherwise; we are

told that the priests were never allowed to bear arms. There is record also of priests among the Burgundians and Goths, while in Tacitus's time they appear to have held a very prominent position in German society. Among all Teutonic peoples from the time of the Cimbri onwards we frequently hear also of holy women whose duties were concerned chiefly with divination. Some- times, indeed, as in the case of Veleda, a prophetess of the Bructeri, during Vespasian's reign, they were regarded practi- cally as deities. After the adoption of Christianity, and possibly to a certain extent even before, such persons came to be re- garded with disfavour — whence the persecutions for witchcraft — but it is clear from Tacitus's works and other sources that their influence in early times must have been very great. In the North the sanctuaries called horgar seem to have been usually under the charge of the wives and daughters of the household. But there is some evidence also for the existence of special priestesses at certain sanctuaries.

Of religious ceremonies the most important was sacrifice. The victims were of various kinds. Those offered to Odin (Woden) were generally, if not always, men, from the time of Tacitus onwards. Human sacrifices to Thor and the other gods are not often mentioned. Of animals, which were consumed at the sacrificial banquets, we hear chiefly of horses, but also of oxen and boars-. At human sacrifices, however, dogs and hawks were often offered with the men. At all sacrifices it seems to have been customary to practise divination; in con- nexion with human sacrifice we have record of this rite from the time of the Cimbri. One barbarous custom which was regarded as a sacrifice was the dedication of an enemy's army to the gods, especially Odin. This custom, which is likewise known to have prevailed from the earliest times, involved the total destruction of the defeated army, together with everything

belonging to them. In general the chief sacrificial festivals seem to have taken place at fixed times in the year, one in early or mid-autumn, another at

mid-winter and a third during the spring. Sacrifices on ai exceptionally large scale were held at Upsala and Leire every nine years, at the former place about the time of the spring equinox, at the latter in the early part of January. Besides these fixed festivals sacrifices could of course be offered in all time of public or private need. In the latter case resort was very frequently had also to sorcery and necro- mancy.

Mention has been made above of the belief that the dead re- tained a conscious existence in or near the place where they were buried, and that they were able to confer blessings upon their friends. Beside this belief, however, we find another which seems hardly to be compatible with it, viz., that the souls of the dead passed to the realm of Hel, who in Northern mythology is represented as the daughter of Loki. Again, those who had fallen in battle were supposed to go to Valhalla, where they became warriors in Odin's service. This last belief seems to have been connected at one time with the practice of cremation. In conclusion it must be mentioned that even the life of the gods was not to be for ever. A day was to come when Odin and Thor would fall in conflict with the wolf and the world-serpent, when the abode of the gods would be destroyed by fire and the earth sink into the sea. But the destruction was not to be final; in the future the gods of a younger generation would govern a better world. How far these beliefs were common to the Teutonic peoples as a whole cannot be determined with cer- tainty. Some scholars hold that they were peculiar to the mythology of Norway and Iceland and that they arose at a late period, largely through Christian influence. But a serious objection to this view is presented by the fact that very similar ideas in some respects were current among the ancient Gauls.

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Tacitus (esp. Germania), Plutarch, Marius, and Ptolemy, Geogr. ii. II. Among later writers much valuable information is given by Ammianus Marcellinus, Jordanes, Procopius, Gregory of Tours, Bede, Paulus DiacOnus, Widukind, Thietmar, Adam of Bremen and Saxo Grammaticus, as well as by the early laws and charters. To these must be added a large number of Old Norse writings including the older Edda and the prose Edda (the chief authorities for Northern mythology), Islands Landnamabok and many sagas dealing with the history of families in Iceland (such as Eyrbyggia Saga) or with the lives of Norwegian and other kings, both historical and legendary (in Heimskringla, Fornmanna Sogur and Rafn's Fornaldar Sogur Norr- landa). For further references see Britain (Anglo-Saxon), Ger- many (Ethnography and Early History), and Scandinavian Civilization.

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TEVIOT, ANDREW RUTHERFORD, Earl of (d. 1664), was the son of William Rutherford of Quarrelholes, Roxburghshire. His education was received in Edinburgh, and he took up the career of soldier of fortune. His services were given to trie French government, which maintained regiments of Scottish mercenaries. On the restoration of Charles II., Rutherford was taken into employment by his own king on the recommenda- tion of Louis XIV. of France. He had held a commission as lieutenant-general in France and had a high reputation for personal courage. Charles II. gave him the Scottish title of Lord Rutherford and the governorship of Dunkirk, which had been acquired by the Protector Oliver Cromwell. When Charles II. sold the town to France in 1662 Rutherford was consoled by the command of the 2nd or Tangier regiment, was made earl of Teviot in the peerage of Scotland, and was sent in 1663 as governor to Tangier. His tenure of office was very short, for on the 4th of May 1664 he allowed himself to be en- trapped into an ambush by the Moors, who carried on incessant irregular warfare against the English garrison, and was killed, together with nineteen officers and nearly five hundred men of his garrison.

See W. F. Lord, The Lost Possessions of England (London, 1896).

TEVIOTDALE, the valley of the Teviot, Roxburghshire, Scotland. In a limited sense the word describes the stretch above Hawick (9 m.) and, in a wider sense, the whole vale, extending in a north-easterly direction from Teviothead nearly to the confines of the parish of Roxburgh, a distance of 23 m. It is

sometimes incorrectly used as an alternative name for the shire, much of the area of which, in point of fact, lies outside the Teviot drainage basin. There are numerous points of interest in the dale. Henry Scott Riddell (1798–1870), the poet, was buried at Teviothead. Almost side by side in the church- yard are the obelisk near his grave and the memorial stone erected in the cemetery wall to John Armstrong of Gilnockie, the celebrated freebooter, who, along with several followers, was treacherously seized in 1530 and hanged at Caerlanrigg, in the immediate vicinity, by order of James V. Riddell is further commemorated by a monument on Dryden hill. Branxholm tower, the peel of Goldielands, and Harden castle (on Harden burn, a tributary of Northwick water) are spots familiar through the writings of Sir Walter Scott and many Border ballads. Five m. to the east of Hawick stands the hill of Ruberslaw (1392 ft.). Among the crags on its summit is the rock, still called " Peden's chair," from which Alexander Peden preached to conventicles of Covenanters. Below Hawick interest principally centres around Minto, Hassendean — the Hazeldean of Sir Walter Scott's song, " Jock o' Hazeldean " — and Ancrum.

TEWFIK PASHA (1852–1892), khedive of Egypt, son of the Khedive Ismail, was born on the 15th of November 1852. His

mother was a fellah woman. Although the eldest son, he was not sent to Europe to be educated, like his younger brothers, but was left to grow up in his native country. In 1866 Ismail succeeded in his endeavour to alter the order of succession to the khediviate. The title, instead of passing to the eldest living male descendant of Mehemet Ali, was now to descend from father to son. Ismail sought this alteration mainly be- cause he disliked his uncle, Halim Pasha, who was his heir- presumptive, and he is supposed to have imagined that he would be able to select whichever of his sons he pleased for his suc- cessor. But he found, after the change had been made, that the powers interpreted the new arrangement as applying strictly to the eldest son.

Tewfik therefore became heir- apparent. He was given a palace near Cairo to live in, and for twelve years he passed an uneventful life, farming, and estab- lishing a reputation for good sense and fair dealing with his fellah tenants. In 1878 he was appointed president of the council after the dismissal of Nubar Pasha. He held this office only for a few months; but this was long enough to show that, if he was unambitious and not particularly intelligent or ener- getic, he had the wisdom to refrain from taking a part in the intrigues which then formed the chief part of political life in Egypt. He went back to his estate, and settled down once more to a quiet country life. He was not left undisturbed for long. On the 26th of June 1879 Ismail, at the instance of Great Britain and France, was deposed by the sultan, who sent orders at the same time that Tewfik should be proclaimed khedive. The new viceroy was so little pleased by the news of his accession that he soundly boxed the ears of the servant who first brought the tidings to him. Egypt at that time was involved in financial and political troubles brought about by the policy of Ismail (q.v.), and the situation was made worse by the inaction of England and France for some months following Tewfik's ac- cession. Tewfik's people were dissatisfied, his army disaffected; his advisers were nearly all of the adventurer class, with their own ends to gain; and he himself had neither the character of a strong ruler nor the experience that would have enabled him to secure an orderly administration of affairs. Disorder pre- vailed until November 1879, when the dual control was re- established by the governments of Great Britain and France. For over two years Major Baring (afterwards Lord Cromer), Mr (afterwards Sir) Auckland Colvin, and M. de Blignieres practically governed the country, endeavouring to institute reforms while possessing no means of coercion. During all this time the disaffection in the Egyptian army was increasing. Tewfik has been blamed for his failure to take a firm line with the rebels, but his attitude was governed by his relations with Great Britain and France, and he was unable to control events. The dissatisfaction culminated in

the anti-foreign movement headed by Arabi Pasha (q.v.), who had gained complete command of the army. In July 1882 the attitude of Arabi, who was carrying out defensive works on a large scale, made it necessary for the British admiral (Sir Beauchamp Seymour, afterwards Lord Alcester) to declare that he would bombard the forts of Alexandria unless they were handed over to him. Before the bombardment began it was suggested to Tewfik that he should leave the city and embark either upon a man-of-war belonging to one of the neutral powers, or in his own yacht, or in a mail steamer which was then in the port. His answer was, " I am still khedive, and I remain with my people in the hour of their danger." At his palace of Ramleh, 3 m. from the town, he was beyond reach of the shells, but his life was nevertheless imperilled. When the rebel soldiers attacked the palace he managed to make his escape and to reach another palace after passing through the burning streets of Alexandria. Here he was obliged to agree that a guard of British bluejackets should protect him from further risk. He showed his courage equally during the cholera epidemic at Alexandria in 1883. He had gone back to Cairo after the battle of Tel-el-Kebir, had con- sented to the reforms insisted upon by Great Britain, and had assumed the position of a constitutional ruler under the guid- ance of Lord Duff erin, the British special commissioner. When

the cholera broke out, he insisted upon going to Alexandria. His wife accompanied him, and he went round the hospitals, setting an excellent example to the authorities of the city, and encouraging the patients by kind and hopeful words. In 1884 Sir Evelyn Baring went back to Egypt as diplomatic agent and consul-general of Great Britain. His first task was to demand that Tewfik should abandon the Sudan. Tewfik gave his con- sent with natural reluctance, but, having consented, he did everything he could to ensure the success of the policy which Baring had

been sent to carry out. He behaved with equal propriety during the negotiations between Sir H. Drummond Wolff and the Turkish envoy, Mukhtar Pasha, in 1886. His position was not a dignified one — that of a titular ruler com- pelled to stand by while others discussed and managed the affairs of his country. The sultan was his suzerain; in Great Britain he recognized his protector: to the representative of each he endeavoured to show friendliness and esteem. As time went on his confidence in Baring increased, until at last he deferred to the British agent in almost everything. On occasion, however, he acted on his own initiative, as when in June 1888 he dismissed Nubar Pasha and summoned Riaz Pasha to form a ministry — an action influenced, nevertheless, by Tewfik 's knowledge of the divergence of views between Nubar and the British agent. Baring encouraged Tewfik to show his activity in matters of administration, and he took a great interest in all matters connected with irrigation, educa- tion and justice. He was not a particularly strong man either in mind or in character, but he showed a genuine desire to govern his country for its own benefit. He understood the importance to Egypt of British assistance and support; his natural shrewdness made him accept the British conditions; his natural good feeling kept him from any inclination to in- trigue. In private life he was courteous and amiable. He had no desire to keep up the unapproachable state of an oriental ruler. Indeed, in many ways his manners and habits were less oriental than European. He married in 1873 his kinswoman, Amina Hanem, with whom he lived very happily. She was his only wife and Tewfik was a strong advocate of monogamy. He died on the 7th to January 1892, at the Heluan palace near Cairo, and was succeeded by his eldest son, Abbas II. (q.v.).

A warm tribute to Tewfik's many admirable qualities was paid by Baring (Lord Cromer) in his report on the administration of Egypt for 1 89 1 (see Egypt, No. 3, 1892, pp. I and 2).

TEWKESBURY, a market town and municipal borough in the Tewkesbury parliamentary division of

Gloucestershire, England, 15! m. N.E. of Gloucester by the Midland railway. Pop. (1901) 5419. It lies in a flat pastoral district, with low hills to the south, on the Warwickshire Avon, close to its junction with the Severn. The Severn is crossed by an iron bridge with a flattened arch of 170 ft. span, erected by Telford in 1824. Of the great Benedictine abbey, one of the richest foundations in England, refounded and enlarged by Sir Robert Fitz-Hamon in the 12th century on the site of an ancient hermitage and Saxon monastery, there only remain the gate and a few other fragments. The abbey church, however, consecrated in n 25, is a magnificent specimen of early Norman. This elaborate cruciform building consists of nave and side aisles, with transepts united by a grand central tower richly arcaded. The choir terminates in an apse and is surrounded by an ambulatory. One of the most remarkable features of the building is the unique western front, the central part of which is occupied by one vast arch extending from the ground to the roof. Originally it was filled in with Norman windows, but a Perpendicular window now occupies the space. The whole building under- went restoration in the Decorated period, and of this style it is one of the finest existing examples. The Norman windows in the nave were replaced, and stone groining was substituted for the carved wooden ceiling, a like transformation taking place in the transepts. The Norman columns in the choir still exist ; but above them rises a grand superstructure of Decorated work. The elegant clerestory windows are of the 14th century, with stained glass of the same date. The ambulatory was re-

built some distance farther out, and from it projected a beautiful series of chapels. The elaborate tombs include those of Sir Robert Fitz-Hamon, the De Spensers, Alan prior of Canterbury, Sir Guy de Brien, and the vault of George duke of Clarence (murdered in the Tower) and his wife Isabella. Edward, prince of Wales, slain after the battle of Tewkesbury (147 1) by the Yorkists, is also buried in the church. Of the two organs, one,

dating from the early 17 th century, is of singularly beautiful tone. In the High Street there are several ancient timbered and gabled houses. Remains of an ancient wall have been discovered adjoining the town. There are a free grammar school (1625) and a number of charities and almshouses. Tewkesbury is chiefly dependent on its agricultural trade. Below the junction of the rivers there is a great lock and weir on the Severn, up to which the stream is sometimes reversed by the tidal bore. The borough is under a mayor, 4 aldermen and 12 councillors. Area, 2532 acres.

Remains of Roman encampments and roads prove that the earliest settlement near Tewkesbury (Theotesburg, Theockes- buria, Thooksburi) of which we have evidence was a military encampment against the British. It was the site of a Saxon castle and monastery, and its position near navigable rivers led to the growth of a town, which was a borough with a market in 1087 when it was part of the royal domain. It was subse- quently granted to Earl Robert of Gloucester, who granted a charter before 1107, which exempted the borough from certain tolls and from suit at the hundred court. Edward III. con- firmed this charter in 1337, and made Tewkesbury free from tolls throughout England. The borough was incorporated by Elizabeth by a charter of 1574, which was confirmed in 1604, 1605, 1609 (when the manor and borough were sold to the corporation) and 1685, while the town was governed under the charter granted by William III. in 1698 until the corporation was remodelled in 1835, the modern government consisting of a mayor, 4 aldermen and 12 councillors. Tewkesbury returned two members from 1609 to 1867, when it lost one member, and in 1885 the representation was merged in that of the county. A fair on July 20 was granted in 1323, and fairs on September 21 and August 24 in 1440, and on April 25 in 1574. For the last May 3 was substituted in 1605, and two more fairs on June 11 and September 29 were granted in 1609. All these grants were confirmed by the charter of 1685. One fair only is now held, on October 10. It is a pleasure fair and a fair for

hiring servants, and has lost the commercial importance of the early wool fairs. The long-existing provision trade along the four rivers declined through railway competition. Cloth-making lasted from the nth century until the beginning of the 18th; gloving in the 17th century was followed by worsted-combing in the 18th. Cotton-thread lace-making, introduced in 1825, collapsed about 1862. Tewkesbury was once celebrated for the manufacture of mustard, which ceased to be important at the end of the 18th century. Stocking-frame knitting was the chief trade in 1830, but has been replaced by the boot and shoe trade. Tewkesbury was strategically important in the Wars of the Roses, and was the site of a battle in 147 1, and in the Civil War was four times besieged.

See Victoria County History, Gloucestershire; James Bennet, History of Tewkesbury (1850); William Wyde, History of Tewkes- bury (1798).

TEXARKANA, two adjoining cities forming one community, situated on either side of the boundary line between Arkansas and Texas, U.S.A., about 165 m. E. by N. of Dallas, Texas; Texarkana, county-seat of Miller county, Arkansas, pop. (1900) 4914, of whom 120 were foreign-born and 2078 were negroes; (1910) 5655; Texarkana, Bowie county, Texas, pop. (1900) 5256, of whom 192 were foreign-born and 1964 were negroes; (19 10) 9790. Texarkana is served by the Kansas City Southern (Port Arthur Route), the Texas & Pacific (of which it is the eastern terminus), the St Louis, Iron Mountain & Southern (Iron Moun- tain Route, the southern terminus), and the St Louis South' Western (Cotton Belt Route) railways. The public buildings are two city halls, a well-designed Post Office, which stands on the

state line and serves both cities, a county court house (on the Arkansas side) , and a Federal court building (on the Texas side) . The chief trade is in

lumber (especially hard woods, such as white oak and ash), cotton, cotton-seed oil and hides. Natural gas is piped here from the Caddo gas-fields, about 48 m. S., in Louisiana. The first permanent settlement here was made in 1874; Texarkana, Texas, was incorporated in 1875, and Texar- kana, Arkansas, in 1881.

TEXAS, a south central state of the United States of America, extending from lat. 26 s 51' N. to lat. 36 39'N. and from long. 93 30' W. to long. 106° 30' W. A western projection is bounded N. by New Mexico, but the main portion of the state is bounded N. by Oklahoma, from which it is separated in part by the Red river; a northern projection (the Panhandle) is bounded E. by Oklahoma, but the main portion is bounded E. by Arkansas and Louisiana, the Sabine river separating it in part from Louisiana; on the S.E. the state is bounded by the Gulf of Mexico; on the S.W. by Mexico, from which it is separated by the Rio Grande; on the W. by New Mexico. Texas is much the largest state in the Union. Its length and breadth are nearly equal — about 750 m. — and its area is 262,398 sq. m., of which 3498 sq. m. are water surface.

Physical Features. — Texas is crossed by four physiographic pro- vinces. In the S.E. are the West Gulf Plains, a part of the Coastal Plain province. Thence westward to the 100th meridian are the prairies, the south-westward extension of the Prairie Plain pro- vince. The Great Plains (really a plateau) comprise the W. half of the state, except a mountainous area in the W. part of the Panhandle, which belongs to the Basin Range province. The surface is principally a series of plains sloping S.E. from the high plateau or from the mountains in the W. to the low shore of the Gulf of Mexico. The mountains of the Basin Range region, known in Texas as the Trans-Pecos Province, rise in Guadalupe Peak near the border of New Mexico, to nearly 9000 ft. (the greatest elevation in the state), and the Great Plains have a maximum elevation in northern Texas exceeding 4000 ft., but from these heights the surface descends to sea level and the mean elevation

of the state is about 1700 ft. The Gulf Plains have a coast line of about 400 m., and are bordered along the Gulf of Mexico by a series of long narrow islands and peninsulas, or sandbars, which have been formed by the waves breaking on the shelving shore. Padre, the longest of these islands, extends northward from the mouth of the Rio Grande more than 100 m. Back of the islands are the quiet waters of lagoons, and at the mouths of rivers are several shallow bays indenting the mainland ; these bays were formed by only a slight subsidence of the land and the rivers are filling them with deposits of silt. For 20 m. or more inland in the N. and for 50 m. inland in the S. the Gulf Plains are low and flat, seldom rising as much as 100 ft. above the sea, but farther W. the surface is more broken and rises to a maximum elevation of about 700 ft. Along a line drawn approximately S.S.W. from the , S.E. corner of Oklahoma, the N.W. part of the Gulf Plains merges with the Prairie Plains. The N.E. portion of the Texas Prairie Plains is only gently rolling, but the S. portion is quite rugged, and the \V. half rises in a succession of scarps or steps to an elevation of 2500 ft., to the Great Plains region, which extends westward past the valley of the Pecos river. One of the scarps or steps is the result of a great fault or displacement of the earth's crust, and is known as the Balcones fault scarp; others are due to erosion and weathering of alternate layers of hard and soft rocks lying almost horizontal. South of the parallel of the S. boundary of New Mexico the Great Plains province is known as the Edwards Plateau ; between the Edwards Plateau and the valley of the Canadian river, as the Llano Estacado, or Staked Plains; and N. of the Ganadian Valley, as the North Plains. The E. and S. parts of the Edwards Plateau and the E. margin of the Llano Estacado have been much dissected by headward erosion of streams, but the central portion of the Edwards Plateau and nearly all of the Llano Estacado have a notably even surface rising slowly to the north- westward. In the S.E. corner of the Trans-Pecos Province is a smaller plain known as the Stockton Plateau, but the remaining portion of this province is traversed from

N.E. to S.W. by isolated mountain ranges of the Basin Range or block mountain type.

The N. portion of the Panhandle is drained by the Canadian river eastward into the Arkansas. The S. portion of the Panhandle and a strip along the N. border of the state, E. of the Panhandle, is drained by the Red river south-eastward into the Mississippi. The rest of the state is drained S.E. directly into the Gulf of Mexico. The Rio Grande and its principal tributary, the Pecos, drain narrow basins in the S.W.; these two rivers and the Canadian river rise in the Rocky Mountains in Colorado and New Mexico, but all the other rivers by which the state is drained rise within its borders. The Red, the Brazos, the Colorado, the Guadalupe, and the Nueces rise on the E. or S.E. border of the Great Plains; the Sabine and

the Trinity, on the Prairie Plains; and numerous small streams, on the Coastal Plain. In the Great Plains region and in the Trans- Pecos Province the rivers have cut deep canyons, and the character of the longer rivers in their upper courses varies from mere rivulets late in summer to swift and powerful streams during spring freshets. Most of the large Texas rivers have deposited great quantities of silt along their lower courses on the Coastal Plain, where the current is often sluggish and the banks are periodically overflowed. Texas has no large lakes; but freshwater lakes, which are fed either by streams or springs, are common on the Coastal Plain; the best known of them are Grand Lake in Colorado county, Clear Lake in Harris county, and Caddo Lake on the Louisiana border. On the Llano Estacado there are both freshwater and salt lakes, and there are a few salt lakes in the Trans-Pecos Province and near the mouth of the Rio Grande on the Coastal Plain.

The Texas Cretaceous is notably rich in the fossil remains of an invertebrate fauna and in the vicinity of Waco Cretaceous fossils of vertebrates have been obtained. Fossils of both vertebrates and invertebrates are also common in the Permian and Jurassic formations.

Fauna. — The varied fauna and flora of Texas may be classified in the following life-zones : the Canadian zone, on the highest parts of the Davis Mountains; the Transition zone, including high parts of the Davis, Chisos and Guadalupe mountains; the Upper Austral zone, Upper Sonoran division, in the Panhandle, E. of the Pecos Valley, and in the Staked Plain and Edwards Plateau; and the widely extending Lower Austral zone, covering most of the state and subdivided into the Lower Sonoran or arid western part, the Austroriparian, or humid eastern, and the narrow Gulf Strip, which is semi-tropical. Originally great herds of bison roamed over the Texas plains, and deer, bears and wolves were numerous, especially in the forests. Only a few of the larger wild animals remain, but the Texas fauna is still varied, for it includes not only many species common' to northern and eastern United States but also several Mexican species. The few remaining bison are on a ranch near Goodnight, in Armstrong county, where they have been crossed with polled Angus cattle. White-tailed, Sonora, and grey mule-deer (Odocoileus) are found in the south-western counties; and there are a few antelope (Antilocapra Americana) in the west. Louisiana bears (Ursus luteolus) still inhabit the inaccessible canebrakes near the coast, and occasionally one is found farther west; and in the western mountains black (and cinnamon) bears, including the New Mexico black bear (Ursus Americanus amblyceps) still are found. Coyotes or prairie wolves (of which there is a local sub-species, Canis nebracensis texensis), grey wolves, prairie dogs (gophers), and jack rabbits are common on the plains; less common are the grey wolf or lobo [Canis griseus) and the timber wolf; and there are several species of foxes, includ- ing the swift. Cottontail rabbits, raccoons (including the Mexican variety), and squirrels are common in the forests. A few otters, beavers and minks are still found in eastern Texas. Opossums and skunks (several varieties of the Mephitis and several of the Spilogale, including S. interrupts,, the prairie spotted skunk or " hydrophobia cat ") are found in nearly all parts of the state. The

peccary (Tayassu angulatum) , the armadillo (Tatu novemcinctum) , the civet-cat (Bassariscus astutus flavus), the Mexican bighorn (Ovis mexicanus) and the jaguar are Mexican species found in southern or south-western Texas. The Mexican cougar (Felis hippolestes aztecus) is found in the west. Other felines are the ocelot (F. partialis limitis) and red and grey cats (F. cacomitli) in the south, the Texan lynx (Lynx rufus texensis) in the south- east, and the plateau wild cat (L. baileyi) in the west. There are several varieties of grasshopper mice (Orychomys), white-footed mice (Peromyscus) , harvest mice (Reithrodontomys), rice- rats (Ory-zomys), wood-rats (Neotoma), voles (Microtus), &c. Bats inhabit caves in Burnet, Williamson, Lampasas, Gillespie and other counties. The mocking-bird is the principal song bird and it and the lark-sparrow are common throughout the state. The snowy heron is a rare plume bird seen occasionally along the coast. The scissor-tailed flycatcher, or Texas bird of paradise, is common on the prairies and in the lightly wooded districts. The Texas screech-owl, the Texas woodpecker, and the road runner, or ground cuckoo, are found mostly in southern and south-western Texas. Among birds common in Texas as well as in the other Southern States are the cardinal, golden-fronted woodpecker, Mississippi kite, mourning-dove, and turkey-buzzard. In a narrow strip along the Gulf there are some Mexican or tropical birds, notably the caracara and two varieties of grackle (Megaquiscalus) . The Texas Bob White or Texas quail is found principally in Texas and a few iieighbouring states. The Texas game birds consist chiefly of plover, snipe, teal, mallard and wild geese. Texas has also the American coot or mud-hen and the pelican. Of reptiles there are the alligator, and several species each of turtles, lizards and snakes. Alligators are found in the low coast region and are especially numerous in the Nueces river. The painted box tortoise is common in the central part of the state; the snapping-turtle and the soft-shell turtle in most of the rivers and creeks; the Louisiana mud-turtle, in the coast marshes. The horned lizard, or horned toad

(Phrynosoma cornutum; P. hernandesi; P. modestum).

is the most common of Texas lizards, except in the western counties where the Texas rock lizards (Sceloporus torquatus ; S. clarkii; S. spinosus; S. consobrinus ; S. dispar) are numerous. The tree swift, or scaly lizard, is also an inhabitant of western and south-western Texas. The green lizard, the fence lizard and whip-tailed lizard (Cnemidophorus gularis; C. sexlineatus ; C. tesselatus, &c.) are quite widely distributed. The Gila Monster (Heloderma suspectum), a poisonous lizard, whose bite is injurious but rarely, if ever, fatal to man, also occurs in the desert regions. The blow snake, or spreading adder (Heterodon platyrrhinus) , black snake (Bascanion constrictor), coach whip (Bascanion flagellum) , and prairie bull snake (Pituophis) are common; the diamond water snake (Natrix fasciata) is found along creeks; the king snake (Lampropeltis getula), in central and southern Texas; and the pilot snake (Callopeltis obsoletus), mostly in the woods of McLennan county. Among venomous snakes the harlequin, or corai snake {Elaps fulvius) is common along the coast; the copperhead (Agkistrodon contortrix) along the wooded banks of creeks and rivers; the cottonmouth (Agkistrodon pisci- vorus), in all parts of the state except the more arid districts; the " sidewiper," or massasauga (Sistrurus catenatus consors, sometimes called Crotalcphorus tergeminus) and the ground rattlesnake (Sis- trurus miliarias), in all sections. The green rattlesnake (Crotalus molossus) inhabits the valley of the Rio Grande; the plains rattle- snake (Crotalus confluentus) , the north-western counties; the diamond rattlesnake (C. adamanteus), the wooded river bottoms; the Texas rattlesnake, western Texas and the southern coast counties; the banded rattlesnake, a few widely separated woodland districts. There are several varieties of the skink (Eumeces). Freshwater fish, consisting mostly of catfish, buffalo fish, bass,

sunfish and drum, are common in the lower courses of the rivers. Oysters, clams, and shrimp abound along the coast, and there are more than 500 species of mollusks in the state. The boll-weevil, preying on the cotton, is the most noxious of the insects.

Flora. — The arboreal flora of Louisiana and Arkansas extends into north-eastern Texas, conformable with the Coastal Plain, where, immediately south of the Colorado river, the great pine belt of the Atlantic and Gulf coasts terminates. The flora of the Great Plains region, consisting principally of nutritious grasses, enters the north-western portion of the state and extends south to the Edwards Plateau and east into the Prairie Plains region The peculiar plants of the Rocky Mountain plateaus penetrate into the Trans-Pecos region, which the north Mexican flora, includ-ing the Agave lecheguilla, a valuable commercial fibre, is found along the Rio Grande. The central region is a transition ground where these floras find representation generally in deteriorated and dwarfed species. The long-leaf pine is the dominant forest tree on the uplands of the Coastal Plain, north of the Colorado river, for 100 m. or more from the coast; farther inland and especially in the north-eastern corner of the state, it is succeeded by the short-leaf pine. Between the rising swells of long-leaf pine lands are impenetrable thickets of hawthorn, holly, privet, plane trees and magnolias. Loblolly pine, cypress, oaks, hickory, ash, pecan, maple, beech and a few other deciduous trees are inter- spersed among both the long-leaf and the short-leaf pines, and the proportion of deciduous trees increases to the westward. In the broad river valleys of the eastern part of the Prairie Plains region are forests and isolated groves consisting principally of pecan, cypress, Cottonwood and several species of oak. Farther west two narrow belts of timber, consisting mostly of stunted post oak and black jack, and known as the Eastern and Western Cross Timbers, cross the prairies southward from the Red river, and a low growth of mesquite, other shrubs and vines are common in the eastern

half of the Prairie Plains. The western half of these plains has only a few trees along the watercourses and some scraggy bushes of oak, juniper and cedar in the more hilly sections. In the canyons of the Edwards Plateau grow the pecan, live oak, syca- more, elm, walnut and cypress; on the hilly dissected borders of the same plateau are cedars, dwa:. r and scrubby oak, and higher up are occasional patches of stunted oak, called " shinneries." The upper slopes of some of the mountains in the Trans-Pecos region are clothed with forests of large pines, cedars and other trees. Smaller trees and shrubs grow farther [down the same mountain slopes, but other mountains and the valleys are wholly destitute of trees. The entire valley of the Rio Grande, from El Paso to Brownsville, grows many species of cactus, and other prickly coriaceous shrubs. The low country along the coast is covered chiefly with grasses and rushes, but scattered over it are clumps cf live oak, called " mottes." Grasses representing several species also cover most of the Great Plains, the uplands in the southern portion of the Coastal Plain, and the treeless portions of the Prairie Plains and the Trans-Pecos region.

Climate. — In the region of Galveston, along the northern section of the coast, where southerly or south-easterly winds from the Gulf prevail throughout the year, the climate is warm, moist and equable, but the moisture decreases westward and south-westward, ind the equability, partly because of northerly winds during the ivintcr months, decreases in all directions inland. The mean annual temperature decreases to the north-westward with an increase of both altitude and latitude, and ranges from 73° F. in the lower

Rio Grande Valley to 55° F. in the northern portion of the Pan- handle. The range between the mean of the maxima of the summer months (June, July and August) and the mean of the minima of the winter months (December, January and February) is only from 88° to 50 at Galveston, but at Mount Blanco, Crosby county, on the eastern border of the Llano Estacado, it is from 90 to 26°. During a period of twenty-six

years (from January 1882 to December 1908) the greatest extremes that were recorded in the state by the United States Weather Bureau were 113 at El Paso in June 1883 and -16 at Amarillo, Potter county, in the Panhandle, in February 1899; within the same period the extremes at Galveston ranged only from 98 to 8°. Along the coast the average number of days during a year in which the temperature falls below freezing-point is only 3 or 4, but in the Panhandle this average is 1 1 1 . January is the coldest month in nearly all parts of the state and July is the warmest. The mean temperature for January decreases from 59° at Browns- ville, at the southern extremity of the state, to 36 at Amarillo in the Panhandle. The mean temperature for July is 85 both at Beeville, Bee county, in the southern coast region, and at Waco, much farther north but also farther inland ; at Amarillo it falls to 76 . The average annual rainfall decreases quite regularly westward and south-westward from 47-6 in. at Galveston to 9-3 in. at El Paso. Along the coast the autumn months are the wettest and the spring months are the driest; for example, at Galveston the rainfall amounts to 5-7 in. in September and only 2-9 in. in April. In the middle, eastern and north-eastern parts of Texas the spring months are the wettest and the winter months are the driest; for example, at Waco the rainfall amounts to 4-5 in. in May and only 1-9 in. in December. In the western and south-western parts the summer months are the wettest and the spring months are the driest; thus, at El Paso the rainfall amounts to 2-2 in. in July and only o-2 in. in April. The average annual snowfall for the state is about 5 in., ranging from 19 in. in the northern portion of the Panhandle to scarcely any along the coast and in the lower Rio Grande Valley. The prevailing winds are southerly or south-easterly throughout most of the state in spring and summer. Along the coast they continue in the same direction throughout the year, but inland they usually shift to the north or north-west either in autumn or winter.

Soils. — The Coastal Plain has for the most part a

light sandy soil, but there is a fertile alluvium in the river bottoms and good clay soils on some of the uplands. The eastern part of the Prairie Plains is a belt known as the Black Prairie, and it has a rich black soil derived from Upper Cretaceous limestone ; immediately west of this is another belt with a thinner soil derived from Lower Cretaceous rocks; a southern part of the same plains has a soil derived from granite; in a large area in the north-west the plains have a reddish clay soil derived from Permian rocks and a variety of soils — good black soils and inferior sandy and clay soils- — derived from Carboniferous rocks. A very thin soil covers the Edwards Plateau, but on the Llano Estacado are brownish and reddish loams derived from the sediments of a Neocene lake.

Agriculture. — The total farm acreage was 125,807,017 acres in 1900, the total number of farms 1 being 351,085, their average acreage 358-3 acres, 84-9 per cent, being operated by white farmers. There were 11,220 farms of 1000 acres and more; 10,183 between 500 and 1000 acres; 115,393 between IOO and 500 acres; and 88,537 between 50 and 100 acres.

The production of Indian corn was 122,250,000 bu. in 1909 (valued at $92,910,000); the wheat crop, 5,050,000 bu. (valued at $5,959,ooo); the oat crop, 11,500,000 bu. (valued at $7,130,000); the rice crop, 9,894,000 bu. (valued at $7,717,000); the acreage under hay was 618,000, the crop being 587,000 tons and its value $6,985,000. Texas ranked first in 1899 among the states in the production and value of cotton, the acreage of which increased from 2,178,435 acres in 1879 to 6,960,367 acres in 1899, and the number of commercial bales from 805,284 in 1879 to 2,506,212 in 1899, when the total crop was valued at $96,729,304. The esti- mates for 1909 were 9,334,000 acres and 2,570,000 bales.

In the value of live stock on farms and ranges, Texas ranked seventh among the states in 1880 and second in 1900, with a value of $240,576,955. The value of all domestic animals on farms and ranges in

1900 was $236,227,934, Texas ranking second in this respect among the states. The censuses from i860 to 1900 showed a far greater number of neat cattle on farms and ranges in Texas than in any other state or Territory; in 1900 the number was 7,279,935 (excluding spring calves) ; and in 1910 there were 8,308,000 neat cattle including 1,137,000 milch cows. In the number of horses the state ranked third in 1900, with 1,174,003 head — excluding colts — and in 19 10 with 1,369,000 head. In the number of mules the state ranked first by a wide margin in 1900, with 474,737 head, and in 10,10 with 702,000 head. In the number of swine the state ranked eighth in 1900 with 2,665,614 head, and third in 1910 with 3,205,000 head. In the number of sheep the state rose from fourth rank in 1880 to first in 1890, but dropped to tenth rank in 1900, when there were 1,439,940 head; in 1910

1 Not including farms of less than three acres and of small pro- ductive capacity.

there were 1,909,000 sheep in the state. The wool product of the state in 1900 was 9,638,002 lb, and in 1910 was 8,943,750 lb washed and unwashed and 3,040,875 lb scoured. In the number of chickens (13,562,302 in 1900) the state ranked fifth, and in the number of ducks, geese and turkeys (1,299,044 in 1900), ranked first.

The cereals grow generally throughout the state, excepting in the arid western lands. The crop of Indian corn is especially large in a belt of counties beginning near the north-eastern corner of the state and extending in a south-westerly direction. Most of the rice is raised along the seaboard, in the south-eastern corner of the state. The largest crops of cotton are grown in the cereal-growing counties.

Forests and Timber. — About 64,000 sq. m., or 24 per

cent, of the area of Texas, is estimated to be wooded. The area of yellow pine forests (the stand is estimated at 67,568-5 million ft.), and the lesser one of hardwood, together with considerable softwood, repre- sent lumber-producing possibilities of much economic importance. The pine and hardwood areas occur chiefly in the north-eastern part of the state, and are bordered on the west by scattering growths of hardwood, extending as far westward as Austin. Sparse scrub timber, of little value except for posts, poles and rough beams and for fuel, occupies the region westward to approximately the longitude of the Pease river. Outside of these general areas, forest products are of relatively little value, the exceptions being the dense growths, in certain restricted areas, of live-oak, which is in demand for ship timbers; and scattering patches of hickory, which is requisite for certain manufactures. The pine and hardwood forests are of great economic value because of the density of their growth, and there are at hand the means of profitable development of this industry in the numerous watercourses which make logging cheap and expeditious. The maple, walnut, oak, ash, beech, elm, gum, sycamore, hickory and poplar, found on the southern slope of the Osage highlands, on the uplands about the source of the highlands and in the central portions of the Red river valley, are valuable for cabinet woods. The cut, consisting almost entirely of yellow pine, was valued in 1900 at $16,296,473.

Fisheries. — The value of the fisheries product of Texas increased from $286,610 (7,174,550 lb) in 1897 to $353,814 (8,044,404 lb) in 1902; and the amount of capital invested in the industry from $237,496 in 1897 to $373,724 in 1902, but the number of wage-earners employed decreased slightly — from 1199 in 1897 to 1 144 in 1902. The values of the principal catches in 1902 were: red snapper, $103,398; oysters, $100,359; squeteague, $49,577, and channel bass, $39,525.'

Minerals. — The total value of the mineral products of Texas in 1890 was $1,986,679; in 1902,

$6,981,532; in 1907, $19,806,458, and in 1908, $15,212,929 — the valuations for the two years last named being those of the United States Geological Survey. By far the largest item in these totals after 1902 represented the value of petroleum. Little attention was paid to this resource until 1883; in 1890 the product was valued at only $227; and five years later it had increased to only $250. A good quality of oil — better in fact than the Ohio product, but not as good as that of Pennsylvania — was accidentally found at Corsicana, Navarro county, about 1894, and in 1898 it was discovered at a depth of 1040 ft. In 1901 an extraordinary " gusher " well was drilled near Beaumont, Jefferson county; in the nine days before this well was capped, it threw a stream of oil 160 ft. high, and poured out about 500,000 barrels. The development of the Hardin county field also began in 1902. As the result of these developments, the value of the oil product increased from $277,135 (546,070 bbls.) in 1898, to $871,996 (836,039 bbls.) in 1900; to $4,174,731 (18,083,658 bbls.) in 1902; and to $10,410,865 (12,322,696 bbls.) in 1907; it decreased to $6,700,708 (11,206,464 bbls.) in 1908. The value of the bituminous coal output was $465,900 (184,440 short tons) in 1890; $1,581,914 (968,373 short tons) in 1900; $2,778,811 (1,648,069 short tons) in 1907; and $3,419,481 (1,805,377 short tons) in 1908. The value of the product of limestones and dolomites in 1900 was $124,728; in 1902, $228,662; of sand- stones and quartzites in 1900, $37,038; in 1902, $165,565; while the value of all stone produced in 1907 was $497,962, and in 1908, $659,574. Natural gas was discovered in Washington county in 1879, but was not commercially used in that vicinity until 1888. In 1902 gas was discovered in Jefferson county. Other minerals found in small quantities are copper, lead, zinc, iron ores, man- ganese ores and tin.

Manufactures. — The value of the manufactured products of Texas in 1905 was $150,528,380, the capital invested in manu- facturing being $115,664,871, and the number of factories, 3158.

In the value ($14,005,324 in 1900 J and $18,698,815 in 1905)

1 Publications of the U.S. Commission of Fish and Fisheries. Part xxix., Report of the Commissioner for the Year ending June 30, 1903 (Washington, 1905).

•The statistics given in the text for 1900 from this point are for factory products and are thus comparable with those" given for 1905; the special census of the latter year was limited to the manufactures under the factory system.

of its cotton-seed oil and cake product Texas surpassed all other states. Flour and grist mill products advanced in value from $11,948,556 in 1900 to $22,083,136 in 1905. The values of other products in 1905 were as follows; slaughtering and meat packing (wholesale), $15,620,931; lumber and timber products (which employed the largest average number of wage-earners— 1 3,332, or 27-2 per cent.), $16,278,240; cars and general shop construction and repairs by steam railway companies, $10,472,742; printing and publishing, $7,782,247 ; foundry and machine shop products, 1005, $4,952,827; malt liquors, $4,153,938; saddlery and harness, 1905. $3. 2 5 I »525- The highest average quantity of rough milled rice per establishment in the United States in 1905 was for Texas, where seventeen establishments produced an average of 18,598,259 lb, valued, together with that of other rice products, at $4,638,867.

Transportation. — Until the middle of the 19th century transpor- tation facilities remained practically undeveloped in Texas. In i860 the steam railway mileage was 307 m.; in 1870, 711 m. ; in 1880, 3244 m.; in 1890, 8709 m.; in 1905, 11,949 m.; in 1907, 12,877 m, ; and in 1908, 13,066 m. Most of this mileage is in the eastern part of the state, the western and southern portions having slight railway facilities. The principal railway systems are the Southern Pacific, the Santa F6, the Texas & Pacific and the Colorado & Southern. The inland

waterways include the 25 ft. ship canal from the Gulf to Port Arthur (the Port Arthur Canal), opened in 1899, and -transferred to the United States government in 1906; the Galveston and Brazos River canal, 29-5 m. long and of a ruling depth of 3 ft., also acquired by the government in 1902, and a privately owned canal, 9 m. long and from 6-5 ft. to 10 ft. deep, extending from Corpus Christi to Aransas Bay. Other important waterways which have been authorized by the United States government and on which work was proceeding in 1910 are canals from the Rio Grande river to the Mississippi river at Donald- sonville, Louisiana; and " a navigable channel depth of 5 ft. in a canal along the coast of Texas, underlying the lagoons lying between the islands and the mainland " to develop light navigation to points not reached by the railways. Another important under- taking is the deepening of the Trinity river to Dallas, a distance of 5 n m., thereby affording a navigable waterway almost to the northern boundary of the state. Congressional appropriations for the survey, improvement and maintenance of waterways began in 1852; amounted to $15,055,688 between 1891 and 1896 inclusive, and $1,613,829 between 1897 and 1907; the total appropriated being $23,249,419. The ports of entry of Texas are Galveston, Corpus Christi, Eagle Pass, El Paso and Brownsville.

Population. — The population in 1880 was 1,591,749; in 1890, 2,235,523; in 1900, 3,048,710; and in 1910, 3,896,542.' Of the population in 1900, 94-1 per cent, was native born, 79-6 per cent, was white and 20-4 per cent, (or 620,722) was negro, or of negro descent. There were in 1900, 2,249,088 native whites, 179.357 persons of foreign birth, 836 Chinese, 470 Indians and 13 Japanese. Of the inhabitants born in the United States 130,389 were natives of Tennessee, 129,945 of Alabama, 90,584 of Mississippi, 77,950 of Georgia and 75,633 of Arkansas; and of the foreign-born 71,062 were Mexicans, 48,295 Germans, 9204 Bohemians, 8213 English, 6870 Austrians and 6173 natives of Ireland. Of the total population 471,573 were of foreign

parent- age — i.e. either one or both parents were foreign-born, and of those both of whose parents were foreign-born 70,736 were of German, 10,967 of Bohemian, 7759 of Irish and 6526 of Austrian parentage. In 1906 1,226,906 inhabitants of the state were members of religious societies. Of these 401,720 were Baptists; 317,495 Methodists; 308,356 Roman Catholics; 62,090 Presby- terians; 39,550 Disciples of Christ; 34,006 members of the Churches of Christ; 27,437 Lutherans; 14,246 Protestant Episcopalians; 7745 members of the German Evangelical Synod of North America, and 1856 Congregationalists. The principal cities are San Antonio, Houston, Dallas, Galveston, Fort Worth, Austin, the capital, Waco, El Paso, Laredo, Denison and Sherman.

Administration. — Texas as a part of Mexico was governed under the constitution (1827) of the "Free State of Coahuila and Texas "; a separate constitution adopted in 1835 was never recognized by the Mexican government and never went into effect. The Texan Declaration of Independence, adopted in November 1835, was accompanied by a provisional constitu- tion; and with the Declaration of Independence of March 1836 there were adopted an executive ordinance and a constitution. As a state of the United States Texas adopted a constitution in 1845, another in 1866, and a third in 1868, and is now

•In other census years the populations were: 1850 (the first under the United States), 212,592- i860 604,215; 1870 818,579,

governed under the constitution of 1876, with amendments of 1879, 1883, 1890, 1891, 1897, 1904 and 1906. All male citizens over twenty-one years of age and resident in the state for one year and in the county or election precinct for six months immediately preceding election (except paupers,

idiots, lunatics, felons, United States soldiers, marines and seamen, and persons who have taken part, either as principal or second, in fighting a duel or in sending a challenge) have the right of suffrage. The constitution originally forbade the registration of voters, but an amendment of 1891 permits it in cities having a population of ten thousand or more, and the Australian ballot system was adopted in such cities by an act of the twenty-second legislature in 1892. An amendment to the constitution may be proposed by a two-thirds vote of all members elected to each house of the legislature, and is adopted if it is approved by a majority of the popular vote on the amendment.

The executive department consists of a governor, lieutenant- governor, secretary of state, comptroller of public accounts, trea- surer, commissioner of the general land office, and attorney-general: Contrary to the usual custom in other states, the secretary of state is appointed by the governor. The other officials are elected by popular vote for two years' terms. The governor and lieutenant- governor must be, at the time of election, at least thirty years of age, citizens of the United States, and residents of the state for the preceding five years. The governor receives an annual salary of $4000 and the use of the governor's mansion. His functions are rather more extensive than those of the average American executive. In addition to the usual privilege of granting pardons and reprieves, he controls considerable patronage, and possesses a power of veto which extends to separate items in appropriation bills. A two-thirds majority in each house is necessary to over- ride a veto.

The legislature of the state is composed of a Senate and a House of Representatives. The Senate consists of thirty-one members, chosen by popular vote for four years, one-half retiring every two years. Representatives are elected biennially. Their number, originally ninety-three, is determined by apportionment bills passed after the publication of each Federal census, but under the con- stitution it

can never exceed one hundred and fifty. Senators and representatives must be at least twenty-six years old, citizens of the United States, qualified electors of the state, and residents of the state for two years, and of the district for one year, preceding the election. The unusual provision that two-thirds of each house shall constitute a quorum would probably prove inconvenient, if the political parties were approximately equal in strength. Bills for raising revenue may originate only in the House of Representa- tives, but may be amended or rejected by the Senate. Meetings of the legislature are biennial, although special sessions may be called by the governor.

The judicial system, revised by a constitutional amendment of 1891, consists of a supreme court of three members, elected for a term of six years, with civil jurisdiction only, largely appellate; a court of criminal appeals, of three members, elected for six years, with appellate jurisdiction in criminal cases; courts of civil appeals (number determined by the legislature) of three members each, elected for six years; district courts, each with one judge, elected for four years, with original jurisdiction in the more important civil and criminal (felony) cases and a limited appellate jurisdic- tion; county and justice of the peace courts with original juris- diction in misdemeanours and petty civil cases. The commissioners' court of five members, including the presiding judge, attends to county business matters, the county being the unit of local govern- ment.

Miscellaneous Laws. — The long domination of Spain and Mexico exercised an influence on the institutions of the state, but it can easily be exaggerated. It must be remembered that during the colonial period the Spanish and Mexican population was never very large, that the first permanent Anglo-American settlement was not established until 182 1, that there was ill-feeling between the two peoples almost from the very beginning, and that in fifteen years the Americans carried through a successful rebellion. The framework of the governments established in 1836-37 and 1845 was not

essentially different from those with which the framers were familiar in the United States. But while this was true of the outward structure it was impossible to disregard entirely private rights based upon Spanish and Mexican legislation. In other words, the system of jurisprudence is the most striking example of Spanish influence. There was the same conflict between the English Common Law and the Roman Civil Law which had taken place in Louisiana a few years before (see Louisiana) ; but the result was different. Owing to the peaceful character of its acquisition and the relative strength of the Romance (French) element, Louisiana continued the use of the Civil Law. The Texas invaders, on the other hand, adopted the Common Law, but with the addition of many Civil Law principles. For example, the state has never

made any distinction between law and equity, and it has always followed the Civil Law procedure by petition and answer. 1 The independent existence of Texas as a republic (1836-45) was also not without influence. By strengthening the feeling of local pride it added force to the states' rights sentiment, and it enabled the state on coming into the Union to retain possession of all its public lands. This vast domain has been utilized to provide homes for settlers, to encourage education, to subsidize railways, and to build the state capitol. There is a general land office at Austin under the charge of a commissioner. Among other features of interest the constitution forbids the suspension of the writ of habeas corpus, makes duelling a disqualification for holding office or exer- cising the right to vote, and authorizes the exclusion of atheists from office. There is also a clause which exempts from seizure for debt the homestead, not more than two hundred acres of land in the country,' or a house of any value in a city or town on a lot or lots not exceeding five thousand dollars in value at the time of its designation as the homestead. The object is the protection of widows and orphans, but the right has been very much abused, and its abuse i3 in part responsible for the high rate of interest

which prevails. State-wide prohibition of the sale of intoxicating liquors was voted down in 1887 and a local option law went into effect; in 1907, when there was no licence in 145 (out of 243) counties and' licence only in parts of 51 other counties, a law was passed giving local option to parts of cities and towns. In 1908-09 there was an unsuccessful attempt to pass in the legislature a con- stitutional amendment providing for state-wide prohibition; the amendment was favoured by the Democratic state platform, but the hostility of the legislature to Governor Campbell, who favoured the amendment, secured its defeat.

Both husband and wife retain their separate title to the pro- perty which each owned before marriage and to that acquired after marriage by gift, devise or descent, and to the increase of all lands thus acquired, but the husband has the sole management both' of his own and of his wife's separate property. However, should the husband neglect to sue for the recovery of any separate property of his wife she may, with the permission of the court, sue for it in her own name; or should the husband refuse to sup- port his wife and educate her children as her fortune would war- rant, the county court may in answer to her complaint require a fixed portion of the proceeds from her property to be paid to her. All property which either husband or wife acquires during the marriage, other than by gift, devise or descent, is their common property, and during coverture may be disposed of by the husband only; on the death of the husband the widow has one-half of the property, which they held in common. The causes for a divorce are cruelty, adultery, desertion for three years, or conviction after marriage of a felony and imprisonment in the state prison without being pardoned within one year after conviction; the plaintiff must reside in the county six months before beginning suit.

Education. — Educational matters are supervised by a state board, composed of the governor, comptroller and secretary of state, by a superintendent of public instruction, who is ex officio secretary of

the board, by county superintendents (in counties having a school population of 3000 or more), by superintendents and boards of trustees in corporate towns and cities, and by school commissioners in the rural districts. The permanent public school fund is the largest of any state in the Union; in 1908 it included $38,406,222 in land notes, $15,136,808 in bonds, $7,915,257 (esti- mated) in leased lands, and $67,956 in cash awaiting investment. The invested fund is largely in Federal, state and county bonds. The revenue for schools in 1907-08 was $8,020,229, of which $2,761,651 was from the state tax, $2,080,159 from the local tax, $1,640,969 from the one dollar poll tax on males between the ages of twenty-one and sixty, $481,899 from a state occupation tax, $429,365 from county funds, and $105,806 from tuition fees. The state apportionment to the districts was $5 per capita of school population in 1906-07, and was $6 in 1907-08. In the latter year the total enrolment in public schools was 777,545, of whom 145,748 were negroes. Separate schools are maintained for white and negro children and impartial provision is made for both races. In 1839 the Congress of the Republic set apart fifty square leagues (221,420 acres) of land for the establishment of two universities. The state legislature approved this grant in 1858, added to the endowment one section (640 acres) out of every ten appropriated co encourage the building of railways, and provided that there should be one university instead of two. The Civil War and Reconstruction delayed the execution of the plan, and the university of Texas was not opened until September 1883. The main university is at Austin, and the medical department (established 1891) at Galveston. The state also supports, wholly or in part: the Agricultural and Mechanical College at College Station (opened in 1876; a land grant college under the Morrill Act of 1862), near Bryan, which has a course in textile engineering besides the courses usually given in state agricultural and mechanical

For a full discussion of this question see E. W.

Townes, Quarterly of the Texas State Historical Association, ii. 29-53, ,134-151 (July and October 1898);

colleges ; the Sam Houston Normal Institute (1879) at Huntsville, the North Texas State Normal (1901) at Denton, the South-west Texas Normal (1903) at San Marcos, the School of Industrial Arts for girls at Denton, and the Prairie View Industrial and Normal School (1876) for negroes near Hempstead. The system is not unified or organized: the university's department of education, the school for girls at Denton and the negro normal school all issue teachers' certificates, but are not under the control of the State Department of Education or the State Board of Education. The state library and museum are a part of the Department of Banking, Statistics, History and Insurance. Denominational schools are: Baylor University (Baptist; 1845), at Waco, with a medical de- partment at Dallas; the East Texas Normal and Industrial Academy (Baptist; 1905), at Tyler; Trinity University (Cumberland Presby- terian; 1869), at Waxahachie; Austin College (Presbyterian; 1850), at Sherman; South-western University (Methodist Epis- copal; 1873), at Georgetown, with a medical department at Dallas; the Polytechnic College (Methodist Episcopal, South; 1891), at Fort Worth; Texas Holiness College (Holiness; 1899), at Peniel, near Greenville; Texas Christian University (Christian; 1873 until 1895 at Thorp's Spring; until 1902 Add-Ran College), at Waco; St Edward's College (Roman Catholic, under the Con- gregation of the Holy Cross; 1885), at Austin; St Mary's Uni- versity (1854; since 1884 under the Society of Jesus), at Galveston; St Basil's College (under the Basilian Fathers; 1899), at Waco; for girls, Baylor Female College (Baptist; 1845), at Belton; San Antonio Female College (Methodist Episcopal, South; 1894), at San Antonio; North Texas Female College (Methodist Episcopal, South; 1877), at Sherman; and the Academy of Our Lady of the Lake,

under the Sisters of Divine Providence, at San Antonio; and for negroes Paul Quinn College (African Methodist Episcopal; 1881), at Waco; Tillotson College (Congregational; 1881), at Austin; Samuel Huston College (Methodist Episcopal; 1900), at Austin; Bishop College (Baptist: 1881), at Marshall; Wiley University (Methodist Episcopal; 1873), at Marshall; and Texas College (Coloured Methodist Episcopal; 1895), at Tyler.

Charitable and Penal Institutions. — Texas has done more than any other Southern state for the humane and scientific treatment of its dependent and defective classes. There are insane asylums at Austin (the State Lunatic Asylum), San Antonio (the South- western Insane Asylum), and Terrell (North Texas Hospital for the Insane); the Texas School for the Deaf (1857), an institution for deaf, dumb and blind coloured youths (1889), a School for the Blind (1856), and a home for dependent Confederate soldiers, at Austin, a state orphan home (1889) at Corsicana, an epileptic colony at Abilene, and a state reformatory (1889) for boys under seventeen years at Gatesville. A statute of 1899, authorized by a constitutional amendment of 1897, instituted a system of pensions for Confederate veterans. For this purpose $200,000 was appro- priated during the fiscal year 1902-1903. The maximum permitted by the constitution is $250,000 per annum. The penitentiaries are at Huntsville and Rusk, and there is a reform school for juvenile offenders at Gainesville. The convict lease system in its most objectionable form was abolished in 1883, and convicts are now employed on state account or by private contract. There are several state farms in successful operation. Each of these institu- tions, penal and charitable, has its own superintendent and board of managers, appointed by the governor.

Finance.— The heavy debt incurred in the struggle with Mexico was paid out of the $10,000,000 received from the United States government under the Compromise of 1850. New loans were made during the Civil War, but they were repudiated by the con- stitution of 1866, and were made void by the

Fourteenth Amend- ment to the Federal constitution. The extravagance of the Reconstruction governments resulted in the accumulation by 1876 of a debt of $4,792,394. The constitution of 1876 forbids the borrowing of money except to supply casual deficiencies of revenue (amount limited to $200,000 at a time), repel invasion, suppress insurrection defend the state in war, or pay existing debts. The nominal amount of the public debt on the 1st of September 1908 was $3,989,400, but the figures are misleading, because, with the exception of $22,000 (held partly by counties), all of these obliga- tions were in the permanent school fund or in funds for the Univer- sity, the Agricultural and Mechanical College, and the various charitable institutions. Owing to a clause in the constitution forbidding the issue of bank charters, the financial business of the state was controlled by national and private banks until 1904, when the constitution was amended and provision was made for the incorporation of state banks under a system of state super- vision, regulation and control, deposits being guaranteed as in the Oklahoma banking system.

History. — The history of Texas may be regarded as a step in the great struggle between England, France and Spain for the possession of America. The earliest explorations were made by the Spaniards, Cabeza de Vaca, 1528-36, and Francisco Vasquez de Coronado, 1540-42, but the first colony was that planted on Matagorda Bay in 1685 by the French under the

Sieur de la Salle. This was, however, soon abandoned, and the field left to the Spanish. Beginning in 1690 they established several ecclesiastical, military and civil settlements known respectively as missions (Franciscan), presidios, and pueblos. In or near the city of San Antonio are the ruins of five missions built of stone; and missions were more numerous in east Texas, but they were built of wood and nothing remains to mark their location. In 1727 the territory, with vaguely defined limits, was formed into a province and named Tejas, or Texas, after the tribe or the confederacy

of Tejas Indians. For more than a century the conditions were favourable for colonization. The French in Louisiana proved to be peaceable neighbours, and that province, both under French (to 1763) and under Spanish rule (1763–1803) served as a protection against the English. Spain failed to take advantage of the opportunity, however, and it was lost when the United States purchased Louisiana in 1803. Three abortive Anglo-American invasions during the first few years of the century indicated the future trend of events. The first, under Philip Nolan, in 1799–1801, was poorly supported, and was crushed without difficulty; the second, under Bernardo Gutierrez and Augustus Magee, 1812–13, captured San Antonio and defeated several Mexican armies, but was finally overpowered; the third, under James Long, an ex-officer of the United States army, 1819–21, was less formidable. The year 182 1 marks a significant turning-point in the history. By the Florida treaty, finally ratified at that time, the claims of the United States to Texas, based on the Louisiana purchase, were given up, and the eastern and northern boundaries of the province were determined. They were to be, in general terms, the Sabine river, the 94th meridian (approxi- mately), the Red river, the 100th meridian, the Arkansas river, and the 42nd parallel. So far as Spain was concerned this was only a form, inasmuch as Mexico, of which Texas formed a part, was just completing its long struggle for independence (1810–21). In that year also (December 1821) Stephen F. Austin established the first permanent Anglo-American settle- ment at San Felipe de Austin on the Brazos river. This was followed by an extensive immigration from the United States during the period of Mexican rule (1821–36). It is estimated that the population, exclusive of Indians, increased from four thousand in 182 1 to ten thousand in 1827, and nearly twenty thousand in 1830. Most of the settlers came from the southern section of the Union and of course brought their slaves with them, but there is no evidence to show that their object was the territorial extension of slavery, or that the revolt against Mexico was the result of dissatisfaction with that country's

anti-slavery policy. Texas was joined to Coahuila in 1824 to form a state of the Mexican federation. Although the attempt to force the Roman Catholic religion upon the people, the federal decree of 1830 forbidding further immigration from the states, and the reckless grants of land to Mexican favourites aroused some ill-feeling, the government on the whole was fairly liberal. The peace party, led by Stephen F. Austin, was able to restrain the more warlike followers of William H. Wharton and Henry Smith (1 794-1 851) until 1835, when Santa Anna overthrew the federal constitution of 1824 and established a dictatorship. A consultation of representatives from the various settlements met at San Felipe de Austin, October to November 1835. Under Austin's influence the delegates rejected an independence resolution and recommended a union with the Mexican Liberals for the restoration of the constitution of 1824. A provisional government was organized with Henry Smith as governor and James W. Robinson (d. 1853) as lieutenant-governor, Sam Houston as major-general of the armies of Texas; and Austin, Wharton and Branch T. Archer (1790-1858) were elected commissioners to seek aid in the United States. Hostilities had already begun. The Texans routed the Mexicans near Gonzales on the 2nd of October. About a hundred men under Colonel James Bowie and Captain J. W. Fannin defeated a Mexican force near Mission Conception on the 28th of October; and after a campaign of nearly two months Bejar was surrendered to them on the nth of December.

In the Matamoras expedition the Texan forces were severely crippled on account of a quarrel between Governor Smith, who desired independence, and the majority of his council, who favoured union with the Mexican Liberals. The command was divided between Houston, who was supported by the governor, and two leaders, Frank W. Johnson and J. W. Fannin, who were appointed by the council. The Mexicans under Santa

Anna captured the Alamo on the 6th of March 1836 and slaughtered its garrison of 183 men; on the 20th of the same month they captured Fannin and his force of 371 men, and a week later slaughtered all except twenty who escaped. Houston now assumed active command and, surprising Santa Anna near the San Jacinto, on the 21st of April, he dealth the enemy a crushing blow and brought the war to an end; nearly all of Santa Anna's army were killed, wounded or taken prisoners, and even Santa Anna himself was captured the next day, while the Texans lost only two killed and twenty-three wounded. The weakness of the Mexican Liberals and the necessity of securing aid in the States led the Austin party to abandon their opposition to independence. A convention, assembled in the town of Washington on the 1st of March, adopted a declaration of independence on the 2nd and a republican con- stitution on the 17th. Houston was elected president in September 1836, and the independence of the republic was recognized in 1837 by the United States, Great Britain, France and Belgium. After a long conflict over the slavery question, the state was admitted into the Union under a joint resolution of Congress adopted on the 1st of March 1845, 1 on condition that the United States should settle all questions of boundary with foreign governments, that Texas should retain all of its vacant and unappropriated public lands, and that new states, not exceeding four in number, might be formed within its limits. The western boundary claimed by the republic was the Rio Grande to its source and the meridian of longitude from that point to the forty-second parallel, although as a political division of Mexico its limits never extended farther west than the Nueces and the Medina. The United States government asserted the Rio Grande claim and prepared to enforce it at the cost of war; at the same time the Mexican government considered annexation, regardless of the boundary question, a declaration of war by the United States. An army of 2000 men under Zachary Taylor (q.v.) arrived on the north bank of the Rio Grande, opposite Matamoras, on the 28th of March 1846. The Mexican commander, Pedro de Ampudia, demanded

Taylor's withdrawal beyond the Nueces within twenty-four hours. He did not obey, and Mariana Arista, Ampudia's successor, opened hostilities. The Americans, out- numbered three to one, defeated the Mexicans in the battles of Palo Alto (May 8th) and Resaca de la Palma (May 9th). The war terminated in the treaty of Guadalupe Hidalgo (February 2, 1848) by which Mexico accepted the Rio Grande boundary. By the Compromise of 1850 Texas received $10,000,000 for its territory lying north and west of a line drawn from the 100th meridian to the Rio Grande, following 36 30' N., 103 W. and 32° N. The final step in the determina- tion of the present boundaries of the state was taken in 1896, when the Supreme Court of the United States decided the Greer county case. Under the Florida treaty of 1810-21 a portion of the Red river was to be the northern boundary of Texas east of the 100th meridian, but as there are two branches of the river meeting east of the meridian the enclosed territory (Greer county) was in dispute. The decision of 1896 selected the southern branch and thus deprived Texas of a large tract of fertile land over which it had previously exercised jurisdiction.

In the crisis of 1860-61 Texas sided with the other Southern States in spite of the strong Unionist influence exerted by the German settlers and by Governor Sam Houston. An ordinance of secession was adopted February 1, 1861, and Governor Houston was deposed from office on March 16th. The state was never the scene of active military operations during the

1 This acquisition of foreign territory by joint resolution instead of by treaty was followed in the case of Hawaii in 1898.

Civil War (1861-65), although it is interesting to note that the last battle of the conflict was fought on its soil, at Palmito, near Palo Alto, on the 13th of May 1865, more than a month after the surrender at Appomattox. In conformity with President Johnson's plan of reconstruction, a constitution recognizing the abolition of slavery, renouncing the

right of secession, and repudiating the war debt was adopted in 1866, and J. W. Throckmorton, Unionist Democrat, was elected governor. When, in 1867, the Congressional plan of recon- struction was substituted, Texas was joined to Louisiana to constitute the fifth military district, and the first commander, General P. H. Sheridan, removed Throckmorton from office as " an impediment to reconstruction " and appointed E. M. Pease in his place. Delegates to a new constitutional convention were elected in 1868, the constitution framed by this body was ratified in November 1869, state officers and congressmen were elected the same day, the new legislature ratified the Thirteenth and Fourteenth Amendments, and on the 30th of March 1870 Texas was readmitted to the Union. But the state remained under the rule of negroes and carpet- baggers, supported by United States troops until the inauguration of Governor Richard Coke in 1874. It has since been consistently Democratic. The supremacy of the party was threatened for a time by the growth of Populism, but the danger was avoided by the accept- ance of free silver, and the partial adoption of the Populist local programme. This surrender aroused strong opposition among the conservative or Cleveland Democrats, which cul- minated in the Hogg-Clark gubernatorial campaign of 1892. The victory of the Radicals resulted in the establishment of a railway rate commission, based upon a constitutional amendment of 1890 and a statute of 1891, the passage of an alien land law in 1 89 1, which was declared unconstitutional and amended in 1892, the adoption of the Australian ballot system for cities and towns of more than 10,000 inhabitants (1892), the retire- ment of Roger Q. Mills from the United States Senate (1899) and the sending of free silver delegations to the national con- ventions of 1896 and 1900.

Governors Spanish Period (1690-1821) 2

Domingo Teran de los Rios. Don Gaspardo de Anaya. Don Martin de Alarcon. Marquis San Miguel de Aguayo. Fernando de Almazan. Melchior deMediavillay Arcona. Juan Antonio Bustillos y Ceval-

los. Manuel de Sandoval. Carlos de Franquis. Prudencio de Oribio de Basterra. Justo Boneo. Jacinto de Barrios y Jaiirequi.

Mexican Period (1821- Trespalacios. Don Luciana Garcia, provisional. Rafael Gonzales, provisional. Victor Blanco. Jose Maria Viesca. Jose Maria Letona.

Francisco Vidauri y Villasenor, provisional. Jose Maria Goribar, > rf j claimants . Juan Jose hlguezebal,) Augustin Viesca. Henry Smith, provisional . . . .

Period of the Republic (1836-46) 4

David G. Burnet, provisional

Sam Houston

Mirabeau B. Lamar

Sam Houston

Anson Jones . . .

Antonio de Martos y Navarrete.

Juan Maria Baron de Ripperda.

Domingo Cabello.

Rafael Pacheco.

Manuel Mufioz.

Juan Bautista Elguezabal.

Antonio Cordero.

Manuel de Salcedo.

Juan Bautista Casas, provisional.

Manuel de Salcedo.

Christoval Dominquez.

Antonio Martinez.

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1835-36

1836

1836-38

1838-41

1841-44

1844-46

2 Coahuila and Texas, 1690-1725, Texas alone 1725-1824. 8 Coahuila and Texas, 1824-35.

4 The state was annexed to the Union in 1845, but the govern- ment of the Republic continued in existence until early in 1846.

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TEXT— TEXTILE-PRINTING

Period of Statehood (1846-)

James Pinckney Henderson, Democrat . . 1846-47

George T. Wood, „ . . 1847-49

P. Hansborough Bell, „ . . 1849-53

Elisha M. Pease, „ , . 1853-57

Hardin R. Runnels, „ . . 1857-59

Sam Houston, „ . . 1859-61 Edward Clark (lieutenant-governor, acting) Dem. 1861

Francis R. Lubbock, Democrat Pendleton Murray, ,,

Andrew J. Hamilton, provisional . James W. Throckmorton, Conservative Elisha M. Pease, provisional Edmund J. Davis, Republican Richard Coke, Democrat Richard B. Hubbard, Democrat . Oran M. Roberts, „

John Ireland, ,,

Lawrence S. Ross, ,,

James S. Hogg, ,,

Charles A. Culberson, ,, Joseph D. Sayers, „

Samuel W. T. Lanham, „ Thomas M. Campbell, ,, O. B. Colquitt,

1861-63 1863-65 1865-66

Democrat 1866-67

1867-70 1870-74 1874-76 1876-79

1879-83

1883-87

1887-91

1891-95

1895-99

1 899-1 903

1903-1907

1907-1911

1911-

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On the administration: see the Constitution of the State of Texas, with Amendments (Austin, 1891); John and Henry Sayles, Anno- tated Civil Statutes of Texas (2 vols., St Louis, 1897); The Session Laws, Twenty-fifth to Twenty-ninth Legislature (Austin, 1897- 1905) ; W. M. Gouge, The Fiscal History of Texas (Philadelphia, 1852), for the early financial history; O. M. Roberts in D. G. Wooten's history (see below), ii. 7-325, for an account of legis- lative and judicial history; and J. J. Lane in Wooten for the educational system. Some valuable statistics will be found in C. W. Raines, Year-Book for Texas, igoi (Austin, 1902).

An excellent guide to the history of the state is C. W. Raines, Bibliography of Texas (Austin, 1896). The best history of the state is George P. Garrison's Texas (Boston and New York, 1903), in the American Commonwealths series, but its treatment of the period since 1845 is too brief. John Henry Brown's History of Texas from 168$ to 1892 (2 vols., St Louis, 1892) is a detailed, rather biased treatment, by an old Texas pioneer who had access to a large mass of unprinted material. The best of the older works and the basis for subsequent books on the period which it covers is Henderson Yoakum's History of Texas from its first Settlement in 1 685 to its Annexation to the United States in 1846 (2 vols., New York, 1856). See also David B. Edward, The History of Texas (Cincinnati, 1836), slightly pro-Mexican in sympathy; H. H. Ban- croft, History of Texas and the North Mexican Slates (2 vols., San Francisco, 1884-89), valuable for authorities cited in the foot- notes; and A. M. Williams, Sam Houston and the War of Inde- pendence in Texas (Boston and New York, 1893), the best life of Houston. Dudley G. Wooten (ed.), A Comprehensive History of Texas, 1685-18Q7 (2 vols., Dallas, 1898), contains a reprint of Yoakum with notes and several chapters by various writers on Anglo-American colonization, the revolution against Mexico, the land system, the educational system, &c. A series of monographs dealing mostly with the period before 1845 will be found in The Quarterly of the Texas Slate Historical

Association (Austin, 1897 sqq.). Among the manuscript treasures at Austin may be mentioned the diplomatic correspondence of the Republic in the state department, the Nacogdoches archives and the W. D. Miller papers in the state library, and the Bexar archives and the Guy M. Bryan (Austin) papers in the university.

TEXT (Lat. texium, woven fabric, from texere, to weave), a term which is applied with several varieties of meaning to the actual words of an author as written; it is thus used of the original composition as opposed to the commentary, paraphrase, notes, &c, written by others upon it, and to the written printed matter as opposed to the illustrations, diagrams, &c, accom- panying it (see Textual Criticism below). A specific meaning is that of a passage of Scripture used as the subject of a sermon or discourse, as an argument or illustration in theological dis- cussion or as a means of edification, exhortation or admonition. Technically the ter,m is also applied to a particular form of writing in MSS. before the age of printing, and so, in com- position, in such uses as " text-hand," " text-writer," &c. A " text-book " is a manual or handbook of instruction, such as

is used by students as the standard book on the subject which they may be studying.

TEXTILE-PRINTING. "Textile" (see Weaving) is a general name for all woven fabrics (Lat. texere, to weave), and the art of ornamenting such fabrics by printing on designs or patterns in colour is very ancient, probably originating in the East. It has been practised in some form, with considerable success, in China and India from time immemorial, and the Chinese, at least, are known to have made use of engraved wood-blocks many centuries before any kind of printing was known in Europe. That the early Egyptians, too, were ac- quainted with the art is proved not merely by the writings of Pliny but by the discovery, in the Pyramids and other Egyptian tombs, of fragments of cloth which were undoubtedly decorated by some method of printing.

The Incas of Peru, Chile and Mexico also practised textile- printing previous to the Spanish Invasion in 15 19; but, owing to the imperfect character of their records before that date, it is impossible to say whether they discovered the art for them- selves, or, in some way, learnt its principles from the Asiatics.

There is no doubt that India was the source from which, by two different channels, Europeans derived their knowledge of block-printing. By land its practice spread slowly westwards through Persia, Asia Minor and the Levant, until it was taken up in Europe — during the latter halt of the 17th century. Almost at the same time the French brought directly by sea, from their colonies on the east coast of India, samples of Indian blue and white " resist " prints, and along with them, particulars of the processes by which they had been produced.

I. Technology

Textile-printing was introduced into England in 1676 by a French refugee who opened works, in that year, on the banks of the Thames near Richmond. Curiously enough this is the first print-works on record; but the nationality and political status of its founder are sufficient to prove that printing was previously carried on in France. In Germany, too, textile printing was in all probability well established before it spread to England, for, towards the end of the 17th century, the dis- trict of Augsburg was celebrated for its printed linens — a reputa- tion not likely to have been built up had the industry been introduced later than 1676.

On the continent of Europe the commercial importance of calico-printing seems to have been almost immediately recog- nized, and in consequence it spread and developed there much more rapidly than in England, where it was neglected and practically at a standstill for nearly ninety years after its intro- duction. During the last two decades of the 17th century and the earlier ones of the 18th new works were started in France, Germany, Switzerland and

Austria; but it was only in 1738 that calico-printing was first practised in Scotland, and not until twenty-six years later that Messrs Clayton of Bamber Bridge, near Preston, established in 1764 the first print-works in Lancashire, and thus laid the foundation of what has since become one of the most important industries of the county and indeed of the country. At the present time calico-printing is carried on extensively in every quarter of the globe, and it is pretty safe to say that there is scarcely a civilized country in either hemisphere where a print-works does not exist.

From an artistic point of view most of the pioneer work in calico-printing was done by the French; and so rapid was their advance in this branch of the business that they soon came to be acknowledged as its leading exponents. Their styles of design and schemes of colour were closely followed — even deliberately copied — by all other European printers; arid, from the early days of the industry down to the latter half of the 19th century, the productions of the French printers in Jouy, Beauvais, Rouen, Alsace-Lorraine, &c, were looked upon as representing " all that was best " in artistic caiico-printing. This reputation was established by the superiority of their earlier work, which, whatever else it may have lacked, possessed in a high degree the two main qualities essential to all good

decorative work, viz., appropriateness of pattern and excellency of workmanship. If, occasionally, the earlier designers per- mitted themselves to indulge in somewhat bizarre fancies, they at least carefully refrained from any attempt to produce those pseudo-realistic effects the undue straining after which in later times ultimately led to the degradation of not only French calico-printing design, but of that of

all other European nations who followed their lead. The practice of the older craftsmen, at their best, was to treat their ornament in a way at once broad, simple and direct, thoroughly artistic and per- fectly adapted to the means by which it had to be reproduced. The result was that their designs were characterized, on the one hand, by those qualities of breadth, flatness of field, simplicity of treatment and pureness of tint so rightly prized by the artist; and, on the other, by their entire freedom from those meretri- cious effects of naturalistic projection and recession so dear to the modern mind and so utterly opposed to the principles of applied art.

Methods of Printing.

Broadly speaking textile-printing means the local application, to textile fabrics, of any colour in definite patterns or designs, but in properly printed goods the colour becomes part and parcel of the fibre, or, in other words, the latter is dyed so as to resist washing and friction. Textile-printing, then, may be looked upon as a form of dyeing; but, whereas in dyeing proper the whole fabric is uniformly covered with one colour, in printing one or more colours are applied to it in certain parts only, and in sharply defined patterns. In principle these two branches of textile colouring are closely allied, for the colouring matters used in each case are practically identical, but in practice the means whereby their respective objects are attained bear little or no resemblance to each other. In dyeing, for instance, it is sufficient, for the most part, to immerse the fabric in an aqueous solution of the dye-stuff, stirring it about constantly or other- wise manipulating it to prevent unevenness. In printing, however, the colour must be applied by special means — either by a wooden block, a stencil or engraved plates, or rollers— and thickened to prevent it from spreading, by capillary attrac- tion, beyond the limits of the pattern or design. Many colours also contain, besides the colouring matter and thickening, all the substances necessary for their proper fixation on the cloth when the

latter is simply passed through a subsequent process of steaming, and others again require to be subjected to many after treatments before they are thoroughly developed and rendered fast to light and washing.

There are five distinct methods at present in use for producing coloured patterns on cloth:—

(1) Hand block-printing.

(2) Perrotine or block-printing by machine.

(3) Engraved plate-printing.

(4) Engraved roller-printing.

(5) Stencilling, which although not really a printing process may be classed here as one.

(1) Hand Block-Printing. — This process, ■ though considered by some to be the most artistic, is the earliest, simplest and slowest of all methods of printing.

The blocks may be made of box, lime, holly, sycamore, plane or pear wood, the latter three being most generally employed. They vary in size considerably, but must always be between two and three inches thick, otherwise they are liable to warp — a defect which is additionally guarded against by backing the wood chosen with two or more pieces of cheaper wood, such as deal or pine. The several pieces or blocks are tongued and grooved to fit each other, and are then securely glued together, under pressure, into one solid block with the grain of each alternate piece running in a different direction.

The block, being planed quite smooth and perfectly flat, next has the design drawn upon, or transferred to it. This latter is effected by rubbing off, upon its flat surface, a tracing in lamp- black and oil, of the outlines of the masses of the design. The portions to be left in relief are then tinted, between their outlines, in ammoniacal carmine or

magenta, for the purpose of distinguishing them from those portions which have to be cut away. As a separate block is required for each distinct colour in the design, a separate tracing must be made of each and transferred (or ” put on as it s termed) to its own special block.

Having thus ‘ received a tracing of the pattern the block is thoroughly damped and kept in this condition by being covered with wet cloths during the whole process of ” cutting.” The block- cutter commences by carving out the wood around the heavier masses first, leaving the finer and more delicate work until the last so as to avoid any risk of injuring it during the cutting of the coarser parts. When large masses of colour occur in a pattern, the corresponding parts on the block are usually cut in outline, the object being filled in between the outlines with felt, which not only absorbs the colour better, but gives a much more even impression than it is possible to obtain with a large surface of wood. When finished, the block presents the appearance of flat relief carving, the design standing out like letterpress type.

Fine details are very difficult to cut in wood, and, even when successfully cut, wear down very rapidly or break off in printing. They are therefore almost invariably built up in strips of brass or copper, bent to shape and driven edgewise into the flat surface of the block. This method is known as ” coppering,” and by its means many delicate little forms, such as stars, rosettes and fine spots can be printed, which would otherwise be quite impossible to produce by hand or machine block-printing.

Frequently, too, the process of ” coppering ” is used for the pur- pose of making a mould, from which an entire block can be made and duplicated as often as desired, by casting. In this case the metal strips are driven to a predetermined depth into the face of a piece of lime- wood cut across the grain, and, when the whole design is completed in this way, the block is placed, metal face downwards, in a tray of molten type-metal or solder, which transmits

sufficient heat to the inserted portions of the strips of copper to enable them to carbonize the wood immediately in contact with them and, at the same time, firmly attaches itself to the outstanding portions. When cold a slight tap with a hammer on the back of the lime- wood block easily detaches the cake of the type-metal or alloy and along with it, of course, the strips of copper to which it is firmly soldered, leaving a matrix, or mould, in wood of the original design. The casting is made in an alloy of low meltingrpoint, and, after cooling, is filed or ground until all its projections are of the same height and perfectly smooth, after which it is screwed on to a wooden support and is ready for printing. Similar moulds are also made by burning out the lines of the pattern with a red-hot steel punch, capable of being raised or lowered at will, and under which the block is moved about by hand along the lines of the pattern.

In addition to the engraved block, a printing table and colour sieve are required. The table consists of a stout framework of wood or iron supporting a thick slab of stone varying in size according to the width of cloth to be printed. Over the stone table top a thick piece of woollen printer's blanket is tightly stretched to supply the elasticity necessary to give the block every chance of making a good impression on the cloth. At one end, the table is provided with a couple of iron brackets to carry the roll of cloth to be printed and, at the other, a series of guide rollers, extending to the ceiling, are arranged for the purpose of suspending and drying the newly printed goods. The " colour sieve " consists of a tub (known as the swimming tub) half filled with starch paste, dn the surface of which floats a frame covered at the bottom with a tightly-stretched piece of mackintosh or oiled calico. On this the " colour sieve " proper, a frame similar to the last but covered with fine woollen cloth, is placed, and forms when in position a sort of elastic colour trough over the bottom of which the colour is spread evenly with a brush.

The modus operandi of printing is as follows: — The

printer commences by drawing a length of cloth, from the roll, over the table, and marks it with a piece of coloured chalk and a ruler to indicate where the first impression of the block is to be applied. He then applies his block in two different directions to the colour on the sieve and finally presses it firmly and steadily on the cloth, ensuring a good impression by striking it smartly on the back with a wooden mallet. The second impression is made in the same way, the printer taking care to see that it fits exactly to the first, a point which he can make sure of by means of the pins with which the blocks are provided at each corner and which are arranged in such a way that when those at the right side or at the top of the block fall upon those at the left side or the bottom of the previous im- pression the two printings join up exactly and continue the pattern without a break. Each succeeding impression is made in precisely the same manner until the length of cloth on the table is fully printed. When this is done it is wound over the drying rollers, thus bringing forward a fresh length to be treated similarly.

If the pattern contains several colours the cloth is usually first printed throughout with one, then dried, re-wound and printed with the second, the same operations being repeated until all the colours are printed.

Many modifications of block-printing have beentried from time to time, but of these only two — ” tobying ” and ” rainbowing “— are of any practical value. The object of ” tobey-printing ” is to print the several colours of a multicolour pattern at one operation, and for this purpose a block with the whole of the pattern cut upon it, and a specially constructed ” colour sieve ” are employed. The sieve consists of a thick block of wood, on one side of which a series

of compartments are hollowed out,, corresponding roughly in shape, size and position to the various objects cut on the block. The tops of the dividing walls of these compartments are then coated with melted pitch, and a piece of fine woollen cloth is stretched over the whole and pressed well down on the pitch so as to adhere firmly to the top of each wall ; finally a piece of string soaked in pitch is cemented over the woollen cloth along the lines of the dividing walls, and after boring a hole through the bottom of each compart- ment the sieve is ready for use. In operation each compartment is filled with its special colour through a pipe connecting it with a colour box situated at the side of the sieve and a little above it, so as to exert just sufficient pressure on the colour to force it gently through the woollen cloth, but not enough to cause it to overflow its proper limits, formed by the pitch-soaked string boundary lines.

The block is then carefully pressed on the sieve, and, as the different parts of its pattern fall on different parts of the sieve, each takes up a certain colour which it transfers to the cloth in the usual way. By this method of ” tobying ” from two to six colours may be printed at one operation, but it is obvious that it is only applic- able to patterns where the different coloured objects are placed at some little distance apart, and that, therefore, it is of but limited application.

Block-printing by hand is a slow process; it is, however, capable of yielding highly artistic results, some of which are unobtainable by any other means, and it is, therefore, still largely practised for the highest class of work in certain styles.

<2) Perrotine-Printing. — The " perrotine " is a block-printing machine invented by Perrot of Rouen in 1834, and practically speaking is the only successful mechanical device ever introduced for this purpose. For some reason or other it has rarely been used in England, but its value was almost

immediately recognized on the Continent, and although block-printing of all sorts has been replaced to such an enormous extent by roller-printing, the " perro- tine " is still largely employed in French, German and Italian works.

The construction of this ingenious machine is too complex to describe here without the aid of several detailed drawings, but its mode of action is roughly as follows: — Three large blocks (3 ft. long by 3 to 5 in. wide), with the pattern cut or cast on them in relief, are brought to bear successively on the three faces of a specially constructed printing table over which the cloth passes (together with its backing of printer's blanket) after each impression. The faces of the table are arranged at right angles to each other, and the blocks work in slides similarly placed, so that their engraved faces are perfectly parallel to the tables. Each block is moreover provided with its own particular colour trough, distributing brush, and woollen colour pad or sieve, and is supplied automatically with colour by these appliances during the whole time that the machine is in motion. The first effect of starting the machine is to cause the colour sieves, which have a reciprocating motion, to pass over, and receive a charge of colour from, the rollers, fixed to revolve, in the colour troughs. They then return to their original position between the tables and the printing blocks, coming in contact on the way with the distributing brushes, which spread the colour evenly over their entire surfaces. At this point the blocks advance and are gently pressed twice against the colour pads (or sieves) which then retreat once more towards the colour troughs. During this last movement the cloth to be printed is drawn forward over the first table, and, immediately the colour pads are sufficiently out of the way, the block advances and, with some force, stamps the first impression on it. The second block is now put into gear and the foregoing operations are repeated for both blocks, the cloth advancing, after each impression, a distance exactly equal to the width of the blocks. After the second block has made its

impression the third comes into play in precisely the same way, so that as the cloth leaves the machines it is fully printed in three separate colours, each fitting into its proper place and completing the pattern. If necessary the forward movement of the cloth can be arrested without in any way inter- fering with the motion of the blocks — an arrangement which allows any insufficiently printed impression to be repeated in exactly the same place with a precision practically impossible in hand-printing.

For certain classes of work the " perrotine " possesses great advantages over the hand-block; for not only is the rate of pro- duction greatly increased, but the joining up of the various impres- sions to each other is much more exact — in fact, as a rule, no sign of a break in continuity of line can be noticed in well-executed work. On the other hand, however, the " perrotine " can only be applied to the production of patterns containing not more than three colours nor exceeding five inches in vertical repeat, whereas hand block-printing can cope with patterns of almost any scale and containing any number of colours. All things considered, therefore, the two processes cannot be compared on the same basis: the " perrotine " is best for work of a utilitarian character and the hand-block for decorative work in which the design only repeats every 15 to 20 in. and contains colours varying in number from one to a dozen.

(3) Engraved Copperplate-Printing. — The printing of textiles from engraved copperplates was first practised by Bell in 1770. It is now entirely obsolete, as an industry, in England, and is only

mentioned here because it is, to a slight extent, still used in Switzer- land for printing finely engraved borders on a special style of handkerchief the centre of which is afterwards filled in by block- printing.

The presses first used were of the ordinary letterpress type, the engraved plate being fixed in

the place of the type. In later improvements the well-known cylinder press was employed; the plate was inked mechanically and cleaned off by passing under a sharp blade of steel; and the cloth, instead of being laid on the plate, was passed round the pressure cylinder. The plate was raised into frictional contact with the cylinder and in passing under it transferred its ink to the cloth.

The great difficulty in plate-printing was to make the various impressions join up exactly; and, as this could never be done with any certainty, the process was eventually confined to patterns complete in one repeat, such as handkerchiefs, or those made up of widely separated objects in which no repeat is visible, like, for instance, patterns composed of little sprays, spots, &c.

(4) Roller-Printing, Cylinder-Printing, or Machine-Printing. — This elegant and efficient process was patented and worked by Bell in 1785 only fifteen years after his application of the engraved plate to textiles. It will probably remain a moot question as to whether he was the originator of the idea, but it is beyond doubt that he was the first man to put into practice the continuous printing of cloth from engraved copper rollers. Bell's first patent was for a. machine to print six colours at once, but, owing probably to its incomplete development, this was not immediately successful, although the principle of the method was shown to be practical by the printing of one colour with perfectly satisfactory results. The difficulty was to keep the six rollers, each carrying a portion of the pattern, in perfect register with each other. This defect was soon overcome by Adam Parkinson of Manchester, and in 1785, the year of its invention, Bell's machine with Parkinson's improvement was successfully employed by Messrs Livesey, Har- greaves, Hall & Co., of Bamber Bridge, Preston, for the printing of calico in from two to six colours at a single operation.

What Parkinson's contribution to the development of the modern roller-printing machine really was is not known with certainty, but it was possibly the

invention of the delicate adjustment known as ” the box wheel,” whereby the rollers can be turned, whilst the machine is in motion, either in or against the direction of their rotation.

In its simplest form the roller-printing machine consists of a strong cast iron cylinder mounted in adjustable bearings capable of sliding up and down slots in the sides of the rigid iron framework. Beneath this cylinder the engraved copper roller rests in stationary bearings and is supplied with colour from a wooden roller which revolves in a colour-box below it. The copper roller is mounted on a stout steel axle, at one end of which a cog-wheel is fixed to gear with the driving wheel of the machine, and at the other end a smaller cog-wheel to drive the colour-furnishing roller. The cast iron pressure cylinder is wrapped with several thicknesses of a special material made of wool and cotton — lapping — the object of which is to provide the elasticity necessary to enable it to properly force the cloth to be printed into the lines of engraving. A further and most important appliance is the ” doctor ” — a thin sharp blade of steel which rests on the engraved roller and serves to scrape off every vestige of superfluous colour from its surface, leaving only that which rests in the engraving. On the perfect action of this ” doctor ” depends the entire success of printing, and as its sharpness and angle of inclination to the copper roller varies with the styles of work in hand it requires an expert to ” get it up ” (sharpen it) properly and considerable practical experience to know exactly what qualities it should possess in any given case. In order to prevent it (the ” doctor “) from wear- ing irregularly it is given a to-and-fro motion so that it is constantly changing its position and is never in contact with one part of the engraving for more than a moment at a time. A second ‘ ‘ doctor ‘ ‘ of brass or a similar alloy is frequently added on the opposite side of the roller to that occupied by the steel or” clean- ing ” doctor; it is known technically as the ” lint doctor ” from its purpose of cleaning off loose filaments

or ” lint ” which the roller picks off the cloth during the printing operation. The steel or ” cleaning doctor ” is pressed against the rol! r by means of _ weighted levers, but the ” lint doctor ” is usually _ _

just allov/ed to rest upon it by its own weight as its function is merely to intercept the nap which becomes detached from the cloth and would, if not cleaned from the roller, mix with the colour and give rise to defective work.

The working of the machine will be best understood by referring to the accompanying diagrammatic sketch of a single colour (fig. 1).

Fig. 1.

A is the cast iron pressure cylinder; B the lapping with which it is usually wrapped; C the engraved copper printing roller; D the steel “cleaning doctor”; E the brass “lint doctor”; F the colour-furnishing roller; G the colour trough or ” box ” in which the latter (F) works partly immersed in colour; X an endless woollen blanket continually circulating between the cloth to be printed (K) and the cylinder A ; and K the cloth in question. In operation, the cylinder A is screwed down with an even pres sure into frictional contact with the roller C; the machine is then set in motion, turning in the direction indicated by the arrows; the cloth is now introduced between A and C and as it leaves the machine fully printed it is carried over a series of drying cylinders situated above and heated by steam. The printing roller C is the only part of the machine directly connected with the motor or main drive of the works through the cog-wheel on its axle — the ” mandril ” — all the other parts deriving their motion from it, either by friction as

in the case of the cylinder or by a spur wheel as in that of the colour-furnishing roller. The mode of printing is almost self-evident; the roller C revolving in the direc- tion of the arrow takes colour from the " furnisher " F, the excess is scraped off by the " doctor " G and, in continuing its course, it comes in contact with the cloth K, which being pressed by the cylinder A into the engraving abstracts the colour therefrom and of course receives an exact impression of the engraved pattern.

Larger machines printing from two to sixteen colours are pre- cisely similar in principle to the above, but differ somewhat in detail and are naturally more complex and difficult to operate. In a twelve-colour machine, for example, twelve [copper rollers, each carrying one portion of the design, are arranged round a central pressure cylinder, or bowl, common to all, and each roller is driven by a common driving wheel, called the " crown " wheel, actuated, in most cases, by its own steam-engine or motor. Another difference is that the adjustment of pressure is transferred from the cylinder to the rollers which work- in specially constructed bearings capable of the following movements: (1) Of being screwed up bodily until the rollers are lightly pressed against the central bowl; (2) of being moved to and fro sideways so that the rollers may be laterally adjusted; and (3) of being moved up or down for the purpose of adjusting the rollers in vertical direction. Not- withstanding the great latitude of movement thus provided each roller is furnished with a " box-wheel," which serves the double purpose of connecting or gearing it to the driving wheel, and of affording a fine adjustment. Each roller is further furnished with its own colour-box and doctors.

With all these delicate equipments at his command a machine- printer is enabled to fit all the various parts of the most com- plicated patterns with an ease, despatch and precision which are remarkable considering the complexity and size of the machine.

In recent years many improvements have been made in printing machines and many additions made to their already wonderful capacities. Chief amongst these are those embodied in the ” Inter- mittent ” and the ” Duplex ” machines. In the former any or all of the rollers may be moved out of contact with the cylinder at will, and at certain intervals. Such machines are used in the printing of shawls and ” sarries ” for the Indian market. Such goods require a wide border right across their width at varying distances— sometimes every three yards, sometimes every nine yards — and it is to effect this, with rollers of ordinary dimensions, that ” intermittent ” machines are used. The body of the ” sarrie ” will be printed, say for six yards with eight rollers; these then drop away from the cloth and others, which have up to then been out of action, immediately fall into contact and print a border or ” crossbar,” say’ one yard wide, across the piece ; they then recede from the cloth and the first eight again return and print another six yards, and so on continually.

The ” Duplex ” or ” Reversible ” machine derives its name from the fact that it prints both sides of the cloth. It consists really of two ordinary machines so combined that when the cloth passes, fully printed on one side from the first, its plain side is exposed to the rollers of the second, which print an exact duplicate of the first impression upon it in such a way that both printings coincide. A pin pushed through the face of the cloth ought to protrude through the corresponding part of the design printed on the back if the two patterns are in good ” fit.”

The advantages possessed by roller-printing over all other pro- cesses are mainly three: firstly, its high productivity — 10,000 to 12,000 yds. being commonly printed in one day of ten hours by a single-colour machine; secondly, by its capacity of being applied to the reproduction of every style of design, ranging from the fine delicate lines of copperplate engraving and the small ” repeats ” and limited colours of the ” perrotine ” to the broadest

effects of block-printing and to patterns varying in ” repeat ” from I to 80 in. ; and thirdly, the wonderful exactitude with which each portion of an elaborate multicolour pattern can be fitted Into its proper place, and the entire absence of faulty joints at its points of ” repeat ” or repetition — a consideration of the utmost import- ance in fine delicate work, where such a blur would utterly destroy the effect.

(5) Stencilling. — The art of stencilling is very old. It has been

applied to the decoration of textile fabrics from time immemorial by the Japanese, and, of late years, has found increasing employ- ment in Europe for certain classes of decorative work on woven goods for furnishing purposes.

The pattern is cut out of a sheet of stout paper or thin metal with a sharp-pointed knife, the uncut portions representing the part that is to be ” reserved ” ‘or left uncoloured. The sheet is now laid on the material to be decorated and colour is brushed through its interstices.

It is obvious that with suitable planning an ” all over ” pattern may be just as easily produced by this process as by hand or machine printing, and that moreover, if several plates are used, as many colours as plates may be introduced into it. The peculiarity of stencilled patterns is that they have to be held together by “ties,” that is to say, certain parts of them have to be left uncut, so as to connect them with each other, and prevent them from falling apart in separate pieces. For instance, a complete circle cannot be cut without its centre dropping out, and, consequently, its outline has to be interrupted at convenient points by ” ties ” or uncut portions. Similarly with other objects. The necessity for ” ties ” exercises great influence on the design, and in the hands of a designer of indifferent ability they may be very unsightly. On the other hand, a capable man utilizes them to supply the drawing, and when thus treated they form

an integral part of the pattern and enhance its artistic value whilst complying with the conditions and the process.

For single-colour work a stencilling machine was patented in 1894 by S. H. Sharp. It consists of an endless stencil plate of thin sheet steel which passes continuously over a revolving cast iron cylinder. Between the two the cloth to be ornamented passes and the colour is forced on to it, through the holes in the stencil, by mechanical means.

(6) Other Methods of Printing. — Although most work is executed throughout by one or other of the five distinct processes mentioned above, combinations of them are not infrequently employed. Some- times a pattern is printed partly by machine and partly by block; and sometimes a cylindrical block is used along with engraved copper-rollers in the ordinary printing machine. The block in this latter case is in all respects, except that of shape, identical with a flat wood or " coppered " block, but, instead of being dipped in colour, it receives its supply from an endless blanket, one part of which works in contact with colour-furnishing rollers and the other part with the cylindrical block. This block is known as a " surface " or " peg " roller. Many attempts have been made to print multicolour patterns with " surface " rollers alone, but hitherto with little success, owing to their irregularity in action and to the difficulty of preventing them from warping. These defects are not present in the printing of linoleum in which opaque oil colours are used — colours which neither sink into the body of the hard linoleum nor tend to warp the roller.

The printing of yarns and warps is extensively practised. It is usually carried on by a simple sort of " surface " printing machine and calls for no special mention.

Lithographic printing, too, has been applied to textile fabrics with somewhat qualified success. Its irregularity and the diffi- culty of printing " all over " patterns to " repeat " properly, have

restricted its use to the production of decorative panels, equal in size to that of the plate or stone, and complete in themselves.

Engraving of Copper Rollers The engraving of copper rollers is one of the most important branches of textile-printing and on its perfection of execution depends, in great measure, the ultimate success of the designs. Roughly speaking, the operation of engraving is performed by three different methods, viz. (1) By hand with a graver which cuts the metal away; (2) by etching, in which the pattern is dissolved out in nitric acid ; and (3) by machine, in which the pattern is simply indented.

(1) Engraving by hand is the oldest and most obvious method of engraving, but is the least used at the present time on account of its slowness. The design is transferred to the roller from an oil- colour tracing and then merely cut out with a steel graver, pris- matic in section, and sharpened to a bevelled point. It requires great steadiness of hand and eye, and although capable of yielding the finest results it is only now employed for very special work and for those patterns which are too large in scale to be engraved by mechanical means.

(2) In the etching process an enlarged image of the design is cast upon a zinc plate by means of an enlarging camera and prisms or reflectors. On this plate it is then painted in colours roughly approximating to those in the original, and the outlines of each colour are carefully engraved in duplicate by hand. The necessity for this is that in subsequent operations the design has to be again reduced to its original size and, if the outlines on the zinc plate were too small at first, they Would be impracticable either to etch or print. The reduction of the design and its transfer to a varnished copper roller are both effected at one and the same operation in the pantograph machine. This machine is capable of reducing a pattern on the zinc plate from one-half to one-tenth

of its size, and is so arranged that when its pointer or " stylus " is moved along the engraved lines of the plate a series of diamond points cut a reduced facsimile of them through the varnish with which the roller is covered. These diamond points vary in number according to the number of times the pattern is required to repeat along the length of the roller. Each colour of a design is trans- ferred in this way to a separate roller. The roller is then placed in a shallow trough containing nitric acid, which acts only on those parts of it from which the varnish has been scraped. To ensure evenness the roller is revolved during the whole time of its immersion in the acid. When the etching is sufficiently deep the roller is washed, the varnish dissolved off, any parts not quite perfect being retouched by hand.

(3) In machine engraving the pattern is impressed in the roller by a small cylindrical " mill " on which the pattern is in relief. It is an indirect process and requires the utmost care at every stage. The pattern or design is first altered in size to repeat evenly round the roller. One repeat of this pattern is then engraved by hand on a small highly polished soft steel roller, usually about 3 in. long and \ in. to 3 in. in diameter; the size varies according to the size of the "repeat" with which it must be identical. It is then rc- polished, painted with a chalky mixture to prevent its surface oxidizing and exposed to a red-heat in a box filled with chalk and charcoal; then it is plunged in cold water to harden it and finally tempered to the proper degree of toughness. In this state it forms the " die " from which the " mill " is made. To produce the actual " mill " with the design in relief a softened steel cylinder is screwed tightly against the hardened die and the two are rotated under constantly increasing pressure until the softened cylinder or " mill " has received an exact replica in relief of the engraved pattern. The " mill " in turn is then hardened and

tempered, when it is ready for use. In size it may be either exactly like the ” die ” or its circumferential measurement may be any multiple of that of the latter according to circumstances.

The copper roller must in like manner have a circumference equal to an exact multiple of that of the ” mill,” so that the pattern will join up perfectly without the slightest break in line.

The modus operandi of engraving is as follows: — The “mill” is placed in contact with one end of the copper roller, and being mounted on a lever support as much pressure as required can be put upon it by adding weights. Roller and ” mill ” are now revolved together, during which operation the projection parts of the latter are forced into the softer substance of the roller, thus engraving it, in intaglio, with several replicas of what was cut on the original ” die.” When the full circumference of the roller is engraved, the ” mill ” is moved sideways along the length of the roller to its next position, and the process is repeated until the whole roller is fully engraved.

Preparation of Cloth for Printing

Goods intended for calico-printing ought to be exceptionally well bleached, otherwise mysterious stains, and other serious de- fects, are certain to arise during subsequent operations. Parti- culars of bleaching will be found in the article Bleaching (q.v.).

The chemical preparations used for special styles will be men- tioned in their proper places; but a general “prepare,” employed for most colours that are developed and fixed by steaming only, consists in passing the bleached calico through a weak solution of ” sulphated ” or turkey red oil containing from 2 J per cent, to 5 per cent, of fatty acid. Some colours are printed on pure bleached cloth, but all patterns containing alizarine red, rose and salmon shades, are considerably brightened by the presence of oil. and

indeed very few, if any, colours are detrimentally affected by it.

Apart from wet preparations the cloth has always to be brushed, to free it from loose nap, flocks and dust which it picks up whilst stored. Frequently, too, it has to be " sheared " by being passed over rapidly revolving knives arranged spirally round an axle, which rapidly and effectually cuts off all filaments and knots, leaving the cloth perfectly smooth and clean and in a condition fit to re- ceive impressions of the most delicate engraving. Some figured fabrics, especially those woven in checks, stripes and " cross-overs," require very careful stretching and straightening on a special machine, known as a " stenter," before they can be printed with certain formal styles of pattern which are intended in one way or another to correspond with the cloth pattern. Finally, all de- scriptions of cloth are wound round hollow wooden or iron centres into rolls of convenient size for mounting on the printing machines.

Preparation of Colours

The art of making colours for textile-printing demands both chemical knowledge and extensive technical experience, for their ingredients must not only be properly proportioned to each other, but they must be specially chosen and compounded for the par- ticular style of work in hand. For a pattern containing only one colour any mixture whatever may be used so long as it fulfils all conditions as to shade, quality and fastness; but where two or more colours are associated in the same design each must be capable

of undergoing without injury the various operations necessary for the development and fixation of the others.

All printing pastes whether containing colouring matter or not are known technically as " colours," and are referred to as such in the sequence.

Colours vary considerably in composition. The greater number of them contain all the elements necessary for the direct production and fixation of the colour-lake. Some few contain the colouring matter alone and require various after-treatments for its fixation; and others again are simply " mordants " thickened. A mordant is the metallic salt or other substance which combines with the colouring principle to form an insoluble colour-lake, either directly by steaming, or indirectly by dyeing.

All printing colours require to be thickened, for the twofold object of enabling them to be transferred from colour-box to cloth "without loss and to prevent them from " running " or spreading beyond the limits of the pattern.

Thickening Agents. — The thickening agents in most general use as vehicles in printing, are starch, flour, gum arabic, gum senega! and gum tragacanth, British gum or dextrine and albumen.

With the exception of albumen all these are made into pastes, or dissolved, by boiling in double or " jacketed " pans, between the inner and outer casings of which either steam or water may be made to circulate, for boiling and cooling purposes. Mechanical agitators are also fitted in these pans to mix the various ingredients together, and to prevent the formation of lumps by keeping the contents thoroughly stirred up during the whole time they are being boiled and cooled.

Starch Paste. — This is made by mixing 15 lb of wheat starch with a little cold water to a smooth creamy paste; a little olive oil is then added and sufficient water to bring the whole up to 10 gallons. The mixture is then thickened by being boiled for about an hour and, after cooling, is ready for use.

Starch is the most extensively used of all the thickenings. It is applicable to all but strongly alkaline or strongly acid colours. With the former it thickens up to a stiff unworkable jelly, while

mineral acids or acid salts convert it into dextrine, thus diminishing its thickening power. Acetic and formic acids have no action on it even at the boil.

Flour paste is made in a similar way to starch paste. At the present time it is rarely used for anything but the thickening of aluminium and iron mordants, for which it is eminently adapted.

Gum arabic and gum Senegal are both very old thickenings, but their expense prevents them from being used for any but pale delicate tints. They are especially useful thickenings for the light ground colours of soft muslins and sateens on account of the pro- perty they possess of dissolving completely out of the fibres of the cloth in the washing process after printing. Starch and artificial gums always leave the cloth somewhat harsh in ” feel ” unless they are treated specially, and are moreover incapable of yielding the beautifully clear and perfectly even tints resulting from the use of natural gums. Very dark colours cannot well be obtained with gum Senegal or gum arabic thickenings; they come away too much in washing, the gum apparently preventing them from com- bining fully with the fibres. Stock solutions of these two gums are usually made by dissolving 6 or 8 ft) of either in one gallon of water, either by boiling or in the cold by standing.

British gum or dextrine is prepared by heating starch. It varies considerably in composition — sometimes being only slightly roasted and consequently only partly converted into dextrine, and at other times being highly torrefied, and almost completely soluble in cold water and very dark in colour. Its thickening power decreases and its ” gummy ” nature increases as the temperature at which it is roasted is raised. The lighter coloured gums or dextrines will make a good thickening with from 2 to 3 lb of gum to one gallon of water, but the darkest and most highly calcined require from 6 to 10 tb per gallon to give a substantial paste. Between these limits all qualities are obtainable.

The darkest qualities are very useful for strongly acid colours, and with the exception of gum senega!, are the best for strongly alkaline colours and discharges.

Like the natural gums, neither light nor dark British gums penetrate into the fibre of the cloth so deeply as pure starch or flour, and are therefore unsuitable for very dark strong colours.

Gum tragacanth, or " Dragon," is one of the most indispensable thickening agents possessed by the textile printer. It may be mixed in any proportion with starch or flour and is equally useful for pigment colours and mordant colours. When added to starch paste it increases its penetrative power, adds to its softness without diminishing its thickness, makes it easier to wash out of the fabric and produces much more level colours than starch paste alone. Used by itself it is suitable for printing all kinds of dark grounds on goods which are required to retain their soft clothy feel. A tragacanth mucilage may be made either by allowing it to stand a day or two in contact with cold water or by soaking it for twenty- four hours in warm water and then boiling it up until it is perfectly smooth and homogeneous. If boiled under pressure it gives a very fine smooth mucilage (not a solution proper), much thinner than if made in the cold.

Albumen. — Albumen is both a thickening and a fixing agent for

insoluble pigments such as chrome yellow, the ochres, vermilion and ultramarine. Albumen is always dissolved in the cold, a pro- cess which takes several days when large quantities are required. The usual strength of the solution is 4 lb per gallon of water for blood albumen, and 6 lb per gallon for egg

albumen. The latter is expensive and only used for the lightest shades. For most purposes one part of albumen solution is mixed with one part of tragacanth mucilage, this proportion of albumen being found amply sufficient for the fixation of all ordinary pigment colours. In special instances the blood albumen solution is made as strong as 50 per cent., but this is only in cases where very dark colours are required to be absolutely fast to washing. After printing, albumen- thickened colours are exposed to hot steam, which coagulates the albumen and effectually fixes the colours.

Formerly colours were always prepared for printing by boiling the thickening agent, the colouring matter and solvents, &c, to- gether, then cooling and adding the various fixing agents. At the present time, however, concentrated solutions of the colouring matters and other adjuncts are often simply added to the cold thickenings, of which large quantities are kept in stock.

Colours are reduced in shade by simply adding more starch or other paste. For example, a dark blue containing 4 oz. of methylene blue per gallon may readily be made into a pale shade by adding to it thirty times its bulk of starch paste or gum, as the case may be. Similarly with other colours.

Before printing it is very essential to strain or sieve all colours in order to free them from lumps, fine sand, &c, which would in- evitably damage the highly polished surface of the engraved rollers and result in bad printing. Every scratch on the surface of a roller prints a fine line in the cloth, and too much care, therefore, cannot be taken to remove, as far as possible, all grit and other hard par- ticles from every colour.

The straining is usually done by squeezing the colour through fine cotton or silk cloths. Mechanical means are also employed for colours that are used hot or are very strongly alkaline or acid.

Styles of Printing

The widely differing properties of the hundreds of colouring matters now on the market give rise to many different styles of textile-printing. Generally speaking, these fall into the following four great divisions: —

(1) Direct printing.

(2) The printing of a mordant upon which the colour is after- wards dyed.

(3) The discharge style.

(4) The resist or reserve style.

The fact that each of these divisions is further sub-divided into many smaller divisions renders it out of the question to give more than a few typical examples of the various styles they include.

(1) Direct Printing. — This style is capable of application to almost every class of colour known. Its essential feature is that the colouring matter and its fixing agent are both applied to the fabric simultaneously. In some instances the fabric requires to be pre- viously prepared for certain of the colours used along with those characteristic of the process; but this is one of many cases where two styles are combined, and it must be classed with the one which it most resembles.

(a) Application of Mordant Dye-Stuffs. — Mordant colours include both artificial and natural dye-stuffs (see also under Dyeing), the most important of all being alizarine, an artificial preparation of the colouring-principle of the madder root. With different metallic oxides alizarine forms different colour-lakes all exceedingly fast to light and soap. Aluminium mordant gives red and pink lakes; iron mordant, purples and lavenders; chromium yields maroons; and uranium gives grey shades. Mixture of iron and aluminium produce various tones of chocolate and brown.

In addition to alizarine the following are a few of the more important mordant dye-stuffs employed in

textile-printing : —

Alizarine orange with aluminium and chrome mordants for orange and warm brown shades respectively; alizarine bordeaux, with alumina, for violets; alizarine blue with chrome and zinc for quiet blue shades; coeruleine and alizarine viridine for greens and olives with chromium mordants; gallocyanine, chrome violet blue, alizarine cyanines, &c, with chromium for various shades of blue and violet; alizarine yellows and anthracene brown for yellows and fawn shades respectively with either alu- minium or chrome mordants. The natural dye-stuffs belonging to this series are chiefly: logwood, with chromium and iron mor- dants, for blacks; Persian berries and quercitron bark, with aluminium, tin and chromium mordants, for colours ranging from brilliant yellow to quiet old golds and browns; catechu, with chromium, for very fast dark browns; and, occasionally, in mix- tures, sapan-wood, peach-wood, Brazil-wood, and divi-divi extracts with any of the above-mentioned mordants.

The mordants are mostly in the form of acetates which are stable in the cold but decompose. during the steaming process, and combine as hydroxides with the colours, forming and fixing on the fabric the insoluble lake.

Alizarine reds and pinks are the most complicated of the mor- dant colours, requiring for their proper production the addition of brightening agents, such as oxalate of tin, oils, tartaric acid, and also acetate of lime. This also applies to alizarine orange, but all the other colours are very simple to compound and are stable for a long time after making. Reds, pinks and oranges are best prepared freshly each day; their constituents are liable to combine if the colour stands twenty-four hours before printing.

The following types of recipes will give some idea of the way in which colours are mixed : —

Red.

Pink.

gallons thick starch and tragacanth paste.

,, alizarine (20 per cent, commercial paste).

„ nitrate of alumina, 18 Tw.

,, acetate of lime, 28 Tw.

,, oxalate of tin, io° Tw.

,, 10 per cent, solution of tartaric acid.

6j gallons starch-tragacanth paste. 1 ,, blue shade alizarine (20 per cent, paste), ii ,, sulphocyanide of alumina, 18 Tw. f „ acetate of lime, 28° Tw. i ,, oxalate of tin. i ,, citrate of alumina, 40 Tw. For reds and pinks the nitrate, sulphocyanide and citrate of alumina are generally preferred in practice to the acetate though the latter is also largely used. Oranges from [alizarine orange are made similarly.

Purple. 9! gallons starch paste.

s ,, blue shade alizarine, 20 per cent.

i „ acetic acid.

I „ acetate of lime, 28° Tw.

j ,, acetate of iron, 24 Tw.

Maroon. 55 gallons paste.

1 „ alizarine, 20 per cent. i ,, acetate of chrome, 32 Tw. f „ acetate of lime, 28 Tw. Blues and the other colours are made by leaving out the lime in the last recipe and replacing the alizarine with another colour.

Alizarine Blue. | lb alizarine blue shade (powd.). {Light Shade.) 1 gallon water.

3i ,, thick paste.

1 J ,, acetate of chrome, 40 Tw. Logwood and other natural colours are specially boiled.

Logwood Black. [15 lb starch.

10 ,, British gum. 4i gallons water. I „ acetic acid. 1 ! „ logwood extract, 48 Tw. - f ,, quercitron extract, 48 Tw. Boil, cool and add: —

(J lb red prussiate of potash.

(J gallon water.

2 „ acetate of chrome, 40 Tw.

2 oz. chlorate of potash.

Quercitron Yellow, ij gallons quercitron extract, 48 Tw. 6J ,, water. 11 lb starch.

Boil, cool and add : — J gallon acetate of chrome, 30 Tw.

The proportions here given are liable to variations according to circumstances. Indeed, no two works employ quite the same recipes, although the proportion of mordant to dye-stuff is pretty generally known and observed.

After printing, the goods are dried, steamed for one hour, and then washed and finished.

(b) Application of Basic Aniline Dye-Stuffs. — These colours all form insoluble lakes with tannic acid; hence tannic acid is the common fixing agent of the group. Arsenic in combination with alumina also gives basic-colour lakes, but their poisonous character and their inferior fastness to most reagents considerably limit their application.

The more important basic dye-stuffs are: methylene blue, methyl violet, rhodamine, auramine yellow, safranine emerald green and indoine blue. Most of them are fairly fast to soaping, but towards the action of light they vary a good deal, methylene blue being perhaps as good as any, and the malachite greens the least stable.

Their application is simple. A solution of the colouring matter is added to the requisite quantity of starch paste or gum, and, when well mixed in, the tannin is added in the form of a solution also. If desired they may be boiled up like the extract dye-stuffs (logwood, &c), but this is not necessary unless large quantities are required, when it would be more convenient to boil the whole at once than to mix small batches by hand.

Methylene blue will serve as a type of the method by which all basic colours are compounded.

Blue. 2 gallons methylene blue, 10 per cent,

solution in water and acetic acid. 6 „ thick starch paste. I ,, tragacanth mucilage. i ,, tannic acid solution, 50 per cent.

10 gallons.

All other basic colours are made up for printing in a similar way by replacing the blue with the required dye-stuff.

After printing, goods containing basic dyes are ” steamed,” and passed through a solution of tartar emetic, or other salt of antimony, whereby an insoluble double tannate of antimony and colouring matter is formed, which constitutes a much faster colour than the single tannate of the dye-stuff.

Basic colours may be printed along with ” mordant ” and albumen colours.

(c) Application of Direct Dyeing Colours. — These colours have a natural affinity for the cotton fibre and therefore require no mor- dant. They are not very ” fast,” however, and, though used enormously in the dyeing of plain shades, they find but little employment in printing except for the tinting of printed goods, and for the ” crepon ” style, where the colours must be able to withstand the action of caustic soda.

They are usually printed with the addition of a slightly alka- line salt (phosphate of soda) and sulphate of soda. Amongst the hundreds of direct colours equally suitable for printing mention may be made of erica for pinks; diamine sky-blue for blues; diamine violet, and diamine, chrysamine, chloramine and dianil yellows. In fact, most of the benzidine, diamine, diaml and Congo dye-stuffs can be used for printing, but with the exception of the yellows none of them will resist the action of light and washing to anything like the extent that ” mordant ” and basic colours will. The general formula for printing these colours is as follows : —

4 oz. colouring matter, j gallon water.

1 ,, starch or tragacanth thickening. 4 oz. phosphate of soda.

2 oz. sulphate of soda.

After printing, with direct colours, the goods are first steamed, then slightly washed in a weak tepid soap solution and finally finished.

(d) Application of Pigment Colours. — Before the introduction of coal-tar colours, pigments and lakes played a much more important part in textile-printing than they do at present, though they are still largely used for certain styles of work. They form a scries of colours more difficult to work than those already mentioned, but very fast to soap and light.

Pigment colours, being insoluble mineral precipitates or lakes, can only be fixed on the fibre mechanically ; consequently they require to be applied in conjunction with vehicles which cause them to adhere to the fabric in much the same way that paint adheres to wood.

Of these vehicles, albumen is the most important and the best. It forms a smooth viscous solution with cold water, mixes readily with all the colours used in pigment printing, and possesses the property of coagulating when heated to the temperature of boiling water. When cloth printed with colours containing albumen is passed through hot steam or hot acid solutions, as in the indigo discharge style, the albumen coagulates, forming a tough insoluble colloidal deposit, which firmly fixes on the fibre any colour with which it is mixed.

The colours chiefly employed in pigment printing are: chrome yellow and orange, Guignet's green or chrome green ; artificial ultramarine; lamp black for greys; the various ochres for golds and browns; zinc oxide; vermilion and its substitutes, and occa-sionally lakes of the natural and artificial colouring matters. All these bodies are applied in exactly the same way and may be mixed together in

any proportion to form compound shades. The amount of albumen necessary to fix them varies according to the depth of shade required (between 10 and 25 per cent, of the total weight of the made-up printing colour), and although it is usually considered in text-books as a thickening agent it is rarely used as such in practice on account of its expense. As a rule the colouring matter is beaten up into a smooth paste with the necessary quantity of a strong solution of albumen and then reduced to its proper strength by the addition of tragacanth mucilage or starch paste.

The main factor in the successful working of pigment colours is their fineness of division; the finer they are the better they print and the more beautiful is their quality of colour. If they are too coarse they give rise to innumerable defects, either by- sticking in the engraving or by scratching the roller, or, if they print at all, by yielding uneven masses of colour, granular and speckled in appearance and quite unsaleable. Even when finally ground they are liable to clog the engraving of the rollers — a defect which is more or less successfully overcome by replacing the colour-furnishing roller in the printing machine by a revolving brush.

The following formula of dark ultramarine blue will serve as a type of all other pigment printing colours: — 24 lb artificial ultramarine.

Place in grinding machine and beat up gradually with 4i gallons 40 per cent, blood albumen solution. 2 j ,, tragacanth mucilage, 8 oz. per gallon. ja ,, ammonia. t\ » glycerin. 5 a ,, turpentine. i 1 j ,, olive or cotton-seed oil.*

Make to 8 gallons with tragacanth or water, and grind the whole until perfectly homogeneous.

The small quantities of ammonia, turpentine, glycerin and oil are added to prevent the colour from frothing during the printing process.

Chrome yellows and oranges are frequently mixed with a little cadmium nitrate to counteract the action of sulphuretted hydrogen on the lead salts.

The great disadvantage of pigment colours is that although extremely fast to light and soap they are liable to rub off, if the fabric is subjected to much friction in washing. They also impart considerable stiffness to the goods, and for these two reasons they are therefore restricted to the printing of small patterns, or are used for such styles as window-blinds where the stiffness is not objectionable. In very pale shades they are used for printing the grounds or " blotches " of multicolour patterns, the small quantity of albumen they then contain being insufficient to appreciably affect the softness of the cloth. In several discharge styles too — notably indigo — they find extensive use, and on the whole they constitute a most useful class of colours.

(e) Application of Indigo. — Indigo is printed on cloth by several different methods, the chief of which are: (1) Schlieper and Baum's glucose process; (2) the hydrosulphite process; and (3) the production of indigo on the fibre itself by means of Kalle's indigo salt and several other artificial preparations. The first and second processes depend upon the facts that indigo in presence of caustic alkalis may be converted into indigo-white by reducing agents, and that the indigo-white, being soluble in the alkali, penetrates into the fibres of the cloth, where it is subsequently re-oxidized to its original insoluble state.

In Schlieper and Baum's process (also known as the glucose process) the cloth is first prepared in glucose, and then printed with a colour containing finely ground indigo, caustic soda and dextrine thickening (also made with caustic soda). After printing, the cloth is " aged," that is, passed through damp steam for a few minutes to effect the reduction and solution of the indigo, and is then hung up in a cool chamber for a day or two, in order to re-oxidize the indigo-white to indigo by the

action of the oxygen in the air. A wash in cold water finally completes the fixation of the indigo, and the cloth may then be soaped and finished as usual. The cloth is prepared by running through a box containing a 30 per cent, solution of glucose in water; the excess is squeezed out in a mangle, and the cloth dried. It is then printed with the following colours according to shade required ; —

Alkaline dextrine paste Caustic soda, 38 Tw. .
Indigo 20 per cent, paste

Dark Blue.

Medium Blue.

Light Blue.

7i gals.

8 gals.

8 gals.

ii „

3 4 ”

1 4 if

1

1 M

10 gals. 10 gals. 10 gals.

The printed goods should be dried quickly, and ” aged ” as soon as possible to prevent the absorption of carbonic acid gas from the air, after which the operations already mentioned may be pro- ceeded with at leisure.

The well-known blue and red pattern is produced by this pro- cess, the only difference being that, instead of white cloth, turkey red dyed cloth is used, the strong alkali dissolving out, or ” dis- charging,” completely the colour from those parts of

the cloth upon which it falls, and leaving the indigo as a blue pattern on a red ground.

In the hydrosulphite process, which is much quicker than the preceding, the reducing agent, the indigo and the alkali are all printed together on unprepared white cloth. The goods are then ” aged,” and allowed to lie a short time, after which they are washed-off in cold water first, until the indigo is thoroughly re- oxidized, and then in hot water or soap.

The hydrosulphite printing colour is as follows ;— (200 parts hydrosulphite N.F. (or 100 of the concentrated pro -j duct).

I-450 ,, alkaline dextrine paste.

(150 ,, indigo 20 per cent, paste (ground up in gum). (200 ,, alkaline dextrine paste. Thickening < 150 parts dextrine or British gum. I 850 „ caustic soda, 70 Tw. Print, dry, " age " and wash off in a copious supply of cold Vater

The third process with Katie’s salt is not properly speaking the printing of indigo, but of a special preparation capable of forming indigo when treated with caustic alkalis. The salt is merely , dis- solved and t’.iickened with gum or starch, printed, and then passed direct through a solution of caustic soda, when the indigo is immedi- ately developed. Instead of being passed through the alkali, which is apt to cause the colour to run before it is properly developed, the cloth is more commonly printed with thickened caustic soda, whereby the indigo is equally well produced without any fear of ” running.”

Besides indigo, other vat dye-stuffs, such as indanthrenes, the algol, helindone and ciba colours,

thioindigo scarlet, &c, are also printed largely at the present time, yielding colours of hitherto unattained fastness to washing and to light.

(/) Insoluble Azo-Colours. — These colours do not exist as such, but require to be produced on the fibre itself from their components. They form a range of exceedingly fast colours, including orange, red, pink, maroon, brown, chocolate, blue and black, and are produced by the combination of various diazo-bodies with phenols, the most important of which latter is /3-naphthol (beta-naphthol).

In practice their application is briefly as follows: — The bleached cloth is prepared in a solution of /3-naphthol in caustic soda (naphtholate of soda), then gently dried and printed with the thickened diazotized amine required to produce the desired shade. The printing colour must be cooled with ice to prevent its decom- position; hence such colours are sometimes known as " ice colours."

The two colours most extensively used are para-nitraniline red and a-naphthylamine maroon, both of which are bright fast colours, only equalled by turkey red and madder chocolate for general usefulness.

On /3-naphthol prepare the following colours may be obtained: — ■

Red with paranitraniline.

Maroon with a-naphthylamine.

Orange with orthonitrotoluidine.

Pink with azo pink 2 B.

Chocolate with benzidine.

Brown with benzidine and orthonitrotoluidine.

Blue with dianisidine.

Black with dianisidine and benzidine.

Other naphthols and other bases give a still greater variety of shades.

The naphthol prepare requires to be freshly made, and the cloth prepared with it carefully dried, if good results are to be obtained.

Paranitraniline is made up for printing by dissolving in hydro- chloric acid. Nitrite of soda is then added, and, after standing a short time to complete the reaction, the resulting diazo-solution is mixed with thickening, and acetate of soda is then added to neutralize any free mineral acid still remaining, the presence of which would prevent the formation of the colour.

In practice the following formulae have given good results: —

(1) Paranitraniline Red Prepare the bleached cloth in : — -

47 parts /3-naphthol. 3 „ naphthol R. 107 „ caustic soda, 50° Tw. 400 ,, hot water.

10 ,, tartar emetic.

12 ,, tartaric acid.

Make up to 1000 parts with hot water.

The cloth is passed through a trough containing this solution, the excess is squeezed out between two wooden rollers, and the cloth is gently dried and then printed with : —

{36 parts paranitraniline C. 100 ,, ice. 100 ,, hydrochloric acid, 30 Tw. 70 ,, water.

Mix and add quickly:

S24 parts nitrite of soda, 93 per cent. 70 ,, water (cold).

And just before printing add further:

100 parts acetate of soda.

100 ,, ice in large pieces.

400 „ tragacanth mucilage, 12 per cent.

Print, dry and wash.

A similar prepare without the naphthol R. may be used for a-naphthylamine maroons, the printing colour for which is made up as follows : —

36 parts a-naphthylamine. 93 ,, hydrochloric acid, 30 Tw. 171 ,, tragacanth mucilage.

Grind till perfectly smooth in a mill and then add : 100 parts ice.

20 „ nitrite of soda of 93 per cent, strength.

80 „ water. 400 „ starch and tragacanth thickening.

25 ,, benzine.

75 „ acetate of soda.

1000

Print, dry and wash.

Immediately these diazo-colour pastes come in contact with the naphthol-prepared cloth the colour itself is formed and fixed and requires no further treatment except that of washing to remove the naphthol from the unprinted parts of the cloth.

The other bases are diazotized in precisely the same way, the quantities of acid and nitrite of soda being varied according to the molecular weights of each base.

Several processes of printing azo-colours directly, without any previous preparation of the cloth, have been proposed, but they are not in general use as yet; those which have passed the experi- mental stage are not very successful on the large scale, and have, for the most part, been abandoned.

(g) Application of Sulphur Dyes. — Of late years the

class of colours known as " sulphur colours " have assumed a prominent place in textile-printing. They are really direct dyeing colours, but their special properties entitle them to be classed apart from those usually known under this name.

There are now an enormous number of sulphur-colours on the market under many different names, but, as they are all similar in general properties, it is needless to mention more than one series. The " thiogen colours " of Meister, Lucius and Bruning will serve as well as any to exemplify the application of these dye-stuffs in printing. They comprise yellows, golds, browns, violets, blues, greys and blacks, all fairly, and some very, fast to light and soap, and, under proper conditions, easy of application to a variety of styles.

The general recipe for printing is as under: —

30 parts by weight of colouring matter.

50

80

5 50

40

700

glycerin.

water.

china clay beaten up with

water.

concentrated hydrosulphite N.F., 50 per

cent, solution, alkaline British gum thickening.

This paste is printed on unprepared bleached cloth, gently dried and then passed through a rapid steam ager, in from 4 to 7 minutes in dry steam at 212° F.

to 220° F. (or twice for 3 minutes), after which the cloth is passed in the open width through the washing and soaping machines, and finally dried up and finished.

The sulphur colours may be used in combination with the azo- colours, on naphthol-prepared cloth, for the production of multi- colour effects, and are eminently adapted also to the production of coloured discharges on paranitraniline red and the direct-dyeing colours.

(h) Aniline Black. — Aniline black was discovered and first used by Lightfoot in 1863. It is one of the fastest blacks known, and is equally useful for direct printing by itself, and for working along with printed mordants and discharge pastes. Aniline black is formed by the oxidation of aniline.

As a rule the oxidation of the aniline is brought about by means of sodium chlorate in presence of suitable oxygen carriers such as copper sulphide, vanadium chloride or potassium ferrocyanide. Copper and vanadium blacks are usually developed after printing by being aged in a moderately warm room for a day or two, when they become converted into " emeraldine," at which stage they are taken down, and passed through a hot solution of bichromate of potash to complete the oxidation of the aniline. Great care is required in printing these two blacks, as if overdried they take fire and have occasionally caused considerable damage to buildings in consequence. The blacks made with ferrocyanide, on the contrary, may be printed in conjunction with " steam " colours, and, after a preliminary passage through a rapid steam ager, and an ammonia " gassing " box, will withstand the long steaming necessary for alizarine colours.

A copper aniline black may be made as follows : — 15 R> starch.

8 lb British gum or dextrine. 5i gals, water.

4 lb chlorate of soda, i gal. olive oil.

Boil, cool and add : 8 lb aniline salt. 3 ft aniline oil.

5 ft sulphide of copper (precipitate pressed to a 30 per cent. paste).

.1 gal. water.

10

2

6

7

This black may be either hung to develop, which is the safer course, or, if printed in fine shirting patterns, it may be " aged " through steam for 2 to 3 minutes. Whichever method is adopted the printed cloth must afterwards be passed through hot bichromate — " chroming " — and then well washed.

The following ferrocyanide black works well in practice : —

lb starch.

lb British gum.

tb yellow prussiate (ferrocyanide) of potash.

gals, water.

Boil, turn off the steam, and add: 2| ft> chlorate of soda in powder.

Cool and add : 8i lb aniline salt.

Print, age 4 minutes through the rapid ager, chrome, wash and soap. If printed with alizarine steam

colours it must be passed through ammonia vapour after " ageing," and then be steamed for one hour before chroming and washing. Sometimes the chroming is omitted, but the colour is then apt to become green after a short time owing to the action of sulphur dioxide present in the air.

Aniline black is now used almost exclusively for printing along with mordants for the madder style, and for black ground goods that were formerly dyed with logwood on an iron mordant. Shirt- ings and all single-colour black dress goods are also executed in aniline black, which is faster to light, washing, and perspiration than any other black except some of the sulphur blacks.

(2) Printing of Mordants. — This, the second of the great styles of textile printing, was, at one time, the most extensively practised of all, and is still the most important for all classes of work where

its weight of arsenious acid, or " white arsenic," a substance which retards its oxidation. For this purpose the goods are printed with either aluminium or iron acetates, and hung or " aged " for 2 to 3 days in a brick chamber containing moist air at about 30 C. dry bulb, and 27 C. wet bulb thermometer. In this operation the " ageing " (which is really the volatilization of the acetic acid, leaving the hydrated oxide on the fibre) goes on slowly and evenly. After hanging, the last traces of acid are removed and the hydroxide thoroughly fixed by " dunging," a process in which the goods are passed through a mixture of cow-dung and chalk at a temperature of about 50° C. In this " dunging " bath they are worked alto- gether j about 1 5 hours, at the end of which the mordants are thoroughly fixed, and all the thickening agents perfectly eliminated, thus leaving the cloth in the best condition to absorb the dye-stuff. The dyeing is carried out by working the goods at 6o° C. in a mixture of alizarine, a little chalk, and glue size for I to 1| hours. They are then well washed, soaped, and the whites cleaned by a passage through weak bleaching powder solution, followed by a passage through

steam. Further soaping and washing is then resorted to until the goods are quite clear and bright.

In the case of cloth dyed in red and pink alone the goods after dyeing are well washed, passed through a bath of alizarine oil containing oxalate of ammonia, and then steamed for one hour at 15 lb pressure. This brightens the colours by removing the brown appearance they possess after dyeing. When reds are associated with chocolates and purples, however, the oiling process must be carefully conducted, otherwise the two latter suffer; frequently it is omitted altogether, the brightening being effected by vigorous soaping.

By printing the following mordants a six-colour design may be produced with a single dye-stuff and in one dyeing : —

Aluminium acetate, 6° Tw. Black liquor, 24° Tw. .

Water

British gum

Acetic acid

Tin crystals

Cotton-seed oil .

Starch

Red.

12 gals.

lift igal. 16 lb

Pink.

3 gals.

8 gals. 36tb 1 gal.

Chocolate.

ioJ gals.

Ii „

igal. 16 lb

Dark Purples.

I gal. II „

igal.

16 ib

Violet.

igal- ni ,. 36 ft

Black.

8 gals.

4 ,.

igal. 16 ft

the fastest colours are required. It may be conveniently divided into two branches: (o) the madder style, and (b) the printing of other mordants such as chrome, tannic acid, /3-naphthol, &c.

(a) The Madder Style. — In this style the only mordants used are those of aluminium and iron.

Aluminium alone yields various shades of red and pink when dyed up in madder, or its artificial competitor alizarine. Iron alone yields with the same dye-stuffs shades varying from black to the palest lavender. Iron and aluminium mordants in combination yield colours ranging in shade from claret through all gradations of bordeaux and maroon to the deepest chocolates, according to which of the two mordants predominates in the mixture. Browns and allied colours may be dyed on the same mordants with either nitroalizarine alone, or with alizarine itself mixed with dyewood extracts — logwood, Persian berry or quercitron bark, &c.

Both aluminium and iron mordants consist of the acetates of their respective metals. The iron mordant which gives the best results is known as " black liquor." It is a crude acetate contain- ing a good deal of organic matter which appears to regulate the speed of its oxidation and so produce much more level colours than have ever been obtained from any other iron mordant.

Aluminium acetate in the pure state is also rarely employed, the crude commercial " red liquor " being found in practice to yield the best results, both as. regards colour and ease of working. The " red liquors " vary considerably in composition, some being normal acetates, others basic acetates, some normal sulphate-acetates, others basic sulphate-acetates, but their mode of application is always the same, that is, they are thickened, printed, aged and dyed in alizarine. If they are too basic they decompose on boiling, or on dilution, and become utterly useless; but this rarely happens nowadays and need not be further gone into. Many difficulties occur in the printing of mordants and their subsequent dyeing, but if the following points are observed most of them may be sur- mounted; (1) after printing the cloth must be gently dried, other- wise the mordants become dehydrated or " burnt," and instead of dyeing up evenly they appear patchy and very light in the over- dried parts; (2) the dye-stuff must not be used in excess; and (3) the temperature of the dye-bath must be kept as low as is con- sistent with the fixation of -the colour. If these last two points are neglected the unprinted parts of the cloth, which should remain a pure white when it is finished, will be soiled beyond repair unless indeed the " whites " are cleared at the expense of weakening the colour. Iron mordants especially are liable to unevenness due to the oxidation being too rapid ; and as this defect is most noticeable in purples and lavenders, the pyrolignite of iron or " black-liquor " is frequently boiled for half an hour or more with I per cent, of

The above mordants are printed on white bleached

cloth, dried hung 2 to 3 days, ” dunged,” dyed, washed, well soaped and washed again; then ” chemicked ’’ through weak bleaching powder solu- tion, and finished.

The ” dunging ” is performed in vats through which the cloth circulates continually during the operation. As a rule dunging is done twice, the second bath being weaker than the first. The vats or ” becks ” contain a mixture of: —

100 gals, water 10 lb chalk 50 lb cow-dung at 6o° C.

1st dunging.

100 gals, water ~)

5 lb chalk [2nd dunging.

25 ft cow-dung j

Wash well after ” dunging ” and dye in alizarine, &c.

The dyeing is carried out in large becks over which a roller or bowl revolves, equal in length to the beck. Over this roller the cloth is wound spirally in large loose loops so that one end of the loop is on the roller and the other dips into the dye liquor. When about 700 yds. of cloth have been entered in this way the two ends of it are knotted together, thus forming an endless rope which circulates continuously in and out of the dye- liquor. The vat or beck is then charged with alizarine, chalk and glue, the propor- tions varying according to the amount of space covered by the mordants on the cloth. If, for instance, half the surface is printed then the dye-liquor might be made up as follows, the quantities being calculated on the weight of the cloth : —

in a sufficiency I of water.

The temperature

4! per cent, alizarine (blue shade), 20 per cent.

ii ,, acetate of lime, 28 Tw.

10 ,, glue solution, or size, 15 per cent.

The goods are entered into this solution cold, is gradually raised to 60° C, and the dyeing continued at this for one hour or more. The goods are then washed in a similar machine, soaped well and finished off by drying.

Aniline black may be printed along with ” red liquor ” and iron liquor, and many other modifications also employed, but the prin- ciple of dyeing is always the same.

(6) The Printing of other Mordants. — Of these the most important are tannic acid, chrome mordants and /3-naphthol.

For printing tannic acid the following is used : — 5 ft tannic acid dissolved in 1 gal. acetic acid and added to 9 ,, starch and tragacanth paste.

The goods are simply dried after printing and the tannic acid immediately fixed by passing through a solution of — r2 oz. tartar emetic. 1 oz. chalk, a gal. water at 6o° C.

After washing they may be dyed up in any of the basic aniline colours.

Various chrome mordants are employed in printing, ^amongst which may be mentioned chromium chromate, and chromium acetate. The former is thickened with starch or gum, printed, and fixed by being passed through boiling sodium carbonate. The latter is applied in the same way but, after printing, is steamed before the carbonate treatment. Both these mordants are suitable for dyeing with any of the dyes mentioned under the direct printing of mordant

colours, such as alizarine, alizarine bordeaux, coeruleine and the natural dye-wood extracts. They are dyed similarly to the madder colours, with an addition of glue size to preserve the white of the unprinted parts of the cloth.

(3) The Discharge Style. — This style is now one of the' most important produced. Its range is so extensive, and its modifica- tions so numerous, that it is impossible to mention more than a few of its chief applications. It may be used for locally destroying either the colours dyed on cloth, or the mordants with which they have been previously prepared. In both cases the resulting pattern appears in white, or colours, on a full rich ground the beauty of which cannot be equalled by direct printing.

The discharging agents consist of organic acids, caustic alkalis, oxidizing agents and reducing agents, each used according to the kind of colour or mordant to be discharged.

(a) Discharge of Iron and Aluminium Mordants. — The cloth is padded with a solution of these mordants, dried in hot air, and then printed with thickened citric acid or acid citrate of soda mixed with china clay to prevent the pattern running. It is then passed through the rapid ager once or twice, " dunged," washed, and dyed in the usual way for madder colours. Wherever the discharge has been printed the mordant is dissolved out, leaving a white pattern on a dyed ground.

(b) Tannate of antimony mordant is similarly discharged by print- ing on caustic soda. The goods are passed in like manner through the ager, well washed in water, and dyed-up in any basic aniline dye.

(c) The chrome discharge is produced by padding the goods in chromium bisulphite; then drying them, and printing-on citric acid, or chlorate of soda and yellow prussiate of potash. They are then steamed, passed through chalk and water, well washed and dyed

up in any mordant dye.

(d) Turkey red may be discharged in both white and coloured patterns by either oxidizing agents or caustic alkalis. (1) The dyed cloth is printed with strong citric acid, or arsenic acid, at 180 Tw\, and then run through bleaching powder solution, whereby the printed parts are completely decolorized. If colours are re- quired, the citric acid is mixed with lead salts and Prussian blue, and the fabric after passing through the bleaching powder solution, is further treated in a bath of bichromate of potash which forms with the lead salts the insoluble chrome yellow. Green is obtained by the combination of Prussian blue with the chrome yellow.

Examples : —

White. 6 ft citric acid or tartaric acid. 1 gal. water.

4 lb British gum or dextrine. Boil together. Yellow. 15 lb British gum.

I \ gals, dark British gum paste, 30 per cent. 2\ ,, water. , 20 lb tartaric acid. 12 lb nitrate of lead. Print, dry, discharge through bleaching powder solution, 18 Tw., and chrome.

(e) The dyed cloth is printed with strongly alkaline discharge pastes, passed through the ” ager ” two or three times, and then washed off in silicate of soda. If blue, yellow and green discharges are desired the dyed cloth must first be passed through glucose solution, well dried, printed with the colours, ” aged,” passed through silicate of soda, chromed in bichromate, well washed and dried. Examples: —

White. 10 lb stannous chloride dissolved cold in 8 gals, alkaline thickening. 2 ,, silicate of soda, 70 Tw.

Blue. 15ft indigo pure 20 per cent, paste. K gal. turpentine, rs .. glycerin. i| ,, British gum paste. 7 ,, alkaline thicken ing. Green. 8 parts of the

yellow without silicate. I part of blue.

Yellow. 30 lb lead hydrated 50 per cent. 2 gals, water.

J ,, .silicate soda. 5i ,, alk. thickening.

Alkaline Thickening. 15ft) yellow dextrine. 8 gals, caustic soda, 100 Tw.

(/) Paranitraniline red is discharged by means of the new hydro- sulphite-formaldehyde compounds. The dyed cloth is printed with the following: —

25 lb hydrosulphite N.F. cone, or hydraldite cone. 1 1 gals. British gum paste.

Heat till dissolved and add — A gal. glycerin.

42 „ starch-tragacanth thickening. After printing, age twice for 4 minutes through dry steam at 220° F., then wash well and soap. Coloured discharges are obtained by mixing hydrosulphite, tannic acid, aniline or phenol, and basic colouring matters together. Mor- dant dyes fixed with chromium acetate may also be used.

On a-naphthylamine maroon the above discharge white requires the addition of induline scarlet, patent blue or anthraquinone, before it becomes effective, otherwise the procedure is the same as for paranitraniline red.

(g) Indigo is usually discharged by oxidation. For this purpose the dyed cloth is printed in two different ways. Firstly, with chlorate of soda, and red or yellow prussiate of potash together with a little citric acid or citrate of soda; secondly, with chromate of potash. In the first instance, the cloth is ” aged ” through the rapid ager after printing, and, in the second, is passed through a vat containing hot sulphuric acid and oxalic acid. Coloured dis- charges may be obtained in both methods by adding albumen and pigment colours to the discharging agents.

(1) Discharge by steaming: —

("12 lb citric acid, dissolve in: ■{ 7 lb caustic soda, 70 Tw., and add: M2 lb sodium chlorate. 5 gals. British gum paste.

Heat till dissolved, cool and add : — (if gals. British gum paste. (2 lb yellow prussiate of potash.

Print, steam and wash. Chlorate of aluminium is also used for this process, but it acts very energetically and is apt to tender the cloth.

(2) Chromate discharge: — White. 8J gals. British gum paste.

12 lb bichromate of soda.

2 gal. turpentine.

Yellow. 32 lb chrome yellow pigment.

3 gals. 50 per cent, albumen solution. \ ,, thick tragacanth mucilage. \ ,, oil (vegetable).

12 lb bichromate of soda neutralized with I gal. caustic soda, 70 Tw. J , , water.

Print, dry, pass through a " beck " (i.e. a bath) containing: — 100 gals, water.

50 lb sulphuric acid (168 Tw.). 50 lb oxalic acid.

Then well wash and dry.

With these oxidation discharges it is impossible to prevent the fibre being attacked in the discharged portions, with the result that it is partially converted into oxycellulose. Recently a method has been brought out for the production of a white discharge on indigo which is said to do away with the formation of oxy- cellulose and which consists in printing on a thickened solution of sodium nitrate and, after drying, running through sulphuric acid of 50 ° Tw.

Another method of producing white discharges on

indigo consists in printing the dyed cloth with hydrosulphite N.F., then steaming and running through a boiling solution of caustic soda. Good whites are thus obtained without the formation of oxycellulose, but the process is expensive.

(h) Direct dyeing or substantive colours can be easily discharged with the hydrosulphite discharge used for paranitraniline red (see above). It must be reduced in strength to about one-fourth for dark shades, and much weaker for lighter colours. Direct colours were formerly discharged by stannous chloride or acetate, but the hydrosulphite has almost entirely displaced these salts for white discharges.

(i) Discharges on manganese bronze are of little importance at the present time. They are effected by means of stannous chloride, colours being obtained by the addition of basic dyes and dyewood extracts.

(j) Sulphur-colours, dyed basic colours, and some alizarine colours, are discharged with chlorate and prussiate like indigo.

(4) The Resist or Reserve Style. — Reserves are substances which, when printed, prevent the fixation or development of mordants and colours subsequently applied, and are used to produce effects similar to those obtained by discharge printing.

The principal reserves are those used for madder dyed goods, steam alizarine reds and pinks, steam basic colours, vat indigo blue, insoluble azo colours, sulphur-colours and aniline black. '

(o) Reserves under Aluminium and Iron Mordants. — For the production of this important class of goods, use is made of the fact that alkaline citrates prevent the fixation of the mordants. The cloth is

first printed with citrate of soda (or sometimes citric and tartaric acids for iron mordants), then dried, and again printed over the previous impression, with either a fine "all over " pattern or flat uniform ground, in iron or aluminium mordants. The fabric is then aged, " dunged," washed and dyed as already described, with the result that wherever the " reserve " of citrate or acid was printed a white pattern is left on a figured or plain ground. The fine patterns printed over " reserves " are called " covers " and the plain grounds " pads," hence the name " cover and pad " style in cases where, as frequently happens, a dark " cover " and a light " pad " are both printed over a white " reserve." The " cover and pad " style is, for the most part, restricted to dyed alizarine purples under which red, black, dark purple and white can all be reserved at the same time, thus giving rise to very pleasing effects. For example: white cloth is first printed with four "colours," viz., citrate of soda and citric acid for the white; log- wood and iron for the black; strong iron mordant for the purple; and aluminium acetate at 6° Tw. with 8 oz. per gallon of stannous chloride for the red. (The stannous chloride acts as a resist for iron mordants.) The whole is then " covered " in a fine pattern printed in a fairly strong iron mordant, dried, and again printed, in a very weak iron mordant, with a pad roller, that is, a roller which prints a uniform ground over the whole surface of the cloth. After this last printing, the cloth is " aged " for a day or two, by being hung as previously described, then " dunged," washed and dyed in a blue shade of alizarine. When finally washed, soaped and " cleared " in bleaching powder solution the first printed pattern in white, red, black and purple is seen to stand out, clearly and sharply, from a figured background in two lighter shades of purple. This " cover and pad " style of reserve printing constitutes one of the staple processes of nearly all print-works, and is produced in enormous quantities for both home and foreign markets. Red is not often introduced as in the above example, the usual colours being white, black and

two purples. The same method of working can be adopted with aluminium mordants for red and pink covers and pads, but they are better produced with the steam alizarine colours as below.

(b) Reserves under Steam Alizarine Red and Pink. — In this case a reserve composed of citrate of chromium alone, or in conjunction with citrate of soda, gives the best results. The goods are first prepared in alizarine oil and then printed with the following: —

10 lb china clay.

J gal. citrate of soda, 54 ° Tw.

j ,, citrate of chromium, 42 Tw.

i , , water. 2 j ,, British gum paste.

After printing the above, the goods are dried and again printed either with ” cover ” or ” pad ” or both, in alizarine pink, dried, steamed for I J hrs., well washed and soaped. On leaving the steamer the parts printed with the resist are yellow, but become quite white on soaping. Like the purples, the alizarine pinks can be reserved in colours. For blue, green, yellow and violet the ordinary steam basic colours are used with additions of citric or tartaric acid. Example : —

(7ft) china clay. I J gal. water. 6| ,, British gum paste. 2 lb methylene blue. I lb citric acid. I gal. acetic acid.

Boil, cool, and add: — I j gals. 50 per cent, tannic acid solution in acetic acid.

Red with steam alizarine red; yellow with thioflavine in place of methylene blue in above; green a mixture of blue and yellow. These colours with the white reserve may all be printed at once. Then steam as usual, pass through a solution of tartar emetic and chalk, wash well and soap.

(c) Reserves under Insoluble Azo-Colours. — These

are based upon the action of stannous chloride, which prevents the combination between the /3-naphthol and the diazo bodies by reducing the latter to hydrazines. The /3-naphthol prepared cloth is printed with the following colours, then dried and passed through diazo- tized solutions of paranitraniline for red grounds; a-naphthylamine for maroon; ortho-nitrotoluidine for orange, &c, &c. The cloth is then washed and soaped until the " whites " are clean.

White Resist. 5 gals, gum Senegal solution. 30 ft) tin crystals. 5 lb tartaric acid.

For heavy rollers this may be reduced with more gum.

Blue.

Yellow.

Green.

Pink.

New methylene blue N. . Auramine G. (B.A.S.F.) . . Brilliant green ….

Rhodamine 6 G. (extra) .

Water

Tragacanth mucilage . Tannic acid sol., 50 per cent. .

Make up to .

2 Jft>

2 gals.

2jft

10 „ 2 gals. 1 „

ii „

20 lb

2 lb

2 gals. 2jlb 10 „ li gals.

1 ,>

2 „ 20 lb

2 ft)

jl

*4 »>

2 gals.

2§ft> 10 „

2 gals. 1 „ li„ 20 ft)

i ftY 2 gals. 2§lb 10 „ 2 gals.

1 .,

2 „ 20 lb

10 gals.

10 gals.

10 gals.

10 gals.

Potassium sulphite is also used as a white reserve under insoluble azo-colours with good results.

(d) Reserves under Steam Basic Colours. — The white cloth is printed with : —

" 20 ft china clay.

2 J gals, water.

15ft) British gum.

20 lb sodium tartar emetic. . 20 ft) zinc sulphate.

All boiled well together,

and then covered, or over-printed, with any steam basic colour — steamed one hour, passed through tartar emetic, then washed and soaped, when the reserve white above comes away, bringing along with it the colour printed upon it and leaving a white pattern on a printed ground.

(e) Reserves under Vat Indigo Blue. — This was formerly a very important style, but at present is only used in special cases. Resist or reserve effects are obtained by printing the white cloth with oxidizing agents, &c, and subsequently dyeing it in the indigo vat. In addition to oxidizing agents the reserve pastes contain lead sulphate, barium sulphate, resins, fats and thickenings in various proportions. The following is a good white reserve: —

15 lb flour. 6 gals, water.

Boil, cool a little, and add —

18 ft copper sulphate powdered. 2J ft) copper nitrate, 90 Tw. 1 pint alizarine oil.

Yellow. 2f gals. British gum paste.

33 lb lead sulphate, 66 per cent, paste. 18 lb zinc sulphate. 22 lb lead nitrate.

Print the white and yellow, dry, dye in the indigo vat — sour slightly in sulphuric acid, wash, and pass into a hot solution of bichromate of soda, which develops the lead yellow. Reserve whites also contain lead salts when used for white alone, but obviously the white given is best suited to white and yellow reserves, as its soluble copper salts wash out before the " chroming " stage is reached.

(/) Reserves under Sulphur Colours. — These are obtained with zinc chloride. They are not much used, but are capable of yielding fine effects.

(g) Reserves under Aniline Black. — Reserves under

aniline black are produced with caustic alkalis, alkaline carbonates, silicates and sulphites, sulphocyanides, oxide of zinc and the acetates of magnesia, zinc and soda. The white and coloured resists may be printed upon either the undeveloped black or upon the cloth before the black is applied.

In the former case the cloth is slop-padded through a mangle- box with the following black : —

7i ft) aniline hydrochloride.

3 J ft) sodium chlorate.

4 lb potassium ferrocyanide- 10 gals, water.

It is then very carefully dried in hot air so that it becomes no darker than a pale yellow; if it is green before printing, the white is sure to be bad.

The dried padded cloth is then printed with the ” resist ” colours, dried and steamed 3 to 4 minutes in a rapid ager, chromed through warm bichromate of potash, and finally washed and soaped. During the steaming the black is developed all over the cloth except where the colours are printed. Here its development is prevented by the I alkali or the reducing agent’, whichever may be present, in the colour, I and instead of a plain black dyed piece a coloured design on a black

ground is produced. The following formulae may be employed for white and coloured resists : —

White. 8 lb starch.

8 lb British gum. 30 lb potassium sulphite, 90 Tw.

3 gals, water. 15ft) soda acetate. 10 lb bisulphite of soda, 66° Tw.

1 lb ultramarine blue.

Boil together.

Rhodamine 6 G.(ioo per cent.) . Auramine O . . . Acridine yell. G. . Thionine blue 0. . New solid green 2 B. Methyl violet, B. x. . Water . . . . . Tragacanth mucilage Glycerin …. Albumen, 40 per cent, soli Resist paste .

Red.

2| lb

it: I

I

6

gal.

Pink.

i lb

if gals.

1 ,,

1 gal.

6 ,,

Blue.

2 lb

I gals.

Yellow.

Violet.

Print on the padded cloth, age, chrome and wash. The resist paste is as under: —

Resist Paste. 10 lb zinc oxide.

1 j gals, magnesium acetate, 40 Tw. 2 j ,, tragacanth mucilage (dragon). I ,, starch paste. For reducing the colours take 6 parts resist paste.

4 ,, starch paste. 4 ,, white resist.

Very good results can be obtained by the alternative method, i.e. printing the resists on white cloth and applying the black afterwards. The basic colours are chiefly used, though chrome yellow and ultramarine are also employed for some styles. The following formulae will serve as types of the composition of white and colours: —

White. 20 lb precipitated chalk.

5 lb potassium sulphite, 90 Tw. 5 lb acetate of soda.

5 lb ultramarine blue for sightening. 1 gal. water.

6 ,, starch paste.

The whole ground together in a mill. Colour. r2 tt> basic dye-stuff. ■I 1 gal. water. 1-2 1 ,, starch paste.

17ft zinc oxide. 1 gal. water. } ,, glycerin, i ,, turpentine. \ ,, bisulphite of soda. 3 ,, starch paste.

Print on white cloth, allow to lie a day or two, then slop-pad in the Prud homme black already given, dry, age, chrome and soap.

Pigment colours may be applied on black padded cloth as follows : —

Yellow. 40 lb chrome yellow, &c. &c. 2 j gals. 40 per cent, albumen. i\ ,, tragacanth water, 6 oz. per gal.

6 lb soda ash.

1 gal. citrate of soda, 40 Tw.

Other methods, varying in detail, have been used

from time to time, but the above two are at the present time generally employed — especially the former, by which many fine patterns have been produced in all sorts of delicate and artistic shades.

The Treatment of Cloth after Printing.

After printing, the various classes of goods undergo many different treatments according to the character of the colours printed. These treatments include steaming, hanging in the ageing chamber, passing through tartar emetic, the chalk bath, washing, soaping, ” chemicking ‘ or clearing and finishing.

(1) The operation of steaming is necessary for all styles except those with the insoluble azo-colours, vat dyes discharged, and some colours that are precipitated on the fibre. The short steaming necessary for most discharges, indigo blue prints, and aniline black is effected in the Mather and Piatt ager, of which a sketch is here given (fig. 2) showing its principle.

XXVl. 23

It consists of an iron box AAA through which the goods (indi- cated by the dotted line) pass in the direction of the arrows. They enter at B, and traverse the whole chamber over a series of top and bottom rollers C C C, finally emerging at the same point B, whence they are drawn forward, by mechanical means, and plaited down on a waggon placed conveniently near. Steam enters the chamber A A A by the steam pipe D at the bottom, and escapes through the same slot (B) that the cloth enters and leaves by. An engine or electric motor drives the gearing, and the whole process is continuous.

This ager affords quite a sufficient steaming for aniline blacks, printed indigo, chlorate discharges, and for some mordants, but alizarine reds and pinks, mordant dyes gener- ally, and basic colours require much more than the 2 to 3 minutes’ exposure to steam which is all that can be given in the ordinary

Mather-Platt ager, although they are frequently passed through it to eliminate the greater part of the volatile acids they contain. Paranitraniline red discharged with hydrosulphite also requires a modification of the ager for its success — for the steam must be very hot and very dry if any of the azo-colours are to be effectively discharged by the hydrosulphite method.

A longer exposure to the action of steam is obtained by means of the cottage steamer and the continuous steamer, in both of which goods may be steamed for any length of time. The cottage steamer consists (1) of a cylindrical iron box or chamber fitted with a false bottom on which rails are laid, and under which lie the pipes for the admission of steam, and for the drawing off of the condensed water; and (2) of a carriage or iron framework mounted on wheels and furnished with a series of removable rods capable of being revolved by means of spur-wheel gearing. Convenient lengths of the cloth to be steamed, together with a " back grey " (a piece of unbleached calico) are then wound in the open width, into a sort of broad hank on a folding frame. As each hank, so to speak, is completed it is removed from the winding frame and hung over one of the rods, which is then placed in position on the carriage.

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Fig. 2.

When the latter is fully loaded in this way it is run into the ” cottage,” the doors are closed, and steam turned in. The steaming is continued for various periods of time — from f hour to 2 hours — according to the style of work in hand, and either with or without pressure, as may be required. The carriage is then withdrawn and the goods unwound in readiness for subsequent operations.

The object of enveloping the printed goods in a ” back grey ” is to prevent the colour from marking off from the face of one fold on to the back of the next, and also to minimize the risk of damage from drops of condensed water. This latter defect is further guarded against by heating up tor an hour or so every morning before any goods are introduced.

In works where the modern continuous steaming apparatus is installed the cottage steamer is reserved for the treatment of dyed alizarine reds and for goods, such as heavy printed velvets, which are difficult to manipulate in the continuous steamer.

The continuous steamer was originally invented by

Cordillot, but its present efficient form is due to Messrs Mather and Piatt, who have continually improved it, so that now it bears but little resemblance to Cordillot's original machine. Its construction is too complex to be adequately described without the aid of detailed sketches. Generally speaking, it may be said to consist of a long,

high, narrow chamber of brick, through which the cloth passes continuously in the form of long loops suspended from rods resting upon, and carried forward by travelling chains, situated at the top. and close to the sides, of the chamber. Steam is admitted to ibis chamber through a series of pipes at the bottom, and the cloth enters and emerges through slots at the top of its opposite ends. On entering, the cloth falls over one of the slowly travelling rods and continues to run downwards until a sufficient length to form the loop has run in. By this time the first rod has moved forward and a second taken its place, with the result that the cloth now falls over the second rod and commences to form the second loop. At this point — the commencement of a second loop — the second rod comes in contact with a brass bar carried by arms pivotted above. The object of this bar, which clips the continuously entering cloth firmly between itself and the rod until the second loop is complete, is twofold, namely (i) to prevent too much cloth being fed into the first loop, and (2) to prevent the weight of the first loop from pulling the cloth over the second rod during the formation of the second loop. By the time this latter is complete the second rod has moved sufficiently far forward to escape contact with the pivotted brass bar, which thereupon swings back and takes up a similar position on the

third rod. In this way each rod is supplied with cloth, which it carries forward continuously until the other end of the steamer is reached, where both cloth and rods emerge — the former through the top of the chamber and the latter through a slotted opening at the top of the end wall. Through a similar slot, at the beginning end of the steamer, the rods are fed in automatically as long as any cloth remains to be steamed.

The usual time occupied in passing the goods through a ” steamer ” of this description is one hour, but it may be shortened or prolonged at will, and, if desirable, the goods may be allowed to remain in it for any length of time.

The room used for ageing is lofty and is furnished near the top with suspending rods of wood, and at the bottom with a series of steam inlet pipes through which thin streams of free steam may be introduced into the chamber, as required. Its temperature is generally kept about 36 C. on the dry-bulb thermometer and 32°-33° on the wet-bulb thermometer.

' ' Dunging “is carried out in a scries of becks provided with rollers at the top and bottom, and heated by steam pipes. . It may also be performed in becks through which the cloth passes in rope form.

Many attempts have been made from time to time to replace cow-dung by sodium silicate, phosphate, arsenite and carbonate of ammonia, but none of them yield results quite so good as cow- dung.

The tartar emetic treatment is only used for the fixation of tannin mordants, and of basic aniline colours printed with tannic acid. It is performed by passing the cloth in the open width over and under a series of wooden rollers arranged in a water-tight box — a beck — containing the following solution : —

2 lb tartar emetic. 2 lb chalk. 16 gals, water at 6o °-7o” C.

The chalk is added simply to neutralize trie acid salt produced in the bath — a salt which exerts a solvent action on the basic colour tannin lakes and utterly spoils any ultramarine blues that may have been printed in combination with them.

Chroming is only applied to a few styles, such as aniline black, catechu brown, and colours containing salts of lead which have to be converted into chrome yellow. ' Chroming" is carried out in a beck similar to that used for tartar emetic. The cloth runs continuously through a 3 to 4 per cent, solution of bichromate of potash at 6o° C. ; the excess is squeezed out in a mangle, and the cloth then passes directly into a washing machine to clear it completely of the chrome. When alizarine reds, and other colours susceptible to chrome, are present, the chroming must be either omitted altogether or the operation conducted cold with a very weak solution.

Washing is a very important process, and upon its proper per- formance depends a good deal of the final success of the work. It may be carried out in several different ways according to the different styles of work to be treated. Alizarine reds and pink, both printed and dyed, dyed chocolates, purples, &c, aniline black, indigo blue, &c. &c, all very fast colours, are usually washed and soaped in the rope form in machines like that described for madder- dyeing. Other colours, especially pigments, must be washed, in the open width-, through a series of wash-boxes furnished with rollers over .which the cloth passes. In these boxes the water usually enters where the cloth leaves, thus ensuring that the cleanest cloth gets the cleanest water. Some of the boxes are occasionally fitted with heaters and others again with " spirt pipes " through which the water is forced at a high pressure for the purpose of causing it to pass straight through the cloth. Other types of machine are also used, for details of which some technical work must be consulted. f

Soaping is also an important factor in the production of the ^est work. It clears the white

parts of the goods, brightens the

colours and generally improves the whole appearance of the cloth. The strength and temperature of the soap solution, the duration of the soaping and the type of machine used are all varied according to the fastness of the colours to be soaped. As in washing, the alizarine dyed colours, alizarine " steam " reds and pinks, aniline black and the ice-colours, will not only withstand a long, hot and strong soaping, but are greatly brightened and enhanced in beauty thereby. On the other hand, direct dyeing colours, basic colours, pigments and a few others require only a moderate soaping and that in the open width. Colours which will stand a drastic soaping are usually soaped, in spiral becks, in the rope state, and pass from one to another of these becks, going through as many as half a dozen times before being washed off in water. Goods requiring to be soaped in the open width are treated in a special soaping machine known as the " open soaper." In principle this is simply a range of watertight boxes each fitted with rollers at the top and bottom. The first two or three boxes contain hot soap solution and the rest hot or cold water or a series of " spirt pipes " to better wash out the soap. Very frequently open soapers are supplied with " tartar emetic " and " chroming " boxes, so that the goods can go through two or more processes directly and without any intermediate handling.

" Chemicking." — In this process all traces of colour still remaining . after soaping are removed from the white parts of the printed cloth, by a weak solution of bleaching powder. Two methods are used in applying the " chemick," or bleaching powder solution, to the cloth. In the first the cloth is passed between a pair of squeezing bowls the lower of which is of wood, and revolves partly immersed in a solution of bleaching powder or " chemick " varying in strength from |° Tw. to i° Tw. This lower bowl carries the chemick to the cloth, the excess is then squeezed by passing between the two, and the cloth goes forward over a set of steam- heated drying cylinders, during its passage over which the

bleaching properties of the chemick effectually remove the last traces of colour on the white parts of the cloth and leave it perfectly clean and bright.

The second method of ” chemicking ” is employed when the cloth is too deeply stained to be successfully ” cleared ” by the first. All madder-dyed goods, and goods printed in strong heavy dark-coloured patterns, are liable to attract, to their white parts, a considerable amount of colour during the dyeing, washing and soaping operations. They therefore require a stronger ” chemick- ing ” to clear them, and this the second method supplies. The goods are passed successively through (1) a trough containing “chemick” at about j” Tw. ; (2) a pair of squeezing rollers; (3) a small steam chest fitted with half a dozen guide rollers top and bottom, and a steam admission pipe; (4) a series of ” spirt pipes ” to wash out the bulk of the lime salts; and (5) through a washing-box and squeezing rollers, whence they go directly to a drying machine.

In both methods the strength of the ” chemick ” depends upon the power of the resistance to its action of the colours printed, and great care must therefore be taken to keep it weak enough.

Occasionally a little ultramarine blue is added to the chemick for the purpose of correcting the yellowish tinge usually possessed by bleached cotton.

From the fact that two or more styles can be combined in one pattern it is obviously impossible to formulate any general rule for the practical application of any of the foregoing after treatments.

For example, in aniline black resists the black ground will stand any amount of soaping, but the basic colours which constitute the pattern are only moderately fast to soaping, and, consequently, this process must be so regulated as to yield the best possible results. The same may be said of alizarine

reds and pinks printed in combination with basic or pigment colours, and of paranitraniline red and other ice-colours associated with basic colours.

Finishing. — In this process the cloth undergoes various opera- tions of softening, stiffening, embossing and polishing or smoothing, according to the requirements of the customer. The following substances are chiefly employed for the above purposes : —

.Softening Agents. — Turkey red oil, tallow, paraffin, stearine, wax and certain soaps.

Stiffening Agents.— Starch of all sorts, dextrine, gum tragacanth, vegetable gelatine or Blandola, glue size, various preparations of soluble starch, lichens, &c. &c, all of which are applied on special finishing mangles, and either to one or both sides of the cloth.

Hygroscopic substances, such as zinc chloride, glycerin and glucose are added to the stiffening pastes for the purpose of softening the feel of the cloth without detracting from its '' body."

The smoothing, polishing and embossing of the fabric are all performed on various types of calenders. Smoothing and polishing calenders have highly polished steel " bowls " which may be heated by steam or gas, embossing calenders have an engraved steel or brass bowl working against one of compressed paper, or one in which depressions are engraved to exactly correspond with the projections on its fellow. The cloth is run between these various kinds of bowls according to the effect desired. In the finishing process all creases are smoothed out of the cloth, and it is stretched to its proper width (and its weft straightened if awry) en special

TEXTILE PRINTING

Plate I.

—Linen, dyed blue, the " reserved " parts represent

the Annunciation; above the reclining figure of the Virgin Mary is the word MAPIA. Coptic, probably 5th or 6lh century. iS in. X 2 ft. 5 in,

Fig. 2—— Child's Tunic ot linen dyed blue, the pattern being "reserved.' Coptic, 4th century (?). i8| in. X 23* in.

Fig, 3. — Piece of red silk, printed in. red, green, and black from wood blocks, with a. repeatiog pattern of black circles or rounds containing pairs of animals and dragons; floriated crosses in the interspaces, Rhenish, 12th or 13th century. 15! in. X 12I in.

Fig. 4. — Piece of red silk, printed in black from wood blocks, with a trellis pattern enclos- ing pairs of birds and anthemkms. Rhenish, 13th or 14th century. 8 & in. X 13^ "*-

Fig. $■ — Tiece of iinen, printed in black from a wood block, with a pattern composed of repetitions of a lady on a turret, leafy sprays, a hound, and a bird on the wing. Rhenish, 14th century. o£ in. X 19^ in.

Fig. 6. — Strip of linen printed m deep purple from a wood block, with a repeating pattern of eagles and conventional leaf and fruit forms. Rhenish, 14th or early 15th century, 2oi in. X 6£ in.

Plate II,

TEXTILE PRINTING

c. 7 —Portion of reddish linen lining for a chasuble printed in black from wood blocks. Rhenish i S th century; from near Dxisseldorf. 3 ft. 8 in. X 24K in.

FIG. 8.— Cotton print in colours. Dutch, 17th century. About 14 in. X gin.

Fig. 9. — Part of a coveriet of cotton, printed at Genoa in colours, from metal plates engraved with trees, flowers, birds, and animals in the style of

Indian palampcres or printed calicoes, 19th century. About 6 ft. X 3 ft.

I'iG.ii, — Part of a cotton chair back, printed in red from a mefal plate engraved with a Chinese pagoda in a landscape; in front is a woman kneeling on the ground, while a priest stands to the left holding up an image. Marked " Collins Woolmers." English, dated 1766. 24 in. X 24M in.

io-— Part of a hanging of cotton, printed in red from meta! platen engraved w t «,r e P tlt j. ons of Pictorial scenes. At the bottom is printed "D 5 T. P Meliher & C* dp Benuliran pres Bordeaux Bon Teirtt. MF. 3 X. Comm. X9, trench, secood half of iSth century, 4 ft 6 in. X 3 ft 410.*

I- ic. 12. — Linen panel, with a stipple engraving printed in colours, for use as a small fire-screea. English, lute 18th century, 2 ft. 4M ia, X 2 ft. $% in.

"' stentering " machines. On these machines the damped cloth is carried forward, over steam-heated drying plates, by two travelling endless chains, each link of which is constructed to clip the selvedge of the cloth. The distance apart of these chains can be regulated to suit various widths of cloth and in travelling forward they diverge, so that as the cloth advances it gradually becomes stretched out to the required width and is dried at the same time to prevent it contracting when it is released from the pull of the chains, as it leaves the machine.

Finally the goods are cut into certain lengths, wound round flat boards, tied up, ticketed and packed.

Wool- Printing.

The printing of wool differs little from the printing of cotton in general. Most of the colours employed in the one industry are used in the other, and the operations of steaming, washing and soaping are almost identical.

Unlike cotton, however, wool requires to be specially prepared, after bleaching, if the full tinctorial value of the colours is to be obtained.

Two quite different methods of preparation are resorted to, namely (1) the chlorination of the wool; and (2) the precipitation of stannic acid on the fibre. In the first method the woollen fabric is first passed through a solution of bleaching powder, then well squeezed and passed, without washing, into dilute sulphuric or hydrochloric acid, squeezed again and well washed in water, after which it is dried. Great care and experience are demanded in this operation to prevent the wool from becoming hard and yellow.

In the second method the cloth is padded in stannate of soda, well squeezed, passed into dilute sulphuric acid, well washed and dried. For certain styles of work it is necessary to combine both preparations.

Although alizarine, mordant colours and dyewood extracts can be used on wool, the vast majority of patterns printed on wool are executed by means of acid dye-stuffs and basic colours, for both of which this fibre possesses a natural affinity. In most cases therefore these colours are simply dissolved in a little acetic and citric acids, thickened with gum and printed without any further addition. The addition of tannic acid, however, can be made to, and considerably increases the fastness of, the basic dyes. Mordant colours like logwood black are applied in the usual way.

The printing of wool is carried out exactly as for cotton, but if the best results are to be obtained, the engraving of the rollers must be deep, the blanket on the machine as soft as possible, and the drying of the printed cloth very gentle. After

printing, the goods are steamed in moist steam or wrapped between moistened ” greys ” and steamed in a ” cottage ” steamer. If too little moisture is given, the colours lack both strength and brilliancy; if too much they run. The correct degree of dampness can only be determined by experience of the work, combined with a special knowledge of the particular apparatus employed.

After steaming, the printed goods are washed in plenty of water, then dried up and finished with a little glycerin or some waxy preparation.

Discharges may be very easily obtained on wool dyed in acid dye-stuffs, by means of stannous chloride and basic colours for the coloured effect, and hydrosulphite for the white.

Silk-Printing.

Silk-printing calls for no special mention. The colours and methods employed are the same as for wool, except that in the case of silk no preparation of the material is required before print- ing and the ordinary dry ” steaming ” is preferable to damp ” steaming.”

Both acid and basic dyes play an important role in silk-printing, which for the most part is confined to the production of articles for wearing apparel—dress goods, handkerchiefs, scarves, &c. &c. — articles for which bright colours are in demand. Alizarine and other mordant colours are mainly used, or ought to be, for any goods that have to resist repeated washings and prolonged exposure to light. In this case the silk frequently requires to be prepared in alizarine oil, after which it is treated in all respects like cotton — steamed, washed awl soaped—the colours used being the same.

Silk is especially adapted to discharge and reserve effects. Most of the acid dyes can be discharged in the same way as when they are dyed on wool ; and reserved effects are produced by printing mechanical resists, such as waxes and fats, on the cloth and

then dyeing it up in cold dye-liquor. The great affinity of the silk fibre for basic and acid dye-stuffs enables it to extract colouring matter from cold solutions, and permanently combine with it to form an insoluble lake. After dyeing, the reserve prints are washed, first in cold water to get rid of any colour not fixed on the fibre, and then in hot water or benzene, &c, to dissolve out the resisting bodies.

As a rule, after steaming, silk goods are only washed in hot water, but, of course, those printed entirely in mordant dyes will stand soaping, and indeed require it to brighten the colours and soiten the material. (E. K.)

II. Art and Archaeology

Printing patterns on textiles whether of flax, cotton or silk, by means of incised wooden blocks, is so closely related in its ornamental effects to other different methods of similar inten- tion, such as by painting and by processes of dyeing and weaving, that it is almost impossible to determine from the pic- turesque indications afforded by ancient records and writings of pre-Christian, classical or even medieval times, how far, if at all, allusion is being made in them to this particular process. Hence its original invention must probably remain a matter of inference only. As a process, the employment of which has been immensely developed and modified in Europe during the last hundred years by machinery and the adoption of stereotypes and engraved metal plates, it is doubtless traceable to a primeval use of blocks of stone, wood, &c, so cut or carved as to make impressions on surfaces of any material; and where the existence of these can be traced in ancient civilizations, e.g. of the Chinese, Egyptians and Assyrians, there is a probability that printing ornament upon textiles may have been practised at a very early period. 1 Nevertheless, highly skilled as the Chinese are, and for ages have been, in ornamental weaving and other branches of textile art, there seem to be no direct evidences of their

having resorted so extensively to printing for the decoration of textiles as peoples in the East Indies, those, for instance, of the Punjab and Bombay, from whose posterity 16th- century European and especially Dutch merchants bought goods for Occidental trade in " Indiennes " or printed and painted calicoes.

Whilst the earlier history of stamping patterns by hand on to textiles in the East has still to be written, a serious attempt has recently been made to account for the existence of this decorative process in Europe during several centuries prior to the introduction of the " Indiennes " above mentioned. As in the case of weaving and embroideries, specimens of printed stuffs have of recent years been obtained from disused cemeteries in Upper Egypt (Akhmim and elsewhere) and tell us of Egypto Roman use of such things. Some few of them are now lodged in European museums. For indications that earlier Egyptians, Greeks and Romans were likely to have been acquainted with the process, one has to rely upon less certain evidence. Of textiles painted by Egyptians there are many actual examples. Apart from these there are wall paintings, e.g., those of Beni Hassan — about 2100 B.C. — in which are represented certain Asiatic people wearing costumes irregularly patterned with spots, stripes and zig-zags, which may have been more readily stamped than embroidered or woven. A rather more com- plicated and orderly pattern well suited to stamping occurs in a painting about 1320 B.C., of Hathor and King Meneptha I. Herodotus, referring to the garments of inhabitants of the Caucasus, says that representations of various animals were dyed into them so as to be irremovable by washing. Pliny describes " a very remarkable process employed in Egypt for the colouring of tissues. After pressing the material, which is white at first, they saturate it, not with colours, but with mordants that are calculated to absorb colour." He does not explain how this saturation is done. But as it is clearly for the purpose of obtaining a decorative effect, stamping or brush- ing the mordants into the material may be

inferred. When this was finished the cloth was "plunged into a cauldron of boiling dye" and "removed the next moment fully coloured." "It is a singular fact, too, that although the dye in the pan is of one uniform colour, the material when taken out of it is of various colours according to the nature of the mordants that have been respectively applied to it." Egypto-Roman bits of printed stuffs from Akhmim exhibit the use, some three hundred years later than the time of Pliny, of boldly cut blocks for stamping figure-subjects and patterns on to textiles. Almost concurrent

1 When Cortes conquered Mexico he sent to Charles V. cotton garments with black, red, yellow, green and blue figures. The North American Indians have a mode of applying patterns in different colours to cloth (see Parnell's Dyeing and Calico Printing, p. 12).

with their discovery was that of a fragment of printed cotton at Aries in the grave of St Caesarius, who was bishop there about a.d. 542. Equal in archaeological value are similar fragments found in an ancient tomb at Quedlinburg. These, however, are of comparatively simple patterns. Other later specimens establish the fact that more important pattern-printing on textiles had become a developed industry in parts of Europe towards the end of the 12th and the beginning of the 13th century.

According to Forrer (Die Kunst des Zeugdruchs, 1898) medieval Rhenish monasteries were the cradles of the artistic craft of ornamental stamp or block cutting. In rare monastic MSS. earlier in date than the 13th century, initial letters (especially those that recurred frequently) were sometimes stamped from hand-cut blocks; and German deeds of the 14th century bear names of block cutters and textile stampers as those of witnesses. Between the nth and 14th centuries there was apparently in Germany no

such weaving of rich orna- mental stuffs as that carried on in Spain and Italy, but her competitive and commercial instincts led her to adapt her art of stamping to the decoration of coarse textiles, and thus to produce rather rough imitations of patterns woven in the Saracenic, Byzantine and Italian silks and brocades. Amongst the more ancient relics of Rhenish printed textiles are some of thin silken stuff, impressed with rude and simplified versions of such patterns in gold and silver foil. Of these, and of a considerable number of later variously dyed stout linens with patterns printed in dark tones or in black, specimens have been collected from reliquaries, tombs and old churches. From these several bits of evidence Dr Forrer propounds an opinion that the printing of patterns on textiles as carried on in several Rhenish towns preceded that of printing on paper. He pro- ceeds to show that from after the 14th century increasing luxury and prosperity promoted a freer use of woven and em- broidered stuffs, in consequence of which textile- printing fell into neglect, and it was not until three centuries later that it revived, very largely under the influence of trade import- ing into Europe quantities of Indian printed and painted calicoes.

Augsburg, famous in the 17th century for its printing on linens, &c, supplied Alsace and Switzerland with many crafts- men in this process. After the revocation of the edict of Nantes, French refugees took part in starting manufactories of both painted and printed cloths in Holland, England and Switzer- land; some few of the refugees were allowed back into France to do the same in Normandy: manufactories were also set up in Paris, Marseilles, Nantes and Angers; but there was still greater activity at Geneva, Neuchatel, Zurich, St Gall and Basel. The first textile-printing works in Great Britain are said to have been begun towards the end of the 17th century by a Frenchman on the banks of the Thames near Richmond, and soon afterwards a more considerable factory was established at Bromley Hall in Essex; many others were opened in Surrey early in the 18th century. At Mulhouse the enterprise of

Koechlin, Schmatzer and Dollfus in 1746, as well as that of Oberkampf at Jouy, led to a still wider spread of the industry in Alsace. In almost every place in Europe where it was taken up and followed, it was met by local and national prohibitions or trade protective regulations and acts, which, however, were gradually overcome.

Towards the end of the 18th century a revolution in the British manufacture of printed textiles was brought about through the invention of cylinder or roller printing from metal plates. This is usually credited to Oberkampf of Jouy, but it seems to have also occurred to a Scotsman named Bell, and was successfully applied in a large way about 1785 at Monsey near Preston. From this and the calico-printing works at Manchester in 1763, and in Scotland in 1768, the present huge proportions of the industry in the United Kingdom have grown.

Illustrations accompanying this brief account merely indicate a few types of patterns used in various European countries up to the beginning of the 19th century. Typical specimens of

East Indian painted and printed calicoes for coverlets and other draperies are shown in the Indian division of the Victoria and Albert Museum. These are sui generis, and therefore differ from the bulk of Western prints on chintz, cretonne, &c, which together with a less quantity of printing on satin, silk, velvet, crepe and the like are principally from adaptations of weaving patterns. An interesting series of over 2500 patterns, chiefly of this character, was made by M. Corimand between 1846 and i860, and is preserved in the National Art Library at South Kensington. For many years of the latter part of the 19th century, William Morris designed and produced attractively ingenious floral and bird patterns, admirable in contrasts of bright colours, frequently basing his arrangement of crisply defined forms in them upon that of Persian surface ornament. His style, which on its appearance struck a distinctive note, has very considerably affected numbers of British and foreign designers of

printed patterns whether for textiles or wall papers.

The portion of linen hanging or valance given in fig. I (Plate I.) comes from an ancient cemetery at Akhmim in Upper Egypt. The linen dyed blue bears ornamentation with figures undyed or ” reserved,” through the previous application to it, by means of an engraved block, of some such saturating fluid as that mentioned by Pliny. The design and cutting of the block were no doubt the work of Coptic artificers, the style of the composition being Egypto-Roman of the 5th century A.D. On the child’s tunic dyed blue (fig. 2) the simple trellis and blossom pattern is similarly produced by the ” reserve ” process, and the specimen is of the same provenance as that of fig. 1. It is perhaps rather earlier in date, i.e. 4th century A.D. Fig. 3 is from a fragment of red silk printed in red, green and black from wood-blocks, thus illustrating another method of applying colours to textiles. It is probably of Rhenish work in the 12th or 13th century, and came from the Eifel district. The ornament, however, is a survival of a scheme of pattern which was in use in Perso-Roman weavings as early as the 7th century A.D. Fig. 4 shows a piece of red silk printed with a Rhenish adaptation of a 13th-century North Italian weaving pattern possessing earlier Byzantine features. The design in fig. 5 is another Rhenish version of a richer style of 14th-century North Italian weaving. An advance in refinement of block-cutting is seen in fig. 6, a Rhenish adaptation of a 14th-century North Italian pattern often employed in brocade weaving of that period. The pattern in fig. 7 (Plate II.) is typical of a style introduced during the 15th century in sumptuous damask satins, and velvets woven at Florence, Genoa and Venice. Very different is the style exem- plified in fig. 8, taken from a Dutch 17th-century ” Indienne,” the trade name for such prints. The repeated wide and narrow stripes recall a scheme of design which the Siculo-Saracens of the nth century employed for brocades; the intertwining floral orna- ment closely resembles such as occurs

in 16th-century Indian painted and printed cottons. Fig. 9 is a 19th-century Italian reproduction of the Persianesque spreading tree device often used in Indian palampores from the 16th century onwards to the present day. These, however, were either painted or printed from wood- blocks, whereas for this Italian copy engraved metal plates were used, after the manner of the process which was started, as already mentioned, by Oberkampf and Bell in the 1 8th century. The remaining figures 10, 11 and 12 are from stuffs metal-printed with subjects of a pictorial character which had a vogue for some time. In fig. 10 — a French print — are family groups: shepherds and shepherdesses with their flocks; children at play; buildings, rocks, trees, &c. ; the decorative effect of which, for the purposes of curtains and furniture covers, resulted mainly from the ordered repetition of these ■somewhat unrelated details. A landscape with a Chinese pagoda was repeated in lengths of the English cotton print, a piece of which was cut to fit the back of a chair as in fig. n. Fig. 12 is from a linen panel printed in colours with a stipple engraving to be used as a small fire screen. The style reflects the pseudo-classical taste of the end of the 18th century in England. Beneath the group of figures" in the original is an inscription, " London, engraved and published, August I, 1799, by M — Bost No. 207 Piccadilly." This sort of printing has practically disappeared: it was unsuitable for manufacture on a large scale.

Authorities.— J. Persoz, L' Impression des Tissus (Paris, 1846, see vol. i. Preface) ; E. A. Parnell, Dyeing and Calico Printing (London, 1849); W. Crookes, F.R.S., Dyeing and Calico Printing (London, 1864, see Introduction); Dr R. Forrer, Die Kunst des Zeugdrucks (Strassburg, 1894). (A. S. C.)

TEXTUAL CRITICISM, a general term given to the skilled and methodical application of human judgment to the settle- ment of texts. By a " text " is to be understood a document written in a language known, more or less, to the inquirer, and assumed to have a meaning which has been or can be ascertained.

The aim of the " textual critic " may then be defined as the restoration of the text, as far as possible, to its original form, if by " original form " we understand the form intended by its author.

Texts may be either autographs or they may be transmitted texts; the latter, again, being immediate copies of autographs or copies of copies in any degree.

Autographs (which may be taken to include whatever, though not actually in the writing of its author, has been revised and attested by him) are not exempt from the operations of textual criticism. Editors of journals remove the slips of the pens of their contributors; editors of books, nowadays usually in footnotes, the similar lapses of their authors. With this branch of textual criticism, however, modern scholarship is not largely concerned. Not so with immediate copies. Textual criticism is called upon to repair the mischief done to inscriptions (texts inscribed upon stones) by weathering, maltreatment or the errors of the stone-cutter. Any great collection, such as the Corpus of Latin inscriptions or the similar Corpus of Greek, will show at once its activity and ability in this direction.

The chief field of textual criticism is elsewhere. The texts of the older authors which have come down to us were written for the most part not on stone but on papyrus, parchment or other perishable material. Of these several copies had to be made, both by way of prevention against the wear and tear of use and as a means of satisfying the desire of other persons than the original possessor to be acquainted with their contents. Had the copies made of ancient writings been mechanical reproductions of the originals, such as the photographic fac- similes of modern times, there would have been little here for textual criticism to do. The ancient texts have

not come to us in this way, but through copies made by the human hand directed more or less by the human intelligence. Now a copy made thus can in no circumstances be a quite exact rendering of that from which it is copied or its exemplar. A copy, qua copy, can never be the equal of the exemplar, and it may be much its inferior. This deterioration increases with the number of successive copyings. Let us suppose that from a text which we will call A a copy has been made which we will call B, and from this again a copy which we will call C. If the copyist of B goes wrong once and the copyist of C twice in a hundred times, then, assuming that there is no coincidence or cancelling of errors, the relative correctness of the three texts A, B, C will be 100 (absolute correctness), 99 and 97-02. If C had made his copy direct from A, his percentage would have been 98. The importance of this must be borne in mind when we are dealing with transmitted texts, which have passed through many stages of copying.

In the Epidicus of Plautus, 1. j. 10, the right reading habitior, " more portly," has been preserved to us by Donatus, an ancient commentator on -Terence {Eunuchus, 2. 2. n). It was corrupted to abilior by omission of the h and confusion of / and /, and this corruption, which is attested by the oldest extant copy, the Ambrosian palimpsest, was still further corrupted in the other copies to agilior.

The first step towards the restoration of a text is the examina- tion of the evidence upon which it is or is to be based. This begins with the investigation of its traditional or transmitted form. For this we have usually to rely upon manuscripts (MSS.). By manuscripts (q.v.) we understand copies of the text made before the art of printing came into general use. These may be either extant or non-extant. The evidence of extant manuscripts must be ascertained by collation. To collate a manuscript is to observe and record everything in it which may be of use towards determining what stood in the source or the sources from which it is derived. A manuscript is not

usually a clean or single piece of writing; it is commonly found to contain alterations by erasure, addition or substitu- tion. Such alterations may be due to the writer or writers of the MS., called the scribe or scribes, or to some other person or persons (for there may be several) called correctors. The relative importance of these corrections, it is obvious, may

be very different. It is therefore necessary to distinguish the different hands which have been at work on the manuscript. Account must also be taken of the number of lines in each page, the number of pages in each quire, of gaps or lacunae in the manuscript, and so forth. The work cannot be considered complete till all the extant manuscripts have been collated or at least examined.

When this is done we shall have the materials for pronouncing a judgment upon the text as directly transmitted. Perhaps there is only one extant MS. of the text, as in the case of the Mimes of Herodas and the Annals and Histories of Tacitus. Then this part of our work is done.

But often we have to take account of a number, and it may be a large number, of manuscripts, whose respective claims to attention we must determine. In the first place we shall discard all manuscripts which are derived by copying from other extant manuscripts. If a MS. is immediately or ultimately derived by copying from another MS., it cannot, qua copy, tell us anything that we do not know already if the latter MS. is known to us. But how can we tell that a MS. is so derived? It must be later than the other MS., and the similarity between them must be such as to permit of no other explanation. In the absence of explicit dates the relative age of MSS. is often hard to determine, and hence the criterion of unmistakable resemblance is one of special importance. If the MSS. agree in singular though trivial mistakes, if they omit, apparently without motive, words and passages which other MSS. preserve, we shall be safe in pronouncing that, there exists a close bond of connexion between them,

and if one of them shows errors which, though strange in themselves, are quite intelligible when we see what stands in the other, then we shall be justified in concluding that the second is that from which the first is derived. For the proper consideration of such points a personal examination, autopsy, of the MSS. or of facsimiles of them, is very often indispensable. It was thought at one time that a MS. of the Latin poet Propertius at Naples {Neap. 268) might have independent value as an authority for the text. But its claims were disposed of when (amongst other facts) it was ob- served that at book iv. 8, 3, the MS. with which it most closely agreed (F, No. 36, 49 in the Laurentian library) had a gap at the beginning of the line and only the end words " uetus est tutela draconis," with the marginal note " non potuit legi in exemplari hoc quod deficit," and that Neap. 268 gives the line as follows, " non potuit legi uetus est tutela draconis."

Accident apart, identity of reading implies identity of sources. The source of a transmitted reading may undoubtedly be the author's autograph: but if not, then it is some MS. in the line of transmission.

The peculiar resemblances of two MSS., though not sufficient to warrant the derivation of either from the other, may be sufficient to establish some connexion between them. From the axiom which has just been cited it follows that this con- nexion can be due only to community of source, and we thus arrive at the idea of families of MSS. Suppose that a text is preserved in seven MSS., A, B, C, D, E, F, G. If we find that of these A stands apart, showing no great similarity to any of the other six, while B, C, D on the one side, and E, F, G on the other, much resemble each other though differing considerably from the rest, we may express this by saying that B, C, D form a " family " descended from a hypothetical common " ancestor " which we may call X, and E, F, G another " family " descended from a hypothetical " ancestor " which we may call Y. The readings of X which can be deduced from considering the agree- ments in B, C, D will be of higher

antiquity and of greater external authority than any of the readings in B, C, D taken singly. And similarly for the readings of Y and those of E, F, G. Nor shall we stop here: but we shall further compare the readings of X and Y with each other and with those of A, and thus deduce the readings of a still more remote ancestor which we may call Z. Z will be the archetype of all our existing MSS., and we may embody our results in a pedigree of manuscripts or stemma codicum as follows: —

'Z " (archetype).

'X"

A

BCD

E F G

If we have done our work properly, the texts that we arrive at for X and for Y will be freer from error than the texts of the separate members of the families B, C and D, and E, F, G respectively, and that of Z freer from error than that authenti- cated by any existing MS.

The procedure, however, is by no means always so simple. That a text may be improved by the comparison of different MSS. is not a modern discovery. It has long been known, and the knowledge has led to the production of what are known as conflated manuscripts or Misch-codiccs. These are MSS. pro- duced by " crossing " or " intermixture." In the following stemma M and N are " mixed " or " conflated " MSS., being formed by the blending of readings from the " pure " or " un- mixed " codices A, B and D, E respectively.

"Z"

r^r,

•Y”

BCD

E F G

Intermixture may take place to any extent, and the more of it there has been the more difficult does it become to trace the transmission of a text.

Whether crossing improves a given text or not depends ultimately on the knowledge and the judgment of the crosser, and these will vary indefinitely. On the whole it is probable that it does, provided it is not accompanied by other attempts at improvement. If it be, as may very well be the case, the text will probably suffer. For but a small proportion of scholars’ corrections are really amendments, and a far smaller proportion of scribes’.

The ” genealogical ” method, as we may call it, cannot in strictness be applied to conflated MSS., as their mutual relations can rarely be with certainty disentangled. But it is often possible to detect in such MSS. a common strain, shown by their agreement in peculiar corruptions or in probable readings when these latter would have been hard to discover by con- jecture. This is practically an application of the method to a portion of such manuscripts.

A special value attaches to a conflated codex when one of the MSS. from which it has been compounded has perished and its readings are thus otherwise irrecoverable. This is exemplified in the Neapolitanus of Propertius, a manuscript now at Wolfen- buttel.

It not unfrequently happens that good or instructive readings are found in manuscripts which are in general of small trust- worthiness (see below), and whose relations to the general tradition it is not worth while to investigate. These readings may be cited by the name of the MS., or if still greater

brevity is required as the readings of inferior MSS. {deteriores) , or, as is frequently done, by the symbol S.

Non-extant Manuscripts. — Some of the most valuable of ancient MSS. have disappeared since their discovery in modern times. When this has happened we have to rely upon mere copies, many times of inferior quality, or upon the information which old scholars have given us respecting them. In the latter case what we have are not " collations," for the art of collation was not understood till the 19th century, but selections

or "excerpts" of readings which we have reason to fear are often imperfect and erroneous. Further, it must not be assumed that all readings which are cited as being " ex uetustis codicibus " are necessarily from older or better MSS. than we now possess or indeed from MSS. at all. Scholars since the Renaissance have not always been above inventing codices to obtain currency for their own conjectures. The codices of Bosius (153 5-1 580) are just as imaginary as the " old plays " which appear as the source of so many of the quotations that head the chapters of the Waverley novels, and suspicion rests on Barth, Lambinus and others.

Some texts and portions of texts of ancient writers are now only known from printed books. The metrical treatise of Terentianus is now preserved in the editio princeps (1497) alone. All known MSS. of Silius Italicus have a considerable gap in the 8th book, first filled up on the authority of Jac. Constantius (1503), and not printed with the rest of the poem till the edition of Aldus (1523). The early printed books are often called by old scholars codices impressi (typis), " printed manuscripts," a phrase which at first seems curious to us but becomes perfectly intelligible when we examine these codices impressi and observe how closely they follow the codices scripti. By the methodical employment of these means we shall arrive at a text different from any existing one. It will not be the best one, possible or existing, nor necessarily even a good

one. But it will be the most ancient one according to the direct line of transmission, and the purest in the sense of being the freest from traceable errors of copying and unauthorized improvements.

The textual critic has occasionally to deal with the effects of oral transmission. A text so transmitted must in the lapse of time be profoundly though insensibly modified, its forms and expressions modernized, and, if widely disseminated, local variations introduced into it. This is the case with the Homeric poems, the ascertainment of the original form of which is a task beyond the powers of criticism. Even where, as in the Vedas, the sacred books of India, there is proof that the work has been transmitted without change through many centuries, the exist- ence of unintelligible passages and unmetrical verses shows that here too there is work for textual criticism to perform, though in the opinion of most scholars it should be confined to the res- toration of such forms as would be unconsciously and inevitably corrupted through changes of pronunciation and the like.

The invention of printing has naturally limited the province of textual criticism, and modified its operations. The writer's autograph, if it is preserved after it has been through the hands of the printer, has seldom more than an antiquarian value. As a source for the text it is superseded by the printed edition, and if there is more than one, then by the latest printed edition, which has been revised in proof by the author, or, in certain cases, by his representative; and the task of -the textual critic is restricted to the detection of " misprints," in other words, of errors which the compositor (the modern analogue to the scribe) has made in " setting up " the manuscript, and which have escaped the notice of the proof-reader and the author or his representative. If, however, this revision has been neglected or incompetently performed, the number of such mistakes may be considerable.

Another question with which the textual critic of

modern authors must be prepared to deal is the relative importance of different editions, each of which may have a prima facie claim to be considered authentic. Thus Shakespearean criticism must decide between the evidence of the first folio and the quartos: the critic of Shelley's poems must consider what weight is to be attached to the readings in the posthumous edition by Mrs Shelley, and in unpublished transcripts of various poems. Where there is great or complicated divergence between the editions, as in the case of Marlowe's Faustus, the production of a resultant text which may he relied upon to represent the ultimate intention of the author is well-nigh impossible.

For the bettering of the transmitted text we can call in aids of a

partial or subsidiary character which are known in general as teslimonia. Such arc Anthologies or collections of extracts. The oldest authority for an epithalamium of Catullus (62) is an anthology at Paris written in the gth century.

Translations from one language into another may help to fix the reading of the original, or this again that of the trans- lation.

In Shelley's Prometheus Unbound, ii. 5, 54, — " Child of Light! thy limbs are burning | Through the vest which seems to hide them " — " limbs " is supported against " lips " (ed. 1) by " membre " in the Italian prose version made by Shelley himself: and similarly in 1. 52 " looks " (not " locks ") by the rendering " sguardi." In his translations of Euripides' Cyclops, 381, "a bowl | Three cubits wide and four in depth, as much | As would contain four amphorae " the Greek original clearly points to " ten amphorae " and four may have come from the previous line.

In direct quotations, either of, passages or single words, and either with or without the author's name, we must be sure that the writer is quoting exactly.

A couplet of Propertius is written upon the walls of Pompeii in the following form : " Quisquis amator erit, Scythiae licet ambulet oris, j Xemo adeo ut feriat, barbarus esse uolet." Here the manuscripts have " Scythicis " — " deo ut noceat," of which deo is rejected by every one in favour of the Pompeian reading, but Scythicis and noceat are retained on the ground that they are in themselves better than the Pompeian readings, which may be simply due to lapse of memory. In Shelley's Julian and Maddalo, 40, — "(talk) such as once, so poets tell, | The devils held within the dales of Hell [Concerning God, freewill and destiny," — vales has been suggested to make it harmonize with the passage of Milton to which reference is made: but the argument is not conclusive.

Parodies may prove of service in restoring the form of what is parodied or this in restoring the parody. So also obvious imitations, especially in a highly imitative literature such as Latin poetry. The connexion of the passages must in all these cases be unmistakable.

In Homer, Iliad, i. 4 seq., Aristarchus had the common reading

aiiTovs dc eXuipia revxe Kvvt&ot. \ oioivoiai re ironri, but another Homeric

critic of note, Zcnodotus, read baira for xacri, and this is supported

by the obvious imitation in Aeschylus, Supplices, 800, who has

Jopviai htiwvov.

The support which a reading gains from the evidence of the directly transmitted text and from the auxiliary testimonia may be called its documental probability. To restore a text from the documental

evidence available we must know and weigh the causes which tend to vitiate this evidence in its various kinds. We shall speak first of those which affect the direct transmission of texts. These are either external or internal.

External. — A text may become illegible through damp or constant thumbing; portions of it may be torn away; if it is in book form, leaves or whole quires may be detached and either lost or misplaced. When this has taken place on a con- siderable scale, the critic is helpless; but minor injuries may sometimes be traced and remedied. The weakest parts of a MS. book were the outer margins; and hence the beginnings and the ends of lines, whether of verse or prose, were specially liable to injury. It obviously makes a difference upon which side of a leaf, whether on the verso or the recto, a line was written. Hence the determination of the paging of the arche- type (as was done for the archetype of Lucretius by Lachmann) has more than a merely antiquarian value. In ancient classical MSS. the first letters of poems in verse and of paragraphs in prose usually, and the initial letters of lines in verse occasionally, were written separate and by another person than the scribe (who was called the rubricator), and hence were apt to be omitted. Other external circumstances may prejudicially affect a text. The copy from which Shelley's Julian and Maddalo was printed was written on very narrow paper, and the punctuation marks at the ends of the lines were frequently omitted.

Internal. — These errors arise from the default of the scribe or copyist, and, in the case of printed books, the compositor. 1 They are very numerous. They may be roughly arranged

1 For the convenience of the general reader these errors have been illustrated as far as possible from English authors and especi- ally from the poems of Shelley (ed. Hutchinson).

according to the degree in which the volition of the copyist is absent or present, as involuntary or

mechanical, semi- voluntary and voluntary; or again as they affect single signs (letters, figures or symbols), words, lines or even larger units such as sentences or paragraphs.

Simple Errors of the Eye. — (a) Confusions of letters. These are very numerous, and different in different scripts or styles of writing (see Palaeography). Thus the Roman letters E and F are liable to be confused in capital script, but not in cursiv.' (e, f) , C, G, in capitals, c, e in the cursive writing called Caroline minuscule, c, t, in the angular cursive of the 13th century and later. Texts which have had a long history will often show by the letter-confusions which they exhibit that they have passed through several distinct stages of copying. It is to be observed that two different styles of writing are often found in the same manuscript, the difference being utilized for the purposes o'i distinction. Thus in Greek cursive MSS. notes were often written in uncials; the use of- majuscules or capitals for headings and for the initial letters of lines is well known, (b) Omissions of letters, (c) Shiftings of letters, sometimes by syllables. This is very common in half intelligent or half mechanical copying. In printing we get the disarrangement of type which is known as " pie." (d) Confusions of symbols and abbreviations.

(a) Examples of confusion of capital letters from Shelley's poems are: Prometheus, i. 553, " ikfark that outcry of despair " for " 7/ark "; Hellas, 472, " Hold each to the other in loud mockery " for " 7bld." Of cursive letters: Marenghi, 130, " the Aim ocean " for "the dun ocean"; Letter to Maria Gisborne 126, sqq., " .above | One chasm of Heaven smiles like the age of Love | On the unquiet world " for " eye." (b) Translations from Goethe's Faust, sc. i. 46, " To live more beastly than any beast," for "beasZ/ily"; ii. 165, "eye" for " eyree " (in spite of the rhyme with 163). (c) Prometh., iv. 575, " Neither to change, nor f/atter, nor repent," for " falter." In Latin MSS. we often find a mere jumble of letters, (d) Confusion of words through abbreviations is very common in ancient MSS., where

they were much employed. At" a famous place in the doxology of 1 Timothy iii. 16, the MSS. vary between os (or o) and 9e6s. _In uncial writing OC (os) might easily be miswritten or altered to 6C (6eos) or vice versa.

Loss of Letters, Syllables, Words or Lines, through Similarity of Writing: Homoeographon. — When similar letters or groups of letters stand next to each other, one of these is liable to be omitted. This is the simplest case and is called haplography.

Similarity operates differently if the similar groups stand in different lines of the exemplar. Then the copyist's eye is apt to slip from the first of two similarly written groups to the second; and he will thus omit all that is between. The term homoeoteleuton (" similarity of ending ") is often used of these omissions, but it is not adequate, as similarity anywhere may produce the same result.

Examples of homoeographon and haplography. Shelley's Cenci, v. 4, 136, " whose love was [as] a bond to all our loves ": a similar omission in Witch of Atlas, 599. In Stanzas written in Dejection near Naples the two lines 4, 5, " The purple noon's transparent might, I The breath of the moist earth is light," were printed in the 1st edition, " The purple noon's transparent light," owing to the homoeographon " might " " light."

Omissions through Simple Negligence. — Groups of letters, words, syllables and lines are often omitted without any con- tributory cause. Short words or such as are not necessary to the sense are especially prone thus to disappear.

Examples of omission. Shelley's Prometheus, iii. i, 70, " No refuge! No appeal! Sink with me [then];" Cenci, i. i, 26, " Respited [me] from Hell! So may the Devil | Respite their souls from Heaven!"; Hellas, 657, "Bask in the [deep] blue noon divine"; Julian and Maddalo, 218, where " Moans, shrieks, and curses, and blaspheming prayers " is absent in the earlier editions though required for the rhyme; so

lines 299-301 of the Letter to Maria Gisborne.

Repetitions: Dittography. — Letters, groups of letters, words and lines may be written twice (or even oftener) instead of once.

Other repetitions of words already written and anticipations of words yet to be written are also found, through the scribe's eye wandering into the preceding or the following context. Wherever the word or group of words repeated is not the one that he has just copied loss is liable to occur.

Dittography is common enough in manuscripts but is usually detected in reading proofs. In the unique MS. of Cicero's treatise De Repuhlica, 2, 33, 57, secutus appears as " secututus secutus." Other kinds of repetition are Shelley's Witch of Atlas, 61 1 seq., " Like one asleep in a green hermitage, | With gentle sleep about its eye- lids playing" {sleep for smiles has come from the previous line); Revolt of Islam, 4749, " Where " for " When " appears to have come from " Where " in 4750 or 4751. Often the word thus extruded is irrecoverable; Cinevra, 125 sqq., "The matin "winds from the expanded flowers j Scatter their hoarded incense and awaken | The earth, until the dewy sleep is shaken | From every living heart which it possesses | Through seas and winds, cities and wilder- nesses " ; the second " winds " is a repetition of the first, but what should stand in its place, — " lands " or " strands " or " waves " or something else — no one can say.

Confusions of Words. — Words are not only changed through confusion of single letters or abbreviations, but also through general resemblance or (a semi-voluntary change) through similarity of meaning.

Shelley, Prometheus, ii. 2, 53: " There streams a plume-uplifting wind " for " steams." In Shelley's

lines, When the lamp is shattered, vv. 5-6, " When the lute is broken,] Sweet tones are remembered not," the printed edition had "notes" for "tones." In Mrs Gaskell's Cranford, ch. xiv. (near the end), " The lunch — a hot savoury mutton-chop, and a little of the cold loin sliced and fried — was now brought in " is the reading of most if not all the editions; but " loin " should be " lion," the reference being to the pudding, " a lion with currant eyes," described earlier in the chapter. In Shelley's " Evening: Ponte al Mare, Pisa," 20, " By darkest barriers of enormous cloud" for "cinereous"; "Hymn to Mer- cury " (trans.), 57, " And through the tortoise's hard strong skin " for " stony." Shelley's " The Boat on the Scrchio," 117, " woods of stunted fir " for " pine " which the rhyme requires; Prince Alhanase, 250, " And sea buds burst beneath the waves serene " for " under."

The same character frequently attaches to transpositions of words and parts of words. The copyist does not as a general rule consciously intend a change, but he falls into one through the influence of dominant associations. He substitutes an order of words which, in respect of syntax, metre or rhythm is more familiar to him.

Transpositions of words, if not purely accidental, as in Chaucer, " Parson's Tale," p. 689 (ed. Skeat), " God yaf (gave) his benison to Laban by the service of Jacob and to Pharao by the service of Joseph," where the MSS. transpose Laban and Pharao, are gene- rally to a more usual order, as in Shelley's Witch of Atlas, 65, " She first was changed " to " she was first changed." An instance of transposition of words in part is in Shelley's " Invocation to Misery," 1. 27, " And mine arm shall be thy pillow," where the 1st ed. had " thine arm " and " my pillow."

Faidty Divisions of Words. — These will generally imply an exemplar in which the words were without any division or without a sufficient one. Under this head we may class errors which arise from the omission or the insertion of such marks as the

apostrophe and the hyphen.

Examples of wrong division of words. Chaucer's House of Fame, iil. , 1975, " Of good or misgovernement " which should be " mis {i.e., bad) governement "; Shelley's Prometheus, iii. 2, 22, " Round many peopled continents " for " many-peopled," ib. 26, " the light laden moon" for "light-laden"; Revolt of Islam, 4805, "Our bark hung there, as one line suspended | Between two heavens," for " on a line."

With this we may class faidty division of sentences. Wrong punctuation is a common error and usually easy to correct.

As an example of mispunctuation we may take Shelley's Triumph of Life, 188 sqq., " ' If thou can'st, forbear | To join the dance, which I had well forborne ' | Said the grim Feature of my thought ' Aware | I will unfold,' " &c., for " said the grim Feature (of my thought aware) ' I will unfold.' "

Grammatical Assimilations. — These are often purely mechani- cal errors: but they may be semi-voluntary or even voluntary, the copyist desiring to set the syntax right.

Examples: Shelley's Rosalind and Helen, 63, "A sound from thee, Rosalind dear " instead of there; Mask of Anarchy, 280 seq., " the daily strife [With common wants and common cares | Which sow the humfn heart with tares," for " sows."

Insertions {or Omissions) of Seemingly Unimportant Words. — These, inasmuch as they must often import some judgment on the sense of the passage copied, will be frequently semi-voluntary if not voluntary.

Examples: Shelley, Prometheus, iii. i, 5, "The soul of man like [an] unextinguished £re." So in Triumph oj Life, 265, " Whom

from the flock of conquerors I Fame singled out for her thunder- bearing minion," out seems to be due to the compositor.

False Recollections. — The passage which a copyist is repro- ducing may suggest to him something else and he will write down what is thus in his mind instead of what is before his eyes.

There is a noteworthy instance in Horace, Odes, iii. 18, II seq., ” festus in pratis uacat otioso \ cum boue pagus ” where some MSS. give pardus, a reminiscence of Isaiah xi. 6, ” The leopard (pardus) shall lie down with the kid.” In iv. i. 20, for ” trabe citrea ” many MSS. have ” trabe Cypria,” which occurs in i. 1, 13.

Incorporation of Marginalia. — The copyist may erroneously suppose that something written in the margin, between the lines or at the top or the foot of the page which he is copying, is intended to be placed in the text. The words so incorporated may appear side by side with the genuine reading or they may expel it.

In Horace, Odes, iii. 27, 47, ” a’mati | cornua monstri ” (of the bull which carried off Europa), more than one MS. has ” cornua tauri,” an explanation of monstri. The celebrated passage about the three heavenly witnesses inserted in the Epistle of St John (v. 2) seems to have been originally a comment explanatorv of the text.

Transpositions of Lines and Passages. — This kind of trans- position is really arrested loss. An accidental omission is dis- covered, and the person responsible, or another, places what is omitted in the margin at the foot of the page or in some other part of the text, usually adding a mark to show where it ought to have been. The next copyist may easily overlook this sign and thus the passage may be permanently displaced.

In Chaucer’s Canterbury Tales, most MSS. place the couplet, ” And eek of many another maner cryme | Which nedeth nat rehercen at this tyme,” which should stand after v. 8 of the ” Friar’s Tale,” in the Prologue to the Tale before the fourth line from the end. In the ” Monk’s Tale ” a block of 88 lines

(3565-3652) is transposed in most MSS. to follow 3956.

Interpolation. — This is the deliberate alteration of an exemplar by way of substitution, addition or omission, but when it - takes the particular form of omission it is naturally very hard to detect. Interpolation then always has a motive. The most frequent motive is the removal of some difficulty in the sense, expression or metre of the text, and especially obvious gaps or corruptions which the interpolator endeavours to fill or to heal. Fraudulent interpolation, whether the fraud be pious or otherwise, does occur, but is comparatively rare. The removal or the mitiga- tion of objectionable matter is also occasionally found. Inter- polation is then a voluntary alteration, but in practice it is often hard to distinguish from other changes in which its motive is absent.

The usual character of scribes' alterations is well illustrated by a passage in Bacon's Advancement of Learning, II. xix., " For these critics have often presumed that that which they understand not is false set down: as the Priest that where he found it written of St Paul Demissus est per sportam " [Acts ix. 25] " mended his book, and made it Demissus est per portam, because sporla was an hard word, and out of his reading." Shelley in Triumph of Life, 201 seq., wrote, " And if the spark with which Heaven lit my spirit j Had been with proper nutriment supplied," but the printed editions made it " sentiment." The transcript used for the printed edition of Marenghi apparently often corrupted what was rare and strange to what was commonplace; e.g., 1. 119, " dewglobes " to "dew- drops." Interpolation is sometimes due to an inopportune use of knowledge, as when a quotation or a narrative is made to agree with what the interpolator has read elsewhere. The text of the Septuagint, a trans'ation of the Old Testament made from MSS. older than those accessible to Origen, was much altered by him in order to make it conform more closely to the Hebrew text with which he was familiar, and in the Synoptic Gospels changes are found, the aim of which is to "

harmonize ” the accounts given by the different evangelists. Deliberate alteration is occasionally due to disapproval of what stands in the text or even to less credit- able reasons. There is an old and seemingly trustworthy tradition that some lines in Homer’s ” Catalogue of the Ships,” Iliad, ii. 553~555 an d 558, were introduced there to gratify the vanity or ambition of the Athenians. Insertions of this or of a similar character may be of almost any length, from a few words to a whole chapter or a complete poem. Literary forgery has never set any bounds to itself, and the history of every literature will supply examples of entire works being foisted upon authors and personages of repute. A notable one was the Epistles of Phalaris, a late Greek forgery, demonstrated to be such by Bentley in a treatise which is a model of what such a demonstration should be.

TEXTUAL CRITICISM

7 J 3

Special Conditions conducing to Corruption. — The chief of these is strangeness or difficulty in the matter to be copied. Proper names, technical expressions, quotations from foreign languages, and frequent change of subject, are all likely to cause difficulty to a scribe and error in his work.

Careful and continuous regard to the various kinds of errors and defaults that are found in transcription will enable us to judge whether a reading which it is suggested stood in the archetype of our text is likely to have been corrupted to the reading, or readings, which stand in the extant manuscripts or editions. If it is, we say of this reading that it is tran- scriptionally probable.

Some precautions must be observed. First we must rule out any proposal which assumes confusions of letters and abbreviations which are not attested for the particular tradi- tion. Secondly, since different scribes are prone to different kinds of error, we must ever bear in mind the particular

failings of the scribes responsible for the transmission of our text as these failings are revealed in the apparatus crilicus.

Maxims of criticism to which we may here refer are that ” harder readings are better than easier ” and that ” the shorter reading is generally the truer.” The first maxim is indisput- able, provided we understand by ” harder ” harder to the scribe, and by ” easier ” easier to the scribe. The characteristic of scribes’ emendations or interpolations is that they are superficial. Their mark is that at the time of their making they ” combine the appearance of improvement with the absence of its reality ” (Westcott and Hort, New Testament, i. p. 27).. The second maxim refers to the well-known fact that accretions from marginalia, &c, lengthen and at the same time weaken a text.

The virtues of a scribe are honesty and care (or in a single word fidelity) and intelligence. But it is rare to find these combined in a very high degree, and out of them we can least easily dispense with fidelity. Paradoxical as it may seem, the mechanical corruptions of a stupid but faithful copyist may tell us more than the intelligent copyings of a less faithful one.

A nice question is how far any alteration of the text of the exemplar is compatible with fidelity. Is a scribe, who recognizes under a corruption the word certainly intended, to perpetuate the error of the exemplar? Considering the liability of corrup- tion to breed corruption we can hardly blame him if he does not, and we may say that it is no derogation to his fides if he makes self-evident corrections. But with these he must stop.

*At certain epochs in the transmission of literature systematic efforts have been made to improve the transmitted texts, and these efforts have naturally been accompanied by a good deal of emendation * both successful and unsuccessful. Such an epoch was the revival of Latin and Greek learning in the 15th century, and a modern scholar would for that reason*

naturally prefer to have a manuscript to work on, which was written immediately before this epoch to one which was written imme- diately after it.

The fidelity of a scribe has to be judged chiefly by internal tests, and these are best applied to his work in passages where there is no reasonable doubt of the correctness of the trans- mitted text. But there are two tests of a more objective character that may be used — orthography, and indication of lacunae or other faults in his exemplar. A scribe who preserves in his spelling the traces of a bygone age is probably trust- worthy. If faithful in small things, he is likely to be faithful in great. A scribe again who scrupulously records the presence of a lacuna or illegibility in what he is copying, inspires us with confidence in the rest of his work.

As regards the use of testimonia, it may be observed to begin with that their value must depend on the trustworthiness of the texts of the writers from whom they are taken, and further upon that of the text used by the translator, the excerptor or the quoter, about which we can know nothing for certain, though we may sometimes make probable inferences. In the case of quotations we must allow for failures of memory.

Many times in the course of his investigations the critic will be confronted with problems which cannot be resolved by

considerations of transcriptional or documental probability. To take an instance already referred to, it is not clear at first sight whether in the couplet from Propertius Scythiae is more likely to be a misrecollection of some text of the 1st century A.D., or Scythicis some scribe's assimilation which made its way into the transmitted text in the course of the next thousand years.

This leads us to consider Intrinsic Probability. By this is meant the likelihood that the writer of our text would at the time of writing have written, or not have written, a particular thing. Two questions

which may be separated, though they are not entirely distinct, are here involved. What was the meaning of the writer ? And how did he express it ? The sense may be clear though the words may no longer be deter- minable.

A reading may be impugned on a number of grounds: that it gives no sense or an inappropriate sense, that it involves a usage or an idiom not current at the assumed time of writing, or foreign to the reputed author, or to the style in which he then was writing, that it involves some metrical or rhythmical anomaly, or that the connexion of thought which it produces is incoherent or disorderly. These charges cannot be played off against each other. It is no answer to the objection that a reading in some Roman poet makes nonsense to say that its Latinity is perfect or its metre excellent. But they may reinforce each other, and to such corroboration great weight must be assigned.

To set the meaning of a passage in a foreign language before us we must frequently have recourse to translation. But this method of representation is a very imperfect one; we may easily impose on ourselves and others by strained and ambiguous renderings. A more subtle danger to which we are especially liable in the case of a dead language is that of our acquiescing in a sense which satisfies us but which would not have satisfied the ancient writer. Above all we must avoid applying our own standards of taste, style and morality to the judgment of the text before us. The textual critic has no concern with what the writer ought to have thought or said; his business is solely with what he did say or think or might have said or thought. Amongst the legitimate reasons for suspecting the correctness of a text are patent contradictions in a passage or its immediate neighbourhood, proved and inexplicable deviations from the standards for forms, constructions and usages (mere rarity or singularity is not enough), weak and purposeless repetitions of a word (if there is no reason for attributing these to the writer) , violations of the laws of metre and rhythm as observed by the author,

obvious breaks in the thought (incoherence) or dis- orderly sequence in the same (double or multiple incoherence).

Where the critic has ascertained the earliest form of a reading in his text, he will apply to it the tests of intrinsic probability. No part of a text can be considered exempt from this scrutiny, though for a very large part of it it may be dispensed with. It should, however, be here observed, that whoever takes a reading without investigation, on the authority either of a manuscript or of a great scholar, or of a number of scholars, ceases for the time being to be a textual critic.

After every such critical examination four Conclusions are possible — acceptance, doubt, rejection and alteration. In other words, a critic may deliberately pronounce that what stands in the text represents what the author wrote or might well have written, that it is doubtful whether it does, that it certainly does not, or, in the last event, that it may be re- placed with certainty by something that does. In the three first cases his judgment will be governed by considerations of intrinsic probability alone: but in the last it must regard transcriptional probability as well. No alteration of a text, or emendation, is entitled to approval, unless in addition to pro- viding the sense and diction required, it also presents a reading which the evidence furnished by the tradition shows might not improbably have been corrupted to what stands in the text. These tests, and these alone, are emendations bound to satisfy; but others are often tacitly imposed upon them. Of this the transposition of lines is the most notable example. This kind

of change is troublesome to estimate and inconvenient to adopt, as it involves placing passages where we are not accustomed to look for

them; but to the question, did the author write the passage here or there? the matter of our trouble or incon- venience is wholly irrelevant. There is, however, one class of cases in which no conclusion may be drawn, documental and intrinsic probability both failing us. This is where two alternative readings, neither of which can have come from the other, have equal external support and equal intrinsic merit. Isolated discrepancies of this kind may be due to some accident to our text at a period now beyond our power to trace. Numerous and striking discrepancies may be due to the fact that there was more than one edition or recension of it in early times, or to the author leaving his work in such a condition that such discrepancies must inevitably gain currency. In the case of dramas, different acting editions will give rise to them.

Up to this point all schools of textual criticism are theo- retically at least in accord. But here begins a divergence which has done more than anything else to discredit the study with the outside world. It emerges because in all judgments on textual matters it is presupposed that they will be acted on, that a reading accepted will remain in the text, a rejected one obelized, enclosed between brackets or removed, and, in this last case, something else substituted in its place.

The " conservative " critic's chief concern is for the safety of the traditional and by preference the transmitted text. He urges very rightly that if alteration is carried beyond a certain point it cuts away its own foundation, and so all cer- tainty is destroyed. His objective is the minimum of change. And as the need of making a text compels some sort of de- cision in every case, the " doubtful " readings of the tradition, some of which on the evidence would be doubtfully accepted and others doubtfully rejected, will all appear with the ac- cepteds in the text. As to alterations (emendations) that are less than certain, his attitude is clearly if somewhat crudely expressed in the dictum that it is better to leave in the text " what if not the original reading is at least the remains of it." The

corresponding thesis of the opposite school would be that it is better to present to the reader something which the author might have written than something which he could not: or, in other words, that " stopgaps " should be preferred to debris.

An editor of a corrupt and disputed text may reasonably adopt either of two methods of procedure. He may present the text in the purest form which the external evidence warrants, and place all plausible suggestions for its improvement in notes or appendices. The text will be faithful but unreadable, and his work will be that of an honest man but of a textual anti- quarian, not a textual critic, since he declines the duty of " the restoration of the text, as far as possible, to its original form." On the other method the editor will provide all necessary information about the evidence for the text in the notes of his critical apparatus; but in the text itself he will give whatever in each case is supported by the balance of the probabilities. Each and every case he will decide on its own merits and without reference to decisions upon the other cases not now before him. Special consideration will be paid to " doubtful " readings, which will be distinguished in his work as " doubtfully ac- cepted " or " doubtfully rejected." Legitimate doubt arises when the evidence pro et contra of documental and intrinsic probability is equal, or nearly equal, or when documental probability points strongly to one side and intrinsic probability to another. Illegitimate doubt is the uncertainty of the doubter as to whether he has examined the whole of the evidence. Such doubt is much more frequently felt than acknowledged, and its effect upon critical work is highly injurious. On the one hand, it is apt to take refuge in an uncritical acceptance of the traditional readings, and, on the other hand, to produce a crop of hesitant and mutually destructive conjectures which a reader naturally resents as a needless waste of his time.

The so-called " conservative text " is neither an antiquarian's text nor a critic's text, but a

compromise between the two. When it is conscientiously obtained, it is arrived at by handi-

capping, more or less heavily, intrinsic probability as compared with documental probability, or by raising the minimum of probability which shall qualify a reading for admission into the text until it is in agreement with the notions of the editor. Both of these procedures are arbitrary in their principle, and liable to be erratic in their application. The text will suffer whichever course is adopted, and it will suffer the more the more conservative is the editor, as may easily be shown. Thus, to take the latter one, if we suppose that of two editors of equal competence A requires a probability of four-fifths to admit a reading into his text and B a probability of three-fifths only, then in all the cases in which the probability lies between these two fractions B will be right seven times to A's three, while outside these limits there will be no difference between them.

Many persons appear to suppose that decisions upon doubtful points can be avoided by the expedient of leaving the tradi- tional reading in possession of the text. The rule is a simple one and easy to apply. But owing to the constitution of the human mind it has consequences which possibly they have not contemplated. The great works of classical literature are not studied as pathological specimens, and they will be studied the less the more they contain to repel and disquiet the reader. If a corruption is left in a text when something might be sub- stituted which would at least, as a " stopgap," give the sort of sense required, then one of two things must happen. Either the sense of the passage is blotted out for the reader and the conservation of the corruption is tantamount to the ex- punging of the rest of the sentence, or else he will obtain the required sense by wresting the meaning of the other constituents of the context until they furnish it. So far so good: the re- quisite sense has been obtained, but the price has now to be paid. And the price is that the reader's perception of the signification of the word or words

so wrested is dimmed and impaired, and his power of discriminating and understanding them when he meets them again is shot with doubt and error. In dealing with writings in dead languages this is particularly mischievous.

There are two reasons in particular why the part which emendation plays in the shaping of Greek and Latin texts is apt to be overlooked. Most people take their notions of a classical book not from its traditional form but from a ” re- ceived ” or vulgate text. This in the case of most writings is fairly readable, because it has been purged by the continuous emendation of scholars during several centuries. But the received conjectures which make this text acceptable have no more authority in themselves than equally good conjectures which have not yet won their way into the text; and it is clearly illogical to treat a text largely built upon conjectures as if it were now beyond the reach of conjecture. Again, it has often happened that readings which have been discovered by con- jecture, and as such received into a text, have afterwards been found to have the support of MSS. Thus in one speech of Cicero, pro Caelio, some thirty conjectures of critics were found to be attested by a single recently discovered MS. Such read- ings it is now commonly the practice to transfer to the credit of the MS. and to suppress the fact that they were originally discovered by emendation. These confirmations, as they are called, should be carefully recorded in all critical texts, inasmuch as they constitute the most striking justification of the critical method.

Some examples from Shelley’s poems are Prometheus, ii. 3, 50, ” See’st thou shapes within the mist ” (Zupitza for ” / see thin shapes”); ib. iv. 4, 242, “Purple and azure, white and green, and golden ” (and inserted by Rossetti) ; Prince Athanase, 150 sqq. ” the rugged path] Where she once saw that horseman toil, with brief I And blighting hope, who with the news of death | Struck body and soul as with a mortal blight ” (blighting, condemned by Rossetti, is cancelled in the Bodleian MS.).

It is a weakness of conservative critics to extol interpretation (or exegesis) at the expense of emendation. Some have even ventured to say that the successful defence of a passage in a text is a greater service than its successful correction. This is> not true. The service to the text is the same, what was previously dark being now made clear. But the emendation

deserves the higher praise as being in most instances the more difficult achievement. The fault of the opposite school, on the other hand, is to disparage interpretation and to regard correc- tion as the proper field of a scholar and gentleman. This bias is reflected in the maxim that " correction should precede interpretation," which is no more than a half-truth. For emendation must inevitably fail unless it express the meaning which the proper interpretation of the passage has shown to be required. Further, a corrector may propose the right word with the wrong meaning. Yet the custom is to give the credit of the emendation to him, and not to a successor who has seen what the right sense was and that this was the only word to express it, whereas the first scholar blundered once if not twice, first assigning the wrong sense to the passage and then selecting what (in most cases) would be the wrong word to express it. The proper course would be not to mention the first conjecturer or to mention him only for his error.

One of the most vexed questions of textual criticism, and one which divides scholars more perhaps than any other, is the question to what extent admitted imperfections and incon- sistencies may properly be left in a text as due to the default of an author rather than of a scribe or compositor. No uni- versal rule is here attainable. Each case must be considered on its merits; and the critic's procedure must of necessity be '' eclectic " — an epithet often used with a tinge of reproach, the

ground for which it is not easy to discover. Two general considerations may be indicated. If the autograph of a work is not accessible, there is no means of distinguishing between the involuntary errors of a scribe and the involuntary errors — " slips of pen " — of an author. For the latter are in fact only scribe's mistakes, the author being his own amanuensis. To take the example given under Confusions of Words above, loin for lion in Cranford is probably a printer's error, but it is con- ceivable that it is due to a deflexion of the authoress's mind or pen through the accidental proximity of the " mutton chop."

Passing over this class we come to one about which there may frequently be serious doubt. What is clearly erroneous or faulty may as clearly be intended, and therefore not to be re- moved by the critic. In Chaucer's " Miller's Tale " (3451, 3457) astromie is used for astronomie, and Noe and Noel (Christmas) confused, " Nowelis flood" (3451, 3457)> because the speaker is an illiterate carpenter. In the Prologue to the " Parson's Tale " (10) there is, on the other hand, a mistake of Chaucer's own, which no judicious critic would think of removing, the constellation Libra being said to be " the moon's exaltation " when it should be Saturn's. But this error in an astrological detail would not warrant us in assigning to the poet the blunder about Jacob and Laban in the same tale (see above). Much depends on the precision with which an error can be corrected: wherever there are more plausible ways than one of doing this, the faulty reading must be allowed to remain. Collateral as well as direct evidence must be obtained. If there are a number of instances where there is faultiness which is hard to remove, it is probable that the evil lies too deep for emendation. The author's own carelessness may be to blame, or, as in the case of Virgil and Lucan, he may not have been allowed to put the finishing touches to his work.

Certain lapses from grammatical correctness and metrical regu- larity that we find in the poems of Shelley are undoubtedly due to the author, though

the number of these has been reduced (as Mr Buxton Forman has pointed out) with our improved knowledge of the sources of the text. Amongst such lapses we may instance Prince Athanase (287),” The shadow of thy moving wings imbue [Its deserts and its mountains “; ” To a Skylark ” (80), ” Thou lovest — but ne’er knew love’s sad satiety.” The solecism in the Preface to the Adonais, ” My known repugnance to the narrow principles of taste on which several of his earlier compositions were modelled prove at least that I am an impartial judge,” would probably have been corrected by the poet if his attention had been called to it ; but the two first ones, with others, cannot be thus regarded. We may detect occasional laxity also in his handling of his verse. L’nea are left unrhymed: e.g., Julian and Maddalo (211); Rosalind fji Helen (366). Or the same word is used in place of another rh’/ming word: Revolt of Islam (3573 and 3576, 3829 and 3831). In the Daemon of the World (341-2), Shelley himself cancelled a

metrical reading for one that makes the verse a syllable too short. It is in this department of criticism that the personal equation has the freest play, and hence the natural adherents of either school of critics should be specially on their guard against their school’s peculiar bias.

The part which conjectural emendation should play must obviously be very different in different texts. In the New Testament, for example, this part is very small indeed, though it cannot be altogether excluded. Colossians ii. 18 is corrupt as it appears; but the adoption of a correction recommended by Bishop Lightfoot and Dr C. Taylor will restore it to sense.

It has been maintained that emendation (being guessing) is no part of textual criticism at all, though judgment upon emendation is. The position approaches to paradox and is not likely to be generally accepted. But it does contain an element of truth and indicates a well-founded reproach against the majority of those who practise conjecture. Nothing has discredited emendation as a

means of improving texts more than the want of method, common care and research, which those addicted to it show. Some of the most distinguished scholars have offended worst. The Milton of Bentley, England's greatest critic, is a by-word. To examine all the causes which may vitiate emendations would mean writing a treatise upon human frailty. But the reason why the vast majority of them fail is that the vast majority of them should never have been made at all. Their proposers do not take even elementary precautions to be right. An inquirer who examines the stars with a shilling telescope is not likely to make observations of value, and even a trained astronomer has to allow for his " personal equation " — a point to which even a finished critic rarely attends. Successful emendation requires a rare union of qualifications — insight, prudence, patience and familiarity with the author emended and the conditions of his text. If any of these is absent, the work is apt to be wasted.

Authority, as already hinted, has properly no place in textual criticism. For his facts a textual critic may, and often must, be beholden to others: but never for his opinions. It adds nothing to the evidence for a reading that it has been approved by a Lachmann or a Madvig or rejected by a Stoeber or a Carutti: and an appeal to names on any such question confuses issues and deters inquiry. But inasmuch as there are many persons, including most makers of school editions, who prudently and modestly desire a better road to truth than their own investigations can discover and think thus to find it, it will not be amiss to observe on the one hand that the concurrence of a succession of editors in a reading is no proof and often no presumption either that their agreement is independent or that their reading is right; and on the other that, though inde- pendence may generally be granted to coinciding emendations of different scholars, yet from the general constitution of the human mind it is likely that not a few of these will be coin- cidences in error rather than in truth.

One of the marks of a great textual critic is his

attention to details. He will not consider his work upon the text com- plete until he has made it, as far as he can, such as the author would approve in every particular. Accordingly he will restore the spelling of the author if that can be ascertained: he will not accept the corruptions which have been introduced into it by copyists or printers, even though these may not affect its sense, nor will he modernize it so as to bring it into harmony with that of a later and to him a more familiar age. Thus, to take an example, he will not print a critical text of Plautus with two letters (Y and Z) which were no part of the Latin alphabet in the age of that comedian; still less will he introduce into Latin texts distinctions, such as i, j and u, v, which were not used till long after the middle ages.

As time goes on, textual criticism will have less and less to do. In the old texts its work will have been performed so far as it is performable. What is left, will be an obstinate remainder of difficulties, for which there is no solution or only too many. In the newer texts, on the other hand, as experience has already shown, it will have from the outset but a very contracted field.

(J. P. P-)

TEZPUR, or Tejpur, a town of British India, the adminis- trative headquarters of Darrang district, Eastern Bengal and Assam, on the right bank of the Brahmaputra. Pop. (1901) 5047. It is the centre of a flourishing tea industry, and contains many houses of English residents. Communications are main- tained by river steamer, while a light railway runs northward through the tea-growing tract.

THA'ALIBI [Abu Mansur 'Abd ul-Malik ibn Mahommed ibn Isma'il uth-Tha'alibi] (961-1038), Arabian philologist, was born in Nlshapur, and is said to have been at one time a furrier. Although he wrote

prose and verse of his own, he was most famous for his anthologies and collections of epigrams. Like many other Arabian writers, he does not always distinguish between his own and other people's work. Of the twenty-nine works known to have been written by him, the most famous is his Kitdb Yatlmat ud-Dahr, on the poets of his own and earlier times, arranged according to the countries of the poets, and containing valuable extracts (published at Damascus, 4 vols., 1887). Another of his works, the Kitdb Fiqh ul-Lugha, is lexicographical, the words being arranged in classes. It has been published at Paris (1861), Cairo (1867), and Beirut (1885, incomplete).

For his other works see C. Brockelmann's Geschichte der Arabischen Litteratur, vol. i. (Weimar, 1898), pp. 284-86. (G. W. T.)

THACKERAY, WILLIAM MAKEPEACE (1811-1863), English novelist, only son of Richmond and Anne Thackeray (whose maiden name was Becher), was born at Calcutta on the 18th of July 181 1. Both his father and his grandfather (W. R. Thack- eray) had been Indian civil servants. His mother was only nineteen at the date of his birth, was left a widow in 1816, and afterwards married Major Henry Carmichael Smyth. Young Thackeray was brought home to England from India as a child, and was sent to private schools, first in Hampshire and then at Chiswick. In 1822 he was transferred to Charterhouse, at that time still on its ancient site near Smithfield. Anthony Trollope, in his book on Thackeray in the " English Men of Letters " series, quotes a letter written to him about Thackeray's school- days by George Stovin Venables. " He came to school young," Venables wrote, " a pretty, gentle, and rather timid boy." This accords with the fact that all through Thackeray's writings the student may find traces of the sensitiveness which often belongs to the creative mind, and which, in the boy who does not understand its meaning and its possible power, is apt to assume the guise of a shrinking disposition. To this very matter Venables tersely referred in a later passage of the letter quoted by Trollope: "

When I knew him better, in later years, I thought I could recognize the sensitive nature which he had as a boy." Another illustration of this idiosyncrasy is found in the statement, which will be recognized as exact by all readers of Thackeray, that " his change of retrospective feeling about his schooldays was very characteristic. In his earlier books he always spoke of the Charterhouse as Slaughter House and Smithfield. As he became famous and prosperous his memory softened, and Slaughter House was changed into Grey Friars, where Colonel Newcome ended his life." Even in the earlier references the bitterness which has often been so falsely read into Thackeray is not to be found. In " Mr and Mrs Frank Berry " {Men's Wives) there is a description of a fight at Slaughter House following on an incident almost identical with that used in Vanity Fair for the fight between Dobbin and Cuff. In both cases the brutality of school life, as it then was, is very fully recognized and described, but not to the exclusion of the chivalry which may go alongside with it. In the first chapter of " Mr and Mrs. Frank Berry," Berry himself and old Hawkins both have a touch of the heroic, and in this story the bully whom Berry gallantly challenges is completely defeated, and one hears no more of him. In Vanity Fair Cuff the swaggerer is defeated as completely as is Berry's opponent, but regains his popularity by one well-timed stroke of magnanimity, and afterwards shows the truest kindness to his conqueror. Thackeray left Charter- house in 1828 to join his mother and her husband at Larkbeare in Devonshire, near Ottery St Mary. Ottery St Mary is the

" Clavering St Mary," as Exeter and Sidmouth are respectively the " Chatteris " and " Baymouth " of Pendennis.

In February 1829 Thackeray went to Trinity College, Cam- bridge, and in that year contributed some engaging lines on " Timbuctoo," the subject for the Prize Poem (the prize for which was won in that year by Tennyson), to a little paper called The Snob, a title which Thackeray afterwards utilized in the famous Book of Snobs. The first stanza has become

tolerably well known, but is worth quoting as an early instance of the direct comic force afterwards employed by the author in verse and prose burlesques: —

" In Africa — a quarter of the world — Men's skins are black ; their hair is crisp and curled ; And somewhere there, unknown to public view, A mighty city lies, called Timbuctoo."

One other passage at least in The Snob, in the form of a skit on a paragraph of fashionable intelligence, seems to bear traces of Thackeray's handiwork. At Cambridge, James Spedding, Monckton Milnes (Lord Houghton), Edward FitzGerald, W. H. Thompson (afterwards Master of Trinity), and others who made their mark in later life, were among his friends. In 1830 he left Cambridge without taking a degree, and went to Weimar and to Paris. His visit to Weimar bore fruit in the keen sketches of life at a small German court which appear in Fitz- Boodle's Confessions and in Vanity Fair. In G. H. Lewes's Life of Goethe is a letter containing Thackeray's impressions of the German poet. On his return to England in 1831 he entered the Middle Temple. He did not care to pursue the study of the law, but he found in his experience of the Temple the material for some capital scenes in Pendennis. In 1832 he came of age, and inherited a sum which, according to Trollope, " seems to have amounted to about five hundred a year." The money was soon lost — some in an Indian bank, some at play and some in two newspapers, The National Standard (with a long sub-title) and The Constitutional. In Lovel the Widower these two papers are indicated under one name as The Museum, in connexion with which our friends Honeyman and Sherrick of The Newcomes are briefly brought in. Thackeray's adventures and losses at play were utilized in his literary work on three occasions, in "A Caution to Travellers" {The Paris Sketch- Book), in the first of the Deuceace narrations {The Memoirs of Mr C. J. Yellow plush), and in Pendennis, vol. ii. chap, v., in a story (wherein Deuceace reappears) told to Captain Strong by " Colonel Altamont." As to Deuceace, Sir Theodore Martin has related how once in the playrooms at Spa Thackeray called his attention to a certain man and said presently, " That was the original of my Deuceace."

In 1834 or at the end of 1833 Thackeray established himself in Paris in order to study art seriously. He had, like Clive in The Newcomes, shown talent as a caricaturist from his early boyhood. His gift proved of great value to him in illustrating much of his own literary work in a fashion which, despite all incorrectness of draughtsmanship, conveyed vivid suggestions that could not have been so well given by anyone but himself. Perhaps his pencil was at its best technically in such fantastic work as is found constantly in the initial letters which he fre- quently used for chapters in his various kinds of work, and in those drawings made for the amusement of some child friends which were the origin of The Rose and the Ring.

In 1836 Thackeray married Isabella, daughter of Colonel Matthew Shawe. There were three daughters born of the marriage, one dying in infancy. The eldest daughter, Anne Isabella (b. 1837), married in 1877 Mr Richmond Ritchie, of the India Office, who in 1007 was created a K.C.B. She inherited literary talent from her father and wrote several charming works of fiction, notably Miss Angel (1875), and subse- quently edited Thackeray's works and published some volumes of criticism and reminiscences. The younger daughter, Harriet Marian (b. 1840), married (Sir) Leslie Stephen in 1867 and died in 1875. Thackeray's own family life was early broken, for Mrs Thackeray, to quote Trollope, " became ill and her mind

failed her," in 1840, and he " became as it were a widower to the end of his days "; Mrs Thackeray did not die till 1892.

In 1837 Thackeray came to London, worked at various kinds of journalism, and became a regular contributor to Fraser's Magazine. In this in 1841 appeared The History of Mr Samuel Tilmarsh and the Great Hoggarty Diamond, a work filled with instances

of the wit, humour, satire, pathos, which found a more ordered if not a fresher expression in his later and longer works. For freshness, indeed, and for a fine perception which enables the author to perform among other feats that of keeping up throughout the story the curious simplicity of its supposed narrator's character, The Great Hoggarty Diamond can scarcely be surpassed. The characters, from Lady Drum, Lady Fanny Rakes, Lady Jane and Edmund Preston, to Brough, Mrs and Miss Brough, Mrs Roundhand, Gus Hoskins, and, by no means least. Samuel Titmarsh's aunt, Mrs Hoggarty, with her store of " Rosolio," are full of life; the book is crammed with honest fun; and for pure pathos, the death of the child, and the meeting of the husband and wife over the empty cradle, stands, if not alone in its own line, at least in the company of very few such scenes in English fiction. The Great Hoggarty Diamond, oddly enough, met with the fate that afterwards befell one of Lever's best stories which appeared in a periodical week by week — it had to be cut short at the bidding of the editor. In 1840 came out The Paris Sketch-Book, much of which had been written and published at an earlier date. The book contains among other things some curious divagations in criticism, along with some really fine critical work, and a very powerful sketch called " A Gambler's Death." In 1838 Thackeray had begun, in Fraser, The Y ellowplush Papers, with their strange touches of humour, satire, tragedy (in one scene, the closing one of the history of Mr Deuceace), and their sublimation of fantastic bad spelling (M'Arony for macaroni is one of the typical touches of this) ; and this was followed by Catherine, a strong story, and too disagreeable perhaps for its purpose, founded closely on the actual career of a criminal named Catherine Hayes, and intended to counteract the then growing practice of making ruffians and harlots prominent characters in fiction. Now, when Pendennis was coming out in serial form (1850), Miss Catherine Hayes, a singer of Irish birth and a famous prima donna (Sims Reeves described her as " the sweetest Lucia [di Lammermoor] he had ever sung with ") was much before the public. A reflective

passage in a number of Pendennis referred indignantly and scornfully to Catherine Hayes, the criminal of old time, coupling her name with that of a then recently notorious murderer. It would appear that Thackeray had for the moment, oddly enough, omitted to think of Miss Catherine Hayes, the justly famed soprano, while certain Irish folk were obviously ignorant or oblivious of the history of Catherine Hayes the murderess. Anyhow, there was a great outcry in the Irish press, and Thackeray was beset by private letters of indignation from enthusiastic compatriots of the prima donna. In deference to susceptibilities innocently outraged Thackeray afterwards suppressed the passage which had given offence. The thing is worth mention if only because it explains the initial letter drawn by Thackeray for chap, xv., vol. ii., of Pendennis. The drawing is in itself highly comic, but must seem quite meaning- less without the key.

There soon followed Fiiz-Boodle's Confessions and Professions, including the series Men's Wives, already mentioned; and slightly before these, the Shabby Genteel Story, a work inter- rupted by Thackeray's domestic affliction and afterwards re-published as an introduction to The Adventures of Philip, which took up the course of the original story many years after the supposed date of its catastrophe. In 1843 also came out the Irish Sketch-Book, and in 1844 appeared the account of the journey From Cornhill to Grand Cairo, in which was included the excellent poem of " The White Squall." In 1844 there began in Fraser the Memoirs of Barry Lyndon, called in the magazine " The Luck of Barry Lyndon, a Romance of the Last Century." " Barry Lyndon " has, with a very great difference in treatment, some resemblance to Smollett's " Ferdinand,

Count Fathom " — the hero, that is to say, is or becomes a most intolerable scoundrel, who is magnificently unconscious of his own iniquity. The form and pressure of the time depicted are caught with striking verisimilitude, and in the boyish career of Barry Lyndon there are fine touches of a

wild chivalry, simplicity, generosity, which mingle naturally with those worse qualities that, under the influence of abominable training, afterwards corrupt his whole mind and career. The man is so infatuated with and so blind to his own roguery, he has so much dash and daring, and is on occasions so infamously treated, that it is not easy to look upon him as an entirely detestable villain until, towards the end of his course, he be- comes wholly lost in brutish debauchery and cruelty. His latter career is founded on that of Andrew Robinson Stoney Bowes, who married the widow of John, 9th earl of Strathmore. There is also no doubt a touch of Casanova in Barry Lyndon's character. Thackeray became a contributor to Punch within the first year of its existence. John Leech, who was one of the earliest contributors, had been at Charterhouse with Thackeray and the two men were friends through life. Thack- eray's first series contributed to Punch did not attain or indeed deserve signal success. He made his first hit with Jeames's Diary, begun in November 1845, and may be said to have estab- lished his reputation by the Snob Papers (1846), now better known as The Book of Snobs. These, besides greatly improving Thackeray's position, provoked much discussion of various kinds. Thackeray himself was naturally accused of being a snob. To this charge he had partly given an anticipatory answer (in the third chapter) in the statement that "it is im- possible, in our condition of society, not to be sometimes a Snob," and in giving the name of " Mr Snob " to the supposed historian of snobs throughout the series. Thackeray's con- nexion with Punch came practically to an end in 1851. The severance was due partly to differences in political opinion. His personal relations with the staff of Punch always remained cordial. Special mention may be made of one other contribu- tion of his to the paper, " Punch's Prize Novelists," containing some brilliant parodies of Edward Lytton Bulwer, Lever, Benjamin Disraeli (in " Codlingsby," perhaps the most perfect of the series), and others. Among minor but admirable works of the same period are found A Legend of the Rhine (a burlesque of the great Dumas's Othon I' Archer),

brought out in George Cruikshank's Table Book, edited by Gilbert Abbott A Beckett, Cox's Diary (on which has been founded a well-known Dutch comedy, Janus Tulp), and The Fatal Boots. This is the most fitting moment for naming also Rebecca and Rowena, which towers, not only over Thackeray's other burlesques, excellent as they are, but over every other burlesque of the kind ever written. Its taste, its wit, its pathos, its humour, are unmaitch- able; and it contains some of the best songs of a particular kind ever written — songs rivalled only by Peacock's best of the same sort. In 1846 was published, by Messrs Bradbury and Evans, the first of twenty-four numbers of Vanity Fair, the work which first placed Thackeray in his proper position before the public as a novelist and writer of the first rank. It was completed in 1848, when Thackeray was thirty-seven years old; and in the same year Abraham Hayward paid a tribute to the author's powers in the Edinburgh Review. It is probable that on Vanity Fair has been largely based the foolish cry, now heard less and less frequently, about Thackeray's cynicism, a cry which he himself, with his' keen knowledge of men, foresaw and provided against, amply enough as one might have thought, at the end of the eighth chapter, in a passage which is perhaps the best commentary ever written on the author's method. He has explained how he wishes to describe men and women as they actually are, good, bad and indifferent, and to claim a privilege.

"Occasionally to step down from the platform, and talk about them; if they are good and kindly, to love and shake them by the hand ; if they are silly, to laugh at them confidentially in the reader's sleeve; if they are wicked and heartless, to abuse them in the strongest terms politeness admits of. Otherwise you might fancy it was I who was sneering at the practice of devotion, which

Miss Sharp finds so ridiculous; that it was I who

laughed good- humouredly at the railing old Silenus of a baronet — whereas the laughter comes from one who has no reverence except for pros- perity, and no eye for anything beyond success. Such people there are living and flourishing in the world — Faithless, Hopeless, Charityless: let us have at them, dear friends, with might and main. Some there are, and very successful too, mere quacks and fools; and it was to combat and expose such as those, no doubt, that laughter was made."

As to another accusation which was brought against the book when it first came out, that the colours were laid on too thick, in the sense that the villains were too villainous, the good people too goody-goody, the best and completest answer to that can be found by anyone who chooses to read the work with care. Osborne is, and is meant to be, a poor enough creature, but he is an eminently human being, and one whose poorness of character is developed as he allows bad influences to tell upon his vanity and folly. The good in him is fully recog- nized, and comes out in the beautiful passage describing his farewell to Amelia on the eve of Waterloo, in which passage may be also found a sufficient enough answer to the statement that Amelia is absolutely insipid and uninteresting. So with the companion picture of Rawdon Crawley's farewell to Becky Sharp: who that reads it can resist sympathy, in spite of Rawdon's vices and shady shifts for a living, with his simple bravery and devotion to his wife? As for Becky, a character that has since been imitated a host of times, there is certainly not much to be said in her defence. We know of her, to be sure, that she thought she would have found it easy to be good if she had been rich, and we know also what happened when Rawdon, released without her knowledge from a spunging- house, surprised her alone with and singing to Lord Steyne in the house in Mayfair. After a gross insult from Steyne, " Rawdon Crawley, springing out, seized him by the neckcloth, until Steyne, almost strangled, writhed and bent under his arm. ' You lie, you dog,' said Rawdon ; ' you lie, you coward and villain!' And he struck the peer

twice over the face with his open hand, and flung him bleeding to the ground. It was all done before Rebecca could interpose. She stood there trembling before him. She admired her' husband, strong, brave, and victorious." This admiration is, as Thackeray himself thought it, the capital touch in a scene which is as powerful as any Thackeray ever wrote — as powerful, indeed, as any in English fiction. Its full merit, it may be noted in passing, has been curiously accented by an imitation of it in Alphonse Daudet's Fromont Jeune et Risler Aim. As to the extent of the miserable Becky's guilt in the Steyne matter, Thackeray leaves it practically open to the reader to form what conclusion he will. There is, it should be added, a distinct touch of good in Becky's conduct to Amelia at Ostend in the last chapter of the book, and those who think that too little punishment is meted out to the brilliant adventuress in the end may remember this to her credit. It is supreme art in the treat- ment of her character that makes the reader understand and feel her attractiveness, though he knows her extraordinarily evil qualities; and in this no writer subsequent to Thackeray who has tried to depict one of the genus Becky Sharp has even faintly succeeded. Among the minor characters there is not one — and this is not always the case even with Thackeray's chief figures — who is incompletely or inconsistently depicted; and no one who wishes fully to understand and appreciate the book can afford to miss a word of it.

Vanity Fair was followed by Pendennis, Esmond and The Newcomes. which appeared respectively in 1850, 1852 and 1854. It might be more easy to pick holes critically in Pendennis than in Vanity Fair. Pendennis himself, after his boyish passion and university escapades, has disagreeable touches of flabbiness and worldliness; and the important episode of his relations with Fanny Bolton, which Thackeray could never have treated otherwise than delicately, is so lightly and tersely handled that it is a little vague even to those who read between the lines. It can hardly be said that there is adequate preparation for the final announcement that

those relations have been innocent,

and one can hardly see why it should have been so long delayed. This does not, of course, affect the value of the book as a picture of middle- and upper-class life of the time, the time when Vaux- hall still existed, and the haunt for suppers and songs which Thackeray in this book called the Back Kitchen, and it is a picture filled with striking figures. In some of these, notably in that of Foker, Thackeray went, it is supposed, very close to actual life for his material, and in that particular case with a most agreeable result. As for the two " umbrae " of Lord Steyne, it is difficult to believe that they were intended as caricatures of two well-known persons. If they were, for once Thackeray's hand forgot its cunning. Here, as in the case of Amelia Sedley (Vanity Fair), the heroine has been thought a little insipid; and there may be good ground for finding Laura Pendennis dull, though she has a spirit of her own. In later books she becomes, what Thackeray's people very seldom are, a tiresome as well as an uninviting person. Costigan is unique, and so is Major Pendennis, a type which, allowing for differences of periods and manners, will exist as long as society exists, and which has been seized and depicted by Thackeray as by no other novelist. The Major's two encounters, from both of which he comes out victorious, one with Costigan in the first, the other with Morgan in the second volume, are true touches of genius. In opposition to the worldliness of the Major, with which Pendennis does not escape being tainted, we have Warrington, whose nobility of nature has come unscathed through a severe trial, and who, a thorough gentleman if a rough one, is really the guardian of Pendennis's career. There is, it should be noted, a characteristic and acknowledged confu- sion in the plot of Pendennis, which will not spoil any intelligent reader's pleasure.

Probably most readers of The Newcomes (1854) to whom the book is mentioned think first of the fine, chivalrous and simple figure of Colonel Newcome, who stands out in the relief of almost ideal beauty of

character against the crowd of more or less imperfect and more or less base personages who move through the novel. At the same time, to say, as has been said, that this book " is full of satire from the first to the last page " is to convey an impression which is by no means just. There is plenty of kindliness in the treatment of the young men who, like Clive Newcome himself and Lord Kew, possess no very shin- ing virtue beyond that of being honourable gentlemen; in the character of J. J. Ridley there is much tenderness and pathos, and no one can help liking the Bohemian " F. B.," and looking tolerantly on his failings. It may be that there is too close an insistence on the fiendish temper of Mrs Mackenzie and on the sufferings she inflicts on the colonel; but it must be remembered that this heightens the singular pathos of the closing scenes of the colonel's life. It has seemed convenient to take The Newcomes after Pendennis, because Pendennis and his wife reappear in this book as in The Adventures of Philip; but Esmond (1852) was written and published before The Newcomes. To some students Esmond seems and will seem Thackeray's capital work. It has not been rivalled as a romance repro- ducing with unfailing interest and accuracy the figures, manners and phrases of a past time, and it is full of beautiful touches of character. But Beatrix, upon whom so much hinges, is an unpleasing character, although one understands fully why men were captivated by her insolent beauty and brilliancy; and there is some truth in Thackeray's own saying, that " Esmond was a prig." Apart from this, the story is, like the illusion of a past time in the narrative, so complete in all its details, so harmoniously worked out, that there is little room for criticism. As to Esmond's marriage with the lady whom he has served and loved as a boy, that is a matter for individual judgment. Beatrix, it has been indicated above, is wonderfully drawn: and not the least wonderful thing about her is her reappearance as the jaded, battered, worldly, not altogether unkindly, Baroness in The Virginians. It was just what Beatrix must have come to, and her decline is handled with the lightest and finest touch. In 1851

Thackeray had written The English Humourists 0} the Eighteenth Century, delivered as a series of lectures at Willis's

Rooms in the same year, and re-delivered in the United States in 1852 and 1853, as was afterwards the series called The Four Georges. Both sets were written for the purpose of lecturing. In 1854 was published a most delightful burlesque, The Rose and the Ring, whereof the origin has already been mentioned. In 1857 Thackeray stood unsuccessfully as a parliamentary candidate for Oxford against Mr Cardwell, and in the same year appeared the first number of The Virginians, a sequel to Esmond. This is a most unequal work — inferior, as sequels are apt to be, to Esmond as an historical romance, less compact and coherent, prone to divagation and desultoriness, yet charm- ing enough in its lifelikeness, in tl»e wit and wisdom of its re- flexions, and, as has been said, in its portrait of Beatrix grown old. The last number of The Virginians came out in 1859, and in the same year Thackeray undertook the editorship of the Cornhill Magazine. This was a task which, as readers of his Roundabout Paper " Thorns in the Cushion " will remember, the kindliness and sensitiveness of his disposition made irksome to him, and he resigned the editorship in April 1862, though he continued to write for the magazine until he died. In the Cornhill appeared from his pen Lovel the Widower, previously written, with different names for some of the personages, in dramatic form; The Adventures of Philip (1861-62); the Roundabout Papers; and (1860-63) the story, unhappily never finished, called Denis Duval. Lovel the Widower, changed from the dramatic to the narrative form, remains a piece of high comedy in which the characters are indicated rather than fully worked out, with a bold and practised touch. The Round- about Papers, a small storehouse of some of Thackeray's best qualities as an essayist, came out in the Cornhill Magazine simultaneously with Lovel

the Widower and with The Adventures of Philip. Among these papers is one differing in form from the rest, called " The Notch on the Axe — a Story a la Mode." It is an almost perfect specimen of the author's genius for burlesque story-telling; but it contains an odd instance, which a careful reader will not fail to discover, of that odd habit of inaccuracy of which Thackeray himself was conscious. The Adventures of Philip is, as has been before said, in the nature of a sequel to or a completion of A Shabby Genteel Story. As with the other direct sequel, it is a work of great inequality. It contains scenes of humour, pathos, satire, which rank with Thackeray's best work; some old friends from others of the novels make brief but pleasant reappearances in its pages; there are fine sketches of journalistic, artistic and diplomatic life, and the scene from the last-named in Paris is inimitable. The Little Sister is altogether delightful; the Twysden family are terribly true and vastly diverting; the minor characters, among whom old Ridley, " J. J.'s " father, should be mentioned, are wonder- fully hit off; nor did Thackeray ever write a better scene , than that of the quarrel between Bunch, Baynes and M'Whirter in the Paris pension. Philip himself is impossible; one cannot say that the character is ill-drawn — it is not drawn at all. It is an entirely different personage in different chapters; and it has here and there a very unpleasant touch which may perhaps have come of rapid writing. Yet so admirable are many parts of the book that Philip cannot be left out of the list of Thack- eray's most considerable works. Denis Duval, which reached only three numbers, promised to be a first-rate work, more or less in the Esmond manner. The author died while it was in progress, on the day before Christmas day 1863. He was buried in Kensal Green, and a bust by Marochetti was put up to his memory in Westminster Abbey.

Little has yet been said of Thackeray's performances in poetry. They formed a small but not the least significant part of his life's work. The grace and the apparent spontaneity of his versification are

beyond question. Some of the more serious efforts, such as " The Chronicle of the Drum " (1841). are full of power, and instinct with true poetic feeling. Both the half- humorous, half-pathetic ballads and the wholly extravagant ones must be classed with the best work in that kind; and the translations from Beranger are as good as verse translations can be. Thackeray had the true poetic instinct, and proved

it by writing poetry which equalled his prose in grace and feeling.

There can be little doubt that Thackeray will always be ranked among the foremost English' writers of fiction, or that his more infrequent work as essayist and poet will go hand in hand with his wider achievements as a novelist. Many attempts have been made at many times to institute a comparison be- tween Thackeray and Dickens as novelists. In truth it would be as much to the purpose, to borrow a homely metaphor, to compare chalk with cheese. The two authors were so radically different in their purviews, in their modes of thought, in their methods of expression, that critical comparison between them is of its nature absolutely unprofitable. It is better to recognize simply that the two novelists stood, each in his own way, distinctly above even their most distinguished con- temporaries. As to preference, that is a matter with which criticism has nothing, and individual inclination has every- thing, to do.

The books of reference that can be best commended to the student of Thackeray's life and works are Mcrivale and Marzials' Life of Thackeray (1891); R. H. Shepherd, Bibliography of Thackeray (1880); C. P. Johnson, The Early Writings of Thackeray (1888); Charles Whibley's Thackeray (1905), a critical commentary; the edition of Thackeray's Works with biographical introductions (1897-1900), by his daughter, Lady Ritchie; the Life of Thackeray (" English Men of Letters Series," 1899) by Anthony Trollope. It is curious that Trollope showed in his own Autobiography far more appreciation of

Thackeray's great qualities than is apparent in the formal Life. (W. H. P.)

THAIS, a Greek courtesan, who lived during the time of Alexander the Great. She accompanied him on his Asiatic campaign, and is chiefly known from the story which represents her as having persuaded the conqueror to set fire to the city of Persepolis. This anecdote forms the subject of Dryden's Ode to Saint Cecilia's Day. But its authenticity is doubtful, since it is based upon the authority of Cleitarchus, one of the least trustworthy of the historians of Alexander. Thai's subse- quently became the wife of Ptolemy Lagus, king of Egypt. Numerous anecdotes and witticisms attributed to her will be found in Athenaeus.

See Diod. Sic. xvii. 72; Plutarch, Alexander, 38; Athenaeus xiii. 576, 585 ; Quintus Curtius v. 7.

THALBERG, SIGISMOND (1812-1871), German pianist and composer, was born at Geneva in 181 2 (May the 5th or January the 7th). In 1822 he was taken to Vienna, where, under the watchful care of Count Dietrichstein, his education was com- pleted. He made his first appearance as a pianist at Prince Metternich's in 1826, and published his first composition — a Fantasia on Airs from " Euryanthe " — in 1828, but it was not until 1830 that he was first fairly introduced to the public, with such brilliant success that from that time forward his only rival was Liszt (q.v.). In 1834 he was appointed " kammer- virtuos " to the emperor of Austria. He first appeared in Paris in 1837; and in 1838 he went to England, astonishing his hearers with the novel effects produced in his Variations on God Save the Queen, while he charmed them with his delicate touch and the purity of his expression. Thenceforward his career was a succession of triumphs. In order to disprove the popular idea that he could execute no music but his own, he played Beethoven's Concerto in C minor (Op. 37) at the London Wednesday Concerts, held in 1846-47 at Exeter Hall, with a keen intelligence which proved his power of interpreting the works of the great masters

to be at least on a level with his wonderful technique. Besides his pianoforte compositions, which are almost innumerable, Thalberg produced two operas — Cristina, which proved a complete failure, and Florinda, which fared but little better at Her Majesty's Theatre in 1851. He played in London for the last time in 1863, and afterwards retired to his estate near Naples. He died at Naples on the 27th of April 1871.

• THALE, a town of Germany, in the Prussian province of Saxony, charmingly situated under the northern declivity of the Harz Mountains, 8 m. by rail S.W. of Quedlinburg, at the entrance to the romantic gorge of the Bode, and in the

immediate vicinity of the Rosstrappe, the Hexeatanzplatz and other notable points in the Harz. Pop. (1905) 13,194. It is largely frequented as a summer resort and for its saline springs. It is also a brisk manufacturing centre, its chief pro- ducts being enamelled goods, iron-ware and machinery.

THALES OF MILETUS (640-546 B.C.), Greek physical philo- sopher, son of Examyus and Cleobuline, is universally recog- nized as the founder of Greek geometry, astronomy and philo- sophy. He is said by Herodotus and others to have been of Phoenician extraction, but the more common account (see Diogenes Laertius) is that he was a native Milesian of noble birth. Zeller thinks that his ancestors belonged to the Cadmean tribe in Boeotia, who were intermingled with the Ionians of Asia Minor, and thus reconciles the conflicting statements. The nationality of Thales is certainly Greek and not Phoenician. The high estimation in which he was held by his contemporaries is shown by the place he occupied as chief of the seven " wise men " of Greece; and in later times amongst the ancients his fame was quite remarkable. It is well known that this name (6$) was given on account of practical

ability; and in accord- ance with this we find that Thales had been occupied with civil affairs, and indeed several instances of his political sagacity have been handed down. Of these the most remarkable is the advice, praised by Herodotus, which he gave to his fellow- countrymen ” before Ionia was ruined ” — ” that the Ionians should constitute one general council in Teos, as the most central of the twelve cities, and that the remaining cities should nevertheless be governed as independent states ” (Herod, i. 170). It is probable, however, that in the case of Thales the appella- tion ” wise man,” which was given to him and to the other six in the archonship of Damasius (586 B.C.), 1 was conferred on him not only on account of his political sagacity, but also for his scientific eminence (Plut. Solon, c. 3). To about the same time must be referred his celebrated prediction of the eclipse of the sun, which took place on the 28th of May 585 B.C. This event, which was of the highest importance, has given rise to much discussion. The account of it as given by Herodotus (i. 74) contains two statements: — (1) the fact that the eclipse did actually take place during a battle between the Medes and the Lydians, that it was a total eclipse (Herodotus calls it a ” night battle "), that it caused a cessation of hostilities and led to a lasting peace between the contending nations; (2) that Thales had foretold the eclipse to the Ionians, and fixed the year in which it actually did take place. Various dates — ranging from 625 B.C. to 583 b.c. — have been assigned by different chrono- logists to this eclipse; but, since the investigations of Airy, 2 Hind, 3 and Zech, 4 the date determined by them (May 28, 585 B.C.) has been generally accepted (for later authorities see Eclipse and Astronomy). This date agrees nearly with that given by Pliny (H. N. ii. 12). The second part of the statement of Herodotus — the reality of the prediction by Thales — has been frequently called in question, chiefly on the ground that, in order to predict a solar eclipse with any chance of success, one should have the command of certain astronomical facts which were not known until the 3rd century

B.C., and then merely approximately, and only employed with that object in the following century by Hipparchus. The question, how- ever, is not whether Thales could predict the eclipse of the sun with any chance of success — much less whether he could state beforehand at what places the eclipse would be visible, as some have erroneously supposed, and which of course would have been quite impossible for him to do, but simply whether he

1 Bretschneider (Die Geom. vor Euklides, p. 40), without stating his authority, gives " between 585 and 583 B.C." as the date of the archonship of Damasius. In this he is followed by some other recent writers, who infer thence that the name " wise " was con- ferred on Thales on account of the success of his prediction. The date 586 B.C., given above, which is taken from Clinton, is adopted by Zeller.

2 " On the Eclipses of Agathocles, Thales, and Xerxes," Phil. Trans, vol. cxliii. p. 179 seq., 1853.

3 Athenaeum, p. 919, 1852.

4 Aslronomische Untersuchungen der wichtigeren Finsternisse, &c, P- 57, 1853.

foretold that there would be a solar eclipse in that year, as stated by Herodotus. Now as to this there is quite a remarkable unanimity in the testimony of the ancients, and the evidence is of the strongest kind, ascending to Herodotus, and, according to the account of Diogenes Laertius, even to Xenophanes, who was an Ionian, and not much later than Thales. Further, we know that in the 8th century B.C., there were observatories in most of the large cities in the valley of the Euphrates, and that professional astronomers regularly took observations of the heavens, copies of which were sent to the king of Assyria; and from a cuneiform inscription found in the palace of Senna- cherib at Nineveh, the text «f which is given by George Smith, 6 we learn that at that time the epochs of eclipses of both sun and

moon were predicted as possible— probably by means of the cycle of 223 lunations or Chaldaean Saros — and that observa- tions were made accordingly.

The wonderful fame of Thales amongst the ancients must have been in great part due to this achievement, which seems, more- over, to have been one of the chief causes that excited amongst the Hellenes the love of science which ever afterwards char- acterized them. Thales seems not to have left any writings behind him, though as to this there appears to be some doubt (see Diog. Laer. i. 23). Many anecdotes, amusing rather than instructive, are related of him, which have been handed down by Diogenes Laertius and other writers. From some of them it would appear that he was engaged in trade, which is indeed expressly stated by Plutarch (Solon, c. 2). It is probable that in the pursuit of commerce he was led to visit Egypt. Of the fact that Thales visited Egypt, and there became acquainted with geometry, there is abundant evidence. Hieronymus of Rhodes (ap. Diog. Laer. i. 27) says, " he never had any teacher except during the time when he went to Egypt and associated with the priests." 6

But the characteristic feature of the work of Thales was that to the knowledge thus acquired he added the capital creation of the geometry of lines, which was essentially abstract in its character. The only geometry known to the Egyptian priests was that of surfaces, together with a sketch of that of solids, a geometry consisting of some simple quadratures and elementary cubatures, which they had obtained empirically. Thales, on the other hand, introduced abstract geometry, the object of which is to establish precise relations between the different parts of a figure, so that some of them could be found by means of others in a manner strictly rigorous. This was a phenomenon quite new in the world, and due, in fact, to the abstract spirit of the Greeks.

The following discoveries in geometry are attributed to Thales : —

(1) the circle is bisected by its diameter (Procl. op. cit. p. 157);

(2) the angles at the base of an isosceles triangle are equal (Id. p. 250) ; (3) when two straight lines cut each other the vertically opposite angles are equal (Id. p. 299); (4) the angle in a semi- circle is a right angle; 7 (5) the theorem Euclid i. 26 is referred to Thales by Eudemus (Procl. op. cit. p. 352). Two applications of geometry to the solution of practical problems are also attri- buted to him: — (1) the determination of the distance of a ship at sea, for which he made use of the last theorem; (2) the deter- mination of the height of a pyramid by means of the length of its shadow: according to Hieronymus of Rhodes (Diog. Laer. i. 27) and Pliny (N. H. xxxvi. 12), the shadow was measured at the hour of the day when a man's shadow is the same length as him- self. Plutarch, however, states the method in a form requiring the knowledge of Euclid vi. 4, but without the restriction as to the hour of the day (Sept. Sap. Conviv. 2). Further, we learn from Diogenes Laertius (i. 25) that he perfected the things relating to the scalene triangle and the theory of lines. Proclus, too, in his summary of the history of geometry before Euclid, which he prob- ably derived from Eudemus of Rhodes, says that Thales, having visited Egypt, first brought the knowledge of geometry into Greece,

5 Assyrian Discoveries, p. 409.

6 Cf. Pamphila and the spurious letter from Thales to Pherecydes, ap. Diog. Laer. ; Proclus, In primum Euclidis Elementorum Librum Commentarii, ed. Friedlein, p. 65; Pliny, H. JV. xxxvi. 12; Iam- blichus, In Vit. Pythag. 12; Plutarch, Sept. Sap. Conviv. 2, De Iside, 10, and Plac. i. 3, 1.

7 This is unquestionably the meaning of the statement of Pamphila (temp. Nero), ap. Diog. Laer. i. 24, that he was the first person to describe a right-angled triangle in a circle.

that he discovered many things himself, and communicated the beginnings of many to his successors, some of which he attempted in a more abstract manner (naffoXiKiirtpov) and some in a more intuitional or sensible manner {aiaOrj-iKartpov) (op. cit. p. 65).

From these indications it is no doubt difficult to determine what Thales brought from Egypt and what was due to his own inven- tion. This difficulty has, however, been lessened since the trans- lation and publication of the papyrus Rhirid by Eisenlohr; 1 and it is now generally admitted that, in the distinction made in the last passage quoted above from Proclus, reference is made to the two forms of his work — alaBTyruiuiTtpov pointing to what he derived from Egypt or arrived at in an Egyptian manner, while KoBokiKUTtpov indicates the discoveries which he made in accord- ance with the Greek spirit. To the former belong the theorems (1), (2), and (3), and to the latter especially the theorem (4), and also, probably, his solution of the two practical problems. We infer, then, [1] that Thales must have known the theorem that the sum of the three angles of a triangle are equal to two right angles. This inference is made from (4) taken along with (2). No doubt we are informed by Proclus, on the authority of Eudemus, that the theorem Euclid i. 32 was first proved in a general way by the Pythagoreans; but, on the other hand, we learn from Geminus that the ancient geometers observed the equality to two right angles in each kind of triangle — in the equilateral first, then in the isosceles, and lastly in the scalene (Apoll. Conica, ed. Halleius, p. 9), and it is plain that the geometers older than the Pythagoreans can be no other than Thales and his school. The theorem, then, seems to have been arrived at by induction, and may have been suggested by the contemplation of floors or walls covered with tiles of the form of equilateral triangles, or squares, or hexagons. [2] We see also in the theorem (4) the first trace of the important conception of geometrical loci, which

we, there- fore, attribute to Thales. It is worth noticing that it was in this manner that this remarkable property of the circle, with which, in fact, abstract geometry was inaugurated, presented itself to the imagination of Dante : —

O se del mezzo cerchio far si puote Triangol si, ch'un retto non avesse."

-Par. c. xiii. 101.

[3] Thales discovered the theorem that the sides of equiangular triangles are proportional. The knowledge of this theorem is dis- tinctly attributed to Thales by Plutarch, and it was probably made use of also in his determination of the distance of a ship at sea.

Let us now consider the importance of the work of Thales.

I. In a scientific point of view: (a) we see, in the first place, that by his two theorems he founded the geometry of lines, which has ever since remained the principal part of geometry; (b) he may, in the second place, be fairly considered to have laid the founda- tion of algebra, for his first theorem establishes an equation in the true sense of the word, while the second institutes a proportion. 2

II. In a philosophic point of view: we see that in these two theorems of Thales the first type of a natural law, i.e. the expression of a fixed dependence between different quantities, or, in another form, the disentanglement of constancy in the midst of variety — has decisively arisen. 3 III. Lastly, in a practical point of view: Thales furnished the first example of an application of theoretical geometry to practice, 4 and laid the foundation of an important branch of the same — the measurement of heights and distances. For the further progress of geometry see Pythagoras.

As to the astronomical knowledge of Thales we have the follow- ing notices: — (1) besides the

prediction of the solar eclipse, Eudemus attributes to him the discovery that the circuit of the sun between the solstices is not always uniform ; '" (2) he called the last day of the month the thirtieth (Diog. Laer. i. 24) ; (3) he divided the year into 365 days (Id. i. 27) ; (4) he determined the diameter of the sun to be the 720th part of the zodiac; 6 (5) he appears to have pointed out the constellation of the Lesser Bear to his countrymen, and instructed them to steer by it [as nearer the pole] instead of the Great Bear (Callimachus ap. Diog. Laer. i 23; cf. Aratus, Pkaenomena, v. 36 seq.). Oth?r discoveries in astronomy are attributed to Thales, but on authorities which are not trustworthy. He did not know, for example, that " the earth is spherical," as is erroneously stated by Plutarch (Placita, iii. 10); on the contrary, he conceived it to be a flat disk, and in this sup-position he was followed by most of his successors in the Ionian schools, including Anaxagoras. The doctrine of the sphericity of

1 Ein mathematisches Handbuch der alien Aegypter (Leipzig, 1877).

2 Auguste Comte, Systeme de Politique Positive, iii. pp. 297, 300.

3 P. Laffitte, Les Grands Types de I Humanite, vol. ii. p. 292.

4 Ibid., p. 294.

5 Theonis Smyrnaei Platonici Liber de Astronomia, cd. Th. H. Martin, p. 324 (Paris, 1849). Cf. Diog. La'r. i. 24.

6 This is the received interpretation of the passage in Diogenes Laertius, i. 24 (see Wolf, Gesch. der Astron., p. 169), where atK-qvaiov is probably a scribe's error for fcoSiaxoO. Cf. Apuleius, Florida, iv. 18, who attributes to Thales, then old, the discovery: " quotiens sol magnitudine sua circulum quern permeat metiatur."

the earth, for which the researches of Anaximander had prepared the way, 7 was in fact one of the great discoveries of Pythagoras, was taught by Parmenides, who was connected with the Pytha- goreans, and remained for a long time the exclusive property of the Italian schools. 8 (G. J. A.)

Philosophy. — Whilst in virtue of his political sagacity and intellectual eminence Thales held a place in the traditional list of the wise men, on the strength of the disinterested love of knowledge which appeared in his physical speculations he was accounted a " philosopher " (ipikoaocbos) . His " philosophy " is usually summed up in the dogma " water is the principle, or the element, of things "; but, as the technical terms" principle " (apxv) an d " element " (o-tolx& ov) had n °t yet come into use, it may be conjectured that the phrase " all things are water" (iravTa v8wp earl) more exactly represents his teaching. Writings which bore his name were extant in antiquity; but as Aristotle, when he speaks of Thales's doctrine, always depends upon tradition, there can be little doubt that they were forgeries.

From Aristotle we learn (1) that Thales found in water the origin of things; (2) that he conceived the earth to float upon a sea of the elemental fluid; (3) that he supposed all things to be full of gods; (4) that in virtue of the attraction exercised by the magnet he attributed to it a soul. Here our information ends. Aristotle's suggestion that Thales was led to his fundamental dogma by observation of the part which moisture plays in the production and the maintenance of life, and Simplicius's, that the impressibility and the binding power of water were perhaps also in his thoughts, are by admission purely conjectural. Simplicius's further suggestion that Thales conceived the ele- ment to be modified by thinning and thickening is plainly inconsistent with the statement of Theophrast.us that the hypo- thesis in question was peculiar to Anaximenes. The assertion preserved by Stobaeus that Thales recognized, together with the material element " water," " mind," which penetrates it and sets it in

motion, is refuted by the precise testimony of Aristotle, who declares that the early physicists did not distin- guish the moving cause from the material cause, and that before Hermotimus and Anaxagoras no one postulated -a creative intelligence.

It would seem, then, that Thales sought amid the variety of things a single material cause; that he found such a cause in one of the forms of matter most familiar to him, namely, water, and accordingly regarded the world and all that it contains as water variously metamorphosed; and that he asked himself no questions about the manner of its transformation.

The doctrine of Thales was interpreted and developed in the course of three succeeding generations. First, Anaximander chose for what he called his "principle" (apxh), not water, but a cor- poreal element intermediate between fire and air on the one hand and water and earth on the other. Next, Anaximenes, preferring air, resolved its transformations into processes of thinning and thickening. Lastly, Heraclitus asserted the claims of fire, which he conceived to modify itself, not occasionally, but perpetually. Thus Thales recognized change, but was not careful to explain it; Anaximander attributed to change two directions ; Anaximenes conceived the two sorts of change as rarefaction and condensation; Heraclitus, perceiving that, if, as his predecessors had tacitly assumed, change was occasional, the interference of a moving cause was necessary, made change perpetual. But all four agreed in tracing the variety of things to a single material cause, corporeal, endowed with qualities, and capable of self-transformation. A new departure was taken by the Eleatic Parmenides (q.v.), who, expressly noting that, when Thales and his successors attributed to the sup- posed element changing qualities, they became pluralists, required that the superficial variety of nature should be strictly distin- guished from its fundamental unity. Hence, whereas Thales and his successors had confounded the One, the element, and the Many, its modifications, the One and the Not-One or Many

became with Parmenides matters for separate investigation. In this way two lines of inquiry originated. On the one hand Empedocles and Anaxagoras, abandoning the pursuit of the One, gave themselves to the scientific study of the Many; on the other Zeno, abandoning the pursuit of the Many, gave himself to the dialectical study of the One. Both successions were doomed to failure; and the result

7 In likening the earth to a cylinder Anaximander recognized its ciicular figure in one direction.

8 See G. V. Schiaparelli, / Precursors di Copernico nell' Antichitd, p. 2 (Milan, 1873).

was a scepticism from which the thought of Greece did not emerge until Plato, returning to Parmenides, declared the study of the One and the Many, jointly regarded, to be the true office of philo- sophy. Thus, meagre and futile as the doctrine of Thales was, all the Greek schools, with the solitary exception of that of Pytha- goras, took their origin from it. Not in name only, but also in fact, Thales, the first of the Ionian physicists, was the founder of the philosophy of Greece.

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Parmenides. A. B. Krische, Forschungen, pp. 34 _ 4 2 (Gottingen, 1840). (H. Ja.)

THALLIUM [symbol Tl, atomic weight 204-0 (0 = i6)], a metallic chemical element. It was discovered in 1861 by Sir William Crookes, who, during a spectroscopic examination of the flue-dust produced in the roasting of seleniferous pyrites occurring at Tilkerode in the Harz, observed a green line foreign to all then known spectra. He concluded that the mineral contained a new element, to which he gave the name of thallium, from 0aXXcs, a green twig. Crookes presumed that his thallium was something of the order of sulphur, selenium or tellurium ; but Lamy, who anticipated him in isolating the new element, found it to be a metal. Our knowledge of the chemistry of thallium is based chiefly upon the labours of Crookes.

The chemical character of thallium presents striking pecu- liarities. Dumas once called it the " ornithorhynchns paradoxus of metals." As an elementary substance, it is very similar in its physical properties to lead; it resembles lead chemically inasmuch as it forms an almost insoluble chloride and an insoluble iodide. But the hydroxide of thallium, in most of its properties, comes very close to the alkali metals; it is strongly basic, forms an insoluble chloroplatinate, and an alum strikingly similar to the corresponding potassium compounds. Yet, unlike potassium or lead, it forms a feebly basic sesquioxide similar to manganic oxide, Mn 2 03.

Traces of thallium exist in many kinds of pyrites, as used for vitriol-making. The only known mineral of which it forms an essential component is the rare mineral crookesite of Skri- kerum, Smaland, Sweden, which, according to Nordenskiold, contains 33-3 per cent, of selenium, 45-8 per cent, of copper, 3-7 per cent, of silver, and 17-2 per cent, of thallium. The best raw materials for the preparation of thallium are the flue-dusts produced industrially in the roasting of thalliferous pyrites and the " chamber muds " accumulating in vitriol-chambers wrought with

such pyrites; in both it is frequently associated with selenium. The flue-dust from the pyrites of Theux, near Spa (Belgium), according to Bottcher, contains 0-5 to 0-75 per cent, of thallium; that of the pyrites of Meggen, according to Carstanjen, as much as 3-5 per cent.; while that of the pyrites of Ruhrort yielded 1 per cent, of the pure chloride to Gunning.

For the extraction of the metal from chamber mud, the latter is boiled with water, which extracts the thallium as the sulphate. From the filtered solution the thallium is precipitated as the chloride by addition of hydrochloric acid, along, in general, with more or less of lead chloride. The mixed chlorides are boiled down to dryness with sulphuric acid to convert them into sulphates, which are then separated by boiling water, which dissolves only the thallium salt. From the filtered solution the thallium is re- covered, as such, by means of pure metallic zinc, or by electrolysis. The (approximately pure) metallic sponge obtained is washed, made compact by compression, fused in a porcelain crucible in an atmosphere of hydrogen, and cast into sticks.

Metallic thallium is bluish white; it is extremely soft and almost devoid of tenacity and elasticity. Its specific gravity is n-86. It fuses at 200° C; at a white heat it boils and can be distilled in hydrogen gas. Its vapour density at 1728 corresponds to the molecule Tl 2 . Its salts colour the Bunsen flame a bright green. When heated in air it is readily oxidized,

with the formation of a reddish or violet vapour. When ex- posed to the air it becomes quickly covered with a film of oxide; the tarnished metal when plunged into water . reassumes its metallic lustre, the oxide film being quickly dissolved. When kept in contact with water and air it is gradually converted into hydroxide, TIOH. It decomposes water at a red heat, liberat- ing hydrogen and being itself converted into the hydrate. It is readily soluble in nitric and sulphuric acids, but less so in hydro-

chloric.

Thallium forms two series of salts: thallous, in which the metal is monovalent;- and thallic, in which it is trivalent. In the thallous series many analogies with lead compounds are observed; in the thallic some resemblance to aluminium and gold.

Thallous hydroxide, TIOH, is most conveniently prepared by de- composing the solution of the sulphate with baryta water. It crystallizes from its solution in long yellow needles, TIOH or TIOH+H2O, which dissolve readily in water, forming an intensely alkaline solution, which acts as a caustic, and like it greedily absorbs carbonic acid from the atmosphere. Unlike the alkalis, it readily loses its water at 100 C. and even at the ordinary tempera- ture, to form the oxide T1 2 0, which is black or black-violet.

Thallic oxide, TIO or T1 2 2 , was obtained by O. Rabe (Abst. J.C.S., 1907, ii. 769) by acting with hydrogen peroxide on an alkaline solution of thallous sulphate at low temperatures, an initial red precipitate rapidly changing into a bluish-black com- pound. It melts at 720 and decomposes rapidly above 800°, giving oxygen and thallous oxide. Thallous chloride, T1C1, is readily obtained from the solution of any thallous salt, by the addition of hydrochloric acid, as a white precipitate similar in appearance to silver chloride, like which it turns violet in the light and fuses below redness into a (yellow) liquid which freezes into a horn- like flexible mass. It is also formed when the metal is burnt in chlorine. The specific gravity of this ” horn ” thallium is 7-02. One part of the precipitated chloride dissolves at 0° C. in 500 parts of water, and in 70 parts at 100 C. It is less soluble in dilute hydrochloric acid. Carbonate of soda solution dissolves it pretty freely. Thallous iodide, Til, is obtained as a yellow precipitate, which requires 16,000 parts of cold water for its solution, by the addition of potassium iodide to a solution of a thallous salt, or by the direct union of its components. The yellow crystals melt at 190

°, and when cooled down assume a red colour, which changes to the original yellow on standing. Thallous bromide, TIBr, is a light yellow crystalline powder; it is formed analogously to the chloride. Thallous fluoride, TIF, forms white glistening octahedra ; it is obtained by crystallizing a solution of the carbonate in hydro- fluoric acid. It resembles potassium fluoride in forming an acid salt, T1HF 2 . Thallous chloroplatinate, Tl 2 PtCl 6 , readily obtainable from thallous salt solutions by addition of platinum chloride, is a yellow precipitate soluble in no less than 15,600 parts of cold water. Thallous perchlorate, TICIO4, and periodate, TIIO4, are interesting inasmuch as they are isomorphous with the corresponding potassium salts. Other instances of the isomorphism of thallous with potassium salts are the nitrates, phosphates, hydrazoates, sulphates, chromates, selenates, and the analogously constituted double salts, and also the oxalates, racemates and picrates. Thallous carbonate, T1 2 C03, more nearly resembles the lithium compound than any other ordinary carbonate. It is produced by the exposure of thallous hydrate to carbon dioxide, and therefore is obtained when the moist metal is exposed to the air. It forms resplendent monoclinic prisms, soluble in water. Thallous sulphate, TI2SO4, forms rhombic prisms, soluble in water, which melt at a red heat with decomposition, sulphur dioxide being evolved. It unites with sulphuric acid giving an acid salt, T1HS0 4 -3H 2 0, and with aluminium, chromium and iron sulphates to form an " alum." It also forms double salts of the type Tl2S0 4 (Mg,Fe,ZnS0 4)-6H 2 0. Thallous sulphide, T1 2 S, is obtained as a black precipitate by passing sulphuretted hydrogen into a thallous solution. It is insoluble in water and in the alkalis, but readily dissolves in the mineral acids. On thallium sul- phides see H. Pelabon, Abst. J.C.S., 1907, ii. 770. . Thallous nitrate, TINO3, is obtained as white, rhombic prisms by crystallizing a solution of the metal, oxide, carbonate, &c, in nitric acid. Various thallous phosphates are known. The normal salt, TI3PO4, is soluble in 200 parts of water, and may be obtained

by precipitation. On thallous salts see W. Stortenbeker, Abst. J.C.S., 1907, ii. 770. Thallic oxide, TUO3, is obtained as a dark reddish powder, insoluble in water and alkalis, by plunging molten thallium into oxygen, or by electrolysing water, using a thallium anode. Thallic hydroxide, Tl(OH)3, is obtained as a brown precipitate by adding a hot solution of thallous chloride in sodium carbonate to a solution of sodium hypochlorite. On drying it has the composition TIO. Hydrochloric acid gives thallous chloride and chlorine; sulphuric acid gives off oxygen; and on heating it first gives the trioxide and afterwards the monoxide. The hydroxide is obtained as brown hexagonal plates by fusing thallic oxide with potash to which a little water has been added. Thallic chloride, TICI3, is

obtained by treating the monochloride with chlorine under water; evaporation in a vacuum gives colourless deliquescent crystals of T10 3 H 2 0. By heating the metal or thallous chloride in chlorine, TlCl-TlCls is obtained, which on further heating gives3TlCl-TlCl 3 . as a yellowish brown mass. The chloride when anhydrous is a crystalline mass which melts at 24 . It forms several double salts, e.g. with hydrochloric acid and the alkaline chlorides, and also with nitrosyl chloride. The chlorine is not completely precipitated by silver nitrate in nitric acid solution, the ionization apparently not proceeding to all the chlorine atoms. Thallic iodide,^ Til 3, is interesting on account of its isomorphism with rubidium and caesium tri-iodides, a resemblance which suggests the formula T1I for the salt, in which the metal is obviously monovalent. On the halogen compounds see V. Thomas, Abst. J.C.S. (1907), ii. 547. Thallic sulphate, T1 2 (S0 4) 3 -7H 2 0, and thallic nitrate, T1(N0 3) 3 8H 2 0, are obtained as colourless crystals on the evapora tion of a solution of the oxide in the corresponding acid. The sulphate decomposes into sulphuric acid and the trioxide on warming with water, and differs

from aluminium sulphate in not forming alums.

Analysis. — All thallium compounds volatile or liable to dissocia- tion at the temperature of the flame of a Bunsen lamp impart to such flame an intense green colour. The spectrum contains a bright green of wave-length 5351. From solutions containing it as thallous salt the metal is easily precipitated as chloride, iodide, or chloroplatinate by the corresponding reagents. Sulphuretted hydrogen, in the presence of free mineral acid, gives no precipitate ; sulphide of ammonium, from neutral solutions, precipitates T1 2 S as a dark brown or black precipitate, insoluble in excess of reagent. Thallic salts are easily reduced to thallous by means of solution of sulphurous acid, and thus rendered amenable to the above reactions. The chloroplatinate serves for the quantitative estima- tion. L. F. Hawley employs sodium thiostannate which precipi- tates thallium as Tl 2 SnS 4 , insoluble in water, and which may be dried on a Gooch filter at 105°. It may be noted that all thallium compounds are poisonous.

The atomic weight of thallium was determined very carefully by Crookes, who found Tl = 204-2 (0 = i6); this figure was con- firmed by Lepierre in 1893.

THALWEG (a German word compounded from Thai, valley, and Weg, way) in physical geography, a term adopted into English usage signifying the line of greatest slope along the bottom of a valley, i.e. a line drawn through the lowest points of a valley in its downward slope. It thus marks the natural direction of a watercourse.

THAMES, the chief river of England, rising in several small streams among the Cotteswold Hills in Gloucestershire. Its source is generally held to be at a place known as Thames Head, in the parish of Coates, 3 m. W. by S. of Cirencester; but claims have also been advanced on behalf of the Seven Springs, the head waters of the river Churn, 5 m. S. of Cheltenham. The length of the river from Thames Head Bridge to London Bridge is i6i| m. and from

London Bridge to the Nore, 47I m,, a total of 209 m. The width at Oxford is about 150 ft., at Teddington 250 ft., at London Bridge 750 ft., at Gravesend 2100 ft., and between Sheerness and Shoeburyness, immediately above the Nore, 5J m. The height of Thames Head above sea-level is 356 ft., but that of Seven Springs, the adoption of which as the source would extend the length of the river by several miles, is 700 ft. The height of the river at Lechlade is 237 ft., the average fall between Lechlade and London, 143I m., being rather less than 20 in. per mile. The drainage area of the Thames is 5924 sq. m., including that of the Medway, which, as it joins the estuary immediately above Sheerness, may be considered a tributary of the Thames. The Thames forms part of the Gloucestershire- Wiltshire boundary to a point below Lechlade; thence for a short distance it separates Gloucestershire from Berkshire; after which it separates successively Oxfordshire and Berkshire, Buckinghamshire and Berkshire, Middlesex and Surrey, and finally, at its estuary, Essex and Kent. In the succeeding paragraph the bracketed figures indicate the dis- tance in miles above London Bridge.

The upper course lies through a broad valley, between the foot-hills of the Cotteswolds on the north, and the slight eleva- tions dividing it from the Vale of White Horse on the south. The scenery is rural and pleasant; the course of the river winding. Before reaching Oxford the stream swings north, east and south to encircle the wooded hills of Wytham and Cumnor, which overlook the city from the west. The Windrush

joins from the north (left) at New Bridge (126;), the Evenlode near Eynsham (119), and the Cberwell at Oxford (112). Be- tween Lechlade and Oxford the main channel sends off many narrow branches; the waters of the Windrush are similarly distributed, and the branches in the neighbourhood of Oxford form the picturesque ” backwaters ” which only light pleasure boats can penetrate. The river then follows a valley confined between the hills on either side of Oxford, passes the pleasant woods of Nuneham, and at

Abingdon (103 J) receives the Ock from the Vale of White Horse. At Dorchester (95!-) the Thame enters on the left, and the river then passes Wallingford (90!) and Goring (85). Hitherto from Oxford its course, though greatly winding, has lain generally in a southerly direction, but it now bends eastward, and breaches the chalk hills in a narrow gap, dividing the Chilterns from the downs of Berkshire or White Horse Hills. From this point as far as Taplow the southern slopes of the Chilterns descend more or less closely upon the river; they are finely wooded, and the scenery is peculiarly beautiful, especially in early summer. The charm of the Thames is indeed maintained throughout its course; the view of the rich valley from Richmond Hill, of the outskirts of London, is celebrated; the river is practically the only physical attribute to the beauty of the metropolis itself, and the estuary, with its burden of shipping and its industrial activity, is no less admirable. At Pangbourne (8of) the Thames receives the Pang on the right, and at Reading (745) the Kennet on the same side. After passing Reading it bends northward to Henley (65), eastward past Great Marlow (57) to Bourne End (54), and southward to Taplow and Maidenhead (49I), receiving the Loddon on the right near Shiplake above Henley. Winding in a south-easterly direction, it passes Eton and Windsor (431), Datchet (415), Staines (36), Chertsey (32), Shepperton (30) and Sunbury (265), receiving the Coin from the left at Staines, and the Wey from the right near Shepperton. Flowing past Hampton Court, opposite to which it receives the Mole on the right, and past Kingston (20I), it reaches Teddington (i8£). Passing Richmond (16) and Kew the river flows through London and its suburbs for a distance of about 25 m., till it has passed Woolwich. Gravesend, the principal town below Woolwich, is 26J m. from London Bridge. The estuary may be taken to extend to the North Foreland of Kent. In the tideway the principal affluents of the Thames are the Brent at Brentford, the Wandle at Wandsworth, the Ravensbourne at Deptford, the Lea at Blackwall, the Darent just below Erith, and the Ingrebourne at Rainham, besides the Medway.

The basin of the Thames is of curiously composite character. Thus, the upper portion of the system, above the gap at Goring, is a basin in itself, defined on the west and south by the Cotteswold and White Horse Hills and on the east and north by the Chilterns and the uplands of Northamptonshire. But there are several points at which its division from other river basins is only marked by a very low parting. Thus a well-marked depression in the Cotteswolds brings the head of the (Gloucestershire) Coin, one of the head-streams of the Thames, very close to that of the Isborne, a tributary of the upper Avon; the parting between the head- streams of the Thames and the Bristol Avon sinks at one point, near Malmesbury, below 300 ft. ; and head-streams of the Great Ouse rise little more than two miles from, and only some 300 ft. above, the middle valley of the Cherwell. The White Horse Hills and the Chilterns strike right across the Thames basin, but almost their entire drainage from either flank lies within it, and similarly a great part of the low-lying Weald, though marked off from the rest of the basin by the North Downs, drains into it through these hills. It may be noted further that the Kennet continues upward the line of the main valley below the Goring gap, and the Cherwell that of the main valley above it. The basin thus presents interesting problems. The existence of wide valleys where the small upper waters of the Cherwell, Evenlode and Coin now flow, the occurrence of waterborne deposits in their beds from the north- west of England and from Wales, and the fact that the Thames, like its lower southern tributaries which pierce the North Downs, has been able to maintain a deep valley through the chalk eleva- tion at Goring, are considered to point to the former existence of a much larger river, in the system of which were included the upper waters of the present Severn, Dee and other rivers of the west. The question, in fact, involves that of the development of a large part of the hydrography of England.

The Thames about Oxford is often called the Isis. Camden gave currency to the derivation of the word from the combina- tion of the names Thame and Isis. But it can be shown con- clusively that the river has borne its present designation from the earliest times. Caesar {De Bell. Gall. v. n) says that at the time of his invasion of Britain it was called Tamesis. Dion Cassius (xl. 3) and Tacitus {Ann. xiv. 32) both call it Tamesa, and in no early authority is the name Isis used. In early Saxon times the river was called Thamis, as may be seen in a grant before a.d. 675 to Chertsey Abbey by the sub-king Frithwald. In the first statute passed for improving the navigation of the river near Oxford (21 Jac. I.) it is called the river of Thames, and it was only in a statute of George II. (1751) that the word Isis appears. The name Isis has indeed the authority of Spenser as applied to the Thames in its course above Dorchester {Faerie Queen, Bk. iv. canto xi. stanza 24), but there is ample evidence to show that long before his time the name of the river through- out its course was not Isis but Thames. The word Isis is prob- ably an academic rendering of Ouse or Isca, a common British river name, but there is no reason to suppose that it ever had much vogue except in poetry or in the immediate neighbour- hood of Oxford.

The flow of the Thames varies greatly, according to the season of the year. The average gaugings at Teddington for the summer months of the years 1883 to 1900 were in July 413,000,000 gallons a day, in August 395,000,000 gallons, and in September 375,000,000 gallons. The normal natural flow in ordinary summer weather is about 350,000,000 gallons a day, and of this, after the companies have taken 130,000,000, only 220,000,000 gallons are left to pass over Teddington Weir. After a long period of dry weather the natural flow has been known to fall considerably below 200,000,000 gallons, whilst, on the other hand, in the rainy winter season, the flow in 1894 rose for a short time to as high a figure as 20,000,000,000 gallons, and the ordinary flow in winter months may be put down as 3,000,000,000 gallons. The importance of storage reservoirs is

manifest under such conditions of flow, especially bearing in mind the growth of population in the London district and of its increasing needs. The water-supply of London is considered under that heading; it may be noted here that the Thames forms the chief source of supoly for the metropolis, but apart from this the corpora- tion of Oxford and two companies in the Staines district have powers to draw water from the river, though not in any large quantities.

Throughout the whole of the Thames watershed, and especially in the 3800 sq. m. above the intakes of the water companies (at Hampton or in the vicinity), the Thames Conservancy has enforced the requirements of parliament that no sewage or other pollution shall be allowed to pass into the Thames, into its tributary streams, or even into any water communicating with them. There is a large staff of inspectors constantly visiting the various parts of the watershed, and in spite of many difficulties arising from vested interests, the work of purification is attaining completion, with a correspondingly great improvement in the quality of the river water. So recently as 1890 the state of the river below London was such as to be dangerous to the public health. The metro- politan sewage was discharged untreated into the river, and the heavier solids deposited over the river-bed, while the lighter parts flowed backwards and forwards on the tide. The London County Council, directly after its establishment, took means to remedy this evil (see London).

The Thames is navigable for rowing-boats as far upwards as Cricklade, except in dry seasons, and for barges at all times as far as Lechlade, 18 m. below Thames Head. At lnglesham, three- quarters of a mile above Lechlade, the Thames and Severn canal has its junction with the Thames. This canal is the link between the two great rivers from which it takes its name, or, in other words, between the east and west of England. It surmounts the watershed by means of Sapperton tunnel, 2 m. long, opened in 1789, and joins the Stroudwater canal, which completes the

con- nexion, at Wallbridge near Stroud. It was long abandoned, but owing to the exertions of a joint committee of the counties and other interests concerned in 1895, powers were obtained from parliament for its restoration, and the works needful for its re- opening were carried out. Concurrently with the repair of the canal, the navigation works on the Thames were remodelled at a large cost, and barges drawing 3 ft. 6 in, can now, even in the summer season, navigate from London to lnglesham. Although the Thames, as one of the " great rivers of England," was always a navigable river, that is to say, one over which the public had the right of navigation, it was not until the last quarter of the 18th century that any systematic regulation of its flow in the upper reaches was attempted. Complaints of the obstructions in it are not uncommon, and John Taylor, the Water Poet (1 580-1 653), in a poem commemorating a voyage from Oxford to London, bewails

the difficulties he found on the passage. No substantial measures to remedy this state of things were adopted till 177 1, when an act of parliament was passed authorizing the construction of pound locks on the Thames above Maindenhead Bridge. In pursuance of the powers thus granted, the Thames Commissioners of that day caused locks to be built at various points above Maidenhead, and between 1 8 10 and 18 15 the Corporation of London carried out river works on the same lines as far down the river as Teddington. The works as subsequently maintained by the Thames Conservancy ensure an efficient head of water during the drier seasons of the year, and facilitate the escape of winter floods. The number of locks is 47, including four navigation weirs above Oxford. The uppermost lock is St John's, below Lechlade; the lowest is Rich- mond, but this is a half-tide lock, keeping the water above at a level corresponding to half that of flood tide. Under ordinary conditions the sluices are raised to admit boats to pass from the half flood to half ebb, so that the river remains tidal up to Ted- dington, the next lock.

The canals in use communicating with the Thames, in addition to the Thames and Severn canal, are the Oxford canal, giving com- munication from that city with the north, the Kennet and Avon canal from Reading to the Bristol Avon, the Grand Junction at Brentford, the Regent's canal at Limehouse, and the Grand Surrey canal at Rotherhithe. A short canal connects Gravesend with Higham. Navigation is also carried on by the Medway to Ton- bridge, on the lower parts of the Darent and Cray, from Dartford and Crayford, and on the Wey up to Guildford and Godalming. The Woking, Aldershot and Basingstoke canal joins the Wey, but is little used. The Wilts and Berks canal, joining the Thames at Abingdon, is disused. By means of the Grand Junction and Oxford canals especially, constant communication is maintained between the Thames and the great industrial centres of England. The trade on the upper Thames is steady, though not extensive. The vast trade on the estuary, which lies within the bounds of the port of London, is considered under London.

The utility of the river is great in the opportunities for exercise and recreation which it affords to the public, especially to Londoners. The scene on any part of the river from Oxford down on public holidays, and on Saturdays and Sundays during the summer, would be sufficient to show how it contributes to the public enjoyment. It is only since about 1870 that this popularity has grown up. Ten years earlier even rowing-boats were few excepting at Oxford, at Henley in regatta time, and at Putney on the tideway. Steam launches did not exist on the river before 1866 or 1867, and house-boats only in the form of college barges at Oxford. But by 1900 there were 541 launches, 162 house-boats, and 11,284 rowing-boats. Each boat is registered, a small tax being charged; while there are fixed prices for the passage of locks. During the season regattas take place at many of the towns and larger villages. Of these Henley Royal Regatta is pre-eminent, by the number and import- ance of the entries, and by its comparative antiquity. The

regattas at Molesey, Kingston, Reading, Marlow and Oxford, as well as many others, attract numerous competitors and spectators. The Oxford and Cambridge boat-race from Putney to Mortlake on the tideway, the summer eights and the " torpids " at Oxford Univer- sity, and the school races at Eton and Radley should also be mentioned.

A statute of 1393 was granted to the citizens of London to remove weirs on the Thames, and empowered the Lord Mayor to enforce its provisions. For the next four centuries he acted through water-bailiffs, till in 1 771 a committee of the Corporation of London took over the work. In 1857 the Thames Conservancy Board was established. Its powers were increased and its constitution varied in 1864, 1866 (till which year the jurisdiction of the river above Staines was under a large body of commissioners), and 1894, but the creation of the Port of London Authority (see London) limited its jurisdiction.

Fish are abundant, especially coarse fish such as pike, perch, roach, dace and barbel. Of trout there are many fine specimens, especially at the weirs. Salmon are known to have existed at Maidenhead so recently as 1812, but they disappeared soon after that date. An association was formed under the presi- dency of Mr W. H. Grenfell, M.P., with the object of reintro- ducing this fish into the river, and in April 1901 and on subsequent occasions a number of young salmon were placed at Teddington by way of experiment. The right of the public to take fish has been frequently in dispute, but a committee of the House of Commons, which took much evidence on the question in the year 1884, came to the conclusion that " it is impossible to recognize anything like a general public right to take fish as now existing. " They added " that the public at large have only to know that their rights are imaginary to induce them also to be content with the extant system under which permission is very freely granted by owners of fisheries to the public for angling on the more fre- quented parts of the Thames. ' These conclusions are interesting in face of the fact that the question has arisen from time

to time since 1884.

The fisheries are under the regulation of by-laws made by the Thames Conservancy, which apply to the riparian owners as Well

as to the public generally. These by-laws are carried into effect by officers of the conservators, assisted by the river-keepers of the various fishing associations. The principal associations are those at Oxford, Reading, Henley, Maidenhead and Windsor, and the Thames Angling Preservation Society, whose district is from Staines to Brentford.

THAMES, a seaport and gold-mining centre in North Island, New Zealand, in the county and at the mouth of the river of its name, on the Firth of Thames, a deep inlet of the Hauraki Gulf of the east coast. Pop. (1906) 3750. It comprises under one municipality the settlement formerly called Grahamstown, with its suburbs Shortland and Tararu. It lies 42 m. S.E. of Auckland by the steamer-route, a pleasant journey among the islands of the Gulf. There is also railway communication with Auckland (but by a circuitous route of 120 m.), and with the neighbouring districts by branch lines. The harbour is good; the industries include foundries, shipbuilding yards and saw- mills. The sea fisheries are valuable, a large part of the yield being exported to Auckland. The inland district watered by the Thames river is auriferous; Waitekuri (40 m.) and Karanga- hake (28 m. S. of Thames) are centres of operations. The small town of Te Aroha (3 2 m. by rail) , on the river, besides being the centre of mining and agricultural industries, is a favourite health resort on account of its hot medicinal springs. The river is navigable for steamers of light draught. The scenery along its course is pleasant, and at Ohinemuri (20 m. from Thames) it flows through a fine gorge.

THANA, or Tanna (= a fort, or police-station), a town and district of British India, in the Northern division of Bombay. The town is on the west of the Salsette creek or Thana river, just where the Great Indian Peninsula railway crosses to the mainland, 21 m. from Bombay city. Pop. (1901) 16,011.

The District of Thana has an area of 3573 sq. m. It extends along the coast for 105 m., with a breadth of 50 m., and is confined between the Western Ghats on the E. and the sea on the W., while on the N. it is bounded by the Portuguese territory of Damaun and by Surat district, and on the S. by Kolaba district. The district is well watered and wooded, and, except in the nort-east, is a low-lying rice tract broken by hills. Most of the hills were once fortified, but the forts built on them are now dilapidated and useless. Matheran (q.v.) is a favourite summer resort for the citizens of Bombay. The only rivers of any importance are the Vaitarna and the Ulhas, the former being navigable for a distance of about 20 m. from its mouth; the latter is also navigable in parts for small craft. There are no lakes; but the Vehar and the Tulsi, formed artificially, supply Bombay city with water. In 1901 the population was 811,433, showing a decrease of 1 per cent, in the decade. The staple crop is rice. Fishing supports many of the people, and the forests yield timber and other produce. Salt is largely manufactured by evaporation along the coast. At Kurla, in Salsette island, there are cotton mills and rice mills. The district is traversed throughout its length by the Bombay and Baroda railway, and also crossed by the two branches of the Great Indian Peninsula line.

The territory comprised in the district of Thana (apart from Salsette island, which was acquired in 1782) formed part of the dominions of the peshwa, and was annexed by the British in 1 81 8 on the overthrow of Baji Rao. Since then the operations to put down the Koli robbers, which extended over several years, have been the only cause of serious trouble.

THANESAR (= ” place of the god”), an ancient town

of British India, in Karnal district of the Punjab, on the river Saraswati, 100 m. by rail N. of Delhi: pop. (1901) 5066. As the centre of the tract called Kurukshetra in the Mahabharata, it has always been a holy place, and was in the seventh century the capital of King Harshavardhana, who ruled over all northern India. The bathing-fair held here on the occasion of a solar eclipse is said to be attended by half a million pilgrims.

THANET, ISLE OF, the extreme north-eastern corner of Kent, England, insulated by the two branches of the river Stour, and forming one of the eight parliamentary divisions of the county. Its name is said to be derived from Saxon tene,

a beacon or fire (probably from the number of watch-fires existing on this easily ravaged coast), and numerous remains of Saxon occupation have been found, as at Osengal near Rams- gate. Thanet is roughly oblong in form, its extreme measure- ments being about 8 m. from E. to W., and 5 m. from N. to S. The branches of the Stour dividing near Sarre take the place of the former Wantsume, a sea-passage which had diminished in breadth to half a mile in the time of Augustine. The Want- sume was guarded by the Roman strongholds of Regulbium (Reculver) in the north and Rutupiae (Richborough) in the south, and was crossed by ferries at Sarre and Wade. With the drying up of this channel and the closing of Sandwich harbour in the 1 6th century, the present marshlands or level to the south and west of the isle were left. The sea-face of Thanet consists mainly of bold slopes or sheer cliffs, and the eastern extremity is the fine headland of the North Foreland. Containing the popular seaside resorts of Ramsgate, Broadstairs, Margate and Westgate, Thanet is served by the South-Eastern & Chatham railway, and Minster is a junction station of the lines to Ramsgate and Sandwich respectively.

THANKSGIVING DAY, in the United States, the fourth Thursday in November, annually set apart for thanksgiving by proclamation of the president and of the governors of the various states. The day is

observed with religious services in the churches, and, especially in New England, as an occasion for family reunion. The Pilgrims set apart a day for thanks- giving at Plymouth immediately after their first harvest, in 1621; the Massachusetts Bay Colony for the first time in 1630, and frequently thereafter until about 1680, when it became an annual festival in that colony; and Connecticut as early as 1639 and annually after 1647, except in 1675. The Dutch in New Netherland appointed a day for giving thanks in 1644 and occasionally thereafter. During the War of Independence the Continental Congress appointed one or more thanksgiving days each year, except in 1777, each time recommending to the executives of the various states the observance of these days in their states. President Washington appointed a day of thanksgiving (Thursday, the 26th of November) in 1789, and appointed another in 1795. President Madison, in response to resolutions of Congress, set apart a day for thanksgiving at the close of the War of 1812. One was annually appointed by the governor of New York from 181 7. In some of the Southern States there was opposition to the observance of such a day on the ground that it was a relic of Puritanic bigotry, but by 1858 proclamations appointing a day of thanksgiving were issued by the governors of twenty-five states and two Territories. President Lincoln appointed the fourth Thursday of November 1864, and since that time each president has annually followed his example.

See F. B. Hough, Proclamations for Thanksgiving (Albany, 1858); W. D. Love, The Fast and Thanksgiving Days of New England (Boston, 1895) ; May Lowe, " Thanksgiving Day " in New Eng- land Magazine (Nov. 1904) ; C. L. Norton, " Thanksgiving Day, Past and Present," in the Magazine of American History (Dec. 1885); R. M. Schauffler (ed.), Thanksgiving (New York, 1907).

THANN, a town of Germany, in Upper Alsace, 16 m. by rail N.W. of Mulhausen. Pop. (1905) 7901. It is the seat of cotton, calico, silk, machinery and other industries, and excellent wine is grown there. The

(Roman Catholic) church of St Theobald (1351) is an elegant specimen of Gothic, and has a remark- ably fine tower (1450–1516), 266 ft. high. Above the town are the ruins of the castle of Engelburg, destroyed by Turenne in 1675.

THAPSACUS, the " large and prosperous city " on the Arabian side of the Euphrates where Cyrus the Younger revealed to the Greeks the object of his expedition (Xen. Anab. i. 4, 11). No such place has yet been found mentioned in cuneiform texts. We may have a Semitic form of the name in the Hebrew Tiphsah; but it is impossible to determine whether* the one phrase 1 " from Tiphsah to Gaza " (1 Kings v. 4— iv. 24 in the English version), where the name seems to occur, is as early

1 2 Kings xv. 16 cannot possibly refer to any place on the Euphrates.

as the Persian period: the Greek text is quite discrepant. Thapsacus was the crossing-place of Darius Codomannus, before and after his defeat (Arrian ii. 13), and of Alexander (iii. 7), and in Strabo's time it was the usual crossing-place (xvi. 1, 21); but Tiglath-pileser I. and Assur-nasir-pal crossed considerably farther north, and we have no reason to suppose that they were not simply following the practice of those early times; and we do not know when the custom of crossing at Thapsacus which the Hebrew text of the passage in 1 Kings may presuppose sprang up. Xenophon's army had to be content with fording the stream. Alexander, however, effected his crossing (Arrian, iii. 7) by two connected bridges (of boats?), and it was from this place that later he had the material for his fleet sent down (Arrian vii. 19; Strabo xvi. 741) 'to Babylonia. His successors must also have valued the place, for according to Pliny (v. 87) it bore later the name of Amphipolis, perhaps bestowed on it (Steph. Byz., Appian Syr. 57) by Seleucus I.,

although the name, like so many others, probably failed to win acceptance; and in the time of Eratosthenes the position of Thapsacus had be- come so central that he chose it as the point from which to make his measurements for all Asia (Strabo ii. 79, 80), and in the time of Strabo himself it was there that goods were em- barked for transport down the Euphrates (Q. Curt. x. 1), and landed after having come by stream from lower districts (Strabo xvi. 1, 23). After Pliny the city is not again men- tioned. 1

After various attempts at identification (see Ritter, Erdkunde) it has apparently been correctly identified by J. P. Peters {Nation, May 23, 1889) and B. Moritz (Sitz.-Ber. d. Berl. Akad., July 25, 1889). The name may survive in Kal'at Dibse, "a small ruin 8 m. below Meskene, and 6 m. below the ancient Barbalissus." See J. P. Peters, Nippur, 196 ff. (H. W. H.)

THAPSUS, a low peninsula, now known as Magnisi, joined by a narrow isthmus to the mainland of Sicily, about 7 m. N.N.W. of Syracuse. The founders of Megara Hyblaea settled here temporarily, according to Thucydides, in the winter of 720-728 B.C., but it seems to have] remained almost if not entirely uninhabited until the Athenians used it as a naval station in their attack on Syracuse early in 414 B.C. A number of tombs were excavated in 1894, containing objects belonging to a transitional stage between the second and third Sicel period, attributable roughly to 1000-900 B.C., and with a certain proportion of Mycenean importations.

See Orsi in Monumenti dei Lincei (1897), vi. 89-150.

THAR AND PARKAR, or Thur and Parker, a district of British India in the Sind province of Bombay. Area, 13,941 sq. m. The district is divided into two portions. The western part, called the " Pat," is watered by the Eastern Nara and the Mithrau canals, which constitute the sole water-system of the district, and the presence of water has created a quantity of jungle and marsh; the other part, called

the "Thar," is a desert tract of rolling sand-hills, running north-east and south-west, composed of a fine but slightly coherent sand. To the south-east of Thar is Parkar, where there are ranges of rocky hills, rising to 350 ft. above the surrounding level, and open plains of stiff clay. This portion contains the ruins of several old temples. The climate is subject to considerable extremes in temperature, being excessively hot in the summer and very cold in winter, the cold increasing as the sand-hills are approached. In 1901 the population was 389,7 r4, showing an increase of 22 per cent, in the decade. The principal crops are millets, rice, wheat, oil-seeds and cotton. Cultivation largely depends upon the control of the water which comes down the canals and occasionally causes flood. Salt is found in two or three places. The western border of the district is entered by the narrow-gauge railway from Hyderabad to Shadi- palli, connected with the North-Western main line by a bridge across the Indus at Kotri, and with the Rajputana system at Jodhpur. Umarkot, the administrative headquarters of the

1 Stephanus of Byzantium gives it in a list of cities as a " Syrian town on the Euphrates," quoting from Theopompus, without noting that he has already referred to it under the name Amphipolis.

district, is on the edge of the desert. Pop. (1901) 4924. It is historically interesting as the birthplace of the emperor Akbar in 1542.

Very little is known of the early history of the district. The Soda Rajputs, said to be descendants of Parmar Soda, are sup- posed to have come into this part of Sind about 1226, when they quickly displaced the rulers of the country, though, according to other authorities, they did not conquer the country from the Sumras, the dominant race, before the beginning of the 16th century. The local dynasty of the Sodas succumbed to the Kalhoras about 1750, since which period the district has been subject more or less to Sind. The Talpur mirs succeeded the Kalhoras, and built a number of forts

to overawe the people, who were lawless and addicted to robbery. On the British conquest of Sind in 1843 the greater part of the district was made over to Cutch, but in 1856 it was incorporated in the province of Sind. In 1859 a rebellion broke out, which was quickly suppressed.

THARANDT, a town of Germany, in the kingdom of Saxony, romantically situated on the Wilde Weisseritz, 9 m. S.W. of Dresden, on the Dresden-Reichenbach railway. Pop. (1905) 2967. It has a Protestant church, a hydropathic establish- ment, and the oldest academy of forestry in Germany (founded by Heinrich Cotta in 181 1) with about sixty students. Tharandt is a favourite summer resort of the people of Dresden, one of its principal charms being the magnificent beech woods which surround it.

See Donner, Tharandt (Tharandt, 1890).

THARGELIA, one of the chief Athenian festivals in honour of the Delian Apollo and Artemis, held on their birthdays, the 6th and 7th of the month Thargelion (about the 24th and 25th of May). The name, which was derived by the ancients from dipetv tt\v yfji' (" to reap the land "), is more probably con nected with Tfpc-fjvM (cf. Lat. torreo, tostus), signifying the produce of the earth " baked " by the sun. Essentially an agricultural festival, the Thargelia included a purifying and expiatory ceremony. While the people offered the first-fruits of the earth to the god in token of thankfulness, it was at the same time necessary to propitiate him, lest he might ruin the harvest by excessive heat, possibly accompanied by pestilence. The purificatory preceded the thanksgiving service. On the 6th a sheep was sacrificed to Demeter Chloe on the Acropolis, and perhaps a swine to the Fates, but the most important ritual was the following. Two men, who were called (papy,anol or crvPanxoi, the ugliest that could be found, were chosen to die, one for the men, the other (according to some, a woman) for the women. On the day of the sacrifice they were led round with strings of figs on their necks, and

whipped on the genitals with rods of figwood and squills. When they reached the place of sacrifice on the shore, they were stoned to death, their bodies burnt, and the ashes thrown into the sea (or over the land, to act as a fertilizing influence). The whipping with squills and figwood was intended to stimulate the reproductive energies of the QapnaKos , who represented the god of vegetation, annually slain to be born again. It is agreed that an actual human sacrifice took place on this occasion, replaced in later times by a milder form of expiation. Thus at Leucas a criminal was annually thrown from a rock into the sea as a scapegoat: but his fall was checked by live birds and feathers attached to his person, and men watched below in small boats, who caught him and escorted him beyond the boundary of the city. Similarly, at Massilia, on the occasion of some heavy calamity (plague or famine), one of the poorest inhabitants volunteered as a scape- goat. For a year he was fed up at the public expense, then clothed in sacred garments, led through the city amidst execra- tions, and cast out beyond the boundaries. The ceremony on the 7th was of a cheerful character. All kinds of first-fruits were carried in procession and offered to the god, and, as at the Pyanepsia (or Pyanopsia), dpeouhvax (branches of olive bound with wool), borne by children, were affixed by them to the doors of the houses. These branches, originally intended as a charm to avert failure of the crops, were afterwards regarded as forming

part of a supplicatory service. On the second day choruses of men and boys took part in musical contests, the prize for which was a tripod. Further, on this day adopted persons were solemnly received into the genos and phr atria of their adoptive parents (see Apatoria).

See Preller-Robert, Griechische Mytliologie, i. (1894); G. F. Schomann, Griechische Alterthilmer (4th ed. by J. H. Lipsius, 1897- 1902); P. Stengel, Die griechischen Kultusalterthumer (1890); article

in Smith's Dictionary of Greek and Roman Antiquities, revised by L. C. Purser (3rd ed.. 1891); A. Mommsen, Feste der Stadt Athen (1898); L. R. Farnell, Cults of the Greek States, iv. (1906), pp. 268- 283; J. G. Frazer, Golden Bough (2nd ed., 1900), ii. appendix C, iir?. enn 5 s of . First - Fr uits," and iii. p. 93, § 15, " On Scapegoats "; VV. Mannnardt, Anhke Wald- und Feldkulte (2nd ed. by W Heuschkel

1904-5).

THARRAWADDY, a town and district in the Pegu division of Lower Burma. The town has a station on the railway, 68 m. N.W. from Rangoon. Pop. (1901) 164.3. The district has an area of 2851 sq. m. The Pegu Yoma range separates it from Toungoo district, and forms the water-parting between the rivers Irrawaddy and Sittang; there are also many small elevations. The Irrawaddy is the principal navigable river. Another important river is the Hlaing, which runs through the district from north to south, receiving from the east, through numerous channels, the drainage of the Pegu Yoma Mountains, which fertilizes the plain on its eastern bank. There are teak forests and fuel reserves, covering an area of 732 sq. m. Among the wild animals found in the mountains are elephant, rhinoceros, bison and various kinds of feathered game. The rainfall in 1905 was 91-65 in. Pop. (1001) 395,570, showing an increase of 17 per cent, in the decade. The railway runs through the centre of the district, with ten stations. The chief towns are Gyobingauk (6030) and Thonze (6578). The staple crop is rice, but orchards and gardens are also common. The history of the district is identical with that of Henzada (q.v.). Tharra- waddy was formed in 1878 out of that portion of Henzada lying east of the Irrawaddy.

THARROS, an ancient town of Sardinia, situated on the west coast, on the narrow sandy isthmus of a peninsula at the north extremity of the Gulf of Oristano, now marked by the tower of S. Giovanni di Sinis. It was 1 2 m. W. of Othoca (Oristano) by the coast road, which went on northward to Cornus (a

milestone of it is given in Corp. Inscr. Lat. x. 8009), and thence to Turris Libisonis. It was of Phoenician origin, but continued to exist in Roman times, as the inscriptions show, though they give but little information (Mommsen in Corp. Inscr. Lat. x. 822). It was destroyed by the Saracens in the nth century. Scanty traces of Roman buildings may be seen, and an ancient road paved with large blocks of stone. A part of the site of the town is now invaded by the sea. The church of S. Giovanni di Sinis is a heavy building of the 8th (?) century a.d. originally cruci- form, with a dome over the crossing; the transepts and dome are still preserved, but the nave with its two aisles is later. It is naturally built of materials from the old town. Close to it is a watch-tower and a spring of fresh water. The importance of Tharros may be inferred from the extent of its necropolis, which lies on the basaltic peninsula of S. Marco to the S.; on the summit of it are the remains of a nuraghe. Casual excavations are mentioned under the Spanish viceroys, but regular explora- tion only began in 1838, when the Roman tombs were examined. In 1850 Spano excavated many Phoenician tombs; they are rectangular or square chambers cut in the rock, measuring from 6 to 9 ft. each way, in which inhumation was the rule. The objects found— pottery, scarabs, jewelry, amulets, &c. — were of considerable interest. In 1851 Lord Vernon opened fourteen tombs, and after that the whole countryside ransacked the necropolis, without any proper records or notes being taken, and with great damage to the objects found. Some of these ob- jects are in the museum at Cagliari, others in private collections, and many scarabs are in the British Museum, all of which by the coins found with them are dated later than the Roman occupation {Catalogue of Gems, London, 1888, pp. 13 sqq.). In 1885-86 regular excavations were made, the results of which

may be seen in the museum at Cagliari. One tomb contained some fine gold ornaments, with Roman coins of the 1st to 3rd century a.d. (F. Vivanet in

Notizie degli Scavi, 1886, 27; 1887, 46, 124). The objects, like those found at Sulcis, show considerable traces of Egyptian influence, but are probably all of Phoenician importation— the theory of the existence of Egyptian colonies in Sardinia being quite inadmissible. Some 3 m. to the N. is the church of S. Salvatore, with underground rock-cut chambers below it, used as a baptistery (?) by the early Christians, though the walls are decorated with paintings of a decidedly pagan nature. (t a s)

THASOS, an island in the north of the Aegean Sea, off the coast of Thrace and the plain of the river Nestus (now the Kara- Su). The island was colonized at an early date by Phoenicians, attracted probably by its gold mines; they founded a temple of Heracles, which still existed in the time of Herodotus. Thasus, son of Phoenix, is said to have been the leader of the Phoenicians', and to have given his name to the island. In 720 or 708 B.C. Thasos received a Greek colony from Paros. In a war which the Parian colonists waged with the Saians, a Thracian tribe, the poet Archilochus threw away his shield. The Greeks ex- tended their power to the mainland, where they owned gold mines which were even more valuable than those on the island. From these sources the Thasians drew great wealth, their annuai revenues amounting to 200 or even 300 talents. Herodotus, who visited Thasos, says that the best mines on the island were those which had been opened by the Phoenicians on the east side of the island facing Samothrace. The place was important during the Ionian revolt against Persia. After the capture of Miletus (494 b.c.) Histiaeus, the Ionian leader, laid siege to Thasos. The attack failed, but, warned by the danger, the Thasians employed their revenues to build war ships and strengthen their fortifications. . This excited the suspicions of t?fce Persians, and Darius compelled them to surrender their ships and pull down their walls. After the defeat of Xerxes the Thasians joined the Delian confederacy; but afterwards, on account of a difference about the mines and marts on the mainland, they revolted. The Athenians defeated

them by sea, and, after a siege that lasted more than two years, took the capital, Thasos, probably in 463, and compelled the Thasians to destroy their walls, surrender their ships, pay an indemnity and an annual contribution (in 449 this was 2J talents, from 445 about 30 talents), and resign their possessions on the mainland. In 411 b.c, at the time of the oligarchical revolution at Athens, Thasos again revolted from Athens and received a Lacedae- monian governor; but in 407 the partisans of Lacedaemon were expelled, and the Athenians under Thrasybulus were ad- mitted. After the battle of Aegospotami (405 b.c), Thasos again fell into the hands of the Lacedaemonians under Lysander who formed a decarchy there; but the Athenians must have recovered it, for it formed one of the subjects of dispute between them and Philip II. of Macedonia. In the embroilment be- tween Philip III. of Macedonia and the Romans, Thasos sub- mitted to Philip, but received its freedom at the hands of the Romans after the battle of Cynoscephalae (197 b.c), and it was still a " free " state in the time of Pliny. After a period of Latin occupation, it was captured by the Turks in 1462; it was given by the Sultan Mahmud II. to Mehemet Ali of Egypt, and still remains the property of the khedive. Thasos, the capital, stood on the north side of the island, and had two harbours, one of which was closed. Archilochus described Thasos as " an ass's backbone crowned with wild wood," and the description still suits the mountainous island with its forests of fir. The highest mountain, Ipsario, is 3428 ft. high. Besides its gold mines, the wine, nuts and marble of Thasos were well known in antiquity. The mines and marble quarries are no longer worked; and the chief exports are now fir timber for shipbuilding, olive oil, honey and wax. The imports consist of manufactured goods, beasts of burden and corn, for the island is too mountainous to grow enough corn for the inhabitants.

The population, distributed in ten villages, is estimated at

8000. The people are Greek Christians, and do not differ in appearance from the inhabitants of the other Greek islands. The villages are mostly situated at some distance from the sea; for the island suffered from pirates. Even in the early part of the 19th century sentinels stood on duty night and day, and at a signal of alarm the whole population, including the Turkish aga himself, used to hide in the woods.

For a description of the island and its remains of antiquity, see A. Conze, Reise auf den Inseln des thrakischen Meeres (Hanover, i860); for inscriptions see Inscr. Gr. xii. 8; the island is fully described by J. ff. Baker- Penoyre in Journal Hell. Stud. xxix. (1909).

THATCH (O.E. thaec; the word is common to many Teutonic languages in the sense of ” roof,” ” cover “; cf. Du. dak, Ger. Dach; from Du. dekken comes “deck”; the Indo-European root is stag, whence Gr. cr’eyos, roof, Lat. tegere, to cover; the French equivalent is chaume), the material employed sometimes for roofs in the place of tiles or slates; it consists of wheat straw, of which several layers are required, to the depth of from 12 to 14 in., or even extending to 18 in. Unthreshed straw is said to last from twenty-five to thirty years, and is easily repaired. In Norfolk the reeds of marshland are employed, and they con- stitute a durable thatch lasting from thirty to forty years or more. Thatched roofs are not now allowed in London or other towns and their vicinity, but if saturated with a solution of lime the thatch is said to be incombustible. It forms an ex- tremely g_ood roof, warm in winter and cool in summer.

THAT6n, a town and district in the Tenasserim division of Lower Burma. The town is situated below a hill range, 10 m. from the sea. It was formerly the capital of the Taking kingdom and a sea-port. Pop. (1901) 14,342. The district has an area of 5079 sq. m.; pop. (1901) 343,510, showing an in- crease

of 29 per cent, in the decade. It was formerly a sub- division of Amherst district, but was formed in 1895 out of part of that and of Shwegyin district, which has now ceased to exist. The staple crop is rice, but a good deal of tobacco also is grown. The railway from Pegu to Martaban, recently opened, passes through this district and is calculated to increase its prosperity and population.

THAXTER, CELIA (1836–1894), American poet, was born at Portsmouth, New Hampshire, on the 29th of June 1836. Her father, Thomas B. Laighton, became offended with some of his associates in state politics, and retired about 1841 to the barren and isolated Isles of Shoals, ten miles off Portsmouth, where for about ten years he was keeper of the White Island lighthouse; and his daughter's girlhood was therefore spent in marine surroundings, which coloured the best of the verse she after- wards wrote. Her poems, mainly in lyrical form, deal with the beacon-light, the sea-storm, the glint of sails, the sand- piper, the flower among the rocks, &c, in characteristic and sym- pathetic fidelity. She also wrote prose sketches of life and scenery, Among the Isles of Shoals (1873); stories and poems for children, and letters; besides a book about floriculture, An Island Garden (1894). In 1896 appeared a complete edition of her poems, edited by Sarah Orne Jewett. She married in 1851 Levi L. Thaxter (d. 1884), a devoted student of Robert Browning's poetry, and spent most of her life on Appledore, one of the Isles of Shoals, where she died on the 26th of August 1894. Her son Roland Thaxter (b. 1858), a well-known crypto- gamic botanist, became professor of botany at Harvard in 1891.

THAYER, ABBOTT HANDERSON (1849-), American artist, was born at Boston, Massachusetts, on the 12th of August 1849. He was a pupil of J. L. Gerome at the Ecole des Beaux Arts, Paris, and became a member of the Society of American Artists (1879), of the National Academy of Design (1901), and of the Royal Academy of San Luca, Rome. As a painter of portraits, landscapes, animals and the ideal figure,

he won high rank among American artists. Among his best- known pictures are, ” Virgin Enthroned,” ” Caritas,” ” In Memoriam, Robert Louis Stevenson,” and ” Portrait of a Young Woman “; and he did some decorative work for the Walker Art Building, Bowdoin College, Maine. Thayer is also well known as a naturalist. He developed a theory of ” protective

coloration ” in animals (see Colours of Animals), which has attracted considerable attention among naturalists. According to this theory, ” animals are painted by nature darkest on those parts which tend to be most lighted by the sky’s light, and vice versa”; and the earth-brown of the upper parts, bathed in sky-light, equals the skylight colour of the belly, bathed in earth-yellow and shadow.

See his article, ” The Law which underlies Protective Coloration,” in the Annual Report of the Smithsonian Institution for 1897 (Washington, 1898) ; and Concealing Coloration in the Animal Kingdom (New York, 1910), a summary of his discoveries, by his son, Gerald H. Thayer.

THAYER, JAMES BRADLEY (1831-1902), American legal writer and educationist, was born at Haverhill, Massachusetts, on the 15th of January 183 1. He graduated at Harvard College in 1852, and at the Harvard Law School in 1856, in which year he was admitted to the bar of Suffolk county and began to practise in Boston. In 1873-83 he was Royall professor of law at Harvard; in 1883 he was transferred to the professor- ship which after 1893 was known as the Weld professorship and which he held until his death on the 14th of February 1902. He took an especial interest in the historical evolution of law.

He wrote: The Origin and Scope of the American Doctrine of Constitutional Law (1893); Cases on Evidence (1892); Cases on Constitutional Law (1895); The Development of Trial by Jury (1896); A Preliminary Treatise on Evidence at the Common Law (1898), and a short life of John Marshall (1901); and edited the twelfth edition of Kent’s

Commentaries and the Letters of Chauncey Wright (1877), and A Westward Journey with Mr Emerson (1884).

THAYER, JOSEPH HENRY (1828–1901), American biblical scholar, was born at Boston on the 7th of November 1828. He studied at the Boston Latin School, and graduated at Harvard in 1850. Subsequently he studied theology at the Harvard Divinity School, and graduated at Andover Theological Seminary in 1857. He preached in Quincy, and in 1859–64 in Salem, Massachusetts, and in 1862–63 was chaplain of the 40th Massachusetts Volunteers. He was professor of sacred literature in Andover Seminary in 1864–82, and in 1884 succeeded Ezra Abbot as Bussey professor of New Testament criticism in the Harvard Divinity School. He died on the 26th of November 1 901, soon after his resignation from the Bussey professorship. He was a member of the American Bible Revision Committee and recording secretary of the New Testament company. His chief works were his translation of Grimm's Clams Novi Testa- ments (1887; revised 1889) as A Greek-English Lexicon of the New Testament, and his New Testament bibliography (.1890).

THAYETMYO, a town and district in the Minbu division of Upper Burma. The town is situated on the right bank of the Irrawaddy, opposite Allanmyo. Pop. (1901) 15,824. The cantonment contains the wing of a British battalion and a native regiment. It enjoys a high reputation for healthiness. There is a special industry of silver work.

The district has an area of 4750 sq. m.; pop. (1901) 239,706, showing a decrease of 4 per cent, in the decade. The total rainfall in 1905 was 41–30 in. On the west is the Arakan Yoma range, and on the east the Pegu Yomas; and the face of the country, where it does not rise into mountains, is every- where broken by low ranges of hills, many of which are barren and destitute of all vegetation. The greater part of the district is wooded, and the Yomas east and west are covered with forests, now mostly preserved. The chief river is the Irrawaddy, which

traverses Thayetmyo from north to south. The drainage finds its way to the Irrawaddy by three main streams (the Pwon, Ma-htun and Ma-de) on the west, and by two (the Kye-ni and Hput) on the east. Several salt and hot springs occur in many localities; petroleum is also found, and extensive lime quarries exist a few miles south of Thayetmyo. The principal wild animals are elephants, rhinoceros, tigers, leopards, black bears and wild hog. Silver pheasants and partridges are found in large numbers, especially in the mountains. The chief products are rice, cotton, oil-seeds and tobacco; cutch is also very abundant, and the manufacture of the dye-stuff is carried On extensively. Coal has been found in the district, and earth

oil-wells exist, but neither coal nor oil has yet been extracted in any quantity. There are 403 sq. m. of reserved forest. Three oil-wells were sunk in 1883 at Pedaukpin, but they were found unprofitable and abandoned.

On the annexation of Pegu by the British in 1852-53, Tha- yetmyo was formed into a subdivision of Prome district; and in 1870 it was erected into a separate jurisdiction and placed under a deputy-commissioner. It was formerly in the Irra- waddy division of Lower Burma, but was transferred to Upper Burma for administrative purposes in 1896.

THEATRE (dkarpov, " a place for seeing," from Btaodai), a building specially devised for dramatic representations. The drama arose from the choric dances in honour of Dionysus, which were held in a circular dancing-place (opxilffTpa, Lat. orchestra) in his precinct at the foot of the Acropolis at Athens. When the leader of the chorus held a dialogue with the remaining choreutae he mounted the table which stood beside the altar of Dionysus in the centre of the orchestra; but as the number of

actors and the importance of the dialogue increased, it became necessary to erect a platform at the side of the dancing-place and a booth in which the performers could change their dresses and masks. At the same time temporary wooden stands (t/cpta) were set up for the spectators, who no longer ranged themselves around the whole ring, but only on the slope of the Acropolis, facing southward. We are told that the collapse of the t/cpta, in 409 B.C. led to the erection of a permanent theatre; this was not, however, a stone building. Embankments were made for the support of the spectators' benches: the stage buildings were of wood, and, although some traces of a stone theatre belonging to the end of the 5th century have been pointed out, the " theatre of Dionysus," whose remains may still be seen (PI. I. and II.), is in the main a work of the 4th century. It was completed soon after 340 B.C. under the administration of the statesman and financier Lycurgus. Alterations were made in the stage-buildings in the Hellenistic period, under Nero, and again in the 3rd century a.d. Although the proto-type of Greek theatres, it is not the most perfectly preserved. Amongst those of purely Greek design the most typical is that of Epidaurus (PI. I.), which was built in the latter part of the 4th century B.C. by Polyclitus the Younger. The largest known to Pausanias was that of Megalopolis, excavated by the British School at Athens in 1889-91, in which the stage buildings were replaced by the Thersilion, a large council - chamber. Others of importance for the study of the ancient theatre have been excavated at Delos, Eretria, Sicyon and Oropus. None of these, of course, is contemporary with the classical period of the Greek drama, and their stone stage-fronts belong to the Hellenistic period.

In Asia Minor we find a type of theatre (belonging to a some- what later date) with a broader, lower and deeper stage; and

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Fig 1 . — Diagram showing the principle on which the Greek theatre was planned according to Vitruvius.

the Roman theatre (see below) carries these changes still further. Before discussing their significance it will be best to describe the parts of the ancient theatre, the fullest account of which is to be found in the fifth book of Vitruvius (written in the Augustan period).

Its three main divisions were the auditorium (Lat. cavea; it had no technical name in Greek), the orchestra, and the stage buildings (oKtivrt, literally ” tent ” or ” booth ” Lat. scena). As the orchestra was the germ of the theatre, so it determined its shape, and in the Greek theatre preserved its circular form in many instances (as at

Epidaurus). In the scheme of proportions given by Vitruvius, however (see fig. I, which carries its own explanation), a segment (ihgf) was cut off by the stage-front (irpoaK-Qviov, proscenium). The auditorium was divided by nights of seats into wedge-shaped blocks (kcpk£5«, cunei) and also longitudinally by a gangway (StdfwMc, praecinctio) . In Greece the slope of a hill was always chosen for the auditorium and furnished with stone seats in tiers like steps. The slope of the Acropolis faces south, which (as Vitruvius points out) was the worst aspect for the spectators; but this was unavoidable for religious reasons, since the perform- ances had to be held in the precinct of Dionysus. At Athens

the inner boundary was a semicircle with the ends prolonged in parallel straight lines, which gave the spectators in the wings a better view of the stage than that obtainable in those theatres where (according to the Vitruvian rule) the boundary was segmental. At Epidaurus

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Fig. 2. From Dorpfeld and Reisch, Das gricchische Theater.

double western wall.

single wall.

;g, walls terminating wings of auditorium.

entrances.

the ” katatome ” (where the rock of the Acropolis was met

by the walls), diazoma.

eastern boundary wall, front wall of Neronian stage, fragment 5th-century orchestra, ancient masonry (? of supporting walls), oldest stage buildings.

stone proscenium (1st or 2nd century B.C.). foundations of Neronian side wings, fragments 5th-century orchestra. 4th-century portico, old Dionysus temple.

a compromise was effected by prolonging the ends of the semi- circle as segments of a curve with a longer radius. The best seats were in the lowest row; at Athens this was formed by a series of marble thrones assigned to various priests or officials whose titles may be read on those (60 out of 67) which are now preserved. The priest of Dionysus occupied the central throne. In some theatres benches with backs took the place of separate thrones. The right of sitting in reserved places was called vpoeSpia.

The orchestra, which was separated from the auditorium by a gutter and kerb and generally paved with slabs, contained an altar of Dionysus called the 8v;xi\ri, whence the choral or musical contests which took place in it were called ayaves 8v)ie \iKoi. At Athens this altar stood in the middle of a lozenge-shaped marble pavement. In a few theatres subterranean passages have been found, leading from the stage-buildings to the middle of the

orchestra, which may be supposed to have been used for the appearance of actors (e.g. as ghosts) in the orchestra : they do not exist, however, at Athens or Epidaurus, so that no general argu- ment can be founded on their remains.

The stage buildings of the earliest Greek theatres have been destroyed save for the foundations and architectural fragments, and the interpretation of

their remains presents a difficult problem. Whether built on level ground or (as at Sicyon and elsewhere) excavated in rock or earth they consisted of a rectangular structure two stories high, usually with projecting side wings_ (irapacrKrivia.). Between these wings was the itpoaK-qvLov (stage), which at Athens and indeed in all early theatres was built of wood, but was after- wards reconstructed in stone, with a front formed by a row of columns from 10 to 13 ft. high; its depth varied from 8 to ioi ft. It has been argued by Dorpfeld that the Trpoanriyiov was not a stage, but a background, which could be characterized as a palace, temple, &c, by means of painted ■wivo.Kts set up in the intervals between the columns, and that throughout the history of the Greek drama actors as well as chorus performed in the orchestra. This theory has been supported by arguments drawn from passages of the classical dramatists, which seem to imply that actors and chorus were on the same level, and by a priori considerations regarding the unfitness of so high and narrow a platform, uncon- nected with the orchestra by stairs (except such temporary wooden steps as may have left no trace in extant remains), for a stage. But these arguments are outweighed by the positive testimony of ancient writers and inscriptions that the actors in the Greek drama mounted on a platform (6/,p£/3as) which was also called the \oytiov (" speaking-place "), and the description of the Greek theatre by Vitruvius, who tells us that the \0yeT0v (Lat. pulpitum) was narrower than that of the Roman theatre, and was from 10 to 12 ft. high. Moreover the background afforded by the Hellenistic Kpoanrivia. would have been diminutive in its proportions — it must be remembered that Greek actors stood some 6 ft. 6 in. high when wearing the cothurnus and tragic mask — and quite unlike a palace or temple. They never have more than one doorway in the centre, though Vitruvius prescribes three, and in some theatres (where the stage buildings were partly excavated) there are no rooms at the back of them, but either virgin rock or earth. We may therefore dis- miss Dorpfeld's theory: but it is more than probable that

the wooden stage of the 5th century B.C. was much lower than that of Hellenistic times, when the chorus had either disappeared from dramatic performances or performed musical interludes unconnected with the action of the play. Horace, in fact, says of Aeschylus: "Aeschylus . . . modicis instravit pulpita tignis," and doubtless preserves a fragment of genuine tradition. When chorus and actors came into contact, wooden steps could be used, and that such were employed even in the later drama is proved by the evidence of South Italian vase-paintings which represent the Phylakes or burlesques popular at Tarentum.

The facade of the okt)vo furnished an architectural background, and this was supplemented by painted scenery, which, according to Aristotle, was introduced by Sophocles: Vitruvius, however, tells us that the first scene-painter, Agatharchus, worked for Aeschylus. In their days the o-mjW; was, of course, a mere booth. Changes of scene were very rare — there are only two in the extant classical tragedies — and were brought about by the use of revolving prisms (irtpiaxToi) . Other appliances used in the Greek drama were the (KKVKXruia, a low platform on rollers which was pushed forward in order to show an action supposed to take place in the interior of the own (the scene in a Greek play was always laid in the open air), and the pnxo-vn, a crane by which an actor representing a god could be suspended in mid-air (hence the phrase dens ex machina). In the upper part of the o-mjh? was a balcony called the Siareyla (" second story "), and at the top a narrow platform called the etoKoytiov, upon which gods supposed to be stationary in heaven could appear. Ghosts ascending^ from the underworld mounted the xo-P&vi-oi K\ip.a.Kes, whose position is uncertain. The fipovrtlov was a machine for imitating thunder by means of stones rolled in metal jars. It is far from certain whether a drop-scene was used in the classical period of the Greek drama; in later times and in the Roman theatre a curtain (avXaia, Lat. aulaea, siparium) was let down into a narrow slit in front of the stage before the play

began and drawn up at the end.

It has been mentioned above that in the later Hellenistic theatres the stage was made broader, lower and deeper, and in the Roman theatre, the principle of whose construction, as explained by Vitru- vius, is illustrated by fig. 3, the orchestra is reduced to a semi- circle (acd). The line ef is that of the background (scenae frons) and its limits are those of the cavea or auditorium.

The Romans, by their use of the arch in construction and also of concrete for vaulting, were enabled to erect theatres on level ground, such as the Campus Martius at Rome, where an elaborate structure, usually in three stories of arcades, 1 took the place of

1 Vitruvius prescribes for the Roman theatre a portico running round the interior of the auditorium on the level of the topmost row of seats; remains of such a portico (or, as at Aspendus, of a series of arcades) can sometimes be traced.

the natural hill-slope of Greek theatres. The Roman theatre thus became an organic whole; the auditorium and stage- buildings were structurally connected, and the orchestra was entered from the wings, not by open passages (irapdSoi.) as in Greece, but by vaulted corridors. The orchestra was no longer used for the performances (whether dramatic, musical or merely spectacular), but was reserved for senators and other persons of distinction. Hence (as Vitruvius points out) arose the necessity for lowering and enlarging the stage. It is hard to say when this change was made or at what date it was first introduced into Italy (if it did not originate in the west). The larger of the two theatres at Pompeii dates from the Hellen- istic period, but was thrice reconstructed, and it is not clear to what date we are to assign the low stage of Roman pattern; possibly it belongs to the earliest period of the Roman colony at Pompeii founded by Sulla (b.c. 80). The theatre of Pompey (see below) is said by Plutarch to have been copied from that of

Mytilene, which suggests that the Roman theatre was de- rived from a late Greek model; and this is made probable by the existence of transitional forms.

During the Republican period the erection of permanent theatres with seats for the spectators was thought to savour of Greek luxury and to be unworthy of the stern simplicity of the Roman citizens. Thus in 1 54 B.C. Scipio Nasica induced the senate to demolish the first stone theatre which had been begun by C. Cassius Longinus (" tanquam inutile et nociturum

Fig. 3. — Diagram showing the principle on which the Roman theatre was planned according to Vitruvius.

publicis moribus," Liv. Epit. 48). Even in 55 B.C., when Pompey began the theatre of which remains still exist in Rome, he thought it wise to place a shrine to Venus Victrix at the top of the cavea, as a sort of excuse for having stone seats below it — the seats theoretically serving as steps to reach the temple. This theatre, which was completed in 52 B.C., is spoken of by Vitruvius as " the stone theatre " par excellence: it is said by Pliny to have held 40,000 people. 2 It was also used as an amphi- theatre for the bloody shows in which the Romans took greater pleasure than in the purer intellectual enjoyment of the drama. At its inauguration 500 lions and 20 elephants were killed by gladiators. Near it two other theatres were erected, one begun by Julius Caesar and finished by Augustus in 13 B.C., under the name of his nephew Marcellus, 3 and another built about the same date by Cornelius Balbus (Suet. Aug. 29; Pliny, H. N. xxxvi. 59). Scanty remains exist of this last theatre, but the ruins of the theatre of Marcellus are among the most imposing of the buildings of ancient Rome.

A long account is given by Pliny (H. N. xxxvi. 5 and 114) of a most magnificent temporary theatre built by the aedile M. Aemilius Scaurus in 58 B.C. It is said to have held the in- credible number of 80,000 people, and was a work of the most costly splendour.

Still less credible is the account which Pliny gives (H. A'', xxxvi. 116) of two wooden theatres built by C. Curio in 50 B.C., which were made to revolve on pivots, so that the two together could form an amphitheatre in the after- noon, after having been used as two separate theatres in the morning.

All Roman provincial towns of any importance possessed at least one theatre; many of these are partly preserved. On

2 Huelsen has shown that this statement is exaggerated, and estimates the number of spectators at 9000 to 10,000.

3 According to Livy (xl. 51), the theatre of Marcellus was built on the site of an earlier one erected by Aemilius, Lepidus.

THEATRE

Plate I.

EPIDAURrS, THE THEATRE FROM THE WEST.

'koto, W. Leaf.

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A 1 HENS, THE THEATRE OF DIONYSUS FROM THE ACROPOLIS. 26

Plate II.

THEATRE

M. Woodward.

ASPENDUS, INTERIOR OF THE UPPER GALLERY OF THE THEATRE.

Photo, R. Ehey Smith.

ATHENS, PRINCIPAL SEATS IN THE THEATRE OF DIONYSUS.

Photo, A. M. Woodward.

ASPENDUS, THE STAGE WALL.

INTERIOR OF THEATRE, ORANGE;

PhoU, ManseU & Co.

THEATRE

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PI. II. will be found reproductions of two of the most important — that of Aspsndus in Pamphylia, which illustrates the Eastern type showing Hellenistic influence, and that of Arausio (Orange) in South Gaul. Covered theatres were sometimes built, whether on account of climatic conditions (as at Aosta) or more commonly for musical performances. These latter were generally called Odea (Gr. uSelov, a place for singing). The best preserved is the Odeum of Herodes Atticus, at the south-west angle of the Athenian Acropolis, which has a semicircular orchestra. It was built in the reign of Hadrian by Herodes Atticus, 1 a very wealthy Greek, who spent enormous sums in beautifying the city of Athens, in honour of his wife Regilla. Its cavea, which is excavated in the rock, held about 6000 people; it was con- nected with the great Dionysiac theatre by a long and lofty porticus or stoa, of which considerable remains still exist, probably a late restoration of the stoa built by Eumenes II. of Pergamum. It was also a common practice to build a small covered theatre in the neighbourhood of an open one, where per- formances might take place in bad weather. We have an example of this at Pompeii. The Romans used scenery and stage effects of more elaboration than was the custom in Greece. Vitruvius (iii. 7) mentions three sorts of movable scenery: — (1) for the tragic drama, facades with columns representing public build- ings; (2) for comic plays, private houses with practicable windows and balconies; 2 and (3) for the satyric drama, rustic scenes, with mountains, caverns and trees.

Bibliography. — By far the fullest account of the Greek theatre is given in Dorpfeld and Reisch, Das

griechische Theater (Athens, 1896). Its main thesis is, however, rejected by many archaeo- logist? on the grounds stated above. Puchstein, Die griechische Biihne, endeavours to prove that a ‘stone theatre was built at Athens in the 5th century B.C., and that the proscenium usually supposed to be Hellenistic dates from the time of Lycurgus (above). For English readers the best account of the Greek theatre is to be found in A. E. Haigh’s Attic Theatre (3rd ed., revised by A. W. Pickard-Cambridge, 1907), where a bibliography of the voluminous literature of recent times is given. Albert Midler’s Lehrbtich der griechischen Buhnenaltertiimer (Freiburg, 1886) is indispensable to the student. For the Roman theatre reference may be made to Durm, Baukunst der Homer, ed. 2, pp. 645 if.

(J. H. M.; H.S.J.)

The Modern Theatre

During the middle ages miracle plays with sacred scenes were the favourite kind of drama; no special buildings were erected for these, as they were represented either in churches or in temporary booths. In the 16th century the revival of the secular drama, which, in the reign of Elizabeth, formed so im- portant a part of the literature of England, was carried on in tents, wooden sheds, or courtyards of inns, mostly by strolling actors of a very low class. It was not till towards the close of the century that a permanent building was constructed and licensed for dramatic representations, under the management of Shakespeare and Burbage.

The first building specially erected in London for dramatic purposes was built in 1576-77 by the actor James Burbage. It was constructed of timber, and stood in Holywell Lane, Shoreditch, till 1598, when it was pulled down; it was known as ” The Theatre ” par excellence. Of almost equally early date was the ” Curtain ” theatre, also in Shoreditch; so called from the plot of ground, known as ” The Curten,” on

which it stood. It probably continued in use till the general closing of theatres by order of the parliament in 1642. The ” Glebe ” theatre, famous for its association with Shakespeare, was built by James Burbage, who used the materials of ” The Theatre,” in the year 1599. Its site was in Southwark, in the Bankside, near the ” Bear Gardens.” It was an octagonal structure of wood, with lath and plaster between the main framework. It was burnt in 1613, rebuilt, and finally pulled down and its site built over

1 This theatre was not begun when Pausanias wrote his book Attica, and was complete when he wrote the Achaica (see Paus. vii. 20). It is illustrated in Mon. Inst, vi., plate 16.

2 These are shown on Graeco-Roman vases of the latest type, with paintings of burlesque parodies of mythological stories.

in 1644. Its name was derived from its sign of Atlas supporting the globe. Near it were two less important theatres, ” The Rose,” opened in 1592 by Henslowe, and “The Swan” (see below), opened in 1598 and partly owned also by Henslowe; like the Globe, the latter was an octagonal wood-and-plaster building. The ” Blackfriars ” theatre, another of the Burbages’ ventures, was built in 1596, near the old Dominican friary. The ” Fortune ” theatre was built by Edward Alleyn, the actor, in 1599, at a cost, including the site, of £1320. It stood between Whitecross Street and Golding Lane. It stood as late as 1819, when a drawing of it was given by Wilkinson {Londina illustrata, 1819). The ” Red Bull ” theatre was probably originally the galleried court of an inn, which was adapted for dramatic pur- poses towards the close of Elizabeth’s reign. Other early theatres were the ” Hope ” or ” Paris Garden ” theatre, the ” Whitefriars ” and ” Salisbury Court ” theatres, and the ” Newington ” theatre. A curious panoramic view of London, engraved by Visscher in 1616, shows the Globe, the Hope and the Swan theatres.

The plan of the first English theatres appears to have had no connexion with those of classical times, as was the case in Italy: it was evidently produced in an almost accidental way by the early custom of erecting a temporary platform or stage in the middle of the open courtyard of an inn, in which the galleries all round the court formed boxes for the chief spectators, while the poorer part of the audience stood in the court on all sides of the central stage. Something similar to this arrange- ment, unsuitable though it now seems, was reproduced even in buildings, such as the Globe, the Fortune and the Swan, .which were specially designed for the drama. In these and other early theatres there was a central platform for the stage, surrounded by seats except on one side, where there was a " green-room " or " tireynge-howse." The upper galleries or boxes completely surrounded the stage, even the space over the green-room being occupied by boxes. This being the arrange- ment, it is easy to see why the octagonal plan was selected in most cases, though not in all — the Fortune theatre, for example, was square. An interesting specification and contract for the building of the Fortune theatre (see below) is printed by Halliwell-Phillipps (op. cit. infra, p. 164). In all its details the Fortune is specified to be like the Globe, except that it is to be square in plan, and with timbers of heavier scantling. The walls are to be of wood and plaster, the roof tiled, with lead gutters, the stage of oak, with a " shadow " or cover over it, and the " tireynge-howse " to have glazed windows. Two sorts of boxes are mentioned, viz., " gentlemen's roomes " and " twoo- pennie roomes." A woodcut showing this arrangement of the interior is given in a collection of plays edited by Kirkman in 1672. The vexed question of the construction of these theatres has been much discussed in recent years. In 1888 a drawing of the Swan theatre (fig. 4), apparently copied from a rough drawing in a London letter from the traveller Johannes de Witt, was discovered by Dr Karl Gaedertz in a manuscript volume in the Utrecht University library, consisting of the common- place book of Arend van Buchell (1565-1641). While un- doubtedly

authentic, and probably broadly accurate, this copied sketch cannot be accepted, however, as giving the regular or typical plan of the contemporary theatre, as in some respects it does not fulfil the known conditions of the stage. What that typical plan was, if (as is probable) one actually existed, has led to much learned conjecture and great difference of opinion as regards the details required by the interpretation of contemporary stage directions on the necessities of the action in contemporary drama. The ingenious reconstruction (fig. 5), drawn by W. H. Godfrey in 1907, of the Fortune theatre, following the builder's specification; appears to approach very nearly to satisfying all the requirements. (See " The Elizabethan Stage," in the Quarterly Review (London), April 1.908.)

In the r6th and 17th centuries a favourite kind of theatrical representation was in the form of ' masques," with processions of grotesquely attired actors and temporary scenic effects of great splendour and mechanical ingenuity. In the reigns of James I.

and Charles I., Ben Jcnson and the architect Inigo Jones worked together in the production of these " masques," Jonson writing the words and Inigo Jones devising the scenic effects, the latter being very costly and complicated, with gorgeous buildings, landscapes, and clouds or mountains, which opened to display mimic deities, thrown into relief by coloured lights. These masques were a form of opera, in which Ben Jonson's words were set to music. Ben Jonson received no more for his libretto than Inigo Jones did for his scenic devices, and was not un-naturally annoyed at the secondary place which he was made to occupy: he therefore revenged himself by writing severe satires on Inigo Jones and the system which placed the literary and mechanical parts of the opera on the same footing. In an autograph MS.

which still exists this satirical line occurs — ” Painting and carpentry are the soul of masque ” (see Cunning- ham, Life of Inigo Jones, London, 1848).

In Italy, during the 16th century, the drama occupied a more important position, and several theatres were erected, professedly on the model of the classic theatre of Vitruvius. One of these, the Teatro Olimpico at Vicenza, still exists; it was designed by Palladio, but was not completed till 1584, four years after his death. It has an architectural scena, with various orders of columns, rows of statues in niches, and the three doors of the classic theatre; but the whole is painted with strong perspective effects which are very unclassical in spirit. Scamozzi, Palladio’s pupil, who completed the Teatro Olimpico,

Italian ballet; and in the middle of the 17th century the regular opera was introduced at Paris.

At the end of the 18th century the theatres of San Carlo at Naples, La Scala at Milan, and La Fenice at Venice were the finest in Europe; all these were rebuilt in the 19th century,

Fig. 4. — Swan Theatre ; from Sidney Lee’s Life of William Shakespeare, by permission.

built another pseudo-classical theatre in 1 588 at Sabbionetta for the duke Vespasiano Gonzaga, but this does not now exist.

In France the miracle play developed into the secular drama rather earlier than in England. In the reign of Louis XL, about 1467, the ” Brothers of the Passion ” had a theatre which was partly religious and partly satirical. In the 16th century Catherine de’ Medici is said to have spent incredible sums on the dresses and scenery for the representation of the

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Fig. 5. — The Fortune Theatre; restoration of Walter H. Godfrey.

but have been eclipsed by the later theatres of London, Paris, St Petersburg and other great cities of Europe and America, both in size and

architectural splendour.

Authorities. — Much valuable information about the early theatres of London is given by Wilkinson, Londina illustrata (18 19), in which are engravings of some of them. See also Collier, Hist, of Dramatic Poetry (1879); Halliwell-Phillipps, Life of Shakespeare (1883); R. Lowe, Life of T. Betterton; Malone, History of the Stage (1790), republished by Boswell in 1 821; the publications of the New Shakspere Society; the Ninth Report of the Historical MSS. Commission ; and a series of articles on early London theatres, by T. F. Ordish, in The Antiquary, vols, xi., xii. and xiv. (1885-86).

On the problems connected with the construction of the Eliza- bethan theatre, see Dr Cecil Brodmeier, Die Shakespeare-Biihne nach den alten Buhneranweisungen (Weimar, 1904); Dr Paul Monkemeyer, Prolegomena einer Darstellung der Englischen Volks- biihne zur Elizabeth und Stuart Zeit (Leipzig, 1905); Dr Richard Wegener, Die Buhneneinrichtung des Shakespeareschen Theaters nach dem zeitgenossischen drama (Halle, 1907) ; George F. _ Reynolds, Some Principles of Elizabethan Staging (Chicago University, 1905); E. K. Chambers, " The Stage of the Globe," in vol. x. of the Strat- ford Shakespeare (1904); Victor E. Albright, A Typical Shake- sperian Stage (New York, 1908). (J. H. M.; H. Ch.)

Modern Stage Mechanism

A movement known as " Stage Reform " originated in Austria about 1880, with the primary object of encouraging the greatest possible imitation of nature in the presentation of opera and drama. The rudiments of art as understood by painters, sculptors, architects and the cultured public of the day were to be applied to the stage, and a true scenic art was to take the place of the nondescript mounting previously given. To facilitate the efforts of the scenic artist, the fullest applica- tion of modern science, notably of mechanics and hydraulics,

and the introduction of up-to-date methods of lighting were considered essential. The numerous fatal conflagrations which had originated on the stage caused the question of pro- tection from fire to be closely associated with this movement,

and the enterprise made great headway, more particularly on account of the protective measures against fire proposed soon after the burning of the old Ring Theatre at Vienna. The movement gradually developed throughout Austria and Ger- many and spread beyond the frontiers of these countries. Con- currently, independent movements originated elsewhere, and from 1885 to 1895 a transitional period may be said to have existed for the stage, both in Europe and in the United States, but by the close of the 19th century the necessity for reform was recognized in every country. During the transitional time various unsatisfactory experiments were made, some of the boldest experiments proving costly failures, yet serving, because of such features as were valuable, as a basis for further developments. Great Britain and France were almost the last countries touched by this movement, although in England throughout the 'nineties there was considerable improvement in actual scenic art and stage-mounting, as far as this could be brought about without the aid of improved stage mechanism.

Amona those primarily responsible for this new epoch in scenic art in Great Britain were Sir Henry Irving and Mr Beerbohm Tree, both actor-managers, Mr Hubert von Herkomer, R.A., Sir L. Alma-Tadema, R.A., and Mr Edwin O. Sachs, architect. Although almost last in the application of stage reform in its best sense, England really completed the experi- mental period with the modernization of the Royal Opera House, Covent Garden, where, by the opening of the season of 1902, the directorate were provided with the latest improve- ments of mechanical skill for the almost complete re-equipment of stage scenery. This

work of remodelling was carried out by the Grand Opera Syndicate, with Mr Edwin O. Sachs as technical adviser and architect. Modern mechanism has also been applied at the Apollo Theatre, London, where, however, the stage equipment was bodily imported from the Continent and does not include any mechanically or electrically driven parts, manual labour alone being used. The stage mechanism which was employed in the equipment of the Royal Opera House, Covent Garden, embodies the Sachs system of dividing the stage- floor into a few large sections and working them with the aid of electrical power, the Brandt system of counter-weighting for the suspension of all scenery from above, the application of light in four colours by electricity, and the designing of all scenery to accord as much as possible with nature, the whole mounting being built up on the basis of a flat stage as distinct from the sloping stage of old.

The classification of stages generally, both home and foreign, whether for the production of opera or plays, should be made Stage as follows: wood stages, wood and iron stages, and iron

Mechan- stages, with subdivisions according to the power chiefly ism. employed in working the appliances. These subsections

are: manual labour, hydraulics and electricity. Owing to the almost entire absence of steam for motor power in connexion with stage machinery, a separate subdivision for appliances where steam is employed is not required. With the wood stage and the wood and iron stage manual labour alone is utilized. But in the iron stage manual labour, hydraulic power and electric power are either used individually, or a combination of any two or three of these classes is applied. The first series of stages built in accordance with the principles of Stage Reform was erected on what was termed the " asphaleia " system, in which direct hydraulic power was utilized throughout. The stage- floor is divided into innumerable small sections supported on rams (some working telescopically) , whilst everything

suspended from above is also worked mechanically by hydraulic power. Notable examples are the Budapest Opera House and the Municipal Theatre at Halle.

The next type is that of the stage of the Court Theatre, Vienna, which, although based to a considerable extent on the " asphaleia " system, showed somewhat larger sections. These are suspended by cables and worked indirectly by small hydraulic rams placed at the side, whilst the whole of the top work is manipulated by manual labour with the partial assist- ance of counter-weights. The next type is the Brandt type,

where the number of divisions of the stage is further reduced to a few medium-sized sections, worked by means of a com- bination of a central hydraulic ram and suspended cables duly counter-weighted. The top work in this case is entirely counter- weighted, and requires the least possible manual labour for manipulation. An example will be found at the Wiesbaden Court Theatre. We next have the Sachs system, where electric power is substituted for hydraulic power, the number of stage divisions limited to several large sections, suspended on cables partly counter-weighted and partly worked by electric motors, while the whole of the top work is balanced on a system similar to that of the Brandt, with intermediate electric motors for the manipulation of particularly heavy loads. It is this last system that has been adopted at the Covent Garden Opera House, with the modification that the top work is entirely operated on the latest development of the Brandt system of manual labour and counter-weights. Another example of the Sachs system, as far as individual stage sections are concerned, will be found in a portion of the Theatre Royal, Drury Lane.

Regarding the question of expense and practicability, the hydraulic system has generally been found to be expensive and impracticable. The system of the Court Theatre, Vienna, though practicable, is costly both in capital and annual outlay. The Brandt method of equipping the upper

stage mechanism has been found particularly suitable for medium-sized theatres, and not expensive. The Sachs system has been found practic- able, of moderate initial cost and minimum annual outlay. The advantages of electricity over hydraulic power have been most marked both in capital and in annual expense. There is of course a far greater initial outlay required to-day than with the wooden stage of old, but the saving in staff and wear and tear of the scenery, and the absence of expensive temporary makeshifts, repairs and reinstatements, compensate for this by a material reduction of annual charges. It is known as a fact that upon an overhaul of the Covent Garden equipment being ordered after five years' running, the contractors could not find anything to do in the way of repairs or reinstatements. The stage carpenter has long reigned supreme in England and France, although in England there are already one or two notable exceptions of men who are advancing to the position of engineers rather than carpenters. In Germany and Austria the stage carpenter is already being .replaced in most theatres by men of engineering or technical training, as the more complex arrange- ments of a modern stage demand intelligent and careful control. It is merely a question of time for the engineer to obtain general control in these matters.

Regarding the actual designing and painting of the scenery, the English scene-painter may now be considered in advance of his Continental and American colleagues, although Scene- the productions of some notable ateliers at Vienna painting. and Munich run the English scene-painter's work very closely. In 1890 Vienna was in advance of England in scene- painting, but the English scene-painters have since then rapidly come to the front, and it is to be anticipated that it will never again be necessary to import scenery from Austria, as has been the case, both at the Theatre Royal, Drury Lane, and at the Royal Opera House, Covent Garden. As a matter of fact, scenery from Covent Garden and Drury Lane is already exported to the United States. The position of the scene-painter is particularly difficult,

inasmuch as whilst artistic temperament and thorough knowledge of art are essential for the practice of his vocation, it is equally essential that he should be thoroughly practical and to a considerable extent a mechanic. He lacks recognition among artists and there is unfortunately a tendency to depreciate his work.

*During the period of interregnum in stage reform there ap- peared a number of faddist inventions which, while creating public interest, cannot be considered of lasting Modern practical utility. Thus in the United States an at- inven- tempt was made to have a large platform constructed * Iobs - like a lift, bodily rising and falling, with three different tiers ot stages on which scenery could be mounted at different levels*

and then raised or lowered into position. Again, at Munich, a scheme of turn-tables based on the Japanese revolving stage was put forward, but this can only be looked upon as an in- teresting experiment of little practical value.

Numerous methods of illuminating the stage have similarly- been attempted, with the aid of search-lights, and proscenium- lights, or by the absence of foot-lights, and the like, but the general method of lighting the stage from the top with battens, from the side with wing-ladders, and from below with foot-lights, if carefully regulated and skilfully handled, produces excellent results. The lighting arrangements as practised at the Royal Opera House, Covent Garden, in which building the lighting engineer is Mr Crawshaw and the consulting engineer for the lighting installation was Mr Bowles, leave nothing to be desired from an artist's point of view. The great difficulty of the light coming too strongly from below, i.e. from the foot-lights, can

be overcome by the regulation and colouring of the lights.

As examples of modern mechanism, two photo- graphs have been reproduced showing views of the electrical stage ” bridges ” of the Royal Opera House, Covent Garden, and of the Theatre Royal, Drury Lane, respectively, both on the Sachs system (see PI. III.). A small general plan and section of the Covent Garden stage are also shown (see fig. 6), and another illustration (see PL IV.) presents the ” gridiron ” at Covent Garden on the Brandt system.

The following is a detailed description of the Covent Garden installation.

The stage may be described as consisting of a series of six horizontal sections running parallel with the curtain line from front to back, each section being 8 ft. wide, and the whole being followed by a large back or rear stage. The first section contains nothing but a plain ” carpet cut,” and openings to take the old-fashioned ” grave ” trap, ” star ” trap, or other similar contriv- ances. The second and third sections comprise large bridges, which can be raised 6 ft. above the stage or lowered 8 ft. below the stage, constructed in two levels, on the lower level of which appliances can be installed for the purpose of raising minor platforms above stage level or sinking traps and the like. The fourth, fifth and sixth sections comprise large bridges running right across the stage front, which can be raised 9 ft. above the stage or lowered 8 ft. below it. The back stage has no openings or mechanism beyond certain trap-doors to a scenery store, and the necessary electrical mechanism for raising and lowering scenery for storage purposes. Between the various sections of the stage, long longi- tudinal flaps, 2 ft. wide, have been formed, which can be easily opened to allow scenery to be passed through below for transformation scenes and the like. Each section is equipped with what is termed a pair of chariots, to hold ” wing ” lights placed on so-called wing ladders. All the electrical bridges are worked from the ” mezzanine ” level and from ordinary switch- boards, and can be raised and lowered at various speeds, and take loads up to 2 tons. They can be moved without vibration or noise at a cost of about \d. for power on a full rise when loaded.

Above the stage level each section has its series of lines to take cloths, borders, &c. Each section has a batten, from which the electric battens are suspended, and has also a large wooden lattice girder, from which heavy pieces of scenery can be hung. There are, on the average, about ten lines for ordinary battens, a girder batten, and a light batten to each section; besides these lines, there are the equipments of flying apparatus and the like,

whilst in front there are, of course, the necessary lines for tableaux curtains, act-drops and draperies. Everything that is suspended from above can be worked at stage level or at either of the gallery levels, every scene being counter-weighted to a nicety, so that one man can easily handle it. No mechanical contrivance is required, and in practice quite a number of scenes can be rapidly changed in a very short time. Throughout the structure and mechanism steel has been used, with iron pulleys and wire cable; and the inflam- mable materials have been absolutely reduced to the flooring of the gridiron and galleries and the hardwood flooring of the stage und mezzanine. In other words, an absolute minimum of inflam- mable material replaces what was almost a maximum ; and seeing

that the electric light has been installed, the risk of an outbreak of fire or its spread has been materially reduced.

No mention of stage mechanism would be complete unless mention were made of the necessity of providing a carefully made and easily worked fire-resisting curtain of substantial but light con-struction. On the Continent metal curtains are favoured. In England the double asbestos curtain is more common. The London County Council prefer a steel framing with asbestos wire-wove cloth on both faces, the intervening space being filled with slag wool, well rammed and packed. Such curtains are somewhat

CKOSS SECTION THRO A B-

Fig. 6. — Plan and Section of Covent Garden Stage.

heavy and require counter-weighting to a nicety, but if well made and fitted may be deemed satisfactory. It is advisable to fit drenchers above fire-resisting curtains and tc so arrange the working of the curtain that it can be lowered from four points, i.e. from both sides of the stage, from the prompt side flies and from the stage door. According to the

Lord Chamberlain's rules, fire resisting curtains must be lowered once during a performance. This is a wise measure for testing the efficiency of the appliances.

Authorities. — Modern Opera Houses and Theatres, 3 vols, grand folio, by Edwin O. Sachs (1896-99); 'Stage Construction, I vol. grand folio, by Edwin O. Sachs (1896); " Engineering " : Articles on Stage Mechanism, by Edwin O. Sachs (1895-97); Fires and Public Entertainments, 1 vol. quarto, by Edwin O. Sachs (1897); Le Thedtre, 1 vol. oct., by Charles Gamier (1871); Les Thedtres

THEATRE

Plate III.

Ptom a Photograph !>v S- B Bolat &* Co.

SACHS' ELECTRICAL STAGE "BRIDGES," ROYAL OPERA HOUSE, COVENT GARDEN.

From a Photograph by Alfred Ellh & Walery,

SACHS" ELECTRICAL STAGE "BRIDGES," THEATRE ROYAL, DRURY LANE.

XXVI. ?34.

Plate IV.

THEATRE

THEATRE

Anglais, by Georges Bourdon (1902); Die Theater, Wien, 2 vols. quarto, by Josef Bayer (1894). (E- O- S.)

"Spectacle"

The appeal to the eye has been the essential feature of dramatic production in its many stages of development from the earliest times of the miracle

plays and " moralities," mummers and morris-dancers, down through the centuries, in the form of masques and ballets, to the luxuriance of scenic and costume display that is lavished on the latest forms of theatrical entertainment. Considering the enormous advance that has been made in mechanical appliances, more especially in the increased powers of illumination supplied by gas and electricity 1 as compared with oil and candles, we must acknowledge that the artistic achievement of spectacle has hardly kept pace with the times. If we may credit the veracity of contemporary chroniclers, the most elaborate effects and illusions were successfully at- tempted in the various courtly entertainments that are recorded under the Tudor and Stuart dynasties, and found perhaps their most sumptuous expression in the courts cf Louis XIV. and Louis XV. It would be a difficult task for the most experienced of modern stage managers to rival the splendours of apparel and the ingenious devices that were exploited in increasing magnificence during successive periods, as described by Froissart, Holinshed, Cavendish, Stow, Pepys and other writers. The sums expended on these entertainments were prodigious, and a perusal of the extraordinarily detailed descriptions of such lavishly appointed masques as those designed by Inigo Jones in particular renders credible the statement that a certain masque presented before Charles I. at the Inns of Court in 1633 cost £21,000. Spectacle in its earlier phases appears to have existed chiefly in connexion with court and civic ceremonial: as evidenced in the wonderful pageantry of the Field of the Cloth of Gold; in such princely entertainment as the Revels at Kenilworth, when the Earl of Leicester welcomed Queen Elizabeth in a series of splendid fetes; and in the more accom- plished imaginings of Ben Jonson, decorated by Inigo Jones, such as the Inns of Court masque, already cited. The scenic effects and illusions which had evidently been brought to great perfection in these masques were not devoted to the service of the drama in the public theatres until Davenant introduced them at the period of the Restoration, although simple

scenery, probably mere background " cloths," had been seen on the stage as early as 1605. The built-up stage pictures, familiar to us as " set-scenes," are said to owe their origin to Philip James de Loutherbourg, R.A., and to have been first used in 1777; but it is difficult to believe that some such elaborate construc- tions had not already enjoyed a term of popularity in view of the contemporary paintings and engravings of the epoch of Louis XIV., who was himself not averse from appearing (in 1653) as " Le Roi Soleil " in the midst of an entourage com- bining much that was artistic and fanciful with the most pompous and most absurd incongruities of character and costume. A greater measure of elegance and refinement distinguished the spectacles of the reign of Louis XV., inspired by the delicate

1 The Savoy Theatre, London, was first entirely lighted by electricity in 1882. The various methods of lighting used have been an important item in the production of striking effects. The old system of a row of " foot-lights, " with their unpleasant upward shadow, is now almost obsolete. Dip candles were used till 1720, when moulded candles were introduced into French theatres. The next improvement was the lamp of M. Argand, with its circular wick. In 1822 gas was first used in a Parisian theatre, next came the oxyhydrogen lime-light, used for special effects, and then electric lighting.

The old way of producing lightning was to blow lycopodium or powdered resin with bellows through a flame, and this is still used in realistic effects of conflagrations. More effective lightning is now made by flashing the electric light behind a scene painted with clouds, in which a zigzag aperture has been cut out and filled with a transparent substance. Thunder is made by shaking large sheets of iron. Wind is imitated by a machine with a cogged cylinder, which revolves against coarse cloth tightly stretched. The sound of rain is produced by shaking parched peas in a metal cylinder.

art of Watteau, Boucher and Lancret, and preserved for our delectation in their delightful canvases.

Under the French Revolution the spectacular ballet lost much of its prestige; and its decorative features were for a time principally associated with the fetes inaugurated by the Republic, and presented in the classic costume, which the severity of the new regime adopted as a reaction, or as a protest against the frivolities and furbelows of the obliterated monarchy. The Festival of the Supreme Being, decreed by the National Convention, designed by David and conducted by Robespierre, was perhaps the most impressive spectacle of the close of the 18th century.

The 19th century saw spectacle devoted almost exclusively to theatrical entertainment. In London, melodrama, both of the romantic and domestic description, claimed its illustrative aid. At Drury Lane Theatre (which, with Covent Garden, the Adelphi and Astley's, was first illuminated by gas in 181 7-18) the Cataract of the Ganges, with its cascade of real water and its prancing steeds, made a great sensation in 1823, and the same stage in 1842, under Macready's management, displayed the " moving wave " effect in the Sicilian views, painted by William Clarkson Stanfield for Acis and Galatea. The Lyceum Theatre from 1847 to 1855 introduced a long series of elegant extrava- ganzas from the pen of J. R. Planche, elaborately illustrated by the scenery of William Beverly. The Golden Branch, the King of the Peacocks and the Island of Jewels (Christmas 1849) were the most remarkable of these productions, and were noteworthy as originating the fantastic fairy pictures that became known as " transformation scenes," and were copied and popularized in all directions. Beverly's skilful brush was at a later date employed at Drury Lane to enhance the attractions of a succession of spectacular versions of Sir Walter Scott's novels, Amy Robsart (1870), Rob Roy (with a beautiful panorama of the Trossachs scenery), Rebecca, England in the Days of Charles II., and others. Later still, under the regime of Sir Augustus Harris and his successors, spectacle at Drury Lane assumed even more costly proportions, and modern melodramas, representing well-known

localities with extra- ordinary fidelity and all kinds of disasters from earthquakes to avalanches, have been alternated with sumptuously mounted pantomimes (so-called), in which the nominal fairy-tales were almost smothered by the paraphernalia of scenery and costume. It is remarkable that, for a " run " of ten weeks only, such a sum as £16,000 each can have been profitably expended on more than one of these productions.

London playgoers will recall the processional glories of A Dream of Fair Women, designed by Alfred Thompson; Ths Land, of Fairy Tales, by Percy Anderson; and The Silver Wedding (Puss in Boots), The Paradise of the Birds (Babes in the Wood), and The Gods and Goddesses of Olympus (Jack and the Beanstalk), for which Mr Wil helm was responsible. The Armada, a historical drama (1888), also deserves to be remembered for the completeness and excellence of its spectacular features. In addition to the names of Clarkson Stanfield and Beverly, already cited as masters of scenic art, it must not be forgotten that the skill of David Roberts was also devoted to the embellishment of the stage; and the names of Grieve, the Telbins (father and son), Hawes Craven, and J. Harker have in successive years carried on the best traditions of the art. Alfred Thompson was one of the first to revise the conventionalities of fanciful stage costume, and to impart a French lightness of touch and delicacyof colour. A ballet, Yolande, which he dressed for the Alhambra in the 'sixties, was the first Japanese spectacle to grace the English stage; and he was also mainly responsible for the attractions of Babil and Bijou, which cost upwards of £11,000 at Covent Garden Theatre in 1872, and was at the time considered to have surpassed all former spectacular accomplish- ments. It achieved, however, merely a succes d'estime, and has bequeathed to a later generation only the recollections of its " Spring " choir of boys, and of the brilliant danseuse, Henriette d'Or, who revived memories of the great days of the ballet, when Taglioni, Cerito, Elssler, Duvernay and other " Deesses de la Danse," appeared

under Lumley's management at the old Her Majesty's Theatre in the Haymarket. Since the memorable tenancy of Sadler's Wells Theatre by Phelps (1844-62), Shake- speare and spectacle have been honourably associated. Charles Kean's revivals at the Princess's Theatre (1850-59) deservedly attracted considerable attention for the splendour and accuracy of their archaeology. Byron's Sardanapalus was also a triumph for the same management in 1853; and the same theatre three

decaHes later witnessed the production (December 1883) by Wilson Barrett of Claudian, a romantic poetic drama of classic days, mounted so exquisitely as to gain Ruskin's enthusiastic praise But undoubtedly the earliest noteworthy alliance of spectacle with Shakespeare was made by Sir Henry Irving at the Lyceum. The art of Royal Academicians was happily enlisted to add lustre and distinction to his productions. . Ravenswood and the sumptuously presented Henry VIII. (1892) owed much to the co-operation of Mr Seymour Lucas. Sir Lawrence Alma-Tadema supervised Cym- beline and Coriolanus (1901), whilst Sir Edward Burne-Jones inspired the decoration of King Arthur (1895). In Tennyson's Cup (pro- duced in January 1881) and in the beautiful revival of Romeo and Juliet it was felt that perfection of stage illusion could scarcely go farther, but the next production, Much Ado about Nothing, with its superb church scene by Telbin, was admittedly Irving's crowning success, alike from the artistic, the dramatic, the 'spec- tacular and the financial standpoints. Great praise was equally won by the version of Faust, which was frankly spectacular, and by the more recent Robespierre by Sardou. Shakespeare and the poetic drama were also finely illustrated by Mr Beerbohm Tree, who secured Sir Lawrence Alma-Tadema's interest for Hypatia at the Haymarket, and Julius Caesar at the new His Majesty's; whilst for his later productions, King John, A Midsummer Night's Dream, Herod (by Stephen

Phillips), Twelfth Night (1901), and such later plays as his revival of Antony and Cleopatra (1907), he was assisted by the designs of Percy Anderson, an artist who made his mark in the costumes for a series of the operas at the Savoy Theatre, notably the 15th-century dresses for the Beauty Stone. Spectacular features of exceptional refinement distinguished the pantomime of Cinderella, presented by Mr Oscar Barrett at the Lyceum Theatre in Christmas 1893, and designed by Mr Wilhelm. This production also enjoyed a prosperous season in New York. The system of international exchange seems to hold good in stage spectacle as in other cases, and in return for English successes that have been welcomed in America, Augustin Daly's Shakespearean productions were greatly admired in London. Other entertain- ments of a more absolutely spectacular order found acceptance in London. In connexion with Barnum and Bailey's Hippodrome, Imre Kiralfy's show, Nero, constituted a "mammoth combination," and attracted crowds to " Olympia " in 1890. The success of this latter spectacle of colour and movement, which was also designed by Mr Wilhelm, induced Mr Kiralfy to produce a still more am- bitious entertainment the following season, Venice, designed by the same artist. A spectacle on these lines may be regarded as the outcome of such ballets as have long been popular on the continent of Europe — especially in Italy, where grace of movement and spontaneity of gesture are natural to the people, and greatly facili- tate such an enterprise as the famous Excelsior ballet of Manzotti, which lasted a whole evening, in several acts, and required the services of hundreds of figurantes. Excelsior was originally pro- duced at La Scala, Milan, in January 1881, and was subsequently given with great success at the Eden Theatre, Paris, in 1883. The revived popularity of the modern ballet, as at the Empire Theatre, London, has also been associated with some memorable triumphs of spectacle with which the name of Mr Wilhelm was closely identified as designer. (C. Wi.)

Law Relating to Theatres.

It was not until comparatively late in Roman history that acting became a distinct calling. The troops of public actors (ministeria publica) were generally slaves, and their earnings enriched their masters more than themselves.

The regulation of the theatre by legislation (except as to struc- ture) belongs chiefly to the time of the lower empire, in which it depended almost wholly upon constitutions of Theodosius and Valentinian, incorporated in the Theodosian Code (Tit. xv. 5, 6, 7), and a century later to a large extent adopted by Justinian. In the whole of this law there is an evident attempt at a compromise between the doctrines of Christianity and the old Roman love of public spectacles of all kinds. It deals less with theatrical repre- sentations proper than with gladiatorial contests and chariot races. 1 The Theodosian Code provided that the sacraments were not to be administered to actors save where death was imminent, and only on condition that the calling should be renounced in case of recovery. Daughters of actors were not to be forced to go on the stage, pro- vided that they lived an honest life. An actress was to be allowed to quit the stagfr in order to become a nun. There were also numerous sumptuary regulations as to the dress of actors. None of the law which has been mentioned so far was adopted by Jus- tinian, but what follows was incorporated in Cod. xi. 40 (De Spec- taculis et Scenicis), which consists entirely of extracts from the Theodosian Code of a very miscellaneous nature. Provision was made for the exhibition of public games and theatrical spectacles

1 The word ludi seems sometimes to include, sometimes to exclude, dramatic performances. Its meaning in a particular instance depends on the context.

by magistrates, practically confining them to exhibiting in their own cities. Statues of actors were not to be placed in the public streets, but only in the proscenium of a theatre. A governor of a province was entitled to take the money raised for

public games for the purpose of repairing the city walls, provided that he gave security for afterwards celebrating the games as usual. Munici- palities were encouraged to build theatres {Dig. 1, 10, 3). By Novel cxvii., it was ground for divorce if a wife went to the theatre without her husband's knowledge. In Cod. iii. 12, 11 {De Feriis) is a constitution of Leo and Anthemius forbidding dramatic repre- sentations on Sunday. The Digest (iii. 2) classed all who acted for hire {omnes propter pecuniam in scenam prodeuntes) as infamous persons, and as such debarred them from filling public offices. A mere contract to perform not fulfilled did not, however, carry infamy with it. By Novel li. actresses could retire from the stage without incurring a penalty even if they had given sureties or taken an oath. There was probably a censorship at certain periods, 2 as well as provisions for safety of the building and the audience (Tacitus, Ann., iv. 63; Leonine Constitutions, cxiii.). The seats were allocated by the state, and the care of the building committed to certain magistrates {Novel cxlix. 2).

England.— In England, as in other countries of western Europe, theatrical legislation was of comparatively recent introduction. Such legislation was unnecessary as long as the theatre was under the control of the Church and actors under its protection, the Church having turned to its own uses what it was powerless to prevent. The earliest regulations were therefore, as might be expected, made by the Church rather than by the state. The ecclesiastical ordinances were directed chiefly against the desecration of churches, though they sometimes extended to forbidding attendance of the faithful as spectators at plays even of a harmless kind. 3 Sacraments and Christian burial were denied by the canon law to actors, whose gains, said St Thomas, were acquired ex turpi causa and who, if they exceeded what was proper, might be in mortal sin. It was a doubtful point as to whether spectators might not be in similar case. The same law forbade plays to be acted by tiie clergy, even under the plea of custom, as in Christmas week, and*

followed the code of Justinian in enjoining the clergy not to consort with actors or be present at plays (see Decretals, iii. 1,12 and 15, De Vita et Honestate Clericorum). As late as 1603, canon lxxxviii. of the canons of the Church of England enacted that churchwardens were not to suffer plays in churches, chapels or churchyards. The latest occurrence of such a play seems to have been at Oxford in 1592.

The Reformation marks the period of transition from the ecclesiastical to the non-ecclesiastical authority over the drama. Precautions began to be taken by the crown and the legislature against the acting of unauthorized plays, by unauthorized persons, and in unauthorized places, and the acting of plays objectionable to the government on political or other grounds. The protection of the Church being withdrawn, persons not enrolled in a fixed company or in possession of a licence from the crown or justices were liable to severe penalties as vagrants. The history of the legislation on this subject is very curious. An act of the year 1572 enacted that " all fencers, bearwards, common players of interludes, and minstrels (not belonging to any baron of this realm, or to any other honourable person of greater degree)," wandering abroad without the licence of two justices at the least, were subject " to be grievously whipped and burned through the gristle of the right ear with a hot iron of the compass of an inch about." This statute was superseded by 39 Eliz. c. 4, under which the punishment of the strolling player is less severe, and there is no mention of justices. The jurisdiction of justices over the theatre disappears from legislation

2 If one may judge from Horace's line (Sat., i. 10, 38): Quae neque in aede sonent certantia judice Tarpa.

3 A large number of such ordinances will be found cited in Prynne, Histriomastix; Bossuet, Maximes et reflexions sur la comedie; Mariana, De Spectaculis. They followed the almost unani- mous condemnation by

the Christian fathers. See, for example, Chrysostom, Contra Ludos et Theatra; Tertullian, De Spectaculis; Augustine, De Civ. Dei, i. 31, Confessions, iii. 2; Dill, Roman Society, pp. 47, 117.

4 For this reason it appears to have been the custom in France for actors to be married under the name of musicians. See Hist. parlementaire de la Revolution francaise, vi. 381. The difficulties attending the funeral of Moliere are well known.

from that time until 1788. In 39 Eliz. c. 4 there is a remark- able exception in favour of persons licensed by Dutton of Dutton in Cheshire, in accordance with his claim to liberty and jurisdiction in Cheshire and Chester, established in favour of his ancestor by proceedings in quo warranto in 1499. 1 The stricter wording of this act as to the licence seems to show that the licence had been abused, perhaps that in some cases privi- leges had been assumed without authority. In 14 Eliz. c. 5 the privileges of a player attached by service of a noble or licence from justices, in the later act only by service of a noble, and this was to be attested under his hand and arms. The spirit of the acts of Elizabeth frequently appears in later legis- lation, and the unauthorized player was a vagabond as late as the Vagrancy Act of 1744, which was law till 1824. He is not named in the Vagrancy Act of 1824. The Theatre Act of 1737 narrowed the definition of a player of interludes, for the pur- poses of punishment as a vagabond, to mean a person acting interludes, 2 &c, in a place where he had no legal settlement.

Before the Restoration there were privileged places as well as privileged persons, e.g. the court, the universities, and the inns of court. With the Restoration privilege became practically confined to the theatres in the possession of those companies (or their representatives) established by the

letters patent of Charles II. in 1662. In spite of the patents other and un- privileged theatres gradually arose. 3 In 1735 Sir John Barnard introduced a bill " to restrain the number of playhouses for playing of interludes, and for the better regulation of common players." On Walpole's wishing to add a clause giving parlia- mentary sanction to the jurisdiction of the lord chamberlain, the mover withdrew the bill. In 1737 Walpole introduced a bill of his own for the same purpose, there being then six theatres in London. The immediate cause of the bill is said to have been the production of a political extravaganza of Fielding's, The Golden Rump. The bill passed, and the act of 10 Geo. II. c. 28 regulated the theatre for more than a century. Its effect was to make it impossible to establish any theatre except in the city of Westminster and in places where the king should in person reside, and during such residence only. The act did not confine the prerogative within the city of Westminster, but as a matter of policy it was not exercised in favour of the non-privileged theatres, except those where the " legitimate drama " was not performed. The legitimate drama was thus confined to Covent Garden, Drury Lane and the Hay market from 1737 to 1843. In the provinces patent theatres were established at Bath by 8 Geo. III. c. 10, at Liverpool by n Geo. III. c. 16, and at Bristol by 18 Geo. III. c. 8, the act of 1737 being in each case repealed pro tanto. The acting of plays at the universities was forbidden by 10 Geo. II. c. 19. It is not a little remarkable that the universities, once possessing unusual dramatic privileges, should not only have lost those privileges, but have in addition become subject to special disabilities. The restrictions upon the drama were found very inconvenient in the large towns, especially in those which did not possess patent theatres. In one direction the difficulty was met by the lord chamberlain granting annual licences for performances of operas, pantomimes and other spectacles not regarded as legitimate drama. In another direction relief was given by the act of 1788 (28 Geo. III. c. 30), under which licences for

occasional performances might be granted in general or quarter sessions for a period of not more than sixty days. The rights of patent theatres were preserved by the prohibition to grant such a licence to any theatre within eight miles of a patent theatre. During this period (1737–1843) there were several decisions of the courts which confirmed the

1 The " advowry," as it was called, over the Cheshire minstrels lasted until 1756, when the latest minstrel court was held at Chester.

2 Interludes were acted in the open air at Berriew in Mont- gomeryshire as lately as 1 819, when the players were indicted before the Great Sessions of Wales. They had been prohibited in the Declaration of Sports (1633) and in the Propositions of Uxbridge (1644).

3 See W. Nicholson, The Struggle for a free Stage in London

(1907).

operation of the act of 1737 as creating a monopoly. The ex- clusive rights of the patent theatres were also recognized in the Disorderly Houses Act, 1751, and in private acts dealing with Covent Garden and Drury Lane, and regulating the rights of parties, the application of charitable funds, &c. (see 16 Geo. III. cc. 13, 31; 50 Geo. III. c. ccxiv.; 52 Geo. III. c. xix.; 1 Geo. IV. c. lx.). The results of theatrical monopoly were beneficial neither to the public nor to the monopolists them- selves. In 1832 a select committee of the House of Commons recommended the legal recognition of " stage-right " and the abolition of theatrical monopoly. The recommendations of the report as to stage-right were carried out immediately by Bulwer Lytton's Act, 3 & 4 Will. IV. c. 15 (see Copyright). But it was not till eleven years later that the Theatres Act, 1843, was passed, a previous bill on the same lines having been re- jected by the House of Lords. The act of

1843 inaugurated a more liberal policy, and there is now complete " free trade " in theatres, subject to the conditions imposed by the act. The growth of theatres since that time has been enormous. Nor does the extension seem to have been attended with the social dangers anticipated by some of the witnesses before the com- mittee of 1832.

The suppression of objectionable plays was the ground of many early statutes and proclamations. While the religious drama was dying out, the theatre was used as a vehicle for enforcing religious and political views not always as orthodox as those of a miracle play. Thus the act of 34 & 35 Hen. VIII. c. 1 made it criminal to play in an interlude contrary to the orthodox faith declared, or to be declared, by that monarch. Profanity in theatres seems to have been a crying evil of the time. Stephen Gosson attacked it as early as 1579 in his School of Abuse. The first business of the government of Edward VI. was to pass an act reciting that the most holy and blessed sacrament was named in plays by such vile and unseemly words as Christian ears did abhor to hear rehearsed, and inflicting fine and im- prisonment upon any person advisedly contemning, despising or reviling the said most blessed sacrament (1 Edw. VI. c. 1). A proclamation of the same king in 1549 forbade the acting of interludes in English on account of their dealing with sacred subjects. In 1556 the council called attention to certain lewd persons in the livery of Sir F. Leke representing plays and interludes reflecting upon the queen and her consort and the formalities of the mass. The same queen forbade the re- currence of such a representation as the mask given by Sir Thomas Pope in honour of the Princess Elizabeth at Hatfield, for she " misliked these follies." By the Act of Uniformity, 1 Eliz. c. 2, it was made an offence punishable by a fine of a hundred marks to speak anything in the derogation, depraving or despising of the Book of Common Prayer in any interludes or plays. In 1605 " An Act to restrain the Abuses of Players " made it an offence punishable by a fine of £10 to jestingly or

profanely speak or use certain sacred names in any stage play, interlude, show, may-game or pageant (3 Jac. I. c. 21). In consequence of the appearance of players in the characters of the king of Spain and Gondomar, an ordinance of James I. forbade the representation on the stage of any living Christian king. The first act of the reign of Charles I. forbade acting on Sunday. Puritan opposition to the theatre culminated in the ordinance of 1648, making it a crime even to be present as a spectator at a play. 4 After the Restoration there are few royal proclamations or ordinances, the necessary jurisdiction being exercised almost entirely by parliament and the lord chamberlain. Among the few post-Restoration royal pro- clamations is that of the 25th of February 1664-65, restraining any but the company of the Duke of York's theatre from enter- ing at the attiring house of the theatre, and that of the 27th of February 1698-99 against immorality in plays.

Preventive censorship of the drama by an officer of state dates from the reign of Elizabeth. The master of the revels (see Revels) appears to have been the dramatic censor from 1545 to

4 For the anti-theatrical Puritan literature see Courthope, History of English Poetry, ii. 381.

1624, when he was superseded by his official superior, the lord chamberlain. 1 In some cases the supervision was put into commission. Thus with Tilney, the master of the revels in 1581, were associated by order of the privy council a divine and a statesman. In other cases it was delegated, as to Daniel the poet by warrant in 1603. The proposal to give statutory authority to the jurisdiction of the lord chamberlain led, as has been already stated, to the withdrawal of Sir John Barnard's bill in 1735, and to considerable debate before the bill of 1737 became law. Lord Chesterfield's objection to

the bill in the House of Lords was not unreasonable. ” If the players,” said he, ” are to be punished, let it be by the laws of their country, and not by the will of an irresponsible despot.” A stage play must now be duly licensed before performance. § 12 of the act of 1843 prescribes that a copy of every new play and of every addition to an old play, and of every new prologue or epilogue or addition thereto (such copy to be signed by the master or manager), shall be sent to the lord chamberlain, and, if the lord chamberlain does not forbid it within seven days, it may be represented. § 13 empowers the lord chamberlain to fix a scale of fees for examination; the fee is now two guineas for a play of three or more acts, one guinea for a play of less than three acts. All plays represented previously to the act are held to be licensed. A play once licensed is licensed once for all unless the licence be revoked under § 14. The examination is the duty of a special officer of the lord chamberlain’s department, the examiner of stage plays. In spite of occasional lapses of judgment, a belief in the wisdom generally shown in the exercise of the censorship has been confirmed by the report of tK«- select committee of the House of Commons in 1866, and also by the report of the joint committee of both Houses in 1909. The censorship has been consistently supported in recent years by theatrical managers, but violently opposed by an advanced section of dramatic authors. There have been instances, no doubt, where perhaps both the lord chamberlain and his subordinate officer, the examiner of stage plays, have been somewhat nice in their objections. Thus, during the illness of George III., King Lear was inhibited. George Colman, when examiner, showed an extraordinary antipathy to such words as ” heaven ” or ” angel.” The lord chamberlain’s powers are still occasionally exerted against scriptural dramas, less frequently for political reasons. Later instances are Oscar Wilde’s Salomi (1892), Joseph of Canaan (1896), Maeterlinck’s Monna Vanna (1902). Housman’s Bethlehem (1902), Gilbert and Sullivan’s Mikado (temporarily in 1907), and a play by Laurence

Housman dealing with George IV. (1910). Before 1866 the lord chamberlain appears to have taken into considera- tion the wants of the neighbourhood before granting a licence, but since that year such a course has been abandoned. The joint committee in 1909 recommended that it should be optional for an author to submit a play for licence, and legal to perform an unlicensed play whether submitted or not, the risk of police intervention being taken. They also recommended that the reasons for which a licence should be refused should be: in- decency, offensive personalities, the representation in an in- vidious manner of a living person or a person recently dead, violation of the sentiments of religious reverence, the presence of anything likely to conduce to crime or vice, or to cause a breach with a friendly power, or a breach of the peace.

A theatre may be denned with sufficient accuracy for the present purpose as a building in which a stage play is performed for hire. It will be seen from the following sketch of the law that there are a considerable number of different persons, corporate and unincor- porate, with jurisdiction over theatres. A consolidation of the law and the placing of jurisdiction in the hands of a central authority for the United Kingdom would probably be convenient. The committee of 1866 recommended the transfer to the lord chamber- lain of the regulation of all places of amusement, and an appeal from him to the home secretary in certain cases, as also the exten- sion of his authority to preventive censorship in all public enter- tainments; but no legislation resulted. The committee of 1909

1 It was probably through his influence that the expletives in Shakespeare were edited. The quarto of 1622 contains more than the folio of 1623.

recommended the abolition of any distinction between theatres and music-halls. Several bills for the amendment of the law have been introduced, but without success in the face of more burning political questions. 2

Building. — A theatre (at any rate to make it such a building as can be licensed) must be a permanent building, not a mere tent or booth, unless when licensed by justices at a lawful fair by § 23 of the act of 1843. It must, if in the metropolis, conform to the regulations as to structure contained in the Metropolis Management Act 1878, and the Local Government Act 1888. These acts make a certificate of structural fitness from the county council necessary as a condition precedent for licence in the case of all theatres of a superficial area of not less than 500 sq. ft. licensed after the passing of the act, give power to the council in certain cases to call upon proprietors of existing theatres to remedy structural defects, and enable it to make regulations for protection from fire. The existing regulations were issued on the 30th of July 1901 and 25th of March 1902. As to theatres in provincial towns, the Towns Improve- ment Act 1847, and the Public Health Act 1875, confer certain limited powers over the building on municipal corporations and urban sanitary authorities. In many towns, however, the struc- tural qualifications of buildings used as theatres depend upon local acts and the by-laws made under the powers of such acts.

Performance. — To constitute a building where a performance takes place a theatre, the performance must be (a) of a stage-play, and (b) for hire, (a) By § 23 of the act of 1843 the word " stage- play " includes tragedy, comedy, farce, opera, burletta, interlude, melodrama, pantomime or other entertainment of the stage, or any part thereof. The two tests of a stage-play appear to be the excitement of emotion and the representation of action. The question whether a performance is a stage-yjlay or not seems to be . one of degree, and one rather of fact than of law. A ballet d'action would usually be a stage-play, but it would be otherwise with a ballet divertissement. § 14 empowers the lord chamberlain to forbid the acting of any stage-play in Great Britain whenever he may be of opinion that it is fitting for the preservation of good manners, decorum, or the public

peace to do so. § 15 imposes a penalty of £50 on any one acting or presenting a play or part of a play after such inhibition, and avoids the licence of the theatre where it appears. Regulations of police respecting the performance are contained in 2 & 3 Vict. c. 47, and in many local acts. A per- formance may also be proceeded against as a nuisance at common law, if, for instance, it be contra bonos mores or draw together a great concourse of vehicles, or if so much noise be heard in the neighbourhood as to interfere with the ordinary occupations of life. Very curious instances of proceedings at common law are recorded. In Sir Anthony Ashley's case (2 Rolle's Rep. 109), 1615, players were indicted for riot and unlawful assembly. In 1700 the grand jury of Middlesex presented the two play-houses and also the bear-garden on Bankside (the " Paris garden " of Henry VIII. act v. sc. 3) as riotous and disorderly nuisances. Per- formances on Sunday, Good Friday, and Christmas day are illegal. Regulations as to the sale of intoxicating liquors during the per- formance are made by the licensing acts and other public general acts, as well as by local acts and rules made by county councils. It is frequently a condition of the licence granted to provincial theatres that no excisable liquors shall be sold or consumed on the premises. The excise duty where such liquors are sold varies according to the annual value of the theatre up to a maximum of £20. The Dangerous Performances Acts, 1879 and 1897, forbid under a penalty of £10 any public exhibition or performance whereby the life or limbs of a child under the age of sixteen if a boy, eighteen if a girl, shall be endangered. It also makes the employer of any such child indictable for assault where an accident causing actual bodily harm has happened to the child, and enables the court on conviction of the employer to order him to pay the child compensation not exceeding £20. The Prevention of Cruelty to Children Act 1904 forbids a child to appear in any public enter- tainment without a licence from a petty sessional court, (b) The performance must be for hire. § 16 of the act of

1843 makes a building one in which acting for hire takes place, not only where money is taken directly or indirectly, but also where the purchase of any article is a condition of admission, and where a play is per- formed in a place in which excisable liquor is sold. In the case of Shelley v. Bethell, 1883 (Law Reports, 12 Q.B.D. 11), it was held that the proprietor of a private theatre was liable to penalties under the act, though he lent the theatre gratuitously, because tickets of admission were sold in aid of a charity.

Licensing of Building. — By § 2 of the act of 1843 all theatres (other than patent theatres) must be licensed. By § 7 no licence

2 Dryden's words in the " Essay on Satire " (addressed to the earl of Dorset, lord chamberlain) still describe the duties of the office. " As lord chamberlain 1 know you are absolute by your office in all that belongs to the decency and good manners of the stage. You can banish from thence scurrility and prefaneness, and restrain the licentious insolence of poets and their actors in all things that shock the public quiet or the reputation of private persons under the notion of humour."

is to be granted except to the actual and responsible manager, who is to be bound by himself and two sureties for due observance of rules and for securing payment of any penalties incurred. The metropolitan theatres other than the patent theatres (as far at least as they are included in the boroughs named in the act of 1843) are licensed by the lord chamberlain. By § 4 his fee on grant of a licence is not to exceed 10s. for each month for which the theatre is licensed. The lord chamberlain appears to have no power to make suitable rules for enforcing order and decency. He can, however, by § 8, suspend or revoke a licence or close a patent theatre where any riot or misbehaviour has taken

place. He has issued a code of regulations.

Provincial theatres fall under three different licensing authorities. The lord chamberlain licenses theatres in Windsor and Brighton, and theatres situated in the places where the king occasionally resides, but only during the time of such occasional residence (§ 3). Theatres at Oxford and Cambridge, or within 14 m. thereof, are licensed by the justices having jurisdiction therein, but before any such licence can come into force the consent of the chancellor or vice-chancellor must be given. The rules made by the justices for the management of the theatre are subject to the approval of the chancellor or vice-chancellor, who may also impose such conditions upon the licence as he thinks fit. In case of any breach of the rules or conditions, he may annul the licence (§ 10). All other provincial theatres are licensed by the county councils or county borough councils 1 under s. 7 of the act of 1888, except in case of a special and temporary performance, where justices still grant the licence as they did in all cases before that act came into operation. The regulations of the London County Council are dated the 27th of July 1897. Penalties are imposed by the act for keeping or acting in an unlicensed theatre, and for producing or acting in an unlicensed play. A contract to perform in an unlicensed theatre is unenforceable.

Music Halls. — Music was at no time the object of restrictions as severe as those imposed upon the drama. The present English act governing music halls, the Disorderly Houses Act 1751, was passed probably in consequence of the publication in 1750 of Fielding's Inquiry into the Causes of the late Increase of Robbers. It is remarkable that two works of the same writer should from opposite causes have led to both theatre and music-hall legislation of lasting importance. The act was originally passed for a term of three years, but was made perpetual by 28 Geo. II. c. 19. It applies only to music halls within 20 m. of London and West- minster. Every such music hall must be licensed at the Michaelmas quarter sessions, the licence to be signified under

the hands and seals of four or more justices. The licence may be granted for music or dancing or both. Public notice of the licence is to be given by affixing over the door the inscription " Licensed in pur- suance of act of parliament for," with the addition of words showing the purpose. The penalty for keeping an unlicensed music hall is £100. This act is amended as to Middlesex by the Music and Dancing Licences (Middlesex) Act 1894, putting the licensing into the hands of the county council. Regulations were made by the council under this act on the 31st of July 1900 and the 27th of June 1901. Music halls beyond the radius of 20 m. from London and Westminster are mainly governed by the Public Health Act 1890, the licensing authority being the licensing justices. There is no censorship of music-hall performance, the only remedy for anything objectionable is for the licensing authority to withdraw the licence or refuse to renew it.

See generally \V. X. M. Geary, Law of Theatres and Music Halls (1885); C. Hamlyn, Manual of Theatrical Law (1891); A. A. Strong, Dramatic and Musical Law (1898); J. B. Williamson, Law of Licensing (1902).

Scotland. — In Scotland the theatre has always exercised a smaller amount of influence than in England, and there has been little exclusively Scottish legislation on the subject. 1555, c. 40, dis- countenanced certain amusements of a semi-theatrical kind by enacting that no one was to be chosen Robert -Hude (sic), Little John, abbot of unreason, or queen of May. A proclamation of lames VI. in 1574, and 1579, c. 12, followed the lines of English legislation by making persons using unlawful plays, such as jugglery or fast and loose, punishable as vagabonds. In 1574 the General Assembly claimed to license plays, and forbade representations on Sunday. As in England, the licensing power seems then to have passed from the church to the crown, for in 1599 James VI. licensed a theatre at Edinburgh. 1672, c. 21, exempted comedians while upon the stage from the sumptuary provisions of the act respecting apparel. The chamberlain of Scotland, while such an office

existed^ appears to have exercised a certain police jurisdiction over theatres. The Theatres Act 1843 extends to Scotland, as did also the previous act of 1737, and further provisions are made by the Burgh Police Act 1892.

Ireland. — Theatrical legislation, as far as it went, was based upon English models. Thus ridicule of the liturgy was forbidden by 2 Eliz. c. 2 (Ir.) ; common players of interludes and wandering

1 The councils may delegate their authority to justices, a district council, or a committee of their own body, such as the Theatre and Music Hall Committee of the London County Council.

minstrels were deemed vagabonds, 10 & II Car. I. c. 4 (Ir.). In 1786 an act was passed to enable the crown to grant letters patent for one or more theatres in Dublin city and county, 26 Geo. III. c. 57 (Ir.). The preamble alleges that the establishing of a well- regulated theatre at the seat of government will be productive of public advantage and tend to improve the morals of the people. Exceptions from the restrictions of the act were made in favour of entertainments for the benefit of the Dublin lying-in hospital and exhibitions of horsemanship or puppet-shows. The existing theatre and music-hall acts do not apply to Ireland, except the Public Health Act 1890, s. 51.

British Colonies. — There is a large amount of legislation. An example is the Victoria Act, No 1430 (1897), giving the chief secretary power to cancel or suspend the licence of any theatre if used on Sunday without special permit.

United States. — Public entertainments, dramatic or other, are usually under the control of the municipal authorities, and there is no act of Congress on the subject, except one of 1898 imposing a temporary war tax on the theatres. In most states there is state legislation, requiring places of public entertainment to be licensed by the proper authority. In many states it is a condition of the

licence that intoxicating liquors shall not be sold in such places. Other conditions, more or less usual, are that there shall be no Sunday or dangerous performances, that acrobats shall be properly protected, and that female waiters shall not be employed. Structural qualifications are in some cases made necessary. Thus in 1885 the New York legislature passed an act containing many minute provisions for ensuring the safety of theatres against fire. A characteristic piece of legislation is the New York Act of 1873, c. 186, enacting that no citizen is to be excluded from a theatre by reason of race, colour or previous condition of servitude. This act of course merely carries out the important principle affirmed in art. xiv. of the amendments to the constitution of the United States. There are two curious and conflicting decisions of other states on the matter. Missouri held that a manager could dis- criminate against a person of colour, Michigan that he could not (see Green's Digest, vol. i. 642).

Continental Europe. — The principal points in which the continental theatre differs from the English are that Sunday is the most impor- tant day, and that the theatre is often owned or subsidized by the state or a municipality. In France there has been much legislation since the days of the Revolution, the principal law being one of 1864. A feature is the tax known as le droit des pauvres, which has been the subject of much discussion. The censure prialable was abolished in 1906. The object is attained by police penalties. Most of the authorities will be found in Dalloz, Supplement, vol. xvii., and, for the older law, Lacan, La Legislation et la jurisprudence des theatres (1853), and Maugras, Les Comediens hors de la lot (1887), may be consulted. Italy has produced at least two modern works on the subject, Rivalta, Storia e Sistema del Diritto dei Teatri (1886), and Tabanelli, Codice del Teatro (1901). What strikes one is how little special legislation there is on the subject. The penal code meets most cases. Spain retained the autos sacramentales much longer than

other countries retained the religious drama. Legisla- tion begins very early. The Siete Partidas enacts that the clergy are not to take part as actors or spectators in scurrilous plays [juegos por escarnio). Cervantes in the first part of Don Quixote makes the canon of Toledo regret that the government had not appointed a censor to prevent the acting of plays not only injurious to morals but also offending a'gainst the classical rules of the drama. There is a considerable amount of law in the Ottoman empire; details will be found in G. Young, Corps de droit ottoman, vol. ii. 320 (1904). (J. W.)

THEBES (Qrj(3cu), the Greek name of the ancient capital of Upper Egypt, presumably an Egyptian name (e.g. Zemi, seen in -o~r]fus, -rrj/iis) assimilated to that of the Greek city. It occurs in Homer (//. ix. 381-4) where it has the epithet iKaroixirvKos, " hundred-gated," probably derived in the first place from the gateways of its endless temples, though perhaps misunderstood as if it referred to a city with a hundred gates in the circuit of its walls. Thebes was never a walled city in this sense, though its vast temple enclosures in different quarters would form as many fortresses in case of siege or tumult. Its Egyptian name was Wesi (or Wis?), later Ne, " the city " (sometimes Ne- Amun, hence No-Amon in Nahum iii. 8), and different quarters were known by special names. In non-literary Greek Thebes was regularly called Diospolis the Great. Ammon, Amen-Re, or Amenrasonther (" Ammon-Re king of the gods ") was its deity, with his consort Mut and their child Khons. Mont also was a local deity and Hathor presided over the western cliffs of Thebes. In very ancient times the city lay on the east bank, the necropolis on the west. As it grew, however, al- though the necropolis was still confined to the west bank, a vast city of temples, priests and necropolis people, to which

were added royal palaces and their accompaniments,

covered the western shore as far back as the desert hills. The chief nucleus of the ancient Wesi was a town about the temple of Karnak: it probably reaches back to the prehistoric period. At Drah abu'l nagga, opposite to it, are tombs of its princes under the Vlth Dynasty. The temple of Karnak is no doubt of immemorial antiquity. Perhaps no sculpture earlier than the Xllth Dynasty has survived there, but Senwosri I. dedi- cated statues to his predecessors of the Vth Dynasty who had probably showed their devotion to Ammon in a substantial manner, and Cheops of the IVth Dynasty is named in it. After the end of the Old Kingdom Thebes grew from an obscure pro- vincial town to be the seat of a strong line of princes who con- tended for supremacy with Heracleopolis and eventually triumphed in the Xlth Dynasty of Manetho. The most im- portant monument of the Middle Kingdom now extant at Thebes is the funerary temple of Menthotp III. of this dynasty, which has been revealed by the excavations of the Egypt Exploration Fund at Deir el Bahri (see Architecture, section Egyptian, fig. 4): and the period is well represented by an abundance of statues of the Xllth and Xlllth dynasties from the temple of Karnak. The name Amenemhe, so common in the Xllth Dynasty, shows the importance of the Theban god at this time. It was not, however, till the XVIIIth Dynasty, the beginning of the New Empire, that the whole site began to be occupied by monuments which have survived to the present day. The early rulers of this dynasty down to Tethmosis III. developed Karnak, and on the west bank built the great funerary temple of Deir el Bahri and smaller temples as far south as Medinet Habu, and began the long series of royal tombs in the famous Valley of the Tombs of the Kings far back in the desert behind Deir el Bahri. Amenophis III. continuing, trans- formed western Thebes monumentally: built three great temples in addition, that of Mont on the north of Karnak, the temple of Mut on the south and the temple of Ammon at Luxor, and connected the last two with the state temple of Karnak by avenues of sphinxes. On the west bank of the huge colossi of Memnon marked the entrance of

his funerary temple, a magnificent building which was afterwards destroyed, and the great lake of Birket Habu was dug and embanked in front of his brick palace at the extreme south. The chief energies of this king in fact were expended on developing the south ex- tremity of Thebes on both banks. The city and its monuments now covered an area about three miles square. After this Thebes experienced a serious set-back with the heresy of Akhenaton, the son of Amenophis III. He moved his capital northward to Akhetaton (El Amarna) and strove to suppress the worship of Ammon, doing infinite damage to the monu- ments of Thebes by defacing his name and figure. After about twenty years, however, the reaction came, Thebes was again the capital, and a little later under Seti (Sethos) I. and Rameses II. of the XXth Dynasty it was raised to greater architectural magnificence than ever. These two kings built the great columnar hall of Karnak, added a large court with pylons to Luxor, and on the west bank built the funerary temple of Seti at Kurna, and the Ramesseum with its gigantic colossus, be- sides other edifices of which only traces remain. Under the XVIIIth and XlXth Dynasties Thebes was at the height of its greatness. Conquering Pharaohs brought home trains of prisoners and spoil, embassies came thither of strange people in every variety of costume and of every hue of skin, from Ethiopia, Puoni (Punt), Mesopotamia, Asia Minor, Libya, and the islands of the Mediterranean, bringing precious stones, rare animals, beautiful slaves, costly garments and vessels of gold and silver, while the ground shook with the movement of colossal architraves, statues and obelisks. The tombs of the XVIIIth Dynasty on the west bank and the sculptures in the temples reflect the brilliancy of these days, but even the reign of Rameses II. marks the beginning of the decline of Thebes. The enormous constructive energy of the proud Pharaoh, in- stead of being concentrated on the capital, was expended with almost equal lavishness on other parts of the country. In

every city he left his mark. A great temple at Tanis

boasted a larger colossus than existed in Thebes: Heliopolis and Memphis must have been lavishly adorned, and the temples of Abu Simbel (q.v.) alone would have been sufficient to satisfy the ambition of many of the great Pharaohs. After Rameses II. the efforts of all his successors combined could add little to the wonders of Thebes. The temple and tower of Rameses III. (XXth Dynasty) at Medinet Habu, his tomb in the Biban el Moluk, the temple of Khons (Rameses III. and later) and the court of Sheshonk I. (XXIInd Dynasty) at Karnak are the only great achievements.

For the rest there are the tombs of many kings in the Biban el Moluk and a good deal of comparatively petty construction and tinkering, with the help of stone robbed from older structures. Earlier and greater kings had remorselessly de- stroyed buildings which interfered with their own plans. The " Memnon " temple of Amenophis III. had already gone, sacrificed perhaps to Akhenaton's god. Rameses II. had plundered his predecessors' monuments for materials. Hitherto Thebes had been glorified by. the process, but henceforth it was rather to perish. The tide of prosperity was flowing northward and such monumental energy as remained was expended more widely. For several centuries after the fall of the New Empire Thebes was but one of several alternating or contemporaneous capitals. Memphis, Tanis, Bubastis, Sais, Heracleopolis had at one time or another at least equal claims. The Ethiopian con- querors of Egypt made Thebes their Egyptian capital, but in 668 Assur-bani-pal sacked the city. Psammetichus did not neglect it, and during the XXVIth Dynasty Petemenopi, a wealthy priest and official, excavated for himself the greatest private tomb that ever was made. Probably every king that included Thebes in his realm, except the Assyrians and the Persians, left his memorial there in chapels erected or sculptures added. Of the Persians, however, not even Darius is traceable at Thebes; on the other hand, there is no support for the tradi- tion that Cambyses destroyed its monuments. Ptolemy I. gave a new capital to the upper country in the

Greek foundation of Ptolemais, and thus struck a fresh blow at the prosperity of Thebes. For a short period in the reign of Epiphanes, when Upper Egypt was in rebellion against the Ptolemaic rule, Thebes was the capital of independent native dynasts. In a later rebellion, Thebes was captured after a three years' siege and severely punished by Lathyrus (Ptolemy X., Soter II.). In the reign of Augustus, having joined in the insurrection against the tax-gatherers, it was destroyed by Cornelius Gallus and became a collection of villages. Though its vast k buildings have since served as quarries for mill-stones and for the lime- burner, Thebes still offers the greatest assemblage of monu- mental ruins in the world.

We will now briefly enumerate the principal groups of monu- ments. On the east bank at Karnak stand the great state temple of Amen-Re with its obelisks of Hatshepsut and Teth- mosis I. and the vast columnar hall of Rameses II.; the temple of Mut and the well-preserved temple of Khons; the temple of Luxor and avenues of rams and sphinxes connecting all these. These temples are described in the articles Karnak, Luxor and Architecture: Egyptian. On the west bank, in front of the necropolis, on the edge of the desert or projecting into the cultivation, was a low row of temples: the northernmost, placed far in front of the others, is the well-preserved temple of Seti I. at Kurna; then follow the Ramesseum and Medinet Habu; and the foundations of many others can be traced. The temple of Amenophis III., to which the colossi of " Memnon " were attached, was again far forward of the line. The Ramesseum contains the remains of a stupendous seated colossus, in black granite, of its builder Rameses II., thrown on its face. When perfect it was probably 57 ft. high and weighed about 1000 tons, surpassing the " Memnon " statues of Amenophis III. in size and weight. The temple of Rameses III. at Medinet Habu, sculptured with very interesting scenes from his Syrian, Libyan and other wars and from religious festivals, is remarkable also for the unique entrance-tower

which probably formed part of the royal palace. Northward and far back in the foot-hills is the Ptolemaic temple of Deir el Medina, and beyond under the cliffs of Deir el Bahri the terrace temple of Queen Hatshepsut, the walls of which are adorned with scenes from her expedition to Puoni (Somaliland) in search of incense trees, and many other subjects. The necropolis extends from Kurna in the north through Drah abu'l nagga, the Assasif, and Shekh abd el Kurna to Kurnet Murrai of Medinet Habu. The finest tombs are of the XVIIIth Dynasty. Far behind Medinet Habu are the Tombs of the Queens, where royal 'relatives of the XXth Dynasty are buried; and imme- diately behind the lofty cliffs of Deir el Bahri, but accessible only by a very circuitous route from Kurna, are the tombs of the kings (from Tethmosis I. onward to the end of the XXth Dynasty) in the Biban el Moluk and the Western Valley. They are decorated with religious scenes and texts, especially those which describe the passage of the sun through the underworld. Those of Seti I. and Rameses III. are the most remarkable. These royal sepulchres are long galleries excavated in the rock with chambers at intervals: in one of the innermost chambers was laid the body in its sarcophagus. In the XXIst Dynasty, when tomb robberies were rife and most of their valuables had been stolen, the royal mummies were removed from place to place and at last deposited for safety in the tomb of Amen- ophis II. and in the burial-place of the priest-kings at Deir el Bahri. The finding of the two cachettes nearly intact has been among the greatest marvels of archaeological discovery, and the systematic exploration of the Valley of the Tombs of the Kings by Theodore M. Davis has been annually rewarded with results of the highest interest.

See Baedeker's Egypt; E. Naville, (Temple of) Deir el Bahari, introduction and parts i.-v. (London, 1894-1906); W. M. F. Petrie, Six Temples at Thebes (ruined temples on west bank), (London, 1897); G. Daressy, Notice explicative des mines de Medinet

Habu (Cairo, 1897) ; G. Maspero, " Les Momies royales de Deir el Bahari " in Memoires de la mission archeologique francaise au Caire, tome I. ; and many other works. (F. Ll. G.)

THEBES (anciently Qfjl3a.i, Thebae, or in poetry sometimes 6i7j3a, in modern Greek Phiva, or, according to the corrected pronwnciation, Thivae), an ancient Greek city in Boeotia, is situated on low hilly ground of gentle slope a little north of the range of Cithaeron, which divides Boeotia from Attica, and on the edge of the Boeotian plain, about 44 m. from Athens, whence it is reached by two carriage-roads and by railway since 1904. It has about 4800 inhabitants, and is the seat of a bishop. The present town occupies the site of the ancient citadel, the Cadmea; two fragments of ancient wall are visible on the north, and another, belonging either to the citadel or the outer wall, on the south. Two streams, rising a little south of the town, and separated by an average distance of about half a mile, flow on the two sides, and are lost in the plain. These are the ancient Ismenus on the east and Dirce (Atp«rj) on the west, which gave to the town its name 0t7roTa/nos. The Dirce, now Plakiotissa, has several springs. From the west side of the Cadmea another copious fountain (Paraporti) falls to the Dirce. In a suburb to the east is another (Fountain of St Theodore), and north-west are two more. The Cadmea itself is supplied with water brought from an unknown source to the south by works supposed of prehistoric antiquity. It now enters the town by an aqueduct of twenty arches of Frankish construction. The " waters " of Thebes are celebrated both by Pindar and by the Athenian poets, and the site is still, as described by Dicae- archus (3rd century B.C.), " all springs," Kadvdpos iraaa. One, from which a pasha of Negroponte (Euboea) is said to have supplied his table, is still called " the spring of the cadi." Some of the marble basins, seats, &c, remain, and, with the fragments of wall above mentioned, are the only relics of the classic time. The most curious of later buildings is the church of St Luke, south-east of the Cadmea,

believed to contain the tomb of the evangelist. From the abundance of water the place is favour- able to gardens, and the neighbouring plain is extremely fertile. But the population is scanty, and the town at present of no importance.

History. — The record of the earliest days of Thebes was pre- served among the Greeks in an abundant mass of legends which rival the myths of Troy in their wide ramification and the influence which they exerted upon the literature of the classical age. Five main cycles of story may be distinguished: (1) the foundation of the citadel Cadmea by Cadmus, and the growth of the Sparti or '' Sown Men " (probably an aetiological myth designed to explain the origin of the Theban nobility which bore that name in historical times); (2) the building of a " seven-gated " wall by Amphion, and the cognate stories of Zethus, Antiope and Dirce; (3) the tale of the " house of Laius, " culminating in the adventures of Oedipus and the wars of the " Seven " and the Epigoni; (4) the advent of Dionysus; and (5) the exploits of Heracles. It is difficult to extract any historical fact out of this maze of myths; the various groups cannot be fully co-ordinated, and a further perplexing feature is the neglect of Thebes in the Homeric poems. At most it seems safe to infer that it was one of the first Greek com- munities to be drawn together within a fortified city, that it owed its importance in prehistoric as in later days to its military strength, and that its original " Cadmean " population was distinct from other inhabitants of Boeotia such as the Minyae of Orchomenus.

In the period of great invasions from the north Thebes re- ceived settlers of that stock which in historical times was homo- geneously spread over Boeotia. The central position and military security of the city naturally tended to raise it to a commanding position among the Boeotians, and from early days its inhabitants endeavoured to establish a complete supremacy over their kinsmen in the outlying towns. This centralizing policy is as much the cardinal fact of Theban history as the

counteracting effort of the smaller towns to resist absorption forms the main chapter of the story of Boeotia. No details of the earlier history of Thebes have been preserved, except that it was governed by a land-holding aristocracy who safeguarded their integrity by rigid statutes about the owner- ship of property and its transmission. In the late 6th century the Thebans were brought for the first time into hostile con- tact with the Athenians, who helped the small fortress of Plataea to maintain its independence against them, and in 506 repelled an inroad into Attica. The aversion to Athens best serves to explain the unpatriotic attitude which Thebes dis- played during the great Persian invasion. Though a con- tingent of 700 was sent to Thermopylae and remained there with Leonidas to the end, the governing aristocracy soon after joined the enemy with great readiness and fought zealously on his behalf at the battle of Plataea (479). The victorious Greeks subsequently punished Thebes by depriving it of the presidency of the Boeotian League, and an attempt by the Spartans to expel it from the Delphic amphictyony was only frustrated by the intercession of Athens. In 457 Sparta, needing a counter- poise against Athens in central Greece, reversed her policy and reinstated Thebes as the dominant power in Boeotia.. The great fortress served this purpose well by holding out as a base of resistance when the Athenians overran and occupied the rest of the country (457-447). In the Peloponnesian War the Thebans, embittered by the support which Athens gave to the smaller Boeotian towns, and especially to Plataea, which they vainly attempted to reduce in 431, were firm allies of Sparta, which in turn helped them to besiege Plataea and allowed them to destroy the town after capture (427). In 424 at the head of the Boeotian levy they inflicted a severe defeat upon an invading force of Athenians at Delium, and for the first time displayed the effects cf that firm military organization which eventually raised them to predominant power in Greece. After the downfall of Athens at the end of the Peloponnesian War the Thebans, finding that Sparta intended to protect the

states which they desired to annex, broke off the alliance. In 404 they had urged the complete destruction of Athens, in 403 they secretly supported the restoration of its democracy in order to find in it a counterpoise against Sparta. A few years later, influenced perhaps in part by Persian gold, they forced on the

so-called Corinthian ^War and formed the nucleus of the league against Sparta. At the battles of Haliartus (395) and Coroneia (394) they again proved their rising military capacity by stand- ing their ground against the Spartans. The result of the war was especially disastrous to Thebes, as the general settlement of 387 stipulated the complete autonomy of all Greek towns and so withdrew the other Boeotians from its political control. Its power was further curtailed in 382, whsn a Spartan force occupied the citadel by a treacherous coup-de-main. Three years later the Spartan garrison was expelled, and a democratic constitution definitely set up in place of the traditional oli- garchy. In the consequent wars with Sparta the Theban army, trained and led by Epaminondas and Pelopidas (q.v.), proved itself the best in Greece. Some years of desultory fighting, in which Thebes established its control over all Boeotia, culminated in 371 in a remarkable victory over the pick of the Spartans at Leuctra (q.v.). The winners were hailed throughout Greece as champions of the oppressed. They carried their arms into Peloponnesus and at the head of a large coalition permanently crippled the power of Sparta. Similar expeditions were sent to Thessaly and Macedonia to regulate the affairs of those countries. But the predominance of Thebes was short-lived. The states which she protected were indisposed to commit themselves permanently to her tutelage, and the renewed rivalry of Athens, which had been linked with Thebes since 395 in a common fear of Sparta, but since 371 had endeavoured to maintain the balance of power against her ally,

prevented the formation of a Theban empire. With the death of Epaminondas in 362 the city sank again to the position of a secondary power. In a war with the neighbouring state of Phocis (356–346) it could not even maintain its predominance in central Greece, and by inviting Philip II. of Macedon to crush the Phocians it extended that monarch's power within dangerous proximity to its frontiers. A revulsion of feeling was completed in 338 by the orator Demosthenes, who persuaded Thebes to join Athens in a final attempt to bar Philip's advance upon Attica. The Theban contingent fought bravely on behalf of Grecian liberty in the decisive battle of Chaeroneia, and bore the brunt of the slaughter. Philip was content to deprive Thebes of her dominion over Boeotia; but an unsuccessful revolt in 335 against his son Alexander was punished by the complete destruction of the city, except, according to tradition, the house of the poet Pindar. Though restored in 315 by Cassander, Thebes never again played a prominent part in history. It suffered from the establishment of Chalcis as the chief fortress of central Greece, and was severely handled by the Roman conquerors Mummius and Sulla. Strabo describes it as a mere village, and in Pausanias's time (a.d. 170) its citadel alone was inhabited. During the Byzantine period it served as a place of refuge against foreign invaders, and from the 10th century became a centre of the new silk trade. Though severely plundered by the Normans in 1146 it recovered its prosperity and was selected by the Frankish dynasty de la Roche as its capital. In 13 1 1 it was destroyed by the Catalans and passed out of history.

The most famous monument of ancient Thebes was the outer wall with its seven gates, which even as late as the 6th century B.C. was probably the largest of artificial Greek fortresses. The names of the gates vary, but four are constant — the Proctides, Electrac, Xcistae or Neitae, and Homoloides; Pausanias gives the others as Ogygiae, Hypsistae, Crenaeae. There is evidence that the gate Electrae was on the south, and near it was the tomb of the

Thebans who fell at the capture by Alexander. The gates shown to Pausanias as Neistae and Proetides led respectively north-west and north-east. Two of the springs have been identified with some probability — that of St Theodore with the Oedipodea, in which Oedipus is said to have purged himself from the pollution of homicide, and the Paraporti with the dragon-guarded fountain of Ares (see Cadmus). Dicaearchus, referring to the town of Cassander, gives two measurements for the circuit, equal to about 9 m. and si m - ; the smaller fairly corresponds to the 4J m. over which the extant remains have been traced; it consisted of sun- dried brick on a stone foundation. Beyond this the topography is wholly uncertain. From the interest of the site in history and still more in literature, as the scene of so many dramas, the tempta- tion to fix details has been specially strong. Conjectural plans or

descriptions, differing widely, are given by Leake, Forchhammer, Ulrichs, Bursian, Fabricius and others (references below). There are two main difficulties to contend with. The description of Pausanias was written at a time when the lower city was deserted, and only the temples and the gates left; and the references to Thebes in the Attic dramatists are, like those to Mycenae and Argos, of little or no topographical value. The literary glory of Thebes is centred in the poet Pindar. It had a flourishing school of painting in the 4th century, of which the most famous repre- sentation was Aristides, who excelled in pathetic subjects.

Authorities. — Herodotus, bks. v.ix. ; Thucydides and Xeno phon (Hellenica), passim; Diodorus xvii., xix. ; Pausanias jx. 5—17; M. Muller, Geschichte Thebens (Leipzig, 1879); E. v. Stern, Geschichte der spartanischen und thebanischen Hegemonie (Dorpat, 1884), pp. 44-246; E. Fabricius, Theben (Freiburg im Breisgau, 1890); E. Funk, De Thebanorum aciis, 378-362 (Berlin, 1890); B. V. Head, Historia Numorum (Oxford, 1887), pp. 295-299. See also Boeotia throughout. (E. Gr.)

THEBES, ROMANCE OF. The French Roman de Thebes is a poem of some 10,000 lines which appears to be based, not on the Thebaid of Statius, but on an abridgment of that work. This view is supported by the omission of incidents and details which, in spite of the altered conditions under which the poem was composed, would naturally have been preserved in any imitation of the Thebaid, while again certain modifications of the Statian version can hardly be due to the author's invention but point to an ancient origin. As in other poems of the same kind, the marvellous disappears; the Greeks adopt the French methods of warfare and the French code of chivalric love. The Roman dates from the 12th century (c. 1150-55), and is written, not in the tirades of the chansons de geste, but in octo-syllabic rhymed couplets. It was once attributed to Benoit de Sainte-More; but all that can be said is that the Thebes is prior to the Roman de Troie, of which Benoit was undoubtedly the author. The Thebes is preserved also in several French prose redactions, the first of which, printed in the 16th century under the name of Edipus, belongs to the early years of the 13th century, and originally formed part of a compilation of ancient history, Histoire ancienne jusqu'a Cesar. The first volume of Lcs histoires de Paul Crose traduites en francais contains a free and amplified version of the Thebes. The Romance of Thebes, written about 1420 by John Lydgate as a supplementary Canterbury Tale, was printed by Wynkyn de Worde about 1500. From the Roman de Thebes also were possibly derived the Ipomedon and its sequel Prothesilaus, two romans d'avenlures written about the end of the 12th century by Hue de Rotelande, an Anglo-Norman trouvere who lived in Credenhill, near Here- ford. The author asserts that he translated from a Latin book lent him by Gilbert Fitz-Baderon, 4th lord of Monmouth, but in reality he has written romances of chivalry on the usual lines, the names of the characters alone being derived from antiquity.

See L. Constans, La Legende d'Oedipe eludiee dans Vantiquite au moyen age ei. dans les temps modernes

(Paris, 1881), and in the section " L'Epopee antique " in De Julleville's Hist, de la langue et de la lift, francaise; Le Roman de Thebes, ed. L. Constans (Soc. des anciens textes francais (Paris, 1890) ; G. Ellis, Specimens of Early English Metrical Romances, iii. (1805).

THECLA, ST, one oi the most celebrated saints in the Greek Church (where she is commemorated on the 24th of September) and in the Latin Church (where her festival is the 23rd of September). She is honoured with the title of " protomartyr." The centre of her cult was Seleucia, in Isauria. Her basilica, south of Seleucia, on the mountain, was long a very popular place of pilgrimage, and is mentioned in the two books of St Basil of Seleucia. The great popularity of the saint is due more particularly to her Acta, which in all their forms derive from the apocryphal work known as the Acta Pauli et Theclae. According to her Ada, Thecla was born of illustrious parentage at Iconium, and came under the personal teaching of the apostle Paul. In her eighteenth year, having broken her engagement with Thamyris, to whom she had been betrothed, she was accused by her relations of being a Christian. Armed with the sign of the cross, she threw herself on the pyre, but the flames were extinguished by a sudden rain. She then went to

Antioch, where she was exposed to wild beasts, then fastened to bulls in order that she might be torn asunder, and finally thrown into a pit full of serpents; but she was delivered from all these perils. She converted many heathen. Returning to Iconium, she withdrew into a mountain solitude, and became distin- guished by many virtues and miracles. In spite of their highly fabulous character, which caused them to be more than once condemned by the Church, the Acta of Paul and Thecla, which date back to the 2nd century, are among the most interesting monuments of ancient Christian literature.

See Acta Sanctorum, September, vi. 546-568; J. A. Lipsius, Acta apostolorum apocrypha (Leipzig, 1891), i. 235-269; C. Schmidt, Acta Paidi (Leipzig, 1905), where an attempt is made to prove that the Acta of Paul and Thecla formed an integral part of the Acta Pauli; see also Apocryphal Literature. W. M. Ramsay, The Church in the Roman Empire before A.D. 170 (London, 1893), PP- 375 seq.; C. Holzey, Die Thekla-Akten, Hire Verbreitung und Beurthcilung in der Kirche (Munich, 1905). (H. De.)

THEFT, the act of thieving or stealing. In English legal usage the practice is to call this act by its Norman-French name of " larceny," but properly theft is a wider term including other forms of wrongful deprivation of the property of another (see Larceny).

The O.E. word peofSe or piefBe is formed from pcof, thief or peofian, tc thieve, cf. Ger. Dieb, Du. dief, Goth, thiubs. The origin is not known. It may be related to Lithuanian tupeti, to crouch or squat down; thus " thief " would mean " one who hides himself." The O.E. stelan, to steal, appears also in other Teut. languages, cf. Du. stelen. Swed. stjdla, Goth, stillan, &c. It has been doubt- fully connected with Gr. arepuv, to deprive.

THEGN, or Thane, an Anglo-Saxon word meaning an at- tendant, servant, retainer or official, and cognate with Gr. rtavov, a child. From the first, however, it had a military significance, and its usual Latin translation was miles, although minister was often used. J. Bosworth {Anglo-Saxon Dictionary, new ed. by T. N. Toller) describes a thegn as " one engaged in a king's or a queen's service, whether in the household or in the country," and adds, " the word in this case seems gradually to acquire a technical meaning, and to become a term denoting a class, containing, however, several degrees." The precursor of the thegn was the gesith, the companion of the king or great lord, the member of his comitatus, and the word thegn began to be used to describe a military gesith. It is only used once in the laws before the time of Aethelstan (c. 895-940), but more

frequently in the charters. H. M. Chadwick (Studies on Anglo- Saxon Institutions, 1905) says that " the sense of subordination must have been inherent in the word from the earliest time," but it has no connexion with the German dienen, to serve. In the course of time it extended its meaning and was more generally used. The thegn became a member of a territorial nobility, and the dignity of thegnhood was attainable by those who fulfilled certain conditions. Thus from a document of uncertain date, possibly about the time of Alfred the Great, and translated by Stubbs {Select Charters) as " Of people's ranks and laws," we learn: — " And if a ceorl throve, so that he had fully five hides of his own land, church and kitchen, bell- house and burh-gate-seat, and special duty in the king's hall, then was he thenceforth of thegn-right worthy." And again — " And if a merchant throve, so that he fared thrice over the wide sea by his own means, then was he thenceforth of thegn-right worthy." In like manner a successful thegn might hope to become an earl. In addition to the thegns there were others who were thegns on account of their birth, and thus thegnhood was partly inherited and partly acquired. The thegn was inferior to the aethel, the member of a kingly family, but he was superior to the ceorl, and, says Chadwick," from the time of Aethelstan the distinction between thegn and ceorl was the broad line of demarcation between the classes of society." His status is shown by his wergild. Over a large part of England this was fixed at 1200 shillings, or six times that of the ceorl. He was the twclfhynde man of the laws, sharply divided from the twyhynde man or ceorl.

The increase in the number of thegns produced in time a subdivision of the order. There arose a class of king's thegns,

corresponding to the earlier thegns, and a larger class of inferior thegns, some of them the thegns of bishops or of other thegns. A king's thegn was a person of great importance, the con- temporary idea being shown by the Latin translation of the words as comes. He had certain special privileges. No one

save the king had the right of jurisdiction over him, while by a law of Canute we learn that he paid a larger heriot than an ordinary thegn.

But, like all other words of the kind, the word thegn was slowly changing its meaning, and, as Stubbs says (Const. Hist., vol. L), " the very name, like that of the gesith, has different senses in different ages and kingdoms, but the original idea of military service runs through all the meanings of thegn, as that of personal association is traceable in all the applications of gesith." After the Norman Conquest the thegns appear to have been merged in the class of knights.

The twelve senior thegns of the hundred play a part, the nature of which is rather doubtful, in the development of the English system of justice. By a law of Aethelred they " seem to have acted as the judicial committee of the court for the purposes of accusation " (W. S. Holdsworth, History of English Law, vol. i. 1903), and thus they have some connexion with the grand jury of modern times.

The word thane was used in Scotland until the 15th century, to describe an hereditary non-military tenant of the crown.

(A. W. H.)*

THEINNI, or Hsenwi, one of the Northern Shan States of Burma. It is called by the Shans Hsenwi, and also officially so designated, but is better known by the Burmanized name of Theinni. It was by far the largest of the cis-Salween Shan states, and at one time included not only all the territory of the present states of North and South Hsenwi, but also Kehsi Mansam, Mong Hsu, Mong Sang, and Mong Nawng, besides having a sort of protectorate over Mang L6n and other Wa states east of the Salween. These had, however, fallen away in Burmese times, and at the period before the British annexation Theinni was divided into five parts by name; but there was no central authority, and the whole state was in hopeless disorder. This continued until the

appearance of British troops in March 1888, when it was divided into two states — North Theinni, which was assigned to a successful adventurer, Hkun Sang, of Ton Hong, and South Theinni, which went to Nawmong, of the old Shan ruling house. North Theinni has an area of 6330 sq. m., and a population (1901) of 118,325 persons; estimated revenue, £6000. South Theinni has an area of 2400 sq. m., with a population (in 1901) of 67,836; estimated revenue, £4800.

The northern part of North Theinni is a mass of hills affected by the geological fault which has produced the rift that forms the Nam Tu or Myit-nge valley, and has thrown up a series of parallel ranges which extend northwards to the Shweli (Lung Kiang), without altogether destroying the north and south trend which is the characteristic of the Shan hills as a whole. In the valleys between these hills are numerous tracts under rice cultivation, some circular or oval, some mere ribands along the river banks. The southern portion has much more flat land, along the line of the Nam Tu, its tributaries the Nam Yao and the Nam Nim, and the Nam Yek flowing into the Saiween. This was formerly thickly populated, and still remains the most valuable portion of the state. A range running westwards from the Salween, and marking the southern border of the rift in the hills, divides North from South Theinni. Both north and south of the Nam Tu there are many peaks which rise to 6000 ft., and several over 7000 ft. The northern portion is almost consistent enough in its altitude of about 4000 ft. to be called a plateau. It has large, grassy, upland downs. This part of the state has fallen almost entirely into the hands of the Kachins. The Shans are found in the Nam Mao (Shweli or Lung Kiang) valley, and in the Nam Tu and other valleys in the southern part of the state. The line of the Nam Mao is the lowest portion of North Theinni, being little over 2000 ft. above sea-level. The southern valleys are about 500 or more ft. higher. South Theinni is practically bisected by the huge mass of Loi' Ling, nearly 9000 ft. above sea-level, and by the spurs which that

peak sends north and south. Apart from this it consists of broken hill-country of no great height, or open rolling downs, the latter chiefly in the eastern half of the state. It is watered by numerous streams, of which the chief is the Nam Pang, an affluent of the Salween. The chief river in the northern state, apart' 'from the Salween, is the Nam

Tu or Myit-nge, which rises on the Irrawaddy-Salween watershed, not far from the latter river, and flows westwards through the state into Taungbaing or Thibaw, and eventually into the Irrawaddy at Amarapuia. The Nam Mao or Shweli only skirts the state, but it receives a considerable tributary, the Nam Paw, which has its entire course in Theinni territory, and is large enough to be barely fordable in the dry weather, and only passable by boats in the rains. The deforestation caused by years of upland cultivation has dried up many of the springs, but as a whole North Theinni is very well watered. Considerable deposits of coal, or rather of lignite, exist in both North and South Theinni, but do not appear to be of high quality. Gold is washed in many of the streams in a fitful way. Limestone exists in large quantities. No valuable timber exists to any considerable extent. There is some teak in the Nam Yao valley, and scattered wood-oil trees exist. Pine forests cover some of the ranges, but, as elsewhere in the Shan states, varieties of the oak and chestnut are the commonest forest trees. The climate of the state as a whole is temperate. In the plains of the uplands there are yearly frosts in January, February and March, but in the greater part of the state the thermometer rarely falls to freezing-point, and in the hot weather does not exceed ninety degrees for any length of time. The average rainfall seems to be about 60 in. yearly. After the disruption of the ancient Shan empire at Tali by Kublai Khan, Theinni seems to have been the centre of the independent Shan kingdom, with various capitals in the Shweli and Nam Tu valleys. This

kingdom of Kawsampi was ended by the Burmese about 1738, and the country was divided into various states, with appointment orders from Ava. Numerous rebellions and civil wars have reduced Theinni from its position as the most powerful and populous Shan state to a condition of fearful desolation. It has regained much population since the British occupation in 1888, but is still far from its old prosperity. Much may be expected from the cart roads that have been made, and from the Mandalay-Kun long Railway.

Hsenwi, the capital of North Theinni, stands near the north bank of the Nam Tu. The ruins of the old capital lie at a short distance, and show it to have been a large and well-built town, with a number of houses variously estimated at from three to ten thousand. Mong Yai is the capital of South Theinni, with a popu- lation of about 2060. Lashio, the headquarters of the super- intendent of the Northern Shan State, is in North Theinni. The races found in Theinni comprise Shans, Kachins, Chinese, Burmese, Lihsaws, Wa, Palaungsand Yanglam. The Shans and Kachins vastly predominate, and are nearly equal in numbers. (J. G. Sc.)

THEISM (Gr. deos, god), literally, and in its widest sense, the belief in a god or gods. The term has had several changes of meaning. (1) It appears for the first time in 18th-century English as an occasional synonym for " deism " (q.v.), and therefore as applying to those who believed in God but not in Christianity. Later criticism, orthodox and heterodox, upon the English deists inclines to charge them with the conception of a divine absentee, who wound up the machine of nature and left it to run untended. That was the general 18th-century way of thinking. God was apt to be thought of as purely transcendent, not immanent in the world. (2) In the 19th century theism is generally used of positive belief in God, either with or without belief in the claim of Christianity to be a revelation, but unassociated with any peculiarities of 18th- century deists. If the word " deism " emphasizes a negative element — rejection of church

Christianity — ” theism ” generally emphasizes the positive element — belief in God. (3) There is also a third usage. ” Theism ” was reclaimed by Theodore Parker, F. W. Newman, Frances Power Cobbe, and others, for their more modern speculative belief in God, which, while non-Christian or at least non-orthodox, held to an immanent God, continually revealing himself — in the moral consciousness. The ambiguity cannot be cured. We use the word in this article in the second sense. 1

I. From this point of view theism is a synonym for Natural Theology, or almost so. But the expression Natural Theology Natural itself has a history. (1) The ” three theologies ” — Theology, recognized by the early Roman Stoics — probably on the suggestion of a passage in Aristotle’s Metaphysics, xi. 8 — are named by St Augustine (Latinizing the Greek terms)

1 Imm. Kant’s distinction of ” deist ” and ” theist ” may be found in the Critique of Pure Reason, ” Transcendental Dialectic,” Book II. chaps, iii. and vii. It is curious, but, unless for the study of Kant, unimportant.

2 Cf. Theology. Natorp’s article quoted there gives the reference to the passage in Aristotle, but does not recognize its connexion with the later Stoical distinction.

mythical, natural, and civil or political {City of God, iv. 27). There is probably a malicious echo in a well-known passage of Gibbon (Decline and Fall, chap, ii.): ” The various modes of worship which prevailed in the Roman world were all con- sidered by the people as equally true, by the philosopher as equally false, and by the magistrate as equally useful.” Augustine rejects all three ” theologies ” as pagan figments, and not a few church writers follow him in this — borrowing his learning without naming him (e.g. the Protestant Grotius in his notes on Rom. i. 20). Yet the natural or physical theology of the philosophers — in contrast to mere myths or mere state- craft — seems a straightforward effort to reach faith in God on grounds of scientific

reason. It deserves the name, in the modern sense, of Natural Theology. (2) Raymond of Sabunde's Liber naturae sive Creaturarum (1434–36) bears also the title Theologia Naluralis— but not from the author's own hand, 3 though his introduction to the book in question, the Prologue, put upon the Index at Rome for its daring, describes the " book of nature " as " connatural to us," in contrast with the " super-natural" book, the Bible, which belongs to the clerics. Laymen may read the book of nature, and Man himself is the most important " leaf " in it. Raymond attempts to demonstrate the whole of church theology upon principles of reason. That is a task quite beyond what is generally recognized as Natural Theology. (3) With Francis Bacon (Advancement of Learning, 1605) the expression Natural Theology emerges in what has become the modern sense — as standing for a part of Christian theology, attainable by reason, and contrasted by most theo-logians with the " mysteries " of faith (Bacon uses that term too) on the principles of Albert the Great and Thomas Aquinas (see Apologetics).

[It is not clear that Bacon is the first to use the term in the now accepted sense; but he and Theophilus Raynaudus, S. J., in his Theologia Naturalis (1622), of which there is a copy in the Bodleian, must at least be among the first in their respective communions to do so. Raynaudus's authorities, in favour of the recognition of a natural theology and against it, do not, so far as the present writer has been able to consult them, use the expression. So too H. Alsted, an early Protestant writer on Natural Theology (in his Methodus Theologiae, 161 1, and in later works), defines it as moderns do — some of the contents of his Natural Theology are fantastic enough — and his authorities, again so far as consulted, differ upon the place to be assigned to Natural Theology within a system of study, but do not employ the term.]

In later times the expression is common; it is used e.g. by Locke, Leibnitz and Wolff. Wolff's influence made the usage habitual, 4 though Schleiermacher and Ritschl, like the Socinians earlier, deny the

existence of a natural theology. Following the text and ordinary interpretation 5 of Aristotle's Roman Metaphysics, it is believed that Aristotle already Catholic identified metaphysics with a theology: accordingly grouping. modern Roman Catholic learning, which owes a great debt to Aristotle through the schoolmen, includes Natural Theology in philosophy, not in theology properly so called. With Natorp's article W. Wallace's Gifford Lecture? chap. L, may also be consulted; but Wallace does not distinguish the un- usual sense which the term bears as applied to Raymond's book. R. Flint has remarked that Natural Theology ought not merely to prove the being of God, but to give a full sys- tematic view of what (it is contended) can be learned of theo- logical truth from the " light of nature " (St Augustine, and

3 See art. " Raimundus Sabiende " by Schaarschmidt in Herzog- Hauck, Realencyklopddie (ed. 1905). At this point we must also call to mind the wide currency given to the term theology by Abelard, and his editors or copyists.

4 A. Harnack and some others use the expression in a wider sense. Any supposed principles (even if not worked out into a system of inferences) used as ready-made clues for the study and interpretation of Christianity are described by this school as natural theology (cf. Theology).

5 Challenged by Natorp ; see Theology.

6 Published in Lectures and Essays.

theologians generally after him). The name " theism " makes that requirement less emphatic (see below).

Another kindred term is " Natural Religion." We meet with this in the titles of two Latin works 1 by German authors Natural in reply to Lord Herbert of Cherbury. They use it Religion. w ; tn strong

condemnation, from the standpoint of rigorous Christian orthodoxy; but it comes into England within very few years upon the Christian side — religion against irreligion— in Bishop John Wilkins's Principles and Duties of Natural Religion (1678). The author died 1672, and left the book unfinished; but the language of the title occurs in the first sentence; so it is undoubtedly Wilkins's, as well as sanc- tioned by his editor and connexion through marriage, Tillotson, afterwards the archbishop. We meet with " Natural Religion " again in Samuel Clarke's works, and notably in Bishop Joseph Butler's Analogy (1736). Thus, as employed by most writers, " Natural Religion " connotes neutrality or even friendliness towards Christianity; just as is the case with theism in sense (2), or with Natural Theology. " Deist," or sometimes " theist " in sense (1), or Naturalist, is a term of reprobation with English 18th-century apologists, but not " Natural Religion." If there is any difference between " theism " or " Natural Theo- logy " on the one hand, and Natural Religion on the other, it is to be found in the more practical character attaching to natural " religion." While Romans i. 19 and 20 (yet cf. Acts xiv. 17, xvii. 24, &c.) is the main New Testament passage which seems to recognize a Natural Theology, Rom. ii. 14, 15 may be said to assert Natural Religion. When the expression Natural Theology comes to the front once more with Archdeacon W. Paley (1802), this is a sort of after-birth or anachronism. 2

Natural Law. — We do not pretend that Law of Nature — the jurist's term, not of course that of inductive science — is Natural strictly a synonym for theism. But it is a cognate Law. conception, of great importance historically, bearing

the marks of the Stoic doctrine of " nature," and helping to turn men's minds towards a " natural " theology. A pantheist may believe in Law of Nature and go no further; a theist who accepts Law of Nature has a large instalment of natural theology ready made to his hand; including an idealist, or else an intuitionalist, scheme of ethics. Both jus

naturale and lex naturalis are as early as Cicero, and the jus gentium of the Roman lawyers is earlier still. Ambrose of Milan (Epistles ix. 71) quotes Romans ii. 14, 15 — the passage already referred to, under "Natural Religion" — as asserting "Natural Law"; St Paul's words suggest that form of thought and may con- ceivably have been suggested by it. J. G. Ritchie's Natural Rights, from the point of view of a very hostile (evolutionary) idealism, sketches the early history of the phrase Natural Law. 3 The philosopher in Abelard's Dialogus inter Judaeum Philo- sophum et Chrislianum expects to be saved ex sola lege naturali; here " law of nature " is fully equivalent to Natural Religion, and the word sola sets it in contrast with Christianity. Not to speak of the canonists, Thomas Aquinas gives natural law an important place; while Melancthon, drawing from Aquinas, gives it an entrance into Protestant thought. Zwingli and Calvin on the other hand prefer the positive view of law as in- stituted by God far back in history in the days of the Old Covenant; but, when exegesis or controversy puts pressure upon them, they fall into line and reiterate the appeal to a Natural Law. Richard Hooker, again with traces of Aquinas, uses the conception as a weapon against Puritanism, with its aggressive positivism of scriptural precept. Natural Law;, he claims, leaves room for discretionary arrangements like epis- copacy; Scripture does not mean to supersede the light of reason. It is intelligible that Locke (Treatises of Civil Govern- ment) should have a relish in quoting Hooker against the divine- right royalism of Sir John Filmer; but in Locke there is already

1 Recorded in J, G. Walch's Bibliotheca Theologica Selecta (1751).

2 See Wallace's Gifford Lecture.

3 For the influence of that conception in theology, especially through the medium of Isidore of Seville, see successive chapters in A. J. Carlyle's Hist, of Mediaeval Political Thought in the West, vol i.

a revival of belief in the (beau-ideal) ” state ” of nature and a growing emphasis upon natural rights; ideas which, heralded by Rousseau, echoed round the world in the French Revolution. Locke had spent some years in Holland, the country of Grotius, who, with help from other great lawyers, and under a mis-apprehension as to the meaning of the Roman jus gentium, shaped modern concepts of international law by an appeal to law of nature. 4 This moral ideal rendered considerable services to civilization; we must not forget these, in the offence which the myth of a primitive golden age may offer to our historic sense. The kernel is sound enough though the husk is a poor thing. Finally, it is of some interest to note that Chr. Wolff, in the intervals of his chequered theological career, lectured and wrote as a jurist upon the Law of Nature.

” Philosophy of religion ” is the modern term. It again is not exactly a synonym, though more nearly so than the last. The new phrase indicates that we are to approach phihso- the thought of God through a study of religious beliefs phy of and practices; ” theism ” tended to make God a religion. purely scientific inference from the facts of nature. But ” philosophy of religion ” can be construed in many different ways. An investigator, pledging himself to no beliefs — even perhaps one who definitely disbelieves and rejects theism — may yet interest himself in tracking out the psychology of religion. Or a philosopher like Hegel, armed with a metaphysical theory, may descend upon the facts of religion and interpret them in its light, till they almost lose their original significance, which we might provisionally define as consisting in this, that the be- liever in any religion finds himself helped or (as he claims) saved by it. Again, we must not be misled by verbal idiosyn- crasies. What James Martineau calls A Study of Religion is really in the main a re-statement of old theistic arguments. 5

[Wallace’s Gifford Lecture may be consulted upon this phrase also. He observes with truth that Natural Theology, if you remove from it the idea of subordination to Christianity as (claiming to be) a

special revelation, tends to pass into a philosophy of religion. But it does not follow that the new standpoint involves what 'Wallace seems to hint, though he conceals his meaning behind complimentary rhetoric — rejection of church Christianity. A. M. Fairbairn's Phil, of the Christian Religion shows by its very title that an effort is being made to combine great confidence in metaphysics with strong belief in the uniqueness of Christianity; and the effort will be found to characterize all Fairbairn's work. Possibly, fuller study of religions may help theologians to formulate the imperial claims of Christianity more happily than in the dry contrast between what is " revealed " and what is " natural." But that contrast is traditional; and it is implied in the ordinary theological usage of such phrases as " natural theology " or " natural religion " and almost of " theism."]

Comparative religion, or, as some call it, history of religion, is yet another modern study, closely akin to the last discussed, although more strictly confined to registering the compara- sequence of religious phenomena and less disposed tire Re- towards criticizing religions or towards ranking them #8> fl ' in an order of merit. We cannot, therefore, call it precisely synonymous with theism. And yet theism — or monotheism — constitutes a special locus in the history of religion. The historian observes and records, in different lands and ages, the rise or explicit utterance of belief in one God.*

Some uncertainty may be felt whether pantheism should rank as a theism. Is unity the main point? Or is not per- sonality rather of prime importance, though doubtless pre- supposing unity? (Usage does not allow us to rank polytheism as a form of theism.) E. Troeltsch, Kultur der Gegenwart, Teil I. Abt. 4, p. 470, finds that the wisdom of the priests, in one land after another, rises to the thought of divine unity. That suggests pantheism, the usual form of such esoteric wisdom. Professor T. W. Rhys Davids (American Lectures, p. 37) sums up that, when the name of an earlier deity is

4 See (with writers already mentioned) Sir H. Maine's Ancient Law. 6 See his Introduction.

Egyptian.

attached to the object of supreme worship, monotheism proper is approached; while, when a new thought-construction is put in the supreme place, there is a tendency rather towards pan- theism. So far as this is true, theism (proper) would seem to be an accident of language.

There is a further problem; whether monotheism is of very early occurrence. Belief in a primitive historical revelation, once universal among Christians, has almost disappeared; but belief in a very early and highly moral theism is stoutly defended, chiefly on Australian evidence, by Andrew Lang (The Making of Religion and later works). If Lang is right, " primitive " peoples drew typical theistic inferences, and argued to God from nature and from conscience, though without displacing other types of religious belief and practice. In many regions — Egypt, Babylonia, &c. — individual investigators of the great religions have thought they found traces of an early — one hesitates to write, of a " primitive " — monotheism. Perhaps J. Legge, who finds true theism at the dawn of Chinese history, is the most authoritative representative of such views.

Passing to later times, we can watch a theory of monotheism rising, and dying down again, during what our scholars distin- Brahman guish as the Brahmanical period of Indian religion. theism. The supreme god, Isvara, has the personal name Prajapati, Visvakarman or some other. But this theism is lifeless — a " pale and shallow deism, which India has often confessed with the lips, but which has never won the homage of her heart." 1 The thought of India is upon the side of pan- theism.

Again, the heretical Egyptian king Amenophis IV. or Akhenaton, one of the sovereigns to whose govern- ment the celebrated Tell el-Amarna letters from Palestine were addressed, was a zealous champion of the ex- clusive claims of the sun-disk God, Ra; but his policy died with him. In Babylonia a mutilated inscription printed by Babylon- T. Pinches (Transactions of Victoria Institute, vol. 28), lan. identifying (so far as preserved) thirteen other Gods

with Marduk, has been hailed by Friedrich Delitzsch (Babel und Bibel) as the great fountain-head of monotheism, and has in- fluenced the bold if highly precarious conjectures of H. Winckler. 2 Of more assured importance was the Zoroastrian faith — " pure Zoroas- moral dualism if not theism " (L. H. Mills) — which Man. proved its zeal by persecutions. But later times

nearly strangled Zoroastrian piety, not only by laws of ritual purity but also by newly evolved secondary deities — personified attributes, and the like. So that here again theism, if theism it was, did not continue in strength. If we understand by theism not simple belief in a divine unity, but such faith in one divine person as will constitute the basis for a popular religion, then — unless we allow a doubtful exception in Zoroastrianism — we must agree with those historians of religion who affirm that the world has known only a single living monotheism, viz. that of the Old Testament, along with what are historically the daughter faiths, Christianity and Islam.

The theist believes that he can further trace many incomplete workings of the monothesitic instinct in the history of religion. lncom- ^°t on ly ' s i l true, as A. Menzies observes, that piete "Reason knows only God, not Gods"; if we take*

theistic religion as saving help, no worshipper possesses re- mpu ses. jjg; on m f u jj secur ;ty un til he has gone straight to the fountain-head, and gained the friendship of the God of Gods. Indian

Vedic henotheism (otherwise called kathenotheism); 3 Semitic monolatry. so important as the probable starting-point of religious development in Israel; the Greek use of ” Zeus ” almost as we say ” God ” — even the attempt to arrange deities in a monarchical pantheon, all show the tendency, though it bro seldom attains a real victory.

‘A. Barth, Religions of India, Eng. trans., pp. 29, 30, 69. We may probably extend this hostile judgment to the theism of the modern Samaj-es.

2 The centralizing of worship at Babylon by its last king, Nabonidos, hardly seems to have amounted to monotheism.

s The two terms are explicitly identified by F. Max Miiller, their inventor (e.g. Hibbert Lectures, chap. vi. p. 271).

II. We have already suggested that theism covers more ground than the name at first may suggest. It can never quite confine attention to the problem of the being of God. Where subordi- God is believed in at all, it is believed that upon God nate eie- everything else depends. With the thought of God, meats ot accordingly, there is correlated a modification in taelsm - thoughts upon all other subjects; and a full system of theism must discourse ” Of God, of the world, of the Soul, ” like Matthew Arnold’s Moses. In other words there must be doctrines re- garding matter and mind, the world and the self, as well as regarding that Absolute Being who is believed to exist behind both, revealing Himself through them. This way of approach- ing theism is illustrated in A. C. Fraser’s Gifford Lectures, or in earlier times in the writings of Christian Wolff, whose sciences, according to the slightly different nomenclature which Kant imposed on them, were ” rational psychology,” ” rational cosmology,” and ” rational theology.” Kant swept away, so far as his influence extended, such ” dogmatic metaphysics ” and the old-fashioned theism which it constituted or included; but Kant himself introduced, in his own more sceptical yet also more

moral type of theistic doctrine, a new trichotomy — God, Freedom, Immortality, the three ” postulates ” of the Kant’s ” practical reason.” It is tempting to try to correlate “postu- the members of this triad with the individual members lates. of the older triad. But that would only mislead us; free will and immortality are really predicates ascribed — on whatever grounds — to the soul; and it is natural that in theism the soul of man should be a topic second in importance only to God Himself. Every theistic system, or almost every one, makes provision in some way for Kant’s three postulates. Accord- ingly, even in a hurried survey of the history of theism, we must try to question the systems we are reviewing upon their attitude towards human freedom and immortality, as well as upon their doctrine of God. Sometimes it will be found that free will is asserted as an assured fact, as a datum, Free

and so as a ground of inference to God. But some- wlH -

times free will is rather a probandum. In Christian theology, much labour has been spent upon vindicating man’s freedom against God’s intrusion, or upon blotting out human power in order to leave room for the divine. Theism s?‘ggests at the very outset that we should rather expect to find a correlation between the two. If there is a God at all, he must be thought of as the guarantee of freedom in man and as the pledge of his immortality.

The mention of Christian theology may remind us that, for the majority of theists in medieval and modern times, theism proper has ranked only as a secondary wisdom. It simpiifi- is possible for Christians to work out natural theology cation ot in separate detail; but we cannot wonder if they theism. rarely attempt the task, believing as they do that they have a fuller revelation of religious truth elsewhere. In point of fact, as we look to history, we find that theism has been much simplified and cut down. First of all, attention has been concentrated upon God. One does not suggest

that this con- centration was an error. On the contrary, even Christian theo- logy makes at least the effort to show that the thought of God regulates the whole system of belief. Yet while an adequate doctrine of God may settle everything in principle, we ought to remember that there are applications of the principle, apart from which we do not see our way clearly. As a second step in concentration, attention is almost confined to the question ” Does God exist? ” and to theistic proofs as answering ” Yes.” The ‘further question “What is God?” is slurred, as if there could be no two opinions regarding that; whereas in truth there are two hundred opinions. A. B. Bruce feels this so strongly that the natural theology section of his Apologetics entirely omits the question “Does God exist?” in favour of the question ” What is God? ” Perhaps that is equally one- sided. When we do find theism dealing with the question ” What is God? ” it tends to borrow from scholastic Sorms of Christian theology the scheme of Being and Attributes (see e.g. Wolff). But such a scheme gives at best an

stand- point.

external preliminary description of the object to which it is applied. 1

So our wealth of material narrows down in the ordinary handling to a single question. God, the world, the soul, free will, immortality, optimism; What then is God? All these questions, and perhaps others, tend to conceal themselves behind a single discussion: Does God exist? But further still. Either the fuller or the narrower way of dealing with theism will differ according to the philosophical stand- eaceof P°i nt of the particular theist who speaks to”the ques- phllo- tion. As long as the battle of the philosophies

sophkal endures, theism can hardly be unified. Its

history is not so much that of a single evolving doctrine, but rather the history of many and diverse theistic schemes.

III. It may help us if we rapidly review at this point the leading types of philosophy in their application to the theistic problem. Grouping and naming are fixed here for one special purpose. From other points of view they may perhaps appear open to blame; but it is hoped they will throw light upon our present study.

The simplest basis for philosophy 2 is empiricism. Such a philosophy makes little serious attempt at constructive work in EmpM- antiquity; but, upon the first great victories of dsm. physical science in modern times, a desire arose to

extend the new and wonderfully fruitful method to the ultimate problems of speculation. Let us take experience as our teacher! Let us stand upon realities — upon facts! Difficulty may be found in carrying out this empiricist programme; but at the outset no one dreams of failure. Beginning with the certainties of everyday experience, it reaches theism at last by means of an analogical argument. Many objects in nature, organisms especially, seem to resemble the works of human design; there- Argumeat fore with high probability we infer a designing mind from behind nature, adequate to the production of these

design. special results. 3 Having got such a mind, we may next inquire whether, on the principle of parsimony, it will not account for more; perhaps for everything in nature! But the starting-point of the argument in question is the purely empirical evidence of a single fact or set of facts; it proceeds by way of analogy, not of strict demonstration; and it claims for its results nothing more than probability. From Socrates, in Xenophon's Memorabilia, downwards, the argument is toler- ably common; it is notable in Cicero; in the modern discussion it dominates the 18th-century mode of thought, is confidently appealed to though not

worked out by Butler, and is fully stated by Paley. The argument does not necessarily imply empiricism in philosophy; still, it is peculiarly characteristic of empiricism. In ethics empiricism begins by recognizing that man possesses sensations, and so is liable to pleasures and pains. Hence, early empiricism makes ethics simply a calculus ethks; °f pleasures (" hedonism "). We may doubt, with Hedon- W. E. H. Lecky, 4 whether such a philosophy affords ism. a Das i s f or natural theology at all; but the attempt

is made. As J. S. Mill tried to reconcile criminal law and its punishments with his very hard type of determinism by saying that law was needed in order to weight the scale, and in order to hold out a prospect of penalties which might deter from crime and impel towards good citizenship, so Paley held that virtue was not merely obedience to God but obedience " for

1 Criticism of the scheme, from the point of view of an idealist theism, will be found in John Caird's Introduc to the Phil, of Religion, chap. viii. Yet the formula is serviceable. Perhaps it is even indispensable as a preliminary statement. We find it substanti- ally revived in the opening sentence and general scheme of a useful book, A. Caldecott's study of The Phil, of Rehg. in England and America.

2 An outline of the history of theism is reserved for Section IV. ; but it has not proved possible to sketch the types of philosophy without introducing references to the history of philosophy and sometimes even to the history of theism as well.

3 Of course the Design Argument is well known in antiquity, but not the type of philosophy which stands or falls by that line of " proof.''

4 Cf. Hist, of European Morals, pp. 58, 59.

the sake of eternal happiness." A second type of hedonism — less ignoble, but perhaps also less logical — calls men to seek the happiness of others.

Paley includes that too; virtue is ” doing good to mankind,” in obedience to God, for the sake of heaven.

The second type of philosophy, for our purpose, is intuition- alism. It finds its chance in the misadventures of empiricism. The Scottish philosophy of Thomas Reid and his intuition- successors believed that David Hume’s scepticism was aiism. no more than the genuine outcome of Locke’s sensationalist appeal to experience when ripened or forced on by the im- materialism of Bishop Berkeley — God and the soul alone; not God, world and soul. And so the Scotsmen fell back upon the witness of consciousness. They did not make much use of the word ” intuition,” which may indeed be taken in different senses, e.g. of visionary experiences as well as of the principles of “common sense” (i.e. universal beliefs). They spoke of ” natural realism ” and a ” natural dualism ” of mind and matter (reinstating here the element which Berkeley had struck out). Still, they do not repudiate the word ” intuition,” and kindred writers make it prominent. The term is borrowed from Sight, of all the physical senses the one which most rapidly instructs the mind. You see, at a glance, that things are so. Indeed, there is a further implication, when the term intuition is borrowed for mental vision; you see at a glance that things must be so. Here then characteristically intuitionalism occupies a half- way house between empiricism, with its appeal to real given fact, and idealism, with its appeal to necessity. The senses, in perception as contrasted with sensation, are held to give immediate knowledge. We perceive, beyond all possi- bility of doubt, that things are so and so. This is Reid’s first reply to Hume. Define more carefully than Locke did, with his blunder about “ideas,” the process of perception, and you cut up scepticism by the roots! So far, this philosophy has little bearing upon theism. But Intuitionalism has further arguments for the doubter. Besides testimony from outer sense, we have testimony and teachings from consciousness within — ” first principles,” as Reid

generally calls them. There are some principles which, as soon as they are presented to the mind and correctly grasped, must be assented to; we see the truth! Two regions become prominent in the working out of intuitionalism, if still more prominent in the widely differing philosophy of Kant— the regions of mathematics and of morals. Though J. S. Mill boldly affirmed that there might be remote realms in space where 2+2 did not make 4 but some different total, even empiricists may hestitate to concur; and yet Mill's assertion is at least the most obvious empiricist reading of the situation. If all knowledge is drawn from experience, state- ments universal in form are but generalizations, holding within the limits of actual experience, or advanced beyond them at our peril. Geometry again is regarded by thoroughgoing empiricists as hypothetical. It deals, according to Mill, with arbitrary and imaginary constructions. If there were such a thing as a triangle contained by absolutely straight lines, its three angles would no doubt measure what Euclid says; but straight lines and true triangles nowhere exist in rerum natura. Kant's point is ignored, that deductions from these " imaginary " figures apply to the " real " world of experience. Every time we survey a field, we go upon the principles, not of special experience, but of a priori necessity. Given certain linear and angular measurements, the area must be so and so. Great as is the difference when we pass from mathematics to morality, yet there are striking similarities, and here again intuitionalism claims to find much support. If we accept moral ideals at all, we are no longer in the world of mere phenomenal sequences, but in a new world. It is a problem for empiricism; given a world where nothing but phenomenal sequences exist, to account for moral ideals. Vulgar materialism sneers at the problem; duty is a fraud or hobgoblin, a mere superstition. Even Jeremy Bentham, restive under appeals to vague and in- tangible standards, breaks out in despairing indignation against the word " ought " as " the talisman of arrogance, indolence

and ignorance," and as "an authoritative imposture." 1 Later ethical empiricism is more refined. J. S. Mill recognizes an ultimate difference in quality between higher and lower plea- sures. A. Bain finds that benevolence is one given element in man's original constitution. H. Sidgwick holds that intuition must justify the claims of the general happiness upon the individual, though everything subsequent is hedonistic cal- culus. Herbert Spencer finds that the modern individual has intuitions of duty which represent the inherited experience of what has been good for the race in the past. Sir Leslie Stephen finds that moral laws are the conditions needful for the good of the social organism, and are imposed as such by society upon its individual members. The problem has altered its form. What the modern empiricist needs is a rational bond uniting the individual with the community or with the aggregate of individuals — a rational principle distinguishing high pleasures from low, sanctioning benevolence, and giving authority to moral generalizations drawn from conditions that are past and done with. The non-empirical moralist will not of course admit that duty to the community or to mankind is a final definition of the ethical ideal. He will accept it as a stage, of no small importance, in progressive definition; but he will seek to go further.

We have already remarked that the difficulties of empiricism constitute the strength of intuitionalism. A critic of intuition- Critkism alism might add that they are its whole strength; ofiatui- intuitionalism is sound upon the intellectual and tlonallsm. m0 ral interests of humanity, but it does little to justify them. It reasserts them, with resolute loyalty; but if philosophy ought to vindicate, to explain, perhaps inciden- tally to modify, even, it may be, to purify our primary beliefs, intuitionalism is hardly a philosophy at all. For good or for evil, so far as

there is an accepted line of theistic doctrine, that doctrine is intuitionalist. Other schools of philosophy pay flying visits to theism; intuitionalism is at home there. Its leading argument is the cosmological, concluding to " God as cause " (Martineau). When David Hume {Dialogues concern- ing Natural Religion) protests that the universe is a " singular effect " and that we have no right to affirm a cause for it, unless we have experience of the origin of many universes, and can generalize the conclusion, They all have causes — he may be unassailable upon empiricist grounds. But intuitionalism claims to allege a higher certainty; everything (or every change) must have a cause — this is not merely actual fact but necessary truth. The universe exists — or, as otherwise stated, the uni- verse is " contingent " — therefore, even without detailed know- ledge of different universes, we can affirm that it must be caused, and in its " Great First Cause " we recognize God. 2 It is generally stated that this argument was for the first time definitely formulated in Aristotle's philosophy. Of course the cosmological argument is rarely or never left to stand quite alone. The design argument is available for the slightly bolder philosophy of intuitionalism as well as for empiricist theism. But there is yet another argument which is even more important. Moral elements must enter into theism at some point: and, as against empiricism, intuitionalism is morally strong. Hence it naturally has a moral argument in reserve. Moral law implies a law-giver; " we are conscious of moral dependence " (Robert Flint). Still the main weight of intuitionalist theism rests upon the conception of God as First Cause.

As a philosophy, intuitionalism leaves the mind in all the embarrassment of an indefinite number of separate starting- points. Every percept is such a starting-point; it is an immediate certainty, remaining with us unmodified as the basis

1 Deontology, p. 42. F. H. Bradley {Ethical Studies, p. 2) quotes an even plainer attack on the conceptions as well as the terminology of ethics in

a Westminster Review article (Oct. 1873, p. 311) which describes" responsibility " or {sic) " moral desert in the vulgar sense" as " horrid figments of the imagination."

2 Any attempt to treat " cause " as pointing to a truth here, but inadequately, would lead its beyond intuitionalism into some phase of idealism. To revise one's first principles is to be an intuitionalist no longer.

of reliable inference. Every First Principle of the mind is a starting-point too. Reid — certainly a very unsystematic thinker — furnishes long and random lists of " first principles "; a later writer, J. M'Cosh, in his Intuitions of the Mind, attempts a more systematic study. (For ethics we may also compare Miss F. P. Cobbe. Contemporary with Reid and even more popular in treatment was James Beattie; Dugald Stewart with trivial modifications followed Reid; but in Sir W. Hamilton and K. L. Mansel there were sweeping changes in the direction of agnosticism — changes due partly or primarily to the influence of Kant.) Memory is included among First Principles. Testimony is also a First Principle (this is aimed against Hume's Essay on Miracles). Inevitably the question forces itself upon the mind, is not some fuller synthesis possible? All these isolated starting-points of thought are said to be, one by one, necessary. Is there no higher or broader necessity? Can we not attain to some farther-reaching philosophy?

If we answer " Yes " to that question, we pass on from intuitionalism to idealism — an idealism not on the lines of Berkeley (matter does not exist) but of Plato (things A transl . obey an ascertainable rational necessity). This third tioato possibility in philosophy does not enter at all into idealism Lecky's grouping referred to above; in fact, it is ? L scep ' very generally strange to older British thinking, 3

which, if it conceives any tertium quid besides empiricism and intuitionalism, is apt to think of

scepticism. The fixed given points of intuitionalism furnish Hamilton with one of his arguments in his unexpected development towards a sceptical or " faith philosophy." You cannot prove any first principle. You accept it by " faith." So — for this among other reasons — we infer that knowledge has narrow limits, beyond which doubt, or faith, presently begins. But is it really a matter of faith that two and two make four? Do we " believe where we cannot prove " that the whole is greater than its part? A less sophisticated intuitionalism would rejoin with great force, " These are matters of sight; it could not be otherwise, and you see that it could not!" Hamilton's line of thought may, however, impress on us the conviction that it is extremely natural for philosophy to pass beyond the limitations of a purely intuitionalist programme. It does so notably in Kant. He is a most difficult writer; different readers under- Kant as stand him differently; and he uses in the earlier parts atrausl- of his Critique of Pure Reason much of the language tional of intuitionalism. But nothing is more certain than Uea,lst - that his thought is a strong solvent of the intuitionalist way of thinking; and he has had an immense influence in many direc- tions. We may state his chief results in our own words. First he breaks up the percept. It is no ultimate given point of departure; it is due to the reaction of thought upon sensation. Sense alone will never create orderly experience, as empiricism supposed; but a group of sensations reacted on by thought does so; it becomes, it is, a percept. Secondly: the "forms" of time and space, not referable to any sensation, and pre- supposed in every experience, come from the mind (" Trans- cendental Aesthetic"). Thirdly: we cannot explain how these three elements — sensation; time and space; thought- work together. True, Kant refers often to the ideal of a " per- ceptive " or " intuitive understanding," whose thought would produce the whole of knowledge out of its native contents. But our understanding, he is convinced, is of a different and inferior type. Incomprehensibly, we are dependent upon sensation; and

incomprehensibly, we place our sensations in time and space. Fourthly: if we try to think of objects not built up out of sensations and not in time and space, we are

t _ 3 Austin's Jurisprudence explicitly assumes that the dilemma of " intuitive " and " utilitarian " is exhaustive. Hence F. H. Bradley's characteristic protest {Ethical Studies, pp. 82, 83): "If we wished to cross an unknown bog, and two men came to us of whom the one said ' Some one must know the way over this bog, for there must be a way, and you see there is no one here beside us two, andtherefore one of us two must be able to guide you. And the other man does not know the way, as you can soon see : there- fore I must ' — should we answer, 'Lead on, I follow'?"

baffled by contradictions or absurdities. Kant admits that we necessarily aspire to think of such objects — " God, the World, tho Soul " — possibly this alleged tendency of our thought is already implied in the dream of a " perceptive understanding." But speculative knowledge breaks down or breaks off at an earlier point. If we try to know the soul, we grasp at a phantom. The self is always subject in consciousness and never can be- come an object of knowledge (" Paralogism of Pure Reason "). If we try to know the real world, we find ourselves distracted by opposite arguments (" Antithetic of Pure Reason "), plausible and resistless in attack, helpless in defence. The only thing which the " Ideas " of " Reason " can do for theoretic know- ledge is to exert a " regulative " function. They teach the in- ferior but working part of our intellect, the " Understanding," that its picture of sensuous reality envisaged in time and space must be as fully articulated as is possible — as much differentiated into detail, and as perfectly integrated again into unity and system. God, for Pure Reason, is an illegitimate personifica- tion of

the idea of perfected experience (" Ideal of Pure Reason "). Fifthly, there are fixed limits to the possibility of improving the quality of experience. Sense-knowledge is an endless process, inconsistent with the requirements of thought. We can by no means regard the physical world as the real world. But we possess knowledge of the physical world and of it alone. " Things in themselves " — whether defined by Kant, illogically enough, as causes of sensations, or again defined by him as the ultimate realities towards which thought vaguely points — in either case, " things in themselves " are unattainable by any definite knowledge. Our " reach " exceeds our " grasp " with a vengeance.

*So far as a remedy for scepticism is found at all, Kant places it, not within theoretic knowledge, but in moral or " practical " experience. Pure knowledge, for man, moves among a Kants world of shadows j duty is certain. Mansel charged Kant '"rt»" C <' with inconsistency in this preferential treatment of the ** " y ' moral consciousness; all our knowledge, even in moral things, was " relative " and was " regulative." 1 But, whether con- sistent or inconsistent, Kant was deliberate in differentiating between the ethical and the theoretic knowledge of man. " Ana- lytic " or tautological thought does not become " synthetic " or capable of embracing a real content except under the sting of sensation ; why sensation should thus help it is obscure, yet the fact is plain. But analytic thirrking is victorious in morals, where the test of formal self-consistency distinguishes virtue from vice. The good man is the perfectly rational or perfect self-consistent man ; and that is a full account of virtue, though Kant pro- fesses to re-irterpret it still further in a much more positive sense as implying the service of humanity. True, at a later stage, the opposition of sense and thought reasserts itself strongly with Kant even in ethics. We are allowed moral certainty, but are forbidden the hope of genuine moral victory. Just as our knowledge never can finish its task of reducing world-experience to an intelli- gible system, so our*

will is never once able perfectly to obey the law of reason. There is always a taint of feeling in man's goodness. This portion of the ethical theory does curious service in Kant's doctrine of religion. That doctrine runs, briefly, as follows. Duty must be accepted as a given certainty, or it is vindicated — unsatis- factorily enough, perhaps — in the way just explained. Next, from the certainty of duty we infer as our first moral postulate free will — " I can because I ought "; which, primarily at least, means " I know I can because I know I ought." But this strong asser- tion is greatly qualified when Kant recurs to what he considers the least discredited portion of our theoretical knowledge. In the world of phenomena, not freedom rules but determinism. Causality is one of the " categories " which our mind uses in building up orderly experience. So we are left with a see-saw. Will is noumen- ally free ; but phenomenally, in all real exercises of will, we are determined by the past. Secondly : from the discrepancy between the pure abstract law of self- consistent reason and the pleasure- tinged nature of man, we infer or postulate Immortality. As we never can hit the bull's eye, we must have literally endless oppor- tunities of aiming at it, so as to get indefinitely nearer the central spot. If we did hit the exact mark, apparently we need no longer be immortal. Lastly, God. We must not, we dare not, aim at happiness. It is an eternal weakness in our moral being which makes us constantly squint aside from the thought of duty towards the forbidden motive — wincing under pain, or hungering after joy.

1 Mansel's term for Kant's " practical." It must be carefully distinguished from Kant's " regulative," which refers to know- ledge — regulative in contrast to constitutive of knowledge — not to oractice.

Yet, if the motive is forbidden us, it is plain from another point of view that good persons ought to be happy. And, as nature reveals no great care for this postulate, we must appeal away beyond nature to a power who shall make good men at the last as happy as they deserve to be. And this power is God. Such is the train of thought as stated for us in the

Critique of Practical Reason.

In the Critique of Judgment, Kant restates his new type of theistic argument in a way which has had great subsequent influence. We must conceive nature as overruled by God not so much _ . for the sake of man's happiness as for the sake of his *,™. moral development. Or, to state this as a theistic argu- '

ment: we are bound to postulate a God who overrules , y " e nature for moral ends. This new statement has at least ° "**" the merit of bringing God into touch with man's good- ness as well as with his happiness. But the train of thought is deeply embedded among characteristic sceptical hesitations. In spite of the various details of the Judgment Critique (as to beauty; and as to the " internal " or as Hegel subsequently phrased it " immanent " adaptations seen in living organisms) Kant regards as extremely precarious all these hints of a higher view of nature. Nature as a machine, governed by changeless causal law, is neces- sary to thought. Were no such machine recognized, the thread of consciousness would be cut and orderly experience impossible; we must all go mad. 2 But nature breathing of life, or of beauty, or, however faintly, of a God immanent in the whole process, and shaping it towards moral purposes — that is or may be no better than a subjective dream. It is doubly uncertain. It has inferior guarantees, as compared with our knowledge of the mechanism of nature. And, after all, not even our knowledge of the mechanism of nature is a knowledge of reality. Things as they truly are lie wholly beyond our poor human vision.

Kant then has broken away from intuitionalism by sub- stituting one system of necessity for the many necessary truths or given experiences from which intuitionalism takes Kant's its start. But there are gaps in Kant's system — a imperfect gap between sensation and the sense-forms of time unifies- and space; a gap between sense-forms and thought; on ' a gap between the lower but practicable processes of the Under- standing and the higher but unrealizable ideas of Reason. And thus Kant's idealism is

incomplete. On one side, the world we know by valid processes of thinking cannot, we are told, be the real world. Or, beginning from the other side; neither the reality which ideal thought reaches after, nor yet the reality which our conscience postulates, is the valid world of orderly thinking. The great critic of scepticism has diverged from idealism toward scepticism again, or has given his idealism a sceptical colour,' mitigated — but only mitigated — by faith in the moral consciousness. If there arises a system of philosophy in which all truths are grasped in unity, and it is seen that the principles of things must be what they are, such a philosophy will give us in perfection the idealistic conception of reality and the idealistic guarantees of truth which Kant gave brokenly. The Absolute Idealism of G. W. F. Hegel was such a system. It ranks, up to our own day, as the last of the great philosophies, and the boldest of all. Kant had fewer isolated points of departure than intuitionalists; yet gaps and isolation recurred in Kant, and helped to make him the father of modern agnosticism. In the later intuitionalism of Hamilton, recoiling from Hegel, the many subjective necessities of the intuitionalist scheme were made to breathe the new agnostic suggestions. We necessarily think as we do — but only because of our entangling faculties. It is a mental " impotence " that makes us believe in such a law as Cause and Effect. Kant had substituted one great necessity, sprung from an ideal source. Reason — under conditions of sensation — created the world of (valid) knowledge; Reason created the practical world of duty. But, having said this, Kant went on to repeat the sceptical suggestion. The whole coherent necessary world of his philo- sophy became " our world," as we necessarily think it, but not by any means of necessity the world as it is. Hegel brushes aside all these hesitations. His Philosophy of Nature — one of the least admired parts of his system — is the answer from his point of view to Kant's assertion that a " perceptive understanding " is for us impossible. Hegel offers a supposed proof that Time and Space, Matter, Nature, are ascertainable and definable

: This is Kant’s positive refutation of Hume’s scepticism.

Hegel.

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lectic” method.

necessities in a reasonable universe. Rational system is the first and last word in this philosophy. The element of given- ness, dominant in empiricism, and partially surviving through intuitionalism even into Kant, is sublimated in Hegel’s thinking. Everything is to be exhibited, in outline or in essence, as the working of necessary truth. You need not wish anything in the universe to be other than it is; as well grumble at once that two and two do not make five ! 1 Hegel will allow no dualism of fact and principles. Nothing is bare fact. Philo- sophy will show you that everything has to be so and so. The effect of this point of view in regard to moral perceptions is that they represent an important relative truth, but that philosophy ” passes ” beyond them ” into a higher region, where imputa- tion of guilt is ” absolutely ” meaningless ” 2 — jenseits des Guten und Bbsen. More peculiarly his own is Hegel’s great doctrine Tbe of contradiction, whereby opposing views of truth

•• Dia- rank as stages in one progressive definition. We may explain this to ourselves as an extraordinarily vehement recoil from Kant’s deification of formal logic with its principle of ” analytic ” tautology. As a result, Hegel’s system undertakes to show candid minds that incom- patible assertions not only may but must both be true. 3 Through this unexpected and obscure principle of “dialectic “* Hegel claimed to fulfil his programme of interpreting everything as manifest necessary truth of ideal relationship. It all must be so and you see it must.

Hegel wrote extensively upon religion, especially in his Philo- sophy of Religion. Yet it remains doubtful whether he was a Ambismi- theist with large pantheistic elements — such as every „ °~ speculative mind will be likely to incorporate in theism —

... or a pantheist rejecting theism altogether. We may

' regard his ambitious programme as the last logical development of idealism and indeed of philosophy itself. If perfect knowledge be possible for us, it must take the form of such a system as Hegel offers. If the world exists purely to be known, and if every other working of reason comes into con- sideration qua incomplete knowledge, Hegel is right with his sweep- ing intellectualism. Or at least he has rightly seen what are the assertions to aim at ; it is difficult to accept the principle or method upon which his answer to the riddle proceeds, the dialectic method. Perhaps it was necessary for human thought to try how far it would carry out this programme. And yet perhaps full success was neither possible nor desirable. If such are our conclusions, we return to a possible basis for theism not very far removed from that of intuitionalism. Certainly history shows that theism has generally been associated with some reduced or limited form of philosophy, usually with the intuitionalist scheme. It is not the first runnings of the stream of religious thinking which have given the world its theistic philosophies. Theism is an afterthought — the reply to doubt — the attempted reflective justification of what announced itself at first as a prophetic certainty. But no more is theism the first runnings of the stream of philosophy. It is philosophy harnessed to a practical and religious interest. It is philosophy called into court to answer selected questions.

Theism then has its most habitual affinities with intui- tionalism, but may fall under any one of our philosophical or quasi philosophical types. We have distinguished three types or tendencies: empiricism,

intuitionalism, idealism. They deal respectively with what is — partly with what is and partly with what must be — with what must be. They are based on facts — upon facts in "the light of principles — upon principles purely and ultimately upon one principle. They claim probability — moral certainty — mathematical certainty. They incline to the Design Argument and Analogy — to the Cosmological argument (with other elements in a subordinate place) and proof by inference — to the Ontological argument. This last and boldest argument is a system of idealistic philosophy in a nutshell.

1 " It may be asked, Why can God not create a triangle whose three angles shall not be equal to two right angles? To abstraction and ignorance everything is possible." From notes of a class lecture by Dr E. Caird.

2 F H. Bradley, Ethical Studies, p. 4.

- *J. E. MacTaggart {Studies in Hegelian Dialectic) contends that direct contradiction is confined to the elementary portions of Hegel's Logic: but he does not deny its existence there, though his inter- pretation, could one accept it, softens the paradox.*

4 Used by Kant sceptically of the limitations of reason, dialectic in Hegel becomes constructive; and scepticism itself becomes a stage in knowledge.

When such a system is worked out in full detail, it essays or ought to essay a proof of the following points: (1) God or the Absolute necessarily exists; (2) He necessarily is what He is; (3) He or it necessarily manifests itself in the finite, (4) and necessarily manifests itself in just this finite which we know from experience. If philosophy is able to fill up that pro- gramme, it justifies itself; it raises all belief to necessary truth; and whether its teaching be theistic or pantheistic, pantheism or theism, whichever turns out victorious, must henceforth rank as a demonstrated certainty.

Again, these contrasted philosophies throw light upon the meaning of a posteriori and a priori in Kant and subsequent writers. 6 To empiricism, all is a posteriori. To in- »Apos- tuitionalism, half is a posteriori and half a priori. To terlorl" idealism, all is a priori. Not that a posteriori is denied, ""d " a or that idealism even in Hegel tries to evolve reality Priori." out of the philosopher's inner consciousness. Mere given fact may be the starting-point; but it is sublimated. We see by degrees — in general outline or upon general principles 6 — that what is is no other than what must be.

There is another conception of necessity which has estab- lished itself in the history of science and philosophy. We may call it mechanical necessity. If this conception is "Mecha- regarded as full and absolute truth, it involves nlcalne- materialism. When we recollect the empiricist start- eesslly." ing-point of science, it is curious to observe with what vehemence the average man of science now rejects free will. To him, it cannot be true. William James stood almost alone in being prepared to go anywhere at the bidding of apparent facts, un- concerned about rational probabilities. On this ground James is a libertarian. The fact appears to be so; he reports it. Similarly, James is willing to believe in many universes neben- einander or durcheinander but not [ineinander. Dualism, pluralism, manifold parallel inconsistency may belong to the nature of fact. Does our intelligence demand unity? That may be a mere subjective fancy. Even polytheism, 7 or some- thing indistinguishable from it, is suggested to this doggedly empiricist mind by the Varieties of Religious Experience; they are all good to those to whom they appeal; and what right have we to talk of objective standards? 8 Ordinary "induc- tive " empiricism shows that it has travelled far from this unprejudiced credulity when it asserts its hard determinism — uniform law, never broken, never capable of being broken. But what is mechanical necessity, if we admit that in some sense it exists? It is a relative necessity. The present

and the future have to be what the past and the absent make them. Past events, ” happening ” to be what they were, have fixed subsequent processes to their channels. But you can never, at any one point, say, from the scientific or mechanical or material- istic standpoint, this “had to be.” 9 The relative necessity never passes into an absolute one. A different primitive “collocation,” as T. Chalmers 10 put it, would have yielded, by the same process of natural law as ours, quite a different uni- verse from ours. 11 T. H. Huxley admitted that this contention could not be ruled out as impossible. Again, in the scheme of mechanism, everything is determined by everything else— in

5 (i)_ Aristotle and the schoolmen meant by a proof a priori reasoning from cause to effect. (2) Kant is often supposed to mean by a priori — see Hamilton’s Reid, p. . 762 — “innate” as opposed to ” acquired from experience.” (3) If we accept the suggestion offered above — that a priori in Kant and later thinkers = necessary — we place ourselves on the track which leads from intuitionalism to some form of idealism.

8 Why only in such general terms? But this limitation is always taken for granted.

7 It does not seem as if James’s ” Pragmatism ” could lend itself to anything so concrete as a theistic conclusion.

s A_very different thinker, Dr J. E. MacTaggart, works round from idealism to an eternal quasi polytheistic society of equal souls.

9 H. Spencer’s ” instability of the homogeneous ’’ is perhaps an attempt to perform the impossible (First Principles, chap. xix.).

10 Quoted in J. S. Mill’s Logic, and with fuller sympathy in W. S. Jevons’s Principles of Science.

11 God has ordered the original ” collocation ” — a new statement of the argument which traces Design in

nature.

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space as well as in time; nothing does anything for itself. Yet again, nafure is broken up into co-operating parts; the whole is the sum of these parts; or, if you prefer to say so, there is no whole. But, if we should take the view that nature is infinitely extended — part of the " Antithesis " in Kant's first " Antinomy " — relative necessity breaks down on the last analysis, since boundless nature may overwhelm that sequence which we thought most securely established. Who can say what may emerge from an infinite background ? We reach similar conclusions when we recognize that the laws of nature are general or hypothetical; not in Mill's sense ("If you had such a non-existent thing as three perfectly straight lines united in a triangle "), but in a sense noted in F. H. Bradley's Logic: " If " or " As often as you have the cause working unimpeded, you get the effect." Pure scientific theory cannot tell you when you have got such a cause, or whether you ever get it at all. No law of nature contains in itself a promise that it shall pass into operation. Its doing so depends upon the totality of conditions. Materialism supposes that this mechanical order is the real world and the only real world — mechanical monism. 1 Intuitionalism supposes that there are two realms — of necessity and freedom, of nature and will, of matter and mind; con- tiguous, independent, yet interacting — dualism. Idealism in one way or other supposes that mind is more real than matter. And thus its first programme — All is in accordance with reason — may pass into the more doubtful programme All is reason, in one of the two forms (a) nothing exists but mind (e.g. Hegel, as often interpreted — pantheistically?) or (b) nothing exists but minds {e.g. Hegel, as interpreted by Dr MacTaggart). Any- how, whatever the method or interpretation is to be, idealism, even more fully than materialism, is pledged to monism and to the rejection of dualism.

The valid or scientific but meta- physically untrustworthy knowledge, to which Kant shut us up, was knowledge of a mechanical universe. His reply to Kant's Hume was this — Mechanical causation is as real as

reply to the unity of consciousness. It is false to suggest that Hume. sequence is a fact and causal connexion a figment; apart from causal connexion, there could be no consciousness of sequences. Over against this " valid " mechanism, in some truer but vaguer region, Kant placed free will; and so left things. The English thinkers influenced by Hegel are inclined to assert mechanism unconditionally, as the very expression of reason — the only thinkable form of order. Thus libertarian free will has to disappear from their belief. In this interpreta- tion of the universe, the difference between mechanical or relative necessity and absolute or ideal necessity is slurred, or dogmatically affirmed to be non-existent. It might be sug- gested in reply that free will, whether or not it be ultimate truth, is true to the same degree of analysis ?s mechanical necessity itself. Mechanism is that which obeys impulses from outside. It is profoundly unsatisfactory to regard mechanism as the whole ultimate truth. For such a r61e it is in no sense fitted. If it is ultimate truth in its own region, that region cannot be accepted as more than half the entire universe of reality (common sense intuitionalism; dualism). If mechanical determination applies to the whole universe, it cannot be ultimate truth at all (cf. H. Lotze; more drastic in Ward's Naturalism and Agnosticism).

Quite a different view of necessity is the moral necessity pointed to by Kant's " Practical Reason." And, as the sym- Morai ae- pathizers with Hegel try to force mechanical necessity cesshy; into the garb of absolute or ideal necessity, so they Kaat. sec k t show that moral necessity is only an inferior

form of absolute or ideal or, we might say, mathematical necessity. Theists, on the other hand, will contend that the distinctiveness of moral

necessity is vital to religion. Thus we might restate our grouping of philosophies in terms of the views they take regarding necessity. Theism is directly inte- rested in this, since it affirms the necessity of God's existence.

1 Ernst Haeckel will not allow us to call his system " Materialism," because he affirms that the rudiments of matter are also rudimentary " mind stuff " (to use W. K. Clifford's term). But in spite of this its materialistic affinities are unmistakable.

At least, it would be hard to name any school of theists which was content to affirm that there " happened " to be a God. On the other hand, theism does not desire to see necessity — or Fate — ranked as superior to the living God.*

One great change and only one since Kant's day has affected the outlook upon theistic problems — the increasing belief in evolution. It is a manifest weakness in intuitionalism Evoiu- that it finds such difficulty in leaving room for evolu- tloa - tionary change. All men may perhaps be aiming everywhere at the same moral ideal, 3 but it is absurd to say that all men actually formulate the same moral judgments. On the other hand, many evolutionists ignore the certainty that there must be a continuum in any real evolutionary process. In the light of that truth, a reformed intuitionalism might justify itself. But fuller conceptions of evolution raise further difficulties for intuitionalism in its wonted forms. Knowledge cannot be divided into the two components — immediate certainties, precarious inferences. The starting-point is reconsidered, modified, transformed, in the light of subsequent acquisitions. Knowledge grows, not by mechanical addition, but by organic transformation. This may help us to appreciate the meaning of Hegel's Dialectic. His thought then is not wholly paradox, whatever the expression may be. Hegel's system is, in its own way, a great evolutionary philosophy of an ideal type. 4 Evolu- tion, repelled by the older intuitionalism, was thus incorporated in the

greatest of all idealisms. It has also been largely applied to empiricism. Sometimes one questions whether empiricism is really still empiricist; so much of the a priori has come in under the name of evolution (e.g. in Herbert Spencer). But the change, if it has taken place, is unrecognized.

IV. Greek philosophy for our purpose begins with Socrates, who formulated the Design Argument. His ethics have some- times been regarded as pure utilitarianism (so e.g. Ouiaoe H. Schultz); but it is surely significant that the great history idealism of Plato was developed from his suggestions, of theism. The new method of definition which Socrates ap- Socrates - plied to problems of human conduct was extended by Plato to the whole universe of the knowable. In the light of this, it may be possible (with J. R. Seeley in Ecce Homo) to call Socrates the ” creator of science.” The man who inspired Plato deserves that name. Those Ideas according to which all reality is objectively shaped — and there- fore too, as a modern would add, subjectively construed — in- clude the idea of the Good, which Plato identifies with God. We might mislead ourselves if we interpreted this expression as referring to moral goodness; on the other hand, Plato more than most of the Greeks thinks of moral virtue as an imitation of God. With all its idealism, Greek thought had difficulty in regarding rational necessity as absolute master of the phj- sical world. Matter was a potentially recalcitrant element. Hence there are tendencies even in Plato to build up the ideal world in sharp contrast to the actual world — to the half interpene- trated or half tamed world of matter. His suggestions as to immortality are affected by this. The body is the soul’s prison. He teaches (whether suggestively, metaphorically or de- liberately), pre-existence 5 as well as survival; perhaps he is moved to this by non-Greek influences. Thus at several points Plato reveals germs of dualism and asceticism. Free will had not yet been formulated as a problem. Aristotle has impressed the ordinary mind chiefly by his criticism of Plato’s .

ideal theory; and therefore he is often ranked as the father of empiricists. But those who treat him as the great

2 Still, Lotze's criticism of the cosmological argument reveals his realist side. On the other hand, in discussing the ontological argument, Lotze commits himself to a moral a priori (below, ad fin.).

3 " We are all embarked upon a troublesome world, the children of one Father, striving in many essential points to do and to become the same " (R. L. Stevenson).

4 The idea of evolution in time (physical evolution) was laughed at by Hegel.

6 A belief hinted again at the close of Lessing's Education of tht Human Race; also — more definitely — by J. E. MacTaggart (Studies in Hegelian Cosmology, p. 48; and elsewhere).

Plato.

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Realist make him almost if not quite intuitionalist; while there is also an idealist reading possible. The threatened dualism of ideal and material becomes for Aristotle mainly a contrast of matter and form; the lower stage in development desires or aims at the higher, matter more and more tending to pass into form, till God is form without any matter. But this God of Aristotle's is a cold consciousness, imitated only by the contemplative virtue of the philosopher, not by the morally active citizen. And the chief contribution of Aristotle to theism is a theory, found in his Physics as well as his Metaphysics, of God as first mover of the universe, himself unmoved. This theory is generally ranked as the earliest appearance in European thought of the cosmological argument. Free will is shaping itself towards discussion in Aristotle's Ethics, but is

hardly yet a formulated problem. For anything like personal immor- tality the medieval Schoolmen searched him anxiously but in vain.

Epicureanism need not detain us. It is a system of empiricism and materialism, remarkable only for teaching free will. Atoms swerved as they fell endlessly downwards, and thus introduced an indeterminate or irrational element into the processes of the world. Theism can take but little interest in this peculiar type of free will doctrine, or again in Epicurus's professed admission of the existence of gods — made of atoms : inhabiting the spaces between the worlds ; Stoicism careless of men. Stoicism is a much more important system, but harder to classify. Perhaps in the department of thought where it is most in earnest — in ethics — it is an idealism. It tells men to " obey reason " and crush passion, or to live " according to nature." In physics — but in that region of speculation its positions are more perfunctory — it teaches pantheism on a gwasj- materialistic basis. God is the soul of the world, although the gods of popular belief are (at least by the later Stoics) respectfully if exoterically acknow- ledged. Human survival is taught, but not ultimate immortality; and, as against Epicureanism, Stoicism on the whole tends to deny free will. There is perhaps a certain religious enthusiasm in the thought of being passively determined by Fate, the Universe, Zeus. Finally, the Stoic analysis of the process of knowledge is sensa- tionalist and empiricist.

So far as a coherent body of theistic doctrine exists, it did not grow out of the great systems, but out of the lesser men who stood nearer to the apprehension of practical citizens. Perhaps the most important of these popular thinkers was Marcus Tullius Cicero — no great philosopher, but a graceful and effective man of letters. Cicero ^ ^ as been truly observed 1 that the lineaments of

intuitionalism are very clear in him. He also gives us " natural law" 2 — a Stoic inheritance,

preserving the form of an idealist appeal to systematic requirements of reason, while practically limiting its assumptions to those of intuitionalism. Formally, Cicero adhered to the Academic 3 philosophy during its ” middle ” or almost sceptical period. (The senses are so far from truth that we must be content with reaching probability.) In Cicero’s De Natura Deorum the burden of theism rests mainly on the Stoic interlocutor. The conclusion, ” academically ” recognizing the contendings of one disputant as more ” probable,” is imitated in D. Hume’s Dialogues Concerning Natural Religion. In the great Roman Stoics — Seneca, Epictetus; less material for theism perhaps Seneca. ‘ n Marcus Aurelius — we see the partial softening and religious deepening of the system, and a doctrine of the wise man’s power over passion and circumstance which has all the essentials of Libertarianism. Philo of Alexandria should also be Phllo. mentioned. He blends the tradition of the Old Testa-

ment with Greek philosophy, and, within the latter, exhibits that union of Platonism with Stoicism, especially in the doctrine of the Logos, which became dominant in the Christian apologists and the great theologians of the ancient church. Philo is Greek enough to believe in the eternity of matter; otherwise he preserves the main outlines of Old Testament theism. He teaches free will and immortality; and the design and cosmological arguments are both traceable in him. Augustine of Hippo trans- mits a type of Platonism as part of his legacy to the stAugus- \v estern church. Against Manichaean dualism he had e ‘ vindicated free will; but as against Pelagianism he

taught the bondage of sinful man — a position accepted in the East but never welcome there, and not more than half welcome even in the West From this theological entanglement the problem of free will did not escape for long centuries. In spite of some waver- ings towards what has lately been called ” conditional immortality ” (see Apologetics) the doctrine of ” natural immortality ” cham- pioned by

Augustine became dominant in the church ; an instal- ment of what was afterwards to be called Natural Theology; and a postulate or presupposition to-day — like free will — in Roman Catholic apologetics.

1 D. G. Ritchie, Natural Rights, p. 36.

2 See above (ad init.).

Platonic.

The middle ages, in the person of Anselm of Canterbury, con- tribute the first clear form of the Ontological argument for theism. If our grouping of philosophies, as given above, is sound, juiddl every idealist scheme contains potentially an ontologi- e

cal argument. In other words; whenever philosophy teaches a doctrine of the Absolute, and regards such doctrine as valid and certain, we have the essence of an ontological or a priori argument. Of course it remains debatable whether this philo- sophical Absolute is necessarily interpreted as a personal God, or perhaps even whether logically it can be. But the Christian bias is sure to make theologians, who borrow a doctrine of the Absolute, interpret it in a Christian sense; hence we may consider it some- thing of an accident that even an Augustine fails exactly to put the argument in form. Anselm tells us that a most perfect being must exist, since the perfection which includes existence is mani- festly greater than a perfection confined to an object of thought. Some of the impression of paradox here is due to Anselm's treating the Absolute simply as one among many other beings, and to his treating existence simply as one element in the quantitative sum of perfections. At least, idealist philosophy will hold that the substance if not the form of the argument is sound 4 though the question of its interpretation remains. In Anselm's case we have the further sanguine hope of justifying not theism merely but all Christian doctrine to the scientific reason. Thomas Aquinas, following Albertus Magnus, but with greater power and greater influence, occupies substantially intuitionalist ground. He

will not have the Ontological argument; but he asserts Natural Law, and relies upon the cosmological and design arguments — with various refinements and distinctions, differently stated in his two Summae. In declaring the supreme doctrines of Christianity to be mysteries above reason, he marks off a lower region where reason is to reign; the study of that lower region may well be called, as later centuries have called it, Natural Theology ; and as such it presents strong intuitionalist affinities. The critics of Aquinas — Duns Scotus and the later Nominalists — show some tendency towards rational scepti- cism. They exercise their acumen in multiplying difficulties; but all such questionable doctrines are presently re-established from a different point of view as truths of faith or findings of church authority. The Church of Rome has discouraged these daring tactics in favour of the more cautious and probably more defensible positions of Aquinas. In Raymond of Sabunde s form of moral argument — there must be a God to reward and punish, if human life is not to be " vain " — we see the kinship of that argument to the argument from design.

Rene Descartes, a faithful though not an unsuspected Roman Catholic, founded modern philosophy by his starting- point of universal doubt and by his arguments in reply. One may regard him as an idealist, though Scottish intuitionalism — especially in the writings of Professor John Veitch — has claimed him for its own; and indeed Descartes's two substances of active mind and passive extended matter are very much akin to " Natural Dualism." Still, Descartes has marked idealist traits, as when he refurbishes the ontological argument with clearer emphasis on the perfect being as "necessarily" existent 5 — reasoning a shade less quantitative or a shade more subtle than Anselm's. Descartes's prelimi- nary statement of the argument in somewhat popular form brings it very near the lines of the cosmological proof. 6 There must be a cause for nature, but particularly for the idea of perfection in us — that

cause must be God. The radical side of Descartes appears again in his offering his own type of theism as a substitute for the old proofs — not a supplement. Design especially was under suspicion with him. He was even more definitely opposed to ” final causes ” than Francis Bacon, who excluded them from science but admitted them to theology. All this was connected with zeal for physical and mathematical science. Descartes was an expert; Bacon was the prophet of a great, if half comprehended, future; and the science they loved was struggling for its infant life against a mass of tradi- tional prejudices, which sought to foreclose every question by confident assertions about the purposes of God and Nature. A difficult question arose for Descartes’s philosophy, when it had to explain the union in man of the absolutely opposite substances,

4 Cf. J. E. MacTaggart in regard to Hegel, Studies in Hegelian Cosmology, chap. iii.

5 So Meditation 5, at least in the French version. Again: ” Existence cannot be separated from the essence of God “; com- pare Spinoza’s ethics, definition 1 ; ” By causa sui I understand that the essence of which involves existence, or that -which by its own nature can only be conceived as existing.”

• Meditation 3.

Descartes.

mind and matter. Malebranche gave all causation to God; and the acosmist — as Hegel called him, in repudiation of Bayle’s nickname ” atheist ” — Spinoza, from the premises of Carte- sianism, and from other suggestions of the past, p noza. ^gygjgpgd tna t g rea t system of determinist pantheism which was a scandal and a terror to his generation. Really, he urged, there could be only

one substance — Descartes himself had dropped a passing hint to that effect — and the bold de- ductive reasoning of Spinoza's Ethics, in process if not in result, betrays its kinship to the ontological argument, with its affirma- tion of what must be. Thought and extension are peaceable attributes in this one substance; there are infinitely many other attributes, but these only are known to us.

In a different region, the tradition of Descartes passes on to G. W. Leibnitz. He accepts the ontological argument with a qualification — almost like his disciple Wolff, who tries to use it for defining the divine attributes. Leib- nitz's Monadology — which has little influence on his theism — may be viewed as a strong recoil from Spinoza's all-swallowing substance. The more Spinozistic side of Leibnitz's thought — God as Monad of Monads — is a theistic postulate if hardly a theistic proof. The free will which Leibnitz teaches is not libertarian but determinist. Each monad works out necessary results, but these flow from its own nature; and so in a sense it is free. Reciprocal action is explained away into a " pre-established harmony " between every monad and all others. In his Theodicy Leibnitz argues, like not a few predecessors, that this universe must be regarded as the best of all possible universes. Pain and sin must have been reduced to a minimum by God; though they are so ingrained in the finite that we have to make up our minds even to the endless sin and endless punishments of hell. It has been truly said that such optimism is a profound relative pessimism. The best? Yes, perhaps the best possible; in familiar speech, the best of a very bad business. But why must universes be so bad? Leibnitz's philosophy has no answer for us. In another direction, Leibnitz — and Wolff — give emphasis to the contrast between the necessary and the contingent ; with important results for popular philosophy, and indirectly for theism. The disciple, Christian Wolff, is one of the most typical figures in the history of theistic thought. He is a pure

scholastic. The great thoughts of his master — or perhaps indeed rather Leibnitz's secondary thoughts — are dried and pressed by him, labelled and catalogued. Monadology drops out of Wolff's teaching. Pre-established harmony drops out — except that it is used to explain the union of soul and body. W r olff tells us zhat six Latin works contain his system: — Ontology, General Cosmology, Empirical Psychology, Rational Psychology, Natural Theology, i.; Natural Theology, ii. In the volume on Empirical Psychology, Wolff discusses free will. He decides that human actions are caused or determined by the nature of the agent, but that, as man is not a necessary being, his actions are contingent. This view seems to preserve all that is questionable in Libertarianism, while omitting its moral meaning. The Rational Psychology formulates immor- tality on the ground that the immaterial soul has no parts to suffer decay — the argument which Kant's Critique of Pure Reason " refutes " with special reference to the statement of it by Moses Mendelssohn. The earlier of the two volumes on Natural Theology relies on the cosmological argument; the later — obviously an afterthought — tries to vindicate the onto- logical argument as an alternative basis for theism, but awkwardly and with manifest uneasiness. In the end, this volume diverges into the Attributes, construing God in the likeness of man via eminentiae. 1 No writer can be less intrinsi- cally worthy of study than Wolff. But he is immortal as the '. nan against whom Kant directed his tremendous battery ; 2

1 Human attributes magnified, or their weak points thought away. The Schoolmen sought to establish other divine attributes by negation of human weaknesses and by finding in God the cause of the varied phenomena of creation.

2 On one side ; another battery of Kant's was aimed against Hume.

Bacon.

and he is also tolerably characteristic in outlook.

He is no intuit ionalist; but he is a drily common-sense mind, piling up in heaps the ruinous fragments of an idealist system.

In England, empiricist thought found a prophet in Bacon. He draws no inferences to theology or religion, whether friendly or hostile, from his new positions. He takes the line of separating the things of God from those of Caesar, and defends the traditional Protestant theology with obvious sincerity. Thomas Hobbes, a rough and anomalous but vigor- ous thinker, is the fountainhead of a more formidable „ ..

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empiricism. He is almost a materialist. In ethics,

he is a hard determinist and hedonist, though not without qualifications (man's boundless desire for ” gain and glory ") and peculiarities. He saves himself theologically by affirming that the good citizen will be of the same faith as the government — which had best be a monarchy. In that sense, living under a professedly Christian ruler, Hobbes himself is a Christian. John Locke, the real father of English philosophy, Locke took the field against what he regarded as Descartes's impossible programme of "Innate Ideas." 3 But Locke is a double-minded or half-hearted philosopher. He admits two sources of knowledge — sensation and reflexion; and God is to him the Great First Cause, especially of our own existence (or of the existence of fi-nite minds). This is a form of the cosmo- logical argument, and ought to go with an intuitionalist not an empiricist doctrine of causality. On ethics, Locke says very little, although that little is hedonist and determinist. But once again in his political writings he breaks away from em- piricism in appealing to natural law — an intuitionalist or con-ceivably an idealist tradition. Locke is thus a sensationalist and empiricist, but incompletely, and without perfect coherence. His suggestions led to different developments. In France, through Condillac, the inconsistencies were purged coadiiiac

out, and materialism was ready for the next comer andma- to affirm — though it may be said with R. Flint ^na/fem. that while materialism requires sensationalist psychology, yet the psychology in question allows no valid inference to matter, and therefore destroys materialism. Bishop George Berkeley, afraid of materialistic developments from a a er k e i e philosophy he was not prepared fully to recast, took refuge in immaterialism. Locke had treated ideas as testifying to the existence of matter. But can they ? The inference seemed unwarrantable. Why should not God, a spirit like our own, though greater, speak to us in this language ? In Alciphron or the Minute Philosopher Berkeley gives the fullest statement of this argument, while adding more commonplace attacks on the pettiness of religious scepticism. David Hume, following up Berkeley's leading suggestion, pointed Hume. out that the inference to God is as precarious as the inference to matter, and that the assertion of a continuous or immaterial mind in man also goes beyond the immediate facts. The truth is, that all truth is uncertain ! Scepticism, with which P. Bayle had played as a historian — he amused himself, too, with praising the Manichaean solution of the riddle of the universe — became a serious power in the history of philosophy with the advent of David Hume. Still, it may be doubted how far Hume was in earnest. Nay, it may be questioned how far it is either psychologically or logically possible to turn general scepticism into a coherent doctrine. The Dialogues Concerning Natural Religion constitute Hume's formal profession of re- ligious faith. The existence of God was no doubt probable; but what a number of difficulties there were! Still, one would not dispute whether God existed; but what he was — that was the hard question. This treatise must not be confused with the Natural History of Religion, in which Fume acts as a pioneer for comparative religion, with its study of facts. Even in that book Hume is able to play with sceptical solutions. Religion began in fear — as if it were no more than a lying superstition. Of course once more Hume saves himself by strong professions of admiration for

rational or natural religion. It was not yet socially safe to be a confessed religious sceptic.

5 And against similar views in Lord Herbert of Cherbury

Samuel Clarke, who defended Newton's view of the world against Leibnitz's strictures, is perhaps chiefly interesting to Butler. us as one °f tne authorities of Bishop Joseph Butler. It is Clarke's defence of free will, Clarke's idealist theory of eternal " fitness " as the basis of ethical distinctions, perhaps Clarke's teaching on immortality, that Butler regards as " the common known arguments " and authoritative enuncia- tions of truth in the regions of philosophy or Natural Theology. 1 Butler himself occupies a peculiar position in more respects than one. He has profoundly influenced British thinking, but is little known abroad. He is difficult to classify. We may be helped in assigning him his proper place if we observe that, almost invariably, he accepts certain beliefs which he forbears to press. Thus in his most important contribution to ethics, the Three Sermons on Human Nature — i., ii., iii. of the Sermons — he grants the validity of an appeal to " nature " upon the lines of a sort of Stoical idealism, but for his own part he prefers the humbler appeal to human nature. He makes the issue, as far as possible, a question of fact. We, from the altered modern point of view, "may doubt whether Butler's curious account of the mechanism of moral psychology is a simple report of facts. There are (a) given instinctive " propensions "; (b) a part of higher principles, " benevolence " and " rational self-love," equally valid with each other, though at times they may seem to conflict; (c) there is the master principle of con- science, which judges between motives, but does not itself constitute a motive to action. Butler is opposing the psycho- logical hedonism 2 of Hobbes. He does not find it

true to experience that man necessarily acts at the dictation of selfish motives. But Butler — for reasons satisfactory to himself, and eminently characteristic of the man; he hoped to conciliate his age! — dwells so much upon the rewards of goodness, as bribes (we must almost say) to rational self-love, that some have called Butler himself an ethical hedonist; though his sermon on the ” Love of God ” ought surely to free him from that charge. In all this, Butler was convinced that he was giving a simple, statement of facts. Any one introspectively apprehending the facts must grant, he thought, that bene- volence was an integral part of human nature and that con- science was rightfully supreme. This reveals the empiricist temper, and points to an attempted empiricist solution of great problems. Butler holds that more ambitious philosophies are valid, but he shrinks from their use. The same thing is seen again in the Analogy. Butler divests himself in this book of the principles of ” liberty ” and ” moral fitness ” in which personally he believes. 3

Part i. of this book shows the ” Analogy ” of ” Natural Religion ” to the ” Constitution and Course of Nature.” Probably ” Nature ” is here employed in a more familiar or humbler sense than in the passing reference in the Sermons. The Analogy means by ” nature,” indisputable human experience. Deists believed in a God of un- mixed benevolence; Butler’s contention is that justice, punish- ment, hell-fire itself are credible in their similarity to the known experiences of man’s life upon earth. What the Three Sermons sought to find written small within — a law of inflexible justice or righteousness — part i. of the Analogy seeks to discover written in larger characters without us. Butler is charged by Sir Leslie Stephen with arguing illegitimately — professing to make no appeal to ” moral fitness,” and yet contending that the facts of human life show (the beginnings of) moral retribution for good and evil. Assuredly Butler did not mean to give up his right of speaking about moral evil and good when he waived the ” high priori ” method of vindicating their real existence. Yet it is a very grave

question whether the idea of God's moral government admits of being argued as pure matter of fact. Butler tries to do this. You call it unjust, he says in effect, that you should be punished. You argue, for example, that you have no free will. Well, what of

1 Analogy, part i. chap. i. (" the natural and moral proofs of a future life commonly insisted upon"); last sentence of part i., Conclusion (" the proper proofs of [natural] religion from our moral nature," &c.); part ii. chap. viii. sub fin., " the proof " of religion, " arising out of the two . . . principles of liberty and moral fitness."

2 These useful distinctions are stated and well explained in W. R. Sorley's Ethics of Naturalism.

3 Analogy, iii. chap, viii.; following S. Clarke?

that? Does it not look very much as though you were being punished? Does not nature seem to treat you as if you had free will ? 4 One thing more should be noted about Butler. He nowhere formally argues for the truth of theism. He will not waste time upon triflers who deny what he thinks, in the light of the (empiricist!) Design argument, an absolutely clear truth. 5 On the whole then Butler in personal conviction is an intuitionalist, waver- ing towards the idealism of his age; but in argument he is an empiricist, trying to reason every question as one of given facts. None the less, in the issue, it is the very element which goes beyond an appeal to facts — it is the depth and purity of Butler's moral nature — which fascinates the reader, and wins praise from Matthew Arnold or Goldwin Smith or even Leslie Stephen. Precisely because he goes beyond phenomenal sequences, it is impossible to fling him aside unheard. On the other hand, no Christian, and perhaps no theist, is interested in maintaining that Butler grasps the whole truth. At the most we might say this: If theism is a growing doctrine, Butler in England like Kant in Germany stands for a fresh ethical emphasis.

Stephen accuses Butler of reasoning in a circle. The things which make for our ultimate welfare are the things we call morally good. No wonder if they prove to involve happiness; that is their definition! But is it? Does not Stephen himself rather say that morally good things are conditions of social, not personal welfare? Butler's argument is that the individual suffers (and feels that he suffers deservedly) from neglecting these If George Eliot is guilty of a platitude when she says that " consequences are unpitying," then Butler's argument is empty: but not other- wise.

Butler on the soul may be studied in chap. i. of the Analogy — where we observe the old assumption of an immaterial and so immortal principle — and in his appendix on Personal Identity Wherever moral postulates make their presence felt, Butler's doctrine of man, as of God, leaps into new vigour.

It is a moot point whether S. Clarke's Demonstration of the Being and Attributes of God is really a priori. Clarke appeals to the immensity of time and space as involving infinity in God. A modification of his views is the starting-point of W. H Gillespie's able Argument a priori for the Being and Attributes of the Godhead, published part by part 1 833-1 872. We find something curiously similar in James Martineau's Study of Religion (" Implicit Attri- butes of God as Cause," sub fin.). One might also compare J. R. Seeley's Natural Religion — though he is no decided champion of a personal God — and F. Max Miiller's Gifford Lectures. Dismiss- ing his earlier intuitionalism, in order, like Butler, to conciliate an empiricist age, M. Miiller tried to show that even sense experi- ence throws us on the Infinite — which for him was the kernel of the idea of God. He therefore appealed to the Indian goddess Aditi or Immensity, a deity connected with a set of personal gods called Adityas. Looking into the immensity of space, man also looks into the depths of godhead. Whatever one may think of the cogency of such arguments, it seems safe to conclude that thinkers, who dislike constructive idealism, but accept time and space as boundless given quanta,

reach in that way the thought of infinity, and if they are theists, necessarily connect their theism with reflexions on the nature of Time and Space.

We have already spoken of Kant's peculiar philosophical positions. One result of these is a very damaging attack upon traditional theism. Kant puts together, as belonging Kant as to " Rational Theology," . three arguments — he is critic of fond of triads, though they have not the significance theism. for him which they came to have for Hegel. Then he attacks the arguments, one after another. Is there anything fresh in the attack? Or is it simply a reiteration of his sceptical contrast between phenomena and noumena, and of his confine- ment of (valid) knowledge to the former? Perhaps the attack on cause as used in the cosmological argument is independent of Kant's philosophical peculiarities. The argument affirms a first cause, or uncaused cause. Does it not then deny rather than assert universal causation? But that special criticism is a question of detail. A more entirely novel and more general principle of Kant's attack upon theism is the challenge of our right to build up the idea of God bit by bit out of different arguments. The arguments had been regarded as alternative or else as cumulative proofs, all pointing to one conclusion — God exists. Kant insists that they are incompatible with each

4 Part ii. of the Analogy tries similarly to establish Christianity as credible matter of fact, sufficiently analogous to known facts of experience (Apologetics) apart from any moral " value judg- ments " (as Ritschlians might say).

5 See (e.g.) ii. chap. ix. The Three Sermons also point to a moral argument for theism, but forbear to press it (Sermon ii.; when the third sense of the word " Nature " is being explained).

other. They offer alternative and mutually exclusive concep- tions of God. If the God of the cosmological argument is the ” Great First Cause,” we have no right to identify him with the ” Most real being ” of the Ontological argument. If the God of the Design argument seems a limited being, working as an artist upon given materials, 1 he is hardly God at all. Kant takes for granted that we cannot sum up these imperfect con- ceptions in a wider reconciling truth. It is a shrewd criticism, but needs arguing out. A great deal of popular theism is un- doubtedly hard hit by it; for popular theism is apt to throw its arguments together in very random fashion.

It is no more than characteristic of Kant’s whole speculative philosophy that he should think the Ontological argument the one which comes nearest to success (yet the Ontological argument is held to prove — or rather to point out — not that God must exist, but that we think of him as necessary if we think of him as existing at all). As a result of this, Kant is metaphysically a sort of pantheist. The God whom all our thinking feels after is the all-inclusive system of reality. On the other hand, Kant’s religion is of a type which requires a sort of deistic God, standing outside the world and constraining it into moral paths, or standing outside our moral struggles and re- warding our goodness. Butler fears profoundly that there must be a just God who will punish us. Kant hopes, with tolerable strength of conviction, that there may be a just God who will reward us.

The main line in pure philosophy runs on from Kant’s waver- ing and sceptical idealism to the all-including gnosis of Hegel. 2 Hegel on Hegel inherits from Kant the three arguments, and thelstk takes them as stages in one developing process of argu- thought. The cosmological argument points to

meats. nature-pantheism, with the religions — especially those of India — which embody that attitude of mind. This involves a re-interpretation

of the Cosmological argument, or a criticism of the view ordinarily taken of it. Trace out the clue of causa- tion to the end, says Hegel in effect, and it introduces you, not to a single first cause beyond nature, but to the totality of natural process — a substance, as it were, in which all causes inhere. This is a suggestion which deserves to be well weighed. The Design argument is held to give a contrasted view. It suggests in every deed a personal but limited God, or a number of Gods — " Religions of spiritual Individuality," including, along with " Judaism," the anthropomorphic religions of Greece and Rome. Finally the Ontological argument sums up the truth in the two previous arguments, and gives it worthier utterance in its vision of the philosophical Absolute. This is the last word of religious truth, though pure philosophy stands still higher. And, in some sense not clearly explained, Hegel identifies this final religion with Christianity.

The theism of Hegel is ambiguous. 3 Later theists may be grouped according as their thought has been remoulded or not Theism by the influences of Kant. The distinguished after writers, whom we have to regard as repeating in

Kant - essence pre-Kantian theories, generally know Kant,

and frequently show traces of him in detail. But it is a plain finding of history that he has brought no " Copernican revolu- tion" 4 to their minds.

Empiricism is restated by Pale}', who is Kant's younger con- temporary as a man and also on the whole as a writer. Doubt- less the archdeacon knew nothing of the German professor, and would have cared nothing for him how- ever well he had known him. A much more significant figure is that of J. S. Mill in the tentative approach to theism found in his posthumous volume {Three Essays on Religion; 1874).

1 The Design argument has mainly to do with living

bodies. Might one suggest that organisms seem at least to be a working up of inorganic matter for new ends, viz. those of life?

2 The idealisms of Fichte and Schelling made contributions to Hegel's thought; Krause and the Roman Catholic Baader repre- sent parallel if minor phases of idealism.

3 Equally so the Hegelian attitude towards personal immortality.

4 Such as Kant claimed to effect: Critique of Pure Reason, preface to 2nd ed.

Paley.

Mill directs his attention to the Design argument. The infer- ence that organized bodies are due to an intelligent cause is only reached by the " Method of Agreement " — a full , „ „..„

■ 1 • r • • 1- ,..,„ , J. S. Mill.

inductive proof requiring, according to Mills Logic, the " Method of Difference." Still, the Design argument is a good sample of a proof by means of the inferior method. Although nothing more than probability is established, it is a high probability. 5 Unfortunately, however, the method of agreement is liable to be baffled by " plurality of causes." In this instance it may happen that the work of intelligence has only been mimicked in nature by blind forces which have accidentally produced organic life; and Mill is disposed to hold that if the evolution of species should be clearly estab- lished as due to natural law — if there has been no creation by special interposition — the argument falls to the ground and theism (apparently) is lost. 6 A further point is of some inte- rest. If Mill's theism holds, what is it? The belief in a God of limited power. That is what Kant contended that the Design argument pointed to, and Mill, proceeding on the Design argument, claims nothing more for his conclusion. Of course that was not Mill's special or

conscious motive for deny- ing divine omnipotence. His extreme sensitiveness and hatred of pain constrained Mill to hold that, if a good God exists, he cannot possess infinite power. Yet the correspondence between Mill's conclusion and what Kant had alleged to be implied in the underlying metaphysical position is very striking indeed.

Intuitionalism also has its restatements of theistic reasoning little modified by Kant. R. Flint's theism carefully excludes the early random talk (e.g. Cicero) of an intuitive or intuition- innate knowledge of God. What is self-evident, Flint aitsm re- justly remarks, neither needs nor admits of argument, peated; We have intuitions of cause, of infinity, of good and " evil. The Cosmological argument proves, with the help of the first-named intuition, that there is one great First Cause; and the Design argument shows the First Cause to be intelligent or personal. The Ontological argument, though not wholly re- jected as a proof, is taken rather as pointing to God's attribute of infinity; thought rather than experience making affirmation that the intuition in question must be attached to God. The moral argument, relying upon the third intuition named, certifies us of a good God. In this way, the attributes are suggestively allotted among the four traditional proofs; 7 but we miss an explicit rebutting of Kant's hostile assumption, that it is in- competent for us to take the thought of God piecemeal. Martineau's Study of Religion is also essentially intuitionalist. It has two parts: " God as cause " and " God as /Mar- perfection." The Design argument comes in as a iineau. special illustration or intensification of the former of these, i.e. of the cosmological proof; but Martineau follows a side modification of intuitionalism (Maine de Biran, &c.) in identi- fying cause with will. This involves a very high doctrine of Libertarianism. The only ultimate cause is God. Nature exists over against Him; but its forces or processes are His own power in immediate exercise, except in so far as God has delegated freedom to human wills; and there follows a theodicy, repeating

Leibnitz in more modern form. Martineau's two main proofs yield two sets of attributes; those known as " natural " and " moral," R. Browning's " power " and " love." In " God as perfection " Martineau handles the basis of ethics without reference to his own modification of the intuitionalist position {Types of Ethical Theory), according to which " good " is the better or the best. We may infer that, whatever the merits of that modification, it does not affect the theistic problem. Martineau's Study also includes a section upon Immortality. The Ontological argument is omitted; but we have already observed that there is a discussion of divine

6 Paul Janet's Final Causes seems to follow Mill in this (" the fact of Finality "), but without naming him.

6 Janet naturally is in opposition here. Ultimately, he argues, if not immediately, there must be a rational cause to account for so rational an effect. But again of course Mill is not named.

7 The three which Kant criticized, with the addition of the moral argument, which he favoured.

infinity in relation to time and space which from one point of view is parallel to the Ontological argument.

Definite theism, bearing the mark of Kant's thought through- out, is found in Hermann Lotze. From the point of view of Definite our g rou P m g> ne i s an idealist of anomalous type. theistk He begins as an empiricist or realist, with given idealism; matter-of-f act ; but from time to time (e.g. in his Lotze. Microcosmus) he makes readjustments without per- haps very clearly informing the reader what is being done, and in the end he is unmistakably idealist. While a pronounced theist — though not a church Christian — he is hardly less an assailant of traditional theism than Kant (e.g. his Outline [Lecture headings] on Philosophy of Religion). He dissents as a realist from the Cosmological argument in the form 1 in which it concludes from " contingent " to " necessary " being. We da not wish to find our way to a being who " must be." That is an idle dream. We must keep to real and assured facts. Lotze was a man of considerable attainments in special science; perhaps he reveals here the bias of the scientific mind, and possibly even its limitations. He regards the Ontological argu- ment strictly so called is having been exploded by Kant. Still it has a value for him if taken not as an argument, but rather as the expression of an immediate conviction; viz. The highest must exist.

This is an intuitionalist touch, or a parallel to intuitionalism, and has called forth a gibe from that very confident ratiocinator, J. E. MacTaggart; Lotze's immediate convictions are matter of interest to a biographer but to no one else. The Design argument elicits from Lotze the criticism that some things look purposeful, but others decidedly purpose- less. The only solid nucleus he finds in it is the fact that there is a great deal of beauty in this world. Obviously this writer is harder to focus than Kant or Hegel. He is not all of one piece. He holds — on grounds of fact and science — to the mechanical orderliness of nature, but claims that the Weltan- schauung thus suggested may be reinterpreted in view of those undying human aspirations which MacTaggart dismisses to instant execution (unless they can dress themselves in syllogism). Thus, for Lotze, freewill is possible; the consequences of action proceed regularly a parte post, and there is no such chaos as the critics of Libertarianism have pretended it would involve. Similarly, miracles — absolute new beginnings — are possible on God's side, if they are not mere anomalies but acts promotive of the general meaning or tendency of things, and of the divine plan of the universe. 2 But this appeal to " values " is only half of Lotze's constructive work. For the other half he falls back on ratiocination. All existences must be individuals, with an inner life (cf. Leibnitz). Since they interact, they must be elements in the life of one supreme being (cf. Spinoza: the Spinozistic affinities of Leibnitz are not so marked as Lotze's). God can be personal and doubtless is (though he has no Non-ego to define himself against) through contrast of passing conscious states with the abiding Ego. It is reasonable to hold that the supreme personality is the only fully personal being, while ours is a broken and imperfect personality, hindered by the Non-ego which in other ways helps it. Lotze resolves space into " ideal space "; and finally, in the philosophy of religion, or in view of the thought of God (in his Metaphysics) , he denies the objective existence of time. God sees all history neither as

future nor as present but as actual.

Besides the stream of tendency which flowed from Kant in the direction of idealism, two other streams emerged from him, often but not always blending. There was a new develop- scepticism — at the very least a doctrine of limitation meats in human knowledge; but in its extremer forms an %° m absolute agnosticism. And there was the positive

ethical element in Kant's theism.

Ancient scepticism was frankly opposed to religious belief. Later, the emergence of a great body of doctrine attributed to

1 Stated and criticized by Kant.

- *Lotze is not to be understood as guaranteeing the actuality of Bible miracles. Such things are philosophically possible — that is all.*

divine revelation and of a great institution like the Christian church suggested the possibility of enlisting scepticism in the service of dogmatic faith. In a sense (see Afologetics) this was done in the middle ages, and possibly repeated by Pascal after the Reformation. We now find Kant's intellectual scepticism borrowed by W. Hamilton and H. L. Mansel, 3 both of them, as J. S. Mill complained, 4 " bringing back under the name of belief what they banished as knowledge." The theory found a melodious echo in Tennyson's In Memoriam, a great hymn of God, Freedom and Immortality on a basis of speculative agnosticism. " We have but faith we cannot know, For know- ledge is of things we see; " but the moral element which Mansel despised is dominant in Tennyson. " The heart Stood up and answered, I have felt. " J c there is a reading of the new theories of evolution in nature which revives rather than darkens hope in immortality and faith in God, Tennyson gave an early sketch of that tentative modern theism.

R. Browning has been charged by H. Jones with

partial agnosticism. But at least we may say that agnosticism is much less clear in Browning than in Tennyson. Browning reasons as far as he can; if reasoning fails him, he gives a leap of faith. Jones, almost as merciless as MacTaggart, calls this procedure by the hard names of agnosticism and dualism. Another who " got the seed " and " grew the flower " was Herbert Spencer. He quotes pages from Mansel's Bampton Lectures in favour of his own type of agnosticism, which is to make peace between religion and science by permanently silencing the former. Religion may " feel," like Tennyson's " man in wrath, " and may expatiate in an undefined awe: science alone is to possess the " knowable." This yields a characteristic type of pantheism, in the theory of the Unknow- able which — rather paradoxically — is offered us. Alongside of this there are other elements in Spencer's composite system of " Naturalism and Agnosticism " (J. Ward's expression, see his Gifford Lecture). The element of naturalism stands for science with a leaning towards materialism (" explanation in terms of matter and motion"). The element of agnosticism tends rather towards pantheism, just as Indian pantheism long ago tended towards agnosticism. John Fiske, however, an able interpreter of Spencer, reached what he called " Cosmic Theism. " He rejected all that is anthropomorphic in theism, but gave a positive not negative interpretation to Spencer's scientific generalizations, and broke away from pantheism — perhaps also from naturalism — when, like Tennyson, he pleaded for human immortality as the climax of evolutionary progress.

[The name agnosticism (q.v.) is T. H. Huxley's. Modern doubt does not say there is no God; it says, We don't know. Popular scepticism — perhaps even Charles Darwin's; Huxley himself was a student of Hume — understands by agnosticism that science is certain while philosophy and theology are baseless. Leslie Stephen gave this popular agnosticism its finest literary expression. Spencer goes much further in rejec- tion of human knowledge: " The man of science more than any other truly knows that in

its ultimate essence nothing can be known. "] 5

An interesting manifesto of agnosticism, with a religious conclusion, is A. J. Balfour's Foundations of Belief, welcomed in Germany by Julius Kaftan (see below). In " Some Conse- quences of (naturalistic) Belief," Balfour argues that the results of " naturalism " are unbearable. In " Some Reasons for Belief, " the author institutes a rapid destructive criticism of all possible philosophies. In " Some Causes of Belief," he tries, standing outside the psychological process, to show how beliefs grow up under every kind of influence except that of genuine evidence. His constructive theory comes at the end, and seems to argue thus: Since (i) there is no discoverable reason why we

8 Mansel's theism (or natural theology), and the revelation he believes in, seem both of them pure matters of assertion on his part, without evidence, or even in the teeth of the evidence as he conceives it.

4 Examination of Sir Wm. Hamilton's Philosophy, chap. v.

5 First Principles, p. 67.

should reach truth, beauty or goodness, but (2) we do, therefore (3) there must be a God outside the process, overruling and counteracting the natural tendencies of the human mind. It seems as if one foot rested on dogmatism and one on scepticism. The fact — assumed without any attempt at justification by argument — that, in spite of the multitude of logical reasons for scepticism, we do know truth and beauty, makes Balfour a theist. And the God he postulates is brought in ex machina like the God of the old Design argument in its roughest popular form. There must be a God, who could compel irrational matter to serve rational ends — so ran

the old argument. There must be a God who can miraculously endow the irrational mind of man with truth — so runs the new.

Emphasis on moral motives is plain in Kant's theism as in Butler's. If this tendency is to take effect, a certain part of Kant's rational scepticism must be accepted. There is no chance for the moral consciousness to claim a decisive vote if a metaphysical system like Hegel's demonstrates all realities in every region, and if its janissaries crush out every movement of rebellion against the tyranny of abstract thought. Is it really impossible to claim for man something between ran-' niscience and universal nescience? May we not cherish what A. C. Fraser calls "reasonable faith"? Granted that, ideally, scientific knowledge ought to be able to demonstrate all truth, is it safe, or humane, for a being who is imperfectly started in the process of knowledge to fling away with scorn those un-analysed promptings and misgivings " Which, be they what they may, Are yet the fountain light of all our day, Are yet a master light of all our seeing . . . truths which wake To perish never "? Those who assert the superior worth and importance of moral judgments speak of " values " (A. Ritschl, after J. F. Herbart and H. Lotze). As worked out by Ritschl, this is specially a basis for Christian belief. With what is speci- fically Christian we have nothing to do in the present article: but it is worth noticing that the appeal to " values, " aesthetic and still more moral, forms a substitute for that natural theology which Ritschl despised and professed to reject. There are not a few difficulties in his programme. When Otto Ritschl 1 interprets values hedonistically — recoiling from Hegel's idealism the whole way to empiricism — he brings again to our minds the doubt whether hedonist ethics can serve as a foundation for any religious belief. Julius Kaftan — Balfour's German editor, and a highly influential theologian, occupying a position of modified Ritschlianism — is also a very thoroughgoing empiricist. On the other hand, W. Herrmann's appeal to Kant's moral teaching is in close analogy to the

more thoughtful forms of intuitionalist ethics. But is the basis for religious belief to be constructed purely within the region of "values"? Can you contrast "judgments of value" with "judgments of fact"? Or, if, as the Ritschlians maintain, it is a slander invented by their enemy, C. E. Luthardt, to say that they draw this contrast, do you achieve much by calling the principles of moral and religious belief, with A. Ritschl, " independent judgments of value "? Independent of what? Surely not of fact? It is explained that they are in contrast with " accessory value- judgments. " Perhaps the meaning is that they are of independent importance. But does that carry us far? It all seems a very hurried and imperfectly studied philosophical analysis. One might prefer as a theist to hold (1) that we need a philo- sophical doctrine of the nature of reality — the "Absolute"; given in popular form in the Cosmological argument; (2) that we take the risk of attaching a higher degree of significance and authority to the revelations of the moral consciousness, which, although moulded or educed by society, do not terminate in the authority of society, but point beyond it to God; this position has its popular form in the moral argument; possibly (3) that necessities of thought shut us up to belief in omnipo- tence or infinity; (4) that divine help is the supreme revela- tion. But such lines of thought might carry us outside the limits of traditional theism.

1 Son of A. Ritschl. The younger theologian has accepted determinism.

If we try to bring the contents of theism under Kant's three traditional arguments, then moral and aesthetic considerations — the " values " — fall under the Design argument or the study of teleology; albeit there is a great gap between Paley's supernatural watchmaker and any moral argument or appeal to the beautiful. It might be argued that beauty bears witness against materialism, and moral values against pantheism; although such an anomalous type as ethical pantheism has its representatives — J. G. Fichte, Matthew Arnold, perhaps H. Hoffding. Kant's

reliance on the moral argument alone goes with his scepticism. Giving that argument the highest place seems to involve, as already said, a dash of the same scepticism. — The arguments, as already noted, may be differently com- bined. (1) Usually they are alternatives or else cumulative.

(2) Flint spaces out the proof (and the attributes) among them.

(3) Hegel regards them as phases.

V. What are the alternative conclusions to theism? The extremest form of antagonism is pure scepticism or pure agnos- ticism, the assertion that nothing can be known. AHerna- Empiricism may lead to this conclusion; or it may tivesto lead to materialism. True materialism includes theism. within itself dogmatic atheism, and is probably the only coherent or reasoned type of atheistic opinion. 2 Materialism further brings with it an extreme or "hard" determinism; and, denying the soul's separate existence in any sense, it naturally denies immortality. Once again, empiricism may lead to some qualified and restricted form of agnosticism, religious or anti- religious. If polytheism is to be seriously defended at all, the basis must be empiricist. 3 Intuitionalism in its turn may harden out of "natural" dualism into moral dualism; either a literally Manichaean scheme — a good God impeded by an evil personality or principle (Bayle) — or belief in a good God of limited powers (Mill). And idealism in some cases may interpret itself in favour of pantheism rather than of theism. Pantheism does not favour free will or immortality, and may move indefinitely near to materialism. Out of pantheism again pessimism develops. If the principle of the universe is im- personal or unconscious, personal consciousness in finite spirits comes to wear the appearance of a blunder. Conversely, if God cares for men, despair is impossible. For another syste- matic grouping, see A. C. Fraser's Gifford Lectures. Wolff's list is of some historical importance — atheism, deism (a God with- out care for men) and naturalism (denial of supernatural

revela- tion) ; anthropomorphism (assigning a human body to God) ; materialism, and idealism (non-existence of matter) ; paganism (polytheism); Manichaeism, Spinozism, Epicureanism. R. Flint has dealt with the following antitheistic theories: atheism, materialism, positivism, secularism, pessimism, pantheism and (in a separate volume) agnosticism. It is hard to be certain that any systematic grouping will anticipate all the sugges- tions that may occur to a restlessly and recklessly inquiring age.

Literature. — Two sets of writers have been considered: — first, the greater philosophers, who have incidentally furthered theism (Socrates, Plato, Aristotle, the Stoics, Descartes, Locke, Kant, Hegel, Mill, Lotze), or opposed it (Epicurus, Spinoza, Hume, Kant, Hegel, Mill, Spencer) ; and, secondly, the deliberate champions of theism — Cicero (especially in the De Natura Deorum), Philo, Raymond of Sabunde (in a sense), Wolff, Butler (in a sense), Paley, and a host of English and German 18th-century authors, who chiefly- handle the Design argument; then recent writers like R. Flint, Theism, Antitheistic Theories, Agnosticism — all with valuable notes and references, and J. Martineau — especially in A Study of Religion. The theistic writers are usually intuitionalists ; but it has been urged above that a fruitful study of theism must in each case inquire what is the writer's philosophical basis. The Bridgewater treatises have little more than historical interest to-day. A certain historical interest also attaches to the Burnett prize essays on theism: 1815, 1st prize, W. L. Bruce, 2nd J. B. Sumner, after- wards archbishop; 1855, 1st R. A. Thompson, 2nd J. Tulloch. Among many lectureships, the Gifford Lectures are supposed to be strictly appropriated to Natural Theology; yet subjects and

2 Dr MacTaggart's beliefs once more present themselves as an unexpected modern type {Studies in Hegelian Cosmology, chap. iii.).

3 Yet cf. once more MacTaggart's society of eternal

spirits with no divine head.

treatment vary immensely. A. C. Fraser's Edinburgh lectures (Phil, of Theism) are central in topic and of distinct value. J. Caird (Glas- gow: Fundamental Ideas of Christianity, comp. his earlier Introduc. to the Phil, of Relig.) and more unreservedly Ed. Caird (St Andrews: The Evolution of Religion; Glasgow: The Evolution of Theology in the Greek Philosophies) represent speculative treatment on a basis of Hegelianism. H. M. Gwatkin (Edinburgh : The Knowledge of God) pours out his historical knowledge, and W. James (Edinburgh: Varieties of Relig. Exp.) reveals his many-sided intellectual interests and ready sympathies. W. Wallace (Lectures and Essays, incor- porating Glasgow lectures) gives some useful historical references. James Ward's masterly criticism of Herbert Spencer (Naturalism and Agnosticism) has been mentioned above. The student will rarely lose by reading Gifford Lectures; but it will not always be upon theism that he finds himself better informed. In France, Paul Janet (Final Causes, Eng. trans.) and Ch. S6cretan (Philo- sophic de la Liberie) may be named: in Germany, H. Ulrici; while R. Eucken represents to a later generation the spirit and tendency of Lotze and Ulrici, in original and powerful, if rather elusive, fashion. H. Hciffding's Phil, of Religion (translated) is one of the most original books under that title, but it cannot be called theistic. F. C. S. Schiller, like W. James, opens up new suggestions in philosophy; the bearing of these upon theistic (or other) beliefs is hard to define. In history compare B. Punjer's Hist, of the Phil, of Relig. (Eng. trans. ; it includes a good deal of the history of general philosophy) ; A. Caldecott's The Philosophy of Religion in England and America; and A. Caldecott and H. R. Mackintosh's Selections from the Literature of Theism (useful texts with useful notes: nothing from Hegel). (R. Ma.)

THEISS (Hungarian, Tisza; Lat., Tisia or Tissus), a large affluent of the Danube, next to which it is the greatest river of Hungary. It rises in the north-eastern part of the Carpathian mountains, in the county of Maramaros, at a height of above 6300 ft., and is formed by the confluence of two branches, the Black Theiss (Fekete Tisza), and the White Theiss (Feher Tisza), which unite at about 20 m. E. of Maramaros-Sziget. The Theiss then follows a north-westerly direction until it leaves its mountainous valley, then runs west, and after a great curve to the north, takes a south-westerly direction and enters the great Hungarian plain (Alfold). From Szolnok it runs south in an almost parallel course with that of the Danube, from which it is separated by a distance of about 60 m., and flows into the Danube near the village of Titel, 20 m. E. of Ujvidek. Its length from source to mouth is, as the crow flies, only about 340 m., but its windings make its course about 870 m. long. The Theiss is clear and swift in its course through the moun- tains, but in the plain it becomes slow, somewhat muddy and very tortuous. Its basin covers an area of 56,600 sq. m., and comprises the whole eastern part of Hungary, and the greater part of Transylvania, and collects all the rivers descending from the Carpathians westward.

The Theiss is navigable for rafts almost everywhere, but for steamers only from Szolnok downwards, a distance of about 200 m., where the breadth of the river is 4.50 to 750 ft. The depth of the Theiss at low-water mark is 7 ft. at Tokaj, 20 ft. at Szeged and 1 1 ft. at Titel, near its mouth, while the difference between the low-water mark and the high-water mark is as high as 25 to 35 ft. During its course through the great Hungarian plain the Theiss flows between flat, low-lying banks, which are the cause of periodical and sometimes disastrous inundations and of extensive marshes. Therefore extensive works have been undertaken for the regula- tion and canalization of the river, which is now strongly dammed in many parts. By these works large tracts of marshes have been transformed into

productive ground. Its chief tributaries are the Szamos, Koros, Maros, Latorcza, and the Sajo. In its lower course ' it is joined to the Danube by the Franz Josef canal, while it is also united with Temesvar by the Bega canal.

THEMIS, in Greek mythology, the personification of justice. In Homer de/xis is used both as a common and as a proper noun. As a common noun (plural Stores, defures, Ot/jaies), it is the body of rules and precedents established at the beginning of the world, as a guarantee of its order and harmony (see Greek Law); personified, Themis is the servant or companion of Zeus, her chief function being to summon the assemblies of both gods and men (Odyssey, ii. 68). In the Hesiodic theogony, she is the daughter of Uranus and Gaea, and according to Pindar the wife of Zeus, by whose side she sits, assisting him with her advice, which is even better than that of any of the gods. She is the mother of the Horae and of the Moirae (Faces), an indica- tion of her influence in the physical and moral world. She is

the representative of divine justice in all its relation? to men, and takes special cognizance of the rights of hospitality. Her opposite is Hybris (vfipis), insolent encroachment upon the rights of others, on whose track she follows to punish, like Nemesis. In this aspect both Themis and Nemesis are called ixvaia (ixvos, track). In the lexicon of Festus, Themis is described as the goddess who prescribes that which is right in accordance with divine law (fas) and is herself identical with this divine law. She is also a prophetic divinity, and there was a tradition that the oracle at Delphi had first been in the hands of Gaea, who transferred it to Themis (sometimes identi- fied with her) by whom it was handed over to Apollo (Aeschylus, Eumenides, 2; Euripides, Iphig. in T. 1181). Orphic poetry makes her a daughter of Helios, whose eye is all-seeing (iravdipKris) and penetrates all mysteries. She was especially honoured at Athens, Delphi, Thebes, Aegina and Troezene, where there was an altar dedicated to a triad of Themides (on the analogy of the triads of Horae, Charites, Moirae).

In art she was repre- sented as of dignified and commanding presence, with the cornucopiae (symbolizing the blessings resulting from order) and a pair of scales.

See article ” Justitia ” by J. A. Hild in Daremberg and Saglio’s Diet, des Antiquites; H. Ahrens, Die Gottin Themis (1862); R. Hirzel, Themis, Dike, und Verwandtes (1907).

THEMISTIUS (3i7~?387), named ev

The first edition of Themistius’s works (Venice, 1534) included the paraphrases and eight of the orations. Nineteen orations were known to Petavius, whose editions appeared in 1613 and 161 8; Hardouin (Paris, 1684) gives thirty-three. Another oration was discovered by Angelo Mai, and published at Milan in 1816. The most recent editions are W. Dindorf’s of the orations (Leipzig, 1832), and L. Spengel’s of the paraphrases (Leipzig, 1866). The Latin translations of the Hebrew versions of the paraphrases of the De Coelo and book A of the Metaphysics were published at Venice in 1574 and 1558 respectively. A new edition of the latter by S. Landauer appeared in 1903. See Fabricius, Bibliotheca Graeca, vi. 790 seq. ; E. ZeWer, History of Greek Phil.; E. Baret, De Themist, sophista (Paris, 1853) ; Jourdain’s Recherches critiques sur I’dge et Vorigine des traductions latines d’Aristote (Paris, 1819); see Neoplatonism. For Themistius’s Commentaries on Aristotle, see Commentaria in Aristotelem Graeca (Berlin), and also Themistii paraphrases Aristotelis librorum quae super sunt, ed. L. Spengel (1866, Teubner series, mentioned above).

THEMISTOCLES (c. 514-449 B.C.), Athenian soldier and statesman in some respects probably the ablest and most far- sighted whom Greece produced in the first half of the 5th century. He was the son of Neocles, an Athenian of no distinction and moderate means, his mother being a Carian or a Thracian, Hence according to the Periclean law «£ a.fx4>otv acrotv he would not have been a free Athenian at all (see

Pericles). Thucydides properly brings out the fact that, though he lacked that education which was the peculiar glory of the Periclean age, he displayed a marvellous power of analysing a complex situation together with a genius for rapid action. Plutarch similarly enlarges on his consuming ambition for power both

Oersonal and national, and the unscrupulous ability with which he pursued his ends. In all these points he is the antithesis of his great rival Aristides (q.v.). Of his early years little is known. He may have been strategus of his tribe at Marathon (Flut. Arist. 5) and we are told that he deeply envied the glory which Miltiades earned. At all events the death of Miltiades left the stage to Aristides and Themistocles. It is sufficiently clear that their rivalry, terminated in 483-82 by the ostracism of Aristides, turned largely on the fact that Themistocles was the advocate of a policy of naval expansion. This policy was unquestionably of the highest importance to Athens and indeed to Greece. Athens was faced by the equal if not superior power of Aegina, while the danger of a renewed Persian invasion loomed large on the horizon. Themistocles therefore persuaded his countrymen to put in hand the building of 200 triremes, and — what was of even greater importance — to fortify the three natural harbours of Peiraeus (see E. Gardner, Ancient Athens, 562 f.) in place of the open roadstead of Phalerum. For the building of the ships Themistocles persuaded the Athenians to allocate 100 talents obtained from the new silver mines at Laurium (Ath. Pol. 22) which were about to be distributed to the citizens (10 drachmae each). One hundred of the proposed 200 were built.

According to the Ath. Pol. it would seem that Themistocles was archon in 483-82 at the time when this naval programme began. Dionysius of Halicarnassus places his archonship in 403-92, in

favour of which are several considerations. In 487 the office lost much of its importance owing to the substitu- tion of the lot for election: the chance that the lot would at the particular crisis of 483 fall on Themistocles was obviously remote: and the Ath. Pol. is generally wrong about Themis- tocles. In any case the year prior to the invasion of Xerxes found Themistocles the chief man in Athens if not in Greece. Though the Greek fleet was nominally under the control of the Spartan Eurybiades, it was Themistocles who caused the Greeks to fight the indecisive battle of Artemisium, and still more it was he who, by his threat that he would lead the Athenian army to found a new home in the West, and by his treacherous message to Xerxes, precipitated the engagement at Salamis {q.v.). The retirement of the Persians left the Athenians free to restore their ruined city (see Athens). Sparta, nominally on the ground that it was dangerous to Greece that there should be any citadel north of the Isthmus which an invader might hold, urged that this should not be done, but Themistocles by means of diplomatic delays and subterfuges enabled the work to be carried sufficiently near to completion to make the .walls defensible. He also carried out his original plan of making Peiraeus a real harbour and fortress for Athens. Athens thus became the finest trade centre in Greece, and this fact, coupled with Themistocles' remission of the alien's tax (fitrolKiov) , induced many foreign business men to settle in Athens.

After the crisis of the Persian invasion Themistocles and Aristides appear to have composed their differences. But Themistocles soon began to lose the confidence of the people, partly owing to his boastfulness (it is said that he built near his own house a sanctuary to Artemis Aristoboule " of good counsel ") and partly to his alleged readiness to take bribes. Diodorus (xi. 54) and Plutarch {Themist. 23) both refer to some accusation levelled against him, 1 and some time between 476 and 471 he was ostracized. He retired to Argos, but the Spartans further accused him of treasonable

intrigues with Persia, and he fled to Corcyra, thence to Admetus, king of the Molossians, and finally to Asia Minor. He was proclaimed a traitor at Athens and his property was confiscated, though his friends saved him some portion of it. He was well received by the Persians and was allowed to settle in Magnesia on the Maeander. The revenues (50 talents) of this town were assigned to him for bread, those of Myus for condiments, those of Lampsacus for wine. He died at Magnesia at the age of sixty- five, and a splendid memorial was raised by the people of the

1 There is, however, much difficulty regarding this accusation. It may be simply a misunderstanding of his ostracism.

town, though it is said that his bones were secretly transferred to Attica. He was worshipped by the Magnesians as a god, as we find from a coin on which he is shown with a patera in his hand and a slain bull at his feet (hence perhaps the legend that he died from drinking bull's blood: cf. Aristoph. Eq. 83; Diod. xi. 58; Plut. Them. 31).

Though his end was discreditable, though his great wealth can hardly have been obtained by loyal public service, there is no doubt that his services to Athens and to Greece were great. He created the Athenian fleet and with it the possibility of the Delian League (q.v.) which became the Athenian empire, and there are many indications (e.g. his well-attested plan of ex- pansion in the west) that the later imperialist ideal originated in his fertile brain.

There are monographs by Bauer (Merseburg, 1 881) and Wecklein (Munich, 1882); but the best discussions of his career will be found in the chief Greek historic - e.g. Busolt ; on the difficult chronology of his later years see Gmte, History of Greece (and the one-vol. ed. by Mitchell and Caspari, 1907, p. 283, note 1, with the authorities there quoted) ; on the Magnesian coin, Rhousopoulos, in Allien. Mitieil. (1896), p. 22. On the walls, see Ed. Meyer in

Hermes, xl. (1905), pp. 561-569. (J. M. M.)

THENARD, LOUIS JACQUES (1777-1857), French chemist, was born on the 4th of May 1777 at Louptiere, near Nogent- sur-Seine, Aube. His father, a poor peasant, managed to have him educated at the academy of Sens, and sent him at the age of sixteen to stud}' pharmacy in Paris. There he attended the lectures of A. F. Fourcroy and L. N. Vauquelin, and succeeded in gaining admission, in a humble capacity, to the latter's laboratory. But his progress was so rapid that in two or three years he was able to take his master's place at the lecture-table, and Fourcroy and Vauquelin were so satisfied with his per- formance that they procured for him a school appointment in 1797 as teacher of chemistry, and in 1798 one as repetiteur at the Ecole Polytcchnique. In 1804 Vauquelin resigned his pro- fessorship at the College de France and successfully used his influence to obtain the appointment for Thenard, who six years later, after Fourcroy's death, was further elected to the chairs of chemistry at the Ecole Polytcchnique and the Faculte des Sciences. He also succeeded Fourcroy as member of the Academy. In 1825 he received the title of baron from Charles X., and in 1832 Louis Philippe made him a peer of France. From 1827 to 1830 he represented the department of Yonne in the chamber of deputies, and as vice- president of the conseil superieur de I'instruction publique, he exercised a great influence on scientific education in France. He died in Paris on the 21st of June 1857. A statue was erected to his memory at Sens in 1861, and in 1865 the name of his native village was changed to Louptiere-Thenard.

Above all things Thenard was a teacher; as he himself said, the professor, the assistants, the laboratory — everything must be sacrificed to the students. Like most great teachers he published a text-book,, and his Traite de Chimie elementaire, theorique et pratique (4 vols., Paris, 1813-16), which served as a standard for a quarter of a century, perhaps did even more for the advance of chemistry than his numerous original dis- coveries. Soon after his appointment as repetiteur at the

Ecole Polytcchnique he began a lifelong friendship with J. L. Gay- Lussac, and the two carried out many researches together. Careful analysis led him to dispute some of C. L. Berthollet's theoretical views regarding the composition of the metallic oxides, and he also showed Berthollet's " zoonic acid " to be impure acetic acid (1802); but Berthollet (q.v.), so far from resenting these corrections from a younger man, invited him to become a member of the Societe d'Arcueil. His first original paper (1799) was on the compounds of arsenic and antimony with oxygen and sulphur, and of his other separate investiga- tions one of the most, important was that on the compound ethers, begun in 1807. His researches on sebacic acid (1802) and on bile (1807), and his discovery of peroxide of hydrogen (i8r8) also deserve mention. The substance known . as " Thenard's blue, " he prepared in 1799 in response to a peremp- tory demand by J. A. Chaptal for a cheap colouring matter, as

bright as ultramarine and capable of standing the heat of the porcelain furnace.

Most of Thdnard's memoirs, a list of which may be found in the Royal Society's Catalogue of Scientific Papers, were published in the Annates de Chimie et de Physique, the Memoires d'Arcueil, the Comptes Renins and the Mimoires of the Academy of Sciences.

THEOBALD (d. 1161), archbishop of Canterbury, was of Norman parentage, but the date of his birth is unknown. Early in life he entered the great abbey of Bee, of which he became prior in 11 27 and abbot ten years later. In n 38 he was selected by Stephen, king of England, to fill the vacant see of Canter- bury. Apparently he owed this advancement to his character for meekness, and as archbishop he behaved with a moderation which is in striking contrast to the conduct of his rival, Henry of Blois, bishop of Winchester. During the struggle between Stephen and

Matilda it was Bishop Henry who fought for the privileges of the Church; Theobald, while showing a preference for Stephen's title, made it his rule to support the de facto sovereign. But as Stephen's cause gained ground the archbishop showed greater independence. He refused to consecrate the king's nephew to the see of York, and in 1148 attended the papal council of Reims in defiance of a royal prohibition. This quarrel was ended by the intercession of the queen, Matilda of Boulogne, but another, of a more serious character, was pro- voked by Theobald's refusal to crown Count Eustace, the eldest son of Stephen, the archbishop pleading the pope's orders as the excuse for this contumacy. He was banished from the kingdom, but Pope Eugenius terrified Stephen into a reversal of the sentence. In n 53 Theobald succeeded in reconciling Stephen with Henry of Anjou, and in securing for the latter the succession to the throne. On the accession of Henry in 1154, Theobald naturally became his trusted counsellor; but ill- health prevented the archbishop from using his influence to its full extent. He placed the interests of the Church in the hands of Thomas Becket, his archdeacon, whom he induced Henry to employ as chancellor. Theobald died on the 18th of April 1 1 61. He is said to have recommended Becket as his successor. In history Theobald lives chiefly as the patron of three eminent men: Becket, who began life as a clerk in his house- hold; Master Vacarius, the Italian jurist, who was the first to teach Roman law in England; and John of Salisbury, the most learned scholar of the age. Theobald's household was a university in little; and in it were trained not a few of the leading prelates of the next generation.

See the Vita Theobaldi printed in J. A. Giles, Lanfranci Opera, vol. i. (Oxford, 1844); W. Hook, Lives of the Archbishops of Canter- bury, ii. c. vi. (London, 1862) ; and K. Norgate, England under the Angevin Kings, vol. i. (London, 1887). (H. W. C. D.)

THEOBALD, LEWIS (1688-1744), English man of letters, playwright and Shakespearian commentator, the son of an attorney, was born at Sittingbourne, Kent, and

was baptized on the 2nd of April 1688. He was educated under a clergyman named Ellis at Isleworth, and became 'a good classical scholar. He followed his father's profession, but soon abandoned it for literature. In 17 13 he translated the Phaedo of Plato, and entered into a contract with Bernard Lintot the publisher to translate the tragedies of Aeschylus. He seems to have made other promises not carried out, but in 1714 and 1715 appeared versions of the Electra, the Ajax, and the Oedipus Rex of Sophocles, and the Plutus and the Clouds of Aristophanes. He became a regular hack-writer, contributing to Mist's Journal, and producing plays and poems of very small merit. The publication of his play The Perfidious Brother (acted 1715; printed 17 16) involved Theobald in considerable difficulty. He apparently received a rough draft of the play from Henry Meystayer, a London watchmaker, with a commission to arrange it for the stage. Theobald brought it out as his own work. In the next year Meystayer produced a version, and charged Theobald with plagiarism, but there is no means of ascertaining the exact rights of the case. His poverty compelled him to produce rapidly. He translated the first bock of the Odyssey (1716), wrote tragi-comedies, operas and masques, and helped

John Rich in the production of pantomimes, then an innova- tion at Drury Lane. But in 1726 he produced Shakespeare Restored, or a Specimen of the many Errors as well Committed as Unamended by Mr Pope in his late edition of this Poet; designed not only to correct the said Edition, but to restore the true Reading of Shakespeare in all the Editions ever published (1726). How- ever ill Theobald may have succeeded as a poet and dramatist, he showed great discrimination as a textual editor. Some of his happiest emendations are to be found in this work, which conclusively proved Pope's incompetence as a Shakespearian editor. Two years later a second edition of Pope's work appeared. In it he stated that he had incorporated some of Theobald's readings, in all amounting to about twenty-five words, and that he added the rest which could " at

worst but spoil half a sheet of paper that chances to be left vacant here." He also insinuated that Theobald had maliciously kept back his emendations during the progress of the edition. All this was a gross misstatement of fact. He had in reality incorporated the majority of Theobald's best emendations. In the first edition of the Dunciad (1728) Theobald figured as the hero, and he occupied the place of chief victim until replaced by Colley Cibber in 1741. In spite of the critics, Theobald's work was appreciated by the public. In 1731 he undertook to edit Shakespeare for Tonson the publisher. The work appeared in seven volumes in 1734, and completely superseded Pope's edition. From 1729 to the date of its publication Theobald had been engaged in correspondence on the subject with War- burton, who after his friend's death published an edition oi Shakespeare, in the preface of which he asserted that Theobald owed his best corrections to him. Study of the correspondence proves, however, that the indebtedness was on Warburton's side. Subsequent editors reaped, in most cases without acknowledgment or with actual scorn, the fruit of Theobald's pains- taking labour, his wide learning and, his critical genius. But Pope's satire, as Johnson justly remarked, blasted the char- acters that it touched. Theobald remained the type of the dry-as-dust commentator. His merits obtained a tardy recog- nition on the publication of a detailed study of his critical work by Mr Churton Collins in an essay entitled " The Porson of Shakespearian Criticism " (Essays and Studies, 1895). Theo- bald gave proof of the same happy gift in classical scholarship in some emendations of Aeschylus, Eustathius, Athenaeus and others, contributed to a learned journal started by John Jortin in 1731. He was a candidate for the laureateship in 1730, but Cibber gained the coveted post. His last years were harassed by poverty and disease. He began a critical edition of the plays of Beaumont and Fletcher, completed by Seward and Sympson after his death, which took place on the 18th of September 1744.

His correspondence with Matthew Concanen, Styan

Thirlby and William Warburton is to be found in Nichols's Illustrations of Literature (ii. 204-654), which also gives the fullest account of his life.

THEOCRACY (Gr. deoKparia, the rule of God, from deos, god, and -Kparta, Kparelv, to rule), a term applied to a form of government or to a state ruled by such a form of government, in which God or the divine power is looked to as the source of all civil povrer, and the divine commandments regarded as the laws of the community. The typical example of such a state is that of the Jews till the establishment of the kingship under Saul (see Jews).

THEOCRITUS, the creator of pastoral poetry, flourished in the 3rd century B.C. Little is known of him beyond what can be inferred from his writings. We must, however, handle these with some caution, since some of the poems (" Idylls ") commonly attributed to him have little claim to authenticity. It is clear that at a very early date tv/o collections were made, one of which included a number of doubtful poems and formed a corpus of bucolic poetry, while the other was confined to those works which were ' considered to be by Theocritus himself. The record of these recensions is preserved by two epigrams, one of which proceeds from Artemidorus, a grammarian, who

lived in the time of Sulla and is said to have been the first editor of these poems. He says, " Bucolic muses, once were ye scattered, but now one byre, one herd is yours." The second epigram is anonymous, and runs as follows: — ' The Chian is another. I, Theocritus, who wrote these songs, am of Syracuse, a man of the people, the son of Praxagoras and famed Philina. I never sought after a strange muse." .The last line may mean that he wrote nothing but bucolic poems, or that he only wrote in Doric. The statement that he was a Syracusan is confirmed by allusions in the " Idylls " (xi. 7, xxviii. 16-18). The

information concerning his parentage bears the stamp of genuineness, and disposes of a rival theory based upon a mis- interpretation of Idyll vii. — which made him the son of one Simichus. A larger collection, possibly more extensive than that of Artemidorus, and including poems of doubtful authen- ticity, was known to Su'idas, who says: " Theocritus wrote the so-called bucolic poems in the Dorian dialect. Some persons also attribute to him the following: Daughters of Proetus, Hopes, Hymns, Heroines, Dirges, Lyrics, Elegies, Iambics, Epigrams." The first of these may have been known to Virgil, who refers to the Proeiides in the Eclogues. 1 The spurious poem xxi. may have been one of the Hopes (cf. 1. 66, e\7r£s tS>v wrap), and poem xxvi. may have been one of the Heroines (cf. 1. 36, jjpaiicat) : elegiacs are found in viii. 33-60, and the spurious epitaph on Bion may have been one of the Dirges. The other classes are all represented in the larger collection which has come down to us.

The poems which are generally held to be authentic may be classified thus: —

I. Bucolics and Mimes. — The distinction between these is that the scenes of the former are laid in the country and those of the latter in a town. The most famous of the Bucolics are i., vii., xi. and vi. In i. Thyrsis sings to a goatherd how Daphnis, the mythical herdsman, having defied the power of Aphrodite, dies rather than yield to a passion with which the goddess had inspired him. In xi. Polyphemus is depicted as in love with the sea-nymph Galatea and finding solace in song : in vi. he is cured of his passion and naively relates how he repulses the overtures now made to him by Galatea. The monster of the Odyssey has been " written up to date " after the Alexandrian manner and has become a gentie simpleton. Idyll vii., the Harvest Feast (OaXwria), is the most important of the bucolic poems. The scene is laid in the isle of Cos. The poet speaks in the first person and is styled Simichidas - by his friends. Other -poets are introduced under feigned names. Thus ancient critics identified Sicelidas of Samos (1. 40) with

Asclepiades the Samian, and Lycidas, " the goatherd of Cydonia," may well be the poet Astacides, whom Callimachus calls "the Cretan, the goatherd." Theocritus speaks of himself as having already gained fame, and says that his lays have been brought by report even unto the throne of Zeus. 3 He praises Philctas, the veteran poet of Cos, and criticizes " the fledgelings of the Muse, who cackle against the Chian bard and find their labour lost." 4 Other persons mentioned are Nicias, a physician of Miletus, whose name occurs in other poems, and Aratus, whom the Scholiast identifies with the author of the Phenomena.

The other bucolic poems need not be further discussed. Several of them consist of a singing-match, conducted according to the rules of amoebean poetry, in which the second singer takes the subject chosen by the first and contributes a variation in the same air. It may be noted that the peasants of Theocritus differ greatly in refinement. Those in v. are low fellows who indulge in coarse abuse. This Idyll and iv. are laid in the neighbourhood of Croton, and we may infer that Theocritus was personally acquainted with Magna Graecia. Suspicion has been cast upon poems viii. and ix. on various grounds. An extreme view holds that in ix. we have two genuine Theocritean fragments, 11. 7-13 and 15-20, describing the joys of summer and winter respectively, which have been provided with a clumsy preface, 11. 1-6, while an early editor of a bucolic collection has appended an epilogue in which he takes leave of the Bucolic Muses. 6 On the other hand, it is clear that both poems were in Virgil's Theocritus, and that they passed the scrutiny of the editor who formed the short collection of Theo-critean Bucolics.

1 " Proetides implerunt falsis mugitibus agros." — Eel. vi. ^.3.

4 Two explanations are offered by the Scholiast : either that the poet was " snub-nosed " (

3 ra. irov Hal Zt)vos iwi dpovov &Ya7e a)ia, 1. 93.

It is possible that Zeus refers to Ptolemy: cf. Horace, Ep. i. 19, 43, Iovis auribus ista Senas, where Iupiter = Augustus.

4 Some think that there is an allusion to Apollonius Rhodius. • Cf. Hiller, ad loc.

The mimes are three in number, viz., ii., xiv., xv. In ii. Simaetha, deserted by Delphis, tells the story of her love to the moon; in xiv. Aeschines narrates his quarrel with his sweetheart, and is advised to go to Egypt and enlist in the army of Ptolemy Phila- delphus; in xv. Gorgo and Praxinoe go to the festival of Adonis. It may be noticed that in the best MSS. ii. comes immediately before xiv., an arrangement which is obviously right, since it places the three mimes together. The second place in the MSS. is occupied by Idyll vii., the " Harvest Feast. " These three mimes are wonder- fully natural and lifelike. There is nothing in ancient literature so vivid and real as the chatter of Gorgo and Praxinoe, and the voces populi in xv.

It will be convenient to add to the Bucolics and Mimes three poems which cannot be brought into any other class, viz. : xii. (AItijs), a poem to a beautiful youth; xviii., the marriage-song of Helen ('EiritfaAajiuos) ; and xxvi., the murder of Pentheus (A.rjvai). The genuineness of the last has been attacked by U. von Wilamowitz- Mollendorff on account of the crudity of the language, which sometimes degenerates into doggerel. It is, however, likely that Theocritus intentionally used realistic language for the sake of dramatic effect, and the MSS. evidence is in favour of the poem. Eustathius quotes from it as the work of Theocritus.

II. Epics. — Three of these are Hymns, viz., xvi., xvii. and xxii. In xvi. the poet praises Hiero II. of Syracuse, in xvii. Ptolemy Philadelphus, and in xxii. the Dioscuri. The other poems are xiii., the story of Hylas and the Nymphs, and xxiv. the youthful Heracles. It cannot be said that Theocritus exhibits signal merit in his Epics. In xiii. he shows some skill in word-painting, in xvi. there is

some delicate fancy in the description of his poems as ” Graces ” (Xdpn-«), and a passage at the end, where he foretells the joys of peace after the enemy have been driven out of Sicily, has the true bucolic” ring. The most that can be said of xxii. and xxiv. is that they are very dramatic. Otherwise they differ little from work done by other poets, such as Callimachus and Apollonius Rhodius. The flattery heaped upon Ptolemy is somewhat nauseous. From another point of view, however, these two poems xvi. and xvii. are supremely interesting, since they are the only ones which can be dated. In xvii. Theocritus celebrates the incestuous marriage of Ptolemy Philadelphus with his sister Arsinoe. This marriage is held to have taken place in 277 B.C., and a recently discovered inscription shows that Arsinoe died in 270, in the fifteenth year of her brother’s reign. 6 This poem, therefore, together with xv., which Theocritus wrote to please Arsinoe {Schol. xapifojueros tjj Paa&i&i) must fall within this period. The encomium upon Hiero II. would from internal reasons seem prior to that upon Ptolemy, since in it Theocritus is a hungry poet seeking for a patron, while in the other he is well satisfied with the world. Now Hiero first came to the front in 275 B.C. when he was made ” General ” (aTparnyos) : Theocritus speaks of his achievements as still to come, 7 and the silence of the poet would show that Hiero’s marriage to Philistis, his victory over the Mamertines at the Longanus and his election as ” King ” (/Sao-iXefls) , events which are ascribed to 270 B.C., had not yet taken place. If so, xvii. and xv. can only have been written within 275 and 270.

III. Lyrics. — Two of these are certainly by Theocritus, viz., xxviii. and xxix. The first is a very graceful poem presented together with a distaff to Theugenis, wife of Nicias, a doctor of Miletus, on the occasion of a voyage thither undertaken by the poet. The theme of xxix. is similar to that of xii. A very corrupt poem, only found in one very late MS., was discovered by Ziegler in 1864. As the subject and style very closely resemble that of xxix., it is assigned to Theocritus by recent

editors.

IV. The Epigrams do not call for detailed notice. They do not possess any special merit, and their authenticity is often doubtful. It remains to notice the poems which are now generally considered to be spurious. They are as follows : —

xix. ” Love stealing Honey ” (Ki)p«wcXe?rr7;s). The poem is anonymous in the MSS. and the conception of Love is not Theo- critean.

xx. ” Herdsman ” (BoukoXJokos), xxi. ” Fishermen ” (‘AXwis), xxiii. ” Passionate Lover ” (‘Epao-rfc). These three poems are remark- able for the corrupt state of their text, whiqh makes it likely that they have come from the same source and possibly are by the same author. The ” Fishermen ” has been much admired. It is addressed to Diophantus and conveys a moral, that one should work and not dream, illustrated by the story of an old fisherman who dreams that he has caught a fish of gold and narrates his vision to his mate. As Leonidas of Tarentum wrote epigrams on fishermen, and one of them is a dedication of his tackle to Poseidon by Diophantus, the fisher, 8 it is likely that the author of this poem was an imitator of Leonidas. It can hardly be by Leonidas him- self, who was a contemporary of Theocritus, as it bears marks of lateness.

xxv. ” Heracles the Lion-slayer ” (Aeovro^foos). This is a long

6 The evidence is contained in a new fragment of the Mer.des Stele. Cf. von Prott in Rheinisches Museum (1898), p. 464.

7 iaaerax oirros h.vqp 6s £ju«i) KfXPy&tT’ ao^ou, 1. 73.

8 6 ypnreis Aio^acTos av&KTopi di]Karo rix”at (Anth. Pal. vi. 4, 7).

poem consisting of two episodes, viz. the interview of Heracles with the bailiff of Augeas and his recital to Phyleus, son of Augeas, of the story of the Nemean lion. The composition is not unworthy of Theocritus. It is, however, anonymous in the MSS. and comes next to another anonymous poem called " Megara, the wife of Hercules." It is probable from some metrical and linguistic pecu- liarities that xxv. and the " Megara" are both by the same author, xxvii. " The wooing of Daphnis" ('Oapiorfa) is also anonymous. It contains imitations of Theocritus, but the tone and the language betray a later writer.

We have no sure facts as to the life of Theocritus beyond those supplied by Idylls xvi. and xvii. It is quite uncertain whether the bucolic poems were written in the pleasant isle of Cos among a circle of poets and students, or in Alexandria and meant for dwellers in streets. The usual view is that Theocritus went first from Syracuse to Cos, and then, after suing in vain for the favour of Hiero, took up his residence permanently in Egypt. Some have supposed on very flimsy evidence that he quarrelled with the Egyptian court and retired to Cos, and would assign various poems to the " later-Coan " period. 1 Wilamowitz-Mollendorff , laying stress on the fact that in the best MS. the poem to Ptolemy (xvii.) comes before that to Hiero (xvi.), very ingeniously puts the Egyptian period first and supposes it to have been of very short duration (i.e. 277 to 275), and then makes the poet, after his unsuccessful appeal to Hiero, retire to Cos for the rest of his life. This view would enable us to see a reference to Ptolemy in vii. 93, and even to the young Apollonius Rhodius in 47-48 of the same poem.

The poems of Theocritus were termed Idylls (eiSvWia) by the grammarians. The word is a diminutive from tldos, and is supposed to mean " little poems." The use of etSos in the sense of " poem " is somewhat doubtful, and so some have referred tl&vWia. to tiSos in its usual sense of " form " or " type."

Thus d&os PoukoXikov, kiruiov, \vpuc6v might be used to classify various kinds of poetry, and these poems might be called el5v\i.a, since they include so many types.

Language and Metre. — Theocritus wrote in various dialects accord- ing to the subject. The Lyrics xxvfii., xxix. (and xxx.) are in Aeolic, that being the traditional dialect for such poems. Two poems, xii. (Atrijs) and xxii. (to Castor and Pollux), were written in Ionic, as is stated in titles prefixed to them, though a number of Doric forms have been inserted by the scribes. The epics in general show a mixture of Homeric, Ionic and Doric forms. The Bucolics, Mimes, and the " Marriage-song of Helen" (xviii.) are in Doric, with occasional forms from other dialects.

The metre used by Theocritus in the Bucolics and Mimes, as well as in the Epics, is the dactylic hexameter. His treatment of this may be compared both with Homeric usage and that of other Alexandrian poets, e.g. Callimachus. It was the tendency of these writers to use dactyls in preference to spondees with a view to lightness and rapidity. This tendency shows itself most in the third foot, the favourite caesura being the trochaic, i.e. after the second syllable (– u ')• On the other hand, the Alexandrians admitted a spondee in the fifth foot, especially when the verse ends with a quadrisyllable. Theocritus in the Epics conforms to the new technique in both these respects: in the Bucolics his practice agrees with that of Homer. The feature in his versification which has attracted most attention is the so-called bucolic caesura. The rule is that, if there is a pause at the end of the fourth foot, this foot must be a dactyl. This pause is no new invention, being exceedingly common in Homer. Theocritus uses it so frequently in the Bucolics that it has become a mannerism. In the Epics his practice agrees with that of Homer.

We always think of Theocritus as an original 'poet, and as the " inventor of bucolic poetry " he

deserves this reputation. At the same time he had no scruple about borrowing from predecessors or contemporaries; in fact he did so in the most open manner. Thus xxix. begins with a line of Alcaeus, 2 and xvii., as the Scholiast points out, with words used by Aratus at the beginning of the Phenomena. The love of the Cyclops for Galatea had been treated by Philoxenus, and fragments quoted from this show that Theo- critus copied some of his phrases closely. In the mimes Theocritus appears to have made great use of Sophron. Idyll ii. is modelled upon a mime of this writer which began in a very similar way. 8

1 The chief argument is that in xii. 5 the poet says —

haaov rapOwucr) npcxfripti rpiyaixoio yvvaui6s. As Arsinoe had been married three times, it is thought that she might have been offended by this remark.

2 olvos, w i\e irat, Xkytrcu icai dXadea.

3 Sophron's mime began with jrei yap d dff^aAros ; Theocritus's begins with xp fiot rat Satpvai',

The Scholiast thought that Theocritus showed want of taste in making Thestylis a persona muta, instead of giving her a share in the dialogue as Sophron had done. The famous poem about Gorgo and Praxinoe at the feast of Adonis was modelled on one by Sophron about women looking on at the Isthmian games ('ladiiia^ovaai), and fragments quoted from this are closely imitated by Theocritus. It is extremely interesting to find a similar poem in the recently discovered mimes of Herondas, the fourth of which is termed " Women making offerings to Aesculapius" ('ActkXijti-uj) avartBttaai Kal dv

Manuscripts. — The oldest authority for any part of Theocritus is a papyrus discovered by B. P. Grenfeli and A. S. Hunt at Oxy- rhynchus, written in the 2nd century a.d. and containing xiii. I 9 _ 34- 5 There are also fragments of another papyrus belonging to the 5th century, which contain some lines of i., v.,

xiii., xv., xvi. and xxvi. 6 These papyri are carelessly written and do not contain any notable variants. The most valuable of the existing MSS. belongs to the Library at Milan (Ambros. 222). It was written in the 13th century, and contains Idylls i.-xvii., xxix., and the Epigrams. Other good MSS. of the same family contain xviii. also. The other poems come from two sources. One of these is represented by several MSS. and contains xix., xx., xxi., xxii., xxiii., xxv. The other contains xxii. 69-223, xxiv., xxv., xxvi., xxvii., xxviii., xxix. This collection was first published in the Juntine edition (1515) from a codex Patavinus now lost. The only existing MS. of any value in which it is found is in Paris (2726), and was written in the 14th century. These two collections ^re termed and 7r by Hiller and other recent writers. It will be noticed that xxv. and a portion of xxii. are found both in and w. In these poems there are constant divergences, and x appears to give the better recension.

There are important Scholia to Theocritus, or rather to that portion of the poems (i.-xvii. and xxix.) which is found in the best MSS. The most valuable of these are those contained by Ambros. 222 (K). They are composite in character. The Argument to xii. is ascribed to Eratosthenes, a contemporary of Justinian, while reference is frequently made to the views of Munatius, who lived in the time of Herodes Atticus, and Amarantus, a contemporary of Galen. Wilamowitz-Mollendorff ascribes the nucleus of these Scholia to Theon, who wrote similar scholia on Lycophron and Apollonius Rhodius, and is stated to have written a commentary on Theocritus. 7 This Theon is stated to have been the son of Artemi-dorus, the first editor of Theocritus. It is, therefore, suggested that Theon formed the shorter collection of Theocritean poems, furnished them with scholia, and wrote the second epigram quoted at the beginning of this article. The other' poems, which possess no scholia and have come down to us from the other collections, would, according to this ingenious theory, be those which appeared in the

larger collection of Artemidorus but were excluded by Theon. Bibliography, — (i.) Editions, (a) Critical, H. L. Ahrens (1855); Ch. Ziegler (1879); U. von Wilamowitz-Mollendorff, in Oxford Classical Texts (1907). (6) epexegetical, E. Hiller (1 881 ; German notes); R. J. Cholmeley (1901 ; English notes), (ii.) Transla- tions. A. Lang (1880; prose); J. H. Hallard (1901; verse), (iii.) Subject-matter. Ph. E. Legrand, Etude sur Theocrite (1898); (iv.) Textual Questions. E. Hiller, Beitrdge zur Textgeschichte der Griechischen Bukoliker (1888); U. von Wilamowitz-Mollendorff, Die Textgeschichte der Griechischen Bukoliker (1906). (v.) Metre. C. Kunst, De Theocriti versu heroico (1887). (vi.) Scholia. Ch. Ziegler, Codicis Ambrosiani 222, Scholia in Theocritum (1867).

(A. C. C.)

THEODECTES (c. 380-340 B.C.) , Greek rhetorician and tragic poet, of Phaselis in Lycia, pupil of Isocrates and Plato, and an intimate friend of Aristotle. He at first wrote speeches for the law courts, but subsequently composed tragedies with success. He spent most of his life at Athens, and was buried on the sacred road to Eleusis. The inhabitants of Phaselis honoured him with a statue, which was decorated with garlands by Alexander the Great on his way to the East. In the contests arranged by Artemisia, queen of Caria, at the funeral of Mausolus, Theodectes gained the prize with his tragedy Mausolus (extant in the 2nd century a.d.), but was defeated by Theopompus in oratory. According to the inscription on his tomb, he was

4 1. 3°> Btwf aSeX^aw relievos, 6 fia

5 Oxyrhynchus Papyri, iv. p. 139.

6 C. Wessely in Berliner Philologische Wochenschrift (1906),

P- 8 3 J - „ ' .

7 Qkoiv ev ry i}irofxpi}(Tei QeoKphov, Ktyni. on 1.

39 : ©cwv b ‘Apre/ui- Scopou, ib. on iv. 5. Cf. Ahrens, ii. p. xxvii.

eight times victorious in thirteen dramatic contests. Of his tragedies (fifty in number) thirteen titles and some fragments remain (A. Nauck, Tragicorum Graecorum Fragmenta, 1887). His treatise on the art of rhetoric (according to Sui’das written in verse) and his speeches are lost. The names of two of the latter — Socrates and Nomos (referring to a law proposed by Theodectes for the reform of the mercenary service) — are pre- served by Aristotle {Rhetoric, ii. 23, 13, 17). The Theodectea (Aristotle, Rhet. iii. 9, 9) was probably not by Theodectes, but an earlier work of Aristotle, which was superseded by the extant Rhetorica.

See monograph by C. F. Marcker (Breslau, 1835). There is a lengthy article on Theodectes in Smith’s Dictionary of Greek and Roman Biography, in which the connexion of the tragedy with the Artemisian contest is disputed.

THEODOLITE, 1 a surveying instrument consisting of two graduated circles placed at right angles to each other, for the measurement of horizontal and vertical angles, a telescope, which turns on axes mounted centrically to the circles, and an alidade for each circle, which carries two or more verniers. The whole is supported by a pedestal resting on footscrews, which are also employed to level the instrument. The size varies from a minimum with circles 3 in. in diameter to a maximum with a 36-in. horizontal and an 18-in. vertical circle.

Theodolites are designed to measure horizontal angles with greater accuracy than vertical, because it is on the former that the most important work of a survey depends; measures of vertical angles are liable to be much impaired by atmospheric refraction, more particularly on long lines, so that

when heights have to be determined with much accuracy the theodolite must be discarded for a levelling instrument. When truly adjusted the theodolite measures the horizontal angle between any two objects, however much they may differ in altitude, as the pole star and any terrestrial object.

The instrument is made in three forms — the Y pattern, the Everest and the transit. Certain parts are common to all the forms in use and to the level. The stand is generally made circular in section, each of the three legs being shod at the lower extremity with steel. Their upper ends are hinged to a flat plate provided with a screwed collar of large diameter (fig. 1). To the legs is screwed a plate OO, which supports the lower side of the plate PP. This receives the ends of the screws SS by which the instru- ment is levelled, its annular portion being larger than the collar in OO, so that, until clamped by the screwed plate above it, the whole of the instrument except the legs can be moved hori- zontally in any direction to the extent of about j in. This facili- tates centring over a point. The upper plate PP is bored centrally to receive a parallel or conical pillar which supports the lower circle of the theodolite or the arm of the level which carries the telescope. In the theodolite the edge of the plate rr is bevelled and divided into 360 or 400 degrees, and to half degrees, or to 20 minutes or 10 minutes, according to the size of the instrument. A collar is provided, which when tightened on the vertical axis, otherwise free to move, holds it rigidly in position with respect to the plate PP. To this collar is attached a slow- motion screw, working against a reaction spring, by which the plate rr can be rotated through a small arc. The upper plate carrying two, three or four verniers w is attached to a vertical coned pillar passing through the centre of the larger pillar and rotating in it; this plate can be clamped to the lower plate by means of the screw C, and can be rotated with respect to it by the slow-motion screw d. On the upper plate are placed two small levelling

bubbles, and two standards tt aie attached to the upper side of the plate for sup- porting the trunnions of the telescope T. The bearings for receiving these trunnions are V-shaped; the V on one side is fixed, while the other is cut through and can be narrowed or made wider, thus lifting or lowering the trunnion by means of two capstan-headed screws. To the telescope the vertical circle for reading angles in

1 This word has been a puzzle to etymologists. Various ingenious explanations have been given; all based on the apparent Greek form of the word; thus it has been derived from 0taa8at, to see, iSos, way, and Xitos, smooth, plain; from diiv, to run, and 5oXtx6s, long, and in other ways equally fanciful. Another imaginary origin has been suggested in a corruption of " the O deleted," i.e. crossed out, the circle being crossed by diameters to show the degrees; others have found in it a corruption of " the alidade " (q.v.). It would appear, however, to be taken from the O. Fr. theodolet or theodelet, the name of a treatise by one Theodulus, probably a mathematician (see Notes and Queries, 3rd series, vii. 337, 428, &c. Skeat, Etym. Diet., 1910).

altitude is fixed, and rotates with it; both can be clamped to the standard, and motion can be given by a suitable double-ended motion screw. The verniers are attached to arms uu bearing on an enlargement of one trunnion of the telescope, one arm pro- jecting downwards and embracing a projection on the standard t. To the same frame is attached a bubble, which should be parallel with the centre line of the verniers. The diagonal telescope nn is provided with cross hairs, and is used for the final centring of the instrument over an object. The use of aluminium in the con- struction of all parts not liable to much wear is to be commended, owing to the smaller weight. The Y theodolite differs from the transit in that the supports for the telescope are low, that the telescope rests in a cradle the trunnions of which rest on the sup- ports, and that a segment of a circle attached to the cradle replaces

Fig. 1.

the vertical circle. When it is desired to read a line in the reverse direction the telescope is lifted out of the cradle, turned end for end, and replaced in the Y bearings of the cradle again. In the Everest theodolite the supports are low and the telescope cannot be transited. The instrument is similar to that described above, except that the vertical circle is not continuous, but is formed of two arcs.

In Germany and elsewhere refracting theodolites and transit instruments are sometimes employed. The eye end of the tele- scope tube is removed — a counterpoise to the object end being substituted in its place — and a prism is inserted at the intersection of the visual axis with the transit axis, so that the rays from the object-glass may be reflected through one of the tubes of the transit axis to an eye-piece in the pivot of this tube. In this case the pillars need only be high enough for the counterpoise to pass freely over the plate of the horizontal rWr\e.: but the observer has always

to place himself at rieht angles to the direction of the object he is observing.

Levelling Instrument. — This is another surveying instrument con- sisting essentially of a telescope bearing a level and mounted horizontally upon a frame. To the upper side of the parallel plates it is similar in construction to the theodolite. No pro- vision is made for centring over a point. The upper plate is bored through the centre and carries a conical pillar, which rotates freely in it and supports a horizontal plate, to the extreme ends of which are attached, by means of capstan screws or otherwise, two vertical supports, on which the telescope, which is constructed to be perpendicular to the vertical axis of the instrument, rests and

rotates with it. The level bubble, by which the instrument is brought into a position at right angles to the axis of the earth, is generally placed on the top of the telescope. In the best telescopes, whether for theodolite or level, the diaphragm on which the image is formed is made of glass, and the cross hairs are engraved thereon. In the level the eye-piece and object-glass are interchangeable, to facilitate adjustment for collimation.

THEODORA, the wife of the emperor Justinian (q.v.), was born probably in Constantinople, though according to some in Cyprus, in the early years of the 6th century, and died in 547. According to Procopius, our chief, but by no means a trustworthy authority for her life, she was the daughter of Acacius, a bear-feeder of the amphitheatre at Constantinople to the Green Faction, and while still a child was sent on to the stage to earn her living in the performances called mimes. She had no gift for either music or dancing, but made herself notorious by the spirit and impudence of her acting in the rough farces, as one may call them, which delighted the crowd of the capital. Becoming a noted courtesan, she accompanied a certain Hecebolus to Pentapolis (in North Africa) , of which he had been appointed governor, and, having quarrelled with him, betook herself first to Alexandria, and then back to Constantinople through the cities of Asia Minor. In Constantinople (where, according to a late but apparently not quite groundless story, she now endeavoured to support herself by spinning, and may therefore have been trying to reform he/ life) she attracted the notice of Justinian, then patrician, and, as the all-powerful nephew of the emperor Justin, practically ruler of the empire. He desired to marry her, but could not overcome the opposition of his aunt, the empress Euphemia. After her death (usually assigned to the year 523) the emperor yielded, and as a law, dating from the time of Constantine, forbade the marriage of women who had followed the stage with senators, this law was repealed. Thereupon Justinian married Theodora, whom

he had already caused to be raised to the patriciate. They were some time after (527) admitted by Justin to a share in the sovereignty; and, on his death four months later, Justinian and Theodora became sole rulers of the Roman world. He was then about forty-four years of age, and she some twenty years younger. Procopius relates in his unpublished history ('AvendoTa.) many repulsive tales regarding Theodora's earlier life, but his evident hatred of her, though she had been more than ten years dead when the Anecdoia were written, and the extravagances which the book contains, oblige us to regard him as a very doubtful witness. Some confirmation of the reported opposition of the imperial family to the marriage has been found in the story regarding the conduct of Justinian's own mother Vigilantia, which Nicholas Alemanni, the first editor of the Anecdota, in his notes to that book, quotes from a certain " Life of Justinian " by Theophilus, to which he fre- quently refers, without saying where he found it. Mr Bryce, however, discovered in Rome what is believed to be the only MS. of this so-called life of Justinian; and his examination of its contents makes him think it worthless as an authority (see Theophilus).

Theodora speedily acquired unbounded influence over her husband. He consulted her in everything, and allowed her to interfere directly, as and when she pleased, in the government of the empire. She had a right to interfere, for she was not merely his consort, but empress regnant, and as such entitled equally with himself to the exercise of all prerogatives. In the most terrible crisis of Justinian's reign, the great Nika in- surrection of 532, her courage and firmness in refusing to fly

when the rebels were attacking the palace saved her husband's crown, and no doubt strengthened her command over his mind. Officials took an oath of allegiance to her as well as to the emperor (Nov., viii.). She even corresponded with foreign am- bassadors, and instructed Belisarius how to deal with the popes. Procopius describes her as acting with harshness, seizing on trivial pretexts persons

who had offended her, stripping some of their property, and throwing others into dungeons, where they were cruelly tortured or kept for years without the knowledge of their friends. The city was full of her spies, who reported to her everything said against herself or the administration. She surrounded herself with ceremonious pomp, and required all who approached to abase themselves in a manner new even to that half-Oriental court. She was an incessant and tyrannical match-maker, forcing men to accept wives and women to accept husbands at her caprice. She constituted herself the protectress of faithless wives against outraged husbands, yet professed great zeal for the moral reformation of the city, en- forcing severely the laws against vice, and immuring in a " house of repentance " on the Asiatic side of the Bosphorus five hundred courtesans whom she had swept out of the streets of the capital. How much of all this is true we have no means of determining, for it rests on the sole word of Procopius. But there are slight indications in other writers that she had a reputation for severity.

In the religious strife which distracted the empire Theodora took part with the Monophysites, and her coterie usually con- tained several leading prelates and monks of that party. As Justinian was a warm upholder of the decrees of Chalcedon, this difference of the royal pair excited much remark and indeed much suspicion. Many saw in it a design to penetrate the secrets of both ecclesiastical factions, and so to rule more securely. In other matters also the wife spoke and acted very differently from the husband; but their differences do not seem to have disturbed either his affection or his confidence. The maxim in Constantinople was that the empress was a stronger and a safer friend than the emperor; for, while he abandoned his favourites to her wrath, she stood by her proteges, and never failed to punish anyone whose heedless tongue had assailed her character.

Theodora bore to Justinian no son, but one daughter — at least it would seem that her grandson, who is

twice mentioned, was the offspring of a legitimate daughter, whose name, how- ever, is not given. According to Procopius, she had before her marriage become the mother of a son, who when grown up returned from Arabia, revealed himself to her, and forthwith disappeared for ever; but this is a story to be received with distrust. That her behaviour as a wife was irreproachable may be gathered from the fact that Procopius mentions only one scandal affecting it, the case of Areobindus. Even he does not seem to believe this case, for, while referring to it as a mere rumour, the only proof he gives is that, suspecting Areobindus of some offence, she had torture applied to this supposed paramour. Her health was delicate, and, though she took all possible care of it, frequently quitting the capital for the seclusion of her villas on the Asiatic shore, she died compara- tively young. Theodora was small in stature and rather pale, but with a graceful figure, beautiful features, and a piercing glance. There remains in the apse of the famous church of S. Vitale at Ravenna a contemporaneous mosaic portrait of her, to which the artist, notwithstanding the stiffness of the material, has succeeded in giving some character.

The above account is in substance that which historians of the two centuries and a half prior to 1885 accepted and repeated re- garding this famous empress. But it must be admitted to be open to serious doubts. Everything relating to the early career of Theodora, the faults of her girlhood, the charges of cruelty and insolence in her government of the empire, rest on the sole authority of the Anecdota of Procopius — a book whose credit is shaken by its bitterness and extravagance. If we reject it, little is left against her, except of course that action in ecclesiastical affairs which ex- cited the wrath of Baronius, who had denounced her before the A necdota was published.

In favour of the picture which Procopius gives of the empress il

may be argued (1) that she certainly did interfere constantly and arbitrarily in the administration of public affairs, and showed her- self therein the kind of person who would be cruel and unscrupulous in her choice of means, and (2) that we gather from other writers an impression that she was harsh and tyrannical, as, for instance, from the references to her in the lives of the popes in the Liber Pontificalis (which used to pass under the name of Anastasius, the papal librarian). Her threat to the person whom she commanded to bring Vigilius to her was " nisi hoc feceris, per Viventem in saecula excoriari te faciam." Much of what we find in these lives is legendary, but they are some evidence of Theodora's reputation. Again, (3) the statute {Cod., v. 4, 23) which repeals the older law so far as relates to scenicae mulieres is now generally attributed to Justin, and agrees with the statement of Procopius that an altera- tion of the law was made to legalize her marriage. There is there- fore reason for holding that she was an actress, and, considering what the Byzantine stage was (as appears even by the statute in question), her life cannot have been irreproachable.

Against the evidence of Procopius, with such confirmations as have been indicated, there is to be set the silence of other writers, contemporaries like Agathias and Evagrius, as well as such later historians as Theophanes, none of whom repeat the charges as to Theodora's life before her marriage. To this consideration no great weight need be attached. It is difficult to establish any view of the controversy without a long and minute examination of the authorities, and in particular 01 the Anecdota. But the most probable conclusions seem to be — (1) that the odious details which Procopius gives, and which Gibbon did not blush to copy, deserve no more weight than would be given nowadays to the malignant scandal of disappointed courtiers under a despotic government, where scandal is all the blacker because it is propagated in secret; (2) that apparently she was an actress and a courtesan,

and not improbably conspicuous in both those characters; and (3) that it is impossible to determine how far the specific charges of cruelty and oppression brought against her by Procopius deserve credence. We are not bound to accept them, for they are uncorroborated; yet the accounts of Justinian's government given in the Anecdota agree in too many respects with what we [know aliunde to enable us to reject them altogether; and it must be admitted that there is a certain internal consistency in the whole picture which the Anecdota present of the empress. About the beauty, the intel- lectual gifts, and the imperious will of Theodora there can be no doubt, for as to these all our authorities agree. She was evidently an extraordinary person, born to shine in any station of life.

Her fortunes have employed many pens. Among the later serious works dealing with them may be mentioned M. Antonin DSbidour's V Imperatrice Theodora: Htude Critique (Paris, 1885), which endeavours to vindicate her from the aspersions of Procopius ; and among more imaginative writings are Sir Henry Pottinger's interesting romance Blue and Green (London, Hurst and Blackett, 1879), M. Rhangab6's tragedy QeoSi>pa (Leipzig, 1884), and M. Sardou's play Theodora, produced in Paris in 1884. See also Dr F. Dahn's Prokopios von Casarea (1865), and, in addition, the works cited under Justinian. (J. Br.)

THEODORA, wife of the Roman emperor Theophilus. In the last year of her husband's reign (842) she overrode his ecclesi- astical policy and summoned a council under the patriarch Methodius, in which the worship of images was finally restored and the iconoclastic clergy dispossessed. Appointed guardian of her infant son, Michael III., she carried on the government with a firm and judicious hand; she replenished the treasury and deterred the Bulgarians from an attempt at invasion. In order to perpetuate her power she purposely neglected her son's education, and therefore must be held responsible for the voluptuous character which he developed

under the influence of his uncle Bardas. Theodora endeavoured in vain to combat Bardas's authority; in 855 she was displaced from her regency at his prompting, and being subsequently convicted of intrigues against him was relegated to a monastery. She was sainted in recompense for her zeal on behalf of image-worship.

THEODORA (d. 1057), daughter of the emperor Constantine VIII. Possessed of a strong and austere character, she refused the hand of the heir-presumptive, Romanus, who was married instead to her sister ZoS (1028). Though living in retirement she excited Zoe's jealousy, and on a pretext of conspiracy was confined in a monastery. In 1042 the popular movement which caused the dethronement of Michael V. also led to Theodora's instalment as joint-empress with her sister. After two months of active participation in government she allowed herself to be virtually superseded by Zoe's new husband, Constantine IX. Upon his death in 1054, in spite of her seventy years, she reasserted her dormant rights with vigour,

and frustrated an attempt to supersede her on behalf of the general Nicephorus Bryennius. By her firm administration she controlled the unruly nobles and checked numerous abuses; but she marred her reputation by excessive severity towards private enemies and the undue employment of menials for advisers. She died suddenly in 1057.

See G. Finlay, History of Greece, vol. ii. (Oxford, 1877); G. Schlumberger, L'Epopee Byzantine, vol. iii.(Paris. 1905).

THEODORE, the name of two popes. Theodore I., pope from November 642 till May 649, succeeded John IV. He was the son of a bishop, and was born in Jerusalem. A zealous opponent of monothelitism, in the course of the protracted controversy he in a Roman synod excommunicated Pyrrhus, patriarch of Constantinople, and signed the document with ink mingled with consecrated wine. Theodore II. had a pontificate of only twenty days (Nov.-Dec. 897).

THEODORE (Rus. Fedor, or Feodor), the name of three tsars of Russia.

Theodore I. (1537–1598), tsar of Russia, the son of Ivan the Terrible and Anastasia Romanova, nominally succeeded his father in 1584, but being of weak intellect was governed throughout his reign by the boyar, Boris Godunov, whose sister Irene he married in 1580. On his death-bed he is said to have left the throne to his consort, with the Patriarch Job, Boris Godunov, and Theodore Romanov, afterwards the Patriarch Philaret, as her chief counsellors. Irene, however, retired into a monastery and her brother Boris stepped into her place.

See S. M. Solovev, History of Russia (Rus.), vol. viii. (Petersburg, 1895, &c).

Theodore II. (1589–1605), tsar of Russia, was the son of Tsar Boris Godunov and one of the daughters of Malyuta- Skuratov, the infamous favourite of Ivan the Terrible. Pas- sionately beloved by his father, he received the best available education for those days, and from childhood was initiated into all the minutiae of government, besides sitting regularly in the council and receiving the foreign envoys. He seems also to have been remarkably and precociously intelligent, and the first map of Russia by a native, still preserved, is by his hand. On the sudden death of Boris he was proclaimed tsar (13th of April 1605). Though his father had taken the precaution to surround him with powerful friends, he lived from the first moment of his reign in an atmosphere of treachery. On the 1st of July the envoys of Pseudo-Demetrius I. arrived at Moscow to demand his removal, and the letters which they read publicly in the Red Square decided his fate. On the 10th of July he was most foully murdered in his apartments in the Kreml.

See D. I. Ilovaisky, The Anarchical Period in the Realm of Moscovy (Rus.) (Moscow, 1894).

Theodore III. (1661–1682), tsar of Russia, was the eldest surviving son of Tsar Alexius and Maria

Miloslavskaya. In 1676 he succeeded his father on the throne. He was endowed with a fine intellect and a noble disposition; he had received an excellent education at the hands of Simeon Polotsky, the most learned Slavonic monk of the day, knew Polish, and even possessed the unusual accomplishment of Latin; but, horribly disfigured and half paralyzed by a mysterious disease, supposed to be scurvy, he had been a hopeless invalid from the day of his birth. In 1679 he married his first cousin Agatha and assumed the sceptre. His native energy, though crippled, was not crushed by his terrible disabilities; and he soon showed that he was as thorough and devoted a reformer as a man incompetent to lead armies and obliged to issue his orders from his Utter, or his bed-chamber, could possibly be. The atmo- sphere of the court ceased to be oppressive; the light of a new liberalism shone in the highest places; and the severity of the penal laws was considerably mitigated. He founded the academy of sciences in the Zaikonospassy monastery, where everything not expressly forbidden by the orthodox church, including Slavonic, Greek, Latin and Polish, was to be taught by competent professors. The chief difference between the

Theodorean and the later Petrine reforms was that while the former were primarily, though not exclusively, for the benefit of the church, the latter were primarily for the benefit of the state. The most notable reform of Theodore III., however, was the abolition, at the suggestion of Vasily Golitsuin, of Myestnechestvo, or " place priority," which had paralyzed the whole civil and military administration of Muscovy for genera- tions (see Golitsuin). Henceforth all appointments to the civil and military services were to be determined by merit and the will of the sovereign. Theodore's consort, Agatha, shared his progressive views. She was the first to advocate beard- shearing. On her death (4th of July 1681) Theodore married Martha Apraksina. He

died on the 27th of April 1682, with- out issue.

See M. P. Pogodin, The First Seventeen Years of the Life of Peter the Great (Rus.) (Moscow, 1875). (R. N. B.)

THEODORE (602-690), seventh archbishop of Canterbury, was born at Tarsus in Cilicia in 602. On the death of Wighard, who had been sent to Pope Vitalian by Ecgberht of Kent and Oswio of Northumbria in 667, apparently for consecration as archbishop, Theodore, who had become prominent in the Eastern work of the church, was recommended by Hadrian of Niridanum to fill the vacant see. Vitalian consecrated Theodore in April 688 on condition that Hadrian, afterwards abbot of St Peter's, Canterbury, should go with him. Hadrian was detained for some time by Ebroin, the Neustrian mayor of the palace, but Theodore reached England in May 669. According to Bede's account he made a tour of the whole of Anglo-Saxon England, reforming abuses and giving instruction as to the monastic rule and the canonical Easter. Bede also declares that he was the first archbishop to whom all the " church of the Angles " submitted. From the first he seems to have ignored the scheme for a separate province of York, but he reorganized the episco- pate, assigning Bisi to East Anglia, Putta to Rochester, Hloth- here to Wessex, and Ceadda after reconsecration to Mercia. He brought the monastic education up to date by introducing literary, metrical and musical studies. In 673 Theodore pre- sided at the first synod of the clergy in England which was held at Hertford. Various disciplinary regulations were emphasized, and an annual meeting arranged at a place called Cloveshoe. After this council Theodore revived the East Saxon bishopric, to which he appointed Earconwald. Soon after the first expulsion of Wilfrid in 678 he divided the Northumbrian diocese, appointing Trumwine bishop to the Picts. This led to a quarrel with Wilfrid which was not finally settled until 686-687. In 679 Theodore intervened to make peace between Ecgfrith of Northumbria and Aethelred of Mercia. He presided at other synods held in 680 at Hatfield and in 6S4

at Twyford, and died in 690. A penitential composed under Theodore's direction is still extant.

See Bede, Hist. Ecd., edited by C. Plummer (Oxford, 1896) ; Eddius, Vita Wilfridii in J. Raine's Historians of the Church of York, vol. i. (London, 1879); Anglo-Saxon Chronicle, edited by Earle and Plummer (Oxford, 1899); Haddan and Stubbs, Councils and Ecclesiastical Documents (Oxford, 1869-78), iii. 173-213.

THEODORE LASCARIS (d. 1222), emperor of Nicaea, was born of a noble Byzantine family. He became the son-in-law of the Emperor Alexius III. and distinguished himself during the sieges of Constantinople by the Latins (1203-4). After the capture of the city he gathered a band of fugitives in Bithynia and established himself in the town of Nicaea, which became the chief rallying-point for his countrymen. Relieved of the danger of invasion by a Latin force which had defeated him in 1 204 but was recalled to Europe by a Bulgarian invasion, he set to work to form a new Byzantine state in Asia Minor, and in 1206 assumed the title of emperor. During the next years Theodore was beset by enemies on divers sides. He main- tained himself stubbornly in defensive campaigns against the Latin emperor Henry, defeated his rival Alexius Comnenus of Trebizond, and carried out a successful counter-attack upon Gayath-ed-din, the sultan of Koniah, who had been instigated to war by the deposed Alexius III. Theodore's crowning

victory was gained in 12 10, when in a battle near Pisidian Antioch he captured Alexius and wrested the town itself from the Turks. At the end of his reign he ruled over a territory roughly conterminous with the old Roman provinces of Asia and Bithynia. Though there is no proof of higher qualities of statesmanship in him, by his courage and military skill he enabled the Byzantine nation not merely to survive, but ultimately to beat back the Latin invasion.

See E. Gibbon, The Decline and Fall of the Roman Empire, vol. vi., ed. J. B. Bury (London, 1896); G.

Finlay, History of Greece, vol. iii. (Oxford, 1877) ; and A. Meliarakes, 'laropla toO BeuriXeiov tijs Nucdios

Theodore's grandson, Theodore II. (Lascaris), emperor from 1254 to 1258, is chiefly noticeable for two brilliant campaigns by which he recovered Thrace from the Bulgarians (1255-56). His ill-health and early death prevented his making full use of his ability as a ruler.

See M. J. B. Pappadopoulos, Theodore II. Lascaris, empereur de Nicee (Paris, 1908).

Irene Lascaris, daughter of Theodore I. (Lascaris), was first married to the general Andronicus Palaeologus, and after his death became the wife of Theodore's successor, John Vatatzes (q.v.), and mother of Theodore II. She is much praised by historians for her modesty and prudence, and is said to have brought about by her example a considerable improvement in the morals of her nation. She died some ten years before her husband.

THEODORE OF MOPSUESTIA (c. 350-428), early Christian theologian, the most eminent representative of the so-called school of Antioch, was born at Antioch about the middle of the 4th century and was a friend of John Chrysostom; in rhetoric the celebrated Libanius was his teacher. Soon, however, he attached himself to the school of the great exegete and ascetic, Diodorus, a presbyter in Antioch, and with only a transitory period of vacillation, from which he was won back by Chrysostom, he remained faithful to the theology and ascetic discipline of this master. Under Diodorus he became a skilful exeget", and ultimately outstripped his master in biblical learning. About 383 Theodore became a presbyter in Antioch, and began to write against Eunomius the Arian and against the christology of Apollinaris. Soon after 392 he became bishop of Mopsuestia in Cilicia (the modern Missis near Adana). As such he was held in great respect, and took part in several synods, with a reputa- tion for orthodoxy that was never questioned. It was greatly to his advantage

that in the Eastern Church the period between the years 390 and 428 was one of comparative repose. He was on friendly terms even with Cyril of Alexandria. He died in 428 or 429, just at the beginning of the Nestorian controversy.

Theodore was a very prolific writer, but, before all, an exegete. He wrote commentaries on almost every book of the Old and New Testaments, of which, however, only a small proportion is now extant, as at a later period he lost credit in the church. We still possess in Greek his commentary on the Minor Prophets, in a Syriac version his commentary on St John, 1 and, in Latin translations, commentaries on the shorter Pauline epistles, besides very many fragments, especially on the epistle to the Romans. Theodore's importance as an exegete lies in two characteristics: (1) in opposi- tion to the allegorical method he insists on getting at the literal meaning, and adheres to it when found; (2) in his interpretation of the Scriptures he takes into account the historical circumstances in which they were produced, and substitutes the historical-typo- logical for the pneumatico-christological interpretation of prophecy; in other words, he interprets all Old Testament passages historically in the first instance, and sees the fulfilment of Old Testament prophecy in the history of Christ and His church only in so far as the entire Old Testament is a " shadow of things to come." Follow- ing his master Diodorus, who had already written a treatise T(s Sta^opA flewp.'as Kai 4XXij-yopias, Theodore also was the author of a special dissertation against the allegorists, i.e. against Origen and his followers, which, however, has unfortunately perished. The comparative freedom of Theodore's view of inspiration is also note- worthy. He discriminates between historical, prophetical anc didactic writings, and in accordance with this distinction assumes varying degrees of inspiration. Finally, he entertained very bole opinions about the canon and several of the books included in it

^d. P. B. Chabot (Paris, 1897).

He esteemed very lightly the Solomonic writings and the book of ' Job; Canticles he explained as a nuptial poem ol Solomon's; the j book of Job appeared to him in many places hardly worthy of its | subject, and he censures the writer sharply; Chronicles, Ezra and Nehemiah he entirely rejected; he denied the accuracy of the titles of the Psalms, anticipated the hypothesis that many of them belong to the Maccabean age, and referred the so-called Messianic element almost invariably to the kings of Israel ; he even criticized the Catholic epistles and rejected the epistle of James. Charac- teristics such as these bring Theodore, of all patristic writers, nearest to the modern spirit. His commentaries contain a great deal of learned matter, and his grammatico-historical observations are still to some extent useful. But, on the other hand, his learning must not be overestimated. It falls behind that of Origen, Eusebius and Jerome, notwithstanding the superiority of his method It is specially noticeable that Theodore troubled himself little about textual criticism. He simply accepts the text of the LXX as that or revelation, and never manifests the slightest effort to control it by the original or even by the Syriac. He is a prosaic and often monotonous writer, and has other faults, e.g a lack of insight into the deeper movements of scriptural thought, and a want of spiritual and devotional fervour.

In addition to his commentaries Theodore also wrote extensive dogmatico-polemical works, which were destined to operate long after his death disastrously for his fame. As a disciple of Diodorus, Theodore accepted the Nicene teaching on the doctrine of the Trinity, but at the same time in christology took up a position very closely approaching that of Paul of Samosata. The violence of his opposition to his fellow-countryman, Apollinaris of Laodicea, perhaps the most acute and far-seeing theologian of the century, made it

necessary for Theodore to formulate his christology with precision (in fifteen books on the Incarnation — all lost except a few fragments — and in special treatises against Apol- linaris). He starts with a theory of man's relation to the world. Man is the vinculum of the cosmos, uniting in his person the material and .the spiritual. This bond, broken by sin, was restored by Christ. According to Theodore the Logos assumed a complete manhood, which had to pass through the stages of ethical development just as in the case of any other human being. In this the Logos only supported the man Christ Jesus, but was not essentially connected with him; the Logos dwelt in him {kvoualv), but any such thing as iruxns 4>vaucri did not and could not exist, because the finite is not " capax infiniti," and because any ivoiais would have destroyed the reality of the human nature. The same sober and thoughtful way of looking at things, and the same tendency to give prominence to the moral element, which charac- terize the commentaries of Theodore, appear also in his dogmatic. When, accordingly, the Nestorian controversy broke out, his works also were dragged into the discussion. At Ephesus, indeed, the memory of Theodore does not appear to have been attacked, 1 but soon afterwards the assault began. Marius Mercator, Rabbula of Edessa, Cyril, and other monophysites brought the charge of heresy against his writings, and sought to counteract their influence. But it was not until more than a century afterwards that his fanatical adversaries succeeded — in spite of the strong opposition of the best theologians of the West — in obtaining from Justinian the condemna- tion of his works in the controversy of the Three Chapters; this act of the emperor was confirmed by the fifth oecumenical council, and Theodore's name was accordingly deleted from the list of orthodox writers. From that day Theodore's works ceased to be read within the Byzantine Church, and hence have been lost. The Syrians, on the other hand, have always held in high esteem the memory of the great teacher, and have even carried back their liturgy to his name. The Nestorians, who called him " the Inter- preter,"

possess, or possessed, a very large number of writings by him in Syriac translations. 2

Theodore took part also in the Pelagian controversy at the time when it raged in Palestine. In the treatise, only partially pre- served, 3 Hpds robs \eyovTCLs 4>i>

A brother of Theodore, Polychronius by name, bishop of Apamea in Syria (d. 430) also achieved high fame as an exegete, and expounded the theology of the school of Antioch. 4

Literature.— Migne, Patrol., ser. Gr., lxvi. The Greek frag- ments of Theodore's New Testament commentaries have been

1 A confession, however, drawn up by him was spoken of ; see Hahn, Biblioth. der Symbole, 2nd ed., p. 229 seq.

'See the catalogue in Assemani, Bibl. Or., lii. 1, p. 3 seq., based on Ebedjesu, the Nestorian metropolitan (d. 1318).

' See Photius, Biblioth., c. 177; Mercator, p. 339 seq., ed. Baluz.

•See O. Bardenhewer, Polychronius (Freiburg, 1879).

collected by O. Fr Fritzsche (Theod. Mops, in N.T, Comm., Turin, 1847). The commentaries on the Pauline epistles (Pitra, Spici- legium Soiesmense, Paris, 1852, i. 49 seq.) have been edited by H. B. Swete {Theod. Mops, in Epp. B. Pauli Comm., i., ii., Cambridge, 1880-82), along with the Greek fragments and the fragments of the dogmatical writings; on this edition, see E. Schiirer, Theol. Lit. Ztg., 1880-82. The commentary on the Minor Prophets will be found in Mai's Nov. Pair. Biblioth., vii. 1854 (Berlin, 1834; Mai, Script. Vet. Nov. Coll., vi., 1832). See also E. Sachau, Theod. Mops. Fragm. Syriaca (Leipzig, 1869); Fr- Bathgen, " Der Psalmen- commentar des Theod. v. Mops, in Syr. Bearbeitung," in Ztschr. f. Alt-Test. Wissensch., v. 53 seq., vi. 261-288, vii. 1-60; and H. Lietzmann in

Sitzungsberichte der Kgl. preuss. Akad. der Wissensch. zu Berlin, 1902, pp. 334 seq. Extracts from the writings of Theodore occur in the Catenae of Marius Mercator, in the Acta ofthe third and fifth oecumenical councils in Facundus, Liberatus, and Theodore's chief adversary Leontius Byzantinus. E. von Dobschiitz, in Amer. Journ. of Theol., ii. 353–387, published the Greek prologue of a commentary on Acts that is probably the work of Theodore.

The princ'pal monograph on Theodore, arjart from the prolego- mena of Swete, and the same writer's article in Diet. Christian Biog., iv. (1887), is that of H. Kihn (Th. v. Mops. u. Junilius Afric. als Exegeten, Freiburg, 1880). On his importance for the history of dogma see the works of Baur, Dorner, Harnack, Loofs and Seeberg. Literary and biographical details will be found in O. Fr. Fritzsche, De Theod. Mops. Vita el Scriptis (Halle, 1836); Fr. A. Specht, Theod. v. Mops. u. Theodoret (Munich, 1871); H. Kihn in the Tub. Quattalsr.hr., 1879: E. Nestle in Theol. Stud, aus Wiirtemb., ii. 210 seq.; P. Batiffol, " Sur une Traduction Latine de Th. de Mops.," in Ann. de Philos. Chret., 1885; Th. Zahn, " Das N. T. Theodors von Mop.," in Neue Kirchl. Zeitschr., xi. 788–806; W. Wright, Syriac Literature (London, 1894); R. Duval, La littera- ture syriaque (Paris, 1899). (A. Ha.)

THEODORET, bishop of Cyrrhus, an important writer in the domains of exegesis, dogmatic theology, church history and ascetic theology, was born in Antioch, Syria, about 386. At an early age he entered the cloister; and in 423 he became bishop of Cyrrhus, a small city in a wild district between Antioch and the Euphrates, where, except for a short period of exile, he spent the remainder of his life. The date of his death is uncertain, but it must have been at least six or seven years later than the council of Chalcedon (451). Although thoroughly devoted to the ideals of monasticism, he discharged his episcopal duties with remarkable zeal and fidelity. He was diligent in the cure of souls, labouring hard and successfully for the conversion of the numerous

Gnostic communities and other heretical sects which still maintained a footing within the diocese. He himself claims to have brought more than a thousand Marcionites within the pale of the church, and to have destroyed many copies of the Diatessaron of Tatian, which were still in ecclesiastical use; and he also exerted himself to improve the diocese, which was at once large and poor, by building bridges and aqueducts, beautifying the town, and by similar works.

As an exegete Theodoret belongs to the Antiochene school, of which Diodorus of Tarsus and Theodore of Mopsuestia were the heads. He was not actually the personal disciple of either, but he adopted their methods, though without the consistency and boldness of the first-named. His extant commentaries (those on Canticles, on the Prophets, on the book of Psalms and on the Pauline epistles — the last the most valuable) are among the best performances of the fathers of the church. They are brief, yet not wanting in that element of practical edification on which Chrysostom lays special weight as characteristic of the Antiochenes. In addition to these complete commentaries, we have fragments of some others (of that on Isaiah, for example), principally met with in catenae. There are also special elucidations of some difficult Scripture texts.

Theodoret's chief importance is as a dogmatic theologian, it having fallen to his lot to take part in the Nestorian controversy and to be the most considerable opponent of the views of Cyril and Dioscurus of Alexandria. For more than twenty years he maintained the struggle against the Alexandrian dogmatic and its formulae {deordKOS, ivwms naB' vir6vgesch., vol. ii.). The issue was not unfavourable to Theodoret's cause, but melan choly enough for Theodoret himself: the council of Chalcedon condemned monophysitism, but he unhappily yielded to pressure so far as also to take part in pronouncing " anathema upon Nestorius, and upon all who call not the Holy Virgin Mother of God, and who divide the ons Son into two." As Theodoret had

previously been a constant defender of Nestorius it was impossible for him to concur in this sentence upon his unfortunate friend with a clear conscience, and in point of fact he did not change his own dogmatic position. It is painful, therefore, to find him in his asubsequent Epitome classing Nestorius as a heretic, and speaking of him with the utmost hostility. Some of Theodoret's dogmatic works are no longer extant: of his five books Ilepi kvavBpunr-qatw, for example, directed against Cyril after the council of Ephesus, we now possess fragments merely. A good deal of what passes under his name has been wrongly attributed to him. Certainly genuine are the refutation ('AvaTpairy) of Cyril's twelve &yaB(naTi. (rp.oi of Nestorius, and the 'Epavhrris, or IIo\u/aop^>os, (written about 446), consisting of three dialogues, entitled respectively "ArpeirTos, 'kovyxvros, and 'KvaSiis, in which the monophysitism of Cyril is opposed, and its Apollinarian character insisted on. Among the apologetico-dogmatic works of Theodoret must be reckoned his ten discourses Ilepi -xpovoiox.

Theodoret gives a valuable exposition of his own dogmatic in the fifth book of his Aipertxys naiconvSlas iin.Toij.fi, already re- ferred to. 1 This, the latest of his works in the domain of church history (it was written after 451), is a source of great though not of primary importance for the history of the old heresies. In spite of the investigations of Volkmar and Hilgenfeld, we are still somewhat in the dark as to the authorities he used. The chief uncertainty is as to whether he knew Justin's Syntagma, and also as to whether he had access to the Philosophumena of Hippolytus in their complete form. Besides this work Theodoret has also left us a church history in five books, from 324 to 429, which was published shortly before the council of Chalcedon. The style is better than that of Socrates and Sozomen, as Photius has remarked, but as a contribution to history the work is inferior in

importance. Its author made use of Eusebius's Life of Consianlim, and of the histories of Rufinus, Socrates and Sozomen, and probably of Philo- storgius as well. He also used other sources, and made a thorough study of the writings of Athanasius, but apart from some docu- ments he has preserved, relating to the Arian controversy, he does not contribute much that is not to be met with in Socrates. As regards chronology he is not very trustworthy; on the other hand, his moderation towards opponents, not excepting Cyril, deserves recognition. The 'EXXtjxikSi' 0epaxcUT«ij ira $t))xa.T

*On this side of his character, however, Theodoret can best be studied in the thirty ascetic biographies of his *iX60eos iaropla. This collection, which has been widely read, is a pendant to the Historia Lausiaca of Palladius and the monkish tales of Sozomen. For the East it has had the same importance as the similar writings of Jerome, Sulpicius Severus and Cassian for the West. It shows that the " sobriety " of the Antiochene scholars can be predicated only of their exegesis; their style of piety was as exaggerated in its devotion to the ideals of monasticism as was that of their mono- physite opponents. Indeed, one of the oldest leaders of the school, Diodorus of Tarsus, was himself among the strictest ascetics.*

181 letters of Theodoret have come down to us, partly in a separate collection, partly in the Acta of the councils, and partly in the Latin of Marius Mercator; they are of great value not only for the biography of the writer, but also for the history of his diocese and of the church in general.

The edition of Sirmond (Paris, 1642) was afterwards completed by Gamier (1684), who has also written dissertations on the author's works. Schulze and Nosselt published a new edition (6 vols., Halle, 1769-74) based on that of their predecessors; a glossary was afterwards added by Bauer. The reprint will_ be found in vo!s. lxxx.lxxxiv. of Migne, and considerable portions occur in Mansi. The church

history has been published frequently in con nexion with the histories of Socrates, Sozomen and others, e.g. by Valesius (1693) and Reading (1720). There is an English transla- tion of the history by Bloomfield Jackson in the Nicene and Posl- Nicene Fathers, series ii., vol. iii.; the translation including also the dialogues and letters.

Besides the earlier labours of Tillemont, Ceillier, Oudin, Du Pin and Fabricius and Harless, see Schrockh, Kirchengesch., vol. xviii. ; Hefele, Conc.-gesch., vol. ii.; Richter, De Theodnreto Epp. Paul. Interprete (Leipzig, 1822); Binder, Etudes sur Theodoret (Geneva, 1844); Staudlin, Gesch. u. Lit. der Kirchengesch. (Hanover, 1827); Kihn, Die Bedeutung der antioch. Schule (1866); Diestel, Das A. T. in der christl. Kirche (Jona, 1869); Specht, Theodor v. Mopsvestia

1 Roman Catholic writers vary greatly in their estimate of Theodoret's christology and of his general orthodoxy. On Ber- tram's essay on this subject (Theodoreti, Episcopi Cyrensis, Doctrina Christologica, Hildesheim, 1883), see Theol. Lit.-Ztung. (1883), 563 seq.

u. Theodoret v. Cyrus (Munich, 187"); Roos, De Theodoreto Clementis el Eusebii Compilatore (Halle, 1883); Nolte in the Tubing. Quar- talschr. (1859), p. 302 seq.; Moller, art. "Theodoret," in Herzog-Hauck's Realencykl.; Venables's article in Smith and Wace's Diet, of Christian Biography; also Bardenhewer's Patrologie, p. 345 ff. On the sources of Theodoret's church history see Jeep, Quellen-unlersuchungen z. d. Griech. Kirchenhistorikern (Leipzig, 1884) ; and especially Giildenpenning, Die Kirchengesch. des Theodoret von Kyrrhos (Halle, 1889). (A. Ha.; A. C. McG.)

THEODORIC, king of the Ostrogoths (c. 454-526). Referring to the article Goths for a general statement of the position of this, the greatest ruler that the Gothic nation produced, we add here some details of a more personal kind. Theodoric was born about the year 454, and was the son of

Theudemir, one of three brothers who reigned over the East Goths, at that time settled in Pannonia. The day of his birth coincided with the arrival of the news of a victory of his uncle Walamir over the sons of Attila. The name of Theodoric's mother was Erelieva, and she is called the concubine of Theudemir. The Byzantine historians generally call him son of Walamir, apparently because the latter was the best known member of the royal fraternity. At the age of seven he was sent as a hostage to the court of Constantinople, and there spent ten years of his life, which doubtless exercised a most important influence on his subsequent career. Soon after his return to his father (about 471) he secretly, with a cornitutus of 10,000 men, attacked the king of the Sarmatians, and wrested from him the important city of Singidunum (Belgrade). In 473 Theudemir, now chief king of the Ostrogoths, invaded Moesia and Macedonia, and obtained a permanent settlement for his people near Thessalonica. Theodoric took the chief part in this expedition, the result of which was to remove the Ostrogoths from the now barbarous Pannonia, and to settle them as foederati in the heart of the empire. About 474 Theudemir died, and for the fourteen follow- ing years Theodoric was chiefly engaged in a series of profitless wars, or rather plundering,, expeditions, partly against the emperor Zeno, but partly against a rival Gothic chieftain, another Theodoric, son of Triarius. 2 In 488 he set out at the head of his people to win Italy from Odoacer. There is no doubt that he had for this enterprise the sanction of the em- peror, only too anxious to be rid of so troublesome a guest. But the precise nature of the relation which was to unite the two powers in the event of Theodoric's success was, perhaps purposely, left vague. Theodoric's complete practical inde- pendence, combined with a great show of deference for the empire, reminds us somewhat of the relation of the old East India Company to the Mogul dynasty at Delhi, but the Ostrogoth was sometimes actually at war with his imperial friend. The invasion and conquest of Italy occupied more than four years (488-493). Theodoric, vfho marched round the head of

the Venetian Gulf, had to fight a fierce battle with the Gepidae, probably in the valley of the Save. At the Sontius (Isonzo) he found his passage barred by Odoacer, over whom he gained a complete victory (28th of August 489). A yet more decisive victory followed on the 30th September at Verona. Odoacer fled to Ravenna, and it seemed as if the conquest of Italy was complete. It was delayed, however, for three years by the treachery of Tufa, an officer who had deserted from the service of Odoacer, and of Frederic the Rugian, one of the companions of Theodoric, as well as by the intervention of the Burgundians on behalf of Odoacer. A sally was made from Ravenna by the besieged king, who was defeated in a bloody battle in the Pine Wood. At length (26th of February 493) the long and severe blockade of Ravenna was ended by a capitulation, the terms of which Theodoric disgracefully violated by slaying Odoacer with his own hand (15th of March 493). (See Odoacer.)

The thirty-three years' reign of Theodoric was a time of unexampled happiness for Italy. Unbroken peace reigned within her borders (with the exception of a trifling raid made by Byzantine corsairs on the coast of Apulia in 508). The

2 In one of the intervals of friendship with the emperor in 483 Theodoric was made master of the household troops and in 484 consul.

venality of the Roman officials and the turbulence of the Gothic nobles were sternly repressed. Marshes were drained, harbours formed, the burden of the taxes lightened, and the state of agriculture so much improved that Italy, from a corn-import- ing, became a corn-exporting country. Moreover Theodoric, though adhering to the Arian creed of his forefathers, was during the greater part of his reign so conspicuously impartial in religious matters that a legend which afterwards became

current represented him as actually putting to death a Catholic deacon who had turned Arian in order to win his favour. At the time of the contested papal election between Symmachus and Laurentius (496–502), Theodoric's mediation was welcomed by both contending parties. Unfortunately, at the very close of his reign (524), the Emperor Justin's persecution of the Arians led him into a policy of reprisals. He forced Pope John to undertake a mission to Constantinople to plead for toleration, and on his return threw him into prison, where he died. Above all, he sullied his fame by the execution of Boetius and Sym- machus (see Boetius). It should be observed, however, that the motive for these acts of violence was probably political rather than religious — jealousy of intrigues with the imperial court rather than zeal on behalf of the Arian confession. Theo- doric's death, which is said to have been hastened by remorse for the execution of Symmachus, occurred on the 30th of August 526. He was buried in the mausoleum which is still one of the marvels of Ravenna (q.v.), and his grandson Athalaric, a boy of ten years, succeeded him, under the regency of his mother Amalasuntha.

Genealogy of Theodoric.

Theudemir = Erelieva. d. 474. I

A first wife=THEoDORTc= Audefleda,

454–526. I sister of Clovis,

I king of the Franks.

Ostrogotho

Theudegotho

(or Arevagni),

marred

married

Sigismund,

Alaric II.,

king of the

king of the

Burgundians.

West Goths.

1.

1

Segeric,

Amalaric,

murdered

king of the

by his

West Goths,

father’s

<*• 53i-

orders, 522.

Amalasuntha : d. 534-

Eutharic, a descendant of the Amals.

Athalaric, Witigis = Matasuentha = Germanus,

d. 534. nephew of

Justinian.

Germanus Postumus,

put to death by

Phocas, 605.

Amalafrida. a full sister of Theodoric, married Thrasamund, king of the Vandals, and was mother, by an earlier marriage, of Theodahad (d. 536).

Authorities. — The authorities for the life of Theodoric are very imperfect. Jordanes, Procopius, and the curious fragment known as Anonymus Valesii (printed at the end of Ammianus Marcellinus) are the chief direct sources of narrative, but far the most important indirect source is the Variae (state- papers) of Cassiodorus, chief minister of Theodoric. Malchus furnishes some interesting par- ticulars as to his early life, and' it is possible to extract a little information from the turgid panegyric of Ennodius. Among German scholars F. Dahn (Konige der Germanen, ii., hi. and iv.), J. K. F. Manso (Geschichte des Ostgothischen Reichs in Italien, 1824), and Sartorius (Versuch iiber die Regierung der Ostgothen, &c.) have clone most to illustrate Theodoric's principles of government. The English reader may consult Gibbon's Decline and Fall, chap, xxxix., and Hodgkin's Italy and her Invaders, vol. iii. (1885), his intro- duction to Letters of Cassiodorus (1886) and Theodoric the Goth (London and New York, 189 1). For the legends connected with the name of Theodoric see the article Dietrich of Bern.

(T. H.)

THEODORUS, FLAVIUS MALLIUS, Roman consul a.d. 399, author of an extant treatise on metres, one of the best of its kind (H. Keil, Grammatici Latini, vi.). He also studied philo- sophy, astronomy and geometry, and wrote works on those subjects, which, together with his consulship, formed the sub- ject of a panegyric by Claudian.

THEODORUS STUDlTA (a.d. 750–826), Greek theological writer, abbot of the monastery of Studium, was born at Con- stantinople. In 794 he succeeded his uncle Plato, who had persuaded him to become a monk some ten years before, as head of the monastery of Saccudium in Bithynia. Soon after- wards he was banished to Thessalonica for having excommuni- cated

Constantine VI., who had divorced his wife Maria in order xxvi. 25

to marry Theodote. After the emperor's death in 797 he was recalled with every mark of favour, and removed with his monks to the monastery of Studium in Constantinople, where he carried on a vigorous campaign in favour of asceticism and monastic reform. In 809 he was again banished in consequence of his refusal to hold communion with the patriarch Nicephorus, who had pardoned the priest Joseph for his part in the marriage of Constantine and Theodote. In 811 he was recalled by Michael Rhangabes, and again banished in 814 for his resistance to the edict of Leo the Armenian, which forbade the worship of images. Liberated in 821 by the Emperor Michael the Stam- merer (Balbus), he soon got into trouble again. In 824 he violently attacked Michael for showing too great leniency towards the iconoclasts and even favoured an insurrection against him. When the attempt failed, Theodoras found it prudent to leave Constantinople. He lived at various monas- teries in Bithynia, on Chalcitis (one of the Princes' Islands) and on the peninsula of Tryphon, near the promontory of Acrita, where he died on the nth of November 826. He was buried at Chalcitis, but his body was afterwards (26th of January 844) removed to Studium. He subsequently re- ceived the honours of canonization. Of his extant works the following are the most important: — Letters, which are of con- siderable value as giving an insight into the life and character of the writer, and throwing light upon the ecclesiastical dis- putes in which he was involved; Catecheses (divided into Magna and Parva), two collections of addresses to his monks on various subjects connected with the spiritual life; funeral orations on his mother and his uncle Plato; various polemical discourses connected with the question of image-worship. He was also the author of epigrams on various subjects, which show considerable originality, and of some church hymns. Like all the monks of Studium, Theodore was famous for his calligraphy and industry in copying MSS.

Bibliography. — General edition of his works in J. P. Migne, Patrologia Graeca, xcix., to be supplemented (for the Letters) by A. Mai s Patrum Nova Bibliotheca, viii. (1871) and (for the Catecheses) by ib., ix. (1888), which contains the Greek text of the Parva (also ed. separately by E. Auvray, 1891); hymns in J. B. Pitra, Analecta Sacra, i. (1876). See also Alice Gardner, Theodore of Studium: his Life and Times (1905), containing specimens of English translation and an account of his published works; C. Thomas, Theodor von Sludion und sein Zeitalter (1892) ; G. A. Schneider, Theodor von Sludion, in " Kirchengeschichtliche Studien," v. 3 (Miinster, 1900) ; S. Schiwietz, De Sancto Theodoro Studita (Breslau, 1896); E. Marin, De Studio coenobio Constantinopolitano (1897); C. Schwarzlose, Der Bilderstreit (1890); A. Tougard, La Persecution iconoctaste d'apres la correspondance de saint Theodore Studite (1891). Some of the hymns have been translated by J. M. Neale in his Hymns of the Eastern Church. For further bibliographical details see C. Krumbacher, Gesch. der byz. Litt. (2nd ed., 1897) and article by Von Dobschiitz in Herzog-Hauck's Realencyclopadie filr protestantische Theologie, xix. (1907). On his relation to Theophanes Confessor (q.v.), see J. Pargoire, ,: Saint Theophane le Chronographe et ses rapports avec saint Theodore Studite " in Bufacrti'd XpoviKb, ix. (St Petersburg, 1902).

THEODOSIA, formerly Kaffa, a seaport and watering-place of South Russia, on the east coast of the Crimea, 66 m. E.N.E. of Simferopol and 72 m. by a branch line from the Sebastopol- Ekaterinoslav railway. It has an excellent modern harbour, and its roadstead, which is never frozen, is well protected from east and west winds, and partly also from the south, but its depth is only n to 14 ft., reaching 35 ft. in the middle. The population was 10,800 in 1881, and 27,236 in 1897. Among the motley population of Russians, Tatars, Armenians, Germans and Greeks are several hundred Qaraite Jews. Few remains of its former importance exist, the chief being the Citadel built by the Genoese and still

showing Latin inscriptions on some of its towers, the one or two detached towers left when the town walls were pulled down, and two or three mosques, formerly Genoese churches. The town also possesses a museum of antiquities and a picture gallery containing the works of the marine painter Ayvazovsky. Theodosia is an episcopal see of the Orthodox Greek Church. Gardening is one of the leading industries; fishing, a few manufactures, and agriculture are

carried on. Theodosia has gained much of the trade of Sevastopol since that town was made a military port in 1894, and the value of its exports (15-25 millions sterling annually), principally grain and oil-seeds, is increasing year by year. A bronze statue of Alexander III. was put up on the sea-front in 1896.

The ancient Theodosia, the native name of which was Ardabda, was a colony founded from Miletus. Archaic terra- cottas show it to have been inhabited in the 6th century B.C., but it is first heard of in history as resisting the attacks of Satyrus, ruler of the Cimmerian Bosporus, c. 390 B.C. His successor Leucon took it and made it a great port for shipping wheat to Greece, especially to Athens. This export of wheat continued until the days of Mithradates VI. of Pontus, against whom the city revolted. Later it became a special part of the Bosporan kingdom with its own governor. In the 3rd cen- tury a.d. it was still inhabited, but seems to have been deserted not long afterwards. Besides the terra-cottas and pottery very beautiful Greek jewelry has been found near Theodosia. It coined silver and copper during the 5th and 4th centuries B.C. The name Kaffa (Genoese Capha, Turkish Kefe) first occurs in a writer of the 9th century. The Genoese established them- selves on the site shortly after 1266, and the settlement flourished exceedingly, being the depot of a trade route reaching to China. It became the

head of the Genoese establishments in Gazaria, the see of a bishop, and the chief port on the northern shore of the Black Sea, far surpassing the Venetian Tana. Its popula- tion is said to have reached 80,000 souls of many creeds and nationalities. There was a citadel (still remaining) and magnifi- cent walls. These were rendered necessary by the occasional hostility of the Tatar khans. When the Turks took Constanti- nople the colony was almost cut off from the mother city, which handed it over to the enterprising bank of St George; but it could not be saved and fell in 1475 to the Turks, who sometimes called it Kuchuk-Stambul (Little Stambul or Con- stantinople) or Krym-Stambul (Stambul of Crimea). Its new masters kept it under their own direct rule and its prosperity was not entirely destroyed. In 1771 it was taken by the Russians, and in 1783 annexed by them, whereupon the greater part of its population deserted it. Its prosperity did not return until about 1894, when new harbour works made it a convenient port for grain ships coming light out of the Sea of Azov and wishing to complete their cargoes.

See E. von Stern, Theodosia (German and Russian, Odessa, 1906); E. H. Minns, Scythians and Greeks (Cambridge, 1909); for the history of Kaffa see Heyd, Histoire du commerce du Levant au moyen age (Paris, 1886), vol. ii. (E. H. M.)

THEODOSIUS, the name of three Roman emperors of the East.

Theodosius I., " the Great," son of Theodosius, Valen- tinian's great general, who in 368-69 drove back the Picts and Scots from the Roman territories in Britain and suppressed the revolt of Firmus in Mauretania (372). Shortly after (376), the elder Theodosius was put to death by order of Valens, probably through fear lest he should be the Theodosius or Theodore whom a magician had indicated as the future emperor. The younger Theodosius was born about the year 346. He was a native of Spain, but the exact place of his birth is uncertain (Cauca in Galicia according to Idatius and Zosimus, Italica

according to Marcellinus). He accompanied his father into Britain (368), and a little later distinguished himself by defeat- ing the Sarmatians who had invaded Moesia (374). On his father's death he retired to his native place, where he lived quietly till after the great battle of Adrianople (August 9, 378), when Gratian summoned him to share the empire. After gaining some fresh victories over the Sarmatians, Theodosius was made Augustus at Sirmium on the 19th of January 379, and was assigned all the eastern provinces, including part of Illyricum. It was a time of great peril for the Roman state. While the Visigoths were carrying their raids up to the walls of Constantinople, bands of Ostrogoths, Taifali, Huns and Alans joined them in overrunning the Balkan countries. In 379

Theodosius, after reorganizing the army at Thessalonica, carried on a successful campaign of skirmishes along the Danube and induced numerous Gothic bands to give in their allegiance; his lieutenant Modares, a Gothic refugee, defeated the in- vaders severely in Thrace. At the end of the year Theodosius went to Constantinople to be crowned. Returning to Thessa- lonica in 380 he was kept out of the field for some time by a serious illness. In this year or the next he was called upon to meet two armies of invaders. He conducted in person the war against the Visigoths under Fritigern (in Macedonia and Epirus), and on one occasion was nearly betrayed into the enemy's hands; this campaign, in which Gratian's general Arbogast eventually lent help, was ended by Fritigern's death. The defence of the Danube against the Ostrogoths under Alatheus and Safrax was entrusted to the general Promotus, who severely defeated the enemy in an attempt to cross the river. Theo- dosius attained even greater successes by his diplomacy. He persuaded the fugitive Visigoth king Athanaric to enter his service, and enlisted 40,000 of his former enemies as foederali, providing them with settlements in various parts of the realm. Though this kindness towards the Germanic tribes was resented by the Romans, and in some cases ill

requited, yet it may be said that it not only averted a great danger to the empire, but considerably strengthened Theodosius' army. In 382 the paci- fication of the Balkans was complete. In 386 Promotus checked a new attempt at invasion on the Danube.

In 383 Theodosius created his eldest son Arcadius Augustus. The same year saw the revolt of Maximus in Britain and the murder of Gratian. For five years Theodosius consented to accept the usurper as his colleague; but when Maximus at- tempted a few years later to make himself master of Italy Theodosius advanced against the invader and overthrew him near Aquileia (July 28, 388). This victory was followed by the murder of Maximus and his son Victor, after whose death Theodosius conferred upon Valentinian II. all that part of the empire which his father had held. After celebrating a triumph in Rome (389) he stayed to arrange the government of Italy for another two years. If we may trust the evidence of Zosimus, from the end of the year 388 Theodosius resigned himself to gluttony and voluptuous living, from which he was only roused by the news that in the Western empire Arbogast had slain the young Emperor Valentinian and set up the grammarian Eugenius in his stead (May 15, 392). ■

Theodosius made extensive levies and with a force partly composed of barbarian auxiliaries marched out against Eugenius. The armies met near the river Frigidus, some thirty-six miles distant from Aquileia. On the first day Theo- dosius' barbarians, engaging with those of the hostile army, were almost destroyed, and the victory seemed to be with Eugenius. After a night of prayer, towards cockcrow the emperor was cheered by a vision of St Philip and St John, who, mounted on white steeds, promised him success. On the second day the issue was doubtful till, if we may trust the con- current testimony of all the contemporary church historians, a sudden gust of wind blew back the enemy's arrows on them- selves. This was the turning-point of the battle: Eugenius was slain by the soldiers; and two days later Arbogast com- mitted suicide (September 5-9,

394). From the north-eastern parts of Italy Theodosius passed to Rome, where he had his son Honorius proclaimed emperor under the guardianship of Stilicho. Thence he retired to Milan, where he died of dropsy (January 17, 395), leaving the empire to be divided between his two sons Honorius and Arcadius.

Important as the reign of Theodosius was from the political point of view, it is perhaps still more so from the theological. According to Sozomen, his parents were both orthodox Christians, according > to the creed sanctioned by the council of Nicaea. It was not, however, till his illness at Thessalonica that the emperor received baptism at the hands of Bishop Ascholius, whereupon, says the same historian, he issued a decree (February 380) in favour of the faith of St Peter and Pope Damasus of Rome. This was to be the true Catholic faith ; the adherents of other creeds were to be reckoned as heretics and punished. The great council of

Constantinople, consisting of 150 orthodox and 36 Macedonian bishops, met in the following year, confirmed the Nicene faith, ordered the affairs of the various sees, and declared the bishop of Constantinople to rank next to the bishop of Rome. The emperor cannot be acquitted of the intolerance which marks edicts such as that depriving apostatizing Christians of the right of bequest. It was not till 389 or 390 that he issued orders for the destruction of the great image of Serapis at Alexandria. Other edicts of an earlier or later date forbade the unorthodox to hold assemblies in the towns, enjoined the surrender of all churches to the catholic bishops, and overthrew the heathen temples ” throughout the whole world.” During the reign of Theodosius Gregory of Nazianzus was made bishop of Constantinople. In 383 Theodosius called a new council for the discussion of the true faith. The orthodox, the Arians, the Eunomians and the

Macedonians all sent champions to maintain their special tenets before the emperor, who finally decided in favour of the orthodox party. He seems to have suffered the Novatians to hold assemblies in the city. Perhaps the most remarkable incident in the life of Theodosius from a personal point cf view is the incident of his submission to the reprimands of Ambrose, who dared to rebuke him and refuse to admit him to the Eucharist till he had done public penance for punishing a riot in Thessalonica by a wholesale massacre of the populace. Equally praiseworthy is the generous pardon that the emperor, after much intercession, granted to the seditious people of Antioch, who, out of anger at the growing imposts, had beaten down the imperial statues of their city (387). When the Christians in the eastern part of the empire destroyed a Jewish synagogue and a church belonging to the Valentinians, Theodosius gave orders for the offenders to make reparation. Such impartial conduct drew forth a remonstrance from Ambrose, who, where the interests of his creed were concerned, could forget the common principles of justice.

Theodosius was twice married — (1) to Aelia Flacilla, the mother of Arcadius (377-408) and Honorius (384-423) ; (2) to Galla (d. 394), the daughter of Valentinian I.

The chief authorities for the age of Theodosius are Ammianus Marcellinus, Zosimus, Eunapius and the ecclesiastical historians (Socrates, Sozomen, Theodoret). Much information may also be gleaned from the writings of St Ambrose, St Gregory of Nazianzus, Isidore of- Seville, and the orators Pacatus, Libanius, Themistius. Among modern authorities see: E. Gibbon, The Decline and Fall of t)ie Roman Empire (ed. Bury, London, 1896), chaps. 25 and 27; T. Hodgkin, Italy and her Invaders (Oxford, 1892), chaps. 5, 6, 8-1 1 ; A. Giildenpenning and J. Ifland, Der Kaiser Theodosius der Grosse (Halle, 1878); G. R. Sievers, Studien zur Geschichte der romischen Kaiser (Berlin, 1870), pp. 283-333.

Theodosius II. (401–450) succeeded his father Arcadius as emperor of the East in 408. During his minority the empire was ably ruled by the praetorian prefect Anthemius and Pul- cheria, who became her brother's guardian in 414. Under his sister's care the young emperor was trained in divers accom- plishments which won him the name of Calligraphes (" the Penman "), but grew up into a weak though amiable character. Through his generals Ardoburius and Aspar he waged two fairly successful wars against the Persians (421 and 441), and after the failure of one expedition (431) by means of a gigantic fleet put an end to the piracies of the Vandal Genseric. A Hunnish invasion in 408 was skilfully repelled, but from 441 the Balkan country was repeatedly overrun by the armies of Attila, whose incursions Theodosius feebly attempted to buy off with ever- increasing payments of tribute. His internal administration, though not sufficiently rigorous to check abuses, was upright and thoughtful. Among its - chief events may be mentioned the endowment of the university of Constantinople (425), the conciliatory council of Ephesus (434) and the publication of the Codex Theodosianus (438), a collection of imperial constitutions for the benefit of public officials, which is our chief source of information about the government of the empire in the 5th century. In 450 Theodosius died of injuries sustained through a fall from his horse.

See E. Gibbon, The Decline and Fall of the Roman Empire (ed. Bury, London, 1896), iii. pp. 381–444; A. Giildenpenning, Geschichte des ostromischen Reiches unter den Kaiscrn Arkadius und Theodosius II. (Halle, 1885), pp. 172 sqq.; T. Mommsen and P. Meyer, Theodosii libri XVI. (Berlin, 1904–5).

Theodosius III., emperor of the East (716–717), was afinancial officer whom a Byzantine army rebelling against Anastasius III. unexpectedly proclaimed monarch in his stead. He captured Constantinople after a six months' siege and deposed Anastasius, but in the following year was himself forced to resign by a

new usurper, Leo III. (q.v.). Theodosius ended his life in a monastery.

See G. Finlay,! History of Greece (ed. 1877, Oxford), i. p. 396).

(M. O. B. C.)

THEODOSIUS OF TRIPOLIS, Greek geometer and astronomer, three of whose works were contained in the collection of lesser writings named 6 fiiKpos acTpovofiovfuvos (sc. towos), or 6 punpos acTpovo/xos. 1 Su'idas erroneously identifies him with a sceptical philosopher of the same name who lived in the second half of the 2nd century a.d. or later, but, on the other hand, distinguishes him from a native of Tripolis who wrote a poem on spring. He is doubtless the same as Theodosius the mathematician, who is mentioned by Strabo amongst the natives of Bithynia distinguished for their learning, and whose sons were also mathematicians, the same, too, as the inventor of a universal sun-dial {horologium Tpos irav icXi/m) of that name who is praised by Vitruvius (De Architecture, ix. 9). His date, there- fore, could not have been later than the 1st century B.C.; he may, however, have lived in the preceding century, inasmuch as the names mentioned by Strabo in the passage referred to above are, as far as we know, arranged chronologically, and Theodosius immediately follows Hipparchus, who made astro- nomical observations between 161 and 126 B.C., and precedes Asclepiades the physician, who lived at Rome at the beginning of the 1st century B.C.

His chief work — aipixa, in three books — is a tolerably com- plete treatise on the pure geometry of the surface of a sphere, and was still the classical book on the subject in Pappus's time. It does not contain (except for a faint suggestion in iii. 11-12) any trace of spherical trigonometry, which, on the other hand, was the special subject of the work having the same title, and included in the same collection, of Menelaus of Alexandria, who lived at the end of the 1st century.

A. Nokk (Ueber die Spharik des Theodosius; Karlsruhe, 1847), Heiberg (Litterargeschichtliche Studien ilber Euklid, pp. 43 seq. ; Leipzig, 1882), and Hultsch (Jahrbucher filr classische Philologte, 1883, pp. 415-420, and Autolycus; Leipzig, 1885) have proved that as early as the middle of the 4th century B.C. there existed a Greek text-book on Spherics which, in its essential contents, scarcely deviated from the three books of Theodosius. He must therefore be regarded as merely the editor, or at most the elaborator and expounder, of a doctrine which existed some centuries before him. A careful analysis of Theodosius' work, from this point of view, will be found in A. A. Bjornbo's Studien iiber Menelaos Spharik (Abhandlungen zur Geschichte der mathematischen Wissenschaften, xiv. ; Teubner, 1902).

The Spherics of Theodosius was translated into Arabic at the beginning of the 10th century, and from the Arabic into Latin in the 1 2th century by Plato of Tivoli (Tiburtinus) This translation was published in 151 8 at Venice, but was found so faulty by J. Voegelinus that he published a new Latin version, together with additions from the Arabian commentators (Vienna, 1529, 4to); other Latin translations were published by F. Maurolycus (Messina, 1558, fol.); by C. Clavius (Rome, 1586, 410); and by Barrow under the title, Theodosii Sphaerica, Methodo Nova Illustrata el Succincte Demonstrata (London, 1675, 4to). The Greek text was first published, and with it a Latin translation, by J. Pena (Paris, 1558, 4to); it has been edited since by Joseph Hunt (Oxford, 1707), and by E. Nizze (Berlin, 1852), but these two editions are founded on that of Pena. There is also a German translation by Nizze (Stralsund, 1826). His two editions are accompanied with valuable notes and an appendix containing additions from Voege- linus and others.

The two other works of Theodosius which have corne down to us have not as yet been published in the original. The propositions, without demonstrations, in the work iripl imtpSsv k

1 This collection contained, according to Fabricius, Bibliolheca Graeca, ed. Harles, iv. p. 16, the following books: — -"Theodosii Tripolitae, Sphaericorum, libri iii. ; Euclidis, Data, Optica, Catoptrica, ac Phaenomena; Theodosii Tripolitae, De Habitationibus et Noctibus ox Diebus, libri ii.; Autolyci Pitanaei, De Sphaera Mota, et libri ii. De Ortu atque Occasu Stellarum Inerrantium ; Aristarchi Samii, De Magnitudinibus ac Distantiis Solis ac Lunae; Hypsiclis Alexandrini, 'Apo^wpucAs sive De Ascensionibus; Menelai, Sphaericorum, libri iii." Euclid's Data is, however, wrongly included, for Pappus, vil., makes it part of analysis (6 i.vaX \ibp.tvos t6hos).

first book of this work of Theodosius. His work xept obcfiaeoiv (On Habitations) also was published by Auria (Rome, 1588). It gives an account of how, for every inhabitant of the earth from the equator to the pole, the starry firmament presents itself in the course of a year. The propositions in it were also given by Dasy- podius in his work mentioned above. (T. L. H.)

THEODULF, bishop of Orleans, was born about the middle of the 8th century, of a noble family of Gothic extraction, pro- bably in Spain. He found favour at the Frankish court, was made abbot of Fleury and of Saint-Aignan, and in 781 became bishop of Orleans. He was a staunch supporter of Charle- magne's principles of government and educational reforms; he established schools, and by his own literary achievements showed himself a worthy member of the learned circle which graced the Carolingian court. He was likewise a good churchman and an able administrator of his diocese; he encouraged the reforma- tion of the clergy and the monasteries. In 798 he was appointed missis dominicus, and two years later performed so great services for Leo III. as judge in the cause between the pope and his enemies, that he returned from Rome with the pallium. After

the death of Alcuin he became the foremost councillor to the king on theological matters: it was he who made, on Charlemagne's request, a collection of the opinions of the fathers on the much-disputed point of the procession of the Holy Ghost. Theodulf maintained his influence a short time after the death of Charlemagne, being sent as escort to Pope Stephen V. who came in 816 to crown Louis the Fair. Later, however, he was accused of having taken part in the con- spiracy of Bernard of Italy, and in 818 was deposed from all his dignities and imprisoned in a monastery at Angers. Theodulf asserted his innocence to the end, and no proof of his guilt has come down to us; in fact, from what we know of the bishop's life and political principles we should presuppose his innocence. He died in prison, probably from poison, in 821.

Theodulf was called Pindar in the palace school of Charlemagne. Fond of Latin literature, whether Christian or pagan, and a friend of the arts, he was himself one of the best writers of the period. His prose works include sermons, treatises on vices and on baptism, a penitential, capitularies and exhortations to bishops, priests and judges. His poems are his best work, and afford us a vivid picture of the times. Theodulf was the author of at least part of the hymn for Palm Sunday, the Gloria laus. The complete works of Theodulf are in J. P. Migne, Patrol. Lot., vol. 105 (Paris, 1851). The best edition of his poetry is that of E. Dummler in the Mon. Germ. Hist. Poetae latini aevi carolini, vol. i. (Berlin, 1881).

See C. Cuissard, Theodulphe eveque a"Orleans, sa vie et ses wuvres, (Orleans, 1892) ; and a critical study of the writings by M. Manitius in Neues Archiv der Ges.fiir a. deutsche Gesch. xi. (1886).

THEOGNIS OF MEGARA (6th century B.C.), Greek poet. More than half the elegiac poetry of Greece before the Alex- andrian period is included in the 1400 lines ascribed to Theognis. This collection contains several poems acknowledged to have been composed by Tyrtaeus, Mimnermus and Solon; with two exceptions

(T. W. Allen in Classical Renew, Nov. 1905, and E. Harrison) modern critics unanimously regard these elegies as intruders, that is, not admitted into his works by Theognis himself; for this and other reasons they assume the existence of further interpolations which we can no longer safely detect. Generations of students have exhausted their ingenuity in vain efforts to sift the true from the false and to account for the origin and date of the Theognidea as we possess them; the question is fully discussed in the works of Harrison and Hudson-Williams.

The best-attested elegies are those addressed to Cyrnus, the young friend to whom Theognis imparts instruction in the ways of life, bidding him be true to the " good " cause, eschew the company of " evil " men (democrats), be loyal to his comrades, and wreak cruel vengeance on his foes. Theognis lived at Megara on the Isthmus of Corinth during the democratic re- volution in the 6th century B.C.; some critics hold that he witnessed the " Persian terror " of 590 and 580; others, in- cluding the present writer, place his floruit in 545 B.C. We know little about his life; few of the details usually given in text-books are capable of proof; we are not certain, for in- stance, that the poem (783-88) which mentions a visit to Sicily,

Sparta and Euboea comes from the hand of Theognis himself; but that is of little concern, for we know the man. Whether, with Harrison, we hold that Theognis wrote "all or nearly all the poems which are extant under his name " or follow the most ruthless of the higher critics (Sitzler) in rejecting all but 330 lines, there is abundant and unmistakable evidence to show what Theognis himself was. However murh extraneous matter may have wormed its way into the collection, he still remains the one main personality, and stands clearly before us, a living soul, quivering with passion and burning with political hate, the very embodiment of the faction-spirit (stasis) and all it implied in the tense city-state life of the ancient Greek.

There is neither profound thought nor sublime poetry in the work of Theognis; but it is full of sound common-sense em- bodied in exquisitely simple, concise and well-balanced verse. As York Powell said, " Theognis was a great and wise man "; he was an able exponent of that intensely practical wisdom which we associate with the " seven sages of Greece." Had he lived a century later, he would probably have published his thoughts in prose; in his day verse was the recognized vehicle for political and ethical discussion, and the gnomic poets were in many ways the precursors of the philosophers and the sophists, who indeed often made their discourse turn on points raised by Theognis and his fellow-moralists. No treatment of the much-debated question "Can virtue be taught?" was regarded as complete without a reference to Theognis 35-36, which appears in Plato, Xenophon, Aristotle, Musonius and Clement of Alexandria, who aptly compares it with Psalm xviii. 26. Another famous couplet is 177-78: " In poverty, dear Cyrnus! we forego | Freedom in word and deed — body and' mind, [Action and thought, are fetter'd and confin'd" (trans. Frere), discussed by Aristotle, mercilessly criticized by Lucian and the Stoics, and warmly commended by Ammianus Marcellinus, who introduces the author as " Theognis poeta vetus et prudens." For many generations Theognis was to the Greeks the moralist par excellence; Isocrates says that Hesiod, Theognis and Phocylides were admitted to be the best teachers of practical morality; and the Emperor Julian in his defence of paganism asks whether " the most wise Solomon is equal to Phocylides or Theognis or Isocrates."

Besides the elegies to Cyrnus the Theognidea comprise many maxims, laments on the degeneracy of the age and the woes of poverty, personal admonitions and challenges, invocations of the gods, songs for convivial gatherings and much else that may well have come from Theognis himself. The second section (" Musa Paedica ") deals with the love of boys, and, with the exceptions already noted, scholars are at one in reject- ing its claim to

authenticity. Although some critics assign many elegies to a very late date, a careful examination of the language, vocabulary, versification and general trend of thought has convinced the present writer that practically the whole collection was composed before the Alexandrian age.

Editions. — Imm. Bekker (1815, 2nd ed. 1827); F. G. Welcker (1826); both these are epoch-making books which no serious student can ignore; Th. Bergk (1843, 4th ed. 1882; re-edited by E. Hiller, 1890, and O. Crusius, 1897); J. Sitzler (1880); E. Harrison (1902) ; T. Hudson-Williams (1910). For further bibliographical references see the two last-mentioned books. There is a prose translation by J. Banks in Bohn's Classical Library (1856), which also includes verse translations by J. Hookham Frere.

(T. H. W.)

THEOLOGY, literally the science which deals with God or the gods. The word is Greek (Qeos, God; X670S, theorj')- But doctrine counted for less in Greek or Roman religion than in Christianity, and forms of worship for more. In the oldest usage Oeokoyoi were those who dealt in myths, like Hesiod and like the supposed Orpheus, the diaK&yos par excellence. Paul Natorp 1 contends that $eo\cryla in Plato 's Republic refers wholly to the control of myths. He further denies that Aristotle identified his First Philosophy with a " theology," holding the text of the Metaphysics to be out of order and

1 Philosophische Monatshefte (1888), Heft 1 and 2. See also Theism.

corrupted, though from a very early period. He regards the Stoics as having initiated a philosophical theology, and gives numerous references for the " three theologies " which they distinguished. Phiio the Jew is also quoted as using

deoKoyos of poets, of Moses par excellence, and of Greek philosophers. It is possible that the epithet deoKoyos for St John may go back as far as Papias. This is the first appearance of the term upon Christian ground. The primitive application of #60X6701 to the poets and myth-fanciers meets us again in Church writers; but there is also a tendency to use the name for a philosophical theology based on the doctrine of the Logos. In this sense Gregory Nazianzen also receives the title 8eo \6yos. His Trepi dtoXoylas is a dissertation on the knowledge of God. 1 Many centuries later Abelard generalized the expression in books which came to bear the titles Theologia Christiana and Introductio ad Theologiam. (Abelard speaks himself of " theo- logia nostra.") 2 It is of interest to note that even in these books the Trinity and Christology are the topics of outstanding importance. In the Summa Thcologiae of Thomas Aquinas the technical sense is fully established. Except in special circum- stances which generally explain themselves, e.g. " Homeric Theology " (a book by Nagelsbach), Old Testament Theology, Comparative Theology, Natural Theology, the word in modern languages means the theology of the Christian Church. What follows here will be confined to that subject.

While the word points to God as the special theme of the theologian, other topics inevitably find entrance. Theistic Contents philosophy thinks of God as the absolute being; and of every monotheistic religion insists, not indeed that

theology. t ^e knowledge f God includes all knowledge, but that this supremely important knowledge throws fresh light upon everything. So, with an added Christian intensity, St Paul declares: " If any man is in Christ, he is a new creature; the old things are passed away; behold, they are become new. But all things are of God, who reconciled us to himself through Christ " (2 Cor. v. 17, 18). A minimum division might be threefold — GottesbegrijJ, Selbslbeurteilung, Weltanschauung. 3 But historically it is more important to note that Christian theology has developed as a doctrine

concerning Christ: his relation to God, our relation to God in or through him. For Christ is viewed as bringing redemption — a conception of im- portance in many religions, but in none so important as in Christianity. Indeed, another possibility opens up here. In- stead of being mainly a doctrine concerning God, or one con- cerning Christ, theology may be construed as being mainly the theory of Christian experience. Most schools of theology will concur, however, in giving prominence to a complementary point of view and making their systems a study of Divine revelation. Even if they accept Natural Theology, they generally hold that Christian theology, properly so called, begins at a further point. Those who deny this were formerly called Naturalists, i.e. deniers of supernatural revelation; those who extend the province of reason in theology, and push back the frontier of revelation, are often called Rationalists. 4 Such being the Theology usual point of view, it is plain that the claim of as a theology to be a science, or a group of sciences, is

science. mac j e m a se nse of its own. In so far as theology is orderly, coherent, systematic, and seeks to rest upon good grounds of some sort, it may be called a science. But, in so far as it claims to deal with special revelation, it lifts itself out of the circle of the sciences, and turns away from natural know-

1 Other usages of BeoXoyia are the Divine nature of Christ (St John Chrysostom, quoted in Konstantinides' Greek Lexicon), Old and New Testaments (Theodoret, ib.) ; Greek theology and Mosaic or revealed theology (Theodoret).

2 F. Nitzsch in Herzog-Plitt, Realencyk. (1877). Fuller details regarding Abelard's writings in the same author's art. in Herzog- Hauck (1896).

3 So Ritschl, following Schleiermacher, Der Christliche Glaube, §30.

4 A. W. Benn (History of English Rationalism in the

19th Cent.) goes beyond ordinary usage in defining rationalism as a militant' theory opposed to all belief in God.

ledge towards what it regards as more intimate messages from God.

Two special usages should be noted: (1) a medieval use of " theology " for mystical or intuitive knowledge of God, as in the well-known book called Theologia Germanica; (2) " theology proper," in Protestant systems, is the portion of theology which deals directly with the doctrine of God.

Another characteristic of theology is its secondary and reflective character. Religion, therefore, is earlier than theo- logy. Or the theology which religion contains is in Theology a state of solution — vaguely defined and suffused ""d with emotion; important practically, but intellectu- Wzlon. ally unsatisfying. " Scientific " theology contrasts with this as a laboratory extract. History may soften the contrast by discovering transitional forms, and by showing the religious interest at work in theology as well as the scientific interest affecting early utterances of religion. Still, this contrast enters into the meaning of divines when they say that they are at work upon a science. A religious man need no more be a theologian than a poet need have a theory of aesthetics.

Where, then, are we to look for Christian theology? It is not the truism it may seem if we reply that we are to find it in the writings of theologians. As authorities control- sources. ling their work, theologians may name the Bible, or tradition, or the religious consciousness, or the Church, or some combination of these. But the, teaching of the Bible is not systematic, and the authority of consciousness is vague; while the creeds into which Church tradition crystallizes emerge out of long theological discussions. Ordinarily, doctrine has been in close connexion not only with edification but with con- troversy. Anselm of Canterbury stands almost alone among the great theological masters in

working purely from a scientific interest; this holds alike of his contribution to theism and of his doctrine of Atonement. Among the earlier theological state- ments are catechetical books, e.g. Cyril of Jerusalem. These books record doctrinal instruction given, for practical ends, to laymen of adult years who were candidates for baptism. Dis- interested discussions by experts for experts is medieval rather than primitive. Modern catechisms in the form of question and answer for the instruction of baptized children are sometimes convenient if dry summaries of doctrine (e.g. the Westminster Assembly's Shorter Catechism); but sometimes they have the glow of religious tenderness, like Luther's Lesser Catechism, or the Heidelberg Catechism. They generally expound (1) The Apostles' Creed, (2) the Ten Commandments, (3) the Lord's Prayer. Medieval theology has an appearance of keeping in touch with the Apostles' Creed when it divides the substance of doctrine into (usually) twelve " articles " — not always the same twelve — a reminiscence of the legendary composition of the Creed in twelve sections by the twelve apostles. This treatment, however, has little real influence upon the structure of medieval theology. German Protestant writers, again, follow- ing their catechisms, often distinguish three articles — of the Father, of the Son, and of the Holy Spirit. This, too, is no more than convenient phraseology.

Before the Christian age, there had been a good deal of reflective thinking in the Jewish schools, though the interest there was legal rather than speculative. To some extent Christianity in- herited this Jewish theology. True, Jesus Christ sprang ' f from the people. He was a ' ' layman' ' (Paul Wernle) , with- ° ogy '

out technical Jewish lore. The great attainment of the Old Testa- ment, ethical monotheism, had become the common property of the nation ; it occurs in Christianity as a simple presupposition. Early Christian writers find it unnecessary to prove what no one dreams of questioning. Along with this great doctrine there pass on into Chris- tianity the

slowly attained hope of resurrection and the dreadful doctrine of future punishment for the wicked. Leading thoughts in the teaching of Jesus, so far as they are new, are the Fatherhood of God — new at least in the central place given it — the imminence of the ” kingdom ” or judgment of God, and Jesus’ own place as ” Messiah,” i.e. as king (and as judge). The “second founder” of Christianity, Paul of Tarsus, was indeed rabbinically trained. His recoil from Judaism is all the more intense because of stPaul. the special intellectual presuppositions which he con- tinues to share with Judaism. In many respects, Pauline Chris- tianity is the obverse of the Pharisaic creed. Modern Christians are

tempted to charge the seeming extravagance of St Paul’s thought upon his Jewish inheritance, while modern Jews are tempted to stigmatize them as grotesque exaggerations of reasonable rabbinical doctrines. Probably both are right, and both wrong. The germs were Jewish; but, transported to a new soil, and watered with a new enthusiasm, they assumed new forms. These cannot claim the merit of correctness, but they are works of religious genius. At the same time, they employ all the resources of dialectic, and have, therefore, taken quite half the journey from primary religion to theology. But the dislocation of religious thinking, when Christianity ceased to be a Jewish faith and found a home with Gentiles, destroyed the continuity of Paulinism and of Jewish thought working through St Paul. In later times, when Paulinism revived, the epistles spoke for themselves, though they were not always correctly understood. It should be added that, according to A. Harnack, Hellenistic Judaism had worked out the principles of a theology which simply passed on into the Greek-speaking Christian Church.

Besides the teaching of Jesus (best preserved in the first three gospels) and the teaching of Paul (in six, ten, or thirteen Contents epistles), the recent

"science" of New Testament of New theology finds other types of doctrine. The Epistle to Testa- the Hebrews is a parallel to Paulinism, working out meat ' upon independent lines the finality of Christianity

and its superiority to the Old Testament. The Johannine Gospel and Epistles are later than Paulinism, and presuppose its leading or less startling positions. Whatever historical elements may be preserved in Christ's discourses as given in the Fourth Gospel, these discourses fit into the author's type of thought better than into the synoptical framework. They have been transformed, i Peter is good independent Paulinism. The Epistle of James may breathe a Christianized Jewish legalism, or, as others hold, it may breathe the legalism (not untouched by Jewish influences) of popular Gentile-Christian thought. The Johannine Apocalypse is chiefly interesting as an apocalypse. F. C. Baur and his school interpreted it as a manifesto of anti-Pauline Jewish Christianity; on the contrary, it closely approaches Paul's doctrine of the Atonement and his Christology. Other writings are of less importance. Acts is indeed of interest in showing us Paulinism in a later stage; the writer wishes to reproduce his great master's thought, but his Paulinism is simplified and cut down. Possibly the Pastoral Epistles show the same process. When we go outside the New Testament, this involuntary lack of grasp becomes even more marked.

Neither the theory of infallible inspiration, with its assertion of absolute uniformity in the New Testament, nor Baur's criticism, with its assertion of irreconcilable antagonisms, is borne out by facts. The New Testament is many-sided, but it has a predominant spiritual unity. Only in minor details do contradictions emerge. It is to be remembered that criticism has broken up the historical unity of the New Testament collection and placed many of its components side by side with writings which have never been canonized, and which conservative writers had supposed to be distinctly later. But in regard to date there has been a remarkable retreat from the

earlier critical assertions. And at any rate, since the New Testament canon was set up, New Testament writings have had a theological influence which no others can claim.

On both sides of the great transition from being a Jewish to being a Gentile faith, Christianity, according to recent study, mani- >'P th *- f este d itself as "enthusiastic." We may distinguish ,'' „" ' several points in this conception, (i) Most important, perhaps — the end of the world was held to be close at hand. "Kingdom of God " as generally used was an eschatological concept; and, whatever difficulties there may be as to certain gospel passages, Christ, to say the least, cannot have disclaimed this view. The watchword rings through all the New Testament — ■ " the Lord is at hand." A broader popular form was given to this expectation in " Chiliasm " — the doctrine of the ' Thousand " years' reign 1 of Christ on earth (Rev. xx. I 7). But even Chiliasm — which itself has its subtler and its grosser modifications — is found in early Gentile as well as in early Jewish Christianity. (2) I Corin thians shows us a. Christian community filled with disturbances, and apparently without recognized officials. The democratic, or rather theocratic, rights of the spiritual man were for a time relied on to extemporize so much Church government as might be needed till the Master returned. Yet the beginnings of Church order come earlier than those of doctrine proper, and much earlier than the cooling of eschatological hopes. (3) There are traces inside and

1 Four hundred years is another significant figure in the Jewish book, 4 Ezra.

outside the New Testament of aversion to receiving back into Church fellowship those who, after confessing Christ, had been guilty of grave sins. The New Testament evidence is by no means uniform (contrast Heb. vi. 4-6, x. 26-31; 1 John v. 16; with 2 Cor. ii. 7) ; but this high conception of Church holiness is attested by a series of rigorist " heresies" during the early centuries; and nothing

could be more characteristic of eschatological enthusiasm. Those who had fallen were not banished from hope, even by the rigorists. Still, their case was held over for a higher Judge; while the Church, especially in these more Puritian and separatist groups, kept her garments white. (4) The enthusiastic view of the possi- bilities of the Christian life — -associated, as modern and especially Western Christians must suspect, with shallow external views of sin — lent itself to belief in sinless perfection. Even St Paul has been supposed, not without a certain plausibility, to teach the sinless perfection of real Christians. The West, with its theology protesting in the background, but in vain, still sings the prayer of the Te Deum: ” Vouchsafe, O Lord, to keep us this day without sin.”

*Such an enthusiastic temper does not lend itself to cool theory. Why should theology labour at definitions? ” The Lord is at hand;” a Christian’s one wisdom is to be ready to „ . . . meet him. And yet materials for theology were richly ae a provided even during this period. That is true above all theolomr of the man whom we know best in New Testament days — *”’*

St Paul. Himself through and through animated with the joyful hope, even when prepared to surrender (2 Cor. v. 8; Phil. i. 23, ii. 17) the prospect of personal survival (1 Thess. iv. 17; 1 Cor. xv. 51, 52) until that bright day_, yet as a teacher he lays such stress upon Christ's first coming that the emphasis on the second Advent may be struck out — leaving still, we might almost claim, a complete Paulinism. He who planned his campaigns to the great civilized centres of Corinth, Ephesus and Rome, and thus prepared for a historic future of which he did not dream, drew his parallels of thought with no less firm hand, and showed himself indeed " a wise master-builder."

In one aspect Montanism is the central reaction of the primitive Christian enthusiasm against the forces which were transforming its character. Of course it had other aspects and elements as well. Hippolytus and Novatian repeat the protest less vehemently; Donatism shows it blended with later hierarchical ideas.

But, when the enthusiasm cooled, it was Greek thought which interpreted the contents of Christianity. The process of change is called by Harnack sometimes " secularization" and rjreekla- sometimes " Hellenization." "Acute Hellenizing," we are tluence. told, took the form of Gnosticism. The Gnostics were the " first theologians." When the Church in turn began to produce a theology of her own she was imitating as well as guarding against those wayward spirits. What was to be the central topic? The Church's first creed had been " the Fatherhood of God and the Messiahship of Jesus " (A. Ritschl) ; but the " Rule of Faith " (Irenaeus; Tertullian, who uses the exact expression; Origen) — that summary of religiously important facts which was meant to ward off error without reliance on speculations such as the Logos doctrine — built itself up along the lines of the baptismal formula of Matt, xxviii. 19. 2 There are traces in the New Testament of a baptismal confession simply of the name of Christ (1 Cor. i. 13, 15; Rom. vi. 2; cf.

even the late verse Acts viii. 37), not of the three- fold name. Moreover, textual criticism points to an early type of reading in Matt, xxviii. 19 without the threefold formula. Still, it is strange how completely this seemingly isolated passage takes command of the development of early theology.

Out of the Rule of Faith there came in time what tradition mis^ calls the Apostles' Creed — the Roman baptismal creed, a formulary of great importance in all the West; then other creeds, which also are in a sense expansions of the Rule of Faith. The Greek mind threw itself upon the problem — who precisely is Jesus Christ the Lord? His Messiahship is asserted; who then is Doctrl the Messiah? and this second figure in the baptismal ffrhiity confession? A provisional answer, linking Christian aa ^of theology with the philosophical theology of antiquity, p erson „/ asserted Jesus Christ to be the divine Logos. But this Christ. assertion was expanded and refined upon till two great doctrines had been built up — that of the Trinity of divine Persons in the unity of the Godhead, and that of the union of two distinct natures, divine and human, in the person of Jesus Christ. It is curious that the Syrian church of the 4th century {e.g. Aphraates) was almost unaffected by the great dogmatic debates. But there is no hint of a reasoned rejection of Greek developments in favour of primitive simplicity, still less of any independent theological development. Aphraates accepts the Logos Christology, and, soon after his time, his church is found on the beaten track of orthodoxy.

2 If Harnack is right in regarding a New Testament canon as one of the " Apostolical authorities " which the Church brought into the field against Gnosticism, we see the truth on historical grounds of the position taught on dogmatic grounds by R. Rainy (Delivery and Development of Christian Doctrine) — -scriptural faith not the starting-point but the goal of theological development. The starting-point is rather he " Rule of Faith."

Modern Christians generally trust this development; and all of them must admit that it seeks to answer a question arising out of the elements of New Testament belief. There is one God; but also there is one Lord ; how are the two related? The strongest claim that can be put forward for the doctrine of the .Trinity is that it is loyal to Christ without being disloyal to the Divine unity. Concurrently, there was a speculative or philosophical interest; and some prefer to defend Trinitarianism as a reconciliation of the personality with the infinity of God. But the biblical materials worked up in the doctrine betray little sign of any except a religious^ interest. We may take it as well established that St Paul (2 Cor. viii. 9: Phil. ii. 5-1 1) taught the personal pre-existence of Christ. A. M. Fairbairn (Phil, of Christian Religion, p. 476) has argued that Paul could not have given this teaching unless he had known of Christ's advancing the claim. Fairbairn barely refers to the Fourth Gospel in this connexion, and it is doubtful-whether Matt, xi. 27 will bear such weight as he puts upon it. Of course, we might seek to infer an unwritten tradition of Christ's words; but without pedantic ultra-Protestant devotion to written scripture, one may distrust on scientific grounds the attempt to reconstruct tradition by a process of inference. If such records as John vi. 36, viii. 58, xvii. 3, 4 can be taken as historical, we may feel certain that Jesus taught his pre-existence. If not, modern Christian minds will hardly regard the doctrine as more than a speculation. Yet we should mention another argument of some weight. There is no trace that any Jewish Christian critics challenged St Paul's Christology. This may point to its being the Christology of the whole Church. If so, who could first teach it except the one Master?

W Bousset has suggested that the title " Son of Man " (Dan. vii. 13), used by Jesus, may have come to imply for all early Christians personal pre'-existence. W. Wrede and others have more boldly conjectured that the Christ's pre-existence had

become an accepted element in Jewish Messianic — it certainly occurs in one portion of the Book of Enoch and in 4 Ezra 1 — and that Paul merely trans- ferred to Jesus a doctrine which he had held while still in the Jews' religion. "Son of God" might seem to carry us further still; but the Old Testament makes free use of the title as a meta- phorical honour, and we have no proof that any Jewish school interpreted the phrase differently.

The rival type of early theology is known as Adoptionism or Adoptianism (?.».). According to it, the man Jesus was exalted Adoption- '° Messianic or divine rank. It has been argued that Ism. t ^ le narra tive of Christ's baptism points to an Adoptionist

Christology, and that the genealogies of Jesus (through Joseph) presuppose this type of belief, if not a still lower view of Christ's person. It has further been argued that the narratives of the Virgin birth (Matthew, Luke) are an intermediate stage in Christology. When pre-existence is clearly taught (Paul, John), virgin birth, it is suggested, loses its importance; another theory of Divine Sonship has established itself. This trenchant analysis is, however, not universally admitted. Further development of doctrine weeded out the last traces of Adoptionist belief, 2 though Christ's exaltation continued to be taught in correlation to His humilia- tion (Phil. ii. 8), and became in due time a dogmatic locus in Protestantism.

The lineaments of Greek Christian theology show themselves more clearly in Justin Martyr than in the other Apologists, but Justin, still more plainly in Irenaeus, who, with little specu- irenaeus, lative power, keeps the safe middle path. Tertullian's legal training as a lawyer was a curious coincidence, if nothing more, and those legal concepts which show themselves strongly in him have done much to mould the Western type of Christian theology. He had great influence on the course of Latin theology, partly through his own writings, but still more through the spell he cast upon Cyprian.

At Alexandria, Clement and his great pupil Origen state Chris- tianity in terms of philosophy. Origen's treatise, De Principiis, Origen. ^ s *- ne nrst an(^ m some respects the greatest theo- logical system in the whole of Church history. The Catechetical school was primarily meant for instructing adult inquirers into Christianity. But it had attained the rank of a Christian university; and in this treatise Origen does not furnish milk for babes; he writes for himself and for like-minded friends. Wildly conjectural as it may seem, his thinking — though partly Greek and only in part biblical — is

1 The passages referred to have sometimes, but with no great probability, been regarded as Christian infiltrations.

2 Adoptionism is one species of Monarchianism. The other species, Modalism, has its most important type historically in Sabellianism. And the name Sabellianism is often loosely applied (e.g. to Swedenborgianism) to any modalistic Monarchianism (Christ one phase of God. Not three persons in the Godhead, but a threefold revelation of a God strictly one in person).

Tertul- llan.

completely fused together in his own mind. Nor does it ever suffer from lack of thoroughness. It may be summed up in one word as the theology of free will.

Unfaltering use is made of that conception as a key to all religious and moral problems. Usually, apologists and divines are hampered by the fact that, beyond a certain limited range, men cannot be regarded as separable moral units. A new world, after death, may be called in to redress the balance of the old; but anomalies remain which faith in a future immortality does not touch. Origen called in a second new world — that of pre-existence. All souls were tried once, with equal privilege; all fell, save one, who steadily clave to the Logos, and thus merited to become in due time the human soul of

Jesus Christ. No higher function could be given to free will; unless, by an extravagance, some theologian should teach that the Almighty Himself had merited His sovereignty by the virtuous use of freedom. On the other hand, a shadow is cast upon the future by Origen's fear that incalculable free will may again depart from God. Human birth in a grossly material body is partly due to the pre-temporal fall of souls; here we see in Origen the Greek, the dualist (mind and matter), the ascetic, and to some extent the kinsman of the Gnostics. But he breaks away again when he asserts that God ever wills to do good, and is seeking each lost soul until He find it. Even Satan must repent and live. 3

It was not possible that this brilliant tour de force should become the theology of Christendom. Origen contributed one or two points to the central development of thought; e.g. the Son of God is " eternally " begotten in a continuous process. But while to Origen creation also was a continuous process, an unspeculative orthodoxy struck out the latter point as incon- sistent with biblical teaching; and we must grant that the eternal generation of the Divine Son adds a more distinctive glory to the Logos when it is no longer balanced by an eternal creation. While the Church thus lived upon fragments of Origen's wisdom, lovers of the great scholar and thinker, who had dominated his age, and reconciled many a heretic to his own version of orthodoxy, must submit to have him branded as a heretic in later days, when all freedom of thought was falling under suspicion.

For a time, freedom in scholarship lingered in the younger rival of Alexandria, the school of Antioch; though speculation was never so strong there. Alexandria, on the other hand, tended to be unduly speculative and allegorizing even in its scholarship. The antagonism of the two schools governs much of the history of doctrine; and behind it we can trace in part the contrast between Church Platonism and what churchmen called Aristotelianism.

Arius, a Libyan by birth, of Antioch by training

(though earlier than the greatest days 'of that theological school), and a presbyter of Alexandria, represents the working of Aristo- Arfanlsm telianism. His chief opponent, Athanasius, is probably the greatest Christian, if Origen is the greatest thinker, among all the Greek fathers. Few will deny that Athanasius stood for the Christian view of the questions at issue, upon the prin- Atbaa- ciples held in common by all disputants. Arius repre- aslus " sented a shallow if honest intellectualism. He found it necessary to think clearly and define sharply; but Athanasius found it necessary to believe in a divine redemption. According to Harnack, Athanasius simplified the faith of his time by fastening on the essential point — human immortality or " deification through the Incarnation of true God. Cosmic theories of the work of a Logos subordinate to the Father fell into the background. 'Onooboios, successfully discredited earlier as a Sabellian formula by Paul of Samosata, was now found to be the one unambi- guous term which asserted that Christ was truly God (Council of Nicaea, a.d. 325) and biroo-raois (Lat. persona) became the technical name for each of the Divine Three. Athanasius himself tried to draw a distinction between affirming the Son o^txwtos, and calling Him novooiaios. Yet it seems plain that he considered Sabelfianizing reduction of the Divine Persons to phases or modes in the unity a lesser evil than regarding the Logos (with Arius) as a creature, however dignified. This was made plain by the leniency of Athanasius towards Marcellus of Ancyra. In those days there was no word for " Person " as modern philo- ju arce ii s sophy defines it; perhaps no word would have served " "

the purpose of the Church if precisely so defined. The result is, however, that a critic of doctrine sometimes questions whether Athanasianism offers a definition of the mystery at all, or only

3 Harnack takes a different view of Origen ; the certainty of ultimate salvation overbears free will with a sort of physical neces- sity. He also thinks that in Origen's esoteric doctrine the historic? 1

Christ becomes unimportant. That is a severe judgment.

a set of sanctioned phrases, and a longer list of phrases which are proscribed as heretical. The long and dubious conflicts of opinion concern Church history but left few traces on doctrine; Athanasius never flinched through all the reaction against Nicaea, and his faith ultimately conquered the Catholic Church. There is only this to notice, that it conquered under the great Cappadocians The Cap (^ as ''> Gregory Nazianzen, Gregory of Nyssa), who padocians. represented a somewhat different type of teaching l

The Trinity in Unity stood firm ; but, instead of recog- nizing God as one yet in some sense three, men now began to recognize three Divine beings, somewhat definitely distinguished in rank each from each and yet in some sense one. Athanasius's piety is thus brought into association with the details of Logos specula- tion. The new type passed on into the West through Augustine,

and the so-called Athanasian creed, which states an t~ne"V Augustinian version of Greek dogma. There is indeed Trlnitarl- one i mmense change. Subordinationism is blotted out, aalsm more even than by Athanasius. On these lines modern

popular orthodoxy maintains the doctrine of the Trinity. It seeks to prove its case by asserting first the divinity of Christ, and secondly the personality of the Holy Spirit. The modern idea of personality, though with doubtful fairness, helps the change.

The first great supplement of the doctrine of the Logos or Son was the more explicit doctrine of the Holy Spirit. Mace- Doctrine donius, who defended the semi-Arian or Homoiousian ofthe position that the

Spirit was merely a Divine in-

SpMt. fluence — Origen had held the Spirit to be a creature — was branded as a heretic (Synod of Alexandria, 362; Council of Constantinople, 381); a strong support to Cappadocian or modern Trinitarianism. Then, in the light of the affirmation of Christ's full divinity, the problems of His person necessarily received further attention. Did the Divine, Logos take the place of the higher rational soul in the humanity of Jesus? So Apollinaris or Apollinarius of Laodicea taught, but the Council of Constantinople (381) marked the position as heretical. Did the two natures, human and divine, remain so separated in Jesus as to jeopardize the unity of His person ? This was the view which Cyril of Alexandria ascribed to Nestorius, who hesitated to call Mary deoroicos, and represented the tradition of the Antiochene school. Such views were marked as heretical by the Council of Ephesus (431), the decision resulting in a profound and lasting schism. Did the two natures coalesce in Monophy Jesus so as to constitute a single nature? This is sites. the Monophysite or Eutychian view, developed out

of the Alexandrian tradition (" Eutychianism is simply Cyril- lianism run mad," A. B. Bruce). The Council of Chalcedon (451) rejected the Alexandrian extreme in its turn, guided by Leo of Rome's celebrated letter, and thus put the emphasis on the duality rather than the unity in Christ's person. Another grave and lasting schism was the result. Two great doctrinal traditions had thus been anathematized ; the narrow line of orthodoxy sought still to keep the middle track. Was there at Monothe- least unity of will in Jesus? No, said orthodoxy; htes. He had two independent faculties of will, divine and

human. The Maronites of Syria, reconciled to the see of Rome in 1182, probably represent the Monothelete schism. John of Eahypos- Damascus's theory of Enhypostasy (Christ's manhood *w- not impersonal, but made personal only through

union with His Godhead) is held by some to be the coping- stone of this great dogmatic development.

In the Trinity the problem is to combine independence and unity; in Christology, to combine duality of nature 2 with the The deft- unity of the person. Verbally this is done; is it unions done substantially? The question, Who is Jesus in East Christ? has been pushed to the very end, and authori- West ta(.j ve iy ansW ered in the definitions of Church ortho- foxy. With these the Orthodox Greek Churches — and with

1 ^roacV and F. Loofs describe them as belonging to the Homo.usi^n party" — believers in the Son's " likeness of essence " to the r ^hNt. not "identity of essence." Bethune Baker vehe- mently -2J*Sihat these great leaders were contented with Homoiousi _ I ^A n y Wa y i we m ust remember that radical theology

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disguise.

reaks up the unity almost without

their divergent decisions the various non-Orthodox Eastern Churches, Coptic, Armenian, &c. — desire to rest satisfied; theology has finished its work, unless in so far as it is to be codified. . It is never true while men live that thought is at a standstill; but, as nearly as it may be true, Eastern theology has made it so. In the West the decisions of the great councils have been accepted as a datum. They enter into the basis of theology; results attained by long struggles in the East are simply presuppositions to the West; but, for the most part, no independent interest attaches to them in the Western world. They are taken as involved in

redemption from sin — in the Atonement, or in the sacraments. Belief in the Trinity is almost unbroken. Western Christendom wishes to call Christ God; even the Ritschlian school uses the wonted language in the light of its own definitions. For others, the Trinity is the accepted way of making that confession. It becomes of prac- tical importance, according to S. T. Coleridge, 3 in connexion with Redemption. It passes, therefore, as a datum of revela- tion. In Christology the tradition has been more frequently challenged since the Reformation.

Harnack criticizes the doctrinal development. He considers that Christianity is best defended on the basis of the doctrine that Christ is a man chosen and equipped for His task by God. But in the Eastern Church the religious interest, as he thinks, points to Monophysitism. Dyophysite orthodoxy has sterilized Eastern Christianity, or thrown it upon inferior forms of piety. Of course this does not mean that Harnack considers monophysitism nearer the historic truth, or nearer the normal type of Christian thought. On the contrary, he would hold that the scholarly tradition of Antioch more nearly reaches the real historical manhood of Jesus. But if it be presupposed that the purpose of Christ's mission was to deify men by bestowing physical immortality, then we must assume, first, Christ's essential Godhead, and, secondly, the fusion of His divine and human natures. Whatever be the truth in the assertion that death rather than sin is the enemy dreaded by Eastern Christianity, and immortality rather than forgiveness the blessing craved, it is difficult to take the talk about deification as anything more than rhetoric. Did they not start from belief in one God ? Was not polytheism still a living enemy ? It is a more obvious, if perhaps a more vulgar, criticism of the great development to say that it was too simply intellectual — seeking clear-cut definitions and dogmas without measuring the resources at the command of Christians or the urgency of their need for such things. We are sometimes told that the

councils simply denied error after error, affirming little or nothing. But the Trinity and the Hypostatic Union are vast speculative constructions reared upon slender biblical data. To complain of the over-subtlety of a theological adversary is a recognized move in the game; it may constantly be played in good faith; it proves little or nothing. The facts appear to be, that the Church embarked confidently on the task of blending philosophy and religion, that the Trinity satisfied most minds in that age as a rational (i.e. neo-platonic) construction, but that in Christology the data or the methods proved less tract- able. If two natures, divine and human, are added to each other, what can the humanity be except one drop in the ocean of divine power, wisdom, goodness ? The biblical authorities plainly set forth " the man Christ Jesus," but theological science failed to explain how Godhead and manhood came together in unity. Fact and theory sprang asunder; for theory had done its utmost, and was baffled. Another admission ought to be made. Western con- tributions to the prolonged debate constantly tended to take the form of asserting truths of faith rather than theories. Yet what was the whole process but a colossal theory? 4

One perplexity connected with theology is the question, How far does Christianity succeed in embodying its essential interests in its doctrines? The Orthodox Eastern Church Further might seem to have succeeded beyond all others, elements Factions of lay-folk, who quarrelled furiously over , " Catho ' shades of opinion never heard of in the West, and scarcely intelligible to Western minds even if expounded, might seem to have placed their sincerity beyond all question. And yet there were at least two other developments which were important in the East and proved still more so in the West — the legal development and the sacramental. The name " Catholic " is one which Protestant Christians may well

3 Cf. Aids to Reflection, Aphorism 2, Comment.

4 A. M. Fairbairn takes the rather unusual view that Greek Christian theology was the climax of the

process of Greek philosophy, and so far alien to piety, although he is far from banishing specula- tion out of theology. Christ in Modern Theol., pp. 81, 90, 183.

hesitate to resign to their rivals. Yet there is convenience and no small significance in connecting the term with a certain characteristic and un- Protestant type of the Christian religion. Catholicism is not dogma only, but dogma plus law plus sacra- ment. From very early days Christianity was hailed as the "new law"; and the suppression of the rigorist sects, by definitely giving law supremacy over enthusiasm, aggrandized it, but at the same time aggrandized the sacraments. The Western Christian must needs hold that the Eastern develop- ment was incomplete. It laid these things side by side; it did not work them into a unity. The latter task was accom- plished with no little power by the Western Church in the period of its independent development. 1 The Greek and the Roman Catholic Churches stand united against Protestantism in the general theory of law and of sacraments; but a Protestant can hardly doubt that, if Catholicism is to be accepted, a Catholic organization, and doctrine are better furnished by the Western Church than by the arrested development of its rival.

The theory of asceticism had also to be more fully worked out and better harmonized with Church authority. The priesthood had successive rivals to face. First in the period of " enthusiasm," the prophets; then the martyrs and confessors; finally the ascetics. Ascetic e ' ast ' m re gulated forms, are a permanent feature

element °^ Catholicism; and the rivalries of these "regular" clergy with their " secular " or parochial brethren continue to make history to-day. That the ascetic life is intrinsically higher, that not every one is called to it, that the call is imperious when

it comes, and that asceticism must be developed under Church control — all this may be common to East and West. But, in the utilization of the monks as the best of the Church's forces, the Western Church far surpasses the East, where meditation rather than practical activity is the monastic ideal. In the West, " en- thusiasm," in the transformation under which it survives, is not merely bridled but harnessed and set to work.

The new developments of the West could not grow directly out of Eastern or even out of early Western conditions. They Augus- grow out of the influence of Ambrose of Milan, but far more of Augustine of Hippo; and behind the latter to no small degree there is the greater influence of St Paul. Intellectual developments do not go straight onward; there are sharp and sudden reactions. Pelagianism, the rival and contradiction of Augustinianism, represents a mode of thought which appeared early in Christianity and which could count upon sympathizers both in East and in West. But, when the Christian world was faced with the clear-cut questions, Was this, then, how it conceived man's relation to God? and Did it mean this by merit? Augustine without much difficulty secured the answer " No." In the East (Council of Ephesus, 431) he was helped by the entanglement of Pelagianism with Nestorianism, just as in the West the ruin of Nestorian prospects was occasioned partly by dislike for the better known system of Pelagianism. In Augustine's own case, reaction against Pelagianism was not needed in order to make his position clear. He may have left a vulnerable frontier in his earlier dealings with the same thorny problem of free will. Certainly his polemic as a Christian against the Manichaeism of his youth constitutes a curious preface to his vehement rejection of Pelagian libertarianism. Once again, a narrow track of orthodoxy midway between the obvious landmarks! But Augustine had a deeply religious nature, and passed through deep personal experiences; these things above all gave him his power. He was also genius and scholar and churchman, transmitting uncriticized the dogmas of

Athanasianism and the philosophy of ancient Greece, according to his understanding of them. Without forgetting that Augustine was partly a symptom and only in part a cause — without committing our- selves to the one-sidedness of the great-man method of con- struing history — we must do justice to his supreme greatness. If earlier times lived upon fragments of Origen, the generations of the West since Augustine have largely lived upon fragments

1 Loof s declares that the very conception of a means of grace is medieval.

of his thought and experience. On the other hand, not even the authority of Paul and of Augustine has been able to keep alive the belief in unconditional predestination. If in the West Athanasianism is a datum, but unexamined, and not valued for its own sake, Augustinianism is a bold interpretation of the essential piety of the West, but an interpretation which not even piety can long endure — morally burdensome if religiously impressive. The clock is wound up at the great crises of history, but proceeds to run down, and does so even more rapidly in Protestantism than in Catholicism. It may be held by hostile critics that the whole thing is a delusion. More sympathetic judgments will divine unquenchable vitality in a faith whose very paradoxes rise up in new power again and again. Augus- tine's (erroneous) interpretation of the Millennium (Rev. xx.), as a parable of the Church's historic triumph, stands for the final eradication of primitive " enthusiasm " in the great Church, though of course millenarianism has had many revivals in special circles.

Even if the Augustinian stream is the main current of Western piety, there are feeders and also side- currents. Ambrose, Augustine, Jerome, Gregory the Great are known as the four Latin Fathers. Jerome is very great as a scholar, and Pope Gregory as an adminis- trator. As a writer, too, Gregory modifies Augustinian beliefs into forms which make them more

*available for Church teaching — a process very characteristic of Western Catholicism and carried still further in later centuries (notably by Peter Lombard). Perhaps two side-currents of piety should be named. There is an pthlr ethical rationalism which can never be wholly suppressed Ethical in the Christian Church by the Pauline or Augustinian f" ' oaa '' soteriology. One thinks one sees traces of it, though *" * held down by other influences, in the whole of medieval m . ys theology, and notably in Abelard. It disengages itself in the 17th century as Socinianism and in the 18th as Rationalism or Deism. Secondly there is a strong side-current in the mystical tradition, which we may perhaps treat as the modified form under which the philosophical theology of the Greek Church maintained its life in the medieval West. If so, Mysticism includes in itself a prophecy of modern Christian Platonism or idealism, with its cry of " Back to Alexandria."*

A Western echo of the Christological controversies of the East is found in the Adoptianism of Spain 785-818). These Adoptianists do not hold that Christ the person is adopted (He is God by birth), but his human nature may be. 2 There might be need of this, indeed, if the Adoptianists' theory of redemption were to stand, according to which Christ had taken to Himself a sinful human nature, and had washed it clean. This extreme assertion of duality as against Christological unity was naturally marked as heretical.

Great advance is made in organizing Catholic theology by the fuller theory of sacraments. The East had a tentative hesitating doctrine of transubstantiation; 3 the West Sacra- defines it with absolute precision (cf. Paschasius menis. Radbertus against Ratramnus; the fourth Lateran Council, 1 21 5). But if the medieval Church and modern Catholics regard the Eucharist as the principal sacrament, Protestants can hardly keep from assigning the supreme place, in the medieval system, to the sacrament of penance. If early " enthusiasm " conceived the Christian as almost entirely free from acts of sin, and if Protestant

Paulinism conceives the child of God as justified by faith once for all, the full Catholic theory, representing one development of Augustinianism, views the Christian as an invalid, perpetually dependent on the good offices of the Church. The number of sacraments is fixed at seven, 4 first by Peter Lombard, and the essence of the three sacraments which do not allow of repetition — baptism, confirmation, orders — is defined as a " character " 6 imprinted on the soul and never capable of being lost. We must mark the advance in formal completeness. Theology is now not merely the dogma of the Divine nature or of Christ's person; it is also a dogmatic

2 The term Adoptianism arose at this time. Modern theologians carry it back to much earlier views.

3 Until indeed, in modern times, Greek theology accepted the Western term and definition.

4 This, too, has been adopted in modern Greek theology.

6 Augustine already has this conception (Loofs). A hostile critic might say that the conception affirms the absolute worth of sacraments while absolutely declining to say what they accom- plish.

theory of how the Christian salvation is conveyed through sacraments to sinful men. On the other hand, a theology which is mainly sacramental is overtaken pretty soon by dumbness. It is of the essence of a sacrament to be an inscrutable process.

Theories of legal merit, amount of debt, supererogatory good- ness, and ascetic claim — representing the aspect of Catholicism as law — are more and more worked out. The Occasion of the formal separation of East and West — the Western doctrine of the twofold " procession " of the Holy Spirit, incorporated in the (so-called Nicene) creed itself

(" filioque ") — is of little or no real theological importance. The schism was due to race rivalries, and to dislike for the ever-growing claims of the see of Rome.

An important contribution to doctrine is contained in the Cur Deus Homo of Anselm of Canterbury. The doctrine of Anseim Atonement, destined to be the focus of Protestant on Atone- evangelicalism, has remained undefined in Catholic meal - circles, 1 an implicate or presupposition, but no part

of the explicit and authorized creeds. When treated in the early centuries, it was frequently explained by saying that Christ's sufferings bought off the devil's claim to sinful man, and some of the greatest theologians (e.g. Gregory of Nyssa) added that the devil was finely outwitted — attracted by the bait of Christ's humanity, but caught by the hidden hook of His divinity. Anselm holds that it was best for the injured honour of God to receive from a substitute what the sinner was per- sonally in no condition to offer. Whatever other elements and suggestions are present, the atmosphere of the medieval world, and its sense of personal claims, are unmistakable. With Anselm Ritschl takes Abelard, who explains the Atonement simply by God's love, and thus is the forerunner of " moral " or " subjective " modern theories as Anselm is of the " ob- jective " or " forensic " theory. It must be admitted, however, that there is less definiteness of outline in Abelard than in Anselm. He does not even deal with the doctrine as a specialist, in a monograph, but only as an exegete.

Contemporaneously with the new and vivid intellectual life of an Anselm or an Abelard, the " freezing up " of traditionalism is evidenced by the preparation of volumes of Sentences from Scripture and the Fathers. One of the earliest of such collections is that of Isidore (q.v.) of Seville (560-636), who, from this and other writings, ranks among the few channels which conveyed ancient learning to the middle ages. His Sentences are selected almost (though not quite) exclusively from

Augustine and Gregory the Great. Direct influence from the Greek Fathers upon the West is vanishing as the Greek language is forgotten. The great outburst of Sentences at a later time has been referred to the consternation produced by Abelard's Sic et Non. The modern reader can hardly banish the impression that Abelard writes in a spirit of sheer mischief. Probably it would be truer to say that he riots in the pleasures of discussion, and in setting tasks to other irresponsible and ingenious spirits. He does not fear to contrast authority with authority, upon each point in succession; the harder the task, the greater the achievement when harmony is reached ! In regard to Scripture alone does he maintain that seeming error or discrepancy must be due to our misinterpreta- tion. If throughout the middle ages Scripture is treated as the ultimate authority in doctrine, yet Abelard seems to stand alone in definitely contrasting Scripture with later authorities. Moderns will question the possibility of asserting Bible infallibility a priori; but it is more really startling and noteworthy that Abelard should preserve a living sense of fallibility outside the Bible.

There are many great collections of Sentences, notably by Hugh of St Victor and Peter Lombard. The last-named — though with mo'e continuity of texture than Isidore — quotes largely from the Bible and the Latin Fathers. If Abelard stands for the intel- lectual daring of scholasticism, Lombard represents its other pole — interest in piety, i.e. in the Church. He is almost timidly cautious. He does not open up difficulties like Abelard, but smoothes them over. This suits the coming age. The great writers of the early centuries were to tell on men's minds not in the breadth of their treatment but in a theological pemmican. And the characteristic task for living theologians was to consist in writing commentaries on the Lombard's Sentences; for a time these Sentences themselves had been suspected, but they gained immense influence.

1 Even the Council of Trent defined what Protestants had challenged — nothing else.

“Sen- tences.’

Had this been all, Western theology might have sunk into a purely Chinese devotion to ancient classics. But the medieval world had not one authority but two. Thin and Gum an- turbid, the stream of classical tradition had flowed tees 0/ on through Cassiodorus or Boetius or Isidore; through progress. these, at second-hand, it made itself known and did its work. But before the great outburst of scholasticism, ancient literature found a somewhat less inadequate channel in Arabian and partly even in Jewish scholarship. Aristotle was no Arabian longer strained through the meshes of Boetius; study of and the new light inspired Roscellinus with heresy. Arist <>Ue. True, we must not exaggerate this influence. There was no genuine renaissance of civilization, such as marked the dawn of modern history. The medieval world did not copy the free scientific spirit of Aristotle; it made him, so far as known, a sort of philosophical Bible side by side with the theo- logical Bible. But it was a very great matter to have two authorities rather than one. And if any man was to be put in the preposterous position of a secular Bible, no writer was fitter for it than Aristotle. The middle ages did their best in this grouping; only here and there a rare spirit like Roger Bacon did something more, something altogether superior to his age, in showing that the faculty of independent scientific inquiry was not quite extinct. It is possible to exaggerate the influence of the revived knowledge of Aristotle; but, so far as one can trace causes in the mysterious intellectual life of mankind, that influence gave scholasticism its vigour. (See Arabian Philosophy, Scholasticism.)

With the new knowledge and impulse, there came a new method. Alexander of Hales is the first to adopt it, in place of the ” rhetori- cal ” method of previous theologians. Everything is c c i, i a

The systems of the leading schoolmen must rank above their commentaries upon the Lombard’s Sentences, as the greatest of atl systems of theology. Especially

is that honour due to St Thomas Aquinas's larger Summa Theologiae. 2 We may Aaulnas well believe that he represents scholastic divinity at its best. He is not an Augustine, still less perhaps an Aristotle, but he is the Aristotle and the Augustine of his age, the normal thinker of the present and the lawgiver of the future. He teaches the medieval Platonic realism, but he accepts the Aristotelian philo- sophy of his day, marking off certain truths as proved and under- stood by the light of nature, and stamping those which are not so proved as not understood nor understandable, i.e. as " mysteries,"

2 The Summa contra Gentiles has a more polemic or apologetic interest than the dogmatic Summa, but deals almost equally with the contents of Christian theology as a whole. Books i.-iii. are said to deal with what is later known as natural theology, and Book iv. with what is later known as dogmatic. But Aquinas appeals to the Bible as an authority all through. That is not the procedure of modern natural theology.

in the sense in which the term has come to be used by ages that have inherited Aquinas's thoughts. He has Augustine's Pre- destinarianism, stiffened (according to Loofs) by Arab philosophical determinism, and he has much of Augustine's doctrine of the grace of God, though it is flanked with doctrines of human merit which might have astonished Augustine. The seven sacraments of course have their place in the body of the system, and are exhaustively studied. When we turn to Duns Scotus, we still find realism, still Duns predestinarianism. And yet these are rivals. An at-

Scotus. tempt has been made by R. Seeberg to interpret Duns as the forerunner of Luther in his emphasis on the prac- tical. Expert knowledge and judicial insight must decide the point; but, so far as the present writer can judge, it is illusory to

imagine that Duns points us beyond the medieval assumptions. As generally understood, Duns makes caprice supreme in God. The arbitrary divine will makes right right and wrong wrong. Here, says Ritschl, the involuntary logic of predestinarianism speaks its last word. Though he may technically be classed as an " extreme realist, " Duns is the forerunner of those later Nomin- alists, like William of Occam, who unsettled every intellectual ground of belief in order that they might resettle belief upon Church authority, not reason but rather scepticism being for them the ancilla domini. Later authoritative pronouncements on the part of the Roman Catholic Church favour Thomism and disown the Occamites; though the keen hostile criticism of Harnack affirms that the Church had need of both systems — of Thomism, to champion its cause in the arena of thought, and of the Nominalist theology to aggrandize the Church as the ruling power in practice.

When Protestantism arose, there was urgent need of reform. All sides granted that at the time, and all grant it now. Separa- Oritfns tion was not contemplated by any one at the first; ofProtes- this again is manifest. Yet it is also matter of plain tantism. history that Protestantism is more than a removal of abuses, or even than a removal carried out with reckless disregard of consequences. It is partly an outcome of Luther's personality — of his violence, no doubt, but also of his great qualities. It is due mainly to the dominant tradition in Church doctrine. Augustinianis: reacted against attempts to tone it down in theory or neutralize it in practice, until at last it broke loose in the form of Protestantism. But Protestantism is largely due further to the Renaissance. The new knowledge enabled men to read the Bible, like all other ancient books, with a fresh mind. Finally, we have the true central cause in the Pauline doctrine of faith. Evaded by Augustinianism, it came back now, with some at least of its difficulties and paradoxes, but also with its immense attractive and dynamic power. When the Reformers went beyond*

Augustine to Paul, Protestantism was born. 1 Even the Counter-Reformation, so far as it was a matter of doctrine (Council of Trent, 1.545-63), took the form of reaffirming a cautious version of Augustinianism.

*Whether Protestantism found its adequate doctrinal expression is very doubtful. Luther was no systematic thinker; Melanchthon, Melanch- tne theologian of the Lutheran Chureh, gave his system thon *^e l° ose form of Loci communes, and went back more*

and more in successive editions to the traditional lines of doctrinal theory — a course which could not be followed without bringing back much of the older substance along with the familiar forms of thought. To find the distinctive technicalities of Luther- anism we have to leave Melanchthon's system (and his great Reformation creed, the Augsburg Confession) for the Formula of Concord and the lesser men of that later period. In Calvin, indeed, Calvin tne Reformed 2 theology possessed a master of system.

We notice in him resolute Predestinarianism — as in Luther, and at first in Melanchthon too; the vehicle of revived Augustinian piety — and resolute depotentiation of sacraments, with their definite reduction to two (admittedly the two chief sacra- ments) — baptism and the Lord's Supper. 3 In affirming the " inamissibility " of grace in the regenerate (not simply in the un- knowable elect) Calvin went beyond Augustine, perhaps beyond Paul, certainly beyond the Epistle to the Hebrews, resolutely loyal to the logic of his non-sacramental theory of grace. Yet, in contrast with the doctrine usually ascribed to Ulrich Zwingli, Calvin teaches that grace does come through sacraments; but then, nothing comes beyond the fruits of faith; from which grace all salvation springs

1 Roman Catholic scholars naturally hold that Paul was mis- construed, but they cannot deny that Protestant theology was directly a version and interpretation of Paulinism.

2 The more radical Protestantism of the non-Lutheran orthodox churches is called in a technical sense ” Reformed. ” German scholarship generally ranks the Church of England with the ” Re- formed ” churches because of its Articles.

; Lutheranism seeks to add, in a sense, a third sacrament, Penance (so even Melanchthon).

necessarily. To use technical language, Calvinism holds that sacraments are needful ex ratione praecepti, (merely) ” because commanded. ” In contrast with this, orthodox Lutheranism has to teach baptismal regeneration and consubstantiation, as well as justification by faith. It is hard to see how the positions harmonize. Zwingli and Calvin, developing a hint of Hus, introduce a distinc- tion between the visible and the invisible Church which Melanchthon repudiates but later Lutheranism adopts. The Articles of the Church of England (19, 26) speak of the visible Church, but unless by inference do not assert a Church invisible. Upon most points Anglicanism seeks for a via media of its own. Resolutely Pro- testant in early days and even Calvinistic, it yielded to the sug- gestions of its episcopal constitution 4 and sacramental liturgies; and now its theologies range from Calvinism at one extreme to outspoken hatred of Protestantism at the other. Historically, great; issues have hung upon the dislike by which High Lutheranism and High Anglicanism, those two midway fortresses between Rome and Geneva, have been estranged from each other.

It is thus plain that the stream of Protestantism was very early split up into separate channels. Did any of these theologies do justice to the great master thought of grace given to faith? Antecedently to their separation from each other the Reformers took over the theology of Greek orthodoxy as a whole. Com- plaints against that theology may be quoted from early writings of every Reformer, even Calvin. They knew well that the centre of gravity in their own belief lay elsewhere than in the elaborately detailed scheme of relations within the

Godhead or in the Theanthropic person. But ultimately they persuaded themselves to accept these definitions as normal and biblical, and as presuppositions of Christ's saving work. The decision had immense results, both for religion and for theology. Nor did the unity of Protestant theology — Lutheran and continued Calvinist — confine itself to the period before the great unity in divergence. Men of the second or third generation ^">

together upon two characteristic doctrines which the fathers of Protestantism left vague. The Reformation doctrine of Atonement, while akin to Anselm's, differs in making God the guardian of a system of public law rather than of His private or personal honour. This conception came to be more fully defined. Christ's twofold obedience, (a) active and (b) passive, produces jointly a twofold result, (1) satisfaction to the broken moral law, (2) merit, securing eternal life to Christ's people. 6 There is no such full and careful theory of Atonement in any Catholic theology, and, according to so unbiassed a judge as A. Ritschl, it represents the last word in doctrine along the lines laid down by the Reformers. Could Catholics adopt it? Hardly; for the Protestant assertion of Christ's merit is shadowed, if any doctrine of merit in the Christian is brought in. Yet the very word reminds us of the legal piety which is characteristic of Western popular religion through all its history. We now find " merit " confined to Christ, and the usual application ruled out, somewhat as St Paul's intenser use of Pharisee conceptions destroyed instead of confirming the idea of righteousness by works. But it is by no means clear that this Protestant doctrine of Atonement is a unity. " Merit " is an intruder in that region of more strict and majestic law; yet Christ's " merit " is the only form under which the positive contents and promises of the Christian Gospel are there repre- sented. Even the most resolute modern orthodoxy usually tries to modify this doctrine. There is a break with the past, which no revival or reaction can quite conceal.

Again, the Reformation had drawn a line round the canon — sharply in Calvinism, less sharply in Lutheranism (which also gave a quasi normative position to its Confessions of Faith). Anglicanism once more resembles Lutheranism with differences;

4 Few Lutheran churches possess bishops. In Germany the " episcopal system " is a right claimed on behalf of the civil government.

6 This is not fully formulated even in the Lutheran Formula of Concord, nor yet in the Calvinistic canons of Dort and Confession of Westminster, though these and other Protestant creeds have various instalments of the finished doctrine. One might add a still further distinction of the Protestant scholasticism. The Atonement imparts to the believer (a) forgiveness, (b) positive acceptance. Actual renewal is, of course, something beyond either of these.

it enjoins public reading of certain lessons from the Apocrypha and uses in worship even the " Athanasian " as well as the two more ancient creeds. On the basis of belief in inspiration we find, during the days of Protestant scholasticism, the most reckless and insane assertions of scriptural perfection. Even in our own time, popular Protestant evangelicalism joins with the newer emphasis upon conversion the two great early Pro- testant appeals — to Atonement and to infallible Scripture. But the Protestant Church is by no means alone in making such assertions. Other Churches make them too, though they over- lay and disguise them with appeals to tradition and to the authority of the Church itself or the Fathers. The definite and limited burden had to be more definitely dealt with; hence these Protestant extravagances.

The first great rival to Protestant orthodoxy, apart from its old enemy of Rome, was Socinianism, guided

by Laelius Soclnlan- Socinus (q.v.), but still more by his nephew Faustus. ism. Thoroughly intellectualist, and rational, and super-

naturalist, it has no one to champion it to-day, yet its influence is everywhere. Jesus, a teacher who sealed His testimony with His blood, and, raised from the dead, was exalted or adopted to divine glory, thus giving to men for the first time the certainty that God's favour could be won and eternal life enjoyed — such is the scheme. There is no natural theology; the teachings so described are really part, or rather are the essence, of the revelation of Jesus. Atonement is a dream, and an immoral dream. Supernatural sacraments of course drop put. The Lord's Supper is a simple memorial. Baptism were better disused, though Faustus will leave the matter to each Christian man's discretion. There is not in all Church history any state- ment of doctrine better knit together. Socinus's church is a school — a school of enlightenment. He was also — like Calvin, if on more narrowly common-sense lines — an admirable exegete. Harnack ranks his system with Tridentine and post-Tridentine theology on the one hand, and with Protestantism on the other hand, as the third great outcome of the history of dogma. Nevertheless the judgment of history declares that this brilliant exploit was entirely eccentric, and could only in indirect ways subserve theological study. Those to-day who are nearest the Socini in belief are as far as any from their fashion of approach- ing and justifying their chosen version of Christian doctrine.

Even after the loss of the Protestants and the suppression or expulsion of the Jansenists, the doctrinal history of the Later his- Church of Rome is described as governed by discus- tory of sions in regard to Thomist Augustinianism. The Roman Molinists {i.e. followers of Louis Molina the Jesuit, not Michael Molinos the mystic) are the leading representatives of a different theology. Harnack, a keenly hostile critic, draws attention to a change in the region of moral theology, not dogmatics. After long controversy, St Alfonso

Liguori's doctrine of Probabilism (originated by Molina) definitely triumphed everywhere. Conduct is considered lawful if any good Church authority holds it to be defensible; and " probability " warrants the confessor in taking a lenient view of sins which he himself, and authorities of weight in the Church, may regard as black in the extreme. From Harnack's point of view, the theory destroys Augustinianism, whatever honour may still be paid to that name. Another important change in Roman Catholic theology has been the increasing personal power of the pope. This was significantly foreshadowed when Pius IV. put forward by his own act what is known as the creed of the Council of Trent; and, after the coldness of the 1 8th century and the evil days of the French Revolution, an Ultramontane revival, relying with enthusiasm on the papacy, grew more and more strong until it became all-powerful under Pius IX. It gained a notable victory when that pope, acting on his own authority, defined (1854) as of faith a doctrine which had been long and hotly discussed — the Immaculate or abso- lutely sinless Conception (deeper than mere sinlessness in act and life) of the Blessed Virgin. The second and decisive victory followed at the Vatican Council (1870), which, at the cost of a small secession of distinguished men, declared the

Catholic doctrine.

pope personally infallible (see Infallibility) and irreformable as often as he rules ex cathedra points of faith or morals. This once again seems to be the last word in a long development. Uncertainty as to the authorities determining religious belief — Scripture, tradition, Fathers, Doctors- — is now, at least poten- tially, at an end; the pope can rule every point definitely, if he sees good to do so.

*The theory of Development (J. A.*M6hler, J. H. Newman), which throws so new a light upon the meaning of tradition, is a valuable support of the conception of a sovereign pontiff drawing out dogmas from implicit into explicit life. Still, new*

Modern theory of

and obscure questionings may still arise. When is the «

It is natural that the ” variations ” with which Bossuet re- proached the Protestants should demand more space. The Christological problem seems to require separate Proies . treatment. In regard to the Trinity, Protestantism tanthis- has nothing very new to say, though ” Sabellianism ” toryof is revived by Swedenborg and Schleietfmacher. But ” octraes - in regard to Christology opinion takes fresh forms as early as Luther himself. While this became conspicuous in connexion with his doctrine of consubstantiation in the Eucharist, it ap- pears 1 that he had a genuine speculative interest in the matter. Communicatio idiomatum was well known in the schools as an affair of terminology. You might say correctly that God has died (meaning the Godman), or that a man is to be worshipped — Christ Jesus. According to Luther, however, it is not merely in words that the attributes of the Godhead qualify Christ’s human nature. 2 That takes place in fact; and so the human glorified body of Christ is, or may become under conditions which please Him, e.g. at the Eucharist, ubiquitous. This new quasi- monophysitism disinclined the Lutherans to make much of Christ’s humanity, while the Reformed, partly from the scholarly tradition of Calvin, partly from a polemical motive, laid great emphasis on the manhood. A. Ritschl 3 even speaks of the Reformed as teaching Kenosis in the modern sense; but it is to be feared they rather taught alternately the manhood and the Godhead than made a serious effort to show the com- patibility of divine and human predicates in one person. Christ as man was one of the Elect (and their head) ; He needed grace; He depended upon the Holy Spirit. On the other hand, as God, He was the very source of grace. The Lutherans held that the Incarnate One possessed all divine attributes, but either willed to suspend their use — this is the Kenosis doctrine of the Lutheran school of Tubingen in the 17th centary — or concealed their working; the latter was the doctrine of the Giessen school.

A theory which flickers through Church history in the train of mystical influence proceeding from the pseudo-Dionysius Areopagita has become more prominent in modern ..yveces- times — that Christ would have become Incarnate sity" of even had man not sinned. Rejected by Thomas, it incaraa- is patronized by Duns — not, one thinks, that he kved ton ' rational certainties more, but that he loved redemptive necessities

1 According to I. A. Dorner.

- *The human predicates are not held to modify the Divine nature, except by modern Kenoticists, who therefore, when they are Lutherans, claim to be completing Luther's theory.*

- *Rechlfertigung u. Versohnung, i. p. 384.*

less. In a sense this theory puts the coping-stone upon Christo- logical development. If we are warranted in regarding the Second Person of the Godhead as in very deed " Himself vouch- safing to be made, " that great Becoming cannot well be sus- pended upon a contingency which might or might not arise; and theologians in general regard the sin of man as such a contingent event. Incarnation almost demands to be speculatively inter- preted as the necessary last stage in the self -manifestation and self-imparting of God. Yet interest in man's moral neces- sities threatens to be lost amid this cosmological wisdom. Theology pushed too far may overleap itself. Those who shrink from the old confident assertion, " Christ would not have become incarnate but for man's sin," might claim to say, from reverence and not from evasiveness, ignoramus. On the other hand, the type of thought which would perfect Christianity in the % form of a philosophy, and subordinates Atonement to Incarnation, is pledged to this doctrine that Incarnation was a rational necessity. Such speculative views are

associated with the revival of another traditional piece of mysticism — the Holy Spirit the Copula or bond of union in the Godhead. There is no such assertion anywhere in the New Testament.

For modern German theories of Kenosis among Lutheran and Reformed, see A. B. Bruce's Humiliation of Christ. Basing on the language of Phil. ii. 7, they teach, in different forms, Modem t | lat tne g on Q f q Q(j became a man un der human limita- eo es o t ; ons a (- conception or birth, and resumed divine predi- enoss. cates at j-j; s exaltation. It might be put in this way — a really Divine personality, a really human experience. Strong as are the terms of Phil. ii. 7, we can hardly suppose that St Paul had a metaphysical theory of Christ's person in view. In Great Britain and America many have adopted this theory. It is often taught, e.g. that Christ's statements on Old Testament literature are to be interpreted in the light of the Kenosis. The enemies of the theory insist that, while it safeguards the unity of Christ's personal experience at any one point, it breaks up by absolute gulfs the continuity of experience and destroys the identity of the person. Indeed, those forms of the theory, which give us a Logos in heaven (John iii. 13) along with the humbled or Incarnate Christ on earth, seem to fail of unifying experience even at the single point. Other suggestions in explanation of the mystery have been : a gradual Incarnation, the process not being complete until Christ's exaltation (I. A. Dorner's earlier view) ; impersonal pre-existence of the Logos, who became personal — compare and contrast Marcellus of Ancyra — - at the Incarnation (W. Beyschlag's earlier view, prac- tically adopted by Dorner in his later days) ; Jesus the man who was absolutely filled with the consciousness of God (Schleiermacher) ; Jesus not to be defined in terms of " nature," either human or divine, but as the perfect fulfiller of God's absolute purpose (A. Ritschl's view, practically adopted in later days by Beyschlag). The orthodoxy which refuses all new theories may look for help to the pathological dissociation of personality, or at

least (e.g. J. O. Dykes in Expository Times, Jan. 1906; Sanday Christologies Ancient and Modern) to the mystery of the subconscious.

We have now to look at Protestant theology in its dealing with questions in which it is more immediately or more fully interested. In the early period known as the Protestant scholasticism there was no desire for progress in doctrine. Armtai- Challenged by Arminianism in Holland, the Calvinistic aaism. theology replied in the Confession of Dort; at which Synod English delegates were present. This creed may almost rank with the Lutheran Formula of Concord as summing up post-Reformation Protestant orthodoxy. But the direct fate of Arminian teachers or churches was no measure of their influence. One proof of the latter is found in Archbishop Laud and the English High Churchmen of his school, who throw off the Augustinian or Calvinistic yoke in favour of an Arminian theology. Lutheranism had set the example of this change. Later editions of Melanchthon's Loci Communes, generously protected by Luther, drop out or tone down Luther's favourite doctrine of predestination. The Augustinian clock was running down, as usual. In the iSth century " Illumination " — an age The which piqued itself upon its " enlightenment, " and

" ilium I- which did a good deal to drive away obscurity, though nation." a j t h e cost f losing depth — Deism outside the churches is matched by a spirit of cool common-sense within them, a spirit which is not confined to professed Rationalists. Civil wars and theological wranglings had wearied men. Supposed

Other

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tlons.

*universal truths and natural certainties were in fashion. The plainest legacy of the 18th century to later times has been a humaner spirit in theology. Christian teachers during the 19th century grew more reticent in regard to future punish- ment. The doctrine when taught is frequently softened; sometimes universalism is taught. A movement to- Uniiari- wards Arianism and then towards Socinianism (Joseph anism. Priestley, Nath. Lardner, W. E. Channing) among English Presbyterians and American Congregationalists left permanent results in the shape of new non-subscribing churches and a diffusion of Unitarian theology (J. Martineau) . The 18th century is very differently interpreted in different quarters. Orthodox evangelicalism is tempted to view it as an apostasy or an aberration. On the other hand, not merely agnostics like Leslie Stephen but Christian theologians of the Left like Ernst Troeltsch regard it as the time when supernaturalism began decisively to go to pieces, and the " modern " spirit to assert its authority even over religion. A. Ritschl, again, claims that neglected elements of Christianity were striving for utterance, particularly a serious belief in God as Father and in His providential care. It was not, says Ritschl, a turning away from Christian motives, but a turning towards neglected Christian motives. This view seems logically to involve Ritschl's belief, that it is not the light of reason but the revelation of Christ which warrants the assertion of God's fatherly providential goodness, i Whether temporary or permanent, a great reaction from the 18th-century spirit set in. It was partly on Augustinian lines, partly on the lines of what the Germans call Pietism. The Evan- Under John and Charles Wesley, a system known as squeal Evangelical Arminianism was worked out in i8th-cen- rev ' va/ * tury England, strongly Augustinian in its doctrines of sin and atonement, modern Augustinian in its doctrine of conversion, strongly anti-Augustinian in its rejection of absolute predes- tination. Within the Anglican Church, however, the new re- vival was Augustinian and Calvinistic, till it gave place to a Church revival, the echo or the sister of the Ultra-*

The Ox- montane movement in the Church of Rome. The f° rd vigorous practical life of the modern school of High Movement ' Church Anglicanism, initiated by John Keble, W. Hurrell Froude, J. H. Newman, E. B. Pusey, is associated with a theological appeal to the tradition of the early centuries, and with a strongly medieval emphasis upon sacramental grace. In Germany, dislike of the Prussian policy of " Union" ^^erao — the legal fusion of the Lutheran and Reformed opposition Churches — gave life to a High Lutheran reaction io ihe which has shown some vigour in thought and some " Un,on '" asperity in judgment (E. W. Hengstenberg; H. A. C. Haever- nick; dogmatic in G. Thomasius and F. A. Philippi ; more liberal type in C. F. A. Kahnis; history of doctrine in G . Thomasius) . The most distinguished of the theologians classed as "mediating" are C. Ullmann, C. I. Nitzsch and Julius Miiller. Later evangelicalism in the English-speaking lands gives up belief in predestination, or at least, with very few exceptions, holds it less strongly. That change is clearly a characteristic feature of 19th-century theology.

Many of the movements just mentioned are, at least in design, pure reactions involving no new thoughts. Apart from apologetics or single doctrines like that of the Atone- Proposals ment, the task of rethinking Christian theology upon to unity the great scale has been left chiefly to German science, theol °xy' philosophical and historical. If the task is to be accom- plished, then, whatever merit in detail belongs to wise and learned writers already referred to, it would seem that some one central principle must become dominant. This considera- tion, as far as an outsider can judge, excludes any formal Roman Catholic co-operation in the suggested task. So long as theo- logical truth is divided into the two compartments of natural or rational theology and incomprehensible revealed mysteries, there is no possibility of carrying through a unity of prin- ciple. Again, many Protestants rule themselves out of par- ticipation in the search for unified doctrine. It is a modern commonplace — Loofs dates

the formula from about 1825 — that

Protestantism has two principles: a ” formal principle,” the authority of Scripture, and a ” material principle,” the doctrine of justification by faith. We have already indicated that some such pair of principles was prominent when historic Protes- tantism pulled itself together for defence during its scholastic age. But surely serious thought cannot acquiesce in a dual control. While the double authority continues or is believed to continue in power, there seems no hope of making theology a living unity, which will claim respect from the modern age.

One great attempt at unifying Christian theology came from the side of philosophy. Kant’s scheme, which in religious theory

as well as in chronology may be regarded as a link / ^""f between the 1 8th and 19th centuries, led on to the or Hegel- very different sc heme of Hegel; and the latter system "”’ began almost at once to influence Church doctrine. D. F. Strauss (q.v.) applied it with explosive effect to the study of the life of Jesus. F. C. Baur, assisted by able colleagues, if hardly less revolutionary, was much more in touch jwith theology than Strauss had been. The Hegelian threefold rhythm was to run through all history, especially for Baur through the history of the Christian Church and of its doctrine. Baur maintained a thorough-going evolutionary optimism. ” The real was the rational ” from first to last. However biassed, this a priori study had its merits. It unified history with a mighty sweep, and revealed through all the ages one evolving process. But we have still to ask whether the doctrines it made prominent are really those which are vital to the Christian Church. And we have to look into Baur’s esoteric interpretation of the doctrinal develop- ment. For him, as for Strauss, the unity of God and

man is the central truth, of which Christ's atoning death is a sort of pictorial symbol. This implies that the whole of Western theology has been an aberration or an exoteric veiling of the truth. 1 In Dogmatic the school is represented by A. E. Biedermann, and with variations by O. Pfleiderer. A more orthodox reading of Hegel's thought, which brings; it into line with some Christological developments already described, is found in J. E. Erdmann and the theologians P. K.

Marheineke and Karl Daub. Influences from Hegel are Influence aIso to be traced in R ichard R ot he, I. A. Dorner, A. M. ia Bag- Fairbairn ; and through the mediation of British philo- "" sophers Hegelianism has widely affected British theology.

The orthodox wing of idealists take as their watchword Incarna- tion; Christianity is " the religion of the Incarnation" (sub-title of Lux Mundi; see B. F. Westcott, passim). The rationalist wing resolve Incarnation and still more Atonement into symbols of philosophical truth. Of the two parties, the latter appears the more successful in accomplishing the task of unifying theology, although at the cost of subordinating both theology and religion to philosophy. The strength of all the idealists consists in their appeal to reason.

Schleiermacher set himself to explain what is distinctive in religion. He distinguishes religion from philosophy as feeling in Schl I r- contrast with thought; but when he has done that macber (R eden ub er die Religion, 1799) he has little to add.

Any type of highly wrought feeling may make a man religious, whether it be theistic or pantheistic ; indeed, as a child of Romanticism, Schleiermacher puts a peculiarly high estimate upon the pantheistic type. What else can we expect from a thinker who is interested simply in feeling as feeling? When he wrote his Glaubenslehre (1821) Schleiermacher had become much more of a Christian churchman. " Christianity is one of the teleological pieties," and has as its peculiarity that " in it everything

is referred to the redemption accomplished through Jesus of Nazareth." But it is doubtful whether the elements of his final synthesis really interpenetrate. He tells us (Kurze Darstellung des theologischen Studiums, 181 1) that the theologian, while himself loyal to his Church, must expound, as a historian, the beliefs actually held in the branch of the Church which he represents. Oil and water do not mix. Do the unchecked individual enthusiasm of the Reden, and the loyalty to established beliefs required in the later writings, combine to form a living theology? It is little wonder if Schleiermacher attains a compromise rather than a unity. He has been one of the great ferments in modern Protestant doctrine both of the Right and of the Left. Alex. Schweizer 2 maintained his general positions more nearly than any other. But there is no Schleiermacher school. W. Herrmann, from his own point of view, has quoted J. C. K. Hofmann and F. R. Frank as making important modifications and sometimes corrections of the lines laid down by Schleiermacher, while J. S. Candlish, representing a moderate Scottish Calvinism, was half inclined to welcome the reduced form of Schleiermacher's basis found in H. L. Martensen (a Dane), J. T. Beck, and the Dutchman, J. J. van Oosterzee, i.e. Scripture the true source of doctrine, but the religious conscious- ness its ordering principle. '

1 Hence R. B. Haldane, in the Scottish Church lawsuit of 1904, is found telling the House of Lords that Justin Martyr had, a grasp of speculative truth which was impossible to St Augustine.

- *Or the Dutchman, J. H. Scholten.*

A bolder and more original attempt to restate Protestantism as a systematic unity is found in the work of A. Ritschl, with H. Schultz and W. Herrmann as independent allies and „„ . . colleagues, and with J. Kaftan, A. Harnack and many Kitscai. others as younger representatives on divergent lines. Reaction against the philosophy of Hegel and the criticism of Baur is common to all the school, though Ritschl went further back than the younger

men towards critical tradition and further in some points towards orthodox dogma. Positively, the school build upon foundations laid in ethics by Kant and in philosophy of religion by Schleier- macher; so also R. A. Lipsius, and yet his dogmatic results coin- cide more nearly with Biedermann's or Pfleiderer's than with the " intermediate though not mediating " position taken up by the Ritschlians. Not even the acceptance of forgiveness as the central religious blessing is exclusively Ritschlian , still, it is a challenge alike to the 1 8th century, to the Church of Rome and to the modern mind. Ritschl and his friends forfeit that unifying of life and duty which is gained by making the moral or perhaps rather legal point of view supreme. As they deny the natural religion of the 18th century — the religion which works its way into harmony with God by virtue — so, still more emphatically, they refuse to bid the sinner merit forgiveness. Thus they constitute one more revival of Paulinism or Augustinianism, though with qualifications.

Their effort is to expound Christianity, not from the point of view of philosophy like the Hegelians, nor from that of an abstract conception of religion, tempered by regard for historical precedents, like Schleiermacher, but from its own, from the Christian point of view. Ritschl has. several dogmatic peculiarities, intenser in him than in his fellow- workers and followers. A notable instance is his doctrine of the Church — the community (Gemeinde) ; the sole object of God's electing love, according to Ritschl's interpretation of St Paul. Hence theology is not to be the utterance of individual Christianity merely, but of the Church's faith, embodied in its classical literature, the New Testament, and (subordinately) in the Old. The finality of the New Testament is partly due to its being the work of minds — including St Paul— who knew the Old Testament from the inside, and did not misconstrue its religious terminology as Greek converts almost inevitably did (cf. Harnack or E. Hatch). Upon the Church, Ritschl, who very much disliked and distrusted mysticism, poured out the

same wealth of emotion which the Christian mystic pours out upon his dimly visualized God or Christ. Again, Ritschl divides all theology into two com- partments, morality and religion; service of men in the Kingdom of God, direct relation to God in the Church by faith. Though he later declared that " Kingdom of God " was the paramount category of Christian thought, it does not appear that he substantially recast his theology. Here then his strong desire for unity is cut across by his own action. There may well be room for relative distinctions in any system of thought, however coherent ; but it looks as if Ritschl's distinction hardened into absolute dualism.

Again Ritschl modifies the doctrine of sin. Like Schleiermacher he substitutes collective guilt for original sin; and he attaches great dogmatic value to the assertion that sin has two stages — ignorance, in which it is pardonable, and obduracy, when it is ripe for final sentence (probably annihilation). Here then Ritschl swerves from Paulinism; it is in other Scriptures 3 that he finds his guarantees for the position just stated. The result is to elimi- nate everything remedial from the Christian gospel. Yet Ritschl claims that his doctrine of Christ as Head of the Church combines the lines of thought found separately in Anselm and Abelard, while Schleiermacher is said to have been one-sidedly Abelardian. Ritschl denies natural theology 4 as well as natural religion, denies dogma outright in its Greek forms — Trinitarian and Christological ; and seeks to transpose the doctrine of Atonement — Christ's Person " or " Works as he puts it — from the legal to the ethical . The Pauline touch shows itself plainly here. Justification by faith is a " syn- thetic " judgment — the sinner is righteous; it is not an "ana- lytic " judgment — the believer is righteous. God " justifieth the ungodly." Sacraments are a republication of the " Word " of the Gospel ; we have to content ourselves with this rather evasive formula, so often employed by the Reformers.

The highly academic Ritschlian movement has had wide

practical influence in many lands. Here English and American thought strikes in sympathetically, offering moral theories of Atonement, though not looking so exclusively towards forgiveness. Horace Bushnell'slast theory declared that in forgiving sirf God " bore cost," as even a good man must do. John M'Leod Campbell — with a strong desire for unity in thought, " the simplicity that is in Christ ' — caught most attention by the suggestion of a vicarious repentance in Jesus Christ. With R. C. Moberly this becomes an assertion that Christ has initiated a redemptive process of self- humiliation, which we can prolong in ourselves by the help of sacraments if we choose; while W. Porcher du Bose (likeE. Irving early in the 19th century) holds the Adoptianist theory styled by A- B. Bruce " redemption by sample " — the divine Christ has

3 Unless I Tim. i. 13 ; but is lhat epistle Paul's?

4 The doctrine of "value judgments" which he substitutes for Schleiermacher's appeal to feeling, belongs to philosophy of religion and is thus analogous to natural theology.

assumed a tainted human nature and washed it clean, thus making it a promise and potency of the world's redemption.

Even if we accept the programme of reconstructing theology from a single point of view, we may desire to criticize not merely Rhschl's execution of the scheme, but his selection of the ruling principle. Is it enough to extricate the spirit of Protestantism from the imperfect letter of its early creeds? Theology O ne set °f difficulties is raised by the progress of and science. No Protestant can deny that it is a duty for

Science. Christianity to come to terms with scientific dis- coveries, and few Catholics will

care to deny it. Anxious negotiations thus arise, which colour all modern schemes of theology. But with a certain school they become central and dominant. We distinguish this position from the new emphasis on Christology, whether churchly or radical. Those who find a gospel in philosophy are ready to dictate terms to outsiders; but those who wait upon science for its verdicts supplicate terms of peace. Just as much of Christianity is to survive as science will spare. Often the theologians in question look to psychology as the permanent basis of religion; who is to deny that religion is a psychological fact, and the natural expression of something in man's constitution? This strain may be recognized, mingled with others, in Schleiermacher; it has found interesting expression in the contributions of H. J. Holtzmann and Ernst Troeltsch to the volume dealing with Christianity in Die Kultur der Gegenwart. Christ is confessed as the greatest figure of the past, and as one of no small im- portance still for the present and future. But, with entire decision, Christianity is called to the bar of modern culture. From that tribunal there is to be no appeal, whether to a higher revelation or to a deeper experience. This view stands in connexion with the study of comparative religion. Out of that very Ritschl school, which began by despising all religions except those of the Bible, has developed the religionsgeschichllich movement, which dissolves Christianity in the wider stream. Such a policy is at the opposite pole to Ritschl's; he desired to interpret Christianity in the light of its own central thought. If Christians can find in their faith new resources to meet the new needs, they may hope to command the future. Theology if it is to live must be henceforth at once more Christian and more scientific than it has ever yet been.

A less threatening yet important possibility of modifica- tion arises out of the scientific study of the New Testament. Augustine, Luther, the evangelical revival, went back Theology t0 g t p au j. can Christianity not dig deeper by going Testa- back to Jesus? A Protestant has to view the past

ment history of doctrine very much as a succession of de-

scholar- clensions and revivals, the latter more than counter-

p ‘ acting the former. He does not claim to have regained

the inspiration of a Paul; but he holds that Augustine was more Christian than the sub-apostolic age, and Luther more Christian than Augustine. That is the hopeful feature in the past. The task for the present, with its unequalled scientific resources, is to get nearer than ever to the heart of the Gospel. Must Pauline categories always be supreme? The Ritschl school, and others too, have made an earnest effort to incorporate Christ’s words in Dogmatic and no longer shunt them into systems of ” Christian Ethics.” They have not idolized Paulinism; but have they not idolized Luther? They seem to take for granted that the spirit — though not the letter — of that great man was a definitive statement of the Christian principle. To interpret Christianity out of itself is one thing; to interpret it out of Luther, even out of a distillate of Luther, is possibly a lower thing. The theology of the future may draw more equally from several New Testament types of doctrines. The scheme that includes most may be the successful scheme. Unity may be safeguarded in the confession of Christ, and theology indeed prove ” Christocentric.” 1 Above all, the social message of Jesus may well prove a gospel to our materially prosperous

1 Thomasius and H. B. Smith are quoted as holding the ” Christo- centric ” ideal. A. M. Fairbairn, mindful of the vast importance of the conception of God, amends the programme. Theology is to be formally Christocentric, materially Theocentric (Fatherhood of God).

but inwardly sorrowful age. Any school of thought which despises that hope has small right to call itself Christian.

Casting a backward glance once more over the evolution of Christian theology, we may say very roughly that at first it recognized as natural or rational truth the being N of the Logos, and as special fact of revelation the and jj e . Incarnation of the Word in Jesus Christ. In medieval veaied— times the basis was altered. What had been rational the truth now claimed acceptance as supernatural mystery. cgos ‘ Modern idealists, ill at ease with this inheritance, try to show that Christ’s Incarnation no less than His eternal divine being is a natural and rational truth. But, when this programme is carried out, there is no small danger lest the relations traced out between God and men should collapse into dust, the facts of Christ transform themselves into symbols, and the idealistic theology of the right wheel to the left.

Again, Western theology, very roughly summarized, while accepting the earlier doctrinal tradition, has broken new ground for itself, in affirming as rational necessity that God Tae must punish sin (this is at least latent in Aquinas’s Atone’ doctrine of natural law), but as contingent fact of re- menu velation that God has in Christ combined the punishment of sin with the salvation of sinners; this is the Reformation or post- Reformation thought. Here again the desire makes itself felt to impute more to God’s nature. Is His mercy not as inherent as His justice? If so, must He not redeem? For, if He merely may redeem but must punish, then His greatest deeds on our behalf wear an aspect of caprice, or suggest unknown if not unknowable motives. The doctrine of penal substitution in the Atonement, as usually conceived, seems to point in the same direction as predestinarianism. Behind superficial mani- festations of grace there is a dark background, almost like the Greek Fate. The ultimate source of God’s actions is something either unintelligible or unrevealed. Christian theology cannot acquiesce in this. In our day especially it must seek to light up every doctrine with the genuine Christian belief in God’s Fatherhood. And yet here again incautious advance may seem to

overleap itself. If it should come to be held that with so kind a God no redemption at all is necessary, the significance of Christ is immensely curtailed if not blotted out. Even if He should still be taken as the prophet of the divine goodwill, yet the loss of any serious estimate of sin makes good nature on God's part a matter of course. Christianity of such a type is likely to be feeble and precarious. Perhaps we may find a third and better possibility by ceasing to aim at a scientific gnosis of God, either limited or unlimited. Perhaps what concerns the Christian is rather the assured revelation that God is acting in character, like Himself, and yet acting wonderfully by methods which we could not predict but must adore. The free life of personal beings is no more to be mastered by a formula than it is to be assigned to caprice. A God who is love will act neither from wilfulness nor from what is called rational but might more correctly be called physical necessity. He will act in and from character. Always wise, always holy, always unsearchable, the Christian's God is that heavenly Father who has His full image and revelation in Jesus Christ.

While the greatest of all theological systems, the Sumtnae of the middle ages, include everything in the one treatise, it has been the business of post-Reformation learning Modern to effect a formal improvement by distributing theo- divisions logical studies among a definite number of headings. of theo- The new theory lived and grew throughout the 18th- ,ogy ' century Age of Enlightenment (e.g. J. S. Semler), linking Pro- testant scholasticism with modern thought, and exhibiting the continuity of science in spite of great revolutionary changes and great reactions. The beginning is ascribed to A. Hyperius (Gerhard of Ypres), a professor at Marburg, and, it seems, a conciliatory Lutheran, not, as sometimes said, a Reformed (15 1 1-64). He published Four Books on the Study of Theo- logy (1556). Book iv. is said to be the first appearance of Practical Theology — Liturgies, Pastoral Theology, &c. In virtue of another work (De Formandis Concionibus,

1553),

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THEOLOGY

Hyperius has been further termed the father of Homiletics. L. Danaeus (Daneau), a French Protestant, has the merit of publishing for the first time on Christian Ethics (1577). It has been supposed that the Reformed divinity here set itself to remedy the dogmatic dryness of Protestant scholasticism, fifty years before the Lutheran G. Calixtus moved in the matter (Theol. Moralis, 1634). Too much has been made of this. Danaeus hardly represents at all what moderns mean by Christian ethics. He does not contrast the Christian outlook upon ethics with all others, but dwells chiefly upon the super- eminence of the Ten Commandments as a summary of duty. Other distinctions are named after an interval of two centuries. J. T. Gabler, for the first time "with clearness" (R. Flint), wrote in 1787 De Justo Discrimine Theologiae Biblicae et Dogtnaticae. Biblical Theology is a historical statement of the different Bible teachings, not a dogmatic statement of what the writer holds for truth, qua truth. Again, P. K. Marheineke is named as the first writer (1810) on Symbolics, the com- parative study of creeds and confessions of faith. In 1764 the introductory study of theology as a whole, which Hyperius invented, had been given by S. Mursinna the name it has since usually borne — " Theological Encyclopaedia. " Most of such Encyclopaedias have been '' material, " i.e. connected treatises, giving a brief outline of theology as a whole; not, of course, alphabetic indexes or dictionaries. The most famous of all, however — Schleiermacher's Kurze Darstellung des theologischen Studiums (1st ed. 181 1) — belongs to the class of "formal" encyclopaedias. It states how theology should be divided, but does not profess to give a bird's-eye view of results.

Schleiermacher's treatise is highly individual. Theology is viewed as essentially a branch of church

administration. True, in the theologian properly so called the scientific interest is strong; where the religious or practical interest is stronger, you get church rulers or administrators in a narrower sense. Still, even to the theologian the practical interest in church welfare is vital. Theology loses its savour when studied in a spirit of merely scientific curiosity; and it does not concern the lay Christian.

In spite of what may be deemed eccentric in this standpoint, Schleiermacher's summary is full of interest. He divides as follows: — I. Philosophical Theology: A. Apologetics; B. Polemics. II. Historical Theology: A. Exegetical — including the determina- tion of the canon; B. Church History proper; C. The depicting of the present state of the Church; (1) its faith — -Dogmatics; the belief of one branch of the Church ; (2) its outward condition — Statistics; these should be universal. Symbolics is to be a branch of statistics. Biblical " Dogmatics " also is said to be nearer this than it is to Dogmatics proper. III. Practical Theology: A. the service of the (local) church; Homiletics, Liturgies, &c. ; B. the Government of the (national or international) Church; questions of relation to the State, &c. The reader will note Schleiermacher's peculiar way of dealing with Dogmatic as the belief of the Church — an unprecedented view, according to A. Ritschl — and his requiring that belief to be reported qua historical fact.

It is singular that Schleiermacher on the whole sums up in the Kurze Darstellung against the separation of Christian Ethics from Dogmatics. But he grants that much may be said on both sides of that question, and in his own Glaubenslehre he follows ordinary usage and as far as possible banishes Ethics to a Christliche Sitten- lehre, a book which has caused him to be regarded by Protestants as the founder of modern Christian Ethics. There are therefore three parallel studies, on all of which Schleiermacher published — Dogmatic or Glaubenslehre, Christian Ethics, Philosophical Ethics.

Curiously enough, it is from Schleiermacher's philosophical ethics that a threefold division — the Chief Good, Virtues, and Duty or the Law — passed into almost all text-books of Chris- tian Ethics, till recently a rebellion rose against it on the ground of redundancy and overlapping. Books on Christian Ethics have also found room for a quasi Synoptic doctrine of the Kingdom of God, which Paulinized dogmatic systems were slow to admit. It should also be noted that Schleiermacher's place for Apologetics is by no means undisputed. Many dislike the subject; some would thrust it into practical theology. Again, the new study of the religions of the world is seeking its place in the curriculum of Christian theology, just as it is seeking — in some way — to modify Christian thought. The recognized place, the assured results, have not yet been attained

Further details must be sought in text-books. But it may be affirmed that Dogmatic must remain the vital centre; and so far we may soften Flint's censure of the British some thoughtlessness which has called that study by the conclu- name " systematic theology." Systems of ethics ami. s/ons. apologetics are welcome to the theologian; " encyclopaedia " is a new and broader-based " systematic theology " in itself; but none of these is central as Dogmatic is. One may also venture to declare that Dogmatic rests upon philosophical and historical studies, and exists for practical uses. Thus a triple or fourfold division of theological sciences seems natural. Lastly, it must be confessed that at the beginning of the 20th century there is more life or health in history than in philosophy, and much more in either than in dogmatic theology.

Sub-divisions of Dogmatic, whether well chosen or ill, throw light upon theology as developed in the past. The six usual Protestant headings are as follows: Theology proper, Anthro- pology, Christology (C. Hodge here inserts Hamartiology), Soteriology, Ecclesiology (omitted by C. Hodge), Eschatology. The Lombard's Sentences deal in bk. i. with God; bk. ii. the creatures; bk. iii.

Incarnation, Redemption, Virtues; bk. iv. Sacraments and Last Things. Aquinas's Summa has no such clear lines of division.

The Church carried forward from the middle ages a tradition of " Moral Theology "' answering to Christian Ethics, alongside of Dogmatics or of all-inclusive Summae. Casuistry (with parallels in early Protestantism like Jeremy Taylor's Ductor Dubitanlium) , growing out of the Confessional, is character- istic of this Roman Catholic Ethic; yet the study is not re- stricted to the technical equipment of confessors. The Roman Catholic contributors to the volume on Christianity in Die Kultur der Gegenwart write on: — I. Dogmatic: A. Apologetic or General Dogmatic; B. Special Dogmatic or Dogmatic proper. II. Moral Theology. III. Practical Theology. The Protestant contributors, representing somewhat varied standpoints in German religion, follow much the same plan. Apologetic has no separate place with them; but the system of theology (in a sense midway between the dogmatists and the encyclopedists), is allotted between Dogmatics, Christian Ethics and Practical Theology.

Literature. — A bibliography of theology cannot name every important book. The effort is made here (1) to mention writers of great originality and distinction, (2) writers of special importance to some one Christian confession, (3) without needless repetition of what has already been said, (4) dogmatic treatises being preferred but not to the exclusion of everything else.

Origen is great in scholarship as well as in system. Athanasius's On the Incarnation of the Eternal Word represents his central thoughts not less interestingly because it is earlier than the Arian contro- versy. Cyril of Jerusalem's Catechetical Lectures are a statement of doctrine for popular use, but arranged as a complete system. Gregory of Nyssa's Great Catechesis is an instruction to catechists how they should proceed — though of course stating the writer's theology and apologetic, with his belief in universal salvation. Theodoret

has an outline of theology in the last book (v.) of his treatise Against Heresies. Theodore of Mopsuestia is a more sus- pected representative of the same scholarship — that of Antioch; John Chrysostom is the orator of the school. Cyril of Alexandria represents the later Alexandrian theology. With John of Damascus the progress of Greek divinity ends. A good modern statement is in Chr. Androntsos's Ao7juariK^. In the West, Augustine is the chief agent in breaking new ground for theology. The Enchiridion ad Laurentium is a slight but interesting sketch of a system, while the De Doctrina Christiana is another lesson in the imparting of Christian instruction, as Is also, naturally, the De Calechizandis Rudibus. The City of God and the Confessions are of unmatched importance in their several ways; and nothing of Augustine's was without influence. Gregory the Great's Magna Moralia should also be named.

In the middle ages Isidore (at its gateway), then Peter Lombard, then Aquinas (and his rivals), are pre-eminent for system, Anselm and Abelard for originality, Bernard of Clairvaux as the theologian who represents medieval piety at its purest and in its most char- acteristic forms, while Thomas a Kempis's devotional masterpiece, On the Imitation of Christ, with Tauler's Sermons and the Theologia Germanica, belong to the world's classics. All the Protestant re- formers are of theological importance — Luther, Melanchthon and

1 " Mystical Theology " is described in Addis and Arnold's Catholic Dictionary as a " branch " of Moral Theology.

Calvin, then Zwingli, then John Knox and others. The reply to Protestantism is represented, by Cardinal Bellarmine, Petavius (less directly), Moehler.

Speculative theology was represented in the Roman

Catholic Church of the 19th century by the Italian writers A. Rosmini, V. Gioberti, T. Mamiani della Rovere. Roman Catholic learning has always taken a high place (the Bollandists; the Benedictines; the huge collections of Migne). Of the Church's ample devo- tional literature St Francis of Sales and F. W. Faber are favourable specimens. A modern Dogmatic is by Syl. T. Hunter, S.J.

Anglican theology is little inclined to dogmatics. We have such unsystematic systems as Bishop Pearson's Exposition of the Apostles' Creed — a book of the golden age of great writers — or we have average 19th-century Church orthodoxy in Bishop H. Browne, On the XXXIX. Articles. Anglicanism prefers to philosophize institu- tions (R. Hooker, Laws of Ecclesiastical Polity), or states ancient learning (R. Cudworth; the Cambridge Platonists), or else polemical learning- Bishop Bull (against Petavius's innovating views of history), D. Waterland (against S. Clarke), S. Horsley (against J. Priestley), J. B. Lightfoot (very strong as an apologist in scholar ship; not strong in pure thinking); the polemic becomes altogether conciliatory in those other glories of 19th-century Cambridge, B. F. Westcott and F. J. A. Hort. Or Anglican theology deals with historical points of detail, such as fill the Journal of Theol. Studies. In devotional literature Anglicanism has always been rich (e.g. Jeremy Taylor, Archbishop R. Leighton, L. Andrewes, W. Law, J. H. Newman). Bishop Butler stands by himself in lonely greatness.

English Puritanism lives in the affections of modern readers more than the Protestant schoolmen of the Continent do — Richard Baxter, John Owen, John Howe, Thos. Goodwin, John Goodwin (an early Arminian) ; for learning, John Lightfoot ; for genius, John Milton; for literary and devotional power, John Bunyan — always admirable except when he talks Puritan dogma. Essential Puritanism is prolonged in the 19th century by R. W. Dale (The Atonement; Christian Doctrine). The Scottish leader, T. Chalmers (Lectures on Divinity), is more important as an orator or as a man than as a thinker. The

somewhat earlier lectures of G. Hill are dry.

Arminianism is less fully worked out by Arminius than by later Dutch divines, of whom the " conciliatory " Limborch is sometimes used as a Methodist text-book. The theologian of English Methodism, apart from John Wesley himself, is Richard Watson. W. B. Pope's Compendium is a somewhat more modern version.

Jonathan Edwards, a very stern Calvinist, is one of the few first-rate geniuses America has to boast in theology. C. Hodge, A A. Hodge, W. G. T. Shedd, published Calvinistic systems. Horace Bushnell had great influence.

While the production of systems of Dogmatic (and of Christian Ethics) never ceases in Germany, A. Ritschl was content to rely on his treatise upon Justification and Reconciliation (vol. i. History of the Doctrine; ii. Biblical material; iii. Positive construction — but much intermingled with history; good English translations of i. and iii.). His Unterrichl in der Christlichen Religion is poor as a school-book but useful for reference. Something is to be learned regarding Ritschl himself from his very hostile Hist, of Pietism. The earlier Entstehung der altkatholischen Kirche (2nd ed. 1857) is a landmark in Apologetics and Church history. J. Kaf- tan's Dogmatic should be named, also the Modern Positive Theology of Th. Kaftan and others.

H L. Martensen's Dogmatics restates substantial orthodoxy with fine literary taste. His Christian Ethics, though diffuse, is per- haps the finest piece of Protestant theology under that title. His friend, I. A. Dorner, had a powerful mind but an inferior gift of style.

The student of theology will do well to seek in the best histories of doctrine more detached treatment than Dogmatic can give.

F. Loofs mentions W. Munscher, J. A. W. Neander, F. C. Baur,

G. Thomasius, F. Nitzsch, A. Harnack, as showing steady advance. Add Loofs himself and R. Seeberg. Works in English by W. G. T. Shedd, G. P. Fisher, J. F. Bethune Baker. Church formularies in Winer (Confessions of Christendom), Schaff (Creeds of Christendom), F. Loofs (Symbolik). The Symbolik of J A. Moehler is a very able anti- Protestant polemic.

A German reviewer has associated as English contributions to Dogmatics, A. M. Fairbairn's Christ in Modern Theology, A. B. Bruce's Apologetics, and the present writer's Essay towards a New Theology. Two American books represent modern evangelicalism — W. N. Clarke's very successful Outline of Theology, and W. A. Brown's Christian Theology in Outline. The High Church position is given in the Manual of T. B. Strong, Evangelical Anglicanism in H. G. C. Moule's Outline.

Encyclopaedia may be studied in J. F. Riibiger, translated with additions by J. Macpherson. J. Drummond (Unitarian) and A. Cave (Congregationalist) have written Introductions to Theology; Cave's bibliographies are not free from errors. American contri- butions in P. Schaff's Propaedeutic and J. F. Hurst's Literature of Theology; a Classified Bibliography. Recent German work by C. F. G. fteinrici; for older treatment see C. R. Hagenbach.

(R. Ma.)

THEON, AELIUS, Alexandrian sophist of uncertain date, author of a collection of preliminary exercises (pro-gymnasmala) for the training of orators. The work (extant, though incom- plete), which probably formed an appendix to a manual of rhetoric, shows learning and taste, and contains valuable notices on the style and speeches of the masters of Attic oratory. Theon also wrote commentaries on Xenophon, Isocrates and Demosthenes, and treatises on style. He is to be distinguished from the Stoic Theon, who lived in the time of Augustus and also wrote on rhetoric (Quintilian, Inst. Oral. ix. 3, 77).

THEON, of Samos, Greek painter of the age of Alexander the Great, is mentioned by Quintilian as a good artist of the second rank. If we may trust the somewhat flimsy stories told about him, his forte consisted in a lifelike, or perhaps, as Brunn (Kunstlergeschichte, ii. 253) puts it, a theatrical representation of action. His figures were said to start out of the picture. He chose such congenial subjects as the madness of Orestes, and a soldier rushing to battle. Another painter, Theorus, is mentioned, whom Brunn regards as identical with Theon.

THEOPHANES, surnamed " the Confessor " (c. a.d. 758-817), Greek ascetic, chronicler and saint, belonged to a noble and wealthy family, and held several offices under Constantine V. Copronymus (741-775). He subsequently retired from the world and founded a monastery (toO MeyaXou 'Aypov) near Sigriane. 1 He was a strong supporter of the worship of images, and in 815 was summoned to Constantinople by Leo the Armenian, who formally ordered him to renounce his principles. Theophanes refused, and, after two years' im- prisonment, was banished to the island of Samothrace, where he died. He subsequently received the honours of canoniza- tion. At the request of his dying friend, George the Syncellus (?.».), Theophanes undertook to continue his Chronicle, which he carried on from the accession of Diocletian to the downfall of Michael I. Rhangabes (284-813). The work, although wanting in critical insight and chronological accuracy, is of great value as supplying the accounts of lost authorities. The language occupies a place midway between the stiff ecclesiastical and the vulgar Greek. In chronology, in addition to reckoning by the years of the world and the Christian era, Theophanes introduces in tabular form the regnal years of the Roman emperors, of the Persian kings and Arab caliphs, and of the five oecumenical patriarchs, a system which leads to considerable confusion. The Chronicle was much used by succeeding chroniclers, and in 873-875 a compilation in barbarous Latin (in vol. ii. of De Boor's edition) was made by the papal

librarian Anastasius from Nicephorus, George the Syncellus, and Theo- phanes for the use of a deacon named Johannes. The transla- tion (or rather paraphrase) of Theophanes really begins with the reign of Justin II. (565), the excerpts from the earlier portion being scanty. At that time there were very few good Greek scholars in the West, and Anastasius shows himself no exception.

There is also extant a further continuation, in six books, of the Chronicle down to the year 961 by a number of mostly anonymous writers (called Of peri. QeoavTiv, Scriptores post Theophanem), who undertook the work by the instructions of Constantine Por- phyrogenitus.

Editions of the Chronicle: — Editio princeps, J. Goar (1655); J. P. Migne, Patrologia Graeca, cviii. ; J. Classen in Bonn Corpus Scriptorum Hist. Byzantinae (1839–41); and C. de Boor (1883–85), with an exhaustive treatise on the MS. and an elaborate index; see also the monograph by J. Pargoire, " Saint Theophane le Chronographe et ses rapports avec saint Theodore studite," in Bufaortxefc Xpovucb, ix. (St Petersburg, 1902).

Editions of the Continuation in J. P. Migne, Patr. Gr., cix., and by I. Bekker, Bonn Corpus Scriptorum Hist. Byz. (1838); on both works and Theophanes generally, see C. Krumbacher, Geschichte der byzantinischen Litteratur (1897); Ein Dithyrambus auf Theo- phanes Confessor (a panegyric on Theophanes by a certain prolo- asecretis, or chief secretary, under Constantine Porphyrogenitus) and Eine neue Vita des Theophanes Confessor (anonymous), both edited by the same writer in Sitzungsberichte der philos.-philol. und

1 Near the village of Kurshunla, on the Sea of Marmora, between the site of the ancient Cyzicus and the mouth of the Rhyndacus, ruins of the monastery may still be seen; on the whole question see J. Pargoire's monograph, section 6 (see Bibliography).

der hist. CI. der k. bayer. Akad. der Wissenschaften (1896, pp. 583- 625; and 1897, pp. 371-399) ; Gibbon's Decline and Fall (ed. Bury), v. p. 500.

THEOPHANO (c. 956-991), wife of the Roman emperor Otto II., was a daughter of the Eastern emperor Romanus II., and passed her early years amid the tragic and changing fortunes which beset the court of Constantinople. Otto the Great having procured her betrothal to his son Otto II., she was married to him and crowned empress at Rome by Pope John XIII. on the 14th of April 972. In return for costly gifts brought by her to her husband, she was granted extensive estates in all parts of the empire. She appears to have been a woman of great beauty and considerable intelligence, and after the death of Otto the Great in 973 gradually superseded his widow Adelaide as the chief adviser of the new emperor, whom she accompanied on several military expeditions. She introduced many Byzantine customs into the German court. After the death of Otto in December 983 she returned to Germany, which she governed with conspicuous success in the name of her son, Otto IIL In 989 she visited Rome, where she exercised as imperatrix the imperial prerogatives, and probably compelled the Romans to swear to acknowledge her son. Theophano died at Nimwegen on the 15th of June 991, and was buried in the church of St Pantaleon at Cologne.

See J. Moltmann, Theophano, die Gemahlin Ottos II. in ihrer Bedeutungfiir die Politik Ottos I. und Ottos II. (Gottingen, 1878).

THEOPHILE, the name by which Theophile de Viau (or Viaud), French poet (1591-1626), is more commonly called. He was born in 1591, at Clairac, near Agen, and spent his early years at Bousseres de Mazeres, his father's property. He was educated at the Protestant college of Saumur, and he went to Paris in his twentieth year. In 161 2 he met Balzac, with whom he made an expedition to the Netherlands, which ended in a serious quarrel. On his return he seems

to have been for two years a regular playwright to the actors at the H6tel de Bour- gogne. In 1615 he attached himself to the ill-fated Henry, duke of Montmorency (1595-1632), under whose protection he produced with success the tragedy of Pyrame et ThisbS, acted probably about 1617 and printed in 1623, although placed later by some critics. This piece, written in the extravagant Spanish- Italian manner, which was fashionable in the interval between the Pleiade model and the innovations of Corneille, was ridiculed by Boileau (Preface to his CEuvres, 1701). Th6ophile was the acknowledged leader of a set of Parisian libertines, whose excesses seem to have been chiefly dictated by a general hatred of restraint. He himself was not only a Huguenot, but a free- thinker, and had made unsparing use of his sharp wit in epigrams on the Church and on the government. In 1619 he was accused of blasphemous and indecent writings, and was banished from Paris. He took refuge in the south of France, where he found protection with many friends. He was allowed to return in the next year, and effected a partial reconciliation with one of his most powerful enemies, the due de Luynes. He served in that year in the campaign against the Huguenots, but in the autumn was again in exile, this time in England. He was re- called in 1621, and began to be instructed in the Roman Catholic religion, though his abjuration of Protestantism was deferred until the end of 1622. There is nothing to show that this conversion was purely political; in any case it did little to mollify his enemies. In 1622 he had contributed four pieces to the Nouveau Parnasse Satirique, a miscellany of verse by many hands. In the next year a new edition appeared, with the addition of some licentious verse, and the inscription par le sieur Thiophile on the title-page. Contemporary opinion justified Tneophile's denial of this ascription, but the Jesuit father, Francois Garasse, published a tract against him entitled La Doctrine curieuse (1623). Theophile was again prosecuted. This time he fled from Paris, to the court of Montmorency, and was condemned in his absence (19th of August 1623) to death. On his

flight to the border he was arrested, and imprisoned in the Conciergerie in Paris. He defended himself in an Apologie au roi (1625), and was liberated in September, his sentence being

commuted to banishment for life. Under Montmorency's pro- tection he was able to hide in Paris fot some ttme, and he subse- quently accompanied his friend and patron to the south. He died in Paris on the 25th of September 1626.

The great interest aroused by the prosecution and defence of Theophile is shown by the number of pamphlets on the subject, forty-two of which, written between the dates 1622 and 1626, are preserved in the Bibliotheque Nationale in Paris.

Les CEuvres du Sieur Theophile were printed in Paris in 1 621, and other collections followed during his lifetime. Six years after his death Georges de Scudery edited his work with a Tombeau (copy of obituary verses), and a challenge in the preface to any one who might be offended by the editor s eulogy of the poet. A tragedy entitled Pasiphae, published in 1631, is probably not Tneophile's, and is not included in his works, the standard modern edition of which is that of Alleaume in the Bibliotheque Elzevirienne (2 vols. 1856). Besides Pyrame et Thisbe, his works include a para- phrase, half verse, half prose, of the Phaedo. There are numerous French and Latin letters, his Apologie, a promising fragment of comic prose narrative, and a large collection of occasional. verses, odes, elegies, stanzas, &c.

In addition to Alleaume's edition, a delightful article in Theo- phile Gautier's Grotesques should be consulted respecting him. A full account of the extensive literature dealing with Theophile is given by Dr K. Schirmacher in a study on Thiophile de Viau (Leipzig and Paris, 1897). In the Page disgracie of Tristan l'Hermite, the page makes the acquaintance of a dramatic author, and his description may be accepted as a contemporary portrait of Theo- phile's vigorous personality.

THEOPHILUS, East Roman emperor (829–842), the second of the " Phrygian " dynasty. Unlike his father Michael II., he declared himself a pronounced iconoclast. In 832 he issued an edict strictly forbidding the worship of images; but the stories of his cruel treatment of recalcitrants are probably exaggerated. At the time of his accession, the Sicilians were still engaged in hostilities with the Saracens, but Theophilus was obliged to, devote all his energies to the war against the caliphs of Bagdad (see Caliphate, especially sect. C, § 8). This war was caused by Theophilus, who afforded an asylum to a number of Persian refugees, one of whom, called Theophobus after his conversion to Christianity, married the emperor's sister Helena, and became one of his generals. The Roman arms were at first successful; in 837 Samosata and Zapetra (Zibatra, Sozopetra), the birth- place of Motasim, were taken and destroyed. Eager for re- venge, Motasim assembled a vast army, one division of which defeated Theophilus, who commanded in person, at Dasymon, while the other advanced against Amorium, the cradle of the Phrygian dynasty. After a brave resistance of fifty-five days, the city fell into Motasim's hands through treachery (23rd of September 838). Thirty thousand of the inhabitants were slain, the rest sold as slaves, and the city razed to the ground. Theophilus never recovered from the blow, his health gradually failed, and he died at the beginning of 842. His character has been the subject of considerable discussion, some regarding him as one of the ablest of the Byzantine emperors, others as an ordinary oriental despot, an overrated and insignificant ruler. There is no doubt that he did his best to check corruption and oppression on the part of his officials, and administered justice with strict impartiality, although his punishments did not always fit the crime. In spite of the drain of the war in Asia and the large sums spent by Theophilus on building, commerce, industry, and the finances of the empire were in a most flourish- ing condition, the credit of which was in great measure due to the highly efficient administration of the department. Theo- philus, who had received an

excellent education from John Hylilas, the grammarian, was a great admirer of music and a lover of art, although his taste was not of the highest. He strengthened the walls of Constantinople, and built a hospital, which continued in existence till the latest times of the Byzantine Empire.

See Zonaras, xv. 25-29; Cedrenus, pp. 513-533; Theophanes continuatus, iii.; Gibbon, Decline and Fall, chaps. 48 and 52-,

F. G. Schlosser, Geschichte der bilderstiirmenden Kaiser (1812);

G. Finlay, History of Greece, ii. (1877) p. 142; G. F. Hertzberg, Geschichte der Byzantiner und des osmanischen Reiches, bk. i. (Berlin, 1883); H. Gelzer, " Abriss der byzantinischen Kaisergeschichte " in C. Krumbacher's Geschichte der byzantinischen Litteratur (2nd ed.

1897) ; and authorities under Roman Empire, Later. On the early campaigns against the Arabs see J. B. Bury, in Joum. Hell. Stud, xxix., 1909, pt. i.

THEOPHRASTUS, the successor of Aristotle in the Peri- patetic school, a native of Eresus in Lesbos, was born c. 372 b. c. His original name was Tyrtamus, but he later became known by the nickname " Theophrastus, " given to him, it is said, by Aristotle to indicate the grace of his conversation. After re- ceiving his first introduction to philosophy in Lesbos from one Leucippus or Alcippus, he proceeded to Athens, and became a member of the Platonic circle. After Plato's death he attached himself to Aristotle, and in all probability accompanied him to Stagira. The intimate friendship of Theophrastus with Callis- thenes, the fellow- pupil of Alexander the Great, the mention made in his will of an estate belonging to him at Stagira, and the repeated notices of the town and its museum

in the History of Plants, are facts which point to this conclusion. Aristotle in his wili made him guardian of his children, bequeathed to him his library and the originals of his works, and designated him as his successor at the Lyceum on his own removal to Chalcis. Eudemus of Rhodes also had some claims to this position, and Aristoxenus is said to have resented Aristotle's choice. Theo- phrastus presided over the Peripatetic school for thirty-five years, and died in 287 B.C. Under his guidance the school flourished greatly— there were at one period more than 2000 students — and at his death he bequeathed to it his garden with house and colonnades as a permanent seat of instruction. Menander was among his pupils. His popularity was shown in the regard paid to him by Philip, Cassander and Ptolemy, and by the complete failure of a charge of impiety brought against him. He was honoured with a public funeral, and " the whole population of Athens, honouring him greatly, followed him to the grave " (Diog. Laert.).

From the lists of the ancients it appears that the activity of Theophrastus extended over the whole field of contemporary know- ledge. His writing probably differed little from the Aristotelian treatment of the same themes, though supplementary in details (see Peripatetics). He served his age mainly as a great popularizer of science. The most important of his books are two large botanical treatises, On the History of Plants, in nine books (originally ten), and On the Causes of Plants, in six books (originally eight), which constitute the most important contribution to botanical science during antiquity and the middle ages. We also possess in fragments a History of Physics, a treatise On Stones, and a work On Sensation, and certain metaphysical 'Airopim, which probably once formed

Cart of a systematic treatise. Various smaller scientific fragments ave been collected in the editions of J. G. Schneider (1818-21) and F. Wimmer (1842-62) and in Usener's Analecta Theophrastea.

The Ethical Characters ('Hducoi xapaKT7;a«$) deserves a separate mention. The work consists of brief, vigorous and trenchant delineations of moral types, which contain a most valuable picture of the life of his time. They form the first recorded attempt at systematic character writing. The book has been regarded by some as an independent work; others incline to the view that the sketches were written from time to time by Theophrastus, and collected and edited after his death; others, again, regard the Characters as part of a larger systematic work, but the style of the book is against this. Theophrastus has found many imitators in this kind of writing, notably Hall (1608), Sir Thomas Overbury (1614-16), Bishop Earle (1628) and La Bruyere (1688), who also translated the Characters.

Bibliography. — A good account of Theophrastus is found in Zeller, Aristotle and the Earlier Peripatetics (Eng. trans, by B. F. C. Costelloe and J. H. Muirhead, vol. ii., chap. 18, 1897). For his astronomical work see Astronomy (Historical Section), and for the botanical works, see Dr J. Berendes, Die Pharmacie bei den alien Culturvolken (vol. i.',' 1891). The Ethical Characters was edited by Casaubon in 1592 and translated by La Bruyere (1688-89); the best modern translation (with introduction and notes) is that of Sir R. C. Jebb (1870; new ed. J. E. Sandys, 1909); recent editions are that of J. M. Edmonds and G. E. V. Austen (1904), containing text, notes and illustrations (intended for schools), and that of C. E. Bennett and W. A. Hammond (1902), a translation, with an introduction. The work has been translated into nearly all Euro- pean languages (see Baldwin's Diet, of Philos. and Psych., vol. iii. pt. i.). (E. Wh.)

THEOPHYLACT (d. cmo), biblical commentator, was born most probably at Euripus, in Euboea, about the middle of the nth century. He became a deacon at Constantinople, attained a high reputation as a scholar, and became the tutor of

Constantine Porphyrogenitus, son of the Emperor Michael VII., for whom he wrote The Education of

Princes (HaiSda. paxriXiicri) . About 1078 he went into Bulgaria as archbishop of Achrida. In his letters he complains much of the rude manners of the Bulgarians, and he sought to be relieved of his office, but apparently without success. His death took place after 1107.

His commentaries on the Gospels, Acts, the Pauline epistles and the Minor Prophets are founded on those of Chrysostom, but deserve the considerable place they hold in exegetical literature for their appositeness, sobriety, accuracy and judiciousness. His other extant works include 130 letters and various homilies and orations and other minor pieces. A careful edition of nearly all his writings, in Greek and Latin, with a preliminary dissertation, was published in 1754-63 by J. F. B. M. de Rossi (4 vols, fol., Venice).

See Krumbacher, Byzantinische Litteraturgeschichte (2nd ed. 1897) pp. 132, 463.

THEOPOMPUS (b. c. 380), Greek historian and rhetorician, was born at Chios about 380 B.C. In early youth he seems to have spent some time at Athens, along with his father, who had been exiled on accouut of his Laconian sympathies. Here he became a pupil of Isocrates, and rapidly made great progress in rhetoric; we are told that Isocrates used to say that Ephorus required the spur but Theopompus the bit (Cicero, Brutus, 204). At first he appears to have composed epideictic speeches, in which he attained to such proficiency that in 352-351 he gained the prize of oratory given by Artemisia (q.v.) in honour of her husband, although Isocrates was himself among the competitors. It is said to have been the advice of his teacher that finally determined his career as an historian— a career for which he was peculiarly qualified owing to his abundant patrimony and his wide knowledge of men and places. Through the influence of Alexander, he was restored to Chios about 333, and figured for some time as one of the leaders of the aristocratic party in his native town. After Alexander's death he was again expelled, and took refuge with Ptolemy in

Egypt, where he appears to have met with a somewhat cold reception. The date of his death is unknown.

*The works of Theopompus were chiefly historical, and are much quoted by later writers. They included an Epitome of Herodotus' s History (the genuineness of which is doubted), the Hellenics ('EXXijwxd, 'EXXrji'utoi ioToplai), the History of Philip (*iXtTir«A), and several panegyrics and hortatory addresses, the chief of which was the Letter to Alexander. The Hellenics treated of the history of Greece, in twelve books, from 41 1 (where Thucydides breaks off) to 394 — the date of the battle of Cnidus (cf. Diod. Sic, xiii. 42, with xiv. 84). Of this work only a few fragments were known up till 1907. The papyrus fragment of a Greek historian of the 4th century B.C., discovered by B. P. Grenfell and A. S. Hunt, and published by them in Oxyrhynchus Papyri, vol. v. (1908), has been recognized by Ed. Meyer, U. von Wilamowitz-Moellendorff and G. Busolt as a portion of the Hellenics. This identification has been disputed, however, by F. Blass, J. B. Bury, E. M. Walker and others, most of whom attribute the fragment, which deals with the events of the year 395 B.C. and is of considerable extent, to Cratippus (q.v.). A far more elaborate work was the- *iX«riruc& in 58 books. In this Theopompus narrated the history of Philip's reign (360-336), with digressions on the names and customs of the various races and countries of which he had occasion to speak, which were so numerous that Philip V. of Macedon reduced the bulk of the history from 58 to 16 books_ by cutting out those parts which had no connexion with Macedonia. It was from this history that Trogus Pompeius (of whose Historiae Philippicae we possess the epitome by Justin) derived much of his material. Fifty-three books were extant in the time of Photius (9th century), who read them, and has left us an epitome of the 12th book. Several fragments, chiefly anec- dotes and strictures of various kinds upon the character of nations and individuals, are preserved by Athenaeus, Plutarch and others. Of the Letter to Alexander we possess one or two fragments cited by Athenaeus,*

animadverting severely upon the immorality and dissipations of Harpalus. The Attack upon Plato, and the treatise On Piety, which are sometimes referred to as separate works, were perhaps only two of the many digressions in the history of Philip; some writers have doubted their authenticity. The libellous attack (Tpixi.pams, the " three-headed ") on the three cities — Athens, Sparta and Thebes — was published under the name of Theopompus by his enemy Anaximenes of Lampsacus. The nature of the extant fragments fully bears out the divergent criticisms of antiquity upon Theopompus. Their style is clear and pure, full of choice and pointed expressions, but lacking in weight and dignity. The artistic unity of his work suffered severely from the frequent and lengthy digressions already referred to. The most important was

that On the Athenian Demagogues in the loth book of the Philippica, containing a bitter attack on many of the chief Athenian statesmen, and generally recognized as having been freely used by Plutarch in several of the Lives. Another fault of Theopompus was his excessive fondness for romantic and incredible stories; a collection of some of these (Qavnaaia.) was afterwards made and published under his name. He was also severely blamed in antiquity for his censoriousness, and throughout his fragments no feature is more striking than this. On the whole, however, he appears to have been fairly impartial. Philip himself he censures severely for drunkenness and immorality, while Demosthenes receives his warm praise.

Bibliography. — Fragments in C. Mtiller, Frag. Hist. Graec, i.; monograph by A. J. Pflugk (1827), and a good account in W. Mure, Language and Literature of Ancient Greece, v. pp. 509–529. See also Greece: Ancient History, § Authorities. A complete edition of the fragments of Theopompus and of Cratippus has been published by the Clarendon Press, Oxford

(1909), containing the fragment of the new historian. For a discussion of the authorship of this fragment see Oxyrhynchus Papyri (1908), vol. v. pp. 110-242; G. Busolt, Hermes (1908), pp. 255-285 (Der Neue Historiker und Xenophon); E. M. Walker, Klio (1908) ("Cratippus or Theo- pompus ") ; W. A. Goligher, English Historical Review, vol. xxiii. pp. 277-282 (" The New Greek Historical Fragment ") ; A. von Mess, Rheinisches Museum (1908), pp. 370-391 (" Die Hellenica von Oxyrhynchos "). (E. M. W.)

THEORBO [Fr. Morbe, Ger. Theorba, Ital. theorba, Barbitone], the large double-necked bass lute much used during the 16th and 1 7th centuries as general bass in the orchestra. The body of the theorbo was constructed on the same principles as that of the lute but larger, and the same scheme of decoration was followed. The neck, instead of being bent back at an angle to form the head, was straight, having sufficient pegs set in the sides of the head for from 12 to 16 strings tuned in pairs of unisons; on the fingerboards were marked 8 or more frets for semitones. Above this neck was another without frets, curving forwards and slightly to one side to enable the long bass strings, stretched not over but at the side of the neck, to escape the pegs of the shorter strings. These free strings, known as diapason strings (Ger. Begleitseiten) were plucked d vide like those of the lyre, each giving but one note; the number of these strings varied from 8 to 11.

The theorbo was made in two sizes, the ordinary instrument measuring about 3 ft. 6 in., and the Paduan, also known as archlute, about 5 ft. The chitarrone, or Roman theorbo, was the largest of all, a contrabass lute in fact, and frequently stood over 6 ft. high. It differed slightly from the theorbo; the body was a little smaller than in the Paduan variety, the whole of the extra length being in the second neck. The strings over the fingerboard were of steel or brass, and the diapason strings of spun wire.

For the history of the theorbo, see Barbiton and

Lute.

THEOSOPHY (from Gr. 0e6s, god, and ao(j>ia, wisdom), a term used to denote those forms of philosophic and religious thought which claim a special insight into the Divine nature and its constitutive moments or processes. Sometimes this insight is claimed as the result of the operation of some higher faculty or some supernatural revelation to the individual; in other instances the theosophical theory is not based upon any special illumination, but is simply put forward as the deepest speculative wisdom of its author. But in any case it is char- acteristic of theosophy that it starts with an explication of the Divine essence, and endeavours to deduce the phenomenal universe from the play of forces within the Divine nature itself.

General Theory. — Theosophy is thus differentiated at once from all philosophic systems which attempt to rise from an analysis of phenomena to a knowledge, more or less adequate, of the existence and nature of God. In all such systems, God is the terminus ad quern, a direct knowledge of whom is not claimed, but who is, as it were, the hypothesis adopted, with varying degrees of certainty in different thinkers, for the ex- planation of the facts before them. The theosophist, on the other hand, is most at his ease when moving within the circle of the Divine essence, into which he seems to claim absolute insight. This, however, would be insufficient to distinguish theosophy from those systems of philosophy which are some- times called " speculative " and " absolute," and which also in many cases proceed deductively from the idea of God.

In a wide sense, the system of Hegel or the system of Spinoza may be cited as examples of what is meant. Both thinkers claim to exhibit the universe as the evolution of the Divine nature. They must believe, therefore, that they have grasped the inmost principles of that nature: so much is involved, indeed, in the construction of an absolute system. But it is to be noted that, though there is much talk of God in such systems, the known universe

— the world that now is- — is no- where transcended; God is really no more than the principle of unity immanent in the whole. Hence, while the accusation of pantheism is frequently brought against these thinkers, the term theosophical is never used in their regard. A theosophical system may also be pantheistic, in tendency if not in intention; but the transcendent character of its Godhead definitely dis- tinguishes it from the speculative philosophies which . might otherwise seem to fall under the same definition. God is re- garded as the transcendent source of being and purity, from which the individual in his natural state is alienated and afar off. An historical survey shows, indeed, that theosophy gene- rally arises in connexion with religious needs, and is the expres- sion of religious convictions or aspirations. Accepting the testimony of religion that the present world lies in wickedness and imperfection, theosophy faces the problem of speculatively accounting for this state of things from the nature of the God- head itself. It is thus in some sort a mystical philosophy of the existence of evil; or at least it assumes this form in some of its most typical representatives.

The term Mysticism (q.v.) has properly a practical rather than a speculative reference; but it is currently applied so as to include the systems of thought on which practical mysticism was based. Thus, to take only one prominent example, the pro- found speculations of Meister Eckhart (q.v.) are always treated under the head of Mysticism, but they might with equal right appear under the rubric Theosophy. In other words, while an emotional and practical mysticism may exist without attempt- ing philosophically to explain itself, speculative mysticism is almost another name for theosophy. There is still a certain difference observable, however, in so far as the speculative mystic remains primarily concerned with the theory of the soul’s relation to God, while the theosophist gives his thoughts a wider scope, and frequently devotes himself to the elaboration of a fantastic philosophy of nature.

In the above acceptation of the term, the Neoplatonic doctrine of emanations from the supra-essential One, the fanciful emana- tion-doctrine of some of the Gnostics (the aeons of the Valen- tinian system might be mentioned), and the elaborate esoteric system of the Kabbalah, to which the two former in all pro- bability largely contributed, are generally included under the head of theosophy. In the two latter instances there may be noted the allegorical interpretation of traditional doctrines and sacred writings which is a common characteristic of theosophical writers. Still more typical examples of theosophy are furnished by the mystical system of Meister Eckhart and the doctrine of Jacob Boehme (q.v.), who is known as " the theosophist " par excellence. Eckhart's doctrine asserts behind God a predicateless Godhead, which, though unknowable not only to man but also to itself, is, as it were, the essence or potentiality of all things. From it proceed, and in it, as their nature, exist, the three persons of the Trinity, conceived as stadia of an eternal self-revealing process. The eternal generation of the Son is equivalent to the eternal creation of the world. But the sensuous and pheno- menal, as such, so far as they seem to imply independence of God, are mere privation and nothingness; things exist only through the presence of God in them, and the goal of creation, like its outset, is the repose of the Godhead. The soul of man, which as a microcosmos resumes the nature of things, strives by self- abnegation or self-annihilation to attain this unspeakable reunion (which Eckhart calls being buried in God) . Regarding evil simply as privation, Eckhart does not make it the pivot of his thought, as was afterwards done by Boehme; but his notion of the Godhead as a dark and formless essence is a favourite thesis of theosophy.

Besides mystical theology, Boehme was indebted to the writings of Paracelsus. This circumstance is not

accidental, but points to an affinity in thought. The nature-philosophers of the Renaissance, such as Nicolaus Cusanus, Paracelsus, Cardan and others, curiously blend scientific ideas with speculative notions derived from scholastic theology, from Neoplatonism and even from the Kabbalah. Hence it is customary to speak of their theories as a mixture of theosophy and physics, or theo- sophy and chemistry, as the case may be. Boehme offers us a natural philosophy of the same sort. As Boehme is the typical theosophist, and as modern theosophy has nourished itself almost in every case upon the study of his works, his dominating conceptions supply us with the best illustration of the general trend of this mode of thought. His speculation turns, as has been said, upon the necessity of reconciling the existence and the might of evil with the existence of an all-embracing and all- powerful God, without falling into Manichaeanism on the one hand, or, on the other, into a naturalistic pantheism that denies the reality of the distinction between good and evil. He faces the difficulty boldly, and the eternal conflict between the two may be said to furnish him with the principle of his philosophy. It is in this connexion that he insists on the necessity of the Nay to the Yea, of the negative to the positive. Eckhart's Godhead appears in Boehme as the abyss, the eternal nothing, the essenceless quiet (" Ungrund " and " Stille ohne Wesen " are two of Boehme's phrases). But, if this were all, the Divine Being would remain an abyss dark "even to itself. In God, however, as the condition of His manifestation, lies, according to Boehme, the " eternal nature " or the mysterium magnum, which is as anger to love, as darkness to light, and, in general, as the negative to the positive. This principle (which Boehme often calls the evil in God) illuminates both sides of the anti- thesis, and thus contains the possibility of their real existence. By the " Qual " or torture, as it were, of this diremption, the universe has qualitative existence, and is knowable. Even the three persons of the Trinity, though existing idealiter beforehand, attain reality only through this principle of nature

in God, which is hence spoken of as their matrix. It forms also the matter, as it were, out of which the world is created; without the dark and fiery principle, we are told, there would be no creature. Hence God is sometimes spoken of as the father, and the eternal nature as the mother, of things. Creation (which is conceived as an eternal process) begins with the creation of the angels. The subsequent fall of Lucifer is explained as his surrender of himself to the principle of nature, instead of dwell- ing in the heart of God. He sought to make anger predominate over love; and he had his will, becoming prince of hell, the kingdom of God's anger, which still remains, however, an in- tegral part of the Divine universe. It is useless to follow Boehme further, for his cosmogony is disfigured by a wild Paracelsian symbolism, and his constructive efforts in general are full of. the uncouth straining jof an untrained writer. In spite of these defects, his speculations have exercised a re- markable influence.

Schelling's Philosophical Inquiries into the Nature of Human Freedom (1800) is almost entirely a reproduction of Boehme's ideas, and forms, along with Baader's writings, the best modern example of theosophical speculation. In his philosophy of identity Schelling (q.v.) had already defined the Absolute as pure indifference, or the identity of subject and object, but without advancing further into theogony. He now proceeded to distinguish three moments in God, the first of which is the pure indifference which, in a sense, precedes all existence — the primal basis or abyss, as he calls it, in agreement with Boehme. But, as there is nothing before or besides God, God must have the ground or cause of His existence in Himself. This is the second moment, called nature in God, distinguishable from God, but inseparable from Him. It is that in God which is not God Himself, it is the yearning of the eternal One to give birth to itself. This yearning is a dumb unintelligent longing, which moves like a heaving sea in obedience to some dark and in- definite law, and is powerless

to fashion anything in permanence.

But in correspondence to the first stirring of the Divine existence there awakes in God Himself an inner reflective perception, by means of which— since no object is possible for it but God — God beholds Himself in His own image. In this, God is for the first time as it were realized, although as yet only within Him- self. This perception combines, as understanding, with the primal yearning, which becomes thereby free creative will, and works formatively in the originally lawless nature or ground. In this wise is created the world as we know it. In every natural existence there are, therefore, two principles to be distinguished — first, the dark principle, through which this is separated from God, and exists, as it were, in the mere ground; and, secondly, the Divine principle of understanding. The first is the particular will of the creature, the second is the universal will. In irrational creatures the particular will or greed of the individual is controlled by external forces, and thus used as an instrument of the universal. But in man the two principles are consciously present together, not, however, in inseparable union, as they are in God, but with the possibility of separation. This possibility of separation is the possibility of good and evil. In Boehme's spirit, Schelling defended his idea of God as the only way of vindicating for God the con- sciousness which naturalism denies, and which ordinary theism emptily asserts. This theosophical transformation of Schelling's doctrine was largely due to the influence of his contemporary Baader (q.v.). Baader distinguishes, in a manner which may be paralleled from Boehme, between an immanent or esoteric process of self-production in God, through which He issues from His unrevealed state, and the emanent, exoteric or real process, in which God overcomes and takes up into Himself the eternal " nature " or the principle of selfhood, and appears as a Trinity of persons. The creation of the world is still further to be distinguished from these two processes as an act of freedom or will; it cannot, therefore, be

speculatively constructed, but must be historically accepted. Baader, who combined his theo- sophy with the doctrines of Roman Catholicism, has had many followers. Among thinkers on the same lines, but more or less independent, Molitor is perhaps the most important. Sweden- borg (q.v.) is usually reckoned among the theosophists, and some parts of his theory justify this inclusion; but his system as a whole has little in common with those speculative constructions of the Divine nature which form the essence of theosophy, as strictly understood.

Besides the books mentioned under Mysticism, and those referred to under individual authors, Baur's Die christliche Gnosis in ihrer geschichtlichen Entwicklung (1835) and Hamberger, Stimmen aus dem Heiligthum der christlichen Mystik und Theosophie (1857), may be mentioned. (A. S. P.-P.)

Oriental Theosophy The term " theosophy " has in recent years obtained a some- what wide currency in a restricted signification as denominat- ing the beliefs and teachings of the Theosophical Society. This society was founded in the United States of America in the year 1875 by Madame H. P. Blavatsky (q.v.), in connexion with Colonel H. S. Olcott (d. 1906) and others. The main objects of the society were thus set out: (1) To establish a nucleus of the universal brotherhood of humanity; (2) to promote the study of comparative religion and philosophy; (3) to make a sys- tematic investigation into the mystic potencies of life and matter, or what is usually termed " occultism." As regards the first object the mere fact of joining the society and becoming an " initiated fellow " was supposed to involve a certain kind of intellectual and social brotherhood, though not implying anything in the nature of an economic union. This latter aspect of the fraternity was to be satisfied by the contribution from each fellow of five dollars by way of initiation fee. The society's theory of universal brotherhood was, however, of far wider scope, being based upon a mystical conception of " the One Life " — an idea derived from and common to various forms»f Eastern thought, Vedic and Buddhist. It implies the

necessary interdependence of all that is — that ultimate Oneness which underlies and sustains all phenomenal diversity, whether

inwardly or outwardly, whether individual or universal. The theosophical conception of brotherhood is thus rather transcen- dental than materialistic, and is not therefore to be regarded as the exact equivalent of the socialistic doctrine of the solidarity of the human race.

The second object of the society, the study of comparative religion and philosophy, soon crystallized into an exposition of a more or less definite system of dogmatic teaching. The leading thesis seems to have been that all the great religions of the world originated from the same supreme source, and that they were all to be regarded as so many divers expressions of one and the same fundamental truth, or " Wisdom Religion," in such form and dress as was best adapted to suit the times and the people for whose spiritual growth and development religious instruction was required. Now, in order to discern this underlying truth in the various and apparently conflicting world creeds, appeal was made to a " Secret Doctrine," and " Esoteric Teaching," which Madame Blavatsky proclaimed had been held for ages as a sacred possession and trust by certain mysterious adepts in occultism, or " Mahatmas," with whom she said she was in psychical as well as in direct physical communication. It is here that the theosophical movement showed its most serious shortcomings. From time to time Madame Blavatsky's numerous friends and associates were allowed to witness the manifestations of " occult phenomena," which she averred were the outcome of her connexion with these " Mahatmas." The fraudulent character of the " phenomena " was on several occasions exposed by numerous painstaking investigators (see Proceedings of the Society for Psychical Research, vols. iii.

and ix., and A Modern Priestess of I sis, by Solovyoff). There are, moreover, numerous passages in the sacred books of the East, especially those of the Buddhists, which warn the student against the assumption that " magical " performances of any kind are to be regarded as proving the truth of the performer's teaching; and indeed it must be owned in justice to the theoso- phists that similar warnings are to be found scattered through- out their writings ; while even Madame Blavatsky herself was wont to expatiate on the folly of accepting her " pheno- mena " as the mark of spiritual truth. Yet at the same time it cannot well be denied that she was in the habit of pointing to the said marvels as evidence of her Mahatma's existence.

If theosophy were to be judged solely by the published revelations of this " Secret Doctrine " it would hardly be de- serving of serious consideration; for, as suggested in the separate article on Madame Blavatsky, the revelations them- selves appear to have been no more than a crude compilation of vague, contradictory and garbled extracts from various periodicals, books and translations. It was an article of faith with her disciples that the outward and visible Helena Petrovna Blavatsky was on certain occasions the vehicle of psychic powers of transcendent spiritual import. Although there is not much to justify such a proposition, it may perhaps be con- ceded that she was in many respects abnormal and that some of her work is characteristic of a process known to modern psychologists as " automatism," or in other words that it is the result of a spasmodic" uprush to the surface of sub-conscious mental activities. Apart, however, from these pseudo-revela- tions the Theosophical Society has given rise to an extensive literature, some of which displays a high degree of argumentative and expository ability; and moreover the movement has from time to time attracted the attention and secured the co-opera- tion of many earnest seekers, of some few of whom it can be truly said that they possessed undoubted spiritual power, in- sight and knowledge.

Soon after the death of Madame Blavatsky a split in the society was brought about by Mr Wm. Q. Judge (d. 1896) of New York, who claimed the leadership; and there came into existence two if not three separate theosophical societies (following Judge and later Mrs Katherine Tingley in America, Olcott and Mrs Annie Besant in America and India, with a more or less independent organization in England), each one con- tending that the original afflatus of the founder had descended

upon it exclusively. The fortunes of the societies are, however, of less importance than their leading doctrine.

It will be surmised from what has been said that any concise statement of orthodox theosophy is hardly to be expected; though from the materials available a fairly definite outline of its leading tenets can be deciphered. We will try to give a cursory review of three of the most important of these, viz. : the constitution and development of the personality or ego; the doctrine of " Karma "; and the Way or Path towards en- lightenment and emancipation. Human personality, we learn, is the temporary manifestation of a complex organization con- sisting of " seven principles," which are united and inter-dependent, yet divided into certain groups, each capable of maintaining temporarily a spurious kind of personality of its own and sometimes capable of acting, so to speak, as a distinct vehicle of our conscious individual life Each "principle" is composed of its own form of matter, determined and condi- tioned by its own laws of time, space and motion, and is, as it were, the repository of our various memories and volitions. These seven " principles," starting from the most gross — the physical body, or " Rupa "—become more and more subtle and attenuated until we reach the Universal Self " Atma," the centre as also the matrix of the whole, both individual and universal. Now that which binds together these elements of our nature and maintains their interrelation in their respective spheres of activity — that which determines an individual's powers, his tastes, his opportunities,

advantages and drawbacks, in a word, the character — is his " Karma." Broadly speaking, it is the sum of an individual's bodily, mental and spiritual growth; having its roots, as it were, spread over many lives, past and future. The two sentences, " as a man soweth, so must he reap," and " as he reaps so also he must have sown," give com- prehensive expression to the idea of Karmic activity.

The doctrine of Karma is with modification common to both Buddhism and Brahminism, and in their expositions theoso- phists have apparently drawn from both sources.

The theosophic " Path " to the final goal of emancipation or Nirvana, is in a great measure derived from the Buddhist literature, available to the English-speaking peoples through numerous excellent translations, more especially those of Pro- fessor T. W. Rhys Davids, and also from the many translations in all the European languages of the Bhagavad Gita and Upanishads. Theosophic teachings on this subject are not, however, exclusively Oriental, for following their contention that they are the exponents of the universal and unchangeable "Wisdom Religion" of all the ages, theosophists have selected from various sources — Vedic, Buddhist, Greek and Cabalistic — certain passages for the purpose of exposition and illustration. To the uninitiated it would appear that this selection has been made, generally speaking, at random; it is at any rate lacking in the wise discrimination one would expect from the supposed source of its inspiration. Nevertheless theosophists by their investigations and expositions have undoubtedly been brought in touch with some of the most profound thought in both ancient and modern worlds; and this fact in itself has assuredly had an inspiring and ennobling influence upon their lives and work. The histories of all the great religious and philosophic movements show them as developments of an evolutionary process, arriving at their accepted dogmas through long periods of contention between numerous tendencies and cross-currents, resulting in some compromises and not a little

confusion of thought. So it is in the main with theosophy. It has followed Buddhism in deprecating any reliance upon ritual. Ceremonial and sacrificial observances of all kinds are held to be useless in themselves, but operative for good or ill indirectly by their effect upon the mental attitude of those who practise them. Theosophists insist, however, that all religious observances had their origin in some mystical process, the true meaning of which has in most instances been lost. The Path is represented as the great work whereby the inner nature of the individual is consciously transformed and developed. The views of life held by the ordinary mortal as well as his aims and motives

must be radically altered;' and simultaneously a change must take place in his modes of speech, conduct and thought. The Path is said to be long and difficult, and with most individuals must extend over many lives. It is divided into four stages, each one representing the degree of spiritual growth and karmie development at which the " chela " or disciple has arrived. But even the entrance upon the very first stage implies some- thing more than, and something fundamentally different from, the life of an ordinary layman, however morally excellent this life may be. Morality, important though it be as preparatory to the " higher life," does not alone lend itself to that awakening of the spiritual faculties without which progress along the Path is not possible. In good citizenship morality is practisedout of regard to certain preconceived notions of the needs, the' health and happiness of ourselves, our fellows and the community at large. According to theosophy, it would appear that these notions are for the most part mistaken, or at any rate they are quite insignificant in comparison with the interests with which the traveller along the Path soon finds himself absorbed. It is not that human needs are to be disregarded, but that the pabulum which he now sees that humanity really

requires is of an incomparably higher order than that which is generally so considered. The physical methods and spiritual exercises re- commended by theosophists are those inculcated in the systems known in Hindu philosophy as Raja Yoga in contradistinction to the Hatha Yoga system, which is most commonly to be met with in India, and in which the material aspects are given greater prominence. The Path has an active and a passive side. Fresh knowledge, new forces and faculties, have to be acquired by positive and strenuous efforts, while, on the other hand, delusions and superstitions are to be abandoned by an attitude of conscious neglect; or to use the phraseology of the Hindus, Avidyd, nescience — the mental state of the unenlightened — through which the individual energies are scattered and dis sipated in futile effort, is. gradually replaced by Vidyd, the higher wisdom which dispels the darkness of the mind, awakens our latent faculties and concentrates our efforts in the direction of that harmonious union, which ultimately results in Nirvana. Although the .way of the disciple or " chela " is always repre- sented as long and difficult, it is said that as he proceeds, the transcendental faculties which arise to help him enable him to pursue the right course with ever increasing confidence and security. These powers of the mind, or " siddhi," should never be sought for their own sake, or be used for selfish purposes. The attempt to develop and use them without regard to the higher purpose is spoken of as practising the arts of " black magic," the exercise of which invariably leads to disaster. It is proclaimed that were the " chela " to attempt to make an improper use of his powers — that is to say, were he to yield to the promptings of selfishness, lust or antagonism — such a lapse would at once set in action counteracting forces, which not only retard his upward growth, but which would, were such evil courses persisted in, lead ultimately to the obliteration of all his newly acquired psychic possessions.

The Path may also be described in terms of the "

seven principles." It may be said to be a process of unification, whereby the centres of volition, consciousness and active memory are systematically shifted upwards from the lower to the higher " principles " until they have become firmly estab- lished in the " Buddhi," or " sixth principle." As this last stage is approached the " chela " becomes less and less dependent on the guidance of traditions and scriptures. The truth be- comes revealed to him by the opening of his inner vision, and he learns to see Dharma, the Eternal Law, as it were, face to face. Thus theosophists may be said to accept in their own sense the saying: " He who does the Will shall know the doctrine."

Along the Path are ranged ten great obstacles, or fetters, the Buddhist Sanyojanas, which have to be successively over- come before the final goal is reached. As these sanyojanas give a very good idea of what has been termed the negative aspect of the Path, we may enumerate them as follows: —

1. The delusion of personality — the belief in a permanent and

unchangeable egoentity.

2. Doubt as to the use of the higher efforts, or as to the possi-

bility of solving the great xiysteries of life.

3. The reliance upon ritual — seeking salvation through outward

acts.

4. Lust.

5. Ill-will, or antagonism.

6. Love of this life and its possessions — " The care of the world

and the deceitfulness of riches."

7. The egoistic longing for a future life.

8. Pride.

9. Self-righteousness. 10. Nescience.

A few words should be added as to the theosophic hell, or " Avichi." This is described as a long drawn-out dream of bitter memories — a vivid consciousness of failure without volition, or the power of initiative — a dream of lost oppor- tunities and futile regrets, of ambitions thwarted and hopes denied, of neglected duties, abused powers and impotent hate; a dream ending ultimately in the oblivion of utter annihilation.

There is no doubt much of valuable suggestion to be found in the philosophic system, or rather the conglomerate of systems, which pass to-day under the name of theosophy; and probably much has been done by means of its propaganda to popularize Eastern thought in the West, and in the East to reawaken a truer appreciation of its own philosophic treasures; but however that may be, the serious student would be well advised to seek his information and his inspiration from the fountain-heads of the theosophists' doctrines, which are all easily accessible in transla- tions; and to avoid the confusions and errors of writers who in most cases have but a superficial if any knowledge of the original languages and systems from which their doctrine has been arbi- trarily culled. (St G. L. F.-P.)

THEOT, CATHERINE (d. 1794), French visionary, was bom at Barenton (Manche). From her youth a victim of hallucina- tions, a long course of religious asceticism in the convent of the Miramiones in Paris unhinged her mind, and she was placed under restraint. Liberated in 1782, her early delusions con- cerning a Messiah became accentuated; that she was destined to be the mother of the new Messia'h, she was now assured; she pictured to her followers the fantastic features of the coming Paradise on earth; and was hailed as the " Mother of God." From

the idea of the advent of a Messiah to its realization was but a step; in Robespierre the Theotists saw the redeemer of mankind; and preparations for his initiation were put in train. The enemies of Robespierre, resenting his theocratic aims, seized upon his relations with the Theotists as an engine of revenge; Catherine, with Gerle (q.v.) and others, was arrested and imprisoned, and a letter to Robespierre discovered in her house; In the Convention M. G. A. Vadier trumped up the conspiracy of Theot, asserting that Catherine was a tool of Pitt, that the mummeries of the Theotists were but a cloak for clerical and reactionary intrigue, and hinting that Robespierre favoured their designs. The case was adjourned to the Re-volutionary Tribunal, and figured in the proceedings of the 9th Thermidor. The accused were ultimately acquitted, Catherine herself having died in prison on the 1st of September 1794.

THERA, the southernmost island of the Sporades, now called Santorin (q.v.). It was known as Thera until after the Fourth Crusade, when it became part of the duchy of the Archipelago.

THERALITE (Gk. Br\pa.v, to pursue), in petrology, a group of plutonic holocrystalline rocks consisting of nepheline, basic plagioclase, augite and olivine, and so called because it is of rare occurrence, and its discovery was looked forward to with interest as' completing the series of basic rocks containing nepheline as an essential constituent. The felspars are mostly of basic character and are often zonal; the nepheline is of later crystallization, rarely idiomorphic and often decomposed. Pyroxene in these rocks may be of green colour or purplish- brown and rich in titanium; olivine is usually abundant. Among the accessories may be mentioned apatite and iron oxides, biotite and dark brown hornblende, the latter often surrounding the purple augite. The rocks have rarely ophitic structure, but their minerals tend to have good crystalline form, except in the case of nepheline and orthoclase (if that be

present). By decomposition the nepheline yields zeolites such as natrolite and analcite. The theralites are rarely cross- grained and have much resemblance to dolerites in hand speci- mens. Among localities for these rocks are Duppau in central Bohemia, Pridazzo (W. Alps), Umptek (on the White Sea), Madagascar and the Crazy Mountains in Montana. A variety of theralite occurs also at Montreal in Canada, and rocks from Crawford John in Lanarkshire and from Paisley in Renfrew- shire have recently been ascribed to this group.

Very close to the theralites is a series of rock types known as the teschenites (from Teschen in Moravia). Instead of nepheline these rocks usually contain analcite, and from their microscopic characters it is by no means likely that the analcite is secondary after nepheline in this case; it appears, in fact, to be either primary or of pneumatolytic origin. Nepheline, however, has been found in teschenites from Portugal and from Moravia, so that the dis- tinction between the two series practically vanishes. In central Scotland, around Edinburgh and Glasgow, teschenites are abundant, forming thick sills intrusive into the Carboniferous rocks, and some are also known from Leicestershire (Whitwick) and from Arran. These teschenites are sometimes ophitic and present transitions to olivine-diabases on the one hand and to picrites on the other. They are the deep-seated representatives of the basaltic lavas which were emitted in great numbers in the early part of the Carboni- ferous period. Other localities for teschenite are the Caucasus and the coast of California (Cuyama Valley, &c).

The essexites are an allied series containing a larger amount of alkali felspar. Nepheline also occurs by no means uncommonly; the augite is sometimes green, but in other specimens is of a rich purple colour with well-marked zonal structure. Olivine is by no means uncommon, and brown hornblende and biotite occur rather frequently. The

type rock is from Essex (Massachusetts) and other examples have been described from Rongstock on the Elbe, from Mount Royal (Montreal), from S. Norway, near Christiania, and from St Vincent in the Cape Verde Islands. A few essexites have been found in Britain, accompanying the Carboniferous teschenites near Edinburgh and in the Campsie Hills of Stirlingshire. As they contain both orthoclase and plagioclase felspar they have a certain affinity to the olivine-monzonites and kentallenites.

The shonkinites are dark grey rocks consisting of olivine, green augite, dark brown biotite, nepheline and orthoclase, which are found at Shonkin Sag in the Highwood Mountains of Montana. They are basic variations of sodahte-syenite and have some resem-blance to theralites, especially in the association of nepheline with large amounts of augite and olivine. They are of exceedingly rare occurrence. (J. S. F.)

THERAMENES (d. 403 B.C.), Athenian statesman, was the adopted son of Hagnon, a prominent conservative who in 430 impeached Pericles, and after the Sicilian expedition became one of the ten probuli (irpof)ov\oi, commissioners) appointed to devise economies in the administration. As a pupil of the sophist Prodicus he acquired facility in public speaking. Under his father's patronage he joined in the conservative reaction which came to a head in 411, when hopes of a Persian alliance or peace with Sparta strengthened the existing dissatisfaction with the democratic rule. Theramenes specially studied the constitutional side of this movement and formulated a new party-cry, " the constitution of our fathers." It was no doubt largely due to his advocacy that the probuli, strengthened by further members, were commissioned to draft new measures on behalf of the public safety and to examine Cleisthenes' " ancestral code." In their report the following measures were recommended: (i.) annulment of the act against promulgating illegal measures; (ii.) abolition of pay, save for the troops in the field and the archons; (iii.) restriction of the franchise to 5000 able to serve "with person and

purse”; (iv.) the appoint- ment of a special board to choose the 5000. When these pro- posals were passed (apparently in a packed assembly outside the walls) , a Constituent Assembly of 100 was elected, nominally by the 5000, who as yet were a mere phantom body, in point of fact by the leading conspirators. The new constitution provided for a boule whose members were to be recruited by lot from all citizens above thirty; the functions of this body to be exercised by four sections succeeding one another by yearly rotation and serving without pay, all high officials to be chosen by it out of its own members. This scheme embodied the chief reforms desired by Theramenes, and marks the triumph of his policy. But before it could be carried into effect it was superseded by a ” provisional constitution,” which gave un-

limited power to a boule of 400 (chosen by a roundabout system which favoured intrigue) and its nominees, the ten ” absolute ” generals. This extreme reaction displeased Theramenes, who in return began to agitate for the calling of the 5000 into real existence. Furthermore he warned Athens against the treason of the extreme oligarchs, and induced the troops to raze a mole erected to facilitate a Spartan descent on Peiraeus.

After the disaster of Eretria (see Peloponnesian War), which caused the fall of the extremists and the institution of a government of ” 5000 ” (i.e. all citizens who could afford a suit of armour), Theramenes stood in high esteem. After assisting in the prosecution of his former colleagues he received the command of a squadron with which he helped to win the great victory at Cyzicus (410) and to recover the Bosporus. After the triumph of the radical democrats which followed upon these successes he lost his high command. At Arginusae (406) he fought as a simple ship’s captain, but after the battle was commissioned by the generals to rescue some drowning crews, an order which, with his ill-trained and exhausted troops, in a heavy storm, he was unable to carry out. For this failure the generals were severely criticized at Athens; an

inquiry by the boule led to their arrest, and before the ecclesia they aggravated their case by pleading (i.) that the storm made a rescue impossible, (ii.) that Theramenes was to blame. Thera- menes in reply brought out the implied contradiction in these statements, and in consequence the assembly condemned the accused to death and subsequently returned Theramenes general.

Late in 405 Theramenes went as plenipotentiary to Lysander (q.v.) to obtain peace terms; after long negotiations he proceeded to Sparta and arranged a settlement which the Athenians ratified (April 404). In spite of this peace the disorder in Athens did not abate. The restored fugitives selected five " ephors," in- cluding Critias, to organize a revolution, while the radicals opposed that return to the " ancestral constitution " for which Theramenes had stipulated. Hereupon Lysander returned to Athens and had a Constituent Committee elected, of whom ten members were nominees of each section. In this body Theramenes at first assumed the chief part, and the new measures rescinding the laws against the Areopagus and sup- pressing sycophancy were well received. But, exactly as in 411, a more violent party under Critias, forgetting its real duties, appointed an autocratic boule of its own creatures, and proceeded by judicial murders and confiscations to earn for the new government the name of " the Thirty Tyrants." Theramenes protested, and managed to get a citizen-body of 3000 admitted to a share of the government. Critias, however, fearing a renewal of the collapse of 411, disarmed the people and decided to remove Theramenes before he could create a new democratic party. The latter successfully repelled Critias' de- nunciation of treason, but was led away by violence and forced to take poison. His well-known gibe, " Here's to the noble Critias," attests his strength of mind at the hour of death. 1

Theramenes demonstrably had a definite policy throughout his career. His ideal was a return to a 6th century constitution, which his contemporaries could equally regard as a moderate oligarchy or a

restricted democracy. The main features of his programme were: (1) property qualification for franchise; (ii.) abolition of pay; (iii.) transference of some judicial powers from the popular courts to a restored Areopagus. At times he seemed likely to succeed, but amid the violent oscillations of party he could not definitely join any one faction, and so earned the nickname Kodopvos (a stage-boot fitting either foot). Aristotle, however, discerned Theramenes' real policy, and, like Cicero and Caesar, in later years ranked him among the greatest Athenian statesmen.

Sources. — The Constitution of Athens with its numerous docu- ments affords much valuable knowledge, but does not give the inner history of 41 1. Thucydidcs viii. supplies this, but his

1 The attempted rescue by Isocrates (Pseudo-Plutarch, Vitae X. Oratorum) is improbable; but Theramenes may have taught Isoc- rates in oratory.

knowledge of the constitutional side of the revolution and of Thera- menes' activity is somewhat fragmentary. Xenophon (Hellenica, i., ii.) was an eye-witness in 406-403, but is clearly inaccurate in his details and prejudiced throughout. Lysias (c. Eratosth. and c. Agorat.) gives an avowedly hostile account of Theramenes. Dio- dorus xiii., xiv., goes too far in making Theramenes a pure democrat. See also Plutarch, Cicero, chap. 59; Cicero, de Oratore, iii. 16, 59; Wilamowitz-Moellendorff, Aristoteles und Athen (Berlin and Leipzig, 1893), ii. p. 113 sqq.; E. Meyer, Forschungen zur alien Geschichte (Halle, 1899), ii. pp. 406 sqq.; B. Perrin in American Historical Review, ix. (1904), pp. 649-69. (M. O. B. C.)

THERAPEUTAE (Gr. depairatTai, literally "attendants" or "physicians," hence "worshippers of God"), a monastic order among the Jews of Egypt, similar to

the Essenes. Our sole authority for their existence is Philo in his treatise De Vita Contemplativa. He takes them as the type of the contemplative, in contrast with the Essenes, who represented rather the practical life. While the Essenes were confined to Palestine or its near neighbourhood, the Therapeutae, we are told, existed in many parts of the world, but especially in Egypt. Their headquarters there were on Lake Mareotis, which at that time debouched into the sea. This establishment near Alexandria was, as it were, the Grande Chartreuse of their order. Philo himself was uncertain as to the meaning of the name, whether it was given to them because they were ” physicians ” of souls or because they were ” servants ” of the One God. Their mode of life he in one place (ii. 473, line 14) calls dtpaireia, and his use of words generally accords better with the latter meaning. That the origin of the name of these ascetics was unknown in Philc’s time goes to prove their antiquity.

A man on joining the order died to the world, and so volun- tarily resigned his property to his heirs. How the order itself was supported does not appear. So far as we are informed, prayer and study were the sole occupations of the Therapeutae. The community at Alexandria lived in mean and scattered houses, near enough to afford protection, without depriving the members of the solitude which they prized. Each of these houses contained a chamber called oenvtiov or iiovacrriipiov (cf. Matt. vi. 6), which was devoted to prayer and study, and into which the inmate brought nothing but the Law and the Prophets, together with the Psalms and other works which tended to the promotion of piety. At sunrise the Therapeutae prayed and again at sunset. The whole interval was devoted to a study of the internal sense of the Scriptures. In addition to the Old Testament the Therapeutae had books by the founders of their sect on the allegorical method of interpreting Scripture. They also contributed to sacred literature themselves in the composition of new psalms. Attendance to the ordinary needs of

nature was entirely relegated to the hours of darkness. Some of these recluses only ate every second day, while others suc- ceeded in confining the necessity to a single week-day. But the Sabbath was a feast on which, after attending to their souls, they indulged their bodies, like yoke animals let out to graze. But their indulgence even then is not mentioned to have gone beyond the coarse bread, flavoured with salt and sometimes hyssop, while their drink was water from the spring. Thus during the six days of the week the Therapeutae " philo- sophized," each in his own cell, but on the Sabbath they met in a common assembly, where women also had places screened off from the men, and listened to a discourse from one who was the eldest and most skilled in their doctrines.

In contrast with the drunken revels of the Greeks, Philo describes the sober enjoyment by the Therapeutae of the feast of Pentecost, or rather of the eve of that festival. They assembled together with glad faces and in white garments, and the proceedings were begun with prayers, in which they stood and stretched their eyes and hands to heaven. Then they took their seats in the order of their admission, the men on the right and the women on the left. Slavery being against their principles, the younger members of the society waited on the elder. No flesh was served at table, and for drink only water either hot or cold. But first came " the feast of reason and the flow of soul." All listened devoutly to a discourse delivered with an emphatic slowness and penetrating beneath the letter

of the Law to the spiritual truth that lay hidden within. When the president's address had been duly applauded, there followed the singing of hymns ancient and modern. Then came the meal of the simple kind already described. And after this a per- vigilium, celebrated with antiphonal and joint singing on the part of men and women and with choral dancing in imitation of Moses and Miriam at the Red Sea. At sunrise, turning to the east, they prayed that the light of truth might illumine their minds, and then returned to their studies.

Such is the account of the Therapeutae given by Philo. It seems to have formed part of the Apology for the Jews (Eus Pr. Ev. viii. 10, § 12) — hence its highly rhetorical character — from which Eusebius gives the extract about the Essenes; while this in its turn may have constituted the fourth book of a large work entitled (" sarcastically," says Eusebius, H.E. ii. 18) ■Ktpl 'Aperaiv, of which the Legatio ad Gaium formed the first. The De Vita Contemplativa thus owes its place next to the Quod Omnis Probus Liber, a place which it already occupied in the copy of Philo's works possessed by Eusebius (H.E. ii. 18), merely to the mention of the Essenes at the beginning of it.*

To the modern reader the importance of the Therapeutae, as of the Essenes, lies in the evidence they afford of the existence of the monastic system long before the Christian era. We have no clue to the origin of the Therapeutae, but it is plain that they were already ancient when Philo described them. Eusebius was so much struck by the likeness of the Therapeutae to the Christian monks of his own day as to claim that they were Christians converted by the preaching of St Mark. He goes so far as to say that " the writings of ancient men, who were the founders of the sect " referred to by Philo, may very well have been the Gospels and Epistles (which were not yet written). This is a strong instance of how the wish may be father to the thought even in a fairly critical mind. Eusebius having gone wrong on this point, others of the Fathers followed suit, so that Philo is reckoned by Jerome among the ecclesiastical writers of the Christians.

Nothing is more likely than that Christianity gained adherents among the Therapeutae, and that their institutions were adapted to the new religion, just as they seem to have been borrowed by the Jews from the Egyptians. Strabo (xi. 29, p. 806) tells us how he saw at Heliopolis large buildings belonging to the priests, which had once been tenanted by men skilled in philosophy and astronomy, who had been consulted by Plato and Eudoxus, but that the o-baTtma. and oovoyo-is (the very words used by Philo

in speaking of the Therapeutae) .had then fallen into decay. The system, however, was not even then extinct, for it was described by Chaeremon the Stoic, a contemporary of Strabo's. Chaeremon's account has been preserved by Porphyry (De Abstinentia, iv. 6), and has curious resemblances to Philo's description of the Therapeutae, even down to such details as their posture and gait and the eating of hyssop with their bread.

After 1879 a theory became current in Germany (first stated in P. E. Lucius, Die Therapeuten und ihre Stellung), and ac- cepted in England, to the effect that the De Vita Contemplativa is not a work of Philo's at all, but a forgery put forward about the end of the 3rd century and intended to procure the authority of Philo's name for the then rising monasticism of the Church. But this theory was signally refuted by F. C. Conybeare in his Philo about the Contemplative Life (Oxford, 1895).

See also works quoted by Conybeare (pp. 391-399) ; Bousset, Religion des Judenthums im neutestamentlichen Zeitalter (1903); A. Harnack, s.v. " Therapeuten " in Herzog-Hauck, Realencyk., xix. 677 (1907). (St G. S.)

THERAPEUTICS (Gr. flepaireim/a), sc. rkxvn, from Bepa- irtveiv, to serve), the name given to that branch of medi- cine which deals specifically with the means employed to cure disease if possible, or to control and lessen its evil results when a cure is impossible.

The cure which is sought for may either be symptomatic or radical. Various morbid conditions of the body generally may give rise to different symptoms. Thus a gouty condition may

manifest itself in one man as eczema of the skin, giving rise to redness and intense itching; in

another as neuralgia, causing most severe pain; in a third as bronchitis, producing a dis- tressing cough; in a fourth as dyspepsia, giving rise to flatulence and intestinal disturbance; and in a fifth as inflammation of the great toe, accompanied by redness, swelling and pain. The therapeutic measures employed in these different cases may be directed towards alleviating the symptoms, such as itching, pain, cough and swelling, in which case the treatment will be merely symptomatic; or they may be directed towards removing the root of the disease, viz. the gouty condition underlying them all, and thus effecting a radical cure. It very frequently happens that we do not know what the underlying condition is, and we are forced simply to relieve as best we can the most prominent and most distressing symptoms. In symptomatic treatment we are frequently obliged to use remedies simply •because we know they have done good before in similar cases, and we expect them to do so again without having the least idea of how they act. Thus in acute gout the most common and most trusted remedy for removing the pain is colchicum, but at present we do not know what action it has upon the system, or why it gives so much ease in the pain of gout while it has comparatively little effect upon pain due to other causes. This plan of treatment is termed empirical. It is a useful method, and is often very satisfactory, but i t has the disadvantage that it admits of but little progress, and when a trusted empirical remedy fails we do not know precisely in what direction to look for a substitute. In contradistinction to empirical we have rational therapeutics, by which we mean the application of a remedy, whose mode of action we know more or less perfectly, in diseased conditions, the nature of which we also understand more or less fully. As an example may be taken the use of nitrite of amyl in angina pectoris. It has been found that in many cases of this disease the pressure of blood within the arteries becomes increased, probably from spasmodic contrac- tion of the arteries themselves. Nitrite of amyl has the power of dilating the arteries; it has consequently been employed with

much success in lowering the blood pressure and removing the pain in angina pectoris. But such rational knowledge as this not only enables us to remove pain at the time, but helps us to prevent its recurrence. For on the one hand knowledge of the fact that nitrite of amyl lessens blood pressure has led to the successful employment of other nitrites and bodies having a similar action, and on the other the knowledge that increased blood pressure- tends to cause anginal pain leads to the pro- hibition of any strain, any food, any exposure to cold, and also of any medicines which would unduly raise the blood pressure. Here we notice one of the greatest advantages of rational over empirical therapeutics. In cases of angina, while the resistance opposed to the action of the heart by spasm in the vessels may be great, the heart itself may be feeble, and it may therefore be necessary to give some remedy which will increase the power of the heart. But if such a remedy were given alone it might, and probably would, act on the arteries as well as the heart, and by causing the contraction of the vessels do more harm than good. But if we know what remedies will increase the power of the heart and what will lessen resistance in the vessels, we may combine them and thus obtain the objects we desired, viz. removal of the pain, better action of the heart, and more perfect circulation.

The testing of ideas by observation and experiment which was begun in anatomy by Vesalius. and by Harvey in physiology, was applied by Morgagni to alterations in the organs produced by disease, by Bichat to the tissues, and by Virchow to the cell. The study of disease in the living body may be said to have been begun by John Hunter, developed by Magendie, Claude Bernard, Brown-Sequard and others. Of late years enormous impulse has been given to our knowledge of the causa- tion of disease by microbes, through the works of Gaspard, who injected putrid matter into the veins of a living animal; by Villemin, who discovered that tuberculosis is infective; by Davaine; and especially by Pasteur, Koch and others too

numerous to mention, who have worked, and are still working, at the microbic causation of disease with marvellous success.

The natural end of life is that all the organs should become old and gradually decay at the same time, so that at the last the individual should become less and less active, weaker and weaker, and finally die without any definite disease, without pain and without struggle. But this is exceptional, and generally one part gives way before another, either on account of one part being naturally weaker or of one part having been overtaxed or more severely attacked by some injurious external influence, or by some undue preponderance of another part of the body itself. For health consists in a due proportion between the action of all the different parts of the body, and if one part be unnaturally strong it may lead to injury or death. Thus a very strong heart, although it may be useful to its pos- sessor for many years, driving the blood rapidly through the vessels, and supplying all his tissues with such abundant nutri- ment as to enable him to endure great exertion, mental or bodily, may in the end cause death by bursting a vessel in the brain, which might have resisted the pressure of a feebler circulation for years longer. On the other hand, a heart that is too feeble may cause its owner's death by its in- Disease ability to carry on the circulation against increased by feeble- resistance. This may occur suddenly, as when the oess or resistance is increased in the arterial system by a ⁘" sudden exertion or strain, and more slowly when the one pari resistance is increased in the pulmonary circulation of the by inflammation of the respiratory passages. The bo ^ thyroid gland, which is situated in front of the neck, yields a secretion which passes into the blood and there tends to maintain a state of moderate dilatation in the blood-vessels and of oxidization in the tissues, so that the circulation remains good and the body- heat and muscular activity remain well maintained. When this gland becomes enlarged, and its secre- tion consequently increases, the vessels dilate, the

heart beats more rapidly, the skin becomes too hot, the nervous system becomes irritable, and tremors occur in the limbs. On the other hand, when it becomes atrophied the circulation becomes feeble, the face heavy and dull, the patient suffers from cold, the features grow lumpish, mental processes become sluggish, and bodily vigour diminishes.

Disease of the whole body may thus be produced by over- action or under-action of some part of it, but such causes of disease are slight as compared with the effect of external noxious influences, and more especially the effect of microbes. These enter the body through various channels, and once they have effected a lodgment they grow, multiply and give rise to various poisons which attack and injure or destroy different tissues or organs in the body. Various safeguards are provided by nature to prevent their entrance. On the skin we have a thick epidermis through which microbes cannot pass, although if an „. . entrance is obtained for them by a prick or cut they may readily grow in the tissues below and spread from them throughout the whole body. They pass more readily through mucous membranes, but almost every one of these is provided not only with a coating of mucus, which obstructs their passage, but with some reflex mechanism which tends to remove them. Thus irritation of the eye causes winking and secretion of tears, by which the irritant is removed; irritation of the nose causes sneezing; of the air-passages, coughing; of the stomach, vomiting; and of the intestines, diarrhoea. Even when they have passed through an abrasion in the skin or through the mucous membranes and enter the blood they are met, in some instances, by a toxic action of the blood itself upon them; and in others they are attacked by the white corpuscles, which destroy them, eat them up, and digest them, the process being known as phagocytosis. The greater the number of leucocytes that can reach the spot where the invading microbes enter the more quickly can the microbes be destroyed and general infection prevented. The microbes appear in many cases to attract the leucocytes (positive chemiotaxis), but

when very virulent they usually repel the leucocytes (negative chemiotaxis)

and excrete toxins which kill the leucocytes. The irritation caused by the microbes generally is followed by dilatation of the vessels of that part and thus more leucocytes are brought up to the fight. This dilatation may be increased by local warmth, and poultices or fomentations are commonly applied to inflamed parts; recently suction apparatus has been used for the same purpose or ligature so as to cause venous stasis (Bier's treatment). Blisters also cause local dilatation of vessels, but are usually applied to the skin for inflammation in deep-seated parts, such as the lungs, though they also relieve pain in the joints in acute rheumatism. Bier increases the blood in a part by compressing the veins and thus producing passive instead of active congestion. The toxins produced by microbes, if too weak to destroy the leucocytes, induce them to secrete anti- toxins, which not only act as antidotes to the toxins and are injurious to the microbes, but also increase the phagocytic power of the leucocytes (opsonius of Wright). By inoculation with increasing doses of these the resistance of the organism is greatly increased and the invading microbes destroyed. The vaccine is usually made by sterilizing a virulent culture and the proper dose is ascertained by noting the extent to which the power of the leucocytes to envelop and digest the microbes is increased.

Moreover, the products of microbic secretion tend to produce fever. The high temperature characteristic of this condition is no doubt injurious to the body itself, but it is frequently more so to the microbe which has invaded the organism; and thus fever, instead of now being regarded as a morbid condition to be suppressed by every means in our power, is considered to be a reaction of the organism tending to protect it by destroying the infection. But it must be kept within limits, lest it should of itself cause death, and here again we see the difference be- tween empirical and rational medicine. Fever is not to be looked upon as an unmitigated evil, to be removed if possible, but rather as a defensive mechanism by which the organism may prevent invasion from noxious microbes. Nevertheless, as in a campaign the general's plan may be spoiled by too hasty or too eager action on the part of some of his troops, so the de- fensive arrangement carried to excess may prove injurious or fatal to the organism. Thus too great a rise of temperature in fever may kill the patient; and the aim of therapeutics is to restrain the temperature within proper limits, neither allowing it to rise too high nor to fall too low. The old plan of lowering it by means of cold baths was known to Musa, the physician of Augustus, and by it he saved the emperor's life; but the same treatment killed the emperor's nephew. The introduction of the clinical thermometer, which allows us to ascertain exactly the amount to which the temperature rises in fever or to which it is reduced by antipyretic measures, is to the physician like the compass to the sailor, and allows him to steer safely between two extremes.

After the struggle between the organism and the microbes is over, even when it has ended victoriously for the former, injuries are left behind which require repair. Every one has noticed after prolonged fever how thin and weak the patient is, and both the muscular and nervous power throughout the whole body are sadly in want of repair. Where there has been local mischief due to inflammation the dead leucocytes must be re- moved,

and this is done either by their being converted into pus in one mass, and making their way through the tissues to the nearest surface, whether of skin or mucous membrane, from which it can be discharged, or they may undergo a process of fatty degeneration and absorption, leaving behind in some cases cheesy matter, in others hard connective tissue.

Poisons formed by microbes are partly eliminated by the kidneys, partly by the mucous membrane of the stomach and intestines, and possibly also by the skin. In old days free elimination by these channels was looked upon as a sign of returning health, and was termed a " critical " diuresis, diarrhoea or sweating, according to the channel through which the elimi- native act had occurred.

By therapeutic measures we strive to limit as far as possible

the entry of injurious microbes into the organism, to expel or destroy them and their harmful products, and to maintain the strength of the organism itself. One of the influences which is most injurious to the body, and favours most the invasion of microbes, is chill. So much is this the case that some diseases which are now known to be due to infection were formerly attributed entirely to the effect of cold. Thus pneumonia is now known to be due to the diplococcus pneumoniae, and yet its invasion occurs so frequently after a chill that it is almost impossible not to look upon chill and pneumonia as cause and effect. The reason of this appears to be that the diplococcus is frequently present in the mouth or air-passages without giving rise to any symptoms; but when the patient is exposed to chill, and the tissues of the respiratory passages are thereby weakened, the diplococcus grows, multiplies and gives rise to inflammation of the lungs. Even what are known as common colds are probably due chiefly to microbic infection aided by a chill, just as in the case of pneumonia. Therapeutic measures which are commonly adopted in the treatment of a cold have for their object to destroy the microbes before they penetrate fairly into the organism, and

to restore the balance of the circulation and increase the strength of the invaded parts. Thus carbolic acid or carbolized ammonia are sniffed into the nose to destroy the microbes there, or the nose is washed out by an antiseptic solution as a nasal douche; bismuth or mor- phine are insufflated, or zinc ointment is applied, to cover the mucous membrane, and protect it from further irritation; and various antiseptic gargles, paints and powders applied to the pharynx in order to prevent the microbic inflammation from extending to the pharynx and down the trachea and bronchi, for many a severe bronchitis begins first by sneezing and nasal irritation. Sometimes the patient is put to bed and the circula- tion is encouraged, especially on the surface of the body, by the use of hot spirits and water, or opium and ipecacuanha, while the outside of the nose is protected to a certain extent from loss of heat, and consequent irritation, by smearing it with a tallow candle or ruhbing some ointment over the skin. At the same time, if the throat has begun to show signs of being involved, a hot poultice or wet pack is applied to the neck.

Both inflammation and fever are protective processes cal- culated to defend the organism against the attacks of microbes. But protective processes misdirected or carried to excess may become injurious or even dangerous to the organism. As an instance of misdirection, we may take the irritation which remains in the eye after a particle of dust has been removed, or the itching of the skin which occurs in eczema. The irritation of the conjunctiva caused by dust leads to winking of the eye- lids, lachrymation and rubbing, which tend to remove it; but after the dust has been removed violent rubbing tends rather to keep up the irritation; and sometimes, if the particle of dust remains under the eyelid and is sharp and angular, the process of rubbing may cause it to injure the conjunctiva much more than if it were left alone. In the same way itching is often caused by the presence of insects or other irritants upon the skin, and it tends reflexly to cause rubbing, which is useful by

removing the irritant. But when the irritation is situated in the skin itself, as in eczema, the scratching tends to increase inflammation, and makes the irritation worse. In the same way, the reflex act of coughing is useful in removing either foreign bodies or excessive secretion from the air passages; but when the mucous membrane of the respiratory tract is irritated and inflamed, it produces a feeling of tickling and a desire to cough sometimes very violently; yet the coughing simply tends to exhaust the patient, because there is really little or nothing to bring up. The same is the case in inflammation of the lung substance itself. As an example of excessive action we may take sneezing, which is calculated to remove irritants from the nose, but when too powerful may cause the patient to burst a blood-vessel. In phthisis also, although there may be some expectoration to bring up, yet a good deal of the irritation is in the lung substance, and the efforts of coughing are far greater and more continuous than are required for the removal of

expectoration, and they simply exhaust the patient. In inflammation of the stomach also such continuous vomiting occasionally occurs that the patient's life is in danger by his inability to retain food; and similar danger also occurs from inflammation of the intestines and consequent diarrhoea.

We will next take the various parts of the body, and consider more in detail the therapeutic measures most commonly em- Defeaaive ployed in the treatment of their diseases. The de- measures. fensive powers of the body against microbes, when actually on or in it, may be classed as means (i) of passive de- fence, (2) of active defence, and (3) of repair. Besides these, however, we must consider the protection of the whole body from injury caused by (a) inaction, or (b) overaction, or © weakness of any one of its parts. The means of passive and

active defence are sometimes so closely associated that it is difficult to distinguish between them. Thus if a little diphtheritic sputum were coughed into a person's eye, or some blood con- taining anthrax bacilli were to touch a raw spot upon the hand, the removal of microbes in either case by washing with simple water might be regarded as a means of passive defence, whilst washing them away with an antiseptic lotion might be regarded as active defence, because the antiseptic would tend not only to remove but to destroy the microbes. In the same way, washing the skin with spirit would tend to harden the epidermis and thus prevent the entrance of microbes; and the application of an ointment to an abrasion would have a similar action. But by the addition of some antiseptic to the ointment its de- fensive action would be converted from passive to active, and its power to prevent infection would become greater; and if inflammation had already set up in the skin, the addition of opium, belladonna, or cocaine would lessen local pain; and an astringent, either metallic or organic, would restrain inflamma- tion and accelerate repair. The thickening of the epidermis in the hands and feet, which occurs from constant use, is nature's provision for meeting the extra wear to which these parts are subjected by much use; but pressure is apt to cause the de- fensive process to be carried too far, and to lead to corns, which give rise to much pain and annoyance. To remove these salicylic acid dissolved in flexible collodion is now generally employed. When this is painted upon the part the corn usually peels off in a day or two, and the patient is cured.

But the object of therapeutics is not merely to cure. It is, in the words of the old formula, Curare, cito, tuto, et jucunde, Principles to cure quickly, safely, and pleasantly. There are o/cure. therefore in most prescriptions (1) a basis or chief ingredient intended to cure (curare), (2) an adjuvant to assist its action and make it cure quickly (cito), (3) a corrective to prevent or lessen any undesirable effect (tuto), and (4) a

vehicle or excipient to make it suitable for administration and pleasant to the patient (Jucunde). In the remedy just mentioned the salicylic acid forms the basis; but sometimes chloride of zinc or lactic acid is added to it to make it act more quickly, and these are the adjuvants. Extract of belladonna is added to lessen the pain which might occur during the removal of the corn, and this acts as a corrective, while the flexible collodion forms a means of applying it conveniently, and constitutes the vehicle.

The surface of the skin may be invaded by parasitic organisms and may exhibit spots, which are removed by something which will destroy the parasite, such as ointments containing mercurial salts. In psoriasis the epidermis separates in flakes at various Inffam- spots which have not been subjected to pressure, nation. anc j t0 cure ; t i n tment containing tar or other pro- ducts of the dry distillation of wood is employed. When the true skin is inflamed various appearances may arise, according to the intensity and extent of the inflammation, and the erup- tion may be papular, vesicular, pustular, tubercular, bulbou,s or ulcerative. To lessen irritation the skin is protected by dusting powders, such as oxide of zinc, starch, fuller's earth, &c, or by ointments. Irritation is lessened by lotions containing substances that will diminish irritability of the nerve-endings and skin, such as carbolic acid, hydrocyanic acid, morphine or

opium, cocaine, belladonna or atropine. Where the surface is ulcerated it may be protected from external violence and placed under favourable conditions for healing by covering it with lint moistened with water and with oil-silk over it to pre- vent evaporation. If the granulations tend to become too abundant, some astringent, such as sulphate of copper or sulphate of zinc, is added to the water. On the other hand, when the ulceration is old and the circulation through it poor, the aim of the therapeutist is to reawaken the normal reparative process, to bring about increased circulation and increased tissue change, and thereby

insure healing. For this reason a blister is placed upon the callous ulcer, which heals with the fresh inflammation thus excited.

The treatment of inflammation of mucous membrane is based upon the same principles as inflammation of the skin, and there too we usually associate means (1) for removing microbes, (2) for destroying them, (3) for lessening the irritation they produce, and (4) for repairing any mischief they have done. Thus in the eye and ear, lotions containing an antiseptic, a sedative and an astringent are very generally used. For inflammation of the mouth a similar combination is used as a mouth wash, in the throat as a gargle, and in the nose as a wash and sometimes as an ointment or spray, the ointment possessing the advantage of protecting the delicate nasal mucous membrane from irritation by stopping the entrance of irritant dust into the nasal cavities. In the stomach we aid the vomiting by which microbes or the products of decomposition of food are usually eliminated by giving to the patient repeated draughts of hot water so as to wash the stomach clean. Frequently this is sufficient; but if the stomach refuses to eject its objectionable contents, we may either give an emetic or wash it out by means of a stomach-pump or siphon. Similar procedures are used for the intestine, and one of the best methods of treating the diarrhoea consequent upon the presence of irritating substances in the intestinal canal is to give a dose of castor-oil together with a few drops of laudanum. By means of the castor-oil the irritating substances are removed, and the laudanum which is mixed with the purgative soothes the intestine. Even in cases of very acute intestinal diseases similar treatment is now pursued, and instead of treating dysentery simply by sedatives or astringents, an eliminative treatment by means of sulphate of magnesia is largely employed. After the irritant has been removed either from the stomach or intestine, a feeling of irri- tation of the mucous membrane may remain, and sickness, diarrhoea or pain may continue in the stomach and intestine although the irritant

is no longer present within them, just as the flow of tears and desire to rub may remain in the eye after the piece of grit which has occasioned it may have been re- moved. The condition which remains after the irritant haa been removed is one of inflammation more or less intense. The process of inflammation is a defensive one, but if carried too far may prove injurious.

For the purpose of checking the inflammatory processes and lessening discharge from mucous membranes astringents are employed. Some of these are of mineral and some of vegetable origin, but they almost all possess one chemical property in common, namely, they precipitate albumin. This power is possessed alike by a glass of brandy, by solution of lime, soluble salts of zinc, copper, or silver, by tannic and gallic acids, as well as vegetable juices and extracts which contain them. The strength of the astringent application and the mode of its ad- ministration are varied according to the delicacy and position of the mucous membrane affected. Thus to the eye we may use a solution of sulphate of zinc of half a grain to the ounce, while to the ear, urethra or vagina a solution of four to eight grains or even more may be applied. For the stomach and intestines we employ the same drug in the form of a pill; and when it is desired to act especially upon the intestines, the pills are made of a harder consistence or less soluble preparation, or are covered with keratin, so that they may not act much, if at all, upon the stomach while passing through it before reaching the intestines. The heat which occurs in inflamed parts is chiefly due to the

larger amount of blood circulating in the part on account of the dilatation of the vessels. The pain is due to stretching of the nerve fibrils or compression of them by the turgid vessels in the swollen tissues. This latter cause is chiefly observed when the tissues are of a very unyielding

character; for example, when the inflammation occurs in a bone or under a thick fibrous and unyielding membrane. The swelling, heat and pain may sometimes be relieved by mere change of position altering the flow of blood to- the inflamed part. Thus when inflammation occurs in the finger, as in a whitlow, the pain is not only con- stantly severe, but it is increased by every pulsation of the heart, and thus has a throbbing character. By raising the hand nearly to a level with the head both the constant pain and the severity of the throbs may be relieved, as the blood is not sent with such great force into the arteries and returns more readily through the veins. In other parts of the body the same relief may be obtained by raising the inflamed part as high as possible. Relief is frequently given also by both heat and cold, and at first sight it seems strange that agents having such an opposite action should each produce a similar effect. The reason probably is that the application of cold causes contrac- tion of the arteries leading to the inflamed part, while heat by dilating the vessels around forms a side channel through which the blood passes, the tension in the seat of inflammation being thus lessened in both cases. When the inflammation occurs in soft parts where the surrounding vessels can be readily dilated, heat often affords more relief to the pain than cold, but when the inflammation is in a bone or in unyielding fibrous tissues, cold generally gives more relief. For example, the pain of a gum-boil is generally relieved more by warmth, because the yielding tissues of the gum, mouth and cheek can be readily relaxed by heat and their vessels dilated; but when the pain is dependent upon inflammation in the hard unyielding socket of a tooth, cold generally gives greater relief. The removal of blood, either by incision or by the application of leeches, some- times gives considerable relief to the pain and tension of inflamed parts. Blisters applied at some distance from inflamed parts are also sometimes useful; and probably they produce this good effect by causing a reflex contraction of the arteries in the inflamed part, and thus acting like a cold application. Certain drugs have the

power of relieving inflammation by slowing the heart and rendering its impulse more feeble. Amongst those are to be classed small doses of aconite and colchicum; the former especially tends to lessen the process of inflammation generally, when it is not too severe. There can be little doubt that the intensity of inflammation frequently depends very much on the condition of the blood, and that by altering the blood inflammation may be lessened. Thus free purgation, and especially purgation by cholagogues and salines, has long been recognized as a useful means of reducing the inflammatory process. For example, a mercurial pill at night, followed by salts and senna in the morning, will often relieve the pain in toothache or gum-boil, and lessen inflammation not only in the mouth, but other parts of the body as well. Such remedies are termed antiphlogistic. Venesection (blood-letting) at one time was highly esteemed as an antiphlogistic measure, and while it is possible that it has now fallen too much into disuse, there can be no doubt that at one time it was very greatly abused, and was carried to such an excess as to kill many patients who would have recovered perfectly had they been let alone. Although the high temperature in an inflamed part is chiefly due to the increased circulation of blood in it, yet the presence of inflammation appears to cause increased formation of heat either in the inflamed part itself or in the body generally, because we rarely find inflammation exist to any extent without the temperature of the body being raised and a febrile condition produced.

Two very old remedies for fever are acetate of ammonia and nitrous ether. These were formerly given empirically, simply because they had been found to do good. Now we can see the reason for their administration, because the nitrous ether, consisting chiefly of ethyl nitrite, dilates the superficial vessels

and thus allows greater escape of heat from the surface; while acetate of ammonia, by acting as a diaphoretic and stimulat- ing the secretion of sweat, increases the loss of heat _ by evaporation.

When a patient is covered with several blankets, loss of heat from the surface both by radiation and evaporation is to a great extent prevented, but if a cradle be placed over him, so as to raise the bedclothes and allow of free circulation of air around his body, both radiation and evaporation will be increased and the temperature consequently lowered. If his body be left uncovered except by the sheet or blanket thrown over the cradle, the loss of heat is still greater, and it may be much increased by sponging the surface with either hot or cold water so as to leave it slightly moist and in- crease evaporation. The temperature may be still further re- duced by placing vessels filled with ice inside the cradle. When the patient is very restless, so that cradling is impossible, a wet pack may be employed, a sheet wrung out of cold water being wrapped round him, and over this a blanket. The pack has the double effect of restraining his movements and thus lessen- ing the production of heat, while at the same time it dilates the vessels of the skin and produces loss of heat. The restraint which it imposes and the equal distribution of heat over the surface frequently cause sleep quickly in patients who have previously been wildly delirious and entirely sleepless. When the temperature continues to rise in spite of wet sponging and cradling, recourse must be had to the cold bath. The bath should be brought to the bedside and the patient, wrapped in a sheet, should be lifted into it by two attendants. The water should be at the temperature of 90° and gradually reduced by the removal of hot water and displacement by cold, until the temperature of the patient as taken in the mouth is reduced to about 992° or 99°. After this the patient should be taken out and again put into bed. It is inadvisable to lower the tempera- ture quite to the normal while the patient is in the bath, as fre- quently it falls after his removal, and may fall so far as to induce collapse. In cases where no bath is available a large mackintosh sheet may be spread upon the bed under the patient, the sides and top may be raised by pillows, and cold water may be applied to the surface of the body with large

sponges. The mackintosh sheet forms a shallow bath, and the water may afterwards be run off from it at the lower end of the bed. Another way of applying cold is to dip an ordinary sheet into cold water, apply it for three or four minutes to the surface of the body, then remove it and replace it by another sheet while the first one is being dipped in water. By the alternate use of the two sheets, or by the use of one quickly wrung out of cold water as soon as it becomes warm, the patient's temperature may be rapidly reduced.

There are a number of drugs which have a very powerful action in lowering temperature. Most of these belong to the aromatic group of bodies, although one of them, antipyrin, belongs rather to the furfurol group. Carbolic acid has an antipyretic action, but on account of its poisonous properties it cannot be employed as an antipyretic. Salicylic acid has a strong antipyretic action, and is most commonly used in the form of its sodium salt, which is much more soluble than the acid itself. Amongst other antipyretics, the most important are quinine, phenacetin and antifebrin. These probably lessen fever by their action upon the nerve centres which regulate the temperature of the body, and partly by their peripheral action in causing the secretion of sweat. Very high fever in itself will cause death, the fatal temperature in rabbits being 114-6°. Before death occurs the pulse and respiration become exceed- ingly rapid and weak, and complete unconsciousness sets in. That these symptoms are simply due to heat is shown by the fact that if the temperature be quickly reduced by the applica- tion of cold the symptoms at once subside. But the delirium which is common in fever, although it may be partly due to rise of temperature, is very often due to poisons in the blood, for in some cases it occurs with quite a low temperature, 101° or 102°, whereas in others the temperature rises to 104° and 105° with no delirium whatever. The presence of toxins in the blood not only

affects the brain, causing delirium, but also other organs, the heart and lung, and may cause fatal syncope or respiratory failure.

Many years ago Dr S. L. Mitchill (1764-1831) pointed out in America the resemblance which exists between symptoms of a ti- poisoning by snake venom and infective fevers. 1

toxlos S. Weir Mitchell and others have shown that serpent aodaatl- venom consists chiefly of albumoses, and the toxins serums. f ormec [by infective bacilli have a somewhat similar chemical nature. Calmette and Fraser found that when small doses of snake venom, insufficient to cause death, are injected into an animal, temporary disturbance is produced; but after a few days the animal recovers, and a larger dose is then re- quired to produce any symptoms. By gradually increasing the dose the animal becomes more and more resistant, until at last a dose fifty times as great as that which would at first have produced immediate death can be injected without doing the animal any harm. If a horse be chosen for the experiment, a considerable quantity of blood may be withdrawn without injuring the animal. When this is clotted the serum is found to act as an anti-venin, so that when mixed with the venom of a snake it renders it harmless. Although this result is best obtained when the venom and serum are mixed in a glass before injection, yet if they be injected at the same time in different parts of the body the animal will still be protected and the poison will not produce its usual deadly results. What occurs with snake venom takes place also when the toxins are formed by microbes, and a new method of treatment by anti-toxic serums has been introduced of late years with great success. This is most commonly and successfully used in the treatment of diphtheria. This disease depends upon the presence of a bacillus which grows rapidly at the back of the throat and in the air- passages specially of children, causing the formation of a mem- brane which, by plugging the

windpipe, causes suffocation and death. At the same time it produces a poison which causes inflammation of the nerves, leading to paralysis, which sometimes proves fatal. By growing this bacillus in broth a toxin is formed which remains in solution and can be separated from the bacilli themselves by filtration. This toxin-containing broth is injected into a horse in increasing doses, just as in the case of the serpent venom, and after the resistance of the horse has been much increased it is bled into sterilized vessels and the blood is allowed to coagulate. The serum is then removed and its anti-toxic power tested by ascertaining the amount necessary to counteract a given amount of active toxin in a guinea-pig of a certain size, the standard weight being three hundred grammes. The serum, the strength of which has thus been ascertained, is distributed in bottles and injected in the proper quantity under the skin of children suffering from diphtheria. If used at an early stage of the disease, and in sufficient quantity, the results are wonderful. The same method of serum therapeutics has been used in other infective diseases, but not with the same success.

*Another therapeutic method which is historically much older than that of serum therapeutics is that of inoculation. Inocula- The virulence of infective diseases varies in different **"»• epidemics, and at different times in the same epidemic.*

It had been noted that many infective diseases did not attack an individual a second time, the first attack appearing to protect from subsequent ones. The idea of inoculation, therefore, was to infect an individual with a mild form of the disease, so that he should escape infection by a more virulent one. This was tried largely in the case of smallpox, and once at least by Dr Erasmus Darwin in the case of scarlet fever. The worst of this method was that the disease thus inoculated did not always prove of a mild character, and in the case of Dr Erasmus Darwin's son the scarlet fever was exceedingly severe and very nearly proved fatal. To Edward Jenner we owe the dis- covery that vaccination

protects against smallpox, and it is now generally acknowledged that smallpox and vaccine are

- *Quoted by Weir Mitchell, " Researches on the Venom of the Rattlesnake, " Smithsonian Contributions (i860), p. 97.*

probably the same disease, the virus of which is modified and its virulence lessened by passing through the body of the cow. Pasteur found that the germs of anthrax could be cultivated outside the body and their virulence weakened either by growing them at too high a temperature or in an unsuitable medium. By inoculating first with a weak virus and then with others which were stronger and stronger, he was able completely to protect oxen either from the effects of inoculation with the strongest virus or from infection through contact with other animals suffering from the disorder. On the other hand, he found the weakened virus could be again strengthened by inocu- lating a feeble animal such as a guinea-pig a day or two old with it, and then inoculating stronger and stronger animals: an in- crease in strength was gained with each inoculation, until at last the virus could attack the strongest. A similar increase in virulence appears to occur in plague, where animals, especially rats and mice, seem to be affected before human beings, and not only increase the virulence of the microbes, but convey the infection. Two methods of protective inoculation have been used. In one, Haffkine employs the toxins obtained by growing plague bacilli in broth for five or six weeks, and then heating the whole to 65 or 70 C. so as to destroy the bacilli. This preparation is prophylactic, but does not seem to be curative. Yersin has prepared a serum from horses in the same way as diphtheria anti-toxin, and this is said to have a curative action during the attack. In the same way sterilized cultures of typhoid bacilli have been used to protect against attacks of typhoid fever, and an anti-typhoid serum has been employed with intent to cure. Protection does seem to be afforded, but the curative action of the serum is still somewhat doubtful. Although the anti-toxins which are used in the cure of infective diseases are

not dangerous to life, yet they sometimes cause unpleasant consequences, more especially an urticarial eruption almost exactly like that which follows eating mussels or other shell-fish. Sometimes the swelling of the skin is much more general, so that the whole body may be so swollen and puffy as exactly to resemble that of a person suffering from advanced kidney disease. These disagreeable results, however, are not to be compared with the benefits obtained by the injection of anti-toxic serum, and this method of treatment is likely to maintain its place in therapeutics.

For many years pepsine has been used as a remedy in dys- pepsia to supplement the deficiency of digestive juice in the stomach, and it has been used popularly in dyspepsia Orgaao- for a still longer period. From time immemorial tkera- savages have been accustomed to eat the hearts of Pontics. lions and other wild animals, under the belief that they will thereby obtain courage and strength like that of the animal from which the heart had been taken, but in 1889 Brown- Sequard proposed to use testicular juice as a general tonic and stimulant. Observations were made on the connexion between thyroid gland and myxoedema, which appeared to show that this disease was dependent upon atrophy of the gland. Accord- ingly the liquid extracts of the gland, or the gland substance itself compressed into tablets, have become largely used in the treatment of the disorder. The success which has been achieved has led to the use of many other organs in a raw or compressed form, or as extracts, in other diseases; e.g. of suprarenal capsule in Addison's disease, of bone marrow in pernicious anaemia, of thymus and suprarenal capsule in exophthalmic goitre, of kidney in renal disease, and of pituitary body in acromegaly. To this method of treatment the name of organo- therapeutics or opo-therapy has been given. The first scientific attempt to employ portions of raw organs in the treatment of disease was made by Lauder Brunton in diabetes in 1873, sixteen years before Brown-S6quard's paper on the effect of testicular juice. From considering the nature of

diabetes, he had come to the conclusion that many cases were due to im- perfect oxidation of sugar in the body; that this oxidation was normally carried out by a ferment in the muscles, and that probably the disease was in some cases dependent upon ab- sence of the ferment. He tried to supply this by giving raw

meat and glycerine extract of meat, but although he seemed to get some benefit from the treatment, it was not sufficiently marked to attract general attention. His attempts to isolate a glycolytic ferment from flesh were also only partially success- ful. One of the great difficulties in the way of applying this treatment is that in all probability many of the ferments or enzymes are altered during the process of absorption in the same way as the normal ferments of digestion, and unless the tissue enzymes can be isolated and injected subcutaneously the desired results will not be obtained. The most striking of all the results of organo-therapy are those obtained in myxoedema. In this disease the face is heavy, puffy and expressionless, the lips thick, the speech slow, the hands shapeless and spade-like, the patient apathetic, the circulation slow and the extremities cold. Under the influence of thyroid gland these symptoms all disappear, and the patient is frequently restored to a normal condition. When the thyroid gland is absent in children, not only is the expression of the face dull and heavy as in the adult, but the growth both of body and mind is arrested, and the child remains a stunted idiot. The effect of thyroid gland in such cases is marvellous, the child growing in body and becoming healthy and intelligent. In the case of the thyroid the function of the gland appears to be to prepare a secretion which is poured out into the blood and alters tissue-change. When the thyroid tablets or extract of thyroid are given in too large quantities to patients suffering from myxoedema, the symptoms of myxoedema disappear, but in their place

appear others in- dicative of increased metabolism and accelerated circulation. The pulse-rate becomes very rapid, the extremities become warm, so that the patient is obliged to wear few clothes, the temper becomes irritable, the patient nervous, and a fine tremor is observed in the hands. On stopping the administration of thyroid these symptoms again disappear. When the thyroid is hypertrophied, as in Graves's disease, the same symptoms are observed, and these are probably due to increased secretion from the thyroid. At the same time other symptoms, such as exophthalmos, may appear, which have an independent origin and are not due to the secretion of the gland. The whole of the secretion here is poured into the blood and not at all on to a mucous surface, and herein the thyroid gland differs largely from such glands as the pancreas or peptic and intestinal glands. But it seems now probable that all glands which have what may be termed an external secretion like the pancreas, stomach, intestine, skin and kidneys have also an internal secretion, so that while they are pouring out one secretion from the ducts into the intestine or external air, they are also pouring into the lymphatics, and thus into the blood, an internal secretion. In fact, a splitting appears to take place in the process of secretion somewhat resembling that which takes place in the formation of a toxin and anti-toxin. The secretion of some digestive glands would prove poisonous if absorbed unchanged. For example, the trypsin of the pancreas (see Nutrition) digests albuminous bodies in neutral or alcoholic solution, and if the whole of that which is secreted in the pancreas for the digestion of meat in the intestine were absorbed unchanged into the circulation, it would digest the body itself and quickly cause death. The secretion of trypsin by the pancreas may therefore be looked upon as the formation of a toxin. We do not know at present if any corresponding anti-toxin or anti-trypsin, as we may term it, is returned into the lymphatics or blood from the gland, but the pancreas, which in addition to secreting trypsin secretes a diastatic ferment forming sugar from

starch, pours this into the intestine and secretes at the same time a glycolytic ferment which breaks up sugar, and this latter passes into the blood by way of the lymphatics. Thus the gland not only breaks up starch into sugar in the intestine, but breaks up the sugar thus formed after it has been absorbed into the blood. It is known that several, perhaps very many, if not all glands have also the power of secreting substances to which Starling has given the name of " hormones." These pass into the blood and cause other glands to secrete. Thus an acid in the duodenum causes it to secrete a hormone to which

the name of " secretin " has been given. This passes to the pancreas and causes increased secretion from that gland. It is probable that the pancreas in its turn also secretes something which activates a ferment in the muscles. It is evident there- fore that the connexion between the different glands of the body is a very complicated one and that the effects of a drug which acts upon any one of them may be of a very far-reaching character. It is by no means improbable that all glands have a double or even triple function, and that sometimes the external may be even less important than the internal secretion. On this point, however, we have but little definite knowledge, and a great field is open for future research. At the same time, there are many indications of the importance of an internal secretion in popular treatment. For example, there are many people who feel very much better after profuse perspiration, and as sweat appears to contain little but water and a few salts, it is not improbable that the improvement in their condition is due rather to the internal secretion from the skin than to the elimination effected by the sweat. It is probable that the kidneys also have an internal secretion, and that the great oedema sometimes found in kidney disease is rather due to the action of some proteid body resembling in its effects the strepto- coccus anti-toxin, than to accumulation of water due to im- perfect action of the kidney. Similarly the beneficial effects of

purgation may be due not only to the elimination which takes place through the bowel, but also to the internal secretion from the intestinal glands.

The health of the body depends upon the proper kind and supply of food, upon its proper digestion and absorption, on the proper metabolism or tissue-change in the body, and the proper excretion of waste. We have considered how these may be disturbed by microbes from without and from within. We have also considered in a general way the treatment of local diseases by passive protection, active protection and repair of waste; but both maintenance of health and repair of waste depend very largely upon the condition of the blood. When this is healthy the attacks of microbes are resisted, wounds heal readily, and patients recover from serious diseases which in persons of debilitated constitution would prove fatal. In order to keep the blood in a satisfactory condition it must be well supplied with fresh nutriment, and the products Nutrition of waste freely eliminated. The food required for aadeiimi- the body may be divided into five kinds — carbo- natlott ' hydrates, such as starches and sugars; fats; proteids, such as meat and eggs; salts; and last, but not least, water. Water forms almost three-fifths of the weight of the body, so that it amounts to more than all the other constituents put together. Without it life would be impossible, and it is well recognized that death from thirst is more awful than death from hunger. The healthy organism can adapt itself to great varieties both in regard to the quality and quantity of food; but when health begins to fail much care may be required, and many ailments arise from dyspepsia. Imperfect digestion is very often caused by defective teeth or by undue haste in eating, so that the food is bolted instead of being sufficiently masticated and insalivated. The food thus reaches the stomach in large lumps which cannot be readily digested, and either remain there till they decompose and give rise to irritation in the stomach itself, or pass on to the intestine, where digestion is likewise incomplete, and the food is

ejected without the proper amount of nourishment having been extracted from it; while at the same time the products of its decomposition may have been absorbed and acted as poisons, giving rise to lassitude, discomfort, headache, or perhaps even to irritability and sleep- lessness. Much dyspepsia would be avoided by attention to the condition of the teeth, by artificial teeth when the natural ones are defective, and by obedience to one or two simple rules: (i) to eat slowly; (2) to masticate thoroughly; (3) to take no liquid with meals excepting breakfast, but sip half a pint of hot water on rising in the morning, on going to bed at night, and again about an hour before luncheon and dinner. The object of taking no liquid with meals is that it ensures mastication

being more complete, because persons cannot wash the un- masticated food down by drinking, and it prevents the gastric juice from being greatly diluted, and so allows it to digest more rapidly. Should these rules be insufficient, then (4) proteid and farinaceous food should be taken in separate meals — farinaceous food at breakfast, proteid alone at lunch; farinaceous in the afternoon, and proteid again in the evening. The reason for this is that farinaceous foods are digested in the intestine and not in the stomach, where they may undergo fermentation, whereas proteid foods are to a great extent digested in the stomach. When the secretion of gastric juice is deficient it may be excited by gastric tonics, such as ten grains of bicar- bonate of soda and a drachm of compound tincture of gentian in water shortly before meals, and may be supplemented by the administration of pepsin and hydrochloric acid after meals. When the nervous system is below par, and both secretion and movements are deficient in the stomach, nervine tonics, such as nux vomica or strychnine, are most useful.

High tension in the arteries is often associated with sleepless- ness, the pressure of blood being such that the circulation in Sleepless- the brain is constantly maintained at a high rate of aess. speed and the brain is unable to obtain rest. The

means of producing sleep may be divided into two classes: those (1) which lessen the circulation, and which (2) diminish the excitability of the brain cells. The circulation in the brain may be lessened by warmth to the feet, cold to the head, warm food in the stomach, warm poultices or compresses to the abdomen, antipyretics, which reduce the temperature and con- sequently slow the beats of the heart in fever, and cardiac or vascular tonics, which slow the heart and tend to restore tone to the blood-vessels, so that the circulation in the brain may be more efficiently regulated. Amongst those which lessen ex- citability of the brain-cells are opium, morphine, hyoscyamus, chloral, sulphonal, trional, paraldehyde, chloralamide, chloralose, hop and many others. A combination of the two kinds of remedy is sometimes useful, and chloral sometimes succeeds when other things fail, because it depresses the circulation as well as lessens the activity of the brain-cells.

Irritation of sensory nerves tends to cause contraction of the vessels and to raise the blood pressure, and where pain is present opium or morphine is the most efficient sedative. The sensation of pain is felt in the brain, and the cause of it may be in the sensory centres of the brain alone, as in cases of hysterical pain, with no lesion to cause it. Ordinarily, however, it is due to some peripheral irritation which is conducted by sensory nerves to the spinal cord and thence up to the sensory centre in the brain. Pain may be stopped by removing the cause of irritation, as, for example, by the extraction of a carious tooth or by rendering the nerve- endings insensitive to irritation, as by the application of cocaine; by preventing its transmission along the spinal cord by anti- pyrin, phenacetin, acetanilide, cocaine, &c; or by dulling the perceptive centre in the brain by

means of opium or its alkaloids, by anaesthetics, and probably also, to a certain extent, by antipyrin and its congeners.

Both sleeplessness and pain are sometimes due to the action of toxins absorbed from the intestine, and both of them may High sometimes be relieved more efficiently by thorough

tension. purgation than by narcotics. Another condition which is probably due to toxins is high pressure within the arteries. When this continues for a length of time it tends by itself to cause deterioration of the blood-vessels and leads to death either by cerebral apoplexy or by cardiac failure. It is therefore very important to discover high tension at an early period. It may be diminished or its increase prevented by a diet from which red meat and meat extracts are excluded, by the use of the lactic acid bacillus, by the administration of laxatives and cholagogues to regulate the bowels, and by the use of iodides and nitrites. By such regime and medicines life may sometimes be prolonged for many years.

Deficient nervous action also leads to defective secretion and movement in the intestine, sometimes with flatulent accumula-

tion and sometimes with constipation. In such cases nux vomica or strychnine is useful. Flatulent distension in the stomach or bowels is partly due to air which has been swallowed Fiatu- and partly to gas which has been formed by the lence. decomposition of food. The stomach may become distended with gas on account of acid fermentation leading to the frequent swallowing of saliva, and both this form of flatulence and that caused by the actual formation of gas are much diminished by such drugs as tend to prevent fermentation. Amongst the best of these are carbolic acid in doses of one or two grains, creosote in one or two drops, and sulpho-carbolate of soda in doses of ten grains. Others which may be mentioned are salicylate of bis-muth, salol, /3-naphthol and naphthalene. By

preventing fer- mentation in the intestine these also tend to prevent or check diarrhoea, and they may do good after the irritant has been re- moved by castor oil. After the irritant has been removed and fermentation stopped, the irritation still remaining in the in- testinal wall may be soothed by chalk mixture and bismuth, to which if necessary small quantities of opium may be added. In cases where diarrhoea is very obstinate and lasts for weeks, sulphuric acid is sometimes more efficacious than alkalis; and in chronic colics it may be necessary to treat the mucous mem- brane by local application of astringent solutions. For this purpose solutions of sulphate of copper or of nitrate of silver may be gently introduced into the bowel in quantities of a quart at a time. It is essential that a large quantity should be used, as otherwise the seat of irritation may not be reached by the astringent. Flatulence and diarrhoea as well as many general disorders are often due to intestinal depression caused by microbes. To these injurious microbes Metchnikoff has given the name of " wild," and he proposes to restore health by giving " tame " microbes, such as lactic acid bacilli. This treatment on the principle of " setting a thief to catch a thief " is frequently very useful. The lactic acid bacilli are given either in the form of tablets or milk soured by them, or cheese made from the sour milk. The most efficient form is soured milk, which acts as a food as well as medicine.

Constipation is so common that it may be almost looked upon as the normal condition in civilized countries. Two of its chief causes probably are (1) improvement in Consti- cookery, whereby the harder and more irritating pation. parts of the food are softened or removed; and (2) improvement in grinding machinery, whereby the harder and more stimulat- ing parts of the grain are separated from the finer flour which is used for bread. In consequence of the absence of mechanical stimulant the bowels act more slowly, and constipation is the result. It may be considerably diminished by a return to a more natural system of feeding, as by using brown bread

instead of white, by taking oatmeal porridge, and by eating raw or cooked fruits, such as apples, oranges, prunes and figs, or pre- serves made of fruit, such as raspberry and strawberry jam, marmalade, &c, by vegetables or by dried and powdered sea- weed". Should these means fail, aperients may be used. The commonest are senna in the form of compound liquorice powder, sulphur in the form of lozenges, cascara sagrada, either in tablets or in the form of liquid or dry extract, rhubarb, colocynth and especially aloes. The last acts chiefly upon the lower bowel, and forms a constituent of nearly every purgative pill. The medicines above mentioned may be taken either in a moderate dose at bedtime or in the form of a dinner pill, or they may be taken in small doses three times a day just before or after meals. Some sufferers from constipation find that they get greater relief from salts dissolved in water, or from natural aperient water taken on rising in the morning, and others again find that the best way of opening the bowels is to inject one or two drachms of glycerine into the rectum, or use it as a sup- pository. If these means fail, exercise, massage and electricity may help a cure.

The most common diseases of malassimilation (or " meta- bolic " diseases) are gout, rheumatism and diabetes. In health most of the nitrogenous waste in the body is eliminated as urea, but in gout uric acid is either formed in too great quantity or

too little is eliminated, so that it tends to be deposited as urate of soda in the joints and other tissues. Two means of treating Diseases it by diet have been proposed. One is to put the ofmai- patient on an almost complete vegetarian diet, so as assimlla- to \[m [t k otn tne amount of uric acid introduced into the body as well as its formation in the body. The other plan is to use an exclusively meat diet, combined with the ingestion of a large

quantity of hot water, so as to cause free elimination. Where neither method is strictly pursued it is usual to forbid to gouty patients sugar, pastry and pickles, and to forbid heavy wines, especially Burgundy and port. During an attack of acute gout nothing relieves so much as colchicum, but during the intervals potash or lithia salts taken in water are advisable, as tending to prevent the deposits of urate of soda. In true diabetes, which probably originates in the central nervous system, or in disease of the pancreas, as well as in the glycosuria common in gouty patients, sugar in every form should be entirely forbidden, and starchy food restricted to within narrow limits. The remedy most trusted to in this disease is opium and its alkaloids, morphine and codeine. In acute attacks of rheumatism the remedy par excellence is salicylate of soda, which reduces the temperature, relieves the pain, and removes the swellings from the joints. Rest in bed should be insisted upon for a longer time than ap- pears actually required, because acute rheumatism tends to bring on cardiac changes, and is more likely to do this when the heart is excited than when the patient is kept at rest. In chronic rheumatism the chief remedies are salicylate of soda, and its allies iodide of potassium, guaiacum and sulphur, while massage, liniments and baths are beneficial as local applications.

Elimination of waste-products is one of the most important points in regard to health, and when this is interfered with by disease of the kidneys, the life of the patient is rendered more or less uncertain and the health frequently seriously impaired. In some cases of chronic inflammation of the kidneys, where the disease is not extensive, the patient may continue in fair health for a number of years, provided attention be paid to the follow- ing rules: — (i) The body must be kept warm, and chills must be scrupulously avoided; (2) the digestion must be attended to carefully, so that no excess of poisonous bodies is formed in the intestine or absorbed from it; (3) eliminating channels such as

the skin and bowel must be kept active. It is usual to reduce the quantity of proteid food to a minimum, in order to lessen the amount of nitrogenous waste to be excreted by the kidneys. Sometimes an entirely milk diet is useful, but in others it does not agree, and a more liberal diet is essential. Alcohol should be avoided as much as possible. The small contracted kidney, which is so common in elderly gouty people, is usually associated with a very large secretion of urine containing only a minute trace of albumin. The tension within the blood-vessels is generally high, and the patients run a risk of anginal attacks or of apoplexy. A nearly vegetarian diet and a complete ab- stinence from alcoholic stimulants is the ideal in such cases, but it must be modified to suit individuals, as sometimes very strict limitations prove injurious. The daily use of potash, and especially nitrate of potash, tends to reduce the tension and increase the patient's safety, but if pushed too far may some-times render him very weak and depressed.

It has already been mentioned that water is absolutely necessary for the body: by taking it hot it does not lie like a Diets and weight on the stomach, and by taking it an hour "cures." ij e f ore me als it washes out the remnants of the pre-vious meal; and being absorbed into the blood, it probably renders the secretion of gastric juice freer and accelerates digestion, instead of diluting it and interfering with the digestive processes. Where the stomach and bowels are irritable, all food likely to cause mechanical irritation should be avoided, such as skins, bones, fibres and seeds. In some cases of diarrhoea an entirely milk diet has to be prescribed, and in the diarrhoea of children it is sometimes necessary to alternate a diet of barley water with one of beef juice or white of egg and water, or to give whey instead of milk. The drinking of large quantities xxvi. 26

of whey is used as a means of cure for dyspepsia in adults, and also in cases of chronic bronchitis. The whey is drunk warm, and for this cure it is usual to go to some Alpine resort where pasturage is abundant

and fresh milk can be had at all times of the day. The cure is greatly helped by the fresh air and sunshine of such places, among which are Interlaken, Rigi-Scheideck and Weggis in Switzerland; Ischl and Meran in Austria; Harzburg, Reichenhall and Sanct Blasien in Germany. Another therapeutic method is the so-called " grape cure," in which, along with a regulated diet, five or six pounds of grapes are eaten daily. As the grapes contain a quantity of water and of salts, they tend to lessen the amount of food taken, to increase the action of the bowels, and to stimulate the kidneys. The " grape cure " is used both in chronic disease of the stomach and intestines with or without constipation, and also in cases of gout or ailments depending upon a gouty constitution.. The chief places where it is carried on are in the neighbourhood of the Rhine, on the Lake of Geneva and in Tirol. Amongst places in the Rhine and its vicinity may be mentioned Kreuznach, Neustadt, Riidesheim and St Goar; on the Lake of Geneva are Montreux and Vevey; and in Tirol Gries and Meran. The so- called " Salisbury " cure consists of living entirely upon minced beef and hot water. It sometimes answers very well in persons troubled with flatulence, since meat does not give rise to the same amount of gas in the intestines as carbohydrates. During its continuance fat is absorbed from the subcutaneous tissue, and patients become very much thinner, so that it not only lessens flatulence, but reduces obesity. It is, in fact, very much the same system as that proposed a number of years ago by Banting (see Corpulence). It is very important for those who are trying this diet to bear in mind the necessity of abun- dance of water, because sometimes they may be tempted to lessen the water on account of the inconvenience produced either by frequent micturition or too profuse sweats. If the meat diet be continued with too small a proportion of water, a gouty condition may be brought on. This diet has been re- commended in gout, and no doubt the essential part of it is the hot water, but there can be little doubt that in fat gouty people it is often useful. An entirely opposite dietary is that in which butcher's meat is

completely excluded and proteids reduced to a minimum, as advocated by Dr Haig. This dietary also is very useful in gout, but it answers better in thin gouty people than in fat ones.

The dietaries already mentioned, the whey cure, the grape cure, the meat cure and the vegetarian cure, are all more or less systems of starvation, one or other article of ordinary diet being either reduced to a minimum or omitted altogether. In three of them at least — the whey cure, the grape cure and the meat cure — a diminution in one or other of the solid con- stituents of food is associated with the ingestion of an unusually large quantity of water. In visiting the most famous watering- places, it is curious to note how one finds, in the various waters, here some chloride, there some sulphate, here some potash, there some magnesium, but in all of them we find water. In watching the troops of patients who go to the wells we notice that most of them do more early rising, take more regular exercise, and drink more water in the course of a month at the well than they would do in the rest of the year at home. The watering-places divide themselves, according to the temperature of the waters, into cold and thermal, and according to the com- position of the waters, into purgative saline, indifferent saline, sulphur and iron. Amongst the most celebrated saline waters are those of Carlsbad, which contain sulphate of soda and bicarbonate of soda. These salts crystallize out when the water is partially evaporated and may be used with hot water at home, the best imitation of the Carlsbad water being obtained by mixing with hot water the powdered Carlsbad salts {pulver- jormig), which contain all the constituents of the natural water. Where it is impossible for the patient to visit Carlsbad, half a teaspoonful or a teaspoonful of salt may be taken in a large tumbler of hot water on rising every morning; but when taken at home the treatment is not so effective as at Carlsbad, because*

at the wells sipping water is associated with early rising, con- siderable exercise and a very carefully regulated diet. It is, indeed, the care with which the diet of patients is regulated and the difficulty that patients find in obtaining forbidden foods at hotels and restaurants, that make Carlsbad better for the liver than any other watering-place. Amongst other places having a similar action are Marienbad, Franzensbad and Tarasp. The waters just mentioned contain free alkali as well as sulphates, and are employed more especially in cases of hepatic disorder, such as congestion of the liver, jaundice, gall-stone and diabetes. A number of other waters containing sulphides and chlorides are powerfully purgative, and are more often drunk at home than at the springs. Amongst these are the Hungarian waters, Aesculap, Apenta, Franz Josef and Hunyadi Janos; and the Rubinat and Condal waters of Spain. Waters which have a similar composition are drunk at the springs of Leamington and Cheltenham in England, Brides Salins and St Gervais in France, for chronic constipation, dyspepsia, gout and hepatic disorders of a milder character than those usually treated at Carlsbad. The waters in which chlorides form the purgative principle are those of Homburg, Kissingen, Wiesbaden and Baden Baden in Germany, and Bridge of Allan in Scotland. Similar waters, but much weaker, are found at Innerleithen and Pitkeithly. Sulphur waters are chiefly used for painful and stiff joints, chronic skin disease, and chronic catarrhal affections. The most important are Aix-les-Bains, and a number of springs in the Pyrenees in France, Aachen in Germany, Harrogate in England, Strathpeffer and Moffat in Scotland. Iron waters are used in anaemia and the affections which are frequently associated with it. The most important are Spa in Belgium, Schwalbach in Germany, St Moritz and Tarasp in Switzerland. Iron waters are, however, common, and are generally found at all those places which have sulphur waters. Simple alkaline waters containing carbonates, chiefly of sodium along with some magnesium and calcium, are drunk for their

utility in gastric and intestinal disorders as well as in rheumatism and gout. They are also employed locally as sprays and douches to the nose, throat, vagina and rectum, for catarrhal conditions of the mucous membranes. The most important are Vichy and Vals in France and Neuenahr in Germany. Alkaline waters containing a little common salt are perhaps even more important than the pure alkaline, as the salt lessens the depressing effect of the alkali. They are therefore used largely in chronic gout, rheumatism and in calculous affections of the kidney. Amongst the most important are Ems and Wildungen in Germany, Contrexeville and Royat in France.

Simple thermal waters are those which contain only a very small quantity of solids, and owe their efficacy chiefly to their temperature. They are used partly for drinking, but even more so for baths. Bath, Buxton and Matlock in England; Mallow in Ireland; Wildbad, Schlangenbad and Baden weiler in Germany; Gastein and Teplitz in Austria; Ragatz in Switzer- land; Plombieres and Dax in France; and Bormio in Italy are amongst the best known. When water is dashed against the body with more or less violence, its effects are more powerful Baths than when the body is simply immersed in it. Thus the stimulating effect of sea-bathing is more marked than simple salt-water baths, for in addition to the effect upon the skin produced by the salt and by the temperature of the water, we have the quicker removal of heat by the continual renewal of the water as the waves dash over the body, and mechanical stimulus from its weight and impetus. Somewhat similar effects are produced by so-called wave-baths, and at Nauheim, although the fresh movement of the water against the surface of the body is much less than in the sea, yet its stimulating effect is greatly increased by the presence of carbonic acid in it. Douches have a still more powerful action than waves. They are generally given in the air, but at Plombieres very simple douches are given under water. These form a more powerful wave-bath, and in combination with

intestinal irrigation, are used very successfully for the treatment of abdominal disorders. Douches to the spine are much employed

for nervous debility, and good effects are also obtained in such cases from the so-called needle-bath, where small streams of water at high pressure are driven against the whole surface of the body. In the treatment of stiffened joints, massage under water is very serviceable, and in the so-called Aix douche a nozzle from which water continuously streams is fastened to the wrist of the masseur, so that a current of water is constantly playing upon the joint which he is rubbing. While water con- taining much saline matter, and more especially water contain- ing free carbonic acid, has a very stimulating action upon the skin, mud has a sedative effect, so that in a mud-bath one feels a pleasant soothing sensation as if bathing in cream. These mud-baths are chiefly employed at Marienbad, Franzensbad and Homburg. Sulphur-baths and sulphur waters are chiefly used in combination for rheumatism and gout, and massage, especially under water, is frequently combined most advan- tageously with baths and drinking water to effect a cure.

Exercises, passive and active, are also used in diseases of the joints, as well as massage and baths, but exercises and training are even more important in cases of cardiac disease. Exercise. In very bad cases of heart disease, where the patient is unable to go about, the best plan of treatment usually is to make him stay absolutely quiet in bed and have massage, which aids the circulation, tends to remove waste, and increases the appetite. To this is added gentle exercise, beginning with the fingers at first. At Meran walks have been arranged according to Oertel's system, and at Llangammarch in Wales both Oertel's and Schott's systems are employed, and baths according to the Nauheim system are also to be .found in London, Sidmouth, Leamington, Buxton, Strathpeffer, &c. Many people who have sedentary employments are unable to get as much exercise as they require because they have not either the time or the oppor- tunity. Such persons

may sometimes get a good deal of exercise in a short time by the use of dumb-bells, of elastic cords, or of cords running over pulleys and weighted at one end. The whole system of methodical exercises was started by Ling in Sweden, but it has been developed to a large extent for the purpose of increasing muscular strength by the professional athlete Sandow. A punching ball or rowing machine is even better as being less monotonous. Fencing, boxing or wrestling may also be resorted to. Walking on the flat is of comparatively little use as a mode of exercise, and has become supplanted to a considerable extent by bicycling. Ascending mountains, how- ever, is very different, because in walking up a steep ascent all the muscles of the body are thrown into action, and not only those of the legs. In addition the purer and rarefied air of the Swiss mountains seems to produce a sense of exhilaration which is not felt nearer the sea-level. For those who suffer from nervous depression, exercise in the Swiss mountains is useful, and even living at a height of about 6000 ft. above the sea-level seems to have an exhilarating influence. The nature of this is not very easy to analyse, but as mental depression is closely associated with irritation of the vagus nerve and weaken- ing of the circulation, it seems not at all unlikely that mountain air acts by accelerating the pulse and quickening the circulation, and thus creating a sense of well-being. Indeed, many patients liken its effect to that of drinking champagne. In some persons rarefied air is too stimulating, so that they find difficulty in sleeping, and for those who suffer from insomnia a warm moist air nearer the sea-level is preferable.

It sometimes happens, however, that people cannot sleep at the seaside itself, although they do so perfectly well a mile or two inland. Where the nervous system is exhausted, such warm and moist climates as Malaga, Madeira, Tenerife and Grand Canary are suitable. In these places not only is the air moist, but the temperature is particularly equable, and they are therefore suitable places also

for persons suffering from kidney disease. Many such persons also do well in dry, Health warm places, such as the higher reaches of the Nile, resorts. Egypt, Mentone, St Raphael and other sheltered places on the Riviera. The places mentioned are all suitable for persons suf- fering from chronic bronchitis, who should avoid any irritation

*of the larynx, trachea or bronchi by air which is too dry or which is liable to great changes of temperature. Some cases of phthisis, therefore, do better in warmer and moist climates, and especially those where the larynx has become affected by the disease. Such patients are apt to suffer much from cough and laryngeal irritation in the cold, dry air of the Alps, whereas they live in comparative comfort on the Riviera, in the Canary Islands, Madeira or at Capri. But warm, moist climates rather favour sedentary habits and tend to lessen appetite, so that the nutrition of the patient is apt to suffer; and although phthisical patients may live in comparative comfort in such climates, their tendency to recovery in them is small. At the Swiss health resorts, on the contrary, during the winter the air is very pure, and has just sufficient coldness to make exercise agreeable to patients. They are thus induced to be out the whole day, and to take food with an appetite which greatly improves their nutrition and aids their restoration to health. The best-known Alpine health resorts are St Moritz and Davos, to which lately Grindelwald ha*s been added. St Moritz is, upon the whole, better for less advanced cases, while Davos is more sheltered and better for cases which are severe. It is a mistake, however, to send those in whom the disease is very far advanced away from home and friends, because when there is no hope of cure it is better for them to die in comfort at home. At the health resorts just mentioned the amount of food taken is regulated by the appetite of the patient himself, but a system of cure has been inaugurated by Dr Brehmer at*

Gorbersdorf, by Dr Dettweiler at Falkenstein, and by Dr Walther at Nord- rach, in the Black Forest. The most important point in this treatment consists in forced feeding, the want of appetite which is so prominent in many cases of phthisis being regarded as an abnormal sensation not to be regarded; and under the forced feeding, combined with open-air life, many marvellous recoveries are recorded. Numerous other institutions have been started in Great Britain in imitation of Dr Walther's with a considerable amount of success. Even when patients are unable to stay long at a sanatorium they learn there the ad- vantages of open air and can continue the treatment at home to their great advantage.

In the well-known " rest " cure, which we owe to Weir Mitchell, forced feeding takes a prominent part. The essence of this cure is to give to the patient rest, bodily and mental, by confinement to bed and isolation from the outside world. While this treament by itself would aid recovery from nervous exhaustion, it would lessen appetite and thus interfere with nervous repair; but the want of exertion is supplied by means of massage, which stimulates the circulation and increases the appetite, so that the patient gets all the benefit of exercise without any exhaustion. Where nervous exhaustion is less marked and the Weir Mitchell treatment is not appropriate — - for example, in men who are simply overworked or broken down by anxiety or sorrow — a sea voyage is often a satisfactory form of " rest " cure. The lack of postS and telegrams prevents much of the excitement which they would have upon shore, the space for exercise is limited, food is abundant and appetite is supplied by the stimulus of constant exposure in the open air. In order that the voyage should be satisfactory, however, it must be sufficiently long, and the weather must be sufficiently warm to allow the patient to stay in the open air the whole day long. During the heat of summer voyages to the North Cape are suitable, and during the spring and autumn to the Mediterranean, but in the colder months of the year the West Indies, India, Cape Town,

Australia or New Zealand forms the best objective.

(T. L. B.)

THERESA, ST (1515-1582), or Teresa de Cepeda, Spanish nun, was born at Avila, in Old Castile, on the 28th of March 1 515, and was educated in an Augustinian convent in the town. As a child she was interested in the stories of martyrs, and at the age of eighteen left home one morning, and applied for ad- mission at the Carmelite convent of the Incarnation. She was disappointed at first at the slackness of discipline, but she ap- pears afterwards to have accommodated herself with tolerable

success to the worldliness of her environment, though not without intervals of religious misgiving. It was in the year 1554, when she was nearly forty, that the event known as her conversion took place, and the second part of her life began. The death of her father roused her to serious reflection, and one day, as she entered the oratory, she was struck by the image of the wounded Christ, placed there for an approaching festival. She fell in tears at the feet of the figure, and felt every worldly emotion die within her. The shock threw her into a trance, and these trances, accompanied by visions, recurred frequently in the subsequent part of her life. They have since been, ad- duced as Divine attestations of her saintship, but the sister- hood in the convent set them down to possession by a devil; her new departure was due in their eyes to no worthier motive than the desire to be peculiar and to be reputed better than other people. Teresa herself was very humble, and thought their explanation might be true; she took her case to her confessor and to the provincial-general of the Jesuits, who put. her under a course of discipline. One day, while thus occupied, her trance came upon her, and she heard a voice say r " Though shalt have no more converse with men, but with angels." After this the trance or fit always returned when she was at prayers, and she felts that Christ was close to her. Presently she was able to see Him, " exactly as He was painted

rising from the sepulchre." Her confessor directed her to exorcise the figure, and she obeyed with pain, but, it is needless to say, in vain. The visions grew more and more vivid. The cross of her rosary was snatched from her hand one day, and when returned it was made of jewels more brilliant than diamonds, visible, however, to her alone. She had often an acute pain in her side, and fancied that an angel came to her with a lance tipped with fire, which he struck into her heart. The 27th of August is kept sacred in Spain to this mystery, which has also formed a favourite sub- ject of Spanish painters. She had also visions of another description: she was shown hell with its horrors, and the devil would sit upon her breviary, belabour her with blows, and fill her cell with imps. For several years these experiences con- tinued, and the verdict as to their source still remained far from unanimous. Meanwhile, the spread of the Reformation became the subject of much searching of hearts to pious Catholics. Teresa reflected like the rest, and her experience led her to find the real cause of the catastrophe in the relaxation of discipline within the religious orders. She formed the project of founding a house in which all the original rules of the Carmelite order would be observed. In spite of great opposition from the authorities of the order, and in particular from the prioress arid sisters of the Incarnation, she persevered with her scheme^ being encouraged to appeal to the pope by certain priests who saw the benefit which would accrue to the Church from her zeal. A private house in Avila was secretly got ready to serve as a small convent, and, when the bull arrived from Rome, Teresa went out on leave from the Incarnation and installed four poor women in the new house dedicated to her patron St Joseph. It was on the 24th of August 1562 that mass was said in the little chapel and the new order constituted. It was to be an order of Descalzos or Barefoots, in opposition to the relaxed parent body, the Calzados. The sisters were not to be literally shoeless, but to wear sandals of rope; they were to sleep on straw, to eat no meat, to be strictly confined to the cloister, and to live on alms

without regular endowment. After lodging her four sisters, Teresa returned to the Incarnation; but, when the secret was discovered, Carmelites and townspeople were alike furious. Violence, however, was prevented, and the matter was referred to the council of state at Madrid. Philip II, referred it again to the pope, and after six months a fresh bull arrived from Pius V. The provincial of her order now gave her leave to remove and take charge of her sisterhood. The number of thirteen, to which on grounds of discipline she had limited the foundation, was soon filled up, and Teresa spent here the five happiest years of her life. Her visions continued, and, by command of her ecclesiastical superiors, she wrote her autobiography containing a full account of these experiences.

though she was far from basing any claim to holiness upon them. The general of the order visited her at Avila, and gave her powers to found other houses of Descalzos, for men as well as women. The last fifteen years of her life were spent mainly in hard journeys with this end and in the continually growing labour of organization. Convents were founded at Medina, Malaga, Valladolid, Toledo, Segovia and Salamanca, and two at Alva under the patronage of the famous duke. Then she had three years of rest, as prioress of her old convent of the Incarnation. She next went to Seville to found a house, thus overstepping for the first time the boundaries of the Castiles, to which her authorization limited her. The latent hostility of the old order was aroused; the general ordered the immediate suppression of the house at Seville, and procured a bull from Gregory XIII. prohibiting the further extension of the reformed houses (1575). But the movement against her came from Italy, and was re- sented by Philip and the Spanish authorities • as undue inter- ference; and after a fierce struggle, during which Teresa was two years under

arrest at Toledo, the Carmelites were divided into two bodies in 1 580, and the Descalzos obtained the right to elect their own provincial-generals (see Carmelites). The few remaining years of Teresa's life were spent in the old way, organizing the order she had founded, and travelling about to open new convents. Sixteen convents and fourteen monasteries were founded by her efforts; she wrote a history of her founda- tions, which forms a supplement to her autobiography. Her last journey of inspection was cut short at Alva, where she died on the 20th of September 1582. A violet odour and a fragrant oil were said to distil from her tomb; and when it was opened nine months afterwards the flesh was found uncorrupted. A hand cut off by a fervent brother was found to work miracles, and the order became convinced that their founder had been a saint. It was resolved in 1585 to remove her remains to Avila, where she was born, the sisters at Alva being consoled by per- mission to retain the mutilated arm. But the family of the duke of Alva procured an order from the pope enjoining that the body should be restored to Alva, and she was accordingly laid there once more in a splendid tomb. But even then she was not allowed to rest: she was again disentombed, to be laid in a more magnificent coffin, and the greed of reverential relic- seekers made unseemly havoc of her bones.

Teresa was canonized by Gregory XV. in 1622. The honour was doubtless largely due to her asceticism and mystic visions. She called herself Teresa de Jesus, to signify the closeness of her relation to the heavenly Bridegroom, who directed all her actions. Though sne deprecated excess of ascetic severity in others, she scourged herself habitually, and wore a peculiarly painful hair- cloth. But her life shows her to have been, besides, a woman of strong practicality and good sense, full of natural shrewdness, and with unusual powers of organization. " You deceived me in saying she was a woman," writes one of her confessors; " she is a bearded man." She was brave in the face of difficulties and dangers, pure in her motives, and her utterances, some of

which have been quoted, have the true ethical ring about them. Her MSS. were collected by Philip II. and placed in a rich case in the Escorial, the key of which the king carried about with him. Besides her autobiography and the history of her founda- tions, her. works (all written in Spanish) contain a great number of letters and various treatises of mystical religion, the chief of which are The Way of Perfection and The Castle of the Soul. Both describe the progress of the soul towards perfect union with God.

Her works, edited by two Dominicans were first published in 1587, and have since appeared in various editions. They were soon afterwards translated into Italian, French (4 vols., Paris, 1840-46) and Latin; an English translation of the Life and works (except the letters) by A. Woodhead appeared in 1669. Other translations of the Life are those by John Dalton (1851), who also translated The Way of Perfection and the Letters (1902), and by David Lewis (1870), who in 1871 also translated the Foundations. A. R. Waller reprinted Woodhead's translation of The Way of Perfection in " The Cloister Library " (1901). Biographies appeared soon after her death by the Jesuit Ribera, who had been her con- fessor (1602), and by Diego de Yepez, confessor to Philip II. (159°)-

Details are also given jn Ribadeneyra's Flos Sanctorum and in Alban Butler's Lives of the Saints. A separate biography, with preface by Cardinal Manning, appeared in 1865; a full and critical edition of the Life is that by Mrs G. C. Graham, 2 vols. (1894). See also H. Prinz v. Oettingen-Spielberg, Geschichte d. heil. Theresia (Regensburg, 1899); A. Whyte, Santa Teresa, an appreciation, with some of the best passages of the writings (1897) ; E. Hello, Studies in Saintship (1903).

THEREZINA, a city of Brazil, capital of the state of Piauhy, on the left bank of the Parnahyba river, about 220 m. from its mouth. Pop. (1890) 21,620; for fiie commune or municipio, 31,523; (1906, estimated), 25,000. It is prettily situated on an

open plain and is laid out regularly with broad straight streets with seven large squares. Among its public buildings are the government palace, the legislative and municipal hall, the " Quatro de Setembro " theatre, Misericordia hospital, public market, sanitation and public works, building, courts, police headquarters, barracks, &c. The town is characteristically Portuguese in appearance, its buildings being one or two stories in height, plastered and frequently coloured outside, with large rooms, thick walls, and tile roofs to ensure coolness. There is one lyceum, or high school, with about 400 students, in addition to its primary schools. Its manufacturing industries include a cotton mill, foundry, and soap-works. A steamboat service, with three small boats, maintains regular communication with Parnahyba, near the mouth of the river, besides which there are a number of independent freight-carrying boats. Therezina was founded in 1852, its site being originally called Chapada de Corisco, and was named in honour of the empress, Dona Thereza Christina.' It was made the capital of Piauhy in succession to Oeiras.

THERMIDOR (from Gr. depnv, heat, and bwpov, gift), the name given during the French Revolution to the eleventh month of the year in the Republican Calendar. The month fell in the hottest season of the year, beginning on the 19th or 20th of July and ending on the 18th or 19th of August, according to the year. As in all the other months of the Republican Calendar, each of the days of Thermidor was, in accordance with the suggestion of Fabre d'figlantine, consecrated to some useful object. Thus 1 Thermidor was consecrated to spelt, 10 Thermidor to the watering-por, 15 Thermidor to sheep, and 27 Thermidor to lentils. The most important event that took place in this month was the revolution of 9 Thermidor year II. (27th of July 1794), which resulted in the fall of Robespierre and the collapse of the Terror. The name Thermidorian (Thermidorien) was given to the authors of this revolution and to the supporters of the reactionary movement of which it was the signal.

See C. d'Hericault, La Revolution de Thermidor (2nd ed., Paris, 1878) ; E. B. Courtois, Rapport fait au nom de la commission chargee de Vexamen des papiers trouves chez Robespierre et ses complices (J 795); D. A. Martin, Papiers inedits . . . supprimes ou omis par Courtois (3 vols., 1828); also bibliography in M. Tourneux, Bibliog. de la ville de Paris . . . (i890),jvol. i., nos. 4265-4309.

THERMOCHEMISTRY, a branch of Energetics, treating of the thermal phenomena which are associated with chemical change.

§ 1. That vigorous chemical action is accompanied by a brisk evolution of heat is evident from such familiar examples as the combustion of fuel or the explosion of gunpowder. The heat attendant on these actions, and on the vital processes of the animal organism, naturally first attracted attention. Robert Boyle, A. Crawford, A. L. Lavoisier and P. S. Laplace, P. L. Dulong, H. Davy, Count Rumford, all concerned themselves with thermochemical investigations of such processes. Their quantitative experiments were, however, too rough to permit of accurate generalization; and although Lavoisier and Laplace stated the principle that the same amount of heat must be supplied to decompose a compound as would . be produced on its formation, the statement was not based on exact experi- ment, and only received experimental confirmation much later.

The beginnings of modern thermochemistry, though made independently of the doctrine of the conservation of energy,

are practically contemporaneous with the recognition of that law, and without it the science could scarcely have reached the degree of development which it rapidly attained. Thomas Andrews and, especially, G. H. Hess (1840) were the first who systematically investigated thermochemical effects

in solution, and arrived at conclusions from their experimental data which still possess validity. Andrews, for example, found that when a series of acids were under similar conditions used to neutralize a given amount of a base, the quantity of heat evolved on the neutralization was the same in all cases. Hess, from his work, arrived at the converse conclusion, that when a series of bases were used to neutralize a given amount of an acid, the heat of neutralization was always the same. Both of these statements are correct when the powerful mineral acid and bases are con- sidered, exceptions only arising when weak acids and bases are employed. Again, Andrews discovered that when one metal displaces another from solution of its salts (e.g. zinc with solu- tions of copper salts) , the thermal effect is practically independent of the nature of the acid radical in the salt employed. Andrews likewise found that when the heat evolved on the displacement from its salts of a metal M′ by a metal M is added to the heat of displacement of another metal M″ by M′, the sum is equal to the heat which is evolved on the direct displacement of M″ from its salts by M. This affords an example of a principle which had been stated by Hess in a very general form under the name of the Law of Constant Heat Sums—namely, that the thermal effect of a given chemical action is the same, inde- pendently of the character and number of the stages in which it takes place. Thus, in the above example, it is immaterial whether M displaces M″ from its salt directly, or whether M first displaces M′, which is then used to displace M″. This important principle is a direct consequence of the law of the conservation of energy, but was discovered independently by Hess from accurate experiment.

Hess employed this principle to determine indirectly the heat of formation of compounds from their elements, when this magni- tude, as is generally the case, was inaccessible to direct measure- ment. Thus the heat of formation of anhydrous zinc sulphate, $ZnSO_4$, which cannot be determined directly, may be arrived at by summation (in Hess's units) as

follows: —

Oxidation of Zn to ZnO 5291 units

S to S0 3 6384 „

Dissolution of SO3 in much water • 2566 ,,

,, ZnO in the resulting aqueous H2SO4, 1609 ,,

Deduct heat of dissolution of anhydrous ZnS04

15850 "93

Heat of formation of ZnS04 from Zn, S, and 40= • 14657 ,,

Heats of formation are still determined for the most part in a precisely similar manner.

Hess also stated another principle on empirical grounds, which, although admitting of many exceptions, is of consider- able utility and significance. It had been known long before his time that when solutions of neutral salts were mixed, and no precipitate resulted, the mixed solution was also neutral. Hess now observed that in the process of mixing such neutral solutions no thermal effect was produced — that is, neutral salts in aqueous solution could apparently interchange their radicals without evolution or absorption of heat. These experimental results were generalized by him under the title of the Law of Thermoneutrality.

After the investigations of Hess and Andrews, a great deal of excellent experimental work was performed by P. A. Favre and J. T. Silbermann, whose chief theoretical achievement was the recognition that the heat of neutralization of acids and bases was additively composed of two constants, one deter- mined by the acid and the other by the base. This deduction harmonized the observations of Andrews and of Hess previously alluded to, and also accounted satisfactorily for the Law of Thermoneutrality.

Julius Thomsen was the first investigator who

deliberately adopted the principle of the conservation of energy as the basis

of a thermochemical system. His thermochemical work was begun in 1853, but most of his experiments were performed in the years 1869–82, the whole being published collectively, under the title Thermochemische Untersuchungen, in four volumes. Somewhat later than Thomsen, Marcellin P. E. Berthelot began (in 1873) a long series of thermochemical determinations. It is to these two investigators and their pupils that most of our exact thermochemical data are due.

Thomsen and Berthelot independently enunciated a generaliza- tion (commonly known as Berthelot's Third Principle, or Principle of Maximum Work), which may be stated in brief as follows: — Every pure chemical reaction is accompanied by evolution of heat. Whilst this principle is undoubtedly applic- able to the great majority of chemical actions under ordinary conditions, it is subject to numerous exceptions, and cannot therefore be taken (as its authors originally intended) as a secure basis for theoretical reasoning on the connexion between thermal effect and chemical affinity. The existence of reactions which are reversible on slight alteration of conditions at once invalidates the principle, for if the action proceeding in one direction evolves heat, it must absorb heat when proceeding in the reverse direction. As the principle was abandoned even by its authors, it is now only of historical importance, although for many years it exerted considerable influence on thermo- chemical research.

§2. From the standpoint of the law of conservation of energy, the relation between chemical and thermochemical action bears the following aspect: — A given amount of any sub- stance under given conditions possesses a perfectly definite amount of intrinsic energy, and, no matter what chemical and physical transformations the substance may undergo, it will, when it returns to its original state, possess the original amount of intrinsic energy. If

we consider now the transformation of one system of chemical substances into another system under specified conditions, we shall find that in general the intrinsic energy of the second system is different from the intrinsic energy of the first. Let us assume, as is commonly the case, that the intrinsic energy of the initial system is greater than that of the final system. When the first system then is transformed into the second, the excess of energy which the former possesses must appear in the shape of heat, light, electrical energy, mechanical energy, &c. It is for the most part a simple matter to obtain the excess of energy entirely in the form of heat, the amount of which is easily susceptible of measurement, and thus the existence of thermochemistry as a practical science is rendered possible. Since the intrinsic energies of the two systems under given conditions are invariable, the difference between them is constant, so that the heat evolved when the first system is converted into the second is equal to that ab- sorbed when the second system is re-transformed into the first (cf. Lavoisier and Laplace, ante, § 1). The total thermal effect, too, which is associated with the transformation, must be the same, whether the transformation is conducted directly or in- directly (Hess's Law of Constant Heat Sums), since the thermal effect depends only on the intrinsic energies of the initial and final systems.

Since the intrinsic energy of a substance varies with the conditions under which the substance exists, it is necessary, before proceeding to the practical application of any of the laws mentioned above, accurately to specify the conditions of the initial and final systems, or at least to secure that they shall not vary in the operations considered. It is also a necessary condition for the application of the preceding laws that no form of energy except heat and the intrinsic energy of the substances should be ultimately involved. For example, when metallic zinc is dissolved in dilute sulphuric acid with production of zinc sulphate (in solution) and hydrogen gas, a definite quantity of

heat is produced for a given amount of zinc dissolved, pro- vided that the excess of energy in the initial system appears entirely as heat. This provision may not always be fulfilled, since by placing the zinc in electrical contact with a piece of platinum, likewise immersed in the sulphuric acid, we can

generate a current of electricity through the solution and the metallic part of the circuit. The reaction as before is com- pletely expressed by the chemical equation Zn-r-H 2 S04 = ZnS04H+ 2 , the initial and final systems being exactly the same as in the first case; yet the amount of heat generated by the action is much smaller, a quantity of the intrinsic energy having been converted into electrical energy. This electrical energy, however, is equivalent to the heat which has disappeared, for it has been shown experimentally that if it is converted into heat and added to the heat actually evolved, the total quantity of heat obtained is exactly equal to that produced by the direct dissolution of the zinc in the absence of platinum.

§3. The following conditions have to be considered as affecting in a greater or less degree the intrinsic energy of the initial and final systems: —

(1) Dilution of solutions.

(2) Physical state.

(3) Change of volume.

(4) Allotropic modifications.

(5) Temperature.

(1) Generally speaking, there is a considerable thermal effect when a substance is dissolved in water, and this effect varies in magnitude according to the amount of water employed. It is only,

however, when we deal with comparatively concentrated solutions that the heat-effect of diluting the solutions is at all great, the heat-change on diluting an already dilute solution being for most practical purposes negligible. In dealing, therefore, with dilute solutions, it is only necessary to state that the solutions are dilute, the exact degree of dilution being unimportant. It occasionally happens that a change in dilution affects the chemical action that occurs. Thus if concentrated instead of dilute sulphuric acid acts upon zinc, the action takes place to a great extent not according to the equation given above, but according to the equation

$Zn + 2H_2SO_4 = ZnSO_4 + SO_2 + 2H_2O$, sulphur dioxide and water being produced instead of hydrogen. Here we have a different final system with a different amount of intrinsic energy, so that the thermal effect of the action is alto- gether different.

(2) The physical state of the reacting substances must be con- sidered, since comparatively large amounts of heat are absorbed on fusion and on vaporization. Thus the heat of fusion of ice (for H_2 = i8 g) is 1440 cal., and the heat of vaporization of water at 100°, for the same quantity, 9670 cal.

(3) The effect of change of volume against external pressure (due to production or consumption of mechanical energy) may be neglected in the case of solids, liquids or solutions, but must usually be taken into account when gases are dealt with. Each gramme- molecule of a gas which appears under constant pressure during a chemical action (e.g. hydrogen during the action of zinc on dilute sulphuric acid) performs work equivalent to 580 cal. at the ordinary temperature, which must be allowed for in the thermochemical calculation. A similar correction, of opposite sign, must be made when a gramme-molecule of gas disappears during the chemical action.

(4) When a substance — e.g. carbon, phosphorus,

sulphur — exists in allotropic forms, the particular variety employed should always be stated, as the conversion of one modification into another is frequently attended by a considerable thermal effect. Thus the conversion of yellow into red phosphorus evolves about one-sixth of the heat of combustion of the latter in oxygen, and so the knowledge of which variety of phosphorus has been employed is of essential importance in the thermochemistry of that element.

(5) The influence of temperature on the thermal effect of a chemical action is sometimes considerable, but since the initial and final temperatures, ^jhich alone determine the variation in the thermal effect, are in almost all cases within the ordinary laboratory range of a few degrees, this influence may in general be neglected without serious error.

§ 4. Methods.— In order to estimate the thermal effect of any chemical process, use is made of the ordinary methods of calori- metry, the particular method being selected according to the nature of the chemical action involved. In almost every case the method of mixture (see Calorimetry) is employed, the method of fusion with Bunsen's ice-calorimeter being only used in special and rarely occurring circumstances.

As a very great number of important chemical actions take place on mixing solutions, the method for such cases has been thoroughly studied. When the solutions employed are dilute, no water is placed in the calorimeter, the temperature-change of the solutions themselves being used to estimate the thermal

effect brought about by mixing them. Known quantities of the solutions are taken, and the temperature of each is ac- curately measured before mixing, the solutions having been allowed as far as possible to adjust themselves to the same temperature. The change of temperature of the solutions after the mixing has taken place is then

observed with the usual precautions. It is of course in such a case necessary to know the specific heat of the liquid in the calorimeter. Thomsen by- direct experiment found that the heat-capacity of a dilute aqueous solution diverged in general less than 1 per cent, from the heat-capacity of the water contained in it, the divergence being sometimes in one sense, sometimes in the other. He there- fore abstained from determining for each case the specific heats of the solutions he employed, and contented himself with the above approximation. Berthelot, on the other hand, assumed that the heat-capacity of an aqueous solution is equal to that of an equal volume of water, and calculated his results on this assumption, which involves much the same uncertainty as that of Thomsen. Since thermochemical measurements of this type may be frequently performed with an error due to other causes of much less than 1 per cent., the error introduced by either of these assumptions is the chief cause of uncertainty in the method. The calorimeter used for solutions is usually cylindrical, and made of glass or a metal which is not attacked by the reacting substances. The total quantity of liquid employed need not in general exceed half a litre if a sufficiently delicate thermometer is available. The same type of calorimeter is used in determining the heat of solution of a solid or liquid in water.

Combustion calorimeters are employed for observing the heat generated by the brisk interaction of substances, one of which at least is gaseous. They are of two kinds. In the older type the combustion chamber (of metal or glass) is sunk in the calori- meter proper, tubes being provided for the entrance and exit of the gaseous substances involved in the action. These tubes are generally in the form of worms immersed in the water of the calorimeter. In the newer type (which was first proposed by Andrews for the combustion of gases) the chemical action takes place in a completely closed combustion chamber of sufficient strength to resist the pressure generated by the sudden action, which is often of explosive violence. The steel com- bustion

chamber is of about 250 c.c. capacity, and is wholly immersed in the calorimeter. ' To withstand the chemical action of the gases, the " calorimetric bomb " is lined either with platinum, as in Berthelot's apparatus, or with porcelain, as in Mahler's. For ordinary combustions compressed oxygen is used, so that the combustible substance burns almost in- stantaneously, the action being induced by means of some electrical device which can be controlled from without the calori- meter. The accuracy of heats of combustion determined in the closed calorimeter is in favourable cases about one-half per cent. of the quantity estimated.

§ 5. Units and Notation. — The heat-units employed in thermo- chemistry have varied from time to time. The following are those which have been in most general use : —

Small calorie or gramme calorie …. cal.

Large or kilogramme calorie Cal.

Centuple or " rational " caloric . . . . K.

The centuple calorie is the amount of heat required to raise 1 g. of water from 0° C. to ioo° C, and is approximately equal to 100 cal. The large calorie is equal to 1000 cal. In view of the not very great accuracy of thermochemical measurements, the precise definition of the heat-unit employed is not a matter of special importance. It has been proposed to adopt the joule, with the symbol j, as thermochemical unit for small quantities of heat, large amounts being expressed in terms of the kilojoule, Kj = iooo j, (For the exact relation between these heat-units^ see Calorimetry.) For ordinary thermochemical work we may adopt the relation 1 cal. — 4-18 j, or 1 Cal. = 4-18 Kj.

Except for technological purposes, thermochemical data are not referred to unit quantity of matter, but to chemical quantities — i.e. to the gramme-equivalents or gramme-molecules of the

reacting substances, or to some multiples of them. The notation which Julius Thomsen employed to express his thermochemical measurements is still extensively used, and is as follows: — The chemical symbols of the reacting substances are written in juxta- position and separated by commas; the whole is then enclosed in brackets and connected by the sign of equality to the number expressing the thermal effect of the action. The chemical symbols stand for quantities measured in grammes, and heat-evolution is reckoned as positive, heat-absorption as negative. Thus

[S, 2O] = 71100 cal.

indicates that 71 100 calories are evolved when 32 grammes of sulphur react with 2X16 grammes of free oxygen to form sulphur dioxide. It is of course necessary in accurate work to state the conditions of the reaction. In the above instance the sulphur is supposed to be in the solid rhombic modification, the oxygen and sulphur dioxide being in the gaseous state, and the initial and final systems being at the ordinary temperature. Again, the equation

[2N, 0] =-18500 cal.

indicates that it 28 grammes of nitrogen could be made to unite directly with 16 grammes of oxygen to form nitrous oxide, the union would cause the absorption of 18500 calories. When sub- stances in solution are dealt with, Thomsen indicates their state by affixing Aq to their symbols. Thus

[XaOH Aq, HNO3 Aq] = 13680 cal.

represents the heat of neutralization of one gramme-equivalent of caustic soda with nitric acid, each in dilute aqueous solution before being brought into contact. One drawback of Thomsen’s notation is that the nature of the final system is not indicated, although this defect in general causes no ambiguity.

Berthelot's notation defines both initial and final systems by giving the chemical equation for the reaction considered, the thermal effect being appended, and the state of the various substances being affixed to their formulae after brackets. W. Ostwald has proposed a modification of Berthelot's method which has many advantages, and is now commonly in use. Like Berthelot, he writes the chemical equation of the reaction, but in addition he considers the chemical formula of each substance to express not only its material composition, but also the (unknown) value of its intrinsic energy. To the right-hand member of the equation he then adds the number expressing the thermal effect of the reaction, heat-evolution being as before counted positive, and heat-absorp- tion negative. The mass-equation then becomes an energy-equation. He thus writes

S+0 2 = S0 2 +7iioo cal.,

which expresses the fact that the intrinsic energy of the quantities of sulphur and oxygen considered exceeds that of the sulphur dioxide derived from them by 71 100 cal. when thermal units are employed. The equation

H 2 + I 2 = 2HI-I2200 cal.

expresses that under certain conditions the intrinsic energy of hydriodic acid is greater than the intrinsic energy of its com- ponent elements by 12200 cal., i.e. that hydriodic acid is formed from its elements with absorption of this amount of heat. Energy- equations, such as the above, may be operated with precisely as if they were algebraic equations, a property which is of great advan- tage in calculation. Thus by transposition we may write the last equation as follows: —

2HI=H2+I 2 +i2200 cal.,

and thus express that hydriodic acid when decomposed into its elements evolves 12200 cal. for the quantity indicated by the equation.

Ostwald has made the further proposal that the formulae of solids should be printed in heavy type (or within square brackets), of liquids (solutions, &c.) in ordinary type, and of gases in italics (or within curved brackets), so that the physical state of the sub- stances might be indicated by the equation itself. Thus the equation

C/ 2 +2KI, Aq=2KCl, Aq+Ia+52400 cal., or (C1 2)+2KI, Aq=2KCl, Aq+[I 2] +52400 cal.,

would express that when gaseous chlorine acts on a solution of potassium iodide, with separation of solid iodine, 52400 calories are evolved.

§ 6. Heat of Formation.- — For thermochemical calculations it is of great importance to know the heat of formation of com- pounds from their elements, even when the combination cannot be brought about directly. As an example of the use of Ost- wald's energy-equations for the indirect determination we may take the case of carbon monoxide. The following equations give the result of direct experiment : — C+20 = C0 2 94300cal. CO = C0 2 +68000 cal.

If now it is required to find the heat of formation of the com- pound CO, which cannot be directly ascertained, we have merely to subtract the second equation from the first, each symbol repre- senting constant intrinsic energy, and thus we obtain

C+O-C0 = 2630ocal., or C+0 = CO +26300 cal.,

that is, the heat of formation of a gramme-molecule of carbon monoxide is 26300 cal.

As has already been stated, the heat of formation of a com- pound is the amount (expressed in thermal units) by which its intrinsic energy exceeds or falls short of that of the elements which enter into its composition. Now of the absolute values of intrinsic energy we know nothing; we can only estimate differences of intrinsic energy when one system is compared with another into which it may be

directly or indirectly converted. But since the elements cannot be converted one into the other. We are absolutely without knowledge of the relative values of their intrinsic energy. This being the case, we are at liberty to make the assumption that the intrinsic energy of each element (under specified conditions) is zero, without thereby introducing any risk of self-contradiction in thermochemical calculations. This assumption has the great advantage, that the intrinsic energy of a compound relatively to its elements now appears as the heat of formation of the com- pound with its sign reversed. Thus if we consider the energy-equation

C+0 2 = C0 2 +94300 cal.,

and replace the symbols by the values of the intrinsic energy, viz. zero for carbon and oxygen, and * for carbon dioxide, we obtain the equation

o+o = x+94300 cal. or x— —94300 cal.

With knowledge then of the heats of formation of the substances involved in any chemical action, we can at once calculate the thermal effect of the action, by placing for each compound in the energy-equation its heat of formation with the sign reversed, i.e. its heat of decomposition into its elements. Thus if we wish to ascertain the thermal effect of the action

Mg+Ca0 = Mg0+Ca,

we may write, knowing the heats of formation of CaO and MgO to be 131000 and 146000 respectively,

0-131000 =0-146000+2

2 = 15000 cal.

Since heats of formation afford such convenient data for calcula- tion on the above method, they have been ascertained for as many compounds as possible.

Substances with positive heats of formation are

termed exo- thermic; those with negative heats of formation are termed endo- thermic. The latter, which are not very numerous, give out heat on decomposition into their elements, and are more or less unstable. Amongst endothermic compounds may be noted hydriodic acid, HI, acetylene, C_2H_2, nitrous oxide, N_2O, nitric oxide, NO, azoimide, NSH, nitrogen trichloride, NClj. Some of these pass into their elements with explosive violence, owing to the heat generated by their decomposition and the gaseous nature of the products.

§ 7. Heat of Combustion. — The thermochemical magnitude which is universally determined for organic compounds is the heat of combustion, usually by means of the calorimetric bomb. The relation between the heat of combustion of a hydrocarbon and its heat of* formation may be readily seen from the following example. The hydrocarbon methane, CH_4, when completely burned to carbon dioxide and water, generates 213800 cal. We may therefore write

$CH_4 + 4O = CO_2 + 2H_2O + 2i38oo$. Now we know the heats of formation of carbon dioxide (from diamond) and of liquid water to be 94300 cal. and 68300 cal. respectively. The above equation may consequently be written, if x is the heat of formation of methane,

$-x + g = -94300 - (2 \times 68300) + 213800$ x = i 7000 cal.

This heat of formation, like that of most hydrocarbons, is comparatively small: the heat of formation of saturated hydrocarbons is always positive, but the heat of formation of unsaturated hydrocarbons is frequently negative. F01 example, ethylene, C_2H_4, is formed with absorption of 16200 cal., acetylene, C_2H_2, with absorption of 59100 cal., and liquid benzene, C_6H_6, with absorption of 9100 cal. Since the heat of combustion of a hydrocarbon is equal to the heat of combustion of the carbon and hydrogen it contains minus its heat of formation,

those hydrocarbons with positive heat of formation generate less heat on burning than the elements from which they were formed, whilst those with a negative heat of formation generate more. Thus the heat generated by the combustion of acetylene, C2H2, is 316000 cal., whereas the heat of combustion of the carbon and hydrogen composing it is only 256900 cal., the difference being equal to the negative heat of formation of the acetylene.

For substances consisting of carbon, hydrogen and oxygen, a rule was early devised for the purpose of roughly calculating their heat of combustion (J. J. Welter's rule). The oxygen contained in the compound was deducted, together with the equivalent amount of hydrogen, and the heat of combustion of the compound was then taken to be equal to the heats of combustion of the elements in the residue. That the rule is not very accurate may be seen from the following example. Cane-sugar has the formula CijHjjOu. According to Welter's rule, we deduct II O with the equivalent amount of hydrogen, namely, 22 H, and are left with the residue 12 C, the heat of combustion of which is 1131600 cal. The observed heat of combustion of sugar is, however, 1354000, so that the error of the rule is here 20 per cent. A much better approximation to the heat of combustion of such substances is obtained by deducting the oxygen together with the amount of carbon necessary to form C0 2 , and then ascertaining the amount of heat produced by the residual carbon and hydrogen. In the above case we should deduct with 11 O the equivalent amount of carbon 5-5 C, thus obtaining the residue 6-5 C and 22 H. These when burnt would yield (6-5X94300) + (11 X68300) = 1364250 cal., an amount which is less than I per cent, different from the observed heat of combustion of sugar. Neither of the above rules can be applied to carbon compounds containing nitrogen.

§ 8. Heat of Neutralization. — It has already been stated that the heats of neutralization of acids and bases in aqueous solution are additively composed of

two terms, one being constant for a given base, the other constant for a given acid. In addition to this, the further regularity has been observed that when the powerful monobasic acids are neutralized by the powerful monacid bases, the heat of neutralization is in all cases the same. The following table gives the heats of neutralization of the commoner strong monobasic acids with soda: —

Hydrochloric acid . HC1 . 137400 cal.

Hydrobromic acid . HBr . . . 137500 ,,

Hydriodic acid . .HI . . 136800 ,,

Nitric acid . . HN0 3 . . 136800 „

Chloric acid . . HC10 3 . . 137600 ,,

Bromic acid . HBr0 3 . . 137800 ,,

Within the error of experiment these numbers are identical.

It was at one time thought that the greater the heat of neutralization of an acid with a given base, the greater was the strength of the acid. It is now known, however, that when weak acids or bases are used, the heat of neutralization may be either greater or less than the normal value for powerful acids and bases, so that there is no proportionality, or even parallelism, between the strengths of acids and their heats of neutralization (see Solutions).

§ 9. Heat of Solution. — When substances readily combine with water to form hydrates, the heat of solution in water is usually positive; when, on the other hand, they do not readily form hydrates, or when they are already hydrated, the heat of solution is usually negative. The following examples show the effect of hydration on heat of solution in a large quantity of water: — ■

Heat of Solution. Heat of Hydration. I. Sodium carbonate —

Na 2 C0 3 . +5640 cal.

Na 2 C0 3 , H 2 .- +2250 ,, +3390 cal.

Na 2 C0 3 , 2H 2 . +20 ,, +5620 ,,

Na 2 C0 3 , 10H2O . — 16160 „ +21800 „

II. Sodium sulphate —

Na 2 S0 4 . . +460 cal.

Na 2 S0 4 , H 2 . —1900 „ +2360 cal.

Na 2 S0 4 , ioH 2 . —18760 „ +19200 ,,

§ 10. Application of the Second Law of Thermodynamics to Thermochemistry.— What is commonly understood by thermo- chemistry is based entirely on the first law of thermodynamics, but of recent years great progress has been made in the study

of chemical equilibrium by the application of the second law. For an account of work in this direction see Chemical Action.

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THERMODYNAMICS (from Gr. depfios, hot, Swa/uis, force). 1. The name thermodynamics is given to that branch of the general science of Energetics which deals with the relations between thermal and mechanical energy, an'd the transforma- tions of heat into work, and vice versa. Other transformations of heat are often included under the same title (see Energetics) . An historical account

of the development of thermodynamics is given in the article Heat. The object of the present article is to illustrate the practical application of the two general principles — (1) Joule's law of the equivalence of heat and work, and (2) Carnot's principle, that the efficiency of a reversible engine depends only on the temperatures between which it works; these principles are commonly known as the first and second laws of thermodynamics. The application will necessarily be confined to simple cases such as are commonly met with in practice, or are required for reference in cognate subjects.

2. Application of the First Law. — The complete transforma- tion of mechanical energy into heat by friction, or some analogous process of degradation, is always possible, and is made the basis of experiments for the determination of the mechanical equi- valent of the heat unit (see Calorimetry). The converse pro- cess of the transformation of heat into mechanical work or other forms of energy is subject to limitations.

When a quantity of heat, H, is supplied to a body, part is expended in raising the temperature of the body, or in expanding the volume against molecular forces, and is represented by an increase in the total quantity of energy contained in the body, which is generally called its Intrinsic Energy, and will be denoted by the symbol E. The remainder is equivalent to the external work, W, done by the body in expanding or otherwise, which can be utilized for mechanical purposes, and ceases to exist as heat in the body. The application of the first law leads immediately to the equation,

$$H = E-E_0+W, \quad . \; . \; . \; . \; . \quad (1)$$

in which E represents the quantity of energy originally present in the body, and all the quantities are supposed, as usual, to be expressed in mechanical units. This equation is generally true for any series of transformations, provided that we regard H and W as representing the algebraic sums of all the quantities of heat supplied to, and of work

done by the body, heat taken from the body or work done on the body being reckoned negative in the summation. E—Eo, then, represents the total increase of the intrinsic energy of the body in its final state, which may be deter- mined by measuring H and W. If after any series or cycle of transformations the body is restored to its initial state, we must have E = Ea, whence it follows that H—W. But this simple rela- tion is only true of the net balances of heat and work in a complete cyclical process, which must be adopted for theoretical purposes if we wish to eliminate the unknown changes of intrinsic energy. The balance of work obtainable in such a cycle depends on the limits of temperature in a manner which forms the subject of the second law.

3. Indicator or p.v. Diagram. — The significance of relation (1) is best appreciated by considering the graphic representation of quantities of heat and energy on a work-diagram.

On the familiar indicator diagram the state of the working sub- stance is represented by the position of a point called the ” state- point,” defined by the values of the pressure p and volume v of unit mass, as ordinate and abscissa respectively (fig. 1). Any line (” path ” or ” graph “) on the diagram, such as BCD, represents an ” operation ” or ” process ” i.e. a continuous series of states through which the substance may be made to pass in any trans- formation. It is tacitly assumed that the motion is relatively so slow that the pressure and temperature of the substance are prac- tically uniform throughout its mass at any stage of the process. Otherwise the transformation could not be fully represented on the diagram, and would not be reversible. The area BCDdi under I the path represents the external work done by the substance in

expanding from B to D, which is analytically

represented by the integral of pdv taken along the given path. Any closed path or figure, such as ABCD, represents a complete cycle or series of operations, in the course of which the substance is restored to its original state with respect to temperature, intrinsic energy and other properties. The area DABbd under the return path (v diminishing) represents work done on the substance, or against the back- pressure, and is negative. The area of the cycle, viz., that enclosed by the path BCDA, represents the balance of external work done by the substance in one cycle, and is positive if the

cycle is described clockwise as indicated by the arrows. The simplest types of pro- cess or operation are: — (1), heating or cooling at constant volume, represented by ver- tical lines such as Mb, called Isometrics, in which the pressure varies, but no ex- ternal work is done. (2) Heating or cooling at con- stant pressure, represented by horizontal lines such as NA, called Isopiestics, in which the external work done is the product of the pressure p and the expan- sion v'—v'. (3) Expansion or compression at constant V temperature, represented by curves called Isothermals, such as BC, AD, the form of which depends on the nature of the working sub-

Fig. 1.

stance. The isothermals are approximately equilateral hyperbolas (pv = constant) , with the axes of p and v for asymptotes, for a gas or unsaturated vapour, but coincide with the isopiestics for a saturated vapour in presence of its liquid. (4) Expansion or compression under the condition of heat-insulation, represented by curves called Adiabatics, such as BAZ or CDZ', which are necessarily steeper than the isothermals.

A cycle such as ABCD enclosed by parts of two isothermals, BC, AD, and two adiabatics, AB, CD, is the simplest form of cycle for theoretical purposes, since all the heat absorbed, H', is taken in during the process represented by one isothermal at the tempera- ture 8', and all the heat rejected, H", is

given out during the process represented by the other at the temperature 8”. This is the cycle employed by Carnot for the establishment of his fundamental principle of reversibility as the criterion of perfect efficiency in a heat engine. The area ABCD, representing the work, W, per cycle, is the difference {H’—H”) of the quantities of heat absorbed and rejected at the temperatures 8' and 8”. As the temperature 8" is lowered, the area of the cycle increases, but since W can never exceed H’ , there must be a zero limit of temperature at which the pressure would vanish and the area of the cycle become equal to the whole heat absorbed at the higher temperature. Taking this ideal limit as a theoretical or absolute zero, the value of H may be represented on the diagram by the whole area included between the two adiabatics BAZ, CDZ’ down to the points where they intersect the isothermal of absolute zero, or the zero isopiestic OV asymptotically at infinity.

If the substance in any state such as B were allowed to expand adiabatically (dH = o) down to the absolute zero, at which point it contains no heat and exerts no pressure, the whole of its avail- able heat energy might theoretically be recovered in the form of external work, represented on the diagram by the whole area BAZci under the adiabatic through the state-point B, bounded by the isometric Bb and the zero isopiestic bV. The change of the intrinsic energy in passing from one state to another, as from B to C is represented by the addition of the heat-area H = BCZZ’ , and the subtraction of the work-area ‘W = BCcb. It follows from the first law that the intrinsic energy of a substance in a given state must always be the same, or that the change of E in any transformation must depend only on the initial and final states, and not on the path or process. It will be observed that the areas representing H and W both depend on the form of the path BC, but that the difference of the areas representing the change of intrinsic energy dE is independent of BC, which is a boundary common to both H and W. This is mathematically expressed by the statement that dE is

an exact differential of a function of the co-ordinates defining the state of the body, which can be integrated between limits without reference to the relation representing the path along which the variations are taken.

4. Application of Carnot' s Principle. — Carnot adopted as the analytical expression of his principle the statement that the effi- ciency W/H, or the work obtainable per unit of heat by means of a perfect engine taking in heat at a temperature t" C. and reject- ing heat at 0° C, must be some function F(t) of the temperature t, the lower limit o° C. being supposed constant. He was unable to

apply the principle directly in this form, as it would require an exact knowledge of the properties of substances through a wide range of temperature. He therefore employed the corresponding expression for a cycle of infinitesimal range dt at the temperature t in which the work dW obtainable from a quantity of heat H would be represented by the equation

dW=HF'(t)dt,

where F'(t) is the derived function of F(t), or dF(t)/dt, and represents the work obtainable per unit of heat per degree fall of temperature at a temperature /. The principle in this form is readily appli- cable to all cases, and is independent of any view with regard to the nature of the heat. It simply asserts that the efficiency function F'(t), which is known as Carnot's function, is the same for all syjo- stances at the same temperature. Carnot verified this by calculating the values of F'{t) at various temperatures from the known pro- perties of vapours and gases, and showed that the efficiency function diminished with rise of temperature, as measured on the scale of the mercury or gas thermometer, from about 1-40 kilogrammetres per kilo-calorie per degree C. at 0° C. to about i-ii at 100° C, according to the imperfect data available in his time. Applying the above equation to a gas obeying the law pv = RT, for which the work done in

isothermal expansion from a volume I to a volume r is W = RT log e r, whence dW= R \og e rdt, he deduced the expression for the heat absorbed by a gas in isothermal expansion

H = R \og,rlF'{t).

He also showed that the difference of the specific heats at constant pressure and volume, S — s, must be the same for equal volumes of all gases at the same temperature and pressure, being repre- sented by the expression R/TF'(t). He remarks that " the law according to which the motive power of heat varies at different points of the thermometric scale is intimately connected with that of the variations of the specific heats of gases at different tempera- tures — a law which experiment has not yet made known to us with sufficient exactness." If he had ventured to assume the difference of the specific heats constant, it would have followed that F'(t) must vary inversely as T. The same result follows if the work W=RT log e r done by a gas in isothermal expansion is assumed to be equivalent or proportional to the heat absorbed, H = R \og e r/ F'(t). Mayer (1842) made this assumption in calculating the mechanical equivalent of heat. Joule (1845) was the first to prove it approximately by direct experiment, but did not see his way to reconcile Carnot's principle, as stated by Clapeyron, with the mechanical theory. Holtzmann (1845) by the same assumption deduced the value JIT for the function F'{f), but obtained erroneous results by combining this assumption with the caloric theory. Clausius (1850), applying the same assumption, deduced the same value of F'{t), and showed that it was consistent with the mechanical theory and Joule's experiments, but required that a vapour like steam should deviate more considerably from the gaseous laws than was at that time generally admitted. The values of F'(t) calculated previously by Sir W. Thomson (Lord Kelvin) from Regnault's tables of the properties of steam, assuming the gaseous laws, did not vary exactly as J/T. Joule's experiments on the equivalence of W and H were not sufficiently precise to decide the

*question. This most fundamental point was finally settled by a more delicate test, devised by Lord Kelvin, and carried out in conjunction with Joule (1854), which showed that the fundamental assumption W=H in isothermal expansion was very nearly true for permanent gases, and that F'(t) must therefore vary very nearly as J/T. Kelvin had previously proposed to define an absolute scale of temperature independent of the properties of any particular substance in terms of Carnot's function by making F'(t) constant. He now proposed to define absolute temperature as proportional to the reciprocal of Carnot's function, so as to agree as closely as possible with the scale of the gas thermometer. With this defini- tion of temperature 8, if the heat H is measured in work units, the expression of Carnot's principle for an infinitesimal cycle of range dd reduces to the simple form dW/d6 = H/8. Combining this with the first law, for a Carnot cycle of finite range, if H' is the heat taken in at 8', and H" is the heat rejected at 8", the work W done in the cycle is equal to the difference H'—H", and we have the simple relations, **

W/(e'-8")=H'18' = H"6''

(2)

5. Thermodynamical Relations. — The most important and most useful of the relations between the thermodynamical properties of a substance may be very simply deduced from a consideration of the indicator diagram by a geometrical method, which is in many respects more instructive than the analytical method gene- rally employed. Referring to fig. 2, let BC be a small portion of any isothermal corresponding to the temperature 8', and AD a neighbouring isothermal 0". Let BE be an isometric through B meeting AD in E, and EC an isopiestic through E meeting BC in C. Let BA, CD be adiabatics through B and C meeting the isothermal 8" in A and D. Then by relations (2) the heat, H, absorbed in the isothermal change BC, is to the work, W, done in the cycle ABCD in the ratio of 8' to (8'—0"). If the difference

of temperature (0' —6”) is small, the figure ABCD may be regarded as a parallelogram, and its area W as equal to the rectangle BE XEC. This is accurately true in the limit when (8’-r0”) is infinitesimal, but in practice it is necessary to measure specific heats, &c, over finite ranges of temperature, and the error involved is generally negligible if the range does not exceed a few degrees. BE is the increase of pressure (p’—p”) produced by the rise of temperature (8' —8”) if the volume is kept constant. EC is the expansion (v”—v) produced by the same rise of temperature if the pressure is kept constant. Substituting these symbols in the expression for the area, the relation becomes

H=e(p’-p”)(v”-v’)i{e’-e’) . . _ . (3)

This relation may be interpreted in two ways, according as we require the heat absorbed in terms of the change of pressure or volume. (1) The heat, H, absorbed in isothermal expansion (latent heat of expansion) from p’ to p” is equal to the diminution of pressure {p’—p”) multiplied by the absolute temperature and by the expansion per degree (»*—v’)/{8' — 8”) at constant pressure. (2) The heat, H, absorbed in isothermal expansion from v’ to v” is equal to the increase-of volume (»*—»’) multiplied by the abso- lute temperature, and by the increase of pressure per degree (p’ — p”)/(8' — 9”), at constant volume. In the notation of the calculus the relations become

-dH/dp (8 const) =8dv/d8 (p const)) dH/dv (8 const) =8dp/d8 (v const) \ ‘

(4)

Fig. 2.

The negative sign is prefixed to dH/dp because absorption of heat +dll corresponds to diminution of pressure — dp. The utility of

these relations results from the circumstance that the pressure and expansion co- efficients are familiar and easily measured, whereas the latent heat of expansion is difficult to determine.

The most instructive ex- ample of the application of relations (1) and (2) is af- forded by the change of state of a substance at constant temperature and pressure. Starting with unit mass of the substance in the first state (e.g. liquid) pos- sessing volume v′ at a tem- perature 8" and pressure p″ represented by the point A in fig. 3, the heat absorbed in raising the temperature to 8' and the pressure to p′ without change of state may be written s′ (8′— 8″), where s′ is the specific heat of the substance in the first state at saturation pressure. If now the substance in the state B is entirely con- verted at constant temperature and pressure into the second state (e.g. saturated vapour), in which it occupies a volume v″, the line BC represents the change of volume (»″—»′)• The heat absorbed in this change is called the latent heat of change of state, and may be represented by the symbol U. The substance is then cooled to the lower temperature 8" along the path CD, keeping it in the saturated state. The heat evolved in this process may be represented by s″(8′— 0″), where s″ is the specific heat of the substance in the second state at saturation pressure. Finally, the substance is reconverted into the first state at the temperature 0″, completing the cycle by the abstraction of a quantity of heat L″ . By the application of the first law, the difference of the quantities of heat absorbed and evolved in the cycle must be equal to the work represented by the area of the cycle, which is equal to (p′ — p″)(v″ —v′) in the limit when the difference of pressure is small. By the application of the second law, relations (2), the same work area is equal to (8' -8″)L′J8\ _ Dividing by (8' -

s′-s″+dL!de = (v″-v′)dpide=Lie, . . . (5)

in which dp/dd is the rate of change of pressure with temperature when the two states are in equilibrium. It is not necessary in this example

that AB, CD should be adiabatics, because the change of volume BC is finite. The same equations apply to the case of fusion of a solid, if L is the latest heat of fusion, and v′, s′, v″, s″ the specific volumes and specific heats of the solid and liquid respectively.

6. Ratio and Difference of Specific Heats.— li we take unit mass of the substance at B, fig. 2, and cool it at constant volume to E, through an interval of temperature (9′— 8″), the amount of heat abstracted may be written h — s(8' —8″), where s is the specific heat at constant volume. If, starting from E, the same amount of heat h is restored at constant pressure, we should arrive at the point F on the adiabatic through B, since the substance has been trans- formed from B to F by a reversible path without loss or gain of

apour

heat on the whole. In order to restore the substance to its original

temperature 8' at constant pressure, it would be necessary to supply

a further quantity of heat, H, represented by the area between

the two adiabatics from

FC down to the absolute

zero. This quantity of heat

is the same as that already

found in equation (3), but

for the small area BFC,

which is negligibly small

in the limit compared with

H. The whole quantity of

heat required to raise the

temperature from 8″ to 8′ p

at constant pressure along

the path EC is H+h, which

is equal to S(8′ — 8″), where

5 is the specific heat at

constant pressure. Since

h = s{8′—8″), the difference

S — s between the specific

heats at constant pressure Fig. 3.

and volume is evidently

Hj(8′—8″). Substituting for H its value from (3), and employing

the notation of the calculus, we obtain the relation

S-s=8{dp/d6)(dv/d8),

■ (6)

in which the partial differential coefficients have the same meaning as in (4).

Since the amounts of heat supplied at constant pressure from E to F and from E to C are in the limit proportional to the expan- sions EF and EC which they produce, the ratio Sjs is equal to the ratio EC/EF. EF is the change of volume corresponding to a change of pressure BE when no heat is allowed to escape and the path is the adiabatic BF. EC is the change of volume for the same change of pressure BE when the path is the isothermal BC. These changes of volume are directly as the compressibilities, or inversely as the elasticities. If we write K for the adiabatic elas- ticity, and k for the isothermal elasticity, we

obtain

S/s = EC/EF =K/k

■ (7)

The value of the specific heat 5 at constant pressure can always be determined by experiment, and in practice is one of the most important thermodynamical properties of a substance. The value of the specific heat s at constant volume can also be measured in a few cases, but it is generally necessary to deduce it from that at constant pressure by means of relation (6). It js often impossible to observe the pressure-coefficient dp/dd directly, but it may be deduced from the isothermal compressibility by means of the geometrically obvious relation, BE = (BE/EC) X EC. The ratio BE/EC of the diminution of pressure to the increase of volume at constant temperature, or —dp/dv, is readily observed.

The amount of heat absorbed in any small change of state, as from E to G in fig. 2, may be found by adding to the heat required for the change of temperature at constant volume, sdd, or at con- stant pressure, Sdd, the heat absorbed in isothermal expansion as given by relations (4). We thus obtain the expressions

dH = sd8+8(dp/d8)dv = Sd8-8{dvldB)dp . . . (8) The first is equivalent to measuring the heat along the path EBG, the second along the path ECG. The two differ by the area BEC, which can be neglected if the change is small. For a finite change it is necessary to represent the path by a series of small steps, which is the graphic equivalent of integration along the path repre- sented by the given relation between v and 8, or p and 8. If we put dH=o in equations (8), we obtain the relations between dv and d9, or dp and dd, under the condition of no heat-supply, i.e. along the adiabatic, which can be integrated, giving the equations to the adiabatics, provided that the values of the specific heats and expansion-coefficients are known.

6. Intrinsic Energy. — The change of intrinsic energy E along any path is found by subtracting the work pdv from either of the expressions for dH. Since the change of energy is independent of the path, the finite change between any two given states may be found by integration along any convenient path. It is generally convenient to divide the path into two steps, isothermal and isometric, or isothermal and isopiestic, and to integrate along each separately. The change of energy at constant volume is simply sd8, the change at constant temperature is (8dp/d8—p)dv, which may be written

dE/d8 (v const) =s, dE/dv (8 const) =8dp/dB-p . (9)
These must be expressed as functions of v and 8, which is theo- retically possible if the values of s, p, and dp/d8 are known. Since the two expressions (9) are the partial differential-coefficients of a single function E of the independent variables v and 8, we shall obtain the same result, namely d 2 E/ d8dv, if we differentiate the first with respect to v and the second with respect to 6. We, thus obtain the relation

ds/dv{8 const) =9d 2 p/d0 2 (v const), . » . . . (10)

which is useful for calculating the variation of the specific heat J with variation of density at constant temperature. A similar expression for the variation of the specific heat 5 at constant pressure is obtained from the second expression in (8), by taking p and 8 as independent variables; but it follows more directly from a consideration of the variation of the function (E + pv).

■j. Total Heat. — The function F={E+pv), like E itself, has a value depending only on the state of the body. It may con- veniently be called the Total Heat, by a slight extension of the meaning of a term which has been for a long time in use as applied to

vapours (see Vaporization). Since dE — dH-pdv, we have evidently for the variation of the total heat from the second ex- pression (8),

dF=d(.E + pv)=dH + vdp = Sd$-(0dvlde-v)dp . (n) This expression shows that the rate of variation of the total heat with temperature at constant pressure is equal to the specific heat at constant pressure. To find the total heat of a substance in any given state defined by the values of p and 8, starting from any convenient zero of temperature, it is sufficient to measure the total heat required to raise the substance to the final temperature under a constant pressure equal to p. For instance, in the boiler of a steam engine the feed water is pumped into the boiler against the final pressure of the steam, and is heated under this constant pressure up to the temperature of the steam. The total heat with which we are actually concerned in the working of a steam engine is the total heat as here defined, and not the total heat as defined by Regnault, which, however, differs from (E-j-pv) only by a quantity which is inappreciable in ordinary practice.

Observing that F is a function of the co-ordinates expressing the state of the substance, we obtain for the variation of 5 with pressure at constant temperature,

dSi'dp (8 const) =

If the heat supplied to a substance which is expanding rever- sibly and doing external work, pdv, is equal to the external work done, the intrinsic energy, E, remains constant. The lines of constant energy on the diagram are called Isenerp.cs. The equation to these lines in terms of v and 6 is obtained by integrating

dE = sde + (8dpldO-p)dv = o .. . . (13)

If, on the other hand, the heat supplied is equal to -odp, we see from (11) that F remains constant. The equation to the lines of constant total heat is found in terms of p and 6 by putting dF = o and

integrating (n).

8. Ideal Gases. — An ideal gas is a substance possessing very simple thermodynamic properties to which actual gases and vapours appear to approximate indefinitely at low pressures and high temperatures. It has the characteristic equation pv = R0, and obeys Boyle's law at all temperatures. The coefficient of expansion at constant pressure is equal to the coefficient of increase of pressure at constant volume. The difference of the specific heats by equation (6) is constant and equal to R. The isothermal elasticity -v(dp/dv) is equal to the pressure p. The adiabatic elasticity is equal to yp, where 7 is the ratio S/s of the specific heats. The heat absorbed in isothermal expansion from Vo to v at a temperature 8 is equal to the work done by equation (8) (since dB = o, and 8(dp/d8)dv = pdv) , and both are given by the expression R8 log,(t>/ i>o). The energy E and the total heat F are functions of the temperature only, by equations (9) and (11), and their variations take the form dE = sdB, dF = Sdd. The specific heats are independent of the pressure or density by equations (10) and (12). If we also assume that they are constant with respect to temperature (which does not necessarily follow from the characteristic equation, but is generally assumed, and appears from Regnault's experiments to be approximately the case for simple gases), the expressions for the change of energy or total heat from 80 to 8 may be written E-E ? = s(8-8o), F-F = S(8-8). In this case the ratio of the specific heats is constant as well as the difference, and the adia- batic equation takes the simple form, pv y — constant, which is at once obtained by integrating the equation for the adiabatic elas- ticity, -v(dp/dv) =yp.

The specific heats may be any function of the temperature con- sistently with the characteristic equation provided that their difference is constant. If we assume that s is a linear function of 8, s=s {i+a8), the adiabatic equation takes the form,

so\og'(8!8 (l)+as (e-e< 1)+R\og e (v/vo)=o . . .

(14)

where (8 ,v), (0 O , »o) are any two points on the adiabatic. The corresponding expressions for the change of energy or total heat are obtained by adding the term \as 6 (8' ! ~8^) to those already given, thus:

E-E = s l) (8-8o)+iaSo(8*-8

F- F = S (8 - do) +ias o {0 2 - 0o 2) , where Sa = So-{-R.

9. Deviations of Actual Gases from the Ideal State. — Since no gas is ideally perfect, it is most important for practical purposes to discuss the deviations of actual gases from the ideal state, and to consider how their properties may be thermodynamically explained and defined. The most natural method of procedure is to observe

the deviations from Boyle's law by measuring the changes of pv at various constant temperatures. It is found by experiment that the change of pv with pressure at moderate pressures is nearly proportional to the change of p, in other words that the coefficient d{pv)jdp is to a first approximation a function of the temperature only. Thi3 coefficient is sometimes called the " angular coeffi- cient," and may be regarded as a measure of the deviations from Boyle's law, which may be most simply expressed at moderate pressures by formulating the variation of the angular coefficient with temperature. But this procedure in itself is not sufficient, because, although it would be highly probable that a gas obeying Boyle's law at all temperatures was practically an, ideal gas, it is evident that Boyle's law would be satisfied by any substance having the characteristic equation pv=f(8), where f(8) is any arbitrary function of 8, and that the scale of temperatures given by such a substance would not necessarily coincide with the absolute scale. A sufficient test, in addition to Boyle's law, is the condition dE/dv = o at constant temperature. This gives by equation (9) the

condition 0dp/_d8 — p, which is satisfied by any substance possessing the characteristic equation p/8=f(v), where f(v) is any arbitrary function of ». This test was applied by Joule in the well-known experiment in which he allowed a gas to expand from one vessel to another in a calorimeter without doing external work. Under this condition the increase of intrinsic energy would be equal to the heat absorbed, and would be indicated by fall of temperature of the calorimeter. Joule failed to observe any change of tempera- ture in his apparatus, and was therefore justified in assuming that the increase of intrinsic energy of a gas in isothermal expansion was very small, and that the absorption of heat observed in a similar experiment in which the gas was allowed to do external work by expanding against the atmospheric pressure was equivalent to the external work done. But owing to the large thermal capacity of his calorimeter, the test, though sufficient for his immediate purpose, was not delicate enough to detect and measure the small deviations which actually exist.

10. Method of Joule and Thomson. — William Thomson (Lord Kelvin), who was the first to realize the importance of the absolute scale in thermodynamics, and the inadequacy of the test afforded by Boyle's law or by experiments on the constancy of the specific heat of gases, devised a more delicate and practical test, which he carried out successfully in conjunction with Joule. A continuous stream of gas, supplied at a constant pressure and temperature, is forced through a porous plug, from which it issues at a lower pressure through an orifice carefully surrounded with non-con- ducting material, where its temperature is measured. If we con- sider any short length of the stream bounded by two imaginary cross-sections A and B on either side of the plug, unit mass of the fluid in passing A has work, p'v', done on it by the fluid behind and carries its energy, £' + !/, with it into the space AB, where U' is the kinetic energy of flow. In passing B it does work, p'v", on the fluid in front, and carries its energy, E"+U", with it out of the space AB. If there is no

external loss or gain of heat through the walls of the pipe, and if the flow is steady, so that energy is not accumulating in the space AB, we must evidently have the condition E'+U'+p'v' = E +U"+p"v" at any two cross-sections of the stream. It is easy to arrange the experiment so that V is small and nearly constant. In this case the condition of flow is simply that of constant total heat, or in symbols, d(E--pv) =0. We have therefore, by equation, (11),

- Sd8 = {8dvlde-v)dp, ... (15)

where dB is the fall of temperature of the fluid corresponding to a diminution of pressure dp. If there is no fall of temperature in passing the plug, d8=o, and we have the condition 8dv/d8=v. The characteristic equation of the fluid must then be of the form vj8=f(p), where f{p) is any arbitrary function of p. If the fluid is a gas also obeying Boyle's law, pv—f(8), then it must be an ideal gas. As the result of their experiments on actual gases (air, hydrogen, and C0 2), Joule and Thomson {Phil. Trans., 1854, 1862) found that the cooling effect, dd, was of the same order of magnitude as the deviations from Boyle's law in each case, and that it was proportional to the difference of pressure, dp, so that d8jdp was nearly constant for each gas over a range of pressure of five or six atmospheres. By experiments at different temperatures between o° and 100° C, they found that the cooling effect per atmosphere of pressure varied inversely as the square of the absolute tempera- ture for air and C0 2 . Putting d8/dp=A/8 2 in equation (15), and integrating on the assumption that the small variations of S could be neglected over the range of the experiment, they found a solution of the type, v/8 =f{p) — SA/38 3 , in which f{p) is an arbitrary function of p. Assuming that the gas should approximate indefinitely to the ideal state pv = R8 at high temperatures, they put f(p)=R/p, which gives a characteristic equation of the form

v = R61p-SA130* (16)

An equation of a similar form had previously been employed by Rankine (Trans. Roy. Soc. Ed., 1854) to represent Regnault's experiments on the deviations of CO2 from Boyle's law. This equation is practically identical for moderate pressures with that

devised by Clausius (Phil. Mag., 1880) to represent the behaviour of CO2 up to the critical point. Experiments by Natanson on C0 2 at 17 C. confirm those of Joule and Thomson, but show a slight increase of the ratio dBjdp at higher pressures, which is otherwise rendered probable by the form of the isothermals as determined by Andrews and Amagat. More recent experiments by J. H. Grindley (Proc. Roy. Soc, 1900, 66, p. 79) and Callendar (Proc Roy. Soc, 1900) on steam confirm this type of equation, but give much larger values of the cooling effect than for CO2, and a more rapid rate of variation with temperature.

11. Modified Joule-Thomson Equation. — G. A. Him (Theorie Mec. de la Ckaleur, ii. p. 211, Paris, 1869) proposed an equation of the form (p--po)(v — b)=R8, in which the effect of the size of the molecules is represented by subtracting a quantity b, the " co- volume," from the volume occupied by the gas, and the effect of the mutual attractions of the molecules is represented by adding a quantity p , the internal pressure, to the external pressure, p. This type of equation, was more fully worked out by van der Waals, who identified the internal pressure, po, with the capillary pressure of Laplace, and assumed that it varied directly as the square of the density, and could be written a/v 2 . This assumption represents qualitatively the theoretical isothermal of James Thomson (see Vaporization) and the phenomena of the critical state (see Con- densation of Gases) ; but the numerical results to which it leads differ so widely from experiment that it is necessary to suppose the

constant, o, to be a function of the temperature. Many com- plicated expressions have been suggested by subsequent writers in the attempt to represent the continuity of the gaseous and liquid states in a single formula, but these are of a highly empirical nature, and beyond the scope of the present inquiry. The simplest assump- tion which suffices to express the small deviations of gases and vapours from the ideal state at moderate pressures is that the coeffi- cient a in the expression for the capillary pressure varies inversely as some power of the absolute temperature. Neglecting small terms of the second order, the equation may then be written in the form

v-b=> R8 ;p - c o (9o/0)” = V - c,

(17)

in which c is a small quantity (expressing the defect from the ideal volume V = R6jp due to co-aggregation of the molecules) which varies inversely as the nth power of 8, but is independent of p to a first approximation at moderate pressures. The constant c<, is the value of c at some standard temperature So. The value of the index, n, appears to be different for different types of mole- cule. For COj at ordinary temperatures w=2, as in the Joule- Thomson equation. For steam between ioo° and 150° C. it approaches the value 3-5. It is probably less than 2 for air and the more perfect gases. The introduction of the covolume, 6, into the equation is required in order to enable it to represent the behaviour of hydrogen and other gases at high temperatures and pressures according to the experiments of Amagat. It is generally taken as constant, but its value at moderate pressures is difficult to determine. According to van der Waals, assuming spherical molecules, it should be four times; according to O. E. Meyer, on slightly different assumptions, it should be 4V2 times, the actual volume of the molecules. It appears to be a quantity of the same order as the volume of the liquid, or as the limiting volume of the gas at very high pressures. The value of the co-aggregation

volume, c, at any temperature, assuming equation (17), may be found by observing the deviations from Boyle's law and by experi* ments on the Joule-Thomson effect. The value of the angular coefficient d(pv)jdp is evidently (b — c), which expresses the defect of the actual volume » from the ideal volume R8jp. Differentiating equation (17) at constant pressure to find dvjde, and observing that dc/d8 = — nc/8, we find by substitution in (15) the following simple expression for the cooling effect dBjdp in terms of c and b,

Sde/dp = (n+i)c-b …. (18)

Experiments at two temperatures suffice to determine both c and n if we assume that b is equal to the volume of the liquid. But it is better to apply the Boyle's law test in addition, provided that errors due to surface condensation can be avoided. The advantage of this type of equation is that c is a function of the temperature only. Other favourite types of equation for approxi- mate work are (1) p = R6/v+f(v), which makes p a linear function of 6 at constant volume, as in van der Waal's equation; (2) v = R8jp --f(p), which makes u a linear function of 6 at constant pressure. These have often been employed as empirical formulae (e.g. Zeuner's formula for steam), but they cannot be made to represent with sufficient approximation the deviations from the ideal state at moderate pressures and generally lead to erroneous results. In the modified Joule-Thomson equation (17), both c and n have simple theoretical interpretations, and it is possible to express the thermodynamical properties of the substance in terms of them by means of reasonably simple formulae.

12. Application of the Modified Equation. — We may take equation (17) as a practical example of the thermodynamical principles already given. The values of the partial differential coefficients in terms of n and c are as follows : —

dv/de (p const) = (R/p)(i+nc/V) (19)

dhsldtP- „ = -n(n+i)c/0 2 (20)

dpjde(v const) = (R/V)(i+nc/V) .... (21)

(Pp/de* „ =Rnc(i-n+2nc/V)/eV 2 . . . (22)

d(pv)jdp(e const) =*b— c (23)

Substituting these values in equations already given, we find,

from (6) S-s = R(i+nc/vy (24)

„ (9) dE/dv (e const) =ncp/V (25)

„ (n)dF/dp „ =(» + i)c-6 (26)

„ (10) ds/dv „ =(i-n+2nclV)Rnc/V 2 . . . (27)

„ (12) dS/dp „ = n(n + i)cj8 (28)

In order to deduce the complete variation of the specific heats from these equations, it is necessary to make some assumption with regard to the variation of the specific heats with temperature. The assumption usually made is that the total kinetic energy of the molecules, including possible energy of rotation or vibration if the molecules consist of more than one atom, is proportional to the energy of translation in the case of an ideal gas. In the case of imperfect gases, all the available experimental evidence shows that the specific volume tends towards its ideal value, V — R8/p, in the limit, when the pressure is indefinitely reduced and the molecules are widely separated so as to eliminate the effects of their mutual actions. We may therefore reasonably assume that the limiting values of the specific heats at zero pressure do not vary with the temperature, provided that the molecule is stable and there is no dissociation. Denoting by So, So, these constant limiting values at p = o, we may obtain the values at any pressure by integrating the expressions (27) and (28) from w ton and from o to p respectively. We thus obtain

S = So+n(n + i)pc/e s = so+(n — i—nc/V)ncple .

(29) (30)

In working to a first approximation, the small term ncjV may be omitted in the expression for s.

The expression for the change of intrinsic energy E between any given limits p_<0t> to p8 is readily found by substituting these values of the specific heats in equations (11) or (13), and integrat- ing between the given limits. We thus obtain

E-E = s~ (8-8)-n(pc-pnCo) . . ■ (31)

We have similarly for the total heat F = E+pv,

F-F = S (e-8)-(n+l)(cp-Cop)+b(p-po).

The energy is less than that of an ideal gas by the term npc. If we imagine that the defect of volume c is due to the formation of molecular aggregates consisting of two or more single molecules, and if the kinetic energy of translation of any one of these aggre- gates is equal to that of one of the single molecules, it is clear that some energy must be lost in co-aggregating, but that the proportion lost will be different for different types of molecules and also for different types of co-aggregation. If two monatomic molecules, having energy of translation only, equivalent to 3 degrees of freedom, combined to form a diatomic molecule with 5 degrees of freedom, the energy lost would be pcJ2 for co-aggregation, c, per unit mass. In this case w = l/2. If two diatomic molecules, having each 5 degrees of freedom, combine to form a molecule with 6 degrees of freedom, we should have w = 2, or the energy lost would be 2pc per unit mass. If the molecules and molecular aggregates were more complicated, and the number of degrees of freedom of the aggregates were limited to 6, or were the same as for single mole- cules, we should have n = so/R. The loss of energy could not be greater than this on the simple kinetic theory, unless there were some evolution of latent heat of co-aggregation, due to the work done by the mutual attractions of the co-aggregating molecules.

It is not necessary to suppose that the co-aggregated molecules are permanently associated. They are continually changing partners, the ratio ejV representing approximately the ratio of the time during which any one molecule is paired to the time during which it is free. At higher densities it is probable that more complex aggregates would be formed, so that as the effect of the collisions became more important c would cease to be a function of the temperature only; experiment, indeed, shows this to be the case.

13. Entropy. — It follows from the definition of the absolute scale of temperature, as given in relations (2), that in passing at constant temperature e from one adiabatic ' (Fig. 1) to any other adia- batic ", the quotient H/0 of the heat absorbed by the temperature at which it is absorbed is the same for the same two adiabatics whatever the temperature of the isothermal path. This quotient is called the change of entropy, and may be denoted by (" —$'). In passing along an adiabatic there is no change of entropy, since no heat is absorbed. The adiabatics are lines of constant entropy, and are also called Isentropics. In virtue of relations (2), the change of entropy of a substance between any two states depends only on the initial and final states, and may be reckoned along any reversible path, not necessarily isothermal, by dividing each small increment of heat, dH, by the temperature, 8, at which it is acquired, and taking the sum or integral of the quotients, dH/8. I so obtained.

The expression for the change of entropy between any two states is found by dividing either of the expressions for dH in (8) by and integrating between the given limits, since dH/8 is a perfect dif- ferential. In the case of a solid or a liquid, the latent heat of isothermal expansion may often be neglected, and if the specific heat,.s, be also taken as constant, we have simply <£--

tf.-tf>o = s logJI/Bo+R logetfA>o

=s\ogja/e -Rios.plP<, . . . (32)

In the case of an imperfect gas or vapour, the above expressions are frequently employed, but a more accurate result may be obtained by employing equation (17) with the value of the specific heat, 5, from (29), which gives the expression

t-tfo^SologJlBo-Rlogcplpo-ntcplB-Copoleo) . . (33)

The state of a substance may be defined by means of the tempera- ture and entropy as co-ordinates, instead of employing the pressure and volume as in the indicator diagram. This method of repre- sentation is applicable to certain kinds of problems, and has been developed by Macfarlane Gray and other writers in its application to the steam engine. (See Steam Engine.) Areas on the tempera- ture-entropy or 8, 4> diagram represent quantities of heat in the same way as areas on the indicator diagram represent quantities of work. The 6, diagram is useful in the study of heat waste and condensation, but from other points of view the utility of the conception of entropy as a ” factor of heat ” is limited by the fact that it does not correspond to any directly measurable physical property, but is merely a mathematical function arising from the form of the definition of absolute temperature. Changes of entropy must be calculated in terms of quantities of heat, and must be interpreted in a similar manner. The majority of thermodynamical problems may be treated without any reference to entropy, but it affords a convenient method of expression in abstract thermo- dynamics, especially in the consideration of irreversible processes and in reference to the conditions of equilibrium of heterogeneous systems.

14. Irreversible Processes. — In order that a process may be strictly reversible, it is necessary that the state of the working substance should be one of equilibrium at uniform pressure and temperature throughout. If heat passes ” of itself ”

from a higher to a lower temperature by conduction, convection or radiation, the transfer cannot be reversed without an expenditure of work. If mechanical work or kinetic energy is directly converted into heat by friction, reversal of the motion does not restore the energy so converted. In all such cases there is necessarily, by Carnot's principle, a loss of efficiency or available energy, accompanied by an increase of entropy, which serves as a convenient measure or criterion of the loss. A common illustration of an irreversible process is the expansion of a gas into a vacuum or against a pres- sure less than its own. In this case the work of expansion, pdv, is expended in the first instance in producing kinetic energy of motion of parts of the gas. If this could be co-ordinated and utilized without dissipation, the gas might conceivably be restored to its initial state; but in practice violent local differences of pressure and temperature are produced, the kinetic energy is rapidly con- verted into heat by viscous eddy friction, and residual differences of temperature are equalized by diffusion throughout the mass. Even if the expansion is adiabatic, in the sense that it takes place inside a non-conducting enclosure and no heat is supplied from external sources, it will not be isentropic, since the heat supplied by internal friction must be included in reckoning the change of entropy. Assuming that no heat is supplied from external sources and no external work is done, the intrinsic energy remains constant by the first law. The final state of the substance, when equilibrium has been restored, may be deduced from this condition, if the energy can be expressed in terms of the co-ordinates. But the line of constant energy on the diagram does not represent the path of the transformation, unless it be supposed to be effected in a series of infinitesimal steps between each of which the substance is restored to an equilibrium state. An irreversible process which permits a more complete experimental investigation is the steady flow of a fluid in a tube already referred to in section 10. If the tube is a perfect non-conductor, and if there are no eddies or frictional

dissipation,, the state of the substance at any point of the tube as to E, p, and v, is represented by the adiabatic or isen- tropic path, dE = — pdv. As the section of the tube varies, the change of kinetic energy of flow, dU, is represented by —vdp. The flow in this case is reversible, and the state of the fluid is the same at points where the section of the tube is the same. In practice, however, there is always some frictional dissipation, accompanied by an increase of entropy and by a fall of pressure. In the limiting case of a long fine tube, the bore of which varies in such a manner that V is constant, the state of the substance along a line of flow may be represented by the line of constant

total heat; d(E+pv) =0; but in the case of a porous plug or small throttling aperture, the steps of the process cannot be followed, though the final state is the same.

In any small reversible change in which the substance absorbs heat, dH,. from external sources, the increase of entropy, Aj>, must be equal to dH/6. If the change is not reversible, but the final state is the same, the change of entropy, d<£, is the same, but it is no longer equal to dH/8. By Carnot's principle, in all irreversible processes, dH/8 must be algebraically less than d, otherwise it would be possible to devise a cycle more efficient than a reversible cycle. This affords a useful criterion (see Energetics) between transformations which are impossible and those which are possible but irreversible. In the special case of a substance isolated from external heat supply, dH = o, the change of entropy is zero in a reversible process, but must be positive if the process is not rever- sible. The entropy cannot diminish. Any change involving de- crease of entropy is impossible. The entropy tends to a maximum, and the state is one of stable equilibrium when the value of the entropy is the maximum value consistent with the conditions of the problem.

15. Heterogeneous Equilibrium. — Tn a system, as distinguished from a homogeneous substance,

consisting of two or more states or phases, a similar condition of equilibrium applies. In any spontaneous irreversible change, if the system is heat-isolated, there must be an increase of entropy. The total entropy of the system is found by multiplying the entropy per unit mass of the substance in each state by the mass existing in that state, and adding the products so obtained. The simplest case to consider is that of equilibrium between solid and liquid, or liquid and vapour. The more general case is discussed in the article Energetics, and in the original memoirs of Willard Gibbs and others. Since the condition of heat-isolation is impracticable, the condition of maxi- mum entropy cannot, as a rule, be directly applied, and it is neces- sary to find a more convenient method of expression. If dW is the external work done, dH the heat absorbed from external sources, and dE the increase of intrinsic energy, we have in all cases by the first law, dH-dE = dW. Since 6d cannot be less than dH, the difference {8d is not a perfect differential, and cannot be evaluated without a knowledge of the path or process of trans- formation. In the special case, however, in which the transforma- tion is conducted in an isothermal enclosure, a common condition easily realized in practice, the temperature at the end of the trans- formation is reduced to its initial value throughout the substance. The value of 8d is then the same as d(8), which is a perfect differential, so that the condition may be written d(8-E)=dW. The condition in this form can be readily applied provided that the external work dW can be measured. There are two special cases of importance: — (a) If the volume is constant, or dW=o, the value of the function (8cj>-E) cannot diminish, or (E-8) cannot increase, if the temperature is kept constant. This function may be represented, for each state or phase of the system con- sidered, by an area on the indicator diagram similar to that repre- senting the intrinsic energy, E. The product 8 may be represented at any point such as D in Fig. I by the whole area 0”DZ’VO under the isothermal 0”D and the adiabatic DZ’, bounded by the axes of pressure and volume. The intrinsic

energy, E, is similarly repre- sented by the area DZ'Vrf under the adiabatic to the right of the isometric Dd. The difference 8-E is represented by the area 0"DdO to the left of the isometric Dd under the isothermal 0"D. The increment of this area (or the decrement of the negative area E-8<)>) at constant temperature represents the external work obtainable from the substance in isothermal expansion, in the same way that the decrement of the intrinsic energy represents the work done in adiabatic expansion. The function J = E-6, has been called the " free energy " of the substance by Helmholtz, and 8 the " bound energy." These functions do not, however, represent energy existing in the substance, like the intrinsic energy ; but the increment of 8 represents heat supplied to, and the decre- ment of {E-8) represents work obtainable from, the substance when the temperature is kept constant. The condition of stable equilibrium of a system at constant temperature and volume is that the total / should be a minimum. This function is also called the " thermodynamic potential at constant volume " from the analogy with the condition of minimum potential energy as the criterion of stable equilibrium in statics.

As an example, we may apply this condition to the case of change of state. If J', J" represent the values of the function for unit mass of the substance of specific volumes v' and v" in the two states at temperature 8 and pressure p, and if a mass m is in the state v', and I— m in the state v", the value of J for unit mass of the mixture is mJ' + (i—m)J". This must be a minimum in the state of equilibrium at constant temperature. Since the volume is constant, we have the condition mv' + {i— tn)v" = con- stant. Since dJ = -(j>dd-pdv, we have also the relations dJ'/dv'=—p = dJ"/dv", at constant temperature. Putting dJ/dm = o at constant volume, we obtain as the condition of equilibrium of the two states J'+p'v' -J"+p"v". This may be interpreted ai

the equation of the border curve giving the relation between p and 0, but is more easily obtained by considering the equilibrium at constant pressure instead of constant volume.

*(b) The second case, which is of greater practical utility, is that in which the external pressure, p, is kept constant. In this case dW = pdv = d(pv) , a perfect differential, so that the external work done is known from the initial and final states. In any possible transformation d{0—E) cannot be less than d(pv), or the function (E—0tj>--pv)=G cannot increase. The condition of stable equili- brium is that G should be a minimum, for which reason it has been called the ” thermodynamic potential at constant pressure.” The product pv for any state such as D in fig. I is represented by the rectangle MDdO, bounded by the isopiestic and the isometric through D. The function G is represented by the negative area 0”DM under the isothermal, bounded by the isopiestic DM and the axis of pressure. The increment of 0<#> is always greater than that of the total heat F = E+pv, except in the special case of an equilibrium change at constant temperature and pressure, in which case both are equal to the heat absorbed in the change, and the function G remains constant. This is geometrically obvious from the form of the area representing the function on the indicator diagram, and also follows directly from the first law. The simplest application of the thermodynamic potential is to questions of change of state. If ‘, E’, v’ ; and 4>”, E”, v”, refer to unit mass of the substance in the first and second states respectively in equilibrium at a temperature 9 and pressure p, the heat absorbed, L, per unit mass in a change from the first to the second state is, by definition of the entropy, equal to 0{“—‘), and this by the first law is equal to the change of intrinsic energy, E”—E’, plus the external work done, p{v’ — »’), *’.«. to the change of total heat, F” — F. If G’ and G” are the values of the function G for the two states in equilibrium at the same pressure and temperature, we must have G’=G”. Assuming the function G to be expressed in terms of p and 0, this*

condition represents the relation between p and corresponding to equilibrium between the two states, which is the solution of the relation (v”—v’)dp/d9 = L/9, (5). The direct integration of this equation requires that L and v’—v’ should be known as functions of p and 0, and cannot generally be performed. As an example of one of the few cases where a complete solution is possible, we may take the comparatively simple case equation (17), already considered, which is approximately true for the majority of vapours at moderate pressures.

Writing formulae (31) and (33) for the energy and entropy with indeterminate constants A and B, instead of taking them between limits, we obtain the following expressions for the thermodynamic functions in the case of the vapour: —

‘=S o \ogJ-R\og.p—ncpl0+A’ .... (34)

E”=s#-ncp+B’ (35)

F”=S<0-(n+i)cp+bp+B" (36)

G” = S<0(i-logj»)+R0log.p-(c-b)r-A'0+B' . (37) J" =s<0-S t 0\og < 0+R0lo Sc p-A"0+B" . . . (38)

The function J” may be expressed in terms of 9 and v by writing for p its value, namely, R0/(v+c — b). We have also in any case the relations

dG”/dS {p const) =

And all the properties of the substance may be expressed in terms of G or J and their partial differential coefficients. The values of the corresponding functions for the liquid or solid cannot be accurately expressed, as the theoretical variation of the specific heat is unknown, but if we take the specific heat at constant pres- sure 5' to be approximately constant, and observe the small residual variation dh of the total heat, we may write

F’ = s‘0+dh+B’ (41)

' =s'\og,0+d4>+A' (42)

G' = s'e{i-\og„0)+(dh-9d)-A'9+B' . . (43)

where d(j> is the corresponding residual variation of ', and is easily calculated from a table of values of h.

To find the border curve of equilibrium between the two states, giving' the saturation pressure as a function of the temperature, we have merely to equate the values of G' and G". Rearranging the terms, and dividing throughout by 0, we obtain an equation of the form

R \og e p=A-Bi0-(s'-S <>)\og < + (.c-b)p!0 + (dhl0-d) . (44)

in which B=B"-B', and A =A"-A'+s'-S . The value of A is determined by observing the value of 0o at some known pressure pa, e.g. at the boiling-point. The value of B is determined by observing the latent heat, Lo = F"o— F' 0, which gives

B=B°-B' = L<,+ (s'-So)0o+(n + l)c o p o -bpo+dho . (45)

This constant may be called the absolute latent heat, as it expresses the thermal value of the change of state in a manner independent of temperature.

The term (dh/9 — d) depending on the variation of the specific heat of the liquid may be made very small in the case of water by a proper choice of the constant s'. It is of the same order as the

probable errors of observation, and may be neglected in practice. (See Vaporization, § 16.) The expression for R logp for an im- perfect gas of this type differs from that for a perfect gas only by the addition of the term (c — b)p/9. This simple result is generally true, and the corresponding expressions for G" and J" are valid, provided that c — b in formula (17) is a function of the temperature only. It is not necessary to suppose that c varies

inversely as the nth power of the temperature, and that b is constant, as assumed in deducing the expressions for , E, and F.

Although the value of G in any case cannot be found without that of 4>, and although the consideration of the properties of the thermodynamic potential cannot in any case lead to results which are not directly deducible from the two fundamental laws, it affords a convenient method of formal expression in abstract thermo- dynamics for the condition of equilibrium between different phases, or the criterion of the possibility of a transformation. For such purely abstract purposes, the possibility of numerical evaluation of the function is of secondary importance, and it is often possible to make qualitative deductions with regard to the general nature of a transformation without any knowledge of the actual form of the function. A more common method of procedure, however, is to infer the general relations of the thermodynamic potential from a consideration of the phenomena of equilibrium.

As it would be impossible within the limits of this article to illustrate or explain adequately the applications which have been made of the principles of thermodynamics, it has been necessary to select such illustrations only as are required for other reasons, or could not be found elsewhere. For fuller details and explana- tions of the elements of the subject, the reader must be referred to general treatises such as Baynes's Thermodynamics (Oxford), Tait's Thermodynamics (Edinburgh), Maxwell's Theory of Heat (London), Parker's Thermodynamics (Cambridge), Clausius's Mechanical Theory of Heat (translated by Browne, London), and Preston's Theory of Heat (London). One or two chapters on the subject are also generally included in treatises on the steam engine, or other heat engines, such as those of Rankine, Perry or Ewing. Of greater interest, particularly from a historical point of view, are the original papers of Joule, Thomson and Rankine, some of which have been reprinted in a collected form. A more complete and more elaborate treatment

of the subject will be found in foreign treatises, such as those of Clausius, Zeuner, Duhem, Bertrand, Planck and others.

Alphabetical Index of Symbols Employed.

6, Thermodynamic or absolute temperature. , Entropy. Section 13.

b, Covolume of molecules of gas. Equation (17).

c, Co, Co-aggregation volume per unit mass. Equation (17). e, Base of Napierian logarithms.

E, Intrinsic energy per unit mass. Section 2.

F =E+pv, Total heat. Section 7.

G, J, Thermodynamic potential functions. Section 15.

H, Quantity of heat (in mechanical units). Section 2.

K, k, Adiabatic and isothermal elasticities. Equation (7).

L, Latent heat of fusion or vaporization. Equation (5).

M, Molecular weight. Section 8.

m, Mass of substance or molecule.

n, Index in expression for c. Equation (17).

p, Pressure of fluid. £0, Initial pressure.

R = So— So, Constant in gas-equation (17).

S, Specific heat of gas at constant pressure. *

So, Limiting value of 5 when p = o. Section 12.

s, Specific heat of gas at constant volume.

so, Limiting value of i when p = o. Section 12.

s′, s″, Specific heat under other conditions.

Equation (5).

U, Kinetic energy of flow of fluid. Section 10.

«, Mean velocity of gaseous molecules. Section 8.

V = R0/p, Ideal volume of gas per unit mass. Equation (17).

v, Specific volume of fluid, reciprocal of density.

W, External work done by fluid. (H. L. C.)

THERMOELECTRICITY. 1. Fundamental Phenomena.—Alessandro Volta (1801) showed that although a separation of the two electricities was produced by the contact of two different metals {Volta Effect), which could be detected by a sensitive electrometer, a continuous current of corresponding magnitude could not be produced in a purely metallic circuit without the interposition of a liquid, because the electromotive force at one junction was exactly balanced by an equal and opposite force at the other. T. J. Seebeck (1822), employing a galvanometer then recently invented, which was more suited for the detection of small electromotive forces, found that a current was produced if the junctions of the two metals were at different temperatures. He explained this effect by supposing that the Volta contact electromotive force varied with the temperature, so that the exact balance was destroyed by unequal heating. The intensity

of the current, C, for any given pair of metals, was found to vary- directly as the difference of temperature, t—t', between the hot and cold junctions, and inversely as the resistance, R, of the circuit. We conclude by applying Ohm's law that the electro- motive force, E, of the thermocouple may be approximately represented for small differences of temperature by the formula E = CR=p(t-t') (1)

2. Thermoelectric Power, Series, Inversion. — The limiting value, dEjdt, of the coefficient, p, for an infinitesimal difference, dt, between the junctions is called the Thermoelectric Power of the couple. One metal (A) is said to be thermoelectrically positive to another (B), if positive electricity flows from A to B across the cold junction when the circuit is completed. The opposite convention is sometimes adopted, but the above is the most convenient in practice, as the circuit is generally broken at or near the cold junction for the insertion of the galvanometer. Seebeck found that the metals could be arranged in a Thermoelectric Series, in the order of their power when com- bined with any one metal, such that the power of any thermo- couple p, composed of the metals A and B, was equal to the algebraic difference (p′—p″) of their powers when combined with the standard metal C. The order of the metals in this series was found to be different from that in the corresponding Volta series, and to be considerably affected by variations in purity, hardness and other physical conditions. J. Cumming shortly afterwards discovered the phenomenon of Thermo- electric Inversion, or the change of the order of the metals in the thermoelectric series at different temperatures. Copper, for instance, is negative to iron at ordinary temperatures, but is positive to it at 300 C. or above. The E.M.F. of a copper- iron thermocouple reaches a maximum when the temperature of the hot junction is raised to 270 C, at which temperature the thermoelectric power vanishes and the metals are said to be neutral to one another. Beyond this point the E.M.F. diminishes, vanishing and changing sign when the temperature of the hot junction is nearly as much above the neutral point as the temperature of the cold junction is below it. Similar phenomena occur in the case of many other couples, and it is found that the thermoelectric power p is not in general a con- stant, and that the simple linear formula (1) is applicable only for small differences of temperature. More accurately it may be stated that the thermoelectromotive force in any given circuit containing a series of different

metals is a function of the temperatures of the junctions only, and is independent of the distribution of the temperature at any intermediate points, pro- vided that each of the metals in the series is of uniform quality. This statement admits of the simple mathematical expression

,/dt+j „p”dt+&c.

(2)

where p’ , p, &c, are the thermoelectric powers of the metals, and t , t’, t”, &c, the temperatures of the junctions. There are some special cases of sufficient practical importance to be separately stated.

3. Homogeneous Circuit. Strain Hysteresis. — In a circuit consisting of a single metal, no current can be produced by varia- tions of temperature, provided that the metal is not thereby strained or altered. This was particularly demonstrated by the experiments of H. G. Magnus. The effects produced by abrupt changes of temperature or section, or by pressing together pieces of the same metal at different temperatures, are probably to be explained as effects of strain. A number of interesting effects of this nature have been investigated by Thomson, F. P. Le Roux, P. G. Tait and others, but the theory has not as yet been fully developed. An interesting example is furnished by an experiment due to F. T. Trouton (Proc. R. S. Dub., 1886). A piece of iron or steel wire in the circuit of a galvanometer is heated in a flame to bright redness at any point. No effect is noticed so long as the flame is stationary, but if the flame be moved slowly in one direction a current is observed, which changes its direction with the direction of motion of the flame. The explanation of this phenomenon is that the metal is trans-

formed at a red heat into another modification, as is proved by simultaneous changes in its magnetic and electrical properties. The change from one state to the other takes place at a higher temperature on

heating than on cooling. The junctions of the magnetic and the non-magnetic steel are therefore at different temperatures if the flame is moved, and a current is produced just as if a piece of different metal with junctions at different temperatures had been introduced into the circuit. Other effects of " hysteresis " occur in alloys of iron, which have been studied by W. F. Barrett (Trans. R. S. Dub., January 1900).

4. Law of Successive Temperatures. — The E.M.F. of a given couple between any temperatures /' and t" is the algebraic sum of the E.M.F. between /' and any other temperature t and the E.M.F. between /' and t". A useful result of this law is that it is sufficient to keep one junction always at some convenient standard temperature, such as o° C, and to tabulate only the values of the E.M.F. in the circuit corresponding to different temperatures of the other junction.

5. Law of Intermediate Metals. — A thermoelectric circuit may be cut at any point and a wire of some other metal introduced without altering the E.M.F. in the circuit, provided that the two junctions with the metal introduced are kept at the same temperature. This law is commonly applied in connecting a thermocouple to a galvanometer with coils of copper wire, the junctions of the copper wires with the other metals being placed side by side in a vessel of water or otherwise kept at the same temperature. Another way of stating this law, which, .though apparently quite different, is really equivalent in effect, is the following. The E.M.F. of any couple, AB, for any given limits of temperature is the algebraic sum of the E.M.F.s between the same limits of temperature of the couples BC and CA formed with any other metal C. It is for this reason unnecessary to tabulate the E.M.F.s of all possible combinations of metals, since the E.M.F. of any couple can be at once deduced by addition from the values given by its components with a single standard metal. Different observers have chosen different metals as the standard of reference. Tait and J. A. Fleming select

lead on account of the smallness of the Thomson effect in it, as ob- served by Le Roux. Noll adopts mercury because it is easily purified, and its physical condition in the liquid state is deter- minate; there is, however, a discontinuity involved in passing from the liquid to the solid state at a temperature of -40 C, and it cannot be used at all with some metals, such as lead, on account of the rapidity with which it dissolves them. Both lead and mercury have the disadvantage that they cannot be employed for temperatures much above 300° C. Of all metals, copper is the most generally convenient, as it is always employed in electrical connexions and is easily obtained in the annealed state of uniform purity. For high temperature work it is necessary to employ platinum, which would be an ideal standard for all purposes on account of its constancy and infusibility, did not the thermoelectric properties of different specimens differ considerably.

6. Thermoelectric Formulae. — On the basis of the principles stated above, the most obvious method of tabulating the observa- tions would be to give the values Et of the E.M.F. between o° C. and / for each metal against the standard. This involves no assump- tions as to the law of variation of E.M.F. with temperature, but is somewhat cumbrous. In the majority of cases it is found that the observations can be represented within the limits of experi- mental error by a fairly simple empirical formula, at least for moderate ranges of temperatures. The following formulae are some of those employed for this purpose by different observers : —

E t = bt+cP …. E, = at--bC+cfi . log E=a--bjT--c log T E(t-t)=c{t-t’) (2t°-(t+t’)) E,+E t ° = io« +i ” + io”’ +6 ‘ , ° . t = aE+bE*+cE s E(i-f)=b(t-t’) il3 . . . E(t-t’) = a (t-f) + b (t-ty . E(t ■ t °) = m T n -m T° n , E t = nit” E, = bt+chg r/273, (c = Ts.) E,=-a+bt+ct 2 . E t =at+cP+s°(Tlog e r-273 log (Where s = s”+2cT, and c ‘

.273)-

mall.

(Avenarius, 1863.) (General type.) (Becquerel, 1863) (Tait, 1870.) (Barus, 1889.) (HolbornandWien, 1892.) (Paschen, 1893.) (Steele, 1894.) (Holman, 1896.) (Stanfield, 1898.) (Holborn and Day 1899.)

See sec. 15.)

For moderate ranges of temperature the binomial formula of M. P. Avenarius is generally sufficient, and has been employed by many observers. It is figured by Avenarius (Pogg. Ann., 119, p. 406) as a semi-circle, but it is really a parabola with its axis parallel to the axis of E, and its vertex at the point t= —b/2c, which gives the neutral temperature. We have also the relations dE/dt — b--2ct and d-E/dt 1 = 2c. The first relation gives the thermoelectric power p at any temperature, and is probably the most convenient method of stating results in all cases in which this formula is applicable. A discussion of some of the exponential formulae is given by S. W. Holman {Phil. Mag., 41, p. 465, June 1896).

7. Experimental Results. — In the following comparative table of the results of different observers the values are referred to lead. Before the time of Tait's researches such data were of little interest or value, on account of insufficient care in securing the purity of the materials tested; but increased facilities in this respect, com- bined with great improvements in electrical measurements, have put the question on a different footing. The comparison of inde- pendent results shows in many cases a remarkable concordance, and the data are becoming of great value for the testing of various theories of the relations between heat and electricity.

wires. Noll employed mercury thermometers, but as he worked over a small range with vapour baths, it is probable that he did not experience any trouble from

immersion corrections. He does not record any systematic deviations from the formula. Dewar and Fleming, working at very low temperatures, were compelled to use the platinum thermometer, and expressed their results in terms of the platinum scale. Their observations were probably free from immersion errors, but they record some deviations from the formula which they consider to be beyond the possible limits of error of their work. The writer has reduced their results to the scale of the gas thermometer, assuming the boiling-point of oxygen to be -182-5° C.

9. Peltier Effect.— The discovery by J. C. A. Peltier (1834) that heat is absorbed at the junction of two metals by passing a current through it in the same direction as the current produced by heating it, was recognized by Joule as affording a clue to the source of the energy of the current by the application of the principles of thermodynamics. Unlike the frictional generation of heat due to the resistance of the conductor, which Joule (1841)

Table I.— Thermoelectric power, p = dE/dt, in microvolts at 50° C. of pure metals with respect to lead. (The mean change, 2c=d 2 E/df-, of the thermoelectric power per degree C. over the range covered by the experiments, is added in each case.)

Metal.

Tait (0°

to 300).

Steele (o°

to IOO°).

Noll (0°

tO 200°).

Dewar and Fleming (+ ioo° to — 200°).

P-

2C.

P-

2C.

P-

2C.

P-

2C.

Aluminium

-0-56

+ •0039

— 0‘42

+ •002 1

— 0-41

+ -OOI74

-0-394

+ •00398

Antimony

+42-83

+ •1450*

+3-210

+ •02817

Bismuth ….

— 76-870

- -08480

Cadmium ….

+475

+ ■0429

+479

+ •0389

+4-71

+ •0339

+4-792

+ •02365

Carbon ….

+ 12795

+ -0325I

Copper ….

+ i-8i*

+ -O095

+3-37

+ ■0122

+3-22

+ •0080

+3-I56

+ •00683

Cobalt ….

-I9-252

-•0734

Gold

+3-3°

+ •0102

+3-19

+ •0131

+3-io

+ •0063

+ I-I6I

+ •00315

Iron

+ 14-74

-•O487

+ 11-835

— -0306

+ 14-522

-•OI33O

Steel (piano)

+9-75

-•0328

+9-600

— •01092

Steel (Mn 12%)

-5-73

-•00445

Magnesium . .

+ i'-75*

-•OO95

-0-113

+ -OOI9

—0-126

+•00353

Mercury . ...

-4-03

-•OO86

Nickel ….

-24-23*

-•0512

-20-58

— -0302

-18-87

-•05639

Palladium

-8-04

-•0359

—9-100

-•04714

Platinum ….

-1-15*

— •OIIO

-4-09

— •021 1

-4-347

— -03708

Silver. ....

+2-86

+•0150

+3-07

+ -OII5

+2-68

+ •0076

+3-317

+•00714

Thallium ….

+ 1-76

-•O077

Tin

— 0-16

+•0055

—0-091

+ •0004

—0-067

+ -OOI9

+0-057

+ •00021

Zinc

+3-51

+ •0240

+ I-77*

+ -OI95

+3-3I8

+ •0172

+3-233

+ •01040

Explanation of Table. — The figures marked with an asterisk (*) represent discrepancies which are probably caused by impurities in the specimens. At the time of Tait's work in 1873 it was difficult, if not impossible, in many cases to secure pure materials. The work of the other three observers dates from 1894-95. The value of the thermoelectric power dE/dt at 50° C. is taken as the mean value between 0° and 100 ° C, over which range it can be most accurately determined. The values of d 2 E/df agree as well as can be expected, considering the difference of the ranges of temperature and the great variety in the methods of observation adopted; they are c?.:culated assuming the parabolic formula, which is certainly in many cases inadequate. Noll's values apply to the temperature of +ioo° C, Dewar and Fleming's to that of — 100° C, approxi- mately.

In using the above table to find the value of E or dE/dt at any temperature or between any limits, denoting by p the value of dE/dt at 50° C, and by 2c the constant value of the second coeffi- cient, we have the following equations : —

dE/dt = p--2c{t— 50), at any temperature t, Cent. . . (3) £(,-.') = (t-t')(p+c(l+t'-ioo)) (4)

for the E.M.F. between any temperature / and I'.

8. Methods of Observation. — In Tait's observations the E.M.F. was measured by the deflection of a mirror galvanometer, and the temperature by means of a mercury thermometer or an auxiliary thermocouple. He states that the deviations from the formula were " quite within the limics of error introduced by the altera- tion of the resistance of the circuit with rise of temperature, the deviations of the mercury thermometers from the absolute scale, and the non-correction of the indications of the thermometer for the long column of mercury not immersed in the hot oil round the junctions." The latter correction may amount to about io° C. at 350°. Later observers have generally employed a balance method (some modification of the potentiometer or Poggendorf balance) (or measuring the E.M.F. The range of Steele's observations was too small to show any certain deviation from the formula, but he notes capricious changes attributed to change of condition of the

proved to be proportional to the square of the current, the Peltier effect is reversible with the current, and being directly propor- tional to the first power of the current, changes sign when the current is reversed. The effect is most easily shown by con- necting a voltaic cell to a thermopile for a short interval, then quickly (by means of a suitable key, such as a Pohl commutator with the cross connectors removed) disconnecting the pile from the cell and connecting it to a galvanometer, which will indicate a current in the reverse direction through the pile, and approxi- mately proportional to the original current in intensity, provided that the other conditions of the experiment are constant. It was by an experiment of this kind that Quintus Icilius (1853) verified the proportionality of the heat absorbed or generated to the first power of the current. It had been observed by Peltier and A. E. Becquerel that the intensity of the effect depended

on the thermoelectric power of the junction and was independent of its form or dimensions. The order of the metals in respect of the Peltier effect was found to be the same as the thermoelectric series. But on account of the difficulty of the measurements involved, the verification of the accurate relation between the Peltier effect and thermoelectric power was left to more recent times. If C is the intensity of the current through a simple thermocouple, the junctions of which are at tempera- tures t and /′, a quantity of heat, PXC, is absorbed by the passage of the current per second at the hot junction, /, and a quantity, i″ X C, is evolved at the cold junction, t′. The co- efficients, P and P′, are called coefficients of the Peltier effect, and may be stated in calories or joules per ampere-second. The Peltier coefficient may also be expressed in volts or micro- volts, and may be regarded as the measure of an E.M.F. located

at the junction, and transforming heat into electrical energy or vice versa. If R is the whole resistance of the circuit, and E the E.M.F. of the couple, and if the flow of the current does not produce any other thermal effects in the circuit besides the Joule and Peltier effects, we should find by applying the principle of the conservation of energy, i.e. by equating the balance of the heat absorbed by the Peltier effects to the heat generated in the circuit by the Joule effect,

(P-P r)C=OR=EC, whence£ = P-P′ . . (5) If we might also regard the couple as a reversible thermo- dynamic engine for converting heat into work, and might neglect irreversible effects, such as conduction, which are independent of the current, we should expect to find the ratio of the heat absorbed at the hot junction to the heat evolved at the cold junction, namely, PjP′ , to be the same as the ratio 77 V of the absolute temperatures of the junctions. This would lead to the conclusion given by R. J. E.

Clausius (1853) that the Peltier effect varied directly as the absolute temperature, and that the E.M.F. of the couple should be directly proportional to the difference of temperature between the junctions.

10. Thomson Effect. — Thomson (Lord Kelvin) had already pointed out (Proc. R.S. Edin., 1851) that this conclusion was in- consistent with the known facts of thermoelectric inversion.

(1) The E.M.F. was not a linear function of the temperature difference.

(2) If the Peltier effect was proportional to the thermoelectric power and changed sign with it, as all experiments appeared to indicate, there would be no absorption of heat in the circuit due to the Peltier effect, and there- fore no thermal source to account for the energy of the current, in the case in which the hot junction was at or above the neutral temperature. He therefore predicted that

Fig. 1 .—Diagram of Apparatus for Demonstrating the Thomson Effect.

there must be a reversible absorption of heat in some

other part of the circuit due to the flow of the current through the unequally heated conductors. He succeeded a few years afterwards in verifying this remarkable prediction by the experimental demonstration that a current of positive electricity flowing from hot to cold in iron produced an absorption of heat, as though it possessed negative specific heat in the metal iron. He also succeeded in showing that a current from hot to cold evolved heat in copper, but the effect was smaller and more difficult to observe than in iron.

The Thomson effect may be readily demonstrated as a lecture experiment by the following method (fig. 1). A piece of wire (No. 28) about 4 cm. long is soldered at either end A, B to thick wires (No. 12), and is heated ioo” to 150 C. by a steady current from a storage cell adjusted by a suitable rheostat.

The experi- mental wire AB is connected in parallel with about 2 metres of thicker wire (No. 22), which is not appreciably heated. A low- resistance galvanometer is connected by a very fine wire (2 to 3 mils) to the centre C of the experimental wire AB, and also to the middle point D of the parallel wire so as to form a Wheatstone bridge. The balance is adjusted by shunting either AD or BD with a box, S, containing 20 to 100 ohms. All the wires in the quadrilateral must be'of the same metal as AB, to avoid accidental thermoelectric effects which would obscure the result. If the current flows from A to B there will be heat absorbed in AC and evolved in CB by the Thomson effect, if the specific heat of elec- tricity in AB is positive as in copper. When the current is reversed, the temperature of AC will be raised and that of CB lowered by the reversal of the effect. This will disturb the resist- ance balance by an amount which can be measured by the deflection of the galvanometer, or by the change of the shunt- box, S, required to restore the balance. Owing to the ;>mall size of the experimental

wire, the method is very quick and sensitive, and the apparatus can be set up in a few fninutes when once the experimental quadri- laterals have been made. It works very well with platinum, iron and copper. It was applied with elaborate modifications by the writer in 1886 to determine the value of the Thomson effect in platinum in absolute measure, and has recently been applied with further improvements by R. O. King to measure the effect in copper.

11. Thomson's Theory. — Taking account of the Thomson effect, the thermodynamical theory of the couple was satis- factorily completed by Thomson (Trans. R. S. Edin., 1854). If the quantity of heat absorbed and converted into electrical energy, when unit quantity of electricity (one ampere-second) flows from cold to hot through a difference of temperature, dt, be represented by sdt, the coefficient s is called the specific heat of electricity in the metal, or simply the coefficient of the Thomson effect. Like the Peltier coefficient, it may be measured in joules or calories per ampere-

second per degree, or more conveniently and simply in microvolts per degree.

Consider an elementary couple of two metals A and B for which s has the values s′ and s″ respectively, with junctions at the tempera- ture. T and ‘ T+dT (absolute), at which the coefficients of the Peltier effect are P and P+dP. Equating the quantity of heat absorbed to the quantity of electrical energy generated, we have by the first law of thermodynamics the relation

dEjdT = dP/dT+(s′-s″) . . . (6) If we apply the second law, regarding the couple as a reversible engine, and considering only the reversible effects, we obtain

(s′-s″)/T=-d(P!T)/dT . . . (7) Eliminating (s′ — s″) we find for the Peltier effect

(8)

P = TdE[dT=Tp . Whence we obtain for the difference of the specific heats

(s′-s″) = -Td?EldT i =-TdpldT ‘. . (9)

From these relations we observe that the Peltier effect P, and the difference of the Thomson effects (s′ — s″), for any two metals are easily deduced from the tabulated values of dE/dt and

12. Experimental Verification of Thomson’s Theory. — In order to justify the assumption involved in the application of the second law of thermodynamics to the theory of the thermocouple in the manner above specified, it would be necessary and sufficient, as Thomson pointed out (Phil. Mag., December 1852), to make experi- ments to verify quantitatively the relation P/T = dE/dT between the Peltier effect and the thermoelectric power. A [qualitative relation was known at that time to exist, but no absolute measure- ments of sufficient accuracy had been made. The most accurate measurements of the heat absorption due to the Peltier effect at present available are probably those of H. M. Jahn (Wied.

Ann., 34. P- 755. 1888). He enclosed various metallic junctions in a Bunsen ice calorimeter, and observed the evolution of heat per hour with a current of about I -6 amperes in either direction. The Peltier effect was only a small fraction of the total effect, but could be separated from the Joule effect owing to the reversal of the current. The values of dE/dT for the same specimens of metal at 0° C. were determined by experiments between +20° C. and — 20° C. The results of his observations are contained in the following table, heat absorbed being reckoned positive as in Table I.:—

Table II.

Thermo- couple.

dE/dT

P = TdE/dT

Heat calc.

Heat observed

Microvolts

Microvolts

Calories

Calories

per deg.

at o” C.

per hour.

per hour.

Cu-Ag

+2-12

+ 579

+0-495

+0-413

Cu-Fe

+ 11-28

+3079

+2-640

+3-I63

Cu-Pt

— I-40

-382

-0-327

— 0-320

Cu-Zn

+ i-5i

+412

+0-353

+0-585

Cu-Cd

+2-64

+721

+0-617

+0-6I6

Cu-Ni

—2003

-5468

-4680

-4-362

The agreement between the observed and calculated values in the last two columns is as good as can be expected considering the great difficulty of measuring such small quantities of heat. The analogous reversible heat effects which occur at the junction of a metal and an electrolyte were also investigated by Jahn, but he did not succeed in obtaining so complete an agreement with theory in this case.

13. Tail's Hypothesis. — From general considerations concern- ing minimum dissipation of energy (Proc. R. S. Edin., 1867-68), Tait was led to the conclusion that " the thermal and electric conductivities of metals varied inversely as the absolute tem- perature, and that the specific heat of electricity was directly proportional to the same." Subsequent experiments led him to doubt this conclusion as regards conductivity, but his thermo- electric experiments (Proc. R. S. Edin., December 1870) appeared to be in good agreement with it. If we adopt this hypothesis, and substitute s=2cT, where c is a constant, in the fundamental equation (9), we

obtain at once cPEjdT 2 = — 2 (c'—c"), which is immediately integrable, and gives

dE/dt = p = 2(t -t) (c'c") .... (10) £,_,' = (<*') ic'-c") 1 2/„ -(t+t')\ • '• • ("')

where /„ is the temperature of the neutral point at which dE/dt—o. This is the equation to a parabola, and is equivalent to the empirical formula of Avenarius, with this difference, that in Tait's formula the constants have all a simple and direct interpretation in relation to the theory. Tait's theory and formula were subsequently assimilated by Avenarius (Pogg. Ann., 149, p. 372, 1873), and are now generally attributed to Avenarius in foreign periodicals.

In accordance with this hypothesis, the curves representing the variations of thermoelectric power, dEjdt, with temperature

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Fig. 2. — Temperature by Thermocouple. Difference from Tait’s Formula.

are straight lines, the slope of which for any couple is equal t© the difference of the constants 2

(c′—c″). The diagram con- structed by Tait on this principle is fully explained and illus- trated in many text-books, and has been generally adopted as embodying in a simple form the fundamental phenomena of thermoelectricity.

14. Experimental Verification. — Tait's verification of this hypo- thesis consisted in showing that the experimental curves of E.M.F. were parabolas in most cases within the limits of error of his obser- vations. He records, however, certain notable divergencies, parti- cularly in the case of iron and nickel, and many others have since come to light from other observations. It should also be remarked that even if the curves were not parabolas, it would always be possible to draw parabolas to agree closely with the observations over a restricted range of temperature. When the question is tested more carefully, either by taking more accurate measurements of temperature, or by extending the observations over a wider range, it is found that there are systematic deviations from the parabola in the majority of cases, which cannot be explained by errors of experiment. A more accurate verification of these rela- tions, both at high and low extremes of temperature, has become possible of late years owing to the development of the theory and application of the platinum resistance thermometer. (See Ther- mometry.) The curves in fig. 2 illustrate the differences from the parabolic formula, measured in degrees of temperature, as observed by H. M. Tory (B.A. Report, 1897). The deviations for the copper-iron couple, and for the copper cast-iron couple over the range 0° to 200 C., appear to be of the order of 1° C, and were carefully verified by repeated and independent series of observations. The deviations of the platinum and platinum-rhodium 10 per cent.

couple over the range 0° to iooo C. are shown on a smaller scale, and are seen to be of a similar nature, but rather greater in pro- portion. It should be observed that these deviations are continuous, and differ in character from the abrupt changes observed by Tait in special cases. A number

of similar deviations at temperatures below 0° C. were found by the writer in reducing the curves repre- senting the observations of Dewar and Fleming (Phil. Mag., J uly 1895) to the normal scale of temperature from the platinum scale in which they are recorded. In many cases the deviations do not appear to favour any simple hypothesis as to the mode of variation of s with temperature, but as a rule the indication is that s is nearly constant, or even diminishes with rise of temperature. It may be interesting therefore to consider the effect of one or two other simple hypotheses with regard to the mode of variation of i with T. 15. Other Assumptions. — If we take the analogy of a perfect gas and assume j = constant, we have

d&IdT'>~-s/T, SE/dT = s log .To/T E (t-t') = sT log .TtlT-sT' log e T /T

(12) (13)

where T and T' are the temperatures of the junctions, and T<, is the neutral temperature. These formulae are not so simple and convenient as Tait's, though apparently founded on a more simple assumption, but they frequently represent the observations more closely. If we suppose that s is not quite constant, but increases or diminishes slightly with change of temperature according to a linear formula s = S!>+2cT (in which So represents the constant part of s, and c may have either sign), we obtain a more general formula which is evidently the sum of the two previous solutions and may be made to cover a greater variety of cases. Another simple and possible assumption is that made by A. Stansfield (Phil. Mag., July 1898), that the value of s varies inversely as the absolute temperature. Putting s = c/T, we obtain

E (t-t') = c log e T/T'-c(T-T')[T

(14)

which is equivalent to the form given by Stansfield, but with the neutral temperature T» explicitly

included. According to this formula, the Peltier effect is a linear function of the temperature. It may appear at first sight astonishing that it should be possible to apply so many different assumptions to the solution of one and the same problem. In many cases a formula of the last type would be quite inapplicable, as Stansfield remarks, but the difference between the three is often much less than might be supposed. For instance, in the case of 10 per cent. Rh. Pt. — Pt. couple; if we calculate three formulae of the above types to satisfy the same pair of observations at o°— 445° and o° — 1000 C, we shall find that the formula s=constant lies midway between that of Tait and that of Stansfield, but the difference between the formulae is of the same order as that between different observers. In this particular case the parabolic formula appears to be undoubtedly inadequate. The writer's observations agree more nearly with the assumption s = constant, thbse of Stansfield with s = c/T. Many Other formulae have been suggested. L. F. C. Holborn and A. Day (Berl. Akad., 1899) have gone back to Tait's method at high tempera- tures, employing arcs of parabolas for limited ranges. But since the parabolic formula is certainly erroneous at low temperatures, it can hardly be trusted for extrapolation above 1000° C.

16. Absolute Measurement of Thomson Effect. — Another method of verifying Tait's hypothesis, of greater difficulty but of con- siderable interest, is to measure the absolute value of the heat absorbed by the Thomson effect, and to observe whether or not it varies with the temperature. Le Roux (Ann. Chim. Phys., x. p. 201, 1867) made a number of relative measurements of the effect in different metals, which agreed qualitatively with obser- vations of the thermoelectric power, and showed that the effect was proportional to the current for a given temperature gradient. Batelli has applied the same method (Accad. Sci. Turin, 1886) to the absolute measurement. He observed with a thermocouple the difference of temperature (about -oi C.) produced by the Thomson effect in twenty

minutes between two mercury calorimeters, Bi and 5 2 , surrounding the central portions of a pair of rods arranged as in Le Roux's method (see fig. 3). The value of the Thomson

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Fig. 3.— Thomson Effect. Batelli (Le Roux's Method).

effect was calculated by multiplying this difference of temperature by the thermal capacity of either calorimeter, and dividing by the current, by the number of seconds in twenty minutes, and by twice the difference of temperature (about 20 °) between the ends a and 6 of either calorimeter. The method appears to be open to the objection that, the difference of temperature reached in so long an interval would be more or less independent of the thermal

capacities of the calorimeters, and would also be difficult to measure accurately with a thermocouple under the conditions described. The general results of the work appeared to support Tait's hypo- thesis that the effect was proportional to the absolute temperature, but direct thermoelectric tests do not appear to have been made on the specimens employed, which would have afforded a valuable confirmation by the comparison of the values of d?E/dT*, as in Jahn's experiments.

17. King's Experiments. — The method employed by the writer, to which allusion has already been made, consisted in observing the change of distribution of temperature in terms of the resistance along a wire heated by an electric current, when the heating current was reversed. It has been fully described by King {Proc. Amer. Acad., June 1898), who applied it most successfully to the case of copper. Although the effect in copper is so small, he suc- ceeded in obtaining changes of temperature due to the Thomson effect of the order of 1° C, which could be measured with satis- factory accuracy. He also determined the effect of change of temperature distribution on the rate of generation of heat by the current; and on the external loss of heat by radiation, convection and conduction. It is necessary to take all these conditions care- fully into account in calculating the balance due to the Thomson effect. According to King's experiments, the value of the effect

4000

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Ft - - II 84 mE Cd -L+47I m f

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P' -r~403m £

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8000

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Fig. 4.-

N, -r^2058mt

4000

*100**

-Potential Diagrams of Thermocouple on the Contact Theory.

appears to diminish with rise of temperature to a slight extent in copper, but the diminution is so small that he does not regard it as established with certainty. The value found at a temperature of 150 C. was +25 microjoules per ampere-second per degree, or +2 5 microvolts per degree in the case of copper, which agrees very fairly with the value deduced from thermoelectric tests. The value found by Batelli for iron was — 50 microvolts per degree at 108 C, which appears too small in comparison. These measure- ments, though subject to some uncertainty on account of the great experimental difficulties, are a very valuable confirmation of the accuracy of Thomson's theory, because they show that the magni- tude of the effect is of the required order, but they cannot be said to be strongly in support of Tait's hypothesis. A comparison of the results of different observers would also suggest that the law of variation may be different in different metals, although the dif- ferences in the values of dPEjdT 2 may be due in part to differences of purity or errors of observation. It would appear, for instance, according to the observations of Dewar and Fleming, that the value of s for iron is positive below 150 C, at which point it vanishes. At ordinary temperatures the value is negative, increas ing rapidly in the negative direction as the temperature rises. This might be appropriately represented, as already suggested, by a linear formula s = s — cT.

18. Potential Diagrams on the Contact Theory. — It is instructive to consider the distribution of potential in a thermoelectric circuit, and its relation to the resultant E.M.F. and to the seat of*

the E.M.F. In fig. 4, which is given as an illustration, the cold junc- tions are supposed to be at 0° C. and the hot junctions at 100° C. Noll's values (Table I.) are taken for the E.M.F., and it is supposed that the coefficient of the Thomson effect is zero in lead, i.e. that there is no E.M.F. and that the potential is uniform throughout

the length of the lead wire. Taking the lead-iron couple as an example, the value of dEjdt at the hot junction ioo° C. is 10-305 microvolts per degree, and the value of the Peltier coefficient P — TdE/dT is +3844 microvolts. In other words, we may suppose that there is an E.M.F. of that magnitude situated at the junction which causes positive electricity to flow from the lead to the iron. If the circuit is open, as represented in the diagram, the flow will cease as soon as it has raised the potential of the iron 3844 micro- volts above that of the lead. In the substance of the iron itself there is an E.M.F. due to the Thomson effect of about 10 micro- volts per degree tending to drive positive electricity from hot to cold, and raising the cold end of the iron 989 microvolts in potential above the hot end on open circuit. At the cold junction the iron is supposed to be connected to a piece of lead at 0° C, and there is a sudden drop of potential due to the Peltier effect of 3648 micro- volts. If the circuit is cut at this point, there remains a difference of potential £ = 1184 microvolts, the resultant E.M.F. of the circuit, tending to drive positive electricity from the iron to the lead across the cold junction. If the circuit is closed, there will be a current C = E/R, where R = R'+R", the sum of the resistances of the lead and iron. The flow of the current will produce a fall of potential ER'/R in the lead from cold to hot, and ER"/R in the iron from hot to cold, but the potential difference due to the Peltier effect at either junction will not be affected. For simplicity in the diagram the temperature gradient has been taken as uniform, and the specific heat i = constant, but the total P.D. would be the same whatever the gradient.

Similar diagrams are given in fig. 4 for cadmium in

which both the specific heat and the Peltier effect are positive, and also for platinum and nickel in which both coefficients are negative. The metals are supposed to be all joined together at the hot junction, and the circuit cut in the lead near the cold junction. The diagram will serve for any selected couple, such as iron-nickel, and is not restricted to combinations with lead. The following table shows the component parts of the E.M.F. in each case: —

Table III.

Thermocouple.

P — _ <_P * 100 r

— looXSj, = £„.,„

Iron-lead

+3844- +3648-

-988 =

+ 1184

Cadmium-lead.

+2389- +823-

+1095 =

+47i

Platinum-lead .

— 1919— —828 —

-682 =

-409

Nickel-lead

8239 5206

-975 =

-2058

The components for any other combination of two are found by taking the algebraic difference of the values with respect to lead.

19. Relation to the Volta Effect. — It is now generally conceded that the relatively large differences of potential observable with an electrometer between metals on open circuit, as discovered by Volta, are due to the chemical affinities of the metals, and have no direct relation to thermoelectric phenomena or to the Peltier effect. The order of the metals in respect of the two effects is quite different. The potential difference, due to the Volta effect in air, has been shown by Thomson (Lord Kelvin) and his pupils to be of the same order of magnitude, if not absolutely the same, as that produced in a dilute electrolyte in which two metallically connected plates (e.g. zinc and copper) are immersed. (On this hypothesis, it may be explained by regarding the air as an electrolyte of infinite specific resistance.) It is also profoundly modified by the state of the exposed sur- faces, a coating of oxide on the copper greatly increasing the effect, as it would in a voltaic cell. The Peltier effect and the thermo-E.M.F., on the other hand, do not depend on the state of the surfaces, but only on the state of the substance. An attempt has been made to explain the Volta effect as due to the affinity of the metals for each other, but that would not account for the variation of the effect with the state of the surface, except as affecting the actual surface of contact. It is equally evident that chemical affinity between the metals cannot be the explanation of the Peltier E.M.F. This would necessitate chemical action at the junction when a current passed through it, as in an electrolytic cell, whereas the action appears to be purely thermal, and leads to a consistent theory on that hypothesis. The chemical action between metals in the solid state must be infinitesimal, and could only suffice to produce small charges analogous to

those of frictional electricity; it could not maintain a permanent difference of potential at a metallic junction through which a current was passing. Although it is possible that differences of potential larger than the Peltier effect might exist between two metals in contact on open circuit, it is certain that the only effective E.M.F. in practice is the

Peltier effect, and that the difference of potential in the substance of the metals when the circuit is complete cannot be greater than the coefficient P. The Peltier effect, it may be objected, measures that part only of the potential difference which depends upon temperature, and can therefore give no information about the absolute potential difference. But the reason for concluding that there is no other effective source of potential difference at the junction besides the Peltier effect, is simply that no other appreciable action takes place ,at the junction when a current passes except the Peltier generation or absorption of heat.

20. Convection Theory. — The idea of convection of heat by an electric current, and the phrase " specific heat of electricity " were introduced by Thomson as a convenient mode of expressing the phenomena of the Thomson effect. He did not intend to imply that electricity really possessed a positive or negative specific heat, but merely that a quantity of heat was absorbed in a metal when unit quantity of electricity flowed from cold to hot through a difference of temperature of i°. The absorption of heat was considered as representing an equivalent conversion of heat energy into electrical energy in the element. The ele- ment might thus be regarded as the seat of an E.M.F., $dE = sdT$, where dT is the difference of temperature between its ends. The potential diagrams already given have been drawn on this assumption, that the Thomson effect is not really due to con- vection of heat by the

current, but is the measure of an E.M.F. located in the substance of the conductor. This view with regard to the seat of the E.M.F. has been generally taken by the majority of writers on the subject. It is not, however, necessarily implied in the reasoning or in the equations given by Thomson, which are not founded on any assumptions with regard to the seat of the E.M.F., but only on the balance of heat absorbed and evolved in all the different parts of the circuit. In fact, the equations themselves are open to an entirely different interpretation in this respect from that which is generally given.

Returning again to the equations already given in § 1 1 for an elementary thermocouple, we have the following equivalent expressions for the E.A4F. dE, namely,

$$dE=dP + (s'-s'')dT = (PIT)dT = pdT=(p''\sim p')dT,$$

in which the coefficient, P, of the Peltier effect, and the thermo- electric power, p, of the couple, may be expressed in terms of the difference of the thermoelectric powers, p' and p", of the separate metals with respect to a neutral standard. So far as these equations are concerned, we might evidently regard the seat of the E.M.F. as located entirely in the conductors them- selves, and not at all at the junctions, if p or (p r —p') is the difference of the E.M.F.s per degree in corresponding elements of the two metals. In this case, however, in order to account for the phenomenon of the Peltier effect at the junctions, it is necessary to suppose that there is a real convection of heat by an electric current, and that the coefficient P or pT is the difference of the quantities of heat carried by unit quantity of electricity in the two metals. On this hypothesis, if we confine our attention to one of the two metals, say p", in which the current is supposed to flow from hot to cold, we observe that p"dT expresses the quantity of heat converted into electrical energy per unit of electricity by an E.M.F. p" per i° located in the element dT. It happens that the absolute magnitude of p" cannot be

experimentally determined, but this is immaterial, as we are only concerned with differences. The quantity of heat liberated by convection as the current flows from hot to cold is represented in the equation by $dP = d(pT)$. Since $d(p''T) = p''dT+Tdp''$, it is clear that the balance of heat liberated in the element is only $Tdp'' = s''dT$, namely, the Thomson effect, and is not the equivalent of the E.M.F. $p''dT$, because on this theory the absorption of heat is masked by the convection. If p is constant there is no Thomson effect, but it does not follow that there is no E.M.F. located in the element. The Peltier effect, on the other hand, may be ascribed entirely to convection. The quantity of heat $p''T$ is brought up to one

side of the junction per unit of electricity, and the quantity of heat $p'T$ taken away on the other. The balance $(p''-p')T$ is evolved at the junction. If, therefore, we are prepared to admit that an electric current can carry heat, the existence of the Peltier effect is no proof that a corresponding E.M.F. is located at the junction, or, in other words, that the conversion of heat into electrical energy occurs at this point of the circuit, or is due to the contact of dissimilar metals. On the contact theory, as generally adopted, the E.M.F. is due entirely to change of substance $(dP-Tdp)$; on the convection theory, it is due entirely to change of temperature (pdT). But the two ex- pressions are equivalent, and give the same results.

21. Potential Diagrams on Convection Theory. — The difference between the two theories is most readily appreciated by drawing the potential diagrams corresponding to the supposed locations of the E.M.F. in each case. The contact theory has been already illustrated in fig. 4. Corresponding diagrams for the same metals on the convection theory are given in fig. 5. In this diagram the metals are supposed to be all joined together and to be at the same time potential at the cold junction at 0° C. The ordinate of the curve at any temperature is the difference of potential between any point in the metal and a point in lead at the

same temperature. Since there is no contact E.M.F. on this theory, the ordinates also represent the E.M.F. of a thermocouple metal-

-♦00<

•Scale of Tempersture Centigrades — 200 —100 +100 +200 \ +300

Fig. 5. — Curves of Thermo-E.M.F., or Potential Diagrams, on the Convection Theory.

lead, in which one junction is at 0° C. and the other at t° C. For this reason the potential diagrams on the convection theory are more simple and useful than those on the contact theory. The curves of E.M.F. are in fact the most natural and most convenient method of recording the numerical data, more particularly in cases where they do not admit of being adequately represented by a formula. The line of lead is taken to be horizontal in the diagram, because the thermoelectric power, p, may be reckoned from any convenient zero. It is not intended to imply that there is no E.M.F. in the metal-lead with change of temperature, but that the value of p in this metal is nearly constant, as the Thomson effect is very small. It is very probable that the absolute values of p in different metals are of the same sign and of the same order of magnitude, being large compared with the differences observed. It would be theoretically possible to measure the absolute value in some metal by observing with an electrometer the P.D. between parts of the same metal at different temperatures, but the differ- ence would probably be of the order of oi.iy one-hundreath of a volt for a difference of loo" C. It would be sufficiently difficult to detect so small a difference under the best conditions. The difficulty would be greatly increased, if not rendered practically insuperable, by the large difference of temperature.

22. Conduction Theory. — In Thomson's theory it is expressly assumed that the reversible thermal effects may be considered Separately without

reference to conduction. In the conduction theory of F. W. G. Kohlrausch (Fogg. Ann., 1875, vol. 156, p. 601), the fundamental postulate is that the thermo-E.M.F. is due to the conduction of heat in the metal, which is contrary to Thomson s theory. It is assumed that a flow of heat Q, due to conduction, tends to carry with it a proportional electric current C = aQ. This is interpreted to mean that there is an E.M.F. dE--akr dT - —6dT, in each element, where k is the thermal conductivity and

r the specific resistance. The ” thermoelectric constant,” 6, of Kohlrausch, is evidently the same as the thermoelectric power, p, in Thomson’s theory. In order to explain the Peltier effect, Kohl- rausch further assumes that an electric current, C, carries a heat- flow, Q—A8C, with it, where ” A is a constant which can be made equal to unity by a proper choice of units.” If A and are constant, the Peltier effects at the hot and cold junctions are equal and opposite, and may therefore be neglected. The combination of the two postulates leads to a complication. By the second postu- late the flow of the current increases the heat-flow, and this by the first postulate increases the E.M.F., or the resistance, which therefore depends on the current. It is difficult to see how this complication can be avoided, unless the first postulate is abandoned, and the heat-flow due to conduction is assumed to be independent of the thermoelectric phenomena. By applying the first law of thermodynamics, Kohlrausch deduces that a quantity of heat, C6dT, is absorbed in the element dT per second by the current C. He wrongly identifies this with the Thomson effect, by omitting to allow for the heat carried. He does not make any application of the second law to the theory. If we apply Thomson’s condition P = TdEjd T = Tp, we have A = T. If we also assume the ratio of the current to the heat-flow to be the same in both postulates, we have a = i/T$, whence (P = kr/T. This condition was applied in 1899 by C. H. J. B.

Liebenow {Wied. Ann., 68, p. 316). It simplifies the theory, and gives a possible relation between the constants, but it does not appear to remove the complication above referred to, which seems to be inseparable from any conduction theory.

L. Boltzmann {Sitz. Wien. Akad., 1887, vol. 96, p. 1258) gives a theoretical discussion of all possible forms of expression for thermo- electric phenomena. Neglecting conduction, all the expressions which he gives are equivalent to the equations of Thomson. Taking conduction into account in the application of the second law of thermodynamics, he propo ses to substitute the inequality, Td/dET-P<2^T(^k'r'+ Vfe" r"), instead of the equation given by Thomson, namely, P=TdE/dT. Since, however, Thomson's equation has been so closely verified by Jahn, it is probable that Boltzmann would now consider that the reversible effects might be treated independently of conduction.

23. Thermoelectric Relations. — A number of suggestions have been made as to the possible relations between heat and electri- city, and the mechanism by which an electric current might also be a carrier of heat. The simplest is probably that of W. E. Weber (Wied. Ann., 1875), who regarded electricity as consisting of atoms much smaller than those of matter, and supposed that heat was the kinetic energy of these electric atoms. If we suppose that an electric current in a metal is a flow of negative electric atoms in one direction, the positive electricity associated with the far heavier material atoms remaining practically stationary, and if the atomic heat of electricity is of the same order as that of an equivalent quantity of hydrogen or any other element, the heat carried per ampere-second at o° C, namely P, would be of the order of 030 of a joule, which would be ample to account for all the observed effects on the convection theory. Others have considered conduction in a metal to be analogous to electrolytic conduction, and the observed effects to be due to " migration of the ions." The majority of these theories are too vague to be profitably discussed in

an article like the present, but there can be little doubt that the study of thermo electricity affords one of the most promising roads to the dis- covery of the true relations between heat and electricity.

AlpJiabetical Index of Symbols.

a, b, c = Numerical constants in formulae.

C = Electric Current.

E = E.M.F. = Electromotive Force.

k = Thermal Conductivity.

P = Coefficient of Peltier Effect.

p —dEjdt= Thermoelectric Power.

Q = Heat-flow due to Conduction.

R = Electrical Resistance ; r, Specific Resistance.

5 = Specific Heat, or Coefficient of Thomson Effect.

t = Temperature on the Centigrade Scale.

r = Temperature on the Absolute Scale.

(H. L. C.)

THERMOMETRY (Gr. 0ep/x6s, warm; pkrpov, a measure), the art of measuring temperature or degree of heat. The instru- ments used for this purpose are known as thermometers, or sometimes, when the temperatures to be measured are high, as pyrometers.

1. A brief sketch of the evolution of the thermometer is in- cluded in the article Heat, §§2 and 3. The object of the

present article is to discuss the general principles on which the accurate measurement of temperature depends, and to describe the application of these principles to the construction and use of the most important types of thermometer. Special attention will be devoted to more recent advances in

scientific methods of testing thermometers and to the application of electrical and optical methods to the difficult problem of measuring high temperatures. In the article Pyrometer an account will be found of some of the thermoscopic methods employed in the arts for determining high temperatures.

2. Zero: Fundamental Interval. — In all systems of measuring temperature it is necessary (1) to choose a zero or starting-point from which to reckon, (2) to determine the size of the degree by subdividing the interval between two selected fixed points of the scale (called the ” fundamental interval “) into a given number of equal parts. The fundamental interval selected is that between the temperature of melting ice and the tem- perature of condensing steam, under standard atmospheric pressure. On the Centigrade system the fundamental interval is divided into 100 parts, and the melting-point of ice is taken as the zero of the scale. We shall denote temperature reckoned on this system by the letter t, or by affixing the letter C. It is often convenient to reckon temperature, not from the melting- point of ice, but from a theoretical or absolute zero representing the lowest conceivable temperature. We shall denote tem- perature reckoned in this manner by the letter T, or 6, or by affixing the letters Abs. In practice, since the absolute zero is unattainable, the absolute temperature is deduced from the Centigrade temperature by adding a constant quantity, T , representing the interval between the absolute zero and the melting-point of ice; thus T = 2-f-T .

3. Arbitrary Scales. — An arbitrary scale can be constructed by selecting any physical property of a substance which varies regularly with the temperature, such as the volume of a liquid, or the pressure or density of a gas, or the electrical resistance of a metal. Thus if V denote the volume of a given mass at the temperature t, and if Vo, Vi represent the volumes of the same mass at the temperatures o° and ioo° C, the size of i° C. on the scale of this arbitrary thermometer is one hundredth

part of the fundamental interval, namely (Vi— Vo)/ ioo, and the temperature t at volume V is the number of these degrees con- tained in the expansion V— Vo between o° and t° C. We thus arrive at the formula

*=ioo (V-V)/(V I -V)

(1).

which is the general expression for the temperature Centigrade on any such arbitrary scale, provided that we substitute for V the particular physical property selected as the basis of the scale. If we prefer to reckon temperature from an arbitrary zero defined by the vanishing of V, which may conveniently be called the fundamental zero of the scale considered, we have, putting V = o in equation (1), the numerical values of the funda- mental zero To, and of the temperature T reckoned from this zero

To=iooVo/(Vi-Vo),andT=.ToV/Vo = *+To . . . (2).

It is frequently convenient to measure temperature in this manner when dealing with gases, or electrical resistance ther- mometers.

4. Absolute Scale. — It is necessary for theoretical purposes to reduce all experimental results as far as possible to the ab- solute scale, defined as explained in Heat, § 21, on the basis of Carnot's principle, which is independent of the properties of any particular substance. Temperature on this scale measured from the absolute zero will be denoted by the letter 6. This scale can be most nearly realized in practice by observing the temperature T on the scale of a gas-thermometer, and .making special experiments on the gas to determine how far its scale deviates from that of the thermodynamical engine. In the case of the gases hydrogen and helium, which can exist in the liquid state only at very low temperatures, the deviations from the absolute scale at ordinary temperatures are so small that

they cannot be certainly determined. Thermometers containing these gases are generally taken as the ultimate standards of reference in practical thermometry.

Mercurial Thermometry

5. The most familiar type of thermometer depends on the apparent expansion of a liquid hermetically sealed in a glass bulb attached to a graduated stem of fine bore. Of all liquid- in-glass thermometers those containing mercury are almost invariably selected for scientific purposes, although at first sight mercury would appear to be the least suitable liquid, on account of its small coefficient of expansion. The smallness of the expansion necessitates an extremely fine bore for the stem, which introduces errors in consequence of the high surface tension of mercury. The considerable density of the liquid also tends to exaggerate the effects of change of position due to variation of the pressure exerted on the interior of the bulb by the liquid column. These errors are small and fairly regular, and can be corrected within certain limits. A much more serious source of trouble, especially at high temperatures, is the imperfect elasticity of the glass, which causes more or less irregular changes in the volume of the bulb. The effect of these changes on the readings of the thermometer is enhanced by the smallness of the expansion of mercury, and might be reduced by employing a more expansible liquid. It is more likely, however, that the defect will be remedied by the con- struction of thermometers of fused quartz, which is the most perfectly elastic solid hitherto discovered. For work at low temperatures the range of a mercury thermometer is limited by its freezing-point (— 39° C).

These are the serious disadvantages attending the use of mercury, but in other respects it possesses

so many advantages over alcohol or other substitutes, that it will in all probability continue to be used almost exclusively in thermometers of this type for scientific work. Among its chief advantages may be reckoned its high boiling-point (357° C), and the absence of evaporation from the top of the thread, which is so serious a source of error with the alcohol thermometer. With mercury the evaporation is almost inappreciable at 100° C, and can in all cases be avoided by exposing the upper parts of the emergent thread to the temperature of the air. Although an evacuated mercury thermometer cannot be safely used at temperatures over 300° C, owing to the breaking up of the thread of liquid in the stem, it has been found possible, by filling the upper part of the stem with nitrogen or carbon dioxide under high pressure, to extend the range to 550 C. A more important advantage for accurate work is the fact that mercury does not wet glass, and avoids any possible errors due to adherent films of liquid on the walls of the tube. This greatly facilitates observations, and also renders it possible to calibrate the thermometer after construction, which cannot be satisfactorily accomplished with other liquids. The process of construction and calibration is further facilitated by the fact that mercury does not dissolve air to any appreciable extent. In consequence of the regularity of expansion of mercury at ordinary temperatures, the scale of the mercury thermometer agrees very closely with that of the gas thermometer. The liquid is very easily obtained in a high state of purity by distillation, and has practically no chemical action on glass. In this respect it is superior to the liquid alloy of potassium and sodium, which has been employed in some high-temperature thermometers, but which rapidly re- duces silica at high temperatures. The high conductivity and low specific heat of mercury as compared with most other liquids tend to render the thermometer quick and sensitive in action. Its opacity considerably facilitates accurate reading, and even the smallness of its expansion has one great countervailing advantage, in that the

correction for stem-exposure is pro- portionately reduced. This correction, which (even in the case of mercury) may amount to as much as 40° C. at 550 C, is far the most uncertain in its application, and is the most serious objection to the use of the liquid-in-glass thermometer at high temperatures.

6. Construction. — The construction of the most accurate type of mercury thermometer has undergone some changes of detail in recent years. The range of the most accurate standards is generally restricted to the fundamental interval. The length of a degree on the stem can be increased to any extent by en- larging the bulb or diminishing the bore of the stem, but it is found in practice that there is no advantage in making the scale more open than one centimetre to the degree C. in standard instruments, or in increasing the number of divisions beyond ten or at most twenty to the degree. Enlarging the bulb makes the instrument sluggish, and exaggerates the errors due to imperfect elasticity. Diminishing the bore of the tube increases the errors due to capillary friction. Even one centimetre to the degree is an impracticable scale for thermometers graduated continuously from 0° to ioo° C, owing to the excessive length of the stem. In order to secure so open a scale, it is necessary to limit the range to 35°, or at most 50 . The fixed points o° and ioo° may still be retained, for purposes of testing and re- ference, by the device, now commonly employed, of blowing auxiliary bulbs or ampoules on the stem, the volume of which is carefully adjusted to correspond with the number of degrees that it is desired to suppress.

In the best instruments for work of precision the bulb is not blown on the capillary tube itself, but is formed of a separate piece of tube fused on the stem. It is possible in this manner to secure greater uniformity of strength and regularity of dimensions. The thickness of the glass is generally between half a millimetre and one millimetre. The advantage in point of quickness gained by making the glass thin is more than counter- balanced by increased fragility and liability to distortion. The

best form of bulb is cylindrical, of the same external diameter as the stem. The bore of the stem should also be cylindrical, and not oval or flattened, in order to diminish errors due to capillarity, and to secure the greatest possible uniformity of section. The glass should be clear, and not backed with opal, both to admit of reading from either side, and to minimize risk of bending or distortion. In the commoner sorts of ther- mometers, which are intended for rough purposes and to be read without the application of minute corrections, it is not unusual to divide the tube into divisions of equal volume by a preliminary calibration. In the most accurate instruments it is preferable to divide the tube into divisions of equal length, as this can be more accurately effected. The corrections to be applied to the readings to allow for inequalities of bore can be most satisfactorily determined in the case of mercury thermo- meters by calibrating the tube after the instruxnent is completed (see Calibration). This correction is known as the " cali- bration correction." Instead of being separately determined it may be included in the scale correction by comparison with a standard instrument, such as a platinum-resistance ther- mometer.

7. Corrections. — The corrections to be applied to the readings of a mercury thermometer, in addition to the calibration correc- tion, may be summarized under the following heads: (i.), Zero, (ii.) Fundamental Interval, (iii.) Internal and External Pres- sure, (iv.) Stem Exposure, (v.) Scale Correction, including Poggendorff's correction.

(I) The changes of zero are of two kinds, (a) Secular rise of zero due to gradual recovery from changes or strains acquired by the bulb during the process of manufacture. This process may be hastened and subsequent changes practically eliminated by anneal- ing the bulb after manufacture, and before final adjustment, at a high temperature, such as that of boiling sulphur (about 450 C). A thermometer which has not been so treated may show a rise of zero amounting to as much as 20° or 30° when exposed

for some time to a temperature of 350° C. (6) Temporary depression of zero after each exposure to a high temperature, followed by a slow recovery which may last for days or weeks. The best thermo- meters of hard glass show a depression of zero amounting to about one-tenth of 1° C. after exposure to 100° C. In softer glass the depression is usually greater and more persistent, and may amount to half a degree after too" C. At higher temperatures the depres- sion generally increases roughly as the square of the temperature above 0° C. It may amount to 2° or 3 at 300 ° C. The effect cannot be calculated or predicted in any series of observations.

because it depends in so complicated a manner on the past history and on the time. It is a most serious difficulty in accurate mer- curial thermometry, especially at high temperatures. The most satisfactory method of correction appears to be to observe the zero immediately after each reading, and to reckon the temperature from the variable zero thus observed. The rationale of this pro- cedure is that the depression is produced at the high temperature much more rapidly than the subsequent recovery at the low tempera- ture. The thermometer is taken from the bath and allowed to cool rapidly by free exposure to the air. As soon as it reaches 40 or 50° C, it is plunged in the melting ice, and the lowest point reached is taken as the temporary zero.

The following formulae have been proposed by various observers to represent the depression of zero for different kinds of glass : —

Pernet, French cnstal, <2z = o-oo4o(//ioo) 2 . . "1

Guillaume, Verre dur, o — 100° C., dz = (8886« +

io-84< 2) io~ 7 1 , , Bottcher, Cristal dur, 0-190° C, dz = (7970* -\-T > 2t)P)lQ- J ' [■ w ,, Jena, 16, iii., rfz = (7ioo/ — 8Z 2) io~ 7 . . .J

The symbol dz in these formulae stands for the depression of zero produced by an exposure to a temperature t. The depression is about three times as large in French crystal as in English flint glass, and varies roughly as the square of /. Verre dur and Jena, 16, iii., are varieties of hard glass chosen as standards in France and Germany respectively, on account of the comparatively small depression of zero to which they are liable. At low temperatures, up to 50 C, the depression is very nearly proportional to I, but at temperatures above ioo° C. it is necessary to adopt another formula in which the term depending upon J 2 is more important. These formulae are useful as giving an idea of the probable size of the correction in any case, but they cannot be employed in practice except in the simplest cases and at low temperatures. On account of these tem- porary changes of zero, a mercury thermo- meter intended for the most accurate work at ordinary temperatures (as in calorimetry) should preferably never be heated above 40° or 50° C., and certainly never above ioo° C. Above ioo 3 C. the changes of zero become more irregular and more variable, depending on the rate of cooling and on the sequence of previous observations, so that even if the method of observing the zero after each reading is adopted, the order of precision attainable rapidly diminishes.

(II) Fundamental Interval. — The thermo- meter to be tested is exposed to steam condensing at atmospheric pressure in an apparatus which is often called a " hypso- meter," constructed with double walls to protect the inner tube containing the thermo- meter from any cooling by radiation. The standard atmospheric pressure at which the temperature of the steam is by definition equal to 100° C. is equivalent to that pro- duced by a column of mercury at 0° C. and 760 millimetres high, the force of gravitation being equal to that at sea-level in latitude 45°. The atmospheric pressure at the time

of observation is reduced to these units by applying the usual corrections for temperature and gravitation. If the pressure is near 760 mm., the temperature of the steam may be de- duced by assuming that it increases at the rate of 1° C. for 27-2 mm. of pressure. If the pressure is not near 760 mm., the application of the correction is less certain, but is generally taken from Regnault's tables, from which the following data are ex- tracted. Thermometers cannot be satisfactorily tested at an elevated station where the height of the barometer H is less than 700 mm., as the steam point is too uncertain.

A convenient type of hypsometer is shown in fig. 1. The boiler B is separate from the steam-jacket A surrounding the thermometer. A gauge G is provided for indicating the steam pressure (difference from atmospheric) and a condenser C for returning the condensed steam to the boiler. The thermometer is observed by the microscope M.

Fig. 1. — Hypso- meter.

steam point. If n be the interval in degrees of the scale between the two observations, and if /1 be the temperature of the steam, the fundamental interval of the thermometer may be taken as 100 n/hi provided that h is nearly 100° C. Since all the readings of a thermometer have to be corrected for the error of the funda- mental interval, by dividing by the fundamental interval thus observed and multiplying by 100, it is a matter of some con- venience in practice to have the instrument graduated so that the difference between the readings in ice and at 100 ° C. is very nearly 100° of the stem. The correction can then be applied as a small percentage independently of the other corrections. The method of determining the fundamental interval above described applies to all other kinds of thermometers, except that it is not generally necessary to observe the zero after the steam point. The tempera- ture of the steam h should be expressed in the scale of the ther- mometer tested, if the scale differs appreciably from that of Regnault.

(Ill) Pressure Correction. — The corrections for variations of internal and external pressure on the bulb are of some importance in accurate thermometry, but can be applied with considerable certainty at moderate temperatures. The correction for external pressure is assumed to be proportional to the change of pressure, and to be independent of the temperature. It is generally deter- mined by enclosing the thermometer to be tested in a vessel of water, and observing the change of reading on exhausting or readmitting the air. The correction is generally between one and two thousandths of a degree per centimetre of mercury change of pressure, but must be determined for each thermometer, as it depends on the nature of the glass and on the form and thickness of the walls of the bulb. The coefficient of the correction for internal pressure is greater than that for external pressure by the difference between the compressibility of mercury and that of glass, and may be calculated from it by assuming this relation. If b , b\, are the external and internal coefficients, expressed in degrees of temperature per centimetre of mercury, we have the relation

bi = 60+0-00015, degrees per cm. of mercury . . (6)

The coefficient of internal pressure can also be determined by taking readings in the horizontal and vertical positions when the thermometer is at some steady temperature such as that of ice or steam. The reading of the thermometer is generally reduced to an external pressure of one standard atmosphere, and to an internal pressure corresponding to the horizontal position. It is also possible to include the internal pressure correction in the scale correction, if the thermometer is always read in the vertical posi- tion. In addition to the variations of internal pressure due to the column of mercury in the stem, there are variations due to capil- larity. The internal pressure is greater when the mercury is rising than when it is falling, and the reading is depressed to an extent depending on the fineness of the bore and the thinness of the walls of the bulb. The capillary pressure does not depend only on the

bore of the tube, but also apparently to an even greater extent on the state of the walls of the tube. The least trace of dirt on the glass or on the mercury is capable of producing capillary pressures much greater than would be calculated from the diameter of the tube. Even in the best thermometers, when there are no in- equalities of bore sufficient to account for the observed variations, it is seldom found that the mercury runs equally easily in all parts of the stem. These variations of capillary pressure are somewhat capricious, and set a limit to the order of accuracy attainable with the mercury thermometer. It appears that the difference of reading of a good thermometer between a rising and falling meniscus may amount to five or ten thousandths of a degree. The difference may be reduced by continuous tapping, but it is generally best to take readings always on a rising column, especially as the varia- tions in the angle of contact, and therefore in the capillary pressure, appear to be much smaller for the rising meniscus. In ordinary work the zero reading and the steam reading would both generally correspond to a falling meniscus; the former necessarily, the latter on account of the phenomenon of the temporary depression of zero, which causes the thermometer to read higher during the first moments of its exposure to steam than it does when the expansion of the bulb has reached its limit. It is easy to secure a rising meniscus at the steam point by momentarily cooling the ther- mometer. At the zero point the meniscus generally begins to rise

Table I. — Temperature of Steam at pressures from 790 to 710 mm.

Pressure (corrected) Steam temp. = 100° C.+

790 + 1-083

780

+•726

770

+•365

760

75o -•369

740

-•742

730

— I-I20

720

-1-502

7IO

-1-888

Approximate formula d/i = -0367(H— 760) — -oooo2o(H—760) 2

(5)

If the barometer has a brass scale correct at o° C, and H be the reading in millimetres, the correction for temperature is made approximately by subtracting 0-00163 H mm.

If L is the latitude and M the height of the station in metres above the sea-level, the correction for gravitation is approximately made by subtracting (0-0026 cos 2L+0-OOOOO02M) H mm.

The zero of the thermometer ia observed immediately after the

after five or ten minutes. The question, however, is not of much importance, as the error, if any, is regular, and the correction for capillarity is necessarily uncertain.

(IV) Stem-Exposure Correction. — When the bulb of a mercury thermometer is immersed in a bath at a

temperature /, and a part of the column of mercury having a length of n degrees is exposed to a lower temperature h, the reading of the thermometer will be

lower by aXnX(t — h) degrees (nearly) than it would have been if the whole of the mercury and stem had been at the temperature t. The factor a in this expression is the apparent coefficient of expan- sion of mercury in glass, and varies from -000150 to -000165 f° r different kinds of glass. In order to apply this correction, it is usual to observe h by means of an auxiliary " stem-thermometer " with its bulb placed near the middle of the emergent column n. Occasionally stem-thermometers with long thin bulbs are employed to give more nearly the average temperature of the whole emergent column. Owing to conduction along the stem of the thermometer, and to heated vapours near the bath, the mean temperature deter- mined in this manner is generally too low. To allow for this empiri- cally, an arbitrary reduction is often made in the value taken for n or a, but this cannot be regarded as satisfactory for work of precision. The only practical method of reducing the correction is to limit the number of degrees n exposed, or, in other words, to work with thermometers of " limited range." Each of these thermometers must then be corrected by comparison with a standard thermometer free from stem-exposure correction, such as a platinum- resistance thermometer. To secure results of any value the correc- tion must be determined at each point under the actual conditions of observation under which the thermometer is to be used. In work of precision it is necessary to use ten or twenty thermometers to cover a range of 300 , as this is the only method of securing an open scale and reasonable accuracy as regards stem-exposure. To quote the opinion of C. E. Guillaume, one of the leading autho- rities on

mercurial thermometry: "When this correction is large, it cannot generally be determined with sufficient approximation for measurements of precision. The mercury thermometer should then be replaced by other instruments, among which those based on the variation of the electrical resistance of metals hold the first rank."

(V) Scale Correction. — The correction required to reduce the readings of a mercurial thermometer to the normal scale may appropriately be called the " scale correction." One of the chief advantages of the mercurial thermometer for scientific purposes is that its scale agrees very closely with the thermodynamical scale between 0° and 200 C. The scale corrections of the standard French thermometers of verre dur have been very carefully deter- mined over the range 0° to 8o° C. by P. Chappuis using a constant- volume gas thermometer containing hydrogen (at an initial pres- sure of one metre of mercury at o° C.) as the representative of the normal scale. His observations between o° and 80 ° C. are repre- sented by the quartic equation

U-t m = l(t-I00) (-61-859+0-47351 f-o-ooii577 ^Xio"*, (7)

in which h and t m represent temperature on the scales of the hydrogen and mercury thermometers respectively. The verre dur mercury thermometer reads 0-112° C. above the hydrogen thermo- meter at 40 C. where the difference of the scales is a maximum. The scale corrections of the Jena-glass thermometers, deduced by comparison with the French verre dur, appear to be practically of the same magnitude, but show differences of as much as o-oio" C. on either side of the mean. It may be questioned whether it is possible to construct mercury thermometers with scales agreeing more closely than this, owing to inevitable variations in the quality and treatment of the glass. According to Guillaume, the scale of a French cristal thermometer t e differs from that of the standard verre dur t m between o°and 50 C, according to the cubic formula' 'c-

The comparisons of the verre dur thermometers with the normal scale at the International Bureau at Paris have not as yet extended beyond ioo° C. The most important observations on the mercury thermometer above these limits appear to be those of Regnault. The later observations of J. M. Crafts were confined to French thermometers of cristal dur (Comples Rendus, 1882, 95, p. 863). He found the following deviations from the hydrogen scale: — t k 150 170 200 230 250° 280° 300 330

h-t m +-25 +-35 +-27 —02 26 —63 -I-2I -2-48

The correction changes sign at about 230 C, owing to the rapid increase in the expansion of mercury. Between 0° and 150 C. it would appear that the coefficient of expansion of glass increases more rapidly than that of mercury.

Poggendorff's Correction. — It should be observed that, since in the construction of a mercury thermometer the tube is divided or calibrated so as to read in divisions of equal volume when the whole of the tube is at one temperature, the degrees do not as a matter of fact correspond to equal increments of the apparent expansion of mercury. The scale does not therefore agree in

practice with the theoretical formula (1) for the .scale of the expan- sion of mercury, since the expansion is measured in a tube which itself is expanding. A similar argument applies to the method of the weight thermometer, in which the overflow is measured by weight. Even if the expansion of mercury and glass were both uniform, as measured on the thermodynamical scale, the scale of the mercury thermometer, as ordinarily calibrated, would not agree with the thermodynamical scale. The difference can be easily calculated if the actual expansion of mercury and glass is known. The correction is known as Poggendorff's, but is generally included in the scale correction, and is not applied separately. It has the effect of making the thermometer read higher at temperatures between 0° and 100° than it would if the divisions of the stem did

Fig. 2. — Differences between Scales of Mercury, and Gas Thermo- meters and Hydrogen Scale, according to Guillaume and Chappuis.

not expand as the temperature rose. The amount of the correction for verre dur is given by Guillaume as

P. C. =2(ioo — 0(23-920+0-0240/) Xio -8 . . (9)

The value of this correction is between -060° and -080° at 50° C. for different thermometers.

Gas Thermometry

8. The deviations of the gas thermometer from the absolute scale are so small that this instrument is now universally regarded as the ultimate standard in thermometry. It had, in fact, already been adopted for this purpose by Regnault and others, on a priori considerations, before the absolute scale itself had been invented. Although the indications of a gas thermometer are not absolutely independent of the changes of volume of the envelope or bulb in which the gas is contained, the effect of any uncertainty in this respect is minimized by the relatively large expansibility of the gas. The capricious changes of volume of the bulb, which are so great a difficulty in mer- curial thermometry, are twenty times less important in the case of the gas thermometer. As additional reasons for ths choice we have the great simplicity of the laws of gases, and the approximate equality of expansion and close agreement of the thermometric scales of all gases, provided that they are above their critical temperatures. Subject to this condition, at moderate pressures and provided that they are not dissociated or decomposed, all gases satisfy approximately the laws of Boyle and Charles. These two laws are combined in the charac- teristic equation of the gaseous state, viz., pv = ~RT, in which p is the pressure and v the volume of unit mass of the gas in question, and R is a constant which varies inversely as the molecular weight of the gas, and is approximately equal to the difference of the specific heats.

9. Practical Conditions. — In practice it is not convenient to deal with unit mass, but with an arbitrary mass M occupying a space V, so that the specific volume »=V/M. It is also necessary to measure the pressure p in terms of mercury columns, and not in absolute units. The numerical value of the constant R is adjusted to suit these conditions, but is of no consequence in thermometry, as we are concerned with ratios and differences only. The equation may be written in the form T=/>V/RM, but in order to satisfy the essential condition that T shall be a definite function of the temperature in the case of a gas which does not satisfy Boyle's law exactly, it is necessary to limit

the application of the equation to special cases which lead to

definite, but not necessarily identical, thermometries scales: There are three special cases of practical importance, corre- sponding to three essentially distinct experimental methods.

(i.) Volumetric Method (constant-pressure). — In this method V is variable and p and M are constant. This method was employed by Gay-Lussac, and is typified in the ideal thermo- meter with reservoir of variable capacity designed by Lord Kelvin (Ency, Brit., ed. ix., vol. xi. p. 575, fig. 10). It corre- sponds to the method ordinarily employed in the common liquid-in-glass thermometer, but is not satisfactory in practice, owing to the difficulty of making a bulb of variable and measurable volume the whole of which can be exposed to the temperature to be measured.

(ii.) Manometric Method (constant-volume or density). — In this method p is variable and V and M are constant. Varia- tions of temperature are

observed and measured by observing the corresponding variations of pressure with a mercury mano- meter, keeping a constant mass, M, of gas enclosed in a volume, V, which is constant except for the unavoidable but small expansion of the material of which the bulb is made.

(iii.) Gravimetric Method (constant-pressure).— In this method M is variable and p and V are constant. This method is gene- rally confounded with (i.) under the name of the constant- pressure method, but it really corresponds to the method of the weight thermometer, or the " overflow " method, and is quite distinct from an experimental standpoint, although it leads to the same thermometric scale. In applying this method, the weight M of the vapour itself may be measured, as in Regnault's mercury-vapour thermometer, or in Deville and Troost's iodine-vapour thermometer. The best method of measuring the overflow is that of weighing mercury displaced by the gas. The mass of the overflow may also be estimated by observing its volume in a graduated tube, but this method is much less accurate.

In addition to the above, there are mixed methods in which both p and V or M are variable, such as those employed by Rudberg or Becquerel; but these are unsatisfactory for pre- cision, as not leading to a sufficiently definite thermometric scale. There is also a variation of the constant-volume method (ii.), in which the pressure is measured by the volumetric compression of an equal mass of gas kept at a constant tempera- ture, instead of by a manometer. This method is experimentally similar to (iii.), and gives the same equations, but a different thermometric scale from either (ii.) or (iii.). It will be considered with method (iii.), as the apparatus required is the same, and it is useful for testing the theory of the instrument. We shall consider in detail methods (ii.) and (iii.) only, as they are the most important for accurate work.

10. Construction of Apparatus. — The manometric or constant- volume method was selected by Regnault as

the standard, and has been most generally adopted since his time. His apparatus has not been modified except in points of detail. A description of his instrument will be found in most text-books on heat.

A simple and convenient form of the instrument for general use is Jolly's (described in Poggendorff's Jubelband, p. 82, 1874), and represented in fig. 3. The two vertical tubes of the manometer are connected by an india-rubber tube properly strengthened by a cotton covering, and they can be made to slide vertically up and down a wooden pillar which supports them; they are provided with clamps for fixing them in any position and a tangent screw for fine adjustment. The connexion between the bulb and the manometer is made by means of a three-way tap. The scale of the instrument is engraved on the back of a strip of plane mirror before silvering, and the divisions are carried sufficiently far across the scale for the reflections of the two surfaces of the mercury to be visible behind the, scale. Parallax can thus be avoided and an accurate reading obtained without the necessity of using a cathetometer. In order to allow for the expansion of the glass of the reservoir a weight-thermometer bulb is supplied with the instrument, made from another specimen of the same kind of glass, and the relative expansion of the mercury and the glass can thus be determined by the observer himself. The volume of the air-bulb and that of the capillary tube and the small portion of the manometer tube above the small beak of glass, the point of which serves as the fiducial mark, are determined by the instru-

mestrmaikers,, The iropjpvernents introduced by Chappujs, of th Jfl%P"%$m : £W3?W 5»t.Sfcy«»i..ty..tPe construction, pf the, con-stant-volume hydrogen thermometer selected ' by the 'comrnit'tee for the determination of the normal scale, are described iii ttife text-books (e.g. Watson's' Physics): The most important is the combination of the manometer and the barometer into a single instrument with a single scale, thus reducing the number of readings required. The level of the mercury in the branch of the mano meter*

communicating with the bulb of the gas thermometer is adjusted in the usual manner up to a fixed contact-point, so as to reduce the contained gas to a constant volume. Simultaneously the barometer branch of the manometer is adjusted so that the surface of the mercury makes contact with another point fixed in the upper end of the barometer tube. The distance between the two contact-points, giving the pres- sure of the gas in the thermometer, is deduced from the reading of a vernier fixed relatively to the upper contact- point. This method of reading the pres- sure is probably more accurate than the method of the cathetometer which is usually employed, but has the disadvan- tage of requiring a double adjustment.

11. Pressure Correction. — In the prac- tical application of the manometric method there are certain corrections peculiar to the method, of which account must be taken in work of precision. The volume of the bulb is not accurately constant, but varies with change of pressure and tempera- Fig. 3. ture. The thermal expansion of the ._ .

bulb is common to all methods, and will be considered in detail later. The pressure correction is small, and is determined in the same manner as for a mercury thermo- meter. The value so determined, however, does not apply strictly except at the temperature to which it refers. If the pressure-coefficient were constant at all temperatures and equal to e, the pressure correction, dt, at any point t of the scale would be obtainable from the simple formula

$$dt = ep$$

where p is the initial pressure at the temperature T . But as the coefficient probably varies in an unknown manner, the correction is somewhat uncertain, especially at high tempera- tures. Another very necessary but somewhat troublesome correction is the reduction of the manometer readings to allow for the varying temperatures of the mercury and scale. Since it is generally

impracticable to immerse the manometer in a liquid bath to secure certainty and uniformity of temperature, the temperature must be estimated from the readings of mercury thermometers suspended in mercury tubes or in the air near the manometer. It is therefore necessary to work in a room specially designed to secure great constancy of tempera- ture, and to screen the manometer with the utmost care from the source of heat in measurements of high temperature. Regnault considered that the limit of accuracy of correction was one-tenth of a millimetre of mercury, but it is probably possible to measure to one-hundredth as a mean of several readings under the best conditions, at ordinary temperatures.

12. Stem- Exposure. — In all gas thermometers it is necessary in practice that the part of the gas in contact with the mercury or other liquid in the manometer should not be heated, but kept at a nearly constant temperature. The space above the mercury, together with the exposed portion of the capillary tube connecting the manometer with the thermometric bulb, may be called the " dead space." If the volume of the dead space is kept as nearly as possible constant by adjusting the mercury always up to a fixed mark, the quantity of air in this space varies nearly in direct proportion to the pressure, i.e. in proportion to the temperature of the thermometric bulb

at constant volume. This necessitates the application of a stem- exposure correction, the value of which is approximately given by the formula

dt = rt{t-loo)ITi (u)

where r is the ratio of the volume of the dead space to the volume of the thermometric bulb, and T 2 is the mean tempera- ture of the dead space, which is

supposed to be constant. The magnitude of the correction is proportional to the ratio r, and increases very rapidly at high temperatures. If the dead space is i per cent, of the bulb, the correction will amount to only one-tenth of a degree at 50 C, but reaches 5° at 445° C, and 30° at iooo C. It is for this reason important in high-temperature work to keep the dead space as small as possible and to know its volume accurately. With a mercury manometer, the volume is liable to a slight uncertainty on account of changes of shape in the meniscus, as it is necessary to use a wide tube in order to secure accurate measurements of pressure.

13. Compensation Method with Oil-Gauge. — It is possible to avoid this difficulty, and to make the dead space very small,

by employing oil or sulphuric acid or other non-volatile liquid to confine the gas in place of mercury {Phil. Trans., A. 1887, p. 171). The employment of a liquid which wets the tube makes it possible to use a much smaller bore, and also greatly facilitates the reading of small changes of pressure. At the same time the instrument may be arranged so that the dead space correction is automatic- ally eliminated with much greater accuracy than it can be calculated. This is effected as shown diagrammatically in fig. 4, by placing side by side with the tube AB, connecting the bulb B to the manometer A, an exact duplicate CD, closed at the end D, and containing liquid in the limb C, which is of the same size as the branch A of the manometer and in direct communication with it. The tube CD, which is called the compensating tube, contains a constant mass of gas under exactly similar conditions of volume and temperature to the tube AB. If therefore the level of the liquid is always

Com~etIatio°n ° f ad J usted to be the same in both tubes AB and CD, the mass of gas contained in the

dead space AB will also be constant, and is automatically

eliminated from the equations, as they contain differences only.

14. Gravimetric Method. — In the writer's opinion, the gravi- metric or overflow method, although it has seldom been adopted, and is not generally regarded as the most accurate, is much to be preferred to the manometric method, especially for work at high temperatures. It is free from the uncertain corrections above enumerated as being peculiar to the mano- metric method. The apparatus is much simpler to manipulate and less costly to construct. If the pressure is kept constant and equal to the external atmospheric pressure, there is no strain of the bulb, which is particularly important at high temperatures. There is no dead space correction so long as the temperature of the dead space is kept constant. The troublesome operation of reading and adjusting the mercury columns of the manometer is replaced by the simpler and more accurate operation of weighing the mercury displaced, which can be performed at leisure. The uncertain correction for the tem- perature of the mercury in the manometer is entirely avoided.

The reasons which led Regnault to prefer the constant-volume thermometer are frequently quoted, and are generally accepted as entirely conclusive, but it is very easy to construct the constant-pressure or gravimetric instrument in such a manner as to escape the objections which he urges against it. Briefly stated, his objections are as follows: (1) Any error in the observation of the temperature of the gas in the overflow space produces a considerable error in the temperature deduced, when the volume of the overflow is large. This source of error is

very simply avoided by keeping the whole of the overflow in melting ice, an expedient which also considerably simplifies the equations. It happened

that Regnault's form of thermometer could not be treated in this manner, because he had to observe the level of the mercury in order to measure the pressure and the volume. It is much better, however, to use a separate gauge, containing oil or sulphuric acid, for observing small changes of pressure. The use of ice also eliminates the correc- tion for the variation of density of the mercury by which the overflow is measured. (2) Regnault's second objection was that an error in the measurement of the pressure, or in reading the barometer, was more serious at high temperatures in the case of the constant-pressure thermometer than in the con- stant-volume method. Owing to the incessant variations in the pressure of the atmosphere, and in the temperature of the mercury columns, he did not feel able to rely on the pressure readings (depending on observations of four mercury surfaces with the cathetometer) to less than a tenth of a millimetre of mercury, which experience showed to be about the limit of accuracy of his observations. This would be equivalent to an error of 0-036° with the constant- volume thermometer at any point of the scale, but with the constant-pressure thermometer the error would be larger at higher temperatures, since the pressure does not increase in proportion to the temperature. This objection is really unsound, because the ideal condition to be aimed at is to keep the proportionate error dT/T constant. That the proportionate error diminishes with rise of tempera- ture, in the case of the constant-volume thermometer, is really of no advantage, because we can never hope to be able to measure high temperatures with greater proportionate accuracy than ordinary temperatures. The great increase of pressure at high temperatures in the manometric method is really a serious disadvantage, because it becomes necessary to work with much lower initial pressures, which implies inferior accuracy at ordinary temperatures and in the determination of the initial pressure and the fundamental interval.

15. Compensated Differential Gas Thermometer. — The chief advantage of the gravimetric method, which

Regnault and others appear to have missed,, is that it is possible to make the measurements altogether independent of the atmospheric pressure and of the observation of mercury columns. This is accomplished by using, as a standard of constant pressure, a bulb S, fig. 5, containing a constant mass of gas in melting ice, side by side with the bulb M, in which the volume of the over- flow is measured. The pressure in the thermometric bulb T is adjusted to equality with the standard by means of a delicate oil-gauge G of small bore, in which the difference of pressure is observed by means of a cathetometer microscope. This kind of gauge permits the rapid observation of small changes of pressure, and is far more accurate and delicate than the mercury manometer. The fundamental measurement of the volume of the overflow in terms of the weight of mercury displaced at 0° C. involves a single weighing made at leisure, and requires no temperature correction. The accuracy obtainable at ordi- nary temperatures in this measurement is about ten times as great as that attainable under the best conditions with the mercury manometer. At higher temperatures the relative accuracy diminishes in proportion to the absolute temperature, or the error dt increases according to the formula

$$dt/t = -(T/To)\ dw'w, \quad . \ . \ . \ . \quad (12)$$

where w is the weight of the overflow and dw the error. This diminution of the sensitiveness of the method at high tempera- tures is commonly urged as a serious objection to the method, but the objection is really without weight in practice, as the possible accuracy of measurement is limited by other con- ditions. So far as the weighing alone is concerned, the method is sensitive to one-hundredth of a degree at 1000° C, which is far beyond the order of accuracy attainable in the application of the other corrections.

16. Method of Using the Instrument. — A form of gas thermo- meter constructed on the principles above laid down, with the

addition of a duplicate set of connecting tubes C for the elimination of the stem-exposure correction by the method of automatic compensation already explained, is shown in fig. 5 (Proc. R. S. vol. 50, p. 243; Preston's Heat, p. 133).

In setting up the instrument, after cleaning, and drying and calibrating the bulbs and connecting tubes, the masses of gas on the two sides arc adjusted as nearly as possible to equality, in order that any changes of temperature in the two sets of connecting tubes may compensate each other. This is effected with all the bulbs in melting ice, by adjusting the quantities of mercury in the bulbs M and S and equalizing the pressures. The bulb T is then heated in steam to determine the fundamental interval. A weight U'i of mercury is removed from the overflow bulb M in order to equalize the pressures again If W is the weight of the mercury at o° C which would be required to fill the bulb T at 0° C, and if W+dWi is the weight of mercury at o° which would be required to fill a volume equal to that of the bulb in steam at ti, we have the following equation for determining the coefficient of expansion a, or the fundamental zero To,

of I = /i/T () =(w 1 +iW 1)/(W-w 1), . . . (13)

Similarly if w is the overflow when the bulb is at any other tem- perature /, and the expansion of the bulb is

Fig. 5. — Compensated Differential Gas Thermometer.

the connecting tubes do not exactly compensate, it is only neces- sary to include in w a small correction div, equivalent to the observed difference, which need never exceed one part in ten thousand.

It is possible to employ the same apparatus at constant volume as well as at constant pressure, but the manipulation is not quite so simple, in consequence of the change of pressure. Instead of removing mercury from the overflow bulb M in connexion with the thermometric bulb, mercury is introduced from a higher level into the standard bulb S so as to raise its pressure to equality with that of T at constant volume. The equations of this method are precisely the same as those already given, except that w now signifies the ” inflow ” weight introduced into the bulb S, instead of the overflow weight from M. It is necessary, however, to take account of the pressure-coefficient of the bulb T, and it is much more important to have the masses of gas on the two sides of the apparatus equal than in the other case. The thermometric scale obtained in this method differs slightly from the scale of the mano- mctric method, on account of the deviation of the gas compressed at o° C. from Boyle’s law, but it is easy to take account of this with certainty.

Another use to which the same apparatus may be put is the accurate comparison of the scales of two different gases at constant volume by a differential method. It is usual to effect this com- parison indirectly, by comparing the gas thermometers separately with a mercury thermometer, or other secondary standard. But by using a pair of bulbs like M and S simultaneously in the same bath, and measuring the small difference of pressure with an oil- gauge, a higher order of accuracy may be attained in the measure- ment of the small differences than by the method of indirect comparison. For instance, in the curves representing the differ- ence between the nitrogen and hydrogen scales (fig. 1), as found

by Chappuis by comparison of the nitrogen and hydrogen thermo- meters with the mercury thermometer, it is probable that the contrary flexure of the curve between 70 and 100 C. is due to a minute error of observation, which is quite as likely to be caused by the increasing aberrations of the mercury thermometer at these temperatures as by

the difficulties of the manometric method. It may be taken as an axiom in all such cases that it is better to measure the small difference itself directly than to deduce it from the much more laborious observations of the separate magnitudes concerned.

17. Expansion Correction. — In the use of the mercury ther- mometer we are content to overlook the modification of the scale due to the expansion of the envelope, which is known as Poggendorff's correction, or rather to include it in the scale correction. In the case of the gas thermometer it is necessary to determine the expansion correction separately, as our object is to arrive at the closest approximation possible to the absolute scale. It is a common mistake to imagine that if the rate of expansion of the bulb were uniform, the scale of the apparent ex- pansion of the gas would be the same as the scale of the real expansion — in other words, that the correction for the ex- pansion of the bulb would affect the value of the coefficient of expansion i/To only, and would be without effect on the value of the temperature t deduced. A result of this kind would be produced by a constant error in the initial pressure on the manometric method, or by a constant error in the initial volume on the volumetric method, or by a constant error in the funda- mental interval on any method, but not by a constant error in the coefficient of expansion of the bulb, which would produce a modification of the scale exactly analogous to Poggendorff's correction. The correction to be applied to the value of t in any case to allow for any systematic error or variation in the data is easily found by differentiating the formula for t with respect to the variable considered. Another method, which is in some respects more instructive, is the following : —

Let T be the function of the temperature which is taken as the basis of the scale considered, then we have the value of /given by the general formula (1), already quoted in § 3. Let di be the correction to be added to the observed value of T to allow for any

systematic change or error in the measurement of any of the data on which the value of T depends, and let dt be the corresponding correction produced in the value of t, then substituting in formula (1) we have,

/+n , -

from which, provided that the variations considered are small, we' obtain the following general expression for the correction to /,

dt={dT-dT< >)-(dT 1 -dT 1))t/ioo. . . (14)

It is frequently simpler to estimate the correction in this manner, rather than by differentiating the general formula.

In the special case of the gas thermometer the value of T is given by the formula

T=£V/RM=/>V/R(M -M 2), . . . (15)

where p is the observed pressure at any temperature /, V the volume of the thermometric bulb, and M the mass of gas remaining in the bulb. The quantity M cannot be directly observed, but is deduced by subtracting from the whole mass of gas Mo contained in the apparatus the mass Ms which is contained in the dead space and overflow bulb. In applying these formulae to deduce the effect of the expansion of the bulb, we observe that if <£V is the expansion from o° C, and Vo the volume at 0° C, we may write

V = Vo+

If the coefficient of expansion of the bulb is constant and equal to the fundamental coefficient / (the mean coefficient between 0° and 100° C), we have simply SV/Vo=/'; and if we substitute this value in the general expression (14) for dt, we obtain

Provided that the correction can be expressed as a

rational integral function of t, it is evident that it must contain the factors t and (t— 100), since by hypothesis the scale must be correct at the fixed points o° and 100° C, and the correction must vanish at these points. It is clear from the above that the scale of the gas ther- mometer is not independent of the expansion of the bulb even in the simple case where the coefficient is constant. The correction is by no means unimportant. In the case of an average glass or

platinum reservoir, for which / may be taken as 0-000025 nearly, the correction amounts to -0-0625° at 50° C, to 3-83° at 445° C, and to 22-5° at 1000° C.

The value of the fundamental coefficient / can be determined with much greater accuracy than the coefficient over any other range of temperature. The most satisfactory method is to use the bulb itself as a mercury weight thermometer, and deduce the cubical expansion of the glass from the absolute expansion of mercury as determined by Regnault. Unfortunately the reductions of Regnault's observations by different calculators differ considerably even for the fundamental interval. The values of the fundamental coefficient range from -00018153 Regnault, and -00018210 Broch, to 00018253 Wiillner. The extreme difference represents an un certainty of about 4 per cent. (1 in 25) in the expansion of the glass. This uncertainty is about 100 times as great as the prob- able error of the weight thermometer observations. But the expansion is even less certain beyond the limits of the fundamental interval. Another method of determining the expansion of the bulb is to observe the linear expansion of a tube or rod of the same material, and deduce the cubidal expansion on the assumption that the expansion is isotropic. It is probable that the

uncertainty involved in this assumption is greater in the case of glass or porce- lain bulbs, on account of the difficulty of perfect annealing, than in the case of metallic bulbs.

Except for small ranges of temperature, the assumption of a constant coefficient of expansion is not sufficiently exact. It is therefore usual to assume that the coefficient is a linear function of the temperature, so that the whole expansion from 0° C. may be expressed in the form dV = t(a+bt)"Vo, in which case the funda- mental coefficient /=

= (/+6T)i(/-ioo)

(18)

It will be observed that the term involving b becomes of consider- able importance at high temperatures. Unfortunately, it cannot be determined with the same accuracy as /, because the conditions of observation at the fixed points are much more perfect than at other temperatures. Provided that the range of the observations for the determination of the expansion is co-extensive with the range of the temperature measurements for which the correction is required, the uncertainty of the correction will not greatly exceed that of the expansion observed at any point of the range. It is not unusual, however, to deduce the values of b and / from observa- tions confined to the range 0° to 100° C, in which case an error of I per cent., in the observed expansion at 50° C, would mean an error of 60 per cent, at 445°, or of 360 per cent, at 1000° C. (Cal- lendar, Phil. Mag. December 1899). Moreover, it by no means follows that the average value of b between 0° and 100° C. should be the same as at higher or lower temperatures. The method of extra- polation would therefore probably lead to erroneous results in many cases, even if the value could be determined with absolute pre- cision over the fundamental interval. It is probable that this expansion correction, which cannot be reduced or eliminated like many of the other corrections which have been mentioned, is the chief source of

uncertainty in the realization of the absolute scale of temperature at the present time. The uncertainty is of the order of one part in five or ten thousand on the fundamental interval, but may reach 0-5° at 500" C, and 2° or 3° at 1000° C.

18. Thermodynamical Correction. — Of greater theoretical interest, but of less practical importance on account of its smallness, is the reduction of the scale of the gas thermometer to the thermo- dynamical scale. The deviations of a gas from the ideal equation pv = R0 may be tested by a variety of different methods, which should be employed in combination to determine the form of the characteristic equation. The principal methods by which the prob- lem has been attacked are the following : —

(1) By the comparison of gas thermometers filled with different gases or with the same gas at different pressures (employing both gravimetric and manometric methods) the differences in their indications are observed through as wide a range of temperature as possible. Regnault, employing this method, found that the differences in the scales of the permanent gases were so small as to be beyond the limits of accuracy of his observations, Applying greater refinements of measurement, Chappuis and others have succeeded in measuring small differences, which have an important bearing on the type of the characteristic equation. They show, for instance, that the equation of van der Waals, according to which all manometric gas thermometers should agree exactly in their indications, requires modification to enable it to represent the behaviour of gases even at moderate, pressures.

(2) By measuring the pressure and expansion coefficients of different gases between 0° and loo° C. the values of the funda- mental zero (the reciprocal of the coefficient of expansion or pres- sure) for each gas under different conditions may be observed and compared. The evidence goes to show that the values of the fundamental zero for all gases tend to the same limit, namely, the absolute

zero, when the pressures are indefinitely reduced. The type of characteristic equation adopted must be capable of repre- senting the variations of these coefficients.

(3) By observing the variations of the product pv with pressure at constant temperature the deviations of different gases from Boyle's law are determined. Experiment shows that the rate of change of the product pv with increase of pressure, namely d(pv)/dp, is very nearly constant for moderate pressures such as those em- ployed in gas thermometry. This implies that the characteristic equation must be of the type

v=F(e)/p+fm

(19)

in which F(0) and /(0) are functions of the temperature only to a first approximation at moderate pressures. The function F(0), representing the limiting value of pv at zero pressure, appears to be simply proportional to the absolute temperature for all gases. The function /(0), representing the defect of volume from the ideal volume, is the slope of the tangent at p = o to the isothermal of on the pv, p diagram, and is sometimes called the " angular coeffi- cient." It appears to be of the form b—c, in which b is a small constant quantity, the " co-volume," of the same order of magni- tude as the volume of the liquid, and c depends on the cohesion or co-aggregation of the molecules, and diminishes for all gases continuously and indefinitely with rise of temperature. This method of investigation has been very widely adopted, especially at high pressures, but is open to the objection that the quantity b — c is a very small fraction of the ideal volume in the case of the permanent gases at moderate pressures, and its limiting value at p=o is therefore difficult to determine accurately.

(4) By observing the cooling effect dS/dp, or the ratio of the fall of temperature to the fall of

pressure under conditions of con- stant total heat, when a gas flows steadily through a porous plug, it is possible to determine the variation of the total heat with pressure from the relation

Sde/dp=6dv/de-v

. (20)

(See Thermodynamics, § 10, equation 15.) This method has the advantage of directly measuring the deviations from the ideal state, since Bdvjdd = v for an ideal gas, and the cooling effect vanishes. But the method is difficult to carry out, and has seldom been applied. Taken in conjunction with method (3), the observation of the cooling effect at different temperatures affords most valuable evidence with regard to the variation of the defect of volume c — b from the ideal state. The formula assumed to represent the variations of c with temperature must be such as to satisfy both the observations on the compressibility and those on the cooling effect. It is possible, for instance, to choose the constants in van der Waals's formula to satisfy either (3) or (4) separately within the limits of experimental error, but they cannot be chosen so as to satisfy both. The simplest assumption to make with regard to c is that it varies inversely as some power n of the absolute tem- perature, or that c = Co(0o/0)", where c is the value of c at the tempera- ture 0o. In this case the expression Bdv/dB — v takes the simple form (n+i)c-b. The values of n, c and b could be calculated from observations of the cooling effect Sd6/dp alone over a sufficient range of temperature, but, owing to the margin of experimental error and the paucity of observations available, it is better to make use of the observations on the compressibility in addition to those on the cooling effect. It is preferable to calculate the values of c and b directly from equation (20), in place of attempting to integrate the equation according to Kelvin's method (Ency. Brit. ed. ix. vol. xi. p. 573), because it is then easy to take account of the variation of the specific heat S, which is sometimes important.

Calculation of the Correction. — Having found the most probable values of the quantities c, b and n from the experimental data, the calculation of the correction may be very simply effected as follows: The temperature by gas thermometer is defined by the relation T = /w/R, where the constant R is determined from the observations at o° and 100° C. The characteristic equation in terms of absolute temperature may be put in the tormd = pv/R' --q, where q is a small quantity of the same dimensions as temperature, given by the relation

q = (c-b)p/R …. (21)

The constant R' is determined, as before, by reference to the funda- mental interval, which gives the relation RYR = l + (?i- 2o)/loo, where q\, go are the values of q at 100° and 0° C. respectively.

The correction to be added to the fundamental zero To of the gas thermometer in order to deduce the value of the absolute zero 0o (the absolute temperature corresponding to o° C.) is given by the equation,

0o-T o =2o- (gi - go)#o/ioo . . . (22)

The correction dt to be added to the centigrade temperature t by gas thermometer reckoned from 0° C. in order to deduce the corre- sponding value of the absolute temperature also reckoned from 0° C. is given by the relation, deduced from formula (14),

where q is the value at t° C. of the deviation (c-b)p/R. The formulae may be further simplified if the index n is a simple integer such as 1 or 2. The values of the corrections for any given gas at different initial pressures are directly proportional to the pressure.

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*Values of the Corrections. — If we take for the gas hydrogen the values c = i-5 c.c. at 0° C, 6 = 8-q c.c., with the index n = I 5, which satisfy the observations of Joule and Thomson on the cooling effect, and those of Regnault, Amagat and Chappuis on the com pressibility, the values of the absolute zero 80, calculated from Chappuis's values of the pressure and expansion coefficients at 100 cms. initial pressure, are found to be 273- 10° and 273-05° respectively, the reciprocals of the coefficients themselves being 273-03 an d 27322. The corrections are small and of opposite signs. For nitrogen, taking £0=1*58, 6 = 1-14, » = I*S. we find similarly 273-10° and 273- 13 for the absolute zero, the correction 0o-To in this case amounting to nearly 1°. The agreement is very good considering the difficulty of determining the small deviations c and 6, and the possible errors of the expansion and pressure- coefficients. It appears certain that the value of the absolute zero is within a few hundredths of a degree of 273-10°. Other observa- tions confirm this result within the limits of experimental error. The value of the index n has generally been taken as equal to 2 for diatomic gases, but this does not satisfy either the observations on the cooling effect or those on the compressibility so well as n = 1-5, although it makes comparatively little difference to the value of the absolute zero. The value deduced from Travers's observation of the pressure-coefficient of helium is 273-13°, taking n = 5, which is the probable value of the index. for a monatomic gas. The application of the method to the condensible gas carbonic acid is interesting as a test of the method (although the gas itself is not suited for thermometry), because its deviations from the ideal state are so large and have been so carefully studied. The observations of Joule and Thomson on the cooling effect give Co = 3-76 c.c, 6 = 0-58 c.c, to = 2, provided that allowance is made for the variation of the specific heat with temperature as determined by Regnault and Wiedemann. Chappuis's values of the pressure and expansion coefficients agree in giving 273-05° for the absolute zero, the*

values of the corrections O -To being 4-6° and 5-8° respectively.

The values of the scale correction it deduced from these formulae agree with those experimentally determined by Chappuis in the case of carbonic acid within the limits of agreement of the observa- tions themselves. The calculated values for nitrogen and hydrogen jtive rather smaller differences than those found experimentally, but the differences themselves are of the same order as the experi- mental errors. The deviations of hydrogen and helium from the absolute scale between o° and 100° C. are of the order of -ooi° only, and beyond the limits of accuracy of experiment. Even at -250° C. (near the boiling-point of hydrogen) the corrections of the constant volume hydrogen and helium thermometers are only a tenth of a degree, but, as they are 01 opposite signs, the difference amounts to one-fifth of a degree at this point, which agrees ap- proximately with that observed by Travers. For a fuller discussion of the subject, together with tables of corrections, the reader may refer to papers by Callendar, Phil. Mag. v. p. 48 (1903), and D. Berthelot, Trav. et Mini. Bur. Int. Paris, xiii. (1903). Berthelot assumes a similar type of equation to that given above, but takes n = 2 in all cases, following the so-called law of corresponding states. This assumption is of doubtful validity, and might give rise to relatively large errors in the case of monatomic gases.

19. Limitations. — In the application of the gas thermometer to the measurement of high temperatures certain difficulties are encountered which materially limit the range of measure- ment and the degree of accuracy attainable. These may be roughly classified under the heads — (1) changes in the volume of the bulb; (2) leakage, occlusion and porosity; (3) chemical change and dissociation. The difficulties arise partly from defects in the materials available for the bulb, and partly from the small mass of gas enclosed. The troubles due to irregular changes of volume of glass bulbs, which affect the mercury thermometer at ordinary

temperatures, become so exaggerated at higher points of the scale as to be a serious source of trouble in gas thermometry in spite of the twentyfold larger expansion. For instance, the volume of a glass bulb will be diminished by from one-quarter to one-half of 1 per cent, the first time it is heated to the temperature of boiling sulphur (445° C). This would not matter so much if the volume then remained constant. Unfortunately, the volume continues to change, especially in the case of hard glass, each time it is heated, by amounts which cannot be predicted, and which are too large to neglect. The most accurate method of taking account of these variations in a series of observations, without recalibrating and refilling and cleaning the bulb, is to assume the known constant value of the coefficient of expansion of the gas, and to calculate the volume of the bulb at any time by taking observations in ice and steam (Phil. Trans. A. 1891, vol. 1S2, p. 124). Similar changes take place with porcelain at higher temperatures.

Metallic bulbs are far more perfect than glass bulbs in this respect. It is probable that silica bulbs would be the most perfect. The writer suggested the use of this material (in the Journ. Iron and Steel Inst, for 1892), but failed to construct bulbs of sufficient size. W. A. Shenstone, however, subsequently succeeded, and there seems to be a good prospect that this difficulty will soon be minimized. The difficulties of leakage and porosity occur chiefly with porcelain bulbs, especially if they are not perfectly glazed inside. A similar difficulty occurs with metallic bulbs of platinum or platinum-iridium, in the case of hydrogen, which passes freely through the metal by occlusion at high temperatures. The difficulty can be avoided by substituting either nitrogen or preferably argon or helium as the thermometric material at high temperatures. With many kinds of glass and porcelain the chemical action of hydrogen begins to be appreciable at temperatures as low as 200 or 300° C. In any case, if metallic bulbs are used, it is absolutely necessary to protect them from furnace

gases which may contain hydrogen. This can be effected either by enclosing the bulb in a tube of porcelain, or by using some method of electric heating which cannot give rise to the presence of hydro- gen. At very high temperatures it is probable that the dis- sociation of diatomic gases like nitrogen might begin to be appreciable before the limit of resistance of the bulb itself was reached. It would probably be better, for this reason, to use the monatomic and extremely inert gases argon or helium.

20. Other Methods. — Many attempts have been made to over- come the difficulties of gas pyrometry by adopting other methods of measurement. Among the most interesting may be men- tioned: (i.) The variation in the wave-length of sound. The objection to this method is the difficulty of accurately observing the wave-length, and of correcting for the expansion of the material of the tubes in which it is measured. There is the further objection that the velocity varies as the square root of the absolute temperature, (ii.) A similar method, but more promising, is the variation of the ref ractivity of a gas, which can be measured with great accuracy by an interference method. Here again there is difficulty in determining the exact length of the heated column of gas, and in maintaining the tempera- ture uniform throughout a long column at high temperatures. These difficulties have been ingeniously met by D. Berthelot (Comptes Rendus, 1895, 120, p. 831). But the method is not easy to apply, and the degree of accuracy attainable is prob- ably inferior to the bulb methods, (iii.) Methods depending on the effusion and transpiration of gases through fine orifices and tubes have been put in practice by Barus and by the writer. The method of transpiration, when the resistance of the tube through which the current of gas is passed is measured on the Wheatstone bridge principle (Nature, 23rd March 1899), is extremely delicate, and the apparatus may be made very small and sensitive, but the method cannot be used for extrapolation at high temperatures until the law of increase of resistance

has been determined with certainty. This may be successfully accomplished in the near future, but the law is apparently not so simple as is usually supposed.

On account of these and similar difficulties, the limit of gas thermometry at the present time must be placed at 1500° C, or even lower, and the accuracy with which temperatures near rooo" C. are known does not probably exceed 2° C. Although measurements can be effected with greater consistency than this by means of electrical pyrometers, the absolute values corresponding to those temperatures must remain uncertain to this extent, inasmuch as they depend on observations made with the gas thermometer.

Electrical Thermometry

21. The convenience of the mercurial thermometer lies in the fact that it is complete in itself, and can be read without sub- sidiary appliances beyond a magnifying glass. Its weakness lies in the very limited range of each single instrument, and in the troublesome and often uncertain corrections which must be applied to its readings in all work of precision. Electrical

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thermometers have the disadvantage of requiring auxiliary apparatus, such as galvanometers and resistances, the use of which involves some electrical training. But they far surpass the mercurial thermometer in point of range, delicacy and adaptability, and can be applied to many investigations in which ordinary thermometers are quite useless.

There are two kinds of electrical thermometers, which depend on different effects of heat on the electrical properties of metals: (r) The Thermocouple, or Thermopile, which depends on the

production of a thermoelectric force when the junctions of different metals in an electric circuit are at different tempera- tures; and (2) the Electrical Resistance Thermometer, the action of which depends on the fact that the resistance of a pure metal to the passage of an electric current increases very con- siderably when the temperature is raised. The theory of the thermocouple is discussed in the article Thermoelectricity, as it possesses many points of interest, and has been studied by many skilful experimentalists. The electrical resistance ther- mometer is of more recent origin; but although the theory has been less fully developed, the practice of the method bids fair to surpass all others in the variety and accuracy of its applica- tions. In order to secure the widest possible range and the greatest constancy, in either variety of electrical thermometer, advantage is taken of the great stability and infusibility charac- teristic of the metals of the platinum group. Other metals are occasionally used in work at low temperatures with thermo- couples for the sake of obtaining a larger electromotive force, but the substitution is attended with loss of constancy and uncertainty of reduction, unless the range is greatly restricted.

22. Applications of the Thermocouple.— The principal uses of the thermocouple in thermometry are for measuring high temperatures, and for measuring small differences of tempera ture, more particularly when the temperature is required to be measured at a point, or in a very small space. The electro- motive force of the couple depends only on the temperature at the plane of junction of the two metals, which can be very exactly located. A typical instance of a measurement to which the thermocouple is peculiarly suited, is the determination of the cyclical variations of temperature at accurately measured depths from one-tenth to one-hundredth of an inch in the metal of the cylinder of a heat engine, the interior surface of which is exposed to cyclical variations of temperature in the working of the engine. 1 The exact depth of the plane of junction

can be measured without difficulty to the thousandth of an inch. The insertion of the wire makes the least possible disturbance of the continuity of the metal. There is no lag, as the thermometer itself is part of the metal. The instantaneous value of the temperature at any particular point of the stroke can be measured separately by setting a periodic contact to close the circuit of the galvanometer at the desired point. A further advantage is gained by measuring only the difference of tem- perature between two junctions of a thermocouple at different depths, instead of the whole interval from some fixed point. None of these advantages could be secured by the use of any ordinary thermometer; some depend on the fact that the method is electrical, but some are peculiar to the thermocouple, and could not be otherwise attained.

On the other hand, the thermocouple is not well suited for thermometry of precision on account of the smallness of the electromotive force, which is of the order of ten microvolts only per degree for the most constant couples. By the use of very delicate galvanometers it is possible to read to the hundredth or even in special cases to the thousandth of a degree on this small difference, but unfortunately it is not possible to eliminate accidental thermal effects in other parts of the circuit due to small differences of temperature and material. These acci- dental effects seldom amount to less than one or two microvolts even in the best work, and limit the accuracy attainable in temperature measurement to about the tenth of a degree with a single platinum thermocouple. This limit can be surpassed

'Hall, Trans. Amer. Inst. Elect. Eng. 1891, vol. viii. p. 226; Callendar and Nicolson, Prec. Inst. C. E. vol. exxxi. p. 1.

by using couples of greater thermoelectric power and less permanence, or by using a pile or series of couples, but in either case it is doubtful whether the advantage gained in power is not balanced by loss of simplicity and constancy. A method of

avoiding these effects, which the writer has found to be of great use in delicate thermoelectric researches, is to make the whole circuit, including all the terminals and even the slide- wire itself, of pure copper. Platinoid, german silver, constantan and other alloys most commonly used for resistances and slide- wires, are particularly to be avoided, on account of their great thermoelectric power when connected to copper. Manganin and platinum-silver are the least objectionable, but the improve- ment effected by substituting copper is very marked. It is clear that this objection to the use of the couple does not apply so strongly to high temperatures, because the electromotive force of the couple itself is greater, and the accuracy attainable is limited by other considerations.

23. The Resistance Thermometer. — In practice the resistance thermometer is almost invariably made of platinum, since there is very seldom any advantage to be gained by the substitution of baser metals. The instrument is for this reason often re- ferred to simply as the " platinum thermometer." It is im- portant that the platinum should be pure, both for the sake of uniformity and also because the change of electrical resistance with temperature is greatly diminished by impurities. The observation of the fundamental coefficient, which is 00390 (or rather larger than the coefficient of expansion of a gas) for the purest metal hitherto obtained, is one of the most delicate tests of the purity of the metal. In addition to the constancy and infusibility of the metal, a special advantage which is secured by the use of platinum is the close agreement of the thermo dynamical scale with the platinum scale of temperature, as defined by the formula

^^ioolR-Ro^C^-Re), . . . (24)

in which the symbol pt stands for the temperature on the platinum scale centigrade, and R, Ri and R are the observed resistances of the thermometer at the temperatures pt, ioo° and o° C. respectively. A platinum thermometer is generally arranged to read directly in degrees of temperature on the platinum

scale, just as a mercury thermometer is graduated in degrees of the mercury scale. The reduction to the scale of the gas thermometer is most conveniently effected by the difference formula

t— pt—dt(t — ioo)/io,ooo, . . . (25)

in which d is a constant, called the difference-coefficient, the value of which for pure platinum is about 1-50, but varies slightly for different specimens. This formula was first given by the writer as the result of a series of comparisons of different platinum wires with each other and with other metals, and also with an air thermometer over the range o° to 625° C. The platinum wire in these comparisons was enclosed inside the bulb of the air thermometer itself, and disposed in such a manner as to be at the mean temperature of the bulb in case the temperature was not quite uniform throughout (Phil. Trans. A. 1887, p. 161). The formula was subsequently verified by C. T. Heycock and F. H. Neville (Journ. Ckem. Soc. February 1805), by the observation of a number of higher points up to the freezing-point of copper at 1082 C, which they showed to agree with the most probable mean of all the best determinations by various methods of gas thermometry. At still higher temperatures, beyond the present range of the gas thermometer, the writer has succeeded in obtaining pre- sumptive evidence of the validity of the same formula by comparison with the scales of the expansion and the specific heat of platinum, which appear to follow similar laws (Phil. Mag. December 1899). If we assume that the coefficient of expansion of platinum, the coefficient of increase of resistance, and the specific heat are all three linear functions of the tem- perature, we obtain results which are in agreement within the limits of error of observation up to the fusing-point of platinum itself. The same formula has been independently verified by

the comparison of platinum thermometers with the constant- volume nitrogen thermometer by Harker and Chappuis (Phil. Trans. A. 1900), working at the International Bureau at Sevres, over the range o° to 650° C, It has also been shown to satisfy very closely the observations on the variation of electrical resistance of other metals over wide ranges of tem- perature. Although the theoretical explanation of the formula has not yet been given, owing to our ignorance of the true nature of electrical conduction and of the molecular constitution of metals, it may be regarded from an empirical point of view as being one of the most accurately established of all thermometric formulae. It will be observed that it also represents the simplest possible type of divergence from the thermodynamical scale.

24. Methods and Apparatus. — The methods of electrical thermometry may be roughly classified under two heads as (1) deflection methods, in which the temperature is deduced from the observed deflection of a galvanometer; and (2) balance methods, in which the resistance or the electromotive force is balanced against a known adjustable resistance or potential difference. The former methods are most suitable for rough work and rapid reading, the latter for accurate measurements. In the practice of the deflection method it is customary to use a movable-coil galvanometer, the sensitiveness of which can be varied by varying the resistance in circuit, or by varying the stiffness of the suspension. The accuracy attainable is of the order of one-half of 1 per cent, on the deflection, and is limited by variations of resistance of the galvanometer, and by the imperfect elasticity of the suspension. In any case the scale of the galvanometer should be calibrated or tested for uniformity. In this kind of work the thermocouple has the advantage over the resistance thermometer in that the latter requires an auxiliary battery to supply the current; but in many cases this is no disadvantage, because it permits a greater latitude

of adjustment, and makes it possible to obtain greater power than with the thermocouple.

In cases where it is desired to obtain greater accuracy with- out abandoning the quickness of reading which is the principal advantage of the deflection method, it is possible to combine the two methods by balancing part of the potential difference by means of a potentiometer and using the galvanometer for the small changes only. In cases where the greatest accuracy is required, a very sensitive galvanometer should be used, and the whole of the potential difference should be balanced as nearly as possible, leaving very little to depend on the deflection of the galvanometer. The degree of sensitiveness and accuracy obtainable depends primarily on the delicacy of the galvano- meter, on the power available, and on the steadiness of the conditions of experiment. For thermometry of precision the resistance thermometer possesses three very great advantages over the thermocouple: (1) The power available, owing to the use of a battery, is much greater; (2) it is possible completely to eliminate the errors due to accidental thermal effects by reversing the battery; (3) the Wheatstone bridge method can be employed in place of the potentiometer, so that the con- stancy of the battery is immaterial, and it is not necessary to use a standard cell. The conditions to be satisfied in the attain- ment of the greatest possible accuracy in the measurement of temperature by this method differ somewhat from those which obtain in ordinary measurements of resistance, so that a special type of apparatus has been evolved for the purpose, a brief description of which will be given.

25. Compensated Bridge Apparatus. — It is necessary that the thermometer should be connected to the measuring apparatus by wires or " leads " of considerable length, generally at least two of three metres, in order to avoid exposing the galvanometer and resistance box, or other delicate parts of the apparatus, to changes of temperature. It is also essential that the leads should not be too thick or heavy, for convenience in handling and to prevent

conduction of heat along the stem of the thermometer. The resistance of that part of the leads which is exposed to variations of temperature necessarily changes, and would give rise to serious errors if it were not determined or compensated. The method now generally adopted in accurate work is to compensate the variations

of resistance of the leads by an exactly similar pair of dummy leads called the " compensator " and connected as shown diagram- matically in fig. 6. The battery, consisting of a single cell, with a rheostat and reversing key in circuit, is connected to the terminals AB of the two equal resistance coils AG, GB, which form the ratio arms of the balance. These coils must be carefully tested for equality of temperature-coefficient, and placed in close proximity to each other so as to be always at the same temperature. If they are interwound on the same reel, they must be most carefully insulated from each other. In parallel circuit with the ratio coils are connected the compensator CC and the balancing resistances C'E, on one side of the bridge-wire EF, and the compensating resistances FP and the pyrometer and leads PRP' on the other side. The galvanometer is connected to the point G between the ratio coils, and to the sliding contact D on the bridge-wire. Since the ratio coils are always equal, equal changes of resistance on either side of D are eliminated, and do not affect the balance. Thus the changes of the pyrometer leads PP' are balanced by the equal changes of the compensator leads CC on the other side. As a further refinement, which is of some importance in delicate work, the ends of the compensator leads are connected by a short piece of the same wire as the pyrometer coil. For instance, in observing the variations of temperature of the steam in the cylinder of a steam engine at different points of the stroke with a very delicate thermometer made of wire one-thousandth of an inch in diameter (Proc. Inst. C. E., vol. cxxxi. fig. 16, p. 23), the ends of the fine wire attached to the thick leads could not follow the rapid varia- tions of temperature, and it was found necessary to adopt

this device to eliminate the end-effect. It is also useful in other cases to eliminate the effect of conduction along the leads in cooling the ends of the fine wire coil. The balancing resistances C'E are made of some alloy such as manganin or platinum-silver, the resistance

Rheostat

C

lOvwvW

AW.Shunt

Com pens a tor Tkermr

U\nJ

CoilM

Fig. 6. — Diagram of Compensated Bridge Method

of which varies very little with change of temperature. Platinum- silver is probably the best material, as it can be perfectly annealed at a red heat without risk of burning, and is then extremely constant. UnleBS the box can be kept at an absolutely constant and uniform temperature, which is not impossible but often inconvenient, it is necessary to allow for the change of resistance of the balancing coils C'E due to change in the temperature of the box. The tem- perature of the coils cannot be accurately determined with a mercury thermometer unless they are immersed in oil, but even in that case it is necessary to know the temperature-coefficient of each individual coil. A more convenient and accurate method, which eliminates the correction automatically, is to compensate each individual coil of the balancing coils C'E by a corresponding com- pensating coil at FP on the other side of the bridge-wire. The compensating coils are made of platinum, also annealed at a red heat, and each is placed in the box in close proximity to the coil it is intended to compensate. Each balancing coil and its com-

pensator are tested together at various temperatures between 10° and 30 C, and are adjusted until their difference remains constant for any small variation of temperature in the neighbour- hood of 20° C. This method of compensation was applied by the writer in 1887, but has not been generally adopted on account of the labour involved in adjusting the coils. The absolute values of the resistances are immaterial, but it is necessary to know the relative values with the greatest possible accuracy. For this reason it is preferable to arrange the resistances in the binary scale, each resistance being equal to twice the next smaller resist- ance, or to the sum of all the smaller resistances, the two smallest resistances being made equal. This arrangement permits the greatest accuracy of comparison in the simplest manner with the fewest observations. The bridge-wire EF provides a continuous scale for reading small changes of resistance. Any change of resistance of the pyrometer coil necessitates the movement of the balance point D through an equivalent resistance along the bridge- wire. The equivalent resistance of the bridge-wire per unit length of the attached scale is preferably adjusted, by means of a shunt shown in parallel with it in fig. S, to be an exact submultiple of

the smallest resistance coil. It is usual also to adjust the resistances of the thermometers so that their fundamental intervals are con- venient multiples of this unit, generally either ioo, 200, 500, or 1000, so that the bridge-wire may read directly in degrees of tem- perature on the platinum scale. It is easy to get a scale of 10 cms. or more to the degree, and it is not difficult with a suitable galvano- meter to read to the ten-thousandth part of a degree. The length of the bridge-wire itself need not be more than 20 or 30 cms., as the balancing resistances enable the scale

to be indefinitely ex- tended. Thus the instrument possesses the great advantage over the mercury thermometer that the most open scale may be easily secured without unwieldy length, and without restricting the range of each thermometer.

26. Errors and Corrections. — It is most instructive to consider the errors and corrections involved in platinum thermometry on the same lines as those on which the corresponding errors of the mercury thermometer have already been treated.

I. The changes of zero of the mercury thermometer arise chiefly from the small expansibility of mercury combined with the im- perfect elasticity of the containing tube. In platinum thermo- metry the containing tube has nothing to do with the reading, and the effect of any possible strain of the fine wire of the coil is minimized by its small dimensions and by the large temperature- coefficient of the increase of resistance, which is more than twenty times greater than the coefficient of apparent expansion of mercury in glass. It is not surprising, therefore, that the changes of zero of a platinum thermometer should be practically negligible, pro- vided that the wire is not strained and contaminated with impurities. It is probable that with ordinary care the changes of zero due to exposure to any given limits of temperature are in all cases less than the limit of accuracy of observation, due to other causes at the extreme limit of the range considered.

II. The fundamental interval of each thermometer must be determined as usual by observations in ice and steam, and a correc- tion must be applied by the method already described in the case of the mercury thermometer. The difference of the temperature of the steam from ioo° C. should be determined on the platinum scale by the approximate formula

dp/i = -985^1 = -0362(11 — 760) — -oooo2o(H — 760) 2 . (26)

III. Pressure Correction. — The effect of change of

pressure on a platinum thermometer of the ordinary tube form is of course nothing, as the wire itself is not exposed to the pressure. Even if the wire is naked and directly exposed to large changes of pressure, the change of reading is almost inappreciable. Similarly there is no source of error analogous to the effects of capillarity, which are so troublesome with delicate mercury thermometers.

IV. Stem Exposure. — The reading of a platinum thermometer with compensated leads depends only on the temperature of the coil of wire forming the bulb, and not on the temperature of the stem, provided that the immersion is sufficient to avoid errors due to conduction or convection along the stem. It is desirable that the top of the bulb should be immersed to a depth equal to from three to ten times the diameter of the tube, according to the accu- racy required.

V. Scale Correction. — The reduction to the thermodynamical scale may be effected, within the limits of probable error of the most accurate measurements at present available, by the very simple difference formula (25) already given, over the whole range from -100° C. to +1100 C. This is in striking contrast with the mercury thermometer, which requires a cubic formula to cover the range o° to 200° C. with equal accuracy. The value of the constant d in the formula varies but little, provided that the wire be fairly pure and the thermometers properly constructed. In order to determine its value in any special case, it is best to take an observation at the boiling-point of sulphur (S.B.P.) for tempera- tures above 0° C, or at that of oxygen for temperatures below 0° C. down to -200° C. It appears probable that there is a point of inflection in the curve of resistance-variation of platinum and some other metals in the neighbourhood of -200 C, and that the formula does not apply accurately below this point. It has become the custom to assume the boiling-point of sulphur (S.B.P.) under normal pressure to be 444-53° C, as determined by Callendar and Griffiths, using a constant-pressure air thermometer, and to take the

rate of change of temperature with pressure as ‘082° per mm. from Regnault’s observations. According to experiments made at Kew Observatory with platinum thermometers (Chree, Proc. R. S., 1900), the rate of change is somewhat larger than that given by Regnault’s formula, namely, about 090° per mm., and it appears desirable to determine this constant with greater accu racy. The difference between the above formulae reaches a tenth of a degree if the barometer differs by 12 mm. from 760 mm. The uncertainty in the absolute boiling-point of sulphur, however, is probably somewhat greater than one-tenth of a degree, on account of the uncertainty of the expansion correction of the gas thermometer (Phil. Mag., December 1899). The thermodynamical correction of the gas thermometer, which amounts to half a degree at this point, is also to some extent uncertain, on account of the extrapolation. Provided, however, that some exact value of the S.B.P. is chosen

for reference, for the reduction of observations with platinum thermometers, the results so reduced will be strictly comparable, and can be corrected at any subsequent time when the value of the S.B.P. is more accurately determined. The boiling-point of oxygen may be taken as -182-5° C. with sufficient approximation for a similar purpose.

VI. Calibration Correction.— The calibration of the resistance box and the bridge-wire corresponds to the calibration of the stem of the mercury thermometer, but the process is much simpler for several reasons. It is more easy to obtain a uniform wire than a uniform tube. The scale of the wire is much more open, it corre- sponds to a very small part of the whole scale, and the process of calibration is easier. One box when calibrated will serve for any number of thermometers of different ranges and scales, and covers the; whole range of temperature (see Calibration).

27. Electrical Precautions. — The platinum thermometer is so far superior to the mercury thermometer in all the points above enumerated that,

if there were no other difficulties, no one would ever use a mercury thermometer for work of precision. In using a platinum thermometer, however, some electrical training is essen- tial to obtain the best results. The manipulation and adjustment of a delicate galvanometer present formidable difficulties to the non-electrical observer. Bad contacts, faulty connexions, and defective insulation, are not likely to trouble the practised elec- trician, but present endless possibilities of error to the tyro. A useful discussion of these and similar details is given in the paper by Chree already referred to. Bad insulation of the pyrometer and connexions can easily be detected, in the compensated instru- ment already described, by disconnecting one of the C leads from the battery and one of the P leads from the bridge-wire. Under these conditions the galvanometer should not deflect if the insula- tion is perfect. Defective insulation is most likely to be due to damp in the thermometer at low temperatures. This source of error is best removed by drying and hermetically sealing the ther^ mometers. Trouble from bad contacts generally arises from the use of plugs for the resistance coils. If plugs are used, they must be specially designed so as not to disturb each other, and must be well fitted and kept very clean. Mercury cups with large copper terminals, well amalgamated, as used with standard resistance coils, are probably the simplest and most satisfactory method of changing connexions. Accidental thermoelectric effects in the circuit are a possible source of error, as with the thermocouple, but they are always very small if the thermometer is properly con- structed, and are relatively unimportant owing to the large E.M.F. available. In any case they may be completely eliminated by reversing the battery. The heating effect of the current through the thermometer is often negligible, but should be measured and allowed for in accurate work. With a current of •01 ampere the rise of temperature should not ex- ceed ,Jt, or ioo of a degree. With a delicate galvanometer it is possible to read to the ten- thousandth of a degree with a current of only •002 ampere, in which case

the heating effect is generally less than yaW of a degree. It can be very easily measured in any case by changing from one cell to two, thus doubling the current in the thermometer, and quadrupling the heating effect. The correction is then applied by subtracting one- third of the difference between the readings with one and two cells from the reading with one cell. The correction is always very small, if a reasonably sensitive galvanometer is used, and is frequently negligible, especially in differential work, which is one of the most fruitful applications of the platinum thermometer.

28. Construction of Thermometers. — One of the chief advantages of the platinum thermometer for research work is the endless variety of forms in which it may be made, to suit the particular exigencies of each individual experiment. It is peculiarly suited for observing the average tem- perature throughout a length or space, which is so often required in physical experiments. For this purpose the wire may be disposed in a straight length, or in a spiral, along the space in question. Again, in observing the temperature of a gas, the naked wire, on account of its small mass and extremely low radiative power, is far superior to any mercury thermometer. The commonest form of platinum thermometer (fig. 7), and the most suitable for general purposes, contains a coil B from Thermometer. i in. to 2 in. long, wound on a cross of thin mica, and enclosed in a tube, about i to J in. in diameter, of glass or porcelain according to the temperature for which it is required. The pyro- meter leads and the compensator leads are insulated and kept in place by passing through mica disks fitting the tube, which serve also to prevent convection currents up and down the tube. The protecting tube of glass or porcelain is fitted with a wooden head A carrying four insulated terminals, PP, CC, to which the pyrometer

B

Fig. 7 — Platinum

and compensator leads are respectively connected, and Which serve to connect the instrument to the measuring apparatus: ' • For work of the highest precision these terminals are often ornitted, and the leads are directly soldered to a flexible cable in order to avoid possible errors from thermoelectric effects and changes of resistance of the screw terminals. For temperatures above 500° C. the protecting tube must be of porcelain, and the leads of platinum throughout that part of the tube which is exposed to high tem- peratures. For lower temperatures a tube of hard glass and leads of copper or silver may be employed, but it is better in any case to make the lower part of the leads of platinum in order to diminish the conduction of heat along the stem. For laboratory work a tube 30 or 40 cm. in length usually suffices, but for large furnaces the length of the protecting tube is often 5 to 10 ft. In the latter case it is usual to protect the porcelain tubes with an external steel tube, which may be removed for delicate measurements.

29. Special Forms of Thermometer. — In the measurement of linear expansion it is a great advantage to employ a thermometer with the bulb or sensitive portion equal in length to the bar or column under test, so as to obtain the mean temperature of the whole length. In measuring the linear expansion of a standard metre or yard, a fine platinum wire enclosed in a glass capillary, or other- wise insulated, is employed, its length being equal to that of the bar. The same method has been applied by Callendar (Phil. Trans. A, 1887) and Bedford (Phil. Mag., 1898) to the expansion of glass and porcelain at high temperatures, employing a fine wire sup- ported along the axis of the tube under test. An equivalent method, applied to the expansion of silica by Callendar, is to enclose a rod of the material inside a platinum tube which is heated by an electric current. This is a very rapid and

convenient process, since the mean temperature of the rod must be equal to that of the enclosing tube. Any temperature up to the melting-point of platinum is readily obtained, and easily regulated. The temperature may be obtained by observing either the resistance of the platinum tube or its linear expansion. Either method may also be employed in J. Joly's meldometer, which consists of an electrically heated strip for observing the melting-points of minerals or other substances in small fragments. In observing the temperature of a long column of mercury, as in the method of equilibrating columns for deter- mining the absolute expansion of mercury, a platinum thermo- meter with a bulb equal in length to the column may similarly be employed with advantage. The application is here particularly important because it is practically impossible to ensure perfect uniformity of temperature in a vertical column, 6 ft. or more in length, at high temperatures.

30. Sensitive Thermometers. — Where quickness of reading is essen- tial, the mercury thermometer, or the tube form of electric ther- mometer, is unsuitable. In cases where the thermometer has to be immersed in a conducting liquid or solution, the fine wire forming the bulb may be insulated by enclosing it in a coiled glass capillary. This method has been employed by Callendar and Barnes and by Jaeger, but the instrument is necessarily fragile, and requires careful handling. For non-conducting liquids or gases the bare wire may be employed with great advantage. This is particularly important in the case of gases owing to the extreme sensitiveness thus obtained and the almost complete immunity from radiation error at moderate temperatures. Thermometers constructed in the form of a flat grid of bare wire mounted on a mica and ebonite frame have been employed by H. Brown (Proc. R. S., 1905, B 76, p. 124) for observing the temperature of leaves and of air currents to which they were exposed. They have also been employed for observing the air-temperature for meteorological purposes in Egypt and Spain with very satisfactory

results (Proc. R. S., 1905, A 77, p. 7). The fine wire, owing to its small size and bright metallic surface, very rapidly acquires the temperature of the air, and is very little affected by radiation from surrounding objects, which is one of the chief difficulties in the employment of mercurial thermometers for the observation of the temperature of the air.

For the observation of rapidly varying temperatures, such as those occurring in the cylinder of a gas- or steam-engine, an electrical thermometer with very fine wire, of the order of -ooi in. diameter is practically the only instrument available. The temperature at any particular moment may be obtained by setting a mechanical contact-maker to close the circuit at the desired point. The sen- sitive part of the thermometer consists simply of a loop of fine wire from half an inch to an inch long, connected by suitable leads to the measuring apparatus as employed by Burstall (Phil. Mag., October 1895) in the gas-engine, and Callendar and Nicolson (Proc. Inst. C. E., 1898) in the steam-engine. The explosion tempera- tures cannot be satisfactorily measured in a gas-engine in this manner, because the radiation error at high temperatures is exces- sive unless the wire is very fine, in which case it is very soon melted even with weak mixtures. Callendar and Dalby accordingly de- vised a mechanical valve (Proc. R. S., A 80, p. 57) for exposing the thermometer only during the admission and compression strokes, and have deduced the actual explosion temperatures from the indicator diagram. B. Hopkinson (Proc. R. S., A 77, p. 387) suc- ceeded in following the course of an explosion in a closed Vessel by means of a similar thermometer connected to a galvanometer

Of short peric^femrig a-«ottflAuous vrecord'ftil a>m6ving^plw>to gfaphic film..' When thfe 'fiawie rtadhect t1ie'Wiire"th«' ***^w»at«te rose 1206 G; in about A irf'S second, wteieh illustrates the orde*** *of sensitiveness attainable with a ■ fine wire of this size. O. R. Lummer and E. Pringsheim, in their measurements of the ratio of the specific heats of*

gases by observing the fall of temperature due to sudden expansion, employed a very thin strip of foil with the object of securing greater sensitiveness. This was a somewhat doubtful expedient, because such a strip is extremely fragile and liable to be injured by air currents, and because the sensitiveness is not as a matter of fact appreciably improved, whereas the radia- tion error is increased in direct proportion to the surface exposed. One of the principal sources of error in employing a short loop of fine wire for observing rapidly varying temperatures is that the ends of the loop close to the thick leads are affected by conduction of heat to or from the leads, and cannot follow the rapid variations of temperature. This error may be readily avoided by the method, first employed by Callendar and Nicolson, of connecting the com- pensating leads with a short length of the same fine wire. The end effect is then eliminated by observing the difference of resist- ance between two loops of different lengths. Thermocouples of very fine wire have also been employed for similar measurements, but they are more difficult to make than the simple loop of one wire, and the sensitiveness attainable is much less, owing to the small E.M.F. of a single thermocouple.

31. Radiation Thermoscopes. — For measuring the intensity of radiation, some form of thermometer with a blackened bulb or sensitive area is employed. It is assumed that the rise of tem- perature of the thermometer is approximately proportional to the intensity of the radiation according to Newton's law of cooling (see Heat) for small differences of temperature. A mercury maximum thermometer with a small blackened bulb is still very generally employed in meteorological observatories for registering the maximum solar radiation. But the indications are liable to error and very difficult to interpret, and an instrument of this type is not sufficiently sensitive or quick in action for weak sources of radiation. Sir John Leslie employed an air thermoscope, similar to that of Galileo (Heat, fig. 1), with a blackened bulb. This has the

advantage of a small capacity for heat, and is still employed in various forms for demonstration purposes, but is not sufficiently sensitive for accurate work. Electrical thermometers are now generally employed on account of their superior sensitiveness, and also on account of the greater facility of adaptation for the require- ments of each particular experiment. The most familiar instru- ment is M. Melloni's thermopile, which is built up of a number of small bars of antimony and bismuth, or other alloys of high thermo- electric power, arranged in the form of a cube with alternate junc- tions on opposite faces. When connected to a galvanometer of suitable resistance, this arrangement gives a high degree of sensi- tiveness on account of the multiplication of couples, but owing to the large mass of metal involved in its construction it takes a considerable time to acquire a steady state. This defect has been remedied in the radiomicrometer of C. V. Boys (Phil. Trans., 1888, 180 A, p. 159) by employing a single junction attached to a small disk of very thin copper. The free ends of the minute bars forming the couple are connected to a loop of thin copper wire suspended by a fine quartz fibre between the poles of a magnet. This arrange- ment forms a very delicate galvanometer and gives the maximum sensitiveness attainable with a single couple, since all unnecessary connecting wires are avoided. It is incomparably quicker and more dead-beat in action than the ordinary thermopile, but has the disadvantage that it must be set up permanently on a steady support and the radiation brought to it in a horizontal direction. An instrument of similar delicacy is the radiometer, the action of which depends on the repulsive effect of the residual gas in a nearly perfect vacuum on a delicately balanced vane suspended by a fine fibre. An instrument of this type was first constructed by Sir William Crookes (see Radiometer) ; the instrument was applied to radiation measurements, and its sensitiveness greatly improved by E. F. Nichols. It requires a very steady mounting, like the radiomicrometer, but has the additional defect that

the radiation must be introduced through a window, which may give rise to selective absorption. Other varieties of thermopile, in which the sensitive parts are constructed, as in Boys' radiomicrometer, so as to have a very small capacity, but are connected like the ordinary pile to a separate galvanometer, have been employed by Lord Rosse for observations of lunar heat and by W. H. Julius and Callendar for the solar corona.

In cases where the radiation can be concentrated on a very small area, such as the receiving disk of the radiomicrometer, the thermoelectric method is probably the most sensitive. But if there is no restriction as to the area of the receiving surface, con- siderable advantage may be gained in convenience of manipulation, without loss of sensitiveness, by the electric resistance method. An instrument of this type was first employed by S. P. Langley (Proc. Amer. Acad., 1881, 16, p. 342) under the name of the bolo- meter, by which it has since been known. The sensitive surface is made in the form of a blackened grid of thin metallic foil, gene- rally platinum coated with platinum black, connected in one of the

arms of a Wheatstone bridge. The rise of temperature of the grid when exposed to radiation is measured by its increase of resistance in the usual manner. In order to compensate for changes of temperature of the surrounding air the balancing resistance is made of a precisely similar grid, placed in close proximity to the first but screened from radiation. The foil should be as thin as possible consistent with strength, in order to secure the maximum sensitiveness. For spectroscopic work a single strip or linear bolometer is employed. For absolute

measurements, where it is necessary to absorb the whole radiation admitted through a given area, two grids are placed with the strips of one behind the inter spaces of the other.*

32. Absolute Measurement of Radiation. — In many cases the object is not to secure the maximum degree of sensitiveness, but an absolute measurement of the intensity of the radiant energy, in calories per square centimetre per minute, or other suitable units. For this purpose some form of radiation thermometer is generally employed, but the method of procedure is modified. The earlier methods as exemplified in C. S. M. Pouillet's pyrhelio- meter, or L. J. G. Violle's actinometer, consisted in observing the rate of rise of temperature of a small calorimeter, or thermometer of known thermal capacity, when exposed to a given area of the radiation to be measured. To secure greater sensitiveness A. P. P. Crova substituted a copper disk with an attached thermocouple for the calorimetric thermometer. The method is very simple and direct, but has the disadvantage that the correction for external loss of heat is somewhat uncertain and difficult to apply, since the conditions are unsteady and the observation depends on rate of change of temperature. For this reason static methods, depending on the steady temperature finally attained, in which the rate of loss of heat is directly determined by an electric compensation method, have come more prominently into favour in recent years. In K. J. Angstrom's pyrheliometer {Acta Soc. Upsala, 1893) two similar blackened strips of equal area and resistance are fixed side by side in a suitable case in such a manner that either may be exposed to the radiation to be measured while the other is simul- taneously heated by an electric current. Attached to the backs of the strips, but insulated from them by thin paper, are the two junctions of a thermocouple which indicates when the temperatures are equal. When this condition is secured the intensity of the radiation is equal to the rate of generation of heat per unit area by the electric current, which is deduced, from a

knowledge of the resistance and area of the strip, by observing the current required to balance the radiation. The instrument is very quick and sen- sitive in action, and the method avoids any assumption with regard to the rate of loss of heat, except that it i6 the same for the two similar strips at the same temperature. The accuracy of the method is limited chiefly by the measurement of the resistance and width of the strips, and by the difficulty of securing exact similarity and permanence in the attachment of the junctions of the thermocouple. Small differences in this respect may be elimi- nated by interchanging the strips, but there remain outstanding differences between different instruments of the same make whicl) often exceed 5 per cent.

An electric method proposed by F. Kurlbaum (Wied. Ann., 1898, 65, p. 748) consists in observing the rise of temperature produced by radiation in a bolometer grid, then cutting off the radiation and observing the increase of current required to produce the same rise of temperature. There is no difficulty in this case in measuring the area exposed or the resistance of the bolometer, and no uncertainty can arise as to the temperature of the strip, because the heated strip itself serves as its own thermometer. The current is easily deduced from a knowledge of the resistances and the E.M.F. of the battery. The chief source of uncertainty mentioned by Kurlbaum lies in possible differences between the effects of radiation and current-heating near the ends of the strips, the area so affected representing a large proportion of the whole area. In Angstrom's method this is not so important because the temperature indicated by the couple is that near the middle of the strip. In the case of the bolometer this end-effect may be com- pensated, as explained by Callendar {Proc. R. S., 1907, 77 A, p. 7), in the same manner as for sensitive thermometers, by employing two similar bolometers with strips of different lengths.

An important defect of all the methods so far considered is that the measurement depends on the

coefficient of absorption of the black with which the receiving surface is coated. The error is probably small, of the order of I or 2 per cent., but is difficult to determine accurately, and varies to some extent with the quality of the radiation. The absorptive power is generally less for /rays of great wave-length than for visible rays. If we assume that the loss of heat by conduction and convection is independent of the nature of the surface the defect in question may be avoided by th? following method. Two bolometer strips, one bright and the other black, but otherwise exactly similar, are simultaneously exposed to the radiation to be measured, and are traversed by the same electric current. The black strip will be more heated by the radiation than the bright, but the rise of temperature of the bright strip due to the current will be greater than that of the black strip because its emissive power is lower. If the current is adjusted

until the temperatures of the two strips are equal the losses by convection and conduction will be equal, and also the rate of genera- tion of heat by the current in each strip. The rise, of temperature must therefore be such that each strip loses as much heat by radia- tion to the surrounding case as it gains from the incident radiation to be measured. Assuming Kirchhoff's law, the ratio of the emissive to the absorptive power is the same for all bodies at the same temperature, and is equal to the emissive power of a perfectly black body. The rise of temperature of each strip, when balance is attained, will be the same as that of a perfectly black strip under the same conditions of exposure. The electric current in this method serves to eliminate losses by convection and conduction, and the result is obtained in terms of the observed rise of tempera- ture and the radiation constant for a black body. The method works well for a source at ioo° C. ; but, for a high temperature source, a correction is required because the absorptive powers of the strips may differ appreciably from their emissive powers.

Another electric compensation method of special interest is the method of the " Peltier cross," A small disk of copper is sup- ported by two thermoelectric couples forming a cross. One of the couples serves to measure the rise of temperature, while the other is traversed by an electric current, which may be employed to compensate the radiation by the heat absorption due to the Peltier effect. The advantage of this method is that the Peltier effect is easily determined from an observation of the thermoelectric power (see Thermoelectricity) in absolute measure, and that it is proportional to the first power of the current. Loss or gain of heat by conduction from the supporting wires, and changes of temperature in the surrounding case, are readily compensated by mounting two similar disks side by side. Small differences between the disks are eliminated by exposing them to radiation alternately, with reversal of the current, so that the irradiated disk is cooled or the other disk heated by the Peltier effect. The current is adjusted in each case so that the temperatures of the disks are equal, as indicated by the second couple connecting the disks. The method is about equal in sensitiveness to that of Angstrom, but it is easier to secure conditions of exact similarity and to measure the quantities involved in the absolute determination, namely, the area of the hole through which the radiation is ad- mitted, and the coefficient of the Peltier effect. The uncertainty due to imperfect blackness of the disks may be eliminated by using cups in place of disks; and the sensitiveness and range may be increased by using thermopiles in place of single couples.

33. Optical or Radiation Pyrometers. — Since the intensity of radiation increases very rapidly with the temperature of the source of radiation, instruments for measuring radiation may be applied for measuring temperature, assuming that the laws connecting radiation and temperature are known. The advantage of this method is that the measurement may be made from a distance without exposing any part of the measuring apparatus to the destructive action of

high temperatures. Apart from the diffi- culty of calibrating the measuring apparatus to give temperature in terms of radiation, the chief source of uncertainty in the appli- cation of the method is the emissive power of the source of radia- tion. The methods principally employed may be divided into two classes: — (1) Radiation methods, depending on the measurement of the radiant energy by means of a radiometer, thermocouple or bolometer; (2) optical or photometric methods, depending on the colour or luminous intensity of the radiation as compared with a suitable standard.

Of the radiation methods the simplest in theory and practice depends on observing the total intensity of radiation, which varies as the fourth power of the absolute temperature according to the Stefan-Boltzmann law (see Heat) for a perfectly black body or full radiator. In applying this method it is very necessary to allow for the emissive power of the source, in case this does not radiate as a black body. Thus the emissive power of polished platinum at 1000 Abs. is only 10 per cent., and that of black iron oxide about 40 per cent, of that of a black body; and the percentage varies differently for different bodies with change of temperature, and also for the same body according to the part of the spectrum used for the measurement. Owing to the rapid increase of radiation with temperature the error due to departure from black body radiation is not so serious as might be imagined at first sight. If the temperature of a polished platinum strip at 1500 C. were estimated by the radiation formula, assuming the constant for a perfectly black body, the error for red light would be about 125°, for green about ioo°, and for blue about 75 °. Such errors may be corrected when the emissive power of the source at various tem- peratures is known from previous experiments, but it is preferable to observe, whenever possible, the radiation from the interior of a uniformly heated enclosure which approximates very closely to that of a black body (see Heat).

Radiation pyrometers of this type are generally

calibrated by the method of sighting on the interior of an electric furnace con- taining a thermocouple or gas-thermometer by which the tempera- ture is measured. The gas-thermometer has been employed for verifying the law of radiation up to 1500 C, but the difficulties of obtaining accurate results with the gas-thermometer increase so

rapidly above 1200 C. that it is questionable whether; anyiadvan- tage is gained by using it beyond this point. The : law of ridiation has been so closely verified by observations at lower temperatures that the uncertainty involved in applying it at higher temperatures, in the case of a black body is probably less than the uncertainty of the gas-thermometer measurements, and much less than the uncertainty of extrapolating an empirical formula for a thermo- couple. Thus L. F. C. Holborn and W. Wien (Wied. Ann., 1895, (6), by extrapolating their thermoelectric formula, found the value 1587° C. for the melting-point of palladium, whereas Violle found 1500 C. by the calorimetric method, and Callendar and Eumorfo- poulos (Phil. Mag., 1899, 48) found 1540 and 1550 C. by the methods of the expansion and the change of resistance of platinum respectively. By a later thermoelectric extrapolation Holborn and Henning [Berlin Akad., 1905, 12, p. 311) found 1535 C. for the melting-point of palladium, and 1710 C. for that of platinum, values which were strikingly confirmed by J. A. Harker at the National Physical Laboratory, and by Waidner and Burgess at the Bureau of Standards, U.S.A. Holborn and Valentiner employing an optical method {Ann. Phys., 1907, 22, p. 1) found 1582° C. and 1789° C. for palladium and platinum respectively. There can be little doubt that the extrapolation of the parabolic formula for the

thermocouple at these temperatures is quite untrustworthy (see Thermoelectricity) and that the values given by the electrical resistance method, or by the laws of radiation, are more likely to be correct. Assuming that the total radiation varies as the fourth power of the absolute temperature, a radiation pyrometer can be calibrated by a single observation at a known temperature, such as the melting-point of gold, 1062 ° C. if a black body is employed as the source; and its indications will probably be accurate at higher temperatures under a similar restriction. If the pyrometer is sighted on the interior of a furnace through a small observation

Fig. 8.

-Fery's Mirror Pyrometer (Camb. Scient. Inst. Co.). For temperatures from 500° C. to 1100 C

hole it will indicate the temperature of the furnace correctly, pro- vided that the temperature is uniform. But it must be remembered that this condition does not generally exist in large furnaces. Sup- pose, for instance, that it is required to find the temperature of the molten metal on the hearth of a furnace viewed through a thick layer of furnace gases, which are probably at a much higher temperature. It is evident that the radiation from the intervening flame may be much greater than that from the metal, and may introduce serious errors. The same objection applies with greater force to optical pyrometers, as the luminous radiation from gases may be of a highly selective character. If, on the other hand, it is required to observe the temperature of metal in a laoHe before casting, the surface of the metal must be cleared of scum, and it is necessary to know the emissive power of the metal or oxide exposed.

For scientific measurements of temperature by the radiation method, the thermopile, or bolometer, or radiomicrometer. previ- ously calibrated by exposure to a black body at a known tempera- ture, is directly exposed at a known distance to a known area

of the source of radiation. The required result may then be deduced in terms of the area and the distance. The use of extraneous optical appliances is avoided as far as possible on account of selec- tive absorption. For practical purposes, in order to avoid trouble- some calculations and measurements, an optical arrangement is employed, either lens or mirror, in order to form an image of the source on the receiving surface. Fig. 8 illustrates Fery's mirror pyrometer, in which a mirror M, focused by the pinion P, forms an image of the source on a disk, supported by wires of constantan and copper forming a thermocouple, connected by the brass strips D and R to the terminals b, V . The observation hole in the wall of the furnace is sighted through the eyepiece O, and is made to overlap the disk slightly. The rise of temperature of the junction is assumed to be proportional to the intensity of radiation, and is indicated by the deflexion of a delicate galvanometer connected to the terminals b, b'. A lens may be substituted for the mirror at high temperatures, but it is necessary to allow for the selective absorption of the lens, and to a less extent for that of the mirror, by a special calibration of the scale.

...AwMMwng! Wien's laws for the distributifth qfi energy- io, th spectrum (see Heat), the 'temperature of a black body .may : also be measured by observing (1) the wave-length corresponding to maximum intensity in the normal spectrum, which varies: inversely as the absolute temperature, or (2) the maximum intensity itself, which varies as the fifth power «f the absolute temperature, or (3) the intensity of radiation corresponding, to some particular radiation or colour, which varies as an exponential function, the exact form of which is somewhat uncertain. Methods (1) and (2) require elaborate apparatus and are impracticable except for pur- poses of scientific research. The exact application of method (3) is almost equally difficult, and is less certain in its results, but for optical purposes this method may be realized with a fair degree of approximation by the use of*

coloured glasses, and forms the basis in theory of the most trustworthy optical pyrometers.

34. Optical or Photometric Pyrometers. — The change of colour of a heated body from red to white with rise of temperature, and the great increase of intrinsic brilliancy which accompanies the change, are among the most familiar methods of estimating high tempera- tures. For many processes eye estimation suffices, but a much greater degree of accuracy may be secured by the employment of suitable photometers. In Mesure and Nouel's pyrometric tele- scope, the estimation of temperature depends on observing the rotation of a quartz polarimeter required to reduce the colour of the radiation to a standard tint. It has the advantage of requiring no auxiliary apparatus, but, owing to the lack of a standard of comparison, its indications are not very precise. In the majority of photometric pyrometers, a standard of comparison for the inten- sity of the light, either an amyl-acetate or gasoline lamp, or an electric glow-lamp, is employed. The optical pyrometer of H. L. Le Chatelier (Comptes Rendus, 1892, 114, p. 214) was one of the earliest, and has served as a model for subsequent inventors. The standard of comparison is an amyl-acetate lamp, the flame of which is adjusted in the usual manner and viewed in the same field as the image of the source. The two halves of the field are adjusted to equality of brightness by means of a cat's eye diaphragm and absorption glasses, and are viewed through a red glass, giving nearly monochromatic radiation in order to avoid the difficulty of comparing lights of different colours. Assuming Wien's law, the logarithm of the intensity of monochromatic radiation for a black body is a linear function of the reciprocal of the absolute temperature, and the instrument can be graduated by observing two temperatures; but it is generally graduated at several points by comparison with temperatures observed by means of a thermo- couple.

The Wanner Pyrometer (Phys. Zeits., 1902, p. 112) is a modi- fication of Konig's spectrophotometer, in which the two halves of the field, corresponding to

the source and the standard of com- parison, are illuminated with monochromatic red light polarized in planes at right angles to each other. The two halves may be equalized by rotating the analyzer, the circle of which is graduated to read in degrees of temperature. The instrument has a some- what restricted range of maximum sensitiveness, and cannot be used below 900° C. owing to the great loss of light in the compli- cated optical system. It cannot be sighted directly on the object since no image is formed as in the Le Chatelier or Fery instruments, but the methods of securing monochromatic light by a direct vision spectroscope, and of adjusting the fields to equality by rotating the analyser, are capable of great precision, and lead to simple theoretical formulae for the ratio of the intensities in terms of Wien's law.

The Fery Absorption Pyrometer (Journ. Phys., 1904, p. 32) differs from Le Chatelier s only in minor details, such as the replacement of the cat's eye diaphragm by a pair of absorbing glass wedges. The principles of its action and the method of calibration are the same. The pyrometers of Morse, and of L. F. C. Holborn and F. Kurlbaum depend on the employment of a glow lamp filament as standard of comparison, the current through which is adjusted to make the intrinsic brilliancy of the filament equal to that of the source. When this adjustment is made the filament becomes invisible against the image of the source as background, and the temperature of the source may be determined from an observation of the current required. Each lamp requires a separate calibration, but the lamps remain fairly constant provided that they are not overheated. To avoid this, the source is screened by absorption glasses (which also require calibration) in observing' high tempera- tures. Except at low temperatures the comparison is effected by placing a red glass before the eyepiece. At low temperatures a special advantage of the glow-lamp as a standard of comparison is that it matches the source in colour as well as in brightness, so that the instrument is very sensitive. At high temperatures the red glass

serves chiefly to mitigate the glare.

35. Registering and Recording Thermometers. — The term register- ing thermometer is usually applied to an instrument with an index which requires setting, and when set will indicate the maximum or minimum temperature occurring, or will register the temperature at a particular time or place. A recording instrument is one con- structed to give a continuous record of the temperature, and requires a revolving drum or some equivalent clockwork mechanism

for recording the time. The most familiar types of registering thermometers are modifications of the common liquid-in-glass thermometer.

John Rutherford's maximum, invented before 1790, was an ordinary mercurial thermometer placed horizontally; the column pushed before it a small steed index which was left at the highest point reached and was drawn down again to the liquid by a magnet when the instrument had to be reset. It is little used now. Negretti and Zambra's maximum has a constriction in the tube near the bulb, past which the mercury easily expands but cannot return when the temperature falls, since the column breaks at the narrowed point when the fluid in the bulb begins to contract. The instrument is set for a fresh observation by shaking the detached portion of the column back down the tube. The clinical thermo- meters used by physicians are instruments of this type, and are made with a very open scale to read only in the neighbourhood of the normal temperature of the human body. In the Phillips or Walferdin maximum a portion of the mercury is separated from the rest by a minute bubble of air. It is placed horizontally and as the temperature rises the detached portion of the column is pushed forward but is not withdrawn when the main column retreats towards the bulb in cooling. It is set for a new

observa- tion by bringing it into a vertical position and tapping it slightly. By reducing the length of the index and the bore of the stem this thermometer may be made suitable for use in any position without altering its register.

The minimum thermometer in most common use is that of Rutherford, invented in 1790. It is a spirit thermometer, pre- ferably filled with amyl alcohol, to reduce risk of distillation, in the column of which a small porcelain index is included. The instru- ment is hung horizontally, and, as the temperature falls, the index is drawn back through surface tension by the end of the column. When the temperature rises the liquid flows past the index, which is left at the lowest point attained. To prepare the instrument for a fresh observation it is inverted, when the index falls back against the end of the column. James Six's combined maximum and minimum thermometer (Phil. Trans., 1782) consists of a U-tube, the bend of which is filled with mercury. One leg contains spirit above the mercury and terminates in a bulb also full of spirit. The other leg also contains a column of spirit above the mercury, but terminates in a bulb containing air and vapour of spirit mixed. With increase of temperature the spirit in the full bulb expands; the mercury in consequence is pushed round the bend and rises to a greater or less extent in the other leg, carrying before it a steel index which thus marks the maximum tempera- ture. With cold the spirit in the full bulb contracts, and the mercury moves back carrying with it a second index which marks the minimum temperature. The instrument is set by drawing down the two indices upon the two ends of the mercury column by means of a magnet.

With a mercury thermometer a continuous record o f tempera- ture can only be obtained by the aid of photographv, a method which has been in use for many years at some first-class obser- vatories, but which cannot be generally employed on account of the expense and the elaborate nature of the apparatus required. The commonest type of recording thermometer works on the principle of the Bourdon

pressure-gauge. The bulb consists of a curved metallic tube filled with liquid, the expansion of which with rise of temperature tends to straighten the tube. The movements are recorded on a revolving drum by a pen carried at the end of a light lever attached to the bulb. This form of instrument is widely employed for rough work, but it has a very limited range and is unsuitable for accurate work on account of want of sensitiveness and of great liability to change of zero, owing to imperfect elas- ticity of the metal tube. For accurate work, especially at high temperatures, electrical thermometers possess many advantages, and are often the only instruments available. They are com- paratively free from change of zero over long periods, and the ther- mometer or pyrometer itself may be placed in a furnace or elsewhere at a considerable distance from the recording apparatus. The principal types are the thermocouple and the platinum resistance thermometer already described, which may be employed for record- ing purposes, without altering the thermometer itself, by connexion to a suitable recording mechanism. The methods in use. for record- ing the indications of electrical thermometers may be classified as in § 24 under the two headings of (1) deflexion methods and (2) balance methods. Deflexion methods, in which the deflexion of the galvanometer is recorded, are more suitable for rough work, and balance methods for accurate measurements. The most delicate and most generally applicable method of recording the deflexions of a mirror galvanometer is by photographing the move- ments of the spot of light on a moving film. Almost any required scale or degree of sensitiveness may be obtained in this manner, but the record cannot be inspected at any time without removal and development. Since the forces actuating the needle of the galvanometer are very small, it is out of the question to attach a pen or marking point directly to the end of the pointer for record- ing a continuous trace on a revolving drum, because the errors due to friction with the recording sheet would be excessive. This difficulty has been avoided in many electrical

instruments by

depressing the pointer so as to mark the paper only at regular intervals of a minute or so, leaving it completely free for the greater part of the time. The record thus obtained is discontinuous, but is sufficient for many purposes. For accurate measurement, or for obtaining an open scale over a particular range of temperature, it is necessary to employ some form of balance method as already explained in § 24.

36. Electric Recorder, Balance Method. — The application of the electric balance, potentiometer or Wheatstone-bridge for recording changes of resistance or electromotive force has been effected by employing a galvanometer of the movable coil type as a relay. The deflexion of the galvanometer to right or left, according as the resistance or E.M.F. increases or diminishes, is made to actuate one or other of a pair of motors for moving the contact point on the bridge wire and the recording pen on the drum in the corre- sponding direction. A continuous record free from friction error is thus obtained, since the galvanometer does not actuate the pen directly. With an electrical resistance thermometer it is possible in this way to obtain continuous pen-and-ink records on a scale of an inch or more to the degree, reading to 01 ° C. and practically free from zero error over any desired range from — 200 ° to +1500 C. With a thermocouple, employing the potentiometer method, the same apparatus can be used with advantage, but it is not possible to obtain so open a scale on account of the smallness of the thermo electromotive force available.

The attainment of sufficient delicacy in the relay mechanism turns on the employment of a rotating or vibrating contact in combination with a moving coil galvanometer of the siphon- recorder type. This was first successfully effected by Callendar (Trans. R. S. Canad., 1897) for records of radiation and tem- perature, and has since been applied to submarine telegraphy by S. G. Brown and by A. Muirhead. The

mechanism of Callendar's electrical recorder, as arranged for temperature measurements, is described and illustrated in Engineering, May 26, 1899, and in a treatise on Pyrometry by Le Chatelier and Boudouard. Electrical recording instruments of both types are now coming into extensive use for industrial purposes in the measurement of furnace tempera- tures, &c, for which they are particularly suitable, because the recording apparatus can be placed at any distance from the furnaces which may be considered most convenient, arid can be connected to any one of a set of furnaces in succession whenever it is desired to obtain a record.

Authorities. — There is no special work on the subject of ther- mometry in English, but most of the principles and methods are described in text-books on heat, of which Preston's Theory of Heat may be specially mentioned. For recent advances in ther- mometry the reader should consult the original papers, the most important of which have been cited. The greater part of the recent work on the subject will be found m the publications of the Bureau International des Poids et Mesures de Sevres (Paris), of the Reichsanstalt (Berlin), of the Bureau of Standards, U.S.A. (Washington), and of the National Physical Laboratory (London). (H. L. C.)

THERMOPYLAE (Gr. 6epn6s, hot, and iruXrj, gate), a Greek pass leading from Locris into Thessaly between Mount Oeta and the sea (Maliac Gulf). It is chiefly famous for the heroic defence made by Leonidas, the Spartan king, with 300 Spartan soldiers against the Persian army of Xerxes advancing upon Greece in 480 (see Leonidas and authorities there quoted). Two other famous battles took place at the pass. In 279 B.C. Brennus and the Gauls were checked for several months by a Greek army under the Athenian Calippus, and in 191 Antiochus of Syria vainly attempted to hold the pass against the Romans under M'. Acilius Glabrio. In the time of Leonidas the pass was a narrow track (probably about 14 yds. wide) under the cliff. In modern times the deposits of the Spercheius have widened it to a breadth of 15 to 3 m. broad. The hot springs from which the pass

derived its name still exist close to the foot of the hill. There is one large spring used as a bath and four smaller ones, and the water, which is of a bluish greeni colour and contains lime, salt, carbonic acid and sulphur, is said to produce good effects in cases of scrofula, sciatica and rheu- 1 matism. The accommodation for bathers is, however, quite inadequate.

For the topography see Grundy, Great Persian War, pp. 277-291.

THEROIGNE DE MERICOURT, ANNE JOSEPHE (1762- 1817), a Frenchwoman who was a striking figure in the Revolu- tion, was born at Marcourt (from a corruption of which name she took her usual designation), a small town in Luxembourg, on the banks of the Ourthe, on the 13th of August 1762. She wis the daughter of a well-to-do farmer, Peter Th6roigne. She

appears to have been well educated, having been brought up in the convent of Robermont ; she was quick-witted, strikingly- handsome in appearance and intensely passionate in temper ; and she had a vigorous eloquence, which she used with great effect upon the mobs of Paris during that short space of her life (1789-93) which alone is of historical interest. The story of her having been betrayed by a young seigneur, and having in consequence devoted her life to avenge her wrongs upon aristocrats, a story which is told by Lamartine and others, is unfounded, the truth being that she left her home on account of a quarrel with her stepmother. In her career as courtesan she visited London in 1782, was back in Paris in 1785, and in Genoa in 1788, where she was a concert singer. In 1789 she returned to Paris. On the outbreak of the Revolution, she was surrounded by a coterie of well-known men, chief of whom were Petion and Desmoulins; but she did not play the role which legend has assigned her. She took no part in the taking of the Bastille nor in

the days of the 5th and 6th of October, when the women of Paris brought the king and queen from Versailles. In 1790 she had a political salon and spoke once at the club of the Cordeliers. The same year she left Paris for Marcourt, whence after a short stay she proceeded to Liege, in which town she was seized by warrant of the Austrian Govern- ment, and conveyed first to Tirol and thereafter to Vienna, accused of having been engaged in a plot against the life of the queen of France. After an interview, however, with the emperor Leopold II., she was released; and she returned to Paris in January 1792, crowned of course with fresh laurels because of her captivity, and resumed her influence. In the clubs of Paris her voice was often heard, and even in the National Assembly she would violently interrupt the expression of any moderatist views. Known henceforth as " la belle Liegoise," she appeared in public dressed in a riding habit, a plume in. her hat, a pistol in her belt and a sword dangling at her side, and excited the mob by violent harangues. Associated with the Girondists and the enemies of Robespierre, she became in fact the " Fury of the Gironde." She commanded in person the 3rd corps of the so-called army of the faubourgs on the 20th of June 1792, and again won the gratitude of the people. She shares a heavy responsibility for her connexion with the riots of the 10th of August. A certain contributor to the journal, the Acts of the Apostles, Suleau by name, earned her savage hatred by associating her name, for the sake of the play upon the word, with a deputy named Populus, whom she had never seen. On the 10th of August, just after she had watched approvingly the massacre of certain of the national guard in the Place Vend6me, Suleau was pointed out to her. She sprang at him, dragged him among the infuriated mob, and he was stabbed to death in an instant. She took no part in the massacres of September, and, moderating her conduct, became less popular from 1793. Towards the end of May the Jacobin women seized her, stripped her naked, and flogged her in the public garden of the Tuileries. The following year she became mad, a fate not surprising when one considers her career.

She was removed to a private house, thence in 1800 to La Salpetriere for a month, and thence to a place of confinement called the Petites Maisons, where she remained— a raving maniac — till 1807. She was then again removed to La Salpetriere, where she died, never having recovered her reason, on the 9th of June

1817.

See M. Pellet, Etude historique et biographique sur Theroigne de Mericourt (1886) ; L. Lacour, Les Origines dufeminisme contemporain. Trots femmes de la Revolution (Paris, 1900) ; Vicomte de Reiset, La Vraie Theroigne de Mericourt (Paris, 1903) ; E. and J. de Gon- court, Portraits intimes,du XVIIP. siecle (2 vols., 1857-58); and the play Theroigne de Mericourt of M. PaulHervieu, produced at the Th&atre Sarah Bernhardt in 1902.

THERSITES, the ugliest man in the Greek^camp before Troy, celebrated for his biting tongue. The special objects of his attack were the leaders of the army, and Homer {Iliad, ii. 212) tells how he was chastised by Odysseus for daring to abuse the commander-in-chief. According to a later story, Achilles, after

he had slain the Amazonian queen Penthesilea, bitterly lamented her death; for this he was reviled by Thersites, who even insulted the body of the dead queen. Achilles thereupon slew Thersites with a blow of his fist (Quint. Smyrn. i. 722). There was a play by Chaeremon called Achilles the Ther sites-slayer , probably a satyric drama, the materials of which were taken from the Aethiopis of Arctinus.

THESAURUS (Gr. drjaavpos), the term in architecture given to the Greek treasure house, and at one time applied to the beehive tombs of Mycenae and other parts of Greece, now recognized as tombs; the subterranean chambers under some of the Greek temples were probably used as treasure rooms. Sometimes in the rear of the cella of a Greek temple there was a chamber, known as the opisthodomus, in

which the treasures were kept; and, failing this provision, the epinaos or rear portico of the temple was enclosed with large railings and utilized for the same purpose; in this case the term opistho-domus was applied to it. " Thesaurus " is also used of a dictionary, or lexicon, as being a " treasure house " or store of knowledge.

THESEUS, the great hero of Attic legend, 1 son of Aegeus, king of Athens, and Aethra, daughter of Pittheus, king of Troezen. Thus through his father he was descended from Erechtheus and the original stock of Attica; through his mother he came of the Asiatic fyouse of Pelops. The legend relates that Aegeus, being childless, went to Pittheus, who contrived that Aegeus should have intercourse with his daughter Aethra, and that in due time Aethra brought forth Theseus. It was given out that the child's father was Poseidon, the great god of Troezen, and that Aethra raised a temple to Athena Apaturia, at which Troezenian maids used to dedicate their girdles before marriage. For his tutor and guardian young Theseus had one Cannidas, to whom, down to Plutarch's time, the Athenians were wont to sacrifice a black ram on the eve of the festival of Theseus. On passing out of boyhood Theseus was sent by his mother to Athens. He encountered many adventures on the way. First he met and slew Periphetes, surnamed Corynetes (Clubman). At the isthmus of Corinth dwelt Sinis, called the Pine-Bender, because he killed his victims by tearing them asunder between two pine-trees. Theseus hoisted the Pine-Bender on his own pine-tree. Next Theseus despatched the Crommyon/an sow (or boar). Then he flung over a cliff the wicked Sciron, who used to kick his guests into the sea, while perforce they washed his feet. In Eleusis Theseus wrestled with Cercyon and killed him. A little farther on he slew Procrustes, who fitted all comers to his only bed: if his guest was too short for the bed, he stretched him out; if he was too long, he cut him down to the requisite length. As he passed through the streets of Athens, his curls and long garment reaching to his ankles drew on him the derision of some masons,

who were putting on the roof of the new temple of Apollo Delphinius: " Why," they asked, " was such a pretty girl out alone? " In reply Theseus took the bullocks out of their cart and flung them higher than the roof of the temple. He found his father married to Medea, who had fled from Corinth. Being a witch, she knew Theseus before his father did, and tried to persuade Aegeus to poison his son; but Aegeus recognized him by his sword and took him to his arms. Theseus was now declared heir to the throne, and the Pallantids, 2 who had hoped to succeed to the childless king, conspired against Theseus, but he crushed the conspiracy. He then attacked the fire- breathing bull of Marathon and brought it alive to Athens, where he sacrificed it to Apollo Delphinius. Next came the adventure of the Cretan Minotaur (q.v.), whom Theseus slew by the aid of Ariadne (q.v.). While Theseus was in Crete, Minos,

1 The story of Theseus is a strange mixture of (mostly fictitious) political tradition, of aetiological myths invented to explain mis- understood acts of ritual and of a cycle of tales of adventure analogous to the story of the labours of Heracles. All the passages in the Iliad and Odyssey in which his name or allusions to his legend occur are regarded with more or less probability as spurious (but see O. Gruppe, Gr. Myth., i. p. 581).

2 The sons of Pallas, the brother of Aegeus.

wishing to see whether Theseus was really the son of Poseidon, flung his ring into the Sea. Theseus dived and brought it up, together with a golden crown, the gift of Amphitrite. On the return voyage the ship touched at Naxos, and there Theseus abandoned Ariadne. He landed also at Delos, and there he and his comrades danced the crane dance, the complicated movements of which were meant to imitate the windings of the Labyrinth. 1 In historical times

this dance was still danced by the Delians round a horned altar. Theseus had promised Aegeus that, if he returned successful, the black sail with which the fatal ship always put to sea should be exchanged for a white one. 2 But he forgot his promise; and when Aegeus from the Acropolis at Athens descried the black sail out at sea, he flung himself from the rock and died. Hence at the festival which commemorated the return of Theseus there was always weeping and lamentation. Theseus now carried out a political revolution in Attica by abolishing the semi-independent powers of the separate townships and concentrating those powers at Athens, and he instituted the festival of the Panathenaea, 3 as a symbol of the unity of the Attic race. Further, according to tradition, he instituted the three classes or castes of the eupatrids (nobles), geomori (husbandmen), and demiurgi (artisans). He extended the territory of Attica as far as the isthmus of Corinth.

He was the first to celebrate in their full pomp the Isthmian games in honour of Poseidon; for the games previously insti- tuted by Hercules in honour of Melicertes had been celebrated by night, and had partaken of the nature of mysteries rather than of a festival. Of Theseus's adventures with the Amazons there were different accounts. According to some, he mailed with Hercules to. the Euxine, and there won the Amazon Antiope as the meed of valour; others said that he sailed on his own account, and captured Antiope by stratagem. There- after the Amazons attacked Athens. Antiope fell fighting on the side of Theseus, and her tomb was pointed out on the south side of the acropolis. By Antiope Theseus had a son, Hippolytus. On the death of Antiope, Theseus married Phaedra. She fell in love with her stepson Hippolytus, who, resisting her advances, was accused by her to Theseus of having attempted her virtue. Theseus in a rage imprecated on his son the wrath of Poseidon. His prayer was answered: as Hippolytus was driving beside the sea, a bull issuing from the waves terrified his horses, and he was thrown and killed. This tragic story is the subject of one of

the extant plays of Euripides. 4

The famous friendship between Theseus and Pirithous, king of the Lapiths, originated thus. Hearing of the strength and courage of Theseus, Pirithous desired to put them to the test. Accordingly he drove away from Marathon some cows which belonged to Theseus. The latter pursued, but when he came up with the robber the two heroes were so filled with admiration of each other that they swore brotherhood. At the marriage of Pirithous to Hippodamia (or Deidamia) a fight broke out between the Lapiths and Centaurs, in which the Lapiths, assisted by Theseus, were victorious, and drove the

1 The Ostiaks of Siberia have an elaborate crane dance, in which the dancers are dressed up with skins and the heads of cranes (P. S. Pallas, Reise durch verschiedene Provinzen des russischen Reichs, iii. 1778).

2 So, too, the ship that sailed annually from Thessaly to Troy with offerings to the shade of Achilles put to sea with sable sails (Philostratus, Heroica, xx. 25). The ship that was to bring Iseult to the mortally wounded Tristram was to hoist a white sail if she was on board, a black sail if she was not. The black sails recur in the modern Greek version of the tale of Theseus. Cf. Asiatick Researches, ix. 97.

1 Besides the Panathenaea Theseus is said to have instituted the festival of the Synoikia or Metoikia. Wachsmuth ingeniously supposes that the latter festival commemorated the local union in a single city of the separate settlements on the Acropolis and its immediate neighbourhood, while the Panathenaea commemorated the political union of the whole of Attica (C. Wachsmuth, Die Stadt A then im Alterthum, 1874, p. 453 sq.).

4 Theseus is also said to have taken part in the Argonautic expedition and the Calydonian boar-hunt.

Centaurs out of the country. Theseus and Pirithous

now carried off Helen from Sparta, and when they drew lots for her she fell to the lot of Theseus, who took her to Aphidnae, and left her in charge of his mother Aethra and his friend Aphidnus. He now descended to the lower world with Pirithous, to help his friend to carry off Proserpine. But the two were caught and confined in Hades till Heracles came and released Theseus. When Theseus returned to Athens he found that a sedition had been stirred up by Menestheus, a descendant of Erechtheus, one of the old kings of Athens. Failing to quell the outbreak, Theseus in despair sent his children to Euboea, and after solemnly cursing the Athenians sailed away to the island of Scyrus, where he had ancestral estates. But Lycomedes, king of Scyrus, took him up to a high place, and killed him by casting him into the sea. Long afterwards, at the battle of Marathon (490 B.C.), many of the Athenians fancied they saw the phantom of Theseus, in full armour, charging at their head against the Persians. When the Persian war was over the Delphic oracle bade the Athenians fetch the bones of Theseus from Scyrus, and' lay them in Attic earth. It fell to Cimon's lot in 469 B.C. to discover the hero's grave at Scyrus and bring back his bones to Athens. They were deposited in the heart of Athens, and henceforth escaped slaves and all persons in peril sought and found sanctuary at the grave of him who in his life had been a champion of the oppressed. His chief festival, called Theseia, was on the 8th of the month Pyanepsion (October 21st), but the 8th day of every other month was also sacred to him. 6

Whatever we may think of the historical reality of Theseus, his legend almost certainly contains recollections of historical events, e.g. the awoiKianis, whether by this we understand the political centralization of Attica at Athens or a local union of previously separate settlements on the site of Athens. The birth of Theseus at Troezen points to the immigration of an Ionian family or tribe. With this agrees the legend of the contest between Athena and Poseidon for supremacy on the acropolis of Athens, for Theseus is intimately

connected with Poseidon, the great Ionian god. Aegeus, the father of Theseus, has been identified by some modern scholars with Poseidon.

The well-preserved Doric temple to the north of the acropolis at Athens, commonly known as the Theseum, was long supposed to be the sanctuary in which the bones of Theseus reposed. But archaeologists have generally abandoned this conjecture. There were several (according to Philochorus, four) temples or shrines of Theseus at Athens; Milchhofer considers he has 1 found one of them in the neighbourhood of Peiraeus. 6

Our chief authority for the legend of Theseus is the life by Plutarch, which is a compilation from earlier writers; see also Bacchylides. G. Gilbert, who has investigated the sources from which Plutarch drew for his life of Theseus, believes that his chief authority was the Atthis of Ister, and that Ister mainly followed Philochorus {Philologus, xxxiii., 1874, p. 46 sq.),

There is a modern Greek folk-tale which preserves some features of the legend of Theseus and the Minotaur, but for the Minotaur has been substituted a seven-headed snake. See Bernhard Schmidt, Griechische Mdrchen, Sagen und Volkslieder (1877), p. 118 sq.

Among modern monographs on Theseus may be mentioned: A. Schultz, De Theseo (Breslau, 1874) ; Th. Kausel, De Thesei Synoikismo (Dillenburg, 1882); E. Pngge, De Thesei rebus gestis (Marburg, 1891); O. Wulff, Zur Theseussage (Dorpat, 1892); see also O. Gruppe, Griechische Mythologie, i. pp. 581-608; J. E. Harrison, Mythology and Monuments of Ancient Athens (1890); ” Der Theseische Synoikismos ” in C. F. Hermann’s Lehrbuch der

friechischen StaatsaltertUmer , i. (1892), pp. 303-306; A. Baumeister,)enkmaler des klassischen Altertums, iii. (1888).

THESMOPHORIA, an ancient Greek festival, celebrated

by women only in honour of Demeter Qecfjuxbopos. At Athens, Abdera, and perhaps Sparta, it lasted three days. At Athens the festival took place on the nth, 12th and 13th of the month

5 The Athenian festival in October, popularly supposed to com- memorate the return of Theseus from Crete, is interesting, as some of its features are identical with those of harvest-festivals still observed in the north of Europe. Thus the eiresidne, a branch of olive wreathed with wool and decked with fruits, bread, &c, which was carried in procession and hung over the door of the house, where it was Vept for a year, is the Erntemai (Harvest-may) of Germany.; See W. Mannhardt, Antike Wold- und Feld-Kulte (1877), p. 212 sq.

e See Erlauternder Text to the Karten von Attika (Berlin, 1881), i- P- 37 sq-

Pyanepsion (24th, 25th and 26th October), the first day being called Anodos (ascent), or, according to others, Kathodos (descent), the second Nesteia (fast), and the third Kalligeneia (fair-born). 1 If to these days we add the Thesmophoria, which were celebrated on the 10th at Halimus, a township on the coast near Athens, the festival lasted four days. 2 If further we add the festival of the Stenia, which took place on the 9th, the whole festival lasted five days. 3 The Stenia are said by Photius to have celebrated the return of Demeter from the lower world (Anodos), and the women railed at each other by night. 4 The Thesmophoria at Halimus seem to have included dances on the beach. 6 The great feature of the next day (the Anodos) is generally assumed to have been a procession from Halimus to Athens, but this assumption seems to rest entirely on an interpretation of the name Anodos, and it loses all pro- bability when we observe that the day was by others called Kathodos. 6 Probably both names referred to the descent of Demeter or Persephone to

the nether world, and her ascent from it. 7 The next day Nesteia, was a day of sorrow, the women sitting on the ground and fasting. 8 As to what took place on the Kalligeneia we have no information. 9 Nor can we define the time or nature of the secret ceremony called the ” pursuit,” or the ” Chalcidian pursuit,” and the sacrifice called the “penalty.” 10

During the Thesmophoria (and for nine days previously, if Ovid, Met., x. 434, is right, and refers to the Thesmophoria) the women abstained from intercourse with their husbands, and to fortify themselves strewed their beds with Agnus castus and other plants. The women of Miletus strewed their beds with pine branches, and put fir-cones in the sanctuaries of Demeter. 11 Whether unmarried women were admitted to the festival seems doubtful; in Lucian’s time it would appear that

1 [Or, mother of a fair daughter, i.e. Persephone.] Schol. on Aristoph., Thesmophoriazusae, 80 and 585; Diog. Laert., ix. 43; Hesychius, s.v. rpiij/jepos (the reading here is uncertain) and ivoSos; Alciphron, iii. 39; Athenaeus, vii. 307 f. Plutarch (Vil. Demosth., 30) states that the Nesteia took place on the 16th of Pyanepsion, but in this he stands alone.

2 Schol. on Aristoph., Thesm., 80; Photius, Lex., s.v. 8«r puxjnpluiv iinipai 8' (where Naber should not have altered the MS. reading 6' into i5’) ; Hesychius, s.v. rpWi] OtapxxjMplwv.

3 Schol. on Aristoph., Thesm., 834.

4 Photius, Lex., s.v. ottivio.; cf. Apollodorus, i. 5, I.

5 Plut., Solon, 8; for this passage probably refers to the Thesmo- phoria, the Cape Colias mentioned being near Halimus (see Erlau- lernder Text to the Karten von Attika, ii. 1 sq.). The Thesmophorion at Halimus is mentioned by Pausanias (i. 31, 1).

6 Hesychius (s.v. &vodot) and the Schol. on Arist.,

Thesm., 585, suppose that the day was so called because the women ascended to the Thesmophorion, which (according to the scholiast) stood on a height. But no ancient writer mentions a procession from Halimus. For the name Kathodos, see Schol., loc. oil.; Photius, Lex., s.v. Bttrncxpoplav rip.ipa.1 8'. For the statement that at one part of the festival (commonly assumed, by the writers who accept the state- ment, to be the Anodos) the women carried on their heads the " books of the law," we have only the authority of the scholiast on Theocritus, iv. 25, who displays his ignorance by describing the women as virgins (see below), and saying that they went in procession to Eleusis. The statement may therefore be dismissed as an etymological fiction. Aristophanes, Eccles., 222, is no evidence for the book-carrying.

7 The Boeotian festival of Demeter, which was held at about the same time as the Athenian Thesmophoria, and at which the megara (see below) were opened, is distinctly stated by Plutarch (De Is. et Osir., 69) to have been a mourning for the descent (Kathodos) of Persephone.

8 Plut., Dem., 30; Id., De Is. et Osir., 69.

9 [It was a day of holiday and rejoicing.]

10 Hesychius, s.v. Sioi-yva [perhaps the pursuit of Persephone] ; Suidas, s.v. xiXki5ucA>' Siwypa [according to whom, the prayers of the women at the Thesmophoria caused the flight of the enemy to Chalcis]; Hesychius, s.v. friila. For flight and pursuit as parts of religious ceremonies, cf. Plutarch, Quaest. Graec, 38, Quaest. Rom., 63, De Def. Orac, 15; Aelian, Nat. An., xii. 34; Pau- sanias, i. 24, 4, viii. 53, 3; Diodorus, i. 91; Lobeck, Aglaophamus (1829), p. 676; Marquardt, Staatsverwaltung, 2nd ed. (1885),

"i- 323-

11 Aelian, Nat. An., ix. 26; Schol. on Theocr., iv. 25; Hesychius s.v. Kviupov; Pliny, N. H., 24, 59 ;

Dioscorides, i. 135 (134, ed. Sprengel); Schol. on Nicander, Ther., 70 sq. ; Galen, xi. 808, ed. Kiihn; Steph. Byz., s.v. MiXi)7-os.

they were. 12 The women of each deme (township) elected two married women of their number to preside over them at the festival; and every married man in the township who possessed property to the value of three talents had to provide a feast for the women on behalf of his wife. 18 During the festival the women seem to have been lodged by twos in tents or huts, probably erected within the sacred precincts of the Thesmo- phorion. 14 They were not allowed to eat the seeds of the pomegranate or to wear garlands of flowers. 15 Prisoners were released at the festival, 16 and during the Nesteia the law-courts were closed and the senate did not meet. 17 Aristophanes's play on the festival sheds little light on the mode of its celebration.

At Thebes Thesmophoria were celebrated in summer on the acropolis (Cadmeia); at Eretria during the Thesmophoria the women cooked their meat, not at fires, but by the heat of the sun, and they did not invoke Kalligeneia (which seems to mean that they did not celebrate the last day of the festival); at Syracuse, during the festival, cakes called mylloi, made of sesame and honey in the shape of pudenda muliebria, were handed round. 18 Agrigentum, Ephesus and Dryme, in Phocis, had also their Thesmophoria. 19

The above was nearly all that was known about the Thesmo- phoria down to 1870. In that year E. Rohde published in the Rheinisches Museum, n.s., xxv., p. 548 sq., a scholion on Lucian (Dial. Mereir., ii. 1), which he discovered in the Vatican MS. Palatinus 73, and which furnishes some curious details about the Thesmophoria. It also explains two obscure and corrupt passages of Clemens Alexandrinus and Pausanias, the true meaning of which had been divined by Lobeck (Aglaophamus, p. 828). The sub- stance of the scholion is this. When Persephone was carried off by Pluto, a swineherd called Eubuleus was herding his swine at the spot, and his herd was

engulfed in the chasm down which Pluto had vanished with Persephone. Accordingly at the Thesmo- phoria it was customary, in memory of Eubuleus, to fling pigs into the " chasms of Demeter and Persephone." (These chasms " may have been natural caverns or perhaps vaults. The scholiast speaks of them also as adyta and megara? 1) In these chasms or adyta there were supposed to be serpents, which guarded the adyta and consumed most of the flesh "of the pigs that were thrown in. The decayed remains of the flesh were afterwards fetched by women called " drawers " (antletriai) , who, after observing rules of ceremonial purity for three days, descended into the caverns, and, frightening away the serpents by clapping their hands, brought up the remains and placed them on the altars." Whoever got a portion of this decayed flesh and sowed it with the seed in the

12 Lucian, Dial. Meretr., ii. 1. On the other hand, we read in Strabo (i. 3, 20) of virgins at Alponus ascending a tower as spec- tators ((ccrrci 8iav) of the Thesmophoria. which would seem to imply that they did not participate in it.

13 Isaeus, De Cironis Hered., 19; Id., De Pyrrhi Hered., 80.

14 Aristoph., Thesm., 624, 658, with the Schol. ad 11. As to the custom of camping out at festivals, Plutarch (Quaest. Conviv., iv, 6, 2) compares the Jewish Feast of Tabernacles with the Greek Dionysia; from which we may perhaps infer that the worshippers camped out at the Dionysia. Ci. J. Gumilla, Histoire de I'Orenoque, i. p. 256 sq. [1758].

15 Clem. Alex., Protrep., ch. ii. [p. 16, ed. Potter]; Schol. on Sophocles, Oed. Col., 681.

16 Marcellinus on Hermogenes, in Rhetores Graeci, ed. Walz, iv. 462; Sopater, ibid., viii. 67.

17 Aristoph., Thesm., 80. The word rpiri) seems to mean the Nesteia, as the Schol. ad I. takes it. That the " middle day " was the Nesteia we know from Athenaeus, vii. 307 f.

18 Xenophon, Hellen., v. 2, 29; Plutarch, Quaest. Gr., 31; Athen- aeus, xiv. 6470.

19 Polyaenus, v. 1, 1; Herodotus, vi. 16; Pausanias, x.

33. "•

20 C. T. Newton discovered in the sanctuary of Demeter and the Infernal Deities at Cnidus a chamber which may have been one of the megara referred to by the scholiast. It contained bones of pigs and marble figures of pigs. The chamber was not, however, originally subterranean. See Newton's Discoveries at Halicarnassus (1863), ii. p. 383, Travels and Discoveries in the Levant (1865), ii. p. 180 sq. According to Porphyry (De Antra Nympharum, 6) the Infernal Deities had megara, as the Olympian had temples, and the sacrificial pits of the former corresponded to the altars of the latter.

21 Compare the functions of the two Arrephoroi at Athens (Paus., i. 27, 3). For serpents in connexion with Demeter, compare Strabo, ix. 1, 9.

ground was supposed thereby to secure a good crop. 1 The rest of the scholion is obscure, and perhaps corrupt, but the following seems to be the sense. The ceremony above described was called the arretophoria [the carrying of things which must not be spoken of], and was supposed to exercise the same quickening and fertilizing influence on men as on fields. Further, along with the pigs, sacred cakes made of dough, in the shape of serpents and of phalli, were cast into the caverns, to symbolize the productivity of the earth and of man. Branches of pines were thrown in 2 for a similar reason.

The custom described in this important scholion is clearly the same as that referred to by Clemens Alexandrinus (Protrep., ch. ii.) [p. 14, ed. Potter] and Pausanias fix. 8, 1). From the latter we learn

that the pigs were sucking pigs, and from the former (if we adopt Lobeck's emendation liey&pois fwiras for tuyapifovrts) that they were thrown in alive. From Pausanias we may further per- haps infer (though the passage is corrupt) that the remains of the pigs thrown down in one year were not fetched up till the same time next year (cf. Paus., x. 32, 14). The question remains, At what point of the Thesmophoria did the ceremony described by the scholiast on Lucian take place? Rohde thinks that it formed part of the ceremonies at Halimus, his chief ground being that Clemens (Protrep., 34) and Arnobius (Adv. Gentes, v. 28) mention phalli in connexion with the " mysteries at Halimus"; but it is not certain that these mysteries were the Thesmophoria. The legend of Eubuleus seems to show that the ceremony commemo- rated the descent of Persephone to the nether world; and, if we are right in our interpretation of the name Kathodos as applied to the first day of the Thesmophoria proper, the ceremony described would naturally fall on that day. Further, if our interpretation of Pausanias is correct, the same day must have witnessed the descent of the living pigs and the ascent of the rotten pork of the previous year. Hence the day might be indifferently styled Kathodos or Anodos (" descent " or " ascent ") ; and so in fact it was.

It is usual to interpret Thesmophorus " lawgiver " and Thesmo- phoria " the feast of the lawgiver." But the Greek for " lawgiver " is not Thesmophorus but Thesmothetes (or Nomothetes, when nomos displaced thesmos in the sense of " law "). If we compare such names of festivals as Oschophoria, Lampadephoria, Hydro- phoria, Scirophoria (" the carryings of grapes, of torches, of water, of umbrellas ") with the corresponding Oschophorus, Lampade- phorus, Hydrophorus, also Thallophorus and Kanephorus, we can scarcely help concluding that Thesmophoria must originally have meant in the literal and physical sense the carrying of the thesmoi, and Thesmophorus the person who so carried them; and, in view of the ceremony disclosed by the scholiast on Lucian (compared with the analogous ceremony observed by

the Arrephoroi at Athens), we are strongly tempted to suppose that the women whom he calls Antletriai may have been also known, at one time or other, as Thesmophoroi, and that the thesmoi were the sacra which they carried and deposited on the altar. The word would then be used in its literal sense, ” that which is set down.” How the name Thesmophorus should have been transferred to the goddess from her ministers is of course a difficulty, which is hardly disposed of by pointing to the epithets Amallophorus (” sheaf-bearing “) and Melophorus (” apple-bearing “), which were applied to men as well as to the goddess.

As to the origin of the Thesmophoria, Herodotus (ii. 171) asserts that they were introduced into Greece from Egypt by the daughters of Danaus; while, according to Plutarch (Fragments, p. 55, ed. Diibner [Frag. Incerta, 84]), the feast was introduced into Athens by Orpheus the Odrysian. From these statements we can only infer the similarity of the Thesmophoria to the Orphic rites and to the Egyptian representation of the sufferings of Osiris, in con- nexion with which Plutarch mentions them. The Thesmophoria would thus form one of that class of rites, widely spread in Western Asia and in Europe, in which the main feature appears to be a lamentation for the annual decay of vegetation or a rejoicing at its revival. This seems to have been the root, e.g., of the lamentations for Adonis and Attis. See W. Mannhardt, Antike Wald- und Feld- Kulte, p. 264 sq.

On the Thesmophoria, see Meursius, Graecia Feriata, p. 151 sq.; L. Preller, Demeter und Persephone (1837), p. 335 sq., Griech. Myth., [3], i. p. 639 sq.; Fritzsche’s ed. of the Thesmophoriazusae (1838), P- 577 S Q-; Aug. Mommsen, Heortologie (1864), p. 287 sq.; Rhein- isches Museum, xxv. (1870), p. 548; Gazette Archeologique (1880), p. 17; Andrew Lang, ” Demeter and the Pig,” in Nineteenth Century, April 1887; J. G. Frazer, Golden Bough, ii. 44; J. E.

1 This, as Andrew Lang has pointed out, resembles

the Khond custom of burying the flesh of the human victim in the fields to fertilize them. The human victim was with the Khonds, like the pig with the Greeks, a sacrifice to the Earth goddess. See Memorials of Service in India . . . of Major S. C. Macpherson, ed. William Macpherson (1865), p. 129.

2 Reading infiaWowi, with Rohde, for XaM/Sdrowi . Compare the custom of Miletus supra. The pine-tree played an important part in the worship of Cybele. Cf. Marquardt, Staatsverwaltung US85), ili. 371-

Harrison, Prolegomena to the Study of Greek Religion (1903); and especially the exhaustive articles by L. C. Purser in Smith's Dic- tionary of Antiquities (ed. 3, 1891) and by F. Lenormant (on Ceres) in Daremberg and Saglio, Dictionnaire des Antiquites.

(J. G. Fr.;X.)

THESPIAE, an ancient Greek city of Boeotia. It stood on level ground commanded by the low range of hills which runs eastward from the foot of Mount Helicon to Thebes. The deity most worshipped at Thespiae, according to Pausanias, was Eros, whose primitive image was an unwrought stone. The town contained many works of art, among them the Eros of Praxiteles, dedicated by Phryne in her native place; it was one of the most famous statues in the ancient world, and drew crowds of people to Thespiae. It was carried off to Rome by Caligula, restored by Claudius, and again carried off by Nero. There was also a bronze statue of Eros by Lysippus. The Thespians also worshipped the Muses, and celebrated a festival in their honour in the sacred grove on Mount Helicon. Remains of what was probably the ancient citadel are still to be seen, consisting of an oblong or oval line of fortification, solidly and regularly built. The adjacent ground to the east and south is covered with foundations, bearing witness to the extent of the ancient city. The neighbouring village Eremokastro, on higher ground, was thought by Ulrichs to be probably the site of the ancient Ceressus. In 1882 there were discovered, about 1200 yds. east of Eremokastro, on the road to Arkopodi

(Leuctra), the remains of a polyandrion, including a colossal stone lion. The tomb dates from the 5th century B.C., and is probably that of the Thespians who fell at Plataea, for those who fell at Thermopylae were buried on the field.

—History.— Thespiae figures chiefly in history as an enemy of Thebes, whose centralizing policy it had all the more to fear because of the proximity of the two towns. During the Persian invasion of 480 B.C. it stood almost alone among Boeotian cities in rejecting the example of treason set by the Thebans, and served the national cause with splendid devotion. Seven hundred Thespians accompanied Leonidas to Thermopylae and of their own free will shared his last stand and destruction. The remaining inhabitants, after seeing their city burnt down by Xerxes, furnished a force of 1800 men to the confederate Greek army at Plataea. In 424 B.C. the contingent which the Thespians had been compelled to furnish sustained heavy losses at Delium, and in the next year the Thebans took advantage of this temporary enfeeblement to accuse their neighbours of friendship towards Athens and to dismantle their walls. In 414 they interfered again to suppress a democratic rising. In the Corinthian war Thespiae sided with Sparta, and between 379 and 372 repeatedly served the Spartans as a base against Thebes. In the latter year they were reduced by the Thebans and compelled to send a contingent to Leuctra (371). It was probably shortly after this battle that the Thebans used their new predominance to destroy Thespiae and drive its people into exile. The town was rebuilt at some later time. In 171 B.C., true to its policy of opposing Thebes, it sought the friendship of Rome. It is subsequently mentioned by Strabo as a place of some size, and by Pliny as a free city.

See Herodotus, v. 79, vii. 132–ix. 30; Thucydides, iv. 93, 133, vi. 95; Xenophon, Hellenica, iv. vi. ; Pausanias, ix. 13, 8–14, 2, 26–27; Strabo, ix. pp. 409–10; B. V. Head, Historia Numorum (Oxford, 1887), pp. 479–80; Leake, Travels in Northern Greece, ii. 479 sq.; Dodwell, Tour through Greece, i. 253;

Bursian, Geogr. von Griechenland, i. 237 sq.; Ulrichs, Reisen u. Forschungen in Griechenland, ii. 84 sq.; Mitteil. d. deutsch. archdol. Inst, in Athen (1879), pp. 190 sq., 273 sq.; UpaKTma. rqs &px. "Eraip(as (1882), PP- 65-74-

THESPIS (6th cent. B.C.), Greek poet, of Icaria, in Attica, generally considered the inventor of tragedy, flourished in the time of the Peisistratidae. According to Diogenes Laertius (iii. 56), he introduced for the first time in the old dithyrambic choruses a person distinct from the chorus, who conversed with the leader, and was hence called wo/cptT^s ("answerer"). 3

3 According to another explanation, he was so called from repeat- ing the words of ahother — the poet or composer. ,

His claim to be regarded as the inventor of tragedy in the true sense of the terra depends upon the extent to which this person was really an "actor" (see Drama). Suidas gives the titles (of doubtful authenticity) of several of his plays (not confined to the legends of Dionysus, but embracing the whole body of heroic legends), but the fragments quoted in various writers as from Thespis are probably forgeries by Heracleides of Pontus, The statement of Horace (Ars Poetica, 276) that Thespis went round Attica with a cart, on which his plays were acted, is •due to confusion between the origin of tragedy and comedy, and a reminiscence of the scurrilous jests which it was cus- tomary to utter from a waggon (o-kuwmto. *£ a/id£ijs) at certain religious festivals. A. and M. Croiset (History of Greek Litera- ture, Eng. tr., 1904), who attach more importance to the part played by Thespis in the development of tragedy, accept the testimony of Horace. According to them, Thespis, actor and manager, transported his apparatus on a cart to the deme in which he intended to produce his drama,

formed and trained a chorus, and gave a representation in public.

See Drama; and W. Christ, Griechische Litteraturgeschichte

(1898).

THESSALONIANS, EPISTLES TO THE, two books of the New Testament. The Christian community in Thessalonica (mod. Salonica) was founded by Paul, Silvanus and Timothy, shortly before the visit to Athens and Corinth. The Gospel preached covered not only the general Christian convictions as to monotheism, belief in Jesus as Messiah Lord, and the im- pending judgment, but also the specifically Pauline doctrine of the indwelling Christ or Spirit, the earnest of acquittal at the Day of the Lord and of life with Christ for ever. It is the same Gospel as that preached in Galatia, in spite of the fact that the word ” justification ” does not appear in the Thessa- lonian letters (cf. 2 Thess. i. n f.). The converts, mainly Gentiles and chiefly manual labourers (many of whom, accord- ing to the episodical narrative of Acts xvii., had been already attached more or less loosely to Judaism) , suffered persecution from the beginning at the hands of their fellow-countrymen. Some of them, moreover, owing partly to this persecution, but mainly to the belief that the Lord was soon to return, gave up work, thus creating most of the difficulties with which Paul, in these letters, has to cope. Forced to leave Thessalonica after a brief sojourn (how long is uncertain), Paul hastened to Athens, from which place he sent Timothy back to Thessalonica, being himself unable to go, much as he longed to see his converts. From Athens, Paul went on to Corinth, where Timothy joined him, bringing good news about the Thessalonian converts, especially about their endurance under affliction, and bringing likewise, as Rendel Harris has suggested, a letter from the leaders of the church. The report was, however, not wholly favourable. The sudden departure of Paul, and his failure to return, had been misinterpreted. Some were insinuating that Paul had preached with intent

to deceive and as a pretext to cover impure designs (1 Thess. ii. 5); some, perhaps the same people, disregarding Paul's injunction (2 Thess. iii. 10), had remained idle, had fallen into drunken habits (1 Thess. v. 7), had been tempted to revert to the impure worship of the heathen gods (1 Thess. iv. 3 ff.), and, in their lack of funds, had demanded, speaking in the spirit (cf. Didache xi. 12), money from the church officers, thus dis- turbing the peace of the church, and causing the soberer minds to question the validity of spiritual gifts (1 Thess. iv. n ff., v. 12 ff.).

Paul's reply, the First Epistle to the Thessalonians, written from Corinth in a.d. 53 or 48, is as tactful as Philemon and as First personal as Galatians. In the first three chapters, he

Epistle. reviews his relation to the church from the beginning, commending highly the reception accorded to the Gospel and its messengers, and meeting the insinuations already alluded to by reminding the readers that, although as an apostle he was entitled not only to special respect but to an honorarium, yet he earned his own living and loved them as a father. As to his failure to return, he explained that it was not his own fatult. He wanted to go back but Satan hindered him. Even

now, as he writes, he is praying that he may soon see them, face to face. After the prayer, he takes up the points in \rnic^ they had shown want of faith. To those who are tempted by the heathen worship, he points out that Christian consecration is something ethical, to be won only in the power of the conse- crating Spirit. Respect for one's wife is an antidote to this enticement, and marriage with pure motives a safeguard against adultery. Passing on to other points, he urges that there would be no schism in love of the brethren, if the idlers would work and mind their own business (1 Thess. iv. 1-12). There is no advantage at the Parousia of the living over the dead, for both simultaneously will meet the Lord. The desire for more accurate information about times and seasons is unnecessary,

for their present knowledge is accurate enough, viz. that the day is to come suddenly and it is a day of destruction for the wicked. The main thing for them is to be prepared for that day (1 Thess. iv. 13–v. 11). With the specific situation still in mind, he adds his final injunctions. Respect your presiding office's, purposely called " the labourers," and let there be peace. Warn the idlers, encourage those who are impatient of the Parousia, and cling to those tempted by the heathen worship. In spite of the temptation to avenge your perse- cutors, be patient with them, return good for evil, exemplifying to all what is the Christian good. In spite of affliction, let there be joy, prayer and thanksgiving (1 Thess. v. 14–18), The charismata are to be respected, and at the same time tested (ibid. 19–22). A prayer for complete consecration, a charge that all should hear the letter read (apparently the leaders were tempted to neglect the idlers and the idlers had threatened not to listen to any epistolary communication from Paul), and a benediction bring the letter to an end (ibid. 23–28).

Such a letter, dominated as it is by the spirit of the Paul we know and fitting nicely the recoverable situation, is unques- tionably genuine, and few there be who deny it.

What effect this letter had, it is impossible fully to say. Apparently, it did not quell the excitement for which the idlers were largely responsible. Paul's discussion of the relation of dead and living at the Parousia seemed insufficient. His re- fusal to go further into times and seasons than the statement " the day comes as a thief in the night," is made the point of departure for the idlers to assert, on the basis of alleged spiritual utterances, corroborated, to the dismay of the leaders, by a reference to an anonymous letter reckoned to the account of Paul, that " the day is present." The troubled leaders send post-haste a letter to Corinth stating the situation and asking definite opinions as to the Parousia and the assembling of the saints. Paul is grievously disturbed, both because the first letter, in his

judgment, was clear, and because of the association of his authority with the anonymous letter. Only a short interval has elapsed, to be reckoned in weeks, when Paul, with the first letter distinctly in mind and with a vivid recollection of his oral teaching on mooted points, hastens with Silvanus and Timothy to write the Second Epistle

In one long sentence of prayer and thanksgiving (2 Thess. i. 3-12), he insists tactfully that their religious-ethical growth makes it his bounden duty to thank God, in spite of Second their written demurrer, compels him indeed of his own Epistle. motion to boast of . their faith and endurance, qualities which are evidence of the Divine purpose to account them worthy of the kingdom for which they, as they wrote, as well as he, are suffering. Suddenly remembering a Pharisaic Psalm, not unlike in purport to one of the Psalms of Solomon, and admirably adapted to his present purpose, namely, of contrasting the fate of the wicked with that of the righteous at the Parousia, he quotes it, making a few Christian touches in his own style (2 Thess. i. 6-10). Whereupon he prays, as they too prayed in their letter, that God would deem them worthy of the calling, and ensure them of the acquittal at the last day, by giving them in the power of the Spirit that present life in the Spirit which guarantees the future life in Christ. Then, disregarding the request for more information about the assembling, of which, he thinks, he had spoken sufficiently in his first letter,

he addresses himself to the other question of the " when " of the Parousia, supplementing what was said in the first letter, but adding nothing to what he had already said orally in their presence, and stoutly disclaiming all authority whatever for the statement " the day is present." Briefly and allusively, in language which has nothing specifically Christian in it and in style similar to

the first chapter (verses 6–10), he recalls the familiar story. The day does not come until the final revolt in heaven and until the lawless one (the man of lawlessness, the son of Perdition) is revealed, which revelation cannot happen, until the controlling or restraining thing or person is removed. Then, however, the tool of Satan will appear, but the Lord will destroy him with the breath of his mouth and annihilate him with the majesty of his presence (2 Thess. ii. 1–12). Following the formal order of the First Epistle, he again thanks God that his converts are chosen to salvation and prays that they may have strength and obey his orders oral or written. Even with a " finally," as in the first letter, he is not quite through, for the second point of the letter remains to be treated — the idlers. These, he says, must rememiber both his example (he was never guilty of begging) and his precept ("if any man will not work let him not eat ''). They must work quietly and eat their own food. Those who refuse to heed his written orders are to be noted. The test of the genuineness of his letters is his autograph greeting (2 Thess. ii. 13^–iii. 18).

The letter meets the known situation excellently. The new material, compared with the First Epistle, is the supplementary discussion of the time of the Parousia (2 Thess. ii. 1 ff.) and the fuller treatment of the idlers (2 Thess. iii. 1 ff.), the points about which the leaders sought advice. The style is Pauline even in the adaptation of Jewish apocalyptic material to Christian purposes. Indeed, the outline of the letter is strikingly similar to that of the First Epistle, and many phrases hold over. At the same time there is a freedom of style sug- gesting not the imitator but the same author. And above all, especially in the treatment of the idlers, the letter reveals a knowledge of the situation which is even more explicit than that of the First Epistle. On such grounds, together with the excellent external attestation, it is probable, as recent writers hold (e.g. Zahn, Wohlenberg, Harnack, Jiilicher, Findlay, Askwith, Charles,

Bacon, McGiffert, Moffatt, MilUgan, et al.), that the letter is Paul's.

The objection to the Pauline authorship felt by the Tubingen school may, for brevity's sake, be here disregarded. The modern difficulties, expressed mainly by recent German scholars (e.g. Wrede and Holtzmann and others), centre not in the un- Pauline language or in the lack of the personal element, but in the eschatology and the over- Pauline character of the language. As to the first objection, the eschatology, it is replied that the section ii. 1-12 is scarcely an interpolation, since it is one of the two main reasons for the letter; that the material of the section is a distinct allusion to, if not a direct quotation of, a definite bit of Jewish apocalyptic, even if we do not connect it, as Bousset does, with a so-called Antichrist legend; that the alleged inconsistency between the eschatology of the First and the Second Epistle does not exist, for in the first letter Paul says not that the day is present, but that the day, when it comes, comes suddenly " as a thief in the. night," while in the second letter he expressly denies the statement attributed to him, namely, that " the day is present." Wrede, in his brilliant argument against the genuineness of the letter (Die Echtheit des zweiten Thessalonicherbriefes, 1903), inclines to admit that the argument from eschatology is secondary. ,

As to the second objection, the over-Pauline character of the letter, an objection used with rigour by McGiffert (whose article on these letters in the Ency. Biblica is the most satisfactory discussion known to the present writer), and renewed inde- pendently by Wrede, it is to be admitted that the similarity of the second to the first letter is striking, particularly in the formal arrangement of the material. At the same time, the differences, both in arrangement and in the content of the reminiscences, are not to be overlooked, as McGiffert and after

him Wernle (Gott. gel. Am., 1905, pp. 347-52) have

both rightly maintained. Again there should be no disparagement of the new material such as is to be found in Holtzmann's acute discussion (Z. N. T. W ., root, pp. 97-108). On the whole, the perplexing situation seems to be met on the assumption that Paul writes the Second Epistle either with a letter from Thessa- lonica before him, which itself suggested the main points of his own epistle, or with a copy or a summary of that epistle before him (cf. Zahn and McGiffert).

The alternative is forgery, as Holtzmann, Wrede and Holl- mann (Z. N. T. W., 1904, PP- 28-38) actually hold. The diffi- culty with this hypothesis is that it does not explain so many facts as the hypothesis of Pauline authorship. As it is im- probable that the forger would write during the lifetime of Paul, the date has to be put either shortly after his death, or with Wrede at the end of the century. But this late date creates the insuperable difficulty that hi. 1 ff. gives a more explicit account of the original situation in Thessalonica touching the idlers than does the First Epistle. The purpose moreover of the forgeTy could not be to discredit the First Epistle as un-Pauline, for the alleged trouble is that the Second Epistle is too Pauline. Hence the purpose is to correct the statements of the First Epistle. If, however, there is no in- consistency between the two letters on the score of eschatology, what is the forger's purpose? The teaching about premonitory signs is not new to Thessalonica, but is assumed as known, hence the allusive character of the second chapter. The state- ments in ii. 2 and hi. 17 are easily explicable on the hypothesis that the idlers found an anonymous letter and attributed it to Paul, especially when they thought, perhaps in good faith, that the Spirit had indicated that the day is present. Finally, the forger handles Paul's style with miraculous knowledge, not only reproducing phrases from the first letter, but knowing how to amend them to present purposes with' singular natural- ness. When it comes to putting Christian touches to a Jewish fragment, the touches turn out to be uniquely

Pauline, although they are not obviously Pauline (e.g. i. 6-10 ” enrep,” “obey the Gospel,” “was believed”). And even with the thought of Paul, he is curiously at home. So certain is he of the substance of Paul’s thought, that he can reproduce it in a concise sentence without recourse to the word “justification” (e.g. i. n). On the whole, then, the situation created by the literary relation of the two letters is best met by the hypothesis that Paul is the author of the Second Epistle.

In addition to the literature mentioned under Colossians, Epistle to the, and the special literature already named in this article, reference should be made to the commentaries on these letters by Ellicott (1858), Jowett (1859), Eadie (1877), Hutchinson (1883), Lightfoot (Notes, 1895), Drummond (1899), Findlay (1892 and 1904), Milligan (1908), and Moffatt (1908); and by Schmidt (1885), Zimmer (1885-93), Schmiedel (1892), Zockler (1894), Bornemann (1894), B. Weiss (1896) and Wohlenberg (1903).

(J- E. F.)

THESSALY, a district of northern Greece, between Mace- donia and the more purely Hellenic countries towards the south, and between the upland region of Epirus and the Aegean Sea. It forms an irregular square, extending for about sixty miles in each direction, and this area, which is for the most part level, is enclosed by well-marked boundaries — by the Cambuniaa Mountains on the north, and by Othrys on the south, while on its western side runs the massive chain of Pindus, which is the backbone of this part of Greece, and towards the east Ossa and Pelion stand in a continuous line; at the north-eastern angle is Olympus, the keystone of the whole mountain system. The elevation of some of the summits in these ranges is con- siderable, for three of the peaks of Pindus ar

On the north side of Thessaly there was an important pass from Petra in Pieria bv the western side of Olympus, debouching on the

plain northward of Larissa; it was by this that Xerxes entered and we learn from Herodotus (vii. 173) that, when the Greeks discovered the existence of this passage, they gave up alT thoughts of defending Terripe. On the side of Epirus the main line of com- munication passed over that part or Pindus which was called Mount Lacmon, and descended the upper valley of the Peneius to Aeginium in the north-west angle of Thessaly. This was, the route by which Julius Caesar arrived before the battle of Pharsalia. Another pass through the Pindus chain was that of Gomphi, farther south, by means of which there was communication with the Ambracian Gulf. The great southern pass was that of Coela, which crosses Mount Othrys nearly opposite Thermopylae. These Thessalian passes were of the utmost importance to southern Greece, as commanding the approaches to that part of the country.

Though Thessaly is the most level district of Greece, it does not present a uniform unbroken surface, but is composed of a number of sections which open out into one another, divided by ranges of hills. The principal of these were called Upper and Lower Thessaly, the former comprising the western and south-western part, which contains the higher course of the Peneius and afl those of its tribu- taries that flow from the south — the Enipeus, the Apidanus, the Onochonus and the Pamisus; while the latter, which reaches eastward to the foot of Ossa and Pelion, is inundated in parts a £ certain seasons of the year by the Peneius, the flood-water from which forms the lake Nessonis, and, when that is full, escapes agalfl and pours itself into the lake of Boebe. The chief city of the latter of these districts was Larissa; and the two were separated from one another by a long spur, which runs southwards from the Cam- bunian Mountains on the western side of that city. Again, when Thessaly, is entered from the south by the pass of Coefa, another plain, containing a small lake, which was

*formerly called Xynias, intervenes, and a line of low hills has to be crossed before the^ town of Thaumaki is reached, which from its commanding position over- looks the whole of the upper plain. The view from this point has been described by Livy in the following remarkable passage *■»- ” When the traveller, in passing through the rugged districts of Thessaly, where the roads are entangled in the windings of the valleys, arrives at this city, on a sudden an immense level expanse, resembling a vast sea, is outspread before him in such a mantter that the > eye cannot easily reach the limit of the plains extended beneath” (xxxii. 4). To the north-east of this, where, a portion of the great plain begins to run up into the mountains, the Plain of Pharsalia is formed, which is intersected by the river Enipeus; and still farther in the same direction is the scene of another great battle, Cynoscephalae. Thessaly was further subdivided into four districts, of which Pelasgiotis embraced the lower plain of the Peneius, and Hestiaeotis and Thessaliotis respectively the northern and the southern portions of the upper plain; while the fourth, Phthiotis, which lies towards the south-east, was geographically distinct from the rest of the country, being separated from it by a watershed. The determining feature of this is the Pagasaeus Sinus (Gulf of Volo), a landlocked basin, extending from Pagasae at its head to Aphetae at its narrow outlet, where the chain of Pelion, turning at right angles to its axis at the end of Magnesia, throws out a projecting line of broken ridges, while on the opposite side rise the heights of Othrys. In the heroic age this district was of great importance. It was the birthplace of Greek navigation, for this seems to be implied in the story of the Argonauts, who started from this neighbourhood in quest of the golden fleece. From it the great Achilles came, and, according to Thucydides (i. 3), it was the early home of the Hellenic race. The site of lolcus, the centre of so many poetic legends, is at no great distance from the modern Volo. Near that town also, at a later period, Demetrius Poliorcetes founded the city of Demetrias, which was called by Philip V. of*

Macedon one of the three fetters of Greece, Chalcis and Corinth being the other two.

The history of Thessaly is closely connected with its geo- graphy. The fertility of the land offered a temptation to invaders, and was thus the primary cause of the early migra- tions. It was this motive which first induced the Thessalians to leave their home in Epirus and descend into this district, and from this movement arose the expulsion of the Boeotians from Arne, and their settlement in the country subsequently called Boeotia; while another wave of the same tide drove the Dorians also southward, whose migrations changed the face of the Peloponnese. Again, this rich soil was the natural home of a powerful aristocracy, such as the families of the Aleuadae of Larissa and the' Scopadae of Crannon; and the absence of elevated positions was unfavourable to the foundation of cities, which might have fostered the spirit of freedom and democracy. The plains, also, were suited to the breeding of horses, and consequently the force in which the Thessalian nation was strong was cavalry, a kind of troops which has usually been associated with oligarchy. The wealth and the semi-Hellenic character of the people— for in race, as in geographical position,

the Thessalians held an intermediate place between the noftf Hellenic Macedonians and the Greeks of pure blood — caused them to be wanting in patriotism, so that at the time of the Persiam wars we find the Aletiadae making common cause with the enemies of Greece. When they were united they were a formidable power, but, like other half-organized communities^ they seldom combined for long together, and consequently they influenced but little the fortunes of the Greeks.

For several centuries during the middle ages Rumanian immi- grants formed so large a part of the population of Thessaly that that district was called by the Byzantine writers Great Wallachia (Meya.X?7 BAaxta): the Jewish traveller, Benjamin of Tudela, who passed through the country in the latter half of

the 1 2th century, describes them as then occupying it. At the present day only a few colonies of that race remain, the prin- cipal of which are found on the western side of Olympus and in some of the gorges of Pindus. The Turkish inhabitants were settled in the larger towns, and here and there in the country districts, the most important colony being those called Konia- rates, who were brought from Konia in Asia Minor shortly before the taking of Constantinople, and planted under the south-west angle of Olympus. The Greeks, however, form the vast majority of the population, so much so that, even while the country belonged to the Ottomans, Greek was employed as the official language. In accordance with the provisions of the Berlin treaty, Thessaly was ceded to the Greeks by the Porte in 1881, and became a portion of the Hellenic kingdom. Since that time the prosperity of the province has greatly increased. The port of Volo, which is almost the only outlet of the trade of the whole district, has become an important town of 23,000 inhabitants, and daily communication by steamers now exists between it and Athens. The interior of the country has also been opened up by means of railways. One line runs north-westwards from Volo by way of Velestino (the ancient Ptierae) to Larissa, which is situated on the Salambria (Peneius), and has a population of 18,000 souls, including 2000 Jews. The Greeks, Turks and Jews here occupy different quarters of the city, but most of the Turkish inhabitants have now quitted the country, so that only four of the numerous mosques remain in use. From Velestino another line branches off to the west by Phersala (Pharsaios), Domokos (Thaumaki), Karditsa, and Trikkala (Trika), to Kalabaka (Aeginium), where the upper valley of the Salambria is entered. In the neighbourhood of the last-named place, where the Cambunian chain of mountains descends in steep precipices to the plain, are the Meteora (" mid- air") monasteries (see Meteora).

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THfiTFQRD, a market town and municipal borough of England, mostly in the south-western parliamentary division of Norfolk, but partly in the Stowmarket division of Suffolk, 91m. N.N.E. from London by the Great Eastern railway. Pop. (1901) 4613. The town lies in a level, fertile country at the junction of the river Thet with the Little Ouse. In the time of Edward III. the town had twenty churches and eight monasteries^ There are now three churches— St Peter's, St Cuthbert's and St Mary's — principally of Perpendicular flint work; of these St Mary's, on the Suffolk side, is the largest. There are a few monastic, remains, the chief being two gate- houses. The most important relic of antiquity is the Castle Hill, a mound 1000 ft. in circumference and too ft. in height. The grammar school was founded in 1610. In Ring Street is the mansion-house occupied as a hunting-lodge by Queen Elizabeth and James I. The chief public buildings are a gild hall and a mechanics' institute; there are several charities. Brewing and tanning are carried on; and there are also manure and chemical works, brick- and lime-kilns, flour-mills and agricultural implement works, engineering works and iron foundries. The Little Ouse is navigable for barges down t«

the Great Ouse. Thetford is a suffragan bishopric in the diocese of Norwich. The town is governed by a mayor, 4 aldermen, and 12 councillors. Area, 7096 acres.

Early antiquaries identified Thetford (Theodford, Tetford, Tefford) with Sitomagus, but modern research shows that there is no conclusive evidence of a permanent settlement before the coming of the

Angles. Tradition tells that Uffa, who probably threw up the earthworks called the Castle Hill, established the capital of East Anglia here about 575. Thetford owned a royal mint in the oth century and was a flourishing town when the Conqueror acquired it. Richard I. granted it to Hamelin, Earl Warenne, and when his heirs failed, it merged in the duchy of Lancaster and so in the crown. About 1 ago its prin- cipal officers were a mayor and coroner, afterwards assisted by eight burgesses, whom Henry VIII. increased to ten. The town, never very prosperous since the Conquest, had then fallen into great decay, but the petitions of the burgesses for a charter were not heeded till 1573 when Elizabeth incorporated it under a mayor and common council. This charter, restored in 1692 after its surrender to Charles II., remained in force till 1835 when the borough was re-constituted. Thetford returned two members to parliament from 1529 till its disfranchisement in 1868. Its Saturday market, which certainly existed in the 13th century, was granted by the charter of 1573 and also a Magdalen fair (the 22nd of July). Fisheries were important in the 13th century.

See A. L. Hunt, Capital of East Anglia (1870); T. Martin, History of Thetford (1779).

THETIS, in Greek mythology, daughter of Nereus, wife of Peleus and mother of Achilles. The chief of the fifty Nereids, she dwelt in the depths of the sea with her father and sisters. When Dionysus leaped into the sea to escape from the pursuit of Lycurgus, king of the Thracian Edones, and Hephaestus was flung out of heaven by Zeus, both were kindly received by Thetis. Again, when Hera, Athena and Poseidon threatened to bind Zeus in chains, she sent the giant Aegaeon, who delivered him out of their hands. She was married against her will to Peleus (q.v.; see also Achilles). Thetis is used by Latin poets simply for the sea.

THEURIET, CLAUDE ADHEMAR ANDRfi (1833-1907), French poet and novelist, was born at Marly-le-Roi (Seine et Oise) on the 8th of October 1833, and was

educated at Bar-le- Duc in his mother's province of Lorraine. He studied law in Paris and entered the public service, attaining the rank of chef de bureau before his retirement in 1886. He published in 1867 the Chemin des bois, a volume of poems, many of which had already appeared in the Revue des Deux Mondes; Le bleu et le noir, poetries de la vie rielle (1874), Nos oiseaux (1886), and other volumes followed. M. Theuriet gives natural, simple pictures of rustic and especially of woodland life, and Theophile Gautier compared him to Jaques in the forest of Arden. The best of his novels are those that deal with provincial and country life. Among them are: Le manage de Gerard (1875); Raymonde (1877); Le fils Maugars (1879); La maison des deux Barbeaux (1879); Sauvageonne (1880); Reine des bois (1890); Villa tranquille (1899); Le manuscrit du chanoine (1902). Theuriet received in 1890 the prix Vitet from the French Academy, of which he became a member in 1896. He died on the 23rd of April 1907, and was succeeded at the Academy by M. Jean Richepin.

See Emm. Besson, Andri Theuriet (1890).

THEVENOT, JEAN DE (1633-1667); French traveller in the East, was born in Paris on the 16th of June 1633, and received his education in the college of Navarre. The perusal of works of travel moved him to go abroad, and his circumstances per- mitted him to please himself. Leaving France in 1652, he first visited England, Holland, Germany and Italy, and at' Rome he fell in with D'Herbelot, who invited him to be his companion in a projected voyage to the Levant. D'Herbelot was detained by private affairs, but Th6venot sailed from Rome in May 1655, and, after vainly waiting five months at Malta, took passage

for Constantinople alone. He remained in Constantinople till the end of the following August, and then proceeded by Smyrna and the Greek islands to Egypt, landing at Alexandria on New Year's Day, 1657. He was a year in Egypt, then visited Sinai, and, returning to Cairo, joined the Lent pilgrim

caravan to Jerusalem. He visited the chief places of pilgrimage in Palestine, and, after being twice taken by corsairs, got back to Damietta by sea, and was again in Cairo in time to view the opening of the canal on the rise of the Nile (on the 14th of August 1658). In January 1659 he sailed from Alexandria in an English ship, taking Goletta and Tunis on the way, and, after a sharp engagement with Spanish corsairs, one of which fell a prize to the English merchantman, reached Leghorn on the i2tH of April. He now spent four years at home in studies useful to a traveller, and in November 1663 again sailed for the East, calling at Alexandria and landing at Sidon, whence he proceeded by land to Damascus, Aleppo, and then through Mesopotamia to Mosul, Bagdad and Mendeli. Here he entered Persia (the 27th of August, 1664), proceeding by Kermanshah and Hamadan to Isfahan, where he spent five months (October i6o4-February 1665), and then joining company with the merchant Tavernier, proceeded by Shiraz and Lar to Bander- Abbasi, in the hope of finding a passage to India. This was difficult, because of the opposition of the Dutch, and though Tavernier was able to proceed, Thevenot found it prudent to return to Shiraz, and, having visited the ruins of Persepolis, made his way to Basra and sailed for India on the 6th of November 1665, in the ship " Hopewell," arriving at the port of Surat on the 10th of January 1666. He was in India for thirteen months, and crossed the country by Golconda to Masulipatam, returning overland to Surat, from which he sailed to Bander-Abbasi and went up to Shiraz. He passed the summer of 1667 at Isfahan, disabled by an accidental pistol- shot; and in October started for Tabriz, but died on the way at Miyana on the 28th of November 1667.

Thevenot was an accomplished linguist, skilled in Turkish, Arabic and Persian, and a curious and diligent observer. He was also well skilled in the natural sciences, especially in botany, for which he made large collections in India. His personal character was admirable, and his writings are still esteemed, though it has been justly observed that,

unlike Chardin, he saw only the outside of Eastern life. The account of his first journey was published at Paris in 1665; it forms the first part of his collected Voyages. The licence is dated December 1663, and the preface shows that Thevenot himself arranged it for publication before leaving on his second voyage. The second and third parts were posthumously published from his journals in 1674 and 1684 (all 4to). A collected edition appeared at Paris in 1689, and a second in i2mo at Amsterdam in 1727 (5 vols.). There is an indifferent English translation by A. Lovell (fol., London, 1687).

THIAZINES, in organic chemistry, a series of cyclic com- pounds containing a ring system of four carbon atoms, one nitrogen and one sulphur atom. These may be grouped in three ways, giving the following skeletal structures: —

(I.)

C’C’N CCS

(II.)

CNC CCS

(III.)

CNC CSC

Members of the first series have not as yet been isolated. De- rivatives of the second type have been obtained by A. Luch- mann (Ber. 1896, 29, p. 1429) by condensing 7-chlorbutyl- arriine with carbon bisulphide or with mustard oils in the presence of caustic alkali; by M. Kahan (ibid., 1897, 30, p. 1321) on condensing bromhexylamine hydrobromide with thioben- zamide:

CH2’CH(CH3)Br HS CH 2 ■ CH(CHs) ‘ S

(CH 3)2C • NH2 + HN :C ‘ C6H5 ~^ (CH 3)2C – N C • CeHs

Benzothiazines are obtained from ortho-aminobenzyl

halides and thio-amides :

+HaNCSCH3->C6H< I

NH2 x N=CCHs.

The most important thiazines are those derived from class III.,

/N\

thiodiphenylamine, c 6 H<^ ">CeH4, being the parent substance of the methylene blue series of dyestuffs. Thiodiphenylamine

is obtained synthetically by heating sulphur with diphenylamine or by the condensation of ortho-aminothiophenol with pyro- catechin. It is a compound of neutral reaction. The first known dyestuff of this series was Lauth's violet, which was prepared by oxidizing paraphenylene diamine in acid solution in the presence of sulphur. By using dimethyl paraphenylene diamine in place of the simple diamine, methylene blue is obtained. The relationship of these substances to thiodiphenyl-amine was shown by A. Bernthsen, who, by nitration of thiodiphenylamine, obtained a dinitro-compound which on re- duction was converted into the corresponding di-amino-deriva- tive and this on oxidation yielded Lauth's violet.

OB

NH

^>CeH.

-» NO* ■ CeHj

O

CHi • N0 2 -

■ NH 2 -CC«Hj

NH

Methylene blue is the most important of all blue basic dyes and is put on the market frequently in the form of its zinc chloride double salt, which is soluble in water. Acid oxidants in dilute aqueous solution convert it into methylene azure.

See further A. Bernthsen, Ann., 230, p. 73; 251, p. 1; German Patents 45839 (1887); 47374 (1888). For a discussion as to the constitution of these dyestuffs, whether they are quaternary am- monium salts or thionium salts, see A. Hantzsch, Ber., 1906, 39, pp. 153, 1365; F. Kehrmann, ibid., 1906, 39, p. 914.

THIAZOLES, in organic chemistry, a series of heterocyclic compounds containing the grouping shown below; the re- placeable hydrogen atoms in which are designated a, /3 and fi. They are prepared by condensing thio-amides with a-haloid ketones or aldehydes, the thio-amide reacting as the tauto- meric thio-imino acid. Amino derivatives similarly result from thio-ureas and a-haloid ketones; the oxy derivatives from o-sulphocyanoketones by the action of caustic alkali; and the carboxylic acids from chloro-aceto-acetic ester, &c. and thio- amides. The thiazoles are somewhat basic in character, and combine with the alkyl iodides to form thiazolium iodides.

Dihydrothiazoles, or thiazolines, are obtained by condensing ethylene dibromides with thio-amides; by the action of /3-haloid alkylamines on thio-amides (S. Gabriel, Ber., 1891, 24, p. 783; 1896, 29, p. 2610) ; and by the action of phosphorus pentasulphide on acyl-(3-bromalkylamides (A. Salomon, Ber., 1893, 26, p. 1328). Thsy are much less stable than the thiazoles. The benzothiazoles are a series of weak bases formed by condensing carboxylic acids with ortho-aminothiophenols (A. W, Hofmann, Ber., 1880, 13, p. 1224), by heating the acid anilides with sulphur or by the oxidation of

thio-anilides. On fusion with caustic alkalis they decompose into their constituent aminothiophenol and acid. De- rivatives of this group are important as substantive cotton dye- stuffs.

s ■ chV

HC:CH

■0) («)'

Thiazole.

■N

/ CH Benzothiazole.

THIBAUDEAU, CLAIR ANTOINE, Comte (1765-1854), French politician, was born on the 23rd of March 1765, the son of Antoine de Thibaudeau (1 739-1813), a lawyer of Poitiers and a deputy to the States-General of 1 789. He was admitted to the bar in 1787, and in 1789 accompanied his father to the States-General at Versailles. When he returned to Poitiers in October he immediately set up a local revolutionary club, and in 1792 was returned as a deputy to the Convention.

Thibaudeau joined the party of the Mountain and voted for the death of Louis XVI. unconditionally. Nevertheless he in- curred a certain amount of suspicion because he declined to join the Jacobin Club. In May 1 793 he was on a special mission in the west and prevented his department from joining the Federalist movement. Thibaudeau occupied himself more par- ticularly with educational business, notably in the organization of the museum of the Louvre. It was he who secured the inclusion of Tom Paine's name in the amnesty of Girondist deputies. Secretary and then president of the Convention for a short period, he served on the Committee of Public Safety and of Generaly Security. After the insurrection of 13 Vende-

miaire (5th October 1795) he opposed those Thermidorians who wished to postpone the dissolution

of the Convention. At the elections for the Corps Legislatif he was elected by no less than thirty-two departments. It was only by the intervention of Boulay de la Meurthe that he escaped transportation after the coup d'itat of 18 Fructidor (4th September 1797), and he then returned to the practice of his profession. The establishment of the consulate brought him back to public life. He was made prefect of the Gironde, and then member of the council of state, in which capacity he worked on the civil code. He at this time had Napoleon's confidence, and gave him whole- hearted support. He did not entirely conceal his disapproval N of the foundation of the Legion of

! > hn : CHs^ ^>C.H 3 • NH2 Honour, of the Concordat and of the Consulate for life, and his appoint ment as prefect of the Bouches du Rhone, with consequent banishment from Paris, was a semi-disgrace.

A peer of the Hundred Days, he fled at the second Restora- tion to Lausanne. During his exile he lived in Vienna, Prague, Augsburg and Brussels, occupying himself with his Memoires sur la Convention et le Directoire (Paris, 2 vols., 1824) ; Mimoires sur le Consulat: par un ancien conseiller d'itat (Paris, 1827); Histoire generate de Napolion Bonaparte (6 vols., Paris and Stuttgart, 1827-28, vol. iii. not printed); Le Consulat et V Empire vol. i. of which is identical with vol. vi. of the Histoire de Napolion (10 vols., 1834). The revolution of 1830 permitted his return to France, and he lived to become a member of the Imperial Senate under the third empire. He died in Paris on the 8th of March 1854 in his eighty-ninth year.

The special value of Thibaudeau's works arises from the fact that he wrote only of those events of which he had personal know- ledge, and that he quotes with great accuracy Napoleon's actual words. His Memoires sur le Consulat has been translated into English, with introduction and necessary notes, by G. K. Fortescue with the title of Bonaparte and the Consulate (1908). Among the papers left by Thibaudeau were documents entitled Ma Biographic and

Memoires avant ma nomination a la Convention. These were published in a small volume (Paris and Niort, 1875) which includes a list of his works and of the narrative of his life.

THIBAUT (or Theobald) IV. (1201-1253), count of Cham- pagne and Brie, and king of Navarre, French poet, was born at Troyes in 1201. His father, Thibaut III. of Champagne, died before his son's birth, and his mother, Blanche of Navarre, was compelled to resign the guardianship of the young prince to Philip Augustus, king of France, but there is little doubt that the child was acquainted with Chretien de Troyes and the other trouveres who found patronage at the court of Cham- pagne. Thibaut's verses belong to what is called " courteous " poetry, but they have a personal note that distinguishes them from mere exercises. They are addressed to Blanche of Castille, the wife of Louis VIIL, and Thibaut's relations with her have been the subject of much controversy. The count took part with Louis in the crusade against the Albigenses, but in 1226, with no apparent reason, left the king and returned to Cham- pagne. Three months later Louis died under doubtful circum- stances, and Thibaut was accused by his enemies of poisoning him to facilitate his own intrigue with Blanche. The real reason for Thibaut's desertion appears to have been a desire to consolidate his position as heir-apparent of Navarre by an alliance with the disaffected nobility of the south of France, but from this confederation Blanche was skilful enough to detach him. The resentment of the league involved him in a war in which Champagne was laid waste, and his capital saved only by the royal intervention. In 1234 he succeeded his uncle, Sancho VII., as king of Navarre, and from this period date his most fervent songs in praise of his lady. The crusade turned Thibaut's thoughts to religion, and he announced his intention of singing henceforth only in honour of the Virgin. Unfortunately his devotion took darker forms, for before sailing for the Holy Land he ordered and witnessed the burning of a hundred and eighty-three unfortunate men and women con- victed

of Manichaeism. The years 1239 and 1240 were spent in Palestine, and from the time of his return Thibaut devoted

himself to efforts for the improvement of his dominions that won for him the title of le Bon. He died at Pampeluna on the 14th of July 1253.

Thibaut was the most popular of all the 13th century song- writers, and his work is marked by a grace and sweetness which he owes perhaps in part to his association with the troubadours of the south. He is said to have set his own songs to music. It seems doubtful whether the notes that have come down to us can with justice be attributed to him, but there is no contesting the musical quality of his verse. His fame spread beyond the Alps, and Dante admired his poetry. He was one of the most celebrated authors of jeux-partis , elaborate discussions between two inter- locutors, usually on the subject of love.

His works were edited in 1851 by P. Tarbe in his Chansonniers it Champagne.

THIBAUT, ANTON FRIEDRICH JUSTUS (17 74-1840), German jurist, was born at Hameln, in Hanover, on the 4th of January 1774, the son of an officer in the Hanoverian army, of French Huguenot descent. After passing his school-days in Hameln and Hanover, young Thibaut entered the university of Gottingen as a student of jurisprudence, went thence to Konigsberg, where he studied under Kant, and afterwards to Kiel, where he was a fellow-student with Niebuhr. Here, after taking his degree of doctor juris, he became a Prival- dozent. In 1798 he was appointed extraordinary professor of civil law, and in the same year appeared his Versuche iiber einzelne Theile der Theorie des Rechts (1798), a collection of essays on the theory of law, of which by far the most important was entitled Uber den Einfluss der Philosophic auf die Auslegung der positiven Gesetze,

wherein he sought to show that history without philosophy could not interpret and explain law. In 1799 was published his Theorie der logischen Auslegung des rdmiscken Rechts, one of his most remarkable works. In 1802 he published a short criticism of Feuerbach's theory of criminal law, which recalls in many ways the speculations of Bentham. The same year appeared Uber Besitz und Verjdhrung, a treatise on the law of possession and the limitation of actions. In 1802 Thibaut was called to Jena, where he spent three years and wrote, in Schiller's summer-house, his chief work, System des Pandektenrechts (1803), which ran into many editions. The fame of this book depends before all else upon the fact that it was the first modern complete compendium of the subject, distinguished alike by the accuracy of its sources and the freedom and unpedantic manner in which the subject is handled. It is, in effect, a codification of the Roman law as it then obtained in Germany, modified by Canon law and the practice of the courts into a comprehensive system of Pandect law. At the invitation of the grand-duke of Baden he went to Heidelberg to fill the chair of civil law and to assist in organizing the university; and he never quitted that town, though he re- ceived in after years, as his fame grew, invitations to Gottingen, Munich and Leipzig. His class was large, his influence great; and, except Gustav Hugo and Savigny, no civilian of his time was so well known. In 1814 appeared his Civilistische Abhand- lungen, of which the principal was his famous essay, the parent of so much literature, on the necessity of a national code for Germany {vide infra). In 1819 he was appointed to the upper house of the newly constituted Baden parliament. He was also made member of the Scheidungsgericht (divorce court). In 1836 Thibaut published his Erbrterungen des romischen Rechts. One of his last works was a contribution in 1838 to the Archiv fur die civilistische Praxis, of which he was one of the editors (see below). Thibaut married, in 1800, a daughter of Professor Ahlers of Kiel. He died after a short illness, at Heidelberg, on the 29th of March

1840.

Thibaut, a man of strong personality and manly consistent nature, was much more than a jurist: he deserves to be remem- bered in the history of music. Palestrina and the early composers of church music were his delight; and in 1824 appeared anony- mously his work, Uber die Reinheit der Tonkunsl, in which he eulogized the old music, and especially that of Palestrina. He was an ardent collector of old compositions, and often sent young men to Italy, at his own expense, to discover interesting musical manuscripts. Among the masters of German prose, too, Thibaut holds no mean place. His style is simple and manly, but rich in the happy accidents of expression which come only to true artists.

Most of Thibaut's works have already been mentioned, but his essay on the necessity of a code for Germany {Uber die Nothwenr digheil eines allegemeinen btirgerlichen Rechts fur Deutschland), which was inspired by the enthusiasm of the war of Liberation and written in fourteen days, deserves further notice. Thibaut himself ex- plained in the Archiv fur die civilistische Praxis, in 1838, the origin of this memorable essay. He had realized the change denoted by the march of German soldiers to Paris in 1814, and the happy future opened up for Germany. The system of small states he hoped and believed would continue ; for the big state he considered crushing to the life of the individual and harmful as concentrating the " warm life " of the nation in one central point. In his judg- ment the only unity practicable and needful for Germany was that of law; and for this he urged all the German governments to labour. The essay was as much a condemnation of the entire state of juris- prudence as an argument for codification; it was a challenge to civilians to justify their very existence. Savigny took up the challenge thus thrown down ; and a long controversy as to points not very clearly defined took place. The glory of the controversy belonged to Savigny ; the real victory rested with Thibaut.

The framers of the new German civil code

{burgerltches Cesetz- buch) in 1879 were indebted for the arrangement of their matter in no small degree to Thibaut's method and clear classification, but beyond this, the code, based on the common law of the several German states, which was adroitly blended by the usus pandectarum into an harmonious whole, does not reflect his influence. He was one of the earliest to criticize the divisions found in the Institutes, and he carried on with Gustav Hugo a controversy as to these

points. _,.,,.„

In modern German legal literature Thibaut s influence is not very perceptible. Even at Heidelberg it was quickly superseded by that of his successor, Karl Adolf von Vangerow (1805-1870), and in Germany his works are now little used as text-books. But those best able to judge Thibaut have most praised him. Austin, who owed much to him, describes him as one " who for penetrating acuteness, rectitude of judgment and depth of learning and elo- quence of exposition, may be placed by the side of von Savigny, at the head of all living civilians."

For further information as to Thibaut's life and work, see Baum- stark, Thibaut, Blatter der Erinnerung (1841); Karl Hagemann, Aus dem Leben H. F. J. Thibaut, mit Corresponded, in die Preuss. Jahrbiicher (1880); Teichmann, in Holtzendorff's Rechtslexikon ; and E. Landsberg, in Allgemeine Deutsche Biographie, vol. 37.

THIBAW, or Hsipaw, one of the Northern Shan States of Burma. It is called by the Shans, and officially, Hsipaw, and also frequently 6ng PawDg (the name of an old capital). It includes four states— Thibaw, the main state, and the sub- states of Mong L6ng, Mong Tung and Thonze (or Hsumhsai). The whole state ha? an area of 5086 sq. m., and the population in 1901 was 104,700. The main state lies on the geological fault which runs east and west across the Shan States, frcm the Salween at Kunlong and beyond to nearly the rim of the Shan tableland at G&kteik.

It is therefore broken up into a mass of not very well-defined ridges and spurs, crossing and re-enter- ing. The chief plain land is in the valley of the Nam Tu (Myit-nge), near Thibaw town, and the valley or strath of the Pyawng Kawng, Nawng Ping neighbourhood. Elsewhere the valleys are insignificant. The hills on the Mong Tung border reach their highest elevations in the peaks Loi Pan (6848 ft.) and Loi Htan (6270 ft.). To the north-west of Thibaw town, on the Tawng Peng border, Loi Lam rises to 6486 ft. The valley of the Nam Tu marks the lowest point in the state at Thibaw town, about 1400 ft., and rises on the east in Mong Tung to a plain level of about 2500 ft., and on the west in Mong Long to a confused mass of hills with an average height of 4500 ft., broken up by the Nam Yawn and Nam Kaw valleys, which are about 3000 ft. above mean sea-level.

The chief river is the Nam Tu or Myit-nge, also frequently called by its classical name the Ddktawadi. The mam stream rises in the Salween-Irrawaddy watershed, and is enlarged by considerable tributaries. At Thibaw town it is 250 yds. wide and about 8 It. deep, with a fairly strong current. The Nam Tu is navigable only in local stretches, and between Thonze and Lawksawk (Yatsau*) it flows through a gorge between cliffs 3000 to 4000 it. high. At the gorge of Hokut (Ng6kteik) the Nam Htang and the Nam Pase unite to form the Nam Kut, which passes into the ground at the natural bridge where the Mandalay-Kunlong railway crosses the gorge, and reappears to join the Nam Tu. The bed ot the Nam Kut is about 1500 ft. below the general level of the country. Coal is found at various places in the state, but is not of very high quality. Salt-wells are worked by the inhabitants of Mawhkio CBawgyo) about 7 m. from Thibaw town. The average maximum temperature at the beginning of April is about 96 . and the minimum

about the same period 65 °. The rainfall averages about 70 in. for the year. The chief crops are rice, cotton, sesamum, tea in the hills, and lhanat, the leaf of a tree used for the wrapper of the Burma, or " green " cheroot. Cotton cloth was formerly much more generally manufactured than it now is, and a coarse country paper is also made. Other industries are merely of articles for local use. The government cart road to Lashio passes through the centre of the state, and from this various unmetalled roads radiate to different parts of the state and the neighbouring states. The Mandalay-Kunl6ng railway, now open as far as Lashio, also passes through the capital. Teak forests exist along the banks of the Nam Tu and in the Mong L6ng states, but both have been practically exhausted, and will have to be closed for many years. Previous to the annexation, and in a general way still, the state is administered by the sawbwa, or chief, aided by a council of six amats or ministers. Under them are a number of ne-baings, who are in charge of circles and townships. Each ne-baing has an asiyin, or clerk, and each village has a headman, or kin-man. The amats supervise the administration of a certain number of districts. The old system is now being assimilated to that followed in Burma. The chief Sao Hke was for a time in England. (J. G. Sc.)

THIELMANN, JOHANN ADOLF, Freiherr von (1765- 1824), Prussian cavalry soldier, was born at Dresden. Entering the Saxon cavalry in 1782, he saw service against the French in the Revolutionary Wars and in the Jena campaign. When, after the disaster of Jena, Saxony allied herself with her con- queror, Thielmann accompanied the Saxon contingent which fought at the siege of Danzig and at Friedland. In 1809, as colonel of a Pree-Corps, he opposed the advance of the Austrians into Saxony, and was rewarded for his services with the grade of major-general, further promotion to lieutenant-general fol- lowing in 1810. As commander of the Saxon Heavy Cavalry Brigade he took part in the advance on Moscow two years later, and his conduct at Borodino attracted the attention of Napoleon, who took

Thielmann into his own suite. His own sovereign at the same time made him Freiherr. In the war of Liberation Thielmann took a prominent part; as governor of Torgau, by his king's orders he at first observed the strictest neutrality, but on receipt of an order to hand over the fortress to the French he resigned his command and, accompanied by his staff officer Aster, joined the allies. As a Russian general he was employed in reorganizing the Saxon army after Leipzig, and in 1814 he commanded the Saxon corps operating in the Low Countries. Early in the following year he became a lieutenant-general in the Prussian service, and in command of the 3rd army corps he took part in the Waterloo campaign. From the field of Ligny he retired with the rest of Bliicher's army on Wavre, and when the other corps marched towards Waterloo, Thielmann covered this movement against Grouchy, fighting the spirited action of Wavre (June 18-19). He was later a corps commander at Minister and at Coblenz, and at the latter place he died in 1824.

See von Hutel, Biographische Skizze des Generals von Tnielmann (Berlin, 1828); von Holzendorff, Beitrdge zur Biographie des Generals Freiherrn von Thielmann (Dresden, 1830) ; von Peters- dorf, General Johann Adolf Freiherr von Thielmann (Leipzig, 1894).

THIERRY, the name of two French historians, the brothers Augustin and Amedee, both of whom, though their literary and historical powers were far from being equal, displayed the same devotion to historical study.

I. Jacques Nicolas Augustin Thierry (1795-1856), the elder and more gifted, was born at Blois on the 10th of May 1795. He had no advantages of birth or fortune, but was greatly distinguished at the Blois Grammar School, and entered the Ecole normale superieure (181 1). In 1813 he left it, and was sent as a professor to Compiegne, but stayed there a very short time. His ardent and generous nature led him to embrace the ideas of the French Revolution with enthusiasm, and he became fired with Saint Simon's ideal society of the future. He became the

secretary, and, as he would say himself, the " adopted son " of the famous visionary (1814-17); but, while most of Saint Simon's followers turned their attention to the affairs of life, devoting themselves to the problems, both theoretical and practical, of political economy, Thierry turned his to history. His imagination had been powerfully impressed by reading

Les Martyrs, in which Chateaubriand had contrasted the two civilizations and the two races from which the modern world has sprung. His romantic ardour was later still further nourished by the works of Sir Walter Scott, and though he did not himself actually write romances, his conception of history fully recognized the dramatic element. His main ideas on the Germanic invasidns, the Norman Conquest, the formation of the Communes, the gradual ascent of the nations towards free government and parliamentary institutions are already ob- servable in the articles contributed by him to the Censeur europien (1817-20), and later in his Lettres sur I'histoire de France (1820). From Fauriel he learnt to use the original authorities; and by the aid of the Latin chronicles and the collection, as yet very ill understood, of the Anglo-Saxon laws, he composed his Histoire de la Conquite de V Angleterre par les Normands, the appearance of which was greeted with great enthusiasm (1825). It was written in a style at once precise and picturesque, and was dominated by an idea, at once generous and false, that of Anglo-Saxon liberty resisting the invasions of northern barbarians, and reviving, in spite of defeat, in the parliamentary monarchy. His artistic talent as a writer makes the weaknesses and deficiencies of his scholar- ship less obvious. This work, the preparation of which had required several years of hard work, cost Thierry his eye- sight; in 1826 he was obliged to engage secretaries and in 1830 became quite blind. Notwithstanding, he continued to pro- duce works. In 1827 he republished his Leltres sur Vkistoire de France, with the addition of fifteen new ones, in which he described some of the more striking episodes in the history of

the rise of the medieval communes. The chronicles of the nth and 12th centuries and a few communal charters provided him, without requiring a great amount of erudition, with materials for a solid work. For this reason his work on the communes has not become so out of date as his Norman Con- quest; but he was too apt to generalize from the facts furnished by a few striking cases which occurred in a small portion of France, and helped to spread among the public, and even among professional historians, mistaken ideas concerning one of the most complex problems relating to the social origins of France.

Thierry was ardent in his applause of the July Revolution and the triumph of liberal ideas; at this time, too, his brother Amedee was appointed prefect, and he went to live with him for four years. He now re-edited, under the title of Dix ans d'eludes historiques, his first essays in the Censeur europeen and the Courrier jrancais (1834), and composed his Recits des temps merovingiens, in which he reproduced in a vivid and dramatic form some of the most characteristic stories of Gregory of Tours. These Recits appeared first in the Revue des deux mondes; when collected in volume form, they were preceded by long and interesting Considerations sur I'histoire de France. From the 7th of May 1830, Thierry had already been a member of the Academie des Inscriptions et Belles Lettres; in 1841, on the motion of Villemain, the French Academy awarded him the first Prix Gobert, which became a kind of literary inherit- ance for him, being renewed in his favour fifteen years in succession. Moreover, he had been allotted the task of publish- ing in the series of the Documents inedits a selection of acts bearing on the history of the Third Estate. By the aid of zealous collaborators (including Bourquelot and Louandre) he compiled, in four volumes, a valuable Recueil des monuments inedits de I'histoire du Tiers Etal (1850-70), which, however, bear only on the northern part of France. The preface appeared afterwards in a separate volume under the title of Histoire du Tiers Etat. To Thierry belongs the

credit for inaugurating in France the really critical study of the communal institutions, and we cannot make him responsible for the neglect into which it relapsed after his death. The last years of his life were clouded by domestic griefs and by illness. In 1844 he lost his wife, Julie de Querengal, an intelligent woman, who had been to him a collaborator as capable as she was I devoted. The revolution of 1848 inflicted on him a final blow.

by overturning that regime of the Liberal bourgeoisie the triumph of which he had hailed and justified as the necessary outcome of the whole course of French history. He began to distrust the rationalistic opinions which had hitherto estranged him from the Church. When Catholic writers animadverted on the ” historical errors ” in his writings he promised to correct them, and accordingly we find that in the final edition of his Histoire de la Conqulte his severe judgments on the policy of the court of Rome, together with some faults of detail, are elimi- nated. Though he did not renounce his Liberal friends, he sought the conversation of enlightened priests, and just before his death he seems to have been disposed to enter the pale of the Church. He died in Paris on the 22nd of May 1856, after several years of suffering endured with heroism.

II. Amedee Simon Dominique Thierry (1797-1873) was the younger brother of Augustin, and was born on the 2nd August 1797. He began life as a journalist (after an essay, like his brother, at schoolmastering), was connected with the famous romantic harbinger the Globe, and obtained a small government clerkship. His first book was a brief history of Guienne in 1825, and three years later appeared the first volume of the Histoire des Gaulois, which was received with much favour, and obtained him, from the royalist premier Martignac, a history professor- ship at Besangon. He was,

however, thought too liberal for the government of Charles X., and his lectures were stopped, with the result of securing him, after the revolution, the important post of prefect of the Haute-Saone, which he held eight years. During this time he published nothing. In 1838 he was trans- ferred to the council of state as master of requests, which post he held through the revolution of 1848 and the coup d' etat till i860, when he was made senator — a paid office, it must be remembered, and, in effect, a lucrative sinecure. He also passed through all the ranks of the Legion of Honour, became a member of the Academie des Inscriptions in 1841, and in 1862 received the honorary degree of D.C.L. at Oxford. He had, except during the time of his prefecture, never intermitted his literary work, being a constant contributor to the Revue des deux pwndes, his articles (usually worked up afterwards into books) almost all dealing with Roman Gaul and its period. The chief were the Histoire des Gaulois, 3 vols. (1828, 1834, 1845; the 8th edition of vol. i. appeared in 1870); Histoire de la Gaule sous V administration romaine (3 vols., 1840-47; 2nd ed. 1871); Histoire d'Attila, de ses fils et successeurs jusqu'A I'etablissement des Hongrois en Europe (1856; 5th ed. in 1874); Tableau de VEmpire romain (1862; 5th ed. in 1871; now quite out of date) ; Recits de I'histoire romaine au V siecle: la lulte contre les Barbares, and les luttes religieuses (i860; 2nd ed. in 6 vols. 1880). He died in Paris on the 27th of March 1873. His son, Gilbert Augustin Thierry (born 1843), who began a literary career by articles on Les Revolutions d' Angleterre (1864) and some Essais d'histoire religieuse (1867), afterwards confined himself to the writing of novels. ' (C. B.*)

THIERS, LOUIS ADOLPHE (1797-1877), French statesman and historian, was born at Marseilles on the 16th of April 1797. His family are somewhat grandiloquently spoken of as " cloth merchants ruined by the Revolution," but it seems that at the actual time of his birth his father was a locksmith. His mother belonged to the family of the Cheniers, and he was

well educated, first at the lycee of Marseilles, and then in the faculty of law at Aix. Here he began his lifelong friendship with Mignet, and was called to the bar at the age of twenty- three. He had, however, little taste for law and much for literature; and he obtained an academic prize at Aix for a discourse on Vauvenargues. In the early autumn of 1821 Thiers went to Paris, and was quickly introduced as a contri- butor to the Constitutionnd: In each of the years immediately following his arrival in Paris he collected and published a volume of his articles, the first on the salon of 1822, the second on a tour in the Pyrenees. He was put out of all need of money by the singular benefaction of Cotta, the well-known Stuttgart publisher, who was part-proprietor of the Consti- tutionnd, and made over to Thiers his dividends, or part of

them. Meanwhile he became very well known in Liberal society, and he had begun the celebrated Histoire de la revolu- tion franc.aise, which founded his literary and helped his political fame. The first two volumes appeared in 1823, the last two (of ten) in 1827. The book brought him little profit at first, but became immensely popular. The well-known sentence of Carlyle, that it is " as far as possible from meriting its high reputation," is in strictness justified, for all Thiers's historical work is marked by extreme inaccuracy, by prejudice which passes the limits of accidental unfairness, and by an almost complete indifference to the merits as compared with the successes of his heroes. But Carlyle himself admits that Thiers is " a brisk man in his way, and will tell you much if you know nothing." Coming as the book did just when the reaction against the revolution was about to turn into another reaction in its favour, it was assured of success.

For a moment it seemed as if the author had definitely chosen the lot of a literary man, not to say of a literary hack. He even planned an Histoire genirale. But the accession to power of the Polignac ministry in August 1829 changed his projects, and at the beginning of the next year Thiers, with Armand

Carrel, Mignet, and others started the National, a new opposition newspaper. Thiers himself was one of the souls of the actual revolution, being credited with " overcoming the scruples of Louis Philippe," perhaps no Herculean task. At any rate he had his reward. He ranked as one of the Radical supporters of the new dynasty, in opposition to the party of which his rival Guizot was the chief literary man, and Guizot's patron, the due de Broglie, the main pillar. At first Thiers, though elected deputy for Aix, obtained only subordinate places in the ministry of finance. After the over- throw of his patron Laffitte, he became much less radical, and, after the troubles of June 1832, was appointed to the ministry of the interior. He repeatedly changed his portfolio, but re- mained in office for four years, became president of the council and in effect prime minister, and began his series of quarrels and jealousies with Guizot. At the time of his resignation in 1836 he was foreign minister, and, as usual, wished for a spirited policy in Spain, which he could not carry out. He travelled in Italy for some time, and it was not till 1838 that he began a regular campaign of parliamentary opposition, which in March 1840 made him president of the council and foreign minister for the second time. But he held the position barely six months, and, being unable to force on the king an anti-English and anti-Turkish policy, resigned on the 29th of October. He now had little to do with politics for some years, and spent his 'time on his Histoire du Consulat et de VEmpire, the first volume of which appeared in 1845. Though he was still a member of the chamber he spoke rarely, till after the beginning of 1S46, when he was evidently bidding once more for power. Immediately before the revolution of February he went to all but the greatest lengths, and when it broke out he and Odillon Barrot were summoned by the king; but it was too late. Thiers was unable to govern the forces he had helped to gather, and he resigned.

Under the republic he took up the position of conservative republican, which he ever afterwards

maintained, and he never took office. But the consistency of his conduct, especi- ally in voting for Prince Louis Napoleon as president, was often and sharply criticized, one of the criticisms leading to a duel with a fellow-deputy, Bixio. He was arrested at the coup d'etat, was sent to Mazas, and then escorted out of France. But in the following summer he was allowed to return. For the next decade his history was almost a blank, his time being occupied for the most part on The Consulate and the Empire. It was not till 1863 that he re-entered political life, being elected by a Parisian constituency. For the seven years following he was the chief speaker among the small band of anti-Imperialists in the French chamber, and was regarded generally as the most formidable enemy of the empire. While nominally protesting against its foreign enterprises, he per- petually harped on French loss of prestige, and so contributed more than any one else to stir up the fatal spirit which brought

on the war of 1870. Even when the Liberal-Imperialist Ollivier ministry was formed, he maintained at first an anything but benevolent neutrality, and then an open opposition, and it is impossible to be sure whether mere " canniness," or some- thing better, kept him from joining the government of the National Defence, of which he was in a manner the author.

Nevertheless the collapse of the empire was a great oppor- tunity for Thiers, and it was worthily accepted. He undertook in the latter part of September and the first three weeks of October .?, circular tour to the different courts of Europe in the hope of obtaining some intervention, or at least some good offices. The mission was unsuccessful; but the negotiator was on its conclusion immediately charged with another — that of obtaining, if possible, an armistice directly from Prince

Bismarck. The armistice having been arranged, and the opportunity having been thus obtained of electing a National Assembly, Thiers was chosen deputy by more than twenty constituencies (of which he preferred Paris), and was at once elected by the Assembly itself practically president, nominally chef du pouvoir executif. He lost no time in choosing a coalition cabinet, and then personally took up the negotiation of peace. Probably no statesman has ever had a more disgusting task; and the fact that he discharged it to the satisfaction of a vast majority is the strongest testimony to Thiers's merits. He succeeded in convincing the deputies that the peace was neces- sary, and it was (March 1, 1871) voted by more than five to one.

Thiers held office for more than two years after this event, which shows the strength of the general conviction that he alone could be trusted. He had at first to meet and crush at once the mad enterprise of the Paris commune. Soon after this was accomplished he became (August 30th) in name as well as in fact president of the republic.

His strong personal will and inflexible opinions had much to do with the resurrection of France; but the very same facts made it inevitable that he should excite violent opposition. He was a confirmed protectionist, and free trade ideas had made great way in France under the empire; he was an advocate of long military service, and the devotees of la revanche were all for the introduction of general and compulsory but short service. Both his talents and his temper made him utterly indisposed to maintain the attitude supposed to be incumbent on a republican president; and his tongue was never a care- fully governed one. -In January 1872 he formally tendered his resignation; and though it was refused, almost all parties disliked him, while his chief supporters — men like Remusat, Barthelemy Saint-Hilaire and Jules Simon — were men rather of the past than of the present.

The year 1873 was, as a parliamentary year in France, occu- pied to a great extent with attacks on

Thiers. In the early spring regulations were proposed, and on April 13th were carried, which were intended to restrict the executive and especially the parliamentary powers of the president. On the 27th of the same month a contested election in Paris, resulting in the return of the opposition candidate, M. Barodet, was regarded as a grave disaster for the Thiers government, and that government was not much strengthened by a dissolution and reconstitution of the cabinet on May 19th. Immediately afterwards the question was brought to a head by an interpellation moved by the due de Broglie. The president declared that he should take this as a vote of want of confidence; and in the debates which followed a vote of this character (though on a different formal issue, and proposed by M. Ernoul) was carried by 16 votes in a house of 704. Thiers at once resigned (May 24th).

He survived his fall four years, continuing to sit in the Assembly, and, after the dissolution of 1876, in the Chamber of Deputies, and sometimes, though rarely, speaking. He was also, on the occasion of this dissolution, elected senator for Belfort, which his exertions had saved for France; but he preferred the lower house, where he sat as of old for Paris. On May 16th 1877, he was one of the " 363 " who voted want of confidence in the Broglie ministry (thus paying his debts),

and he took considerable part in organizing the subsequent electoral campaign. But he was not destined to see its success, being fatally struck with apoplexy at St Germain-en-Laye on September 3rd. Thiers had long been married, and his wife and sister-in-law, Mile Dosne, were his constant companions; but he left no children, and had had only one — a daughter — who long predeceased him. He had been a member of the Academy since 1834. His personal appearance was remarkable, and not imposing, for he was very short, with plain features, ungainly gestures and manners, very near-sighted, and of dis- agreeable voice; yet he became (after wisely giving up an attempt at the ornate style of oratory) a very effective speaker in a kind

of conversational manner, and in the epigram of debate he had no superior among the statesmen of his time except Lord Beaconsfield.

Thiers was by far the most gifted and interesting of the group of literary statesmen which formed a unique feature in the French political history of the 19th century. There are only two who are at all comparable to him — Guizot and Lamartine; and as a states- man he stands far above both. Nor is this eminence merely due to his great opportunity in 1870; for Guizot might under Louis Philippe have almost made himself a French Walpole, at least a French Palmerston, and Lamartine's opportunities after 1848 were, for a man of political genius, illimitable. But both failed — Lamar- tine almost ludicrously — while Thiers in hard conditions made a striking if not a brilliant success. But he only showed well when he was practically supreme. Even as the minister- of a constitu- tional monarch his intolerance of interference or joint authority, his temper at once imperious and intriguing, his inveterate inclina- tion towards brigue, that is to say, underhand rivalry and caballing for power and place, showed themselves unfavourably; and his constant tendency to inflame the aggressive and chauvinist spirit of his country neglected fact, was not based on any just estimate of the relative power and interests of France, and led his country more than once to the verge of a great calamity. In opposition, both under Louis Philippe and under the empire, and even to some extent in the last four years of his life, his worst qualities were always manifested. But with all these drawbacks he conquered and will retain a place in what is perhaps the highest, as it is cer- tainly the smallest, class of statesmen — the class of those to whom their country has had recourse in a great disaster, who have shown in bringing her through that disaster the utmost constancy, courage, devotion and skill, and who have been rewarded by as much success as the occasion permitted.

As a man of letters Thiers is very much smaller. He has not only the fault of diffuseness, which is

common to so many of the best-known historians of his century, but others as serious or more so. The charge of dishonesty is one never to be lightly made against men of such distinction as his, especially when their evident confidence in their own infallibility, their faculty of ingenious casuistry, and the strength of will which makes them (unconsciously, no doubt) close and keep closed the eyes of their mind to all incon- venient facts and inferences, supply a more charitable explanation. But it is certain that from Thiers's dealings with the men of the first revolution to his dealings with the battle of Waterloo, constant, angry and well-supported protests against his unfairness were not lacking. Although his search among documents was undoubtedly wide, its results are by no means always accurate, and his admirers themselves admit great inequalities of style in him. These char- acteristics reappear (accompanied, however, by frequent touches of the epigrammatic power above mentioned, which seems to have come to Thiers more readily as an orator or a journalist than as an historian) in his speeches, which after his death were collected in many volumes by his widow. Sainte-Beuve, whose notices of Thiers are generally kindly, says of him, " M. Thiers sait tout, tranche tout, parle de tout," and this omniscience and " cocksure- ness " (to use the word of a prime minister of England contemporary with this prime minister of France) are perhaps the chief pervading features both of the statesman and the man of letters.

His histories, in many different editions, and his speeches, as above, are easily accessible; his minor works and newspaper articles have not, we believe, been collected in any form. Several years after his death appeared Deux opuscules (1891) and Melanges inedites (1892), while Notes et souvenirs, 1870-73, were published in 1901 by " F. D.," his sister-in-law and constant companion, Mile Felicie Dosne. Works on him, by M. Laya, M. de Mazade, his colleague and friend M. Jules Simon, and others, are numerous.

(G. Sa.)

THIERS, a town of central France, capital of an arrondisse- ment in the department of Puy-de-D6me, 24 m. E.N.E. of Clermont-Ferrand, on the railway between that town and St Etierme. Pop. (1006) town r 12,601; commune, 17,413. Thiers is most picturesquely situated on the side of a hill at the foot of

which the Durolle rapidly descends through a narrow valley into the Dore, a tributary of the Allier. The streets rising in steep rows contain a large number of stone and wooden houses, some of which date to the 15th century. A fine view of the Plain of Limagne and the Dome mountain is obtainable from the terraces. The church of St Genes was built in 575 by Avitus, bishop of Clermont, and rebuilt in the 12th century. It has some curious mosaic work of the Merovingian period and a fine tomb of the 13th century. The church of Le Moutier, which formerly formed part of a Benedictine monastery, dates chiefly from the nth century. Thiers is the seat of a sub- prefect and has tribunals of first instance and of commerce, a chamber of commerce, a board of trade arbitration, a com- munal college, a commercial and industrial school, and a branch of the Bank of France. Its special industry is the manufac- ture of cutlery, which employs some 12,000 hands in the town and its vicinity. The manufacture of handles and buttons of bone, pasteboard, stamping, hand-made and other papers and machinery are also carried on.

Thiers was sacked about 531 by the soldiers of Thierry, son of Clovis. About the same period Gregory of Tours speaks of a wooden chapel which may have occupied the site of the pre- sent church of Le Moutier. The commercial importance of the town was much increased in the 16th century when the manu- facture of cutlery was introduced from the neighbouring town of Chateldon.

THIERSCH, FRIEDRICH WILHELM (1784–1860), German classical scholar and educationist, was born at Kirchschei- dungen near Freiburg on the Unstrut, on the 17th of June 1784. In 1809 he became professor at the gymnasium at Munich, and in 1826 professor of ancient literature in the university of Landshut, transferred in that year to Munich. He died at Munich on the 25th of February i860. Thiersch, the ” tutor of Bavaria ” (praeceptor Bavariae), found an extremely unsatisfactory system of education in existence. There was a violent feud between the Protestant ” north ” and the Catholic ” south ” Germans; Thiersch's colleagues, chiefly old monks, offered violent opposition to his reforms, and an attempt was made upon his life. His schemes, how- ever, were carried out, and have remained the governing prin- ciple of the educational institutions of Bavaria. Thiersch was an ardent supporter of Greek independence. In 1832 he visited Greece, and it is said that his influence had much to do with securing the throne of the newly created kingdom for Otto of Bavaria. He wrote a Greek grammar, a metrical translation of Pindar, and an account of Greece {L'Etat actuel de la Grece (1833).

Biography by his son, H. W. J. Thiersch (1866); see a'so G. M. Thomas, Geddchtnissrede auf Friedrich von Thiersch (i860) , articles by A. Baumeister in Allgemeine Deutsche Biographie and O. Zockler in Herzog-Hauck's Realencyclopddie fur protestantische Theologie, xix. ; J. E. Sandys, History of Classical Scholarship, iii. (1908).

THIETMAR (Dietmar or Dithmar) OF MERSEBURG (075–1018), German chronicler, was a son of Siegfried, count of Walbeck, and was related to the family of the emperor Otto the Great. Born on the 25th of July 975 he was educated at Quedlinburg and at Magdeburg and became provost of Wal- beck in 1002 and bishop of Merseburg seven years later. He took some part in the political events of the time; in 994 he was a hostage in the hands of the Northmen, and he was not unfamiliar with the actualities of war. He died on the 1st of December 1018.

Thietmar wrote a Chronicon in eight books, which deals with the period between 908 and 1018. For the earlier part he used Widukind's Res gestae Saxonicae, the Annates Quedlinburgenses and other sources; the latter part is the result of personal know- ledge. It is rough in form and the author shows no power of discriminating between important and unimportant events; yet the chronicle is an excellent authority for the history of Saxony during the reigns of the emperors Otto III. and Henry II. No kind of information is excluded, but the fullest details refer to the bishopric of Merseburg and to the wars against the Wends and the Poles. The original manuscript of the work is preserved at Dresden and has been published in facsimile by L. Schmidt (Dresden, 1905). It has been edited by J. M. Lappcnberg in Band 111. of the

Monumenta Germaniae historica, Scriptores; and by F. Kurze (Han- over, 1889); and has been translated into German by J. Laurent (new ed. revised by W. Wattenbach, Leipzig, 1892). See F. Kurze, Bischof Thietmar von Merseburg und seine Chronik (Halle, 1890); and W. Wattenbach, Deutschlands Geschichtsquellen, Band II. (Berlin, 1904).

THIMBLE, an implement for use in sewing, serving as a pro- tective covering for the finger in pushing the needle through the material worked upon. For ordinary purposes the thimble is a bell-shaped cap reaching to the first joint and is usually worn on the middle finger. It is made of silver or other metal, sometimes of horn, ivory or bone. The sail- maker's thimble or " thummel " is a heavy ring, worn on the thumb, with a disc attached which is the part used to press against the needle. The O.E. thymel, from which the word descends, is formed, with the suffix -el, from thuma, the thumb, the protective covering having been formerly worn on that digit. The thumb by etymology means the " thick " finger, and is to be referred to the root turn, to swell up, become thick, seen in Lat. tumere, " tumid," &c. The term " thimble " is used of many mechanical appliances, especially of various forms of sleeve, bushing or joining for the ends of pipes, or

shaftings, or as covering for an axle, &c. In nautical usage the "thimble" is a metal ring concave on the outside in which a rope runs; it is a protection against chafing.

THIOPHEN, C4H4S, a compound occurring in small quantities in crude coal-tar benzene, from which it was first isolated in 1883 by V. Meyer (Ber., 1883, 16, p. 1465). The method adopted by Meyer to recover the thiophen was as follows. Ten volumes of the purest coal-tar benzene were shaken for four hours with one volume of sulphuric acid, the acid layer was removed and neutralized with lead carbonate, and the lead thiophen sulphonate obtained was distilled with an equivalent quantity of ammonium chloride. The distillate obtained was diluted with one hundred volumes of ligroin (previously purified by shaking with fuming sulphuric acid) and then shaken for one or two hours with sulphuric acid (using ten volumes of acid to one volume of the distillate), the acid layer diluted with water, neutralized by lead carbonate and the lead salt again distilled with an equivalent quantity of ammonium chloride. The distillate is finally rectified. It may be obtained in small quantity by passing ethylene or acetylene into boiling sulphur; by passing ethyl sulphide through a red-hot tube; by heating crotonic acid, butyric acid or erythrite with phosphorus pentasulphide; by heating succinic anhydride with phosphorus pentasulphide or sodium succinate with phosphorus trisulphide (J. Volhard and H. Erdmann, Ber., 1885, 18, p. 454); or by heating succindialdehyde with two parts of phosphorus trisulphide (C. Harries, Ber., 1901, 34, p. 1496).

It is a colourless liquid having a faint smell resembling that of benzene and boiling at 84 C. In its chief properties it very much resembles benzene, being readily brominated,sulphonated, and nitrated; also, the side chains in the alkyl thiophens are readily oxidized to carboxyl groups. On passing its vapour through a red-hot tube it yields di-thienyl, CgH 6 S2. It is com- pletely decomposed by hydriodic acid at 140 C. It condenses with aldehydes (in chloroform solution) in the presence of phosphorus

pentoxide to give dithienyl hydrocarbons (A. Nahke, Ber., 1897, 30, p. 2037). It can be readily recognized by the blue colour produced when a trace of thiophen is added to isatin dissolved in concentrated sulphuric acid (the indophenin reaction). The thiophen ketones may be prepared by the inter- action of thiophen and its homologues with acid chlorides in the presence of anhydrous aluminium chloride. The thiophen homologues are best prepared by heating the 1-4 diketones with phosphorus pentasulphide, the diketones reacting in the enolic form:

,CH-CH;

R-CR-C

VlfTWfi/

f X \,.

Thiotenol, or oxymethyl thiophene, is prepared by heating laevulinic acid with phosphorus pentasulphide (W. Kues and C. Paal, Ber., 1886, 19, p. 555). On this group see also V. Meyer Die Thiophcngruppc.

THIRLBY (or Thirleby), THOMAS (c. 1506-1570), English prelate, was born at Cambridge and was educated at Trinity Hall in the university there, becoming a fellow of his college. Through the good offices of his friend, Thomas Cranmer, he was introduced to the court of Henry VIII., and he served this king, one of whose chaplains he had become, in several ways. Among his numerous public appointments were those of dean of the chapel royal and member of the council of the north. In 1540 he was made bishop of Westminster, being the first and only occupant of that see; in 1550, three years after Henry VIII. 's death, he resigned the bishopric, which was dissolved, and became bishop of Norwich. As a diplomatist Thirlby had a long and

varied experience; on several occasions he was sent on embassies to the emperor Charles V., and he helped to arrange the peace between England and France in 1550. He appears to have served Edward VI. loyally through- out his short reign, both at home and abroad, although it is certain that he disliked the religious changes and he voted against the act of uniformity in 1549. He was thus more at ease when Mary ascended the throne. Translated in 1554 to the bishopric of Ely, he took part in the trial of Cranmer at Oxford and in the consecration of Reginald Pole as archbishop of Canterbury, but he himself did not take severe measures against heretics. When Elizabeth became queen the bishop refused to take the oath of supremacy; in other ways he showed himself hostile to the proposed religious changes, and in 1559 he was deprived of his bishopric. For preaching against the innovations he was arrested in 1 560, and he was in honourable confinement at Lambeth Palace when he died on the 26th of August 1570.

THIRLWALL, COHNOP (1797–1875), English bishop and historian, was born at Stepney, London, on the nth of January 1797. His family was of Northumbrian extraction. He was a precocious boy, learning Latin at three, reading Greek at four, and writing sermons at seven. He went to the Charterhouse school, where George Grote and Julius Hare were among his schoolfellows. He went up to Trinity College, Cambridge, in October 1814, and gained the Craven university scholarship and the chancellor's classical medal. In October 1818 he was elected to a fellowship, and went for a year's travel on the Continent. At Rome he gained the friendship of Baron (Christian C. J.) von Bunsen, which had a most important in- fluence on his life. On his return, " distrust of his own re- solutions and convictions " led him to abandon for the time his intention of being a clergyman, and he settled down to the study of the law, " with a firm determination not to suffer it to engross my time so as to prevent me from pursuing other branches of knowledge." How little his heart was with it was shown by the labour

he soon undertook of translating and prefacing Schleiermacher's essay on the Gospel of St Luke. He further rendered two of Tieck's most recent Novelkn into English. In 1827 he at length made up his mind to quit the law, and was ordained deacon the same year.

Thirlwall now joined with Hare in translating Niebuhr's History of Rome; the first volume appeared in 1828. The translation was attacked in the Quarterly as favourable to scepticism, and the translators jointly replied. In 183 1 the friends established the Philological Museum, which lived through only six numbers, though among Thirlwall's contributions was his masterly paper on the irony of Sophocles — " the most ex- quisite criticism I ever read," says Sterling. On Hare's de- parture from Cambridge in 1832, Thirlwall became assistant college tutor, which led him to take a memorable share in the great controversy upon the admission of Dissenters which arose in 1834. Thomas Turton, the regius professor of divinity (afterwards dean of Westminster and bishop of Ely), had written a pamphlet objecting to the admission, on the ground of the apprehended unsettlement of the religious opinions of young churchmen. Thirlwall replied by pointing out that no pro- vision for theological instruction was in fact made by the colleges except compulsory attendance at chapel, and that this was mischievous. This attack upon a time-hallowed piece of college discipline brought upon him a demand for the resignation

of his office as assistant tutor. He complied at once; his friends generally thought that he ought to have tested the master's power. The occurrence marked him out for promotion by a Liberal Government, and in the autumn he received from Lord Brougham as chancellor the living of Kirby-under-Dale in Yorkshire. Though devoted to his parochial duties, he found time to begin his principal work, the History of Greece. This work was a commission from Lardner's Cabinet Cyclopaedia, and was originally intended to have been condensed into two or three duodecimo volumes. The scale was enlarged,

but Thirlwall always felt cramped. He seems a little below his subject, and a little below himself. As compared with Grote's history it lacks enthusiasm for a definite political ideal and is written entirely from the standpoint of a scholar. It is in this respect superior, and further shows in places a more impartial treatment of the evidence, especially in respect of the aristo- cratic and absolute governments of Greece. For these reasons its popularity was not so immediate as that of Grote's work, but within recent years its substantial merits have been more adequately recognized. A noble letter from Thirlwall to Grote, and Grote's generous reply, are published in the life of the latter. John Sterling pronounced Thirlwall " a writer as great as Thu- cydides and Tacitus, and with far more knowledge than they." The first volume was published in 1835, the last in 1847.

In 1840 Thirlwall was raised to the see of St David's. The promotion was entirely the act of Lord Melbourne, an amateur in theology, who had read Thirlwall's introduction to Schleier- macher, and satisfied himself of the propriety of the appoint- ment. " I don't intend to make a heterodox bishop if I know it," he said. In most essential points he was a model bishop, and he acquainted himself with Welsh, so as to preach and con- duct service in that language. He was not greatly beloved by his clergy, who felt their intellectual distance too great, and were alternately frozen by his taciturnity and appalled by his sarcasm. The great monument of his episcopate is the eleven famous charges in which he from time to time reviewed the position of the English Church with reference to whatever might be the most pressing question of the day — addresses at once judicial and statesmanlike, full of charitable wisdom and massive sense. His endeavours to allay ecclesiastical panic, and to promote liberality of spirit, frequently required no ordinary moral courage. He was one of the four prelates who refused to inhibit Bishop Colenso from preaching in their dioceses, and the only one who withheld his signature from the addresses calling upon Colenso to

resign his see. He took the liberal side in the questions of Maynooth, of the admission of Jews to parliament, of the Gorham case, and of the educational conscience clause. He was the only bishop who voted for the disestablishment of the Irish Church, though a scheme of con- current endowment would have been much more agreeable to him. He would have made an admirable successor to Howley in the primacy, but such was the complexion of ecclesiastical politics that the elevation of the most impartial prelate of his day would have been resented as a piece of party spirit.

Thirlwall's private life was happy and busy. Though never married, he was fond of children and of all weak things except weak-minded clergymen. He had a very judicial mind, and J. S. Mill said he was the best orator he had ever heard. During his latter years he took great interest in the revision of the authorized version of the Bible, and was chairman of the re- visers of the Old Testament. He resigned his see in May 1874, and retired to Bath, where he died on the 27th of July 1875. He lies in Westminster Abbey in the same grave as Grote.

As scholar, critic and ecclesiastical statesman Thirlwall stands very high. He was not a great original thinker; he lacked the creative faculty and the creative impulse. His character, with its mixture of greatness and gentleness, was thus read by Carlyle: " A right solid, honest-hearted man, full of knowledge and sense, and, in spite of his positive temper, almost timid."

Thirlwall's History of Greece remains a standard book. His Remains, Literary and Theological, were edited by J. J. S. Perowne

in three volumes (1877-78), two of which are occupied by his charges. His Letters, Literary and Theological, with a connecting memoir, were edited

by J. J. S. Perowne and L. Stokes (1881). His Letters to a Friend (Miss Johnes of Dolaucothy) are a splendid monument to his memory. They were originally published by Dean Stanley, and there is a revised and corrected edition. For a general view of Thirlwall's life and character, see the Edinburgh Review, vol. cxliii. ; for a picture of him in his diocese, Temple Bar, vol. lxxvi.

THIRSK, a market-town in the Thirsk and Malton parlia- mentary division of the North Riding of Yorkshire, England, 22 m. N.W. by N. from York by the North-Eastern railway. Pop. (1901) 3093. It lies in a fertile plain W. of the Hambleton Hills, on the Codbeck, a small tributary of the Swale. The church of St Mary, entirely Perpendicular, with parvise, chancel, nave, aisles, porch, and tower 80 ft. in height, is one of the most beautiful churches in the Riding. The original work of oak is especially noteworthy. The moat of the ancient castle built by the Mowbrays about 980 remains. The principal modern buildings are the assembly rooms, mechanics' institute, and court-house. Standing in the fertile district of the Vale of Mowbray, the town has an extensive agricultural trade. Agri- cultural implements are largely manufactured. Iron-founding, engineering, tanning and brick-making are carried on, and there are large flour-mills.

At the time of the Domesday Survey, Thirsk (Treske) was a manor of little importance belonging partly to the king and partly to Hugh, son of Baldric. Soon afterwards it was granted to Robert de Mowbray, who often resided there, and is said to have raised the castle round which the borough grew up. His estates, being forfeited for treason against William Rufus, were restored by Henry I. to Nigel de Albini, Robert's cousin, who took the name of Mowbray. Roger, son of Nigel, took part in the rebellion against Henry II. in 11 74, and although he was allowed to retain his estates, his castle at Thirsk was destroyed. The manor remained in his family until the death of John de Mowbray, duke of Norfolk, without issue male in 1475, and after passing through several families was finally sold in 1723 to

Ralph Bell, whose descendants thereafter held the manor. Thirsk is first mentioned as a borough in a charter granted by Roger de Mowbray to Newburgh Priory in the reign of Henry II. It was governed by a bailiff elected by the burgesses at the court leet of the lord of the manor, and never received a charter of incorporation. The burgesses were represented in parlia- ment by two members in 1295 and again from 1552–53 to 1832, when by the Municipal Reform Act the number was reduced to one. In 1885 the town was disfranchised. Roger de Mowbray held a market by prescription in Thirsk in the 13th century, and by Camden's time (c. 1586) it had become one of the best markets in the North Riding. It is still held by the lordof the manor.

See Victoria County History: Yorkshire; William Grainge, The Vale of Mowbray: a historical and topographical account of Thirsk and its neighbourhood (1859).

THIRTY YEARS' WAR (1618–1648), the general name of a series of wars in Germany which began formally with the claim of Frederick the elector palatine to the throne of Bohemia and ended with the treaty of Westphalia. It was primarily a Nature religious war and was waged with the bitterness of the characteristic of such wars, but at the same time struggle. political and feudal quarrels were interwoven with the religious question, with the consequence that the armies, considering themselves as their masters' retainers rather than champions of a cause, plundered and burned everywhere, military violence being in no way restrained by expediency. In a war based on the principle cujus regio ejus reiigio it was vain to expect either the professional or the national type of army to display its virtues.

Fifty years before the outbreak of the war the Convention of Passau had compromised the burning questions of the Re- formation, but had left other equally important points as to the secularization, of church lands and the consecration of Protestant bishops to the future. Each such case, then, came

before the normal government machine — a Diet so constituted that even though at least half of the secular princes and nine- tenths of their subjects were Protestants, the voting majority was Catholic in beliefs and in vested interests. Moreover, the Jesuits had rallied and disciplined the forces of Catholicism, while Protestantism, however firm its hold on the peoples, had at the courts of princes dissipated itself in doctrinal wrangles. Thus, as it was the princes and the free cities, and by no means the mass of the people, that settled religious questions, ... the strongest side was that which represented con- "Union" servatism, peace and Catholicism. Realizing this and the from the preliminary mutterings of the storm, the "League" t.^^* ■ r j • i.- 1. formed.

Protestant princes formed a union, which was

promptly answered by the Catholic League. This group was headed by the wise and able Maximilian of Bavaria and sup- ported by his army, which he placed under a soldier of long experience and conspicuous ability, Count Tilly.

The war arose in Bohemia, where the magnates, roused by the systematic evasion of the guarantees to Protestants, refused to elect the archduke Ferdinand to the vacant throne, Bohemian offering it instead to Frederick, the elector palatine. move- But the aggrandizement of this elector's power was menU entirely unacceptable to most of the Protestant princes — to John George of Saxony above all. They declared themselves neutral, and Frederick found himself an isolated rebel against the emperor Ferdinand, and little more than the nominal head of an incoherent nobility in his new kingdom.

Even thus early the struggle showed itself in the double aspect of a religious and a political war. Just as the Protestants and their nominee found themselves looked upon askance by the other Protestants, so the emperor himself was unable to call upon Maximilian's Army of the League without promising to aggrandize Bavaria. Indeed the emperor

was at first — before Frederick intervened — almost a mere archduke of Austria waging a private war against his neighbours. Only the in- coherence of his enemies saved him. They ordered taxes and levies of soldiers, but the taxes were not collected, and the soldiers, unpaid and unfed, either dispersed to their homes or plundered the country-side. The only coherent force was the mercenary corps of Ernst von Mansfeld, which, thrown out of employment by the termination of a war in Italy, had entered the service of the Union. Nevertheless, the Bohemians were conspicuously successful at the outset. Under Count Thurn they won several engagements, and Ferdinand's army under Carl Bonaventura de Longueval, Count Buquoi (1571-1621), was driven back. Thurn appeared before Vienna itself. Moravia and Silesia supported the Bohemians, and the Austrian nobles attempted, in a stormy conference, to wrest from Ferdinand not only religious liberty but also political rights that would have made Austria and Bohemia a loose confedera- tion of powerful nobles. Ferdinand firmly refused, though the deputation threatened him to his face, and the tide ebbed as rapidly as it had flowed. One or two small military failures, and the enormous political blunder of bringing in the elector palatine, sealed the fate of the Bohemian movement, for no sooner had Frederick accepted the crown than Maximilian let loose the Army of the League. Spanish aid arrived. Spinola with 20,000 men from the Low Countries and Franche Comte invaded the Palatinate, and Tilly, with no fears for the safety of Bavaria, was able to combine with Buquoi against Defeat of the Bohemians, whose resistance was crushed at the Frederick. battle of the Weisser Berg near Prague (8/18 November 1620). With this the Bohemian war ended. Some of the nobles were executed, and Frederick, the " Winter King," was put to the ban of the Empire.

The menace of Spinola's invasion broke up the feeble Pro- testant Union. But the emperor's revenge alarmed the Union princes. They too had, more or less latent, the tendency to separatism and they were Protestants, and neither in religion nor in

politics could they suffer an all-powerful Catholic emperor. Moreover, the alternative to a powerful emperor was a powerful Bavaria, and this they liked almost as little.

There still remained for the armies of Tilly and Buquoi the reduction of the smaller garrisons in Bohemia, and these when finally expelled rallied under Mansfeld, who was joined by the disbanded soldiery of the Protestant Union's short-lived army. Then there began the wolf-strategy that was the distinguishing mark of the Thirty Years' War. An army even of ruffians could be controlled, as Tilly controlled that of the League, if it were Predatory P 11 ^. But Mansfeld, the servant of a shadow king, armies could not pay. Therefore " he must of necessity plunder

where he was. His movements would be governed neither by political nor by military considerations. As , soon as his men had eaten up one part of the country they must go on to another, if they were not to die of starvation. They obeyed a law of their own, quite independent of the wishes or needs of the sovereign whose interests they were supposed to serve." These movements were for preference made upon hostile territory, and Mansfeld was so far successful in them that the situation in 162 1 became distinctly unfavourable to the emperor. He had had to recall Buquoi's army to Hungary to fight against Gabriel Bethlen, the prince of Transylvania, and in an unsuccessful battle at Neu- hausel (July 10) Buquoi was killed. Tilly and the League Army fought warily and did not risk a decision. Thus even the proffered English mediation in the German war might have been accepted but for the fact that in the Lower Palatinate a corps of English volunteers, raised by Sir Horace Vere for the service of the English princess Elizabeth, the fair queen of Bohemia, found itself com- pelled, for want of pay and rations, to live, as Mansfeld lived, on the

country of the nearest probable enemy — in their case the bishop of Spire. This brought about a fresh intervention of Spinola's army, which had begun to return to the Low Countries to prose- cute the interminable Dutch war. Moreover Mansfeld, having so thoroughly eaten up the Palatinate that the magistrates of Frede- rick's own towns begged Tilly to expel his general, decamped into Alsace, where he seized Hagenau and wintered in safety.

The winter of 1621-22 passed in a series of negotiations which failed because too many interests, inside and outside Germany, were bound up with Protestantism to allow the Catholics to speak as conquerors, and because the cause of Protestantism was too much involved with the cause of the elector palatine to be taken in hand with energy by the Protestant princes. But Frederick and Mansfeld found two allies. One was Christian of Brunswick, the gallant young knight-errant, titular bishop of Halberstadt, queen Elizabeth's champion, and withal, though he called himself Fresh Goltes Freund, der Pfqffen Feind, a plunderer of peasants

combat- as we " as °^ P r ' ests - T" e other was the margrave George aats In Frederick of Baden- Durlach, reputed to be of all German the war. princes the most skilful sequestrator of ecclesiastical lands. In April 1622, while Vere garrisoned the central fortresses of the Palatinate, Mansfeld, Christian and George Frederick took the field against Tilly, who at once demanded assistance from Spinola. The latter, though engaged with the Dutch, sent a corps under his subordinate Cordova. Before this arrived Mansfeld and the margrave of Baden had defeated Tilly at Wiesloch, south of Heidelberg (17/27 April 1622). Nevertheless Tilly's army was not as easily dissolved as one of theirs, and soon the allies had to separate to find food. Then Cordova came up, and Tilly and the Spaniards combined defeated George Frederick at Wimpfen on the Neckar (26 April/6 May). Following up this success, Cordova chased Mansfeld back into Alsace, while Tilly went north to oppose Christian of Brunswick on the Main.- On June 10/20 the latter's army was

almost destroyed by the League Army at Hochst. Mans- feld, and with him Frederick, had already set out from Alsace to join Christian, but when that leader arrived with only a handful of beaten men, the war was practically at an end. Frederick took Mansfeld and Christian back to Alsace, and after dismissing their troops from his employment, retired to Sedan. Henceforth he was a picturesque but powerless exile, and his lands and his electoral dignity, forfeited by the ban, went to the prudent Maxi- milian, who thus became elector of Bavaria. Finally Tilly con- quered the Palatinate fortresses, now guarded only by the English volunteers.

The next act in the drama, however, had already begun with the adventures of the outlaw army of Mansfeld and Christian. Mansfeld Af ter Hochst, had it not been for them, the war might and Chris- have ended in compromise. James I. of England was tian of busy as always with mediation schemes. Spain, wick'' k e i n S tnen m c l° se connexion with him, was working to prevent the transfer of the electorate to Maxi- milian, and the Protestant princes of North Germany being neutral, a diplomatic struggle over the fate of the Palatinate, with Tilly's and Cordova's armies opposed in equilibrium, might have ended in a new convention of Passau that would have regulated the present troubles and left the future to settle its own problems. The struggle would only have been deferred, it is true, but meanwhile the North German Pro- testants, now helpless in an unarmed neutrality, would have

taken the hint from Maximilian and organized themselves and their army. As it was, they remained powerless and inactive, while Tilly's army, instead of being disbanded, was kept in hand to deal with the adventurers.

These, after eating up Alsace, moved on to Lorraine, whereupon the French government " warned them off." But ere long they found a new employment. The Dutch were losing ground before Spinola, who was besieging Bergen-op-Zoom, and the States- General invited Mansfeld to relieve it. Time was short and no detour

*by the Lower Rhine possible, and the adventurers therefore moved straight across Luxemburg and the Spanish Netherlands to the rescue. Cordova barred the route at Fleurus near the Sambre, but the desperate invaders, held together by the sheer „ ... force of character of their leaders, thrust him out of ” laBSf * u their way (19/29 August 1622) and relieved Bergen-op- ma ^ es Zoom. But ere long, finding Dutch discipline intolerable, ? j S ‘ they marched off to the rich country of East Friesland.*

Their presence raised fresh anxieties for the neutral princes of North Germany. In 1623 Mansfeld issued from his Frisian strong- hold, and the threat of a visitation from his army induced the princes of the Lower Saxon Circle to join him. Christian was himself _ a member of the Circle, and although he resigned his bishopric, he was taken, with many of his men, into the service of his brother, the duke of Brunswick-Wolfenbiittel ; around the mercenary nucleus gathered many thousands of volunteers, and the towns and the nobles’ castles alike were alarmed at the progress of the Catholics, who were reclaiming Protestant bishoprics. But this movement was nipped in the bud by the misconduct of the mercenaries. The authorities of the Circle ordered Christian to depart. He returned to Holland, therefore, but Tilly started in pursuit and caught him at Stadtlohn, where on 28 July/6 August 1623 his army was almost destroyed. Thereupon the Lower Saxon Circle, which, like the Bohemians, had ordered collectively taxes and levies of troops that the members individually furnished either not at all or unwillingly, disbanded their army to prevent brigandage. Mansfeld, too, having eaten up East Friesland, returned to Holland in 1624.

The only material factor was now Tilly’s ever- victorious Army of the League, but for the present it was suspended inactive in the midst of a spider’s web of European Foreign and German diplomacy. Spain and England had inter- quarrelled. The latter became the ally of France, wiion, over whose policy Richelieu now ruled, and the United Pro- vinces and (later) Denmark joined them. Thus the war was

extended beyond the borders of the Empire, and the way opened for ceaseless foreign interventions. From the battle of Stadtlohn to the pitiful end twenty years later, the decision of German quarrels lay in the hands of foreign powers, and for two centuries after the treaty of Westphalia the evil tradition was faithfully followed.

France was concerned chiefly with Spain, whose military possessions all along her frontier suggested that a new Austrasia, more powerful than Charles the Bold's, might arise. To Ger- many only subsidies were sent, but in Italy the Valtelline, as the connecting link between Spanish possessions and Germany, was mastered by a French expedition. James, in concert with France, re-equipped Mansfeld and allowed him to raise an army in England, but Richelieu was unwilling to allow Mansfeld's men to traverse France, and they ultimately went to the Low Countries, where, being raw pressed-men for the most part, and having neither pay (James having been afraid to summon parliament) nor experience in plundering, they perished in the winter of 1625. At the same time a Huguenot rising paralysed Richelieu's foreign policy. Holland after the collapse of Mansfeld's expedition was anxious for her own safety owing to the steady advance of Spinola. The only member of the alliance who intervened in Germany itself was . . Christian IV. of Denmark, who as duke of Holstein u n of was a member of the Lower Saxon Circle, as king of Christian Denmark was anxious to extend his influence over of ?^' the North Sea ports, and as Protestant dreaded the rising power of the Catholics. Gustavus Adolphus of Sweden, judging better than any of the difficulties of affronting the Empire and Spain, contented himself for the present with carrying on a war with Poland.

Christian IV. raised an army in his own lands and in the Lower Saxon -Circle in the spring of 1625. Tilly at once advanced to meet him. But he had only the Army of the League, Ferdinand's

troops being occupied with repelling a new inroad of Gabriel Bethlen. Then, like a deus ex machina, Wallenstein, duke of Friedland, came forward and offered to raise and maintain an army in the emperor's service. It was an army like Mansfeld's in that it lived on the country, but its exactions were systematic and the WaUea- products economically used, so that it was possible to stela ' eet ' 50,000 men where Mansfeld and his like had barely

raises an SUDsis t ed 20,000. This method, the high wages which army ne P a '^> anc ^ ms own princely habits and commanding

y ' personality gave it a cohesion that neither a free com-

pany nor an army of mere Lower Saxon contingents could ever hope to attain.

In 1625, in spite of Tilly's appeals, Wallenstein did nothing but levy contributions about Magdeburg and Halberstadt, keeping his new army well away from the risks of battle until he could trust it to conquer. It was fortunate for Ferdinand that he did so. Christian IV., who had been joined by Mansfeld and Christian of Brunswick, had in 1626, 60,000 men. Wallenstein and Tilly together had only a very slight numerical superiority, and behind them was nothing. Even the hereditary provinces of Austria were threatening revolt owing to their having to maintain Maximilian's troops (the new elector thus recouping his expenses in the Palati- nate war) and Gabriel Bethlen was again in the field. But on the other side the English subsidies failed, and the Protestant armies soon began to suffer in consequence. Tilly opposed Christian IV., Wallenstein Mansfeld. The latter, having stood still about Lubeck and in the outskirts of Brandenburg till the food was exhausted, advanced upon Wallenstein, attacked him in an entrenched position at the Bridge of Dessau and was thoroughly defeated (15/25 April 1626). He then wandered across Germany into Silesia and joined Bethlen. Wallenstein followed up, and by taking up

w d th str °ng positions, compelled Mansfeld and Bethlen to ""/m - cn oose between attacking him and starving. So, with- °. m*" S ~ out a battle, he brought about a truce, whereby Bethlen " ' wasdisarmedandMansfeldwasrequiredtoleaveHungary.

Mansfeld and Christian of Brunswick died soon afterwards, the one in Hungary, the other in Westphalia. King Christian, left alone and unable without English subsidies to carry on the war methodically, took the offensive, as Mansfeld had done, in order to live on the Thuringian countryside. But Tilly, with whom Wallenstein had left a part of his army, moved as quickly as the king, brought him to action at Lutter-am-Barenberge in Brunswick and totally defeated him (17/27 August).

With this, armed opposition to Tilly and Wallenstein in the field practically ceased until 1630. But there was enough danger to prevent the disbandment of their armies, which con- tinued to live on the country. In the intervening years the balance of forces, political and military, was materially altered. France opposed Spain and the emperor in Italy with such Latt vigour as Huguenot outbreaks permitted, England

ia the quarrelled with France, but yet ' like France sent struggle. subsidies to the North German Protestants. Gustavus held his hand, while Christian slowly gave up fortress after fortress to Tilly. Wallenstein, returning from the campaign against Gabriel Bethlen, subdued Silesia, where a small part of Mansfeld's army had been left in 1626, and afterwards drove Christian's army through Jutland (1627). But Wallenstein, with his dreams of a united Germany free in conscience and absolutely obedient to the emperor, drifted further and further away from the League. Ferdinand thought that he could fulfil the secular portion of Wallenstein's policy while giving satisfaction to the bishops. The princes and bishops of the League continued to oppose any aggrandizement of the em- peror's power at their expense and to insist upon the resumption

of church lands. In this equilibrium the North German Pro- testant cities were strong enough to refuse to admit Wallen- stein's garrisons. In 1628 Wallenstein, who had received the duchy of Mecklenburg on its rightful lord being put to the ban for his share in the Danish war, began to occupy his new towns, and also to spread along the coasts, for his united Germany could never be more than a dream until the possibility of Danish and Swedish invasions was removed. But the Hanse towns rejected his overtures, and Stralsund, Becond-rate seaport though it was, absolutely refused to admit a garrison of his siege of w ^d soldiery. The result was the famous siege strai- of Stralsund (February to August 1628), in which, suad. w ; tn some slight help from oversea, the citizens com-

pelled the hitherto unconquered Wallenstein army to retire. The siege was, as the result proved, a turning-point in German history. The emperor's policy of restoring order had practically

universal support. But the instrument of the restoration was a plundering army. Even this might have been borne had Wallenstein been able to give them, as he wished, not only peace but religious freedom. But when Christian signed the peace of Lubeck, and the Edict of Restitution (1629) gave back one hundred and fifty northern ecclesiastical foundations to the Catholics, men were convinced that one ruler oast. meant one religion. Rather than endure this the Adoiphus North Germans had called in Gustavus Adoiphus, of and, just as Gustavus landed, the resentment of the Swvdea - princes of the League against Wallenstein's policy and Wallen- stein's soldiers came to a head, and the emperor was forced to dismiss him. His soldiers were taken over by Tilly, and for the moment he disappeared from the scene.

A thoroughly trained army, recruited from good yeomen and good soldiers of fortune, paid good wages, and led by a great captain, was a novelty in war that more than compensated for Tilly's numerical superiority. Gustavus, however, after landing at

Peenemiinde in June, spent the rest of the year in establishing himself firmly in Mecklenburg and Pomerania, partly for military reasons, partly in view of a future Swedish hegemony of the Baltic, and most of all in order to secure the active support of the more important Protestant princes, so as to appear as an auxiliary rather than a principal in the German conflict. First the old duke Bogislav of Pomerania, then George William of Brandenburg joined him, very unwillingly. He was soon afterwards allied with France, by the treaty of Barwalde (January 1631). John George of Saxony, still attempting to stifle the war by his policy of neutrality, sent a last appeal to Vienna, praying for the revocation of the Edict of Restitution. Meanwhile Tilly had marched into north-eastern Germany. On the 19/29 March 1631, the old general of the League destroyed a Swedish garrison at New Brandenburg, and although Gustavus concentrated upon him with a swiftness that surprised the old-fashioned soldiers, Tilly wasted no time in manoeuvres but turned back to the Elbe, where his lieutenant Pappenheim was besieging Magdeburg. This city had twice defied Wallenstein's attempts to introduce a garrison, and it was now in arms against the League. But John George, their prince, had not yet decided to join Gustavus. The latter, as yet without active allies, thought it impossible to go forward alone, and could only hope that his sudden and brilliant storm (s/ii April) of Frankfurt-on-Oder l ' would bring back Tilly from the Elbe. But the hope was vain. Tilly and sack 0/ Pappenheim pressed the siege of Magdeburg, and Magde- although the citizens, directed by Swedish officers, DHT x- fought desperately the place was stormed, sacked and burnt on the night of the 10th of May 1631, amidst horrors that neither of the imperialist generals was able to check, or even to mitigate. The Catholics rejoiced as though for another St Bartholomew's day, the Protestants were . paralysed, and even Gustavus, accused on all hands of having allowed the Magde- burgers to perish without giving them a helping hand, sorrow- fully withdrew into Pomerania. But Tilly, in spite of Pappen- heim's remonstrances, turned westward

against Hesse-Cassel and other minor principalities whose rulers had declared for Gustavus. The king of Sweden, thereupon, clearing away the remaining League garrisons, on the Oder, advanced to Werben (at the junction of the Elbe and the Havel), where the army entrenched itself, and, in spite of sickness and famine, stoically awaited the attack. The desired result was achieved. At the end of July Tilly, returning from the west before he had accom- plished its reduction, made his appearance and was twice re J pulsed (13/23 and 18/28 July), losing 6000 men out of 22,000. Moreover, Ferdinand having in his moment of triumph flatly rejected John George's appeal against the Edict, Saxony took up arms. Thereupon Tilly, turning away from Gustavus's entrenchments, invaded Saxony, being reinforced en route by 30,000 men from Italy (the war there being left to the Spaniards). The elector at once made an alliance with the Swedes. > :

*fo which he exacted ljfe for life and plunder for plunder in return ifor the slaughter at New Brandenburg. '

THIRTY YEARS* WAR

Hs

Them Gustavus advanced is earnest. Tilly had taken no measures to hold him off while the" invasion of Saxony was in Battle of progress, and he crossed the Elbe at Wittenberg. Breitea- 16,000 Saxons joined the 26,000 Swedes at Diiben, feU - and some of the western Germans had already come ;

in. Tilly had just captured Leipzig, and outside that place, carried away by Pappenheim's enthusiasm, he gave battle on the 7/17 September to the now superior allies. The first battle of Breitenfeld (q.v.) was a triumphant success for Gus- tavus and for the new Swedish system of war, such a battle as no living soldier had seen. The raw Saxons, who were com- manded by Arnim, once Wallenstein's lieutenant, were routed by Tilly's men without the least difficulty, and the balance of numbers returned

again to the imperialist side. But the veterans of the League army were nevertheless driven off the field in disorder, leaving 6000 dead. Tilly himself was thrice wounded, and only the remnant of his own faithful Walloon regiments remained with him and bore him from the field.

*All Protestant Germany hailed Gustavus as the liberator. Wallenstein, glad of the defeat of the Catholic army, proposed to co-operate with the Swedes. John George, the Swedish general Horn and the Swedish chancellor Oxenstierna united strong * n advising Gustavus to march straight upon Vienna. posi- Richelieu, who desired to humble Ferdinand rather*

tioo of than to disestablish the power of the Catholic princes, Ad i* bus ^ as of t ' 5e same m i ncl - But Gustavus deliberately chose to move into South Germany, there to relieve the Protestants oppressed by Maximilian, to organize the cities and the princes in a new and stronger Protestant Union, the Corpus Evangelicorum, and to place himself in a country full of resources whence he could strike out against the emperor, Tilly, and the Rhine Spaniards in turn. To the Saxons he left the task of rousing the Bohemian Protestants, perhaps with the idea of thoroughly committing them to the war upon Ferdinand. The' Swedish army pushed on through Halle, Erfurt, Wiirzburg to Mainz, where in the middle of the " Pfaffengasse," the long lane of bishoprics and abbacies along the Main and the Rhine, it wintered in luxury. The Palatinate was reorganized under Swedish officials and the reformed religion established again. In March i6j2 : the campaign was resumed. Nuremberg and Donauworth welcomed Gustavus. Tilly's army, rallied and re-orgarrized for the defence of Bavaria, awaited him on the Lech, but after a fierce battle the passage was forced by the Swedes (4/14 April) and Tilly himself was mortally wounded. Augsburg, Munich and all the towns and open country south of the Danube were occupied without resistance. At the same time John George's army entered Prague without firing a shot.*

The emperor had now either to submit or to reinstate Wallen- stein. Wallenstein demanded as the price of his servites the reversal of the Edict, and power to dethrone every stela n- prince who adhered to the Swedes. His terms were turns accepted, and in April 1632 he took the field as the to the emperor's alter ego with a new army that his recruiters 'wvfce' *" gathered in a few weeks. He soon expelled the Saxons from Bohemia and offered John George amnesty and the rescinding of the Edict as the basis of peace. The elector, bound by his alliance with Gustavus, informed the Swedish king of this offer, and a series of negotiations began between the three leaders. But John George had too much in common with each to follow either Wallenstein or Gustavus unreservedly, and the war recommenced. Gustavus's first danger was on the Rhine side, where Pappenheim, aided by the Spaniards, entered, the field. But Richelieu, the half-hearted enemy of distant Catholic princes, was a vigorous enough op- ponent of Spain on his own frontier, and Gustavus was free in turn to meet Wallenstein's new army of 60,000, composed of the men immortalized by Schiller's play, excellent in war and in plundering, destitute of all home and national ties, and owning allegiance to its general alone. While Gustavus in Franconia was endeavouring with little success to consolidate his Corpus Erangelicorum Wallenstein came upon the scene. Gustavus,*

as soon as his : Rkine detacfaraeats had rejoined, ofief ed him battle. But as in 1625 Wallenstein would risk no battle until his army had gained confidence. He entrenched himself near Fiirth, while Gustavus camped his army about Nuremberg and a contest of endurance ensued, in which the Swedes, who, although they had learned to plunder in Bavaria, were kept rigidly in hand, fared worse. Wallenstein, aided by his superiority in irregular cavalry, was able to starve Tae for three days longer than the king, and at last lines ot Gustavus furiously attacked the entrenchments Nurem- (battle of the Alte Veste, 24 August/3 September, berg ' 1632) and was repulsed with heavy losses. Thereupon

*Gustavus retired, endeavouring in vain to tempt Wallenstein out of his stronghold by making his retreat openly and within striking distance of the imperialists. Wallenstein had other views than simple military success. Instead of following Gustavus, who first retired north-westward and then returned to the Danube at Ingolstadt, he marched into Saxony, his army plundering and burning even more thoroughly than usual in order to force the Saxons into peace, Gustavus followed with the swiftness that was peculiar to the Swedish system, and his detachments on the Main under Bernhard of Saxe- Weimar having secured the road through Thuringia, he concentrated at Erfurt when Wallenstein had scarcely mastered Leipzig. But it was now late in the season, and Wallenstein, hoping to spin out the few remaining Weeks of the campaign in an entrenched position, allowed Pappenheim, who had joined him, to return towards the Weser country, where, as in many other districts, spasmodic minor campaigns were waged by local forces and small detach- ments from the lesser bodies. Within forty-eight hours Pappen- heim was called back. Gustavus, without waiting for Battle Arnim's Saxons to join him, had suddenly moved for- 0/ ward, and on the 6/16 November the battle of *•"<*«■. Liitzen {q:v.) was fought, a battle as fierce even as Breitenfeld. Gustavus and Pappenheim were slain, and Wallenstein's army, yielding to Bernhard's last attack, retreated.*

The fall of Gustavus practically determined the intervention of France, for Richelieu supported all electors, Catholic or Protestant, against the central power at Vienna as part of his anti-Spanish policy, and French assistance was now indis- pensable to the Protestants. For although Lutzen was a victory and the Protestant circles formed the League ofHeilbronn in April 1633, the emperor was really in the ascendant. John George of Saxony; uneasy both at the prospect of League more foreign armies in Germany and at the expressed ofHeii- intention of Bernhard to carve out a principality for broniu himself, needed but little inducement to

make peace. But the tragedy of Lutzen was soon to be followed by the tragedy of Eger. Wallenstein, gradually forming the resolve of forcing peace on Germany with his army, relaxed his pressure on Saxony, and drawing Arnim's army out of Silesia to protect Dresden, he flung himself upon the Swedish garrisons in Silesia. Winning a victory at Steinau (October n, 1633) and capturing one town after another, he penetrated almost to the Baltic. But he was recalled to the south-west before his operations had had any effect. The Swedish army, under Bernhard, Horn and Baner, had before the formation of the League of Heilbronn returned to the Palatinate, and while Horn and Baner operated against aii imperial army under Aldringer in the Neckar country, Bernhard took Regensburg from Maximilian's army. But it was now late in the year and Wallenstein was intent upon peace. With this object he endeavoured to secure the higher officers of the army, but these were gradually won over by Spanish emissaries; the emperor, having decided to D y SIBfcsa / continue the war in alliance with Spain, dismissed aad his general for the second time. Wallenstein then murder openly attempted to unite the Swedish, Saxon and f'^J"

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other Protestant armies with his own, so as to compel all parties to make peace. But his army would not follow, the coup d'&tat failed, and Wallenstein was murdered at Eger (15/25 February 1634). AH unity, Catholic or Protestant, died with him, and for the

next fourteen years Germany was simply the battle-ground of l French, Spanish, Austrian and Swedish armies, which, having learned the impunity and advantages of plunder in the school of Mansfeld and Wallenstein, reduced the country to a state of misery that no historian has been able to describe,

save by detailing the horrors of one or other village among the thousands that were ruined, and by establishing the net result that Germany in 1648 was worse off than, England in 1485, so much worse that while England was the healthier for having passed through the fever of the Wars of the Roses, Germany remained for 150 years more in the stillness of exhaustion.

Success was for the present with the emperor and Spain. Gallas, now appointed to Wallenstein's place, was Aldringer's companion from boyhood, whereas Bernhard, the Rupert of the German war, disagreed with Horn. Under the leadership nominally of the king of Hungary, Ferdinand's heir, but really of Gallas, the army re- captured Regensburg and Donauworth, and when the Spanish Cardinal Infante joined them with 15,000 men on his way from Italy to the Netherlands, they were invincible. Bernhard attacked

them in an entrenched position at Nordlingen (27 August/ tNSrd ^ September 1634) and was beaten with a loss of ° 17,000 men to 2000 of the defenders. Nordlingen was to

*"&"• the Swedes what Malplaquet was seventy-five years later to the Dutch. The model army of Gustavus perished there, and for the rest of the war a Swedish army, except for some advantages of organization and technical form, was intrinsically no better than another. Gallas reconquered the towns in southern Franconia. John George, having obtained from Ferdinand a compromise on the question of the Edict— its complete revocation Wallenstein's death and Bernhard's defeat had made impossible — agreed to the Pc as f P eace °f Prague (20/30 May 1635), wherein all that Prasrue was P rotestant in 1627 was to remain so, or if since *" ' resumed by the Roman Church to be returned to the Lutherans. A certain number of princes followed John George's example on the same terms, but those who were excepted by name from the amnesty and those who had to gain or to regain the lands lost before 1627 continued the war. There was now no ideal, no objective, common even to*

two or three parties. The Catholic claims were settled by compromise. The power of the central authority, save in so far as the army could without starvation make itself successively felt at one place and another, had long disappeared. Gustavus's Corpus Evangelicorum as a German institution was moribund since Nordlingen, and Richelieu and the Spaniards stepped forward as the protagonists, the League of Heilbronn and the emperor respectively being the puppets.

The centre of gravity was now the Rhine valley, the highroad between Spanish Italy and the Spanish Netherlands. Richelieu had, as the price of his assistance after Nordlingen, taken over the Alsatian fortresses held by Bernhard, and in May, just before the treaty of Prague was signed, he declared war on Spain. The French army numbered 130,000 men in 1635, and 200,000 in

the year after. One army assembled in Upper Alsace Aggressive for the attack Q f the Spaniards in Franche Comte; France another occupied Lorraine, which had been conquered

in 1633 ; a corps under Henri de Rohan was despatched from the same quarter across Switzerland, doubling itself from soldiers of fortune met with en route, to expel the ene'my from the Valtelline, and so to cut the route to the Netherlands. Another force, co-operating with the duke of Savoy, was to attack the Milanese. Bernhard was to operate in the Rhine and Main country, French garrisons holding the places of Alsace, Having thus arranged to isolate the Spanish Netherlands, Richelieu sent his main army, about 30,000 strong, thither to join Frederick Henry of Orange and so to crush the Cardinal Infante. This was strategy on a scale hitherto unknown in the war. Tilly, Wallenstein and Gustavus had made war in the midst of political and religious troubles that hung over a confused country. They had therefore made war as they could, not as they wished. Richelieu had unified France under the single authority of the king, and his strategy, like his policy, was masterful and clear. But the event

proved that his scheme was too comprehensive. To seize and to hold with an unshakeable grip the neck of the Spanish poWer when Gallas and the imperialists were at hand was a great undertaking in itself and absorbed large forces. But not content with this Richelieu proposed to strike at each of the two halves of his enemy's power at the same time as he separated them. His forces were not Soaia sufficient for these tasks and he was therefore compelled

attacked la t0 eke ^^ o ut ' both in Italy and the Netherlands, by Italy sad wor king with allies whose interests were not his. The the Nether- armv on the Meuse won a victory at Avins, south of lands. Huy, and afterwards joined Frederick Henry in the siege

of Maestricht. But the Brabanters and Flemings had in sixty years of warfare parted so far from their former asso- ciates over the Waal that the inroad of Frederick Henry's army produced one of those rare outbursts of a momentary "people's war," which occur from time to time in the wars Of the 17th and 18th centuries. The effect of it was that Frederick Henry withdrew

to his own country, and in 1636 the French northern army had to face the whole of the Cardinal Infante's forces. In Italy the Franco-Piedmontese army achieved practically nothing, the gathering of the French contingent and its passage of the Alps consuming much time. In the Valtelline Rohan conducted a suc- cessful mountain campaign, which even to-day is quoted as a model of its kind. 1

In Alsace and Lorraine, besides the Spaniards, the dispossessed duke of Lorraine was in the field against the French. Neither side was strong enough to prevail completely. Bernhard waged a desultory campaign in Germany, and then, when supplies gave out and Gallas advanced, joined the French. Towards the end of the year his army was taken into the French service, he himself remaining in command and receiving vague promises of a future duchy of Alsace. Gallas's army from Frankfurt-on-Main pushed

far into Lorraine, but it was late in the season and want of food com- pelled it to retreat. In eastern Germany the consequences of the peace of Prague were that Saxony, Brandenburg and other states, signatories to the treaty, were ipso facto the enemies of those who continued the war. Thus John George turned his arms against the Swedes in his neighbourhood. But their commander Baner was as superior in generalship as he was inferior in numbers, and held the field until the renewal of Gustavus's truce with Poland, which expired in this year, set free a fresh and uncorrupted Swedish corps that had been held ready for eventualities in that country. This corps, under Torstensson, joined him in October, and on the 1st of November they won an action at Domitz on the Elbe.

Thus Richelieu's great scheme was only very partially executed. The battle of Avins and Rohan's Valtelline campaign, the only important military events of the year, took place outside Germany ; within Germany men were chiefly occupied in considering whether to accept the terms of the peace of Prague. But the land had no rest, for the armies were not disbanded.

In 1636 the movements foreshadowed in 1635 were carried out with energy. John George, aided by an imperialist army, captured Magdeburg, drove back Baner to Liineburg, and extended his right wing (imperialists) through Mecklenburg into Pomerania, where, however, a Swedish force under the elder Wrangel checked its progress. The Saxons then passed overthe Elbe at jTangermiinde ana joined the imperialists, threatening to interpose between Baner and the Baltic. But Baner was too quick for them. He destroyed an isolated brigade of imperialists at Perleberg, and before the Brandenburg contingent could join John George, brought on a general action at Wittstock (24 September /4 October 1636). The elector had 30,000 men against 22,000 and sought _ . to attack both in front and rear. But while his TJfiSL k entrenchments defied the frontal attack Baner threw """- most of his army upon the enveloping force and crushed it. The Swedes lost*

5000 killed and wounded, the combined army 11,000 killed and wounded and 8000 prisoners.. The prestige of so brilliant a victory repaired even Nordlingen, and many North German princes who were about to make peace took fresh heart.

*In the west, though there were no such battles as Wittstock, the campaign of 1636 was one of the most remarkable of the whole war. The Cardinal Infante was not only relieved by the retreat of the Dutch, but also reinforced by a fresh army * under a famous cavalry officer, Johann von Weert. He pre- pared, therefore, to invade France from the north-west. Even though the army that had fought at Avins and Maestricht re- turned by sea from Holland, the French were too much scattered to offer an effective resistance, and Prince Thomas of Savoy- Carignan and Johann von Weert, the Cardinal Infante's generals, took Corbie, La Capelle, and some other places, passed the Somme and advanced on Compiegne. For a moment Paris was terror-stricken, but the Cardinal Infante, by invasion ordering Prince Thomas not to go too far in case of France. he were needed to repel a Dutch inroad into Belgium, missed his opportunity. Louis XIII. and Richelieu turned the Parisians from panic to enthusiasm. The burghers armed and drilled, the workmen laboured unceasingly at the dilapidated walls, and the old Huguenot marshal, Jacques Nompart, due de La Force (d. 1642), standing on the steps of the H6tel de Ville, raised men for the regular army by the hundred. Money, too, was willingly given, and some 12,000 volunteers went to Compiegne, whither Gaston from Orleans, Longueville from Normandy, and Conde, from Franche Comte, brought levies and reinforcements. Thus the army at Compiegne was soon*

1 See Shadwell, Mountain Warfare; and Hardy de Perini, Batailles francaises, vol. iii., for details.

2 Composed partly of Bavarians, who had fought their way from the Danube to the Weser, partly of Cologne troops who had joined the Bavarians against the Protestants of north-west Germany.

50,000 strong. The army of Lorraine under Duke Bernhard and Louis de Nogaret, Cardinal de La Valette (d. 1639), placed itself at Epinal to prevent any junction between Prince Thomas and the army of Gallas. But Gaston of Orleans, the king's lieutenant at Compiegne, was no more enterprising as a de- fender of the country than he had been as a rebel and con- spirator, and the army itself was only half mobile owing to its rawness and its " trained-band " character, and the Spaniards and Bavarians retired unmolested to oppose Frederick Henry in the Low Countries. They left a garrison in the little fortress of Corbie, which Monsieur's army recaptured in November. The gallantry of the defenders, which bore heavily on the towns- people, was alloyed with a singular trait of professionalism. The time had come for the Cardinal Infante to distribute his forces in winter quarters, and the garrison of Corbie, it is said, surrendered in good time in order not to be omitted in the allotment of comfortable billets in Belgium.

During the episode of Corbie another storm burst on the eastern frontier of France. The prince of Conde, governor of Burgundy, had in the spring entered Franche Comte and besieged Dole, but the inhabitants as well as the Spanish troops vigorously War la opposed him, and his army ultimately went to swell that Lorraine Q \ Q aston . g uti although Duke Charles IV. was active and Bur- m repossessing himself of Lorraine, Gallas with the main **" ■''' imperialist army ' stood still in Lower Alsace during the summer. At first he had to await the coming of the nominal commander, Ferdinand's son, but afterwards, when heavy detach- ments from the defending armies had gone to Compiegne, Gallas himself missed his opportunity. It was not until September that he joined the duke of Lorraine, and later still when he made his inroad into Burgundy. He took a few small towns, but Dijon and the entrenchments of Bernhard's army there defied him,

and his offensive dwindled down to an attempt to establish his army in winter quarters in Burgundy, an attempt of which the heroic defence of the little town of St Jean-de-Losne sufficed to bring about the abandonment. Charles IV., however, continued a small war in Lorraine with some success.

In Italy the duke of Savoy with his own army and a French corps under Crequi advanced to the Ticino, and an action in which w both sides lost several thousand men was fought at

„ , ° Tornavento a few miles from the future battlefield of Italy. Magenta, to which in its details this affair bears a singular

resemblance (June22, 1636). But the victory of the French was nulli- fied by the refusal of Victor Amadeus, for political reasons, to advance on Milan, and Rohan, who had come down from the Valtelline to co-operate, hastily drew back into his stronghold. On the edges of the western Pyrenees a few towns were taken and retaken.

The campaign of 1637, on the French and Spanish side, was not productive of any marked advantage to either party. From Cata- lonia a Spanish army invaded Languedoc, but was brought to a standstill in front of the rocky fortress of Leucate and defeated with heavy losses by the French relieving army under Schomberg, due d'Halluin. In Italy nothing was done. In the Valtelline the local regiments raised by Rohan mutinied for want of pay and Rohan had to retire to France. On the Low Countries frontier the cardinal de La Valette captured Cateau Cambresis, Landrecies and Maubeuge. The deaths of Ferdinand II., the landgrave of Hesse-Cassel, the duke of Savoy and the duke of Mantua, which occurred almost simultaneously, affected the political foundations of the war but little. The balance, such as it was, however, was unfavourable to France, for the duchess of Mantua went over to the imperialists and the duchess of Savoy was opposed by the princes of her house. On the other hand, Ferdinand III., in spite of Spain, had to

concede more power to the electors as the price of the imperial dignity.

On the Rhine and in the adjacent countries Johann von Weert, returning from Belgium with his Bavarians, captured Ehren- breitstein, the citadel of Coblcnz, and expelled small War nJ". French detachments from the electorate of Trier, whose the Rhine, ru l e r, t h e archbishop, had been put to the ban by the emperor. Then, passing into the Main valley, he took Hanau. The main imperialist army, still under Gallas, had departed from Alsace to the east in order to repair the disaster of Wittstock, and Charles of Lorraine, with his own small force and a detach- ment under Count Mercy left by Gallas, was defeated by Bernhard on the SaSne in June, after which Bernhard advanced vigorously against Piccolomini, the imperialist commander in Alsace, and crossed the Rhine at Rheinau. But soon Piccolomini was joined by Johann von Weert, and Bernhard retired again.

1 For the first time in the history of western Europe Cossacks appeared on the Rhine. Their march through Germany was marked by extraordinary atrocities. They did not remain long at the front, for their insubordination and misconduct were so flagrant that even Gallas found them intolerable and dismissed them.

In the north-east, the effect of Wittstock proved but transient. The widow of the landgrave of Hesse-Cassel, after an attentat at resistance, agreed to the treaty of Prague. In 1638 Ban&r after taking Erfurt and Torgau found himself the target of several opponents — the Bavarians under G6tz, who had remained on the Weser to subdue Hesse-Cassel when their comrades „, , passed into Belgium in 1635, the beaten army of Witt- no rf Aera stock, and a potential Brandenburg contingent. The a „j norta . Saxons did no more than defend their own country, but eas t era the imperialists and Bavarians uniting under General aermany. Geleen manoeuvred Baner out of his strongholds on the Elbe. He retreated on the Oder, but there found, not the expected assistance

of Wrangel's Pomeranian army, but Gallas with the main imperial army which had hurried over from the west to cut off the Swedes. Baner escaped only by a stratagem. Deluding Gallas with an appearance of retreat into Poland, he turned north- wards, joined Wrangel, and established himself for a time in Pome- rania. But Gallas ruined his army by exposing it to an open winter in this desolate country, and at last retired to the Elbe. Pomerania, by the death of the old duke Bogislav, became a bone of contention between rival claimants, and in the prevailing equili- brium of greater powers its fate remained unsettled, while a feeble small war slowly consumed what Wallenstein and Gustavus, Gallas and Wrangel had spared.

In 1638 the French operations in Italy, Belgium and Spain were in the main unsuccessful. In Italy Crequi was killed in an action on the 17th of March, and the Spanish commander in the Milanese, Leganez, advanced to the Scsia and took Vercelli. In the Low Countries Prince Thomas and Piccolomini repulsed in turn the Dutch and the French. In the south Conde led from Bayonne an invading army that was to dictate terms qt Madrid, but the fortress of Fontarabia, though invested by land and sea, checked the French until a relieving army arrived and drove Conde in dis- order to Bayonne. So angry was King Louis at this failure that Conde's lieutenant- general, the brother of ,„™° z Cardinal de La Valette, was condemned for high treason.

In the Nether- lands and

But the case was different in Alsace. There Richelieu was more than ever determined to strike at the Spanish Tfeace" power, and there too was Bernhard, who hoped that Alsace was to be his future principality, and under whom served the survivors of Breitenfeld and Nordlingen, now in French pay under the name of the " Weimar Army." After the raid into south Germany Bernhard had wintered about Basle, and began operations by taking a few towns in the Black Forest. He then besieged Rheinfelden. Johann von Weert, however, fell upon him by surprise and drove

him away (February 28th). Rohan was amongst the dead on the French side. But Bernhard reassembled his adventurers and invited them to return and beat the imperialists at once. The outcome was the battle of Rheinfelden, in which the redoubtable Weert, who had terrified Paris in 1636, was taken prisoner and his army dissipated (March 3rd). Although the Bavarians in the Weser country hurried south to oppose him, Bernhard took Rheinfelden and Freiburg. Lastly he invested Breisach — the town that, scarcely known to-day, was then the " Key of Alsace." Gotz's Bavarians and Charles of Lorraine's army hastened thither, but Bernhard beat them in turn at Witten-weiher (August Qth) and Thann (October 15th), and received the surrender of Breisach, when the garrison had eaten the cats, dogs and rats in the place, on the 17th of December.

In the course of 1638 peace negotiations were carried on at Cologne and Hamburg, but the war still dragged on. In the east, 1639 began with Baner's pursuit of the retreating Gallas. g estl „„ la „ Thanks to his skill the Swedish star was again in the ot „ eso t^. ascendant. Baner crossed the Elbe, captured Halle and t]f, n gf or Freiburg, inflicted a severe defeat on the imperialists at peace> Chemnitz (April 14, 1638), and then after overrunning western Saxony advanced into Bohemia, judging rightly that Bern- hard was too much occupied with his prospective duchy to co- operate with him in the south-west. Ferdinand III. sent his brother, the archduke Leopold William, to take command of Gallas's army and sent all available reinforcements to Bohemia. But Baner contented himself, after an unsuccessful attempt upon Prague, with thoroughly eating up the country and, as winter came on, he retired into the Saxon mountains. The other Swedish troops overran Brandenburg and fomented a revolt in Silesia.

In 1639, as before, Richelieu's attacks on Spain, other than those directed upon Alsace and Baden, were unsuccessful. In the north the French devoted this year, as they had devoted 1637 and 1638, to a methodical conquest of walled towns in f rance view

of a future frontiere de fer. The two objectives and gpaln. selected, Hesdin and Thionville, were far apart, and a covering army to protect both sieges against Piccolomini was posted midway between them. Piccolomini, by a forced march from Liege and Huy through the Ardennes, flung himself upon the besiegers of Thionville before their " circumvallation " was completed, and being greatly superior in numbers he -almost annihilated them (June 7, 1639) before the covering or rescuing army had even passed the Argonne. Then, however, Piccolomini, whose troops had bought the victory dearly, stood still for a time,

and Hesdin, besieged with much pomp by Richelieu's nephew, La Meilleraye, surrendered on the 29th of June. On the side of the Pyrenees Conde as usual showed himself both unlucky and incapable. In Italy Cardinal de La Valette died, after allowing Prince Thomas to win over Savoy to the emperor's side and seeing every French post except Casale, Chivasso and the citadel of Turin taken by Thomas and Leganez.

His successor was the due d'Harcourt, called by his men " Cadet- Ia-Perle " on account of his earrings, but a bold and exceedingly competent soldier. Under him served Turenne, hitherto known only as a younger brother of the duke of Bouillon. Harcourt reviewed his army for the first time late in October. The day after the review he advanced from Carignano to revictual Casale, detach- ing Turenne as flank-guard to hold off Prince Thomas on the side of Turin. The enterprise was entirely successful, but Thomas and Leganez determined to cut off the French on the return march. Leganez beset a defile on the Chieri-Carignano road (whence the action is called the Route de Quiers) while Thomas lay in wait to the north. But Turenne and the flank-guard sharply repulsed the prince, and by hard fighting the French returned safe and victorious (November 29th).

In Alsace Bernhard was carried off by a fever just as he was preparing to fight his way to a junction with Baner. Nevertheless

he was fortunate in the opportunity of his death, for Death of n j s (j rearn „f a d uc hy of Alsace had already brought

him into conflict with Richelieu, and their conflict could

Bernhard ofSaxe-

W Imar on ' y nave ended in one way. Marshal Guebriant at and lis once took steps to secure his army ' for the service of effects. France, and Richelieu's oificers were placed in charge of

the fortresses he had conquered. At the same time the long negotiations between the landgravine of Hesse-Cassel and the various powers ended in her allying herself with France and raising an army in return for a subsidy. Another event of importance in this year was the episode of the Spanish fleet in the Downs. Now that the land route was imperilled the sea communications of Spain and Belgium were brought into use. A squadron sailed from Spain for the Netherlands, and, though it evaded the now powerful French navy, it was driven into English territorial waters by the Dutch. Charles I. of England offered France free access to the victim if France would restore the elector palatine, and Fate of the °ff ere d Spain protection if she would furnish him with Spanish i^nds for his army. Richelieu in reply encouraged the fleet. growing opposition to Charles at home, and the Dutch,

contemptuous of his neutrality, sailed in and destroyed the fleet at anchor.

In 1640 the French still kept up their four wars in Belgium, Germany, Italy and Spain. But the Belgian and Spanish frontiers were no longer directly attacked. On the side of Languedoc there was no further danger, for the foolish imposition of strict

military forms, and equally foolish threats to punish those who did not appear at the rendezvous, caused the Catalans, who were already defending themselves against the French both efficiently and vigorously, to turn their arms, against the old enemy Castile. In December 1640 Portugal declared herself independent under a king of the house of Braganza. In the Low Countries Louis XIII. himself presided over the siege of the important fortress of Arras, which surrendered on the 8th of August.

In Italy, however, Cadet-la-Perle kept the moral ascendancy he had won in the brave action of the Route de Quiers. In April with 10,000 men he advanced from Carignan against the 20,000 Spaniards who were besieging Casale and attacked their line of Casale circumvallation boldly and openly on the 29th of April. and Turin. ^ e himself on horseback led his stormers over the parapet.

Turenne spread out his cavalry in one thin line and, thus overlapping Leganez's cavalry on both flanks and aiding his charges with the fire of his dismounted dragoons, drove it away. The Spanish infantry rearguard was cut off and destroyed, and at the end of the day half of Leganez's army was killed or captive. After this, Harcourt promptly turned upon Prince Thomas, and then followed one of the most remarkable episodes in military history. Thomas, himself defending Turin, was besieging the French who still held the citadel, while Harcourt, at once besieging the town and attempting to relieve the citadel, had, externally, to protect himself against Leganez's army which was reorganized and reinforced from Naples and the Papal States. For long it seemed as though the latter, master of the open country, would starve the small army of Harcourt into submission. But Harcourt's courage and the disunion of his opponents neutralized this advan- tage. Their general attack of the nth of July on the French lines was made not simultaneously but successively, and Harcourt repulsed each in turn with heavy losses. Soon afterwards the French received fresh troops and a large convoy. The citadel was relieved and the town surrendered soon

afterwards. Leganez retired to Milan, Prince Thomas was allowed to take his few remain- ing troops to Ivrea, and recognized the duchess's regency.

1 Forestalling others who desired its services, notably the Winter King's son, who intended to ally himself with Spain and so to force the retrocession of the Palatinate. The war had indeed progressed far since the days of the Protestant Union !

In Germany Baner's course was temporarily checked. The arch- duke dislodged him from his few remaining posts in Bohemia, and when at last Bernhard's old army, under the due de Longueville, crossed the Rhine at Bacharach and joined Baner in y.£ e Thuringia, the Austrians held them in check in the Swedes broken country about Saalfeld until the country would checked. no longer support the combined army. The Weimar army then retired to the Rhine valley and Baner to Waldeck, and, in the hope of detaching both George of Liineburg and the landgravine of Hesse-Cassel from the Swedish alliance, the imperial general wasted their territories, ignoring Baner. After the depar- ture of the Liineburgers and Hessians, recalled for home defence, the Swedish general could only watch for his opportunity.

This came in the winter months of 1640-41. Negotiations for peace were constantly in progress, but no result seemed to come out of them. The Diet was assembled at Regensburg, the imperial army scattered over north-western Germany. Baner suddenly moved south heading for Ratisbon, for the defence of which the archduke's and all available troops — even Piccolomini's from the upper Rhine — were hurried up by the emperor. The Weimar Army under Guebriant joined the Swedes en route, and the com- bined army reached the objective. But a thaw hindered them and gave the emperor time to concentrate his forces, and after a variety of minor operations Baner's army found itself again in possession of Hesse, Liineburg, Brunswick, &c. Guebriant's army, however, had again separated from him in order to live, and in May was at Bamberg— even an army of 18,000 could

hardly keep _ , ^ the field at this stage of the war. On the 20th of May J£ ^*, Baner, worn out by fatigue, died, and after some intrigues cesses and partial mutinies, Torstensson succeeded to the command. The last fortified place held by the Austrians in Lower Saxony, Wolfenbiittel, was now besieged by Torstensson's Swedes and Germans and Guebriant's French and Weimarians, and the archduke and Piccolomini advancing to its relief were defeated outside the walls on the 29th of June. The war had now receded far from Alsace, which was firmly held by France, and no longer threatened even by Charles of Lorraine, who had made his peace with Louis XIII. in the spring, and whose army had followed Guebriant into Germany. The losses of the Germans at Wolfen- biittel caused some of their princes to accept the peace of Prague, but, on the other hand, the new elector of Brandenburg (Frederick William, the Great Elector) gave up the Austrian alliance and neutralized his dominions.*

In 1641 Harcourt thoroughly established his position, without much fighting, in Piedmont. In Spain the Catalan and Porttt- guese insurrections continued and the French occupied Barcelona!, but underwent a serious reverse at Tarragona. In the north La Meilleraye captured and held some of the Artois towns, but was driven out of the open country by the superior army of the Cardinal Infante. A formidable conspiracy against Richelieu brought about a civil war in which the king's troops q„ii_, were defeated at La Marfee, near Sedan (the fortress of ^ p ra g Ce Turenne's discontented brother, the semi-independent duke of Bouillon), by a mixed army of rebels, Spaniards and Imperialists (July 6th). This, however, led to nothing further and the conspiracy collapsed. Charles of Lorraine having joined the rebels, his newly regained fortresses were reoccupied by the French.

In December 1641 there began at Miinster and Osnabriick in Westphalia the peace negotiations which, after eight more years of spasmodic fighting, were to close this ruinous war.

In 1642 Torstensson, having cleared up the war for a moment in the north-west, turned upon Silesia, defeated an imperialist corps at Schweidnitz and took some fortresses, but drew back when the archduke and Piccolomini came up with the main Austrian army. In October, however, he was joined by fresh troops from the north-east, crossed the Elbe and besieged Leipzig. The imperialist army, which was joined by the Saxons when xorstens' their country was again the theatre of war, marched to the son . g rescue. But Torstensson defeated them with enormous victory of loss in the second battle of Breitenfeld 2 (November 2, Breken- 1642). But, although the Austrians feared an advance on f e / d> Vienna itself, the victors waited for the fall of Leipzig and then took up winter quarters. Guebriant had throughout the year operated independently of the Swedes. The Bavarians had advanced into the lower Rhine region in order to support, in concert with the Belgian army of Spain, a fresh outbreak in France (Cinq- Mars' conspiracy). But Lamboy, the Spanish general, was attacked and defeated before Hatzfeldt's Bavarians came up, at Hulst between Kempen and Crefeld (January 17th), whereupon the Bava- rians took shelter under the guns of the fortress of Jiilich.

On the northern frontier of France Harcourt, the brilliant com- mander of the Italian army, failed to prevent the Spaniards from capturing Lens and La Bassee, and Guiche, with another army farther east at Le Catelet, was defeated and routed at Honnecourt (May 26th), saving only 2000 of his 9000 men. But Francisco de

5 The emperor executed all the officers and every tenth man of the regiment in which the panic began.

Melo, the Cardinal Infante's successor, did not profit by his victory, turning back instead to oppose the Dutch and Guebriant. In Italy Thomas of

Savoy and his brother, submitting to the regency of the duchess, led her troops in concert with the French against the Spaniards of the Milanese, and took Tortona. Louis himself conquered Roussillon, Richelieu crushed the conspiracy of Cinq Mars by executing its leaders, and Marshal de la Motte- Houden- court held Catalonia and defeated Leganez at Lerida (October 7th).

*Before the next campaign opened Louis and Richelieu were dead. One of the last acts of the king was to designate the young due d'Enghien, son of the incapable Conde, as general of his northern army. Harcourt had strangely failed, Gue- briant was far away, and the rest of the French marshals were experienced but incapable of commanding an army. d'Enghien ^ et * l was no sma h matter to put in their place a youth of twenty-one, who might prove not merely inexperienced but also incompetent. But Enghien's victory was destined to be the beginning for the French army of a long hegemony of military Europe.*

Melo had selected the Meuse route for his advance on Paris. On it he would meet only the places of Rocroi and Rethae; these mastered, he would descend upon Paris by the open lands between the Marne and the Oise. He began by a feint against Landrecies, and under cover of this secretly massed his Sambre and Ardennes corps on the Meuse, while Enghien, having the safety of Landrecies in mind, moved to St Quentin. There, however, the young general learned at the same moment that Louis XIII. was dead and that the Spaniards had invested Rocroi. With the resolution and swiftness which was to mark his whole career, he marched at once to offer them battle. Enghien's more experienced counsellors, the generals of the old school, were for delay. To risk the only French army at such a moment would, they said, be madness, and even the fiery Gassion asked, " What will become of us if we are beaten?" But Enghien replied, " That will not concern me, for I shall be dead," and his personality overcame the fears of the doubters. The battle took place on the 19th of May 1643, in a plain before Battle of Rocroi, without

any marked tactical advantage of Rocroi. ground in favour of either side. Melo's cavalry was routed, and nearly all the infantry, 18,000 men of the best regiments in the Spanish army, the old Low Countries tercios, with their general the Conde de Fuentes, 1 a veteran of fifty years' service, in their midst, stood their ground and were annihilated. 8500 were dead and 7000 prisoners. Two hundred and sixty colours and standards went to grace Notre Dame.

But even Rocroi, under the existing conditions of warfare, was decisive only in so far as, by the destruction of Spain's superiority in Belgium, it saved France from further inroads from the north. Enghien indeed followed up the debris of Melo's army beyond the Sambre, but on the Rhine Guebriant had marched away from the region of Cologne into Wurttemberg, and there was nothing to prevent the imperialists in the north- west from joining Melo. The thorough establishment of the French on the Rhine and the need of co-operating with the Swedes was considered by the young general to be more im- portant than fighting Melo in front of Brussels, and in spite of Surrender the protests of the Regent and Mazarin, he decided ofThion- to attack Thionville. Taking a leaf out of Melo's Y,Ue - book, he threatened Brussels in order to draw all the

defenders thither, and then suddenly turned eastward. Enghien arrived on June 18th, a corps from Champagne had already reached the place on the 16th, and on the 8th of August Thionville surrendered. The small fortress of Sierck followed suit (September 8th).

Guebriant meanwhile had attempted without success to cover the French and Protestant posts in Wurttemberg against the united forces of his old opponents from the lower Rhine (Hatzfeldt's Bavarians) and a fresh Bavarian army under Mercy, and had retired into Alsace. Thither Enghien, before dispersing his army into rest -quarters in October, sent him a corps under Josias Rantzau to enable him to recross the Rhine and to seize winter-quarters in Germany so as to spare Alsace. Guebriant did so, but he was

mortally wounded in the siege of Rottweil, a town at the source

1 Paul Bernard Fontaine de Fougerolles, a noble of Franche Cotnte.

of the Neckar, and Rantzau, taking over the command, allowed himself to be surprised in the act of dispersing into winter-quarters by Charles of Lorraine (who had again changed sides and now commanded his own, Hatzfeldt's and Mercy's armies !). At Tutt- lingen on the headwaters of the Danube, Rantzau was taken prisoner with the greater part of his army of 12,000 men (November 24th), and the rest hurriedly fell back into Alsace.

In the east the campaign had as usual turned more upon sub- sistence than upon military operations. Torstensson, by his halt before Leipzig after Breitenfeld, had given the emperor T orsten .. a whole winter in which to assemble a new army. The aralnst hereditary provinces, as the devastations of war ap- Qgjj^ proached their own borders, willingly supplied a force of 12,000 men, which under Piccolomini manoeuvred for a while to the west of Dresden. But Piccolomini was replaced by Gallas, who, though cherishing visionary schemes of uniting Hatzfeldt's troops and Gotz's Cologne-Bavarian-North German army with his own for a decisive blow, had in fact to fall back through Bohemia. The Swedes followed. Taking the small towns and avoiding the large places, Torstensson swept through Bohemia and Moravia, his steps dogged through the devastated country by Gallas, until he reached Briinn. Thence, however, he suddenly retreated to the shores of the Baltic. Christian of Denmark had declared war on Sweden, and threatened to isolate the Swedish forces in Germany. Torstensson, therefore, wintered in Holstein, Gallas, unable to follow him through districts already eaten up, in Saxony. In Italy and Spain there was no event of any importance.

In 1644 Gaston of Orleans, with La Meilleraye and Gassion under him, began the conquest of the Dunkirk region, capturing Gravelines in July. Melo, having

no army to oppose The warl „ them, remained inactive. In Italy Prince Thomas and ta Nether-Marshal Plessis-Praslin undertook nothing serious, while y^,,^ an * in Spain La Motte-Houdencourt lost Lerida, and was^,^/,, imprisoned by Mazarin in consequence. But the Rhine campaign is memorable for the first appearance of Turenne at the head of an army, and for the terrible battle of Freiburg.

The momentary combination of forces on the other side that had ruined Guebriant's expedition soon broke up. Hatzfeldt was called by the emperor to join Gallas, Charles of Lorraine wandered with his mercenaries to the Low Countries, and Mercy's Bavarians alone were left to oppose Turenne, who spent the first months of the year in restoring discipline and confidence in the shaken Weimar Army. Bat Mercy was still considerably superior in strength, and, repulsing Turenne'a first inroad into the Black Forest, besieged Freiburg. Turenne made one cautious attempt at relief, then waited for reinforcements. These came in the shape of Enghien's army, and Enghien as a prince of the blood took over the supreme command. But both armies together numbered hardly 17,000 men when Enghien and Turenne united at Breisach on the 2nd of August. On the 3rd, although Freiburg had meantime surrendered, they crossed the Rhine and attacked Mercy's position, o-^l, which was of great natural and artificial strength, in B*"™*

front and flank. Three separate battles, which cost the Bavarians one-third of their force and the French no

around Freiburg.

less than half of theirs, ended in Mercy's retreat (see Freiburg) on the loth of August. Enghien did not follow him into the mountains, but having assured himself that he need not fear inter-ference, he proceeded to the methodical conquest of the middle Rhine fortresses (Philippsburg, Heidelberg, Mannheim, Mainz, &c), and returned with his own army to the Moselle, leaving Turenne and the

Weimar Army at Spire.

In the east, or rather in the north, a desultory campaign was carried on during 1644 between Torstensson and the younger Wrangel, on the one side, the Danes and Gallas on the other, and in the end Gallas retreated to Austrian territory, so completely demoralized f at for want of supervision his army dwindled on the way from 20,000 men to 2000. Torstensson followed him, having little to fear from the Danes. Meanwhile the prince of Transylvania, George Rakoczy, playing the part of Gabriel Bethten his predecessor, made war upon the emperor, who not being able on that account to send fresh troops against Torstensson, called upon Hatzfeldt, as above mentioned, to reform the Battle ot wrecks of Gallas's army on the nucleus of his own. Jankau. Maximilian of Bavaria sent most of his own troops under Weert on the same errand — hence Mercy's defeat at Freiburg.. But Torstensson pressed on by Eger, Pilsen and Budweis towards Vienna, and on the 24 February /6 March 1645 he inflicted a crushing defeat on Gotz, Weert and Hatzfeldt at Jankau near Tabor. Gotz Was killed and half of his army dead or captive. In his extremity Ferdinand offered part of Bohemia and Silesia to Maximilian^ in return for soldiers. But the Bavarian ruler had no soldiers to give, for Turenne was advancing again from the Rhine.

At the end of March the Weimar Army was at Durlach, on the 6th of April at Pforzheim. Thence it marched to Heilbronn, and Rothenburg-on-Tauber, when Turenne resolved to go northward in search of supplies and recruits in the territories of his ally and

J The three " armies " combined were hardly more than 25,000 strong.

cousin the landgravine of Hesse-Cassel. But at this point the army, headed by Bernhard's old colonels,

demanded to be put into rest-quarters, and Turenne allowing them to disperse as they wished, was surprised by Mercy and Weert — who brought his courage, if nothing else, back from the field of Jankau— and lost two-thirds of his forces. But Turenne instead of retreating to Tureaae's the Rnine installed himself in the landgravine's country, Army. where he collected reinforcements of Hessians and Swedes,

while Enghien hurried up from the Moselle and crossed u 7T A lne to re P air the disaster. The " Army of Weimar " and the Army of France " joined forces, as in 1644, almost under the eyes of the enemy. Enghien at once pushed forward from Ladenburg, by Heidelberg, Wimpfen, Rottenburg and Dinkelsbuhl. But from day to day the balance leaned more and more on the u a Tj rian Slde ' for Torst e"sson, after threatening Vienna (April), had drawn off into Moravia without waiting for the dilatory Rakoczy, and the emperor was able to give Maximilian an Austrian corps to be added to Mercy's army. Mercy therefore, after manoeuvring for a time on Enghien's left flank, placed himself in a strong position at Allerheim near Nordlingen, directly barring the way to the Danube. The second battle of Nordlingen (August 3, 1645) was Second t S des P eratel y fought as the first, and had not Mercy battle ot J: en kll,ed at the crisis of the da y Enghien would prob- Nbrdlln- abl y nave been disastrously defeated. As it was, the gen. young duke was victorious, but he had only 1500 infantry

left in rank and file out of 7000 at the end. Soon after- wards Enghien fell ill, and his army returned to France. Turenne, left with a few thousand men only, attempted in vain to hold his ground in Germany and had to make a hasty retreat before the archduke Leopold William, who had meantime made peace with Rakoczy, and, leaving Torstensson's ' successor Wrangel undis- turbed in his Silesian cantonments, brought Gallas's and Hatz- feldt's troops to aid Weert's. Turenne wintered around Philipps- burg, almost the only remaining conquest of these two brilliant but costly campaigns. But

before he settled down into winter quarters he sent a corps to the Moselle, which dislodged the imperialist garrison of Trier and restored the elector in his arch- bishopric. In Flanders Gaston of Orleans conquered a number of fortresses, and his army united with that of the Dutch. But the allies separated again almost at once, each to undertake the sieges which suited its own purposes best.

From Silesia Wrangel passed into Bohemia, where he remained until the forces employed against Rakoczy and Turenne could send help to the imperialists opposed to him. He then drew away into Hesse 2 to support the landgravine of Cassel against the landgrave of Darmstadt, the archduke Leopold William and the Bavarians following suit.

The campaign of 1646 in Hesse up to August was as usual uneventful, each army being chiefly concerned with its food. But at last the archduke retired a little, leaving Turenne and Wrangel free to join their forces. Turenne had no intention of repeating the experiences of Freiburg and Nordlingen. War Turenne' s had ^ y now sett l e< ^ down into the groove whence it did strategy. not issue tm 1 793 • It was more profitable to attain the small objects that were sought by manoeuvre than by battle, and the choice of means practically lay between manoeuvring the enemy's army into poor districts and so breaking it up by starvation, and pushing one's own army into rich districts regardless of the enemy's army. The usual practice was the first method. Turenne chose the second.

Delayed at the opening of the year by orders from Mazarin to stand still — the elector of Bavaria had opened negotiations in order to gain time for the archduke Leopold William to march into the west— Turenne found it impossible to reach Hesse by the short and direct route, and he therefore made a rapid and secret march down the Rhine as far as Wesel, whence, crossing unopposed, he joined Wrangel on the upper Lahn (August 10th). The united armies were only 19,000 strong. Then the im- perialists, fearing to be hemmed in and starved between Turenne

and the Rhine, fell back to Fulda, leaving the Munich road clear. The interior of Bavaria had not been fought over for eleven years, and was thus almost the only prosperous land in desolated Germany. Turenne and Wrangel marched straight forward on a broad front. On the 22nd of September, far ahead of the pursuers, for whom they left nothing to eat, they reached*

1 Torstensson, suffering from gout and worn out by the cam- paign, retired after the unsuccessful Vienna raid.

1 John George of Saxony, seeing that his country was faring worse in a state of open war against Sweden than it would even in the most impotent neutrality, had made a truce with Wrangel on what terms he could obtain.

Augsburg, and for the rest of the year they devastated the country about Munich in order to force Maximilian to make terms. An armistice was concluded in the winter, Maximilian having been finally brought to consent by an ill-judged attempt of the emperor (who feared that Bavaria would go the way of Brandenburg and Saxony) to seduce his army. The French and Swedes wintered in southern Wurttemberg.

*In Flanders, Gaston of Orleans and Enghien took Dunkirk and other fortresses. In Italy, where the Tuscan fortresses were attacked, the French and Prince Thomas their ally were completely checked at first, until Mazarin sent a fresh Last corps thither and restored the balance. In Catalonia """"** ol Harcourt underwent a serious reverse in front of Lerida the war ' at the hands of his old opponent Leganez, and Mazarin sent Enghien, now Prince of Conde, to replace him.*

1647 was a barren year. The Low Countries Spaniards, con- cluding a truce with the Dutch, threw their whole force upon France, but this attack dissipated itself in sieges. In Italy Plessis- Praslin won an unprofitable victory over the viceroy of the

Milanese on the Oglio (July 4th). In Spain Conde, resuming the siege of Lerida, Was repulsed with even more loss than Harcourt had been the year before, and had to retire upon the mere appearance of a relieving army. In Germany Turenne and Wrangel parted com- pany- The latter returned to Hesse, whence he raided into Bohemia, but was driven back by the imperialists under their new general, Melander-Holzapfel. As the few obtainable supply areas gave out one by one, the Swedes gradually retired almost to the coast, but the imperialists did not follow, swerving into Hesse instead to finish the quarrel of the landgravine and the landgrave. Turenne meanwhile had had to send all the French troops to Luxemburg to help in the defence of northern France against the Spaniard. The Weimar Army had refused to follow him to the Meuse, and mutinied for its arrears of pay. Turenne, however promptly seized the ringleaders and after a sharp fight disarmed the rest. Thus ignominiously Bernhard's old army vanished from the scene.

In the autumn the elector of Bavaria was reconciled to the emperor and his army re-entered the field. Turenne was therefore sent back to Germany to assist the Swedes. But winter came on before any further inroads could be made into south Germany.

*The campaign of 1648 brought the decision at last. Turenne and Wrangel, having refitted their forces and united in Hesse as in 1646, steadily drove back the imperialists and Bavarians, whose 30,000 combatants were accompanied by a horde of nearly 130,000 hangers-on— men, women and children— to the Danube. For a moment, at Nordlingen, the French and the Swedes separated, but they soon reunited, moved on to and beyond the Danube, and at Zusmarshausen (May 17th) catch- ing the enemy in the act of manoeuvring, they destroyed his rear-guard, Melander being amongst the dead. The Battle of victors advanced as far as the Inn, but Piccolomini, Zusman- reorganizing the debris of the Austro-Bavarian army, *«««"• checked their further progress and even drove them back to the line of the Isar. Meantime, however, the Swedish general Konigsmarck, gathering*

all the scattered forces of his side in Saxony and Silesia, had entered Bohemia and was besieging Prague. This caused the recall of Piccolomini's army, and Turenne and Wrangel invested Munich. But Mazarin ordered the French to retire into Suabia so as not to compromise the peace negotiations at the critical moment, and Wrangel followed suit. Before Konigsmarck was in a position to assault Prague news came of peace.

Meanwhile in Artois Cond6 had repulsed the Spanish in- vasion by his brilliant victory of Lens (August 5th), which was a second Rocroi. After the thanksgiving service for the victory at N6tre Dame, Mazarin arrested the leaders of the Parlement of Paris, and in a few hours the streets were barricaded and a civil war in progress. This was the Fronde (q.v.), which went on for another eleven years.

Authorities.— S. R. Gardiner, Thirty Years' War; A. Gindely, Gesch. des 3036.hr. Krieges; Chemnitz, Gesch. des Schwedischen Krieges; v. Pufendorf, 26 Bilcher der Schwedish-deutschen Kriees- geschtchte (1688) ; Hon. E. Noel, Gustaf Adolf; Hardy de Perini Batmlles Francoises; iii. and iv.; lives of Turenne, Conde, Wallen- stem, Gustavus, &c. ; vols. ix 1 . and x. of Clausewitz's works- Lorentzen, Schwedens Armee im jojdhr. Kriege; Loewe; Organisa- Hon der Wallensteinschen Heere; Precis des Campagnes de Gustave Adolphe (Brussels, 1887). (Q. p. a.)

THISTLE, a name, as generally employed, of vague application, being given to almost any herbaceous plant that is of a spiny character. More strictly, it is applied to the species of Carduus. These are Composite herbs with very spiny leaves, and similar bracts surrounding a head of purplish-white, tubular, five-parted flowers seated on a pitted and hairy receptacle. The anthers have appendages both at the apex and at the base, and the style has a ring of hairs at the point of bifurcation of the two stigmas. The fruit is surmounted by a tuft of silky-white hairs. The species, chiefly natives of Europe and Western Asia, are numerous, and some are of great beauty, though, not unnaturally, looked on with disfavour by the farmer. The blessed thistle is Carduus benediclus; Lady's thistle, the leaves of which are spotted with white, is C. marianus. The common C. lanceolatus seems to be the most suitable prototype for the Scots thistle, though that honour is also conferred on an allied plant Onopordon acanlhium, the cotton thistle, remarkable for its covering of white down, a doubtful native, and on other species. The carline thistle is Carlina vulgaris, a member of the same family as is also the sow-thistle, Sonchus oleraceus. The great objection to thistles from an agricultural point of view resides in the freedom with which they produce seed, and in the vigour of their underground growth, which makes their uprooting a matter of difficulty. Partial uprooting may, indeed, in the case of the perennial species, increase the mischief, for each fragment left behind may grow into a distinct plant. Annual species might be kept in check were they cut. down before the flowers appear, but unless all the cultivators in a particular district co-operate the efforts of individuals are of little avail. The Artichoke (q.v.), Cynara scolymus, and Cardoon {q.v.) are very near allies of the thistles. The Safflower, Cartha- mus, another thistle, yields a serviceable dye, the Burdock, Arctium lappa, a member of the same family, has an edible root; and numerous allied species have medicinal properties.

THISTLEWOOD. ARTHUR (1770–1820), the principal insti- gator of the Cato Street conspiracy, a plot formed to murder many British ministers in 1820. A son of William Thistlewood, and born at Tupholme in Lincolnshire, young Thistlewood passed his early years in a desultory fashion ; he became a soldier and visited France and America, imbibing republican opinions abroad and running into debt at home. Then taking up his residence in London he joined the Spencean Society, a revolu- tionary body; associated himself with James Watson (d. 1838) and other agitators; and in December 1816 helped to arrange a meeting in Spa Fields, London, which was to be followed by the seizure of the Tower of London and the Bank of England, and by a general revolution. The proposed rising was a dismal failure, but the Habeas Corpus Act was suspended and Thistle- wood and Watson were seized, although upon being tried they were acquitted. Becoming more violent Thistlewood formed other plots, talked of murdering the prince of Wales, and was sentenced to a year's imprisonment for challenging the home secretary, Lord Sidmouth, to a duel. After his release in May 1819, having broken away from Henry Hunt and the more moderate reformers, he prepared a new and comprehensive plot. On the 23rd of February 1820, at a time of great distress and during the unrest caused by the death of George III., the cabinet ministers had arranged to dine at the earl of Harrowby's house in Grosvenor Square. Thistlewood knew of the dinner. With some associates he hired a room in the neighbouring Cato Street, collected arms and made ready to fall upon Harrowby's guests. However the authorities had been informed of the plot, probably by one of the conspirators named George Edwards; officers appeared upon the scene and arrested some of the conspirators; and although Thistlewood escaped in the con- fusion he was seized on the following day. Tried for high treason, Thistlewood and four others were sentenced to death, and were hanged on the 1st of May 1820.

See Sir S. Walpole, History of England (1890), vol. i.

TH6K6LY, IMRE (Emerich), Prince (1657-1705), Hungarian statesman, was born at Kesmark on the 25th of September 1657. He lost both parents while still a child. In 1670,

fleeing from the dangers of Upper Hungary, where the Protes- tants and Imperialists were constantly in arms against each other, he took refuge with his kinsman Michael Teleki, the chief minister of Michael Apafy, prince of Transylvania. Here he came into contact with the Magyar refugees, who had great hopes of the high-born, high-gifted youth who was also a fellow sufferer, a large portion of his immense estates having been confiscated by the emperor. The discontent reached its height when Leopold (Feb. 27, 1673) suspended the Hun- garian constitution, appointed Johan Gaspar Ampringen dictator, deprived 450 Protestant clergy of their livings and condemned 67 more to the galleys. Encouraged by promises of help from Louis XIV., the Magyars now rose pro libertate et justilia, and chose the youthful Thokoly as their leader. The war began in 1679. Upper Hungary and the mining towns were soon in Thokoly's possession. In 1681, reinforced by 10,000 Transylvanians and a Turkish army under the pasha of Nagyvarad, he compelled the emperor to grant an armistice. On the 15th of June 1682 he married Helen Zrinyi, the widow of Prince Francis Rakoczy I. Thokoly's distrust of the emperor now induced him to turn for help to the sultan, who recognized him as prince of- Upper Hungary on condition that he paid an anuual tribute of 40,000 florins. In the course of the same year Thok5ly captured fortress after fortress from the emperor and extended his dominions to the Waag. He refused, however, the title of king offered to him by the Turks. At the two Diets held by him, at Kassa and Talya, in 1683, the estates, though not uninfluenced by his personal charm, showed some want of confidence in him, fearing lest he might sacrifice the national independence to the Turkish alliance. They refused therefore to grant him either subsidies or a levie en masse, and he had to take what he wanted by force. Thokoly materially assisted the

Turks in the Vienna campaign of 1683, and shared the fate of the gigantic Turkish army. The grand vizier nevertheless laid the blame of the failure on Thokoly, who thereupon hastened to Adrianople to defend himself before the sultan. Shortly afterwards, perceiving that the Turkish cause was now lost, he sought the mediation of Sobieski to reconcile him with the emperor, offering to lay down his arms if Leopold would confirm the religious rights of the Magyar Protestants and grant him, Thokoly, the thirteen north-eastern counties of Hungary with the title of prince. Leopold refused these terms and demanded an unconditional surrender. Thokoly then renewed the war. But the campaign of 1685 was a series of disasters, and when he sought help from the Turks at Nagyvarad they seized and sent him in chains to Belgrade, possibly because of his previous negotiations with Leopold, whereupon most of his followers made their peace with the emperor. In 1686 Thokoly was released from his dungeon and sent with a small army into Transylvania, but both this expedition and a similar one in 1688 ended in failure. The Turks then again grew suspicious of him and imprisoned him a second time. In 1690, however, the Turks despatched him into Transylvania a third time with 16,000 men, and in September he routed the united forces of General Heister and Michael Teleki at Zernest. After this great victory Thokoly was elected prince of Transylvania by the Keresztenymez Diet, but could only maintain his position against the imperial armies with the utmost difficulty. In 1691 he quitted Transylvania altogether. He led the Turkish cavalry at the battle of Slankamen, and in fact served valiantly but vainly against Austria during the remainder of the war, especially distinguishing himself at Zenta. He was excluded by name from the amnesty promised to the Hungarian rebels by the peace of Karlowitz (Jan. 26, 1699). After one more unsuccessful attempt, in 1700, to recover his principality, he settled down at Galata with his wife. From the sultan he received large estates and the title of count of Widdin. He was buried in the great Armenian cemetery at Nicomedia, but in the

course of 1906 his relics were transferred to Hungary.,

See Correspondence of Thokoly (Hung.), ed. by Kaloian Thaly (Budapest, 1896); V. Fraknoi, Papst Innocenz XI. und Ungarn's Befreiung von de Turkenherrschaft (Freiburg, 1902); Memoirs of

Enteric Count Teckely (London, 1693); Correspondence of Michael Teleki (Hung.), ed. by S. Gergely (Budapest, 1905-1906). (R. N. B.)

THOLOBATE (Gr. 06Xos, a circular structure, dome, and Savis, a base), the architectural term given to the cylindrical drum on which a dome is raised. In the earlier Byzantine churches, the dome rested direct on the pendentives and the windows were pierced in the dome itself; in later examples, between the pendentive and the dome an intervening circular wall was built, in which the windows were pierced, and this is the type which was universally employed by the architects of the Renaissance, of whose works the best-known examples are those of St Peter at Rome, St Paul's in London, and the churches of the Invalides, the Val de Grace and the Sorbonne in Paris.

THOLOS (06Xos), the term given in Greek architecture to a circular building, with or without a peristyle; the earliest examples are those of the beehive tombs at Mycenae and in other parts of Greece, which were covered by domes built in horizontal courses of masonry. The Tholos at Epidaurus, built by Polycleitus (c. 400 B.C.), and the Tholos at Olympia, known as the Philippeion, are the most remarkable examples, and in both cases were covered with a sloping roof and not with a dome.

THOLUCK, FRIEDRICH " AUGUST GOTTREU (1799-1877), German Protestant divine, was born at Breslau, on the 30th of March 1 799. He received his education

at the gymnasium and university of his native town, and early distinguished himself by great versatility of mind and power of acquiring languages. A love of Oriental languages and literature led him to exchange the university of Breslau for that of Berlin, that he might study to greater advantage, and there he was received into the house of the Orientalist Heinrich Friedrich von Diez (1750–1817). He was introduced to pietistic circles in Berlin, and came specially under the influence of Baron Hans Ernst von Kottwitz (1757–1843), who became his " spiritual father," and of the historian Neander. Before deciding on the career of theological professor, he had in view that of a missionary in the East. Meanwhile he was feeling the influence to a certain degree of the romantic school, and of Schleiermacher and Hegel too, though he never sounded the depths of their systems. At length, in his twenty-first year, he finally decided to adopt the academical calling. In 1821 he was Privatdozent and in 1823 became professor extraordi- narius of theology in Berlin, though he was at the same time active in the work of home and foreign missions. He lectured on the Old and New Testaments, theology, apologetics and the history of the church in the 18th century. In 1821 appeared his first work, Sufismus, sive theosophia Persarum pantkeistica; following the same line of study he published Bliitensammlung aus der morgenl&ndischen Mystik (1825) and Speculative Trini- ttitslehre des spdteren Orients (1826). His well-known essay on the nature and moral influence of heathenism (1822) was published by Neander, with high commendation, in his Denkwiirdigkeilen; and his Commentary on the Epistle to the Romans (1824) secured him a foremost place amongst the most suggestive, if not the most accurate, Biblical interpreters of that time. Another work, which was soon translated into all the principal European languages, Die wahre Weihe des Zweiflers (1823; 9th ed., with the title Die Lehre von der Siinde und dent Versohner, 1870), the out- come of his own religious history, procured for him the position which he ever after held of the modern Pietistic apologist of Evangelical Christianity. In

1825, with the aid of the Prussian government, he visited the libraries of England and Holland, and on his return was appointed (in 1826) professor ordinarius of theology at Halle, the centre of German rationalism, where he afterwards became preacher and member of the supreme cbnsis- torial council. Here he made it his aim to combine in a higher unity the learning and to some extent the rationalism of J. S. Semler with the devout and active pietism of A. H, Francke; and, in spite of the opposition of the theological faculty of the university, he succeeded in changing the character of its theology. This he effected partly by his lectures, particularly his exegetical courses, but, above all, by his personal influence upon the stvdents, and, after 1833, by his preaching. His theological

position was that of a mild and large-hearted orthodoxy, which laid more stress upon Christian experience than upon rigid dogmatic belief. On the two great questions of miracles and inspiration he made great concessions to modern criticism and philosophy. The battle of his life was on behalf of personal religious experience, in opposition to the externality of rational- ism, orthodoxy or sacramentarianism. Karl Schwarz happily remarks that, as the English apologists of the 18th century were themselves infected with the poison of the deists whom they endeavoured to refute, so Tholuck absorbed some of the heresies of the rationalists whom he tried to overthrow. He was also one of the prominent members of the Evangelical Alliance, and few men were more widely known or more beloved throughout the Protestant churches of Europe and America than he. He died at Halle on the 10th of June 1877. As a preacher, Tholuck ranked among the foremost of his time. As a teacher, he showed remarkable sympathy and won great success. As a thinker he can hardly be said to have been endowed with great creative power.

After his commentaries (on Romans, the Gospel of John, the Sermon on the Mount and the Epistle to the Hebrews) and several volumes of sermons, his best-

known books are Stunden christlicher Andacht (1839; 8th ed., 1870), intended to take the place of J. H. D. Zschokke's standard rationalistic work with the same title, and his reply to David Strauss's Life of Jesus (Glaubwurdigkeit der evangeli- schen Geschichte, 1837). He published at various times valuable contributions towards a history of rationalism — Vor geschichte des Rationalismus (1853-1862), Geschichte des Rationalismus (1865), i. and a number of essays connected with the history of theology and especially of apologetics. His views on inspiration were indicated in his work Die Propheten und ihre Weissagungen (i860), in his essay on the " Alte Inspirationslehre," in Deutsche Zeitschrift fur christliche Wissenschaft (1850), and in his Gesprache uber die vornehmsten Glaubensfragen der Zeit (1846; 2nd ed., 1867).

He also contributed many articles to Herzog's Realencyklopadie, and for several years edited a journal (1830-1849), Literarischer Anzeiger.

See Das Leben Tholucks, by L. Witte (2 vols., 1884-1886); A. Tholuck, einLebensabriss, by M. Kahler (1877), and the sameauthor's art. "Tholuck," in Herzog's Realencyklopadie; " Zur Erinnerung an Tholuck," by C. Siegfried, Protestantische Kirchzeitung (1885), No. 45, and 1886, No. 47; Karl Schwarz, Zur Geschichte der neuesten Theologie (4th ed., 1869) ; F. W. F. Nippold's Handbuch der neuesten Kirchengeschichte ; cf. Philip Schaff, Germany; its Universities, Theology and Religion (1857), and the article in the Allgemeine deutsche Biographie.

THOMA, HANS (1839-), German painter, was born at Bernau in the Black Forest. Having started life as a painter of clock-faces, he entered in 1859 the Carlsruhe academy, where he studied under Schirmer and Des Coudres. He subsequently studied and worked, with but indifferent success, in Diisseldorf, Paris, Italy, Munich and Frankfort, until his reputation became firmly established as the result of an exhibition of some thirty of his paintings in Munich. In spite of his studies under various

masters, his art has little in common with modern ideas, and is formed partly by his early impressions of the simple idyllic life of his native district, partly by his sympathy with the early German masters — -particularly with Altdorfer and Cranach. In his love of the details of nature, in his precise (though by no means faultless) drawing of outline, and in his predilection for local colouring, he has distinct affinities with the pre-Raphaelites. Many of his pictures have found their way into two private collections in Liverpool. A portrait of the artist, and two subject pictures, " The Guardian of the Valley " and " Spring Idyll," are at the Dresden Gallery; " Eve in Paradise " and " The Open Valley " at the Frankfort Museum. Other impor- tant pictures of his are " Paradise," " Christ and Nicodemus," "The Flight into Egypt," "Charon," " Pieta," " Adam and Eve," " Solitude," " Tritons," besides many landscapes and portraits. He has also produced numerous lithographs and pen drawings, and some decorative mural paintings, notably in a cafe at Frankfort, and in the music room of Mr Pringsheimer's house in Munich.

THOMAR, a town of central Portugal,- in the district of Santarem; on the river Nabao, a tributary of the Zezere, 4 m. from Paialvo railway station, which is 80 m N.F-. of Lisbon

by the main line to Oporto. Pop. (1900), 6888. Thomar contains examples of the best Portuguese arctetecture from the 12th century to the 17th. The ruined castle of the Knights Templar, given to that order in 11 59, is said to occupy the site of the ancient Nabantia. On the suppression of the Templars, who had done good service against the Moors, King Diniz of Portugal founded the Order of Christ in 1314. The convent palace of the Knights of Christ includes a church and cloister dating from the 12th century, two cloisters and a chapter-house added in the 15th century by Prince Henry the

Navigator, a very fine r6th century church built in the Manoellian or Manue- line style by Joao de Castilho, to which the older church served as a chancel, and other buildings erected later. The convent contains Flemish and Portuguese paintings of the 16th century, of the so-called " Grao Vasco " school. Its aqueduct, 3 m. long, was built 1 595-161 5. Other interesting buildings are the churches of Santa Maria do Olival, rebuilt in the Gothic style in 1450 on the site of an older Templar foundation; Sao Joao Baptista, also Gothic, built in 1490, but with Manoellian addi- tions; Nossa Senhora da Conceicao, Renaissance of 1579; and the palace of Prince Henry the Navigator, restored in the 16th century by Queen Catherine, widow of John III.

THOMAS, ST, one of the twelve .apostles. The synoptical Gospels give only his name, associating him in their lists with Matthew (Matt. x. 3; Mark iii. 18; Luke vi. 15); in Acts i. 13 he is coupled with Philip. In the Gospel of John (xi. 16; xiv. 5; xx. 24 seq.; xxi. 2) he appears in a characteristic light, full of personal devotion and ready to die with his Master, but slow to grasp the true significance of the personality of Jesus, and incredulous of the resurrection till direct evidence convinces him of its truth and at the same time of the Divinity of his risen Lord. John translates the Aramaic name or surname Thomas by the Greek equivalent Didymus (twin). Tradition has it that he was the twin brother of a sister Lysias (his parents being Diophanes and Rhoa, and his birthplace Antioch; " XII. Apost. Patriae," in Chron. Pasch. ii. 142), or of a brother Eliezer {Horn. Clem. ii. 1), or, according to the Syriac Ada Thomae (ed. Wright, Eng. trans, pp. 155, 180), of Jesus Himself. The last form of the tradition seems to be derived from the name Judas Thomas, which he bears in Edessene legend (cf . Eusebius, H. E. i. 13, 10), and implies the identification of Thomas with Judas, the brother of the Lord, The most ancient tradition makes Thomas the evangelist of Parthia (Eus. H.E. iii. 1, 1); and at Edessa, which claimed to possess his bones, it was related that their missionary

Addai (Doctrine of Addai, ed. Phillips, 1876, p. 5), whom Eusebius calls Thaddaeus (H.E. i. 13), was sent to them by him. Later tradition, originating with the Ada Thomae, and accepted by catholic teachers from the middle of the 4th century, makes him proceed to India and there suffer martyrdom. The Indian king Gundaphar of the Ada is, however, certainly identical with the historical Gondophares, whose dynasty was Parthian, though his realm included regions loosely reckoned to India. The Parthian and Indian missions of Thomas may perhaps therefore be regarded as derived from a single tradition, but it is very doubtful whether it is based on any historical facts. . The oldest extant tradition is that St Thomas did not suffer martyrdom at all (Heracleon ap. Clem. Alex. Strom, iv. 9). The best investigation of the traditions connecting St Thomas with India is that by W. R. Philipps (Indian Antiquary, 1903, xxxii. 1-15, 145-160). The ingenious conjectures of von Gutschmid (N. Rhein. Mus. xix. 161 seq.) and Sylvain Levi (Journ. asiatique, 1897, p. 27 seq.) are greatly weakened by the fact that they do not start from a consideration of the names in thejr original Syriac form. Bishop Medlycott's India and the Apostle Thomas (1905) is wholly uncritical.

The Acta Thomae, very imperfectly published by Thito (1823) and Tischendorf (1851), have been edited in Greek by Bonnet 'Leipzig, 1883, 2nd ed., with new matter, 1903), and in the original Syriac, with an English translation, by W. Wright (Apocryphal Acts, 2 vols., London, 1871). See also Lipsius, Die apocryphen Aposlelgesch., ii.(2nd. ed. ^23-425 (Brunswick) ;F.C. Burkittin Journ. Theol. St. i. 280 seq., ii. 94. The Acta are said by Photius to be a part of the Uipioioi tuv AtrnttAXmc of the Gnostic Lcucius Charinus,

but this unknown personage is to be thought of as a collector of Gnostic " Acts of Apostles," rather than as the first author. In spite of extensive Catholic revision, the " Acts of Thomas " form one of the most interesting monuments of Syriac Gnosticism. Internal evidence assigns them with

great probability to the school of Barde- sanes, and the very ancient allegorical hymn about the soul which is preserved in the Syriac text (p. 274 seq., Eng. trans., p. 238 seq.) is per- haps by Bardesanes himself (cf. Noldeke in Z.D.M.G., 1871, p. 676). This hymn was translated into the Greek Acta, along with the rest of the work (Bonnet, pp. 219-224, Anal, bolland. xx. 158-164). It is one of the most remarkable pieces in Syriac literature, and has been edited separately by A. A. Bevan, Texts and Studies, v. 3 (Cambridge, 1897). "■ metrical English version is given in F. C. Burkitt's Early Eastern Christianity, p. 2.18 seq. (London, 1904).

(F. C. B.)

" Christians of St Thomas " is a name often applied to- the mem- bers of the ancient Christian churches of southern India, which claim him as their first founder, and honour as their second founder a certain bishop named Thomas, who is said to have come with some presbyters from Jerusalem to Malabar in a.d. 345- 1 According to their tradition, St Thomas went from Malabar to Mylapur, now a suburb of Madras, where the shrine of his martyrdom, rebuilt by the Portuguese in 1547, still stands on Mt St Thomas, and where a miraculous cross is shown with a Pahlavi inscription which may be as old as the end of the 7th century. We know from Cosmas Indicopleustes that there were Christian churches of Persian (East-Syrian) origin, and doubtless of Nestorian creed, in Ceylon, in Malabar, and at Caliana (north of Bombay) before the middle of the 6th century, and even then St Thomas, the reputed apostle of Persia, may have been their special saint. The ancient churches of southern India never died out or wholly lost their sense of connexion with their mother church, for we find them sending deputies in 1490 to the Nestorian patriarch Simeon, who furnished them with bishops (Assemani, Bib. or. iii. 1, 590 seq.). Hard pressed by the Moslems, they welcomed the approach of the Portuguese, but proved by no means tractable to efforts to bring them within the Roman obedience. At length a formal union with Rome was carried through in the synod of

Diamper (1599). Syriac was to remain the ecclesiastical language, but the service books were corrected and purified from error. A century and a half of foreign Jesuit rule followed, but the love of independence was not lost. A great schism took place in 1653, and of 200,000 Christians of St Thomas only 400 remained loyal to Rome, though many of their churches were soon won back by the Carmelites. Those who remained independent fell under the influence of the Jacobite Mar Gregorius, styled patriarch of Jerusalem, who reached Malabar in 1665 as an emissary from Ignatius, patriarch of Antioch. From his time the independent Christians have been Jacobites, the counter-efforts of the Nesto- rians under Mar Gabriel, bishop of Azerbaijan, having apparently come to nothing after his death in 1730. Since the visit of Claudius Buchanan, whose Christian. Researches in Asia (181 1) excited great interest, much has been done for the Christians of South India by English missionary effort, and Anglicans have cultivated friendly relations with the clergy of the inde- pendent native church, while discouraging dependence on the Jacobite patriarch of Antioch.

A valuable though tedious and ill-arranged history of the Christians of St Thomas is that by W. Germann, Die Kirche der Thomaschristen, (Giitersloh, 1877). See also La Croze, Histoire du christianisme des Indes (The Hague, 1724); Alexius de Menezes, Hisloria ecclesiae malabarieae (Latin by F. Raulin, Rome, 1745) (especially for the synod of Diamper) ; Paulinus a S. Bartholomaeo, India orientalis Christiana (4to, Rome, 1794); George Milne Rae, The Syrian Church in India (Edinburgh and London, 1892).

THOMAS A KEMPIS (c. 1380-1471), the name by which the Augustinian canon and writer Thomas Hammerken (Hamm'er- chen, Malleolus) is commonly known. He was born in 1379 or 1380 in the town of Kempen, lying about 15 miles north-west of Dtisseldorf, in one of the many patches of territory between

1 See the sketch in Syriac of the history of the church of Malabar printed and translated by Land,

Anecd. Syr. i. 24 seq. It was sent to Schaaf at Leiden in 1720 by Mar Gabriel, the last Nestorian bishop in Malabar (see Germann, p. 542).

the Meuse and the Rhine belonging to the archiepiscopal prin- cipality of Cologne. " Ego Thomas Kempis," he says in his chronicle of the monastery of Mount St Agnes, " scholaris Daventriensis, ex diocesi Coloniensi natus." His father was a poor hard- worked peasant; his mother " ad custodiam rei domesticae attenta, in opere alacris, in victu sobria, in potu abstemia, in verbo pauca, in factis pudica," as her son fondly says, kept a dame's school for the younger children of the town. John and Gertrude Hammerken had two sons, John and Thomas, both of whom found their way to Deventer, and thence to Zwolle and to the convent of Mount St Agnes. Thomas reached Deventer when he was barely twelve years' old, was taught by a dame the beginnings of his learning, and in a few months to his great joy entered the classes of Florentius Radewyn. After the fashion of the time he was called Thomas from Kempen, and the school title, as was often the case then, pushed aside the family name. Thomas Hammerken was forgotten; Thomas a Kempis has become known to the whole Christian world.

This school at Deventer had become famous long before Thomas a Kempis was admitted to its classes. It had been founded by Gerhard Groot (q.v.), a wealthy burgher who had been won to pious living mainly through the influence of Ruys- broeck, the Flemish mystic. It was at Deventer, in the midst of this mystical theology and hearty practical benevolence, that Thomas a Kempis was trained. Gerhard Groot was his saintly ideal. Florentius Radewyn and Gerhard's other early disciples were his heroes; their presence was his atmosphere, the measure of their lives his horizon. But he was not like them; he was not an educational reformer like Radewyn, nor a man of affairs like Gerhard. He liked

books and quiet corners all his days, he says; and so, when conviction of sin and visions of God's grace came to him in the medieval fashion of a dream of the anger and forgiveness of the Virgin, Florentius told him that a monk's life would suit him best, advised him to join the August inian order, and sent him to Zwolle to the new convent of Mount St Agnes, where his brother John was prior. Thomas was received there in 1399, he professed the vows in 1407, received priest's orders in 1413, became sub-prior in 1425 and died on the 8th of August 1471, being ninety-one years old.

The convent of Mount St Agnes was poor, and most of the monks had to earn money to support their 1 household by copying MSS. Thomas was a most laborious copyist: missals, books of devotion and a famous MS. Bible were written by him. He also wrote a large number of original writings, most of them relating to the convent life, which was the only life he knew. He wrote a chronicle of the monastery and several biographies — the life of Gerhard Groot, of Florentius Radewyn, of a Flemish lady St Louise, of Groot's original disciples; a number of tracts on the monastic life — The Monk's Alphabet, The Discipline of Cloisters, A Dialogue of Novices, The Life of the Good Monk, The Monk's Epitaph, Sermons to Novices, Sermons to Monks, The Solitary Life, On Silence, On Poverty, Humility and Patience; two tracts for young people — A Manual of Doctrine for the Young, and A Manual for Children; and books for edification — On True Compunction, The Garden of Roses, The Valley of Lilies, The Consolation of the Poor and the Sick, The Faithfiil Dispenser, The Soul's Soliloquy, The Hospital of the Poor. He also left behind him three collections of sermons, a number of letters, some hymns and the famous Imitatio Chris ti (though his authorship of this has been disputed). These writings help us to see the man and his surroundings, and contemporary pious records make him something more than a shadow. We see a real man, but a man helpless anywhere save in the study or in the convent — a little fresh-coloured man, with soft brown eyes, who had a habit

of stealing away to his cubiculum whenever the conversation became too lively; somewhat bent, for it is on record that he stood upright when the psalms were chanted, and even rose on his tiptoes with his face turned upwards; genial, if shy, and occasionally given to punning, as when he said that he preferred Psalmi to Salmones; a man who perhaps led the most placid uneventful life of all men who ever wrote a book or scribbled letters. It was not that he lived in uneventful

times: it is impossible to select a stormier period of European history, or a perfcd when the stir of the times made its way so well into the obscurest corners. Bohemia, Huss leading, was ablaze in revolt at one end of Europe; France and England, then France and Burgundy, were at death-grips at the other. Two popes anathematized each other from Avignon and from Rome, and zealous churchmen were at their wit's end to concoct ways and means, by general councils of Constance and Basel and otherwise, to restore peace to a distracted church, and to discipline the clergy into decent living. But Thomas knew nothing about all this. He was intent on his copying, on his little books, and on his quiet conversations. His very bio- graphies are colourless. He had not even the common interest in the little world coming up to the convent gate which most monks may be supposed to have. His brethren made him oeconomiae prefectus, but he was too " simple in worldly affairs " and too absent-minded for the post, and so they deposed him and made him sub-prior once more. And yet it is this placid kindly fresh-coloured old man who has come down to us as the author of that book the Imitation of Christ, which has been translated into more languages than any other book save the Bible, and which has moved the hearts of so many men of all nations, characters and conditions of life.

On the controversy as to the author of the Imitatio, see the article Imitation of Christ. See also James Williams, Thomas of Kempen (19 10). The classical edition of the works of Thomas a Kempis by Sommalius — Thomas Malleoli a Kempis opera omnia (3 vols, in

I, 1607) — has been many times reprinted. A critical edition in 8 vols, by M. J. Pohl, has also been undertaken. The best accounts in Eng- lish of Thomas a Kempis are those by S. Kettlewell (1882) and F. R. Cruise (1887), written from the Protestant and the Catholic stand- points respectively. A penny tract by F. R. Cruise, entitled Outline of the Life of Thomas a Kempis (1904), contains substantially all that is known concerning him. (T. M. L.)

THOMAS (d. 1 100), archbishop of York, was a native of Bayeux, and is usually called Thomas of Bayeux. His father was a priest named Osbert, and Samson, bishop of Worcester from 1086 until his death in May n 12, was his brother. Owing largely to the generosity of Odo, bishop of Bayeux, Thomas studied in France, Germany and Spain and became known as a scholar; then he became one of Bishop Odo's officials and after 1066 one of William the Conqueror's chaplains, or secretaries. In 1070 he succeeded Aldred as archbishop of York, but declining to promise obedience to the archbishop of Canterbury, Lanfranc, the latter prelate refused to consecrate him. King William, however, induced him to submit and he was consecrated, but his profession of obedience was to Lanfranc personally and not to the archbishops of Canterbury. In 107 1 both archbishops travelled to Rome for their palls and while there Thomas wished Pope Alexander II. to decree the equality of the sees of Canter- bury and York. The pope, however, referred the dispute to a council of English prelates, and this met at Windsor at Whitsun- tide 1072. It was then decided that the archbishop of Canter- bury was the superior of the archbishop of York, who had no rights south of the Humber, but whose province included Scot- land. But this decision did not put a period to the dispute. It broke out again, and in 1092 and again in 1093 Thomas protested against what he regarded as infringements of his archiepiscopal rights. The first of these occasions was over the dedication of the cathedral built by Remigius at Lincoln and the second was over the consecration of St Anselm to the archbishopric of Canterbury. In 1100, during

Anselm's exile, Thomas reached London too late to crown Henry I., the ceremony having been hurriedly performed by Maurice, bishop of London, but his anger at this slight was soon appeased. He died at York on the 18th of November 1100. Thomas rebuilt the minster at York, where he appears to have been an excellent archbishop; he knew something of church music and wrote hymns.

Thomas had a nephew, Thomas, the son of his brother Samson, who was also archbishop of York. The younger Thomas became archbishop in 1 108 and like his uncle he refused to promise obedi- ence to the archbishop of Canterbury; his consecration was then

delayed and the dispute was still unsettled when St Anselm died in April 1109. Henry I. and his bishops then decided against Thomas, who was forced to make the necessary promise and was consecrated in London in June 1109. He died at Beverley on the 24th of February 1114-

THOMAS, surnamed Magister (i.e. officiorum), 1 also known as a monk by the name Theodulos Monachos, a native of Thessa- lonica, Byzantine scholar and grammarian and confidential adviser of Andronicus II. (1282-1328). His chief work, 'EkXoy?j 'Ovoixaroiv kox 'Fihi&tccv 'Attik&v, is a collection of selected Attic words and phrases, partly arranged in alphabetical order, compiled as a help to Greek composition from the works of Phrynichus, Ammonius, Herodian and Moeris. He also wrote scholia on Aeschylus, Sophocles, Euripides (with life), and three of the comedies of Aristophanes; the scholia on Pindar, attributed to him in two MSS., are now assigned to Demetrius Triclinius. His speeches and letters consist partly of declamations on the usual sophistical themes, partly deal with contemporary histo- rical events: an argument between the fathers of Cynegirus and Callimachus (two Athenians who fell at Marathon) as to which had the better claim to

have the funeral oration pronounced over him first; a discussion on the duties of a king and of his subjects; a defence of the Byzantine general Chandrenos addressed to the emperor; a letter on the cruelties of the Catalans and Turks in Thessaly and Macedonia; a congratulatory letter to Theodoras Metochita; a panegyric on the king of Cyprus.

Editions of the 'Ek\ojv by F. Ritschl (1832), C. Jacobitz (1833) and C. D. Beck (1836); other works in J. P. Migne, Patrologta graeca, cxlv. ; sae also C. Krumbacher, Geschichte der byzantinischen Lilteratur (1897).

THOMAS OF CELANO, Franciscan friar and disciple and biographer of St Francis of Assisi. Born at Celano in the Abruzzi, he joined St Francis probably about 12 14, and he appears to have been one of the first band of friars who went into Germany. He was commissioned by Gregory IX. to write the Life of St Francis, and in 1229 he completed the First Legend; in 1 247 at the command of the minister general he composed the Second Legend, and a few years later the Tract on the Miracles of St Francis. He also composed in 1255 the Legend of St Clare; and he is one of those to whom the sequence Dies

irae is attributed.

Thomas of Celano's writings on St Francis have been critically edited by E. d'Alengon in 1906 ; the value of this work is enhanced by the fact that critical opinion is veering round to the view that Thomas of Celano is the best authority for the life of the saint (see " Note on the Sources," appended to article Francis of Assisi).

An English translation {The Lives of S. Francis of Assisi by Brother Thomas of Celano) by A. G. Ferrers Howell appeared in 1908. All that is known of Thomas of Celano is brought together in Edouard d'Alencon's Prolegomena; see also introduction to Ferrers Howell's translation. (E. C. B.)

THOMAS OF ERCELDOUNE, called also The Rhymer, and

sometimes given the surname of Learmont {ft. ? 1220-? 1297), poet and prophet in the legendary literature of Scotland. The historical person of that name figures in two charters of the 13th century, and from these it appears that he owned lands in Erceldoune (now Earlstoun), in Berwickshire, which were made over by his son and heir on the 2nd of November 1294 to the foundation of the Holy Trinity at Soltra (or Soutra) on the borders of the same county. This would seem to imply that Thomas the Rhymer was already dead, but J. A. H. Murray, who edited The Romance and Prophecies (E.E.T.S., 1875), thinks that he was living three years later in a Cluniac priory in Ayrshire. He figures in the works of Barbour and Harry the Minstrel as the sympathizing contemporary of their heroes, and Walter Bower, who continued the Scotichronicon of Fordun, tells how he prophesied the death of Alexander III. in 1285. Barbour makes the bishop of St Andrews in 1306 express a hope that a prophecy of Thomas referring to Bruce will come true; and Wyntoun says that he foretold the battle of Kilblane. In the folk-lore of Scotland his name is associated with numerous fragments of verse of a gnomic and prophetic character. The 1 For the duties of this important office, see J. B. Bury, Later Roman Empire (1669), i. 45.

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romance of Thomas and the elf-queen was attributed to Ercel- doune by Robert Mannyng de Brunne, but the earliest text, in the Auchinleck MS. in the Advocates' library, Edinburgh, is in a dialect showing southern forms, and dates from the beginning of the 14th century. It may be based on a genuine work of Thomas, a version by him of the widely diffused Tristan Saga. This text was published in 1804 by Sir Walter Scott, and was by him assigned to the Rhymer. The most widely accepted opinion is that it is a translation of a French original. The Rhymer's lands at Earlstoun are still identified. In 1840 died the last of a family named Learmont, which claimed descent from the poet. It may be noted that the Russian poet Michael Lermontov claimed Thomas of

Erceldoune as his ancestor.

See J. A. H. Murray's edition of The Romance and Prophecies (E.E.T.S., 1875); Brandl's Thomas of Erceldoune (Berlin, 1880), and Kolbing's Die nordische und die englische Version der Tristransage (Heilbronn, 1882) ; also McNeill's Sir Tristrem (S.T.S., 1886) ;Lumby's Early Scottish Prophecies (E.E.T.S., 1870), and the reprint of the Whole Prophesie of Scotland. (1603) by the Bannatyne Club (1833).

THOMAS OF MARGA, a Nestorian bishop and author of an important monastic history in Syriac, who flourished in the 9th century a.d. He was born early in the century, probably of Persian parents, in the region of Salakh to the north-east of Mosul. As a young man he became in 832 a monk of the famous Nestorian monastery of Beth 'Abhe, which was situated at the confluence of the Great Zab with one of its tributaries, about 25 m. due east of Mosul. A few years later he was acting as secretary to Abraham, who had been abbot of Beth 'Abhe, and was catholicus (patriarch) of the Nestorians from 837 to 850. At some date during these 13 years Thomas was promoted by Abraham to be bishop of Marga, a diocese in the same district as Beth 'Abhe, and afterwards he was further advanced to be a metropolitan of Beth Garmai, a district farther to the south- east in the mountains which border the Tigris basin. It was during the period of his life at Beth 'Abhe and his bishopric that he composed The Book of Governors, which is in the main a history of his own monastery, but includes lives of holy men in other parts of Mesopotamia and the regions east of the Tigris. The work was probably planned in imitation of the famous Paradise of Palladius, the history of Egyptian monasticism which had become well known to Syriac-speaking Christians in the version of 'Anan-Isho' (6th century).

The Book of Governors has been edited with an English translation and a copious introduction by E. W. Budge (2 vols., London, 1893), who claims that " it occupies a unique position in Syriac literature,

and it fully deserves the veneration with which it has been and is still regarded by all classes of Nestorians to whom it is known." It gives a detailed history of the great monastery cf Beth 'Abhe during its three centuries of existence down to the author's time. It is full of interesting narratives of saintly men told in a naive and candid spirit, and it throws much light on the history of Christianity in the Persian dominions. There is a later edition by P. Bedian (Paris, 1901). (N. M.)

THOMAS, ARTHUR GORING (1850-1892), English musical composer, was the youngest son of Freeman Thomas and Amelia, daughter of Colonel Thomas Frederick. He was born at Ratton Park, Sussex, on the 20th of November 1850, and educated at Haileybury College. He was intended for the Civil Service, but delicate health interfered with his studies, and in 1873 he went to Paris to cultivate the musical talent he had displayed from an early age. Here he studied for two years with Emiie Durand. In 1875 he returned to England, and in 1877 entered the Royal Academy of Music, where for three years he studied under Ebenezer Prout and Arthur Sullivan, winning twice the Lucas medal for composition. At a later period he received some instruction in orchestration from Max Bruch. His first published composition was a song, " Le Roi Henri," which appeared in 1871. An early comic opera, Don Braggadocio (libretto by his brother, C. I. Thomas), was apparently un- finished; some of the music in it was afterwards used for The Golden Web. A selection from his second opera, The Light of the Harem (libretto by Clifford Harrison), was performed at the Royal Academy of Music on the 7th of November 1879, |; with such success that Carl Rosa commissioned him to write

Esmeralda (libretto by T. Marzials and A. Randegger), which was produced at Drury Lane on the

26th of March 1883. Two years later it was given (in German) at Cologne and Hamburg, and in 1890 (in French) at Covent Garden. On the 16th of April 1885 Rosa produced at Drury Lane Thomas's fourth and best opera, Nadeshda (libretto by Julian Sturgis) ; a German version of which was given at Breslau in 1890. A fifth opera, The Golden Web (libretto by F. Corder and B. C. Stephenson), slighter than its predecessors, was produced (after the composer's death) at Liverpool, Feb. 15, and at the Lyric Theatre, London, Mar. 11, 1893. Besides these dramatic works Thomas's chief composi- tions were a psalm, " Out of the Deep," for soprano solo and chorus (London, 1878); a choral ode, " The Sun Worshippers " (Norwich, 1881), and a suite de ballet for orchestra (Cambridge, 1887). A cantata, The Swan and the Skylark, was found in pianoforte score among his MSS. after his death: it was orches- trated by C. Villiers Stanford, and produced at the Birmingham Festival of 1894. His minor compositions include over 100 songs and duets. In 1891 Thomas became engaged to be married; shortly afterwards he showed signs of mental disease, and his career came to a tragic end on the 20th of March 1892. He was buried in Finchley cemetery. Goring Thomas occupies a distinct place among English composers of the 19th century. His music, which shows traces of his early French training, reveals a great talent for dramatic composition and a real gift of refined and beautiful melody. Personally the most amiable of men, he was most critical of his own work, never attempting anything for which he felt he was unfitted, and constantly revising and rewriting his compositions. (W.B.S.*)

THOMAS, CHARLES LOUIS AMBROISE (1811-1896), French musical composer, was born at Metz on the 5th of August 181 1. He studied at the Paris Conservatoire, and won the Grand Prix de Rome in 1832. Five years later (in 1837) his first opera, La Double echelle, was produced at the Opera Comique. For the next five-and-twenty years Thomas's productivity was incessant, and most of his operatic works belonging to this period enjoyed an ephemeral popularity. A

few of these are still occasionally heard on the continent, such as Le Ca'id (1849), Le Songe d'une nuit d'Ue (1850), Psyche (1857). The overture to Raymond (1851) has remained popular. So far the composer's operatic career had not been marked by any overwhelming success. He occupied a place among the recognized purveyors of operas in the French capital, but could scarcely claim to having achieved European renown. The production of Mignon at the Opera Comique in 1866, however, at once raised Ambroise Thomas to the position of one of the foremost French composers. Goethe's touching tale had very happily inspired the musician; Mme Galli Marie, the original interpreter of the title-role, had modelled her conception of the part upon the well-known picture by Ary Scheffer, and Mignon at once took the fancy of the public, its success being repeated all over the continent. It has since remained one of the most popular operas belonging to the second half of the 19th century. Thomas now attempted to turn Shakespeare's Hamlet to operatic account. His opera of that name was produced with success at the Paris Op6ra in 1868, where it enjoyed a long vogue. If the music is scarcely adequate to the subject, it nevertheless contains some of the composer's best work. The scene of the esplanade is genuinely dramatic, the part of Ophelia is poetically conceived, and the ballet music is very brilliant. Ambroise Thomas's last opera, Francoise de Rimini, was given at the Opera in 1882, but has not maintained itself in the repertoire. Seven years later La Tempite, a ballet founded on Shakespeare's play, was produced at the same theatre. Ambroise Thomas succeeded Auber as director of the Paris Conservatoire in 1871. His music is often distinguished by refined touches which reveal a sensitive mind, and there is a distinct element of poetry in his Mignon and Hamlet, two operas that should suffice to keep the composer's memory green for some time to come. He died on the 12th of February 1896. (A. He.)

THOMAS, GEORGE (c. 1756-1802), British military adventurer in India. Thomas was born of poor

parentage in Ireland in

1756, deserted from the British Navy in Madras, and made his way north to Delhi, where he took service under the begum Samru of Sardhana. Supplanted in her favour by a Frenchman, he transferred his allegiance to Appa Rao, a Mahratta chieftain, and subsequently set up an independent kingdom of his own in Hariana with his capital at Hansi. Thomas was a man of great personal strength and daring, and considerable military genius. In the turmoil of falling kingdoms in the India of that day his sword was always at the service of the highest bidder; but he had the virtues of his profession — he never betrayed an employer, was kind and generous to his soldiers, and was always ready to succour a woman in distress. He cherished dreams of conquering the Punjab, and fought one of his best campaigns against the Sikh chiefs; but he was finally defeated and captured by Sindhia's army under General Perron (q.v.). His iron constitution was broken by exposure and excessive drinking, and he died on his way down the Ganges on the 22nd of August

1802.

See Francklin, Military Memoirs of Mr George Thomas (1803) ; Compton, Military Adventurers of Hindustan (1892).

THOMAS, GEORGE HENRY (1816–1870), American general, was born in Southampton county, Virginia, on the 31st of July 1816. Graduating from West Point in 1840, he served as an artillery subaltern in the war against the Seminole Indians in Florida (1841), and in the Mexican War at the battles of Fort Brown, Resaca de la Palma, Monterey and Buena Vista, receiving three brevets for distinguished gallantry in action. From 1851 to 1854 he was an instructor at West Point. In 1855 he was appointed by Jefferson Davis, then secretary of war, a major of the 2nd Cavalry. His regimental superiors were A. S. Johnston, R. E. Lee and Hardee. All three resigned at the outbreak of the Civil War and Thomas was long in doubt as to his duty. He finally decided to

adhere to the United States. He was promoted in rapid succession to be lieutenant- colonel and colonel in the regular army, and brigadier-general of volunteers. In command of an independent force in eastern Kentucky, on the 19th of January 1862, he attacked the Con- federate General Zollicoffer at Mill Springs, and completely routed him, gaining by vigorous attack and relentless pursuit the first important Union victory in the West. He served under Buell and was offered, but refused, the chief command in the anxious days before the battle of Perryville. Under Rosecrans he was engaged at Stone River and was in charge of the most important part of the manoeuvring from Decherd to Chattanooga. At the battle of Chickamauga (q.v.) on the 19th of September 1863 he achieved great distinction^ his firmness on that disastrous field, where he gained the nafne of ” The Rock of Chickamauga,” being all that saved a terrible defeat from becoming a hopeless rout. He succeeded Rose- icrans in command of the Army of the Cumberland shortly before the great victory of Chattanooga (q.v.), in which Thomas and his army played a most conspicuous part, his divisions under Sheridan, Wood and Baird carrying Missionary Ridge in superb style. In Sherman’s advance through Georgia in the spring of 1864, the Army of the Cumberland numbered over 60,000 men present for duty. Thomas handled these with great skill in all the engagements and flanking movements from Chattanooga to Atlanta. When J. B. Hood broke away from Atlanta in the autumn of 1864,: menaced Sherman’s long line of communica- tions and endeavoured to force Sherman to follow him, Sherman determined to abandon his communications and march to the sea, leaving to Thomas the difficult task of dealing with Hood. Thomas hastened back with a comparatively small force, racing with Hood to reach Nashville, where he was to receive reinforcements. At the battle of Franklin on the 30th of November 1864, a large part of Thomas’s force, under command of Schofield, checked Hood long enough to cover the concentra- tion at Nashville (q.v.). Here Thomas had to organize his force, which was drawn from all parts of the West and included many young troops and

even quartermaster's employes. He declined to attack until his army was ready and the ice which covered the ground had melted sufficiently to enable his men

to move. The whole of the North, and even General Grant himself, were impatient of the delay. General Logan was sent with an order to supersede Thomas, and soon afterwards Grant left the Army of the Potomac to take command in person. Before either arrived Thomas made his attack (December i5th-i6th, 1864) and inflicted on Hood the most crushing defeat sustained in the open field by any army on either side in the whole war. Hood's army was completely ruined and never again appeared on the field. For this brilliant victory Thomas was made a major-general in the regular army and received the thanks of Congress. After the termination of the Civil War he commanded military departments in Kentucky and Tennessee until i860, when he was ordered to command the division of the Pacific with headquarters at San Francisco. He died there of apoplexy, while writing an answer to an article criticizing his military career, on the 28th of March 1870.

Thomas was beloved by his soldiers, for whom he always had a fatherly solicitude. He was a man of solid rather than brilliant attainments; he remained in the army all his life, and never had any ambitions outside of it; the nickname of "Slow Trot Thomas " given him by the cadets at West Point character- ized him physically and mentally; his mind acted deliberately, and his temperament was somewhat sluggish; but his judgment was accurate, his knowledge of his profession was complete in every detail, and when he had finally grasped a problem, and the time arrived for action, he struck his blow with extra- ordinary vigour and rapidity. The only two battles in which he was in chief command — Mill Springs and Nashville, one at the beginning and the other near the end of the war — were signal victories, without defect and above

criticism. His service during the intervening three years of almost incessant conflict and manceuvring was marked by loyal obedience to his superiors, skilful command cf his subordinates, and successful accomplish- ment of every task entrusted to him.

THOMAS, ISAIAH (1 749-1831), American printer, was born in Boston, Massachusetts, on the 19th of January 1749. He was apprenticed in 1755 to Zechariah Fowle, a Boston printer, with whom, after working as a printer in Halifax, Portsmouth, New Hampshire, and Charleston, South Carolina, he formed a partnership in 1770. He issued in Boston the Massachusetts Spy three times each week, then (under his sole ownership) as a semi-weekly, and beginning in 1771, as a weekly which soon espoused the Whig cause and which the government tried to suppress. On the 16th of April 1775 (three days before the battle of Concord, in which he took part) he took his presses and types from Boston and set them up at Worcester, where he was postmaster for a time; here he published and sold books and built a paper-mill and bindery, and he continued the paper until about 1802 except in 1776-1778 and in 1786-1788. The Spy supported Washington and the Federalist party. In Boston Thomas published, in 1774, the Royal American Magazine, which was continued for a short time by Joseph Greenleaf, and which contained many engravings by Paul Revere; and in 177 5-1803 the New England Almanac, continued until 1819 by his son. He set up printing houses and book stores in various parts of the country, and in Boston with Ebenezer T. Andrews, published the Massachusetts Magazine, a monthly, from 1789 to 1793. At Walpole, New Hampshire, he published the Farmer's Museum. About 1802 he gave over to his son, Isaiah Thomas, junr., his business at Worcester including the control of the Spy. Thomas founded in 1812 the American Antiquarian Society. He died in Worcester on the 4 th of April 1 83 1.

His History of Printing in America, with a Biography of Printers, and an Account of Newspapers (2 vols., 1810; 2nd ed., 1874, with a catalogue of American publications previous to 1776 and a memoir of Isaiah

Thomas, by his grandson B. F. Thomas) is an important work, accurate and thorough.

THOMAS, PIERRE (1634-1698), sieur du Foss6, French scholar and author, was the son of a master of accounts at Rouen. He was sent as a child to be educated at Port Royal, and there he received his final bent towards the life of a recluse,

and even of a hermit, which drew him to establish himself in the neighbourhood of Port Royal des Champs. In 1661 he came to Paris, and in 1666 was arrested along with I. L. Le Maistre (de Sacy), and after a month in the Bastille was exiled to his estate of Foss6. He later made yearly visits to Paris. Apart from his collaboration with de Sacy, Thomas wrote some hagiographic works and left Memoires (1697-1698 and again 1 876—1 879), which are highly praised by Ste Beuve as being a remarkable mirror of the life at Port Royal.

THOMAS, SIDNEY GILCHRIST (1850-1885), British inventor, was born on the 16th of April 1850 at Canonbury, London. His father, a Welshman, was in the civil service, and his mother was the daughter of the Rev. James Gilchrist. His father's death leaving his family with a considerably reduced income, he gave up his original idea of becoming a doctor and obtained an appointment as a police court clerk, which he held till May 1879. During these twelve years, besides the work of a busy police court, which brought him into intimate contact with social problems, he found time to study chemistry, and attended lectures at the Birkbeck Institute. He set himself to solve the problem of eliminating phosphorus from iron by means of the Bessemer converter, and by the end of 1875 was convinced that he had discovered a method. He communicated his theory to his cousin, P. C. Gilchrist, who was chemist to iron works in Wales, and experiments were made, which proved satis- factory. Edward Martin, manager of the Blaenavon Works, gave facilities for conducting the experiments on a larger scale and undertook to help in taking out a patent. In March 1878, the first public announcement of the discovery

was made at the meeting of the Iron and Steel Institute, but without attract- ing much attention; and in September a paper was written by Thomas and Gilchrist on the "Elimination of Phosphorus in the Bessemer Converter " for the autumn meeting of this institute, but was not read till May 1879. Thomas, however, made the acquaintance of E. W. Richards, the manager of Bolckow Vaughan & Co.'s works at Cleveland, Yorkshire, whom he interested in the process, and from this time the success of the invention was assured and domestic and foreign patents were taken out. The " basic process " invented by Thomas was especially valuable on the continent of Europe, where the proportion of phosphoric iron is much larger than in England, and both in Belgium and in Germany the name of the inventor became more widely known than in his own country. In America, although non phosphoric iron largely predominates, an immense interest was taken in the invention. But Thomas had been overworking for years, and his lungs became affected. A long sea voyage and a residence in Egypt proved unavailing to restore his health and he died in Paris on the 1st of February 1885. He had what W. E. Gladstone, in a review of the Memoirs published in 1891, described as an " enthusiasm of humanity," and he left his fortune to be used for the promotion of philan thropic work. A police court mission was endowed in his memory.

See Memoirs and Letters of Sidney Gilchrist Thomas (1891), ed. by R. W. Burnie.

THOMAS, THEODORE (1835-1905), American musician, was born in Esens, Germany, on the nth of October 1835. His early musical training was received chiefly from his father. At the age of five he made his first public appearance as a violinist. In 1845 he was taken to America by his parents, and became first violin in the orchestra that accompanied Jenny Lind in 1850, Sontag in 1852 and Grisi and Mario in 1854. In 186a he began to organize his own orchestra, and from 1864 to 1878 were performed a series of symphony concerts inaugurated by him in Irving Hall, which were regarded as one of the great musical

institutions of New York City. His " summer night " concerts begun in 1866 in Terrace Garden were continued in Central Park. From 1855 to 1868 he took part in a series of chamber music concerts in New York. In the latter year his orchestra made its first tour, and continued to give concerts in various American cities until it was disbanded in 1888. To Theodore Thomas is largely due the popularization of Wagner's

works in America, and it was he who founded the Wagner union in 1872. During most of the seasons from 1877 to 1891 he was conductor of the New York Philharmonic Society, and from 1862 to 1891, of the Brooklyn Philharmonic Society. He was director of the Cincinnati College of Music (1878-1879), conductor of the American Opera Company (1886-1887), and for more than thirty years (1873-1904) the conductor of the biennial May festivals at Cincinnati. In 1891 he removed to Chicago, and became the conductor of the Chicago Orchestra; in 1893 he was musical director of the Columbian Exposition. He died on the 4th of January 1905.

THOMAS, WILLIAM (d. 1554), English soldier and writer, was probably a native of Radnorshire and was educated at Oxford. In 1544 he went to Italy, where he spent the greater part of the next five years, and in April 1550, soon after his return to England, he was made one of the clerks of the privy council; he also taught the science of politics to the young king Edward VI., for whose instruction he wrote some treatises and some " commonplaces of state." Being a strong Protestant he took part in the rising against Queen Mary led by Sir Thomas Wyat in 1554, being captured and thrown into the Tower of London. Having whilst in prison tried to commit suicide and been tortured on the rack in the hope of incriminating the princess Elizabeth, he was found guilty and was hanged at Tyburn on the 18th of May 1554.

During his residence at Bologna Thomas, who was a very learned man, wrote // Pellegrino ingless, published in 1552. This is a valuable and interesting defence of Henry VIII. by a contemporary and it originated in a discussion between the author and some Italian gentlemen. He also prepared an English version of this work, but this was not published during his lifetime. As The Pilgrim: a dialogue of the life and actions of King Henry VIII., it was edited with notes by J. A. Froude and appeared in 1861. It had pre- viously been edited by A. D'Aubant, who had added to it the six treatises written for Edward VI. and had called the whole The Works of William Thomas (1774). Of his other writings perhaps the most important is The Historie of Italie (1549), and his Principal Rules of the Italian Grammar with a Dictionarie for the better under- standing of Baccate, Pelrarcha and Dante (1550, 1560, 1562 and 1567) may also be mentioned. This was the first work of its kind in Eng- lish. Thomas made an English translation of Josafat Barbaro s account of his voyages, Barbaro being a Venetian traveller who died in 1494. With an introduction by Lord Stanley of Alderley this was published by the Hakluyt Society in a volume of Travels to Tana and Persia (London, 1873). See John Strype, Ecclesiastical Memorials (Oxford, 1822).

Thomas has a namesake, William Thomas (1613–1689), bishop of St David's from 1677 to 1683 and bishop of Worcester from

1683 to 1689. He was one of the bishops who refused to take the oaths of allegiance to William and Mary in 1689 and was suspended, but in the midst of the dispute he died on the 25th of June 1689 (see Nonjurors). The bishop's grandson was William Thomas (1670–1738), the Worcestershire antiquary.

THOMASIUS, CHRISTIAN (1655–1728), German jurist and publicist, was born ac Leipzig on the 1st of January 1655, and was educated by his father, Jakob Thomasius (1622–1684), at that time head master of the Thomasschule. Through his father's lectures Christian came under the influence of the political

philosophy of Hugo Grotius and Samuel Pufendorf, and continued the study of law at Frankfort-on-Oder. In

1684 he commenced the career of professor of natural law at Leipzig, and soon attracted attention by his abilities, but particularly by his daring attack upon traditional prejudices, in theology and jurisprudence. In 1687 he made the daring innovation of lecturing in German instead of Latin, and in the following year published a monthly periodical (Scherzhafte und ernsthafte, vemiinftige und einfdltige Gedanken iiber ailerhand lustige und niitzliche Biicher und Fragen) in which he ridiculed the pedantic weaknesses of the learned, taking the side of the Pietists in their controversy with the orthodox, and defending mixed marriages of Lutherans and Calvinists. In consequence of these and other views, he was denounced from the pulpits, forbidden to lecture or to write (May 10, 1690) , and his arrest was ordered. The latter he escaped by flight to Berlin, and the elector Frederick III. offered him a refuge in Halle, with a salary of 500 talers and the permission to lecture. He took part

in founding the university of Halle (1694), where he became second and then first professor of law and rector of the university. He was one of the most esteemed university teachers and influ- ential writers of his day. He died, after a successful and honourable career, on the 23rd of September 1728.

Though not a profound and systematic philosophical thinker, Thomasius prepared the way for great reforms in philosophy, and, above all, in law, literature, social life and theology. It was his mission to introduce a rational, common-sense point of view, and to bring the high matters of divine and human sciences into close and living contact with the everyday world. He thus created an epoch in German literature, philosophy and law, and Spittler opens with him the modern period of ecclesiastical history. He made it one of the aims of his life to free politics and jurisprudence from the control of theology, and fought bravely and consistently for free- dom of thought and speech on religious

matters. He is often spoken of in German works as the author of the " territorial system," or Erastian theory of ecclesiastical government. But he taught that the state may interfere with legal or public duties only, and not with moral or private ones. He would not have even atheists punished, though they should be expelled the country, and he came forward as an earnest opponent of the prosecution of witches and of the use of torture. In theology he was not a naturalist or a deist, but a believer in the necessity of revealed religion for salvation. He came strongly under the influence of the pietists, particularly of Spener, and there was a mystic vein in his thought; but other elements of his nature were too powerful to allow him to attach himself wholly to that party.

Thomasius's most popular and influential German publications were his periodical already referred to (1688-1689); Einleilung zur Vernunfllehre (1691, 5th ed. 1719); Vemiinftige Gedanken uber ailerhand auserlesene und juristische Handel (1 720-1 721) ; Historie der Weisheit und Torheil (3 vols., 1693) ; Kurze Lehrsdlze von dem Laster der Zauberei mil dem Hexenprozess (1704) ; Weitere Erlaulerungen der neueren Wissenschafl anderer Gedanken kennen zu lernen (1711).

See Luden, Christian Thomasius nach scinen Schicksalen und Schriften (1805); H. Dernburg, Thomasius und die Stiftung der Universiidl Halle (1865); B. A. Wagner, Thomasius, ein Beitrag zur Wiirdigung seiner Verdiensie (1872) ; Nicoladoni, Christian Thomasius. Ein Beitrag zur Geschichle der Aufkldrung (Berlin, 1888); and E. Landsberg, Zur Biographic von Christian Thomasius (1894).

THOMASON, GEORGE (d. 1666), English book and tract collector, was a London bookseller, whose life contains few items of interest save the fact that he was concerned in a royalist plot in 1651. He is famous, however, as the man who brought together the great collection of books and tracts published during the time of the Civil War and the Commonwealth; this was formerly called the " King's

Pamphlets," but is now known as the " Thomason Collection." During the years just before che outbreak of war a great number of writings covering every phase of the questions in dispute between king and people were issued, and in 1641 Thomason began to collect these. Working dili- gently at his task for about twenty years, he possessed nearly 23,000 separate publications in 1662, and having arranged these in chronological order he had them bound in 1983 volumes. After many vicissitudes the collection was bought in 1761 from his descendants by George III., who presented it to the British Museum, where it now is (see Newspapers). Thomason died in London in April (1666).

THOMASVILLE, a city and the county-seat of Thomas county, Georgia, U.S.A., about 200 m. S.W. of Savannah. Pop. (1900), 5322, of whom 3296 were negroes; (1910), 6727. Thotnas- ville is served by the Atlanta, Birmingham & Atlantic, the Atlantic Coast Line and the Florida Central railways. The city is attractively situated (about 250 ft. above the sea) on a high plateau, is surrounded by pine forests, and is a well-known winter resort. There are fine drives in the vicinity. Thomasville has a city hospital, a public library (1876) and a good public school system, and is the seat of Young's College (for girls), which was founded by E. Remer Young, a wealthy planter of Thomas county, was incorporated in 1869 and was opened in 1871, and of the Vashti industrial school (1903) for girls, maintained by the Women's home mission society of the Methodist Episcopal Church, South. The city has a large trade in lumber, especially yellow pine; other products of the region are cotton, sugar-cane tobacco, melons, fruits and vegetables. The municipality own; and operates the water-works and electric-lighting plant; th< water supply is obtained in part from artesian wells 1900 ft

deep. Thomasville was settled about 1825, was incorporated as a town in 183 1, and was chartered as a city in 1889.

THOMOND, EARL AND MARQUESS OF, Irish titles borne by the great family of O'Brien, the earldom from 1543 to 1741 and the marquessate from 1800 to 1855. Thomond, or Tuaidh- Muin, was one of the three principalities of Munster, forming the northern part of the province. Its earls were descended from Turlough O'Brien (c. 1000-1086), king of Munster, and through him from the celebrated king of Ireland, Brian Boroimhe. Turlough's descendants, Conchobhar O'Brien (d. 1267) and Brian Ruadh O'Brien (d. 1276), kings of Thomond, were both typical Irish chieftains. Conchobbar's tomb and effigy with a crown are still to be seen in the ruined abbey of Corcomroe, Cc. Clare. His descendant Conor O'Brien (d. 1539), prince of Thomond, took part in the feud between the great families of Fitzgerald and Butler and was the last inde- pendent prince of Thomond. It is interesting to learn that in 1534, when he was in some straits, he wrote to the emperor Charles V. offering to submit to his authority. Conor's brother, Murrough O'Brien (d. 1551), prince of Thomond, the succeeding chief of the race, gave up his " captainship, title, superiority and country" to Henry VIII. in 1543, when he was created earl of Thomond. By special arrangement the earldom de- scended, not to his son Dermod, but to his nephew, Donough, who became the 2nd earl. Dermod, however, inherited the barony of Inchiquin, which was conferred upon his father at the same time as the earldom. • ; _ , .

Conor O'Brien, the 3rd earl (c. 1534-c. 1582), was for some years at the outset of his career, harassed by the attacks of his discontented kinsmen. Then in his turn he rose against the English, but was defeated and fled to France; in 1571, however, he was pardoned and formally surrendered his lands to Eliza- beth. One of his younger sons was Daniel O'Brien (c. 1577- c. 1664) who, after loyally serving Charles I. and Charles II., was created Viscount Clare in 1663. His grandson Daniel, the 3rd viscount (d. 1691) served James II. in Ireland, being outlawed and deprived of his estates by the English parliament. The three succeeding viscounts

Clare all distinguished them- selves in the service of Fiance. Daniel, the 4th viscount, was mortally wounded at the battle of Marsaglia in 1693; his brother Charles, the 5th viscount (d. 1706), was killed at the battle of Ramillies; and the latter's son Charles, the 6th viscount (1699- 1761) after a brilliant military career, was made a marshal of France in 1757. When Charles, the 7th viscount, died in 1774 the title became extinct.

Donough O'Brien, the 4th earl (d. 1624), called the "great earl," was the son and successor of the 3rd earl. He served England well in her warfare with the rebellious Irish during the closing year of Elizabeth's reign and was made president of Munster in 1605. He had two sons, Henry, the 5th earl, (d. 1639) and Barnabas, the 6th earl (d. 1657). During the Irish rebellion of 1640-41 Barnabas showed a prudent neutrality, and then joined Charles I. at Oxford, where in 1645 he was created marquess of Billing, but the patent never passed the great seal and the title was never assumed. The succeeding earls were Barnabas's son Henry (c. 1621-1691) and Henry's grandson Henry (1688-1741) who was created an English peer as Viscount Tadcaster. When he died the earldom of Thomond became extinct.

The estates of the earldom descended to the last earl's nephew, Percy Wyndham (c. 1713-1774), a younger son of Sir William Wyndham, Bart. He took the additional name of O'Brien and was created earl of Thomond in 1756. When he died unmarried the title again became extinct.

In 1800 Murrough O'Brien, 5th earl of Inchiquin (c. 1724- 1808), was created marquess of Thomond. He was succeeded by his nephew William (c. 1765-1846) who was created a British peer as Baron Tadcaster in 1826. His brother James, the 3rd marquess (c. 1768-1855), was an officer in the navy and became an admiral in 1853. When he died the marquessate became extinct.

See John O'Donoghue, Historical Memoirs of the O'Byiens (Dublin, i860).

THOMPSON, FRANCIS (i860- 1907), English poet, was born at Ashton, Lancashire, in i860. His father, a doctor, became a convert to Roman Catholicism, following his brother Edward Healy Thompson, a friend of Manning. The boy was accord- ingly educated at Ushaw College, near Durham, and subse-. quently studied medicine at Owens College, Manchester; but he took no real interest in the profession of a doctor and was bent on literary production. A period of friendlessness and failure (from the point of view of " practical life ") followed, in which he became a solitary creature who yet turned his visions of beauty into unrecognized verse. It was not till 1893 that, after some five obscure years, in which he was brought to the lowest depths of destitution and ill health, his poetic genius became known to the public. Through his sending a poem to the magazine Merrie England, he was sought out by Mr and Mrs Wilfrid Meynell and rescued from the verge of starvation and self- destruction, and these friends of his own com- munion, recognizing the value of his work, gave him a home and procured the publication of his first volume of Poems (1893). His debt to Mrs Meynell was repaid by some of his finest verse. The volume quickly attracted the attention of sympathetic critics, in the St James's Gazette and other quarters, and Coventry Patmore wrote a eulogistic notice in the Fortnightly Review (Jan. 1894). An ardent Roman Catholic, much of Francis Thompson's verse reminded the critics of Crashaw, but the beauty and splendid though often strange inventiveness of his diction were imme- diately recognized as giving him a place by himself among contemporary poets, recalling Keats and Shelley rather than any of his own day. Persistent ill health limited his literary output, but Sister Songs (1895) and New Poems (1897) confirmed the opinion formed of his remarkable gifts. But his health was hopelessly broken down by tuberculosis. Cared for by the friends already mentioned, he lived a frail existence, chiefly at the Capuchin monastery at Tanlasapt, and later at Storrington; and on the 13th of November 1907 he died in London. He had done a

little prose journalism, and in 1905 published a treatise on Health and Holiness, dealing with the ascetic life; but it is with his three volumes of poems that his name will be connected. Among his work ther^> is a certain amount which can justly be called eccentric or unusual, especially in his usage of poetically compounded neologisms; but nothing can be purer or more simply beautiful than ” The Daisy,” nothing more intimate and reverent than his poems about children, or more magnificent than ” The Hound of Heaven.” For glory of inspiration and natural magnificence of utterance he is unique among the poets of his time. (H. Ch.)

THOMPSON, SIR HENRY, Bart. (1820-1904), English surgeon, was born at Franilingham, Suffolk, on the 6th of August 1820. His father wished him to enter business, but circumstances ultimately enabled him to follow his own desire of becoming a physician, and in 1848 he entered the medical school of University College, London. There he had a brilliant career, and obtained his degree at London University in 1851 with the highest honours in anatomy and surgery. In 1851 he married Miss Kate Loder, a talented pianist, who, though stricken with paralysis soon afterwards, was always a devoted helpmate to him. In 1853 he was appointed assistant surgeon at University College Hospital, becoming full surgeon in 1863, professor of clinical surgery in 1866, and consulting surgeon in 1874. In 1884 he became professor of surgery and pathology in the Royal College of Surgeons, which in 1852 had awarded him the Jacksonian prize for an essay on the Pathology and Treatment of Stricture of the Urethra, and again in 1S60 for another on the Health and Morbid Anatomy of the Prostate Gland. These two memoirs indicate the department of medical practice to which he devoted his main attention. Specializing in the surgery of the genito-urinary tract, and in particular in that of the bladder, he went to Paris to study under Civiale, who in the first quarter of the 19th century proved that it is possible to crush a stone within the human bladder, and after his return he soon acquired a high reputation as a

skilful operator in thai

class of disease. In 1863, when the king of the Belgians was suffering from stone, he was called to Brussels to consult in the case, and after some difficulties was allowed to perform the operation of lithotrity: this was quite successful, and in recogni-* tion of his skill Thompson was appointed surgeon-extraordinary to the king, an appointment which was continued by Leopold II. Nearly ten years later he carried out a similar operation on the emperor Napoleon, who, however, died four days after the second crushing, not from the surgical interference, as was proved by the post-mortem examination, but from uraemic poisoning. Besides devising various operative improvements in the treat- ment of the disorders which were his speciality, Sir Henry Thompson wrote various books and papers dealing with them, including Clinical Lectures on Diseases of the Urinary Organs, Practical Lithotomy and Lithotrity, Tumours of the Bladder, Suprapubic Lothotomy, and Preventive Treatment of Calculous Disease. Among other books of a medical character that came from his pen were Food and Feeding, and Diet in Relation to Age and Activity, both of which passed through a number of editions. In 1874 he took a foremost part in founding the Cremation Society of England, of which he was the first president; and not only was he active in urging the advantages of crema- tion as a means of disposing of the body after death, but also did much towards the removal of the legal restrictions by which it was at first sought to prevent its practice in England. On various occasions he denounced the slackness and inefficiency of the methods of death-certification prevalent in Great Britain, and in 1892 his agitation was instrumental in procuring the appointment of a select committee to inquire into the matter; its report, published in the following year, in great measure confirmed his criticisms and

approved the remedies he suggested. But medicine and hygiene by no means exhaust the list of Sir Henry Thompson's activities. In art he was an accomplished sketcher and, moreover, an amateur of painting whose pictures were hung at the Royal Academy and the Paris Salon. About 1870 he began to get together his famous collection of china, in particular of old blue and white Nanking; this in time became so large that he could no longer find room for it, and most of it was sold. A catalogue of it, illustrated by himself and Mr James Whistler, was published in 1878. In his famous " octaves " he may be said to have elevated the giving of dinner parties into a fine art. The number of courses and of guests was alike eight, and both were selected with the utmost care and discrimination to promote the " feast of reason and the flow of soul." In literature, in addition to more serious works, he produced two novels — Charley Kingston's Aunt (1885) and All But (1886) — which met with considerable success. In science he became a devotee of astronomy, and for a time maintained a private observatory in his house at Molesey. He further did much to promote astronomical study in Great Britain by presenting Greenwich Observatory with some of the finest instruments now among its equipment, his gifts includ- ing a photoheliograph of o-in. aperture; a 30-in. reflecting telescope, and a large refracting telescope having an object-glass of 26-in. diameter and a focal length of 22J ft. The offer of the last instrument was made in 1894. Its manufacture was undertaken by Sir Howard Grubb of Dublin, and its erection was completed in 1897. It added greatly to the instrumental resources of Greenwich, especially for photographic work, and its importance may be gauged from the fact that both in aperture and focal length it is double the size of any instrument possessed by the observatory at the time it was put in place. That Sir Henry Thompson, who was knighted in 1867, received a baronetcy in 1899 "was probably not unconnected with the presentation of this telescope to the national observatory. Thompson died on the 18th of April 1904. His family consisted of an only son, Herbert, a barrister and well-known

egyptologist, who succeeded to the baronetcy, and two daughters, of whom the elder (author of a valuable Handbook to the Public Picture Galleries of Europe, first published in 1877), married Archdeacon Watkins of Durham, and the younger married the Rev. H. de Candole.

THOMPSON, SIR JOHN SPARROW (1844-1894), Canadian jurist and statesman, was bom at Halifax, Nova Scotia, on the 10th of November 1844, of Irish descent. At fifteen he entered a lawyer's office, and in 1865 was called to the provincial bar! In 1871 he incurred much odium by leaving the Methodist Church, in which he had been prominent, and becoming a Roman Catholic, a change dictated solely by religious motives. In 1877 he was elected to the local legislature for Antigonish as a Conservative, and in 1878 became attorney-general. In May 1882 he became premier, but in June was defeated at the general election, though retaining his own seat, and in July was made a judge of the provincial Supreme Court. In September 1885, he was appointed minister of justice in the Federal cabinet, and soon after was elected member for Antigonish. In 1886 he successfully defended in the Federal parliament the hanging of Louis Riel (q.v.), which had greatly angered the French Roman Catholics; in 1887-1888, together with Mr Joseph Cham- berlain and Sir Charles Tupper, he arranged a Fisheries Treaty with the American commissioners, which was afterwards thrown out by the United' States Senate. During the following years he defended the government with great skill in various politico-religious disputes, and in November 1892 succeeded Sir John Abbott as premier of Canada. The length of time during which the Conservatives had held office had gathered around many parasites, and Thompson was compelled to face charges, some of them true, against prominent Conservatives He promptly announced his intention to " lop the mouldering branches away," and would probably have reorganized his party, but on the 12th of December 1894 he dropped dead at Windsor Castle, a few minutes after having been sworn in by Queen Victoria as a member of the privy council.*

Though a quiet man who did not advertise, few Canadian statesmen have done so much honest and solid work. In 1892 he finished the codification of the Canadian criminal code; in 1893 his firmness and knowledge as British arbitrator at Paris on the Bering Sea dispute between Gteat Britain and the United States were of great service.

His Life has been written by J. C. Hopkins (Toronto, 1895).

THOMPSON, LAUNT (1833-1894), American sculptor, was born at Abbeyleix, Ireland, on the 8th of February 1833. In 1847 he emigrated to the United States, and settled with his mother at Albany, New York. After studying anatomy in the office of a physician, Dr Armsby, he spent nine years in 1 the studio of the sculptor, E. D. Palmer. In 1857 he opened a studio in New York, and in 1862 became a National Academician. He visited Rome in 1868-1869, and from 1875 to 1887 was again in Italy, living for most of the time at Florence. He died at Middletown, New York, on the 26th of September 1894. Among his important works are : " Napoleon the First," at the Metropoli- tan Museum, New York; " Abraham Pierson," first president of Yale University, New Haven, Connecticut; an equestrian statue of General A. E. Burnside, Providence, Rhode Island; " General Winfield Scott," Soldiers' Home, Washington, D.C.; "Admiral S. F. Du Pont " (Washington, D.C.) ; " General John Sedgwick " (West Point, N.Y.); a medallion portrait of General John A. Dix; and portrait busts of James Gordon Bennett, William Cullen Bryant, S. F. B. Morse, Edwin Booth as Hamlet, Stephen H. Tyng and Robert B. Minturn.

THOMPSON, THOMAS PERONNET (1783-1869), English political writer and mathematician, was born at Hull in 1783. He was educated at the Hull grammar school, and in October (1798) entered Queens' College, Cambridge. He entered the navy as midshipman in the " Isis " in 1803, but in 1806 ex- changed to the army. Through his acquaintance with William Wilberforce, he was appointed governor of Sierra Leone in 1808, but was recalled on account of his

hostility to the slave trade. In 1812 he returned to his military duties, and, after serving in the south of France, was in 181 5 attached as Arabic interpreter to an expedition against the Wahabees of the Persian Gulf, with whom he negotiated a treaty (dated Jan. 1820) in which the slave trade was for the first time declared piracy. He was promoted major in 1825, lieutenant-colonel in 1829 and major-general in

1854. He entered parliament as member for Hull (1835-1837), and afterwards sat for Bradford (1847-1852, 1857-1859). He took a prominent part in the corn-law agitation, his Catechism of the Com Laws (1827) being by far the most effective pamphlet published on the subject. In 1829 he became the proprietor of the Westminster Review, to which he contributed a large number of articles, republished in 1842 in six volumes, under the title Exercises, Political and Others. His mathematical publications were of a somewhat eccentric kind. He published a Theory of Parallels (1844), and was also the author of Geometry without Axioms, in which he endeavoured to " get rid " of axioms and postulates. His new Theory of Just Intonation (1850) was, however, a contribution of great value to the science of musical acoustics, and went through many editions. It may be said to have formed the basis of the tonic sol-fa system of music. He died at Blackheath, near London, on the 7th of September 1869.

See Colonel C. W. Thompson's memoir in the Proc. Roy. Soc.

(1869).

THOMPSON, WILLIAM HEPWORTH (1810-1886), English classical scholar and master of Trinity College, Cambridge, was born at York on the 27th of March 1810. He was privately educated before entering the

university. In 1834 he became a fellow of Trinity, in 1853 professor of Greek (to which a canonry in Ely Cathedral was then for the first time attached), and in 1866 master of his college. With the exception of the year 1836, when he acted as headmaster of a newly established school in Leicester, his life was divided between Cambridge and Ely. He died at the master's dodge on the 1st of October 1886. Thompson proved a worthy successor to Whewell; the twenty years of his mastership were years of progress, and he himself took an active part in the abolition of tests and the reform of university studies and of the college statutes. As a scholar he devoted his attention almost entirely to Plato; and his Phaedrus (1868) and Gorgias (187 1), with especially valuable introductions, still remain the standard English editions of these two dialogues. He also edited (1856) from the author's MSS. Lectures on the History of Ancient Philosophy by William Archer Butler (1814- 1848; lecturer on moral philosophy at Trinity College, Dublin), the value of which was greatly enhanced by Thompson's notes.

See article by J. W. Clark in Diet. Nat. Biog. ; and J. E. Sandys, History of Classical Scholarship (1908), vol. iii.

THOMSEN, GRfMUR (1820-1896), Icelandic poet and man of letters, was born in 1820. He came in 1837 to the university of Copenhagen, where he first studied law and philology, but later, philosophy and aesthetics. He became an enthusiastic follower of the Pan-Scandinavian movement, although this was not generally favoured by his countrymen. After some years of foreign travel, in 1848 he entered the Danish diplomatic service, and remained in it till 185 1, when he returned to Copen- hagen, where he became the chief of one of the departments of the Danish foreign office. He retired in 1866, and then went back to Iceland, where he passed the rest of his life, active in the politics and the literature of his native island. He died in 1896. He is the best ballad poet Iceland has produced. His poems are unaffected and mostly free from rhetoric, the

besetting sin of Icelandic poets. His subjects are principally taken from Icelandic or Scandinavian history and mythology. He is very unlike most of his contemporaries, both in style and thought: he is Icelandic to the core, and on that account is perhaps the modern Icelandic poet most appreciated by foreigners Besides his poems (two separate collections, Reykjavik, 1880, and Copenhagen, 1895), he is the author of numerous critical and historical essays in Icelandic and Danish, and some larger works in Danish, of which his dissertation on Lord Byron (Copenhagen, 1845) deserves to be mentioned. Grf mur Thomsen was a warm admirer of Greek literature, and translated a great number of poems from that language into Icelandic. (S. Bl.)

THOMSEN, HANS PETER JORGEN JULIUS (1836-1909), Danish chemist, was born in Copenhagen on the 16th of February 1826, and spent his life in that city. From 1847 to 1856 he was engaged in teaching chemistry at the Polytechnic, of which

from 1883 to 1892 he acted as director, and from 1856 to 1866 he was on the staff of the military high school. In 1866 he was appointed professor of chemistry at the university, and retained that chair until his retirement from active work in 1891. His name is famous for his researches in thermochemistry, and, especially between 1869 and 1882, he carried out a great number of determinations of the heat evolved or absorbed in chemical reactions, such as the formation of salts, oxidation and reduction, and the combustion of organic compounds. His collected results were published in 1882-1886 in four volumes under the title Thermochemische Untersuchungen, and also a resume in English under the title Thermochemistry in 1908. In 1857 he established in Copenhagen a process for manufacturing soda from cryolite, obtained from the west coast of Greenland. He died on the 13 th of February 1909. His brother, Carl August Thomsen (1834-1894), was lecturer on technical chemistry at the Copenhagen Polytechnic, and a second brother, Thomas Gottfried Thomsen (1841-1901), was assistant in the chemical laboratory at the university till

1884, when he abandoned science for theology, subsequently becoming minister at Norup and Randers.

THOMSON, SIR CHARLES WYVILLE (1830–1882), Scottish naturalist, was born at Bonsyde, Linlithgowshire, on the 5th of March 1830, and was educated at Edinburgh University. In 1850 he was appointed lecturer in, and in 1851 professor of, botany at Aberdeen, and in 1853 he became professor of natural history in Queen's College, Cork. A year later he was nominated to the chair of mineralogy and geology at Queen's College, Belfast, and in i860 was transferred to the chair of natural history in the same institution. In 1868 he assumed the duties of professor of botany at the Royal College of Science, Dublin, and finally in 1870 he received the natural history chair at Edinburgh. He will be specially remembered as a student of the biological conditions of the depths of the sea. Being inter- ested in crinoids, and stimulated by the results of the dredgings of Michael Sars (1305–1869) in the deep sea off the Norwegian coasts, he succeeded, along with Dr W. B. Carpenter, in obtaining the loan of H.M.S. " Lightning " and " Porcupine," for successive deep-sea dredging expeditions in the summers of 1868 and 1869. It was thus shown that animal life exists in abundance down to depths of 650 fathoms, that all invertebrate groups are repre- sented (largely by Tertiary forms previously believed to be extinct), and, moreover, that deep-sea temperatures are by no means so constant as was supposed, but vary considerably, and indicate an oceanic circulation. The results of these expeditions were described in The Depths of the Sea, which he published in 1873. The remarkable results gained for hydrography as well as zoology, in association with the practical needs of ocean tele- graphy, soon led to the granting of H.M.S. "Challenger" for a circumnavigating expedition, and Thomson sailed at the end of 1872 as director of the scientific staff, the cruise lasting three years and a half (see Challenger Expedition). On his return he received many academic honours, and was knighted. In 1877 he published two volumes {The Voyage of the Challenger

in the Atlantic), of a preliminary account of the results of the voyage, meanwhile carrying on his administrative labours in connexion with the disposition of the special collections and the publication ot the monographs dealing with them. His health, never robust, was meanwhile giving way; from 1879 he ceased to perform the duties of his chair, and he died at Bonsyde on the 10th of March 1882.

See obituary notice in Proc. Soc. Edin. (1883); also Thomson and Murray , Reports 0] 'the Voyage of H.M.S. "Challenger" (Edinburgh.

1885).

THOMSON, JAMES (1700-1748), English poet, author of The Seasons, was born at Ednam, in Roxburghshire, on the nth of September 1 700 — the third son and fourth child of Thomas Thomson, minister of that place. His mother, Beatrix, was the daughter of Mr Trotter of Fogo, whose wife, Margaret, was one of the Homes of Bassenden. About 1701 Thomas Thomson removed to Southdean near Jedburgh. Here James was educated at first by Robert Riccaltoun, to whose verses on

Winter he owed the suggestion of his own poem. In 1712 he attended a school at Jedburgh, held in the aisle of the parish church. He learnt there some Latin, but with difficulty, and the earliest recorded utterance of the future poet was " Confound the building of Babel." He began very soon to write verses, and we are told that every January he destroyed almost all the productions of the preceding year. And this was just as well, for the little that has escaped the fire contains no promise of his future powers. In 1715 he went to the university of Edinburgh. It is said that as soon as the servant who brought him thither had quitted him, he returned full speed to his father's house, declaring that he could read just as well at home;

he went back, however, and had not been long at college before he lost his father, who died, according to one remarkable but highly improbable story, in the attempt to lay a ghost. The incident should have left more impression than we Can trace upon the mind of the poet, at this date nervous and afraid of the dark; but in his Winter he writes of all such stories with a quiet contempt for " superstitious horror." He made friends at the university with David Mallock, who afterwards called himself Mallet, and with Patrick Murdoch, his. future biographer. In 1719 he became a divinity student, and one of his exercises so enchanted a certain Auditor Benson, that he urged Thomson to go to London and there make himself a reputation as a preacher. It was partly with this object that Thomson left Edinburgh without a degree in March 1725. His mother saw him embark, and they never met again; she died on the 10th of May of that year. There is sufficient evidence that on his arrival in London he was not in the extreme destitution which Dr Johnson attributes to him; and in July 1725 we find him engaged, as a make-shift, in teaching " Lord Binning's son to read." This son was the grandson of Lady Grizel Baillie, a somewhat distant connexion of Thomson's mother. She was the daughter of Sir Patrick Home, whom, after the defeat of Argyll, she fed in his conceal- ment near his own castle; she was also, like other Scottish ladies, a writer of pretty ballads. This heroine and poetess is supposed to have encouraged Thomson to come to England, and it is certain that she procured him a temporary home. But he had other friends, especially Duncan Forbes of Culloden, by whom he was recommended to the duke of Argyll, the earl of Burlington, Sir Robert Walpole, Arbuthnot, Pope and Gay. Some introductions to the literary world he may have owed to Mallet, then tutor in the family of the duke of Montrose.

Thomson's Winter appeared in March 1726. It was warmly praised by Aaron Hill, a man of various interests and projects, and in his day a sort of literary oracle. It was dedicated to Sir Spencer

Compton, the Speaker, who rewarded the poet, to his great disgust, with a bare twenty guineas. By the nth of June 1727a second edition was called for. Meanwhile Thomson was residing at Mr Watts's academy in Tower Street as tutor to Lord George Graham, second son of the duke of Montrose, and previously a pupil of Mallet. Summer appeared in 1727. It was dedicated in prose, a compliment afterwards versified, to Bubb Dodington. In the same year Thomson published his Poem to the Memory of Sir Isaac Newton, with a fulsome dedication to Sir Robert Walpole, which was afterwards omitted, and the verses themselves remodelled when the poet began to inveigh against the ministry as he did in Britannia, published in 1729. Spring appeared in 1728, published by Andrew Millar, a man who, according to Johnson, dealt hand- somely by authors and " raised the price of literature." It was dedicated to the countess of Hertford, afterwards duchess of Somerset, a lady devoted to letters and the patroness of the unhappy Savage. In 1729 Thomson produced Sophonisba, a tragedy now only remembered by the line " O Sophonisba, Sophonisba, O," and the parody " O Jemmy Thomson, Jemmy Thomson, O," which caused him to remodel the unhappy verse in the form, " O Sophonisba, I am wholly thine." A poem, anonymous but unquestionably Thomson's, to the memory of Congreve who had died in January 1729, appeared in that year. In 1730 Autumn was first published in a collected edition

of The Seasons. It was? dedicated to the Speaker, Onslow. In this year, at the suggestion of Rundle, bishop of Derry, one of his patrons, he accompanied the son of Sir Charles Talbot, solicitor-general, upon his travels. In the course of these he projected his Liberty as " a poetical landscape of countries, mixed with moral observations on their government and people." In December 1731 he returned with his pupil to London. He probably lived with his patrons the Talbots, leisurely meditating his new poem, the first part of which did not appear until the close of 1734 or the beginning of 1735. But meanwhile his pupil died, and in the opening lines

of Liberty Thomson pays a tribute to his memory. Two months after his son's death Sir Charles Talbot became chancellor and gave Thomson a sinecure in the court of chancery. About this time the poet worked for the relief of Dennis, now old and in extreme poverty and induced even Pope to give a half-contemptuous support to the bitter critic of the Rape of the Lock. Liberty was completed in five parts in 1736. The poem was a failure; its execution did not correspond with its design; in a sense indeed it is a survey of countries and might have anticipated Goldsmith's Traveller. It was not, however, the poem which readers were expecting from the author of The Seasons, who had taken them from the town to the country, and from social and political satire to the world of nature. It is in the main a set of weari- some declamations put in the mouth of the goddess, and Johnson rightly enough remarks that " an enumeration of examples to prove a position which nobody denied as it was from the beginning superfluous, must quickly grow disgusting." The truth is that Thomson's poetical gift was for many years perverted by the zeal of partisanship.*

He was established in May 1736 in a small house at Richmond, but his patron died in February 1737 and he lost his sinecure; he then " whips and spurs " to finish his tragedy Agamemnon, which appeared in April 1738, not before he had been arrested for a debt of £70, from which, according to a story which has been discredited on quite insufficient grounds, Quin relieved him in the most generous and tactful manner. Quin, it is said, visited him in the sponging-house and " balanced accounts with him " by insisting on his accepting a hundred pounds as a return for the pleasure which the actor had received from the poet's works. The incident took place probably a little before the production of Agamemnon, in which Quin played the leading part. The play is of course modelled upon Aeschylus and owes whatever of dignity it possesses to that fact; the part of Cassandra, for instance, retains something of its original force, pathos and terror.

But most of the other characters exist only for the purpose of political innuendo. Agamemnon is too long absent at Troy, as George is too long absent in Germany; the arts of Aegisthus are the arts of Walpole; the declamations of Arcus are the declamations of Wyndham or Pulteney; Melis- ander, consoling himself with the muses on his island in Cyclades, is Bolingbroke in exile. Thomson about this time was introduced to Lyttelton, and by him to the prince of Wales, and to one or the other of these, when he was questioned as to the state of his affairs, he made answer that they were " in a more poetical posture than formerly." Agamemnon was put upon the stage soon after the passing of Walpole's bill for licensing plays, and its obvious bias fixed the attention of the censorship and caused Thomson's next venture, Edward and Eleanora, which has the same covert aim, to be proscribed. The fact has very generally escaped notice that, like its predecessor, it follows a Greek original, the Alcestis of Euripides. It has also, what Agamemnon has not, some little place in the history of literature, for it suggested something to Lessing for Nathan der Weise, and to Scott for the Talisman. The rejection of the play was defended by one of the ministry on the ground that Thomson had taken a Liberty which was not agreeable to Britannia in any Season. These circumstances sufficiently account for the poet's next experiment, a preface to Milton's Areopagitica. He joined Mallet in composing the masque of Alfred, represented at Clieveden on the Thames before the prince of Wales, on the 1st of August 1740. There can be little question that " Rule

Britannia," a song in this drama, was the production of Thomson. The music of the song, as of the whole masque, was composed by Arne. In 1744 Thomson was appointed surveyor-general of the Leeward Islands by Lyttelton with an income of £300 a year; but his patron fell into disfavour with the prince of Wales, and in consequence Thomson lost, at the close of

1747, the pension he received from that quarter. For a while, however, he was in flourishing circumstances, and whilst completing at his leisure The Castle of Indolence produced Tancred and Sigis- tnunda at Drury Lane, in 1745. The story is found in Gil Bias, and is ultimately to be traced to The Decameron. It owes much to Le Sage in language, plot and sentiment, and the conflict of emotion, in depicting which Thomson had some little skill, is here effectively exhibited. He was assisted herein by his own experience. The " Amanda " of The Seasons is a Miss Elizabeth Young, a lady of Scottish parentage, whose mother was ambitious for her and forbade her to marry the poet, anticipating that she would be reduced to singing his ballads in the streets. The last years of his life were saddened by this disappointment.

The Castle of Indolence, after a gestation of fifteen years, appeared in May 1748. It is in the Spenserian stanza with the Spenserian archaism, and is the first and last long effort of Thomson in rhyme. It is not impossible that his general choice of blank verse was partly due to the fact that he had not the southron's ear and took many years to acquire it. The great and varied interest of the poem might well rescue it from the neglect into which even The Seasons has fallen. It was worthy of an age which was fertile in character-sketches, and like Gay's Welcome to Pope anticipates Goldsmith's Retaliation in the lifelike presentation of a noteworthy circle. There is in it the same strain of gentle burlesque which appears in Shen- jtone's Schoolmistress, whilst the tone and diction of the poem harmonize with the hazy landscape, the pleasant land of drowsy- head, in which it is set. It is the last work by Thomson which appeared in his lifetime. In walking from London to his house at Richmond he became heated and took a boat at Hammer- smith; he thus caught a chill with fatal consequences and died on the 27th of August 1748. He was buried in Richmond churchyard. His tragedy Coriolanus was acted for the first time in January 1749. In itself a feeble performance, it is noteworthy for the

prologue which his friend Lyttelton wrote for it, two lines of which —

" He loved his friends — forgive the gushing tear!
Alas! I feel I am no actor here " — ■

were recited by Quin with no simulated emotion.

It may be questioned whether Thomson himself ever quite realized the distinctive significance of his own achievement in The Seasons, or the place which criticism assigns him as the pioneer of a special literary movement and the precursor of Cowper and WordsVorth. His avowed preference was for great and worthy themes of which the world of nature was but one. Both the choice and the treatment of his next great subject, Liberty, indicate that he was imperfectly conscious of the gift that was in him, and might have neglected it but that his readers were wiser than himself. He has many audacities and many felicities of expression, and enriched the vocabulary even of the poets who have disparaged him. Yet it is difficult to believe that he was not the better for that training in refinement of style which he partly owed to Pope, who almost unquestionably contributed some passages to The Seasons. And, except in The Castle of Indolence, there is much that is conventional, much that is even vicious or vulgar in taste when Thomson's muse deals with that human life which must be the background of descriptive as of all other poetry; for example, his bumpkin who chases the rainbow is as unreal a being as Akenside's more sentimental rustic who has " the form of beauty smiling at his heart." But if Thomson sometimes lacks the true vision for things human, he retains it always for things mute and material, and whilst the critical estimate of his powers and influence will vary from age to age, all who have read him will concur in the colloquial judgment which only candour

could have extorted from the prejudice of Dr Johnson — • " Thomson had as much of the poet about him as most writers. Everything appeared to him through the medium of his favourite pursuit. He could not have

viewed those two candles burning but with a poetical eye."

For the day of Thomson's birth see the Aldine edition of his poems (1897). In the same volume (pp. 189 seq.) is discussed the question of Pope's contributions to The Seasons. These Pope, if the handwriting be his, made in an interleaved edition of The Seasons dated 1738, and they were for the most part adopted by Thomson in the edition of 1744. The writer seldom makes more than verbal changes in passages of pure description, but sometimes strikingly enhances the scenes in which human character comes into

Elay, adding, for example, the comparison, in Autumn, of the fair avinia to a myrtle in the Apennines, of which the first suggestion can be found in The Rape of the Lock. But whereas many years ago the opinion of experts at the British Museum pronounced the handwriting of these notes to be Pope's beyond a doubt, their successors at the present day are equally positive that it is not. Some account should be taken of the cramping of the hand, due to writing on a curved surface, and of the letters at Blenheim (see Pall Mall Magazine for August 1894), which bear a greater resemblance to the disputed handwriting than any specimens in the British Museum.

The first collected editions of The Seasons bear dates 1730, 1738, 1744, 1746. Lyttelton tampered both with The Seasons and with Liberty in editions after his friend's death. Among the numerous lives of the poet may be mentioned those by his friend Patrick Murdoch, by Dr Johnson in Lives of the Poets, by Sir Harris Nicolas (Aid. ed., i860), by M. Morel, James Thomson, ,sa vie et ses ceuvres (Paris, 1895), and James Thomson, in the English Men of Letters Series, by G. C. Macaulay (1908). See also Dr G. Schmeding's Jacob Thomson, ein vergessener Dichter des achtzehnten Jahrhunderts; the life prefixed to the Aldine edition of his works in 1897; and an excellent edition of The Seasons in the Clarendon Press Series by J. Logie Robertson. (D. C.

To.)

THOMSON, JAMES (1834–1882), British poet, best known by his signature ” B.V.”, was born at Port-Glasgow, in Renfrew- shire, on the 23rd of November 1834, the eldest child of a mate in the merchant shipping service. His mother was a deeply religious woman of the Irvingite sect. On her death, James, then in his seventh year, was procured admission into the Caledonian Orphan Asylum. In 1850 he entered the model school of the Military Asylum, Chelsea, from which he went out into the world as an assistant army schoolmaster. At the garrison at Ballincollig, near Cork, he encountered the one brief happiness of his life: he fell passionately in love with, and was in turn as ardently loved by, the daughter of the armourer- sergeant of a regiment in the garrison, a girl of very exceptional beauty and cultivated mind. Two years later he suddenly re- ceived news of her fatal illness and death. The blow prostrated him in mind and body. Henceforth his life was one of gloom, disappointment, misery and poverty, rarely alleviated by episodes of somewhat brighter fortune. While in Ireland he had made the acquaintance of Charles Bradlaugh, then a soldier stationed at Ballincollig, and it was under his auspices (as editor of the London Investigator) that Thomson first appealed to the public as an author, though actually his earliest publication was in Tait’s Edinburgh Magazine for July 1858, under the signature ” Crepusculus.” In i860 was established the paper with which Bradlaugh was so long identified, the National Reformer, and it was here, among other productions by James Thomson, that appeared (1863) the powerful and sonorous verses ” To our Ladies of Death,” and (1874) his chief work, the sombre and imaginative City of Dreadful Night. In October 1862 Thomson was dismissed the army, in company with other teachers, for some slight breach of discipline. Through Bradlaugh, with whom for some subsequent years he lived, he gained employment as a solicitor’s clerk. From 1866 to the end of his life, except for two short absences from England, Thomson lived in a single room, first in Pimlico and then in

Bloomsbury. He contracted habits of intemperance, aggravated by his pessimistic turn of mind to dipsomania, which made a successful career impossible for him. In 1869 he enjoyed what has been described as his "only reputable appearance in respectable literary society," in the acceptance of his long poem, " Sunday up the River," for Fraser's Magazine, on the advice, it is said, of Charles Kingsley.

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THOMSON, J.

In 1872 Thomson went to the western states of America, as the agent of the shareholders in what he ascertained to be a fraudulent silver mine; and the following year he received a commission from the New York World to go to Spain as its special correspondent with the Carlists. During the two months of his stay in that distracted country he saw little real fighting, and was himself prostrated by a sunstroke. On his return to England he continued to write in the Secularist and the National Reformer, under the initials "B.V." 1 In 1875 he severed his connexion with the National Reformer, owing to a disagreement with its editor; henceforth his chief source of income (1875-1881) was from the monthly periodical known as Cope's Tobacco Plant. Chiefly through the exertions of his friend and admirer, Bertram Dobell, Thomson's best-known book, The City of Dreadful Night, and other Poems, was published in April 1880, and at once attracted wide attention; it was succeeded in the autumn by Vane's Story, and other Poems, and in the following year by Essays and Phantasies. All his best work was produced between 1855 and 1875 (" The Doom of a City," 1857; " Our Ladies of Death," 1861; Weddah and Om-el-Bonain; "The Naked God- dess," 1866-1867; The City of Dreadful Night, 1870-1874). He died at University College Hospital, in Gower Street, on the 3rd of June 1882, and was buried at Highgate cemetery, in the same grave, in unconsecrated ground, as his friend Austin Holyoake.

To the productions of James Thomson already mentioned may be added the posthumous volume entitled A Voice from the Nile, and other Poems (1884), to which was prefixed a memoir by Bertram Dobell. This volume contained much that is interesting, but nothing to increase Thomson's reputation. If an attempt be made to point to the most apparent literary relation- ship of the author of The City of Dreadful Night, one might venture the suggestion that James Thomson was a younger brother of De Quincey. If he has distinct affinity to any writer it is to the author of Suspiria de profundis; if we look further afield, we might perhaps discern shadowy prototypes in Leopardi, Heine and Baudelaire. But, after all, Thomson holds so unique a place as a poet that the effort at classification may well be dispensed with. His was no literary pessimism, no assumed gloom. The poem " Insomnia " is a distinct chapter of biography; and in " Mater Tenebrarum " and elsewhere among his writings passages of self-revelation are frequent. The merits of Thomson's poetry are its imaginative power, its sombre intensity, its sonorous music; to these characteristics may be added, in his lighter pieces, a Heine-like admixture of strange gaiety, pathos and caustic irony. Much the same may be said of his best prose. His faults are a monotony of epithet, the not infrequent use of mere rhetoric and verbiage, and perhaps a prevailing lack of the sense of form; besides an occasional vulgar recklessness of expression, as in parts of Vane's Story and in some of his prose writings.

See the Life, by H. S. Salt (1905 edition).

THOMSON, JAMES (1822-1892), British physicist and engineer, was born in Belfast on the 16th of February 1822, and, like his younger brother, Lord Kelvin, at an unusually early age began to attend the classes at Glasgow University, where his father had been appointed professor of mathematics in 1832. After his graduation he decided to study civil engineering, and for that purpose became a pupil in several engineering offices and works successively; but ill-health obliged him to leave them all, and he

had finally to accept the fact that an occupation involving physical exertion was out of the question. Accord- ingly, from about 1843, he devoted himself to theoretical work and to mechanical invention. To this period belong his well- known researches in thermodynamics, which enabled him to predict by the application of Carnot's theorem that the tempera- ture of the freezing point of substances which expand on solidi- fying must be lowered by the application of pressure, the reverse being the case with substances which contract on solidification;

1 Bysshe Vanolis: " Bysshe," as the commonly used Christian

irvia n(CUallav Td/itMcnn'e (r* **rm i ri f t** wrrit^f • and " VannllS. 311

name of Shelley, Thomson's favourite writer; anagram of Novalis — (F. von Hardenberg).

and " Vanolis," an

and he was able to calculate the amount by which a given pressure lowers the freezing-point of water, a substance which expands on solidification. His results were experimentally verified in the physical laboratories of Glasgow University under Lord Kelvin's direction, and were afterwards applied to give the explanation of regelation. In 1861 he extended them in a paper on crystallization and liquefaction as influenced by stresses tending to change of form in the crystals, and in other studies on the change of state he continued Thomas Andrews's work on the continuity of the liquid and gaseous states of matter, constructing a thermodynamic model in three dimensions to show the relations of pressure, volume and temperature for a substance like carbonic acid. With regard to his inventions, he devised a clever feathering mechanism for the paddles of steamboats when only a boy of sixteen, and later turned his attention to water engines. In 1850 he patented his " vortex water-wheel," and during the next three or four years carried on inquiries into the properties of " whirling fluids,"

which resulted in improved forms of blowing-fans and water-turbines (see Hydraulics). Settling in Belfast in 1851, he was selected to be the resident engineer to the Belfast Water Commissioners in 1853, and four years later became professor of civil engineering and surveying in Queen's College, Belfast. Thence he removed in 1873 to Glasgow as successor to Macquorn Rankine in the chair of engineering in the university, and retained this position until 1889, when the failure of his eyesight compelled him to resign. He died on the 8th of May 1892 at Glasgow. His contributions to geological science included studies of the parallel roads of Glen Roy and of the prismatic jointing of basalt, as seen at the Giant's Causeway. In 1876 and following years he studied the origin of windings of rivers in alluvial plains and made many experiments with the aid of artificialjstreams; and the currents of atmospheric circulation afforded him the material for the Bakerian lecture of 1892.

THOMSON, JOHN (1778-1840), Scottish landscape painter- Thomson of Duddingston, as he is commonly styled — was born on the 1st of September 1778 at Dailly, Ayrshire. His father, grandfather and great-grandfather were clergymen of the Church of Scotland. He studied for the same vocation in the university of Edinburgh; and, residing with his elder brother, Thomas Thomson, afterwards celebrated as an anti- quarian and feudal lawyer, he made the acquaintance of Francis Jeffrey and other young members of the Scottish bar afterwards notable. During the recess he sketched in the country, and, while attending his final college session, he studied art for a month under Alexander Nasmyth. After his father's death he became, in 1800, his successor as minister of Dailly; and in 1 805 he was translated to the parish of Duddingston, close to Edinburgh. He continued, however, to practise art as an amateur, apparently without any detriment to his pastoral duties. Thomsgn's popularity as a p'ainter increased with his increasing artistic skill; and, having mastered his initial scruples against receiving artistic fees, on being offered £15 for a

landscape — reassured by ” Grecian ” Williams’s stout assertion that the work was X worth thrice the amount ” — the minister of Duddingston began to dispose of the productions of his brush in the usual manner. In 1830 he was made an honorary member of the Royal Scottish Academy. Thomson was also an accomplished performer on violin and flute, an exact and well-read student of physical science, and one of the writers on optics in the early numbers of the Edinburgh Review. He enjoyed a singularly wide and eminent circle of friends, including, among artists, Turner and Wilkie, and among men of letters, Wilson and Scott — the latter of whom desired that Thomson, instead of Turner, should have illustrated the collected edition of his works. He died at Duddingston on the 27th of October 1840 (not the 20th, as stated by some authorities). Thomson was twice married, and his second wife, the widow of Mr Dalrymple of Cleland, was herself also a skilful amateur artist.

Thomson is fairly represented in the Scottish National Gallery; ‘ and the ” Aberlady Bay ” of that collection, with the soft infinity of

its clouded grey sky, and its sea which leaps and falls again in waves of sparkling and of shadowed silver, is fit to rank among the triumphs of Scottish art.

THOMSON, JOSEPH (1858-1895), Scottish explorer in Africa, was born on the 14th of February 1858 at Penpont, Dumfries- shire, being the fifth son of William Thomson, originally a working stonemason, who had attained the position of a master builder. In 1868 his father removed to Gatelawbridge, where he rented a farm and a quarry. Joseph Thomson was soon attracted by the geological formation and historical associations of Nithsdale. For a short time he worked in his father’s quarry. In 1875 he went to Edinburgh University, where he paid

particular attention to geology and botany, and after completing his course in 1878 he was appointed geologist and naturalist to the Royal Geo- graphical Society's expedition to East Central Africa under Keith Johnston. The latter died at Behobeho, between the coast and the north end of Lake Nyasa, on the 28th of June 1879, and Thomson then took command. Though only twenty- one his coolness and tact were remarkable, and he successfully conducted the expedition across the desolate region of Uhehe and Ubena to the north end of Lake Nyasa, and then by a hitherto unexplored track to Lake Tanganyika, where he investigated the moot question of the Lukuga outlet. From Tanganyika he started to reach the Congo, but troubles with his carriers, who dreaded the warlike Warua, obliged him to retrace his steps. Going round the south end of Tanganyika he discovered Lake Rukwa, whence he marched via Tabora to the coast at Bagamoyo, reaching London in August 1880. In the following year he published an account of his travels under the title To the Central African Lakes and Back. About this time the sultan of Zanzibar, being anxious to develop certain supposed coal beds on the river Rovuma, was advised to obtain independent expert opinion as to their value. Application was made to Thomson, who undertook to survey them, and started from Mikindani, on the 17th of July 1881. The coal, however, turned out to be merely bituminous shale, and Thomson, on his return to Zanzibar, had to endure much delay and vexation through the sultan's chagrin. For a considerable time the explorer had directed his attention to Masailand, a region of East Africa occupied by a powerful tribe of warriors who had a reputation for savagery and intractability somewhat greater than their actions warranted. Through their territory ran the shortest route from the sea to the headwaters of the Nile. In 1882 the Royal Geographical Society took up the question, and requested Thomson to report on the practicability of taking a caravan through the Masai country, which no European had yet been able to penetrate beyond Mt Kilimanjaro. By undaunted courage and great resourcefulness he succeeded in crossing the Njiri

desert and exploring the eastern rift-valley. Thence he went with a picked company through Laikipia to Mt Kenya and Lake Baringo, afterwards traversing the unknown region lying between Baringo and Victoria Nyanza, reached on the 10th of December 1883. On his way back he visited Mt Elgon and discovered there a series of wonderful caves. The account of this adventurous journey appeared in 1884, under the title of Through Masiiland, and it is a classic in modern travel. The hardships and anxieties attendant on such a career began to. tell upon Thomson's exceptionally hardy constitution, but in 1885 he undertook an expedition to Sokoto for the National African (afterwards the Royal Niger) Company, and succeeded in obtaining the signatures of the sultans of Sokoto and Gando to treaties with which he had been entrusted by the company, treaties which did much to secure British interests in Nigeria. In 1888, by way of recreation, he travelled through southern Morocco and explored a portion of the Atlas range, and published the results in the following year, under the title Travels in the Atlas and Southern Morocco. In 1890 he entered the service of the British South Africa Company and in that and the following year, starting from Quilimane he traversed the region between lakes Nyasa and Bangweulu and the Zambezi. It was a period of great tension between the Portuguese and the British, and Thomson's party on leaving the Portuguese frontier

was fired on by the Portuguese who, too late, realized that they had allowed a treaty-making envoy to pass through their territory in the guise of a peaceful trader. Thomson concluded treaties with native potentates which gave to the Chartered Company political, trading and mining rights over a large part of the district since known as North-East Rhodesia. This journey, in which he covered nearly a thousand miles of hitherto unexplored country, proved disastrous to a constitution already undermined. In 1893 he visited South Africa in search of health, but unavailingly. He died in London on the 2nd of August 1895. The accounts of his travels not recorded in the books mentioned were

published in magazines or in the Proceedings of the Royal Geographical Society. Thomson was the last, as he was one of the most successful, of the great geographical pioneers in Africa. He had an extraordinarily keen topographical instinct which enabled him to comprehend at a glance the natural features of the countries he traversed. To undaunted courage and promptness of decision he added a forbearing and patient disposition. " Joseph Thomson," wrote Sir Clements Markham, " had the high and glorious distinction of never having caused the death of a native. This is a proof of very rare qualities in the leader of an expedition, and places him in the very first rank of explorers."

Besides the accounts of his own travels Thomson wrote, in collaboration with Miss E. Harris Smith, Ulu (London, 1888), a novel based on his insight into the working of the African mind, Mungo Park and the Niger (London, 1890), a sound critical biography and many magazine articles on African politics.

See Joseph Thomson, African Explorer (London, 1896), a bio- graphy by his brother, the Rev. J. B. Thomson, which contains a list of the published writings of the explorer.

THOMSON, THOMAS (1773-1852), Scottish chemist, was born at Crieff, Perthshire, on the 12th of April 1773. He was educated at the universities of St Andrews and Edinburgh, and after taking the degree of M.D. at the latter place in 1799 established himself there as a teacher of chemistry. From 1796 to 1800 he was sub-editor of the Encyclopaedia Britannica, in succession to his elder brother, James Thomson (1768-1855), who filled that position in 1795-1796, and who in 1805 was ordained to the parish of Eccles, Berwickshire; and the chemical and mineralogical articles which he contributed to the supplement to the third edition formed the basis of his System of Chemistry, the first edition of which was published in 1802 and the seventh in 1 83 1. At first this work was merely a compilation, but in the later editions many of his original results were incorporated ; the third edition (1807) is

noteworthy as containing the first detailed account of the atomic theory, communicated to him by John Dalton himself. In 181 1 he left Edinburgh, and after a visit to Sweden went to London, where in 1813 he began to edit the Annals of Philosophy, a monthly scientific journal which in 1827 was merged in the Philosophical Magazine. In 1817 he became lecturer in chemistry at Glasgow University, and in the following year was appointed to the regius professor- ship. This chair he retained until his death, which happened on the 2nd of July 1852 at Kilmun, Argyleshire; but from 1841 he was assisted by his nephew and son-in-law Robert Dtjndas Thomson (1810-1864), who subsequently became medical officer of health for St Marylebone, London, and after 1846 he ceased active work altogether. He was a most energetic pro- fessor, and, according to his colleague, but no relation, Lord Kelvin (Sir William Thomson), founded the first chemical laboratory for students at a time when practical work was scarcely recognized as a necessary part of chemical education. He did much to spread a knowledge of Dalton's atomic theory, and carried out many experiments in its support, but his strong predilections in favour of Prout's hypothesis tended to vitiate his results, many of which were sharply criticized by J. J. Ber- zelius and other chemists. In addition to various textbooks he. published a History of Chemistry (1830-1831) which has provided material for many chemical biographers, but which, although it reads very plausibly, cannot be regarded as an authority of unimpeachable accuracy. His eldest son, Thomas Thomson (1817-1878) graduated as M.D. at Glasgow in 1839, accompanied

Sir J. D. Hooker on his travels in Sikkim in 1850, and collaborated with him in publishing his Flora indica in 1855 and in 1854 was appointed superintendent of the botanic gardens at Cal- cutta, also acting as professor of botany at the Calcutta medical college.

THOMSON, WILLIAM (1810-1800), English divine, archbishop of York, was born on the nth of February 18 19 at Whitehaven, Cumberland. He was educated at Shrewsbury and at Queen's College, Oxford, of which he became a scholar. He took his B.A. degree in 1840, and was soon afterwards made fellow of his college. He was ordained in 1842, and worked as a curate at Cuddesdon. In 1847 he was made tutor of his college, and in 1853 he delivered the Bampton lectures, his subject being " The Atoning Work of Christ viewed in Relation to some Ancient Theories." These thoughtful and learned lectures established his reputation and did much to clear the ground for subsequent discussions on the subject. Thomson's activity was not confined to theology. He was made fellow of the Royal and the Royal Geographical Societies. He also wrote a very popular Outline of the Laws of Thought. He sided with the party at Oxford which favoured university reform, but this did not prevent him from being appointed provost of his college in 1855. In 1858 he was made preacher at Lincoln's Inn and there preached some striking sermons, a volume of which he published in 1 86 1. In the same year he edited Aids to Faith, a volume written in opposition to Essays and Reviews, the progressive sentiments of which had stirred up a great storm in the Church of England. In December 1861 he was rewarded with the see of Gloucester and Bristol, and within a twelvemonth he was elevated to the archiepiscopal see of York. In this position his moderate orthodoxy led him to join Archbishop Tait in support- ing the Public Worship Regulation Act, and, as president of the northern convocation, he came frequently into sharp collision with the lower house of that body. But if he thus incurred the hostility of the High Church party among the clergy, he was admired by the laity for his strong sense, his clear and forcible reasoning, and his wide knowledge, and he remained to the last a power in the north of England. In his later years he published an address read before the members of the Edin- burgh Philosophical Institution (1868), one on Design in Nature, for the Christian Evidence Society, which reached a fifth edition, various

charges and pastoral addresses, and he was one of the projectors of The Speaker's Commentary, for which he wrote the " Introduction to the Synoptic Gospels." He died on the 25th of December 1890.

See the Quarterly Review (April 1892).

THOR, one of the chief deities of the heathen Scandinavians. He is represented as a middle-aged man of enormous strength, quick to anger, but benevolent towards mankind. To the harmful race of giants (demons), on the other hand, he was an implacable foe, and many stories are told in the poetic and prose Eddas of the destruction which he brought upon them at various times with his hammer. On the whole his figure is somewhat secondary in the mythology to that of Odin, who is represented as his father. But there is no doubt that in Iceland he was worshipped more than any other god, and the same seems to have been the case in Norway — indeed, perhaps, in all northern countries — except among the royal families. Even in the great temple at Upsala his figure is said to have occupied the chief place. There is evidence that a corresponding deity named Thunor or Thonar was worshipped in England and on the Continent, but little information is obtainable regarding him, except that he was identified with the Roman Jupiter. His name is identical with the Teutonic word for thunder, and even in Sweden the association of Thor with the thunder seems not to have been forgotten. Outside the Teutonic area he has close affinities not only with Jupiter or Zeus, but still more with the Lithuanian god Perkunas, whose name (which likewise means " thunder ") appears to be connected with that of Thor's mother (Fiorgyn). The Varangian god Perun was probably Thor him- self under a Slavonic name (Russian perun, " thunderbolt ").

See H. Petersen, Om ' Nordboernes Gudedyrkelse og Gudetro i Hedenold (Copenhagen, 1876). For other references see Teutonic Peoples: Religion (ad fin). (H. M. C.)

THORAX (Gr. 0c!>pa£, breastplate, also the part of

the body covered by it), the anatomical term for the chest, that part of the body which contains the heart and lungs (see Anatomy: Superficial and Artistic, and Skeleton: Axial). For the surgery of the thorax reference may be made to the headings Heart, Lung and Respiratory System.

THORBECKE, JAN RUDOLF (1798–1872), Dutch statesman, was born at Zwolle, in the province of Overijssel, on the 14th of January 1798. Thorbecke was of German extraction, his grand- father, Heinrich Thorbecke, having settled in Overijssel towards the end of the 17th centuiy. Little is known of his youth, beyond the fact that he was sent in the year of Waterloo to Amsterdam for his education. For two years he stayed with a Lutheran clergyman of the name of Sartorius, whilst attending the lectures of the Athenaeum Illustre. In 181 7 he commenced his studies at Leiden University, proving a brilliant scholar, and twice obtaining a gold medal for his prize essays. In 1820 he obtained the degrees of Lit.D. and LL.D. In the following years Thorbecke undertook a journey of research and study in Germany, staying at most of her famous universities, and making the acquaintance of his best-known contemporaries in the fatherland. At Giessen he lectured as an extraordinary professor, and at Gottingen, in 1824, published his treatise, Ueber das Wesen der Geschichte. After his return to Amsterdam in 1824 Thorbecke wrote his first political work of any impor- tance, Bedenkingen aangaande het Rechl en den Staat (" Objec- tions anent Law and the State "), which by its close reasoning and its legal acumen at once drew attention to the young barrister, and procured him in 1825 a chair as professor in Ghent University. Here he wrote two pamphlets cf an educational character before 1830. The Belgian revolt of that year forced Thorbecke to resign his position at Ghent, and he subsequently went to Leiden. He did not approve of the Belgian movement, nor of the part that Europe played in it, and published his views in three pamphlets, which appeared in the years 1830 and 1831. In 1831 he was appointed professor of jurisprudence and political

science at Leiden University. In that capacity, and, before his appointment at Leiden, as a lecturer on political science, history and economics at Amsterdam, he gained great reputa- tion as a political reformer, particulaily after the publication of his standard work, Aanteekeningen op de Crondwet (" Annota- tions on the Constitution," 1839; 2nd ed., Amsterdam, 1841- 1843), which became the textbook and the groundwork for the new reform party in Holland, as whose leader Thorbecke was definitely recognized. Thorbecke's political career until his death, which occurred at the Hague on the 4th of June 1872, is sketched under Holland: History. Thorbecke's speeches in the Dutch legislature were published at Deventer in six volumes (1867-1870), to which should be added a collection of his unpublished speeches, printed at Groningen in 1900. The first edition of his Historische Schetsen (" Historical Essays ") was issued in i860, the second in 1872. At Amsterdam there appeared in 1873 a highly interesting Correspondence with his academy friend and lifelong political adversary Groen van Prinsterer (q.v.), which, although dating back to the early 'thirties, throws much light on their subsequent relations and the political events that followed 1848. Of Dutch statesmen during the Napoleonic period, Thorbecke admired Falck and Van Hogendorp most, whose principles he strove to emulate. Of Van Hogendorp's Essays and Speeches, indeed, he published a standard edition, which is still highly valued. Thorbecke's speeches form a remarkable continuation of Van Hogendorp's orations, not only in their style, but also in their train of thought. Thorbecke's funeral furnished the occasion for an imposing national demonstration, which showed how deeply he was revered by all classes of his countrymen. In 1876 a statue of Thorbecke was unveiled in one of the squares of Amsterdam. Thorbecke's gifts and public services as a statesman have

been as fully recognized as his political genus has been. As an orator and writer his style was clear and forcible. His very dogmatism brought him many enemies, but at times, especially when he went in advance of his time, he was a much mis- understood man. These misunderstandings, frequently wilful, extended often beyond the domain of pure politics. Thus, by his enemies, Thorbecke was often held up to scorn as a pure materialist and no friend of the fine arts, because at a sitting of the states-general in 1862 he had said that it is not the duty of the state, nor in the true interest of art itself, for the government to " protect " art, since all state-aided art must be artificial, like any forced plant. This was popularly condensed into the aphor- ism, yet current in Holland, that " Art is not the business of the government," and Thorbecke was condemned as the author of it. Again, his adversaries used to call him a dangerous dema- gogue. As a matter of fact, there was no more ardent royalist than Thorbecke. He believed in constitutional monarchy, as offering the best guarantees both for sovereign and people, and he was bitterly opposed to all forms of state socialism. Long before his death he realized that he had outlived his own prin- ciples, and many of his former admirers had commenced to dub him a " rank conservative," whose political aims and reforms were no longer adequate. But Thorbecke's life-work will endure, and the Dutch constitution of 1887 practically embodied his principles, as laid down in the constitution of 1848. The former is the outcome of the latter and could not have been made without it.

The best biographical sketch of Thorbecke we owe to the late Professor Buys, his principal scholar and devoted friend, whose biography appeared in 1876 at Tiel. Another biography which deserves mention was issued in the same year at the Hague, from the pen of Dr J. A. Levy, an Amsterdam lawyer. (H. Ti.)

THOREAU, HENRY DAVID (1817-1862), American recluse, naturalist and writer, was born at Concord, Massachusetts, on the 1 2th of July 1817. To Thoreau

this Concord country contained all of beauty and even grandeur that was necessary to the worshipper of nature: he once journeyed to Canada; he went west on one occasion; he sailed and explored a few rivers; for the rest, he haunted Concord and its neighbourhood as faithfully as the stork does its ancestral nest. John Thoreau, his father, who married the daughter of a New England clergy- man, was the son of a John Thoreau of the isle of Jersey, who, in Boston, married a Scottish lady of the name of Burns. This last-named John was the son of Philippe Thoreau and his wife Marie le Gallais, persons of pure French blood, settled at St Helier, in Jersey. From his New England Puritan mother, from his Scottish grandmother, from his Jersey-American grandfather and from his remoter French ancestry Thoreau inherited dis- tinctive traits: the Saxon element perhaps predominated, but the " hauntings of Celtism " were prevalent and potent. The stock of the Thoreaus was a robust one; and in Concord the family, though never wealthy nor officially influential, was ever held in peculiar respect. As a boy, Henry drove his mother's cow to the pastures, and thus early became enamoured of certain aspects of nature and of certain delights of solitude. At school and at Harvard University he in nowise distinguished himself, though he was an intelligently receptive student; he became, however, proficient enough in Greek, Latin, and the more general acquirements to enable him to act for a time as a master. But long before this he had become apprenticed to the learning of nature in preference to that of man: when only twelve years of age he had made collections for Agassiz, who had then just arrived in America, and already the meadows and the hedges and the stream-sides had become cabinets of rare knowledge to him. On the desertion of schoolmastering as a profession, Thoreau became a lecturer and author, though it was the labour of his hands which mainly supported him through many years of his life: professionally he was a surveyor. In the effort to reduce the practice of economy to a fine art he arrived at the conviction that the less labour a man did, over and above the positive

demands of necessity, the better for him and for the community at large; he would have had the order of the week

reversed — six days of rest for one of labour. It was in 1845 he made the now famous experiment of Walden. Desirous of proving to himself and others that man could be as independent of this kind as the nestTbuilding bird, Thoreau retired to a hut of his own construction on the pine-slope over against the shores of Walden Pond — a hut which he built, furnished and kept in order entirely by the labour of his own hands. During the two years of his residence in Walden woods he lived by the exercise of a little surveying, a little job-work and the tillage of a few acres of ground which produced him his beans and potatoes. His absolute independence was as little gained as if he had camped out in Hyde Park; relatively he lived the fife of a recluse. He read considerably, wrote abundantly, thought actively if not widely, and came to know beasts, birds and fishes with an intimacy more extraordinary than was the case with St Francis of Assisi. Birds came at his call, and forgot their heredi- tary fear of man; beasts lipped and caressed him; the very fish in lake and stream would glide, unfearful, between his hands. This exquisite familiarity with bird and beast would make us love the memory of Thoreau if his egotism were triply as arro- gant, if his often meaningless paradoxes were even more absurd, if his sympathies were even less humanitarian than we know them to have been. His Walden, the record of this fascinating two years' experience, must always remain a production of great interest and considerable psychological value. Some years before Thoreau took to Walden woods he made the chief friendship of his life, that with Emerson. He became one of the famous circle of the transcendentalists, always keenly preserving his own individuality amongst such more or less potent natures as Emerson, Hawthorne and Margaret Fuller. From Emerson he gained more than from any man, alive or dead; and, though the older philosopher both enjoyed and learned from the association with the

younger, it cannot be said that the gain was equal. There was nothing electrical in Thoreau's intercourse with his fellow men; he gave off no spiritual sparks. He absorbed intensely, but when called upon to illuminate in turn was found wanting. It is with a sense of relief that we read of his having really been stirred into active enthusiasm anent the wrongs done the ill-fated John Brown. With children he was affectionate and gentle, with old people and strangers considerate. In a word, he loved his kind as animals, but did not seem to find them as interesting as those furred and feathered. In 1847 Thoreau left Walden Lake abruptly, and for a time occu- pied himself with lead-pencil making, the parental trade. He never married, thus further fulfilling his policy of what one of his essayist-biographers has termed "indulgence in fine renounce-ments." At the comparatively early age of forty-five he died, on the 6th of May 1862. His grave is in the Sleepy Hollow cemetery at Concord, beside those of Hawthorne and Emerson. Thoreau's fame will rest on Walden; or, Life in the Woods (Boston, 1854) and the Excursions (Boston, 1863), though he wrote nothing which is not deserving of notice. Up till his thirtieth year he dabbled in verse, but he had little ear for metrical music, and he lacked the spiritual impulsiveness of the true poet. His weakness as a philosopher is his tendency to base the laws of the universe on the experience-born, thought-produced convictions of one man — himself. His weakness as a writer is the too frequent striving after antithesis and paradox. If he had had all his own originality without the itch of appearing original, he would have made his fascination irresistible. As it is, Thoreau holds a unique place. He was a naturalist, but abso- lutely devoid of the pedantry of science; a keen observer, but no retailer of disjointed facts. He thus holds sway over two domains: he had the adherence of the lovers of fact and of the children of fancy. He must always be read, whether lovingly or interestedly, for he has all the variable charm, the strange saturninity, the contradictions, austerities and delightful surprises, of Nature herself.

After Thoreau's death were also published: The Maine Woods (Boston, 1863) ; Cape Cod (Boston, 1865) ; A Yankee in Canada (Boston, 1866). Inthe Atlantic Monthly, in 1862, appeared "Walking," " Autumn Tints " and " Wild Apples " ; in 1863, " Night and

Moonlight." The standard editions of his works are The Writings of Henry David Thoreau, Riverside edition (11 vols., Boston, 1894- 1895), and Manuscript edition (12 vols., ibid., 1907).

See also W. E. Channing, Thoreau: The Poet Naturalist (Boston, 1873) ; R. W. Emerson, an introductory note to Excursions (Boston, 1863); F. B. Sanborn, Henry David Thoreau (Boston, 1882), in the " American Men of Letters Series " ; H. S. Salt, Life of Henry David Thoreau (London, 1 890); Some Unpublished Letters of H. D. and Sophia E. Thoreau (Jamaica, New York, 1890) ; J, Russell Lowell, My Study Windows; R. L. Stevenson, Familiar Studies in Men and Books; and F. H. Allen, Bibliography of H. D. Thoreau (Boston, 1908). (W. Sh.)

THORFINN KARLSEFNI, or Karlsejot: (fl. 1002-1007), Scandinavian explorer, leader of the chief medieval expedition for American colonization. Thorfinn belonged to a leading Ice- landic family and had great success in trading voyages. In 1002 he came to Greenland, married Gudrid, widow of Red Eric's son Thorstein, and put himself at the head of a great expedition now undertaken from Ericsfiord for the further exploration and settlement of the western Vinland (south Nova Scotia?) lately discovered by Leif Ericsson (q.v.). Three vessels took part in the venture, with 160 men and some women, including Gudrid, and Freydis,, a natural daughter of Red Eric. They first sailed north-west to the Vesterbygd or " Western Settlement " of Greenland, thence to Bear Island, and thence away to the south till they reached a country they named Helluland (some part of Labrador?) from its great flat slabs of stone

(hellur). Two days' sail farther southward brought them to a thickly-wooded land they called Markland {i.e. Wood- land, our Newfoundland?). Two days after this they sighted land to the right hand, and came to a cape, where they found the keel of a ship — perhaps a relic of some earlier, possibly Scandi navian explorer — and which they called therefore Kialames (Keelness; Cape Breton, or some adjacent point?); the long bleak sandy shores of this coast they called the W onderstrands (on the east coast of Cape Breton Island?). After passing the W onderstrands and reaching a coast indented with bays, Thorfinn put two fleet Gael runners ashore, with orders to explore southwards (see Leif Ericsson): they returned with grapes and wild wheat, proofs that the Northmen were not far from Vinland. The fleet now stood in to a bay called by the explorers Streamfiord or Firth of Currents, and wintered there (1003-1004), suffering some privations, and apparently getting no more news of the fruitful country desired. Thorfinn's son Snorri was born this first autumn in the new world. Next spring nine of the party, headed by the chief malcontent Thorhall, Red Eric's huntsman, sailed off northward, intending to come to Vinland by rounding Keelness and thence working round west (and south). Adverse weather drove them to Ireland, where they were enslaved. Meanwhile Thorfinn, with the rest of the venturers, sailed south " for a long time," till they reached a spot they called Hop, at the mouth of a river which flows from a lake into the sea (several estuaries near the southern extremity of Nova Scotia would do equally well here). Here they found the " self-sown " wheatfields and vines of Leif's Vinland, and here accordingly they settled and built their huts above the lake (1004-1005). After a fortnight natives, swarthy and ill-looking, with ugly hair, great eyes andhroad cheeks (Beothuk or Micmac Indians?) appeared with many skin canoes; in the spring follow- ing these Skraelings came back and bartered with their visitors. Terrified by a bull belonging to the latter they fled, and after three weeks returned to fight. They were beaten off, but the Northmen narrowly escaped destruction, and

two Of their number (one a leading settler) were slain. The colony at Hop was there- fore abandoned and the whole force returned to Streamfiord. Thence Thorfinn revisited Hop, staying two months; and also made a voyage northward in search of Thorhall, rounding Keelness and sailing westward (along the north coast of Cape Breton Island?), and apparently southward also, till they came to the mouth of a river flowing from east to west. Here Thorvald Ericsson was killed by a (Skraeling?) arrow, and the expedition came back to Streamfiord where they passed the next winter (1005-1006). Internal dissensions now broke out, mainly about the women of the colony, and in the next summer (1006) the

entire project of Vinland settlement was abandoned and the fleet sailed to Markland. Two Skraeling children were captured here and the expedition divided, Thorfinn making Greenland and Ericsfiord in safety with his own vessel, while the other was lost in the Irish Sea, only half the crew escaping to Ireland in the ship's boat.

It may be noticed that the Flatey Book narrative gives a somewhat different but much slighter account of Thorfinn's expedition, making both Thorvald Ericsson and Freydis under- take separate Vinland ventures — one before, the other after, Karlsefni's enterprise— Thorvald being killed on his (as in Red Eric Saga, but with divergent details), and Freydis on her committing atrocities upon her comrades, the Icelanders Helgi and Finnbogi, which are unnoticed in Red Eric. The latter, however, in its mention of the domestic broils which arose over the women of the colony in its third winter, points to something which may have been the germ of the highly elaborated Freydis story in Flatey.

On Flatey Book, Red Eric Saga and the whole bibliography for the Vinland voyages, including that of Thorfinn, see Leif Ericsson arid Vinland. The six Vinland voyages of Flatey, we may repeat, Red Eric reduces to three, wholly omitting the alleged voyage of Biarni Heriulfsson, and grouping those of Thorvald Ericsson and Freydis with Thorfinn

Karlsefni's in one great colonizing venture.

(C. R. B.)

THORIANITE, a rare mineral, discovered by W. D. Holland, and found in the gem-gravels of Ceylon, where it occurs as small, heavy, black, cubic crystals, usually much water-worn. It was so named by W. R. Dunstan, on account of its high percentage of thorium (about 70% TI1O2); it also contains the oxides of uranium, lanthanum, cerium and didymium. Helium is present, and the mineral is slightly less radio-active than pitch- blende. It has been examined for new elements. Miss Evans (Journ. Chem. Soc, 1908, 93, p. 666) obtained what is possibly anew element, whilst M. Ogawa {Journ. Coll. Set. Tokyo, 1908, vol. 25) found indications of three new species: one which he called nipponium, with an equivalent weight of about 50 and atomic weight 100; the second with an equivalent of about 16-7; whilst the third yielded a radio-active oxide.

THORITE, a rare mineral consisting of thorium silicate, crystallizing in the tetragonal system and isomorphous with zircon. The theoretical formula, ThSiO*, requires 81-5% of thoria, but analyses show only 50-70%, there being also some uranium, cerium, &c. The mineral is almost always altered by hydration and is then optically isotropic and amorphous. Owing to differences in composition and to alteration, the specific gravity varies from 4-4 to 5-4. The colour is usually light brown, but in the variety known as "orangite" it is orange-yellow. The mineral occurs as isolated crystals and small masses in the augite-syenite near Brevik in South Norway; also at Arendal, and in the gem-gravels of Ceylon. If found in larger amount it would be an important source of thoria for incandescent gas mantles. (L. J, S.)

THORIUM (symbol Th, atomic weight ,232-42 [0=i6]), a metallic chemical element. It belongs to the group of metals whose oxides are generally denominated " rare earths," and its history is bound up in the history of the group, which is especially

interesting from the fact that it supplies the material for the manufacture of the mantles used in incandescent gas- lighting, and also that the radio-active substances are almost invariably associated with these oxides. The name thoria (after the Scandinavian god Thor) was first given in 181 5 by Berzelius to a supposed new earth which he had extracted from several rare Swedish minerals. This " new earth " turned out to be nothing more nor less than a basis yttrium phosphate. In 1828 he gave the name thoria to an earth which he extracted from a mineral found at Lerbn. This mineral is the modern' thorite. Thorium has proved to be very widely, although extremely sparingly, distributed: pyrochlor, orangite, monazite, euxehite, gadoloriite, orthite, and in fact most of the rare minerals of this type contain it (see B. Szilard, Le Radium, 19Q9, 6, P- ^33)- The extraction of thorium salts from these minerals is a matter of much tedium. Metallic thorium is obtained by

heating potassium thorium chloride or the tetrachloride with sodium (see W. von Bolton, R. J. Meyer and H. Karstens, J own. Chetn. Soc, 1909, vol. 96). It forms microscopic hex- agonal plates having a silver-white streak. It is very heavy; its density being about n; it inflames when heated in air and is not attacked by alkalis; it readily dissolves in nitric acid and aqua regia, but with difficulty in hydrochloric acid.

In its salts, thorium is tetravalent, and in the periodic classification it occurs in the same sub-group aa titanium, cerium and zirconium.

Thorium dioxide or thoria, ThO : , is the most important compound, being manufactured commercially in comparatively large quantities from monazite sands, with a view to its utilization for gas mantles (see Lighting, Gas). It is an amorphous white powder; but it may also be obtained in

crystals isomorphous with cassiterite by heating the amorphous form with borax to a very high temperature. An oxide TtnOs is formed by heating the oxalate. .

Thorium fluoride, ThF 4 , is obtained as a heavy white insoluble powder by dissolving the hydrate in hydrofluoric acid and evaporat- ing. By precipitating a thorium salt with a fluoride, a gelatinpu,s hydrate, ThF 4 4H 2 0, is obtained. Acid potassium fluoride pre cipitates K 2 ThF 6 -4ThF4-H 2 from a solution of thorium chloride. Potassium thorofluoride, K 2 ThF 6 -4HjO, is a heavy black powder formed by boiling the hydroxide with potassium fluoride and hydrofluoric acid. Thorium chloride, ThCU, is obtained as white shining crystals by heating a mixture of carbon and thoria in a current of chlorine. Baskerville (Journ. Amer. Chetn. Soc, 1904, 26, p. 922) divided the product into three fractions according . to their volatility. He concluded that the first contained the chloride of berzelium, having an atomic weight of 212, the second contained thorium chloride, and the third the chloride of carolinium, having an atomic weight of 255-6. E. Chauvenet (Compt. rend., 1908, 147, p. 1046) obtains it by heating thoria in a current of carbonyl chloride. Thorium chloride readily deliquesces on exposure and forms double salts with alkaline chlorides.

Thorium sulphate, Th(S0 4) 2 , is obtained by dissolving the oxide in sulphuric acid. It forms several crystalline hydrates. Evapora- tion of a solution at ordinary temperatures gives colourless mono- clinic prisms of Th(S04)v9H 2 0, which is isomorphous with uranium sulphate, U(S0 4) 2 -9H 2 0. Above 43° Th(SC>4) 2 -4H 2 Q is deposited. B. Roozeboom (Zeit. phys. Chem., 1890, 5, p. 198) has described several other hydrates. Thorium sulphate forms double salts with the alkaline sulphates. Thorium nitrate, Th(NOs)4-12H 2 0, forms white deliquescent tables very soluble in water. It forms double salts such as MgTh(N0 3)*-8H 2 0, which are isomorphous with the corresponding cerium compounds. Thorium sulphide, ThS^ is obtained by burning the

metal in sulphur. It cannot be produced by precipitation.

The atomic weight has been variously given. Berzelius found 2355 ; Delafontaine, 229-7 ; Cleve, 232-6 by analyses of the sulphate, and 232 -2 by analyses of the oxalate. Krilss and Nilson deriveid the value 230-7 (H = i) from analyses of the carefully riurified sulphate. >'-■ ■

For the so-called " disintegration of the thorium atom and the relation of this element to the general subject of radio-active emanations, see Radio-Activity. _

A number of salts of thorium have been prepared for therapeutic use, including the hydroxide, nitrate, salicylate, oleate and lactate. The oleate has been used in chronic eczema and psoriasis and locally in cancer. Inhalations of thorium emanations produced from thorium nitrate through a wash-bottle inhaler are said to have a bactericidal action in diseases of the lungs. F. Soddy has used them in phthisis, and Louisa Chesney speaks favourably of the emanations in chronic and acute laryngitis and in tuberculous laryngeal ulcerations.

THORN (Polish Torun), a fortress town of Germany, in the Prussian province of West Prussia, situated on the right bank of the Vistula, near the point where the river enters Prussian territory, 85 m. by rail N.E. of Posen, 92 m. S. of Danzig and 12 m. from the Russian frontier at Alexandrovo. Pop. (1895); 30,314; (1906), 43,435. Its position as a bridge head commanding the passage of the Vistula makes it a point of strategic impor- tance; it was strongly fortified in 1818, and in 1878 was converted into a fortress of the first class. The defensive works consist of a circle of outlying forts, about 2§ m. from the centre of the town— eight on the right and five on the left bank of the river. The " old town," founded in 1231, and the " new town," founded thirty-three years later, were united in 1454, and both retain a number of quaint buildings dating from the 15th and 16th centuries, when Tnorn was a

flourishing member of the Hanseatic League. The town-hall of the 14th and 16th centuries, the churches of St John of the Virgin, and of St Tames (all of the

I3th-i4th centuries), the ruined castle of the Teutonic order (a tower, the so-called ” Dansker “), and a leaning tower, the sole remnant of the old environing walls, are among the most inter- esting of the ancient edifices. Among modern buildings may be mentioned the Artushof, containing concert and assembly halls, the new garrison church (1897), and the monument erected in 1853 to Copernicus, who was a native of Thorn. The ancient wooden bridge, now burned down, at one time the only permanent bridge across the lower Vistula, has been succeeded by a massive iron railway viaduct, 3300 ft. long. Thorn carries on an active trade in grain, timber, wine, groceries and minerals, and has ironworks, saw-mills, and various other manufactures. It is famous for its Pfeferkuchen, a kind of gingerbread. Part of the trade is carried on by passenger and cargo vessels on the Vistula, which ply as far as Warsaw.

Thorn, founded in 1231 by the Teutonic order as an outpost against the Poles, was colonized mainly from Westphalia. The first peace of Thorn, between the order and the Poles, was concluded in 1411. In 1454 the townspeople revolted from the knights of the order, destroyed their castle, and attached them-selves to the king of Poland. This resulted in a war, which was terminated in 1466 by the second peace of Thorn. In the 15th and 1 6th centuries Thorn was a Hanse town of importance, and received the titles of ” Queen of the Vistula ” and ” the beautiful,” It embraced the Reformation in 1557, and in 1645 it was the scene of a. colloquium charitativum, or discussion betwixt the doctors of the rival creeds, which, however, resulted in no agreement. In 1724 a riot between the Protestant and Roman Catholic inhabitants was seized upon by the Polish king as a pretext for beheading the burgomaster and nine other leading Protestant citizens, an act of oppression which is known as the ” blood-bath of Thorn.” The second partition of

Poland (1793) conferred Thorn upon Prussia; by the treaty of Tilsit it was assigned to the duchy of Warsaw; but since the congress of Vienna (1815) it has again been Prussian.

See Wernicke, Geschichte Thorns (Thorn, 1 839–1 842); Hoburg, Die Belagerungen der Stadl und Festung Thorn (Thorn, 1850) ; and Steinbrecht, Die Baukunst des deutschen Ritterordens in Preussen (1st part, Berlin, 1884) ; Uebrick, Thorn (Danzig, 1903).

; THORN (0. Eng. \orn, cf; Du. doom, Ger. Dorn, &c), in botany, a hard pointed structure, 1 also termed a ” spine,” generally representing a small branch, as in hawthorn, where a normal branch arising in the axil of a leaf is replaced by a sharply pointed thorn; accessory buds on each side of the thorn and developed in the same leaf-axil will grow in the next season into ordinary branches. The similarly developed thorns of the honey-locust iflleditschia) are branched. In other cases, as the sloe or the wild pear, branches become spiny at the apex tapering into a stiff leafless point. On a cultivated tree these branches dis- appear owing to their more vigorous growth. Leaves may be modified into spines, as in barberry, the leaves of which show every gradation between a leaf with a spiny-toothed edge and those which have been reduced to simple or multiple spines. In some species of Astragalus the petiole of the pinnately com- pound leaf persists after the fall of the leaflets as a sharp spine. In the false acacia (Robinia) the stipules are represented by spines.

The reduction of the leaf-surface, of which the spinous habit is often an expression, is associated with growth in dry or exposed windy places. Thus, in the gorse, a characteristic plant of exposed localities such as open commons, the smaller branches, instead of being leaf -bearing shoots, are reduced to slender green spines, while the leaves on the main shoots are also more or less spinous in character. As the giving off of water from its surface is one of the chief functions of a leaf, this process is thus reduced to a minimum in

situations where water is scarce or would be liable to be given off too rapidly. An extreme case is afforded by the cacti and cactus-like euphorbias, which are a characteristic type of desert vegetation where water is extremely scarce. The whole plant is reduced to a simple or branching succulent, leafless, columnar or flattened stem, the branches of which are represented by small clusters of thorns. Incidentally the

thorns protect the plant which bears them from the attacks of animals seeking food.

Prickles are structures of less importance from the morpho^ logical point of view, being mere superficial outgrowths which may occur anywhere on stem or leaf, or even fruit.

THORNABY-ON-TEES, a municipal borough in the North Riding of Yorkshire, England, 3 m. S.W. of Middlesbrough, on the North-Eastern railway. Pop. (1901), 16,054. It lies opposite Stockton-on-Tees, with which it is connected by a bridge, on the river Tees. There are blast furnaces, iron foundries, engineering works, iron ship-building yards, extensive saw-mills, flour-mills and a manufactory of " blue and white " pottery. The town was formerly known as South Stockton, and is still included in the parliamentary borough of Stockton (it is within the Cleveland division of the county), but was incorporated as a separate municipal borough in 1892. It is under a mayor, 6 aldermen and 18 councillors. Area, 1927 acres.

THORNE, a market town in the Doncaster parliamentary division of the West Riding of Yorkshire, 10 m. N.E. of Doncaster by the North-Eastern railway, served also by a branch of the Great Central railway. Pop. (1901), 3818. It lies near the river Don, in a low, fiat district, which was formerly a marshy waste, resembling the fens of the eastern counties.

Hatfield Chase, a portion of this tract south of Thorne, was partly drained by the Dutch engineer Vermuyden in the 17th century, and there were in the district numerous Dutch settlers. The Chase is generally considered to have been the scene of the battle of Heathfield in 633, when King Edwin of Northumbria fell before the heathen. King Penda of Mercia. The Levels, as this district is generally named, aire of remarkable fertility, and Thorne, having water communication with Goole and the Humber, is consequently an agricultural centre of importance; while some barge-building and a trade in peat fibre are also carried on. The church of St Nicholas is a fine building of various periods from the 12th century.

THORNHILL, SIR JAMES (1676-1734), English historical painter, was born at Melcombe Regis, Dorset, in 1676, of an ancient but impoverished county family. His father died while he was young, but he was befriended by his maternal uncle, the celebrated Dr Sydenham, and apprenticed to Thomas Highmore, serjeant-painter to King William III., a connexion of the Thornhill family. Little is known regarding his early career. About 1715 he visited Holland, Flanders and France; and, having obtained the patronage of Queen Anne, he was in 1719-1720 appointed her serjeant-painter in succession to High- more, and was ordered to decorate the interior of the dome of St Paul's with a series of eight designs, in chiaroscuro heightened with gold, illustrative of the life of that apostle — a commission for which Louis Laguerre had previously been selected by the commissioners for the repair of the cathedral. He also designed and decorated the saloon and hall of Moor Park, Herts, and painted the great hall at Blenheim, the princesses' apartments at Hampton Court, the hall and staircase of the South Sea Company, the chapel at Wimpole, the staircase at Easton-Neston, North- amptonshire, and the hall at Greenwich Hospital, usually considered his most important and successful work, upon which he was engaged from 1708 to 1727. Among his easel pictures are the altar-pieces of All Souls and

Queen's College chapels, Oxford, and that in Melcombe Regis church; and he executed such portrait subjects as that of Sir Isaac Newton, in Trinity College, Cambridge, and the picture of the House of Commons in 1 730, in the possession of the earl of Hardwicke, in which he was assisted by Hogarth, who married Jane, his only daughter. He also produced a few etchings in a slight and sketchy but effective manner, and executed careful full-size copies of Raphael's cartoons, which now belong to the Royal Academy. About 1724 he drew up a proposal for the establishment of a royal academy of the arts, and his scheme had the support of the lord treasurer Halifax, but government declined to furnish the needful funds. Thornhill then opened a drawing - school in his own house in James Street, Covent Garden, where instruction

continued to be given till the time of his death. He acquired a considerable fortune by his art, and was enabled to repurchase his family estate of Thornhill, Dorsetshire. In 171 5 he was knighted by George I., and in 17 19 he represented Melcombe Regis in parliament, a borough for which Sir Christopher Wren had previously been member. Having been removed from his office by some court intrigue, and suffering from broken health and repeated attacks of gout, he retired to his country seat, where he died on the 4th of May 1734. His son James, also an artist, succeeded his father as serjeant-painter to George II. and was appointed " painter to the navy."

The high contemporary estimate of Sir James Thornhill's works has not since been confirmed; in spite of Dr Young, " late times " do not

" Understand How Raphael's pencil lives in Thornhill's hands." He is weak in drawing — indeed, when dealing with complicated figures he was assisted by Thomas Gibson; and, ignorant of the great monumental art of Italy, he formed himself upon the lower model of Le Brun.. ^

THORNHILL, an urban district in the Morley

parliamentary division of the West Riding of Yorkshire, England, 2 m. S. of Dewsbury, on the Great Northern, Lancashire & Yorkshire, and London & Noith-Western railways. Pop. (1901), 10,290. The church of St Michael has a modern nave, but the chancel with aisles are of good Decorated work, and the tower is Perpendicular. There are interesting monuments of the ancient family of Savile, the site of whose mansion, Thornhill Hall, may be traced near the church. The east window of the church contains fine fragments of stained glass of the 15th century. The large industrial population is employed in the woollen mills and manufactures of shoddy, carpets, &c, which are numerous in this locality.

THORNHILL, a village of the parish of Morton, Nithsdale, Dumfriesshire, Scotland, 14 m. N.N.W. of Dumfries by the Glasgow & South-Western railway. Pop. (1901), 1132. It is beautifully situated in the midst of tree-clad hills and watered by the bountiful Nith and such streams as the Carron, Cample and Crichope. Morton parish church lies in the village, and among other buildings are the library and the natural history museum, in the grounds of which there is a statue of Richard Cameron, the covenanter (1680). The weekly sales of livestock are important, and an agricultural show is held every September. Three miles N.N.W. stands Drumlanrig Castle, a seat of the duke of Buccleuch. It is built of red sandstone in the form of a hollow square, and has 145 ft. of outer walls, which are surmounted with turrets, and capped and spired at the angles. The castle was begun in 1679 and finished in 1689, and cost the first duke of Queensberry an immense sum. He is believed to have spent but a single night under its roof. The fourth duke of Queensberry, Old ” Q.,” incurred the wrath of Robert Burns and Wordsworth by his wanton destruction of the magnificent woods. On the death of ” Old Q.” without issue in 1810, Henry, third duke of Buccleuch, succeeded to the dukedom of Queensberry, and the property has since been adequately cared for. Trees, planted on the most extensive scale, have repaired the ravages of the

former owner; the gardens have been laid out with exquisite taste; and the vast policy, intersected by the Nith, is one of the finest parks in Scotland. The ruins of Tibber's Castle, dismantled in 13 11 by Robert Bruce, stand in the grounds, about 1 m. from the ducal mansion. Two miles and a half N.N.E. of Thornhill is found- another ruined fortress, that of Morton Castle, interesting as the residence of Thomas Randolph, earl of Moray, regent during the early years of the minority of David II., and as belonging afterwards to a branch of the Douglases, who derived from it the title of earl. About 3 m. south-east of Thornhill stands the ruined castle of Closeburn, once a stronghold of the Kirkpatricks. It was Sir Roger of that ilk who helped " mak sikker " the death of John, " Red " Comyn, of Badenoch (1300). In Closeburn parish (pop. 1275) occur cairns, tumuli and a stone circle, besides Roman and prehistoric remains. Two mineral wells give the piace the

promise of some degree of popular favour, likely to be enhanced by the romantic beauty of its surroundings.

THORNTON, HENRY (1760-1815), English banker and economist, was born on the 10th of March 1760. In 1784 he became a member of the banking firm of Downie, Free & Thornton, with which he was associated till his death on the 16th of January 1815. In 1783 he was elected member of parliament for Southwark, a constituency which he represented for the rest of his life. Although an indifferent speaker, he soon acquired a high reputation as an authority on financial matters. This reputation he confirmed by An Inquiry into the Nature and Effects of the Paper Currency of England (1802), defending the legislature in suspending cash payments. He strongly supported the income tax on its original imposition in 1798, but was in favour of a graduated system, and indeed paid his own income tax "on the

scale of his ideal, not his legal debt." He was one of the founders of the Sierra Leone Company (see Sierra Leone) and its chairman until the colony was taken over by the English government.

THORNTON, WILLIAM THOMAS (1813–1880), English economist, was bom at Burnham, Buckinghamshire, on the 14th of February 1813. In 1836 he obtained a clerkship in the London house of the East India Company. In 1858 he became secretary for public works in the India office, a post which he held till his death. He was created a C.B. in 1873. His works include Over-population and its Remedy (1846), in which he put forward a plan for colonizing Irish wastes by Irish peasants; A Plea for Peasant Proprietors (1848), in which his views were developed in greater detail; On Labour (1869); and Old-fashioned Ethics and Commonsense Metaphysics, a volume of essays, published in 1873.

THORNYCROFT, WILLIAM HAMO (1850-), British sculptor. A pupil of his father, Thomas Thornycroft, and of the Royal Academy schools, he was still a student when he was called upon to assist his father in carrying out the important fountain in Park Lane, London. He accordingly returned in 1 87 1 to England from Italy, where he was studying, and modelled the figures of Shakespeare, Fame and Clio, which were rendered in marble and in bronze. In the following year he exhibited at the Royal Academy " Professor Sharpley," in marble, for the memorial in University College; and " Mrs Mordant," a relief — a form of art to which he has since devoted much atten- tion. The " Fame," already mentioned, was shown in 1873. Believing that the pendulum had overshot its swing from conventional classicality towards pictorial realism, he turned from the " fleshy " school towards the Greek, while realizing the artistic necessity for modern feeling. In 1875 his " Warrior Bearing a Wounded Youth from the Field of Battle " gained the gold medal at the Royal Academy schools, and when exhibited in 1876 it divided public attention with the "Tennyson" of Woolner and " Wellington monument " sculptures of Alfred Stevens, now in St Paul's Cathedral. Then followed the

dramatic ” Lot’s Wife,” in marble (1878), and ” Artemis ” (1880), which for grace, elegance and purity of taste the sculptor never surpassed. He was thereupon elected an associate of the Royal Academy, and more than justified the selection by his ” Teucer ” of the following year, a bronze figure of extraordinary distinction which, bought for the Chan trey collection, is now in the National (Tate) Gallery of British Art. It is simple and severe, classic yet instinct with life and noble in form; and in it he touched the high-water mark of his career. Turning to the ideal, in works entirely modern in motive and treatment, Hamo Thorny- croft produced ” The Mower ” (1884) and ” A Sower ” (1886); the ” Stanley Memorial ” in the old church at Holyhead par- takes of the same character. Among the sculptor’s principal statues are ” The Bishop of Carlisle ” (1895; Carlisle Cathedral), ” General Charles Gordon ” (Trafalgar Square, London), “Oliver Cromwell” (Westminster), “Dean Colet ” (a bronze group — early Italianate in feeling — outside St Paul’s School, Hammersmith), “King Alfred” (a colossal memorial for Winchester), the “Gladstone Monument” (in the Strand, London) and ” Dr Mandell Creighton, Bishop of London ”

(bronze, erected in St Paul’s Cathedral). Mr Thornycroft’s other memorials, such as the ” Queen Victoria Memorial ” (Karachi), the ” War Memorial ” (at Durban) and the ” Armstrong Memorial ” (at Newcastle), are well known, and his portrait statuary and medallions are numerous. He was elected a full academician in 1888, and an honorary member of the Royal Academy of Munich. He was awarded a medal of honour at the Paris Exhibition, 1900.

See M. H. Spielmann, British Sculpture and Sculptors of To-day (London, 1901). (M. H. S.)

THORODDSEN, J(5N pOR oARSON (1819-1868), Icelandic poet and novelist, was born in 1819 at Reykholar in western Iceland. He studied law at the university of Copenhagen, entered the Danish army as volunteer in 1848 in the war against the insurgents of Schleswig and Holstein, who were aided by Prussia and the

other German States. He went back to Iceland in 1850, became sheriff (syslumadur) of Bar3astrandarsysla, and later in BorgarfjarSarsysla, where he died in 1868. He is the first novel writer of Iceland. Jonas Hallgrimsson had led the way by his short stories, but the earliest veritable Icelandic novel was Jon Thoroddsen's Piltur og stiilka (" Lad and Lass "), a charming picture of Icelandic country life. Still better is Maftur og kona (" Man and Wife "), published after his death by the Icelandic Literary Society. He had a great fund of delicate humour, and his novels are so essentially Icelandic in their character, and so true in their descriptions, that he is justly considered by most of his countrymen not only as the father of the Icelandic novel, but as the best novelist Iceland has produced. His poems, mostly satirical, are deservedly popular; he follows Jonas Hallgrimsson closely in his style, although he cannot reach him in lyrical genius. (S. Bl.)

THOROTON, ROBERT (1623-1678), English antiquary, belonged to an old Nottinghamshire family, which took its name from Thoroton, near Newark. He resided mainly at another village in the same neighbourhood, Car Colston, where he practised as a physician and where he lived the life of a country gentleman. He took very little part in the Civil War, although his sympathies were with the royalists, but as a magistrate he was very active in taking proceedings against the Quakers. In 1667 Thoroton, aided by a band of helpers, began to work upon his elaborate Antiquities of Nottinghamshire. This was published in London in 1677; it was dedicated to Gilbert Sheldon, archbishop of Canterbury, and was illustrated by engravings by W. Hollar.

In 1797 a new edition of the Antiquities was published by John Throsby (1740-1803), who added an additional volume. In 1897 the Thoroton Society was founded in honour of the antiquarian, its object being to promote the study of the history and antiquities of Nottinghamshire. Under its auspices annual volumes of Transac- tions and several volumes of Records have been published and much valuable

work has been done. A brass tablet to the memory of Thoroton has been placed in Car Colston church. See J. T. Godfrey, Robert Thoroton, Physician and Antiquary (1890).

THORPE, BENJAMIN (1782–1870), English Anglo-Saxon scholar, was born in 1782. After studying for four years at Copenhagen University, under the Danish philologist Rasmus Christian Rask, he returned to England in 1830, and in 1832 published an English version of Caedmon's metrical paraphrase of portions of the Holy Scriptures, which at once established his reputation as an Anglo-Saxon scholar. In 1834 he published Analecta Anglo-Saxonica, which was for many years the standard textbook of Anglo-Saxon in English, but his best-known work is a Northern Mythology in three volumes (1851). His was the first complete good translation of the elder Edda (1866). His other works include Ancient Laws and Institutes of England (1840), an English translation of the laws enacted under the Anglo-Saxon kings; The Holy Gospels in Anglo-Saxon (1842); Codex Exoniensis (1842), a collection of Anglo-Saxon poetry with English translation; an English translation of Dr Lappen- burg's History of England under the Anglo-Saxon Kings (1845); Anglo-Saxon Poems of Beowulf (1855), a translation; an edition for the ■" Rolls " series of the Anglo-Saxon Chronicle (1861); and Diplomatarium Anglicum aevi saxonici (1865), a collection oi

early English charters. Thorpe died at Chiswick on the 19th of July 1870. The value of his work was recognized by the grant to him, in 1835, of a civil list pension.

THORPE [or Thokp], JOHN (J. 1570–1618), English architect. Little is known of his life, and his work is dubiously inferred, rather than accurately known, from a folio of drawings in the Soane Museum, to which Horace Walpole called attention, in 1780, in

his Anecdotes of Painting; but how far these were his own is uncertain. He was engaged on a number of important English houses of his time, and several, such as Longleat, have been attributed to him on grounds which cannot be sustained. He was probably the designer of Kirby Hall, Northamptonshire; the original Longford Castle, Wiltshire; and the original Holland House, Kensington; and he is said to have been engaged on Rushton Hall, Northamptonshire, and Audley End, Essex (with Bernard Janssens).

See J. A. Gotch, Architecture of the Renaissance in England

(1891-1894).

THORWALDSEN, BERTEL (1770-1844), Danish sculptor, the son of an Icelander who had settled in Denmark, and there carried on the trade of a wood-carver, was born in Copenhagen on the 19th of November 1770. While very young he learnt to assist his father; at the age of eleven he entered the Copen- hagen school of art, and soon began to show his exceptional talents. In 1792 he won the highest prize, the travelling student- ship, and in 1796 he started for Italy in a Danish man-of-war. Gn the 8th of March 1797 he arrived in Rome, where Canova was at the height of his popularity. Thorwaldsen's first success was the model for a statue of Jason, which was highly praised by Canova, and he received the commission to execute it in marble from Thomas Hope, a wealthy English art -patron. From that time Thorwaldsen's success was assured, and he did not leave Italy for twenty-three years. In 1819 he returned to Den- mark, where he was commissioned to make the colossal series of statues of Christ and the twelve apostles which are now in the Fruenkirche in Copenhagen. These were executed after his return to Rome, and were not completed till 1838, when Thor- waldsen again returned to Denmark. He died suddenly in the Copenhagen theatre on the 24th of March 1844 and bequeathed a great part of his fortune for the building and endowment of a museum in Copenhagen, and also left to fill it all his

collection of works of art and the models for all his sculpture — a very large collection, exhibited to the greatest possible advantage. Thorwaldsen is buried in the courtyard of this museum, under a bed of roses, by his own special wish.

On the whole Thorwaldsen was the most successful of all the imitators of classical sculpture, and many of his statues of pagan deities are modelled with much of the antique feeling for breadth and purity of design. His attempts at Christian sculpture, such as the tomb of Pius VII. in St Peter's and the " Christ and Apostles" at Copenhagen, are less successful, and were not in accordance with the sculptor's real sympathies, which were purely classic. Thorwaldsen worked sometimes with feverish eagerness ; at other times he was idle for many months together. A great number of his best works exist in private collections in England. His not very successful statue of Lord Byron, after being refused a place in Westminster Abbey, was finally de- posited in the library of Trinity College, Cambridge. The most widely popular among Thorwaldsen's works have been some of his bas-reliefs, such as the " Night " and the " Morning," which he is said to have modelled in one day.

See Eugene Plon, Thorwaldsen, sa vie, &c. (Paris, 1880) ; Andersen, B. Thorwaldsen (Berlin, 1845) ; Killerup, Thorwaldsen's Arbeiten, &c. (Copenhagen, 1852); Thiele, Thorwaldsen's Leben (Leipzig, 1852-1856); C. A. Rosenberg, Thorwaldsen . . . mit 146 Abbildungen (1896; " Kunstlermonographien," No. 16); S. Trier, Thorvaldsen (1903); A. Wilde, Erindringer om Jerichau og Thorvaldsen (1884).

THOTH, the Greek name of the Egyptian god of letters, invention and wisdom (e.g. Thowt, Zhwty), the mouthpiece and recorder of the gods, and arbiter of their disputes. Thoth is found on the earliest monuments symbolized by an ibis (Ibis aethiopica, still not uncommon in Nubia), which bird was sacred to him. In the Pyramid texts Thoth is already closely

associated with the Osiris myth, having aided the god by his science and knowledge of magic, and demonstrated the justice of his claims in the contest with Set. Thoth presided over writing, measuring and calculation, and is prominent in the scene of the weighing of the soul. He was often identified with the moon as a divider of time, and in this connexion, during the New Empire, the ape first appears as his sacred animal. Thoth was identified by the Greeks with Hermes, and Hermes Trismegistus (q.v.) is a late development of the Egyptian god. Geographically the worship of Thoth in Lower Egypt centred in the Hermopolite nome, contiguous to the Busirite and Mendesian nomes. This was the district anciently called Zhwt, and the god's name Zhwty means simply "him of Zlvwt." But Hermopolis Magna in Upper Egypt, now Eshmunain, was a city of greater political irnportance than Hermopolis in Lower Egypt. See E. A. W. Budge, The Gods of the Egyptians; and specially Egypt: Ancient, § Religion. (F. Ll. G.)

THOU, JACQUES AUGUSTE DE [Thuantjs] (1553-1617); French historian, was the grandson of Augustin de Thou, president of the parlement of Paris (d. 1544), younger son of Christophe de Thou, " first president " of the same parle- ment, who began to collect a number of books and notes for a history of France which he was never to write (d. 1582), and nephew of Nicolas de Thou, who was bishop of Chartres (1573-1598). In these family surroundings he imbibed a love of letters, a firm and orthodox, though enlightened and tolerant piety, and an attachment to the traditional power of the Crown. At the age of. seventeen he began his studies in lav/, first at Orleans, later at Bourges, where he made the acquaintance of Hotman, and finally at Valence, where he had Cujas for his master and Scaliger as a friend. He was at first intended for the Church; he received the minor orders, and on the appointment of his uncle Nicolas to the episcopate succeeded him as a canon of Notre-Dame. But his tastes led him in a different direction; not content with a knowledge of books, he wished to know the world and men. During a

period of ten years he seized every opportunity for profitable travel. In 1573 he accompanied Paul de Foix on an embassy, which enabled him to visit most of the Italian courts; he formed a friendship with Arnaud d'Ossat (afterwards bishop of Rennes and Bayeux and cardinal, d. 1604), who was secretary to the ambassador. In the following year he formed part of the brilliant cortege which brought King Henry III. back to France, after his flight from his Polish king- dom. He also visited several parts of France, and at Bordeaux met Montaigne. On the death, however, of his elder brother Jean (April 5, 1579), who was mattre des requites to the parlement, his relations prevailed on him to leave the Church, and he entered the parlement and married (1588). In the same year he was appointed conseiller d'ttat. He served faithfully both the effeminate, bigoted and cruel Henry III. and Henry IV., a sceptic and given to love-intrigues, because they were both the repre- sentatives of legitimate authority. He succeeded his uncle Augustin as president a mortier (1 595) , and used his new authority in the interests of religious peace, negotiating, on the one hand, the Edict of Nantes with the Protestants, while in the name of the principals of the Gallican Church he opposed the recognition of the Council of Trent. This attitude exposed him to the animosity of the League party and of the Holy See, and to their persecution when the first edition of his history appeared. This history was the work of his whole life. In a letter of the 31st of March 1611 addressed to the president Jeannin, he himself describes his long labours in preparation of it. His materials for writing it were drawn from his rich library, which he established in the Rue des Poitevins in the year 1587, with the two brothers, Pierre and Jacques Dupuy, as librarians. His object was to produce a purely scientific and unbiassed work, and for this reason he wrote it in Latin, giving it as title Historia sui temporis. The first 18 books, embracing the period from 1 545-1560, appeared in 1604 (1 vol. folio), and the work was at once attacked by those whom the author himself calls les envieux et les factieux. The second part, dealing with the first wars of religion

(1 560-1 572), was put on the Index librorum prohibitorum

THOU ARS-^F H A»H>' 0NE NIGHTS

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(Nov. 9, 1609). The third part (up to 1574), and the fourth (up to 1584), which appeared in 1607 and 1608, caused a similar outcry, in spite of de Thou's efforts to remain just and impartial. He carried his scruples to the point of forbid- ding any translation of his book into French, because in the process there might, to use his own words, " be committed great faults and errors against the intention of the author "; this, however, did not prevent the Jesuit Father Machault from accusing him of being " a false Catholic, and worse than an open heretic" (1614); de Thou, we may say, was a member of the third order of St Francis. As an answer to his detractors, he wrote his MSmoires, which are a useful complement to the History of his own Times. After the death of Henry IV., de Thou met with another disappointment; the queen-regent refused him the position of first president of the parlement, appointing him instead as a member of the Conseil des finances intended to take the place of Sully. This was to him a distinct downfall; he continued, however, to serve under Marie de Medicis, and took part in the negotiations of the treaties concluded at Ste Menehould (1614) and Loudun (1616). He died at Paris on the 7th of May 1617.

Three years after the death of de Thou, Pierre Dupuy and Nicolas Rigault brought out, with pt. v., the first complete edition of the Hisloria sui temporis, comprising 138 books; they appended to it the Memoires, also given in Latin (1620). A hundred years later, an Englishman, Samuel Buckley, published a critical edition, the material for which had been collected in France itself by Thomas Carte (1733). De Thou was treated as a classic, an honour which he deserved. His history is a model of exact research, drawn from the best sources, and presented in a style both elegant and animated ;

unfortunately, even for the men of the Renaissance, Latin was a dead language; it was impossible for de Thou, for example, to find exact equivalents for technical terms of geography or of administra- tion. As the reasons which had led de Thou to forbid' the transla- tion of his monumental history disappeared with his death, there soon arose a desire to make it accessible to a wider public. It was translated first into German. A Protestant pastor, G. Boule, who was afterwards converted to Catholicism, translated it into French, but could not find a publisher. The first translation printed was that of Pierre Du Ryer (1657), but it is mediocre and incomplete. In the following century the abb<5 Prevost, who was a conscientious collaborator with the Benedictines of Saint-Maur before he became the author of the more profane work Manon Lescaut, was in treaty with a Dutch publisher for a translation which was to consist of ten volumes ; only the first volume appeared ('733)- But competition, perhaps of an unfair character, sprang up. A group of translators, who had the good fortune of being able to avail themselves of Buckley's fine edition, succeeded in bringing out all at the same time a translation in sixteen volumes (De Thou, Histoire universelle, Fr. trans, by Le Beau, Le Mascrier, the Abbe Des Fontaines, 1734). As to the Mimoires they had already been translated by Le Petit and Des Ifs (1711); in this form they have been reprinted in the collections of Petitot, Michaud and Buchon. To de ThoU we also owe certain other works: a treatise De re accipitraria (1784), a Life, in Latin, of Papyre Masson, some Poemata sacra, &c.

For his life may be consulted the recollections of him collected by the brothers Dupuy (Thuana, sive Excerpta J. A. Thuani per ff. P. P., 1669; reprinted in the edition of 1733), and the biographies by J. A. M. Collinson (The Life of Thuanus, 1807), and Duntzer, {De Thou's Leben, 1837). Finally, see Henry Harrisse, Le President de Thou et ses descendants, leur celbbre bibhothkque, leurs armoiries el la traduction francaise de J. A. Thuani Historiarum sui Temporis [sic] (1905). (C B.)*

THOUARS, a town of western France, in the department of Deux-Sevres, on the right bank of the Thouet, 24 m. S. by W. of Saumur on the railway to Bordeaux. Pop. (1906), 5321. A massive stronghold built in the first half of the 17th century by the La Tremoille family, and now used as a prison, stands on a rocky eminence overlooking the river, towards which it has a frontage of nearly 400 ft. The adjoining Sainte-Chapelle dating from the early years of the 16th century is in the Gothic style with Renaissance details, and was built by Gabrielle de Bourbon, wife of Louis II. of La Tremoille. The church of St Medard, rebuilt in the 15th century, preserves a doorway of a previous Romanesque building. That of St Laon (12th and 15th centuries) was formerly attached to an abbey, the buildings (17th century) of which serve as town-hall. It has a fine square tower in the Romanesque style and con- tains the sculptured tomb of the abbot Nicholas. Remains of

the ramparts of the town dating from the 13th century and flanked by huge towers are still to be seen, and a bridge of the same period crosses the Thouet. The manufacture of furniture and wooden shoes, and the preparation of veterinary medicine and lime, are carried on. Wine, livestock and agricultural produce are the chief articles of trade.

Thouars, which probably existed in the Gallo-Roman period, became in the 9th century the seat of powerful viscounts, who in later times were zealous supporters of the English. In 1372 the latter were expelled from the town by Bertrand du Guesclin. In 1563 Charles IX. created Louis III., the head of the family of La Tremoille, duke of Thouars. In 1793 the Vendeanstook the town by assault.

THOURET, JACQUES GUILLAUME (1746-1794), French revolutionist, was born at Pont FEvfique. He was the son of a notary, and became an avocat at the parlement of Rouen. In 1789 he was elected deputy to the states-general by the third estate of Rouen, and in the Constituent Assembly his eloquence gained him great influence. Like so many lawyers of his time,

he was violently opposed to the clergy, and strongly supported the secularization of church property. He also obtained the suppression of the religious orders and of all ecclesiastical privileges, and actively contributed to the change of the judiciary and administrative system. He was one of the promoters of the decree of 1790 by which France was divided into depart- ments, and was four times president Of the Constituent Assembly. After its dissolution he became president of the court of cassation. He was included in the proscription of the Girondists, whose political opinions he shared, and was executed in Paris. Besides his speeches and reports he wrote an A brigi des revolutions de I'ahcien gouvemement franqais and Tableau chronologique de Vhistoire ancienne et moderne.

' 'His brother, Michel Atjgustin Thouret (i 748-1810), a physician, was a keen opponent of the ideas of Mesmer and a promoter of vaccination in France.

See F. Aulard, Les Orateurs de Vassemblee constituante (2nd ed., Paris, 1905); E. Carette and A. Sanson, Thouret . . . sa vie, ses osuvres, (1890).

THOUSAND AND ONE NIGHTS. The Thousand and One Nights, commonly known in English as The Arabian Nights' Entertainments, is a collection of tales written in Arabic, which first became generally known in Europe in the early part of the 1 8th century through the French translation by Antoine Galland, and rapidly attained universal popularity. In the J'ournal asidtique for 1827, p. 253, von Hammer (J. von HammeSr- Purgstall) drew attention to a passage in the Golden Meadows of Mas'tidi (ed. Barbier de Meynard, iv. 89 seq.), written in a.d. 943, in which certain stories current among the old Arabs are compared with " the books which have reached us in translations from Persian, Indian and Greek, such as the book of Heztir Afsane, a title which, translated from Persian into Arabic, means ' the thousand tales.' This book is popularly called The Thousand and One Nights, and contains the story of the king and his vizier and of his daughter Shiraz&d and her slave girl Dlnazad. Other books of the same kind are the book of Ferza and Simds, containing stories of Indian kings and viziers, the book of Sindibad, &c." Von Hammer concluded that the Thousand and One Nights were of Persian or Indian origin. Against this conclusion Silvestre De Sacy protested in a memoir (Mtm. de I'acad. des inscr., 1833, x. 30 seq.), demonstrating that the character of the book we know is genuinely Arabian, and that it must have been written in Egypt at a comparatively recent date. Von Hammer in reply adduced, in Journ. as. 3(1839), "■ J 7S sec l-. a passage in the Fihrist (a.d. 987), which is to the following effect: —

" The ancient Persians were the first to invent tales and make books of them, and some of their tales were put in the mouths of animals. The Ashghanians, or third dynasty of Persian kings, and after them the Sasanians, had a special part in the

development of this literature, which found Arabic translators, and was taken up by accomplished Arabic literati, who edited it and imitated it. The earliest book of the kind was the Hezar afsane or Thousand Tales, which had the following origin. A certain Persian king was

accustomed to kill his wives on the morning after the consummation of the marriage. But once he married a clever princess called Shahrazad, who spent the marriage night in telling a story which in the morning reached a point so interesting that the king spared her, and asked next night for the sequel. This went on for a thousand nights till Shahrazad had a son, and ventured to tell the king of her device. He admired her intelligence, loved her, and spared her life. In all this the princess was assisted by the king's stewardess DInazad. This book is said to have been written for the princess Homai (MSS. HomanI), daughter of Bahman. ... It contains nearly two hundred stories, one story often occupying several nights. I have repeatedly seen the complete book, but it is really a meagre and uninteresting production " {Fihrist, ed. Flugel, p. 304).

Persian tradition (in Firdousi) makes Princess Ilomai the daughter and wife of Bahman Ardashir, i.e. Artaxerxes I. Longimanus. She is depicted as a great builder, a kind of Persian Semiramis, and is a half-mythical personage already mentioned in the Avesta, but her legend seems to be founded on the history of Atossa and of Parysatis. Firdousi says that she was also called Shahrazad (Mohl v. 11). This name and that of DInazad both occur in what Mas'udI tells of her. According to him, Shahrazad was IJomai's mother (ii. 129), a Jewess (ii. 123). Bahman had married a Jewess (i. 118), who was instrumental in delivering her nation from captivity. In ii. 122 this Jewish maiden who did her people this service is called DInazad, but " the

accounts," says our author, " vary." Plainly she is the Esther of Jewish story. Tabarl (i. 688) calls Esther the mother of Bahman, and, like Firdousi, gives to rjomai the name of Shahrazad. The story of Esther and that of the original Nights have in fact one main feature in common. In the former the king is offended with his wife, and divorces her; in the Arabian Nights he finds her unfaithful, and kills her. But both stories agree that thereafter a new wife was brought to him every night, and on the morrow passed into the second house of the women (Esther), or was slain (Nights). At length Esther or Shahrazad wins his heart and becomes queen. The issue in the Jewish story is that Esther saves her people; in the Nights the gainers are " the daughters of the Moslems," but the old story had, of course, some other word than " Moslems." Esther's foster- father becomes vizier, and Shahrazad's father is also vizier. Shahrazad's plan is helped forward in the Nights by DInazad, who is, according to Mas'udI, her slave girl, or, according to other MSS., her nurse, and, according to the Fihrist, the king's stewardess. The last account comes nearest to Esther ii. 15, where Esther gains the favour of the king's chamberlain, keeper of the women. It is also to be noted that Ahasuerus is read to at night when he cannot sleep (Esther vi. 1). And it is just pos- sible that it is worth notice that, though the name of Ahasuerus corresponds to Xerxes, Josephus identifies him with Artaxerxes I.

Now it may be taken as admitted that the book of Esther was written in Persia, or by one who had lived in Persia, and not earlier than the 3rd century B.C. If now there is real weight in the points of contact between this story and the Arabian Nights — and the points of difference cannot be held to outweigh the resemblances between two legends, each of which is neces- sarily so far removed from the hypothetical common source— the inference is important for both stories. On the one hand, it appears that (at least in part) the book of Esther draws on a Persian source; on the other hand, it becomes probable that the Nights are older than the

Sasanian period, to which Lane (iii. 677) refers them.

It is a piece of good fortune that Mas'udI and the Fihrist give us the information cited above. For in general the Moslems, though very fond of stories, are ashamed to recognize them as objects of literary curiosity. In fact, the next mention of th% Nights is found only after a lapse of three centuries. Maqrlzl, describing the capital of Egypt, quotes from a work of Ibn Sa'Id (c. a.d. 1250), who again cites an older author (Al-Kortobl), who, in speaking of a love affair at the court of the caliph Al-Amir (1097-1 130), says " what is told about it resembles the romance of Al-Battal, or the Thousand and One Nights " (Hitat, Biilaq ed., i. 485, ii. 181).

That the Nights which we have are not the original translation

of the Hezar Afsdne is certain, for the greater part of the stories are of Arabian origin, and the whole is so thoroughly Mahom- medan that even the princes of remote ages who are introduced speak and act as Moslems. It might be conceived that this is due to a gradual process of modernization by successive generations of story-tellers. But against this notion, which has been entertained by some scholars, Lane has remarked with justice that, much as MSS. of the Nights differ from one another in points of language and style, in the order of the tales, and the division into nights, they are all so much at one in essentials that they must be regarded as derived from a single original. There is no trace of a recension of the text that can be looked on as standing nearer to the Hezar Afsdne. And the whole local colour of the work, in point of dialect and also as regards the manners and customs described, clearly belongs to Egypt as it was from the 14th to the 16th century. Some points, as De Sacy and Lane have shown, forbid us to place the book earlier than the second half of the 15th century. Galland's MS. copy, again, was in existence in 1548. Lane accordingly dates the work from the close of the 1 5th century or the beginning of the 1 6th, but this

date appears to be too late. For Abu'1-Maha.sin, an Egyptian historian who died in 1470, writing of IJamdi, a famous highwayman of Bagdad in the 10th century, remarks that he is probably the figure who used to be popularly spoken of as Ahmad al-Danaf (ed. Juynboll ii. 305). Now in the Nights Ahmad al-Danaf really plays a part corresponding to that of the historical IJamdi, being now a robber (Lane ii. 404) and again a captain of the guard (Lane ii. 249). It would seem that Abu'l-Mahasin had read or heard the stories in the Nights, and was thus led to compare the historical with the fictitious character. And, if this be so, the Nights must have been composed very soon after 1450. 1

No doubt the Nights have borrowed much from the Hezar Afsdne, and it is not improbable that even in the original Arabic translation of that work some of the Persian stories were replaced by Arab ones. But that our Nights differ very much from the Hezar Afsdne is further manifest from the circumstance that, even of those stories in the Nights which are not Arabian in origin, some are borrowed from books mentioned by Mas'udI as distinct from the Hezar Afsdne. Thus the story of the king and his son and the damsel and the seven viziers (Lane, ch. xxi. note 51) is in fact a version of the Book of Sindbdd, 2 while the story of Jali'ad and his son and the vizier Shammas (M'Naghten iv. 366 seq. ; cf . Lane iii. 530) corresponds to the book of Ferza and Simds?

Not a few of the tales are unmistakably of Indian or Persian origin, and in these poetical passages are rarely inserted. In other stories the scene lies in Persia or India, and the source is foreign, but the treatment thoroughly Arabian and Mahomme- dan. Sometimes, indeed, traces of Indian origin are perceptible, even in stories in which Harun al-Rashld figures and the scene is Bagdad or Basra. 4 But most of the tales, in substance and form alike, are Arabian, and so many of them have the capital of the caliphs as the scene of action that it may be guessed that the author used as one of his sources a book of tales taken from the era of Bagdad's

prosperity.

The late date of the Nights appears from sundry anachronisms. In the story of the men transformed into fish — white, blue, yellow or red according as they were Moslems, Christians, Jews or Magians (Lane i. 99) — the first three colours are those of

1 The hypothesis of gradual and complete modernization is also opposed to the fact that the other romances used by Cairene story- tellers (such as those of 'Antar and of Sa'if) retain their original local colour through all variations of language and style.

2 The Syriac Sindiban, the Greek Syntipas, and the Seven Sages of the European West.

3 De Sacy and Lane suppose that the original title of the Arabic translation of the Hezar Afsdne was The Thousand Nights. But most MSS. of Mas'udI already have The Thousand and One Nights., which is also the name given by Maqrizi. Both ciphers perhaps mean only " a very great number," and Fleischer (De glossis Habichlianis, p. 4) has shown that 1001 is certainly used in this sense.

4 Gildemeister, Dt rebus indicis, p. 89 seq.

the turbans which, in 1301, Mahommed b. Kala'un of Egypt commanded his Moslem, Christian and Jewish subjects respec- tively to wear. 1 Again, in the story of the humpback, whose scene is laid in the 9th century, the talkative barber says, " this is the year 653 " (= a.d. 1255; Lane, i. 332, writes 263, but see his note), and mentions the caliph Mostansir (d. 1242), who is incorrectly called son of Mostadi. 2 In the same story several places in Cairo are mentioned which did not exist till long after the 9th century (see Lane i. 379).' The very rare edition of the first 200 nights published at Calcutta in 1814 speaks of cannon, which are first

mentioned in Egypt in 1383; and all editions sometimes speak of coffee, which was discovered towards the end of the 14th century, but not generally used till 200 years later. In this and other points, e.g. in the mention of a mosque founded in 1501 (Lane iii. 608), we detect the hand of later interpolators, but the extent of such interpolations can hardly perhaps be determined even by a collation of all copies. For the nature and causes of the variations between different copies the reader may consult Lane, iii. 678, who explains how transpositions actually arise by transcribers trying to make up a complete set of the tales from several imperfect copies.

Many of the tales in the Nights have an historical basis, as Lane has shown in his notes. Other cases in point might be added: thus the chronicle of Ibn al-Jauzi (d. a.d. 1200) contains a narrative of ICamar, slave girl of Shaghb, the mother of Moqtadir, which is the source of the tale in Lane i. 310 seq., and of another to be found in M'Naghten iv. 557 seq.; the latter is the better story, but departs so far from the original that the author must have had no more than a general recollection of the narrative he drew on. 4 There are other cases in the Nights of two tales which are only variations of a single theme, or even in certain parts agree almost word for word. Some tales are mere compounds of different, stories put together without any art, but these perhaps are, as Lane conjectures, later additions to the book; yet the collector himself was no great literary artist. We must picture him as a professional story- teller equipped with a mass of miscellaneous reading, a fluent power of narration, and a ready faculty for quoting, or at a push improvising, verses. His stories became popular, and were written down as he told them — hardly written by himself, else we should not have so many variations in the text, and such insertions of "the narrator says," "my noble sirs," and the like. The frequent coarseness of tone is proper to the condition of Egyptian society under the Mameluke sultans, and would not have been tolerated in Bagdad

in the age to which so many of the tales refer. Yet with all their faults the Nights have beauties enough to deserve their popularity, and to us their merit is enhanced by the pleasure we feel in being transported into so entirely novel a state of society.

The Thousand and One Nights became known in Europe through A. Galland's French version (12 vols. i2mo, Paris, 1704-1712); the publication was an event in literary history, the influence of which can be traced far and wide. This translation, however, left much to be desired in point of accuracy, and especially failed to reproduce the colour of the original with the exactness which those who do not read merely for amusement must desire. It was with a special view to the remedying of these defects that E. W. Lane produced in 1840 his admirably accurate, if somewhat stilted, translation, enriched with most valuable notes and a discussion of the origin of the work (new edition, with some additional notes, 3 vols. 8vo, London, 1859). Lane's translation omits the tales which he deemed uninteresting or unfit for a European public. Sir Richard Burton's unexpurgated English translation, with elaborate notes, was issued in 10 vols., 1 885-1 886, with six supplementary vols., 1887-1888. A new French version (1899 seq.) was undertaken by J. C. Mardrus. Of the Arabic text of the Nights the principal editions are — (1) M'Naghten's edition (4 vols. 8vo, Calcutta, 1 839-1 842); (2) the Breslau edition (12 vols., i2mo, 1835-1843), the first 8 vols, by Habicht, the rest by Fleischer (compare as to the defects of Habicht's work, Fleischer, De glossis Habichtianis.

1 Quatremere, Sultans Mamloucs, ii. 2, p. 177 seq _

2 Lane, i. 342, arbitrarily writes " Montasir " for '" Mostansir." ? See also Edin. Review (July 1886), p. 191 seq.

.'See De Goeje in Gids (1876), ii. 397-411.

Leipzig, 1836); (3) the first Bulaq edition (4 vols., 1862-1863). See the Biblioeraphie des ouvr.

drabes (1901), vol. iv., by V. Chauvin,

(M.J.deG.)

THRACE, a name which was applied at various periods to areas of different extent. For the purposes of this article it will be taken in its most restricted sense, as signifying the Roman province which was so called after the district that intervened between the river Ister (Danube) and the Haemus Mountains (Balkan) had been formed into the separate provinces of Moesia, and the region between the rivers Strymon and Nestus, which included Philippi, had been added to Macedonia. The boundaries of this were^-towards the N. the Haemus, on the E. the Euxine Sea, on the S. the Propontis, the Hellespont and the Aegean, and towards the W. the Nestus. The most dis- tinguishing features of the country were the chain of Rhodope (Despoto-dagh) and the river Hebrus (Maritza). The former separates at its northernmost point from the Haemus, at right angles, and runs southward at first, nearly parallel to the Nestus, until it approaches the sea, when it takes an easterly direction (See Virg. Georg. iii. 351). Several of the summits of this chain are over 7000 ft. in height. The Hebrus, together with its tributaries which flow into it from the north, east and west, drains almost the whole of Thrace. It starts from near the point of junction of Haemus and Rhodope, and at first takes an easterly direction, the chief town which lies on its banks in the earlier part of its course being Philippopolis; but when it reaches the still more important city of Hadrianopolis it makes a sharp bend towards the south, and enters the sea nearly opposite the island of Samothrace. The greater part of the country is hilly and irregular, though there are considerable plains; but besides Rhodope two other tolerably definite chains intersect it, one of which descends from Haemus to Adrianople, while the other follows the coast of the Euxine at no great distance inland. One district in the extreme north-west of Thrace lay beyond the watershed separating the streams that flow into the Aegean from those that reach the Danube: this was the territory of Sardica, the modern Sophia. In the

later Roman period two main lines of road passed through the country One of these skirted the southern coast, being a continuation of the Via Egnatia, which ran from Dyrrhachium to Thessalonica, thus connecting the Adriatic and the Aegean; it became of the first importance after the foundation of Constantinople, because it was the direct line of communication between that city and Rome. The other followed a north-westerly course through the interior, from Constantinople by Hadrianopolis and Philip- popolis to the Haemus, and thence by Naissus (Nish) through Moesia in the direction of Pannonia, taking the same route by which the railway now runs from Constantinople to Belgrade. The climate of Thrace was regarded by the Greeks as very severe, and that country was spoken of as the home of the north wind, Boreas. The coast in the direction of the Euxine also was greatly feared by sailors, as the harbours were few and the sea proverbially tempestuous; but the southern shore was more attractive to navigators, and here we find the Greek colonies of Abdera and Mesambria on the Aegean, Perinthus on the Propontis, and, the most famous of all, Byzantium, at the meeting-point of that sea and the Bosporus. Another place which proved attractive to colonists of that race was the curious narrow strip of ground, called the Thracian Chersonese, that intervened between the Hellespont and the Bay of Melas, which penetrates far into the land on its northern side. Among the cities that occupied it the most important were Sestos and Callipolis (Gallipoli). In order to prevent the incursions of the Thracians, a wall was built across its isthmus, which was less than 5 m. in breadth. The north-eastern portion of the Aegean, owing to its proximity to the coast of Thrace, was known as the Thracian Sea, and in this were situated the islands of Thasos, Samothrace and Imbros.

History. — The most striking archaeological monuments of the prehistoric period are the sepulchral mounds, which are found by thousands in various parts of the country, especially in the neighbourhood of the ancient towns. As Roman

and ornaments have been found in some of them, it is plain that this mode of burial continued to be practised until a late period. The country was overrun several times by Darius and his generals, and the Thracian Greeks contributed 120 ships to the armament of Xerxes (Herod, vii. 185). The most powerful Thracian tribe was that of the Odrysae, whose king, Teres, in the middle of the 5th century B.C. extended his dominion so as to include the greater part of Thrace. During the Peloponnesian War his son Sitalces was an ally of some impor- tance to the Athenians, because he kept in check the Macedonian monarch, who opposed the interests of the Athenians in the Chalcidic peninsula. Again, in the time of Philip of Macedon we find Cersobleptes, who ruled the south-eastern portion of the country, exercising an important influence on the policy of Athens. During the early period of the Roman Empire the Thracian kings were allowed to maintain an independent sove- reignty, while acknowledging the suzerainty of Rome, and it was not until the reign of Vespasian that the country was reduced to the form of a province (Kalopathakas, De Thracia, provincia romana, 1894; Mommsen, Roman Provinces, Eng. trans., 1886). From its outlying position in the northern part of the Balkan peninsula it was much exposed to the inroads of barbarian invaders. It was overrun by the Goths on several occasions, and subsequently by the Huns; but its proximity to Constanti- nople caused its fortunes to be closely connected with those of that city, from the time when it became the capital of the Eastern Empire. In the course of the middle ages the northern parts of Thrace and some other districts of that country were occupied by a Bulgarian population; and in 1361 the Turks made themselves masters of Adrianople, which for a time became the Turkish capital. When Constantinople fell in 1453 the whole country passed into the hands of the Turks, and in their possession

it remained until 1878, when, in accordance with the provisions of the Treaty of Berlin, the northern portion of it was placed under a separate aciministration, with the title of Eastern Rumelia; this province has now become, to all intents and purposes, a part of the principality of Bulgaria. The population is composed of Turks, Greeks and Bulgarians. (H. F. T.)

Ancient Peoples. — The name " Thracians," from being used both ethnically and geographically, has led to confusion. There were the true indigenous Thracians and also Celtic tribes such as the Treres in the early period, the Getae and Trausi later, and the Gallic Scordisci in Roman days. These were the " red " Thracians of Greek writers, and they differed not merely in physique and complexion, but also in their customs and religion from the native Thracians (Herod, v. 14). The native Thracians were inferior in morals, allowing their girls complete licence till marriage. The chief native deities were Dionysus, Ares and Bendis (Artemis), but many of these tribes had Celtic chiefs, who traced their descent from and worshipped a god called Hermes by the Greeks, but possibly Odin. The substantial features of the ancient Dionysiac rites, including a ritual play by " goat-men " carrying a wooden phallus, may still be seen at Bizye, the old residence of the Thracian kings (see R. M. Dawkins in Hellenic Journal, 1906, p. 191). The true Thracians were part of that dark-complexioned, long-skulled race, which had been in the Balkan peninsula from the Stone Age, closely akin to the Pelasgians (q.v.), the aborigines of Greece, to the Ligurians, the aborigines of Italy, and to the Iberians. The name " Illyrian " (see Illyria) was applied to all the tribes of this stock who dwelt west of the northern extensions of the Pindus range and in what was termed Upper Macedonia in later times, and who extended right up to the head of the Adriatic. In Homer the name Macedonia is not yet known, and the term Thracian is applied to all the tribes dwelling from Pieria to the Euxine. There is no well-defined difference between aboriginal Thracians and

Illyrians. Thus there was an Illyrian tribe Brygi, a Thracian one Bryges; some of the latter had passed into Asia and settled in the land called from them Phrygia, whence some of them later passed into Armenia; some of the Mysians (regarded by Strabo as Thracians) had also crossed into what was later known as Mysia: closely connected with the Mysians were the

Dardanii, of Trojan fame, who had a city Dardania or Dardanus. In Strabo's time a tribe called Dardanii, then reckoned Illyrian, living next the Thracian Bessi (in whose land was the oldest oracle of Dionysus), were probably as much Thracian as Illyrian. All the Thracian and Illyrian tribes tattooed, thus being dis- tinguished from the Celtic tribes who had conquered many of them. The Thracians differed only dialectically from the Illyrians (Strabo), their tongue being closely allied to Greek. The Thracians of the region from Olympus to the Pangaean district, usually regarded as rude tribes, had from a very early time worked the gold and silver of that region, had begun to strike coins almost as early as the Greeks, and displayed on them much artistic skill and originality of types. The most famous were the Bisaltae, the Orrescii, Odomantes and Edoni. Alexander I. of Macedon on his conquest of the Bisaltae adopted the native coinage, merely placing on it his own name (see, further, Numismatics: Greek, §§ Thrace and Macedonia). They were famous for their skill in music and literature. Orpheus, Linus, Thamyris and Eumolpus were theirs, and in later days the Dardanii were noted for their love of music as well as for their uncleanliness.

See Herodotus v. 3-8; H. Kiepert, Lehrbuch der alten Geographie (Berlin, 1878); A. Boue\ La Turquie a" Europe (4 vols,, Paris, 1840); G. Finlay, History of Greece, vols, i.iv. (Oxford, 1877) ; W. Ridge way, Early Age of Greece, i. 351 seq. (Cambridge, 1902) ; Tomas- chek, Die alten Thraker (1893-1895); Hiller von Gaertringen, De Graecorum fabulis ad Thraces pertinentibus (1886). (W. Rl.)

THRALL, a slave, a captive or bondman, a term

especially applied to the serfs (Lat. servi) of the early northern Teutonic peoples. It only occurs in Old English as a word borrowed from the Norse, the proper term in Old English being ” theow ” Q>eow); the Icel. \raell (Dan. trael, Swed. tril) is probably represented by 0. H. Ger. dregil, trigil, trikil, a slave, and would therefore be derived from the root meaning ” to run,” seen in O. Eng. \>raegian, Goth, thagjan, cf. Gr. rpexecv; Skeat (Etym. Diet., 1898) compares the ” trochilus ” (Gr. rpox^os), the small bird that according to Herodotus waits or attends on the crocodile and picks insects out of his teeth.

THRASEA PAETUS, PUBLIUS CLODIUS, Roman senator and Stoic philosopher, lived during the reign of Nero. He was the husband of Arria the daughter of Arria (q.v.), father-in- law of Helvidius Priscus, and a friend and kinsman of the poet Persius. He was born at Patavium, and belonged to a dis- tinguished and wealthy family. The circumstances under which he came to settle in Rome are unknown. At first he was treated with great consideration by Nero, probably owing to the influence of Seneca, and became consul in a.d. 56 and one of the keepers of the Sibylline books. In 57 he supported in the senate the cause of the Cilician envoys, who came to Rome to accuse their late governor, Cossutianus Capito, of extortion. In 50 Thrasea first openly showed his disgust at the behaviour of Nero and the obsequiousness of the senate by retiring without voting after the emperor’s letter justifying the murder of Agrippina had been read. In 62 he prevented the execution of the praetor Antistius, who had written a libel upon the emperor, and per- suaded the senate to pass a milder sentence. Nero showed his displeasure by refusing to receive Thrasea when the senate went in a body to offer its congratulations on the birth of a princess. From this time (63) till his death in 66 Thrasea retired into private life and did not enter the senate-house again. But his death had been decided upon. The simplicity of his life and his adherence to Stoic principles were looked upon as a reproach to the

frivolity and debaucheries of Nero, who ” at last yearned to put Virtue itself to death in the persons of Thrasea and Soranus ” (Tacitus). Cossutianus Capito, the son-in-law of Tigellinus, who had never forgiven Thrasea for securing his condemnation, and Eprius Marcellus undertook to conduct the prosecution. Various charges were brought against him, and the senate, awed by the presence of large bodies of troops, had no alternative but to condemn him to death. When the news was brought to Thrasea at his house, where he was entertaining a number of friends, he retired to his chamber, and had the veins of both his arms opened. The narrative

of Tacitus breaks off at the moment when Thrasea was about to address Demetrius, the Cynic philosopher, with whom he had previously on the fatal day held a conversation on the nature of the soul. Thrasea was the subject of a panegyric by Arulenus Rusticus, one of the tribunes, who had offered to put his veto on the decree of the senate, but Thrasea refused to allow him to throw his life away uselessly. Thrasea’s own model of life and conduct was Cato of Utica, on whom he had written a panegyric, one of Plutarch’s chief authorities in his biography of Cato.

See Tacitus, Annals (ed. Furneaux), xiii. 49, xiv. 12, 48, xv. 20-22, xvi.,21-35, containing a full account of his trial and condemnation, Hist. ii. 91, iv. 5; Dio Cassius lxi. 15, lxii. 26; Juvenal "v. 36; W. A. Schmidt, Geschichte der Denk- und Glaubensfreikeit (Berlin, 1847); Merivale, Hist, of the Romans under the Empire, ch. 53; F. Hersche, Zwei Characterbilder , on Diogenes of Sinope and Paetus (Lucerne, 1865); monographs by A. S. Hoitsema (Groningen, 1852); and G. Joachim (Lahr, 1858); see also Pauly-Wissowa’s Realencyclopddie der classischen Altertwnswissenschaft (1900), iv. pt. 1.

THRASHING, or Threshing (from ” to thrash,” O. Eng.

kerscan, cf. Ger. dreschen, Du. dorschen, &c), the process by which the grain or seed of cultivated plants is separated from the husk or pod which contains it.

Historical. — It is probable that in the earliest times the little grain that was raised was shelled by hand, but as the quantity increased doubtless the grain was beaten out with a stick or the sheaf beaten upon the ground. An improvement on this, as the quantity further increased, was the practice of the ancient Egyptians and Israelites of spreading out the loosened sheaves on a circular enclosure of hard ground 50 to 100 ft. in diameter, and driving oxen, sheep or other animals round and round over it so as to tread out the grain. This enclosure was placed on an elevated piece of ground so that when the straw was removed the wind blew away the chaff and left the corn. This method, however, damaged part of the grain, and as civilization advanced it was partially superseded by the thrashing sledge — the charatz of Egypt and the morag of the Hebrews — a heavy frame mounted with three or more rollers, sometimes spiked, which revolved as it was drawn over the spread out corn by two oxen. A common sledge with a ridged or grooved bottom was also used. Similar methods to these were used by the Greeks and are still employed in backward countries. In Italy a tapering roller fastened to an upright shaft in the centre of the thrashing floor and pulled round from the outer end by oxen is still in vogue and would seem to be a descendant of the Roman tribulum or roller sledge.

Doubtless the flail was evolved from the early method of using the stick. It seems to have been the thrashing implement in general use in all Northern European countries, and was the chief means of thrashing grain as late as i860. It was known to the Japanese from the earliest times, and was probably used in conjunction with the stripper, an implement fashioned very much like a large comb, with the teeth made of hard wood and pointing upwards. The straw after being reaped was brought to this and combed through by hand, the heads being drawn off

and afterwards thrashed on the thrashing floor by the flail. At the present day just such an implement, known as a " heckle," is used for combing the bolls or heads off flax or for straightening the fibre in the after treatment.

The flail consisted of two pieces of wood, the handstaff or helve and the beater, fastened together loosely at one end by a thong of raw hide or eelskin, which made a very durable join. The handstaff is a light rod of ash about 5 ft. long, slightly increasing in girth at the farther end to allow for the hole for the thong to bind it to the beater. The length of the handstaff enabled the operator to stand in an upright position while working. The beater is a wooden rod about 30 in. long, made of ash, though a more compact wood such as thorn is less likely to split. This also has a hole at one end for the thong to bind it to the handstaff. The shape of the beater was cylindrical, of about 1} in. diameter and constructed so that the edge of the grain of the wood received the force of the blow; 30 to 40 blows or strokes per minute was the average speed.

After the grain had been beaten out by the flail or ground out by other means the straw was carefully raked away and the corn and chaff collected to be separated by winnowing when there was a wind blowing. This consisted of tossing the mixture of corn and chaff into the air so that the wind carried away the chaff while the grain fell back on the thrashing floor. The best grain fell nearest while the lightest grain was carried some distance before

falling, thus a very rough-and-ready grading of the grain was obtained. It was also performed when there was no wind by fanning while pouring the mixture from a vessel. Later on a fanning or winnowing mill was invented. All ancient barns were, constructed with large doors giving on to the thrashing floor and opening in the direction of the prevailing winds so that the wind could blow right through the barn and across the thrashing floor for the purpose of winnowing the corn. The flail is still in use for

special purposes such as flower seeds and also where the quantity grown is so small as to render it not worth while to use a thrashing mill.

With regard to the amount of grain thrashed in a day by the flail, a fair average quantity was 8 bushels of wheat, 30 bushels of oats, 16 bushels of barley, 20 bushels of beans, 8 bushels of rye and 20 bushels of buckwheat.

There seem to have been many attempts to devise some form of power-driven machinery for thrashing. In 1732 Michael Menzies, a Scotsman, obtained a patent for a power-driven machine. This was a contrivance arranged to drive a large number of flails operated by water power, but though worked for a time it was not particularly successful. The first practical effort leading in the right direction was made by a Scottish farmer named Leckie about 1758. He invented what was described as a " rotary machine consisting of a set of cross arms attached to a horizontal shaft and enclosed in a cylindrical case." This machine did not work very well, but it demonstrated the superiority of the rotary motion and pointed out the lines on which thrashing machines should be constructed.

The first really successful thrashing machine — the type which is embodied in modern thrashers — was invented by another Scotsman named Andrew Meikle in 1786 In this the loosened sheaves were fed, ears first, from a feeding board between two fluted revolving rollers to the beating cylinder. This cylinder or " drum " was armed with four iron-shod beaters or spars of wood parallel to its axle, and these striking the ears of corn as they protruded from the rollers knocked out the grain. The drum revolved at 200 to 250 revolutions per minute and carried the loose grain and straw on to a concave sieve beneath another revolving drum or rake with pegs which rubbed the straw on to the concave and caused the grain and chaff to fall through. Another revolving rake tossed the straw out of the machine. The straw thus passing under one peg drum and over the next was subjected to a thorough rubbing and

tossing which separated the grain and chaff from it. These fell on to the floor beneath, ready for winnowing.

A later development of the beater-drum was to fix iron pegs on the framework, and thus was evolved the Scottish ” peg-mill,” which remained the standard type for nearly a hundred years and is found at nearly every farmstead in Scotland as a fixed machine in the barn to the present day, though in many cases unused since the advent of the portable thrasher. Further, it is the type adopted in America, and all ” separators ” in use on the great wheat lands of ” the West ” are simply modifications of the peg- mill principle. In Great Britain, however, a reversion has been made to the beating or rubbing principle, where the arms of the ” drum ” rub the straw against an encircling concave framework and thus shell the grain out, and the portable thrashing machines now taken from farm to farm are all constructed on this principle. It was not till about 1800 that a machine for winnowing was invented to work as part of Meikle’s peg-drum thrasher, and this made a complete separator or thrasher which thrashed, cleaned and delivered the grain at one operation. Still, these machines were stationary, being generally built up in homesteads and operated by water power, and the unthrashed corn had to be brought to them. Port- able thrashing machines operated by horse power were used to a small extent, but the work was very hard on the horses and took them away when their services were otherwise required on the farm. When steam was developed as a motive power the portable thrashing machine became more general.

When Meikle had brought together the peg-drum and concave he had solved the difficulty of mechanical thrashing. The develop- ment of the machine to the efficiency of the modern thrasher was very gradual, and was in the direction of greater speed to the drum and more beaters on it, and improved arrangements to ensure a clean sample of grain. It is generally supposed that each part was invented and perfected singly, but in reality the early

experi- menters had tried to make a complete separating machine. In fact they covered the whole ground in theory before any main features were made practical.

The Modern Thrashing Machine.- — The present-day thrashing machine embodies the main features of Meikle's machine and will thrash up to 16 quarters of oats per hour, depending on the size of the same. There are no fluted rollers at the feed, the sheaves are fed straight to the drum; but as the working of these high-speed drums was attended with considerable risk, the Threshing Machine Act 1878 now provides for some sort of guard or safety feed.

In the most modern thrashing machine the ordinary routine is as follows: The loosened sheaf is fed in at the feed mouth under the drum guard and passes between the drum beaters

and the concave; most of the corn falls through the concave on to the corn and chaff receiving board, but some of the corn and chaff remain among the straw; as the " cavings " (the short broken straw and leaf) need to be separated from the straw it is given a thorough tossing up on the shakers, which have an upwards and onwards peristaltic action, and deliver the straw at the end of the machine. The corn, chaff and cavings fall on to a reciprocating board or " upper shoe," which carries them back to the middle

Fig. i. — The internal construction and arrangement of the " Rus- ton " double crank finishing Thrashing Machine. (Ruston, Proctor & Co., Lincoln.)

A, Corn feed opening. O, Grain passage.

B, Thrashing drum. P, Spout.

CC, Straw shakers. Q, Rotary screen.

D, Collecting board of top shoe. R, Grain passage.

EE, Caving riddle. T, Classified grain.

FF, Dressing riddles. U, Rotary screen brush.

G, Grain spout. V, Dust spout.

H, Large blower. W, Grain delivery to sacks.

I, Shut off lid. X, Dust.

J J, Elevator. Z, Cavings delivery.

K, Smutter. Y, Chaff delivery or chaff collec-

L, Creeper. tor may be fitted here to

MM, Riddle. deliver chaff upon either

N, Second blower. side of machine, as desired.

of the machine, where they meet the corn that fell through the concave. The upper shoe passes the cavings, &c, over the end into a " lower shoe," which thoroughly sifts the corn and chaff from the cavings. The cavings are then carried along to the outside of the machine and emerge at an opening beneath the point where the straw passes out. The corn and chaff fall through the lower shoe or caving riddle on to a receiving board

Fig. 2. — Thrashing Machine at work with stacking elevator behind. (Clayton & Shuttleworth, Lincoln.)

which takes them back to the middle of the machine, where they fall, meeting with a strong blast of wind from the first fan, which blows out the chaff and light matter, the small seeds and light dust being sifted out through finely perforated sieves, while larger debris such as thistle heads and " chobs " (broken heads) are taken off by a coarse sieve. The corn then passes into the shaker shoe, which is fitted with sieves to take off the larger seed, and thence to the elevator, which carries it to the top of the

machine in a roughly dressed condition. The elevator delivers the corn into the awner or " hummeller, " which is fitted with helical blades to rub off the awns or beards which may still adhere to the grain. From here the grain falls on to a second series of sieves, where it meets the blast of air from the second fan, which blows and sifts the light and coarse foreign matter from the grain, delivering this debris on the first corn and chaff receiving board to undergo separation again along with that just fallen from the concave. The corn falls from the sieve of this second dresser into a rotary screen where separations are made producing the clean sample and the tail corn, which are delivered at separate openings below. There are modi-fications on the machine described — such as single fan-blast instead of double, &c. — but the general principles are the same. The concave which surrounds the drum is made adjustable, so that it can be regulated according to the nature of the crop to be thrashed. An ordinary machine will thrash all usual farm crops, but great care has to be taken in adjusting the concave or the seed will be injured. Clover, however, is twice

Fig. 3. — Thrashing, Machine with fan-blast straw-stacker. (Clayton & Shuttleworth, Lincoln.)

passed through a machine of this description, to free the seed from the haulm and afterwards to rub the seed clear from the chaff, but special machines to thrash it all in one operation are made.

The drum is carried on the main shaft and all other pulleys take their motion from it directly or indirectly. Sometimes the main shaft is lengthened to accommodate another pulley and so drive a chaff-cutter behind and chaff up the straw as it leaves the thresher. In some districts an elevator is driven behind to stack the straw. Others use a trusser, which ties the straw into large bundles before delivering it for stacking.

American Machines. — In American machines the straw, cavings, &c, are caught in a blast at the rear end

of the machine and blown up in a light iron pipe of about 18 in. diameter on to the top of the stack, and the grain is delivered loose at the side through a spout into a box wagon. As the payment for thrashing is per bushel the grain is usually passed through a self-registering weighing apparatus, so that accurate account is kept of the bushels thrashed. In Great Britain payment is per quarter of 8 bushels, and as the machine delivers into 4-bushel

Fig. 4. — American " Separator " with self-feeder and fan-blast delivery-pipe for straw. (Avery Manufacturing Co., Peoria. Illinois.)

sacks this rough-and-ready measure is accepted. On American machines self-feeders are adopted, in which the sheaves are thrown on to a travelling web which carries them under re- volving knives to cut the bands and deliver them loose into the

drum, so that while many more bushels of grain are passed per day through an American machine than is done in Great Britain, only about half the men are required at the work.

Thrashing Work. — The minimum number of hands required in Great Britain are: An engine-driver, a feeder, a sackman, and ten other men to handle the sheaves, straw, chaff, grain, &c, while half as many more may be needed where the grain has to be carted, as when the thrashing is done in the field in harvest time. An 8-h.p. steam engine is the usual motive power, but the development of the oil engine has provided a very satisfactory substitute. The engine is usually of the " traction " type, so that it can move the thrashing machine or " barn work" (as it is sometimes called) and elevator from place to place. The usual quantities thrashed with a " double blast finishing machine," as described, in the United Kingdom are, with a 5 ft. wide drum, from 60 to 80 bushels per hour of wheat, and one-third to

one-half more of oats and barley.

Sometimes the straw is stacked loose, while sometimes it is tied up with twine by a tier exactly like that on a " string binder " and then stacked up. Where all the straw is used at the farm for fodder, &c, the fixed thrashing machine set up in the barn is the most convenient. The sheafed corn has to be carried to it, but, on the other hand, everything is under cover, the work can be done on a wet day, and all the products of thrashing in the shape of grain, straw, cavings, chaff, &c, are kept dry. In the great corn districts, however, the portable thrasher is most convenient; it is set alongside the stack and only the grain and chaff are carried under cover, while the thrashed straw, &c, is restacked up on the spot as the work goes on. The farmer finds the coal and the men and horses to cart water to the engine and corn to the barn and pays the proprietor of the thrashing outfit, who finds all the other men, about the following rates: wheat, is. iod., oats and barley, is. 6d. per quarter. (P. McC.)

THRASYBULUS, an Athenian general, whose public career began in 411 B.C., when by his resolute behaviour he frustrated the oligarchic rising in Samos (see Peloponnesian War), and secured the Athenian armament to the cause of democracy. Elected general by the troops, he effected the recall of Alcibiades and assisted him in the ensuing naval campaigns. By his brave defence at Cynossema (411) he won the battle for Athens, and in 410 contributed towards the brilliant victory of Cyzicus. In 406 he fought at Arginusae as a simple ship's captain, but after the engagement was commissioned with Theramenes (q.v.) to rescue some drowning crews. In the subsequent inquiry Thrasybulus successfully disclaimed respon- sibility for the failure.

In 404, when exiled by the Thirty Tyrants for his services to the democracy, he retired to Thebes and there prepared for a desperate attempt to recover his country. Late in the year, with seventy men, he seized Phyle, a hill fort on Mt Parnes. A force sent

by the Thirty was repulsed and routed by a surprise attack. Thrasybulus now gained the Peiraeus, 1000 strong, and successfully held the steep hill of Munychia against the oligarchs' full force. After this repulse the Thirty gave way to a provisional government of moderate oligarchs. Meanwhile a Spartan fleet, which the latter had summoned, blockaded the Peiraeus, but king Pausanias, commanding the land forces, after some skirmishes effected a general reconciliation by which the democracy was restored (October 403). Thrasybulus was now the hero of the people; but a decree by which he secured the franchise for all his followers, including many slaves, was rescinded as illegal.

In 395 Thrasybulus induced Athens to join the Theban league against Sparta, but did not himself take the field till 389, when he led a new fleet of 40 ships against the Spartans at Rhodes. Sailing first to the Bosporus he effected a democratic revolution at Byzantium and renewed the corn-toll. After a successful descent on Lesbos and the renewal of the 5% import tax at Thasos and Clazomenae he sailed south in quest of further contributions, but met his death in a night surprise by the people of Aspendus. By hi3 exactions he had forfeited the confidence both of the allies and of Athens; but after his death the ill-feeling subsided, and he was ever remembered as one of the saviours of his country.

See Thucydides, viii. 75-105; Xenophon, Hellenica; Lysias, c. Eratosth. 55-61 and c. Ergocl. 5, 8; and Const, ath. xl. Diodorus xiii., xiv., Justin v. 9, 10, and Nepos depend almost whollv on Xenophon. Corpus inscr. att. ii. lib and 14b.

(M. O. B. C.) THRASYMEDES, of Paros, a Greek sculptor. Formerly he was regarded as a pupil of Pheidias, because he set up in the temple of Asclepius at Epidaurus a seated statue of that deity made of ivory and gold, which was evidently a copy of the Zeus of Pheidias. But an inscription recently found at Epidaurus proves that the temple and the statue belong to the fourth century. (See

Epidaurus.)

THREAD (O. Eng. \rald, literally, that which is twisted, Iprawan, to twist, to throw, cf. " throwster," a silk-winder, Ger. drehen, to twist, turn, Du. draad, Ger. Draht, thread, wire), a thin or fine cord of two or more yarns of fibrous substance, such as cotton, silk, wool or flax, tightly twisted together (see Spinning and Cotton and Cotton Manufacture). Thread, whether as silk or cotton thread, is particularly used for sewing, but it is also used in weaving. Lisle thread, a hard-twisted linen thread, originally made at Lille in France, is specially used in the manufacture of stockings (see Hosiery). Apart from the figurative sense of that which runs through the course of a subject, narrative or speech, as a connecting thought, idea or purpose, the term is also applied specifically to the spiral part of a screw (q.v.).

THREAT, a menace or intimidation. At common law the employment of threats or other forms of intimidation to induce a person to enter into a contract will give the right to sue for its recision or avoidance, or to plead the special form of intimidation in answer to any action brought, or to sue for damages occasioned by entering into the contract. (See such headings as Coercion; Contract; Extortion, &c.)

In criminal law the sending of threatening letters (or causing them to be received), demanding with menaces and without reasonable cause money or other valuable thing, is a felony. So is the sending a letter threatening to burn or destroy any house, barn or other building or to kill or maim cattle. It is also a felony to threaten to accuse a person of a crime for the purpose of extorting money, or merely to demand money or other property, without having any claim to it, by means of a threat.

THREE BODIES, PROBLEM OF, the problem of determining the motion of three bodies moving under no influence but that of their mutual gravitation. No general solution of this problem is possible. As practically attacked it consists in the problem of determining

the perturbations or disturbances in the motion of one of the bodies around the principal or central body, pro- duced by the attraction of the third. Examples are the motion of the moon around the earth as disturbed by the action of the sun, and of one planet around the sun as disturbed by the action of another planet.

THREE RIVERS, or Trois Rivieres, a city and port of entry of Quebec, Canada, and capital of St Maurice county, situated at the confluence of the rivers St Maurice and St Lawrence. The St Maurice flows in from the north, and, being divided at its mouth by two islands, the channels give the town its name. It is on the line of the Canadian Pacific railway, 78 m. S.W. of Quebec and 92 m. N.E. of Montreal. Founded in 1634 by Champiain, Three Rivers is one of the oldest towns in Quebec. It is the centre of a large lumber trade, which is carried on along the St Maurice and its tributaries. Some miles from the city are the St Maurice forges, where iron wares were manufactured as early as the 17th century. Other industries are furniture- and cabinet-making, boot and shoe making, and those carried on in the brass and lead foundries, saw-mills, and carriage factories. The city is the seat of a Roman Catholic bishopric. A large trade is carried on in lumber, grain, cattle, &c, which are shipped to South America, the West Indies, Great Britain and the United States, and a great development has been caused by the utilization of the water-power of the St Maurice at Shawanegan, Grand Mere and other falls, for the manufacture of wood pulp. As a result, the population, long

stationary or slightly declining, increased from 8334 (1891) to 9981 (1901), and 12,730 (1906). The city was almost destroyed by fire on the 23rd of June 1908, but it was quickly rebuilt.

THRENODY, a lament written in verse, a dirge, a

funeral ode composed in honour of a dead personage. The word is an adaptation of the Greek Opr/vcpdia, a funeral dirge, from Oprjvos, lamentation, wailing, 8piop.ai, I cry aloud, and 4>5i7, a song, ode, qSew, to sing.

THRESHOLD, the door-sill, the piece of stone or wood which is placed at the bottom of a door, gate, or entrance to a house or other building. The word is used in psychology as the equiva- lent of Ger. Schwelle and of Lat. limen, i.e. the lowest limit of sensation, the point at which the intensity of sensation becomes just noticeable. Etymologically threshold (O. Eng. \>erscold, M. Eng.)jreswold) has usually been divided " thresh," i.e. thrash, beat, and wold, wald, wood; the word meaning the pieces of wood beaten or trampled by the feet. The termination, as is shown by the Old English form, has probably no connexion with wald, but is merely a suffix, as in O. H. Ger. driscufli, threshold. The first part is certainly " thrash," beat; some have supposed that in early times the entrance to a house was used as a threshing-floor.

THRIFT, economy in personal or domestic expenditure, the habit and practice of saving, careful or frugal management in money matters. The word, which is borrowed from Scan- dinavian languages, meant the condition of one who thrives or prospers (M. Eng. thriven, Icel. thrifa, to clutch, seize, Norw. iriva, seize). There are several species of plants, such as the sea-pink, Armeria maritima, or March rosemary (Statice) which from their vigorous growth are often termed " thrift."

THRING, EDWARD (1821-1887), English schoolmaster, was the son of John Gale Dalton Thring, rector of Alford, Somerset, and was born on the 19th of November 182 1. His elder brother was Henry, afterwards Lord, Thring (1818-1907) the distinguished Parliamentary counsel (1868-1886), who was made a peer in 1886. Edward was educated first at Ilminster grammar school and afterwards at Eton, where he became head of the school, and Captain of Montem in 1841, the last occasion on which that

ancient festival was celebrated. He then entered King's College, Cambridge, won the Porson Prize for Greek Verse, and was elected fellow. At that time King's College scholars retained the privilege of proceeding to a degree without examination, but Thring thought the maintenance of this usage inexpedient in the interests of learning and wholly indefensible in principle, and his vigorous protests against it aroused lively academic controversy, and became effective in 1 8s 1, when it was abolished. On leaving the university in 1846 he was ordained, and served for a short time as curate in Gloucester. Here he took remarkable interest in the elementary school of the parish, and ever afterwards attributed much of his professional success and his insight into educational principles and methods to the experience he had acquired in imparting the humble rudiments of learning to the children of the poor. After an interval of two or three years, spent partly in private tuition and partly as curate at Cookham Dean, he married in 1833 a daughter of Carl Koch, commissioner of customs at Bonn, and was elected to the mastership of Upping- ham School, a post which he retained until his death in 1887. That school had been founded in 1584, was slenderly endowed, poorly housed, and little known. Thring found only twenty-five boys in it, but he succeeded in raising it, both in numbers and repute^ to a position in the first rank among English public schools. He had a strong conviction that there should be a limit to the number of pupils entrusted to the care of one head master, and he fixed that limit at 300, although, owing to the increasing popularity of the school, he was under strong temptation to exceed it. Little by little he surrounded himself with a loyal staff of masters, raised money for the building and equipment of a noble schoolroom and chapel, besides class-rooms and eleven boarding-houses. Among the distinctive features of his plans and achievements were: (1) his strong sense of the need for a

closer study of the characteristics of individual boys than is generally found possible in large

public schools; (2) his resolute adherence to the discipline of the ancient languages, in connexion with English, as the staple of a liberal education; (3) his careful provision of a great variety of additional employments and interests, in studies and in games, to suit the aptitudes of different pupils; (4) the value he attached to the aesthetic side of school training, as evinced in the encouragement he gave to music and to drawing and to the artistic decoration of the schoolrooms; and above all (5) his rebellion against mere routine, and his constant insistence on the moral purpose of a school as a training-ground for character, rather than as a place solely concerning itself with the acquisition of knowledge. The vigour and intrepidity of his character were conspicuously shown in 1875, when an outbreak of fever made Uppingham for a time untenable, and when, at a few days' notice, he took a disused hotel and some boarding-houses at Borth, on the Cardiganshire coast, and transported the whole 300 boys, with 30 masters and their households, to it as to a city of refuge. Here the school was carried on with undiminished and even fresh zest and efficiency for fourteen months, during which needful sanitary measures were taken in the town.

Unlike Arnold, with whose moral earnestness and lofty edu- cational aims he was in strong sympathy, he took little or no part in outside controversies, political or ecclesiastical. All the activity of his life centred round the school. His was the first public school to establish a gymnasium, and the first to found a town mission in a district of South London, with a view to interest the boys in an effort to improve the social condition of the poor. He took the first step in 1869 in the formation of the Head Masters' Conference, an institution which has ever since done much to suggest improvements in method and to cultivate a sense of corporate life and mutual helpfulness among the teachers in the great schools. And in 1887 he took the bold and unpre- cedented step of inviting the Association of Head Mistresses to Uppingham, and giving to them a

sympathetic address. He also formed an association in Uppingham, with lectures, cookery classes, concerts, and other aids to the intellectual and social improvement of the residents of the little town. He gave valuable evidence before the Schools Inquiry Commission of Lord Taunton in 1866, but it was very characteristic of him that he dreaded the" intrusion of public authority, whether that of royal commissioners or of the legislature, into the domain of the school, wherein he thought it indispensable that the liberty and personal inventiveness and enthusiasm of teachers should have full scope and be hindered by no official regulations.

His contributions to literature were not numerous, but were all closely connected with his work as a schoolmaster. They were: Thoughts on Life Science (1869), written under the assumed name of Benjamin Place; Education and School (1864); The Theory and Practice of Teaching (1883); Uppingham School Sermons (1858) The Child's Grammar (1852); The Principles of Grammar (1868) Exercises in Grammatical Analysis (1868); School Songs (1858) Borth Lyrics, poems and translations (1887); and a volume of Miscellaneous Addresses, published after his death in 1887.

The fullest account of his life is that written by G. R. Parkin. (1898), containing copious extracts from his diary and letters, A Memory of Edward Thring; and Uppingham by the Sea, written by J. H. Skrine, the warden of Glenalmond, who was first a pupil and afterwards an assistant master at the school, presents a vivid and attractive picture of Thring's active life, and an affectionate and yet discriminating estimate of his character. Other particulars may be found in the chapter devoted to his biography in Sir Joshua Fitch's Educational Aims and Methods, and in Edward Thring, Teacher and Poet, by Canon H, D. Rawnsley. (J. G. F.)

THROAT (O. Eng. \rotu, \rote or \rota, possibly from \reotan, to press, whence threat, or, with loss of initial 5, connected with strut, to swell), the term applied to the front external part of the neck from

below the chin to the collar-bone in human and animal anatomy, and to the internal parts, which include the gullet, viz. the fauces, pharynx and oesophagus, and the wind- pipe, viz. the larynx and trachea (see Pharynx, Alimentary Canal, and Respiratory System: Anatomy; and for diseases see Pharyngitis, Laryngitis, Diphtheria, Tonsilitis and Oesophagus) .

THROCKMORTON (or Throgmorton), FRANCIS (igs-jp

1584), English conspirator, was the son of Sir John Throckmorton of Feckenham in Warwickshire, and his wife Margery Putten- ham. Sir John had been concerned in Wyat's rebellion against Queen Mary Tudor, but was afterwards known as a sympathizer with the Roman Catholic party in the reign of Queen Eliza- beth, and in 1580 was removed from his office of chief justice of Chester for irregularities in his office, but probably because he was suspected of disloyalty by the government. Francis was educated at Hart Hall, Oxford, which he entered in 1572. In 1576 he was enrolled in the Inner Temple. At Oxford he had come under the influence of the Roman Catholics, whose power was still great in the university, and must have heard of Edmund Campian (q.v.) who had left shortly before he him- self entered the university. When Campian and Parsons came to England in 1580 to conduct the Jesuit propaganda against Queen Elizabeth, Francis Throckmorton was one of a society of members of the Inner Temple who united to hide and help them. In that year he went abroad, first to join his brother Thomas, who was engaged with the exiled Roman Catholics in Paris, and then to travel in Italy and Spain. While abroad he consorted with exiled papists, and was undoubtedly engaged in treasonable intrigues. In 1583 he returned to act as the confidential agent of an elaborate conspiracy which had for its object the invasion of England by a French force under command of the duke of Guise, or

by Spaniards and Italians sent by Philip II. for the purpose of releasing the imprisoned Mary Queen of Scots and restoring the authority of the pope. Throck- morton possessed, or occupied, a house on Paul's wharf, London, which served as a meeting-place for the conspirators. Many plots were being carried on alongside of the chief one, and the suspicions of the government were aroused. Throckmorton's constant visits to the Spanish ambassador, Bernardino de Mendoza, attracted attention, and he was arrested in October 1583. He was ciphering a letter to Queen Mary when the constables came upon him suddenly, but he found time to send a casket of compromising papers by a trustworthy maidservant to Mendoza, and a card in cipher in which he promised to reveal nothing. As he refused to confess when brought before the council, he was put on the rack in the Tower. He resisted a first application of the torture, but his strength and courage failed when he was threatened with a second, and he made a full confession. At a later period he retracted and asserted that his avowals were false and had been extorted from him by pain, or had been put in his mouth by the examiners. His confession agreed, however, fully with what is known from other sources of the plot, and there can be no doubt that when his house was searched the constables found lists of his confederates, plans of harbours meant for use by foreign invaders, treatises in defence of the title of the Queen of Scots to the throne of England, and " infamous libels on Queen Elizabeth printed beyond seas." His trial, which in the circumstances was a mere formality, took place on the 21st of May 1584, and he was executed at Tyburn on the 10th of July. The arrest and confession of Throckmorton were events of great importance. They terrified the conspirators, who fled abroad in large numbers, and led to the expulsion of the Spanish ambassador and so to war with Spain.

THROCKMORTON (or Throgmorton), SIR NICHOLAS (1515-1571), English diplomatist and politician, was the fourth of eight sons of Sir George Throckmorton

of Congleton in Warwickshire, and uncle of the conspirator Francis Throck- morton (see above). He was brought up in the household of Catherine Parr, the last wife of Henry VIII. In his youth he was favourable to the reformers in religion. He sat in par- liament from 1545 to 1567. During the reign of Edward VI. he was in high favour with the regents. In 1547 he was present at the battle of Pinkie during the invasion of Scotland. When on the death of Edward VI. an attempt was made to place Lady Jane Grey on the throne, he contrived to appear as the friend of both parties, and secured the favour of Queen Mary Tudor. He was, however, suspected of complicity in Wyat's

rebeUi^in ^$j4.,,pjad,.w^s brought ,t;o trial at the Guildhall on the 17th of Apri} ,;ofc $at year. > By defence, readiness of wit, and adroit flattery of the jury he : cori^^t*) MC»ju;e his acquittal in the face of the open hostility of. the judge^&^uimw achievement at a time when the condemnation of .'.pifeoin$& whom the authorities wished to convict was a mere matter of course. The jurymen were fined and sent to prison, and Throck- morton was detained in the Tower till the following year. There was some talk of bringing him to trial again, but he made his peace, and was employed by Queen Mary. After the accession of Elizabeth he rose rapidly into favour. He became chamber- lain of the exchequer, and from May 1559 to April 1564 he was ambassador in France. During the latter part of this period he was associated with Sir Thomas Smith, whose function was at least partly to watch and check his fellow-ambassador. It was in these years that Throckmorton became acquainted with Mary Queen of Scots. He had to conduct the delicate nego- tiations which accompanied her return to Scotland, and though he was a supporter of the reformers on political grounds, he became her personal friend and was always willing to do her service. As ambassador in France he exerted himself to induce Elizabeth to aid the Huguenots, and took a part in the war of religion. He was taken prisoner by the Catholic leader, the duke of Guise. After his return to

England he was sent as ambassador to Scotland in May 1565. The mission entrusted to him was to prevent Queen Mary's marriage with Darnley, which however he was unable to do. After the murder of Darnley he was again sent to Scotland in June 1567 on a still more hopeless mission than the first. He was instructed to persuade the Scottish barons who had just imprisoned the queen to restore her to her authority. His known friendship for Queen Mary and his constant support of her claim to be recognized as Elizabeth's successor, made him a very unwelcome representative of England in that crisis. Moreover, the queen of England in- creased his difficulties by making him the bearer of offensive messages to the barons, and by contradictory instructions. He cannot have undertaken his task with much zeal, for his own opinion was that Elizabeth would consult her interests best by supporting the barons. In Edinburgh Throckmorton could effect little, but he exerted himself to secure the personal safety of the queen. He offended his mistress by showing his instructions to the Scottish barons, and was recalled in August. In 1569 he fell under suspicion during the duke of Norfolk's conspiracy in favour of Mary, and was imprisoned for a time at Windsor, but was not further proceeded against. He died on the 12th of February 1571. Sir Nicholas married Anne Carew, and his daughter Elizabeth became the wife of Sir Walter Raleigh.

THRONE, a royal, viceregal, or episcopal chair of state stand- ing upon a dais or platform. Formerly the platform, with the steps leading up to it, was comprised in the significance of the word — hence the familiar expression to " mount the throne." The ceremonial induction of a sovereign into his throne is one of the usual solemnities of a coronation, while enthronization of the bishop in his cathedral is the final observance in the making of a diocesan. The throne, which is of immemorial antiquity, is the universal ancestor of all chairs, which were for long symbols of authority and rule. In early days and in Oriental countries thrones were of barbaric magnificence. Solomon's was of ivory " overlaid with

the best gold." There were two figures of lions at the sides, with two other lions on each of the six steps. The remains of a throne in rock-crystal were found in the ruins of Sennacherib's palace. The Persian throne made for Abbas the Great was of white marble. This monarch appears to have had a nice taste in thrones, for in 1605 he presented one to the Russian tsar Boris which is covered with sheets of gold and decorated with precious stones and pearls. Tsar Michael Feodorovitch, grandfather of Peter the Great, outdid even this magnificence, for his " golden throne" is set with eight thousand turquoises, fifteen hundred rubies, four great amethysts and two large topazes. One of the glories of Delhi, until it was sacked by Nadir Shah, was the "peacock throne," the vajue

of which was estimated, perhaps with some Eastern exuberance, at twelve millions sterling. It was ascended by silver steps and stood on golden feet set with jewels. It obtained its name from the two open peacocks' tails composed of magnificent diamonds, rubies, and other stones which formed part of its appurtenances. Apparently it was made for Shah Jahan by the French designer of the Taj Mahal. According to that veracious chronicler, Sir John Mandeville, the seven steps of the throne of Prester John were respectively of onyx, crystal, green jasper, amethyst, sardonyx, cornelian and chrysolite. They were bordered with gold and set with pearls. The throne itself was of gold enriched with jewels. Ranjit Singh's golden throne — it is of wood covered with plates of gold — is in the possession of the British Crown. European thrones were usually more modest in concep- tion and less barbaric in execution than those, real or legendary, of the East. The medieval emperors of Byzantium had, how- ever, imbibed a good deal of the Orient, and their famous throne, which is supposed to have been imitated from, as well as named after, that of Solomon, was guarded by golden lions, which rose to

their feet and roared when some artful mechanism was set in motion. An exceedingly ancient chair of state is the so-called throne of Dagobert (see Chair). The most recent writers on this remarkable relic suggest that it is a bronze copy of Dagobert's golden throne. However that, may be, there can be no doubt that it possesses at least one illustrious modern association, for Napoleon sat in it when he distributed the first decorations of the Legion of Honour in his camp at Boulogne in 1804. The throne which Napoleo' . had made for himself was a heavy gilded chair with an abundance of Egyptian orna-ment, lions' heads and imperial eagles. One of the many curiosities of a conclave for the electing of a Pope is that every cardinal present occupies a throne, since, during the vacancy of the Holy See, each member of the Sacred College is a potential sovereign. When the election has taken place the canopy of every throne is lowered, with the exception of that occupied by the new pontiff. The palaces of the great Roman nobles contained — and still in some cases contain — a throne for use in the event of a visit from the pope. The papal throne itself is an antique bronze chair which stands in St Peter's. Embassies frequently contain a throne for the use of the sovereign in whose territory the building technically stands. No ancient throne-chair pertains to the British monarchy; the coronation chair is not, properly speaking, a throne, since it is used only during a portion of the coronation ceremonies. The actual throne of Great Britain is the oaken Gothic chair in the House of Lords occupied by the sovereign at the opening and prorogation of parliament. _ ;

THRUM-EYED, a botanical term for flowers which occur in two forms, one of which shows the stamens in the mouth of the cbrolla, as in the primrose, contrasted with pin-eyed (g.v.).

THRUSH (A. S. prysce, Icel. prdstr, Norw. Trast, O. H. Ger. Drosce, whence the mod. Ger. Prossel, to be compared with the analogous English form Throstle, 1 now almost obsolete, both being apparently diminutives), the name that in England seems to have

been common to two species of birds, the first now generally distinguished as the song-thrush, but known in many districts as the mavis, 2 the second called the mistletoe- thrush, but having many other local designations, of which more presently.

The former of these is one of the finest songsters in Europe, but it is almost everywhere so common that its merits in this respect are often disregarded, and not unfrequently its melody, when noticed, is ascribed to the prince of feathered vocalists, the nightingale {q.v.). In the spring and summer there is hardly a field, a copse or a garden that is not the resort of a pair or more of song-thrushes; and the brown-backed bird with its spotted

1 For many Interesting facts connected with the words ” thrush ” and ” throstle ” which cannot be entered upon here, the reader should consult Professor Skeat’s Etymological Dictionary.

2 Cognate with the French mauvis, though that is nowadays almost restricted to the redwing. Its diminutive is mauviette, the modern table-name of the skylark, and perhaps mavis was in English originally the table-name of the thrush.

breast, hopping over the grass for a few yards, then pausing to detect the movement of a worm, and vigorously seizing the same a moment after, is one of the most familiar sights. Hardly less well-known is the singular nest built by this bird — a deep cup, lined with a thin but stiff coating of fragments of rotten wood, ingeniously spread, and plastered so as to present a smooth interior — in which its sea-green eggs spotted with black are laid. An early breeder, it builds nest after nest during the season, and there can be few birds moie prolific. Its ravages on ripening fruits, especially strawberries and gooseberries, excite the enmity of the imprudent gardener who leaves his crops unprotected by nets, but he would do well to stay the hand of revenge, for no bird can or does destroy so many snails, as is testified to the curious observer on inspection of the stones that it selects

against which to dash its captures — stones that are besmeared with the slime of the victims and bestrewn with the fragments of their shattered shells. Nearly all the young thrushes reared in the British Islands — and this expression includes the storm-swept isles of the Outer Hebrides, though not those of Shetland — seem to emigrate as, soon as they are fit to journey, and at a later period they are followed by most of their parents, so that many parts of the kingdom are abso- lutely bereft of this species from October to the end of January. On the continent of Europe the autumnal influx of the birds bred in the North is regarded with much interest, for they are easily ensnared and justly esteemed for the table, while their numbers make their appearance in certain districts a matter of great importance. - •

The second species to which the name applies is distinguished as the mistletoe-thrush, or, by corrupt abbreviation, the missel- thrush. 3 It is known also in many districts as the " storm-cock," from its habit of singing in squally weather that silences almost all other birds, and " holm-(i.e. holly-) thrush" ; while the harsh cries it utters when angry or alarmed have given it other local names, as " screech," " shrite" and " skrike," all traceable to the Anglo-Saxon Scric. 1 This is a larger species than the last, of paler tints, and conspicuous in flight by the white patches on its outer tail-feathers. Of bold disposition, and fearless of the sleety storms of spring, as of pred.atory birds, the cock will take his stand on a tall tree, " like an enchanter calling up the gale " (as Knapp happily wrote), and thence with loud voice proclaim in wild and discontinuous notes the fervour of his love for his mate; nor does that love cease when the breeding-season is past, since this species is one of those that appear to pair for life, and even when, later in the year, it gathers in small flocks, husband and wife may be seen in close company. In defence of nest and offspring, too, few birds are more resolute, and the daw, pie or jay that approaches with an ill intent speedily receives treatment that causes a rapid retreat, while even

the marauding cat finds the precincts of the "master of the coppice," {Pen y llwyn), as the Welsh name this thrush, unsuitable for its stealthy operations. The connexion of this bird with the mistletoe, which is as old as the days of Aristotle, is no figment, as some have tried to maintain. Not only is it exceedingly fond of the luscious viscid berries, but it seems to be almost the only bird that will touch them.

The thrushes form a distinct family, Turdidae, of the Oscines division of perching birds, and are now divided into five sub- families: (1) Turdinae, or true thrushes and their immediate allies, the ousel {q.v.), the fieldfare {q.v.), the redwing {q.v.), the rock-thrushes {Monticola), the wheatears, stonechats, whinchats (see Wheatear), the redstarts {q.v.), robins (see Redbreast), and

3 There is no doubt of the bird taking its name from the plant mistletoe {Viscum album), about the spelling of which there can be no uncertainty — A. S. Misteltan, the final syllable originally signifying " twig," and surviving in the modern " tine," as of a fork or of a deer's antler.

4 It seems quite possible that the word shrike, though now commonly accepted as the equivalent, in an ornithological sense, of Lanius, may have been originally applied to the mistletoe-thrush. In several of the Anglo-Saxon Vocabularies dating from the 8th to the nth century, as printed by Thomas Wright, the word Scric, which can be hardly anything else than the early form of " shrike," is glossed Turdus.

hedge-sparrows (see Sparrow). In these, as opposed to the warblers, the young are spotted. (2) Myiodectinae, a small group, chiefly South American, with strong bristles round the gape. (3) Sylviinae (see Warblers). (4) Polioptilinae or gnat-catchers

of North and South America. (5) Miminae or mocking-birds (q.v.). The so- called ” babbling-thrushes ” which occur throughout the Old World are usually referred to a distinct family, the Timeliidae, characterized by strong bills and feet, and short, rounded and in- curved wings. The ” ant thrushes ” belong to a different family (see Pitta). (A. N.)

THUCYDIDES (®ovicv8i$ris) , Athenian historian. Materials for his biography are scanty, and the facts are of interest chiefly as aids to the appreciation of his life’s labour, the History of the Peloponnesian War. The older view that he was probably born in or about 471 B.C., is based on a passage of Aulus Gellius, who says that in 431 Hellanicus “seems to have been” sixty-five years of age, Herodotus fifty-three and Thucydides forty (Noel. alt. xv. 23). The authority for this statement was Pamphila, a woman of Greek extraction, who compiled bio- graphical and historical notices in the reign of Nero. The value of her testimony is, however, negligible, and modern criticism inclines to a later date, about 460] (seeBusolt, Gr. Gesch. iii., pt. 2, p. 621). Thucydides’ father Olorus, a citizen of Athens, belonged to a family which derived wealth and influence from the possession of gold-mines at Scapte Hyle, on the Thracian coast opposite Thasos, and was a relative of his elder namesake, the Thracian prince, whose daughter Hegesipyle married the great Miltiades, so that Cimon, son of Miltiades, was possibly a connexion of Thucydides (see Busolt, ibid., p. 618). It was in the vault of the Cimonian family at Athens, and near the remains of Cimon’s sister Elpinice, that Plutarch saw the grave of Thucydides. Thus the fortune of birth secured three signal advantages to the future historian: he was rich; he had two homes — one at Athens, the other in Thrace — no small aid to a comprehensive study of the conditions under which the Pelo- ponnesian War was waged; and his family connexions were likely to bring him from his early years into personal intercourse with the men who were shaping the history of his time.

The development of Athens during the middle of the

5th century was, in itself, the best education which such a mind as that of Thucydides could have received. The expansion and consolidation of Athenian power was completed, and the inner resources of the city were being applied to the embellishment and ennoblement of Athenian life (see Cimon; Pericles). Yet the History tells us nothing of the literature, the art or the social life under whose influences its author had grown up. The " Funeral Oration " contains, indeed, his general testimony to the value and the charm of those influences. But he leaves us to supply all examples and details for ourselves. Beyond a passing reference to public " festivals," and to " beautiful surroundings in private life," he makes no attempt to define those " recreations for the spirit " which the Athenian genius had provided in such abundance. He alludes to the newly- built Parthenon only as containing the treasury; to the statue of Athena Parthenos which it enshrined, only on account of the gold which, at extreme need, could be detached from the image; to the Propylaea and other buildings with which Athens had been adorned under Pericles, only as works which had re- duced the surplus of funds available for the war. He makes no reference to Aeschylus, Sophocles, Euripides, Aristophanes; the architect Ictinus; the sculptor Pheidias; the physician Hippo- crates; the philosophers Anaxagoras and Socrates. Herodotus, if he had dealt with this period, would have found countless occasions for invaluable digressions on men and manners, on letters and art; and we might almost be tempted to ask whether his more genial, if laxer, method does not indeed correspond better with a liberal conception of the historian's office. No one can do full justice to Thucydides, or appre- ciate the true completeness of his work, who has not faced this question, and found the answer to it.

It would be a hasty judgment which inferred from the omis-

1 Christ {Gesch. der griech. Litt.) gives the date of birth as " about

sions of the History that its author’s interests were exclusively political. Thucydides was not writing the history of a period. His subject was an event — the Peloponnesian War — a war, as he believed, of unequalled importance, alike in its direct results and in its political significance for all time. To his task, thus defined, he brought an intense concentration of all his faculties. He worked with a constant desire to make each successive incident of the war as clear as possible. To take only two instances: there is nothing in literature more graphic than his description of the plague at Athens, or than the whole narrative of the Sicilian expedition. But the same temper made bim resolute in excluding irrelevant topics. The social life of the time, the literature and the art did not belong to his subject.

The biography which bears the name of Marcellinus states that Thucydides was the disciple of Anaxagoras in philosophy and of Antiphon in rhetoric. There is no evidence to confirm this tradition. But Thucydides and Antiphon at least belong to the same rhetorical school and represent the same early stage of Attic prose. Both writers used words of an antique or decidedly poetical cast; both point verbal contrasts by insisting on the precise difference between terms of similar import; and both use metaphors somewhat bolder than were congenial to Greek prose in its riper age. The differences, on the other hand, between the style of Thucydides and that of Antiphon arise chiefly from two general causes. First, Antiphon wrote for hearers, Thucydides for readers; the latter, consequently, can use a degree of condensation and a freedom in the arrangement of words which would have been hardly possible for the former. Again, the thought of Thucydides is often more complex than any which Antiphon undertook to interpret; and the greater intricacy of the historian’s style exhibits the endeavour to express each thought. 2 Few things in the history of literary prose are more interesting than to watch that vigorous mind in its

struggle to mould a language of magnificent but immature capabilities. The obscurity with which Thucydides has sometimes been reproached often arises from the very clearness with which a complex idea is present to his mind, and his strenuous effort to present it in its entirety. He never sacrifices thought to language, but he will sometimes sacrifice language to thought. A student may always be consoled by the reflection that he is not engaged in unravelling a mere rhetorical tangle. Every light on the sense will be a light on the words; and when, as is not seldom the case, Thucydides comes victoriously out of this struggle of thought and language, having achieved perfect expression of his meaning in a sufficiently lucid form, then his style rises into an intellectual brilliancy — thoroughly manly, and also penetrated with intense feeling — which nothing in Greek prose literature surpasses.

The uncertainty as to the date of Thucydides' birth renders futile any discussion of the fact that before 431 he took no prominent part in Athenian politics. If he was born in 455, the fact needs no explanation; if in 471, it is possible that his opportunities were modified by the necessity of frequent visits to Thrace, where the management of such an important property as the gold-mines must have claimed his presence. The manner in which he refers to his personal influence in that region is such as to suggest that he had sometimes resided there (iv. 105, 1). He was at Athens in the spring of 430, when the plague broke out. If his account of the symptoms has not enabled physicians to agree on a diagnosis of the malady, it is at least singularly full and vivid. He had himself been attacked by the plague; and, as he briefly adds, " he had seen others suffer." The tenor of his narrative would warrant the inference that he had been one of a few who were active in ministering to the sufferers.

The turning-point in the life of Thucydides came in the winter of 424. He was then forty seven (or, according to Busolt, about thirty-six), and for the first time he is found holding an official position.

He was one of two generals entrusted with the com- mand of the regions towards Thrace (to. exi ©p^ktjs), a phrase which denotes the whole Thracian seaboard from Macedonia 2 See Jebb's Attic Orators, i. 35.

eastward to the vicinity of the Thracian Chersonese, though often used with more special reference to the Chalcidic penin- sula. His colleague in the command was Eucles. About the end of November 424 Eucles was in Amphipolis, the stronghold of Athenian power in the north-west. To guard it with all possible vigilance was a matter of peculiar urgency at that moment. The ablest of Spartan leaders, Brasidas (q.v.), was in the Chalcidic peninsula, where he had already gained rapid success; and part of the population between that penmsula and Amphipolis was known to be disaffected to Athens. Under such circumstances we might have expected that Thucydides, who had seven ships of war with him, would have been ready to co-operate with Eucles. It appears, however, that, with his ships, he was at the island of Thasos when Brasidas suddenly appeared before Amphipolis. Eucles sent in all haste for Thucy- dides, who arrived with his ships from Thasos just in time to beat off the enemy from Eion at the mouth of the Strymon, but not in time to save Amphipolis. The profound vexation and dismay felt at Athens found expression in the punishment of Thucydides, who was exiled. Cleon is said to have been the prime mover in his condemnation; and this is likely enough.

From 423 to 404 Thucydides lived on his property in Thrace, but much of his time appears to have been spent in travel. He visited the countries of the Peloponnesian allies— recom- mended to them by his quality as an exile from Athens; and he thus enjoyed the rare advantage of contemplating the war from various points of view. He speaks of the increased leisure which his banishment secured to his study of

events. He refers partly, doubtless, to detachment from Athenian politics, .partly also, we may suppose, to the opportunity of visiting places signalized by recent events and of examining their topography. The local knowledge which is often apparent in his Sicilian books may have been acquired at this period. The mind of Thucy- dides was naturally judicial, and his impartiality— which seems almost superhuman by contrast with Xenophon's Hellenica— was in some degree a result of temperament. But it cannot be doubted that the evenness with which he holds the scales was greatly assisted by his experience during these years of

exile

His own words make it clear that he returned to Athens, at least for a time, in 404, though the precise date is uncertain. The older view (cf. Classen) was that he returned some six months after Athens surrendered to Lysander. More probably he was recalled by the special resolution carried by Oenobius prior to the acceptance of Lysander's terms (Busolt, ibid., p. 628). He remained at Athens only a short time, and retired to his property in Thrace, where he lived till his death, working at his History. The preponderance of testimony certainly goes to show that he died in Thrace, and by violence. It would seem that, when he wrote chapter 116 of his third book, he was ignorant of an eruption of Etna which took place in 396. There is, indeed, strong reason for thinking that he did not live later than 399. His remains were brought to Athens and laid in the vault of Cimon's family, where Plutarch (Cimon, 4) saw their resting-place. The abruptness with which the History breaks off agrees with the story of a sudden death. The historian's daughter is said to have saved the unfinished work and to have placed it in the hands of an editor. This editor, according to one account, was Xenophon, to whom Diogenes Laertius (ii. 6, 13) assigns the credit of having " brought the work into reputa- tion, when he might have suppressed it." The tradition is, how- ever, very doubtful; it may have been suggested by a feeling that' no one then living

could more appropriately have discharged the office of literary executor than the writer who, in his Hellenica, continued the narrative.

The History.— At the outset of the History Thucydides indicates his general conception of his work, and states the principles which governed its composition. His purpose had been formed at the very beginning of the war, in the conviction that it would prove more important than any event of which Greeks had record. The leading belligerents, Athens and Sparta, were both in the highest condition of effective equipment. The whole Hellenic world- including Greek settlements outside of Greece proper — was divided

into two parties, either actively helping one of the two combatants or meditating such action. Nor was the movement confined within even the widest limits of Hellas; the " barbarian 'world also was affected by it— the non- Hellenic populations of Thrace, Macedonia, Epirus, Sicily and, finally, the Persian kingdom itself. The aim of Thucydides was to preserve an accurate record of this war, not only in view of the intrinsic interest and importance of the facts, but also in order that these facts might be permanent sources of political teaching to posterity. His hope was, as he says, that his History would be found profitable by " those who desire an exact knowledge of the past as a key to the future, which in all proba- bility will repeat or resemble the past. The work is meant to be a possession for ever, not the rhetorical triumph of an hour. As this context shows, the oft-quoted phrase, " a possession for ever, had in its author's meaning, a more definite import than any mere anticipation of abiding fame for his History. It referred to the permanent value of the lessons which his History contained.

Thucydides stands alone among the men of his own days, and has no superior of any age, in the width of mental grasp which could seize the general significance of particular events. The political education of mankind began in Greece, and in the

time of Thucy- dides their political life was still young. Thucydides knew only the small city-commonwealth on the one hand, and on the other the vast barbaric kingdom; and yet, as has been well said of him, ” there is hardly a problem in the science of government which the statesman will not find, if not solved, at any rate handled, in the pages of this universal master.” 1 …

Such being the spirit in which he approached his task, it is interesting to inquire what were the points which he himself con- sidered to be distinctive in his method of executing it. WsPrede . His Greek predecessors in the recording of events had cessofs been, he conceived, of two classes. First, there were the epic poets, with Homer at their head, whose characteristic tendency, in the eyes of Thucydides, is to exaggerate the greatness or splendour of things past. Secondly, there were the Ionian prose writers whom he calls “chroniclers” (see Logographi), whose general object was to diffuse a knowledge of legends preserved by oral tradition and of written documents— usually lists of officials or genealogies — preserved in public archives; and they published their materials as they found them, without criticism. Thucydides describes their work by the word {.vvriBivat., but his own by Zvyypafaiv— the difference between the terms answering to that between compilation of a somewhat mechanical kind and historical composition in a higher sense. The vice of the ” chroniclers, in his view, is that they cared only for popularity, and took no pains to make their narratives trustworthy. Herodotus was presumably regarded by him as in the same general category.

In contrast with these predecessors Thucydides has subjected his materials to the most searching scrutiny. The ruling principle of his work has been strict adherence to carefully Dlstlactlre verified facts. “As to the deeds done in the war, Mm of I have not thought myself at liberty to record them on Thucydides. hearsay from the first informant or on arbitrary con- jecture. My account rests either on personal knowledge or on the closest possible

scrutiny of each statement made by others. The process of research was laborious, because conflicting accounts were given by those who had witnessed the several events, as partiality swayed or memory served them."

It might be supposed that the speeches which Tnucydides has introduced into his History conflict with this standard of scientific accuracy; it is, therefore, well to consider their nature Tfifi and purpose rather closely. The speeches constitute Speecbes . between a fourth and a fifth part of the History. _ If they were eliminated, an admirable narrative would indeed remain, with a few comments, usually brief, on the more striking characters and events. But we should lose all the most vivid light on the inner workings of the Greek political mind, on the motives of the actors and the arguments which they used — in a word, on the whole play of contemporary feeling and opinion. To the speeches is due in no small measure the^ imperishable intellectual interest of the History, since it is chiefly by the speeches that the facts of the Peloponnesian War are so lit up with keen thought as to become illustrations of general laws, and to acquire a permanent suggestive- ness for the student of politics. When Herodotus made his persons hold conversations or deliver speeches, he was following the pre- cedent of epic poetry; his tone is usually colloquial rather than rhetorical; he is merely making thought and motive vivid in the way natural to a simple age. Thucydides is the real founder of the tradition by which historians were so long held to be warranted in introducing set speeches of their own composition. His own account of his practice is given in the following words: ' As to the speeches made on the eve of the war, or in its course, 1 have found it difficult to retain a memory of the precise words which I had heard spoken ; and so it was with those who brought me reports

1 Freeman, Historical Essays, 2nd series, vol. iii. ; on the genera] questions of the structure of the work and the view of the wai which it represents see Peloponnesian War; and Greece Ancient History, $

The Greek View.

But I have made the persons say what it seemed to me most op- portune for them to say in view of each situation ; at the same time I have adhered as closely as possible to the general sense of what was actually said." So far as the language of the speeches is concerned, then, Thucydides plainly avows that it is mainly or wholly his own. As a general rule, there is little attempt to mark different styles. The case of Pericles, whom Thucydides must have repeatedly heard, is probably an exception; the Thucydidean speeches of Pericles offer several examples of that bold imagery which Aristotle and Plutarch agree in ascribing to him, while the " Funeral Oration," especially, has a certain majesty of rhythm, a certain union of impetuous movement with lofty grandeur, which the historian has given to no other speaker. Such strongly marked characteristics as the curt bluntness of the Spartan ephor Sthene- laidas, or the insolent vehemence of Alcibiades, are also indicated. But the dramatic truth of the speeches generally resides in the matter, not in the form. In regard to those speeches which were delivered at Athens before his banishment in 424 — and seven such speeches are contained in the His/ory— Thucydides could rely either on his own recollection or on the sources accessible to a resident citizen. In these cases there is good reason to believe that he has reproduced the substance of what was actually said. In other cases he had to trust to more or less imperfect reports of the " general sense "; and in some instances, no doubt, the speech represents simply his own conception of what it would have been " most opportune " to say. The most evident of such instances occur in the addresses of leaders to their troops. The historian's aim in these military harangues — which are usually short — is to bring

out the points of a strategical situation; a modern writer would have attained the object by comments prefixed or subjoined to his account of the battle. The comparative indifference of Thucydides to dramatic verisimilitude in these military orations is curiously shown by the fact that the speech of the general on the one side is sometimes as distinctly a reply to the speech of the general on the other as if they had been delivered in debate. We may be sure, however, that, wherever Thucydides had any authentic clue to the actual tenor of a speech, he preferred to follow that clue rather than to draw on his own invention.

Why, however, did he not content himself with simply stating, in his own person, the arguments and opinions which he conceived to have been prevalent? The question must be viewed from the standpoint of a Greek in the 5th century B.C. Epic poetry had then for many generations exercised a powerful influence over the Greek mind. Homer had accustomed Greeks to look for two elements in any complete expression of human energy — first, an account of a man's deeds, then an image of his mind in the report of his words. The Homeric heroes are exhibited both in action and in speech. Further, the contemporary readers of Thucydides were men habituated to a civic life in which public speech played an all-important part. Every adult citizen of a Greek democracy was a member oi the assembly which debated and decided great issues. The law courts, the festivals, the drama, the market-place itself, ministered to the Greek love of animated description. To a Greek of that age a written history of political events would have seemed strangely insipid if speech " in the first person " had been absent from it, especially if it did not offer some mirror of those debates which were inseparably associated with the central interests and the decisive moments of political life. In making historical persons say what they might have said, Thucydides confined that oratorical licence to the purpose which is its best justification: with him it is strictly dramatic, an aid to the complete presentment of action, by the

vivid expression of ideas and arguments which were really current at the time. Among later historians who continued the practice, Polybius, Sallust and Tacitus most resemble Thucydides in this particular; while in the Byzantine historians, as in some moderns who followed classical precedent, the speeches were usually mere occasions for rhetorical display. Botta's History of Italy from 1780 to 1814 affords one of the latest examples of the practice, which was peculiarly suited to the Italian genius.

The present division of the History into eight books is one which might well have proceeded from the author himself, as being a natural and convenient disposition of the contents. TneEfgat -pjj e jj rs(. j 300] Ci a ft er a general introduction, sets forth 00 s " the causes of the Peloponnesian War. The first nine years of the war are contained in the second, third and fourth books — three years in each. The fifth book contains the tenth year, followed by the interval of the " insecure peace." The Sicilian expedition fills the sixth and seventh books The eighth books opens that last chapter of the struggle which is known as the " Decelean " or " Ionian " War, and breaks off abruptly — in the middle of a sentence, indeed — in the year 411.

The principal reason against believing that the division into eight books was made by Thucydides himself is the fact that a Oriri t different division, into thirteen books, was also current zZf" ' n antiquity, as appears from Marcellinus (§ 58). It is

Division verv improbable — indeed hardly conceivable — that this should have been the case if the eight-book division had come down from the hand of the author. We may infer, then,

that the division of the work into eight books was introduced at Alexandria — perhaps in the 3rd or 2nd century B.C. That division was already familiar to the grammarians of the Augustan age. Dionysius of Halicarnassus, who recognizes it, has also another mode of indicating portions of the work, viz. by

stichomelria, or the number of lines which they contained. Thus, in the MS. which he used, the first 87 chapters of book i. contained about 2000 lines (equivalent to about 1700 lines in Bekker's stereotyped 8vo text). (On the order of composition, see Peloponnesian War, ad init.; and Greece: Ancient History, § Authorities).

The division of the war by summers and winters (kotA 0!pos koY XiiH&va) — the end of the winter being considered as the end of the year — is perhaps the only one which Thucydides him- self used, for there is no indication that he made any " lo ° eof

Reckoning Time.

division of the History into books. His " summer includes spring and autumn and extends, generally speaking, from March or the beginning of April to the end of October. His " winter " — November to February inclusive — means practi- cally the period during which military operations, by land and sea, are wholly or partly suspended. When he speaks of " summer " and " winter " as answering respectively to " half " the year (v. 20, 3), the phrase is not to be pressed: it means merely that he divides his year into these two parts. The mode of reckoning is essentially a rough one, and is not to be viewed as if the commencement of summer or of winter could be precisely fixed to constant dates. For chronology, besides the festivals, he uses the Athenian list of archons, the Spartan list of ephors and the Argive list of priestesses of Hera.

There is no reference to the History of Thucydides in the extant Greek writers of the 4th century B.C. ; but Lucian has preserved a tradition of the enthusiasm with which it was studied by Demos- thenes. The great orator is said to have copied it out eight times, or even to have learnt it by heart. The Alexandrian critics acknow- ledged Thucydides as a great master of Attic. Sallust, Cornelius Nepos, Cicero and Quintilian are among the Roman writers whose admiration for him can be traced in their work, or has been ex- pressly recorded. The most

elaborate ancient criticism on the diction and composition of Thucydides is contained in three essays by Dionysius of Halicarnassus.

Among the best MSS. of Thucydides, the Codex vaticanus 126 (nth century) represents a recension made in the Alexandrian or Roman age. In the first six books the number of MSS jj„ passages in which the Vaticanus alone has preserved ”

a true reading is comparatively small; in book vii. it is somewhat larger; in book viii. it is so large that here the Vaticanus, as com- pared with the other MSS., acquires the character of a revised text. Other important MSS. are the Palatinus 252 (nth century); the Casselanus (a.d. 1252) ; the Augustanus monacensis 430 (a.d. 1301). A collation, in books i., ii., of two Cambridge MSS. of the 15th century (Nn. 3, 18; Kk. 5, 19) has been published by Shilleto. Several Parisian MSS. (H. C. A. F.), and a Venetian MSS. (V.) collated by Arnold, also deserve mention. The Aldine edition was published in 1502. It was formerly supposed that there had been two Juntine editions. Shilleto, in the ” Notice ” prefixed to book i., first pointed out that the only Juntine edition was that of 1526, and that the belief in an earlier Juntine, of 1506, arose merely from the accidental omission of the word vicesimo in the Latin version of the imprint. Some papyrus fragments were published in Grenfell and Hunt’s Oxyrhynchus papyri (1908), vi., which also contains an anonymous commentary (pub. 1st century) on Thuc. ii.

The most generally useful edition is Classen’s, in the Weidmann Series (1862-1878; new ed. by Steup, 1882-1892) ; each book can be obtained separately. Arnold’s edition (1848-1851) contains much that is still valuable. For books i. and ii. Shilleto’s edition (1872- 1876) furnishes a commentary which, though not full, deals admir- ably with many difficult points. Among other important complete editions, it is enough to name those of Duker, Bekker, Goeller, Poppo and Kriiger. For editions of separate books and selections (up to 1895) see J. B.

Mayor's Guide to the Choice of Classical Books. Special mention may be made of those by E. C. Marchant. Later editions of the text are by H. Stuart Jones (1900-1901), in the Oxford Scriptorum classicorum bibliotheca, and C. Hude (Teubner Series," 1 901; ed. minor, 1903). Betant's lexicon to Thucydides (1843) is well executed. Jowett's translation (1883) is supplemented by a volume of notes. Dale's version (Bohn) also deserves mention for its fidelity, as Crawley's (1876) for its vigour. Hellenica (1880) contains an essay on " The Speeches of Thucydides," which has been translated into German (see Eduard Meyer, Forschuneen zur alten Geschichte, Bd. ii. pp. 269-436). The best clue to Thucydidean bibliography is in Engelmann's Scriptores graeci (1880), supple- mented by the articles by G. Meyer, in Bursian's Jahresbericht, (1895) lxxix., (1897) lxxxviii. Busolt, Griechische Geschichte, iii. 616-693, is invaluable. For the life of Thucydides, U. von Wilamo- witz-Moellendorff, " Die Thukydides-Legende," Hermes, (1878) xii., all important. All works on ancient Greek History contain

criticism is that of F. M. Cornford,

discussions of Thucydides, and an interesting J. B. Bury, Ancient Greek Historians (1909)

Thucydides mythisloricus (1907), sought to prove that the. History is really only an historical tragedy, i.e. a dramatized version of the facts, but this view has not been adopted. (R. C. J.; J. M. M.)

THUGS. That the Sanskrit root sthag (Pali, thak), to cover, to conceal, was mainly applied to fraudulent concealment, ap- pears from the noun sthaga, a cheat, which has retained this signification in the modern vernaculars, in all of which it has assumed the form thag (commonly written thug), with a specific meaning. The Thugs were a well-organized

confede- racy of professional assassins, who in gangs of whom 10 to 200 travelled in various guises through India, wormed themselves into the confidence of wayfarers of the wealthier class, and, when a favourable opportunity occurred, strangled them by throwing a handkerchief or noose round their necks, and then plundered and buried them. All this was done according to certain ancient and rigidly prescribed forms and after the performance of special religious rites, in which the consecration of the pickaxe and the sacrifice of sugar formed a prominent part. From their using the noose as an instrument of murder they were also frequently called Phansigars, or " noose-operators." Though they them- selves trace their origin to seven Mahommedan tribes, Hindus appear to have been associated with them at an early period; at any rate, their religious creed and practices as stanch wor- shippers of Kali (Devi, Durga), the Hindu goddess of destruction, had certainly no flavour of Islam in them. Assassination for gain was with them a religious duty, and was considered a holy and honourable profession. They had, in fact, no idea of doing wrong, and their moral feelings did not come into play. The will of the goddess by whose command and in whose honour they followed their calling was revealed to them through a very complicated system of omens. In obedience to these they often travelled hundreds of miles in company with, or in the wake of, their intended victims before a safe opportunity presented itself for executing their design; and, when the deed was done, rites were performed in honour of that tutelary deity, and a goodly portion of the spoil was set apart for her. The fraternity possessed also a jargon of their own (Ramasi). as well as certain signs by which its members recognized each other in the remotest parts of India. Even those who from age or infirmities could no longer take an active part in the operations continued to aid the cause as watchers, spies, or dressers of food. It was owing to their thorough organization, the secrecy and security with which they went to work, but chiefly to the religious garb in which they shrouded their murders, that they

could, unmolested by Hindu or Mahommedan rulers, recognized as a regular profession and paying taxes as such, continue for centuries to practise their craft. Both the fractions into which they were divided by the Nerbudda river laid claim to antiquity: while the northern, however, did not trace their origin further back than the period of the early Mahommedan kings of Delhi, the southern fraction not only claimed an earlier and purer descent, but adhered also with greater strictness to the rules of their profession.

The earliest authenticated mention of the Thugs is found in the following passage of Ziau-d din Barni's History of Firoz Shah (written about 1356): "In the reign of that sultan," that is, about 1 290, " some Thugs were taken in Delhi, and a man belong- ing to that fraternity was the means of about a thousand being captured. But not one of these did the sultan have killed. He gave orders for them to be put into boats and to be conveyed into the lower country, to the neighbourhood of Lakhnauti, where they were to be set free. The Thugs would thus have to dwell about Lakhnauti and would not trouble the neighbourhood of Delhi any more " (Sir H. M. Elliot's History of India, iii. 141). The first European travellers who speak of them without mentioning their name are Thevenot (1665) and Fryer (1673). Though instances of Thagi (Thuggee) had been known to the English rulers in India for many years, and sporadic efforts had been made by them towards the extinction of the gangs, it was not till Lord W. Bentinck (1828-1835) took vigorous steps in this matter that the system was gradually unmasked, and finally all but stamped out. His chief agent, Captain (afterwards Sir William) Sleeman, with several competent assistants, and the

co-operation of a number of native states, succeeded in completely grappling with the evil, so that up to October 1835 no fewer than 1562 Thugs had been committed, of which number 382 were hanged and 086 transported or imprisoned for life. According to the Thuggee and Dacoity Report for iSjg, the number of registered Punjabi and Hindustani Thugs then still

amounted to 344; but all of these had already been registered as such before 1852, and the whole fraternity may now be considered as extinct. The Thuggee and Dacoity department continued to exist until 1904, though its operations had long been confined to the sup- pression of organized robbery in native states. Its place is now taken by the Central Criminal Intelligence department.

Full particulars concerning the system of Thagi are given by Dr Sherwood, " On the Murderers called Phansigars," and J. Shake- spear, " Observations regarding Bradheks and Thegs " (both treat- ises in vol. xiii. (1820), of the Asiatic Researches); W. N. Sleeman, Ramaseeana, or a Vocabulary of the Language used by the Thugs, with an Introduction and Appendix (Calcutta, 1836) ; the Edinburgh Review for January 1837; E. Thornton, Illustrations of the History and Practices of the Thugs (London, 1837); Meadows Taylor, Confessions of a Thug (London, 1839; new ed. 1879); Major Sleeman, Report on the Depredations committed by the Thug Gangs (Calcutta, 1840); J. Hutton, Popular Account of the Thugs and Dacoits (London, 1857). (R. R.)

THUGUT, JOHANN AMADEUS FRANCIS DE PAULA, Baron (1736-1818), Austrian diplomatist, was born at Linz on the 24th of May 1736. His origin and name have been the subject of legends more or less malicious and probably the inventions of enemies. It has been said that the correct form of his name was Thunichtgut, or Thenitguet (do no good), and was altered to Thugut (do good) by Maria Theresa. Tunicotta has been given as a variation. But Thugut was the name of his great- grandfather, who belonged to Budweiss in southern Bohemia. He was the legitimate son of Johann Thugut, an army paymaster, who married Eva Maria Mosbauer, daughter of a miller near Vienna. The paymaster, who died about 1760, left his widow and children in distress, and Maria Theresa took charge of them. Johann Amadeus was sent to the school of Oriental languages. He entered the Austrian foreign office as an interpreter and was appointed dragoman to the embassy at Constantinople. In 1769 he was appointed charge d'affaires, and in

that capacity secured a grant of money and a promise of the territory of Little Wallachia from the Turks during the negotiations connected with the first partition of Poland (see Poland: History). In 1771 he was appointed internuncio at Constantinople and was actively engaged, under the direction of Prince Kaunitz, in all the diplomacy of Austria in Turkey and Poland until he secured the cession of the Bukovina on the 7th of May 1775. During these years Thugut was engaged in a mean intrigue. His salary as dragoman was small, and his needs great. He therefore agreed to receive a pension of 13,000 livres, a brevet of lieutenant- colonel, and a promise of a safe refuge in case of necessity from the king of France, Louis XV. The condition on which the pension was granted was that he took advantage of his position as an Austrian official to render secret services to France. The only excuses to be made for him are that such hidden arrange- ments were not uncommon before and in his time, and that as a matter of fact he never did render France any real service, or betray his masters at Vienna. Yet the terror of discovery disturbed him at several periods of his life, and when Louis XV. died in 1774 he showed a strong disposition to take refuge in France, and would have done so if Louis XVI. would have given him a promise of employment. His pension was continued. It seems to be tolerably certain that at a later period he made a clean breast to the emperor Francis II. His services at Constantinople were approved by Prince Kaunitz (q.v.), who may possibly have been informed of the arrangement with the French secret diplo- matic fund. It is never safe to decide whether these treasons were single or double. When Thugut was appointed internuncio he was also ennobled, being raised to the Ritter stand. After 1775 he travelled in France and Italy, partly on diplomatic service. In 1778 he was the agent through whom Maria i Theresa entered into direct negotiations with Frederick the Great, in order to stop the Bavarian War. In 1780 he was Austrian envoy in

Warsaw, but in 1783 he applied for leave and satisfied his hankering after France by living for four years in Paris. It was in this time that his savings, made during his years of service at Constantinople, by means which would probably not bear investigation, were invested in France. Thugut became acquainted with many of the leaders in the Revolution. From 1787 to 1789 he was minister at Naples, and showed great tact in managing the queen, Maria Carolina, a daughter of Maria Theresa. In 1790 he was sent by the emperor Joseph II. to Bucharest, nominally as commissioner with the hospodar of Wallachia, but in reality in order that he might open negotiations for peace with the Turks. Until 1792 he was much in France and Belgium, partly as a diplomatic agent, but largely because he was anxious to rescue his investments, which were ultimately lost. His personal grievances may have had some share in creating the hatred of the Revolution and the Jacobins, for which he was afterwards famous. In 1792 he was associated with Mercy Argenteau, formerly Austrian ambassador in France, as diplo- matic agent at the headquarters of the allied army. The mismanagement of the invasion of France excited his anger. He came back to Vienna to report the facts to Francis II., to whom he presented a statement on the 27th of December. On the 19th of January 1793 he was appointed armee-diplomat at head- quarters, largely, it is said, by the intrigues of Philip Cobenzl and Spielmann, who wished to have him out of the way. But he never went, for at this time Russia and Prussia annexed large parts of Poland. Austria, entangled in the war with France, was left empty-handed (see Poland : History) . The emperor, dis- satisfied with the ministers who had not prevented this mis- fortune, dismissed them, and after some delay Thugut was named "director of the foreign affairs of Austria" on the 25th of March 1793. When Prince Kaunitz died in the following year Thugut was appointed to " discharge the duties of the office of house, court, and state chancellor." His promotion to the foremost

place in the Austrian administration met with much opposition, and is known to have been largely due to the empress Maria Theresa of Naples. The Austrian government was by tradition very aristocratic. The empress Maria Theresa, mother of Francis II., though she valued the services of Thugut, had consented with reluctance to make him commander of the order of St Stephen, and had only yielded to the urgent requests of Kaunitz and of her son Joseph II. She thought the promotion excessive for a man of his plebeian origin. The nobles, who thought that the great offices of state should go to themselves, were of the same opinion. Thugut, who had a large fund of vanity, resented their insolence, and did nothing to disarm their hostility. He was unmarried, and he avoided all society. In the discharge of his duties he took counsel with nobody. All the confidential work of his department was done by himself with the help of two clerks he could trust, and he took all important papers directly to the emperor, keeping no copies in his own office. He had his own experience to teach him how easy it was to bribe the officials of Austria. The nobles, who regarded themselves with good cause as the supporters of the Crown, and who expected to be consulted, resented his indifference and secrecy as the arrogance of an upstart. They were his constant enemies and critics. A few of them who admired his abilities supported him on personal grounds, but with these exceptions Thugut had no friends in Austria. Out of it, he was commonly regarded as the representative of all that was most unscrupulous and self-seeking in the methods of the Austrian government. He had inherited from his master Prince Kaunitz the firm conviction that Prussia was the worst enemy of Austria. From him, too, he had learnt that the first duty of an Austrian minister was to be an increaser of the empire, even at the expense of allies, and that excuses for annexation were to be made when they could not be found. His hatred of France, and of the Revolution, was no doubt sincere. But while prepared to defend Europe from French aggression, it was with the implied intention that Austria should be rewarded for her exertions by increases of

territory, and should be made the absolute mistress of Germany. The history of his policy from 1793 to 1800 is the history of Europe. The conflicting objects xxvi. 23

which he kept before him, resistance to French aggression on the west, and to Russian and Prussian aggressions on the east, and the pursuit of more territory for Austria, compelled him to divide his exertions and his forces. Thus in 1793–94 he recalled troops from the west to participate in a partition of Poland, thereby taking pressure off France, and doing much to smooth the way for her subsequent victories. Some of his actions cannot be described as other than criminal. He was certainly responsible for the murderous attack on the French envoys at Rastadt in April 1799. He may have intended that they should only be robbed, but he must be held responsible for the acts of his agents. So again he has to answer for the perverse policy of Austria in 1799 when Suvarov (q.v.) and the Russians were recalled from northern Italy for no visible reason except that Austria should be left in sole possession of the dominions of the king of Sardinia, with a good excuse for keeping them. The correspondence of Joseph de Maistre shows how bitterly the continental allies of Austria resented her selfishness, and how firmly they were persuaded that she was fighting for her own hand. That Thugut believed that he was doing his duty, and that he was carrying on the traditional policy of Austria, may be true. Yet his methods were so extreme, and his attitude so provocative as to justify the judgment passed on him by Kaunitz — namely, that he required the control of a strong hand if good results were to be obtained from his ability. After the defeats of Austria in Italy in 1796–97 and the peace of Campo Formio, it became a fixed object with the French, and with a growing party in Austria who held him responsible for the disasters of the war, to secure the removal of Thugut. He found no support, except from the British government, which considered him, as a sure ally and had great influence at Vienna as paymaster of subsidies. The death of the empress

Catherine of Russia deprived him of a friend at court. During the campaigns of

1799 and 1800 Thugut was the advocate of war " to the knife." At the end he was kept in office only by the vigorous support of England. The battle of Hohenlinden on the 3rd of December

1800 made his position untenable. He retired from public life, and left Vienna for Pressburg on the 27th of March 1801. At a later period he returned to Vienna and lived quietly on a pension of 7000 florins till his death on the 28th of May 1818. In personal appearance Thugut is described as looking like " a faunish Mephistopheles," a favourite of Louis XL, an Italian tyrant of the worst type, and by the prince de Ligne as what Henry IV. of France would have been if he had been king of the Jews, and if his mouth had worn a constant expression of derision, hate and malignity. The only known portrait of him appears to bear out these unpleasant descriptions.

See A. von Vivenot, Thugut und sein politisches System, a strong defence of his policy in 1793-1794 (Vienna, 1870); and Quellen z. Geschichte d. deutschen Kaiserpolitik Oesterreichs wahrend d. franzbs. Revolutions-Krieg (Vienna, 1873-1885).

THUIN, a town of Belgium, in that part of the province of Hainaut called " entre Sambre et Meuse." Pop. (1904), 6198. It is situated on the Sambre about 9 m. S.W. of Charleroi. The old part of the town, which dates back to the 10th century, occupies a narrow promontory between the Sambre and a small stream called the Biesmelle. The ruined tower called after him is all that remains of the fortress constructed by Bishop Notger of Liege. It was successfully defended against the Normans and long afterwards against the French under Marshal de Lorges in 1654. Although the town itself retains something of its medieval appearance it is the centre of a great manufacturing and mining district, the banks of the Sambre being lined with factories and coal-yards.

THULE, the Greek and Roman name for the most northerly known land in the north Atlantic. The first to use the name was the Greek navigator Pytheas (about 300 B.C. probably). He calls it the most northerly of the British Isles and says that he reached it after six days' sail from Britain: it was inhabited, but produced little; corn grew there sparingly and ripened ill; in summer the nights were long and bright. This account of his travels is lost save for fragments, and the few surviving fragments

do not determine where his Thule was, but Miillenhoff is probably right in thinking it was the Shetlands. The Faeroes, Iceland and Norway have also been suggested, but are for various reasons much less likely. After Pytheas, the name is used loosely for the farthest north. Thus Agricola's fleet in A.d. 84 sailing up the east coast of Scotland is said to have espied but not to have reached Thule ("dispecta est Thule") but the phrase is merely literary. The actual point meant may be the Orkneys or the Shetlands, or even some fragment of Scotland seen across the water. In some later writers (Procopius, &c.) Thule seems some- times used to denote Scandinavia. The phrase "ultima Thule " is commonly used to describe the farthest limit possible.

(F. J. H.)

THUMMEL, MORITZ AUGUST VON (1738-18 17), German humorist and satirical author, was born on the 27th of May 1738 at Schonefeld near Leipzig. Educated at Rossleben and the university of Leipzig, where he studied law, he held from 1761 till 1783 various offices in the ducal court of Saxe-Coburg, where he became privy councillor and minister of state. He retired in 1783 and died at Ccburg on the 26th of October 1817. He wrote a comic prose epic,

Wilhelmine, cder der vermahlte Pedant (1764); and Die Inoculation der Liebe (177 1), a tale in verse. His most famous work is his Reise in die mittdglichen Provinzen von Frankreich im Jahre 1785–1786 (1791–1805), a "sentimental journey " in ten volumes, in which the influence of Wieland is unmistakable. Schiller, who found this work wanting in aesthetic dignity, yet allowed that the keen knowledge of men and things it displays makes it a valuable contribution to literature. Thummel's other writings are unimportant.

His collected works were published at Leipzig in six volumes (1812), and again in 1820 (7 vols.), with a biography by J. E. von Gruner. The most recent edition is that of 1855 (8 vols.). See also F. Bobertag, Erzahlende Prosa der klassischen Periode vol. i. (Kiirschner's Deutsche Nationalliteratur, vol. cxxxvi., 1886). Wilhel- mine has also been edited by R. Rosenbaum (1894).

THUN (Fr. Thoune), a picturesque little town in the Swiss canton of Bern, built on the banks of the Aar, just as it issues from the Lake of Thun, and by rail 19 m. S.E. of Bern, or 175 m. N.W. of Interlaken. It is the capital of the Bernese Oberland, the snowy peaks of which are well seen from it. It has 6030 inhabitants, mostly German-speaking and Protestants. The 18th-century parish church and the 15th-century castle rise in a striking fashion above the town, in the chief street of which are arcades (locally called Laubcn) as in Bern. There is a museum in the tower of the castle, while in and near the town (in the Heimberg valley) are several potteries of local ware. From its local lords it passed by n 27 to the house of Zahringen, and on its extinction (12 18) to the counts of Kyburg. The heiress of that family brought Thun (and Burgdorf) in 1273 to the cadet or Laufenburg line of the Habsburg family, her mother having (1264) granted the town a charter of liberties that con- firmed an earlier grant of 1256. In 1375 the town was mort- gaged to Bern, to which it was sold outright in 1384. From 1798 to 1802 Thun was the capital of the canton Oberland of the Helvetic Republic. (W. A. B. C.)

THUN, LAKE OF, in the Swiss canton of Bern, the second lake (the first being that of Brienz) into which the river Aar (q.v.) expands. It lies in a deep hollow between (N.W.) the town of Thun (q.v.) and (E.) the plain on which Interlaken (q.v.) is built between this lake and that of Brienz. It is 115 m. in length, 2 m. in width, and its maximum depth is 712 ft., while its area is 185 sq. m., and its surface is 1837 ft. above sea-level. Most splendid views of the great snowy peaks of the Bernese Ober- land range are obtained from the lake, while the beauty of its shores renders it a formidable rival in point of picturesqueness to the Lake of Lucerne. Its chief feeder is the Kander (swollen shortly before by the Simme), which in 17 14 was diverted by a canal into the lake (south-western end). On or above the south- western shore (along which runs the railway from Thun to Inter-laken, 175 m.) are Spiez (a picturesque village with an ancient castle, and the starting-point of railways towards the Gemmi and Montreux) and Aeschi (admirably situated on a high ridge). On the other shore of the lake are Oberhofen and Gunten

(above which is Sigriswil), and Merligen, while above the lake, near its east end, are the wooded heights of St Beatenberg, well known to summer visitors. The first steamer was placed on the lake in 1835. ' (W. A. B. C.)

THUNBERG, KARL PETER (1743-1828), Swedish naturalist, was born at Jonkoping on the nth of November 1743, and became a pupil of Linnaeus at the university of Upsala. After graduating in medicine there in 1770 he obtained an appoint- ment as surgeon in the Dutch East India Company, and sailed to the Cape of Good Hope in 1772. He spent three years there, and then went to Japan, where he remained till 1778, engaged in making collections of plants. On his return in 1779 he visited England, and made the acquaintance of Sir Joseph Banks. In 1 781 he was appointed demonstrator of botany at Upsala, and he succeeded the younger Linnaeus as professor of botany in 1784. He published his Flora japonica in 1784, and in 1788 he began to publish

his travels. He completed his Prodomus plantarum in 1800, his Icones plantarum japonicarum in 1805, and his Flora capensis in 1813. He published numerous memoirs in the transactions of many Swedish and other scientific societies, of sixty-six of which he was an honorary member. He died near Upsala on the 8th of August 1828. A genus of tropical plants (Thunbergia) , of the natural order Acanthaceae, which are cultivated as evergreen climbers, is named after him.

THUNDER, the noise which accompanies or follows a flash of lightning, due to the disturbance of air by a discharge of electricity (see Lightning; Atmospheric Electricity and Meteorology). The Old English word is \iunor, also the name of the Scandinavian god Thor (q.v.), which is cognate with Dutch donder, German Donner. The root is than,- Indo-European tan-, cf. Latin tonare, tonitru. This root is apparently another form of stan-, as in Skr. stan, to sound, thunder, Gr. ariveiv, to groan, Eng. ” stun.”

THUN-HOHENSTEIN, The family of Thun-Hohenstein, one of the wealthiest of the Austrian nobility, which has for more than 200 years settled at Tetschen, in Bohemia, has given several distinguished members to the Austrian public service. Of the three sons of Count Franz, the eldest, Friedrich (1810- 1881), entered the diplomatic service; after holding other posts he was in 1850 appointed president of the restored German Diet at Frankfort, where he represented the anti-Prussian policy of Schwarzenberg, and often came into conflict with Bismarck, who was Prussian envoy. He was afterwards ambassador at Berlin and St Petersburg. After his retirement from the public service in 1863 he supported in the Bohemian Landtag and the Austrian Reichsrat the federal policy of his brother Leo. In 1879 he was made hereditary member of the Upper House. In this position he was on his death, on the 24th of September 1881, succeeded by his eldest son Franz Anton (b. 1847). Like the rest of his family, he belonged to the Federalist party, and his appointment in 1889 as governor of Bohemia was the

cause of grave dissatisfaction to the German Austrians. He took a leading part in the negotiation of 1890 for the Bohemian settlement, but the elections of 1891, in which the young Czechs who were opposed to the feudal party gained a decisive victory, made his position a very difficult one. Contrary to expectation, he showed great energy in suppressing disorder; but after the proclamation of a state of siege his position became untenable, and in 1895 he had to resign. On the resignation of Badeni in 1898 he was made minister president, an office which he held for little more than a year, for, though he succeeded in bringing to a conclusion the negotiations with Hungary, the support he gave to the Czechs and Slovenians increased the opposition of the Germans to such a degree that parliamentary government became impossible, and at the end of 1899 he was dismissed.

The third son of Count Franz, Leopold or Leo (1811–1888), was one of the leading Austrian statesmen. After studying at the university of Prague he travelled through Europe, and among other countries he visited England, where he became acquainted with James Hope (afterwards Hope-Scott) and other leaders of the Tractarian party. He was much affected by the romantic

movement and the Ultramontane revival, and after his return home interested himself greatly in the revival of Czech language and literature and the growth of the Bohemian national feeling. He formed a personal friendship with Palacky and others of the Czech leaders; he helped in the foundation of schools in which Czech should be taught, and set himself to acquire some knowledge of the language. He was also interested in prison reform, on which he wrote, and other philanthropic work. After serving under Stadion in Galicia, he was in 1848, after the out- break of the revolution, appointed president of the administra- tion and acting Stadthalter in

Bohemia. He had scarcely entered on his duties when the rebellion of June broke out in Prague. In order to avoid bloodshed, he went down to the in- surgents on the barricade, but was seized by them, imprisoned, and for some time his life was in danger. On his release he vigorously supported Windischgratz, who was in command of the troops, in the restoration of order, but thereby lost his popularity and was superseded. He still defended the Bohemian national movement, and in one of his writings laid down the principle that nationality was one of the interests outside the control of the state. Notwithstanding this, in 1849 he accepted the office of minister of religion and education, which he held in i860 under the autocratic and centralizing administration of Schwarzenberg and Bach. At first he threw himself with great energy into the task of building up an adequate system of schools. He summoned experienced teachers, Protestant as well as Catholic, from Germany, established middle and higher schools in all parts of the empire, superseded the antiquated textbooks and methods of instruction, and encouraged the formation of learned societies and the growth of a professional spirit and independence among the teachers. It is noticeable that at this time he insisted on the use of German in all schools of higher education. As minister of religion he was to a certain extent responsible for the concordat which again subjected the schools to the control of the Church: to a certain extent he thereby undid some of his work for the extension of education, and it was of him that Grillparzar said, " I have to announce a suicide. The minister of religion has murdered the minister of education." But during his administration the influence of the church over the schools was really much less than, by the theory of the con- cordat, it would have appeared to be. The crisis of i860, by which the office he held was abolished, was the end of his official career; for the rest of his life he was very prominent as the leader of the Federalist party in Bohemia. His high social position, his influence at court, his character, as well as his undoubted abilities and

learning, not often in Austria found in a man of his rank, gave him great influence. He supported the claims of Bohemia to a full autonomy; he strongly attacked both the February constitution and the Ausgleich with Hungary; what he desired was a common parliament for the whole empire based on a settlement with each one of the territories. With the old Czechs he refused to recognise the constitution of 1867; he helped to draft the declaration of 1868 and the fundamental articles of 1871, and took a leading part in the negotiations during the ministry of Potocki and Hohenwart. In order to found a strong Conservative party he established a paper, the Vaterland, which was the organ of the Clerical and Federalist party. It is needless to say that he protested against the ecclesiastical legislation of 1867 and 1873. He married in 1847 the countess Clam-Martinic, but there was no issue of the marriage. He died in Vienna on the 17th of December 1888.

S:e the very full article by Frankfurter in the Allgemeine deutsche Biographie, which supersedes his earlier biography. (J. W. He,)

THURET, GUSTAVE ADOLPHE (1817-1875), French botanist, was born in Paris on the 23rd of May 1817. He came of an old Huguenot family, which had sought refuge for a time in Holland after the revocation of the Edict of Nantes. A trace of Dutch influence still persists in the pronunciation of the family name in which the final / is sounded. Thuret's mother was brought up in England; English was the first language that he learnt, and he appears to have retained strong sympathies with Great Britain throughout life. As a young man he studied

for the law; in his leisure time he was an ardent musician, and it was from a musical friend, de Villers, that he received, in 1837, his first initiation into botany. Beginning simply as a collector, he soon came under the influence of Joseph Decaisne (1809-1882), whose pupil he became. It was Decaisne who first encouraged him to undertake those algological studies which were to

become the chief work of his life. Thuret twice visited Constantinople in company with the French ambassador, M. de Pontois, and was for a time attache to the French embassy there. His diplomatic career, though of short duration, gave him a valuable opportunity of studying the Oriental flora. After travelling in Syria and Egypt in the autumn of 1841, he returned to France. Giving up his intention of entering the civil service, he retired to his lather's country house at Rentilly, and thenceforth devoted himself to scientific research. He had already, in 1840, published his first scientific paper, " Notes sur l'anthere de Chara et les animalcules qu'elle renferme," in which he first accurately described the organs of motion of the " animalcules " or sperm- atozoids of these plants. He continued his studies of the zoos- pores and male cells of Algae and other Cryptogams, and our exact knowledge of these remarkable motile stages in vegetable life is largely due to his labours. He spent a great part of his time, up to 1857, on the Atlantic coast of France, assiduously observing the maiine Algae in their natural habitat and at all seasons. In conjunction with his friend Edouard Bornet, he became the, recognized authority on this important group of plants, of which the two colleagues acquired an unrivalled knowledge. Their work, while remarkable for taxonomic accuracy, was more especially concentrated on the natural history, development and modes of reproduction of the plants investigated. The discovery of sexual reproduction in seaweeds is almost wholly the work of these two men. The researches on the fecundation of the Fucaceae were published by Thuret in 1853 and 1855; the complicated and difficult question of the sexual reproduction in Floridae was solved by the joint work of Thuret and Bornet (1867). These great dis- coveries — of, far-reaching biological significance — stand out as the chief, but every group of marine Algae was elucidated by the researches of Thuret and his colleague. There are few scientific authors whose work has so completely stood the test of subsequent investigation and criticism. Thuret's style in expounding his results was singularly clear

and concise; he was a man of wide education, and possessed the power of express- ing his ideas with literary skill. Unfortunately, much of his best work remained unpublished during his life. A portion of the material accumulated by himself and his colleague was embodied in two magnificent works published after his death- — the Notes algologiques (1876-1880), and the still finer Eludes phycologiques (1878). These volumes, as well as earlier memoirs, are illustrated by drawings of unequalled accuracy and beauty from the hand of the artist Riocreux, whom Thuret employed. In 1857 Thuret removed to Antibes on the Mediterranean coast, where, on a once barren promontory, he established a botanic garden which became famous throughout the scientific world. Since his death the Antibes establishment has been placed at the disposal of botanical workers as an institute for research. Thuret died suddenly, while on a visit to Nice, on the 10th of May 1875, when he had scarcely completed his fifty-eighth year. He was a man of considerable wealth, who devoted his money as freely as his time and labour to the advancement of science, but his high reputation rests on the brilliancy of his personal investigations.

The best and fullest account of Thuret's career is that by his friend and fellow worker Bornet, published in the Annates des sciences naturelles for 1876. An English notice of his life, by Professor W. G. Farlow, will be found in the Journal of Botany for the same year. (D. H. S.)

THURGAU (Fr. Thurgovie), one of the cantons of north- eastern Switzerland, bordering on the Lake of Constance and the Rhine as it issues from that lake. Its total area is 390-4 sq. m., of which 3 26-9 sq. m. are reckoned as" productive " (forests cover- ing 69-3 sq. m. and vineyards 4-4 sq. m.) ; of the " unproductive "

portion most (59I sq. m.) consists of the cantonal share of the Lake of Constance. The canton is partly made up of the cen- tral portion of the valley of the Thur (which rises in the Toggenburg), with its affluent the Murg, and partly of the level stretch along the west shore of the Lake of Constance and left bank of the Rhine. Low ranges of wooded hills separate the lake from the Thur valley and the latter from that of the Murg, as well as from the cantons of Zurich and of St Gall, the highest point in the canton being situated at its southern extremity, and forming the northern slope (3271 ft.) of the Hornli (3727 ft.), itself wholly in Zurich. The small outlying district of Horn is an " enclave " in the canton of St Gall, because it was acquired in 1463 by the bishop of Constance, who incor- porated it with the bailiwick of Arbon, the fate of which it has followed. In 1798 the lower portion of the Stammheim glen was given to Zurich, as well as the Diessenhofen region to Schaff- hausen, but the latter region came back to Thurgau in 1800. The main railway line from Winterthur to Romanshorn (with a branch to St Gall) runs right through the canton, while on its north edge is the direct line along the left bank of the Rhine from Constance to Schaffhausen. A network of well-made roads traverses the canton in every direction, some of them being now served by public motor cars. It is a prosperous region, the population being mainly engaged in agriculture, and in cotton-spinning, which is often combined with it at home. The orchards are so splendid that Thurgau has been called " the garden of Helvetia." The vineyards produc.e a number of highly esteemed wines (the best known is the red Bachtobler), which are said to retain their strength for eight or ten years, this being attributed to the influence of the east wind to which the vines are much exposed. In 1900 the population was 113,221, of whom 110,845 were German-speaking, 1867 Italian-speaking and 332 French-speaking, while there were 77,210 Protestants, 35,824 Romanists and 113 Jews. Its capital is Frauenfeld iq.v.), while other important places are Arbon (pop. 5677), Kreuzlingen (4732), practically a suburb of Constance, and

Romanshorn (q.v.), the chief port of the canton on the Lake of Constance. Till 1814 it was in the diocese of Constance, and since 1828 in that of Basel. The canton is divided into eight administrative districts, which comprise 212 communes. In 1869 the very advanced existing constitution was adopted, by which the ” initiative ” (or right of 2500 electors to compel the cantonal assembly to take any subject into consideration), and the ” obligatory referendum,” taking place twice a year (by which all laws passed by the cantonal assembly, and all financial resolutions involving a capital expenditure of 50,000 francs or an annual one of 10,000, must be submitted to a popular vote), were introduced. The cantonal government consists of a legislative assembly or Grossvat (one member to every 250 electors, or fraction over 125) and a Regierungsvat or execu- tive council of five members, both elected directly by the people and holding office for three years; 5000 electors can at any time call for a popular vote on the question of the dismissal of either one or the other. Further, to show the very democratic character of the (1869) constitution, it may be added that members of both houses of the Federal assembly are in Thurgau elected direct by the people, and hold office for three years. The ” communes ” in Thurgau are of no less than eleven or twelve varieties. The division of the lands, &c, of the old ” burgher communes ” between them and the new communes, consisting of all residents (with whom political power rests), was carried out (1872) in all the 212 communes; but there are still 38 gilds or corporations with special rights over certain forests, &c. The Thurgau originally took in all the country, roughly speaking, between the Reuss, the Lake of Lucerne, the Rhine and the Lake of Constance; but many smaller districts (Ziirichgau, Toggenburg, Appenzell, St Gall) were gradually carved out of it, and the county was reduced to about the size of the present canton when in 1264 it passed by the gift of the last count of Kyburg to his nephew Rudolph of Habsburg, chosen emperor in 1273. In 141 5 the count, Duke Frederick of Austria (a Habsburg), was

put under the ban of the empire by the emperor Sigismund for having aided Pope John XXIII. to escape from Constance, and the county was overrun, Sigismund in 1417 mortgaging to the city of Constance the appellate jurisdiction in all civil and criminal matters (" Landgericht " and " Blutbann ") arising within the county, which he had declared to be forfeited in consequence of Frederick's conduct. In 1460 some of the Confederates, now becoming very eager for conquests, overran and seized the county. Winterthur was saved, but in 1461 Frederick's son, Duke Sigismund, had perforce to cede the county to the Confederates. Henceforth it was ruled as a " subject district " by seven members of the League — Bern occupied in the west, not being admitted to a share in the govern- ment till 171 2, after one of the wars of religion. It was only in 1499 that the Confederation (then consisting of ten members) obtained from the emperor (the claims of Constance being passed over in silence) the supreme jurisdiction, through the mediation of the duke of Milan, but there were still 103 minor jurisdictions belonging to various lords spiritual (particularly the bishop of Constance, the abbot of St Gall and the abbot of Reichenau) and temporal, which went on till 1798 and greatly limited the power of the Confederates. Thurgau had hoped, but in vain, to be admitted in 1499 a full member of the Confederation.

At the time of the Reformation many of the inhabitants became Protestants, and bitter quarrels ensued between the Protestant and Catholic (the latter having a large majority) members of the Confederation who had rights over Thurgau, with regard to the toleration of the new doctrines in the " subject districts " such as Thurgau. By the first peace of Kappel (1 529) the majority in each " commune " was to settle the religion of that "commune," but by the second (1531, after Zwingli's death) both religions were to be allowed side by side in each " commune." Thurgau thus became a " canton of parity," as it is to this day. Its rulers, however, continued to watch each other very closely, and Kilian Kesselring, one of the chief military

commanders in Thurgau, was in 1633, on suspicion of having connived at the advance of the Swedes through Thurgau on Constance, seized by the Catholic cantons and severely punished. In 1798 Thurgau became free, and was one of the nineteen cantons of the Helvetic republic, being formally received (like the other " subject lands ") as a full member of the Swiss Confederation in 1803 by the Act of Mediation. It was one of the very first cantons to revise, in 1830, after the July revolution in Paris, its constitution in a very liberal sense, and in 1831 proposed a revision of the Federal Pact of 18 15. This failed, but the new Federal constitutions of 1848 (of which one of the two drafters was Kern of Thurgau) and 1874 were approved by very large majorities. In 1848 almost all of the convents in the canton were suppressed, one only (that of the Dominican nuns at St Katharinenthal) surviving till extinguished in 1869 by the new cantonal constitution, which also forbade the erection of any new religious houses. In 1849 the cantonal constitution was revised and the veto introduced, by which the people might reject a bill passed by the cantonal assembly. The castle (modern) of Arenenberg, above the western arm of the Lake of Constance, belonged to the Napoleonic family from 181 7 to 1843, and was repurchased by them in 1855. It contains many relics of Napoleon III., whose widow, the ex-empress Eugenie, in 1906 presented it (with provision for annual masses in the chapel) to the canton of Thurgau, which has converted it into an agricultural college.

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mittelalt. Kunstdenkmaler d. Cant. Thurgau (1899) ; ” Thurgauische Rechtsquellen,” in the Zeitschriftf. schweiz. Recht (1852), vol. i. (W. A. B. C.)

THURIBLE (Lat. thuribulum or turibulum, thus or tus, incense, Gr. 6vos, from dv’av, to offer a burnt sacrifice, cf. Skr. dhuma and Lat. fumus, smoke), the ecclesiastical term foi a censer, a

portable vessel in which burning incense (q.v.) can be carried. The censer, to use the more general term, is a vessel which con- tains burning charcoal on which the aromatic substances to be burned are sprinkled. The early Jewish portable censer would seem to have been a bowl with a handle, resembling a ladle. A similar form was used by the ancient Egyptians long prior to the Jewish use. There are very numerous representations on the monuments; in some the censer appears as a small cup or bowl held by a human hand to which a long handle is attached on which is a small box to hold the incense. The Greek and Roman censers {dv/uarripcov and turibulum or thuribulum) are of quite different shape. They are small portable braziers (foculi) of bronze or sometimes of silver and of highly ornate design. One type took the form of a candelabrum with a small flat brazier on the top. They were carried in processions and were lifted by cords. Terra cotta censers have also been found of a similar shape. The censers or thuribles in Christian usage have been specially adapted to be swung, though there are in existence many early specimens of heavy weight and made of gold or silver which were obviously not meant to be used in this way and have handles and not chains. The thurible, the proper ecclesiastical term for the vessel in the Western Church, is usually spherical in form, though often square or

polygonal, containing a small receptacle for the charcoal and covered by a perforated lid; it is carried and swung by three chains, a fourth being attached to the lid, thus allowing it to be raised at intervals for the volume of smoke to be increased. The early thuribles were usually simple in design; but in the medieval period an architectural form was given to the lids by ornamenting them with towers, battlements and traceries, varying according to the prevalent Gothic style of the period. A censer lid with a late Saxon tower upon it, now in the British Museum, dates from the 12th century or earlier.

THURII, or Thueium, a city of Magna Graecia on the Gulf of Tarentum, near the site of the older Sybaris (q.v.). It owed its origin to an attempt made in 452 B.C. by Sybarite exiles and their descendants to repeople their old home. The new settle- ment was crushed by Crotona, but the Athenians lent aid to the fugitives and in 443 Pericles sent out to Thurii a mixed body of colonists from various parts of Greece, among whom were Herodotus and the orator- Lysias. The pretensions of the Sybarite colonists led to dissensions and ultimately to their expulsion; peace was made with Crotona, and also, after a period of war, with Tarentum, and Thurii rose rapidly in power and drew settlers from all parts of Greece, especially from Pelopon- nesus, so that the tie to Athens was not always acknowledged. The oracle of Delphi determined that the city had no founder but Apollo, and in the Athenian War in Sicily Thurii was at first neutral, though it finally helped the Athenians. Thurii had a democratic constitution and good laws, and, though we hear little of its history till in 390 it received a severe defeat from the rising power of the Lucanians, many beautiful coins testify to the wealth and splendour of its days of prosperity. In the 4th century it continued to decline, and at length called in the help of the Romans against the Lucanians, and then in 282 against Tarentum. Thenceforward its position was dependent, and in the Second Punic War, after several vicissitudes, it was

de- populated and plundered by Hannibal (204). In 194 a Roman colony was founded, with Latin rights, known for a time as Copiae, but afterwards by the old name of Thurii. It continued to be a place of some importance, the situation being favourable and the region fertile, and does not seem to have been wholly abandoned till the middle ages. The site of the original Greek city is not accurately known, though that of the Roman town, which probably though not certainly occupied the same site, is fixed by insignificant ruins as being 4 m. to the east of Terranova di Sibari, and as occupying an area some 4 m. in circuit. The tombs found in 1870-1880 (see Sybaris) lie a little to the east of the site.

See F. Lenormant, La Grande-Grke i. 317 (Paris, 1881). (T. As.)

THURINGIA (German Thuringen), an historical division of Germany, but now a territorial term without political significance.

It strictly designates only that district in upper Saxony that is bounded by the Werra, the Harz Mountains, the Saale and the Thuringian Forest; in common parlance, however, it is frequently used as equivalent to the Thuringian states, i.e. the group of small duchies and principalities lying between Prussia, Hesse-Nassau, Bavaria and the kingdom of Saxony. Such Thuringian states are Saxe- Weimar-Eisenach, Saxe-Coburg- Gotha, Saxe-Meiningen, Saxe-Altenburg, Schwarzburg-Rudol- stadt, Schwarzburg-Sondershausen, and the two principalities of Reuss, all of which are separately described. Besides these, the term Thuringia also, of course, includes the various " ex- claves " of Prussia, Saxony, Bavaria and Bohemia which lie embedded among them.

The Thuringians are first mentioned by Vegetius Renatus about a.d. 420 when they occupied the district between the Harz Mountains and the Thuringian Forest. They were probably descended from the Hermunduri, a Suevic people referred to by Tacitus as living in this region during the 1st century. They were tributary to Attila the Hun,

under whom they served at the battle of Chalons in 451. They were governed by kings, whose realm in the early 6th century touched both the Danube and the lower Elbe. At this time King Basin divided Thuringia among his three sons. The eldest, Hermannfried, eventually obtained sole possession by the help of Theuderich I., king of Austrasia, but having refused to pay the price he had promised for this assistance, was defeated by Theuderich in a series of battles and murdered by him in 531. The northern portion of the kingdom was given to the Saxons who had joined him against Hermannfried; the southern part was added to Austrasia; and the name of Thuringia was confined to the district bounded by the Harz Mountains, the Werra, the Thuringian Forest and the Saale. It remained under the direct rule of the Frankish kings until 634, when Radulf was appointed duke of the Thur- ingians by King Dagobert I. Radulf made himself practically independent of the Franks, in spite of an attack made on him by Sigebert III., king of Austrasia. About this time the con- version of the Thuringians to Christianity was begun by British missionaries and continued by St Boniface, who founded a bishopric at Erfurt. They were again reduced to dependence on the Franks by Charles Martel, who abolished the office of duke and divided the country among Frankish counts. About 804 Charlemagne, in order to defend the line of the Saale against the Slavs, founded the Thuringian mark, which soon became practically coextensive with the former duchy. In 849 King Louis the German recognized Thakulf as duke (dux Sorabici limitis), and some of his successors bore the title of margrave until the death of Burkhard in 908, when the country was seized by Otto the Illustrious, duke of Saxony. Thuringia was retained by Otto's son and successor, Henry I. the Fowler, in spite of the opposition of the German king, Conrad I., and ceased for a time to enjoy a separate political existence. It appears to have been united with Meissen for some time, and this was certainly the case from ioa6 to 1067, when both countries were ruled by William and Otto, counts of Weimar. During the nth century the Thuringians refused to pay tithes to Siegfried,

archbishop of Mainz, and this was probably one reason why they joined the rising of the Saxons against the emperor Henry IV. in 1073.

About this time a new dominion was founded by Louis the Bearded, who by purchase, gift or marriage obtained several counties in Thuringia. These passed on his death in 1056 to his son Louis the Springer (d. n 23), who took part in the Saxon risings against the emperors Henry IV. and Henry V., built the castle of the Wartburg near Eisenach, which was the residence of his family for nearly 200 years, and founded the monastery of Reinhardsbrunn, where as a monk he passed his last days. His son Louis was appointed landgrave of Thuringia in 1130 by the emperor Lothair II.; by his marriage with Hedwig of Gudensberg in 1137 he obtained a large part of Hesse. He was succeeded in 1140 by his son Louis II. the Hard, who married Judith, a sister of the emperor Frederick I., and on his behalf took a leading part in the opposition to his powerful neighbour Henry the Lion, duke of Saxony. In 1172 he was succeeded

by his son Louis III. the Pious. He acquired the Saxon palatin- ate in 1 179, on the death of Adalbert, count of Sommerschen- burg, went to Italy to assist Frederick I. in 1157, joined in the war against Henry the Lion in n 80, and distinguished himself at the siege of Acre in the Third Crusade, on the return from which he died at Cyprus in n 90. He was succeeded by his brother Hermann I., during whose reign Thuringia suffered greatly from the ravages of the adherents of Philip, duke of Swabia, and also from those of his rival Otto of Brunswick. The next landgrave (1217-1227) was his son Louis IV. the Saint, who married St Elizabeth, daughter of Andrew II., king of Hungary, and acted as guardian for his kinsman Henry III. the Illustrious, margrave of Meissen. This Louis, who is cele- brated in story, destroyed many robber-castles in Thuringia

and died at Otranto while accompanying the emperor Frederick II. on crusade. The next ruler was Henry Raspe, who made himself regent on behalf of his nephew Hermann II. from 1227 to 1238 and in 1241 succeeded his former ward as landgrave. Henry was appointed regent for King Conrad IV., but he soon transferred his allegiance from the emperor to Pope Innocent IV., and in 1246 was chosen German king at Beitshochheim. He defeated Conrad near Frankfort in August 1246, but died in the following year at the Wartburg, when the male line of the family became extinct.

In 1242 Thuringia had been promised by Frederick II. to Henry III. the Illustrious, margrave of Meissen, a maternal grandson of the landgrave Hermann I. Henry, however, found himself obliged to defend his title against Sophia, wife of Henry II., duke of Brabant, who was a daughter of the land- grave Louis IV., and it was not till 1263 that an arrangement was made by which Thuringia and the Saxon palatinate fell to Henry. Two years later Henry apportioned Thuringia to his son Albert the Degenerate, who sold it in 1293 to the German king Adolph of Nassau for 12,000 marks of silver. Albert's sons Frederick the Undaunted and Dietrich contested this transaction, and the attempts of Adolph and his successor Albert I. to enforce it led to the infliction of great hardships upon the Thuringians. Frederick defeated Albert decisively and in 13 14 was formally invested with Thuringia by the emperor Henry VII. His son Frederick II. the Grave (1323-1349) consolidated the power of his dynasty against rebellious vassals and the neighbouring counts of Weimar and Schwarzburg. His son Frederick III. the Strong (1349-1381) and his grandson Balthasar (1381-1406) further extended their dominion by marriage and conquest, and the latter of these founded the university at Erfurt (1392). Balthasar's son, Frederick the Peaceful, became landgrave in 1406 but left the government largely to his father-in-law Giinther, count of Schwarzburg. He died childless in 1440, and Thuringia then passed to the electoral dynasty of Saxony. After a joint rule by Frederick II. and his

brother William, the latter in 1445 became sole landgrave as William III. and died without sons in 1482. In 1485 his nephews and heirs Albert and Ernest made a division of their lands, and Thuringia was given to the Ernestine branch of the family of Wettin, with which its subsequent history is identified (see Saxony).

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THURINGIAN FOREST (Thiiringerwald), a range of hills in Germany, extending in an irregular line from the neighbour- hood of Eisenach in the N.W. to the Lobensteiner Kulm on the Bavarian frontier on the S.E. On the S.E. it is con- tinued directly by the Frankenwald Mountains to the Fichtelgebirge, while on the N.E. it approaches the Harz Mountains, and thus takes its place in the great Sudetic chain of central Germany. The length of the Thuringian chain is

70 m., and its breadth varies from 6 to 22 m. It nowhere rises into peaks, and only a few of its rounded summits reach 3000 ft.; the successive hills form a continuous comb; the north-west slopes are precipitous and seamed with winding gorges. This range encloses many charming valleys and glens; the most prominent feature of its scenery is formed by the forests, chiefly of pines and firs. The north- west part of the system is the loftier and the more densely wooded as well as the more beauti- ful; the highest summits here are the Grosser Beerberg (3225 ft.), Schneekopf (3203) and the Finsterberg (3104),

all in the duchy of Gotha. The south-east part of the Thuringian Forest is the more populous and industrial; the chief summits are the Kieferle (2848 ft.), the Blessberg (2834 ft.), the Wurzelberg (2841 ft.) and the Wetzstein (2575 ft.). The crest of the Thuringian Forest, from the Werra to the Saale, is traversed by the Rennsteig or Rain- steig, a broad path of unknown antiquity, perhaps referred to in a letter of Pope Gregory III. dated 738. The name means probably "frontier-path"; and the path marks in fact the boundary between Thuringia and Franconia. It may be also regarded as part of the boundary line between north and south Germany, for dialect, customs, local names and costume are different on the two sides. The rocks are largely volcanic, the stratification being complex. The mineral resources have been nearly exhausted, but the district is an important centre of small industries (glassware, earthenware, meerschaum-ware, iron castings and toys being among its principal products) and a favourite resort for tourists.

See Regel, Thiiringen, ein landeskundlicher Grundriss (Jena, 1897); Trinius, Thiiringer Wanderbuch (8 vols., Minden, 1896-1902); Prcscholdt, " Der Thiiringer Wald und seine nachste Umgebung," in Forschungen zur deutschen Landes- und Volkskunde, vol. v. (Stutt- gart, 1891); Walther, Geologische Heimatskunde von Thiiringen (Jena, 1906); and Meyer's Reisebuch, "Thiiringen" (18th ed., Leipzig, 1906).

THURLES, a market town of Co. Tipperary, Ireland, pleasantly situated on the Suir, and on the main line of the Great Southern & Western railway, 87 m. S.W. of Dublin. Pop. (1901), 441 1. Thurles is the seat of the Roman Catholic archdiocese of Cashel; and the cathedral of St Patrick is a beautiful building. The town is the seat of other important Catholic establishments, including an Ursuline convent; a Presentation convent; St Patrick's Catholic College (1829) for ecclesiastical students, where was held in 1850 the synod of Thurles; and an establishment of Christian Brothers, who devote themselves to the instruction of boys on the

Lancasterian method. The town has a considerable agricultural and retail trade, and there is a monthly horse fair largely attended by English and continental buyers. Thurles is governed by an urban district council.

Originally the town was called Durlas O'Fogarty. In the 10th century it was the scene of a defeat of the Irish by the Danes. A preceptory was founded here by the Knights Templars, who possessed themselves of a castle, of which there are remains, erected early in the 13th century. A castle was subsequently erected by James Butler, first lord palatine of Tipperary, of which the keep collapsed in 1868. There were several other strongholds in the vicinity. South-west of the town, at a distance of 3! m., stands the Cistercian abbey of Holy Cross, one of the finest ruins in Ireland. It was founded by Donnell O'Brien, king of Thomond (1 168-1 194) ; and owes its foundation and name to the presentation to his family of a portion of the true Cross, which attracted numerous pilgrims. The shrine of this relic is in the Ursuline convent at Blackrock, Co. Cork. The ruins, beautifully placed on the bank of the river, embody a cruciform church, transitional Norman in style, and exhibiting the carving of the period in its highest development. There is a fine Perpendicular tomb in the choir. A large portion remains of the adjoining buildings, including chapter-house, sacristy, cloisters and dormitory.

THURLOE, JOHN (1616-1668), English politician, son of Thomas Thurloe, rector of Abbot's Roding in Essex, was baptized on the 12th of June 1616. He studied law, entered the service

of Oliver St John, through whose interest he was appointed a secretary to the parliamentary commissioners at Uxbridge in January 1645. He was admitted to Lincoln's Inn in 1647, and in March 1648 he received the appointment of receiver of the

cursitor's fines, worth £350 a year. He took no part in the subsequent historical events or in the king's death. In March 1651 he attended St John and Sir Walter Strickland as secretary in their mission to Holland, and on the 29th of March 1652 he was appointed secretary to the council of state, being apparently also elected a member thereof about the same time. His duties included the control of the intelligence department and of the posts, and his perfect system of collecting information and success in discovering the plans of the enemies of the administration astonished his contemporaries. By his means, it was said, " Cromwell carried the secrets of all the princes of Europe at his girdle." On the 10th of February 1654 he was made a bencher of Lincoln's Inn. In the parliaments of 1654 and of 1656 he represented Ely; he was appointed a member of Crom- well's second council in 1657; was elected a governor of the Charterhouse in the same year; and in 1658 became chancellor of Glasgow University. Thurloe was attached to Cromwell as a man and admired him as a ruler, and Cromwell probably placed more confidence in the secretary than in any one of those who surrounded him. Thurloe, however, by no means directed Cromwell's policy. He was in favour of the protector's assump- tion of the royal title, and was opposed to the military party who obtained the ascendancy. After Oliver's death he sup- ported Richard Cromwell's succession and took a prominent part in the administration, sitting in the parliament of January 1659 as member for Cambridge University. Attacked by the republicans on the ground of arbitrary imprisonments and transportations during the Protectorate, he succeeded in vindicat- ing his conduct; but the breach between the army and the parliament, and the ascendancy obtained by the former, caused his own as well as Richard's downfall. Nevertheless, being indispensable, he was reappointed secretary of state on the 27th of February 1660. He appears to have steadily resisted the Restoration, and his promises of support to Hyde in April inspired little confidence. On the 15th of May 1660 he was arrested on the charge of high treason, but was set free on

the 29th of June, subject to the obligation of attending the secretaries of state " for the service of the state whenever they should require." He subsequently wrote several papers on the subject of foreign affairs for Clarendon's information. He died on the 21st of February 1668 at his chambers in Lincoln's Inn, and is buried under the chapel there. Thurloe was twice married, and by his second wife Anne, daughter of Sir John Lytcote of East Moulseyin Surrey, he had four sons and two daughters.

His extensive correspondence, the originals of which are in the Bodleian Library at Oxford and the British Museum (Add. MSS. 4156, 4157, 4158), is one of the chief sources of information for the period. A portion was published with a memoir by T. Birch in 1742, and other correspondence is printed in R. Vaughan's Pro- tectorate of Oliver Cromwell (1836). See also Die Politik des Pro- tectors Oliver Cromwell in der Auffassung und Thdtigkeit . . . des Staatssecretdrs John Thurloe, by Sigismund, Freiherr von Bishoffs- hausen (1899); Eng. Hist. Review, xiii. 527 (Thurloe and the post office); Notes and Queries, nth series, vol. viii. p. 83 (account ot his death) ; A Letter to a Friend . . . on the Publication of Thurloe' s State Papers (1742) ; Clarendon's History of the Rebellion; Gardiner's History of the Commonwealth.

THURLOW, EDWARD THURLOW, ist Bakon (1731-1806), English lord chancellor, was born at Bracon Ash, in the county of Norfolk, on the 9th of December 1731. He was the eldest son of the Rev. Thomas Thurlow. He was educated at a private school and at the grammar school of Canterbury, where he was considered a bold, refractory, clever boy. In 1748 Thurlow entered Caius College, Cambridge, but an act of insubordination necessitated his leaving Cambridge without a degree (1751). He was for some time articled to a solicitor in Lincoln's Inn along with the poet Cowper, but in 1754 was called to the bar at the Inner Temple, and subsequently went on the western circuit — at first with little success. But in the case of Luke Robinson v. The Earl of Winchelsea (1758) Thurlow came into

collision with Sir Fletcher Norton, afterwards ist Baron Grantley (1716-1789), then the terror of solicitors and the tyrant of the bar, and put down his arrogance with dignity and success. From this time his practice increased rapidly. In 1761 he was made a king's counsel, through the influence of the duchess of Queens- berry. In 1762 he was elected a bencher of the Inner Temple. Thurlow now with some hesitation entered himself into tie ranks of the Tory party. In 1768 he became member for Tara- worth. In 1769 the Douglas peerage case came on for hearing in the House of Lords, and Thurlow, who had drawn the plead' ings some years before (Notes and Queries, 3rd series, vol. iii, p. 122), led for the appellant in a speech of great analytic power. In 1770, as a recognition of his defence in the previous January of the expulsion of Wilkes, Thurlow was made solicitor-general on the resignation of Dunning, and in the following year, after he had enhanced his reputation with the government by attack- ing the rights of juries in cases of libel (Rex v. Miller, 20 St. Tr. 870-896) and the liberty of the press (16 Parly. Hist. 1 144), was raised to the attorney-generalship. Thurlow's public life was as factious as his youth had been daring. His hatred of the American colonists, and his imprudent assertion that as attorney-general he might set aside by scire facias as forfeited every charter in America (debate on the American Prohibitory Bill, 18 P.H. 999); his speech in aggravation of punishment in the case of Home Tooke (20 St. Tr. 777-783), when he argued that the prisoner ought to be pilloried, because imprisonment was no penalty to a man of sedentary habits and a fine would be paid by seditious subscription; and his opposition to all interference with the slave trade---are character- istic. In 1778 Thurlow became lord chancellor and Baron Thurlow of Ashfield, and took his seat in the House of Lords, where he soon acquired an almost dictatorial power. He opposed the economical and constitutional reforms proposed by Burke and Dunning. Under Rockingham he clung to the chancellorship, while conducting himself like a leader of the opposition. To the short-lived

ministry of Shelburne he gave consistent support. Under the coalition of Fox and North (April to December 1783) the great seal was placed in commission, and Lord Loughborough was made first commissioner. But Thurlow, acting as the king's adviser, and in acccordance with his wishes, harassed the new ministry, and ultimately secured the rejection of Fox's India Bill (24 P.H. 226). The coalition was at once dissolved. Pitt accepted office, and Thurlow again became lord chancellor (Dec. 23, 1783). At first he supported the government, but soon his overbearing temper asserted itself. Imprudently relying on the friendship of the king, and actuated by scarcely disguised enmity to Pitt, Thurlow passed rapidly from occasional acts of hostility to secret disaffection, and finally to open revolt. He delivered himself strongly against a bill, introduced without his privity, for the restoration to the heirs of attainted owners of estates forfeited in the Jacobite rebellion of 1745. Partly to please the king and queen, partly from dislike to Burke, and partly perhaps from a real belief in the ground- lessness of the accusation, he supported Warren Hastings on every occasion " with indecorous violence." His negotiations with the Whigs during the discussion of the Regency Bill (1788-Feb. 19, 1789) were designed to secure his seat on the woolsack in the event of Fox being called to power. The climax was reached in 1792, when he attacked Pitt's bill " to establish a sinking fund for the redemption of the national debt," not on account of the economic objections to which it was liable, but on the trivial ground that it was an unconstitutional attempt to bind further parliaments. The bill was carried, but only by a narrow majority, and Pitt, feeling that co-operation with such a colleague was impossible, insisted successfully on his dismissal (June 15, 1792). The ex-chancellor, who had a few days before been created Baron Thurlow of Thurlow, with remainder to his brothers and their male descendants, now retired into private life, and, with the exception of a futile intrigue, under the auspices of the prince of Wales, for the formation of a ministry from which

Pitt and Fox should be excluded, and in which the earl of Moira should be premier and Thurlow chancellor (1797), finally

abandoned hope of office. In 1795 he opposed the Treason and Sedition bills without success. In 1801 he spoke on behalf of Home Tooke — now his friend — when a bill was introduced to render a priest in orders ineligible for a seat in the House of Commons. His last recorded appearance in the House of Lords was in 1802. He now spent his time between his villa at Dulwich and various seaside resorts. He died at Brighton on the 1 2th of September 1806, and was buried in the Temple church. Thurlow was never married, but left three natural daughters, for whom he made a handsome provision. The title descended to his nephew, son of the bishop of Durham.

Lord Thurlow was a master of a coarse caustic wit, which habitu- ally in his private and too frequently in his public life displayed itself in profanity. He was a good classical scholar and made occasional translations in verse from Homer and Euripides. His judicial and his ecclesiastical patronage were wisely exercised; he was the patron of Dr Johnson and of Crabbe, and was the first to detect the great legal merits of Eldon. Thurlow's personal ap- pearance was striking. His dark complexion, harsh but regular features, severe and dignified demeanour, piercing black eyes and bushy eyebrows, doubtless contributed to his professional and political eminence and provoked the sarcasm of Fox that he looked wiser than any man ever was. Yet he was far from being an impostor. By intense though irregular application he had ac- quired a wide if not a profound knowledge of law. Clear-headed, self-confident and fluent, able at once to reason temperately and to assert strongly, capable of grasping, rapidly assimilating, and forcibly reproducing minute and complicated details, he possessed all the qualities which command success.

His speeches in the trial of the duchess of Kingston for bigamy (20 St. Tr. 355–651) are vigorous and effective, while his famous opening in the Douglas peerage case and his argument for the Crown in Campbell v. Hall (20 St. Tr. 312–316) show that he might have rendered high service to the judicial literature of his country had he relied more upon his own industry and less upon the learning of Hargrave and Kenyon.

See Lord Campbell's Lives of the Chancellors, vii. 153–333; Foss's Judges of England, yiii. 374–385; Public Characters (1798); Notes and Queries, 2nd series, vol. iii. p. 283; 3rd series, vol. iii. p. 122; Reports of his decisions by Brown, Dickens and Vesey (jun.) ; Brougham's Statesmen of the Time of George III. (A. W. R.)

THURMAN, ALLEN GRANBERY (1813–1893), American jurist and statesman, was born at Lynchburg, Virginia, on the 13th of November 1813. In 1819 he removed with his parents to Chillicothe, Ohio, where he attended the local academy for two years, studied law in the office of his uncle, William Allen, 1 and in 1835 was admitted to the bar, becoming his uncle's law partner. He began to take an active part in politics in 1844, and in 1845–1847 was a Democratic representative in Congress, where he advocated the Wilmot Proviso. From 1851 to Feb- ruary 1856 he was an associate justice of the state supreme court, and from December 1854 was chief justice. He was Democratic candidate for governor of Ohio in 1867, and was defeated by Rutherford B. Hayes by a majority of less than 3000 votes; but the Democrats gained a majority in both branches of the state legislature, and Thurman was elected to the United States Senate, where he served from 1869 until 1881 — during the 46th Congress (1879–1881) as president pro tempore. Here he became the recognized Democratic leader and in 1879–1881 was chairman of the judiciary committee. He contested the constitutionality of the Civil Rights Bill, opposed the resump- tion of specie payments, advocated the payment of the public- debt in silver and supported the Bland-Allison Act. He intro- duced the Thurman Bill, for which he was chiefly responsible, which became law in May 1878, and readjusted the government's relations with the bond-aided Pacific railways. Thurman was a member of the Electoral Commission of 1877, and was one of the American delegates to the international monetary con- ference at Paris in 1881. In 1876, 1880 and 1884 he was a candidate for the .presidential nomination, and in 1888 was nominated for vice-president on the ticket with Grover Cleve- land, but was defeated in the election. He died at Columbus, Ohio, on the 12th of December 1895.

THURSDAY ISLAND, one of the smallest of the Prince of Wales group, N. of Cape York, in the Torres Strait, attached

1 William Allen (1806–1879), a native of North Carolina, removed in 1822 to Chillicothe, Ohio, was admitted to the bar in 1827, was a representative in Congress in 1833–1835, served in the United States Senate in 1837–1–849, and was governor of Ohio in 1874–1875.

to Somerset county, Queensland, Australia. Pop. (1901), 1534. It has an excellent harbour, Port Kennedy, and is a port of call for mail steamers and the centre of the beche-de-mer and pearl fisheries of the Torres Strait. It is a fortified coaling station for the British navy. The neighbouring Friday Island is the quarantine and leper station for Queensland.

THURSO, a municipal and police burgh, and seaport of Caithness, Scotland. Pop. (1901), 3723. It is situated at the mouth of the Thurso, on Thurso Bay, 21m. N.W. of Wick, and 319 m. N. of Edinburgh by the North British and Highland railways, the most northerly town in Scotland. Coaches run daily to Mey and Wick and every day a mail-car goes to Tongue, in Sutherlandshire, about 40 m. west.

In Macdonald Square, laid out with ornamental walks, there is a statue of Sir John Sinclair. A promenade along the sands was opened in 1882. The town-hall contains a public library and museum, which possesses the geological and botanical specimens of Robert Dick (1811–1866), the " Thurso baker," as well as a large collection of northern birds. In the neighbour- hood are quarries for Caithness flags, which are cut and dressed in the town. They constitute the leading export, but the trade of the port is hindered by the inconvenience of the harbour. There is, however, communication daily from Scrabster pier, 2 m. north-west, with Scapa and Stromness in Pomona (Orkneys), calling at Hoxa; once a week with Wick, Aberdeen and Leith; and occasionally in summer with Liverpool. To the east is Thurso Castle, the residence of the Ulbster branch of the Sinclairs, and near it is Harold's Tower, built over the grave of Earl Harold, once owner of half of Caithness, and half of the Orkneys

and Shetlands, who fell in battle with Earl Harold the Wicked in 1190. About three-quarters of a mile west stand the ruins of the bishop's palace, which was destroyed by fire in 1222. Thurso was the centre of the Norse power on the mainland when at its height under Thorfinn (1014), and afterwards till the battle of Largs (1263). Count Modach, nephew of King Duncan, quartered his army for a time at Thurso and despoiled it till he was surprised and slain by Thorfinn in 1040. In the time of Malcolm II. Earl Erlend resided in the town. In 1633 it was created a burgh of barony, and was the seat of the sheriff courts of the county till they were removed to Wick in 1828.

THURSTAN, or Turstin (d. 1140), archbishop of York, was the son of a certain Anger, or Auger, prebendary of St Paul's, London, and a brother of Audoen (d. 1139), bishop of Evreux. He hiniself was a prebendary of St Paul's, and was also a clerk in the service of William II. and then of Henry I., who secured his election as archbishop of York in August n 14. He now entered upon the great controversy which occupied him during a large part of his subsequent life and made him for several years an exile from England. Archbishop Ralph of Canter- bury refused to consecrate him unless he made a profession of obedience to the southern see; this Thurstan refused and asked the king for permission to go to Rome to consult Pope Paschal II. Henry I. declined to allow him to make the journey, while Paschal declared against Archbishop Ralph. At the Council of Salisbury in n 16 the English king ordered Thurstan to submit, but instead he resigned his archbishopric, although this did not take effect. The new pope, Gelasius II., and also his successor, Calixtus II., espoused the cause of the stubborn archbishop, and in October n 19, in spite of promises made to Henry I., he was consecrated by Calixtus at Reims. Enraged at this the king refused to allow him to enter England, and he remained for some time in the company of the pope. At length, however, his friends succeeded in reconciling him with Henry, and, after serving the king in Normandy,

he was recalled to England, which he entered early in 1121. Refusing to recognize the new archbishop of Canterbury, William of Corbeil, as his superior, Thurstan took no part in his consecration, and on two occasions both archbishops carried their complaints in person to Rome. In 1138 he made a truce at Roxburgh between England and Scotland, and took active part in gathering together the army which defeated the Scots at the Battle of the Standard

in August 1 138. Early in 1140 he entered the order of the Cluniacs at Pontefract and here he died on the 6th of February 1 140. Thurstan was generous to the churches of his diocese and was the founder of several religious houses.

See his life in the Fasti eboracenses, edited by J. Raine (1863).

THYLACINE (Thylacinus cynocephalus) . The only known living species of this genus, though smaller than a common wolf, is the largest predaceous marsupial existing. It is con- fined to the island of Tasmania, although fragments of bones and teeth found in caves afford evidence that a closely allied species once inhabited the Australian mainland. The general colour of the thylacine is grey-brown, but it has a series of transverse black bands on the hinder part of the back and loins, whence the name of " tiger " frequently applied to it by the colonists. It is also called "wolf," and sometimes, though less appropriately, " hyena." Owing to the havoc it commits among the sheep- folds, it has been nearly exterminated in all the more settled parts of Tasmania, but still finds shelter in the more moun- tainous regions of the island. The female produces four young at a time. (See Marsupialia.)

THYME. The genus Thymus (nat. ord. Labiatae) comprises a number of fragrant aromatic undershrubs,

with very small leaves and whorls of small purple honey-bearing flowers in the axils of the leaves or at the ends of the branches. The common garden thyme, a native of the Mediterranean region, is Thymus vulgaris; the wild thyme of English banks is T. serpyllum. Marjoram {Origanum) is also closely allied. All these plants are remarkable for their essential oil, to which their fragrance is due. From this oil is produced by distillation the substance known as thymol.

THYMOL, C 10 H 14 O or C 6 H 3 (OH) (CH 3) (C 3 H 7) [1 : 3 :6], a methylisopropylphenol isomeric with carvacrol (q.v.), is an aromatic substance found with the hydrocarbons cymene, C10H14, and thymene, CioH 16 , in oil of thyme (from Thymus vulgaris) and in other essential oils, e.g. Carum copticum, from which it may be extracted by shaking with potassium hydroxide, filtering and precipitating the phenol with hydrochloric acid. It can be prepared from dibrom-menthone (obtained by brominating menthone in chloroform solution) by eliminating two molecules of hydrobromic acid. Thymol crystallizes in large colourless plates, which melt at 44 and boil at 230 . On distillation with phosphorus sulphide it gives cymene.

Thymol has a strong odour of thyme and a pungent taste, and is freely soluble in alcohol, ether, chloroform or olive oil, but almost insoluble in cold water. It is a more powerful antiseptic than carbolic acid, but its insolubility prevents its being used for the same purposes. A saturated solution (1 in 1000 of warm water), thymol gauze and an ointment are used. Externally it is anti-parasitic, and is used in certain stages of eczema and psoriasis, and the alcoholic solution has been used in ringworm; internally it has been employed as an intestinal antiseptic in typhoid fever. Its chief use is as an anthelmintic to destroy the Ankylostoma duodenale. Thymol may colour the urine green. Thymol iodide, official in the United States, is a compound of iodine and thymol; it is also known as aristol or annidalin. It was introduced as a substitute for iodoform and is stated to be less toxic.

Glycoihymolin is a proprietary preparation, used in the treatment of catarrhal condi- tions of mucous membranes, while a mixture of naphthalene, camphor and thymol is sold under the name of thymolin.

THYROID (Gr. Ovpouhys, shield-shaped, from dvpeos, a large oblong shield, shaped like a door, dvpa, and elSos, form), in anatomy, a term applied (1) to the largest of the cartilages of the larynx (see Respiratory System), (2) to one of two arteries which lie near the thyroid cartilage and gland (see Arteries), and (3) to a vascular ductless gland, which rests on the larynx and upper part of the trachea (see Ductless Glands). The thyroid gland is used in medicine in two forms. Thyroideum siccum is a light dull brown powder, prepared by drying the thyroid gland of a sheep. Its chief constituent is a proteid known as thyreoglobulin, the active principle of which contains 9'3% of iodine and 0-5% of phosphorus, and is known as iodothyrin or thyroiodin. The dried gland easily becomes damp and deteriorates. Liquor thyroidei is a pink turbid liquid made by macerating the fresh gland of a sheep with glycerin and phenol.

Thyroid gland administered to man increases the pulse rate, causes increased and enfeebled cardiac beat and leads to increased metabolism, consequently excess of urea, uric acid and phosphates are excreted in the urine; it therefore reduces the body weight. Glycosuria develops from the inability of the body to ingest glucose. Overdoses of thyroid cause rapid pulse, headache and vomiting, together with diarrhoea and pruritus, emaciation and weakness. These symptoms are known as thyroidism.

Thyroid gland was introduced for the treatment of patients suffering from goitre, myxoedema and cretinism, in which diseases it has been remarkably successful, cretins growing rapidly under the thyroid treatment and developing intelligence. It has also been used in dwarfism, excessive obesity, psoriasis and scleroderma. When used in obesity an excess of nitrogenous food should be taken to balance the destruction of proteid. In certain forms

of insanity, melancholia and climacteric insanities it has given good results. Full doses of thyroid are valuable in the prevention and relief of eclampsia. It should not be given to patients suffering from exophthalmic goitre, for which an anti-thyroid serum (anti- thyreoidin of Moebius), which is the serum of thyroidectomized animals, has been introduced.

Rodagen is a white powder consisting of the dried milk of thyroi- dectomized goats, mixed with 50 % of milk sugar. In exophthalmic goitre this preparation causes a reduction of the swelling and of the pulse rate, and an increase of body weight.

THYROSTRACA, an order of Crustacea, comprising barnacles, acorn shells and some allied degenerate parasites. The embryos are free-swimming, active forms, but in adult life the animals are fixed head downwards, and are very degenerate. The body is indistinctly segmented, and is enveloped in a fold of the integument, usually with calcareous plates. The anterior antennae are fused with the anchoring attachment, whilst the posterior pair is vestigial, and the appendages of the mouth and body present various degrees of degeneration and specialization. In most cases the adults are hermaphrodite, but unisexual forms also occur, whilst the hermaphrodite adults may carry with them minute " complementary " males. In strong con- trast with the condition in most Crustacea, the spermatozoa are mobile. As shown by Burmeister in his historical review (1834), these animals, comprised by Linnaeus in the genus Lepas, first received a more comprehensive title from Cuvier, who called them Cirrhopoda, a word strictly meaning tawny- footed. Lamarck in 1809 altered this into the hybrid form Cirrhipoda, meaning curl-footed, which was subsequently improved into Cirripedia or Cirrhipedia. So long as the group was held to be a subordinate member of the Entomostraca, this term, though not the earliest, was generally accepted. The name Thyrostraca, meaning doorshells or valve-shells, is pre- ferred as agreeing in termination with the titles of the other two divisions, the Malacostraca and Entomostraca. The group may conveniently be arranged in two principal

sections — the Genuina with cirrhiform feet, and the Anomala without them.

Thyrostraca genuina. — It is with these that Darwin's classical treatises (Ray Soc. and Palaeont. Soc, 1851–1854) are almost exclusively concerned. Therein an order Thoracica comprehends the pedunculate Lepadidae, together with the operculate and sessile Balanidae and Verrucidae; a single species without cirrhi constitutes the order Apoda, and a single species with only three pairs of cirrhi the order Abdominalia. Within the last Kochlorine (Noll, 1872) with two species, and Lithoglyptes (Aurivillius, 1892) with three species, have since been included. But H. J. Hansen (Die Cirripedien der Plankton-Expedition, 1899) states that Crypto- phialus minutus, for which the order Abdominalia was founded, has, like Alcippe and other Genuina, its cirrhi on the thorax, not, as Darwin wrongly supposed, on the abdomen. In place, therefore, of the Abdominalia, it will be right to accept the family Crypto- phialidae, v. Martens, side by side with the Lithoglyptidae of Aurivillius and the Alcippidae of Gerstaecker. These, with Darwin's three families above mentioned, complete the section of genuine cirripedes now existing. Gruvel submitted to the Linnaean Society a rearrangement of the Lepadidae, unfortunately using for the first of his new families the preoccupied name Anaspidae. It is con- fusing, but not uninstructive, to find that within the Balanid group such generic titles as Stephanolepas and Platylepas have been coined. The vernacular name barnacle, traceable to the fable of pedunculate cirripedes hatching out into bernicle geese, has also been transferred to the sessile cirripedes, which are popularly known as acorn barnacles. A complete list of all the recent species of Thyrostraca in both sections, down to the year 1897, was published by Weltner (Arch. Naturg., 1898, § 63, pt. i. pp. 227–280). For fossil species, Woodward's Catalogue of Brit. Foss. Crust. (1877), pp. 137–144, should be consulted. Hoek

(" Challenger " Reports, " Cirripedia," 1883, viii. 8–11), gives a brief geological summary down to 1882. In that year J. M. Clarke (Amer. Journ. Sci. and Arts, 3rd series, vol. xxiv., p. 55) added a new species to Plumulites (Barrande, 1872), remarking that the species in question, P. devonicus, " is interesting in being the first representative of fossil barnacles from the Devonian, Barrande's species of Plumulites and Anatifopsis, as well as the Turrilepis of Woodward, being from the Upper and Lower Silurian, and Plumu- lites jamesi (Hall and Whitf., Pal. Ohio, vol. ii.) from the Hudson River group." Since Plumulites appears to be a synonym of Turri- lepas (not Turrilepis), the species Turrilepas wrightii (Woodward, 1865), from the Upper Silurian of Dudley, did not long enjoy an isolated eminence as the oldest known cirripede. As pointed out by Dr Bather (Geol. Mag. 1901, decade 4, vol. viii. p. 521), palae- ontologists themselves have in this branch not very closely followed the progress of their own science, since Dr Ruedemann, in regard to his new Pollicipes siluricus, 1901, speaks of " the enormous gap existing between the appearance of this Lower Siluric type and the next Upper Triassic (Rhaetic) representatives of the genera Pollicipes and Scalpellum." Many species of Scalpellum from the Wenlock shale of Gotland were described in 1892 by C. W. S. Aurivillius, who at the same time founded the species Pollicipes signatus on an almost perfect specimen from the Lower Ludlow of Wisby in Sweden. Aurivillius considered that Pollicipes signatus showed a closer approach to the Balanidae than any other of the Lepadidae, but he, too, in ignorance of the Devonian Protobalanus (Whitf.), dis- coursed needlessly about the gap in the distribution. Dr Bather justifiably anticipates further discoveries, but if, already in Silurian as in modern times, the members of these families had to pass through nauplius and cypris stages to maturity, there is one " enor- mous gap " between them and the common ancestor of the crustacean

class that will not be easily filled. To later

phylogenetic links an addition is offered by Dr Wood- ward (Geol. Mag., 1901, p. 145), who transfers his Pyrgoma cre- taceum, 1865, to a new genus Brachylepas (fig. 1), and a new family Brachylepadidae, intermedi- ate between the Rhaetic Pollicipes and the modern Balanus. Among other fossil genera of recent insti- tution, Archaeolepas, Lepidocoleus, Fig. i.— Brachylepas cretacea Squama, Stramentum can only be (Woodward), from Margate mentioned as incentives to re- chalk search. Among living forms, added

since Weltner's catalogue, may be noticed Koleolepas willeyi, from the Loyalty Islands (Stebbing, in Willey's Zool. Results (1900) pt. v., p. 677. This was found in a Turbo shell, occupied also by a Pagurid, and coated with Actinians. The cirripede, which has an elastic peduncle, a crested capitulum, but no valves, and the first cirrhi longer than the rest, should stand near Eremolepas, the name given by Weltner in place of the preoccupied Gymnolepas (Aurivillius). In the genus Scalpellum, S. giganteum, Gruvel (Trans. Linn. Soc, 1901) disputes with 5. stearnsii (fig. 2), Pilsbury, 1890, which shall be accounted the greater. The latter is threatened with a new generic name (Chun, Aus den Tiefen des Weltmeeres, 1900, p. 502).

The horizontal distribution of barnacles over all seas is fully explained by Darwin. The bathymetric range of sessile as well as pedunculate forms down to such depths as twelve or eighteen thousand feet — Verruca quadrangularis, Hoek, 1900 fathoms; Scal- pellum regium, Wyville Thomson, 2850 „ .. fathoms — is a more recent discovery. Gruvel Jr, C .v ^ (Contribution a I'etude des CirrhipUes, 1894)

found that the species frequenting sea sur- face or shallow water, notwithstanding their feeble powers of vision, cannot live long when entirely debarred from light. It must, therefore, be supposed that abyssal forms have gradually acquired such tolerance of dark- ness as makes their health independent of the sun. Among other singularities of habitat, not the least curious is the freedom with which some

small species, especially in the genus Dichelaspis, occupy the very jaws of large crustaceans. It is generally stated that cirripedes are confined to salt water, and, generally speaking, that is true. But Platylepas bissexlobata (De Blainville), from the west coast of Africa, is sometimes found entirely buried, except its operculum, in the skin of the manatee. Now, since it seems this Manatus senegalensis ascends rivers, we may infer that its parasite travels with it. Studer (Crustacea of the Gazelle, 1882) records Balanus amphitrite (Darwin?) from roots and stems of mangroves in the Congo, where, he says, " it follows the mangroves as far as their vegetation extends along the stream, to six sea-miles from the

Fig. 2.

stearnsii.

mouth." Darwin notes B. improvisus as quite tolerant of water not saline. Why the Thyrostraca, so hardy, so widely dispersed and multitudinous, and with a history so prolonged, should not have made more extended and more independent incursions into fresh water remains a problem. Though the Ornitholepas australis (Targioni Tozzetti, 1872), found on the tail feathers of a bird, repre- sents only the cypris-larva of a cirripede, it still shows one of the many facilities for dispersion which these creatures enjoy. A striking instance of their abundance is cited by Aurivillius (1894) from a report by Captain G. C. Eckman, who late in the summer observed great masses of Lepas fascicularis forming broad belts in the North Sea. Aurivillius himself examined a humpback whale which had as many as fifty specimens of Coronula diadema on each side of its head. He believes that the cetacean approaches not only rocks, but ships, in the hope of freeing itself from its lodgers. Yet the fact that the long, soft Conchoderma auritum stands exposed on the Coronula, sometimes ten on one, indicates that the whale can have little chance of evicting its tenants, even at the expense of rubbing off the eighteen flattened horns of its own skin embedded in

cavities round the domed base of the Coronula shell. The fecundity in the genus Lepas has struck many observers. Hoek (" Challenger " Reports, " Cirripedia," 1884, vol. x.) notes that, while in Scalpellum the number of eggs may be less than a hundred, " in Lepas anatifera it amounts, on the contrary, to many thousands and tens of thousands." In the same treatise Dr Hoek has useful chapters on the anatomy, development and sexes of the group, with references to the important researches since Darwin by Krohn, Claus, Kossmann and others. Francis Darwin, in the life of his father (1888, iii. 2), says, " Krohn stated that the structures described by my father as ovaries were in reality salivary glands, also that the oviduct runs down to the orifice described in the Mono- graph of the Cirripedia as the auditory meatus." Hoek, however, observes that the interpretation of the glands as salivary is not given by Krohn as his own opinion, but only quoted from Cuvier. Hoek himself proposes to call them pancreatic glands.

On the absorbing question of the development, T. T. Groom (Phil. Trans., 1894, vol. clxxxv.) supplies a full bibliography, beginning with the pioneers Slabber (1778; properly 1769) and J. Vaughan Thomson (1830). Groom's monograph was almost immediately supplemented by Chun's chapters on the same subject (Bibliotheca Zoologica, 1895, Heft 19, Lieferung 2), to which an important dis- cussion is contributed by H. J. Hansen (Die Cirripedien der Plankton- Exp., 1899). He insists on the value of the upper lip or labrum for generic distinction, and as an aid in affiliating larval forms of different stages to their several species. He cites Groom's evidence that larvae obtained from the egg readily go through one moult in the aquarium, and the known fact that the last larval stage is marked by a longitudinal series of six pairs of immovable spines or processes. He considers, then, that by a judicious comparison of larval forms with these two easily determinable stages the poverty of existing information on the subject may be gradually, if labori- ously, diminished. The large and peculiar

Archizoea gigas of Dohrn must, he thinks, belong to the Lepadidae as a larva in the last stage, but not, as v. Willemoes Suhm supposed, to Lepas australis, or even to the genus Lepas at all.

Thyrostraca anomala. — This section comprises Darwin's Apoda, the footless, Lilljeborg's Suctoria, called by Fritz Miiller the Rhizo- cephala or rootlet-headed, and the group to which Lacaze-Duthiers gave the alternative names Ascot horacida, sac-bodied or Rhizo- thoracida, rootlet-bodied. For the present these names may be dispensed with in favour of their equivalents, the three families Proteolepadidae, Sacculinidae and Lauridae. The first is still limited to the single genus and species Proteolepas bivincta (Darwin), parasitic within the sac of another cirripede. Nothing is certainly known of its development, except that the ova are extremely small, but H. J. Hansen (Die Cirripedien der Plankton-Exp.,18c)<), p. 53) argues that various nauplii of a type not previously described may probably be referred to this group or family. The second family, discussed by Delage, Giard, Kossmann and others, has no dearth of genera and species, though about several of them the in- formation is scanty. Almost all of them are parasitic on other crustaceans. Sphaerothylacus polycarpus (Sluiter, 1884) has an ascidian for its host. Sarcotaces (Olsson, 1872) has two species parasitic in fishes. But these exceptional and dubious forms do not obtain nutriment by sending rootlets in a rhizocephalous manner into their patrons. The family Peltogastridae is sometimes separated from the Sacculinidae, and sometimes made to do duty for both, the latter course being improper, since Sacculina (J. Vaughan Thompson, 1836) is not, as has been supposed, preoccupied, and must, therefore, take precedence of Peltogaster (Rathke, 1843). In the same family stands the genus Sylon, noted by Kroyer with- out a name in 1842, named by him without a description in 1855, described by Michael Sars in 1869, and published by G. O. Sars in 1870. Hoek (" Challenger " Reports, 1888, vol. xxiv. app. A) will orientate the English

reader on this genus. For the complicated parasitism of isopods and Sacculinidae on the same hosts Giard and Bonnier (Bopyriens, 1887, p. 197) should be consulted.

The remaining family may, till further knowledge, be allowed to

cover four remarkable species, three of them resident on Anthozoa,

I one on an echinoderm. Only the first, the celebrated Laura

gerardiae (Lacaze-Duthiers, 1865), sends such rootlets into its host as would justify the term Rhizothoracida. The small sinuous seg- mented body is enclosed, except for one small opening, in an enormous sac-like carapace, between the lamellae of which are protruded from the body the ovary and " liver," both large, bifurcate and ramified. It is this sac-like and not valvular cara- pace, therefore, that justifies the term Ascothoracida. But Synagoga mira, Norman, 1888 (Brit. Assoc. Report for 1887), has the body covered by two nearly circular valves instead of a sac. Petrarca bathyactidis , G. H. Fowler (Quart. Journ. Mic. Sci., 1889, vol. xxx. pt. ii. p. 115), has a bilobed carapace, ventrally open; Dendrogaster astericola, Knipovitch (Biologisches Centralblatt, 1891, x. 707), is a multilobular sac, with apparently indistinct segmentation of the body proper on the dorsal side. For this highly problematic group the original authorities should by all means be consulted. The student may then be asked to compare the account of Synagoga mira both with the figure of the cypris- stage of Dendrogaster astericola and with the figure of the " indeter- minate animal found on Gerardia," about which Lacaze-Duthiers asks, " Is it the cypris-stage of Laura?" (Mem. Acad. Sci., 1883, xlii. 160, pi. I, fig. 102). S.

mira was found, like Laura gerardiae (fig. 3), in the Mediterranean, and found like it attached

Fig. 3. — A, Laura gerardiae; B, Carapace slit open to show the body proper.

to an antipatharian. Its six pairs of limbs are not like the bare and simple feet of the Laura, but two-branched and setose as in the ordinary cypris-stage of the cirripede. The conclusion, therefore, from these facts and from the suggested comparisons, seems at. least extremely probable that the question asked by H. Lacaze-Duthiers should be answered in the affirmative, and that 5. mira is either the cypris-stage of Laura gerardiae or of some congeneric species. In Lacaze-Duthiers's highly-elaborated memoir it should be noticed that he uses the term " cirrhes " rather misleadingly, not for cirrhiform feet, but as the equivalent of setae. Also he gives two different reckonings of the segmentation, counting first eleven body segments without the caudal furca (p. 40), and then the caudal turca as itself the eleventh segment (p. 41). Of Petrarca the development is not yet known. The points of agreement and difference between it and Laura are carefully drawn out in the essay by Dr G. H. Fowler, who inclines to favour a close relationship between the Thyrostraca and Ostracoda. To the extreme development of the carapace in Laura, as compared with the segmented body, it would be difficult to find among crustaceans any analogy more striking than that of the great ovarial expansions in Nicothoe astaci, the little copepod parasite of the common lobster. The compactness of the class Crustacea is generally admitted; of the precise affinities of its subdivisions there is still much to learn.

(T. R. R. S.)

THYRSUS (the latinized form of Gr. Bvpao^, a stem or stalk) the wand or staff of Dionysus (Bacchus), the Bacchants and Maenads and the votaries taking part in his orgiastic rites. As commonly represented on the monuments it was a straight staff terminating in

a pine cone, a ribbon or fillet being attached to the head below it. Another form terminated in a bunch of grapes and vine leaves, or ivy-berries and leaves. The pine- cone or bunch of leaves was sometimes supposed to cover the head of a spear, and the thyrsus was termed dvpadXoyxos (see Dionysus and Mystery).

THYSANOPTERA (dvaavos, a fringe, and wrepov, a wing), a term used in zoological classification for a small order of the class Hexapoda iq.v.). The minute insects included in it, which haunt blossoms and leaves^ are fairly well known to gardeners

by the name Thrips, a generic term used by Linnaeus for the four species of the group which he had examined and relegated to the order Hemiptera. The term Thysanoptera was first used by the Irish entomologist A. H. Haliday (1836), who made a careful study of the British species and recognized that their structural peculiarities required ordinal separation. H. Bur- meister in 1838 also considered that these insects should form a distinct order, for which he proposed the name Physopoda , with reference to the bladder-like outgrowths (fig. 3) on the feet. Since then various authors have incorporated the Thysanoptera with one of the large orders, some, following Linnaeus, re- garding them as Hemiptera, others grouping with them the Orthoptera or " Pseudoneurop- tera." But all recent students agree with Haliday and Bur- meister in allowing the Thysan- optera to rank as a distinct

(The illustrations in this article are all after

H. Uzel, Monographic der Ordnung

Thysanoptera, and are used with his

permission.)

Fig. i. — Limothrips denticornis,

female, Europe.

order, showing affinities on the one hand with the

Corrodentia (book-lice and biting lice) and on the other with the Hemiptera (cicads, bugs, &c).

Characters. — The Thysanoptera, small insects with firmly chitinized cuticle, are recognized by the combination of im- perfectly suctorial jaws— the mandibles acting as piercers and maxillae retaining their palps (see fig. 2) — with the presence of two pairs of excessively nar- row wings (fig. 1), which are partly or completely surrounded by elongate delicate bristles forming a fringe. Other im- portant structural features are mentioned below. In their life-history the Thysanoptera belong to the Exopterygote division of the Hexapoda (

Uzel.)

b,

(After H.

Fig. 2. — Head of Aeoloihrips I fasciata, face view, showing eyes, bases of feelers and jaws. a, Clypeus.

Membrane between clypeus and

labrum. Labrum. Mandible. Unpaired piercer (? inner lobe of

left maxilla). Maxilla. Its palp.

Second maxillae, forming la- bium. Labial palp.

Structure. — The head is usually quadrangular in form with small but prominent compound eyes (fig. 2), whose facets are relatively large and convex; three ocelli may also be present on the vertex. The feelers are inserted close together (fig. 2) on the extreme front of the head; they exceed the head in length, but they are composed of only from six to nine segments, which are beset with prominent spines, some of the latter appearing to be organs of special sense. The mouth, with its jaws, forms a conical outgrowth which projects backwards, so that its apex lies beneath the prothorax. The labrum (fig. '2 c), which encloses the cone in front, is

irregularly triangular in shape. Behind the mouth the two maxillae of the second pair are intimately

c, d, e,

f, g, h,

(After H. Uzel.)

Fig. 3. — Foot of young Trichothrips (under surface). A, With "bladder," b,

protruded; B, retracted,

a, Claws.

associated to form the labium (fig. 2 h), whose appendicular nature is shown only by a median furrow and by short, cylindrical palps (fig. 2 i) with two or four segments. The maxillae of the first pair (fig. 2 f) enclose the mouth at either side. They are broad at the base, but taper towards the tip and carry palps (fig. 2 g) with two or three segments. Within the mouth lie a pair of slender piercers (fig. 2 d), while a single piercer (fig. 2 e) is situated asymmetrically on the left side. The nature of these structures has been much dis- puted. H. Uzel, with the majority of students, regards the paired organs as mandibles and the unpaired as an epipharynx. H. Gar- man and W. E. Hinds believe that the paired piercers are the inner lobes of the maxillae, and the unpaired piercer the left mandible, the right mandible being absent. C. Borner has stated that the unpaired piercer is attached directly to the base of the left maxilla. He therefore regards it as the inner lobe {lacinia) of that maxilla, comparing it with the remarkable " pick " of the maxilla of a book-louse (see Copeognatha in article Neuroptera), The paired piercers, connected by muscles with the base of the maxillae, but attached directly to the head skeleton, into which they can be withdrawn, are

regarded by Borner as true mandibles.

Turning to the thorax we find that the first segment (prothorax) is distinct and free, with a wide dorsal sclerite. The mesothorax and metathorax are rather intimately fused together. Most j remarkable in this order is the structure of the feet; there are never more than two tarsal segments, and the claws, usually so conspicuous in insect feet, are reduced (fig- 3 a) or absent. But the legs carry peculiar spines, and the terminal tarsal segment is cup-shaped at the end ; from this hollow a delicate bladder (fig. 3 b) can be pro- truded, apparently by the force of the blood-pressure, and by means of this bladder — acting as a sucker — the insect obtains firm hold on any surface which the foot touches. The narrow, delicate, fringed wings have already been de scribed; each wing may be surrounded by a nervure and traversed by two longitudinal nervures, or the nervuration may be altogether degenerated. A fair number of species are wingless (fig. 5), either in one or both sexes, and the occurrence of winged females with wingless males is noteworthy.

Ten segments are recognizable in the abdomen, which is elongated and tapers at the hinder end. In two of the three families of Thysan- optera the female has a conspicuous ovi- positor (fig. 4) with serrate processes, projecting from the ventral surface of the abdomen between the eighth and ninth segments. The number of spiracles is greatly reduced; in the adult a pair is present on the mesothorax, sometimes also a pair on the metathorax, and there is always a pair on the first and another pair on the eighth abdominal segment. . These spiracles, according to Hinds, are remarkable honeycomb-like structures, and perforations to the tracheal tubes have not been demonstrated. The internal structure of the Thysanoptera has been studied by fAft H u I) ^SK. Jordan. They possess a long, tubular

Flo.' 4 !~O v ipositor S ul ! et and a highly concentrated nervous (side view) of Physo- s^tem; "» addition to the suboesophageal ' ganglion, there are

two thoracic ganglia

and a single abdominal nerve-mass which is situated far forward. In this condensa- tion of the nervous system and in the presence of four Malpighian (excretory) tubes the Thysanoptera resemble the Hemiptera.

Development and Habits. — Many species of Thysanoptera are known to be habitually parthenogenetic. The eggs are laid on the food-plant, those females possessed of an ovipositor cutting through the epidermis and placing their eggs singly within the plant-tissues ; a single female may take five or six weeks to deposit all her eggs. The young insect resembles its parent in most points, but the head is disproportionately large; the anterior abdominal spiracles are on the second segment instead of on the first, and the foot has only a single segment. At first the eyes consist of a few distinct facets on either side of the head; they increase in number as growth pro- ceeds, and become aggregated to form the curious compound eye of the adult. From two to four moults occur, after which the " pro- nymph " stage is reached, which in the insect is moderately active and possesses wing-rudiments reaching to the second abdominal segment. After another moult the insect passes into the passive nymphal or " pupal " stage, during which it takes no food and rests in some safe hiding-place, such as the soil at the base of its food-plant or the hollow of a leaf-stalk. During this stage the cuticle draws away from the imaginal cuticle which is forming beneath, ultimately becoming separated as a thin

through which the form of the adult can be

pus.

8, 9, 10, Abdominal segments.

a, Anterior; 6, pos- terior process cSf ovipositor,

transparent pellicle seen.

Thysanoptera are found on the leaves and in the blossoms of plants. According to Hinds they feed chiefly on the green tissues, which ” are punctured by the piercing mouth-parts and the sap withdrawn by suction. The traces of their feeding are left in irregular streaks of dry, whitened cells.’’ It has been stated that when present in blossoms they feed on nectar, but it is more prob- able that there — as on the green parts — they suck sap. In any case, their presence in apple blossoms has been known to prevent the formation of fruit through injury to the essential organs of the flower, and some species do considerable damage to ears of corn. Some Thysanoptera habitually dwell on the under-surface of leaves, and others periodically migrate to roots. While the majority of the Thysanoptera are thus vegetarian in their diet, and are frequently injurious in farm and garden, some species, at least occasionally, adopt a predaceous habit, killing aphids and small mites (so-called ” red-spiders “) and sucking their juices. There are even records of an Anaphothrips, when cut off from its normal vegetable food- supply, becoming cannibalistic and feeding on its own species. The usual variations in habit that characterize plant-feeding insects are exhibited by the Thysanoptera some species being found only on one particular food-plant, while others thrive indifferently on a large assortment. Some members of this order spend the winter in the adult state, others in the ” larval ” or ” pupal ” condition. They shelter in crevices of the bark of trees, in the dried stems of herbaceous plants, or among moss and fallen leaves on the ground. Hinds states that the hibernating individuals live for more than six months. During summer there may be eight or nine successive generations when conditions are favourable and food abundant.

Distribution and Fossil History. — The Thysanoptera are probably world-wide in their range, but they have hardly been studied outside Europe and North America. Fossil insects referable to the order have been found in Tertiary beds as old as the White River Oligocene of North America, and the Baltic

amber, but nothing is known as to the previous history of the group.

Classification. — Only about 150 species of Thysanoptera are known; the European species with a few exotic forms have been described by Uzel, the North American by Hinds. These writers both follow the classification of Haliday, who divided the order into two groups or sub-orders.

1. Terebrantia: In this division (figs. I, 4) the abdomen is cylin- drical, the female is provided with a ventral ovipositor and has the terminal abdominal segment conical; the corresponding segment in the male is usually bluntly rounded. The forewings have at least a single longitudinal nervure — often two — reaching from base to tip of the wing. The maxillary palps have usually three, the labial either two or four segments. There are two families of Terebrantia: (a) the Aeolothripidae, whose feelers have nine seg- ments; whose wings, relatively broad and rounded at the tip, have a few cross nervules, and whose ovipositor is curved backwar- Is; and (b) the Thripidae, whose feelers have six to eight segments, whose narrow acuminate wings have no cross nervules, and whose ovipositor (fig. 4) is curved downwards. This latter family contains the great majority of the order.

2. Tubulifera: This division com- prises but a single family — the Phloeothripidae ; the species are not numerous, but some of them are of large size for Thysanoptera, as much as 8 mm. (one- third inch) in length. These insects have the abdomen flattened, with its terminal segment (see fig. 5) narrow and cylindrical. The palps, both maxillary and labial, have two segments. There is no ovipositor, and the wings are either without nervures or have only a single degraded longitudinal ner- vure which does not reach to the tip. While the Terebrantia are

(After H. Uzel.)

often rapid in their movements, the Fig. 5. — Megalothrips lati- Tubulifera are slow and deliberate, ventris, female, Europe. According to

Hinds, ” they never run or spring.”

Bibliography. — The number of important writingsontheThysan- optera is not large. A. H. Haliday’s papers in Entom. Mag., 1836- 1837, vols. iii. and iv., are still valuable and contain nearly all that is known of the fifty British species. K. Jordan’s anatomical studies (Zeits. wiss. Zool., 1888, vol. xlvii.) are valuable and the descriptions of the jaws by H. Garman (Amer. Nat., 1896, vol., xxx.) and C. Borner (Zool. Anz., 1904, vol. xxvii.) should also be consulted. Indispensable to the student are H. Uzel’s Monographic der Ordnung Thysanoptera (Koniggratz, 1895; in the Czech language, but with a German summary), and W. E. Hinds’s Monograph of the North American species (Proc. U. S. Nat. Mus., 1903, vol. xxvi.). (G. H. C.)

THYSANURA, the name applied by P. A. Latreille to the primitive wingless insects known as springtails and bristletails. Sir J. Lubbock (Lord Avebury) separated the springtails as a distinct order, the Collembola, and by many students this separation has been maintained. It is better, on the whole, to regard the Thysanura and Collembola as sub-orders of a single order, the Aptera (q.v.). The Thysanura are recognizable by their elongate feelers and tail-processes (cerci). Campodea (q.v.) Machilis and Lepisma — to which belongs the ” silver- fish ” {q.v.) — are the best known genera. (See also Hexapoda and Afteea.)

THYSSAGETAE, an ancient tribe described by Herodotus (iv. 22, 123) as occupying a district to the north-east of Scythia separated from the Budini by a desert seven days’ journey broad — perhaps the Voguls. From their land four rivers flowed into the Maeotis, but as one of them, the Oarus, is almost certainly the Volga, there must be some mistake about this. They seem to have held the southern end

of the Urals about Ufa and Orenburg. (E. H. M.)

TIAN-SHAN, or Celestial Mountains, one of the most extensive mountain systems of Asia. In the widest accepta- tion, the system extends from the E. edge (in about 67° E.) of the Aral-Caspian depression in the W. to the great bend of the Hwang-ho (about 103 E.) in the E. The Chinese geographers, however, appear to have confined the term to that part of the system which falls between the conspicuous mountain-knot of Khan-tengri (80° n' E. and 42 13' N.) and the Otun-koza or Barkul depression in 02°-93° E., where the northern ranges of the system abut upon the Ek-tagh Altai; and this conception and limitation of the term are more or less accepted by some Euro- pean geographers, e.g. Dr Max Friedrichsen and G. E. Grum- Grshimailo. On the other hand P. P. Semenov (or Semyonov), one of the earliest scientific explorers of the system, applies the name to the ranges which lie immediately west of Khan-tengri, including Khan-tengri itself. The Tarbagatai Mountains and their north-western continuation, the Chinghiz-tau, are some- times considered to belong orographically to the Altai system; but there are good reasons for regarding them as an independent range. Excluding these mountains, the northernmost member of the Tian-shan system is the Dzungarian Ala-tau in 45°- 45° 30' N. The southernmost range is the Trans-Alai, or rather its W.S.W. prolongation, Peter the Great Mountains in Karateghin (Bokhara), though some geographers (e.g. Max Friedrichsen) assign both the Alai and the Trans-Alai Mountains to the Pamirs.

General Orographical Description. — The Tian-shan consists almost everywhere of " sheaves " of parallel ranges, having their strike predominantly east and west, with deflexions to the W.S.W., west of Khan-tengri and to the E.S.E., east of 93° E., thus describing as it were a wide flattened arc open to the south. The principal constituent ranges are accompanied by another set of ranges which break away from the main axes in a westerly or even in a north-westerly direction. In the east, where the system is narrowest, the predominant feature, at

least as far west as 87 E., the longitude of the Bagrash-kul, is the Pe-shan swelling, with its flanking ranges, the Chol-tagh on the north and the Kuruk-tagh on the south. North of the Chol-tagh and west of Barkul and the depression of Otun-koza. (alt. 2390 ft.) the principal constituent ranges are the Bogdo-ola, continued west and north-west in the Iren-khabirga, the Talki Mountains and the Boro-khoro, flanking in succession the great depression of Dzungaria on the south. South of this last line of elevations comes the depression of Kulja or Hi, cutting deep and far into the outer edge of the great plateau of central Asia. This again is bordered on the south by another series ot ranges, the Narat Mountains and the Tomurlik-tau. The last bifurcates into the Trans-Ili Ala-tau and the Kunghei Ala-tau, skirting the north shore of Lake Issyk-kul. The west continuation of the Kunghei Ala-tau is the Alexander range, which in its turn bifurcates into the Talas-tau and the Kara-tau, this last stretching far out into the desert beside the Syrdarya. South of Lake Issyk-kul, which appears to be a hollow of tectonic origin, runs the Terskei Ala-tau, separating the lake from the high valley of the Naryn. On the south side of the Naryn valley comes the Kokshal-tau, called also in part the Boz-adyr, striking south-west from the Khan-tengri knot and terminating in the Terek-tau (40° 30' N. and 74°-76° E.), at which point the system again bifurcates, the Ferghana Mountains running away from it towards the north-west until it, or rather its prolongation the Uzun-tau, strikes against the Talas-tau. From this latter point, again, the Chotkal-tau strikes away to the south-west, screening the

valley of Ferghana against the Aralo-Caspian desert. The other arm of the bifurcation, situated farther south, and beginning at the Terek-tau, is double; it consists of the Alai and Trans-Alai ranges, continued westwards in the Karateghin, Zarafshan, Hissar and Turkestan ranges, though orographically the Trans-Alai ought probably to be described as the border-ridge of the Pamir plateau. Thus the Tian-

shan is as a whole narrowest in the east and spreads out fan-like in the west.

Khan-tengri and the Central Tian-shan. — The peak of Khan-tengri, which according to Max Friedrichsen's observations is not so high as had generally been supposed, being 22,800 ft. instead of 24,000 ft., stands, not on the main watershed of the central Tian-shan, but on a spur which projects from the watershed towards the south-west. The loftiest summit on the actual watershed, according to G. Merz- bacher, is a peak to which he has given the name of Nicholas Mikhail- ovich; its altitude he puts at 20,670 ft. But the general altitude of the crest of the watershed he estimates at about 16,500 ft., and it is overtopped by peaks (e.g. Dr von Almasy's peak Edward VII.) rising 3000-3500 ft. higher.

Closely connected with the Khan-tengri knot are the Khalyk-tau on the east, and on the west three diverging lines of elevation, namely the Terskei Ala-tau or Kirghiz Ala-tau, overhanging the south shore of Issyk-kul; the Kokshal-tau, stretching away south- west as far as the Terez Mountains between Kashgar and Ferghana; and, intermediate between these two, the successive ranges of the Sary-jas, Kulu-tau, and Ak-shiryak. The snowy chain of Khalyk-tau is highest in the north and west and sinks gradually towards the south and east. The highest parts of the range have generally an east-west strike and the range itself is continued east in the Kokteke (12,300 ft.), with the Kui-kuleh pass at an altitude of 11,500 ft. •

From Issyk-kul there is a sharp rise of 6000-9000 ft. to the snow- capped ridge of the Terskei Ala-tau, the peaks of which ascend to 15,000-16,500 ft. and even reach 18,000 ft. At this part the system as a whole has a breadth of 150 m. The Terskei Ala-tau forms a sharply accentuated, continuous, snow-clad range. According to I. V. Mushketov it is continued westwards in the Son-kul (alt. 9,500 ft.) of Baron Kaulbars, the Kara-kol, and the Suzamir-tau, until it abuts upon the Talas-tau. The country immediately

south of the Terskei Ala-tau consists " of broad, shallow basins running east and west in en echelon pattern, and lying at 10,000 ft. Between them and bordering them run from five to seven- ridges as broad as the basins and rising by gentle slopes to 13,000-16,000 ft. The ridges rise by long, gentle slopes to flat summits, where often for many miles the sky-line is an almost straight crest, from which the rounded slopes of pure white snowfields descend towards the basins. The crest line is notched by high passes only 1000-2000 ft. below the top of the crest. Oftener the summit of the ridge is broken into individual mountains, broadly flat-topped and of nearly equal elevation. . . . (Since late Tertiary times) erosion has had but little effect in altering the country from the state to which it was brought by the uplifting and warping of the old peneplain. The result of these geological changes is that, although the internal structure of the Tian-shan region is highly mountainous, its external appearance, or in other words its geographical aspect, is that of a plateau." 1 The passes over the Terskei Ala-tau and the plateau country to the south lie at great altitudes — at 13,560 ft. in the Kulu-tau; at 13,800 in the Bedel pass, 12,400 in the Kubergenty, at 12,600 in the Terekty, and at 14,440 in the Jan-art pass — all in the Kokshal- tau; the Terek pass at 12,800 ft., and the Turugurt at 12,730 ft., both in the Terek range; the Barskoun at 12,000 ft., the Suka or Sauka at 11,650 ft., and the Jauku at 14,000 ft. in the Terskei Ala- tau; and the Tez at 11,800 and the Akbel at 12,000 ft., both in the Sary-jas; while the pass of Muz-art, on the east shoulder of the Khan-tengri, necessitates a climb of 12,000 ft. or more. The snow- line on the Terskei Ala-tau runs at 11,500 ft. The summits of the Kulu-tau or Kyulyu-tau reach 13,700 to 14,750 ft.; those of the Ak-skiryak 15,000-16,000 ft., overtopping by some 2000-3000 ft. the plateau or highland region which forms the water- parting between the Tarim basin on the east and the Syr-darya catchment area on the west. The Kokshal-tau, which consists of several parallel ranges, is truly alpine in character and bears large glaciers, which send out

polyp-like arms into U-shaped valleys, behind which the mountain peaks tower up into sharp-cut, angular " matterhorns." The loftiest range is that to the north, which exceeds 16,000 ft., and the altitude increases generally from west to east as far as the Bedel pass in 78 ° 30' E., where the road crosses from Ak-su and Uch-Turfan to the valley of the Naryn and Ferghana. At its south-western extremity the Kokshal-tau merges in the Kokiya Mountains (16,000-18,000 ft.), which at their other end are met by the Alai Mountains and the Terek-tau.

Eastern and Northern Tian-shan. — The mutual relations and exact orographical connexions of several of the ranges east and north of the Khan-tengri group are not yet elucidated. The region east of the Barkul-Hami route was in part explored in the closing years of the 19th century, by P. K. Kozlov, V. A. Obruchev, the brothers G. E. and M. E. Grshimailo, V. I. Roborovsky and Sven Hedin. The system is known there locally as the Barkul Mountains and the

1 Ellsworth Huntington, in Geog. Journ. (1905), pp. 28 seq.

Karlyk-tagh 1 which stretch from W.N.W. to E.S.E. Its middle parts are snow-clad, the snow lying down to 12,000 ft. on the north side, while the peaks reach altitudes of 14,000-15,000 ft., but so far as is known the range is not crossed by any pass except in the east, where there are passes at 9600 ft. and 10, 600ft. (Belu-daban). Towards the east, the Karlyk-tagh radiates outwards, at the same time decreasing in altitude, though it rises again in the rocky Emir- tagh. From the Karlyk-tagh a stony desert slopes south to the Chol-tagh. The Chol-tagh marks the northern escarpment, as the Kuruk-tagh, farther south, marks the southern escarpment, of the great Pe-shan swelling of the desert of Gobi. These two ranges (described under Gobi) are apparently

eastern prolongations, the former of the Khaidyk-tagh or Khaidu-tagh, and the latter of the Kok-teke Mountains, which enclose on north and south respectively the Yulduz valley and the Lake of Bagrash-kul. Thus the Kuruk- tagh are linked, by the Kok-teke, on to the Khalyk-tau of the Khan- tengri group. The Khaidyk-tau, which are crossed by the passes of Tash-againyn (7610 ft.) and Kotyl (9900 ft.), are not improbably connected orographically with the Trans-Ili Ala-tau, or its twin parallel range, the Kunghei Ala-tau, in the west, in that they are an eastern prolongation of the latter. The Narat-tau appear to form a diagonal (E.N.E. to W.S.W.) link between the Khaidyk- tau and the Khalyk-tau and are crossed by passes which V. I. Roborovsky estimates at 10,800 ft. (Sary-tyur) and 11,800 ft. (Mukhurdai). The Jambi pass in this same range lies at an altitude of 11,415 ft. and the Dundeh-keldeh pass at 11,710 ft.

At the west end of the Barkul range is the gap of Otunkoza (2390 ft.), by which the Hami-Barkul caravan road crosses into the valley of Dzungaria, and at Urumchi (87°3o' E.),over 200 m. farther west, is a similar gap (2800 ft.) which facilitates communication between the oasis of Turfan and Dzungaria. Between these two gaps stretches the snow-clad range of the Bogdo-ola, which runs at an average altitude of some 13,000 ft., and rises to an altitude of 17,000-18,000 ft. in the conspicuous double peak of Turpanat-tagh or Topotar-aulie, a mountain which the Mongols regard with religious veneration. On the north side of this range the snow-line runs at an altitude of 9500 ft. At the foot of the same slopes lies the broad, deep valley of Dzungaria (2500-1000 ft.). On the south the Bogdo-ola is flanked by the nearly parallel range of the Jargoz, a range which, in contrast to most of the Tian-shan ranges, carries no perpetual snow. But its altitude does not exceed 10,000 ft., and its steep rocky slopes meet in a sharp, denticulated crest. West of the Urumchi gap, the Bogdo-ola is continued in the double range of the Irenkhabirga Mountains (11,500 ft.), which curve to the north-

west and finally, under the name of the Talki Mountains, merge into the Boro-khoro range. The Iren-khabirga, like the Bogdo-ola and the Terskei Ala-tau, are capped with perpetual snow. They culminate in the peak of Dos-megen-ora at an altitude of 20,000 ft. The more southerly of the twin ranges, the Avral-tau, in which is the Arystan-daban pass at an altitude of 10,800 ft., terminates in 82 E., over against the confluence of the Kash and the Kunghez (Hi) rivers. The Boro-khoro Mountains, with an average elevation of at least 11,500 ft., have all the characteristics of a border-ridge. This range, the slopes of which are clothed with Coniferae between the altitudes of 6000 and 9000 ft., separates the valley of Kulja (Hi) on the south from the depressions of Zairam-nor (6820 ft.) and Ebi-nor (670 ft.) in the valley of the Borotala on the north, the said, valley opening out eastwards into the wider valley of Dzungaria. The passes in the Boro-khoro lie at lower altitudes than is usual in the Tian-shan ranges, namely at 7000-7415 ft.

On its northern side the valley of Borotala is skirted by the im- portant orographic system of the Dzungarian Ala-tau, the northern- most member of the Tian-shan. Its constituent ranges run from E.N.E. to W.S.W., though some of them have a W.N.W. and E.S.E. strike. The two principal series of parallel ranges possess no common names, but are made up as follows : The northern series (going from east to west) of the Baskan-tau, Sarkan-tau, Karazryk-tau, Bionyn-tau, and Koranyn-tau, running at an average elevation of 11,000- 13,000 ft., and the southern series of the Urtak-saryk, Bejin-tau and Kok-su (Semenov's Labazy chain), at altitudes of 12,000-14,000 ft.

Western and Southern Tian-shan. — On the north side of the Issyk- kul, and separated from the Terskei Ala-tau by that lake, are the twin ranges of the Trans-Ili Ala-tau and Kunghei Ala-tau, parallel to one another and also to the lake and to the Terskei Ala-tau. The two chains are connected by the lofty transverse ridge of Almaty, Almata or Almatinka. The

more northerly range, the Trans- Ili Ala-tau, swings away to the north-west, and is continued in the echeloned ranges of Kandyk-tau, Kulja-bashi, Khan-tau and the Chu-Ili Mountains, the general altitudes of which lie between 4000 ft. and 0000 ft. These latter ranges separate the Muyun- kum desert on the west from the Balkash deserts on the east. The Trans-Ili itself culminates in Mt Talgar at an altitude of 14,990 ft. The Kunghei Ala-tau rises nearly 8000 ft. above the Issyk-kul and lifts its summits higher than 13,000 ft. The passes across the twin

1 It may however eventually turn out that these ranges, together with the Mechin-ola, farther to the north-east and intimately con- nected with the Karlyk-tau, belong to the Altai system.

ranges lie at 8000-11,000 ft. (Almaty pass) in the Trans-Ili Ala- tau and at 9000-10,885 ft. (Kurmenty pass) in the Kunghei Ala- tau. This last is continued without a break past the western end of Issyk-kul, being directly prolonged by the Alexander Mountains, although parted from them by the gorge of Buam or Bom, through which the Issyk-kul probably once drained. On neither of these ranges are there any true glaciers.

The Alexander Mountains terminate over against the town of Aulie-ata (71 20' E.) at the relatively low altitude of 2460 ft., though farther east they rise to 13,000-14,000 ft., and even reach 15,350 ft. in Mt Semenov. On the north their declivities are steep and rugged. They are crossed by passesat 6550-1 1, 825ft. (Shamsi). From the middle of the Alexander range, in about 74 E., a chain known as the Talas-tau breaks away from its south flank in a W.S.W. direction, and from near the western extremity of this latter two parallel ranges, the Chotkal or Chatkal (14,000 ft.), and the Ala- tau, break away in a south-westerly direction, and running parallel to one another and to the river Naryn, or upper Syr-darya, terminate at right angles to the middle Syr-darya, after it has made its sweeping turn to the north-west. The Talas-tau, some- times known as the

Urtak-tau, while the name of Ala-tau is also extended to cover it, has an average elevation of 14,000-15,000 ft., but lifts its snow-capped summits to 15,750 ft.; it is crossed by passes at 8000-10,650 ft.

From near the west end of the Alexander range, in about 71 E., the Kara-tau stretches some 270 m. to the north-west, between the Syr-darya and the Chu. It belongs to the later series of transverse upheavals, and consists almost entirely of sedimentary rocks. It is not clear, however, whether orographically it is connected with the Alexander range or with the Talas-tau. Its average elevation is 5000 ft., but in places it reaches up to 7000-8000 ft. In the same north-westerly to south-easterly direction and belonging to the same series of later transverse upheavals are the Ferghana Mountains, which shut in the plain of Ferghana on the north-east, thus running athwart the radiating ranges of the central Tian-shan. The Ferghana Mountains, which are cleft by the Naryn (upper Syr-darya) river, have a mean altitude of 10,000 ft., but attain elevations of 12,740 ft. (Suyuk) and are crossed by the Terek pass (distinct from the Terek pass in the Terek Mountains) at an altitude of 9140 ft.

On the south the Ferghana valley is fenced in by the lofty range of the Alai, backed by the parallel range of the Trans-Alai. Both ranges abut at their eastern or E.N.E. extremity upon the Pamir plateau, and both extend in their respective continuations a long way out into the desert. The Alai is a well-defined ridge with steep slopes, and both it and the Terek- tau, which prolongs it towards the Kokshal-tau, are flanked next the Ferghana valley by what appear to be the old uplifted strata both of the old Palaeozoic series of metamorphic limestones and of the newer Tertiary series of softer conglomerates and sandstones. The general altitude of both ranges is 16,000-19,000 ft., but the Trans-Alai culminates in peak Kauf- mann (23,000 ft.). The Trans-Alai is a true border range, the ascent to it from the Pamir plateau (13,000 ft.) on the south-east being gentle

and relatively short, while both it and the Alai tower up steeply to a height of 11,000-14,000 ft. above the valley of the Alai. This valley, which runs up at its eastern end to the Muz-tagh-tau, is about 75 m. long and is continued towards the south-west by the valley of Karateghin. Its breadth varies from 3 to 12 m. and its altitude decreases from 10,500 ft. in the north-east to 8200 ft. in the south-west. It is drained by the Kyzyl-su, which, under the name of Vakhish, finally enters the Amu-darya. The Alai valley is in ill repute because of the enormous masses of snow which fall in it in the winter. Despite that it is an important highway of communica- tion between Bokhara and the Pamirs on the one hand and Kashgar and Ferghana on the other. The principal passes over it into the valley of Ferghana are Taldyk, 11,605 ft.; Jiptyk, 13,605 ft.; Saryk-mogal, 14,110 ft. ; Tenghiz-bai, 12,630 ft.; and Kara-kasyk, 14,305 ft. The first-named has been made practicable for artillery and wheeled carriages. The Pamir plateau is reached by means of the Kyzyl-art pass at an altitude of 14,015 ft.

The Alai Mountains are continued westwards in the radiating ranges of the Karateghin Mountains, Zarafshan Mountains, the Hissar Mountains and the Turkestan range, which reach altitudes of 18,500-22,000 ft., though peak Baba in the Zarafshan range reaches nearly 20,000 ft. The Trans-Alai are continued in the Peter the Great range, which culminates in the Sandal group at close upon 25,000 ft. (see further Bokhara). The passes across these ranges are as a rule difficult and lie at altitudes of some 10,000-13,000 ft. The last outlying range of the Tian-shan system in this direction is the Nura-tau, which, like the Kara-tau farther north, belongs to the more recent series of upheavals having a W.N.W to E.S.E. axis. It rises abruptly from the desert and lifts its snowy peaks to altitudes of 15,000-16,000 ft., separating the river Syr-darya from the river Zarafshan. The passes over it lie at altitudes of 10,000-13,000 ft.

Glaciation. — In the central and western parts of the Tian-shan there exist numerous indications of

former glaciation on an extensive scale, e.g. in the Sary-jas, the Terskei Ala-tau, Khan-tengri, Alai, Trans-Alai, Terek range, Trans-Ili Ala-tau, Kunghei Ala-tau, Kok- shal-tau, Dzungarian Ala-tau, Alexander Mountains and Talas-tau.

TIARA

iii

Indeed, the evidences, so far as they have been examined, appear to warrant the conclusion that the region of the western Tian-shan, from Lake Issylc-kul southwards, was in great part the scene of probably five successive glacial periods, each being less severe than the period which immediately preceded it. At the present day four or five large glaciers stream down the shoulders and embed them-selves in the hollow flanks of Khan-tengri — the Semenov at altitudes of 12,410-11,100 ft., the Mushketov at 11,910-10,920 ft., the Invlchik at 11,320-10,890 ft., and the Kaindy at 10,810-10,040 ft. The Inylchik glacier is computed to have a length of about 45 m. Glaciers occur also on Manas mount to the south of the town of Aulie-ata. In the Alai region there are other extensive glaciers, e.g. the Fedchenko and Shurovsky glaciers south of peak Kauffmann. Generallv speaking, the snow-line runs at 11,500-12,800 ft. above sea-leveC and all ranges the peaks of which shoot up above 12,000 ft. are snow-clad, and all ranges which are snow-clad rise to higher altitudes than 11,500 ft. A feature generally characteristic of the Tian-shan as a whole is that the absolute elevation of the ranges increases gradually from north to south, and from the centre decreases towards both the east and the west. At the same time the relative altitudes, or the heights of the mountain ranges above the valleys which flank them, decrease from north to south. For instance, in the Dzungarian Ala-tau, the valleys going south lie successively at altitudes of 4300 ft. in the Borotala, at 5600 ft. in the Urtaksaryk and at 6820 beside the Zairam-nor. Again, while the Hi (Kulja) valley lies at 1300 ft., the Issyk-kul has an altitude of 5300 ft., the Koshkar basin, in which

the river Chu has its source, reaches 6070 ft., the Son-kul valley 9430 ft., the Ak-sai valley, farther east, 10,000 to 11,150 ft., and the Chatyr-kul on the north side of the Terek Mountains 11,200 ft. In the elevated regions of this part of the system, between the Kokshal-tau and the Pamir plateau, the snow-line runs at a higher level than is usual elsewhere, namely at 12,500 ft. and even at 13,000-13,800 ft. on the Kokiya Mountains.

Climatic Conditions. — As a rule on all the Tian-shan ranges the ascent from the north is steep and from the south relatively gentle. But the deep lateral indentations (e.g. Kulja) provide a more or less easy access up to the loftier tablelands and plateaus of the interior. Broadly speaking, the climate on the north and west of the main ranges is both milder and moister than on the south and east, and accordingly the precipitation in the former is relatively heavier, namelv 10 to 20 in. annually. It used to be supposed that the Tian-shan confronted the basin of the Tarim with a steep, wall-like versant. But this is not the case. G. Merzbacher, speaking of the slopes of the Khalyk-tau and other neighbouring ranges of the central Tian-shan, says that " nearly everywhere the Tian-shan slopes away gradually towards the high plain at its southern base, in places. . .subsiding gradually in ranges of trans- verse spurs, whose cape-like ends project far into the desert, or in other places in the step-like tailing off of longitudinal ranges. ... In some places limestones appear as projections from the range; at others conglomerates and Tertiary clay marls form the outermost fold." 1 On the north versant of the ranges the rainfall increases from the foot of the mountains upwards, and at 9000-10,000 ft. the vegetation becomes luxuriant. According to P. P. Semenov, the following vegetable zones may be distinguished on the northern slopes: altitudes of 525-1575 ft. are steppe lands, of 1575-4300 ft. are the zone of cultivation, 4300-8100 ft. the zone of coniferous trees, 8100-9500 ft. alpine pastures, 9500-11,900 ft., the higher alpine regions, and above the last limit is the region of

perpetual snow. The south versant, on the other hand, is barren and desolate below the 10,000 ft. limit and above that it is dotted with scanty patches of grass and bush vegetation. Its general aspect is that of rugged slopes of bare rock, seamed with the beds of dry torrents choked with gravel (see further Turkestan, West).

Routes.— The traditional routes between China on the one side and West Turkestan and Persia on the other have from time imme- morial crossed the Tian-shan system at some half a dozen points. After traversing the desert of Gobi from Sa-chou to Hami, the great northern route crossed over into the Dzungarian valley either by the Otun-koza depression or by the gap at Urumchi, or else it proceeded over the Muz-art pass on the east side of Khan-tengri or over the Bedel pass in the Kokshal-tau and so down into the valley of Kulja. The shortest route, though not the easiest, between Kashgar and East Turkestan in the east and Ferghana and West Turkestan in the west is over the Terek pass or the pass at the head of the Alai valley, a dangerous route in winter by reason of the vast quantity of snow which usually accumulates there.

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TIARA (Gr. rcapa), also called regnum, triregnum and corona, the papal crown, a bee-hive shaped, somewhat bulging head- covering, ornamented with three crowns (whence triregnum or "triple crown"). It has no sacral character, being solely the ensign of sovereign power (cf. Innocent III. Serm. vii. in S. Silvest: " Pontifex romanus in signum imperii utitur regno "), and is therefore never worn at liturgical functions, when the pope always wears the mitre. The tiara is first mentioned, under the name of camelaucum, in the Vita of Pope Constantine (d. 715), and next under the name of pileus phrygius or phrygium, or the Constilutum Constantini, the so-called " Donation of Con- stantine." In the 9th century it appears in the 9th Ordo of Mabillon in connexion with the description of the consecration of the pope. On papal coins it first appears on those of Sergius III. (d. 911) and then on those of Benedict VII. (d. 983). At

1 G. Merzbacher, The Central Tian-shan Mountains, pp. 139-140 (London, 1905).

Drawn by Father Joseph Braun, S.J.

Figure to illustrate the development of the Tiara, this period it was, according to the Ordo above mentioned, a sort of cap of white stuff, and helmet-shaped. Before the 9th century the tiara was certainly without any crown; any such ornament would not have been in keeping with the circum- stances of the time, and seems also to be excluded by the terms of the Constitutum Constantini. It is quite uncertain when the crown was first added. It is true that Mabillon's 9th Ordo calls this head-gear regnum, but it appears to know nothing of a crown. The papal coins and a few pictures of the 10th and nth centuries leave it doubtful whether the ornamental band at the lower edge of the tiara is intended to represent a crown or merely a decorative orphrey (aurifrisium) . At the beginning of the 1 2th century, however, the papal tiara was already decorated j with a circlet, as the Ordo of Benedict (c. 1140) and statements made by Bruno of Segni and Suger, abbot of St Denys, prove; but it is only in representations of the tiara dating from the late 13th century that the circlet appears as a regular spiked crown. The two pendants at the back of the tiara (caudae, infulae) are like- wise only traceable to this period. The second circlet was added by Boniface VIII., as is proved by three statues executed during his lifetime (one in the Lateran church and two in the crypt of St Peter's). Perhaps this was due only to the pope's love of display, but possibly the two crowns were intended to symbolize Boniface's views as to the twofold nature of the papal authority. In the inventory of the papal treasury made in 13 16 the tiara is described as having three crowns; the third must therefore have been added under Benedict XI. or Clement V. The monumental effigy of Benedict XI. in S. Domenico at Perugia still has a tiara with one circlet in the antique fashion of the 13th century; that of John XXII. showed only two crowns. The earliest monumental effigy of a pope giving an example of a triple-crowned tiara is now, therefore,

that of Benedict XII. (d. 1342), of which the head is preserved in the museum at Avignon, while an effigy of the same pope in the crypt of St Peter's at Rome has a tiara with only two crowns. Since Benedict XII. the triple-crowned tiara has appeared regularly on the monuments of the popes. The crowns are essentially uniform, though the ornament varies (leaves or spikes) .

Outside Rome it was still a considerable time before the triple- crowned tiara appeared in representations of the popes, and as late as the 15th century they are sometimes pictured with the single- crowned tiara. The reason for the addition of the third crown is unknown. The symbolism now attached to the triple crown (authority over heaven, earth and hell, or the temporal power and the powers of binding and loosing) is certainly not the original explanation.

Several baseless hypotheses have been advanced as to the origin of the papal tiara. In all probability the camelaucum, the oldest form of the tiara, came into use under the Greek and Syrian popes of the 7th, or the beginning of the 8th century, perhaps even under Pope Constantine himself. The prototype of the camelaucum must undoubtedly be sought at Constantinople in the head-ornament forming part of the Byzantine court costume. (J. Bra.)

TIARET (Tahert), a town of Algeria, in the Tell Atlas, depart- ment of Oran, 122 m. S.E. of Mostaganem by rail. It occupies an important strategic position on a pass through the mountains at an elevation of 3552 ft. Pop. (1906), 5778, of whom 3433 were Europeans. The Wadi Tiaret flows through the town in a series of cascades. The upper town, the residential quarter, is on the right bank of this stream. The citadel occupies a separate hill on the other side of the wadi. The chief business centre is the lower town where are also the principal public buildings. On another hill opposite the citadel is the native town.

The citadel occupies the site of a Roman station believed to be that of Tingurtia. Tiaret (Berber for ” station “) was a town of note at the time of the Arab invasion of North Africa in the 7th century and is stated by Ibn Khaldun to have offered a stubborn resistance to Sidi-Okba. In 761 it was taken by Abdurrahman ibn Rostem, the founder of the dynasty of the Beni Rustam (Rostem). Their empire, which during the reign of Abdurrahman (761-784) and his son Abdul Wahab (784-823) extended over the greater part of the modern Algeria, was known as the Ibadite Empire from Abdallah ibn Ibad, the founder of the heretical sect to which Abdurrahman belonged. The Ibadites represented the moderate section of the Kharijites (see Mahomhedan Religion). Seven princes of the Rustamite house succeeded Abdul Wahab at Tiaret, but in 909 the dynasty was overthrown by the Fatimite general al Shi’i. Two years later Tiaret was captured by Massala ibn Habbus of the Miknasa dynasty of Morocco, and after his death in 924 two other princes of the same house maintained their independence, but in 933 the Fatimites again gained the mastery. The Ibadites, after being expelled from the Tell, took refuge in Wargla. They were driven thence in the nth century and migrated to Mzab, where their descendants still profess the Ibadite doctrines (see Mzabites). After its second capture by the Fatimites, Tiaret ceased to be the capital of a separate state. For a long period it was included in the sultanate of Tlemcen, and in the 16th century fell to the Turks. It was one of the chief towns of Abd el Kader, but was occupied by the French in 1843. At Takdempt, 6 m. west of Tiaret, Abd el Kader had his principal arsenal. About a mile from Takdempt are ruins of a town supposed to be the remains of the Ibadite capital. Eighteen miles S.S.W. of Tiaret are the sepulchral monuments known as the Jedars (see Algeria: § Archaeology) .

TIBBU, or Tebu (‘.’ Men of Tu,” i.e. ” of the rocks “), a nomad negro-Berber race of the eastern Sahara, their territory being conterminous westward with that of the Tuareg Berbers. Roughly, their domain is some 200,000 sq. m. Their western- most settlements

are the oases of Agram, Kawar and Jebado, their northernmost the district of Gatron (Qatrun) within the Fezzan frontier, while south and south-east they merge gradually in the negroid populations of Kanem, Bornu (Chad basin), Wadai and north-west Darfur. But the bulk of the nation is

concentrated in the region of Tibesti or Tu, hence their name. There are two main divisions — the northern Teda, or less negroid Tibbu, and the southern Daza, or more negroid Tibbu. Some- what more distantly connected with the same family are the Baele of the eastern and south-eastern oases and the Zoghawa (Zaghwa) of Darfur. The Tibbu are variously estimated as numbering from 60,000 to 100,000, but their districts are so little known that these figures are not to be relied on.

The Tibbu are usually identified with the Garamantes of Herodo- tus (iv. 183), whose capital was Garama (Idrisi's Germa) in Phazania (Fezzan), and of whom Ptolemy already spoke doubtfully as Ethio- pians (Negroes ?) : "Orou" St koI abr&v tjSt; /xSXAop AiBidiruv (i. 8). But Leo Africanus transfers them to the Berber connexion, whose fifth great division he deals with under the names of Gumeri (Gara- mantes?) and Bardaei or Bardoa, that is, the Teda of the Bardai oasis, Tibesti. 1 Lastly Heinrich Barth on linguistic grounds grouped them with the Kanuri of Bornu, who are undoubtedly negroes ; and since his time (1852-1853) the Tibbu have been regarded by most ethnologists as a negroid people. 2 Gustav Nachtigal, who studied them carefully (1870-1873), although his own inferences are somewhat vague, supplies sufficient evidence for a solution of this difficult ethnological problem. There can be little doubt that the Teda, or true Tibbu, probably identical with the Tedamansii, a branch of the Garamantes, placed by Ptolemy south of the Sama- mycii in Tripolitana, 3 physically resemble their western Tuareg neighbours. They are a pure homogeneous race, who have for ages undergone no perceptible change in their rocky homes, and are still distinguished by the regular features, long black ringlety hair, haughty bearing and fierce

expression common to so many of the Berber peoples. Mostly of middle size, they are finely pro- portioned, except the somewhat too small hands and feet, with lighter complexion than that of the southern Daza, and no trace of the flat nose, thick tumid lips, or other marked characteristics of the true negro. " Their women are charming while still in the bloom of youth " (Keane's Reclus, xxii. 429). But there has been a general displacement of the race southwards; and, while a few linger in the northern Gatron and Kufara districts, large numbers have since medieval times penetrated into the Kanem, Bornu, Wadai and Darfur regions of central Sudan. Here they have everywhere merged in the natives, so that in the Daza, Kanembu, Kanuri, Baele and Zoghawa groups the Tibbu race presents all the shades of transition between the true negro and the true Berber.

The same transitional stages are observed in the Tibbu forms of speech, which constitute a wide- spread linguistic family, whose most archaic and purest branch is the Tedaga of Tibesti (Nachtigal). Through the southern Dazaga the Tedaga merges in the more highly developed and more recent Kanem, Bornu (Kanuri), Ennedi (Baele) and Darfur (Zoghawa) dialects, which, owing to the absence of grammatical gender and some other structural features, are usually classed as negro languages. But a negro tongue could not have arisen among the people of Hamitic speech of the Tibesti uplands, and the explanation of this linguistic difficulty is obviously the same as that of the physical puzzle. The negro affinities of the southern members of the group have arisen through assimilation with the original and now partly displaced negro idioms of central Sudan. There remains the final difficulty that Tedaga itself has nothing in common with the Berber or any Hamitic tongue. If, therefore, it is neither Hamitic nor negro, the only two stock languages recog- nized by Lepsius in Africa, how is it to be placed? Lepsius's generalization, inconsistent as it is with the conditions occurring in other parts of the continent, must be rejected.

Room having thus been found for other linguistic families, the Tedaga of Tibesti may be explained as an independent evolution from a primeval Tibbu-Berber germ, analogous to other linguistic evolutions in other isolated or inaccessible highland regions, such as the Caucasus, the Pyrenees and the Anahuac table-land. The common germ has long since perished, or can no longer be detected, and the Tibbu and Berber languages stand side by side as fundamentally distinct, while the two races remain physically one. The Tibbu are therefore a Berber people, who in their secluded homes have had time to evolve an independent form of speech, which southwards has become largely assimilated to the Sudanese negro dialects.

Lying on the tract of the great caravan route between Fezzan and Lake Chad, the Tibbu have always been a predatory race, levying blackmail on the convoys passing through their territory, maintaining inter-tribal feuds and carrying on constant

1 See Vater, Mithradates, ii. p. 45 of Berlin ed. 1812, and Nachtigal, Sahara una" Sudan (1881), ii. 189.

2 " Urspriinglich ein Negervolk," Lepsius, Nubische Grammatik {Einleitung) (Berlin, 1880).

3 The original inhabitants of the Kufara (Kufra) oases were Teda, some of whom survive in a settlement south of Jebel Nari. Since the beginning of the 18th century they have been replaced elsewhere in Kufara by the Zwiya Arabs from the Leshkerreh oases.

warfare with the surrounding Berber and Sudanese populations. The tribal organization embraces dardai or headmen, maina or nobles, and the common folk, while the unwritten law of custom rules supreme over all classes. Their customs are partly negroid,

partly Arab. They scar their faces like the negroes and wear the veil like the Tuareg.

See G. F. Lyon, Narrative of Travels in Northern Africa (London, 1821); Gustav Nachtigal, Sahara und Sudan (Berlin and Leipzig, 1879–1889) ; Gerhard Rohlfs, Quer durch Africa (1874–1875).

TIBER (anc. Tiberis; Ital. Tevere), a river of central Italy. It traverses the Tuscan Apennines — in which it rises at a point some 12 m. N. of Pieve San Stefano, 4160 ft. above sea- level — in a series of picturesque ravines, skirts the west foot of the Sabine Mountains in a broad shallow valley, then crosses the Roman Campagna, cutting its way through Rome, and finally enters the Tyrrhenian (Mediterranean) Sea by two arms at Ostia and Fiumicino, the latter artificial. Its principal tribu- taries are the Paglia, the Nera and the Anio or Teverone, and it is generally navigable by boats up to the confluence of the Nera, a distance of 104 m., though, owing to the rapidity of the current, there is very little navigation above Rome. The total length of the river is 240 m., of which 21 m. lie between Rome and the sea. This latter portion of the river's course is tortuous, but in spite of this, and although the depth varies from only 7 to 20 ft., and in 'places at low water does not exceed 4 ft., it is nevertheless navigated by vessels up to 180 tons burden and proposals have been made to embank and dredge it so as to increase this depth to 8 ft. at least, or to build a ship canal up to Rome. The area of the Tiber basin is 6845 sq. m. The stream is heavily charged with sediment, and from that circumstance got its ancient epithet of flavus (tawny). It does not, however, form a delta proportionate to the volume of its water, owing to a strong sea current flowing northwards close to the shore, to the sudden sinking of the sea to a great depth immediately off the mouth of the river, and possibly also to the permanent subsidence of the Italian coast from the Tiber mouth southwards to Terracina. Still it has advanced at each mouth about 2 m. since Roman times, while the effect of the sedi- ment it brings down is seen on the north-west

almost as far as Palo (anc. Alsium), and on the south-east beyond Tor Paterno (see Laurentina Via) in the gradual advance of the coast. The rate of advance at Fiumicino is estimated at 13 ft. per annum. From Rome to the sea the fall is only 6-5.: 1000. The arm which reaches the sea at Fiumicino is a canal, dug by Claudius and improved by Trajan (see Portus), which partially silted up in the middle ages, and was reopened for navigation by Paul V. in 161 2, 2% m. long, 80-130 ft. wide, and with a minimum depth of s ft. The lower course of the Tiber has been from the earliest ages subject to frequent and severe inundations; of more recent ones, those of 1598, 1870 and 1900 have been especially destructive, but since the year 1876 the municipality of Rome, assisted by the Italian Government, has taken steps to check, and possibly to prevent these calamities within the city by constructing embankments of stone, resting on caissons, for a total distance (counting in both sides of the river) of 6 miles. The flood of 1900 carried away about i m. of the new embank- ment on the right bank of the right arm opposite the island owing to the faulty planning of the course of the river at that point, which threw the whole of the water mto the right arm, and except in flood time, left the left arm dry — a fault which has since been corrected.

In the prehistoric period the mouth of the Tiber must have been situated at the point where the hills which follow it on each side cease, about 12 m. below Rome. On the right bank they are of pliocene gravel, on the left of tufa; and on the latter, on a cliff above the river (the ancient Puilia saxa) stood Ficana (marked by the farmhouse of Dragoncello) , which is said to have owed its origin to Ancus Martius. Beyond these hills the low coast belt formed by the solid matter brought down by the river begins; and on each side of the mouth in the flat ground were salt marshes (see Ostia, Portus). The flood of 1900, when the river both above and below Rome extended over the whole width of its valley, from hill to hill, and over most of the low ground at its mouth, gave an idea of the conditions

which must have existed in prehistoric days.

TIBERIAS, a town on the western shore of the sea of Galilee (to which it gives its modern Arabic name, Bahr Tubariya, i.e. Sea of Tiberias). It has a population of about 4000, more than half of whom are Jews (principally Polish immigrants). It stands in a fertile but fever-stricken strip of plain between the Galilee hills and the sea-shore. It is the seat of a kaimmakam or sub-governor, subordinate to the governor of 'Akka. There are Latin and Greek hospices here, as well as an important mission, with hospital and schools, under the United Free Church of Scotland. The pre-Herodian history of the city is not certain. There is a rabbinical tradition that it stands on the site of a city called Rakka, but this is wholly imaginary. Josephus (Ant. xviii. 2, 3) describes the building of Tiberias by Herod Antipas near a village called Emmaus, where are hot springs. This is probably the Hammath of Jos. xix. 35. The probability is that Herod built an entirely new city; in fact, the circumstance that it was necessary to disturb an ancient graveyard proves that there were here no buildings previously. The graveyard was probably the cemetery of Hammath. Owing to this necessity Herod had a difficulty in peopling his city, and, indeed, was compelled to use force (Jos. Ant., loc. cit.) to cause any but the dregs of the populace to incur defilement by living in a place thus unclean. On this account Tiberias was long regarded with aversion by Jews, but after the fall of Jerusalem it was settled by them and rose to be the chief centre of rabbinic learning.

The building of the city falls between a.d. 16 and a.d. 22. It was named in honour of the emperor Tiberius, and rapidly increased in luxury and art, on entirely Greek models. Pro- bably because it was so completely exotic in character it is passed over in almost total silence in the Gospels — the city (as opposed to the lake) is mentioned but once, as the place from which came boats with sight-seers to the scene of the feeding the five thousand, John vi. 23. There is no reason to suppose that Christ ever visited it. The city surrendered to Vespasian, who

restored it to Agrippa. It now became a famous rabbinic school. Here lived Rabbi Judah hak-Kadosh, editor of the Mishnah; here was edited the Jerusalem Talmud, and here are the tombs of Rabbi Aqiba and Maimonides. Christianity never succeeded in establishing itself here in the Byzantine period, though there was a bishopric of Tiberias, and a church built by Constantine. In 637 the Arabs captured the town. The crusaders under Tancred retook it, but lost it to Saladin in 1 187. In the 16th century the city was rebuilt by Joseph ben Ardut, subvented by Dona Gracia and Sultan Suleiman. An attempt was made to introduce the silk industry. In the 18th century it was fortified and occupied by the famous independent sheikh Dhahir el-Amir.

Tiberias is notoriously dirty and proverbial for its fleas, whose king is said by the Arabs to hold his court here. Most of the town was ruined by the earthquake of 1837. The most interesting buildings are the ruins of a fortress, perhaps Herodian, south of the town, and an ancient synagogue on the sea-coast. The hot springs mentioned by Josephus (and also by Pliny) are about half an hour's journey to the south. (R. A. S. M.)

TIBERIUS [Tiberius Claudius Nero] (42 b.c.-a.d. 37), Roman' emperor, was born on the 16th of November, 42 B.C. His father, who bore the same name, was an officer of Julius Caesar, who afterwards proposed to confer honours on the assassins, then joined Mark Antony's brother in his mad attack on Octavian, took refuge with Mark Antony, and returned to Rome when the general amnesty was proclaimed in 39 B.C. Livia, the mother of Tiberius, was also of the Claudian family, out of which her father had passed by adoption into that of the Livii Drusi. Early in 38 Livia was amicably ceded to Octavian (the future Augustus), and three months after her new marriage Drusus, brother to Tiberius, was born. Livia had no children by Augustus, and therefore devoted all her remarkable gifts to the advancement of her sons. Tiberius passed through the list of state offices in the usual princely fashion, beginning with the quaestorship at the age of eighteen, and attaining

the consulate for the first I time at twenty-nine. From the great capacity for civil affairs

which he displayed as emperor it may be inferred that he applied himself with determination to learn the business of govern- ment.

But from 22 to 6 B.C. and again from a.d. 4 to 10 by far the greater part of Tiberius's time was spent in the camp. His first service was as legionary tribune in one of the desperate and arduous wars which led to peace in the Spanish peninsula through the decimation, or rather the extermination, of the rebellious tribes. In 20 B.C. Augustus sent Tiberius with an army to seat Tigranes of Armenia on the throne as a Roman vassal. When Tiberius approached the frontier of Armenia, he found its throne vacant through the assassination of the king, and Tigranes stepped into his place without a blow being struck. Tiberius crowned Tigranes king with his own hand. Then the Parthian monarch grew alarmed, and surrendered " the spoils and the standards of three Roman armies." The senate ordered a thanksgiving such as was usually celebrated in honour of a great victory. The following year was passed by Tiberius as governor of Transalpine Gaul. In the next year (15) he was despatched to aid his brother Drususin subjugating the Raeti and VindeJici, peoples dwelling in the mountainous region whence the Rhine, Rhone and Danube take their rise. 1 Drusus attacked from the eastern side, while Tiberius operated from the upper waters of the Rhine, and by stern measures the mountaineers were reduced to a state of quietude, and could no longer cut com- munications between northern Italy and Gaul, nor prosecute their raids in both countries. In 12 B.C. Agrippa, the great general of Augustus, died at the age of fifty-one, leaving Julia, the emperor's only child, a widow. Agrippina, daughter of Agrippa by an earlier marriage, was wife of Tiberius, and had borne him a son, Drusus, afterwards father of Germanicus. Livia,

with great difficulty, prevailed upon Augustus to replace Agrippa by Tiberius, who was compelled to exchange Agrippina for Julia, to his bitter grief. During the year of mourning for Agrippa, which delayed his new marriage, Tiberius was occupied with a victorious campaign against the Pannonians, followed by successful expeditions in the three succeeding summers. For his victories in the Danube regions, the emperor conferred on him the distinctions which flowed from a military triumph in republican times (now first separated from the actual triumph), and he enjoyed the " ovation " or lesser form of triumphal entry into the capital. On the death of Drusus in the autumn of 9 B.C. Tiberius, whose reputation had hitherto been eclipsed by that of his brother, stepped into the position of the first soldier of the empire. The army, if it did not warmly admire Tiberius, entertained a loyal confidence in a leader who, as Velleius (the historian who served under him) tells us, always made the safety of his soldiers his first care. In the campaign of the year after Drusus's death Tiberius traversed all Germany between the Rhine and the Elbe, and met with slight opposition. But it would be too much to believe the statement of Velleius that " he reduced Germany almost to the position of a tributary province." He was rewarded with the full triumph, the military title of " imperator," and his second consulship, though the opposition of the powerful Sugambri had been only broken by an act of treachery, the guilt of which should perhaps be laid at the door of Augustus. In 7 B.C. there was another but insignificant campaign in Germany. Next year Augustus bestowed on his stepson the tribunician authority for five years. Tiberius was thus in the most formal manner associated with the emperor in the conduct of the government on the civil side; but Tacitus (Ann. iii. 56) goes too far when he says that this promotion marked him out as the heir to the throne.

Tiberius now suddenly begged permission to retire to Rhodes and devote himself to study. He seems to have declined abso- lutely at the time to state his

reasons for this course, but he obstinately adhered to it, in spite of the tears of Livia and the lamentations of Augustus to the senate that his son had betrayed him. The departure from Italy was as secret as it could be made. Years afterwards, when Tiberius broke silence about his motives, he declared that he had retired in order 1 Horace, Odes, iv. 14.

to allow the young princes, Gaius and Lucius, sons of Agrippa and Julia, a free course. There was perhaps a portion of the truth wrapped up in this declaration. Like Agrippa, who retired to Mytilene to avoid the young Marcellus, Tiberius had clearly no taste to become the servant of the two children whom Augustus had adopted in their infancy and evidently destined to be joint emperors after his death. But it may well be believed that Tiberius, unlike Agrippa, had no burning ambition to see himself in the place destined for his stepsons; and it may have been in his eyes one of the attractions of exile that it released him from the obligation to aid in carrying out the far-reaching designs which Livia cherished for his sake. But the contemporaries of Tiberius were no doubt right in believing that the scandal of Julia's life did more than all else to render his position at Rome intolerable. His conduct to her from first to last gives a strong impression of his dignity and self-respect. When at length the emperor's eyes were opened, and he inflicted severe punishment upon his daughter, her husband, now divorced by the emperor's act, made earnest intercession for her, and did what he could to alleviate her suffering. At Rhodes Tiberius lived simply, passing his time mainly in the company of Greek professors, with whom he associated on pretty equal terms. He acquired considerable proficiency in the studies of the day, among which was astrology. But his attempts at composition, whether in prose or verse, were laboured and obscure. After five years' absence from Rome, he begged for leave to return; but the boon was angrily refused, and Livia with difficulty got her son made nominally a legate of Augustus, so as in some degree to veil his disgrace.

The next two years were spent in solitude and gloom. Then, on the intercession of Gaius, Augustus allowed Tiberius to come back to Rome, but on the express understanding that he was to hold aloof from all public functions — an understanding which he thoroughly carried out.

He had scarcely returned before death removed (a.d. 2) Lucius, the younger of the two princes, and a year and a half later Gaius also died. The emperor was thus left with only one male descendant, Agrippa Postumus, youngest son of Julia, and still a boy. Four months after Gaius's death Augustus adopted Agrippa and at the same time Tiberius. The emperor now indicated clearly his expectation that Tiberius would be his principal successor. The two essential ingredients in the imperial authority — the proconsulare imperium and the tribuni- cia poteslas — were conferred on Tiberius, and not on Agrippa, who was too young to receive them. Tiberius' career as a general now began anew. In two or three safe rather than brilliant campaigns he strengthened the Roman hold on Germany, and established the winter camps of the legions in the interior, away from the Rhine.

In a.d. 5 it became necessary to attack the formidable con- federacy built up by Maroboduus, with its centre in Bohemia. At the most critical moment, when Pannonia and Dalmatia broke out into insurrection, and an unparalleled disaster seemed to be impending, Maroboduus accepted an honourable peace. The four serious campaigns which the war cost displayed Tiberius at his best as a general. When he was about to celebrate his well-won triumphs, the terrible catastrophe to Varus and his legions (a.d. 9) turned the rejoicing into lasting sorrow, and produced a profound change in the Roman policy towards Germany. Although Tiberius with his nephew and adopted son Germanicus made in a.d. 9 and 10 two more marches into the interior of Germany, the Romans never again attempted to bound their domain by the Elbe, but clung to the neighbourhood of the Rhine. Tiberius was thus robbed in great part of the fruit of his campaigns; but nothing can deprive him

of the credit of being a chief founder of the imperial system in the lands of Europe. From the beginning of 11, when he celebrated a magni- ficent triumph, to the time of the emperor's death in 14 Tiberius remained almost entirely in Italy, and held rather the position of joint emperor than that of expectant heir. Agrippa Postumus had proved his incapacity beyond hope, and had been banished to a desolate island. In all probability Tiberius was not present when Augustus died, although Livia

spread reports (eagerly amplified by Velleius) of an affectionate interview and a lingering farewell.

Tiberius ascended the throne at the age of fifty-six. What struck his contemporaries most was his absolute impenetrability. All his feelings, desires, passions and ambitions were locked behind an impassable barrier, and had to be interpreted by the very uncertain light of his external acts. It is recorded of him that only once did he as commander take counsel with his officers concerning military operations, and that was when the destruc- tion of Varus's legions had made it imperatively necessary not lightly to risk the loss of a single soldier. The penalty of his inscrutability was widespread dislike and suspicion. But behind his defences there lay an intellect of high power, cold, clear and penetrating all disguises. Few have ever possessed such mental vision, and he was probably never deceived either about the weaknesses of others or about his own. For the littleness and servility of public life in regions below the court he enter- tained a strong contempt. It is a question whether he ever liked or was liked by a single being; but he did his duty by those with whom he was connected after a thorough though stern and unlovable fashion. As a general he commanded the full confi- dence of his soldiers, though he was a severe disciplinarian; yet the men of his own legions greeted his accession to the throne with a mutiny. Tiberius proved himself

capable in every department of the state more by virtue of industry and application than by genius. His mind moved so slowly and he was accustomed to deliberate so long that men sometimes made the mistake of deeming him a waverer. He was in reality one of the most tenacious of men. When he had once formed an aim he could wait patiently for years till the favourable moment enabled him to achieve it, and if compelled to yield ground he never failed to recover it in the end. The key to much of his character lies in the observation that he had in early life set before himself a certain ideal of what a Roman in high position ought to be, and to this ideal he rigidly adhered. He practised sternness, silence, simplicity of life and frugality as he deemed that they had been practised by the Fabricii, the Curii and the Fabii. That Tiberius's character was stained by vice before he became emperor, no one who fairly weighs the records can be- lieve. The persuasion entertained by many at the end of his life that he had been always a monster of wickedness, but had succeeded in concealing the fact till he became emperor, has slightly discoloured the narratives we possess of his earlier years. The change which came over him in the last years of his life seems to have been due to a kind of constitutional clouding of the spirits, which made him what the elder Pliny calls him, " the gloomiest of mankind," and disposed him to brood over mysteries and superstitions. As this gloom deepened his will grew weaker, his power tended to fall into the hands of unworthy instruments, terrors closed in around his mind, and his naturally clear vision was perturbed.

The change of masters had been anticipated by the Roman world with apprehension, but it was smoothly accomplished. Tiberius was already invested with the necessary powers, and it may even be that the senate was not permitted the satisfaction of giving a formal sanction to his accession. Agrippa Postumus was put to death, but Livia may be reasonably regarded as the instigator of this crime. Livia indeed expected to share the imperial authority with

her son. At first Tiberius allowed some recognition to the claim; but he soon shook himself free, and later became estranged from his mother and held no communi- cation with her for years before her death. The history of Tiberius's relations with other members of his family is hardly less miserable. Perhaps with any other commander than Ger- manicus the dangerous mutiny of the troops on the Rhine which broke out soon after Tiberius's accession would have ended in a march of the discontented legions upon the capital. The perilous episode of Arminius caused the recall of Germanicus and his despatch to the East on an honourable but comparatively inactive mission. The pride and passion of Agrippina, the grand- daughter of Augustus and wife of Germanicus, tended to open a breach between the husband and the emperor. In his Eastern

command Germanicus found himself perpetually watched and even violently opposed by Piso, the governor of Syria, who was suspected to have received secret orders from Tiberius. When Germanicus died at Antioch in a.d. 19, the populace of Rome combined with Agrippina in demanding vengeance upon Piso; and the emperor was forced to disown him. The insinuation, conveyed by Tacitus, that Piso poisoned Germanicus on orders from Tiberius, will not stand criticism. The death of Germanicus was followed four years later by that of the emperor's son Drusus. These two princes had been firm friends, and Livilla, the wife of Drusus, was sister to Germanicus. Years afterwards it was found that Drusus had fallen a victim to the treachery of his wife Livilla, who had joined her ambition to that of the emperor's minister of State Sejanus. When Drusus died, Tiberius nomi- nated two of Agrippina's sons as his heirs. But Sejanus had grown strong by nursing the emperor's suspicions and dislike for the household of Germanicus, and the mother and the princes were imprisoned on a charge of crime. In his memoirs of his own life Tiberius declared that he killed Sejanus because he had discovered that he entertained a mad rage against the sons of

Germanicus. But the destruction of Sejanus did not save Agrippina and her two children. The third son Gaius Caesar (Caligula), lived to become emperor when Tiberius died in 37.

Throughout his reign Tiberius strove earnestly to do his duty to the empire at large; his guiding principle was to maintain with an almost superstitious reverence the constitutional forms which had been constructed by Augustus. Only two changes of moment were introduced. The imperial guard, hitherto only seen near the city in small detachments, was by the advice of Sejanus encamped permanently in full force close to the walls. By this measure the turbulence of the populace was kept in check. The officer in command of the guard became at once the most important of the emperor's lieutenants. The othei change was the practically complete abolition of the old comitia, But the senate was treated with an almost hypocritical defer ence, and a pedantically precise compliance with the old republic can forms was observed towards the senatorial magistrates, The care expended by Tiberius on the provinces was unremitting, His favourite maxim was that a good shepherd should shear tht> flock and not flay it. When he died he left the subject peoples of the empire in a condition of prosperity such as they had never known before and never knew again. Soldiers, governors and officials of all kinds were kept in wholesome dread of vengeance if they oppressed those beneath them or encouraged irregularity of any kind. Strict economy permitted light taxation and enabled the emperor to show generosity in periods of exceptional distress. Public security both in Italy and abroad was maintained by a strong hand, and commerce was stimulated by the improvement of communications. Jurisdiction both within and without the capital was on the whole exercised with steadiness and equity, and the laws of the empire were at many points improved. The social and moral reforms of Augustus were upheld and carried further. Such risings against the emperor's authority as occurred within the Roman domain were put down with no great difficulty. The foreign or

rather the frontier policy was a policy of peace, and it was pursued with consider- able success. With few exceptions the duties of the Roman forces on the borders were confined to watching the peoples on the other side while they destroyed each other. On the Rhine, at least, masterly inactivity achieved tranquillity which lasted for a long period.

The disrepute which attaches to the reign of Tiberius has come mainly from three or four sources — from the lamentable story of the imperial household, from the tales of hideous de- bauchery practised in deep retirement at Capreae during the last eleven years of the emperor's life, from the tyranny which Sejanus was permitted to wield in his master's name, and from the political prosecutions and executions which Tiberius encouraged, more by silent compliance than by open incitement. The stories of immorality are recorded chiefly by Suetonius, who has evidently used a poisoned source, possibly the memoirs . of the younger Agrippina, the mother of Nero. Tiberius loved to

shroud himself in mystery, and such stories are probably the result of unfriendly attempts to penetrate the darkness. If history ventures to doubt the blackness of Theodora, that of Tiberius grows continually lighter under the investigations of criticism. Suetonius makes the emperor's condition to have been one of mania, issuing frequently in the abandonment of all moral restraint. But in that case the authority of Tiberius, which was as firmly upheld during the years spent at Capreae as it had been earlier, must have fallen to pieces and come to an end. With respect to Sejanus, it is impossible to acquit Tiberius of blame. If he was deceived in his favourite he must have been willing to be deceived. He conferred on Sejanus a position as great as had been held by Agrippa during the reign of Augustus, and the minister was actually, and all but formally, joint emperor. Of the administrative ability of

Sejanus there can be no question; but the charm and secret of his power lay in the use he made of those apprehensions of personal danger which seem never to have been absent from his master's mind. The growth of " delation," the darkest shadow that lies on the reign, was mainly a consequence of the supremacy and the arts of Sejanus. Historians of Rome in ancient times remembered Tiberius chiefly as the sovereign under whose rule prosecutions for treason on slight pretexts first became rife, and the hateful race of informers was first allowed to fatten on the gains of judicial murder. Augustus had allowed considerable licence of speech and writing against himself, and had made no attempt to set up a doctrine of constructive treason. But the history of the state trials of Tiberius's reign shows conclusively that the straining of the law proceeded in the first instance from the eager flattery of the senate, was in the earlier days checked and controlled to a great extent by the emperor, and was by him acquiesced in at the end of his reign, with a sort of contemptuous indifference, till he developed, under the influence of his fears, a readiness to shed blood.

The principal authorities for the reign of Tiberius are Tacitus and Suetonius. The Annals of Tacitus were not published till nearly eighty years after the death of Tiberius. He rarely quotes an authority by name. In all probability he drew most largely from other historians who had preceded him; to some extent he availed himself of oral tradition; and of archives and original records he made some, but comparatively little, use. In his history of Tiberius two influences were at work, in almost equal strength: on the one hand he strives continually after fairness; on the other the bias of a man steeped in senatorial traditions forbids him to attain it. No historian more frequently refutes himself. Suetonius was a biographer rather than an historian, and the ancient bio- grapher was even less given to exhaustive inquiry than the ancient historian; moreover Suetonius was not gifted with great critical

faculty, though he told the truth so far as he could see it. His Lives of the Twelve Caesars was written nearly at the time when Tacitus was composing the Annals, but was published a little later. Velleius Paterculus is by far the oldest authority for any part of Tiberius's life. He had been an officer under Tiberius, and he eulogizes his old general enthusiastically — feeling it necessary, however, to do less than justice to the achievements of Germanicus. To Velleius all defenders of Tiberius have eagerly appealed. In truth it is his silence alone which affords any external aid in repelling the charges of Tacitus and Suetonius, and the fact that Velleius published his work in the lifetime of his master deprives that silence of its value. The eulogy of Sejanus which is linked with that of Tiberius must needs shake faith in the scrupulousness of the author. It is still doubtful whether Dio Cassius (whose History ended with the year 229) in his narrative of the reign of Tiberius is to any great extent independent of Tacitus. In recent times a considerable mass of inscriptions has added to our knowledge of the administra- tion of this emperor. The chief account of Tiberius in English is that contained in Dean Merivale's History of the Romans under the Empire. Professor E. S. Beesly has written an interesting defence of him in his Catiline, Clodius and Tiberius (1878). The best recent history of this period is Hermann Schiller's Geschichte der rbmischen Kaiserzeit (Gotha, 1883). Much historical information is given in the editions of the Annals of Tacitus, of which the best in English is that of Furneaux (Oxford, 1884); Freytag, Tiberius and Tacitus (Berlin, 1870) (following Stahr, Tiberius, Berlin, 1863), exposes the inconsistencies of Tacitus' account. Many mono- graphs have since appeared, written on similar lines, among which may be mentioned Ihne, Zur Ehrenretlung des Kaisers Tiberius (Strassburg, 1892); Gentile, L'Imperatore Tiberio secondo la moderna critica storica (1887); J. C. Tarver, Tiberius the Tyrant (1902). The principles of the imperial administration of the provinces by Tiberius have been treated by Mommsen in the fifth volume of

his History of Rome, translated into English by W. P. Dickson (1886).

a. s. r.)

TIBESTI, a mountainous and little known region of the central Sahara, inhabited by the Tibbu (q.v.). The country was partly explored in 1870 by Gustav Nachtigal; it had not been again visited by Europeans up to 1910, though French officers had reached Borku on its southern borders. By the Anglo-French declaration of the 21st of March 1899 Tibesti was included in the French sphere of influence in North Africa.

TIBET, or Thibet, a country of central Asia. It is the highest country in the world, comprising table-lands averaging over 16,500 ft. above the sea, the valleys being at 12,000 to 17,400 ft., the peaks at 20,000 to 24,600 ft., and the passes at 16,000 to 19,000 ft. It is bounded on the N. by Turkestan, on the E. by China, on the W. by Kashmir and Ladak, and on the S. by India, Nepal and Bhutan. It has an area of over 1,000,000 sq. m., and an estimated population of about 3,000,000, being very sparsely inhabited.

Origin of Name. — The Tibetans call their country Bod, which

word in colloquial pronunciation is aspirated into Bhod or Bhot, and in the modern Lhasa dialect is curtailed into Bho. Hence the country is known to Indians as Bhot, and the inhabitants as Bhot-ias. This territory came to be known to Europeans as " Tibet " evidently because the great plateau with its uplands bordering the frontiers of China, Mongolia and Kashmir, through which travellers communicated with this country, is called by the natives To-bhbt (written stod-bod) or " High Bod " or " Tibet," which designation in the loose orthography of

travellers assumed a variety of forms. Thus in Chinese annals are found T'u-bat (5th century, a.d.), Tu-po-te, Tie-bn-te, T'u-bo-te (10th and nth centuries) and at the present day T'u-fan (fan, as Bushell shows, being the same Chinese character which had formerly the sound of po); in Mongolian, Ttibet, Tobot; in Arabic, Tubbet; Istakhri (c. 590), Tobbat; Rabbi Benjamin (1165), Thibet; J. de Piano Carpini (1247), Thabet; Rubruquis (1253), Marco Polo (1298), Tebet; Ibn Batuta (1340), Thabat; Ibn Haukal (976), Al Biruni (1020), Odoric of Pordenone (c. 1328), Orazio della Penna (1730), Tibet, which is the form now generally adopted. The inhabitants of Tibet call themselves Bod-pa (pronounced usually Bho-pa), or " people of Bod." Other Tibetan epithets for the country sometimes used by flowery native writers are " The Icy Land " (Gangs-dan) and the " Country of the Red Faces " (Gdong-mar-gyi yul). The Chinese name for central Tibet is Wei- Ts'ang, which is a transcription of the Tibetan designation of the two' provinces t) and Tsang (spelt dbus-gtsang) that constitute central Tibet. Among the Mongols, Tibetans are called Tangutu and the country Barontala or the " right side," in contradistinction to Dzontala or " left side," which was their own name for Mongolia itself.

Geography. — Physically Tibet may be divided into two parts, the lake region in the west and north-west, and the river region, which spreads out on three sides of the former on the east, south, and west. The lake region extends from the Pangong t'so (t'so =lake) in Ladak, near the source of the Indus, to the sources of the Salween, the Mekong and the Yangtse. This region is called the Chang-t'ang (Byang tang) or " Northern Plateau " by the people of Tibet. It is some 700 m. broad, and covers an area about equal to that of France. From its great distance from the ocean it is extremely arid, and possesses no river outlet. The mountain ranges are spread out, rounded, disconnected, separated by flat valleys rela- tively of little depth. The country is dotted over with large and small lakes, generally salt or alkaline, and intersected by streams, and

the soil is boggy and covered with tussocks of grass, thus resem- bling the Siberian tundra and the Pamirs. Its average altitude is over 16,000 ft., the northern portion of it being the highest. Salt and fresh-water lakes are intermingled. The lakes are generally without outlet, or have only a small effluent. The deposits consist of soda, potash, borax and common salt. This last is frequently found piled high and split into blocks apparently of artificial forma- tion, but probably the result of the action of wind and intense cold. The loftiest lake so far as observed is Hospa t'so, near the Lingshi plain on the Kashmir frontier; its altitude is given as 17,930 ft. The lake region is noted for a vast number of hot springs, which are widely distributed between the Himalayas and 34 N., but are most numerous to the west of Tengri Nor (north-west of Lhasa). So intense is the cold in Tibet that these springs are sometimes repre- sented by columns of ice, the nearly boiling water having frozen in the act of ejection. The southern portion, from Lake Pangong to Tengri Nor, is inhabited by pastoral tribes of Tibetans, and possesses a few hamlets, such as Ombo, Rudok and Senja jong. The river region comprises the upper courses of the Brahmaputra (Yaru Tsangpo), the Salween (? Gyama nyul chu), the Yangtsze (Dre chu), the Mekong (Nya-lungchu),and the Yellow River (Ma chu). Amidst the mountains there are many narrow valleys, partially cultivated from an altitude of 12,000 ft. downwards, with here and there fine forests covering the mountain sides. Villages of high stone- built houses are to be found wherever the valley bottoms open out enough to afford a little space for agriculture. The northern portion of Tibet is an arid and wind-swept desert; but in the southern portion the valleys of Lhasa, Shigatse, Gyantse and the Brahma- putra are covered with good soil and groves of trees, well irrigated, and richly cultivated.

The valley of the Brahmaputra (q.v.), or Yaru Tsang-po or simply Tsang-po — the river has also various local names — is the great arterial valley of southern Tibet. On the south it is bounded by the

Himalayas, on the north by a mountain-system still more vast. This mountain-system was only vaguely known, in fact its existence throughout its length was only suspected, until Sven Hedin, during his journeys in 1906-1908, crossed it at several points. He found the system to form the chief physiographical feature of southern Tibet, and stated it to be " on the whole the most massive

range on the crust of the earth, its average height above the sea- level being greater than that of the Himalayas. Its peaks are 4000 to 5000 feet lower than Mount Everest, but its passes average 3000 feet higher than the Himalayan passes." Its extreme breadth is about 120 m. in the central part, its northern limit being marked by the chain of lakes running N.W. and S.E. between 30 and 33 N., beyond which the mountains of central Tibet are much lower. The system at no point narrows to a single range ; generally there are three or four across its breadth. As a whole the system forms the watershed between rivers flowing to the Indian Ocean — the Indus and its tributaries, Brahmaputra and its tributaries, and Salween — and the streams flowing into the undrained salt lakes to the north. The principal ranges in the system are the Nien-chen-tang-la, called Kanchung-gangri in the west, the Targo-Gangri-Lapchung range, the very lofty Hlunpo-Gangri range, the Dingla range, &c. The whole system had been marked by inference on some maps before Hedin's discoveries, and named Gangri; Hedin proposed for it the name of Trans-Himalaya.

Geology and Mineral Wealth. — Little is known of the geological structure of the central regions of Tibet. The observations of Strachey, Godwin-Austen and of Griesbach and other members of the Geological Survey of India only extend to the southern edge or rim of the great plateau, where vast alluvial deposits in horizontal strata have been furrowed into deep ravines, while Russian explorers have but superficially examined the mountain regions of the north and north-east, and the British mission to Lhasa in 1904 afforded observations merely along the trade-route to that city.

The general structure of the trans-Himalayan chains appears to indicate that the main axis of upheaval of the whole vast mass of the Tibetan highlands is to be found on two approximately parallel lines, represented the one by the Kuen-lun and the other by a line which is more or less coincident with the watershed between India and the central lake region, extending from Lake Pangong to Tengri Nor, the plateau enclosed between the two being wrinkled by minor folds, of which the relative elevation is comparatively low, averaging from 1000 to 1500 ft. The strike of these folds is usually east and west and roughly parallel to the axes of elevation of the plateau. A remarkable economic feature is the almost universal distribution of gold throughout Tibet. The gold-digging is referred to in somewhat mythical terms by Herodotus. Every river which rises in Tibet washes down sands impregnated with gold, and it has been proved that this gold is not the product of intervening strata, but must have existed primarily in the crystalline rocks of the main axes of upheaval. In western Tibet the gold mines of Jalung have been worked since 1875. They have been visited by native explorers of the Indian Survey, who reported that much gold was produced and remitted twice a year under a Chinese guard to Peking. The Tibetan diggers collected together at the mines chiefly during the winter, when the frost assisted to bind the loose alluvial soil and render excavation easy. These mines are within 200 m. of the Ladak frontier, near the sources of the Indus, at an elevation which cannot be less than 15,000 ft. above sea-level. They are worked in crude desultory fashion and are sometimes abandoned owing to the exorbitant imposts levied on gold production by Chinese and Tibetan officials. Between the Ladak frontier and Lhasa the plateau region teems with evidences of abandoned mines. These mines are excavations in the alluvial soil, never more than from 20 to 30 ft. deep.

The researches of Prjevalsky demonstrate that gold is plentiful in northern and eastern Tibet. Here Tungus diggers were encoun- tered who had extracted

handfuls of gold in small nuggets from a stream bed at a depth which they stated to be no greater than 2 ft. Another scientific explorer, W. Mesny , has observed similar evidences of the existence of gold at comparatively shallow depths in Koko Nor region, and records that he has seen nuggets, ” varying from the size of a pea to that of a hazel-nut,” in eastern Tibet. The gold was almost pure and perfectly malleable. The Gork goldfields, which are visible from Koko Nor, are reported to have yielded to China considerable quantities of gold as lately as 1888. They are now deserted. Prjevalsky, indeed, predicts of northern Tibet that it will prove a ” second California ” in course of time. But little gold at present finds its way across the Tibetan passes to India; and the export to China has diminished of late years.

Iron is found in eastern Tibet in the form of pyrites, and is rudely smelted locally. Salt and borax exist in abundance in the western lake regions. The exportation of borax to India is only limited by the comparatively small demand. Lapis-lazuli and mercury are among the minor mineral products of the country.

Climate. — The climate of Tibet varies so greatly over the enormous area and different altitudes of the country that no two travellers agree precisely in their records. Tibet is affected by the south-west monsoon, just as the Pamirs are affected, but in varying degrees according to geographical position. In western Tibet, bordering the Kashmir frontier, the climate differs little from that of Ladak. Intense dryness pervades the atmosphere during nine months of the year; but little snow falls, and the western passes are so little subject to intermittent falls of fresh snow as frequently to be traversable during the whole year round (seeLADAKH). Low tempera- tures are prevalent throughout these western regions, whose bleak

desolation is unrelieved by the existence of trees or vegetation of any size, and where the wind sweeps unchecked across vast expanses of arid plain. All the western region is but slightly affected by the monsoon. The central lake region, extending from the Kuen-lun to the Himalaya, is also characterized by extreme dryness in autumn, winter and spring, with an abundance of rain in summer, whilst the eastern mountain region, extending to China south of the Dang la (which, with an altitude of about 20,000 ft., stretches from 90° to 97° E. along the parallel of 33° N., and arrests the monsoon currents), is subject to much the same climatic influences as the eastern Hima- laya. The southern slopes of the Dang la are deluged with rain, hail and snow throughout the year. Northern Tibet is an arid waste, subject to intense heat in summer and intense cold in winter. In March snow still lies deep in the Tsaidam passes, while Wellby found the heat oppressive in June at 16,000 ft. elevation on the plateau south of the Kuen-lun, and a temperate climate prevailing about the sources of the Dre chu (Yangtsze) in August.

All travellers testify to the perpetual wind currents from the west, which sweep across the salt bogs of Tsaidam (9500 ft.) and through the higher valleys of eastern Tibet. Wind is a prevailing feature throughout Tibet at certain seasons of the year, as it is in the Pamirs, in Turkestan, in western Afghanistan and in Persia. The climate of southern Tibet is, however, subject to considerable modifications from that of the northern and central regions, owing doubtless to its geographical connexion with northern India. Here, at an elevation of 15,000 ft., about the great Lake Dangra, we hear of well-built villages and of richly cultivated fields of barley, indicat- ing a condition of climate analogous to that which prevails in the districts south of Lhasa, and in contrast to the sterility of the lake region generally and the nomadic character of its population. Modern travellers bear witness to a gradual progress of desiccation in the Tibetan uplands. Everywhere there

are signs of the diminu- tion of the lakes and the recession of the water line — a phenomenon that has also been observed in the Pamirs. There are still enormous glaciers about the head of the Brahmaputra, but the glacial epoch of the Chang-t'ang highlands has passed away, though comparatively recently.

Flora. — Our knowledge of the flora of northern and central Tibet has been considerably increased by the collections of Prjevalsky, Wellby, Bower, Thorold, Littledale and the Lhasa Mission, and that of eastern Tibet by Rockhill. The former and other collections have been described in W. B. Hemsley's The Flora of Tibet or High Asia. Western and southern Tibetan flora were partially explored pre- viously to the advent of these travellers. Professor Maximowicz concludes from an analysis of the Prjevalsky collection that the flora of Tibet is extremely ancient, and that it is chiefly composed of immigrants from the Himalaya and Mongolia. There is also a large percentage of endemic species. Chinese and European plants followed in the process of immigration. Those species which are distinctive of the eastern border ridges are found to reach the plateau, but do not spread westwards, so that a botanic separation or distinction is found to exist between the true plateau of Tibet in the west and the alpine tracts of the east. Thiselton-Dyer classes the flora of Tibet on the whole as belonging to the Arctic-Alpine section of the great northern division, but containing a purely endemic element. Two typical species are Lychnis apetala, which extends to Spitsbergen, and the well-known edelweiss. A single fern specimen obtained by Littledale (Polypodium hastahim) is indicative of eastern China. Of the forty or fifty genera obtained by Littledale in central Tibet a large proportion are British, includ- ing many of the most characteristic mountain forms. In the higher regions of northern and western Tibet the conditions under which vegetation exists are extreme. Here there are no trees, no shrubs, nor any plants above a foot high. Wellby says he saw nothing higher than an onion. The peculiar form of tussocky grass which

prevails in the Pamirs is the characteristic feature of the Tibetan Chang-t'ang of the Tsaidam plains and of the bogs north-east of Lhasa. Of grasses indeed there are many forms, some peculiar to Tibet, but no trees or shrubs at any elevation higher than 15,000 ft., except in the Kharo Pass of central Tibet, where Waddell has recorded trees (? Hippophae sp.) about 20 ft. high at an elevation of 16,300 ft. A flowering plant (Saussurea tridactyla) was discovered by Bower at an elevation of 19,000 ft. In south-eastern Tibet, where Himalayan conditions of climate prevail, we have a completely different class of flora. Of the flora of Tibet Rockhill writes: " In the ' hot lands ' (Tsa-rong) in southern and south-eastern Tibet, extending even to Batang, peaches, apricots, apples, plums, grapes, water-melons, &c, and even pomegranates, are raised; most of Tibet only produces a few varieties of vegetables, such as potatoes, turnips, beans, cabbages, onions, &c. The principal cereals raised are barley and buckwheat, wheat in small quantities, and a little oats. A few localities in the extreme southern portions of the country, and around Lhasa possibly, are said to produce a non-glutinous variety of rice. A variety of mountain bamboo is found in southern and parts of eastern Tibet, and is much used for basket work. Tibet produces a large number of medicinal plants much prized by the medical profession in China and Mongolia, among others the Cordyceps sinensis, the Coptis teeta, Wall., and Pickorhiza kuwoa, Royle, &c. Rhubarb is also found in great quantities in eastern Tibet and Amdo;

it is largely exported for European use, but does not appear to be used medicinally in the country. The trees most commonly found are the plane, poplar, maple, walnut, oak, the Cupressus junebris, and various varieties of the genera Pinus, Abies and Larix. Some valuable plants are obtained in the mountains of south and south- western Tibet, yielding the excellent yellow and red colours used to dye the native cloths." Waddell gives a list of 164 species of plants collected by him at Lhasa,

several being new species.

Fauna. — The fauna of Tibet has been by no means exhaustively investigated, especially the rodents and smaller species of animals. Among domesticated animals are to be found the horse, mule, donkey, cattle, sheep and goats, dogs, fowls and pigs, ducks and geese. Probably no country in the world, excepting perhaps inner Africa, so abounds in wild animals as the cold solitudes of the nor- thern plateau. Here are to be found yak, wild asses (kyang), several varieties of deer, musk deer and Tibetan antelope (Pantholops) ; also wild sheep (the bharal of the Himalaya), Ovis hodgsoni and possibly Ovis poli, together with wild goats, bears (in large numbers in the north-eastern districts), leopards, otter, wolves, wild cats, foxes, marmots, squirrels, monkeys and wild dogs. To this list must be added the curious sloth-bear Aeluropus melanoleucus, a rare eastern species, and the so-called ” unicorn ” antelopes, the ” takyin ” {Budorcas taxicolor) , also an eastern Indo-Malayan species. Birds are fairly numerous, and include many varieties of water-fowl, several of which (Anser indicus, the bar-headed goose, for instance) breed in Tibet, while others are only found as birds of passage. In eastern Tibet, on the Chinese border, varieties of the pheasant tribe abound, some of which are rare. Among them are the ” white ” pheasant, the Ceriornis temminckii, two kinds of eared pheasant and Anderson’s pheasant. The Tibetan sand-grouse is peculiar to the country, and the snow-partridge (Lerva nivicola) and the snow-cock (Tetraogallus tibetanus) are occasionally met with in the uplands, while the ordinary partridge (Perdix hodgsoni) is common in the ravines on the plateau.

People. — The Tibetan race, which probably belongs to the Turko-Mongol stock, is divided between the nomadic tent- dwelling Tibetans of the lake region and transition zone between it and the river region, and the settled sedentary population of the valleys. The tent-dwelling Tibetans, called Dokpa or Drupa (spelt hbrog-pa), or ” Steppe-dwellers,” are generally of a more Mongolized type than the people

of the lowlands. The males measure about 5 ft. 5 in., except in eastern Tibet, where 5 ft. 9 in. is a common stature; the females are appreciably less. The head is mesati-cephalic, verging on brachycephalic in the case of many of the Dokpa; the hair is black and somewhat wavy; the eyes are usually of a clear brown, in some cases even hazel; the cheek-bones are high, but not so high as with the Mongols; the nose is thick, sometimes depressed at the root, in other cases prominent, even aquiline, though the nostrils are broad. The teeth are strong but irregular; the ears, with toler- ably large lobes, stand out from the head, but to a less degree than with the Mongols. The mouth is broad, the lips not full, and, among the people of the lower altitudes, decidedly thin. The beard is sparse, and, with the exception of the moustache, which is sometimes worn, especially in central Tibet, it is plucked out with tweezers. The shoulders are broad, the arms round; the legs are not well developed, the calf is especially small. The foot is somewhat small but broad, the hand coarse. The women are usually stouter than the men. The colour of the skin of the Tibetans is a light brown, sometimes so light as to show ruddy cheeks in children; where exposed to the weather it becomes a dark brown. Their voices are full, deep and powerful. They can endure exposure without much apparent inconvenience; and though the nature of the food they use is such that they cannot stand absolute privation for any considerable length of time, they can exist for long periods on starvation rations, if eked out with weak soup or buttered tea, which is drunk at frequent intervals.

The sedentary population of Tibet has to a greater or less degree the same physical traits as the Dokpa, but as one approaches China, India or the border lands generally, one observes that the admixture of foreign blood has considerably modified the primitive type. Among the customs of the Tibetans, perhaps the most peculiar is polyandry, the brothers in a family having one wife in common. Monogamy, however, seems to be the rule among the

pastoral tribes, and polygamy is not unknown in Tibet, especially in the eastern parts of the country.

Their religion is described under Lamaism.

(L. A. W.;T. H. H.”>

TIBET

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Language. — The language of Tibet bears no special name, it is merely known as ” The Speech of Bod or Tibet,” namely, Bod-skad (pronounced Bho-kd), while the vernacular is called P’al-skad or ” vulgar speech,” in contradistinction to the rje-sa or ” polite respectful speech ” of the educated classes, and the ch’os-skad or ” book language,” the literary style in which the scriptures and other classical works are written.

It is not a uniform speech, but comprises several dialects which have been classed by Jaeschke into three groups, namely (1.) the central or the dialects of Lhasa and the central provinces of U and Tsang (including Spiti) which is the lingua franca of the whole country, (2) the western dialects of Ladak, Lahul, Baltistan and Purig, and (3) the eastern dialects of the province of Khams. In addition to these, however, are many sub-dialects of Tibetan spoken in the frontier Himalayan districts and states outside Tibet, namely, in Kunawar and Bashahr, Garhwal, Kumaon, Nepal including especially the Serpa and Murmi of eastern Nepal, Sikkim (where the dialect is called Danjong-ka), Bhutan (Lho-ka or Duk-ka), all of which are affiliated to a central group of dialects. Farther east the Takpa of Tawang in the eastern Assam Himalayas appears to form a transition between the central and the Sifan group of dialects on the Chinese frontier, which includes the Minyak, Sungpan, Lifan and Tochu dialects. On the north bordering on Turkestan the dialect of the nomadic Hor-pa tribes is much mixed with Turkic ingredients. The number of speakers of Tibetan

dialects is probably not far short of eight millions.

Linguistically, Tibetan is allied to the Burmese languages, and forms with the latter a family of the so-called Turano- Scythian stock called " Tibeto-Burman " (q.v.), the unity of which family was first recognized by Brian Hodgson in 1828, and indeed several of the dialects of Tibetan are still only known through the copious vocabularies collected by him. The little that was known of the Tibetan language before Hodgson's time was mainly derived from the writings of the Romish friars who resided for several years in Lhasa in the first half of the 1 8th century. 1 The first serious European student of Tibetan was Csoma de Koros (1784-1842), an indefatigable Hungarian, who devoted his life to the study of this language and the ancient Buddhist records enshrined in its unknown literature. For this purpose he resided like a monk for several years among the lamas at the monasteries of Zangla and Pukdal in Zanskar and latterly at Kanum in upper Bashahr, enjoying the assistance of learned lamas. His Tibetan-English Dictionary, and pioneer Tibetan Gram- mar, both published in 1834, opened to Europeans the way to acquire a knowledge of the Tibetan language as found in the ancient classics. 2 The next great advance in the study of the Tibetan language we owe to the labours of H. A. Jeaschke of the Moravian mission which was established in Ladak in 1857. This scholarly linguist, equipped with modern methods of scientific research, did not confine himself to the classical period like Csoma, but extended his

1 The Capuchin friars who were settled in Lhasa for a quarter of a century from 1719 studied the language; two of them, Francisco Orazio della Penna, well known from his accurate description of Tibet, and Cassian di Macerata sent home materials which were utilized by the Augustine friar Aug. Ant. Georgi of Rimini (171 1- 1797) in his Alphabetum tibetanum (Rome, 1762, 4to), a ponderous and confused compilation, which may be still referred to, but with great caution. The Tibetan characters

were drawn by Delia Penna and engraved by Ant. Fontarita in 1738. In 1820 Abel R6musat published his Recherches sur les langues tartares, a chapter of which was devoted to Tibetan.

2 The first Tibetan dictionary for Europeans was a Dictionary of the Bhotanta or Bhutan Language, published at Serampur near Calcutta in 1828. It was, however, crude and unedited and con- tained many serious mistakes, having been taken from the MS. notes of an unknown Italian priest (now believed to be Father Juvenal of Agra, who had been stationed near the frontier of Bhutan), whose MS. was translated into English by Fr. Chr. G. Schroeter and published without supervision by any Tibetan scholar; and Csoma was unaware of its existence when compiling his dictionary. At St Petersburg J. J. Schmidt published his Grammatik der tibetischen Sprache in 1839 and his Tibetisch-deutsches Worterbuch in 1 841, but neither of these works justified the great pretensions of the author, whose access to Mongolian sources had enabled him to enrich the results of his labours with a certain amount of information unknown to his predecessors. In France, P. E. Foucaux published in 1847 a translation from the Rgya tcher rol-pa, the Tibetan version of the Lalita Vistara, and in 1858 a Grammaire thibitaine ; while Ant. Schiefner had begun at St Petersburg in 1849 his series of translations and researches. His Tibetische Studien (1851-1868) is a valuable collection of documents and observations. In 1861 Lepsius published his paper Ueber chinesische und tibetische Lautver- haltnisse; and after 1864 Leon Feer brought out in Paris many translations of texts from Tibetan Buddhist literature. In 1828- 1849 the Journal of the Asiatic Society of Bengal published com- parative vocabularies of spoken and written Tibetan by Brian H. Hodgson, and grammatical notices of Tibetan (according to Csoma's grammar).

investigations to the language as a whole, and provided Europeans for the first time with the means of making a practical study of modern Tibetan and the speech of the people His Tibetan-English

Dictionary and Tibetan Grammar are models of scientific precision and important sources of our knowledge of the structure and develop- ment of the language, and the former is not superseded by Chandra Das's Dictionary. 3

The language was first reduced to writing with the assistance of Indian Buddhist monks in the middle of the 7th century A. D. by Thonmi, a Tibetan layman. The letters, which are a _ form of the Indian Sanskrit characters of that period, urammar - follow the same arrangement as their Sanskritic prototype. The consonants, 30 in number, which are deemed to possess an inherent sound o, are the following: ha, k'a, ga, nga, ca, ia, ja, nya, ta, t'a, da, na, pa, p'a, ba, ma, tsa, ts'a, dza, wa, z'a, za, 'ha, ya, ra,la,s'a,sa,ha, a; the so-called Sanskrit cerebrals are represented by the letters to, t'a, da, na, s'a, turned the other way. Ya, when combined as second consonant with k-, p-, m-, is written under the first letter. Ra, when combined as second letter with k-, t-, p-, is written under the first, and when combined with another consonant as first letter over the second. The vowels are a, i, u, e, 0, which are not distinguished as long or short in writing, except in loan words transcribed from the Sanskrit, &c, though they are so in the vernaculars in the case of words altered by phonetic detrition. By means of agglutination, that is, by adding to the bases form-words as prefixes, suffixes or infixes, the Tibetan language has developed a considerable grammatical system and is now agglutinating rather than isolating. Agglomera- tions of consonants are often met with as initials, giving the appear- ance of telescoped words — an appearance which historical etymology often confirms. Many of these initial consonants are silent in the dialects of the central provinces, or have been resolved into a simpler one of another character. The language is much ruled by laws of euphony, which have been strictly formulated by native gram- marians. Among the initials, five, viz. g, d, b, m, 'h, are regarded as prefixes, and are called so for all purposes, though they belong sometimes to the stem. As a rule none of these

letters can be placed before any of the same organic class. Post-positions, pa or ba and ma, are required by the noun (substantive or adjective) that is to be singled out; po or bo (masc.) and mo (fem.) are used for dis- tinction of gender or for emphasis. The cases of nouns are indicated by suffixes, which vary their initials according to the final of the nouns. The plural is denoted when required by, adding one of several words of plurality. When several words are connected in a sentence they seldom require more than one case element, and that comes last. There are personal, demonstrative, interrogative and reflexive pronouns, as well as an indefinite article, which is also the numeral for " one." The personal pronouns are replaced by various terms of respect when speaking to or before superiors, and there are many words besides which are only employed in ceremonial language.

3 Jaeschke from i860 to 1867 made several important communica- tions, chiefly with reference to the phonetics and the dialectical pronunciation, to the academies of Berlin and St Petersburg, and in the Journal of the Asiatic Society of Bengal. In 1868 at Kyelang he published by lithography A Short Practical Grammar of the, Tibetan Language, with special reference to the spoken dialects, and the following year a Romanized Tibetan and English Dictionary. He also published in 1871-1876 at Gnadau in Prussia by the same process a Tibetan and German dictionary. Afterwards he prepared for the English Government a Tibetan-English Dictionary, with special reference to the prevailing dialects, in 1881. Dr H. Wenzel, one of his pupils, edited in 1883 from his MS. a Simplified Tibetan Grammar. Major Th. H. Lewin with the help of a Sikkimese lama compiled A Manual of Tibetan, or rather a series of colloquial phrases in the Sikkimese dialect, in 1879. In 1894 Mr Graham Sandberg compiled a useful Handbook of Colloquial Tibetan. Pere Desgodins in 1899 issued from Hong-Kong a large Tibeto-Latin-French dictionary, Dictionnaire thibetain-latin-francais. In 1890 Captain H. Ramsay published at Lahore his useful Practical Dictionary of Western

Tibet. In 1902 was brought out at Calcutta Sarat Chandra Das's Tibetan English Dictionary with Sanskrit syno- nyms, a massive volume compiled with the aid of Tibetan lamas and edited by Graham Sandberg and the Moravian missionary A. W. Heyde. The Tibetan Manual by V. C. Henderson (1903) is a useful work, and so is the Manual of Colloquial Tibetan by C. A. Bell (Calcutta, 1905), which has full English-Tibetan vocabularies, graduated exercises and examples in the Lhasa dialect of to-day. An interesting and important analysis of many of the dialects and of the general structure of the language has been made by Dr G. A. Grierson, with the collaboration of Dr S. Konow, in his Linguistic Survey of India (1908). As regards native philology, the most ancient work extant is a grammar of the Tibetan tongue preserved in the Bstan-hgyur (mdo exxiv.). This collection also contains other works of the same kind, dictionaries by later writers, transla- tions of many Sanskrit works on grammar, vocabulary, &c, and bilingual dictionaries, Sanskrit and Tibetan. As separate publica- tions there are several vocabularies of Chinese and Tibetan ; Mongol and Tibetan; Chinese, Manchu, Mongol, Oelot, Tibetan and Turkish; Tibetan, Sanskrit, Manchu, Mongol and Chinese.

The verb, which is properly a kind of noun or participle, has no element of person, and denotes the conditions of tense and mood by an external and internal inflexion, or the addition of auxiliary verbs and suffixes when the stem is not susceptible of inflexion, so that instead of saying " I go," a Tibetan says" my going." The conditions which approximate most closely to our present, perfect, future and imperative are marked either by aspiration of the initial or by one of the five prefix consonants according to the rules of euphony, and the whole looks like a former system thrown into confusion and disorder by phonetic decay. As to the internal vowel, o or e in the present tends to

become o in the imperative, the e changing to a in the past and future; i and u are less liable to change. A final s is also occasionally added. Only a limited number of verbs are capable of four changes; some cannot assume more than three, some two, and many only one. This deficiency is made up by the addition of auxiliaries or suffixes. There are no numeral auxiliaries or segregatives used in counting, as in many languages of eastern Asia, though words expressive of a collective or integral are often used after the tens, sometimes after a smaller number. A good deal of new research on the grammar is to be found in Grierson's Linguistic Survey of India, part III., 1908. In scientific and astrological works, the numerals, as in Sanskrit, are expressed by symbolical words. In the order of the sentence the substantive precedes the adjective and the verb stands last; the object and the adverb precede the verb, and the genitive precedes the noun on which it depends— this contrasts with the order in the isolating Chinese, where the order is subject, verb, object. An active or causal verb requires before it the instrumental instead of the nominative case, which goes only before a neuter or intransi- tive verb. The chief differences between the classical language of the Tibetan translators of the 9th century and the vernacular, as well as the language of native words, existed in vocabulary, phrase- ology and grammatical structure, and arose from the influence of the translated texts.

The Tibetan language, presenting such marked differences between its written and spoken forms, has a great interest for philologists, Phltolozy on account °' its bearing on the history of the mono- syllabic languages of eastern Asia, with their so- called " isolation " or absence of form- words and consequently of gram- matical forms. Is the Tibetan a monosyllabic language passing to agglutination, or the reverse? The question has turned mainly upon the elucidation of the phenomenon of the silent letters, gene- rally prefixed, which differentiate the spelling of many words from their pronunciation, in the central dialect or current speech of Lhasa.

Remusat rather dubiously suggested, while Schmidt and Schiefner maintained, that the silent letters were a device of gram- marians to distinguish in writing words which were not distinguished in speech. But this convenient opinion was not sufficient for a general explanation, being supported by only a few cases. Among these are — (a) the addition of silent letters to foreign words in analogy with older terms of the language (e.g. the Persian tadjik was transcribed staggzig or " tiger-leopard," because the foreign term left untouched would have been meaningless for Tibetan readers) ; (b) the addition for the sake of uniformity of prefixed letters to words etymologically deprived of them ; (c) the probable addition of letters by the Buddhist teachers from India to Tibetan words in order to make them more similar to Sanskrit expressions (for instance rje- for " king," written in imitation of raja, though the original word was je or she, as is shown by cognate languages). On the other hand, while phonetically the above explanation was not inconsistent with such cases as vka dkah, bkah, bska, and nga, rnga, nga%, sngogs, \nga, ngad and brtse, brdzun, dbyar, &c, where the italicized letters are pronounced in full and the others are left aside, it failed to explain other cases, such as dgra, mgron, spyod, spyan, sbrang, sbrul, bkra, k'ri, krad, k'rims, k'rus, &c, pronounced da, don, cod, or swod, ten, dang, deu, (a, ti, tad or leh, t'itn, tu, &c, and many others, where the spoken forms are obviously the alteration by wear and tear of sounds originally similar to the written forms. Csoma de Koros, who was acquainted with the somewhat archaic sounds of Ladak, was able to point to only a few letters as siient. Foucaux, in his Grammaire (1858), quoted a fragment from a native work on grammar several centuries old, in which the pronunciation of the supposed silent letters is carefully described. Since then the problem has been disentangled ; and now minor points only remain to be cleared up. Jaeschke devoted special attention to the dialectical sounds, and showed in several papers and by the comparative table prefixed to his dictionary that in the western and eastern dialects

these sounds correspond more or less closely to the written forms.

Jaeschke first noted the existence of tones in Tibetan, and these have been found by Professor Conrady to have developed on the Tones same lines as in Chinese. Thus intransitive bases seem

to have begun only with soft consonants, and it is doubtful whether the parent tongue possessed hard consonants at all; whi'.i transitive bases were formed by hardening of the initial consonants and at the same time pronouncing the words in a higher tone, and these two latter changes are supposed to have been indicated by a prefix to the base-word. Many of these old soft

initial consonants which are now hardened in the modern dialects are preserved in classical Tibetan, i.e. in Tibetan of the 7th to the 9th century A.D. The old language seems to have pronounced prefixes extensively which in modern pronunciation in central Tibet are largely lost, whilst the soft initials have become aspi- rated or hardened and tones have developed, and in the west and east, where prefixes and soft initials have been preserved, there are no tones. Thus the valuable testimony of these dialects may be added to the evidence furnished by foreign transcriptions of Tibetan words, loan words in conterminous languages, and words of common descent in kindred tongues. And the whole shows plainly that the written forms of words which are not of later remodelling are really the representatives of the pronunciation of the language as it was spoken at the time of the transcription.

The concurrence of the evidence indicated above enables us to form the following outline of the evolution of Tibetan. In the 9th century, as shown by the bilingual Tibeto-Chinese edict at Lhasa, there was relatively little difference between the spoken and the written language. Soon afterwards, when the language was extended to the western valleys, many of the prefixed and most of the important consonants vanished from the spoken words.

The ya-tag and ra-tag, or y and r subscript, and the 5 after vowels and consonants, were still in force. The next change took place in the central provinces; the ra-tags were altered into cerebral dentals, and the ya-tags became i. Later on the superscribed letters and finals d and s disappeared, except in the east and west. It was at this stage that the language spread in Lahul and Spiti, where the superscribed letters were silent, the d and g finals were hardly heard, and as, os, us were ai, oi, ui. The words introduced from Tibet into the border languages at that time differ greatly from those introduced at an earlier period. The other changes are more recent and restricted to the provinces of U and Tsang. The vowel sounds ai, oi, ui have become e, 0, u; and a, 0, u before the finals d and n are now a, 0, u. The mediae have become aspirate tenues with a low intonation, which also marks the words having a simple initial consonant; while the former aspirates and the complex initials simplified in speech are uttered with a high tone, or, as the Tibetans say, " with a woman's voice," shrill and rapidly. An inhabitant of Lhasa, for example, finds the distinction between 5' and z', or between s and z, not in the consonant, but in the tone, pronouncing s' and s with a high note and z' and z with a low one. The introduction of the important compensation of tones to balance phonetic losses had begun several centuries before, as appears from a Tibetan MS. (No. 4626 St Petersburg) partly published by Jaeschke (Monatsber. Akad. Berl., 1867). A few instances will serve to illustrate what has been said. In the bilingual inscriptions, Tibetan and Chinese, set up at Lhasa in 822, and published by Bushell in 1880, we remark that the silent letters were pronounced: Tib. spudgyal, now pugyol, is rendered suh-pot-ye in Chinese symbols; khri, now ti, is kieh-li; hbrong is puh-lung; snyan is sheh-njoh and su-njoh; srong is su-lun, su-lung and si-lung. These transcriptions show by their variety that they were made from the spoken and not from the written forms, and, considering the limited capacities of Chinese orthoepy, were the nearest attempt at rendering the Tibetan sounds. Spra or

spreu (a monkey), now altered into deu at Lhasa, \eu in Lahul, Spiti and Tsang, is still more recognizable in the Gyarung shepri and in the following degenerated forms — shreu in Ladak, streu-go in Khams and in cognate languages, soba in Limbu, saheu in Lepcha, simai in Tablung Naga, sibeh in Abor Miri, shibe in Sibsagar Miri, sarrha in Kol, sara in Kuri, &c. Grog-ma. (ant), now altered into the spoken t'oma, is still kyoma. in Bhutan, and, without the suffix, korok in Gyarung, k'oro- in Sokpa, k'orok, k'alek in Kiranti, &c. Grang-po- (cold), spoken t'ammo, is still grang-mo in Takpa, k'yam in Burmese, &c. A respectful word for " head " is «, written dbu, which finds its cognates in Murmi thobo, Sibsagar Miri tub, &c. Bya (bird), spoken cha, is still pye in Gyarung. Brjod (to speak), pronounced jod, is cognate to the Burmese pyauhtso, the Garo brot, &c. The word for " cowries " is 'gron- in written, rum- in spoken Tibetan, and grwa in written Burmese; slop (to learn), spoken lop, is slop in Melam. " Moon " is zlava in written and dawa in spoken language, in which va is a suffix; the word itself is zla, cognate to the Mongol ssara, Sokpa sara, Gyarung t-sile, Vayu cholo, &c. The common spoken word for " head " is go, written mgo, to which the Manipuri moko and the Mishmi mkura are related. Sometimes the written forms correspond to double words which have disappeared. For instance, gye (eight), which is written brgyad and still spoken vrgyad in Balti in the west and Khams in the east, is gydd in Ladak, Lahul, Tsang and t). The same word does not appear elsewhere; but we find its two parts separately, such as Gurung pre, Murmi pre, Taksya phre and Takpa gyet, Serpa gye, Garo chet, &c. Rta (horse) is reduced to ta in speech, but we find ri, rhyi, roh in Sokpa, Horpa, Tochu, Minyak, and ta, tah, teh, t'ay in Lhopa, Serpa, Murmi, Kami, Takpa, &c, both with the same meaning. Such are the various pieces of evidence obtained from an endless number of instances. The cases referred to above do not, owing to the difference of the causes, yield to any explanation of this kind. And it must be admitted that there are also many cases, some of them caused by irregularities of writing,

modification of spelling by decay, and by a probable use of pre- fixes still unascertained, which also resist explanation, though the

account just given stands good whatever solution the question of prefixes may receive in future.

Literature. — The religious literature, which is very considerable, is referred to under Lamaism. The non-religious literature of Tibet is not extensive, probably owing to the printing being in the hands of the priests. One of the most popular and widely circulated books is called The Hundred Thousand Songs of the Venerable Milaraspa. Their author Milaraspa (unless the work should be attributed to his disciples), often called Mila, was a Buddhist ascetic of the nth century, who, during the intervals of meditation travelled through the southern part of middle Tibet as a mendicant friar, instructing the people by his improvisations in poetry and song, proselytizing, refuting and converting heretics, and working manifold miracles. His legends are not without wit and poetical merit. An equally popular book is the Love Songs of Ts'angs-dbyangs rgyamts'o, attri- buted to the dissipated young Dalai lama who was deposed in 1701 (see Lhasa). There are a number of poems written in an elevated style, also dramatic works chiefly of the character of mystery plays, and collections of fairy tales and fables. The Kesar Epic, which has been translated by A. H. Francke under the title of the Kesar Saga, is a widely known tale of a heroic warrior king of northern Asia named Kesar (believed by some to be a transcription of " Czar "), but it is not found as a printed book. Several collections of folk songs have also been published by A. Francke from Ladak. A long story book, called the Djiung yi (Sgrungs gyi gsungs ?), and regarded as the national epic in Kham, has been partly seen by Desgodins and Baber. It is in prose; but the dialogue, interspersed with songs, is metrical, and is much

more extensive than the prose framework. Religious discussions and philosophical dissertations alternate with comic episodes. It includes three divisions — the Djiung ling, which describes the invasion of part of Tibet by the Djiung or Moso; the Hor ling, which recounts the conquest of the Hor (Turk tribes) by the Tibetans, and conveys much historical information in a tale of magic and marvel; and the Djia ling (Chinese division), which narrates a contest of unknown date between the Tibetans and the Chinese. This work has apparently never been published, and even the manuscripts of the three divisions cannot, says Baber, be obtained in a complete form. But every Tibetan, or at least every native of Kham, who possesses any education, is able to recite or to chant passages of great length. Another Tibetan epic in Khaur, the Gyaldrung, praises Dagyolong, a famous warrior who subdued the savage men of Kham. Dramatic works exist, as also a version of the Ramayana in the first volume of the Bstodts'ogs of the Bstan-hgyur.

Writing. — Writing was not introduced until the 7th century. Notched sticks {shing-chram) and knotted cords were in current use, but the latter contrivance is only faintly alluded to in the Tibetan records, while of the other there are numerous examples. No mention is anywhere made of a hieroglyphical writing, but on the eastern frontier the medicine-men or toniba of the Moso have a peculiar pictorial writing, which is known in Europe from two published MSS. (in Journ. Roy. Asiatic Soc, 1885, vol. xvii.) ; though apparently now confined solely to purposes of witchcraft, it perhaps contains survivals of a former extensive system superseded by the alphabetic writing introduced from India. According to tradition — a tradition of which the details are still open to criticism — the alphabet was introduced from India by Tonmi, a lay Tibetan minister who was sent to India in 632 by King Srong-btsan to study the Sanskrit language and Buddhist literature. Tonmi introduced the modified Sanskritic " writing in thirty characters " (already detailed under Language and six of which do not

exist in Sanskrit) in two styles — the "thick letters" or "letters with heads" {u-ch'en), now commonly used in printed books, and the half-cursive ' ' cornered letters," so called from their less regular heads. The former are traditionally said to have been derived from the Landza character. The Landza of Nepal, however, is certainly not the origin of the Tibetan letter, but rather an ornamental development of the parent letter. The close resemblance of the Tibetan characters " with heads " to the Gupta inscriptions of Allahabad shows them to have been derived from the monumental writing of the period; and various arguments appear to show that the other Tibetan letters came from the same Indian character in the style in which it was used in common life. The Tibetan half-cursive was further developed into the more current " headless " (u-med) characters, of which there are several styles. The ancient manuscripts discovered by Dr M. Aurel Stein in Khotan seem to include very early, if not the earliest known, Tibetan documents. (L. A. W. ; T. DE L.)

Political Divisions. — Tibetans divide their country into five provinces: (1) Amdo, which comprises that part of the Chinese province of Kansuh which is inhabited by-Tibetans, and Koko Nor region, extending southwards to the Yellow river and west-wards as far as the Tsaidam. Amdo is inhabited in its eastern part by Tibetans, called Rongwa or " ravine-folk," who are agriculturists, and in the western by pastoral tribes, collec- tively called Panaka or the Three Panakas. (2) Khams or Kkatndo, which includes all eastern Tibet between the Chinese provinces of Szechuen and Yunnan, and the district of Lhorong

jong, which forms the eastern border of the Lhasa-governed territory. This province is divided into the five Horba tribes, the eighteen Nyarong states in the valley of the upper Yalung, and the districts of Litang, Batang, Derge, Gartok Chiamdo and Draya. In Khamdo, but subject to the direct rule of Lhasa, are several small districts, the principal are Nyarong, Tsarong, and Mar Khams or " Lower Khamdo."

Most of these districts are governed by deba or chiefs, while a few have kings or gyalpo, the most powerful of the latter being the king of Derge, famous for its inlaid metal and leather work, and of Chagla, or, as it is better known, Tachienlu, as it is called by the Chinese or the Dartsemdo of the Tibetans, the headquarters of the tea trade with China. Khamdo is under the direct rule of the Chinese provincial authorities of Szechuen. Some of its rulers send also tribute missions to Peking. For convenience of classification we may include in Khamdo a long strip of country extending along the northern border of the Lhasa territory of Lhorong jong and Larego as far as Tengri Nor, and bounded to the north by the Dang-la mountains, which is designated by Tibetans as Gyade or " the Chinese province." This strip of country has its own native chiefs, but is under the control of a high Manchu officer stationed at Lhasa, known colloquially as the " super- intendent of savage tribes." (3) The third political division of Tibet is U (written Dbus), meaning " Central." It includes Lhasa and a large number of outlying districts in south-eastern Tibet, such as Po, Pemakoichen, Zayul. The pastoral or Dokpa tribes, north and north-east of Tengri Nor, are also under its rule. (4) The fourth division of Tibet, called Tsang, includes all south-west Tibet from the Lhasa or Central province to the Indian frontier as far as Lake Manasarowar. (5) The fifth divi- sion, called Nari (Mngah-ris) by the Tibetans or Hilndesh by the Indians, who call the inhabitants Huniyas, comprises the whole country around the sources and along the upper course of the Indus and the Sutlej, and also all north-western Tibet generally, as far as Ladak and the border of Kashmir. Tsang and Nari are under the rule of Lhasa, all the high civil and military authorities in these provinces holding their offices from it. These five provinces, however, do not include the elevated steppes of Tsaidam (extending between the Kuen-lun and the Altyn Tagh or Nan Shan ranges), inhabited by a mixed race of marauding people, Tunguts and Mongols. Yet Tsaidam is geographically but a northern extension of the great Tibetan plateau, and

in most of its essential physical features it is more closely allied to the Chang-t'ang of the south than to the great sandy depressions of Chinese Turkestan or Mongolia on the north.

Government. — Though the whole of Tibet is under the suzerainty of China, the government of the country is divided into two distinct administrations, the one under the rule of the Dalai lama of Lhasa, the other under local kings or chiefs, and com- prising a number of ecclesiastical fiefs. Both are directed and controlled by the high Chinese officials residing at Lhasa, Sining Fu, and the capital of the Chinese province of Szechuen. North- eastern Tibet or Amdo, and also a portion of Khamdo, are under the supervision of a high official (Manchu) residing at Sining Fu in Kansuh, whose title is Imperial Controller-General of Koko Nor. The native chiefs of the Panaka and other Tibetan tribes of this region are styled pbmbo (" official " or " headman ") by both the natives and the Chinese. The region under the supervision of the imperial controller includes all the countries north of the upper course of the Dre chu (Yangtsze-kiang). The people pay a small poll-tax to China, and are exempted from any other impost; they also pay a small tax in kind, sheep, butter, &c, to their chiefs. The province of Khamdo, including all eastern Tibet, is governed by local chiefs, styled gyalpo, " king," and deba, " chief," succession to the chieftainship being usually assured to the eldest son not a lama. Each chief appoints a certain number of civil and military officers to assist in the govern- ment of the country, and each village has its headman or bese, also an hereditary office. None of these officials receive salaries; they are only exempt from taxation, and some have grants of land made to them. The only tax paid to China is a so-called " horse-tax " of about 5d. for each family. Once in every five

years the chiefs send a tribute mission to the capital of Szechuen, and once every ten years to Peking, but the tribute sent is purely nominal. The Chinese maintain a few small military posts with from six or eight to twenty men stationed in them ; they are under the orders of a colonel residing at Tachienlu. There are also a few lama chiefs.

The part of Tibet under the rule of Lhasa, by far the largest and wealthiest, includes the central province of U, Tsang, Nari and a number of large outlying districts in southern and even in eastern Tibet. The central government of this part of the country is at Lhasa; the nominal head is the Dalai lama or grand lama. The Tashi lama or head of the monastery of Tashilhunpo near Shigatse is inferior to the Dalai lama in secular authority, of which, indeed, he has little — much less than formerly — but he is considered by some of his worshippers actually superior to him in religious rank. The person next in consideration to the two great lamas is the regent, who is an ecclesiastic appointed .during the minority of each Dalai lama. Under him are four ministers of state {sha-pe or. kalon), who divide among themselves, under the immediate supervision of the two imperial Chinese residents (or amban), the management of all secular affairs of the country. There is also a Tsong-du or National Assembly, divided into a greater assembly, including all government officials, and called together only to decide on matters of supreme importance, and a lesser assembly, consisting of certain high officials of Lhasa, noblemen, and delegates from the monasteries of Debung, Sera and Galdan, and fairly constantly in session. The Tsong-du discusses all matters of importance, especially relating to foreign policy, and its decisions are final. The army is under the command of the senior Chinese amban, a Tibetan generalissimo or mag-pon, and six Tibetan generals (dah-pon or de-pon) . The military duties of the generals are slight, but their political status is high. Under the dah-pon are six riipon or colonels, and a number of subordinate officers. The regular army consists (in theory) of

6000 men, on active service for three years, and at home on half- pay for three years. After the six years they pass into the reserve or militia (yulmag). The taxes paid to the Lhasa govern- ment are mostly in kind, sheep, ponies, meal, butter, wool, native cloth, &c, and the coin paid is said to be about 130,000 ounces of silver a year. Chandra Das states that the crown revenues of Lhasa amount to about 2,000,000 rupees annually. All high Tibetan officials, whether ecclesiastics or laymen, are appointed subject to confirmation by the Chinese government. The administrative subdivisions of the Lhasa country, of which there are fifty-four, are called jong, or " prefecture," each of which is under the rule of two jong-pon, the one a lama, the other a layman. They collect all taxes, are responsible for the levy of troops, the courier service, corvees, &c, and exercise judicial functions, corresponding directly with Lhasa. There are 123 sub-prefectures under jong-nyer. Under them are village head- men or tso-pon, headmen or mi-pon, and elders or gyan-po. All are appointed for indefinite periods by the prefects.

Industries and Trade. — The industries are confined to the manu- facture of woollen cloth of various degrees of fineness and colour, and called truk, tirma and lawa, to that of small rugs, pottery of an inferior quality, utensils of copper and iron, some of which show considerable artistic skill in design, and to such other small trades as are necessary to supply the limited wants of the people. The best artisans are Nepalese and Chinese, the former being the best workers in metal and dyers.

The great trade routes are, first, that which, starting from Cheng-tu, the capital of the Chinese province of Szechuen, passes by way of Tachienlu or Dartsedo, Litang, Batang, Chiamdo, It t « Larego, Lhasa, Gyantse, Shigatse, reaches the Nepalese Homes, «c f ront i er at Niel am and goes thence to Katmandu. This route is called Gya-lam, " the China road " (or " high road ") ; the great bulk of Tibetan travel goes over it. Minor roads go from Sining Fu in the Chinese province of Kansuh via

Tsaidam and the Tang la pass to Nagchuka and Lhasa. This road, called the Chang lam or " northern road," was much used by traders till the middle of the 19th century, when the Mahommedan rebellions in north-western China practically closed it. Another road starts from ?ung-pan in north-western Szechuen, and, by way of the sources of the Yellow River, joins the Gya-lam at Chiamdo; it is little used, as it passes through the country of the wild marauding Golok. Still another route starts from Tachienlu, and by the valley of

the Yalung and the Dze chu runs to Yekundo, and thence to Chiamdo, From this point it leads to Riwoche, and then through Gyade or Chinese province to Nagchuka and Lhasa. An important trade road starts from Likiang Fu in Yunnan, and by way of Chung-tien (Guiedam of the French missionaries) joins the Gyalam at Batang.

The most direct route from India to Lhasa, and that most fre- quented by the traders of Lhasa, is by the Chumbi Valley, and was followed by the British Mission. It crosses the Himalayas by the Tang Pass (15, 200 ft.), and thence proceeds via Gyantse (13,200 ft.) and the Kharo Pass (16,500 ft.), Yamdok Lake (15,000) to the Tsang-po (12,100 ft.), and crossing the river winds up along the Kyi Chu, on which Lhasa stands, 33 m. from the Tsang-po. The total distance from Siliguri railway station is 357 m. From Katmandu, the capital of Nepal, a difficult mountain route runs by Kirong to the No la (16,600 ft.), descending from which pass it strikes the Tsangpo about midway between Lhasa and Lake Manasarowar. Farther west Tibet may be reached from Kumaon by one of a group of passes (of which the best known is the Milam) leading to Lake Manasarowar. The lake becomes a sort of obligatory point on all routes to Tibet which lie between Ladak and Nepal. The Shipki road from Simla, which strikes the Sutlej at Totling (where there is a bridge), leads up to Manasarowar, coinciding with the great high-road (Changlam) after passing Totling. The remarkable area of gold-mining industry which lies to the north-east of Gartok is reached by another

route from Leh, which, crossing the Chang la close to Leh, passes by Rudok at the eastern extremity of Lake Pangong in a south-easterly direction, running north of the great mountain masses which crowd round the Indus sources. It continues through the central lake district to Tengri Nor and Lhasa. The principal trade with China is carried on over the Lhasa-Tachienlu road.

According to a summary furnished by Lieut.-Colonel Waddell {Lhasa and its Mysteries), the chief imports from China are silk, carpets, porcelain and tea-bricks. From Mongolia come leather, saddlery, sheep and horses, with coral, amber and small diamonds from European sources ; from Kham perfumes, fruits, furs and inlaid metal saddlery; from Sikkim and Bhutan rice, musk, sugar-balls and tobacco; from Nepal broadcloth, indigo, brasswork, coral, pearls, sugar, spices, drugs and Indian manufactures; from Ladak saffron, dried fruits and articles from India. In the market at Lhasa opium sells for its weight in silver. The exports from Tibet are silver, gold, salt, wool, woollen cloth, rugs, furs, drugs, musk. By the Nepal, Kumaon and Ladak routes go borax, gold and ponies. Patna in Bengal is the chief market for the Nepal trade; Diwangiri and Udalguri for Assam, and Darjeeling and Kalimpong for Sikkim and Chumbi. One of the most universal articles of consumption in Tibet is the Chinese brick-tea, which even passes as currency. The tea imported from Szechuen is for the most part of very inferior quality, estimated at 35% tea-leaves and 65% twigs and other material. It is compressed into large bricks, and costs two-thirds of a penny per pound. Efforts have been made by the planters of the Duars to prepare Indian brick-tea for the Tibetan market, which is calculated to consume some 11,000,000 lb yearly.

Money. — It is curious that Tibet, though using coined money, seems never, strictly speaking, to have had a coinage of its own. Till nearly the end of the 1 8th century the coinage had for a long time been derived from Nepal. That valley prior to the Gurkha domination (1768) was under three native dynasties (at Bhatgaon, Patan and Katmandu), and

these struck silver mohurs, as they were called, of the nominal value of half a rupee. The coins were at first not struck specially for Tibetan use, but were so afterwards. These latter bore (obverse) a Nepalese emblem surrounded by eight neurons containing the eight sacred Buddhist jewels, and (reverse) an eight-petalled flower surrounded by eight fleurons con- taining the names of the eight jewels in Tibetan characters. Ingots ot Chinese silver were sent from Lhasa with a small proportion of gold dust, and an equal weight in mohurs was returned, leaving to the Nepal rajahs, between gold dust and alloy, a good profit. The quality of these coins (weighing about 81 grains troy) was low, and at last deteriorated so much that the Tibetans deserted the Nepal mints. The Gurkhas, after becoming masters of Nepal, were anxious to renew the profitable traffic in coin, and in this view sent a deputation to Lhasa with a quantity of coin to be put in circulation. But the Gurkhas were mistrusted and their coin refused. A coinage was then issued (it would appear once only) in Tibet for domestic use, modelled on an old Kathmandu pattern and struck by Nepalese artists. The Gurkhas, however, in 1788 and following years con- tinued to strike coins of progressively debased quality, which were rude imitations of the old Nepalese mintage, and to endeavour to force this currency on the Tibetans, eventually making the departure of the latter from old usage a pretext for war and invasion. This brought the intervention of the Chinese, who drove the Gurkhas out of Tibet (1792), and then began to strike silver coins for Lhasa use, bearing Chinese and Tibetan characters. For practical use these Tibeto-Chinese coins (of which 2j = i rupee, and which are known as naktang, i.e. nagskyang, " cash ") are cut into aliquot parts by the guidance of the figures on them. Large lumps of Chinese silver, stamped with the imperial seal, are also used. But of late years there has been an enormous influx of Anglo-Indian rupees, so that these have become practically the currency of the

country, even to the frontier of China, and are now counted, instead of being valued as bullion. They are called Piling tanka, (foreign coins), from the Hindi tanka, a rupee.

Weights and Measures. — The weights and measures in use are practically those of China; the dry measures, the most commonly employed, are the bre or bo of about four pints and the bchal of twenty bo ; the capacity of the bo varies according to localities. The most commonly used measures of length are the span (mto), the cubit (km), and the arm's-length or fathom {dompa).

Exploration. — Tibet was long a terra incognita to Europeans. It is difficult of access on all sides, and everywhere difficult to traverse. Its great elevation causes the climate to be rather arctic than tropical, so that there is no gradual blending of the climates and physical conditions of India and Tibet, such as would tend to promote intercourse between the inhabitants of these neighbouring regions; on the contrary, there are sharp lines of demarcation, in a mountain barrier which is scalable at only a few points, and in the social aspects and conditions of life on either side. No great armies have ever crossed Tibet to in- vade India; even those of Jenghiz Khan took the circuitous route via Bokhara and Afghanistan, not the direct route from Mon- golia across Tibet. Added to this was the religious exclusive- ness of the Tibetans themselves. Thus it was no easy matter for the early European travellers to find their way into and explore Tibet. Friar Odoric of Pordenone is supposed to have reached Lhasa c. 1328, travelling from Cathay; but this visit is doubtful. On the strength of certain statements in the narrative of Fernao Mendes Pinto, some authorities hold that he may have visited Lhasa in the course of his journeys in the middle of the 16th century. The Jesuit Antonio Andrada, a native of Portugal (1580-1634), travelling from India, appears to have entered Tibet on the west, in the Manasarowar Lake region, and

made his way across to Tangut and north-western China; in 1661 the Jesuit fathers Johann Grueber (an Austrian) and Albert D 'Orville (a B elgian) travelled from Peking via Tangut to Lhasa, and thence through Nepal to India. The extracts from Grueber's narrative, given by Athanasius Kircher in his China illustrata (Amsterdam, 1667), are accompanied by a good drawing of Potala. During the first half of the 18th century various Capuchin friars appear to have passed freely between Calcutta and Lhasa (1708) by way of Nepal. They even founded a mission in Lhasa, which, after failing at first, was more firmly established in 17 15 and lasted till 1733.

In 1 7 16 two Jesuits, P. Ipolito Desideri, of Pistoia, and P. Freyre, a Portuguese, reached Lhasa by way of Kashmir, Ladak, and the enormous journey from Ladak by the holy lakes and the valley of the Tsangpo. Desideri remained at Lhasa till April 1 72 1, witnessing the capture of Lhasa successively by Dzungar and Chinese. Of the moderation of the latter, and their abstinence from all outrage or plunder, he speaks highly. His departure was due to controversies between the Jesuits and Capuchins at Rome, which caused an order to be issued for his retirement from Tibet. An interesting letter from him, dated the 10th of April, 1716, is printed in the Lettres edifiantcs, rec. xv., and he left a large MS. volume of his observations. The next European visitor was Samuel Van de Putte, of Flushing, an LL.D. of Leiden, whose thirst for travel carried him through India to Lhasa (1730), where he is said to have resided a long time, to have acquired the language, and to have become intimate with some of the lamas. After travelling from Lhasa to Peking with a lama mission he returned, again by Lhasa, to India, and was an eyewitness of the sack of Delhi by Nadir Shah in 1737. Un- happily he ordered his papers to be burnt after his death, and the knowledge that such a traveller must have accumulated died with him. In 1745 the Capuchin mission finally collapsed after a revival had been attempted in 1741 by a party under

Orazio della Penna, of which Cassiano Beligatti was chronicler. We possess some of the results collected by this mission in an excellent short treatise on Tibet by P. Orazio himself, as well as in the Alphabetum Tibetanum of the Augustine monk A. Georgi (Rome, 1762). Some fifty volumes, the relics of the mission library, were in 1847 recovered from Lhasa by Brian Hodgson, through the courtesy of the Dalai lama himself, and were transmitted as an offering to Pope Pius IX. The first Englishman to enter Tibet was

George Bogle, a writer of the East India Company, in 1774, on an embassy from Warren Hastings to the Tashi lama of Shigatse. In 1783 Lieut. Samuel Turner was despatched on a mission similar to that of Bogle, and reached Shigatse. In 1811-1812 the first English visit to Lhasa occurred. The traveller was Thomas Manning, a Cambridge man of Caius College, who had been long devoted to Chinese studies, the " friend M." of Charles Lamb, from whom " Elia " professes to have got that translation of a Chinese MS. which furnished the dissertation on roast pig. After residing some years at Canton, Manning went to Calcutta, bent on reaching the interior of China through Tibet, since from the seaboard it was sealed. He actually did reach Lhasa, stayed there about five months, and had several interviews with the Dalai lama, but was compelled to return to India. He never published anything regarding his journey, and its occurrence was known to few, when his narrative was printed, through the zeal of Mr (afterwards Sir) C. Markham, in 1876. The account, though containing some passages of great interest, is disappointing. Manning was the only Englishman known to have reached the sacred city without the aid of an army. But the Abbe Hue states that William Moorcroft, an Englishman who made a journey into Tibet in the neighbourhood of Lake Manasarowar in 181 2, and another into Kashgar in 1824, lived in Lhasa for twelve years disguised as a Mussulman. He was supposed to have died on the Afghan frontier in 1825 on his second journey; but if Hue's story is true he reached Lhasa in 1826, and did not leave it

till 1838, being assassinated on his homeward journey, when maps and drawings were found on him, and his identity was for the first time suspected by the Tibetans. During the 19th century Europeans were systematically prevented from entering the country or speedily expelled if found in it. In 1844-1846 the French missionaries, Evariste Regis Hue and Joseph Gabet,made their way to Lhasa from China. They travelled from China the route followed by Grueber and by Van de Putte, via Siningfu, and reached Lhasa on the 29th of January 1846. On the 15th of March they were sent off under escort by the rugged road to Szechuen. Hue's book, Souvenirs d'un voyage, &c, is one of the most delightful books of travel. Hue was, indeed, not only with- out science, perhaps without accurate knowledge of any kind, but also without that geographical sense which sometimes enables a traveller to bring back valuable contributions to geographical knowledge though unable to make instrumental observations. He was, however, amazingly clever as a narrator and sketcher of character. It was Ke-shen, a well- known Chinese statesman, who was disgraced for making peace with the English at Canton in 1841, and was then on a special deputation to Lhasa, who ostensibly expelled them. The Tibetan regent, with his enlightened and kindly spirit, is painted by Hue in most attractive colours, and Markham expressed the opinion that the native authorities were then willing to receive strangers, while the jealousy that excluded them was Chinese only. The brothers Henry and Richard Strachey visited Manasarowar Lake in 1846 and 1848 respectively. In 1866 the Abbe Desgodins travelled through portions of eastern Tibet and reached Chiamdo (in Kham), but was prevented from approaching any closer to Lhasa.

Beginning in 1863 a number of native Indian explorers were sent by the government of India into Tibet, for the purpose of surveying the country and collecting information The Secret- about its inhabitants. These men were specially Service trained at Dehra Dun in the work of surveying, and Puaall s. entered Tibet with a strong wooden box

with a specially concealed secret drawer for holding observing instruments, a prayer wheel with rolls of blank paper instead of prayers in the barrel on which observations might be noted, and lamaic rosaries by the beads of which each hundred paces might be counted. As may be imagined, they carried their lives in their hands in case of dis- covery. The best known of these men were Pundit Nain Singh, Pundit Krishna, originally known as A.-K. (from the first and last letters of his name transposed) and Ugyen Gyatso, or U.-G. Nain Singh reached Lhasa in the course of two remarkable journeys. In the first, after an ineffectual attempt by Nepal, he

travelled by the Manasarowar Lake, and the road thence east- ward, parallel to the course of the Tsangpo, reaching Lhasa on the ioth of January 1866, and leaving it on the 21st of April 1867. On the second journey (1874) he started from Ladak, crossing the vast and elevated plateau by the Tengri Nor and other great lakes, and again reaching Lhasa on the 18th of November. Nain Singh gave an account of his journeys, and of his residence there, which, though brief, is full of intelligence and interest. This enterprising and deserving man, on the comple- tion of his journey in 1875, was rewarded by the Indian govern- ment with a pension and grant of land, and afterwards received the gold medal of the Royal Geographical Society and the Companionship of the Star of India. He died early in 1882.

In 1878 A.K also revisited Lhasa, stayed a year, and after wards continued into Tsaidam, not returning to India till 1882. Lama Ugyen Gyatso, a semi-Tibetan, who was originally a teacher of Tibetan in a Darjeeling school, was trained by the Indian Survey Department as a surveyor, and being deputed to take tribute from his monastery to Tashilhunpo, he secured permission in 1879 from the Tashilhunpo authorities for Sarat Chandra Das, Bengali schoolmaster at Darjeeling, to visit that monastery,

where his name was entered as a student. This was the opportunity for a series of valuable exploratory journeys through the Tibetan provinces adjoining the Indian and Nepalese frontiers, which added greatly to our stock of information about Lhasa and the districts surrounding that city. In their first journey the travellers set out from Jongri in Sikkim, and travers- ing the north-east corner of Nepal, crossed into Tibet by the Chatang la, and travelled northwards to Shigatse and Tashil- hunpo. They returned by much the same way to near Khamba jong, and re-entered Sikkim by the Donkya pass. The journey was fruitful of information and valuable for mapping. Ugyen Gyatso undertook another journey in 1883 to complete and extend his former surveys. Travelling by way of Khamba jong directly to Gyantse and Shigatse, he turned eastwards at the latter town, finished the survey of the Yamdok t'so, and crossed the Himalaya into the valley of the Lobratsangpo or Upper Manas river. At Shakhang jong he was arrested, and his true character discovered. He managed, nevertheless, to extricate himself, and turning north-eastwards he passed through Chetang, and reached Lhasa by way of Samye monastery. From this city he started for Darjeeling, which he reached on December 15th, 1883. Chandra Das made a second journey in 1881, with the intention of reaching Lhasa. He travelled by way of Tashilhunpo, lay dangerously ill for some time at Samding monastery, duly reached Lhasa, where he visited the Dalai Lama, but owing to small-pox in the city could remain there only a fortnight, though he made full use of this time. During a journey home occupying nearly half a year he collected much further valuable information. Sarat Chandra Das's reports of his two journeys were published by the Indian government, but for political reasons were until 1890 kept strictly confidential. In 1899 they were edited by the Royal Geographical Society and in 1902 published. They contain valuable information on the superstitions, ethnology and religion of Tibet. Chandra Das also brought back from his journeys a large number of interesting books in Tibetan and Sanskrit, the most valuable of which have been

edited and published by him, some with the assistance of Ugyen Gyatso and other lamas.

The Russian explorer Prjevalsky, although he was not, strictly speaking, an explorer of Tibet, did much incidentally towards determining the conformation of its north-eastern and eastern mountain systems. His third journey into Central Asian wilds, which lasted from March 1879 to October 1880, included the sources of the Hwang Ho, or Yellow river, till then unmapped and unknown. His fourth journey, between November 1883 and October 1885, covered much of northern Tibet, and established the true character of Tsaidam. It was when setting out in 1888 to make an attempt to reach Lhasa that he died.

After Prjevalsky's death, V. I. Roborovski, with several companions, explored the western ranges of the Kuen-lun, and

crossed southwards into Tibet, tracing the course of the Kiria river to the north-western plains of the central plateau. The distinguishing feature of these explorations, led by Russian officers, is their high scientific value and the contributions they have offered to the botany, natural history, geology and meteor- ology of the regions under investigation in addition to the actual geographical data attained. The Kuen-lun is known in their writings as the Russian Range.

In 1888 Mr W. W. Rockhill, an American possessing the unique qualifications for Tibetan exploration of a profound knowledge of the language and history of the country, coupled \y.w.Q 0c k- with the instincts and training of a scientific explorer, hill, 1888- lef t the lamasery of Kumbum in north-western 1SS9 > '891- Kansuh with three Chinese servants - and a small caravan, proceeded round the north shore of Koko Nor, crossed eastern Tsaidam, and explored some of the rivers and lakes directly south of that region. Leaving Barong Tsaidam, he travelled south

by way of the sources of the Yellow river, till he reached the Dre chu (upper Yangtsze-kiang) , which he crossed to the north of the important trading centre of Yekundo. From this point he followed the valley of the Dre chu till about lat. 30 31', when he passed into the basin of the Yalung river, traversed the Horba states and finally reached Tachienlu by the Gi la and the valley of the Darchu.

In 1 89 1 Mr Rockhill, starting again from Kumbum with three Chinese, passed south of Koko Nor through the country of the pastoral Panaka Tibetans, and by a very difficult pass (Vahon jamkar la) entered again the basin of the Tsaidam. He then turned west, followed the base of the south Tsaidam range as far as the Naichi Gol, where he entered the southern mountainous region forming the northern borderland of Tibet. From this point the traveller followed a general south-westerly direction around the heads of all the feeders of the upper Dre chu, and thence into the lake region of northern central Tibet, crossing Bonvalot's route south of the Chi-chang t'so and that of Bower a few days farther south. Near the Namru t'so his farther progress south was arrested and he was compelled to take an easterly course. After making a long detour north, often crossing the roads previously travelled by Bonvalot and Bower, and passing by Riwoche, he came to Chiamdo and Tachienlu. The results of Mr Rockhill's two journeys were important and valuable.

Messrs A. D. Carey and A. Dalgleish in 1885-1887 made a protracted journey from Ladak, in the course of which they crossed the Aksai Chin, reached Khotan, entered the At D# Carey Tarim basin, and subsequently made their way east- and A. Dal- ward and then southward across the Altyn Tagh a.nd^^J , - ,a8S - other ranges to the Tsaidam region. Finally a great circuit was made to the north and west, across the Humboldt range, and by Hami, Urumchi, and Yarkand to Ladak again. Bonvalot, accompanied by Father Dedeken of the Belgian Catholic Mission and Prince Henri d'Orleans, left Charkhlik, south-west of the Lob Nor, in November 1889, and aabrlel taking a very nearly due southerly course, reached on

Bonvalot, the 13th of February 1890 the eastern end of the 'SS9-1890. Tengri Nor. Then pushing on southwards, he crossed the Nien- chen-tang-la and entered the Dam district near the Lhasa-Sining high road. Here the party was stopped by Tibetan authorities and forced to take the tea route through Chinese Tibet (Gyade) by way of Batasumdo, Chebotenchin, Riwoche, Chiamdo to Chiangka, near the upper Yangtse-kiang, whence they proceeded to Tachienlu by Batang and Litang. Bonvalot noted some extinct volcanoes in the northern Tibet desert.

Accompanied by Dr W. G. Thorold, of the India Medical Service, and a native sub-surveyor, Captain Hamilton Bower, I.S.C., set out from Leh on the 1st of June 1891, and captain crossed the Lanak la and the Ladak frontier on the H.Bower, 3rd of July. From this point the party took a 1891-1892. general easterly direction past the Mangtza t'so, Horpa t'so, Charol t'so, and around the northern end of the Aru t'so, all important lakes, at an average altitude of about 16,500 ft, From the Aru t'so the travellers took a south-easterly direction

across the great northern plateau or Changtang till they reached the south-east side of the Garing t'so, in about 31 30' N. and 89° 10' E. At this point Bower was stopped by some of the head- men of the Tibetan pastoral tribes (here under the rule of Lhasa), and obliged to make a long circuit to the north well out of Lhasa territory, and then eastward — till he struck the road to Chiamdo through Gyade or Chinese Tibet. Crossing the Sining-Lhasa road a little south of the Dang la range, and about two days' journey north of Nagchuka, Captain Bower crossed the Su chu, and follow- ing a course parallel to the Giama-nu chu, he made his way to Riwoche and thence to Chiamdo, from which town he followed the Lhasa-Tachienlu high road to the latter town, which he reached on the 10th of February 1892. The results of Captain Bower's journey were all of first-class importance.

Miss Annie R. Taylor, an Englishwoman of the China Inland Mission, started from Tao-chow (Kansuh) in September 1892, Miss A. R. accompanied only by five Asiatics. Passing by the Taylor, famous lamasery of Labrang, south of the Yellow 1892. river, she crossed that river and traversed the

southern part of the country inhabited by the predatory Tibetan tribes called Golok. Thence, after crossing the upper Yalung, which flows by the town of Kanze, she pursued her journey to the upper course of the Yangtse-kiang (Dre chu), crossing that river somewhere near where A.-K. had crossed it in 1881 and Rockhill in 1889, and then came to the town of Gye-Yekundo. From this point she seems to have followed the Chiamdo road to near that town, when she turned westwards and continued in that direction till she came on the high road from Lhasa to SiningFu somewhere north of Nagchuka. Here, like all other European travellers who have tried to reach Lhasa from the north, she was stopped by the Lhasan

authorities. She appears to have followed about the same route on her way back to China, for she again went to Yekundo and thence by the high road, followed previously by A.-K. and Rockhill, to Tachienlu in Sze-ch'uen, where she arrived on the 12th of April 1893.

In 1893 MM J. L. Dutreuil de Rhins and Fernand Grenard, both Frenchmen, left Cherchen, with Lhasa as their objective. After

crossing the Kara muren davan in the Arka Tagh, they Dutreuil de entered the lake region of north Tibet and followed a F^Orenarf 8 enera l southerly direction across low ranges of hills 1893-1894. ' and by numerous small lakes till they arrived in

3 2 30' N., where they changed direction to east-south-east, passing to the north of the Chargut and Zilling lakes. The travellers were able to push on as far as the north-eastern bank of the great Tengri Nor, which they reached on the 30th of November 1893. Here they were finally stopped by the Tibetans, and after a delay of six weeks passed in vain attempts to obtain permission to go to Lhasa, they were only allowed to proceed to Nagchuka on the Sining-Lhasa road, and to continue by the Gyade route to Yekundo, near the upper Dre chu, and thence to Sining in Kansuh. From Nagchuka the travellers followed a heretofore unexplored road through the Gyade country, crossing Rockhill's route in the Pere-Sangyi districts near Tashiling (their Tachi gomba). The road followed by them to Yekundo is called by Tibetans the upper road {gong lam) , and had apparently been followed previously by Miss Taylor. Reaching Yekundo (or Giergundo) on the 21st of May 1894, the travellers started for the Koko Nor and Sining on the 1st of June; but the party was attacked near Tungbumdo (Tumbumdo of previous travellers), and Dutreuil de Rhins was killed on the 5th of June. M Grenard after a few days resumed his march, passed east of the Noring t'so, the eastern extremity of Tosu Nor, and thence by the south-east corner of Koko Nor to the town of Sining Fu in Kansuh. The results of this exploration were a large

number of maps and a report of great scientific importance.

Mr Littledale, an Englishman, accompanied by his wife, left Khotan in the early part of 1895, and travelling thence to srGeoise R.Cherchen, he turned southwards, and following up Littledale, the course of the Cherchen darya to a point near its ,89S ' source, he continued in that direction between 87 and

89 E. across the northern plateau of Tibet till he reached the Zilling (or Garing) t'so. Pursuing, amid great difficulties, his

southerly course, he finally reached the western bank of Tengri Nor. Pushing rapidly on in the direction of Lhasa, when not over 50 m. away from the city (camp, 30 12' 12" N.) he was finally stopped by the Lhasan authorities and obliged, in great part on account of the severe illness of Mrs Littledale, to give up the attempt to reach Sikkim, and to take a direct trail to Ladak. In the latter part of this remarkable journey Littledale's route lay parallel but to the south of the routes followed previously by Nain Sing, and more recently by Bower. Passing by Rudok, the party re-entered Ladak at the village of Shushal on the 27th of October 1895, and Leh on the 2nd of November. Mr Littledale surveyed about 1700 m. of country between Cherchen and Shushal, and brought back a valuable collection of plants, which, added to those collected by other travellers in this part of Tibet, enabled botanists considerably to extend their scanty knowledge of this region.

Accompanied by Lieut. N. Malcolm of the 93rd High-landers, Captain Wellby, of the British army, left Leh on the 4th of May 1896. The travellers were compelled to enter Tibet by way of the Lighten t'so in 35 N. ^wlub', From this point they turned due east and continued, j's96, with the usual incidents experienced by all travellers in those regions — cold, storms, lack of food and of grass, loss of ponies and pack animals, &c. — until they reached

the northern branch of the Dre chu, the Chumar. Passing into the valley of the Nomoron Gol, south of the Tsaidam, they made their way by Barong Tsaidam to Donkyr and Sining Fu by the high road along the northern shore of the Koko Nor.

Captain Deasy, of the British army, left Leh on the 27th of May 1896, and crossing the Lanak la, passed by the Mangtza t'so, north of the Horpa t'so, to Yeshil kul. Thence he endeavoured to proceed due east, but was obliged „„'„ by the nature of the country to turn south, crossing /$pg. Bower's route on the west side of the Aru t'so. He finally completed a valuable survey of an important part of western Tibet.

In 1898 a Dutch missionary in China named Rijnhart started with his wife from the vicinity of Koko Nor, with the intention of reaching Lhasa, but at the upper Mekong, to the Rijnhart, east-north-east of the city, he was murdered, and 1898. his' wife reached the Chinese province of Sze-ch'uen with great difficulty alone.

In 1896 Sven Hedin, a Swede (1865-), left Kopa, a point about 100 m. south of Cherchen, and after crossing the Arka Tagh took an easterly course between that range and the western continuation of the Kokoshili range till he t896-i908. ' entered the valley of the most northerly feeders of the Dre chu, when he passed into the valley of the Naichi Gol and entered the Tsaidam. His careful observations concerning the meteorology of this region are of great value, and his surveys be- tween Kopa and the' Naichi Gol were in a country not previously explored. During his second and more important journey in Central Asia (1899-1902), Sven Hedin left Charkhlik, on the edge of the Taklamakan desert, in May 1901, intending to cross Tibet in a diagonal direction to the sources of the Indus. He made crossings of the lofty Arka Tagh and other parallel ranges to the south (running east and west). On his final penetration south- ward, arriving within fourteen days of Lhasa, he left the bulk of his caravan and pushed rapidly on towards that city, but

was stopped when about five days from it (Aug. 5, 1901). Rejoin- ing his caravan he turned westward, and passing through the country previously traversed by Bower and Littledale he reached Leh on the 20th of December 1901. His careful and detailed maps, lake soundings, hydrographic, geological, meteorological and other investigations gave him the highest rank among modern explorers.

On a third journey (1906- 1908) he travelled by way of Turkish Armenia, Persia, Baluchistan and India, and entered Tibet by way of the Aksai Chin. Proceeding south-east, or diagonally across the country, he traversed 840 m. of unknown country, investigating the lake Ngangon t'so or Ngantse t'so, which had hitherto been only hypothetically mapped, and marched thence

over the watershed between this and the Tsangpo. This water- shed was found to lie much farther north than had been supposed, and to consist of very lofty mountains, in complicated ranges, from which large tributaries descend to the Tsangpo (Brahma- putra). After a journey of half a year Hedin reached Shigatse; on leaving it he turned north again, intending to explore the large sacred lake Dangra-yumso, west of Ngantse t'so, but when within sight of it he was prevented by Tibetans from approaching it. He now followed a devious route to Lake Manasarowar, entering Nepal for a short distance from Tradum, discovering the main source of the Brahmaputra in a great mass of glaciers called Kubi-gangri, in the northernmost chain of the Himalaya. He next investigated the sources of the Sutlej, made hydrographic investi- gations of the Manasarowar lakes, with the neighbouring under- ground waterways, and proceeded thence to Gartok. He con-firmed the existence, long suspected, of a lofty mountain chain extending right across the country from the lake Tengri Nor (i.e. about 90 E.) to the district north of Gartok (about 81° E.). He returned

to Ladak in 1908. He was created a K.C.I.E. in

1910.

In May 1900 Kozlov, in command of the Russian Geographical Society's expedition to Central Asia and Tibet, left Barong Tsaidam, and travelling southwards, came to the Dre Captain chu (his Ndu chu, or Blue river), at about the p. k. Kozlov, same point as Rockhill in 1889. Assisted by the 1900–1901. Qjjj chief of Nyamtso, he crossed the river and reached Yekundo (his Jarku Lomba). One stage beyond this place he left the route followed by former travellers and pushed northwards to near the town of Chiamdo, where after a sharp fight with the natives he turned eastwards. The winter was passed in the valley of the Ra chu, a tributary of the Chiam- do chu (his Dza chu), and excursions were made as far as Derge droncher. In the spring of 1901 the expedition resumed its march eastwards around the Dre chu and the Ja chu (Yalung river), followed up the left bank of the latter and got back to Russian Lelu (Oring t'so) on the 30th of May 1901.

In 1903 Captain C. G. Rawling and Lieut. A. J. G. Har- greaves of the Somerset Light Infantry, starting from Leh as Captain C. a base, carried out careful survey work (their chief o. Rawling, object being to extend that of Captain Deasy) in the 1903. territory lying east of the British frontier, i.e. about

8o° to 83 E., and 34 N.

The British armed mission of 1904 performed a brilliant feat of marching and reached Lhasa, whose mysteries were thus unveiled, but this exploit belongs to the section dealing with history, below. (T. H. H.; L. A. W.; O. J. R. H.)*

History. — Previous to the 7th century a.d. there was no indigenous recorded history of the country, the people being steeped in barbarism and devoid of any written language. The little that is known of this prehistoric period is gathered from the legends

and the more trustworthy sidelights of contemporary Chinese records.

From the nth century B.C. the Chinese used to call by the name of Kiang (or Shepherds) the tribes (about 150 in number) of nomads and shepherds in Koko Nor and the north-east of present Tibet; but their knowledge continued to be confined to the border tribes until the sixth century of our era. In the annals of the T'ang dynasty it is said that the population of the country originated from the Bat-Kian or Fah Kiang; and, as the infor- mation collected in the first part of the notice concerning Tu-bat, afterwards Tu-ban, the modern Tu-fan, dates partly (as is proved by internal evidence) from a time anterior to the T'ang dynasty (a.d. 618), some degree of reliance may be placed on it. There we are told that Fanni, a scion of the southern Liang dynasty of the Tu-bat family (which flourished from 397 to 415 at Lian-chow in Kansuh), who had submitted to the northern Liang dynasty, fled in 433 with all his people from his governorship of Lin-sung (in Kan-chow) westwards across the Yellow river, and founded beyond Tsih-shih (" heapy stones ") a state amidst the Kiang tribes, with a territory extending over a thousand li. By his mild and just rule he was soon enabled to establish his sway over an immense territory. His original state was apparently situated

along the upper course of the Yalung river, an affluent of the Kin-sha-kiang.

Through the exertions of Prinsep, Csoma de Koros, Emil Schlag- intweit, Chandra Das, Rockhill, Huth, Waddell and others, we possess many copies of lists of kings, forming the dynasties of Tibet from the legendary beginnings between the 5th and 2nd century B.C. down to the end of the monarchy in 914. But the serious divergences which they show (except as to later times and in general outlines) make their unauthentic character plain. As one of the lists is accompanied by a commentary, it is the easiest to follow, and requires only to be supplemented here and there from the other lists and from the Chinese

sources, translated by Bushell and Rockhill. The first king, Gnya-khri btsan-po, is said to have been the fifth son of King Prasenajit of Kosala, and was born with obliquely drawn eyes. He fled north of the Himalayas into the Bod country, where he was elected king by the twelve chiefs of the tribes of southern and central Tibet. He took up his residence in the Yarlung country south of Lhasa. This Yarlung, which borrowed its name from the Yalung of the state of Fanni Tu-bat, is a river which flows into the Yaro-tsangpo (Brahmaputra), The first king and his six successors are known as the seven celestial khri; the next series consists of six kings known as the earthly legs; and they were followed by eight terrestrial ld&. This three- fold succession is apparently an imitation or a debased form of the ancient legend of heavenly, earthly and human rulers, which was carried into Persia and China, and from the latter country into Japan and Tibet — the relative number of kings being altered in the last-named countries to suit local convenience and the small amount of truth which they contain. Whilst giving an Aryan descent to their first kings, the ancient Tibetans assigned to their princesses a divine origin, and called them lhamo, ” goddess.” The gynaecratic habits of the race are manifested in the names of all these kings, which were formed by a combination of those of their parents, the mother’s generally preceding that of the father The Ide kings were followed by four rulers simply called btsan (” mighty “).

Then occurs a break in the lineal descent, and the king next in order (c. 461) may be the Tatar Fanni Tu-bat, but most probably his son and successor. His name was Lha-tho thori gnyan-tsan, otherwise Gnyan-tsan of Lha-tho thori, according to the custom usual in Tibet of calling great personages after the name of their birthplace. Lha-tho means ” heaps of stones,” and therefore appears to be a translation of Tsih-shih, ” heapy stones,” the country mentioned in connexion with the foundation of a state by Fanni Tu-bat. It was during his reign that the first Buddhist objects are reputed to have reached Tibet,

probably from Nepal. Little is said of his three immediate successors. The fourth was gNam-ri srong btsan, who died in 630. During his reign the Tibetans obtained their first knowledge of arithmetic and medicine from China; the prosperity and pastoral wealth of the country were so great that " the king built his palace with cement moistened with the milk of the cow and the yak." To the same king is attributed the discovery of the inexhaustible salt mine called Chang-gi- tsa'wa (Byang-gi-tsa'wa = " northern salt "), which still supplies the greater portion of Tibet. The reign of his illustrious son, Srong tsan gam-po, opened up a new era ; he introduced Buddhism and the art of writing from India, and was the founder (in 639) of Lha-ldan, afterwards Lha-sa. He was greatly helped in his prose- lytism by his two wives, one a Nepal princess, daughter of King Jyoti varma, the other an imperial daughter of China; afterwards, they being childless, he took two more princesses from the Ru-yong (= "left corner " 0) and Mon (general appellative for the nations between Tibet and the Indian plains) countries. As a conqueror he extended his sway from the still unsubdued Kiang tribes of the north to Ladak in the west, and in the south he carried his power through Nepal to the Indian side of the Himalayas. How far southward this dominion at first extended is not known; but in 703 Nepal and the country of the Brahmans rebelled, and the Tibetan king, the third successor of Srong tsan gam-po, was killed while attempting to restore his power. It is rather curious that nothing is said of this Tibetan rule in India, except in the Chinese annals, where it is mentioned until the end of the monarchy in the loth century, as extending over Bengal to the sea — the Bay of Bengal being called the Tibetan Sea. J. R. Logan has found ethnological and linguistic evidence of this domination, which was left unnoticed in the Indian histories. Mang-srong mang tsan, the second son and successor of Srong tsan gam-po, continuing the conquests of his father, subdued the Tukuhun Tatars around the Koko-Nor in 663, and attacked the Chinese; after some adverse fortune the latter took their revenge and

penetrated as far as Lhasa, where they burnt the royal palace (Yumbu-lagang). Khri Ide gtsug-brtan-mesag-ts'oms, the grandson of Mang-srong and second in succession from him, promoted the spread of Buddhism and obtained for his son, Jangts'a Lhapon, who was famous for the beauty of his person, the hand of the accomplished princess Kyim- shang, daughter, otherwise hung-chu, of the Chinese emperor Juy- (? Tai) tsung. But the lady arrived after the death of her betrothed and after long hesitation became the bride of the father. She gave

birth in 730 to Khri srong lde tsan, in the Buddhist annals the most illustrious monarch of his country, because of the strenuous efforts he made in favour of that religion during his reign of forty- six years (743-789). His son and successor Muni tsan-po, being determined to raise all his subjects to the same level, enacted that there should be no distinction between poor and rich, humble and great. He compelled the wealthy to share their riches with the indigent and helpless and to make them their equals in respect of all the comforts and conditions of life. He repeated this experi- ment three times; but each time he found that they all returned to their former condition, the rich becoming still richer and the poor still poorer. The sages attributed this curious phenomenon to the good and evil acts of their former lives. Nothing of impor- tance occurred during the following reigns, until that of Ralpachen, who won glory by his care for the translations of the Buddhist scriptures which he caused to be completed, or rewritten more accurately when required. In this reign a severe struggle took place with China, peace being concluded in 821 at Ch'ang-ngan and ratified at Lhasa the following year by the erection of bilingual tablets, which still exist. Ralpachen was assassinated by the

E artisans of Lang-dharma and the country fell into disorder. ,ang-dharma instituted a violent

persecution of Buddhism; but he was soon assassinated in his turn and the kingdom divided into a western and an eastern part by his two sons. The partition did not, however, prevent internecine wars. The history for some time now becomes rather intricate and requires some attention. Pal K'or tsan, the second western king, after a reign of thirteen years, died leaving two sons, Thi Tashi Tsegpa-pal and Thi Kyida Nyimagon. The latter went to Nari (Mngari) and founded the capital Purang; he left three sons, of whom the eldest declared himself king of Mang-yul, the second seized Purang, and the youngest, Detsud-gan, became king of the province of Shang-shung (the modern Gughe). The revival of Buddhism began with the two sons of the last-named, the elder of whom became a monk. The younger, Khorre, inherited his father's throne, and was followed in his authority by twenty successors. Tashi Tsegpa also had three sons — Palde, Hodde and Kyide. The descendants of the first made themselves masters of Gung-t'ang, Lugyalwa, Chyipa, Lhatse, Langlung and Tsakor, where they severally ruled as petty chiefs. The descendants of Kyide spread themselves over the Mu, Jang, Tanag, Yarulag and Gyaltse districts, where they also ruled as petty princes. Hodde left four sons — Phabdese, Thide, Thich- ung and Gnagpa. The first and fourth became masters of Tsan- grong, the second, took possession of Amdo and Tsongkha, the third became king of U (or the central Lhassan province), and removed the capital to Yarlung, south of Lhasa. He was followed on his throne from son to son by eleven successors. History is silent as to the fate of the eastern king, the other son of Lang-dharma, and his successors, but the geographical names of the chieftainships enumerated above make it clear that the western kingdom had extended its power to the east. Chronology is deficient for all that period. While the dynasty of Khorre in Shang-shung and that of Thich'ung in U were running, another authority, destined to become the superior of both, had arisen in Tibet. Khorr6 left his throne to his son Lhade, who was himself succeeded by his three sons, the youngest of whom invited the celebrated Indian

Buddhist, Atisha, to leave his monastery Vikramashila for Tibet, where he settled in the great lamaserai of Thoding in Nari. Besides religious books and teachings, he introduced in 1026 the method of com- puting time by cycles of sixty years, " obtained from the Indian province of Shambala." He was the first of the several chief priests whose authority became paramount in the country. The kings of U greatly patronized them, as for instance in the case of the celebrated Sakya Pandita by the seventh of these kings. Pandita, at the special request of Kuyuk, the successor of Ogdai, paid a visit to his court in 1246-1248. Five years afterwards Kublai Khan conquered all the east of Tibet; and, after he had ascended the throne of China, the Mongol emperor invited to his court Phagspa Lodoi Gyaltshan, the nephew of the same Pandita. He remained twelve years with the emperor, and at his request framed for the Mongol language an alphabet imitated from the Tibetan, which, however, did not prove satisfactory, and disappeared after eighty- five years without having been very largely used. In return for his services, Kublai invested Phagspa with sovereign power over

(1) Tibet proper, comprising the thirteen districts of l) and Tsang,

(2) Kham and (3) Amdo. From this time the Sakya-pa lamas became the universal rulers of Tibet, and remained so, at least nominally, under twenty-one successive lamas during seventy years (1270-1340). Their name was derived from the Sakya monastery, which was their cradle and abode, and their authority for temporal matters was exercised by specially appointed regents. When the power of the Sakya began to wane, that of the rival monasteries of Digung, Phagdub and Tshal increased largely, and their respective influence and authority overbalanced that of the successors of Phagspa. It was at this troubled epoch that Chyang Chub Gyalt- shan, better known as Phagmodu from the name of his native town, appeared on the scene. He subdued Tibet proper and Kham, for the continued possession of which he was, however, compelled to fight for

several years; but he succeeded in the long run, and with

the approval of the court of Peking established a dynasty which furnished twelve rulers in succession. When the Mongol dynasty of China passed away, the Mings confirmed and enlarged the dominion of the Tibetan rulers, recognizing at the same time the chief lamas of the eight principal monasteries of the country. Peace and prosperity gradually weakened the benign rule of the kings of this dynasty, and during the reign of the last but one internecine war was rife between the chiefs and nobles of U and Tsang. This state of things, occurring just as the last rulers of the Ming dynasty of China were struggling against the encroachments of the Manchus, their future successors, favoured the interference of a Khoshot Mongol prince, Tengir To, called in the Tibetan sources king of Koko Nor. The Mongols were interested in the religion of the lamas, especially since 1576, when Altan, khakan of the Tumeds, and his cousin summoned the chief lama of the most important monastery to visit him. This lama was Sodnam rGyamtso, the third successor of Gedundub, the founder of the Tashilhunpo monastery in 1447. who had been elected to the more important abbotship of Galdan near Lhasa, and was thus the first of the great, afterwards Dalai, lamas. The immediate successor of Gedundub, who ruled from 1475 to 1541, had appointed a special officer styled depa to control the civil administration of the country. To Sodnam rGyamtso the Mongol khans gave the title of Vajra Dalai Lama in 1576, and this is the first use of the widely known title of Dalai Lama. During the minority of the fifth (really the third) Dalai Lama, when the Mongol king Tengir To, under the pretext of supporting the religion, intervened in the affairs of the country, the Pan-ch'en Lo-sang Ch'o-kyi Gyal-ts'ang lama obtained the withdrawal of the invaders by the payment of a heavy war indemnity, and then applied for help to the first Manchu emperor of China, who had just ascended the throne. This step enraged the Mongols, and caused the advance of Gushri Khan, son and successor of Tengir To, who

invaded Tibet, dethroned all the petty princes, including the king of Tsang, and, after having subjugated the whole of the country, made the fifth Dalai lama supreme monarch of all Tibet, in 1645. The Chinese government in 1653 confirmed the Dalai Lama in his authority, and he paid a visit to the emperor at Peking. The Mongol Khoshotes in 1706 and the Sungars in 1717 interfered again in the succession of the Dalai lama, but the Chinese army finally conquered the country in 1720, and the present system of government was established. It is probable that the isolation of Tibet was inspired, originally by the Chinese, with the idea of creating a buffer state against European aggression from this direction.

In 1872–1873 some attempt was made by Indian officials to open up trade with Tibet; further attempts followed in 1884, and in 1886 a mission was organized to proceed to Lhasa. The Chinese, however, although they had at first Mo ff" granted a passport to this mission, later objected to g ass i BO its advance, and it was abandoned. The Tibetans Relations. assumed this to show England's weakness; they invaded Sikkim, and in 1888 it was necessary to send a force under General Graham to expel them. In 1890 a treaty was concluded, and trade regulations under this treaty in 1893; but the negotiations were carried on with the Chinese authorities, and the lamas, considering themselves to have received insufficient recognition, repudiated them and offered further insults. A new development presently appeared in the situation. A lama, a Mongolian Buriat by birth and a Russian subject, whose Russianized name was Dorjiev, had come to Lhasa about 1880. When subsequently visiting Russia, he appears to have drawn the attention of the authorities towards Tibet as a field for their statecraft, and he established himself as the unofficial represen- tative of Russia in Lhasa. He obtained a commanding influence over the Dalai Lama, impressed upon him the dangers which threatened Tibet from England, and suggested the desirability of securing Russian protection and even the

possibility of con- verting the tsar and his empire to Buddhism. The Dalai Lama assented, and was even prepared to visit St Petersburg, but was checked by the Tsong-du (assembly). He therefore sent a representative of high rank, who had audience of the tsar, and returned with proposals for a treaty and for the residence of a Russian royal prince in Lhasa in order to promote friendly relations. But both the Chinese authorities in Lhasa and the Tsong-du were averse from any such proceedings. The Dalai Lama, inspired by Dorjiev, now took steps to bring on a crisis by provoking England. He felt sure of Russian support. Russian arms had been imported into Lhasa. It was suspected, although denied, that a treaty was in draft under which Russia should assume the suzerainty of Tibet. A further encroachment on

British territory in Sikkim was made by Tibetans, and various other slights were offered.

The viceroy of India, Lord Curzon, now decided that strong action was necessary; but the home government at first assented only to the despatch of Colonel (afterwards Sir) F. E. Young- husband with a small escort to negotiate at Khambajong, to the north of the Sikkim frontier. The mission arrived at this point on the 7th of July 1903, and here it remained till the nth of December. No responsible Tibetan. representatives appeared, and such negotiations as were carried on were abortive. On the 3rd of October, therefore, the British government authorized the occupation of the Chumbi valley, and an advance to Gyantse in Tibet and military preparations, with the difficult attendant problem of transport, were undertaken. Colonel Younghusband again accompanied the mission, and the troops were commanded by General Ronald Macdonald. The Jelep pass was crossed and the entry into Tibet effected on the 12th of December. British \ n advance was made to Tuna, where part of the a/aT/wi!” expedition wintered. A further advance being made on the 31st

of March 1904, the first hostile encounter took place at Guru, when the Tibetans (the aggressors) were defeated. With some further fighting en route the expedition reached and occupied Gyantse on the 12th of April; here some of the British forces were subsequently beleaguered, and the most serious fighting took place. In fact the advance to Lhasa, resumed after the storming of the Gyantsejowg (fort) on the', 6th of July, met with comparatively little opposition, and the capital was reached on the 3rd of August. The Dalai Lama had fled with Dorjiev. Partly on this account, and in spite of the attempts of the Chinese authorities to' bring about a settlement, there was some delay owing to the attitude of the lamas, but finally a treaty of peace was concluded on the 7th of September. The principal provisions were — the Sikkim frontier violated by the Tibetans was to be respected; marts were to be established for British trade at Gyantse, Gartok and Yatung; Tibet was to pay an indemnity of £500,000 (subsequently reduced to one-third of this sum) ; and no foreign power was to receive any concession in Tibet, territorial or mercantile, or to concern itself with the government of the country. The expedition left Lhasa on the 23rd of September and reached India again at the close of the following month. The treaty was slightly modified later in matters of detail, while the adhesion of China to the treaty was Becured by an agreement of the 27th of April 1906.

The Anglo-Russian convention of 1907 determined the follow- ing conditions with respect to Tibet — the recognition of the suzerain rights of China and the territorial and administrative integrity of the country; that no official representative at Lhasa should be appointed either by England or by Russia, and that no concessions for railways, mines, &c, should be sought by either power. An annex to the convention provided that, except by arrangement between England and Russia, no scientific expedition should be allowed to enter the country for three years.

In January 1908 the final instalment of the Tibetan

indemnity was paid to Great Britain, and the Chumbi valley was evacuated. The Dalai Lama was now summoned to Peking, where he obtained the imperial authority to resume his administration in place of the provisional governors appointed as a result of the British mission. He retained in office the high officials then appointed, and pardoned all Tibetans who had assisted the mission. But in 1909 Chinese troops were sent to operate on the Sze-ch'uen frontier against certain insurgent lamas, whom they handled severely. When the Dalai Lama attempted to give orders that they should cease, the Chinese amban in Lhasa disputed his authority, and summoned the Chinese troops to enter the city. They did so, and the Dalai Lama fled to India in February 19 10, staying at Darjeeling. Chinese troops followed him to the frontier, and he was deposed by imperial decree. The British government, in view of the apparent intention of China to establish effective suzerainty in Tibet, drew the attention of the government at Peking to the necessity of strictly observing its treaty obligations, and especially pointing out that the integrity

of the frontier states of Nepal, Bhutan and Sikkim must be respected. To the Dalai Lama, who had attempted to obtain British intervention at Peking, it was made clear that he person- ally had no claim to this, as the British government could only recognize the de facto government in Tibet.

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(T. de L. ; L. A. W. ; O. J. R. H.)

TIBETO-BURMAN LANGUAGES. The Tibeto-Burman family comprises a long series of dialects spoken from

Tibet in the north to Burma in the south, and from the Ladakh wazarat of Kashmir in the west to the Chinese provinces of Sze-ch'uen and Yiinnan in the east. In the first place we have the various Tibetan dialects, spoken all over Tibet and in the neighbouring districts of India and China. Another series of dialects, the Himalayan group, is spoken in the southern Himalayas, from Lahul in the west to Bhutan in the east. Some of these dialects approach Tibetan in structure and grammatical principles, while others have struck out new lines of development, probably under the influence of the dialects spoken by an older population. East of Bhutan, to the north of the Assam valley, we find a third- small group, the North Assam group, which consists of three dialects. A fourth group, the Bodo group, can be followed in a series of dialects from Bhutan in the north to the Tippeera state in the south. They have at one time extended over most of Assam west of Manipur and the Naga hills, and even far into Bengal proper. To the west of the Bodos,in and in the neighbourhood of the Naga hills we find a fifth group, the so-called Naga group. It comprises dialects of very different kinds. Some of them approach Tibetan and the dialect of the North Assam group. Others lead over to the Bodo languages, and others again connect the Naga dialects with their Tibeto-Burman neighbours to the south and east. To the south of the Naga hills, in the long chain of hills extending southwards under various names such as the Lushai hills, the Chin hills and the Arakan Yoma, we find a sixth group, the Kuki-Chin dialects. The old Meitei language of Manipur lies midway between this group and the easternmost branch of the Tibeto-Burman family, the Kachin group. The Kachins inhabit the tract of country to the east of Assam and to the north of Upper Burma, including the headwaters of the

Chindwin and the Irrawaddy. The Kachins have not as yet settled down, and are still pushing southwards.

The Kachins and the Kuki-Chins gradually and finally merge into Burmese, the language of the ancient kingdom of Burma.

It is impossible to bring the relationship existing between all these various groups under one single formula. The dialects spoken in the Himalayas and in Assam can be described as a double chain connecting Tibetan with Burmese, which are the two principal languages of the family. In the first place the Kachin group runs from the easternmost Tibetan dialects in Sze-ch'uen down to the Burmese of Upper Burma. The second chain has a double beginning in the north. We can trace one line through the North Assam group, the Naga, Bodo and Kuki- Chin groups. Another line can be followed from Tibetan through the Himalayan and Bodo groups into Kuki-Chin. The latter dialects finally merge into Burmese.

The original home of the Tibeto-Burman race seems to have been on the Upper Hwangho and the Upper Yangtsze-kiang in the Chinese provinces of Sze-ch'uen and Yunnan. The oldest invaders followed the Tsangpo into Tibet and became the Tibe- tans of the present day. Other hordes crossed the Brahmaputra and settled in the hills on the southern slopes of the Himalaya range. From the headwaters of the Irrawaddy and the Chindwin successive waves entered Assam and Further India. Some fol- lowed the course of the Brahmaputra and settled in the hills to the south and east of the great bend of the river. Others entered the Naga hills, while numerous tribes must have followed the Chindwin into Manipur and the hills to the south. The in- habitants of Burma have probably come down along the Chindwin and the Irrawaddy, and the latest immigrants, the Kachins, have only in modern times begun their wanderings southwards through the hills. The tribes settled in the hills north of the Assam valley appear to possess a mixed character. Their home can be considered as a kind of backwater which has been over- flowed by the waves of successive invasions.

In their original home the Tibeto-Burmans were the neighbours of Chinese and Tai tribes. Their

languages are also closely related to Chinese and Tai, more closely to the former than to the latter. The agreement is apparent in the phonetical system, in vocabulary and in grammar. The principal point in which they differ is the order of words. The Tibeto-Burman family arranges the words of a sentence in the order of subject, object, verb, while the order in Chinese and Tai is subject, verb, object. Together all these languages form one great family, which is usually called Indo-Chinese.

The Indo-Chinese family is usually considered as a typical instance of the so-called isolating languages. The single words do not consist of more than one syllable. They are incapable of inflexion because there are no form-words, which merely denote relation in time and space. Grammatical relations are therefore not indicated by inflexion, but simply by putting together, according to fixed rules, words of which each retains its independence. Thus a sentence such as " the father struck the boy " would be translated " father agent son striking completion." This state of affairs, which is the prevailing condition in Chinese, is not, however, the original one. While the bases of the words are monosyllabic, i.e. each word consists of one syllable, comparative philology' shows that these bases were often preceded by prefixes, short additions, the meaning of which cannot always be ascer- tained, but which modified the meaning of the base in the same way as the terminations of other languages. Such prefixes were not accented, and in the course of time they were commonly reduced and often dropped altogether, so that each word (i.e. the prefix plus base) itself came to be monosyllabic. Such words were then pronounced in a higher tone, and this gave rise to the development of a complicated system of tones in Chinese, Tai and some Tibeto- Burman languages. The existence of old prefixes can therefore still be inferred from the tones.

This development can still be followed in the Tibeto-Burman languages. They have, to some extent, retained the old prefixes. This is, for example, the

case in Old Tibetan and some modern Tibetan dialects, while the prefixes have been dropped in the modern dialect of Central Tibet. Compare Old Tibetan b-dun, Balti ab-dun, but Central Tibetan dim, seven. The connexion between the drop- ping of prefixes and the development of tones can be seen from the fact that Balti, which has, to some extent, preserved the prefixes, is devoid of tones, while Central Tibetan has developed a system of tones corresponding to that prevailing in Chinese. The same

is the case with Kachin and some Naga dialects, while the re- maining Tibeto-Burman languages apparently agree with such Tibetan dialects as are devoid of tones. The development ol tones in many dialects was probably counteracted by the influence of the speech of the former inhabitants whom the Tibeto-Burman found in possession of the country when they invaded their present habitat. Remnants of such old inhabitants are still found in the Khasi hills of Assam, in the midst of the Tibeto-Burman territory. Traces of the speech of an old, non-Tibeto-Burman population, can also be found in some dialects belonging to the Himalayan group.

Through the dropping of old prefixes several different words coincided in form. The same result was effected by another tendency, which is apparent in all Indo-Chinese languages, viz. to harden soft consonants. Thus Tibetan ba, cow, is often pro- nounced bha and pa. The confusion which might arise from this double tendency is counteracted by the system of tones and the fixed rules for the order of words.

The vocabulary is richly varied. Thus the different varieties of some animal are often denoted by separate words. On the other hand, there are few general terms or such as denote abstract ideas.

All these features of Tibeto-Burman speech tend to make the difference between the dialects

considerable, and the changes within one and the same dialect bewildering. Instances are said to be on record where one small tribe has changed its language in the course of a couple of generations so as to be unrecognizable. This fact, if fact it be, can however be accounted for by assuming that the male individuals in question have robbed their wives from some other tribe. At all events, the changes are not so important in cases where we are able to compare the existing vocabulary of a tribe with words noted down, say, a century ago.

The different classes of words are not clearly distinguished, and many instances occur in which a word can be used at will as a noun, as an adjective or as a verb. The verb can, on the whole, be described as a noun of action, and we find phrases such as " my going is " instead of " I go." Inflexion is often effected by isolation. Thus gender is commonly denoted by adding words meaning "male," "female," respectively; number is indicated by means of numerals and words meaning " many," " heap "; and there is no relative pronoun and no clear distinction between the various verbal tenses. Many of the words added in order to indicate relation in time, space, &c, have, however, ceased to be used as separate words, and have become what can "for all practical pur- poses be called case and tense affixes. The inflexion is therefore at the present date, to a great extent, effected by agglutination, i.e. by adding modifying particles to the base, which itself remains un- changed. Such particles are only put once if there are more than one word put together in the same relation. Thus an adjective and a qualified noun only takes one " case-suffix." Several dialects have in this way developed a complicated system of grammatical forms, partly perhaps under the influence of non-Tibeto-Burman languages.

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TIBIA, a pipe played by means of a reed mouthpiece, exten- sively used in classic Rome. The tibia, often mistranslated ” flute,” was identical with the aulos of the Greeks, and accord- ing as it was made with a cylindrical or with a conical bore, .it may be regarded as the prototype of our clarinet or oboe. The tibia was used at musical contests, in the theatre, in the arena,

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at banquets, &c. A set of ivory tibiae of cylindrical bore found at Pompeii in a good state of preservation are in the museum at Naples.

TIBULLUS, ALBIUS (c. 54–19 B.C.), Latin elegiac poet. The information which we possess about him is extremely meagre. Besides the poems themselves — that is to say, the first and second books — we have only a few references in later writers and a short Life of doubtful authority. We do not knew his praenomen; his gentile name has been questioned; nor is his birthplace ascertained. His station was not improbably that of a Roman knight (so the Life affirms); and he had inherited a very considerable estate. But, like Virgil, Horace and Proper- tius, he seems to have lost the greater part of it in 41 amongst the confiscations which Antony and Octavian found expedient to satisfy the rapacity of their victorious soldiery. Tibullus's chief friend and patron was M. Valerius Messalla Corvinus, himself an orator and poet as well as a statesman and a com- mander. Messalla, like Maecenas, was the centre of a literary circle in Rome; but the bond between its members was that of Uterature alone. They stood in no relations to the court; and the name of Augustus is not once to be found in the writings of Tibullus. About 30 B.C. Messalla was despatched by Augustus to Gaul to quell a rising in Aquitania and restore order in the country, and Tibullus may have been in his retinue. On a later occasion, probably in 28, he would have accompanied his friend who had been sent on a mission to the East, but he fell sick and had to stay behind in Corcyra. Tibullus had no liking for war, and though his life seems to have been divided between Rome and his country estate, his own preferences were wholly for the country life. His first love, the subject of book i., is called Delia in the poems, but we learn from Apuleius {Apol. 10) that her real name was Plania. Delia seems to have been a woman of middle station. It is impossible to give an exact account of the intimacy. The poems which refer to her are arranged in no chronological order. Now she appears as single, now as married;

but we do not hear anything either of her marriage or of her husband's death. It is clear, however, that it was the absence of her husband on military service in Cilicia which gave Tibullus the opportunity of making or renewing the acquaint ance. It was not dropped when he returned. It was not difficult to deceive the simple soldier; and Delia was an apt pupil in deception — too apt, as Tibullus saw with dismay when he found that he was not the only lover. His entreaties and appeals were of no avail; and after the first book we hear no more of Delia. In the second book the place of Delia is taken by Nemesis, which is also a fictitious name. Nemesis (like the Cynthia of Propertius) was a courtesan of the higher class; and she had other admirers besides Tibullus. He complains bitterly of his bondage, and of her rapacity and hardhearted- ness. In spite of all, however, she seems to have retained her hold on him until his death. Tibullus died prematurely, probably in 19, and almost immediately after Virgil. His death made a deep impression in Rome, as we learn from his contemporary Domitius Marsus and from the elegy in which Ovid {Amoves, iii. 19) has enshrined the memory of his predecessor.

The character of Tibullus is reflected in his poems. Though not an admirable it is certainly an amiable one. He was a man of generous impulses and a gentle unselfish disposition. He was loyal to his friends to the verge of self-sacrifice, as is shown by his leaving Delia to accompany Messalla to Asia, and constant to his mistresses with a constancy but ill deserved. His tender- ness towards them is enhanced by a refinement and delicacy which are rare among the ancients. Horace and the rest taunt the cruel fair with the retribution which is coming with the years. If Tibullus refers to such a fate, he does it by way of warning and not in any petty spirit of triumph or revenge. Cruelly though he may have been treated by his love, he does not invoke curses upon her head. He goes to her little sister's grave, hung so often with his garlands and wet with his tears, and bemoans his fate to the dumb ashes there.

Tibullus has no leanings to an active life: his ideal is a quiet retirement in

the country with the loved one at his side. He has no ambition and not even the poet's yearning for immortality. As Tibullus loved the country life so he clung to its faiths, and in an age of crude materialism and the grossest superstition, he was religious in the old Roman way. As a poet he reminds us of Collins and Longfellow. His clear, finished and yet unaffected style made him a great favourite with his countrymen and placed him, in the judgment of Quintilian, at the head of their elegiac writers. And certainly within his own range he has no Roman rival. For natural grace and tenderness, for exquisiteness of feeling and expression, he stands alone. He has far fewer faults than Propertius, and in particular he rarely overloads his lines with Alexandrian learning. But, for all that, his range is limited; and in power and compass of imagination, in vigour and originality of conception, in richness and variety of poetical treatment, he is much his rival's inferior. The same differences are perceptible in the way the two poets handle their metre. Tibullus is smoother and more musical, but liable to become monotonous; Propertius, with occasional harshnesses, is more vigorous and varied. It may be added that in many of Tibul- lus's poems a symmetrical composition can be traced, although the symmetry must never be forced into a fixed and unelastic scheme.

It is probable that we have lost some of the genuine poems of Tibullus. On the other hand, much has come down to us under his name which must certainly be assigned to others. Only the first and second books can claim his authorship. The first book consists of poems written at various times between 30 and 26. About the second book we can only say that in all likelihood it was published before the poet's death in 19. It is very short, containing only 428 verses, and apparently incomplete. In both books occur poems which give evidence of internal disorder; but scholars cannot agree upon the remedies to be applied.

The third book, which contains 290 verses, is by a much inferior hand. The writer calls himself Lygdamus and. the fair that he sings of Neaera. He was born in the same year as Ovid, but there is nothing Ovidian about his work. He has little poetical power, and his style is meagre and jejune. He has a good many reminis- cences and imitations of Tibullus and Propertius; and they are not always happy. The separation of the fourth book from the third has no ancient authority. It dates from the revival of letters, and is due to the Italian scholars of the 15th century. The fourth book consists of poems of very different quality. The first is a composition in 211 hexameters on the achievements of Messalla, and is very poor. The author is unknown; but he was certainly not Tibullus. The poem itself was written in 31, the year of Messalla's consulship. The next eleven poems relate to the loves of Sulpicia and Cerinthus. Sulpicia was a Roman lady of high station and, according to Haupt's probable conjecture, the daughter of Valeria, Messalla's sister. She had fallen violently in love with Cerinthus, about whom we know nothing but what the poet tells us, and he soon reciprocated her feelings. The Sulpicia elegies divide into two groups. The first comprises iv. 2-6, containing ninety-four lines, in which the theme of the attachment is worked up into five graceful poems. The second, iv. 8-12 (to which 7 should be added), consists of Sulpicia's own letters. They are very short, only forty lines in all; but they have a unique interest as being the only love poems by a Roman woman that have escaped the ravages of time. Their frank and passionate outpourings remind us of Catullus. The style and metrical handling betray a novice in poetical writing. The thirteenth poem (twenty-four lines) claims to be by Tibullus; but it is hardly more than a cento from Tibullus and Propertius. The fourteenth is a little epigram of four lines with nothing to determine its authorship. Last of all comes the epigram or fragment of Domitius Marsus already referred to. To sum up: the third and fourth books appear in the oldest tradition as a single book, and they comprise pieces

by different authors in different styles, none of which can be assigned to Tibullus with any certainty. The natural conclusion is that we have here a collection of scattered compositions, relating to Messalla and the members of his circle, which has been added as an appendix to the genuine relics of Tibullus. When this " Messalla collection" was made cannot "be exactly determined; but it was not till after the death of Tibullus, 19 B.C., and probably between 15 and 2 B.C. Besides the foregoing, two pieces in the collection called Priapea (one an epigram and the other a longer piece in iambics) have been attributed to Tibullus; but there is little external and no internal evidence of his authorship (see Hiller in Hermes, xviii. 343–349).

The value of the short Vita Tibulli, found at the end of the Ambrosian, Vatican and inferior MSS., has been much discussed. There is little in it that we could not at once infer from Tibullus himself and from what Horace says about Albius, though it is

possible that its compiler may have taken some of his statements From Suetonius's book De poetis. It is as follows: " Albius Tibullus eques R. (R. being the customary abbreviation for Romanus, the MSS. have the corruption regalis), insignis forma cultuque corporis observabilis, ante alios Corvinum Messalam Oratorem (MSS. Or., i.e. oratorem) ingenue (MSS. iginem) dilexit, cuius et contubernalis Aquitanico bello militaribus donis donatus est. Hie multorum iudicio principem inter elegiographos optinet locum. Epistulae quoque eius, quamquam breves, omnino utiles sunt (the " letters " are the Sulpicia elegies). Obiit adulescens, ut indicat epigramma superscriptum " (i.e. the one ascribed to Domitius Marsus. These words seem to be a later addition to the Life). It is another moot question of some importance whether our poet should be identified with the Albius of Horace (Od. i. 33;

Epist. i. 4), as is done by the Horatian commentator Porphyrio (a.d. 200–250) in his Scholia. Porphyrio's view has been most recently examined by Postgate (Selections from Tibullus, appendix A). If it is rejected, the authority of the Life is considerably impaired.

Ovid, Trist, iv. 10, 53 seq., " successor fuit hie [Tibullus] tibi, Galle, Propertius illi, quartus ab his serie temporis ipse fui." In the preceding couplet he had said, " Vergilium vidi tantum nee amara Tibullo tempus amicitiae fata dedere meae." Ovid, who was born in 43, would be only twenty-four at Tibullus's death if it occurred in 19. The loss of Tibullus's landed property is attested by himself (i. I, 19 seq.), " Felicis quondam, nunc pauperis agri custodes " (cf. 41, 42). Its cause is only an inference, though a very probable one. That he was allowed to retain a portion of his estate with the family mansion is clear from ii. 4, 53. Tibullus may have been Messalla's contubernalis in the Aquitanian War (Vita Tib. and Tib. i. 7, 9 seq., a poem composed for Messalla's triumph), and may have received militaria dona (Vita).

Delia's name (from SijXos) is a translation of Plania. As regards her station, it should be noticed that she was not entitled to wear the stola, the dress of Roman matrons (i. 6, 68). Her husband is mentioned as absent (i. 2, 67 seq.). She eludes the custodes placed over her (i. 2, 15 and 6, 7). Tibullus's suit was favoured by Delia's mother, of whom he speaks in very affectionate terms (i. 6, 57 seq.). For Tibullus's illness at Corcyra, see i. 3, 1 seq., 55 seq. The fifth elegy was written during estrangement (discidium), and the sixth after the return of the husband and during Delia's double infidelity.

Ovid, writing at the time of Tibullus's death (Am. iii. 9, 31), says: " Sic Nemesis longum, sic Delia, nomen habebunt, altera cura recens, altera primus amor." Nemesis is the subject of book ii. 3, 4, 6. The mention of a Una (ii. 6) settles her position. The con- nexion had lasted a year when ii. 5 was

written (see ver. 109). It is worth noticing that Martial selects Nemesis as the source of Tibullus's reputation (viii. 73, 7; cf. xiv. 193).

Specimens of Tibullus at his best may be found in i. 1, 3, 89–94; 5, 19–36; 9, 45–68; ii. 6. Quintilian says (Inst. x. I, 93), " Elegia quoque Graecos provocamus, cuius mihi tersus atque elegans maxime videtur auctor Tibullus; sunt qui Propertium malint; Ovidius utroque lascivior, sicut durior Gallus."

Charisius (pp. 66 and 105) quotes part of a hexameter which is not found in the extant poems of Tibullus.

Lygdamus is probably the real name of the author of the first six elegies in book iii., but little further is known about him. His elegies and the other poems in the third book (" third " and " fourth" books) appear to have been known to Ovid. There are agreements between iii. 5, 15–20, and three passages of Ovid, Ars. am. ii. 669 seq.; Tr. iv. 10, 6: "cum cecidit fato consul uterque pari" (Lygdamus and Ovid using word for word the same expression for the year of their birth, the consulship of Hirtius and Pansa) and Am. xi. 14, 23 seq., much too close to be accidental. We do not know when they were added to the genuine poems of Tibullus.

Most scholars since Lachmann have condemned the " Panegyric on Messalla." It is an inflated and at the same time tasteless declamation, entirely devoid of poetical merit. The language is often absurdly exaggerated, e.g. 190 seq. The author himself seems to be conscious of his own deficiencies (1 seq., 177 seq.). Like so many of his contemporaries, he had been reduced to poverty by the loss of his estates (181 seq.). If we could set the question of poetical merit aside, it would not be impossible to identify him with Propertius as in fact is done by Nfimethy (op. cited below). The date is fixed by 121 seq. Sulpicia was the daughter of Servius Sulpicius (iii. i6 = iv. 10, 4), and she seems to have been under the tutelage of Messalla, her uncle by marriage

(Haupt, Opuscula, iii. 502 seq.).

Some scholars attribute iii. 8-12 =iv. 2-6 to Tibullus himself; but the style is different, and it is best to answer the question, as Bahrens does, with a non liquet.

The direct ascription of iii. I9 = iv. 13 (verse 13, ” nunc licet e caelo mittatur arnica Tibullo”) to Tibullus probably led to its inclusion in the collection and later on to the addition of the third book to the two genuine ones. For the evidence against the ascription, see Postgate, Selections, app. C.

Manuscripts. — The two best MSS. of Tibullus are the Ambrosianus (A), of date about 1374, and the Vaticanus (V), of the 15th century. Besides these we have a number of extracts from Tibullus in Florilegium Parisinum, an anthology from various Latin writers which probably goes back to the nth century, and the Excerpta

frisingensia, preserved in an nth-century MS. now at Munich, unfortunately very few in number. Also excerpts from the lost Fragmentum cuiacianum, made by Scaliger, and now in the library at Leiden. It only contained the part from iii. 4, 65 to the end. The Codex cuiacianus, a late MS. containing Catullus, Tibullus and Propertius, is still extant.

Editions. — Tibullus was first printed with Catullus, Propertius, and the Silvae of Statius by Vindelinus de Spira (Venice, 1472), and separately by Florentius de Argentina, probably in the same year. Amongst other editions we may mention those by Scaliger (with Catullus and Propertius, 1577, &c), Broukhusius (1708), Vulpius (1749), Heyne (1817, 4th ed. by Wunderlich, with supple- ment by Dissen, 1819), Huschke (1819), Lachmann (1829), Dissen (1835). Among more recent texts Bahrens (1878, the first of the modern critical editions), L. Muller (1880, with a useful intro- duction), Hiller (1885, with index verborum), Postgate (1905). Of the commentaries Heyne’s, Huschke’s and Dissen’s are

still of value. The most recent (with Latin notes) is Nemethy's (1905- 1906). The greater part of the poems are included in Postgate's Selections (with English notes, 1903). For further information see the accounts in Teuffel's History of Roman Literature (translated by Warr), Schanz's Geschichte der romischen Litteratur, and Marx's article s.v. " Albius," in Pauly-Wissowa's Realencyclopadie. A history of recent contributions is given in A. Cartault's A propos du corpus Tibullianum (1906; not quite complete); see also his Tibulie et les auteurs du Corpus Tibullianum (Paris, 1909). The following translations into English verse are known — by Dart (London, 1720), Grainger (1739, with Latin text and notes), Cranstoun (1872). An Essay towards a New Edition of the Elegies of Tibullus, with a Translation and Notes (London, 1792), contains only i. I and 7, 29-48. C. A. Elton's Specimens of the Classic Poets (London, 1814; xii. 141-171) contains 1. 1; ii. 4; iii. 2-4; 6, 33 to end; iv. 2, 3. To these 'should probably be added Tibullus, with other Translations from Ovid, Horace, &c, by Richard Whiffin (London, 1829). Cranstoun's is the only complete version of merit; but it is far inferior to the translations by Elton. (J. P. P.)

TIBUR (mod. Tivoli, q.v.), an ancient town of Latium, 18 m. E.N.E. of Rome by the Via Tiburtina (see Tiburtina, Via). It is finely situated at the point where the Anio forms its cele- brated falls; it is protected on the E., N., and N.W. by the river and it commands the entrance to its upper course, with an exten- sive view over the Campagna below. The modern town is in part built upon the terraces of a large temple of Hercules Victor, the chief deity of Tibur, of which some remains exist: many small votive objects in terra-cotta were found in the gorge of the Anio below the town on the north-west in 1898. Below it, on the cliffs above the Anio, is a large building round a colonnaded court-yard in opus reticulatum built over the Via Tiburtina (which passes under it in an arched passage), generally known as the villa of Maecenas, but shown by the discovery of inscriptions to have

been in reality the meeting place of the Herculanei Augustales, connected probably with the temple.

In an ancient hall at one side of the modern cathedral two mensae ponderariae — marble tables with holes in them for measuring solids — erected by one M. Varenus Diphilus, a freed- man, a magister herculaneus, were found in situ in 1883, and in 1902 two vases of statues erected by Diphilus, as inscriptions showed, in honour of his patron, and a bas-relief of a bearded Hercules entirely draped in a long tunic with a lion's skin on his shoulders.

Remains of two small temples- — one circular, with Corinthian columns, the other rectangular with Ionic columns — stand at the north-east extremity of the town, above the waterfalls. They are traditionally, but without foundation, attributed to Vesta and the Sibyl of Tibur (Varro adds Albunea, the water goddess worshipped on the banks of the Anio as a tenth Sibyl to the nine mentioned by the Greek writers.

The so-called Tempio della Tosse, an octagonal domed structure just below the town, is probably a tomb of the 4th century a.d. Two Roman bridges and several tombs were found above the falls in 1826.

Tibur was a favourite place of resort in Roman times, and both Augustus and Maecenas had villas here, and possibly Horace also. It is certain that a house was shown as being his in the time of Suetonius; and this has been identified with a villa of the Augustan period, the site of which is now occupied by the monastery of S. Antonio. In his poems he frequently mentions Tibur with enthusiasm. Catullus and Statius, too, have rendered it famous by their poems. The abundance of

water from aqueducts and springs and the falls of the Anio were among its chief attractions. The

remains of villas in the district are numerous and important (see T. Ashby in Papers of the British School at Rome, iii.). The largest is that of Hadrian, situated in the low ground about 2 m. to the south-west of Tibur, and occupying an area of some 1 60 acres. The remains are exten- sive and well preserved, though the identifications of the existing buildings with those mentioned by Spartianus who records that Hadrian gave to them the names of various well-known edifices at Athens and elsewhere, cannot in most cases be treated as certain. A large number of statues have been found in the villa, and costly foreign marbles and fine mosaic pavements, some of the last being preserved in situ, while among others may be named the mosaic of the doves in the Capitol and that of the masks in the Vatican. Of the fresco and stucco decora- tions of the walls and ceilings, less is naturally preserved. Excavations have gone on since the 16th century, the last having been carried on by the Italian government to which the greater part of the site now belongs: but little has been done since 1884. 1

The ancient Tibur was founded, according to tradition, by Tiburtus, Corax and Catillus, grandsons of Amphiaraus. Though on the edge of the Sabine mountains, it was a member of the Latin League. There are remains of ancient roads and out- lying forts in its territory dating from the period of its indepen- dence. It allied itself with the Gauls in 361 B.C., and in the war which followed the towns of Empulum and Saxula were destroyed (their sites are unknown) and triumphs over Tibur were celebrated in 360 and 354 B.C., and again in 338, wher its forces were defeated, with those of Praeneste. It did not, Low- ever, lose its independence, but became an ally of Rome, as is shown by an inscription, probably of the 2nd century B.C., in which it is recorded that the ambassadors of Tibur successfully cleared themselves before the Roman senate of a suspicion that they were acting contrary to their treaty with Rome. It acquired Roman citizenship in 90 B.C., though some of its

citizens gained the franchise previously. Syphax, king of Numidia, died in the territory of Tibur as a captive in 201 B.C.; and in a.d. 273 Zenobia, queen of Palmyra, was assigned a residence here by Aurelian. Its prosperity during the imperial period was mainly due to the favour in which it stood as a summer resort. During the siege of Rome by Narses, Beli- sarius occupied Tibur : it was afterwards treacherously surren- dered to Totila, whose troops plundered it, but who rebuilt it in a.d. 547.

See H. Dessau in Corp. inscript. latin, xiv. 365 sqq. and reff. (Berlin, 1887); Notizie degli scavi, passim. (T. As.)

TIBURTINA, VIA, an ancient road of Italy, leading E.N.E. from Rome to Tibur, a distance of about 18 m. It must have come into existence, as a track at any rate, during the establishment of the Latin League. Though it afterwards be- came an important thoroughfare, the first portion of it always retained its original name, that of Via Valeria (see Valeria, Via) being applied only to the portion of the road beyond Tibur. The road is in the main followed by a modern highroad. There is, however, a difficulty about the last portion of its course from the Albulae Aquae (q.v.) to Tibur; whereas, according to the milestones and itineraries, it should be 20 m. from Rome to Tibur, it is impossible to make the distance more than 18 m. along any probable line.

See T. Ashby in Papers of the British School at Rome, iii. 84 sqq.

(T. As.)

TICHBORNE CLAIMANT, THE. Roger Charles Tichborne (1820–1854), whose family name became a household word on account of an attempt made by an impostor in 1868 to personate him and obtain his heritage, was the eldest grandson of Sir Edward Tichborne, the 9th baronet, of a very ancient Hamp- shire family. Sir John de Tichborne, sheriff of Southampton, was created a baronet by James I. in 1621, and from him

his

1 See H. Winnefeld, Die Villa des Hadrian (Berlin, 1895). Jahrbuch des k. d. arch. Instituts, Erganzungsheft III.: R. Lanciani, La Villa Adriana (Rome, 1906).

descendants' inherited great wealth and the position of one of the leading Roman Catholic families in the south of England. Roger Charles, born at Paris on the 5th of January 1829, was the eldest son of James Francis Dough ty-Tichborne (who subse- quently became 10th baronet and died in 1862) by Henriette Felicite, natural daughter of Henry Seymour of Knoyle, in Wiltshire. This lady, who hated England, was intent upon bringing up her son as a Frenchman; the result was that he got hardly any education until he went in 1846 to Stonyhurst, whence he proceeded in 1849 to Dublin and joined the 6th Dragoon Guards. His eccentricity and his French accent made him a butt in his regiment, and, being disappointed of war service, he sold out in 1852, and in the following year proceeded on a trip to South America. He sailed in March 1853 from Havre for Valparaiso, whence he crossed the Andes, reaching Rio de Janeiro in 1854. In April of that year he sailed from Rio in the " Bella " and was lost at sea, the vessel foundering with all hands. His insurance was paid and his will proved in July 1855. The baronetcy and estates passed in 1862 to Roger's younger brother, Sir Alfred Joseph Doughty-Tichborne, who died in 1866. The only person unconvinced of Roger's death was his mother the dowager Lady Tichborne, from whom every tramp-sailor found a welcome at Tichborne Park. She adver- tised largely and injudiciously for the wanderer, and in Novem- ber 1865 she learnt, through an agency in Sydney, that a man " answering to the description of her son " had been found in the guise of a small butcher at Wagga Wagga, in Queensland. As a matter of fact, the supposed Sir Roger did not correspond at all to the lost heir, who was slim, with sharp features and straight black hair, whereas the claimant was enormously fat, with wavy, light-brown hair. His first letter to Lady Tichborne was not

only ignorant and illiterate, but appealed to circum- stances (notably a birth-mark and an incident at Brighton) of which she admitted that she had no recollection. But so great was her infatuation with her fixed idea, that she soon overcame the first qualms of distrust and advanced money for the claimant to return to Europe. Like all pretenders, this one was impelled by his entourage, who regarded him in the light of an investment. He himself was reluctant to move, but the credulity of persons under the influence of a romantic story soon came to his aid. Thus an old friend of Sir James Tichborne's at Sydney, though puzzled by the claimant's answers, was convinced by a resemblance to his supposed father. At Sydney, too, he made the acquaintance of Bogle, a negro servant of a former baronet. Bogle sailed with him from Sydney in the summer of 1866, and coached him in the rudi- ments of the role which he was preparing to play. On reaching London on Christmas Day 1866 the claimant paid a flying visit to Tichborne House, near Alresford, where he was soon to obtain two important allies in the old family solicitor, Edward Hopkins, and a Winchester antiquary, Francis J. Baigent, who was inti- mately acquainted with the Tichborne family history. He next went over to Paris, where in an hotel bedroom on a dark January afternoon he was promptly " recognized " by Lady Tichborne. This " recognition " naturally made an enormous impression upon the English public, who were unaware that Lady Tichborne was a monomaniac. That such a term is no exaggeration is shown by the fact that she at once acquiesced in her supposed son's absolute ignorance of French. She allowed the claimant £1000 a year, accepted his wife, a poor illiterate girl, whom he had married in Queensland, and handed over to him the diaries and letters written by Roger Tichborne from South America. From these documents the claimant now carefully studied his part; he learnt much, too, from Baigent and from two carabiniers of Roger's old regiment, whom he took into his service. The villagers in Hampshire, a number of the county families, and several of Tichborne's fellow officers in the 6th Dragoons, became eager victims of the

delusion. The members of the Tichbome family in England, however, were unanimous in declaring the claimant to be an impostor, and they were soon put upon the track of discoveries which revealed that Tom Castro, as the claimant had been called in Australia, was

identical with Arthur Orton (1834-1898), the son of a Wapping butcher, who had deserted a sailing vessel at Valparaiso in 1850, and had received much kindness at Melipilla in Chile from a family named Castro, whose name he had subse- quently elected to bear during his sojourn in Australia. It was shown that the claimant, on arriving in England from Sydney in 1866, had first of all directed his steps to Wapping and inquired about the surviving members of his family. It was discovered, too, that Roger Tichborne was never at Meli- pilla, an assertion to which the claimant, transferring his own adventures in South America to the account of the man whom he impersonated, had committed himself in an affidavit. These discoveries and the deaths of Lady Tichborne and Hopkins were so discouraging that the " claimant " would gladly have " retired " from the baronetage; but the pressure of his creditors, to whom he owed vast sums, was importunate. A number of " Tichborne bonds " to defray the expenses of litigation were taken up by the dupes of the imposture, and an ejectment action against the trustees of the Tichborne estates (to which the heir was the 12th baronet, Sir Henry Alfred Joseph Doughty- Tichborne, then two years old) finally came before Chief Justice Bovill and a special jury at the court of common pleas on the nth of May 1871. During a trial that lasted over one hundred days the claimant exhibited an ignorance, a cunning and a bulldog tenacity in brazening out the discrepancies and absurdities of his depositions, which have probably never been surpassed in the history of crime. Over one hundred persons swore to the claimant's identity, the majority of them — and they were drawn

from every class — being evidently sincere in their belief in his cause. It was not until Sir John Coleridge, in a speech of unparalleled length, laid bare the whole conspiracy from its inception, that the result ceased to be doubtful. The evidence of the Tichbornes finally convinced the jury, who declared that they wanted no further evidence, and on the 5th of March 1872 Serjeant Ballantine, who led for the claimant, elected to be non-suited. Orton was immediately arrested on a charge of perjury and was brought to trial at bar before Chief Justice Cockburn in 1873. The defendant showed his old quali- ties of impudence and endurance, but the indiscretion of his counsel, Edward Kenealy, the testimony of his former sweet- heart, and Kenealy's refusal to put the Orton sisters in the box, proved conclusive to the jury, who, on the one hundred and eighty-eighth day of the trial, after half-an-hour's deliberation found that the claimant was Arthur Orton. Found guilty of perjury on two counts, he was sentenced on the 28th of February 1874 to fourteen years' penal servitude. The cost of the two trials was estimated at something not far short of £200,000, and of this the Tichborne estates were mulcted of fully £90,000. The claimant's better-class supporters had deserted him before the second trial, but the people who had subscribed for his defence were stanch, while the populace were convinced that he was a persecuted man, and that the Jesuits were at the bottom of a deep-laid plot for keeping him out of his own. There were symptoms of a riot in London in April 1875, when parliament unanimously rejected a motion (by Kenealy) for referring the Tichborne case to a royal commission, and the military had to be held in readiness. But the agitation subsided, and when Or-ton emerged from gaol in 1884 the fickle public took no interest in him. The sensation of ten years earlier could not be galvanized into fresh life either by his lectures or his alternate confessions of imposture and reitera- tions of innocence, and Orton sank into poverty and oblivion, dying in obscure lodgings in Marylebone on the 2nd of April 1898. (T. Se.)

TICINO (Ger. Tessin, anc. Ticinus), a river of Switzerland and north Italy, which gives its name to the Swiss canton of Ticino(g.ii.), and gave it in classical times to the town of Ticinum (Pavia). It rises at the foot of the Gries Pass to the west of Airolo; from Airolo to the Lago Maggiore its valley bears the name of Val Leventina, and is followed as far as Bellinzona by the St Gotthard road and railway. It flows through Lago Maggiore, leaving it at its south end atSesto Calende, and thence

flows S.S.E. into the Po, which it joins a little way south of Pavia.

TICINO (Fr. and Ger. Tessin), a canton of Switzerland, the only one situated almost wholly on the southern slope of the Alps and inhabited by a population of which the majority is Italian-speaking. It takes its name from the Ticino river, the whole upper course of which (the Val Leventina, with its side glen of Val Blenio, the so-called Riviera, extending from Biasca to near Bellinzona, and the bit beyond Bellinzona), till it swells into the Lago Maggiore, is within the canton. Not far from the head of the Lago Maggiore the lake is increased by the Maggia tor- rent which is formed by the union of the torrents descending from the mountain glens known as the valleys of Locarno, save the Val Verzasca, the stream from which falls into the lake without joining the Maggia. The third portion of the canton is that called Monte Cenere, including the hilly region between Bellinzona on the Ticino and Lugano, together with most of the lake of that name, and stretching on the south as far as Mendrisio, not far from Como. These three districts were all formerly part of the duchy of Milan till conquered by the Swiss, and in 1803 were joined together to form a Swiss canton of the most artificial kind (Campione, opposite Lugano, is still an Italian ” enclave “). Its total area is 1081-1 sq. m., of which 721-9 sq. m. are reckoned as “productive” (forests covering 267-2 sq. m. and vineyards 19-9 sq. m.), while of the rest part is taken up by the Lake of Lugano (the Swiss share of which is 7! sq. m.), and those of the Lago Maggiore

(Swiss share i6| sq. m.), and by 131 sq. m. of glaciers. In point of size the canton is surpassed by only four other cantons (Bern, the Grisons, the Valais, and Vaud), while only Vaud can boast of a larger vine-growing district. The highest points in the canton are two of the loftiest summits of the two halves of the Lepontine Alps — the Basodino (10,749 ft.) an d the Rheinwaldhorn or Piz Valrhein (11,149 ft-) in the Adula Alps. Save the Ticino valley between Biasca, Bellinzona and Locarno, and the en- virons of Lugano, the canton is principally composed of hills and mountains, and is therefore poor from the material point of view, though rich in fine scenery.

The canton is traversed from end to end, from Airolo at the southern mouth of the St Gotthard tunnel to beyond Mendrisio (about 74 m.), by the main line of the St Gotthard railway, many of the marvellous engineering triumphs of which occur between Airolo and Biasca. From Bellinzona there is a short branch railway to Locarno (14 m.), whence another runs up to Bignasco (175 m.), while from Lugano there is a mountain line up the Monte S. Salvatore (3004 ft.), and from Capolago another similar line up the Monte Generoso (5591 ft., that summit being just on the political frontier). Till 1859 the can- ton was legally included in the Italian dioceses of Milan (the portion north of Bellinzona, the Val Leventina and the Val Blenio therefore still using the ancient " Ambrosian Liturgy") and of Como (the rest of the canton). In that year the Swiss Confederation abolished this foreign jurisdiction, but practically the two bishops named had charge of these districts till in 1888 the purely Swiss diocese of Lugano was set up, being now joined to that of Basel, and governed by an administrator apostolic. In 1900 the population of the canton was 138,638, of whom 134,774 were Italian-speaking, 3180 German- speaking and 403 French-speaking, while 135,828 were Romanists, 2209 Protestants and 18 Jews. Of the German-speaking inhabi- tants 260 belonged to the hamlet of Bosco or Gurin, situated at the head of one of the side glens of the Val Maggia, and

colonized before 1253 from the neighbouring Tosa or Pommat valley (now politically Italian), which is inhabited by German-speaking emigrants from the canton of the Valais. In 1900 there were in the canton 75,731 women to 62,907 men, the men being in the habit of emigrating in search of work. Up to 1881 Bellinzona, Locarno and Lugano were alternately the political capital, each for six years, but since 1881 Bellinzona is the permanent capital. Yet it is but the second town in size, being surpassed by Lugano (q.v.), while after it come Locarno (q.v.) and Mendrisio (3338 inhabitants). Being practically Italian, though now " Italian Switzerland," the canton has produced many sculptors, painters and architects. But its industrial development is backward, though the opening of the St Gotthard railway has attracted many foreign travellers. Yet the male population largely migrate in search of work and wages as coffee-house keepers (such as Delmonico, of New York), waiters in cafe's, masons, plasterers, labourers, navvies, &c. Fruit, chestnuts and wine are among the principal exports. The canton is divided into 8 administrative districts, which comprise 265 communes. The cantonal constitution is still that of 1830, which, however, has been almost mended out of sight owing to the political struggles

that have raged in the canton. The legislature (Gran consiglio) is composed of members elected (since 1880) in the proportion of one to every 1200 (or fraction over 600) of the Swiss inhabitants, and holding office for four years. The executive (Consiglio di stato) is (since 1892) elected directly by the people, is composed (since "875) of five members, and holds office for four years. Since 1883 5000 citizens have the right (facultative referendum) of claiming a popular vote as to bills passed by the legislature, while (since 1892) 5000 citizens have the right of " initiative " in legislative matters, though 7000 signatures are required in case of a proposal to revise the

cantonal constitution. In 1891 the system of proportional representation was introduced for elections to the cantonal legis- lature and the communal assemblies. In 1904 a very complicated system of proportional representation was adopted by a narrow majority of the people of Ticino. In elections to the cantonal legislature all fractions below that required to secure a member in the entire canton are added together and then divided by the number of the non-elected candidates, plus one, the persons thus selected being, as far as possible, assigned to the constituencies in which they have obtained most votes (the point remains obscure). In 1904 also the " limited vote " was adopted as to the election of members of the executive, no one being allowed to vote for more than four out of the five members. In 1896, by a strange anomaly only to be explained by the previous political history of the canton, non-resident citizens were given a vote in all cantonal and communal matters, though residence is strictly required for all voters in Federal matters. The two members of the federal Standerath and the seven members of the Federal Nationalrath are elected by a popular vote.

The canton is made up of all the permanent conquests (with one or two trifling exceptions) made by different members of the Swiss Confederation south of the main chain of the Alps. From an historical point of view Italian Switzerland falls into three groups: (1) the Val Leventina conquered by Uri in 1440 (previously held from 1403 to 1422); (2) Bellinzona (pre- viously held from 1419 to 1422) ; the Riviera and the Val Blenio, all won in 1 500 from the duke of Milan by men from Uri, Schwyz and Nidwalden, and confirmed by Louis XII. of France in 1503; (3) Locarno, Val Maggia, Lugano and Mendrisio, seized in 151 2 by the Confederates when fighting for the Holy League against France, ruled by the twelve members then in the league, and confirmed by Francis I. in the treaty of 1516. These dis- tricts were governed by bailiffs holding office two years and purchasing it from the members of the League; each member of group 3 sent annually an envoy, who

conjointly constituted the supreme appeal in all matters. This government was very harsh and is one of the darkest pages in Swiss history. Yet only one open revolt is recorded — that of the Val Leventina against Uri in 1755. In 1798 the people were distracted by the Swiss and " Cisalpine republic " parties, but sided with the Swiss. On being freed from their hated masters, they were formed into two cantons of the Helvetic republic — Bellinzona (=1 and 2 above) and Lugano (= 3). In 1803 all these dis- tricts were formed into one canton — Ticino — which became a full member of the Swiss Confederation. From 1810 to 1813 it was occupied by the troops of Napoleon. The carriage road over the St Gotthard (1820-1830) was made under the constitu- tion of 1814. But many of the old troubles reappeared, and were only done away with by the constitution of the 23rd of June 1830. In 1848, on religious grounds and owing to fears as to customs duties, the canton voted in the minority against the Federal constitution of that year; but in 1874, though the people voted against the revised constitution, the legislature adopted it, and the canton was counted as one of the majority. Since 1830 the local history of the canton has been very disturbed owing to the fact that, though Roman Catholicism is the state religion, and all the population are Roman Catholic (the few Protestants having been expelled from Locarno in 1555), they are divided between the Radical and Ultramontane parties. Since 1876 the intervention of Federal troops (already known in 1870) has been frequent in consequence of conflicts of the local authorities inter sc, or against the Federal Assembly.

The political troubles of Ticino were increased in 1888 by the foundation of the see of Lugano, considered by the Radicals as likely to advance Clericalism, though it freed Switzerland from foreign ecclesiastical rule. Hence in September 1890 the Radicals carried out a bloody revolution, which necessitated Federal intervention, but at a state trial at Zurich in July

1 89 1 the leaders were acquitted. Political

passions still run high in the canton, as the Radicals and Conservatives are nearly balanced in point of numbers.

. Authorities. — A. Baragiola, II Canto popolare a Bosco Gurin (Cividale, 1891); A. Baroffio, Dei Paesi e delle terre costituenti il cantone del Ticino fino all' anno i?g8 (Lugano, 1879); Bollettino delta Svizzera Italiana, published by the Cant. Hist. Soc. (Bellinzona, from 1879) ; S. Borrani, II Ticino sacro (Lugano, 1896) ; S. Franscini, Der Kanton Tessin (St Gall and Bern, 1835); H. Gubler, Geschichte d. Kant. Tessin, 1830-1841 (Zurich, 1906) ; L. Lavizzari, Escursioni nel cantone Ticino (Lugano, 1863) ; Th. von Liebenau, La Battaglia di Arbedo (Bellinzona, 1886); F. Meyer, Die evangelische Gemeinde in Locarno (2 vols., Zurich, 1836); E. Motta, Dei Personaggi celebri che varcarono il Gottardo nei tempi antichi e moderni (Bellinzona, 1884); J. R. Rahn, Die mittelalt. Kunstdenkmaler d. Kant. Tessin (Zurich, 1893) ; " Rechtsquellen d. Kant. Tessin," in the Zeitschrift f. schweiz. Recht, vols. 33-36, 40-42, 44 and 47; L. Regolatti, Le Costituzioni del Ticino, 1803-1903 (Lugano, 1903) ; G. Respini, Storia politica del cantone Ticino (Locarno, 1904); M. Wanner, Geschichte des Banes d. Gotthardbahn (Lucerne, 1885).

(W. A. B. C.)

TICINUM (mod. Pavia, q.v.), an ancient city of Gallia Trans- padana, founded on the banks of the river of the same name (mod. Ticino) a little way above its confluence with the Padus (Po). It is said by Pliny to have been founded by the Laevi and Marici, two Ligurian tribes, while Ptolemy attributes it to the Insubres. Its importance in Roman times was due to the extension of the Via Aemilia from Ariminum to the Padus (187 B.C.), which it crossed at Placentia and there forked, one branch going to Mediolanum and the other to Ticinum, and thence to Laumellum where it divided once more — one branch going to Vercellae (and thence to Eporedia and Augusta Praetoria) and the other to Valentia

(and thence to Augusta Taurinorum or to Pollentia). The branch to Eporedia must have been constructed before 100 B.C. Ticinum is not in- frequently mentioned by classical writers. It was a municipium, and from an inscription we know that a triumphal arch was erected in honour of Augustus and his family, but we learn little of it except that in the 4th century a.d. there was a manufacture of bows there. It was pillaged by Attila in a.d. 452 and by Odoacer in 476, but rose to importance as a military centre in the Gothic period. At Dertona and here the grain stores of Liguria were placed, and Theodoric constructed a palace, baths and amphitheatre and new town walls; while an inscription of Athalaric relating to repairs of seats in the amphitheatre is preserved (a.d. 528–529). From this point, too, navigation on the Padus seems to have begun. Narses recovered it for the Eastern Empire, but after a long siege, the garrison had to surrender to the Lombards in 572. The name Papia, from which the modern name Pavia comes, does not appear until Lombard times, when it became the seat of the Lombard king- dom, and as such one of the leading cities of Italy. Cornelius Nepos, the biographer, appears to have been a native of Ticinum. Of Roman remains little is preserved — there is, for example, no sufficient proof that the cathedral rests upon an ancient temple of Cybele — though the regular ground plan of the central portion, a square of some 11 50 yds., betrays its Roman origin, and it may have sprung from a military camp. This is not unnatural, for Pavia was never totally destroyed; even the fire of 1004 can only have damaged parts of the city, and the plan of Pavia remained as it was. Its gates were possibly pre- served until early in the 19th century. The picturesque covered bridge which joins Pavia to the suburb on the right bank of the river was preceded by a Roman bridge, of which only one pillar, in blocks of granite from the Baveno quarries, exists under the central arch of the medieval bridge, the rest having no doubt served as material for the latter. The medieval bridge dates from 1351–1354.

See A. Taramelli in Notizie degli scavi (1894), 73 sqq. and reff.

(T. As.)

TICKELL, THOMAS (1686–1740), English poet and man of letters, the son of a clergyman, was born at Bridekirk near Carlisle in 1686. After a good preliminary education he went (1701) to Queen's College, Oxford, taking his M.A. degree in 1709. He became fellow of his college in the next year, and in

171 1 university reader or professor of poetry. He did not take orders, but by a dispensation from the Crown was allowed to retain his fellowship until his marriage in 1726. Tickell's success in literature, as in life, was mainly due to the friendship of Addison, who procured for him (1717) an under-secretaryship of state, to the chagrin of Richard Steele, who thenceforth bore Tickell no goodwill. During the peace negotiations with France Tickell published in 17 13 the Prospect of Peace. In 1715 he brought out a translation of the first book of the Iliad contem- poraneously with Pope's version. Addison's reported descrip- tion of Tickell's version as the " best that ever was in any language " roused the anger of Pope, who assumed that Addison himself was the author, 1 or had at any rate the principal share in the work. Addison gave Tickell instructions to collect his works, which were printed in 1721 under Tickell's editorship. In 1724 Tickell was appointed secretary to the lords justices of Ireland — a post which he retained until his death, which took place at Bath on the 23rd of April 1740.

Kensington Gardens (1722), his longest poem, is inflated and pedantic. It has been said that Tickell's poetic powers were awakened and sustained by his admiration for the person and genius of

Addison, and undoubtedly his best work is the sincere and dignified elegy addressed to the earl of Warwick on Addison's death. His ballad of Colin and Mary was long the most popular of his poems. Tickell contributed to the Spectator and the Guardian.

See " T. Tickell," in Johnson's Lives of the Poets; the Spectator; Ward's English Poets. His Works were printed in 1749 and are included in Chalmers's and other editions of the English Poets.

TICKET (O. Fr. esliquet, also estiquette, mod. etiquette, from Ger. stechen, to stick up), by origin a small bill stuck up for the purpose of giving notice or information, hence a small printed or written card or slip, containing a notice, order or the like, and more particularly such an one as embodies the terms under which the party issuing the ticket grants some right, privilege or licence to the party to whom it is issued; where there has been valuable consideration for such given by the holder the ticket is the method by which the parties enter into a con- tract. The most familiar of this last class of tickets is the passenger's ticket issued by railway companies, tramways or " common carriers " in general. The ticket does not usually contain the whole terms of the contract, but refers to the con- ditions under which it is issued, to which the holder is consi- dered subject if sufficient notice of them is given. A ticket of admission issued for a theatre, or place of entertainment, constitutes a licence to the holder to occupy and use a seat, whether particularized or not, and such parts of the building as may be open to him. Such a licence can be revoked by the issuer, and the holder may be ejected as a trespasser, subject to his right to bring an action for damages.

TICKET-OF-LEAVE, a term first invented for the " emanci- pists " in the days of Australian transportation (see Deporta- tion); in the English penal system, a document or "pass" handed to a convict who has completed the second stage of his sentence and is about to enter the third and last, that of con- ditional liberation or semi-freedom, in

which he goes at large to earn his own livelihood as a more or less independent member of the community. The " ticket " or " licence " is the outward sign of " remission " gained by industry and blameless conduct in prison (see Prison), and it may be forfeited for disobedience or neglect of certain conditions endorsed upon the licence. Convicts are by law required to report themselves at an appointed place within forty-eight hours after liberation and again every succeed- ing month at the police station nearest to their place of abode, between the hours of nine in the morning and nine in the evening. They must get their living by honest means and regular employ- ment, and must reside — that is to say, sleep — at the address notified by them to the police in order that they may be found at once if required for any legal and justifiable purpose. If they

1 See Warton's note in the Bathos (ed. Pope and Elwin, x. 388) where he quotes from Tickell's version and from Addison and says the same author.

change their address or withdraw from any known police district, they must give notice of their removal at the police station at which they have been reporting, stating the place to which they are going, and, as far as practicable, their address there, and also at the nearest police station within forty-eight hours of arriving in any other police district in any part of the United Kingdom They must produce their licences whenever they are called upon to do so by a police officer.

This treatment of offenders who have already expiated their crimes has been deemed to bear heavily on any who are anxious to turn over a new leaf. To be ever subject to the watchfulness of the police must often increase the licence-holder's difficulty of leading an honest life. The struggle is known to be often severe; employers of labour are not too ready to accept the services of " gaol birds," and free workmen often resent the admission of an old convict amongst their number. Private charity has come forward to diminish or remove this

hardship, and many societies have been called into existence for the pur- pose of assisting discharged prisoners. They are to be found in most of the principal cities of the United Kingdom. London alone has those of the Church Army, the St Giles's Christian Mission, the Salvation Army, the Catholic Aid Society and the Royal Society for the Assistance of Discharged Prisoners, which was founded in 1856 and has done a vast and meritorious work. It labours chiefly in the metropolis; it is supported by private subscriptions, but it has control also over the gratuities of the licencees who accept its aid. The prisoners on release are first examined at the society's office as to their prospects and wishes; they are given some pocket-money out of their own gratuities; and their " liberty clothing," a present from the prison, is changed for more suitable clothes. They are then placed in respectable lodging-houses until employment is obtained for them, after which the society undertakes the reporting to the police and by its own agents exercises a watch over its proteges. There are upwards of sixty-five societies, all certified by the secretary of state, of which the number is increasing; every year the subscriptions increase, more money is expended, more cases are aided and more ex-convicts are rehabilitated. Unfortunately a large number of those who solicit help belong to the class of " lazy loafers who like neither work nor honesty," and who, when the first is found, will not adhere to the latter. Most of the societies employ agents who act as intermediaries between employers and ex-convicts and fill a place analogous to that of the " probation officers " in parts of the United States (see Probation); but the probation officer generally interposes at an earlier stage and shields the first offender from the consequences of his act, by sparing him a visit to the gaol. In a speech on Prison Reform in the English House of Commons on the 20th of July 1910, the home secre- tary outlined a proposed scheme for abolishing ticket-of-leave altogether, and entrusting the after-supervision of released prisoners to a central agency of semi-official character.

Aid to discharged prisoners has been largely undertaken in European countries, where it is known under the name of patronage. Local societies exist in most of the capitals and chief cities, and efforts are made to rescue neglected or criminal children and find work for adults on leaving gaol. This assis- tance has been called by its keenest supporters the best pro- phylactic for crime. Conditional liberation is in force in most of the Northern states of America, and prisoners are constantly released on " parole " when they have satisfied the parole board (of prison officials) that they will not abuse their liberty; a watch is kept over all thus released, who are expected to make a monthly report of their conduct and actual position at the time of reporting. If any one relapses he is liable to recommittal.

See Three Reports of Commons' Committee on the Operation of the Act substituting other Punishment in lieu of Transportation (1856); F. H. Wines, Punishment and Reformation (1895). (A. G.).

TICKING, a strong linen or cotton fabric usually woven in stripes of colour; blue and pink with white being the most common. The name is derived from a word " tick," common in various forms to many languages, signifying a case or sheath.

Ticking is used for mattresses, awnings and tents. In some qualities it is also used as a foundation for embroidery.

White, grey, or brownish warp threads are usually flax, while the coloured threads are often cotton. The weft is flax or tow. The warps of many of the cheaper kinds are made entirely of cotton, and jute is used for weft in the cheapest grades. A feather tick should be made of fine flax yarns set closely, and there should also be a large number of weft threads per inch. Sometimes the inside of the tick

is waxed in order to prevent the feathers from working out.

The structure of the fabric is termed a twill, of which four varieties, each showing four units, are illustrated. Fig. I, the ordinary three- leaf twill, is more extensively used than any other. Occasionally

a*^

FIG. I.

Fig. 2.

the pattern or twill is in one direction only, but more often the direction is reversed at intervals, thus producing what is technically termed a " herring-bone " or an " arrow-head " twill. Fig. 2 com- plete op twenty-four threads and three picks shows such a pattern, where the twill is reversed every twelve threads. Figs. 3 and 4 are

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Fig. 3.

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Fig. 4.

Fig. 5.

the four-thread and five-thread straight twills respectively, while fig. 5 is the five-thread sateen twill. These two latter weaves require a great number of threads and picks per inch, and are used only in the finest ticks. The plain weave is occasionally used for cheaper varieties.

Mattress ticks and awnings are woven with the same twills, but the colouring of these, especially of the former, is more elaborate.

TICKNOR, GEORGE (1791-1871), American educator and author, was born in Boston, Massachusetts, on the

1st of August 1 791. He received his early education from his father, Elisha Ticknor (1757-1821), who had been principal of the Franklin public school and was a founder of the Massachusetts Mutual Fire Insurance Company, of the system of free primary schools in Boston, and of the first New England savings bank. In 1805 the son entered the junior class at Dartmouth, where he graduated in 1807. During the next three years he studied Latin and Greek with Rev. Dr John Sylvester Gardiner, rector of Trinity, Boston, and a pupil of Dr Samuel Parr. In 1810 Ticknor began the study of law, and he was admitted to the bar in 1813. He opened an office in Boston, but practised for only one year. He went to Europe in 181 5 and for nearly two years studed at the university of Gottingen. In 1817 he became Smith professor of French and Spanish languages and literatures (a chair founded in 18 16), and professor of belles- lettres at Harvard, and began his work of teaching in 1819 after travel and study in France, Spain and Portugal. During his professorship Ticknor, advocated the creation of departments, the grouping of students in divisions according to proficiency, and the establishment of the elective system, and reorganized his own department. In 1835 he resigned his chair, in [which he was succeeded in 1836 by Professor H. W. Longfellow, and he was again in Europe in 1835-1838. After his return he devoted himself to the chief work of his life, the history and criticism of Spanish literature, in many respects a new subject at that time even in Europe, there being no adequate treatment of the literature as a whole in Spanish, and both Bouterwek and Sismondi having worked with scanty or second- hand resources. Ticknor developed in his college lectures the scheme of his more permanent work, which he published ?s the History of Spanish Literature (New York and London, 3 vols., 1849). The book is not merely a story of Spanish letters, but, more broadly, of Spanish civilization and manners. The History is exhaustive and exact in scholarship, and direct and unpre- tentious in style. It gives many illustrative passages from representative works, and copious bibliographical

references.

It was soon translated into Spanish (1851–1857) by de Gayangos and de Vedia; French (1864–1872), a poor version by Magnabal; and German (1852–1867), by N. H. Julius and Ferdinand Wolf. The second American edition appeared in 1854; the third corrected and enlarged, in 1863; the fourth, containing the author's last revision, in 1872, under the supervision of George S. Hillard; and the sixth in 1888. Ticknor had succeeded his father as a member of the Primary School Board in 1822, and held this position until 1825; he was a trustee of the Boston Atheneum in 1823–1832, and was vice-president in 1833; and he was a director (1827–183 5) and vice-president (1841–1862) of the Massachusetts Hospital Life Insurance Company, and a trustee of the Massachusetts General Hospital (1826–1830) and of the Boston Provident Institution for Savings (183S–1850), the bank that his father had helped to found. He was especially active in the establishment of the Boston Public Library (1852), and served in 1852–1866 on its board of trustees, of which he was president in 1865. In its behalf he spent fifteen months abroad in 1856–1857, at his own expense, and to it he gave at various times money and books; a special feature of his plan was a free circulating department. He left to the library his own collection, which was particularly strong in Spanish and Portuguese literatures. He died in Boston on the 26th of January 1871.

Ticknor's minor works include, besides occasional reviews and papers, Syllabus of a Course of Lectures on the History and Criticism of Spanish Literature (1823) ; Outline of the Principal Events in the Life of General Lafayette (1825) ; Remarks on Changes Lately Proposed or Adopted in Harvard University (1825) ; The Remains of Nathan Appleton Haven, with a Memoir of his Life (1827) ; Remarks on the Life and Writings of Daniel Webster (1831) ; Lecture on the Best Methods of Teaching the Living Languages, delivered, in 1832, before the American Institute of Education; and the Life of William Hickling Prescott (1864).

See Life, Letters and Journals of George Ticknor (2 vols., 1876), by George S. Hillard and Mrs Anna (Eliot) Ticknor and Miss Anna Eliot Ticknor. This book was edited, with a critical intro- duction, in 1909, by Ferris Greenslet.

TICKS, the common name for Arachnida (q.v.) belonging to the order Acari, of which they constitute the two families, Ixodidae and Argasidae. Collectively the Ixodidae and Argasidae may be distinguished from other Acari by the presence of a median probe, armed with recurved teeth, which project forwards beneath the mouth and between the palpi, and of a conspicuous spiracular area above and usually behind the base of the fourth leg on each side. As compared with the majority of Acari, ticks are of large size, distended female specimens of some of the species measuring half an inch or more in length, while even the newly hatched young can hardly be regarded as micro- scopical. The integument is tough, leathery or horny. The mouth parts consist of two small retractile mandibles, of a pair of short palpi and of the toothed probe above mentioned. The palpi and probe or hypostome are attached to a movable sclerite or horny plate called the capitulum. The capitulum, with its associated structures, is sometimes called the rostrum, whereas sometimes the term rostrum is restricted to the hypo- stome alone. It is by means of the hypostome that ticks pierce the integument and firmly adhere to the host whose blood they suck for food. The two families Argasidae and Ixodidae may be distinguished as follows. In the Argasidae the anterior portion of the dorsal surface of the body is extended forwards above the capitulum, so that this structure is concealed from above; the integument is fairly uniformly granular or coriaceous above and below; the palpi are simple and unmodified; there is no sucker beneath the claws in the adult, and there is only a slight structural difference between the sexes. In the Ixodidae the capitulum is not overlapped by a forward extension of the dorsal area, which is smooth and firmly chitinized either in front or all over; the palpi are usually

modified, that is to say, their second and third segments are usually excavated internally to form a sheath for the hypostome; there is a distinct sucker beneath the claws and the difference between the sexes is well marked, the males having the dorsal integument thickly and continuously chitinized, whereas in the females only its anterior

portion bears a chitinous- plate, the rest of the integument being soft to admit of its distension by the blood which is imbibed in quantity by members of this sex. For a longer or shorter period of their lives' ticks are parasitic upon vertebrate animals of various kinds; but although the belief that the bite of certain tropical species is poisonous has long been held by the natives of the countries they infest and has been recorded with corroborative evidence by European authors in : books of travel, it is only of recent years that accurate information has been acquired of the part played by these Arachnids in transmitting from one host to another protozoal blood-parasites which cause serious or fatal diseases to man and other animals.

Both the Argasidae and Ixodidae contain pathogenic species, of which the best known are the following: Ornitkodoros monbata, belonging to the Argasidae, and called bibo in Uganda, monbata in Angola, and tampan on the Zambezi, is widely distributed in tropical Africa from Uganda in the north to the Transvaal in the south. It was first recorded as poisonous by Livingstone and is now known to be the carrier of the Spirochaete of relapsing fever in man, known as tick fever. Although Europeans suffer from this disease far more severely than negroes, death seldom follows. The tick especially infests old huts and camping grounds and is nocturnal in habit, spending the day hidden in crevices of the walls or floor and coming out at night to feed upon the sleeping inmates. An allied species, 0-turicala, occurs in Mexico and Texas, where it

causes considerable destruction amongst poultry' and is a pest to mankind as well. A similar bad repute attaches to other species in different parts of South America; while Argas miniatus has been proved to be the carrier of the Spirochaete causing spirillosis in fowls in Rio Janeiro, and also in New South Wales whithefit has been introduced with imported poultry. Argas persicus has been introduced in the same way into South Africa from Europe. As its name indicates it was first discovered in Persia, where the belief in the venomous nature of its bite to human beings is both widespread and historical. It is singular that the Argasidae; which are for the most part parasitic upon birds, contain the only species of ticks, especially O. monbata, wmcti are known to be seriously harmful to mankind; whereas amongst the Ixodidae no human pathogenic species has been ascer- tained to exist, although several forms have been proved to be highly destructive to domestic mammals of different species. The most important of these are the. following ^ Dermacentor retictdatus, a species widely distributed in .Europe, Asia and America, infects dogs in Europe with the Haematozoon causing the disease known as " biliary fever," and has been asserted to be answerable for the so-called spotted or tick fever in man in the Rocky Mountains. The same canine disease results in South Africa from the bite of Haemaphysalis leachi. A mblyomma hebraeum, the bont or variegated tick of the Cape Colonists, infects sheep with the Sporozoon causing " heart-water " sickness, and in Europe sheep are inoculated with the same disease by another tick, Rhipicephalus bursa. The so- called " coast fever " in cattle in South Africa is conveyed by two distinct species of the genus Rhipicephalus, namely by R. appendicu- latus and R. simus, which are locally known respectively as the "brown tick" and the "black-pitted tick." Finally Margaropus annulatus, of which there are several geographical races, is the carrier of the germ causing the destructive cattle-disease variously known as " Texas " or "red water " fever in America, South Africa and Australia. In the United States alone the annual pecuniary loss in

cattle stock occasioned by the ravages of this tick disease was computed in 1907 at One hundred million dollars. With one or two possible exceptions, like Argas vespertilonis, which has only been obtained from European bats, no species of tick is known to be confined to a particular host. The common sheep-tick (Ixodes vir.inus) of England, for example, infects cattle and dogs as well as sheep; and the pathogenetic Ixodidae above mentioned occur parasitically upon other mammals than those to which they convey the diseases- specified. Reptiles are infested as well as mammals, and it is no uncommon thin»j to find specimens of Ixodidae of various kinds adherent to tortoises, snakes and lizards. Ticks belonging to the Ixodidae differ to a certain extent in their life-histories.

Matote males and females are found together upoin the same host. Fertilisation is effected by the male transferring spermatophores into the genital orifice of the female by means of his proboscis. The gorged and fertilized female quits her hold of the ; host, and falling to'the ground, proceeds after a short delay t6 lay her eggs in some sheltered spot. The number of eggs laid is enormous, one computa- tion putting it at twentyrthousahd. After oviposition, which may extend over several weeks, the female dies. The newly ^hatched young has only three pairs of legs and is without spiracular and genital orifices. These young, or larvae as they are called, after. the integument has hardened by exposure to the air, climb up the stalks of grain or herbage and cling with outstretched legs waiting for passing animals. They seize hold of the first that brushes by, and crawling to a suitable place become engorged with blood. 'After about a week's feeding they drop to the ground, lie dormant for a month, during which time they acquire their fourth pair of legs

and spiracles, and,, moulting, emerge from their old skin as nymphs. Nymphs repeat the behaviour of the larvae, and finally moult into the adult, showing the generative orifice, which is the mark of maturity. The adult secures a host in the same way as the young. Both' sexes' feed upon blood ; whereas

the male alters but little in appearance, the female becomes enormously distended.

From the foregoing epitome which applies to many species, Rhipicephalus appendiculafus for example, it is evident that every individual tick has to find a host' on three occasions, namely, as larva, nymph and adult. In R. bursa, however, the moult that

Fig. i.—Hyalomma aegyptium Savigny. Undistended female. a Rostrum or hypostome ; b, b, Palpi ; c, Capitulum ; /, Abdomen,

Fig. 2. — The same; under side.

a, Rostrum or hypostome; b, 6, Palpi; c, Genital aperture yd, Anal orifice; e, e, Ventral surface of capitulum; g, Sternum; 1-7, seg- ments of teg",

transforms the larva into the nymph takes place on the host, and in Margaropus annulatus the transformation of larva into nymph and- , nymph into adult is effected without the temporary sojourn on the ground. Another species, Hyalomma aegyptium, the so-called camel-tick of Egypt arid Arabia, is alleged to be parasitic only in its mature stage. Again, in Ornithodorus monbata, which is parasitic apparently only at night, the young does not hatch from the egg until it has attained the nymphal stage.

It is an interesting and important fact that the newly hatched young of certain species, Margaropus annulatus for instance, before it has fed, if produced by a female carrying the germs of spirillosis, can infect healthy organisms with the disease. From this it is evident that the Spirochaetes pass directly from the mother tick to her offspring.

Duration of life in ticks depends upon the conditions of their existence. Under favourable conditions, when food is obtainable, growth is rapid, the time from the hatching of the young until it reaches maturity and dies after oviposition

being, for example, about'eleven weeks in R, appendiculatus and Only abotrt three weeks in M. annulatus. On the other hand, when food is not obtainable, life may be indefinitely prolonged if the tick be guarded from enemies and from atmospheric conditions inimical to existence. Examples of Ixodes vicinis have been kept for two years and three months with- out feeding, and specimens of Argas persicus were still alive after four years' starvation. (R. I. P.)

TICONDEROGA, a village in the township of Ticonderega, Essex county, New York, U.S.A., on the outlet of Lake George, 106 m. by rail N. by E. of Albany. Pop. (1890), 2267; (1900), 19,11;. (1905), 1749; (1910), 2475. Ticonderoga is served by the Delaware & Hudson and the Rutland railways. The water

from Lake George falls here about 30 ft., providing water-power, and among the manufactures are paper pulp, paper-making machinery and lumber. Flake graphite was discovered' in this vicinity as early as 1815, and for years two mines (with quartzite veins, respectively 1-5 and : 2-is ft. thick) at Ticonderoga were the principal source of stipply of good crystalline graphite. Commanding a portage on the line of 'water communication between Canada and the English colonies, Ticonderoga was a place of considerable strategic importance during the Seven Years' War. Orva commanding elevation overlooking the present village and Lake Champlain the French began building a fort of earth and timber in 1755 and called it Fort" Carillon; later it was named Fort Ticonderoga. Sir William Johnson led an expe- dition in the same year against this fort and Crown Point; though he failed to capture the forts he defeated Baton Ludwig August Dieskau in the battfe'bfXake Geojrge and erected at "the head of the lake Fort William Henry,'wMci» was captured by the marquis de Montcalm in 1757. On the 8th of July

1758 less than 4000 Frenchmen were confronted at Fort Carillon by about 6000 British regulars and 10,000 provincials under Lieut.-General James Abercrombie and Brigadier-General George A. Howe, but Howe, the controlling spirit of the British force, had been killed on the 6th of July, and Abercrombie,' after an ineffective attack which cost him nearly 2000 men killed or wounded, retreated. In 1758, however, when Montcalm had gone to Quebec to oppose Wolfe and a force of only 400 men was left at Ticonderoga, Lord Amherst with 11,000 men invested it, and on the 26th of July the garrison blew up and abandoned the fortifications. At the beginning of the War of Independence, on the 10th of May 1775, the fort was surprised and captured by Ethan Allen. It was recovered by the British on the 5th of July 1777, during"Butgoync'%. campaign, was abandoned immedi- ately after^ Hurjjoyne's surrender in October 1777, but was re-occupied by the British in 1780. After the close of the war it was allowed to fall into ruins. In 1909, on the occasion of the tercentenary celebration of- the discovery of Lake Champlain, the restoration of the fort was begun under the direction of the owner of the site. ■" The settlement of this region was begun soon after the close of the Seven Years' War, and the township of Ticonderoga was set apart from the township of Crown Point in 1804. The village of Ticonderoga was incorporated in 1889. The name " Ticonderoga " is a corruption of an Indian word said to mean " sounding waters."

TIDE (O. Eng. 'lid, cf. Ger. Zeit, time or season, connected with root of Sanskrit a-dili, endless), a term used generally lot the daily rising and falling of the water of the sea, but more specifically defined below.

I. — General Account of Tides and Tidal Theories

§. 1. Definition of Tide. — When, as occasionally happens, a ship in the open sea meets a short succession of waves of unusual magnitude, we hear of tidal waves; and the large wave caused by an earthquake is commonly so described. But the use of

the adjective ” tidal ” appears to us erroneous in this context, for the tide is a rising and falling of the water of the sea produced by the attraction of the sun and moon. A rise and fall of the sea produced by a regular alternation of day and night breezes, by regular rainfall and evaporation, or by any influence which the moon may have on the weather cannot strictly be called a tide. Such alterations may be inextricably involved with the rise and fall of the true astronomical tide, but we shall here distinguish them as meteorological tides. It is well known that there are strongly marked diurnal and semi-diurnal inequalities of the barometer due to the sun’s- heat, and they may be described as atmospheric meteorological tides. 1 These movements both in the case of the sea and in that of the atmosphere are the result of the action of the sun, as a radiating body, on the earth. True astronomical tides in the atmosphere would be Shown by a

1 Lord Kelvin shows that the attraction of the sun on these tides must produce an excessively small acceleration’ of the earth’s rotation. See Sociite de physiqut {September 1881), or Proc. Roy. Soc. Edin. (1881-1882), p. 396.

regular rise and fall in the barometer, but such tides are undoubtedly very minute, and we shall not discuss them in this article, merely referring the reader to the Micanique cileste of Laplace, bks. i. and xiii. We^”” shall in the present article extend the term ” tide ” to denote an elastic or viscous periodic deformation of a solid or viscous globe under the action of tide-generating forces.

§ 2. General Description of Tidal Phenomena}— If we live by the sea or oil an estuary, we see that the water rises and falls nearly twice a day; speaking more exactly, the. average interval from high-water to high-water is about i2 h 25™, so that the average retardation from day to day is about 50°*. The times of high- water are then found to bear an intimate relation with the moon’s position. Thus at Ipswich high-water occurs when the moon is nearly south, at London Bridge when it is south-west, and at Bristol

when it is east-south-east. For a very rough determination of the time of high-water it is sufficient to add the solar time of high-water on the days of new and full moon (called the ” establishment of the port “) to the time of the moon’s passage over the meridian, either visibly above or invisibly below the horizon. The interval between the moon’s variability passage over the meridian and high-water varies of interval sensibly with the moon’s age. From new moon to after Moon’s first quarter, and from full moon to third quarter Traasit - (or rather from and to a day later than each of these phases), the interval diminishes from its average to a minimum, and then increases again to the average; and in the other two quarters it increases from the average to a maximum, and then diminishes again to the average.

The range of the rise and fall of water is also subject to great variability. On the days after hew and full moon the range of tide is at its maximum, and on the day after the first and third quarter at its minimum. The maximum f^ a nf an is called “spring tide” and the minimum “neap tide,” and the range of spring tide is usually nearly three times as great as that of neap tide. At many ports, however, especially non-European ones, two Successive high-waters are of unequal heights, and the law of variability of the difference is somewhat complex; a statement of that law will be easier when we come to consider tidal theories. In considering any single oscillation of water level we find, especially in estuaries, that the interval from high to low- water is longer than that from low to high-water, and the difference between these two intervals is greater at springs than at neaps.

In a river the current continues to run up stream for some considerable time after high-water is attained and to run down similarly after low- water. Much confusion has been, occasioned by the indiscriminate use of the term ” tide ” to denote a tidal current and a rise of water, and it has often been incorrectly inferred that high-water must have been attained at the moment of cessation of the

upward current. The distinction between ” rising and falling ” and ” flowing and ebbing ” must be maintained in rivers, whilst it is Dfaanc< y 0B unnecessary at the seaboard. If we examine the of Rise and progress of the tide- wave up a river we find that high- Fall from water occurs at the sea earlier than higher up. If, F \ D v ^ ani for instance, on a certain day it is high-water at Margate at noon, it is high- water at Gravesend at a quarter past two, and at London Bridge a few minutes before three. The interval from low to high-water diminishes also as we go up the river; and at some distance up certain rivers— as, for example, the Severn — the rising water spreads over the flat sands in a roaring surf and travels up the river almost like a wall of wafer. This kind of sudden rise is called a " bore " 3 (q.v.). In other cases where the difference between the periods of rising and falling is considerable there are, in each high-water, two or three rises and falls. A double high-water exists at Southampton.

When an estuary contracts considerably, the range of tide becomes largely magnified as it narrows; for example, at the

- Founded on G. B. Airy’s ” Tides and Waves,” in Eney. MetroJ>.
- See a series of papers bearing on this kind of wave by Sir W,. Thomson (Lord Kelvin) in Phil. Mag. (1886-1887).

River Tides.

Wind.

entrance of the Bristol Channel the range of spring tides is about 18 ft., and at Chepstow about 50 ft. This augmentation Augments- of tne nei g ht °* t ne tide-wave is due to the concen- Hoaat tration of the energy of motion of a large mass of Height la water

into a narrow space. At oceanic ports the estuaries. t ; dal ph enomena are m UC h less marked, the range of tide being usually only 2 or 3 ft., and the interval from high to low-water sensibly equal to that from low to high-water The changes from spring to neap tide and the relation of the time of high-water to the moon's transit are, however, the same both on the open coast and in rivers.

In long and narrow seas, such as the English Channel, the tide in mid-channel follows the same law as at a station near the mouth of a river, rising and falling in equaltimes; the current fated seas. runs m tne di rec ti°n analogous to up stream for three ' hours before and after high-water, and down stream for the same period before and after low- water. But near the sides of channels and near the mouths of bays the changes of the currents are very complex; and near the headlands separating two bays there is usually at certain times a very swift current, termed a " race."

In inland seas, such as the Mediterranean, the tides are nearly insensible except at the ends of long inlets. Thus at Malta the tides are not noticed by the ordinary observer, whilst at Venice they are conspicuous.

The effect of a strong wind on the height of tide is generally supposed to be strongly marked, especially in eetuaries. In the case of an exceptional gale, when the wind veered - round appropriately, Airy states 1 that the water has been known to depart from its predicted height at London by as much as 5 ft. The effect of wind 'will certainly be different at each port. The discrepancy of opinion on this subject appears to be great — so much so that we hear of some observers concluding that the effect of the wind is Atmospheric ; nsens ibi e Variations in barometric pressure also

Pressure. . , • ? .

cause departures from the predicted height 01 water, high barometer corresponding to decrease of height

of water. Roughly speaking, an inch of the mercury column will corre- spond to about a foot of water, but the effect seems to vary much at different ports. 2

Mariners and hydrographers make use of certain technical terms which we shall now define and explain.

The "establishment of the port," already referred to above, is the average interval which elapses between the moon's transit across _ . the meridian, at full moon and at change of moon, and

Technical ^ occurrence of high-wjater. Since at these, times the bv^aii" moon crosses the meridian at twelve o'clock either of oyaauors. ^^ Qr n ; g j lt) the "establishment'' is the hour of the clock of high-water at full and change.

It has already been remarked that spring tide occurs at most places a day or a day and a half after full and change of moon. Now it is more important in the theory of the tides to know what occurs at spring tide than what occurs at full and change of moon. Thus the term " the corrected establishment of the port " is used to denote the interval in hours elapsing at spring tide between moon's transit and high-water. The difference between the ordinary ahd the corrected establishments is of small amount. At any other state of the moon, except full and change, the " interval " or " lunitidal interval" means the interval between the moon's upper or lower transit and high-water. '

The average interval elapsing between full or change of moon and spring tide is called the " age of the tide " ; as already remarked this interval is commonly about a day or a day and, a half, but it may be twice as great in some places. The use of this term arises from the idea that spring tides are generated at some undefined place exactly at full or change of moon, and take an interval of time denoted the " age " to reach the place of observation. The term is not altogether satisfactory, since it

implies a theory, but it must be referred to as in general use.

The average height at spring tide between high and low-water marks is called ” the spring rise “; the similar height at neap tides is, however, called ” the neap range.” ” Neap rise ” is used tp mean the average height between high-water ot neap tides arid low-water of spring tides. Thus both at springs and neaps the term ” rise ” refers to the rise above the level of low- water at spring tide. French hydrographers call half the spring rise ” the unit of height.”

The “diurnal inequalijty “t of. tha tide denotes th,e-,faaj t|at successive high-waters and successive lpw^a’titrs mr unequajj to one another. In England the diurnal iiiequalify ‘scarcely ‘exists 1 .

The practice of the British admiralty is to refer’thelr. sdori*HWi and tide tables to ” mean low-water mark of ordinary sprmg^iSdesr 1 This datum is found by taking the mean of all the available obserya* tions of spring tides, excluding, however, from the mean any spring tides which may be considered abnormal. The admiralty datum is riot, then, susceptible of exact scientific definition ; but when it has once been fixed with reference to a bench-mark ashore it is expedient toadhere to it, by whatever process it was first fixed. 3

When new tidal stations are established in India the datum of reference has, since about 1885, been ” Indian low-water mark,” which is defined as being below mean sea-level by the sum of the semi-ranges of the tides Ms, Sj, Ki, O (see §§ 24, 25 on Harmonic Analysis below).

In ordinary .parlance sailors very commonly use the term ” tide ” when they mean what may be more accurately described as a tidal current.

§ 3. Tidal Observation: the Tide-gauge* — Tidal prediction is only possible when accurate

observations have been made of the phenomena; -to be predicted; and the like is true of ; verification aftef preSctioii. It was formerly thought sufficient to jtote the heights of the water at high and low-water, togetherwith the times of those events, a»d the larger part of the observations which exist are still of this character, but complete investigation of the .law of tidal oscillations demands that the height of the water should be measured at other times than at high and low- water.

With whatever degree of thoroughness it is proposed to observe the tides the procedure is much the same. The simplest sort ol observation is. to note the height of the water on a- .fue.noie, graduated staff fixed in the sea, with such allowance as may be possible for wave motion. It is, however, far preferable to sink a tube into the sea into which the water penetrates through small holes; and the wave motion is thus annulled. In the calm water inside the tube there lies a float, to which is attached a cord passing over a pulley and counterpoised at the end. The motion of the counterpoise against a scale is observed. In either case the observations may be made every hour, or the times and heights of high and low-water may be noted.

In more careful observations than those referred to above the tidal record is automatic and continuous and is derived by means of an instrument called a tide-gauge.

This gauge shquld be placed in a place where we may obtain a fair representation of the oscillation of the surrounding sea. T ~ such a site a well or tank is built on the. shore communi- cating by a channel with the sec at about 10 ft. below lowest low.water mark. In some cases an artificially constructed well may be dispensed with, where some lagoon or pool exists so near to the sea as to permit junction with the sea by means of a channel below low water mark. At any rate we suppose that Water is provided rising and falling with the tide, without much wave-motion. A cylindrical float, usually a hollow metallic box

or a block of greenheart wood, hangs and floats in the well, and is of such density as just to sink without support. The float hangs under very light tension by a platinum wire, or by a metallic ribbon, or" by a chain. The suspension wire is wrapped round a Wheel, and imparts to it rotation proportional to the rise and fall of tide; By a Simple gearing this wheel drives another, by which the range is reduced to any convenient extent. A fine wire wound on the final wheel of the train drags a pencil or pen up and down or to and fro proportionately to the tidal oscillations. The pencil is lightly pressed against a drum, which is driven by clockwork so as to make one revolution per day. The pen leaves its trace or tide-curve on paper wrapped round the drum. The paper is fixed to the drum with the edges of the paper at the XII o'clock line, and the record of a fortnight may be taken without change of paper. Art esarnple of a tide-curve for Apollo Bunder, Bombay, from the 1st to the 15th of January 1884, is shown in fig. 1.

The curves are. to be read from right to left, and when we reach the left-hand edge of the paper, we re-enter again at the same height on the right-hand edge. The numbers on the successive curves denote the days of the month.

We have chosen an example from a sub-tropical region because it illustrates the remarkable regularity of the tides in a region where the weather is equable. Further, if the reader will note the succes- sive high-waters or low-waters which follow one another on any one day, he will see a strongly marked " diurnal inequality," which would have been barely perceptible in a European tide-curve.

In Tide-gauge.

Airy, " Tides and Waves." ! Ibid. §§ 572-573.

'See J. I (1879)-

N. Shoolbred on datum levels, Brit. Assoc. Reports

§4. Tide-Tables and the Degree of Accuracy in Tidal Prediction. 1 — The connexion between the tides and the movements of the Empirical moon and sun is so obvious that tidal predictions Tide-tablet. were re gularly made and published long before mathematicians had devoted their attention to them; and these predictions attained considerable success, although they were founded on empirical methods. During the 18th century* and even in the earlier part of the 19th, the art of prediction was regarded as a valuable family secret to be jealously guardedtfrom the public. The best example of this kind of tide-table was afforded by Holden's tables for Liverpool, founded on twenty years of observation by a harbour-master named Hutchinson. 2

the heights and times are tabulated according to the hour of the clock at which the moon will cross the meridian at the place of observation, distinguishing between the visible and invisible transits. Certain simple corrections have also to be applied. A considerable degree of elaboration has to be given to the table, in order that it may give accurate results, and it would occupy some half-dozen to a dozen pages of a book, its extension varying according to the degree of accuracy aimed at. It might occupy about five minutes to extract a prediction from the more elaborate form of such a table. There are many ports of considerable commercial importance where, nevertheless, it would hardly be' worth while to incur the great and repeated

Fig. 1.-

-Tide-curve for Bombay from the beginning of the civil year 1884 to the midnight' ending] Jan. 14, Zero of : from 12° Dec. 31, 1,883; to I2 1 * Jan. 14, 1884, astronomical time. Gauge

1884, or f

About 1832 the researches of W. Whewell and of Sir John Lubbock (senior) pointed the way to improvement on the empirical tables prepared by secret methods, and since that time the preparation of tide-tables has become a branch of science. A perfect tide-table would tell the height of the water at the place of observation at every moment of the day, but such a Prediction table would be cumbrous; it is, therefore usual to tor each predict only the times and heights of high- water and of low-water. The best kind of tide-table contains

Day.

definite forecasts for each day of a definite year, and we may describe it as a special table. Although the table is only made for one definite place, yet it is often possible to give fairly accurate predictions for neighbouring ports by the application of corrections both for time and height. Special tide-tables are published by all civilized countries for theit most important harbours.

But there is another kind of table, which we may describe as a general one, where the heights and times are given by reference Predict! *° tne t ' me at wrj i cn tne m °on crosses the meridian. by Reference Although such a table is only applicable to a definite to Time of place, yet it holds good for all time. In this case it is Transit necessary to refer to the Nautical Almanac for the time of the moon's transit, and a simple calculation then gives the required .result. In a general • tide-table

1 References may be given to two papers by G. H. Darwin on this subject, viz. " Tidal Prediction," Phil. Trans., A. (1891) pp. 159-229; and " An apparatus for facilitating the reduction of tidal observa- tions," Proc. Roy. Soc. (1892), vol. lii. For a general account with- out mathematics see Darwin's Tides, &c. ; this section is founded on chs. xiii. and xiv. of that book. For mathematical methods see Maurice LeVy, Theorie des maries (Paris, 1898).

- *Whewell, History of Inductive Sciences,, ii, 248; Darwin's Tides, Sfc, ch. iv.*

loglcal Dis- turbance of Prediction.

expenditure involved in the publication of special tables. But this kind of elaborate general table has been used in few cases, 3 and the information furnished to mariners usually consists either of a full prediction for every day of a future year, or of a meagre statement as to the average rise and interval, which must generally be almost useless.

The success of tidal predictions varies much according to the place of observation. In stormy regions the errors are often considerable, and the utmost that can be expected of, a tide-table is that it shall be correct with a steady barometer and in palm weather. But such conditions are practically non-existent, and therefore errors are inevitable.

Notwithstanding these perturbations, tide-tables are usually of surprising accuracy even in northern latitudes ; this may be seen from the following table showing the results of com- .

parison between prediction and actuality at Portsmouth.™"'"'"'; The importance of the errors in height depends, of p^ r t sm0ll tii. course, on the range of the tide; it is well, therefore, to note that the average ranges of the tide at springs and neaps are 13 ft. 9 in. and 7 ft. 9 in. respectively. ,

Prediction at such a place as Portsmouth is difficult on account of the instability of the weather, but, on the other hand, the tides in themselves are remarkably simple in character. Let . .....*

us now turn to such a port as Aden, where the weather jJJJ ,"^ is very uniform, but the tides very complex on account /^den. of the large diurnal inequality, which frequently obliterates one of two successive high- waters. The snort, series oi

comparisons between actuality and, prediction which we give below may be taken as a fair example of what would hold, good when a long series is examined. The results refer to the intervals 10th of March to the 9th of April and the 1.2th of November to, the 12th of December 1884. -J n these two periods there should have been 118 high waters, but. the tide-gauge failed to register on one occasion,

s Darwin, " Tidal Prediction," quoted above. This kind of table has been applied with some success at Cairns in North Queensland, where there is a large diurnal inequality.

so that one comparison is lost. We thus have 117 cases to consider, but on one occasion the diurnal inequality obliterated a high- water, leaving 116 actual comparisons. The maximum range of the tide at Aden is 8 ft. 6 in., and this serves to give a standard of importance for the errors in height.

Table of Errors in the Prediction of High-Water at Portsmouth in the months of January, May and September 1897.

Time.

Height.

Magnitude of

Number of

Magnitude of

Number of

Error.

Cases.

Error.

Cases.

Inches.

0" to 5 m

69

to 6

89

6™ to io m

50

7 to 12

58

n m to I5 m

25

13 to 18

2 4

i6 m to 20 m

10

19 to 24

6

2I m to 25 m

11

—

—

26 m to 30 m

7

—

—

3 ,m to 35 m

4

—

—

52 m

1

—

—

I

177

■ —

177

Table of Errors in the Prediction of High-Water at Aden in March-

April and Novembe

r-DeCember 1884.

Time.

Height.

Magnitude of

Number of

Magnitude of

Number of

Error.

Cases.

Error.

Cases.

. Inches.

m to gm

35

15

5 m to lo ro

32

1

48

io m to i5 m

19

2

28

15™ to 20 m

19

3

14

20™ to 25 m

5

4

11

26 m and 28 1 ”

2

No high water.

1

33- and 36™

2

—

—

56™ and $7 m

2

—

»

No high water.

1

—

—

—

117

—

■”?’ ,.

It would be natural to think that when a prediction is erroneous by as much as fifty-seven minutes it is a very bad one, but such a conclusion may be unjust. There was one case in which the high- water was completely obliterated by the diurnal inequality, but there were many others in which there was nearly complete obliteration, so that the water stood nearly stagnant for several hours., A measure of the degree of stagnation is afforded by the amount of

rise from low to high-water. Now, on examining all the eleven cases where the error of time was equal to or over twenty minutes, we find five cases in which the range from low to high-water was less than 8 in., and these include the errors of fifty-six and of fifty-seven minutes. There is one case of a rise of 13 in. with an error of thirty-six minutes; one case of a rise of 17 in. with an error of twenty-two minutes; one of 19 in. rise with thirty-three minutes error. The remaining three cases have rises of 2 ft. 10 in., 3 ft. 9 in., 3 ft- 11 in., and errors of twenty-two, twenty-three, twenty minutes. Thus all the very large errors of time correspond with approximate stagnation, and are unimportant. It is fair to conclude, therefore, that the predic- tions as to time are very good. The predictions as to height are obviously good, for more than half were within 1 in., and only eleven had an error of as much as 4 in.

When it is considered that the. incessant variability of the tidal forces, the complex outlines of the coast, the depth of the sea, the earth's rotation and the perturbations by meteorological influences are all involved, it should be admitted that the success of tidal prediction is remarkable. If further evidence were needed, we might appeal to tidai prediction as a convincing proof of the truth of the theory of gravitation.

§ 5. General Explanation of the Cause of Tides. — The moon attracts every particle of the earth and ocean, and by the law of Tide- gravitation the force acting on any particle is directed

generating towards the moon's Centre, and is jointly proportional /;ortJM • to the masses of the particle and of the moon, and inversely proportional to the square of the distance between the particle and the moon's centre. If we imagine the earth and ocean subdivided into a number of small portions or particles of equal mass, then the average, both as to direction and intensity of the forces acting on these particles is equal to the force acting on that

particle which is at the earth's centre. For there is

symmetry about the line joining the centres of the two bodies, and, if we divide the earth into two portions by an ideal spherical surface passing through the earth's centre and having its centre at the moon, the portion remote from the moon is a little larger than the portion towards the moon, but the nearer portion is under the action of forces which are a little stronger than those acting on the farther portion, and the resultant of the weaker forces on the larger portion is exactly equal to the resultant of the stronger forces on the smaller. If every particle of the earth and ocean were being urged by equal and parallel forces there would be no cause for relative motion between the ocean and the earth. Hence it is the departure of the force acting on any particle from the average which constitutes the tide-generating force. Now it is obvious that on the side of the earth towards the moon the departure from the average is a small force directed towards the moon ; and on the side of the earth away.f rom the moon the depar- ture is a small force directed away from the moon. Also these two departures are very nearly equal to one another, that on the near side being so little greater than that on the other that we may neglect the excess. All round the sides of the earth along a great circle perpendicular to the line joining the moon and earth the departure is a force directed inwards towards the earth's centre. Thus we see that the tidal forces tend to pull the water towards and away from the moon, and to depress the water at right angles to that direction.

Fig. 2. — Tide-generating Force.

In fig. 2 this explanation is illustrated graphically. The relative magnitudes of the tidal forces are given by the numbers on the figure. M is the direction of the moon, V the centre of the. hemisphere of the earth at which the man in the moon would look, I the centre of the hemisphere which would be invisible to him, DD are the sides of the earth where the tidal force is directed towards the

earth's centre. The outward forces at V and I are exactly double the inward forces at D and D.

If it were permissible to neglect the earth's rotation and to consider the system as at rest, we should find that the water was in equilibrium when elongated into a prolate ellipsoidal or oval form with its longest axis directed towards and away from the moon.

But it must not be assumed that this would be the case when there is motion. For, suppose that the ocean consisted of a canal round the equator, and that an earthquake theory of or any other cause were to generate a great wave in Equatorial the canal, this wave would travel along it with Canal on a velocity dependent on the depth. If the canal Eartn ' were about 13 miles deep the velocity of the wave would be about 1000 miles an hour, and with depth about equal to the depth of our seas the velocity of the wave would be about half as great. We may conceive the moon's tide-generating force as making a wave in the canal and continually outstripping the wave it generates, for the moon travels along the equator at the rate of about 1000 miles an hour, and the sea is less than 13 miles deep. The resultant oscillation of the ocean must therefore be the summation of a series of partial waves generated at each instant by the moon and always falling behind her, and the aggregate wave, being the same at each

instant, must travel iooo m. an hour so as to keep up with the moon.

Now it is a general law of Motionless oscillation that, if a slowly varying periodic force acts on a system which would oscillate quickly if left to itself, the maximum excursion on one side of the equilibrium position occurs simultaneously with the maximum force in the direction of the excursion; but, if a quickly varying periodic force acts on a

system which would oscillate slowly if left to itself, the maximum excursion on one side of the equilibrium position occurs simultaneously with the maximum force in the direction opposite to that of the excursion. An example of the first is a ball hanging by a short string, which we push slowly to and fro; the ball will never quit contact with: the hand, and will agree with its excursions. If, however^ the ball is hanging by a long string we can play at battledore and shuttlecock with it, and it always meets our blows. The latter is the analogue of the tides, for a free wave in our shallow canal

goes slowly, whilst the moon's tide-generating inverted. act i° n 8 0es quickly. Hence when the system is left

to settle into steady oscillation it is low- water under and opposite to the moon, whilst the forces are such as to tend to make high-water at those times.

If in this case we consider the moon as revolving round the earth, the water assumes nearly the shape of an oblate spheroid or orange-shaped body with the shortest axis pointed to the moon. The rotation of the earth in the actual case introduces a complexity which it is not easy to unravel by general reasoning. We can see, however, that if water moves from a lower to a higher latitude it arrives at the higher latitude with more velocity from west to east than is appropriate t6 its latitude, and it will move accordingly on the eartli's surface. Following out this conception, we see that an oscillation of the water to and fro between south and north must be accompanied by an eddy. The solution of the difficult problem involved in working out this idea will be given below.

The conclusion at which we have arrived about the tides of an equatorial canal is probably more nearly true of the tides of a globe partially covered with land than if we were to suppose the ocean at each moment to assume the prolate figure of equili-brium. In fact, observation shows that it is more

nearly low- water than high-water when the moon is on the meridian. If we consider how the oscillation of the water would appear to an observer carried round with the earth, we see that he will have low-water twice in the lunar day, somewhere about the time when the moon is on the meridian, either above or below the horizon, and high- water half* way between the low waters.

If the sun be now introduced we have another similar tide of about half the height, and this depends on solar time, giving

low-water somewhere about noon and midnight. influence. The superposition of the two, modified by friction

and by the interference of land, gives the actually observed aggregate tide, and it is clear that about new and full moon we must have spring tides and at quarter moons neap tides, and that (the sum of the lunar and solar tide-generating forces being about three times their difference) the range of spring tide will be about three times that of neap tide.

So far we have supposed the luminaries to move on the equator; now let us consider the case where the moon is not

on the equator. It is clear in this case that at any

place the moon's zenith distance at the upper transit

is different from her nadir distance at the lower transit. But the tide-generating force is greater the smaller the zenith or nadir distance, and therefore the forces are different at successive transits.^ This was not the case when- the moon was deemed to move on the equator. Thus there is a tendency for two successive lunar tides to be of unequal heights, and the resulting inequality of height is called a " diurnal tide." This tendency vanishes when the moon is on the equator; and as this occurs each fortnight the lunar diurnal tide is

evanescent once a fortnight. Similarly in summer and winter the successive solar tides are generally of unequal height, whilst in spring and autumn this difference is inconspicuous.

Diurnal Tides.

One of the most remarkable conclusions of Laplace's theory of the tides, on a globe covered with ocean to a uniform depth, is that the diurnal tide is everywhere non-existent. By aafseea t But this hypothesis differs much from the reality, In Ocean qt and in fact at some ports, as for example Aden, Uniform the diurnal tide is so large that during two portions Dep< *' of each lunation there is only one great high-water and one great low- water in each twenty-four hours, whilst in other parts of the lunation the usual semi-diurnal tide is observed.

§ 6. Progress of the Tide-wave over the Ocean and in the British Seas. — Sufficient tidal data would give the state of the tide at every part of the world at the same instant of time, and if the tide wave is a progressive one, like such wave as we may observe travelling along a canal, we should be able to picture mehtally the motion of the tide- wave over the ocean and the successive changes in the height of water at any one place. But we are not even sure that the wave is progressive, for in some oceans, such as perhaps the Atlantic, the motion ma}? be only a see-saw about some line in mid-ocean— up on one side and down on the other; or it may more probably be partly a progressive wave and partly a see-saw or stationary oscillation. In contracted seas the wave is undoubtedly predominantly progressive in character, but too little is known to enable us to speak with any confidence as to wider seas.

Whewell and Airy, while acknowledging the uncertainty of their data, made the attempt to exhibit graphically the progress of the tide-wave over a large portion of the oceans of the world. In the first edition of this article (Ency. Brit., 9th ed.) we reproduced their chart. But, since doubts as

to its correct- ness have gradually accumulated, we think it more prudent to refrain from reproducing it again. 1

As we have already indicated, the tide in British seas has mainly a progressive character, and the general, march of the wave may be exhibited on a chart by what are called cotidal lines. If at the full and change of moon we draw lines on the sea through all the places which have high-water simultaneously, and if we mark such lines successively XII, I, II, &c, being the Greenwich time of high-water along each line, we shall have a succession of lines which show the progress of the wave from hour to hour.

For phases of the moon, other than full and change, the num- bers may be taken to represent the interval in hours after the moon's transit, either visible or invisible, until the occurrence of high water. But for these other phases of the moon the interval varies by as much as one hour in excess or defect of the number written on any of the lines. Thus when the moon is about five days old, or five days past full, the numbers must all be reduced by about one hour so that I, II, III, &c, will then be replaced by XII, I, II, &c; and when the moon is about ten days old, or ten days past full, the numbers must all be augmented by about one hour, and will read II, III, IV, &c. However, for a rough comprehension of the tides in these seas it is unnecessary to pay attention to this variation of, the intervals.

Airy in his " Tides and Waves " gives such a chart for Great Britain and the North Sea, and he attempts to complete the cotidal lines conjecturally across the North Sea to Norway, Denmark and the German coast. In this case, as in the more ambitious attempt referred to above, further knowledge has led to further doubt. We therefore give in fig. 3 Berghaus's modification of Airy's Chart, 2 abandoning the attempt to draw complete cotidal lines. In this chart we can watch, as it were, the tide-wave running in from the Atlantic, passing up the Bristol Channel and Irish Sea, travelling round

the north of Scotland and southward along the east coasts of Scotland and England. Another branch comes up the Channel, and meets the wave from the north off the Dutch coast. The Straits of Dover are so narrow, however, that it may be doubted whether

1 Portion of Airy's Chart (Encycl. Metrop., art. " Tides and Waves ") is given in Darwin, Tides and Kindred Phenomena in the Solar System.

- Berghaus's Physical Atlas (1891), pt. ii., " Hydrography."

the tides on the English coasts would be profoundly modified if the Straits were completely closed.

It will be noticed that between Yarmouth and Holland the cotidal lines cross one another. Such an intersection of lines is in general impossible; it is indeed only possible if there is a region in which the water neither rises nor falls, because at such a place the cotidal line ceases to have a definite meaning. A set of observations by Captain Hewitt, R.N., made in 1840, appears to prove the existence of a region of this kind at the part of the chart referred to.

Emery VxlkcrK.

(From Berghaui's Atlas.)

Fig. 3. — Cotidal Lines in British Seas.

§ 7. Historical Sketch. 1 — The writings of various Chinese, Arabic and Icelandic authors show that some attention was paid by them to the tides, but the several theories advanced are fantastic. It is natural that the writings of the classical authors of antiquity should contain but few references to the tides, for the Greeks and Romans lived on the shores of an almost tide- less sea. Nevertheless, Strabo quotes from Posidonius a clear account of the

tides on the Atlantic coast of Spain, and connects the tides correctly with the motion of the moon, He also gives the law of the tide in the Indian Ocean as observed by Seleucus the Babylonian, and the passage shows that Seleucus had unravelled the law which governs the diurnal inequality of the tide in that sea.

We shall not give any details as to the medieval speculations on the tides, but pass on at once to Newton, who in 1687 laid the foundation for all that has since been added to the theory of the tides when he brought his grand generalization of universal gravitation to bear on the subject.. Johann Kepler had indeed Kepler. at an ear ly date recognized the tendency of the water of the ocean to move towards the centres of the sun and moon, but he was unable to submit his theory to calculation. Galileo expresses regret that so acute a man as Kepler should have produced a theory which appeared to him to reintroduce the occult qualities of the ancient philosophers. His own explanation referred the phenomenon to the rotation and orbital motion of the earth, and he considered that it afforded a principal proof of the Copernican system.

In the 19th corollary of the 66th proposition of bk. i. of the

Principia, Sir Isaac Newton introduces the conception of a canal

circling the earth, and he considers the influence of

a satellite on the water in the canal. He remarks

that the movement of each molecule of fluid must be accelerated

in the conjunction and opposition of the satellite with the

1 The account from the time of Newton to that of Laplace is founded on Laplace's Mecanique cileste, bk. xiii. ch. i.

molecule, that is to say when the molecule, the earth's centre and the satellite are in a straight line, and retarded in the quadra- tures, that is to say when the line joining the molecule and the earth's centre is at right, angles to the line joining the earth's centre and the satellite. Accordingly the fluid must undergo a tidal oscillation. It is, however, in propositions 26 and 27 of bk. iii. that he first determines the tidal force due to the sun and moon. The sea is here supposed to cover the whole earth and to assume at each instant a figure of equilibrium, and the tide-generating bodies are supposed to move in the equator. Considering only the action of the sun, he assumes that the figure is an ellipsoid of revolution with its major axis directed towards the sun, and he determines the ellipticity of such an ellipsoid. High solar tide then occurs at noon and midnight, and low-tide at sunrise and sunset. The action of the moon produces a similar ellipsoid, but of greater ellipticity. The superposition of these ellipsoids gives the principal variations of the tide. He then proceeds to consider the influence of latitude on the height of tide, and to discuss other peculiarities of the phenomenon. Observation shows, however, that spring tides occur a day and a half after full and change of moon, and Newton falsely attributed this to the fact that the oscillations would last for some time if the attractions of the two bodies were to cease.

The Newtonian hypothesis, although it fails in the form which he gave to it, may still be made to represent the tides if the lunar and solar ellipsoids have their major axes always directed toward a fictitious moon and sun, pidus." which are respectively at constant distances from the true bodies; these distances are such that the full and change of the fictitious moon as illuminated by the fictitious sun occur about a day or a day and a half later than the true full and change of moon. In fact, the actual tides may be supposed to be generated directly by the action of the real sun and moon, and the wave may be imagined to take a day and

a half to arrive at the port of observation. This period has accordingly been called ” the age of the tide.” In what precedes the sun and moon have been supposed ‘ to move in the equator; but the theory of the two ellipsoids cannot be reconciled with the truth when they move, as in actuality, in orbits inclined to the equator. At equatorial ports the theory of the ellipsoids would at spring tides give morning and evening high waters of nearly equal height, whatever the declinations of the bodies. But at a port in any other latitude these high waters would be of very different heights, and at Brest, for example, when the declinations of the bodies are equal to the obliquity of the elliptic, the evening tide would be eight times as great as the morning tide. Now observation shows that at this port the two tides are nearly equal to one another, and that their greatest difference is not a thirtieth of their sum. Newton here also offered an erroneous explanation of the phenomenon.

In 1738 the Academy of Sciences of Paris offered, as a subject for a prize, the theory of the tides. The authors of four essays received prizes, viz. Daniel Bernoulli, Leonhard Euler, Colin Maclaurin and Antoine Cavalleri. The first

three adopted not only the theory of gravitation, but also Newton’s method of the superposition of the two ellipsoids. Bernoulli’s essay contained an extended development of the conception of the two ellipsoids, and, under the name of the equilibrium theory, it is commonly associated with his name. Laplace gives an account and critique of the essays of Bernoulli and Euler in the MScanique cileste. The essay of Maclaurin presented little that was new in tidal theory, but is notable as containing certain important theorems concerning the attraction of ellipsoids. In 1746 Jean-le-Rond D’Alembert wrote a paper in which he treated the tides of the atmosphere; but this work, like Maclaurin’s, is

chiefly remarkable for the importance of collateral points;

The theory of the tidal movements of an ocean was therefore, as Laplace remarks, almost untouched when in 1774 he first undertook the subject. In the Mtcanique cileste he gives an

interesting account of the manner in which he was led to attack the problem. We shall give below the investigation of the tides of an ocean covering the whole earth; the theory is substantially Laplace's, although presented in a dif- ferent form, and embodying an important extension of Laplace's work by S. S. Hough. This theory, although very wide, is far from representing the tides of our ports. Observation shows, in fact, that the irregular distribution of land and water and the various depths of the ocean in various places produce irregu- larities in the oscillations of the sea of such complexity that the rigorous solution of the problem is altogether beyond the power of analysis. Laplace, however, rested his discussion of tidal observation on this principle — The state of oscillation of a system of bodies in which the primitive conditions of movement have disappeared through friction is coperiodic with the forces acting on the system. Hence if the sea is acted on by forces which vary Principle of periodically according to the law of simple oscilla- Forccd tions (a simple time-harmonic), the oscillation of Osciiia- the sea will have exactly the same period, but the tions. moment at which high-water will occur at any

place and the amplitude of the oscillation can only be de- rived from observation. Now the tidal forces due to the moon and sun may be analysed into a number of constituent periodic parts of accurately

determinable periods, and each of these will generate a corresponding oscillation of the sea of unknown amplitude and phase. These amplitudes and phases may be found from observation. But Laplace also used another prin ciple, by which he was enabled to effect a synthesis of the various oscillations, so that he does not discuss a very large number of these constituent oscillations. As, however, it is impossible to give a full account of Laplace's methods without recourse to technical language, it must suffice to state here that this procedure enabled him to discuss the tides at any port by means of a combination of theory with observation. After the time of Laplace down to 1870, the most important workers in this field were Sir John Lubbock (senior), William Whewell Lubbock, an(l Sir G. B. Airy. The work of Lubbock and Whewell Whewell (see § 33 below) is chiefly remarkable for and Airy. t he co-ordination and analysis of enormous masses of data at various ports, and the construction of trustworthy tide-tables and the attempt to construct cotidal maps. Airy contributed an important review of the whole tidal theory. He also studied profoundly the theory of waves in canals, and explained the effects of frictional resistance on the progress of tidal and other waves.*

The comparison between tidal theory and tidal observations has been carried out in two ways which we may describe as the synthetic and the analytic methods. Nature is herself synthetic, since at any one time and place we only observe one single tide-wave. All the great investigators from Newton down to Airy have also bee'n synthetic in their treatment, for they have sought to represent the oscillation of the sea by a single mathematical expression, as will appear more fully in chapter V. below. It is true that a presupposed analysis lay behind and afforded the basis of the synthesis. But when at length tide-gauges, giving continuous records, were set up in many places the amount of data to be co-ordinated was enor- mously increased, and it was found that the simple formulae previously in use had to be overloaded with a multitude of

corrections, so that the simplicity became altogether Kelvin. fi ct i t i ous . This state of matters at length led Lord Kelvin (then Sir William Thomson) to suggest, about 1870, the analytic method, in which the attempt at mathematical synthesis is frankly abandoned and the complex whole is re- presented as the sum of a large number of separate parts, each being a perfectly simple wave or harmonic oscillation. All the best modern tidal work is carried on by the analytic method, of which we give an account below in chapter IV.

Lord Kelvin's other contributions to tidal theory are also of profound importance; in particular we may mention that he established the correctness of Laplace's procedure in discussing the dynamical theory of the tides of : an ocean covering the whole

earth, which had been impugned by Airy and by William Ferrel. We shall have frequent occasion to refer to his name hereafter in the technical part of this article.

Amongst all the grand work which has been bestowed on the theory of this difficult subject, Newton, notwithstanding his errors, stands out first, and next to him we must rank Laplace. However original any future contribution to the science of the tides may be, it would seem as though it must perforce be based on the work of these two.

§ 8. The Tide- Predicting Instrument. — In the field of the practical application of theory Lord Kelvin also made another contribution of the greatest interest, when in 1872 he Tide- suggested that the laborious task of constructing a. Predicting tide- table might be effected mechanically. Edward Iastrumeat - Roberts bore a very important part in the first practical realization of such a machine, and a tide-predictor now in regular use at the National Physical Laboratory for the Indian government was constructed by Lege, under his' direction. We refer the reader to Sir William Thomson's (Lord Kelvin's) paper on ' Tidal Instruments" in Inst. C.E., vol. lxv., and to. the

sub: sequent discussion, for a full account and for details of the share borne by the various persons concerned in the realization oiE the idea.

Fig. 4 illustrates diagrammatically the nature of the instrument. A cord passes oyer and under a succession of pulleys, every other pulley being fixed or rather balanced and the alternate ones being movable; the cord is fixed &t one end and carries a pen or pencil at the other end. In the diagram there are two balanced pulleys and one movable one; a second unit would require one more movable pulley and one fnore balanced one. If, in our diagram, the lowest or movable pulley were made to oscillate up and down (with a simple har- monic motion), the pencil would execute the same motion on half the linear scale. If the instru- ment possessed two units and the second movable pulley also rocked up and down, the pencil would add to its previous motion that of this second oscillation, again on half scale. So also if there were any number of additional units, each consisting of one movable and one balanced pulley, the pencil would add together all the separate simple oscillations, and would draw a curve upon a drum, which is supposed to be kept revolving uniformly' at an appropriate rate.

The rocking motion is communicated to each movable pulley by means of a pin attached to a wheel C sliding in a slot attached to the pulley frame. All the wheels C and the drum are geared together so that, as the drum turns, all the movable pulleys rock up and down. The gearing is of such a nature that if one revolution of the drum represents a single day, the rocking motion of each movable pulley corresponds to one of the simple constituent oscilla- tions or tides into which the aggregate tide-wave is analysed. The nature of the gearing is determined by theoretical considerations derived from the motions of the sun and moon and earth, but the throw of each crank, and the angle at which it has to be set at the start are derived from observation at the particular port for which the tide-curve is required. When the tide-predictor has been set appropriately, it will run off a complete

tide-curve for a whole year; the curve is subsequently measured and the heights and times of high and low-water are tabulated and published for a year or two in advance.

The Indian instrument possesses about 20 units, so that the tide- curve is regarded as being the sum of 20 different simple tides; and tide-tables are published for 40 Indian and Oriental ports. A tide-predictor has been constructed for the French government under the supervision of Lord Kelvin and is in use at Paris; another has been made by the United States Coast Survey at Washington ; in 1910 one was under construction for the Brazilian government. These instruments, although differing considerably in detail, from the Indian predictor, are essentially the same in principle.

§ 9. Tidal Friction.— All solid bodies yield more or less to stress; if they are perfectly elastic they regain their shapes after the stresses are removed, if imperfectly elastic or viscous they yield to the stresses. We may thus feel certain that the earth yields fo ; tide-generating for.ee, either with perfect or imperfect elasticity. Chapter VIII. will contain some discussion of this

Fig. 4. — Tide-Predicting Instrument.

ot Tidal Friction.

iubject, and it must suffice to say here, that the measurement of the minute elastic tides of the solid earth has at length been achieved. The results recently obtained by Dr 0. Hecker at Potsdam constitute a conspicuous advance on all the previous attempts.

The tides of an imperfectly elastic or viscous globe are ob- viously subject to frictional resistance, and the like is true of the tides of an actual ocean. In either case it is clear that the system

must be losing energy, and this leads to results of so much general interest that we propose to give a short sketch of the subject, deferring to chapter VIII. a more rigorous investiga- tion. It is unfortunately impossible to give even an outline of the principles involved without the use of some technical terms:

In fig. 5 the paper is supposed to be the plane of the orbit of a satellite M revolving in the direction of the arrow about the planet C, fl neral which rotates in the direction of the arrow about an

Bxolanatlon ax ' s P er P en dicular to the paper. The rotation of the planet is supposed to be more rapid than that of the satellite, so that the day is shorter than the month. Let us suppose that the planet is either entirely fluid, or has an ocean of such depth that it is high-water under or nearly under the satellite. When there is no friction, with the satellite at m, the planet is elongated into the ellipsoidal shape shown, cutting the mean sphere, which is dotted. The tidal protuberances

*are drawn with much ex- aggeration and the satellite is shown as very close to the planet in order to illus- trate the principle more clearly. Now, when there is friction in the fluid motion, the tide is retarded, and high-tide occurs after the satellite has passed the meridian. Then, if we keep the same figure to represent the tidal deformation, the satellite must be at M, instead of at m. If we number the four quadrants as shown, the satellite must ** IG- 5- be in quadrant I. The*

protuberance P is nearer to the satellite than P', and the defi- ciency Q is farther away than the deficiency Q'. Hence the resultant action of the planet on the satellite must be in some such direction as MN. The action of the satellite on the planet is equal and opposite, and the force in NM, not being through the planet's centre, must produce a retarding couple on the planet's rotation, the magnitude of which depends on the length of the arm CN T . This tidal frictional couple varies as the

height of the tide, and as the satellite's distance. The magnitude of the tidal pro- tuberances varies inversely as the cube of the distance of the satellite, and the difference between the attrac- tions of the satellite on the nearer and farther pro- tuberances also varies inversely as the cube of the Accordingly the tidal frictional couple varies as the inverse sixth power of the satellite's distance. Let us now consider its effect on the satellite. If the force acting on M be resolved along and perpendicular to the direction CM, the perpendicular component tends to accelerate the satellite's velocity. It alone would carry the satellite farther from C than it would be dragged back by the central force towards C. The satellite would describe a spiral, the coils of which would be very nearly circular and very nearly coincident. If now we resolve the central component force along CM tangentially and perpendicular to the spiral, the tangential component tends to retard the velocity of the satellite, whereas the disturbing force, already considered, tends to accelerate it. With the gravitational law of force between the two bodies the retardation must prevail over the acceleration. 1 The action of tidal friction may appear somewhat paradoxical, but it is the exact converse of the acceleration of the linear and angular velocity and the diminution of distance of a satellite moving through a resisting medium. The latter result is generally more familiar than the action of tidal friction, and it may help the reader to realize the result in the present case. Tidal friction then diminishes planetary rotation, increases the satellite's distance and diminishes the orbital angular velocity. The comparative rate of diminution of the two angular velocities is generally very different. If the satellite be close to the planet the rate of increase of the satellite's periodic time or month is large compared with the rate of increase of the period of planetary rotation or day ; but if the satellite is far off the converse is true. Hence, if the satellite starts very near the planet, with the month a little longer than the day, as the satellite

‘ This way of presenting the action of tidal friction is due to Sir George G. Stokes.

Plaoel’s Rotation Retarded.

distance.

Satellite’s

Velocity

Retarded.

recedes, the month soon increases so that it contains many days. The number of days in the month attains a maximum and then diminishes. Finally the two angular velocities subside to a second identity, the day and month being identical and both very long.

We have supposed that the ocean is of such depth that the tides are direct; if, however, they are inverted, with low-water under or nearly under the satellite, friction, instead of retarding, accelerates the tide ; and it would be easy by drawing another figure to see that the whole of the above conclusions would hold equally true with inverted tides.

Attempts have been made to estimate the actual amount of the retardation of the earth’s rotation, but without much success. It must be clear from the sketch just given that the effect of tidal friction is that the angular motion of the moon round the earth is retarded, but not to so great an extent as the earth’s rotation. Thus a terrestrial observer, who regards the earth as a perfect time- keeper, would look on the real retardation of the moon’s angular motion as being an acceleration. Now there is a true acceleration of the moon’s angular motion which depends on a slow change in the eccentricity of the earth’s orbit round the sun. After many thou- sands of years this acceleration will be reversed and it will become a retardation, but it will continue for a long time from now into the future; thus it is indistinguishable to us at present from a

permanent acceleration. The amount of this true acceleration maybe derived from the theories of the motions of the moon and of the earth when correctly developed. Laplace conceived that its observed amount was fully explained in this way, but John Couch Adams showed that Laplace had made a mistake and had only accounted for half of it. It thus appeared that there was an unexplained portion which might be only apparent and might be attributed to the effects of tidal friction.

The time and place of an eclipse of the sun depend on the motions of the moon and earth. Accordingly the records of ancient eclipses, which occurred centuries before the Christian era, afford exceedingly delicate tests of the motions of the moon and earth. At the time when Thomson and Tait's Natural Philosophy 2 was first published it was thought that all the numerical data were known with sufficient precision to render it possible to give a numerical estimate of the retardation of the earth's rotation. But the various revisions of the lunar theory which have been made since that date throw the whole matter into doubt. It seems probable that there is some portion of the acceleration of the moon's motion which is unexplained by gravitation, and may therefore be attributed to tidal friction, but its amount is uncertain. We can only say that the amount is very small. It is, however, not impossible that this smallness may be due to counteracting influences which tend to augment the speed of the earth's rotation; such an augmentation would result from shrinkage of the earth's mass through cooling. However this matter may stand, it does not follow that, because the changes produced by tidal friction in a man's lifetime or in many generations of man are almost insensible, the same must be true when we deal with millions of years. It follows that it is desirable to trace the effects of tidal friction back to their beginnings.

We have seen above that this cause will explain the repulsion of a satellite from a position close to the planet to a more remote distance. Now when we apply these considerations to the moon and earth we

find that the moon must once have been nearly in contact with the earth. This very remarkable initial configura- tion of the two bodies seems to point to the origin of the moon by detachment from the earth.

Further details concerning this speculation in cosmogony are given below in chapter VIII. 3

8 10. Bibliography. — Many works on popular astronomy contain a few paragraphs on the tides, but the treatment is generally so meagre as to afford no adequate idea of the whole subject.

A complete list of works both general and technical bearing on the theory of the tides, from the time of Newton down to 1 88 1, is contained in vol. ii. of the Bibliographic de I'astronomie by J. C. Houzeau and A. Lancaster (1882). This list does not contain papers on the tides of particular ports, and we are not aware of the existence of any catalogue of works on practical observation, reduction of observations, prediction and tidal instruments. The only general work on the tides, without mathematics, is George Darwin's Tides and Kindred Phenomena in the Solar System. This book treats of all the subjects considered in the present article (with references to original sources), and also others such as seiches (q.v.) and the borefg.n.).*

The most extensive monograph on the tides is A Manual of Tides by Mr Rollin A. Harris, published by the United States Coast Survey in a series of parts, of which pt. i. appeared in 1897, and pt. iv.

1 See that work (ed. 1883), § 830; P. H. Cowell, M. N. R. Ast. Soc. (1905), lxv. 861.

3 For a discussion of the subject without mathematics, see G. H. Darwin's Tides.

4 London (1898) and with important changes (1901, 191 1); (Boston, 1898); translations: German, by A. Pockels (Leipzig, 1902, 1911); Italian, by G. Magrini (Turin, 1905), with appendices by translator; Magyar, by Rad6 von KSvesligethy

(Budapest, 1904) , with appendices by translator.

B in 1904. This work contains an enormous mass of useful work, and gives not only complete technical developments both on the theoretical and practical sides but also has chapters of general interest. The present writer feels it his duty, however, to dissent from Mr Harris's courageous attempt to construct the cotidal lines of the various oceans.

This work contains the most complete account of the history of tidal theories of which we know. Laplace's admirable history of the subject down to his own time has been summarized in § 7. Dr Giovanni Magrini has an appendix to his translation of Darwin's book, entitled La Conoscensa de.Ua marca nell'antichitct, founded on the researches of Dr Roberto Almagia. Dr Almagia himself gives the results of his researches more fully in a memoir, presented to the Accademia dei Lincei of Rome (5th series, vol. v. fascic. x.,

1905, 137 PP)- . .

Another monograph on tides, treating especially the mathematical developments, is Maurice Levy's La Theorie des marees (Paris, 1898). Colonel Baird's Manual of Tidal Observation (1886) contains instructions for the installation of tide-gauges, and auxiliary tables for harmonic analysis. Airy's article on " Tides and Waves " in the Ency. Metrop., although superseded in many respects, still remains important. Harris's Manual contains a great collection of results of tidal observations made at ports all over the world.

The article " Die Bewegung der Hydrosphare " in the Encyklopddie der mathematischen Wissenschaften (vi. I, 1908) gives a technical account of the subject, with copious references. The same article is given in English in vol. iv. (191 1) of G. H. Darwin's

collected Scientific Papers; and vols. i. and ii. contain reprints of the several papers by the same author referred to in the present article.

Since the date of the 9th edition of the Ency. Brit, some technical discussion of the tides has appeared in textbooks, such as H. Lamb's Hydrodynamics. 1 That work also reproduces in more modern form Airy's investigation of the effects of friction on the tides of rivers. We are thus able to abridge the present article, but we shall present the extension by Hough of Laplace's theory of the tides of an ocean- covered planet, which is still only to be found in the original

memoirs.

II.— Tide-Generating Forces

§11. Investigations of Tide-Generating Potential and Forces. — We have already given a general explanation of the nature of Tide- tide-generating forces; we now proceed to a rigorous

Generating investigation. If a planet is attended by a single Forces. satellite, the motion of any body relatively to the planet's surface is found by the process described as reduc- ing the planet's centre to rest. The planet's centre will be at rest if every body in the system has impressed on it a velocity equal and opposite to that of the planet's centre; and this is accomplished by impressing on every body an acceleration equal and opposite to that of the planet's centre.

Let M, m be the masses of the planet and the satellite; r the radius vector of the satellite, measured from the planet's centre; p the radius vector, measured from same point, of the particle whose motion we wish to determine; and z the angle between r and p. The satellite moves in an elliptic orbit about the planet, and the acceleration relatively to the planet's centre of the satellite is (M+m)/r 2 towards the planet along the radius vector r. Now the centre of inertia of the planet

and satellite remains fixed in space, and the centre of the planet describes an orbit round that centre of inertia similar to that described by the satellite round the planet but with linear dimensions reduced in the proportion of m to M+m. Hence the acceleration of the planet's centre is »t/ r 2 towards the centre of inertia of the two bodies. Thus, in order to reduce the planet's centre to rest, we apply to every particle of the system an acceleration »i/r 2 parallel to r, and directed from satellite to planet.

Now take a set of rectangular axes fixed in the planet, and let Mir, M 2 r, M 3 r be the co-ordinates of the satellite referred thereto; and let £p, r/p, fp be the co-ordinates of the particle P whose radius vector is p. Then the component accelerations for reducing the planet's centre to rest are -wMi/r 1 , — wMj/r 2 , -wMj/i; and since these are the differential coefficients with respect to pj, pij, p£ of the function*

and since cos z^Mif+Mjij-f-Ma} - , it follows that the potential of the forces by which the planet's centre is to be reduced to rest is

1 The theory as presented in the Mecanique c&leste is unnecessarily difficult, and was much criticized by Airy. Before the publication of the 9th and 10th editions of the Ency. Brit, it was necessary for the student to read a number of controversial papers published all over the world in order to get at the matter.

Now let us consider the other forces acting on the particle. The planet is spheroidal, and therefore does not attract equally in all directions; but in this investigation we may make abstraction of the ellipticity of the planet and of the ellipticity of the ocean due to the planetary rotation. This, which we set aside, is considered in the theories of gravity and of the figures of planets. Outside its body, then, the planet contributes forces of which the potential is M/p. Next the direct attraction of the satellite contributes forces of which the

potential is the mass of the satellite divided by the distance between the point P and the satellite ; this is

V{r 2 + p 2 — 2rp cos z\

To determine the forces from this potential we regard p and z as the variables for differentiation, and we may add to this potential any constant we please. As we are seeking to find the forces which urge P relatively to M, we add such a constant as will make the whole potential at the planet's centre zero, and thus we take as the potential of the forces due to the attraction of the satellite

m

r'

V [t* + p 2 — 2rp cos~z\

It Is obvious that in the case to be considered r is very large compared with p, and we may therefore expand this in powers of pjr. This expansion gives us

7i^ + ^ + F>. + ---!'

where Pi = cos z, . Pj = |. cos 2 z — J, P 3 = § cos 5 z — § cos z, &c. The reader familiar with spherical harmonic analysis of course recognizes the zonal harmonic functions; but the result for a few terms, which is all that is necessary, is easily obtainable by simple algebra.

Now, collecting together the various contributions to the potential,

and noticing that — • -P 1 = ^ cos z, and is therefore equal and

opposite to the potential by which the planet's centre was reduced to rest, we have as the potential of the forces acting on a particle whose co-ordinates are p£, ptj, pf

M . mp* f

■~-t^r(|co#jJ-i)+ 2jS-(4 cos’s-* cos z) + .-.. (1)

The first term of (1) is the potential of gravity, and the terms of the series, of which two only are written, constitute the tide-generating potential. In all practical applications this series converges so rapidly that the first term is amply suffi- cient, and thus we shall generally denote

F=pp 2 (cos 2 z-l)

(2)

as the tide-generating potential. 2

At the surface of the earth p is equal to a the earth’s radius.

§ 12. Form of Equilibrium. — Consider the shape assumed by an ocean of density a, on a planet of mass M , density & and radius a, when acted on by disturbing forces whose potential is a solid spherical harmonic of degree t, the planet not being in rotation.

If Si denotes a surface spherical harmonic of order i, such a potential is given at the point whose radius vector is p by

In the case considered in § n, i = 2 and Sj becomes the second zonal harmonic cos 2 z — §.

The theory of harmonic analysis tells us that the form of the ocean, when in equilibrium, must be given by the equation

P = a+eiSj. (4)

Our problem is to evaluate et. We know that the external potential of a layer of matter, of depth etSi and density a, has the value

\ir

5*T~

5©’

dSi.

Hence the whole potential externally to the planet and up to its surface is

M , 3ma? /p\ ’’ ~ , 4T

«iSi.

(5)

The first and most important term is the potential of the planet, the second that of the disturbing force, and the third that of the departure from sphericity.

Since the ocean must stand in a level surface, the expression (5) equated to a constant must be another form of (4). Hence, if we put p=a-{-eiSi in the first term of (5) and p = a in the second and third terms, (5) must be constant ; this can only be the case if the

2 The reader may refer to Thomson and Tait’s Natural Philosophy (1883), pt. ii. §§ 798-821, for further considerations on this and analogous subjects, together with some interesting examples.

coefficient of Si vanishes. Hence on effecting these substitutions and equating that coefficient to zero, we find

But by the definitions of 6 and a we have M^irSa’ — ga 1 , where j is gravity, and therefore

- 3 wa i

e^—JMTl (6)

3°-

(2*+i)8 In the particular case considered in § 1 1 we therefore have

as the equation to the equilibrium tide under the potential F = p>'(cos' Z -i).

If a were very small compared with 5 the attraction of the water on itself would be very small compared with that of the planet on

the water; hence we see in the general case that i/ 1 1 — -'jf.w)

is the factor by which the mutual gravitation of the ocean augments the deformation due to the external forces. This factor will occur frequently hereafter, and therefore for brevity we write

(8)

and we may put (6) in the form

3*

(2*+l)J'

_ 3mfl\

(9)

2gr 3 bi Comparison with (5) then shows that

V=gb i (^y ei S i (10)

is the potential of the disturbing forces under which

p=a+eiSi (11)

is a figure of equilibrium.

We are thus provided with a convenient method of specifying any disturbing force by means of the figure of equilibrium which it is competent to maintain. In considering the dynamical theory of the tides on an ocean-covered planet, we shall specify the disturb- ing forces in the manner expressed by (10) and (11). This way of specifying a disturbing force is equally exact whether or not we choose to include the effects of the mutual attraction of the ocean. If the augmentation due to mutual attraction of the water is not included, 6,- becomes equal to unity ; there is no longer any necessity to use spherical harmonic analysis, and we see that if the equation to the surface of an ocean be 1 p = a+S,

where 5 is a function of latitude and longitude, it is in equilibrium under forces due to a potential whose value at the surface of the sphere (where p = a) is gS.

In treating the theory of tidal observation we shall specify the tide-generating forces in this way, and then by means of ” the principle of forced vibrations,” referred to in § 7 as used by Laplace for discussing the actual oscillations of the sea, we shall pass to the actual tides at the port of observation.

In this equilibrium theory it is assumed that the figure of the ocean is at each instant one of equilibrium under the action of gravity and Effect of °^ tne tide-generating forces. Lord Kelvin has,

how- Lsmd in ever > reasserted 1 a point which was known to Bernoulli, Ea BJbrkim^* nas since been overlooked, namely, that this law ZV 1 of rise and fall of water cannot, when portions of the

'ory. gi be are continents, be satisfied by a constant volume of water in the ocean. The necessary correction to the theory depends on the distribution of land and sea, but a numerical solution shows that it is practically of very small amount.

§ 13. Development of Tide-generating Potential in Terms of Hour- Angle and Declination.— We now proceed to develop the tide generating potential, and shall of course implicitly (§ 12) determine the equation to the equilibrium figure.

We have already seen that, if z be the moon's zenith distance at the point P on the earth's surface, whose co-ordinates referred to A, B, C, axes fixed in the earth, and a£, art, af, cos « = £Mi+i»Mj-ffM«, where Mi, Ms, M» are the moon's direction eosines referred to the same axes. Then, with this value of cos 2,

cos's — i =2$ijMiM 2 + 2-

,,. e , +i»'-|2£ < M 1 '+M,'-2M,'

+ ' 3 3

(12)

1 Thomson and Tait, Nat. Phil. § 807. G. H. Darwin and H. H Turner, Proc. Roy. Soc. (1886).

The axis of C is taken as the polar axis, and AB is the equatorial plane, so that the functions of {, 1;, £ are functions of the latitude and longitude of the point P, at which we wish to find the potential

The functions of Mi, M2, M3 depend on the moon's position and we shall have occasion to develop them in two different ways— first in terms of her hour-angle and declination, and secondly (§ 25) in terms of her longitude and the elements of the orbit.

Now let A be on the equator in the meridian of P, and B 90° east of A on the equator. Then, if M be the moon, the inclination of the plane MC to the plane CA is the moon's easterly local hour-angle. Let fto = Greenwich westward hour-angle; / = the west longitude of the place of observation; X = the latitude of the place; 6 = moon's declination : then we have

Mi = cos 6 cos (Ao— I), M 2 = —cos Ssin(ho—l), M s = sin &, £ = cos X, i) = o, f = sin X. Also the radius vector of the place of observation on the earth's surface is a. Whence we find

V**- — j- j icos 2 Xcos ! 6cos 2(ho — I) + sin 2X sin 5 cos 5 cos (ho — I)

-r-I(|-sin 2 S)(J-sin J X) |

(13)

The tide-generating forces are found by the rates of variation of V for latitude and longitude,' and also for radius o, if we care to find the radial disturbing force.

The westward component of the tide-generating force at the earth's surface, where p = a, is dV/a cos X

If we consider the motion of a pendulum-bob under the influence of these forces during any one day, we see that in consequence of the semi-diurnal changes of level it twice describes an ellipse with major axis east and west, and the formula when developed shows that the ratio of axes is equal to the sine of the latitude, and the linear dimensions proportional to cos* i. It describes once a day ah ellipse whose north and south axis is proportional to sin 25 cos 2X and whose east and west axis is proportional to sin 28 sin X. Obvi- ously the latter is circular in latitude 30 . When the moon is on the equator, the maximum deflexion occurs when the moon's local hour-angle is 45 , and is then equal to

3j£/£) 3 cosX . 2M\r)

This angle is equal to 0‘0I74" cos X. Attempts actually to measure the deflexion of the vertical have at length proved successful (see Seismometer).

III. — Dynamical Theory of the Tides

§ 14. Recent Advances in the Dynamical Theory of the Tides. — The problem of the tidal oscillation of the sea is essentially dynamical. In two papers in the second volume of Liouville’s Journal (1896) H. Poincare has considered the mathematical principles involved in the problem, where the ocean is inter- rupted by land as in actuality. He has not sought to obtain nuhierical results applicable to any given configuration of land and sea, but he has aimed rather at pointing out methods by which it may some day be possible to obtain such solutions.

Even when the ocean is taken as covering the whole earth the problem presents formidable difficulties, and this is the only case in which it has been solved hitherto. 2

Laplace gives the solution in bks. i. and iv. of the Micanique celeste; but his work is unnecessarily complicated. In the 9th edition of the Ency. Brit, we gave Laplace’s theory without these complications, but the theory is now accessible in H. Lamb’s Hydrodynamics and other works of the kind. It is therefore not reproduced here.

In 1897 and 1898 S. S. Hough undertook an important revision of Laplace’s theory and succeeded not only in intro- ducing the effects of the mutual gravitation of the ocean, but

s Lord Kelvin’s (Sir W: Thomson’s) paper on the gravitational oscillations of rotating water, Phil. Mag. (October 1880), bears on this subject. It is the only attempt to obtain numerical results in respect to the effect of the earth’s rotation on the oscillations of land-locked seas.

also in determining the nature and periods of the free oscil- lations of the sea. 1 A dynamical problem of this character cannot be regarded as fully solved unless we are able not only to discuss the ” forced ” oscillations of the system but also the ” free.” Hence we regard Mr Hough’s work as the most important contribution to the dynamical theory of the tides since the time of Laplace. We shall accordingly present the theory briefly in the form due to Mr Hough.

The analysis is more complex than that of Laplace, where the mutual attraction of the ocean was neglected, but this was perhaps inevitable. Our first task is to form the equations of motion and continuity, which will be equally applicable to all forms of the theory. •

§ 15. Equations of Motion. — Let r, 0, be the radius vector, colatitude and east longitude of a point with reference to an origin, a polar axis and a zero-meridian rotating with a uniform angular velocity n from west to east. Then if R, H, S be the radial, colati- tudinal and longitudinal accelerations of the point, we have

R =

dt-‘

a ~r dt\ r dt)

sinty (‘

‘*+■)”

-r sin cos

«+■)*

H =

sin^

rsm0Jtl r ‘ sm ‘ a (I £ +n)]-

If the point were at rest with reference to the rotating meridian we

should have ■ :

*R = — nV sin 6, a = — n*r sin 6 cos 9, H =0.*

When these considerations are applied to the motion of an ocean relative to a rotating planet, it is clear that these accelerations, which still remain when the ocean is at rest, are annulled by the permanent oblateness of the ocean. As then they take no part in the oscillations of the ocean, and as we are not considering the figure of the planet, we may omit these terms from R and 2. This

being so we must replace (^+») as !t occurs in R and 3: by d

&

+ 2tl

dt

Now suppose that the point whose accelerations are under consideration never moves far from its zero position, and that its displacements £, i> sin 8 in colatitude and longitude are very large compared with p its radial displacement. Suppose, further, that the velocities of the point are so small that their squares and products are negligible compared with nV ; then we have

51 = 2j, a very small quantity;

*a£-aj(*sin«). d$ d£ r dl df Since the radial velocity always remains very small it is not neces- to concern ourselves further with the value of R, and we only the two other components which have the approximate forms,*

r sin 6

sary require

■=■ 1 — 2n sin 6 cos 8^,

H = sin 9g^+2n cos 0j t

(14)

The surface value of the potential of the force* which would marti- tain the ocean in equilibrium in the shape it has at any moment is Eg&ib,-. Hence it follows that in the actual case the forces due to fluid pressure and to the attraction of the ocean must be such as to balance the potential just determined. Therefore these forces are those due to a potential — 2g6

It follows, then, from (14) that the equations of motion are

sin 6jp+ 2n cos 9^ =

We have now to consider the forces by which an element of the ocean is urged in the direction of colatitude and longitude. These forces are those due to the external disturbing forces, to the pressure of the water, surrounding an element of the ocean, and to the attraction of the ocean itself. - . . .

If e denotes the equilibrium height of the tide, it is a function of colatitude and longitude, and may be expanded in a series of spherical surface harmonics e>. Thus we may write the equation to the equilibrium tide in the form.

r = a+e = a+Xe t .

Now it appears from (10) and (11) that the value of the potential, at the surface of the sphere where p=a, under which this is a figure of equilibrium, is

V = 2g6;ei. . . . ■. ■ ^ ....

We may use this as specifying the external disturbing force due to the known attractions of the moon and sun, so that U may be regarded as known.

But in our dynamical problem the ocean is not a figure ot equi- librium, and we may denote the elevation of the surface at any moment of time by b. Then the equation to the surface may be written in the form

*r = a+b = *-rSbi, where fy denotes a spherical harmonic just as e,- did before. ^*

1 Phil. Trans., 189 A, pp. 201-258 and 191 A, pp. 139-185.

i? b 4A bi - e)

a sin d

*It remains to find the equation of continuity. This may be de- duced geometrically from the consideration that the volume of an element of the fluid remains constant ; but a shorter way is to derive it from the equation of continuity as it occurs in ordinary hydro- dynamical investigations. If * be a velocity potential, the equation Of continuity for incompressible fluid is*

*Sr Jr(rS S sin96fl5 *)+ 5 4('*

*. *

r sin 6-zjro

"rdd"'

..,H^('F=r.8H-°-

The element referred to in this equation is defined by r, 0, , r+dr, 8+38, 4>+5. The colatitudinal and longitudinal velocities are the same for all the elementary prism defined by 8, , 8+$0,

4>+S, and the sea bottom. Then ^ = S , r sin ed = sin J{ ■

and, since the radial velocity is db/dt at the surface of the ocean., 0+7, and is zero at the sea

where r -

integrating

bottom, where r -

with respect to r from to t from time / to the

dr 7 r = a-{-y to r = a, and again with respect time when b, £, jj all vanish, and treating y and f) as small compared with o, we have

basin 9+2^(7! sin 9) +^(71 sine) =0. (16)

This is the equation of continuity, and, together with (15), it forms the system which must be integrated in the it „ t

general problem of the tides. The difficulties in the B ^*^°^ way of a solution are so great that none has hitherto ^° .**' been found, except on the supposition that 7, the depth of the ocean, is only a function of latitude. In this case (16) becomes

ba sTn-8^ sin9 >^& = °- (I 7)

§ 16. Adaptation to Forced Oscillations, — Since we may suppose that the free oscillations are annulled by friction, the solution re- quired is that corresponding to forced oscillations. Now we have seen from (13) that e (which is proportional to V) has terms of three kinds, the first depending on twice the moon's (or sun's) hour-angle, the second on the hour-angle, and the third independent thereof. The coefficients of the first and second vary slowly, and the whole of the third varies slowly. Hence e has a semi-diurnal, a diurnal and a long-period term. We shall see later that these terms may be expanded in a series of approximately semidiurnal, diurnal and slowly varying terms, each of which is a strictly harmonic function of the time. .

Thus according to the usual method of treating oscillating systems, we may make the following assumptions as to the form of the solution

e = Ze< = 2«i co.s(.2»t/<-H4>+a) "1

b = b2< = 2/n cos^nfi+st+a) I / g\

Z = -2biXiCos(2nft+s4>+«) \ v .

where e,-, hi, Xi, y< are functions of colatitude only, and a, kt are the associated functions' of colatitude corresponding to the harmonic of order i and rank s. ...

For the semi-diurnal tides J = 2 and / is approximately unity; for the diurnal tides s = 1 and / is approximately \ ; and for 1 the tides of kmg period s = o and /is a small fraction, allies

Substituting these values in (17) we have

s [iin~9 2e(ybiXi sin fi+srtw+k*] =0> and put m = n'a/g,

Then if we Write «,• for hi— et from (18) in (15) leads at once to

id

pxbiXi -f sin 9 cos 92&;>'i = — ffiZbiiu, ■ p sin 92%< +/ cos KSnit = - 4>n 5 s i n y

(19)

substitution

(26)

Xbitti.

TIDE

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Solving (20), we have

(Zfc*) sin' 0(/*-cos> 8) = -^[^ ^6,%+^Si,

Then substituting from (21) in (19) we have

m]_

(21)

+4ma2(«i+«i) =0.

(22)

sinO (/''-cos 2 6)

This is almost the same as Laplace's equation (or tidal oscillations in an ocean whose depth is only a function of latitude. If indeed we treat ii as unity (thereby neglecting the mutual attraction of the water) and replace Ztii and 2ei by u and e, we obtain Laplace's equation.

When iu is found from this equation, its value substituted in (21) will give Xi and yi.

§ 17. Zonal Oscillations. — We might treat the general harmonic oscillations first, and proceed to the zonal oscillations by putting s = o. These waves are, however, comparatively simple, and- it is well to begin with them. The zonal tides are those which Laplace describes as of the first species, and are now more usually called the tides of long period. As we shall only consider the case of an ocean of uniform depth, 7 the depth of the sea is constant. Then since in this case s=o, our equation (22), to be satisfied by Wi or hi — et, becomes

sin 8-fjj2biUi

7

(*3)

^-cos 2 ^ This may be written

<2„, , \ma f — cos'S /"» , . -,,, , ■

s^'+V -inrr-J xh ' sin m+A -°«

where A is a constant.

Let us assume ,

hi = C;Pi, ti = RiPi where Pi denotes the ith zonal

harmonic of cos 8. The coefficients Ci are unknown, but the Ei are known because the system oscillates under the action of known forces.

If the term involving the integral in this equation were expressed in terms of differentials of harmonics, we should be able to equate to zero the coefficient of each dPi/dS in the equation, and thus find the conditions for determining the C's.

The task then is to express-'— . — 3— I P, sin Odd in differentials

of zonal harmonics.

It is well known that Pi satisfies the differential equation

Therefore

(24)

sin ede = ■

»'(»+!)

sin 6-

, and

-COS'

sinfl

^fp, sin ⁻(/*-co*»«)^

:dPi

JPi

Another wetl-krtown property of zonal harmonics is that

sin S

jiPi iji+i) d6.

-l^T(P< +l P<

.).

(25)

(26)

If we differentiate (25) and use (24) we have

i(i+i) /dPi+t dPi-A . .... , D .. .

Multiplying (25) by sin 0, and using (26) twice over,

i(i + i) (- 1 (dP i+i dPA 1 (dPj dPj-A) -1 (2J+3V d$ d8 / + 2i-H \d0 dO J y 1 dP,_ 2

■ u£E±

Therefore-^/Pisi

sin ede = -.

de

-I

'(2t-l)(2i+l) P-l 1 2) dPj I dPt+t

.t7+I) i "(2»-i)(2»-i-3) $ 'de + (at+i)(2»+3)- de ■

This expression, -when multiplied by $majy and by Ci and summed, is the second term of our equation. The first term is

Xbiid-Ei)^.

In order that the equation may be satisfied, the coefficient of each dPi/dO must vanish identically. Accordingly we multiply the whole by y/4ma and equate to zero the coefficient in question , and obtain

vik (Ci - Ei)+ w-

d.

■I) (21

+

-3) I »(» + !) + (2»-l)(2i+3)! C<

(*7)

(2t+3)(2t + 5)”

This equation (27) is applicable for all values of i from 1 to infinity, provided that we take Co, £0, C_i, £_i as being zero.

We shall only consider in detail the case of greatest interest, namely that of the most important of the tides generated by the attraction of the sun and moon. We know that in this case the equilibrium tide is expressed by a zonal harmonic of the second order; and therefore all the Ei, excepting £ 2 , are zero. Thus the equation (27) will not involve Ei in any case excepting when i — 2.

If we write for brevity

T f-i , 2 hy

u -i{i+i)^{2i-l){2i+i) 4ma’ the equation (27) is

1-^+73=

Ci-2

(28)

(»+3)(a»t5)~’ W . 1 ”” r (2 »’-3)(»-0 Save that when 1 = 2, the right-hand side is b-rtEilpna, a known quantity ex hypothesi.

The equations naturally separate themselves into two groups in one of which all the suffixes are even and the other odd. Since our task is to evaluate all the C’s in terms of E t , it is obvious that all the C’s with odd suffixes must be zero, and we are left to consider only the cases where t = 2, 4, 6, &c.

We have said that C must be regarded as being zero;

if however we take

C = -362T E%l\ma, so that Co is essentially a known quantity, the equation (28) has complete applicability for all even values of i from 2 upwards.

The equations are

^-i 4 C4+—

&c. &c.

13

= 0.

It would seem at first sight as if these equations would suffice to determine all the C's in terms of C», and that Cj would remain in- determinate; but we shall show that this is not the case.

For very large values of »' the general equation of condition (28) tends to assume the form

Ci + ;-|-Ci_t . &y Ci 'ma By writing successively »+2, i-t-4, t+6 for i in this equation, and taking the differences, we obtain an equation from which we seC that, unless Ci/Ci+t lends to become infinitely small, the equa- tions are satisfied "by Ci = d+i in the limit for very large values of 1.

Hence, if Ci does not tend to zero, the later portion of the series for h tends to assume the form Ci(Pi+Pi+j-(Pi + i. . .)._ All the P's are equal td unity at the pole; hericethe hypothesis that Ci does riot tend to zero leads to the conclusion that the tide is of Infinite height at the pole. The expansion of the height of tide is essentially converjgen't, and therefore the hypothesis is negatived. Thus we are entitled to assume that C, tends to zero for large values of i.

Now writing for brevity

Oi = l/(2t + l)(2t+3) S (2t-|-5),

we may put (28) into the form

Cj- 2 /Cj

(2»-3)(2t-l)

= Li-

CjjCi+t (2« + 1)(2*+3)

By successive applications of this formula we may write the right- hand side in the form of a continued fraction. Let

Ki =

Oi-2

Then we have

or Thus

Lti X.vt-2 '

Ci_,/C-

Oj+1

(2t-3)(2i-l) _ Ki' Ci/Ci_ 2 =(2t-l)(2»+l)iTi.-

C 2 = 3-5^C„; C4 = 3-5-79^^4C ;

Ce = 3 • 5 • 7 • 9 • 1 1 ■ l&iKiK.Co, &c. If we assume that any of the higher C's, such as Cu or Cm, is of negligible smallitess, all the continued fractions Ki, K ti K t , &c, may be computed ; and thus we find all the C's in terms of Co, which is equal to — ifityEtl^ma. The height of the tide is therefore given by

b = SAiCos(2n/<+a)

jhy

4Mtf Ei.3-5Wi+3-5-7-9*»W4 + . . .} cos (m/j + a). It is however more instructive to express fy as a multiple of tlw

equilibrium tide c, which is as we know equal to EiPt cos (2ttft+a). Whence we find

The number / is a fraction such that its reciprocal is twice the number of sidereal days in the period of the tide. The greatest value of / is that appertaining to the lunar fortnightly tide (Mf in notation of harmonic analysis), and in this case /is in round numbers i/a8j or more exactly /' *» ooi 33. The ratio of the density a of sea water to 6 the mean density of the earth is -18093; which value gives us

61 = 1— |f =-89^144-

The quantity m is the ratio of equatorial centrifugal force to gravity, and is equal to 1/289. Finally, 7/0 is the depth of the ocean expressed as a fraction of the earth's radius.

With these numerical values Mr Hough has applied the solution to determine the lunar fortnightly tide for oceans of various depths. Of his results we give two: —

First, when 7 = 7260 ft. = 1210 fathoms, which make's y/^ma - 1/40, he finds

b =-p-{ -266gP 2 — i678P 4 -0485P 6 —oo8i?8-ooo9-Pio — oooiPh…! .

If the equilibrium theory were ttue we should have ,

thus we see how widely the dynamical solution differs from the equilibrium value.

Secondly, when 7 = 58080 ft. =9680 fathoms, and i\ma = 1/5, he finds

b=-p-j-7208P 2 -0973i > 4+-oo48P«—oooii'j. . .).

From this we see that the equilibrium solution

presents some sort of approximation to the dynamical one; and it is clear that the equilibrium solution would be fairly accurate for oceans which are still quite shallow when expressed as fractions of the earth's radius, although far deeper than the actual sea.

"' The tides of long period were not investigated by Laplace in this manner, for he was of opinion that a very small amount of friction would suffice to make the ocean assume its form of equilibrium. In the arguments which he adduced in support of this 'view the friction contemplated was such that the integral effect was propori tional to the velocity of the water relatively to the bottom. It is probable that proportionality to the square of the velocity would have been nearer the truth, but the distinction is unimportant.

The most rapid of the oscillations of this class is the lunar fort- nightly tide, and the water of the ocean moves northward for a week and then southward for a week. In oscillating systems, where the

Now in order that the result contemplated by Laplace may be true, the friction must be such that the modulus of decay is short compared with the semi- period of oscillation. It seems certain that the friction of the ocean bed would not reduce a/ slow ocean current to one-third of its primitive value in a day or two. Hence we cannot accept Laplace's discussion as satisfactory, and the inves- tigation which has just been given becomes necessary. (See § 34).

§ 18. Tesseral Oscillations. — The oscillations which we now have

to consider are those in which the form of surface is

Transforms- express ible by the tesseral harmonics^ The results will

tion of k e a ppii ca ble to the diurnal and semi-

diurnal tides —

Equation. L ap lace's second and third species.

If we write o- = .s// the equation (22) becomes

del

sin 0ji-W cos 0) Zbttii

M

a cos Jkfa+s* leasee $)p>iUi

4-^sinflJ5fc = 0.

(29)

If we write D for the operation sin 9^, the middle term may be

arranged in the form

a cot 9 CP+g cos 9)(2biUj) ZbjUj s 2 —

Therefore on multiplying by sin 8 the equation becomes

(¯ s 4 (D tXy] -Ca^+gfiw«*-a (3 o) We now introduce two auxiliary functions, ssch that

Zbdhi-ed^SbiUi ■'

= (D-). (31) It is easy to prove that

0+s»4

(P-Kcp* d)(.D+c.cQS 9) D***-^ sinM + O^ 2 9&»),.\ Ki2}

Also

(D+a cos e)(s*-o* cos* 9) =(s 2 -

4-2ct 2 sin? 9 cos 9 #. (33)

Now perform P+

(D+

\(s*-o* cos 2 9)(£>+

(D*-s*+2o 2 sin 2 9 cos 9 *. (35)

Then (34) may be written

Substituting from this in (30), and using the'second of (32), the function * disappears and the equation reduces to '

(Z> 2 -s 2 -

Since by (35)-* 2 cos 2 9 * = i| n T^(£ 2 —s 2 + ff sin 2 9)*, (31) may be written ,

XbiUi = \d-c cos 9+ J^1 (2>»-5»+

■ The equations (35), (36) and (37) define * and #, and furnish the equation which must be satisfied.

If we denote cos 9 by n the zonal harmonics are defined by

-i!(ffi)'<*-i>'. The following are three well-known properties of zonal harmonics :

(.i+i)P i+1 -{2i+i)^Pi+iP i . 1 =0, (39)

d]i

' = (2J + I)P<.

(40)

If P\ ■ sd> are the two tesseral harmonics of order * and rank s, * sin T

it is also known that

xd'Pi

(41)

Let us now assume

**=CjP;, «i=£jPj (*=Sa;p;, *=a8jp;.

These must now be substituted in our three equations (35), (36), (37), and the result must be expressed by series of the P*. functions. It is clear then that we have to transform into P\ functions the following functions of P' t , namely

■£^%{V l -s % ±c sin 2 0)Pl cos 9P',

\D-c cos e+i^(D*-s*+ a sin 2 0)]P'.

If we differentiate (38) s times, and express the result by means of the operator D, we find

(2?>-s 2)Pj4-»Xi+l)P;sin 2 9 = o. , (42)

Again, differentiating (39) s times and using (40), we find

(i-s-f l)Pj -{?i+i) cos 9 P". + (i+s)Pl_ 1 = o.

(43)

Lastly, differentiating (41) once and using (38), (40) and (43)

DP . '. i(i-s'+i) p, _(i±0(i±i)p. (4A)

vri ii + i ^' +1 2i + i ^«- 1 * (W

By means of (42), (43) and (44) we have

-^(D 2 -* 2 ** sin 2 9)P; = [-i(i+l) ±

cos 9 P, =^f- I Pi-i+^i+T P ™ Tn , . cos » rty , ., 1 c .,.,]„._ (t-54-i)[ff4r«(t'-^i)] p.

(i + s)[« + (i + lW+2)] n .

2(2i + l) ' ri - 1-

Therefore the equations (35), (36), (37) give 2[a'{ i(i+i)+*)P+2M- \ i+L P -_ l+ t£+lp-» j] = q ,

2[^i-i(i+i)-<,}Pj+^c*p;] =0,

*\b i (c>-EVP: + 4 ii - s+ $+?- l)] p-> l

Since these equations roust be true identically, the coefficients of P\ in. each of them must vanish. Therefore

a*(

i+s + l ^ t-s + l 2J+3 ” rp, ‘- 1 2*

HH

i^C’- £*)+<«:_,

(i-s)[

ya 3

-2)]

2(21— I)

, « (i+ s+i)l

(45)

2(2» + 3)

If we eliminate the as and /S’s from the third equation (45), by means of the first two, we find Solution tor -y6 j .

t„«™/ 5^C*- 2 -i*cr+,J +2 C* H =^£’, (46)

Oscillations.

where

\ma

L\ =

<,'{

(j2-S*)[, + (i -l)(i-2)] i + (4t 2 - I) [

[(« + l)'-5»l[g + (t+2)(t+3)] + [4(J + I>l][(i + l)(l+2)][a+t(i + l)]' -(«-s)(f-s-l)

4«o

Whence

It follows that

C' == — -C« .

7i

7'

4 *»: "

C» = -

.«

iiiH*

?C.; : '«c.

Then since we have defined

S '—»~"(2*-l)(2t-3)**-(t-l)*** J -(«+S+l)(«+3+2)

, *«' != (2*4-3)(2*+5)l

In the case of the luni-solar semi-diurnal tide (called Kj in the notation of harmonic analysis) we have i-2, s=2,

The equation (46) for the successive Cs is available for all values of i provided that C_i, E- U Co, £0 are regarded as being zero.

As in the case of the zonal oscillations, the equations with odd suffixes separate themselves from those with even suffixes, so that the two series may be treated independently of one another. In- deed, as we shall see immediately, the series with odd suffixes are satisfied by putting all the Cs with odd suffixes zero for the case of such oscillations as may be generated by the attractions of the moon

or sun.

For the semi-diurnal tides t = 2, j = 2, and / is approximately equal to unity. Hence the equilibrium tide is such that all the E', excepting E\, are zero.

For the diurnal tides t' = 2, s — \, and / is approximately equal to 4- Hence all the E\, excepting E\, are zero. Since in neither case is there any E with an odd suffix, we need only consider those with even suffixes.

In both cases the first equation among the Cs is

-i-q+i;c;=^E* 2 (s=2ori).

tt follows that if we write

rfC'=—^-£5(i = 2or i), so 4ma ^

the equation of condition amongst the Cs would be of general appli- cability for all even values of » from 2 upwards.

The symbols £"o, 1*2 do not occur in any of the equations, and therefore we may arbitrarily define them as denoting unity, although the general formulae for £ and -n would give them otfier values. Accordingly we shall take

&Cl=Q=-^ a E-As = 2ori).

With this definition the equation

£-,CU-IAC-+,£^U=o(s^2 or 1)

is applicable (or «=2, 4, 6, &c.

It may be proved as in the case of the tides of long period that we may regard CJ/Q+, as tending to zero. Then our equation may be

written in the form

,, Q-2 =2> — ffi>*+2

and by successive applications the right-hand side may be expressed in the form of a continued fraction. Let us write

r ' r« t * ...

Hence our equation may be written

all the Cs are expressed in terms of known quantities. Hence the height of tide b is given by b = 2hicqs(,2nft+s+a)

= -&* «(»*+*+.) [**+^+^Jr* ■'•]

But the equilibrium'tide e is given by

« = £JPJcos(2»/«+^+o).

Hence we may write our result in the following form, which shows the relationship between the true dynamical tide and the equilibrium tide: —

b=— ;

mpi+^p\+-

pj+...:|

4wio P\ ("- ■ ■ ijj - ' vivi From a formula equivalent to this Mr Hough finds for the lunar semi-diurnal tide (s = 2), for a sea of 1210 fathoms .(t^ = 2m'i

b = F| j -10396^ +'-57998-PJ — i9273^S + ; 03054>S- ■ • \ •

This formula shows us that at the equator the tide is " Inverted," and has 2-4187 times as great a range as the equilibrium tide.

For this same ocean he finds that the solar semi-diurnal tide is " direct " at the equator, and has a range 7-9548 as great as the equilibrium tide.

Now the lunar equilibrium tide is 2-2 times as great as the solar equilibrium tide, and since 2-2X2-4187 is only 5-3, it follows that in such an ocean the

solar tides would have a range haU as great again as the lunar. Further, since the lunar tides are ” inverted ” and the solar “direct,” spring tide would occur at quarter moon and neap tide at full and change.

We give one more example from amongst those computed by Mr Hough. In an ocean of 9680 fathoms (-y/4ma>=i/5), he finds

*=7f I 1-7H&PI- -06057^1:+ -001447^ ■ •■■ j •

At the equator the tides are ” direct ” and have a range of 1-9225 as great as the equilibrium tide. In this case the tides approximate in type to those of the equilibrium theory, although at the equator, at least, they have nearly twice the range.

We do not give any numerical results for the diurnal tides, tor reasons which will appear from the following section.

§ 19. Diurnal Tide approximately evanescent.’ — The equilibrium diurnal tide is given by

e = £J Pi cos(2»/f +*+»}, where /is approximately 5 and the associated function for ,» = ?, j — i is

Pi = 3 sin cos 0. Now the height of tide is given by

‘t^TC’iP’i cos(2nft+

If possible suppose that b is also expressed by a single term like that which represents «, so that

b = 3C| sin 9 cOs 8 cos(2n/«+*+a). Then the differential equation (22) to be satisfied becomes .’■ „du , I A cos 9 du , u V

sin flgg+^cos^ _ J dl+^Te [

sin”0(/*-cos s 0))

y{C-Eh)

1 d_ sin dB

/ 2 -cos 2

+4wo-CJ«=o, where u is written for brevity in place of sin 9 cos 6.

Now when / is rigorously equal to |, it may be proved by actual differentiation that the expression inside the brackets j) Vanishes identically , and the equation reduces to C\ = o.

We thus find that in this case the differential equatiori is satisfied by zero oscillation of water-level. In other words we reach Laplace's remarkable conclusion that there is no diurnal rise and fall of the tides. There are, \t is true, diurnal tidal currents,' but they are so arranged that the water level remains unchanged.

In reality /is not rigorously 5 (.except for the tide called jy and there will be a small diurnal tide. The lunar diurnal tide called has been evaluated for various depths of ocean by Mr Hough and is found always to be small. ,

§ 20. Free Oscillations of the Ocean. — Mr Hough discusses the various types-of free oscillations of the ocean. They are very com- plex, and consist of westward waves and eastward waves of very various periods. He finds, as was to be expected, that if, for an ocean of given depth, a free wave very nearly coincides in period

with the forced lunar or solar wave, the actual tide is largely aug- mented. Thus, for example, for an ocean of 29,000 ft. in depth the solar semi-diurnal tide would have a height at the equator 235 times as great as the equilibrium height, and would be inverted so 1 that low water would agree with the high water of the equilibrium theory.

The general outcome of the discussion is that it is impossible to foresee the height of any forced tide-

wave by mere general inspection. If this is so in the simple case of an ocean of uniform depth, how much more must it be true of oceans of various depths interrupted by continents?

§ 21. Stability of the Ocean. — Imagine a globe of density i, sur- rounded by a spherical layer of water of density a. Then, still maintaining the spherical figure, and with water still covering the nucleus, let the layer be displaced sideways. The force on any part of the water distant r' from the centre of the water and r from the centre of the nucleus is Jiror' towards the centre of the fluid sphere and Jr(5-(r)r towards the centre of the nucleus. If 5 be greater than a there is a force tending to carry the water from places where it is deeper to places where it is shallower ; and therefore the equili- brium, thus arbitrarily disturbed, is stable. If, however, * is less than o- (or the nucleus lighter than water) the force is such that it tends to carry the water from where it is shallower to where it is deeper and therefore the equilibrium of a layer of fluid distributed over a nucleus lighter than itself is unstable. As Lord Kelvin remarks, 1 if the nucleus is lighter than the ocean, it will float in the ocean with part of its surface dry. Suppose, Submits a g a in, that the fluid layer be disturbed, so that its •fVaHoia e q ua ti on ; s r = a(i+s>), where .?< is a surface "™"'' harmonic of degree 1; then the potential due to this

deformation is j^rf; — ra s >> anc ' tne whole potential is

4ir3a 3 4xj a' +3 3r + 2i+i r* +1 * -

If, therefore, o-/(2»-t-i) is greater than ^5, the potential of the forces due to deformation is greater than that due to the nucleus. But we have seen that a deformation tends to increase itself by mutual attraction, and therefore the forces are such as to increase the deformation. If, therefore,

§ 22. Precession and Nutation. — Suppose we have a

*planet covered with a shallow ocean, and that the ocean is set into .oscillation. Then, if there are no external disturbing forces, so that the oscillations are ” free,” not ” forced,” the resultant moment of momentum of the planet and ocean remains constant. And, since each particle of ths ocean executes periodic oscillations about a mean position, it follows that the oscillation of the ocean imparts to the solid earth oscillations such that the resultant moment of momentum of the whole system remains constant. But the mass of the ocean being very small compared with that of the planet, the component angular velocities of the planet necessary to counterbalance the moment of momentum of the oscillations of the sea are very small compared with the component angular velocities of the sea, and therefore the disturbance of planetary rotation due to oceanic reaction is negligible. If now an external disturbing force, such as that of the moon, acts on the system, the resultant moment of momentum of sea and earth is unaffected by the interaction between them, and the precessional and nutational couples are the same as if sea and earth were rigidly connected together. Therefore the additions to these couples on account of tidal oscillation are the couples due to the attraction of the moon on the excess or deficiency of water above or below mean sea-level. The tidal oscillations are very small in height compared with the equatorial protuberance of the earth, and the density of water is ^ths of that of surface rock; hence the additional couples are very small compared with the couples due to the moon’s action on the solid equatorial protuberance. Therefore pre- Comdluas fusion an(j nu tation take place sensibly as though the to Prtc *’’ ^a were congealed in its mean position. If the Afatmtlo ocean be regarded as frictionless, the principles of energy laseoMlble snow us that these insensible additional couples must ‘ be periodic in time, and thus the corrections to nutation must consist of semi-diurnal, diurnal and fortnightly nutations of absolutely insensible magnitude. We shall have much to say below on the results of the introduction of friction into the*

conception of tidal oscillations as a branch of speculative astronomy.

§ 23. Some Phenomena of Tides in Rivers. — As a considerable part of our practical knowledge of' tides is derived from observations in estuaries and rivers, we shall state the results of an investigation of waves which travel alone a shallow canal, and we refer the reader to the article Waves for the mathematical investigations on which they are based.

1 Thomson and Tait, Nat. Phil. § 816.

- Compare an important paper by H. Poincare, in Acta math.

(1885), 7:3, 4.

It must be premised that when the profile of a wave does not pre- sent the simple harmonic form, it is convenient to analyse its shape into a series of partial waves superposed on a fundamental wave; and generally the principle of harmonic analysis is adopted in which the actual wave is regarded as the sum of a number of simple waves.

Suppose that the water is contained in a straight and shallow canal of uniform depth h, and that at one end the canal debouches on to the open sea. Suppose further that in the open sea there is a forced oscillation of water level, given by this formula

7i=H sin nt where »i is the elevation of the water at time / above its mean level, 2r(n the period of the oscillation and H the amplitude of the oscillation.

Waves will clearly be transmitted along the canal, and the problem is to obtain a formula which shall represent the oscillations of level at any distance * measured from the mouth of the canal.

The mathematical investigation shows that, if g denotes gravity, the formula for the oscillation of

water level at the point defined by x is

„ = ff sin n (t-Jfr) +$jfh x sin 2n ('78») • The second of these terms is proportional to x, and if the canal were infinitely long it would become infinite. The difficulty thus occasioned may be eluded by supposing the canal to debouch on a second sea in which a second appropriate oscillation is maintained. In actuality friction gradually annuls all motion, and no such diffi culty arises.

The first term of the formula is called the fundamental tide, the second gives what is called the first over-tide; and further approxi- mation would give second and third over-tides, &c. All the over- tides travel up the river at the same rate as the fundamental, but they have double, treble, quadruple frequencies or " speeds," and the ratio of the amplitude of the first over-tide to the fundamental is

$H nx 4fe Vg/i - As a numerical example, let the range of tide at the river mouth be 20 ft., and the depth of the river 50 ft. The " speed " of the semi-diurnal tide, which is an angular velocity, is 28-98 per hov or 1/1-9

radians per hour; V gh = 27 miles per hour; hence r- y~T = 'TT x -

Therefore 34 miles up the river the over-tide is i/ ioth of the funda- mental and t» c a range of 2 ft. If the river shallows very gradually, the .formula wiil still hold, and we see that the height of the over- tide varies as (depth)-?.

Fig. 6 s read from left to right exhibits the progressive change of shape. The steepness of the advancing crest shows that a shorter

v7*~

(From Airy's Tides and Waves.)

Fig. 6. — Tide Wave in Rivers.

time elapses between low to high water than inversely. The same investigation shows that the law of the ebb and flow of currents, mentioned in § 2, must hold good.

The second law of waves in rivers to which we draw attention relates to the effects produced by the simultaneous propagation into shallow water of two waves of different periods. It appears that the effect is not simply the summation of the two separate waves.

Suppose that at the mouth of the river the oscillation of the open sea is represented by

7; = Hi sin nil-H 2 sin (n 2 l+t). Then wc find that at distance x from the river's mouth the wave is given by the formula*

n = Hi sin », (f-^x) + m sin [«, (<- ^5) + «]

3//1//2 n t + »2

[(»!

\t-

+ nt) (t Hi +n 2) (t-

^) +e

]

"V" "TUT sln l> + M2) ('" leSJ ■+«] "*

The first two terms give us the two waves just as if each existed by itself. The third and fourth terms give the results of their combina- tion, and are called "compound " tides, the first being a summation tide and the second a difference tide.

As a numerical example, suppose at the mouth of a river 50 ft. deep that the solar semi-diurnal tide has a range 2Hi = 4 Il -> an d the lunar semi-diurnal tide has a range 2Hi = \2\ then »i+»» "= 59/57 radians per hour, and ni— w« = i/57 radians

per hour, and as before V gft = 27 miles per hour.

With these figures

tfUI* »i +”» „._’

4A Vgfe 170 ■

8 From Airy’s Tides and Waves, with omission of part which was erroneous.

Thus 15 miles up the river the quater-diurnal tide (called MS in harmonic analysis) would have a range of 1/60 of an inch. Where the two interacting compound tides are nearly of the same ” speed ” the summational compound tide is much the larger of the two. As before, when the river shallows gradually this formula will still hold true.

It is interesting to note the kind of effect produced by these com- pound tides. When the primary tides are in the same phase (as at spring tide)

Tilt = W 2 /-f”€,

and we may write the formula in the form

,= (Hi+tf.) sin n, [t-jft) +% }r - T grx «n [21.,* j^- J

+

3H1H2 ni — n 2

(tii — n»)* .

A,h V«*’*”” \gh

Hence the front slope of the tide-wave is steeper at springs than at neaps, and the compound tide shows itself at springs in the form of an augmentation of the first over-tide; the converse holds at neaps. Also mean water-mark is affected to a slight extent

as we go up the river by an inequality represented by the last term.

IV. — Harmonic Analysis

§ 24. Outline of the Method. — We have seen in § 13 that the poten- tial of the tide-generating force of the moon consists of three terms, one being approximately semi-diurnal, one approximately diurnal, and one varying slowly. In consequence of the irregular motion cf the moon in right ascension and in declination and the variability of parallax, none of these three classes of terms is simply harmonic in time. The like is also true of the potential of the sun's tide- generating force. In the method of harmonic analysis we conceive the tidal forces or potential due to each disturbing body to be developed in a series of tarms each consisting of a constant (deter- mined by the elements of the planet's orbit and the obliquity of the ecliptic) multiplied by a simple harmonic function of the time. Thus in place of the three terms of the potential as developed in § 1 3 we have an indefinitely long series of terms for each of the three terms. The loss of simplicity in the expression for the forces is far more than counterbalanced by the gain of facility for the dis- cussion of the oscillations of the water. This facility arises from the dynamical principle of forced oscillations, which we have ex- plained in the historical sketch. Applying this principle, we see that each individual term of the harmonic development of the tide- generating forces corresponds to an oscillation of the sea of the same period, but the amplitude and phase of that oscillation must depend on a network of causes of almost inextricable complication. The analytic or harmonic method, then, represents the tide at any port by a series of simple harmonic terms whose periods are determined from theoretical considerations, but whose amplitudes and phases are found from observation. Fortunately the series representing the tidal forces converges with sufficient rapidity to permit us to consider only a moderate number of harmonic terms in the series.

Now it seems likely that the corrections which have been applied in the use of the older synthetic method might have been clothed in a more satisfactory and succinct mathematical form had investigators first carried out the harmonic development. In this article we shall therefore invert history and come back on the synthetic method from the analytic, and shall show how the formulae of correction stated in harmonic language may be made comparable with them in synthetic language. One explanation is expedient Fusion of De f ore proceeding with the harmonic development. n't dh There are certain terms in the tide-generating forces of M ^/ ' t t ' le moon ' depending en the longitude of the moon's Moon's n °des, which complete their revolution in 18-6 years. Node Now it has been found practically convenient, in the

application of the harmonic method, to follow the syn- thetic plan to the extent of classifying together terms whose periods differ only in consequence of the movement of the moon's node, and at the same time to conceive that there is a small variability in the intensity of the generating forces.

§ 25. Development of Equilibrium Theory of Tides in Terms of the Elements of the Orbits. — Within the limits at our disposal we cannot do more than indicate the processes to be followed in this development. We have already seen in (2) that the expression for the moon's tide-generating potential is

*V=^(cos*z-\),*

and in (12) that

COS Z— $= 2fl)MiMi+2*

*f-V.Mi'-Mj**

-r-27,rM 2 M 3 +2{rMiMi

,3 P+g'-2f Mi'+Mj.'-aM,'

-j * 1

23 3

where Mi, Mj, M 3 and £, ij, f are respectively the direction cosines referred to axes fixed in the earth of the^moon and of a place on the earth's surface at which the potential V is to be evaluated. At such a place the radius vector p is equal to o the earth's radius.

Fig. 7.

Let the axes fixed in the earth be taken as follows : the axis C the north polar axis; the axis A through the earth's centre and a point on the equator on the same meridian as the place of observa- tion ; the axis B at right angles to the other two and eastward of A. Then if X be the latitude of the place of observation

£ = cos X, i) = 0, f = sin X.

With these values we have

cos 2 z-i = i cos 2 X(Mi 2 -M, 2) +sin 2X.MiM 2

-H(t-sin 2 X) (M 1 2 +M 2 2 2M 3 2). In fig. 7 let ABC be the axes fixed in the earth; XYZ a second set of axes, XY being the plane of the moon's orbit; M the projection of the moon in her orbit; I = ZC, the obliquity of the lunar orbit to the equator; x = AX = BCY; l = MX, the moon's longitude in her orbit measured from X, the descending node of the equator on the lunar orbit, hereafter called the " intersec tion." Then

Mi = cos / cos x+sin I sin x cos I =cos 2 \I cos (x—l)

+sin 2 il cos (x+l),

M 2 = —cos / sin x+sin / cos x cosT= —cos 2 \I sin (x — /)

—sin 2 \I sin (x+l),

Mj = sin I sin / —2 sin \I cos \I sin /.

When these expressions are substituted in Mi 2 — M 2 2 , M1M3,

Mi 2 +M 2 2 — 2M» 2 , it is clear that the first will have terms in the

cosines of 2(x — I), 2x, 2(x+/); the second in sines of x — 2/, x>

X+2/; and the third in cos 2/, together with a term depending only on /.

Now let c be the moon's mean distance, e the eccentricity of her o*bit, and let

X . [£ilz^] *m„ Y = [*L=A] *m 2 i Z = pfLriS] 'M„

and t=t— :■ 2 c 3

Then we have for the lunar tide-generating potential at Tlde-

the place of observation generating

y= ^^ 3 [|cos 2 X.(X 2 -Y 2) -t-sin 2X.XZ
Potential.

+ i(|-sin 2 X)(X 2 +Y 2 -2Z 2) (47)

The only parts of this expression which are variable in time are the functions of X, Y, Z.

To complete the development the formulae of elliptic motion are introduced in these functions, and terms which appear numerically negligible are omitted. Finally, the three X-Y-Z functions are obtained as a series of simple time-harmonics, the arguments of the sines and cosines being linear functions of the earth's rotation, the moon's mean motion, and the longitude of the moon's perigee. The next step is to pass, according to the principle of forced oscillations, from the potential to the height of tide generated by the forces corresponding to that potential. The X-Y-Z functions being simple time-

harmonics, the principle of forced oscillations allows us to con- clude that the forces corresponding to V in (47) will generate oscilla- tions in the ocean of the same periods and types as the terms in V, but of unknown amplitudes and phases. Now let 3€ 2 — g 2 , KZ, (X 2 T 2 — 2Z 2) be three functions having respectively similar forms to those of

X 2 -Y 2 XZ

(1 -«*>•» r?

e’)

, (X 2 +Y 2 -2Z 2)

but differing from Aem in that the argument of each Height of of the simple time-harmonics has some angle subtracted Tide at any from it, and that the term is multiplied by a numerical Port. factor. Then, if g be gravity and h the height of tide at the place of observation, we must have

Ttt !

h = y[J cos 2 X (X 2 -^ 2) sin 2X3CZ f (i-sin 2 X)i(3P+l 2 -2Z 2)].(48)

The factor ra 2 /g may be more conveniently written^ryl-Ja, where

M is the earth’s mass. It has been so chosen that, if the equilibrium theory of tides were fulfilled, with water covering the whole earth, the numerical factors in the di-^-Z functions would ~„ , ... OBot be each unity and the alterations of phase would be H]B TU f zero. The terms in (3€ 2 f^g 2 — 2Z 2) require special T ^ eofL on „ consideration. The function of the latitude being Per] od J— sin 2 X, it follows that, when in the northern hemis phere it is high-water north of a certain critical latitude, it is low- water on the opposite side of that parallel; and the same is true of the southern hemisphere. It is best to adopt a uniform system for the whole earth, and to regard high-tide and high-

water as

consentaneous in the equatorial belt, and of opposite meanings outside the critical latitudes. We here conceive the function always to be written $— sin 2 X, so that outside the critical latitudes high-tide is low-water. We may in continuing the development write the li-ig -Z functions in the form appropriate to the equilibrium theory with water covering the whole earth, for the actual case it is only then necessary to multiply by the reducing factor, and to subtract the phase alteration k. As these are unknown constants for each place, they would only occur in the development as symbols of quantities to be deduced from observation. It will be understood, therefore, that in the following schedules the ” argument ” is that part of the argument which is derived from theory, the true complete argument being the ” argument ” — k, where k is derived from observation.

Up to this point we have supposed the moon’s longitude and the earth’s position to be measured from the “intersection”; but in order to pass to the ordinary astronomical formulae we must measure the longitude and the earth’s position from the vernal equinox. Hence we determine the longitude and right ascension of the ‘ inter- section ” in terms of the longitude of the moon’s node and the in- clination of the lunar orbit, and introduce them into our formulae for the H-Tg-ht functions. The expressions for the functions corre- sponding to solar tides may be written down by symmetry, and in this case the intersection is actually the vernal equinox.

The final result of the process sketched is to obtain a series of

terms each of which is a function of the elements of the moon’s

or sun’s orbit, and a function of the terrestrial latitude

fWfJ” a J, of the place of observation, multiplied by the cosine

of Schedules Q j an an g) e w hi cn increases uniformly with the time.

e ow – \v e shall now write down the result in the form of a

schedule ; but we must first state the notation employed : e, e,—

eccentricities of lunar and solar orbits; T,a = obliquities of equator

to lunar orbit and ecliptic; p, p,= longitudes of lunar and solar

perigees, ts, (S,= hourly increments of p, p,; s, k= moon’s and

sun’s mean longitudes;

mean solar time reduced to angle; 7—17 = 15° per hour; X =

latitude of place of observation; £, ><=longitude in lunar orbit,

and R.A. of the intersection; iV = longitude of moon’s node; i =

inclination of lunar orbit. The ” speed ” of any tide

is defined as the rate of increase of its argument, and is

expressible, therefore, as a linear function of 7, i \, a, ar;

for we may neglect ar, as being very small.

The following schedules, then, give h the height of tide. The arrangement is as follows. First, there is a universal coefficient

3 « 2 M

there are general coefficients, one for each schedule, viz. cos 2 X for the semi-diurnal terms, sin 2X for the diurnal, and \ — jj sin 2 X for the terms of long period. In each schedule the third column, headed " coefficient," gives the functions of I and e. In the fourth column is given the mean semi-range of the corresponding term in numbers, which is approximately the value of the coefficient in the first column when I = w; but we pass over the explanation of the mode of computing the values. The fifth column contains arguments, linear functions of t, h, s, p, v, £. In [A, i.] 2t-{-2{h — v) and in [A, ii.] t--(h—v) are common to all the arguments. The argu- ments are grouped in a manner convenient for subsequent computa- tion. Lastly, the sixth is a column of speeds, being the hourly increases of the arguments in the preceding column, estimated in degrees per hour. It has been found practically convenient to denote each of these partial tides by an initial letter, arbitrarily chosen. In the first column we give a descriptive name for the tide, and in the second the arbitrarily chosen initial.

The schedule for the solar tides is drawn up in precisely the same manner, the only difference being that the coefficients are absolute constants. In order that the comparison of the importance of the solar tides with the lunar may be complete, the same universal

coefficient tt () a is retained, and the special coefficient for each

term is made to involve the factor sun's mass. With

Speed Defined.

■ (– J 3 o, which multiplies every term of all the schedules. Secondly,

Here

= 3—5, m, being the

M a

– = 81–5,

•_j _,

46035 =

2–17226'

To write down any term, take the universal coefficient, the general coefficient for the class of tides, the special coefficient, and multiply by the cosine of the argument. The result, taken with the positive sign, is a term in the equilibrium tide, with water covering the whole earth. The transi- tion to the actual case by the introduction of a factor and a delay of phase (to be derived from observation) has been already explained. The sum of all the terms is the complete expression for the height of tide h.

It must be remarked that the schedule of tides is here largely abridged, and that the reader who desires fuller information must refer to the Brit. Assoc. Report for 1883, or vol. i. of G. H. Darwin's Scientific Papers, or to Harris's Manual of Tides.

Mode of Reading Schedules Explained.

A. — Schedule of Lunar Tides.

Universal Coefficient =

3 J2. 2 M

(!)'«•

i. — Semi-diurnal Tides; General Coefficient = cos 2 X.

Descriptive Name.

.3 '5

Coefficient.

(3 4J 3

all

Argument

2t+2(h-V.)

Speed in Degrees

per m. s. Hour.

Principal \ lunar. S

Luni-solar 1 (lunar > portion) J

Larger . > elliptic \

M 2 K 2

N

i(i-£e*)cos

i(i+a« !)Jsin2/

i- Xetxs'il

•45426 ■03929 •08796

28-9841042° 30-0821372° 28-4397296°

ii.— Diurnal Tides; General Coefficient = sin 2.

Descriptive Name.

3 '5

Coefficient.

a” 3 !

3 «

t>

u

Argument

Speed in Degrees psr m.s. Hour.

1

Lunar di- i urnal)

Luni-solar 1 (lunar > portion) J

Larger) elliptic J

Q

(i — ge s) } sin I cos*}-/ (i-He !).;sin/cos/

•18856 •18115 •03651

-iir

$ -j(»-fH«-« I

I3-043O3S6 15-0410686° i3*39866og°

iii.— Long Period Tides; General Coefficient J — | sin 2 X.

Descriptive Name.

‘3

1— 1

Coefficient.

a “S.S

<; pi aj

>

U

Argument.

Speed in

Degrees

per m.s.

Hour.

Change of "1 mean >■ level. J

Fort- I nightly. \

Mf

U-frl^lld-IsinV).

■25224 1 •07827

fOf variable part "J < isA'.the long. V _ of node J

19-34° per annum

1-0080330°

B. — Schedule of Solar Tides.

Universal Coefficient = r — (-) a. 2 m \c/

Descriptive

Name.

.3

"3

Coefficient.

"8 g

Argument.

Speed in Degrees per m.s. Hour.

i. — -Semi-diurnal Tides; General Coefficient =cos 2 X.

Principal^ ?

solar J) Luni-solar 1

(so^r >

portion) J Larger)

elliptic J

s 2

T

-(i-HOJsin'

■21137 •01823 ■01243

2t

2/+2A 2l-(h-p.)

30-ocooooo 30-0821373° 29-9589314°

ii. — Diurnal Tides; General Coefficient = sin 2X.

Solar di- ? urnal)

Luni-solar ") (solar V portion) J

P

Kj

Ii(1 - %e,')i sin <•> cos 2 Jiu

T

-(r + fo 2)^ 3 ' 11 w cos w

'08775

•08407

14-9589314°

150410686*

iii. — Long Period Tides; General Coefficient = i — % sin^

Semi-an-) mial)

Ssa t

•03643

2h 1 0-0821372°

From the fourth columns we see that the coefficients in de- scending order of magnitude are M 2 , Ki (both combined), 82, O, Ki (lunar), N, P, Ki (solar) K 2 (both combined), ,,,.„. , K 2 (lunar), Mf, Q, K 2 (solar), Ssa. SporfLe

The tides which we omit from the schedules are ofTldes relatively unimportant, but nevertheless commonly evaluated in accurate tidal work, are all lunar tides, viz. the follow- ing semi-diurnal tides: the smaller elliptic tide L, the larger and smaller evectional tides v, X, the variational tide 11. Also the fol- lowing diurnal tides, viz. the smaller elliptic tide Mi, a tide of speed 7+0-- tS called J. Also amongst the tides of long period, the luni-solar fortnightly called MSf.

The tides depending on the fourth power of the moon's parallax

!The mean valueof this coefficient is J(i +3e 2)(l -isin 2 »')(i - gsirAu) = -25, and the variable part is approximately — (1 +1« 2) sin i cos i sinu cos w cos N= — -0328 cos N.

TIDE

955

Meteont'

logical

Tides.

arise from the potential V=—y (| cos 3 z-| cos z). They give

rise to a small diurnal tide Mi, and to a small ter-diurnal tide M 3 ; but we shall not give the analytical development.

§ 26. Over-Tides. Compound Tides and Meteorological Tides. — We have in § 23 stated results derived from dynamical theory as - Tl . to over-tides, which represent the change of profile Over-Tides. q j ^ wave as j t advances in shallow water. The only tides in which it has hitherto been thought necessary to represent this change of form belong to the principal lunar and principal solar series. Thus, besides the fundamental astronomical tides M 2 and S2, the over-tides M t , M«, M 8 and S 4 , S« are usually deduced by harmonic analysis.

Compound tides have been also referred to in § 23; they represent a result of the combination of two waves of different speeds travel- _ w ling through shallow water. On combining the speeds

Compound of the i mportant tic i eSi i t w j[i be found that there is

- in many cases a compound tide which has itself a speed

identical with that of an astronomical or meteorological tide. We thus find that the tides O, Ki, P, M 2 , Mf, Q, M u L are liable to perturbation in shallow water. We refer to the Brit. Assoc. Report for 1883 or to Harris's Manual for a schedule, with initials, of the compound tides which are usually evaluated.

All tides whose period is an exact multiple or submultiple of a mean solar day, or of a tropical year, are affected by meteorological conditions. Thus all the tides of the principal solar astronomical series S, with speeds 7 — 1, 2(7—1?), 3(7-1). & c > are subject to more or less

meteorological perturbation. An annual inequality in the diurnal meteorological tide Si will also give rise to a tide 7— 2ij, and this will be fused with and indistinguishable from the astronomical P; it will also give rise to a tide with speed 7, which will be in distinguishable from the astronomical part of Ki. Similarly the astronomical tide K 2 may be perturbed by a semi-annual inequality in the semi-diurnal astronomical tide of speed 2(7—77). Although the diurnal tide Si or 7— ij and the semi-annual and annual tides of speeds 2r; and >j are all quite insensible as arising from astronomtcal causes, yet they have been found of sufficient importance to be con- sidered. The annual and semi-annual tides are of enormous importance in some rivers, representing in fact the yearly flooding in the rainy season. In the reduction of these tides the arguments of the S series are t, it, 32, &c, and of the annual, semi-annual, ter-annual tides h, 2h, 3/1. As far as can be foreseen, the magni- tudes of these tides are constant from year to year.

§ 27. On the Form of Presentation of Results of Tidal Observations. — Supposing n to be the speed of any tide in degrees per mean solar hour, and t to be mean solar time elapsing since o h of Immediate ^ g rst (j ay f (gay) a year f continuous observation, Result of t j len t fo c immediate result of harmonic analysis is to Harmonic obtain a height R and an angle f such that the height Analysis. of th j s t ; de at the t j me (j g g j ven j,y

Rcos (nt— f). R is the semi-range of the tide (say) in British feet, and f is an angle such that f/n is the time elapsing after o h of the first day until it is high water of this particular tide. It is obvious that f may have any value from o° to 360 , and that the results of the analysis of successive years of observation will not be comparable with one another when presented in this form.

But let us suppose that the results of the analysis are presented in a number of terms of the form

fHcos (V+k-k),

where V is a linear function of the moon's and sun's mean longi- tudes, the mean longitude of the moon's and sun's perigees, and . _ . the local mean solar time at the place of observation, tiaaiiorm; re(i uce(j to ang i e at I5 ° per hour. V increases uni-

Constants f° rm 'y w ' tn tile ti" 16 ' anc * ' ts rate °f increase per ' mean solar hour is the n of the first method, and is called the speed of the tide. It is supposed that u stands for a certain function of the longitude of the node of the lunar orbit at an epoch half a year later than & of the first day. Strictly speaking, u should be taken as the same function of the longitude of the moon's node, varying as the node moves; but, as the variation is but small in the course of a year, u may be treated as a constant and put equal to an average value for the year, which average value is taken as the true value of u at exactly mid year. Together V--u constitute that function which has been tabulated as the 'argument" in the schedules of §25. Since V--u are together the whole argument according to the equilibrium theory of tides, with sea covering the whole earth, it follows that x/n is the lagging of the tide which arises from kinetic action, friction of the water, imperfect elasticity of the earth, and the distribution of land It is supposed that H is the mean value in British feet of the semi-range of the particular tide in question; f is a numerical factor of augmentation or diminution, due to the variability of the obliquity of the lunar orbit. The value of f is the ratio of the " coefficient " in the third column of the preceding schedules to the mean value of the same term. It is obvious, then, that, if the tidal observations are consistent from year to year, H and k should

come out the same from each year's reductions. It is only when the results are presented in such a form as this that it will be possible to judge whether the harmonic analysis is yielding satisfactory results. This mode of giving the tidal results is also essential for the use of a tide-predicting machine (see § 8).

We must now show how to determine H and k from R and f . It is clear that H = R/f , and the determination of f from the schedules depends on the evaluation of the mean value of each of the terms in the schedules, into which we shall not enter. If Vo be the value of Fate* of the first day when I is zero, then clearly

— ?=Vo+M-fi so that K = t+Vo+u.

Thus the rule for the determination of k is: Add to the value of f the value of the argument at o h of the first day.

The results of harmonic analysis are usually tabulated by giving H, k under the initial letter of each tide; the results are thus com- parable from year to year. 1 For the purpose of using _, . . the tide-predicting machine the process of determining constants H and k from R and f has simply to be reversed, with the difference that the instant of time to which to refer the argument is o h of the first day of the new year, and we must take note of the different values of u and f for the new year. Tables 2 have been computed for f and u for all longitudes of the moon's node and for each kind of tide, and the mean longitudes of moon, sun, and lunar perigee may be extracted from any ephemeris. Thus when the mean semi-range H and the retardation k of any tide are known its height may be computed for any instant. The sum of the heights for all the principal tides of course gives the actual height of water.

§ 28. Numerical Harmonic Analysis. — The tide-gauge furnishes us with a continuous graphical record of the height of the water above some known datum mark for every instant of treatment time. The first operation performed on the tidal ot rM e record is the measurement in feet and decimals of the curves. height of water above the datum at every mean solar hour. The period chosen for analysis is about one year and the first measurement corresponds to noon.

If T be the period of any one of the diurnal tides,

or the double period of any one of the semi-diurnal tides, it approximates more or less nearly to 24 solar hours, and, if we divide it into 24 equal parts, we may speak of each as a T-hour.

The process of harmonic analysis consists of finding the average height of water at each of the 24 T-hours of the T-day, but we shall not go into the way in which this may be done. 3 It must suffice to say that it depends on the fact that in the long run any given T-hour will fall at all hours of any other special day.

The final outcome is that we obtain the height of water at each of the 24 T-hours of a.- T-day, freed from the influence of all the other tides. We may see that it is thus possible to isolate the T-tide. When this has been done let / denote T-time expressed in T-hours, and let n be 15°. Then we express the height h as given by the averaging process above indicated by the formula

& = Ao + Ai cos nt + Bi sin nf + A 2 cos 2«/ + B 2 sin 2nt+ . . ., where / is o, 1, 2, . . . 23.

See the article Harmonic Analysis for the numerical processes by which A Ai, Bi, A 2 , B 2 , &c, may be evaluated. It is obvious that such a formula as A cos nZ-j-B sin nt may easily be reduced to the form R cos {nt — f) An actual numerical example of harmonic analysis of tidal observations is given in the Admiralty Scientific Manual (1886) in the article "Tides," or G. H. Darwin's Scientific Papers, vol. i.

V. — Synthetic Method

§ 29. On the Method and Notation. — The general nature of the synthetic method has been already explained; we now propose to show how the expressions for the tide may be developed from the result as expressed in the harmonic notation. If it should be desired to make a comparison of the results of tidal observation as expressed in the synthetic method with those of the harmonic method,

or the converse, or to compute a tide-table from the har- monic constants by reference to the moon's transits and the declina- tions and parallaxes of sun and moon, analytical expressions founded on a procedure indicated in the following sections are necessary.

In chapter iv. the mean semi-range and angle of retardation of any one of the tides have been denoted by H and k. We shall here, however, require to introduce several of the H's and k's into the same expression, and they must therefore be distinguished from one another. This may in general be done conveniently by writing as a subscript letter the initial of the corresponding tide; for example H„, K m will be taken to denote the H and k of the lunar tide M 2 . This notation does not suit the K. and Ki tides,

1 See, for example, a collection of results by Baird and Darwin, Proc. Roy. Soc. (1885), No. 239, and a more extensive one in Harris's Manual.

2 Report on Harmonic Analysis to Brit. Assoc. (1883), and more extended table in Baird's Manual of Tidal Observation (London,

1887).

3 See Darwin's Tides for an account without mathematics.

and we shall therefore write H", k" for the semi- diurnal K 2 , and H', k' for the diurnal Ki tide. These two tides proceed according to sidereal time and arise from the sun and moon jointly, and a synthesis of the two parts of each is effected in the harmonic method, although that synthesis is not explained in chapter iv. It is now necessary to reverse this partial synthesis, in order to obtain a more complete one. We must therefore note that the ratio of the solar to the lunar part of the total Kj

tide is 0-46407 ; so that 0-683 H' is the lunar portion of the total Kj. There will be no occasion to separate the two portions of Ki, and we shall retain the synthesis which is effected in the harmonic method.

§ 30. Semi-Diurnal Tides. — The process adopted is to replace the mean longitudes and elements of the orbit in each Mean Loogi- term f t i le harmonic development of the schedules tade and Q f g 2 g ^y hour-angles, declinations, and parallaxes. d"i Hi. A* tne time ' (mean solar time of port reduced to Replaced by angle) let a _ 6 ^ be 5>s R A declination, and hour-

Declioatfon an 8^ e > an< ^ ' 1>' S longitude measured from the " inter- anll section." These and other symbols when written with

Parallax. a SUDScr ipt accent are to apply to the sun. Then v being the R.A. of the intersection, we have from the right- angleH spherical triangle of which the sides are /, 5, a — v the relations

tan (o— v) = cos J tan /, sin 8 = sin / sin /. (49)

Now s— £ is the 5's mean longitude measured from the intersection and s — p is the mean anomaly; hence approximately

/ <= i - £ + 2e sin (s - p). (50)

From (49) and (50) we have approximately

o = s + (v — £) + 2e sin (s — £) — tan 2 \I sin 2{s — £).

Now, h being the © 's mean longitude, / + h is the sidereal hour- angle, and \p = t j h — a. Hence

t+h — s — {v-£) =f+2e sin (s — p) — tan* \ I sin 2(5 — {). ■ (51) Again, if we put

cos 2 A =i—| sin 2 / (52)

we have approximately from (49) and (50) cos 2 3 —

cos 2 A

whence

sin 2 A sin a cos a dS>

dt'

= cos 2 (s — £) = sin 2(s — £)

(53)

a sin 2 A

Obviously A is such a declination that sin 2 A is the mean value of sin 2 5 during a lunar month. Again, if P be the ratio of the d's parallax to her mean parallax, the equation to the ellipse described

gives -(P - I) = cos (s - p))

u 1 dP . , „, \ ■ (54)

whence - — = sin (s — p) \

e{a — 0) dt K e ' 1

Now it appears in schedule A of § 25 that the arguments of all the lunar semi-diurnal tides ar-e of the form 2(t+h— v) =»= 2(5—1) or =fc (s — p). It is clear, therefore, that the cosines of such angles may by the relations (51), (53), (54) be expressed in terms of hour-angles, declinations and parallaxes. Also by means of (52) we may intro- duce A in place of / in the coefficients of each term. An approxi- mate formula for A is 16-51 "+3 '44° cos N— 0-19° cos 2N. Details will be found in the Brit. Assoc. Report for 1885.

We shall not follow the analytical processes in detail, but the formulae given show the possibility of replacing the symbols used in the method of harmonic analysis by others involving R.A., declination and parallax.

Before giving the results of the processes indicated it must be remarked that greater succinctness is

obtained by the introduction . fn m of the symbol &' to denote the l>'s declination at a time cUaatlonal earuer than that of observation by an interval which Parallactic ma X ^ e ca " e(^ the " a & e °f the declinational inequality," aad and is computed from the formula tan (k"— K m)/2a or

Corrections.^ 2 ' 2 * tan (* "»»)• Similarly, it is convenient to introduce P' to denote the value of P at a time earlier than that of observation by the " age of the parallactic inequality," to be computed from tan (n m — K„)/(

The similar series of transformations when applied to the solar tides lead to simpler results, because A, is a constant, being 16-33°, al, d t ne " ages " may be treated as zero; besides the terms depending on dijdt and dPJdt are negligible. Formulae for the semi-diurnal tide of great exactness are obtainable by means of these transformations, but they lack the simplicity of those obtained in the harmonic method. On the other hand they are in some respects even more exact, since all lunar inequalities are represented. We shall not give the complex formulae which represent the com- plete substitution of R.A., declination and parallax in the earlier formulae, but shall content ourselves with rougher results, which are still fairly accurate.

Let us write them

M = P'

cos 2 v

2y.—

M,

cos J A /

, cos 2 h' Km +

H m +

cos 2 5' — co s 2 A sin 2 A 7

, cos 2 &, cos 2 A .

sin 2 A, H„

cos 2 A ,. H” . , „ 0-683 tJ-sm (k”

H„

0-683 H’cosXk’-ic),

Km),

K55)

Lunar aad one Solar Tide.

(57)

2n, = K..

Then we find that the height h 2 of the complete lunar and solar semi- diurnal tide is represented with a fair degree of approximation by hj = M cos 2 (t — fi) + M, cos2(^ — ti,). (56)

The first of these is the lunar tide, and it will be observed that the height M depends on the cube of the moon’s parallax at a time earlier than that of observation by ” the age of the Synthesis parallactic inequality,” and that it depends also on giving one the moon’s declination at a time earlier by ” the age of the declinational inequality.” The phase of the tide, represented by the angle 2j«, also has a declinational inequality.

The second term is the solar tide, and it also has parallactic and declinational inequalities.

The formulae (55), (56) have been used in an example of the computation of a tide-table given in the Admiralty Scientific Manual

(1886).

§ 31. Synthesis op Lunar and Solar Semi-Diurnal Tides.— Tet A be the excess of »‘s over ‘s R.A., so that A =a — a /t ^, = * + A, and h 2 = M cos 2(— aO+M,

cos 2(+A— n t)

The synthesis is then completed by writing

H cos2(ji-)= M+M, cos 2(A-/ 1/ +m), H sin 2(/t—(j>)= M, sin 2(A— jn, +M),

so that h 2 = H cos 2 (^ -4,). (58)

Then H is the height of the total semi-diurnal tide and 4>j{y — dajdt) or approximately l(y— is given in Synthesis degrees, is the "interval" from the moon's transit to to obtain high water. Single

The formulae for H and may be written Term.

H = V|M 2 +M / 2 +2MM / cos2(A-ai / -|-m)))

M > sin2(A->x < +M) V (59)

M+M,cos2(A-M,-h") ' J

Since A goes through its period in a lunation, it follows that H and <(> have inequalities with a period of half a lunation. These are called the " fortnightly inequalities in the Fortnightly height and interval. Inequality.

Spring tide obviously occurs when A = ju / — 11. Since the mean value of A is 5— h (the difference of the mean longitudes), and since the mean values of / i and p., are \K m , \k„ it follows that the mean value of the period elapsing after full moon and change of moon up to spring tide is {<,— K m)J2{

In computing a tide-table it is found practically convenient not to use A, which is the difference of R.A.'s at the unknown time of high-water, but to refer the tide to A , the difference of R.A.'s at the time of the moon's transit. It is clear that A is the apparent time of the moon's transit reduced to angle at 15° per hour. We have already remarked that l(y—da/dt) is the interval from transit to high- water, and hence at high- water

tan s(n— <)>) =

Ageot Tide.

. . , da/dl—dajdt- .

A = Ao-r’ j — 7j5 —

7 — dajdt

(60)

As an approximation we may attribute to all the quantities in the second term their mean values, and we then Reference have to Moon’s

A = A„ + -2^u 7 — a

Transit.

and

-M/ + M = Ao—m, + ^r^M= A - n, + l%ii.

(61)

This approximate formula (61) may be used in computing from (59) the fortnightly inequality in the ” height ” and ” interval.”

In this investigation we have supposed that the declinational and parallactic corrections are applied to the lunar, and solar tides before their synthesis; but it is obvious that the process may be reversed, and that we may form a table of the fortnightly inequality based on mean values H m and H, and afterwards apply corrections. This is the process usually adopted but it is less exact. The labour of computing the fortnightly inequality, especially by graphical methods, is not great, and the plan here suggested seems preferable.

§ 32. Diurnal Tides.— These tides have not been usually treated

with much completeness ir, the synthetic method. In the tide- tables of the British Admiralty we find that the tides at some ports are " affected by diurnal inequality" ; such a statement may be interpreted as meaning that the tides are not to be predicted by the information given in the so-called tide-table. The diurnal tides are indeed complex, and do not lend themselves easily to a complete synthesis. In the harmonic notation the three important tides are Ki, O, P, and the lunar portion of Ki is nearly equal to O in height, whilst the solar portion is nearly equal to P. A complete synthesis may be carried out on the lines adopted in treating the semi-diurnal tides, but the advantage of the plan is lost in conse- quence of large oscillations of the amplitude through the value zero, so that the tide is often represented by a negative quantity multiplied by a circular function. It is best, then, only to attempt a partial syn- thesis, and to admit the existence of two diurnal tides. One of these will be a tide consisting of Ki and P united, and the other will be O.

We shall not give the requisite formulae, but refer the reader to the Brit. Assoc. Report for 1885. A numerical example is given in the Admiralty Manual for 1886.

§ 33-. On the Reduction of Observations of High- and Low-Water. 1 — A continuous register of the tide or observation at fixed intervals of time, such as each hour, is certainly the best; but for the adequate use of such a record some plan analogous to harmonic analysis is necessary. Observations of high- and low-water only have, at least until recently, been more usual. In the reduction the immediate object is to connect the times and heights of high- and low-water with the moon's transits by means of the establishment, age and fortnightly inequality in the interval and height. The reference of the tide to the establishment is not, however, scientifically desirable, and it is better to determine the mean establishment, which is the mean interval from the moon's transit to high-water at spring tide, and the age of the tide, which is the mean period from full

moon and change ofmoon to spring tide.

*For these purposes the observations may be conveniently treated graphically. 1 An equally divided horizontal scale is taken to OrMohkal re P re9ent ” le twelve hours of the clock of civil time, Dttermloa- re g u ‘ a ted to the time of the port, or— more accurately— tloo of ‘ arran ? e< i always to show apparent time by being fast Establish- OT s ' ow ^ y tne ec l uat ' on of time; this time-scale represents , meat, Ac, * ne time-pf-clock of the moon's transit, either upper or lower. The scale is perhaps most conveniently arranged in the order V, VI,. . .XII, I. . . II II. Then each interval of time from transit to high-water is set off as an ordinate above the corre- sponding time-of-clock of the moon’s transit. A sweeping curve is drawn nearly through the tops of the ordinates, so as to cut off minor irregularities. Next along the same ordinates are set off lengths corresponding to the height of water at each high-water. A second similar figure may be made for the interval and height at low-water. In the curve of high-water intervals the ordinate corresponding to XII. is the establishment, since it gives the time of high-water at full moon and change of moon. That ordinate of high-water intervals which is coincident with the greatest ordinate of high-water heights gives the mean establishment. Since the moon s transit falls about fifty minutes later on each day, in setting off a fortnight’s observations there will be about five days for each four times-of-clock of the upper transit. Hence in these figures we may regard each division of the time-scale I to II, II to III, &c, as representing twenty-five hours instead of one hour. Then the distance from the greatest ordinate of high-water heights to XII is called the age of the tide. From these two figures the times and heights of high- and low-water may in general be predicted with fair approximation. We find the time-of-clock of the moon’s upper or lower transit on the day, correct by the equation of time, read off the corresponding heights of high- and low-water from the figures, and the intervals being also read off*

are added to the time of the moon's transit and give the times of high- and low-water. At all ports there is, however, an irregularity of heights and intervals between successive tides, and in consequence of this the curves present more or less of a zigzag appearance. Where the zigzag is perceptible to the eye, the curves must be smoothed by drawing them so as to bisect the zigzags, because these diurnal inequalities will not present themselves similarly in the future. When, as in some equatorial ports, the diurnal tides are large, this method of tidal prediction fails in the simple form explained above. It may however be rendered applicable by greater elaboration. 3

This method of working put observations of high- and low-water was not the earliest. In the Micanique Celeste, bks. i. and v., Laplace treats a large mass of tidal observations by dividing them into classes depending on the configurations of the tide-generating Ixxlies. Thus he separates the two syzygial tides at full moon and change of moon and divides them into equinoctial and solstitial tides. He takes into consideration the tides of several days

1 Founded on Whewell's article " Tides," in Admiralty Manual (ed. 1841), and on Airy's " Tides and Waves," in Ency. Metrop.

' For a numerical treatment, see Directions for Reducing Tidal Observations, by Commander Burdwood, R.N. (London, 1876).

» G. H. Darwin " On Tidal Prediction," Phil. Trans. (1891), vol. 189 A.

embracing these configurations. He goes through the tides at quadratures on the same general plan. The effects of declination and parallax and the diurnal inequalities are similarly treated. Lubbock (Phil. Trans., 1831, seq.) improved the , J" " method of Laplace by taking into account all the ob- 7^JJU2t served tides, and not merely those appertaining to certain zSbxli configurations. He divided the

*observations into a num- waew *"' ber of classes. First, the tides are separated into parcels, one for each month ; then each parcel is sorted according to the hour of the moon's transit. Another classification is made according to declination; another according to parallax; and a last for the diurnal inequalities. This plan was followed in treating the tides of London, Brest, St Helena, Plymouth, Portsmouth and Sheerness. Whewell (Phil. Trans., 1834, seq.) did much to reduce Lubbock's results to a mathe- matical form, and made a highly important advance by the intro- duction of graphical methods by means of curves. The method explained above is due to him. Airy remarks of Whewell's papers that they appear to be " the best specimens of reduction of new observations that we have ever seen."*

VI. — Tidal Deformation of the Solid Earth

§ 34. Elastic Tides. — The tide-generating potential varies as the square of the distance from the earth's centre, and the correspond- ing forces act at every point throughout its mass. No _, solid matter possesses the property of absolute rigidity, r? and we must therefore admit the probable existence «*«• of tidal elastic deformation of the solid earth. The problem of finding the state of strain of an elastic sphere under given stresses was first solved by G. Lamd; 4 he made, however, but few physical deductions from his solution. An independent solution was found by Lord Kelvin, 6 who drew some interesting conclusions concerning the earth.*

His problem, in as far as it is now material, is as follows. Let a sphere of radius a and density w be made of elastic material whose bulk and rigidity moduli are k and n, and let it be subjected to forces due to a potential per unit volume, equal to TWr(sm 1 \ — §), where X is latitude. Then it is required to find the strain of the sphere. We refer the reader to the original sources for the methods of solution applicable to spherical shells and to solid spheres. The investigation applies either to*

tidal or to rotational stresses. In the case of tides T = |m/c 3 , m and c being the moon's mass and distance, and in the case of rotation t = — fur, us being the angular velocity about the polar axis. The equation to the surface is found to be

In most solids the bulk modulus is considerably larger than the rididity modulus, and in this discussion it is sufficient to neglect n compared with k. With this approximation, the ellipticity e of the surface becomes

19B

Now suppose the sphere to be endued with the power of gravitation, and write

lq» Swd 1 '

9 5 «

where g is gravity at the surface of the globe. Then, if there were no elasticity, the ellipticity would be given by « = r/g, and without gravitation by e = r/r. And it may be proved in several ways that, gravity and elasticity co-operating,

_ T _ T_ 1

r +9 _ 3' i + r/g' If n be the rigidity of steel, and if the globe have the size and mean density of the earth, r/g = 2, and with the rigidity of glass r/

It is not possible in general to compute the tides of an ocean lying on an unyielding nucleus. But Laplace argued that friction would cause the tides of long period (§ 17) to conform to the equilibrium law, and thus be amenable to calculation. Acting on this belief, G. H. Darwin discussed the tides of long period as observed during 33 years at various ports, and found them to be § as great as on an unyielding globe, indicating an elasticity equal to that of steel. 6 Subsequently W. Schweydar repeated the calculation from 194 years of observation with nearly the same result. 7 But as Laplace's argument

appears to be unsound (§ 17), the conclusion seems to become of doubtful validity. Yet subseq uently Lord Rayleigh showed

4 Theorie math, de V elasticile (1866), p. 213.

5 Thomson and Tait, Nat. Phil. §§ 732–737 and 833–842, or Phil. Trans. (1863), pt. ii., p. 583. Compare, however, J. H. jeans, Phil. Trans. (1903), 201 A, p. 157.

6 Thomson & Tait, Nat. Phil. § 843.

7 Beitrdge zur Geophysik (1907) ix. 41.

that the existence in- the ocean of continental barriers would have the same effect as that attributed by Laplace to friction, and thus he re-established the soundness of the result. 1

A wholly independent estimate derived from what is called the variation of latitude also leads to the same conclusion, namely that the earth is about as stiff as steel. 2

The theory of the tides of an elastic planet gives, mutatis mutandis, that of the tides of a viscous spheroid. The reader who desires to know more of this subject and to obtain references to original memoirs may refer to G. H. Darwin's Tides.

VII. — Tidal Friction

§ 35- Investigation of the Secular Effects of Tidal Friction. — We have indicated in general terms in § 9 that the theory of tidal friction leads to an interesting speculation as to the origin of the moon. We shall therefore investigate the theory mathematically in _ the case where a planet is attended by a single satellite moving in a circular orbit, and rotates about an axis perpendicular to that orbit. In order, however, to abridge the

investigation we shall only consider the case where the planetary rotation is more rapid than the satellite's orbital motion.

Suppose an attractive particle or satellite of mass m to be moving in a circular orbit, with an angular velocity «, round a planet of mass M and suppose the planet to be rotating about an axis perpendicular to the plane of the orbit, with an angular velocity n ; suppose, also, the mass of the planet to be partially or wholly imperfectly elastic or viscous, or that there are oceans on the sur- face of the planet; then the attraction of the satellite must produce a relative motion in the parts of the planet, and that motion must be subject to friction, or, in other words, there must be frictional tides of some sort or other. The system must accordingly ^"fy be losing energy by friction, and its configuration must h Prtcffa change in such a way that its whole energy diminishes. by Friction. g ucn a S y S tem does not differ much from those of actual planets and satellites, and, therefore, the results deduced in this hypothetical case must agree pretty closely with the actual course of evolution, provided that time enough has been and will be given for such changes. Let C be the moment of inertia of the planet about its axis of rotation, r the distance of the satellite from the centre of the planet, h the resultant moment of momentum of the whole system, e the whole energy, both kinetic and potential, of the system. It is assumed that the figure of the planet and the distribu- tion of its internal density are such that the attraction of the satellite causes no couple about any axis perpendicular to that of rotation. A special system of units of mass, length and time will now be adopted such that the analytical results may be reduced to their sim- plest forms. Let the unit of mass be Mm/(M+m). Let the unit of length 7 be such a distance that the moment of inertia of the planet about its axis of rotation may be equal to the moment of inertia of the planet and satellite, treated as particles, about their centre of inertia, when distant y apart from one another. This

condition gives

Let the unit of time t be the time in which the satellite revolves through 57-3° about the planet, when the satellite's radius vector is equal to y. This system of units will be found to make the

three following functions each equal to unity, viz. f/^*' a/ n*Mm[M+m)-*, nMm, and C, where m is the attrac- *• tional constant. The units are in fact derived from the

consideration that these functions shall each be unity. In the case of the earth and moon, if we take the moon's mass as ^ of the earth's and the earth's moment of inertia as JMa 2 (as is very nearly the case), it may easily be shown that the unit of mass is uVof the earth's mass, the unit of length 5-26 earth's radii or 33,506 kilometres (20,807 miles), and the unit of time 2 hrs. 41 mins.

In these units the present angular velocity of the Moment of garth's diurnal rotation is expressed by 0-7044, and the Momentum. m0 o n 'S present radius vector by 11-454. The two bodies being supposed to revolve in circles about their common centre of inertia with an angular velocity u, the moment of momen- tum of orbital motion is

■Ktt mr \ 2 a-m(Mr \ 2 Mm .

Ml

M + m Then, by the law of periodic times in a circular orbit,

w 2 r» = ix(M+m); whence ar , = ii'(M + m)-r 2 .

Thus the moment of momentum of orbital motion

= ii-Mm{M \ m)~'r', and in the special units this is equal to r-. The moment of momen- tum of the planet's rotation is Cn, and C=i in the special units. Therefore h = n + r\ (62)

Sirtce tbe moon's present radius vector is 11-454,

it follows that the orbital momentum of the moon is 3-384. Adding to this the

1 Phil. Mag. (1903). v. 136.

» Hough, Phil. Trans. (1897), 187 A, p. 319.

rotational momentum of the earth, which is 0-704, we obtain 4-088 for the total moment of momentum of the moon and earth. The ratio of the orbital to the totational momentum is 4-80, so that the total moment of momentum of the system would, but for the obliquity of the ecliptic, be 5-80 times that of the earth's rotation. Again, the kinetic energy of orbital motion is

\M + ml \M + ml 'M + m r

The kinetic energy oT the planet's rotation is \Cn % . The potential energy of the system is —tiMmjr. Adding the three energies together, and transforming into the special units, we have

2e = » 2 — i/r. (63)

Now let x = r', y = n, ¥ = 2e.

It will be noticed that x, the moment of momentum of orbital motion is equal to the square root of the satellite's distance from the planet. Then equations (62) and (63) become

h = y + x (64)

Y = y 1 - 1/x 2 = (h - x) 1 - 1/x 2 (65)

(64) is the equation of conservation of moment of momentum, or, shortly, the equation of momentum; (65) is the equation of energy.

Now consider a system started with given positive moment of momentum h; and we have all sorts of ways in which it may be started. If the two rotations be of opposite /M **f™« UB kinds, it is clear that we may start the system with fjl any amount of energy, however great, but the true l ™'** mma maxima and

minima of energy compatible with the given eoe/ W« moment of momentum are supplied by dY/dx*=o, or * — h + i/x* ±= o,

that is to say, x* - to' + 1 = O; (66)

We shall presently see that this quartic has either two real roots and two imaginary, or all imaginary roots. The quartic may be derived from quite a different considera- No Relative tion, viz. by finding the condition under which the M°t ,on satellite may move round the planet so that the planet ? e **'ff ± shall always show the same face to the satellite — in facty „' ? 'rf** a ? • ■ so that they move as parts of one rigid body.. The "anetyrlieB, condition is simply that the satellite's orbital angular ^ etl f y mor velocity u =n, the planet's angular velocity of rotation, Minimum or y—llx s , since n=y and r»=ar*=#. By substituting this value of y in the equation of momentum (64), we get as before

x 4 — te 3 +i=o. At present we have only obtained one result, viz. that, if with given moment of momentum it is possible to set the satellite and planet moving as a rigid body, it is possible to do so in two ways, and one of these ways requires a maximum amount of energy and the other a minimum; from this it is clear that one must be a rapid rotation with the satellite near the planet and the other a slow one with the satellite remote from the planet. Of the three equations h = y+x, (67)

Y={h-xY-ilx\ . ■ ■ ■ (68)

x*y = i, (69) '

(67) is the equation of momentum, (68) that of energy, and (69) may be called the equation of rigidity, since it indicates that the two bodies move as though parts of one rigid body. To illustrate these equations geometrically, we may :? f* take as abscissa x, which is the moment of momentum omentum, of orbital motion, so that the axis of x may be called j«| (Sg the axis of orbital momentum. Also, for

equations (67) ,n y oll and (69) we may take as ordinate y, which is the moment of momentum of the planet's rotation, so that the axis of y may be called the axis of rotational momentum. For (68) we may take as ordinate Y, which is twice the energy of the system, so that the axis of Y may be called the axis of energy. Then, as it will be convenient to exhibit all three curves in the same figure, with a parallel axis of x, we must have the axis of energy identical '•with that of rotational momentum. It will not be necessary to consider the case where the resultant moment of momentum h is negative, be-cause this would only be equivalent to reversing all the rotations ; h is therefore to be taken as essentially positive. The line of momentum whose equation is (67) is a straight line inclined at 45° to either axis, having positive intercepts on both axes. The curve of rigidity whose equation is (69) is clearly of the same nature as a rectangular hyperbola, but it has a much more rapid rate of approach to the axis of orbital momentum than to that of rotational momentum. The intersections (if any) of the curve of rigidity With the line of momentum have abscissae which are the two roots of the quartic x* — hx' + l =0. The quartic has, therefore, two real roots or all imaginary roots. Then, since x = r", the intersection which, is more remote from the origin indicates a configuration where the satellite is remote from the planet ; the other gives the configuration where the satellite is closer to the planet. We have already learnt that these two correspond respectively to minimum and maximum energy. When x is very large the equation to the curve of energy is Y={h — x) 1 , which is the equation to a parabola with a vertical' axis parallel to Y and distant h from the origin , so that the axis of the parabola passes through the intersection of the line of momentu'Br

with the axis of orbital momentum. When x is very small, the equation becomes Y= — l/x % . Hence the

axis of Y is asymptotic on both sides to the curve of energy. If the line of momentum intersects the curve of rigidity, the curve of energy has a maximum vertically underneath the point of intersection nearer the origin and a minimum underneath the point more remote. But if there are no intersections, it has no maximum or minimum.

Fig. 8 shows these curves when drawn to scale for the case of the earth and moon, that is to say, with h = 4. The points a and b, which are the maximum and minimum of the curve of energy, are supposed to be on the same ordinates as A and B, the intersections of the curve of rigidity with the line of momentum. The intersection of the line of momentum with the axis of orbital momentum is

Fig. 8.

denoted by D, but in a figure of this size it necessarily remains indistinguishable from B. As the zero of energy is quite arbitrary the origin for the energy curve is displaced downwards, and this prevents the two curves from crossing one another in a confusing manner. On account of the limitation imposed we neglect the case where the quartic has no real roots. Every point of the line of momentum gives by its abscissa and ordinate the square root of the satellite s distance and the rotation of the planet, and the ordinate of the energy curve gives the energy corresponding to each distance of the satellite. Part of the figure has no physical meaning, for it is impossible for the satellite to move round the planet at a distance less than the sum of the radii of the planet and satellite. For example, the moon’s diameter being about 2200 m. and the earth’s about 8000, the moon’s distance cannot be less than 5100 miles. Accordingly a strip is marked off and shaded on each side of the vertical axis within which the figure has no physical meaning. The point P indicates the present configuration of the earth and moon. The curve of rigidity x*y = \ is the same for all values of h, and by moving the line of momentum parallel to itself Least Mo- nearer to or further from the

origin, we may represent .nentum ' a " P° ss 'b' e moments of momentum of the whole system. for which ^he smallest amount of moment of momentum with ■o Relative wn ' c ' 1 lt ls possible to set the system moving as a rigid Motion body, with centrifugal force enough to balance the Possible, mutual attraction, is when the line of momentum touches the curve of rigidity. The condition for this is clearly that the equation x l —hx 3 + i—o should have equal roots. If it has equal roots, each root must be \k, and therefore

(lh) 3 -h{ih)*+i=o, whence A 4 = 4 4 /3 3 , or A = 4/3? = 1-75. The actual Value of h for the moon and earth is about 4; hence, if the moon earth system were Maximum start ed w ith ' ess than & of its actual moment of momen- Namberof tum ' lt wou 'd not be possible for the two bodies to Days In move so that the earth should always show the same Month. * ace to the moon. Again, if we travel' along the line of momentum, there must be some point for which yx l is a maximum, and since yx' = n/ca there must be some point for which the number of planetary rotations is greatest during one revolution of the satellite; or, shortly, there must be some configura- tion for which there is a maximum number of days in the month. Now yx 3 is equal to x 3 (h—x), and this is a maximum when x-\h and the maximum number of days in the month is (ffc) 3 (fe — \h) or 3 3 fc 4 /4 4 ; if h is equal to 4, as is nearly the case for the earth and moon, this becomes 27. Hence it follows that we now have very nearly the maximum number of days in the month. A more accurate investigation in a paper on the " Precession of a Viscous Spheroid " in Phil. Trans. (1879), pt. i., showed that, taking account of solar tidal friction and of the obliquity to the ecliptic, the maximum number of days is about 29, and that we have already passed through the phase of maximum.

We will now consider the physical meaning of the figure. It is assumed that the resultant moment of momentum of the whole Discussion s y stem corresponds to a positive rotation. Now 0/ Figure ima S me two points with the sanK; abscissa, one on

*the w * momentum line and the other on the energy curve, and suppose the one on the energy curve to guide that on the momentum line. Since we are supposing frictional tides to be raised on the planet, the energy must degrade, and however the two points*

History of Satellite as Energy Degrades.

satellites-

are set initially the point on the energy curve must always slide down a slope, carrying with it the other point. Looking at the figure, we see that there are four slopes in the energy curve, two running down to the planet and two down to the minimum. There are therefore four ways in which the system may degrade, according to the way it was started; but we shall only consider one, that corresponding to the portion AB60 of the figure. For the part of the line of momentum AB the month is longer than the day, and this is the case with all known satellites except the nearer one of Mars. Now, if a satellite be placed in the condition A— that is to say, moving rapidly round a planet which always shows the same face to the : the condition is clearly dynamically unstable, for the least distur- bance will determine whether the system shall degrade down the slopes ac or ab — that is to say, whether it falls into or recedes from the planet. If the equilibrium breaks down by the satellite receding, the recession will go on until the system has reached the state corresponding to B. It is clear that, if the intersection of the edge of the shaded strip with the line of momentum be identical with the point A, which indicates that the satellite is just touching the planet, then the two bodies are in effect parts of a single body in an unstable configuration. If, therefore, the moon was originally part of the earth, we should expect to find this identity. Now in fig. 9, drawn to scale to represent the earth and moon, there is so close an approach between the edge of the shaded band and the intersec- tion of the line of momentum and curve of rigidity that it would be scarcely possible to

distinguish them. Hence, there seems a probability that the two bodies once formed parts of a single one, which broke up in consequence of some kind of instability. This view is confirmed by the more detailed consideration of the case in the paper on the " Precession of a Viscous Spheroid," already referred to, and subsequent papers, in the Phil. Trans. 1

§ 36. Effects of Tidal Friction on the Elements of the Moon's Orbit and on the Earth's Rotation. — It would be impossible within the limits of the present article to discuss completely the effects of tidal friction; we therefore confine ourselves to certain general considerations which throw light on the nature of those effects. We have in the preceding section supposed that the planet's axis is perpendicular to the orbit of the satellite, and that the latter is circular ; we shall now suppose the orbit to be oblique to the equator and eccentric. For the sake of brevity the planet will be called the earth, and the satellite the moon. The complete investigation was carried out on the hypothesis that the planet was a viscous spheroid, because this was the only theory of Irictionally resisted tides which had been worked out. Although the results would be practically the same for any system of fnctionally resisted tides, we shall speak below of the planet or earth as a viscous body. 2

We shall show that if the tidal retardation be small the obliquity of the ecliptic increases, the earth's rotation is retarded, and the moon's distance and peri- odic time are increased. Fig. 9 represents the

Obliquity of the Ecliptic Increases.

Fig. 9.

earth as seen from above ' the south pole, so that S is the pole and the outer circle the equator. The earth's rotation is in the direc- tion of the curved arrow at S. The half of the inner circle which is drawn with a full line is a semi-small-circle of. south latitude, and the dotted semicircle is a semi-

small-circle in the same north latitude. Generally dotted lines indicate parts of the figure which are below the plane of the paper. If the moon were cut in two and one half retained at the place of the moon and the other half transported to a point diametrically opposite to the first half with reference to the earth, there would be no material change in the tide-generating forces. It is easy to verify this statement by reference to § 11. These two halves may be described as moon and anti-moon, and such a substitution will facilitate the explanation. Let M and M' be the projections of the moon and anti-moon on to the terrestrial sphere. If the fluid in which the tides are raised were perfectly frictionless, 3 or if the earth were a perfect fluid or perfectly elastic, the apices of the tidal spheroid would be at M and M'. If, however, there is internal friction, due to any sort of viscosity, the tides will lag, and we may suppose the tidal apices to be at T and T*. Now suppose the tidal protuberances to be replaced by two equal heavy particles at T and T', which are instantaneously rigidly con- nected With the earth. Then the attraction of the moon on T is greater

1 For further consideration of this subject see a series of papers by G. H. Darwin in Proceed, and Trans, of the Royal Society from 1878 to 1881, and app. G. (b) t. pt. ii. vol. i. of Thomson and Tait's Nat. Phil. (1883) ; or Scientific Papers, vol. h. •

2 These explanations, together with other remarks, are vo De found in the abstracts of G. H. Darwin's memoirs in Prcc, Roy. Soc, 1878 to 1881.

3 We here suppose the tides not to be inverted. If they are, inverted the conclusion is precisely the same. :

than on T', and that of the anti-moon on T' is: greater than on T. The resultant of these forces is

clearly a pair of forces acting on the earth in the direction TM, T'M'. These forces cause a couple about the axis in the equator, which lies in the same meridian as the moon and anti-moon. The direction of the couple is shown by the curved arrows at L,L'. If the effects of this couple be compounded with the existing rotation of the earth according to the principle of the gyroscope, the south pole S will tend to approach M and the north pole to approach M'. Hence, supposing the moon to move in the ecliptic, the inclination of the earth's axis to the ecliptic dimin- ishes, or the obliquity increases. Next the forces TM, T'M' clearly produce, as in the simpler case considered in § 9, a couple about the earth's polar axis, which tends to retard the diurnal rotation.

This general explanation remains a fair representation of the state of the case so long as the different harmonic constituents of the aggregate tide-wave do not suffer very different amounts of retardation; and this is the case so long as the viscosity is not great. The rigorous result for a viscous planet shows that in general the obliquity will increase, and it appears that, with small viscosity of the planet, if the period of the satellite be longer than two periods of rotation of the planet, the obliquity increases, and vice versa. Hence, zero obliquity is only dynamically stable when the period of the satellite is less than two periods of the planet's rotation.

It is possible, by similar considerations, to obtain some insight

into the effect which tidal friction must have on the plane of the

lunar orbit, but as the subject is somewhat complex

Inclination we gjjall not proceed to a detailed examination of the

tn'hH question. It must suffice to say that in general the inclin- of Orbit at ; on { t j, e l unar

orbit must diminish. Now let us con- [f^.*™ e s '^ er a satellite revolving about a planet in an elliptic nas s ' orbit, with a periodic time which is long compared with the period of rotation of the planet ; and suppose that frictional tides are raised in the planet. The major axis of the tidal spheroid ^^ always points in advance of the satellite, and exercises

/Or** on !t a ” >Tce which tends to accelerate its linear velocity. JL „ When the satellite is in perigee the tides are higher, and / 'crease* t ' 1 ' s disturbing force is greater than when the satellite is

” s ' in apogee. The disturbing force may therefore be repre-

sented as a constant force, always tending to accelerate the motion of the satellite, to which is added a periodic force accelerating in perigee and retarding in apogee. The constant force causes a secular increase of the satellite's mean distance and a retardation of its mean motion. The accelerating force in perigee causes the satellite to swing out farther than it would otherwise have done, so that when it comes round to apogee it is more remote from the planet. The retarding force in apogee acts exactly inversely, and diminishes the perigean distance. Thus, the apogean distance in- creases and the perigean distance diminishes, or in other words, the eccentricity of the orbit increases. Now consider another case, and suppose the satellite's periodic time to be identical with that of the planet's rotation. Then, when the satellite is in perigee, its angular motion is faster than that of the planet's rotation, and when in apogee it is slower; hence at apogee the tides lag, and at perigee they are accelerated. Now the lagging apogean tides give rise to an „ accelerating force on the satellite, and increase the peri- Batitmay g ean c ii s t ancC) whilst the accelerated perigean tides give "”' rise to a retarding force, and decrease the apogean dis- tance. Hence in this case the eccentricity of the orbit will diminish. It

follows from these two results that there must be some inter- mediate periodic time of the satellite for which the eccentricity does not tend to vary.

But the preceding general explanation is in reality somewhat less satisfactory than it seems, because it does not make clear the exist- ence of certain antagonistic influences, to which, however, we shall not refer. The full investigation for a viscous planet shows that in general the eccentricity of the orbit will increase. When the viscos- ity is small the law of variation of eccentricity is very simple : if eleven periods of the satellite occupy a longer time than eighteen rotations of the planet, the eccentricity increases, and vice versa. Hence in the case of small viscosity a circular orbit is only dynamically stable if the eleven periods are shorter than the eighteen rotations.

VIII. — Cosmogonic Speculations Founded on Tidal Friction § 37. History of the Earth and Moon. — We shall not attempt to discuss the mathematical methods by which the complete history of a planet, attended by one or more satellites, is to be traced. The laws indicated in the preceding sections show that there is such a problem, and that it may be solved, and we refer to G. H. Darwin^s papers for details {Phil. Trans., 1879-1881). It may be interesting, however, to give the various results of the investigation in the form of a sketch of the possible evolution of the earth and moon, fol- lowed by remarks on the other planetary systems and oh the solar system as a whole.

We begin with a planet not very much more than 8000 m. in diameter, and probably partly solid, partly fluid, and partly gaseous. It is rotating about an axis inclined at about n° or 12 to the normal to the ecliptic, with a period of from two to four hours, and is revolving about the sun with a period not much shorter than our present year. The rapidity of the planet's rotation causes so

great a compression of its figure that it cannot continue to exist in an ellipsoidal form with

*stability ; or else it is so nearly unstable that complete instability is induced by the solar tides. cb Btecto ,; The planet then separates into two masses, the larger n eaes isof being the earth and the smaller the moon. It is jff oon f ntm not attempted to define the mode of separation, or gj, r t nt to say whether the moon was initially a chain of meteorites. At any rate it must be assumed that the smaller mass became more or less conglomerated and finally fused into a spheroid, perhaps in consequence of impacts between its constituent meteor ites, which were once part of the primeval planet. Up to this point the history is largely speculative, for the investigation of the conditions of instability in such a case surpasses the powers of the mathematician. We have now the earth and moon nearly in con- tact with one another, and rotating nearly as though they were parts of one rigid body. This is the system T? 5. 1 *? which was the subject of dynamical investigation. As %°? a f /'^'~ the two masses are not rigid, the attraction of each ' ec ^? ?!' distorts the other ; and, if they do not move rigorously vtgt V a en ' with the same periodic time, each raises a tide In the other. Also the sun raises tides in both. In consequence of the frictional resist- ance to these tidal motions, such a system is dynamically unstable. If the moon had moved orbitally a little faster than the earth rotated, she must have fallen back into the earth; thus the exist- ence of the moon compels us to believe that the equilibrium broke down by the moon revolving orbitally a little slower than the earth rotates. In consequence of the tidal friction the periodic times both of the moon (or the month) and of the earth's rotation (or the day) increase; but the month increases in length at a much greater rate than the day. At some early stage in the history of the system the moon was conglomerated into a spheroidal form, and acquired a rotation about an axis nearly parallel to that of the earth.*

The axial rotation of the moon is retarded by the attraction qf the earth on the tides raised in the moon, and this retardation take's place at a far

*greater rate than the similar retardation ,. „ of the earth’s rotation. As soon as the moon rotates * Demooa ‘ round her axis with twice the angular velocity with which she revolves in her orbit, the position of her axis of rotation (parallel with the earth’s axis) becomes dynamically unstable. The obli quity of the lunar equator to the plane of the orbit increases, attains a maximum, and then diminishes. Meanwhile the lunar axial rotation is being reduced towards identity with the orbital motion. Finally, her equator is nearly coincident with the plane of the orbit, and the attraction of the earth on a tide, which degene- rates into a permanent ellipticity of the lunar equator, causes her always to show the same face to the earth.*

*All this must have taken place early in the history of the earth, to which we now return. At first the month is identical with the day, and as both these increase in length the lunar orbit will retain its circular form until the month is equal to ** Esrt * iijr days. From that time the orbit begins to be eccen- “Jf’ib’”’”* trie, and the eccentricity increases thereafter up to its 0rb “• present magnitude. The plane of the lunar orbit is at first practically identical with the earth’s equator, but as the moon recedes from the earth the sun’s attraction begins to make itself felt. We shall not attetapt to trace the complex changes by which the plane of the lunar orbit is affected. It must suffice to say that the present small inclination of the lunar orbit to the ecliptic accords with the theory.*

As soon as the earth rotates with twice the angular velocity with which the moon revolves in her orbit, a new instability sets in. The month is then about twelve of our present hours, and the day about six such hours in length. The inclination of the equator to the ecliptic now begins to increase and continues to do so until finally it reached its present value of 23 J°. All these changes continue and no new phase now supervenes, and at length we have the system in its present configuration. The minimum time in which the changes from first to last can

have taken place is 54,000,000 years.

*There are other collateral results which must arise from a supposed primitive viscosity or plasticity of the earth's mass. For during this course of evolution the earth's mass must have suffered a screwing motion, so that the polar regions f„'^?f have travelled a little from west to east relatively to the ™ * equator. This affords a possible explanation of the **"”'• north and south trend of our great continents. The whole of this argument reposes on the imperfect rigidity of solids and on the internal friction of semi-solids and fluids; these are verue causae. Thus changes of the kind here discussed must be going .*

*on, and must have gone on in the past. And for this £?',» ##'"'' history of the earth and moon to be true throughout, gltr? f it is only necessary to postulate a sufficient lapse oftime, * uW ***' and that there is not enough matter diffused through yJJJJ ■ space materially to resist the motions of the mopn and earth in perhaps 200,000,000 years. It seems hardly too much ta say that, granting these two postulates, and the existence of a*

1 See criticism, by Nolan, Genesis of Moon (Melbourne, 1885); also Nature (Feb. 18, 1 885).

primeval planet such as that above described, a system would necessarily be developed which would bear a strong resemblance to our own. A theory, reposing on verae causae which brings into ijuantitative correlation the lengths of the present day and month, the obliquity of the ecliptic, and the inclination and eccentricity of the lunar orbit should have claims to acceptance.

§ 38. The Influence of Tidal Friction on the Evolution of the Solar System and of the Planetary Sub-systems. 1 — According to the nebular hypothesis

of Kant and Laplace the planets and satellites are portions detached from contracting nebulous masses, and other theories have been advanced subsequently in explanation of the present configuration of the solar system. We shall here only examine what changes are called for by the present theory of tidal friction. It may be shown that the reaction of the tides raised in the sun by the planets must have had a very small influence in changing the dimensions of the planetary orbits round the sun, and it appears improbable that the planetary orbits have been sensibly enlarged by tidal friction since the origin of the several planets.

Similarly it appears unlikely that the satellites of Mars, Jupiter and Saturn originated very much nearer the present surfaces of the planets that we now observe them. But, the data being Planetary insufficient, we cannot feel sure that the alteration Sub-systems. j n tne (ji mens i ons f the orbits of these satellites has not been considerable. It remains, however, nearly certain that they cannot have first originated almost in contact with the present surfaces of the planets, in the same way as in the pre- ceding sketch has been shown to be probable with regard to the moon and earth. Numerical data concerning the distribution of moment of momentum in the several planetary sub-systems exhibit so striking a difference between the terrestrial system and those of the other planets that we should from this alone have grounds for believing that the modes of evolution have been considerably different. The difference appears to lie in the genesis of the moon close to the pre-sent surface of the planet, and we shall see below that solar tidal friction may be assigned as a reason to explain how it has happened that the terrestrial planet had contracted to nearly its present dimensions before the genesis of a satellite, but that this was not the case with the exterior planets. The efficiency of solar tidal friction is very much greater in its action on the nearer planets than on the farther ones. The time, however, during which solar tidal friction has been

operating on the external planets is probably much longer than the period of its efficiency for the interior ones, and a series of numbers proportional to the total amount of rotation destroyed in the several planets would present a far less rapid decrease as we recede from the sun than numbers simply expressive of the efficiency of tidal friction at the several planets. Nevertheless it must be admitted that the effect produced by solar tidal friction on Jupiter and Saturn has not been nearly so great as on the interior planets. And, as already stated, it is very improbable that so large an amount of momentum should have been destroyed as materially to affect the orbits of the planets round the sun.

We will now examine how the difference of distances from; the sun may have affected the histories of the several planets. According to the nebula hypothesis, as a planetary nebula contracts, Distribution tnc increasing rapidity of the rotation causes it to of Satellites k ecome unstable, and an equatorial portion of matter /" «**' detaches itself. The separation of that part of the mass ■ s ' which before the change had the greatest angularmomen- tum permits the central portion to resume a planetary shape. The contraction and the increase of rotation proceed continually until another portion is detached, and so on. There thus recur at intervals epochs of instability, and something of the same kind must have occurred according to other rival theories. Now tidal friction must diminish the rate of increase of rotation due to contraction, and therefore if tidal friction and contraction are at work together the epochs of instability must recur more rarely than if con 1 traction alone acted. If the tidal retardation is sufficiently great, the increase of rotation due to contraction will be so far counteracted as never to permit an epoch of instability to occur. Since the rate of retardation due to solar tidal friction decreases rapidly as we recede from the sun, these considerations accord with what we observe in the solar system. For Mercury and Venus have no satellites, and there is*

progressive increase in the number of satellites as we recede from the sun. Whether this be the true cause of the observed distribu- tion of satellites amongst the planets or not, it is remarkable that the same cause also affords an explanation, as we shall now show; of that difference between the earth with the moon and the other planets with their satellites which has caused tidal friction to be the principal agent of change with the former, but not with the latter. In the case of the contracting terrestrial mass we may suppose that there was for a long time nearly a balance < jf* e ? f . between the retardation due to solar tidal friction and Earth and tne acce i erat ; on due to contraction, and that it was not

>Mo

tat from

occur. It may also be noted that if there be two

equal planetary masses which generate satellites, but under very

different conditions as to the degree of condensation of the masses, the

1 A review of this and of cognate subjects is contained in G. H.

vtarwin's presidential address to the Brit. Assoc, in 1905.

two satellites will be likely to differ in mass; we cannot, of course, tell which of the two planets would generate the larger satellite. Thus, if the genesis of the moon was deferred until a late epoch in the history of the terrestrial mass, the mass of the moon relatively to the earth would be likely to differ from the mass of other satellites relatively to their planets. If the contraction of the planetary mass be almost completed before the genesis of. the satellite, tidal friction will thereafter be the great cause of change in the system ; and thus the hypothesis that it is the sole

cause of change will give an ap- proximately accurate explanation of the motion of the planet and satellite at any subsequent time. We have already seen that the, theory that tidal friction has been the ruling power in the evolution of the earth and moon co-ordinates the present motions of the two bodies and carries us back to an initial state when the moon first had a separate existence as a satellite ; and the initial configuration of the two bodies is such that we are led to believe that the moon is a portion of the primitive earth detached by rapid rotation or by other causes.

Let us now turn to the other planetary sub-systems. The satellites of the larger planets revolve with short periodic times; for the smallness of their masses would have prevented tidal friction from being a very efficient cause of change in the dimensions of their orbits, and the largeness of the planet's masses would have caused them to proceed slowly in their evolution. The satellites of Mars present one of the most remarkable features in the solar system, for, whereas Mars rotates in 24I1. 37m., Deimos has a period of 30I1. 18m. and Phobos of only 7I1. 39m. The minuteness of these satellites precludes us from supposing that they have had much influence on the rotation of the planet, or that the dimensions of their own orbits have been much changed.

The theory of tidal friction would explain the shortness of the periodic time of Phobos by the solar retardation of the planet's rotation, which would operate without directly affecting satellites the satellites' orbital motion. We may see that, given f M a „ sufficient time, this must be the ultimate fate of all satellites. Numerical comparison shows that the efficiency of solar tidal friction in retarding the terrestrial and martian rotations is of about the same degree of importance, notwithstanding the much greater distance of the planet Mars. In the above discussion it will have been apparent that the earth and moon do actually differ from the other planets to such an extent as to permit tidal friction to have been the most

important factor in their history.

*By an examination of the probable effects of solar tidal friction on a contracting planetary mass, we have been led to assign a cause for the observed distribution of satellites in the solar system, and this again has itself afforded an explanation : "" nm "y' of how it happened that the moon so originated that the tidal friction of the lunaF tides in the earth should have been able to exercise so large ?.n influence. We have endeavoured not only to set forth the influence which tidal friction may have, and probably has had in the history of the system, if sufficient time be granted, but also to point out what effects it cannot have produced. These investigations afford no grounds for the rejection of theories more or less akin to the nebular hypothesis ; but they introduce modifica- tions of considerable importance. Tidal friction is a cause of change of which Laplace's theory took no account; and, although the activity of that cause may be regarded as mainly belonging to a later period than the events described in the nebular hypothesis, yet it seems that its influence has been of great, and in one instance of even paramount, importance in determining the present condition of the planets and their satellites. Throughout the whole of this discussion it has been supposed that sufficient time is at our disposal. Yet arguments have been adduced which f seemed to show that this supposition is not justifiable, J^y" " for Hclmholtz, Lord Kelvin and others have attempted ° me * to prove that the history of the solar system must be comprised within a period considerably less than a hundred million years. 3 But the discovery of radio-activity and the consequent remarkable advances in physics throw grave doubt on all such arguments, and we believe that it is still beyond our powers to assign definite numerical limits to the age of the solar system.*

Dr T. J. J. See (Researches on the Evolution of Stellar Systems; vol. ii. (1910) Capture Theory) rejects the applicability of tidal friction to the cosmogony of the solar system, and argues that the

satellites were primitively wandering bodies and were captured by the gravitational attraction of the planets. Such captures are considered by Dr See to be a necessary result of the presence in space of a resisting medium ; but the present writer does not feel convinced by the arguments adduced. (G. H. D.)

TIDORE or Tidor, an island of the Malay Archipelago, off the W. coast of Halmahera, S. of Ternate. It is nearly circular and has an area of about 30 sq. m. Several quiescent volcanic peaks, reaching 5700 ft., occupy most of the island, arid are covered with furests. The capital, Tidore, on the east coast, is a walled town and the seat of a sultan tributary to the Dutch

'Thomson and Tait's Nat, Phil., app. E; Nature (Jan. 27, 1887): Wolf, Theories cosmogoniques (1886).

and of a Dutch controleur (commissioner or agent). By an agree- ment of 1879 the sultan exercises authority over some parts of Halmahera, the Papuan Islands, the western half of New Guinea and the islands in Geelvink Gulf. The sultanate is included in the residency of Ternate (q.v.). The population, of Malay race and Mahommedans in religion, is about 8000. They live by agriculture (cotton, tobacco, nutmegs, &c.) and fishing.

TIECK, JOHANN LUDWIG (1773-1853), German poet, novelist and critic, was born in Berlin on the 31st of May 1773, his father being a rope-maker. He was educated at the Friedrich-Werdersche Gymnasium, and at the universities of Halle, Gottingen and Erlangen. At Gottingen Shakespeare and the Elizabethan drama were the chief subjects of his study. In 1794 he returned to Berlin, resolved to make a living by his pen. He contributed a number of short stories (1795-1798) to the series of Slraussfedern, published by the bookseller C. F. Nicolai and originally edited by J. K. A. Musaus,

and wrote Abdallah (1796) and a novel in letters, William Lovell (3 vols. 1795–1796). These works are, how- ever, immature and sensational in tone. Tieck's transition to romanticism is to be seen in the series of plays and stories published under the title V olksmarchen von Peter Lebrecht (3 vols., 1797), a collection which contains the admirable fairy-tale Der blonde Eckbert, and the witty dramatic satire on Berlin literary taste, Der gestiefelie Kater. With his school and college friend W. H. Wackenroder (1773— 1798), he planned the novel Franz Slernbalds Wanderungen (vols. i-ii. 1798), which, with Wackenroder's Herzensergies- sungen (1798), was the first expression of the romantic enthusiasm for old German art. In 1798 Tieck married and in the following year settled in Jena, where he, the two brothers Schlegel and Novalis were the leaders of the new Romantic school. Kis writings between 1798 and 1804 include the satirical drama, Prinz Zerbino (iygg), and Romantische Dich- tungen (2 vols., 1 799–1800). The latter contains Tieck's most ambitious dramatic poems, Leben und Tod der heiligen Genoveva, Leben und Tod des klcinen Rotkappchens, which were followed in 1804 by the remarkable " comedy " in two parts, Kaiser Oktavi- anus. These dramas, in which Tieck's poetic powers are to be seen at their best, are typical plays of the first Romantic school; although formless, and destitute of dramatic qualities, they show the influence of both Calderon and Shakespeare. Kaiser Oklavianus is a poetic glorification of the middle ages.

In 1 801 Tieck went to Dresden, then lived for a time near Frankfort-on-the-Oder, and spent many months in Italy. In 1803 he published a translation of Minnelieder aus der schwabischen Vorzeit, between 1799 and 1804 an excellent version of Don Quixote, and in 181 1 two volumes of Elizabethan dramas, Altenglisches Theater. In 1812–1817 he collected in threevolumes a number of his earlier stories and dramas, under the title Phantasus. In this collection appeared the stories Der Runen- berg, Die Elfen, Der Pokal, and the dramatic fairy tale,

Fortunat. In 181 7 Tieck visited England in order to collect materials for a work on Shakespeare (unfortunately never finished) and in 18 19 he settled permanently in Dresden; from 1825 on he was literary adviser to the Court Theatre, and his semi-public readings from the dramatic poets gave him a reputation which extended far beyond the Saxon capital. The new series of short stories which he began to publish in 1822 also won him a wide popu- larity. Notable among these are Die Gemalde, Die Reisenden, Die Verlobung. Des Lebens Uberfluss. More ambitious and on a wider canvas are the historical or semi-historical novels, Dichter- 'eben (1826), Der Aufruhr in den Cevennen (1826, unfinished), Der Tod des Dichters (1834); Der junge Tischlermeister (1836; but begun in 181 1) is an excellent story written under the in- fluence of Goethe's Wilhelm Meister; Vittoria Accorombona (1840), in the style of the French Romanticists, shows a falling- off. In later years Tieck carried on a varied literary activity as critic (Dramaturgische Blatter, 2 vols., 1825-1826; Kriti-scke Schriflen, 2 vols., 1848); he also edited the translation of Shake- speare by A. W. Schlegel, who was assisted by Tieck's daughter Dorothea (1 790-1841) and by Graf Wolf Heinrich Baudissin

(1789-1878); ShakesPeares Vorschule (2 vols., 1823-1829); the works of H. von Kleist(i826) and of J. M. R. Lenz (1828). In 1841 Friedrich Wilhelm IV. of Prussia invited him to Berlin where he enjoyed a pension for his remaining years. He died on the 28th of April 1853.

Tieck's importance lay rather in the readiness with which he adapted himself to the new ideas which arose at the close of the 18th century, than in any conspicuous originality or genius. His importance as an immediate force in German poetry is restricted to his early period. In later years it was as the helpful friend and adviser of others, or as the well-read critic of wide sympathies, that Tieck distinguished himself.

Tieck's Schriflen appeared in 20 vols. (1828-1846),

and his Gesam- mefa Novellen in 12 (1852-1854). Nachgelassene Schriften were published in 2 vols, in 1855. There are several modern editions of Ausgewahlte Werke by H. Welti (8 vols., 1886-1888); by J. Minor (in Kiirschner's Deutsche Nationalliteratur, 144, 2 vols., 1885) ; by G. Klee (with an excellent biography, 3 vols., 1892), and G. Witkowski (4 vols., 1903). The Elves and The Goblet were trans- lated by Carlyle in German Romance (1827), The Pictures and The Betrothal by Bishop Thirlwall (1825). A translation of Vittoria Accorombona was published in 1845. Tieck's Letters have not yet been collected, but Briefe an Tieck were published in 4 vols, by K. von Holtei in 1864. See for Tieck's earlier life R. Kopke, Ludwig Tieck (2 vols., 1855) ; for the Dresden period, H. Von Friesen, Ludwig Tieck: Erinnerungen (2 vols., 1871); also A. Stem, Ludwig Tieck in Dresden (Zur Liter atur der Gegenwarl, 1879); J. Minor, Tieck als Novellendichter (1884); B. Sbeiner, L. Tieck und die Volksbucher (1893); H. Bischof, Tieck als Dmmalurg (1897); W. Miessner. Tucks Lyrik (1902).

TIEDEMANN, FRIEDRICH (1781-1861), German anato- mist and physiologist, eldest son of Dietrich Tiedemann (1748- 1803), a philosopher and psychologist of considerable repute, was born at Cassel on the 23rd of August 1781. He graduated in medicine at Marburg in 1804, but soon abandoned practice. He devoted himself to the study of natural science, and, betaking himself to Paris, became an ardent follower of Baron Cuvier. On his return to Germany he maintained the claims of patient and sober anatomical research against the prevalent specu- lations of the school of Lorenz Oken, whose foremost antagonist he was long reckoned. His remarkable studies of the develop- ment of the human brain, as correlated with his father's studies on the development of intelligence, deserve mention. He spent most of his life as professor of anatomy and physiology at Heidelberg, a position to which he was appointed in 1816, after having filled the chair of anatomy and zoology for ten years at Landshut, and died at Munich on the 22nd of January

1861.

TIEL, a town in the province of Gelderland, Holland,. on the right bank of the Waal (here crossed by a pontoon bridge), 25 m. by rajl west of Nijmwegen. Pop. (1900), 10,788. It possesses fine streets and open places, but of its fortifications the Kleiberg Gate (1647) alone remains. The principal build- ings are St Martin's church (15th century), the town hall, court-house and the historical castle of the family of van Arkel. In 1892 a harbour was built, but the shipping of Tiel is now chiefly confined to craft for inland navigation. It carries on a flourishing trade, especially in fruit, and is an important market for horses and cattle. It also manufactures agricultural im- plements, furniture, paper, tobacco, &c.

Five miles W.N.W. of Tiel is the small town of Buren, which contains some interesting old houses and is an important market for horses. Buren was the seat of an independent lordship which is mentioned as early as 11 52. In later times it was held in fief, first from the dukes of Brabant, then from the dukes of Gelderland. In 1492 the emperor Charles V. raised it to a countship, and in 1551 it passed by marriage to Prince William of Orange Nassau. The title is now sometimes used by the royal family of the Netherlands when travelling iticqg'- nito. The castle was destroyed in the beginning of, the ■ 1,9th century, and the site of it is now marked by the park on. the west side of the town. It contained not less than 170 apart- ments and was memorable for the imprisonment within its walls of Arnoud duke of Gelderland (d. 1473), and as the birth- place of Philip William of Orange in 1554.

TIELEWTIEPOLO

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TIELE, CORNELIS PETRUS (1830-1902), Dutch theologian and scholar, was born at Leiden on the 16th of December 1830. He was educated at Amsterdam, first studying at the Athenaeum Illustre, as the communal

high school of the capital was then named, and afterwards at the seminary of the Remonstrant Brotherhood. He was destined for the pastorate in his own brotherhood. After steadily declining for a considerable period, this had increased its influence in the 'second half of the 19th century by widening the inelastic tenets of the Dutch Methodists, which had caused many of the liberal clergy among the Luth- erans and Calvinists to go over to the Remonstrants. Tiele certainly had liberal religious views himself, which he early enunciated from the pulpit, as Remonstrant pastor of Moor- drecht (1853) and at Rotterdam (1856). Upon the removal of the seminary of the brotherhood from Amsterdam to Leiden in 1873, Tiele was appointed one of its leading professors. In 1877 followed his appointment at the university of Leiden as professor of the history oi religions, a chair specially created for him. Of his many learned works, the Vergelijkende ges- chiedenis van de egyptische en mesopotatnische Godsdiensten (1872), and the Geschiedenis van den Godsdienst (1876; new ed. 1 891), have been translated into English, the former by James Ballingall (1878-1882), the latter by J. Estlin Carpenter (1877) under the title " Outlines of the History of Religion " (French translation, 1885; German translation, 1893). A French trans- lation of the Comparative History was published in 1882. Other works by Tiele are: De Godsdienst van Zarathustra, van het Ontstaan in Baktrie, lot den Vol van het Oud-Perzische Rijk (1864) a work now embodied, but much enlarged and improved by the latest researches of the author, in the History of Religions (vol. ii. part ii., Amsterdam, 1901), a part which appeared only a short time before the author's death; De Vrucht der Assyriologie voor de vergelijkende geschiedenis der Godsdiensten (1877; German ed., 1878); Babylonisck-assyrische Geschichte (two parts, Leipzig, 1886-1888); Western Asia, according to the most Recent Dis- coveries (London, 1894). He was also the writer of the article " Religions " in the 9th edition of the Ency. Brit. A volume of Tide's sermons ' appeared in 1865, and a collection of his poems in 1863. He also edited

(1868) the poems of Petrus Augustus de Genestet. Tiele was best known to English students by his Outlines and the Gifford Lectures " On the Elements of the Science of Religion," delivered in 1896^-1898 at Edinburgh University. They appeared simultaneously in Dutch at Amsterdam, in English in London and Edinburgh (1897-1899, 2 vols.). Edinburgh University in 1900 conferred upon Tiele the degree of D.D. honoris causd, an honour bestowed upon him previously by the universities of Dublin and Bologna. He was also a fellow of at least fifteen learned societies in Holland, Belgium, France, Germany, Italy, Great Britain and the United States. He died on the nth of January 1902. In 1901 he had resigned his professorship at Leiden University. Tiele's zeal and power for work were as extraordinary as his vast knowledge of ancient languages, peoples and religions, upon which his researches, according to F. Max Miiller, have shed a new and vivid light. With Abraham Kuenen and J. H. Scholten, amongst others, he founded the " Leiden School " of modern theology. From 1867 he assisted A. Kuenen, A. D. Loman and L. W. Rauwenhoff editing the Theologisch Tijdschrift.

His brother Pieter Anton Tiele (1834-1888) acted for many years as the librarian of Utrecht University, and dis- tinguished himself by his bibliographical studies, more especially by his several works on the history of colonization in Asia. Among these the most noteworthy are: De Opkomst van het nederlandsch Gezag in Oost-Indie (1886); De Vestiging der Portugeezen, in Indie (1873), and other books on the early Portuguese colonization in the Malay Archipelago,

-TIENTSIN, the largest commercial city in Chih-li, the metro- politan province of China. Pop. (1907), about 750,000. It is situated at the junction of the Peiho and the Hun-ho, which is connected by the grand Canal with the Yangtsze-kiang. It is a prefectural city, and has, since the conclusion of the

foreign treaties, become the residence of the

viceroy of the province during a great portion of the year. The town is built on a vast alluvial plain, which extends from the mountains beyond Peking to the sea, and through which the Peiho runs a circuitous course, making the distance by water from Tientsin to the coast about 70 m. as against 30 m. by railway.

The appearance of the city has greatly changed since the Boxer rising in 1900. After that event the city walls, which measured about three quarters of a mile each way, were razed, wide streets were made, the course of the river straightened, electric lighting and tramways introduced and a good water service supplied. Among the public. buildings are a university (in which instruction is given in western learning) and an arsenal. There are several cotton mills and important rice and salt markets. The city has always been a great commercial depot; a wharf nearly two miles long affords ample facilities for vessels able to cross the bar of the Peiho, over which there is a depth of water varying from 9 to 12 ft.

In 1907 the imports amounted to 79,500,000 taels (a tael in 1907 averaged 3s. 3d.); viz. foreign imports 61,200,000, native imports 18,317,000 taels; the exports in the same year amounted to 17.253,000. Valuable cargoes of tea are landed here for carriage overland, via Kalgan and Kiakhta, to Siberia. During the winter the river is frozen. The principal articles of import are shirtings, drills, jeans and twills, opium, woollens, steel, lead, needles, Japanese sea-weed and sugar; and of export, wool, skins, beans and pease, straw braid, coal, dates, tobacco and rhubarb. The coal exported is brought from the Kaiping colliery to the east of Tientsin; its output in 1885 was 181,039 tons and in 1904 28,956 tons.

The importance of Tientsin has been enhanced by the railways connecting it with Peking on the one hand and with Shanhai-kwah and Manchuria on the other. The British concession, in which the trade centres, is situated on the right bank of the river Peiho

below the native city, and occupies some 200 acres. It is held on a lease in perpetuity granted by the Chinese government to the British Crown, which sublets plots to private owners in the same way as is done at Hankow. The local management is entrusted to a municipal council organized on lines similar to those which obtain at Shanghai. Besides the British concession the French, Germans, Russians, Japanese, Austrians, Italians and Belgians have separate settlements, five miles in all, the river front being governed by foreign powers.

In 1853 Tientsin was besieged by an army of T'aip'ing rebels, which had been detached from the main force at Nanking for tie capture of Peking. The defences of Tientsin, however, saved the capital, and the rebels were forced to retreat. Five years later Lord Elgin, accompanied by the representative of France, steamed up the Peiho, after having forced the barriers at Taku, and took peaceable possession of the town. Here the treaty of 1858 was signed. But in i860, in consequence of the treacherous attack made on the British plenipotentiary the preceding year at Taku, the city and suburbs were occupied by an allied British and French force, and were held for two years. The city was constituted an open port. On the establishment of Roman Catholic orphanages some years later the pretensions oi the priests so irritated the people that on the occurrence ot an epidemic in the schools in the year 1870 they attacked the French and Russian establishments and murdered twenty-one oi the foreign inmates, besides numbers. of their native followers. The Chinese government suppressed the riot, paid £80,000 in compensation and sent a representative to Europe to apologize for the outbreak.

During the period 1874-1894, when Li Hung-Chang was viceroy of Chih-li and ex officio superintendent of trade, he made Tientsin his headquarters and the centre of his experiments in military and naval education. As a consequence the city became the chief focus of enterprise and foreign progress. Having arrogated to him'- self the practical control

of the foreign policy of the nation, Li's yamen became the scene of many important negotiations, and attracted distinguished visitors from all parts of the globe. The loss of prestige consequent on the Japanese War brought about the retirement of Li, and with it the political importance of Tientsin ceased. Both the foreign concessions and the native city suffered severely during the hostilities resulting from the Boxer movement in June-July, 1900. (See China : History $ D.)

TIEPOLO, GIOVANNI BATTISTA (1692-1769), Italian painter; was born at Venice, and acquired the rudiments of his art from Gregorio Lazzarini, and probably from Piazzetta, though' the decisive influence on the formation of his style was the study of Paolo Veronese's sumptuous paintings. When hardly but of his teens he developed an extraordinary facility of brushworkj and proved himself, as a fresco-painter, a colourist of the first

order, though this eaily mastery of technique made him fre- quently neglect form and composition. The more solid quali- ties of Paolo Veronese — depth of thought and balance of design —are frequently wanting in his work, but he approaches the earlier master in richness of colour and in the management of difficult effects of lighting. He decorated many Venetian churches and palaces with ceilings and frescoes full of turbulent movement and rich colour, extending his operations to tne near cities of the mainland and to Bergamo (Colleoni Chapel) and Milan (ceiling at Palazzo Chierici). In 1750 he proceeded to Wiirzburg to paint the magnificent ceilings and frescoes at the archbishop's palace. From 1753 to about 1763 he worked again at Venice and in the cities of north-east Italy, until he was summoned to Madrid by Charles III. to paint some frescoes for the royal palace. He died at Madrid in 1769. He was the last important figure in Venetian art, and at

the same time the initiator of the baroque period.

Tiepolo's altarpieces and easel pictures show more clearly even than his frescoes how deeply he -was imbued with the spirit of Paolo Veronese, for in these smaller works he paid more attention to the balance of composition, whilst retaining the luminosity of his colour harmonies. The majority of his works, both in fresco and in oils, are to be found in Venice in the churches of S. Aloise, SS. Apostoli, Gesuati, SS. Giovanni e Paolo, in the Scalzi, and the Scuola del Carmine, the Academy, and the Palazzi Labia, Rezzonico, and Quirini-Stampalia, and the Doge's Palace. Besides the cities already mentioned, Padua, Udine, Parma and Vicenza boast of fine examples of his work. At the National Gallery are two designs for altarpieces, a " De- position from the Cross," " Esther at the Throne of Ahasuerus," and "The Marriage of Marie de Medicis." Two versions of " Christ and the Adulteress " are in the collection of Dr L. Richter. Other easel pictures by Tiepolo are at the Louvre, and at the Berlin and Munich galleries. His paintings in Madrid belong to the closing years of his life and show signs of waning power. Tiepolo also executed some notable work with the etching-needle, the list comprising some fifty plates. His two sons, Giovanni Domenico (about 1726-1804) and Lorenzo, did not attain to his excellence.

See Les Tiepolo, by Henry de Chennevieres (Paris, 1898); and Pompeo Molmenti, G. B. Tiepolo (Milan, 1910).

TIERNEY, GEORGE (1 761-1830), English Whig politician, was born at Gibraltar on the 20th of March 1761, being the son of a wealthy Irish merchant of London, who was living there as prize agent. He was sent to Eton and Peterhouse, Cambridge, where he took the degree of LL.B. in 1784, and was called to the bar; but he abandoned law and plunged into politics. He contested Colchester in 1788, when both candidates received the same number of votes, but Tierney was declared elected. He was, however, defeated in 1790. He sat

for Southwark from 1796 to 1806, and then represented in turn Athlone (1806- 1807), Bandon (1807-1812), Appleby (1812-1818), and Knares-borough (1818-1830). When Fox seceded from the House of Commons, Tierney became a prominent opponent of Pitt's policy. In 1797 Wilberforce noted in his diary that Tierney's conduct was " truly Jacobinical "; and in May 1798 Pitt accused him of want of patriotism. A duel ensued at Putney Heath on Sunday, the 27th of May 1798; but neither combatant was injured. In 1803 Tierney, partly because peace had been ratified with France and partly because Pitt was out of office, joined the ministry of Addington as treasurer of the navy, and was created a privy councillor; but this alienated many of his supporters among the middle classes, and offended most of the influential Whigs. On the death of Fox he joined (1806) the Grenville ministry as president of the board of control, with a seat in the cabinet, and thus brought himself once more in to line with the Whigs. After the death of George Ponsonby in 181 7 Tierney became the recognized leader of the opposition in the House of Commons. In Canning's ministry he was master of the mint, and when Lord Goderich succeeded to the lead Tierney was admitted to the cabinet; but he was already suffering from ill-health and died suddenly at Savile Row, London, on the 25th oi January 1830.*

Tierney was a shrewd man of the world, with a naturaLaptitude for business. His powers of sarcasm were a cause of terror to his adversaries, and his presence in debate was much dreaded. His arguments were felicitous, and his choice of language was the theme of constant admiration. Lord Lytton, in his poem of St Stephen's, alludes to " Tierney's airy tread," and praises his " light and yet vigorous " attack, in which he inflicted, " with a placid smile," a fatal wound on his opponent.

TIERRA DEL FUEGO, an archipelago at the southern ex-tremity of South America, from which it is separated by Magellan Strait, at the First Narrows and other points scarcely a mile wide. The group lies between 52 40' and 55° 59' S. and 63 30' and 74 30' W.

stretching nearly in a line with the Pata- gonian Andes for over 400 m. N.W. and S.E., between Capes Pillar (Desolation Island) and Horn, and for about 270 m. W. and E. from Cape Pillar to Catherine Point at the north of the main island of Tierra del Fuego. Southwards it tapers to 120 m. between Capes Horn and San Diego, east of which extends Staten Island, which terminates in Cape St John. The boundary between Argentina and Chile has been settled in such a manner that Argentina holds that part of the main island of Tierra del Fuego which is situated east of the meridian of Cape Espiritu Santo, the frontier striking the north shore of Beagle Channel about its centre; and Chile holds all the western part of the main island and the other numerous islands to the west and to the south of Beagle Channel. The Argentine side is known as the Territory of Tierra del Fuego (including Staten Island), and the Chilean forms part of the Territory of Magallanes. Although on ordinary maps this region presents to the eye a hopelessly confused aggregate of islands, channels and fjord-like inlets, it is nevertheless clearly disposed in three main sections: (1) the main island; (2) the islands to the south, from which it is separated by Beagle Channel; (3) the islands to the west, marked off from those to the south by the Brecknock Peninsula.

Knowledge of these lands increased considerably during the later years of the 19th century, and their reputation for dreariness has been favourably modified. The climate in the eastern and southern regions is not so rigorous as was believed, there are no barren lands, the soil is fertile and can support fruitful industries, and the aborigines are far from being so dangerous as they were once considered to be. The greater part of the main island of Tierra del Fuego is formed by the continuation of the Tertiary beds of the Patagonian tableland cut by the transversal depression of Magellan Strait and by the low land extending from Useless Bay on the west to San Sebastian Bay on the east, of so recent origin that there exist still some salt lakes, this depression being represented

in the old charts as an inter-oceanic passage for small boats. Although in 1880 numerous prospectors discovered extensive deposits of alluvial gold, its exploitation was not generally successful, and farms took the place of mines. By the end of the 19th century 120 square miles had been occupied by cattle and sheep on the Argentine side, and about the same extent on the Chilean; and the cattle industry proved very profitable.

The undulating tableland has an average height of 300 ft. above the sea, and its climate, however cold in winter — in 1892 and 1893 the temperature reached 12-6° F. — allows of the cultivation of barley, oats and occasionally potatoes, which, however, grow better along Beagle Channel. To the south the tableland is higher and more broken, being drained by the Silva and Grande, among smaller rivers, the Grande being navigable in some parts by small craft. To the west and south-west the general character of the land changes; the ends of the Tertiary beds are raised in small hills and Mesozoic rocks appear, forming broken ridges of the Pre-Cordillera, a name given on the continent to the ridges which precede, to the east, the Andes. In this region appears the Antarctic forest in which pre- dominates the Fagus antarctica and F. betuloides, Drymis WinUri, Berber is li-cifolia, Pernettia, Desfonteinia and Philesia buxifolia. Lake Solier and Lake Fagnano receive the waters of these mountains and hills. Lake Fagnano is only 180 ft. above the sea, and its depth reaches 700 ft. To the south of the lake rises the south-eastern pro- longation of the Cordillera of the Andes, with ridges of a uniform height of 3500 ft., in which predominate crystalline schists which do not seem to be very old. Some peaks of Tertiary granite break the uniformity, such as Mt Sarmiento (7200 ft.), Mt Darwin, of which two peaks have been measured (6201 and 7054 ft.), I and Mt Olivaia (4324 ft.). Sarmiento, the culminating point of

the archipelago, was generally supposed to be volcanic, but it presents such extremely precipitous flanks that John Ball considered it more probably " a portion of the original rock skeleton that formed the axis of the Andean chain during the long ages that preceded the great volcanic outbursts that have covered the framework of the western side of South America." ' Sir Martin Conway, who ascended it, ascertained that it is, not a volcano. This is altogether an alpine region with numerous snow-clad summits and glaciers descending down to the sea. Deep valleys, which seem to be only the prolongation of fjords, penetrate into the chain in the southern slope where exist several harbours on which settlements have been founded. Yendegaia, Lapatia and Ushuaia Bays are among the larger. Ushuaia is the site of the capital of the Argentine Territory, and has shown considerable development, having regular communication by monthly steamers with Buenos Aires, While smaller steamers serve the different settlements along the coast. Cattle farms prosper along Beagle Channel, the timber industry is growing, lignite seams have been discovered, and alluvial gold is washed principally at Slogget Bay. These regions, as they become more known, may even invite the attention of tourists by their sublime scenery. Staten Island to the east of Tierra del Fuego has been settled by the Argentine government; there are a prison and lighthouse at St John Harbour, and a first-class permanent meteorological and magnetic station.

The division of the archipelago to the south of Beagle Channel includes the islands of Hoste, Navarin, Gordon, Londonderry, Stewart, Wollaston and numerous islets, disposed in triangular form with the base on Beagle Channel and the apex at the rocky headland of Cape Horn. At its west end Beagle Channel takes the name of Darwin Sound, which leads to the Pacific at the Londonderry and Stewart Islands. Partial exploration in this region was conducted by the French Mission du Cap Horn in 1882-1883, and the geological foundations are granite and basic volcanic rocks. The western group

of islands, demarcated bv Brecknock Peninsula, includes Clarence Island and Captain Cook's Desolation Land, with Dawson Island and numerous rocks and islets. Desolation Land was supposed by Cook to form a continuous mass stretching from the western entrance of Magellan Strait to Cockburn Channel, but it actually consists of several islands, separated from each other by very narrow channels flowing between the Pacific and the western branch of Magellan Strait. The name Desolation is given to the northern member of the group terminating at Cape Pillar; the southernmost and largest island nearer to Clarence Island, is Santa Iiies. In other cases small surveys among these fjords have shown that several of the larger islands are cut by channels which separate them into smaller ones, while elsewhere the low valleys which unite the mountains and hills are the result of post-Glacial deposits that have filled part of the former channels, these islands being the summits of an old continuous half-submerged mountain chain. At Dawson Island the Chilean government has established settlements, and a Roman Catholic mission has carried on work among the Alakaluf Indians.

Climate. — At Ushuaia ten years' meteorological observations 2 have shown a mean annual temperature of 42-84° F., with a winter mean of 34-7° and a summer mean of 50'18°. These figures show that tolerably mild winters (as a whole, apart from the extremes of cold already indicated) are followed by cool summers, both seasons being accompanied by overcast skies, constant and sudden changes from fair to foul weather; while fogs, mists, rains, snows and high winds (prevailing throughout the year) endanger the navigation of the intricate inland channels. The precipitation during ten years at Ushuaia has been observed to average 24-8 in. But on the southern seaward islands, under the influence of the prevalent westerly or south-westerly winds, it is very much heavier, and reaches 59 in. at Staten Island.

Fauna. — In the main island of Tierra del Fuego, the low-lying plains with their rich growth of tall

herbage are frequented by the rhea, guanaco and other animals common to the adjoining mainland. In the southern and western islands the fauna is restricted mainly to foxes, bats, rats, mice, the sea otter, the penguin and other aquatic birds, and various cetaceans in the surrounding waters.

Inhabitants. — To the three geographical divisions correspond three well-marked ethnical groups— the Onas of the main island, the Yagans (Yahgans) of the south and the Alakalufs of the west. With the settlement of the main island, which is now sometimes called Onisia, leaving the name of Tierra del Fuego to the archi- pelago, the Onas tribe has become fairly known. Their origin, like that of the other groups, is obscure. Undoubtedly among these Indians are many that recall some Patagonian types; it seems that they are not the same as the Tehuelche type, but that they pertain to one of the races that in earlier times existed in Pata- gonia. Their language is closely allied to that called Old Tehuelche ; it is a hard, slow-spoken speech, not at all resembling the soft, rapidly-spoken language of the Yagans, which has many points

1 Notes of a Naturalist in South America (London, 1887). * Dr Chavanne, Die Temperatur und Regenverhaltnisse Argen- iiniens (Buenos Aires, 1903).

of similarity with that of the Alakaluis. The isolation of the Onas is peculiarly marked, inasmuch as they are an insular people who do not use boats. Their life is nomadic, and they are hunters, living upon the flesh of the guanaco, and using only tussock-roots and wild celery for vegetable food. Their skill in and necessary devotion to the chase influence their whole mode of life; ” then- moral code is based upon a standard of physical culture and health.” 3 They live in small groups, every member of which is connected by family ties; between these groups, as in the case of the Yagans and Alakalufs, the vendetta is common. They have no gods, though certain legends are preserved. They have maintained their stock untainted, and have

withstood the influence of the white man to a remarkable degree (for example, they use no spirituous or fermented drink), though they have suffered a serious decrease in numbers at his hands. The men average about 5 ft. 10 in. in height; the women 5 ft. 6 in. They are of a light copper colour, with black straight hair, and remarkably muscular. The Yagans live under conditions of extraordinary rigour. In order to obtain food, they venture naked in small canoes into the treacherous seas; their life is a constant battle with starvation and a rude climate, and their character has become rude and low in conse- quence. They have no higher social unit than the family. On the authority of Charles Darwin they have been held by many to be cannibals, but they are not, although those suffering from incurable ailments are often put to death. Although taller than the Negritoes of the eastern hemisphere (4 ft. 10 in. to 5 ft. 4 in.), the Yagans present in some respects a more debased type character- ized by low brows, prominent zygomatic arches, large tumid lips, flat nose, loose wrinkled skin, black restless eyes very wide apart, coarse black unkempt hair, and head and chest disproportionately large compared with the extremely slender and outwardly curved legs. The missionaries, who have reduced the language to writing (Gospel of St Luke, London, 1881), assert that it contains no fewer than 30,000 words, although the numerals stop at five, already a compound form, and although the same word expresses both hand and finger; but it appears that a large number of the words included in this total are compounds. Comparatively little is known about the Alakalufs. _ They have a reputation for treachery, and for assaults on shipwrecked crews. They are hunters both on land and on the water, using the bow and arrow like the Onas, and building canoes often of large size.

The aborigines are decreasing rapidly in the whole archipelago, and although the Rev. Thomas Bridges, who, as missionary first and then as farmer, resided thirty years there, calculated the population to be 10,000 when he arrived, towards the close of the

19th century it was estimated to be little more than 1000.

Tierra del Fuego was discovered by Fernando de Magellan in 1520, when he sailed through the strait named after him, and called this region the ” Land of Fire,” either from now extinct volcanic flames, or from the fires kindled by the natives along parts of his course. In 1578 Sir Francis Drake first sighted the point which in 1616 was named Cape Hoorn (anglicized Horn) by the Dutch navigators Jacob Lemaire and Willem Cornelis Schouten (1615- 1617). In 1619 the brothers Garcia and Gongalo de Nodal first circumnavigated the archipelago, which was afterwards visited at intervals by Captain Sir John Narborough (1670), M. de Gennes and the Sieur Froger (1696), Commodore John Byron (1764), Samuel Wallis and Philip Carteret (1767), James Cook (1768) and James Weddell (1822). But no systematic exploration was attempted until the British Admiralty undertook a thorough survey of the whole group by Philip Parker King (1826-1828) and Robert Fitzroy (1831-1836). The latter expedition (Voyage of the ” Beagle “) was accompanied by Charles Darwin, then a young man. To these admirable surveys is due most of the present geographical terminology of the archipelago. Subsequently the work of ex- ploration was continued by Dumont d’Urville (1837), Charles Wilkes (1839), Parker Snow (1855), various later travellers, a selection of whose works are quoted below, and British, American and Roman Catholic missionaries.

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» W. S. Barclay, ” The Land of Magallanes, with some account of the Onas and other Indians,” Geographical Journal, vol. xxiii. (London, 1904).

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TIETJENS, THERESE JOHANNE ALEXANDRA (183 1- 1877), Hungarian soprano vocalist, was born at Hamburg on the 17th of July 1831. Her voice was trained at Hamburg, where she made a successful debut in 1849 as Lucrezia Borgia in Donizetti’s opera. Thence she proceeded to Frankfort and Vienna. She sang for the first time in London in 1858, appearing as Valentine

in Les Huguenots. Her success was so great that for the rest of her life she made England her home, and soon gained as brilliant a reputation in concert and oratorio work as she had already won upon the stage. Her voice was a dra- matic soprano of magnificent quality, and her powers as an actress were supreme. Her most famous parts were Fidelio, Medea (in Cherubini's opera) and Donna Anna (in Don Gio- vanni). She died in London on the 3rd of October 1877, having endeared herself to the English people as much by her private virtues as by her artistic gifts.

TIFFANY, CHARLES LEWIS (181 2-1902), American jeweler, was born at Killingly, Connecticut, on the 15th of February 1812. At fifteen he became a clerk in his father's store, but removed to New York City in 1837, and with John B. Young opened a fancy goods store. In 1847 the firm began to manu- facture gold jewelry, and in 1848, when the pplitical unrest in Europe caused great depreciation in the price of precious stones, Tiffany invested heavily in diamonds, which were sold at a great profit a few years later. The firm became Tiffany, Young & Ellis in 1 84 1 and was reorganized as Tiffany & Company (Mr Young and Mr Ellis retiring) in 1853. In 1851 the firm had established the sterling silver standard of 925 fine, sub sequently adopted by other jewelers; and in the same year had founded a branch house in Paris. In 1858 Tiffany bought the unused portion of the Atlantic telegraph cable which he made into cane handles or sold in sections. At the beginning of the Civil War, foreseeing that the jewelry business would suffer, he turned most of his capital to the manufacture of swords, medals and similar war material. In 1868 the com- pany was incorporated, and branches were established at London and at Geneva. Tiffany made a speciality of importing historic gems, jewelry and art works, and in 1887 bought some of the crown jewels of France, paying for them about half a million dollars. He was made a chevalier of the Legion of Honour in 1878. He died in New York on the 18th of February

1902.

TIFFANY, LOUIS COMFORT (1848-), American artist, son of Charles L. Tiffany, was born in New York City, on the 1 8th of February 1848. He was a pupil of George Inness and of Samuel Coleman, New York, and of Leon Bailly, Paris. He became a member of the Society of American Artists (1877), of the National Academy of Design (1880), of the American Water Color Society, and of the Societe Nationale des Beaux Arts, Paris. He travelled extensively in Europe, and painted in oil and water-colour, but subsequently devoted himself to decorative glass work. He became president and art director of the Tiffany Glass and Decorating Co., and produced a " Favrile " glass, of unusual beauty of colour.

TIFFIN, a city and the county-seat of Seneca county, Ohio, U.S.A., on the Sandusky river, about 40 m. S.S.E. of Toledo. Pop. (1900), 10,989, of whom 1168 were foreign-born; (1910 census), 11,894. Tiffin is served by the Baltimore & Ohio, the Cleveland. Cincinnati, Chicago & St Louis and the Pennsylvania

railways, and by an electric line to Fostoria, about 12 m. west. It is the seat of ah Ursulihe College for girls, founded in 1863 and incorporated with power to confer degrees in 1878; and of Heidelberg University (Reformed Church), founded in 1850, incorporated as Heidelberg College in 1851 and rein-corporated under its present name in 1890. The Heidelberg Theological Seminary was conducted here from 1850 to 1907, when it was combined with the "School of Theology " of Ursinus College, Collegeville, Pennsylvania, to form the Central Theo- logical Seminary of the Reformed Church in the United States, which in 1908 was removed to Dayton, Ohio. In Tiffin are the St Francis Home (1869), and the National Orphans' Home (1897). The city had 87 factories in 1905, of which 54-2%' were owned by individuals, and the value of the, factory products was $2,434,502. Tiffin was settled in 1817, incorporated as a town in 1835, and chartered as a city in 1830, when the village of Ft. Ball, on the opposite side of the Sandusky, was consolidated with it. It was named in honour of Edward Tiffin (1 766-1 829), a native of Carlisle, England, who

emigrated to the United States. He graduated at the University of Pennsylvania in 1789, removed in 1796 to Chillicothe, Ohio, where he practised medicine and was a local Methodist preacher. He was speaker of the House of Representatives of the North- west Territory in 1799, president (1802) of the convention which framed the first constitution of Ohio, the first governor of the state (1803–1807), a Democratic member of the United States Senate in 1807–1809, first commissioner of the United States General Land Office in 1812–1814, and surveyor-general of public lands north-west of the Ohio River in 1814–1829.

TIFLIS, a government of Russian Transcaucasia, occupying the eastern portion of the great valley which stretches between the main Caucasus range and the Armenian highlands, from the Meskes Mountains eastward, and extending up into the higher regions on both' north and south. The district of Akhaltsikh lies actually on the Armenian highlands. The government is rich in minerals, but only copper is extracted, at Alaverdi and Akhtal; petroleum and other mineral springs are abundant. The government is drained by the Kura and its tributaries (Lyakhva, Aragva, Yora and Alazan), all of whose waters are largely used for irrigation; but in the lower parts of the valley there are extensive waterless steppes, Shirak and Karayaz, on the left bank of the Kura, which are chiefly inhabited by nomad Tatars. The area of the government is 15,601 sq. m. (17,140 with the Zakataly district), and the estimated population in 1906 was 1,081,900. The government is divided into nine districts, the chief towns of which are Tiflis, Akhalkalaki, Akhaltsikh, Dushet, Gori, Signakh and Telav. Agriculture is the principal occupation. Good silk is produced, especially in the region of Kakhetia. Livestock breeding is extemively carried on on the steppes. About one-fourth of the area is under forest. The natives exhibit remarkable skill in the manufacture of leather and metallic goods, felt, woollen stuffs (e.g. carpets and shawls) and gold embroidery.

TIFLIS, a town of Russian Caucasia, capital of the

govern- ment of the same name and of the governor-generalship of Caucasia, picturesquely situated (44° 48' E,, 41 42' N.) at the loot of bare high mountains, on both banks of the river Kura, 300 ft. above the Black Sea. It is connected by rail with Poti and Batum (217 m.) on the Black Sea, with Baku on the Caspian Sea (342 m.), with Kars (185 m.),and, via Baku and Petrovsk, with the railway system of European Russia, which it joins at Beslan, near Vladikavkaz. Omnibuses also run regularly across the main range to Vladikavkaz, which by this route is only 133 m. distant. The heat in summer is excessive (mean, 73-4° F.)i owing to the confined position; but the surrounding hills (1500 to 2400 ft.) shelter the town effectively from the cold winds of winter (mean, 34'7°). A large square, cathedrals, handsome streets, gardens, bridges, many fine buildings — among them the grand-ducal palace, the opera-house and the museum — European shops, the club or " circle," hotels and public offices, are evidence of western civilization. Among the modern public buildings are the Hall of Fame (1885), the Caucasian Museum, a

cathedral of the Catholic Greek Church, and a sericultural museum. The chief of the older edifices is the (Sion) cathedral, which traces back its origin to the 5th century. Other churches date from the 14th and 15th centuries, the Armenian cathedral of Van from 1480, and the Catholic church from the 14th century. At Tiflis are the Caucasian branch of the Russian Geographical Society, an astronomical and a physical observatory, a botanical garden and museum, and a public library. There are cotton and silk factories, tanneries, soap-works and brick-works. The artisans of Tiflis are renowned as silversmiths, gunsmiths and sword-makers. Tiflis is the chief centre for the import of raw silk and silken goods, raw cotton, cottons, woollens, boots, tobacco, wine, carpets, and dried fruits from Persia and Trans- caucasia, while manufactured wares are

imported from Russia. The city has considerably developed, and had, in 1897, 160,645 inhabitants, as compared with 104,024 in 1883. They include Georgians, Russians, Germans, Persians and Tatars.

In the old division of Tiflis three distinct towns were included — Tiflis, Kal'a (the fort) and Isni; subsequently Tiflis seems to have been known as Saidabad, Kal'a as Tiflis, and Isni as Aulabar. Kal'a and Isni possessed citadels; that of the former contained the church of St Nicholas and a royal palace; that of the latter the church of the Holy Virgin and the residence of the archimandrite. The town is now divided into quarters: the Russian (the finest of all), the German, the Armenian, and that in which are congregated Jews, Mahommedans and the mass of Orientals.

The Georgian annals put the foundation of Tiflis back to a.d. 379. In the later half of the 5th century the chieftain of Georgia, Wakhtang, Gurgaslan, transferred his capital from Mtskhet to the warm springs of Tphilis, where he erected several churches and a fort. In 570 the Persians took the place and made it the residence of their rulers, but retained it only for ten years. Tiflis suffered successive plunderings and devastations at the hands of the Greeks in 626, of one of the commanders of the Caliph Omar in 731, of the Khazars in 828, and of the Arabs in 851. The Georgians, however, always managed to return to it and to keep it in their permanent possession. In the course of the succeeding centuries Tiflis fell repeatedly into Persian hands; and it was plundered by the Mongol conqueror Tamerlane towards the end of the 14th century. Afterwards the Turks seized it several times, and towards the end of the 17th century the Lesghians attacked it. In 1795, when the shah of Persia plundered Tiflis, Russia sent troops to its protection, and the Russian occupation became permanent in 1799.

Perhaps one of the fullest accounts of Tiflis is contained in Brosset's edition of the Description geogrdphigue de la Georgie (St Petersburg, 1842), by

the illegitimate son of Wakhtang VI., king of Karthli (i.e. Georgia), who became a pensioner of Peter the Great. (P. A. K. ; J. T. Be.).

TIGELLINUS, SOPHONIUS, minister and favourite of the emperor Nero, was a native of Agrigentum, of humble origin and possibly of Greek descent. During the reign of Caligula he was banished (a.d. 39) for adultery with the emperor's sisters, but recalled by Claudius (41). Having inherited a fortune, he bought land in Apulia and Calabria and devoted himself to breeding race-horses. In this manner he gained the favour of Nero, whom he aided and abetted in his vices and cruelties. In 62 he was promoted to the prefecture of the praetorian guards. In 64 he made himself notorious for the orgies arranged by him in the Basin of Agrippa, and was suspected of incendiarism in connexion with the great fire, which, after having subsided, broke out afresh in his Aemilian gardens. In 65, during the investigation into the abortive conspiracy of Piso, he and Poppaea formed a kind of imperial privy council. In 67 he accompanied Nero on his tour in Greece. When the emperor's downfall appeared imminent, Tigellinus deserted him, and with Nymphidius Sabinus brought about the defection of the praetorians. Under Galba he was obliged to give up his command, but managed to save his life by lavishing presents upon Vinius, the favourite of Galba, and his daughter. Otho on his accession (69) deter- mined to remove one so universally detested by the people. While in the baths at Sinuessa, Tigellinus received the news that he must die, and, having vainly endeavoured to gain a respite, cut his throat.

See Tacitus, Annals, xiv., xv., xvi.; Hist. i. 72; Dio Cassius lix. 23, lxii. i,3, 15, 27, lxiii. 12, 21, briv. 3; Suetonius, Galba, 15; Plutarch, Galba, Otho; ancient authorities quoted by Mayor on Juvenal, i. 155; B. W. Henderson, Life and Principate of the Emperor Nero (1903).

TIGER (Felis tigris), an animal only rivalled by the lion in size, strength and ferocity among the cat-

like beasts of prey (see Carnivora). Almost everything that is stated in the article Lion concerning the structure of the skeleton, teeth and claws of that animal will apply equally well to the tiger, the difference between the two lying mainly in the skin and its coverings. A tiger's skull may, however, always be distinguished from that

The Tiger (Felis tigris).

of a'lion by the circumstance that the nasal bones extend higher on the forehead than the maxillae, instead of stopping on nearly the same line. Although examples of both species present considerable variations in size, it is ascertained that the length of the largest-sized Bengal tiger may exceed that of any lion. Much larger specimens are recorded, but 10 feet from the tip of the nose to the end of the tail is no unusual length for a large male tiger. The female is somewhat smaller and has a lighter and narrower head. The tiger has no mane, but in old males the hair on the cheeks is rather long and spreading. The ground- colour of the upper and outer parts of the head, body, limbs and tail is bright rufous fawn; and these parts are beautifully marked with transverse stripes of a dark, almost black colour. The markings vary much in different individuals, and even on the two sides of the same individual. The under-parts of the body, the inside of the limbs, the cheeks and a large spot over each eye are nearly white. The tigers which inhabit hotter regions, as Bengal and the south Asiatic islands, have shorter and smoother hair, and are more richly coloured and distinctly striped than those of northern China and Siberia, in which the fur is longer, softer and lighter-coloured. The Siberian tiger is F. tigris mongolica, and the Persian F. tigris virgata. Black and white phases have been recorded, but they are rare. The tiger is exclusively Asiatic, but has a very wide range in that continent, having been found in almost all suitable localities south of a line drawn from the river Euphrates, passing along the southern shores of the Caspian and Sea of Aral by Lake Baikal to the Sea of Okhotsk. Its most northern range is the

territory of the Amur, its most southern the islands of Sumatra, Java and Bali. (Westward it reaches to Turkish Georgia and eastward to the island of Sag-halin. It is absent, however, from the great elevated plateau of Central Asia, nor does it inhabit Ceylon, Borneo or the other islands of the Indo-Malay Archipelago, except those named.

The principal food of the tiger in India is cattle, deer, wild hog and pea-fowl, and occasionally human beings. The regular ” man-eater ” is generally an old tiger whose vigour is past, and whose teeth are worn and defective; it takes up its abode in

the neighbourhood of a village, the population of which it finds an easier prey than wild animals. Though chiefly affecting grassy plains or swamps, tigers are also found in forests, and seem to be fond of haunting the neighbourhood of old ruins. As a rule, they do not climb trees; but when pressed by fear, as during an inundation, they have been known to do so. They take to the water readily and are good swimmers. The tigers of the Sundar- bans (Ganges delta) continually swim from one island to the other to change their hunting-grounds for deer. The following extract from Sir J. Fayrer’s Royal Tiger of Bengal (1875) may complete this notice of the tiger’s habits.

The tigress gives birth to from two to five, even six cubs: hut three is a frequent number. She is a most affectionate and attached mother, and generally guards and trains her young with the most watchful solicitude. They remain with her until nearly full-grown, or about the second year, when they are able to kill for themselves ai.d begin life on their own account. Whilst they remain with her she is peculiarly vicious and aggressive, defending them with the greatest courage and energy, and when robbed of them is terrible in her rage; but she has been known to desert them when pressed, and even to

eat them when starved. As soon as they begin to require other food than her milk, she kills for them, teaching them to do so for themselves by practising on small animals, such as deer and young calves or pigs. At these times she is wanton and extravagant in her cruelty, killing apparently for the gratification of her ferocious and bloodthirsty nature, and perhaps to excite and instruct the young ones, and it is not until they are thoroughly capable of killing their Own food that she separates from them. The young tigers are far more destructive than the old. They will kill three or four cows at a time, while the older and more ex- perienced rarely kill more than one, and this at intervals of from three or four days to a week. For this purpose the tiger will leave its retreat in the dense jungle, proceed to the neighbourhood of a village or gowrie, where cattle feed, and during the night steal on and strike down a bullock, drag it into a secluded place, and then remain near the " murrie " or " kill," for several days, until it has eaten it, when it will proceed in search of a further supply, and, having found good hunting ground in the viciniiy of a village or gowrie, continue its ravages, destroying one ot two cows or buffaloes a week. It is very fond of the ordinary domestic cattle, which in the plains of India are generally weak, half-starved, under- sized creatures. One of these is easily struck down and carried or dragged off. The smaller buffaloes are also easily disposed of ; but the buffalo bulls, and especially the wild ones, are formidable antagonists, and have often been known to beat the tiger off, and even to wound him seriously. (W. H. F.; R. L.)*

TIGER-CAT, typically Felis tigrina, an American wild cat ranging from Mexico, on the east of the Andes to Paraguay and the central forest region of Argentina. Together the bead and body measure something over 30 in., of which the tail counts for a third. The fur is grizzly grey, with black spots that do not form chains. The name is also applied to the Ocelot (q. v.), and often used of any small striped or spotted wild cat, either from the western or eastern

hemisphere.

TIGER-FLOWER, known botanically as Tigridia, a genus of bulbous plants (natural order Iridaceae), natives of Mexico, Central America, Peru and Chile. They have long narrow plicately-vcined leaves springing from the bulb and a stem bear- ing two or three scattered smaller leaves and above a few flowers emerging from a spathe. The flowers are spotted (whence the name tiger-flower or tiger-iris) and have free segments springing from a tube; the three large broad outer segments are concavely spreading, the three inner are much smaller and more erect. T. pavonia (Flower of Tigris) has large flowers with a golden orange, white or yellow ground colour.

TIGHE, MARY (1 772-1810), Irish poet, daughter of the Rev. William Blachford, was born on the 9th of October 1772. In 1793 she contracted what proved to be an unhappy marriage with her cousin, Henry Tighe, of Woodstock, Co. Wicklow. She died on the 24th of March 1S10, at Woodstock, Co. Kilkenny, and was buried at Inistioge. Mrs Tighe was the author of a poem of unusual merit, Psyche or the Legend of Love, printed privately in 1805 and published posthumously in 181 1 with some other poems. It is founded on the story as told by Apuleius, and is written in the Spenserian stanza. The poem had many admirers, and high praise is awarded it in a contemporary notice in the Quarterly Review (May 181 1).

TIGLATH-PILESER (Ass. Tukulti-pal-E-sarra, "my con- fidence is the son of E-sarra," i.e. the god In-AristiJ,the name of several Assyrian kings. The numbering of these kings is not certain.

Tiglath-Pileser I., the son of Assur-ris-isi, ascended the throne c. 11 20 B.C., and was one of the greatest of Assyrian conquerors. His first campaign was against the Moschi who had occupied certain Assyrian districts on the Upper Euphrates; then he overran Commagene and eastern Cappadocia, and drove the Hittites from the Assyrian province of Subarti north-east of Malatia. In a subsequent campaign the Assyrian forces pene- trated into the

Kurdish mountains south of Lake Van and then turned westward, Malatia submitting to the invader. In his fifth year Tiglath-Pileser attacked Comana in Cappadocia, and placed a record of his victories engraved on copper plates in a fortress he built to secure his Cilician conquests. The Aramaeans of north Syria were the next to be attacked, and he thrice made his way as far as the sources of the Tigris. The command of the high road to the Mediterranean was secured by the possession of the Hittite town of Pethor at trie junction of the Euphrates and Sajur, and at Arvad he received presents, including a crocodile, from the Egyptian king, and, embarking in a ship, killed a dolphin in the sea. He was passionately fond of the chase and was also a great builder, the restoration of the temple of Assur and Hadad at Assur (q.v.) being one of his works.

Tiglath-Pileser II. or III., son of Hadad-nirari II., appears to have reigned from about 950 to 930 B.C., but nothing is known about him. r .

Tiglath-Pileser III. or IV., was a successful general who usurped the Assyrian throne oh the 13th of lyyar 745 B.C., after the fall of the older dynasty, and changed his name of Pulu (Pul) to that of the famous conqueror of earlier times. In Babylonia, however, he continued to be known as Pulu. He was a man of great ability, both military and administrative, and initiated a new system of policy in Assyria which he aimed at making the head of a centralized empire, bound together by a bureaucracy who derived their power from the king. The empire was supported by a standing army and an elaborate system of finance. The first task of Tiglath-Pileser was to reduce the Aramaean tribes to order, and so win the gratitude of the Baby- lonian priests. Then he struck terror into the wild tribes on the eastern frontiers of the kingdom by a campaign which ex- tended into the remotest parts of Media. Next came the defeat of a northern coalition headed by Sar-duris of Ararat, no fewer than 72,950 of the enemy being captured along with the city of Arpad, where the Assyrian king received the homage

of various Syrian princes. Arpad revolted soon afterwards, but after a siege was taken in 740 B.C. The following year Azaridh of Judah appears among the enemies of Tiglath-Pileser, who had over- thrown his Hamathite allies and annexed the nineteen districts of Hamath. The conquered populations were now transported to distant parts of the empire. In 737 B.e. Tiglath-Pileser again marched into Media, and in 735 he invaded Ararat and wasted the country round the capital Van to a distance of 450 miles- In 734 B.C. he was called to the help of Yahu-khazi (Ahaz) of Judah, who had been attacked by Pekah of Israel and Rezon (Rasun) of Damascus. Rezon, defeated in battle, fled to his capital which was at once invested by the Assyrians, while with another portion of his army Tiglath-Pileser ravaged Syria and overran the kingdom of Samaria. Ammon, Moab, Edom and the queen of Sheba sent tribute, and Teima in northern Arabia was captured by the Assyrian troops. In 732 B.C. Damascus fell; Rezon was put to death, and an Assyrian satrap appointed in his stead. Tyre also was made tributary. The next year Tiglath-Pileser entered Babylonia, but it was not until 729 B.e; that the Chaldaean prince Ukin-zer (Chinzirus) was driven from Babylon and Tiglath-Pileser acknowledged as its legitimate ruler. In the early part of Tebet 727 B.C. he died, after having built two palaces, one at Nineveh, the other at Calah.

See P. Rost, Die Keilschrijttexte Tiglat-Pilesers III. (1893); also Babylonia and Assyria, § v. History (" Second Assyrian Empire ") ; and authorities quoted in § viii. Chronology. ■

TIGRANES, or Dikran, king of Armenia (c. 95—55 B.C.). Armenia had by the conquests of Alexander the Great become a province of the Macedonian Empire; but it was never thoroughly subjected to the foreign rule. A Persian family, that of Hydarnes, one of the associates of Darius Hystaspis, which possessed

large domains in Armenia and had been invested with the satrapy for several generations, was dominant in the country, and assumed the royal title in defiance of the Seleucid. Antio- chus III. the Great put an end to this dynasty about 211 and divided Armenia into two satrapies, which he gave to two generals of Persian origin, the district of Sophene in the west (on the Euphrates and the sources of the Tigris) to Zariadres, the eastern part, called Armenia Major (round the lake of Van) to Artaxias (see Armenia). After the battle of Magnesia (190) both made themselves independent; Artaxias conquered the valley of the Araxes, where he founded his new capital Artaxata (" town of Artaxias," said to be built by the advice of Hannibal, Strabo xi. 528; Plut. Luc. 31). He was defeated and taken prisoner by Antiochus IV. Epiphanes in 165 (Appian, Syr. 45, 66), but soon became independent again in the troubles which followed his death (cf. Diod. xxxi. 22. 27a); and his successors extended their power even farther against Media and the districts on the Kur. But from 140 the Parthians became the dominant power east of the Euphrates. King Artavasdes of Armenia was attacked by Mithradates II. the Great about 165 B.C. (Justin xlii. 2). He had to give his son Tigranes (b. 140 B.C. according to Lucian, Macrob. 15; by Appian, Syr. 48, he is called " son of Tigranes "; if that is correct, he probably was the nephew of Artavasdes) as hostage to the Parthians, and he obtained his freedom only by ceding seventy valleys bordering on Media (Strabo xi. 532; cf. xvi. 745; Justin xxxviii. 3). This sketch of the earlier history of Armenia is principally based upon the data given by Strabo xi. 528, 53 1 seq. The traditions preserved by the Armenian historians (who fancy that an Arsacid dynasty ruled over Armenia since the time of Alexander) have no historical value whatever.

Tigranes, who ascended the throne in 95 or 94 B.C. (Plut. Luc. 21), immediately began to enlarge his kingdom. He deposed Artanes, the last king of Sophene from the race of Zariadres (Strabo xi. 532), and entered into close alliance with Mithradates VI.

Eupator of Pontus, whose daughter Cleopatra he married. In 93 he invaded Cappadocia in the interest of Mithradates, but was driven back by Sulla in 92 (Plut; Sulla, 5, Justin xxxviii. 3). During his first war with Rome, Mithradates was supported by Tigranes, although he abstained from interfering openly. But he meanwhile began war with the Parthians, whose empire was weakened after the death of Mithradates II. (about 88) by internal dissensions and invasions of the Scythians. Tigranes reconquered the valleys which he had ceded, and laid waste a great part of Media, down to Ecbatana (Isidor. Charac. 6), and the districts of Nineveh and Arbela; the kings of Atropatene, Gordyene (the country of the Carduchi, now Bohtan), Adiabene (the former Assyria) and Osroene (Edessa) became his vassals, who attended him like slaves wherever he went; northern Meso- potamia also was torn from the Parthian Empire (Strabo xi. 532, 747; Plut. Luc. 32). In 83 he invaded Syria, defeated the last successors of Seleucus and occupied Cilicia, of which the eastern parts still belonged to the Seleucids (Justin xl. 1; Appian, Syr. 48; Plut. Luc. 14, 21). In the war between Mithra- dates and Sulla he did not interfere, but after the death of Sulla (78) he occupied Cappadocia again and expelled King Ariobarz- anes I., the vassal of the Romans (Appian, Mithr. 67; Strabo xii. 539). During the next years wars are mentioned in Syria, where the princess Cleopatra Selene attempted in vain to restore the Seleucid rule, but was besieged in Acco and afterwards killed (Joseph. Ant. xiii. 16, 4; Strabo xvi. 749), and in Cilicia, where he destroyed the Greek town of Soli (Plut. Pomp. 28; Dio Cass, xxxvi. 37). Tigranes now had become " king of kings " and the mightiest monarch of Asia. So he built a new royal city, Tigranocerta, on the borders of Armenia and Mesopotamia, between Mt Masius and the Tigris, where he accumulated all his wealth and to which he transplanted the inhabitants of twelve Greek towns of Cappadocia, Cilicia and Syria (Plut. Luc.

21, 26; Appian, Mithr. 67; Strabo xi. 522, 532, S39! Plhi. vi. 26 seq.; for the situation, which is much

disputed, cf. Tac. Ann. xiv. 24, xv. 5, ed. Furneaux). He also transplanted many Arabic tribes into Mesopotamia (Plut. Luc. 21; Plin. vi. 142). But the Romans could not tolerate encroachment upon their sphere of power, and in 69 Lucullus invaded Armenia. Tigranes was beaten at Tigranocerta on the 6th of October 69, and again near Artaxata in September 68. The recall of Lucullus gave some respite to the two kings, who even invaded Asia Minor again. But meanwhile a son of Tigranes and Cleopatra, called Tigranes, like his father, rebelled against him (as the old man had already killed two of his sons, he had reason enough to be afraid for his life) and found refuge with the Parthian king Phraat.es III., whose daughter he married and who sent him back with an army (Appian, Mithr. 104; Plut. Pomp. 33; Dio Cass, xxxvi. 51). The old king now gave up all hope of resistance; he put a price on the head of Mithradates, and when Pompey advanced into Armenia and united with the younger Tigranes, he surrendered himself to the Roman general (66 B.C.). Pompey now changed his policy; he received the old Tigranes graciously and gave him back his diadem, while he treated the son very coolly and soon made him prisoner. The younger Tigranes was led in triumph into Rome, where he found his death when he tried to escape from his confinement by the intrigues of P. Clodius in 58 (Dio Cass. 38, 30). The father after his defeat ruled about ten years longer over Armenia, as vassal of the Romans. He died about 56, and was succeeded by his son Artavasdes. (See also Mithra- dates.) (Ed. M.)

TIG RE, a northern province of Abyssinia; one of the three principal divisions of the country, the others being Amhara or Gondar in the centre and Shoa in the south. The ras (or prince) of Tigre has been often a more powerful potentate than the nominal emperor. Tigre contains the town of Axum (q.v.), capital of the ancient Ethiopic Empire. Adua (Adowa, q.v.) is the capital of the province. (See Abyssinia.)

Tigrina, the dialect spoken in Tigre' and Lasta, is nearer the ancient Geez than is Amharic, the

official and more widely diffused language of Abyssinia. See J. Schreiber, Manuel de la langue tigrai (Vienna, 1 887–1 893); and L. de Vito, Grammatica delta lingua tigrigna (Rome, 1895).

TIGRIS (Old Persian Tigrd, Diktat of the cuneiform inscrip- tions, Hiddekel of the Old Testament, Diglath of the Targum, Digla of the Arabs), a great river of western Asia, rising from two principal sources. The more western of these is about 10 m. S. of Lake Geuljik (Colchis of the ancients), at an altitude of 5050 ft., some 2 or 3 m. only from the channel of the Euphrates, which here forms a peninsula by a great bend (38 10' N., approxim- ately 39 20' E.). The eastern source, which joins the main stream at Til (37 45' N., 41° 46' E.), is itself divided into two branches, or rather it may be said to consist of a network of small streams, the most northerly of which has its origin in about 38 40' N. to the west of Lake Van, and close to the headwaters of the Murad Su, the eastern branch of the Euphrates, while the most easterly point is situated in a region about 42° 50' E., southward of the same lake. The two sources together drain the region south as the Euphrates drains the region north of the Taurus mountains. After the junction of the two branches the river pursues a winding course, generally south-east, for about 800 m. to the point of union with the Euphrates at Garmat Ali, whence it is known as the Shatt-el-Arab until it empties into the Persian Gulf some 70 m. lower down. For some five or six centuries before 1 908–1 909 the junction with the Euphrates was at Korna, some 30 m. above Garmat Ali. On the western side there are no tributaries at the present day. As late as a.d. i 200, however, the Arabian geographers mention a tributary, the Tharthar, navigable in flood time, which flowed from the Jaghi- gagh branch of the Khabur, a tributary of the Euphrates, to the Tigris. Ormsby, in 1832, also reported a river, the Asas Amir, as coming down from the Sin jar hills and joining the Tigris near Kal-'at Shergat, about 35° 30' N.; but this seems now to be a dry bed. On the eastern side of the river, on the other hand, there

are several important tributaries descending from the Persian

mountains: the Khabur, a little north of 37° N., navigable for raft3; the Great Zab, at 36 N., just below Nimrud, the ancient Calah; the Little Zab, about 35° 15' N.; the 'Adhem at 34 N. and the very large and important Diyala, a little below Bagdad, at 33° 15' N.

The course of the Tigris is much shorter than that of the Euphrates, about 1 150 m. as compared with 1800 m., but its volume of water is greater, at least in its lower course. At Bagdad it has an average breadth of about 200 yards and a current in flood time of about 4} m. per hour. It is navigable for steamers to a point a little above the mouth of the Great Zab, about 30 m. south of Mosul, at which point navigation is blocked by two ancient dams, erected, apparently, to control the river for the Assyrian city of Calah, the ruins of which are called Nimrud by the natives after these dams, which they conceive to be the work of that mythical hero. Were it not for these dams steamers might reach Mosul itself, at an eleva- tion of 353 ft. above the Persian Gulf. Two lines of steamers, an English and a Turkish, furnish an inadequate service between Basra and Bagdad, but there is no steam navigation oh the river above the latter city. Small sailing craft navigate upwards as far as Samarra; above this all navigation is downward, and by raft. For rafts the river is navigable from Diarbekr and is termed by the natives " the cheap cameleer." The rafts used are the so-called kelleks, of wood supported on inflated skins, which are broken up at Bagdad, the wood sold and the skins carried back by caravan.

Near the source of the Tigris, at Arghana-Ma'den, are copper mines. In the neighbourhood of Diarbekr is iron. Below Mosul, for some distance, occur sulphurous and bituminous springs. There are also in

that neighbourhood famous marble quarries. This part of the river's course, the ancient Assyria, is also a rich agri- cultural region.

From a little above the confluence of the Great Zab downward, the banks of the river are absolutely uninhabited, and the river flows through a desert until Tekrit is reached. Beginning shortly below Tekrit there are indications of considerable canalization, both for the purpose of irrigating country remote from the river, and also of shortening the course of the river for navigation. _ In ancient times the country on both sides of the river was well irri- gated below this point, the waters of the Tigris were under thorough control, and it and its lower tributaries, the 'Adhem and the Diyala, were made, by means of huge canals, to furnish great water-ways for the country between it and the Persian hills eastward. Of these canals the best known, and probably the greatest, was the Nahrawan, which, leaving the Tigris, on its eastern side, above Samarra, over 100 m. north of Bagdad, rejoined it below Kut-el- Amara, an equal distance to the south. None of these canals is serviceable at the present time, and few carry water in any part of their course, even in flood time.

A little south of Samarra the stony plateau of Mesopotamia ends, and the alluvial plain of Irak, ancient Babylonia, begins. Here the palm groves begin also, and from this point to a little beyond Bagdad the shores of the river are well cultivated. At the point of entering the alluvial plain the bed of the Tigris seems to be lower than that of the Euphrates, so that the canals run from the latter to the former stream. At Bagdad the Tigris and Euphrates are jess than 35 m. apart, then they recede again, the Tigris bending eastward, until, below the Shatt-el-Hai, they are separated by almost 100 m. From Bagdad downward, the course of the Tigris is peculiarly serpentine and shifting. The mud brought down by it, calculated at 7150 lb an hour at Bagdad, is not deposited in marshes to form alluvium, as in the case of the Euphrates, but although in flood time the river becomes at places

an inland sea, rendering navigation extremely difficult and uncertain, the bulk of the mud is deposited in banks, shoals and islands in the bed of the river, and is finally carried out into the Persian Gulf. At Kut-el-Amara, approximately half way from Bagdad to Korna, the bed of the Tigris is higher than that of the Euphrates, and accordingly from this point downward its waters flow into the Euphrates and not vice versa.

Shortly below Kut-el-Amara all traces of ancient canalization on the east side vanish, and it would appear as though much of that region, now largely under water at flood time, constituted an inland sea. On the west side, however, there are the remains of several canals or channels, some still carrying water, one of which, the Shatt- el-Hai, leaving the Tigris at Kut-el-Amara, and emptying into the Euphrates at Nasrieh, is still navigable. Indeed, in the time of the caliphate this was the channel of the Tigris, and on its banks stood the important" city of Wasit. At a much more remote period also the great city of Lagash stood by or on its banks. In the time of the Sassanian kings, however, as at the present time, the Tigris occupied a more easterly course. Indeed, the lower course of the Tigris, even more than that of the Euphrates, has always been subject to change. Below the Shatt-el-Hai the country on both sides of the river is practically a swamp, except where the palm groves have formed land.

The Tigris begins to rise about the middle of November and is highest in May and June, and lowest in September and October,

The principal towns on its banks are Diarbekr (anc. Amida), on the western branch; Bitlis, on the eastern branch; Mosul; Tekrit, a town dating from Persian days, said to have been founded by Shapur I. son of Ardashir I., formerly important, but now relatively insignificant; Samarra, also called Samira, the capital of the caliphate from a.d. 836 to 892, a place of pilgrimage of the Shia Moslems, containing magnificent tombs of two of their Imams the tenth

and eleventh, with another much venerated shrine of the twelfth, as well as some interesting ruins; and Bag- dad. While the Tigris never played the same role historically as the Euphrates, numerous remains of antiquity are to be seen along its course. Cuneiform inscriptions and bas-reliefs have been found at the sources of both the western and eastern Tigris, as well as at various points on the cliffs along the upper course of both branches. Opposite Mosul are the ruins of ancient Nineveh, the last capital of Assyria, and 20 m. below that the ruins of Calah, the second capital; while 35 m. farther south, on the oppo- site bank, lies Kal'at-Shergat, the ancient Assur, the original name-place and capital of the Assyrian Empire. A little south of Samarra are found remains of the Median Wall, which stretched south-west towards the Euphrates near Sahlawych, marking the edge of the Babylonian alluvial plain. In this neighbourhood also stood the ancient Opis. At Bagdad, besides the memorials of the caliphate, may be seen a few remains of the old Babylonian city of Bagdadu, and a dozen miles southward, on the east bank of the river, stands Takhti-Khesra, the royal palace at Ctesiphon, the most conspicuous and picturesque ruin in all Babylonia, opposite which, on the other side of the river, are the low ruin mounds of ancient Seleucia.

See W. F. Ainsworth, Researches in Assyria (1838) ; R. F. Chesney, Expedition to the Euphrates and Tigris (1850); W. F. Ainsworth, The Euphrates Expedition (1888); Guy Le Strange, " Description of Mesopotamia and Bagdad " {Journal of the Royal Asiatic Society, 1895); E. Sachau, Am Euphrat und Tigris (1900. (J. P. Pe.)

TILBURG, a town in the province of north Brabant, Holland, and a junction station 135 m. by rail E. by S. of Breda. A steam tramway connects it northwards with Waalwijk. Pop. (1905), 46,517. Tilburg has risen into importance since the separation of Belgium from Holland as one of the chief industrial centres of the south. It has Roman Catholic and Protestant churches, a synagogue, a cloth hall, a higher-burgher school, an art and music school, and

a Roman Catholic seminary. The woollen manufacture is the chief ' industry, besides which there are leather, soap, oil and tobacco factories, as well as breweries, tanneries and iron foundries.

TILBURY DOCKS, on the north shore of the Thames, in the county of Essex, England. They lie opposite Gravesend 25 m. below London Bridge and about the same distance from the Nore, being thus within the port of London. They were constructed in 1886 by the East & West India Docks Company, and were later owned by the London & India Docks Company. The docks are four in number, having, with tidal basin and entrance locks, a total area of 74 acres. The depth of water in the tidal basin is 25 ft. at low tide and 44 ft. at high tide. The length of quayage is about 2! m., and there is extensive warehousing as well as accommodation for passengers, as the largest passenger steamers trading with the Port of London lie here. Railway communication is provided by the London, Tilbury & Southend line, and there is direct connexion for goods traffic with all the northern lines.

TILDEN, SAMUEL JONES (1814-1886), American statesman, was born at New Lebanon, New York, on the 9th of February 1 8 14. In 1834 he entered Yale University, but soon withdrew on account of ill health, and later studied in the University of the City of New York. He was admitted to the bar in 1841, and rose rapidly to the front rank. In the financial troubles between 1850 and i860 it is said that more than half the railways north of the Ohio river and between the Hudson and the Missouri rivers were at some time his clients. In spite of his activity at the bar, Tilden maintained an interest in politics, serving in the State Assembly in 1846 and in the state constitutional conventions of 1846 and 1867. In 1848, largely on account of his personal attachment to Martin Van Buren, he participated in the revolt

of the " Barnburner " or free-soil faction of the New York Democrats, and in 1855 was the candidate of the " softshell," or anti-slavery, faction for attorney-general of the state. During the Civil War, although he opposed several of the war measures of President Lincoln's administration, he gave the Union cause his heartiest support. In 1866 Tilden became chairman of the Democratic state committee, and soon came into conflict with the notorious " Tweed ring " of New York City. As the " ring " could be destroyed only by removing the corrupt judges whcwere its tools, Tilden, after entering the Assembly in 1872 to promote the cause of reform, took a leading part in their impeachment. By analysing the bank accounts of certain members of the " ring," he obtained legal proof of the principle on which the spoils had been divided. His fame as a reformer brought him to the governor's chair in 1874, and he at once gave his attention to a second set of plunderers — the " canal ring," made up of members of both parties who had been systematically robbing the state through the maladministration of its canals — and succeeded in breaking them up. In 1876 the Democrats nominated him for the presidency, the Republicans nominating Rutherford B. Hayes of Ohio. The result was the disputed election of 1876, when two sets of returns were sent to Washington from the states of Florida, Louisiana, South Carolina and Oregon. As the Federal Constitution contained no provision for settling a dispute of this kind the two houses of Congress agreed to the appoint- ment of an extra-constitutional body, the " Electoral Com- mission " (q.v.) which decided all the contests in favour of the Republican candidates. Tilden counselled his followers to abide quietly by the result. In 1878 the New York Tribune (Repub- lican) published a series of telegraphic despatches in cipher, accompanied by translations, by which it attempted to prove that during the crisis following the election Tilden had been negotiating for the purchase of the electoral votes of South Carolina and Florida. Tilden denied emphatically all knowledge of such despatches, and appeared

voluntarily before a Congres- sional sub-committee in New York City to clear himself of the charge. The attempts to implicate him in corrupt transactions were not successful; but his political opponents endeavoured to make capital in subsequent campaigns, out of the ” Cipher Dispatches.” The remainder of his life was spent in retirement at his country home, Greystone, near Yonkers, New York, where he died on the 4th of August 1886. Of his fortune (estimated at $5,000,000) approximately $4,000,000 was bequeathed for the establishment and maintenance of ” a free public library and reading-room in the City of New York "; but, as the will was successfully contested by relatives, only about $2,000,000 of the bequest was applied to its original purpose; in 1895 the Tilden Trust was combined with the Astor and Lenox libraries to form the New York Public Library.

See the Writings and Speeclies of Samuel J. Tilden (2 Vols., New York, 1885) and Letters and Literary Memorials of Samuel J. Tilden (2 vols., New York, 1008), both edited by John Bigelow; also Bigelow’s Life of Samuel J. Tilden (2 vols., New’ York, 1895); and P. L. Haworth’s The Hayes-Tilden Disputed Presidential Election of 1876 (Cleveland, 1906).

TILE (O. Eng. tigel, Fr. tuile, connected with Lat. tegula), the name given to flat slabs of baked clay or other material used for a great variety of architectural purposes, such as covering roofs, floors and walls.

1. Roofing Tiles. 1 — In the most important temples of ancient Greece the roof was covered with tiles of white marble, fitted together in the most perfect way so as to exclude the rain. In most cases as in the Athenian Parthenon and the existing temple of Aegina the tiles were large slabs of marble, with a flange along each side over which joint tiles (dpyuot) were accurately fitted (see A. in fig. 1). In the temple of Apollo at Bassae, though the main building was of limestone, the roof was covered with very beautiful tiles of Parian marble, which are specially mentioned by Pausanias as being one of the

chief beauties of the temple. Some of these were found by Mr Cockerell during his excavations

1 In Egypt and Assyria temples and palaces were mostly roofed with stone, while inferior buildings had flat roofs covered with beaten clay (see also Terra Cotta).

at Bassae early in the 19th century. 2 In design they resemble the other examples mentioned above, but are peculiar in having a joint piece worked out of the same slab of marble as the adjacent tiles (see B in fig. 1) at great additional cost of material and labour, in order to secure a more perfect fit. Fig. 2 shows the A

Fig. 1. — Examples of roofing tiles from Greek Temples.

A, B, Marble tiles from Aegina and Bassae, showing two methods of working the joint tiles.

C, C, Clay tiles from Olympia.

D, Sketch showing method of

jointing at the lower edge.

E, Longitudinal section of a clay

joint-tile (dp;u6s).

F, Joint-tile with peg to fix it.

way in which they were set on the roof. Great splendour of effect must have been gained by continuing the gleaming white of the columns and walls on to the roof. All along the eaves each end of a row of joint tiles was usually covered by an antefixa, an oval topped piece of marble with honeysuckle or some other con- ventional pattern carved in relief. 3 In most cases the Greeks used terra-cotta roofing tiles, shaped like the marble Ones of fig. i, A. Others were without a flange, being formed by a concave upper surface to prevent the rain getting underneath the joint tiles. The lower edge of the tile, whether of marble or of clay, was usually half-lapped and fitted into a corresponding rebate in

Fig. 2. — Perspective sketch showing the arrangement of tiles B in fig. 1, at Bassae.

B, B, Dowels to fix the joint-tiles. C, Tilting piece, a, a, Flat

surface of tiles.

the upper edge of the next tile (see D in fig. 1). The apfioi also were half -lapped at the joints (see E in fig. 1): All these were usually fastened with bronze nails to the rafters of the roof. In some cases each joint-tile had a projecting peg to fix it to the next apfios, as shown at F. In the temples of

Imperial Rome marble roofing tiles were used like those shown at fig. 1. These were copied from Greek work along with other salient archi- tectural features. For domestic and other less important work clay tiles (tegulae) were employed, of the form shown in A, fig. 3. These are narrower at the lower edge, so as to fit into the upper

2 See Cockerell, Temples of Aegina and Bassae (London, i86o). ; * Marble tiles are said to have been first made by Byzes of Naxoe about 620 B.C. ; see Pausanias v. 10, 2.

edge of the next tile and the joints were covered with a semi- circular joint tile (imbrex). Rows of terra-cotta antefixae were set along the eaves of the roof, and were often moulded with very beautiful reliefs. In localities which supply laminated stone, such as Gloucestershire and Hampshire in Britain, the Romans often roofed their buildings with stone tiles fastened

Fig. 3.

A, Section and elevation of the clay tiles commonly used in ancient Rome.

B, Roman stone tiles, each fixed with one iron nail at the top angle.

C, Pan-tiles used in medieval and modern times.

with iron nails. Fig. 3, B, shows an example from a Roman villa at Fifehead Neville, in Dorset, England. Each slab had a lap of about 2" over the row of tiles below it; many large iron nails were found with these stone tiles.

In a few cases, in the most magnificent temples of ancient Rome, as in those of Capitoline Jupiter and of Venus and Rome, and also the small circular temple of Vesta 1 tiles of thickly gilded bronze

were used, which must have had a most magnificent effect. Those of the last named building are specially mentioned by Pliny {H.N. xxxiv. 7) as having been made of Syracusan bronze 2 — an alloy in great repute among the Romans. The bronze tiles from the temples of Jupiter Capitolinus and of Venus and Rome were taken by Pope Honorius I. (625-638) to cover the basilica of St Peter, whence they were stolen by the Saracens during their invasion of the Leonine city in 846. 3

In medieval times lead or copper 4 in large sheets was used for the chief churches and palaces of Europe; but in more ordinary work clay tiles of very simple form were employed. One variety, still very common in Italy, is shown in C, fig. 3. In this form of so-called ” pan-tile ” each tile has a double curve, forming a legula and imbrex both in one. Stone tiles were also very common throughout the middle ages. Another kind of roofing tile, largely used in pre-Norman times, and for some centuries later for certain purposes, was made of thin pieces of split wood, generally oak; these are called ” shingles.” They stand the weather fairly well, and many old examples still exist, especially on the wooden towers and spires of East Anglia.

At the present day, when slate is not used, tiles of burnt clay are the ordinary roofing material, and many complicated forms have been invented to exclude rain. Most of these are, however, costly and do not answer better than the rectangular tile about 9 by 6 in., fastened with two copper or even stout zinc nails, and well bedded on mortar mixed with hair. For additional security clay tiles are usually made with two small projections at the upper edge, which hook on to the battens to which they are nailed. The district round Broseley (Shropshire) is one of the chief centres in England for the manufacture of roofing tiles of the better sort. The common kinds are made wherever good

‘ The dome of the Pantheon was covered with tiles or plates of bronze thickly gilt, as were also the roofs of the forum of Trajan.

• Bronze tiles for small buildings such as this were usually of a pointed oval form, something like the feathers of a bird. This kind of tiling is called payottaceum by Pliny, H.N., xxxvi. 22.

' Part of the bronze tiles had been stripped from the temple of Jupiter bv the Vandals in 455 ; see Procopius, Bell. Van. i. 5.

4 The gilt domes of Moscow are examples of this use of copper. See also the domed churches at Rotterdam, Amsterdam, Hamburg and Lubeck.

brick-clay exists. In some places pan- tiles are still used and have a very picturesque effect; but they are liable to let in the rain, as they cannot be securely nailed or well bedded in mortar. In Gloucestershire, Yorkshire, north-east Lancashire and other counties of England, stone tiles are still employed, but are rapidly going out of use, as they require very strong roof timbers to support them, and the great extension of railways has made the common purple slates cheap in nearly every district. The green slates of the Lake District are now extensively used for this purpose, often with excellent effect.

Some of the mosques and palaces of Persia are roofed with the most magnificent, enamelled, lustred tiles, decorated with elaborate painting, so that they shine like gold in the sun. They were specially used from the 13th century to the 15th. In style and manufacture the finest of them resemble the frieze shown in fig. 5.

2. Wall Tiles. — These are partly described under Mukal Decoration {q.v.)J> In most oriental countries tiles were used in the most magnifi- cent way throughout the middle ages especially in Constantinople, Broussa, Damascus, Cairo,Moorish Spain, and in the chief towns of Persia. Fig. 4 shows a fine example from a mosque in Damas- cus. From the 12 th to the 1 6th century a special kind of lustred tiles was largely employed for dadoes, friezes and other wall surfaces, being fre- quently

made in large slabs, modelled boldly in relief with sentences from sacred books or the names and dates of reign- ing caliphs. The whole was picked out in colour, usually dark or turquoise blue, on a ground of cream- white enamel, and

Fig. 4.-

■Wall Tiles from Damascus, of

the 16th century.

in the last firing minute ornaments in copper lustre were added over the whole design, giving the utmost splendour of effect (see fig. 5). Great skill and taste are shown by the way in which the delicate painted enrichments are

Fig. 5. — Persian Lustred Tiles of the 13th century, forming part of a frieze.

made to contrast with the bold decoration in relief. These lustred tiles sometimes line the prayer-niche in houses and mosques; in such cases the slabs usually have a conventional representation of the kaaba at Mecca, with a lamp hanging in front of it and a border of sentences from the Koran. 6 The mosques of Persia are specially rich in this method of decoration 1 ,

6 For the enamelled wall tiles of ancient Egypt, see Ceramics.

6 The Victoria and Albert Museum, London, contains many fine examples of the early as well as of the later sorts, like those shown in fig. 4.

magnificent examples existing at Natenz, Seljuk, Tabriz, Isfahan jnd other places. 1 Indian tile-work is specially described in the article Kashi.

Stamped Spanish tile decoration in its earliest form

was an imitation of mosaic, pieces of enamelled tile of various colours being arranged in geometrical patterns, or combined with glass or stone for the purpose. In the 14th and 15th centuries this process was supplanted by one in which the variously shaped and coloured sections of tile were separated by means of narrow bands of the same material, enamelled in white and disposed in various combinations of geometrical interlacing. Of this kind are the bulk of the Alhambra tiles. But the tediousness of the process gave rise, about 1450, to what is known as the cuerda seca (or " dry cord ") method, in which narrow fillets at the edges of the separating interlacings were first stamped upon the tile itself and filled with clay and manganese; these being fired (thus forming a " dry cord " or line) formed shallow compartments which were in turn filled with coloured enamel, white being used for the interlacings themselves. The process was much in vogue in Andalusia and Castile until about 1550, when there arose the method de cuenca in which the parts of the design to receive different coloured enamels were stamped, slightly concave {cuenca — a bowl or socket), their edges alone being left in relief. This process lasted until about the commencement of the 18th century.

At Manises, Paterna and elsewhere in Valencia, soon after the middle of the 14th century there commenced an extensive pro- duction of white enamelled tiles painted with designs in blue (more rarely in lustre and manganese) for wall and pavement decoration. This manufacture continued throughout the 15th century and produced some of the finest freehand tile designs that are known to-day. The motives included figure compositions, animals, plants, coats of arms, &c, drawn with great skill and facility. Most of these tiles are to be found in old houses in the city and province of Valencia.

In Catalonia, in the 16th century, blue and white painted tiles were produced in imitation of those of Valencia. For the most highly finished of these stencils were employed to block out the designs.

Polychrome painting upon tiles in the Italian manner was introduced into Spain by Niculose Francisco of Pisa, who settled at Seville (1 503-1 508) and executed altar-pieces and architectural details in tile work. This imported Italian style was much affected for armorial decoration.

In the 16th and 17th centuries tiles of a coarse kind of majolica were used for wall decoration in southern Spain; some rich examples still exist in Seville. These were the work of Italian potters who had settled in Spain.

Literature. — A. Van de Put, Hispano- Moresque Ware of the XVth Century (1904); G. J. de Osma, Apuntes sobre ceramica morisca: textos y documentos valencianos, No. 1 (1906), and " Los Letreros ornamentales en la ceramica morisca del siglo XV." (in the review Cullura espaHola, no. ii., 1906); J. Font y Guma, Rajolas valencianas y catalanas (1905); J. Gestoso y Perez, Historia de los barros vidriados sevillanos (1904).

3. Floor Tiles. — After the development of painted and lustred tiles in Spain and Italy for the decoration of wall surfaces, they were also introduced, during the latter part of the 1 5th and the first part of the 16th centuries, as pavements, especially in the chapels of the famous cathedrals of those countries. Compara- tively few examples of these pavements now exist, as the majolica enamel was too soft to stand the wear of the feet of worshippers. The earliest known pavement of this type is that in the church of San Giovannia Carbonara in Naples, which is dated, approxi- mately, 1440. The tiles, square and hexagonal in shape, are coated with white enamel and are painted chiefly in dark blue, with touches of green and purple. The British Museum, the Louvre and other museums have secured odd examples of these tiles. It seems probable from the technical methods of the work that it was produced by a Spanish or even a Moorish hand. It is well known that Moorish tile- makers did travel both into Italy and into France to embellish the palaces of great nobles or the chapels

1 See Coste, Monuments de la Perse (Paris, 1867).

they founded. There is the well-known instance of the Moorish potter, Jean de Valence, who, in 1384, was brought to France by Jean de Berry to make tiles for the adornment of his ducal palace at Poitiers. One of the most important of these early majolica pavements is that made for the Convent of San Paulo at Parma, now in the museum of that town, which was probably laid down in 1482. One of the south chapels in the church of S. Maria del Popolo in Rome has a very fine pavement of painted tiles, executed probably at Forli, about 1480, for Cardinal della Rovere (Julius II.), whose arms — an oak tree — are repeated over and over again among the rich decorations. A still more magnificent tile floor, in the uppermost of Raphael's Vatican loggie, is mentioned in the article Della Robbia, where also are described the exquisite, enamelled tiles which Luca della Robbia made as a border for the tomb of Bishop Federighi at Fiesole near Florence. Fine examples of tile pavements of i486 exist in the basilica of S. Petronio at Bologna. The chapel of St Catherine at Siena and the church of S. Sebastiano at Venice have majolica pavements of about is 10. Fig. 6 shows an example of about this date from

(Victoria and Albert Museum.)

Fig. 6. — Majolica Paving Tiles from Siena, made in 1509. the Petrucci Palace in Siena, now in the Victoria and Albert Museum. In the early part of the 16th century majolica tiles from Spain were occasionally imported into England. At the south-east of the mayor's chapel at Bristol there exists, though much worn, a fine pavement of Spanish tiles dating from about 1520. Others have been found in London, at Newington Butts, and in other places.

Long before the southern nations of Europe were introducing their painted majolica tile pavements, a much more practical type of flooring tile was in use in Germany, France and England; of these the English encaustic tile pavements, dating from the early years of the 13th century to the end of the 16th

century, are particularly important and beautiful. These Northern peoples had no knowledge of enamels and colours such as was possessed by the contemporary tile-makers of Moorish Spain or of Italy, and they were confined to the native red-brick earths and white pipeclays for their materials. The method of decoration was as simple and homely as the materials. Slabs of ordinary red-brick clay freed from pebbles, but not from grit or sand, were shaped by pressing cakes of clay into a mould of wood or baked clay, carved in such fashion that when the clay was just hard and dry enough to be removed from the mould the important elements of the design were formed as sunk cells divided by broad raised outlines. While this red tile was still soft and plastic, a thickish paste of pipeclay or other light burning clay was poured into the cells and allowed to stiffen.

When the whole had dried sufficiently the surface was scraped level, with a thin sharp tool, with the result that the tile appeared with a kind of cloisonne design, the cloisons or boundaries of the cells being, of course, the upstanding ridges of the moulded red tile. 1 Over the surface of the tile finely powdered galena (native sulphide of lead) was freely dusted, and the whole was fired at one operation with the resulting production of a tile or tiles bearing a yellowish white pattern relieved against red or chocolate, and glazed with a natural lead glaze, which was much harder and better adapted to resist wear than the majolica glazes of Spain or Italy. The origin of this type of pavement tile is still obscure; one idea is that they were a development of the Roman Mosaic pavement, for, in examples discovered at Fountains Abbey and at Prior Crauden's Chapel, Ely, in which the tiles were! of great variety of form and size, and, in- stead of the patterns being wholly inlaid in the tiles themselves, the design is, to a large extent, produced by the outlines of the individual pieces,

which, in the later examples, are cut to the forms required to be represented, including the subject of the " Temptation of Adam and Eve," trees, lions, &c, the tesserae being also enriched with what may be more strictly called encaustic decoration. The more probable origin of this method of work seems, however, to be a development of the pavement tiles with simple incised designs which were made in the northern parts of Burgundy, in the Rhine Valley and in Flanders. Most interesting examples of these incised tiles are to be found in the cathedral of St Omer, which are known to be of the 1 2th century, and it seems impossible to resist the conclusion that such incised work forms the starting-point of the English encaustic tile-makers. A similar piece of work exists in Canter- bury Cathedral, where we have stone tiles engraved with pictorial designs, the sunk parts being filled with a dark cement — this pavement also belongs to the 1 2th century.

Four styles of decoration are found on medieval Gothic tiles (i) incised or impressed, (2) raised, (3) inlaid, (4) slip-painted. It is to the third of these groups — the inlaid — that the name of "encaustic" tiles, had been particularly given. The manu- facture of medieval Gothic tiles was apparently the secret of certain religious houses in England, belonging either to the Benedictine or the Cistercian Orders. The earliest date at which we have tangible proof of the existence of this art is 1237, in which year it was ordered that the king's little chapel at Westminster should be paved with "painted tile": " mandatum est etc., quod Parvum capellam apud Westm. tegula picta decenter paveari faciatis," Rot. Claus. 22, Henry III. M. 19, a.D. 1237-38. In 1840 the removal of a wooden floor in the chapter-house at Westminster, exposed to view a tile pavement in good preservation which, though it can hardly be the pavement in question, is evidently of contemporary manufacture.

*The finest and most artistic of these early English tiles were those found in Chertsey Abbey in Surrey. They were found in a very fragmentary condition on the Abbey site, but have been to a great extent**

pieced together by Mr Shurlock. Practically all the tiles that have been recovered are now in the British Museum (a number of them were formerly in the archi- tectural museum at Westminster). They present a remarkable series of illustrations from the English romance of Sir Tristram and of events in the history of Richard Cceur-de-Lion (see Hobson's Catalogue of English Pottery in the British Museum, pi. ii.). Mention should also be made of the tile pavement discovered at the abbey of Halesowen in south Staffordshire. Many of these tiles are of very similar design to those of Chertsey, while some appear to have been made from the same moulds. From the evidence of inscriptions it would appear that this pavement was laid down in the latter part of the 13th century.

Combinations of tiles forming a cross were frequently used as

1 It is interesting to note the similarity of technique between the English encaustic tiles, and the later methods of Hispano- Moorish work. The English filled their cells in the surface of the tiles with another clay; the Spanish-Moorish potters with coloured

mortuary slabs; an example is in Worcester Cathedral in situ, whilst detached component tiles of similar slabs are to be found in other ancient churches.

Encaustic tiles are almost exclusively used for pavements, but an interesting instance of their employment for wall decora- tion occurs in the Abbey Church of Great Malvern, where these tiles have probably been originally used to form a reredos, and bear designs representing Gothic architecture in perspective, have introduced into them the sacred monogram " I.H.S.," the crowned monogram of " Maria," the symbols of the Passion, the Royal Arms and other devices. This example is also inter- esting as bearing the date of its manufacture on the margin " Anno R.R. H.VI. XXXVJ.," that is the thirty-sixth year of the reign of Henry VI. (1457-1458).

Kilns for tile-burning have been found at Bawsey, near Lynn, Norfolk; Malvern, containing some 15th-century tiles; Reptdn; Farringdon Street, London; and Great Saredon, in Staffordshire, with tiles of the 16th century.

Literature. — John Gough Nicholls, Examples of Encaustic Tiles (1845); Henry Shaw, Specimens of Tile Pavements (1858); T. Oldham, Ancient Irish Pavement Tiles; Frank Renaud, "The Uses and Teachings of ^ncient Encaustic Tiles " (Trans. Lancashire and Cheshire Antiquarian Society, vol. ix.) ; W. W. Pocock's article in The Surrey Archaeological Collections (1885); J. R. Holiday on " Halesowen," in Transactions of the Birmingham and Midland Institute (1871); Manwaring Shurlock, Tiles from Chertsey Abbey (1885) ; Major Heales, F.S.A., The Chertsey Tiles (1880) ; W. Burgess, in The Builder (July 24, 1858).

With the downfall of the monasteries in the reign of Henry VIII. the making of encaustic tiles in England appears to have come to an end, and for nearly two centuries foreign tiles were imported from Germany, the Netherlands, Italy and Spain, or workmen from those countries must, have practised then- art here. There are in evidence the well-known green glazed tiles in the British Museum which, if made in England at all, are obviously inspired by contemporary German work, and the tiles used in the house of Sir Nicholas Bacon (e. 1500-1579) are obviously the work of an Italian majolist, whether they were 1 made in Italy or in England. Increasing intercourse with the Netherlands brought into this country and, during the 17th century into the American colonies, the famous Delft tiles, painted either in blue, or in blue and manganese purple, on a tin enamel ground like that of the contemporary Delft pottery. From the 16th century onwards every country in Europe continued to makes tiles by methods strictly analogous with their contemporary pottery (see Ceramics). Thus we have in Italy and Spain, throughout the 17th and 18th centuries, wall tiles in the style of the debased Italian majolica; in Ger- many a continuation of the ancient German

stove tiles, either glazed with green, brown or black glaze, or bearing painted designs in the crude colours characteristic of the contemporary German pottery; in France there were, first, the painted tile pavements of Masseot Abaquesne of Rouen (1542–1557), and later the decorative tiles produced at Rouen, Nevers, Marseilles and elsewhere, always in the style of the Current pottery of the same centres; and painted tiles for the decoration of fireplaces and for use as wall panels formed a considerable part of the output of the Dutch factories. Wherever imita- tions of Delftware were made, in England, Germany or the north of France, the manufacture of similar tiles naturally followed; and at Lambeth, Liverpool and Bristol, the chief centres of this industry in England, large quantities of tiles were made, especially during the 18th century. The tiles produced at Lambeth and Bristol factories were invariably painted after the manner of their Dutch prototypes, but during the latter half of the 18th century Liverpool became famous for its printed tiles, in which designs, mostly in black, trans ferred from engraved copper plates, took the place of hand- painting. Fine examples of all these 18th-century English tiles are to be found in the British Museum; the Guildhall Museum; the Victoria and Albert Museum, London; and in the museums at Liverpool and Bristol.*

During the 17th and 18th centuries the old painted and

decorated pavement tiles seemed to have been entirely replaced by the common buff or red terra-cotta " quarries " so largely used in farmhouse kitchens, dairies, &c, arid it is to the painted tiles for walls and fireplaces that we have to look for the progress of the art.

The modern revival of tile-making in Europe dates from about 18.30, when Samuel Wright, a potter of

Shelton, near Stoke-upon-Trent, was granted a patent for the manufacture of tiles by mechanical means. His patent was extended for fourteen years, and in 1844 was purchased, in equal shares, by Herbert Minton— head of the famous firm of Mintons, of Stoke- upon-Trent — and Fleming St John, of Worcester. In 1848 the firm of Mintons acquired the sole right of the patent, and

Fig. 7. — A Panel of De Morgan's.

for many years Mintons were the most famous tile manufacturers in the world. In 1850 the firm of, Maw & Go. purchased the remaining stock of encaustic tiles made at Worcester, and, on the expiration of Wright's patent, commenced to manufacture at the old works at Worcester, removing in 185 1 to Benthall, Shropshire, and afterwards, about 1887, to their present works at Jackfield in the same district.

From the methods thus invented in England all the modern processes of tile-making have sprung. In some cases they re- semble the old " plastic " method of encaustic tile-making as it was practised in England in the middle ages, except that the tile is finally pressed in a mechanical press.

The tile-makers of this mid-Victorian period owed much of their success to the birth of modern Gothic architecture, and

many of their designs were produced by such famous architects as Pugin, Gilbert Scott,. Street, &c, so that between 1850 and 1880 encaustic tiles had a great vogue for pavement work not only in England, but in all civilized countries, and fine examples of the rich encaustic pavements made at Mintons', Maw's, or Godwin's of Hereford, are to be found in most of the restored cathedrals and churches of this period.

Side by side with the revival of this ancient process, there was developed an essentially modern process of manufacturing by compressing pulverized clay in metal dies under a screw press. This was the

outgrowth of a patent granted to Richard Prosser in 1840, and worked out and perfected at the works of Minton at Stoke-upon-Trent. The advantages of this method of manu- facture consist in (a) greater rapidity in execution than can be effected by the plastic method, and (b) the greater mechanical accuracy of the finished tile due to the steel dies used in shaping the tile and to the diminished contraction in drying and firing. This essentially modern method of tile-making is really an out- come of the methods introduced in the manufacture of English earthenware (see Ceramics), and it has not only been extensively developed in England, but has been adopted, practically without modification, in all the leading countries of Europe and in the United States.

The manufacture of tiles by the compression of powdered clay rendered possible the introduction of many varieties — plain, inlaid, embossed and incised. The designs in these cases, though generally based on old work, are so different, especially in mechanical finish, that they form a class of tiles entirely distinct from old work. Economically, and for air practical purposes, they afford a style such as the world has never before seen, but, like many modern productions — perfect in execution and finish — they lack the spontaneity and artistic charm of the work of bygone days.

Since the middle of the 19th century artist-potters in many countries have gone back to the ancient methods of production for richly painted tile panels, and, in this connexion, the pro- ductions of Deck in France, William de Morgan and Pilkington's in England, mark a distinct departure from contemporary modern work.

The extended use of tiles for interior decoration has created a large trade in these articles, either for wall or floor decoration. Among the most important firms engaged in this branch of the ceramic industry must be mentioned Mintons, Hollins & Co., Maw & Co., and Pilkington's in England; Villeroy & Boch in Germany; Utschneider & Co. in

France; Boch Freres in Belgium; Thooft & Labouchere at Delft, Holland; and the American Encaustic Tile Co., in the United States.

Literature. — Besides the works mentioned in connexion with special sections in the text a good deal of information about tiles in general, and modern tiles in particular, will be found in Furni- val, Leadless Decorative Tiles, &c. ; L. L. Jewitt, Ceramic Art of Great Britain; see also Forrer, Geschichte der europgischen Fliesen- Keramik. ” (W. B.*)

TILLEMONT, SEBASTIEN LE NAIN DE (1637–1608), French ecclesiastical historian, was born in Paris on the 30th of Novem- ber 1637. His father, a wealthy member of the legal class, being a devoted Jansenist, the boy was brought up in the little schools of Port Royal. Here his bent towards historical study was warmly encouraged, and in 1660 he was made a tutor in the seminary of Buzenval, Jansenist bishop of Beauvais. Ten years later he came back to Paris, and was eventually persuaded (1676) to enter the priesthood, and become a chaplain at Port Royal. In 1679 the storm of persecution drove him to settle on his family estate of Tillemont, between Montreuil and Vin- cennes. There he spent the remainder of his life, dying on the 10th of January 1698. He was buried at Port Royal; in 1711, on the desecration of the cemetery, his remains were transferred to the church of St Andre des Arcs in Paris.

From the age of twenty he was at work on his two great books— the Memoires pour servir d, I’histoire ecclesiastique des six premiers slides, and the Histoire des empereurs during the same period. Both works began to appear during his lifetime — the Histoire in 1690, the Memoires in 1693 — but in neither case was the publication

finished till long after his death. To his modesty Bossuet bears witness, when he told him to stand up sometimes, and not be always on his knees before a critic. Gibbon vouches for his learn- ing, when (in the 47th chapter) he speaks of ” this incomparable guide, whose bigotry is overbalanced by the merits of erudition, diligence, veracity and scrupulous minuteness.” There is a full account of his life in the 4th volume of Sainte-Beuve’s Port Royal.

TILLEY, SIR SAMUEL LEONARD (1818-1896), Canadian statesman, was born at Gagetown, New Brunswick, on the 18th of May 1818, the son of Samuel Tilley, an American Loyalist, who had settled in St John in 1783. Jn 1850 he was elected to the local legislature as a Liberal representative of St John. He soon became prominent from his opposition to the liquor traffic, and in 1855 persuaded the assembly to pass a prohibitory law, which proved a failure, and was repealed. From i860 to March 1865 he was premier of the province, and was prominent in organizing the conference on the union of the maritime provinces, which met at Charlottetown in 1864, and which soon widened into a discussion of Canadian federation. In 1865 he was defeated in a general election on the federation question, but returned to power in 1866, partly through an intrigue of the colonial office. From 1868 till November 1873 he held various portfolios in the Dominion cabinet; from 187310 1878 he was lieutenant-governor of New Brunswick, but in 1878 was again elected as member for St John, and entered the Conservative cabinet as minister of finance. Later in 1878 he introduced and carried through parliament the ” national policy ” of protection, on which issue the election of 1878 had been won. The tariff so introduced became the basis of Canadian financial policy. In October 1885 i|l health forced him to retire from the cabinet, and; he was again appointed lieutenant-governor of New Brunswick, which position he held till 1893. He died on the 25th of June 1896. In 1879 he was created K.C.M.G. His kindly and honourable private character was admitted by all; his political merits are judged

differently by advocates and opponents of the policy of protection which he introduced, but of his financial ability and grasp of detail there is no doubt.

His Life, by James Hannay (1907), forms one of the ” Makers of Canada ” series.

TILLODONTIA, a group of mammals of uncertain position, typified by Tillotherium from the Middle Eocene of Wyoming,

(From Marsh.)

Skull of Tillotherium fodiens. (j nat. size.)

and perhaps including Estlwnyx from the Lower Eocene of the same district, and other genera from the same horizon in both North America and Europe. In Tillotherium the skull is decidedly rodent-like, with an elongated cranial and a short facial portion, and a small brain-cavity; the jugal bone occupying the middle of the zygomatic arch. The dentition, of which the formula is *. \, c. \, p. f , m. |, also approximates to the rodent type, the canines being minute and functionless, and the first pair of incisors large and chisel-like. On these and other grounds it has been suggested that Tillotherium (of which the greater part of the skeleton is known) indicates the ancestral form of the Rodentia. Professor Max Weber considers, however, that such a view has but little justification. Relationship with the Ungulata and Carnivcra has also been suggested; if there be any with the latter, it must have been with the most primitive forms, as the plantigrade feet are furnished with five toes carry- ing long pointed claws.

Possibly Platychoerops richardsoni, from the Lower Eocene London Clay, belongs to the group. (R. L.*)

TILLOTSON, JOHN (1630-1694), English archbishop, was the son of a Puritan clothier in Sowerby, Yorkshire, where he was born in October 1630. He entered as a

pensioner of Clare Hall, Cambridge, in 1647, graduated in 1650 and was made fellow of his college in 1651. In 1656 he became tutor to the son of Edmond Prideaux, attorney-general to Cromwell. About 1661 he was ordained without subscription by T. Sydserf, a Scottish bishop. Tillotson was present at the Savoy Conference in 1661, and remained identified with the Presbyterians till, the passing of the Act of Uniformity in 1662. Shortly afterwards he became curate of Cheshunt, Herts, and in June 1663, rector of Kedington, Suffolk. He now devoted himself to an exact study of biblical and patristic writers, especially Basil and Chrysostom. The result of this reading, and of the influence of John Wilkins, master of Trinity College, Cambridge, was seen in the general tone of his preaching, which was practical rather than theological. He was a man of the world as well as a divine, and in his sermons he exhibited a tact which enabled him at once to win the ear of his audience. In 1664 he became preacher at Lincoln's Inn. The same year he married Elizabeth French, a niece of Oliver Cromwell; and he also became Tuesday lecturer at St Lawrence, Jewry. Tillotson employed his contro- versial weapons with some skill against atheism and popery. In 1663 he published a characteristic sermon on " The Wisdom of being Religious," and in 1666 replied to John Sergeant's Sure Fooling in Christianity by a pamphlet on the " Rule of Faith." The same year he received the degree of D.D. In 1670 he became prebendary and in 1672 dean of Canterbury. In 1675 he edited John Wilkins's Principles of Natural Religion, com- pleting what was left unfinished of it, and in 1682 his Sermons. Along with Burnet, Tillotson attended Lord Russell on the scaffold in 1683. He afterwards enjoyed the friendship of Lady Russell, and it was partly through her that he obtained so much influence with Princess Anne, who followed his advice in regard to the settlement of the crown on William of Orange. He possessed the special confidence of William and Mary, and was made clerk of the closet to the king in March 1689. It was chiefly through his advice that the king appointed an ecclesiastical commission for the

reconciliation of the Dissenters. In August of this year he was appointed by the chapter of his cathedral to exercise the archiepiscopal jurisdiction of the province of Canterbury during the suspension of Sancroft. He was also about the same time named dean of St Paul's. Soon afterwards he was elected to succeed Sancroft; but accepted the promotion with extreme reluctance, and it was deferred from time to time, at his request, till April 1691. In 1693 he published four lec- tures on the Socinian controversy. His attempts to reform certain abuses of the Church, especially that of clerical non- residence, awakened much ill-will, and of this the Jacobites took advantage, pursuing him to the end of his life with insult and reproach. He died on the 22nd of November 1694.

For his manuscript sermons Tillotson's widow received 2500 guineas. Ralph Barker edited some 250 of them together with the " Rule of Faith" (1695-1704). In 1752 an edition appeared in 3 vols., with Life by Thomas Birch, compiled from Tillotson's original papers and letters. Various selections from his sermons and works have been published separately, e.g. by G. W. Weldon in 1886.

TILLY, JOHANN TZERCLAES, Count of (1559-1632), general of the Catholic League in the Thirty Years' War, was born in 1559 at the chateau of Tilly in Brabant. He was destined for the priesthood and received a strict Jesuit educa- tion. But, preferring the career of a soldier, he entered a Spanish foot regiment about 1574 as a volunteer, and in the course of several campaigns rose to the command of a company. This being reduced, he again became a simple pikeman, and as such he took part in the famous siege of Antwerp by Parma, whose army afforded the best training in the art of war then obtain- able. He distinguished himself by his bravery, and the duke of Lorraine gave him the governorship of Dun and Villefranche, which he held from 1590 to 1504. Henry IV. made tempting

offers, which were refused, to induce him to enter the service of France. Somewhat later he left the. Spanish service for that of Austria to fight against the Turks. In 1602 he became colonel in the imperial army, and raised a regiment of Walloon infantry, which he commanded in the assault on Budapest, receiving a severe wound. In 1604 he was made general of artillery, and handled his new force with conspicuous success; the campaign of this year showed Tilly as a soldier of great capacity, and in 1605 he was made a field-marshal. His part in the dissensions in Austria, which preluded the Thirty Years' War, was marked by unswerving loyalty and devotion to the emperor and the Catholic religion. In 1610 he left the service of the emperor to enter that of Maximilian, duke of Bavaria, the head of the Catholic League. It was not, however, until 1620 that he became lieutenant-general to Maximilian and commander-in-chief of the field forces.

With the great victory of the Weisser Berg near Prague (1630) the new army and its leader became celebrated through- out Germany, and the long and weary campaigns against Chris- tian, Mansfeld and the Protestant princes of the north-west established their reputation. The chief battles were Wimpfen (1622), Stadtlohn (1623), Wiesloch (1622), Hochst (1622), the last being a great victory for the Catholic forces, and winning for Tilly the title of count, which was given by the emperor himself (1622). The military operations of the Thirty Years' War will be found described under that heading. With the intervention of the king of Denmark, the struggle entered upon a new phase, and on the imperial side a new army, that of Wallenstein, appeared on the scene, though it was the army of the League which won the great success of the war at Lutter-am-Barenberge (1626). Throughout these arduous campaigns Tilly had other than military difficulties with which to contend. The military superiority of his veterans, trained as they were to his own ideal of " a ragged soldier and a bright musket," may be held to explain his victories over

superior numbers, but the energy which he displayed in the midst of political difficulties was not less conspicuous than his leadership and strategy. On two occasions, at least, he was thwarted by orders from the League; once the Protestants were allowed to escape into Holland, once the army of Wallenstein was left to its own resources in the presence of the enemy. That the League achieved the successes which it actually did, was to the credit of Tilly and his men rather than to any action of the allied princes. It may be that Tilly cannot be considered as great a soldier as Wallenstein; it should, however, be borne in mind that the League army never possessed the prestige of an imperial force: that Tilly was repeatedly thwarted by political considerations, and that, even so, the hardest part of the task was achieved by the League army.

The defeat of King Christian was soon followed by the inter- vention of Gustavus Adolphus, a great captain at the head of the finest troops in Europe. But Tilly was the best general of the old school; the League troops were trained after the Spanish model, and the opening stages of the campaign did not display any marked superiority of the Swedes. At this time Tilly was commander of the imperial forces as well as of his own army. The first great contest was for the possession of Magdeburg (163 1). After one of the fiercest struggles of the war the town was taken by storm on the 20th of May, and the sack which followed was accompanied with every sort of atrocity. For this the old general has been held resporisible, yet it was rather the magnitude of the catastrophe than its special cruelties which made it the most striking example of military barbarity in modern history. Tilly's personal exertions saved the cathe- dral and other religious buildings from pillage and fire. Four months later Tilly and Gustavus, the representatives of the old and the new art of war, met in the battle of Breitenfeld (q.v.). The victory of Gustavus was complete, though the imperial general, severely wounded as he was, managed to draw off his men in good order. A few more months of campaigning brought the two armies to

the Lech, where Gustavus was again victorious, and Tilly received a mortal wound, He died on

the 30th of April 1632, in Ingolstadt, and was buried in the church at Altenotting in Bavaria.

See O. Klopp, Tilly im 30-jdhrigen Krieg (Stuttgart, 1861); K. Wittich, Magdeburg, Gustav Adolf und Tilly; also memoir of Tilly in Allg. deutsche Biographic; Keym-Marcour, Johann Tzerclaes, Graf v. Tilly; Count Villermont, Tilly, ou La Guerre de trente ans (Tournay, 1859).

TILSIT, a town of Germany, in the Prussian province of East Prussia, situated on the left bank of the Memel or Niemen, here crossed by an iron railway bridge, 57 m. S.E. of Memel and 72 N.E. of Konigsberg by rail. Pop. (1905), 37,148. The town has a number of handsome modern buildings, including a town hall, a post office, law courts, and a large hospital. It contains four Protestant churches, among them the German church, with a handsome steeple, and the curious circular Lithuanian church, a Roman Catholic church, a Jewish synagogue and a classical school {Gymnasium). The manufactures include machinery, chemicals, soap, leather, shoes, glass and other articles, and there are iron-foundries, breweries, and, steam flour and saw-mills. Tilsit carries on trade in timber, grain, hemp, flax, herrings and coal; but its trade with Russia, at one time considerable, has fallen off since the construction of the railway from Konigsberg to Kovno. The river is navigable above the town, and there is a steamboat communication with Konigsberg, Memel and Kovno.

Tilsit, which received civic rights in 1552, grew up around a castle of the Teutonic order, known as the ” Schalauner Haus,” founded in 1288. It owes most of its interest to the peace signed here in July 1807, the preliminaries of which were settled by the emperors Alexander and Napoleon on a raft moored in the Memel. This treaty, which constituted the kingdom of Westphalia and the duchy of Warsaw, registers the nadir of Prussia’s humiliation under

Napoleon. The poet Max von Schenkendorf (1784-1817) was born at Tilsit.

See Aus Tilsits Vergangenheit (5 vols., Tilsit, 1888-1892); and R. Thimm, Beitrdge zur Geschichte von Tilsit (Tilsit, 1893).

TIMAEUS (c. 345-c. 250 B.C.), 1 Greek historian, was born at Tauromenium in Sicily. Driven out by Agathocles, he migrated to Athens, where he studied rhetoric under a pupil of Isocrates and lived for fifty years. During the reign of Hiero II. he returned to Sicily (probably to Syracuse), where he died. While at Athens he completed his great historical work. The Histories, in at least 38 (Bury says 33) books, was divided into unequal sections, containing the history of Italy and Sicily in early times; of Sicily alone; of Sicily and Greece; of the cities and kings of Syria (unless the text of Suidas is corrupt) ; the lives of Agathocles and Pyrrhus, king of Epirus. The chronological sketch ('OXu/ wriomcu, the victors at Olympia) perhaps formed an appendix to the larger work. Timaeus was bitterly attacked by other historians, especially by Polybius, and indeed his unfairness towards his predecessors, which gained him the nickname of Epitimaeus (fault-finder), laid him open to retaliation. Polybius was a practical soldier and statesman, Timaeus a bookworm without military experience or personal knowledge of the places he described. The most serious charge against Timaeus is. that he wilfully distorted the truth, when influenced by personal con- siderations: thus, he was less than fair to Dionysius and Agatho- cles, while loud in praise of his favourite Timoleon. On the other hand, as even Polybius admits, Timaeus consulted all available authorities and records. His attitude towards the myths, which he claims to have preserved in their simple form (hence probably his nickname ypaoovWeKTpia, " collector of old wives' tales," though some authorities render this "old rag- woman," in allusion to his fondness for trivial details) , is preferable to the rationalistic interpretation under which it had become the fashion to disguise them. Timaeus also devoted much

attention to chronology, and introduced the system of reckon- ing by Olympiads, with which he compared the years of the Attic archons, the Spartan ephors, and the priestesses of Argos. , This system, although not adopted in everyday life, was afterwards generally used by the Greek historians. Although a pupil of Philiscus of Miletus, a disciple of Isocrates, Timaeus is a representative of the Asiatic style of Hegesias of , 1 J. E. Sandys, c, 350–c. 260; J. B. Bury, 340–256.

Mognesia rather than of the Attic (see Norden, Griech. Kunst- prosa i. 136). Both Dionysius of Halicarnassus and the pseudo- Longinus characterized him as a model of ” frigidity ” (\JA>xpbv), although the latter admits that in other respects he is a competent writer. Cicero, who was a diligent reader of Timaeus, expresses a far more favourable opinion, specially commending his copiousness of matter and variety of expression. Timaeus was one of the chief authorities used by Trogus Pompeius, Diodorus Siculus and Plutarch in his life of Timoleon.

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TIMANTHES, of Cythnus or Sicyon, a Greek painter of the 4th century B.C. The most celebrated of his works was a picture representing the sacrifice of Iphigenia, in which he finely de- picted the

emotions of those who took part in the sacrifice; but despairing of rendering the grief of Agamemnon, he represented him as veiling his face. A painting discovered at Pompeii, and now in the Museum at Naples, has been regarded as a copy or echo of this painting (Helbig, Wandgemalde Campaniens, No.

I3°4)–

TIMARU, a seaport of Geraldine county, New Zealand, on the E. coast of South Island, 100 m. S.W. of Christchurch by rail. Pop. (1906), 7615. The slight inward sweep of the coast forms the Canterbury Bight, and the shore-line northward from Timaru is called the Ninety-mile Beach. The harbour is formed by breakwaters enclosing a space of 50 acres. Chief exports are wool, flour and frozen meat, and the industries are in connexion with these. Opals are found in the district. The Anglican church of St Mary is built of Oamaru and bluestone, with a roof of kauri wood. Caroline Bay, to the north, is a bathing resort. The volcanic soil is highly fertile. Timaru is the chief town in South Canterbury district, and the seat of the supreme and district courts. A branch railway traverses the inland agricultural district.

TIMBER, the term given to wood Cut and shaped for build- ing purposes, or growing wood suitable for such purposes; in English law the tenant for life may not cut such trees (see Waste). The word appears in many forms in various Teu- tonic languages, meaning originally material to be used for building purposes; in the case of Ger. zi'mmer, and Du. timmer, both meaning " room," the word has been transferred to the structures made of this material. The root is seen in Gr. Si/my, to build, and Lat. domus, house.

The wood used in building is obtained from trees of the class known to botanists as exogens, or those trees which grow larger by the addition each year of a layer of new wood on their outer surface. A transverse section of a tree of this class shows it to consist of three distinct parts: the pith or

medulla, the wood, made up of annual rings or layers, and the bark. The pith is in the centre of the tree and around it the wood is disposed in approximately concentric rings; that part near the pith is hard and close in grain, and from its position is termed heart-wood. The sap-wood is made up of the outer layers or rings, and these are softer than the heart and generally of more open grain. Each annual ring is made Up of two parts — an inner soft portion light in colour, and a hard, dark coloured outer portion. The inner portion is formed early in the season and is termed " spring wood," the darker part being called " autumn wood." The medullary rays extend radially from the centre of the tree to the bark at right angles to the grain of the wood, and serve during life to bind the whole together as well as to convey nourishment from one part of the tree to another.

The greatest care should be exercised in the selection of trees for felling. If the tree is too young .the proportion of sap-wood

is large, and the heart-wood is not so hard as that of a tree of mature age. The wood of an old tree, on the other hand, has lost a great part of its toughness, and is of bad colour, brittle and often predisposed to decay. In Timber trees that have arrived at a mature age the heart-wood is in its largest proportion and the sap-wood is firm and elastic; and the timber from such trees is of the strongest, toughest and most durable character. The age at which the northern pine and Norway fir arrive at maturity is between seventy and one hundred 'years. The larch, elm and ash should be felled when the trees are between the ages of fifty and one hundred years. The oak should be about one hundred years old when it is cut. The best time of the year for felling timber is in midsummer or midwinter, when the sap of the tree is at rest; it is not desirable to cut timber in the spring or autumn. By some authorities it is considered a good plan to remove the bark in the early spring and fell the tree in the ensuing winter.

As soon as possible after felling, logs should be converted by sawing into scantling sizes, for if the log is left to dry or season, it is liable on shrinking to split. The usual ■ method is to saw a log into planks or boards by of Timber. cutting it into slices longitudinally as shown in fig. 1; this is called bastard sawing, and is the most

bastard sawin g

Fig. 1.

q uarter sawing

Fig. 2.

economical method, but, as will be seen in the diagram, the quality of the boards will vary very much, some consisting almost entirely of sap-wood cut at a tangent to the annular rings such as a, b, c, whilst the centre boards contain the heart- wood cut in the best way at right angles across the annual rings as d, e, f. For oak and other hard woods another method of conversion is often adopted, called quarter sawing. The log is first cut into quarters and then sawn diagonally (fig. 2). In oak this develops the beautiful silver gram by cutting longitudinally through the medullary rays. Timber is now^ generally sawn into marketable sizes in the country of its growth, and shipped as scantling timber.

Definitions and sizes are given below of the most usual forms of sawn timber : —

A log is the trunk of a tree with the bark removed and branches lopped. '

A balk is a log hewn or sawn to a square section, and varying in size from 11 to 18 in. square.

Planks are parallel-sided pieces of timber from 2 to 6 in. thick, 11 or more ins. wide, and from 8 to 21 ft. long.

Deals are similar pieces 9 in. wide, and 2 to 4 in.

thick.

Battens are similar to deals, but not more than 7 in. widej Pieces of planks, deals and battens under 8 ft. long are called ends. Many of the soft woods, such as pine and fir, are sold by the standard. The standard of measurement most in Use is the St Petersburg standard, which contains 165 cubic ft. or 720 lineal ft. of 11 in. by 3 in.

A load of sawn or hewn timber contains 50 cub. ft., and a load of unhewn timber 40 cubic ft. ‘■■■■.

A square is a superficial measurement, used chiefly for boarding, and contains 100 sq. ft.

Seasoning.

Norwegian timber is stencilled with the shipper’s initials in blue letters painted on the ends. Swedish timber is stencilled with red letters or devices, the. inferior qualities in blue. Prussian timber is scribed on the sides near the middle; By scribing is meant that the distinguishing letters are roughly cut in with a gouge. Russian timber is dry-stamped or hammer-branded on the ends. American (Canadian) timber is stencilled in black and white. United States timber is marked with red chalk on the sides.

To fit timber for use in building construction the super- fluous sap and moisture contained in the green wood must be evaporated, either by natural or artificial means. During this process the wood shrinks considerably, and unless much care and attention are given to the drying wood it will warp and shake sufficiently to unfit it for practical uses. After the log is converted into scantlings, or ” lumber,” as it is termed in America, it is stacked in the timber yard tinder covered sheds with open sides to enable it to ” season.” The wood is carefully piled in tiers or courses, with strips of

wood about an inch thick between each layer, so as to allow of the free circulation of air all round each piece. This is the natural and best method of seasoning, and timber treated in this way is more durable than that seasoned by artificial methods; the time taken, however, is much longer. For joiners' work the drying of the wood is often hastened by stacking the timber in well-ventilated rooms kept at a tempera- ture of from 8o° to 1 50° F. The time taken in seasoning wood by this desiccating process is not more than one-tenth of that occupied in the natural or open-air method. Where it is convenient, timber is sometimes treated with a water seasoning process which enables it to be more easily dried. The wood is placed in a running stream and so tied or chained down as to be entirely submerged. The water enters the pores of the wood (which should be placed with the butt end pointing up stream) and dissolves and forces out the sap. After about two weeks in this position it is taken out and stacked in open sheds to be dried in the natural way, or treated by warm air in special chambers; Steaming and boiling are sometimes resorted to as artificial means of seasoning, but not to any great extent, as the timber deteriorates under such treatment, and the cost of the process is in many cases prohibitive. When wood is required to be bent, however, this is often the method that is adopted to soften the material, so as to allow it to be bent easily. The time allowed in the English government dockyards for the natural process of seasoning for hard woods such as oak is, for pieces 24 in. sq. and upwards, 26 months; from 16 in. to 20 in. sq., 18 months; from 8 in. to 12 in. sq., 10 months; from 4 in. to 8 in. sq., 6 months. Soft woods are allowed half these periods. When the wood is required in a " dry " state for joiners' work, twice the length of time is given. Planks are allowed from a half to two-thirds of the above time, according to their thickness.

Deals with coarse annual rings (i.e. coarse grain) should be re- jected for good work, as also should those with waney or naturally bevelled edges. The

wide annual rings show that the T¥ fca ” tree was S rown t0 ° quickly, probably in marshy ground. m r ‘ Timber with waney edges has a large proportion of sap-wood, and is cut either from a small tree or from the outer por- tion of a large one, the waney edge being obviously due to irregu^ larities in the surface of the tree. ‘ Cup shake ” is a natural splitting in the interior of the tree between two of the annular rings. It is supposed to be caused in severe weather by the freezing of the ascending sap. ” Heart shake ” is often found in old trees and extends from the pith or heart of the tree towards the circum- ference. When there are fissures radiating in several directions it is called ” star shake.” ” Upsets ” are the result of some crush- ing force or violent shock to the balk or log. ” Foxey ” timber is tinged with dull red or yellow stains, indicating incipient decay. ” Doatiness,” similarly, is a speckled or spotted stain denoting decay in certain varieties of timber, such as beech and some kinds of oak.

The primary causes of decay in timber are the presence of sap, exposure to conditions alternately wet and dry, and want of Oecnyia efficient ventilation, especially if accompanied by a Timber warm and moist atmosphere. Timber is most durable when it is kept quite dry and well ventilated, but some varieties last an indefinite period when kept continually under water. When, on the other hand, the wood becomes alter- nately Wet and dry ■, ” wet rot ” results. The wood affected shrivels

up and becomes reduced after a time to a fine brown powder. It is only by actual contact that wet rot affects the surrounding good wood, and if the decayed timber is cut out the remainder of the wood will be found to be unaffected.

” Dry rot,” which usually attacks the sap-wood, generally starts in a warm damp unventilated place, and is caused by the growth of fungi, some of which are visible to the naked eye, some microscopic. The spores from the fungi on the decayed wood float in the air and alight on any adjacent timber, infecting

this also if the conditions be favourable. In this way the disease is spread rapidly, continually eating into the timber, which is first rendered brittle, and then reduced to powder. A strong growth of the fungus gives the appearance of mildew on the wood, and produces an unpleasant musty smell. The spores of the fungus will find a way through brickwork, concrete and similar material, in order to reach woodwork that may be on the other side. Damp- ness and a close atmosphere are essential to the growth of dry rot, and it is under these conditions that it spreads most quickly, the fungus soon dying when exposed to the fresh air.

There will be little danger of the decay of timber used in the con- struction of ordinary buildings if care has been taken, in the first place, to have it well seasoned, and, in the second, to _^ ensure its being well ventilated when fixed in position. ^ vse 'y a ' There are, however, several preservative processes to ^"? which timber may be subjected when it is to be fixed / " D " eA in positions which favour its decay (see also Dry Rot). In creosot- ing, which was invented by J. Bethell and patented by him in 1838, the timber is impregnated with oil of tar. This may be done by soaking the wood in the hot oil for several hours, but the better way is to place the seasoned timber in an iron chamber in which a partial vacuum is created by exhausting the air. The creosote is then forced in at a pressure of from 100 lb to 160 ih to the sq. in., according to the sire of the timber. In warm weather the pressure need not be so great as in winter. The whole process only occupies from two to three hours. Soft woods take up from to to 12 lb to the cub. ft.; hard woods are not usually treated by this process. Kyan's process, patented in 1832, consists in impregnating the timber with corrosive sublimate which, acting on the' albumen in the wood, converts it into an indecomposable sub- stance. Boucherie, a Frenchman, originated a system in which the sap is expelled from the timber under pressure, and a strong solution of copper sulphate is then injected at the end of the wood. In Blythe's process the timber is

dried, and crude carbolic acid injected. In Burnett's process a solution of zinc chloride is forced into the pores of the wood. A new process of preserving timber by means of steam heat has been tried and seems to be effectual. The wood is placed in closed chambers and steam admitted at high pressure (200 lb to the sq. in.). The heat and pressure together exert a chemical action upon the sap, which becomes insoluble and itself preserves the wood from decay.

Posts that are to be fixed in the ground should have their buried ends either charred or else well tarred. External woodwork may be protected by painting or oiling.

The timber used in building is obtained from trees which may be classed under two heads: (1) Coniferous or needle-leaved trees; (2) the non-coniferous or broad-leaved trees.

Coniferous Trees. — This class includes most of the soft woods which furnish timber for the framing and constructional portions of nearly all building work. They are also used for the finishing joinery of the ordinary class of building. The numerous varieties of pine which are used more extensively than any other kind of wood are included in this class.

The northern pine (Pinus sylvestris) has a number of other names and may be referred to under any of the following: Scotch fir, red deal, red fir, yellow deal, yellow fir, Baltic pine, Baltic fir. It grows in Sweden, Norway, Russia, Germany and Great Britain, ana often gets a name from the port of shipment, such as Memel fir, Danzig fir, Riga fir, and so on. The colour of the wood of the different growths of northern pine varies considerably, the general characteristics being a light reddish yellow colour. The annual rings are well defined, each ring consisting of a hard and a soft portion, respectively dark and light in colour. No medullary rays are visible; the wood is straight in the grain, durable, strong and elastic, easy to work, and is used by the carpenter for internal and external

constructional work, and by the joiner for his fittings. Tar, pitch and turpentine are obtained from the wood of this tree, which weighs from 30 to 38 lb per cub. ft.

The white fir, or Norway spruce (Abies txcelsa), is exported from Russia, Sweden and Norway, where it grows in enormous quantity. It is the tallest and straightest of European firs, growing with a slender trunk to a height of from 80 to 100 ft. Like the northern pine, it is called by several names, such as "spruce,"" white deal," " white wood," " Norway fir." The col6ur of the cut wood is a very light yellowish or brownish white, the hard parts of the

annual rings being of a darker shade. A characteristic feature is the large number of very hard black knots which the wood contains. It is easy to work, but rather inferior in all respects to the northern pine. Its weight per cubic foot averages about 33 lb.

The red pine (Pinus resinosa or P. rubra) is also known as " Canadian pine " and " American deal." It grows in the northern parts of North America, where the tree attains a height of 60 or 70 ft. with a diameter of from 12 to 30 in. It weighs about 36 lb to the cubic foot. In Canada it is called " Norway pine " and " red pine " from the colour of the bark. The wood is white, tinged with yellow or red, of fine grain, and works to a smooth lustrous surface remarkably free from knots.

The white pine (Pinus strobus) is exported from the northern parts of the United States of America and from Canada. Other names for this timber are " yellow pine " and " Weymouth pine," the last name originating in the fact that the earl of Weymouth first introduced it into England. The tree attains a

height of from 150 to 200 ft. with a thickness of trunk at 5 ft. from the bottom of from 5 to 10 ft. The wood when cut is white oryellowish white, straight in grain and easily worked, but is not so tough, elastic or durable as the northern pine, and therefore is not so suitable for constructional work. For joiners' work, however, it is well adapted, and glue adheres strongly to it, though nails do not hold well. It weighs about 30 lb per cub. ft.

The Kauri pine (Dammara australis) is a native of New Zealand. It grows to a height of from 80 to 140 ft., with a straight stem 4 to 8 ft. in diameter. The wood is a light yellowish brown in colour, fine in grain and of even texture, the annular rings being marked by a darker line. It is strong, elastic and resinous. A cubic foot weighs about 35 to 40 ft.

The pitch pine (Pinus rigida) is a native of Canada and is Common throughout the United States of America. It is remarkable for the large quantity of resin it contains, the weight of the wood, which is about 48 lb per cub. ft., and the strong red markings of the grain, usually straight but sometimes exhibiting a beautiful figure. Its weight and strength, and the large size of the balks, make it very valuable for heavy constructional works and piling, and its fine figure makes it equally valuable for joinery.

Of the larch the best known variety is the European larch (Larix europaea), which grows in Switzerland, Italy, Russia and Germany. The larch frequently attains a height of 100 ft. but the average height is about 50 ft. and diameter 3 ft. The wood is extremely durable and lasts well where exposed alternately to wet and dry; indeed, the larch is useful for every purpose of building, internal and external. It is the hardest and toughest of the cone-bearing trees and weighs 30 to 40 lb per cub. ft.; it has a straight grain free from many knots; in colour it is of a rather deep yellow or brownish tint, with the hard portions of the annular rings marked in a darker red. The American black larch

(Larix pendula) and the American red larch (Larix microcarpa) are native to North America. The latter tree is of comparatively little service. The black larch yields timber of good quality, nearly equal to that of the European tree.

The cedar used in building work is really a species of juniper. The Virginian red cedar (Juniperus virginiana) grows in the United States, Canada and the West Indies. The tree produces excellent timber, and is much used for furniture, its strong acrid taste driving away insects. It weighs about 40 lb per cub. ft. The Bermuda cedar (Juniperus bermudiana) is used for internal joinery and is extremely durable.

Hard Woods. — The timbers in the second class are obtained from non-coniferous trees, containing no turpentine or resin, and are given the general name of hard woods. Their initial expense and the high cost of working preclude their general use, and they are consequently reserved to a great extent for specially heavy constructional work and ornamental finishing joinery.

The oak (Quercus), of which some sixty distinct species are known, grows freely in Europe and America. Several kinds yield valuable timber : in England the two best-known varieties are Quercus pedun- culata and Quercus sessilifiora. There is little difference between the quality of the two woods, the variation being in the foliage and fruit. The wood is very hard, tough, with fine regular grain and close texture, the annular rings being distinct and the medullary rays well marked. When it is cut along these rays beautiful markings are revealed, called silver grain. The colour is a light brown, and its weight is about 50 to 56 lb per cub. ft. Oak is very durable either in a dry or a wet situation, or in a position where it will be alternately dry and wet. It is very suitable for constructional and engineering works, and it supplies one of the finest woods for ornamental joinery work. The Durmast oak grows in France and the south of England ; it is not so strong, or

durable as the English oak. Baltic oak is grown in Norway, Russia and Germany, and is exported from the Baltic ports. Though inferior to the English oak, it is very- straight in the grain and free from knots. Austrian oak is light in colour, and is much used

for joinery work. White oak comes principally from Canada, under the name of American oak. It is straight in grain but subject to warping, and is not so durable as British oak.

The common walnut (Juglans regia) grows in Great Britain. On account of its scarcity it is little used for building purposes, except for ornamental joinery, being more used by the cabinet and furniture maker. A cubic foot weighs about 45 lb. The white walnut (Juglans alba) or hickory is common in North America, and is very tough, hard and elastic. The black walnut (Juglans nigra) is also native to America. It has a fine grain with beautiful figure, and takes a fine polish. It weighs 56 lb per cub. ft.

Of the elm (Ulmus) there are five common varieties, the two most cultivated being the rough-leaved elm (Ulmus campestris), which is grown in large quantities in England and North America, and the smooth-leaved wych elm (Ulmus glabra). The colour of the wood is brown; it is hard, heavy, strong and very tough, and when kept either always wet or always dry is durable. Elm is very liable to warp and shake, is porous and usually cross-grained. The piles of old London Bridge were of elm, and after six centuries of immersion were but little decayed. The wood is not much used in building operations. It weighs about 40 lb per cub. ft.

The common ash (Fraxinus excelsior) is a native of Europe and Northern Asia, and is grown extensively in Great Britain. Its colour is light brown, sometimes with a greenish tint, with the annular rings of darker colour. The wood is very tough and strong, and superior to most wood in elasticity; and it weighs 40 to 55 fb per cub. ft.

Beech (Fagus sylvatica) grows in the temperate districts of Europe. The wood is heavy, strong and hard; white to light reddish-brown in colour; and durable if kept either dry or wet; is porous and works easily; it weighs about 40 to 48 lb per cub. ft. The red beech (Fagus ferrugina) is common in North America.

Sycamore (Acer pseudo-platanus), sometimes mistakenly called the plane tree, is common in Germany and Britain and in the eastern states of North America. It is a large tree of rapid growth. The wood is light brown or yellowish white, with annular rings not very distinct, often cross-grained and of uniformly coarse texture. It warps and cracks rather badly, and weighs from 35 to 42 lb per cub. ft.

Teak (Tectona grandis) is a native of southern India and Burma. It grows rapidly to a great height, often exceeding 150 ft., with a straight trunk and spreading branches. Teak wood is straight in the grain and exceptionally strong and durable, its oily nature enabling it to resist the attacks of insects and to preserve iron nails and fastenings. It weighs from 45 to 56 lb per cub. ft.

Mahogany (Swietenia mahogani) is a native of the West Indies and Central America, the best-known varieties being Cuban or Spanish and Honduras. The Spanish wood has a darker colour and richer figure than the Honduras, and is therefore preferred for ornamental joinery work. The colour of mahogany is reddish brown, and in the Cuban wood the pores are often filled with a white chaiky substance which is usually absent in the Honduras variety; the latter, however, may be obtained in larger sizes, and is straighter in the grain and easier to work. Spanish mahogany weighs about 56 lb to the cubic ft., and the Honduras variety about 36 lb.

G'eenheart (Nectandra rodiaei) is a very heavy, hard and durable wood from the East Indies. It ranges in colour from pale yellow to a deep brown, and the grain is very compact and of close texture. The wood

contains an oil which enables it to resist the attack of sea worms, and this quality makes it suitable for use in marine construction. The average weight of a cubic foot is about 61 lb.

Basswood (Tilia americana) is common in Canada and in the northern United States. It is soft and easy to work, and of even texture and straight grain. It may be obtained in wide boards, and thus is fitted for use in large panels. It weighs about 30 lb per cub. ft.

There are several varieties of maple growing in Canada and the United States, but the one in most common use is the sugar maple, also called rock maple, which grows freely in the districts around the Great Lakes. The wood is fine-grained, frequently with a beautiful wavy figure, yellowish white to light brown in colour; it is very hard, tough and durable. Birds'-eye maple has a peculiar curly grain, and is much in request for ornamental joinery.

The numerous tests of the strength of timber which have been made by various authorities from time to time vary so much, both as regards the conditions under which they were carried out and the results obtained, that Timber. great discretion is required in using them for any practical purpose. An important series of tests was made in 1883 and 1887 at Munich by Professor Johann Bauschinger. • He reduced all the specimens submitted for test to a stan- dard of moisture, the percentage selected being 15%. This was necessary on account of the great difference in strength found to exist between specimens cut from the same piece of timber but differing in the amount of moisture they contained.

In America, Professor J. B. Johnson made a large number of tests for the Forest Department of the Board of Agriculture of the United States between

1891 and 1895- More than 300 trees were cut down and experimented with, the species under test embracing ten different kinds of pine and five different varieties of hard-wood trees. Records were made as to the nature of the soil and climate where the trees were grown; their conditions of growth, their age and size, and the season of felling. As in the tests made by Bauschinger, the per- centage of moisture contained in the wood was very carefully observed, and it was found that this amount of moisture has a very great influence upon the resisting power of the wood, the strength increasing with the dryness of the material up to 3 or 4 % of moisture, at which point the greatest strength of the wood is reached. Wood in such a dry condition, however, is never found in actual practice, timber in an ordinary well-warmed and well- ventilated situation probably containing at least 10%.

One general conclusion arrived at both by Bauschinger and Johnson was that the strength is much affected by the specific gravity of the timber. In all cases the strength increases pro- portionately with the density of the wood. A most complete series of tests upon the physical characteristics of the hard woods of Western Australia was completed for the govern- ment of Western Australia by G. A. Julius in 1907. This work was carried out in a most thorough manner, and as many as 16,000 tests were made, the conditions of test being based upon those laid down by Johnson. The results serve to show the great value of Australian timbers, and the comparisons made with the typical timbers of many other countries emphasize the fact that the Australian woods are equal to any in the world for hardness, strength and durability.

For use under special conditions a wood suited to the par- ticular requirements must be selected. The following is a list of the best timbers for different situations: for general con- struction, spruce and pine of the different varieties; for heavy constructions, pitch pine, oak (preferably of English growth), teak, jarrah; for constructions

immersed in water, Baltic pine, elm, oak, teak, jarrah; for very dry situations, spruce, pines, mahogany, teak, birch, sycamore.

There are no regulations in England limiting the working stresses that may safely be placed upon timber, although in some districts the least sizes that may be used for timbers in roofs and floors are specified. In some European and other, countries, however, the safe working stresses of timber used for constructional purposes are defined. The building by-laws of the municipality of Johannes-burg, in South Africa, contain the following table : —

Safe Working Stresses for Timber. In tons per square inch.

Material.

Tensional.

Compressive.

Bending. Extreme Fibre

Stress.

Timber …. Fir and Pine . . .

Hardwood

1 2

1 2

1 2

i

1

2

1 2

Note. — The compression stresses are for short

struts and columns where the length does not exceed for timber 15 times the least transverse dimension, and where the ends are fixed. Where the ratio of the length to the least transverse dimension is higher, the load per square inch shall be proportionately reduced. No post of timber shall exceed in length 30 times its least transverse dimension.

References. — T. Tredgold, Principles of Carpentry, § xii.; R. E. Grandy, Timber Importer's Guide; G. A. Julius, Report of a Series of Tests upon the Physical Characteristics of the Hardwoods of Western Australia (1906—1907); J. B, Johnson, Report of Tests upon Timber made for the Forest Department of the Board of Agri- culture of tlie United Stales (1891-1895); I. Bauschinger, " Report of Tests made upon Timber at Munich, Mittheilungen aus dem Mechanisch-Tcchnischen Laboratorium der K. Technischen Hochschule in Miinchen; F. E. Kidder, Building Construction and Superinten- dence, vol. ii. ; Rivington, Notes on Building Construction, vol. iii. ; T. Laslett, Timber and Timber Trees; H. Stone, The Timbers of Commerce and their Identification; H. M. Ward, Timber and some of its Diseases; R. Hartig, Timbers and How to know them; J. Brown, The Forester; G. S. Boulger, Wood. (J. Bt.)

TIMBER-LINE, in physical geography, the line of elevation above sea-level above which trees do not grow. In any

hilly locality, which is not of too high latitude to allow of trees growing near the sea-level, this line is generally clearly marked. It varies not only with general but also with local conditions of climate, just as does the snow-line.

TIMBER-WOLF (Canis occidentalis) , or grey wolf, an American species, or, perhaps, a geographical race of the European C. lupus (see Wolf). The length of good specimens is about 64 in., of which the tail forms nearly a quarter, and the range of colour is from black to white. Cattle ranchers and shepherds have established a war of extermination against this

wolf and the coyote; several states offer bounties ranging from $2 to $10 on wolf-scalps. In Montana in 1901 during a month in the saddle an observer saw no wolves, which have become so scarce that the occupation of the professional wolf-hunter is almost gone. These animals are, however, far from being exterminated, the " bad lands " forming an absolutely secure refuge.

TIMBREL, or Tabret (the tof of the ancient Hebrews, the deff of Islam, the adufe of the Moors of Spain), the principal musical instrument of percussion of the Israelites, identical with the modern tambourine. The word timbrel is used in the Old Testament in both singular and plural form, so as to suggest that the former referred to a hoop of wood or metal over which was stretched a parchment head; while the plural was perhaps used to designate the tambourine with bells or jangles fixed at intervals in hoops. The Israelites learnt to use the timbrel during their sojourn in Egypt, and it has been suggested that as the Egyptians used it to scare away their evil spirit Typhon, the word tof is derived from the latter. The tabret or timbrel was a favourite instrument of the women, and was used with dances, as by Miriam, to accompany songs of victory, or with" the harp at banquets and processions; it was one of the instru- ments used by King David and his musicians when he danced before the Ark. It was also used in the valley of Hinnom at the sacrificial rites, when human victims were " passed through the fire " to Moloch. (K. S.)

TIMBS, JOHN (1801-1875), English antiquary, was born in Clerkenwell, London, on the 17th of August 1801. He was edu- cated at a private school at Hemel Hempstead, and in his sixteenth year apprenticed to a druggist and printer at Dorking. He had early shown literary capacity, and when nineteen began to write for the Monthly Magazine. A year later he became secretary to Sir Richard Phillips, its proprietor, and permanently adopted literature as a profession. He was successively editor of the Mirror of Literature, the Harlequin, the Literary World, and sub-editor of the Illustrated London News. He

was also founder and first editor of Year-Book of Science and Art. His published works amounted to more than one hundred and fifty volumes. In 1834 he was elected a fellow of the Society of Antiquaries. He died in London on the 6th of March 1875.

TIMBUKTU (French spelling Tombouctou), chief town of the territory of Timbuktu, French West Africa, 9 m. N. of the main stream of the Niger in 16° N. and 5° W.

Timbuktu lies on a terrace formed by the southern scarp of the Sahara, about 800 ft. above sea-level, and overlooking a chain of dhayas or marshy hollows, fringed here and there with a few mimosas and palm thickets, amid the surrounding sandy wastes. These dhayas, which are flooded every three or four years, converting the lowland tracts between the terrace and the main stream into a labyrinth of channels and backwaters, mark the bed of a navigable creek which formerly branched from the Niger northwards to the foot of the scarp, and which in 1640 inundated a low-lying quarter of the city. It is conjectured that the main stream followed this course before it took its present easterly curve to Burrem, where it bends southwards to the coast. Here also it was probably joined at some remote period by the now dried-up Wadi Messaura from the Tuat oases south of Algeria, although the rough levels taken by Oscar Lenz and others make it uncertain whether the flow through this depression was northwards or southwards. In any case Timbuktu has been left, so to say, high and dry by the general process of desiccation going on throughout the Saharan region.

Timbuktu has been described as " the meeting point of the camel and the canoe," " the port of the Sahara in the Sudan," and (more correctly) " the port of the Sudan in the Sahara." It is a great " exchange " for the produce of North Africa and

that of the rich countries south and west of the Niger. It was formerly a much larger place than it was found to be at the time oi its occupation by the French in 1893-1894. Extensive ruins exist north and west of the present town. The great mosque which at one time stood in the centre of the town now lies near the western outskirts, where its high but unsightly earth tower forms a striking landmark. The mosque of Sidi Yaia (in the centre of the town) and that of Sankore in the north-east also possess prominent towers. Two forts, built by the French and placed, one on the northern the other (Fort Bonnier) on the southern side of the town, protect the roads to the desert and the river respectively. Whereas in 1895 the town was little more than a vast ruin, under French protection the inhabitants, relieved from the fear of Tuareg oppression, set about repairing and rebuilding their houses; trade revived; new streets were built; European schools, churches and other establishments were opened.

The industries of Timbuktu — cotton-weaving, earthenware, leather-work and embroidery — are of subordinate importance, and the great bulk of the people are occupied exclusively with trade. The whole traffic of the surrounding lands converges on Timbuktu, which has a transit trade estimated at over £800,000 per annum. Considerable quantities of British and German fabrics, hardware, beads, &c, are conveyed across the Sahara from Mogador (Morocco), while two great caravans of 3000 or 4000 camels are yearly charged with salt from the Taudeni district, salt being an article which the Niger countries lack. The imports via the Sahara average about £50,000 annually, and by way of Senegal goods of equal value are received. From the south come cereals, gold, wax, ivory and coarse native "cotton goods, now brought to Kabara (the port of Timbuktu) by steamers plying on the upper Niger. Cowries, the former currency (2500=5 francs), have been generally replaced by French money. It is proposed to connect the city with the Niger by a canal.

Timbuktu, which possesses some valuable Arabic manuscripts — notably the Tarik es-Sudan, a 17th-

century history of the Sudan written by Abderrahman Sadi of Timbuktu — and is a centre of Moslem teaching, is a converging point of the chief west Sudanese and Saharan races — Arabs or Arabized Berbers to the west; Songhoi in the immediate vicinity, and thence south-eastwards along the Niger; Ireghenaten or " mixed " Tuareg southwards across the Niger as far as the Hombori Hills and in the fertile Libbako plains beyond them; Fula, Mandingos, and Bambara in and about the city; and Imoshagh (Tuareg) belonging to the Awellimiden confederation mainly to the north and east.

The local administration— preserved under French rule — is in the hands of an hereditary kahia, a kind of mayor, descended from one of the Ruma families (see below). The kahia, during the greater part of the 19th century, was more or less under the control of the powerful Bakhai (Backay) family, who, as " sherifs " and marabouts, were revered throughout the western Sahara.

History. — The history of Timbuktu l is intimately connected with that of the city of Jenne and the Songhoi Empire. The Songhoi {q.v.) are a negro race reported to have come to the Niger countries from the Nile valley. In the 8th century they made themselves masters of a considerable tract of country within the bend of the Niger, and built the city of Gao {q.v.) 200 m. in a direct line S.S.E. of Timbuktu, making it their capital. In the nth century they were converted to Islam. Besides Gao, the Songhoi founded Jenne (q.v.), which early attained consider- able commercial importance. Meantime (nth century) a settlement had been made at Timbuktu by Tuareg. Perceiving the advantages for trade with the north offered by this desert rendezvous, the merchants of Jenne sent agents thither (12th century), and Timbuktu shortly afterwards became known to the inhabitants of the Sahara and Barbary as the best market in which to dispose of their salt and other goods, and also for

'Tin-Buktu in Arabic may stand for " the well of Buktu "; in the Songhoi tongue the word means a

hollow.

the purchase of the many commodities of the western Sudan. In the 1 2th or 13th century Timbuktu fell under the power of the Mandingo kings of Melle or Mali, a country lying west and south of Jenne. Its fame as a mart for gold and salt spread to Europe, ” Timboutch ” being marked on a Catalan map dated 1373. In 1353 it had been visited by the famous traveller Ibn Batuta. In 1434 the Tuareg made themselves masters of the city, which in 1469 was captured by the Songhoi king Sunni Ali. In the days of Sunni’s successor Askia (1494- 15 29), who completed the conquest of Melle begun by Sunni Ali, the Songhoi empire reached its highest development, and Timbuktu rose to great splendour. The ” university ” of Sankor6 became a chief centre of Mahommedan culture for the peoples of the western Sudan. One of the sheikhs of Sankore, Ahmad Baba, was among the most learned of Moslems. Some of his writings are still extant. The riches of Timbuktu excited the cupidity of El Mansur. sultan of Morocco, who, in 1590, sent an army across the Sahara under an ” Andalusian ” Moor (that is, a Moor descended from those expelled from Spain) , which captured Timbuktu(i59i)and completely broke up th e Songhoi empire. The Moors made Timbuktu their capital city. For about twenty years after the conquest the pasha who ruled at Timbuktu was nominated from Morocco, but the distance of the Niger countries from Marrakesh enabled this vast viceroyalty to throw off all allegiance to the sultan of Morocco.

The Niger Moors, known asRumas after El Mansur’s musketeers, quarrelled continually among themselves, and oppressed the negro tribes. By the end of the 18th century two hundred years of oppression had reduced Timbuktu to comparative desolation and poverty. By this time the whole country was in a state of anarchy, and in 1800 the Tuareg swooped down from the desert and captured the place. They were in turn (1813) dispossessed by the Fula, who in 1840 gave place to the Tukulor, led by El Haj Omar, the first great opponent of the extension of French influence in the Niger bend. When the French reached

Tim- buktu in December 1893 they found that the town had again fallen beneath the rule of the Tuareg. The townsfolk, indeed, from the time of the decay of the Ruma power being at the mercy of all comers, were content to pay tribute to each in turn and sometimes to more than one simultaneously, for which they indemnified themselves by peaceful intervals of trade whenever the land routes Were open and the upper and lower reaches of the Niger clear of pirates. But at times even the short tract separating the town from Kabara was so beset with marauders that it bore the ominous name of " Ur-immandess," that is, " He (God) hears not." Little wonder then that the townsfolk, wearied by the extortions and internecine strife of their Fula and Tuareg masters, freely opened their gates to the French as soon as Lieut. Boiteux reached Kabara in command of a small flotilla.

The occupation of the town, against orders, was a daring exploit of a handful of marines. The force which " garrisoned " Timbuktu consisted of but seven Europeans and twelve Sene- galese, a somewhat larger body being left with the gunboats at Kabara. On the 28th of December the Tuareg attacked the boat party, killing Naval Ensign Aube, another officer, and eighteen black sailors. Colonel T. P. E. Bonnier, who was at Mopti, 200 m. to the south-west, marched to the relief of Boiteux and entered Timbuktu without opposition on the 10th of January 1894. Leaving part of his force in the town the colonel set out with about 100 men to chastize the nomads. In the night of the 14th-! 5th January his camp was surprised and the colonel and nearly all his men perished. The enemy did not follow up their victory, and within a short period French rule was firmly established in Timbuktu.

Apart from some Christian captives, the place was reached during the 19th century, previous to its capture by the French, by four Europeans — Major Gordon Laing from Tripoli (1826), who was murdered by order of the Fula; Rene Caillí6 from the south (1828), Heinrich Barth from Central Sudan (1853) and Oskar Lenz from Morocco (1880). (In 1903 the French

authori- ties placed commemorative tablets on the houses occupied by

these four men during their stay in Timbuktu. The tablets bear simply the name of the explorer and the date of his visit .) In 1 89 5 Felix Dubois made a stay of some duration in the town, investi- gating its history and that of the surrounding country. In 1904 Timbuktu became part of the colony of Upper Senegal and Niger.

The British connexion with Timbuktu may be briefly stated. Barth went to West Africa as the officially credited representa- tive of the British government, empowered to enter into relations with the native princes. At Timbuktu he stayed under the protection of the sheikh Sidi Mahommed El Backay (Bakhai), and took back to England letters from the sheikh professing friendship with the British. In reply Lord Clarendon, secretary of state for foreign affairs, wrote a letter dated the 15th of April 1859, to El Backay, stating that ” the friendship binding us shall not diminish through the centuries ” and ” as our govern- ment is very powerful we will protect your people who turn to us.” A nephew of the sheikh went to Tripoli where he received presents for his uncle and other chieftains from the Biitish consul, who also wrote a letter to El Backay, saying, among other things, ” The English government has sent a steamer up the river which flows out of your country and has recommended those on board to make every effort to reach you.” The steamer did not ascend the Niger to Timbuktu, and no further efforts appear to have been made in England to maintain political relations with Timbuktu. Moreover the power of El Backay seems not to have been so great as was believed in England, or at least did not long continue after the departure of Barth.

Authorities. — The chief original authorities are the Tarih es- Sudan (trans. Houdas, Paris, 1901) ;

and Ahmad Baba's " Chronicle" (trans. Barth) in Zeitsch. der morgenldnd. Gesellsch. ix. 826. Among medieval writers, see especially Ibn Batuta and Leo Africanus. Of early European records Barth's Travels are the most important. The best popular account is F. Dubois, Timbuctoo the Mysterious (London, 1896). Consult also H. N. Frey, Senegal et Soudan (Paris, 1888); Lieut. Hourst, The Exploration of the Niger (London, " ; O. Lenz, Timbuktu (Leipzig, 1884); VV. D. Cooley, Negroland

of the Arabs (London, 1 841); A. Lebon, Rapport de la mission au Senegal et au Soudan (Paris, 1898); Commandant Toutee, Dahome, Niger, Touareg (Paris, 1897), Du Dahome au Sahara (Paris, 1899); Lady Lugard, A Tropical Dependency (London, 1905). (F. R. C.)

TIME (O. Eng. tima, cf. Icel. timi, Swed. limme, hour, Dan. time; from the root also seen in " tide," properly the time of be- tween the flow and ebb of the sea, cf. O. Eng. getidan, to happen, " even- tide," &c; it is not directly related to Lat. tempus), the general term for the experience of duration or succession, either in whole or in part. For time in its psychological sense see Space and Time; for time in music, see Rhythm; for the methods of reckoning time see Calendar; Day; Month; and the articles Time, Measurement of, and Time Standard, below. Gener- ally in English law, where any particular time is mentioned in acts of parliament or legal instruments, it is to be defined as meaning, in Great Britain, Greenwich mean time, and in Ireland, Dublin mean time. At common law, where parties enter into legal relations, and specify their intention of being bound by any particular arbitrary system, the courts will, as a rule, give effect to their intentions.

TIME, MEASUREMENT OF. Time is measured by successive phenomena recurring at regular intervals. The only astronom- ical phenomenon which rigorously fulfils this condition, and the most striking one — the apparent daily revolution of the celestial sphere caused by the rotation of the earth — has from the

remotest antiquity been employed as a measure of time. The interval between two successive returns of a fixed point on the sphere to the meridian is called the sidereal day; and sidereal time is reckoned from the moment when the " first point of Aries " (the vernal equinox) passes the meridian, the hours being counted from o to 24. Clocks and chronometers regulated to sidereal time are only used by astronomers, to whom they are indispensable, as the sidereal time at any moment is equal to the right ascension of any star just then passing the meridian. For ordinary purposes solar time is used. The solar day, as defined by the successive returns of the sun to the meridian, does not furnish a uniform measure of time, owing to the slightly variable velocity of the sun's motion

and the inclination of its orbit to the equator, so that it becomes necessary to introduce an imaginary mean sun moving in the equator with uniform velocity. The equation of time is the difference between apparent (or true) solar time and mean solar time. The latter is that shown by clocks and watches used for ordinary purposes. Mean time is converted into apparent time by applying the equation of time with its proper sign, as given in the Nautical Almanac and other ephemerides for every day at noon. As the equation varies from day to day, it is necessary to take this into account, if the apparent time is required for any moment different from noon. The ephemerides also give the sidereal time at mean noon, from which it is easy to find the sidereal time at any moment, as 24 hours of mean solar time are equal to 24 11 3 m 56-5554" of sidereal time. About the 2 1 st of March of each year a sidereal clock agrees with a mean time clock, but it gains on the latter 3 m 56- 5" everyday, so thiat in the course of a year it has gained a whole day. For a place not on the meridian of Greenwich the sidereal time at noon must be corrected by the addition or subtraction of 9-8565" for each hour of longitude, according as the place is west or east of Greenwich.

While it has for obvious reasons become customary in all civilized countries to commence the ordinary or

civil day at midnight, astronomers count the day from noon, being the transit of the mean sun across the meridian, in strict conformity with the rule as to the beginning of the sidereal day. The hours of the astronomical day are also counted from o to 24. An international conference which met in 1884 at Washington to consider the question of introducing a universal day (see below), recommended that the astronomical day should commence at midnight, to make it coincide with the civil day. The great majority of astronomers, however, expressed themselves very strongly against this proposal, and it has not been adopted.

Determination oj Time. — The problem of determining the exact time at any moment is practically identical with that of determining the apparent position of any known point on the celestial sphere with regard to one of the fixed (imaginary) great circles appertaining to the observer's station, the meridian or the horizon. The point selected is either the sun or one of the standard stars, the places of which are accurately determined and given for every tenth day in the modern ephemerides. The time thus determined furnishes the error of the clock, chrono- meter or watch employed, and a second determination of time after an interval gives a new value of the error and thereby the rate of the timekeeper.

The ancient astronomers, although they have left us very ample information about their dials, water or sand clocks (clepsydrae) , and similar timekeepers, are very reticent as to how these were controlled. Ptolemy, in his Almagest, states nothing whatever as to how the time was found when the numer- ous astronomical phenomena which he records took place; but Hipparchus, in the only book we possess from his hand, gives a list of 44 stars scattered over the sky at intervals of right ascension equal to exactly one hour, so that one or more of them would be on the meridian at the commencement of every sidereal hour. H. C. F. C. Schjellerup 1 has shown that the right ascensions assumed by Hipparchus agree within about 15' or one minute of time with those

calculated back to the year 140 B.C. from modern star-places and proper motions. The accuracy which, it thus appears, could be attained by the ancients in their determinations of time was far beyond what they seem to have considered necessary, as they only record astronomical phenomena (e.g. eclipses, occultations) as having occurred " towards the middle of the third hour," or " about 8£ hours of the night," without ever giving minutes. 2 The Arabians had a

1 " Recherches sur l'astronomie des Anciens: I. Sur le chrono- metre celeste d'Hipparque," in Copernicus: An International Journal of Astronomy, i. 25.

2 For astronomical purposes the ancients made use of mean- time hours — wpoi iarinepival, horae equinoctiales- — into which they translated all indications expressed in civil hours of varying length — Upai naipi.Ko.1, horae temporales. Ptolemy counts the mean day from noon.

clearer perception of the importance of knowing the accurate time of phenomena, and in the year 829 we find it stated that at the commencement of the solar eclipse on the 30th of November the altitude of the sun was 7° and at the end 24°, as observed at Bagdad by Ahmed ibn Abdallah, called Habash. 1 This seems to be the earliest determination of time by an altitude ; and this method then came into general use among the Arabians, who, on observing lunar eclipses, never failed to measure the altitude of some bright star at the beginning and end of the eclipse. In Europe this method was adopted by Purbach and Regiomontanus apparently for the first time in 1457 Bernhard Walther, a pupil of the latter, seems to have been the first to use for scientific purposes clocks driven by weights: he states that on the 16th of January 1484 he observed the rising of the planet Mercury, and immediately

attached the weight to a clock having an hour- wheel with fifty-six teeth; at sunrise one hour and thirty-five teeth had passed, so that the interval was an hour and thirty- seven minutes. For nearly two hundred years, until the applica- tion of the pendulum to clocks became general, astronomers could place little or no reliance on their clocks, and conse- quently it was always necessary to fix the moment of an observa- tion by a simultaneous time determination. For this purpose Tycho Brahe employed altitudes observed with quadrants; but he remarks that if the star is taken too near the meridian the altitude varies too slowly, and if too near the horizon the refrac- tion (which at that time was very imperfectly known) introduces an element of uncertainty. He sometimes used azimuths, or with the large " armillary spheres " which played so important a part among his instruments, he measured hour-angles or distances from the meridian along the equator. 2 Transits of stars across the meridian were also observed with the meridian quadrant, an instrument which is alluded to by Ptolemy and was certainly in use at the Maragha (Persia) observatory in the 13th century, but of which Tycho was the first to make extensive use. But he chiefly employed it for determining star-places, having obtained the clock error by the methods already described.

In addition to these methods, that of " equal altitudes " was much in use during the 17th century. That equal distances east and west of the meridian correspond to equal altitudes had of course been known as long as sundials had been used; but, now that quadrants, cross-staves and parallactic rules were commonly employed for measuring altitudes more accurately, the idea naturally suggested itself to determine the time of a star's or the sun's meridian passage by noting the moments when it reached any particular altitude on both sides 6f the meridian. But Tycho's plan of an instrument fixed in the meridian was not forgotten, and from the end of the 17th century, when Romer invented the transit instrument, the observation of transits across the meridian became the principal means of determining

time at fixed observatories, while the observation of altitudes, first by portable quadrants, afterwards by reflecting sextants, and during the 10th century by portable alt-azimuths or theodolites, has been used on journeys. Since about 1830 the small transit, instrument, with what is known as a " broken telescope," has also been much employed on scientific expedi- tions; but great caution is necessary in using it, as the difficulties of getting a perfectly rigid mounting for the prism or mirror which reflects the rays from the object glass through the axis to the eyepiece appear to be very great, f6r strange discrepan- ces in the results have often been noticed. The gradual develop- ment of astronomical instruments has been accompanied by a corresponding development in timekeepers. From being very untrustworthy, astronomical clocks are now made to great perfection by the application of the pendulum and by its com- pensation, while the invention of chronometers has placed a portable and equally trustworthy timekeeper in the hands of travellers.

We shall now give a sketch of the principal methods of determining time.

1 Caussin, Le Livre de la grande table Hakemite, p. 100 (Paris,

1804).

' See his Epistolae astronomicae, p. 73.

In the spherical triangle ZPS between the zenith, the pole and a star the side Zi> = 90°— (being the latitude), P5=90° — « (5 being the declination), and ZS or z = 90° minus the observed altitude. The angle ZPS = t is the star's hour-angle or, in time, the interval between the moment of observation and the meridian passage of the star. We have then

cos z — sin 4> sin 5

cos t = ■ 7 ; 1

cos 4> cos i>

which formula can be made more convenient for the use of logarithms by putting 3 4-0+5 = 25, which gives

tan 4 U=-

(S-

cos 6' cos (S — z)

According as the star was observed west or east of the meridian, t will be positive or negative. If a be the right ascension of the star, the sidereal time = (+<*, a as well as S being taken from an ephemeris. If the sun had been observed the hour-angle t would be the apparent solar time. The latitude observed must be cor- rected for refraction, and in the case of the sun also for parallax, while the sun's semi-diameter must be added or subtracted accord- ing as the lower or upper limb was observed. The declination of the sun being variable, and being given in the ephemerides for noon of each day, allowance must be made for this by interpolating with an approximate value of the time. As the altitude changes very slowly near the meridian, this method is most advantageous if the star be taken near the prime vertical, while it is also easy to see that the greater the latitude the more uncertain the result. If a number of altitudes of the same object are observed, it is not necessary to deduce the clock error separately from each observa- tion, but a correction may be applied to the mean of the zenith distances. Supposing n observations to be taken at the moments T,, Ti, Tz, . . . , the mean of all being To, and calling the z corresponding to this Z, we have

dZ rn , _. , rcPZ, n

Z + ^ T '

To)+^(Ti-T 9 y

= Z+f(T 2 -T)+ 1 -^(T 2 -

r„) 2

and so on, t being the hour-angle answering to To. As 2(7″— To) ‘ these equations give

zi +Z2 + z 3 + . . . _ 1 cPZ (7\ - T,Y + (T 2 -T y +... n 2 ifi n

0,

Z = ■

Si +*i + Z3

d*Z X2 sinH (T - dP

T*)

n at’ n .

But, if in the above-mentioned triangle we designate the angles at Z and S by 180 — A and p, we have sin z sin A = cos S sin t ;

sin z cos A = —cos 4> sin 8 f sin cos 5 cos t; and by differentiation

d?Z _ cos cos 8 cos A cos p IF ~ sin Z

in which A and p are determined by

• a s in t , . sin t

sin A = ■ y cos S and sin p = ■ 7 cos . sin Zj 0111 £j

With this corrected mean of the observed zenith distances the hour- angle and time are determined, and by comparison with 7 the error of the timekeeper.

The method of equal altitudes gives very simply the clock error equal to the right ascension minus half the sum of the clock times corresponding to the observed equal altitudes on both sides of the meridian. When the sun is observed, a correction has to be applied for the change of declination in the interval between the observations. Calling this interval 2t, the correction to the apparent noon given by the observations x, the change of declination in half the interval AS, and the observed altitude h, we have

sin h=sin sin (5 — A5)+cos $ cos (S — A5) cos (t+x) and sin h = sin **cos (5+A5) cos (t—x), whence, as cos x may be put = 1, sin x = x, and tan A5=A5, /tan tan**

S \ x = - Um7 ~ torTTV A8, which, divided by 15, gives the required correction in seconds of time. Similarly an afternoon observation may be combined with an observation made the following morning to find the time of apparent midnight.

The observation of the time when a star has a certain azimuth may also be used for determining the clock error, as the hour-angle can be found from the declination, the latitude and the azimuth. As the azimuth changes most rapidly at the meridian, the observa- tion is most advantageous there, besides which it is neither necessary to know the latitude nor the declination accurately. The observed time of transit over the meridian must be corrected for the deviations of the instrument in azimuth, level and collimation. This corrected time of transit, expressed in sidereal time, should then be equal to the right ascension of the object observed, and the difference is the clock error. In observatories the determination of a clocks error (a necessary operation during a night's work with a transit

circle) is generally founded on observations of four or five " clock stars," these being standard stars not near the pole, of which the absolute right ascensions have been determined with great care, besides observation of a close circumpolar star for finding the error of azimuth and determination of level and collimation error. 1

Observers in the field with portable instruments often find it inconvenient to wait for the meridian transits of one of the few close circumpolar stars given in the ephemerides. In that case they have recourse to what is known as the method of time deter- mination in the vertical of a pole star. The alt-azimuth is first directed to one of the standard stars near the pole, such as a or 5 Ursae Minoris, using whichever is nearest to the meridian at the time. The instrument is set so that the star in a

few minutes will cross the middle vertical wire in the field. The spirit-level is in the meantime put on the axis and the inclination of the latter measured. The time of the transit of the star is then observed, after which the instrument, remaining clamped in azimuth, is turned to a cock star and the transit of this over all the wires is observed. The level is applied again, and the mean of the two results is used in the reductions. In case the collimation error of the instrument is not accurately known, the instrument should be reversed and another observation of the same kind taken. The observations made in each position of the instrument are separately reduced with an assumed approximate value of the error of collimation, and two equations are thus derived from which the clock error and correction 10 the assumed collimation error are found. This use of the transit or alt-azimuth out of the meridian throws considerably more work on the computer than the meridian observations do, and it is there- fore never resorted to except when an observer during field operations is pressed for time. The formulae of reduction as developed by Hansen in the Astronomische Nachrichten (xlviii. 113 seq.) are given by Chauvenet in his Spherical and Practical Astronomy ii. 216 seq. (4th ed., Philadelphia, 1873) The subject has also been treated at great length by Dollen in two memoirs : Die Zeitbestimmung rermittelst des tragbaren Durchgangsinstrument im Verticale des Polarsterns (4to, St Petersburg, 1863 and 1874).

Longitude. — Hitherto we have only spoken of the deter- mination of local time. But in order to compare observations made at different places on the surface of the earth a knowledge of their difference of longitude becomes necessary, as the local time varies proportionally with the longitude, one hour corre- sponding to 1 5 . Longitude can be determined either geodetic- ally or astronomically. The first method supposes the earth to be a spheroid of known dimensions. Starting from a point of departure of which the latitude has been determined, the azimuth from the meridian (as determined astronomically) and

the distance of some other station are measured. This second station then serves as a point of departure to a third, and by repeating this process the longitude and latitude of places at a considerable distance from the original starting-point may be found. Referring for this method to the articles Earth, Figure of the, and Geodesy, we shall here only deal with astronomical methods of determining longitude.

The earliest astronomer who determined longitude by astronomical observations seems to have been Hipparchus, who chose for the first meridian that of Rhodes, where he ob- served; but Ptolemy adopted a meridian laid through the " In- sulae Fortunatae " as being the farthest known place towards the west. 2 When the voyages of discovery began the peak of Teneriffe was frequently used as a first meridian, until a scientific congress, assembled by Richelieu at Paris in 1630, selected the island of Ferro for this purpose. Although various other meridians {e.g. that of Uraniburg and that of San Miguel, one of the Azores, 29° 25' W. of Paris) continued to be used for a long time, that of Ferro, which received the authorization of Louis XIII. on the 25th of April 1634, gradually superseded the others. In 1724 the longitude of Paris from the west coast of Ferro was found by Louis Feuillee, who had been sent there by the Paris Academy, to be 20° 1' 45"; but on the proposal of Guillaume de Lisle (1675-1726) the meridian of Ferro was assumed to be exactly 20 W. of the Paris observatory. Modern maps and charts generally give the longitude from the observatory of either Paris or Greenwich according to the nationality of the con- structor; the Washington meridian conference of 1884 recom- mended the exclusive use of the meridian of Greenwich. On the same occasion it was also recommended to introduce the use

1 The probable error of a clock correction found in this way from one star is about *o-04", if a modern transit circle and chronograph is used

2 This was first done early in the 2nd century by

of a " universal day," beginning for the whole earth at Greenwich midnight, without interfering with the use of local time. This proposal has, however, not been adopted, but instead of it the 1 system of " Standard Time " (see below) has been accepted in most countries. Already in 1883 four standard meridians were adopted in the United States, 75°, 90 , 105", 120 west of Green- wich, so that clocks showing " Eastern, Central, Mountain or Pacific time " are exactly five, six, seven or eight hours slower than a Greenwich mean time clock. In Europe Norway, Sweden, Germany, Austro-Hungary, Switzerland and Italy use mid-European time, one hour fast on Greenwich. In South Africa the legal time is two hours fast on Greenwich, &c. 3

The simplest method for determining difference of longitude consists in observing at the two stations some celestial pheno- menon which occurs at the same absolute moment for the whole earth. Hipparchus pointed out how observations of lunar eclipses could be used in this way, and for about fifteen hundred years this was the only method available. When Regiomontanus began to publish his ephemerides towards the end of the 15th century, they furnished other means of determining the longitude. Thus Amerigo Vespucci observed on the 23rd of August, 1499, somewhere on the coast of Venezuela, that the moon at 7 h 3» m p.m. was i°, at midnight s|° east of Mars; from this he concluded that they must have been in conjunction at 6 h 30 m , whereas the ephemeris announced this to take place at midnight. This gave the longitude of his station as roughly equal to 5^ hours west of Cadiz. The instruments and the lunar tables at that time being very imperfect, the longitudes determined were very erroneous. The invention of the telescope early in the 17th century made it possible to observe eclipses of Jupiter's satellites; but there is to a great extent the same drawback attached to these as to lunar eclipses: that it is impossible to observe with sufficient accuracy the moments at which they occur.

Eclipses of the sun and occultations of stars by the moon were also much used for determining longitude before the invention of chronometers and the electric telegraph offered better means for fixing the longitude of observatories. These methods are now hardly ever employed except by travellers, as they are very inferior as regards accuracy. For the necessary fdrmulae see Chauvenet's Spherical and Practical Astronomy, i. 518–542 and

5SO–5S7–

We now proceed to consider the four methods for finding the longitudes of fixed observatories, viz. by (1) moon culminations, (2) rockets or other signals, (3) transport of chronometers and (4) transmission of time by the electric telegraph.

I. Meon Culminations. — Owing to the rapid orbital motion of the moon the sidereal time of its culmination is different for different meridians. If, therefore, the rate of the moon's change of right ascension is known, it is easy from the observed time of culmination at two stations to deduce their difference of longitude. In order to be as much as possible independent of instrumental errors, some standard stars nearly on the parallel of the moon are observed at the two stations; these " moon-culminating stars " are given in the ephemerides in order to secure that both observers take the same stars. As either the preceding or the following limb, not the centre, of the moon is observed, allowance must be made for the time the semi-diameter takes to pass the meridian and for the change of right ascension during this time. This method was proposed by Pigptt towards the end of the 1 8th century, and has been much used; but, though it may be very serviceable on journeys and expeditions to distant places where the chronometric and telegraphic methods cannot be employed, it is not accurate enough for fixed observatories. Errors of four to six seconds of time have frequently been noticed in longitudes obtained by this method from a limited number of observations: e.g. 4–47" in the case of the Madras observatory. 4

3 For a complete list of the standard times adopted in all countries see Publications of the U.S. Naval Observatory, vol. iv. app. iv. (Washington, 1906).

4 For field stations the photographic method first proposed and carried out by Captain Hills, R.E., in 1895, may be found advan- tageous. A camera of rigid form is set up and some instantaneous moon-exposures are made, after which the camera is left untouched until a few exposures can be made of a couple of bright stars, which are allowed to impress their trails on the plate for 15 or 30 seconds. If the exact local time of each exposure be known, such a plate gives the data necessary for computing the moon's position at the time of each exposure, and hence the Greenwich time and longitude (Memoirs Roy. A'sir. Soc, 1899, liii. 117).

2. Signals.-^-ln 1671 Picard determined the difference of longitude between Copenhagen and the site of Tycho Brahe's observatory by watching from the latter the covering and uncovering of a fire lighted on the top of the observatory tower at Copenhagen. Powder or rocket signals have been in Use since the middle of the 1 8th century; they are nowadays never used for this purpose, although several of the principal observatories of Europe were connected in this manner early in the 19th century. 1

3. Transport of Chronometers. — This means of determining longi- tude was first tried in cases where the chronometers could be brought the whole way by sea, but the improved means of communication on land led to its adoption in 1828 between the observatories at Greenwich and Cambridge, and in the following years between many other observatories. A few of the more extensive expeditions undertaken for this object deserve to be mentioned. In 1843 more than sixty chronometers were sent sixteen times 'backwards and forwards between Altona and Pulkowa,

and in 1844 forty chrono- meters were sent the same number of times between Altona and Greenwich. In 1844 the longitude of Valentia on the south-west coast of Ireland was determined by transporting thirty pocket chronometers via Liverpool and Kingstown and having an inter- mediate station at the latter place. The longitude of the United States naval observatory has been frequently determined from Greenwich. The following results will give an idea of the accuracy of the method."

Previous to 1849, 373 chronometers . . 5 h 8™ 12-52"

Expedition of 1849, Bond's discussion . . 11-20"

„ „ Walker's „ ... 12-06"

„ ,, Bond's second result . 12-26" =>=o-20 a

„ 1855, 52 chronometers, 6 trips,

Bond 13-49" ±o- 19"

The value now accepted from the telegraphic determination is gh gm 12-09*. The probable errors of the results for Pulkowa- Altona and Altona-Greenwich were supposed to be =■= 0-039" an d ±0-042". It is of course only natural that the uncertainty of the results for the transatlantic longitude should be much greater, considering the length of time which elapsed between the rating of the chronometers at the observatories of Boston, Cambridge Massachusetts) and Liverpool. The difficulty of the method consists in determining the " travelling rate." Each time a chrono- meter leaves the station A and returns to it the error is determined, and consequently the rate for the time occupied by the journeys from A to B and from B to A and by the sojourn at B. Similarly a rate is found by each departure from and return to B, and the time of rest at A and B is also utilized for determining the stationary rate. In this way a series of rates for overlapping intervals of time are found, from which the travelling rates may be interpolated. It is owing to the uncertainty which necessarily

attaches to the rate of a chronometer during long journeys, especially by land, where they are exposed to shaking and more or less violent motion, that it is desirable to employ a great number. It is scarcely necessary to mention that the temperature correction for each chronometer must be carefully investigated, and the local time rigorously determined at each station during the entire period of the operations.

4. Telegraphic Determination of Longitude. — This was first sug- gested by the American astronomer S. C. Walker, and owed its development to the United States Coast Survey, where it was em- ployed from about 1849. Nearly all the more important public observatories have now been connected in this way on the continent of Europe, chiefly at the instigation of the " Europaische Grad- messung," while the determinations in connexion with the transits of Venus and those carried out in recent years by the American, French, British and Colonial governments have completed the circuit of the greater part of the globe. The telegraphic method compares the local time at one station with that at the other by means of electric signals. If a signal is sent from the eastern station A at the local time T, and received at the western station B at the local time T\, then, if the time taken by the current to pass through the wire is called z, the difference of longitude is

\ = T—T+x, and similarly, if a signal is sent from B at the time T% and received at A at Tz, we have \ = T% — T 2 — x,

from which the unknown quantity x can be eliminated.

The operations of a telegraphic longitude determination can be arranged in two ways. Either the local time is determined at both stations and the clocks are compared by telegraph, or the time determinations are marked simultaneously on the two chrono- graphs at the two stations, so that further signals for clock compari- son are unnecessary. The first method has to be used when the telegraph is only for a limited time each night at the disposal

of the observers, or when the climatic conditions at the two stations are so different that clear weather cannot often be expected to occur at both simultaneously, also when the difference of longitude is so considerable that too much time would be lost at the eastern station waiting for the arrival of the transit record of one star from the

1 For instance, Greenwich and Paris in 1825 (Phil. Trans., 1826). The result, Q m 21-6″, is only about o-6″ too great.

2 Gould, Transatlantic Longitude, p. 5 (Washington, 1869).

western station before observing another star. The independent time determination also offers the advantage that the observations may be taken either by eye and ear or by the chronograph, but as the observations made with the chronograph are somewhat more accurate than those made by eye and ear, the chronograph should be used wherever possible. This method is the one generally adopted. The method of simultaneous registration at both stations of transits of the same stars has one advantage. Each transit observed at both stations furnishes a value of the difference of longi- tude, so that the final result is less dependent on the clock rate than in the first method, which necessitates the combination of a series of clock errors determined during the night to form a value of the clock error for the time when the exchange of signals took place. When using this method it is advisable to select the stars in such a manner that only one station at a time is at work, so that the in- tensity of the current can be readjusted (by means of a rheostat) between every despatch and receipt of signals. This attention to the intensity of the current is necessary whatever method is employed, as the constancy of the transmission time (x in the above equations) chiefly depends on the constancy of the current. The probable error of a difference of longitude deduced from one star appears to be * for eye and ear transits ±0-08″, for chronograph transits ±0-07″; while the probable error of the

final result of a carefully planned and well executed series of telegraphic longitude operations is generally between ± o″-o 10 and= fc o-o20″.

Wireless telegraphy was for the first time employed in 1906 in a determination of the difference of longitude between Potsdam and Brocken, the signals being sent from Nauen, 32 km. from the former and 1 83 km. from the latter station. The resulting clock-differences were found to be quite independent of the energy of the electric waves. Wireless telegraphy will no doubt in future be much used in places where it may be desirable to determine the longitudes of a number of stations at the same time.

It is evident that the success of a determination of longitude depends to a very great extent on the accurate determination of time at the two stations, and great care must therefore be taken to determine the instrumental errors repeatedly during a night's work. But in addition to the uncertainty which enters into the results from the ordinary errors of observation, there is another source of error which becomes of special importance in longitude Work, viz, the so-called personal error. The discovery of the fact that all observers differ more or less in their estimation of the time when a star crosses one of the spider lines in the transit instrument was made by F. W. Bessel in 1820 ; 4 and, as he happened to differ fully a second of time from several other observers, this remarkably large error naturally caused the phenomenon to be carefully examined^ Bessel also suggested what appears to be the right explanation, viz, the co-operation of two senses in observing transits by eye and ear, the ear having to count the beats of the clock while the eye compares the distance of the star from the spider line at the last beat before the transit with the distance at the first beat after it, thus estimating the fraction of second at which the transit took place. It can easily be conceived that one person may first hear and then see, while to another these sensations take place in the reverse order ; and to this possible source of error may be added the sensible time required by the transmission of sensations

through the nerves to the brain and for the latter to act upon them. As the chronographic method of observing dispenses with one sense (that of hearing) and merely requires the watching of the star's motion and the pressing of an electric key at the moment when the star is bisected by the thread, the personal errors should in this case be much smaller than when the eye and ear method is employed. And it is a fact that in the former method there have never occurred errors of between half and a whole second such as have not infrequently appeared in the latter method.

In transit observations generally this personal error does not cause any inconvenience, so long as only one observer is employed at a time, and unless the amount of the error varies with the magni- tude of the star (which is often the case) ; but when absolute time has to be determined/as in longitude work, the full amount of the per- sonal equation between the two observers must be carefully ascer- tained and taken into account. And an observer's error has often been found to vary very considerably not only from year to year but even within much shorter intervals; the use of a new instrument, though perhaps not differing in construction from the accustomed one, has also been known to affect the personal error. For a numbef of years this latter circumstance was coupled with another which seemed perfectly incomprehensible, the personal errorjappearing to vary with the reversal of the instrument, that is, with the position of the illuminating lamp east or west. But in 1869-1870 Hirseh noticed during the longitude operations in Switzerland that this was

8 Albrecht, Bestimmung von Ldngendifferenzen mit Hilfe des electrischen Telegraphen, p. 80 (4to Leipzig, 1869).

4 Maskelyne had in 1795 noticed that one of his assistants observed transits more than half a second later than himself, but this was supposed to arise from some wrong method of observing adopted by the assistant, and the matter was not further looked

into.

caused by a shifting of the reflector inside the telescope, by means of which the field is illuminated, which produced an apparent shifting of the image of the spider lines, unless the eyepiece was very accurately focused for the observer's sight. The simplest and best way to find the equation between two observers is to let one observe the. transits of stars over half the wires in the telescope, and the other observe the transits over the remainder, each taking care to refocus the eyepiece for himself in order to avoid the above-mentioned source of error. The single transits reduced to the middle wire give immediately the equation; and, in order to eliminate errors in the assumed wire-intervals, each observer uses alternately the first and the second half of the wires. In longitude work, the two observers generally after the completion of a certain number of nights' work exchange stations and commence a new set of observa- tions; the mean of the two results thus obtained should be free from the effect of personal error, provided that the errors of both observers have remained constant the whole time. It is therefore advisable to let the observers compare themselves, at the beginning, middle and end of the operations, and, if possible, at both the instruments employed. A useful check on the results is afforded by simultaneous experiments with one of the instruments contrived by C. Wolf, Kaiser and others, by which the absolute personal error of an observer can be determined. Though differing much in detail, these instruments are all constructed on the same principle: an artificial star (a lamp shining through a minute hole in a screen mounted on a small carriage moved by clockwork) passes in succes- sion across a number of lines drawn on oiled paper, while an electric contact is made at the precise moment when the star is bisected on each line by the carriage passing a number of adjustable contact

makers. The currents thus made register the transits automatically on a chronograph, while the observer, viewing the apparatus through his telescope, can observe the transits in the usual manner either by eye and ear or by chronograph, thus immediately finding his personal error. These contrivances have sometimes been used to educate pupils learning to observe, and experience has shown that a consider- able personal error can be generally somewhat diminished through practice. By using Repsold's self-registering micrometer, which enables the observer to follow the motions of the star with a movable vertical wire which automatically registers its passage over certain fixed points in the eyepiece, the effect of personal error is almost completely eliminated. In the determination of the difference of longitude between Potsdam and Greenwich in 1903 the two observers with their instruments exchanged stations in the middle of the opera- tions, and the sum of their personal and instrumental equation was o-ooo" with a probable error of =*=0-003 s .

Literature. — General treatises on spherical astronomy, such as Briinnow's Lehrbuch der sphdrischen Astronomie (3rd ed., Berlin, 1 87 1 ; trans, into English and several other languages) and Chauve- net's Manual, treat very fully of the numerous methods of deter- mining time by combination of altitudes or azimuths of several stars. For telegraphic longitude work see the Publicationen des kon. preussischen eeoddtischen Instituts; the Reports of the United States Coast and Geodetic Survey; vol. ix. of the Account of the Great Trigonometrical Survey of India; and Report of the Chief Astronomer, 190$ (Ottawa, 1906), which gives a useful review of recent longitude work in the Pacific and adjacent countries. On personal errors see Dreyer, Proc. Roy. Irish Acad. (1876), 2nd series, vol. ii. p. 484, and " Recherches sur 1'equation personelle par M. F. Gonnesiat " in

—•■•• (J. L. E. D.)

and ' .. ._ .

the Trav. de I'observ. de Lyon (1892), vol. ii.

TIME, STANDARD. Local time is determined by the relation of the meridian of a place to the sun. Noon at any place is defined as the moment when either the true or mean sun passes the meridian of that place, according as apparent or mean time is used. Practically, the use of mean time is now universal, so that we may regard the mean sun as that by which noon is determined. As the earth revolves, all its meridians are brought under the sun in succession or, relative to the earth, noon con- tinually travels around the earth, making the circuit in twenty- four hours. It follows that noon, and therefore any other hour of the day, is later by four minutes for every degree of longitude towards the west, so that a watch carried east or west will be found to deviate from local time by an amount proportional to the change of longitude. Before the time of railways this devia- tion was not productive of inconvenience. But when railway travelling became common, train schedules had to be more exact than those of a mail eoach, and the traveller was rapidly carried to places where the local time continually deviated from that shown by his watch. The use of such time thus had to be modified in places where intercommunication with others of a different longitude was frequent. Thus arose a practice on the part of railways of using the time of some central or important city on its line for all places not too distant, which time would naturally be adopted by the inhabitants of the region through which it

passed. For a similar reason, in countries which did not extend through a large fraction of an hour of longitude, it was natural to use the time of the capital throughout all or a large part of its extent. Thus Greenwich time has long been in use throughout England, and all the railways of France are run by Paris time. But inconvenience was still unavoidable in passing from one country to another, or in travelling through long stretches in the same country. The inconvenience was especially felt in the United States, where every railway, and even every long stretch of several great railways, had

its own time system. Thus it happened not infrequently that in a single station clocks would be found set to the time of three different meridians, one for the road toward the east, another for the road toward the west, and a third for the meridian of the place, or local use.

A device now being generally adopted to ; do away with this confusion was planned in 1878–1879; by Mr (afterwards Sir) Sandford Fleming, and published in the Journal of the Canadian Institute of Toronto for 1879. On the initiative of this organiza- tion, Mr Fleming's proposals were officially communicated to the leading governments of the world with a view of securing an international unification of the method of designating the hour of the day for common use. Naturally connected with the proposal was that of a prime meridian, from which all longitudes should be reckoned. United States invited an international con- ference, which was held in Washington in 1884, for the purpose of proposing a standard meridian to which longitudes and times should be referred.

Before this conference was called the railway managers of the United States, after long discussion, adopted the system. Its fun- damental idea was that twenty-four standard meridians should be established 1 5 apart in longitude, starting from the meridian of Greenwich and extending round the globe. Then on each meridian the local time would differ from Greenwich time by some entire number of hours. At every point of the globe the time to be adopted for common use was that of the nearest standard meridian. These meridians would therefore mark the central lines of twenty-four zones, within each of which the time to be adopted would be uniform, but which would change by an hour on passing from one zone into another. The inhabitants of each zone naturally use the time of the zone instead of their local time, the maximum difference between the two being half an hour.

When the system was first established in the United States a delicate legal question arose as to whether the business of banks and courts should be legally

adjusted to the new time. . This was soon settled by state laws making the standard time legal within the limits of each zone. A similar system is being adopted in Europe, the standard meridians being those of 15°, 30 , &c, east of Greenwich. France, however, still adheres to Paris time;* but Belgium arid Holland use Greenwich time, and Switzerland, Italy and central Germany use the time of 15 E., and therefore one hour in advance of that of Greenwich. This is termed mid-European time.

The system we have described is that adopted for the purposes of the railways and of daily life. For scientific and for some international purposes yet other modifications are desirable. An important distinction must be made between the cases in which convenience requires that the time have some relation to the hour of the day, and those where no such relation is required. The former is the case in designating acts or occurrences which depend upon our daily routine of rest and wakefulness. But if nothing is necessary except the designation of some moment of absolute time, irrespective of our daily routine of life, then only a single measure for the whole world is necessary. At the Washington Meridian Conference of 1884 it was proposed that Greenwich time should be adopted as a standard for the whole world in all matters of this class, especially in astronomical practice and in cable despatches. But this system does not seem to have been extensively adopted outside of astronomy, the

1 A bill adopting Greenwich time in France, which had already passed the Chamber of Deputies, was favourably reported on in the Senate in December. 1910.

cultivators of which are most accustomed to the conversion of local into standard or Greenwich time. An unavoidable inconvenience associated with the system is the uncertainty in many cases whether

local or Greenwich mean time is under- stood. This must be especially the case with magnetic and seismic phenomena, the designation of which should be uniform for the whole earth; at present, however, we cannot invariably expect local observers to convert their observations from local into Greenwich mean time.

Associated with this question is that of the moment when the day should begin, or from which the hours should be counted. The civil division of the day into a.m. (ante meridiem, before mid-day) and p.m. (post meridiem, after mid-day), now practi- cally universal in household and ordinary civil life, is impracti- cable for scientific purposes, where a count of the hours from o up to 24 is necessary. In railway schedules the necessity of distinguishing a.m. from p.m. when our civil time is used is found so troublesome that in some countries, especially Italy and Canada, the 24-hour system is used. Hours after noon are there designated as 13, 14, &c, up to midnight, at which moment a new day begins. On the other hand, with some few exceptions, astronomers have almost from time immemorial begun their day at noon, and navigators have very generally adopted the same practice, but for a quite different reason. In astronomy the day begins at noon for two reasons of convenience. One is that as the day is fixed by the transit of the sun over the meridian, it is more natural to start the count of the hours from this moment than from that when the sun is on the invisible antimeridian at midnight. This practice also coincides with that of counting the hours of sidereal time from the transit of the vernal equinox, and leads to the simple rule that the local mean time is equal to the hour angle of the mean sun. The other reason is that, as the astronomer makes most of his observations at night, and often after midnight, it is inconvenient to begin a new day at the latter hour. This consideration is however reversed in day observations, especially those on the sun, but these are few in number.

Navigators began the day at noon because their latitude is determined by observations of the sun,

while the longitude is also generally determined during the daytime. Thus, in doing the " day's work " in the log, the position of the ship was always computed for noon. Such being the case, it was found more convenient to begin the count of a new day at this hour, to be continued through the night until the following noon. But the navigator's count of days was one day in advance of that of the astronomers; for example, March the 10th, astronomical time, begins on the 10th day of March at noon, and this count continues until noon of the day following, so that the forenoon of March the nth, civil time, is still March the 10th, astronomical time. But' the navigator begins March the nth at noon on March the 10th. This difference is worthy of mention because a widespread misapprehension exists that the navigator was forced to count his days from noon owing to the adoption of the same system in the Nautical Almanac. The fact is that the practice of the navigator, like that of the astronomer, was adopted purely for his own convenience, and for the reasons just set forth. It is, however, being changed so as to conform to civil time, but as yet no general law prescribes the change.

At the Meridian Conference of 1884, it was proposed that the practice of beginning the day at midnight should be adopted universally in astronomy and navigation, and that the hours should be counted from that moment in all the nautical and astronomical ephemerides. The question of adopting this system became a subject of international correspondence. The views of the directors of the astronomical ephemerides, so far as elicited, were strongly against the change. The considerations which determined them were the confusion which the change would introduce into the tables and the count of time in the ephemerides, including the relation of sidereal and solar time; the unavoidable doubt as to whether the one or the other system was used in astronomical publications; and the danger of placing in the hands of the navigator an ephemeris in which

the hours should have a different meaning from that

to which he was accustomed. On the other hand, the reasons of con- venience which led to the practice of beginning the day at noon still continued, so that nothing could be shown to counterbalance these drawbacks Still, in works to be used by the public, especially almanacs ani other astronomical annuals, it is neces- sary to convert astronomical into civil time. This must con- tinue to be done, but offers no difficulty to the authors of such works, who are acquainted with the difference, nor to the public, which has no interest in the ephemerides and measures of time used by the professional astronomer. (S. N.)

TIME BARGAINS, a financial or commercial term for opera- tions in securities or commodities which are to be completed at a future date, as opposed to bargains which are settled immediately. (See Market.)

TIMGAD, a ruined city 23 m. S.E. of Batna in the department of Constantine, Algeria. Timgad, the Thamugas of the Romans, was built on the lower slopes of the northern side of the Aures Mountains, and was situated at the intersection of six roads. It was traversed by two main streets, the Cardo Maximus running north and south, and the Decumanus Maximus east and west. The residential part of the town was on a lower level than the capitol and most of the other public buildings. The ruins of the capitol occupy a prominent position in the south-west of the city. Some of the columns of the facade (which are of the Corinthian order and 45 ft. high) have been re-erected. The dimensions of the capitol correspond with those of the Pantheon at Rome. Immediately north of the capitol are the remains of a large market; to the east are the ruins of the forum, basilica and theatre. The auditorium of the theatre, which held nearly 4000 persons, is complete. A little west of the theatre are baths, containing paved and mosaic floors in perfect preservation. Ruins of other and larger thermae are found in all four quarters of the city, those on the north being very extensive. Across the Decumanus Maximus just north-east of the market is the arch of

Trajan — still erect, and restored in 1900. The arch is of the Corinthian order, and has three openings, the central one being 11 ft. wide. Each fagade has four fluted columns 19 ft. high. The chief material used in building the arch was sandstone. The fluted columns are of fine white limestone and smaller columns are of coloured marble. At the other (eastern) end of the street are the remains of another triumphal arch. West of the capitol are the ruins of a large church, a square building with circular apse, built in the 7th century. There are also remains of six other churches. About 400 yds. south of the city, the walls nearly entire, is a ruined citadel, a quadrangular building 360 ft. by 295 ft., with eight towers. It was built (or rebuilt) by the Byzantine army in the 6th century. Near the northern thermae is the house of the director of the excavations and a museum containing small objects found in the ruins.

Numerous inscriptions have been found on the ruins, and from them many events in the history of Thamugas have been learnt. In the year a.d. 100 the emperor Trajan gave orders to build a city on the site of a fortified post on the road between Theveste and Lambaesis. This city, called Colonia Marciana Trajana Thamugas (Marciana in honour of Trajan's sister) appears from the inscriptions to have been completed, as far as the principal buildings were concerned, in seventeen years. A legion of Parthian veterans was stationed in the newly founded city. From the time of its foundation to the 4th century Thamugas seems to have enjoyed a peaceful and prosperous existence. Numerous inscriptions testify to the manner of life of the citizens. In the 3rd century Thamugas became a centre of Christian activity, and in the next century espoused the cause of the Donatists. The city declined in importance after the Vandal invasion in the 5th century, and was found in a ruinous condition by the Byzantine general Solomon, who occupied it a.d. 535. It is believed that the Berbers from the neighbouring mountains destroyed the city, hoping thus to prevent it being used as a stronghold from which to harry

them. Thamugas was, however, repeopled, and in the 7th century was a Christian

city. After the defeat of Gregorius, governor of Africa, by the Arabs in 647, Thamugas passes from history. After centuries of neglect James Bruce, the African traveller, visited the spot (1765), made careful drawings of the monuments and deciphered some of the inscriptions. Bruce was followed, more than a century later (1875), by Sir R. Lambert Playfair, British consul general at Algiers, and soon afterwards (1875–1876) Professor Masqueray published a report on the state of the ruins. Since 1 88 1 Thamugas has been systematically explored, and the ruins excavated under the direction of the Service des monuments historiques. Among the objects discovered are a series of standard measures — five cavities hollowed out of a stone slab.

Seventeen miles west of Timgad, on the site of the Roman city Lambaesis, is Lambessa (q.v.).

See G. Boeswillwald, R. Cagnat and A. Ballu, Timgad, une cite africaine sous I'empire romain; and A. Ballu, Guide illustre de Timgad (Paris, 1903).

TIMOCREON, of Ialysus in Rhodes, Greek lyric poet, flourished about 480 B.C. During the Persian wars he had been banished on suspicion of " medism." Themistocles had promised to procure his recall, but was unable to resist the bribes of Timo- creon's adversaries and allowed him to remain in exile. Timo- creon thereupon attacked him most bitterly (see Plutarch, Themistocles, 21); and Simonides, the friend of Themistocles, retorted in an epigram (Anth. Pal. vii. 348). Timocreon was also known as a composer of scolia (drinking-songs) and, accord- ing to Suldas, wrote plays in the style of the old comedy. His gluttony and drunkenness were notorious, and he was an athlete of great prowess.

TIMOLEON (c. 411–337 B.C.), of Corinth, Greek statesman and general. As the champion of Greece against Carthage he is closely connected with the history of Sicily, especially Syracuse (q.v.). When his brother Timophanes, whose life he had saved in battle, took possession of the acropolis of Corinth and made himself master of the city, Timoleon, after an ineffectual protest, tacitly acquiesced while the friends who accompanied him put Timophanes to death. Public opinion approved his conduct as patriotic; but the curses of his mother and the indignation of some of his kinsfolk drove him into retirement for twenty years. In 344 envoys came from Syracuse to Corinth, to appeal to the mother-city for relief from the intestine feuds from which the Syracusans and all the Greeks of Sicily were suffering. Carthage too, their old and bitter foe, was intriguing with the local despots. Corinth could not refuse help, though her chief citizens declined the responsibility of attempting to establish a settled government in the factious and turbulent Syracuse. Timoleon, being named by an unknown voice in the popular assembly, was chosen by a unanimous vote to undertake the mission, and set sail for Sicily with a few of the leading citizens of Corinth and a small troop of Greek mercenaries. He eluded a Carthaginian squadron and landed at Tauromenium (Taor- mina), where he met with a friendly reception. At this time Hicetas, tyrant of Leontini, was master of Syracuse, with the exception of the island of Ortygia, which was occupied by Dionysius, still nominally tyrant. Hicetas was defeated at Adranum, an inland town, and driven back to Syracuse. In 343 Dionysius surrendered Ortygia on condition of being granted a safe conduct to Corinth. Hicetas now received help from Carthage (60,000 men), but ill-success roused mutual suspicion; the Carthaginians abandoned Hicetas, who was besieged in Leontini, and compelled to surrender. Timoleon was thus master of Syracuse. He at once began the work of restoration, bringing new settlers from the mother-city and from Greece generally, and establishing a popular government on the basis of the democratic laws of Diodes. The citadel was razed to the ground, and a court of

justice erected on its site. The amphi- polos, or priest of Olympian Zeus, who was annually chosen by lot out of three clans, was invested with the chief magistracy. The impress of Timoleon's reforms seems to have lasted to the days of Augustus. Hicetas again induced Carthage to send (340-339) a great army (70,000), which landed at Lilybaeum (Marsala). With a miscellaneous levy of about 12,000 men,

most of them mercenaries, Timoleon marched westwards across the island into the neighbourhood of Selinus'and won a great and decisive victory on the Crimissus. The general himself led his infantry, and the enemy's discomfiture was completed by a blinding storm of rain and hail. This victory gave the Greeks of Sicily many years of peace and safety firm Carthage. Carthage made, however, one more effort and despatched some mercenaries to prolong the conflict between Timoleon and the tyrants. But it ended (338) in the defeat of Hicetas, who was taken prisoner and put to death; by a treaty the dominion of Carthage. in Sicily was confined to the west of the Halycus (Platani). Timoleon then retired into private life without assuming any title or office, though he remained practically supreme, not only at Syracuse, but throughout the island. Not- withstanding the many elements of discord Sicily seems to have been during Timoleon's lifetime tranquil and contented. He became blind some time before his death, but persisted in attending the assembly and giving his opinion, which was usually accepted as a unanimous vote. He was buried at the cost of the citizens of - Syracuse, who erected a monument to his memory in their market-place, afterwards surrounded with porticoes, and a gymnasium called Timoleonteum.

Lives by Plutarch and Cornelius Nepos; see also Diod. Sic. xvi. 65-90; monograph by J. F. Amoldt (1850), which contains an ex- haustive examination of the authorities ; also Sicily : History ; and Syracuse, with works quoted.

TIMOMACHUS, a Greek painter of the 1st century B.C. He was noted especially for two pictures, one of

which represented Ajax during his madness, the other Medea meditating the slay- ing of her children. Both of these works were remarkable for their power of expression, especially in the face, and so belong to the latest phase of Greek art. Of the Medea we may form some notion from paintings found at Pompeii, representing that heroine standing with a sheathed sword in her hand, and watching the children at play (Helbig, Wandgemalde Campaniens, Nos. 1262-

1265).

TIMON, of Athens, the noted misanthrope, celebrated in Shakespeare's play, lived during the Peloponnesian War. He is more tha^i once alluded to by Aristophanes and other comedians. Plutarch introduces a short account of his life in his biography of Mark Antony (ch. 70), who built a retreat called Timonium (Strabo xvii. 794) at Alexandria. Timon also gave his name to one of Lucian's dialogues. Shakespeare probably derived his knowledge of Timon mainly from Plutarch; but the Timon of Shakespeare so resembles the Timon of Lucian that Shakespeare (or whoever wrote the first sketch of the play) may have had access to the dialogue.

TIMON (c. 320-230), of Phlius, Greek sceptic philosopher and satirical poet, a pupil of Stilpo the Megarian and Pyrrho of Elis. Having made a fortune by teaching and lecturing in Chalcedon he spent the rest of his life chiefly at Athens, where he died. His writings (Diogenes Laertius, ix. ch. 12) were numerous both in prose and in verse: besides the StXXot, he is said to have written epic poems, tragedies, comedies and satyric dramas. But he is best known as the author of the S£XXot, three books of sarcastic hexameter verses, written against the Greek philosophers.

The fragments that remain (about 140 lines or parts of lines, printed in F. W. A. Mullach, Frag. phil. grace, i. 84-98) show that Timon possessed some of the qualities of a great satirist, together with a command of the hexameter ; but he had no loftier aim

than to awaken laughter. Philosophers are ” excessively cunning murderers of many wise saws ” (v. 96) ; the only two whom he spares are Xenophanes, “the modest censor of Homer’s lies” (v. 29), and Pyrrho, against whom “no other mortal dare contend” (ii. 126). Besides the SiXXoi we have some lines preserved from the ‘ivSciXfiol, a poem in elegiac verse, which appears to have inculcated the tenets of scepticism, and one or two fragments which cannot be with cer- tainty assigned to either poem. There is a reference to Timon in Eus. Praep. Ev. xiv. (Eng. trans, by E. H. Gifford, 1903, p. 761). Fragments of his poems have been collected by Wolke, De graecorum syllis (Warsaw, 1820), Paul, Dissertatio de syllis (Berlin, 1821);, and Wachsmuth, Sittographorum graec. reliquiae (Leipzig, 1885).

TIMOR, an island of the Malay Archipelago, the easternmost and largest of the Lesser Sunda Islands, stretching S.W. and N.E.

for 300 m. between 8° 40′ and io° 40′ S., and between 123 30′ and 1 2 7 E. It ‘has a mean breadth of 60 m., and an area of about 12,500 sq. m. Politically its north-eastern half is Portu- guese, as are two small enclaves in the south-western half, the remainder being Dutch. Timor lies in deep water a little to the west of the hundred fathom line, which marks in this direction the proper limit of the shallow Arafura Sea, extending between it and northern Australia. It differs considerably from the other members of tile Sundanese group both, in the direction of its main axis and in the prevalence of old rocks and slighter volcanic character. It comes, however, within the great volcanic zone which stretches from the north of Surtiatra, through Java and the other Sundanese islands, round to Amboyna, Tidore, Ternate, Halmahera and the Philippines. There appear to be volcanic centres in both the east and the west of the island, and the surface is

everywhere extremely rugged, with ridges from 4000 to 8000 ft. high, forming a confused orographic system, which is by no means fully understood. Mount Kabalaki in the north rises above 10,000 ft.; the culminating point appears to be Mt Alas (over 12,000 ft.) near the east coast. Owing to the prevalent dry easterly winds from the arid plains of north Australia, Timor, like Ombay, Flores and other neighbouring islands, has a much drier climate, and a poorer vegetation, than islands further west, and has few perennial streams and no considerable rivers. Hence, apart from almost untouched mineral wealth, such as iron, copper and gold, the island is poor in natural resources. Coal and petroleum have been found. At Kupang, on the south coast, the number of rainy days per month in the six months May to October dwindles from 4 to o, while the monthly rainfall gradually sinks from a little less than 2 in. to nil; the northern districts are better watered. Though the mineral products' are varied, the supply of ores has hitherto proved scanty; besides which their exploitation is rendered difficult by the lack of labourers, water and wood. The uplands yield fairly under cultivation, while the woodlands, which nowhere form true forests, contain much excellent sandalwood. This and a noted breed of hardy ponies form the Chief articles of export. Owing to the deep water between Timor and the Arafura Sea, the fauna of Timor presents scarcely any Australian types beyond a marsupial cuscus. The few mammals, such as deer, civet, pigs, shrews and monkeys, as well as the birds and insects, resemble ordinary Malayan forms.

Timor consists of a core of ancient rocks (Archean?) upon which rest Permian and later deposits of sedimentary origin. Volcanic rocks are also present but they are not so extensively developed as in the islands of the Javan arc. The Permian beds consist chiefly of limestone and contain numerous fossils similar to those of the middle and upper divisions of the Productus limestone of northern India and the Artinsk stage of the Urals. The best-known locality is the bed of the Ayer Mati near Kupang. These rocks

were origin- ally referred to the Carboniferous system, and similar limestones have been recorded in many parts of the island. Triassic beds with Hdlobia and Monotis are well-developed in Rotti and appear also to occur in Timor. The fauna is similar to that of the Mediterranean Trias. Fragments of Jurassic rock have been found amongst the volcanic material on the island of Rotti, but they have not yet been discovered in situ. The Tertiary deposits form a fringe around the older rocks, and in some places this fringe extends far up into the interior of the island.

The bulk of the population is certainly Papuan, but intermingled with Malayan, Polynesian and other elements; hence it presents an extraordinary diversity of physical types, as is clearly shown by the portraits figured in H. O. Forhes's Naturalist's Wanderings in the Eastern Archipelago. The natives, still mainly independent of their nominal Dutch and Portuguese rulers, are divided into many hostile tribes, speaking as many as forty distinct Papuan and Malayan languages or dialects. Some are addicted to head- hunting, at least during war, and to other barbarous practices. In their uma-luli, or sacred (tabooed) enclosures, rites are performed resembling those of the Polynesian islanders.

Portuguese Timor includes the neighbouring isle of Pulo Kamb- ing, and has an area of about 7450 sq. m. Estimates of the popula- tion vary from 300,000 to over half a million. Dilli, on the north coast, the administrative headquarters and chief settlement, is a poor little place of some 3000 inhabitants, containing hardly any Europeans apart from the officials. Macao was administratively united to Portuguese Timor till 1896, and still pays a contribution to the revenue. The estimated revenue for 1901-1902 was £25,196 (£71200 from Macao), and in 1905-1906 it was £26,968; the estimated

expenditure was £36,532 in the earlier and £43,320 in the later, period. Few ships visit the colony, except Dutch vessels trading in the archipelago, which call regularly at Dilli. Exports (principally

coffee and wax) are valued at about £55,000 annually, and imports at about the same amount.

Dutch Timor has an area of a little over 5000 sq. m. Kupang, the chief town of the residency, contains some 8000 inhabitants, of whom 145 are Europeans living in well-built houses, 594 Chinese, and 43 Arabs. In agriculture, European plants have not been successful, and of native products the supply is only sufficient for the home consumption. The export of sandalwood, ponies, cattle, pinang nuts, &c, amounts in a year to only about £8500. Dutch Timor gives its name to a residency comprising, besides its own territory, the small adjacent islands, Rotti, Peman, &c, the Savu islands, Sumba or Sandalwood island, the Solor and Allor group of islands, ;and the eastern half of Flores, all lying between 8° 5' and ii° 5' S. and 119 3' and 125° 15' E., the total area being 17,698 sq. m. It is divided into four administrative districts — Timor, Rotti and Savu, Larantuka (eastern Flores) arid Sumba. Pop. of the residency (1905), 308,500.

It is possible that the Portuguese visited Timor before the Spaniards did so in 1522. They were, at any rate, established ©n-the island when the Dutch expelled them from Kupang in 1613, During the 1 8th century the two powers came frequently into conflict ; and in 1859 their boundaries were settled by treaty. This treaty was replaced by one signed at Lisbon in June 1893. The old treaty had proved irksome in many ways, especially as it left portions of the territory belonging to protected chieftains of each power as enclaves within the boundaries of the other. This led to frequent disputes, and a mixed boundary commission was therefore appointed under the new treaty and determined , more satisfactory boundaries. The new treaty, moreover, stipulates that a,ll future disputes shall be referred to arbitration. Equally important is the declaration, signed at the same time, that either power would favour the subjects of the other in granting concessions, &c<, to the exclusion of all others. Thus Portugal and Holland secured the exclusive possession of Timor to themselves. . . ,

See P. A. van der Lith, Nederlands- Indie (Leiden, 1893-1894). H. O. Forbes, A Naturalist's Wanderings in the Eastern Archipelago (London, 1885) ; and other general works (cf . Malay Archipelago). Some of the problems connected with the physical features of Timor are discussed in H,. Zondervan's" Timor en deTimoreezen," Tijdschr. A ardr. Gen. (1888), vol. v. (with bibliography); K.Martin and A, Wich- mann, Sammlungen des geologischen Reichsmuseums (Leiden, 1881- 1884); A. Wichmanh, " Bericht liber eine Reise nach dem indischen Archipel," Tijdschr. Aardr. Gen. (1890^1892), with sketches of Timor, map, &c; A. Rothpletz, Die Perm-, Trias-, und Jura- Formation auf Timor und Rotti im indischen Archipel, Palaeontographica (1892) pp. 57-106. There is a summary of Rothpletz's results in American Naturalist (1891), xxv. 959-962. For the remarkable flying survey of the south coast by the commandant of the Siboga expedition, exploring the deep seas and fauna of the archipelago, see Bulletin (No. 35) of the Maatschappij ter bevordering van het natuurkun onderzoek der N.I. Kolonien; R. Dores, " Apontamentos para um diccionario chorographico de Timor," Bol. Soc. Geogr. Lisbon (1901), vol. xix.

TIMOR LAUT ("Seaweed Timor"; Dutch, Timor Laoet), Tenimber or Tenimbar, a group of islands in the Malay Archi- pelago, S.W. of the Aru Islands, between 6° 20' and 8° 30^ S., and 130 40' and 132° 5' E. By the Dutch, in whose residency of Amboyna they are included, they are politically divided into two districts; Larat, including the inhabited islands of Larat, Vordate, Molu, and Maro, together with many uninhabited islands; and Sera, including the Sera Islands, Selaru, and the southern part of Yamdena, all inhabited. Only Yamdena and Selaru are by the natives called Timor Laut; all the others they call Tenimbar. The group is in the main coralline. Vordate, Molu and south-eastern Yamdena have a maximum height of 820 ft.; the rest are low and flat, except Laibobar, apparently a volcanic islet on the west, which has an extinct crater 2000 ft. high. Yamdena, the largest island, has an area of about 1100 sq. m.; the Test together about 1000.

Ritabel in Larat is the only safe roadstead during the east and west monsoons. The fauna includes buffaloes, a mairsupial cuscus, some bats, the beautiful scarlet lory, rare varieties of the ground-thrush, honeyreater and oriole. The population is estimated at about 19,000. The aborigines are Papuans, but much mixed with Malayan and perhaps Polynesian elements. They are a fine race, often over 6 ft. tall, noted for I their artistic sense. In other respects they are pagans in a low state of culture, mostly divided into hostile communities and addicted to piracy. The only means of subsistence is primitive agriculture

on a poor soil, turtle and trepang fishery and cattle-rearing. The yearly export (trepang, turtle and kamuning wood) is valued at only £850 to £1650.

See H. O. Forbes, " Three Months' Explorations in the Tenimbar Islands," in Proc. of Roy. Geog. Soc. (1884) ; J. G. Riedel, De sluiken kroesharige rassen tusschen Selebes en Papua (1886); W. R. van Hoevell, " Tanimbar en Timor Laoet-Eilanden," in Tijdschrift Batavian Genootschap (1889), vol. xxxiii. ; J. D. Garson, " On Cranial Characters of the Natives of Timor- Laut," Journ. Anlhrop. Instil. xiii. 386.

TIMOTHEUS, Athenian statesman and general, son of Conon, the restorer of the walls of Athens. From 378-356 B.C. he frequently held command in the war between Athens (in alliance with Thebes), and Sparta. The object of Athens was to revive the old confederacy (see Delian League, § B), and to regain command of the sea, and in 375 Timotheus was sent with a fleet to sail round Peloponnesus by way of demonstration against Sparta. He gained over Cephallenia, secured the friend- ship of the Acarnanians and Molossians, and took Corcyra, but used his victory with moderation. Want of funds and jealousy of the Thebans led to a short peace. In 373 Timotheus was appointed to the command of a fleet

for the relief of Corcyra, then beleaguered by the Spartans. But his ships were not fully manned, and to recruit their strength he cruised in the Aegean. The delay excited the indignation of the Athenians, who brought him to trial; but, thanks to the exertions of his friends — Jason, tyrant of Pherae, and Alcetas, king of the Molossians, both of whom went to Athens to plead his cause— he was acquitted. He had previously been superseded in his command by Iphicrates. Being reduced to great povery — for he had pledged his private property in order to put the fleet in an efficient state — ■ he left Athens and took service with the king of Persia. We next hear of him about 366, when, having returned to Athens, he was sent to support Ariobarzanes, satrap of Phrygia. But, finding that the satrap was in open revolt against Persia, Timo- theus, in conformity with his instructions, abstained from helping him and turned his arms against Samos, then occupied by a Persian garrison, and took it after a ten months' siege (366–65). He then took Sestus, Crithote, Torone, Potidaea, Methone, Pydna and many other cities; but two attempts upon Amphi- polis failed. An action was brought against him by Apollodorus, the son of the banker Pasion, for the return of money lent by the father. The speech for the plaintiff is still extant, and is attri- buted (though not unanimously) to Demosthenes. It is interesting as showing the manner in which Timotheus had exhausted the large fortune inherited from his father and the straits to which he was reduced by his sacrifices in the public cause. In 358 or 357, the Athenians, in response to a spirited appeal of Timotheus, crossed over to Euboea and expelled the Thebans in three days. In the course of the Social War Timotheus was despatched with Iphicrates, Menestheus, son of Iphicrates, and Chares to put down the revolt. The hostile fleets sighted each other in the Hellespont; but a gale was blowing, and Iphicrates and Timo- theus decided not to engage. Chares, disregarding their opposi- tion, lost many ships, and in his despatches he complained so bitterly of his colleagues that the Athenians put them on their trial. The accusers were Chares and

Aristophon, both men of notoriously bad character. Iphicrates, who had fewer enemies than Timotheus, was acquitted; but Timotheus, who had always been disliked for his arrogance, was condemned to pay a very heavy fine. Being unable to pay, he withdrew to Chalcis, where he died soon afterwards. The Athenians showed their repentance by remitting the greater part of the fine to his son Conon. His remains were buried in the Ceramicus and statues erected to his memory in the agora and the acropolis.

See Life by Cornelius Nepos; Diodorus Siculus xv., xvi. ; Isocrates, De permutatione ; Pseudo-Demosthenes, Adversus Timotheum; C. Rehdantz, Vitae Iphicratis, Chabriae, Timothei (1845); and especially Holm, Hist, of Greece (Eng. trans., vol. iii.).

TIMOTHEUS, an Athenian sculptor of the 4th century B.C., and one of the artists employed on the Mausoleum of Hali- carnassus. An inscription at Epidaurus shows that he was employed to furnish models for the pedimental sculptures of

the temple of Aesculapius on that site, and to execute fri marble the external decorations (acroteria) for one of the gables. Cori- siderable remains of the acroteria and the pedimental figures have been discovered (see Gjreek Art, fig. 44; and Epidaurus).

TIMOTHEUS* of Miletus (c. 446-357 B.C.), Greek musician and dithyrambic poet. He added one or more strings to the lyre, whereby he incurred the displeasure of the Spartans and Athe- nians (E. Curtius, Hist, of Greece, bk. v. ch. 2). He composed musical works of a mythological and historical character.

Fragments in T. Bergk, Poetae lyrict graeci. A papyrus-fragment of his Persians (the oldest papyrus in existence), discovered at Abusir has been edited by U. von Wilamowitz-Mollendorff (1903), with dis- cussion of the nome, metre, the number of strings of

the lyre, date of the poet and fragment. See V. Strazzulla, /. Persiani di Eschilo ed il nomo di Timoteo (1904); S. Sudhaus in Rhein. Mus., lviii. (1903), p. 481 ; and T. Reinach and M. Croiset in Revue des Hudes grecques, xvi. (1903), pp. 62, 323.

TIMOTHY or Timotheus, in the Bible (Acts xvi. 1, xvii. 14, &c), a Lycaonian, the son of a Gentile father and a Jewish mother, Eunice (2 Tim. i. 5), was born at Lystra, and was already a member of the Christian Church there at the time of Paul's second visit. He took the place formerly occupied by John Mark in Paul's company, and in deference to Jewish feeling was circumcised. He accompanied the apostle on many of his journeys, and was employed by him on important missions (r Thess. iii. 2; 1 Cor. iv. 17; xvi. 10). Paul speaks of him as his " son," and this (see Phil. ii. 22) refers to loyal service rather than to spiritual parentage. He was especially interested in the Macedonian churches, which he helped to found. His name is associated with that of Paul in the opening salutations of both epistles to the Thessalonians, the second epistle to the Corinthians, and those to the Philippians and Colossians. He was, therefore, with Paul at Rome. At a later date he is men- tioned in Heb. xiii. 23 as having undergone imprisonment, but as having been released. On the basis of the epistles of Paul to Timothy, Timothy is traditionally represented as bishop of Ephesus, and tradition also tells that he suffered under Domitian. His martyrdom is celebrated on the 24th of January in the Latin Church, on the 22nd in the Greek.

The apocryphal Acta Timothei (Greek and Latin) have been edited by Usener (Bonn, 1877) ; cf. Lipsius, Apokr. Apostelgeschichten (1884), ii. 2.

TIMOTHY, FIRST EPISTLE TO. This book of the New Testament is really a pastoral letter upon church order, addressed by the apostle Paul to the Asiatic Christian communities in and round Ephesus (i. 3). 1 The object of the writing is stated in iii. 15: irS>s Stl kv olnq dtov avaarpicpecrdai. It is thrown into, the literary form 2 of a letter from Paul to

his lieutenant Timothy, but, as the closing salutation indicates (vi. 21, "grace be with you," iifuv), the writer really has the Church in his mind all through. The Pauline standard of doctrine is set up (i. 3–20) as the norm of thought and practice. This trust and tradition is to be maintained throughout the churches. It involves, the writer proceeds to argue, the proper conduct of public worship (ii. 1 seq. ,8 seq.), and the proper qualification for episcopi(m. 2 seq.) and diaconi (iii. 8 seq.). The finale of this section (iii. 15–16) leads, by way of contrast, to a sharp prophetic warning against contemporary errorists. (iv. 1 seq.), with advice upon the proper management of various classes of people within the Church (v. 1 seq.). Special attention is given to the ecclesiastical "widows" (3 seq.) and to presbyters (17 seq.). After a word on slaves and masters (vi. 1–2), the epistle recurs to the errorists (vi. 3 seq.), passing into a warning against wealth (6 seq.) and an impressive closing charge (n seq.). The writing closes with the 17 x&P« M*#' vfj£>v of verse 21. The context and contents of vi. 17–218 suggest that it is a later interpolation, such as writings on church discipline were

1 The same motive occurs in the preface to Irenaeus's treatise, Adv. haer.

2 The opposite view, which insists upon the definite charactei of the pastorals, is ably stated by A. Ruegg in Aus Schrift una Geschichte (1898), pp. 50–108. Otto and Kolling attempt to refet iropeuA/ ueroj (i. 3) to Timothy, not to Paul, and in this way to refei the situation to Acts xix. 22 ; but this is exegetically untenable.

particularly exposed to (Harnack). Theif inorganic character naturally permitted later generations to bring them up to date, and accretions of this kind may be suspected in i Tim. iii. i–i3,v. 17–20 (22a),

vi. 17–21, as well as in Tit. i. 7–9. Other verses, like iii. n and v. 23, have all the appearance of misplaced glosses, perhaps from the margin. When vi. 20–21 is thus taken as a later addition, it becomes possible 1 to see in the reference to avridtcui rrjs ^euSww^ou yvtiiaaas an allusion to Marcion's well-known volume.

Attempts have been made by some critics, particularly Hesse (Die Entstehung der mutest. Hirtenbriefe, 1889: i. 1–10, 18–20, iv. 1–16, vi. 3–16, 20 seq.) and Knoke (Prakt. theol. Kommentar, 1887, 1889: o = i. 3 seq., 18–20, ii. 1–10, iv. 12, v. 1–3, 4C–6, n–15, 10–23, 24 seq., written to Timothy from Corinth; 6 = i. 12–17, iii– i4 –I 6, iv. 1–11, 13–16, ii. 12–15, v. 7 seq., vi. 17–19, i. 5–11, vi. 2C–16, 20 seq., written from Caesarea), to disentangle one or more original notes of Paul from the subsequent additions, but the comparative evenness of the style does not favour such analyses. 2 They have more relevance and point in 2 Tim. than in 1 Tim. P. Ewald, in his Probabiiia belr. d. Text des 1 Tim. (1901), falls back upon the hypothesis of the papyri leaves or sheets having been displaced, and conjectures that i. 12–17 originally lay between i. 2 and i. 3, while iii. 14–iv. 10 has been misplaced from after vi. 2. But his keen criticism of Hesse and Knoke is more successful than his positive explanation of the textual phenomena, and a more thorough-going process of literary criticism is necessary in order to solve the problems of the epistle. Its irregular character, abrupt connexions and loose transitions 3 are due to the nature of the subject rather than to any material disarrangement of its paragraphs.

The phenomena of style have to be viewed in a broad light. Allowance must be made for the difference of vocabulary produced by change of subject. The evidence of airaf tipripiva is always to be received with caution and strict scrutiny ; no hard and fast rule must be set up to judge the language of a man like Paul. Yet such considerations do not operate against the literary judgment that the pastorals did not come from Paul's pen. The words and phrases

which are common to the pastorals and the rest of the Pauline epistles are neither so characteristic nor so numerous as those pecu- liar to the former, and the data of style may be summed up in the verdict that they point to a writer who, naturally reproducing Paul's standpoint as far as possible, and acquainted with his epistles, yet betrays the characteristics of his later milieu in expressions as well as in ideas. 4 Thus, of 174 words which occur in the pastorals alone (of all the New Testament writings), 97 are foreign to the Septuagint and 116 to the rest of the Pauline letters. This proportion of 4jra£ tvpr\piv* is extremely large, when the size of the pastorals is taken into account, and its significance is heightened by the further fact that several of Paul's characteristic expressions tend to be replaced by others (e.g. TtpnraTtiv and aroixtiv by avaarpitpuv, &c, KVpuK by itairbrrp, irapovola by iirufravua), while a large number of Pauline words are entirely absent (e.g. ft8u«w, thtvdepla., Kavxio&ai, pti^tjiv, 'pwpos, /xcopla, irapafiofft*, irtiBttv, • ircpttrac&eii', awpa, &c). Nor is this by any means all. " Difference in vocabu- lary may be partially explained (though only partially in this case) by difference of subject-matter and of date; bu the use of particles is one of the most unfailing of literary tests. The change in the use of particles and the comparative rarity of the definite article form, together with the startling divergence in vocabulary, the chief ground of our perplexity " {Church Quarterly Review, 1903, pp. 428 seq). Pauline particles like &pa, 816, 8161-t, Iir«ra, in, tSe and 'i&ov

1 When the literary integrity of the epistle is maintained this allusion naturally drops to the ground, since the use of the epistle by Polycarp rules the earlier conjectures of Baur and ethers (who made the pastorals anti-Marcionite) out of court; besides, passages like i. 7 (Titus i. 10, 14) would not apply to the Marcionites. Dr Hort (Judaistic Christianity, pp. 113 seq.) prefers to group both the false yvSxris (cf. Rom. ii. 20) and

the avrtOiatis as Jewish casuistical decisions, the yevfaXoyiat. of i. 4 and Tit. iii. 9 being the legendary pedigrees of Jewish heroes, such as are prominent in Philo and the Book of Jubilees. Cf. Wohlenberg, pp. 30–36, and on the other side Klopper in Zeits. fur wiss. Theologie (1902), pp. 339 seq.

- Hesse's, in particular, is shipwrecked on the assumption that the Ignatian epistles must be dated under Marcus Aurelius.

4 Thus ii. 11–15 seems almost like a gloss (Hesse, Knoke), iv. 1–8 parts easily from its context, and the ouc of ii. 1 indicates a very loose relationship to the preceding paragraphs.

- So the philologist T. Nii'jeli (Der Wortschatz des Aposlels Paulus, 1905, pp. 85 seq.), whose opinion is all the more significant on this point that he refuses to admit any linguistic features adverse to the Pauline authorship of the other epistles.

disappear; the Pauline aiiv is replaced by ptrd, while prepositions like 6m, fixP'i luirpooBiv and irapa (accus.) drop out , entirely. A number of Latinisms, unexampled in the rest 01 Paul's epistles, occur within the pastorals; whole families of new words, especially composite words (often compounded with A-privative, 8to-, o'iko-, kccXo-, 6 autppo-, iXo-), emerge with others, e.g. ■ dxrifleia, Trunin 6 X670S, &c. ; and the very greeting is un- Pauline (1 Tim. i. 2 ; 2 Tim. i. 2). The peculiarities of syntax corroborate the impression made by such features of the vocabulary. There is less flow than in the rest of the Pauline letters; " the syntax is stiff er and more regular . . . the clauses are marshalled together, and there is a tendency to parallelism " (Lightfoot, Biblical Essays, p. 402). An increase of sententious imperative clauses is also to be noted. Doubtless- some of these features might be set down to Paul's amanuensis.' But not all of them, more especially when the characteristic concep- tions and ideas of the pastorals are taken into account. Nor can it be

argued that the characteristics of the pastorals are those of private letters; they are not private, nor even semi-private as they stand; besides, the only private note from Paul's hand (Philemon) bears no traces of the special diction exhibited in the epistles to Timothy and Titus.

Furthermore, throughout the pastorals, and especially in I Tim., there are traces of a wider acquaintance with Greek literature 7 than can be detected in the letters of Paul. Affinities to Plutarch (cf. J. Albani in Zeitschrift fur wiss. Theologie, 1902, 40-58) and to 4 as well as to 2 Maccabees are not improbable.

I Tim. also gives clearest expression to the author's ecclesiastical and doctrinal views. The objective sense of tIjtis has begun to overpower the subjective. Christianity is becoming more and more a " form of sound words," a crystallized creed, whose teaching is the vital point. The deep conceptions of Paul, viz. the fatherly love of God, the faith-mysticism of the Christian's relation to Christ, and the inward witness of the Spirit, fall into the background, while unusual prominence is assigned to the more tangible and practical tests of Christianity.

Of all the pastorals, 1 Tim. is furthest from Paul. 8 The author writes more out of bis own mind, evidently with little or no special material to fall back upon. The epistle is not a compilation from the two others (as Schleiermacher thought), but it seems to denote a slightly later stage. 9 Many critics therefore (e.g. De Wette, Mangold, Reuss, Bruckner, Pfleiderer, vonSoden.McGiffert, S.David- son, Bourquin, Clemen and Jiilicher) conclude that the pastorals were written in this order (2 Tim., Titus, 1 Tim.). When the epistles were arranged for the canon, it was natural to put 2 Tim. later than the other two, since its setting seemed to imply the close of Paul's career. Its literary priority is confirmed by several resemblances between it and Philippians, the last of Paul's epistles (e.g. AedAwis iv. 6 = avakbeiv Ph*l. i. 23, and

oirivheoBat. iv. 6 = Phil. ii. 17).

Literature. — The following special monographs on 1 Tim. are noteworthy : Melanchthon's Enarratio epist. I. Pauli ad Timotheum et duorum capitum secunda (1561), Heshusius, Commentarius in priorem epist. Pauli ad Timotheum (1582), Gerhard, Annotationes ad I. Pauli ad Tim. epistolam (1643) and M. G. E. Leo, Pauli epistola I. ad Tim. cum perpetuo commentario (Leipzig, 1837; full and exact). More modern essays are published by Rolling, Der I. Brief Paulus an Tim. aufs neue untersucht und ausgelegt (1882 seq.) and, from a conser- vative standpoint, by Liddon (1897). Two other essays appeared in the early part of last century, by Beckhaus, Specimen observationum de verbis &Vaj; \tyop. et rarioribus dicendi formulis in prima ad Tim* epistola Paulina obviis (1810) and A. Curtius, De tempore quo prior epist. Tim. exarata sit (1828). In the difficult passage (v. 18), both quotations seem to be ranked as from 17 ypatfri), in which case: the

5 KaXos, which Paul neveruses as an attribute, is mainly employed in this way by the author. On o- wrijp as applied to God, cf . Wagner in Zeits. f. neut. Wiss. (1905), pp. 221 seq.

6 The so-called " Lucan " features (cf. Holtzmann, pp.92 seq., and Von Soden in Theologische Abhandlungen, 1892, pp. 133-135) have suggested that Luke may have been the amanuensis (cf. 2 Tim. iv. 11), or even the author of the pastorals.

1 E.g. Tit. i. 11 (=f. Plut. Moral. 967, 13), ii. 3 (cf. Thuc. ii. 61 ; Xen. Mem. i. 5, 5, 6, 8); 2 Tim. ii. 17 (cf. Plut. Moral. 65 D b Si Kapdvm woXvUiaxorov iv rt? owpari reados) ; I Tim. i. 6 (cf. Plut. Moral. 414 Et aaroxovffi rod ptrplov Kal TrpkirovTos) , i. 10 (cf. Plut. De educ. lib. 5 A toO vyiaivovTos Kal reraypivov (3Lov KaTa

8 Even linguistically Titus and 1 Tim. are closer to one another than either to 2 Tim. The latter has no allusion to the ko\6v tpyov, the irtpobibaaKoKtiv, the 5io.8t(iaiovcr6ai, &c, of the others, and

contains one or two specific phrases of its own. I Tim., like Ephesians, is a writing whose lack of greetings and general tone point to the functions of an encyclical or Catholic epistle.

9 For details, cf. Ency. Bib. 5093–5094. Of the five ″ faithful sayings,″ three occur in I Tim.; these condensed aphorisms tally with liturgical fragments such as the famous quotation in I Tim. iii. 16, a formula of confession written in small short cola (cf. Klopper in Zeitschrift fur wiss. Theologie, 1902, pp. 336 seq.).

second (cf . Luke x. 7) goes back to either Luke's gospel or its source at this particular point. The hypothesis that a saying of Jesus is loosely added here to an Old Testament citation is very forced, and the inference is that by the time the author wrote, Luke's gospel was reckoned as yptutni. This would be explicable if Luke could be assumed to have been the author, in whole or part, of the pastorals.

(J. Mi.)

TIMOTHY, SECOND EPISTLE TO. In this book of the New Testament, after a brief thanksgiving for the faith of Timothy (i. 1–5), Paul is represented as warning him against false shame (6 seq.), adducing his own example and that of Onesiphorus. The need and the reward of endurance are then urged (ii. 1–13), and Timothy is bidden to adhere in his work to the Pauline gospel against the seductions ot controversial and immoral heretics (ii. 14 seq.). 1 The practices of the latter are pungently depicted 2 (iii. 1–9); Paul reiterates his opening counsels (10 seq.) and then closes with a solemn charge to personal faithfulness. A note of personal matters concludes the epistle (iv. 6–22).

The last verse, with its two-fold greeting (6 Kvpios fiera, tov irvfufiark cov, r/ x^pts M*^'

vn&v), shows unconsciously but plainly that, while the epistle professes to be a private letter to Timothy, it is in reality addressed to a wider circle, like 1 Tim. and Titus. But its composite origin is also clear. 3 Thus iv. 6–2 2a, which is certainly authentic, is not homogeneous in itself, the situation of verses 6–8 hardly agreeing with that of seq., while verse n (" Luke alone is with me ") cannot have been written at the same time as verse 21. Various schemes of analysis have been proposed to account for this and other passages of the same nature in the epistle, e.g. i. 15–18, iii. 10 seq. But the general result of such reconstructions is tentative. All that criticism has succeeded in establishing is the fact that the author had some reliquiae Paulinae at his disposal, notes written either before or during his last imprisonment in Rome, 4 and that these have been worked up into the present letter by one who rightly believed that his master would stoutly oppose the current errors of the age.

2 Timothy, like 1 Timothy, reveals with fair precision the period and aim of the writer of the pastorals. Evidently (cf. Acts xx. 20–30) the Pauline Christianity of Ephesus was im- perilled seriously during the last quarter of the 1st century. Its very growth invited attempts to weave ascetic, theosophic, semi- Jewish fancies round the faith, not unlike the attempts often made in modern India to assimilate Christian and local philosophies of religion. Against such the writer argues in Paul's name, as Luke had already done. From the composition of a speech in Paul's name (for, though the farewell in Acts goes back to first-hand tradition, it represents the author's standpoint as well as Paul's), it was but a step to compose letters in his name, especially on the basis of some of his extant notes. A genuine concern for local Christianity is the writer's justification for his work, and any idea of fraudulent aims must be dismissed at once. 6 " To a writer of this period, it would seem as legitimate an artifice to compose a letter as to compose a speech in the

1 Bahnsen gives an ingenious analysis of this section in the epistle. In ii. 8–13, ii. 6 is developed; in ii. 14–26, ii. 4; and in iii. 1–4 (8), ii. 5. But this is as artificial as Otto's attempt to classify the con- tents of the epistle under the three notes of the irvtiixa in i. 7.

1 On iii. 6 see the fragment from Philo quoted in Euseb. Praep. Evang. viii. IT.

J " If the epistle was an integral as we have it, its genuineness could scarcely be maintained " (Laughlin, p. 26).

4 Bacon {Story of St Paul, p. 198) and Clemen both assign part of the epistle to the Caesarean imprisonment, the former disentangling iv. 9, 11–18, 20–2ia, 22b, the latter iv. 9–18. Hitzig had already found a Caesarean letter in i. 15, iv. 13–16, 20–22a. One great point in favour of such theories is that they give a natural sense to iv. 16, Paul's first defence being that before the Jews or before Felix.

6 Cf. the present writer's Historical New Testament (2nd ed., 1901, pp. 619 seq.), where the relevant literature is cited. An adequate monograph on ancient pseudonymous literature remains to be written; meantime, further reference may be made to the older essays of Mosheim (Dissertatio de caussis suppositorum librorum inter Christianos saeculi primi el secundi, 1733); Bentley's Disserta- tion on Phalaris, pp. 80 seq.; K. R. Kostlin's article in Theol. Jahr- bucher (1851), pp. 140–221, on " Der pseud. Litteratur der altesten Kirche " ; and A. Giidemann, in Classical Studies in Honour of H. Drissler, pp. 52–74 (New York, 1894).

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name of a great man whose sentiments it was desired to reproduce and record; the question which seems so important to us, whether the words and even the sentiments are the great man's own or only his historian's, seems then hardly to have occurred

either to writer or readers " (W. H. Simcox, Writers of the New Testa- ment, p, 38). The address at Miletus is Paul's last word to the Christian elders of Ephesus, warning them against heresies (Acts xx. 29 seq.) and solemnly bidding them exercise their disciplinary duties. The Second Epistle to Timothy carries on this line of advice. Here Paul, being dead, yet speaks through Timothy to the local Christians who are exposed to such mis- chievous tendencies in their environment.

Where the writer has hardly succeeded in representing Paul is in his relations to Timothy. One may admit that, strictly speaking, the latter at the age of about thirty-five or forty could still be called vkos, and that Paul might conceivably have termed him still his rkKvov. But the counsels addressed^ to him seem rather out of place when one recollects the position which he occupied. To a writer who desired a situation for such advice on church life and doctrine from the lips of Paul to his lieutenant, it was natural to think of a temporary absence. 6 But many of the directions are much too serious and fundamental to have been given in this form ; one can hardly imagine that Paul considered Timothy (or Titus) still in need of elementary advice and warning upon such matters, and especially on personal purity. When they are re- garded as typical figures of the later episcopi of the Church, the point of this emphasis upon elementary principles and duties is at once clear; they outline graphically the qualifications for the church offices in question.

The pressing need of the Church, as the writer conceives it, is to maintain the true Pauline tradition (2 Tim. i. 13, &c.) against certain moral and speculative ideas. This maintenance takes the twofold practical form of (a) adherence to formulated statements of the ." sound teaching " and (b) insistence on a succession of church officials (2 Tim. 11,1-2) who are not merely to preside but to teach. The last point is significant in view of Didachfi xv. I. The standpoint of the author is practically that of Clemens Romanus (xlii. seq.),

who asserts that the apostles preached " everywhere in country and jtown, appointing their first-fruits, when they had proved them by the Spirit, to be bishops and deacons." The interests of discipline and doctrine were thus to be conserved.' Paul's lieutenants possess the central deposit of the apostolic faith, and have the duty as well as the right of exercising the authority with which that position invests them.

The occasional coincidences between the pastorals and Barna* bas or Clemens Romarms do not prove anything more than a common milieu of thought, but the epistles were plainly familiar to Polycarp, who alludes to 1 Tim. ii. 1, vi. 7, 10, and 2 Tim. ii. 11, 25, iv. 10 (for this and the other passages from Polycarp, see The New Testament in the Apostolic Fathers, 1905, pp. 95 seq.). This indubitable use of the pastorals in Polycarp 8 throws the terminus ad quern of their composition back into the first decade of the 2nd century, and additional confirmation of this would be forthcoming were the evidence for their use in Ignatius more

6 The drawback was that, if Paul was soon to see his colleagues again (Titus i. 5; I Tim. i. 3), such detailed advice was hardly necessary ; but this imperfection was inevitable.

7 The post- Pauline atmosphere of the ecclesiastical regulations is felt most plainly in the references to such sub-apostolic features as the organized register of " widows." The iirianoiros, the SidKocos and the xhpa. are also forbidden to contract a second marriage. Such, at any rate, seems the fairest interpretation of 1 Tim. iii. 2 (fflWoiros) in the light of early Christian tradition, for although the phrase " husband of one wife " might conceivably be intended as a prohibition of polygamy or vice (=faithful husband, or sober, married man), the antipathy to second marriages (cf. Jacoby, Neutest. Ethik, pp. 378 seq.) is quite in accord with sub-apostolic practice. It is almost as un-Pauline as the assumption that every iiviaKoiros must be married. Cf. on this whole subject

Hilgenfeld (Zeiischrift fur wiss. Theologie, 1886, pp. 456 seq.) and Schmiedel (Encycl. Biblica, 31 13 seq.) ; the opposite position is stated excellently by Hort (Christian Ecclesia, 1898, 189 seq.) and Dr T. M. Lindsay (Hibbert Journal, i. 166 seq., and in The Church and the Ministry in the early Centuries, 1903, pp. 139 seq.).

8 The pastorals soon passed into great favour in the early Church. Their method and aim were entirely congenial to the rising Catholic Church, and one is not surprised to find from writers in the East (Theophilus of Antioch, Justin Martyr) and West (Irenaeus, Ter-i tullian and the author of 2 Clement) that they were widely read and valued. Absent from Marcion's canon, they were included in the Muratorian, where they appear as private letters ("pro affectu et dilectione "). §e-e, on the external evidence in general, Zahn's Geschichte der neutest. Kanons, i. 634 seq.

II

Secure. The occasional similarities of thought and expression between them and the Lucan writings suggest that the period ot their origin lies within a quarter of a century after Paul's death, and, when one or two later accretions are admitted, the internal evidence, either upon the organization of the church 1 or upon the errors controverted, tallies with this hypothesis.

Literature. — Special monographs on this epistle by Leo (1850) and Bahnsen {Die sogenannten Pastoralbriefe, I., der 2 Tim., 1876) are to be noted. For a textual discussion of ii. 19, cf. Resch's Paulinismus, pp. 258-259. The allusion to the fitfiKla, n&XurTa rds fi€/ji(}pa.vas (iv. 13) has produced a wealth of discussion; the latter were probably pugillares membranei, sheets for private memoranda. The books may have included the Logia or

Evangeli Scriptiires from which 1 Tim. v. 18 is quoted (so Resch), but this is a mere conjecture. Cf., on the whole question, Bin's Das antike Buchttiesen, pp. 50 seq., 65, 88 seq., and Nestle's Einfiihrung in das griechische N. T. (1899), pp. 39 seq. (J. Mt.)

TIMOR {Timur i Leng, the lame Timur), commonly known as Tamerlane, the renowned Oriental conqueror, was born in 1336 at Kesh, better known as Shahr-i-Sabz, " the green city," situated some 50 m. south of Samarkand in Transoxiana. His father Teragai was head of the tribe of Berlas. Great-grandson of Karachar Nevian (minister of Jagatai, son of Jenghiz Khan, and commander-in-chief of his forces), and distinguished among his fellow-clansmen as the first convert to Islamism, Teragai might have assumed the high military rank which fell to him by right of inheritance; but like his father Burkul he preferred a life of retirement and study. Under the paternal eye the education of young Timur was such that at the age of twenty he had not only become an adept in manly outdoor exercises but had earned the reputation of being an attentive reader of the Koran. At this period, if we may credit the Memoirs (Malfiifdt), he exhibited proofs of a tender and sympathetic nature.

About 1358, however, he came before the world as a leader of armies. His career for the next ten or eleven years may be thus briefly summarized from the Memoirs. Allying himself both in cause and by family connexion with Kurgan, the dethroner and destroyer of Kazan, chief of the western Jagatai, he was deputed to invade Khorasan at the head of a thousand horse. This was the second warlike expedition in which he was the chief actor, and the accomplishment of its objects led to further operations, among them the subjection of Khwarizm and Urganj, After the murder of Kurgan the contentions which arose among the many claimants to sovereign power were arrested by the invasion of Toghluk Timur of Kashgar, a descendant of Jenghiz. Timur was despatched on a mission to the invader's camp, the result of which was his own appointment to the government of MawarS-

'lnahr (Transoxiana). By the death of his father he was also left hereditary head of the Berlas. The exigencies of his quasi-sovereign position compelled him to have recourse to his formidable patron, whose reappearance on the banks of the Sihon created a consternation not easily allayed. Mawara'lnahr was taken from Timur and entrusted to a son of Toghluk; but he was defeated in battle by the bold warrior he had replaced at the head of a numerically far inferior force. Toghluk's death facilitated the work of reconquest, and a few years of perse- verance and energy sufficed for its accomplishment, as well as for the addition of a vast extent of territory. During this period Timur and his brother-in-law, Hosain — at first fellow- fugitives and wanderers in joint adventures full of interest and romance — became rivals and antagonists. At the close of 1369 Hosain was assassinated and Timur, having been formally proclaimed sovereign at Balkh, mounted the throne at Samarkand, the capital of his dominions.

The next thirty years or so were spent in various wars and expeditions. Timur not only consolidated his rule at home by the subjection of intestine foes, but sought extension of territory by encroachments upon the lands of foreign potentates. His conquests to the west and north-west led him among the Mongols of the Caspian and to the banks of the Ural and the Volga;

1 The pastorals in this aspect are closer to Clemens Romanus than to Ignatius.

those to the south and south-west comprehended almost every province in Persia, including Bagdad,, Kerbela and Kurdistan. One of the most formidable of his opponents, was Toktamish, who after having been a refugee at the court of Timur became ruler both of the eastern Kipchak and the Golden Horde, and quarrelled with Timur over the possession of Khwarizm. It was not until 1395 that the power' of Toktamish was finally broken (see Mongols; Golden Horde).

In 1398, when Timur was more than sixty years of

age, Farishta tells us that, ″ informed of the commotions and civil wars of India,″ he ″ began his expedition into that country,″ and on the 12th of September ″ arrived on the banks of the Indus.″ His passage of the river and upward march along the left bank, the reinforcement he provided for his grandson Pir Mahommed (who was invested in Multan), the capture of towns or villages accompanied, it might be, with destruction of the houses and the massacre of the inhabitants, the battle before Delhi and the easy victory, the triumphal entry into the doomed city, with its outcome of horrors— all these circumstance^ belong to the annals of India. In April 1399, some three months after quitting the capital of Mahmud Toghluk, Timur was back in his own capital beyond the Oxus. It need scarcely be added that an immense quantity of spoil was conveyed away. Accord- ing to Clavijo, ninety captured elephants were employed merely to carry stones from certain quarries to enable the conqueror to erect a mosque at Samarkand. The war with the Turks and Egyptians which succeeded the return from India, was rendered notable by the capture of Aleppo and Damascus, and especially by the defeat and imprisonment of Sultan Bayezid I. (see Turkey: History, and Egypt; History, Mahommedan period), Thisi was Timur's last campaign. Another was projected against China, but the old warrior was attacked by, fever and ague when encamped on the farther side of the Sihon (Syr-Daria) and died at Atrar (Otrar) on the 17th of February 1405. Mark- ham, in his introduction to the narrative of Clavijo's embassy., states that his body ″ was embalmed with musk and rose water, wrapped in linen, laid in an ebony coffin and sent to Samarkand, where it was buried.″ Timur had carried his victorious arms on one side from the Irtish and the Volga to the Persian Gulf and on the other from the Hellespont to the Ganges.

Timur's generally recognized biographers are — 'All Yazdl, commonly called Sharifu d-DIrt, author of the Persian Zafar^ nSmd, translated by Petis de la Croix in 1722, and from French into English by J. Darby in the following, year; and Ahmad ibri Mohammed ibn

Abdallah, al Dimashki, al ‘Ajrni, commonly called Ibn ‘Arabshah, author ot the Arabic ‘Ajaibu ‘I MakhlnkSt, trans- lated by the Dutch Orientalist GoliUs in 1636. In the work of the former, as Sir William Jones remarks, ” the Tartarian conqueror is represented as a liberal, benevolent and illustrious prince”; in that of the latter he is ” deformed and impious, of a low birth and detestable principles.” But the favourable account was written under the personal supervision of Timor’s grandson, Ibrahim, while the other was the production of his direst enemy. Few in- deed, if any, original annals of this class are written otherwise than to order, under patronage, or to serve a purpose to which truth is secondary. Among less reputed biographies or materials for biography may be mentioned a second Zafarnama, by Majjlana Nizamu ‘d-DIn Shanab Ghazani (Nizam Shami), stated to be ” the earliest known history of Timur, and the only one written in his lifetime”; and vol. i. of the Matla’tt’s-Sa’dain — a choice Persian MS. work of 1495 — introduced to Orientalists in Europe by Hammer, Jahrbucher, Dorn and (notably) Quatremere. There are also the Memoirs {Malfuzat) and Institutes (Tuzukat), of which an important section is styled Designs and Enterprises (Tadbirat wa Kangdshaha).’ Upon the genuineness of these doubt has been thrown. The circumstance of their alleged discovery and presenta- tion to Shah Jahan in 1637 was of itself open to suspicion. Alhazen, quoted by Purchas in his quaint notice of Timur and referred to by Sir John Malcolm, can hardly be accepted as a serious authority. His assumed memoir was printed for English readers in 1597 by William Ponsonby under the title of a Historie of the Great Emperor Tamerlan, drawn from the ancient monuments by Messire Jean du Bee, Abbot of Mortimer; and another version of the same book is to be found in the Histoire du Grand Tamerlan, by De Sainctyon, published at Amsterdam in 1678. But, although the existence of this Alhazen of Jean de Bee has been believed by many, the more trustworthy critics consider the history and historian to be equally fictitious.

Reference may be made to two more sources of information.

Apart from modern European savants and historians, and the more strictly Oriental chroniclers who have written in Persian, Turkish or Arabic, the following authorities may be cited — Laonicus Chalcondylas, Joannes Leunclavius, Joachimus Camerarius, Petrus Perondinus, Lazaro Soranzo, Simon Mairlus, Matthew Michiovius. A score or so of other names are given by Samuel Purchas. See also Sir Clements Markham's Clavijo, in the Hakluyt Society's publications; White's edition of Davy's translation of the Institutes (1783); Stewart's translation of the Malfuz&t; Malcolm's History of Persia; and Trans. Roy. Soc. (1885); Horn, " Gesch. Irans in islam. Zeit," in Geiger and Kuhn, Crundr. der iranisch. Philol. (1904); works quoted, s.v. Mongols. (F. J. G.)

TIN (Lat* stannum, whence the chemical symbol " Sn "; atomic weight = 117–6, 0=i6), a metallic chemical element. Being a component of bronze, it was used as a metal thousands of years prior to the dawn of history; but it does not follow that prehistoric bronzes were made from metallic tin. When the unalloyed metal was first introduced cannot be ascertained with certainty. The "tin" of the Bible {no.aalTtpos in the Septuagint) corresponds to the Hebrew bedhil, which is really a copper alloy known as early as 1600 B.C. in Egypt. All we know is that about the 1st century the Greek word Kaaalrtpos designated tin, and that tin was imported from Cornwall into Italy after, if not before, the invasion of Britain by Julius Caesar. From Pliny's writings it appears that the Romans in his time did not realize the distinction between tin and lead: the former was called plumbum album or candidum to distinguish it from plumbum nigrum (lead proper). The word stannum definitely assumed its present

meaning in the 4th century (H. Kopp). By the early Greek alchemists the metal was named Hermes, but at about the beginning of the 6th century, it was termed Zeusor Jupiter, and the symbol 2/ assigned to it; it was also referred to as diabolus metallorum, on account of the brittle alloys which it formed.

Occurrence.^- Grains of metallic tin occur intermingled with the gold ores of Siberia, Guiana and Bolivia, and in a few other localities. Of minerals containing this element mention may be made of cassiterite (q.v.) or tinstone, Sn0 2 , tin pyrites, Cu4SnS4+(Fe,Zn) 2 SnS4; the metal also occurs in some epidotes, and in company with columbium, tantalum and other metals. Of these ″ tinstone ″ is of the greatest commercial importance. It occurs in its matrix, either in or closely associated with fissure veins or disseminated through rock masses. It is also found in the form of rolled lumps and grains, ″ stream tin,″ in alluvial gravels; the latter are secondary deposits, the products of the disintegration of the first-named primary deposits. Throughout the world, primary deposits of tinstone are in or closely connected with granite or acid eruptive rocks of the same type, its mineral associates being tourmaline, fluorspar, topaz, wolfram and arseni- cal pyrites, and the invariable gangue being quartz: the only exception to this mode of occurrence is to be found in Bolivia, where the tin ore occurs intimately associated with silver ores, bismuth ores and various sulphides, whilst the gangue includes barytes and certain carbonates. Over five-sixths of the world's total production is derived from secondary alluvial deposits, but all the tin obtained in Cornwall (the alluvial deposits having been worked out) and Bolivia is from vein mining, while a small portion of that yielded by Australasia comes from veins and from granitic rocks carrying disseminated tinstone.

Production. — During the 1 8th century the world's supply of tin was mainly drawn from the deposits of England, Saxony and Bohemia; in 1801 England produced about 2500 tons, while the supplies of

Saxony and Bohemia had been greatly diminished. The English supply increased, with some oscilla- tions, to between six and seven thousand tons annually in the period 1840–1860, when it suddenly rose to about 10,000 tons, and this figure was fairly well sustained until about 1890, when a period of depression set in; the yield for 1900 was ! 4336 tons, and for 1905 about 4200 tons. In the opening decades of the 19th century supplies began to be drawn from Banka; in 1820 this island contributed 1200 tons; the production was increased to 12,000 tons in 1900, when a diminution set in, 9960 tons being the output during 1905. Billiton became of note in 1853 with a production of 40 tons, which increased to ,,6000 in 1900 and has since declined to about 3000 tons in 1905. The Straits Settlements ranked as an important producer in 1870 with 2337 tons; it now supplies the greater part of the world's supply, contributing 46,795 tons in 1900, and over 60,006 tons in 1905. Australian deposits were worked in 1872, and" hi the following year the production was 3000 tons; the maximum outputs were in 1881–1883, averaging 10,000 tons annually; but the supply declined to 2420 tons in 1898 and has since increased tp about 5028 tons in 1905. Bolivia produced 501 tons in 1883, 10,245 in 1900 and 12,500 in 1905.

The world's supply in 1900 was 72,911 long tons; this increased in 1904 to 97,790 tons, but in 1905, principally owing to a shortage in the supplies from the Straits and Banka, the yield fell to 94,089 tons. ' . , '

Metallurgy. — The operations in the metallurgy of tin may be enumerated as: (1) mining and dressing, (2) smeltingy (3) refining. The first stage has for its purpose the production of a fairly pure tinstone; the second the conversion of the oxide into metallic tin; and the third preparing a tin pure enough for commercial purposes.

Mining and Dressing. — The alluvial deposits are almost invariably worked opencast, those of the Malay Peninsula and Archipelago chiefly by Chinese

labour : in a few instances hydraulic mining has been resorted to, and in other cases true underground mining is carried on ; but the latter is both exceptional and difficult. The alluvial extracted, which in the Malay Peninsula and Archipelago carries from 5 to 60 lb of tinstone (or " black tin," as it is termed 1 by Cornish miners) to the cubic yard of gravel, is Washed in various simple sluicing appliances, by which the lighter clay, sand and stones are removed and tinstone is left behind comparatively pure, con- taining usually 65 to 75 % of metallic tin (chemically pure tinstone contains 78 -7%).

Lode tin, as tinstone derived from primary deposits is often termed, is mined in the ordinary method, the very hard gangue in

which it occurs necessitating a liberal use of explosives. The vein- stuff is broken small either by hand or in rock-breakers, and stamped to fine powder in stamp mills, which are practically large mechani- cally-worked pestles and mortars, the stamp proper weighing from 500 to 1000 lb. The mineral, crushed small enough to pass a sieve with perforations £, in. in diameter, leaves the stamps in suspension in water, and passes through a series of troughs in which the heavier mineral is collected; this then passes through a series of washing operations, which leaves a mixture consisting chiefly of tinstone and arsenical pyrites, which is calcined and washed again, until finally black tin containing about 60 to 65 % of metal is left. The calcina- tion is preferably effected in mechanical roasters, it being especially necessary to agitate the ore continually, otherwise it cakes. The crude tinstuff raised in Cornwall carries on an average a little over 2 % of black tin. The Bolivian tin ore is treated by first extracting the silver by amalgamation, &c, and afterwards concentrating the residues; there are,

however, considerable difficulties in the way of treating the poorer of these very complex ores, and several chemical processes for extracting their metallic contents have been worked out. Of the impurities of the ore the wolframite (tungstate of iron and manganese) is the most troublesome, because on account of its high specific gravity it cannot be washed away as gangue. To remove it, Oxland fuses the ore with a certain proportion of carbonate of soda, which suffices to convert the tungsten into soluble alkaline tungstate, without producing noteworthy quantities of soluble stannate from the oxide of tin ; the tungstate is easily removed by treatment with water.

2. Smelting. — The dressed ore is smelted wjth carbon by one of two main methods, viz. either in the shaft furnace or the reverbera- tory ; the former is the better suited to stream tin, the latter 1 to lode tin, but either ore can be smelted in either way, although reverbera- tory practice yields a purer metal. Shaft furnace smelting is confined to those parts of the world where charcoal can still be obtained in large quantities at moderate prices. The furnace consists of a shaft, circular (or more rarely rectangular) in plan, into which alternate layers of fuel and ore are charged, an air blast being generally injected near to the bottom of the furnace through one or more tuyeres. This was the primitive process all over the world ; in the East, South America and similar regions it still holds its own. In Europe, Australasia and one large works at Singapore it has been practically replaced by the reverberatory furnace process, first introduced into Cornwall about the year 1700. In this process the purified ore is mixed with about one-fifth of its weight of a non- caking coal or anthracite smalls, the mixture being moistened to prevent it from being blown off by the draught, and is then fused on the sole of a reverberatory furnace for five or six hours. The slag and metal produced are then run off and the latter is cast into bars; these are in general contaminated with, iron, arsenic, copper and other impurities.

3. Refining. — All tin, except a small quantity produced by the shaft furnace process from exceptionally pure stream tin ore, requires refining by liquation and " boiling " before it is ready for the market. In the English process the bars are heated cautiously on an inclined hearth, when relatively pure tin runs off, while a skeleton of impure metal remains. The metal run off is further purified by poling, i.e. by stirring it with the branch of a tree — the apple tree being preferred traditionally. This operation is no doubt intended to remove the oxygen diffused throughout the metal as oxide, part of it perhaps chemically by reduction of the oxide to metal, the rest by conveying the finely diffused oxide to the surface and causing it to unite there with the oxide scum. After this the metal is allowed to rest for a time in the pot at a temperature above its freezing point and is then ladled out into ingot forms, care being taken at each stage to ladle off the top stratum. The original top stratum is the purest, and each succeeding lower stratum has a greater proportion of impurities; the lowest consists largely of a solid or semi-solid alloy of tin and iron.

To test the purity of the metal the tin-smelter heats the bars to a certain temperature just below the fusing point, and then strikes them with a hammer or lets them fall on a stone floor from a given height. If the tin is pure it splits into a mass of granular strings. Tin which has been thus manipulated and proved incidentally to be very pure is sold as grain tin. A lower quality goes by the name of block tin. Of the several commercial varieties Banka tin is the purest; it is indeed almost chemically pure. Next comes English grain tin.

For the preparation of chemically pure tin two methods are employed. (1) Commercially pure tin is treated with nitric acid, which converts the tin proper into the insoluble metastannic acid, while the copper, iron, &c, become nitrates; the metastannic acid is washed first with dilute nitric acid, then with water, and is lastly dried and

reduced by fusion with black flux or potassium cyanide. (2) A solution of pure stannous chloride in very dilute hydrochloric acid is reduced with an electric current. According to Stolba, beautiful crystals of pure tin can be obtained as follows: A platinum basin, coated over with wax or paraffin outside, except a small circle at the very lowest point, is placed on a plate of amalgamated zinc, lying on the bottom of a beaker, and is filled with a solution of pure 'Stannous chloride. The beaker also is cautiously filled with acidu- lated water up to a point beyond the edge of the platinum basin.

The whole is then left to itself, when crystals of tin gradually separate out on the bottom of the basin.

Properties. — An ingot of tin is pure white (except for a slight tinge of blue) ; the colour depends, however, upon the temperature at which it is poured — if too low, the surface is dull, if too high, iridescent. It exhibits considerable lustre and is not subject to tarnishing on exposure to normal air. The metal is pretty soft and easily flattened out under the hammer, but almost devoid of tenacity .1 That it is elastic, with narrow limits, is proved by its clear ring when struck with a hard body in circumstances permitting of free vibration. The specific gravity of cast tin is 7–29, of rolled tin 7–299, and of electrically deposited tin 7–143 to 7–178. A tin ingot is distinctly crystalline; hence the characteristic crackling noise, or "cry " of tin, which a bar of tin gives out when being bent; This structure can be rendered visible by superficial etching with dilute acid ; and as the minuter crystals dissolve more quickly than the larger ones, the surface assumes a frosted appearance (moiree metattique). The metal is dimorphous: by cooling molten tin at ordinary air temperature tetragonal crystals are obtained, while by cooling at a tempera- ture just below the melting point rhombic forms are produced. When exposed for a sufficient time to very low temperatures (to — 39° C. for 14 hours), tin becomes so brittle that it falls into a grey powder, termed the grey

modification, under a pestle; it indeed sometimes crumbles into powder spontaneously. At ordinary temperatures tin proves fairly ductile under the hammer, and its ductility seems to increase as the temperature rises up to about 100° C. At some temperature near its fusing point it becomes brittle, and still more brittle from — 14 C. downwards. Iron renders the metal hard and brittle; arsenic, antimony and bismuth (up to 0-5%) reduce its tenacity; copper and lead (1 to 2%) make it harder and stronger but impair its malleability; and stannous oxide reduces its tenacity Tin fuses at about 230 C. ; at a red heat it begins to volatilize slowly; at 1600° to 1800° C. it boils. The hot vapour produced combines with the oxygen of the air into white oxide, Sn02. Its coefficient of linear expansion between 0° and 100° is 0-002717; its specific heal 0-6562; its thermal and electrical conductivities are 145 to 152 and 114-5 t0 I 4 ' 1 respectively compared to silver as 1000.

Industrial A pplications.~ Commercially pure tin is used for making such apparatus as evaporating basins, infusion pots, stills, &c. It is also employed for making two varieties of tin-foil — one for the silvering of mirrors (see Mirror), the other for wrapping up choco- late, toilet soap, tobacco, &c. The mirror foil must contain some copper to prevent it from being too readily amalgamated by the mercury. For making tin-foil the metal is rolled into thin sheets, pieces of which are beaten out with a wooden mallet. As pure tin does not tarnish in the air and is proof against acid liquids, such as vinegar, lime juice, &c, it is utilized for culinary and domestic vessels. But it is expensive, and tin vessels have to be made very heavy to give them sufficient stability of form ; hence it is generally employed merely as a protecting coating for utensils made essentially of Copper or iron. The tinning of a copper basin is an easy operation. The basin, made scrupulously clean, is heated to beyond the fusing point of tin. Molten tin is then poured in, a little powdered sal- ammoniac added, and the tin spread over the inside with a bunch of tow. The

sal-ammoniac removes the last unavoidable film of oxide, leaving a purely metallic surface, to which the tin adheres firmly. For tinning small objects of copper or brass (i.e. pins, hooks, &c.) a wet-way process is followed. One part of cream of tartar, two of alum and two of common salt are dissolved in boiling water, and the solution is boiled with granulated metallic tin (or, better, mixed with a little stannous chloride) to produce a tin solution; and into this the articles are put at a boiling heat. In the absence of metallic tin there is no visible change; but, as soon as the metal is introduced, an electrolytic action sets in. and the articles get coated over with a firmly adhering film of tin. Tinning wrought iron is effected by immersion. The most important form of the operation is making tinned from ordinary sheet iron (making what is called " sheet tin "); This process was mentioned by Agricola ; it was practised in Bohemia in 1620, and in England a century later. The iron plates, having been carefully cleaned with sand and hydrochloric or sulphuric acid, and lastly with water, are plunged into heated tallow to drive away the water without oxidation of the metal. They are next steeped in a bath, first of molten ferruginous, then of pure tin. They are then taken out and kept suspended in hot tallow to enable the surplus tin to run off. The tin of the second bath dissolves iron gradually and becomes fit for the first bath. To tin cast-iron articles they must be decarburetted superficially by ignition within a bath of ferric oxide (powdered haematite or similar material), then cleaned with acid, and tinned by immersion, as explained above, (See Tin-Plate.) By far the greater part of the tin produced metallurgically is used for making tin alloys (see Pewter, Bronze).

Compounds of Tin.

Tin forms two well-marked series of salts, in one of which it js divalent, these salts being derived from stannous oxide, SnO, in the other it is tetravalent, this series being derived from stannic oxide, Sn02.

Stannous Oxide, SnO, is obtained in the hydrated

form Sn 2 0(OH)s from a solution of stannous chloride by addition of sodium car- bonate; it forms a white precipitate, which can be washed with

air-free water and dried at 80° C. without much change by oxidation ; if it be heated in carbon dioxide the black SnO remains. Precipi- tated stannous hydrate dissolves readily in caustic potash ; if the solution is evaporated quickly it suffers decomposition, with forma- tion of metal and stannate, 2SnO+2KOH = K 2 Sn0 3 -|-Sn+H 2 0. If it is evaporated slowly, anhydrous stannous oxide crystallizes out in forms which are combinations of the cube and dodecahedron. Dry stannous oxide, if touched with a glowing body, catches fire and burns to stannic oxide, Sn0 2 . Stannous oxalate when heated by itself in a tube leaves stannous oxide.

Stannic Oxide, Sn0 2 . — This, if the term is taken to include the hydrates, exists in a variety of forms. (1) Tinstone (see above and also Cassiterite) is proof against all acids. Its disintegration for analytical purposes can be effected by fusion with caustic alkali in silver basins, with the formation of soluble stannate, or by fusion with sulphur and sodium carbonate, with the formation of a soluble thiostannate. (2 J A similar oxide (flores jovis) is produced by burn- ing tin in air at high temperatures or exposing any of the hydrates to a strong red heat. Such tin-ash, as it is called, is used for the polishing of optical glasses. Flores stanni is a finely divided mixture of the metal and oxide obtained by fusing the metal in the presence of air for some time. (3) Metastannic acid (generally written HioSnsOu, to account for the complicated composition of meta- stannates, e.g. the sodium salt HsNa 2 Sn 5 0u) is the white compound produced from the metal by means of nitric acid. It is insoluble in water and in nitric acid and apparently so in hydrochloric acid; but if heated with this last for some time it passes into a

compound, which, after the acid mother liquor has been decanted off, dissolves in water. The solution when subjected to distillation behaves very much like a physical solution of the oxide in hydrochloric acid, while a solution of orthostannic acid in hydrochloric acid behaves like a solution of SnCU in water, i.e. gives off no hydrochloric acid, and no precipitate of hydrated SnC>2. Metastannic acid is distin- guished from orthostannic acid by its insolubility in nitric and sul- phuric acids. The salts are obtained by the action of alkalies on the acid. (4) Orthostannic acid is obtained as a white precipitate on the addition of sodium carbonate or the exact quantity of precipitated calcium carbonate to a solution of the chloride. This acid, HaSnCh, is readily soluble in acids forming stannic salts, and in caustic potash and soda, with the formation of orthostannates. Of these sodium stannate, Na 2 Sn0 3 , is produced industrially by heating tin with Chile saltpetre and caustic soda, or by fusing very finely powdered tinstone with caustic soda in iron vessels. A solution of the pure salt yields fine prisms of the composition Na2Sn0 3 + loH20, which effloresce in the air. The salt is used as a mordant in dyeing and calico-printing. Alkaline and other stannates when treated with aqueous hydrofluoric acid are converted into fluostannates (e.g. K 2 Sn0 3 into K 2 SnF 6), which are closely analogous to, and isomorphous with, fluosilicates.

A colloidal or soluble stannic acid is obtained by dialysing a mixture of tin tetrachloride and alkali, or of sodium stannate and hydro- chloric acid. On heating it is converted into colloidal metastannic acid.

A hydrated tin trioxide, Sn0 3 , was obtained by Spring by adding barium dioxide to a solution of stannous chloride and hydrochloric acid ; the solution is dialysed, and the colloidal solution is evaporated to form a white mass of 2Sn0 3 -H20.

Stannous Chloride, SnCU, can only be obtained pure by heating pure tin in a current of pure dry

hydrochloric acid gas. It is a white solid, fusing at 250° C. to an oily liquid which boils at 606S, and volatilizing at a red heat in nitrogen, a vacuum or hydrochloric acid, without decomposition. The vapour density below 700 C. corresponds to Sn_2Cl_4, above 8oo° C. to nearly $SnCl_2$. The chloride readily combines with water to form a crystallizable hydrate $SnCl_2 - 2Hj0$, known as " tin salt " or " tin crystals." This salt is also formed by dissolving tin in strong hydrochloric acid and allowing it to crystallize, and is industrially prepared by passing sufficiently hydrated hydrochloric acid gas over granulated tin contained in stoneware bottles and evaporating the concentrated solution produced in tin basins over granulated tin. The basin itself is not attacked. The crystals are very soluble in cold water, and if the salt is really pure a small proportion of water forms a clear solution ; but on adding much water most of the salt is decomposed, with the formation of a precipitate of oxychloride, $2Sn(OH)Cl-H_2O$. According to Michel and Kraft, one litre of cold saturated solution of tin crystals weighs 1827 grammes and contains 1333 grammes of $SnCl_2$. The same oxychioride is produced when the moist crystals, or their solution, are exposed to the air. Hence all tin crystals as kept in the laboratory give with water a turbid solution, which contains stannic in addition to stannous chloride. The complete conversion of stannous into stannic chloride may be effected by a great many reagents — for instance, by chlorine (bromine, iodine) readily; by mercuric chloride in the heat, with precipitation of calomel or metallic mercury; by ferric chloride in the heat, with formation of ferrous chloride; by arsenious chloride in strongly hydrochloric solutions, with precipitation of chocolate-brown metallic arsenic. All these reactions are available as tests for " stannosum " or the respective agents. In opposition to stannous chloride, even sulphurous acid (solution) behaves as an oxidizing: agent. If the two reagents are mixed a precipitate of yellow stannic

sulphide is produced. A strip of metallic zinc when

placed in a solution of stannous chloride precipitates the tin in crystals and takes its place in the solution. Stannous chloride is largely used in the laboratory as a reducing agent, in dyeing as a mordant.

Stannic Chloride, SnCU, named by Andreas Libavius in 1605 Spiritus argenti vivi sublimati from its preparation by distilling tin or its amalgam with corrosive sublimate, and afterwards termed Spiritus fumans Libavii, is obtained by passing dry chlorine ovei granulated tin contained in a retort; the tetrachloride distils over as a heavy liquid, from which the excess of chlorine is easily removed by shaking with a small quantity of tin filings and re-distilling. It is a colourless fuming liquid of specific gravity 2-269 at °°; it freezes at —33° C, and boils at 113-9°. The chloride unites energetically with water to form crystalline hydrates (e.g. SnCL-3H20), easily soluble in water. With one-third its weight of water it forms the so-called ″ butter of tin.″ It combines readily with alkaline and other chlorides to form double salts, e.g. M 2 SnClt, analogous to the chloroplatinates ; the salt (NH^SnCle is known industrially as ″ pink salt ″ on account of its use as a mordant toproduce a pink colour. The oxymuriate of tin used by dyers is SnCl4-5H 2 0. The plain chloride solution is similarly used. It is usually prepared by dissolving the metal in aqua regia.

Stannous Fluoride, SnF 2 , is obtained as small, white monoclinic tables by evaporating a solution of stannous oxide in hydrofluoric acid in a vacuum. Stannic Fluoride, SnF 4 , is obtained in solution by dissolving hydrated stannic oxide in hydrofluoric acid; it forms a characteristic series of salts, the stannofluorides, M 2 SnF e , iso- morphous with the silico-, titano-, germano- and zirconofluorides. Stannous bromide, SnBr 2 , is a light yellow substance formed from tin and hydrobromic acid. Stannic bromide, SnBn, is a white crystalline mass, melting at 33° and boiling at 201 °, obtained by the combi«ation of tin and bromine, preferably in carbon bisulphide solution. Stannous iodide, Snl 2 , forms

yellow red needles, and is obtained from potassium iodide and stannous chloride. Stannic iodide, SnL, forms red octahedra and is prepared similarly to stannic bromide. Both iodides combine with ammonia.

Stannous sulphide, SnS, is obtained as a lead-grey mass by heating tin with sulphur, and as a brown precipitate by adding sulphuretted hydrogen to a stannous solution ; this is soluble in ammonium poly- sulphide, and dries to a black powder. Stannic sulphide, SnSj, is obtained by heating a mixture of tin (or, better, tin amalgam), sulphur and sal-ammoniac in proper proportions in the beautiful form of aurum musivum (mosaic gold) — a solid consisting of golden yellow, metallic lustrous scales, and used chiefly as a yellow "bronze " for plaster-of- Paris statuettes, &c. The yellow precipitate of stannic sulphide obtained by adding sulphuretted hydrogen to a stannic solution readily dissolves in solutions of the alkaline sulphides to form thiostannates of the formula M 2 SnS 3 ; the free acid, H^SnSj, may be obtained as an almost black powder by drying the yellow- precipitate formed when hydrochloric acid is added to a solution of a thiostannate.

Analysis. — Tin compounds when heated on charcoal with sodium carbonate or potassium cyanide in the reducing blowpipe flame yield the metal and a scanty ring of white SnOj. Stannous salt solutions yield a brown precipitate of SnS with sulphuretted hydrogen, which is insoluble in cold dilute acids and in real sulphide of ammonium, (NH 4) 2 S; but the yellow, or the colourless reagent on addition of sulphur, dissolves the precipitate as SnS 2 salt. The solution on acidification yields a yellow precipitate of this sulphide. Stannic salt solutions give a yellow precipitate of SnSj with sulphuretted hydrogen, which is insoluble in cold dilute acids but readily soluble in sulphide of ammonium, and is re-precipitated therefrom as SnSj on acidification. Only stannous salts (not stannic) give a precipitate of calomel in mercuric chloride solution. A mixture of stannous and stannic chloride, when, added to a sufficient quantity of solution of chloride of gold, gives an intensely purple precipitate of gold purple

(purple of Cassius). The test is very delicate, although the colour is not in all cases a pure purple. Tin is generally quantita- tively estimated as the dioxide. The solutions are oxidized, precipi- tated with ammonia, the precipitate dissolved in hydrochloric acid, and re-thrown down by boiling with sodium sulphate. The precipitate is filtered, washed, dried and ignited.

Bibliography. — For the history of tin and statistics of its production, &c, see Bernard Neumann, Die Metalle (1904); A. Rossing, Geschichte der Metalle (1901). For its chemistry see Roscoe and Schorlemmer, Treatise on Inorganic Chemistry, vol. ii.; H. Moissan, Traite de chimie mine'rale; O. Dammer, Handbuch der anorganischen Chemie. For its production and metallurgy see Sydney Fawns, Tin Deposits of the World; A. G. Charleton, Tin Mining; Henry Louis, The Production of Tin, and C. Schnabel, Handbook of Metallurgy (English trans, by Louis, 1907). General statistical information, and improvements in the metallurgy, &c, are recorded annually in The Mineral Industry.

TINAMOU, the name given in Guiana to a certain bird, as stated in 1741 by P. Barrere {France iquinoxiale, p. 138), from whom it was taken and used in a more general sense by Buffon (Hist. not. oiseaux. iv. 502). In 1783 J. Latham (Synopsis, ii. 7. '4) adoplcd it as English, and in 1790 (Index, ii. 633) Latinized

it Tinamus, as the name of a new and distinct genus. The " Tinamou " of Barrere has been identified with the " Macu- cagua " described and figured by Marcgrav in 1648, and is the Tinamus major of modern authors. 1

Buffon and his successors saw that the Tinamous, though passing among the European colonists of South America as " Partridges, ' could not be associated

with those birds, and Latham's step, above mentioned, was generally approved. The genus he had founded was usually placed among the Gallinae, and by many writers was held to be allied to the bustards, which, it must be remembered, were then thought to be " struthious." Indeed the likeness of the Tinamou's bill to that of the Rhea {a.v.) was remarked in 181 1 by Illiger. On the other hand L'Hermimer in 1827 saw features in the Tinamou's sternum that in his judgment linked the bird to the Rallidae. In 1830 J. Wagler {Nat. Syst. Amphibien, &c., p. 127) placed the Tinamous in the same order as the ostrich and its allies ; find, though he did this on very insufficient grounds, his assignment has turned out to be not far from the mark, as in 1862 the great affinity of these groups was shown by W. K. Parker's researches, which were afterwards printed in the Zoological Transactions (v. pp. 205–232, 236–238, pis. xxxix.xli.), and was further substan tiated by him in the Philosophical Transactions (1866, pp. 174–178, pi. xv.). Shortly after this T. H. Huxley in his often-quoted paper in the Zoological Proceedings (1867, pp. 425, 426) was enabled to place the whole matter in a clear light, urging that the Tinamous formed a very distinct group of birds which, though not to be removed from the Carinatae, presented so much resemblance to the Ratitae as to indicate them to be the bond of union between those two great divisions. The group from the resemblance of its palatal characters to those of the Emeu {q.v.), Dromaeus, he called Dromaeognathae, but it is now more usual to place them in a separate order, the Tinamiformes.

The Tinamous are comparatively insignificant in numbers. They are peculiar to the neotropical region — a few species finding their way into southern Mexico and none beyond. Some of them inhabit forests and others the more open country; but setting aside size (which in this group varies from that of a quail to that of a large common fowl) there is an unmistakable uniformity of appearance among them as a whole, so that almost anybody having seen' one species of the group would always recognize another.

Yet in minor characters there is considerable difference among them ; and about sixty-four species are recognized, divided into the genera Tinamus, Nothocercus, Crypturus, Rhynchotus, Nothoprocla, Nothura, Taoniscus and Tinamotis.

To the ordinary spectator Tinamous have much the look of partridges, but the more attentive observer will notice that their

Rufous Tinamou {Rhynchotus rufescens),

/longated bill, their small head and slender neck, clothed with very short feathers, give them a different air. The plumage is generally inconspicuous: some tint of brown, ranging from rufous to slaty, and often more or less closely barred with a darker shade or black, is the usual style of coloration; but some species are characterized by a white throat or a bay breast. The wings are short and rounded, and in some forms the feathers

1 Brisson and after him Linnaeus confounded this bird, which they had never seen, with the Trumpeter {q.v.).

of the tail, which in all are hidden by their coverts, are soft. In bearing and gait the birds show some resemblance to their distant relatives the Ratitae, and A. D. Bartlett showed (Proc. Zool. Soc, 1868, p. 115, pi. xii.) that this is especially seen in the newly hatched young. He also noticed the still stronger Ratite character, that the male takes on himself the duty of incubation. The eggs are very remarkable objects, curiously unlike those of other birds; and their shell looks as if it were of highly-burnished metal or glazed porcelain, presenting also various colours, which seem to be constant in the particular species, from pale primrose to sage-green or light indigo, or from chocolate brown to pinkish orange. All who have eaten it declare the flesh of the Tinamou to have a most delicate taste, as it has a most inviting appearance, the pectoral muscles being semi-opaque.

Of their habits not much has been told. Darwin {J own. ch. iii.) has remarked upon the silliness they show in allowing themselves to be taken, and this is wholly in accordance with what W. K. Parker observes of their brain capacity and is an additional testimony to their low morpho- logical rank. At least one species of Tinamou has bred not infrequently in confinement, and partly successful attempts to naturalize the species Rhynchotus rufescens have been made in England. (A. N._)

TINCTURE (Fr. teinture, Lat. tinctura, tingere, to dye, stain), the colour with which a substance is dyed; hence, metaphori- cally, distinctive character or quality. The term is used in heraldry of the metals, argent, or, of the colours, gules, azure, sable, vert, &c, or of the furs, ermine, vair, &c. Since the 1 6th century a conventional arrangement of lines and dots gives the equivalents of these tinctures in black and white (see Heraldry). In medicine, a tincture is a fluid solution of the essential properties of some substance, animal, vegetable or mineral; the menstruum being either alcohol, ether or ammonia; the various kinds are accordingly distinguished as alcoholic, etherial or ammoniated tinctures.

TINDAL, MATTHEW (d. 1733), English deist, the son of a clergyman, was born at Beer Ferrers (Ferris), Devonshire, probably in 1653. He studied law at Lincoln College, Oxford, under the high churchman George Hickes, dean of Worcester; in 1678 he was elected fellow of All Souls College. About 1685 he saw " that upon his High Church notions a separation from the Church of Rome could not ,be justified," and accordingly he joined the latter. But discerning " the absurdities of popery," he returned to the Church of England at Easter 1688. His early works were an Essay of Obedience to the Supreme Powers (1694); an Essay on the Power of the Magistrate and the Rights of Mankind in Matters of Religion (1697); and The Liberty of the Press (1698). T^he first of his two larger works, The Rights of the Christian Church associated against the Romish and all other priests who claim an independent power over it, pt.

i., appeared anonymously in 1706 (2nd ed., 1706; 3rd, 1707; 4th, 1709). The book was regarded in its day as a forcible defence of the Erastian theory of the supremacy of the state over the Church, and at once provoked criticism and abuse. After several attempts to proscribe the work had failed, a case against the author, publisher and printer succeeded on the 12th of December 1707, and another against a bookseller for selling a copy the next day. The prosecution did not prevent the issue of a fourth edition and gave the author the opportunity of issuing A Defence of the Rights of the Christian Church, in two parts (2nd ed., 1709). The book was, by order of the House of Commons, burned, along with Sacheverell's setmon, by the common hangman (1710). It continued to be the subject of denunciation for years, and Tindal believed he was charged by Dr Gibson, bishop of London, in a. Pastoral Letter, with having undermined religion and promoted atheism and infidelity — a charge to which he replied in the anonymous tract, An Address to the Inhabitants of London and Westminster, a. second and larger edition of which appeared in 1730. In this tract 2 he makes a valiant defence of the deists, and anticipates

! A Second Address to the Inhabitants, &c, with replies to Some of the critics of that book, bears the same date (1730), though some of the works it refers to appeared in 1731.

here and there his Christianity as Old as the Creation; or, the Gospel a Republication of the Religion of Nature (London, 1 730, 2nd ed., 1731; 3rd, 1732; 4th, 1733), which was regarded as the " Bible " of deism. It was really only the first part of the whole work, and the second, though written and entrusted in manu- script to a friend, never saw the light. The work evoked many replies, of which the ablest were by James Foster (1730), John Conybeare (1732), John Leland (1733) and Bishop Butler (1736). It was translated into German by J.

Lorenz Schmidt (1741), and from it dates the influence of English deism on German theology. Tindal had probably adopted the principles it expounds before he wrote his essay of 1697. He claimed the name of ” Christian deist,” holding that true Christianity is identical with the eternal religion of nature. He died at Oxford on the 16th of August

1733–

The religious system expounded in Christianity as Old as the Creation, unlike the earlier system of Lord Herbert of Cherbury, was based on the empirical principles of Locke. It assumed the traditional deistic antitheses of external and internal, positive and natural, revelations and religions, and perpetuated at the same time the prevalent misconceptions as to the nature of religion and revela- tion. The system was worked out by the a priori method, with an all but total disregard of the fa,cts of religious history. It starts from the assumptions that true religion must, from the nature of God and things, be eternal, universal, simple and perfect; that this religion can consist of nothing but the simple and universal duties towards God and man, the first consisting in the fulfilment of the second — in other words, the practice of morality. The author’s moral system, somewhat confused and inconsistent, is essentially utilitarian. True revealed religion is simply a republication of the religion of nature or reason, and Christianity, if it is the perfect religion, can only be that republication, and must be as old as crea- tion. The special mission of Christianity, therefore, is simply to deliver men from the superstition which had perverted the religion of nature. True Christianity must be a perfectly ” reasonable service,” reason must be supreme, and the Scriptures as well as all religious doctrines must submit ; only those writings can be regarded as divine Scripture which tend to the honour of God and the good of man. The strength of Tindal’s position was the conviction of the essential harmony between man’s religious and rational nature. Its weakness

from the standpoint of modern theology was that, like the whole religious philosophy of the time, it was founded on a misconception of religion and revelation, and on a disregard of the course of man's religious development.

See works quoted under Deism.

TINDER (O. Eng. tyndre, from tindan, tendan, to kindle, cf. Dan. fonder, Ger. anzilnden), a term applied to any dry substance that will readily take light from a spark and so be used for kindling a fire. Before the invention of matches (see Match) fire or light was procured by the ignition of tinder through sparks obtained by the striking of flint against steel, the whole apparatus of tinder, flint and steel being contained in a metal box, which was an essential utensil of all households and was also carried on the person of everyone who might require a light in an emergency. The usual material of " tinder " was a mass of charred linen, but the term was also applied to " touchwood," or wood converted into an easily ignitible consistency by the action of certain fungi. Another form of " tinder " was " touchpaper," paper dipped in nitre and used as a slow-match for igniting gunpowder. In both these words " touch " stands for an earlier tach, tache or tasshe, tinder, of which the origin is unknown. It may be related to Du. tak, bough, twig, and would thus mean dried twigs used as tinder.

TINEO, a town of northern Spain, in the province of Oviedo; on a small tributary of the river Narcea, among the northern outliers of the Cantabrian Mountains, and on the high road from Cangas de Tineo to the Biscayan port of Cudillero. Pop. (1900), 21,865. Mining, agriculture and stock-rearing are the principal industries.

TINKER, an itinerant mender of kettles, pots, pans, &c. The name means simply one who makes a tinkling sound as he mends the vessels, and the word is found as " tinkler " in the 16th century. From early times " tinkers " were looked on as vagabonds, and were so classed in the act of Elizabeth against vagrancy.

TINNE, ALEXANDRINE PETRONELLA FRANCINA (1839- 1869)^ Dutch traveller in Africa, born at the Hague on the 17th

of October 1839, was the daughter of Philip F. Tinne, a Dutch merchant who settled in England during the Napoleonic wars, but afterwards returned to his native land, and of his wife, Baroness Van Steengracht-Capellan. Her father died when she was five years old, leaving her the richest heiress in the Nether- lands. After travelling in Norway, Italy and the East, and visiting Egypt, when she ascended the Nile to near Gondokoro, Miss Tinne left Europe again in 1861 for the Nile regions. Ac- companied by her mother and her aunt, she set out from Cairo on the 9th of January 1862. After a short stay at Khartum the party ascended the White Nile to a point above Gondokoro, and explored a part of the Sobat, returning to Khartum in November. Baron Theodor von Heuglin (q.v.) and Dr H. Steudner having meantime joined the ladies at Khartum, the whole party set out in February 1863 for the Bahr-el-Ghazal. The intention was to explore that region and ascertain how far westward the Nile basin extended; also to investigate the reports of a vast lake in Central Africa eastwards of those already known — reports referring in all probability to the lake-like expanses of the middle Congo. '

Ascending the Bahr-el-Ghazal the limit of navigation was reached on the 10th of March. From Meshra-er-Rek a journey was made overland, across the Bahr Jur and south-west by the Bahr Kosango, to Jebel Kosango, on the borders of the Niam- Niam country. During the journey all the travellers suffered severely from fever. Steudner died in April and Madame Tinn6 in June, and after many fatigues and dangers the remainder of the party reached Khartum in July 1864, where Miss Tinne's aunt died. Miss Tinne returned to Cairo by Berber and Suakin. The geographical and scientific results of the expedition were highly important, as will be seen in Heuglin 's Die Tinn&schc Expedition im westlichen Nilgebiet (1863-1864 (Gotha, 1865), and Reise in das Gebiet des Weissen Nils Leipzig, 1869). A descrip- tion, by

T. Kotschy and J. Peyritsch, of some of the plants discovered by the expedition was published at Vienna in 1867 under the title of Plantes Tinniennes. At Cairo- Miss Tinn6 lived in Oriental style during the next four years, visiting Algeria, Tunisia and other parts of the Mediterranean. In January 1869 she started from Tripoli with a caravan, intending to proceed to Lake Chad, and thence by Wadai, Darfur and Kordofan to the upper Nile. On the 1st of August, however, on the route from Murzuk to Ghat, she was murdered, together with two Dutch sailors, by Tuareg in league with her escort, who believed that her iron water tanks were filled with gold.

See John A. Tinne's Geographical Notes of an Expedition in Central Africa by three Dutch Ladies (Liverpool, 1864), and Sir H. H. Johnston, The Nile Quest, ch. xvi. (London, 1903).

TINNEVELLY, a town and district of British India, in the Madras presidency. The town is on the left bank of the Tam- braparni river, on the other side of which is Palamcottah, the administrative headquarters of the district. Pop. (1901), 40,460. It is the terminus of a branch of the South Indian railway, 444 m. S.W. of Madras. Its most noteworthy building is a beautifully sculptured temple of Siva.

The District of Tinnevelly has an area of 5389 sq. m. It is for the most part a plain with an average elevation of 200 ft., sloping to the east with slight undulations. It is watered by numerous short streams, the principal being the Tambraparni with a length of 80 m. The chief irrigation work is the Srivaikuntam anicut or dam on this river. In the north the scenery is unattractive and the soil poor; in the south red sandy soil prevails in which little save the Palmyra palm will grow. This palm yields toddy as well as a coarse sugar. Along the banks of the rivers are rice-fields and a variety of trees' and crops; and coffee is grown on the slopes of the Travancore hills. The district contains many ancient and magnificent buildings. But the most interesting antiquities are the large sepulchral earthen urns of prehistoric races, which have been found at several

places, especially along the course of the Tambraparni; they contain bones, pottery, beads and bronze ornaments, iron weapons, implements, &c. The South Indian railway has its maritime terminus at Tuticorin, the chief seaport. The

principal exports are rice to Ceylon and cotton to Japan and Europe. In 1901 the population was 2,059,607, showing an increase of 8 % in the decade. The number of native Christians was 159,213, Tinnevelly being the most Christian district in India. The Society for the Propagation of the Gospel and the Church Missionary Society have important and flourishing stations at Tinnevelly town and Palamcottah, as also have the Jesuits. It was here that St Francis Xavier began his preaching in India. The Shanans, or caste of toddy-drawers, have supplied many converts to Christianity. In 1899 their treatment by the Vellalars, or cultivating caste, led to serious riots and bloodshed.

The early history of Tinnevelly is mixed up with that of Madura and Travancore. Down to 178 1 it is a confused tale of anarchy and bloodshed. In that year the nawab of Arcot assigned the revenues to the East India Company, which then undertook the internal administration. Several risings subse- quently took place, and in 1801 the whole Carnatic, including Tinnevelly, was ceded to the British.

TIN-PLATE and TERNE-PLATE. Tin-plate consists of sheets of iron or steel which have been thinly coated with tin by being dipped in a molten bath of that metal. Terne-plate is a similar product, but the bath is not of tin, but of tin and lead mixed, the latter metal constituting from 75-90% of the whole; it has not the bright lustre of tin-plate, whence its name, from terne, dull, tarnished. The sheets employed in the manufacture are known as " black plates," and are now of steel, either Bessemer or open-hearth. Formerly iron was used, and was of

two grades, coke-iron and charcoal-iron; the latter, being the better, received a heavier coating of tin, and this circumstance is the origin of the terms ″ coke plates ″ and ″ charcoal plates ″ by which the quality of tin-plate is still designated, although iron is no longer used. Tin-plate is consumed in enormous quantities for the manufacture of the tin cans in which pre- served meat, fish, fruit, biscuits, cigarettes and numerous other products are packed, and also for the household utensils of various kinds made by the tinsmith or silversmith; terne-plates, which began to be produced in England about the middle of the 19th century, are widely employed in America for roofing purposes.

The manufacture of tin-plate was long a monopoly of Bohemia, but about 1620 the industry spread to Saxony. In 1665 Andrew Yarranton (1616-1684?), an English engineer and agriculturist, was commissioned to go to Saxony and if possible discover the methods employed. According to his own account {England's Improvement, pt. ii. 16S1), he was ″ very civilly treated ″ and was allowed to see the whole process. On his return to England his friends undertook the manufacture on an experimental scale, but though they were successful they had to abandon it, because their method became known and a patent for it was ″ trumpt up ″ by a rival, who, however, from lack of technical skill was unable to work it. Half a century later the manufacture was revived by Major John Hanbury (1664-1734) at Pontypool; the ″ method of rolling iron plates by means of cylinders,″ said to have been devised by him, enabled more uniform black plates to be produced than was possible with the old plan of hammering, and in consequence the English tin-plate became recognized as superior to the German. During the next hundred years or so the industry spread steadily in England and Wales, and after 1834 its expansion was rapid, especially in Wales, Great Britain becoming the chief source of the world's supply. In that year her total production was 180,000 boxes of 108 lb each (in America a box is 100 lb), in 1848 it was 420,000 boxes, in i860 it reached 1,700,000 boxes, in 1870

nearly 3,460,000 boxes, and in 1890 it exceeded 9,500,000 boxes. In the United States the manufacture of tin- and terne-plates did not make much way until about 1890, and up to 1892 the bulk of the supply was imported from Great Britain. But subsequently the advance was rapid, and the production, which was about 2,236,000 lb in 1891, had by 1900 increased to more than 849,000,000 lb, of which over 141,000,000 ft- were terne-plates. The total imports in that year were only 135,264,881 lb. In later years, again, there was a decline in the American production, and in 1907 only 20% of the American tin-plate mills were at work, while the British production reached 14 million boxes.

There are two processes for the tinning of the black plates. In the " palm-oil " process, which is the older, the plates, after being properly annealed, are scoured with sand and water and pickled in dilute sulphuric acid alternately until they are perlectly clean and bright. They are then washed in water, and after being boiled in

palm oil to remove all traces of acid and water are dipped into a bath of molten tin, covered with oil to prevent oxidation. They are then taken to a second bath containing purer tin than the first. After this they are scoured with a hempen rubber and dipped in a third bath containing the purest tin of all; then they are passed through rolls to finish the surface and regulate the thickness of the coating. As the tin in the third bath becomes alloyed with iron from the operation, it is removed into the second, pure fresh tin being substituted; and similarly the metal of the second, as the amount of iron in it increases, is removed to the first. In the " acid process " only a single bath of tin is required. The molten metal is covered with a layer of muriate of zinc, which acts as the flux, and by means of rolls the plates are passed through this down into the tin, to be brought out at another point in the bath where there is a layer of oil on the surface.

TINTAGEL, or Trevena, a village in the Launceston

parlia- mentary division of Cornwall, England, on the north coast, 45 m. from Camelford. Pop. (1901), 868. It stands on a bare upland, close to the sea; and below it is Tintagel Haven, or Porth, a small cove surrounded by cliffs of almost black slate. The scanty ruins of a castle are built partly on the mainland, partly on a rugged promontory spoken of as the Island, but united by a narrow peninsula to the shore. They have been celebrated as the birthplace of King Arthur, or as the stronghold of King Mark, in a host of medieval romances, and in the poems of Tenny- son and Swinburne. The Norman walls are so darkened and weathered that, from a little distance, they seem a part of the rock itself. Portions of a chapel remain, dating from the 13th century, and including a porch and a stone altar; while beside it are traces of a tomb hewn out of the slate, and of some domestic building which had a staircase and a pointed arch above the door. The cruciform parish church of St Marcelliana stands on a high cliff, west of the castle. Although it has been restored, there remain traces of Saxon workmanship in the chancel, besides two Norman doorways, a font of the same period, a stone altar bearing five crosses and a fine 15th-century brass. In the churchyard the graves are buttressed, storms being frequent and violent on this unprotected coast. For a time the church belonged to Fontevrault Abbey in Normandy; but it was made over by Edward IV. to the collegiate church of Windsor. A 9th-century roodstone stands in the village. Portions of the vicarage date from the 14th century, and in its garden there is a stone dovecote of great age. A little slate is quarried, being taken from the rocks below the church, and exported in the small vessels which can visit Tintagel Haven in calm weather. The magnificence of the coast has inspired more than one famous painting.

Tintagel (Tintajol, Dundagel) is a parish a portion of which appears in the Domesday Survey as Bossiney (Botcinnu). The latter was held in the time of the Confessor by a thegn of St Petrock and at the time of the survey by Robert, count of Mortain, of the

same saint. The castle probably existed in pre-Saxon times. Under the Norman earls of Cornwall this was rebuilt, embattled and furnished with munitions of war. Its officers included a constable and a chaplain. It was in a ruinous condition in Leland's time (c. 1540). Queen Elizabeth abolished the office of constable. In the parish of Tintagel is the hamlet of Bossiney which under the name of Tintagel received a charter (undated) from Richard king of the Romans, granting freedom to the borough and to the burgesses freedom from pon- tage and stallage throughout Cornwall, a market on Wednesdays and a three days' fair at Michaelmas. This charter was con- firmed in 1386. In 1333 the burgesses, those who held tenements within the borough, numbered 100. The borough, which apparently owed its existence to the castle, shared its fortunes. Leland calls attention to the decay of a great number of houses. Its charter was surrendered to Charles II. and a new one obtained from his brother in 1685. Under the latter a mayor, recorder, six common councillors, a coroner, six freemen and a common clerk were to constitute the corporation. For supplying vacancies in it the votes of those only who were members of it were required. Provision was made for the administration of the borough. Bossiney acquired the right of electing two mem- bers of parliament in 1553, the franchise being originally vested in the freeholders within the borough. By the middle of the

18th century the franchise had become restricted to the freemen or burgesses. In 1784 the vicar of Tintagel, as mayor and only qua'ined elector, enjoyed the probably unique privilege of return- ing two members to the House of Commons. In 1832 there were ten resident legal voters within the borough and nine out-voters. The Reform Act transferred their votes to the county. There is now no market, and the only fair is held on the 21st of October.

See Victoria County History: Cornwall; Sir J.

Maclean, History of Trigg Minor.

TINTERN ABBEY, in Monmouthshire, one of the most famous ecclesiastical ruins in England. It is beautifully situated on the right bank of the river Wye. The abbey was founded by Walter de Clare in 1131 for Cistercian monks. The existing church, however, dates from the later part of the 13th century; it is unroofed, and the nave is imperfect, but many of the finest details of a style transitional from Early English to Decorated are preserved. The church is cruciform. Cloisters and other monastic buildings, of which there are considerable remains, lay to the north of the church. The foundation was dissolved by Henry VIII. At the neighbouring village of Tintern Parva there is a station on a branch of the Great Western railway.

TINTORETTO, JACOPO ROBUSTI (1 518–1594), one of the greatest painters of the Venetian school, was born in Venice in 1 518, though most accounts say in 1512. His father, Battista Robusti, was a dyer, or "tintore"; hence the son got the nickname of " Tintoretto," little dyer, or dyer's boy, which is Englished as Tintoret. In childhood Jacopo, a born painter, began daubing on the dyer's walls; his father, noticing his bent, took him round, still in boyhood, to the studio of Titian, to see how far he could be trained as an artist. We may suppose this to have been towards 1533, when Titian was already (according to the ordinary accounts) fifty-six years of age. Ridolfi is our authority for saying that Tintoret had only been ten days in the studio when Titian sent him home once and for all. The reason, according to the same writer, is that the great master observed some very spirited drawings, which he learned to be the production of Tintoret; and it is inferred that he became at once jealous of so promising a scholar. This, however, is mere conjecture; and perhaps it may be fairer to suppose that the drawings exhibited so much independence of manner that Titian judged that young Robusti, although he might become a painter, would never be properly a pupil. From this time forward the two

always remained upon distant terms — Robusti being indeed a professed and ardent admirer of Titian, but never a friend, and Titian and his adherents turning the cold shoulder to Robusti. Active disparagement also was not wanting, but it passed unnoticed by Tintoret. The latter sought for no further teaching, but studied on his own account with laborious zeal; he lived poorly, collecting casts, bas-reliefs, &c, and prac- tising by their aid. His noble conception of art and his high personal ambition were evidenced in the inscription which he placed over his studio — " II disegno di Michelangelo ed il colorito di Tiziano " (Michelangelo's design and Titian's colour). He studied more especially from models of Michelangelo's " Dawn," " Noon," " Twilight " and " Night," and became expert in modelling in wax and clay — a method (practised likewise by Titian) which afterwards stood him in good stead in working out the arrangement of his pictures. The models were sometimes taken from dead subjects dissected or studied in anatomy schools; some were draped, others nude, and Robusti was wont to suspend them in a wooden or cardboard box, with an aperture for a candle. Now and afterwards he very frequently worked by night as well as by day. The young painter Schiavone, four years Robusti's junior, was much in his company. Tintoret helped Schiavone gratis in wall-paintings; and in many subse- quent instances he worked also for nothing, and thus succeeded in obtaining commissions. The two earliest mural paintings of Robusti — done, like others, for next to no pay — are said to have been " Belshazzar's Feast " and a " Cavalry Fight," both long since perished. Such, indeed, may be said to have been the fate of all his frescoes, early or later. The first work of his which attracted some considerable notice was a portrait-group

of himself and his brother — the latter playing a guitar — with a nocturnal effect; this also is lost. It was followed by some historical subject, which Titian was candid enough to praise. One of Tintoret's early pictures still extant is in the church of the Carmine in Venice, the " Presentation of Jesus in the Temple"; also in S. Benedetto are the "Annunciation" and " Christ with the Woman of Samaria." For the Scuola delta. Trinita (the scuole or schools of Venice were more in the nature of hospitals or charitable foundations than of educational institutions) he painted four subjects from Genesis. Two of these, now in the Venetian Academy, are " Adam and Eve " and the " Death of Abel," both noble works of high mastery, which leave us in no doubt that Robusti was by this time a consummate painter — one of the few who have attained to the highest eminence by dire study of their own, unseconded by any training from some senior proficient.

Towards 1 546 Robusti painted for the church of the Madonna dell' Orto three of his leading works — the " Worship of the Golden Calf," the " Presentation of the Virgin in the Temple," and the "Last Judgment" — now shamefully repainted; and he settled down in a house hard by the church. It is a Gothic edifice, looking over the lagoon of Murano to the Alps, built in the Fondamenta de' Mori, still standing, but let out cheap to artisans. In 1548 he was commissioned for four pictures in the Scuola di S. Marco — the " Finding of the body of St Mark in Alexandria" (now in the church of the Angeli, Murano), the " Saint's Body brought to Venice," a " Votary of the Saint delivered by invoking him from an Unclean Spirit " (these two are in the library of the royal palace, Venice), and the highly and justly celebrated "Miracle of the Slave." This last, which forms at present one of the chief glories of the Venetian Academy, represents the legend of a Christian slave or captive who was to be tortured as a punishment for some acts of devotion to the evangelist, but was saved by the miraculous intervention of the latter, who shattered the bone-breaking and blinding

implements which were about to be applied. These four works were greeted with signal and general applause, including that of Titian's intimate, the too potent Pietro Aretino, with whom Tintoret, one of the few men who scorned to curry favour with him, was mostly in disrepute. It is said, however, that Tintoret at one time painted a ceiling in Pietro's house; at another time, being invited to do his portrait, he attended, and at once proceeded to take his sitter's measure with a pistol (or a stiletto) , as a signifi- cant hint that he was not exactly the man to be trifled with. The painter having now executed the four works in the Scuola di S. Marco, his straits and obscure endurances were over. He married Faustina de' Vescovi, daughter of a Venetian nobleman. She appears to have been a careful housewife, and one who both would and could have her way with her not too tractable husband. Faustina bore him several children, probably two sons and five daughters.

The next conspicuous event in the professional life of Tintoret is his enormous labour and profuse self-development on the walls and ceilings of the Scuola di S. Marco, a building which may now almost be regarded as a shrine reared by Robusti to his own genius. The building had been begun in 1525 by the Lombardi, and was very deficient in light, so as to be particularly ill-suited for any great scheme of pictorial adornment. The painting of its interior was commenced in 1560. In that year five principal painters, including Tintoret and Paul Veronese, were invited to send in trial-designs for the centre-piece in the smaller hall named Sala dell' Albergo, the subject being S. Rocco received into Heaven. Tintoret produced not a sketch but a picture, and got it inserted into its oval. The competitors remonstrated, not unnaturally; but the artist, who knew how to play his own game, made a free gift of the picture to the saint, and, as a by-law of the foundation prohibited the rejection of any gift, it was retained in situ — Tintoret furnishing gratis the other decorations of the same ceiling. (This is one version of the anecdote: there is another

version, which, though differing in incident, has the like general bearing.) In 1565 he resumed work at the scuola, painting the magnificent " Crucifixion," for which a sum of

250 ducats was paid. In 1576 he presented gratis another centre-piece — that for the ceiling of the great hall, representing the " Plague of Serpents "; and in the following year he com- pleted this ceiling with pictures of the " Paschal Feast " and " Moses striking the Rock " — accepting whatever pittance the confraternity chose to pay. Robusti next launched out into the painting of the entire scuola and of the adjacent church of S. Rocco. He offered in November 1577 to execute the works at the rate of 100 ducats per annum, three pictures being due in each year. This proposal was accepted and was punctually fulfilled, the painter's death alone preventing the execution of some of the ceiling-subjects. The whole sum paid for the scuola throughout was 2447 ducats. Disregarding some minor per- formances, the scuola and church contain fifty-two memorable paintings, which may be described as vast suggestive sketches, with the mastery, but not the deliberate precision, of finished pictures, and adapted for being looked at in a dusky half-light. " Adam and Eve," the " Visitation," the " Adoration of the Magi," the " Massacre of the Innocents," the " Agony in the Garden," " Christ before Pilate," " Christ carrying His Cross," and (this alone having been marred by restoration) the " Assump- tion of the Virgin " are leading examples in the scuola; in the church, " Christ curing the Paralytic."

It was probably in 1 560, the year in which he began working in the Scuola di S. Rocco, that Tintoret commenced his numerous paintings in the ducal palace; he then executed there a portrait of the doge, Girolamo Priuli. Other works which were destroyed in the great fire of 1577 succeeded — the " Excommunication of Frederick Barbarossa by Pope

Alexander III." and the " Victory of Lepanto." After the fire Tintoret started afresh, Paul Veronese being his colleague; their works have for the most part been disastrously and disgracefully retouched of late years, and some of the finest monuments of pictorial power ever produced are thus degraded to comparative unimportance. In the Sala dello Scrutinio Robusti painted the " Capture of Zara from the Hungarians in 1346 amid a Hurricane of Missiles "; in the hall of the senate, " Venice, Queen of the Sea "; in the hall of the college, the " Espousal of St Catherine to Jesus "; in the Sala dell' Anticollegio, four extraordinary masterpieces — " Bacchus, with Ariadne crowned by Venus," the " Three Graces and Mercury," " Minerva discarding Mars," and the " Forge of Vulcan " — which were painted for fifty ducats each, besides materials, towards 1578; in the Antichiesetta, " St George and St Nicholas, with St Margaret " (the female figure is sometimes termed the princess whom St George rescued from the dragon), and " St Jerome and St Andrew "; in the hall of the great council, nine large composi- tions, chiefly battle-pieces. We here reach the crowning pro- duction of Robusti's life, the last picture of any considerable importance which he executed, the vast " Paradise," in size 74 ft. by 30, reputed to be the largest painting ever done upon canvas. It is a work so stupendous in scale, so colossal in the sweep of its power, so reckless of ordinary standards of conception or method, so pure an inspiration of a soul burning with passionate visual imagining and a hand magical to work in shape and colour, that it has defied the connoisseurship of three centuries, and has generally (though not with its first Venetian contemporaries) passed for an eccentric failure; while to a few eyes (including those of the present writer) it seems to be so transcendent a monjment of human faculty applied to the art pictorial as not to be viewed without awe nor thought of without amazement. While the commission for this huge work was yet pending and unassigned Robusti was wont to tell the senators that he had prayed to God that he might be commissioned for it, so that, paradise itself might

perchance be his recompense after death. Upon eventually receiving the commission in 1588 he set up his canvas in the Scuola della Misericordia and worked indefatigably at the task, making many alterations and doing various heads and costumes direct from nature. When the picture had been brought well forward he took it to its proper place and there finished it, assisted by his son Domenico for details of drapery, &c. All Venice applauded the superb achievement, which has in more recent times suffered from neglect, but fortunately

hardly at all from restoration. Robusti was asked to name his own price, but this he left to the authorities. They tendered a handsome amount; Robusti is said to have abated something from it, which is even a more curious instance of ungreediness for pelf than earlier cases which we have cited where he worked for nothing at all.

After the completion of the " Paradise " Robusti rested for a while, and he never undertook any other work of importance, though there is no reason to suppose that his energies were ex- hausted had his days been a little prolonged. He was seized with an attack in the stomach, complicated with fever, which prevented him from sleeping and almost from eating for a fortnight, and on the 31st of May 1594 he died. A contemporary record states his age to have been seventy-five years and fifteen days. If this is accurate, the 16th of May 1519 must have been the day of his birth; but we prefer the authority of the register of deaths in S. Marciliano, which states that Tintoret died of fever, aged seventy-five years, eight months and fifteen days — thus bringing us to the 16th of September 1.518 as the true date of his birth. He was buried in the church of the Madonna dell' Orto by the side of his favourite daughter Marietta, who had died in 1590, aged thirty; there is a well-known tradition that as she lay dead the heart-stricken father painted her portrait. Marietta had herself been a portrait-painter of considerable skill, as well as a musician, vocal and instrumental; but few of her works are now traceable. It is said that up to the

age of fifteen she used to accompany and assist her father at his work, dressed as a boy; eventually she married a jeweller, Mario Augusta. In 1866 the grave of the Vescovi and Robusti was opened, and the remains of nine members of the joint families were found in it; a different locality, the chapel on the right of the choir, was then assigned to the grave.

Tintoret painted his own portrait at least twice, one of the heads being in the Uffizi Gallery of Florence and the other, done when his age was advanced, in the Louvre. It is a very serious face, somewhat blunt and rugged, but yet refined without the varnish of elegance — concentrated and resolute, its native ardours of frankness and energy welded down into lifelong laboriousness, with a pent look as of smouldering fire. The eyes are large, dark and round; the grizzled hair close and compact. The face has been held to bear some resemblance to that of Michelangelo, but this does not go very far. Robusti appears also as one of the figures in the two vast pictures by Paul Veronese — the " Marriage in Cana " and the " Feast in the House of Levi."

Audacious and intrepid, though not constantly correct, as a draughtsman, majestically great as a colourist, prodigious as an executant, Tintoret was as absolute a type of the born painter as the history of art registers or enables us to conceive. Whatever he did was imaginative — sometimes beautiful and suave (and he was eminently capable of painting a lovely female countenance or an heroic man), often imposing and romantic, fully as often turbulent and reckless, sometimes trivial, never unpainter-like or prosaic. When he chose — which was not always — he painted his entire personages characteristically", but, like the other highest masters of Venice, he conceded and attended little to the expression of his faces as evincing incidental emotion. In several of his works — as especially the great " Crucifixion " in S. Rocco — there is powerful central thought, as well as inventive detail; but his imagination is always concrete: it is essentially that of a painter to whom the means of art — the form, colour,

chiaroscuro, manipulation, scale, distribution — are the typical and necessitated realities. What he imagines is always a visual integer, a picture — never a treatise, however thoughtfully planned or ingeniously detailed. Something that one could see — that is his ideal, not something that one could narrate, still less that one could deduce and demonstrate. In his treatment of action or gesture the most constant peculiarity is the sway and swerve of his figures : they bend like saplings or rock like forest-boughs in a gale ; stiffness or immobility was entirely foreign to his style, which has therefore little of the monumental or severe character. Perhaps he felt that there was no other way for combin- ing " the colour of Titian with the design of Michelangelo." The knitted strength and the transcendent fervour of energy of the supreme Florentine might to some extent be emulated; but, if they were to be united with the glowing fusion of hue of the supreme Venetian, this could only be attained by a process of relaxing the excessive tension and modifying muscular into elastic force. In this respect he was a decided innovator; but he had many imitators, comparatively feeble if we except Paul Veronese.

Tintoret scarcely ever travelled out of Venice. He loved all the arts, played in youth the lute and various instruments, some of them of his own invention, and designed theatrical costumes and proper- ties, was versed in mechanics and mechanical devices, and was a very agreeable companion. For the sake of his work he lived in a most retired fashion, and even when not painting was wont to remain in his working room surrounded by casts. Here he hardly admitted any, even intimate friends, and he kept his modes of work secret, save as regards his assistants. He abounded in pleasant witty sayings whether to great personages or to others, but no smile hovered on his lips. Out of doors his wife made him wear the robe of a Venetian citizen; if it

rained she tried to indue him with an outer garment, but this he resisted. She would also when he left the house wrap up money for him in a handkerchief, and on his return expected an account of it; Tintoret's accustomed reply was that he had spent it in alms to the poor or to prisoners. In 1574 he obtained the reversion of the first vacant broker's patent in a fondaco, with power to bequeath it — an advantage granted from time to time to pre-eminent painters. For his phenomenal energy in painting he was termed " II Furioso." An agreement is extant showing that he undertook to finish in two months two historical pictures each containing twenty figures, seven being portraits. The number of his portraits is enormous; their merit is unequal, but the really fine ones cannot be surpassed. Sebastiano del Piombo remarked that Robusti could paint in two days as much as himself in two years; Annibale Caracci that Tintoret was in many pictures equal to Titian, in others inferior to Tintoret. This was the general opinion of the Venetians, who said that he had three pencils — one of gold, the second of silver and the third of iron. The only pictures (if we except his own portrait) on which he inscribed his name are the " Miracle of Cana " in the church of the Salute (painted originally for the brotherhood of the Crocifftri), the " Miracle of the Slave," and the " Crucifixion" in the Scuola di S. Rocco; the last was engraved in 1589 by Agostino Caracci. Generally he painted at once on to the canvas without any preliminary. Some of his dicta on art have been recorded as follows by Ridolfi: " the art of painting remains increasingly difficult "; " painters in youth should adhere to the best masters, these being Michelangelo and Titian, and should be strict in representing the natural forms "; " the first glance at a picture is the crucial one "; " black and white, as developing form, are the best of colours "; " drawing is the foundation of a painter's work, but drawing from life in the nude should only be essayed by well-practised men, as the real is often wanting in beauty."

Of pupils Robusti had very few; his two sons and

Martin de Vos of Antwerp were among them. Domenico Robusti (1562-1637), whom we have already had occasion to mention, frequently assisted his father in the groundwork of great pictures. He himself painted a multitude of works, many of them oil a very large scale; they would at best be mediocre, and, coming from the son of Tintoret, are exasperating; still, he must be regarded as a considerable sort of pictorial practitioner in his way.

We conclude by naming a few of the more striking of Tintoret's very numerous works not already specified in the course of the article. In Venice (S. Giorgio Maggiore), a series of his later works, the "Gathering of the Manna," " Last Supper," " Descent from the Cross," " Resurrection," " Martyrdom of St Stephen," " Coronation of the Virgin," "Martyrdom of St Damian"; (S. Francesco del Vigna) the " Entombment " ; (the Frari) the " Massacre of the Innocents"; (S. Cassano) a "Crucifixion," the figures seen from behind along the hill slope; (St Mark's) a mosaic of the " Baptism of Christ " — the oil-painting of this composition is in Verona. In Milan (the Brera), " St Helena and other, saints." In Florence (Pitti Gallery), " Venus," " Vulcan " and " Cupid." In Cologne (Wallraff-Richarts Museum), " Ovid and Corinna." In Augsberg (the town-hall), some historical pictures, which biographers and tourists alike have unaccountably neglected — one of the siege of a fortified town is astonishingly fine. In England (Hampton Court), " Esther and Ahasuerus," and the " Nine Muses "; (the National Gallery), " The Origin of the Milky Way," a memorable tour deforce, " Christ washing Peter's Feet," a grand piece of colour and execution, not greatly interesting in other respects, also a spirited smallish work, " St George and the Dragon."

The writer who has done by far the most to establish the fame of Tintoret at the height which it ought to occupy is Ruskin in his Stones of Venice and other books ; the depth and scope of the master's power had never before been adequately brought out, although his extraordinarily and somewhat

arbitrarily used executive gift was acknowledged. Ridolfi (Meraviglie dell' Arte) gives interesting per- sonal details; the article by Dr Janitschek in Kunst und Kiinstler (1876) is a solid account. For an English reader the most handy narrative is that of W. R. Osier {Tintoretto, 1879), in the series en- titled " The Great Artists." Here the biographical facts are clearly presented ; the aesthetic criticism is enthusiastic but not perspicuous. Other works deserving of mention are: L. Mesnard, Alude sur Tintoret (1881); T. P. Stearns, Four Great Venetians (1901); H. Thode, Tintoretto (1901); Stoughton Holborn, Jacopo Robusti (1003).

(W. M. R.)

TIPASA. (1) A town and commune on the coast of Algeria, in the department of Algiers, 30 m. W. of the capital. Pop.

of the commune (1906), 2725. The modern town, founded in 1857, is remarkable chiefly for its pleasant situation and sandy beach. The roadstead is exposed to the N.E. and N.W. There is a mole about 90 ft. long and anchorage in six fathoms. A considerable trade is done. The Roman city of Tipasa was built on three small hills which overlooked the sea. Of the houses, most of which stood on the central hill, no traces re- main; but there are ruins of three churches — the Great Basilica and the Basilica Alexander on the western hill, and the Basilica of St Salsa on the eastern hill — two cemeteries, the baths, theatre, amphitheatre and nymphaeum. The line of the ram- parts can be distinctly traced and at the foot of the eastern hill the remains of the ancient harbour. The basilicas are surrounded by cemeteries, which are full of coffins, all of stone and covered with mosaics. The basilica of St Salsa, which has been excavated by S. Gsell, consists of a nave and two aisles, and still contains a mosaic. The Great Basilica served for centuries as a quarry, but it is still possible to make out the plan of the building, which was divided into seven aisles. Under the foundations of the church are tombs hewn out of the

solid rock. Of these one is circular, with a diameter of 60 ft. and space for 24 coffins.

Tipasa was founded by the Phoenicians, was made a Roman military colony by the emperor Claudius, and afterwards became a municipium. Commercially it was of considerable impor- tance, but it was not distinguished in art or learning. Chris- tianity was early introduced, and in the third century Tipasa was a bishop's see. Most of the inhabitants continued heathens until, according to the legend, Salsa, a Christian maiden, threw the head of their serpent idol into the sea, whereupon the enraged populace stoned her to death. The body, miraculously recovered from the sea, was buried, on the hill above the har- bour, in a small chapel which gave place subsequently to the stately basilica. Salsa's martyrdom took place in the 4th century. In 484 the Vandal king Huneric (477-484) sent an Arian bishop to Tipasa; whereupon a large number of the in- habitants fled to Spain, while many of the remainder were cruelly persecuted. After this time the city disappears from history; and, whether or not its ruin was caused by the Arabs, they seem to have made no settlement there.

(2) Another town which in Roman times was called Tipasa is in the department of Constantine, Algeria, 55 m. due south of Bona, 3140 ft. above the sea; it is now called Tifesh. The chief ruin is that of an extensive fortress, the walls of which are 9 ft. thick.

TIP-CAT (also called Cat and Cat and Dog), a pastime which consists in tapping with a stick a short billet of wood with sharpened ends upon one of these ends, so that it jumps in the air, and then hitting it to the greatest possible distance. There are many varieties of the game, but in the most common the batter, having placed the billet, or cat, in a small circle on the ground, tips it into the air and hits it to a distance. His opponent then offers him a certain number of points, based upon his estimate of the number of hops or jumps necessary to cover the distance. If the batter thinks the distance

underestimated he is at liberty to decline the offer and measure the distance in jumps, and score the number made. The game is one or more hundreds.

TIPPERA {Tripura), a native state and also a British district of India, in Eastern Bengal and Assam. The state, which is known as Hill Tippera (q.v.), represents that portion of the raja's territory that was never conquered by the Mahommedans The dynasty, which is of great antiquity, was converted to Hinduism many centuries ago; but the people still profess an aboriginal religion, similar to that of the neighbouring hill tribes. The raja owns an estate of 570 sq. m., yielding an income of more than £40,000, in the British district, where he ranks as an ordinary zamindar. His residence is at Agartalla, just within the boundary of Hill Tippera.

The British district of Tippera, with administrative head- quarters at Comilla, has an area of 2499 sq. m. It has a flat and open surface, with the exception of the isolated Lalmai range

(ioo feet), and is for the most part laid out in well-cultivated fields, intersected by rivers and khals (creeks) partially affected by the tides. In the lowlands the soil is light and sandy; but in the higher parts a deep alluvial soil alternates with bands of clay and sand. The principal rivers are the Meghna, or estuary of the Brahmaputra; and the Gumti, Dakatia, and Titas, which are also navigable for a considerable portion of their course. There are many marshes or bils. The wild animals include tigers, leopards, wild boars and buffaloes. The climate is mild and healthy. In 1901 the population was 2,117,991, showing an increase of 19% in the decade, being the highest rate in the province. Mahommedans form nearly three-fourths of the total. Rice is the staple crop, followed by jute; betel-nut and betel- leaf and chillies are also grown. The chief exports are rice, jute and betel-nuts; and the

principal imports cotton goods, salt and kerosene oil.

The eastern border of the district is traversed by the Assam- Bengal railway, with branches from Laksham to Chandpur and Noakhali; but waterways remain the chief means of com- munication.

Tippera came under the East India Company in 1765; but more than a fifth of its present area was under the immediate rule of the raja of Hill Tippera, who paid a tribute of ivory and elephants. At that time Tippera with Noakhali formed part of Jalalpur, one of Shuja-ud-Din's divisions of the province of Bengal; but in 1822 it was separated, and since then great changes have been made in its boundaries. With the exception of a serious raid in i860 by the Kukis or Lushais, nothing has disturbed the peace of the district.

TIPPERARY, a county of Ireland in the province of Munster, bounded N.W. by Galway, N.E. by King's County, E. by Queen's County and Kilkenny, S. by Waterford, and W. by Cork, Limerick, Clare and Galway. The county is the sixth in size of the Irish counties, having an area of 1,062,963 acres, or about 1661 sq. m. The surface is varied and picturesque. The Knockmealdown Mountains on the southern border reach an elevation of 2609 ft. To the north of this range are the pic- turesque Galty or Galtee Mountains (Galtymore 3015 ft.). To the east, bordering Kilkenny, are the Slieveardagh Hills, and near Templemore the Devil's Bit Mountains (1583 ft.) with a curious gap on the summit. In the north-west is Keeper Hill, 2278 ft. The greater part of the county, however, is a gently undulating plain. From the rich level country the Rock of Cashel rises boldly. Tipperary has only one considerable river, the Suir, which has its source in the Devil's Bit Moun- tains, and flows southward and eastward by Templemore, Thurles, Caher, and Clonmel. The Nore, which also rises in the Devil's Bit Mountains, soon passes into Queen's County, and the Shannon forms part of the western border. The Mitchelstown stalactite caverns, discovered

accidentally in 1833, attract a large number of visitors. They are in the extreme south-west of the county; take their name from the neighbouring town of Mitchelstown, 6 m. distant in County Cork; and were explored and surveyed by M. Martel, the French speleologist, in 1895.

Geology. — In this county the Carboniferous Limestone is escaping, as it were, from confinement between the Old Red Sandstone ridges of the south, and spreading out northward into the great plain. Its folded character is seen in the anticlinal boss on which the acro- polis of Cashel stands; but generally its level surface is covered by boulder-drift. A great denuded dome of Old Red Sandstone, with Silurian exposed across the centre, divides the north of the county, and another similar mass, the Arra Mountains, rises between Nenagh and Lough Derg. The same rocks form the Galtees, Slieve- naman and the Knockmealdown Mountains. In the east, Upper Carboniferous shales and sandstones lie along a synclinal axis, from Cashel to Kilkenny, and anthracite is mined on a Coal Measure plateau at Killenaule. The lead-ore mined for many centuries at Silvermines south of Nenagh is silver-bearing, and is associated with zinc blende. Indications of ore have been traced along the junction of the limestone with the older rocks for thirty miles. Good slates are quarried in the Silurian area in Clashnasmuth townland on Slievenaman.

Industries. — Tipperary ranks among the best agricultural districts of Ireland. The subsoil in the lower grounds is limestone, which is overlaid by a rich calcareous loam, capable of yielding the finest

crops. The centre of the county is occupied by the Golden Vale, the most fertile district in Ireland, which stretches from Cashel to the town of Limerick. On the higher districts the soil is light and thin, partaking much of the character of the clay slate and sands on which it rests. Detached portions of the Bog of Allen encroach on the north-east of the county. The proportion of tillage to pasture is

roughly as 1 to 2 J, and the area under the standard crops of oats and potatoes decreases. The area under barley, however, is well maintained, as distillation causes a steady demand for this grain. Turnips are also an important and steady crop. The numbers of cattle, sheep, pigs, goats and poultry also increase generally; and butter-making occupies considerable attention. A few persons are employed in mining, but the occupation of the inhabitants is chiefly agricultural. There is a considerable number of meal and flour mills.

Communications are supplied by the Great Southern & Western railway, the main line of which crosses the county from north-east to south-west by Templemore and Thurles. The Ballybrophy (Queen's County) & Limerick branch from this line serves the north of the county by Roscrea (junction for Birr) and Nenagh. The Waterford & Limerick line passes through the south of the county by way of Clonmel and Tipperary, crossing the main line at Limerick junction. The two lines are also connected by the Thurles, Fethard and Clonmel branch.

Population and Administration. — The population (175,217 in 1891; 160,232 in 1901) shows a serious decrease (though much less so than formerly), and emigration is very heavy. Of the total about 94% are Roman Catholics, and about 76% constitute the rural population. The principal towns are Clonmel (the county town, pop. 10,167), Tipperary (6281), Carrick-on-Suir (5406), Nenagh (4704), Thurles (4411), Cashel (a cathedral city, 2938), Roscrea (2325), Caher (2058), Temple- more (2774) and Fethard (1498). Tipperary is divided into a north and south riding, each consisting of six baronies. For parliamentary purposes it is separated into four divisions — East, Mid, North and South — each returning one member. Before the Union in 1800 the county returned two members to the Irish parliament, and the boroughs of Cashel, Clonmel and Fethard two each; afterwards, until the Redistribution Act of 1885, the county returned two members and Cashel and Clonmel one each. Assizes for the north riding are held in Nenagh and for the south riding in Clonmel.

Quarter-sessions are held at Cashel, Clonmel, Nenagh, Roscrea, Thurles and Tipperary. Ecclesiastically the county belongs to the Pro- testant dioceses of Cashel and Killaloe, and the Roman Catholic dioceses of Cashel, Killaloe, Waterford and'Lismore.

History and Antiquities. — Tipperary is one of the counties generally considered to have been formed by King John in 1210; in 1328 Edward III. made it a county palatine in favour of the earl of Ormonde; and, though the king shortly after- wards resumed his regal prerogative, the county was regranted in 1337. In 1372 the grant was confirmed to James Butler, earl of Ormonde, the lands belonging to the Church retain- ing, however, a separate jurisdiction, and being known as the county of Cross Tipperary, or the Cross of Tipperary. In 162 1 James I. took the county palatine into his own hands. It was, however, restored in 1664 to James, 12th earl and 1st duke, whose regalities were further made to include the county of the Cross. On the attainder of James, 2nd duke, in 1715, the jurisdiction reverted to the Crown, and the last of the Irish palatinates thus ceased to exist.

There are two round towers within the county — one at Roscrea and the other on the Rock of Cashel. The county is rich in posses- sion of remains of several ecclesiastical foundations of the highest interest. Of these the following are described under the names of the respective towns : the remarkable collection of buildings on and adjacent to the Rock of Cashel ; the Cistercian abbey of Holy Cross near Thurles, one of the finest monastic ruins in Ireland ; and the abbey and Franciscan friary at Roscrea. The stronghold of Caher, occupied as a barrack, is in good preservation. At Roscrea one of the towers of the castle built by King John remains, and the strong- hold of the Ormondes, erected in the reign of Henry VIII., forms the d^pot attached to the barracks. The other principal ecclesias- tical ruins are the priory of Athassel, founded for Augustinian monks about 1 200; and Fethard Abbey, founded in the 14th century, now used as a chapel.

TIPPKRARY, a market town of Co. Tipperary, Ireland. Pop. (1901), 6281. It is beautifully situated near the base of the Slieve na muck or Tipperary Hills, a branch of the Galtee

range, on the Waterford & Limerick line of the Great Southern & Western railway, 3 m. S.E. of Limerick Junction and iioj S.W. of Dublin. It is governed by an urban district council. It is situated in the centre of a fine agricultural district, and its butter market ranks next to that of Cork. Condensed milk is manufactured. The town is of great antiquity, but first acquired importance by the erection of a castle by King John, of which there are no remains. A monastery founded for Augustinians by Henry III. gave a second impulse to its growth. The gatehouse, all that remains of this foundation, is the only building of antiquity in the town. Formerly Tipperary was a corporation from a grant made in 13 10 by Edward II. New Tipperary was founded outside the town by Mr William O'Brien in 1890 during the " Plan of Campaign " inaugurated to boycott the Smith-Barry estate, in order to accommodate the tenants who vacated their holdings, but the scheme was a failure, and the place was abandoned and sold.

TIPPOO SAHIB (1753-1799), sultan of Mysore, son of Hyder Ali (q.v.), was born in 1753. He was instructed in military tactics by French officers in the employment of his father. In 1767 in the invasion of the Carnatic he commanded a corps of cavalry, and he distinguished himself in the Mahratta War of I 77S~79- On the outbreak of the first Mysore War in 1780 he was put at the head of a large body of troops, and defeated Brathwaite on the banks of the Coleroon in February 1782. He succeeded his father in December 1782, and in 1784 concluded peace with the British, and assumed the title of sultan. In 17S7-88 he subjugated the Nairs of Malabar, and in 1789 pro- voked British invasion by

ravaging the territories of the raja of Travancore. When the British entered Mysore in 1790, he retaliated by a counter-invasion, but was compelled by Corn- wallis's victory near Seringapatam to cede half his dominions (March 16, 1792). The British having deemed it necessary to renew hostilities in March 1799, he was shut up in Seringapatam and finally killed during the storm (May 4, 1799). Tippoo was of cruel disposition, and inferior in military talents to his father.

See L. B. Bowring, Haidar Ali and Tipu Sultan (" Rulers of India series," 1893).

TIPSTAFF (Mid. Eng. tipped slaf), a staff of office mounted with a tip or cap of metal, or with a crown, carried by a con- stable or sheriff's officer, the term being hence applied to such an officer. Tipstaffs are attached to the king's bench and chancery divisions of the High Court of Justice in England; their duty is to arrest or take into custody any person on an order of com- mittal, if within the precincts of the court, and convey him to the king's prison at Holloway. The tipstaff for the common law courts was originally appointed by the marshal of the king's bench, and the tipstaff of the lord chancellor by the marshal of the Fleet prison. Since the abolition of these prisons the tip- staffs have been appointed by the lord chancellor and lord chief justice respectively.

TIPTON, an urban district of Staffordshire, England, in the parliamentary borough of Wednesbury, adjacent to Dudley (i\ m. S.), served by the London & North Western and Great Western railways. Pop. (1901), 30,543. Its streets are in- terspersed with coal-mines and iron works. Heavy iron goods are the principal products, anchors and cables being a speciality; there are numerous furnaces and rolling mills; also cement- works, brick-works and makings. The village round which the modern town sprang up is mentioned in Domesday as Tib- bington; its ancient church was undermined and collapsed in

1797-

TIRABOSCHI, GIROLAMO (1 731-1794), the first historian of Italian literature, was born at Bergamo on the 18th of De- cember 1 73 1. He studied at the Jesuit college at Monza, entered the order, and was appointed in 1755 professor of eloquence in the university of Milan. Here he produced (1766-1768) Vetera humiliatorum monumenta (3 vols.), a history of the extinct order of the Humiliati, which made his literary reputation. Nominated in 1770 librarian to Francis III., duke of Modena, he turned to account the copious materials there accumulated for

the composition of his Storia delta letteratura italiana. This vast work, in which Italian literature from the time of the Etruscans to the end of the 17th century is traced in detail, occupied eleven years, 1 77 1-1 782, and the thirteen quarto volumes embodying it appeared successively at Modena during that period. A second enlarged edition (16 vols.) was issued from 1787 to 1794, and was succeeded by many others, besides abridgments in German, French and English. Tiraboschi died at Modena on the 3rd of June 1794, leaving a high reputation for virtue, learning and piety.

Tiraboschi wrote besides Biblioteca modenese (6 vols., 1781-1786); Notizie de' pittori, scullori, incisori, ed architetti modenesi (1786); Memorie storiche modenesi (5 vols., 1793-1794), and many minor works. He edited the Nuovo giornale dei lelterati d'ltalia (1773- 1790), and left materials for a work of great research entitled Dizionario topografico-storico degli stati estensi (2 vols. 4to, Modena,

1824-1825).

TIRAH, a mountainous tract of country on the Peshawar border of the North-west Province of India. It lies between the Khyber Pass and the Khanki Valley, and is inhabited by the Afridi and Orakzai tribes. It is chiefly notable as the scene of the Tirah Campaign of 1897 (see below). It is a cul-de-sac in the mountains, lying off all the roads to India, and the difficulty of its passes and the

fierceness of its inhabitants had hitherto preserved it inviolable from all invaders. Tirah com- prises an area of some six to seven hundred square miles and includes under this general name all the valleys lying round the source of the Bara river. The five chief valleys are Maidan, Rajgul, Waran, Bara and Mastura.

Maidan, the summer home of the Afridis, lies close under the snow- bound ridges of the Safed Koh at an elevation of about 6400 ft. It is an oval plain about seven to eight miles long, and three or four wide, and slopes inwards towards the centre of its northern side, where all the drainage gathered from the four corners of the plain is shot into a narrow corkscrew outlet leading to the Bara Valley. Centuries of detritus accumulated in this basin have filled it up with rich alluvial soil and made it one of the most fertile valleys on the frontier. All its alluvial slopes are terraced and revetted and irrigated till every yard is made productive. Here and there dotted about in clusters all over the plain are square-built two storeyed mud and timber houses, standing in the shade of gigantic walnut and mulberry trees. Up on the hillsides surrounding the Maidan basin are wild olives in wide-grown clumps, almost amounting to forest, and occasional pomegranates. Higher still are the blue pines; but below on the shelving plains are nothing but fruit trees. Rajgul Valley lies north of Maidan, from which it is separated by a steep valley and well-wooded spur, eight to nine thousand feet high, and west of the Bara Valley, which it joins at Dwatoi. It is ten miles long, four to five miles at its widest, and has an elevation of 5000 ft. It is inhabited by the Kuki Khel Afridis. The Waran Valley is another valley about the same size as Maidan, lying east of it, and separated from it by the Tseri-Kandao Pass. It was the home of the Afridi mullah Sayad Akbar, and is the country of the Aka Khels. After the junction of the Rajgul and Maidan drainage at Dwatoi, the united stream receives the name of Bara, and the valley through which it flows down to its exit in the Peshawar Valley is also

known by this name. The elevation of the valley is from 5000 ft. at Dwatoi to 2000 at Kajurai; on the north side it is hemmed in by the Surghar range, which divides it from the Bazar Valley; on the south lies another range dividing it from Maidan and the Waran Valley. The heat of the Bara Valley in summer is said to be excessive, malaria is prevalent, and mosquitoes very troublesome, so the hamlets are deserted and the Afridis migrate to the pleasant heights of Maidan. The Mastura Valley occupies the southern half of Tirah, and is inhabited by the Orakzais. It is one of the prettiest valleys on the frontier, lying at an elevation of 6000 ft. The Orakzais live, for the most part, in the Miranzai Valley, in the winter, and retreat to Mastura, like the Afridis, during the summer months. The chief passes in Tirah are the Sampagha Pass (6500 ft.), separating the Khanki Valley from the Mastura Valley; the Arhanga Pass (6995 ft.), separating Mastura Valley from Maidan; Saran Sar (8650 ft.), leading from the Zakka Khel portion of Maidan into the Bara Valley; the Tseri Kandao (8575 ft.), separating Maidan from the Waran Valley, and the Sapri Pass (5190 ft.), leading from the east of the Mastura Valley into the Bara Valley in the direction of Mamanai. The whole of Tirah was thoroughly explored and mapped at the time of the Tirah Expedition.

TIRAH CAMPAIGN, an Indian frontier war in 1897–98. The Afridis had for sixteen years received a subsidy from the Indian government for the safeguarding of the Khyber Pass, in addition to which the government had maintained for this

purpose a local regiment entirely composed of Afridis, who were stationed in the pass. Suddenly, however, the tribesmen rose, captured all the posts in the Khyber held by their own country- men, and attacked the forts on the Samana Ridge near Peshawar. It was estimated that the Afridis and

Orakzais could, if united, bring from 40,000 to 50,000 men into the field. The prepara- tions for the expedition occupied some time, and meanwhile the Mohmand rising north-west of the Khyber Pass was first dealt with (see Mohmand).

The general commanding was General Sir William Lockhart (q.v.) commanding the Punjab Army Corps; he had under him 34,882 men, British and native, in addition to 20,000 followers. The frontier post of Kohat was selected as the base of the cam- paign, and it was decided to advance along a single line. On the 18th of October the operations commenced, fighting ensuing immediately. The Dargai heights, which commanded the line of advance, were captured without difficulty, but abandoned owing to the want of water. On the 20th the same positions were gallantly stormed, with a loss of 199 killed and wounded. The progress of the expedition, along a wretched track through the mountains, was obstinately contested on the 29th of October at the Sampagha Pass leading to the Mastura valley, and on the 31st at the Arhanga Pass from the Mastura to the Tirah valley. The force, in detached brigades, now proceeded to traverse the Tirah district in all directions, and to destroy the walled and fortified hamlets of the Afridis. The two divisions available for this duty numbered about 20,000 men. A force about 3200 strong commanded by Brigadier- General (afterwards Major- General Sir Richard) Westmacott was first employed to attack Saran Sar, which was easily carried, but during the retirement the troops were hard pressed by the enemy and the casualties num- bered sixty-four. On the nth of November Saran Sar was again attacked by the brigade of Brigadier-General (afterwards Sir Alfred) Gaselee. Experience enabled better dispositions to be made, and the casualties were only three. The traversing of the valley continued, and on the 13th of November Brigadier- General Kempster's brigade visited the Waran valley via the Tseri Kandao Pass. Little difficulty was experienced during the advance, and several villages were destroyed; but on the 16th, during the return march, the rearguard was hotly

engaged all day, and had to be relieved by fresh troops next morning. The casualties numbered seventy-two. Almost daily the Afridis, too wise to risk general engagements, waged a perpetual guerrilla warfare, and the various bodies of troops engaged in foraging or survey duties were constantly attacked. On the 21st of November a brigade under Brigadier-General Westmacott was detached to visit the Rajgul valley. The road was exceedingly difficult and steady opposition was encountered. The objects were accomplished, and the casualties during the retirement alone numbered twenty-three. The last important work under- taken was the punishment of the Chamkannis, Mamuzais and Massozais. This was carried out by Brigadier- General Gaselee, who joined hands with the Kurram movable column ordered up for the purpose. The Mamuzais and Massozais submitted im- mediately, but the Chamkannis offered resistance on the 1st and 2nd of December, the British casualties numbering about thirty. The Kurram column then returned to its camp, and Sir W. I.ockhart prepared to evacuate Tirah, despatching his two divisions by separate routes — the 1st under Major-General W. Penn Symons (d. 1899) to return via the Mastura valley, destroying the forts on the way, and to join at Bara, within easy march of Peshawar; the 2nd division under Major-General Yeatman Biggs (d. 1898), and, accompanied by Sir W. Lock- hart, to move along the Bara valley. The base was thus to be transferred from Kohat to Peshawar. The return march began on the 9th of December. The cold was intense, 21 degrees of frost being registered before leaving Tirah. The movement of the 1st division though arduous was practically unopposed, but the 40 miles to be covered by the 2nd division were contested almost throughout. The actual march down the Bara valley (34 miles) commenced on the 10th, and involved four days of the hardest fighting and marching of the campaign. The road

crossed and recrossed the icy stream, while snow, sleet and rain fell constantly. On the 10th the casualties numbered about twenty. On the nth some fifty or sixty casualties were recorded among the

troops, but many followers were killed or died of exposure, and quantities of stores were lost. On the 12th the column halted for rest. On the 13th the march was resumed in improved weather, though the cold was still severe. The rearguard was heavily engaged, and the casualties numbered about sixty. On the 14th, after further fighting, a junction with the Peshawar column was effected. The 1st division, aided by the Peshawar column, now took possession of the Khyber forts without opposition. Negotiations for peace were then begun with the Afridis, who under the threat of another expedition into Tirah in the spring at length agreed to pay the fines and to surrender the rifles demanded. The expeditionary force was broken up on the 4th of April 1898. A memorable feature of this campaign was the presence in the fighting line of the Imperial Service native troops under their own officers, while several of the best known of the Indian princes served on Sir W. Lockhart's staff. (C. J. B.)

TIRANA, a town of Albania, European Turkey, in the vilayet of Scutari; 20 m. E. by N. of Durazzo, at the southern ex- tremity of the plain of Krola. Pop. (1905) about 12,000. Tirana is beautifully situated on the border of the richly wooded high- lands inhabited by the Mirdite Albanians. It is a picturesque town with a large bazaar and many mosques, gardens and olive groves. It was founded early in the 17th century and was long the see of a Greek bishop, although the majority of its inhabitants have always been Moslems. Krola, the ancient stronghold of Scanderbeg (q.v.), is 14 m. north.

TIRARD, PIERRE EMANUEL (1827–1893), French poli- tician, was born of French parents at Geneva on the 27th of September 1827, and, after studying in his native town, became a civil engineer. After five years of government service he resigned to become a jewel merchant. His determined opposi- tion to the empire, culminating in 1869 in a campaign in favour of the radical candidate opposed to Ollivier, was rewarded by his election as mayor of the nth arrondissement of Paris and as deputy for the Seine.

Nominated a member of the Commune, he protested against the tyranny of the central committee, and escaped from Paris to resume his place among the extreme Left in the National Assembly at Versailles. In 1876 he was returned for the 1st arrondissement of Paris to the Chamber of Deputies, and was re-elected next year. He specially de- voted himself to finance, being for a short time president of the customs commission before his appointment as minister of agriculture and commerce in March 1879 in the Waddington cabinet. He held the same portfolio in the first Freycinet ministry (1879–1880) and in the Jules Ferry cabinet (1880–1881). He was minister of commerce in Freycinet's second cabinet (1882), of finance under E. Duclerc (1882–1883), and under A. Fallieres (1883), retaining the same office in the second Jules Ferry ministry (1883–1885). When Carnot became president of the Republic in 1887 he asked Tirard to form a ministry. He had to deal with the Wilson scandal which had led to Pre- sident Grevy's downfall, and with the revisionist agitation of General Boulanger. His refusal to proceed to the revision of the constitution of 1875 led to his defeat on the 30th of March 1888. He returned to power next year, and decided to bring Boulanger and his chief supporters before the High Court, but the general's flight effectively settled the question. He also arrested Philip, duke of Orleans, who had visited France in disguise. He resigned office on the 15th of March 1890 on the question of the Franco-Turkish commercial treaty. He re- placed M. Rouvier in the Ribot cabinet (1892- 1893) as minister of finance, and died in Paris on the 4th of November 1893.

TIRE, an homonymous word, of which the meanings are (1) to weary out, (2) to adorn, or, as a substantive, a head-dress, (3) the outer rim of a wheel. '* Tire " in sense (1) is from the Old Eng- lish teorian, to weary, transitive and intransitive. Ultimately this word is connected with" tear," to rend, the stages of meaning being to rend apart, to wear out, to be or make exhausted.

In sense (2) the word is a shortened form of " attire," dress, equipment; this is from the Old French atirer, to put in order, tire, a row, hence the word now spelled in English tier, but earlier found as tire or tyre. " Tire " (3) is somewhat obscure etymologically. It may be connected with " attire," especially with reference to a similarity to the band of a woman's head- dress, or it may be a corruption of " tie-r," meaning that which " ties " or fastens together, though this is rejected by Skeat. The spelling " tyre " is not now accepted by the best English authorities, and is unrecognized in America.

The tire of a wheel is the outer circumferential portion that rolls on the ground or the track prepared for it. When the track is smooth and level, as in a railway, the principal functions of the tire are to provide a hard, durable surface for the wheel, and to reduce to a minimum the resistance to rolling. Railway vehicle wheels usually have hard steel tires, this combination with the hard steel rail giving the maximum endurance and the minimum rolling resistance. For road vehicles also, in which durability is the prime consideration, the tires are usually rings of iron or steel shrunk on the wooden wheels.

In bicycles, motor-cars, and other road vehicles in which freedom from vibration and shock from uneven road surface is desired, rubber or pneumatic tires are employed. These elastic tires are capable of absorbing small irregularities in the road surface without transmitting much vibration to the frame of the vehicle. Their range of yield is, however, too limited to absorb the larger irregularities met with on rough roads, so that their use does not obviate the necessity of spring support of the carriage body on the wheel axles. The pneumatic tire has a very much smaller rolling resistance than a solid rubber tire. Where the driving power is limited, as in

bicycles, this consideration is by far the most important. A pneumatic tired bicycle requires less power to drive it at a given speed than does one with solid rubber tires — in popular language, it is much faster; hence pneumatic tires are now almost universally used on bicycles.

Rolling Resistance. — Professor Osborne Reynolds, in his investi- gations on the nature of rolling resistance, found that it is due to

actual sliding of the surfaces in con- tact. Fig. 1 shows an iron roller resting on a flat, thick sheet of india-rubber. A series of equidis- tant parallel lines drawn on the india-rubber are distorted by the pressure, as shown in the figure. The distance between the marks on the periphery of the roller corresponds to that between the lines on the undistorted sheet of rubber. The motion of the roller being from left to right, actual contact takes place between C and D. The surface of the rubber is depressed at P, is bulged up in front at D, and behind at C. The vertical compression of the rubber at P causes it to bulge laterally, this causing a lateral contraction at D, which in turn causes a vertical extension at D. There is thus created a tendency to relative creeping motion between the roller and rubber. Between / and e there is no relative sliding, but over the portions eD and Cf there is slipping, with a consequent expenditure of energy. The action causes the actual distance traversed by the roller to be different from the geometric distance calculated from the diameter and number of revolutions of the roller. A certain amount of energy is expended in distorting the rubber between P and D ; part of this energy is restored as the rear portion of the roller passes over this and the rubber gets back to its original unstrained state.

With a solid rubber tire rolling on a hard, smooth surface the action is similar. Fig. 2 shows a portion of the tire flattened out:

pi and p 2 are the intensities of the pressures at

points ai and a 2 at equal distances in front of and behind c, the geometrical point of contact: pi opposes, pi assists the rolling of the wheel. At usual speeds the opposing force, pi, will be greater than the force of resti- tution, pi, the difference being a measure of the elastic hysteresis of the material, //, at that speed. If the vertical compression cd of the tire be denoted by y, the energy lost may be said to be proportional to Hy. Comparing three tires of steel, solid rubber and air respectively rolling on a smooth, hard surface, H is probably smallest for steel and largest for rubber, y is least for steel, greater for a pneumatic tire pumped

Fig. 1.

Fig. 2.

hard, greater still for solid rubber and for a pneumatic tire in- sufficiently inflated. The rolling resistance of the steel tire will therefore be least; next in order come the pneumatic tire inflated hard, 'and the pneumatic tire inflated soft, while the solid rubber tire has the greatest resistance.

Pneumatic Tires. Weight Supported. — Let a pneumatic tire inflated to p ft) per square inch support a load W lb. The portion

Fig. 3.

near the ground is flattened (fig. 3). If the tire fabric is assumed to be perfectly flexible, then, since the part in contact with the ground is quite flat, the pressure p and q on the opposite sides must be equal; that is, the tire presses on the ground with an intensity p lb per square inch. The area of the flattened portion

Fig. 4.

is therefore W/p. Fig. 4 shows the~shapes of the

areas of contact of a bicycle tire 28 in. by ij in., for various amounts of vertical flattening, the figures annexed to the curves in plan and to the corresponding lines in elevation indicating the amount of vertical flattening in sixteenth parts of an inch. Let y be the vertical flattening, a the semi-major axis, and b the semi-minor axis of the curve of contact. For small values of y, corresponding to a tire pumped hard, the curves of contact may be considered plane sections of a circular ring. The area of the curve may be taken equal to that of an ellipse having the same axes, i.e. vab. But

a = and

= Vi?°—(i?-y) 2 = V2i?y-y = Vy V2i?-y,

b = vV 2 — (r— y) 2 = yjy \2r — y, R and r being the principal radii of section of the tire longitudinally and transversely. Therefore, approximately,

A =irab = iryij2R — yil2r—y. For small values of y, y may be neglected in comparison with 2R and 2r respectively, and the above equation becomes

A =2vy^Rr = Tcy4D&, and therefore W = 2tryp^ 'Rr = iryp^Z)d.

For larger values of y, A is smaller than that given by the above formula, as shown in fig. 5, which gives the areas of contact plotted with respect to the vertical flattenings for a tire 28 in. by i% in. The same curve may serve to show values of W, thus corresponding to the load-deflection curve of a spring. The curve clearly shows the small value of the pneumatic tire as a spring device. Thus, when pumped hard, so that the normal load is carried with J in. vertical flattening, when _ the bicycle is travelling quickly, a lump on *'"• the road equivalent to % in. further flattening nearly doubles the upward reaction on the wheel. With the normal load carried with f in. vertical flattening the same lump on the road increases the upward

reaction by only 23 %, the area of contact of the tire being

vd _ lb c.

Vertical flattening

Fig. 5.

increased from 6-5 to 8 sq. in. The above brief investigation, involving a few approximations, is yet sufficiently accurate to afford a clear idea of the usual conditions of a tire.

ioo8

TIRE

Fig. 7.

given by the formula pd-

Outer Cover. — The outer cover has to be strong enough to with- stand the air-pressure inside the tire and to transmit the driving or the braking effort from the wheel to the road surface. For the latter purpose, the threads of the fabric are best disposed spirally, as shown in fig. 6. While driving in the direction of the arrow the tension on the fibres cc will be slightly increased, that on fibres dd decreased. The distortion of the fabric due to driving is thus reduced to a minimum. A woven fabric is sometimes used, but one made up of two or more layers of parallel threads embedded in rubber is better. This construction makes the outer cover more flexible, and consequently less energy is wasted in distorting the fabric as the tire rolls on and off the ground, while greater durability is also secured. Fig. 7 shows a plain woven fabric, from which it is seen that each thread takes the form of a sinuous line. As the air-pressure inside the tire is increased the threads tend to become straighter, thus pressing together with a cutting action. The total thickness is greater than that of two layers of parallel threads, while on the latter the threads can be placed closer together. The woven fabric is

therefore stiffer, weaker and less durable than that built up of parallel layers. The average tensile stress per inch width, ti, on the longitudinal section of the cover is = 2/1; that on the transverse section, fe, by pd = 4(2, d being the diameter of the tire in transverse section ; consequently the stress on the longitudinal section is twice that on the transverse. With the spiral disposition of the threads, as shown in fig. 6, this inequality of stress in the two principal directions has the effect of tending to enlarge the transverse section of the tire, while at the same time tending to contract the tire on the rim.

Single tube, Double tube and Tubeless Tires. — A tire, beside being strong enough to resist the stresses to which it is subjected, must be

air-tight. In most tires for cycles and motor-cars an inner tube of india-rubber is made separate from the outer cover. In these double- tube tires the outer cover is more or less easily detachable from the rim. The air under pressure is pumped inside the inner tube, which is sup- ported by the outer cover. In case of puncture of a bicycle tire, the inner tube is repaired by cementing a patch of rubber on the outside of the inner tube, a solution of india-rubber in naphtha or bisulphide of carbon being the cementing agent employed. Motor-car tires are best re- paired by vulcanizing, as solution patches usually come loose owing to the heating of the tire. In a single-tube tire, as its name indicates, the outer cover and the air-tight tube are vulcanized together to form a single hollow ring. To repair a simple puncture of a single-tube tire it is not necessary to detach it from the rim. Single-tube tires are not often used now, except for path-racing bicycles. A tubeless tire, such as the " Fleuss " (fig. 8), consists of the outer cover, as used in a double-tube tire, to the inner surface of which an air-tight layer of sheet-rubber has been cemented. A continuous flap projects from one edge of the tire, and when in position on the rim this flap is pressed against the other edge, forming an air-tight seal. A slight moistening of the flap with soft soap tends

to remove any imperfection in the tightness of the air seal. The repair of a puncture of a tubeless tire can be very quickly done. Since the inner surface of the air- tight layer is accessible, after placing the patch in position the tire can be inflated and the bicycle ridden at once ; whereas in the double- tube tire sufficient time must elapse between the patching and the inflation to allow the rubber solution to set.

Attachment of Tires to Rims. — A single-tube tire can be cemented (directly to the rim. For detachable double-tube tires on bicycles, two methods, the Dunlop- Welch endless wire (fig. 9) and the "beaded edge" (fig. 11), account for by far the greater proportion. , In the Dunlop-Welch tire the endless wires are embedded in the two edges of the outer cover respectively, the transverse tension of the fabric being transmitted to them. Each endless wire is formed of three coils, so as to give flexibility to the edge of the cover. The ring formed by each endless wire is smaller in diameter than the edge of the rim. The middle portion of the rim is deepened, its diameter being less than that of the ring of endless wire. To detach the tire after deflation, one part of the edge of the outer cover is depressed into the bottom of the rim, the opposite part then projects slightly beyond the edge of the rim and is pulled outside ; one portion being got outside, the rest easily follows. Fig. 10 shows the nature of the mutual action between outer cover C, rim R, and endless wire W in a Dunlop-Welch tire. The transverse tension T on the outer cover

is transmitted to the endless wire W, which is also subjected to the reaction N of the rim. The resultant Q must lie in the plane of the endless wire W, and constitutes a radially outward force acting at all points, which in turn causes a longitudinal pull, P, on the wire. Let d be the diameter of the inner air-tube, D the diameter of the ring formed by the endless wire W, p the air pressure, and 8 the angle

Fig. 10.

Fig. 11.

between T and Q. Then for each inch length of wire T=pdJ2, Q = T/cos 0; while P — QD/2. Combining these results, we get P = pdD\ cos 0. If 6 =30°, P=o-29pdD, from which the section of wire for a tire of any size can be calculated.

In the " beaded edge " fastening, thickened edges on the outer cover take into corresponding edges formed on the rim, and are securely held therein when the tire is inflated.

Prevention of Punctures. — The outside of the tire is covered with a thick layer of rubber, which protects the fabric from injury by contact with the rough road surfaces. In full roadster tires this outer layer of rubber is thinner at the sides than at the tread (the part which actually rolls on the ground), but still completely covers the fabric. In light roadster and racing tires the sides are not covered, and an appreciable gain in speed or ease of driving is due to the greater flexibility of the cover thus obtained. Numerous puncture-proof bands and other devices have been tried with the object of absolutely preventing punctures, or making the tire self- sealing after puncture; but they increase the rolling resistance, and therefore the effort necessary to drive the bicycle at a given speed.

Valve for Pneumatic Tire. — A non-return valve is permanently attached to the inner tube of the tire, which allows the air forced from the inflater to pass inside the inner tube. The most commonly used, the Dunlop-Woods valve, consists of a short piece of rubber tubing mounted on a brass stem, which has a small hole communi- cating from its outer end to the inner surface of the rubber tube. Normally, the tubing closes the mouth of this hole, preventing the air from escaping from the tire, but lifts freely when air is being forced from the inflater. The arrangement of the parts for deflating and for getting access to the rubber tubing is very simple and effective. The cyclist should be careful that the small piece of valve tubing, and the two fibre

washers at the ends of the flexible connecter which serve to make air-tight the two joints between the latter and the pump and valve stem respectively, are always in good condition. If either of these seemingly small details is out of order it may be impossible to pump the tires hard enough ; the bicycle being ridden, the tires may be nipped in many places between the rim and sharp edges on the road surface, and practically ruined.

Tires for Motor Cars. — In the cost of upkeep of a motor car the tires are the most expensive item. For a slow speed vehicle an ordinary steel tire, shrunk or hydrauhcally pressed on a wooden wheel, is cheap and durable. At higher speeds over uneven roads it is less satisfactory; the wheel, forming with the tire one rigid body, receives violent accelerations vertically, due to the uneven road, and is being continually shot upwards into the air out of contact with the ground. Thus excessive noise and vibration are caused at all but very moderate speeds, and for passenger cars an elastic tire is a necessity. The solid rubber tire, not being liable to puncture, is trustworthy if made of sufficient sectional area, but it is expensive and lacks the comfort and easy running of the pneumatic. The motor car pneumatic tire is made on the same lines as the cycle tire, but the air-tube is thicker, and the outer cover is built up with

several layers of canvas or fabric to give the necessary strength (fig. 14). To provide for wear, the outer protective layer of rubber is considerably thickened at the tread, where it is also reinforced with two or three layers of canvas. The Palmer cord tire is built up of two layers of cord (fig. 12) arranged spirally, each cord being composed of four strands of six threads. The cords are flattenec

Fig. 13.

somewhat, their narrow surfaces being together at the tread of the tire, and their wide ones at the beaded edge. The anchorage of the

cord to the beaded edge is obtained by steel pins passing through the loops of the cord and into the canvas beads (fig. 13). The cords, tread and beads being all vulcanized together, the tire is practically impervious to moisture, and has there- fore less tendency to rot than a canvas tire. Fur- ther, the threads, by the process of manufacture, are insulated each from the others by a layer of rubber, and there is thus less tendency for them to fray or saw each other as the tire yields dur- ing continuous running. These features of con- struction tend to greater durability.

Strains on Fabric of Pneumatic Tire. — As each portion of the tread comes in contact with the ground it is flattened, while the rest of the transverse section has its radius of curvature slightly decreased (fig- 3)- Thus the transverse section is repeatedly undergoing flexure through a range extending from flatness (radius of curva- ture infinity) to a radius of curvature slightly less than that cf the normal section. On the longitudinal section the range of flexure is from flat to a radius of curvature equal to that of the normal section. The latter range is therefore much less than the former. The necessary thickness of the fabric and rubber to resist the air pressure and punctures involves a certain amount of stiffness; consequently the energy expended in the flexure of the tire is much greater than in a thin cycle tire. This energy appears as heat; the temperature of the cover rises until the heat carried away by the air is equal to that generated by flexure. At very high speeds this heating becomes so great as to have !an injurious action on the rubber and fabric. Unfortunately, the solid rubber tire is worse off in this respect, its elastic hysteresis, and there- fore the heating effect, being greater than that of a pneumatic tire. It is evident that increase of the diameter of the tire-section lessens the heating action, while reduction of diameter of the wheel has

no effect, so long as the range of longitudinal flexure is less than the transverse. Nearly all tire fabrics are equally stiff longitudinally and transversely; but probably greater durability would be obtained from a fabric more flexible transversely, even if somewhat stiffer longitudinally.

Pneumatic Tires for Heavy Loads. — From the formula for load

supported, W = wypyl Dd, for a given air pressure p and vertical flattening y, the load supported is proportional to the square root of the product of the longitudinal and transverse diameters ; thus a tire 36″X4" is equivalent to one 24″X6″. But the latter can be subjected to a much greater vertical flattening y than the former, with a less range of flexure of the cover, probably twice the amount. In this event, with the same air pressures, the 24" X6" tire could carry a load twice that of the 36" X4" tire. Or, if both tires carried the same load, the air pressure in the former might be half that in the latter, and, its vertical flattening under normal load being twice as great, its value as a spring in absorbing vertical unevenness of the road would be double. Since the first use of pneumatic tires for motor cars, they have been steadily reduced in diameter, and probably they can be made still smaller with advantage, if the transverse section be proportionately increased.

The following table gives the maximum loads and minimum air pressures for a few sizes of tires, as recommended by the Dunlop Pneumatic Tire Company. The corresponding vertical flattening has been calculated from the formula given above.

(fig. 14). Fig. 13 shows a flange fastening as used for the Palmer

cord tire, the two flanges being secured by a number of bolts passing

through the rim of the wheel.

Solid Rubber Tires for Heavy Vehicles. — Fig. 15 shows a section

of a solid rubber tire and rim, the rubber being forced under

pressure on the beaded rim. For very heavy loads, as in motor omnibuses, a twin tire gives the best results. The

WHW ""^KPlk two t ' res are lastene d on the

s x same rim, at a sufficient dis-

tance apart to allow each to bulge laterally as it rolls on the ground.

Diameter.

Section.

Maximum

Load per

Wheel.

Minimum Air

Pressure.

Vertical Flattening.

Light r

Tires (

In.

28 28 28

In.

3

3 J

360 400 700

lb

per sq. in.

70

I 5

80

In.

•19 •19

•25

Heavy f Tires {

32 32 32

3*

4 5

900 1000 1300

80

85 95

•33 •33

•34

Fig. 15. -As a pneumatic tire flattens where it is in

Fastenings of Motor Tires to Rims. — The ″ beaded edge ″ type of fastening is most largely used, supplemented by security bolts

Fig. 14.

Non-Skid Devices.-

contact with the road, under certain conditions of road surface a

semi-liquid film of mud gets interposed, and frictional contact is reduced to a minimum. The vehicle has then no lateral constraint, and side-slipping or skidding may occur. On a bicycle this means a dismount, probably a severe fall; on a three or four-wheeled vehicle the steering control is temporarily lost. Cycle tires are usually provided with longitudinal ridges at the tread (figs. 8, 9, 11) ; the narrow surfaces of the ridges penetrate the mud and get a better grip on the solid road surface. Motor car tires are sometimes left with a smooth tread (fig. 14); fig. 13 shows a non-slipping tread with longitudinal ridges. The Dunlop non-slipping tread is formed by a series of lateral grooves about 2 in. apart all round the tread. Fig. 16 shows a tire fitted with a non-skid leather band, to which hard steel studs are fastened. This type of non-skid band can be either vulcanized to the tire or independently fastened to the rim at the beaded edges. The Parsons .■" non-skid " device consists of chains crossing the tire at right angles and

fitting loosely over its surface; they are

fastened at intervals to two chain rings one

on each side of the wheel, and can be easily

adapted to any tire. (A. Sp.)

TIREH (anc. Teira), a town of Asia Minor, situated in the

valley of the Kuchiik Menderes (Caystrus) at the foot of Mt Messogis. It was the capital of the amirate of Aidin in the 14th century, and is described by Ibn Batuta as a fine city with streams and gardens. Pop. over 14,000, the larger half Moslems. It is connected with Smyrna by a branch of the Aidin railway, and has a trade in raisins, wheat, rice, tobacco and cotton.

TIRGOVISHTEA (Rumanian Ttrgovistea, or Tdrgovislea, sometimes incorrectly written Tergovista or Tirgovisf), the capital of the department of Dimbovitza, Rumania; situated at the foot of the Carpathians, on the right bank of the river Jalomitza, 48 m. N.N.W. of Bucharest. Pop. (1900), 9398. A branch line connects Tlrgovishtea with the main Walachian system, and is prolonged northwards into the hills, where there are rich deposits of petroleum, salt and lignite. Coal is also found but not worked. Apart from the scanty ruins of a 14th-century palace, the most interesting building in the town is the Metropolitan church, still one of the finest in the country, with its nine towers and monuments of the princely house of Cantacuzino. It was founded in 1515 by Neagoe Basarab, builder of the famous cathedral of Curtea de Argesh. Tlrgo-vishtea is a garrison town, with a cavalry training school and an artillery depot and repairing arsenal.

Fig. 16.

Under Mircea the Old (1383–1419) Tirgovishtea became the third capital of Walachia. In the 15th century it was sacked by the Szeklers. Michael the Brave defeated the Turks under its walls in 1597. In the 16th century it had a population of 60,000 and contained 70 churches and 40 convents. After Constantine Brancovan moved the seat of government to Bucharest in 1698, Tirgovishtea lost its importance and the population decreased.

TIRGU JIU (often incorrectly written Tergu Jiu), the capital of the department of Gorjiu, Rumania; situated among the lower slopes of the Carpathians, on the left bank of the river Jiu, and at the terminus of a branch railway which joins the main Walachian line between Turnu Severin and Craiova. Pop. (1900), 6634. The town has a small trade in timber, petroleum and farm produce. Anthracite coal is found in the neighbourhood.

TtRGU OCNA (Rumanian also Targul Ocna). a town of Rumania, on the left bank of the river Trotosh, an affluent of the Sereth, and on a branch railway which crosses the Ghimesh Pass into Transylvania. Pop. (1900), 8033. Tirgu Ocna is built among the Carpathian Mountains, on bare hills formed of rock salt. Outside the town stands the largest prison in Rumania; beyond this are the mines, worked, since 1870, by convicts, who receive a small wage. The thickness of the salt is unknown; the mines yield about 11,000 tons annually.

TIRHUT, or Tirhoot, the historic name of a tract in northern India, being that portion of Behar which lies north of the Ganges. It corresponds roughly with the ancient Hindu kingdom of Mithila (q. v.), Down to 1873 it formed a single district, which was then divided into the two districts of Darbhanga and Muzaffarpur. In 1908, when the division of Patna was sub- divided, the name of Tirhut was again officially given to a new division, containing the four districts of Darbhanga, Muzaffarpur, Saran and Champaran: total area, 12,588 sq. m.; total pop. (1901), 9,867,373. It is a continuous alluvial plain, tra- versed by many winding rivers, and it

supports the densest population in all India. It is the main centre of the indigo industry, conducted by European planters, which is now in a declining condition. Other crops are rice, millets, wheat, maize, oilseeds, sugar-cane aad tobacco. Apart from indigo there are no large industries. Since the famine of 1874 the whole country has been saved from its former isolation by the construction of the Bengal & North-Western railway, with numerous branches; but the Ganges is nowhere bridged.

TIRIDATES, or Teridates, a Persian name, given by Arrian in his Parthica (preserved by Photius, cod. 58, and Syncellus, p. 539 seq.) to the brother of Arsaces I., the founder of the Parthian kingdom, whom he is said to have succeeded. But Arrian's account seems to be quite unhistorical (cf. Parthia).

The king commonly called Tiridates II. was set up by the Parthians against Phraates IV. in 32 B.C., but expelled when Phraates returned with the help of the Scythians (Dio Cass. li. 18; Justin xlii. 5 seq.; cf. Horace, Od. i. 26). Tiridates fled to Syria, where Augustus allowed him to stay, but refused to support him. During the next years Tiridates invaded Parthia again; some coins dated from March and May, 26 B.C., with the name of a king " Arsaces Philoromaios, " belong to him; on the reverse they show the king seated on the throne, with Tyche stretching out a palm branch towards him. He was soon expelled again, and brought a son °f Phraates into Spain to Augustus. Augustus gave the boy back to his father, but declined to surrender " the fugitive slave Tiridates " (Justin xlii. 5; Dio liii. 33; cf. Mon. Ancyr. 5, 54; in li. 18 Dio has wrongly placed the surrender of the son in 30 B.C.).

Tiridates III., grandson of Phraates IV., lived as a hostage in Rome and was educated there. When the Parthians rebelled against Artabanus II. in a.d. 35 they applied for a king to Tiberius, who sent Tiridates. With the assistance of L. Vitellius Tiridates entered Seleucia, but could not maintain himself long (Tacitus, Ann. vi. 32 sqq.; Dio Cass,

lviii. 26).

The name Tiridates is also borne by some local kings of Persis, and by some Arsacid kings of Armenia and Georgia. The best known of the Armenian kings is the Tiridates (a.d. 238–314)

who was baptized by Gregory the Illuminator (see Armenian Church). (Ed. M.)

TIRLEMONT (Flemish Thienen), a town of Belgium in the province of Brabant, 1 1 m. S.E. of Louvain. Pop. (1904), 18,340. It still preserves its enceinte, 6 m. in circumference. The principal church, Notre Dame du Lac, begun in the 12th and enlarged in the 15th centuries, is still unfinished. The church of St Germain also dates from the 12 th century, and contains a fine altar-piece by Wappers. John Borland, the Jesuit who began the collection of the Acta sanctorum, was born here in 1596. The principal industries are brewing, soap manufacture and tanning.

TIRMIDHl [Abu Tsa Mahommed ibn Tsa ut-Tirmidhl] (d. 892), Arabian traditionalist, was born at Tirmidh on the Jihun. He was a scholar of the traditionalist Bukhari, and in his search for traditions travelled through Khorasan, Irak and Hejaz. His al-Jdmi' us-Sahih is one of the six canonical collections of traditions. In it he admitted every tradition that had ever been used to support a legal decision, indicating the doctrine it supported and mentioning the doctrines opposed to it. It was published at Bulaq in 1875. He also wrote the Kitdb usk- Shama'il on the character and life of Mahomet (printed at Calcutta, 1846). (G. W. T.)

TIROL (or Tyrol 1), the most southerly province of the Austrian Empire. It makes a great bend southwards towards Italy, by which it is bounded on the S.E., S. and S.W., while on the W. it adjoins part of present Switzerland (till 1652 the Lower Engadine was Tirolese, and not Swiss) and also the Austrian province of Voralberg; to the N. it borders on Bavaria and to the E. the province of Upper

Austria. It is traversed from west to east by the main chain of the Alps, which rises in various snow-covered summits, the more important being the Ortler (12,802 ft., the loftiest peak in Tirol and in the Eastern Alps generally), the Wildspitze (12,382 ft., Oetzthal group), the Zuckerhutl (11,520 ft., Stubai group), the Hochfeiler (11,559 ft., Zillerthal group), the Gross Venediger (12,008 ft.) and the Gross Glockner (12,461 ft., both in the Tauern range), while more to the south are the Dolomites, which culminate in the Marmolata (10,972 ft.). It is divided into two very distinct portions by the Brenner Pass (4495 ft.), connecting the Stubai and the Zillerthal groups; over this pass a splendid railway was built in 1864-186 7 from Inns- bruck to Verona, while the highway over the pass has from the earliest times been of immense importance from every point of view. The Brenner, too, being on the main watershed of the Alps, separates the two main river systems of which Tirol is composed. To the north this province comprises the middle portion of the Inn Valley, with its tributaries, as well as the upper portion of the Lech valley, all flowing towards the Danube and so to the Black Sea, while south of the pass is the great upper valley of the Adige or Etsch, with many tributaries, as well as (since 1500) a portion of the upper Drave valley, which physically belongs to Carinthia — all these (save the Drave) flow to the Adriatic Sea. The area of Tirol is 10,204 sq. m. In 1900 its population was 852,712 (all but wholly Romanist), of whom more than half were German-speaking, and many in the south Italian-speaking, while in certain side valleys of the Adige system the quaint old Ladin dialect, still surviving also in the Swiss Engadine, is the prevailing tongue; in the southern half of the region there are a few German-speaking among the Italian-speaking folk. The capital is Innsbruck, while other important towns are Trent, Botzen and Rovereto.

The present very irregular shape of the district is due to historical causes. The original Tirol consisted of part of the middle Inn valley and of

the uppermost portion (the Vintschgau) of the Adige valley. In 1500, by inheritance from the counts of Gorz, the Pusterthal and upper Drave valley (east) were added; in 1505 the lower portion of the Zillerthal; with the Inn

1 To speak, as is commonly done, of " the Tirol " is as absurd as speaking of " the England." As regards the English spelling of the name adopted throughout the Ency. Brit., it should, however, be stated that the writer of this article regards " Tyrol " as more correct. — (Ed.)

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valley from its entrance to Kufstein, and the Kitzbiihel region (north-east) were all won from Bavaria; in 1517 Rovereto and several other places on the present south-eastern frontier were acquired from Venice ; in 1 803 many fiefs in the bishoprics of Trent and Brixen were annexed on the secularization of those two bishoprics; while finally the rest of the Zillerthal, with Windisch Matrei, was obtained in 1816 from the archbishopric of Salzburg. Besides the great railway line over the Brenner, there are other lines from Botzen past Meran to Mais, from Franzensfeste up the Pusterthal to Lienz in the Drave valley, and from Innsbruck, by a tunnel beneath the Arlberg Pass to the Vorarlberg and the Rhine valley.

The majority of the population is devoted to pastoral, and in some degree to agricultural pursuits, the cattle, as in other Alpine lands, being the mainstay of the peasants. In summer they are driven up to the mountain pastures (called here Almen, but Alpen in Switzerland), which are, however, less carefully looked after than in Switzerland, partly because in many cases they have been alien- ated by the neighbouring hamlets to far distant places. Forestry also employs a certain proportion of the population, but the felling of trees is carried on wastefully, though less so than

in former years. A few minerals are found in the district, but in this department the saltworks of Hall, near Innsbruck, take the first place. In southern Tirol, silk-spinning is still one of the principal industries, while good local wines are produced near Meran and Botzen. There are also some factories of preserved fruits and tobacco. But, save in the towns, Tirol is above all a pastoral land.

The peasants are famous for their devotion to the Roman Catholic religion, their fervent loyalty to the House of Austria, their excellent marksmanship, and their love of singing and music, the zither being the national instrument. There is a university at Innsbruck, but primary education, though compulsory, does not attain any very high degree of excellence, as in summer the schools are closed, for all hands are then required in the fields or on the mountain pastures. The picturesque local costumes have nearly altogether disappeared, save in the Passeyerthal, near Meran, while the increasing crowds ot summer visitors have largely spoilt the simplicity of the natives. Ecclesiastically, Tirol is ruled by the archbishop of Salzburg and his two suffragans, the bishops of Trent and of Brixen. The country is divided into 21 administrative districts (Bezirke), each composed of a number of communes or civil parishes. Tirol sends 25 repre- sentatives to the Austrian parliament at Vienna. Locally it is ruled by an Imperial governor (the Statthalter) who resides at Inns- bruck, where, too, meets annually the local legislature or Diet (the Landtag), composed (according to the constitution of 1861) of 68 members; the archbishop of Salzburg, the bishops of Trent and Brixen, and the rector of the university of Innsbruck sit in person, while the great ecclesiastical corporations send four deputies, the chambers of commerce of Innsbruck, Trent and Rovereto each one, the nobles ten, the towns 13, and the peasants 34.

History. — By far the greater portion of the region later called Tirol was inhabited, when it makes its appearance in history, by the Raetians (perhaps a Celtic race, though some still hold that they were

connected with the Etruscans), who were con- quered (14 b.c.) by Drusus and Tiberius, and were later organized into the Roman province of Raetia. In the 5th and following cen- turies the north portion was Teutonized, first by the Ostro- goths, mainly by the Baiouarii, but the Teutonic Langobardi who pressed up from the south became Romanized them- selves, so that the double character of the inhabitants of the land appears quite early. In 774 the Carolingians con- quered the Langobardi or Lombards, and in 788 the Baiouarii. But the officials charged with the rule of these parts gradually became semi-independent, particularly the Bavarian dukes in the region north of Trent. Some time after the break-up of that duchy in 976, the emperor Conrad II. entrusted all temporal powers in the northern region to the bishop of Brixen, and in the southern portion to the bishop of Trent, detaching theBe southern districts from Italy (to which they had always belonged, save from 951 to 962, when the march of Verona was annexed to the duchy of Carinthia) and incorporating them with Germany. The bishops, in their turn, had to exercise their temporal rights through lay vassals, of whom the most powerful in the course of the 12th century were the lords of Andechs, near Munich. On the extinction of this family in 1248, most of their fiefs were given by the two bishops to the father-in-law of the last lord of Andechs, Albert, count of Tirol. This new family took its name from the still existing castle of Tirol (Later Roman, Teriolis), above Meran, in the upper Adige valley, and

is mentioned for the first time in IT40. Albert's elder daughter," Adelaide, married Meinhard, count of Gorz (north of Trieste); their elder son Meinhard (d. 1295) took Tirol, and the younger Gorz; but in 1500 the latter's line became extinct, and the elder line inherited its possessions. Long before that time the senior branch of the elder line had ended in Margaret, nicknamed die •Maultasche (the Pocket-mouth), who, in 1342, married Louis of Brandenburg (d. 1361), and whose only child Meinhard died in her lifetime in 1363; Tirol accordingly passed by

agreement in the latter year of the junior branch of the elder line, the Habsburgers, dukes of Austria since 1282. In this way Tirol came to the dynasty which has ever since heldit (save 1 805–1814). From that time onwards till 1665 Tirol was generally entrusted to a cadet of the Austrian house, who ruled first at Meran, and from about 1420 at Innsbruck, as a nearly independent prince; but since 1665 the province has been governed from Vienna. We have noted above the manner in which the limits of Tirol were gradually extended. Several of these additions were due to the archduke Maximilian, who ruled Tirol from 1490 onwards, becoming emperor in 1493 and dying in 1519. His memory is still cherished in the district, for he conferred on it the title of Gefiirstete Grafschaft, spent much time in it, and erected in the chief church of Innsbruck a sumptuous monument as his tomb.

Owing to its position astride of the Alps, and so commanding the road across them, Tirol has often been the scene of sharp fighting. In 1499 the Swiss won a victory in the Calven gorge (near the head of the Adige valley) against Maximilian, which resulted in the Swiss gaining their practical independence of the empire. In 1703 the Bavarians and French, during the War of the Spanish Succession, took Innsbruck, but were then driven back. In 1805, by the peace of Pressburg, Napoleon forced Austria to hand over Tirol to his ally, Bavaria, which held it till 1814. On the outbreak cf war (1809) between France and Bavaria, the people rose in revolt. Their leader was Andreas Hofer (b. 1767), a small innkeeper of the Passeyerthal, and under him the peasants repeatedly defeated the Bavarian, French and Saxon troops. Three times (April 13, May 29 and Aug. 13) did they drive the foe out of Innsbruck. On the 15th of August, Hofer, yielding to the popular wish, assumed the government of Tirol. But in October the ill-success of the Austrians against the French elsewhere forced them to conclude the peace of Vienna, by which Tirol was definitely secured to Bavaria. The peasants refused to believe in the bad news, and continued to resist the French, but were

at last overpowered by numbers. The French occupied the Passeyerthal on the 23rd of November, and Hofer was obliged to seek shelter in a hut on the mountain pastures. Here he was betrayed by a neighbour to the French (Jan. 27, 1810), who took him captive to Mantua, where, by express order of Napoleon, he was shot (Feb. 20, 1810) for the sole offence of being loyal to his emperor and his native land. His bones now lie in the great church at Innsbruck, side by side with those of his two chief supporters, the Capuchin friar and army chaplain, Joachim Haspinger (d. 1858), and the peasant, Joseph Speckbacher.

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TIRSO DE MOLINA, the pseudonym of Gabriel Tellez (1571–1648), Spanish dramatist. Born at Madrid in October 1571, he studied at the Alcala de Henares, joined the Order of Mercy on the 4th of November 1600, and made his religious profession in the Monastery of San Antolln at Guadalajara on the 21st of January 1601. He was a dramatist of ten years' standing when he was sent by his superiors on a mission to the West Indies in 1615; returning to Europe in 161 7, he resided at the Mercenarian monastery in Madrid, took part in the proceedings of the Accidentia pottica de Madrid, founded by Sebastian Francisco de Medrano, competed in the literary tournaments then in vogue, and wrote copiously for the stage. His first publication, the incomplete Cigarrales de Toledo (licensed in 1621, but apparently not published till 1624), is a miscellany, containing short tales, novels, verses and three plays; one of the novels, Los Tres maridos burlados, probably derived from II Cieco da Ferrara's Mambriano, and the play entitled El Vergonzoso en palacio are admirable examples of

witty contrivance. The preface to the Cigarrales de Toledo (the second part of which was never printed) states that Tirso de Molina had already written three hundred plays, and at this period of his career he was second only to his friend Lope de Vega in popularity. He avowed himself hostile to culteranismo in the Cigarrales de Toledo, and made numerous enemies by his attacks on the new school in such pieces as Amar por arte mayor and La Celosa de si misma. The realistic character of some of his productions provided his unsuccessful rivals with an excuse for denouncing him as a corrupter of public morals to the council of Castile in 1625, and, though no legal action was taken against him, he appears to have been reprimanded privately. In 1626 it was deemed advisable to transfer him to Salamanca, and Tirso de Molina left Madrid determined to write no more for the stage. Though one of his plays, La Huertd de San Juan, is dated 1626, there is no proof that it was begun after his depar- ture from Madrid, and he seems to have kept to his resolution for eight years. But he had not lost his interest in the theatre, and felt justified in publishing twelve representative pieces as the first part of his dramatic works (1626). This may be taken as a formal protest against the weakness of those who had sacrificed him to hypocritical clamour. In other respects he was submissive, and worked zealously on behalf of his order in which he rose to important positions; he became superior of the monastery at Trujillo in 1626, was elected later to the posts of reader in theology and definidor general, and in May 1632 was appointed chronicler of the Order of Mercy. His Deleitar aprovechado (1635) is a devout counterpart of the Cigarrales de Toledo, much inferior to its predecessor in interest; a sequel was promised to this collection of pious tales, pious lyrics, and autos, but, as in the case of the Cigarrales de Toledo, the continuation never appeared. Twelve plays constitute the third part of his dramatic works which was published (before the second) in 1634 under the nominal editorship of the writer's nephew Francisco Lucas de Avila, but the existence of this nephew is doubtful. The second

part (1635), the printing of which was paid for by the confraternity of St Jerome, contains four plays by Tirso de Molina, and eight written by him in collaboration with other dramatists; one of these collaborators was Ruiz de Alarcon {q.v.), but the internal evidence goes to show that Tirso de Molina was the predominant spirit in these literary partnerships. The fourth part of Tirso's dramatic works (1635) and the fifth

(1636) each contain twelve plays; the haste with which these five volumes were issued indicates the natural desire of a great author to save some part of his work from destruction, and the appearance of a supposititious nephew's name on the title-pages of the last four volumes indicates the equally natural desire of a prominent monk to avoid conflict with the authorities. A sixth volume of dramatic pieces, consisting of light comedies, was announced; but the project was abandoned. That dramatic composition still entertained the scanty leisure of Tirso's old age is shown by the fact that the fragmentary autograph copy of Las Quinas de Portugal is dated the 8th of March 1638; but his active career as a dramatist ended two years earlier. He was absorbed by other duties. As official chronicler of his order, he compiled the elaborate Historia de la merced, which occupied him till the 24th of December 1639, an d still survives in manu- script. As a tribute to the count de Sastago, who had accepted the dedication of the fourth part of the plays, and who had probably helped to defray the publishing expenses, Tirso de Molina is said to have compiled the Genealogia de la casa de Sdstago (1640), but the ascription of this genealogical work is disputed. On the 29th of September 1645 Tirso de Molina became superior of the monastery at Soria, and died there on the 12th of March 1648.

It is only within the last few years that it has become possible to give an outline of his life; it will always be impossible for posterity to do justice to his genius, for but a fraction of his plays have been preserved. The earliest of his extant pieces is dated 1605 and bears no sign of

immaturity; in 1624 he had written three hundred plays, and in 1634 he stated that he had composed four hundred within the previous twenty years; of this immense production not more than eighty plays are in existence. Tirso de Molina is univer- sally known as the author of El Burlador de Sevilla y con- vidado de piedra, the piece in which Don Juan is first presented on the stage; but El Burlador de Sevilla represents only one aspect of his genius. No less remarkable than his represen- tation of perverse depravity in El Burlador de Sevilla is his dramatic treatment of a philosophical enigma in El Condenado por desconfiado. Though manifestly attracted by exceptional cases, by every kind of moral aberration, by the infamous and the terrible, his range is virtually unlimited. He reveals him- self as a master of historical interpretation in La Prudencia de la mujer and of tragical pathos in La Venganza de Tamar; his sympathetic, malicious wit finds dramatic expression in El Vergonzoso en palacio and Don Gil de las calzas verdes, and the fine divination of feminine character in Averigiielo Vargas and La Villana de Vallecas is incomparable. Tirso de Molina has neither Lope de Vega's inventive resource, nor his infinite seduction; he has neither Calderon's idealistic visions, nor his golden music; but he exceeds Lope in massive intellectual power and in artistic self-restraint, and he exceeds Calderon in humour, in creative faculty, and in dramatic intuition. That his reputa- tion extended beyond the Pyrenees in his own lifetime may be gathered from the fact that J. Shirley's Opportunity is derived from El Castigo del pensSque ; but he was neglected in Spain itself during the long period of Calderon's supremacy, and his name was almost forgotten till the end of the 18th century, when some of his pieces were timidly recast by Dionisio Solis and later by Juan Carretero. The renaissance of his fame, however, dates from 1839-1842, when an incomplete but serviceable edition of his plays was published by Hartzenbusch; and he is now accepted as among the greatest dramatists of Spain.

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TIRUPATI, or Tripetty, a town of British India, in the North Arcot district of Madras, with a station on the Madras railway, 84 m. N.E. of Madras city. Pop. (1901), 15,485. It is famous for a temple on the neighbouring hill of Tirumala, 2500 ft. above the sea, which is one of the most frequented places of pilgrimage in southern India. The town contains numerous temples con- nected with the shrine of Tirumala, and is noted for its brass- work and wood-carving.

TIRYNS, the Tipvvs raxioecrcra of Homer (II. ii. 559), a small Peloponnesian city, in the prehistoric period of the Achaean race, long before the Dorian immigration. It stood on a small rock in the marshy plain of Argolis, about 3 m. from the sea, and was fabled to have been founded by King Proetus, the brother of Acrisius, who was succeeded by the hero Perseus. It was the scene of the early life of Heracles, who is hence called Tirynthius. The massive walls, which appear to be of earlier

Fig. 1. — Plan of the Palace in the Upper Part of Tiryns.

1, Main gate in the outer wall.

2, Inner gate, approached be-

tween massive walls.

3, Main propylaeum.

4, Inner propylaeum.

5, Court (av\ri) surrounded by a

colonnade on three sides: the altar to Zeus Herceus is by the entrance.

6, KWovaa, portico of the megaron.

7, ItpoSo^os, inner porch.

8, Megaron, with roof supported

on four columns, and the circular hearth in the middle.

9, Bath-room and small 0dXa/*oi.

10, 10, Chambers round the great

court.

11, 11, Guard chambers by the

main propylaeum.

12, Passage (kabpTj) from the main propylaeum to the second house.

I3i I3> Courts of the second house.

14, Megaron.

15, Chambers (OaXafioi).

16, Passage to the rock-cut

stairs.

17, Small postern door in the

semicircular bastion, ap- proached by flight of rock- cut steps.

18, 18, Massive outer wall of

city.

19, Inner wall to guard the en-

trance passage.

20, Part of outer wall, with inter-

mediate passage and rows of chambers, as shown in fig. 2.

type than those of Mycenae, were said to have been the work of Cyclopean masons. Its period of greatest splendour was probably between the 14th and 12th centuries B.C.; in Homeric and subsequent times it was usually subject to Argos. The palace was probably burnt at the time of the Dorian conquest. After the Spartan defeat of Argos in 494 B.C. Tiryns regained temporary independence, and the Tirynthians fought on the

Greek side at Plataea, while the Argives held aloof. Soon after, in 468 B.C., Tiryns was finally destroyed through the jealousy of the Argives, and the site has been deserted ever since, but for a brief occupation in Byzantine times.

Excavations made in 1884-1885 by Schliemann and DSrpfeld over part of the rock on which Tiryns stood have exposed a most interesting building, which offers the most complete example of a palace of the Mycenaean age in Greece. The rock on which Tiryns is built is of an irregular oval shape, about 330 yds. long by 112 at the widest part, and is surrounded by

a very massive wall, varying from 30 to 40 ft. in thickness and averaging when complete about 50 ft. in height, measuring from its base outside. Inside, the wall was probably not more than 10 or 12 ft. high above the ground, so the masonry acts as a retaining wall to a considerable depth of earth which covers the rock (see fig. 2 below). The wall is built of very large hammer-dressed blocks, some as much as 10 ft. long by 3 ft. 3in. or 3 ft. 6 in. wide, with smaller ones to fill up the interstices. The whole was bedded, not in mortar, but in clay, which has mostly been washed out of the joints; originally the surface was probably protected with a coating of stucco. The only important gateway, which was on the east side, away from the sea, probably resembled the " lion gate " at Mycenae. The other entrances are mere slits in the wall. One of these and the chief gate are shown in fig. I. Internally the area of the city was divided by cross walls into three parts at successive levels. The lowest and middle divisions have not yet been excavated ; the upper part at the south end of the rock was completely exposed in 1884-1885 by Schliemann and Dorpfeld, and the almost complete plan of the various structures clearly made out. This division contains the palace of the ruler of Tiryns, a building which shows careful and skilful construction, elaborate decoration, and a well-arranged plan, suitable to the wants] of a wealthy autocratic chief, who lived in a manner which partly recalls the luxury of an Oriental king, and also resembled the feudal state of a medieval baron, surrounded by a crowd of vassals. From the main gate, which was defended by a tower, a strong passage led between the outer wall and an inner one to an inner gate, thence to a propylaeum or double porch, with two wooden columns on each side, adjoining which were chambers for guards. Then came another similar, but smaller propylaeum, and opposite to that was the entrance to the great court (aiXri), nearly 53 by 70 ft., in which stands an altar or pit of sacrifice, in a position similar to that occupied by the altar of Zeus Herceus in the later Greek house. This court was surrounded by

wooden columns supporting a roof, like a medieval cloister; on the south side are chambers for attendants (OaXaum). On the north side is the great hall (p.i yapov) , with an outer portico supported by two columns {oZdovaa.) and an inner vestibule (wpdSopios) with three doors. The hall is about 40 by 30 ft., with a circular hearth in the centre {tenia, or kaxapa). Four columns supported the roof, the central part of which probably rose above the rest like a medieval "lantern." On the west side of the hall are a

A, Outer base of wall.

B, Inside level of city.

C, Chambers in the thick-

ness of the wall open- ing out of the gallery.

D, Gallery, with roof

formed of projecting courses of stone in large blocks.

E, Top of main wall,

paved with clay, level with the inside.

F, Wooden columns on

existing stone bases, forming a porticus or covered walk along the top of the wall.

G, Outer wall of the

colonnade built of brick, now missing. H, Probable roof of the colonnade of wood, covered with beaten clay.

Fig.

2. — Section through the Outer Wall of the City at 20 in fig. I.

number of small chambers (edXa/ioi), and a bathroom about 12 by 10 ft., with its floor formed of one

great slab of stone, sloped so as to drain out at, one side through a pipe which passes through the wall. In addition to this there is also a second system, with open courts, hall and chambers; this has been generally supposed to be the women's quarters, but there is no authority for such duplication, and it is possible that it should rather be explained as another house. It is approached in a very circuitous way, either by a passage (Xaipri) leading from a side door in the main propylaeum or by another long passage which winds round the back of the chief hall, and so leads by a lon^ flight of steps, cut in the rock, to the little postern door in the semicircular bastion. A staircase led to an

upper floor. The circuit wall round the palace is more strongly constructed than the rest. On the south is a gallery built in the thickness of the wall, and roofed by projecting courses of stone; and chambers or storehouses open out of this gallery. The wall on the east side has a similar arrangement (see fig. 2). At the top level the wall was covered by a colonnade of wooden pillars resting on circular stone blocks. This supported a fiat roof and was open to' the inside of the fortress. The back of the colonnade was built of brick, and is now missing, as are all the brick parts of the palace, owing to the bricks having been only sun-dried.

The methods of construction employed in the Tiryns palace are of the highest interest. The foundations and about 3 ft. of the walls above the ground are made of large blocks of stone bedded in clay; above this the wall was of brick, sun-dried, and covered with stucco. The upper storey was probably of wood. Some of the thresholds of the doors were massive blocks of stone (XdiVos o656s) ; others were of wood (hpb'ivos oii&bs). Wood was also used for all the columns, doorposts, and antae (TrapacrrdSes), and in some cases the walls of the rooms were lined with

wood, carefully fixed by dowels, the holes for which still exist. The doors" had pivots of bronze revolving in well-fitted bronze cup-like sockets let into the thresholds. In the megaron and other rooms the floors are of good concrete decorated with a simple series of incised lines, coloured blue and red. The stucco of the internal wall is decorated with bold and very effective patterns — birds and scroll-work and other decorative designs. The best preserved painting shows a scene from a bull- fight. Both subjects and style show close analogy to the paintings in the palace at Cnossus in Crete. One example of rich and costly decoration remains — part of a frieze of white alabaster, sculptured in relief with rosettes and interlacing patterns, and studded with jewel-like pieces of blue glass or enamel, the Bpiyibs nvavoio of Od. vii. 87. Further excavations in the lower parts of the city will probably bring to light the dwellings of the citizens who garrisoned the place. The great bulk of the Tirynthians must have lived in houses outside the citadel, but under the shelter of its protection, just as in medieval Italy villages grew up round the castles of any powerful lord. The relation of the palace at Tiryns to those described in the Homeric poems has given rise to much discussion. The case is somewhat altered by the discovery of several other early houses, of similar character, but not identical in plan, at Mycenae and else- where in Greece; these do not, for example, show the duplication of the essential parts of the house found at Tiryns. It is now gener- ally recognized that, while the general character of the palace at Tiryns is invaluable as illustrating the type of house in the mind of the Homeric poet, it is a mistake to appeal to it for the explanation of details of arrangement such as probably varied considerably according to the conditions and requirements in different cases.

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(J. H. M.;E. Gr.)

TISCHENDORF, LOBEGOTT FRIEDRICH KONSTANTIN

VON (1815–1874), German biblical critic, the son of a physician, was born on the 18th of January 181 5 at Lengenfeld, near Plauen, in the Saxon Vogtland. From the gymnasium at Plauen he passed in 1834 to the university of Leipzig, where he was mainly influenced by J. G. B. Winer (1789–1858), and began to take special interest in New Testament criticism. In 1838 he took the degree of doctor of philosophy, and then be- came master at a school near Leipzig. After a journey through southern Germany and Switzerland, and a visit to Strass- burg, he returned to Leipzig, and set to work upon a critical study of the New Testament text, following the guidance of Karl Lachmann. In 1840 he qualified as univer- sity lecturer in theology with a dissertation on the recensions of the New Testament text, the main part of which re- appeared in the following year in the prolegomena to his first edition of the New Testament. These early textual studies convinced him of the absolute necessity of new and exacter collations of MSS. From October 1840 till January 1843 he was in Paris, busy with the treasures of the great library, eking out his scanty means by making collations for other scholars, and producing for the publisher, F. Didot, several editions of the Greek New Testament, one of them exhibiting the form of the text corresponding most closely to the Vulgate. The great triumph of these laborious months was the decipher- ment of the palimpsest Codex Ephraemi Syri Rescriptus, of which the New Testament part was printed before he left Paris and the Old Testament in 1845. His success in dealing with a MS. much of which, owing to the fact that it had been rewritten

with the works of Ephraem Syrus, bad been illegible to earlier collators, brought him into note and gained support for more extended critical expeditions. From Paris he had paid short visits to Holland (1841) and England (1842). In 1843 he visited Italy, and after a stay of thirteen months

went on to Egypt, Sinai, Palestine and the Levant, returning by Vienna and Munich. 1 From Sinai he brought a great treasure, forty-three leaves of what is now known as the Codex Sinaiticus. He kept the place of discovery a secret, and the fragments were pub- lished in 1846 as the Codex Friderico-Augustanus, a name g'ven in honour of the king of Saxony. He now became professor extraordinarius in Leipzig, and married (1845). In the same year he began to publish an account of his travels in the East (2 vols., 1845-1846). In 1850 appeared his edition of the Codex Amiatinus and of the Septuagint version of the Old Testament (7th ed., 1887); in 1852, amongst other works, his edition of the Codex Claromontanus. In 1853 and 1859 he made a second and a third voyage to the East. In the last of these, in which he had the active aid of the Russian government, he at length got access to the remainder of the precious Sinaitic codex, and persuaded the monks to present it to the tsar, at whose cost it was published in 1862 (in four folio volumes). In 1869 he was given the style of " von " Tischendorf as a Russian noble. Meanwhile, in 1859, he had been made professor ordinarius of theology and of biblical palaeography, this latter professorship being specially created for him; and another book of travel, Aus dem heiligen Lande, appeared in 1862. Tischen- dorf's Eastern journeys were rich enough in other discoveries to deserve the highest praise. 8 Side by side with his industry in collecting and collating MSS., Tischendorf pursued a constant course of editorial labours, mainly on the New Testament, until he was broken down by overwork in 1873. He died on the 7th of December 1874 at Leipzig.

The great edition, of which the text and apparatus appeared in 1869 and 1872, 3 was called by himself editio viii.; but this number is raised to twenty or twenty-one if mere reprints from stereotype plates and the minor editions of his great critical texts are included ; posthumous prints bring up the total to forty-one. Four main recensions of Tischendorf s text may be distinguished, dating respec- tively

from his editions of 1841, 1849, 1859 (ed. vit.), 1869–1872 (ed. viii.). The edition of 1849 may be regarded as historically the most important from the mass of new critical material it used ; that of 1859 is distinguished from Tischendorf 's other editions by coming nearer to the received text ; in the 8th edition the testimony of the Sinaitic MS. received great (probably too great) weight. The readings of the Vatican MS. were given with more exactness and certainty than had been possible in the earlier editions, and the editor had also the advantage of using the published labours of S. P. Tregelles.

Much less important was Tischendorf's work on the Greek Old Testament. His edition of the Roman text, with the variants of the Alexandrian MS., the Codex Ephraemi and the Friderico- Augustanus, was of service when it appeared in 1850, but, being stereotyped, was not greatly improved in subsequent issues. Its imperfections, even within the limited field it covers, may be judged by the aid of C. E. Nestle's appendix to the 6th issue (1880). Besides this may be mentioned editions of the New Testament Apocrypha [De Evangeliorum apocryphorum origine et usu (1851); Acta Apostolorum apocrypha (1851); Evangelia apocrypha (1853; 2nd ed., 1876); Apocalypses apocryphae (1866)] and various minor writings, in part of an apologetic character, such as Wann warden unsere Evangelien verfasst ? (1865; 4th ed., 1866), Haben wir den echten Schrifttext der Evangelisten und Apostel ? (1873), and Synopsis evangelica (7th ed., 1898).

See, in addition to the handbooks on New Testament criticism, Carl Bertheau's article on Tischendorf in Herzog–Hauck, Realen- cyklopadie (3rd ed., 1907).

TISIO (orTrsi), BENVENUTO (1481–1559), commonly called II Garofalo, Italian painter of the Ferrarese school, was born in

1 See his Reise in den Orient (Leipzig, 1845–1846).

2 The MSS. brought to Europe on the first two journeys are catalogued in the Anecdota sacra et

profana (Leipzig, 1855, enlarged 1861). See also the Monumenta sacra inedita (Leipzig, 1846), and Nova collectio of the same (1855–1869). The 3rd volume of the Nova collectio gives the results of his last Eastern journey.

3 The prolegomena remained unfinished at his death, and have been supplied by C. R. Gregory (cf. his Textkritik des Neuen Testa~ mentes, vol. L, 1900).

1481 at Garofolo, in the Ferrarese territory, and constantly used the gillyflower (garofalo) as a symbol with which to sign his pictures. He took to drawing in childhood, and was put to study under Domenico Panetti (or Laneto), and afterwards at Cremona under his maternal uncle Niccolo Soriani, a painter who died in 1499; he also frequented the school of Boccaccio Boccaccino. He stayed fifteen months with Giovanni Baldini in Rome, acquiring a solid style of draughtsmanship, and was two years with Lorenzo Costa at Mantua. He then entered the service of the marquis Francesco Gonzaga. Afterwards he went to Ferrara, and worked there four years. Attracted by Ra- phael's fame, and invited by a Ferrarese gentleman, Geronimo Sagrato, he again removed to Rome, and found the great painter very amicable; here he stayed two years, rendering some assistance in the Vatican frescoes. From Rome family affairs recalled him to Ferrara; there Duke Alphonso I. com- missioned him to execute paintings, along with the Dossi, in the Villa di Belriguardo and in other palaces. Thus the style of Tisio partakes of the Lombard, the Roman and the Venetian modes. He painted extensively in Ferrara, both in oil and in fresco, two of his principal works being the " Massacre of the Innocents" (1519), in the church of S. Francesco, and the " Betrayal of Christ " (1524), accounted his masterpiece. For the former he made clay models for study and a lay figure, and executed everything from nature. He continued constantly at work until in 1550 blindness overtook him, painting on all feast-days in monasteries for the love of God. He had married at the age of forty-eight, and

died at Ferrara on the 6th (or 16th) of September 1559, leaving two children.

Garofalo combined sacred inventions with some very familiar details. A certain archaism of style, with a strong glow of colour, suffices to distinguish from the true method of Raphael even those pictures in which he most closely resembles the great master — this sometimes very closely; but the work of Garofalo is seldom free from a certain trim pettiness of feeling and manner. He was a friend of Giulio Romano, Giorgione, Titian and Ariosto ; in a picture of ″ Paradise ″ he painted Ariosto between St Catherine and St Sebastian. In youth he was fond of lute-playing and also of fencing. He ranks among the best of the Ferrarese painters; his leading pupil was Girolamo Carpi. The ″ Adoration of the Magi,″ in the church of San Giorgio near Ferrara, and a ″ Peter Martyr,″ in the Dominican church. Ferrara (sometimes assumed to have been done in rivalry of Titian), are among his principal works not already mentioned. The National Gallery, London, contains four, one of them being a Madonna and Christ enthroned, with St Francis and three other saints.

TISSAPHERNES (Pers. Cithrafarna), Persian soldier and statesman, son of Hydarnes. In 413 he was satrap of Lydia and Caria, and commander in chief of the Persian army in Asia Minor (Thuc. viii. 5). When Darius II. ordered the col- lection of the outstanding tribute of the Greek cities, he entered into an alliance with Sparta against Athens, which in 412 led to the conquest of the greater part of Ionia. But Tissaphernes was unwilling to take action and tried to achieve his aim by astute and often perfidious negotiations; Alcibiades persuaded him that Persia’s best policy was to keep the balance between Athens and Sparta, and rivalry with his neighbour Pharnabazus of Hellespontic Phrygia still further lessened his energy. When, therefore, in 408 the king decided to support Sparta strenuously, Tissaphernes was removed from the generalship and limited to the satrapy of Caria, whereas Lydia and the conduct of the war were entrusted to Cyrus the

Younger. On the downfall of Athens, Cyrus and Tissaphernes both claimed jurisdiction over the Ionian cities, most of which acknowledged Cyrus as their ruler; but Tissaphernes took possession of Miletus, where he was attacked by Cyrus, who gathered an army under this pretence with the purpose of using it against his brother Arta- xerxes II. The king was warned by Tissaphernes, who took part in the battle of Cunaxa, and afterwards tried to destroy the Greek mercenaries of Cyrus by treachery. He was then sent back to Asia Minor to his old position as general in chief and satrap of Lydia and Caria. He now attacked the Greek cities, to punish them for their allegiance to Cyrus. This led to the war with Sparta in 399. Tissaphernes, who once again had recourse

to subtle diplomacy, was beaten by Agesilaus on the Pactolus near Sardis (395); and at last the king yielded to the repre- sentations of Pharnabazus, strongly supported by the chiliarch (vizier) Tithraustes and by the queen-mother Parysatis, who hated Tissaphernes as the principal cause of the death of her favourite son Cyrus. Tithraustes was sent to execute Tissaphernes, who was lured to Colossae and slain in 395.

(Ed. M.)

TISSERAND, FRANCOIS FELIX (1845-1896), French astro- nomer, was born at Nuits-Saint-Georges, Cote-d'Or, on the 13th of January 1845. In 1863 he entered the Ecole Normale Superieure, and on leaving he went for a month as professor at the lycee at Metz. Le Verrier offered him a post in the Paris Observatory, which he accordingly entered as aslronome adjoint in September 1866. In 1868 he took his doctor's degree with a brilliant thesis on Delaunay's Method, which he showed to be of much wider scope than had been contemplated by its inventor. Shortly afterwards he went out to Malacca to observe the famous solar eclipse of the 18th of August 1868. In 1873 he was appointed director of the observatory at Toulouse,

whence he published his Recueil d'exercices sur le calcul infinitesimal, and in 1874 became corresponding member of the Academie des Sciences. He took part in the French expeditions of 1874 to Japan, and in 1882 to Martinique to observe the transits of Venus. In 1878 he was elected a member of the Academie des Sciences in succession to Le Verrier, and became a member of the Bureau des Longitudes. In the same year he was appointed professeur suppliant to Liouville, and in 1883 he succeeded Puiseux in the chair of celestial mechanics at the Sorbonne. Tisserand always found time to continue his important researches in mathematical astronomy, and the pages of the Compies rendus bear witness to his surprising activity. His writings relate to almost every branch of celestial mechanics, and are always distinguished by rigour and simplicity in the solution of the most difficult problems. He treated in a masterly manner (Bulletin astronomique, 1889) the theory of the capture of comets by the larger planets, and in this connexion published his valuable Criterion for establishing the identity of a periodic comet, whatever may have been the perturbations brought about in its orbit, between successive appearances, by the action of a planet. His principal work, Traili de mecanique celeste, is the noblest and most lasting monument to his memory, and is worthy to stand beside the Mecanique dsleste of his fellow- countryman, Laplace. In this treatise, published in four quarto volumes, the last of which appeared only a few months before his death, he fused into one harmonious whole the researches of Laplace and those of other workers in the same field since his time. It furnishes a faithful and complete resumS of the state of knowledge in that department of astronomy at the end, as Laplace's great work did for the beginning, of the 19th century. In 1892 he succeeded Mouchez as director of the Paris Observatory, and as president of the committee of the photographic chart of the heavens he contri- buted largely to the success of that great project. Under his direction the revision of Lalande's catalogue was brought almost to completion, and four volumes of the

Annales de I'Observatoire de Paris exhibit the progress made in this important undertaking. He was also editor of the Bulletin astronomique from the beginning, and contributed many important articles to its pages. He died suddenly, in the fullness of his power, of congestion of the brain, on the 20th of October 1896.

(A. A. R.)

TISSOT, JAMES JOSEPH JACQUES (1836–1902), French painter, was born at Nantes on the 15th of October 1836. He studied at the Fcole des Beaux Arts in Paris under Ingres, Flandrin and Lamothe, and exhibited in the Salon for the first time at the age of twenty-three. In 1861 he showed "The Meeting of Faust and Marguerite, " which was purchased by the state for the Luxembourg Gallery. His first characteristic period made him a painter of the charms of women. Demi- mondaine would be more accurate as a description of the series of studies which he called La Remme a Paris. He fought

in the Franco-German War, and, falling under suspicion as a Communist, left Paris for London. Here he studied etching with Sir Seymour Haden, drew caricatures for Vanity Fair, and painted portraits as well as genre subjects. It was many years before he turned to the chief labour of his career — the production of a series of 700 water-colour drawings to illustrate the life of Christ and the Old Testament. Some sudden shock or bereavement was said to have turned his thoughts from ideals of the cafe and the boulevard into a more serious channel. He disappeared from Paris, whither he had returned after a stay of some years in England, and went to Palestine. In 1895 the series of 350 drawings of incidents in the life of Christ was exhibited in Paris, and the following year found them on show in London. They were then published by the firm of Lemercier in Paris, who had paid him 1,100,000

francs for them. After this he turned to the scenes of the Old Testament, upon which he was still engaged at the abbey of Buillon, in the depart- ment of Doubs, France, when he died on the 8th of August 1902. The merits of Tissot's Bible illustrations lay rather in the care with which he studied the details of scenery than in any quality of religious emotion. He seemed to aim, above all, at accuracy, and, in his figures, at a vivid realism, which was far removed from the conventional treatment of sacred types.

TISSOT, PIERRE FRANQOIS (1768-1854), French man of letters, was born at Versailles on the 10th of March 1768. His father, a native of Savoy, was a perfumer appointed by royal warrant to the court. At the age of eighteen he entered the office of a procureur of the Chatelet, in order to learn the practice of the law; but he cultivated the Muses rather than the study of procedure, and, being a handsome youth, was occasionally invited to the fetes of the Trianon. He devoted himself ardently to the cause of the Revolution, in spite of the fact that it had ruined his family. While with the procureur he had made the acquaintance of Alexandre Goujon, and they soon became inseparable; he married Goujon's sister, Sophie (March 5, 1793), and when his brother-in-law was elected deputy to the Convention and sent on a mission to the armies of the Moselle and Rhine, Tissot went with him as his secretary; he then returned to Paris and resumed his more modest position of secretaire general des subsistences. On the 1st of Prairial he tried in vain to save his brother-in-law, who had been involved in the proscription of the " last Montagnards "; all he could do was to give Goujon the knife with which he killed himself in order to escape the guillotine, and he afterwards avenged his memory in the Souvenirs de Prairial. He also took under his care Goujon's widow and children. His connexion with the Jacobin party caused him to be condemned to deportation after the attempt of the 3rd Nivose in the year IX., but Bonaparte, having been persuaded to read his translation of the Bucolics, struck ,his

name off the list. Though still a friend of the Republic, Tissot was henceforth an admirer of the First Consul; he cele- brated in verse several of the emperor's victories, and the arrival in France of Marie-Louise (1810). So far he had lived on the income derived from a factory of horn lanterns in the Faubourg St Antoine; and, being at last in fairly comfortable circumstances he now devoted himself to literature. The abbe Delille took him as his assistant at the College de France; and Tissot suc- ceeded him as head of it (1813) ; the emperor signed the appoint- ment as a reward for a poem composed by Tissot on his victory at Liitzen. He was removed from this post, however, in 1821, in consequence of the publication of a Precis sur les guerres de la revolution, in which rather colourless work he had dared to say that the Convention had saved France and vanquished the Coalition. Deprived of his post, Tissot was left still more free to attack the government in the press. He was one of the founders of the newspaper Le Constitutionnel, and of the review, the Minerve. Without laying stress on his literary works (Traite de la poesie latine, 1821; translation of the Bucolics, 3rd ed., 1823; Etudes sur Virgile, 1825) we should mention the Memo ires historiques et militaires sur Carnot, which he based on the papers left by the " Organizer of Victory " (1824), the Discours du General Foy (1826) and a Histoire de la guerre de

la P6ninsule also inspired by General Foy (1827). On the overthrow of Charles X., Tissot made a successful effort to regain his position at the College de France; he was also elected as a member of the French Academy on the death of Dacier (1833). It was then that he published his chief works: Histoire de Napoleon (2 vols., 1833), and Histoire complete de la revolution Jrancaise de 17&9 a 1806 (6 vols., 1833-1836), full of inconsisten- cies and omissions, but containing a number of the author's reminiscences; in some places they become practically memoirs, and are consequently of real value. In 1840 a carriage accident almost cost him his sight; he had to find an assistant, and passed

the last years of bis life in circumstances of increasing suffering, amid which, however, he preserved his cheerfulness and good- ness of heart. He died at Paris on the 7 th of April 1854.

See an excellent essay on Tissot by P. Fromageot in the Revue de Versailles et de Seine-et-Oise, in 1901.

TISSUE (Fr. tissu, tissue, participle of lisser, Lat. texere, to weave), properly the name of a fine textile fabric interwoven with gold and silver threads, hence used of any delicate or gauzy fabric (see Gold and Silver Thread). It was also early applied, as in French, to a ribbon, fillet or various forms of woven ligaments. In biology the word is of general use for an aggregate of cells forming a texture or fabric; in animal anatomy it is thus applied to the primary layers of which the parts are composed, and named by some qualifying word denoting its substance or its use (see Connective Tissue and Epithelial, Endothelial and Glandular Tissue).

TISTA, a river of northern India, which rises on the edge of the Tibetan plateau, and flows through the mountain gorges of Sikkim and Darjeeling, till it spills itself over the plain of Eastern Bengal. In the 18th century its course was due south to join the Ganges; but in 1787 great floods diverted the stream towards the south-east, and it now enters the Brahmaputra, the whole district of Rangpur being scored by various interlacing channels. Its total length in British territory is about 170 m.

TISZA, KALMAN [Koloman] (1830-1902), Hungarian states- man, was born at Geszt on the 10th of December 1830, the son of Lajos Tisza and the countess Julia Teleki, and was educated at his father's castle. In 1848 he obtained a post in the ministry of instruction of the revolutionary government which he accom- panied to Debreczen. After the war he went abroad with most of his family, and carefully studied foreign institutions. On returning home he devoted himself to the

improvement of the family estates, and in 1855 was elected assistant curator of the Calvinist church at Nagyszalonta, in succession to his father. When, on the 1st of September 1859, the Austrian government issued the " Patent " which struck at the very roots of Protes- tant autonomy in Hungary, Tisza, at the congress of the Cal- vinist Church beyond the Theiss, held at Debreczen, publicly repudiated the Patent on behalf of the Calvinist laity. He renewed his opposition in the most uncompromising terms at the ensuing congress (Jan. 11, i860), shrewdly guessing that the Patent was directed as much against the Hungarian con- stitution as against the Calvinist confession. His fears were justified by the October Diploma (see Hungary: History), which he attacked with equal vehemence. In August i860 Tisza married the countess Helen Degenfeld-Schomburg, a union which brought him into close connexion with the Karolyis, the Podmaniczkys and the Odescalchis. He was unanimously elected to represent Debreczen at the 1861 Diet, and was elected vice-president of the house at its second session. The Diet was divided between the Addressers, led by Deak, and the " Resolutionists," led by Count Laszlo Teleki, and on the death of the latter Tisza succeeded him as the leader of the more radical party. During the Provisorium (1861-1865) Tisza fought for constitutional reform in the columns of the Hon and the Magyar Sajto, his leading articles, afterwards collected and published under the title of Alfoldi Levelek (Letters from the Alfold), being by far the most important contribution to the controversy. When the Diet was again summoned by

royal decree (Dec. 10, 1865), Tisza once more represented Debreczen and formed, with Kalman Ghyczy (1808-1888), the Left-centre party. From 1867 onwards his influence con- tinued to increase, despite the rupture of his party, which he reconstructed at the conference of Nagyvarad (March 17, 1868), when the famous Bihari pontok, or

articles of Bihar, were subscribed. The Bihari pontok started from the assumption that Hungary was a free and independent state. They bound the Tisza party to repeal all laws or institutions contrary to, and to promote all measures necessary for, the national inde- pendence. Thus the delegation system and the common minis- tries were marked out for attack, while every effort was to be made to procure for Hungary a separate army, a separate diplomacy and a separate financial system. It was chiefly owing to the efforts of Tisza and his party that Austria remained neutral during the Franco-German War. His speech on the 3rd of March 1875 led to the resignation of Istoan Bitto's administration and the welding of Deak's followers and the Left- centre into a new party, the Szabadelvii pdrt or Free Principles Party, which took office under Bela Wenckheim (1811-1879), whom (Oct. 2) Tisza succeeded as prime minister, a post he held, with a few interruptions, for the next fifteen years (1875-1890). In 1877 be resigned on the discussion of the question of the Composition (Ausgleich), but he returned to office on his own terms. The same thing happened the following year, when his brief resignation compelled the Magyar Diet to agree to the occupation of Bosnia. In 1879 he materially contributed to the formation of the Austro-German alliance. Not till 1888, when the national army bill was introduced, did he encounter any serious opposition, but thenceforth his position became precarious. On the 13th of March 1890, on the occasion of the revision of the Indigenat Act, he resigned office, but continued, as deputy for Nagyvarad to place his vast political experience at the disposal of the house. It is no exaggeration to say that Hungary owes to Klaman Tisza a consolidated government, the formation of a parliamentary majority, a healthy public spirit, public credit, the reform of the Upper House, an admirable educational system, economical, and particularly railway, development, and administrative and judicial reconstruction on modern lines. His opponents have accused him of unscrupu- lousness and party spirit, but not one of them can deny that he

reshaped Hungary and made her the leading partner of the dual monarchy. As to his personal integrity and disinterested- ness there has never been the slightest doubt. It is an open secret that, on the retirement of Andrassy, he was offered the chancellorship. He refused it because, to use his own expression, " I am as wholly and solely Hungarian as the river (Theiss, Hung. Tisza) whose name I bear. "

See Imre Visi, Kalman Tisza, a political appreciation (Hung. ; Budapest, 1885); Kornel Abranyi, Kalman Tisza Life and Political Career (Hung.; Budapest, 1878); G. Gratz, Kalman Tisza (Modem Magyar Statesmen, I.) (Hung. ; Budapest, 1902) ; P. Busbach, The Last Five Years (Hung.; Budapest, 1895).

His youngest son, Count Stephen Tisza (1861-), was born on the 22nd of April 1861. After being educated at Berlin, Heidelberg and Budapest, he entered the ministry of the interior for the purpose of studying technical and economical questions at the fountain-head, and soon became a specialist in agrarian matters. His Magyar agrdrpolitik (Budapest, 1897), authoritative on its subject, was translated into German the same year (Leipzig). In 1886 Tisza began his parliamentary career, speedily becoming a leading member of the principal committees on economical and educational questions. On the resignation of Kalman Szell (June 17, 1903) he was entrusted with the formation of a ministry of pacification, but abandoned the attempt on finding it impossible to secure a majority. On the 27th of October, however, with the assistance of the Free Principles Party, he succeeded in composing a cabinet, in which he was minister of the interior as well as premier. From the first the ministry was exposed to the most unscrupulous opposi- tion, exacerbated by the new and stringent rules of procedure which Tisza felt it bis duty to introduce if any business were

to be done. The motion for their introduction was made by the deputy Gabor Daniel, supported by the

premier, and after scenes of unheard.-of obstruction and violence (Nov. 16-18) the speaker, in the midst of an ear-splitting tumult, declared that the new regulations had been adopted by the house, and produced a royal message suspending the session. But the Andrassy group, immediately afterwards, separated from the Free Principles Party, and during the rest of the year the Opposition made legislation impossible. By January 1905 the situation had become ex lex or anarchical. Tisza stoutly stood ' by his rules, on the ground that this was a case in which the form must be sacrificed to the substance of parliamentary government. But his appeal to the country at the beginning of 1905 was unsuccessful, and his opponents triumphed by a large majority. Tisza thereupon resigned and retired from public life. (R. N. B.)

TITANIUM [symbol Ti, atomic weight 48-1 (O = 16)], a metallic chemical element. Its discovery as an element was due to William Gregor in 1789 who found in the mineral ilmenite or menachinite a new earth, which was regarded as the oxide of a new metal, menachin. Independently of him Klaproth in 1793 discovered a new metal in rutile, and called it titanium; he subsequently found that it was identical with Gregor's element. Klaproth, however, was unable to prepare the pure oxide, which was first accomplished in 1821 by Rose. The isolation of the pure metal is of much later date. Titaniurri, although pretty widely diffused throughout the mineral king- dom, is not found in abundance. The commonest titanium mineral is rutile or titanium dioxide, Ti02j anatase and brookite are crystalline allotropes. Titanium is most frequently found associated with iron; ilmenite (Ger. Titan-eisen) is FeTi0 3) perofskite (Ca,Fe)Ti0 3 , and the metal occurs in most magnetic iron ores. The titanates are well marked in the mineral king- dom. Ilmenite is isomorphous with geikielite, MgTiOs, and pyrophanite, MnTi0 3 ; many of the " rare minerals " — aeschy- nite, euxenite, polycrase, &c. — contain titanates (and also niobates). Silicates also occur; sphene or titanite, CaTiSiOs, is the commonest;

keilhauite is rarer.

The isolation of metallic titanium is very difficult since it readily combines with nitrogen (thus resembling boron and magnesium) and carbon. In 1822 Wollaston examined a speci- men of those beautiful copper-like crystals which are occasionally met with in iron-furnace slags, and declared them to be metallic titanium. This view had currency until 1849, when Wohler showed that the crystals are a compound, $Ti(CN)_2 - 3Ti_3N_2$, of a cyanide and a nitride of the metal. An impure titanium was made by Wohler and Sainte-Claire Deville in 1857 by heating to redness fluotitanate of potassium (see below) in the vapour of sodium in an atmosphere of dry hydrogen, and extracting the alkaline fluoride formed by water. The metal thus pro- duced formed a dark brown amorphous powder resembling iron as obtained by the reduction of its oxide in hydrogen. In 1887 Nilson and Petersson (Zeit. phys. Chem. 1, p. 25) obtained a purer product by heating the chloride with sodium in a steel cylinder; it then formed yellow scales with a bluish surface colour. H. Moissan (Com.pt. rend., 1895, 120, p. 290) obtained a still purer metal by igniting the oxide with carbon in the electric furnace. The product has a brilliant white fracture, a specific gravity of 4-87, very friable, but harder than quartz or steel. Moissan (ibid., 1906, 142, p. 673) has distilled this metal in a very intense electric furnace. When heated in air it burns brilliantly with the formation of the oxide. It combines directly with the halogens, and dissolves in cold dilute sulphuric acid, in hot strong hydrochloric acid and in aqua regia, but less readily in nitric acid. Its most curious property is the readiness with which it unites with nitrogen. Several nitrides have been de- scribed. Ti_3N_4 is a copper-coloured powder obtained by heating the ammonio-chloride $TiCl_4 - 4NH_3$ in ammonia. TiN_2 is a dark blue powder obtained when the oxide is ignited in an atmosphere of ammonia; while TiN is obtained as a bronze yellow mass as hard as the diamond by heating the oxide in an atmosphere of nitrogen in the electric furnace.

TITANOTHERIIDAE

In its chemical relations, titanium is generally tetravalent, and occurs in the same sub-group of the periodic classification as Eirconium, cerium and thorium. It forms several oxides, Ti0 2 , Tij0 3 and Ti0 3 being the best known; others (some of doubtful existence) have been described from time to time.

Titanium dioxide, Ti0 2 , occurs in nature as the three distinct mineral species rutile, brookite and anatase. Rutile assumes tetragonal forms isomorphous with cassiterite, Sn0 2 (and also zircon, ZrSiOi) ; anatase is aUo tetragonal, and brookite or thorhombic. Rutile is the most stable and anatase the least, a character reflected in the decrease in density from rutile (4-2) and brookite (4-0) to anatase (3 '9). The minerals are generally found together — a feature rarely met with in the case of polymorphs. They have been obtained artificially by Hautefeuille by the interaction of titanium fluoride and steam. At a red heat rutile is produced, at the boiling point of zinc brookite, and of cadmium anatase. It is apparent that these minerals all result in nature from pneumatolytic action. Amorphous titanium oxide may be obtained in a pure form by fusing the mineral, very finely powdered, with six times its weight of potassium bisul- phate in a platinum crucible, then extracting the melt with cold water and boiling the filtered solution for a long time. Titanic oxide separates out as a white hydrate, which, however, is generally contaminated with ferric hydrate and often with tin oxide. A better method is Wohler's, in which the finely powdered mineral is fused with twice its weight of potassium carbonate in a platinum crucible, the melt powdered and treated in a platinum basin with aqueous hydrofluoric acid. The alkaline titanate first produced is converted into crystalline fluotitanate, K 2 TiFe, which is with difficulty soluble and is extracted with hot water and filtered off. The filtrate, which may be collected in glass vessels if an excess of

hydrofluoric acid has been avoided, deposits the greater part of the salt on cooling. The crystals are collected, washed, pressed and recrystallized, whereby the impurities are easily removed. The pure salt is dis- solved in hot water and decomposed with ammonia to produce a slightly ammoniacal hydrated oxide; this, when ignited in platinum, leaves pure TiO_2 in the form of brownish lumps, the specific gravity of which varies from 3-9 to 4-25, according to the temperature at which it was kept in igniting. The more intense the heat the denser the product. The oxide is fusible only in the oxy-hydrogen flame. It is insoluble in all acids, except in hot concentrated sulphuric, when finely powdered. If the sulphuric acid solution be evaporated to dryness the residue, after cooling, dissolves in cold water. The solution, if boiled, deposits its titanic oxide as a hydrate called meta- titanic acid, $TiO(OH)_2$, because it differs in its properties from ortho-titanic acid, $Ti(OH)_4$, obtained by decomposing a solution of the chloride in cold water with alkalis. The ortho-body dissolves in cold dilute acids; the meta-body does not. If titanic oxide be fused with excess of alkaline carbonate a titanate, R_2TiO_s, is formed. This salt is decomposed by -water with the formation of a solution of alkali free of titanium, and a residue of an acid titanate, which is insoluble in water but soluble in cold aqueous mineral acids. The titanates are very similar to the silicates in their tendency to assume complex forms, e.g. the potassium salts are $K_2TiO_3 - 4H_2O$, $K_2Ti_3O_7 - 3H_2O$ and $K_3Ti_6O_{13} - 2H_2O$.

Titanium monoxide, TiO, is obtained as black prismatic crystals by heating the dioxide in the electric furnace, or with magnesium powder. Titanium sesquioxide, Ti_2O_3, is formed by heating the dioxide in hydrogen. A hydrated form is prepared when a solution of titanic acid in hydrochloric acid is digested with copper, or when the trichloride is precipitated with alkalis. Titanium trioxide, TiO_3, is obtained as a yellow precipitate by dropping the chloride into alcohol, adding hydrogen peroxide, and finally ammonium carbonate or potash. When

shaken with potash and air it undergoes autoxidation, hydrogen peroxide being formed first, which converts the trioxide into the dioxide and possibly pertitanic acid; this acid may contain sexavalent titanium (see W. Manchot and Richter, Ber., 1906, 39, pp. 320, 488, and also Faber, Abst. Journ. Chem. Soc. 1907, ii. 557.)

Titanium fluoride, TiF 4 , is a fuming colourless liquid boiling at 284°, obtained by distilling a mixture of titanium oxide, fluorspar and sulphuric acid; by heating barium titanofluoride, BaTiFe (Emrich, Monats., 1904, 25, p. 907); and by the action of dry hydro- fluoric acid on the chloride (Ruff and Plato, Ber., 1904, 37, p. 673). By dissolving the dioxide in hydrofluoric acid a syrupy solution is obtained which probably contains titanofluoric acid, H 2 TiF6. The salts of this acid are well known ; they are isomorphous with the silico-, stanno- and zircono-fluorides. They are obtained by neutral- izing the solution of the acid, or by fusing the oxide with potassium carbonate and treating the melt with hydrofluoric acid. Potassium titanofluoride, K 2 TiFe-H 2 0, forms white, shining, monoclinic scales. When ignited in a current of hydrogen it yields titanium trifluoride, TiF 3 , as a violet powder.

Titanium chloride, TiCU, is obtained as a colourless fuming liquid of 17604 sp. gr. at 0° C. boiling at 136-4° under 753-3 mm. pressure (T. E. Thorpe), by heating to dull redness an intimate dry mixture Of the oxide and ignited lamp-black in dry chlorine. In the method of A- Stabler and H. Wirthwein, the titanium mineral is fused with

carbon in the electric furnace, the carbides treated with chlorine, and the titanium chloride condensed. The distillate is freed from vanadium by digestion with sodium amalgam. Other methods are due to E. Vigouroux and G. Arrivaut (Abst. Journ. Chem- Soc, 1907, ii. 97, 270) and Ellis (ibid., p. 270). _ By passing chloroform vapour over the heated dioxide the tetra- di- and tri-chlorides are formed, together with the free metal and a gaseous hydride,

TiH 4 (Renz, Ber., 1906, 39, p. 249). When dropped very cautiously into cold water it dissolves into a clear solution. According to the amount of water used, TiCl 3 OH, TiCl 2 (OH) 2 , TiCl(OH) 3 or titanic acid is formed. The solution when boiled deposits most of its oxide in the meta-hydrate form. It forms addition compounds similar to those formed by stannic chloride, and combines with ammonia to form TiCl 4 -8NH 3 and TiCl4-6NH 3 , both of which with liquid ammonia give titanamide,. Ti(NH 2) 4 . Titanium dichloride, TiCI 2 , obtained by passing hydrogen over the trichloride at a dull red heat, is a very hygroscopic brown powder which inflames when exposed to air, and energetically decomposes water. Titanium trichloride, TiCl 3 , forms involatile, dark violet scales, and is obtained by passing the vapour of the tetrachloride mixed with hydrogen through a red-hot tube, or by heating the tetrachloride with molecular silver to 200 . It is a powerful reducing agent.

Titanium tetrabromide, TiBr4, is an amber-coloured crystalline mass. The tetraiodide, Til 4, is a reddish brown mass having a metallic lustre. The di-iodide, Til 2 , is obtained as black lamella by passing the vapour of the tetraiodide over heated mercury in an atmosphere of hydrogen (E. Defacqz and H. Copaux, Compt. rend., 1908, 147, p. 65). Sulphides are known corresponding to the best- known oxides.

Titanium sesquisulphate, Ti 2 (S04) 3 8H 2 0, obtained by concentrat ing the violet solution formed when the metal is dissolved in sulphuric acid, is interesting since it forms a caesium alum, CsTi(S04) 2 -l2H a O. It gives the normal sulphate as a yellow, deliquescent, amorphous mass when treated with nitric acid.

Acid solutions of titanates are not precipitated by sulphuretted hydrogen ; but ammonium sulphide acts on them as if it were ammonia, the sulphuretted hydrogen being liberated. Titanium oxide when fused with microcosmic salt in the oxidizing flame yields a bead which is yellowish in the heat but colourless

after cooling. In the reducing flame the bead becomes violet, more readily on the addition of tin; in the presence of iron it becomes blood-red. Titanic oxides when fused on charcoal, even with potassium cyanide, yield no metal. Rose determined the atomic weight to be 47-72 (H = i). A redetermination in 1885 by T. E. Thorpe gave the value 47-7 (see Journ. Chem. Soc., 1885, p. 108).

TITANOTHERIIDAE (also known as Menodontidae and Brontotheriidae), a family of large rhinoceros-like perissodactyl ungulate mammals from the Oligocene and Eocene strata of North America. The cheek-teeth are low-crowned, with the external cones of the upper molars fused into a W-like outer wall, and the inner ones retaining a regular conical form; while in the lower teeth the crown is formed of crescentic ridges, of which there are three in the last and two each in the other teeth. There is generally little gap between the canines and the premolars.

Titanotherium, of the Oligocene of the Dakotas and neighbour- ing districts, was a huge beast, with the hinder upper premolars similar in character to the molars, a pair of horn-cores, arising from the maxilla, overhanging the nose-cavity, four front and three hind toes, only twenty dorso-lumbar vertebrae, and an almost continuous and unbroken series of teeth, in which the canines are short; the dental formula being i. \, c. \, p. -f , m. f . The muzzle probably formed a snout in life; and there is presumptive evidence that these animals were very long-lived. Br onto ps seem scarcely separated from the type genus; but the name Brontotherium is applied to species with two pairs of incisor teeth in both jaws. The length of the largest species was about 14 ft.; and the height about 8 ft. The alleged occurrence of remains of members of the group in the Balkans apparently rests on insufficient evidence.

A second group is typified by Palaeosyops, of the Bridger Eocene of North America; P. paludosus being an animal about the size of a tapir. The skull, which has a longer face than in Titanotherium, lacks horn-cores, while all the upper premolars are

simpler than the molars, and the full series of 44 teeth was present. The limbs were relatively slender, and the brain was small. In the lower, or Wasatch, Eocene the group was represented by the still more primitive Lambdolherium. On the other hand, Palaeosyops is connected with Titanotherium by means of Telmalotherium of the upper

Bridger and Washakia Eocene, a larger animal, with a longer and flatter skull, showing rudiments of horn-cores, only two pairs of lower incisors, and a general approximation in dental character to Titanotherium. Another of these titanotheroid forms is Diplacodon, from the Upper or Uinta Eocene; an animal the size of a rhinoceros, with the last two upper premolars molar-like. It was probably off the direct ancestral line of Titanotherium. These intermediate forms render the reference of the group to a distinct family — Palaeosyopidae — unnecessary.

Professor H. F. Osborn, who recognises four genera, Titano- therium, Megacerops, Symborodon and Brontotherium, in the typical section of the family, considers that each of these represents a distinct line of descent from the Palaeosyops-like group. The whole assemblage forms one of the four main sections of the Perissodactyla, namely the Titanotheroidea.

See H. F. Osborn, " The Cranial Evolution of Titanotherium," Bull. Anter. Mus. (1896), viii., 137, and the " Four Phyla of Oligocene Titanotheres," op. cit. (1903), xvi. 91; C. H. Earle, " A Memoir on the Genus Palaeosyops and its Allies," Journ. Acad. Philadelphia (1892), ix. 267. (R. L.*)

TITANS (Gr. Tirades), in Greek mythology, the children of Uranus and Gaea. According to Hesiod {Theog. 133), the male Titans were Oceanus, Coeus, Crius, Hyperion, Iapetus and Cronus; the female, Thea, Rhea, Themis, Mnemosyne, Phoebe and Tethys, to

whom Apollodorus adds Dione. At the instiga- tion of Gaea they rebelled against their father, who had shut them up in the bowels of the earth, and set up as ruler their youngest brother, Cronus, who in turn was dethroned by his son Zeus. A struggle then ensued between Zeus and Cronus, in which the Titans took different sides. The opponents of Zeu3 were finally defeated, and imprisoned in Tartarus {Theog. 153-210, 617 sqq.). The rebellious Titans are the representatives of the wild, disorderly forces of nature, who are defeated by the Olympian deities, who stand for law and order. The name Titans is usually explained as " avengers," referring to the vengeance taken by Cronus on his father Uranus, but A. Diete- rich (Rheinisches Museum, 1893, xlviii., and J. E. Harrison (Prolegomena to Greek Religion) connect it with tLtclvos (gypsum).

According to Harpocration (s.v. 'Atojuo.ttcoj'), the Titans, when they mutilated Dionysus Zagreus (see Dionysus), besmeared themselves with gypsum tp conceal their identity, as Artemis daubed her face with mud to escape the river- god Alpheus. The custom was practised at Bacchic and purificatory rites (Demosthenes, De corona, p. 313) as among savage tribes at the present day. The Titan story is probably an attempt to explain the fact that the Orphic worshippers, when about to tear the sacred animal, daubed themselves with gypsum. L. Weniger, in an article " Feralis exercitus " in Archiv fur Religionsgeschichte (May 1906, February and March 1907), while regarding the " white colouring " as an original feature, does not accept the derivation of Tirades from tLtolvos. According to him, Zagreus is the divine hunter, in turn pursued and slain by others mightier than himself, the " snow-clad " (white) giants dwelling on Parnassus. These Titans, whose original is to be found in Pentheus and Lycurgus (for whom see Dionysus), had nothing to do with the Titans of Hesiod's Theogony. The whole has reference to the winter festival of Dionysus, when the god arrived with his Thyiades (the wind spirits) on the heights of Parnassus, there to be murdered by the Titans, to be buried and come to life again.

The standard work on the subject is M. Mayer, Die Giganten und Titanen in der antiken Sage und Kunst (1887).

TITE, SIR WILLIAM (1798–1873), British architect, the son of a Russian merchant, was born in London in February 1798. From 181 7 to 1820 he assisted in the rebuilding of the body of the church of St Dunstan-in-the-East, and in compiling its history. Between 1827 and 1828 he built the Scottish church, Regent Square, for Edward Irving, and ten years later collaborated with Charles Robert Cockerell in designing the London & Westminster Bank, Lothbury. The rebuilding of the Royal Exchange, opened in 1844, was, however, Tite's greatest

undertaking. He also designed' many of the early railway stations in England, including the termini of the London & South- Western railway at Vauxhall (Nine Elms) and Southamp- ton; the terminus at Blackwall, 1840; the citadel station at Carlisle, 1847–1848; the majority of the stations on the Caledonian and Scottish Central railways, including Edinburgh, 1847–1848; Chiswick, 1849; Windsor, 1850; and the stations on the Exeter & Yeovil railway. The stations on the line from Havre to Paris are also his work. Between 1853 and- 1^54 he planned the Woking Cemetery, and between 1858 and 1859 he built a memorial church in the Byzantine style at Gerrard s Cross, Buckinghamshire. Tite's active work ceased about twenty years before his death. In 1851 he visited Italy after a grave illness. In 1854 he contested Barnstaple unsuccessfully as a Liberal, but in the following year was returned to parliament for Bath, which he represented until his death. He keenly opposed Sir George Gilbert Scott's proposal to build the new foreign office and other government buildings adjacent to the treasury in the Gothic style. In 1869 he was knighted, and in 1870 was made a Companion of the Bath. He died on the 20th of April 1873. Tite had a wide knowledge of English literature and was a good linguist; he was an active citizen and a lover of old books.

TITHES, a form of taxation, secular and

ecclesiastical, usually, as the name implies, consisting of one-tenth of a man's property or produce. The tax probably originated in a tribute levied by a conqueror or ruler upon his subjects, and perhaps the custom of dedicating a tenth of the spoils of war to the gods led to the religious extension of the term, the original offerings to deity being " firstfruits."

The custom was almost universal in antiquity; for Greece and Rome see Pauly-Wissowa, Realencycloptidie, iv. 2306, 2423; for Babylon, M. Jastrow, Religion of Babylonia and Assyria, p. 668; for China, J. Legge, Chinese Classics, i. 119; for Egypt, G. Maspero, Struggle of Nations, p. 312. 1 The general notion of tax or tribute often prevailed over that of " the tenth " part, so that in Dion Halicarnassus (i. 23) and Philo (De mutat. nom. i. 607) a.wapxa.1 and SeK&rcu. are synonymous, and in Mahommedan law the " tithe " is sometimes only -^oth or ^th.

Among the early Hebrews the king could exact a tithe from cornfields, vineyards and flocks (1 Sam. viii. 15, 17). On the religious side the oldest laws (e.g. Exod. xxxiv. 26) speak of bringing the firstfruits of the land to the house of Yahweh. In the 8th century the term " tithe " was used in Israel of religious dues (Amos iv. 4; Gen. xxviii. 22), and in the 7th century Deuteronomic legislation the word is often found. In Deutero- nomy the new point emphasized is not that tithes must be paid, but that they must be consumed at the central, instead of a local, sanctuary (Deut. xii. 6, n, xiv. 23 sqq.), apparently at the great autumn feast or feast of Tabernacles (q.v.). 2 Such a tithe is still nothing more than the old offering of " firstfruits " (bik- kiirlm) made definite as regards quantity, and it was only natural that as time went on there should be some fixed standard of the due amount of the annual sacred tribute. 3 The establishment of such a standard does not necessarily imply that full payment was exacted; in Gen. xxviii. 22 Jacob vows of his own free will to pay tithes, just as the Arabs used to vow the tithe of, the increase of the

flock (schol. on Harith, Moall. 1. 69, ed. Arnold). The Arab did not always fulfil his vow, and there was no force to make him do so. A distinction is drawn in Deuteronomy between the ordinary annual tithe, which may not have been a full tenth, and the " whole " or " full tithe," paid once in three

1 For other instances see Spencer, De legibus hebraeorum, lib. iii. cap. 10, § 1. Among the Semites in particular note the tithe paid by the Carthaginians to the Tyrian Melkarth (Diod. xx. 14), and the tithe of frankincense paid in Arabia to the god Sabis (Pliny, H N. xii. 32; and cf. W. R. Smith, Prophets of Israel, p. 382 seq.t. A tithe of cattle appears in Lydia (Nic. Damasc. fr. 24).

2 Cf. Deut. xxvi. with 1 Sam. i. 21 (Sept.) and Jerome on Ezek. i, 3; and see Wellhausen, Prolegomena, p. 94 (Eng. trans., p. 92 seq.).

3 In Deuteronomy, accordingly, the firstfruits (bikkunm) are not mentioned; the tithe takes their place. The word translated " first- fruits " in Deut. (reshith) is a small gift to the priests, a mere basket' ful (xviii. 4, xxvi. 2 seq.).

years (Deut. xiv. 28, xxvi. 12), which the legislator directs to be stored at home, and spent in feeding the poor. Amos iv. 4, " Bring your sacrifices every morning and your tithes every three days " (not " years " as E.V.), hardly implies more than that occasions of sacrifice were three times as frequent as tithe- day, and so alludes to the fact that there were by old usage three annual feasts and one annual tithe. A triennial sacrificial tithe is inconceivable when it is remembered that the tithe is only an extension of the firstfruits. The triennial tithe in Deuter- onomy seems to be rather an innovation necessary in the interests of the poor, when sacrificial feasts were transferred to the central sanctuary, and ceased to benefit the

neighbours of the offerer, who, as stated above, had a prescriptive claim to be considered on such occasions (cf. 1 Sam. xxv. 8 sqq.; Neh. viii. 10; Luke xiv. 13).

The priests of the sanctuaries had of old a share in the sacri- ficial feasts, 1 and among those who are to share 'in the triennial tithe Deuteronomy includes the Levites, i.e. the priests of the local sanctuaries who had lost their old perquisites by the centralization of worship. In Ezekiel as in the Law of Holiness there is no mention of tithes ; he proposes to support all public worship from the proceeds of a general tax (xiv. 13) levied by the prince, the old firstfruits being allotted to the priests. In the Persian period the tithe was converted to the use of the Temple (Mai. iii. 8–10). As Malachi speaks in Deuteronomic phrase of the " whole tithe," the payment to the Levites (now subordinate ministers of the Temple) was perhaps still only triennial; and if even this was difficult to collect, we may be sure that the minor sacrificial tithe had very nearly disappeared. The indifference complained of in Mai. i. was in great part due to the fundamental changes in the religion of Israel, which made private altar gifts and feasts almost meaning- less. On the other hand, the provision of regular support for the priests and Levites, the ministers of the public ritual, was now all important, and received special attention from Ezra and Nehemiah (Neh. x. 37 sqq., xiii. 10 sqq.). They effected it by enforcing the new law of the priestly code (Num. xviii. 21 sqq.), in which it is formally laid down that the tithe is a tribute paid to the Levites, who in turn pay a tithe of it to the priests. It is doubtful whether the system ever worked. The plain intention of the priestly code is to allow the old tithe of Deuteronomy to drop; but the harmonistic interpretation of the later scribes was to the effect that two tithes were to be paid every year, and a third tithe, for the poor, on every third year (Tob. i. 7 seq.; Jos. Ant. iv. 8, § 22). The last change in the system was the appropriation of the Levitical tithe by the priests,

which apparently was effected by John Hyrcanus, though a tradition, glaringly inconsistent with Nehemiah, ascribes it to Ezra, alleging that he deprived the Levites because so few of them were willing to return to Palestine (Mishnah, " Ma'aser Sh. " v. 15; " Sota," ix. 10, and Wagenseil's note). 2

On the whole subject of Hebrew tithes see further G. F. Moore in Ency. Bib. col. 5102; A. S. Peake in Hastings's Diet, of the Bible, iv. 780; and the works on Hebrew antiquities by H. Nowack and I. Benzinger. (A. J. G.)

Tithes in Law.

Tithes were generally regarded up to the 17th century as existing jure divino, and as having been payable to the sup- port of the Church ever since the earliest days of Christianity.

1 The tithe offered to Yahweh may have originally been consumed —in whole or in representative part — on the altar, but in the rituals preserved to us the offering is symbolical, the deity ceding his tithe to the priest, so that from quite early times the tithe helped to support the priesthood who like the poor had a customary share (guest-right) in the feasts.

s A cattle tithe is demanded in Lev. xxvii. 32, and spoken of in 2 Chron. xxxi. 6. It is doubtful if this was ever acknowledged in practice. See Kuenen, Godsdienst, ii. 269 seq., and Wellhausen, Prolegomena, v. I, § 2 (Eng. trans., p. 155 seq.), who argue that the passage in Leviticus is a later addition. The tendency of the Pharisees was to pay tithe on everything, and to make a self-righteous boast of this (Matt, xxiii. 23 ; Luke xviii. 12). The Mishna (Ma'aseroth i. 1) says " everything that is eaten and is watched over and grows out of the ground is liable to tithe."

History, as Selden showed in his learned and exhaustive treatise (History of Tithes 16 18), does

not bear out this view. 3 In the words of Hallam, " the slow and gradual manner in which parochial churches became independent appears to be of itself a sufficient answer to those who ascribe a great antiquity to the universal payment of tithes." 4

Long before the 8th century payment of tithes was enjoined by ecclesiastical writers and by councils of the Church ; but the earliest authentic example of anything like a law of the state enforcing payment appears to occur in the Capitularies of Charlemagne at the end of the 8th or the beginning of the 9th century. Tithes were by that enactment to be applied to the maintenance of the bishop and clergy, the poor, 6 and the fabric of the Church. In course of time the principle of pay- ment of tithes was extended far beyond its original intention. Thus they became transferable to laymen and saleable like ordinary property, in spite of the injunctions of the third Lateran Council, and they became payable out of sources of income which were not originally tithable. The canon law contains numerous and minute provisions on the subject of tithes. The Decretum forbade their alienation to lay proprietors, de- nounced excommunication against those who refused to pay, and based the right of the Church upon scriptural precedents. 6 The decretals contained provisions as to what was and what was not tithable property, as to those privileged from payment, as to sale or hypothecation to laymen, as to priority over state taxes, &c. 7 Various questions which arose later were settled by Boniface VIII. 8 The Council of Trent enjoined due payment of tithes, and excommunicated those who withheld them. 9

In England the earliest example of legal recognition of tithes is, according to Selden, a decree of a synod in 786. 10 Other examples before the conquest occur in the Foedus JEljredi et Guthruni and the laws of Athelstan, Edgar and Canute. 11

A full discussion of their origin and history is to be found in Lord Selborne's Ancient Facts and Fictions concerning Churches and Tithes (1888); the History of the Law of Tithes in England, by G.

Edwardes Jones; and the Sacred Tenth, Ancient and Modern, by H. Lansdell (1906). (J. W.)

Tithes in England may be best dealt with in two chronological divisions — tithes under the system existing previously to the Commutation Acts and tithes under the system then introduced.

1. Whether or not, as it is said, before the Council of Lateran in 1 180, a man could have given his tithes to any church or monastery that he pleased, at any rate since that Before the time, with the division of dioceses into parishes, Commuta- they now of common right belong to the church Mo** Acts. within whose parish they arise, although by prescription they may belong elsewhere. The general rule was said to be that all lands within a parish are subject to tithes, and a layman was not allowed to prescribe generally that his lands were exempt; but he had to show a special exemption, and no length of possession was regarded in law in view of the maxim nullum tempus occurrit ecclesiae, although equity did take account of it. The tithes in places extra-parochial, e.g. forest lands, belong to the Crown, although by canon law they were to be disposed of by the bishop; but by custom a parson or vicar might be entitled to them. The tithes of tithable cattle pasturing in any waste or common ground, whereof the parish is not certainly known, were made payable to the parson of the parish where the cattle dwell by a statute of Edward VI.

Tithes were classified according to their nature as praedial, or

8 It was his denial of the divine right of tithes that brought down the wrath of the Star Chamber upon the author. He was forced to retract an opinion, too liberal for the time. (See Selden.)

4 Hallam, Middle Ages, ii. 205.

6 See Dante, Par. xii. 93, " decimas quae sunt pauperum Dei."

6 Pt. ii. 16, 7. 7 Bk. iii. 30.

8 Extrav. Comm. bk. iii. 7.

9 Sess. xxv. 12. 10 C. viii. § 2. "The grant said to have been made by ^Ethelwulf in 855, to which

the general payment of tithes in England has been commonly traced, appears not to rest on satisfactory evidence.

arising immediately from the ground, e.g. grain of all sorts, hay, wood and the like; mixed, or arising from things immediately nourished by the ground, e.g. colts, lambs, eggs and the like; or personal, namely, of profits arising from the honest labour and industry of man, and being the tenth part of the clear gain, e.g. fishing, mills and the like; or according to value, as great, e.g. corn, hay and wood; or little, which embraced all others. Of common right tithes were only payable of such things as yield a yearly increase by the act of God, and generally only once a year. They were not payable of the following, except by custom: things of the substance of the earth, such as coals, minerals, turf and the like; things ferae naturae, such as fish, deer and the like; things tame, such as fowls, hounds or fish kept for pleasure or curiosity; barren land, until it is converted into arable or meadow land, and has been so for seven years; forest land, if in the hands of the king or his lessee, unless dis- afforested; a park which is disparked; or glebe land in the hands of the parson or vicar, which was mutually exempted from payment by the one to the other, but not if in the hands of the vicar's lessee. Another exception to the incidence of tithes were abbey lands. These were exempted generally by Pope Pascal II. while in the hands of their owners, but the privilege was restricted by Pope Adrian IV. in the time of Henry II. to the three religious orders of Cistercians, Templars and Hospitallers (to

whom the Templars' lands were given on their dissolution in 17 Edw. II.), to which Pope Innocent III. added the Prae- monstratenses. The Council of the Lateran in 1215 further restricted this exemption to lands of which these orders were in possession before that council. A custom by the religious to obtain exemption for lands let to their tenants by means of bulls from the pope was put an end to by a statute of Henry IV. making the acquisition or use of such bulls henceforward a praemunire. When the religious houses were dissolved by Henry VIII., in the case of the greater abbeys and priories the exemptions from payment of tithes enjoyed by them passed to the Crown or the persons to whom the Crown assigned them, and thus any lands which might have been thus exempted, whether they had been actually so or not, were presumed to be exempt; and a further exemption was created by parsonages coming into the same hands as tithable lands, which lasted so long as such union continued.

A further exemption from tithes was given by an act of 1832 (2 &3 Will. IV. c. 100), which fixed a period of prescription against claims of tithe by laymen or corporations aggregate, of thirty years during which there had been no payment of tithes or a modus or composition had existed, in the absence of contrary evidence, and in any case of sixty years; and against corpora- tions sole, of sixty years or the tenures of two successive incum- bents and three years after the entry of a third. The tithes which came into lay hands by the dissolution of the religious houses and the previous suppression of alien priories by Henry V. became in all respects incorporeal freehold property. Under the Limitation Act of 1833 twenty years of adverse posses- sion of an estate in tithes gave a good title, except as against spiritual or eleemosynary corporations sole whose right to recover tithes was limited, if at all, to a period of two incumbencies and six years afterwards, or sixty years (s. 29).

Tithes were generally recovered by a writ against the owner of the tithable property usually brought in the ecclesiastical courts (questions of title to

tithes being reserved to the temporal courts), the jurisdiction of which in this respect was confirmed by the statutes Circumspecte agatis (r3 Edw. I.), Articuli cleri (a Edw. II.) , and others of Henry VIII. and Edward VI., and was enforced by ecclesiastical censures and the writ Be excommuni- cato capiendo; and an act 2 & 3 Edw. VI. made any person refusing to set out tithes liable to pay double the value in the ecclesiastical court or treble in a common law court. Tithes of small amount or due from Quakers could be recovered by sum- mary proceedings before justices under statutes ranging from William III. to Victoria. Tithes could also be sued for in equity, especially the equity side of the exchequer. A custom also sprang up, and was common at the time of the Commutation

Acts, for a tithe-owner to accept a fixed sum of money or fixed quantity of the goods tithable in place of the actual tithes, known as a modus decimandi, whether in respect of a whole parish or only of particular lands within it; and this could be sued for in the ecclesiastical courts. Tithe- payers could also file bills in equity to establish a modus against a tithe-owner. In the City of London there were customary tithes; in other towns and places there were compositions for tithes which were confirmed by local acts of parliament; and according to a return presented to the House of Commons in 1 831, there were passed between 1757 and 1830 no less than 2000 local acts containing . clauses for the commutation of tithes. Enclosure Acts often gave a portion of the lands enclosed to the spiritual or lay rector and exempted the rest from tithes; and in other local acts a corn rent or yearly money payment was substituted for tithes. Except, however, where made under parliamentary authority, no composition for tithes, although made between the landowner and the parson or vicar with the consent of the patron and ordinary, bound a succeeding incumbent, the statute 13 Eliz. c. 10 prohibiting any parson or vicar from making any conveyance of {inter alia) tithes, being parcel of the possessions of their churches, to any persons, except leases for twenty-

one years or three lives.

2. The principle of the Tithe Commutation Acts (1836- 1860) is to make permanent and general the system which had been only partial or temporary (in most cases), After the and to " substitute a corn rent (known as a tithe Commuta- rent charge), permanent in quantity and payable in money, but fluctuating in value, for all tithes, whether payable under a modus or composition or not, which may have heretofore belonged either to ecclesiastical or lay persons " (Phillimore, Eccles. Law, ii. 1161).

Commissioners (now the board of agriculture) are appointed to execute the acts; a rent charge on all lands liable to tithes at the time of the passing of the first act is substituted for those tithes, of which the gross amount is ascertained either by voluntary parochial agreement, or, failing that, by compulsory award con- firmed by the commissioners ; and the value of the tithes is fixed in the latter case by their average value in the particular parish during the seven years preceding Christmas 1835, without deduction for parochial or county and other rates, charges and assessments falling on tithes, the rent charge being liable to all the charges to which tithes were liable. The rent charge is apportioned on all the lands liable in the parish, and such apportionment may be altered or a new one made : and the value of the rent charge is fixed at the value (at the time of confirmation of the apportionment) of the number of imperial bushels and decimal parts of bushels of wheat, barley and oats as the same would have purchased at the prices so ascertained by the advertisement (of prices of corn) to be published immediately after the passing of the act 6 & 7 Will. IV. c. 71, in case one-third part of such rent charge had been invested in the purchase of wheat, one-third part in the purchase of barley, and the remaining third part in the purchase of oats; and the respective quantities of wheat, barley and oats so ascertained shall be stated in the draft of every apportionment. The price at which the conversion from money into corn is to be made at the

time of confirmation of such apportionment, according to the provisions of the said act, are 7s. ojd. for a bushel of wheat, 3s. n \A. for a bushel of barley and 2s. 9d. for a bushel of oats (7 Will. IV. and 1 Vict. c. 69) ; the average price of the bushel of each grain is now computed by substituting for the " advertisement " above the statement of the septennial average price of the imperial bushel of British corn made under the Corn Returns Act 1882 ; and thus the value of the statutory amount of corn is now fixed for each year at the beginning thereof at the average price of the three components of corn for the previous seven years. The extent of the depreciation in value of tithe may be gathered from the fact that for 1902 the price of the wheat bushel is thus fixed at 3s. 5jd., that of the barley bushel at 3s. ojd. and that of the oats bushel at 2s. id.

As already indicated above, certain lands are exempt from pay- ment of tithes while in the occupation of their owners, either by reason of their having been parcel of the possessions of any privileged order, or by reason of their being of the tenure of ancient demesne and exempt whilst in the tenure, occupation or manurance of the Crown, its tenants, farmers and lessees or under-tenants, although they are subject to tithes when aliened or occupied by subjects not being such ; and in these and in all such cases, with the consent of such owners, a fixed rent charge may be substituted for any contingent rent charge imposed on them (2 & 3 Vict. c. 62 ; 3 & 4 Vict, c. 15, now repealed except as to tithes not commuted). In certain cases where commutation of tithes for rent charge in the ordinary

way was impracticable, e.g. in the case of Lammas lands or in the case of common lands, power was given to charge a fixed sum or rate per head of the cattle there pasturing, with an exception in the case of Lammas lands which for seven years before Christmas 1835 had paid no tithe; and also to fix a

rent charge in respect of tithes of common appurtenant on the allotment made in respect of the lands to which such right of common attached (2 & 3 Vict. c. 62 ; 3 & 4 Vict, c. 15; 9& 10 Vict. c. 73). By an act of i860 (23 & 24 Vict. c. 93) a gross rent charge can be substituted for a commutation of tithes on common rights at a fixed sum per head; a gross rent charge made payable in respect of the tithes of a gated or stinted pasture rated to the relief of the poor may be apportioned thereupon and enforced in the method prescribed by the other Tithe Acts; a rent charge on commons may be commuted for part of the land or redeemed, if the landowners and persons liable for tithe so agree; and upon enclosure, a rate per head may be converted into a rent charge on the lands allotted. These rent charges are not subject to the Tithe Act of 1 89 1. This act of i860 also gave power to convert the corn rents established under local acts into rent charges.

In the case of hop-grounds, orchards, fruit-plantations and gardens power was given to the commissioners to value them separately, according to the average rate of composition for the seven years preceding Christmas 1835, and to fix an ordinary and an extraordinary charge for tithes thereof, the former for such lands going out of cultivation, the latter for such as were there- after newly cultivated: lands subject to the latter were exempted during their first years of cultivation; and such lands were only subject to it if situated in a parish in which an extraordinary charge had been distinguished at the time of commutation (6 & 7 Will. IV. c.71 ; 2&3Vi::t. c. 62; 3&4Vict. c. 15; 23 & 24 Vict. c. 93; 36 & 37 Vict. c. 42). In 1886, however, it was enacted that no such extraordinary charge shall be levied on any such grounds so newly cultivated in future; the capital value of the existing charges was assessed, and the payment of interest thereon was made a rent charge on the land payable in priority to all other charges until its redemption, and recoverable in the same way as ordinary rent charge and exempt from ail rates,

charges and assessments: the charge was redeemable at the capital value, and, saving existing contracts, it was as between landlord and tenant payable by the landlord, any agreement to the contrary notwithstanding; and it is not subject to the Tithe Act of 1 89 1. Under the act of 1840 (3 & 4 Vict. c. 15) gardens and lawns and the like, of small size, could be exempted from tithes.

Besides the tithes dealt with by local acts as already mentioned, certain other kinds of tithes are outside the scope of the Commuta- tion Acts, namely, tithes of fish and fishing, personal tithes other than tithes of mills, and mineral tithes, unless the landowners and tithe-owners consent to make a parochial agreement for commutation before the confirmation of an apportionment after a compulsory award in such parish. As already seen, fish being ferae naturae are only tithable by custom; but fish taken in the sea by the custom of the realm are tithable as a personal tithe, i.e. in some small sum for the net profits of the fishing, and customs for payment in kind have been upheld by the courts. Personal tithes, if not commuted or otherwise still payable, are regulated by a statute of Edward VI., which (except in the case of fishing and tithes for houses in cities and towns, which may be due by custom) restricted them to such persons exercising merchandises, bargaining and selling clothing, handicraft or other art or faculty in such places as had for forty years previously so used to do. Personal tithes are now rare, except of fish caught at sea, when they are payable to the church where the taker hears divine service and receives the sacraments. Tithes on houses or customary payments in lieu of tithes have, by local acts, in some cases been turned into church rates. Statutory provision is also made for allowing tithes and tithe rent charge to be exchanged for land, and for the redemption of rent charges made under the acts, and also of corn rents under the local acts. Tithe rent charge may also be merged in the land tithable, with the consent of the tithe commissioners and the landowner, by the legal and equitable owners of

tithes in fee simple or fee tail, or persons having power to appoint the fee simple in tithes, or owners of glebes, or owners of lands and tithes settled to the same uses.

Tithe rent charge under these acts is subject to the same liabilities and incidents as tithes, such as parliamentary, parochial, county and other rates, especially the poor rate and highway rate; but the owner of tithe rent charge attached to a benefice has been exempted by an act of 1899 from payment of half the amount of any rate which he would be liable to pay under the Agricultural Rates Act 1896, the other half being borne by the Inland Revenue Commissioners. The limitation of time for recovery of tithes or estates in tithes, whether between rival claimants to tithes or tithe-owners or tithe-payers, if belonging to lay individuals or lay or spiritual corporations aggregate, is a period of twelve years, as in the case of other real property (37 & 38 Vict. c. 57) ; and in the case of spiritual corporations sole the period of limitation of actions, if any, is governed by the

Limitation Act 1833, s. 29, already quoted, the act 2 & 3 Will. IV. c. 100 being held only to apply to demands of tithe in kind.

The method of recovering rent charge under the Commutation Acts was distraint where the rent charge is in arrear for twenty- one days after the half-yearly days of payment, and entry and possession with power of letting if it is in arrear for forty days, and arrears for two years are so recoverable: this power of distress and entry extends to all lands occupied by the occupier of the land whose tithe is in arrear as owner or under the same landlord; but no action lies against the owner or occupier of the land personally. If a tenant quits leaving tithe unpaid, the landlord may pay it and recover it from him. The tithe-owner cannot recover damages from the tithe-payer for not cultivating the land. Special provision is made for the recovery of the rent charge in railway lands.

The act of 1891, has, however, altered this method of recover- ing tithes, and substituted another intended to shift the burden of responsibility from the occupier to the landowner, by making the latter directly and solely responsible, but giving the remedy against the land. The landowner is mada liable to pay the rent charge in spite of any contract to the contrary between him and the occupier; the rent charge if in arrear for three months is recoverable by an order of the county court, whatever its amount may be : if the land is occupied by the owner, the order is executed by the same means as those prescribed in the Tithe Acts; but if it is not, then by a receiver being appointed for the rents and profits of the land: neither landlord nor occupier is personally liable for payment; and appeal lies to the High Court on points of law; and a remission of rent charge may be claimed when its amount exceeds two-thirds of the annual value of the land. The act does not apply to the particular kinds of rent charges mentioned above.

The Tithe Acts do not apply to the city of London, which has always had its own peculiar customary payment regulated by episcopal constitutions of 13 Hen. III. and 13 Ric. II. and statutes of Henry VIII., confirming a decree of the privy council, under which the rate of tithes was fixed at i6^d. for every 10s. rent, and at 2s. gd. for every 20s. rent of houses, shops and the like by the year. Provision was made by statute after the fire of London for certain annual tithes to be paid in parishes whose churches had been destroyed, and there have been local acts from time to time with regard to particular parishes therein.

Authorities. — Phillimore, Ecclesiastical Law (2nd ed., London, 1895); Cripps, Law of Church and Clergy (6th ed., London, 1886); Eagle, Tithes (London, 1836); Leach, Tithe Acts (6th ed.,1896).

(G. G. P.*)

TITHING (for tithe, tenth; Lat. decuma), formerly a

unit of local administration in England. In some districts the men who were bound to be in frankpledge (q.v.) were grouped in associa- tions of ten, twelve or more individuals called tithings. When a person who was accused of any crime was not forthcoming, inquiry was made whether he was in frankpledge; if he were not, and had no right of exemption, the township was amerced, but if he were in a tithing, then it was upon the tithing that the amercement fell. South of the Thames the tithings were dis- tricts normally identical with the township which discharged the duties of the frankpledge. Some townships, however, contained more than one tithing. There are also indications that in the ancient kingdom of Mercia the tithing was originally a district and not a mere association of persons; but in Northumbria it is doubtful whether the system of frankpledge and tithing, either personal or territorial, was ever established. If, as seems likely, the territorial tithing is older than the personal, each territorial hundred (q.v.) was probably divided into ten tithings.

TITHONUS, in Greek legend, according to Homer son of

Laomedon, king of Troy and husband of Eos (the morning).

In the Homeric Hymn to Aphrodite, Eos is said to have carried

him off because of his great beauty. She entreated Zeus that

I he might live lor ever; this was granted, but she forgot to ask

for immortal youth for him. He became a hideous old man; Eos then shut him up in a chamber; his voice " flowed on unceas- ingly," but his limbs were helpless. A later development is the change of Tithonus into a grasshopper, after Eos had been

obliged to wrap him like a child in swaddling-clothes and to put him to sleep in a kind of cradle. He was probably associated with the Trojan royal house, since the inhabitants of the original home of the legend (probably central or northern Greece) looked upon the East, the land of the morning, as the home of Eos. In some versions she is said to have carried him away still farther East, to the land of Ethiopia near the ocean streams; this is euhemeristically referred by Diodorus Siculus to an expedition undertaken against Ethiopia by Tithonus, son of Laomedon.

It is probable that Tithonus was originally a sun-god ; the scholiast on Iliad, xi. 5, who calls him Titan, identifies him with Apollo, and there are many points of resemblance between him and the sun-god Helios. The story is generally regarded as an allegorical representa- tion of the fresh morning sun dried up by the heat of the advancing day. Possibly it is merely intended as a warning to mortals not to unite with immortals, lest they incur the jealousy and wrath of the gods.

See Homer, Iliad, xi. I, xix. 237; Hymn in Venerem, 219 sqq., with Allen and Sikes's notes; Apollodorus iii. 12, 4; Diod. Siculus iv. 75; Horace, Odes, ii. 16, 30; Propertius iii. 10 (18) ; O. Gruppe, Griechische Mythologie, i. 313, n. 16, who attributes a Milesian origin to the story; articles " Eos " by Rapp in Roscher's Lexikon der Mythologie and by Escher in Pauly-Wissowa's Realencyclopadie.

TITIAN (c. 1477-1576). Tiziano Vecellio, or Vecelli, one of the greatest painters of the world, and in especial the typical representative of the Venetian school, was commonly called during his lifetime " Da Cadore," from the place of his birth, and has also been designated " II Divino." The country of Cadore, in the Friuli, barren and poor, is watered by the Piave torrent poured forth from the Carnic Alps, and is at no great distance from Tirol. Titian, therefore, was not in any sense a Venetian of the lagoons and Adriatic, but was native to a country, and a range of association, perception and

observation, of a directly different kind. Venice conquered Friuli at a date not very remote from the birth of Titian; and Cadore, having to choose between Venetian and imperial allegiance, declared for the former. Approaching the castle of Cadore from the village Sotto Castello, one passes on the right a cottage of humble pretensions, inscribed as Titian's birthplace; the precise locality is named Arsenale. The near mountain — all this range of hills being of dolomite formation — is called Marmarolo. At the neighbouring village of Valle was fought in Titian's lifetime the battle of Cadore, a Venetian victory which he recorded in a painting. In the 12th century the count of Camino became count also of Cadore. He was called Guecello; and this name descended in 1321 to the podesta (or mayor) of Cadore, of the same stock to which the painter belonged. Titian, one of a family of four, and son of Gregorio Vecelli, a distinguished councillor and soldier, and of his wife Lucia, was born in 1477. So it has very generally been stated; but of late years a subsequent date, 1489-1400, has been suggested, so as to make Titian, at the time of his death, not so singularly long-lived a man. As to this interesting point one should remember that Vasari in one passage (at variance with some others) says that Titian was born in 1480; while Titian himself, writing to Philip II. in 1571, professed to be ninety-five years old.

It used to be said that Titian, when a child, painted upon the wall of the Casa Sampieri, with flower-juice, a Madonna and Infant with a boy-angel; but modern connoisseurs say that the picture is a common work, of a date later than Titian's decease. He was still a child when sent by his parents to Venice, to an uncle's house. There he was placed under an art teacher, who may perhaps have been Sebastiano Zuccato, a mosaicist and painter now forgotten. He next became a pupil of Gentile Bellini, whom he left after a while, because the master considered him too offhand in work. Here he had the opportunity of study- ing many fine antiques. His last instructor was Giovanni Bellini;

but Titian was not altogether satisfied with his tutoring. The youth was a contemporary of Giorgione and Palma Vecchio; when his period of pupilage expired, he is surmised to have

entered into a sort of partnership with Giorgione. A fresco of " Hercules " on the Morosini Palace is said to have been one of his earliest works; others were the "Virgin and Child," in the Vienna Belvedere, and the " Visitation of Mary and Elizabeth " (from the convent of S. Andrea), now in the Venetian Academy. In 1507–1508 Giorgione was commissioned by the state to execute frescoes on the re-erected Fondaco de' Tedeschi. Titian and Morto da Feltre worked along with him, and some fragments of Titian's paintings, which are reputed to have surpassed Giorgione's, are still discernible. According to one account, Giorgione was nettled at this superiority, and denied Titian admittance to his house thenceforth. Stories of jealousies between painters are rife in all regions, and in none more than in the Venetian — various statements of this kind applying to Titian himself. One should neither accept nor reject them uninquir- ingly; counter-evidence of some weight can be cited for Vecelli's vindication in relation to Moroni, Coneggio, Lotto and Coello. Towards 1511, after the cessation of the League of Cambrai — which had endeavoured to shatter the power of the Venetian republic, and had at any rate succeeded in clipping the wings of the lion of St Mark — Vecelli went to Padua, and painted in the Scuola di S. Antonio a series of frescoes, which continue to be an object of high curiosity to the students of his genius, although they cannot be matched against his finest achievements in oil painting. Another fresco, dated 1523, is " St Christopher carrying the Infant Christ," at the foot of the doge's steps in the ducal palace of Venice. From Padua Titian in 151 2 returned to Venice; and in 15 13 he obtained a broker's patent in the Fondaco de' Tedeschi (state-warehouse for the German mer- chants), termed " La Sanseria " or " Senseria " (a privilege much coveted by rising or risen artists), and became super- intendent of the

government works, being especially charged to complete the paintings left unfinished by Giovanni Bellini in the hall of the great council in the ducal palace. He set up an atelier on the Grand Canal, at S. Samuele — the precise site being now unknown. It was not until 1516, upon the death of Bellini, that he came into actual enjoyment of his patent, at the same date an arrangement for painting was entered into with Titian alone, to the exclusion of other artists who had heretofore been associated with him. The patent yielded him a good annuity — 120 crowns — and exempted him from certain taxes — he being bound in return to paint likenesses of the successive doges of his time at the fixed price of eight crowns each. The actual number which he executed was five. Titian, it may be well to note as a landmark in this all but centenarian life of incessant artistic labour and productiveness, was now (if we adopt 1477 as the birth-date) in the fortieth year of his age. The same year, 1516, witnessed his first journey to Ferrara. Two years later was produced, for the high altar of the church of the Frari, one of his most world-renowned masterpieces, the " Assumption of the Madonna," now in the Venetian Academy. It excited a vast sensation, being indeed the most extraordinary piece of colourist execution on a great scale which Italy had yet seen. The signoria took note of the facts and did not fail to observe that Titian was neglecting his work in the hall of the great council.

Vecelli was now at the height of his fame; and towards i52r, following the production of a figure of " St Sebastian " for the papal legate in Brescia (a work of which there are numerous re- plicas), purchasers became extremely urgent for his productions. In 1525, after some irregular living and a consequent fever, he married a lady of whom only the Christian name, Cecilia, has come down to us; he hereby legitimized their first child, Pom- ponio, and two (or perhaps three) others followed. Towards 1526 he became acquainted, and soon exceedingly intimate, with Pietro Aretino, the

literary bravo, of influence and audacity hitherto unexampled, who figures so strangely in the chronicles of the time. Titian sent a portrait of him to Gonzaga, duke of Mantua. A great affliction befell him in August 1530 in the death of his wife. He then, with his three children — one of them being the infant Lavinia, whose birth had been fatal to the mother — removed to a new home and got his sister Orsa to

come from Cadore and take charge of the household. The mansion, difficult now to find, is in the Biri Grande, then a fashionable suburb, being in the extreme end of Venice, on the sea, with beautiful gardens and a look-out towards Murano. In 1532 he painted in Bologna a portrait of the emperor Charles V., and was created a count palatine and knight of the Golden Spur, his children also being made nobles of the empire — for a painter, honours of an unexampled kind.

The Venetian government, dissatisfied at Titian's neglect of the work for the ducal palace, ordered him in 1538 to refund the money which he had received for time unemployed; and Pordenone, his formidable rival of recent years, was installed in his place. At the end of a year, however, Pordenone died; and Titian, who had meanwhile applied himself diligently to painting in the hall the battle of Cadore, was reinstated. This great picture, which was burned with several others in 1577, repre-sented in life-size the moment at which the Venetian captain, D'Alviano, fronted the enemy, with horses and men crashing down into the stream. Fontana's engraving, and a sketch by Titian himself in the gallery of the Uffizi in Florence, record the energetic composition. As a matter of professional and worldly success, his position from about this time may be regarded as higher than that of any other painter known to history, except Raphael, Michelangelo, and at a later date Rubens. In 1 540

he received a pension from D'Avalos, marquis del Vasto, and an annuity of 200 crowns (which was afterwards doubled) from Charles V. on the treasury of Milan. Another source of profit — for he was always sufficiently keen after money — was a contract, obtained in 1542, for supplying grain to Cadore, which he visited with regularity almost every year, and where he was both generous and influential. This reminds us of Shakespeare and his relations to his birthplace, Stratford-on-Avon; and indeed the great Venetian and the still greater Englishman had some- thing akin in the essentially natural tone of their inspiration and performance, and in the personal tendency of each to look after practical success and " the main chance " rather than to work out aspirations and pursue ideals. Titian had a favourite villa on the neighbouring Manza Hill, from which (it may be inferred) he made his chief observations of landscape form and effect. The so-called " Titian's mill," constantly discernible in his studies, is at Collontola, near Belluno (see R. F. Heath's Life of Titian, p. 5). A visit was paid to Rome in 1346, when he obtained the freedom of the city, his immediate predecessor in that honour having been Michelangelo in 1537. He could at the same time have succeeded the painter Fra Sebastiano in his lucrative office of the piombo, and he made no scruple of becoming a friar for the purpose; but this project lapsed through his being summoned away from Venice in 1547 to paint Charles V. and others, in Augsburg. He was there again in 1550, and executed the portrait of Philip II., which was sent to England and proved a potent auxiliary in the suit of the prince for the hand of Queen Mary. In the preceding year Vecelli had affianced his daughter Lavinia, the beautiful girl whom he loved deeply and painted various times, to Cornelio Sarcinelli of Serravalle; she had succeeded her aunt Orsa, now deceased, as the manager of the household, which, with the lordly income that Titian made by this time, was placed on a corresponding footing. The marriage took place in 1554. She died in childbirth in 1560. The years 1531 and 1552 were among those in which Titian worked least assiduously

— a circumstance which need excite no surprise in the case of a man aged about seventy-five. He was at the Council of Trent towards 1 5 5 5 , of which his admirable picture or finished sketch in the Louvre bears record. He was never in Spain, notwithstanding the many statements which have been made in the affirmative. Titian's friend Aretino died suddenly in is 56, and another close intimate, the sculptor and architect Jacopo Sansovino, in 1570. With his European fame, and many sources of wealth, Vecelli is the last man one would suppose to have been under the necessity of writing querulous and dunning letters for. payment, especially when the defaulter addressed was lord of Spain and of the American Indies; yet he had con- stantly to complain that his pictures remained unpaid for and his

pensions in arrear, and in the very year of his death (February) he recites the many pictures which he had sent within the preced- ing twenty years without receiving their price. In fact, there is ground for thinking that all his pensions and privileges, large as they were nominally, brought in but precarious returns. It has been pointed out that in the summer of 1566 (when he was elected into the Florentine Academy) he made an official declara- tion of his income, and put down the various items apparently below their value, not naming at all his salary or pensions. Possibly there was but too much reason for the omission.

In September 1565 Titian went to Cadore and designed the decorations for the church at Pieve, partly executed by his pupils. One of these is a Transfiguration, another an Annuncia- tion (now in S. Salvatore, Venice), inscribed " Titianus fecit," by way of protest (it is said) against the disparagement of some persons who cavilled at the veteran's failing handicraft. He continued to accept commissions to the last. He had selected as the place for his burial the chapel of the Crucifix in the church of the Frari; and, in return for a grave, he offered the Franciscans a picture of the " Pieta," representing himself and his son Orazio before the Saviour, another figure in the com-

position being a sibyl. This work he nearly finished; but some differences arose regarding it, and he then settled to be interred in his native Pieve. Titian was ninety-nine years of age (more or less) when the plague, 1 which was then raging in Venice, seized him, and carried him off on the 27th of August 1576. He was buried in the church of the Frari, as at first intended, and his " Pieta, " was finished by Palma Giovane. He lies near his own famous painting, the " Madonna di Casa Pesaro." No memorial marked his grave, until by Austrian command Canova executed the monument so well known to sightseers. Immediately after Titian's own death, his son and pictorial assistant Orazio died of the same epidemic. His sumptuous mansion was plundered during the plague by thieves, who prowled about, scarce controlled.

Titian was a man of correct features and handsome person, with an uncommon air of penetrating observation and self-possessed composure — a Venetian presence worthy to pair with any of those " most potent, grave and reverend signors " whom his pencil has transmitted to posterity. He was highly distinguished, courteous and winning in society, personally unassuming, and a fine speaker, enjoying (as is said by Vasari, who saw him in the spring of 1566) health and prosperity unequalled. The numerous heads currently named Titian's Mistress might dispose us to regard the painter as a man of more than usually relaxed morals ; the fact is, however, that these titles are mere fancy-names, and no inference one way or the other can be drawn from them. He gave splendid entertain- ments at times; and it is related that, when Henry III. of France passed through Venice on his way from Poland to take the French throne, he called on Titian with a train of nobles, and the painter presented him as a gift with all the pictures of which he inquired the price. He was not a man of universal genius or varied faculty and accomplishment, like Leonardo da Vinci and Michelangelo; his one great and supreme endowment was that of painting.

Ever since Titian rose into celebrity the general

verdict has been that he is the greatest of painters, considered technically. In the first place neither the method of fresco painting nor work of the colossal scale to which fresco painting ministers is here in question. Titian's province is that of oil painting, and of painting on a scale which, though often large and grand, is not colossal either in dimension or in inspiration. Titian may properly be regarded as the greatest manipulator of paint in relation to colour, tone, luminosity, richness,_ texture, surface and harmony, and with a view to the production of a pictorial whole conveying to the eye a true, dignified and beautiful impression of its general subject- matter and of the objects of sense which form its constituent parts. In this sense Titian has never been deposed from his sovereignty in painting, nor can one forecast the time in which he will be deposed. For the complex of qualities which we sum up in the words colour, handling and general force and harmony of effect, he stands un- matched, although in particular items of forcible or impressive execution — not to speak of creative invention — some painters, one in one respect and another in another, may indisputably be preferred to him. He carried to its acme that great colourist conception of the Venetian school of which the first masterpieces are due to the two Bellini, to Carpaccio, and, with more fully developed suavity of manner, to Giorgione. Pre-eminent inventive power or sublimity

1 Out of a total population of 190,000 there perished at this time

50,000.

of intellect he never evinced. Even in energy of action and more especially in majesty or affluence of composition the palm is not his; it is (so far as concerns the Venetian school) assignable to Tintoretto. Titian is a painter who by wondrous

magic of genius and of art satisfies the eye, and through the eye the feelings — • sometimes the rnind.

Titian's pictures abound with memories of his home-country and of the region which led from the hill-summits of Cadore to the queen-city of the Adriatic. He was almost the first painter to exhibit an appreciation of mountains, mainly those of a turreted type, exemplified in the Dolomites. Indeed he gave to landscape generally a new and original vitality, expressing the quality of the objects of nature and their control over the sentiments and imagina- tion with a force that had never before been approached. The earliest Italian picture expressly designated as " landscape " was one which Vecelli sent in 1552 to Philip II. His productive faculty was immense, even when we allow for the abnormal length of his professional career. In Italy, England and elsewhere more than a thousand pictures figure as Titian's; of these about 250 may be regarded as dubious or spurious. There are, for instance, 6 pictures in the National Gallery, London, 18 in the Louvre, 16 in the Pitti, 18 in the Uffizi, 7 in the Naples Museum, 8 in the Venetian Academy (besides the series in the private meeting-hall) and 41 in the Madrid Museum. In the National Gallery 3 other works used to be assigned to Titian, but are now regarded rather as examples of his school. , Naturally a good deal of attention has been given by artists, connoisseurs and experts to probing the secret of how Titian managed to obtain such astonishing results in colour and surface. The upshot of this research is but meagre; the secret seems to be not so much one of workmanship as of faculty. His figures were put in with the brush dipped in a brown solution, and then altered and worked up as his intention developed. The later pictures were touched off rapidly, telling well from a distant view. He himself averred that after his visit to Rome in 1546 he had greatly improved in art ; and in his very last days he said — certainly with the modesty of genius, perhaps also with some of the tenacity of old age — that he was then beginning to

understand what painting meant. In his earlier pictures the gamut of colour rests mainly upon red and green, in the later ones upon deep yellow and blue. The pigments which he used were nothing unusual ; indeed they were both few and common. Palma Giovane records that Vecelli would set pictures aside for months, and afterwards, examining them with a stern countenance, as if they were his mortal enemies, would set to work upon them like a man possessed; also that he kept many pictures in progress at the same time, turning from one to the other, and that in his final operations he worked far more with finger than with brush. It has been said, and probably with truth, that he tried to emulate Palma Vecchio in softness as well as Giorgione in richness. Michel- angelo's verdict after inspecting the picture of " Danae in the Rain of Gold," executed in 1546, has often been quoted. He said, " That man would have had no equal if art had done as much for him as nature." He was thinking principally of severity and majesty of draughtsmanship, for he added, " Pity that in Venice they don't learn how to draw well." As a draughtsman of the human figure Titian was not only competent but good and fine, and he is reported to have studied anatomy deeply; but one can easily understand that he fell not a little short of the standard of Michelangelo, and even of other leading Florentines. He was wont to paint in a nude figure with Venetian red, supplemented by a little lake in the contour and towards the extremities. He observed that a colourist ought to manipulate white, black and red, and that the carnations cannot be done in a first painting, but by replicating various tints and mingling the colours. He distanced all predecessors in the study of colour as applied to draperies — working on the principle (in which Giorgione may perhaps have forestalled him) that red comes forward to the eye, yellow retains the rays of light, and blue assimi- lates to shadow. In his subject- pictures the figures are not very numerous, and the attitudes are mostly reserved ; even in bacchanals or battles the athletic display has more of facility than of furor. His architectural scenes were

sometimes executed by other persons, especially the Rosas of Brescia. The glow of late afternoon, or the passionate ardour of early sundown, was much affected by Titian in the lighting of his pictures. Generally it may be said that he took great pains in completing his works, and pains also in concealing the traces of labour. He appears to have had little liking for teach- ing, partly from distaste of the trouble, and partly (if we are to believe biographers) from jealousy. He was quite willing, however, to turn to some account the work of his scholars: it is related that on going out of doors he would leave his studio open, so that the pupils had a clandestine opportunity of copying his works, and if the copies proved of saleable' quality he would buy them cheap, touch them up, and resell them.

Titian's family relations appear to have been happy, except as regards his eldest son, Pomponio. This youth, at the age of six, was launched upon the ecclesiastical career; but he proved wasteful and worthless, and Titian at last got so disgusted with him that he obtained the transfer to a nephew of a benefice destined for Pomponio. The fortune which he left was, after his decease, squan- dered by the tcnsured prodigal. The other son, Orazio, born

towards 1528, who (as we have seen) assisted Titian professionally, became a portrait-painter of mark — some of his likenesses, almost comparable with Titian's own, being often confounded with his by owners and connoisseurs. He executed an important picture in the hall of the great council, destroyed by fire. He gave to alchemy some of the time which might have been bestowed upon painting. Several other artists of the Vecelli family followed in the wake of Titian. Francesco Vecelli, his elder brother, was introduced to painting by Titian (it is said at the age of twelve, but chronology will hardly admit of this) , and painted in the church of S. Vito in Cadore a picture of the titular saint armed. This was a noteworthy performance, of which

Titian (the usual story) became jealous; so Francesco was diverted from painting to soldiering, and afterwards to mercantile life. Marco Vecelli, called Marco di Tiziano, Titian's nephew, born in 1545, was constantly with the master in his old age, and learned his methods of work. He has left some able productions — in the ducal palace, the " Meeting of Charles V. and Clement VII. in 1529 "; in S. Giacomo di Rialto, an " Annuncia- tion " ; in SS. Giovani e Paolo, "Christ Fulminant." A son of Marco, named Tiziano (or Tizianello), painted early in the 17th century. From a different branch of the family came Fabrizio di Ettore, a painter who died in 1580. His brother Cesare, who also left some pictures, is well known by his book of engraved costumes, Abiti antichi e moderni. Tommaso Vecelli, also a painter, died in 1620. There was another relative, Girolamo Dante, who, being a scholar and assistant of Titian, was called Girolamo di Tiziano. Various pictures of his were touched up by the master, and are difficult to distinguish from originals. Apart from members of his family, the scholars of Titian were not numerous ; Paris Bordone and Bonifazio were the two of superior excellence. El Greco (or Domenico Theotocopuli) was employed by the master to engrave from his works. It is said that Titian himself engraved on copper and on wood, but this may well be questioned.

We must now briefly advert to Titian's individual works, taking them in approximate order of time, and merely dividing portraits from other pictures. Details already given indicate that he did not exhibit any extreme precocity ; the earliest works which we proceed to mention may date towards 1505. In the chapel of S. Rocco, Venice, is his " Christ Carrying the Cross," now greatly dilapidated ; it was an object of so much popular devotion as to produce offerings which formed the first funds for building the Scuola di S. Rocco: in the scuolo itself is his " Man of Sorrows." The nobly beautiful picture in the Villa Borghese in Rome, commonly named " Divine and Human Love " (by some, " Artless and Sated Love "), bears some obvious relation to

the style ot Palma Vecchio. The story goes that Titian was enamoured of Palma's daughter; but nothing distinct on this point is forthcoming. The " Tribute Money " (" Christ and the Pharisee "), now in the Dresden Gallery, dated towards 1508; Titian is said to have painted this highly finished yet not " niggling " picture in order to prove to some Germans that the effect of detail could be produced without those extreme minutiae which mark the style of Albert Diirer. The St Mark in the church of the Salute — the evangelist enthroned, along with SS. Sebastian, Roch, Cosmo and Damian — a picture much in the style of Giorgione, belongs to 1512. Towards 1518 was painted, also in the same class of style, the " Three Ages," now in Bridgewater House — a woman guiding the fingers of a shepherd on a reed-pipe, two sleeping children, a cupid, an old man with two skulls, and a second shepherd in the distance — one of the most poetically impressive among all Titian's works. Another work of approximate date was the " Worship of Venus," in the Madrid Museum, showing a statue of Venus, two nymphs, numerous cupids hunting a hare, and other figures. Two of the pictures in the National Gallery, London — the " Holy Family and. St Catherine " and the " Noli me tangere " — were going on at much the same time as the great " Assumption of the Madonna." In 1 52 1 Vecelli finished a painting which had long been due to Duke Alphonso of Ferrara, probably the " Bacchanal," with Ariadne dozing over her wine-cup, which is now in Madrid. The famous " Bacchus and Ariadne " in the National Gallery was produced for the same patron in 1523. The " Flora " of the Uffizi, the " Venus " of Darmstadt, and the lovely " Venus Anadyomene " of the Bridge- water Gallery may date a year or so earlier. Another work of 1523 is the stupendous " Entombment of Christ " in the Louvre, whose depth of colour and of shadow stands as the pictorial equivalent of individual facial expression; the same composition, a less admir- able work, appears in the Manfrini Gallery. The Louvre picture comes from the Gonzaga collection and from the gallery of Charles I. in Whitehall. In 1530 Titian completed the " St

Peter Martyr " for the church of SS. Giovanni e Paolo ; for this work he bore off the prize in competition with Palma Vecchio and Pordenone. Of all his pictures this was the most daring in design of action, while it yielded to none in general power of workmanship and of feeling. It showed the influence of Michelangelo, who was in Venice while Vecelli was engaged upon it. A calamitous fire destroyed it in 1867; the copy of it which has taken its place is the handiwork of Cardi da Cigoli. To 1530 belongs also the " Madonna del Coniglio " (Louvre), painted for Gonzaga; to 1536 the " Venus of Florence "; to 1538 the portraits of the "Twelve Caesars," for Gonzaga; ard to 1539 the " Presentation of the Virgin in the Temple " — one of the

conspicuous examples in the Venetian Academy, yet not of the first interest or importance. About 1540 were done the forcible but rather uninspired paintings for S. Spirito, Venice, now in the church of the Salute — " Cain Killing Abel," the " Sacrifice of Abraham " and " David and Goliath " ; in 1543 the " Ecce Homo " of the Vienna Gallery, where Areiino figures as Pilate. The " Venus and Cupid " of Florence, the " Venus " of Madrid and the " Supper of Emmaus " in the Louvre were still in hand, or just completed, when Titian was summoned to Augsburg in 1547. In 1554 he sent to Philip II. in England a second " Danae " and a " Venus and Adonis." About the same time he sent to Charles V. a " Trinity " (or, as Titian himself termed it, " Last Judgment "), which represented the emperor, with his family and others, all in shrouds, praying to the Godhead ; Moses and various other personages are also portrayed. This was the object upon which Charles continued to keep his eyes fixed until the film of death closed on them. Later pictures, from 1558 onwards, are the " Martyrdom of St Lawrence," " Christ Crowned with Thorns " (Louvre), " Diana and

Actaeon,"' " Diana and Callisto," " Jupiter and Antiope," the " Magdalene," " Christ in the Garden," and " Europa " — the last six for Philip II.; of the two Diana subjects there are duplicates in London and in Vienna. Philip, it will be observed, was equally aufait with nudities and with sanctities. The " Jupiter and Antiope, ' now much restored, is commonly called " La Venus del Pardo," having at first been in the Pardo Palace. The " Magdalene " here spoken of (1561) seems to be the picture now in the Ufiizi of Florence; Titian, in one of his letters, said that it was the most popular picture he had ever painted. In 1563 Vecelli offered to Philip II. his " Last Supper," which had been in hand for six years; it was cut down in the Escorial to suit a particular space, and offers now little noticeable beyond the fine grouping. The " St Jerome " of the Brera Gallery in Milan, a work of wonderful energy, spirit and force, especially for a more than octogenarian hand, was probably rather earlier than this; there is a replica of it in the Escorial. One of the master's latest pictures (1574-1575) is in Madrid, and commemorates the " Battle of Lepanto "; it is a work of failing power — but still the power of a Titian. Two of the mosaics in St Mark's church, Venice — the Mark in pontificals and the sword-sheathing angel on the right of the high altar — are after Vecelli's designs; but they are contrary to the true spirit of mosaic work, and the Mark in especial is a decided eyesore.

We now turn to the portraits — works so great in style, so stately, and in the best sense so simple in perception and feeling that, after allowing everything which can be said on behalf of some other masters of the craft, such as Raphael, Velazquez, Rubens and Rembrandt, one is still compelled to say that Titian stands on the whole supreme. Among the highest examples are — Alphonso, duke of Ferrara (Madrid), the same duke and his second wife Laura Dianti (Louvre), commonly called "Titian and his Mistress"; Francis I. (Louvre), painted towards 1536, but not from direct sittings, for Titian never saw the French king; various likenesses of himself,

one of about 1542, and another of 1562; Paul III., also the same pope with his grandsons Cardinal Alessandro and duke Ottavio (Naples) — the former, done in about four weeks, was presented to the pontiff in May 1543 and cost two gold ducats; Pietro Aretino (Pitti) ; Titian's daughter Lavinia (with a fan in the Dresden Gallery, with a jewelled casket in Lord Cowper's collec- tion) ; the Cornaro Family (Alnwick Castle) ; " L'Homme au Gant " (Louvre), an unknown personage, youthful and handsome, the ne plus ultra of portraiture; Sansovino Eleonora duchess of Urbino, Francesco duke of Urbino, Caterina Cornaro queen of Cyprus (these four are in the Uffizi) ; Charles V. on horseback (Madrid) ; Cardinal Bembo (Naples), discovered in an uncared-for condition in 1878, very unlike the portrait in the Barberini Gallery. The female portraits done by Titian are few, and are almost invariably of women of exalted rank. Of Ariosto, with whom Titian was intimate in Ferrara, though there may probably have been nothing approaching to a romantic friendship between them, the painter is said to have done three portraits. Much uncertainty, however, besets this matter. One of the three appears as a woodcut in an edition of the Orlando furioso. A second, formerly at Cobham Hall, corresponds with the woodcut likeness, and is signed " Titianus F." — a work of admirable beauty; it is now in the National Gallery of London. It is difficult, however, to reconcile the features here with those which appear in some other portraits of Ariosto. There is also in the gallery another and singularly beautiful portrait which used to be called " Ariosto " by Titian, then was assumed to be an " Unknown Poet " by Palma Vecchio ; it is now again attributed to Titian, but not as representing Ariosto.

Authorities. — For English readers, the Life and Times of Titian by Crowe and Cavalcaselte (1877) superseded all previous works, such as those of Sir Abraham Hume (1829) and Northcote (1830). There is now also the translation (1904) of the monumental German work (1900) by George Gronau, which may be regarded as taking the first place of all. Claude

Phillips has brought out two valuable books (1897 and 1898) on the earlier and the later work of Titian, which should be consulted on controversial details. Josiah Gilbert's book, Cadore, or Titian's Country (1869), supplies many. interesting side-lights on the subject. R. F. Heath's monograph (1885) is founded mainly on Crowe and Cavalcaselle and on Gilbert, and forms a very convenient compendium. (W. M. R.)

TITLE (0. Fr. title, mod. litre, from Lat. titulus), an inscription prefixed to a book or other writing, designating the name by which it is to be known, and in many cases indicating the scope of the book or some idea of the nature of its contents. Further, the term is extended to the descriptive heading or caption to a document, such as a deed or other instrument, or to a bill or act of parliament. Another general meaning is that of an appella- tion of rank (see Titles of Honour, and the articles Emperor, King, Prince, Majesty, Highness, Duke, &c). In law " title " is equivalent to right of ownership. The instruments in writing forming the evidences of the title to land are the title-deeds (see Conveyancing; Land Registration). In ecclesiastical usage, the word " title " (titulus) are used of certain churches in Rome to which districts were attached, their history being of importance in the evolution of the Roman cardinalate (see Cardinal). It was also used, as now, for a condition precedent to ordination; in the early Roman Church an appointment to officiate in a particular church; this was extended gradually from the idea of locality to that of evidence of means of support. In the Church of England the candidate must have " some certain place where he can exercise his function"; for deacon's orders he must have a nomination to a curacy, and for priest's orders either that or a presentation to a living. A fellowship or chaplaincy at the university of Oxford or Cambridge is also a sufficient " title."

TITLE GUARANTEE COMPANIES, the name given to com- panies which apply the principle of corporate indemnity to the protection of those interested in

real estate titles, either as owners or lenders. They are of the class of indemnity companies in which technical skill and experience in investigation of risks are relied upon to protect the guarantor from loss. They are peculiar to countries where the title to real estate is a matter of public record, and where the complexity of the record and the variety of possible liens and encumbrances have made it difficult and expensive to determine whether the title is good. The only country where they have reached large proportions or achieved success as independent business enterprises is the United States. In Australia no investigation of a title to real estate is necessary, because before the land passed into individual ownership the government adopted a system of state registration and guarantee of title, so that its certificate of registered title was universally accepted. In certain other countries there is neither registration of title nor recording of deeds; the title-deeds are preserved and passed from owner to owner, and are accepted on the authority of the records and opinions of family solicitors. In the United States, however, there have been from the begin- ning acts providing that all deeds and mortgages be recorded, and the records, when properly made, constitute legal notice to all the world of their contents and claims. At the same time, there are other records of wills, suits, judgments, taxes and mechanics' claims which may encumber the title. In the great cities these various records became in course of time so volu- minous that the proper investigation of them, and the deter- mination of the validity of the title in view of them, required the best skill of an experienced lawyer and involved very heavy expenses. On a re : sale of the property the new buyer did not rely upon the lawyer who had made the examination for the seller, but felt called upon to employ and pay his own lawyer, who had to go over the same work again, and more, for with each new transaction the history was getting longer. The delay and expense involved were great, and yet the owner had little or no protection, for a lawyer is not held to guarantee

the correctness of his opinion.

The first legislative grant of corporate authority to guarantee titles to real estate was included in the charter of the New York Guaranty and Indemnity Company, a trust company incorporated in New York by act of the legislature in 1864; but the power to guarantee titles was never exercised. In 1869 the Real Estate Assurance Company of the City of New York was chartered with the sole object of insuring the validity of titles, but was never organized. In 1871 a pamphlet was issued by a member of the New York bar, calling attention to the business carried on by the Prussian Mortgage Insurance Company of Berlin, and outlining plans very similar to those now followed by the principal title guarantee

companies of the United States ; but the pamphlet seems to have been forgotten. The first company actually to undertake the guarantee of real estate titles was formed in Philadelphia, Pennsylvania, in 1876. It differed from the Prussian Mortgage Insurance Company (which guaranteed titles merely as an incident in its business as a dealer in, and custodian and guarantor of, mortgages) in that its main business was the issue of a policy of guarantee on a transfer of title to land. The advantages of its method were immediately recognized. Corporations to carry on the business were organized in Washington, Baltimore, Boston and New York, in the order named, and subsequently in nearly every considerable city in the United States.

In order to be independent of the inaccurate and clumsy methods of the public record offices, title guarantee companies generally compile in their own office a copy or digest of all the real estate records of the locality in which they are established, maintaining for this purpose a staff of skilled clerks. To make the necessary examination of a title prior to the issuing of a guarantee, they

require continually a body of experienced real estate lawyers. By these means a title can be examined and guaranteed in a week, whereas thirty or forty days was formerly required. This has done much to make real estate available capital, for individual and corporate lenders on mortgage accept the guarantee of the companies as the best evidence of title, and loans can be had without the delay that once prevailed.

The expense of maintaining the staff of clerks and lawyers is great, amounting to half of the gross charges on titles guaranteed. Strictly speaking, the risks outstanding are also large, running up to $100,000,000 a year for a single company in New York City; but in well-managed companies the losses are very small, not exceeding 2 % of the gross charges on titles guaranteed, so that the outstanding obligations should scarcely be called risks. In spite of the office expenses, the charges for first bringing a piece of land under the guarantee are no more than owners were in the habit of paying each time for examination and opinion by counsel, amounting to about one-half of 1 % on the value of the property or on the amount of the mortgage; and when once the guarantee has been issued, it is re-issued on a subsequent sale or mortgage on short notice and for a small fee. (C. H. K.)

TITLES OF HONOUR, " those various names of greatness or eminency, which are the most distinguishing titles of civil dignity " (John Selden, Titles of Honor, 3rd ed., 1672). This de- finition covers, if we understand " civil " in its proper and widest sense, all titles, whether official or honorary, civil or military, temporal or ecclesiastical. In general, however, we now under- stand by titles of honour what Selden calls " honorary titles," i.e. distinctive designations implying rank and dignity, not office or vocation. The broader definition would cover all titles, includ- ing those of military and ecclesiastical rank, of municipal office and of university degrees. The narrower definition, which it is proposed to adopt for the purposes of this article, would cover only what in the United Kingdom

are known as the " titled classes," which embrace only those whose titles are meaningless save as a mark of rank. In this category it is, however, necessary to include, somewhat illogically, the highest titles of all — those of sovereigns; for, though they have not been divorced from the functions of sovereignty, they are the fount and source of ail the rest. In the present work a large number of titles are dealt with under their several headings (Emperor, King, Duke, &c.) ; in this article it is proposed therefore to discuss them only in their general aspect and to attempt some classification of them according to their meanings and origins.

The philosophy of titles is as tempting a subject as Carlyle found the philosophy of clothes. The democrat and the superior man affect to despise them. They point out that the world's greatest men need no such hall-mark to prove they are not base metal; in England they point to such examples as those of Pitt and Gladstone, who, dispensers of titles themselves, lived and died untitled; and they argue that to accept a title is not a sign of " greatness or eminency." but at best of a quality which falls short of this standard. This attitude has some justification in the limitless abuse at all times in the bestowal of titles as a means of bribing those whose ambition looks no higher than to be a " figure among cyphers." But the desire to be taken notice of is an instinct too deeply rooted in human nature for all the satirists that ever lived, or shall live, to eradicate; and of this instinct titles are the most ancient expression, more ancient — • it may be hazarded — even than clothes. 1 The French Revolu-

1 Many proper names are but primitive titles in disguise: e.g. Henry (q.v.)=" ruler of the home," or Walter = " lord of power."

tionists in their zeal for primeval equality essayed to abolish them; at best they succeeded in making them universal, the citoyens of the first generation of republican France becoming the monsieurs of the

next — just as every Englishman is now a ″ gentleman ″ or an ″ esquire,″ every Castilian a caballero, and every German a Herr. Similarly, in the democratic countries of the English-speaking world the common style of Mr (master), also once a prerogative of gentle birth, is apt to become too commonplace, and the official prefix of ″ honourable ″ is assumed on very slender pretexts. For where titles are not planted, they tend to sow themselves.

Titles are also elaborated under cultivation; for they are apt to degenerate if too widely scattered, and need to be crossed with other varieties to produce a more marketable type. Thus James I. of England produced the baronet (q.v.), and the titles, of minister plenipotentiary, and envoy extraordinary were combined in the evolution of that fine flower of diplomacy the ″ envoy extraordinary and minister plenipotentiary,″ so styled honoris causa, since technically he is neither ″ extraordinary ″ nor, as such, armed with plenary powers (see Diplomacy). These are but two familiar examples of a process which was at one time carried on with a singular earnestness and in a spirit of the keenest competition. Rival sovereigns, by the mouths of heralds and ambassadors, recited the long roll of their styles and titles at each other, in the spirit of Homeric heroes endea- vouring to shout down the enemy before coming to blows. The ambassador of Queen Elizabeth to the tsar of Muscovy boggled at the length and complexity of the barbaric emperor's style, and endeavoured to address him by six of his principal titles only, but in the end was forced to repeat the whole (Fletcher, Russian Commonwealth, cap. 6). As for the Ottoman sultans, the Oriental imagination of their secretaries was exhausted in adding ″ exorbitant and swelling attributes ″ to their styles, which were usually intended to be insulting to those whom they addressed. Thus Ahmed I., writing to Henry IV. of France, describes himself, with very much besides, as ″ emperor of victorious emperors, distributor of crowns to the greatest princes of the earth, . . . lord of Europe, Asia and Africa.″

So far as medieval Europe was concerned, the court of Con- stantinople, where East and West met, was the forcing-bed of the more extravagant varieties of titles and attributes. Old Rome had granted to its deserving citizens titles of honour, such as felix, pius, pater patriae, besides those which, like patricius, denoted hereditary rank. The first emperors were, in theory, merely citizens who alone and in a supreme degree were entitled to be the recipients of these honours. But the tnajestas reipub- licae Romanae was soon identified with the person of the emperor. Himself become the fountain of honour, he showered his titular attributes upon those whom it was his whim or his policy to distinguish, while ever fresh styles were invented to illustrate his own unique dignity. For this purpose all the abstract terms in the vocabulary of flattery were put under contribution, not even excepting the lofty attributes of God {nostra etemitas, nostra perennitas, " most high," " most mighty," " most sacred majesty"). This tendency ran riot when the East Roman Empire had become byzantinized, until by the middle ages there was — to quote Selden — " such innovation of titles as made the dignities of the empire almost ridiculous in those strange and affected compounds." 2

From the Byzantine court that of the Frankish emperors of the West largely borrowed its forms, and this again set the fashion for the courts of lesser potentates. To this source, then, are due the honorary attributes, if not in all cases the titles, of the sovereigns of modern Europe. Throughout the middle ages, indeed, there was no rigid classification of the abstract attributes (highness, eminence, excellency, honour and the like) addressed in the second and third persons to sovereigns or other dignitaries. These depended very much on the fancy of secretaries eager to display their Latinity — or even a smattering of Greek— by

2 E.g. Sebastocrator, compounded of a-efiaaros (augustus) and Kpardv (to rule), or panhypersebastos.

devising new forms. 1 It was not until the 17th century that they became fixed, under the influence mainly of the newly organized international diplomatic service (see Diplomacy) But meanwhile they had developed from the simplicity of the early feudal age 2 into a Byzantine pomposity, the exuberance of which bored even the ceremonious court of Spain into a free use of the pruning knife. 3 Honorary styles are, for the rest, now mere stereotyped formulae; the words that compose them have become — to use Emerson's phrase — " polarized " and deprived of meaning. Not otherwise could a German journalist, late in the 19th century, have recorded, without exciting surprise, that " to-day their All-highest majesties went to church to give thanks to the Highest." 4 The same is more or less true of all titles. They are traditional, and are mainly valued for this reason. An imaginative person might devise a dozen styles in themselves better fitted to express the peculiar eminency of a successful money-lender or a wealthy brewer than the feudal title of baron, or than that of knight to indicate the qualities of a Radical apostle of the gospel of " peace at any price." But the instinct in these matters is to put new wine into old bottles; and, on the whole, the bottles bear the strain. The process is, indeed, very old. William Harrison, in his inimitable style, has left a description of it in the 16th century (see Gentleman), and it was older far than his day. In all ages the new nobility has been looked down upon by the old; but the ancient titles have always in the end adapted themselves to their new users. Long before the bourgeois age was dreamed of, dukes as such had ceased to " lead " (ducere), marquesses to guard the " marches," Ritters to " ride," and no one marked the incongruity of their styles. The process is but continued if, for instance, in the 20th century the title of baron often suggests, not the feudal power of the sword, but the international power of the purse.

Titles have therefore in themselves a world of historical significance. In some the significance is obvious, the history comparatively recent. In others the significance is veiled under obscure etymologies, which carry us back to the very beginnings of social life. We find in these words, too, most singular con- trasts of fortune. Caesar, a nickname (caesaries) given to some long-haired Roman, grows into a surname which the founder of the empire chanced to bear, and so remains to this day the title of German kaisers and Slavonic tsars, of the king of England as Kaisar-i-Hind and of the sultan of Turkey as Kaisar-i-Rum. The first of the German Caesars bore the name of Karl, 6 which in itself means no more than " man " and in English speech has sunk to the base meaning of " churl " (see Charles); for the barbarians beyond the eastern borders of his empire, the Slavs and Magyars who felt the weight of his arm, his name became identified with his office, and remains to this day in the sense of " king " (Mag. Kirdly, Slav. Krai, Russ. Korol). 6 On the other hand, we have the contrary process. The proud title of " count of the stable," once borne by the highest official of the Byzantine court, is now associated in the public mind

1 The papal chancery, however, seems early to have established definite rules. Those sovereigns who had special titles, bestowed or recognized by the pope, such as " Most Catholic King " (Spain) or " Most Christian King " (France), were so addressed. The rest were "Illustrious" (illustres).

2 The only title of mere honour would, e.g. in the 12th century, seem to have been dominus (Sire, Lord),_ which in the Anglo-Norman poem of Guillaume le Mareschal is applied to any one of birth, from the king's son of France down to the humblest noble (see Sir).

3 By the Pragmatico de los titulos y cortesias of the 8th of October 1636 King Philip III. decreed that he was to be addressed in letters only as Seiior, while at the end was to appear no more than

" God guard the Catholic person of your Majesty." (Selden p. 103.)

4 Die Allerhochsten Herrschaften sind heute in die Kirche gegangen dem Hochsten ihren Dank u.s.w. The sentence is fixed in the writer's memory, but the exact reference is forgotten.

5 Known traditionally as Charlemagne (Carolus Magnus, Karl the Great), the unique instance of a posthumous title of honour being absorbed into a name." Modern English historians have tended to dissolve this immemorial union in the interest of historic accuracy. But " Charles " is only a degree less conventional than Charlemagne.

6 A parallel case, but more obscure, of a proper name developing into a title is that of the curious title of " Dauphin," ultimately borne only by the heir-apparent to the French throne (see Dauphin).

mainly with humble police officials, in the United States with the humblest of all, the village constable only (see Constable). Less impressive perhaps is the fate of the title " valet," which, once that of a gentleman, has sunk to be that of a '' gentleman's gentleman " (see Valet). The same word, too, develops differently in different languages. The German Knechl remains a servant; in England the cniht has developed into the knight, just as the serviens (servant) survives in the very various modern uses of the title serjeant (qv.). In one exalted case at least we even have a title based on a mistaken etymological deduction. The title " Augustus," i.e. sublime or sacred, used originally of persons or places consecrated by the auguries, is derived ulti- mately, in a passive sense, from augere, to increase. This led to the rendering of the Latin title " semper Augustus," borne by the Holy Roman emperors until 1806, in German as " at all times augmenter of the empire " (zu alien Zeilen Mehrer dss Reichs), a style as ill-grounded in etymology as it was lamentably untrue in fact. 7

The fortunes of individual titles are outlined in

the separate articles devoted to them. Here it only remains to discuss them generally from the point of view of their classification according to origin and general character. Of the styles that are mere attributes — like serene, honourable, reverend — enough has been said; they are but stereotyped courtesies. Most titles proper, on the other hand, have in their origins a deeper significance. The title king, for instance, recalls a remote time when it was borne by right of kinship, as head of a tribe (see King). Other titles recall that forgotten stage of society in which it was the rule for age to command and youth to obey: such as the French seigneur, sieur, sire, monsieur, monseigneur; the Italian signor, monsignore; the Spanish senor, and the English " sir," all derived from senior, " older " (see Monsieur and Sir), itself a Latin translation of a type of title which in the Teutonic lan- guages appears to survive only in the English alderman (q.v.). Seigneur, sire and the rest developed, of course, into the equiva- lents, not of senior, but of dominus (lord). But the idea of the title originally must have been the same as that of "elder," like the Arab sheikh (q.v.) or the starostas and starshinas of the Russian village communities; the seniores, in early feudal times, were the full grown fighting men as opposed to the pueri (boys), the un- fledged squires and valets. Other titles are derived from the idea of command or rule: such are those of emperor (q.v.); the Latin rex (regere, to rule, guide) — whence the French rot, Italian ri and the English attributive style " royal " — and from the same common Indo- European root the Indian titles of raja and maharaja; the title of duke (q.v.); the Latin dominus, domina (originally, a master or mistress in the house, domus), whence the modern dame, madame, mademoiselle, don and dom; the German Herr (cf. herrschen, to rule); or, to take an Oriental instance, that of sultan (Arabic salat, to rule). Some titles again are derived from mere ideas of precedence, like that of "prince" (q.v.), which may be described as the generic sovereign title; the Spanish title of "grandee" (q.v.); or that of

"master" (q.v.), which as a title of honour survives in Scotland. Very rare are the titles of honour that have their origin in the idea of gentle birth, which indeed, in earlier times, was predicated of all wearers of titles in Europe. The only modern equivalent of the Anglo-Saxon mtheling (q.v.) in Europe would appear to be the Austrian title of Edler, which means, strictly speaking, no more than " noble," though it implies a rank higher than that of the untitled Adeliger. The English title "earl" (q.v.) has a similar origin, but passed through the stage of an official style as the equivalent of " count." The word " gentleman" (q.v.) is not a title, any more than the French gentilhomme; it is, in so far as it is used in any definite sense at all, an attribute, like the German kochwolgeboren or the Russian barin — the equivalent of the Latin generosus, " well-born." In the Mahommedan East its equivalent, in the sense of well-born, is the Arabic title sherif,

7 So Rigord, the monk of St Denis, says in his Gesta of Philip Augustus, king of France, that he was so styled after the Caesars, who bore the name of Augustus because they augmented the empire Unde iste merito dictus est Augustus ab aucta republica.

now applied only to the descendants of the Prophet. The most characteristic and familiar of English titles, again, that of " lord," carries us back to a very primitive state, when the lord was par excellence the " loaf -warden " (hlaf-ord, hlaf-weard). Here it may be noted that the title " lord " has no foreign European equivalent: the German Herr (though Herrenhaus is strictly House of Lords), the Italian signor, the Spanish senor, the Slavonic pan and the Greek niipios are all equivocal, being used most commonly in the sense of Mr (Master). Even the French do not translate " lord " by monseigneur (though seigneur is strictly speaking its equivalent), and still less by monsieur, though the

ancient custom has survived of using the latter colloquially in place of all titles, 1 but by milord. Lastly there are two important European titles derived from personal relations with the sovereign, though they have long ceased to have any such connotation. Of these the oldest is that of " count," which goes back to the comites (companions) of the early Roman emperors (see Count); the second is "baron," originally meaning no more than " man " and so, under the feudal system, the king's " men " par excellence, the great tenants-in-chief of the crown (see Baron). In England the barons formed and form the body of the peerage, "peer" not being a title of honour, but the description of a status and function bestowed by their creation upon all barons, viscounts, earls, marquesses and dukes (see Peerage). In France, on the other hand, ""peer " {pair) was under the old monarchy a title of honour; for not even all dukes were peers of France, and the style of such as were, therefore, ran due et pair.

From the above it will already have become apparent that titles of honour, as they now survive in Europe, are picturesque relics of the feudal system (see Feudalism). In theory they are still territorial, and it is the shadowy suggestion of landed estate that gives, in France and Germany, to the nobiliary particles de and von their mystic virtue. 2 In Great Britain there has been of late years a tendency in the case of some newly made peers to drop the affectation of territorial power. In the case of some titles, e.g. Earl Carrington—this merely follows a very ancient English tradition; even under the feudal system after the Norman Conquest it was not unusual for the great nobles to use their titles with their family names or those of their fiefs indifferently; for instance, the Norman earls of Derby described themselves, as often as not, as Earls Ferrers (see Derby, Earls or). Con- vention, however, dictates that barons and viscounts should, on creation, adopt a territorial style. In the case of such titles as Lord James of Hereford and Lord Morley of Blackburn, this style is adopted from the place of birth; for which a certain

precedent might perhaps be pleaded in the medieval custom exemplified in such names for royal princes as " John of Gaunt " or " Henry of Woodstock." On the other hand, there has been also a somewhat absurd tendency to exaggerate the territorial styles by piling one on the top of the other. It would be invidious to mention actual instances; but the process may be illustrated by the imaginary title of Baron Coney hurst of Ockley.

From the fact that, as feudalism developed, fiefs became hereditary, it comes that most European titles of honour are hereditary. Knighthood alone formed, in general, an exception to this rule. Yet, in their origin, no one of the titles familiar to us were descendible from father to son, and the only hereditary quality was that of abstract nobility. Yet, by a curious inver- sion of the whole idea of titles of honour, an inherited title has come to be far more valued than one bestowed; 3 it has the

1 E.g. Monsieur de la Rochefoucauld, for M. le due de la R. In the United Kingdom the parallel custom stops short of dukes. All

• other peers, from marquesses to barons, are commonly spoken of and addressed by the title of lord.

2 In Germany a distinction is drawn between those titles derived from estates still held by the head of the family and those that are landless. The latter are simply " of " (von), the former are " of and at " (von und zu).

3 Thus in the Instructions annexed to the commission for the selection of the new order of baronets, King James I. gives these precedence over knights, " because this is a Dignity, which shall be Hereditary, wherein divers circumstances are more considerable, than such a Mark as is but Temporary." (Selden, op. cit. p. 685.)

peculiarly aristocratic virtue ascribed by Lord Palmerston to the most Noble Order of the Garter: "

There is no damned merit about it;" it has the crowning quality that it must needs be the monopoly of the few. Hereditary titles sink in value, indeed, just" in proportion as they become common. In the United Kingdom their value has been kept up by the rule of primogeni- ture: there can be only one bearer of such a title in a single generation. In France custom distributes the various titles of a family among all the sons, the eldest son, for instance, of a duke inheriting his dukedom, the second son his marquisate, the third his countship, and so on. In Germany and Austria titles pass to all the sons in each successive generation, though in Prussia the rule of primogeniture has been introduced in the case of certain new creations (e.g. Fiirst, prince). The result is that equivalent titles vary enormously in social significance in different countries. An attempt has been made to estimate the extent of this variation in the case of individual titles in articles devoted to them. Here we need only illustrate the argument by one striking example. The Russian title of " prince " (knyaz) implies undoubted descent from the great reigning houses of Russia, Poland and Lithuania; but the title descends to all male children, none of whom is entitled to re- present it par excellence. There may be three or four hundred princes bearing the same distinguished name; of these some may be great nobles, but others are not seldom found in quite humble capacities — waiters or droshky-drivers. The title in itself has little social value.

In the countries east of the marches of the old Empire, i.e. Hungary and the Slav lands, existing titles are partly developed from the native tradition (feudal in Hungary, Bohemia and Poland; autocratic and Oriental in Russia and the lands of the Balkan peninsula), partly borrowed from the West, like that of grof (count) in Hungary and graf in Russia. Just as in autocratic Russia the sole indigenous title of honour (knyaz) is associated with royal descent, 4 so in the Mahommedan East there are, outside the reigning families, no hereditary titles, except that of sherif, already

mentioned. In India the hereditary styles of certain great Mahommedan nobles are exceptions that prove the rule; they represent reigning families whose raj has been absorbed in the imperial government, and they are still reigning princes in the sense in which the heads of German mediatized houses are so described (see Mediatization). For the rest, the titles of Oriental princes follow much the same gradation as those of the West. As caliph (q.v.), or vicar of the Prophet, the Ottoman sultan is in Islam the equivalent of the pope in Roman Catholic Christendom; his imperial dignity is signified by the Persian title of padishah (lord king), his function as leader of a militant religion by the style of " commander of the faithful " (see Amir). Shah is in Persia the equivalent of king; the style of shah-in-shah, king of kings, recalls the days of the Persian " great king " familiar in the Old Testament. Khan (prince) and amir (commander, lord) are other Eastern sovereign titles. Pasha and bey, originally exclusively military titles, are now used also as civilian titles of honour, but they are not hereditary. When the pashalik of Egypt was made hereditary the situation was ultimately regularized by bestowing on the pasha the Persian title of khedive (q.v.). In the Far East, Japan has adopted a system of titles, based on her ancient feudal hierarchy, which closely corresponds to that of Europe (see Japan). China, on the other hand, stands apart in the curious custom of bestowing titles on the ancestors of persons to be honoured, and in making them hereditary only for a limited number of generations (see China: Social Customs). In Europe such posthumous honours are rendered only in the case of saints (see Canonization).

Of ecclesiastical titles of honour it can only be said that they tend to an even greater exaggeration than those bestowed on secular dignities. The swelling styles of the Eastern patriarchs are relics of the days when Rome, Constantinople, Antioch, Alexandria and Jerusalem were vying with each other for precedence (see Church History and Patriarch). The style

4 The designation barin (boyarin, boyar) is not, properly speaking, a title, but the equivalent of " gentleman."

of the bishop of Rome, who alone in the Western Church retains the name of pope, includes the old Roman titles of pontifex maximus and pater patriae, and always in his signatures the proudly humble phrase " slave of the slaves of God " (servus servorum Dei), based on Matt. xx. 27 (see Pope). Of ecclesiasti- cal titles those expressing orders and no more — priest, deacon, sub-deacon and the rest — are never honorary (Prester John, q.v., is a shadowy medieval exception). Those expressing office, whether in the Church at large (patriarch, archbishop, &c), or in the papal court (e.g. protonotary), are often merely honorary. That of bishop even became for a time, after the Reformation, a title borne by certain secular princes (see Bishop). " Cardinal," which with the predicate Eminence (q.v.) is now reserved for the princes of the Roman Church, was at one time the honorary style of the chief clergy of great cathedrals generally (see Cardinal). " Abbot," the official title of the head of the monastery, has also in several languages (e.g. the French abbe) come to be used as a purely honorary title (see Abbot) . For the honorary styles of the clergy in the English- speaking countries, see the articles Reverend, Vicar, Rector, Canon, Dean. As for the archdeacon, it is only in the Church of England that he can be still defined as " one who performs archidiaconal functions"; elsewhere, if he exists at all, be is purely titular (see Archdeacon).

Among titles of honour, finally, may be reckoned honorary degrees bestowed by universities, the pope, and in England by the archbishop of Canterbury. Any degree may be bestowed honoris causa. The universities of Oxford and Cambridge thus regularly bestow the degree of D.D. (doctor of divinity) on

those of their alumni who become bishops. It is also the custom to bestow honorary degrees at the yearly " Commemora- tion " (generally D.C.L., doctor of civil law, at Oxford ; LL.D., doctor of laws, at Cambridge) on a selected list of eminent personages. The right of the archbishop of Canterbury to confer degrees honoris causa, known as " Lambeth degrees," is sup- posed to be derived from one of his powers as legatus natus of the pope, which survived the Reformation. An attempt was made by some of the Swiss reformers of the 16th century to abolish degrees. They were certainly " popish " in their origin, and others besides Herbert Spencer have objected to them as misleading, since they are by no means necessarily a hall-mark of learning. They tend, however, to multiply rather than to decrease in number, and in England some criticism has been aroused by the growing custom in certain quarters of assuming degrees (notably that of D.D.) granted corruptly, or for wholly insufficient reasons, by certain so-called " universities," notably in the United States. For a, list of the degrees of the principal universities and their hoods, see Universities, ad fin.

The history of many peerage and other titles is outlined in the articles on historic families in this work. For British peerage titles the standard work is G. E. C. (okayne)'s Complete Peerage (1st ed., 8 vols., 1887; new ed., vol. i., 1910). For baronets and others see the manuals of Burke and Debrett. The standard authority for the royal houses and " high nobility " of Europe is the Almanack de Gotha, published yearly. See also the article Nobility, and for further references the authorities attached/ to those on individual titles, e.g. Count. (W. A. P.)

TITMOUSE (O. Eng. mase and lytmase, Ger. Meise, Swed. mes, Du. mees, Fr. mlsange), the name 1 long in use for several species of small English birds, which are further distinguished from one another by some characteristic appellation. These go to make up the genus Parus of Linnaeus, and with a large number of other genera form the Passerine family Paridae.

Titmice are usually non-migratory, and the genus Parus occupies most of the globe except South America and the Australian region east of Lombok and Flores.

1 The prefix " tit " by heedless writers often used alone, though equally proper to the titlark (see Pipit), is perhaps cognate with the Greek titis, which originally meant a small chirping bird (Ann. Nat. Hist., 4th series, vol. x. p. 227), and has a diminutive form in the Icelandic Titlingur — the English or at least Scottish titling. It is by false analogy that the plural of titmouse is made titmice; it should be titmouses. A nickname is very often added, as with many other familiar English birds, and in this case it is " torn."

Among the more common European and English forms the first to be mentioned is that called, from its comparatively large size, the great titmouse, P. major, but known also in many parts as the oxeye, 2 conspicuous by its black head, white cheeks and yellow breast, down which runs a black line while in spring the cock makes himself heard by a loud love-note that resembles the noise made in sharpening a saw. It is widely distributed throughout the British Islands and over nearly the whole of Europe and northern Asia. The next is the blue titmouse, bluecap or nun, P. coeruleus, smaller than the last and more common. Its names are so character- istic as to make any description needless. A third common species, but not so numerous as either of the foregoing, is the coal-titmouse, P. ater, distinguished by its black cap, white cheeks and white nape. Some interest attaches to this species because of the difference observable between the race inhabiting the scanty remnants of the ancient Scottish forests and that which occurs throughout the rest of Britain. The former is more brightly tinted than the latter, having a clear bluish-grey mantle and the lower part of the back greenish, hardly either of which colours are to be seen in the same parts of more southern examples, which last have been described as forming a distinct species, P. britannicus. But it is to be observed that the

denizens of the old Scotch fir-woods are nearly midway in coloration between the dingy southern birds and those which prevail over the greater part of the continent of Europe. It would therefore seem unreasonable to speak of two species only: there should be either three or one, and the latter alternative is to be preferred, provided the existence of the local races be duly recognized. Much the same thing is to be noticed in the next species to be mentioned, the marsh- titmouse, P. palustris, which, sombre as is its plumage, is subject to considerable local variation in its very extensive range, and has been called P. borealis in Scandinavia, P. alpestris in the Alps, and P. lugubris in south-eastern Europe, to say nothing of forms like P. baicalensis, P. camchatkensis and others, whose names denote its local variations in northern Asia, while no great violence is exer-cised if to these be tacked on P. atricapilla, with several geographical races which inhabit North America. A fifth British species is the rare crested titmouse, P. cristatus, only found in limited districts in Scotland, though common enough, especially in pine-woods, in many parts of Europe.

In addition to species of Parus, North America possesses two peculiar genera of tits — Psaltriparus and Auriparus. During the greater part of the year the various species of the genus Parus associate in family parties and only break up into pairs at the beginning of the breeding season. The nests are nearly always placed in a hollow stump, and consist of a mass of moss, feathers and hair, the last being worked almost into a kind of felt. Thereon the eggs, often to the number of eight or nine, are laid, and these have a translucent white shell, freckled or spotted with rust colour. The first plumage of the young closely resembles that of the parents ; but, so far as is known, it has always a yellower tinge, very apparent on the parts, if there be such, which in the adult are white. Few birds are more restless in disposition. Most of the European species and some of the North American become familiar, haunting the neighbourhood of houses, especially in winter,

and readily availing themselves of such scraps of foftd, about the nature of which they are not particular, as they can get. 3 By gardeners every titmouse is generally regarded as an enemy, for it is supposed to do infinite damage to the buds of fruit-trees and bushes; but the accusation is wholly false, for the buds destroyed are always found to be those to which a grub — the bird's real object — has got access, so that there can be little doubt that the titmouse is a great benefactor to the horticulturist.

Akin to the genus Parus, but in many respects differing from it, is Acredula, containing that curious-looking bird the long-tailed or bottle titmouse, with many local races or species. The bird itself, having its tail longer than its body, is unlike any other found in the northern hemisphere, while its nest is a perfect marvel of construction, being in shape nearly oval, with a small hole in one side. The exterior is studded with pieces of lichen, worked into a firm texture of moss, wool and spiders' nests, and the inside is profusely lined with soft feathers — 2379 having been, says Macgillvray, counted in one'example. Not inferior in beauty or ingenuity is the nest built by the penduline titmouse, Aegithalus pendulinus, of the south of Europe, which differs, however, not merely in composition, but in being suspended to a bough, while the former is nearly always placed between two or more branches.

The so-called bearded titmouse, Panurus biarmicus, has habits wholly unlike those of any of the foregoing, and is now placed in

2 The signification of this name is obscure. It may perhaps be correlated with a Swedish name for the bird— Talgoxe.

3 Persons fond of watching the habits of birds may with little trouble provide a pleasing spectacle by adopting the plan, practised by the late A. E. Knox, of hanging a lump of suet or tallow by a short string to the end of a flexible rod stuck aslant

into the ground close to the window of a sitting-room. It is seldom long before a titmouse of some kind finds the dainty, and once found visits are made to it until every morsel is picked off. The attitudes of the birds as they cling to the swinging lure are very diverting, and none but a titmouse can succeed in keeping a foothold upon it.

a separate Passerine family — Panuridae. It was formerly found in many parts of England, especially in the eastern counties, where it bore the name of reed-pheasant ; 1 but through the draining of meres, the destruction of reed-beds, and the rapacity of collectors it now exists in few localities. It is a beautiful little bird, of a bright tawny colour, variegated with black and white, while the cock is further distinguished by a bluish grey head and a black tuft of feathers on each side of the chin. Its chief food seems to be reed- seeds and the smaller kinds of fresh-water molluscs, which it finds zimong the reed-beds it seldom quits.

The general affinities of the Paridae seem to lie rather with the Sittidae (see Nuthatch) and the tree-creepers. (A. N.)

TITUS, one of the companions of St Paul, was of Greek origin (Gal. ii. 3), and was perhaps a native of Asia Minor. He appears to have been among the apostle's earliest converts, being first mentioned (Gal. ii. 1) as having accompanied Paul and Barnabas to Jerusalem (cf. Acts xv. 2) " to represent the success of the Pauline gospel outside Judaism." Here the conservative section demanded that he should be circumcised; but Paul successfully opposed this (see Paul). Subsequently he came into close connexion with the Achaean churches and especially with Corinth, bearing letters from Paul and being charged with promoting the proposed collection for poor Christians in Judaea. In these matters he proved himself a trusty lieutenant, winning the esteem of

the Corinthians by his zeal and disinterestedness. The liberality which a generation later was recognized by Clement of Rome as a traditional virtue of the Corinthian Church owed its inception to Titus. In the epistle with which his name is associated he is represented (Titus i. 5) as having been left by Paul in Crete to " set in order the things that are wanting, and ordain elders in every city." He is expected afterwards to join Paul at Nicopolis (iii. 12). In 2 Tim. iv. 10 he is spoken of as having gone (perhaps on a mission) to Dalmatia. Tradition, obviously resting on the Epistle to Titus, has it that he died in Crete as bishop at an advanced age; another line connects him with Venice. Attempts to make him the author of the "We" sections in Acts and to include him in the seventy disciples are futile. There is more to be said for the suggestion that he was the brother of St Luke.

See A. Souter and E. P. Boys-Smith in The Expository Times, xviii. 285, 335, 380.

TITUS, THE EPISTLE TO, in the New Testament, an epistle which purports to have been written by Paul to Titus (i. 1-4) , who is in charge of the local churches at Crete (i. 5). The younger man is reminded of the qualifications which he is to insist upon in officials (i. 5-16), in view of current errors, 2 doctrinal and moral. The genuine teaching, or " sound doc- trine," which he is to propound (ii. 1, seq.), is then outlined, with regard to aged men and women, younger men and slaves especially. 3 After a postscript (iii. 8-1 1), reiterating the counsels of the letter, with particular reference to the outside public, some personal notices are briefly added (iii. 12-13), and, with some final exhortations, the epistle ends.

The origin of Christian missions in Crete is obscure. A strong Jewish element existed among the population (cf. i. 13 seq., iii. 9), which explains the particular hue of the local heresies as well as, perhaps, the initial efforts of a Christian propaganda (cf. Acts ii. 11). The geographical

situation of the island also favoured an early introduction of the new faith. ″ Crete was a great winter- ing place ″ for vessels (cf. Acts xxvii. 12 seq.) working their slow way to Rome along the southern coast of the Mediterranean, 4 so that the possibility of Jewish Christian evangelists having reached it before long is to be granted freely.

1 The common names given to this bird are so very inapplicable that it is a pity that ″ silerella ″ (from siler, an osier) bestowed upon it by Sir T. Browne, its original discoverer, cannot be restored.

2 On the somewhat harsh estimate of the Cretans in i. 12 see DrJ. Rendel Harris in Expositor (7th series, vol. ii. p. 305 seq.). The other features noted in the epistle, their turbulence, drunkenness and greed, all happen to be verified in the pages of ancient writers like Polybius.

3 On the sub-Pauline tone of iii. 5 cf. Sokolowski's Ceist und Leben bei Paulus (1903). p. 108 seq.

4 Cf. W. M. Ramsay: Pauline and other Studies (1907), p. 76, Hoennicke's Das Judenckristentum (1908), p. 156 seq., and Harnack's Mission and Expansion of Christianity, ii. 229-230 (2nd ed., 1908).

It is more difficult to determine when Paul can have visited the island and left Titus behind him. Attempts have been made to find a setting for the epistle within the apostle's life previous to his Roman imprisonment (as recorded in Acts), but by common consent 5 it is now held that the epistle (if written by the apostle) must fall later, during the period of missionary enterprise which is supposed to have followed his release from the first captivity. Like the epistles to Timothy, the Epistle to Titus thus belongs to a phase of the apostle's life for which we possess no other contemporary evidence. The second imprisonment of "Paul, after a period of freedom following his acquittal, is an historical hypothesis (cf. the statement in Steinmetz's Diezweiterifm.Gefan- genschaft des Paulus, p. 46

seq.), which is absolutely essential to tlfe Pauline authorship of the pastorals. It is indeed supported by several critics who reject the latter, just as it is occasionally rejected by advocates of their authenticity. But, upon the whole, such evidence from early tradition as can be adduced from the 2nd century seems no more than an expansion of Paul's language in Rom. xv. 24, 28. The pastorals themselves never mention any mission in Spain. Spanish tradition is silent on the fact, and the allusion to the " west" (in Clem. Rom. v.) can be inter- preted at least as fairly of Rome as of Spain. The entire problem is not without its difficulties still, after all the research lavished upon it, but the probabilities seem to converge upon the conclu- sion that Paul was never released from his imprisonment, and consequently that he never revisited the East.

The internal criticism of the epistle starts from i. 7–9, which is plainly an interpolation, perhaps from the margin, upon the qualifica- tions of episcopoi. On the other hand a passage like iii. 12–13 is indubitably a Pauline fragment, and the problem for the critic is to determine whether in the epistle as a whole we have a redacted and interpolated edition of what was originally a note from the hand of Paul, or whether the epistle drew upon some Pauline tradi- tion (connecting Titus with Crete) and material, and was afterwards interpolated at i. 7–9. The latter hypothesis seems more probable, upon the whole, although there is little to choose between the two. The substantially Pauline character of the epistle, for all practical purposes, is to be granted upon either hypothesis, for the author or the editor strove not unsuccessfully, upon the whole, to reproduce the Pauline spirit and tradition. 6 The older notion that the personal data in Titus, or in the rest of the pastorals, were invented to lend verisimilitude to the writing must be given up. They are too circumstantial and artless to be the work of a writer idealizing or creating a situation. Thus, in the present epistle, a passage like iii. 12–13 is palpably genuine. But it is another question whether other passages can be added to it {e.g. i. 1 seq., 5–6, 12–130, 16, iii. 1–7, 15, by Hesse; i. I, 4, iii. 15, by von Soden; i. 1–6?, iii. 1–7, by McGiffert), in order to reconstruct a more or less independent note from Paul's own pen.

It seems improbable that Titus or any of the pastorals is directed against any one phase of contemporary heresy. 7 The prohibition of marriage (1 Tim. iv. 3) was common to Marcion and Apelles, while the injunction of fasting 8 is attributed to the Encratites (Iren. Adv. Haer. i. 28, 1) and to Saturninus of Antioch in Syria (ibid. I. 24, 3), the latter being also credited with having been the first to introduce a dualism into humanity, which made God send his Saviour to destroy the evil and redeem the good, both classes having been formed by the angels (cf. Titus ii. 11 ; 1 Tim. iv. 10). The exhaustive discussions on this point (cf. Bourquin,

pp. 55 seq.) have led most scholars to the conclusion that no one system of snd-century gnosticism is before the writer's mind. He is maintaining Paul's r61e. He makes the apostle prophesy, vaguely of course, the evil tendencies which were to come upon the church; but the internal evidence,

5 W. E. Bowen, Professor Bartlet (Apostolic Age, pp. 178 seq.; cf. also article en Paul), Lisco {Vincula sanctorum, 1900) and Laughlin are the only recent exceptions, and their conjectural schemes are mutually destructive. The common style of the epistles forbids any dispersion of them over a term of years. They stand or fall together, as critics of all schools are practically agreed. The impossibility of placing them within the period of Acts is best known by Hatch, Bourquin (pp. 10-25), Bertrand (23-47) a "d von Soden.

6 The historical site for iii. 12-13, as well as for the tradition which forms the setting of the epistle, is probably to be sought in the neighbourhood of Acts xx. 3 (so Krenkel). Clemen dates iii. 12-13 from Macedonia after2 Cor. x.-xiii., i.-ix., previous to Romans (in A.D. 59).

7 Essenism, blended with Ebionitism, is the plausible conjecture of Schleiermacher, Neander and Mangold, but the Essenes do not seem to have prohibited marriage so dogmatically.

8 Asceticism was bound up with the gnostic depreciation of the body. By a natural recoil it produced licentiousness of conduct which the pastorals hotly denounce.

together with the impossibility of placing the epistles later than the first ten or twenty years of the 2nd century, render it impracticable to detect anything except incipient phases of syncretistic gnosticism behind the polemical allusions. It was a

gnosticism fluctuating not only in its relation to the Church but in its emphasis upon certain ethical and theosophical ideas. One definite trait is its Jewish character (Titus i. 10 ; 2 Tim. iii. 16; 1 Tim. i. 7, &c). The errorists developed speculations and practical theories on the basis of the Old Testament law, which proved extremely seductive to many Christians. But it is difficult to find any homogeneity in the repeated descriptions of this semi-gnostic phase, although now and then (e.g.-in 1 Tim. i. 7 seq. ; Titus i. 14, iii. 9) there are suggestions of the legalism which Cerinthus advocated. The Ophites are said to have not only used myths but forbidden marriage and held that the resurrection was purely spiritual (Lightfoot) ; this, however, is probably no more than an interesting coincidence, and all attempts to identify the errorists definitely must be abandoned. 1 The early Fathers often indeed identify them with later types of gnosticism, but this cannot be taken as any sure clue to the author's meaning. They naturally found in his prophetic words the anticipation of heresies current in their own age.

Sometimes, as in the cases of the resurrection being allegorized 2 and marriage repudiated, 3 it is feasible to detect distortions or exaggerations of Paul's own teaching, against which the Paulinist of the pastorals puts in a caveat and a corrective. But these some- what " indiscriminate denunciations are certainly not what we expect from a man like Paul, who was an uncommonly clear-headed dialectician " (McGiffert). They partake of the nature of a pastoral manifesto, which does not trouble to draw any fine distinctions between the principles or motives of its opponents. The method resembles that of the First Epistle of John, for although the errorists attacked in the latter manifesto are not those of the pastorals, and although the one writer eschews entirely the inner authority of the Spirit which the other posits, the same anti-gnostic emphasis on practical religion and stereotyped doctrine is felt in both.

Literature. — Special monographs on Titus have been

written by Jerome, Casper Cruciger (Expositio brevis et familiaris, 1542), Mosheim (Erklarung des Brief s an Tit., 1779), and Kuinoel {Explicatio epist. Pauli ad Titum, 1812). Commonly, however, the epistle has been edited and criticized along with the epistles of Timothy. The ablest recent editions are by B. Weiss (in Meyer's Commenlar, 7th ed., 1902; full and exact), Wohlenberg (in Zahn's Commenlar, 1906), and J. E. Belser, the Roman Catholic savant (1907), with which may be ranked Wace's (Speaker's Commentary, 1886) and J. H. Bernard's (Cambridge Greek Testament, 1899) editions. All these present the conservative position. On the other side, Von Soden's Hand-Commentar (2nd ed., 1893) and Franz Koehler's popular commentaries Die Schriften des N. T. (1906) are most notable. Brief English notes are furnished by Horton (Century Bible, 1901, from Zahn's standpoint) and J. P. Lilley (Edinburgh, 1901). Of the older editions, the most valuable are Heydenreich's (Die Pastoral- briefe, 1826-1828), Alford's (3rd ed., 1862), Huther's (3rd ed., Gottingen, 1866), Bisping's (1866), P. Fairbairn's (Edinburgh, 1874), Ellicott's (5th ed., 1883, strong in exegesis) and Knoke's (in Lange's Bibel-Werk, 4th ed., 1894), with Riggenbach's (in the Strack-Zockler Commenlar, 1897). Editions, in English have recently been undertaken in the International Critical Commentary (by W. Lock), in the Expositor's Greek Testament (by N. J. D. White), and by Sir W. M. Ramsay. For the patristic literature see Wohlenberg (op. cit. p. 76).

For the view that a Paulinist was the author, see Schleiermacher, tjber den sogen. erslen Brief des Paulus an den Tim. (1807), which really opened the modern phase of criticism on all three epistles; Baur, Die sogenannten Pastoralbriefe des Apostels Paulus (1835); H. J. Holtzmann, Die Pastoralbriefe kritisch u. exegetisch behandelt (1880), an exhaustive treatment; Hilgenfeld, Zeitschrift fiir die wiss. Theologie (1897), 49 seq., 61 seq., 79 seq. ; E. Y. Hincks, Journal of Bibl. Literature (1897), 94-117; and Renan, 5. Paul xxiii.liii., L'ltglise chretienne, ch. v. The conservative

position is maintained with varying confidence by C. W. Otto, Die geschichtlichen Verhalt nisse der Pastoralbriefe (i860) ; Bertrand, Essai critique sur Vauthenti- cile des ep. pastorales (1888) ; G. G. Findlay, appendix to Eng. trans, of Sabatier's L'Apdtre Paul, pp. 341 seq. ; W. E. Bowen, Dales of Pastoral Letters (1900) ; T. C. Laughlin, The Pastoral Epp. in the Light of one Roman Imprisonment (California, 1905) ; and J. D. James, The Genuineness and Authorship of the Pastoral Epistles (1906). For general studies, see Schenkel's Bibel-Lexicon, iv. 393-402; Sabatier's article in Ency. des sciences religieuses, x. 250-259; J. R. Boise,

1 Clemen (Paulus i. 148) distinguishes broadly between the errorists of 2 Tim. and those controverted in the other two epistles. The former, he argues, are in the last resort libertinists and anti- nomians; the latter must be regarded as ascetic Judaists.

2 2 Tim. ii. 18. Paul's teaching about the believer being already risen with Christ gave a welcome handle to the later Gnostics. The passage in John v. 28-29 seems a correction of the possible inferences which might be drawn from such teaching in Paul and in the Fourth Gospel itself.

3 Cf. Von Dobschtitz, Christian Life in the Primitive Church (pp. 261 seq.).

The Epp. of Paul written after he became a Prisoner (New York, 1887) ; Plummer, Expositor's Bible (1888); Bourquin, Atude critique sur les past, epitres (1890) ; Harnack, Die Chronologie, 480 seq., 710-71 1 ; Moffatt, Ency. Bib., 5079-5096, and W. Lock (Hastings's Diet. Bible, vol. iv.). (J. Mt.)

TITUS, FLAVIUS SABINUS VESPASIANUS, Roman emperor from a.d. 79-81, son of the emperor Vespasian, was born on the 30th of December a.d. 40 (or 41). He was educated in the imperial court, and thoroughly accomplished: he could speak Greek fluently and compose verses; he was a proficient in music; he could write shorthand, and imitate handwriting so

skilfully that he used to say that he might have been a most successful forger. He was handsome and commanding, and had a vigorous frame, well trained in all the exercises of a soldier. As a young man he served with credit in Germany and in Britain. Soon he had the command of a legion, and joined his father in Syria, where he took an active part in the Jewish War. In 68 he was sent by his father to congratulate the newly proclaimed emperor, Galba ; but, hearing of Galba's death and of the general confusion in the Roman world, he returned to Palestine, having in the mean- time consulted the oracle of the Paphian Venus and received a favourable answer. In the following year Vespasian, having been proclaimed emperor, returned to Italy, and left Titus to carry on the siege of Jerusalem, which was captured on the 8th of September 70. On his return to Rome, Titus and his father celebrated a magnificent triumph, which has been immortalized by the so-called Arch of Titus. He was now formally associated with his father in the government, with the title of Caesar, and during the nine remaining years of Vespasian's reign he was in fact emperor. He was anything but popular ; he had the character of being profligate and cruel. His connexion with Berenice, the sister of the Agrippa of the Acts of the Apostles, also created a scandal; both brother and sister followed Titus to Rome, and were allowed to reside in the imperial palace. Public opinion was outraged, and Titus, though he had promised Berenice marriage, felt obliged to send her back to the East. Vespasian died in 79, leaving his son a safe throne and a well-filled treasury. The forebodings of the people were agreeably disappointed, for Titus put an end to prosecutions for high treason, and the delatores (informers) were scourged and expelled from the city. He assumed the office of pontifex maximus, in order that he might keep his hands free from blood. He forgave his brother Domitian, who more than once plotted against his life, and having let a day pass without bestowing a present, he exclaimed, " I have lost a day."

Titus, like his father, spent money in adding to the

magnifi- cence of Rome. The Flavian amphitheatre (later called the Colosseum) was completed and dedicated in his reign, with combats of gladiators, shows of wild beasts, and representations of some of the great Greek naval battles. He gave the city splendid baths, which surpassed those of Agrippa and of Nero, and supplied the mob with every kind of luxury.

During his reign, in 79, occurred the eruption of Vesuvius which destroyed Herculaneum and Pompeii. The emperor visited the scenes and contributed liberally to the relief of the distressed inhabitants. During his absence a fire raged for three days at Rome, in which the new temple of Jupiter Capitolinus, the library of Augustus, and other public buildings were burnt ; then followed a pestilence, and Titus again assisted freely with his purse. Italy and the Roman world were peaceful during his reign. The only fighting was in Britain under Agricola, who in the year 80 carried the Roman arms as far as the Tay. Titus died on the 13 th of September 81. The verdict of history is favourable to him, but the general feeling throughout the Roman world was that he had been fortunate in the briefness of his reign.

See Suetonius, Titus: Dio Cassius lxvi. 18-26; C. Beul6, Titus et sa dynastie (1870) ; L. Double, L'Empereur Titus (1877) ; Merivale, Hist, of the Romans under the Empire (ch. 60); H. Schiller, Geschichte der rbmischen Kaiserzeit, i. pt. 2.

TITUS TATIUS, in Roman legend, the Sabine king of Cures, who waged war upon the Romans to avenge the rape of the Sabine women (see Romulus). After various indecisive conflicts

the latter, who had become Roman matrons, intervened and prevailed upon the combatants to cease fighting. A formal treaty was then arranged between the Romans

and Sabines, whereby Romulus and Tatius were to be joint and equal rulers of the Roman people. Rome was to retain its name and each citizen was to be called a Roman, but as a community they were to be called Quirites {q.v.) ; the Sabines were to be incorporated in the state and admitted into the tribes and curies. After this arrangement had lasted for five years it came to an end by the death of Tatius, who was killed out of revenge by the inhabitants of Lavinium. According to Mommsen, the story of his death, (for which see Plutarch) look.; like an historical version of the abolition of blood-revenge. Tatius, who in some respects resembles Remus, is not an historical personage, but the epony- mous hero of the religious college called Sodales Titii. As to this body Tacitus expresses two different opinions, representing two different traditions: that it was introduced either by Tatius himself to preserve the Sabine cult in Rome; or by Romulus in honour of Tatius, at whose grave its members were bound to offer a yearly sacrifice. The sodales fell into abeyance at the end of the republic, but were revived by Augustus and existed to the end of the 2nd century a.d. Augustus himself and the emperor Claudius belonged to the college, and all its members were of senatorial rank. Varro derives the name from the Titiae aves which were used by the priests in certain auguries.

See Livy i. 10-14; Tacitus, Annals, i. 54, Hist. ii. 95; Dion. Halic. ii. 36-52; Plutarch, Romulus, 19-24; Marquardt, Romische Staatsverwaltung (1885) iii. 446; Schwegler, Romische Geschichle, bk. ix. 3, 14; x. 5.

TITUSVILLE, a city of Crawford county, Pennsylvania, U.S.A., on Oil Creek, about 42 m. S. by E. of Erie. Pop. (1900), 8244, of whom 1573 were foreign-born; (1910 census) 8533. Titusville is served by the Dunkirk, Allegheny Valley & Pittsburg, and the Pennsylvania railways. It has the Benson Memorial library (1904), and in Woodlawn Cemetery there is a monument (erected by Henry H. Rogers in 1902) to Colonel Edwin L. Drake (1819-1880), who here sank the first oil well (695 ft. deep) in America in

August 1859 and who is buried here. Titusville was the principal centre in Pennsylvania of the opposi- tion to the Standard Oil Company; but after 1875, when John D. Archbold (b. 1848), a leader of the independents, became a director of the Standard, few of the Titusville operators remained independent. It was in the Titusville district that the natural, gas industry of Pennsylvania was first established about

1872.

There are various manufactures, and in 1905 the value of the factory products was $3,249,890. The first settlement was made here in 1796 by Samuel Kerr and Jonathan Titus (in whose honour the place was named). Titusville was incorporated as a borough in 1847 and was chartered as a city in 1866. On the 5th of June 1892 Oil Creek rose suddenly, overflowed its banks and wrecked many oil tanks along the bottom-lands. A large part of the water was covered with oil, which soon caught fire. About 60 persons were drowned or burned to death, and about a quarter of the city was destroyed.

TIVERTON, a market town and municipal borough in the Tiverton parliamentary division of Devonshire, England, situated amid beautiful scenery at the confluence of the Loman and Exe, 187! m. W. by S. of London by the Great Western railway. Pop. (1901), 10,382. The upper town is built on high ground along the left bank of the Exe, and a bridge leads to the lower town, named West Exe. St Peter's church, originally consecrated as a chapel by Leofric, bishop of Exeter, in 1073, is a beautiful Perpendicular building. Its high tower has four stages, each adorned with grotesques; and Greenway's chapel, built in 1517 by John Green way, a wool merchant of Tiverton, is ornamented with figures minutely carved in stone. Of the original Norman fabric only a doorway remains. Within are some fine carvings, brasses and monuments. Of the castle, founded about 110$ by Richard de Redvers, the banqueting- hall, a tower, the chapel and a 14th- century gateway remain. After serving as the home of the Redvers and Courtenay families,

earls of Devon, until the 16th century, the castle was dismantled by Fairfax. Partly rebuilt, it is used as a dwelling-house; while in its gardens an annual race-meeting is held in August. Blundell's grammar school, founded under the will of Peter Blundell, a rich cloth merchant, in 1604, has modern build- ings outside the town in Tudor style; and, among others, scholarships at Balliol College, Oxford, and Sidney Sussex College, Cambridge. The number of boys is about 230. The Chilcott Free School was established in 1611, and the Bluecoat Charity School, dating from 1714, was reorganized in 1876 to give secondary education to boys and girls. After the decline of its woollen trade Tiverton became noted for the lace manu- facture introduced by John Heathcoat (1 783-1861), inventor of the bobbin net frame. There are also breweries, flour-mills, and a large trade in farm produce and livestock. Amicia, countess of Devon, brought a stream of water from Norwood, S m. distant. This system was improved in the 19th century. Hannah Cowley, the dramatist (1 743-1809), Richard Cosway, the miniature painter (b. 1742) and John Cross, an artist of some celebrity (b. 1819), were natives of Tiverton. The town is governed by a mayor, 6 aldermen and 18 councillors. Area, 17,680 acres.

Tiverton {Tuyverton, Tovretona) exhibits traces of very early settlement, and is mentioned under the name of Tuyford in the will of King Alfred. In the Domesday survey it appears as a royal manor containing two mills, but it was bestowed by Henry I. on Richard de Redvers, and in 1245 appears as a mesne borough under Baldwin de Redvers, who in that year obtained a grant of a Monday market and a three days' fair at the feast of St James. In 1275 Amicia, countess of Devon, claimed to hold fairs at Tiverton at the feasts of St Andrew and St Giles, and at the translation of St Thomas the Martyr. In 1618 the borough received its first charter of incorporation from James I., instituting a governing body of a mayor, 12 chief burgesses, and 12 assistant burgesses, with a recorder, deputy-recorder, town-clerk and two serjeants-at-mace; a court of record

every fort- night on Tuesday; and fairs at Michaelmas and on the second Tuesday after Trinity Sunday, which were kept up until within the last fifty years. The borough also sent two representatives to parliament until disfranchised by the Reform Act of 1885. Cromwell in 1655 changed the market day from Monday to Tuesday. Fresh charters of incorporation from James II. in 1689 and from George I. in 1724 left the style and constitution of the governing body unchanged. Tiverton was an important centre of the woollen trade in the 16th century, and Risdon, writing in 1608, describes it as thronged with rich clothiers, and the Monday market famous for its kersies, known as "Tiverton kersies," while as late as the reign of George II. the town had 56 f ulling-mills ; but about this time the industry began to decay, and is now extinct.

See Victoria County History: Devonshire; M. Dunsfold, Historical Memoirs of the Town and Parish of Tiverton (Exeter, 1790); W. Harding, History of Tiverton (1 845-1 847).

TIVOLI (anc. Tibur, q.v.), a town and episcopal see of the pro- vince of Rome, Italy, 18 m. E.N.E. of Rome by road and tram- way, 245 m. by rail, 760 ft. above sea-level. Pop. (1901), 11,610 (town), 12,881 (commune). Tivoli lies on the west of the Sabine Mountains, where the river Anio issues from them, upon a lime- stone rock above the river. The town on one side overlooks the Campagna di Roma and Rome itself, on the other the deep gorge of the Anio, with its lofty falls, and the environs are very beautiful. The Roman remains are described under the heading of Tibur. The Villa d'Este, begun in 1549 by Pirro Ligorio for Cardinal Ippolito d'Este the younger (the cardinal of Ferrara), has the finest example of a Renaissance garden in Italy; it was erected on a steep slope, with many terraces, and embellished with numerous fountains, fantastically decorated in stucco, which once formed the background to the splendid collection of ancient statuary formed by the cardinal, but now dispersed (see F. S. Seni, La Villa d'Este in Tivoli, Rome, 1902; T. Ashby, in Archaeologia, vol. Ixi.). The

villa contains damaged frescoes by the brothers Zuccari. The register of the see of

Tivoli has documents dating from the ioth century relating to the landed property of the see (L. Bruzza, Regeslo della chiesa di Tivoli, Rome, 1883), and the municipal archives date from 1450. The castle was erected in 1460 by Pius II. on the site of the amphitheatre; it is now a prison. In November 1826 a flood of the Anio led to a change in its course, and threatened to carry away the town. A new channel, consisting of two parallel tunnels (the Traforo Gregoriano) 200 and 330 yds. long, was therefore made to the north-east in 1826-1835 by Folchi, and on emerging from these the river has a fall of 354 ft. Farther north-west are smaller falls (the cascatelle) of that portion of the river which is carried through the town and serves for industrial purposes. Five miles west are the sulphur baths of Acque Albule, which were known to the ancients, and are now frequented by over 40,000 persons annually. The temperature of the water is 75 • 2° F. The falls in the river afford electric power for lighting Rome and driving its trams, as well as for driving several factories in Tivoli itself. Tivoli is also the centre of an agricultural district, and its olive trees are especially fine.

TLAXCALA, an inland state of Mexico, bounded N.E. and S. by Puebla, and W. by the state of Mexico. Area 1505 sq. m. Pop. (1900), 172,315. Tlaxcala lies on the great central plateau of Mexico and has a mean altitude of about 7000 ft. Several mountains rise in the west and south, culminating in the volcanic peak of Malinche, or Malintzin (14,636 ft.). The state has three railway lines crossing its territory. The capital is Tlaxcala and the principal towns are Chiautempan (about 5000). Calpulalpan, San Antonio, Tlaxco, Huamantla and Barron-Escandon (Apizaco). The state nearly coincides with the ancient Indian republic founded in the 13th century

by a branch of the Nahuatlan race, who migrated from the western shores of Lake Texcoco. Though surrounded on all sides by the great Aztec Empire, the tiny republic maintained its independence until the arrival of the Spaniards. The Tlaxcaltecs, or Tlascalans, after a fierce resist- ance to Cortes in 15 19, became efficient allies of the Spaniards and contributed largely to their final success. The present inhabitants are chiefly of this original stock, and retain their language and many ancient customs.

TLAXCALA, a town of Mexico, capital of a state of the same name, on the Atoyac river, 58 m. E. of Mexico city by rail. Pop. (1900), 2715. It is of historic interest in connexion with the conquest of Mexico by Cortes. The State-house is its only fine edifice of a political character, and the old bishop's palace its finest building of a religious character. Of most historic interest, perhaps, is the church of San Francisco, the first erected on the American continent, which still contains the vestments, pulpit, font and cedar ceiling brought from Spain in 1521. The handsome sanctuary over the holy well of Ocotlan, on a hill outside the town, is one of the landmarks of the surrounding country.

TLEMQEN, a town of Algeria, the capital of an arrondisse- ment in the department of Oran, near the frontier of Morocco, 68 m. by road and 102 by rail S.W. of Oran. It stands 2500 ft. above the sea, on the north slope of the Leila Setta hills, which rise to a height of over 4000 ft. It is the chief town of a wide district exporting olive oil, esparto, corn and flour, wools and Algerian onyx; and has a population of (1906) 24,060. From Tlemcen the railway is continued westward to the Moroccan frontier at Lalla Maghnia, a distance of 44 m.

Among the cities famous in the annals of Arab-Berber, or Moorish, art and civilization, Tlemcen takes high rank. In architectural merits its monuments, though not so extensive, are worthy of comparison with those of Granada. The older walls and towers — there were three ancient lines of

fortifications — are in great part destroyed, but a wall built by the French encircles the town.

The various quarters are grouped around the principal mosque — the Jewish to the south-west, the Moorish to the south-east, that of the merchants to the north-east, while the new town with the civic buildings lies to the north-west. Of the sixty-four mosques which existed at the period of the French conquest, several have

SldlBu Media.

disappeared. The great mosque (Jamaa-el-Kebir) has a brick minaret 112 ft. high, adorned with marble columns, and cased with mosaic of the most varied designs; a fountain of alabaster — of the kind known as Algerian onyx — stands in the alabaster-paved inner court ; and 72 columns support the arches of the interior. This mosque was built A.D. 1 136 to replace a much older building. The mihrab is finely ornamented with arabesques. The mosque of Sidi Ahmed bel Hassan, usually called Abul Hassan, built A.D. 1298, now trans- formed into a museum of antiquities, has two series of arches, which rest on alabaster pillars. The courts are ornamented by sculptures of great beauty and richness; the delicately-carved cedar ceiling bears traces of polychromatic painting. The exterior has been altered in French taste. Among the antiquities preserved in the museum are the epitaph of Boabdil, the last king of Granada, who died at Tlemcen in 1494, and the standard cubit measure — in marble — used in the Kissaria, bearing date a.h. 728 (1328). The mosque of El-Halawi (the Sweetmeat Maker), dating from 1353, is outside the walls of the town. It has eight magnificent columns of Algerian onyx, with richly sculptured capitals. The ceiling of cedar is richly carved, and there is a fine colonnade on each side of the court. The minaret is decorated with mosaics. The military authorities occupy the Meshuar or citadel, built in 1145, which separ- ates the Jewish and Moorish quarters and was formerly the palace of the rulers of Tlemcen. Only the minaret of the mosque, dating from the 14th

century, and the battlemented wall, flanked by two towers, remain of its former magnificence. The vast basin (sahrij) under the old walls, now dry (720 ft. in length, 490 in width and 10 in depth), was apparently made for naval exhibitions. At one period barracks of the spahis occupied all that remains of the Kissaria. the place of residence of European merchants from Pisa, Genoa, Catalonia and Provence. The barracks have been cleared away and a covered market made in the upper part of the Kissaria. The ancient college (medressa) where many learned Arabs taught — ■ of whom Ibn Khaldun, author of a History of the Berbers, may be mentioned — has entirely disappeared. The church erected by the French is a fine building in the Byzantine style. Besides the large trade carried on there are native manufactories of cloth, carpet3 and leathern articles. A special manufacture is that of red shawls, used throughout the department of Oran by Jewish women when in mourning.

In the immediate neighbourhood of the modern Tlemcen are numerous remains of the fortifications of Agadrr {vide infra), and the minaret of the mosque, a beautiful tower dating from the 13th century, the lower part of which is built of large hewn stones from the Roman Pomaria. More noteworthy, however, are the ruins of Sidi Bu Medin and of Mansura. Sidi Bu Medin (more properly El Eubbad) is a little over a mile south-east of Tlemcen. It was founded A.D. 1337 by Ali V., the first of the Beni-Marin (Marinide) sultans who ruled Tlemgen, and commonly called the Black Sultan. The ruins of a small building, conjectured to be a palace of Sultan Ali, which commands a beautiful view, were excavated in 1881. The kubba or tomb of Sidi Bu Medin, near the palace, is held in great veneration by the Arabs. The roof and walls are covered with arabesques, and the legend El-Mulk Lillah, ″ the kingdom is God's,″ is repeated again and again. The saint himself was born at Seville A.D. 1126, and died near Tlemcen in his 75th year; his disciple Sidi Abd-es-Selam of Tunis lies near him. The adjacent mosque is a beautiful specimen of Moorish art. The large double

doors of cedar wood, covered with bronze showing a geometric interlaced pattern, have been compared with those of Ghiberti at the Baptistery of Florence. The mosque is divided by columns into five aisles. Delicate lacework extends from the spring of the arches to the roof. The tile mosaics are believed to have come from Morocco. The medressa is a building resembling the mosque.

Mansura, which is about 1 J m. west of Tlemgen, owes its founda- tion to the attempts of the Beni-Marin rulers of Morocco to extend their sovereignty. The Amir Abu Yakub Yusef be- „ sieged Tlemcen in the early years of the 14th century Manst "'B- The siege lasted eight years, and Yusef turned his camp into a walled city. The siege being raised, El Mansura (the victorious), as the new city was called, was abandoned. It was reoccupied when (I 335) Ali V. renewed the siege, which jthis time proved successful. On the expulsion of the Marinides in 1359 Mansura was finally deserted. Besides the walls and towers, and the minaret of the mosque, little remains of Mansura, of which Ibn Khaldun has left a contemporary and graphic sketch. The minaret, notwithstanding that one side and parts of two other sides have perished, is one of the finest mosque towers in existence. It is 125 ft. high, and is built of hewn stone. The arches are circular or pointed. The upper part of the tower is ornamented with green and blue tiles and the entrance arch is beautifully carved. An inscription records that the tower was built by order of Abu Yakub Yusef. Of the rest of the mosque only the outer walls remain. It is about 320 ft. long by 200 wide and was divided by magnificent marble columns into thirteen aisles. Excavations made by the French brought to light some of these columns, which are now in the museums of Tlemcen and Algiers.

History. — A Roman town, Pomaria, occupied a site east of the present town. It derived its name from the abundance and

luxuriance of the apple, pear and other fruit trees in the neigh- bourhood. The Roman town was ruined in the period following the Vandal invasion, and at the time of the Arab conquest appears to have been deserted. Many inscriptions of the Christian era have been found, some as late even as the 7th century. The site was purchased from the Zenata Berbers, in the 8th century, by Idris-bin-Abdallah, who began the building of a new city named Agadir (Berber, the fortress). Idris, founder of the Idrisite dynasty of Fez, left his brother Suleiman in possession of Agadir, and the city was ruled by the Beni-Suleiman until 931, when it fell into the hands of the Fatimites. From the Fatimites it passed into the possession of the Beni-Yala, of the Beni-Ifren branch of the Zenata Berbers, who held it as vassals of theOmayyad rulers of Spain. In 1080 the Almoravide sovereign Yusef ibn Tashfin, after besieging and sacking Agadir, built a new town on the site of his camp. The new town, called Tagrart, became the com- .mercial quarter, whilst Agadir remained the royal residence. The two towns when united received the name of Tlemcen. The Almoravides reigned sixty-five years, when, after holding Agadir four years against the enemy, they were overcome by the Almohades, who massacred the inhabitants, rebuilt, en- larged and repeopled the ruined town, and built a wall (1161) surrounding the double town. In 1 248 Tlemcen was captured The by Abu Yahia Yarmorasen (Ghamarasan) who was

Sultanate of chief of the Zenata tribe of Berbers and claimed Tlemgen. descent from the Caliph Ali. Yarmorasen, who died in 1282, founded the dynasty of the Abd-el- Wahid, who ruled the greater part of what now constitutes Algeria. Under their sway Tlemcen flourished exceedingly. The presence of Jews and Christians was encouraged and the Christians possessed a church. The bazaar of the Franks (kissaria) was a large walled enclosure, the gates of which were closed at sunset. As many as 5000 Christians lived peaceably in Tlemcen, and the Sultan included in his army a Christian bodyguard.

In 1337 the power of the Abd-el-Wahid was temporarily extinguished by the Marinide sultans of Morocco. They left some fine monu- ments of the period of their ascendancy, which lasted twenty- two years. Once more, under the Abd-el-Wahid, now known as the Beni-Zeiyan, from 1359 to 1553, Tlemcen enjoyed pros- perity. It had a population reputed to number 125,000, an extensive trade, a brilliant court and a powerful army. The Spanish occupation of Oran (1509) struck a fatal blow at the European commerce of the town. The Beni-Zeiyan, after the capture of Algiers in 1516 by the corsair Barbarossa (q.v.) gradually lost their territory to the Turks, while Tlemcen itself for forty years became tributary to the Spanish governor of Oran. In 15 18 the town was held for a short time byArouj Barbarossa, but Arouj was killed in a fight with the Spaniards. It is said that, while master of the town, Arouj caused twenty- two of the Zeiyan princes to be drowned in the sahrij. In 1553 the Turks under Salah Rais, pasha of Algiers, captured Tlemcen and the Sultanate of Tagrart, as it was still frequently called, came to an end. Under the Turks the town ceased to be of any importance. When the French entered Algeria the sultans of Morocco were disputing the possession of Tlemcen with the Kuluglis, who fought first for themselves and after- wards for France. In 1835 Abd-el-Kader, on whose appear- ance the Moors retired, sought to re- establish the ancient empire of Tlemcen, but he retreated before General Clausel in 1836. The treaty of the Tafna (1837) gave Tlemcen to Abd-el-Kader, but, war being renewed in 1842, Tlemgen was definitely occupied by the French, under whom it has prospered.

The commune of Tlemgen, which includes a number of villages near the city, had a population (rgo6) of 39,757, and the arrondissement, which includes nine communes, 149,467.

See Les Monuments arabes de Tlemgen, by William Margais and Georges Margais (Paris, 1903). This accurate and finely-illustrated work, one of the publications of the Service des monuments

historiques de VAlgerie, cites the principal works dealing with Tlemgen, and ?ives a critical estimate of their value. (F. R. C.)

TOAD, a name commonly applied, in contradistinction to " frog," to tailless batrachians of stout build, with more or less warty skin. Thus, of the two closely related discoglossid genera Bombinator and Discoglossus, the former is called a toad and the latter a frog. But the true toads are the Bufonidae, arci- ferous batrachians with dilated processes to the sacral vertebra and without any teeth in the jaws. The type of the family is our common toad, Bufo vulgaris, and round it cluster a large number of species of the same genus, and the smaller genera Eupemphix, Pseudophryne, Nectophryne, Nectes, Notaden, Myo- batrachus, Khinophrynus and Cophophryne. That the shape of the body is not a safe guide in judging of the batrachians is shown by certain species, such as Bufo jerboa, which in its slender form and extremely long limbs surpasses the typical frogs, whilst on the other hand, some true frogs (Rana), adapted to burrowing habits, are absolutely toad-like. The Bufonidae include terrestrial, burrowing, thoroughly aquatic and arboreal types; Khinophrynus, of Mexico, may be described as an ant- eater.

The genus Bufo embraces about 100 species, and is repre- sented in nearly every part of the world except the Australian region and Madagascar. Two species are found in the British Isles: the common toad, Bufo vulgaris, and the natterjack, Bufo calamita. The former is found almost everywhere; the second, which differs in its shorter limbs with nearly free toes (which are so short that the toad never hops but proceeds in a running gait) and in usually possessing a pale yellow line along the middle of the back, is local in England, the south-west of Scotland, and the west of Ireland; it is further remarkable for the very loud croak of the males, produced by a large vocal bladder on the throat which, when inflated, is larger than the head. Toads lay their eggs in long strings, forming double files in straight, jelly-like tubes.

A small toad, Pseudophryne vivipara, recently discovered in German East Africa, has proved to be viviparous, this being the only such instance known among tailless bactrachians.

TOADSTOOL, the popular name for fungi which more or less resemble mushrooms, but are either poisonous or worthless as food.

TOAST, a slice of bread scorched brown on the two surfaces by the heat of a fire. The word was borrowed from the O. Fr. toste, Lat. torrere, tostum, to scorch, burn. It was formerly the custom to have pieces of toast floating in many kinds of liquor, especially when drunk hot. It is said to be from this custom that the word is used of the calling upon a company to drink the health of some person, institution or cause (see Health).

TOBACCO, the name (see below) for the leaves of several species of Nicotiana (nat. ord. Solanaceae), variously prepared for use as a narcotic. While it is principally manufactured for smoking, a large amount is also prepared for chewing, and, to a more limited extent, it is taken in the form of snuff. Under one or other of these forms the use of tobacco is more widely spread than is that of any other narcotic or stimulant.

History. — Although the fact has been controverted, there cannot be a doubt that the knowledge of tobacco and its uses came to the rest of the world from America. In November 1492 a party sent out by Columbus from the vessels of his first expedition to explore the island of Cuba brought back information that they had seen people who carried a lighted firebrand to kindle fire, and perfumed themselves with certain herbs which they carried along with them. The habit of snuff-taking was observed and described by Ramon Pane, a Franciscan who accompanied Columbus on his second voyage (1494-1496), and the practice of tobacco-chewing was first seen by the Spaniards on the coast of South America in 1502. As the continent of America was opened up and explored, it became evident that the

consumption of tobacco, especially by smoking, was a universal and immemorial usage, in many cases bound up with the most significant and solemn tribal ceremonies.

The term tobacco appears not to have been a commonly used original name for the plant, and it has come to us from a peculiar instrument used for inhaling its smoke by the inhabitants of

Hispaniola (San Domingo). The instrument, described by Oviedo (Historia de las Indias Occidentales, Salamanca, 1535), consisted of a small hollow wooden tube, shaped like a Y, the two points of which being: inserted in the nose of the smoker, the other end was held into the smoke of burning tobacco, and thus the fumes were inhaled. This apparatus the natives called ″ tabaco "; but it must be said that the smoking pipe of the continental tribes was entirely different from the imper- fect tabaco of the Caribees. Benzoni, on the other hand, whose Travels in America (1542-1556) were published in 1565, says that the Mexican .name of the herb was ″ tabacco.″

The tobacco plant itself was first brought to Europe in *$$& by Francisco Fernandes, a physician who had been sent by Philip II. of Spain to investigate the products of Mexico. By the French ambassador to Portugal, Jean Nicot, seeds were sent from the Peninsula to the queen, Catherine de' Medici. The services rendered by Nicot in spreading a knowledge of the plant have been commemorated in the scientific name of the genus Nicoliana. At first the plant was supposed to possess almost miraculous healing powers, and was designated ″ herba panacea,″ ″ herba santa,″ ″ sana sancta Indorum"; "divine tobacco" it is called by Spenser, and ″ our holy herb nicotian ″ by William Lilly. While the plant came to Europe through Spain, the habit of smoking was initiated and spread through English example.

Ralph Lane, the first governor of Virginia, and Sir Francis Drake brought with them in 1586, from that first American possession of the English crown, the implements and materials of tobacco smoking, which they handed over to Sir Walter Raleigh. Lane is credited with having been the first English smoker, and through the influence and example of the illustrious Raleigh, who " tooke a pipe 01 tobacco a little before he went to the scaffolde," the habit became rooted among Elizabethan courtiers. During the 17th century the indulgence in tobacco spread with marvellous rapidity throughout all nations, and that in the face of the most resolute opposition of statesmen and priests, the " counterblaste " of a great monarch, penal enactments of the most severe description, the knout, ex- communication and capital punishment.

Botany. — There are about fifty species of Nicotiana, nearly all of which are natives of America. Few, however, are of economic importance. The great bulk of the tobacco supply is derived from

Fig. 1 .—^Flowering Top of N. Tabacum.

N. tabacum, the Virginian tobacco, a native of some part of Central or South America and now cultivated in almost all temperate and warmer countries. It is a coarse rank-growing annual, with a simple, unbranched, cylindrical stem which attains a height of 6 ft. and upwards, terminating in a panicle of pink or rose-coloured flowers and an elongated corolla tube (fig. 1). The plant has alternate, simple, oblong-lanceolate leaves, those at the lower part of the stem being slightly stalked, and of large size, reaching to 2 ft.

in length, while the upper are semi-amplexicaul and of variable outline. The seeds are brown in colour, with a rough surface, of minute size, and exceedingly numerous; as many as 1,000,000 may be produced by a single plant. The whole of the green parts of the plant are covered with long soft hairs which exude a viscid juice, giving the surface a moist glutinous feeling. The hairs are

multicellular, and of two kinds, one branching and ending in a fine point, while the other, unbranched, terminates in a clump of small cells. Stomata occur on both surfaces of the leaves, and, with the peculiar hair structure render the microscopic appearance of the plant highly characteristic.

Fig. 2. — Microscopic Structure of Tobacco Leaf.

From this species the tobaccos of Cuba, the United States, the Philippine Islands and the Latakia of Turkey are derived, and it is also largely cultivated in India ; the variety macrophylla is the source of the Maryland tobaccos. N. persica, Persian tobacco, the source of the famous Shiraz tobacco, is regarded as only a variety of N. tabacum, and an introduction from America. East Indian, or Green, tobacco is the product of another species, N. rustica, a smaller plant with a much-branched stem and greenish-yellow flowers with a short, broad tube. It is a native of Mexico, and now widely cultivated in southern Germany, Hungary and the East Indies.

Cultivation. — Tobacco is cultivated in localities scattered over almost the whole world, ranging as far north as Quebec, Stockholm and the southern shores of Lake Baikal in one hemisphere, and as far south as Chile, the Cape of Good Hope and Victoria in the other. Whilst, however, the plant adapts itself to a great variety of climatic conditions and will grow on almost all kinds of soil, the flavour and quality of the produce are profoundly affected by variations in these two factors. Very slight differences in climate appear to cause very great differences in the quality of the tobacco, and ordinary meteorological records are of little use in determining the suitability or not of a region for a particular kind of leaf; this essential point must be determined by experiment. In general, tropical and semi- tropical conditions as to temperature, with a comparatively dry climate, give the best results.

Given suitable climatic conditions, the type of

tobacco produced is determined mainly by the soil, and particularly by its mechanical or physical condition. Speaking generally, clay soils retentive of moisture produce heavy-cropping tobaccos which cure to a dark brown or red colour. Sandy soils produce tobaccos with a thin leaf, curing to a yellow or bright red colour. In the same locality, i.e. under the same climatic conditions, quite different kinds of tobacco may be produced in direct relation to the character of the soil. Thus the bright yellow tobacco used for cigarettes, &c, is largely produced in Virginia and N. Carolina on a loose porous sand, which must be at least a foot deep, and contains usually about 8 % of clay; this sand is underlaid by a clay subsoil, and, as Mr Milton Whitney points out in Tobacco Soils (U.S.A. Dept. of Agriculture, Farmers' Bulletin, No. 83), this clay is the same as that on which the heavy manufacturing and export tobacco is grown. Where the clay is exposed on the surface the heavy type of tobacco is produced, and bright tobacco where the clay is covered by from 12 to 20 in. of sand. Tobacco soils should be well drained and contain a large percentage of humus.

Tobacco being cultivated over such a large area of the world, under very varying climatic conditions, and by many different races of mankind, the methods employed in its production naturally differ very considerably. As the United States of America produce more tobacco than any other country it will be best to deal generally with conditions there and to refer to marked differences in dealing with production in other countries.

The seed is sown in nursery beds, and the plants set out in the field later. Tobacco seeds are very small, and it is estimated that about 300,000 to 400,000 seeds go to the ounce. Allowing for those which fail to germinate (perhaps 25%), loss in transplanting, weak and backward plants, &c, one ounce of seed should yield about 40,000 plants.

The greatest possible care is bestowed on the preparation of the

seed bed — it must have good, very rich soil in fine tilth, be protected from winds, and yet well exposed to sunlight; the southern or south-eastern slope of an open place in a forest is often selected. Hot beds are made when necessary. A bed with an area of about 50 sq. yds. is adequate for 1 oz. of seed. To destroy the seeds, &c, of weeds, and the larvae of insect pests, a fire is often lighted, kept from the ground itself by intervening wood logs, or the seed-bed is thoroughly steamed. After this treatment the upper 2 or 3 in of soil are well pulverized, and fertilizers added, usually, to prevent reintroduction of seeds of weeds, in the form of guano or chemical manures. The seed is now set ; usually it is thoroughly mixed with a relatively large quantity of fine ashes, sand or meal, to facilitate thin and even sowing, and the surface of the bed is afterwards lightly brushed over with a broom; it is very important to avoid burying the seed at all deeply; a light covering of cloth or muslin, raised on short sticks, is often stretched over the bed. Great care is necessary in attending to the watering of the young and delicate seedlings, which are ready for transplanting in from fifty to sixty days after sowing. They must be well hardened off before being set out in the open.

The land for their reception must be thoroughly well tilled and manured. If moist, ridges are formed about 3 to 4 ft. apart ; the dis- tance apart in the rows varies greatly with various types of tobacco : 3 ft. is the normal for ordinary manufacturing and smoking tobaccos, I to 1 j ft. for Cuba and Sumatra types. Cigar tobaccos become coarse if planted too widely. An acre of tobacco planted 3 ft. by 15 in. will contain 11,600 plants and 3 ft. 6 in. by 15 in., 10,000 plants. During the transplanting, preferably done on cloudy days or during light rains, the plants must be handled very carefully; machines are now available which can set out and water plants over from two to six acres in a working

day.

After transplanting the crop takes about another sixty days to mature, i.e. about 120 days in all from the date the seed was sown. During this period, until the plants begin to ripen, the tilth is maintained and weeds checked first by horse cultivators or horse- hoes, and, as the plants increase in size, by hand labour. When the plants show signs of flowering they are " topped " to prevent seed formation, the terminal buds being removed, and only a certain number of leaves left on each plant to ripen. This operation requires experienced judgment to decide when it should be done; the number of leaves to be left varies with the variety and vigour of the plant, the nature of the soil, climate, seasons and particular use for which the crop is intended. The product from plants which have not been topped is 'of little value. In the U.S.A., in the cigartobacco district, fifteen to twenty leaves are often left on each plant, and of manu- facturing tobaccos only ten to twelve leaves. As one result of the topping, suckers are usually formed; these also must be removed, although, e.g. in Florida, vigorous suckers are sometimes allowed to remain when the plant is cut, and produce a " sucker crop " inferior in character to the first or principal crop, but still serviceable.

The leaves now ripen, indicated by a change from a dark to lighter green, and by the appearance of yellow spots. Ripening is com- plete in about 35 days after topping or about 155 days afcer sowing. A ripe leaf easily cracks or shows a crease when folded between the fingers. The leaves on a plant decrease in age from below upwards, and all are not ripe at exactly the same time. In high quality tobaccos the leaves are " primed " or picked singly as they ripen, but in the great bulk of American tobaccos the whole plant is cut close to the ground when the middle leaves are about ripe. In either case leaves should not be gathered when wet with dew or rain, or in very hot sunshine ; the afternoon is usually the best time. The next step is to remove the harvested crop to the drying-shed ; primed

leaves are placed at once in shallow baskets or boxes, and when under cover are strung on string or on wire and hung up on laths in the barn. Cut plants are allowed to wilt, or become flaccid, before removal from the field, to prevent injury to the turgid leaves. These cut plants may be laid in rows on the ground to wilt, or spitted on long rods or laths supported on trestles, or placed on special drying racks. When sufficiently wilted they are hauled to the barn and hung up there on the same laths on which they were placed in the field.

A very interesting development of quite recent years is that of

growing some valuable cigar tobaccos under artificial shade. Sumatra

produced the best cigar wrappers of the world, and

Cultivation e ff orts to cultivate Sumatra tobacco in Florida under

”” ” apparently suitable conditions of climate and soil were

a e ‘ not successful. It was noticed, however, that if the tobacco was grown under the shade of trees the character of the leaf was improved. Artificial shading, first by laths, and later by cheese- cloth, both supported on posts, was then resorted to with eminently satisfactory results. The U.S.A. Department of Agriculture, in co-operation with local growers, devoted a great deal of attention and money to the problem, and Sumatra tobacco of very high quality is now produced in Florida and Connecticut. The yield of leaf is often much increased, the plants are protected from the weather, and the enhanced value of the crop much more than repays the very considerable expense involved in artificially shading whole fields. So successful have the results been that American-grown tobacco of the Sumatra type is now exported even to Cuba.

Important changes take place in the tobacco leaf from the time

it is cut until the finished product is ready for consumption. These may be all placed under curing, but it is usual to _ . recognize three stages: (1) curing proper; (2) fer- curing. mentation; and (3) ageing.

Sun curing, now but little practised in the United States, is the simplest method. The wilted tobacco is suspended on racks in the sun. Great care is necessary to protect it from rain, and it must if necessary be placed in a barn in which fires may be required during wet weather. This method is employed in a portion of Virginia and results in a very sweet chewing tobacco.

Air curing is essentially similar to sun curing. The tobacco is hung in a barn in which there is a free circulation of air during dry weather. Artificial heat may be resorted to in bad weather; in the States, cigar tobaccos and " White Burley " are usually cured in this way. The process takes about six weeks.

In fire curing the tobacco is hung in the barn, and, after it has become of a rich yellow colour, slow fires, producing a gradual increase in temperature up to about 150 F., are lighted on the floor and maintained for four or five days. The firing must be repeated at intervals as the leaves become soft again. A considerable portion of the tobacco exported to England and Africa is fire-cured.

In flue curing, also known as the Virginian cure, fires are set outside the barn, and the heat led in iron pipes or flues, into the building are under the suspended tobacco, which is placed there quite fresh from the field. The temperature is raised, during three to five days, from about 90° F. to 140 F. for primed leaves, or 160 to 175 F. for tobacco on the stalk. The process, which requires great judg- ment and care, results in the bright yellow leaf so largely used for pipe tobacco, cigarettes and

chewing tobacco. In a modification of this method, known as the Kentucky cure, large barns are used, the temperature is not raised above 100 F., and the process occupies from four to six weeks. By whichever way treated, the tobacco- leaf after curing is brittle and cannot be handled without crumbling to powder. The contents of the barn are therefore left till moist weather occurs, and then by the admission of atmospheric air the leaf blades absorb moisture and become soft and pliant. In this condition the leaves are stripped from the stems and sorted into qualities, such as " lugs, " or lower leaves, " firsts " and " seconds. " These are made up into " hands, " or small bundles of from six to twelve leaves. Each bundle is tied round with a separate leaf, and in this condition the tobacco is ready for bulking for fermentation.

The tobacco, whether in bundles, hands or separate leaves, is piled up or bulked on the floor in a barn into a solid stack to the height of 5 or 6 ft. Within this stack a process of p erme „t-„ fermentation is quickly set up, and the temperature . of the mass rises steadily till it reaches about 130 F. Great care is now taken to prevent^ overheating and to secure the uniform fermentation of all the tobacco. The pile is from time to time taken down and rebuilt, the tobacco from the top going to the bottom and that exposed at the edges being turned in to the centre. In from three to five weeks the fermentation should be sufficiently carried out, and the leaves then have a nice uniform brown colour. Dark-coloured leaves are produced when the temperature is allowed to mount higher than when light leaves are required. Fermentation is essentially a chemical process due apparently to the presence of enzymes, developed in the leaf during the earlier curing stages. The view has been put forward that fermentation is due to the activity of bacteria, distinct types occurring in various tobaccos, but the balance of evidence is against it. On the bacterial theory it was thought possible to inoculate a poor tobacco with, say, the special bacteria present in Cuban tobacco, and so give the

product the aroma and other good qualities 'of the more valuable tobacco. When fermentation is completed the tobacco is graded, an operation carried out very carefully in the case of the better cigar tobaccos, and packed for export, cigar tobaccos in bales, and other kinds in hogsheads. It is then kept at a moderate and fairly uniform temperature in a warehouse, when, although there is no marked outward change, the tobacco becomes more mellow. Two years are usually required for ageing, but some tobaccos are kept for four or five years before being manufactured.

An artificial aroma is sometimes given to tobaccos, especially for the " fillers " of cigars, by saucing or treating the leaves with a solution containing an infusion of fine quality tobacco stems, rum, sour wine and various flavouring materials such as oil of aniseed, tincture of valerian, powdered cloves, cinnamon and liquorice.

Pests and Diseases. — Tobacco, like other cultivated plants, is subject to attack by various pests and diseases, but fortunately these are less destructive than with many crops. On the other hand, comparatively trivial incidents do more harm to a relatively delicate plant like the tobacco than to more robust plants.

The "tobacco flea-beetle" {Epitrix parvula, Fabr.) isa smallactive beetle, the larvae of which attack the roots, while the adult beetles eat holes in the leaves. The latter is the more serious, as in addition to the actual damage done by the beetle the holes afford entrance to fungus spores, &c. Under the name " horn worms " are included the larvae or caterpillars of species of Protoparce. These compara- tively large and voracious animals, when abundant, do great damage by eating the leaves. Other caterpillars, "budworms" {Heliothis, spp).

attack the buds or burrow into the seed-pods. Seedling plants of tobacco, like many other crops, are liable to attack by ″ cut worms,″ the caterpillars of species of Peridromia and Agrotis. ″ Plant bugs,″ which suck the juice of the leaves, have been recorded as serious enemies in some parts of the world. Recently, shade-grown tobacco in some localities has suffered considerably from the attacks of small sucking insects known as thrips, which produce ″ white veins ″ in the leaf. White vein may also be induced by other causes besides the attacks of thrips.

Stored tobacco is liable to be attacked and ruined by the ″ ciga- rette beetle,″ a cosmopolitan insect of very varied tastes, feeding not only on dried tobacco of all kinds, including snuff, but also on rhubarb, cayenne pepper, tumeric, ginger, figs and herbarium specimens. Other beetles, such as the rice weevil {Calandra oryza) , also attack dried tobacco.

The fungoid diseases of tobacco are comparatively unimportant ; there are, however, some diseases of obscure origin which at times cause considerable damage. ″ Mosaic disease ″ is the name given to a condition in which the leaves are more or less sharply differenti- ated into light and dark green patches. The matter has been fully investigated by Mr A. F. Woods (Bulletin No. 18, Bureau of Plant Industry, U.S. Department of Agriculture), who attributes it not to any specific parasite but to a disturbance of the normal physiological activity Of the cells.

″ Frog's eye,″ or ″ leaf spot,″ denotes the occurrence of small white specks on the leaf. This disease is probably bacterial in origin. Wind and hail may break plants or damage leaves, especially if required for wrapper purposes. The provision of wind breaks is the only effective remedy.

Diseases which occur in curing are important. Excessive humidity causes small dark spots to appear; these become confluent and the whole leaf may become dark and decay. Various names are given,

such as ″ pole burn,″ ″ pole sweat,″ ″ house burn.″ The disease is checked by raising the temperature above no° F., and reducing the humidity of the barn. Stem rot, due to a mould (Botrytis sp.), occurs in wet weather. Too rapid drying of the outer tissue of the leaf leads to the formation of ″ white veins,″ which injure leaves required for wrapper purposes, otherwise it is not important. Another defect arising during curing and fermentation is the efflorescence of salts on the surface, a phenomenon known as ″ saltpetre "; light brushing and spraying with a weak solution of acetic acid are effective remedies.

Improvement by Selection. — Careful examination of a large number of individuals of one variety growing under similar conditions reveals differences in such characters as number of leaves per plant, the size and shape of the leaves, tendency to form suckers, time of maturing and resistance to disease. Other tests show variability in burning quality, elasticity of leaf, texture, taste, &c. The United States Department of Agriculture has closely investigated this important question and the results attained are brought together by Messrs H. D. Shamel and W. W. Cobey in Tobacco Breeding (Bulletin 96, Bureau of Plant Industry, 1907). No crop, it is pointed out, responds so readily to breeding as tobacco, or deteriorates more rapidly, as regards both yield and quality, if neglected.- The variations are classified as: (1) Variation in type due to crossing, change of soil and climate, especially, for example, when seed from the tropics is introduced to temperate regions. (2) Variations within the type, due to natural tendency to vary, local conditions and maturity of seed. When Cuban tobaccos were first introduced into Florida, the type broke up, but by carefully selecting the best plants and using them only as sources of seed for later crops, a good type was obtained. The tobacco flower is fortunately perfectly self-fertile, and by enclosing the flowers of selected plants in paper bags, so as to exclude all possibility of hybridization, progeny true to the type of the

mother plant can be obtained.

No attempt should ever be made to raise large crops of tobacco from imported seed, but only a small crop, and the seed of the selected plants should be used for future propagation. In selection work the grower must keep definitely in view the special market requirements for the kinds of tobacco he is producing. Thus for wrapper tobaccos, amongst other points a broad, rounded leaf, which will yield perhaps eight wrappers, is much more valuable than a narrow pointed leaf which yields perhaps only four. Plants may be found growing side by side, the one with broad leaves, the other with narrow, but by selection the broad type can be perpetu- ated and gradually improved.

Hybridization can also be readily controlled in the case of tobaccos, and in this connexion it is useful to note that, if pollen is desired of some variety growing at a distance, it will retain its vitality for several weeks if kept perfectly dry, and so can readily be sent by post from one place to another. Another favourable feature is the fact that a single capsule contains from 4000 to 8000 seeds, and one tobacco plant may easily produce from 500,000 to 1 ,000,000 seeds.

Production. United States. — Tobacco cultivation dates in the States from the very early years of the 17th century, when it was taken up in Virginia. A general description has already been given of the methods of cultivation and preparation. In 1906 the total area u.ider tobacco in twenty-five states was 796,099 acres, and the

production 682,428,530 ft, valued at about £13,500,000. The principal tobacco-producing states, with the approximate value of their crops, were: Kentucky, £3,885,400; Ohio, £1,706,600; North Carolina, £1,396,153; Wisconsin, £1,342,600; Virginia, £1,206,309, Pennsylvania, £979,550; Connecticut, £883,184; Tennessee, £511,035; Florida, £330,750; New York, £244,053, and Maryland, £241,046. The average yield per acre in the States

as a whole in 1906 was 857-2 lb. New Hampshire had the highest average, 1785 lb per acre, and Mississippi the lowest, 440 lb.

The successful production of cigar tobaccos from Cuban and Sumatran seed was a development of the late 19th century.

Perique tobacco is worthy of special notice. This famous tobacco is produced only at Grand Points in Louisiana. Great care is given to the cultivation, and damp atmospheric conditions are desirable during the ripening stages. The leaves, when stripped from the stalks, are made into rolls and subjected to great pressure, which is released daily to allow the leaves to absorb their expressed juice. To the chemical changes, mainly oxidation, which go on in this juice while it is exposed to the air, the characteristic aroma and flavour of Perique tobacco are mainly due.

Cuba.— Tobacco is the second industry of the country, the value of the crop being surpassed only by that of sugar. The cultivation was formerly a monopoly of the Spanish crown, but from 181 7 payment of a tax, usually heavy, has been the only restriction. The superiority of Cuban tobaccos in flavour and aroma, especi- ally for cigar fillers, has long been recognized, but exactly to what conditions these qualities are due is not fully known. The leaf known as " Vuelta Abajo," produced in the province of Pinar del Rio, is perhaps the best cigar leaf of the world. The other tobacco-producing provinces in order of importance are Havana, Santa Clara and Santiago de Cuba. The crop is mostly grown in the open, air-cured and carefully fermented. Cuban tobacco is grown as a " winter " crop, the summer months being those of high rainfall. Cultivation under shade was recently tried with satisfactory results; " 166-65 acres cultivated under cheesecloth produced in 1903 10 bales of wrappers and 1-5 bales of fillers of tobacco per acre, the output under the old system having been 4-5 bales of tobacco per acre of which only 10% represented wrappers of good colour " (Diplomatic

and Consular Report on Cuba, 1904, No. 3522).

Mexico is an important tobacco-producing country, and Mexican leaf is largely used in Europe for cigar wrappers and other purposes. Mexican tobacco approximates more or less closely to that of Cuba, and is cultivated and prepared in very similar ways.

France. — Tobacco cultivation is an important industry, and the home production is carried out under government supervision. In 1905, 53,750 planters cultivated 39,439 acres, and the total crop amounted to 61,614,900 ib, of the approximate value of £2,000,000. The variety grown is usually of the Virginia type, and the leaf is coarse, dark and heavy, and suited to the manufacture of plug and snuff.

Germany. — The chief tobacco-producing divisions are Baden and Alsace. The leaf is of medium size, heavy, and is mainly used in the manufacture of cigars.

Hungary produces tobacco of a rich, dark brown colour, useful for cigars, and also a small, bright yellow leaf, of value as a cigarette and pipe tobacco.

Russia. — In northern Russia the produce is mainly a large, coarse, heavy, dark leaf, of use only for the manufacture of plug and snuff. In southern and Asiatic Russia good tobacco of the Turkish type is produced.

Italy produces two principal types, a dark, heavy Virginian tobacco on the heavy soils of northern Italy, and a Turkish type tobacco on the sandy soils of the southern part of the country.

Syria. — The distinctive Latakia tobacco is produced in the province of Saida in northern Syria. The leaf is subjected to the smoke produced by burning in the green condition leafy branches of species of evergreen oaks (Quercus spp.). The process of fumigation lasts from seven to nine months, and during it the tobacco acquires its black colour and

peculiar flavour.

Greece. — Grecian tobacco is grown from Turkish seed and closely resembles Turkish tobacco in character and uses. Egyptian cigarettes are to a great extent made from Grecian tobacco. Paper is a monopoly in Greece, and Grecian cigarette manufacturers, to escape the monopoly, have transferred their business to Egypt, where they make cigarettes from Grecian tobaccos by the aid of Greek workmen.

Turkey. — Tobacco is an important crop in Turkey, where its cultivation and manufacture are monopolies. The ordinary tobacco and cigarette trade is controlled by the Regie Compagnie interessee des tabacs de l'empire Ottoman, and Narquileh tobacco (called " tumbeki " and used in " hubble-bubbles ") is in the hands of a similar organization. The small Turkish leaf is famous through- out the world. Some of the finest flavoured tobaccos are produced in the regions around Cavalla in Macedonia and ancient Ephesus in Asia Minor. The cultivation of Turkish tobaccos has been taken up in various parts of the world, e.g. South Africa, and to maintain the standard of the produce fresh supplies of seed were obtained annually from Turkey. To guard against this competition, the export of tobacco seed from Turkey was prohibited in 1907. The

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method of cultivation in Turkey is simple, and the plants are set out close together. For the best qualities the leaves are primed, air- cured, and then subjected to a lengthy treatment corresponding to mild fermentation. High prices are obtained for the best Turkish tobaccos. Thus in 1906 from Cavalla and Xanthi 11,000 tons were exported of a value of about £1,101,000, the range of the various qualities per kilo (2J lb) being: —

Ghienbek

Kir .

Pursuccian ….

Drama

Inferior brands . . The exports go mainly to Austria-Hungary, Rumania, Italy, Egypt, the United Kingdom and the United States.

Japan. — Tobacco cultivation is a government

monopoly, and in 1905 the crop amounted to about 106,572,000 lb, yielding a profit to the government of some £3,500,000. The produce is usually leaf of considerable size, of medium colour and suited only for cigarette and pipe smoking.

China. — The cultivation is widespread throughout Southern China. The picked leaves are usually either prepared for market by simple exposure to the sun for a few days, or in addition are sprinkled with groundnut oil and sometimes other materials also, which result in an increase of strength.

Sumatra. — The tobaccos of Sumatra are especially valued for outside wrappers of cigars, being very uniform, of fine texture, light brown colour, thin and elastic. They do not, however, possess the aroma essential to cigar-fillers. The industry is of quite recent growth, dating only from 1862. The famous tobacco region, about 15,000 sq. m. in area, is on the east coast of the island, almost directly on the equator, and has a very uniform and high temperature and a very high rainfall. The soil is mainly of volcanic origin. Deli is the principal district. and produces the best tobaccos. The estates are usually very large, and are divided up into fields which are cultivated in rotation, each field being given several years' rest after producing one crop. The tobacco is air-cured, fires being only employed during continuous wet weather, and the process of curing occupies four or five weeks. The fermentation is very carefully controlled, and to obtain the desired light colour the temperature is kept comparatively low. The leaves are graded with the most scrupulous care and finally packed in bales of about 176 lb each. The high quality of Sumatra tobacco is due in part to the local conditions of soil and climate, and perhaps to an even greater degree to the care taken at every stage in its cultivation and preparation. The work is done by Chinese coolies under Euro- pean — chiefly Dutch — supervision. The commercial success of some of the companies has been very striking, dividends as high as 1 1 1 % having been paid. Java and Borneo tobacco is very similar to that of Sumatra. The Philippines.

— Tobacco is extensively cultivated in the plains and on the rich alluvial deposits along the sides of rivers. During recent years the average value of the product has fallen, due ap- parently to deterioration in quality. The exports of manufactured tobacco, such as Manila cheroots, find their principal market in China, British India, Australasia and the United Kingdom, whilst of the leaf tobacco fully three-quarters goes to Spain.

British Empire. — Tobacco is grown for local use in many parts of India, but the principal centres of its cultivation on a commercial scale are Bombay, Madras and the Punjab. American experts are frequently employed to superintend the estates and factories. In Ceylon tobacco is grown in the northern portion of the island; the produce is but little suited to the European market and is mainly exported to southern India and Cochin China.

British North Borneo competes with Sumatra as the source of the best cigar wrappers. The cultivation was begun in the island in 1883 by planters seeking new lands free from the heavy taxation to which they were subjected in Sumatra. The industry is now in the hands of three large companies, the survivors of some twenty or more which have started at various times. The greater portion of the most suitable land appears to be already under cultivation and there is little immediate prospect for much expansion of the industry. The annual value of tobacco exported is over £300,000.

In Australia tobacco is produced on a small scale in Queensland, New South Wales and Victoria. Efforts are being made to develop the industry. New Zealand has attempted to produce tobacco as a commercial crop, but the effort was abandoned several years ago. In the West Indies tobacco is grown on a small scale in many of the British colonies, but only in Jamaica is there a definite in- dustry. An expert, Mr F. V. Chambers, recently reported on Jamaica tobacco as of good quality and flavour but often of a heavy nature. The shade-grown tobacco was, however, hardly likely for making wrappers to be

excelled by any tobacco in the world.

In the British African possessions the outlook for tobacco cultiva- tion is in several instances favourable. Rhodesian-grown Turkish tobacco is already on the English market, as also various brands of tobacco from the Transvaal. Natal and Cape Colony have also industries of considerable local importance. Tobacco cultivation has made considerable progress in Nyasaland (British Central Africa). In 1900 there were 69 acres under this crop, the yield being

4480 lb of the value of £113. In 1907 the acreage had increased to 2330, the yield to 413,316 lb, and the value to £6889. Flue-cured bright tobacco is principally produced, but sun-cured is also exported; and in 1906-1907 experiments with Turkish tobacco gave encouraging results.

Canada produces in Ontario and Quebec coarse Virginian type tobacco.

Chemistry. The constituents of tobacco, as of all other vegetable matter, can be grouped under three heads: water, mineral acids and bases (which pass into the ash on combustion) and organic substances. The following analyses of upper leaves made at the Connecticut state station, and recorded in Report No. 63, Office of Experiment Stations, U.S. Department of Agriculture, indicate the more important constituents and also the changes which take place during fermentation.

Water

Ash

Nicotine …. Nitric acid (N 2 5) . . Ammonia (NHj) . . Other nitrogenous matters

Fibre

Starch

Nitrogen free extract Ether extract ….

Unfermented. Fermented.

%

23–50

% 23–40

14–89

15–27

2–50

1–79

1–89

1–97

0–67

0–71

12–19

13–31

7–90

8–78

3–20

3–36

29–39

27–99

3–87

3–42

Nicotine (q.v.) (C10H14N2) is a volatile alkaloid which appears to be present only in plants of the genus Nicotiana (see Nicotine).

Manufacture.

In the manufacture of tobacco for smoking, we have to do with the numerous forms of tobacco used for smoking in pipes, embracing cut smoking mixtures, cake or plug, and roll or spun tobacco. Under this heading come also the cigar and cigarette manufacture.

The raw material in the warehouses is of various qualities: some is strong, rough and harsh, and so is unfit for ordinary smoking; other samples are mild and fine, with aromatic and pleasant flavour, but devoid of strength. By a proper mixing and blending the manufacturer is enabled to prepare the smoking mixture which is desirable for his purpose; but certain of the rough, bitter qualities cannot be manufactured without a preliminary treatment by which their intense disagreeable taste is modified. The storing of such tobacco for a lengthened period matures and deprives it of harshness, and the same result may be artificially hastened by macerating the leaves in water acidulated with hydrochloric acid, and washing them out with pure water. The most efficient means, however, of improving strong, ill-tasting tobacco is by renewed fermentation artificially induced by moisture and heat.

The manufacturer having prepared his mixture of leaves, proceeds to damp them, pure water alone being used in the United Kingdom, whereas on the Continent and in America certain „ ., ″ sauces ″ are employed, which consist of mixtures of Mixtures aromatic substances, sugar, liquorice, common salt and saltpetre, &c, dissolved in water. The primary object is to render the leaves soft and pliant ; the use of the sauces is to improve the flavour and burning qualities of the leaves used. When uniformly damped, the leaves are separately opened out and smoothed, the midrib, if not already removed, is torn out, except when ″ bird's- eye ″ cut is to be made, in which mixture the midrib gives the peculiar ″ bird's-eye ″ appearance. The prepared tobacco, while still moist and pliant, is pressed between cylinders into a light cake, and cut into fine

uniform shreds by a machine analogous to the chaff-cutter. The cut tobacco is now roasted, partly with the view of driving off moisture and bringing the material into a condition for keeping, but also partly to improve its smoking quality. The roasting is most simply effected by spreading it on heated slabs, on which it is constantly turned, or a roasting machine is used, consisting of a revolving drum in which the tobacco is rotated, gradually passing from one end to the other, and all the time under the influence of a current of heated air. The increase in favour of packet tobaccos has brought about the invention of elaborate packing machines.

For roll, twist or pigtail tobacco the raw material is damped or sauced as in the case of cut tobacco. The interior of the roll consists of small and broken leaf of various kinds, called

" fillers '

and this is enclosed within an external

covering of large whole leaf of bright quality, such leaves being called " covers." The material is supplied to the twisting machinery by an attendant, and formed into a cord of uniform thickness, twisted and wound on a drum by mechanism analogous to that used in rope-spinning. From the drum of the twisting machine the spun tobacco is rolled into cylinders of various sizes. These are enclosed in canvas, and around the surface of each stout hempen cord is tightly and closely coiled. In this form a large number, after being cooked or stoved in moist heat for about

twenty-four hours, are piled between plates in an hydraulic press, and subjected to great pressure for

a month or six weeks, during which time a slow fermentation takes place, and a considerable exudation of juice results from the severe pressure. The juice is collected for use as a sheep-dip.

Cake or plug tobacco is made by enveloping the desired amount of fillers within covering leaves of a fine bright colour. The packages are placed in moulds, and submitted to powerful pressure in an hydraulic press, by which they are moulded into solid cakes. Both cake and roll tobacco are equally used for smoking and chewing; for the latter purpose the cake is frequently sweetened with liquorice, and sold as honey-dew or sweet cavendish.

For cigar-making the finest and most delicately flavoured qualities of tobacco are generally selected. A cigar consists of a core or Clears central mass of fillers enveloped in an inner and an outer ' cover, the former the binder and the latter the wrapper. The fillers or inner contents of the cigar must be of uniform quality, and so packed and distributed in a longitudinal direction that the tobacco may burn uniformly and the smoke can be freely drawn from end to end. For the binder whole leaf of the same quality as the fillers is used, but for the wrapper only selected leaves of the finest quality and colour, free from all injury, are employed. The covers are carefully cut to the proper size and shape with a sharp knife, and, after being damped and smoothed out are placed together in a pile. In making cigars by the hand, the operator rolls together a sufficient quantity of material to form the filling of one cigar, and experience enables him or her to select very uniform quantities. This quantity is wrapped in the inner cover, an oblong piece of leaf the length of the cigar to be made, and of width sufficient to enclose the whole material. The cigar is then rolled in the hand to consoli- date the tobacco and bring it into proper shape, after which it is wrapped in the outer cover, a shaped piece made to enclose the whole in a spiral manner, beginning at the thick end of the cigar and working down to the pointed end, where it is dexterously finished by twisting to a fine point

between the fingers. The finished cigars are either spread out in the sunlight to be dried, or exposed

Havana cigars are, as regards form, classification, method of putting up and nomenclature, the models followed by manufacturers of all classes of the goods. Genuine (" legitimas ") Havana cigars are such only as are made in the island; and the cigars made in Europe and elsewhere from genuine Cuban tobacco are classed as " Havanas." Other brands of home manufacture contain some proportion of Cuban tobacco; and very good cigars may be made in which the name only of that highly-prized leaf is employed. When we come to the inferior classes of cigars, it can only be said that they may be made from any kind of leaf, the more ambitious imitations being treated with various sauces designed to give them a Havana flavour. The highest class of Cuban-made cigars, called " vegueras," are prepared from the very finest Vuelta Abajo leaf, rolled when it is just half dry, and consequently never damped with water at all. Next come the " regalias," similarly made of the best Vuelta Abajo tobacco; and it is only the lower qualities, " ordinary regalias," which are commonly found in commerce, the finer, and the " vegueras," being exceedingly high-priced. The cigars, when dry, are carefully sorted according to strength, which is estimated by their colour, and classed in a scale of increasing strength as claro, Colorado claro, maduro and oscuro. They are pressed into the cigar boxes for sale, and branded with the name or trade mark of their makers. Cheroots differ from ordinary cigars only in shape, being either in the form of a truncated cone, or of uniform thickness throughout, but always having both ends open and sharply cut across. Cheroots come principally from Manila, but there are now large quantities imported into the United Kingdom from the East Indies and Burma.

Cigarettes consist of small rolls of fine cut tobacco wrapped in a covering of thin tough paper specially made for such use. Originally Cigarettes c 'g aret tes were entirely prepared by the smoker himself;

- ‘ but now they are very largely made by automatic

machinery. The machines cut the paper, gum its edge, measure out the proper quantity of tobacco, wrap it up, make the gummed edge adhere, and cut the ends. In other machines a roll of narrow paper, in width equal to the circumference of the cigarette, is converted into a long tube, filled with tobacco, and automatically cut off into proper lengths. Such machines can make several hundred cigarettes per hour. The best cigarettes, however, are made by hand; the tobacco leaves are selected and hand-cut, and the paper tubes are filled by hand.

The manufacture of snuff is the most complex, tedious and difficult undertaking of the tobacco manufacture, but it is now of but little „ „ importance. The tobacco best suited for snuff-making

is thick fleshy leaf of a dark colour, but scraps and waste pieces resulting from the preparation of smoking mixtures and cigars, and the midribs of leaves are largely used. The material is moistened with a solution of common salt and placed in very large heaps to ferment for some weeks. Various flavouring materials,

such as liquorice, tonka beans (Dipteryx odorata) and other ingredients are added, the natures of which are often trade secrets.

The mass is dried, ground, and allowed to ferment again, the pro- cess being repeated if necessary. The peculiar properties of snuff are dependent on the presence of free nicotine, free ammonia and the aromatic principles developed during fermentation.

Fiscal Restrictions. In nearly all civilized countries the cultivation of tobacco and its manufacture are conducted under state supervision and form an important source of public revenue. In some, for instance, France, Austria-Hungary and Italy, the cultivation is a state monopoly, and in other countries the crop is subject to heavy excise

duties. Since the time of Charles II. the growth of tobacco in Great Britain has been practically prohibited, the original enactment to that effect having been passed to encourage trade with the yoUng colony of Virginia. In 1886 experiments were conducted, under certain restrictions, and the plant was grown in Norfolk, Kent and other counties with sufficient success to prove the entire practicability of raising tobacco as a commercial crop in England. In more recent years tobacco has been grown in Ireland, but up to 1910 it had been found impracticable to obtain from the government sufficient relaxation from fiscal restrictions to encourage the home cultivation, though in 1907 the prospect of licences being issued was held out.

Statistics. The following table, taken from the Year Booh of the U.S. Depart- ment of Agriculture, iqo6, indicates the crops of tobacco in 1905 in the regions mentioned, so far as figures are available.

1905-

North America 721,492,000 ft).

South America 108,575,000 ,,

Europe 630,133,000 ,,

Asia 690,161,000 ,,

Africa 23,346,000 ,,

Australia and Fiji 1,486,000 ,,

Total 2,175,193,000 lb.

The estimated value of the world's annual crop is approximately £40,000,000.

Consumption of Tobacco. — The comparative consumption of tobacco in various countries is best appreciated by expressing it in pounds per head, and the following figures are taken from Bartholomew's Atlas of the World's Commerce: Belgium 6-21 ft, United States 5-40 lb, Germany 3-44 ft, Austria 3-02

lb, Australasia 2-20 lb, Canada 2-54 lb, Hungary 2-42 lb, France 2- 16 lb, United Kingdom 1-95 lb, Russia i-io ft.

The literature of tobacco is very extensive. William Bragge of Birmingham published in 1880 a revised bibliography of the subject, Bibliotheca nicotiana, extending to 248 quarto pages. From such a mass of authorities it would be vain here to make selections, but mention may be made of Fairholt's capital gossiping work, Tobacco, its History and Associations (2nd ed., 1876). As modern standard works there may also be quoted Tiedemann's Geschichle des Tabaks (1856) and Wagner's Tabakcultur, Tabak- und Cigarren- Fabrication (1884). In the foregoing account various passages from the article by J. Paton and W. Dittmar, in the 9th ed. of the Ency. Brit., have been utilized. (W. G. F.)

TOBAGO, an island in the British West Indies, 20 m. N.E. of Trinidad, in 11° 15' N. and 6o° 40' W. Pop. 18,751. It is 26 m. long and 75 m. broad, and has an area of 114 sq. m. or 73)313 acres, of which about 10,000 are under cultivation. It consists of a single mountain mass (volcanic in origin)', 18 m. in length, and rising in the centre to a height of 1800 ft. A great part of the island is clothed with dense forest, in which many valuable hardwood trees are found. The higher lands form part of what is known as the " Rain Preserve," where, in order to attract and preserve the rainfall, the trees are never allowed to be felled. The average temperature is 81° F. and the yearly rainfall is 66 in. The rainy season lasts from June to December, with a short interval in September. The valleys are particularly adapted to horse- and sheep-farming, which are growing industries. The soil is fertile and produces rubber, cotton, sugar, coffee, cocoa, tobacco and nutmegs, all of which are exported; pimento (allspice) grows wild in the greatest profusion. The schools are conducted by various denominations, assisted by government grants. The island is divided into seven parishes. Scarborough (pop. 769), the capital, is on the south coast, 8 m. from its south-

western point. It stands at the foot of a hill 425 ft. high, on which is situated Fort King George, now without a garrison. There is a lighthouse at Baedlet Point. Tobago, properly Tobaco, was discovered in 1498 by Columbus, who

named it Assumption, and the British flag was first planted in 1580. It afterwards passed into the hands of the Dutch and then of the French, and was finally ceded to the British in 1814. Until 1889 it formed part of the colony of the Windward Islands, but in that year it was joined to Trinidad, its legal and fiscal arrangements, however, being kept distinct. Ten years later it became one of the wards of Trinidad, under a warden and magistrate; its revenue, expenditure and debt were merged into those of the united colony, and Trinidadian law, with very few exceptions, was made binding in Tobago.

TOBIN, JOHN (1 770–1804), English dramatist, was born at Salisbury on the 28th of January 1770, the son of a merchant. He was educated at Bristol Grammar School, and practised in London as a solicitor. From 1789 he devoted all his spare time to writing for the stage. He submitted no fewer than thirteen plays before, in 1803, he got an unimportant farce staged. In 1804, having just submitted his fourteenth play, a romantic blank verse drama entitled The Honey Moon, to the Drury Lane management, he came to the conclusion that it was useless to continue playwriting and left London to recruit his health. The news that his play had been accepted came too late. He had long had a tendency to consumption, and was ordered to winter in the West Indies. He left England on the 7th of December 1804, but died on the first day of the voyage. In the following year The Honey Moon was produced at Drury Lane, and proved a great success. Several of Tobin’s earlier plays were subsequently produced, of which The School for Authors, a comedy, was probably the best.

See also The Memoirs of John Tobin, with a selection from his unpublished writings, by Miss Benger (London, 1820).

TOBIT, THE BOOK OF, one of the books of the Old Testa- ment Apocrypha. It is a good specimen of the religious novel, a form of literature invented by the Jews. The romance may be read in a beautiful dress in the Revised Version of the English Apocrypha. It was never admitted into the Jewish canon, but it was admitted into the Christian Canon at the Council of Carthage (a.d. 397). In the Roman Church it still forms a part of the Bible, but by the Church of England it is relegated to the position of those other books which " the Church doth read for example of life and instruction of manners, but yet doth it not apply them to establish any doctrine " (art. vi.). Some verses (Tob. iv. 7-9), however, are read in the offertory; and Tobias and Sarah once occupied the position now held by Abraham and Sarah in the marriage service.

The Book of Tobit has reached us in Greek, Latin, Syriac, Aramaic and Hebrew versions; of these the Hebrew are the latest, and need not be considered. Of the Greek there are three forms. One is in the Vatican and Alexandrian MSS.; another is in the Sinaitic. Both these texts are to be found in Swete's Septuagint, the former denoted by B, and the latter by n. B is the common text, which is followed in the English Apocrypha. Nevertheless n is fuller, except in ch. iv., and more intelligible; it is also more Semitic than B. The two must have behind them a common original, for they throw light upon one another, and the full meaning of a passage is sometimes only to be got from a combination of both. The fullness of n often runs into superfluities, which are retrenched in B. The third Greek text is only a partial one (vi. 9-xiii. 8). It may be derived from a study of Codices 44, 106, 107 in Holmes and Parsons, which diverge from the Vatican text throughout the part indicated. Of the Latin there are two chief forms, the old translation, sometimes called the Itala, and that of Jerome in the Vulgate. The Itala was published by Pierre

Sabatier at Paris in 1751, and is reproduced in the Book of Tobit by Neu- bauer (Clarendon Press, 1878). It agrees very fairly with n, except in the matter of proper names. Jerome's version is from the Aramaic, or, as it used to be called, the Chaldee. It cost the saint one day's work. He describes in his preface the method of its production. He procured the services of a man who was familiar with Chaldee and Hebrew. This man trans- lated to him out of Chaldee into Hebrew, while Jerome dictated to a shorthand writer his own translation into Latin. The work

was done at the request of two Christian bishops, Chromatius and Heliodorus. Jerome does not mention the Itala, but it is plain that he was indebted to it. The Syriac text is said to be based on a Greek version. It was only in 1878 that the Aramaic version was brought to light, being published by Adolph Neu- bauer from a unique MS. in the Bodleian Library. It agrees with n and the Itala, but resembles the Vulgate in having nothing in the first person. According to Neubauer, it is the very text which was used by Jerome, after allowance has been made for the arbitrary methods of the Rabbis and of Jerome himself. But the Aramaic version has Greek birthmarks (see especially p. 7, line 18), which other scholars than its editor have thought decisive against its originality. It was held by Robertson Smith (after Noldeke) to be "in the highest degree probable that the Greek text is original." But the Greek text appears to be itself a translation from some Semitic source. Was this source Hebrew or Aramaic? The forms 'A6r)p and 'Adovpdas in xiv. 4, 1 5 of k show that, at least, that chapter is drawn from Aramaic, not from Hebrew. But that chapter does not appear in all the versions, and so may be later than the rest.

With regard to the date of composition there is the widest difference of opinion. Ewald refers it to the end of the Persian period, about 350 B.C. (an opinion which Westcott declared to be " almost certainly correct ") ; Kohut thinks that the book was composed in Persia under the Sassanid Dynasty,

about a.d. 250. But Tobit is already quoted as " scripture " by Clement of Alexandria (Strom, ii. 139, p. 503 Pott). The words of Tobit (xii. 8, 9) seem almost to have been present to the writer of ii. Clement (xvi. 4). The date of this document is uncertain; but in Irenaeus (i. 28, § 5) in his refutation of the Kabbalistic heresy of the Ophites, we find Tobias figuring as a prophet, on the same level as Haggai. Earlier still the Book of Tobit is quoted, though not by name, in the Epistle of Polycarp to the Philippians (x. 2; Tob. iv. 10. Cf. Prov. xii. 2; Ecclus. xxix. 12). Now the martyrdom of Polycarp is assigned by C. H. Turner to the year a.d. 156. We seem to have even a quotation by St Paul from the Book of Tobit (1 Tim. vi. 19; Tob. iv. 9), in which the identity amid difference seems to show that the Apostle is drawing, not from the Greek, but from the Semitic original. Josephus displays no knowledge of the work, but he may have been animated by the same prejudice as the Pharisees of St Jerome's day, whose displeasure, that father tells us, he had to face in giving to Latin readers a book which was against their canon. (Preface to Tobit.) Internal evidence shows that the writer of the 14th chapter lived after the building of the Second Temple, which was " not as the first." In w. 5 and 6 of that chapter Tobit is made to predict a glorious building of Jerusalem and the Temple, which was to be followed by the conversion of all the Gentiles. Such a passage might well have been penned when the idea of Herod's Temple was already in the air. If so, this chapter may be supposed to have been written a little before 19 B.C., while the bulk of the work may have been indefinitely earlier.

As to the place of composition Persia, Egypt and Palestine have each had advocates. One thing only appears fairly certain, namely, that the Greek versions were composed in Egypt. This conclusion could, we think, be established by an examination of the language, especially of some technical terms of adminis- tration. But the tale itself carries us back to Persia. It has what Moulton called an " Iranian background." The evil demon Asmodeus (q.v.)

is the Persian Aeshma Daeva. Raphael, " one of the seven holy angels, which present the prayers of the saints, and go in before the glory of the Holy One," resembles the protecting spirit Sraosha. And the dog, the companion of Sraosha, is there too. For Tobit differs from all other books of the Bible in containing the only polite reference to the dog. Tobias's dog indeed does nothing but accompany his young master on his journey to Ecbatana and back. But he is there as the companion and friend of man, which is Aryan and not Semitic. So alien indeed is this from the Semitic mind that in the Aramaic and Hebrew versions the dog does not appear.

Even in k, the more Semitic of the two Greek versions, the dog has evidently been found an offence. Mention of him is suppressed in v. 17, while in xi. 4, 6 KOptos is made to go behind Tobias, instead of 6 kvu)v\

The motive of the story has been variously regarded as a desire to insist upon the duty of tithe-paying, upon that of alms- giving, and upon that of burying the dead. The Midrash given by Neubauer has no doubts on this point, as the story is immedi- ately followed by the remark—" Behold we learn how great is the power of alms and tithes!" But the third motive is equally apparent. Accordingly some have insisted that the story must have been composed at some period when Jewish dead were left unburied, either in the time of Antiochus Epiphanes (2 Mace, v. 10), or in that of Hadrian, after the revolt of Bar-Cochebas. If our choice were limited to these two periods, we should certainly prefer the former. For the book carries within itself signs of early date. It contains no Messianic expectation nor any reference to a future life. The last fact is obscured by the Vulgate. Even in the Itala the word aeterna is added in xii. 9 after saturabuntur vita.

A new interest has been added recently to the study

of Tobit by the publication of the Wisdom of Ahikar (Ahiqar). In the Book of Tobit Ahikar is represented as the prime minister of Sennacherib and his son Esar-Haddon, and is claimed by Tobit as his nephew. There is a desire manifested to bring in Ahikar wherever possible (i. 21, 22; ii. 10; xi. 18; xiv. 10). The intention evidently is to bestow authority upon the fiction by connecting it with a story already known.

See K. D. Ilgen, Die Geschichte Tobias nach drei verschiedenen Originalen (Jena, 1800); Fritzsche, Handbuch zu den Apocryphen (Leipzig, 1853); F. H. Reusch, Das Buch Tobias (Freiburg, 1857); Schiirer, Geschichte, 3rd edition; Ad. Neubauer, The Book of Tobit (Ox/ord, 1878); Fuller in Speaker's Commentary (1888); E. J. Dillon, Contemporary Review (March 1898); The Story of Ahikar, by Cony- beare, Harris and Lewis (Cambridge, 1898) ; J. Rendel Harris, " The Double Text of Tobit," American Journal of Theology (July 1899), pp. 541-554; Moulton, " The Iranian Background of Tobit," Expository Times (March 1900), pp. 257-260; B. F. Westcott in Smith's Diet. Bible; I. T. Marshall in Hastings's Diet. Bible; W. Erbt in Ency. Bib.; Toy in Jewish Encyclopedia; Johannes Miiller, Beitrdge zur Erkldrung und Kritik des Buches Tobit; and in the same volume Alter und Herkunft des A chicar- Romans und sein Verhaltniss zu Aesop, by Rudolf Smend. (St G. S.)

TOBOGGANING (Micmac Indian, iobaakan, sledge), the sport of sliding down snow-covered hills and artificial ice-shutes on the toboggan, a sled from 3 ft. to 8 ft. long and 2 ft. to 3 ft. wide, formed of strips of wood from \ in. to § in. in width, fitted together and curved up at the front. The toboggan is not so well fitted for use on roads that are not steep or very smooth as is the sled pro- vided with runners, but is generally used on open hills, or upon artificial courses (chutes), which are very popular in Canada. For " Tobogganing," as known in the Engadine winter resorts, see Coasting.

TOBOLSK, a government of western Siberia, having the

Arctic Ocean on the N., the governments of Archangel, Vologda, Perm and Orenburg on the W., the provinces of Akmolinsk and Semi- palatinsk on the S., and the governments of Tomsk and Yeni- seisk on the E. It is one of the largest provinces of the Russian Empire, occupying 530,820 sq. m. The northern coast is formed by the Yalmal or Yanmal peninsula, separating the Bay of Kara (on the west) from the double bays of the Ob and Taz (on the east). The Pai-ho coast-ridge touches Tobolsk only at its south-eastern extremity. The Urals proper, which run south-west from the Kara Sea as far as the Toll-pos (5445 ft.), and thence take a southerly direction, form the boundary between Tobolsk and Vologda as far as 62 N., but further south their eastern slopes are included in the government of Pe- rm, and only their lowest spurs, 200 m. from the main chain, belong to Tobolsk.

The remainder of the government is lowland, but varies greatly in its different parts. In the south it assumes the character of grassy steppes or prairies, in the north of immense marshes sparsely over- grown with forest, and of treeless tundras as the shores of the Arctic Ocean are approached. The south steppes, in their turn, may be subdivided into two distinct portions, the Tobol and Ishim steppe

in the west and the Baraba in the east. The former, nearly 43,000 sq. m. in area, is one of the most fertile parts of the empire. One- third is under forest, and the remainder has a soil of very productive black earth, which enjoys the further advantage of being sufficiently drained. The climate is very severe, the mean annual temperature (30 to 34 F.) being that of the north of Sweden and of Archangel ; but the warm summer (65° to 68° in July) and the amount of light received from a bright sky combine to make vegetation develop with a rapidity unknown to west Europe. The Baraba steppe extends to about 55,000 sq. m. and is covered with recent deposits; but, as there is no definite slope, the surface waters accumulate in a large number of lakes and marshes. The climate is moister and the summer shorter and less hot than in the Tobol and Ishim

steppe. Forests, consisting chiefly of birch, occur sporadically over its surface. The soil of this region also is very productive, but the fertile patches are separated by marshy ground, and the dense clouds of mosquitoes in summer are a plague to both man and beast. To the north of the regions just indicated lie the administrative districts of Tura, Tobolsk and Tara, with an area of about 110,000 sq. m. ; this may be described as the taiga region. It consists throughout of impenetrable forests and quaking quagmires — the dreadful urmans, which are altogether impenetrable 50 m. from the scattered settlements. Gigantic cedar-trees, larches, firs, pines, birches and maples grow very close together, and the underwood is so dense that a passage can be forced only with the hatchet, the difficulties being further increased by the abundance of decayed wood and by the marshy foothold. To cross these urmans, which are treacherously concealed under a swaying carpet of grassy vegeta- tion, a kind of snow-shoe has to be used even in summer, and many can be crossed only in winter. Indeed vast areas have never been visited by man. The south-western parts of this region are traversed by the Siberian highway, and to this circumstance alone is it indebted for its population of nearly half a million.

The government is drained by the Ob, which traverses it for more than 1300 m., and is navigable throughout. It receives many tributaries, some of which are 200 to 350 m. long, but flow through quite uninhabited regions. The Irtysh, a left-hand tributary, spreads a network of affluents all over the south of the government and is navigable for the whole of its length of 760 m. ; it receives the Toboi, about 420 m. long, also navigable, the Ishim, and a number of less important streams; while the Tura, a tributary of the Tobol, is also navigable. Navigation lasts for nearly six months in the south. The first steamer on the Ob system was launched in 1845 and the second in i860; since the latter date steam navigation has steadily developed.

The estimated population in 1906 was 1,656,700, and is prac- tically all Russian, except for some 42,000

Tatars in the south, 18,000 Ostyaks, 4500 Samoyedes, and 4800 Voguls. There are, moreover, about 5000 Germans and Finns, somejews in the towns, and about 1500 gipsies. The government is divided into ten districts, the chief towns of which are Tobolsk, Berezov, Ishim, Kurgan, Sugut, Tara, Turinsk, Tyukalinsk, Tyumen and Yalutorovsk. The standard of education is very low. The Ostyaks are in a very miserable condition, having come under heavy obligations to the Russian merchants and being compelled to hand over to them nearly all the produce of their hunting and fishing. The Tatar settlements are prosperous in the south, but not in the Tobolsk district, where their lands have been appropriated for the Russian settlers. Many of the Samoyedes, Ostyaks and Voguls are nominally Christians. The Russians and the Tatars live mostly by agriculture. Of the total area of land regarded as suitable for cultivation (28,400,000 acres), 15,600,000 or 55 % are owned by the peasant com- munities.

Agriculture is generally the chief occupation, and Tobolsk is fast becoming a granary from which corn is exported to the northern governments of European Russia. The total area under cereal crops in 1900 was 3,334,600 acres, and the principal crops are rye, wheat, oats, barley and potatoes. Flax, hemp and tobacco are cultivated in the south. Livestock breeding is carried on on a large scale. Dairy-farming has made remarkable progress since the trans-Siberian railway was built.

The industries are insignificant (chiefly tanning, distilling and tallow-melting) ; ironworks and cloth mills are still in their infancy. The export of cattle, hides, tallow, corn, flour, fish and furs to Russia, both from Tobolsk and from the Kirghiz steppe, is of some importance. Spirits are sent farther east to Tomsk ; while all kinds of manufactured wares are imported from Russia. The fairs of Irbit and Ishim are the chief centres for trade. (P. A. K. ; J. T. Be.)

TOBOLSK, a town of Asiatic Russia, capital of the government of the same name, on the right bank of

the Irtysh, near its con- fluence with the Tobol. Pop. (1900), 21,401. It is 305 m. E.N.E. from Ekaterinburg, and is no longer the capital of West

Siberia nor even an administrative centre for exiles. The kreml, or citadel, built in the reign of Peter the Great, by Swedish prisoners, in imitation of the kreml of Moscow, contains the cathedral, erected towards the end of the 17th century. Some 12 m. south-east are the ruins of the "fort of Kuchum," the site of the capital of Siberia, Isker, before the Russian conquest. Tobolsk was founded in 1587 by Cossacks, and forms the see of the bishop of Tobolsk and Siberia.

TOBRUK (anc. Antipyrgos), a settlement with small Turkish garrison on a fine natural harbour situated on the N. coast of Africa at the intersection of 32° N. Lat., with 24° E. Long. The harbour, which is small but deep, and sheltered by high ground, opens to the east. It is about i\ m. long by f m. wide; the depth in the centre is over 40 ft. and soundings of over 30 ft. extend to within a very short distance of the shores. It is the only safe port easily accessible to large vessels for over 1000 m., between Sfax in Tunisia and Alexandria, for, although there is safe and deep anchorage in the recess of the Gulf of Bomba, the entrance is rocky and difficult. Tobruk has long been the out- let for the trade of the oa'ses which extend from Jarabub to Siwah, and are a stronghold of the Senussi order (see Cyrenaica) ; and it is also the headquarters of the Libyan sponge fishery, prosecuted by Greeks. In the spring it is visited by a great number of boats, to protect which a small Hellenic warship has sometimes been despatched. But it is as a future man-of- war harbour that Tobruk is likely to be important. It has been visited both by British and Italian squadrons and has become an object of considerable solicitude to the government of Italy. By running into Tobruk and the neighbouring Gulf of

Bomba the French fleet eluded British vigilance on its way to Egypt in 1798. (D. G. H.)

TOCHI VALLEY, or Dawar, one of the chief routes into Afghanistan in the North- West Frontier Province of India. It leads from the Bannu through tribal country, and is inhabited by the Dawari (q.v.). The valley is divided into two parts, known as Upper and Lower Dawar, by a narrow pass called the Taghrai Tangi, some three m. long. Between Dawar and British territory is the low range of uninhabited hills, which skirt the Bannu district. It was by this route that Mahmud of Ghazni effected several of his raids into India and the remains of a road flanking the valley and of defensive positions are still to be traced. After the Waziristan Expedition of 1894 the Tochi was garrisoned by British troops; but when Lord Curzon reorganized the frontier in 1901, the British troops were withdrawn, and their place supplied by tribal militia. The chief posts are Saidgi, Idak, Miranshah, Datta Khel and Sheranni. The valley was the scene of action for the Tochi or Dawari Expedition under Brigadier-General Keyes in 1872, and the Tochi Expedition under General Corrie Bird in 1897.

TOCQUEVILLE, ALEXIS HENRI CHARLES MAURICE CLEREL, Comte de (1805-1859), was born at Verneuil on the 29th of July 1805. His family on the father's side were of good descent, and distinguished both in the law and in arms, while his mother was the granddaughter of Malesherbes. Alexis de Tocqueville was brought up for the bar, or rather for the bench, and became an assistant magistrate in 1830. A year later he obtained from the government of July a mission to examine prisons and penitentiaries in America, and proceeded thither with his life-long friend Gustave de Beaumont. He returned in less than two years, and published a report, but the real result of his tour was the famous De la Dimocratie en Amerique, which appeared in 1835, and very soon made his reputation (3rd ed. 1868). It was at once caught up by influential members of the Liberal party in England, which country Tocqueville soon after visited, and where he married an Englishwoman. Return- ing to France, he was elected a me/nber of the Academie des sciences morales et politiques

(Jan. 6, 1838), and beginning life as a country gentleman at Tocqueville, he thought to carry out the English ideal completely by standing for the chamber of deputies. But, with a scruple which illustrated his character, he refused government nomination from Mole, and was defeated. Later he was successful, and sat for several years both before

and after the revolution of February, becoming in 1849 vice- president of the assembly, and for a few months' minister of foreign affairs. He was a warm supporter of the Roman expedi- tion, but an equally warm opponent of Louis Napoleon; and after being one of the deputies who were arrested at the coup d'Stat he retired from public life. Twenty years after his first, he produced another book, De I'Ancien regime, which almost, if not quite, equalled its success. His health was never very strong, and in 1858 he broke a blood-vessel. He was ordered to the south, and, taking up his residence at Cannes, died there on the 16th of April 1859. He had published some minor pieces during his lifetime, and his complete works, including much unpublished correspondence, were produced after his death in uniform shape by H. G. de Beaumont (CEuvres completes de Tocqueville, 9 vols., 1860-1865).

During the last twenty years of his life, and for perhaps half that time after his death, Tocqueville had an increasing European fame. His manner, which is partly imitated from Montesquieu, has considerable charm; and he was the first and has remained the chief writer to put the orthodox liberal ideas which governed European politics during the first half or two- thirds of the 19th century into an orderly and attractive shape. He was, moreover, as has been said, much taken up by influential persons in Eng- "land — N. W. Senior, John Stuart Mill and others — and he had the great advantage of writing absolutely the first book of reasoned politics on democratic government in America. Besides, he was, if not an entirely impartial writer, neither a devotee nor an opponent of democracy. All this gave him a very great advantage which he has not yet wholly lost. At the

same time he had defects which were certain to make themselves felt as time went on, even without the alteration of the centre of liberal opinion which has taken place of late years. The chief of these was a certain weakness which can hardly be described by any word more dignified than ." priggishness." His correspondence with Mole, above alluded to, is an instance of this, and it was also reflected on in various epigrams by countrymen and contemporaries; one of these accuses him of having " begun to think before he had begun to learn," while another declares that he avail I' air de savoir de toule eiernite ce qu'il venait d'apprendre. He appears both in reading history and in conducting actual political business to have been constantly surprised and disgusted that men and nations did not behave as he expected them to behave. This excess of the deductive spirit explains at once both the merits and the defects of his two great works, which will probably remain political classics, though they are less and less likely to be used as practical guides.

See Heinrich Jacques, Alexis de Tocqueville; ein Lebens- und Geistesbild (Vienna, 1876); James Bryce, The Predictions of Tocque- ville (Baltimore, 1887); Count de Puymaigre, Les Souvenirs d' Alexis de Tocqueville (1893); and Correspondance entre Alexis de Tocqueville et Arthur de Gobineau (1908).

TOCSIN, a signal of alarm given by the ringing of a bell, hence any warning or danger signal. The earliest form in English is tocksaine, which was borrowed from the O. Fr. toquesin (toquer, to strike, cf. toucher and sin, mod. signe, a signal, Lat. signum). The use of " touch " and its cognate forms with the idea of giving a sound is seen in " tucket," Ital. toccata, which probably originally meant a signal given by tap of drum, but is always applied to a flourish or fanfare on a trumpet.

TOD, JAMES (1782-1835), British officer and - Oriental scholar, was born on the 20th of March 1782, and went to India as' a cadet in the Bengal army in 1799. He commanded the escort attached to the resident with Sindia from 1812 to 1817. In the

latter year he was in charge of the Intelligence Department which largely contributed tq break up the confederacy of Maratha chiefs in the Pindari War, and was of great assistance in the campaign in Rajputana. In 1818 he was appointed political agent for the states of western Rajputana, where he conciliated the chieftains, settled their mutual feuds and collected materials for his Annals and Antiquities of Rajasthan (2 vols., 1829–183.2). Another book of value, Travels in Western India (1839), was published posthumously. He returned from India in 1823,

was promoted lieutenant-colonel in. 1826, and died in London on the 17th of November 1835.

TODAS, a small pastoral tribe of Southern India, found only on the Nilgiri hills. They are distinguished by their tall, well- proportioned figures, aquiline noses, long, black, wavy hair and full beards. Their colour is a light brown. Their dress con- sists of a single cloth, which they wear like the plaid of a Scotch highlander. The women cover the whole body with this mantle. Their sole occupation is cattle-herding and dairy-work. They practise polyandry, a woman marrying all the brothers of a family. 1 he proportion of females to males is about three to five. Their language is a mixture of Tamil and Kanarese, and is classified by Bishop Caldwell as a separate language of the Dravidian family. The Todas worship their dairy-buffaloes, but they have a whole pantheon of other gods. The only purely religious ceremony they have is Kona Shastra, the annual sacrifice of a male buffalo calf. Toda villages, called mands, usually consist of five buildings or huts, three of which are used as dwellings, one as a dairy and the other for sheltering the calves at night. These huts are of an oval, pent-shaped construction usually 10 ft. high, 18 ft. long and 9 ft. broad. They are built of bamboo fastened with rattan and thatched. Each hut

is enclosed within a wall of loose stones. The inhabitants of a mand are generally related and consider themselves one family* The Todas numbered 807 in 1901. See W. H. R. Rivers, The Todas (1906).

TODHUNTER, ISAAC (1820–1884), English mathematician, son of George Todhunter, a Nonconformist minister, was born at Rye on the 23rd of November 1820. He was educated at Hastings, at which town his mother had opened a school after the death of his father in 1826. He became an assistant master at a school at Peckham, attending at the same time evening classes at the University College, London. In 1842 he obtained a mathematical scholarship and graduated as B.A. at London University, and was awarded the gold medal on the M.A. examination. About this time he became mathematical master at a school at Wimbledon. In 1844 he entered St John's Col- lege, Cambridge, where he was senior wrangler in 1848, and gained the first Smith's prize and the Burney prize; and in 1849 he was elected to a fellowship, and began his life of college lecturer and private tutor. In 1862 he was made a fellow of the Royal Society, and in 1865 a member of the Mathematical Society of London. In 1871 he gained the Adams prize and was elected to the council of the Royal Society. He was elected honorary fellow of St John's in 1874, having resigned his fellowship on his marriage in 1864. In 1880 his eyesight began to fail, and shortly afterwards he was attacked with paralysis. He died at Cambridge on the 1st of March 1884.

Works. — Treatise on the Differential Calculus and the Elements of the Integral Calculus (1852, 6th ed., 1873), Treatise on Analytical Statics (1853, 4th ed., 1874); Treatise on the Integral Calculus (1857, 4th ed., 1874); Treatise on Algebra (1858, 6th ed., 1871); Treatise on Plane Coordinate Geometry (1858, 3rd ed., 1861); Plane Trigo- nometry (1859, 4th ed., 1869) ; Spherical Trigonometry (1859) ; History of the Calculus of Variations (1861); Theory of Equations (1861, 2nd ed. 1875); Examples of Analytical Geometry of Three Dimensions (1858, 3rd ed., 1873); Mechanics (1867), History of the Mathematical Theory of Probability from the Time

of Pascal to that of Lagrange (1865); Researches in the Calculus of Variations (1871); History of the Mathematical Theories of Attraction and Figure of the Earth from Newton to Laplace (1873); Elementary Treatise on Laplace's, Lame's and Bessel's Functions (1875); Natural Philosophy for Beginners (1877). An unfinished work, The History of the Theory of Elasticity, was edited and published posthumously in 1886 by Karl Pearson. Todhunter also published keys to the problems in his textbooks on algebra and trigonometry; and a biographical work, William Whewell, account of his writings and correspondence (1876), in addition to many original papers in scientific journals.

See obituary notices in the Proc. Lond. Math. Soc. (1884), and Proc. Roy. Soc. (1884).

TODI (anc. Tuder), a town and episcopal see of the province of Perugia, Italy, 28 m. S. of Perugia by road, on a steep hill above the east bank of the Tiber, 1348 ft. above sea-level, and 866 ft. above the river. Pop. (1901), 3599 (town), 16,528 (commune). Some portions of the ancient town walls — of two enceintes, an inner and an outer, the former attributed to the »riginal Umbrian inhabitants, the latter to the Romans — are

preserved, and also remains of baths, amphitheatre, theatre, and a substruction wall of massive masonry, with four niches. Here was found the bronze statue of Mars, now in the Vatican, so that the building is sometimes erroneously called the temple of Mars. Beneath the cathedral square, at the highest point of the town, is a large reservoir. The Romanesque cathedral has a simple facade (partly of the nth, partly of the 14th and 15th centuries), with a fine portal and rose window. In the same square is the massive Romanesque Gothic Palazzo Comunale of 1267, the Palazzo dei Priori and the Palazzo della Podesta. The Gothic church of S. Fortunato, with its nave and aisles of the same height, has a splendid portal; the upper part of the facade is unfinished. Both this church and the cathedral have good choir-stalls.

Just outside the town on the west is the pilgrimage church of S. Maria della Consolazione, one of the finest buildings of the Renaissance, and often wrongly attributed to Bramante. Con- temporary documents prove that the interior was begun in 1508 by Cola Matteuccio da Caprarola, and the exterior com- pleted in 1516-1524 by Ambrogio da Milano and Francesco di Vito Lombardo; the slender dome was not added till 1606; its plan is a Greek cross. S. Fillippo in the town, a church of the early 16th century, betrays the influence of the Consolazione in details.

During the period of its independence, the town struck coins with the legend Tutere. It is hardly mentioned in history until it received Roman citizenship in the Social War. Crassus took it in 83 B.C.; and a colony was founded there by Octavian, including some soldiers of the 41st legion, which only existed in his time, after which it bore the name Colonia Iulia fida Tuder. It was a station on the road between America and Perusia, but otherwise is hardly mentioned. Narses won a victory over the Goths near Todi in 552, and Totila lost his life. _ In the middle ages it had frequent struggles with Perugia, and its obedience to the church until the 16th century was somewhat fitful. The village of Vicus Martis Tudertium lay 9 m. to the east on the Via Flaminia. Several inscriptions mention it (Corpus inscript. lat. xi. 694).

TODLEBEN (or Totleben), FRANZ EDUARD IVANOVICH,

Count (1818-1884), Russian engineer general, was born at Mittau in Courland, on the 20th of May 1818. His parents were of German descent, and of the mercantile class, and he himself was intended for commerce, but a strong instinct led him to seek the career of a military engineer. He entered the school of engineers at St Petersburg, and passed into the army in 1836. In 1848 and the two following years he was employed, as cap- tain of engineers, in the campaigns against Schamyl in the Caucasus. On the outbreak of war between Russia and Turkey in 1853, he served in the siege of Silistria, and after the

siege was raised was transferred to the Crimea (see Crimean War). Sevastopol, while strongly fortified toward the sea, was almost unprotected on the land side. Todleben, though still a junior field officer, became the animating genius cf the defence. By his advice the fleet was sunk, in order to blockade the mouth of the harbour, and the deficiency of fortifications on the land side was made good before the allies could take advantage of it. The construction of earthworks and redoubts was carried on with extreme rapidity, and to these was transferred, in great part, the artillery that had belonged to the fleet. It was in the ceaseless improvisation of defensive works and offensive counterworks to meet every changing phase of the enemy's attack that Todleben's peculiar power and originality showed itself. He never commanded a large army in the open field, nor was he the creator of a great permanent system of defence like Vauban. But he may justly be called the originator of the idea that a fortress is to be considered, not as a walled town but as an entrenched position, intimately connected with the offensive and defensive capacities of an army and as susceptible of alteration as the formation of troops in battle or manoeuvre. Until the 20th of June 1855 he conducted the operations of defence at Sevastopol in person; he was then wounded in the foot, and at the operations which immediately preceded the fall of the fortress he was not present. In the course of the siege he had risen from the rank of lieutenant-colonel to that of lieutenant-general, and had also been made aide-de-camp to the

tsar. When he recovered he was employed in strengthening the fortifications at the mouth of the Dnieper, and also those of Cronstadt. In 1856 he visited England, where his merits were well understood. In i860 he was appointed assistant to the grand-duke Nicholas, and he became subsequently chief of the department of engineers with the full

rank of general. He was given no command when war with Turkey began in 1877. It was not until after the early reverses before Plevna (q.v.) that the soldier of Sevastopol was called to the front. Todleben saw that it would be necessary to draw works round Osman Pasha, and cut him off from communication with the other Turkish commanders. In due time Plevna fell. Todleben then undertook the siege of the Bulgarian fortresses. After the conclusion of preliminaries of peace, he was placed in com- mand of the whole Russian army. When the war was over he became governor of Odessa and hereditary count. But his 'health was broken, though for some time after 1880 he held the post of governor of Vilna, and after much suffering he died at Bad Soden near Frankfort-on-Main, on the 1st of July 1884.

His great work on the defence of Sevastopol appeared m Russian, French and German (g vols. 1864-1872). Besides this, he wrote a letter to General Brialmont on the operations around Plevna; this was printed in the Russian engineer journal, and in German in the Archiv fur preussische Artillerie-offiziere (1878).

See Brialmont, Le General comte Todleben (Brussels, 1884); Rieger, " Todleben u. seines Wirkens Bedeutung fur die Kriegskunst der Zukunft " (in Mittheilungen iiber Gegenstdnde des Artillerie- und Geniewesens, Vienna, 1885); Witzleben, in Internationale Revue iiber die gesammten Armeen und Flotten (1879); Schroder, in Archiv fur Artillerie- und Ingenieur-Offiziere (Berlin, 1888); Life by Schilder (in Russian, St Petersburg, 1885-1887); Krahmer, General-Adjutant Graf Todleben (Berlin, 1888).

TODMORDEN, a market town and municipal borough in the Sowerby parliamentary division of the West Riding of York- shire, England, extending into the Middleton parliamentary division of Lancashire; 19 m. N.N.E. of Manchester, on the Lancashire & Yorkshire railway. Pop. (1901), 25,418. It lies on both sides of the river Calder, and the scenery of the valley is beautiful in spite of the numerous factories. Tod- morden Hall, a picturesque old

mansion of various dates, was the seat of the Radcliffes, but they sold the manorial rights about the close of the 17th century. The town hall is a hand- some classical building erected in 1875; it bridges the county boundary, the Calder, enabling the magistrates to exercise jurisdiction in both counties. There is a bronze statue to John Fielden (1 784–1849), to whose energy in developing the cotton manufacture the town owes much of its prosperity. The staple industry is the spinning and weaving of cotton, and there are also foundries and machine-works. The municipal borough, incorporated in 1896, is under a mayor, 6 aldermen and 18 councillors. Area, 12,773 acres.

TODY, T. Pennant's rendering (Gen. Birds, pp. 15, 61) through the French Todier of M. J. Brisson (Ornithologie, iv. 528) of the somewhat obscure Latin word Todus, 1 not un- happily applied in 1756 by Patrick Browne (Civ. and Nat. Hist. Jamaica, p. 476) to a little bird remarkable for its slender legs and small feet, the " green sparrow " or " green humming- bird " of Sir H. Sloane (Voyage, ii. 306). The name, having been, taken up by Brisson (loc. cil.) in 1760, was adopted by Lin- naeus, and has since been recognized by ornithologists as that

1 In Forcellini's Lexicon (ed. De Vit, 1875) we find " Todus genus parvissimae avis tibias habens perexiguas." Ducange in his Glossa- rium quotes from Festus, an ancient grammarian, " Toda est avis quae non habet ossa in tibiis; quare semper est in motu, unde Todiu (al. Todinus) dicitur ille qui velociter todet et movetur ad modum todae, et todere, moveri et tremere ad modum todae." The evidence that such a substantive as Todus or Toda existed seems to rest on the adjectival derivative found in a fragment of a lost play (Syrus) by Plautus, .cited by this same Festus. It stands " cum extritis [extortis] talis, cum todillis [todinis] crusculis " ; but the passage is held by scholars to be corrupt. Among naturalists Gesner in 1555 gave currency (Hist, animalium, iii. 719) to the word as a substan tive, and it is found in Levins's Manipulus vocabidorum of 1570 (ed. Wheatley, 1867, col. 225) as the equivalent of the

English ″ tit- mouse.″ Ducange allows the existence of the adjective todinus. Stephanus suggests that todi comes from rvrdol, but his view is not accepted. The verb todere may perhaps be Englished to ″ toddle ″ !

of a valid genus, though many species have been referred to it which are now known to have no affinity to the type, the Todus viridis of Jamaica, and accordingly have since been removed from it. The genus Todus was at one time placed among the Muscicapidae (cf. Flycatcher); but J. Murie's investigations (Proc. Zool. Society, 1872, pp. 664-680, pL lv.) have conclu- sively proved that it is not passerine, and is nearly allied to the Momotidae (cf. Motmot) and Alcedinidae (cf. Kingfisher). it being regarded as forming a distinct sub-family Todinae of the Momotidae peculiar to the Greater Antilles, each of which islands has its own species, all of small size, the largest not exceeding four inches and a half in length.

Of the species already named, T. viridis, P. H. Gosse (B. Jamaica, pp. 72-80) gives an interesting account. ″ Always conspicuous from its bright grass-green, coat and, crimson-velvet gorget, it is

(After Gosse.)

Tody (Todus viridis).

still a very tame bird ; yet this seems rather the tameness of indiffer- ence than of confidence ; it will allow a person to approach very near, and, if disturbed, alight on another twig a few yards distant . . . commonly it is seen sitting patiently on a twig, with the head drawn in, the beak pointing upwards, the loose plumage puffed out, when it appears much larger than it is. It certainly has an air of stupidity when thus seen. But this abstraction is more apparent than real; if we watch it, we shall see that the odd-looking grey eyes are glancing hither and thither, and that ever and anon the bird sallies out upon a short feeble flight, snaps at something in the air, and returns to his

twig to swallow it." The birds of the family also show their affinity to the kingfishers, motmots and bee-eaters by burrowing holes in the ground in which to make their nest, and therein laying eggs with a white translucent shell. The sexes differ little in plumage. _ All the four species of Todus, as now restricted, present a general similarity of appearance, and possess very similar habits; and even these, by some ornithologists, might be regarded as geographical races. The Cuban form is T. multicolor; that of Haiti is T. sub- ulatus or dominicensis; and that of Porto Rico, originally named in error T. mexicanus, has since been called hypochondriacus.

(A. N.) TOGGENBURG, THE, a special name given to the upper valley of the river Thur, in the Swiss Canton of St Gall. It descends in a N.W. direction from the watershed between the Rhine and the Thur, and is enclosed N.E. by the chain of the Santis (8216 ft.) and S.W. by that of the Kurfiirsten (7576 ft.) and of the Speer (641 1 ft.). It is a fertile valley of about 30 m. in length from the source of the river to Wil on the railway line between Winterthur and St Gall. The upper half is traversed by an excellent carriage road, while from Kappel there is a railway to Wil (155 m.). Its industrious population numbered 34,594 in 1900, nearly equally divided between Romanists and Pro- testants, mostly German-speaking. Those of the upper half are devoted to pastoral pursuits while those of the lower half are engaged in the manufacture of muslin and cotton. This valley is as yet frequented only by Swiss visitors, and retains many characteristics of sub-alpine Switzerland before the arrival

of the horde of tourists. At Wildhaus, the highest village (3632 ft.), the house wherein Huldreich Zwingli, the Swiss Reformer, was born in 1484, is still shown. The chief village is Lichtensteig (1387 inhab.), but those of Kirchberg (5025 inhab.) and of

Wattwil (4971 inhab.) are the most populous. On the extinction of the main line of the local counts (1436), this portion of their dominions passed to the lord of Raron (in the Valais) , who sold it in 1468 to the abbot of St Gall. (W.A.B.C.)

TOGO, HEIHACHIRO, Count (1847–), Japanese admiral, was born in Kagoshima. He studied naval science and navi- gation in England from 1871 to 1878, and first became a pro- minent figure when, in 1894, as captain of the cruiser " Naniwa," he sunk the Chinese troopship " Kowshing " en route for Korea, thus precipitating war with China. When the Russo-Japanese conflict broke out in 1904, he was appointed to the command- in-chief of the Japanese fleet, and under his direction various brilliant operations took place, culminating in the battle of the Sea of Japan when the Russian fleet was annihilated. For these services he received (1907) the title of count. In 1906 he was made a member of the British Order of Merit.

TOGOLAND, a German colony on the Gulf of Guinea, West Africa. It forms part of the territory formerly distinguished as the Slave Coast and was annexed by Germany in 1884. It is bounded S. by the Atlantic, W. by the British possessions on the Gold Coast, N. by the French colony of Upper Senegal and Niger, E. by Dahomey, also a French colony. (For map see French West Africa and Gold Coast). The coastline is only 32 m. in length (1° 14′ E. to i° 38′ E.) but inland Togo- land widens to three or four times that breadth. It contracts again at its northern boundary to about 30 m. From the coast northward the extreme length is 350 m. The area of the colony is some 33,700 sq. m. Pop. about 1,000,000. The white inhabitants numbered (1909) 330 of whom 300 were German. The boundary between Togo and Dahomey, by Franco-German agreement of 1897, follows the coast lagoon from Little Popo to the Mono river, ascends the middle of that river as far as 7° N., thence goes in a direct line to 9° N. and from that point in a north-westerly direction to 11° N. The western boundary was settled by Anglo-German agreements of 1890 and 1899; it leaves the coast west of the town

of Lome and proceeds in a zigzag line to where the Deine river joins the Volta; thence follows the Volta to its junction with the Daka and then the Daka up to the point where g° N. cuts the river. From this point the frontier follows a north-easterly course to 11° 8′ N., leaving the town of Yendi and the Chakosi territory on the Ger- man side of the boundary line. The agreement of 1899 defined the western boundary from 8° N. northward, and partitioned between the two powers a large block of territory, which by an agreement of 1888 had been declared a neutral zone. The northern frontier is a line drawn between the northernmost points of the eastern and western frontiers.

Physical Features. — The coast is low and sandy and is formed by the detritus deposited by the sea current called Calema. It is perfectly straight, without harbours, and approached only through a dangerous bar. This coast strip is nowhere more than 2 m. broad. It masks a series of lagoons, of which the largest, occupying a central position, is called the Togo, Avon or Haho lagoon. It is connected by a channel running eastward parallel with the sea, with the Wo and Little Popo lagoons, and with the Mono river. Behind the lagoons an undulating plain stretches some 50 m. The Sio and Haho, the two largest rivers of the coast region, both flow into the Togo lagoon. These rivers rise on the eastern versant of a chain of mountains which traverse the country in a south-westerly to north-easterly direction. Beginning in the south-east corner of the Gold Coast colony this range, composed of quartzites and schists, extends beyond the borders of Togoland into upper Dahomey. It has no general name, but in the south is called Agome. On the eastern side it presents a fairly "continuous escarpment. It is most elevated in its southern portion, Mt Dabo having a height of 3133 ft. and Mt Atilakuse (in 7° 20′ N. o" 43′ E.) 3248 ft. Its general eleva- tion is between 2000 and 2500 ft. ; on the north-west side of the range the country is table-land some 600 to 1000 ft. high. Baumann Spitze (3215 ft.) is an isolated peak in 6° 50′ N., 0° 46′ E., east of the main range.

South and east of the range the country, apart from chat watered by the coast streams, drains to the Mono river. The greater part of the colony lies west and north of the chain and belongs to the basin of the Volta. The chief river traversing it is

the Oti, which rises in about 12° N., enters Togoland at its north- east corner, and runs with a very sinuous course south-south-west to its junction with the Volta in 7 37′ N. For a considerable distance the left bank of the Volta itself is in German territory, but its lower course is wholly in the Gold Coast colony.

Climate. — The climate on the coast is hot, humid and unhealthy. There are two wet seasons, the first lasting from March till June, the second from September to November. Apart from the coast region, seasons of drought are not uncommon. The dry wind from the Sahara called harmattan, which' carries great quantities of fine red sand, causes a fall of temperature in the (European) summer.

Flora and Fauna. — Coco-nut palms, introduced about the begin- ning of the 19th century by the Portuguese, grow along the coast and for 80 m. or so inland. The lagoons are surrounded by dense belts of reeds, and the coast-land is covered with low, impenetrable bush. There are considerable forests of oil palms, rubber trees and vines, and timber and dyewood trees. Many of the river valleys are densely wooded. On the hills the baobab and hyphaene palm are characteristic; on the plateau are stretches of open savanna, and park-like country with clumps of silk cotton and shea-butter trees. The fauna resembles that of other parts of West Africa; it is poor on the coast. Elephants and lions are found in the interior.

Inhabitants. — The inhabitants are negroes and negroids. In the north the people are mostly Hausa, in the west they belong to the Tshi-speaking clans, while on the coast they are members of the Ewe (Dahomey) tribes. Among the coast people there is a distinct infusion of Portuguese blood, and in all

the ports are descendants of Brazilian negroes who returned to Africa during the 19th century. Pidgin English is the common language along the coast. The Adeli and Akposso hill tribes have a dialect of their own. In the north the tribes form small, well-organized states. In the coast lands the inhabitants are traders and agriculturists, in the interior they are largely pastoralists. The Hausa are often traders, traversing the country in large caravans. The inhabitants are partly Mahommedans, partly believers in fetish; comparatively few profess Christianity. As a rule the tribes are peaceful. Slave raiding has ceased, but domestic slavery in a mild form continues.

Towns. — The capital and chief port is Lome (pop. about 5000), near the western frontier. It is a creation of the Germans, the site, in 1884, being occupied by a small fishing village. It is provided with a jetty, is the sea terminus of the railway systems, the residence of the governor, and has churches, schools, hospitals and large business houses. The chief African traders are Hausa immigrants. Togo, which has given its name to the country, is a town on the south-eastern shores of the Togo lagoon. On the narrow spit of land between the lagoons and the sea are Bagida and Porto Seguro — the last named one of the oldest towns on the Slave Coast and the port of Togo town — and, close to the eastern frontier, Little Popo, called by the Germans Anecho. Anejo or Anecho means the houses or quarter of the Anes. The Anes are reported to have come from the Gold Coast by sea and to have been wrecked at this place. Little Popo dates from the 17th century or earlier. At the time of the German annexation Anecho was one of three distinct quarters into which the town was divided. In the hill country are the government stations of Misahohe and Bismarckburg. On the Volta, a short distance above the Oti confluence, are the adjacent towns of Kete-Krachi ; on an affluent of the Mono in 7 N. is Sagada. In the north are the large native towns of Yendi and Sansane Mangu, both on caravan routes between Ashanti and the Niger countries.

Agriculture and Trade. — The country is rich in natural products, and its resources have been largely developed by the Germans. It was the first German colony to dispense (1903–1904) with an imperial subsidy towards its upkeep. Several firms have acquired plantations in which coffee, cocoa, cotton, kola and other tropical products are cultivated. Coco-nut palms thrive; maize, yams, bananas, tapioca and ginger are cultivated by the natives. The chief trade is in, and the principal exports are, palm oil and kernels, rubber, cotton, maize, groundnuts (Arachis), shea-butter from the Bassia parkii (Sapotaceae), fibres of the Raphia vinifera, and the Sansevieria guineensis, indigo, and kola nuts, ebony and other valuable wood. In the interior cattle and sheep are plentiful, on the plateau horses and donkeys. The natives have several industries, including pottery, straw plaiting, smithwork and woodcarving. Some of their carving is very fine. They collect and spin the indigenous cotton, which is of good quality, and dye it with indigo or other pigfnents; they also manufacture very handsome shawls. Cotton growing under European direction began about 1900, with the result that in 1901– 1902 over 100,000 lb of cotton grown from native, American and Egyptian seed were shipped to Bremen. In subsequent years the industry attained considerable proportions.

The imports are chiefly textiles, metals and hardware, and gin. Imports are mainly from Germany, exports to Germany and to other West African colonies. In 1908 the value of the imports was £425,000, of the exports £389,000.

Communications. — Good roads have been built connecting the coast towns with the principal places in the interior. A railway about 20 m. long connects Lome with Little Popo. From Lome another railway 76 m. long runs north-west to Agome-Palime near Misahohe. There are telegraph and telephone lines

between Lome and Little Popo, and both places are in telegraphic communication with the Gold Coast and Dahomey, and thus with the international cable system. There is direct steamship communication between Togoland and Hamburg, and the steamers of three French and two English lines call at Togoland ports.

Government, &c. — The colony is administered by a governor who is advised by a nominated council of unofficial members. Revenue is derived principally from customs duties, direct taxation being light. In 1907–1908 revenue and expenditure balanced at £103,000. A judicial system has been instituted to which natives as well as Europeans are amenable. The government maintains schools at all the coast towns. Various missionary societies have also estab- lished schools. In 1909 some 10,000 native children were receiving instruction.

History. — Before its annexation by Germany the lagoons were a favourite resort of slavers, and stations were established there by Portuguese, British, French and German traders. The coast natives were dependent on the rulers of Dahomey or Porto Novo. Little Popo and Togo were capitals of small inde- pendent kingdoms. Little Popo is said to have been founded in the 17th century by refugees from Accra, who were driven out by the Akwamu. At the time that " the scramble for Africa " began, the narrow strip of coast over which the king of Togo ruled was the sole district between the Gambia and the Niger to which Great Britain, France or some other civilized power had not a claim. At Togo Bremen merchants had trading stations, and taking advantage of this fact Dr Gustav Nachtigal, German imperial commissioner, induced the king of Togo (July 5, 1884) to place his country under German suzerainty. The claims made by Germany to large areas of the hinterland gave rise to considerable negotiation with France and Great Britain, and it was not until 1899 that the frontiers were fixed on all sides (see Africa, § 5). Meantime the development of the coast region had been taken in hand. On the whole the history of the colony has

been one of peaceful progress, interrupted now and again, as in 1903, by severe droughts. At stated intervals the native chiefs are summoned to Lome to discuss adminis- trative matters with the government.

See H. Klose, Togo unter deutscher Flagge (Berlin, 1899), a com- prehensive survey, with bibliography; N. Seidel, Die Kiiste und das Vorland der Togocolonie (Berlin, 1897), and Die Ewhesprache in Togo (Heidelberg, 1906) ; Schonhart, Volkstiimliches aus Togo (Dresden, 1909) ; R. Biittner, Die F or schungs station Bismarckburg und Adeli (1894); Das deutsche Schutzgebiet Togo (Bremen, 1891); L. Von Ammon, " Zur Geologie von Togo und vom Nigerlande " in Mitteil. der geog. Gesell. in Miinchen (1905); Klose, "Religiose Anschauungen und Menschenopfer in Togo" in Globus 1902; P. Sprigade, Karte von Togo, scale 1 :200,ooo, 12 sheets, also in 2 sheets on the scale 1 :500,ooo (Berlin, 1902–1907).

TOILET, the process or operation of dressing, also dress and its appurtenances, also applied, especially in the French form " toilette," to a particular costume worn by a lady. The word is adapted from French toilette, a diminutive of toile, cloth, Latin tela, web, woven cloth, from root of texere, to weave; this word survives in the English " toils," net, snare. 1 The earliest use of " toilet " and toilette is for a cloth, usually of linen or other fine material spread over a table when used to hold the looking- glass and all the other articles used in dressing, or for a small sheet or cloth thrown over the shoulders of a person while being shaved or having his or her hair dressed. It was thus applied especially to the various articles collectively which form the apparatus of a toilet- table or dressing-table. Dressing-tables or toilettes were articles of domestic furniture on which the 18th century cabinet makers and ibenistes of France lavished iheir decorative art. The escritoire and toilette combined which belonged to Marie Antoinette is in the Victoria and Albert Museum, South Kensington (see Furniture, Plate IV., fig. 4).

1 ″ Toil, ″ labour, fatigue, weariness, must of course be distin- guished. The M. Eng. toilen appears to mean to pull, struggle, and is probably related to Scots toilyie, broil, and to Fr. touiller, to entangle, shuffle together, smear. It is, however, usually reierred to ″ till,″ to cultivate, O. Eng. tiolian, from til, profitable, cf. Ger. Ziel, goal.

TOKAJ (or Tokay), a town of Hungary, in the county of Zemplen, 148 m. E.N.E. of Budapest by rail. Pop. (1900), 5104. It is situated at the confluence of the Bodrog with the Theiss, and gives its name to the famous Tokay wine. Tokaj lies at the foot of the Hegyalja Mountains, which stretch to the north and north-west of the town, between the rivers Hernad and Bodrog, for a distance of about 60 m. as far north as Eperjes. The northern part of the range is also called Sovar Mountains. These mountains, which have in the northern part an altitude of 2700 ft., slope down towards the south-east near Tokaj in a hilly plateau of about 1500 ft. altitude, where the vineyard region is situated. This vineyard region covers an area of about 135 sq. m., and belongs to 21 adjoining communities. The soil is of volcanic origin (trachyte) . The principal places where the wine is produced are Tarczal, Talya, Mad, Liszka, Tokaj, Tolcsva, Sarospatak, Keresztur, and Zsadany. The yearly production averages 5,000,000 gallons. It is believed that the vine was introduced into this region by colonists from Italy and Morea in 1 241.

TOKAT (Armenian Evtoghia, anc. Dazimon) the chief town of a sanjak of the same name in the Sivas vilayet of Asia Minor. It is situated in the Sivas-Samsun chausee, altitude 2280 ft., at the mouth of a rocky glen which opens out to the broad valley of the Tozanli Su, a tributary of the Yeshil Irmak. It rose to importance under the Seljuks. Pop. about 30,000, two- thirds Mussulman. The industries are the manufacture of copper utensils and yellow leather, and the stamping of colours on white Manchester cotton. Near Tokat copper pyrites, with iron and manganese, kaolin and coal are found; but most of the copper worked here comes from the mines

of Keban Maden and Arghana Maden, on the upper Euphrates and Tigris.

(D. G. H.)

TOKELAU (or Union Islands), a group of three atolls in the Pacific Ocean, about 350 m. N.E. of Samoa, belonging to Britain. Atafu consists of 63 islets, Nukunau of 93 and Fakaafo of- 62. They produce little but copra. The natives are all Christians, and in type and speech are akin to the Samoans. They number about 500.

TOKEN MONEY, the term employed originally to describe the counters or " tokens " issued by traders to meet the lack of small change. It has now been appropriated by economists and officials to denote the smaller currency that circulates at a nominal value higher than its cost. It is contrasted with " standard " money, and is limited in its amount by state authority. Its power of discharging debts is also limited: in England, e.g., silver is legal tender only up to 40s., copper to 12 pence. Various substances have been utilized for the manu- facture of token coinage — silver at a lower degree of fineness, copper in different alloys, and nickel. The French term mon- naie divisionnaire has much the same meaning; so has the German Scheidemunze. A currency, restricted in amount, but with full legal tender power — such as the Indian rupees and the French 5-franc pieces — is midway between token and standard money. Representative money also bears some analogy to token coinage. (See Money and Seigniorage.) (C. F. B.)

TOKUGAWA, the name of a Japanese family which provided the ruling dynasty of shoguns from 1603 until the revolution which restored the power of the mikado in 1867. The founder of this dynasty was Iyeyasu Tokugawa (1542-1616), a great general and consummate politician, who was connected by descent with the Minamoto clan. The most famous of the subsequent shoguns was his grandson Iyemitsu (from 1623 to 1650. (See Japan: History)

TOKYO (or Tokio, formerly called Yedo), the capital of the empire of Japan, situated in 35 41' N. and 139° 45' E., at the head of the bay of the same name on the south-east coast of the main island. The city stands on the banks of the river Sumida, which, although pretty wide, is unnavigable by vessels ■of large tonnage owing to its shallowness. Yokohama, with which T6ky5 is connected by 18 m. of railway, is practically the port of the capital. Tokyo is. the centre from -which several railways radiate. The trains of the Tokai-do line, starting from

the Shimhashi station, run westwards to Kobe, thence to Shim- onoseki, at the western end of the main island, a distance of 700 m. The Uyeno station is the starting-point for trains to Aomori, a town 460 m. away, at the northern extremity of the island. In 1907 a central station was designed to be built south of the imperial palace.

The climate is mild and healthy, and for the greater part of the year very pleasant, the seasons of spring and autumn being more especially delightful.

The area of Tokyo is about 30 sq. m. Topographically it may be divided into two parts, upland and lowland (Yamanote and Shitamachi). There are hills varying in height from 50 to 130 ft. in the upland district; that is to say, the outskirts of the city from north to west. Lowland T5kyo, that part of the city covering the flats on both sides of the river Sumida, is intersected by a system of canals. The bridges over the Sumida, and those which span the canals, have always been distinctive features of Tokyo. The Nihon-bashi (Bridge of Japan), in the district of the same name, is by far the most famous. It is the point from which all distances in Japan are measured. The largest bridges are those named Azuma, Umaya, Ryogoku, Shin-o and Eitai over the Sumida.

The streets were formerly narrow and irregular, but the principal thoroughfares have been widened under the Street Improvement Act of 1888. Electric tramcars run throughout the city carrying passengers at a uniform rate of 4 sen, which means that it is possible to travel some 10 m. for one penny. The jinrikisha, drawn by one man or sometimes two men, which were formerly the chief means of passenger conveyance, have notably decreased in number since the introduction of the trams. Tokyo has often experienced earthquakes, and more than once has suffered from severe shocks, which have hitherto prevented the erection of very large buildings. The numerous residences of the daimyos were the chief characteristics of the old town, especially in the Kojimachi-ku. Many of these have been de- molished and government offices erected on their sites; others have given place to new streets and houses. Nearly in the centre of Kojimachi-ku, on an eminence, surrounded by moats, stood the castle of Yedo, formerly the residence of the shoguns, which was burnt down in 1873. The imperial palace was subse- quently erected on this site. The palace is half European and half Japanese in its style of architecture. The Niju-bashi is the main entrance. To the east and south of the palace the neigh- bourhood has undergone great changes in modern times. It was here, at the Sakurada Gate, that Ii Kamon-no-Kami, prime minister of the shogun's government, was assassinated by the anti-foreign party in i860. On the site of his residence a little higher up to the right of the gate now stand the war office and the offices of the general staff. In another street, leading from the gate, are the foreign office, the supreme court, the local court and the departments of justice and the navy. The temporary buildings of the Imperial Diet, which first met in 1890, are also in this part of the capital. Adjoining the above-named buildings is the Hibiya Park, modelled on the European style, while retaining the special features of the Japanese gardeners' art. The parks have always afforded to the people their chief means of recreation. The largest and most beautiful are those in Shiba and

Uyeno, formerly the mausolea of the shoguns. In Uyeno, too, are the Imperial Museum, the Imperial Library and the Zoological Gardens. The famous temple of Kwannon, the goddess of mercy, is in the Asakusa Park, in which a per- manent fair is held; it is a great holiday resort of the citizens. In Kudanzaka Park is the Yasukuni Temple, popularly known by the name of Shokonsha, and consecrated to the spirits of departed heroes who fell in war. In the same ground is a museum of arms, containing trophies of the wars with China and Russia.

Administration. — For administrative purposes Toky5 is divided into fifteen districts or Ku, of which Kojimachi, Hongo, Koishikawa, Ushigome, Yotsuya, Akasaka, Azabu and Shiba are situated in the upland portion, while Kanda, Kiobashi, Nihonbashi, Shitaya, Asakusa, Honjo and Fukagawa are in the lowland. Suburban Tokyo is divided into eight districts or Gun, which, with the city proper, collectively form the Tokyo-Fu (prefecture), under the

general control of one governor called Fu-Chiji. Questions affecting the interests of the whole Fu come before the Fu-kwai, or prefectural assembly, made up of representatives from both Ku and Gun, and a prefectural council, of which the governor is president; while matters concerning the city alone are discussed by a Shi-kwai, or municipal assembly, and administered by a municipal council, of which the Shicho or mayor is president. There is a regular water supply worked by the municipality. The reservoir at Yodo- bashi is capable of supplying water (from the river Tama) to all parts at a pressure varying from 80 to 100 ft. Hydrants are fixed in all the streets for the use of the fire brigade, which has a well disciplined and efficient personnel, and does not lack opportuni- ties for the exhibition of its skill in a town built largely of wood. The police force is another well-trained and successful service. Both police and fire brigade are under the command of a single Keishi-sokan (inspector-general). The postal arrangements are very satisfactory, frequent deliveries being made with the utmost de- spatch. The telephone system is

extensive, including long-distance wires to Yokohama, Osaka and other large towns. A complete and successful system of education exists. There are many schools for advanced students devoted to the various branches of science, mechanics and art. The imperial university of Tokyo, which consists of the colleges of law, medicine, literature, science, engineer- ing and agriculture, is the principal institution of learning in the empire. There are several daily newspapers as well as weekly and monthly publications of all kinds. In the lowland part of the city and in the suburbs there are many factories, their number having so much increased in recent years that Tokyo may now be described as an industrial town.

Population. — There are no reliable data as to the population of Yedo during the shogunate. Owing to the influx caused by the periodical visits of the daimyos (feudal lords) with their nu- merous attendants, it probably exceeded ij million during the early part of the 19th century. The population was 857,780 in 1880; 1,207,341 in 1890; 1,339,726 in 1895; 1,497,565 in 1900, and 1,969,833 in 1905.

History. — No mention is made of Tokyo in Japanese history before the end of the 12th century. It appears to have assumed no importance till about 1457, when Ota Dokwan, a general in the service of Uyesugi Sadamasa, governor of Kamakura, built a castle here. About thirty years later the town fell into the hands of Hojo of Odawara, and on his overthrow by Hideyoshi and Iyeyasu, the castle was granted to the latter, who was the founder of the shogun house of Tokugawa. In 1590 Iyeyasu made his formal entry into the castle of Yedo, the extent of which he greatly enlarged. From this date the real importance of Yedo began. The family of the Tokugawas furnished the shoguns (or tycoons) of Japan for nearly three hundred years, and these resided during that period at Yedo. At the restora- tion in 1868 the shogunate was abolished, and the population of Yedo speedily decreased. A fresh vitality was imparted by the transfer of the court from Kioto, and the town then received its present

name Tokyo (eastern capital). (G. U.)

TOLAND, JOHN [christened Janus Junius] (1670–1722), English deist, was born on the 30th of November 1670, near Londonderry, Ireland. Brought up a Roman Catholic, in his sixteenth year he became a zealous Protestant. In 1687 he entered Glasgow University, and in 1690 was created MA. by the university of Edinburgh. He then spent a short time in some Protestant families in England, and with their assistance went to Leiden University, to qualify for the dissenting ministry. He spent about two years studying ecclesiastical history, chiefly under the famous scholar Friedrich Spanheim. He then went to Oxford (1694), where he acquired a reputation for great learning and " little religion," although at the time he professed to be a decided Christian. While at Oxford he began the book which made him famous — his Christianity not Mysterious (1696, anonymous; 2nd ed. in the same year, with his name; 3rd ed., 1702, including an Apology for Mr. Toland). It gave great offence, and several replies were immediately published. The author was prosecuted by the grand jury of Middlesex; and, when he attempted to settle in Dublin at the beginning of 1697, he was denounced from the pulpit and elsewhere. His book having been condemned by the Irish parliament (Sept. 9, 1697) and an order issued for his arrest, Toland fled to England. The resem- blance, both in title and in principles, of his book to Locke's Reason- ableness of Christianity, led to a prompt disavowal on Locke's part of the supposed identity of opinions, and subsequently

to the famous controversy between Stillingfleet and the philo- sopher. Toland's next work of importance was his Life of Milton (1698), in which a reference to " the numerous supposititious pieces under the name of Christ and His apostles and other great persons," provoked the charge that he had called in question the genuineness of the New Testament

writings. Toland re- plied in his Amynior, or a Defence of Milton's Life (1699), to which he added a remarkable list of what are now called apocryphal New Testament writings. In his remarks he really opened up the great question of the history of the canon. The next year his Amyntor and Christianity not M ysterious were under discussion in both houses of Convocation, and the Upper House declined to proceed against the author. In 1701 Toland spent a few weeks at Hanover as secretary to the embassy of the earl of Macclesfield, and was received with favour by the electress Sophia in acknowledgment of his book Anglia Libera, a defence of the Hanoverian succession. On his return from the Conti- nent he published Vindicius Liberius (1702), a defence of him- self and of the bishops for not prosecuting him. In this he apologized for Christianity not Mysterious, as a youthful indis- cretion, and declared his conformity to the doctrines of the established Church. The next year he visited Hanover and Berlin, and was again graciously received by the electress and her daughter Sophia Charlotte, queen of Prussia, the " Serena" of the Letters published on his return to England (1704). In two of these {A Letter to a Gentleman in Holland, and Motion essential to Matter), ostensibly an attack on Spinoza, he antici- pated some of the speculations of modern materialism. The Account of the Courts of Prussia and Hanover (1705) was used by Carlyle in his Life of Frederick the Great. From 1707 to 17 10 Toland lived in varying circumstances on the Continent. In 1709 he published (at the Hague) Adeisidaemon and Origines Judaicae, in which, amongst other things, he maintained that the Jews were originally Egyptians, and that the true Mosaic institutions perished with Moses. After his return to England, he lived chiefly in London and latterly in Putney, subsisting precariously upon the earnings of his pen and the benevo- lence of his patrons. His literary projects were numerous (see Mosheim's Vila); his warm Irish nature appears in his projected history of the ancient Celtic religion and his chivalrous advocacy of the naturalization of the Jews. The last of his theological works were

Nazarenus, or Jewish, Gentile and Mahometan Christianity (1718), and Tetradymus (1720), a collection of essays on various subjects, in the first of which (Hodegus) he set the example, subsequently followed by Reimarus and the rationalistic school in Germany, of interpret- ing the Old Testament miracles by the naturalistic method, maintaining, for instance, that the pillar of cloud and the fire of Exodus was a transported signal-fire. His last and most offen- sive book was his Pantheisticon (1720). He died on the nth of March, 1721-1722, as he had lived, in great poverty, in the midst of his books, with his pen in his hand. Just before his death he composed an epitaph on himself, in which he claimed to have been " Veritatis propugnator, libertatis assertor." The words " Ipse vero aeternum est resurrecturus, at idem f uturus Tolandus nunquam " seem to indicate his adherence to the pantheistic creed expounded in the Pantheisticon.

Toland is generally classed with the deists, but at the time when he wrote Christianity not Mysterious he was decidedly opposed to deism. The design of the work was to show, by an appeal mainly to the tribunal of Scripture, that there are no facts or doctrines of the " Gospel," or the " Scriptures," or " Christian revelation," which, when revealed, are not perfectly plain, intelligible and reasonable, being neither contrary to reason nor incomprehensible to it. It was intended to be the first of three discourses, in the second of which he was to attempt a particular and rational explanation of the reputed mysteries of the gospel, and in the third a demonstra- tion of the verity of Divine revelation against atheists and all enemies of revealed religion. After his Christianity not Mysterious and his Amyntor, Toland's Nazarenus was of chief importance, as calling attention to the right of the Ebionites to a place in the early church though it altogether failed to establish his main argument or to put the question in the true light. His Pantheisticon, sive formula celebrandae sodahtatis socraticae, of which he printed a few

copies for private circulation only, gave great offence as a sort of liturgic

service made up of passages from heathen authors, in imitation of the Church of England liturgy. The title also was in those days alarming, and still more so the mystery which the author threw round the question how far such societies of pantheists actually existed.

See Mosheim's Vindiciae anliquae christianorum disciplinae (1722), _ containing the most exhaustive account of Toland s life and writings; a Life of Poland (1722), by " one of his most intimate friends "; " Memoirs of the Life and Writings of Mr John Toland," by Des Maizeaux, prefixed to Phe Miscellaneous Works of Mr John Poland (London, 1747) ; John Leland's View of the Principal Deistical Writers (last ed. 1837); G. V. Lechler's Geschichte des englischen Deismus (1841); Isaac Disraeli's Calamities of Authors (new ed., 1881) ; article on " The English Freethinkers " in Pheological Review, No. 5 (November, 1864) ; J. Hunt, in Contemporary Review, No. 6, June 1868, and his Religious Phought in England (1870-1873); Leslie Stephen's History of English Phought in the Eighteenth Century, vol. i. (1881), and article in Dictionary of National Biography; J. Cairns's Unbelief in the Eighteenth Century (1881). On Toland's relation to the subsequent Tubingen school, as presented in his Nazarenus, see D. Patrick in Pheological Review, No. 59 (October, 1877); and on his relation to materialism, F. A. Lange's Geschichte des Materialismus (Eng. trans, by E. C. Thomas, 1877), and also G. Berthold, John Poland und der Monismus der Gegenwart (1876).

TOLEDO, a province of central Spain, formed in 1833 from part of New Castile; bounded on the N. by Avila and Madrid, E. by Cuenca, S. by Ciudad Real and W. by Caceres. Pop. (1 900) , 376,814; area 5919 sq. m. The surface is throughout lofty, and in a great part of its extent mountainous. Towards the centre there are extensive plains or tablelands, but the whole of the south and east is occupied by the

Montes de Toledo, and the hills which separate the waters of the Tagus on the north from those of the Guadiana on the south. These mountains are of no great height; until late in the 19th century they were densely covered with forests. Toledo is well watered by the Tagus (q.v.) and its numerous affluents, including the Guadarrama and Alberche on the north and the Algodor, Torcon, Pusa and Sangrera on the south. The Giguela waters the eastern districts. Gold, silver, lead, iron, quicksilver, copper, tin and other minerals have been discovered, but the mining industry does not prosper and there is little export trade in agricultural products. The number of sheep, goats, asses and mules is large; dairy-farming and the breeding of draught oxen and fighting bulls are also practised. Bees and silkworms are kept in considerable number. Manufactures once flourished, but now silk and woollen cloth, earthenware, soap, oil, chocolates, wine, rough spirit (aguardiente), guitar strings and arms are almost the only articles made. There is also a small trade in charcoal and timber. The province is traversed by three lines of railway—that of Madrid-Seville-Cadiz in the east, Madrid-Toledo-Ciudad Real through the centre, and Madrid-Caceres-Lisbon in the north.

TOLEDO, the capital of the Spanish province of Toledo and formerly of the whole kingdom, 47 m. by rail S.S.W. of Madrid, on the river Tagus, 2400 ft. above sea-level. Pop (1900), 23,317. Toledo occupies a rugged promontory of granite, washed on all sides except the north by the Tagus, which here flows swiftly through a deep and precipitous gorge. Towards the north the city overlooks the desolate Castilian plateau; beyond the river it is confronted by an ampitheatre of bare mountains, the Montes de Toledo. From a distance it has the aspect of a vast fortress, built of granite, defended by the river and by a double wall on the north, and dominated by the towers of its cathedral and alcazar. The absence of traffic in its maze of dark and winding alleys creates a silence uncommon in so large a city. There are few plazas, the principal open spaces being the

arcaded Zocodover, described by Cervantes in the Novelas ejemplares; and some of the finest [monuments of antiquity are hemmed in by meaner structures. The houses, tall, massive and sombre, are entered by huge iron-studded doors, and, owing to the extremes of heat and cold characteristic of the Castilian plateau, most of their windows open on a sheltered inner court (patio), the walls facing the street being often blank, though their monotony is sometimes relieved by carved Gothic or Moorish stonework. Nowhere, even in Spain, have the appearance and atmosphere of a Gothic city been

preserved with so little change. Though the Moslems have left their imprint upon its architecture, and though many ancient buildings were destroyed after the Christian reconquest to make room for churches, convents and seminaries, Toledo as a whole remains as distinctively Gothic and medieval as Granada is Moorish, Madrid Castilian or Barcelona modern. It has also been from the earliest times the centre of Spanish Christianity, and its archbishop is styled ex officio " primate of all the Spains."

Principal Buildings. — The Tagus is spanned by two fortified Moorish bridges, the Puente de Alcantara, on the north-east, which was rebuilt in the 13th and 17th centuries, and the Puente de San Martin, or. the north-west, founded in 1212 and rebuilt in 1390. The inner wall of the city is said to have been founded in the 7th century by the Visigothic King Wamba; much of its masonry is Moorish. Alphonso VI. of Castile added the outer wall in 1109. To the same period belongs the Mudejar Puerta del Sol, the finest of several ancient gateways, among which the Puerta Visagra (1550, restored 1575). an d the Puerta del Cambron (1102, restored 1576) are also interesting. The Puerta Visagra Antigua, a Moorish gateway of the 9th century, has been walled up, but its original form is preserved. The Alcazar, a huge square building with a tower at each corner and a

fine arcaded patio, stands on the highest ground in Toledo, originally the site of a Roman fort. Built as a citadel by King Wamba and used as such by the Moors, it was converted into a palace by St Ferdinand (1200–1252) and was enlarged in the 15th and 16th centuries by Ferdinand and Isabella, Charles V. and Philip II. During the war of the Spanish Succession it was burned down (1710), but Cardinal Lorenzana restored it in 1775. After the French had burned it a second time in 1810, it was again rebuilt and in 1882 became a military academy. In 1887 a third fire was followed by a third restoration. Despite these successive disasters, part of the 15th and 16th century palace has been preserved, including a fine facade designed by Juan de Herrera, a gateway by Alonso de Covarrtibias and a staircase by Herrera and Francisco de Villalpando. The Ayuntamiento, or City Hall, is a 15th-century building with 17th-century alterations by Domenico Theotocopuli (el Greco). Some fine Moorish work is preserved in the Salon de Mesa (r. 1450) ; in the Taller del Moro, which dates in part from the 14th century and was long the workshop {taller) of masons employed in repairing the cathedral ; and in the palace of the counts of Fuen- salida.

More important architecturally than any of these secular buildings are the churches of Toledo, and especially its magnificent Gothic cathedral (for illustration see Architecture). The cathedral occupies the site of a Visigothic church, which an inscription pre- served in the cloister shows to have been dedicated to the Virgin by King Reccared, on the 12th of April 589. If the event thus commemorated were a reconsecration — and it was in 589 that Reccared was converted from Arianism to orthodoxy — the church may well have been the cathedral of Eugenius, Eladius, Ildefonso and Julian, the four Toledan bishops who were canonized, and the first of whom is said to have been a disciple of St Paul. From 712 until 1227 the Visigothic church was used by the Moors as their principal mosque. It was then razed by St Ferdinand, who founded the present cathedral in August 1227.

The completion of the main fabric was delayed until 1493, while many of the chapels and other subordinate buildings were added even later; thus Renaissance and baroque features have been introduced into a design which was originally Gothic of the 13th century. Though sacked by the Comuneros in 1521 and by the French in 1808, the cathedral is still one of the richest and most splendid foundations in the Peninsula. The exterior is masked by adjacent buildings, its most impressive part being the western facade, flanked by two towers, of which one is unfinished while the other rises to a height of 295 ft. The interior is somewhat dwarfed in appearance by its immense width. It is 395 ft. long by 178 ft. broad, and is divided by 84 pillars into five naves, with central lantern and choir, and a complete series of side chapels. Most of the chapels date from the 15th and 16th centuries, and are very magnificent in detail. The superb stained-glass windows, chiefly of Flemish work, belong to the same period and number 750. The choir-stalls, placed in alabaster recesses divided by columns of red jasper and white marble, are among the finest extant examples of late medieval and Renaissance wood-carving, though rivalled by the retablo, which rises behind the high altar to the roof. The treasury, reliquaries and library, notwithstanding their repeated despoilings, contain many priceless MSS. and works of art, including the custodia executed by Enrique de Arfe in 1524, which is nearly 10 ft. high and is adorned with 260 silver-gilt statuettes. In it is a monstrance, said to have been wrought from the first gold brought home by Columbus. There are paintings by many masters, including Goya, El Greco, Titian and Rubens. In the Mozarabic chapel mass and other offices are still performed daily according to the Mozarabic liturgy, which was also used in six of the parish churches until the middle of the 19th century. (See Mozarab.) Within the precincts of the cathedral are interred the archbishops and cardinals Tenorio, Fonseca, Mendoza, Ximenez,

the great constable Alvaro de Luna and a long array

of kings and heroes. In the principal tower is hung the campana gorda, a bell weighing nearly two tons and said to be audible as far as Madrid. A huge wooden rattle [matraca) is used to summon worshippers between Maundy Thursday and the Saturday before Easter.

Apart from the cathedral, many of the other churches are of great interest and beauty. The Franciscan convent and church of San Juan de los Reyes (florid Gothic) were founded in 1476 by Ferdinand and Isabella, who intended the church to be their own burial-place; but after the erection of a royal mausoleum in Granada the fabric remained incomplete until the 17th century. El Cristo de la Luz was originally a mosque, built in 922 and incorporating some pillars from an older Visigothic church. Santo Tome, also a mosque, was reconstructed in the Gothic style during the 14th century. El Cristo de la Vega, formerly known as the Basilica de Santa Leocadia, occupies the site of a Visigothic church built in the 4th century to mark the burial-place of the saint, whose reputed remains, like those of St Eugenius, are enshrined in the cathedral — here several church councils were held, but the original church was destroyed by the Moors and the present building dates principally from 1816. The Mudejar Santa Maria la Blanca became successively a synagogue, in the 13th and 14th centuries, a church (1405), an asylum for women (1550), barracks (1791-1798) and again a church. El Transito, a Mudejar synagogue (c 1365) was occupied by the knights of Cala- trava in 1492, and was afterwards dedicated to the Passing (Transito) of the Virgin. Its inner walls are adorned with Moorish arabesques. It was restored after the ceiling, of cedar inlaid with ivory, had fallen in 1903. Santiago del Arrabal dates from the 1 ith century and has a Moorish tower. Some admirable Renaissance sculpture is preserved in the court and staircase of the former hospital of Santa Cruz (1494-1514), which was restored in 1906, to be used as a provincial library and museum. The Hospital de San Juan Bautista, outside the walls, was founded in 1541.

Toledo was the seat of a university from 1498 to 1845, and is still an important educational centre, having numerous elementary schools, a military academy and a provincial institute; it also contains the provincial court of justice and several modern hospitals. Its characteristic industry is the manufacture of swords, carried on by private firms and especially in the royal factory (1788), which, like the railway station, is about 1 m. from the city. Toledan blades have been famous for 2000 years, the culter toletanus being men- tioned in the Cynegetica of Grattius (Faliscus), during the 1st century B.C. The industry throve under the Moors and especially during the 16th century; it is now practised on a smaller scale, but the blades produced are still remarkable for flexibility and strength.

History. — Toledo is of immemorial antiquity; Spanish legend variously ascribes its foundation to Hercules, to Tubal, the grand- son of Noah, to " Iberia, daughter of Hispanus," and to Jews who, having been exiled by Nebuchadrezzar, settled here, naming their city Toledoth, the " city of generation." It was a stronghold of the Carpetani and may have been a Carthaginian trading-station. Livy (xxv. 7) mentions Toletum as urbs parva, sed loco munila, which was captured by the Romans in 193 B.C. Under Roman rule it became a colonia and the capital of Carpetania. Various fragmentary remains have been preserved, including parts of an aqueduct, of a circus, which seems never to have been completed, and of a temple (the so-called Cave of Hercules). Toletum was never captured by the Vandals. Its ecclesiastical importance is coeval with the introduction of Christianity into Spain; numerous church councils (see below) were held here, notably in 396, 400 and 589, and here was the chief battle-ground in the long political and religious struggle which ended (589) in the triumph of Spanish Catholicism over Arianism. From the reign of Athanagild (534-547) until the Moorish conquest in 712, Toletum was generally regarded as the capital of Visigothic Spain. The Moorish chroniclers grow

eloquent over the treasures captured by Musa and his army in 712; these are said to have included the "Table of Solomon," carved from a single flawless emerald, and a copy of the Psalms, written upon gold with ink made from melted rubies. Tolaitola, as the city was now called, prospered under the Moors, first as a provincial capital in the caliphate of Cordova, governed by an emir (712–1035), afterwards as an independent state (1035–1085). Its rulers protected the large Jewish colony, founded extensive silk and woollen industries, and made their city an important centre of Arab and Hebrew culture, one of the great names associated with it being that of Rabbi ben Ezra (1119–1174). The Spanish and Jewish inhabitants adopted the language and many customs of their conquerors, becoming "Mozarabs," but retaining their own creeds. In 1085 Alphonso VI. of Leon and Castile captured Toledo, aided by the Cid, and in 1087 made it his capital. For

a time the Castilians emulated the tolerance of the Moors, but the Jews were expelled in 1492 and the Arabic language was forbidden (except in church services) in 1580. Before this the archbishops of Toledo had become almost independent of any secular power; they possessed enormous wealth and some of them, such as the Cardinal Jimenez de Cisneros, directed the policy and even led the armies of all Spain. In 1521 Toledo was the centre of the revolt of the Comuneros (see Spain: History); its commercial and political decline dates from 1560, when Philip II. chose Madrid as his capital. The city was the home of Lope de Vega (1 562–1635) and forms the scene of several of his dramas. It suffered severely during the Peninsular War, being several times occupied by the French in 1808–1812.

See J. Ibanez Marin, Recuerdos de Toledo (Madrid, 1893); H. Lynch, Toledo (London, 1898) ; A. F. Calvert, Toledo (London, 1907).

TOLEDO, a city and port of entry, the county-seat of Lucas county, Ohio, U.S.A., on both banks of the Maumee river, about 4 m. from Maumee Bay, Lake Erie, and about 95 m. W. of Cleveland. Pop. (1900), r3i,822, of whom 1710 were negroes, and 27,822 were foreign-born, including 12,373 Germans, 2449 English Canadians, and 1636 English; (1910 census) 168,497. Area, 28-57 sq. m. Toledo is served by the Ann Arbor, the Cincinnati, Hamilton & Dayton, the Cleveland, Cincinnati, Chicago & St Louis, the Detroit, Toledo & Milwaukee, the Detroit & Toledo Shore Line, the Hocking Valley, the Lake Shore & Michigan Southern, the Michigan Central, the Pennsylvania, the Pere Marquette, the Toledo, St Louis & Western, the Wabash, and the Wheeling & Lake Erie railways, by a belt line " (30 m. long), the Toledo Railway & Terminal Company, by ten interurban electric railways (about 585 m.), and by the Wabash & Erie and the Miami & Erie canals. A channel 400 ft. wide and 21 ft. deep admits the largest vessels from Lake Erie to the city. Six passenger and freight steamship lines communi- cate with Cleveland, Buffalo, Sandusky, Detroit, Port Huron, Alpena, Mackinac, Georgian Bay and other points on the Great Lakes, and the city has 25 m. of docks. The city park system includes Ottawa Park (280 acres), Bay View Park (202 acres), Riverside Park (118 acres), Central Grove Park (100 acres), Collins Park (90 acres), Walbridge Park (67 acres), with a zoo- logical collection, Navarre Park (53 acres), several smaller parks and triangles, and a boulevard, 18 m. long (incomplete in 19 10), connecting the parks. Noteworthy public buildings are the County Court-house, the Public Library (about 85,000 volumes in 1 9 10), the Soldiers' Memorial Building, the Toledo Club and the Toledo Museum of Art (1901). The city is the seat of Toledo L T niversity, including Toledo Medical College (r88o), which is affiliated, for clinical purposes, with the Toledo Hospital (1876). There are numerous hospitals and charities.

Toledo is the port of entry for the Miami customs district and is an important shipping point for the

iron and copper ores and lumber from the Lake Superior and Michigan regions, for petroleum, coal, fruit, and grain and clover-seed. In 1909 the imports of the port were valued at $642,286 and the exports at $600,794. The capital invested in manufacturing under the factory system in 1905 was $38,643,390 (62-4 % more than that of 1900). The value of the factory products in 1905 was $44,823,004 (40-2 % more than in 1900). Foundry and machine-shop products ($4,087,497) were the most valuable manufactures in 1905. In flour and grist mill products (value in 1905, $3,676,290) Toledo is the most important city of the state. Other important manufactures in 1905 were petroleum products ($2,006,484) ; lumber and planing mill products ($1,604,274); women's clothing ($1,477,648); children's carriages and sleds ($1,465,599); car-shop construction and repairs, by steam railway companies ($1,366,506); carriages and wagons ($1,225,387); structural iron work ($1,102,035); agricultural implements, bicycles, automobiles (a recent and growing industry), plate and cut-glass (made largely from a fine quality of sand found near the city), tobacco, spices and malted liquors. The building of boats, and of large vessels is also an important industry. At Rossford (pop. about 400), a suburb, is the large plant of the Ford plate-glass works. The water supply is derived from the Maumee river and is filtered by a municipal filtration plant.

The administration of the city became famous after 1897 when Samuel Milton Jones (1846-1904), a manufacturer of oil machinery, was elected mayor by the Republican party ; he was re-elected on a non-partisan ticket in 1899, 1901 and 1903, and introduced business methods into the city government. His honesty and sincerity in

business and politics gained him the nickname "Golden Rule" Jones. The independent movement which he started was carried on under Brand Whitlock (b. 1869), a lawyer and writer who was mayor of Toledo in 1906-1911. The city council has 16 members, three elected at large and the others by wards, and there

are boards of public service, public safety, public health and education.

The site of Toledo lies within an immense tract of land, constituting sixteen reservations, acquired by the United States government from several Indian tribes in 1795, and a stockade fort, called Fort Industry, was built here about 1800. In 1817 two companies bought from the government a portion of the tract, at the mouth of Swan Creek, including most of the land now occupied by Toledo. Upon the tract farthest up-stream the town of Port Lawrence was laid out (in 1817). In 1832 a rival company laid out the town of Vistula on the tract immedi- ately below Port Lawrence, in the following year these towns were united and were named Toledo, and in 1837 the city was incorporated. The " Toledo War " was a dispute over the boundary between Ohio and Michigan. When Ohio Territory was organized in 1800 its northern boundary was described as a line drawn from the southern extremity of Lake Michigan due east to the Pennsylvania line, and the official map of the time placed the southern end of Lake Michigan at 42 20' N. lat. The state constitution adopted in 1802 followed the enabling act in accepting this line, but made the proviso that if it should not intersect Lake Erie east of the mouth of the Miami river, then the northern boundary should be a line from the southern end of Lake Michigan to the most northern cape of Maumee Bay and thence to the Territorial line, and to the Pennsylvania line. In 1805 the Territory of Michigan was organized with a southern boundary in accordance with the line extending due east from the southern end of Lake Michigan; and therefore there was in dispute a strip of land, about 5 m. wide at its western end and about 8 m. wide at its eastern end, a rich agricultural region, stretching, across portions of what are now Lucas, Fulton and Williams counties, and including all of what are now Ashtabula and Lake counties, and portions of Geauga and Cuyahoga counties, in Ohio. Within the belt lay what is now Toledo, and its great importance as a lake port was even then clearly recognized. On the 29th of January r8i8 the

Ohio legislature accepted the " Harris line " (surveyed in 181 7 in accordance with the proviso of the state constitution) as the northern boundary of the state. Acting on the recommendation of Governor Robert Lucas ^781-1853), on the 23rd of February 1835 the Ohio legislature passed an Act extending the northern boundaries of what were then Wood, Henry and Williams counties (lying partly within the disputed strip) north to the Harris line, and providing for the organization of new townships within this added territory, and_ for the appointment of three commissioners to re-mark the line. Upon the appointment (March 9, 1835) by Governor Lucas of the three commissioners to re-mark the Harris line, Governor Stevens T. Mason of Michigan ordered out a division of Michigan militia, which near the end of March entered and took possession of Toledo. A division of Ohio militia marched to Perrysburg, on the Maumee river, about 10 m. south of Toledo; but both militias disbanded when Richard Rush, of Philadelphia, and Benjamin C. Howard, of Baltimore, appeared at Toledo as peace emissaries, appointed by President Jackson. In April several members of the party accompanying the Ohio commissioners were arrested by Michigan militia. In June the Ohio legislature created Lucas county, mostly from the disputed territory, and made Toledo its county-seat. President Jackson now urged Michigan to discontinue interfering with the re-marking of the Harris line, and requested Ohio to postpone putting into effect the Act of February 1835; but as petty outbreaks continued throughout the summer and an Ohio judge and court officers at Toledo were arrested in September, he peremptorily removed Governor Mason from office. In June 1836 Congress decided the dispute in favour of Ohio, and in 1837 Michigan was admitted to the Union as a state upon condition of relinquishing all claim to the disputed territory, but received what is now known as the Upper Peninsula (the land between Lakes Superior, Huron and Michigan).

TOLEDO, COUNCILS OF {Concilia toletana). From the 5th to the 16th century about thirty synods, variously counted, were held at Toledo in Spain. The earliest, directed against Priscil- lianism, assembled in 400. The " third " synod of 589 marked the epoch-making conversion of King Reccared from Arianism to Roman Catholicism. The " fourth," in 633, probably under the presidency of the noted Isidore of Seville, regulated many matters of discipline, decreed uniformity of liturgy throughout the kingdom and took stringent measures against baptized Jews who had relapsed into their former faith. The " twelfth " council in 681 assured to the archbishop of Toledo the primacy of Spain. As nearly one hundred early canons of Toledo found a place in the Decrelum Gratiani, they exerted an important influence on the development of ecclesiastical law. The synod of 1 565 and 1 566 concerned itself with the execution of the decrees of Trent; and the last council of Toledo, that of 1582 and 1583, was so guided in detail by Philip II. that the pope ordered the name of the royal commissioner to be expunged from the acts.

See Cananes apostolorum it conciliorum saeculorum, tv., v., vi., vii., rec. H. T. Bruns, pars prior (Berlin, 1839), critical text of seventeen councils of Toledo (a.d. 400-694) ; P. B. Gams, Die Kirchengeschichte von Spanien (Regensburg, 1862-1879); E. H. Landon, A Manual of the Councils of the Holy Catholic Church, revised ed. (London, 1893), 151-169. These two summarize the chief canons. Neher, in Wetzer and Welte's Kirchenlexicon (1855-1857), vol. xi. (2nd ed. Freiburg, 1899), gives a list of 29 synods. (W. W. R.*)

TOLENTINO (anc. Tolentinum Picenum), a town of the Marches, Italy, in the province of Macerata, n m. by rail W. by S. oi that town. Pop. (1901), 5111 (town), 13,197 (commune). It is situated on the Chienti, 735 ft. above sea-level, and was once a fortified town of great strength. The cathedral has a fine portal by the Florentine Giovanni Rosso (1435), and contains the remains of S Nicholas of Tolentino (d. 1309), whose Renaissance tomb and

frescoes illustrating the life of the saint by Lorenzo and Jacopo da San Severino are preserved in a room adjoining the chapel north of the high altar. The church of San Catervo contains the early Christian sarcophagus of that saint, which is embellished with curious reliefs. The Museo Civico contains antiquities discovered during excavations near the town (in 1880–1884) in the Picene necropolis, dating from the 8th–4th centuries B.C. The town is the birthplace of the condottiere Niccolo Mauruzzi, and of the learned Francis Philelphus, one of the first disseminators of classical literature, who was born in 1398. At Tolentino the treaty was made between Bonaparte and the pope in 1797, by which the pope ceded Avignon; and here in 1815 a battle was fought in which the French under Murat were defeated by the Austrians.

TOLERATION (from Lat. tolerare, to endure), the allowance of freedom of action or judgment to other people, the patient and unprejudiced endurance of dissent from one's own or the generally received course or view.

TOLFA, a town of the province of Rome, Italy, 10 m. E.N.E. of Civitavecchia by road, 1558 ft. above sea-level. Pop. (1901), 3956. It is the chief place in the Tolfa Mountains, an extinct volcanic group between Civitavecchia and the Lake of Bracciano. Vapours are emitted which deposit sulphur and alum, and some mining is carried on. The output of alum averages 4000 to 5000 tons a year, and is mostly exported from Civitavecchia.

TOLL, JOHAN KRISTOFFER, Count (1743–1817), Swedish statesman and soldier, was born at Mollerod in Scania. Toll came of a very ancient family, of Dutch origin, which can be traced back to the 13th, but migrated to the Baltic provinces in the 16th century. Toll's father was one of Charles XII. 's warriors, his mother a descendant of the aristocratic Gyel- lenstjernas. In his youth Johan Kristoffer served in the Seven Years' War, and then, exchanging the military for the civil service, became head ranger of the county of Kristianstad.

During the riksdag of 1771–1772 the dominant "Caps" deprived him of his post, and Toll, shrewdly guessing that the king was preparing a revolution, almost forced his services on the con- spirators, Goran Magnus Sprengtporten (q.v.) declaring that a man who knew so much of their most secret plans must either

" be killed or squared." To Toll was assigned by far the most difficult part of the enterprise. It was his business to secure the important southern fortress of Kristianstad. Two days after the coronation, on the 31st of May 1772, he set forth from Stockholm with twenty-two pounds wherewith to corrupt a garrison and revolt a province. He had no sort of credentials, and the little that was known about him locally from the official point of view was not to his credit. Finally, in the fortress itself there was but one man known to be a safe royalist, namely, Captain Abraham Hellichius. On the 21st of June Toll reached Kristianstad. By sheer bluff Toll first won over Hellichius, and, six weeks later (August 12), the whole garrison of Kristian- stad, arresting the few officers who proved recalcitrant; taking possession of the records and military chest, and closing the gates in the face of the " Cap " high commissioner who had been warned by the English minister, John Gooderich, that some- thing was afoot in the south. Seven days later Gustavus III.'s coup d'etat at Stockholm completed the revolution. Toll was liberally rewarded and more and more frequently employed as his genius as an administrator and his blameless integrity came to light. His reforms in the commissariat department were epoch-making, and the superior mobility of the Swedish forces under Gustavus III. was due entirely to his initiative. But it was upon Toll's boundless audacity that Gustavus chiefly relied. Thus as Gustavus, under the pressure of circumstances, inclined more and more towards absolutism, it was upon Toll that he principally leant. In 1783 Toll was placed at the head of the secret " Commission of National Defence " which ruled Sweden during the king's absence abroad without the privity of the

senate. It was he who persuaded the king to summon the riksdag of 1786, which, however, he failed to control, and in all Gustavus's plans for forcing on a war with Russia Toll was initiated from the first. In 1786 he had already risen to the rank of major-general and was Gustavus's principal adjutant. It was against Toll's advice, however, that Gustavus, in 1788, began the war with Russia. Toll had always insisted that, in such a contingency, Sweden should be militarily as well as diplomatically prepared, but this was far from being the case. Nevertheless, when the inevitable first disasters happened, Toll was, most unjustly, made a scapegoat, but the later suc- cesses of the war were largely due to his care and diligence as commissary-general. After the death of Gustavus III. Toll was for a short time war minister and commander-in-chief in Scania and, subsequently, was sent as ambassador to Warsaw. Unjustly involved in the so-called " Armfelt conspiracy," he was condemned to two years' imprisonment; but was fully reinstated when in 1796 Gustavus IV. attained his majority. At the riksdag of Norrkoping, 1800, he was elected marshal of the Diet, and led the royalist party with consummate ability. On this occasion he forced the mutinous riddarhus to accept the detested " Act of Union and Security" by threatening to reveal the names of all the persons suspected of complicity in the murder of the late king. Subsequently he displayed great diplomatic adroitness in his negotiations with the powers concerning Sweden's participation in the war against Napoleon. In the Pomeranian campaign of 1807 Toll assisted in the defence of Stralsund. The fortress was compelled to surrender on the 20th of August by Marshal Brune, whereupon the Swedish army of 13,000 men, which had retired to Riigen, seemed irre- trievably lost. It was saved by Toll, who cajoled the French marshal into a convention whereby the Swedish army, with all its munitions of war, was permitted to return unmolested to Sweden (September 7). For this exploit Toll received his marshal's baton. It was in the camp of Toll, then acting commander-in-chief in Scania, that Gustavus IV. was about to take refuge when the western army rebelled

against him, but he was arrested in the capital before he could do so. Toll retained his high position under Bernadotte, who, in 1814, created him a count. He died unmarried.

See R.Nisbet Bain, Gustavus III. and his Contemporaries (London, 1895) ; K. N. Liliekrona, Fdltmarskalken Grefve J. K. Toll (Stockholm, 1849–1850). (R. N. B.)

TOLL (etymologically, that which is numbered or counted; from a common Teutonic form, cf. " tale," " tell "), a sum of money paid for : the use and enjoyment of a privilege or advan- tage. In England it is now usually a sum of money ; but formerly tolls in kind were frequent. Among the sins of the Miller in Chaucer's Prologue is that he could " tollen thryes," in that he was clever enough and rogue enough to subtract thrice the legal allowance from the corn he ground. In a note to the Heart of Midlothian, Scott asserts that the name of Lockman given in Old Scots to the hangman was because he was entitled to take a lock or fixed toll out of every boll of meal exposed in the market for sale. An act of 1796 for the regulation of mills, substituting a money payment for tolls of corn in kind taken by millers, makes an exception for tolls taken by custom in soke mills. The Weights and Measures Act 1878 enacts that all tolls are to be charged and collected according to imperial weights and measures.

The word " toll " in early times had various meanings, thus it is denned by Glanville as the liberty of buying and selling in one's own land : " tol, quod nos vocamus theloneum, scilicet libertatem emendi et vendendi in terra sua. It also signified the right to be free of toll, but this implies a more general signification of the term, the right to take and the thing so taken. It formed the most obvious source of revenue in the early English

boroughs; goods coming to market or passing through the borough paid toll, to this extent the practice still exists in various European countries under the name of octroi (q.v.). Private lords also levied tolls, but these in no case were levied theoretically at pleasure, all ultimately depending upon some real or feigned grant from the Crown. Imposts by the Crown are more properly taxes, though the name was frequently used, as in maletote, an arbitrary and vexatious impost levied till Edward III.'s time, usually on wool. Such payments might bring freedom from other exactions. We learn from Domesday Book that the men of Dover who paid the king's dues there were quit of toll throughout all England. Many subsequent charters granted the like, or even greater immunities from toll to favoured folk. In modern English law toll is either an incident of a franchise, as of a market or fair, or is independent ot franchise. In the latter case it is claimed by prescription, as toll traverse or toll thorough, or is created by act of parliament, as in the case of turnpikes, railways, harbours, navigable rivers and canals. Toll traverse is paid for passing over a private way, bridge or ferry. No consideration need be proved. Toll thorough is paid for the use of a highway. In this case, if charged by a private person, some consideration, such as repair of the highway, must be shown, as such a toll is against common right. At common law a toll must be reasonable. The same principle appears in various acts of parliament. The Statute of Westminster the First inflicts a penalty for taking excessive toll. The Railway Clauses Act 1845 provides for the equality of tolls, that is, that all persons and classes of goods shall in like circumstances be treated alike as to charges. A right of distress is incident to the right to toll, but the distress cannot be sold unless an act of parliament expressly authorizes the sale. Tolls are not rateable, unless they are appurtenant to land. Exemption from tolls may be claimed by the prerogative, by grant or prescription, or by act of parliament. The king and queen consort pay no toll, and the Crown may grant to another exemption from toll. Turnpike tolls,

bridge money and causeway mail were abolished in Scotland by the Roads and Bridges Act 1878 as from the 1st of June 1883. In England tolls on roads and bridges are now only payable in a few places.

In the United States tolls are a subject for state legislation, unless they affect the whole commonwealth, when they are dealt with by acts of congress. A city may levy reasonable tolls in a market established by itself. A shunpike, or road constructed to facilitate evasion of tolls on a turnpike road, may be closed by injunction.

The question of tolls was at one time an important one in inter- national law. Tolls were exacted on certain straits and tidal rivers by virtue of the sovereignty of a particular state. Notable instances were the Scheldt tolls and the Sound dues levied by Denmark. These last were justified as a return for the lights maintained on the coast and the terror to pirates inspired by the castle of Elsinore. In 1659, owing to the united efforts of England, France and Holland, an unvarying rate was arranged.

See Pollock and Maitland, History of English Law (1895); Pease and Chitty, Markets and Fairs (1899); Cunningham, Growth of English Industry and Commerce (1903).

TOLLEMACHE (or Tai.mash), THOMAS (c. 1651-1694), British soldier, was the second son of Sir Lionel Tollemache, Bart. (d. 1668), of Helmingham, Suffolk, although an idle report of the time made his mother, Elizabeth Murray (d. 1698), after- wards countess of Dysart and duchess of Lauderdale, the mistress of Oliver Cromwell. In 1678 he became captain in the Guards, with which he served in Tangier, and in 1685 he was made

lieutenant-colonel of a regiment of fusiliers, but almost at once he gave up his commission because he disliked the proceedings of James II., and became colonel of an Anglo-Dutch regiment, usually stationed in Holland. At the head of his men he landed in England with William of Orange in 1688 and

was made governor of Portsmouth and colonel of the Coldstream Guards, while in 1689 he was chosen an English member of parliament. With the Coldstreams he served William III. at the battle of Walcourt, and then as a major-general in Ireland, where in 1 69 1 he gained fame at the battle of Aughrim and at the sieges of Athlone, Galway and Limerick. He then went to the Nether- lands and added to his high reputation by his conduct at the battles of Steenkirk and Neerwinden. In 1694 Talmash, as he was generally called, proposed an expedition against Brest, the leadership of which was given to him. The fortifications, however, were too strong, and although he led on the English troops with great gallantry they were beaten off with heavy loss. Talmash himself was wounded, and returning to Plymouth he died there on the 12th of June 1694. He was buried in Helming- ham church, where a long inscription summarizes his life.

TOLSTOY, LEO (1828-1910), Russian novelist and social reformer, was born on the 9th of September (August 28) 1828, in the home of his fathers — Yasnaya Polyana, near Toula — a large country house (not the present one) built in a severely formal style, with Doric pillars and architraves, standing solitarily in a typical Russian landscape. The Tolstoy family, to whom it had belonged for several generations, was originally of German extraction, and had settled in Russia in the days of Peter the Great. The first ancestor of distinction was Petr Andreevich Tolstoy (q.v.). His descendant Nicholas (the father of the great author) was born in 1797. After serving for a short time in the army he retired in 1824, and led the life of a Russian boyar. By his marriage with the princess Maria Volkonsky, Count Nicholas in a great measure rebuilt the family, fortunes, which had fallen into decay during the two previous decades. Count Leo Tolstoy was the youngest but one of the five children of this marriage, and lost his mother when he was barely three years old. Six years later his father died also, at the age of forty-one. As a child, Tolstoy, though observant and thoughtful, showed no

marked talent. He was plain and very sensitive on the point, suffering keenly for want of notice and affection. This sensitiveness led him as he grew older to hide himself away from his playmates and spend hours in lonely brooding. He describes in Childhood how, one day, it dawned suddenly upon his mind that Death was ever lying in wait, and that to be c … db happy one must enjoy the present, unconcerned with '■

the future. Whereupon the youthful Epicurean flung aside his books and pencils, and, stretched on his bed, fell to munching sweetmeats and reading romances. But Tolstoy's childhood was not without its share of wholesome pleasure. Hunting and shooting, the delight of the Russian noble, occupied much of his father's leisure, and from his earliest years the boy was wont to accompany his parent. At other times he was quite happy sitting beside his father's coachman on an expedition to one of the neighbouring towns, or with his brothers running in and out of the stables and coach-houses. The tedium of the schoolroom and the reproofs of his tutor made a reverse side to the picture, but did not prevent this fund of early memories from being, as he writes, " ever to be treasured, and fondled again and again, serving as a well-spring from which to draw my choicest treasures." After his father's death at Moscow, in 1837, Tolstoy and his brothers were placed under the guardian- ship of his aunt, the countess Osten-Sacken, and in the care of Mme Ergolskaya, a distant relative. The former died, however, in 1840, and the charge devolved on another aunt, Mme Jushkov, who lived in Kazan. Mme Jushkov was a typical Russian lady of her class. Keeping open house, fond of gaiety and society, her ideas on moral questions were liberal in the extreme. Tolstoy was eleven years old when he became subject to her influence — an influence which he subsequently regarded as having been the reverse of beneficial. A French tutor was engaged for him and his brothers, prior

At College.

to their entrance into the university of Kazan. Outside the hours of study Tolstoy spent his days either in solitary rambles, during which he reflected on the problems of life, or in violent exercise at the gymnasium (the only form of athletics enjoyed by boys of his position in Russia). Thus the physical and philosophical impulses of his nature were developed in equal measure, and these two conflicting forces began their lifelong duel. Only in later years has the philosopher sometimes seemed to outweigh the man of action in Tolstoy's vigorous personality.

In 1843, at the age of fifteen, he entered the university of Kazan, and gained with his college cap and uniform what he prized most, his independence. The lax rule of the university — which was of no high scholastic repute, giving ready admittance to the sons of the rich and noble — enabled him at the same time to enter the world of society and study its complex problems at leisure. Kazan was in those days a real paradise for such as sought happiness in social excitement, dining and dancing. No city in Russia was so given up to the pursuit of pleasure. Among these scenes of luxury and licence the students played a prominent part. Amid such influences the boy soon ripened into the man. The constant succession of balls, picnics and parties wearied and disgusted him. The pages of Youth are eloquent of deadly ennui. He is for ever seeking " Her," engaged in an undefined " pursuit of the Well-beloved," with a half spiritual, half physical longing. At intervals in this quest of the unknown he devoured the novelists of his day, chiefly Dumas and Eugene Sue. He already thought deeply on the object of existence; forming new ideals, aspiring to noble deeds, seeing himself in imagination now a passionate lover, now a leader of men. He was always trying to be original, and to tread unbeaten tracks. Partly in consequence of this feeling, he determined to enter the school of Eastern languages. His first

attempt was unsuccessful, but finally passing in through the medium of a supplemental examination, he took up Arabic and Turkish. These studies, however, proved uncongenial to his versatile nature, and failing to distinguish himself in them, he turned his attention in 1845 to the school of law. Here he met with equal discouragement. The professors — all Ger- mans, and many of them not knowing enough Russian to make themselves understood — were favourite butts for the students' wit. There was practically no serious teaching, nor any per- sonal interest shown in the pupils. Tolstoy's evil genius had once more cast him in stony places and left him to work out his own salvation. History, religion and law now claimed his attention in his final efforts to gain the university diploma. In religion his opinions had undergone a great change. From the child's unthinking acquiescence in a hereditary faith had sprung absolute unbelief. History he held a useless form of knowledge. " Of what avail," he said, " to know what happened a thousand years ago ? " Hence he neglected the lectures on these subjects, absented himself from the examinations, was confined in the university gaol for irregular attendance, and ended by coming out but moderately well in the yearly ex- amination. The conviction that he was wasting his time forced itself upon him. An idle, dissipated life had told upon his health, and early in 1847 Tolstoy asked permission to go down, " on account of ill health and private reasons." Thus ended his college life, which from an educational point of view he had treated as a jest. Somewhat of an enigma as he was to his companions, with his alternate fits of feverish gaiety and melan- choly abstraction, aristocratic hauteur and liberal views, there was yet found a little band of students to accompany him on the first stage of his journey homewards. While probably admiring the original bent of his mind, they little dreamed their late comrade would one day be acclaimed as Russia's greatest thinker and novelist.

Tolstoy went back to his estates with fresh hope and energy, determined to ameliorate the condition of

his peasantry and fulfil The the duties of a landlord. Rumours had reached

Youthful him at Kazan from time to time of the recurring Reformer. f ammeS) revolts and miseries of the serfs. In 1847, as often before, the crops failed to suffice for the needs of the

starving people, and whole districts set forth to petition the tsar for food. Here was a vital problem requiring prompt solution. In the course of desultory reading at the university he had studied the writings of Jean Jacques Rousseau, and the Frenchman's plea for Nature, honest work and simplicity of life, had impressed him greatly. Fired with enthusiasm, he now entered heart and soul on the task of realizing this ideal. Unfortunately, he was as yet without sufficient moral stamina to withstand recurring disappointments and to combat the suspicions of the serfs. The youthful reformer lacked the patience necessary to deal with the deep-rooted mistrust engendered by years of oppression and neglect. After six months of struggle with this discouraging state of things he temporarily gave up the attempt, and we find him in St Petersburg taking up for a time the broken threads of his education. But with the restlessness of transition strong upon him he soon returned to country life, and in company with his brother Sergius gave himself up to hunting, gambling, carousing with Zigani dancers, and throwing all serious thoughts to the winds. The Landlord's Morning may be taken as a picture of this stage of Tolstoy's life. The inevitable reaction soon came. Op- pressed by debts and difficulties, in the spring of 1851 he betook himself to the Caucasus, where his eldest brother Nicholas was stationed with his regiment. At Pyatigorsk, at the foot of the mountains, he rented a cottage for about twelve shillings a month, and lived there with the utmost frugality.

Finally his brother's persuasions, aided by the influence of relations in high places, led him to enter the army. He passed the necessary examination at Tiflis, and joined the artillery in the autumn of

the year. Army . At that time Russia was much disturbed by the lawlessness of the Caucasian races. Bands of Circassians were constantly on the move, plundering and looting. The punitive expeditions in which Tolstoy took part were his first taste of warfare. Neither his military duties nor his love of sport entirely absorbed him, however. The great power which had hitherto lain dormant now awoke. He began to write, and within the next few years produced some of his finest works. Nekrassov, the editor of the Russian Contemporary, accepted Childhood, the young author's maiden effort. In accordance with the common practice, he received nothing for the MSS. Publication of a first attempt was considered ample payment in those days. Tolstoy was now twenty-four years of age. Child- hood was followed by The Landlord's Morning, Boyhood and Youth, in quick succession. His early aspirations were revived in these pages, which reflect the doctrines of Rousseau. " You neither know what happiness is nor what life is," he writes to expostulating friends. " Once taste life in all its natural beauty, happiness will consist in being with Nature, seeing her, commun- ing with her." His philosophy notwithstanding, Tolstoy felt a pardonable desire for promotion, which was slow in coming to him. Some verses ascribed to him (an authorship never denied) making fun of the general during the siege of Sevastopol, which appeared in print, may possibly have had something to answer for. Be that as it may, the spirit of unrest and dissatisfac- tion was moving Tolstoy to return home, when rumours of hostilities arose, and the Crimean War burst into flame. He promptly volunteered for active service, and asked to be allowed to join the army on the Danube, under the command of Prince Gortchakov.

In the early part of 1854 we find him encamped before the walls of Silistria, a town of Bulgaria, which Gortchakov had invested. At the very height of the bombardment, however, Austrian intervention prevailed, and the Crimea. siege was raised. The din of battle was hushed and revelry took its place. At

the ball which promptly celebrated the event Tolstoy felt ill at ease. The joyous music and babel of tongues jarred on his sensitive ear, fresh from the moans of the wounded and dying. He went up to the prince and asked leave to start for Sebastopol. Permission being granted, he hastened from the ballroom, and left Silistria without delay.

He now exchanged the offensive for the defensive. Shot and shell fell like hailstones on the bastions of Sebastopol. Courage, fortitude, presence of mind were at every moment demanded, while assault followed assault, until at last the overwhelming strength of the allies compelled the Russians to retreat. Through- out that trying time Tolstoy cheered his companions, whiling away many a weary hour with jest and story. Amid this " wrackful siege of battering days " he wrote those Tales from Sebastopol which earned him instant literary celebrity, and caused the emperor Nicholas to issue special orders that he should be removed from a post of danger. An official despatch recount- ing the events of the siege was next written by Tolstoy at the command of his superior officer, and with the charge of this document he was shortly afterwards sent to St Petersburg. He was never again on the field of battle.

Tolstoy returned home with new impressions. Sad at heart

and sick of the horrors of war, he came back with a feeling of

brotherly love for the common soldiers, whom he

Petersburg nad Seen day by day d ° ing quiet deedS ° f C0Ura 8 e

' and devotion, fighting for their country without hope of reward, without fear of death. He contrasted them with the more self-seeking nobles, and felt

their supe- riority. The stirring scenes through which he had passed, the simple faith of his men, all had helped to renew his belief in God. Preceded by the fame of his descriptions of Sebastopol and the Caucasus, he arrived in St Petersburg to find himself the object of a general ovation. The Sovremennik {Contem- porary) , in which Tolstoy's first work, Childhood, had appeared, numbered among its contributors the foremost writers of the day. To be admitted to their ranks was considered by them an honour equivalent to the award of a fauteuil in the French Academy. They welcomed Tolstoy with open arms, the veteran novelist, Turgeniev, in particular hastening to greet him on his arrival, and begging him to make his house his home. Society was equally eager to open its doors to the young soldier-author. His vivid and dramatic pictures of the war had been widely read and had created a profound sensation. The great official world of St Petersburg proceeded to offer him a brilliant series of entertainments in which he found himself the central figure. It is not surprising that this combined adulation from literary men and society overcame for a time the growing asceticism of his character. Yet it also in a measure hastened its develop- ment. Even while borne swiftly on the current of pleasure, his strenuous nature gradually reasserted itself. In the pages of My Confession Tolstoy describes the phases of this mental unrest. The narrowness of a literary clique soon became irk- some to his dominant character. His passionate desire for truth brought him into frequent conflict with those who paid more regard to convention. With Turgeniev especially he found himself constantly at variance. A friendship between natures so diametrically opposite, between two men who might be described as leaders respectively of the old and the new school of thought, could not long subsist. Mutual admiration does not imply sympathy. Turgeniev presently wrote to a friend, " I regret I cannot draw nearer to Tolstoy, our views are so opposed, the one to the other." And these differences of opinion gradually led to a complete estrangement. On the other hand, in Fet, the poet, he found a lifelong friend. Others

of his inti- mates were Nekrassov, the editor of the Contemporary, already mentioned; Katkov, the celebrated journalist; Droushinine, Grigorovitch, Fet, and Ostrovski, the dramatist.

While Tolstoy was thus waking to a sense of distaste for his environment, a great event was pending. With the accession Russian of Alexander II. in 1855 a wave of progressive policy Popular — set in motion by the tsar himself — stirred the Movement, bureaucratic circles of Russia, and while fiercely resisted by some of the nobility, met generally with cordial encouragement. The emancipation of the serfs became the burning question. " The People ! " and " Progress ! " were the cries quickly caught up by the press of Russia and of Germany also. It was in Germany, indeed, that the novel of humble life sprang into being, Gotthelf leading the way with his

tales, Uli the Serf and Uli the Tenant. Auerbach followed with his village stories, which opened a new world of thought; Stifter and a host of others brought up the rear. This new impulse in literature soon spread to Russia. Turgeniev in his Sportsman's Tales, Grigorovitch in The Village and Anton Goremika, showed their sympathy with the moujik. But above all others, Tolstoy was most deeply and lastingly affected. Awakened by this echo from without of his own inmost yearnings, he' realized at last the true bent of his mind. " The People " became his watchword. One increasing purpose henceforth ruled his life, and gradually brought into harmony the inequalities and con- tradictions of his character. Roused from the inertia which had been caused by nerves and hypochondria, he wrote Polikoushka, a painful story dealing with the ills of serfdom. His active brain then turned to considering the meaning and scope of the catchword " Progress," and fully to do this he determined to go abroad and study the educational and municipal systems of other countries. He finally started for Germany in January 1857. Tolstoy only three times crossed the Russian frontier, and these journeys were all between 1857 and 1861. O^jtis first trip, Germany and Italy were hurriedly visited. He#

Porelgn also made a short stay in Paris, which had attrac- Travel. tions for him in the society of several Russian friends, among whom were Nekrassov and Turgeniev. With the latter he had not yet come to open rupture. From Paris he went to Lucerne. An incident which occurred there, and is reproduced in his semi-autobiographical Lucerne, shows the workings of his spirit. He tells how a wandering musician stood one day in the hotel courtyard, and after his performance asked in vain for alms from the convivial crowd assembled. Tolstoy, in the person of the hero, then indignantly came to the rescue, brought the poor minstrel into the hotel, and, moved to wrath with the churlish waiters who were unwilling to serve him, ordered a private room where he himself supplied his guest's wants, and sent him away happy with a double lining to his pockets. Of his successive journeys westwards, the third alone was of long duration and of corresponding importance in its results. Prior to this last visit to foreign parts, his time was spent between Yasnaya Polyana and Moscow, often in the company of his friend Fet. On a bear-hunt together, Tolstoy narrowly escaped death, an incident which he graphically describes in his Fourth Reading-book for Children (20th ed., 1900, &c). Fet also mentions it in his Reminiscences. His departure was finally hastened by the serious illness of his brother Nicholas, who had gone to France to recruit his failing health. Tolstoy, after halt- ing in Berlin and Dresden, joined him, but only to endure the grief of witnessing his end. Nicholas died on the 20th of Sep- tember i860, and Tolstoy's letters of that period show how deeply he was affected by the death of his brother. It gave a yet more serious turn to his thoughts. In a letter to Fet he reverts to his old trouble, the enigma of life. " In truth," he writes, " the position in which we stand is terrible." This mental gloom probably still hung over him during his wanderings through Italy. There is no record of his impressions of Rome, Naples, Florence. Turning his footsteps northwards, however, he began to take renewed interest in social conditions, elementary and monastic education, and

the general subject ofhis quest. From Paris (where his friend spoke of him as "singular indeed, but subdued and kindly ") he went to London in 1861, no noteworthy incident marking his brief visit.

The spring of 186 1 found him once more at Yasnaya Polyana, where some little time before he had forestalled the Emancipa- tion Act by freeing all the serfs on that estate. Tic Educational now began digesting the mass of information he **^" had acquired abroad, eager to put his ideas into n,efls ' practice. The feelings with which he reviewed his expe- riences were largely those of disappointment. Of the edu- cational systems of Italy, France and Germany, that of the last-named country alone earned his partial approval. While there he visited the universities, prisons and working-men's clubs. He made the acquaintance of Auerbach, and was greatly influenced by his ideas on village schools. He was also much

impressed by the novel institution of the kindergarten, to which Frobel, the great educationist, was devoting all his energies. Determined to follow these lines, he sought and obtained per- mission to open a school. In his zeal he also started an edu- cational journal called Yasnaya Polyana. This journal now only exists as a literary curiosity, but the essays published in it have all been reprinted in his collected works. The time for opening the school was well chosen. The liberal spirits of Russia had gained the day and won a great victory. Just two months previously the decree of emancipation (February 1861) had been sent forth. The air was rife with schemes for the betterment of the peasantry. A new era seemed to have begun. Tolstoy's school was essentially " free." " Everything that savours of compulsion is harmful," he said, " and proves either that the method is indifferent or the teaching bad." So that not only were no fees paid, but the children came

and went as they pleased, learned what they pleased, and were subjected to no sort of punishment. It was the duty of the teacher to fix the pupils' attention, and his the blame if they failed to learn. " The student," said Tolstoy " must have the right to refuse those forms of education which do not satisfy his instincts. Freedom is the only criterion. We of the older generation do not and cannot know what is necessary for the younger." On these principles the Yasnaya Polyana school was started in a house near that of Tolstoy. He himself taught drawing, singing and Bible history. The Old Testament was his handbook; he held it as indispensable in any course of instruction, a model for all books. Doubts and fears sometimes assailed him, still for a year all went well. Other schools were opened on the same lines in the district, and success seemed assured. But the eyes of the government inspectors had long been suspiciously fixed on them, and a correspondence on the subject presently ensued between the ministry of education and the home department. The verdict passed by the former was free from overt animus. " The activity of Count Tolstoy deserves respect and should win co-operation from the educational department, although it cannot agree with all his ideas; ideas which he will in all proba- bility abandon on due consideration " (October 1862). Yet there was a subtle threat conveyed in these last words which was probably not without effect. Signs of discouragement grew visible. We find the enthusiast complaining that his masters desert him, his pupils fall away. The plague of inquisitive visitors annoys him. At the end of the second year the schools were closed, the journal discontinued, and Tolstoy, disheartened and sick, " more," as he writes, " in mind than body," betook himself to the healthful quiet of the steppes, to breathe fresh air, to drink koumiss and to vegetate. This was the end of his educational experiment, the aim of which was rather to develop the character than to educate in the ordinary sense of the term. When later he asked leave from the authorities to reopen the schools, it was peremptorily refused.

His socialistic theories were now fully unfolded. In his view the people were everything, the higher classes nothing. The latter had misinterpreted the meaning of " progress," imagining it to be synonymous with education; and hence compulsory teaching had been resorted to, with harmful results. Reading and writing played but a small part in forming a man's mind and fitting him for life. They merely rendered him more articulate. These questions should be left to the people themselves. Their demands were very clearly expressed. They knew what they wanted, and were thoroughly convinced that " in the great question of their spiritual development they would neither take a wrong step nor accept that which was false." Such was in substance Tolstoy's doctrine. " The people," he affirms, " are stronger, more independent, more just, more human, and, above all, more necessary than the upper class. It is not they who should come to our schools; we should learn of them." This desire to subvert society is akin to the philosophy of Rousseau, as expressed in Entile (livre iv.) :—

" C'est le peuple qui compose le genre humain; ce qui n'est pas peuple est si peu de chose, que ce n'est pas la peine de le compter. L'homme est le mime dans tous les 6tats; si cela est, les 6tats les plus nombreux meVitent le plus de respect. Devant celui qui

pense, toutes les distinctions civiles disparaissent : il voit les mimes passions, les mimes sentiments dans le goujat et dans l'homme illustre; il n'y discerne que leur langage, qu'un coloris plus ou moins appr6t6. . . . fitudiez les gens de cet ordre, vous verrez que, sous un autre langage, ils ont autant d'esprit et plus de bon sens que vous. Respectez done votre espece ; songezqu'elle est composee essentielle- ment de la collection des peuples; que quand tous les rois et tous les philosophes en seraient 6tes, il n'y paraitrait gueire, et que les choses n'en iraient pas plus mal."

While Tolstoy's theories were thus in course of

practical solution, his literary powers suffered eclipse. Turgeniev, who lived near him in the country, writes in disgust that he " has grown a long beard, leaves his hair to fall in curls over his ears, holds newspapers in detestation, and has no soul for anything but his property." Indeed, his time was fully taken up, for while still occupied in supporting the school, he had allowed himself to be nominated to the position of " Arbitrator," which he held for a year and some months (1861–1862). Relations This was an arduous post. The arbitrators were vith the appointed under the Law of Emancipation to Pe asaatr y– supervise the distribution of land, to adjust the taxes, define the conditions of purchase, and decide all matters in this con– nexion. These duties were after his own heart, and he went to work with a will. Every day he had difficult points to deal with, deputations of peasants coming to see him, the new law and the rights it bestowed on them having to be explained. The hardest of all Tolstoy's tasks was to remove the suspicion and mistrust felt by the serf towards the landlord. On the other hand, he had to contend with the nobility of the district, who were well aware of the side on which his sympathies placed him. For a year and a half he tried energetically to do his duty, but this experience led him eventually to regard the Emancipation Law as a not unmixed blessing. It had come too soon, and been granted unasked. The condition of the peasantry was worse than before. A noble impulse, inspired by love of the people, impelled Tolstoy to become their champion and interpreter.

A tragic incident occurring about this period (1866) forcibly illustrates Tolstoy's character as a defender of the helpless. A regiment had recently been stationed near Yasnaya Polyana, in consequence of some five hundred convicts being at work upon the railway. In this regiment was a certain Captain N., a strict disciplinarian, who led a solitary life and was much disliked by his brother officers and his men. For trifling faults he would condemn his soldiers to unheard-of punishments. One of his

orderlies in particular, a young man of some education — who had voluntarily taken the place of a comrade to free him from military service — was' constantly getting into trouble, until, for some slight clerical error in a report, Captain N. ordered him to be degraded and flogged. This was too much for the poor volunteer. He followed the officer as he was leaving the orderly- room, and struck him a blow on the face. He was immediately placed under arrest, and the details of the occurrence quickly spread through the neighbouring villages. Two officers of the regiment brought the story to Tolstoy and begged him to under- take the soldier's defence. He consented readily, and no opposi- tion being made by the military authorities, at once prepared for the court-martial. A few days afterwards the court assembled. Warned by the president of the severity of military law, Tolstoy made answer that he was come to defend not a criminal but a man compelled to crime by force of circumstances outside his will. The plea he set up was that the prisoner was not in full possession of his senses; but this defence was not allowed to stand. The soldier was condemned to be shot, in spite of the utmost intercession Tolstoy could make. The emotion of the crowded assembly stirred by his appeal, the mute quiescence of the soldier (persuaded that death was better than the living agony of exile), the closing tragedy — all this, added to the many scenes of war and bloodshed which he had previously witnessed, made a lasting impression and caused him to raise his voice yet louder in the cause of universal love and peace. During the preceding period of ethical experiment he published only two books, but these stand high among his works. They were Three Deaths (1859) and The Cossacks (1863)— the latter written ten years before, its leading idea being that culture is the enemy

of happiness. At the conclusion of his

arbitratorship, seeing his efforts partially nullified, and feeling himself overstrained and overworked, he determined to exile himself for a time to Samara, a south-eastern province. He halted on his way in Moscow, and here one night's high play cost him the MSS. of The Cossacks, which he sold to the editor of the Russian Messenger for £100 to pay his debts of honour. A pleasanter feature of this visit to Moscow lay in the- renewal of his intimacy with the Behrs family, Sophia, the younger daughter of the house, being his special attraction. He finally reached Samara in the spring of 1862, and went through a " koumiss cure," revelling in what he called " the life of a beast of the field."

By the month of July he felt completely restored to health, and returned to Yasnaya Polyana, where his sister Maria and his aunt, Mme Ergolskaya, were looking after the property. The house in which he now lived was comparatively new. The one in which he was born was sold to pay some earlier gambling debts, and had been removed bodily to the Dolgoe estate some 30 m. distant. He now felt a sense of something wanting in his home — a feeling of incompleteness took posses- sion of him. He wanted to see Sophia Behrs, and accordingly left almost immediately for Moscow. Sophia's father was a fashionable Russian doctor, born and bred in Moscow, and a graduate of that university. He had three daughters, of whom Sophia was the second. The friendship between the Behrs and the Tolstoy families was of old standing, Countess Maria Tolstoy having been a school companion of Mrs Behrs. It was now the height of summer, and every one of consequence was leaving the city for their country seats. The Behrs family were going on a visit to their grandfather, whose estate lay not more than 40 m. from Yasnaya Polyana. Here they accord- ingly broke' their journey, and during the pleasant days that followed Tolstoy's attachment deepened. Not long after their departure his impulse took shape, and mounting his horse, he set out for Twicy, where they were staying. His errand was a definite one; and he lost no time in fulfilling it. At first

Marriage. ^ T Behrs demurred, unwilling to allow his second daughter to marry before her elder sister, but his objections were presently overruled. On the 23rd of September 1862 the marriage took place, and Tolstoy installed his bride at Yasnaya Polyana with the conviction that calm and con- tentment were his at last. Two weeks later he wrote to his friend Fet, saying that he was now happy and felt quite a new man. In his Confession some years later he writes: "The new conditions of a happy family circle led me away from my researches into the meaning of life. My whole mind became concentrated on the family — on the mother, the children, and the anxiety to provide due means of subsistence. The effort after perfection resolved itself into the effort to ensure the happiness of my offspring." Tolstoy thereupon settled down to country life, and though to the young countess this exile from her town friends and relations must have been somewhat of a trial, they remained on their estates for the following eighteen years, with very short intervals of absence. They had thirteen children, of whom the eldest was born in June 1863. In the bringing up and instruction of his family Tolstoy con- formed in essentials to the requirements of his position. No experiments were attempted. English and German governesses were engaged, and their educational methods followed the usual routine. Both father and mother devoted a considerable amount of time to their children. Punishment was rare. It consisted in a strict " boycott " of the offender, which was not relaxed until a frank confession of fault was made — no light penalty to a sensitive child. The theory of free option in study was dropped by Tolstoy in the case of his children, but he was for ever joining in their games, taking them on his shooting expeditions and sharing in their gymnastic exercises. Manual labour was always congenial to the great writer, and formed a natural concomitant to his pastoral existence. It was a common thing for him to mow the lawns, hoe and rake the garden beds, or when out walking to take the scythe from a labourer and wield it lustily. xxvi 34

War and Peace and Anna Karenina, Tolstoy's two most widely known and finest novels, date their commencement from this period. These two novels were received with scant favour by both the Liberals and Con- work. servatives in Russia. Katkov, the editor who was publishing Anna Karenina in his periodical, introduced so many changes into the MSS. that the publication was not continued. It was due to N. Strachov, the literary critic, that public opinion was brought to recognize the merits of these novels. Every day Tolstoy retired to his room for a certain number of hours, and whether in the humour or not, sat at his table and wrote. " Inspiration comes with writing," he used to say. Authorship he avowedly despised, yet confessed the temptation of public applause and heavy gains was too great to resist. The reading world has reason to be glad of this touch of inconsistency. Despite his genius for characterization, the task of novel-writing cost him a severe and determined effort. The technique of literary composition irked him exceedingly. " You cannot conceive," he writes in 1864 to his friend Fet, " how hard is this preliminary labour of ploughing the field in which I am compelled to sow. To consider and reconsider all that may happen to all the characters beforehand, and to think over the million of possible combinations, and to choose one out of a hundred thousand, is very difficult."

In the course of this correspondence interesting sidelights are thrown on Tolstoy as landowner and farmer. Not long after his marriage he wrote, " I have made an important dis- covery, of which I hasten to tell you. Agents, stewards and overseers are only so many hindrances to farming! Dismiss them all and lie abed till 10 o'clock, and you will see things will certainly go none the worse. I have made the experiment, and am quite satisfied. Now to business. When you are in Orel buy me 20 poods of various kinds of string, &c, and send them to me if it does not cost more than two roubles thirty kopecks a pood with the carriage "; and in this vein he enters into manifold rural matters, the progress of crops, the illness of a favourite horse or the

calving of a valuable cow. Again the philosopher rises to the surface, and he questions Fet as to the workings of his mind.

" I don't mean in the Zemstvo nor in agriculture; these are occupations for active men, with which we employ ourselves in a perfunctory fashion, much like ants engaged in hollowing out a clod of earth — work of which the result is neither good nor bad. But what are you doing with your thoughts; how is the inner mechanism working? Is the secret spring trying to show itself, making its presence felt? Has it forgotten how to work? that is the all-important question."

At another time he pays a well-earned tribute to his wife's helpful sympathy. " She is by no means a trifler," he writes, " but is an earnest helpmeet to me." In literary matters he valued above everything the opinions, of Fet and of Turgeniev (notwithstanding his saying of the latter, " the older I grow the less I love him "). Fet, indeed, was an intimate and devoted friend, constantly interchanging visits with the Tolstoy family. To him the scenes of War and Peace were first un- folded as Tolstoy read them aloud in the quiet evenings.

It was at Fet's house (in 1864) that the violent quarrel took place between Turgeniev and Tolstoy which nearly culminated in a duel. Many inaccurate accounts of it have Quarrel been given, but the history of the rupture as re- with corded by Fet may be looked on as trustworthy. Turgeniev. It seems that Turgeniev in rather a boasting spirit was praising his daughter's English governess — how she had desired him to name the precise sum his daughter might spend in charity, and how, at her instigation, the young lady made a practice of mending the clothes of some of the poorest peasants. Tolstoy, who was always against the artificial "philanthropy " of the wealthy, said brusquely that he thought it was theatrical and poseuse for a daintily-dressed girl to sit sewing at filthy, evil-smelling garments in the name of charity. Turgeniev thereupon rose, furious, from the table. " Stop saying such things !

" he cried, " or I will force you to silence, with insults if need be." Peace was with difficulty

restored by M and Mme Fet. The letters which subsequently passed between them only served to fan the flame, so that even the amiable Fet was involved in the dispute and for a short time estranged from Tolstoy. Finally, after a lengthy and acrimonious correspondence, the threatened resort to arms was averted through the interposition of friends; but fourteen years were allowed to pass before a reconciliation took place. In 1878 Tolstoy, believing himself to be in a dying state, at length made overtures of peace to his brother author; overtures which Turgeniev met cordially in the following terms: —

" Dear Leo Nikolaevitch, — I received your letter to-day which you sent to me poste restante. I was delighted and much moved by it. With the greatest pleasure I am ready to renew our former friendship and to press your proffered hand. You are quite right in thinking I harbour no feelings of enmity towards you. If they ever did exist they have long since disappeared, and no remem- brance of you now remains save that of a man to whom I am sincerely devoted, and of a writer whose first step it was my great privilege to be one of the earliest to welcome; whose every new work has always aroused in me the greatest interest. I rejoice from my heart that our misunderstanding has come to an end. I hope to be in the province of Orel this summer, and then we shall meet. I send you my best wishes, and once more grasp your hand in friendship."

Meanwhile Tolstoy had pursued literary labours with relent- less ardour and with ever-increasing fame. Prince Andre (the hero of War and Peace) and Anna Karenina in turn occupied all his thoughts. Several

years were given to the perfecting of these remarkable character-paintings. When the publica- tion (1864-1869) of War and Peace had been succeeded by that of Anna Karenina, he set himself to write yet another great novel, dealing with the times of Peter the Great, but after working at it for some months he suddenly abandoned the scheme. One of the few excursions made during these years of tranquillity was undertaken in 1866 to the battlefield of Borodino, the scene of the famous fight in 181 2. For two days Tolstoy wandered over the plain, investigating and taking notes, and there he drew a plan of the battle, which was after- wards published as a frontispiece to War and Peace. But the continued pressure of severe nervous and mental strain was bound to affect a man of his calibre; health and spirits gradu- ally sank, so that in 1870 Countess Tolstoy induced him once more to seek the healthful air of Samara, and subject himself to the " koumiss cure " in practice there. A strange feature of this " treatment " lay in the avoidance of meal and vegetables, the diet being strictly confined to meat. Tolstoy pitched his tent in the village of Karalieck, where the primitive life among the Bashkir nomads exactly suited his habits and disposition. He had a faculty for making himself at home with peasant folk, and was a great favourite among them. In this district there was a large community of Molochans, a sect whose tenets differ consider- ably from those of the Orthodox religion of Russia. They acknowledge no guide save the Bible, and reject all the rites and ceremonies of the Greek Church. Their honesty, industry and temperance made them an example to all the country round, and caused Tolstoy to study them with special interest. So delighted was the count with this visit to Samara, that he shortly afterwards purchased an estate of over 2000 acres in the district. But his pleasure was short-lived, for not long afterwards (1872-1873) the crops failed and a serious famine broke out. He thereupon opened a subscription fund for the starving population, and went from village to village taking a quantity of grain with him, and making what provision was possible in the

circumstances.

Tolstoy was now making up for lost time, learning what he had failed to learn at the university. Greek was his great attraction. ″ Without Greek,″ he exclaims, ″ there is no culture.″ He also became enamoured of the writings of Schopenhauer, and for the greater part of a year (1869) devoted himself to the study of that philosopher. ″ Never,″ he says, ″ have I experienced such spiritual joys.″ Enthusiastic in everything he takes up, he assures his friends that Schopenhauer is the greatest genius hs has met with. He sets himself to translate his works,

At Samara.

Studies la Philosophy.

and tries to enrol Fet as a co-translator. Philosophy at this stage of his life went hand in hand with sport and agricultural interests. He contemplated buying an estate in the province of Penza, but on the 21st of October 1869 he writes: —

″ The purchase of the estate in Penza has not come to anything. I have now finished the sixth volume {War and Peace), and I hope it will be published on the 1st of November. There are a lot of snipe. I have shot four brace, and to-day found two brace and killed one bird.″

After a period of comparative rest and ease, the shadows of war and death once more encompassed Tolstoy. Two of his children died in 1873, and their loss was followed by that of his much-loved aunt, Mme Ergolskaya. A mental restlessness and uneasiness came over Tolstoy, and also a desire for the exercise of a wider philanthropy. The Russo-Turkish War put the crowning touch to these feelings. God and death, war and the intricacies of life were now the constant subjects of his letters. ″ You will not believe what joy your last letter has given me,″ he writes in 1877 to his dear iriend Fet. ″ When you speak of the existence of the Deity, I agree with

every- thing you say, and I would wish to write much, but time fails me and it is difficult in a letter. For the first time you write to me on the Divinity of God. I have been thinking about it for a long time. Don 't say that we must not think about it. Not only we must, but we ought. In all ages the best people, the true people, have thought about it." Tolstoy now resumed the study of the Bible, and took special delight in the books of Ecclesiastes and Proverbs. He treats them as a new discovery, and recommends them to his friends as having much in common with the teaching of Schopenhauer ! This revived interest in religious questions was accompanied and perhaps deepened by a state of extreme depression. It was then he reconciled himself with Turgeniev, and in December 1878 we find the latter staying with him on a visit of three days' duration. Turgeniev writes that he finds him " very silent, but much developed." The count on his side feels the same want of mutual sympathy as of old, and confesses that no real friendship seems possible between them.

Tolstoy now entered on the third phase of his life. He himself thus describes the stages of his mental growth. In the first phase he lived only for his own lusts and Religious pleasures. This came to an end at the age of Develop- thirty-four. Then came the interest in the wel- meat. fare of humanity, which married life cooled and obscured for a while. The striving for the welfare of mankind was mingled with the striving for personal well-being. But the third and highest phase was reached when the service of God became the motive power of his existence. All other aims grew subservient to this, and interest in the merely personal life had begun to disappear. He had passed through every imaginable grade of religious thought. As a child he had gone to church and confession unquestioningly. As a student and young man he had scorned and ridiculed religion. Later in life he became a pious and devoutly orthodox Greek Churchman, until one day during the Russo-Turkish War he was filled with a spirit of revolt at hearing the priests pray for the

destruction of the enemv, beseeching the Almighty to help them to kill their hundreds and thousands. His whole being recoiled from the un-Christianity of these prayers, and he then and there renounced the orthodox faith. For three years he had exceeded the priests themselves in the regularity of his attendance. Now he felt there was something vitally amiss, and he flung it all to the winds. The novelist was rapidly being hidden in the philo- sopher's cloak, to the dismay of literary Europe. So early as 1859 Turgeniev had exclaimed, "If only Tolstoy would not philosophize, all might yet be well." His brilliant contem- poraries, Gogol, Dostoievski and others, had all in different ways been seized in turn by what may be called the fever of religion. Tolstoy was to suffer from it too. Like the flickering of a dying lamp, his imagination again shone out in The Death of Ivan Ilyitch and The Power of Darkness. Subsequently, with rare exceptions, his writings were overloaded with ethical reasonings. He was now fifty. While leading a life outwardly calm and

peaceful, he had passed through innumerable mental struggles and vicissitudes. Of these he speaks with simple candour in My Confession, an autobiographical sketch which appeared in print at intervals between the years 1879 and 1882. In the orthodoxy of the Greek Church, with fastings, prayers and rigid observances of her rites, he vainly sought an answer to his doubts; finally he broke away from a ceremonial which had become empty and lifeless to him, and built up a religion of his own. Impressed with the conviction that the peasant's mental ease was the result of his life of physical toil, Tolstoy tried to adopt the same habits, and for some ten years (dating from about 1880) he renounced the life of his own class as completely as it was possible for him to do. He rose early and went to work in the fields, ploughing, cutting the corn, working for the widow and orphan, and helping them to gather in the

crops. He also learnt boot and shoe making, and enjoyed being praised for his skill. Thus he laboured late and early, and in these simple physical acts found the best cure for his attacks of despondency. ″ Simplicity ! Simplicity ! Simplicity ! ″ His food and drink, his pleasures and personal indulgences, were curtailed. Meat was given up and replaced by a vegetarian diet. Field sports — equivalents for cruelty and lust of blood — were abandoned, and his gun hidden away to rot and rust. Even tobacco was renounced as luxurious and unhealthy.

But with all his straining towards simplicity, it was in the nature of things impossible for Tolstoy absolutely to lead the life of a peasant. Labour though he might throughout the day, there was his well-appointed house to return to. He could not cut himself off from his wife and children. Friends and acquain- tances could not be wholly ignored by the would-be Diogenes. Circumstances in this respect were too strong for his views and wishes. The renunciation was still only a partial one. But as the strain of a great surrender is greatest while it is still incom- plete, so Tolstoy felt more and more impelled to emancipate himself from worldly concerns. The break in the long speli of country life which presently occurred only served to deepen this desire. In 1881 his eldest son went to the university, and the two next in seniority soon followed him. It became neces- sary for the family to be in Moscow a great deal, for the sake of the children's education. The eldest daughter had come out into society, and friends were continually calling, obliging Tolstoy to sit and talk with them. All the elements of town Renuncia- ^ e wer e distasteful to him. Money was an evil Hon of thing in his sight, and he gave up carrying it about Property. w ;t n him, or even making use of it. ″ What makes a man good is having but few wants,″ he said, and he accordingly set himself to limit his wishes rigidly, and to detach his heart from all treasured objects. The year 1880 was the census year in Russia. The government, as usual, called for

volunteers to help to carry it out. Tolstoy became one of the enumerators, whose duties afforded an excellent opportunity for seeing the conditions under which the poor lived. The misery of it made him often wish to surrender all his property and have nothing more to do with lands and money, but the government and family circumstances prevented him. In the pamphlet, What are we to do ? he graphically narrates his census experiences. Again and again he attempted to carry his theories into effect. At last, calling his wife into his room, he explained to her that property and many possessions had become irksome to him. Wealth he now regarded as a sin. He wished to be rid of all personal ownership. In 1888 Tolstoy renounced all claim to his estates; everything was made over to his wife and children, the countess acting as trustee. True, this renunciation made little difference in his manner of life. He lived under the same roof as before, ateat the same table, wrote and read in the same study. The change was mental rather than material. He cared no longer for the growth or improvement of his estates, but gave nimself up to ethical questions, and endeavoured day by day to bind himself more closely to the people. He now began to write specially for their benefit a number of simple tales which have been widely read, tales directed mostly against crying evils — the peasant's love of vodka, and like themes. He

found willing fellow workers in the firm of Russian publishers known under the name of Posrednik (V. Tchertkoff, and a group of friends). John the Fool, which was published in 1886 in the " Posrednik Series," is generally considered the best of these stories. The Power of Darkness (1885) also appeared in this series, and was written with the same object in view. Un- fortunately, the popularity of these stories aroused the attention of the government, and led to many of them being forbidden on account of their Socialistic tendencies.

The terrible famine of 1891-1892 added fresh lustreto Tolstoy's name. He and his family worked unceasingly in soup-kitchens and barns, distributing

food and clothes. No true leader lacks a following. Every oppressed sect or individual turned instinctively to Tolstoy for sympathy and support, the most important case in point being that of the sect of the Doukhobors. Early in 1891 rumours began to reach headquarters of social and religious excitement fermenting among the inhabitants of the Caucasus, and especially among the Doukhobors (q.v.). This people, numbering from fifteen to sixteen thousand, shared their goods and property in common, and made no ^ or s" laws of conduct for themselves, based on a simple form of religion unobscured by ceremonies or ritual. In these matters, and especially in refusing to serve as soldiers, they defied the governors of the Caucasian provinces, so that, : as their numbers and strength of opposition to authority grew formidable, severe measures were put in practice for their suppression. Several of their leaders were exiled, and in 1895 some hundred of them were condemned to be enrolled for three years in the so-called " disciplinary regiment." It was in that year that Tolstoy came in contact with them personally, and became deeply interested in them. He promptly identified himself with the agitation in their favour, and by his endeavours aroused sympathy for them in other countries, especially in England. After many rebuffs from the government, and many unavailing efforts to reach the kindly ear of the Tsar, the persecution of the Doukhobors at length ceased, and they were allowed to emigrate. It was in aid of these people that Tolstoy wrote . and published Resurrection. The attack on the Orthodox Church in this novel was probably the chief cause which led to his formal excom- munication by decree dated the 22nd of February 1901. In later years Tolstoy maintained all his interests, but old age gradually told on his strength. He died on the 20th of November 1910 at Astapovo, where he was stricken with pneumonia when carrying out a sudden decision to leave Yasnaya Polyana and end his days in retirement.

No account of Tolstoy can pretend to any measure of completeness which does not refer to his views on

religion. Tolstoy himself attributes so much importance to them that he has written several books with the sole object of telling the T°!f t f ys world what he considers truth. In My Confession he R e,l X loa – describes the various stages of religious experience through which he has passed. He begins with a graphic picture of the religious state of the society in which he was brought up. There, although people were nominally orthodox, actually they believed in nothing. Indeed so inconsistent were the ideals of that society with any real belief in the Orthodox Church that at sixteen Tolstoy practically renounced Christianity and became a sceptic. During the whole of this period he felt unhappy and dissatisfied, for he had no theory which enabled him to solve the riddle of life. He found no solution to the question he often put to himself — Why do I live? nor to the other which depended on the first — How ought I to live?

It seemed to him that the men he met dealt with these questions in four ways. Some ignored them and treated life as if it were a meaningless jumble of vanity and evil. Others, recognizing the difficulty of satisfactorily solving these questions, simply shut their eyes and made the best of life as they understood it without thinking of the future. A third group answered these questions by regarding life as an evil and foolish thing and by putting an end to it. Fourthly, there were those who considered it a stupid and ridiculous farce and yet continued to live on, making the best of it.

Tolstoy himself took up the last position, although it failed to meet his spiritual needs. He felt that the millions who accepted the religious theory of life had somehow a better answer to the problem, notwithstanding that their solution was based on an absurd hypothesis. Although faith was unreasonable it alone gave meaning to life, faith being understood as the theory which linked man's finite life with the infinite. Having arrived at this conclusion Tolstoy

Death.

was ready to accept any faith which did not require a direct denial of reason, and for this purpose studied Buddhism, Mahommedanism and Christianity. The only persons he felt who were happy and found a meaning in life were the poor, and the only life that could be lived in accordance with reason was life under simple conditions such as animals lived. Only man must labour, not as the animals, each for itself, but for all. The search after God was not an act of reason but of feeling. To live after God's word we must renounce all the material pleasures of life and be humble and charitable to all men. This belief he found in the churches, but mixed up with other things which he could not understand and which repelled him, viz. sacraments, fasts, bowing before relics and images. The church festivals, as commemorating miracles or alleged facts of Christ's life, were repugnant _ to him. Com- munion he explained to himself as an action done in remembrance of Christ and as signifying a cleansing from sin and an accep- tance of Christ's teaching. When asked by the priest to repeat before receiving the elements that he believed that what he was about to receive were the real Body and Blood, he repeated the formula but found that no wish to believe could make him believe it. The attitude of the various Christian churches towards one another also alienated his sympathy; it had no resemblance to a union of love. He thought that there should be mutual concessions where beliefs had so much in common, but was told that any compromise involved an admission that the clergy had altered the primitive faith and that it was their duty to hand on the faith inviolate. He was also very much repelled by the attitude of the Church towards war and capital punishment. Tracing the happiness of the peasantry to their faith, he became convinced that there were certain elements of truth in Christianity. The Christian churches and the Greek Orthodox Church in particular had in his view combined to obscure the basis of truth in Christ's teaching.

Tolstoy therefore set himself to endeavour to eliminate what he thought the false doctrines and superstitious elements which had grown up round Christianity, and to discover the verities contained in it. Tolstoy started with the premise that Christ's teaching was communicated to unlettered persons and only put down in writing long after his death. " It may be assumed," he says, " that the Church in accepting the three synoptic gospels had accepted much that was inaccu- rate." Tolstoy argues that it should be remembered that the gospels must have gone through many changes and that he is therefore at liberty to deal with them critically. He sees in Chris- tianity" not an exclusively divine revelation, nor a mere historical phenomenon, but a teaching which gives meaning to life. The churches, he considered, were substituting a teaching which was not Christ's, but was a strained and contorted version of what Jesus taught. The sectarianism of Christianity had its root in the idea that the gospels are to be understood not by taking them by them- selves, but by interpreting them in such a manner as to make them agree not only with the other sacred writings but with the traditions of the Church,which were themselves obscure. Tolstoy maintained that it was the foreign elements foisted upon Christ's teaching which have alienated the best minds from Christianity. Anyone taking Christ's teaching alone will see that it has no admixture of elements that contradict common sense. It has no sympathy with supersti- tions, contains no " dregs," has no " darknesses," but is the strictest and fullest system of ethics.

The substance of Christianity seems to Tolstoy the inculcation of love, humility, self-denial and the duty of returning good for evil, and these essential principles attracted him throughout his life, even when he was a sceptic. The Greek Orthodox Church treated these principles rather as accessory to the teaching of Jesus than of its essence, and the Church considered dogma of more importance. The rule of the Orthodox Church concerning dogmas, sacraments, fasts, prayers, seemed not only

unnecessary but were not based on anything in Christ's teaching. The Sermon on the Mount as reported in Saint Matthew contains, according to Tolstoy, the essence of Christ's teaching which Christians should carry out entirely. The key to the sermon is contained in the words "Resist not evil," this injunction meaning that not only should Christians never repay evil with evil but also that they should not oppose it with physical force. Any physical resistance of evil is contrary to the law of love. This command he regards as the central point of the doctrine of Jesus and as really easy to obey, for which view he quotes Christ's statement, " My yoke is easy." The whole teach- ing of the churches was contrary to Christ's teaching when they gave their sanction and approval to armies and the enforcement of the criminal law by the executive powers of a government. Christian society not only ignored Christ's injunction not to resist evil but was actually based -on a denial of its truth. The words " Judge not that ye be not judged " Tolstoy treats as an expansion or rather as a logical result of the command " Resist not evil." Jesus denied the possibility of human justice, demonstrating in the case of the woman taken in adultery that man could not judge his fellow man, since he himself was also guilty. Jesus' declaration amounted to saying, " You believe that your laws reform criminals; as a matter of fact they only make more criminals. There is only one way to suppress evil, that is to return good for evil without respect of persons.," The whole social fabric of modern so-called " Christian "

society was founded upon principles disapproved of by Christ Its prison cells, factories and houses of infamy, its state church, its culture, science, art and civilization were all based on coercion and violence. People pretended that Christ did not abolish the Mosaic law, but that the law of Christ and the law of Moses harmon- ized. But Christians acted on the principle of " an eye for an eye," discarding the law of Christ and following that of Moses.

Tolstoy goes through the gospel for the purpose of

finding out what Christ's teaching really is. In doing so, he puts aside the miraculous events of Christ's birth and all other miracles as irrelevant to his inquiry, and also impossible of belief. The result is that he finds that Christ laid down five " entirely new " commandments, the first commandment being " Live in peace with all men," which was the interpretation put upon the words " Ye have heard it ever said by the men of old time that thou shalt not kill and that who- soever shall kill shall be in danger of the judgment, but I say unto you whosoever is angry with his brother shall be in danger of the judgment." The words " without cause," 'Tolstoy rejects, as does also the Revised Version. He considers these words open the door to the evasion of the commandment. Tolstoy interprets the next words, " and whoever shall say to his brother ' raca ' shall be in danger of the council, but whosoever shall say ' thou fool ' shall be in danger of hell fire " to mean that one must never look upon a human being as worthless and as a fool. Not only must Christians refrain from anger, but it is the duty of a follower of Jesus to live in peace with all men. They should not regard anger as justifiable in any circumstances. The second commandment of Jesus Tolstoy declares to be, " Thou shalt not be united physically to any woman except the one whom thou hast originally known sexually. You commit a sin if you ever abandon that woman. Marriage is marriage, whether there have or have not been any legal or ecclesiastical formalities, once there has been physical union." The third com- mandment as Tolstoy understands it is " Swear not at all." This commandment applies not merely to profane swearing but to all kinds of oaths, whether taken by witnesses in courts of Taw, by soldiers when being sworn in, by magistrates in pursuance of their office, oaths of fidelity and the like. All the oaths are imposed for an evil purpose and are entirely wrong. The fourth commandment is " Resist not evil." Christ's followers were never meant to act as judges, citizens, policemen or in any other capacity in which it would be their duty to resist evil. Christians should do good in the sen. e of

living virtuously. To abolish evil they should avoid the commission of evil, and never under any circumstances resist wrongs by force. They should never return violence by violence. Christ taught " If any one strike you, suffer it; if any one would deprive you of anything, yield it up to him ; if any one would force you to work for him, go and work for him ; if any one would take away your property, abandon it to him." The fifth commandment is laid down in Matt. v. 43-48. After calling the attention of his readers to the fact that the words which introduce the injunction to " Love your enemies," &c, read, " Ye have heard it said of old that thou shalt love thy neighbour, and hate thine enemy," Tolstoy points out that these words must be understood as meaning " Thou shalt love thy fellow countryman and hate the foreigner." But when Christ taught in opposition to this maxim " Love your enemies, bless them that curse you," He meant " You have heard it laid down of old that you must love those of your own race and hate foreigners, but I say to you, love every one without distinction of nationality." It is difficult to love your personal enemy, but it is perfectly possible to love citizens of a foreign nation equally with your own. Tolstoy admits that it is difficult to conceive that everything that is considered essential and natural — what is thought noble and grand — love of country, defence of one's own country, its glory, fighting against one's country's enemies — is not only an infraction of the law of Christ but directly denounced by Him. People might here retort " If it is true that Jesus really meant this He would have said so plainly." To this objection he replies " We must not forget that Jesus did not foresee tiiat men having faith in His doctrine of humility, love and fraternity could ever with calmness and premeditation organize themselves for the murder of their brethren. Christ not foreseeing this did not in so many words forbid Christians to participate in war." To make good this point Tolstoy shows by quotations from the Fathers that none of the early Christians ever contemplated fighting with any thing but spiritual weapons.

The doctrines of original sin, of the Atonement, of the Trinity, of the Resurrection, are, according to Tolstoy, all without founda- tion and contrary to Christ's teaching. Man is conscious, he writes, of a spiritual essence which exists in an imperfect form not only within himself but also in all other living creatures. The perfect spiritual essence is what we call God. It is the indwelling of this spiritual essence in man which creates the desire for communion with God and with those who possess the spirit imperfectly. The true life of man consists in fulfilling the needs of the spirit; and everything that helps to free it from the influence of the body which is antagonistic, tends to encourage the growth of that immortal part. When death comes the spirit is emancipated from the body and returns to God, where possibly, says Tolstoy, it ceases to have an individual existence. The spirit in man is not subject to the limitations of time and space. The life of the individual, however, is essentially bounded bv time and space. With the destruction

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of the body this life ceases to exist, but the divine spiritual life remains. Death is therefore not annihilation but merely the eman- cipation of the spirit, its introduction to a new and unknown state of existence, to another form of manifestation of the divine spiritual essence. The more a man endeavours to live the life of the spirit the nearer his approach to the eternal and the less the significance of death. But it is impossible for the human intellect to conceive any form of existence outside space and time. So far therefore as immortality implies a resurrection of the body Tolstoy denies it ; so far as it implies an individual consciousness of the soul he states we can predicate nothing of it. There are two doctrines of life. One of these doctrines, the source of all error, consists in believing that the personal life of man is one of his essential attributes. The other doctrine, that taught by Jesus, is that the whole

purpose of our personal life lies in the fulfilment of the will of God.

Before attempting to define the powers and position of an author, it is best to pass in review the works which have led to his present _, . reputation. Tolstoy the writer is a guide of unusual

Writ " f a ' tn f u ' ness to Tolstoy the man. The gradual evolu- er% tion of the reformer and preacher out of the brilliant

novelist is described in no pages so clearly as in his own. Childhood (1852), Boyhood (1854) and Youth (1855-1857) — Tolstoy's first literary efforts — may be regarded as semi-autobiographical studies; if not in detail, at least in the wider sense that all his books contain pictures, more or less accurate, of himself and his own experiences. No plot runs through them; they simply analyse and describe with extraordinary minuteness the feelings of a nervous and morbid boy, a male Marie Bashkirtseff. They are tales rather of the development of the thoughts than of the life of a child, with a pale background of men and events. The distinct charm lies in the sincerity with which this development is represented. We are introduced by the child, Nicholas Irtenyev, to a number of characters one after the other — father, mother, grandmother, tutor, servants and serfs ; and are led by him from the father's study to the morning- room, and so on to the kitchen and the housekeeper's closet ; and we catch, as in a magic crystal, the lifelike scenes on his waking — in the schoolroom — at his mother's side. But the apparently unconscious change of the child's mind into that of the youth — his budding thoughts, hopes, fears — form the true drama of the story. The Cossacks (1 863) , written round the theory that culture is an enemy to happiness, was followed by War and Peace (1 864-1 869), which has been justly called a Russian epic. Within its pages Tolstoy has marshalled a panoramic array of kings, princes and nobles as they lived and moved during the times of the great Napoleonic wars. There are so many figures in the picture, so much kaleidoscope

colour and movement, that the spectator often finds it difficult to follow the thread of the narrative. The leading characters principally belong ti to the highest Russian society, whose circle — with its

"War ana inflexible code of laws and customs, and a vitiated Peace. moral atmosphere affecting each member of it in a

greater or less degree — links them together. The interest centres not so much in any single person as in the groups formed by four leading families of the " grand monde " — the Rostovs, Bezouchovs, Volkonskys and the Kouragines — all bound together by common aims and interests. The men are eager to make a name and enjoy life ; the women seek pleasure in gossip and romance. Peter Bezou- chov and Prince Andre, with natures essentially different but united by a love of truth, are the exceptions to this rule. Peter Bezouchov is one of Tolstoy's finest characterizations, drawn with a masterly hand. He is the embodiment of all that is good and bad in the Russian temperament. On the one side there is the striving after an ideal and a capacity for self-sacrifice, on the other an absence of firmness and balance. Like Tolstoy himself, he is always in doubt as to what is right and what is wrong, as to the meaning of life and death, and, like Tolstoy at that time, can as yet find no answer to these riddles. While Peter Bezouchov is a typical Russian, a very Tolstoy, Prince Andre if a less striking, is a more lovable personality. Upright and noble-minded, he yet is unable to cast off the chains of custom which have held him from childhood. He too is constantly seeking mental rest and finding none. The love-story of Andre and Natasha Rostov, which runs through the novel, is a poem in itself. Natasha is almost the only heroine Tolstoy has given us who wins our affections; but even she, after many transitions, sinks to the level of the Hausfrau, with no aim beyond the propagation and nurture of the race. It must be borne in mind that in War and Peace Tolstoy winged his shafts not at men generally but at that particular section of society to which he himself by birth and association belonged.

A long period of silence followed the publication of this novel, during which the world heard little of him. At length in 1873 ne '•Anna issued the first parts of Anna Karenina. It is without

Karealna " doubt ^' s greatest literary production. The area of time and space in it, as in the preceding book, is large, but it has more continuity of action, and the principal characters are kept well in the foreground. It is a study of modern Russian life, in which the normal passivity of unsympathetic conjugal relations is sharply contrasted with the transient omnipotence of passion and deep love. The hero and heroine are Count Wronsky, a young soldier in a crack regiment, and Anna Karenina, the wife of an important official in the political world of St Petersburg. The

" Kreutzer Sonata."

parts of secondary heroine and hero are filled by Kitty Cherbat^y and her lover and ultimate husband, Levine. The central figurfe is of course Anna herself, an elegant and fascinating " mondaine." She is honest, frank and well endowed by nature, and has an innate striving after truth and beauty in art and in life, but her early marriage with Karenina (who is double her age, reserved and taci- turn), while socially advantageous, has dulled and stunted her ideals. Ignorant of the meaning of love, she despises it, and it is not till she meets Wronsky that she realizes to the full the empti- ness of her existence. Wronsky, young, handsome, impassioned, recognizing no principle but his own desires, offers her the rich wine of life at a draught. She tastes it, after scant hesitation; and then, flinging away her worldly position, deserting her husband and child, she drains it to the dregs, only to find that poison lies in the cup. Anna and Wronsky have no true ideal to cling to. He, as their passion cools, finds the tie irksome and a hindrance to his career. She grieves for her lost and dearly-loved son, and frets as she sees that Wronsky's devotion is waning, recognizing too late that he loved her chiefly for vanity's sake, that they are slipping daily asunder,

and growing displeasing to each other. Her past life is closed to her, the future opens like an abyss. The crisis has come, and swiftly obeying the impulse of her despair she seizes on death as her only weapon for wounding Wronsky and cutting the hopeless knot of her life. This pitiful end is led up to step by step with microscopic truth and insight into the springs of human action. In the married life of Kitty and Levine, en the other hand, Tolstoy describes a state of happiness of a material nature — disagreements easily bridged over, and mutual interest in their children and the pleasures of the country. Levine is the Tolstoy of fiction. The improvement and development of his estates, the life of a country squire, fail to satisfy him. The death of his brother, the birth of his child, awaken his mind to the problems of exist- ence, and he is plunged in melancholy. Finally, relief comes to him with the words of a peasant who bids him " live for his soul and for his God." Thereupon Levine exclaims, " I have discovered nothing. I have simply opened my eyes to what I knew already; I have come to the recognition of that power which formerly gave me life and which renews life in me to-day. I am freed from error; I recognize my master." And the novel ends with the effacing of the intellect in a cloud of happy mysticism.

The Kreutzer Sonata, published in 1890, created a profound im- pression. Many who were previously unacquainted with Tolstoy's work read this story of love, jealousy and revenge, and were dumbfounded by its boldness. It, is a startling advance upon Family Happiness, published thirty years earlier. Society generally, and Russian society in particular, is ruthlessly condemned for its views on marriage and its attitude towards the vexed question of the relations between man and woman. Marriage, Tolstoy says, can only be condoned if spiritual sympathy exists, and then only as the means to the continuance of the race ; otherwise it is a breach of true morality. The " motive " of the Sonata is that the ideal we should strive after is a life where the spiritual penetrates and pervades

everything, and where all that is carnal is eliminated. But in the " Sequel " to the Sonata Tolstoy adds that great ideals are always unattainable, and affirms that no man can know, whilst yet striving, how nearly he approaches them. He is only conscious of his deviations.

The views of culture forming the basis of The Cossacks are yet further elaborated in What is Art? (1898), a sweeping criticism of the philosophy of aesthetics, to which he had devoted fifteen years of thought. He dismisses as inadequate the theories which define art as the pursuit of beauty, whether beauty be regarded with Shelley and Hegel as an approxi- mation to archetypal perfection, and thus allied to God and good- ness, or with Kant as that which gives disinterested pleasure. Tolstoy sets forth his own view that art is a human activity which aims at the transmission of emotion. He proceeds to demand that the emotion shall be actually felt and shall belong to the highest feelings to which men can rise. True art must appeal to the religious perception of the brotherhood of man, and it must find universal response. He asserts that exclusive art is bad art, and that such subjects as sexual love, patriotism and religious devotion should be avoided. (C. K. W.)

TOLSTOY, PETR ANDREEVICH, Count (1645–1729), Russian statesman, was the son of the okolmnichy Andrei Vasilevich Tol- stoy. He served in 1682 as chamberlain at the court of Theo- dore III. Miscalculating the strength of the tsarevna Sophia (g.v.) he became one of her most energetic supporters, but contrived to join the other, and winning, side just before the final catastrophe. For a long time Peter kept his latest recruit at arm's length; but when, in 1697, Tolstoy volunteered to go to Venice to learn Italian and ship-building, Peter could not resist the subtle flattery implied in such a proposal from a middle-aged Muscovite noble. In November 1701 Tolstoy was appointed the first regularly accredited Russian ambassador to the Porte, and more than justi- fied the confidence of the most exacting of masters; though his

peculiar expedients (e.g. the procuring of the strangulation of a grand vizier and the removal by poison of an inconvenient private secretary) savoured more of the Italian than of the Russian Renaissance. Even before Poltava, Tolstoy had the greatest difficulty in preventing the Turks from aiding the Swedes, and when Charles XII. took refuge on Turkish soil he instantly demanded his extradition. This was a diplomatic blunder, as it only irritated the already alarmed Turks; and on the ioth of October 1710 Tolstoy was thrown into the Seven Towers, a proceeding tantamount to a declaration of war against Russia. On his release from " this Turkish hell," in 1714, he returned to Russia, was created a senator, and closely associated himself with the omnipotent favourite, Menshikov. In 1717 his position during Peter's reign was secured once for all by his successful mission to Naples to bring back the unfortunate tsarevich Alexius, whom he may be said to have literally hunted to death. For this he earned the undying hatred of the majority of the Russian people; but Peter naturally regarded it as an inestimable service and loaded Tolstoy with honours and riches, appointing him, moreover, the head of the secret chancellery, or official torture chamber, a post for which Tolstoy was by nature emi- nently fitted. He materially assisted Menshikov to raise the empress consort to the throne on the decease of Peter (1725), and the new sovereign made him a count and one of the six members of the newly instituted supreme privy council. Tolstoy was well aware that the elevation of the grand duke Peter, son of the tsarevich Alexius, would put an end to his own career and en- danger his whole family, so that when Menshikov, during the last days of Catherine I., declared in favour of Peter II., Tolstoy endeavoured to form a party of his own whose object it was to promote the accession of Catherine's second

daughter, the tsarevna Elizabeth. But Menshikov was too strong and too quick for his ancient colleague. On the very day of the empress's death (May 11, 1727), Tolstoy, now in his eighty-second year, was banished to the Solovetsk monastery in the White Sea, where he died two years later. He is the author of a sketch of the impressions made upon him by western Europe during his tour in the years 1697-1698 and also of a detailed description of the Black Sea.

See N. A. Popov, "Count P. A. Tolstoy" (Russ.) in Old and New Russia (Petersburg, 1875); and "From the Life of P.A.Tolstoy" (Russ.) in Russian Reporter (Petersburg, i860); R. N. Bain, Pupils of Peter the Great (London, 1897); and The First Romanovs (London, 1905). (R. N.B.)

TOLTECS (Mexican Tolteca), or dwellers in Tollan (the place of reeds), the name of a people that if partly mythical is also partly historical. Traces of this people can unquestionably be detected in historic times; and many cities, particularly those which carried on traffic with the coast, claimed to be of Toltec origin. The conception of Toltecs, like that of Chichimecs, acquired in time so general and vague a significance that in vocabularies such a word as " tolteca tl " is interpreted as mean- ing merely an expert artist. So that in some cases the name " Toltecs " denotes no more than some race of Nahua affinities possessed of a certain degree of culture. In others, however, there is a substantial reason for believing in the existence of a specific tribe or people called Toltecs, though the genuine historical background has been obscured by the legends which the priests embroidered upon it to glorify their hero and god Quetzalcoatl.

Our ignorance as to the distribution and movements of the native peoples before the time of the Spanish invasion forbids any positive statement as to the original home of the Toltecs. It is certain, however, that they, as well as their god and their ancient city of Toilan, were known to those who lived in the Maya countries far beyond the confines

of Mexico proper. Their migration-myths point to the eastern districts known as the " tierras calientes," famous for such valuable products as feathers and cacao, with which the Mexicans from the earliest times carried on a vigorous commerce. It is possible that the legendary wanderings of Quetzalcoatl (Feathered Serpent), who was said to have committed himself to the flames in Tlillan-Tlapallan (the

land of the black. and red, i.e. the land of picture-writing), the region of Tabasco and Campeche, are mainly a mythological description of the moon's periodic course. But even in that case there can be no doubt that the nature-myth has been embellished with details derived from an actual race movement which took place in prehistoric times.

The Historia de Colhuacan y de Mexico is a most valuable manuscript written by an anonymous author in the Mexican language. In this work it is stated that Quetzalcoatl died in a.d. 895, and was followed by four kings in succession, after whom the wise Huemac ascended the throne in a.d. 994 under the name of Atecpanecatl. In the reign of this sovereign there broke out a great famine, which occasioned the institution of the custom of human sacrifice. From the same source we learn that it was in a.d. 1064 (a date which is assigned to the beginning of a half-mythical history by various other documents and MSS.) that the Toltecs left their homes and migrated eastward to Tabasco and Soconusco. At the same time Huemac killed himself in the cave of Cincalco. Tradition ascribes to him the authorship of an encyclopaedic picture-writing called " teoamoxtli " dealing with the history of his people, with astronomy, the calendar system, &c. According to the Hisioria de Colhuacan y de Mexico, which is confirmed in spite of some slight variations of detail by Ixtlilxochitl, the duration of the " Toltec Empire " was not more than 318 years.

Archaeologists are justified in claiming as indubitable monuments of the Toltecs the serpent-pillars which have been found in situ at Tula, close to the City of Mexico. The historian Sahagun states

that Tula was an old centre of the Toltecs and explicitly mentions these pillars as their work. It is interesting therefore to note that the only other place where such pillars occur is Chichenitza in Yucatan (see Central America: Archaeology) , a site which exhibits most strikingly Mexican features, so that archaeology fully confirms the assertion of the historians that Chichenitza, though in Mayan territory, was subject to the domination of some Nahua people. Chichenitza and Mayapan are the only sites in Mayan territory at which are found those round temples, which are attributable exclusively to Quetzalcoatl, the principal god and national hero of the Toltecs. (W. L.*)

TOLUCA, or Toloccan, a city of Mexico and capital of the state of Mexico, on the S.W. border of the Anahuac plateau, at the foot of the Cerro San Miguel de Tutucuitlalpillo, about 8650 ft. above sea-level. Pop. (1900), 25,940. Toluca is on the Mexican National railway, 36 m. W.S.W. of the national capital. Its situation near the high Cordillera gives it a cold, changeable climate. The government has a meteorological station here and a national college. Industries include the manufacture of cotton fabric, flour and wax candles. Swine-breeding is a profitable occupation in the vicinity. The Nevado de Toluca, an extinct volcano, rises to a height of 14,950 ft. on the south-west side of the town. Its summit is frequently draped with snow, and its broken-down crater contains a lake. Traditionally Toluca was one of the earliest Toltec settlements on the Anahuac tableland, but no remains of this occupation have been preserved.

TOLUENE, or Methylbenzene,C_7H_8 or $C_6H_5-CH_3$, an aromatic hydrocarbon; the first homologue of benzene. Discovered by Pelletier (Ann. chim. phys., 1838, 67, p. 269) in the oil obtained in the manufacture of gas from the resin of Pinus maritima, and named retinnaphte, it was prepared from the same gas by Couerbe (ibid., 69, p. 184) and named heptacarbure quadrihydrique, C_7H_4 (C = 6); Sainte-Claire Deville (ibid. 1841 [3] 3, p. 168) obtained it by distilling Tolu balsam, naming it benzoene,

and Glenard and Bouldault obtained a substance by the dry distilla- tion of dragon's blood which they called dracyl. The complete identity of these substances was established by A. W. Hofmann and Muspratt, and they adopted the name toluol (anglicized to toluene), which was proposed by Berzelius. Its derivatives and its relation to benzene had been previously studied by the above and other experimenters, its relation to benzene being first proved experimentally by Cannizzaro and its constitution

settled by Fittig and Tollens's synthesis from sodium and a mixture of methyl iodide and brombenzene.

The hydrocarbon occurs in wood-tar and in petroleum, and is prepared commercially by fractional distillation of the light oil fraction of the coal-tar distillate (see Coal Tar). It may be obtained synthetically by Fittig and Tollens's method (above) ; by Friedel and Craft's process, devised in 1877, of acting with aluminium chloride on a mixture of benzene and methyl chloride; this reaction leads to the production of higher homologues which may, however, break down under the continued action of the aluminium chloride; or by heating the toluene carboxylic acids obtained by oxidizing the higher homologues of benzene. It forms a colourless mobile liquid, boiling at 110-3° C. and having a specific gravity of 0-8708 (13-1/4°). It is insoluble in water, but dissolves readily in alcohol and ether. On reduction it yields hexahydrotoluene ; oxidation with dilute nitric acid or chromic acid gives benzoic acid ; whilst chromyl chloride and water give benzaldehyde. On nitration it gives ortho- and para-nitrotoluenes — which on reduction yield the valuable toluidines, $C_6H_4(CH_3)(NH_2)$ — and on sulphonation the parasulphonic acid is formed with a little of the ortho acid. Chlorination in the cold gives ortho- and para-chlortoluenes, but at the

boiling point the side chain is substituted (see Benzaldehyde).

TOMAHAWK (a native American word, probably from the Algonquian verb otomahuk, to knock down), the war-hatchet of the North American Indians. The earliest tomahawks were of chipped stone, usually sharpened to a point at each end some- thing like a pickaxe, and passed through a hole bored in a stout wooden cudgel. In the more primitive types the stone head was simply tied to the handle by animal sinews, or a withe was doubled- over the head and fastened below to form a handgrip. Sometimes deer antlers were used instead of stones. After the arrival of the white man the heads were usually of iron. Where the stone head was sharpened only at one end the blunt end was sometimes cut out into a pipe-bowl, the handle, hollowed, serving as the stem. The weapon was at once symbolical of war and peace, and was ceremoniously buried at the termination of hostilities, to be as formally exhumed when the feuds revived. Hence the colloquialism " to bury the hatchet."

TOMASZOW, or Tomaszow Fabryczny, an industrial town of Russian Poland, in the government of Piotrkow, 41 m. N.E. of the town of Piotrkow. Pop. (1897), 21,041. It has woollen mills, steam flour-mills and ironworks.

TOMATO, Lycopersicum esculentum (Nat. Ord. Solanaceae), a tender annual, native of South America, probably Peru. The fruit is much esteemed in salads and as a vegetable. Efforts have been made to popularize it for dessert, with varying success.

Plants intended to fruit out of doors during the summer should be raised from seed sown at the end of February or early in March, under glass, in a temperature of about 60°. Pots, pans or shallow boxes are suitable for the purpose. The compost should be light and fresh, preferably of loam, sand and leaf mould in equal proportions.

As soon as the young plants appear they should be

fully exposed to sunlight, as near the glass as practicable. When the second pair of leaves appear they should be potted singly in pots of about 3 in. diameter, using slightly richer compost and less sand. This opera- tion should on no account be deferred. The next shift should be into pots 7-8 in. diameter, the compost mostly loam, enriched with the ashes of plants, &c, from the refuse heap. The first flowers will appear towards the end of April or early in May. The pollen should be gathered and applied to the stigmas of the flowers by hand. The plants should be fit for planting out early in June, and should bear at least two clusters of rapidly growing fruits. They should be planted in the sunniest and warmest position available. It is customary to confine the plants to one shoot, pinching off all lateral shoots as they appear. Owing to the fickleness of the English climate it is of the utmost importance that the setting of fruit should be secured early. Manure should be applied sparingly to tomatoes until the crops become heavy.

Under glass, without artificial heat, tomatoes succeed well. In cold, sunless seasons, however, the crops are seldom remunerative. The culture is substantially as advised for out of doors. In heated structures tomatoes may be produced all the year round. They are always a small and precarious crop during winter, however. During summer the crops are usually heavier and of better flavour, even in favourable seasons, than from out of doors. It is necessary to provide a succession of plants to replace those that are being worn out by heavy cropping. Periodical sowings are therefore necessary. Some prefer to raise the plants intended for winter fruiting by cuttings inserted in August. Planting out is usually effected on shallow benches in small quantities of moderately rich soil, and the shoots trained on wires near the glass. As more nourishment is required, new soil is added. In this way excessive luxuriance, to

which the tomato is so addicted, is avoided. The plants should never be allowed to become dry — they are large consumers of water.

The following varieties comprise some of the best in cultivation:

Large Smooth Red Fruited. — The Hastings, Conference, Ham Green Favourite Perfection.

Yellow Fruited. — Chiswick Peach, Golden Jubilee, Carter's Green- gage.

Early Varieties for Outdoor Culture. — Chemin, Frogmore Selected.

TOMB (Gr. TUju/3a, rvufios, probably allied to Lat. tumulus, literally a swelling, turner e, to swell), a general term for a place of burial for the dead, including the excavation or cavity in which the body is laid and the superstructure which marks the place. (See Burial and Funeral Rites.)

The various forms which the tomb has taken throughout the ages are treated under such heads as Barrow; Cairn; Tumulus; Cenotaph; Sarcophagus; &c.

TOMPA, MIHALY [Michael] (1817-1868), Hungarian lyric poet, was born in 1817 at Rima-Szombat, in the county of Gbmor, his father being village bootmaker. He studied law and theology in Saros-Patak, and subsequently at Budapest; and, after many vicissitudes, at the age of thirty he accepted the post of Protestant minister in Beje, a small village in his native county, whence, in two years, he removed to Kelemer, and four years later to Hanva, in the county of Borsod, where he remained till his death in 1868.

At the age of four-and-twenty Tompa published his first poems in the Athenaeum, which soon procured for him a high reputation. His first volume, NepregSk es Nepmonddk (" Folk-Legends and Folk-Tales "), in 1846, met with great success, and the same may be said of the first volume of his " Poems " in 1847. In 1848 he took part in the War of Independence, acting as field chaplain to the volunteers of his county and seeing several battles; but the unfortunate close of that heroic struggle

silenced his poetic vein for a considerable time, and when in 1852 and 1853 he gave vent to his patriotic grief in some masterly allegories on the state of oppressed Hungary, he was twice arrested by the Austrian authori- ties. After being released he published his Virdgregek ("Legends of Flowers "), a collection of poems showing great imagination and love of nature. Soon after this he became oppressed with melancholy and abandoned this branch of poetry. He published three volumes of sermons, " which," says his biographer, Charles Szasz, Protestant bishop of Budapest, " are among the best in Hungarian literature, and will favourably compare with those of Robertson, Monod or Parker." His collected poetical works were published at Budapest in 1870, and again in 1885.

TOMPKINS, DANIEL D. (1774-1825), American politician, was born at Scarsdale, Westchester county, New York, on the 2 1 st of June 1774. He graduated at Columbia College in 1795, and was admitted to the bar in 1797. In 1801 he was elected to the state constitutional convention, in 1803 was a member of the state assembly, and in 1804 was elected to the national House of Representatives, but became a judge of the state supreme court, and served as such until 1807. He was governor of New York in 1807-1817; and in 1817-1825, during both terms of President James Monroe, was vice-president of the United States. In March 181 2, under the authority of art. xviii. of the New York constitution of 1777, he prorogued the legislature — the only instance of the exercise of this power. During the War of 181 2 he was active in equipping and arming the New York militia. For this purpose he borrowed much money on his personal security, and sometimes neglected to secure proper vouchers. Later the state comptroller announced a shortage of $120,000 in the military accounts, but Tompkins claimed that the state owed him $130,000. Later investigations disclosed that the state actually owed him more than $90,000. In 1821 he was president of the state constitutional convention. He died on Staten Island, N.Y., on the nth of June 1825.

The Military Papers 0) Daniel D. Tompkins, 1807–1817 (3 vols., 1898–1902) were published by the state. See D. S. Alexander, Political History of New York, vol. i. (New York, 1906).

TOMPKINSVILLE, a former village of Richmond county, New York, U.S.A., since 1898 a part of the borough of Richmond, New York City. It is on the N.E. shore of Staten Island in New York Bay, about 5! m. S. by W. of the southern extremity of Manhattan Island, and is a residential district of New York City. Tompkinsville was laid out in 1814–1815 upon a tract of about 700 acres, most of which was owned by Daniel D.

Tompkins. It was chartered as a village in 1823, but because of legal flaws the charter was revoked soon after Tompkins's death (in 1825), and thereafter the village was gradually absorbed by New Brighton and Edgewater (both incorporated in 1866), though the locality continued to be called Tompkinsville.

TOMSK, a government of western Siberia, extending from the Chinese frontier northwards to 6° N., and bounded by the government of Tobolsk on the N.W., by Yeniseisk on the N.E. and E., by north-western Mongolia on the S.E. and by the pro- vince of Semipalatinsk on the S. and W. Itsarea, 327,284sq.m., is more than one and a half times that of France. The surface includes in the south-east the high alpine tracts of the Altai Mountains, and in the north-west and west the lowlands 01 the Irtysh and the marshy tracts of the Ob. The Altai Mountains or Sailughem system, which at their northern extremity join with the Sayan Mountains, run from north-east to south- west along the Russo-Chinese frontier, and are cleft by a deep gorge through which flows the Yenisei (see Altai). A zone, some 200 m. in width, of alpine tracts fringes the outer margin of these mountains, which have a very steep slope towards the north-west, although 'their

south-eastern foot-hills rest on the plateau of Kobdo (4500 to 5000 ft.). A chain having a north-western direction — the Salair Mountains — shoots off from the main range of the Altai, between the Tom and the Chumysh ; it is about 1 70 m. in length, with a width of nearly 60 m., and contains the most productive silver-mines of the region, as also several gold-washings. Its upheaval belongs to a more recent epoch than that of the Sailughem range, and (like the mountains of Turkestan, having a north-west direction) it is composed of dioritic rocks. In the Kuznetsk depression it is overlain by deposits of the Lower and Upper Carboniferous, containing beds of coal. The Kuznetskiy Ala-tau, one of A. von Humboldt's meridional upheavals, consists of a series of ridges running south-west to north-east.

Tomsk is drained principally by the Ob and its tributaries, but the south-east corner drains into the Abakan, a tributary of the Yenisei. The Ob, formed by the union of the Biya and Katun, has within the government a course of more than 806 m., and is navigated as far as Barnaul and Biysk. Its tributaries, the Tom (450 m.), Vasyugan (530 m.), Ket (230 m.) and Tym (200 m.), are all navigable. The Chulym and the Chumysh are also large rivers. The Bukhtarma, Om, Uba and Tara, tributaries of the Irtysh, are worthy of notice.

The climate is severe, and is, moreover, very wet in the north-west. The average yearly temperatures at Tomsk, Kainsk and Barnaul are 30-2°, 31 and 32-7° (Jan., 4 , 6-2° and 3-7°;. July, 65-5°, 68-5° and 62-2°) respectively. The Altai steppes enjoy a much drier climate than the lowlands, and are clothed with beautiful vegetation ; in the sheltered valleys corn is grown up to altitudes of 3400 and 4250 ft.

The population was estimated in 1906 as 2,412,700. The bulk (90%) is Russian, the remainder being Ostyaks, Mord- vinians, Tatars (mostly in the Altai), Teleuts and Telenguts (Mongol tribes, chiefly in the Altai), and nomad Samoyedes, representing a mixture between the Samoyedes and the

Ostyaks, and dwelling along the Ob River and its tributaries. The pre- vailing religion is Greek-Orthodox, but there are also some Non- conformists, Roman Catholics, Jews, Mahommedans and pagans.

Agriculture is the predominant occupation, and excellent crops are obtained in the southern portion of the government especially in the Altai. Livestock breeding is very important, and butter-making in model dairies, partly co-operative, has developed greatly, butter being exported from Tomsk to western Europe. Trade is actively carried on at Tomsk and Barnaul, the chief centres for the trade of Siberia with Russia. The Biysk merchants carry on a barter trade with Mongolia and China.

The government is divided into six districts, the chief towns of which are Tomsk, Barnaul, Biysk, Kainsk, Kuznetsk and Marlinsk.

(P. A. K. ; J. T. Be.)

TOMSK, a town of Western Siberia, capital of the government of the same name, on the Tom, 27 m. above its confluence with the Ob. Pop. (1900), 63,533. Tomsk is an episcopal see and the largest city of Siberia, exceeding even Irkutsk in population and commercial importance. The great Siberian highway from Tyumen to Irkutsk passes within 54 m. (by branch railway to Taiga) of Tomsk, which is the terminus of the navigation by steamer from the Urals to Siberia. It has, moreover, communica- tion by steamer with Barnaul and Biysk in the Altai. The town is not an administrative centre, like so many Russian cities, but an entrepot of wares. Before 1824 it was a mere village; bul after the discovery of gold in the district it grew rapidly. It is built on two terraces on the right bank of the Tom, and is divided into two parts by the Ushaika. The best building is the univer- sity. The industries are almost entirely confined to tanning and the manufacture of carriages. Tomsk has a university (founded in 1888, with 600 students), and archaeological, ethnological, zoological, botanical and mineralogical museums, a technological

institute, a cathedral (finished in 1900), public libraries and scientific societies (naturalist, geographical, medical, musical, &c). The city was founded in 1604.

TOM-TOM, or Tam-Tam, a native Indian and Asiatic word, reduplicated and onomatopoeic in form, for a drum, h^nce often loosely applied to the various types of primitive drvra used for purposes of religious excitement, war, signalling, &c. by savage tribes throughout the world. The term is applied strictly to the metal gongs of the Far East, which are flat disks with a shallow rim.

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Fellow and Tutor in Mathematics, Christ’s College, Cambridge. Mathematics in the University.

Stokes Lecturer in -i Trigonometry,

Frederick Cornwallis Conybeare, M.A., D.Th.

Fellow of the British Academy. Formerly Fellow of University College, Oxford, j T p. f . .

Editor of The Ancient Armenian Texts of Aristotle. Author of Myth, Magic and] lon 5 ues > «*”’ 01. Morals; &c. I

Frank Dawson Adams, Ph.D., D.Sc, F.G.S., F.R.S. f

Dean of the Faculty of Applied Science and Logan Professor of Geology, McGill _ University, Montreal. President of the Canadian Mining Institute. Author of Papers dealing with problems of Metamorphism ; &c.

Frederick George Meeson Beck, M.A.

Fellow and Lecturer of Clare College, Cambridge.

Frederick Gymer Parsons, F.R.C.S., F.Z.S., F.R.Anthrop.Inst. o _ˆ

Vice-President, Anatomical Society of Great Britain and Ireland. Lecturer on J irI c r„iV» c„„i™. a , «. Anatomy at St Thomas's Hospital, London, and the London School of Medicine for 1 ….. &vslem – Anatomy, Women. Formerly Hunterian Professor at the Royal College of Surgeons. *- veins: Anatomy.

Francis John Haverfield, M.A., LL.D., F.S.A. fTrimontium;

Camden Professor of Ancient History in the University of Oxford. Fellow of J Trinovantes" Brasenose College. Fellow of the British Academy. Formerly Censor, Student, | TJriconium – ' Tutor and Librarian of Christ Church, Oxford. Ford's Lecturer, 1906-1907. uiiluiiiuih, Author of Monographs on Roman History, especially Roman Britain ; &c. L Verulamium.

Frederick Jackson Turner, M.A., LL.D., Litt.D., Ph.D. f United States: History (in

History, Harvard University. Formerly Professor of American "j j, ar A

Vancouver Island.

ˆ Vandals (in part). r Tongue;

Professor of History, Harvard History at the University of Wisconsin.

Professor of American Author of Rise ef the New West; &c.

Sir Frederick Pollock, Bart., LL.D., D.C.L.

See the biographical article: Pollock (Family).

{

Tort.

Frank R. Cana.

Author of South Africa from the Great Trek to the Union.

Transvaal: Geography and Statistics and History (in part) ;

Tripoli: North Africa (in part) ; . Tsana (in part) ; Tuat.

Francis Richard Maunsell, C.M.G. f

Lieut. -Col., Royal Artillery. Military Vice-Consul, Sivas, Trebizond, Van (Kurd- J Van* Turkey (in part) istan), 1 897-1 898. Military Attache, British Embassy, Constantinople, 1901-1905. ”

Author of Central Kurdistan ; &c. I

_ f United States: Population

Francis Samuel _ Philbrick, A.M Ph.D. J and Social Conditions;

Formerly Fellow of Nebraska State .University, and Scholar and Resident Fellow < Indusiries and Commerce]

I Finance and Army.

of Harvard University. Member of the American Historical Association.

Francis Watt, M.A.

Barrister-at-Law, Middle Temple. Author of Law’s Lumber Room.

Frederick William Gamble, D.Sc, F.R.S. Professor of Zoology, Birmingham University.

Zoological Laboratories and Lecturer in Zoology, University of Manchester. of Animal Life. Editor of Marshall and Hurst’s Practical Zoology; &c.

Treasure Trove.

Formerly Assistant Director of the J

Author] Trematodes.

Frederick William Rudler, I.S.O., F.G.S. (“Topaz;

Curator and Librarian of the Museum of Practical Geology, London, 1897-1902. i Tourmaline; President of the Geologists' Association, 1887-1889. LTurauoise

George A. Boulenger, D.Sc, F.R.S. [

In charge of the Collections of Reptiles and Fishes, Department of Zoology, British -j Trout. Museum. Vice-President of the Zoological Society of London. I

Rev. George Albert Cooke, M.A., D.D. r

Oriel Professor of the Interpretation of Holy Scripture, Oxford, and Fellow of Oriel J College. Canon of Rochester. Hon. Canon of St Mary's Cathedral, Edinburgh. 1 Author of Text-Book of North Semitic Inscriptions ; &c. I

Rev. George Edmundson, M.A., F.R.Hist.S. I

Formerly Fellow and Tutor of Brasenose College, Oxford. Ford's Lecturer, 1909. J Hon. Member Dutch Historical Society, and Foreign Member, Netherlands Associa- " tion of Literature.

George Edward Dobson, M.A., M.B., F.Z.S., F.R.S. (1848-1895).

Army Medical Department, 1 868-1 888. Formerly Curator of the Royal Victoria ˆ Museum, Netley. Author of Monograph of the Asiatic Chiroptera; A Monograph of* the Insectivora, Systematic and Anatomical; &c.

Rev. George Herbert Box, M.A.

Rector of Sutton Sandy, Beds. Formerly Hebrew Master, Merchant Taylors' -< School, London. Author of Translation of the Book of Isaiah; &c.

George James Turner.

Barrister-at-Law, Lincoln's Inn. Society.

Tyre (in part).

Utrecht: Province (in part).

Vampire.

Urim and Thummin.

Editor of Select Pleas of the Forests for the Selden J Trinoda Necessitas.

Sir George Reid, LL.D.

See the biographical article: Reid, Sir George.

Turner.

INITIALS AND HEADINGS OF ARTICLES

IX

G. W. C* H. A. C.

H. Ch.

H. De. H. E. A.

H. F. B.

H. F. G. H. F. T.

H. H.

H. Ha. H. H. F.

H. H. J. H. Lb.

H. L. C.

H. L. H. H. L. 0.

H. M. C. H. M. R. H. M. Wo.

H.St. H. Sw.

I. M. A.

J. An.

Rev. George Willis Cooke. f

Lecturer at Rand School of Social Science, New York. Author of Critical Study of J TTnitnrinnicnr TT V J O / Emerson; History of Unitarianism in America; Woman in the Progress of Civiliza-\ umwiamsm. united Slates. Hon; &c. L

Howard Adams Carson, A.M. f

Civil Engineer. Past President of the Boston Society of Civil Engineers. Formerly J Tunnel Chief Engineer of the Boston Transit Commission. In charge of designing and con- 1 structing the Boston Subway, the East Boston Tunnel ; &c. L

Hugh Chisholm, M.A.

Formerly Scholar of Corpus Christi College, Oxford. Editor of the nth edition of the Encyclopaedia Britannica; Co-editor of the ioth edition.

Rev. Hippolyte Delehaye, S.J.

Bollandist. Joint-editor of the Acta Sanctorum and the Analecta Bollandiana.

Henry Edward Armstrong, Ph.D., LL.D., F.R.S.

Professor of Chemistry at the City and Guilds of London Central Institute, South ” Kensington. Author of Introduction to the Study of Organic Chemistry.

Horatio Robert Forbes Brown, LL.D.

Editor of the Calendar of Venetian State Papers, for the Public Record Office. . Author of Life on the Lagoons; Venetian Studies; John Addington Symonds, a Biography; &c. L

Hans Friedrich Gadow, F.R.S. , Ph.D. f

Strickland Curator and Lecturer on Zoology in the University of Cambridge. -I Tortoise. Author of ” Amphibia and Reptiles ” in the Cambridge Natural History. [

Rev. Henry Fanshawe Tozer, M.A., F.R.G.S. r

Hon. Fellow, formerly Fellow and Tutor of Exeter College, Oxford. Fellow of the British Academy. Corresponding Member of the Historical Society of Greece. – Author of History of Ancient Geography; Classical Geography; Lectures on the Geography of Greece ; &c.

Henri Simon Hymans, Ph.D.

Keeper of the Bibliotheque Royale de Belgique, Brussels. Author of Rubens: sa ‘ vie et son ceuvre.

Transvaal: History (in part).

J Valentine; \ Veronica, St.

Valency.

Venice.

Trebizond.

Van Dyck (in part).

Heber Leonidas Hart, LL.D. Barrister-at-law.

H. Hamilton Fyfe.

Special Correspondent of the Daily Mail; Dramatic Critic of The World. of A Modern Aspasia; The New Spirit in Egypt; &c.

Sir Harry Hamilton Johnston, G.C.M.G., K.C.B., D.Sc, LL.D. See the biographical article: Johnston, Sir H. H.

Horace Lamb, M.A., LL.D., D.Sc, F.R.S.

Professor of Mathematics, University of Manchester. Formerly Fellow and Assistant Tutor of Trinity College, Cambridge. Member of Council of the Royal Society, 1894-1896. Royal Medallist, 1902. President of the London Mathematical Society, 1902-1904. Author of Hydrodynamics; &c.

Hugh Longbourne Callendar, F.R.S., LL.D. f

Professor of Physics, Royal College of Science, London. Formerly Professor of < Vaporization, Physics in McGill College, Montreal, and in University College, London. [

\ Valuation and Valuers.

Author J Tricoupis, CharUaos.

f Tunisia;

1 Uganda; Unyoro.

Vector Analysis.

Harriet L. Hennessy, M.D. (Brux.), L.R.C.P.I., L.R.C.S.I.

-j Tuberculosis.

Herbert Levi Osgood, A.M., Ph.D.

Professor of History at Columbia University, New York. Author of The American -I United States: History(in part). Colonies in the Seventeenth Century ; &c.

Hector Munro Chadwick, M.A.

Fellow and Librarian of Clare College, Cambridge. Author of Studies on Anglo- – Saxon Institutions.

Hugh Munro Ross.

Formerly Exhibitioner of Lincoln College, Oxford. ing Supplement. Author of British Railways.

Editor of The Times Engineer-

.(“Tyr; 1 Valkyries.

Typography: Modern Practical Typography (in part).

Trypanosomes.

Harold Mellor Woodcock, D.Sc.

Assistant to the Professor of Proto-Zoology, London University. Fellow of Uni- _ versity College, London. Author of ” Haemoflagellates ” in Sir E. Ray Lankester’s Treatise on Zoology, and of various scientific papers. I

Henry Sturt AT A f

Author of Idola Thealri; The Idea of a Free Church; Personal Idealism. \ Utilitarianism.

Henry Sweet, M.A., Ph.D., LL.D. r

University Reader in Phonetics, Oxford. Member of the Academies of Munich, J Berlin, Copenhagen and Helsingfors. Author of A History of English Sounds since H Universal Languages.

the Earliest Period ; A Handbook of Phonetics ; &c. [

Rev. Isaac Morgan Atwood, M.A., D.D., LL.D. r

Secretary of the Universalist General Convention. Associate-editor of the Uni- I

versalist Leader, Boston. General Superintendent of the Universalist Church, -{ Universalist Church. 1898-1906. Author of Latest Word of Universalism; &c. [

Joseph Anderson, LL.D. r

Keeper of the National Museum of Antiquities, Edinburgh, and Assistant Secretary of the Society of Antiquaries of Scotland. Honorary Professor of Antiquities to J TumulUS. the Royal Scottish Academy. Author of Scotland in Early Christian and Pagan Times. {,

X

J. A. P.

J. A. H.

J.Br. J. Bt.

J. B. M.

*J. C. H. J. F.-K.

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INITIALS AND HEADINGS OF ARTICLES

John Ambrose Fleming, M.A., F.R.S., D.Sc. f

Pender Professor of Electrical Engineering in the University of London. Fellow of J Transformers* University College, London. Formerly Fellow of St John's College, Cambridge, and] ¥j n j* s pv,v

Lecturer on Applied Mechanics in the University. Currents.

Author of Magnets and Electric

] 1

John Allen Howe.

Curator and Librarian of the Museum of Practical Geology, London. The Geology of Building Stones.

Right Hon. James Bryce, D.C.L., D.Litt. See the biographical article: Bryce, James

. , A Torridonian; Authorof lTrlassic System.

f Tribonian;

■j United States: Constitution [and Government.

James Bartlett. |

Lecturer on Construction, Architecture, Sanitation, Quantities, &c, at King's I v t ., t . College, London. Member of the Society of Architects. Member of the Institute 1 » entuatlon ' of Junior Engineers. I

James Bass Mullinger, M.A. r

Lecturer in History, St John's College, Cambridge. Formerly University Lecturer in History and President of the Cambridge Antiquarian Society. Birkbeck Lecturer J Universities. in Ecclesiastical History at Trinity College, Cambridge, 1890-1894. Author of History of the University of Cambridge ; The Schools of Charles the Great ; &c. I

Right Rev. John Cuthbert Hedley, O.S.B., D.D.

R.C. Bishop of Newport. Author of The Holy Eucharist; &c.

James Fitzmaurice-Kelly, Litt.D., F.R.Hist.S. r

Gilmour Professor of Spanish Language and Literature, Liverpool University. Translation; Norman McColl Lecturer, Cambridge University. Fellow of the British Academy, -j Valera y Alcala Galiano, Juan; Member of the Royal Spanish Academy. Knight Commander of the Order of Vega Carpio (in part). Alphonso XII. Author of A History of Spanish Literature; &c. I

J Transubstantiation.

John Forbes White, M.A., LL.D. (d. 1904).

Joint-author of the Life and Art of G. P. Chalmers, R.S.A.

&c.

J Velazquez (in part).

Tool.

Joseph G. Horner, A.M.I.Mech.E.

Author of Plating and Boiler-Making; Practical Metal-Turning; &c.

John Gray M'Kendrick, M.D., LL.D., F.R.S., F.R.S. (Edin.). f£ 0UCh , ; « .

Emeritus Professor of Physiology in the University of Glasgow. Professor of \ Vascular System: History Physiology, 1 876-1906. Author of Life in Motion; Life of Helmholtz; &c. of Discovery.

John Henry Hessels, M.A.

Author of Gutenberg: an Historical Investigation.

-j Typography: History.

John Henry Middleton, M. A., Litt.D., F.S.A., D.C.L. (1846-1896). f

Slade Professor of Fine Art in the University of Cambridge, 1886-1895. Director Verona (in part);

of the Fitzwilliam Museum, Cambridge, 1889-1892. Art Director of the Souths Verrocchio, Andrea del;

Kensington Museum, 1892-1896. Author of The Engraved Gems of Classical Vesta (in part) Times; Illuminated Manuscripts in Classical and Mediaeval Times. I

John Horace Round, M.A., LL.D. f

Balliol College, Oxford. Author of Feudal England; Studies in Peerage and Family \ Vere (Family). History; Peerage and Pedigree, [

Sis Joseph John Thomson, F.Sc, LL.D., Ph.D., F.R.S. r

Cavendish Professor of Experimental Physics and Fellow of Trinity College, Cambridge. President of the British Association, 1900ˆ-1910. Author of A Treatise i Vacuum Tube. on the Motion of Vortex Rings ; A pplication of Dynamics to Physics and Chemistry ; Recent Researches in Electricity and Magnetism ; &c. I

Sir Joseph Larmor, M.A., D.Sc., LL.D., F.R.S.

Fellow of St John's College, Cambridge, and Lucasian Professor of Mathematics in the University. Secretary of the Royal Society. Professor of Natural Philo- " sophy, Queen's College, Galway, 1 880-1 885. Author of Ether and Matter, and various memoirs on Mathematics and Physics.

John Louis Emil Dreyer. f

Director of Armagh Observatory. Author of Planetary Systems from Thales to < Transit Circle. Kepler; &c. I

Jessie Laidlay Weston. -f Tristan.

Author of Arthurian Romances unrepresented in Malory. \

Josiah Oldpield, M.A., D.C.L., M.R.C.S., L.R.C.P. f …

Barrister-at-law. Senior Physician of the Lady Margaret Fruitarian Hospital, ■} Vegetarianism. Bromley. Author of Myrrh and Amaranth; The Voice of Nature; &c. [

Units, Dimensions of.

John Oliver Borley, M.A.

Gonville and Caius College, Cambridge.

James George Joseph Penderel-Brodhurst. Editor of the Guardian, London.

Rev. John Punnett Peters, Ph.D., D.D.

Canon Residentiary, Protestant Episcopal Cathedral of St John the Divine in New York City. Formerly Professor of Hebrew, University of Pennsylvania. In charge . of the Expedition of the University of Pennsylvania to Nippur, 1 888-1 895. Author of Scriptures, Hebrew and Christian; Nippur, or Explorations and Adventures on the Euphrates; &c.

Trawling, Seining and Netting.

Vernis, Martin.

Ur.

INITIALS AND HEADINGS OF ARTICLES

XI

J. So. J. S. F.

J. S. N.

J. S. R.

John Southward.

J. T. Be.

J. W.

J. W. He.

J. W. J. K. S.

L. C* L. Du.

L. E. H. L. J.* L. J. S. L.V.*

H. Br. M. G.

M. N. T. H. 0. B. C. N. D. M.

Author of A Dictionary of Typography and its Accessory Arts; Practical Printing; , &c. I

. J Typography: Modem Practical

Typography (in part).

John Smith Flett, D.Sc, F.G.S. f Tonalite; Trachyte;

Petrographer to the Geological Survey. Formerly Lecturer on Petrology in I Tuff- Varmlifoc- Edinburgh University. Neill Medallist of the Royal Society of Edinburgh. Bigsby 1 ,,' v « 10 " le! >» Medallist of the Geological Society of London. I Veins {Geology).

Joseph Shield Nicholson, M.A., Sc.D. f

Professor of Political Economy at Edinburgh University. Fellow of the British Academy. Author of Principles of Political Economy; Money and Monetary Problems; &c.

James Smitf Reid, M.A., LL.D., Litt.D.

Professor of Ancient History and Fellow and Tutor of Gonville and Caius College, Cambridge. Hon. Fellow, formerly Fellow and Lecturer of Christ's College. Browne's and Chancellor's Medals. Editor of editions of Cicero's Academia; De Amicitia; &c.

John Thomas Bealby.

Joint-author of Stanford's Europe. Formerly Editor of the Scottish Geographical Magazine. Translator of Sven Hedin's Through Asia, Central Asia and Tibet; &c.

J Usury; [Value.

r

1 Trajan;

| Tribune;

I Varro, Marcus Terentius.

Transbaikalia (in part); Transcaspian Region (in part); Turgai (in part); Turkestan (in part); Ufa (Government) (in part); Ural Mountains (in part).

Torture.

James Williams, M.A., D.C.L., LL.D.

All Souls Reader in Roman Law in the University of Oxford, and Fellow of Lincoln College. Author of Wills and Succession ; &c.

James Wycliffe Headlam, M.A. _ f

Staff Inspector of Secondary Schools under the Board of Education, London.

Formerly Fellow of King’s College, Cambridge. Professor of Greek and Ancient < Treitschke, Heinrich VOn. History at Queen's College, London. Author of Bismarck and the Foundation of the German Empire; &c. >-

Jeremiah Whipple Jenks.

See the biographical article: Jenks, Jeremiah Whipple.

Trusts.

Kathleen Schlesinger.

Editor of The Portfolio of Musical Archaeology. Orchestra.

(Trigonon; Tromba Marina; Trombone (in part); Trumpet (in part); Tuba; Valves.

Traction.

Louis Courtauld, M.A., M.R.C.S., L.R.C.P.

Formerly Research Scholar, Middlesex Hospital Cancer Laboiatories. Author of -J Tumour. Life-History of Pneumococcus ; &c.

Louis Duncan, Ph.D., M.Am.Inst.E.E.

Late Associate Professor of Applied Electricity at the Johns Hopkins University, Baltimore, Md. Head of the Department of Electrical Engineering, Massachusetts ” Institute of Technology. L

Leonard Erskine Hill, F.R.S., M.R.C.S., L.R.C.P. .

Lecturer on Physiology at the London Hospital. Formerly Demonstrator of Physiology in the University of Oxford; and Assistant Professor of Physiology, University College, London. Author of Manual of Physiology; &c.

Lionel James, F.R.G.S.

The Times Special Correspondent in South Africa, 1899-1901. Reuter’s Special Correspondent in the Chitral Campaign, 1 894-1 895. Author

of With the Chitral Relief Force; On the Heels of De Wet; &c. &c.

Leonard James Spencer, M.A.

Assistant in the Department of Mineralogy, British Museum. Formerly Scholar of Sidney Sussex College, Cambridge, and Harkness Scholar. Editor of the Mineralogical Magazine.

LUIGI VlLLARI.

Italian Foreign Office (Emigration Department). Formerly Newspaper Corre- spondent in the east of Europe. Italian Vice-Consul in New Orleans, 1906; Phila- delphia, 1907; and Boston, 1907-1910. Author of Italian Life in Town and Country; &c.

Margaret Bryant.

Moses Gaster ; Ph.D.

Chief Rabbi of the Sephardic Communities of England. Vice-President, Zionist Congress, 1898, 1899, 1900. Ilchester Lecturer at Oxford on Slavonic and Byzantine Literature, 1886 and 1891. Author of A New Hebrew Fragment of Ben-Sira; The Hebrew Version of the Secretum Secretorum of Aristotle.

Marcus Niebuhr Tod, M.A.

Fellow and Tutor of Oriel College, Oxford. University Lecturer in Epigraphy. Joint-author of Catalogue of the Sparta Museum.

Maximilian Otto Bismarck Caspari, M.A.

Reader in Ancient History at London University. Lecturer in Greek at Birmingham University, 1905-1908.

Newton Denntson Mereness, A.M., Ph.D. Author of Maryland as a Proprietary Province.

-{ Vascular System: Physiology.

\ Transvaal: History (in part).

f Torbernite; Tremolite; \ Tridymite; Vanadinite; [Vesuvianite.

1 Tuscany: History; Vespers, Sicilian.

fTourneur, Cyril: Introduction

\ and Bibliography .

Vacarescu.

I

Vaphio.

Trachis;

Umbria (Ancient).

f United States: \ Flora.

Fauna and

Xll O. Ba.

P. A. K. P. C. M.

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fi K. D. R. L.*

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R. Tr. S. A. C.

INITIALS AND HEADINGS OF ARTICLES

Oswald Barron, F.S.A. f Tnnrn . jnmi .

Editor of the Ancestor, 1902-1905. Hon. Genealogist to Standing Council of the \ *°” rn aineni. Honourable Society of the Baronetage. I Tudor {Family).

Prince Peter Alexeivitch Kropotkin.

See the biographical article: Kropotkin, Prince P. A.

Transbaikalia {in part); Transcaspian Region {in part); Turgai {in part); Turkestan {in part); Ufa {Government) {in part); Ural Mountains {in part).

Variation and Selection; Vertebrata.

Vane, Sir H.

Peter Chalmers Mitchell, M.A., F.R.S., F.Z.S., D.Sc, LL.D.

Secretary of the Zoological Society of London. University Demonstrator in Com- parative Anatomy and Assistant to Linacre Professor at Oxford, 1888-1891. Author of Outlines of Biology ; &c.

Philip Chesney Yorke, M.A.

Magdalen College, Oxford. Editor of Letters of Princess Elizabeth of England.

Peter Giles, M.A., LL.D., Litt.D. r

Fellow and Classical Lecturer of Emmanuel College, Cambridge, and University J “• Reader in Comparative Philology. Formerly Secretary of the Cambridge Philo- 1 V. logical Society. I

Paul George Konody. f Van Dyck {in part)-

Art Critic of the Observer and the Daily Mail. Formerly Editor of the Artist. { \ rt .i a „„„„„ /■ j, „\ Author of The Art of Walter Crane; Velasquez: Life and Work; &c. I velaZ(l uez <■*» P an >

Philip Lake, M.A., F.G.S. f

Lecturer on Physical and Regional Geography in Cambridge University. Formerly J v . r , of the Geological Survey of India. Author of Monograph of British Cambrian 1 ven ezueia. ueotogy. Trilobites. Translator and Editor of Kayser’s Comparative Geology. I

Robert Anchel.

Archivist of the Department de l’Eure.

Vended, Wars of the.

Richard Alexander Streatfeild. ... f

Assistant in the Department of Printed Books, British Museum. Musical Critic of < Verdi, Guiseppe. the Daily Graphic. Author of Masters of Italian Music ; The Opera ; &c. |_

Sir P.ich\rd Claverhouse Jebb, LL.D., D.C.L., Litt.D. See the

biographical article: Jebb, Sir Richard C.

Rollin D. Salisbury, A.M., LL.D. r

Geologist in charge of Pleistocene Geology of New Jersey. Dean of Ogden (Grad.) J United States: Geology {in School of Science and Head of the Department of Geography in the University of 1 part).

-j Troy and Troad {in part).

Chicago.

Reginald Innes Pocock, F.Z.S.

Superintendent of the Zoological Gardens, London.

Ronald John McNeill, M.A.

Christ Church, Oxford. Barrister-at-law. Formerly Editor of the St James's – Gazette (London).

Sir Robert Kennaway Douglas.

Formerly Keeper of Oriental Printed Books and MSS. at the British Museum; and Professor of Chinese, King's College, London. Author of The Language and Litera- ” ture of China; &c.

Richard Lydekker, M.A., F.R.S., F.G.S., F.Z.S.

Member of the Staff of the Geological Survey of India, 1874-1882. Author of Catalogues of Fossil Mammals, Reptiles and Birds in the British Museum ; The Deer ■ of All Lands; The Game Animals of Africa; &c.

Robert Nisbet Bain (d. 1909).

Assistant Librarian, British Museum, 1883-1909. Author of Scandinavia: the Political History of Denmark, Norway and Sweden, 75 13-1900; The First Romanovs, 1613-1725 ; Slavonic Europe: the Political History of Poland and_Russia from 1469 to 1796; &c.

R. Phene Spiers, F.S.A. , F.R.I.B.A..

Formerly Master of the Architectural School, Royal Academy, London. Past President of Architectural Association. Associate and Fellow of King's College, . London. Corresponding Member of the Institute of France. Editor of Fergusson's History of Architecture. Author of

Architecture: East and West; &c.

Robert Seymour Conway, M.A., D.Litt. (Cantab.). r

Professor of Latin and Indo-European Philology in the University of Manchester. J Veneti; Formerly Professor of Latin in University College, Cardiff ; and Fellow of Gonville 1 Vestini. and Caius College, Cambridge. Author of The Italic Dialects. [

J Trilobites.

‘ Tone, Theobald Wolfe; Tyler, Wat; Ulster, Earls of.

Tseng Kuo-fan.

Toxodontia;

Tylopoda;

Ungulata.

Torkenskjold, Peder; Torstensson, Count; Valdemar I., II. and IV. of

Denmark; Verboezy, Istvan.

Tower; Tracery;

Triumphal Arch; Vault.

Roland Truslove, M.A.

Fellow, Dean and Lecturer in Classics at Worcester College, Oxford.

Stanley Arthur Cook, M.A.

Editor for the Palestine Exploration Fund. Lecturer in Hebrew and Syriac, and formerly Fellow, Gonville and Caius College, Cambridge. Examiner in Hebrew and Aramaic, London University, 1904-1908. Author of Glossary of Aramaic Inscriptions- The Laws of Moses and the Code of Hammurabi; Critical Notes on Old Testament History Religion of Ancient Palestine; &c.

{

Troyes.

Tree-Worship; Uzziah.

s. m. c.

S. M. E.-W.

S.N.

T. As.

Sydney Monckton Copeman, M.A., M.D., F.R.C.P., M.R.C.S., F.R.S.

Medical Inspector to H.M. Local Government Board, London. Medical Lecturer on Public Health at Westminster Hospital. Lt.Col. and Divisional Sanitary Officer, 1st London Division, Territorial Force. Milroy Lecturer, Royal College of" Physicians, London, 1898. Author of Vaccination, its Natural History and Patho logy ; &c.

Sir Sydney Marow Eardley-Wilmot.

Rear-Admiral (retired). Commanded H.M.S. " Dolphin " in Red Sea, 1885-1886, and assisted in the defence of Suakin. Superintendent of Ordnance Stores, 1 902-1 909. Author of Life of Vice- Admiral Lord Lyons; Our Navy for a Thousand Years; &c.

Simon Newcomb, LL.D., D.Sc.

See the biographical article: Newcomb, Simon.

Vaccination.

Torpedo.

Thomas Ashby, M.A., D.Litt.

Director of the British School of Archaeology at Rome. Formerly Scholar of Christ Church, Oxford. Craven Fellow, 1897. Conington Prizeman, 1906. Member of the Imperial German Archaeological Institute. Author of The Classical Topo- graphy of the Roman Campagna.

T. A. A. T. A. I. T. C. C.

Thomas Andrew Archer, M.A.

Author of The Crusade of Richard I. ; &c.

Thomas Allan Ingram, M.A., LL.D. Trinity College, Dublin.

Chamberlin, A.M., Ph.D., LL.D., Sc.D., F.G.S.,

{Uranus {Astronomy); Venus {Astronomy). Tortona; Trapani; Trasimene, Lake; Trebula; Turin; Turris Libisonis; Tuscany: Geography; Tuseulum; Tyndaris; Udine; Umbria {Modern); Valeria, Via; Varia; Vasto; Veii; Veleia; Velia; Velletri; Venafrum; Venusia; Vercelli; Verona {in part); Vesuvius {in part).

“[Ursula, St {in part).

\ Unemployment; Vagrancy.

T. E. H.

T. F. C. T. H. T. S.

T. Se. V. C*

V. M.

W. A. B. C.

W. A. He.

W. A. P.

W. Bo.

Thomas Chrowder F.A.A.S., &c. Professor and Head of Department of Geology and Director of the Walker Museum, J United States: Geology University of Chicago. Investigator of Fundamental Problems of Geology at the ~\ Carnegie Institute. Consulting Geologist, United States and Wisconsin Geological Survey. Author of Geology of Wisconsin; General Treatise on Geology (with R. D. Salisbury) ; &c.

Thomas Erskine Holland, M.A., D.C.L., LL.D., K.C.

Fellow of the British Academy. Fellow of All Souls College, Oxford. Professor of International Law and Diplomacy in the University of Oxford, 1874-1910. Bencher of Lincoln’s Inn. Author of Studies in International Law; The Elements of Juris- prudence; Alberici Gentilis de jure belli; The Laws of War on Land; Neutral Duties in a Maritime War; &c.

Theodore Freylinghuysen Collier, PhD (Urban VII. and VIII.

Assistant Professor of History, Williams College, Williamstown, Mass. (_

United States:

{in part).

Treaties; Vacarius.

Thomas Hodgkin, D.C.L., Litt.D.

See the biographical article : Hodgkin, Thomas.

The Right Honourable Lord Shaw of Dunfermline.

Lord of Appeal. M.P. for Hawick District, 1892-1909. Lord Advocate for Scotland, –

1905-1909.

Thomas Seccombe, M.A.

Balliol College, Oxford. Lecturer in History, East London and Birkbeck Colleges, . University of London. Stanhope Prizeman, Oxford, 1887. Assistant Editor of Dictionary of National Biography, 1891-1901. Author of The Age of Johnson; &c.

Sir Vincent Henry Penalver Caillard.

Director of Vickers, Sons & Maxim, Ltd.; and the London, Chatham & Dover Railway. Formerly President of the Ottoman Public Debt Council, and Financial Representative of England, Holland and Belgium in Constantinople. Author of Imperial Fiscal Reform.

Vandals {in part).

Vergniaud, Pierre.

Vanbrugh, Sir John.

Chevalier of the Legion ”

Victor Charles Mahillon.

Principal of the Conservatoire Royal de Musique at Brussels, of

Honour.

Rev. William Augustus Brevoort Coolidge, M.A., F.R.G.S.

Fellow of Magdalen College, Oxford. Professor of English History, St David's College, Lampeter, 1880-1881. Author of Guide to Switzerland; The Alps in Nature and in History; &c. Editor of the Alpine Journal, 1 880-1 889.

William Abbot Herdman, D.Sc, F.R.S.

Professor of Natural History in the University of Liverpool. President of the Linnean Society, 1904. Author of Report upon the Tunicata collected during the Voyage of the " Challenger "; &c.

Walter Alison Phillips, M.A.

Formerly Exhibitioner of Merton College and Senior Scholar of St John's College, Oxford. Author of Modern Europe ; &c.

Wilhelm Bousset, D.Th.

Professor of New Testament Exegesis in the University of Gottingen. Author of Das Wesen der Religion; The Antichrist Legend; &c.

J Turkey: Geography and

Statistics.

Trombone {in part); Trumpet {in part).

f Topfler, Rodolphe; Trent; "j Tschudi; Unterwalden; I Uri; Valais; Var; Vaud.

■j Tunicata.

f Utrecht: Province {in part); J Valet; Vavassor; 1 Verona, Congress of; I Vestments.

[Valentinus and the 1 Valentinians.

XIV W. E. G.

W. F. C.

W. G.*

W. L. F.

W. McD.

W. MacD.*

INITIALS AND HEADINGS OF ARTICLES

w.

M. D

w.

P. C.

w.

R. M.

W. R. S.

Sir William Edmund Garstin, G.C.M.G.

Governing Director, Suez Canal Co. Formerly Inspector-General of Irrigation, Egypt, and Adviser to the Ministry of Public Works in Egypt.

William Feilden Craies, M.A.

Barrister-at-Law, Inner Temple. Lecturer on Criminal Law, King's College, London. Editor of Archbold's Criminal Pleading (23rd edition).

Walcot Gibson, D.Sc, F.G.S.

Geologist on H.M. Geological Survey. Author of The Gold-bearing Rocks of the S. Transvaal ; Mineral Wealth of Africa ; The Geology of Coal and Coal Mining ; &c.

Walter Lynwood Fleming, A.M., Ph.D.

Professor of History in Louisiana State University. Editor of Documentary History of Reconstruction ; &c.

William McDougall, M.A.

Wilde Reader in Mental Philosophy in the University of Oxford.

Formerly Fellow of St John's College, Cambridge.

William MacDonald, LL.D.

Professor of American History in Brown University, Providence, R.I. Professor of History and Political Science at Bowdoin, 1893-1901. Author of History and Government of Maine ; &c. Editor of Select Documents illustrative of the History of the United States; &c.

William Morris Davis, D.Sc, Ph.D.

Professor of Geology in Harvard University. Geography. Author of Physical Geography ; &c.

William Prideaux Courtney.

See the biographical article: Courtney, L. H. Baron.

William Richard Morfill, M.A. (d. 1910).

Formerly Professor of Russian and the other Slavonic Languages in the University of Oxford. Curator of the Taylorian Institution, Oxford. . \ Author of Russia; Slavonic Literature ; &c.

William Robertson Smith, LL.D.

See the biographical article: Smith, William Robertson.

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Tsana (in part).

Trade Marks {in part); Treason; Trial; Venue.

Transvaal: Geology.

\ Union League of America, 1 Tne –

Trance.

Formerly Professor of Physical

Tyler, John;

Van Buren, Martin.

j United States: Physical 1 Geography and Climate.

j Tooke, John Home. \ Turgueniev, Ivan. J Tyre {in part).

PRINCIPAL UNSIGNED ARTICLES

Tonga.

Tongking.

Toronto.

Toul.

Toulouse.

Touraine.

Tours.

Townshend, Charles.

Townshend, Viscount.

Trade, Board of.

Trade Organization.

Trade Unions (in part).

Transylvania.

Transylvanian Mountains.

Trap.

Trenck, Franz.

Trendelenburg, Friedrieh.

Trenton (N.J.).

Tresham, Francis.

Trespass.

Triazines.

Trieste.

Trinidad.

Tristan da Cunha.

Trollope, Anthony.

Tromp.

Tropine.

Troy (N.Y.).

Truffle.

Trust and Trustees.

Tschaikovsky, Peter.

Tuareg.

Tuke (Family).

Tulip.

Tungsten.

Tunis.

Turgot, Anne Robert

Jacques. Turkey: History. Turpentine.

Tweeddale, Marquesses of. Tyndale, William. Tyndall, John. Tynemouth. Typewriter. Typhoid Fever. Typhus Fever. Tyrone.

Ulfeldt, Korfits.

Ulm.

Ulrich.

Umbelliferae.

United Kingdom of Great Britain and Ireland.

United Presbyterian Church.

United Provinces of Agra and Oudh.

United States Naval Acade- my.

Upsala.

Uranium.

Urbino.

Urea.

Urinary System.

Ursins, Princess des.

Urticaceae.

Uruguay.

Usher, James.

Uskoks.

Utah.

Utica (N.Y.).

Uxmal.

Valencia (Province).

Valencia (City).

Valens.

Valentinian I.-II.

Valerian.

Valla, Lorenzo.

Valladolid.

Valtellina.

Vanadium.

Vanderbilt, Cornelius.

Vane, Sir Henry.

Vanilla.

Vauban.

Vaughan, Henry.

Vauvenargues, Marquis de,

Venezuela: History.

Venus’s Fly-trap.

Verdun.

Vermont.

Vernet (Family).

Verney (Family).

Vernon, Edward.

Versailles.

Vespasian.

ENCYCLOPEDIA BRITANNICA

ELEVENTH EDITION

VOLUME XXVII

TONALITE, in petrology, a rock of the diorite class, first described from Monte Adamello near Tonale in the Eastern Alps. It may be described as a quartz-diorite containing biotite and hornblende in nearly equal proportions. The prin- cipal felspar is plagioclase, but orthoclase occurs also, usually in small amount. Those varieties which are rich in orthoclase, in addition to plagioclase, have been called quartz-monzonites or adamellites, but a better term is grano-diorite, which has been very generally adopted in America for rocks which are intermediate in character between the granites and the diorites. The hornblende of the diorites is green, sometimes with a tinge of brown; the biotite is always brown and strongly pleochroic. Often these two minerals are clustered together irregularly or in parallel growths. They have generally a fairly strong tendency to idiomorphism, but may sometimes enclose plagioclase fel- spar in ophitic manner. Both of them decompose to chlorite, epidote and carbonates. The plagioclase felspar, which may form more than one-half of the rock, is andesine or oligoclase; simple crystals are rare, the majority being complex growths with centres of felspar rich in lime, while in the external zones the proportion of soda felspar increases greatly. The inner portions have often well-defined, but very irregular, boundaries, and are sometimes sponge-like, with the cavities filled up with a later, more acid, deposit. This seems to indicate that growth has taken place in stages, alternating with periods when the crystallized felspar was eroded or partly dissolved. The ortho- clase sometimes forms irregular plates enclosing individuals of plagioclase. Quartz occurs both in irregular simple grains and as micropegmatite. Occasionally pale green pyroxene is visible in the centre of crystals of dark green hornblende. The accessory minerals apatite, magnetite and zircon are always present, and very common also are orthite in coffee-coloured zonal prisms practically always encircled by yellow epidote, and reddish-brown crystals of sphene, simple or twinned.

In external appearance the tonalites are very like the granites but

usually darker in colour. Tonalite-porphyrites often accom- pany them, having the same composition but with phenocrysts of felspar, quartz, hornblende and biotite in a fine-grained ground- mass. Veins and threads of fine grey rock, mainly composed of quartz and felspar, often intersect tonalite-masses and have been called tonalite-aplites, seeing that they bear the same relations to aplites as ihe aplites do to the granites. They contain more soda- lime felspar than the normal aplites. Towards their margins the larger alpine masses of tonalite often assume banded or gneissic facies, due apparently to movement during intrusion.

In eastern Tirol another tonalite occurs at Rieserferner ; there is also a well-known mass of this rock near Traversella. In the south of Scotland (Galloway district) tonalites accompany hornblende- and biotite-granites, hornblende- and augite-diorites. The newer granites of the Highlands of Scotland in many places pass into tonalites, especially near their margins, and similar rocks occur in Ireland in a few places. Grano-diorites have been described from California, and rocks of very similar character occur in the Andes, Patagonia and the lesser Antilles. Tonalites are also said to be frequent among the igneous rocks of Alaska. (J. S. F.)

TONAWANDA, a city of Erie county, New York, U.S.A., about n m. by rail N. of Buffalo on the Niagara River at the mouth of Tonawanda Creek (opposite North Tonawanda), and on the Erie Canal. Pop. (1900), 7421, of whom 1834 were foreign-born; (1010 census), 8290. Tonawanda is served by the New York Central & Hudson River and the Erie railways, and is connected with Buffalo, Niagara Falls and Lockport by electric lines. The industries depend chiefly on electric power generated by the Niagara Falls, 1 1 m. distant. There are rolling- mills, planing-mills, ship-yards, and blast-furnaces, and among the manufactures are wooden ware, flour and paper. The surrounding region was the scene of hostilities during the Seven Years' War, and the War of 181 2. The first permanent white settlement was made about 1809, and Tonawanda was in- corporated as a village in 1854 and was chartered as a city in 1903. The name of the city is an Indian word said to mean " swift water."

TONBRIDGE [Ttjnbridge], a market town in the Tonbridge or south-western parliamentary division of Kent, England, 29ˆ m. S.S.E. of London by the South Eastern & Chatham railway. Pop. of urban district (1901), 12,736. It is situated on rising ground above the river Medway, which is crossed by a stone bridge erected in 1775. The

church of St Peter and St Paul, chiefly Decorated and Perpendicular, with some portions of earlier date, was completely restored in 1879. There are remains of an ancient castle, consisting chiefly of a finely pre- served gateway, of the Early Decorated period, flanked by two round towers. The castle was formerly defended by three moats, one of them formed by the Medway. Tonbridge School was founded by Sir Andrew Judd, lord mayor of London in the time of Edward VI., and was rebuilt in 1865, remodelled in 1880, and extended subsequently. Ornamental articles of inlaid wood, called Tonbridge ware, chiefly sold at Tunbridge Wells, are largely manufactured. There are gunpowder mills on the banks of the Medway, and wool-stapling, brewing and

tanning are carried on. There is some traffic on the Medway, which is navigable for barges.

Tonbridge owed its early importance to the castle built by Richard, earl of Clare, in the reign of Henry I. The castle was besieged by William Rufus, was taken by John in the wars with the barons, and again by Prince Edward, son of Henry III. After being in the possession of the earls of Clare and Hert- ford, and of the earls of Gloucester, it became the property of the Staffords, and on the attainder of the duke of Bucking- ham in the reign of Henry VIII. was taken by the Crown. It was dismantled during the Civil War. The lords of the castle had the right of attending the archbishops of Canterbury on state occasions as chief butlers.

TONDERN, a town of Germany, in the Prussian province of Schleswig-Holstein, on the Widane, 8 m. from the North Sea at Hoyer, opposite the island of Sylt, and 42 m. by rail N.W. from Flensburg. Pop. (1900), 4244. Tondern was in early days a seaport, but since the reclamation of the marshes and the dredg- ing of the Widane navigation has ceased, and vessels load and unload at Hoyer, with which the place has direct railway com- munication. The trade consists chiefly in agricultural produce and cattle, and there is an important horse market.

In the village of Galhus, lying about 4 m. N., were discovered, in 1639 and 1734 respectively, two golden horns of the Scandi- navian period; these were stolen in 1802 from the Museum of Northern Antiquities in Copenhagen, where they had been treasured, and have never been recovered.

See Karstens, Die Stadt Tondern (Tondern, 1861).

TONE, THEOBALD WOLFE (1763-1798), Irish rebel, the son of Peter Tone, a Dublin coachmaker, was born in Dublin on the 20th of June 1763. His grandfather was a small farmer in county Kiidare, and his mother was the daughter of a captain in the merchant service. Though entered as a student at Trinity College, Dublin, Tone gave little attention to study, his inclination being for a military career; but after eloping with Matilda Witherington, a girl of sixteen, he took his degree in 1786, and read law in London at the Middle Temple and after- wards in Dublin, being called to the Irish bar in 1789. Though idle, Tone had considerable ability. Chagrined at finding no notice taken of a wild scheme for founding a military colony in the South Seas which he had submitted to Pitt, he turned to Irish politics. An able pamphlet attacking the administration of the marquess of Buckingham in 1790 brought him to the notice of the Whig club; and in September 1.791 he wrote a remarkable essay over the signature ” A Northern Whig,” of which 10,000 copies are said to have been sold. The principles of the French Revolution were at this time being eagerly em- braced in Ireland, especially among the Presbyterians of Ulster, and two months before the appearance of Tone’s essay a great

meeting had been held in Belfast, where republican toasts had been drunk with enthusiasm, and a resolution in favour of the abolition of religious disqualifications had given the first sign of political sympathy between the Roman Catholics and the Protestant dissenters of the north. The essay of ” A Northern Whig ” emphasized the growing breach between the Whig patriots like Flood and Grattan, who aimed at Catholic emancipation and parliamentary reform without disloyalty to the connexion with England, and the men who desired to establish a separate Irish republic. Tone expressed in his pamphlet unqualified contempt for the constitution which Grattan had so triumphantly extorted from the English govern- ment in 1782; and, himself a Protestant, he urged co-operation between the different religious sects in Ireland as the only means of obtaining complete redress of Irish grievances.

In October 1791 Tone converted these ideas into practical policy by founding, in conjunction with Thomas Russell (1767— 1803), Napper Tandy (q.v.) and others, the society of the ” United Irishmen.” The original purpose of this society was no more than the formation of a political union between Roman Catholics and Protestants, with a view to obtaining a liberal measure of parliamentary reform; it was only when that object appeared to be unattainable by constitutional methods that the majority

of the members adopted the more uncompromising opinions which Wolfe Tone held from the first, and conspired to establish an Irish republic by armed rebellion. Tone himself admitted that with him hatred of England had always been ” rather an instinct than a principle,” though until his views should become more generally accepted in Ireland he was prepared to work for reform as distinguished from revolution. But he desired to root out the popular respect for the names of Charlemont and Grattan, and to transfer to more violent leaders the conduct of the national movement. Grattan was a reformer and a patriot without a tincture of democratic ideas; Wolfe Tone was a revolutionary whose principles were drawn from the French Convention. Grattan’s political philosophy was allied to that of Edmund Burke; Tone was a disciple of Danton and Thomas Paine.

Democratic principles were gaining ground among the Roman Catholics as well as the Presbyterians. A quarrel between the moderate and the more advanced sections of the Roman Catholic Committee led, in December 1791, to the secession of sixty-eight of the former, led by Lord Kenmare; and the direction of the committee then passed to more violent leaders, of whom the most prominent was John Keogh, a Dublin tradesman. The active participation of the Roman Catholics in the movement of the United Irishmen was strengthened by the appointment of Tone as paid secretary of the Roman Catholic Committee in the spring of 1792. When the legality of the Roman Catholic Convention in 1792 was called in question by the government, Tone drew up for the committee a statement of the case on which a favourable opinion of counsel was obtained; and a sum of £1500 with a gold medal was voted to Tone by the Convention when it dissolved itself in April 1793. Burke and Grattan were anxious that provision should be made for the education of Irish Roman Catholic priests at home, to preserve them from the contagion of Jacobinism in France; Wolfe Tone, ” with an incomparably juster forecast,” as Lecky observes, ” advocated the same measure for exactly opposite reasons.” He rejoiced that the breaking up of the French schools by the revolution had rendered necessary the foundation of Maynooth College, which he foresaw would draw the sympathies of the clergy into more democratic channels. In 1794 the United Irishmen, persuaded that their scheme of universal suffrage and equal electoral districts was not likely to be accepted by any party in the Irish parliament, began to found their hopes on a French invasion. An English clergyman named William Jackson, a man of infamous notoriety who had long lived in France, where he had imbibed revolutionary opinions, came to Ireland to nogotiate between the

French committee of public safety and the United Irishmen. For this emissary Tone drew up a

memorandum on the state of Ireland, which he described as

ripe for revolution; the paper was betrayed to the government by an attorney named Cockayne to whom Jackson had impru- dently disclosed his mission; and in April 1794 Jackson was arrested on a charge of treason. Several of the leading United Irishmen, including Reynolds and Hamilton Rowan, immediately fled the country; the papers of the United Irishmen were seized; and for a time the organization was broken up. Tone, who had not attended meetings of the society since May 1793, remained in Ireland till after the trial and suicide of Jackson in April 1795. Having friends among the government party, including members of the Beresford family, he was enabled to make terms with the government, and in return for information as to what had passed between Jackson, Rowan and himself he was per mitted to emigrate to America, where he arrived in May 1795. Taking up his residence at Philadelphia, he wrote a few months later to Thomas Russell expressing unqualified dislike of the American people, whom he was disappointed to find no more truly democratic in sentiment and no less attached to order and authority than the English; he described George Washington as a ” high-flying aristocrat,” and he found the aristocracy of money in America still less to his liking than the European aristocracy of birth.

Tone did not feel himself bound in honour by his compact

with the government at home to abstain from further conspiracy; and finding himself at Philadelphia in the congenial company of Reynolds, Rowan and Napper Tandy, he undertook a mission to Paris to persuade the French government to send an expedi- tion to invade Ireland. In February 1796 he arrived in Paris and had interviews with De La Croix and L. N. M. Carnot, who were greatly impressed by his energy, sincerity and ability. A commission was given him as adjutant-general in the French army, which he hoped might protect him from the penalty of treason in the event of capture by the English; though he himself claimed the authorship of a proclamation said to have been issued by the United Irishmen, enjoining that all Irishmen taken with arms in their hands in the British service should be instantly shot; and he supported a project for landing a thousand criminals in England, who were to be commissioned to burn Bristol and commit any other atrocity in their power. He drew up two memorials representing that

the landing of a considerable French force in Ireland would be followed by a general rising of the people, and giving a detailed account of the condition of the country. The French directory, which possessed informa- tion from Lord Edward Fitzgerald (q.v.) and Arthur O'Connor confirming Tone, prepared to despatch an expedition under Hoche. On the 15th of December 1796 the expedition, consist- ing of forty-three sail and carrying about 15,000 men with a large supply of war material for distribution in Ireland, sailed from Brest. Tone, who accompanied it as " Adjutant-general Smith," had the greatest contempt for the seamanship of the French sailors, which was amply justified by the disastrous result of the invasion. Returning to France without having effected anything, Tone served for some months in the French army under Hoche; and in June 1797 he took part in prepara- tions for a Dutch expedition to Ireland, which was to be sup- ported by the French. But the Dutch fleet was detained in the Texel for many weeks by unfavourable weather, and before it eventually put to sea in October, only to be crushed by Duncan in the battle of Camperdown, Tone had returned to Paris; and Hoche, the chief hope of the United Irishmen, was dead. Bona- parte, with whom Tone had several interviews about this time, was much less disposed than Hoche had been to undertake in earnest an Irish expedition; and when the rebellion broke out in Ireland in 1798 he had started for Egypt. When, therefore, Tone urged the directory to send effective assistance to the Irish rebels, all that could be promised was a number of small raids to descend simultaneously on different points of the Irish coast. One of these under Humbert succeeded in landing a force in Killala Bay, and gained some success in Connaught before it was subdued by Lake and Cornwallis, Wolfe Tone's brother Matthew being captured, tried by court-martial, and hanged; a second, accompanied by Napper Tandy {q.v.), came to disaster on the coast of Donegal; while Wolfe Tone took part in a third, under Admiral Bompard, with General Hard)' in command of a force of about 3000 men, which encountered an English squadron near Lough Swilly on the 12th of October 1798. Tone, who was on board the " Hoche," refused Bompard's offer of escape in a frigate before the action, and was taken prisoner when the " Hoche " was forced to surrender. When the prisoners were landed a fortnight later Sir George Hill recognized Tone in the French adjutant-general's uniform. At his trial by court-martial in Dublin, Tone made a manly straightforward speech, avowing his determined hostility to England and his design " by fair and open war to procure the separation of the two countries," and pleading in virtue of his status as a French officer to die by the musket instead of the rope. He was, however, sentenced to be hanged on the 12th of November; but on the nth he cut his throat with a penknife, and on the 19th of November

1798 he died of the wound.

Although Wolfe Tone had none of the attributes of greatness, ” he rises,” says Lecky, “far above the dreary level of common- place which Irish conspiracy in general presents. The tawdry and exaggerated rhetoric; the petty vanity and jealousies; the weak sentimentalism ; the utter incapacity for proportioning means to ends, and for grasping the stern realities of things,

which so commonly disfigure the lives and conduct even of the more honest members of his class, were wholly alien to his nature. His judgment of men and things was keen, lucid and masculine, and he was alike prompt in decision and brave in action.” In his later years he overcame the drunkenness that was habitual to him in youth; he developed seriousness of character and unsel- fish devotion to what he believed was the cause of patriotism; and he won the respect of men of high character and capacity in France and Holland. His journals, which were written for his family and intimate friends, give a singularly interesting and vivid picture of life in Paris in the time of the directory. They were published after his death by his son, William Theobald Wolfe Tone (1 791-1828), who was educated by the French government and served with some distinction in the armies of Napoleon, emigrating after Waterloo to America, where he died, in New York City, on the 10th of October 1828.

See Life of Theobald Wolfe Tone by himself, continued by his son, with his political writings, edited by W. T. Wolfe Tone (2 vols., Washington, 1826), another edition of which is entitled Auto- biography of Theobald Wolfe Tone, edited with introduction by R. Barry O’Brien (2 vols., London, 1893); R. R. Madden, Lives of the United Irishmen (7 vols., London, 1842) ; Alfred Webb, Com- pendium of Irish Biography (Dublin, 1878); W. E. H. Lecky, History of Ireland in the Eighteenth Century, vols, iii., iv., v. (cabinet ed., 5 vols., London, 1892). (R. J. M.)

TONGA, or Friendly Islands (so called by Captain Cook), an archipelago in the South Pacific Ocean, about 350 m. S.S.W. of Samoa and 250 m. E.S.E. of Fiji. The long chain of islands, numbering about 150, though with a collective land area of only 385 sq. m., extends from 18° 5′ to 22 29′ S. and 174 to 176 10′ W., and is broken into three groups, viz. the Tonga to the south, Hapai (which again is divided into three clusters) in the centre and Vavau to the north. The largest island is Tongatabu (the Sacred Tonga, Tasman’s Amsterdam) in the southern group, measuring about 25 by 10 m., and 165 sq. m. in area, which contains the capital, Nukualofa. The vegetation is rich

and beautiful, but the scenery tame, the land seldom rising above 60 ft.; Eua (Tasman's Middelburg), 9 m. south-east and 67 sq. m. in area, is 1078 ft. in extreme height, and much more picturesque, being diversified by rocks and woods. Vavau, in the northern group, is 55 sq. m. in extent and 300 ft. high. Next to these come the coral islands Nomuka and Lifuka in the Hapai group; Tofua, 2846 ft., Late or Lette, 1800 ft. and Kao. 3020 ft. high, which are volcanic and smaller. The numerous islets of the central group are very fertile. It is along the western side of the northern half of the chain that the line of volcanic action is apparent; the islands here (of which some are active volcanoes) are lofty. To the east the whole chain is bounded by a profound trough in the ocean bed, which extends south- westward, east of the Kermadec Islands, towards New Zealand. The majority of the Tonga Islands, however, are level, averaging 40 ft. high, with hills rising to 600 ft.; their sides are generally steep. The surface is covered with a rich mould unusual in coral islands, mixed towards the sea with sand, and having a substratum of red or blue clay. The soil is thus very productive, although water is scarce and bad. Barrier reefs are rare; fringing reefs are numerous, except on the east side, which is nearly free, and there are many small isolated reefs and volcanic banks among the islands. If the reefs impede navigation they form some good harbours. The best is on the south-western side of Vavau; another is on the north of Tongatabu.. Earthquakes are not infrequent. From 1845 to 1857 volcanic eruptions were very violent, and islands once fertile were devastated and nearly destroyed. A new island rose from the sea, and was at once named " Wesley," but disappeared again. In 1886 there was a serious volcanic eruption in the outlying island of Niuafoou, and at the same time Falcon Reef, normally awash at high water, discharged sufficient scoriae and pumice to form a new island 50 ft. high. In 1898 the island had been washed away, but in 1900 H.M.S. " Porpoise " found that a solid core of black rock had been extruded 6 ft. above high water. All the volcanoes in the group were then quiescent.

Geology. — The line of volcanic action extends along the western side of the northern half of the chain. Some of the islands are built of

volcanic rocks alone ; such are Hongu-tonga and Hongu-hapai, which appear to be fragments of a single ancient crater, Tofua, Kao, Late, Metis, Amargua and Falcon Island. The lava is a basic augite- andesite. Another group of islands consists of elevated masses of submarine volcanic deposits, upon some of which coral-reef limestone forms a more or less complete covering; such are Tonumeia and the Nomuka

group (Mango, Tonua, Nomuka-iki). All the volcanic rocks of these islands are submarine stratified tuffs which are penetrated here and there by andesite or diabase dikes. The Vavau group consists entirely of coral limestone, which is occasionally crystalline, and contains stalactitic caves of great beauty.

Climate, Flora, Fauna. — The climate is healthy for Europeans, being dry and cool as compared with that of Samoa and Fiji. There are frequent alternations of temperature, which averages 75° to 77° F., though considerably higher in the wet season. Cool south- east trade winds blow, sometimes with great violence, from April to December. During the rest of the year the winds blow from west-north-west and north, with rain and occasional destructive hurricanes. A cyclone which devastated Vavau in April 1900 was the most destructive ever recorded in the group, but hurricanes are rare. The average rainfall for the year is about 80 ins. The vegetation •5 similar to that of Fiji, but more definitely Indo-Malayan in character; it embraces all the plants of the groups to the east with many that are absent there. Ferns abound, some of them peculiar, and tree ferns on the higher islands, and all the usual fruit trees and cultivated plants of the Pacific are found. There are several kinds of valuable timber trees. The only indigenous land mammalia are a small rat and a few curious species of bats. The dog and the pig were no doubt introduced by man. Of birds some 30 kinds are known, an owl being the only bird of prey; parrots, pigeons, kingfishers, honey-suckers, rails, ducks, and other water birds are numerous. There are snakes and small lizards, but no frogs or toads. Of insects there are relatively few kinds; but ants, beetles and mosquitoes abound. The fishes, of an Indo-Malay type, are varied and numerous. Turtle and sea-snakes abound, as do mollusca, of which a few are peculiar, and zoophytes.

Inhabitants. — The population of the archipelago is about 19,000, of whom about 370 are whites or half-castes. The natives, a branch of the Polynesian race, are the most progressive and most intellectual in the Pacific Islands, except the Hawaiians. They have exercised an influence over distant neighbours, especially in Fiji, quite out of proportion to their numbers. Their conquests have extended as far as Niue, or Savage Island, 200 m. east, and to various other islands to the north. In Captain Cook's time Poulaho, the principal chief, considered Samoa to be within his dominions. This pre- eminence may perhaps be due to an early infusion of Fijian blood: it has been observed that such crosses are always more vigorous than the pure races in these islands; and this influence seems also traceable in the Tongan dialect, and appears to have been partially transmitted thence to the Samoan. Various customs, traditions and names of places also point to a former

relation with Fiji. Their prior conversion to Christianity gave the Tongans material as well as moral advantages over their neighbours. Crime is infrequent, and morality, always above the Polynesian average, has improved. The people have strict notions of etiquette and gradations of rank. In disposition they are amiable and courteous, but arrogant, lively, inquisitive and inclined to steal — their attacks in earlier days on Europeans, when not caused by misunderstandings, being due probably to their coveting property which to them was of immense value. They are brave and not unenergetic, though the soft climate and the abundance of food discourage industry. They value children, and seldom practised infanticide, and cannibalism was rare. Their women are kindly treated, and only do the lighter work. Agriculture, which is well understood, is the chief industry. They are bold and skilful sailors and fishermen; other trades, as boat and house building, carving, cooking, net and mat making, are usually hereditary. Their houses are slightly built, but the surrounding ground and roads are laid out with great care and taste.

There were formerly (till the early 18th century) two sovereigns; the higher of these, called Tui Tonga (chief of Tonga), was greatly reverenced but enjoyed little power. The real ruler and the chief officers of the state were members of the Tubou family, from which also the wife of the Tui Tonga was always chosen, whose descendants through the female line had special honours and privileges, under the title of tamaha, recalling the vasu of Fiji. The explanation of the dual kingship is probably this — the Tui Tonga were regarded as the direct descendants of the original head of the family from which the people sprang; regarded with reverence, and possessing

unlimited power, they came to misuse this and discontent resulted, whereupon, to protect themselves, they appointed an executive deputy. Below these came the Eiki or chiefs, and next to them the class called Matabule. These were the hereditary counsellors and companions of the chiefs, and conveyed to the people the decisions formed at their assemblies. They also directed the national ceremonies, and preserved the popular traditions. While, under the control of Europeans, the Tongans have shown some aptitude for administration, they fail when left to themselves. They pick up superficial acquirements with astonishing ease, but seem to be incapable of mastering any subject. They write shorthand, but speak no English; they have a smattering of higher mathematics, yet are ignorant of book-keeping. Their government, effective enough when dealing with natives, breaks down in all departments concerned with Europeans, and becomes the prey of designing traders. Their ambition is to rank as a civilized state, and the flattery lavished on them by

their teachers has spoiled them.

There are some ancient stone remains in Tongatabu, burial places (feitoka) built with great blocks, and a remarkable monument consisting of two large upright blocks morticed to carry a transverse one, on which was formerly a circular basin of stone.

Administration and Trade. — In May 1900 the group became a British protectorate under the native flag, the appointment of the consul and agent being transferred to the government of New Zealand. In 1904 the financial and legal administration was put into the hands of the British High Commissioner for the Western Pacific. The native king is assisted by a legislative assembly consisting, in equal numbers, of hereditary nobles and popular (elected) representatives. The wisdom of King George Tubou in refusing to alienate an acre of land, except upon lease, has resulted in Tonga having been the last native state in tiie Pacific to lose its independence. There is a revenue of about £21,000 annually derived chiefly from a poll-tax, leases and customs. The principal exports are copra, bananas, oranges and fungus, and the annual values of exports and imports are £80,000 and £70,000 respectively on an average, though both fluctuate considerably. British coin is legal tender (since 1905). There are five churches in Tonga — the Free Wesleyaris, embracing the great majority of the inhabitants, Wesleyans, Roman Catholics, and Seventh Day Adventists. These last are few; a still smaller number of natives are nominally Anglicans.

History. — In 1616 the vessels of Jacob Lemaire and Willem Cornells Schouten reached the island of Niuatobutabu, and had a hostile encounter with the natives. In 1643 Abel Tasman arrived at Tongatabu and was more fortunate. The next visit was that of Samuel Wallis in 1767, followed in 1773 by that of Captain Cook. In 1777 Cook returned, and stayed seven weeks among the islands. In 1799 a revolution, having its origin in jealousy between two natives of high rank, broke out. Civil war dragged on for many years — long after the deaths of the first leaders — but Taufaahau, who became king in 1845 tinder the name of George Tubou I., proved a strong ruler. In 1822 a Methodist missionary had arrived in the island, and others followed. The attempt to introduce a new faith led to renewed strife, this time between converts and pagans, but King George (who fully appreciated the value of intercourse with foreigners) supported the missionaries, and by 1852 the rebels were subdued. The missionaries, finding their position secure, presently began to take action in political affairs, and persuaded the king to grant a constitution to the Tongans, who welcomed it with a kind of childish enthusiasm, but were far from fitted to receive it. A triennial parliament, a cabinet, a privy council,

and an elaborate judicial system were established, and the cumbrous machinery was placed in the hands of a ” prime minister,” a retired Wesleyan missionary, Mr Shirley Baker. Treaties of friendship were concluded with Germany, Great Britain, and the United States of America. Baker induced the king to break off his connexion with the Wesleyan body in Sydney, and to set up a state church. Persecution of members of the old church followed, and in 1890 the missionary-premier had to be removed from the group by the high commissioner. He afterwards returned to initiate a new sect called the ” Free Church of England,” which for a time created further divisions among the people.

King George Tubou died in 1893 at the age of ninety-six, and was succeeded by his great-grandson under the same title.

TONGKING

Mr Basil Thomson (who after Baker’s deportation had carried out reforms which the natives, when left alone, were incapable of maintaining) was sent in 1900 to conclude the treaty by which the king placed his kingdom under British protection.

See Captain Cook’s Voyages and other early narratives; Martin, Mariner’s account of the Tonga Islands (Edinburgh, 1827); Vason, Four Years in Tongatabu (London, 1815); A. Monfort, Les Tonga, ou Archipel des Amis (Lyons, 1893) ; B. H. Thomson, The Diversions of a Prime Minister (London, 1894).

TONGKING, 1 a province of French Indo-China, and protec- torate of France, situated between 20 and 235 N. and 102 and io8j° E., and bounded N. by the Chinese provinces of Kwang- Tung, Kwang-Si and Yun-nan, W. by Laos, S. by Annam, and E. by the Gulf of Tongking. Area, about 46,000 sq. m. The population is estimated at 6,000,000, including 33,000 Chinese and about 4000 Europeans. Geographically, Tongking com- prises three regions: (1) the delta of the Song-Koi (Red river), which, beginning at Son-Tay and coalescing with the delta of the Thai-Binh, widens out into the low-lying and fertile plain within which are situated the principal cities. (2) Two moun- tainous tracts, to the north and west of the delta, running approximately from north-west to south-east, one separating the basins of the Song-Koi and the Canton river, the other those of the Song-Koi and the Mekong. (3) A region of plateaus and low hills forming a transition between the delta and the mountains. The main geographical feature in the country is the Song-Koi, which, taking its rise near Tali Fu, in Yun-nan, enters Tongking at Lao-Kay (the Lao boundary), and flows thence in a south-

easterly direction to the Gulf of Tongking. It was this river which mainly, in the first instance, attracted the French to Tongking, as it was believed by the explorers that, forming the shortest route by water to the rich province of Yun-nan, it would prove also to be the most convenient and expeditious means of transporting the tin, copper, silver and gold which are known to abound there. This belief, however, has proved fallacious. The upper course of the stream is constantly impeded by rapids, the lowest being about thirty miles above Hung-Hoa. Beyond Lao-Kay navigation is impracticable during the dry season, and at all other times of the year goods have to be there transferred into light junks. Below Lao-Kay larger junks, and in the summer months steam launches of shallow draught use the river. Within the limits of Yun-nan the navigation is still more difficult. Near Son-Tay the Song-Koi receives the waters of the Song-Bo (Black river) and the Song-Ka (Clear river), parallel affluents rising in Yun-nan, and from that point divides into a network of waterways which empty themselves by countless outlets into the sea. The Song-Cau rises in north-eastern Tongking and below the town of Sept Pagodes, where it is joined by the Song- Thuong to form the Thai-Binh, divides into numerous branches, communicating with the Song-Koi by the Canal des Rapides and the Canal des Bambous.

The coast line of Tongking from Mon-Kay on the Chinese frontier to Thanh-Hoa, near .that of Annam, has a length of 375 m. From Mon-Kay as far as the estuary of the Song-Koi it is broken, rugged and fringed with islands and rocky islets. The bay of Tien-Hien, to the south of which lies the island of Ke-Bao, and the picturesque bay of Along, are the chief indentations. Beyond the island of Cac-Ba, south of the Bay of Along, the coast is low, flat and marshy, and tends to advance as the alluvial deposits of the delta accumulate.

The climate of Tongking is less trying to Europeans than that of the rest of French Indo-China. During June, July and August, the temperature ranges between 82 and ioo° F., but from October to May the weather is cool. The country is subject to typhoons in August and September.

In the wooded regions of the mountains the tiger, elephant and panther are found, and wild buffalo, deer and monkeys are common.ˆ The delta is the home of ducks and many other varieties of aquatic birds. Tea, cardamom, and mulberry grow wild, and in general the flora approximate to that of southern China.

The Annamese (see Annam), who form the bulk of the population of Tongking, are of a somewhat better physique than those of the

1 See also Indo-China, French, and Annam.

rest of Indo-China. Savage tribes inhabit the northern districts — the Muongs the mountains bordering the Black river, the Th6s the regions bordering the Clear river and the Thai-Binh. The Muongs are bigger and stronger than the Annamese. They have square foreheads, large faces and prominent cheek-bones, arid their eyes are » often almost straight.

Rice, which in some places furnishes two crops annually, is incomparably the most important product of the delta. Elsewhere there are plantations of coffee, tobacco, ramie, paper-tree {Daphne odora), cotton, jute, sugar-cane, pepper and mulberry. The cultivation of silkworms is of growing importance.

Gold, copper, tin, lead and other metals are found in the higher regions of Tongking, but only gold and tin are exploited, and these only to a very limited extent. There is a large output of coal of inferior quality from Hon-Gay on the bay of Along and there are coal-workings on the island of Ke-Bao.

Hanoi, Hai-phong and Nam-Dinh carry on cotton-spinning, and Hanoi and Nam-Dinh are well known for the manufacture of carved and inlaid furniture. The natives are skilful at enamelling and the chasing and ornamentation of gold and other metals. The manu- facture of paper from the fibrous bark of the paper-tree is a wide- spread industry and there are numerous distilleries of rice-spirit.

The imports of Tongking, which in 1905 reached a value of £3,501,422, comprise railway material, cereals, flour, liquors, woven goods, petroleum, glassware, paper, prepared skins, clocks and watches, arms and ammunition, &c. Exports (valued at £1,393,674 in 1905) comprise rice, rubber, manila hemp, ramie, lacquer and badian oils, raw skins, silk-waste, coal, Chinese drugs, rattan, mats, gamboge.

The transit trade via Tongking between Hong-Kong and the province of Yun-nan in southern China is of considerable importance, reaching in 1905 a value of £1,146,000. This trade is entirely in the hands of Chinese houses, the tin of the Yun-nan mines and cotton yarns from Hong-Kong constituting its most important elements. Goods in transit enjoy a rebate of 80% of the customs duties. Goods are carried on the Song-Koi to Lao-Kay or Man-Hao, thence on mules. The waterways of the delta are lined with em- bankments, the causeways along which form the chief means of land communication of the region. (For railways, see Indo-China, French.)

The protectorate of Tongking approaches nearer to direct administration than that of Annam, where the conditions of the protectorate are more closely observed. Till 1897 the emperor of Annam was represented in Tongking by a viceroy (kinh-luoc), but now the native officials are appointed by and are directly under the control of the resident-superior, who resides at Hanoi, presides over j the protectorate council, and is the chief territorial representative of France. Tongking is divided into nineteen provinces, in each of which there is a resident or a vice-resident, and four military territories, the latter administered by commandants. In each province there is a council of native " notables," elected by natives and occupied with the discussion of the provincial budget and public works. There is also a deliberative council of natives (instituted 1907) for the whole of Tongking. The provincial administration, local government and educational system are analogous to those of Annam (g.D.). Two chambers of the court of appeal of Indo-China and a criminal court sit at Hanoi ; there are tribunals of first instance and tribunals of commerce at Hanoi and Hai-Phong. When both parties to a suit are Annamese, it comes within the jurisdiction of the An-Sat or native judge of the province.

The following is a summary of the budgets of 1899 and 1904: —

Receipts.

Expenditure.

1899 1904

£

461,235 756,648

£

427,993

494,034

The chief source of revenue is the direct taxes (including especially the poll-tax and land-tax), which amounted in 1904 to £417,723, while the chief items of expenditure are the cost of the residencies and general staff, public works and the civil guard.

For the early history of Tongking, see Annam and Indo-China, French. Tongking was loosely united to Annam until 1801, when Gia-long, king of Annam, brought it definitely under his sway. Having, by the

treaty of 1862 and the annexation of Cochin China, firmly established themselves in Annamese territory, the French began to turn their attention to Tongking, attracted by the reported richness of its mineral wealth. They found a pretext for interfering in its affairs in the disturbances arising from the invasion of its northern provinces by the disbanded followers of the Taiping rebels. The Franco-German War of 1870-71 put an end to the project for a time, but the return of peace in Europe was the signal for the renewal of hos- tilities in the East. The appearance of Garnier's work on his expedition up the Mekong again aroused an interest in Tongking,

and the reported wealth of the country added the powerful motive of self-interest to the yearnings of patriotism. Already Jean Dupuis, a trader who in the pursuit of his calling had penetrated into Yun-nan, was attempting to negotiate for the passage up the Song-Koi of himself and a cargo of military stores for the Chinese authorities in Yun-nan. Meanwhile Captain Senez appeared from Saigon, having received instructions to open the route to French commerce. But to neither the trader nor the naval officer would the Tongkingese lend a favourable ear, and in default of official permission Dupuis determined to force his way up the river. This he succeeded in doing, but arrived too late, for he found the Taiping rebellion crushed and the stores no longer wanted.

On the return of Dupuis to Hanoi, the Tongkingese general at that place wrote to the king of Annam, begging him to induce the governor of Cochin-China to remove the intruder. An order was thereupon issued calling upon Dupuis to leave the country. This he declined to do, and, after some negotiations, Francis Gamier with a detachment was sent to Hanoi to dp the best he could in the difficult circumstances. Gamier threw himself heart and soul into Dupuis's projects, and, when the Tongkingese authorities refused to treat with him except on the subject Of Dupuis's expulsion, he attacked the citadel in November, 1873, and carried it by assault. Having thus secured his position, he sent to Saigon for reinforcements, and meanwhile sent small detachments against the five other important fortresses in the delta (Hung-yen, Phu-Ly, Hai-Duong, Ninh-Binh and Nam- Dinh), and captured them all. The Tongkingese now called in the help of Lu-Vinh-Phuoc, the leader of the " Black Flags," ' who at once marched with a large force to the scene of action. Within a few days he recaptured several villages near Hanoi, and so threatening did his attitude appear that Gamier, who had hurried back after capturing Nam-Dinh, made a sortie from the citadel. The movement proved a

disastrous one, and resulted in the death of Gamier and of his second in command, Balny d'Avricourt.

Meanwhile the news of Garnier's hostilities had alarmed the governor of Saigon, who, having no desire to be plunged into a war, sent Philastre, an inspector of native affairs, to offer apologies to the king of Annam. When, however, on arriving in Tongking Philastre heard of Garnier's death, he took command of the French forces, and at once ordered the evacuation of Nam-Dinh, Ninh-Binh and Hai-Duong — a measure which, however advantageous it may have been to the French at the moment, was most disastrous to the native Christian population, the withdrawal of the French being the signal for a general massacre of the converts. In pursuance of the same policy Philastre made a convention with the authorities (March, 1874) by which he bound his countrymen to withdraw from the occu- pation of the country, retaining only the right to trade on the Song-Koi and at Hanoi and Hai-Phong, and agreed to put an end to Dupuis's aggressive action.

For a time affairs remained in statu quo, but in 1882 Le Myre deVillers, the governor of Cochin-China, sent Henri Riviere with a small force to open up the route to Yun-nan by the Song-Koi. With a curious similarity the events of Gamier s campaign were repeated. Finding the authorities intractable, Riviere stormed and carried the citadel of Hanoi, and then, with very slight loss, he captured Nam-Dinh, Hai-Duong, and other towns in the delta. And once again these victories brought the Black Flags into the neighbourhood of Hanoi. As Gamier had done, so Riviere hurried back from Nam-Dinh on news of the threatened danger. Like Gamier also he headed a sortie against his enemies, and like Gamier he fell a victim to his own impetuosity (May, 1883).

In the meantime" the Annamese court had been seeking to enlist the help of the Chinese in their contest with the French. The tie which bound the tributary nation to the sovereign state had been for many generations slackened or drawn closer as circumstances determined, but it had never been entirely dissevered, and from the Annamese point of view this was one

1 Bands of Chinese rebels who infested the mountainous region of Tongking.

of the occasions when it was of paramount importance that it should be acknowledged and acted upon. With much more than usual regularity, therefore, the king despatched presents and letters to the

court of Peking, and in 1880 he sent a special embassy, loaded with unusually costly offerings, and bearing a letter in which his position of a tributary was emphatically asserted. Far from ignoring the responsibility thrust upon him, the emperor of China ordered the publication of the letter in the Peking Gazette.

The death of Riviere and the defeat of his troops had placed the French in a position of extreme difficulty. M. Jules Ferry, who had become premier of France in February 1883, determined on a vigorous forward policy. But for the moment the outlying garrisons, except those of Nam-Dinh and Hai-Phong, had to be withdrawn and Hanoi itself was besieged by the Black Flags. Reinforcements brought by Admiral Courbet and General Bouet were insufficient to do more than keep them at bay. So con- tinued was the pressure on the garrison that Bouet determined to make an advance upon Son-Tay to relieve the blockade. He attacked Vong, a fortified village, but he met with such resistance that, after suffering considerable loss, he was obliged to retreat to Hanoi. In the lower delta fortune sided with the French, and almost without a casualty Hai-Duong and Phu-Binh fell into their hands. Meanwhile, in order to put more effective pressure upon the court of Hue, Dr Harmand, commissary- general, supported by Courbet, proceeded with a naval force to the Hue river. They found that, though King Tu Due was dead, his policy of resistance was maintained, and therefore stormed the city. After a feeble defence it was taken, and Harmand concluded a treaty with the king (August 1883) in which the French protectorate was fully recognized, the king further binding himself to recall the Annamese troops serving in Tong-king, and to construct a road from Saigon to Hanoi.

Though this treaty was exacted from Annam under pressure, the French lost no time in carrying out that part of it which gave them the authority to protect Tongking, and Bouet again advanced in the direction of Son-Tay. But again the resistance he met with compelled him to retreat, after capturing the fortified post of Palan. Meanwhile, on the determination to attack Son-Tay becoming known in Paris, the Chinese ambassador warned the ministry that, since Chinese troops formed part of the garrison, he should consider it as tantamount to a declaration of war. But his protest met with no consideration. On the arrival of reinforcements an advance was again made; and on the 1 6th of December 1883, after some desperate fighting, Son-Tay fell.

During 1884 the French made themselves masters of the lower delta. Throughout the campaign Chinese regulars fought against the French, who thus found themselves involved in war with China. While hostilities were in progress M. Fournier, the French consul at Tientsin,

had been negotiating for peace, so far as China was concerned, with Li Hung-chang, and in May 1884 had signed and sealed a memorandum by which the Chinese plenipotentiary agreed that the Chinese troops should evacuate the northern provinces of Tongking " immSdiatement." In the following month another treaty, signed at Hue, confirmed the French protectorate over Annam and Tongking. It was not, however, followed by a cessation of military operations. A misunderstanding arose between the French and the Chinese as to the exact date for the evacuation of their posts by the Chinese, and in June General Millot, then commander-in-chief of the French forces, dispatched Colonel Dugenne at the head of a strong force to occupy Lang-Son. The expedition was badly arranged; the baggage train was far too unwieldy; and the pace at which tLe men were made to march was too quick for that scorching time of the year. They advanced, however, to Bac-Le, within 25 m. of Lang-Son, when they suddenly came upon a Chinese camp. An irregular engagement began, and, in the pitched battle which ensued, the Chinese broke the French lines, and drove them away in headlong flight. This brought the military operations for the season to a close. During the rainy season fevers of all kinds became alarmingly

prevalent, and the number of deaths and of men invalided was very large. In the meantime, however, an expedition, led by Colonel Donnier, against the Chinese garrison at Chu, about 10 m. south-east from Lang-kep, was completely successful; and in a battle fought near Chu the Chinese were defeated, with a loss of 3000 killed, the French loss being only 20 killed and go wounded. In the skirmishes which followed the French were generally victorious, but not to such a degree as to warrant any enlargement of the campaign.

In January 1885 large reinforcements arrived and Briere de 1'Isle, who had succeeded Millot as commander-in-chief, ordered an advance towards Lang-Son. The difficulties of transport greatly impeded his movements, still the expedition was successful. On the 6th of February three forts at Dong- Song, with large supplies of stores and ammunition, fell into the hands of the French. Three days' heavy fighting made them masters of a defile on the road, and on the 13th Lang-Son was taken, the garrison having evacuated the town just before the entrance of the conquerors. With his usual energy General Negrier, who commanded a division under Briere de 1'Isle, pressed on in pursuit to Ki-Hea, and even captured the frontier town of Cua-Ai. But Briere de 1'Isle had now to hurry back to the relief of Tuyen-Kwan, which was doggedly resisting the attacks of an overwhelming

Chinese force, and Negrier was left in command at Lang-Son. The withdrawal of Briere de ITsle's division gave the Chinese greater confidence, and, though for a time Negrier "was able to hold his own, on the 22nd and 23rd of March he sustained a severe check between Lang-Son and That-Ke, which was finally converted into a complete rout, his troops being obliged to retreat precipitately through Lang-Son to Than-Moi and Dong-Song. Briere de 1'Isle reached Tuyen-Kwan, the garrison of which was commanded by Colonel Domine, on the 3rd of March, and effected its relief. The disaster at Lang-Son caused the downfall of the Ferry ministry (March 30). Shortly afterwards Sir Robert Hart succeeded in negotiating peace with China. By the terms agreed on at Tientsin (June, 1885), it was stipulated that France was to take Tongking and Annam under its protection and to evacuate Formosa and the Pescadores. (For further history, see Indo-China.)

See J. Dupuis, Le Tong-kin et V intervention francaise (Paris, 1898) ; C B. Norman, Tonkin or France in the Far East (London, 1884); Prince Henri d'Orleans, Autour du Tonkin (Paris, 1896); J. Ferry, Le Tonkin et la mere-patrie (Paris, 1890); J. Chailley, Paul Bert au Tonkin (Paris, 1887); E. Lunet de Lajonquiere, Ethnographie du Tonkin Septentrional (Paris, 1906) ; A. Gaisman, L'CEuvre de la France au Tonkin (Paris, 1906) ; also the bibliography under Indo-China, French.

TONGS (0. Eng. tange, M. Eng. tonge, cf. Du. tang, Ger. Zange, from base tang, to bite, cf. Gr. SaKveiv), a gripping and lifting instrument, of which there are many forms adapted to their specific use. Some are merely large pincers or nippers, but the greatest number fall into three classes: the first, as in the com- mon fire-tongs, used for picking up pieces of coal and placing them on a fire, which have long arms terminating in small flat circular grippers and are pivoted close to the handle; the second, as in the sugar-tongs, asparagus tongs, and the like, consisting of a single band of metal bent round or of two bands joined at the head by a spring, and third, such as the blacksmith's tongs or the crucible-tongs, in which the pivot or joint is placed close to the gripping ends. A special form of tongs is that known as the " lazy-tongs," consisting of a pair of grippers at the end of a series of levers pivoted together like scissors, the whole being closed or extended by the movement of the handles communi- cated to the first set of levers and thence to the grippers, the whole forming ah extensible pair of tongs for gripping and lifting things at a distance.

TONGUE (O. Eng. tunge), in anatomy, a movable organ situated in the floor of the mouth, and serving for the sensation of taste besides helping in the mastication of food, in articulate speech, and in feeling

the exact position of any structure within the mouth.

The tongue is divided into a main part or body, a base which

looks backward toward the pharynx, a dorsum or upper surface, a root by which it is attached to the hyoid bone and floor of the mouth, a tip which is free and an inferior free surface in contact with the front part of the floor of the mouth and with the lower incisor teeth. Owing to the large amount of muscle in its com- position the shape of the tongue varies considerably from time to time. The dorsum of the tongue is covered by stratified squamous epithelium, and, when at rest, is convex both antero- posteriorly and transversely; it is thickly studded with papillae, of which four kinds are recognized.

Filiform papillae are minute conical projections covering the whole of the dorsum, by which term the true upper surface is meant, as well as the tip and borders of the tongue. They are very numerous and contain a short core of subepithelial mucous mem- brane covered by a thick coating of epithelial cells, which coating may divide at its tip into a number of thread-like processes.

Fungiform papillae are less numerous than the last, and somewhat resemble “button mushrooms”; they generally contain special taste buds.

Circumvallate papillae are usually from seven to ten in number and are arranged in the form of a V, the apex of which points down the throat. They lie quite at the back of the upper surface of the tongue and each consists of a little flat central mound surrounded by a deep moat, the outer wall of which is slightly raised above the surface, and it is to this that the papillae owe their name. Both sides of the moat have taste buds embedded in them, while into the bottom small serous glands open.

Foliate papillae are only vestigial in man and consist of a series of vertical ridges occupying a small oval area on each side of the tongue near its base and just in front of the attachment of the anterior pillars of the fauces. (See Pharynx.)

The posterior surface or base of the tongue forms part of the anterior wall of the pharynx and has a quite different appearance to that of the dorsum. On it are found numerous circular or oval elevations of the mucous membrane caused by lymphoid tissue (lymphoid follicles), on the summit of the most of which is a mucous crypt or depression. The division between the superior or oral surface of the tongue and the

posterior or pharyngeal is sharply marked by a V-shaped shallow groove called the sulcus terminalis which lies just behind and parallel to the V-shaped row of circumvallate papillae. At the apex of this V is a small blind pit, the foramen caecum. ■ –

At the lower part of the pharyngeal surface three folds of mucous membrane, called glosso-epiglottic folds, run backward ; the middle one passes to the centre of the front of the epiglottis, while the two lateral ones, in modern anatomy often called pharyngo-epiglottic folds, pass backward and outward to the fossa of the tonsil.

On the inferior free surface of the tongue, that is to say, the surface which is seen when the mouth is looked into and the tongue turned up, there is a median fold of mucous membrane called the fraenum linguae, which is attached below to the floor of the mouth. On each side of this the blue outlines of the ranine veins are seen, while close to these a little fold on each side, known as a plica fimbriata, is often found. It must not, however, be confused with the plica sublin- gualis described in the article Mouth and Salivary Glands.

The substance of the tongue is composed almost entirely of striped muscle fibres which run in different directions. Some of these bundles, such as the superficial, deep, transverse and oblique linguales are confined to the tongue and are spoken of as intrinsic muscles. Other muscles, such as the hyo-glossus, stylo-glossus, &c. come from elsewhere and are extrinsic ; these are noticed under the head of Muscular System. The arteries of the tongue are derived from the lingual, a branch of the external carotid (see Arteries), while the veins from the tongue return the blood, by one or more veins on each side, into the internal jugular vein (see Veins).

The nerves to the tongue are the (1) lingual or gustatory, a branch of the fifth (see Nerves: Cranial) which supplies the anterior two- thirds with ordinary sensation and also, by means of the chorda tymphani which is bound up with it, with taste sensation; (2) the glossopharyngeal which supplies the circumvallate papillae and posterior third of the tongue with taste and ordinary sensation; (3) a few twigs of the superior laryngeal branch of the vagus to the pharyngeal surface of the tongue ; and (4) the hypoglossal which is the motor nerve to the muscles.

Embryology. The mucous membrane covering the second and third visceral arches fuses to form the furcula (see Respiratory System). Just in front of this a rounded eminence appears at an early date in the ventral wall of the pharynx to form the tuberculum impar which is

separated from the furcula by the depression known as the sinus arcuatus. This tuberculum impar gradually grows to form the central part of the tongue in front of the foramen caecum, while the anterior part of the organ is derived from two lateral swellings which appear in the floor of the mouth and surround the tuberculum impar antero-laterally. The posterior third, or pharyngeal part, is developed from the anterior part of the furcula

in the middle line, that is to say from the third visceral arch. The sinus arcuatus becomes gradually shallower as these two parts of the tongue grow together and eventually is indicated by the sulcus terminalis; in the mid line, however, the isthmus of the thyroid growB down from it, forming the thyro-glossal duct the remains of which are seen in the foramen caecum (see Ductless Glands). ft will be seen that the tongue is developed in connexion with the first, second and third visceral arches, and it is therefore to be expected that the fifth, seventh and ninth nerves which supply those arches would help to supply it, but the vagus from the fourth arch reaches it in addition, while the fact that most of the muscular substance of the tongue is supplied by the hypoglossal nerve is explained on the theory that some of the cervical skeletal muscula- ture has grown cephalad into the tongue and has carried its nerve with it.

Comparative Anatomy. The tongue is present in fishes but it is an immovable swelling in the floor of the mouth and is practically devoid of muscles. In the hag (Myxine) among the Cyclostomata, and pike {Esox) among the

Internal jugular vein Spinal accessory nerve | Digastric muscle

Hypoglossal nerve

I Internal carotid artery I Pneumogastric nerve | | Sympathetic

Ascending pharyngeal artery

Odontoid process

Stylohyoid-

Glosso

pharyngeal nerve’

Parotid gland’

Tempore

maxillary vein

External c&rotid

artery

Styloglossus”

Ascending palatine artery

Internal pterygoid

Epiglottis

Frenulum epiglottidis

Masseter’

Pharyngeal portion of tongue

Fungiform papilla Buccinator

Fungiform papilla

(From Ambrose Birmingham in Cunningham’s Text Book of Anatomy.)

Horizontal Section through Mouth and Pharynx at the Level of the Tonsils.

Teleostei, teeth are developed on the tongue. In the Amphibia the tailed forms (Urodela) usually have tongues like fishes, though in the genus Spelerpes the organ is very free and can be protruded for a great distance. In the majority of the Anura the tongue is usually attached close to the front of the floor of the mouth so that it can be flapped forward with great rapidity. There are, however, two closely allied families of frogs (Xenopodidae and Pipidae) which form the order of Aglossa, because in them the tongue is suppressed.

In the reptiles the tongue is generally very movable, though this is not the case in the Crocodilia and many of the Chelonia. The forked tongues of snakes and many lizards and the highly specialized telescopic tongue of the chameleon are familiar objects.

In birds the tongue is usually covered with horny epithelium and is poorly supplied with muscles. When it is very protrusible, as in the woodpecker, the movement is due to the hyoid, with the base of the tongue attached, moving forward.

In the Mammalia the tongue is always movable by means of well-developed extrinsic and intrinsic muscles, while papillae and glands are numerous. The filiform papillae reach their maximum in the feline family of the Carnivora where they convert the tongue into a rasp by which bones can be licked clean of all flesh attached to them.

Foliate papillae are best seen in the rodents, and when they are

well developed the circumvallate papillae are few, often only one on each side.

In the lemurs an under tongue or sub lingua is found, which is probably represented by the plicae fimbriatae under the human tongue, and by some morphologists is regarded as the homologue of the whole tongue of the lower vertebrates, the greater part of the mammalian tongue being then looked upon as a new formation.

For further details and literature see R. Wiedersheim's Compara- tive Anatomy of Vertebrates, translated by W. N. Parker (London, 1907); C. Gegenbaur, Vergleich. Anat. der Wirbelthiere (Leipzig, 1901); A. Oppel, Lehrb. vergleich. mikroskop. Anat. der Wirbelthiere, Teil 3 (Jena, 1900) ; Parker and Haswell, Text Book of Zoology (London, 1897). (F. G. P.)

Surgery of the Tongue.

During infancy it is sometimes noticed that the little band of membrane [fraenum) which binds the under part of the tongue to the middle line of the floor of the mouth is unusually short. The condition will probably right itself as the front part of the tongue takes on its natural growth. In some children the tongue is so

large that it hangs out of the mouth, scratching itself upon the teeth. This condition is likely to be associated with weak intellect.

Acute inflammation of the tongue may be caused by the sting of a wasp or by the entrance of septic germs through a wound, and the trouble may end in an abscess.

Chronic inflammation of the tongue may be caused by syphilis, by the irritation of decayed teeth or of a badly-fitting plate of artificial teeth,

or by excessive smoking. The con- dition is one of danger in that it may lead eventually to the tongue becom- ing the seat of cancer. The treatment demands the removal of every source of irritation. The teeth must be made sound and smooth and must be kept so. Smoking must be absolutely and entirely given up, and salt, mustard, pickles, spirits, aerated waters, and everything else which is likely to be a cause of irritation must be avoided.

Cancer of the tongue is the result of chronic irritation which produces an excessive growth of the scaly covering of the tongue and causes an invasion of the deeper parts of the tongue by the scales. It is more often found in men than women and is usually asso- ciated with a hard swelling at one side of the tongue — perhaps near a jagged tooth or at the spot where the end of the pipe-stem approaches the tongue. The nerves of the tongue being caught and compressed in the growth, pain is constant and severe, and the move- ments during mastication cause great distress. The swelling gradually in- creases in size and, spreading to the floor of the mouth, hinders the free movements of the tongue. In due course it breaks down in the middle and a hard-walled ulcer appears. All this time the small scales of the cancer are finding their way along the lymph-channels and causing a secondary enlargement in the glands just below the jaw and along the side of the neck. Enlargement of the cervical glands is a very serious complication of cancer of the tongue.

The only treatment for cancer of the tongue which is at present known in surgery is the early removal by operation. It not seldom happens that because there is a certain amount of doubt as to the exact nature of the growth in the early weeks delay in operating is reasonably permitted, but during this time there is the risk ot the cells of the disease finding their way to the lymphatic system. Still, inasmuch as there may be great difficulty in determining the diagnosis from tertiary syphilitic disease, a course of treatment by iodide of potassium may well be recommended. Syphilis is often the precursor of lingual cancer, and it is impossible to say exactly when the syphilitic lesion becomes malignant. In the case of a cancerous tumour of the tongue being so deeply or so widely attached that its removal cannot be recommended, relief may be afforded by the extraction of most, or all of the teeth, by limiting the food to the most simple and unirritating kinds, and possibly by dividing the great sensory nerves of the tongue.

Cancer of the tongue is now operated on in advanced cases such as in former years would not have been dealt with by a radical operation. An incision is made beneath the jaw and through the floor of the

Post-pharyngeal lymphatic gland

Superior

constrictor muscle Posterior palatine arch

Tonsil

Pharyngo-epiglottic fold

Anterior palatine arch

Circumvallate papilla

Raphe of tongue Conical papillae

TONGUES, GIFT OF

mouth, by which the tongue is drawn out and rendered easily accessible, the arteries being leisurely secured as the tissues are cut across. The upper part of the gullet is plugged by a sponge so that no blood can enter the lungs, and unimpeded respiration is provided for by the preliminary introduction of a tube into the windpipe. Through the incision which is made below the jaw the infected lymphatic glands are removed. To Dr Kocher of Berne the profes- sion and the public are indebted for this important advance in the treatment of this disease. (E. O*.)

TONGUES, GIFT OF, or Glossolalia (y\uc

Firstly, then, it was a grace (charisma) of the spirit, yet not of the holy or pure spirit only, but of evil spirits also who on occasions had been known to take possession of the larynx of a saint and exclaim, ” Jesus is Anathema.” As no one could curse Jesus except under the influence of a devilish afflatus, so none could say ” Jesus is Lord ” except he was inspired by the Holy Spirit. But, secondly, the pneumatic utterances techni- cally known as speaking with tongues failed to reach this level of intelligibility; for Paul compares ” a tongue ” to a material object which should merely make a noise, to a pipe or harp twanged or blown at random without tune or time, to a trumpet blaring idly and not according to a code of signal notes. Unless, therefore, he that has the gift of tongues also possess the gift of interpreting his exclamations, or unless some one present can do so for him, he had not better exercise it in church. He is a barbarian to others and they to him, since they cannot under- stand what is spoken by him. Paul discriminates between the Spirit which during these paroxysms both

talks and prays to God and the nous or understanding which informs a believer's psalm, teaching, revelation or prophesy, and renders them intelligible, edifying and profitable to the assembly. Accordingly Paul lays down rules which he regarded as embodying the Lord's commandment. A man " that speaketh in a tongue speaketh not unto men, but unto God; for no man understandeth;" and therefore it is expedient that he keep this gift for his private chamber and there pour out the mysteries. In church it is best that he should confine himself to prophesying, for that brings to others " edification and comfort and consolation." If, however, tongues must be heard in the public assembly, then let not more than three of the saints exhibit the gift, and they only in succession. Nor let them exhibit it at all, unless there is some one present who can interpret the tongues and tell the meeting what it all means. If the whole congregation be talking with tongues all at once, and an unbeliever or one with no experience of pneumatic gifts come in, what will he think, asks Paul. Surely that " you are mad." So at Pentecost on the occasion of the first outpouring of the Spirit the saints were by the bystanders accused of being drunk (Acts ii. 15). In the church meeting, says Paul, " I had rather speak five words with my understanding, that I might instruct others also, than ten thousand words in a tongue."

The writer of Acts ii., anxious to prove that Providence from the first included the Gentiles in the Messianic Kingdom, assumes that the gift of tongues was a miraculous faculty of talking strange, languages without having previously learned them. Augustine accordingly held that each of the disciples talked all languages miraculously; Chrysostom that each talked one other than his own. The Pentecostal inspiration has been construed as a providential antithesis to the confusion of tongues — an idea which Grotius expressed in the words: " Poena linguarum dispersit homines; donum linguarum dispersos in unum populum collegit." Competent critics to-day recognize that such a view is impossible; and it has been suggested with

much probability that in the second chapter of Acts the words in v. 5: " Now there were dwelling . . . under heaven " as well as vv. 6-1 1 : " because that every man . . . mighty works of God " were interpolated by Luke in the document he transcribed. 1 The faithful talking with tongues were taken by bystanders for drunken men, but intoxicated men do not talk in languages of which they are normally ignorant. 2

Paul on the whole discouraged glossolaly. " Desire earnestly the greater gifts," he wrote to the Corinthians. The gift of tongues was suitable rather to children in the faith than to the mature. Tongues were, he felt, to cease whenever the perfect should come; and the

believer who spoke with the tongues of men and of angels, if he had not love, was no better than the sounding brass and clanging cymbal of the noisy heathen mysteries. It was clearly a gift productive of much disturbance in the Church (1 Cor. xiv. 23). He would not, however, entirely forbid and quench it (1 Thess. v. 19), so long as decency and order were preserved.

It is not then surprising that we hear little of it after the apostolic age. It faded away in the great Church, and probably Celsus was describing Montanist circles (though Origen assumed that they were ordinary believers) when he wrote 3 of the many Christians of no repute who at the least provocation, whether within or without their temples, threw themselves about like inspired persons; while others did the same in cities or among armies in order to collect alms, roaming about cities or camps. They were wont to cry out, each of himself, ” I am God; I am the Son of God; or I am the divine Spirit.” They would indulge in prophecies of the last judgment, and back their threats with a string of strange, half-frantic and utterly unmeaning sounds, the sense of which no one with any intelligence could discover; for they were obscure gibberish, and merely furnished any fool or impostor with an occasion to twist the utterances as he chose to his own purposes.

In the above we get a glimpse both of the glossalist and of his interpreter as they appeared to the outside world; and the impression made on them is not unlike that which Paul appre- hended would be left on outsiders by an indiscriminate use of the gift. Tertullian early in the 3rd century testifies that glossolaly still went on in the Montanist Church which he had joined; for we must so interpret the following passage in his De anima, cap. ix.: ” There is among us at the present time a sister who is endowed with the charismatic gift of revelations, which she suffers through ecstasy in the spirit during the Sunday service in church. She converses with angels, sometimes even with the Lord, and both hears and see mysteries’.” The magical papyri teem with strings of senseless and barbaric words which probably answer to what certain of the Fathers called the language of demons. It has been suggested that we here have recorded the utterances of glossolalists.

The attitude of Paul toward glossolaly among his converts Strikingly resembles Plato’s opinion as expressed in the Timaeus, p. 72, of the enthusiastic ecstasies of the ancient /xavrcs (sooth- sayer). ” God,” he writes, ” has given the art of divination not to the wisdom, but to the foolishness of man; for no man, when in his wits, attains prophetic truth and inspiration; but when he receives the inspired word either his intelligence is enthralled by sleep, or he is demented by some

distemper or possession. And he who would understand what he remembers to have been said, whether in a dream or when he was awake, by the prophetic and enthusiastic nature, or what he has seen, must first recover his wits; and then he will be able to explain rationally what all

1 This misunderstanding of Acts ii. has influenced the official Roman doctrine of demoniacal possession. The Sacerdotale indi- cates as one of the symptoms of possession the ability of the possessed to talk other tongues than his own. Cf. the Fustis daemonum, cap. xi. Venetus (1606): ” Aligui sermonem alienum a patria sua loguuntur etsi nunquam e laribus paternis recesserint.”

2 It is noteworthy that in Eph. v. 18 Paul contrasts the being filled with the Spirit with the foolishness of intoxication with wine, and remarks that those filled with the Spirit speak to themselves in psalms and hymns and spiritual songs and give thanks always for all things.

3 Origen, Contra Celsum, vii. 9.

such words and apparitions mean, and what indications they afford to this man or that, of past, present or future good and evil. ‘ But, while he continues demented, he cannot judge of the visions which he sees or the words which he utters. . . . And for this reason it is customary to appoint diviners or interpreters to be judges of the true inspiration.” 1 From such passages as the above we infer that the gift of tongues and of their inter- pretation was not peculiar to the Christian Church, but was a repetition in it of a phase common in ancient religions. The very phrase 7Xa)<7ffcus XaXelv, " to speak with tongues," was not invented by the New Testament writers, but borrowed from ordinary speech.

Virgil (Aen. vi. 46, 98) draws a life-like picture of the ancient prophetess ” speaking with tongues.” He depicts her quick changes of colour, her dishevelled hair, her panting breast, her apparent increase of stature as the god draws nigh and fills her with his divine afflatus. Then her voice loses its mortal’s ring: ” nee mortale sonans.” The same morbid and abnormal trance utterances recur in Christian revivals in every age, e.g. among the mendicant friars of the 13th century, among the Jansenists, the early Quakers, the converts of Wesley and Whitefield, the persecuted protestants of the Cevennes, the Irvingites.

Oracular possession of the kind above described is also common among savages and people of lower culture; and Dr Tylor, in his Primitive Culture, ii. 14, gives examples of ecstatic utterance interpreted by the sane. Thus in the Sandwich Islands the god Oro gave his oracles through a priest who " ceased to act or speak as a voluntary agent, but with his limbs convulsed, his features distorted and terrific, his eyes wild and strained, he would roll on the ground foaming at the mouth, and reveal the will of the god in shrill cries and sounds violent and indis- tinct, which the attending priests duly interpreted to the people."

See E. B. Tylor, Primitive Culture; H. Weinel, Die Wirkungen des Geistes und der Geister (Freiburg, 1899) ; Shaftesbury's Letter on Enthusiasm; Mrs Oliphant, Life of Irving, vol. ii. (F. C. C.)

TONK, a native state of India, in the P.ajputana agency. It consists of six isolated tracts, some of which are under the Central India agency. Total area, 2553 sq. m.; total population (1901), 273,201; estimated revenue £77,000. No tribute is payable. The chief, whose title is nawab, is a Mahommedan of Afghan descent. The founder of the family was Amir Khan, the noto- rious Pindari leader at the beginning of the 19th century, who received the present territory on submitting to the British in 1817. The nawab Mahommed Ibrahim Ali Khan, G.C.I. E., succeeded in 1867, and was one of the few chiefs who attended both Lord Lytton's Durbar in 1877 and the Delhi Durbar of 1903 as rulers of their states. The late minister, Sir Sahibzada Obeidullah Khan, was deputed on political duty to Peshawar during the Tirah campaign of 1897. Grain, cotton, opium and hides are the chief exports. Two of the outlying tracts of the state are served by two railways. Distress was caused by drought in 1899-1900. The town of Tonk is situated 1462 ft. above sea-level, 60 m. by road south from Jaipur, near the right bank of the river Banas. Pop. (1901), 38,759. It is surrounded by a wall, with a mud fort. It has a high school, the Walter female hospital under a lady superintendent, and a hospital for males.

There is another town in India called Tonk, or Tank, in Dera Ismail Khan district, North-West Frontier Province; pop. (1901), 4402. It is the residence of a nawab, who formerly exercised semi-independent powers. Here Sir Henry Durand, lieutenant- governor of the Punjab, was killed in 1870 when passing on an elephant under a gateway.

TONNAGE. The mode of ascertaining the tonnage of mer- chant ships is settled by the Merchant Shipping Acts. But before explaining the method by which this is computed, it is well to remark that there are

several tonnages employed in different connexions. Displacement tonnage is that which is invariably used in respect of warships, and is the actual weight of water displaced by the vessel whose tonnage is being dealt 1 Jowett's translation.

with. Men-of-War are designed to carry all their weights, including coal, guns, ammunition, stores and water in tanks and in boilers, at a certain draught, and the tonnage attributed to them is the weight of water which at that designed draught they actually displace. This displacement tonnage is therefore a total made up of the actual weight of the ship's fabric and that of everything that is on board of her. It can be found by ascertaining the exact cubic space occupied by the part of her body which is immersed (including her rudder, propellers and external shafting) at the draught under consideration in cubic feet, and dividing this by 35, since 35 cubic feet of sea-water weigh one ton. Of course there is nothing to prevent displace- ment tonnage from being used in describing the size of merchant ships, and indeed in regard to the performances of fast steam- ships on trial it is usual to give their draught on the occasion when they are tested, and to state what was their actual displace- ment under these trial conditions. But it is obvious, from what has been said as to the components which go to make up the displacement at load draught, that this tonnage must, in respect of any individual ship, be the greatest figure which can be quoted in regard to her size. It is usual for dues to be assessed against merchant vessels in respect of their registered tonnage. This must therefore be fixed by authority, and at present vessels are measured by the officer of customs according to the rules laid down in the second schedule to the Merchant Shipping Act 1894. As will be seen from the explanation of the method adopted, this is a somewhat arbitrary process, and even the gross registered tonnage affords little indication of the actual size of the ship, whilst the under-deck and net tonnages are still less in accord with the extreme dimensions.

As to length for tonnage, the measurements start with the tonnage deck, which in vessels with less than three decks is the upper, and in vessels of three or more 1 decks is the second from below. The length for tonnage is measured in a straight line along this deck from the inside of the inner plank at the bow to the inside of the inner plank at the stern, making allowance for the rake, if any, which the midship bow and stern timbers may have in the actual deck. When this is measured it is apparent into which of five classes the ship's tonnage-length places her. If she be under 50 ft. in length she falls into the first class, while if she be over 225 ft. in length she falls into the fifth class, the remaining three classes being intermediate to these. Vessels of the first class are measured as in four equal sections, and vessels of the

larger class as in twelve equal sections, according to their length. Then at each of the points of division so marked off transverse areas are taken. This is done by measuring the depth in feet from a point at a distance of one- third of the round of the beam below the tonnage deck to the upper side of the floor timbers. Where the vessel has a ceiling and no water-ballast tanks at the point of measurement, 25 in. is allowed for ceiling. But where there are such tanks the measurement is taken from the top of the tank and no allowance is made for ceiling, whether there in fact be any or not. If .the midship depth so found exceeds 16 ft., each depth is divided into six equal parts, and the horizontal breadths are measured at each point of division and also at the upper and lower points of the depth, extending each measurement to the average thickness of that part of the ceiling which is between the points of measure- ment. They are then numbered from above, and the second, fourth and sixth multiplied by four, whilst the third and fifth are multiplied by two. The products are then added together. To the sum are added the first and the seventh breadths. This total having been multiplied by one-third the common interval between the breadths, the resultant is the transverse area. The transverse areas so obtained at each point of the vessel's length are numbered from the bow aft. Omitting the first and last, the second and every even area so obtained are multiplied by four, whilst the third and every odd area are multiplied by two. These products are added together, as are also those of the first and last areas if they yield anything, and the figure thus reached is multiplied by one-third of the common interval between the I areas. This product is reckoned as the cubical capacity of the

ship in feet. When divided by ioo the result is the registered under-deck tonnage of the ship — subject to the additions and deductions ordered by the act. Directions of a kind similar to those already set out are given whereby the tonnage in the space enclosed between the tonnage and upper decks may be ascertained, and also for the measuring of any break, poop or other permanent closed-in space on the upper deck available for stores, and the sum of the capacity of these must be added to the under-deck tonnage to arrive at the gross registered tonnage. But an express proviso is enacted that no addition shall be made in respect of any building erected for the shelter of deck pas- sengers and approved by the board of trade. In the process of arriving at the net tonnage the main deduction allowed from the gross tonnage is that of machinery space in steamships. The method of

measurement here is similar to that by which the under-deck tonnage is reached. Where the engines and boilers are fitted in separate compartments, each compartment is measured separately, as is the screw shaft tunnel in the case of steamships propelled by screws. The tonnage of these spaces is reckoned, not from the tonnage deck, but from the crown of the space; whilst, if it has previously been reckoned in the gross tonnage, there may be an allowance for the space above the crown, if enclosed for the machinery or for the admission of light and air. Allowances are only made in respect of any machinery space if it be devoted solely to machinery or to light and air. It must not be used for cargo purposes or for cabins. Further, by the act itself in the case of paddle steamships, where the machinery space is above 20% and under 30% of the gross tonnage, it is allowed to be reckoned as 37% of such gross tonnage; whilst similarly, in the case of screw steamships, where such machinery space is over 13 % and under 20% of the gross tonnage, it is allowed to be reckoned as 32%. Further deductions are also made in respect of space used solely for the accommodation of the master and the crew, and for the chart-room and signal-room, as well as for the wheel- house and chain cable locker and for the donkey-engine and boiler, if connected with the main pumps of the ship, and in sailing vessels for the sail locker. The space in the double bottom and in the water-ballast tanks, if these be not available for the carriage of fuel stores or cargo, is also deducted if it has been reckoned in the gross tonnage in the first instance.

From the rules above laid down it follows that it is possible for vessels, if built with a full midship section, to have a gross registered tonnage considerably below what the actual cubical capacity of the ship would give, whilst in the case of steam tugs of high power it is not unprecedented, owing to the large allowances for machinery and crew spaces, for a vessel to have a registered net tonnage of nil.

Suez Canal dues being charged on what is practically the registered tonnage (though all deductions permitted by the British board of trade are not accepted), it is usual, at all events in the British navy, for warships to be measured for what would be their registered tonnage if they were merchant ships, so that in case they may wish to pass through the canal a scale of payment may be easily reached. But such tonnage is never spoken of in considering their size relative to other vessels.

Two other tonnages are also made use of in connexion with merchant ships, especially when specifications for vessels are being made. The first of these is measurement capacity. This is found by measuring out the true cubic capacity of the holds, whereby it is found what amount

of light measurement goods can be carried. The second is deadweight capacity. This is generally given as excluding what is carried in the coal bunkers, and it is therefore the amount of deadweight which can be carried in the holds at load draught when the vessel is fully charged with coals and stores. (B. W. G.)

TONNAGE AND POUNDAGE, in England, customs duties anciently imposed upon exports and imports, the former being a duty upon all wines imported in addition to prisage and butlerage, the latter a duty imposed ad valorem at the rate of twelve- pence in the pound on all merchandise imported or exported. The duties were levied at first by agreement with merchants

(poundage in 1302, tonnage in 1347), then granted by parliament in 1373, at first for a limited period only. They were considered to be imposed for the defence of the realm. From the reign of Henry VI. until that of James I. they were usually granted for life. They were not granted to Charles I., and in 1628 that king took the unconstitutional course of levying them on his own authority, a course denounced a few years later by 16 Car. I. c. 18 (1640), when the Long Parliament granted them for two months. After the Restoration they were granted to Charles II. and his two successors for life. By acts of Anne and George I. the duties were made perpetual, and mortgaged for the public debt. In 1787 they were finally abolished, and other modes of obtaining revenue substituted, by 27 Geo. III. c. 13 (1787).

Poundage also signifies a fee paid to an officer of a court for his services, e.g. to a sheriff's officer, who is entitled by 29 Eliz. c. 4 (1586-1587) to a poundage of a shilling in the pound on an execution up to £100, and sixpence in the pound above that sum.

TONNERRE, a town of north-central France, capital of- an arrondissement in the department of Yonne, 52 m. S.E. of Sens on the Paris-Lyon railway. Pop. (1906), 3974. It is situated on a slope of the vineclad hills on the left bank of the Armancon. At the foot of the hill rises the spring of Fosse-Dionne, enclosed in a circular basin 49 ft. in diameter. The town has two interest- ing churches. That of St Pierre, which crowns the hill, possesses a fine lateral portal of the Renaissance period to which the church, with the exception of the choir (1351), belongs. The church of Notre-Dame is mainly Gothic, but the facade is a fine specimen of Renaissance architecture. The Salle des Malades, a large timber-roofed apartment in the hospital, dates from the end of the 13th century and is used as a chapel. It is 330 ft. long and contains the tombs of Margaret of Burgundy, wife of Charles of Anjou, king of Sicily, and foundress of the hospital, and of

Francois-Michel Le Tellier, marquis of Louvois, war minister of Louis XIV. The hospital itself was rebuilt in the 19th century. The Renaissance Hdtel d'Uzes was built in the 16th century. Tonnerre is the seat of a sub-prefect and has a tribunal of first instance. The vineyards of the vicinity produce well- known wines. The trade of the town is chiefly in wine, in the good building-stone found in the neighbourhood and in Portland cement. Cooperage is carried on.

Its ancient name of Tornodorum points to a Gallic or Gallo- Roman origin for Tonnerre. In the 6th century it became the capital of the region of Tonnerrois and in the 10th century of a countship. After passing into the possession of several noble families, it was bought from a count of Clermont-Tonnerre by Louvois, by whose descendants it was held up to the time of the Revolution.

TONQUA BEAN. The Tonqua, Tonka or Tonquin bean, also called the coumara nut, is the seed of Dipterix odorala, a leguminous tree growing to a height of 80 ft., native of tropical South America. The drupe-like pod contains a single seed possessed of a fine sweet " new-mown hay " odour, due to the presence of coumarin (?.».). Tonqua beans are used principally for scenting snuff and as an ingredient in perfume sachets and in perfumers' " bouquets."

TONSBERG, a fortified seaport of Norway, in Jarlsberg- Laurvik amt (county), situated on a bay on the south coast, near the entrance to Christiania Fjord, 72 m. S. by W. of Christi- ania on the Skien railway. Pop. (1900), 8620. It is one of the most ancient towns in Norway. It is the headquarters of a sealing and whaling fleet. The principal industries are refineries for preparing whale and seal oil and saw-mills. An interesting collection of antiquities and whaling implements is preserved in the Slotstaarn on Castle Hill.

TONSILLITIS, acute inflammation of the tonsils, or quinsy, due to the invasion of the tonsil, or tonsils, by septic micro- organisms which may have gained access through the mouth or by the blood-stream. Sometimes the attack comes on as the result of direct exposure to sewer gas, and it is not at all an uncommon affection of house surgeons, nurses and others who have to spend most of their time in a hospital. The association of quinsy with rheumatism may be the result of the

infection of the tonsils by the micro-organisms or the toxins of that disease. Acute tonsillitis is very apt to run on to the formation of abscess. Quinsy may begin with a feeling of chilliness or with an attack of shivering. Then comes on a swelling in the throat with pain, tenderness and difficulty in swallowing. Indeed, if both tonsils are acutely inflamed it may be impossible to swallow even fluid and the breathing may be seriously embarrassed. The temperature may be raised several degrees. There is pain about the ear and about the jaw, and there is a swelling of the glands in the neck. The breath is offensive and the tongue is thickly coated. There may be some yellowish markings on the surface of the tonsil, but these differ from the patches of ” false membrane ” of diphtheria in that they can be easily brushed off by a swab, but often a true diagnosis can only be made by bacteriological examination. The treatment consists in giving a purgative, and in encouraging the patient to use an inhaler containing hot carbolized water. Hot compresses also may be applied to the neck. As regards medicines, the most trustworthy are salicylic acid, iron and quinine. As soon as abscess threatens, a slender-bladed knife should be thrust ‘ from before backward deeply into the swollen mass. And if, as most likely happens, matter then escapes, the patient’s distress speedily ends. Con- valescence having set in, a change of air and course of tonic treatment will be advisable.

Chronic tonsillitis is often associated with adenoid vegetations at the back of the throat of tuberculous or delicate children, such children being spoken of as being ” liable to sore throat.” Chronic enlargement of the tonsils may seriously interfere with a child’s general health and vigour and, should the condition not subside under general measures such as a stay at a bracing seaside place and the taking of cod-liver oil and iron, it will be well to treat the tonsils by operation. (E. O.*)

TONSON, the name of a family of London booksellers and publishers. Richard and Jacob Tonson (c. 1656-1736), sons of a London barber-surgeon, started in 1676 and 1677 indepen- dently as booksellers and publishers in London. In 1679 Jacob, the better known of the two, bought and published Dryden’s Troilus and Cressida, and from that time was closely associated with Dryden, and published most of his works. He published the Miscellany Poems (1684-1708) under Dryden’s editorship, the collection being known indifferently as Dryden’s or Tonson’ s Miscellany, and also Dryden’s translation of Virgil (1697). Serious disagreements over the price paid, however, arose between poet and publisher, and in his Faction Displayed (1705) Dryden described Tonson as having ” two left legs, and Judas-coloured hair.” Subsequently the relations between the two men injproved. The brothers jointly published Dryden’s Spanish Friar (1683). Jacob

Tonson also published Congreve's Double Dealer, Sir John Vanbrugh's The Faithful Friend and The Confederacy, and the pastorals of Pope, thus justifying Wycherly's description of him as "gentleman usher to the Muses." He bought also the valuable rights of Paradise Lost, half in 1683 and half in 1600. This was his first profitable venture in poetry. In 171 2 he became joint publisher with Samuel Buckley of the Spectator, and in the following year published Addison's Cato. He was the original secretary and a prominent member of the Kit-Cat Club. About 1720 he gave up business and retired to Herefordshire, where he died on the 2nd of April 1736. His business was carried on by his nephew, Jacob Tonson, jun. (d. 1735), and subsequently by his grand-nephew, also Jacob (d. 1767).

TONSURE (Lat. tonsura, from tondere, to shave), a religious observance in the Roman Catholic and Orthodox Eastern Churches, consisting of the shaving or cutting part of the hair of the head as a sign of dedication to special service. The reception of the tonsure in these churches is the initial ceremony which marks admission to orders and to the rights and privileges of clerical standing. It is administered by the bishop with an appropriate ritual. Candidates for the rite must have been confirmed, be adequately instructed in the elements of the Christian faith, and be able to read and write. Those who have received it are bound (unless in exceDtional circumstances) to renew the mark, consisting of a bare circle on the crown of

the head, at least once a month, otherwise they forfeit the privileges it carries. The practice is not a primitive one; Ter- tullian simply advises Christians to avoid vanity in dressing their hair, and Jerome deprecates both long and closely cropped hair. According to Prudentius (Hepio: xiii. 30) it was customary for the hair to be cut short at ordination. Paulinus of Nola (c. 490) alludes to the tonsure as in use among the (Western) monks; from them the practice quickly spread to the clergy. For Gaul about the year 500 we have the testimony of Sidonius Apollinaris (iv. 13), who says that Germanicus the bishop had his hair cut " in rotae speciem."

The earliest instance of an ecclesiastical precept on the subject occurs in can. 41 of the Council of Toledo (a.d. 633) : " omnes clerici, detonso superius capite toto, inferius solam circuli coronam relin- quant." Can. 33 of the Quinisext council (692) requires even singers and readers to be tonsured. Since the 8th century three tonsures have been more or less in use, known respectively as the Roman, the Greek and the Celtic. The first two are sometimes distinguished as the tonsure of Peter and the tonsure of Paul. The Roman or St Peter's tonsure prevailed in France, Spain and Italy. It consisted in shaving

the whole head, leaving only a fringe of hair supposed to symbolize the crown of thorns. Late in the middle ages this tonsure was lessened for the clergy, but retained for monks and friars. In the Eastern or St Paul's tonsure the whole head was shaven, but when now practised in the Eastern Church this tonsure is held to be adequately shown when the hair is shorn close. In the Celtic tonsure (tonsure of St John, or, in contempt, tonsure of Simon Magus) all the hair in front of a line drawn over the top of the head from ear to ear was shaven (a fashion common among the Hindus). The question of the Roman or Celtic tonsure was one of the points in dispute in the early British Church, settled in favour of the Roman fashion at the Council of Whitby (664). The tonsure at first was never given separately, and even children when so dedicated were appointed readers, as no one could belong to the clerical state without at least a minor order. From the 7th century, however, children were tonsured without ordination, and later on adults anxious to escape secular jurisdiction were often tonsured without ordination. Till the 10th century the tonsure could be given by priests or even by laymen, but its bestowal was gradually restricted to bishops and abbots.

TONTINE, a system of life insurance owing its name to Lorenzo Tonti, an Italian banker, born at Naples early in the 17th century, who settled in France about 1650. In 1653 he proposed to Cardinal Mazarin a new scheme for promoting a public loan. A total of 1,025,000 livres was to be subscribed in ten portions of 102,500 livres each by ten classes of subscribers, the first class consisting of persons under 7, the second of persons above 7 and under 14, and so on to the tenth, which consisted of persons between 63 and 70. The annual fund of each class was to be divided among the survivors of that class, and on the death of the last individual the capital was to fall to the state. This plan of operations was authorized under the name of "tontine royale" by a royal edict, but this the parlement refused to register, and the idea remained in abeyance till 1689, when it was revived by Louis XIV., who established a tontine of 1,400,000 livres divided into fourteen classes of 100,000 each, the subscription being 300 livres. This tontine was carried on till 1726, when the last bene- ficiary died — a widow who at the time of her decease was drawing an annual income of 73,500 livres. Several other government tontines were afterwards set on foot; but in 1763 restrictions were introduced, and in 1770 all tontines at the time in existence were wound up. Private tontines continued to flourish in France for some years, the " tontine Lefarge," the most cele- brated of the kind, being opened in 1791 and closed in 1889.

The tontine principle has often been applied in Great Britain, at one

time in connexion with government life annuities. Many such tontines were set on foot between the years 1773 and 1789, those of 1773, 1775 and 1777 being commonly called the Irish tontines, as the money was borrowed under acts of the Irish parlia- ment. The most important English tontine was that of 1789, which was created by 29 Geo. III. c. 41. Under this act over a million was raised in 10,000 shares of £100, 5s. It was also often applied to the purchase of estates or the erection of buildings. The investor staked his money on the chance of his own life or the life of his nominee enduring for a longer period than the other lives involved in the speculation, in which case he expected to win a large prize. It was occasionally introduced into life assurance, more particularly by American life offices, but newer and more ingenious forms of contract nave now made the tontine principle practically a thing of the past. (See National Debt ; Insurai*ce.)

TOOKE, J. H.

TOOKE, JOHN HORNE (1736-1812), English politician and philologist, third son of John Home, a poulterer in Newport Market, whose business the boy when at Eton happily veiled under the title of a ” Turkey merchant,” was born in Newport Street, Long Acre, Westminster, on the 25th of June 1736. After passing some time at school in Soho Square, and at a Kentish village, he went from 1744 to 1746 to Westminster School and for the next five or six years was at Eton. On the 1 2th of January 1754 he was admitted as sizar at St John’s College, Cambridge, and took his degree of B.A. in 1758, as last but one of the senior optimes, Richard Beadon, his lifelong friend, afterwards bishop of Bath and Wells, being a wrangler in the same year. Home had been admitted on the 9th of November 1756, as student at the Inner Temple, making the friendship of John Dunning and Lloyd Kenyon, but his father wished him to take orders in the English Church, and he was ordained deacon on the 23rd of September 1759 and priest on the 23rd of November 1760. For a few months he was usher at a boarding school at Blackheath, but on the 26th of September 1760 he became perpetual curate of New Brentford, the incumbency of which his father had purchased for him, and he retained its scanty profits until 1773. During a part of this time (1763-1764) he was absent on a tour in France, acting as the bear-leader of a son of the miser Elwes. Under the excitement created by the actions of Wilkes, Home plunged into politics, and in 1765 brought out a scathing pamphlet on Lords Bute and Mansfield, entitled ” The Petition of an Englishman.” In the autumn of 1765 he escorted

to Italy the son of a Mr Taylor. In Paris he made the acquaintance of Wilkes, and from Montpellier, in January 1766, addressed a letter to him which sowed the seeds of their personal antipathy. In the summer of 1767 Home landed again on English soil, and in 1768 secured the return of Wilkes to parliament for Middlesex. With inexhaustible energy he promoted the legal proceedings over the riot in St George's Fields, when a youth named Allen was killed, and exposed the irregularity in the judge's order for the execution of two Spital- fields weavers. His dispute with George Onslow, member for Surrey, who at first supported and then threw over Wilkes for place, culminated in a civil action, ultimately decided, after the reversal of a verdict which had been obtained through the charge of Lord Mansfield, in Home's favour, and in the loss by his opponent of his seat in parliament. An influential association, called " The Society for Supporting the Bill of Rights," was founded, mainly through the exertions of Home, in 1769, but the members were soon divided into two opposite camps, and in 1 77 1 Home and Wilkes, their respective leaders, broke out into open warfare, to the damage of their cause. On the 1st of July 1 77 1 Home obtained at Cambridge, though not without some opposition from members of both the political parties, his degree of M.A. Earlier in that year he claimed for the public the right of printing an account of the debates in parliament, and after a protracted struggle between the ministerial majority and the civic authorities, the right was definitely established. The energies of the indefatigable parson knew no bounds. In the same year (1771) he crossed swords with Junius, and ended in disarming his masked antagonist. Up to this time Home's fixed income consisted of those scanty emoluments attached to a position which galled him daily. He resigned his benefice in 1773 .and betook himself to the study of the law and philology. An accidental circumstance, however, occurred at this moment which largely affected his future. His friend Mr William Tooke had purchased a considerable estate, including Purley Lodge, south of the town of Croydon in Surrey. The possession of this property brought about frequent disputes with an ad- joining landowner, Thomas de Grey, and, after many actions in the courts, his friends endeavoured to obtain, by a bill forced through the houses of parliament, the privileges which the law had not assigned to him (February 1774). Home, thereupon, by a bold libel on the Speaker, drew public atten- tion to the case, and though he himself was placed for a time in the custody of the serjeant-at-arms, the clauses which were injurious to the interest of Mr Tooke were eliminated from

the bill. Mr Tooke declared his intention of making Home the heir of his fortune, and, if the design was never carried into effect, during his

lifetime he bestowed upon him large gifts of money. No sooner had this matter been happily settled than Home found himself involved in serious trouble. For his conduct in signing the advertisement soliciting subscriptions for the relief of the relatives of the Americans " murdered by the king's troops at Lexington and Concord," he was tried at the Guildhall on the 4th of July 1777, before Lord Mansfield, found guilty, and committed to the King's Bench prison in St George's Fields, from which he only emerged after a year's durance, and after a loss in fines and costs amounting to £1200. Soon after his deliverance he applied to be called to the bar, but his application was negatived on the ground that his orders in the Church were indelible. Home thereupon tried his fortune, but without success, on farming some land in Hunting- donshire. Two tracts about this time exercised great influence in the country. One of them, Fads Addressed to Landholders, &c. (1780), written by Home in conjunction with others, criticizing the measures of Lord North's ministry, passed through numerous editions; the other, A Letter on Parliamentary Reform (1782), addressed by him to Dunning, set out a scheme of reform, which he afterwards withdrew in favour of that advocated by Pitt. On his return from Huntingdonshire he became once more a frequent guest at Mr Tooke's house at Purley, and in 1782 assumed the name of Home Tooke. In 1786 Home Tooke conferred perpetual fame upon his bene- factor's country house by adopting, as a second title of his elaborate philological treatise of "E7rca irrtpbevra, the more popular though misleading title of The Diversions of Purley. The treatise at once attracted attention in England and the Continent. The first part was published in 1786, the second in 1805. The best edition is that which was published in 1829, under the editorship of Richard Taylor, with the additions written in the author's interleaved copy.

Between 1782 and 1790 Tooke gave his support to Pitt, and in the election for Westminster, in 1784, threw all his energies into opposition to Fox. With Fox he was never on terms of friendship, and Samuel Rogers, in his Table Talk, asserts that their antipathy was so pronounced that at a dinner party given by a prominent Whig not the slightest notice was taken by Fox of the. presence of Home Tooke. It was after the election of Westminster in 1788 that Tooke depicted the rival statesmen (Lord Chatham and Lord Holland, William Pitt and C. J. Fox) in his celebrated pamphlet of Two Pair of Portraits. At the general election of 1790 he came forward as a candidate for that distinguished constituency, in opposition to Fox and Lord Hood, but was defeated; and, at a second trial in 1796, he was again at the bottom of the poll. Meantime the excesses of the French republicans had provoked reaction in England, and the Tory ministry adopted a

policy of repression. Home Tooke was arrested early on the morning of the 16th of May 1794, and conveyed to the Tower. His trial for high treason lasted for six days (17 th to 22nd of November) and ended in his acquittal, the jury only taking eight minutes to settle their verdict. His public life after this event was only distinguished by one act of importance. Through the influence of the second Lord Camel- ford, the fighting peer, he was returned to parliament in 1801 for the pocket borough of Old Sarum. Lord Temple endeavoured to secure his exclusion on the ground that he had taken orders in the Church, and one of Gilray's caricatures delineates the two politicians, Temple and Camelford, playing at battledore and shuttlecock, with Home Tooke as the shuttlecock. The ministry of Addington would not support this suggestion, but a bill was at once introduced by them and carried into law, which rendered all persons in holy orders ineligible to sit in the House of Commons, and Home Tooke sat for that parliament only.

The last years of Tooke's life were spent in retirement in a house on the west side of Wimbledon Common. The traditions of his Sunday parties have lasted unimpaired to this day, and the most pleasant pages penned by his biographer describe the politicians and the men of letters who gathered round his

hospitable board. His conversational powers rivalled those of Dr Johnson; and, if more of his sayings have not been chronicled for the benefit of posterity, the defect is due to the absence of a Boswell. Through the liberality of his friends, his last days were freed from the pressure of poverty, and he was enabled to place his illegitimate son in a position which soon brought him wealth, and to leave a competency to his two illegitimate daughters. Illness seized him early in 1810, and for the next two years his sufferings were acute. He died in his house at Wimbledon on the 1 8th" of March 181 2, and his body was buried with that of his mother at Ealing, the tomb which he had prepared in the garden attached to his house at Wimbledon being found unsuitable for the interment. An altar-tomb still stands to his memory in Ealing churchyard. A catalogue of his library was printed in 1813.

The Life of Home Tooke, by Alexander Stephens, is written in an unattractive style and was the work of an admirer only admitted to his acquaintance at the close of his days. The notice in the Quarterly Review, June 1812, of W. Hamilton Reid's compilation, is by J. W.

Ward, Lord Dudley. The main facts of his life are set out by Mr J. E. Thorold Rogers, in his Historical Gleanings, 2nd series. Many of Home Tooke's wittiest sayings are preserved in the Table Talk of Samuel Rogers and S. T. Coleridge. (W. P. C.)

TOOKE, THOMAS (1774-1858), English economist, was born at St Petersburg on the 29th of February 1774. Entering a large Russian house in London at an early age, he acquired sound practical experience of commercial matters and became a recognized authority on finance and banking. He was one of the earliest advocates of free trade and drew up the Merchants' Petition presented to the House of Commons by Alexander Baring, afterwards Lord Ashburton. He gave evidence before several parliamentary committees, notably the committee of 1 82 1, on foreign trade, and those of 1832, 1840 and 1848 on the Bank Acts. He was elected a fellow of the Royal Society in 1821. He died in London on the 26th of February 1858.

Tooke was the author of Thoughts and Details on the High and Low Prices of the last Thirty Years (1823), Considerations on the State of the Currency (1826), in both of which he showed his hostility to the policy afterwards carried out in the Bank Act of 1844, but he is best known for his History of Prices and of the State of the Circulation during the Years 1703-1856 (6 vols., 1838-1857). In the first four volumes he treats (a) of the prices of corn, and the circumstances affecting prices; (6) the prices of produce other than corn; and © the state of the circulation. The two final volumes, written in conjunction with W. Newmarch (q.v.), deal with railways, free, trade, banking in Europe and the effects of new discoveries of gold.'

TOOL (0. Eng. tdl, generally referred to a root seen in the Goth, taujan, to make, or in the English word " taw," to work or dress leather), an implement or appliance used by a worker in the treatment of the substances used in his handicraft, whether in the preliminary operations of setting out and measuring the materials, in reducing his work to the required form by cutting or otherwise, in gauging it and testing its accuracy, or in duly securing it while thus being treated.

For the tools of prehistoric man see such articles as Archaeology ; Flint Implements; and Egypt, § Art and Archaeology.

In beginning a survey of tools it is necessary to draw the distinction between hand and machine tools. The former class includes any tool which is held and operated by the unaided hands, as a chisel, plane or saw. Attach one of these to some piece of operating mechanism, and it, with the environment of which it is the central essential object,

becomes a machine tool. A very simple example is the common power-driven hack saw for metal, or the small high-speed drill, or the wood-boring auger held in a frame and turned by a winch handle and bevel-gears. The difference between these and a big frame-saw cutting down a dozen boards simultaneously, or the immense machine boring the cylinders of an ocean liner, or the great gun lathe, or the hydraulic press, is so vast that the relationship is hardly apparent. Often the tool itself is absolutely dwarfed by the machine, of which nevertheless it is the central object and around which the machine is designed and built. A milling machine weighing several tons will often be seen rotating a tool of but two or three dozen pounds' weight. Yet the machine is fitted with elaborate slides and self-acting movements, and provision for taking up wear,

and is worth some hundreds of pounds sterling, while the tool may not be worth two pounds. Such apparent anomalies are in constant evidence. We propose, therefore, first to take a survey of the principles that underlie the forms of tools, and then pursue the subject of their embodiment in machine tools.

Hand Tools The most casual observation reveals the fact that tools admit of certain broad classifications. It is apparent that by far the larger number owe their value to their capacity for cutting or removing portions of material by an incisive or wedge-like action, leaving a smooth surface behind. An analysis of the essential methods of operation gives a broad grouping as follows : —

I. The chisel group . . Typified by the chisel of the woodworker. II. The shearing group . ,, ,, scissors.

\' J he scra P ers • • • „ ,, cabinet-maker's scrape.

IV. The percussive and) , , , ,

detrusive group .) " " hammer and the punch.

V. The moulding group . „ ,, trowel.

The first three are generally all regarded as cutting tools, notwithstanding that those in II. and III. do not operate as wedges, and therefore are not true chisels. But many occupy a border-line where the results obtained are practically those due to cutting, as in some of the shears, saws, milling cutters, files and grinding wheels, where, if the action is not directly wedge-like, it is certainly, more or less incisive in character.

Cutting Tools. — The cutting edge of a tool is the practical outcome of several conditions. Keenness of edge, equivalent to a small degree of angle between the tool faces, would appear at first sight to be the prime element in cutting, as indeed it is in the case of a razor, or in that of a chisel for soft wood. But that is not the prime condition in a tool for cutting iron or steel. Strength is of far greater importance, and to it some keenness of edge must be sacri- ficed. All cutting tools are wedges; but a razor or a chisel edge, included between angles of 15 or 20 , would be turned over at once if presented to iron or steel, for which angles of from 6o° to 75 are required. Further, much greater rigidity in the latter, to resist spring and fracture, is necessary than in the former, because the resistance to cutting is much greater. A workman can operate a turning tool by hand, even on heavy pieces of metal-work. Formerly all turning, no matter how large, was done by hand-operated tools, and after great muscular exertion a few pounds of metal might be removed in an hour. But coerce a similarly formed tool in a rigid guide or rest, and drive it by the power of ten or twenty men, and it becomes possible to remove say a hundredweight of chips in an hour. Or, increase the size of the tool and its capacity for endurance, and drive by the power of 40 or 60 horses, and half a ton of chips may be removed in an hour.

Allmachine tools of which the chisel is the type operate by cutting ; that is, they act on the same principle and by the same essentia! method as the knife, razor or chisel, and not by that of the grind- stone. A single tool, however, may act as a cutting instrument at one time and as a scrape at another. The butcher's knife will afford a familiar illustration. It is used as a cutting tool when sever- ing a steak, but it becomes a scrape when used to clean the block. The difference is not therefore due to the form of the knife, but to the method of its application, a distinction which holds good in reference to the tools used by engineers. There is a very old hand tool once much used in the engineer's turnery, termed a " graver." This was employed for cutting and for scraping indiscriminately, simply by varying the angle of its presentation. At that time the question of the best cutting angles was seldom raised or discussed, because the manipulative instinct of the turner settled it as the work pro- ceeded, and as the material operated on varied in texture and degree of hardness. But since the use of the slide rest holding tools rigidly fixed has become general, the question of the most suitable tool formation has been the subject of much experiment and discussion. The almost unconscious experimenting which goes on every day in every workshop in the world proves that there may be a difference of several degrees of angle in tools doing similar work, without having

any appreciable effect upon results. So long as certain broad principles and reasonable limits are observed, that is sufficient for practical purposes.

Clearly, in order that a tool shall cut, it must possess an incisive form. In fig. 1, A might be thrust over the surface of the plate of metal, but no cutting action could take place. It would simply grind and polish the surface. If it were formed like B, the grinding action would give place to scraping, by which some material would be removed. Many tools are formed thus, but there is still no incisive or knife-like action, and the tool is simply a scrape and not a cutting tool. But C is a cutting tool, possessing penetrative capacity. If now B were tilted backwards as at D, it would at

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once become a cutting tool. But its bevelled face would rub and grind on the surface of the work, producing friction and heat, and interfering with the penetrative action of the cutting edge. On the other hand, if C were tilted forwards as at E its action would approximate to that of a scrape for the time being. But the high angle of the hinder bevelled face would not afford adequate support to the cutting edge, and the latter would therefore become worn off almost instantly, precisely as that of a razor or wood-working chisel would crumble away if operated on hard metal. It is obvious

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Tool which

only. Scrape. Cutting tool, and E, Scraping and cutting

tools improperly presented.

G, H, Presentations of tools for planing, turning and boring respectively.

K, L, Approximate angles of tools; a, clearance angle, or bottom rake ; b, front or top rake; c, tool angle.

therefore that the correct form for a cutting tool must depend upon a due balance being maintained between the angle of the front and of the bottom faces — ” front ” or ” top rake,” and “bottom rake ” or ” clearance ” — considered in regard to their method of presentation to the work. Since, too, all tools used in machines are held rigidly in one position, differing in this respect from hand- operated tools, it follows that a constant angle should be given to instruments which are used for operating on a given kind of metal or alloy. It does not matter whether a tool is driven in a lathe, or a planing machine, or a sharper or a slotter; whether it is cutting on external or internal surfaces, it is always maintained in a direction perpendicularly to the point of application as in fig. I, F, G, H, planing, turning and boring respectively. It is consistent with reason and with fact that the softer and more fibrous the metal, the keener must be the formation of the tool, and that, conversely, the harder and more crystalline the metal the more obtuse must be the cutting angles, as in the extremes of the razor and the tools for cutting iron and steel already instanced. The three figures J, K, L show tools suitably formed for wrought iron and mild steel, for cast iron and cast steel, and for brass respectively. Cast iron and cast steel could not be cut properly with the first, nor wrought iron and fibrous steel with the second, nor either with the third. The angles given are those which accord best with general practice, but they are not constant, being varied by conditions, especially by lubrication and rigidity of fastenings. The profiles of the first and second tools are given mainly with the view of having material for grinding away, without the need for frequent reforging. But there are many tools which are formed quite differently when used in tool-holders and in turrets, though the same essential principles of angle are observed.

The angle of clearance, or relief, a, in fig. I, is an important detail of a cutting tool. It is of greater importance than an exact angle of top rake. But, given some sufficient angle of clearance, its exact amount is not of much moment. Neither need it be uniform for a given cutting edge. It may vary from say 3° to io c , or even 20 , and under good conditions little or no practical differences will result. Actually it need never vary much from 5 to 7°. The object in giving a clearance angle is simply to prevent friction between the non-cutting face immediately adjacent to the edge and the surface of the work. The limit to this clearance is that at which insufficient support is afforded to the cutting edge. These are the two facts, which if fulfilled permit of a considerable range in clear- ance angle. The softer the metal being cut the greater can be the clearance; the harder the material the less clearance is permissible because the edge requires greater support.

The front, or top rake, b in fig. I, is the angle or slope of the front, or top face, of the tool ; it is varied mainly according as materials are crystalline or fibrous. In the turnings and cuttings taken off the more crystalline metals and alloys, the broken appearance of the chips is distinguished from the shavings removed from the fibrous materials. This is a feature which always distinguishes cast iron and unannealed cast steel from mild steel, high carbon steel from

that low in carbon, and cast iron from wrought iron. It indicates too that extra work is put on the tool in breaking up the chips, following immediately on their severance, and when the comminu- tions are very small they indicate insufficient top rake. This is a result that turners try to avoid when possible, or at least to minimize. Now the greater the slope of the top rake the more easily will the cuttings come away, with the minimum of break in the crystalline materials and absolutely unbroken over lengths of many- feet in the fibrous ones. The breaking up, or the continuity of the cuttings, therefore affords an indication of the suitability of the amount of top rake to its work. But compromise often has to be made between the ideal and the actual. The amount of top rake has to be limited in the harder metals and alloys in otder to secure a strong tool angle, without which tools would lack the ; endur- ance required to sustain them through several hours without regrinding.

The tool angle, c, is the angle included between top and bottom faces, and its amount, or thickness expressed in degrees, is a measure of the strength and endurance of any tool. At extremes it varies from about 15° to 85 °. It is traceable in all kinds of tools, having very diverse forms. It is difficult to place some groups in the cutting category; they are on the border-line between cutting and scraping instruments.

Typical Tools. — A bare enumeration of the diverse forms in which tools of the chisel type occur is not even possible here. The grouped illustrations (figs. 2 to 6) show some of the types, but it will be understood that each is varied in dimensions, angles and outlines to suit all the varied kinds of metals and alloys and conditions of operation. For, as every tool has to be gripped in a holder of some kind, as a slide-rest, tool-box, turret, tool-holder, box, cross-slide, &c, this often determines the choice of some one form in preference to another. A broad division is that into roughing and finishing

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Fig. 2. — Metal-turning Tools.

A, Shape of tool used for scrap-

ing brass.

B, Straightforward tool for turn-

ing all metals.

C, Right- and left-hand tools for

all metals.

D, A better form of same.

E, Diamond or angular-edge tool

for cutting all metals.

F, Plan of finishing tool.

G, Spring tool for finishing. H, Side or knife tool.

/, Parting or cutting-off tool. K, L, Round-nose tools. M, Radius tool'.

Fig. 3. — Group of Planer Tools.

A, Planer type of tool, cranked

to avoid digging into the metal.

B, Face view of roughing tool.

C, Face view of finishing tool.

D, Right- and left-hand knife or

side tools.

E, Parting or cutting-off or

grooving tool.

F, V tool for grooves.

G, Right- and left-hand tools for

V-slots. H, Ditto for T-slots. J, Radius tool held in holder.

tools. Generally though not invariably the edge of the first is narrow, of the second broad, corresponding with the deep cutting Had fine traverse of the first and the shallow cutting and broad

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Fig. 4. — Group of Slotter Tools.

A, Common roughing tool. B, Parting-off or grooving tool. C, Roughing or finishing tool in a holder. D, Double-edged tool for cutting opposite sides of a slot.

Fig. 5. — Group of Tool-holders. A, Smith & Coventry swivelling holder. B, Holder for square steel. C, D, right- and left-hand forms of same. E, Holder for round steel. F, Holder for narrow parting-off tool.

traverse of the second. The following are some of the principal forms. The round-nosed roughing tool (fig. 2) B is of straight- forward type, used for turning, planing and shaping. As the correct tool angle can only occur on the middle plane of the tool, it is usual to employ cranked tools, C, D, E, right- and left-handed, for heavy and moderately heavy duty, the direction of the crank- ing corresponding with that in which the tool is required to traverse. Tools for boring are cranked and many for planing (fig. 3). The slotting tools (fig. 4) embody the same principle, but their shanks are in line with the direction of cutting. Many roughing and finishing tools are of knife type II. Finishing tools have broad edges, F, G, H. They occur in straightforward and right- and left-hand types. These as a rule remove less than 5ˆ in. in depth, while the rough- ing tools may cut an inch or more into the metal. But the traverse of the first often exceeds an inch, while in that of the second \ in. is a very coarse amount of feed. Spring tools, G, used less now than formerly, are only of value for imparting a smooth finish to a surface. They are finishing tools only. Some spring tools are formed with considerable top rake, but generally they act by scraping only.

Solid Tools v. Tool-holders. — It will be observed that the fore- going are solid tools ; that is, the cutting portion is forged from a solid

Fig. 6. — Group of Chisels.

A, Paring chisel.

B, Socket chisel for heavy duty.

C, Common chipping chisel.

D, Narrow cross-cut er cape chisel.

E, Cow-mouth chisel, or gouge.

F, Straight chisel or sett.

G, Hollow chisel or sett.

bar of steel. This is costly when the best tool steel is used, hence large numbers of tools comprise points only, which are gripped in permanent holders in which they interchange. Tool steel usually ranges from about J in. to 4 in. square; most engineers' work is done with bars of from i in. to lj in. square. It is in the smaller and medium sizes of tools that holders prove of most value. Solid tools, varying from 2j in. to 4 in. square, are used for the heaviest cutting done in the planing machine. Tool-holders are not employed for very heavy work, because the heat generated would not get away fast enough from small tool points. There are scores of holders; per- haps a dozen good approved types are in common use. They are divisible into three great groups: those in which the top rake of the tool point is embodied in the holder, and is constant; those in which the clearance is similarly embodied ; and those in which neither is provided for, but in which the tool point is ground to any angle. Charles Babbage designed the first tool-holder, and the essential type survives in several modern forms. The best-known holders now are the Tangye, the Smith & Coventry, the Armstrong, some by Mr C. Taylor, and the Bent. The Smith & Coventry (fig. 5), used more perhaps than any other single design, includes two forms. In one E the tool is a bit of round steel set at an angle which gives front rake, and having the top end ground to an angle of top rake. In the other A the tool has the section of a truncated wedge, set for constant top rake, or cutting angle, and having bottom rake or clearance angle ground. The Smith & Coventry round tool is not applicable for all classes of work. It will turn plain work, and plane level faces, but will not turn or plane into corners or angles. Hence the invention of the tool of V-section, and the swivel tool- holder. The round tool-holders are made right- and left-handed, the swivel tool-holder has a universal movement. The amount of projection of the round tool points is very limited, which impairs their utility when some overhanging of the tool is necessary. The V-tools can be slid out in their holders to operate on faces and edges situated to some considerable distance inwards from the end of the tool-holder.

Box Tools. — In one feature the box tools of the turret lathes resemble tool-holders. The small pieces of steel used for tool points are gripped in the boxes, as in tool-holders, and all the advantages which are derived from this arrangement of separating the point from its holder are thus secured (fig. 7). But in all other

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Fig. 7. — Box Tool for Turret Lathe. (Alfred Herbert, Ltd., Coventry.)

A, Cutting tool. B, Screw for adjusting radius of cut. C C, V-steadies supporting the work in opposition to A. D, Diameter of work. E, Body of holder. F, Stem which fits in the turret.

respects the two are dissimilar. Two or three tool-holders of different sizes take all the tool points used in a lathe, but a new box has to be devised in the case of almost every new job, with the exception of those the principal formation of which is the turning down of plain bars. The explanation is that, instead of a single point, several are commonly carried in a box. As complexity increases with the number of tools, new designs and dimensions of boxes become necessary, even though there may be family resemblances in groups. A result is that there is not, nor can there be, anything like finality in these designs. Turret work has become one of the most highly specialized departments of machine-shop practice, and the design of these boxes is already the work of specialists. More and more of the work of the common lathe is being constantly appropriated by the semi- and full-automatic machines, a result to which the magazine feeds for castings and forgings that cannot pass through a hollow spindle have contributed greatly. New work is constantly being attacked in the automatic machines that was deemed impracticable a short time before ; some of the commoner jobs are produced with greater economy, while heavier castings and forgings, longer and larger bars, are tooled in the turret lathes. A great deal of the efficiency of the box tools is due to the support which is afforded to the cutting edges in opposition to the stress of cutting. V-blocks are introduced in most cases as in fig. 7, and these not only resist the stress of the cutting, but gauge the diameter exactly.

Shearing Action. — In many tools a shearing operation takes place, by which the stress of cutting is lessened. Though not very apparent, it is present in the round-nosed roughing tools, in the knife tools, in most milling cutters, as well as in all the shearing tools proper — the scissors, shears, &c.

Planes. — We pass by the familiar great chisel group, used by wood-workers, with a brief notice. Generally the tool angles of these lie between 15° and 25 °. They include the chisels proper, and the gouges in numerous shapes and proportions, used by carpenters,

cabinet-makers, turners, stone-masons and allied tradesmen. These are mostly thrust by hand to their work, without any mechanical control. Other chisels are used percussively, as the stout mortise chisels, some of the gouges, the axes, adzes and stone-mason's tools. The large family of planes embody chisels coerced by the mechanical control of the wooden (fig. 8) or metal stock. These also differ

Fig. 8. — Section through Plane. A, Cutting iron. B, Top or back iron. C, Clamping screw. D, Wedge. E, Broken shaving. F, Mouth, from the chisels proper in the fact that the face of the cutting iron does not coincide with the face of the material being cut, but lies at an angle therewith, the stock of the plane exercising the necessary coercion. We also meet with the function of the top or non-cutting

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Fig. 9. — Group of Wood-boring Bits. A, Spoon bit. B, Centre-bit. C, Expanding centre-bit. Gilpin or Gedge auger. E, Jennings auger. F, Irwin auger.

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Fig. 10. — Group of Drills for Metal.

A, Common flat drill. B, Twist drill. C, Straight fluted drill. D, Pin drill for flat countersinking. E, Arboring or facing tool. K Tool for boring sheet-metal.

iron in breaking the shaving and conferring rigidity upon the cutting iron. This rigidity is of similar value in cutting wood as in cutting metal though in a less marked degree.

Drilling and Boring Tools. — Metal and timber are bored with equal facility; the tools (figs. 9 and 10) embody similar differences to the cutting tools already instanced for wood and metal. All the wood-working bits are true cutting tools, and their angles, if analysed, will

be found not to differ much from those of the razor and common chisel. The drills for metal furnish examples both of scrapers and cutting tools. The common drill is only a scraper, but all the twist drills cut with good incisive action. An advantage possessed by all drills is that the cutting forces are balanced on each side of the centre of rotation. The same action is embodied in the best wood- boring bits and augers, as the Jennings, the Gilpin and the Irwin — much improved forms of the old centre-bit. But the balance is impaired if the lips are not absolutely symmetrical about the centre. This explains the necessity for the substitution of machine grinding for hand grinding of the lips, and great developments of twist drill grinding machines. Allied to the drills are the D-bits, and the reamers (fig. 11). The first- named both initiate and finish a hole;

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Fig. 11.

A, D-bit. B, Solid reamer. C, Adjustable reamer, having six flat blades forced outward by the tapered plug. Two lock-nuts at the end fix the blades firmly after adjustment.

the second are used only for smoothing and enlarging drilled holes, and for correcting holes which pass through adjacent castings or plates. The reamers remove only a mere film, and their action is that of scraping. The foregoing are examples of tools operated from one end and unsupported at the other, except in so far as they receive support within the work. One of the objectionable features of tools operated in this way is that they tend to ” follow the hole,” and if this is cored, or rough-drilled out of truth, there is risk of the boring tools following it to some extent at least. With the one exception of the D-bit there is no tool which can be relied on to take out a long bore with more than an approximation to concentricity throughout. Boring tools (fig. 12) held in the slide-rest will spring and bend and chatter, and unless the lathe is true, or careful com- pensation is made for its want of truth, they will bore bigger at one end than the other. Boring tools thrust by the back centre are liable to wabble, and though they are variously coerced to prevent them from turning round, that does not check the to-and-fro wabbly

Fig. 12. — Group of Boring Tools.

A , Round boring tool held in V-blocks on slide-rest. B, C, Square and V-pointed boring tools. D, Boring bar with removable cutters, held straight, or angularly.

motion from following the core, or rough bore. In a purely reaming tool this is permitted, but it is not good in tools that have to initiate the hole.

This brings us to the large class of boring tools which are supported at each end by being held in bars carried between centres. There are two main varieties: in one the cutters are fixed directly in the bar (fig. 13, A to D), in the other in a head fitted on the bat

(fig. 13, E), hence termed a ” boring head.” As lathe heads are fixed, the traverse cannot be imparted to the bars as in boring machines. The boring heads can be traversed, or the work can be

Fig. 13. — Group of Supported Boring Tools.

A, Single-ended cutter in boring D, Flat double-ended finishing

bar. cutter.

B, Double-ended ditto. E, Boring head with three cutters

C, Flat single-ended finishing and three steady blocks.

cutter.

traversed by the mechanism of the lathe saddle. The latter must be done when cutters are fixed in bars. A great deal of difference exists in the details of the fittings both of bars and heads, but they are not so arbitrary as they might seem at first sight. The principal differences are those due to the number of cutters used, their shapes, and their method of fastening. Bars receiving their cutters direct include one, two or four, cutting on opposite sides, and therefore balanced. Four give better balance than two, the cutters being set at right angles. If a rough hole runs out of truth, a single cutter is better than a double-ended one, provided a tool of the roughing shape is used. The shape of the tools varies from roughing to finishing, and their method of

attachment is by screws, wedges or nuts, but we cannot illustrate the numerous differences that are met with.

Saws. — The saws are a natural connecting link between the chisels and the milling cutters. Saws are used for wood, metal and stone.

Slabs of steel several inches in thickness are sawn through as readily as, though more slowly than, timber planks. Circular and band saws are common in the smithy and the boiler and machine shops for cutting off bars, forgings and rolled sections. But the tooth shapes are not those used for timber, nor is the cutting speed the same. In the individual saw-teeth both cutting and scraping actions are illustrated (fig. 14). Saws which cut tim- ber continuously with the grain, as rip, hand, band, circular, have incisive teeth. For though many are destitute of front rake, the method of sharpening at an angle imparts a true shearing cut. But all cross- cutting teeth scrape only, the teeth being either of triangular or of M-form, variously modified. Teeth for metal cutting also act strictly by scraping. The pitching of the teeth is related to the nature of the material and the direction of cutting. It is coarser for timber than for metal, coarser for ripping or sawing with the grain than for cross cutting, coarser for soft than for hard woods. The setting of teeth, or the bending over to right and left, by which the clearance is provided for the blade of the saw, is subject to similar variations. It is greatest for soft woods and least for metals, where in fact the clearance is often secured without set, by merely thinning the blade backwards. But it is greater for cross cutting than for

Fig. 14. — Typical Saw Teeth.

A , Teeth of band and ripping saws.

B, Teeth of circular saw for hard wood ;

shows set.

C, Ditto for soft wood.

D, Teeth of cross-cut saw.

E, M -teeth for ditto.

ripping timber. Gulleting follows similar rules. The softer the timber, the greater the gulleting, to permit the dust to escape freely. Milling Cutters. — Between a circular saw for cutting metal and a thin milling cutter there is no essential difference. Increase the thickness as if to produce a very wide saw, and the essential plain edge milling cutter

for metal results. In its simplest form the milling cutter is a cylinder with teeth lying across its periphery, or parallel with its axis — the edge mill (fig. 15), or else a disk with teeth radiating on its face, or at right angles with its axis — the end mill (fig. 16). Each is used indifferently for producing flat faces and edges, and for cutting grooves which are rectangular in cross-section. These milling cutters invade the province of the single-edged tools of the planer, shaper and slotter. Of these two typical forms the

Fig. 15. — Group of Milling Cutters.

A, Narrow edge mill, with

straight teeth.

B, Wide edge mill with spiral

teeth.

C, Teeth on face and edges.

D, Cutter having teeth like C.

E, Flat teeth held in with screws

and wedges.

F, Large inserted tooth mill ; with

taper pins secure cutters.

Fig. 16. — Group of End Mills.

A, End mill with straight teeth. B, Ditto with spiral teeth. C, Showing method of holding shell cutter on arbor, with screw and key. D, T-slot cutter.

changes are rung in great variety, ranging from the narrow slitting tools which saw off bars, to the broad cutters of 24 in. or more in width, used on piano-millers.

When more than about an inch in width, surfacing cylindrical cutters are formed with spiral teeth (fig. 15, B), a device which is

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Fig. 17.

A, Straddle Mill, cutting faces and edges.

B, Set of three mills cutting grooves.

Fig. 18. — Group of Angular Mills.

A, Cutter with single slope.

B, Ditto, producing teeth in another cutter.

C, Double Slope Mill, with unequal angles.

essential to sweetness of operation, the action being that of shearing. These have their teeth cut on universal machines, using the dividing and spiral head and suitable change wheels, and after hardening they are sharpened on universal grinders. When cutters exceed about 6 in. in length the difficulties of hardening and grinding render the ” gang ” arrangement more suitable. Thus, two, three or more similar edge mills are set end to end on an arbor, with the spiral teeth running in reverse directions, giving a broad face with balanced endlong cutting forces. From these are built up the numerous gang mills, comprising plane faces at right angles with each other, of which the straddle mills are the best known (fig. 17, A). A common element in these combinations is the key seat type B having teeth on the periphery and on both faces as in fig. 15, C, D. By these combinations half a dozen faces or more can be tooled simul- taneously, and all alike, as long as the mills retain their edge. The advantages over the work of the planer in this class of work are seen in tooling the faces and edges of machine tables, beds and slides, in shaping the faces and edges of caps to fit their bearing blocks. In a single cutter of the face type, but having teeth on back and edge also, T-slots are readily milled (fig. 16, D) ; this if done on the planer would require re-settings of awkwardly cranked tools, and more measurement and testing with templets than is required on a milling machine.

When angles, curves and profile sections are introduced, the capacity of the milling cutter is infinitely increased. The making of the cutters

is also more difficult. Angular cutters (fig. 18) are used for producing the teeth of the mills themselves, for shaping the teeth of ratchet wheels, and, in combination with straight cutters in gangs, for angular sections. With curves, or angles and curves in combination, taps, reamers and drills can be fluted or grooved,

the teeth of wheels shaped, and in fact any outlines imparted (fig. 19). Here the work of the fitter, as well as that of the planing and allied machines, is invaded, for much of this work if prepared on these machines would have to be finished laboriously by the file.

There are two ways in which milling cutters are used, by which their value is extended; one is to transfer some of their work proper to the lathe and boring machine, the other is by duplication. A good many light circular sections, as wheel rims, hitherto done in lathes, are regularly prepared in the milling machine, gang mills being used for tooling the peri- phery and edges at once, and the wheel blank being rotated. Similarly, holes are bored by a rotating mill of the cylindrical type. Internal screw threads are done similarly. Duplication occurs when milling sprocket wheels in line, or side by side, in milling nuts on an arbor, in milling a number of narrow faces arranged side by side, in cutting the teeth of several spur-wheels on one arbor and in milling the teeth of racks several at a time.

One of the greatest advances in the practice of milling was that of making backed-off cutters. • The sectional shape behind the tooth

Fig. 19.

A, Convex Cutter.

B, Concave Cutter.

C, Profile Cutter.

face is continued identical in form with the profile of the edge, the outline being carried back as a curve equal in radius to that of the cutting edge (fig. 20). The result is that the cutter may be sharpened on the front faces of the teeth without interfering with the shape which willbe milled, because the periphery is always con- stant in outline. After re- peated sharpenings the teeth would assume the form indi- cated by the shaded portion two of the teeth. The

Fig. 20.-

-Relieved Teeth of Milling Cutter.

limit of grinding is reached

when the tooth becomes too

thin and weak to stand up to its work. But such cutters will endure

weeks or months of constant service before becoming useless. The

Fig. 21. — Group of Scrapes.

A, Metal-worker's scrape, pushed D, Diamond point used by

straightforward. wood-turners.

B, Ditto, operated laterally. E, F, Cabinet-makers' scrapes.

C, Round-nosed tool used by

wood-turners, chief advantage of backing-off or relieving is in its application to cutters of intricate curves, which would be difficult or impossible to sharpen along their edges. Such cutters, moreover, if made with

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Fig. 22. — Cross-sectional Shapes of Files.

/, Topping. P, Round.

K, Reaper. Q, Pit-saw or

L, Knife. frame-saw.

M, Three-square. R, Half-round.

N, Cant. S, T, Cabinet.

0, Slitting or U, Tumbler, feather-edge. V, Crossing, ordinary teeth would soon be worn down, and be much weaker than the strong form of teeth represented in fig. 20. The relieving is usually done in special lathes, employing a profile tool which cuts the surface

A,

Warding.

B,

Mill.

c,

Flat.

D,

Pillar.

£,

Square.

F,

G, Swaged reapers.

u.

Mill.

LJC

E F

Parallel or blunt. Taper bellied. Knife reaper. Tapered square.

Fig. 23. — Longitudinal Shapes of Files.

E, Parallel triangular.

F, Tapered triangular.

G, Parallel round. H, Taper or rat-tail. /, Parallel half- round.

K, Tapered half- round. L, Riffler.

of the teeth back at the required radius. Relieved cutters can of course be strung together on a single arbor to form gang mills, by which very complicated profiles may be tooled, beyond the capacity of a single solid mill.

Scrapes. — The tools which operate by scraping (fig. 21) include many of the broad finishing tools of the turner in wood and metal (cf. fig. 2), and the scrape of the wood worker and the fitter. The practice of scraping surfaces true, applied to surface plates, machine slides and similar objects, was due to Sir Joseph Whitworth. It superseded the older and less accurate practice of grinding to a mutual fit. Now, with machines of precision, the practice of grinding has to a large extent displaced the more costly scraping. Scraping is, however, the only method available when the most perfect contact is desired. Its advantage lies in the fact that the efforts of the work- man can be localized over the smallest areas, and nearly infinitesimal amounts removed, a mere fine dust in the last stages.

Files. — These must in strictness be classed with scrapes, for, although the points are keen, there is never any front rake. Collec- tively there is a shearing action because the rows of teeth are cut diagonally. The sectional forms (fig. 22) and the longitudinal forms (fig. 23) of the files are numerous, to adapt them to all classes of work. In addition, the method of cutting, and the degrees of coarseness of the teeth, vary, being single, or float cut, or double cut (fig. 24). The rasps are another group. Degrees of coarse- ness are designated as rough, middle cut, bastard cut, second cut, smooth, double dead smooth; the first named is the coarsest, the last the finest. The terms are relative, since the larger a file is the coarser are its teeth, though of the same name as the teeth in a shorter file, which are finer.

Screwing Tools. — The forms of these will be found discussed under Sc rew. They can scarcely be ranked among cutting tools, yet the best kinds remove metal with ease. This is due in great measure to the good clearance allowed, and to the narrowness of the cutting portions. Front rake is generally absent, though in some of the best screwing dies there is a slight amount.

Shears and Punches. — These may be of cutting or non-cutting types. Shears (fig. 25) have no front rake, but only a slight clearance. They generally give a slight shearing cut, because the blades do not lie parallel, but the cutting begins at one end and continues in detail to the other. But strictly the shears, like the punches, act by a

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Fig. 24. — File Teeth.

A, Float cut.

B, Double cut.

C, Rasp cut.

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Fig. 25. — Shear Blades.

a, a. Blades.

b, Plate being sheared.

FlG. 26. — Punching. a, Punch, b, Bolster. c, Plate being punched.

severe detrusive effort; for the punch, with its bolster (fig. 26), forms a pair of cylindrical shears. Hence a shorn or punched edge is always rough, ragged, and covered with minute, shallow cracks. Both processes are therefore dangerous to iron and steel. The metal being unequally stressed, fracture starts in the annulus of metal. Hence the advantage of the practice of reamering out this annulus, which is completely removed by enlargement by about an | in. diameter, so that homogeneous metal is left throughout the entire unpunched section. The same results follow reamering both in iron and steel. Annealing, according to many experiments, has the same effect as reamering, due to the rearrangement of the molecules of metal. The perfect practice with punched plates is to punch, reamer, and finally to anneal. The effect of shearing is practically identical with that of punching, and planing and annealing shorn edges has the same influence as reamering and annealing punched holes.

Hammers. — These form an immense group, termed percussive, from the manner of their use (fig. 27). Every trade has its own peculiar shapes, the -total of which number many scores, each with its own appropriate name, and ranging in size from the minute forms of the jeweler to the sledges of the smith and boiler maker and the planishing hammers of the coppersmith. Wooden hammers are termed mallets, their purpose being to avoid bruising tools or the surfaces of work. Most trades use mallets of some form or another. Hammer handles are rigid in all cases except certain percussive tools of the smithy, which are handled with withy rods, or iron rods flexibly attached to the tools, so that when struck by the sledge they shall not jar the hands. The fullering tools, and flatters, and setts, though not hammers strictly, are actuated by

percussion. The dies of the die forgers are actuated percussivelyi being closed by powerful hammers. The action of caulking tools is

percussive, and so is that of moulders' rammers.

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Fig. 27. — Hammers.

A , Exeter type.

B, Joiner's hammer.

C, Canterbury claw hammer

(these are wood-workers' hammers).

D, Engineer's hammer, ball pane.

E, Ditto, cross-pane.

Moulding Tools. — This is a group of tools which, actuated either by simple pressure or percussively, mould, shape and model forms in the sand of the moulder, in the metal of the smith, and in press work. All the tools of the moulder (fig. 28) with the exception of the rammers and vent wires act by moulding the sand into shapes

F, Ditto, straight, pane.

G, Sledge hammer, straight

pane.

H, Ditto, double-faced.

/, K, L, M, Boiler makers' ham- mers.

N, Scaling hammer.

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Fig. 28. — Moulding Tools.

J, Button sleeker. K, Pipe smoother.

A , Square trowel. E, Flange bead.

B, Heart trowel. F, Hollow bead.

C, D, Cleaners. G, H, Square corner sleekers.

by pressure. Their contours correspond with the plane and curved surfaces of moulds, and with the requirements of shallow and deep work. They are made in iron and brass. The fullers, swages and flatters of the smith, and the dies used with hammer and presses, all mould by percussion or by pressure, the work taking the counter- part of the dies, or of some portion of them. The practice of die forging consists almost wholly of moulding processes.

Tool Steels. — These now include three kinds. The common steel, the controlling element in which is carbon, requires to be hardened and tempered, and must not be overheated, about 500 F. being the highest temperature permissible — the critical tempera- ture. Actually this is seldom allowed to be reached. The dis- advantage of this steel is that its capabilities are limited, because the heat generated by heavy cutting soon spoils the tools. The second is the Mushet steel, invented by R. F. Mushet in 1868, a carbon steel, in which the controlling element is tungsten, of which it contains from about 5 to 8 %. It is termed self-hardening, because it is cooled in air instead of being quenched in water. Its value consists in its endurance at high temperatures, even at a low red heat. Until the advent of the high-speed steels, Mushet steel was reserved for all heavy cutting, and for tooling hard tough steels. It is made in six different tempers suitable for various kinds of duty. Tools of Mushet steel must not be forged below a red heat. It is hardened by reheating the end to a white heat, and blowing cold in an air blast. The third kind of steel is termed high-speed, because much higher cutting speeds are practicable with these than with other steels. Tools made of them are hardened in a blast of cold air. The controlling elements are numerous and vary in the practice of different manufacturers, to render the

tools adaptable to cutting various classes of metals and alloys. Tungsten is the principal controlling element, but chromium is essential, and molybdenum and vanadium are often found of value. The steels are forged at a yellow tint, equal to about 1850 F. They are raised to a white heat for hardening, and cooled in an air blast to a bright red. They are then often quenched in a bath of oil.

The first public demonstration of the capacities of high speed steels was made at the Paris Exhibition of 1900. Since that time great

advances have been made. It has been found that the section of the shaving limits the practicable speeds, so that, although cutting speeds of 300 and 400 ft. a minute are practicable with light cuts, it is more economical to limit speeds to less than 100 ft. per minute with much heavier cuts. The use of water is not absolutely essential as in using tools of carbon steel. The new steels show to much greater advantage on mild steel than on cast iron. They are more useful for roughing down than for finishing. The removal of 20 lb of cuttings per minute with a single tool is common, and that amount is often exceeded, so that a lathe soon becomes half buried in turnings unless they are carted away. The horse-power absorbed is proportionately large. Ordinary heavy lathes will take from 40 to 60 h.p. to drive them, or from four to six times more than is required by lathes of the same centres using carbon steel tools. Many remarkable records have been given of the capacities of the new steels. Not only turning and planing tools but drills and milling cutters are now regularly made of them. It is a revelation to see these drills in their rapid descent through metal. A drill of I in. in diameter will easily go through 5 in. thickness of steel in one minute.

Machine Tools The machine tools employed in modern engineering factories number many hundreds of well-defined and separate types. Besides these, there are hundreds more designed for special functions, and adapted only to the work of firms who handle specialities. Most of the first named and many of the latter admit of grouping in classes. The following is a natural classification:

I. Turning Lathes. — These, by common consent, stand as a class alone. The cardinal feature by which they are distin- guished is that the work being operated on rotates against a tool which is held in a rigid fixture — the rest. The axis of rotation may be horizontal or vertical.

II. Reciprocating Machines.- — The feature by which these are characterized is that the relative movements of tool and work take place in straight lines, to and fro. The recipro- cations may occur in horizontal or vertical planes.

III. Machines which Drill and Bore Holes. — These have some features in common with the lathes, inasmuch as drilling and boring are often done in the lathes, and some facing and turning in the drilling and boring machines, but they have become highly differentiated. In the foregoing groups tools having either single or double cutting edges are used.

IV. Milling Machines. — This group uses cutters having teeth arranged equidistantly round a cylindrical body, and may therefore be likened to saws of considerable thickness. The cutters rotate over or against work, between which and the cutters a relative movement of travel takes place, and they may therefore be likened to reciprocating machines, in which a revolving cutter takes the place of a single-edged one.

V. Machines for Cutting the Teeth of Gear-wheels. — These comprise two sub-groups, the older type in which rotary milling cutters are used, and the later type in which reciprocating single-edged tools are employed. Sub-classes are designed for one kind of gear only, as spur-wheels, bevels, worms, racks, &c.

VI. Grinding Machinery. — This is a large and constantly extending group, largely the development of recent years. Though emery grinding has been practised in crude fashion for a century, the difference in the old and the new methods lies in the embodiment of the grinding wheel in machines of high precision, and in the rivalry of the wheels of corundum, car- borundum and alundum, prepared in the electric furnace with those of emery.

VII. Sawing Machines. — In modern practice these take an important part in cutting iron, steel and brass. Few shops are without them, and they are numbered by dozens in some establishments. They include circular saws for hot and cold metal, band saws and hack saws.

VIII. Shearing and Punching Machines. — These occupy a border line between the cutting and non-cutting tools. Some must be classed with the first, others with the second. The detrusive action also is an important element, more especially in the punches.

IX. Hammers and Presses. — Here there is a percussive action in the hammers, and a purely squeezing one in the presses. Both are made capable of exerting immense pressures, but the latter are far more powerful than the former.

X. Portable Tools.— This large group can best be classified by the common feature of being readily removable for operation on large pieces of erection that cannot be taken to the regular machines. Hence they are all comparatively small and light. Broadly they include diverse tools, capable of performing nearly the whole of the operations summarized in the pre- ceding paragraphs.

XI. Appliances. — There is a very large number of articles which are

neither tools nor machine tools, but which are in- dispensable to the work of these; that is, they do not cut, or shape, or mould, but they hold, or grip, or control, or aid in some way or other the carrying through of the work. Thus a screw wrench, an angle plate, a wedge, a piece of packing, a bolt, are appliances. In modern practice the appliance in the form of a templet or jig is one of the principal elements in the interchangeable system.

XII. Wood-working Machines. — This group does for the conversion of timber what the foregoing accomplish for metal. There is therefore much underlying similarity in many machines for wood and metal, but still greater differences, due to the conditions imposed on the one hand by the very soft, and on the other by the intensely hard, materials operated on in the two great groups. –

XIII. Measurement. — To the scientific engineer, equally with the astronomer, the need for accurate measurement is of paramount importance. Neither good fitting nor interchange- ability of parts is possible without a system of measurement, at once accurate and of ready and rapid application. Great advances have been made in this direction lately.

I. — Lathesˆ 1

The popular conception of a lathe, derived from the familiar machine of the wood turner, would not give a correct idea of the lathe which has been developed as the engineer’s machine tool. This has become differentiated into nearly fifty well-marked.types, until in some cases even the term lathe has been dropped for more precise definitions, as vertical boring machine, automatic machine, while in others prefixes are necessary, as axle lathe, chucking lathe, cutting-off lathe, wheel lathe, and so on. With regard to size and mass the height of centres may range from 3 in. in the bench lathes to 9 or 10 ft. in gun lathes, and weights will range from say 50 lb to 200 tons, or more in exceptional cases. While in soma the mechanism is the simplest possible, in others it is so complicated that only the specialist is able to grasp its details.

Early Lathes. — Space will not permit us to trace the evolution of the lathe from the ancient bow and card lathe and the pole lathe, in each of which the rotary movement was alternately for- ward, for cutting, and backward. The curious thing is that the wheel-driven lathe was a novelty so late as the 14th and 15th centuries, and had not wholly displaced the ancient forms even in the West in the 19th century, and the cord lathe still survives in the East. Another thing is that all the

old lathes were of dead centre, instead of running mandrel type; and not until 1794 did the use of metal begin to take the place of wood in lathe construction. Henry Maudslay (1771-1831) did more than any other man to develop the engineer's self-acting lathe in regard to its essential mechanism, but it was, like its immediate successors for fifty years after, a skeleton-like, inefficient weakling by comparison with the lathes of the present time.

Broad Types. — A ready appreciation of the broad differences in lathe types may be obtained by considering the differences in the great groups of work on which lathes are designed to operate. Castings and forgings that are turned in lathes vary not only in size, but also in relative dimensions. Thus a long piece of driving shafting, or a railway axle, is very differently proportioned in length and diameter from a railway wheel or a wheel tire. Further, while the shaft has to be turned only, the wheel or the tire has to be turned and bored. Here then we have the first cardinal distinction between lathes, viz. those admitting work between centres (fig. 29) and face and boring lathes. In the first the piece of work is pivoted and driven between the centres of head-stock and tail-stock or loose poppet; in the second, it is held and gripped only by the dogs or

jaws of a face-plate, on the head-stock spindle, the loose poppet being omitted.

These, however, are broad types only, since proportions of length to diameter differ, and with them lathe designs are modified whenever there is a sufficient amount of work of one class to justify the laying down of a special machine or machines to deal with it. Then further, we have dupli- cate designs, in which, for example, provision is made in one lathe for turning two or three long shafts simultane- ously, or for turning and boring two wheels or tires at once. Further, the position of the axis of a face lathe need not be horizontal, as is necessary when the turning of long pieces has to be done between centres. There are obvious advantages in arranging it vertically, the princi- pal being that castings and forgings can be more easily set and secured to a horizontal chuck than to one the face of which lies vertically. The chuck is also better sup- ported, and higher rates of turning are practicable. In recent years these vertical lathes or vertical

turning and – boring mills (fig. 30) have been greatly increasing in num- bers; they also occur in several designs to suit either general or special duties, some of them being used for boring only, as chucking lathes. Some are of immense size, capable of boring the field magnets of electric generators 40 ft. in diameter.

Standard Lathes. — But for doing what is termed the general work of the engineer's turnery, the stan- dard lathes (fig. 29) predominate, i.e. self-acting, sliding and surfacing lathes with headstock, loose poppet and slide-rest, centres, face plates and chucks, and an equip- ment by which long pieces are turned, either between centres or on the face chucks, and bored. One of the greatest objections to the employment of these standard types of lathes for indiscriminate duty is due to the limited height of the centres or axis of the head- stock, above the face of the bed. This is met generally by providing a gap or deep recess in the bed next the fast headstock, deep enough to take face work of large diameter. The device is very old and very common, but when the volume of work warrants the employment of separate lathes for face-work and for that done between centres it is better to have them.

Screw-cutting. — A most important section of the work of the engineer's turnery is that of cutting screws (see Screw). This has resulted in differentiation fully as great as that existing between centres and face-work. The slide-rest was designed with this object, though it is also used for plain turning. The standard " self- acting sliding, surfacing and screw-cutting lathe " is essentially the standard turning lathe, with the addi- tion of the screw-cutting mechanism. This includes a master screw — the lead or guide screw, which is gripped with a clasp nut, fastened to the travelling carriage of the slide-rest. The lead-screw is connected to the headstock spindle by change wheels, which are the variables through which the relative rates of move- ment of the spindle and the lead-screw, and therefore of the screw-cutting tool, held and traversed in the slide-rest, are effected. By this beautiful piece of mechanism a guide screw, the pitch of which is per- manent, is made to cut screw-threads of an almost infinite number of possible pitches, both in whole and fractional numbers, by virtue of rearrangements of the variables, the change wheels. The objection to this method is that the trains of change wheels have to be recalculated and rearranged as often as a screw of a different pitch has to be cut, an operation which takes some little time. To avoid this, the nest or cluster system of gears has been largely adopted, its most successful embodiment being in the Hendey-Norton lathe. Here all the change wheels are arranged in a series permanently on one shaft underneath the headstock, and any one of them is put into engagement by a sliding pinion operated by the

simple movement of a lever. Thus the lead-screw is driven at different rates without removing any wheel from its spindle. This has been extensively applied to both small and large lathes. But a moment's thought will show that even this device is too cumbrous when large numbers of small screws are required. There is, for example, little in common between the screw, say of 5 or 6 ft. in length, for a massive penstock or valve, and |-in. bolts, or the small screws required in thousands for electrical fittings. Clearly while the self-acting screw-cutting lathe is the best possible machine to use for the first, it is unsuitable for the last. So here at once, from the point of view of screw cutting only, an important diver- gence takes place, and one which has ultimately led to very high specialization.

Small Screws. — When small screws and bolts are cut in

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LATHES]

TOOL

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Urge quantities, the guide-screw and change wheels give place to

other devices, one of which involves the use of a separate master-screw for every different pitch, the other that, of encircling cutting instruments or dies. The first are represented by the chasing lathe, the second by the screwing lathes and automatics. Though the principles of operation are thus stated in brief, the details in design are most extensive and varied.

In a chasing lathe the master-screw or hob, which may be either at the rear of the headstock or in front of the slide-rest, receives a hollow clasp-nut or a half-nut, or a star-nut containing several pitches, which, partaking of the traverse movement of the screw- thread, imparts the same horizontal movement to the cutting tool. The latter is sometimes carried in a hinged holder, sometimes in a common slide-rest. The attendant throws it into engagement at the beginning of a traverse, and out when completed, and also

this is an economical system, but in others not. It cannot be considered so when bolts, screws and allied forms are of small dimensions.

Hollow Mandrel Lathes. — It has been the growing practice since the last decade of the 19th century to produce short articles, re- quired in large quantities, from a long bar. This involves making the lathe with a hollow mandrel ; that is, the mandrel of the head- stock has a hole drilled right through it, large enough to permit of the passage through it of the largest bar which the class of work requires. Thus, if the largest section of the finished pieces should require a bar of i| in. diameter, the hole in the mandrel would be made if in. Then the bar, inserted from the rear-end, is gripped oy a chuck or collet at the front, the operations of turning, screwing and cutting off done, and the bar then thrust farther through to the exact length for the next set of identical operations to be

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Fig. 30. — Boring and Turning Mill, vertical lathe. (Webster Bennett, Ltd., Coventry.)

A, Table, running with stem in vertical bearing.

B, Frame of machine.

C, Driving cones.

D, Handle giving the choice of two rates, through concealed

sliding gears, shown dotted.

E, Bevel-gears driving up to pinion gearing with ring of teeth

on the table.

F, Saddle moved on cross-rail G.

changes the hobs for threads of different sections. The screwed stays of locomotive fire-boxes are almost invariably cut on chasing lathes of this class.

In the screwing machines the thread is cut with dies, which encircle the rotating bar; or alternatively the dies rotate round a fixed pipe, and generally the angular lead or advance of the thread draws the dies along. These dies differ in no essentials from similar tools operated by a hand lever at the bench. There are many modifications of these lathes, because the work is so highly special- ized that they are seldom used for anything except the work of cutting screws varying but little in dimensions. Such being the case they can hardly be classed as lathes, and are often termed screwing machines, because no provision exists for preliminary turning work, which is then done elsewhere, the task of turning and threading being divided between two lathes. In some cases

H, Vertical slide, carrying turret /.

K, Screw feeding F across.

L, Splined shaft connecting to H for feeding the latter up of down.

M, M, Worm-gears throwing out clutches N, N at predeter- mined points.

0, Cone pulley belted up to P, for driving the feeds of saddle and down-slide.

performed, and so on. This mechanism is termed a wire feed, because the first lathes which were built of this type only operated on large wires; the heavy bar lathes have been subsequently developed from it. In the more advanced types of lathes this feeding through the hollow spindle does not require the intervention of the attendant, but is performed automatically.

The amount of preliminary work which has to be done upon a portion of a bar before it is ready for screwing varies. The simplest object is a stud, which is a. parallel piece screwed up from each end. A bolt is a screw with a head of hexagonal, square or circular form, and the production of this involves turning the shank and shoulder and imparting convexity to the end, as well as screwing. But screw-threads have often to be cut on objects which are not primarily bolts, but which are spindles of various kinds used on mechanisms and machine tools, and in which reductions in the form

of steps have to be made, and recesses, or flanges, or other features ptoduced. Out of the demands for this more complicated work, as well as for plain bolts and studs, has arisen the great group of turret or capstan lathes (fig. 31) and the automatics or automatic screw machines which are a high development of the turret lathes.

Turret Lathes. — The turret or capstan (fig. 32) is a device for gripping as many separate tools as there are distinct operations to be performed on a piece of work; the number ranges from four to as many as twenty in some highly elaborated machines, but five or six is the usual number of holes. These tools are brought round

Fig. 31. — Turret,

Bed.

Waste oil tray.

Headstock.

Hollow mandrel.

Cones keyed to D.

Split tapered close-in chuck, actuated by tube G. H, Toggle dogs which push G. J, Coned collar acting on H. K, Handle to slide / through sleeve on bar L. M, Rack slid on release of chuck, moving bearing ft torward,

A, B, C, D, E, F,

Lathe. ˆ (Webster 1 N,

O, P, Q, R, s,

T,

V,

i Bennett, Ltd., Coventry.)

Bearing to feed the work through mandrel (constituting the wire or bar feed). A collar is clamped on the work, and is pushed by the bearing N at each time of feeding.

Cross-slide.

Hand-wheel operating screw to travel O.

Turret-slide.

Cross-handle moving Q to and fro.

Turret or capstan.

U, Sets of fast and loose pulleys, for open and crossed belts.

Cone belted down to E on lathe.

Fig. 32. — Plan of Set of Turret Tools.

D operation or

(A. Herbert, Ltd.)

A, Turret.

B, Tool for first

chucking.

C, Cutting tools for second

operation, starting or point- ing.

Box tool carrying two cutters for third operation, rough turning.

E, Similar tool for fourth opera-

tion, finish turning.

F, Screwing tools in head for

final operation of screwing.

in due succession, each one doing its little share of work, until the cycle of operations required to produce the object is complete, the cycle including such operations as turning and screwing, rough- ing and finishing cuts, drilling and boring. Severance of the finished piece is generally done by a tool or tools held by a cross-slide between the headstock and turret, so termed because its movements take place at right angles with the axis of the machine. This also often performs the duty of " forming," by which is meant the shap- ing of the exterior portion of an object of irregular outline, by a tool the edge of which is an exact counterpart of the profile required. The exterior of a cycle hub is shaped thus, as also are numerous handles and other objects involving various curves and shoulders, &c. The tool is fed perpendicularly to the axis of the rotat- ing work and completes outlines at once: if this were done in ordinary lathes much tedious manipulation of separate tools would be involved.

Automatics. — But the marvel of the modern automatics (fig. 33) lies in the mechanism by which the cycle of operations is rendered absolutely independent of attendance, beyond the first adjustments and the insertion of a fresh bar as often as the previous one becomes used up. The movements of the rotating turret and of the cross- slide, and the feeding of the bar through the hollow spindle, take place

within a second, at the conclusion of the operation preceding. These movements are effected by a set of mechanism independent of that by which the headstock spindle is rotated, viz. by cams or cam drums on a horizontal cam shaft, or other equivalent device, differing much in arrangement, but not principle. Move- ments are hastened or retarded, or pauses of some moments may ensue, according to the cam arrangements devised, which of course have to be varied for pieces of different proportions and dimensions. But when the machines with their tools are once set up, they will run for days or weeks, repeating precisely the same cycle of opera- tions; they are self-lubricating, and only require to be fed with fresh lengths of bar and to have their tools resharpened occasionally. Of these automatics alone there are something like a dozen distinct types, some with their turrets vertical, others horizontal. Not only so but the use of a single spindle is not always deemed suffi- ciently economical, and some of these designs now have two, three and four separate work spindles grouped in one head.

Specialized Lathes. — Outside of these main types of lathes there are a large number which do not admit of group classification. They are designed for special duties, and only a representative list can be given. Lathes for turning tapered work form a limited

Fig. 33. — Automatic Lathe or Screw Machine. (A. Herbert, Ltd.)

A, Main body. a, a

B, Waste oil tray.

C, Headstock.

D, Wire-feed tube.

E, Slide for closing chuck.

F, Shaft for ditto. c,

G, Feed-slide. d,d H, Piece of work. e, e, J, Turret wich box tools.

K, Turret slide.

L, Saddle for ditto, adjustable

along bed. T,

M, Screw for locating adjustable

slide. N, Cut-off and forming cross- slide. V, 0, 0, Back and front tool-holders

on slide. W,

P, Cam shaft. g, g

Q, Cam drum for operating

chuck. X,

R, Cam drum for operating Y,

turret. 5, Cam disk for actuating Z,

cross-slide.

, a, Cams for actuating chuck movements through pins 6, b. The cam which re- turns D is adjustable but is not in view.

Feeding cam for turret.

Return cams for turret.

Cams on cam disk for oper- ating the lever /, which actuates the cut-off and forming slide.

Worm-wheel which drives cam shaft by a worm on the same shaft as the feed-pulley U.

Handwheel on worm shaft for making first adjustments.

Change feed disk.

.Change feed dogs adjustable round disk.

Change feed lever.

Oil tube and spreader for lubricating tools and work.

Tray for tools, &c.

number, and they include the usual provisions for ordinary turning. In some designs change wheels are made use of for imparting a definite movement of cross traverse to the tool, which being com- pounded with the parallel sliding movements produces the taper. In others an upper bed carrying the heads and work swivels on a lower bed, which carries the slide rest. More often tapers are turned by a cross adjustment of the loose poppet, or by a taper attachment at the rear of the lathe, which coerces the movement of the top or tool-carrying slide of the rest. Or, as in short tapers, the slide-rest is set to the required angle on its carriage. Balls are sometimes turned by a spherical attachment to the slide-rest of an ordinary lathe. Copying lathes are those in which an object is reproduced from a pattern precisely like the objects required. The commonest example is that in which gun-stocks and the spokes of wheels are turned, but these are used for timber, and the engineer's copying lathe uses a form or cam and a milling cutter. The form milling machine is the copying machine for metal-work. The manufacture of boilers has given birth to two kinds of lathes, one for turning the boiler ends, the other the boiler flue flanges, the edges of which have to be caulked. Shaft pulleys have appropriated a special lathe containing provision for turning the convexity of the faces. Lathes are duplicated in two or three ways. Two, four, six or eight tools sometimes operate simultaneously on a piece of work. Two lathes are mounted on one bed. A tool will be boring a hole while another is turning the edges of the same wheel. One will be boring, another turning a wheel tire, and so on. The rolls for iron and steel mills have special lathes for trueing them up. The thin sheet metal-work produced by spinning has given rise to a special kind of spinning lathe where pressure, and not cutting, is the method adopted.

_ Methods of Holding and Rotating Work. Chucks.— The term chuck signifies an appliance used in the lathe to hold and rotate work. As the dimensions and shapes of the latter vary extensively, so also do those of the chucks. Broadly, however, the latter corre- spond with the two principal classes of work done in the lathe, that between centres, and that held at one end only or face work.

This of course is an extremely comprehensive classification, because chucks of the same name differ vastly when used in small and large lathes. The chucks, again, used in turret work, though they grip the work by one end only, differ entirely in design from the face chucks proper.

Chucking between Centres. — The simplest and by far the commonest method adopted is to drill countersunk centres at the ends of the work

to be turned, in the centre or longitudinal axis (fig. 34, A), and support these on the point centres of headstock and poppet. The angle included by the centres is usually 6o°, and the points may enter the work to depths ranging from as little as ˆ in. in very light pieces to J in., f in. or I in. in the heaviest. Obviously a piece centred thus cannot be rotated by the mere revolution of the lathe, but it has to be driven by some other agent making con-

A , Centring and driving ; a, point centre; b, carrier; c, driver fixed in slot in body of point centre; d, back centre; e, work.

B, Face-plate driver or catch- plate; a, centre; b, driver.

C, Common heart-shaped carrier.

D, Clement doubledriver; a, face- plate ; b, b, drivers ; c, loose plate carrying drivers.

nexion between it and the mandrel. The wood turner uses a forked or prong centre to obtain the necessary leverage at the headstock end, but that would be useless in metal. A driver is therefore used, of which there are several forms (fig. 34), the essential element being a short stiff prong of metal set away from the centre, and rotat- ing the work directly, or against a carrier which encircles and pinches the work. As this method of driving sets up an unbalanced force, the ” Clement ” or double driver (fig. 34, D), was invented, and is frequently made use of, though not nearly so much as the common single driver. In large and heavy work it is frequently the practice to drive in another way, by the dogs of the face-plate. Steadies. — Pieces of work which are rigid enough to withstand the stress of cutting do not require any support except the centres.

Fig. 35.

A, Travelling steady with adjust- slotted bolt holes a, a;b, b,

able studs a, a; b, work; brass or steel facings.

c, tool ; d, slide-rest. C, Fixed steady with hinged top

B, Steady with horizontal and and three setting pieces.

vertical adjustment through

But long and comparatively slender pieces have to be steadied at intermediate points (fig. 35). Of devices for this purpose there are

many designs; some are fixed or bolted to the bed and are shifted when necessary to new positions, and others are bolted to the carriage of the slide-rest and move along with it — travelling

steadies. In some the work is steadied in a vee, or a right angle, in others adjustable pins or arms are brought into contact with it. As the pressure of the cut would cause an upward as well as back- ward yielding of the work, these two movements are invariably provided against, no matter in what ways the details of the steadies are worked out. Before a steady can be used, a light cut has to be taken in the locality where the steady has to take its bearing, to render the work true in that place. The travelling steady follows immediately behind the tool, coming in contact therefore with finished work continually.

Mandrels. — Some kinds of work are carried between centres indirectly, upon mandrels or arbors (fig. 36). This is the method

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Fig. 36. — Mandrels.

A , Plain mandrel. B, Stepped mandrel. C, Expanding mandrel, adopted when wheels, pulleys, bushes and similar articles are bored first and turned afterwards, being chucked by the bore hole, which fits on a mandrel. The latter is then driven between point centres and the

bore fits the mandrel sufficiently tightly to resist the stress of turning. The large number of bores possible involves stocking a considerable number of mandrels of different diameters. As it is not usual to turn a mandrel as often as a piece of work requires chucking, economy is studied by the use of stepped mandrels, which comprise several diameters, say from three to a dozen. A better device is the expanding mandrel, of which there are several forms. The essential principle in all is the capacity for slight adjustments in diameter, amounting to from j in. to J in., by the utilization of a long taper. A split, springy cylinder may be moved endwise over a tapered body, or separate single keys or blades may be similarly moved.

Face-Work. — That kind of work in which support is given at the headstock end only, the centre of the movable poppet not being required, is known as face-work. It includes pieces the length of which ranges from something less than the diameter to about three or four times the diameter, the essential condition being that the unsupported end shall be sufficiently steady to resist the stress of cutting. Work which has to be bored, even though long, cannot be steadied on the back centre, and if long is often supported on a cone plate. The typical appliance used for face-work is the common face-plate (fig. 37). It is a plain disk, screwed on the mandrel

the jaws being independent, there is no self-centring capacity, and thus much time is lost. A large group, therefore, are rendered self-centring by the turning of a ring which actuates a face scroll

Fig. 37. — Face-plate. A, Screwed hole to fit mandrel nose. B, Slots for common bolts.

C, Tee-slots for tee-head bolts, nose, and having slot holes in which bolts are inserted for the pur- pose of cramping pieces of work to its face. There are numerous forms of these clampSj and common bolts also are used. The face- plate may also serve to receive an intermediary, the angle-plate, against which work may be bolted when its shape is such as to render bolting directly to the plate inconvenient.

Jaw Chucks. — When a face-plate has fitted to it permanent dogs or jaws it is termed a dog or jaw chuck (fig. 38). In the commonest form the jaws are moved radially and independently, each by its own screw, to grip work either externally or internally. In some cases the dogs are loosely fitted to the holes in a plain face- plate. In all these types the radial setting is tentative, that is,

A, Body, a, Recess to receive face-plate.

B, Jaws or dogs.

C, Screws for operating jaws.

Fig. 38. — Independent Jaw Chuck.

b, Square heads of screws for key.

c, Tee-grooves for bolts.

Fig. 39. — Scroll Chuck, ungeared.

A, Face-plate screwed to man-

drel nose.

B, Back of chuck screwed to

A.

C, Knurled chuck body with

scroll a on face. Chuck face.

D,

Jaws in chuck face, having sectional scroll teeth en- gaging with scroll o, and moved inwards or outwards by the scroll when C is turned.

Tommy or lever hole in C.

Piece of work outlined.

Fig. 40. — Combination Geared Scroll Chuck.

A , Back plate ; a, recess for face-

plate.

B, Pinions.

C, Circular rack with scroll b on

face.

D, Chuck body.

E, Jaws fitting on intermediate

pieces c that engage with the scroll b. d, Screws for operating jaws independently.

Fig. 41. — Spiral Geared Chuck, concentric movement. (C.Taylor, Birmingham.)

A, Back.

B, Body.

C, Spiral plate with teeth engag-

ing in jaws D. E, Bevel pinions gearing with teeth on back of C.

(fig. 39) or a circular rack with pinions (fig. 40), turned with a key which operates all the jaws simultaneously inwards or outwards. But as some classes of jobs have to be adjusted eccentrically, many chucks are of the combination type (fig. 40), capable of being used independently or con- centrically, hence termed uni- versal chucks. The change from one to the other simply means throwing the rLng of teeth out of or into engage- ment with the pinions by means of cams or equivalent devices. Each type of chuck occurs in a large range of dimensions to suit lathes of all centres, besides which every lathe includes several chucks, large and small, in its equip- ment. The range of dia- meters which can be taken by any one chuck is limited, though the jaws are made with steps, in addition to the range afforded by the ope- rating screws. The ” Taylor ” spiral chucks (fig. 41) differ

essentially from the scroll types in having the actuating threads set spirally on the sloping interior of a cone. The result is that the outward pressure of each jaw is received behind the body, because the spiral rises up at the back. In the ordinary scroll chucks the pressure is taken only at the bottom of each jaw, and the tendency to tilt and pull the teeth out of shape is very noticeable. The spiral, moreover, enables a stronger form of tooth to be used, together with a finer pitch of threads, so that the wearing area can be increased.

The foregoing may be termed the standard chucks. But in addition

there are large numbers for dealing with special classes of work. Brass finishers have several. Most of the hollow spindle lathes and automatics have draw-in or push-out chucks, in which the jaws are operated simultaneously by the conical bore of the encircling nose, so that their action is instantaneous and self-centring. They are either operated by hand, as in fig. 31, or automatically, as in fig. 33. There is also a large group used for drills and reamers — the drill chucks employed in lathes as well as in drilling machines.

II. — Reciprocating Machine Tools This is the only convenient head under which to group three great classes of machine tools which possess the feature of reciprocation in common. It includes the planing, shaping and slotting machines. The feature of reciproca- tion is that the cutting tool is operative only in one direction ; that is, it cuts during one stroke or movement and is idle during the return stroke. It is, therefore, in precisely the same condition as a hand tool such as a chisel, a carpenter's plane or a hand saw. We shall return again to this feature of an idle stroke and discuss the devices that exist to avoid it.

Planing Machines. — In the standard planer for general shop purposes (fig. 42) the piece of work to be operated on is attached to a horizontal tj table moving to and fro on a rigid bed, and passing under- neath the fixed cutting tool. The tool is gripped in a box having certain necessary ad- justments and movements, so that the tool can be carried or fed transversely across the work, or at right angles with the direction of its travel, to take successive cuts, and also downwards or in a vertical direction. The tool-box is carried on a cross-slide which has capacity for several feet of vertical adjustment on up- right members to suit work of varying depths. These up- j rights or housings are bolted to the sides of the bed, and the whole framing is so rigidly designed that no perceptible tremor or yielding takes place under the heaviest duty im- posed by the stress of cutting.

be C.-J .

Moreover, after the required adjustments have been made and the machine started, the travel and the return of the work-table and the feeding of the tool across the surface are performed by self-acting

mechanism actuated by the reciprocations of the table itself, the table being driven from the belt pulleys.

To such a design there are objections, which, though their importance has often been exaggerated, are yet real. First, the cross- rail and housings make a rigid enclosure over the table, which sometimes prevents the admission of a piece that is too large to pass under the cross-rail or between the housings. Out of this

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Fig. 43. — 20-in. Side Planing Machine. (G. Richards & Co., Ltd., Manchester.) ”

A , Bed. G, Tool-box on travelling arm H, travelled by fast and loose

B, B, Feet. pulleys / for cutting, and by pulleys K for quick return.

C, C, Work tables adjustable vertically on the faces D, D, by L, Feed-rod with adjustable dogs a, a, for effecting reversals through

means of screws E, E, from handles F, F, through bevel the belt forks 6, 6.

gears. M, Brickwork pit to receive deep objects.

-c = $

Fig. 44. — 8-in. Shaping Machine. (C

A, Base.

B, Work-table, having vertical movement on carriage C, which has

horizontal movement along the face of A . D, Screw for effecting vertical movement, by handle E, and bevel gears.

F, Screw for operating longitudinal movement with feed by hand

or power.

G, Tool ram. H, Tool-box.

a, Worm-gear for setting tool-holder at an ang*.

b, Crank handle spindle for operating ditto.

c, Handle for actuating down feed of tool.

unliffe & Croom, Ltd., Manchester.)

Driving cone pulley actuating pinion d, disk wheel e, with slotted disk, and adjustable nut moving in the slot of the crank /, which actuates the lever g, connected to the tool ram G, the motion constituting the Whitworth quick return ; g is pivoted to a block which is adjustable along a slot in G, and the clamping of this block in the slot regulates the position of the ram G, to suit the position of the work on the table.

Feed disk driven by small gears from cone pulley.

Pawl driven from disk through levers at various rates, and controlling the amount of rotation of the feed screw F.

Conical mandrel for circular shaping, driven by worm and wheel /.

objection has arisen a new design, the side planer (fig. 43), in which the tool-box is carried by an arm movable along a fixed bed or base, and overhanging the work, which is fastened to the side of the base, or on angle brackets, or in a deep pit alongside. Here the important difference is that the work is not traversed under the tool as in the ordinary planer, but the tool moves over the work. But an evil results, due to the overhang of the tool arm, which being a cantilever supported at one end only is not so rigid when cutting as the cross-rail of the ordinary machine, supported at both ends on housings. The same idea is embodied in machines built in other respects on the reciprocating table model. Sometimes one housing is omitted, and the tool arm is carried on the other, being therefore unsupported at one end. Sometimes a housing is made to be removable at pleasure, to be temporarily taken away only when a piece of work of unusual dimensions has to be fixed on the table. Another objection to the common planer is this. It seems unmechanical in this machine to reciprocate a heavy table and piece of work which often weighs several tons, and let the tool and its holder of a few hundredweights only remain stationary. The mere reversal of the table absorbs much

there is no limitation whatever to the length of the work, since it may extend to any distance beyond the base-plate.

Shaping Machines. — The shaping machine (fig. 44) does for comparatively small pieces that which the planer does for long ones. It came later in time than the planer, being one of James Nasmyth's inventions, and beyond the fact that it has a reciprocating non- cutting return stroke it bears no resemblance to the older machine. Its design is briefly as follows: The piece of work to be shaped is attached to the top, or one of the vertical side faces, of a right- angled bracket or brackets. These are carried upon the face of a main standard and are adjustable thereon in horizontal and vertical directions. In small machines the ram or reciprocating arm (see fig. 44, G) slides in fixed guides on the top of the pillar, and the necessary side traverse is imparted to the work table B. To the top of the main standard, in one design, a carriage is fitted wifh hori- zontal traverse to cover the whole breadth, within the capacity of the machine, of any work to be operated on. In the largest machines two standards support a long bed, on which the carriage, with its ram, traverses past the work. These machines are frequently made double-headed, that is carriages, rams and work tables are dupli-

Fic 45. — 12-in. Stroke Slotting Machine.

A, Main framing.

B, Driving cone.

C, D, Gears driven by cones.

E, Shaft of L.

F, Tool ram driven from shaft E through disk G and rod H, with

quick return mechanism D. J, Counter-balance lever to ram.

than the actual work of cutting. Hence a strong case is often stated for the abandonment of the common practice. But, on the other hand, the centre of gravity of the moving table and work lies low down, while when the cross-rail and housings with the cut- ting tool are travelled and reversed, their centre of gravity is high, and great precautions have to be taken to ensure steadiness of movement. Several planers are made thus, but they are nearly all of extremely massive type — the pit planers. The device is seldom applied to those of small and

medium dimensions. ‘ But there is a great group of planers in which the work is always fixed, the tools travelling. These are the wall planers, vertical planers or wall creepers, used chiefly by marine engine builders. They are necessary, because many of the castings and forgings are too massive to be put on the tables of the largest, standard machines. They are therefore laid on the base-plate of the wall planer, and the tool-box travels up and down a tall pillar bolted to the wall or standing independently, and so makes vertical cutting strokes. In some designs horizontal strokes are provided for, or either vertical or horizontal as required. Here, as in the side planer,

(Greenwood & Batley, Ltd., Leeds.) K, Flywheel. L, Driving-disk. M , N, Feed levers and shaft operated from disk, actuating linear

movements of slides 0, P, and circular movement of table

Q, through gears R. S, Hand-feed motions to table. T, Countershaft.

cated, and the operator can set one piece of work while the other is being shaped. In all cases the movement of the reciprocating arm, to the outer end of which the tool is attached, takes place in a direction transversely to the direction of movement of the carriage, and the tool receives no support beyond that which it receives from the arm which overhangs the work. Hence the shaper labours under the same disadvantages as the side planer — it cannot operate over a great breadth. A shaper with a 24-in. stroke is one of large capacity, 16 in. being an average limit. Although the non-cutting stroke exists, as in the planer, the objection due to the mass of a ‘ reciprocating table does not exist, so that the problem does not assume the same magnitude as in the planer. The weak point in the shaper is the overhang of the arm, which renders it liable to spring, and renders heavy cutting difficult. Recently a novel design has been introduced to avoid this, the draw-cut shaper, in which the cutting is done on the inward or return stroke, instead of on the outward one.

Slotting Machines. — In the slotting machine (fig. 45) the cutting takes place vertically and there is a lost return stroke. All the

necessary movements save the simple reciprocating stroke are imparted to the compound table on which the work is carried. These

include two linear movements at right angles with each other and a circular motion capable of making a complete circle. Frequently a tilting adjustment is included to permit of slotting at an angle. The slotting machine has the disadvantage of an arm unsupported beyond the guides in which it moves. But the compound movements of the table permit of the production of shapes which cannot be done on planers and shapers, as circular parts and circular arcs, in combination with straight portions. Narrow key grooves in the bores of wheels are also readily cut, the wheels lying on the horizontal table, which would only be possible on planer and shaper by the use of awkward angle brackets, and of specially projecting tools.

Quick return in planers is accomplished by having two distinct sets of gearing — a slow set for cutting and a quick train for return, each operated from the same group of driving pulleys. The return travel is thus accomplished usually three, often four, times more quickly than the forward rate; sometimes even higher rates are arranged for. In the shaper and slotter such acceleration is not practicable, a rate of two to one being about the limit, and this is obtained not by gears, but by the slotted crank, the Whitworth return, on shapers and slotters, or by elliptical toothed wheels on slotters. The small machines are generally unprovided with this acceleration.

The double-cutting device seems at first sight the best solution, and it is adopted on a number of machines, though still in a great minority. The pioneer device of this kind, the rotating tool-box of Whitworth, simply turns the tool round through an angle of 180° at the termination of each stroke, the movement being self-acting. In some later designs, instead of the box being rotated to reverse the tool, two tools are used set back to back, and the one that is not cutting is relieved for the time being, that is tilted to clear the work. Neither of these tools will plane up to a shoulder as will the ordinary ones.

Allied Machines. — The re- ciprocation of the tool or the work, generally the former, is adopted in several machines besides the standard types named. The plate-edge planer is used by platers and boiler makers. It is a side planer, the plates being bolted to a bed, and the tool traversing and cutting on one or both strokes. Provision is often included for planing edges at right angles. The key-seaters are a special type, designed mainly to remove the work of cutting key grooves in the bores of wheels and pulleys from the slotting machine. The work is fixed on a table and the keyway cutting tool is drawn downwards through the bore, with several resulting practical advantages. Many planing machines are portable so that they may be fixed upon very massive work. Several gear-wheel cutting machines

embody the reciprocating tool.

III. — Drilling and Boring Machines The strict distinction between the operations of drilling and boring is that the first initiates a hole, while the second enlarges one already existing. But the terms are used with some latitude. A combined drilling and boring machine is one which has provision for both functions. But when holes are of large dimensions the drilling machine is useless because the proportions and gears are unsuitable. A 6-in. drill is unusually large, but holes are bored up to 30 ft. or more in diameter.

Types of Machines. — The distinction between machines with vertical and horizontal spindles is not vital, but of convenience only. The principal controlling element in design is the mass of the work, which often determines whether it or the machine shall be adjusted relatively to each other. Also the dimensions of a hole determine

the speed of the tools, and this controls the design of the driving and feeding mechanism. Another important difference is that between drilling or boring one or more holes simultaneously. With few exceptions the tool rotates and the work is stationary. The notable exceptions are the vertical boring lathes already mentioned. Obviously the demands made upon drilling machines are nearly as varied as those on lathes. There is little in common between the machines which are serviceable for the odd jobs done in the general shop and those which are required for the repetitive work of the shops which handle specialities. Provision often has to be made for drilling simultaneously several holes at certain centres or holes at various angles or to definite depths, while the mass of the spindles of the heavier machines renders counter-balancing essential.

Bench Machines are the simplest and smallest of the group. They are operated either by hand or by power. In the power machines generally, except in the smallest, the drill is also fed downwards by power, by means of toothed gears. The upper part of the drilling

•Fig. 46.

A, Base-plate.

B, Pillar.

C, Radial arm.

D, Spindle carriage.

E, Drill spindle.

F, Main driving cones driving vertical shaft G through mitre-gears H.

J, Spur-wheels, driving from C to vertical shaft K.

L, Mitre-wheels, driving from K to horizontal shaft M, having its bearings in the radial arm.

N, Nest of mitre-wheels driving the wheel spindle E from M.

0, Feed-gears to drill spindle, actuated by hand- wheel P or worm-gears Q.

Pillar Radial Drilling Machine, 5 ft. radius.

R, R, Feed cones driving from shaft if to worm- shaft S, for self-acting feed of drill.

T, Change-speed gears.

V, Hand-wheel for racking carriage D along radial arm C.

V, Clutch and lever for reversing direction of rotation of spindle.

W, Worm-gear for turning pillar B.

d, Handle for turning worm.

X, Screw for adjusting the height of the radial arm.

Y, Gears for actuating ditto from shaft C.

Z, Rod with handle for operating elevating gear.

spindle being threaded is turned by an encircling spur-wheel, operated very slowly by a pinion and hand-wheel by the right hand of the attendant, the movement being made independent of the rotation of the spindle. A rack sleeve encircling the spindle is also common. In the power machines gears are also used, but a belt on small cone pulleys drives from the main cone shaft at variable speeds. From three to four drilling and feeding speeds are provided for by the respective cone pulleys. Work is held on or bolted to a circular table, which may have provision for vertical adjustment to suit pieces of work of different depths, and which can usually be swung aside out of the way to permit of deep pieces of work being introduced, resting on the floor or on blocking.

Wall Machines. — One group of these machines resembles the bench machines in general design, but they are made to bolt to a wall instead of on a bench. Their value lies in the facilities which they afford for drilling large pieces of work lying on the floor o on blocking, which could not go on the tables of the bench machines. Sometimes a compound work-table is fastened to the floor beneath; and several machines also are ranged in line, by means of which long plates, angles, boilers or castings may be brought under the simultaneous action of the group of machines. Another type is the radial arm machine, with or without a table beneath. In each case

an advantage gained is that a supporting pillar or standard is not required, its place being taken by the wall.

Self-contained Pillar Machines include a large number having the above-named feature in common. In the older and less valuable types the framework is rigid, and the driving and feeding are by belt cones. But the machines being mostly of larger capacities than those just noted, back-gears similar to those of lathes are generally in- troduced. The spindles also are usually counterbalanced. The machine framing is bolted to a bed-plate. A circular work-table may or may not be included. When it is, provision is made for elevating the table by gears, and also for swinging it aside when deep work has to be put on the base-plate.

Radial Arm Machines. — In these (fig. 46) the drilling mechanism is carried on a radial arm which is pivoted to the pillar with the object of moving the drill over the work, when the latter is too massive to permit of convenient adjustment under the drill. The driving takes place through shafts at right angles, from a horizontal shaft carrying the cones and back-geared to a vertical one, thence to a horizontal one along the radial arm, whence the vertical drilling

makers and platers. In others the spindles are adjustable in circles of varying radii, as in those employed for drilling the bolt holes in pipe flanges. In many of these the spindles are horizontal. Some very special multiple-spindle machines have the spindles at different angles, horizontal and vertical, or at angles.

Universal Machines are a particular form of the pillar type in which

the spindle is horizontal, moving with its carriage on a pillar capable of traversing horizontally along a bed ; the carriage has ver- tical adjustment on its pillar and so commands the whole of the face of a large piece of work bolted to a low bed-plate adjacent to the machine. The term ” universal ” signifies that the machine com- bines provision for drilling, boring, tapping screws and inserting screw studs, facing and in some cases milling. The power required for boring is obtained by double and treble gears. These machines are used largely in marine engine works, where very massive castings and forgings must be operated on with their faces set vertically.

Boring Machines, — Many machines are classified as suitable for drilling and boring. That simply means that provision is made on

Fig. 47. — Lincoln Milling Machine.

A, Bed.

B, B, Legs.

C, Upright.

D, Spindle or arbor.

E, Headstock, carrying bearings for spindle D.

F, Tailstock, carrying point centre for tail end of spindle.

G, Hand-wheel for effecting adjustment in height of headstock,

through bevel-gears H and screw /. K, Cross-bar connecting head- and tail-stocks, and ensuring

equal vertical adjustment of the spindle bearings from the

screw /. spindle is driven. The latter has its bearings in a carriage which can be traversed along the arm for adjustment of radius. The spindle is counterbalanced. Hand as well as power adjustments are included. In the work-tables of radial and rigid machines there is a great diversity, so that work can be set on top, or at the sides, or at an angle, or on compound tables, so covering all the requirements of practice.

Sensitive Machines have developed greatly and have superseded many of the older, slower designs. The occasion for their use lies in the drilling of small holes, ranging up to about an inch in diameter. They

are belt-driven, without back-gears, and usually without bevel-gears to change the direction of motion. The feed is by lever moving a rack sleeve. A slender pillar with a foot supports the entire mechanism, and the work-table, with a range of vertical adjustment.

Multiple Spindle Machines. — Many of the sensitive machines are fitted with two, three or more spindles operated in unison with a belt common to all. In other machines the multiple spindles are capable of adjustment for centres, as in the machines used by boiler

(John Holroyd & Co., Ltd., Milnrow.j L, Speed cones for driving spindle, through pinion M and wheel

N. 0, Frame, carrying the bearings for the cone pulley L, and pivoted

to the bed at a, and to the headstock E. This device keeps

the gears M and N in engagement in all variations in the

height of the spindle D. P, Q, Cones for driving the table R through worm-gears S, T, and

spurs U, V, to the table screw. W , Stop for automatic knock-off to feed. X, Hand-wheel for turning the same screw through worm-gears

Y, Z. a drilling machine for boring holes of moderate size, say up to 8 or 10 in., by double and treble back-gears. But the real boring machine is of a different type. In the horizontal machines a splined bar actuated by suitable gears carries a boring head which holds the cutters, which head is both rotated with, and traversed or fed along the bar. The work to be bored is fixed on a table which has pro- vision for vertical adjustment to suit work of different dimensions. -The boring-bar is supported at both ends. In the case of the largest work the boring-bar is preferably set with its axis vertically, and the framing of the machine is arch-like. The bar is carried in a bearing at the crown of the arch and driven and fed there by suit- able gears, while the other end of the bar rotates in the table which forms the base of the machine. Some boring machines for small engine cylinders and pump barrels have no bar proper, but a long boring spindle carrying cutters at the further end is supported along its entire length in a long stiff boss projecting from the headstock of the machine — the snout machine. The work is bolted on a carriage which slides along a bed similar to a lathe bed. Many of these machines have two bars for boring two cylinders simultaneously.

IV. — Milling Machines

In milling machines rotary saw-like cutters are employed. To a certain extent these and some gear-cutting machines overlap because they have points in common. Many gear-wheel teeth are produced by rotary cutters on milling machines. In many machines designed for gear cutting only, rotary cutters alone are used. For this reason the two classes of machines are conveniently and naturally grouped together, notwithstanding that a large and increasing group of gear-cutting machines operate with reciprocating tools.

The French engineer, Jacques de Vaucanson (1709-1782), is credited with having made the first milling cutter. The first very crude milling machine was made in 1818 at a gun factory in Connecti- cut. To-day the practice of milling ranks as of equal economic value with that of any other department of the machine shop, and the varieties of milling machines made are as highly differentiated as are those of any other group. An apparent incongruity which is rather striking is the relative disproportion between the mass of these machines and the small dimensions of the cutters. The failures of many of the early machines were largely due to a lack of appreciation of the intensity of the stresses involved in milling. A single-edged cutting tool has generally a very narrow edge in operation. Milling cutters are as a rule very wide by comparison, and several teeth in deep cuts are often in simultaneous operation. The result is that the machine spindle and the arbor or tool mandrel are subjected to severe stress, the cutter tends to spring away from the surface being cut, and if the framings are of light proportions they vibrate, and in- accuracy and chatter result. Even with the very stiff machines now made it is not possible to produce such accurate results on wide sur- faces as with the planer using a narrow-edged tool. Because of this great resistance and stress, cutters of over about an inch in width are always made with the teeth arranged spirally, and wide cutters which are intended for roughing down to compete with the planer always have either inserted cutters or staggered teeth. Hence the rotary cutter type of machine has not been able to displace the planing machine in wide work when great accuracy is essential. Its place lies in other spheres, in some of which its position is unassailable. Nearly all pieces of small and medium dimensions are machined as well by milling as by single-edged tools. All pieces which have more than one face to be operated on are done better in the milling machine than elsewhere. All pieces which have

profiled outlines involving combinations of curves and plane faces can generally only be pro- duced economically by milling. Nearly all work that involves equal divisions, or pitchings, as in the manufacture of the cutters themselves, or spiral cutting, or the teeth of gear-wheels when pro- duced by rotary cutters, must be done in milling machines. Beyond these a large quantity of work lies on the border-line, where the choice between milling and planing, shaping, slotting, &c, is a matter for individual judgment and experience. It is a matter for some sur- prise that round the little milling cutter so many designs of machines have been built, varying from each other in the position of the tool spindles, in their number, and in the means adopted for actuating them and the tables which carry the work.

A very early type of milling machine, which remains extremely popular, was the Lincoln. It was designed, as were all the early machines, for the small arms factories in the United States. The necessity for all the similar parts of pistols and rifles being inter- changeable, has had the paramount influence in the development of the milling machine. In the Lincoln machine as now made (fig. 47) the work is attached to a table, or to a vice on the table, which has horizontal and cross traverse movements on a bed, but no capacity for vertical adjustment. The cutter is held and rotated on an arbor driven from a headstock pulley, and supported on a tail- stock centre at the other end, with capacity for a good range of ver- tical adjustment. This is necessary both to admit pieces of work of different depths or thicknesses between the table and the cutter, and to regulate the depth of cutting (vertical feed). Around this general design numerous machines small and large, with many variations in detail, are built. But the essential feature is the ver- tical movement of the spindle and cutter, the support of the arbor (cutter spindle) at both ends, and the rigidity afforded by the bed which supports head- and tail-stock and table.

The pillar and knee machines form another group which divides favour about equally with the Lincoln, the design being nearly of an opposite character. The vertical movements for setting and feed are imparted to the work, which in this case is carried on a bracket or knee that slides on the face of the pillar which supports the headstock. Travelling and transverse movements are imparted to the table slides. The cutter arbor may or may not be supported away from the headstock by an arched overhanging arm. None of these machines is of large dimensions. They are made in two leading designs — the plain and the universal. The first embodies rectangular relations only, the second is a marvellous instrument both in its range of movements and fine degree of precision. The first machine of this kind was

exhibited at Paris in 1867. The design permits the cutting of spiral grooves, the angle of which is embodied in the adjustment of a swivelling table and of a headstock thereon (universal or spiral head). The latter embodies change-gears like

a screw-cutting lathe and worm-gear for turning the head, in combination with an index or dividing plate having several circles of holes, which by the insertion of an index peg permit of the work spindle being locked during a cut. The combinations possible with the division plate and worm-gear number hundreds. The head also has angular adjustments in the vertical direction, so that tapered work can be done as well as parallel. The result is that there is nothing in the range of spiral or parallel milling, or tapered work or spur or bevel-gear cutting, or cutter making, that cannot be done on this type of machine, and the accuracy of the results of equal divisions of pitch and angle of spiral do not depend on the human element, but are embodied in the mechanism.

Fig. 48. — Vertical Spindle Milling Machine. (James Archdale & Co., Ltd.)

A, Main framing.

B, Knee.

C, Spindle, having its vertical position capable of adjustment by

the sliding of D on A. E, Driving cone, belt driving over guide pulleys F to spindle

pulley G. H, Enclosed gears for driving spindle by back gear. J, Hand-wheel for adjusting spindle vertically. K, K, Pulleys over which spindle is counterbalanced. L, Feed pulley, driven from counter shaft. M, Vertical feed shaft, driven from L through mitre-gears. N, Change gear box. 0, Horizontal feed shaft, operating longitudinal and transverse

feed of table through spiral and spur-gears. P, P, Handles for operating changes in feed speeds, nine in number. <2, Handle for reversing direction of motion of table R. S, Hand-wheel for longitudinal movement of table. T, Hand- wheel for effecting cross adjustments. V, Spiral gears indicated for effecting self-acting rotation of

circular table W. X, Hand-wheel for rotation of table. Y, Hand-wheel for vertical movements of knee B on screw Z.

Machines with vertical spindles (fig. 48) form another great group, the

general construction of which resembles that either of the com- mon drilling machine or of the slotting machine. In many cases the horizontal position is preferable for tooling, in others the vertical, but often the matter is indifferent. For general purposes, the heavier class of work excepted, the vertical is more convenient. But apart from the fitting of a special brace to the lower end of the spindle which carries the cutter, the spindle is unsupported there and is thus liable to spring. But a brace can only be used with a milling cutter that operates by its edges, while one advantage of the vertical spindle machine is that it permits of the use of end or face cutters. One of the greatest advantages incidental to the vertical position of the spindle is that it permits of profile milling being done. One of the most tedious operations in the machine shop is the production of outlines which are not those of the regular geometric figures, as rectangles and circles, or combinations of the same. There is

only one way in which irregular forms can be produced cheaply and interchangeably, and that is by controlling the movements of the tool “vith an object of similar shape termed a “form” or ” former,” as in the well-known copying lathes, in the cam grinding machine, and in the forming adjuncts fitted to vertical spindle milling machines, so converting those into profiling machines. The prin- ciple and its application are alike simple. An object (the form) is made in hardened steel, having the same outlines as the object to be milled, and the slide which carries the cutter spindle has a hardened former pin or roller, which is pulled hard against the edges of the form by a suspended weight, so causing the tool to move and cut in the same path and in the same plane around the edges of the work. Here the milling machine holds a paramount place. No matter how many curves and straight portions may be combined in a piece, the machine reproduces them all faultlessly, and a hundred or a thousand others all precisely alike without any tentative corrections. Piano-millers, also termed slabbing machines, form a group that grows in value and in mass and capacity. They are a comparatively late development, becoming the chief rivals to the planing machines, for all the early milling was of a very light character. In general outlines the piano-millers closely resemble the planing machines, having bed, table, housings and cross-rail. The latter in the piano- miller carries the bearings for the cutter spindle or spindles under which the work travels and reciprocates.

These spindles are ver- tical, but in some machines horizontal ones are fitted also, as in planers, so that three faces at right or other angles can be operated on simultaneously. The slabbing operations of the piano-millers do not indicate the full or even the principal utilities of these machines. To understand these it must be remembered that the cross-sections of very many parts which have to be tooled do not lie in single planes merely, but in combinations of plane surfaces, horizontal, vertical or angular. In working these on the planing machine separate settings of tools are required, and often successive settings. But milling cutters are built up in ” gangs ” to deal with such cases, and in this way the entire width of profile is milled at once. Horizontal faces, and vertical and angular edges and grooves, are tooled simul- taneously, with much economy in time, and the cutter profile will be accurately reproduced on numbers of separate pieces. Allied to the piano-millers are the rotary planers. They derive their name from the design of the cutters. An iron disk is pierced with holes for the insertion of a large number of separate cutters, which by the rotation of the disk produce plane surfaces. These are milling cutters, though the tools are single-edged ones, hence termed ” inserted tooth mills.” These are used on other machines besides the rotary planers, but the latter are_ massive machines built on the planer model, with but one housing or upright to carry the carriage of the cutter spindle. These machines, varied considerably in design, do good service on a class of work in which a very high degree of accuracy is not essential, as column flanges, ends of girders, feet of castings, and such like.

V. — Gear-cutting Machines

The practice of cutting the teeth of gear-wheels has grown but slowly. In the gears used by engineers, those of large dimensions are numerous, and the cost of cutting these is often prohibitive, though it is unnecessary in numbers of mechanisms for which cast wheels are as suitable as the more accurately cut ones. The smallest gears for machines of precision have long been produced by cutting, but of late years the practice has been extending to include those of medium and large dimensions, a movement which has been largely favoured by the growth of electric driving, the high speeds of which make great demands on reduction and trans- mission gears. Several new types of gear-cutting machines have been designed, and specialization is still growing, until the older machines, which would, after a fashion, cut all forms of gears, are being ousted from modern establishments.

The teeth of gear-wheels are produced either by rotary milling cutters or by single-edged tools (fig. 49). The advantage of the first is that the cutter used has the same sectional form as the inter- tooth space, so

that the act of tooth cutting imparts the shapes without assistance from external mechanism. But this holds good only in regard to spur-wheel teeth, that is, those in which the teeth lie parallel with the axis of the wheel. The teeth of bevel-wheels, though often produced by rotary cutters, can never be formed absolutely correctly, simply because a cutter of unalterable section is employed to form the shapes which are constantly changing in dimensions along the length of the teeth (the bevel-wheel being a frustum of a cone). Hence, though fair working teeth are ob- tained in this way, they result from the practice of varying the relative angles of the cutters and wheel and removing the material in several successive operations or traverses, often followed by a little correction with the file. Although this practice is still commonly followed in bevel-wheels of small dimensions, and was at one time the only method available, the practice has been changing in favour of shaping the teeth by a process of planing with a single-edged reciprocating tool. As, however, such a tool embodies no formative section as do the milling cutters, either it or the wheel blank, or both, have to be coerced and controlled by mechanism outside the tool itself. Around this method a number of very ingenious

machines have been designed, which may be broadly classed under two great groups — the form and the generating types.

In the form machines a pattern tooth or form-tooth is prepared in hardened steel, usually three times as large as the actual teeth to be cut, and the movement of the mechanism which carries the wheel blank is coerced by this form, so that the tool, reciprocated by its bar, produces the same shape on the reduced dimensions of the wheel teeth. The generating machines use no pattern tooth, but the principles of the tooth formation are embodied in the mechan- ism itself. These are very interesting designs, because they not only shape the teeth without a pattern tooth, but their movements are automatically controlled. A large number of these have been brought out in recent years, their growth being due to the demand for accurate gears for motor cars, for electric driving, and for general high-class engineers' work. These are so specialized that they can only cut the one class of gear for which they are designed — the bevel-wheels, and these in only a moderate range of dimensions on a single machine of a given size. The principal bevel-gear cutting machines using forms or formers, are the Greenwood & Batley, Le Progres Industriel, the Bouhey (cuts helical teeth), the Oerlikon, which includes two types, the single and double cutting tools, the Gleason and the Rice. Generating machines include the Bilgram (the oldest), the Robey-

Smith, the Monneret, the Warren, the Beale and the Dubosc.

Fig. 49. — Gear Cutting.

A, Rotary milling cutter pro- D, Action of ” Fellows ” cutter,

ducing tooth space. planing teeth.

B, Planer tool operating on tooth E, Shape of ” Fellows ” cutter.

flank. F, Hobbing cutter.

C, Planer form-tool finishing G, Tapered hob beginning worm-

tooth space. wheel.

H, Ditto finishing.

As the difficulties of cutting bevel-wheels with rotary cutters, consequent on change of section of the teeth, do not occur in spur-gears, there are no examples of form machines for spur-wheel cutting, and only one generating planing type of machine, the Fellows, which produces involute teeth by a hardened steel-cutting pinion, which shapes wheels having any number of teeth of the same pitch, the cutter and blank being partly rotated between each cut as they roll when in engagement.

The worm-gears appropriate a different group of machines, the demands on which have become more exacting since the growth of electric driving has brought these gears into a position of greater importance than they ever occupied before. With this growth the demand for nothing less than perfect gears has developed. A perfect gear is one in which the teeth of the worm-wheel are envelopes of the worm or screw, and this form can only be produced in practice in one way — by using a cutter that is practically a serrated worm (a hob), which cuts its way into the wheel just as an actual worm might be supposed to mould the teeth of a wheel made of a plastic substance. To accomplish this the relative move- ments of the hob and the wheel blank are arranged to be precisely those of the working worm and wheel. Very few such machines are made. A practical compromise is effected by causing the hob

both to drive and cut the blank in an ordinary machine. When worms are not produced by these methods the envelope cannot be obtained, but each tooth space is cut by an involute milling cutter set at the angle of thread in a universal machine, or else in one of the general gear-cutting machines used for spur, bevel and worm gears, and only capable of yielding really accurate results in the case of spur-wheels.

The previous remarks relate only to the sectional forms of the teeth. But their pitch or distance from centre to centre requires dividing mechanism. This includes a main dividing or worm- wheel, a worm in conjunction with change gears, and a division plate for setting and locking the mechanism. The plate may have four divisions only to receive the locking lever or it may be drilled with a large number of holes in circles for an index peg. The first is adopted in the regular gear-cutters, the second on the universal milling machines which are used also for gear-cutting. In the largest number of machines this pitching has to be done by an attendant as often as one tooth is completed. But in a good number of recent machines the pitching is effected by the move- ments of the machine itself without human intervention. With spur-wheels the cutting proceeds until the wheel is complete, when the machine is often made to ring a bell to call attention to the fact. But in bevel-wheels only one side of the teeth all the way round can be done; the attendant must then effect the necessary settings for the other side, after which the pitchings are automatic.

As a general rule only one tooth is being operated on at one time. But economy is studied in spur-gears by setting several similar wheels in line on a mandrel and cutting through a single tooth of the series at one traverse of the tool. In toothed racks the same device is adopted. Again, there are cases in which cutters are made to operate simultaneously on two, three or more adjacent teeth.

Recently a generating machine of novel design has been manu- factured, the spur-wheel hobbing machine. In appearance the hob resembles that employed for cutting worm-gears, but it also generates the teeth of spur and spiral gears. The hob is a worm cut to form teeth, backed off and hardened. The section of the worm thread is that of a rack. Though it will cut worm-wheels, spiral-wheels or spur-wheels equally correctly, the method of pre- sentation varies. When cutting worm-wheels it is fed inwards per- pendicularly to the blank; when cutting spirals it is set-at a suitable angle and fed across the face of the blank. The angle of the worm thread in the hob being about

25°, it has to be set by that amount out of parallel with the plane of the gear to be cut. It is then fed down the face of the wheel blank, which Is rotated so as to syn- chronize with the rotation of the worm. This is effected through change gears, which are altered for wheels having different numbers of teeth. The advantage is that of the hob over single cutters; one hob serves for all wheels of the same pitch, and each wheel is cut absolutely correct. While using a set of single cutters many wheels must have their teeth only approximately correct.

VI. — Grinding Machines

The practice of finishing metallic surfaces by grinding, though very old, is nevertheless with regard to its rivalry with the work of the ordinary machine tools a development of the last part of the 19th century. From being a non-precision method, grinding has become the most perfect device for producing accurate results measured precisely within thousandths of an inch. It would be rather difficult to mention any class of machine-shop work which is not now done by the grinding wheel. The most recent develop- ments are grinding out engine cylinders and grinding the lips of twist drills by automatic movements, the drills rotating constantly.

There are five very broad divisions under which grinding machines may be classified, but the individual, well-defined groups or types might number a hundred. The main divisions are: (1) Machines for dealing with plane surfaces; (2) machines for plain cylindrical work, external and internal; (3) the universals, which embody movements rendering them capable of angular setting; (4) the tool grinders; and (5) the specialized machines.' Most of these might be again classed under two heads, the non-precision and the precision types. The difference between these two classes is that the first does not embody provision for measuring the amount of material removed, while the second does. This distinction is a most important one.

The underlying resemblances and the differences in the main designs of the groups of machines just now noted will be better understood if the essential conditions of grinding as a correc- tive process are grasped. The cardinal point is that accurate results are produced by wheels that are themselves being abraded constantly. That is not the case in steel cutting tools, or at least in but an infinitesimal degree. A steel tool will retain its edge for several hours (often for days) without the need for regrinding, but the particles of abrasive in an emery or other grinding wheel are being incessantly torn out and removed. A wheel in traversing along a shaft say of 3 ft. in length is smaller in diameter at the termination than at the beginning of the traverse, and

therefore the shaft must be theoretically larger at one end than the other. Shafts, nevertheless, are ground parallel. The explanation is, and

it lies at the basis of emery grinding, that the feed or amount removed at a single traverse is extremely minute, say a thousandth or half a thousandth of an inch. The minuteness of the feed receives compensation in the repetition and rapidity of the traverse. The wear of the wheel is reduced to a minimum and true work is produced.

From this fact of the wear of grinding wheels two important results follow. One is that a traverse or lateral movement must always take place between the wheel and the piece of work being ground. This is necessary in order to prevent a mutual grooving action between the wheel and work. The other is that it is essential to provide a large range in quality of wheels, graded according to coarseness and fineness, of hardness and softness of emery to suit all the different metals and alloys. Actually about sixty grades are manufactured, but about a dozen will generally cover average shop practice. With such a choice of wheels the softest brass as well as the hardest tempered steel or case-hardened glass-like surfaces that could not possibly be cut in lathe or planer, can be ground with extreme accuracy.

Fig. 50. — Universal Grinding Machine, 7 in. centres; 3 ft. 6 in. between centres. (H. W. Ward & Co., Ltd., Birmingham.)

A, Base or body, with waste

water tray round top edge, and interior fitted as cup- boards, with shelves and doors.

B, Sliding table.

C, Swivel table.

D, Grinding wheel.

E, Wheel guard.

F, Wheel headstock swivelling

in a horizontal plane, and having the base graduated into degrees for angular setting.

G, Slide carrying headstock.

H, Hand-wheel for traversing table.

J, Headstock for carrying and driving work, used for chuck work or dead centre work ; the base is graduated into degrees.

a, Dogs, which regulate auto- matic reversals. An internal grinding fixture, not shown, is fitted to wheel head.

L, Countershaft pulley driving to wheel pulley.

M , Pulley driving to cones.

N, Pulley driving to work head- stock pulley.

0, Belt from line shaft.

P, Water pipe from pump.

Q, Water guards above table.

Plane surfacing machines in many cases resemble in general outlines the well-known planing machine and the vertical boring mill. The wheels traverse across the work, and they are fed vertically to precise fractional dimensions. They fill a large place in finishing plane surfaces, broad and narrow alike, and have be- come rivals to the planing and milling machines doing a similar class of work. For hardened surfaces they have no rival.

Cylindrical grinders include many subdivisions to embrace external and internal surfaces, either parallel or tapered, small or

large. In their highest development they fulfil what are termed ” universal ” functions (fig. 50), that is, they are capable of grinding both external and internal cylinders, plane faces, tapers, both of low and high angle, and the teeth of various kinds of tools and cutters. These machines occur in two broad types. In one the axis of the revolving wheel is traversed past the work, which revolves but is not traversed. In the other the reverse occurs, the work traversing and the axis of the wheel with its bearings remaining stationary. Equally satisfactory results are obtained by each.

In all external cylindrical grinding, when the work can be rotated, the piece being ground rotates in an opposite direction to the rotation of the wheel (fig. 51, A). In all small pieces ground internally the same procedure is adopted (fig. 51, B). Incidentally,

■-\>ly c

Fig. 51.

A, External cylindrical grinding. B, Internal ditto. C, External

grinding when the work is fixed. D, Internal ditto.

mention should be made of the fineness of the fitting required and attained in the construction of the spindles which carry the wheels for internal grinding. The perfection of fitting and of the means of adjustment for eliminating the effects of wear in the ordinary spindles for external and internal grinding is remarkable. The spindles for internal work have to revolve at rates ranging from about 6000 to 30,000 times ,in a minute, yet run so truly that the holes ground do not depart from accuracy by more than say ^^j to xsJtiTT of an inch. Yet so long as the work can be revolved no special complication of mechanism is required to ensure good results. The revolution of the wheel and the work is mutually helpful. The real difficulties arise when the work, on account of its mass or awk- wardness of shape, cannot be revolved. The principle embodied in machines designed to deal satisfactorily with such cases, though much diversified in detail, is the application of the planet device to the grinding wheels. That is, the wheel spindle rotating at a high speed, 6000 or 7000 revolutions per minute, is simultaneously carried round in a circular path, so that its axis makes about 25 or 30 revolutions per minute (fig. 51, C and D). The diameter of the path is capable of adjustment with minute precision within wide limits to suit bores of different diameters. The periphery of the grinding wheel which lies farthest from its axis of revolution sweeps round in a path the diameter of which equals that of the bore to be ground. These machines are now used largely for grinding out the cylinders of gas and petrol engines, valve seatings, the bushed holes of coupling rods, and similar classes of work. Many of them have their spindles set horizontally, others vertically.

Allied to these are a relatively small but important group of machines used for grinding the slot links of the slide-valve gear of locomotive and other engines. The slot is mounted on a pivoted bar adjusted to the same radius as the slot to be ground, and the slot is moved relatively to the wheel, so producing the required curves.

In another direction much development has taken place in the practice of grinding. The increasing use of the milling cutter has

Fig. 52.

A, Grinding front edges of milling cutter. B, Grinding side edges of milling cutter; a, a, Tooth rests. C, Grinding face of formed mill.

been the occasion for the growth and high specialization of the cutter grinding machines. It is essential to the efficiency of such cutters that regrinding shall be done without drawing the temper, and this can only be effected by the use of an abrasive. In the early days of their use the temper had to be drawn to permit of filing and rehardening effected with its inevitable distortion.

Cutter grinding machines must possess universality of movements to deal with the numerous shapes in which milling cutters are made; hence they often resemble in general outlines the universal grinding machines. But as a rule they are built on lighter models, and with a - mailer range of movements, because the dimensions of cutters are

generally much smaller than those of the ordinary run of engineers' work which has to be ground. Frequently a single pillar or standard suffices to carry the mechanism. In an ordinary universal tool grinder all the teeth of any form of cutter can be ground precisely alike (fig. 52) excepting those having irregular profiled outlines, for which a special machine, or an extra attachment to an ordinary machine, is necessary. But little of this is done, because in such cases, and in many others, the faces of the teeth are ground instead of the edge. This idea, due to the firm of Brown & Sharpe, may seem a trifle, but nevertheless to it the credit is largely due for the economies of cutter grinding. The principle is that in the " formed cutter," as it is termed, the profiles of the teeth are not struck from the axis of revolution, but from another centre (fig. 20) ; grinding the tooth faces, therefore, has no effect on the shapes of the profiles, but only lessens the tooth thicknesses. Designed originally for the cutters for the teeth of gear-wheels, it has long been applied to profiles which involve combinations of curves. The pitching of the teeth is effected by a strip of metal, or tooth rest a (fig. 52), on which each successive tooth rests and is coerced during the grinding. If teeth are of special form the traverse movement of a spiral tooth along the rest ensures the required movement.

Besides the cutter grinders used for milling cutters, reamers and screwing taps, there are two other groups of tool grinders, one for twist drills only and the other for the single-edged tools used in lathe,

planer, shaper and other machines. Both these in their best forms are of recent development. The machines used for grinding twist drills embody numerous designs. Hand grinding is practically abandoned, the reason being that a very minute departure from symmetry on the two cutting lips of the drill results inevitably in the production of inaccurate holes. It is essential that the two lips be alike in regard to length, angle and clearance, and these are embodied in the mechanism of the grinding machines. But formerly in all these the drill holder had to be moved by hand around its pivot, and one lip ground at a time There are now some very beautiful machines of German manufacture in which the necessary movements are all automatic, derived from the continuous rotation of a belt pulley The drill rotates constantly, and small amounts are ground off each lip in turn until the grinding is finished. The other group for grinding single-edged tools is a very small one. The correct angles for grinding are embodied in the setting of the machine, with the great advantage that any number of similar tools can be ground all alike without skilled attendance.

Lying outside these broad types of machines there is a large and growing number designed fof special service. The knife-grinding group for sharpening the planer knives used in wood-working machinery is a large one. Another is that for gulleting or deepening the teeth of circular saws as they wear. Another is designed for grinding the cups and cones for the ball races of cycle wheels, and another for grinding the hardened steel balls employed in ball bearings.

B C O £ F 6

Fig. 53. — Typical Grinding Wheels.

A , Common disk held on spindle with washers and nuts.

B, Thin disk.

C, Flanged disk for grinding to shoulders. Z>, Bevelled disk for cutter grinding.

E, F, Cupped and dished wheels for cutter grinding.

G, Cup wheel for grinding on face a; diameter remains constant.

Emery grinding is dependent for much of its success on a plentiful supply of water. Dry grinding, which was the original practice, is hardly employed now. The early difficulties of wet grinding were due to the want of a cementing material which would not soften under the

action of water. Now wheels will run constantly without damage by water, and they are so porous that water will filter through them. Improvements in the manufacture of wheels, and the increased use of water, have concurred to render possible heavier, and more rapid grinding without risk of distortion due to heating effects. In the best modern machines the provisions for water supply_ are a study in themselves, including a centrifugal pump, a tank, jointed piping, spraying tube, guards to protect the bearings and slides from damage, and trays to receive the waste water and conduct it back to the tank.

There are two points of view from which the modern practice pi grinding is now regarded — one as a corrective, the other as a

formative process. The first is the older and is still by far the most ; important. The second is a later ideal towards which design and

practice have been extending. As yet grinding cannot compete with the work of the single-edged tools and milling cut- ters when large quantities of mateiial have to be removed. Just as some (— 1 fja —»aKN' — r ~\ leading firms have been designing

J V Jl stiffer machines having fuller lubri-

— WAWK "i~T cation with a view to increase the duty

of grinding wheels, the advent of the high-speed steels has given a new lease of life to the single-edged cutting tools. The rivalry now lies not with the tools of carbon temper steel, but with high- speed varieties. But as a corrective process grinding never occupied so im- portant a position as it does to-day, and its utility continues to extend.

The commoner forms in which grind- ing wheels are made are shown in fig. 53. These are varied largely in dimensions, from tiny cylindrical rollers a fraction of an inch in diameter for hole grind- ing, to big wheels of 3 ft. or more in diameter. Safety mountings, two examples of which are shown in fig. 54, embody means of retaining the broken pieces of a wheel in case it bursts.

■Sand-blast. — The well-known erosive

action of sand when driven against

rocks and stones by the wind is utilized

Fig. 5 4.-Safety Devices, industrially in the sand-blastapparatus,

4, Grinding wheel, with the invention of B. C. Tilghman. The

coned washer to retain sand . ls propelled by a current of steam

broken pieces in case or air, .an

of fracture nozzle is directed against the surface of

B, Cup wheel with encircling the ˆ ork – cuttin S * away by the action

ring, moved backwards ° f * e ™onnous number of grains

as the wheel face wears, stnkmg the face, each removing a very

minute quantity of material. I he

fiction is very gentle, and may be modified

by varying the class of sand and its velocity.

Other materials, such as emery, chilled iron

globules, &c, are employed for certain classes

of work. In some instances the powder is

used dry, in others it is mixed with water,

being then in the condition of fluid mud. The

plant includes an air-compressing engine, an

air reservoir and the blast nozzle through which the air passes and propels the sand in the form of a jet. The pressures range from 8 lb up to about 60 lb per sq. in., depending on the class of work which is done.

The peculiar advantage of the sandblast lies in its adaptability to the working of irregular surfaces, which could not be touched by any other class of grinding. The blast penetrates hollows and recesses, and acts over an entire surface. There are many classes of operation done with the sand-blast, including cleaning, frosting, ornamentation,

engraving and sharpening. In engineers works a large amount of cleaning is effected upon castings, forgings, sheets and other products, either preparatory to machining or to painting, enamelling, tinning, galvanizing or plating. Cycle frames are cleaned with the sand-blast after brazing. The teeth of files are sharpened by directing a stream of sand and water against their backs, with the result that the burr thrown up by the chisel when cutting is obliterated, and a strong form of tooth is produced. Worn files may also be sharpened up to equal new ones by sand-blasting them. Frosting glass is another useful application of the sand-blast, and by attaching suitable patterns or designs to the surface the sand may be caused to work ornamental figurings. It is a peculiar circum- stance that the sand has little effect upon soft and yielding substances in comparison with the abrasion it produces on hard surfaces, so that the pattern will remain undamaged, while the glass or other object beneath is frosted where the sand reaches it, through the openings. Not only can designs be worked on glass, or cut in stone, but perforations may be made in glass, &c, by the continued action of the sand, without any risk of fracture occurring. Much sand- blasting is performed inside closed chambers, having panes through which the workman watches the progress of the operation. But when the blast must be used in the open, protection is necessary and is afforded to the operator by a special helmet, which keeps out the flying dust and gives a supply of pure air through a tube in a similar fashion to the diver's helmet.

VII.— Sawing Machines Metal-sawing machines are employed extensively in engineering works for cutting off bars, shafts, rails, girders and risers on _Steel castings, and for getting out curved pieces which would be difficult and expensive to slot. There are three classes of these saws, circular, band and reciprocating. The first named are used for straight- > forward work, operating at

right or other angles, the second for straight cuts and also for curves which can- not be treated with circular saws, and the third for small pieces. The circular saws em- body a stiff spindle, carrying the saw disk and driven by gearing. This spindle may be mounted in a sliding bearing to carry it past the work held on a fixed table, or the spindle may be sta- tionary and the work be moved along past the saw. The method of feeding should be sensitive, so that it will " give " and prevent damage

A, B, C, D,

E,

Saw blade.

Spindle. Sliding spindle carriage.

Driving pulleys.

First pinion, connecting through train of gears to wheel F, driving

splined shaft G. _ .

H, Wheel driven from sliding pinion on G. J, Bevel-gears, communicating the motion to spindle B. K, Screw for feeding carriage C along.

Fig. 55. — Cold-sawing Machine. (Isaac Hill & Son, Derby.)

Three-step cone on shaft G, belted to M, connected by bevel-gears N and worm-gear 0, to the screw K. P, Clutch for throwing in to drive K.

Q, Gears connecting shaft of L direct to K, also through clutch P. R, Handle for operating clutch P, which thus gives slow feed when clutch is in mesh with 0, and quick return when engaging with P. 5, Tappet rod, having dogs struck by carriage to stop feeding. T, Work-table, with clamp to hold objects. U, H-Girder being sawn off.

to the teeth, should undue stress come upon the saw. This is usually effected by the use of weights or springs, which allow a certain freedom or latitude to the driving gears. The work is held by screw clamps, V-blocks being required in the case of circular objects. A number of pieces, such as shafts, rails or girders, can be fastened down close together in a pile and cut through in one operation.

There is a very useful class of circular saw, the flush-side (fig. 55), ti'at is valuable for cutting close up to a surface. The disk is bolted to a flange on the end of the spindle with countersunk bolts, so that the face is quite flat. Another class of saw used for dealing with girders and bars is carried in bearings upon a pivoted arm, which is pulled downwards by a weight to give the feed. The work is bolted to a table below the saw. Ample lubrication, by oil or soapy water, is essential in cutting wrought iron and steel; it is pumped on the blade, keeping it

cool and washing away the cuttings.

Band-saw machines resemble in outline the familiar types employed for sawing wood, but they are necessarily stronger and stiff er, and the saws run at a much lower speed. The tables, moreover, differ in possessing compound slides for moving the work and in the provision of a series of slots on the top table, whereby the object to be sawn is secured with bolts and clamps. The tables are moved automatic- ally or by hand. The rate of cutting must be varied according to the thickness of metal. Lubrication is effected by running the lower saw pulley in a bath of oil or soapy water, which is carried up, so keeping the blade cool and ” easing ” the cut.

The reciprocating class of saw has until recently been confined to small types for workshop use, termed hack saws, which have a small blade ranging from 12 to 18 in. long. This is strained between a couple of bearings in a frame which is reciprocated above the work clamped in a vice. An arrangement of weights feeds the saw downwards. The larger hack saws cut off bars and girders up to 12 in. across, and in some there is a provision introduced for giving intermittent rotation to the bar, thus presenting fresh faces to the saw. The hack saw is of great utility for comparatively light work, and, as the smallest blades are cheap enough to be thrown away when worn out, there is no trouble and expense connected with their sharpening, as in the circular and band saws. An adaptation of the reciprocating saw is that of the jig type, which has a small blade set vertically and passing up through a table on which the work is laid. It is handy for cutting out dies and various curved outlines, in the same manner that fret-sawing in wood is done.

VIII. — Shearing and Punching Machines

These have much in common as regards their mode of operation. They are actuated either by belt and spur gearing, by steam-engine, by electric motor, or hydraulically. The first named is only suitable where arrangements can be made for driving from a line shaft. In view of the great convenience of the other methods of driving, they are coming into greater use, especially for ship-yards and other works where shafting is undesirable or inconvenient.

For boiler makers’ and platers’ use the function of punching, and shearing are usually combined in one machine, the rams being placed at opposite ends and actuated from the same source of power. The last shaft in the train of gearing is set to bring its ends within the boxes containing the rams, and eccentrics on the shaft are moved within die

blocks fitted to the rams, so that as the shaft revolves it causes the rams to move up and down and operate the shear blade and

A, C, D, E, F, G, J,

L,

N,

0,

Fig. 56. — Hydraulic Punching and Shearing Machine. (Musgrave Brothers, Leeds.) A, Frame. E, Punch. /, K, Main and return rams for

B Shear blades, set angularly. F & G, Main and return rams ditto.

C- Ram for operating blade. for punch. L, M, N, Attendant's control-

D, Small ram for returning ditto. H, Angle shear. ling handles.

Fig. 57. — Steam Hammer, small Overhanging Type. (B. & S. Massey, Manchester).

Standard. B, Base-plate.

Anvil block (independent of standards).

Tup or hammer head.

E, Pallets, or forging blocks, attached to anvil and tup.

Steam cylinder.

Piston, solid with piston rod H.

Piston valve, regulating period of admission of steam, operated

by hand by lever K or lever N. Stop or throttle valve for controlling admission of steam to

valve chest, operated by hand lever M. Lever in contact with roller on tup D, which moves the valve

J automatically as the tup rises and falls. Lever for pre-adjusting the range of movement of N and /, according to its setting in the notches of the quadrant from

a to b. Steam supply pipe from boiler. Q, Exhaust steam pipe.

the punch attached to the bottom end. Another class of machines is worked by means of massive levers, pivoted in the framing, and actuated by cams on the driving shaft which cause the levers to rock and move the punches or shears up and down by the opposite ends. The punch slides are constructed to ” dwell ” for a short period at the top of the stroke at each revolution, thus giving the attendant time to place and ad- just the plate accurately beneath the punch. The same effect is obtained in the eccentric types of machines mentioned above, by a disengaging motion,which is thrown in by touching a lever, thus stopping the punch until the operator is ready for its descent. The more complete machines have an angle shear situated centrally, with V-blades for severing angle iron. The largest forms of shears, for massive plates, usually have the blade recipro- cated by crank or eccentrics on the driving shaft, coupled by connecting- rods to the slide.

Hydraulic punching and shearing machines are used largely on account of their convenience, since they dis- pense with all belts, engines or motors in the vicinity, and give a very powerful

stroke. The hydraulic cylinder is generally direct-connected to the slides, and the operator turns on the pressure water by a lever. The machine shown in fig. 56 is a very complete example of the hydraulic type, combining punching and shearing with angle-cutting. Circular shears are used for the thinner plates and for sheet-metal work; they embody two circular blades placed with their axes parallel, and the sharp bevelled edges’n early in contact. The blades being rotated sever the plate as it is fed between them. Either straight or circular cuts may be made; true circles or disks are pro- duced by mounting the plate on a fixed stud and rotating it through a complete revolution past the cutters.

IX. — Hammers and Presses The growth in the use of hammers actuated by steam and com- pressed air, and of presses worked by water power, has been remark- able. The precursors of the power hammers were the helve and the Oliver; the first named was operated by gravity, being lifted by a circle of cams, while the second was lifted by a spring pole overhead and pulled down by the foot of the workman, acting on a lever — the hammer shaft. The first was used

by the ironworkers and the second by the smiths, until displaced by the Nasmyth hammer and its extensive progeny. Even now the old helve and Oliver survive in some unprogressive shops.

Steam Hammers. — The original hammer as invented by James Nasmyth was single acting, operating simply by gravity, the function of the steam being to lift the hammer for each succeeding fall. The first improvement was made by Rigby, who took the waste steam exhausted from the lower side of the piston to the upper side and so imparted some slight pressure in the descent. It was a stage between the early and the present hammers. In these, high-pressure steam is admitted above the piston to impart a more powerful blow, compounded of velocity X mass, than is obtainable by gravity; hence they are termed double-acting hammers (fig. 57). The principal difficulties which have to be surmounted in their construc- tion are those due to the severe concussion of the blows, which very sensibly shake the ground over an area of many yards. Fram- ings are made very rigid, and in the larger hammers double, enclosing the hammer head between them. The foundations are by far the heaviest used in any machine tools. Deep piling is often resorted to, supporting crossing timber balks; or concrete is laid in mass on which the iron anvil block is bedded. This block weighs anywhere between 100 and 1000 tons. The piston and its rod and the hammer head are generally a solid steel forging, for the piston rod is a weak element and cottered or screwed fittings are not trust- worthy. Piston valves are gener- ally used in preference to ordinary D-valves, combining simplicity of fitting with good balance. The periods of steam admission are under the control of the attendant, so that the length of stroke and the force of the blow are instantly responsive to his manipulation of the operating lever. Many hammers can be set to run automatically for any given length of stroke.

Pneumatic Hammers. — A suc- cessful type of hammer for the ordinary operations of the smithy is that which is actuated by com- pressed air. Though designs vary the principle is the same, namely, air compressed in a controlling cylinder (fig. 58), and brought into an operating or hammer cylinder above the piston. Cushioning.or releaseof the air be- low the piston, is under control, as is the pressure of the air above it. Drop Hammers. — The require- ments of forged work have, be- „ . _ . sides the power hammers ope-

Fig. 58.— Pneumatic Forging rated by a positive down stroke,

been the cause of the develop

Hammer. (W. & J. Player, Birmingham.) A , Standards. Base-plate. Anvil block. Tup. E, Pallets.

B, C, D, E, G,

H,

R,

ment of an equally large group

which are gravity hammers only

— the drop hammers. They are

put into operation by a belt or

belts, but the function of the

belt is simply to lift the hammer

Hammer cylinder, the piston to the height desired, at which

rod of which is attached point it is released and falls.

to D. The place of the drop hammer

Air compressing cylinder. is in the lighter class of smith's

Belt pulleys which reciprocate work, as that of the steam

by means of the crank 0, hammer lies in the heavier, but

the piston in H. there is much overlapping, since

Handle controlling the valve small steam hammers are rivals

between H and G. to the others in light forging.

But, speaking generally, the largest volume of repetitive die forging or stamping of light articles is done under drop hammers. The small arms factories and the regular stamping shops scarcely use any other type. They may be roughly divided into three great groups; the belt, the board and the latest form — the Brett lifter. In each the hammer head or tup is lifted to any height within the range of lift, the height being controlled by the attendant at each blow. In most machines setting can be done at any constant height and the blows delivered

automatically. Control is effected by hand or foot or both. Drop hammers generally have the advantage of working with greater rapidity than steam hammers. The original drop hammers, which are believed to have originated with the locksmiths of Birmingham and district, consisted of a hammer head attached to a rope, one end of which ran up over a loose pulley suspended in the roof, and the other was pulled by a man or two men, so lifting the hammer, which was then allowed to drop. The principle is embodied in many belt hammers to-day, but the pulley is driven constantly by shafting, and when the attendant pulls at the free end of the belt the friction of the pulley draws the belt over and lifts the hammer until the attendant lets it go. The weight lifted is greater than in the old type, but the labour is nevertheless very severe, and the blows are not rapid enough for quick forging. A far better machine is the board hammer. In this (fig. 59) the place of the belt is taken by an ordinary strip of board which passes between two rollers at the top of the hammer, which rollers are belt driven. The rollers are fitted on eccentric

Fig. 59.— Drop Hammer— board type. (B. & S. Massey, Manchester.)

A, A, Standards.

B, Anvil, or baseblock.

C, Tup.

D, Board, fitting in slot in tup.

E, F, Rollers gripping and lifting board.

G, H, Pulleys actuating rollers through eccentrics J, K.

L, Rod by which the amount of lift is regulated. _

a, Dog and lever adjustable on L, which strikes the edge b of the

tup, releasing eccentrics and roller and allowing tup to fall, c, Catch on which tup rests previous to release, fitted into either

one of the row of holes beneath, to suit various heights of drop. M, Mechanism struck by the edge d of the tup, which either keeps

the roller F clear of the board D, allowing the tup to fall, or

brings the rollers E and F into contact, and lifts the board

and tup. N, Hand-lever for operating hammer. 0, Foot-lever for ditto,

connected by chain e. /, Spring for lifting levers. ,

P, Rod with nuts g, to compensate for wear on the rollers by the

adjustment of roller E.

pins, so that the movement of levers causes them to grip the board for the lift, or release it for the fall, these levers being under the control of the attendant. They can also be set to operate automically for any height of lift.

These types are all subject to much concussion and vibration, because the machines are self-contained ; anvil, standards and heads being rigidly bolted together, the concussion of every blow is trans- mitted through the entire mechanism. The Brett hammers (fig. 60) are designed to lessen this, in some cases by making the anvil distinct from the superstructure, and in all by connecting the lifting ropes to the ends of long levers which act something like elastic springs, absorbing vibration. The driving mechanism is also original, comprising a cylinder with a wing piston, which is rotated by steam pressure through an arc of a circle only, sufficiently to operate the lifting levers. Another advantage is that the lifter cylinder need not be immediately over the hammer, but may be situated elsewhere. The hammer can be operated by hand directly for each stroke, or be set to work automatically.

Fig. 60. — 5 cwt. Belt Drop Hammer with Brett's Lifter. (Brett's Patent Lifter Co., Ltd., Coventry.)

A, A, Uprights.

B, Anvil. Tup. Belt.

Lifter cylinder. Valve casing. Rod operating

lever H. Rock shaft.

C, D, E, F, G,

o,

h, Buffer blocks which arrest motion of lever c.

d, Lever for automatic regula-

tion of valve. /, Lever for regulating amount of opening of valve by hand, valve by K, Foot lever for holding tup in either of the stops L.

e, Spring for foot lever.

Spring Hammers are a rather smaller group than the others. In these a belt-driven pulley actuates the tup through the medium of elastic leaf springs. The length of stroke is adjustable across the face of a slotted disk on the driving shaft.

Forging Machines. — The Ryder forging machine is fitted with four or five pairs of swage tools, the lower halves being fixed and the upper ones driven by a rotating eccentric shaft. The operations imitate those on the anvil by hand forging, but from 800 to 1200 blows are delivered in a minute. The swages are arranged in succes- sion, so that an operation is begun at one end and finished at the other, the attendant moving the bar rapidly through the successive swages or dies.

Forging Presses. — These are rivals to the hammers, especially for heavy forgings, from which hammers are being rapidly dis- placed (fig. 61). It is now well understood that a hammer will not

effect the consolidation of a massive forging right to the centre as a press will. The force of the hammer blow is not transmitted to the centre as is that of a press, nor is the hammer so useful in work of large dimensions but of no great weight. In railway and wagon shops the' presses are used far more frequently than the hammers. A great advan- tage of the press is that two and three rams can be brought into operation so that a forging may be pressed from above, from below and to one side, which is of great value in complicated forms and in welding, but is not practicable in the hammers. Hence the forging presses have be- come developed for work of average dimensions as well as for the most massive. Many are of horizontal type, termed bull-dozers.

Power presses for working sheet- metal articles include those for cut- ting out the blanks, termed cutting- out or blanking presses, and those for cupping or drawing the flat blank into shape if desired (fig. 62). The lower dies are held upon a bed, and the upper in a sliding ram, moved up and down by a cam or crank- shaft. A clutch mechanism is fitted, by means of which this shaft is connected with or disconnected

from the heavy driving-wheel at will to give a single stroke or a series of strokes to the ram.

Fig. 61. — Hydraulic Forg- ing Press. (Fielding & Piatt, Ltd., Gloucester.)

A, Table.

B, Vertical ram.

C, Drawback ram for return-

r , 1 ln S B.

. In th .e normal D< Horizontal ram. state the ram remains stationary at £ Controlling valves, the top position. The lightest presses '

are driven direct by belt on the crank-shaft pulley, but in the heavier classes spur-gearing must be interposed between the pulley shaft and the final shaft. The operation of drawing requires an encircling die which presses on the blank as it lies on its die, the cupping of the blank being effected by the downward motion of the plunger.

Sectional Elevation.

Fig. 62.-

Front Elevation.

-Power Press.

A, Main frame.

B, Bed for attaching dies.

C, Central slide.

D, Outer slide.

E, Belt pulleys on shaft, geared to wheel F thrown in by clutch

to drive its shaft, which has two crank pins to reciprocate D and a cam disk actuating C. G Extractor rocked downwards as slide rises to raise lever H and work an ejector rod, forcing finished article out of die.

This is why the machine shown in fig. 62 has an outer slide D, which is made to ” dwell ” with an even pressure, while the middle ram is

moving down and drawing out the article. Blanking and cupping may be done as one continuous operation if the work is shallow.

Inclinable presses are employed for certain classes of work, the object being to let the stamped articles slide down the slope of the bed as rapidly as they are produced, instead of having to be removed by the operator. Much work can be placed on the dies by hand, but for producing large quantities of small articles automatic feeds

are employed whenever possible. A good deal of work is produced from flat sheet, supplied in the form of a roll and fed through rollers by intermittent movements to the dies. Circular turn-tables are also used, operated by ratchet devices, which turn the tables round to bring a ring of pockets, carrying the pieces, successively under the dies; the attendant keeps the pockets supplied, but his hands do not come near the dies.

X. — Portable Tools

The growth of portable machine tools is one of the remarkable movements of the present day. To some extent they have always been used, notably in the drilling and tapping operations of loco- motive fire-boxes, but not until recently to any important extent in the ordinary fitting and erecting shops. The main reason lay in the difficulties due to transmission of power by ropes or shafts. The employment of compressed air, water, electricity and flexible shafts, by which long distances can be covered, has given new life to the portable system, which is destined to occupy a place of even greater importance than it does at present. The reason for the grow- ing desirability of these tools is to be seen in the massive character of much, engine and machine construction of the present time. Although firms that undertake the largest work can generally arrange to tool the individual parts on machines of massive sizes, that only meets a part of the difficulty. Very big work cannot be treated like that of small or even medium dimensions, done repetitively; that is, it is not practicable to drill and bore and ream and provide for the fitting of every piece by the aid of templets and jigs, while the work lies on the machine, but a great deal of adjustment and mutual fitting has to be accomplished in the course of erection. Therein lies the opportunity

for the portable machine. If this is not used the alternatives are partial dismantling of the work and the transference of certain portions to machines or hand work. Another cause has been the substitution of machining for much hand work formerly done on massive constructions.

The principal operations for which portable tools are designed are the following: Drilling, screwing, cutting the seatings for keys, planing short portions of work, facings for the attachment of other pieces, as brackets and bearings, hammering operations, as in making welded joints, caulking the edges of boiler plates, chipping with hammer and chisel, riveting, ramming sand in foundry moulds, planing ships' decks, and some operations of lesser magnitude.

Portable tools are used in various ways. The first and most obvious is to attach them directly to the casting, forging or machine which is being built up. Thus a drilling machine will be clamped just where it is required to operate. Or if it has to be used on a large plane surface as a ship's deck, an electrical machine is suitable, in which magnetic attraction is set up between the foot of the machine and the deck sufficient to hold it down. A key-seating machine will be clamped on the shaft in which a keygroove has to be cut. A drilling machine may be fastened to a pipe with a chain embracing the pipe. Very many of the drills, and all the caulking and chipping hammers, are grasped in the hands and so thrust to their work. The tapping of screw holes is mostly done in this way, a common example being the holes for the stay bolts in the fire-boxes of steam boilers.

Another later method which has been introduced and practised in a few shops consists in installing a cast-iron floor-plate of large area, planed truly and provided with bolt holes and slots. On this a massive casting, forging or piece of work undergoing erection will be bolted. Then the portable tools — planers, drills, &c, as required — will be bolted to the table and brought into operation on the various sections of the work, several sometimes operating simultaneously. This method is to a certain extent coming into rivalry with the abnormal growth of machine tools, the development of which has been greatly accelerated by the massive dimensions of productions which only became possible by the substitution of steel made fey the Bessemer and Siemens processes for iron.

The reciprocating motion necessary to effect hammering, chipping or caulking operations is produced by the action of a solid piston, sliding in a cylinder (fig. 63) and driven sharply against the end of the tool by the inrush of compressed air, being then returned for another stroke.

The strokes range in number up to as many as 2000 per minute in some cases. For heavy riveting a ” long- stroke ” hammer is employed, having a longer barrel than the chipping hammer shown in fig. 63, in order to obtain a greater force of blow. The operator grasps the hammer by the handle, with his fingers or thumb on the controlling lever, and as long as this is held down the blows continue. The air-supply pipe is flexible, so that it does not impede the movements of the workman. The tools at the end of the cylinder are simply held in a socket, so that they can be changed rapidly.

Rotative motion can be produced either by electric or pneumatic motors, and both systems are in wide use. Pneumatic motors are very suitable when an air-compressing plant is already laid down for other tools, while if electricity is used in the works portable tools operated by this agent may be employed instead of the pneumatic ones. In the electric drills (fig. 64) a small motor is fitted within the body and connected by spur-gears to the spindle to effect suitable speed reduction. A switch provides for stopping and starting the motor; the current is brought through a flexible cable which, like

pneumatic hose, is armoured with wire to protect it from damage. The smallest drills are simply gripped in the operator’s hand and

Fig. 63. — Tierney Pneumatic Chipping Hammer. (The Globe Pneumatic Engineering Co., Ltd.)

A, Cylinder.

B, Tool socket, carrying chisel C.

D, Piston, which strikes the back of C.

E, Handle, screwed and clamped to A.

F, Trigger or lever clasped by operator’s hand and opening valve G,

admitting compressed air through connexion H, up passage /, through valve-box K, past valve L, and so against end of D, moving it towards C. As soon as the groove in the piston D registers with the hole M, air is admitted from a small hole (not shown), passes round the groove through hole M and passage N to the rear of the valve. This acting on the back of the valve throws it forward, thus shutting off the supply to the rear of the piston and permitting a small quantity of air to flow to the forward end of the piston for driving it in a backward direction. As soon as the air pressure is relieved on the back of the valve by the uncovering of exhaust holes (not seen) by the piston D, the valve is

returned to the original position, owing to the air constantly pressing on the small area of the valve.

pushed up to the work; larger ones are supported by a pillar and arm, against which the thrust is taken, and the feed given by turning a screw at intervals.

Fig. 64. — Electrically-driven Hand Drill. (Kramos Ltd., Bath.)

A , Body, cast in aluminium, with handles a, a.

B, Motor, with revolving armature C, connected by spur-gears D,

to the drill spindle E, fitted with ball thrust bearings. F, Switch, operated by attendant pushing in a plug; the current is brought by flexible wires through the right-hand handle o.

Pneumatic drills are usually worked by little motors having oscillating cylinders, by which the air and exhaust ports are covered and uncovered. They run at a high speed and are geared down to the spindle. In some cases two cylinders are used, but often four are fitted to give a powerful and equable turning moment. Grinding machines are also built with air motors directly coupled to the wheel spindle, the machines being moved about over the work by handles.

Another class of portable tools is driven, not by self-contained motors, but from an outside source of power, which is conveyed to the tools through flexible shafts built up of a series of spiral springs, or through flexible joints which form a connexion that permits the shaft to bend round corners and accommodate itself to any position in which the tool may be placed. The advantage of this is that the tool itself is much lightened, since there is no motor, and it can therefore be easily handled. Thus a drill simply contains the spindle, running in a frame which carries bevel-gears for transmitting the motion of the flexible shaft. Portable grinders also have nothing but the spindle, wheel and frame.

XI. — Appliances Appliances are vastly more numerous in a modern shop than in the older works, largely on account of the more repetitive character

WOOD-WORKING MACHINERY]

TOOL

of the operations done and of the desire to eliminate human labour, with its greater cost and chances of inaccuracy in the finished product. On all machines there are numerous aids by which the fixing of the work is facilitated. Many of these consist of simple packing blocks, by which heights are adjusted. These reach their higher developments in wedge-shaped packings, some of which are operated by a screw, while others act directly by screws. In some cases the exact height can be ascertained by observing graduations on the packings. Circular work is held in V-blocks, which occur in numerous modified forms. Various kinds of straps, clamps and bolts are used for gripping work with sufficient security to enable it to withstand the stress of the heaviest cutting. The highest develop- ment of all is attained in the templets and jigs, which are now indispensable in all modern shops, and which increase in number and complexity as the product of the shop becomes more specialized. A templet is a piece of metal cut to a definite shape, which being laid upon the work becomes a guide for striking the same shape on the surface of the work with a pointed scriber, and by which the tooling of any number of similar pieces is done without the labour of lining out each separate piece. Obviously, in such a case the degree of accuracy of the tooling still depends on the machine hand, who may work exactly, or only approximately, to these lines. Hence a great advance is made in the jig, which may be defined generally as a templet that is clamped rigidly to the work, or a box in which the work to be tooled is held. No marking off is done, but the jig becomes the actual guide for the operation of the cutting tools. The operation most frequently performed in jigs is drilling. Then the holes in the jig receive and coerce the drills, so that the holes made cannot vary in the least degree from those already in the jig. As it will often happen that hundreds or thousands of similar pieces will have to be tooled in this manner, holes in jigs are generally bushed with hardened steel, which is capable of enduring very lengthy service, and which can be renewed when worn. This is a simple illustration, but many jigs are of an extremely elaborate character, for it is obvious that the cost of a jig, though it may run into many pounds, becomes a mere trifle when spread over some thousands of pieces of work.

XII. — Wood-working Machinery

There is a large range of various classes of tools for performing the operations on timber, from the rough log to the finished product. Division is effected by saws, planing and finishing to outlines by knives or cutters, boring by augers and smoothing by sandpaper.

The first operation is that of tree-felling, which is often effected by

machine, consisting of a reciprocating blade, working horizontally in a frame and moved by a steam cylinder. The boiler is separate, so that the machine may be transported about and set to work over a considerable area, steam being conveyed to it by a flexible pipe. When the trees are brought into the saw-mills in the form of logs, i.e. with the branches lopped off, they are often cross-cut to reduce them to suitable lengths. This operation is effected either by a reciprocating saw, operated by a pulley and crank, or by an electric motor, or else with a circular saw, travelling on a carriage which moves the saw through the log laid in front of it. The next opera- tion, that of division or breaking-down into smaller portions, is done by saws of various types, according to the class of work. The oldest form of machine is the frame-saw, which is still used very largely. It comprises a framing within which a saw-gate or saw- frame is reciprocated up and down by a crank; the frame holds a number of saws or webs of flat form, strained up tightly with wedges or cotters between the top and bottom of the frame, the distance between the saws being capable of variation to suit boards of all thicknesses. The log is fed longitudinally to the gang of saws upon carriages, which are of two types. In the roller-feed, which is suitable for comparatively even and straight logs, ribbed rollers in front and behind the saws obtain a bite on the top and bottom of the timber and feed it forward by their rotation. In the rack-feed the log is mounted bodily upon a long carriage that runs by rollers upon a set of rails, and the carriage is travelled along by pinions and racks, which give a positive feed regardless of the shape of the log. The carriage in the roller-feed machines is only represented by a couple of plain trolleys supporting the timber at back and front. The feed is obtained through a friction wheel of V-shape, with a smooth pawl, called the silent feed ; the wheel is given a partial rotation at each down stroke of the saw-gate to turn the rollers or the pinions for carrying forward the log. The division of the timber may be either into deals or flitches, or planks or boards. In the last-named case as many as fifty saw-blades are sometimes held in a frame.

For the more valuable hardwoods a single blade reciprocating saw, operated horizontally, is used very largely, the machine being termed a board-cutter. The log is clamped to a travelling table, passing underneath the saw, which is strained in a frame sliding on a cross-rail that can be adjusted up or down on a couple of up- rights like a planing machine. The saw is worked from a crank and connecting-rod. As only one board is sawn at a time the attendant is able to see the figuring of the timber and to avoid waste when bad places are encountered.

A machine much more rapid in operation is the horizontal band-

saw, modelled on the lines of the above machine, but with a band-saw blade running over two pulleys, at a high speed, of about 7000 ft. per minute. The saws are very thin, so that a minimum of wood is wasted in the cut or " kerf," a very important consideration in dealing with costly woods. Vertical band-saws, having one pulley above the other so that the blade runs vertically, are very popular in America; they occupy less floor space than the horizontal types. It is necessary to present the log from the side, and it is therefore clamped by dogs upon a carriage running on rails, with provision for feeding the log laterally to the saw by sliding ways on the carriage.

The use of circular saws for breaking-down is confined chiefly to squaring up heavy balks, which need only a cut on each side, or for cutting thick slabs. The thickness of the saw entails considerable waste of wood, and a large amount of power is required for driving. The machines are termed rack-benches, and comprise a long divided table built up of thin plates and travelling past the fixed saw upon rollers, the movement being effected by a rack and pinion.

Re-sawing machines are those designed for further cutting-up deals, flitches, planks, &c, already broken out from the log, into boards and other scantlings. The deal and flitch frames are built on the model of the frame-saws first described, but with the differ- ences that roller feed is always used, because the stuff is smooth and easily fed, and that the back of the timber is run against fences to keep it moving in a straight line. In the double equilibrium frames, which are much favoured, there are two sets of saws in separate frames connected by rods to opposite crank-shafts, so that as one frame is rising the other is going down ; the forces are thus balanced and vibration is diminished, so that the machines can be speeded rather higher. Re-sawing is also done on circular and band saws of various types, fitted with fences for guiding the timber and controlling the thicknesses.

The cross-cut saws constitute another large group. They are employed for cutting-off various classes of stuff, after breaking-down or re-sawing, and are of circular saw type. The pendulum saw is a suspended form, comprising a circular saw at the bottom of a hang-ing arm, which can be pulled over by the attendant to draw the saw through a piece of wood laid on a bench beneath. Circular saws are also mounted in tables or benches and made to part off stuff moved laterally upon a sliding-table. When there is sufficient repetition work machines with two or more saws are used to cut one or more pieces to accurate length without the necessity for measurement.

The lighter classes of circular and band-saws, employed for sawing up

comparatively small pieces of timber, embody numerous provisions for quickening output. The plain saw benches, with circular saws, are the simplest class, Consisting merely of a framed table or bench carrying bearings for the saw spindle and a fence on the top to guide the wood. A mechanical feed is incorporated in the heavier machines to push the timber along. The rope-feed mechanism includes a drum driven at varying rates and giving motion to a rope, which is connected with a hook to the timber, to drag it along past the saw, roller supports on rails taking the weight at each end of the bench. Roller-feed saws propel the stuff by the contact of vertical fluted rollers placed opposite the fence. Other classes of saws for joinery work, &c, are constructed with rising and falling spindles, so that the saw may be made to project more or less from the table, this provision being necessary in grooving and tonguing with special types of saws. The same effect is obtained by making the table instead of the spindle rise and fall.

As it is necessary to use different saws for ripping (with the grain) and cross-cutting, some machines embody two saws so that work can be cut to shape on the same machine. These ” dimension saws ” have two spindles at the opposite ends of a pivoted arm that can be turned on a central pin to bring one or the other saw above as required. In cases where much angular and intricate sawing is done universal benches are employed, having in addition to the double saws a tilting motion to the table, which in conjunction with various special fittings enables the sawyer to produce a large range of pieces for any class of construction.

Band-saws, which have a thin narrow blade, are adapted especi- ally for curved sawing and cutting-out work which the circular saw cannot manage. The usual design of machine (fig. 65) comprises a stiff standard supporting a lower pulley in fixed bearings, and an upper one in a sliding bearing, which by means of a weight or spring is caused to rise and maintain an even tension on the saw blade as it is driven by the lower pulley, and runs the upper one. India-rubber tires are placed around the pulley rims to prevent damage to the saw teeth. The table, placed between the pulleys, may be angled for cutting bevel work. It is necessary, in order to do true work, to guide the saw blade above and below the cut, and it is therefore run in guides consisting of flat strips, in combination with anti- friction rollers which take the backward thrust of the saw. Fret or jig saws are a small class with a vertical reciprocating blade, employed chiefly for cutting out interior portions which necessitate threading the saw first through a hole.

Planing machines, used for truing up the surfaces of wood after

sawing, depend for their action upon rapidly revolving knives fastened to flat-sided cutter blocks. The simplest machines, the hand-planers, have a cutter cylinder revolving between two flat

table slides adjustable for height to support the wood while it is pushed along over the knives by the hand. A fence guides it in a straight line. Exact thicknessing is done on another type of machine, the panel planer or thicknesser, in which the cutter cylinder revolves above the table and the stuff is fed through by rollers above

Fig. 65. — Band-sawing Machine with 30 in. pulleys. (Thomas White & Sons, Paisley.)

A , Cast-iron cored frame.

B, Fast and loose pulleys driving pulley C. D, Belt shipper operated by handle E.

F, Upper saw pulley, with its shaft carried in swivel bearing.

G, Screw for raising or lowering F to suit saw.

H, Spring to maintain even tension on saw, by raising E.

J, Counterbalanced guide bar, having a Jackson guide K at bottom ; K has wooden strips embracing the saw and a ball-bearing roller against which the back runs, while / is adjusted up or down to bring K as near to the work as convenient.

L, Table, with slit for saw; it may be canted for bevel sawing, by means of hand worm-gear M.

N, Protective casing to saw.

0, Guard to prevent saw flying over in case of breakage.

and below. By altering the height of the table the thickness of wood can be varied. Double machines include a cutter cylinder above and below the timber, so that the upper and under sides are planed simultaneously. A combination of the hand-planer and the thicknesser is useful in cases where space or expenditure must be limited.

When large quantities of planed stuff are wanted, such as for flooring-boards, &c, other types of machines are employed. The four-cutter planers are the most rapid in output, and the timber is passed through them at a high rate, ranging up to 150 ft. per minute. There is first a revolving cutter cylinder, which roughs off the underside of the stuff, whence it passes (being propelled by rollers) to a fixed knife which imparts a very smooth face. A little farther on in the machine two vertical cutter blocks are encountered which carry cutters to plane or tongue or mould the edges, after which another cylinder above finishes the top face. Similar types of machines are made to produce mouldings, using four cutters shaped to suit the pattern required.

Moulding is also done on the vertical spindle shapers, which carry a cutter or cutters at the top of a spindle projecting through a flat table. The work is slid over the table and controlled by touching a collar below the cutter. Any form may be given to the cutters to produce different profiles. Some special moulding machines

use a cutter at the end of a spindle projecting downwards from an arm overhanging a table, an arrangement which enables recessing and carving to be performed.

Boring machines comprise rotating spindles and feeding mechanism to actuate augers. The single spindle machines are satisfactory enough for ordinary work, but when a number of differently sized holes have to be bored in a single piece of work, or in rapid succession, it is the practice to employ a machine with a number of spindles, so that a succession of augers of graduated diameters may be ready to use at will.

Mortising or cutting slots is done in vertical machines with a reciprocating spindle, operated either by hand or by crank disk and pulleys. The tool that cuts the mortise resembles a wood- worker's chisel, but is of stouter form and has a suitable shank to fit in the spindle. The latter can be reversed to turn round and let the chisel face in the opposite direction for cutting at each end of a

Fig. 66. — Mortising and Boring Machine with graduated stroke. (John McDowall & Sons, Johnstone.)

A, Frame.

B, Auger head, driven by belt C.

D, Mortising chisel reciprocated up and down by crank-disk E,

F, G, Levers connecting crank-pin to spindle of D.

H, Treadle connected to F; a gradually increasing stroke is imparted to the chisel by depressing H, which brings F, G into play and continually lengthens the stroke of D, cutting the mortise without shock.

/, Fast and loose pulleys driving E.

K, Cord actuated from shaft of /, which reverses the chisel when the handle L is moved and makes it cut in the reverse position.

M, Knee raised or lowered by hand-wheel and screw.

N, Cross-slide, adjusted by hand- wheel and screw.

0, Longitudinal slide, moved by rack and pinion and hand- wheel.

P, Timber vice.

mortise. A boring spindle is often incorporated with the machine to make holes for the mortising chisel to start in (fig. 66). Another class of mortiser employs a square hollow chisel, inside of which an auger rotates and first bores a hole leaving to the chisel the duty of finishing out the corners. The chain mortiser is another type; it has an endless chain of flat links, sharpened to make cutting teeth, and is run around a bar and a roller at a high speed, so that when fed into the wood a recess or mortise is cut out.

Tenoning machines, designed to cut the reduced ends or tenons to fit in mortises, perform their work by the aid of cutter blocks, revolved on horizontal spmdles above and below the timber, which is fed laterally upon a sliding carriage.

Dovetailing is effected by revolving cutters in machines having mechanism for pitching out the cuts, or if the work warrants it an entire row of dovetails is made at one traverse, by fitting a row of

cutters and feeding simultaneously. Corner-locking, or cutting parallel tongues and grooves in the edges of boxes, &c, is a rather more rapid operation than dovetailing, and is done with suitable cutter blocks or disks of appropriate thickness and pitching apart.

The general joiner, as its name implies, will do a large variety of operations, and is used in shops and on estates where a complete plant of machines would be out of the question. It usually has a circular saw and sometimes a band-saw also, together with planing and moulding apparatus, a moulding spindle, boring spindle and tenoning apparatus.

The lathes used in woodworking comprise the plain hand types with a simple T-rest on which the turner rests the tools to deal with the work revolving between centres, and the copying or Blanchard lathes, in which a master form or copy is rotated and caused by the contact and coercion of a roller to move the cutter rest in a corre- sponding fashion, so that the work is cut away until it exactly matches the shape of the copy.

Sand-papering machines, which finish the surface of wood to a high degree, deal with both flat and curved faces. Flat boards, panels, &c, can be done by contact against revolving drums or disks covered with glass-paper, being fed along over them by hand or by rotating rollers. In one class of machine a revolving disk is placed at the end of a series of jointed arms, by which the disk can be moved about over the work resting on a table underneath.

XIII. — Measurement

An advance of the greatest importance made in mechanical engineering is that of measurement. Since the beginning of the 19th century steady movement has been going on in this direction until it seems impossible that much greater refinement can now be looked for. Probably the chief advances to be expected will lie in the general extension in workshop practice of the knowledge already acquired, rather than in the acquisition of higher degrees of refinement.

Methods of measurement adopted in woodworking have but little application in high-class engineers' work. They are adopted, how- ever, to a considerable extent in the metal trades which are allied to engineering, as sheet metal working, girder work, &c. When a carpenter or joiner sets about constructing a door, window sash, roof or box he takes a two-foot rule, a flat lead pencil, and marks off the dimensions and lines by which he intends to work. If he has to work very carefully, then instead of using a pencil he cuts a line with the

edge of a keen scriber or chisel-like tool, by which to saw, plane or chisel. If outlines are curved, the compasses are brought into requisition, and these cut a fine line or lines on the surface of the wood. But in any case the eye alone judges of the coincidence ot the cutting with the lines marked. Whether the tool used be saw, chisel, gouge or plane, the woodworker estimates by sight alone whether or not the lines marked are worked by.

The broad difference between his method and that of the engineer's machinist lies in this, that while the first tests his work by the eye, the second judges of its accuracy or otherwise by the sense of touch. It may seem that there cannot be very much difference in these two methods, but there is. To the first, the sixty-fourth part of an inch is a fine dimension, to the second one-thousandth of an inch is rather coarse. Now the thickness of tissue paper is about one-thousandth of an inch, and no one could possibly work so closely as that by the eye alone. Engineers' steel rules usually have one inch which is divided into one hundred parts. Tolerably keen sight is required to distinguish those divisions, and few could work by them by ocular measurement alone, that is, by placing them in direct juxtaposition with the work. A thousandth part of an inch seems by com- parison a fine dimension. But it is very coarse when considered in relation to modern methods of measurement. In what are called " limit gauges " the plugs and rings are made of slightly different dimensions. If a plug is made a thousandth of an inch less than its ring it will slip through it easily with very perceptible slop. The common rule is therefore scarcely seen in modern machine shop, while the common calipers fill but a secondary place, their function having been invaded by the gauges. A minute dimension cannot be tested by lines of division on a rule, neither can a dimen- sion which should be fixed be tested with high precision with a movable caliper of ordinary type. Yet it must not be supposed that the adoption of the system of gauging instead of the older methods of rule measurement relieves men'of responsibility. The instruments of precision require delicate handling. Rough forcing of gauges will not yield correct results. A clumsy workman is as much out of place in a modern machine shop as he would be in a watch factory. Without correctness of measurement mechanical constructions would be impossible, and the older device of mutual fitting of parts is of lessening value in face of the growth of the inter- changeable system, of international standards, and of automatic machine tools which are run with no intervention save that of feeding stock.

The two broad divisions of measurement by sight and by contact are represented in a vast number of instruments. To the first- named belong the numerous rules in wood and metal and with English and

metric divisions, and the scales which are used for setting out dimensions on drawings smaller than those of the real objects, but strictly proportional thereto. The second include all

the gauges. These are either fixed or movable, an important sub-division. The first embrace two groups — one for daily workshop service, the other for testing and correcting the wear of these, hence termed ” reference gauges.” They are either made to exact standard sizes, or they embody ” limits of tolerance,” that is, allowances for certain classes of fits, and for the minute degrees of inaccuracy which are permissible in an interchangeable system of manufacture. The movable group includes a movable portion, either correspond- ing with one leg of a caliper or having an adjustable rod, with pro- vision for precise measurement in the form of a vernier or of a screw thread divided micrometrically. These may be of general character for testing internal or external diameters, or for special functions as screw threads. Subtitles indicate some particular aspect or design of the gauges, as ” plug and ring,” ” caliper,” ” horseshoe,” ” depth,” ” rod,” “end measure,” &c. So severe are the require- ments demanded of instruments of measurement that the manu- facture of the finer kinds remains a speciality in the hands of a very few firms. The cost and experience necessary are so great that prices rule high for the best instruments. As these, however, are not required for ordinary workshop use, two or three grades are manufactured, the limits of inaccuracy being usually stated and a guarantee given that these are not’exceeded.

Measurement by Sight. Rules and Scales. — The rules are used for marking off distances and dimensions in conjunction with other instruments, as scribers, compasses, dividers, squares; and for test- ing and checking dimensions when marked, and work in course of reduction or erection, directly or from calipers. They are made in boxwood and in steel, the latter being either rigid or flexible, as when required to go round curves. Rules are fitted in combination with other instruments, as sliding calipers, squares, depth gauges, &c. The scales are of boxwood, of ivory, the value of which is dis- counted by its shrinkage, and of paper. They are of flat section with bevelled edges, and of oval and of triangular sections, each giving a thin edge to facilitate readings. They are fully divided, or open divided ; in the first case each division is alike subdivided, in the second only the end ones are thus treated.

The Gauges. Fixed Gauges. — These now embrace several kinds, the typical forms being represented by the cylindrical or plug and ring gauges and by the caliper form or snap gauges. The principle in each

is that a definite dimension being embodied in the gauge, the workman has not to refer to the rule, either directly or through the medium of a caliper. This distinction, though slight, is of immense importance in modern manufacturing. Broadly it corre- sponds with the difference between the older heterogeneous and the present interchangeable systems.

Plug and Ring Gauges. — The principal ones and the originals of all the rest, termed Whitworth gauges after the inventor, are the plug and ring gauges (fig. 67, A and B). The principle on which they depend is that if the two gauges are made to fit with perfect accuracy, without tightness on the one hand or slop on the other, then any work which is measured or turned and bored or ground by them will also fit with equal accuracy. Bored holes are tested by the plug gauge, and spindles are tested by the ring gauge, and such spindles and holes make a close fit if the work is done carefully. Of course, in prac- tice, there is very much variation in the character of the work done, and the finest gauges are too fine for a large propor ion of engineers' work. It is possible to make these Fig. 67.

gauges within S t>oTˆ of an inch, a n tji .„ ' a '■ But they are seldom required so r" 'n'ff g g gaUgeS>

fine as that for shop use; VAo is n' Difference gauge, generally fine enough. For general D > Stepped reference gauge, shop work the gauges are made to within about jˆns of an inch. Standard gauges in which the plug and ring are of the same diameter will only fit by the application of a thin film of oil and by keeping the plug in slight movement within the ring. Without these precautions the two would " seize " so hard that they could not be separated without force and injury.

Plug and Ring v. Horseshoe Gauges. — The horseshoe, snap or caliper gauges (fig. 68) are often used in preference to the plug and ring types. They are preferred because the surfaces in contact are narrow. These occur in various designs, with and without handles, separately and in combination and in a much larger range of dimensions than the plug and ring. Ring gauges are not quite such delicate instruments as the fixed caliper gauges. But since they measure diameter only, and turned work is not always quite circular, the caliper gauges are not so convenient for measurement as the round gauges, which fit in the same manner as the parts have to fit to one another.

Fixed Gauges. Limit Gauges. — Some fits have to be what is termed in the shops " driving fits," that is, so tight that they

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have to be effected by driving with a hammer or a press, while others have to be ” working fits,” suitable, say, for the revolution of a loose pulley on its shaft or of an axle in its bearings. The ” limit ” or ” difference gauges ” (figs. 67 and 68) are designed for producing these working fits ; that is, the plug and ring gauges differ in dimen- sions so that the work bored will drive tightly, or slide freely over

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Fig. 68.

A, Separate caliper or snap C, Difference gauge.

gauges. D, Newall adjustable limit

B, Combined internal and ex- gauge.

ternal gauges. a, b, Plugs,

the work turned. These are variously sub-classified. The system which is generally accepted is embodied in the gauges by the Newall Engineering Co. These embrace force fits, which require the applica- tion of a screw or hydraulic press; driving fits, that require less power, as that of a hammer; push fits, in which a spindle can be thrust into its hole by hand; and running fits, such as that of shafts in bearings. Fixed gauges are made for each of these, but as this involves a heavy outlay the Newall firm have adjustable limit gauges (fig. 68, D) for external dimensions, the standard plug being used for holes. The setting is done by screwed plugs or anvils adjusted by reference bars. In all these gauges the ” go on ” and ” not go on ” ends respectively are stamped on the gauge, or the equivalents of + and — .

Fixed Reference Gauges. Reference Disks and End Measuring Rods. — Shop working gauges become in time so damaged by service that they fail to measure so accurately as when new. To correct these errors reference gauges are provided, by which the inaccuracy of the worn

ones is brought to the test. These are never used in the shops for actual measurement of work, but are only kept for checking the truth of the working gauges. They include disk, stepped and end measurement gauges. The disk and the stepped are used for testing the ring gauges, the stepped kind comprising essentially a collection of disks in one piece (fig. 67, D). The end measure pieces test the external gauges. The end measure standard lengths made by the Pratt & Whitney Co. are so accurate that any sizes taken at random in any numbers from J in. to 4 in., varying by sixteenths of an inch, will, when placed end to end, make up an exact length ; this is a difficult test, since slight variations in the lengths of the components would add up materially when multiplied by the number of pieces. The ends are ground off with diamond dust or emery in a special machine under water, and are so true that one piece will support another by cohesive force, and this though the surfaces are less than \ in. square.

Movable Gauges. — This extensive group may be regarded as compounded of the common caliper and the Whitworth measuring machine. They are required when precise dimensions have to be ascertained in whole numbers and minute fractional parts. They combine the sense of touch by contact, as in the calipers, with the exact dimensions obtained by inspection of graduated scales, either the vernier or the micrometer screw. If gauges must not vary by more than Trim of an inch, which is the limit imposed by modern shop ideals, then instruments must be capable of measuring to finer dimensions than this. Hence, while the coarser classes of micrometers read directly to tAir P ar t of an inch, the finest measure up to iobWo oi an inch, about 200 times as fine as the diameter of a human hair. They range in price correspondingly from about a sovereign to £100.

The Calipers. — Common calipers (fig. 69) are adjusted over or within work, and the dimensions are taken therefrom by a rule or a gauge. They usually have no provision for minute adjustment beyond the gentle tapping of one of the legs when setting. In some forms screw adjustment is provided, and in a few instances a vernier attachment on the side of the pivot opposite to the legs.

Vernier Calipers. — The vernier fitting, so named after its inventor, Pierre Vernier, in 1631, is fitted to numerous calipers and caliper rules. It is applied to calipers for engineers' use to read to ˆ-fc$ of an inch without requiring a magnifier. The beam of the caliper is divided into inches and tenths of the inch, and each tenth into

fourths and the vernier into twenty-five parts, or the beam is divided into fiftieths of an inch (fig. 70) and the vernier has 20 divisions to 19

on the rule. The caliper jaws are adapted to take both external and internal dimensions. These ” beam calipers ” are also made for metric divisions. Minor variations in design by different manufacturers are numerous.

Fig. 69. — Calipers.

A, Ordinary external type, adjusted by tapping the legs.

B, Type adjusted by screw in auxiliary leg.

C, Screw calipers, opened by contraction of curved spring and closed

by nut.

D, Self-registering caliper, with pointer moving over quadrant.

E, Common internal type.

F, Screw type with spring.

G, Combined internal and external for measuring chambered holes. H, Compass caliper for finding centres.

J, Keyhole caliper for measuring from hole to outside of boss.

Fig. 70. — Vernier Caliper. A, Beam; B, vernier; C, fixed jaw; D, movable jaw; E, clamping head; F, abutment head, with adjusting screw a, for fine adjustment of D.

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Fig. 71. — Measuring Machine. (The Newall Engineering Co.)

A, Hollow base or bed, mounted on three points.

B, Measuring or fast headstock.

C, Movable head, or tailstock.

D, Spirit-level to indicate alterations in length of piece being

measured due to changes in temperature, termed the indi- cator or comparator.

E, Measuring screw.

F, Nut for rapid adjustment of ditto.

G, Knob of speed screw for slow movement of ditto. H, Dividing and measuring wheel.

/, Vernier or reading bar.

a, a. Points between which contact is made.

Micrometer Calipers are the direct offspring of the Whitworth measuring machine. In the original form of this machine a screw of 20 threads to the inch, turned by a worm-wheel of 200 teeth iuid single-threaded worm, had a wheel on the axis of the worm with 250 divisions on its circumference, so that an ad j ustment of ro $ of an inch was possible. The costly measuring machines made to-day have a dividing wheel on the screw, but they combine modifications to ensure freedom from error, the fruits of prolonged experience. Good machines are made by the Whitworth, the Pratt & Whitney, the Newall (fig. 71), and the Brown & Sharpe firms. These are used for testing purposes. But there are immense numbers of small instruments, the micrometer calipers (fig. 72), made for general shop use, measuring directly to jjVj of an inch, and in the

Micrometer Calipers. a,

Fig. 72.

A, Frames.

B, Anvil or abutment.

C, Hub divided longitudinally.

D, Spindle with micrometer

screw.

E, Thimble, divided circularly.

(Brown & Sharpe Mfg. Co.) Adjusting nuts for taking up

wear. Clamping nut.

Ratchet stop.which slips under undue pressure to ensure uniform measurement.

hands of careful men easily to half and quarter thousandths ; these cost from £1 to £1, 10s. only. In these the subdivision of the turns of the screw is effected by circular graduations. Usually the screw

Fig. 73.

A, Beam.

B, Head, . adjustable by equal

inch divisions, by lines a, a, or holes b, b, and plug b' holes bushed.

■Beam Micrometer Calipers.

C, Abutment block with c for fine adjustment.

d, Clamping screws.

D, Micrometer.

e, Anvil.

pitch is 40 to the inch, and the circular divisions number 25, so that a movement of one division indicates that the screw has been advanced ˆ5 of jˆor jj'jij of an inch. Provision for correcting or taking up the effects of wear is included in these designs (e.g. at a in fig. 72), and varies with different manufacturers. A vernier is sometimes fitted in addition, in very high class instruments, to the circular divisions, so that readings of ten thousandths of an inch can be taken. Beam micrometer calipers (fig. 73) take several inches in length, the micrometer being reserved for fractional parts of the inch only.

Depth Gauges. — It is often necessary to measure the depth of one portion of a piece of work below another part, or the height of one portion relatively to a lower one. To hold a rule perpendicularly and take a sight is not an accurate method, because the same objections apply to this as to rule measurement in general. There are many depth gauges made with rule divisions simply, and then these have the advantage of a shouldered face which rests upon the upper portion of the work and from which the rule measurement is

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Fig. 74. — Depth Gauges.

A, Plain round rod o, sliding in head b, and pinched with screw c.

B, Rule a, graduated into inches or metric divisions, sliding on head

b, in grooved head of clamping screw c.

C, Slocomb depth gauge, fitted with micrometer, a, Rod marked in

half inches, sliding in head b; c, hub; d, thimble corresponding with similar divided parts in the micrometer calipers ; e, clamp- ing screw.

taken (fig. 74). These generally have a clamping arrangement. But for very accurate work either the vernier or the micrometer fitting is applied, so that depths can be measured in thousandths of an inch, or sometimes in sixty-fourths, or in metric subdivisions.

3 a *

C

Fig. 75. — Rod Gauges.

A, Pratt & Whitney gauge, o, Tube split at ends; 6, b, chucks

clamping tube on plain rod c, and screwed end d. Rough adjustment is made on rod c, of which several are provided; fine adjustment is by screwed end d.

B, Sawyer gauge, a, Body; 6, extension rods for rough adjust-

ment, several being supplied and pinched with screw c ; d, screwed end with graduated head ; e, reading arm extending from body over graduations ; /, clamping screw.

Rod Gauges. — When internal diameters have to be taken, too large for plug gauges or calipers to span, the usual custom is to set a rod of iron or steel across, file it till it fits the bore, and then measure its length with a rule. More accurate as well as adjust- able are the rod gauges (fig. 75) to which the vernier or the micro- meter are fitted.

These occur in a few varied designs.

Screw Thread Gauges. — The taking of linear dimensions, though provided for so admirably by the systems of gauging just dis- cussed, does not cover the important section of screw measurement. This is a department of the highest importance. In most English shops the only test to-day of the size of a screw or nut is the ‘use of a standard screw or nut. That there is variation in these is evidenced by the necessity for fitting nuts to bolts when large

numbers of these are being assembled, after they have been used in temporary erections or when nuts are brought from the stores to fit smds or bolts cut in the shop. This method may suffice in many classes of work, but it is utterly unsuited to an interchange- able system ; and when there is a fair amount of the latter firms sometimes make thread gauges of their own, in general form like the plug and ring gauges, using a hard quality of steel for small sizes or a tough quality of cast iron for the larger. These, though not hardened, will endure for a long time if treated carefully. But

of an inch (fig. 77). They are used in some kinds of lathe chuck work, but their principal value is in fitting and erecting the finer mechanisms.

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a

ill

A

cˆtr

b ˆ

Fig. 76. — Screw Thread Gauges. (Pratt & Whitney Co.)

A, Plug gauge; o, size of tapping hole; b, thread.

B, Ring gauge; a, pins to prevent lateral movement ; J, adjusting screw
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for opening gauge ; c, screw for closing ditto.

though very useful and far better than none at all they lack two essentials. They are simply accommodation gauges, made to an existing tap or die, and do not therefore embody any precise abso- lute measurement, nor do they include any means for measuring variations from standard, nor are they hardened. To produce gauges to fulfil these require- ments demands an original standard to work by, micrometric measurements, and the means of grinding after the harden- ing process. These requirements are fulfilled in the screw thread gauges and calipers of the Pratt & Whitney and the Brown & Sharpe companies. The essen- tial feature of a screw gauge is that it measures the sides of the threads with- out risk of a possible false reading due to contact on the bottom or top of the V. This is fulfilled by flatting the top and making the bottom of the gauge keen. The Pratt & Whitney gauges are made as a plug and ring (fig. 76), the plug being solid and the ring capable of precise adjustment round it. There is a plain round end, ground and lapped exactly to the standard size of the bottom of the thread, a dimension which is

obliterated in the threaded end because of the bottoms of the angles being made keen for clearance. There are three kinds of this class of gauge made; the first and most expensive is hardened and ground in the angle, while the second is hardened but not ground. The first is intended for use when a very perfect gauge is required, the second for ordinary shop usage. The third is made unhardened for purposes of reference simply, and it is not brought into contact with the work to be tested at all, but measurements are taken by calipers; in every detail it repre- sents the standard threads. The Brown & Sharpe appliance is of quite a different character. It is a micrometer caliper having a fixed V and a movable point between which the screw to be measured is embraced. By the reading of the micrometer and the use of a constant the diameter of any thread in the middle of the thread can be estimated.

Miscellaneous. — The foregoing do not exhaust the gauges. There are gauges for the sectional shapes of screw threads of all pitches, gauges for drilled holes that have to be screwed, gauges for the depth and thickness of the teeth of gear-wheels, gauges for the tapers of machine spindles, gauges for key-grooves, &c. There are also the woodworker's gauges — the marking and cutting, the panel, the mortise and the long-tooth.

Indicators are a small group of measuring instruments of a rather peculiar character. They magnify the most minute error by adapta-

tions of long and short lever arms. The Bath, the Starrett and the Brown & Sharpe are familiar in high-class shops. Some simply magnify inaccuracy, but in one type an index reads to thousandths

Fig. 77. — Indicator. A, Base; B, stem; C, arm; D, pointer or feeler, pivoted at a, and magnifying movement of the work E upon the scale b; P, spring to return D to zero.

Surface Plates and Cognate Forms. — Allied to the gauges are the instruments for testing the truth of plane surfaces: the surface plates, straight-edges and winding strips. The origination of plane surfaces by scraping, until the mutual coincidence of three plates is secured, was due to Whitworth. These surface plates (fig. 78, A) fill an important place in workshop practice, since in the best work plane surfaces are tested on them and corrected by scraping. To a large extent the precision grinding machines have lessened the value of scraping, but it is still retained for machine slides and other work of a similar class. In the shops there are two classes of surface plates : those employed daily about the shops, the accuracy of which becomes impaired in time, and the standard

ZZZZ2W

i=o

h

4=*#=

C, Common square.

D, Square with adjustable blade.

Fig. 78.,

A , Surface plate ; o, protecting cover for ditto when not in use.

B, Large ribbed straight-edge.

plate or plates employed for test and correction. Straight-edges are derived from the surface plates, or may be originated like them. The largest are made of cast-iron, ribbed and curved on one edge, to prevent flexure, and provided /■ with feet (fig. 78, B). But the \J smaller straight-edges are gener- ally parallel, and a similar pair constitutes ” winding strips,” by which any twist or departure fiom a plane surface is detected. Squares, of which there are numer- ous

designs (fig. 78, C and D), are straight-edges set at right angles. Bevels or bevel-squares (fig. 79), are straight-edges comprising a stock and a blade, which are ad- justable for angle in relation to each other. Shop protractors often p IG _„

include a _ blade adjustable for A Common bevel.' angle, forming a bevel with gradua- fi _ Universal bevel for testing tions. Spint-levels test the non- j ow ane [es

zontal truth of surfaces. Many

levels have two bubble tubes at right angles with each other, one of which tests the truth of vertical faces. Generally levels have flat feet, but some are made of V-section to fit over shafting. The common plumb-bob is in frequent use for locating the vertical position of centres not in the same horizontal plane. When a

plumb-bob is combined with a parallel straight-edge the term plumb-rule is applied. It tests the truth of vertical surface more accurately than a spirit-level. (J. G. H.)

TOOLE, JOHN LAWRENCE (1832-1906), English actor, son of an old employe of the East India Company who for many years acted as toast-master in the City of London, was born in London on the 1 2th of March 1832. He was educated at the City of London School, and started life in a wine merchant's office; but his natural propensity for comic acting was not to be denied, and after some practice as an amateur with the City Histrionic Club, he definitely took to the stage in 1852, appearing in Dublin as Simmons in The Spitalfields Weaver. He gained experience in the provinces, and in 1854 made his first professional appearance in London at the St James's theatre, acting Samuel Pepys in The King's Rival and Weazel in My Friend the Major. In 1857, having just had a great success as Paul Pry, he met Henry Irving in Edinburgh, and recommended him to go to' London; and their friendship remained thenceforth of the closest kind. In 1858 Toole joined Webster at the Adelphi, and established his popularity as a comedian, among other parts creating Joe Spriggins in Id on park francais. In 1868 he was engaged at the Gaiety, appearing among other pieces in Thespis, the first Gilbert and Sullivan collaboration. His fame was at its height in 1874, when he went on tour to the United States, but he failed to reproduce there the success he had in

England. In 1879 he took the ” Folly ” theatre in London, which he renamed ” Toole’s ” in 1882. He was constantly away in the provinces, but he pro- duced here a number of plays: H. J. Byron’s Upper Crust and Auntie; Pinero’s Hester’s Mystery and Girls and Boys; burlesques such as Paw Claudian, and, later, J. M. Barrie’s Walker, London. But his appearances gradually became fewer, and after 1893 he was seen no more on the London stage, while his theatre was pulled down shortly afterwards for an extension of Charing Cross Hospital. He published his reminiscences in 1888. Toole married in 1854; and the death of his only son in 1879, and later of his wife and daughter, had distressing effects on his health; attacks of gout, from 1886 onwards, crippled him, and ultimately he retired to Brighton, where after a long illness he died on the 30th of July 1906. In his prime he was immensely popular, and also immensely funny in a way which depended a good deal on his tricks and delivery of words. He excelled in what may be called Dickens parts — combining humour and pathos. He was a good man of business, and left a considerable fortune, out of which he made a number of bequests to charity and to his friends. His genial and sympathetic nature was no less conspicuous off the stage than on it.

TOOMBS, ROBERT (1810-1885), American political leader, was born near Washington, Wilkes county, Georgia, on the 2nd of July 1810. He was educated at Franklin College (univer- sity of Georgia), at Union College, Schenectady, New York, from which he graduated in 1828, and at the law school of the university of Virginia. He was admitted to the bar in 1830, and served in the Georgia House of Representatives (1838, 1840-1841 and 1843-1844), in the Federal House of Represen- tatives (1845-1853), and in the United States Senate (1853- 1861). He opposed the annexation of Texas, the Mexican War, President Polk’s Oregon policy, and the Walker Tariff of 1846. In common with Alexander H. Stephens and Howell Cobb, he supported the Compromise Measures of 1850, denounced the Nashville Convention, opposed the secessionists in Georgia, and helped to frame the famous Georgia platform (1850). His position and that of Southern Unionists during the decade 1850- 1860 has often been misunderstood. They disapproved of secession, not because they considered it wrong in principle, but because they considered it inexpedient. On the dissolution of the Whig party Toombs went over to the Democrats. He favoured the Kansas-Nebraska Bill, the admission of Kansas under the Lecompton Constitution, and the English Bill (1858), and on the 24th of June 1856 introduced in the Senate the Toombs Bill, which proposed a constitutional convention in Kansas under conditions which were acknowledged by various anti-slavery leaders as fair, and

which mark the greatest con-

cessions made by the pro-slavery senators during the Kansas struggle. The bill did not provide for the submission of the constitution to popular vote, and the silence on this point of the territorial law under which the Lecompton Constitution of Kansas was framed in 1857 was the crux of the Lecompton struggle (see Kansas). In the presidential campaign of i860 he supported John C. Breckinridge, and on the 22nd of December, soon after the election of Lincoln, sent a telegram to Georgia which asserted that ” secession by the 4th of March next should be thundered forth from the ballot-box by the united voice of Georgia.” He delivered a farewell address in the Senate (Jan. 7, 1861), returned to Georgia, and with Governor Joseph E. Brown led the fight for secession against Stephens and Herschel V.Johnson (181 2-1880). His influence was a most powerful factor in inducing the “old-line Whigs ” to support immediate secession. After a short term as secretary of state in President Davis’s cabinet, he entered the army (July 21, 1861), and served first as a brigadier-general in the Army of Northern Virginia and after 1863 as adjutant and inspector-general of General G. W. Smith’s division of Georgia militia. He then spent two years in exile in Cuba, France and England, but returned to Georgia in 1867, and resumed the practice of law. Owing to his refusal to take the oath of allegiance, he was never restored to the full rights of citizenship. He died at his home in Washington, Georgia, on the 15th of December 1885.

See Pleasant A. Stovall, Robert Toombs, Statesman, Speaker, Soldier, Sage (New York, 1892).

TOOTHWORT, the popular name for a small British plant of curious form and growth, known botanically as Lathraea squa- maria. It grows parasitically on roots, chiefly of hazel, in shady places such as hedge sides. It consists of a branched whitish underground stem closely covered with thick fleshy colourless leaves, which are bent over so as to hide the under surface; irregular cavities communicating with the exterior are formed in the thickness of the leaf. On the inner wall of these chambers are stalked hairs, which when stimulated by the touch of an insect send out delicate filaments by means of which the insect is killed and digested. The only portions that appear above ground are the short flower-bearing shoots, which bear a spike of two-lipped dull purple flowers. The scales which represent the leaves also secrete water, which escapes and softens the ground around the plant. Lathraea is closely allied to another British parasitic plant, broomrape (Orobanche) .

TOOWOOMBA, a town of Aubigny county, Queensland, Australia, 76 m. by rail W. by N. of Ipswich, and 101 m. from Brisbane. It is situated on the summit of the Great Dividing Range, and is the centre of the rich pastoral and agricultural district of Darling Downs. The chief buildings are the town-hall, a large theatre, a school of arts and a library; the Christian Brothers College and several handsome churches. The industries are brewing, tanning, soap-boiling, flour-milling, malting, iron- founding, saw-milling and jam-making. Vineyards are culti- vated by a German colony and large quantities of wine are made. The town received a municipal charter in i860, and during the governorship of Lord Lamington (1896-1897) became the summer residence of the governor and his staff. Pop. (1901), 9137; within the five-mile radius, 14,087.

TOP (cf. Dan. top, Ger. Topf, also meaning pot), a toy consist- ing of a body of conical, circular or oval shape with a point or peg on which it turns or is made to whirl. The twisting or whirl- ing motion is applied by whipping or lashing when it is a ” whip- ping top ” or ” peg-top,” or by the rapid unwinding of a string tightly wound round a head or handle. When the body is hollow this results in a whirring noise, whence the name ” hum- ming top.” Other kinds of tops are made as supports for coloured disks which on revolving show a kaleidoscopic variation of patterns. The top is also used in certain games of chance, when it is generally known as a ” teetotum.” There are many references to it in ancient classical literature. The Greek terms for the toy are /3e/uj3t£, which was evidently the whipping or peg top (Arist. Birds, 1461), and <7rp6/3iXo5, a humming top, spun by a string (Plato, Rep. iv. 436 E.). In Homer {II. xiv. 413) the word

CTpbftfios seems to point to the humming top. The Latin name for the top was turbo. This word and the Greek ftdfifios are sometimes translated by ” top ” when they refer to the instrument used in the Dionysiac mysteries, which, when whirled in the air by a string, produced a booming noise. This was no doubt the equivalent of the ” bull roarer ” (q.v.). Strutt (Games and Pastimes, 491) says that the top was known in England as early as the 14th century. For the scientific properties of the top see Gyroscope and Gyrostat.

This word must be distinguished from that signifying the highest or uppermost part of anything. It appears to have meant origin- ally a tuft or crest of hair, cf. Ger. Zopf, Du. top, Icel. topps, &c. ; it is allied

to Eng. ” tap,” a spike for a cask, and ” tip,” point. Some etymologists have identified the two words, the toy being so called from spinning on its top or tip, but the two German forms seem to prove conclusively that the words are different.

TOPAZ, a mineral usually found in connexion with granitic rocks and used, when fine, as a gem-stone. It is believed that the topaz of modern mineralogists was unknown to the ancients, and that the stone described under the name of TOirdftos, in allusion to its occurrence on an island in the Red Sea known as T07r&f 10s vrjcrot, was the mineral which is now termed chrysolite or peridot (q.v.). The Hebrew pitdah, translated ” topaz ” in the Old Testament, may also have been the chrysolite.

Topaz crystallizes in the orthorhombic system, usually with a prismatic habit (figs. 1 and 2). Many of the crystals, like those from Saxony and Siberia, are rich in faces, and present with the prisms a complicated combination of pyramids and domes. The faces of the prism-zone are usually striated vertically. Doubly- terminated crystals are rare, and sometimes apparently hemi- morphic. The mineral presents a perfect cleavage transverse

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Fig. 1.

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Fig. 2.

to the long axis of the prism, and the cleavage-plane often has a pearly lustre. The chemical composition of the topaz has given rise to much discussion, but it is now generally regarded as an aluminium fluo-silicate having the formula Al 2 F 2 Si04. It was shown by Professor S. L. Penfield and Mi- J. C. Minor that the fluorine may be partially replaced by hydroxyl. When strongly heated topaz suffers considerable loss of weight. Sir D. Brewster found in topaz numerous microscopic cavities containing fluids, some of which have received the names of brewsterlinite and cryptolinite. Possibly some of the liquid inclusions may be hydrocarbons.

The topaz, when pure, may be colourless, and if cut as a brilliant has been mistaken for diamond. It has, too, the same specific gravity, about 3-5. It is, however, greatly inferior in hardness, the hardness of topaz being only 8; and it has lower refractivity and dispersive powers: moreover, being an orthorhombic mineral, it possesses double refraction. From phenacite and from rock-crystal, for which it may be mistaken, it is distinguished by being biaxial and by having a much higher specific gravity. The topaz becomes electric by heating, by friction or by pressure. Colourless limpid topazes are known in Brazil as pingos d'agoa, or " drops of water," whilst in England they pass in trade as " minas novas," from a locality in the state of Minas Geraes in Brazil.

Coloured topazes usually present various shades of yellow, blue or brown. The pleochroism is fairly marked, the colour of the sherry-yellow crystals from Brazil being generally resolved by the

dichroscope into a brownish-yellow and a rose-pink. The colour in many cases is unstable, and the brown topazes of Siberia are specially liable to suffer bleaching by exposure to sunlight. In 1750 a Parisian jeweller named Dumelle discovered that the yellow Brazilian topaz becomes pink on exposure to a moderate heat, and this treatment has since been extensively applied, so

that nearly all the pink topaz occurring in jewelry has been artificially heated. Such ” burnt topaz ” is often known as ” Brazilian ruby,” a name applied also to the natural red topaz, which, however, is excessively rare. ” Brazilian sapphire ” is the term sometimes given to blue topaz, but the colour is usually pale. The delicate green topaz has been incorrectly called aquamarine, which is a name applicable only to the sea-green beryl (q.v.). According to A. K. Coomaraswamy, yellow sapphire is often sold as topaz in Ceylon, where yellow topaz is unknown, whilst pink corundum is frequently called there ” king topaz.”

The topaz is cut on a leaden wheel, and polished with tripoli. It is generally step-cut, or table-cut, but its beauty is best developed when in the form of a brilliant. Cut topazes of large size are known, and it is said that the great ” Braganza diamond ” of Portugal is probably a topaz.

Topaz usually occurs in granitic and gneissose rocks, often in greisen, and is commonly associated with cassiterite, tourmaline and beryl. It seems to have been formed, in many cases, by pneumato- lytic action. In the west of England it is found in Cornwall, notably at St Michael’s Mount and at Cligga Head near St Agnes. It occurs also in Lundy Island. The finest British topaz is found in the Cairngorm group of mountains in the central Highlands, especially at Ben a Buird. Rolled pebbles occur in the bed of the Avon in Banffshire. Beautiful, though small, crystals occur in the drusy cavities of the granite of the Mourne Mountains in Ireland. The famous topaz-rock of the Schneckenstein, near Auerbach, in Saxony, yields pale yellow crystals, formerly cut for jewelry, and it is said that these do not become pink on heating. Fine topazes occur in Russia, at several localities in the Urals and in the Adun-chalon Mountains, near Nerchinsk, in Siberia. A very fine series from the Koksharov collection is in the British Museum. Beautiful crystals of topaz are found in Japan, especially at Taka- yama in the province of Mino, and at Tanokamiyama in Omi province. Ceylon and Burma occasionally yield topazes. Brazil is a famous locality, the well-known sherry-yellow crystals coming from Ouro Preto, formerly called Villa Rica, the capital of Minas Geraes, where they occur in a kaolinitic matrix, resulting from the alteration of a mica-schist, which is regarded by Professor O. A. Derby as a metamorphosed igneous rock. Topaz occurs in the tin-drifts of New South Wales, especially in the New England district; it has been discovered in the Coolgardie goldfield, West Australia; and it is found also in the tinfields of Tasmania and on Flinders Island

in Bass's Strait. Fine topaz has been worked near Pike's Peak in Colorado, and in San Diego county, California. The mineral occurs in rhyolite at Nathrop in Chaffee county and Chalk Mountain in Summit county, Colorado, and in trachyte near Sevier Lake, Utah. The occurrence of topaz in these volcanic rocks is very notable, and contrasts with its common occurrence in granites. It is found in like manner in rhyolite at San Luis Potosi in Mexico; and beautiful little limpid crystals accompany stream-tin at Durango. Common topaz occurs in coarse crystals at many localities. A columnar variety from the tin-districts of Saxony and Bohemia, and from Mt Bischoff in Tasmania, is known as pycnite (jtukvAs, dense) ; whilst a coarse opaque topaz from granite near Falun, in Sweden, has been termed pyrophysalite (irOp, fire; tfrmaa, to blow), in allusion to its behaviour when heated.

" Oriental topaz " is the name sometimes given to yellow corundum, a mineral readily distinguished from true topaz by superior hardness and density. Yellow and smoke-tinted quartz, or cairngorm, is often known as " Scotch topaz " or " Spanish topaz," according to its locality; but these, on the contrary, are inferior in hardness and density. The chief differences between the three minerals may be seen in the following table, in which they are arranged in order of hardness, density and refractivity : —

Hardness .... Specific gravity . Refractive indices Crystallization Chemical composition

Scotch Topaz.

7

2-6

i-54. i-55

Hexagonal

Si0 2

True Topaz.

3'5

i-6i, 1-62

Orthorhombic

Al 2 F 2 Si0 4

Oriental Topaz.

9

4

176, 177

Hexagonal

A1 2 3

(F. W. R.*) TOPEKA, a city and the county-seat of Shawnee county, Kansas, U.S.A., the capital of the state, situated on both sides of

the Kansas river, in the east part of the state, about 60 m. W. of

Kansas City. Pop. (1900), 33,608, of whom 3201 were foreign-born (including 702 Germans, 575 Swedes, 512 English, 407 Russians, 320 Irish, &c.) and 4807 were negroes; (1010, census), 43,684. It is served by the Atchison, Topeka & Santa Fe, the Chicago, Rock Island & Pacific, the Union Pacific and the Missouri Pacific railways. The city is regularly laid out on a fairly level prairie bench, considerably elevated above the river and about 890 ft. above sea-level. Among its prominent build- ings are the United States government building, the Capitol (erected 1866-1903 at a cost of $3,200,589 and one of the best state buildings in the country), the county court house, the public library (1882), an auditorium (with a seating capacity of about 5000), the Y.M.C.A. building, a memorial building, housing historical relics of the state, and Grace Church Cathedral (Protestant Episcopal). The city is the see of a Protestant Episcopal bishop. In the Capitol are the library (about 6000 volumes) and natural history collections of the Kansas Academy of Science, and the library (30,000 books, 94,000 pamphlets and 28,500 manuscripts) and collections of the Kansas State Historical Society, which publishes Kansas Historical Collections

(1875 sqq.) and Biennial Reports (1879 sqq.). The city is the seat of Washburn (formerly Lincoln) College (1865), which took its present name in 1868 in honour of Ichabod Washburn of Worcester, Massachusetts, who gave it $25,000; in 1909 it had 783 students (424 being women). Other educational establishments are the College of the Sisters of Bethany (Protestant Episcopal, 1861), for women, and the Topeka Industrial and Educational Institute (1895), for negroes. In Topeka are the state insane asylum, Christ's Hospital (1894), the Jane C. Stormont Hospital and Training School for nurses (1895), the Santa Fe Railway Hospital, the Bethesda Hospital (1906) and the St Francis Hospital (1909). Topeka is an important manufacturing city. Its factory product was valued in 1905 at $14,448,869. Natural gas is piped from southern Kansas for manufacturing and domestic use.

The first white settlement on the site of Topeka was made in 1852, but the city really originated in 1854, when its site was chosen by a party from Lawrence. It was from the first a free-state stronghold. More than one convention was held here in Territorial days, including that which framed the Topeka Constitution of 1855; and some of the meetings of the free-state legislature chosen under that document (see Kansas) were also held here. Topeka was made the temporary state capital under the Wyandotte Constitution, and became the permanent capital in 1861. It was first chartered by the pro-slavery Territorial legislature in 1857, but did not organize its government until 1858 (see Lawrence). In 1881 it was chartered as a city of the first class. The first railway outlet, the Union Pacific, reached Eugene, now North Topeka, in 1865. The construction of the Atchison, Topeka & Santa Fe was begun here in 1868, and its construction shops, of extreme importance to the city, were built here in 1878. In 1880, just after the great negro immigration to Kansas, the coloured population was 31 % of the total.

See F. W. Giles, Thirty Years in Topeka (Topeka, 1886).

TOPELIUS, ZAKRIS [Zacharias] (1818-1898), Finnish author, was born at Kuddnas, near Nykarleby, on the 14th of January 1818. He was the son of a doctor of the same name, who was distinguished as the earliest collector of Finnish folk-songs. Topelius became a student at Hel- singfors in 1833, was made professor in 1863 and received in succession all the academic distinctions open to him. Quite early in his career he began to distinguish himself as a lyric poet, with the three successive

volumes of his Heather Blossoms (1845-1854). The earliest of his historical romances was The Duchess of Finland, published in 1850. He was also editor-in-chief of the Helsingfors Gazette from 1841 to i860. In 1878 Topelius was allowed to withdraw from his professional duties, but this did not sever his connexion with the university; it gave him, however, more leisure for his abundant and various literary enterprises. Of all the multi- farious writings of Topelius, in prose and verse, that which has

enjoyed the greatest popularity is his Tales of a Barber-Surgeon, episodes of historical fiction from the days of Gustavus II. Adolphus to those of Gustavus III., treated in the manner of Sir Walter Scott; the five volumes of this work appeared at intervals between 1853 and 1867. Topelius attempted the drama also, with most success in his tragedy of Regina von Emmeritz (1854). Topelius aimed, with eminent but perhaps pathetic success, at the cultivation of a strong passion of patriotism in Finland. He died on the 13th of March 1898 at Helsingfors. Topelius was an exceptionally happy writer for children, his best-known book being Lasning for bam. His abundant poetry is graceful and patriotic, but does not offer any features of great originality. (E. G.)

TOPETE, JUAN BAUPTISTA (1821-1885), Spanish naval commander and politician, was born in Mexico on the 24th of May 182 1. His father and grandfather were also Spanish admirals. He entered the navy at the age of seventeen, cut out a Carlist vessel in 1839, became a midshipman at twenty-two, obtained the cross of naval merit for saving the life of a sailor ii? 1841 and became a lieutenant in 1845. He served on the West Indian station for three years, and was engaged in repressing the slave trade before he was promoted frigate captain in 1857. He was chief of staff to the fleet during the Morocco War, 1859, after which he got the crosses of San Fernando and San Hermenegildf. Having been appointed chief of the Carrara arsenal at Cadiz, he was elected deputy and joined the Union Liberal of O'Donnell and Serrano. He was sent out to the Pacific in command of the frigate " Blanca," and was present at the bombardment of Valparaiso and Callao, where he was badly wounded, and in other engagements of the war between Chile and Peru. On his return to Spain, Topete was made port captain at Cadiz, which enabled him to take the lead of the conspiracy in the fleet against the Bourbon monarchy. He sent the steamer " Buenaventura " to the Canary Isle for Serrano and the other exiles; and when Prim and Sagasta arrived from Gibraltar, the whole fleet under the

influence of Topete took such an attitude that the people, garrison and authorities of Cadiz followed suit. Topete took part in all the acts of the revolutionary government, accepted the post of marine minister, was elected a member of the Cortes of 1869, supported the pretensions of Montpensier, opposed the election of Amadeus, sat in several cabinets of that king's reign, was prosecuted by the federal republic of 1873 and again took charge of the marine under Serrano in 1874. After the Restora- tion Topete for some years held aloof, but finally accepted the presidency of a naval board in 1877, and sat in the Senate as a life peer until his death on the 29th of October 1885 at Madrid.

TOPFFER, RODOLPHE (1799-1846), the inventor of pedes- trian-journeys in Switzerland by schoolboys, was born at Geneva on the 31st of January 1799. His grandfather, a tailor, came about 1 760 from Schweinfurt (Bavaria) to settle in Geneva, while his father, Adam, was an artist. Rodolphe's literary education was rather desultory, as he intended to be an artist, like his father. But in 1819 his weak eyesight put an end to that intention, so he studied in Paris, intending to devote himself to the profession of schoolmaster. After passing some time in a private school in Geneva (1822-1824), he founded (1824) one of his own, after his marriage. It was in 1823 that he made his first foot journey in the Alps with his pupils, though this became his regular practice only from 1832 onwards. These Voyages en zigzag were described annually (1832-1843) in a series of lithographed volumes, with sketches by the author — the first printed edition appeared at Paris in 1844, and a second series (Nouveaux voyages en zig- zag) also at Paris in 1854. Both series have since passed through many editions. In 1832 he was named professor of belles-lettres at the university of Geneva, and held that chair till his death, on the 8th of June 1846. As early as 1834 he published an article in the Bibliotheque universelle of Geneva. It was followed by a number of tales, commencing with the Bibliotheque de mon oncle (1832), many of which were later collected (1841) into the weil- known volume which bears the title of Nouvelles genevoises. He took some part (on the Conservative side) in local politics, and was (1841-1843) editor of the Courrier de Geneve. Among

his other works are an edition of Demosthenes (1824), and a volume of artistic studies, the Reflexions et menus propos d'un

peintre genevois (1848).

Lives by A. Blondel and the abbe Relave (both published at Paris, 1886), and shorter notices in E. Rambert's Ecrivains nationaux (Geneva, 1874) ; and E. Javelle's Souvenirs d'un alpiniste (Lausanne, 1886; Eng. trans., 1899, under the title of Alpine Memories), and several chapters in Ste Beuve's Causeries du lundi, Verniers portraits litteraires and Portraits contemporains. (W. A. B. C.)

TOPHET, or Topheth (nsnn), the name given in 2 Kings xxiii. 10; Jer. vii. 31, to a spot in the valley of Ben Hinnom near Jerusalem where the Hebrews in the time of Ahab and Manasseh offered children to Molech and other heathen gods. Josiah " defiled" it as part of his reforming activity, and it became a place for the bestowal and destruction of refuse, and a synonym for Gehenna (Isa. xxx. 3$; Jer. vii. 32).

The uncertain etymology of the word is discussed in the Ency. Bib., s.v. " Molech," § 3, "Topheth."

TOPIARY, a term in gardening or horticulture for the cutting and trimming of shrubs, such as cypress, box or yew, into regular and ornamental shapes. It is usually applied to the cutting of trees into urns, vases, birds and other fantastic shapes, which were common at the end of the 17th century and through the 18th, but it also embraces the more restrained art necessary for the laying out of a formal garden. Yew and holly trees cut into fantastic objects may still be seen in old-fashioned cottage or farmhouse gardens in England. The Lat. topiarius meant an ornamental or landscape gardener, and was formed from topia (Gr. T07ros, place), a term specially employed for a formal kind of landscape painting used as a mural decoration in Roman houses. TOPLADY, AUGUSTUS MONTAGUE (1740-1778), Anglican divine, was born at Farnham, Surrey, and educated at West- minster and Trinity College, Dublin. Although originally a follower of Wesley, he in 1758 adopted extreme Calvinist opinions. He was ordained in 1762 and became vicar of Harpford with Fenn-Ottery, Devonshire, in 1766. In 1768 he exchanged to the living of Broadhembury, Devonshire. He is chiefly known as a writer of hymns and poems, including " Rock of Ages," and the collections entitled Poems on Sacred Subjects (Dublin, 1759) and Psalms and Hymns for Public, and Private Worship (London, 1776). His best prose work is the Historic Proof of the Doctrinal Calvinism of the Church of England (London, 1774). Some comments by Wesley

upon Toplady's presentation of Calvinism led to a controversy which was carried on with much bitter- ness on both sides. Toplady wrote a venomous Letter to Mr Wesley (1770), and Wesley repeated his comments in The Consequence Proved (1 771), whereupon Toplady replied with increased acridity in More Work for Mr Wesley (1772). From 1775 to 1778, having obtained leave of non-residence at Broadhembury, he lived in London, and ministered at a Calvinist church in Orange Street.

TOPOGRAPHY (Gr. rbvos, place, ypaeiv, to write), a description of a town, district or locality, giving details of its geographical and architectural features. The term is also applied in anatomy to the mapping out of the surface of the human body, either according to a division based on the organs or parts lying below certain regions, or on a superficial plotting out of the body by anatomical boundaries and landmarks.

TORAN, the name in Hindustani (Skr. torana, from tor, pass) of a sacred or honorific gateway in Buddhist architecture. Its typical form is a projecting cross-piece resting on two uprights or posts. It is made of wood or stone, and the cross-piece is generally of three bars placed one on the top of the other; both cross-piece and posts are usually sculptured.

XORBERNITE (or cupro-uranite), a mineral which is one of the " uranium micas "; a hydrous uranium and copper phosphate, Cu(U02) 2 (P04)2-|-i2H20. Crystals are tetragonal and have the form of square plates, which are often very thin. There is a perfect micaceous cleavage parallel to the basal plane, and on this face the lustre is pearly. The bright grass-green colour is a characteristic feature of the mineral. The hardness is 25 and the specific gravity 3-5. The radio-activity of the mineral

is greater than that of some specimens of pitchblende. It was first observed in 1772 at Johanngeorgenstadt in Saxony, but the best examples are from Gunnislake near Calstock and Redruth in Cornwall. The name torbenite is after Torbern Bergman: chalcolite is a synonym. (L. J. S.)

TORCELLO, an island of Venetia, Italy, in the lagoons about 6 m. to the N. W. of Venice, belonging to the commune of Burano. It was a flourishing city in the early middle ages, but now has only a few houses and two interesting churches. The former cathedral of S. Maria was founded in the 7th century. The present building, a basilica with columns, dates from 864; the nave was restored in

1008, in which year the now ruined octagonal baptistery was built. It contains large mosaics of the 12th century, strongly under Byzantine influence; those on the west wall represent the Resurrection and Last Judgment. The seats for the priests are arranged round the semicircular apse, rising in steps with the bishop's throne in the centre — an arrange- ment unique in Italy. Close by is S. Fosca, a church of the 12th century, octagonal outside, with colonnades on five sides and a rectangular interior intended for a dome which was never executed, beyond which is a three-apsed choir. In the local museum are four Mycenaean vases, one found in the island and another on the adjacent island of Mazzorbo, proving direct intercourse with the Aegean Sea in prehistoric times.

See R. M. Dawkins, in Journal of Hellenic Studies (1904), xxiv. 125.

TORCH (O. Fr. torche, from Med. Lat. tortia, derived from tortus, twisted, torquere, to twist), a light or illuminant that can be carried in the hand, made of twisted tow, hemp or other inflammable substance. Torches or " links " were, till the general introduction of street lighting, necessary adjuncts for passengers on foot or in carriages in towns at night, and many of the older houses in London and elsewhere still retain the iron stands outside their doors, in which the torches might be placed.

TORCHERE, a candelabrum mounted upon a tall stand of wood or metal, usually with two or three lights. When it was first introduced in France towards the end of the 17th century the torchere mounted one candle only, and when the number was doubled or tripled the improvement was regarded almost as a revolution in the lighting of large rooms.

TORDENSKJOLD, PEDER (1 691-17 20), eminent Danish naval hero, the tenth child of alderman Jan Wessel of Bergen, in Norway, was born at Trondhjem on the 28th of October 1691. Wessel was a wild unruly lad who gave his pious parents much trouble. Finally he ran away from them by hiding in a ship bound for Copenhagen, where the king's chaplain Dr Peder Jes- persen took pity on the friendless lad, gratified his love for the sea by sending him on a voyage to the West Indies, and finally procured him a vacant cadetship. After further voyages, this time to the East Indies, Wessel was, on the 7th of July 1711, appointed 2nd lieutenant in the royal marine and shortly afterwards became the captain of a little 4-gun sloop " Ormen" (The Serpent), in which

he cruised about the Swedish coast and picked up much useful information about the enemy. In June 1712 he was promoted to a 20-gun frigate, against the advice of the Danish admiralty, which pronounced him to be too flighty and unstable for such a command. His dis- criminating patron was the Norwegian admiral Lovendal, who was the first to recognize the young man's ability as a naval officer. At this period Wessel was already renowned for two things: the audacity with which he attacked any Swedish vessels he came across regardless of odds, and his unique seaman- ship, which always enabled him to escape capture. The Great Northern War had now entered upon its later stage, when Sweden, beset on every side by foes, employed her fleet principally to transport troops and stores to her distressed German provinces. The audacity of Wessel impeded her at every point. He was continually snapping up transports, dashing into the fjords where her vessels lay concealed, and holding up her detached frigates. In July 1714 he encountered a frigate which had been equipped in England for the Swedes and was on its way to Gothenburg under the command of an English captain. Wessel instantly

attacked her but in the English captain he met his match. The combat lasted all day, was interrupted by nightfall, and renewed again indecisively the following morning. Wessel's free and easy ways procured him many enemies in the Danish navy. He was accused of unnecessarily endangering his majesty's war-ships in the affairs with the frigate and he was brought before a court-martial. But the spirit with which he defended himself and the contempt he poured on his less courageous comrades took the fancy of King Frederick IV., who cancelled the proceedings and raised Wessel to the rank of captain. When in the course of 171 5 the return of Charles XII. from Turkey to Stralsund put a new life into the jaded and dispirited Swedish forces, Wessel distinguished himself in numerous engagements off the Pomeranian coast and did the enemy infinite damage by cutting out their frigates and destroy- ing their transports. On returning to Denmark in the beginning of 1716 he was ennobled under the title of " Tordenskjold " (Thundershield). When in the course of 1716 Charles XII. invaded Norway and sat down before the fortress of Fredrik- shald, Tordenskjold compelled him to raise the siege and retire to Sweden by pouncing upon the Swedish

transport fleet laden with ammunition and other military stores which rode at anchor in the narrow and dangerous strait of Dynekil, utterly destroying the Swedish fleet with little damage to him- self. For this, his greatest exploit, he was promoted to the rank of commander, but at the same time incurred the enmity of his superior officer Admiral Gabel, whom he had omitted to take into his confidence on the occasion. Tordenskjold's first important command was the squadron with which he was entrusted in the beginning of 17 17 for the purpose of destroying the Swedish Gothenburg squadron which interrupted the com- munications between Denmark and Norway. Owing to the disloyalty of certain of his officers who resented serving under the young adventurer, Tordenskjold failed to do all that was expected of him. His enemies were not slow to take advantage of his partial failure. The old charge of criminal recklessness was revived against him at a second court-martial before which he was summoned in 17 18; but his old patron Admiral U. C. Gyldenlove again intervened energetically in his behalf and the charge was quashed. In December 17 18 Tordenskjold brought to Frederick IV. the welcome news of the death of Charles XII. and was made a rear-admiral for his pains. Tor- denskjold's last feat of arms was his capture of the Swedish fortress of Marstrand, when he partially destroyed and partially captured the Gothenburg squadron which had so long eluded him. He was rewarded with the rank of vice-admiral. Tordenskjold did not long survive the termination of the war. On the 20th of November 1720 he was killed in a duel with a Livonian colonel, Jakob Axel Stael von Holstein. Although, Dynekil excepted, Tordenskjold's victories were of far less importance than Sehested's at Stralsund and Gyldenlove's at Rtigen, he is certainly, after Charles XII., the most heroic figure of the Great Northern War. His courage was fully equal to the courage of " The Lion of the North," but he lacked that absolute self-command which gives to the bravery of Charles XII. its peculiar, almost superhuman, character.

See Carstensen and Liitken, Tordenskjold (Copenhagen, 1887).

(R. N. B.)

TOREADOR, a Spanish word derived from torear, to engage in a bull-fight, toro, a bull, Latin taurus, for one of the principal performers in the national sport of bull-fighting '(q.v.).

TORELL, OTTO MARTIN (1828-1900), Swedish geologist, was

born in Varberg on the 5th of June 1828. He was edu- cated at Lund for the medical profession, but became interested in zoological and geological studies, and being of independent means he devoted himself to science. He gave his attention first especially to the invertebrate fauna and the physical changes of pleistocene and recent times. He studied the glacial phenomena of Switzerland, Spitzbergen and Green- land, making two Arctic expeditions in company with A. E. Nordenskiold. In 1866 he became professor of zoology and geology in the University at Lund, and in 187 1 he was appointed

chief of the Swedish Geological Survey. In the latter capacity he laboured until 1897. His published contributions, though of much interest and importance, were not large, but his influence in promoting a knowledge of geology in Sweden, was of great service. His Arctic experiences enabled him to interpret the method of origin of the drift deposits in northern Europe, and to show that they were largely of glacial or fluvio-glacial origin. In the English drifts he recognized many boulders of Scandinavian origin. He died on the nth of September 1900.

His publications include: Bidrag till Spitzbergens molluskfauna (1859); and memoirs to accompany several sheets of the Geological Survey map of Sweden.

Obituary with portrait, in Geo!. Mag (May 1902), reproduced in abridged form from memoir by L. Holmstrom, in Geologiska forenin- gen i Stockholm ‘s forhandlingar, xxiii.

TORENO, JOSE MARIA QUIEPO DE LLANO RUIZ DE SARAVIA, Count of (1786-1843), Spanish politician and his- torian, was born at Oviedo on the 25th of November 1786. His family was wealthy and belonged to the most ancient nobility of Asturias. His mother, Dominga Ruiz de Saravia, had property in the province of Cuenca. The son received a better education in classics, mathematics and modern languages than was usual at that time. The young viscount of Matarrosa, the title he bore in his father’s lifetime, was introduced to the writings of Voltaire and Rousseau by the abbot of the Benedictine house of Monserrat in Madrid. He was present at Madrid when the city rose against Murat on the 2nd of May 1808, and took part in the struggle which was the beginning of the Peninsular War. From Madrid he escaped to Asturias, and on the 30th of May he embarked in a Jersey privateer at Gijon, with other delegates, in order to ask for the help of England against the French. The deputation was

enthusiastically received in London. By the 30th of December he was back in Asturias, his father having died in the interval. During the Peninsular War he saw some service in the first occupation of Asturias by the French, but he was mainly occupied by his duties as a member of the Cortes. In 1809 he was at Seville, where one of his uncles was a member of the central Junta. In the following year he was a leader of the party which compelled the Regency to summon the Cortes — to which he was elected by Asturias early in 181 1 though he wanted some months of the legal age of twenty-five. His election was opposed by some of his own relatives who did not share his advanced opinions, but it was ratified by the Cortes. Toreno was conspicuous among the well-meaning men who framed the constitution of 181 2, which was made as if it was meant for some imaginary republic and not for Catholic and monarchical Spain. When Ferdinand VII. returned from prison in France in 1814 Toreno foresaw a reaction, and put himself out of reach of the king. He was the more an object of suspicion because his brother- in-law, Porlier, perished in a wild attempt to support the con- stitution by force. Toreno remained in exile till the outbreak of the revolution of 1820. Between that year and 1823 he was in Spain serving in the restored Cortes, and experience had abated his radical ardour. . When the French intervened in 1823 Toreno had again to go into exile, and remained abroad till the king published the amnesty of the 15th of October 1832. He returned home in July 1833, but remained on his estates till the king's death on the 29th of September. As hereditary standard bearer of Asturias (Alferez Mayor) it fell to him to proclaim the young queen, Isabella II. In 1834 his now moderate opinions pointed him out to the queen regent, Maria Christina, as a useful man for office. In June 1834 he was minister of finance, and became prime minister on the 7th of June. His tenure of the premiership lasted only till the 14th of September of the same year, when the regent's attempt to retain a practically despotic government under a thin constitutional veil broke down. The greater part of the remainder of his life was spent in voluntary exile, and he died in Paris on the 1 6 th of September 1843. As a politician he felt the need for a revision of the worn out despotism which ruled till 1808, but he was destitute of any real political capacity. Toreno is chiefly remembered as the author of the History of the Rising, War

and Revolution of Spain, which he began between 1823 and 183 2 and published in 1836-1838 in Paris. As a work of military criticism it is not of high value, and Toreno was prejudiced in favour of his colleagues of the Cortes, whose errors and ex- cesses he shared in and excused. The book is, however, written in excellent Castilian, and was compiled with industry. It is worth consulting as an illustration of the time in which the author lived, as a patriotic Spanish view of the war, and for the pro- minence it gives to the political side of the Peninsular War, which he justly treated as a revolution.

A biography by Don Antonio de Cueto is prefixed to the reprint of the Levantamiento giterra y revolution de Espana, in vol. lxiv. of the Biblioteca de autores espanoles of Rivadeneyra (Madrid

1846-1880).

TORENO, QUEIPO DE LLANO Y GAYOSO DE, Count (1840-1890), Spanish politician, son of the preceding, was born in Madrid in 1840. He was educated at the Madrid Institute and University, entered parliament in 1864 as a Moderado, and sat in all the Cortes of Queen Isabella's reign as a deputy for his ancestral province, Asturias. Loyal to the Bourbons all through the revolution, he nevertheless became a deputy in the Cortes of 1871-1873, and founded an Alphonsist paper, El Tiempo, in 1873. When the Restoration took place, its first cabinet made Count de Toreno mayor of the capital, and in 1875 minister of public works, in which capacity he im- proved the public libraries, museums, academies and archives, and caused many important works to be published, includ- ing the Cartas de Indias. In 1879 he became minister for foreign affairs, in 1880 president of the House of Deputies, in 1884 again governor of Madrid, and in 1885 again president of the House of Deputies. During the reign of Alphonso XII. and the first years of the regency of Queen Christina Count de Toreno was one of the most prominent Conservative leaders, and was often consulted by the Crown. He died on the 31st of January 1890. He was a patron of the turf, and established a race-course in Madrid, where the first races took place in the reign of Alphonso XII.

TORGAU, a town of Germany, in the Prussian province of Saxony, situated on the left bank of the Elbe, 30 m. N.E. of Leipzig and 26 m. S.E. of Wittenberg by rail. Pop. (1905), 12,299. Its most conspicuous building is the Schloss Hartenfels, on an island in the Elbe, which was built, or at least was finished, by the elector

of Saxony, John Frederick the Magnanimous. This castle, which is now used as a barracks, is one of the largest Renaissance buildings in Germany. It was for some time the residence of the electors of Saxony and contains a chapel con- secrated by Martin Luther. The town hall, a 16th-century building, houses a collection of Saxon antiquities. Torgau has two Evangelical churches and a Roman Catholic church. One of the former, the Stadt Kirche, contains paintings by Lucas Cranach and the tomb of Catherine von Bora, the wife of Luther. The chief industries of the town are the manufacture of gloves, carriages, agricultural machinery, beer and bricks; there is a trade in grain both on the Elbe and by rail. The fortifications, begun in 1807 by order of Napoleon, were dis- mantled in 1889-1891. In the vicinity is the royal stud farm of Graditz.

Torgau is said to have existed as the capital of a distinct principality in the time of the German king Henry I., but early in the 14th century it was in the possession of the margraves of Meissen and later of the electors of Saxony, who frequently resided here. The town came into prominence at the time of the Reformation. In 1526 John, elector of Saxony, Philip, landgrave of Hesse, and other Protestant princes formed a league against "the Roman Catholics, and the Torgau articles, drawn up here by Luther and his friends in 1530, were the basis of the confession of Augsburg. Torgau is particularly celebrated as the scene of a battle fought on the 3rd of November 1760, when Frederick the Great defeated the Austrians (see Seven Years' War). In January 1814 Torgau was taken by the Germans after a siege of three months and it was formally ceded to Prussia in 1815.

See Grulich and Burger, Denkwurdigkeiten der altsachsischett Residenz Torgau aus der Zeit der Reformation (Torgau, 1855) ; Knabe, Geschichte der Stadt Torgau bis zur Reformation (Torgau, 1880) ; and the publications of the Altertumverein tu Torgau (Torgau, 1884 sqq.).

TORNADO (Span., tornada, a turning about, cf. "turn"), a local whirlwind of extreme violence, usually formed within a thunderstorm. In appearance it consists of a funnel-shaped cloud, depending from the mass of storm-cloud above, and when fully developed tapering downwards to the earth. Besides its whirling motion, a tornado has an advancing movement of from 20 to 40 m. an hour — and along its own narrow path it carries destruction. Its duration is usually from half an hour to an hour. Tornadoes are most common in America, espe- cially in the

Mississippi Valley and the Southern states; in Europe and elsewhere they are comparatively rare. Owing to their association with thunderstorms they generally occur in warm weather. A tornado is the result of a condition of local instability in the atmosphere, originating high above the earth. A current of air is induced to ascend with a rapid spiral motion round a central core of low pressure. The moisture in the ascending air is condensed by cooling both as it ascends and as it expands into the low-pressure core. The cloud-funnel appears to grow downwards because the moisture in the air is condensed more rapidly than the air itself, following a spiral course, ascends.

TORO, a town of Spain, in the province of Zamora, on the right bank of the river Duero (Douro), and on the Zamora- Medina del Campo railway. Pop. (1900), 8379. Toro is an ancient fortified town, with picturesque narrow streets, among which are many medieval churches, convents and palaces, besides modern schools and public buildings. A fine bridge of twenty-two arches spans the river. The cathedral church is Romanesque; it dates from the 12th century but has been partially restored. The palace of the marquesses of Santa Cruz was the meeting place of the Cortes of 1371, 1442 and 1505, which made Toro and its code of laws celebrated. Toro is first mentioned in documents of the 10th century. It played an important part in the development of the kingdoms of Leon and Castile and in the reconquest of Spain from the Moors.

TORONTO, the capital of the province of Ontario, and the second largest city in the Dominion of Canada, situated on the northern shore of Lake Ontario, almost due north from the mouth of the Niagara river. It lies on a plateau gradually ascending from the lake shore to an altitude of 220 ft., and covers an area of nearly 20 sq. m. The river Don flows through the eastern part of the city, and the river Humber forms its western limit. The fine bay in front of the city, affording a safe and commodious harbour, is formed by an island stretching along the south of it. The city is well laid out for the most part, the streets crossing each other at right angles; Yonge Street, the chief artery, running north from the bay, was constructed as a military road in 1796, and extends under the same name for upwards of 30 m. to Lake Simcoe. It constitutes the dividing line of the city, the cross streets being called east or west according to the side of it they are on.

Toronto is the seat of government for the province, and contains

the parliament buildings, the lieutenant-governor's residence, the courts of law and the educational departmental buildings. The parliament buildings are situated in Queen's Park, almost in the centre of the city, and are an imposing structure of red. sandstone in the neo-Greek style built at great cost. They are shortly to be enlarged, as the needs of the province have outgrown them. A little distance to the west stand the university buildings, the central one being a splendid piece of architecture in the Norman style. Stretching in a semi' circle round the broad campus are the library, the medical building, the biology building and museum, the school of practical science, the geology and chemistry buildings and the convoca- tion hall, their architecture varying very greatly, beauty having been sacrificed to more practical considerations; the magnetic observatory is also in the grounds, but is overshadowed by some of the more recent erections. It is one of the meteorological

stations established by the British government on the recom- mendation of the Royal Society in 1840 and is now maintained by the Dominion government. The university of Toronto, for the support of which the province is responsible, includes faculties of arts, science and medicine, in the teaching of which it is strictly secular. But near at hand and in full affiliation with the university are Victoria College (Methodist), Wycliffe College (Anglican), Knox College (Presbyterian) and St Michael's College (Roman Catholic), wherein courses in divinity are given and degrees conferred. Victoria College, likewise, provides a course in arts, but none in science. Trinity College (Anglican), though some distance away, is also affiliated with the univer- sity, and her students enjoy its full advantages. Besides the university, Toronto is remarkably rich in educational institu- tions. Upper Canada College, founded in 1829, in many respects resembles one of the English public schools. It has over 300 students. St Andrew's College, also for boys, is a more recent establishment, and has about the same number of pupils. There are three large collegiate institutes, having some 300 to 600 pupils each, and in addition a number of schools for girls, such as Havergal College and Westminster College. Osgoode Hall, a stately structure in the heart of the city, houses the higher courts of law and appeal, and also a nourishing law school. The city hall and court-house is one of the finest civic build- ings in North America. It is in the

Romanesque style, and accommodates all the civic offices, the board of education, the police and county courts, &c. Many of the churches are worthy examples of good architecture.

Toronto is essentially a residential city. The houses of the better class stand separate, not in long rows, and have about them ample lawns and abundant trees. It is consequently a widespread city, the length from east to west approximating ten miles. An electric railway system provides means of com- munication. There are many parks, ranging in size from Carlton Park of one acre to High Park (375 acres) and Island Park (389), the latter being across the harbour and constitut- ing the favourite resort of the people during the summer. In Exhibition Park there is held annually an industrial and agri- cultural exhibition that has grown to great magnitude. It lasts a fortnight in late summer. It is a municipal enterprise and the profits belong to the city.

The population in 1907, as shown by the police census, exceeded 300,000. The government of the city is vested in a council consisting of the mayor and four controllers elected annually and eighteen aldermen (three from each of the six wards into which the city is divided). The council as a whole is the legislative body, while the board of control is the executive body, and as such is responsible for the supervision of all matters of finance, the appointment of officials, the carrying on of public works, and the general administration of the affairs of the city, except the departments of education and of police, the first being under the control of the board of education, elected annually by the citizens, and the latter under the board of police commissioners, consisting of the mayor, the county judge and the police magistrate.

Toronto is one of the chief manufacturing centres of the dominion; agricultural machinery, automobiles, bicycles, cotton goods, engines, furniture, foundry products, flour, smoked meats, tobacco, jewelry, &c, are flourishing industries, and the list is constantly extending. The situation of the city is favourable to commerce, and the largest vessels on the lakes can use its harbour. It is the outlet of a rich and extensive agricultural district, and throughout the season of navigation lines of steamers ply between Toronto and the other lake ports on both the Canadian and American sides, the route of some of them extending from Montreal to Port Arthur on Lake Superior. Railway communication is complete, three great trunk lines making the city a terminal point, viz. the Grand Trunk, the

Canadian Pacific and the Canadian Northern.

As a financial centre Toronto has made remarkable advance. The transactions on the stock exchange rival those of Montreal. The Bank of Commerce has its headquarters here, as have also

the Bank of Nova Scotia, the Bank of Toronto, the Standard Traders, Imperial, Sovereign, Dominion, Crown, United Empire, Sterling and other banks.

The name of the city is of Indian origin, meaning " a place of meeting," the site in the days before the coming of the white man being an established rendezvous among the neighbouring Indian tribes. It first appears in history in 1749 as a centre of trade when the French built a small fort and started a trading establishment called Fort Rouille. Before long, however, British traders came up from the south and entered into active rivalry with the French, and in 1793 the fort was burned by the latter to prevent its occupation by their foes. A year later Governor Simcoe transferred the seat of government of the new province of Upper Canada from the town of Newark at the mouth of the Niagara River to Toronto, giving the new capital the name of York, in honour of the second son of George III. Under its new name it made slow progress as the surrounding country was cleared and settled. The entrance to the harbour was guarded by two blockhouses; provision was made for barracks and garrison stores; buildings were erected for the legislature; and there the members of parliament, summoned by royal proclamation to " meet us in our provincial parliament in our town of York," assembled on the 1st of June 1797. Sixteen years later the population numbered only 456. The town was twice sacked in the war of 181 2. General Dearborn captured it at the head of a force of upwards of 2000. On their advance to the outworks of the garrison the magazine of the fort exploded, whether by accident or design, killing many of the invaders. The halls of legislature and other buildings were burnt and the town pillaged. On the restoration of peace the work of creating a capital for Upper Canada had wellnigh to begin anew. The organization of Upper Canada College in 1830, with a staff of teachers nearly all graduates of Cambridge, gave a great impetus to the city and province. In 1834 the population of York numbered fully 10,000; and an act of the provincial legislature conferred on it a charter of incorporation, with a mayor, aldermen and councilmen. Under this charter it was constituted a city with the , name of Toronto. Since that time the progress of the city has been rapid and

substantial, the population doubling every twenty years. In 1885 the total assessment was $69,000,000; in 1895 $146,000,000 and in 1906 $167,411,000, the rate of taxation being 185 mills.

TORPEDO. In 1805 Robert Fulton demonstrated a new method of destroying ships by exploding a large charge of gunpowder against the hull under water. No doubt then remained as to the effectiveness of this form of attack when successfully applied; it was the difficulty of getting the torpedo, as it was called, to the required position which for many years retarded its progress as a practical weapon of naval warfare. Attempts were first made to bring the explosive in contact with the vessel by allowing it to drift down to her by the action of tide or current, and afterwards to fix it against her from some form of diving boat, but successive failures led to its restriction for a considerable period to the submarine mine (q.v.) in which the explosive is stationary and takes effect only when the ship itself moves over or strikes the charge. Used in this way, it is an excellent deterrent to hostile warships forcing a harbour.

Spar or Outrigger Torpedo. — The limitations attached to the employment of submarine mines, except for coast defence, revived the idea of taking the torpedo to the ship instead of waiting for the latter to gain some exact point which she might very possibly avoid. This first took practical shape in the spar or outrigger torpedo. This consisted of a charge of explosive at the end of a long pole projecting from the bow of a boat, the pole being run out and immersed on arriving near the object. Directly the charge came in contact with the hull of the ship it was exploded by an electric battery in the boat. If the boat was not discovered and disabled while approaching, the chances were favourable to success and escape afterwards. Against a vigilant enemy it was doubtless a forlorn hope, but to brave men the venture offered considerable attractions.

Frequent use of this spar or outrigger torpedo was made during

the American Civil War. A notable instance was the destruction of the Confederate ironclad ” Albemarle ” at the end of October 1864. On this mission Lieut. Cushing took a steam launch equipped with an outrigger torpedo up the Roanoke River, in

which lay the ” Albemarle.” On arriving near the ship Cushing found her surrounded by logs, but pushing his boat over them, he immersed the spar and exploded his charge in contact with the ” Albemarle ” under a heavy fire. Ship and launch sank together, but the gallant officer jumped overboard, swam away and escaped. Submerged boats were also used for similar service, but usually went to the bottom with their crews. During the war between France and China in 1884 the ” Yang Woo ” was attacked and destroyed by an outrigger torpedo.

Locomotive Torpedoes. — Though the spar torpedo had scored some successes, it was mainly because the means of defence against it at that time were inefficient. The ship trusted solely to her heavy gun and rifle fire to repel the attack. The noise, smoke, and difficulty of hitting a small object at night with a piece that could probably be discharged but once before the boat arrived, while rifle bullets would not stop its advance, favoured the attack. When a number of small guns and electric lights were added to a ship’s equipment, success with an outrigger torpedo became nearly, if not entirely, impossible. Attention was then turned in the direction of giving motion to the torpedo and steering it to the required point by electric wires worked from the shore or from another vessel; or, dispensing with any such connection, of devising a torpedo which would travel under water in a given direction by means of self-contained motive power and machinery. Of the former type are the Lay, Sims-Edison and Brennan torpedoes. The first two — electrically steered by a wire which trails behind the torpedo— have in-sufficient speed to be of practical value, and are no longer used. The Brennan torpedo, carrying a charge of explosive, travels under water and is propelled by unwinding two drums or reels of fine steel wire within the torpedo. The rotation of these reels is communicated to the propellers, causing the torpedo to advance. The ends of the wires are connected to an engine on shore to give rapid unwinding and increased speed to the torpedo. It is steered by vary- ing the speed of unwinding the two wires. This tor- pedo was adopted by the British war office for harbour defence and the protection of narrow channels.

Uncontrolled Torpedoes.— The objection of naval officers to have any form of torpedo connected by wire to their ship during an action, impeding her free move- ment, liable to get entangled in her propellers and perhaps exploding where not desired — disadvantages which led them to discard the Harvey towing torpedo many years ago — has hitherto prevented any navy from

adopting a controlled torpedo for its sea-going fleet. The last quarter of the 19th century saw, however, great advances in the equipment of ships with locomotive torpedoes of the uncontrolled type. The Howell may be briefly described, as it has a special feature of some interest. Motive power is provided by causing a heavy steel fly-wheel inside the torpedo to revolve with great velocity. This is effected by a small special engine outside operating on the axle. When sufficiently spun up, the axle of the flywheel is connected with the propeller shafts and screws which drive the torpedo, so that on entering the water it is driven ahead and continues its course until the power stored up in the flywheel is exhausted. Now when a torpedo is discharged into the sea from a ship in motion, it has a tendency to deflect owing to the action of the passing water. The angle of deflexion will vary according to the speed of the ship, and is also affected by other causes, such as the position in the ship from which the torpedo is discharged, and its own angle with the fine of keel. Hence arise inaccuracies of shooting; but these do not occur with this torpedo, for the motion of the flywheel, acting as a gyroscope — the principle of which applied to the Whitehead torpedo is described later — keeps this torpedo on a straight course. This advantage, combined with simplicity in construction, induced the American naval authorities at one

time to contemplate equipping their fleet with this torpedo, for they had not, up to within a few years ago, adopted any loco- motive torpedo. A great improvement in the torpedo devised by Mr Whitehead led them, however, definitely to prefer the latter and to discontinue the further development of the Howell system.

The Whitehead torpedo is a steel fish-shaped body which travels under water at a high rate of speed, being propelled by two screws driven by compressed air. It carries a large charge of explosive which is ignited on the torpedo striking any hard substance, such as the hull of a ship. The body is divided into three parts. The foremost portion or head contains the explo- sive — usually wet gun-cotton — with dry primer and mechanical igniting arrangement; the centre portion is the air chamber or reservoir, while the remaining part or tail carries the engines, rudders, and propellers besides the apparatus for controlling depth and direction. This portion also gives buoyancy to the torpedo.

When the torpedo is projected from a ship or boat into the water

a lever is thrown back, admitting air into the engines causing the propellers to revolve and drive the torpedo ahead. It is desirable that a certain depth under water should be main- tained. An explosion on the surface would be deprived of the greater part of its effect, for most of the gas generated would escape into the air. Immersed, the water above confines the liberated gas and compels it to exert all its energy against the bottom of the ship. It is also necessary to correct the tendency to rise that is due to the torpedo getting lighter as the air is used up, for compressed air has an appreciable weight. This is effected by an ingenious apparatus long maintained secret. The general principle is to utilize the pressures due to different depths of water to actuate horizontal rudders, so that the torpedo is automatically directed upwards or downwards as its tendency is to sink or rise.

The efficiency of such a torpedo compared with all previous types was clearly manifest when it was brought before the maritime states by the inventor, Whitehead, and it was almost universally adopted. The principal defect was want of speed — which at first

Speed Z9 Knots to 800 Metres

Charge — 133 Lbs wet Gun Cotton !Heieht-....llbO Lbs.

18-INCH TORPEDO

fc

« n

Speed 30 Knots to GOO Yds.

Charge~..H5 LbsofVlet GunCoH-on 14-INCH TORPEDO. Weight— 706 Lbs

l4 – 7 021— *!

FlG. I. — Diagrams of 14- and 18-in. Torpedoes, did not exceed 10 knots an hour — but by the application of Brother- hood's 3-cylinder engine the speed was increased to 18 knots— a great advance. From that time continuous improvements have resulted in speeds of 30 knots and upwards for a short range being obtained. For some years a torpedo 14 ft. long and 14 in. in diameter was considered large enough, though it had a very limited effective range. For a longer range a larger weapon must be employed capable of carrying a greater supply of air. To

obtain this, torpedoes of 18 in. diameter, involving increased length and weight, have for some time been constructed, and have taken the place of the smaller torpedo in the equipment of warships. This advance in dimensions has not only given a faster and steadier torpedo, but enabled such a heavy charge of gun-cotton to be carried that its explosion against any portion of a ship would inevit- ably either sink or disable her. The dimensions, shape, &c, of the 14- and 18-in. torpedoes are shown in fig. 1. A limited range was still imposed by the uncertainty of its course under water. The speed of the ship from which it was discharged, theangle with her keel at which it entered the water, and the varying velocity of impulse, tended to error of flight, such error being magnified the farther the path of the torpedo was prolonged. Hence 800 yds. was formerly considered the limit of distance within which the torpedo should be discharged at sea against an object from a ship in motion.

In these circumstances, though improvements in the manufacture of steel and engines allowed of torpedoes of far longer range being

made (the fastest torpedo up to 1898 having a speed of 29 knots for 800 yds.), it was of no advantage to make them, as they could not be depended upon to run in a straight line from a stationary point for more than 800 yds., while from a ship in motion good practice could only be ensured at a reduced range. It was obvious, therefore, that to increase the effective range of the torpedo, these errors of direction must be overcome by some automatic steering arrangement. Several inventors turned their attention to the subject, nearly all of whom proposed to utilize the principle of the gyroscope for the purpose. The first which gave any satisfactory results was an apparatus devised by Ludwig Obry — an engineer in Austria — and tried by the Italian government about 1896. These trials demonstrated the feasibility of accurately and auto- matically steering a torpedo in a direct line by this means. Messrs Whitehead & Co., of Fiume, then acquired the invention, and after exhaustive experiments produced the apparatus which’ is now fitted to every torpedo made. It is based on the principle that a body revolving on a free axis tends to preserve its plane of rotation. A gyroscope with plane of rotation parallel to the vertical axis of the torpedo will

have an angular motion if the torpedo is diverted from its original course. This angular motion is employed to actuate the steering mechanism by operating an air motor connected with the rudders, and keeping the torpedo in the line of discharge. The apparatus consists of a flywheel caused to rotate by a spring, the barrel on which the latter is wound having a segmental wheel which gears into a toothed pinion spindle of the flywheel. Owing to the diameter of the segment being much greater than the pinion, a rapid rotatory motion is imparted. The spring is wound up by a key from outside the torpedo, and kept in tension until the pro- jectile is discharged, when the spring is released by the air lever being thrown back, which admits air to the engine; the gyroscope is then freed and set in motion with its plane in the plane of the vertical axis of the torpedo as it was in the launching tube.

Assuming now that the course of the torpedo is diverted by any cause, its axis will move or perform a certain angular motion with regard to the plane of the flywheel, which will have the same result as if we consider the conditions reversed, i.e. as if the plane of rotation of the flywheel were altered and that of the axis of the torpedo remained the same. The axis of the flywheel performs a relative angular motion which it imparts to a crank actuating a servo-motor worked by compressed air, and connected with the rudders of the torpedo, moving them in the opposite direction to that in which the torpedo was diverted from its original course. Thus all inaccuracies of flight due to errors of adjustment, mis- calculation of deflexion, or even damage to some part, are elimin- ated. As long as the gyroscope is in good order the torpedo is bound to run in the line it was pointing when the flywheel was started. It is placed in the after-body of the torpedo, as indicated in fig. 2.

limited by the strength of the engines and other parts. Improve- ments in steel manufacture have permitted the use of much higher pressures of air and the construction of air-chambers able to with- stand the pressure of 2000 lb to the sq. in. with the same weight of air-chamber. This has enabled increased range without reduction in speed to be attained, or conversely, increased speed at shorter ranges. By improvement in the engines which are now of the Brotherhood 4-cylinder central crank type further gains have been effected.

Having reached the limit of pressure and endurance of air-chambers with present materials without undue increase of

weight, the designer had to seek additional energy in another direction. Now the energy obtainable from a given weight of compressed air is dependent upon the volume of air available at the working pressure of the engines. At a constant pressure this volume of air is proportionate to its absolute temperature. If then the air be stored cold and highly heated before delivery to the engine the available energy from a given weight will be greatly increased. By this means we obtain the equivalent of a larger and heavier air-chamber without the increased weight such would involve.

As originally used a quantity of hydrocarbon fuel was placed in the air-vessel. Upon discharging the torpedo this fuel was; automatically ignited and the contents of the air-chamber were heated. Unless, however, the combustion could be regulated there were serious risks of abnormal pressures, of overheating and weakening the air-vessel. Devices have been applied to overcome this liability, and other methods devised to obtain the same result.

By the use of heating and thereby increasing the volume of air in proportion to the rise of temperature the extra volume will allow of an increased speed for a given range or a greater range without increase of speed. The limit to the development of this system seems to be the temperature the materials will stand, but even at this early stage it has added several knots to the speed of this wonderful weapon.

Torpedo Carriages and Discharge. — As no gun which is inefficiently mounted can give good results, so the best torpedo is valueless without a good carriage or system of discharge. In the darly days of the Whitehead, discredit came upon it because the importance of this was not sufficiently realized; and an erratic course under water was in nine cases out of ten due to a crude method of dis- charge. A delicate piece of mechanism was dropped into the water from a height of several feet, and naturally suffered Internal derange- ment. Gun-ports were then used for the purpose, but now a special orifice is made, to which the torpedo carriage is fitted with a ball- and-socket joint — forming a water-tight aperture— so that this carriage or tube may be only 2 or 3 ft. above the water-line. The ball-and-socket joint enables it also to have a considerable angle of training. Originally the torpedo was pushed out by a rod acted upon by compressed air, in which case the carriage was a

Fig. 2. — Arrangement The efficiency of the Whitehead torpedo has thus been enormously increased, and more accurate practice can now be made at 2000 yds. than was formerly possible at 800 yds. This adds con- siderably to the chances of torpedrj-boats attacking ships, even in day-time, at sea or at anchor, and will render further protection necessary against this weapon. Against a ship in motion there is still, however, the calculation as to her speed and the distance she will travel before the torpedo reaches her. Should this be mis- calculated, an increased range for torpedoes will magnify the error. For instance, a 30-knot torpedo will travel 1000 yds. in a minute. If aimed at a ship on the beam assumed to be steaming 15 knots an hour, to reach her when 1000 yds. distant the- torpedo must be discharged at a point 500 yds. ahead of her. But if the ship is actually steaming 12 knots, she will have travelled only 400 yds. in the minute, and the torpedo will be 100 yds. in advance of her. If discharged at a range of 500 yds., such a miscalculation causes an error of only 50 yds. or 150 ft. But if the object is 300 tt. long, and her centre was taken as the target, her bow would be just at the spot the torpedo would reach in thirty seconds. It would seem, therefore, that increased velocity of torpedo is necessary before the full advantages of the gyroscope can be realized. Now the range of the torpedo is entirely dependent upon the store of energy which can be carried; upon, therefore, the capacity of the air reservoir, the maximum pressure it can stand, and on the effici- ency of the propelling engines. The speed over a given range is also dependent upon these factors; the maximum speed being

of Gyroscope in Torpedo, simple frame. The rod, pressing against the tail with some force, was apt to damage or disarrange the rudders, so the air-gun took the place of rod impulse. Here the torpedo fits closely in a tube or cylinder with an opening at the rear made air-tight when closed. At the desired moment compressed air is admitted to the rear part of the cylinder and blows the torpedo out. Gunpowder then superseded air for this operation; and now this has given place to a small charge of cordite, which does not leave any deposit on the inside of the cylinder. There is a double risk in the use of locomotive torpedoes from above water. (1) The charge may be exploded by hostile fire. Though mainly consisting of damp gun-cotton, which is not readily ignited, the dry primer and detonator may be struck, which would lead to a disastrous explosion. (2) The air-chamber is also a source of danger. As it contains air compressed to a high degree of tension, experiments have shown that if

struck by a small shell it may burst with great violence ; and as ˆt offers a considerable mark, this is not an improbable event in an action. An instance of the danger of above-water torpedo tubes occurred in the Spanish-American War at the battle of Santiago. A shell entered the ” Almirante Oquendo ” and struck a 14-in. torpedo in the tube. The charge detonated, causing a fearful explosion and practically wrecking that part of the vessel. The develop- ment of moderate-sized quick-firing guns has increased this risk. Hence we find the use of above-water torpedo tubes now mainly confined to torpedo and other craft too small for submerged discharge.

Submerged Discharge. — The risk attached to having loaded torpedoes above the water-line — independently of the fact that to get the best result they should start in the element to which they belong — has given great impetus to the system of submerged

Gun end Torpedo ready to fire

VERTICAL SECTION

and tube into the ship again, so that practically the whole operation

is one motion.

Fig. 3 will further explain this apparatus. A is the outer tube;

B the inner tube; C the shield; D torpedo; E explosion chamber for cordite charge placed at K ; F pipe for gas to pass into outer tube ; G and Y doors of inner and outer tube ; J the valve which opens automatically when inner tube arrives at position shown in fig. 2 ; T and P appliance for running the tube in and out by hand when desired ; arrangement for bringing whole apparatus back for repair, &c. ; M and N sluice- valve and handle; R, r\ r 2 , r 3 , for draining tubes before torpedo is put in ; X indicator showing position of inner tube.

Torpedoes have been discharged from this apparatus with successful result from a ship steaming at 17! knots.

The advantage of cordite over compressed air for impulse is that it requires no attention : when a charge

PLAN VIEW

Fig. 3. — Broadside Submerged 18-in. Torpedo Tube.

discharge. From the earliest days of the weapon this has been employed to some extent. But it was principally in the direction of right-ahead fire, by having an orifice in the stem of the ship under water, t* which a torpedo tube was connected. The tactical idea was thus to supplement attack with the ram, so that if the vessel endeavouring to ram saw that the object would evade this attack, she could project a torpedo ahead, which, travelling faster than the vessel, might as effectually accomplish the required service. The stem orifice had a water-tight cover, which was removed on the torpedo being placed in the tube and the inner door closed; then, sufficient impulse being imparted to eject the torpedo, and its machinery being set in motion at the same time, it darted forward towards the enemy. There is, however, some risk of the ship using a torpedo in this manner striking it before the missile has gathered the necessary impetus from its propellers to take it clear of the vessel. The system, moreover, has the disadvantage of weakening the ram, the construction of which should be of immense strength. There is the further liability of ramming with a torpedo in the bow tube, which would be as disastrous to friend as foe. This method of submerged discharge has therefore given place to ejecting the torpedo from the broadside. Considerable difficulty attached to getting the torpedo clear of the ship from this position without injury, especially when the vessel was proceeding at speed. The natural tendency of the passing water acting on the head of the torpedo as it emerged was to give a violent wrench and crush the rear end before that portion could clear the aperture. To prevent this the torpedo must be held rigid in the line of projection until the tail is clear of the ship. This is thus effected. Besides the tube with the aperture in side of the ship under water, fitted with sluice-valve, all broadside submerged discharge apparatus possess the following features: A shield is pushed out from the ship’s side. In this shield there are grooves of some form. Guides on the torpedoes fit and run in these grooves. When discharged the torpedo is thus supported against the streams of passing water, and guided so that its axis continues in the line of projection until the tail is clear of the side, the shield being of such length that this occurs at the same time that the guides on

the torpedo leave the grooves in the shield. An apparatus on this principle has been fitted to a number of ships of the British navy, and gives good results at high rates of speed. It has the defect that the shield must be run out previous to the torpedo being discharged, and brought back afterwards, thus involving three separate operations, each performed by compressed air.

In the broadside submerged discharge, designed, constructed and supplied to many foreign navies by Messrs Armstrong of the Elswicli works, the three operations are combined in one. There is an outer tube as before, but it contains an inner tube carrying the torpedo. Fized to this tube, and prolonging it, is the shield fitted with grooves. Both tubes have a door at the rear — made air- tight when closed — by which the torpedo is entered. A charge of cordite is used for ejection instead of compressed air, the gas from which entering the outer cylinder first forces the inner tube out, and then by means of a valve in the door of the inner tube passes in and blows out water and torpedo together, the shield supporting the latter until the tail is clear of the ship. By this time the cordite gas has expanded and cooled so as to relieve the pressure in rear; this causes the pressure of the water outside to push the shield

is placed in the explosion chamber, and a torpedo is in the tube, all is in readiness for firing when desired, without further attention in the torpedo-room. The cordite is fired by electricity from the conning-tower; the officer, therefore, having ascertained that all is ready below, has only to press a button when the object is in the required position. Automatic indications are given in the conning- tower when the sluice-valve is opened and when all is in readiness for firing.

This method of discharging torpedoes from the broadside under water eliminates the principal danger of the system, which required the shield to be put into position beforehand. It was then liable to be struck and distorted by passing wreckage without the fact being apparent to those in the ship. On the discharge of a torpedo its course might thus be arrested, or possibly the charge be pre- maturely exploded in dangerous proximity to its own ship. There was a risk of getting the shield out too soon, and thereby exposing it unduly to injury, or leaving the operation until too late. The tendency of naval equipment being towards complication, any readjustment which makes for simplicity cannot be otherwise than beneficial, and this feature is especially desirable in all matters connected with the use of

torpedoes.

The compartment containing the broadside submerged apparatus usually extends across the ship, so as to contain a tube for each side.

Use in War. — This has been mainly confined to attacks upon squadrons and single ships by torpedo craft of various types. At the battle of Yalu, between the Chinese and Japanese fleets, torpedoes were discharged by the former, but none took effect. The Japanese trusted solely to gun-fire. After the defeat of the Chinese at sea, their remaining ships took refuge in the harbour of Wei-hai-Wei. Here they were blockaded by the Japanese fleet, which, having a number of torpedo-boats, made several determined attacks upon the ships inside. After one or two attempts, foiled by the obstructions placed by the Chinese to bar the passage, the Japanese boats succeeded in torpedoing several ships, and thus expedited the reduction of the place. In the war between Spain and the United States the inferiority of Admiral Cervera's squadron to that under Admiral Sampson might at the battle of Santiago have been to some extent counterbalanced by a skilful and vigorous use of torpedoes. If, instead of striving only to escape, a bold dash had been made for the American ships, the Spanish cruisers rapidly approaching end on to the foe, enveloped in the smoke of their own guns, should — some at least — have got within torpedo range without fatal injury. Closing each other at a speed of 10 knots only they would cover an interval of 6000 yds. in 9 minutes — a short time in which to disable a ship by gun-fire under such conditions. But Cervera elected to offer a passive resistance only, and while suffering destruction wrought no material injury upon his opponents. On the other hand, there have been

several instances of large warships being sunk by locomotive torpedoes discharged from small craft. During the Chilean revolutionary war of 1891, a battleship, the " Blanco Encalada," of 3500 tons, was attacked in Caldera Bay by two torpedo vessels — the " Lynch " and " Condell " — of 750 tons. They entered the bay at dawn, the " Condell " leading. This vessel fired three torpedoes which missed the ironclad; then the " Lynch," after one ineffective shot, discharged a second torpedo, which struck

the ” Blanco ” on the side, nearly amidships. The latter had opened fire with little result, and sank soon afterwards. A similar incident occurred in 1894, when the Brazilian ironclad ” Aquidaban ” was sunk in Catherina Bay by the ” Sampaio ” — a torpedo vessel of 500 tons. She entered the bay at night, and first discharged her bow torpedo at the ironclad, which missed; she then fired a broadside torpedo, which struck and exploded against the bow of the ” Aquidaban.” It caused a great shock on board, throwing an officer on the bridge into the water. The vessel sank soon afterwards, and the “Sampaio” escaped uninjured.

In the war (1904-5) between Russia and Japan the Whitehead torpedo did not exercise an important influence upon the naval operations. It scored a success at the beginning of the struggle when a Japanese torpedo-flotilla made an attack upon the Russian fleet lying at anchor outside Port Arthur. For some unaccountable reason, though war was imminent, little or no precautions seemed to have been taken for effectually guarding the vessels. They had no nets in position nor boats patrolling outside them. Thus taken by surprise when the Japanese torpedo-boats suddenly appeared about midnight on the 8th of February 1904, several Russian ships were struck by torpedoes before they could offer any resistance. The most damaged were the ” Retvisan ” and ” Tsarevitch ” (battleships) and ” Pallada ” (cruiser), but all managed to get into Port Arthur and were eventually repaired. With three ships hors de combat the Russian fleet was considerably weakened at an early stage. The loss of the ” Petropavlovsk ” in April from a mine explosion was a further discouragement, especially as with this ship went down the gallant and energetic Admiral Makarov. In these circumstances the Russian fleet could not assume the offensive nor prevent the Japanese troops being sent by sea to invest Port Arthur. In June when the injured vessels were fit for service again the fleet put to sea but returned the same evening. The incident is noteworthy only because it led to an attack by the Japanese torpedo craft on the retiring squadron after sunset. As illustrating the uncertainty of hit- ting a moving object at sea with the Whitehead torpedo, already mentioned, no vessels were struck on this occasion and they reached the anchorage uninjured. In the battle of Tsushima the Japanese torpedo-boats attacked the Russian fleet after its disablement by gun-fire and gave the coup de grdce to some of the ships, which had little power of resistance owing to the destruction of their light armament. This war, therefore, did not

increase to any extent our knowledge of the actual capability of this weapon.

Effect upon Naval Tactics: Blockade. — It has often been assumed that steam and the torpedo will in future render blockade impossible as it was carried out in .the old wars; that, no longer dependent upon the wind to allow egress from the blockaded port, a vessel using steam can emerge when she chooses, while the fear of torpedo attack will deter a blockading squadron from keeping such watch as to foil the attempt. As regards the power conferred by steam, it will be no less advan- tageous to a blockading squadron, enabling it to maintain its position, whereas sailing ships were often driven by gales to leave their station and seek a port. This gave opportunities for the blockaded vessels to escape. As regards torpedo-boats, they would no doubt be a danger to a blockading squadron unpro- vided with a means of defence against these craft. Such defence consists in an adequate number of small vessels interposing an in-shore squadron between the port and the main body outside. Thus they perform the twofold service of watching the enemy's movements within and frustrating a torpedo attack. As an

instance of blockade under modern conditions, we have that of Admiral Sampson upon Santiago — a guard more rigidly maintained than any in the old wars. So little was he deterred by the knowledge that' Admiral Cervera had two torpedo vessels in his force, that he drew his squadron closer in at night when an attack might be expected, actually illuminating the entrance of the harbour with his electric searchlights, so that no craft could come out unperceived. No attempt was made to ' dislodge him from that position, and we may assume that blockade, if required in any scheme of naval strategy, will be carried out, whatever the weapons of warfare.

As regards the effect of torpedoes upon tactics at sea, and in general, as well as single ship, actions, they must operate against close range and employment of the ram. If it is recognized that a vessel within 1000 yds. is liable to a fatal blow, she will endeavour in ordinary circumstances to keep outside that distance and rely upon gun-fire. The exception would be where she is overmatched in that respect, and hence might endeavour to restore the balance by the use of torpedoes. In a fleet action the danger of missing a foe and hitting a friend would restrict the discharge of torpedoes; and this risk increases as formations disappear. But the torpedo must be conceded a tactical

superiority over the ram for the following reasons: A vessel to use the latter must come within torpedo range, while her adversary may successfully apply torpedoes without placing herself in any danger of being rammed. The ram can only be used in one direction, and a small miscalculation may cause disaster. If a vessel has, more than one position from which torpedoes can be discharged, she is not confined as regards attack to a single bearing or direction.

In action we may consider the speed of the torpedo as double that of the ship, and since against a moving object allowance must be made for the space traversed while ram or torpedo is travelling towards it, the faster weapon is less affected in its chance of successful impact by change of direction and speed of the object at the last moment. Lastly, with machinery disabled a ship is powerless to use the ram, but can avert a ram attack with her torpedoes. The movements of squadrons or single ships on entering an action are not likely to be influenced by any contemplated immediate use of torpedoes, for the gun must remain the primary weapon, at any rate at the first onset. Commanders would hardly risk being crushed by gun-fire before getting within torpedo range. Having faith in the efficiency of their ordnance and the gunnery skill of their crew, they would first manoeuvre to bring these into play. Tactics for torpedo attack in such circumstances have not therefore been laid down, and it is only necessary to consider the positions which are advantageous for the use of this weapon, and, conversely, what should be avoided when a vessel, finding herself overmatched in gunnery, seeks to redress the balance with torpedoes.

Size of Target. — This, with a ship, varies in length as the torpedo approaches end on to the vessel, or at angle to the line of keel ; the greatest being' when the path of both forms a right angle. Hence the object is to place your ship where it presents the former condition to the enemy, while he affords the larger target. It must be remembered that, owing to the comparatively slow velocity of the torpedo, it must be aimed not directly at a ship in motion — like a shot from a gun — but at a point ahead which the ship will reach after the torpedo has traversed the intervening distance. Thus speed of object has to be estimated, and hence the importance of adding to the velocity of the torpedo and getting a broadside shot so as to reduce as much as possible errors of calculation. The great increase of the dimensions of warships, especially in length, which now has reached 500 ft., adds to the chances of a successful hit with

torpedoes, and will doubtless tend to diminish a desire in future naval tactics to close inside torpedo range for the purpose of ramming.

Range. — Though the effective range of a torpedo discharged from a ship or torpedo vessel against a single object moving at high speed may be considered as approximately within 1000 yds. this limit of distance is considerably augmented where the target consists of several vessels at sea in close order, or is that afforded by a fleet at anchor. In the first case it may be worth while to discharge torpedoes from a distance of two or three thou- sand yards at the centre of the line for the chance of hitting one of the vessels composing it. As regards a mass of ships at anchor.

unless protected by an impenetrable guard such as a breakwater or some invulnerable defence carried by the ships themselves, the increased range and accuracy of the torpedo imparted by recent developments would give it a chance of success if discharged against such a target at even greater distance.

Finally, by improvements in construction and methods of dis- charge the torpedo has recovered the place it was rapidly losing a few years ago. As armour receives increased resisting power to above-water projectiles, and gets on a level again with the gun, more attention will be given to under-water attack, against which no adequate protection has yet been devised. Thus we shall probably find the torpedo taking a very prominent place in any future war between the great maritime powers. (S. M E.-W.)

TORQUAY, a municipal borough, seaport and watering place, in the Torquay parliamentary division of Devonshire, England, on Tor Bay of the English Channel, 26 m. S. of Exeter, by the Great Western railway. Pop. (1901), 33,625. Owing to the beauty of its site and the equability of its climate, and to its being screened by lofty hills on the north, east and west, and open to the sea- breezes of the south, it has a high reputation as a winter residence. The temperature seldom rises as high as 70° F. in summer or falls below freezing-point in winter. To the north lies the populous suburb of St Mary Church. There are some remains of Tor or Torre Abbey, founded for Praemonstratensians by William, Lord Brewer, in 1196. They stand north of the modern

mansion, but, with the exception of a beautiful pointed arch portal, are of small importance. On the south of the gateway is a 13th-century building, known as the Spanish barn. On Chapel Hill are the remains of a chapel of the 12th century, dedicated to St Michael, and supposed to have formerly belonged to the abbey. St Saviour's parish church of Tor-Mohun, or Tor- moham, an ancient stone structure, was restored in 1874. The old church at St Mary Church, north of Torquay, was rebuilt in Early Decorated style; and in 1871 a tower was erected as a memorial to Dr Phillpotts, bishop of Exeter, who with his wife is buried in the churchyard. St John's Church, by G. E. Street, is a fine example of modern Gothic. Among the principal buildings and institutions are the town-hall, museum of the natural history society, theatre and opera-house (1880), market, schools of art and science, the Torbay infirmary and dispensary, the Western hospital for consumption, Crypt House institution for invalid ladies and the Mildmay home for incurable consumptives. The control of the harbour, piers, pleasure grounds, &c, was acquired from the lord of the manor by the local board in 1886. The harbour has a depth of over 20 ft. at low water. The principal imports are coal, timber and slates, and the principal export stone of the Transition limestone or Devonshire marble. In the town are a number of marble-polishing works. Terra-cotta ware of fine quality is also manufactured from a deposit of clay at Watcombe and at Hele. The town is governed by a mayor, 9 aldermen and 27 councillors. Area, 3588 acres.

There was a village at Torre even before the foundation of the abbey, and in the neighbourhood of Torre evidence has been found of Roman occupation. The manor was granted by William the Conqueror to Richard de Bruvere or de Brewere, and was subsequently known as Tor Brewer. After the defeat of the Spanish Armada, Don Pedro's galley was brought into Torbay; and William, prince of Orange, landed at Torbay on the 5th of November 1688. Until the middle of the 19th century it was an insignificant fishing village. It was incorporated in 1892.

TORQUE, or Torc (Lat. torquis, torques, a twisted collar, torquere, to twist), the term given by archaeologists to the twisted collars or armlets of gold or other metal worn particularly by the ancient Gauls and other allied Celtic races. The typical torque is a circlet with twisted rope-like strands, the ends not joined together; the torque was usually worn with the opening in the front as seen in a figure of a Gaul in a sculptured sarcophagus in the Capitoline Museum at Rome. In mechanics,

the term " torque " is used of the turning-moment of a system-force, as in a series dynamo.

TORQUEMADA, JUAN DE (1388-1468), or rather Johannes de Turrecremata, Spanish ecclesiastic, was born at Valladolid,

in 1388, and was educated in that city. At an early age he joined the Dominican order, and soon distinguished himself for learning and devotion. In 1415 he accompanied the general of his order to the Council of Constance, whence he proceeded to Paris for study, and took his doctor's degree in 1423. After teaching for some time in Paris he became prior of the Dominican house first in Valladolid and then in Toledo. In 143 1 Pope Eugenius IV. called him to Rome and made him " magister sancti palatii." At the Council of Basel he was one of the ablest supporters of the view of the Roman curia, and he was rewarded with a cardinal's hat in 1439. He died at Rome on the 26th of September 1468.

His principal works are In Gratiani Decretum commentarii (4 vols., Venice, 1578) ; Exposilio brevis et utilis super toto psalterio (Mainz, 1474) ; Quaestiones spirituales super evangelia totius anni (Brixen, 1498); Summa ecclesiastica (Salamanca, 1550). The last- named work has the following topics: (1) De universa ecclesia; (2) De Ecclesia romana et pontificis primatu ; (3) De universali- bus conciliis; (4) De schismaticis et hacreticis. His De conceplione deiparae Mariae, libri viii. (Rome, 1547), was edited with preface and notes by E. B. Pusey (London, 1869 seq.).

TORQUEMADA, THOMAS (1420-1498), inquisitor-general of Spain, son of Don Pedro Ferdinando, lord of Torquemada, a small town in Old Castile, was born in 1420 at Valladolid during the reign of John II. Being nephew to the well-known cardinal of the same name, he early displayed an attraction for the Dominican order; and, as soon as allowed, he joined the Friars Preachers in their convent at Valladolid. His biographers state that he showed himself from the beginning very earnest in austere life and humility; and he became a recognized example of the virtues of a Dominican. Valladolid was then the capital, and in due course eminent dignities were offered to him, but he gave signs of a determination to lead the simple life of a Friar Preacher, In the convent, his modesty was so great that he refused to accept the doctor's degree in theology, which is the highest prized honour in the order. His superiors, however, obliged him to take the priorship of the convent of Santa Cruz in Segovia, where he ruled for twenty-two years. The royal family, especially the queen and

the infanta Isabella, often stayed at Segovia, and Torquemada became confessor to the infanta, who was then very young. He trained her to look on her future sovereignty as an engagement to make religion respected. Esprit Flechier, bishop of Nimes, in this Histoire du cardinal Jimenes (Paris, 1693), says that Torquemada made her promise that when she became queen she would make it her principal business to chastise and destroy heretics. He then began to teach her the political advantages of religion and to prepare the way for that tremendous engine in the hands of the state, the Inquisition.

Isabella succeeded to the throne (1474) on the death of Henry IV. Torquemada had always been strong in his advice that she should marry Ferdinand of Aragon and thus consolidate the kingdoms of Spain. Hitherto he had rarely appeared at court; but now the queen entrusted him not only with the care of her conscience, but also with the benefices in the royal patronage. He also helped her in quieting Ferdinand, who was chafing under the privileges of the Castilian grandees, and succeeded so well that the king also took him as confessor. Refusing the rich see of Seville and many other preferments he accepted that of councillor of state. For a long time he had pondered over the confusion in which Spain was, which he attributed to the intimate relations allowed between Christians and infidels for the sake of commerce. He saw Jews, Saracens, heretics and apostates roaming through Spain unmolested; and in this lax toleration of religious differences he thought he saw the main obstacle to the political union of the Spains, which was the necessity of the hour. He represented to Ferdinand and Isabella that it was essential to their safety to reorganize the Inquisition, which had since the 13th century (1236) been established in Spain. The bishops, who were ex officio inquisitors in their own dioceses, had not succeeded in putting a stop to the evils, nor had the friars, by whom they had been practically superseded. By the middle of the 15th century there was

hardly an active inquisitor left in the kingdom. In 1473 Torquemada and Gonzalez de Mendoza, archbishop of Toledo, approached the sovereigns. Isabella had been for many years prepared, and she and Ferdinand, now that the proposal for this new tribunal came before them, saw in it a means of over-

coming the independence of the nobility and clergy by which the royal power had been obstructed. With the royal sanction a petition was addressed to Sixtus IV. for the establishment of this new form of Inquisition; and as the result of a long intrigue, in 1479 a papal bull authorized the appointment by the Spanish sovereigns of two inquisitors at Seville, under whom the Dominican inquisitions already established elsewhere might serve. In the persecuting activity that ensued the Dominicans, " the Dogs of the Lord " {Domini canes), took the lead. Commissaries of the Holy Office were sent into different provinces, and ministers of the faith were established in the various cities to take cogni- sance of the crimes of heresy, apostasy, sorcery, sodomy and polygamy, these three last being considered to be implicit heresy. The royal Inquisition thus started was subversive of the regular tribunals of the bishops, who much resented the innovation, which, however, had the power of the state at its back.

In 1481, three years after the Sixtine commission, a tribunal was inaugurated at Seville, where freedom of speech and licence of manner were rife. The inquisitors at once began to detect errors. In order not to confound the innocent with the guilty, Torquemada published a declaration offering grace and pardon to all who presented themselves before the tribunal and avowed their fault. Some fled the country, but many (Mariana says 17,000) offered themselves for reconciliation. The first seat of the Holy Office was in the convent of San Pablo, where the friars, however, resented the orders, on the pretext that they were not delegates of the inquisitor-general. Soon the gloomy fortress of Triana, on the opposite bank of the Guadalquivir, was prepared as the palace of the Holy Office; and the terror-stricken Sevil- lianos read with dismay over the portals the motto of the Inquisition: " Exsurge, Domine, Judica causam tuam, Capite nobis vulpes." Other tribunals, like that of Seville and under La Supremo., were speedily established in Cordova, Jaen and Toledo. The sovereigns saw that wealth was beginning to flow in to the new tribunals by means of fines and confiscations; and they obliged Torquemada to take as assessors five persons who would represent them in all matters affecting the royal prerogatives. These assessors were allowed a definite vote in temporal matters but not in spiritual, and the final decision was reserved to Torquemada himself, who in 1483 was appointed the sole inquisitor-general over all the Spanish possessions. In the next year he ceded to Diego Deza, a Dominican, his office of

confessor to the sovereigns, and gave himself up to the congenial work of reducing heretics. A general assembly of his inquisitors was convoked at Seville for the 29th of November 1484; and there he promulgated a code of twenty-eight articles for the guidance of the ministers of the faith. Among these rules are the following, which will give some idea of the procedure. Heretics were allowed thirty days to declare themselves. Those who availed themselves of this – grace were only fined, and their goods escaped confiscation. Absolution in foro externo was forbidden to be given secretly to those who made voluntary confession; they had to submit to the ignominy of the public auto-de-fe. The result of this harsh law was that numerous applications were made to Rome for secret absolution; and thus much money escaped the Inquisition in Spain. Those who were reconciled were deprived of all honourable employment, and were forbidden to use gold, silver, jewelry, silk or fine wool. Against this law, too, many petitions went to Rome for rehabilitation, until in 1498 the Spanish pope Alexander VI. granted leave to Torquemada to rehabilitate the condemned, and withdrew practically all concessions hitherto made and paid for at Rome. Fines were imposed by way of penance on those confessing willingly. If a heretic in the Inquisition asked for absolution, he could receive it, but subject to a life imprisonment; but if his repentance were but feigned he could be at once

condemned and handed over to the civil power for execution. Should the accused, after the testimony against him had been made public, continue to deny the charge, he was to be Condemned as impenitent. When serious proof existed against one who denied his crime, he could be submitted to the question by torture; and if under torture he avowed his fault and confirmed his guilt by subsequent confession he was punished as one convicted; but should he retract he was again to be submitted to the tortures or condemned to extraordinary punishment. This second questioning was afterwards forbidden; but the prohibi- tion was got over by merely suspending and then renewing the sessions for questioning. It was forbidden to communicate to the accused the entire copy of the declaration of the witnesses. The dead even were not free from the Holy Office; but processes could be instituted against them and their remains subjected to punishment. But along with these cruel and unjust measures there must be put down to Torquemada's credit some advanced ideas as to prison life. The cells of the Inquisition were, as a rule,

large, airy, clean and with good windows admitting the sun. They were, in those respects, far superior to the civil prisons of that day. The use of irons was in Torquemada's time not allowed in the Holy Office; the use of torture was in accordance with the practice of the other royal tribunals; and when these gave it up the Holy Office did so also.

Such were some of the methods that Torquemada introduced into the Spanish Inquisition, which was to have so baneful an effect upon the whole country. During the eighteen years that he was inquisitor-general it is said that he burnt 10,220 persons, condemned 6860 others to be burnt in effigy, and reconciled 97,321, thus making an average of some 6000 convictions a year. These figures are given by Llorente, who was secretary of the Holy Office from 1790 to 1792 and had access to the archives; but modern research reduces the list of those burnt by Torque- mada to 2000, in itself an awful holocaust to the principle of intolerance. The constant stream of petitions to Rome opened the eyes of the pope to the effects of Torquemada's severity. On three separate occasions he had to send Fray Alfonso Badaja to defend his acts before the Holy See. The sovereigns, too, saw the stream of money, which they had hoped for, diverted to the coffers of the Holy Office, and in 1493 they made com- plaint to the pope; but Torquemada was powerful enough to secure most of the money for the expenses of the Inquisition. But in 1496, when the sovereigns again complained that the inquisitors were, without royal knowledge or consent, disposing of the property of the condemned and thus depriving the public revenues of considerable sums, Alexander VI. appointed Jimenes to examine into the case and make the Holy Office disgorge the plunder.

For many years Torquemada had been persuading the sove- reigns to make an attempt once for all to rid the country of the hated Moors. Mariana holds that the founding of the Inquisi- tion, by giving a new impetus to the idea of a united kingdom, made the country more capable of carrying to a satisfactory ending the traditional wars against the Moors. The taking of Zahaia in 148 1 by the enemy gave occasion to reprisals. Troops were summoned to Seville and the war began by the siege of Alhama, a town eight leagues from Granada, the Moorish capital. Torquemada went with the sovereigns to Cordova, to Madrid or wherever the states-general were held, to urge on the war; and he obtained from the Holy See the same spiritual favours that had been enjoyed by the Crusaders. But he did not forget his favourite work of ferreting out heretics; and his ministers of the

faith made great progress over all the kingdom, especially at Toledo, where merciless severity was shown to the Jews who had lapsed from Christianity. The Inquisition, although as a body the clergy did not mislike it, sometimes met with furious opposition from the nobles and common people. At Valentia and Lerida there were serious conflicts. At Saragossa Peter Arbue, a canon and an ardent inquisitor, was slain in 1485 whilst praying in a church; and the threats against the hated Torquemada made him go in fear of his life, and he never went abroad without an escort of forty familiar*

of the Holy Office on horseback and two hundred more on foot. In 1487 he went with Ferdinand to Malaga and thence to Valladolid, where in the October of 1488 he held another general congregation of the Inquisition and promulgated new laws based on the experience already gained. He then hurried back to Andalusia where he joined the sovereigns, who were now besieging Granada, which he entered with the conquering army in January 1492 and built there a convent of his order.

The Moors being vanquished, now came the turn of the Jews. In 1490 had happened the case of El Santo nifto de la Guardia — a child supposed to have been killed by the Jews. His existence had never been proved; and in the district of Guardia no child was reported as missing. The whole story was most probably the creation of imaginations stimulated by torture and despair, unless it was a deliberate fiction set forth for the purpose of provoking hostility against the Jews. For a long time Torquemada had tried to get the royal consent to a general expulsion; but the sovereigns hesitated, and, as the victims were the backbone of the commerce of the country, proposed a ransom of 300,000 ducats instead. The indignant friar would hear of no compromise: “Judas,” he cried, “sold Christ for 30 pence; and your highnesses wish to sell Him again for 300,000 ducats.” Unable to bear up against the Domini- can’s fiery denunciations, the sovereigns, three months after the fall of Granada, issued a decree ordering every Jew either to embrace Christianity or to leave the country, four months being given to make up their minds; and those who refused to become Christians to order had leave to sell their property and carry off their effects. But this was not enough for the in- quisitor-general, who in the following

month (April) issued orders to forbid Christians, under severe penalties, having any communi- cation with the Jews or, after the period of grace, to supply them even with the necessaries of life. The former prohibition made it impossible for the unfortunate people to sell their goods which hence fell to the Inquisition. The numbers of Jewish families driven out of the country by Torquemada is variously stated from Mariana's 1,700,000 to the more probable 800,000 of later historians. The loss to Spain was enormous, and from this act of the Dominican the commercial decay of Spain dates.

Age was now creeping on Torquemada, who, however, never would allow his misdirected zeal to rest. At another general assembly, his fourth, he gave new and more stringent rules, which are found in the Compilation de las instrucciones del officio de la Santa Inquisicidn. He took up his residence in Avila, where he had built a convent; and here he resumed the common life of a friar, leaving his cell in October 1497 to visit, at Salamanca, the dying infante, Don Juan, and to comfort the sovereigns in their parental distress. They often used . to visit him at Avila, where in 1498, still in office as inquisitor-general, he held his last general assembly to complete his life's work. Soon afterwards he died, on the 16th of September 1498, " full of years and merit " says his biographer. He was buried in the chapel of the convent of St Thomas in Avila.

The name of Torquemada stands for all that is intolerant and narrow, despotic and cruel. He was no real statesman or minister of the Gospel, but a blind fanatic, who failed to see that faith, which is the gift of God, cannot be imposed on any conscience by force. (E. Tn.)

TORRE ANNUNZIATA.a seaport of Campania, Italy, in the province of Naples, on the east of the Bay of Naples, and at the south foot of Mt Vesuvius, 14 m. S.E. of Naples by rail. Pop. (1901), 2S,o7o(town); 28,084 (commune). Itis on the main line to Battipaglia, at the point of junction of a branch line from Cancello round the east of Vesuvius, and of the branch to Castellammare di Stabia and Gragnano. It has a royal arms factory established by Charles IV., and other ironworks, considerable manufacture of macaroni, paper, breeding of silkworms, and some fishing and shipping. The harbour is protected by moles. Remains attributed to the Roman post-station of Oplontis were discovered in making the railway

between Torre del Greco and Torre Annunziata, a little west of the latter, in 1842.

TORRE DEL GRECO, a seaport of Campania, Italy, in the province of Naples, 7! m. S.E. of that city by rail. Pop. (1901), 35,328. It lies at the south-west foot of Vesuvius, on the shore of the Bay of Naples. It is built chiefly of lava, and stands on the lava stream of 1631, which destroyed two-thirds of the older town. Great damage was done by the eruptions of 1737 and 1794; the earthquake of 1857 and the eruption of the 8th of December 1861 were even more destructive. After each dis- aster the people returned, the advantage of the rich volcanic land overcoming apprehensions of danger. In the outskirts are many beautiful villas and gardens. The town has shipbuilding yards and lava quarries. The inhabitants take part in the coral and sponge fishing off the African and Sicilian coasts, and coral is worked in the town. There is also fishing for tunny, sardines and oysters; hemp is woven, and the neighbourhood is famed for its fruit and wine. In June the great popular festival " Dei Quattro Altari " is annually celebrated here in commemoration of the abolition of the feudal dominion in 1700. Remains of ancient villas and baths have been found here.

TORRENS, ROBERT (1 780-1 864), English soldier and econo- mist, was born in Ireland in 1780. He entered the Marines in 1797, became a captain in 1806, and major in 1811 for bravery in Anhalt during the Walcheren expedition. He fought in the Peninsula, becoming lieutenant-colonel in 1835 and retiring as colonel in 1837. After abortive attempts to enter parliament in 1818 and 1826, he was returned in 1831 as member for Ashburton. He was a prolific writer, principally on financial and commercial policy. Almost the whole of the pro- gramme which was carried out in legislation by Sir Robert Peel had been laid down in his economic writings. He was an early and earnest advocate of the repeal of the corn laws, but was not in favour of a general system of absolute free trade, maintaining that it is expedient to impose retaliatory duties to countervail similar duties imposed by foreign countries, and a lowering of import duties on the productions of countries retaining their hostile tariffs would occasion a decline in prices, profits and wages.

His principal writings of a general character were : The Economist [i.e. Physiocrat] refuted (1808); Essay on the Production of Wealth (1821); Essay on the External Corn-trade (eulogized by Ricardo) (1827) ; The Budget, a Series of Letters on

Financial, Commercial and Colonial Policy (1841-1843); The Principles and Practical Operations of Sir Robert Peel's Act of 1844 Explained and Defended

(1847).

TORRENS, SIR ROBERT RICHARD (1814-1884), British colonial statesman, was born at Cork, Ireland, in 1814, and educated at Trinity College, Dublin. He went to South Aus- tralia in 1840, and was appointed collector of customs. He was an official member of the first legislative council and in 1852 was treasurer and registrar-general. When responsible govern- ment was established he was elected as a representative for Adelaide and became a member of the first ministry. In 1857 he introduced his famous Real Property Act, the principle of which consists of conveyance By registration and certificate instead of deeds. The system was rapidly adopted in the other colonies and elsewhere, and was expounded by the author during a visit to the United Kingdom in 1862-1864. After leaving South Australia, Sir R. R. Torrens represented Cambridge in the House of Commons from 1868 to 1874; in 1872 he was knighted. He was the author of works on the effect of the gold discoveries on the currency, and other subjects. He died on the 31st of August 1884.

TORRENS, WILLIAM TORRENS M'CULLAGH (1813-1894), English politician and social reformer, son of James M'Cullagh (whose wife's maiden name, Torrens, he assumed in 1863), was born near Dublin on the 13 th of October 1813. He was called to the bar, and in 1835 became assistant commissioner on the special commission on Irish poor-relief, which resulted in the extension of the workhouse system in Ireland in 1838. In the 'forties he joined the Anti-Corn Law League,

and in 1846 published his Industrial History of Free Nations. In 1847 he was elected to parliament for Dundalk, and sat till 1852. In 1857 he was elected as a Liberal for Yarmouth and from 1865 to 1885 he represented Finsbury. Torrens was a well known man in political life, and devoted himself mainly to social questions in parliament. It was an amend- ment of his to the Education Bill of 1870 which established the London School Board, and his Artisans' Dwellings Bill in 1868 facilitated the clearing away of

slums by local authorities. He published several books, and his Twenty Years in Parlia- ment (1893) and History of Cabinets (1894) contain useful material. He died in London on the 26th of April 1894.

TORRES NAHARRO, BARTOLOMlJ DE (1480-1530;, Spanish dramatist, was born towards the end of the 15th century at Torres, near Badajoz. After some years of soldiering and of captivity in Algiers, Torres Naharro took orders, settled in Rome about 1511, and there devoted himself chiefly to writing plays. Though he alludes to the future pope, Clement VII. as his protector, he left Rome to enter the household of Fabrizio Colonna at Naples where his works were printed under the title of Propaladia (1517). He is conjectured to have returned to his native place, and to have died there shortly after 1529. His Didlogo del nacimiento is written in unavowed, though obvious, imitation of Encina, but in his subsequent plays he shows a much larger conception of dramatic possibilities. He classifies his pieces as comedias & noticia and comedias a fantasia; the former, of which the Soldatesca and Tinellaria are examples, present in dramatic form' incidents within his personal experience; the latter, which include such plays as Serafina, Himenea, Calamita and Aqnilana, present imaginary episodes with adroitness and persuasiveness. Torres Naharro is much less dexterous in stage-craft than many inferior successors, his humour is rude and boisterous and his diction is unequal; but to a varied knowledge of human nature he adds knowledge of dramatic effect, and his rapid dialogue, his fearless realism and vivacious fancy prepared the way for the romantic drama in Spain.

TORRES NOVAS, a town of Portugal, in the district of San- tarem, 19 m. N.N.E. of Santarem on the Lisbon-Entroncamento railway. Pop. (1900), 10,746. It manufactures cottons, linens, jute, paper, leather and spirits. It was probably founded by Greeks, and was held by the Romans, Goths and Moors, from whom it was conquered in 1148 by Alphonso I. of Portugal.

TORRES VEDRAS, a town of Portugal, in the district of Lisbon, 43 m. N. by W. of Lisbon, on the Lisbon-Figueira da Foz railway. Pop. (1900), 6900. Torres Vedras is built on the left bank of the river Sizandro; it has a Moorish citadel and hot sulphur baths. Roman inscriptions and other remains have been found here, but the Latin name of the town, Turres Veteres, is probably medieval. Here were the noted fortifica- tions known as the " lines of Torres Vedras," constructed by Wellington in r8ro (see Peninsular War).

Here also in 1846 the troops of General Saldanha defeated those of the count de Bomfin and seized the castle and town (see Portugal: History).

TORRES Y VILLAROEL, DIEGO DE (1696-1759?), Spanish miscellaneous writer, was born in 1696 at Salamanca, where his father was bookseller to the university. In his teens Torres escaped to Portugal where he enlisted under a false name; he next moved te Madrid, living from hand to mouth as a hawker; in 1 71 7 he was ordained subdeacon, resumed his studies at Salamanca, and in 1726 became professor of mathematics at the university. A friend of his having stabbed a priest, Torres was suspected of complicity, and once more fled to Portugal, where he remained till his innocence was proved. He then returned to his chair, which he resigned in 1751 to act as steward to two noblemen; he was certainly alive in 1758, but the date of his death is not known. Torres had so slight a smattering of mathematics that his appointment as professor was thought scandalous even in his own scandalous age; yet he quickly acquired a store of knowledge which he displayed with serene assurance. His almanacs, his verses, his farces, his devotional and pseudo-scientific writings show that he possessed the alert

adaptiveness of the born adventurer; but all that remains of his fourteen volumes (1745-1752) is his autobiography, an amusing record of cynical effrontery and successful imposture.

TORREVIEJA, a seaport of south-eastern Spain, in the pro- vince of Alicante, 3 m. S.W. of Cape Cervera, and at the terminus of a railway to Albatera on the Alicante-Murcia line. Pop. (1900), 7706. The district is famous for its salt beds, which are owned and worked by the state, the Laguna Grande alone yielding more than 100,000 tons a year. The other industries are chiefly fishing, shipbuilding and the manufacture of ropes and sails. The roadstead affords safe anchorage. There is an active trade in fruit and agricultural products.

TORREY, JOHN (1796-1873), American botanist, was born at New York on the 15th of August 1796. When he was 15 or 16 years of age his father received a prison appointment at Greenwich, and there he made the acquaintance of Amos Eaton (1 776-1842), a pioneer of natural history studies in America. He thus learned the elements of botany, as well as something of mineralogy and chemistry. In 181 5 he began the study of medicine, qualifying in 1818. In the following year he issued his

Catalogue of Plants growing spontaneously within Thirty Miles of the City of New York, and in 1824 he issued the first and only volume of his Flora of the Northern and Middle States. In the same year he obtained the chair of chemistry and geology at West Point military academy, and three years later the pro- fessorship of chemistry and botany in the College of Physicians and Surgeons, New York. In 1836 he was appointed botanist to the state of New York and produced his Flora of that state in 1843; while from 1838 to 1843 he carried on the publication of the earlier portions of Flora of North America, with the assistance of his pupil, Asa Gray. From 1853 he was chief assayer to the United States assay office, but he continued to take an interest in botanical teaching until his death at New York on the 10th of March 1873. He made over his valuable herbarium and botanical library to Columbia College in i860, and he was the first president of the Torrey Botanical Club in 1873. His name is commemorated in the small coniferous genus Torreya, found in North America and in China and Japan. T. taxifolia, a native of Florida, is known as the Torrey tree or savin, and also as the stinking cedar.

TORREY, REUBEN ARCHER (1856-), American evange- list, was born in Hoboken, New Jersey, on the 28th of January 1856. He graduated at Yale University in 1875 and at the Yale Divinity School in 1878. ‘ He became a Congregational minister in 1878, studied theology at Leipzig and Erlanger in 1882-1883,ˆ, joined D. L. Moody in his evangelistic work in Chicago in 1889,’ and became pastor of the Chicago Avenue Church in 1894 and afterwards superintendent of the Moody Bible Institute of Chicago. In 1902-1903 he preached in nearly every part of the English-speaking world, and with Charles McCallon Alexander (b. 1867) conducted revival services in Great Britain in 1903- 1905; Torrey conducted a similar campaign in American and Canadian cities in 1 906-1 907.

TORRICELLI, EVANGELISTA (1608-1647), Italian physicist and mathematician, was born at Faenza on the 15th of October 1608. Left fatherless at an early age, he was educated under the care of his uncle, a Camaldolese monk, who in 1627 sent him to Rome to study science under the Benedictine Benedetto Castelli (1577-1644), professor of mathematics at the Collegio di Sapienza. The perusal of Galileo’s Dialoghi delle nuove scienze (1638) inspired him with many developments of the mechanical principles there set forth, which he embodied in a treatise De motu (printed amongst his Opera geometrica, 1644). Its

communication by Castelli to Galileo in 1641, with a proposal that Torricelli should reside with him, led to Torricelli repairing to Florence, where he met Galileo, and acted as his amanuensis during the three remaining months of his life. After Galileo's death Torricelli was nominated grand-ducal mathematician and professor of mathematics in the Florentine academy. The discovery of the principle of the barometer (q.v.) which has perpetuated his fame (" Torricellian tube " " Torricellian vacuum ") was made in 1643.

The publication amongst Torricelli's Opera geometrica (Florence, 1644) of a tract on the properties of the cycloid involved him in a controversy with G. P. de Roberval, who accused him of plagiarizing his earlier solution of the problem of its quadrature. There seems, however, no room for doubt that Torricelli's was arrived at independently. The matter was still in debate when he was seized with pleurisy, and died at Florence on the 25th of October 1647. He was buried in San Lorenzo, and a commemorative statue of him erected at Faenza in 1864.

Among the new truths detected by him was the valuable mechanical principle that if any number of bodies be so con- nected that, by their motion, their centre of gravity can neither ascend nor descend, then those bodies are in equilibrium. He also discovered the remarkable fact that the parabolas described (in a vacuum) by indefinitely numerous projectiles discharged from the same point with equal velocities, but in all directions have a paraboloid of revolution for their envelope. His theorem that a fluid issues from a small orifice with the same velocity (friction and atmospheric resistance being neglected) which it would have acquired in falling through the depth from its sur- face is of fundamental importance in hydraulics. He greatly improved both the telescope and microscope. Several large object lenses, engraven with his name, are preserved at Florence. He used and developed B. Cavalieri's method of indivisibles.

A selection from Torricelli's manuscripts was published by Tommaso Bonaventura in 17 15, with the title Lezioni accademiche (Florence). They include an address of acknowledgment on his admission to the Accademia della Crusca. His essay on the inun- dations of the Val di Chiana was

printed in Raccolta d'autori che trattano del moto dell' acque, iv. 115 (Florence, 1768), and amongst Opusculi idraulici, iii. 347 (Bologna, 1822). For his life see Fabroni, Vitae Italorum, i. 345 ; Ghinassi, Lettere fin qui inedite di Evan- gelista Torricelli (Faenza, 1864); Tiraboschi, Storia della Lett. it. viii. 302 (ed. 1824); Montucla, Hist, des math., vol. ii. ; Marie, Hist, des sciences, iv. 133.

TORRIDONIAN, in geology, a series of pre-Cambrian are- naceous sediments extensively developed in the north-west high- lands of Scotland and particularly in the neighbourhood of upper Loch Torridon, a circumstance which suggested the name Torridon Sandstone, first applied to these rocks by J. Nicol. The rocks are mainly red and chocolate sandstones, arkoses, flagstones and shales with coarse conglomerates locally at the base. Some of the materials of these rocks were derived from the underlying Lewisian gneiss, upon the uneven surface of which they rest; but the bulk of the material was obtained from rocks that are nowhere now exposed. Upon this ancient denuded land surface the Torridonian strata rest horizontally or with gentle inclination. Their outcrop extends in a belt of variable breadth from Cape Wrath to the Point of Sleet in Skye, running in a N.N.E.-S.S.W. direction through Ross-shire and Sutherlandshire. They form the isolated mountain peaks of Canisp, Quinag and Suilven in the neighbourhood of Loch Assynt, of Slioch near Loch Maree and other hills. They attain their maximum development in the Applecross, Gairloch and Torridon districts, form the greater part of Scalpay, and occur also in Rum, Raasay, Soay and the Crowlin Islands. The Torridonian rocks have been subdivided into three groups: an upper Aultbea group, 3000-5000 ft.; a middle or Applecross group, 6000-8000 ft.; and a lower or Diabeg group, 500 ft. in Gairloch but reaching a thickness of 7200 ft. in Skye.

See " The Geological Structure of the North-West Highlands of Scotland," Mem. Geol. Survey (Glasgow, 1907). (J. A. H.)

TORRIGIANO, PIETRO (1472-1522), Florentine sculptor, was, according to Vasari, one of the group of talented youths who studied art under the patronage of Lorenzo the Magnificent in Florence. Benvenuto Cellini, reporting a conversation with Torrigiano, relates that he and Michelangelo, while both young, were copying the frescoes in the Carmine chapel, when some slighting remark made by Michelangelo so enraged Torrigiano that he struck him on the nose, and thus caused that disfigure-

ment which is so conspicuous in all the portraits of Michelangelo. Soon after this Torrigiano visited Rome, and helped Pintu- ricchio in modelling the elaborate stucco decorations in the

Apartamenti Borgia for Alexander VI. After some time spent as a hired soldier in the service of different states, Torrigiano was invited to England to execute the magnificent tomb for Henry VII. and his queen, which still exists in the lady chapel of West- minster Abbey. This appears to have been begun before the death of Henry VII. in 1509, but was not finished till 1517. The two effigies are well modelled, and have lifelike but not too realistic portraits. After this Torrigiano received the com- mission for the altar, retable and baldacchino which stood at the west, outside the screen of Henry VII.'s tomb. The altar had marble pilasters at the angles, two of which still exist, and below the mensa was a life-sized figure of the dead Christ in painted terra-cotta. The retable consisted of a large relief of the Resurrection. The baldacchino was of marble, with enrich- ments of gilt bronze; part of its frieze still exists, as do also a large number of fragments of the terra-cotta angels which sur- mounted the baldacchino and parts of the large figure of Christ. The whole of this work was destroyed by the Puritans in the 17th century. 1 Henry VIII. also commissioned Torrigiano to make him a magnificent tomb, somewhat similar to that of Henry VII., but one-fourth larger, to be placed in a chapel at Windsor; it was, however, never completed, and its rich bronze was melted by the Commonwealth, together with that of Wolsey's tomb. The indentures for these various works still exist, and are printed by Neale, Westminster Abbey, i. 54-59 (London, 1818). These interesting documents are written in English, and in them the Florentine is called " Peter Torrysany." For Henry VII.'s tomb he contracted to receive £1500, for the altar and its fit- tings £1000, and £2000 for Henry VIII.'s tomb. Other works attributed from internal evidence to Torrigiano are the tomb of Margaret of Richmond, mother of Henry VII., in the south aisle of his chapel, and a terra-cotta effigy in the chapel of the Rolls.

While these royal works were going on Torrigiano visited Florence in order to get skilled assistants. He tried to induce Benvenuto Cellini to come to England to help him, but Cellini refused partly from his dislike to the brutal and swaggering manners of Torrigiano, and also because he did not wish to live among " such beasts as the English." The latter part of Torrigiano's life was spent in Spain, especially at Seville, where,

besides the painted figure of St Hieronymus in the museum, some terra-cotta sculpture by him still exists. His violent temper got him into difficulties with the authorities, and he ended his life in 1522 in the prisons of the Inquisition.

See Wilhelm Bode, Die italienische Plasiik (Berlin, 1902).

TORRINGTON, ARTHUR HERBERT, Earl or (1647- 17 16), British admiral, was the son of a judge, Sir Edward Herbert (c. 1591-1657). He entered the navy in 1663, and served in the Dutch wars of the reign of Charles II., as well as against the Barbary pirates. From 1680 to 1683 he commanded in the Mediterranean. His career had been honourable, and he had been wounded in action. The known Royalist sentiments of his family combined with his reputation as a naval officer to point him out to the favour of the king, and James II. appointed him rear-admiral of England and master of the robes. The king no doubt counted on his support of the repeal of the Test Acts, as the admiral was member for Dover. Herbert refused, and was dismissed from his places. He now entered into com- munication with the agents of the prince of Orange, and promised to use his influence with the fleet to forward a revolution. After the acquittal of the seven bishops in 1688 he carried the invitation to William of Orange. The Revolution brought him ample amends for his losses. He was named first lord, and took the command of the fleet at home. In 1689 he was at sea attempting to prevent the French admiral Chateau-Renault (q.v.) from landing the troops sent by the king of France to the aid of King James in Ireland. Though he fought an action with

1 An old drawing still exists showing this elaborate work; it is engraved in the Hierurgia anglicana, p. 267 (London, 1848). Many hundreds of fragments of this terra-cotta sculpture were found a few years ago hidden under the floor of the triforium in the ‘abbey; they are jnfortunately too much broken and imperfect to be fitted together.’

the French in Bantry Bay on the 10th of May he failed to baffle Chateau-Renault, who had a stronger force. Being discontented with the amount of force provided at sea, he resigned his place at the admiralty, but retained his command at sea. In May 1689 he

was created earl of Torrington. In 1690 he was in the Channel with a fleet of English and Dutch vessels, which did not rise above 56 in all, and found himself in front of the much more powerful French fleet. In his report to the council of regency he indicated his intention of retiring to the Thames, and losing sight of the enemy, saying that they would not do any harm to the coast while they knew his fleet to be ” in being.” The council, which knew that the Jacobites were preparing for a rising, and only waited for the support of a body of French troops, ordered him not to lose sight of the enemy, but rather than do that to give battle ” upon any advantage of the wind.” On the 10th of July Torrington, after consulting with his Dutch colleagues, made a half-hearted attack on the French off Beachy Head in which his own ship was kept out of fire, and severe loss fell on his allies. Then he retired to the Thames. The French pursuit was fortunately feeble (see Tourville, Comte de) and the loss of the allies was comparatively slight. The indignation of the country was at first great, and Torrington was brought to a court martial in December. He was acquitted, but never again employed. Although twice married, he was childless when he died on the 14th of April 1716, his earldom becoming extinct. The unfavourable account of his moral character given by Dartmouth to Pepys is confirmed by Bishop Burnet, who had seen much of him during his exile in Holland. An attempt has been made in recent years to rehabilitate the character of Torrington, and his phrase ” a fleet in being ” has been widely used (see Naval Warfare, by Vice-Admiral P. H. Colomb).

See Charnock’s Biog. Nav., i. 258. The best account of the battle of Beachy Head is to be found in ” The Account given by Sir John Ashby Yice-Admiral and Rear-Admiral Rooke, to the Lords Commissioners ” (1691).

TORRINGTON, GEORGE BYNG, Viscount (1663-1733), English admiral, was born at Wrotham, Kent. His father, John Byng, was compelled by pecuniary losses to sell his property and his son entered the navy as a king’s letter boy (see Navy) in 1678. He served in a ship stationed at Tangier, and for a time left the navy to enter one of the regiments of the garrison, but in 1683 he returned to the navy as lieutenant, and went to the East Indies in the following year. During the year 1688, he had an active share in bringing the fleet over to the prince of Orange, and by the success of the revolution his fortune was made. In 1702 he was appointed to the command of the ” Nassau,” and was at the taking and burning of the French fleet at Vigo,« and the next year

he was made rear-admiral of the red. In 1704 he served in the Mediterranean under Sir Cloudesley Shovel, and reduced Gibraltar. He was in the battle of Malaga, and for his gallantry received the honour of knight- hood. In 1708 as admiral of the blue he commanded the squadron which baffled the attempt of the Old Pretender to land in Scotland. In 1718 he commanded the fleet which defeated the Spaniards off Cape Passaro and compelled them to withdraw from their invasion of Sicily. This commission he executed so well that the king made him a handsome present and sent him full powers to negotiate with the princes and states of Italy. Byng procured for the emperor's troops free access into the fortresses which still held out in Sicily, sailed afterwards to Malta, and brought out the Sicilian galleys and a ship belonging to the Turkey Company. By his advice and assistance the Germans retook the city of Messina in 1719, and destroyed the ships which lay in the basin — an achievement which completed the ruin ot the naval power of Spain. To his conduct it was entirely owing that Sicily was subdued and the king of Spain forced to accept the terms prescribed him by the quadruple alliance. On his return to England in 1721 he was made rear-admiral of Great Britain, a member of the privy council, Baron Byng of Southill, in the county of Bedford and Viscount Torrington in Devonshire. He was also made one of the Knights Com-

panions of the Bath upon the revival of that order in 1725. In 1727 George II. on his accession made him first lord of the admiralty, and his administration was distinguished by the establishment of the Royal Naval College at Portsmouth. He died on the 17th of January 1733, and was buried at Southill, in Bedfordshire. Two of his eleven sons, Pattee (1699-1747) and George (1701-1750), became respectively the 2nd and 3rd viscounts. The title is still held by the descendants of t\e latter.

See Memoirs relating to Lord Torrington, Camden Soc, new series 46, and A True Account of the Expedition of the British Fleet to Sicily 1718-1720, published anonymously, but known to be by Thomas Corbett of the admiralty in 1739. Forbin's Memoirs contain the French side of the expedition to Scotland in 1708.

TORRINGTON, a borough of Litchfield county, Connecticut, U.S.A., in the township of Torrington, on the Naugatuck river, about 25 m. W. of Hartford. Pop. (1900), 8360, of whom 2565 were foreign-born; (1910) 15,483; of the township, including the borough (1900) 12,453; (1910) 16,840. It is served by the New

York, New Haven & Hartford railway and by an electric line connecting with Winsted. It has a public library (1865) with 15,000 volumes in 1909. There is a state armoury in the borough. Torrington is a prosperous manufacturing centre. In 1905 the value of the factory product was $9,674,124. The township of Torrington, originally a part of the township of Windsor, was first settled in 1734, and was separately incorporated in 1740. The site was covered by pine trees, which were much used for ship-building, and for this reason it was known as Mast Swamp. In 1751 a mill was erected, but there were few, if any, residences until 1800. In 1806 the settlement was known as New Orleans village. In 1813 members of the Wolcott family of Litchfield, impressed with the water-power, bought land and built a woollen mill, and the village that soon developed was called Wolcottville. Its growth was slow until 1864. In 1881 its name was changed to Torrington, and in 1887 the borough was incorporated.

See S. Orcutt's History of Torrington (Albany, 1878), and an article, " The Growth of Torrington," in the Connecticut Magazine, vol. ix., No. 1.

TORRINGTON (Great Torrington), a market town and municipal borough in the South Molton parliamentary division of Devonshire, England, on the Torridge, 225 m. W. by S. of London by the London & South- Western railway. Pop. (1901), 3241. It stands on a hill overlooking the richly wooded valley of the Torridge, here crossed by three bridges. Glove manufactures on a large scale, with flour and butter making and leather dressing, are the staple industries. The town is governed by a mayor, 4 aldermen and 12 councillors. Area, 3592 acres.

Torrington {Toritone) was the site of very early settlement, and possessed a market in Saxon times. The manor was held by Brictric in the reign of Edward the Confessor, and in 1086 formed part of the Domesday fief of Odo Fitz Gamelin, which later constituted an honour with Torrington as its caput. In 1221 it appears as a mesne borough under William de Toritone, a descendant of Odo and the supposed founder of the castle, which in 1228 was ordered to be razed to the ground, but is said to have been rebuilt in 1340 by Richard de Merton. The borough had a fair in 1221, and returned two members to parlia- ment from 1295 until exempted from representation at its own request in 1368. The government was vested in bailiffs and a commonalty, and no charter of incorporation was granted till that of Queen Mary in 1554, which instituted a governing body of a mayor, 7

aldermen and 18 chief burgesses, with authority to hold a court of record every three weeks on Monday; law-days and view of frankpledge at Michaelmas and Easter; a weekly market on Saturday, and fairs at the feasts of St Michael and St George. This charter was confirmed by Elizabeth in 1568 and by James I. in 1617. A charter from James II. in 1686 changed the style of the corporation to a mayor, 8 aldermen and 12 chief burgesses. In the 16th century Torrington was an important centre of the clothing trade, and in 1605 the town is described as very prosperous, with three

fairs, and a great market ” furnished from far on every quarter, being the most convenient place for occasions of king or county in those parts.” The Saturday market is still maintained, but the fairs have been altered to the third Saturday in March and the first Thursday in May. In 1643 Colonel Digby took up his position at Torrington and put to flight a contingent of parliamentary troops; but in 1646 the town was besieged by Sir Thomas Fairfax and finally forced to surrender. The borough records were destroyed by fire in 1724.

See Victoria County History: Devonshire; F. T. Colby, History of Great Torrington (1878).

TORSTENSSON, LENNART, Count (1603-1651), Swedish soldier, son of Torsten Lennartsson, commandant of Elfsborg, was born at Forstena in Vestergotland. At the age of fifteen he became one of the pages of the young Gustavus Adolphus and served during the Prussian campaigns of 1628-29. In 1629 he was set over the Swedish artillery, which under his guidance materially contributed to the victories of Breitenfeld (1631) and Lech (1632). The same year he was taken prisoner at Alte Veste and shut up for nearly a year at Ingolstadt. Under Baner he rendered distinguished service at the battle of Wittstock (1636) and during the energetic defence of Pomerania in 1637-38, as well as at the battle of Chemnitz (1638) and in the raid into Bohemia in 1639. Illness compelled him to return to Sweden in 1641, when he was made a senator. The sudden death of Baner in May 1641 recalled Torstensson to Germany as generalissimo of the Swedish forces and governor-general of Pomerania. He was at the same time promoted to the rank of field marshal. The period of his

command (1641-1645) forms one of the most brilliant chapters in the military history of Sweden. In 1642 he marched through Brandenburg and Silesia into Moravia, taking all the principal fortresses on his way. On returning through Saxony he well nigh annihilated the imperialist army at the second battle of Breitenfeld (Oct. 23, 1642). In 1643 he invaded Moravia for the second time, but was suddenly recalled to invade Denmark, when his rapid and unexpected intervention paralysed the Danish defence on the land side, though Torstensson's own position in Jutland was for a time precarious owing to the skilful handling of the Danish fleet by Christian IV. In 1644 he led his army for the third time into the heart of Germany and routed the imperialists at Juterbog (Nov. 23). At the beginning of November 1645 he broke into Bohemia, and the brilliant victory of Jankow (Feb. 24, 1645) laid open before him the road to Vienna. Yet, though one end of the Danube bridge actually fell into his hands, his exhausted army was unable to penetrate any farther and, in December the same year, Tor- stensson, crippled by gout, was forced to resign his command and return to Sweden. In 1647 he was created a count. From 1648 to 1651 he ruled all the western provinces of Sweden, as governor-general. On his death at Stockholm (April 7, 1651) he was buried solemnly in the Riddarholmskyrka, the Pantheon of Sweden. Torstensson was remarkable for the extraordinary and incalculable rapidity of his movements, though very frequently he had to lead the army in a litter, as his bodily infirmities would not permit him to mount his horse. He was also the most scientific artillery officer and the best and most successful engineer in the Swedish army.

His son, Senator Count Anders Torstensson (1641-1686), was from 1674 to 1681 governor-general of Esthonia. The family became extinct on the sword-side in 1727.

See J. W. de Peyster, History of the Life of L. Torstensson (Pough-keepsie, 1855); J. Feil, Torstensson before Vienna (trans, by de Peyster, New York, 1885); Gustavus III., Eulogy of Torstensson (trans, by de Peyster, New York, 1872). (R. N. B.)

TORT (Fr. for wrong, from Lat. tortus, twisted, participle of torquere), the technical term, in the law of England, of those dominions and possessions of the British Empire where the common law has been received or practically adopted in civil affairs, and of the United States, for a civil wrong, i.e. the breach of a duty imposed by law, by which breach some person becomes entitled to sue for damages. A tort must, on the

one hand, be an act which violates a general duty. The rule which it breaks must be one made by the law, not, as in the case of a mere breach of contract, a rule which the law protects because the parties have made it for themselves. On the other hand, a tort is essentially the source of a private right of action. An offence which is punishable, but for which no one can bring a civil action, is not a tort. It is quite possible for one and the same act to be a tort and a breach of contract, or a tort and a crime; it is even possible in one class of cases for the plaintiff to have the option — for purposes of procedural advantage — of treating a real tort as a fictitious contract; but there is no necessary or general connexion. Again, it is not the case that pecuniary damages are always or necessarily the only remedy for a tort; but the right to bring an action in common law juris- diction, as distinct from equity, matrimonial or admiralty jurisdiction, with the consequent right to damages, is invariably present where a tort has been committed.

This technical use of the French word tort (which at one time was near becoming a synonym of wrong in literary English) is not very ancient, and anything like systematic treatment of the subject as a whole is very modern. Since about the middle of the 19th century there has been a current assumption that all civil causes of action must be founded on either contract or tort; but there is no historical foundation for this doctrine, though modified forms of the action of trespass — actions in consimili casu, or ” on the case ” in the accustomed English phrase — did in practice largely supplant other more archaic forms of action by reason of their greater convenience. The old forms were designed as penal remedies for manifest breach of the peace or corruption of justice; and traces of the penal element remained in them long after the substance of the procedure had become private and merely civil. The transition belongs to the general history of English law.

In England the general scope of the law of torts has never been formulated by authority, the law having in fact been developed by a series of disconnected experiments with the various forms of action which seemed from time to time to promise the widest and most useful remedies. But there is no doubt that the duties enforced by the English law of torts are broadly those which the Roman institutional writers summed up in the precept Alterum non laedere. Every member of a civilized commonwealth is entitled to require of others a certain amount of respect for his person, reputation and property, and a certain amount of care

and caution when they go about undertakings attended with risk to their neighbours. Under the modern law, it is submitted, the question arising when one man wilfully or recklessly harms another is not whether some technical form of action can be found in which he is liable, but whether he can justify or excuse himself. This view, at any rate, is countenanced by a judgment of the Supreme Court of the United States delivered in 1904. If it be right, the controverted question whether conspiracy is or is not a substantive cause of action seems to lose most of its importance. Instead of the doubtful proposition of law that some injuries become unlawful only when inflicted by concerted action, we shall have the plain proposition of fact that some kinds of injury cannot, as a rule, be inflicted by one person with such effect as to produce any damage worth suing for.

The precise amount of responsibility can be determined only by full consideration in each class of cases. It is important to observe, however, that a law of responsibility confined to a man's own personal acts and defaults would be of next to no practical use under the conditions of modern society. What makes the law of torts really effective, especially with regard to redress for harm suffered by negligence, is the universal rule of law that every one is answerable for the acts and defaults of his servants (that is, all persons acting under his direction and taking their orders from him or some one representing him) in the course of their employment. The person actually in fault is not the less answerable, but the remedy against him is very commonly not worth pursuing. But for this rule corporations could not be liable for any negligence of their servants,, however disastrous

TORT

to innocent persons, except so far as it might happen to constitute a breach of some express undertaking. We have spoken of the rule as universal, hut, in the case of one servant of the same employer being injured by the default of another, an unfortunate aberration of the courts, which started about two generations ago from small beginnings, was pushed to extreme results, and led to great hardship. A partial remedy was applied in 1880 by the Employers' Liability Act; and in 1897 a much bolder step was taken by the Workmen's Compensation Act (super- seded by a more comprehensive act in 1906). But, as the common law and the two acts (which proceed on entirely different principles) cover different fields, with a good deal of overlapping, and the acts are full of complicated provisos and exceptions, and contain very special provisions as to procedure, the improvement in substantial justice has been bought, so far, at the price of great confusion in the form of the law, and considerable difficulty in ascertaining what it is in any but the most obvious cases. The Workmen's Compensation Act includes cases of pure accident, where there is no fault at all, or none that can be proved, and therefore goes beyond the reasons of liability with which the law of torts has to do. In fact, it establishes a kind of compulsory insurance, which can be justified only on wider grounds of policy. A novel and extraordinary exception to the rule of responsibility for agents was made in the case of trade combinations by the Trade Disputes Act 1906. This has no interest for law as a science.

There are kinds of cases, on the other hand, in which the law, without aid from legislation, has imposed on occupiers and other persons in analogous positions a duty stricter than that of being answerable for themselves and their servants. Duties of this kind have been called " duties of insuring safety." Gene- rally they extend to having the building, structure, or works in such order, having regard to the nature of the case, as not to create any danger to persons lawfully frequenting, using, or passing by them, which the exercise of reasonable care and skill could have avoided; but in some cases of " extra-hazardous " risk, even proof of all possible diligence — according to English authority, which is not unanimously accepted in America — will not suffice. There has lately been a notable tendency to extend these principles to the duties incurred towards the public by local authorities who undertake public works. Positive duties created by statute are on

a similar footing, so far as the breach of them is capable of giving rise to any private right of action.

The classification of actionable wrongs is perplexing, not because it is difficult to find a scheme of division, but because it is easier to find many than to adhere to any one of them. We may start either from the character of the defendant's act or omission, with regard to his knowledge, intention and otherwise; or from the character of the harm suffered by the plaintiff. Whichever of these we take as the primary line of distinction, the results can seldom be worked out without calling in the other. Taking first the defendant's position, the widest governing principle is that, apart from various recognized grounds of immunity, a man is answerable for the " natural and probable " consequences of his acts; i.e. such consequences as a reasonable man in his place should have foreseen as probable. Still more is he answer- able for what he did actually foresee and intend. Knowledge of particular facts may be necessary to make particular kinds of conduct wrongful. Such is the rule in the case of fraud and other allied wrongs, including what is rather unhappily called " slander of title," and what is now known as " unfair com- petition " in the matter of trade names and descriptions, short of actual piracy of trade-marks. But where an absolute right to security for a man's person, reputation or goods is interfered with, neither knowledge nor specific intention need be proved. In these cases we trespass altogether at our peril. It is in general the habit of the law to judge acts by their apparent tendency, and not by the actor's feelings or desires. I cannot excuse myself by good motives for infringing another man's rights, whatever other grounds of excuse may be available;

XXVII. 3

and it is now settled conversely, though after much doubt, that an act not otherwise unlawful is not, as a rule, made unlawful by being done from an evil motive. This rule was known some time ago to apply to the exercise of rights of property, and such speculative doubt as remained was removed by the decision of the House of Lords in the leading case of Allen v. Flood (1898, A.C. 1). We now know that it applies to the exercise of all common rights. The exceptions are very few, and must be explained by exceptional reasons. Indeed, only two are known to the present writer — malicious prose- cution, and the misuse of a " privileged occasion " which would justify the communication of defamatory matter if made in good faith. In each case the wrong

lies in the deliberate perversion of a right or privilege allowed for the public good, though the precise extent of the analogy is not certain at present. 1 It must be remembered, however, that the presence or absence of personal ill will, and the behaviour of the parties generally, may have an important effect, when liability is proved or admitted, in mitigating or aggravating the amount of damages awarded by juries and allowed by the court to be reasonable. It may likewise be noted, by way of caution, that some problems of criminal law, with which we are not here concerned, require more subtle consideration. However, it is hardly ever safe to assume that the bounds of civil and criminal liability will be found coextensive. Perhaps we may go so far as to say that a man is neither civilly nor criminally liable for a mere omission (not being disobedience to a lawful command which he was bound to obey), unless he has in some way assumed a special duty of doing the act omitted.

We have already had to mention the existence of grounds of immunity for acts that would otherwise be wrongful. Such grounds there must be if the law is to be enforced and justice administered at all, and if the business of life is to be carried on with any freedom. Roughly speaking, we find in these cases one of the following conditions: Either the defendant was executing a lawful authority; or he was justified by extraordinary necessity; or he was doing something permitted by legislation for reasons of superior utility, though it may produce damage to others, and either with or without special provisions for compensating damage; or he was exercising a common right in matters open to free use and competition; or the plaintiff had, by consent or otherwise, disabled himself from having any grievance. Pure accident will hardly seem to any one who is not a lawyer to be a special ground of exemption, the question being rather how it could ever be supposed to be a ground of liability. But it was supposed so by many lawyers down to recent times; the reason lying in a history of archaic ideas too long to be traced here. Exercise of common rights is the category where most difficulty arises. Here, in fact, the point at which a man's freedom is limited by his neighbour's has to be fixed by a sense of policy not capable of formal demonstration.

As Justice Holmes of the Supreme Court of the United States has said, we allow unlimited trade competition (so long as it is without fraud) though we know that many traders must suffer, and some may be ruined by it, because we hold that free competition is worth more to society than its costs. A state with

different economic foundations might have a different law on this, as on many other points. This freedom extends not only to the exercise of one's calling, but to choosing with whom and under what conditions one will exercise it. Also the law will not inquire with what motives a common right is exercised; and this applies to the ordinary rights of an owner in the use of his property

1 It was formerly supposed that an action by a party to a contract against a third person for procuring the other party to break his contract was within the same class, i.e. that malice must be proved. But since Allen v. Flood, and the later decision of the House of Lords in Quinn v. Leathern (1901, A.C. 495), this view seems untenable. The ground of action is the intentional violation of an existing legal right; which, however, since 1906, may be practised with impunity in the United Kingdom " in contemplation or furtherance of a trade dispute"': Trade Disputes Act, § 3.

as well as to the right of every man to carry on his business. 1 Owners and occupiers of immovable property are bound, indeed, to respect one another's convenience within certain limits. The maxim or precept Sic utere tuo ul alienum non laedas does not mean that I must not use my land in any way which can possibly diminish the profit or amenity of my neighbour's. That would be false. It is a warning that both his rights and mine extend beyond being free from actual unlawful entry, and that if either of us takes too literally the more popular but even less accurate maxim, " Every man may do as he will with his own," he will find that there is such a head of the law as nuisance.

From the point of view of the plaintiff, as regards the kind of damage suffered by him, actionable wrongs may be divided into four groups. We have some of a strictly personal kind; some which affect ownership and rights analogous to owner- ship; some which extend to the safety, convenience and profit of life generally — in short, to a man's estate in the widest sense; and some which may, according to circumstances, result in damage to person, property or estate, any or all of them. Per- sonal

wrongs touching a man's body or honour are assault, false imprisonment, seduction or " enticing away " of members of his family. Wrongs to property are trespass to land or goods, " conversion " of goods (i.e. wrongful assumption of dominion over them), disturbance of easements and other individual rights in property not amounting to exclusive possession. Tres- pass is essentially a wrong to possession; but with the aid of actions " on the case " the ground has been practically covered. Then there are infringements of incorporeal rights which, though not the subject of trespass proper, are exclusive rights of enjoyment and have many incidents of ownership. Actions, in some cases expressly given by statute, lie for the piracy of copyright, patents and trade marks. Wrongs to a man's estate in the larger sense above noted are defamation (not a strictly personal wrong, because according to English common law the temporal damage, not the insult, is, rightly or wrongly, made the ground of action); deceit, so-called "slander of title" and fraudulent trade competition, which are really varieties of deceit; malicious prosecution; and nuisance, which, though most important as affecting the enjoyment of property, is not considered in that relation only. Finally, we have the results of negligence and omission to perform special duties regarding the safety of one's neighbours or customers, or of the public, which may affect person, property, or estate generally.

The law of wrongs is made to do a great deal of work which, in a system less dependent on historical conditions, we should expect to find done by the law of property. We can claim or reclaim our movable goods only by complaining of a wrong done to our possession or our right to possess. There is no direct assertion of ownership like the Roman vindicatio. The law of negligence, with the refined discussions of the test and measure of liability which it has introduced, is wholly modern; and the same may be said of the present working law of nuisance,

1 The rule that a man's motives for exercising his common rights are not examinable involves the consequence that advising or procuring another, who is a free agent, to do an act of this kind can, a fortiori, not be an actionable wrong at the suit of a third person who is damnified by the act, and that whatever the adviser's motives may be. This appears to be included in the decision of the House of Lords in Allen v. Flood. That decision, though not binding in any American court, is approved and followed in most American jurisdictions. It is otherwise where a system of coercion is exercised on a man's workmen or customers

in order to injure him in his business. The extension of immunity to such conduct would destroy the value of the common right which the law pro- tects: Quinn v. Leathern. The coercion need not be physical, and the wrong as a whole may be made up of acts none of which taken alone would be a cause of action. In this point there is nothing novel, for it is so in almost every case of nuisance. Conspiracy is naturally a frequent element in such cases, but it does not appear to be necessary; if it were, millionaires and corporations might exceed the bounds of lawful competition with impunity whenever they were strong enough. The reasons given in Quinn v. Leathern are many and various, but the decision is quite consistent with Allen v. Flood. However, the Trade Disputes Act will probably have its intended effect of reducing the law on this head to relative insignificance in England.

though the term is of respectable antiquity. Most recent of al] is the rubric of " unfair competition," which is fast acquiring great importance.

It will be observed that the English law of torts answers approximately in its purpose and contents to the Roman law of obligations ex delicto and quasi ex delicto. When we have allowed for the peculiar treatment of rights of property in the common law, and remembered that, according to one plausible theory, the Roman law of possession itself is closely connected in its origin with the law of delicts, we shall find the corre- spondence at least as close as might be expected a priori. Nor is the correspondence to be explained by borrowing, for this branch of the common law seems to owe less to the classical Roman or medieval canon law than any other. Some few misunderstood Roman maxims have done considerable harm in detail, but the principles have been worked out in all but complete independence.

A list of modern books and monographs will be found at the end of the article on " Torts " by the present writer in the Encyclo- paedia of the Laws of England (2nd ed.). Among recent editions of works on the law of torts and new publications the following may be mentioned here: Addison, by W. E. Gordon and W. H. Griffith (8th ed., 1906); Clerk and Lindsell, by Wyatt Paine (4th ed., 1906); Pollock (8th ed., 1908); Salmond, The Law of Torts (2nd ed., 1910). In America: Burdick, The Law of Torts (1905); Street, The Foundations of Legal Liability (1906), 3 vols, of which vol. i. is on Tort. (F. Po.)

TORTOISE. Of the three names generally used for this order of reptiles, viz. tortoise, turtle and terrapin, the first is derived from the Old French word tortis, i.e. twisted, and was probably applied first to the common European species on account of its curiously bent forelegs. Turtle is believed to be a corruption of the same word, but the origin of the name terrapin is un- known: since the time of the navigators of the 16th century it has been in general use for fresh-water species of the tropics, and especially for those of the New World. The name tortoise is now generally applied to the terrestrial members of this group of animals, and that of turtle to those which live in the sea or pass a great part of their existence in fresh water. They consti- tute one of the orders of reptiles, the Chelonia: toothless reptiles, with well developed limbs, with a dorsal and a ventral shell composed of numerous bony plates, large firmly fixed quadrates, a longitudinal anal opening and an unpaired copulatory organ.

The whole shell consists of the dorsal, more or less convex carapace and the ventral plastron, both portions being joined laterally by the so-called bridge. The carapace is (with the exception of Sphargis) formed by dermal ossifications which are arranged in regular series, viz. a median row (1 nuchal, mostly 8 neurals and 1-3 supracaudal or pygal plates), a right and left row of costal plates which surround and partly replace the ribs, and a consider- able number (about 11 pairs) of marginal plates. The plas- tron consists of usually 9, rarely 11, dermal bones, viz. paired epi-, hyo-, hypo- and xiphi-plastral plates and the unpaired endo-plastral ; the latter is homologous with the interclavicle, the epi-plastra with the clavicles, the rest with so-called abdominal ribs of other reptiles.

In most Chelonians the bony shell is covered with a hard epi-dermal coat, which is divided into large shields, commonly called ” tortoiseshell.” These horny shields or scutes do not correspond in numbers and extent with the underlying bones, although there is a general, vague resemblance in their arrangement; for instance, there is a neural, a paired costal and a paired marginal series. The terminology may be learned from the accompanying illus- trations (figs. I and 2) “■-...-,.

The integuments of the neac, neck, tail and limbs are either soft and smooth or scaly or tubercular, frequently with small osseous nuclei.

All the bones of the skull are suturally united. The dentary

portion of the mandible consists of one piece only, both halves being completely fused together. The pectoral arch remains separate in the median line ; it consists of the coracoids, which slope backwards, and the scapulae, which stand, upright and often abut against the inside of the first pair of costal plates. Near the glenoid cavity for the humerus arises from the scapula a long process which is directed transversely towards its fellow; it represents the acromial process of other vertebrates, although so much enlarged, and is neither the precoracoid, nor the clavicle, as stated by the thought- less. The tail is still best developed in the Chelydridae, shortest ir the Trionychoidea. Since it contains the large copulatory organ it is less reduced in the males. No Chelonians possess the slightest

traces of teeth, but their jaws are provided with horny sheaths, with hard and sharp edges, forming a beak.

The number of Chelonians known at present may be estimated at about 200, the fresh-water species being far the most numerous, and are abundant in well-watered districts of the tropical and sub-tropical zones. Their number and variety decrease beyond the tropics, and in the north they disappear entirely about the 50th parallel in the western and about the 56th in the eastern hemisphere, whilst in the southern hemisphere the terrestrial forms seem to advance to 36° S. only. The marine turtles, which are spread over the whole of the equatorial and sub-tropical seas, sometimes stray beyond those limits. As in other orders

Epidermal shields: —

CO,

Costals.

“.

Vertebrals.

m,

Marginals.

?.

Gulars.

PC

Postgulars or humerals

P,

Pectorals.

ab,

Abdominals.

pa,

Preanals or femorals.

an,

Anals.

FlGS. I, 2. — Shell of Testudo pardalis, to show the divisions of the integument, which are marked by entire lines, and of the osseous carapace, these being marked by dotted lines. Fig. I, Upper or dorsal aspect. Fig. 2, Lower or ventral aspect.

Bones of the Carapace : —

co l , Costals.

we, Neurals.

nu. Nuchal.

py, Pygals.

m 1 , Marginals.

ent, Entoplastron.

ep, Epiplastron.

hyo, Hyoplastron.

hyp, Hypoplastron.

xyp, Xiphiplastron.

of reptiles, the most specialized and the largest forms are restricted to the tropics (with the exception of Macroclemmys) ; but, unlike lizards or snakes, Chelonians are unable to exist in sterile districts or at great altitudes.

They show a great divergence in their mode of life — some living constantly on land, others having partly terrestrial partly aquatic habits, others again rarely leaving the water or the sea. The first-mentioned, the land tortoises proper, have short club-shaped feet with blunt claws, and a very convex, heavy, completely ossified shell. In the fresh-water forms the joints of the limb bones are much more mobile, the digits distinct, armed with sharp claws, and united by a membrane

or web; their shell is less convex, and is flattened, and more or less extensive areas may remain unossified, or transparent windows are formed with age, for instance in Batagur. As a rule, the degree of development of the interdigital web and of convexity of the shell indicates the prevalence of aquatic or terrestrial habits of a species of terrapin. Finally, the marine turtles have paddle-shaped limbs resembling those of Cetaceans.

Land tortoises are sufficiently protected by their carapace, and therefore have no need of any special modification of structure by means of which their appearance would be assimi- lated to the surroundings and thus give them additional security from their enemies. These, however, are few in number. On the other hand, among the carnivorous terrapins and fresh- water turtles instances of protective resemblance are not scarce, and may even attain to a high degree of specialization, as in Chelys, the matamata. The colours of land tortoises are generally plain, or in yellow and brown patterns, whilst those of many terrapins are singularly varied, bright and beautiful, especially in the very young, but all this beauty is lost in the adult of many species.

Chelonians are diurnal animals; only a few are active during the night, habitually or on special occasions, as, for instance, during oviposition. Land tortoises are slow in all their move- ments, but all kinds living in water can execute rapid motions, either to seize their prey or to escape from danger. All Chelonians are stationary, residing throughout the year in the same locality, with the exception of the marine turtles, which periodically migrate to their breeding-stations. Species inhabiting temperate

regions hibernate.

Land tortoises, a few terrapins, and some of the marine turtles are herbivorous, the others carnivorous, their prey con- sisting chiefly of fish, frogs, molluscs, and other small aquatic animals; some, e.g. Clemmys insculpta and Cisludo Carolina, have a mixed vegetable and animal diet.

All Chelonians are oviparous, and the eggs are generally covered with a hard shell, mostly elliptical, rarely quite round, as in the case of the marine turtles. The various modifications, and also the not uncommon individual variations, in the composition of the carapace plates and the number and disposition of the shields, are very significant. They show an unmistakable tendency towards reduction in numbers, a concentration and simplification of the shell and its covering shields. We can to a certain extent reconstruct a generalized ancestral tortoise and thereby narrow the wide gap which separates the Chelonia from every other reptilian order. The early Chelonians possessed most likely more than five longitudinal dorsal rows of plates. The presence of several small supramarginal shields in Macroclemmys may be an indication that the total number of longitudinal rows was originally at least seven. The number of transverse rows, both of plates and shields, was also greater. We can account for at least twelve median plates and as many pairs of marginals, but for onlv eieht median and eight pairs of costal shields (individual variations observed in Thalassochelys). It stands to reason that originally each trunk metamere had its full complement of plates and shields ; consequently that about twelve trunk metameres partook in the formation of the shell, which, with subsequent shortening and broadening of the trunk, has under- gone considerable concentration and reduction, a process which has reduced the costal plates to seven pairs in the American species of Trionyx, has completely abolished the neural plates of some Chelydidae, and has brought down the costal shields to four pairs in the majority of recent Chelonians. In several species of Testudo the little nuchal shield is suppressed, thereby reducing the unpaired median shields to five. The complete absence of shields in the Triony- chidae and in Carettochelys is also due to a secondary process, which, however, has proceeded in a different way.

Classification of Chelonia. H. Stannius in 1854 clearly separated the Trionychoidea from the rest. E. D. Cope, in 1870, distinguished between Pleurodira and Cryptodira according to

whether the neck, Stpri or bupri, is bent sidewards, or hidden by being withdrawn in an S-shaped curve in a vertical plane; he also separated Sphargis as Athecae from all the other Chelonians, for which L. Dollo, in 1886, proposed the term Thecophora. These terms are most unfortunate, misleading. Athecae (from #17107, shell) has reference to the absence of a horny shell-covering in the leathery turtle; but since the same character applies to Trionychoidea and to Carettochelys, nobody can guess that

the term Athecae in Dollo's sense refers to the fact that the shell of the leathery turtle is not homologous with the typical shell or 617KT) of the other Chelonians. The grouping of the latter into families recognizable by chiefly internal, skeletal characters has been effected by G. A. Boulenger. For practical purposes the following " key " is preferable to those taxonomic characters which are mentioned in the descriptions of the different families. The relationships between them may be indicated as follows: —

fAthecae .

Chelonia-ˆ

[Thecophora

J Chelydidae (Pelomedusidae

Chelonidae

palatines, and these do not at all ventrally roof over the choanae. The position of Sphargis in the system is still a moot question. G. A. Boulenger looks upon it as the sole remnant of a primitive group in opposition to all the other recent Chelonia; G. Baur considered it the most specialized descendant of the Chelonidae, a

Sphargidae ("Pelomedusidae Pleurodira A Chelydidae

L Carettochelydidae rChelydridae — Derma- temydidae-
Cinosternida Cryptodira \ Platysternidae Testudinidae

_ . , ., I Chelonidae Tnonychoidea

Key to the Families of Chelonia. Shell covered with horny shields.

Digits distinct, with five or four claws. Pectoral shields separated from the mar- ginals by inframarginals. Tail long and crested. Plastron small

and cruciform Chelydridae

Tail long, covered with rings of shields.

Plastron large Platysternidae

_ ., , { Dermatemydidae

Tal1 short I Cinosternidae

Pectoral shields in contact with the mar- ginals. Plastral shields 1 1 or 12, without an inter-

guiar. Neck retractile in an S-shaped vertical

curve Testudinidae

Plastral shields 1 3, an intergular being present.

Neck bending sideways under the shell

Limbs paddle-shaped, with one or two

claws

Shell without horny shields, covered with soft leathery skin. Digits distinct, broadly webbed, but with

only three claws Trionychoidea

Limbs paddle-shaped.

Shell composed of regular series of bony

plates. Two claws Carettochelydidae

Shell composed of very many small plates

arranged like mosaic. No claws . . Sphargidae.

Sub-order I. Athecae. — The shell consists of a mosaic of numerous small polygonal osseous plates and is covered with leathery skin without any horny shields. The limbs are transformed into paddles, without claws. Marine. Sole

representative Sphargis or Derma- tochelys coriacea, the leathery turtle or luth ; it is the largest of living Chelonians, surpassing 6 ft. in length, has a wide distribution over all the intertropical seas, but is very rare everywhere; a few stragglers have appeared as far north as the coasts of Long Island, and those of Great Britain, Holland and France. It is a curious fact that only adults and young, but none of intermediate size, happen to be known. This creature shows many im- portant features. The vertebrae and ribs are not fused with, but remain free from, the cara- pace, and this is fundamentally different from and not homologous with that of other Chelon- ians. O. P. Hay has suggested that the mosaic polygonal components of the shell of Sphargis are, so to speak, an earlier generation of osteo- dermal plates than the fewer and larger plates of the Thecophora, which in them fuse with the neural arches and the ribs. Sphargis has, how- ever, the later category in the plastron and in its first neural or nuchal plate. If this suggestion is correct, this turtle has either lost or perhaps never had developed the horny shields. The many mosaic plates comprise larger plates which form an unpaired median, two pairs of other dorsal, a lateral and three pairs of ventral series or ridges; thirteen, or when the inner ventral pair fuses, twelve pairs in all.

The skull, excellently studied by J. F. van Bemmelen, much resembles that of Chelone, but so-called epipterygoids are absent; further, the pterygoids, instead of sending lateral arms to the jugals and maxillaries, are widely separated from these bones by the

Fig. 3. — A portion of the Osseous Plates of the Carapace of Sphargis coriacea, showing three large keeled plates of one of the longitudinal ridges of the carapace, with a number of the small irregular plates on either side of them.

view which has been supported by W. Dames, E. C. Case, and to a certain extent by J. F. van Bemmelen. For literature, &c, see L. Dollo, Bull. S. R. Bruxelles (Fevrier 4, 1901).

Sub-order II. Thecophora. — The bony shell is composed of several longitudinal series of plates (on the dorsal side a median or neural, a paired lateral or costal series, and marginal plates). With few exceptions this shell is covered with large horny scutes or shields.

Super-family 1. Cryptodira. — The neck, if retractile, bends in an

S-shaped curve in a vertical plane. The pelvis is not fused with the shell, and this is covered with large horny shields, except in Carettochelys.

Family I . Chelydridae. — The plastron is rather narrow, and cross- shaped ; the bridge is very narrow and is covered by a pair of shields, the displaced abdominals, which are separated from the marginals by a few inframarginals. The limbs, neck and head are so stout that they cannot completely be withdrawn into the shell. The tail is very long. Only two genera with three species, confined to America. Chelydra serpentina, the ” snapping turtle,” ranging from the Canadian lakes through the United States east of the Rockies; closely allied is C. rossignoni of Central America and Ecuador. Macroclemmys temmincki, the ” alligator turtle,” is the largest known fresh-water Chelonian, its shell growing to a length

Fig. 4. — The Snapping Turtle (Chelydra serpentina).

of 3 ft. It is characterized by the three series of strong prominent keels along the back; it inhabits the whole basin of the Mississippi and Missouri rivers.

Family 2. Dermatemydidae. — The pectoral shields are widely separated from the marginals by inframarginals, the gulars are small or absent, and the tail is extremely short. Only a few species, in Central America. The plastron is composed of nine plates. The nuchal plate has a pair of rib-like processes like those of the Chelydridae. One or more of the posterior costal plates meet in the middle line. The shell of these aquatic, broadly web-fingered tortoises, is very flat and the covering shields are thin. They feed

upon leaves, grass and especially fruit. Staurotypus, e.g. salvini with 23, Dermatemys, e.g. mawi, with 25 marginal shields.

Family 3. Cinosternidae. — Closely allied to the two previous families from which Cinosternum, the only genus, differs chiefly by the absence of the endo-plastral plate. Inframarginals are present. The nuchal plate has a pair of rib-like processes. The neural plates are interrupted by the meeting of several pairs of the costal plates. Twenty-three marginal shields. In some species

the skin of the legs and neck is so baggy that these parts slip in, the skin rolling off, when such a turtle withdraws into its shell. In some the plastron is hinged and the creature can shut itself up tightly, e.g. C. leucostoma of Mexico; in others the plastron leaves gaps, or it is narrow and without hinges, e.g. C. odoratum, the mud turtle or stinkpot terrapin of the eastern half of North America. About a dozen species, mostly Central American.

Family 4. Platysternidae. — Platysternum megacephalum, the only species, from Burma to southern China. The total length of these thick-headed, very long-tailed turtles is about I ft., only 5 in. belonging to the shell. The plastron is large, oblong, not cruciform, composed of nine plates. The nuchal is devoid of rib-like processes. A unique arrangement is that the jugals are completely shut off from the orbits owing to the meeting of the post-frontals with the maxillaries.

Family 5. Testudinidae. — The shell is always covered with well-developed shields; those which cover the plastral bridge are in direct contact with the marginals. The plastron is composed of nine bones. The digits have four or five claws. The neck is completely retractile.

This family contains the majority of tortoises, divided into as many as 20 genera. These, starting with Emys as the least specialized, can be arranged in two main diverging lines, one culminating in the thoroughly aquatic Batagur, the other in the exclusively terrestrial forms. Emys, with the plastron movably united to the carapace; with well-webbed limbs, amphibious. E. orbicularis or europaea was, towards the end of the Pleistocene period, distributed over a great part of middle Europe, remains occurring in the peat of England, Belgium, Denmark and Sweden; it is now withdrawing eastwards, being restricted in Germany to isolated localities east of Berlin, but it reoccurs in Poland and Russia, whence it extends into western Asia ; it is common in south Europe. The other species, E. blandingi, lives in Canada and the north-eastern states of the Union. Clemmys with the plastron immovably united to the cara- pace; temperate holarctic region, e.g. C. caspica, C. leprosa in Spain and Morocco; C. insculpta, in north-east America. Mala- codemmys with a few species in North America, e.g. M. terrapin, the much prized ” diamond-back. ” Chrysemys with many American species, e.g. Ch. picta, the ” painted terrapin ” and C. concinna, most of them very handsomely coloured and marked when still young. Batagur and Kachuga in the Indian sub-region.

Cistudo Carolina, the box tortoise of North America, with the plastron divided into an anterior and a posterior movable lobe, so that the creature can shut itself up completely. Although essen- tially by its internal structure a water tortoise, it has become absolutely terrestrial in habits, and herewith agree the high- backed instead of depressed shell, the short webless fingers and its general coloration. It has a mixed diet. The eyes of the males are red, those of the females are brown. From Long Island to Mexico. Cinixys, e.g. belliana of tropical Africa, has the posterior portion- of the carapace movably hinged. Pyxis arachnoides of Madagascar has the front-lobe of the plastron hinged.

Testudo, the main genus, with about 40 species, is cosmopolitan in tropical and sub-tropical countries, with the exception of the whole of the Australian and Malay countries; most of the species are African. T. graeca, in Mediterranean countries and islands. T. marginata in Greece with the posterior margin of the carapace much flanged or serrated, and T. ibera or mauritanica from Morocco to Persia; both differ from T. graeca by an unpaired supracaudal, marginal shield, and by the possession of a strong, conical, horny tubercle on the hinder surface of the thigh. With age the posterior portion of the plastron develops a transverse ligamentous hinge. T. polyphemus, the ” gopher ” of southern United States, lives in pairs in self-dug burrows. T. tabulata is one of the few South American terrestrial tortoises.

Of great interest are the so-called gigantic land tortoises. In former epochs truly gigantic species of the genus Testudo had a wide and probably more continuous distribution. There was T. atlas, of the Pliocene of the Sivalik hills with a skull nearly 8 in. long, but the shell probably measured not more than 6 ft. in length, the restored specimen in the Natural History Museum at South Kensington being exaggerated. T. perpigniana of Pliocene France was also large. Large land tortoises, with a length of shell of more than 2 ft., became restricted to two widely separated regions of the world, viz. the Galapagos Islands (called thus after the Spanish galapago, i.e. tortoise), and islands in the western Indian Ocean viz. the Mascarenes (Bourbon, Mauritius and Rodriguez) and Aldabra. When they became extinct in Madagascar is not known, but T. grandidieri was a very large kind, of apparently very recent date. At the time of their discovery those smaller islands were un- inhabited by man or any predaceous mammal. It was on these peaceful islands that land tortoises lived in great numbers; with

plenty of food there was nothing for them to do but to feed, to propagate, to grow and to vary. Most of the islands were or are inhabited by one or more typical, local forms. As they provided, like the equally ill-fated dodo and solitaire, a welcome provision of excellent meat, ships carried them about, to be slaughtered as occasion required, and soon almost exterminated them; some were occasionally liberated on other islands, for instance, on the Seychelles and on the Chagos, or they were left as presents, in Ceylon, Java or on Rotuma near the Fijis. Thus it has come to pass that the few survivors have been very much scattered. The small genuine stock at Aldabra is now under government protection, in a way. A large male of T. gigantea or elephantina or hololissa or ponderosa, was brought to London and weighed 870 lb; another specimen had in 1908 been living at St Helena for more than one hundred years. A specimen of T. daudini, native of the South Island of Aldabra, was known for many years on Egmont Island, one of the Chagos group, then it was taken to Mauritius and then to England, where of course it soon died ; its shell measures 55 in. in a straight line, and it weighed 560 lb. The type specimen of T. sumeirei, supposed to have come originally from the Seychelles, was in 1908 still kept in the barrack grounds at Port Louis, Mauri- tius, and had been known as a large tortoise for about 150 years. T. vosmaeri was a very thin-shelled species in Rodriguez. Of the Galapagos species T. ephippium still survives on Duncan Island; T. abingdoni lived on Abingdon Island; of T. elephantopus or vicina, G. Baur still collected 21 specimens in 1893 on Albemarle Island. One monster of this kind is said to have measured 56 in. over the curve of the carapace, with a skull a little more than 7 in. in length. All the Galapagos species are remarkable for their comparatively small head and the very long neck, which is much larger and more slender than that of the eastern species.

Family 6. Chelonidae. Marine turtles, with only two recent genera, with three widely distributed species. The limbs are paddle- shaped, with only one or two claws, and the shell is covered with horny shields. The neck is short and incompletely retractile. The parietals, post-frontals, squamosals, quadrato-jugals, and jugals are much expanded and form an additional or false roof over the temporal region of the skull.

The Chelonidae are a highly specialized offshoot of the Cryptodira, adapted to marine life. Fundamentally they agree most with the Testudinidae, and there is nothing primitive about them except that they still possess complete series of

inframaxginal shields.

Chelone, with only 4 pairs of costal shields, with 5 neurals and a broad nuchal. C. mydas s. viridis, the ” green or edible turtle,”

Fig. 5. — Green Turtle {Chelone mydas).

has, when adult, a nearly smooth shell. It attains a length of nearly 4 ft., and may then weigh more than three hundredweight. Their food consists of algae, and of Zostera marina. Their capture forms a regular pursuit wherever they occur in any numbers. Comparatively few are caught in the open sea, others in staked nets, but the majority are intercepted at well-known periods and localities where they go ashore to deposit their eggs. These are round, with a parchment-like shell and buried in the sand, above the high-tide mark, as many as 100 to 250 being laid by one female. They are eagerly searched for and eaten. The famous turtle- soup is made not only of the meat and the fat, but also from the thick and gelatinous layer of subcutaneous tissue which lines the inside of the shell. Only. the females are eaten; the males, recogniz- able by the longer tail, are rejected at the London market. This species inhabits the Atlantic, Indian and Pacific Oceans.

C. imbricata, the ” hawksbill turtle. ” The shields are thick, strongly overlapping each other from before backwards, but in old specimens the shields lose their keel, flatten and become juxta- posed. The horny cover of the upper jaw forms a hooked beak. This species lives upon fish and molluscs and is not eaten; but is much persecuted for the horny shields which yield the

” tortoise-shell, ” so far as this is not a fraudulent imitation. When heated in oil, or boiled, the shields (which singly are not thick enough to be manufactured into larger articles) can be welded together under pressure and be given any desired shape. The ” hawksbill ”

Fig. 6. — Hawksbill Turtle {Chelone imbricata).

ranges over all the tropical and sub- tropical seas and scarcely reaches 3 ft. in length, but such a shell yields up to 8 lb of tortoiseshell.

Thalassochelys caretta, the ” loggerhead, ” has normally five pairs of costal shields, but whilst the number of shields in the genus Chelone is very constant, that of the loggerhead varies individually to an astonishing extent. The greatest number of neurals ob- served, and counting the nuchal as the first, is 8, and 8 pairs of costal, in all 24; the lowest numbers are 6 neurals with 5 pairs of costals; odd costals are frequent. The most interesting facts are that some of the supernumerary shields are much smaller than the others, sometimes mere vestiges in all stages of gradual suppression, and that the abnormalities are much more common in babies and small specimens than in adults. The importance of these ortho- genetic variations has been discussed by H. Gadow in A. Willey’s Zoolog. Results, pt. iii. p. 207-222, pis. 24, 25 (Cambridge 1899).

Fig. 7.— Loggerhead {Thalassochelys caretta).

The ” loggerhead ” is carnivorous, feeding on fish, molluscs and crustaceans, and is not esteemed as food. A great part of the turtle-oil which finds its way into the market is obtained from it; its tortoiseshell is of an inferior quality. Besides all the inter-tropical seas it inhabits the Mediterranean, and is an accidental visitor of the western coasts of Europe. The old specimen captured on the Dutch coast in 1894 contained the enormous number of 1 1 5″ eggs.

Super-family 2. Pleurodira. — The lonˆ neck bends laterally and is tucked away between the anterior portion of the carapace and the

plastron. The dorsal and ventral ends of the pelvis are anchylosed to the shell. Fresh-water tortoises of South America, Australia, Africa and Madagascar.

Fig. 8. — The Matamata (Chelys fimbriata) with side view of head, and separate view of plastron.

Family 1. Pelomedusidae. — Neck completely retractile. Carapace covered with horny shields, of which the nuchal is wanting. Plastron composed of 11 plates. With 24 marginal and 13 plastral shields,

Fig. 9. — Lower view of Trionyx euphratica.

inclusive of a conspicuous intergular. Sternothaerus in Africa and Madagascar. Pelomedusa galeata in Madagascar and from the

Cape to the Sinaitic peninsula. Podocnemis is common in tropical South America, e.g. P. expansa of Brazilian rivers, noteworthy for

the millions of eggs which are, or were, annually collected for the sake of their oil. Bates (The Naturalist on the River Amazon) gives a most interesting account of these turtles, which are entirely frugivorous.

Family 2. Chelydidae. — The neck, when bent, remains partly exposed. Shell covered with shields. Plastron composed of 9 plates, but covered with 13 shields. This family, still represented by nearly 30 species, with 8 genera, is found in South America and in Australia. Chelys fimbriata, the ” matamata ” in the rivers of Guiana and North Brazil ; total length about 3 ft. ; with animal diet. Hydromedusa, e.g. tectifera, with very long neck, in Brazil, much resembling Chelodina, e.g. longicollis of the Australian region.

Family 3. Carettochelydidae. — Carettochelys insculpta, the only species, in the Fly river of New Guinea; still imperfectly known. This peculiar turtle seems to stand in the same relation to the Chely- didae and to the Trionychidae as do the Chelonidae to the Testu- dinidae by the transformation of the limbs into paddles with only two claws, and the complete reduction of the horny shields upon the shell, which is covered with soft skin. The plastron is composed of 9 plates; the 6 neural plates are all separated from one another by the costals. The premaxilla is single, as elsewhere only in

Fig. 10. — Upper view of the Turtle of the Euphrates (Trionyx euphratica).

Chelys and in the Trionychidae. The neck is short and non-retractile. Length of shell about 18 in.

Super-family 3. Trionychoidea. — The shell is very flat and much smaller than the body, and covered with soft leathery skin, but traces of horny structures are still represented, especially in the young of some species, by numerous scattered little spikes on the back of the shell and even on the soft parts of the back. The limbs are short, broadly webbed and only the three inner digits are pro- vided with claws. Head and neck are retractile, bending in a

sig- moid curve in a vertical plane. The jaws are concealed by soft lip-like flaps and the nose forms a short soft proboscis. The tem- poral region is not covered in by any arches ; the quadrate is trumpet- shaped as in the Chelydidae, but the jugular arch is complete. The pelvis is not anchylosed to the shell. The carapace is much reduced in size, the ribs extending beyond the costal plates, and there are no marginals; except in the African Cyclanorbis the neural plates form a continuous series. All the nine elements of the plastron are deficient and but very loosely connected with each other. Most of these reductions in the skeletal and tegumentary armature are the result of life in muddy waters, in the bottom of which these creatures bury themselves with only the head exposed. They feed upon aquatic animals; those which are partial to hard- shelled molluscs soon wear down the sharp horny edges of theiaws, and thick horny crushing pads are developed in their stead. They

only crawl upon land in order to lay their round brittle eggs. Trionyxes inhabit the rivers of Asia, Africa and North America. Trionyx ferox, the ” soft-shelled turtle,” in the whole of the Missis- sippi basin and in the chain of the great northern lakes. T. triunguis in Africa, the largest species, with a length of shell of 3 ft. T. hurum and T. gangeticus are the commonest Indian species. The young are ornamented with two or three pairs of large, round, ocellated spots on the back. (H. F. G.)

TORTOISESHELL. The tortoiseshell of commerce consists of the epidermic plates covering the bony carapace of the hawksbill turtle, Chelonia imbricata, the smallest of the sea turtles. The plates of the back or carapace, technically called the head, are 13 in number, 5 occupying the centre, flanked by 4 on each side. These overlap each other to the extent of one-third of their whole size, and hence they attain a large size, reaching in the largest to 8 in. by 13 in., and weighing as much as 9 oz. The carapace has also 24 marginal pieces, called hoofs or claws, forming a serrated edge round it; but these, with the plates of the plastron, or belly, are of inferior value. The plates of tortoiseshell consist of horny matter, but they are harder, more brittle, and less fibrous than ordinary horn. Their value depends on the rich mottled colours they display — a warm translucent yellow, dashed and spotted with rich brown tints — and on the high polish they take and retain. The finest tortoiseshell is obtained from the Eastern Archipelago, par- ticularly from the east coast of Celebes to New Guinea; but the creature is found and tortoiseshell obtained from all tropical coasts, large supplies coming from the West Indian

Islands and Brazil.

Tortoiseshell is worked precisely as horn ; but, owing to ‘the high value of the material, care is taken to prevent any waste in its working. The plates, as separated by heat from the bony skeleton, are keeled, curved, and irregular in form. They are first flattened by heat and pressure, and superficial inequalities are rasped away. Being harder and more brittle than horn, tortoiseshell requires careful treatment in moulding it into any form, and as high heat tends to darken and obscure the material it is treated at as low a heat as practicable. For many purposes it is necessary to increase the thickness or to add to the superficial size of tortoiseshell, and this is readily done by careful cleaning and rasping of the surfaces to be united, softening the plates in boiling water or sometimes by dry heat, and then pressing them tightly together by means of heated pincers or a vice. The heat softens and liquefies a superficial film of the horny material, and that with the pressure effects a perfect union of the surfaces brought together. Heat and pressure are also employed to mould the substance into boxes and the numerous artificial forms into which it is made up.

Tortoiseshell has been a prized ornamental material from very early times. It was one of the highly esteemed treasures of the Far East brought to ancient Rome by way of Egypt, and it was eagerly sought by wealthy Romans as a veneer for their rich furniture. In modern times it is most characteristically used in the elaborate inlaying of cabinet-work known as buhl furniture, and in com- bination with silver for toilet articles. It is also employed as a veneer for small boxes and frames. It is cut into combs, moulded into snuff-boxes and other small boxes, formed into knife-handles, and worked up into many other similar minor articles. The plates from certain other tortoises, known commercially as turtle-shell, possess a certain industrial value, but they are either opaque or soft and leathery, and cannot be mistaken for tortoiseshell. A close imitation of tortoiseshell can be made by staining translucent horn or by varieties of celluloid.

TORTOLl, a town and episcopal see of Sardinia, on the east coast, 140 m. N.N.E. of Cagliari by rail (55 m. direct). Pop. (1901), 2105. It lies 60 ft. above sea-level to the south-west of a large lagoon, which renders it unhealthy. The harbour is 25 1:1. to the east, and serves for the export of the wine and agricultural produce of the Ogliastra. A little to the south of Tortoli was the station of Sulci on the Roman coast road, known to us only from

the itineraries.

TORTONA (anc. Dertona), a town and episcopal see of Piedmont, Italy, in the province of Alessandria, from which it is 14 m. E. by rail, on the right bank of the Scrivia, at the northern foot of the Apennines, 394 ft. above sea-level. Pop. (1901), 11,308 (town); 17,419 (commune). Tortona is on the main line from Milan to Genoa; from it a main line runs to Alessandria, a branch to Castelnuovo Scrivia, and a steam tramway to Sale. Its fortifications were destroyed by the French after Marengo (1799); the ramparts are now turned into shady

promenades. The cathedral, erected by Philip II., contains a remarkably fine Roman sarcophagus of the Christian period. Silk-weaving, tanning and hat-making are the chief industries; and there is some trade in wine and grain.

Dertona, which may have become a Roman colony as early as the 2nd century B.C. and – certainly did so under Augustus, is spoken of by Strabo as one of the most important towns of Liguria. It stood at the point of divergence of the Via Postumia (see Liguria) and the Via Aemilia, while a branch road ran hence to Pollentia. A number of ancient inscriptions and other objects have been found here. In the middle ages Tortona was zealously attached to the Guelphs, on which account it was twice laid waste by Frederick Barbarossa, in 1155 and 1163. (T. As.)

TORTOSA, a fortified city of north-east Spain, in the province of Tarragona; 40 m. by rail W.S.W. of the city of Tarragona, on the river Ebro 22 m. above its mouth. Pop. (1900), 24,452. Tortosa is for the most part an old walled town on the left bank of the river, with narrow, crooked and ill-paved streets, in which the houses are lofty and massively built of granite. But some parts of the old town have been rebuilt, and there is a modern suburb on the opposite side of the Ebro. The slope on which old Tortosa stands is crowned with an ancient castle, which has been restored and converted into barracks and a hospital. All the fortifications are obsolete. The cathedral occupies the site of a Moorish mosque built in 914. The present structure, which dates from 1347, has its Gothic character disguised by a classical facade with Ionic pillars and much tasteless modernization. The stalls in the choir,

carved by Cristobal de Salamanca in 1 588-1 593, and the sculpture of the pulpits, as well as the iron-work of the choir-railing and some of the precious marbles with which the chapels are adorned, deserve notice. The other public buildings include an episcopal palace, a town- hall and numerous churches. There are manufactures of paper, hats, leather, ropes, porcelain, majolica, soap, spirits, and ornaments made of palm leaves and grasses. There is an important fishery in the river, and the harbour is accessible to vessels of 100 tons burden. Corn, wine, oil, wool, silk, fruits and liquorice (a speciality of the district) are exported. The city is connected with Barcelona and Valencia by the coast railway, and with Saragossa by the Ebro valley line; it is also the terminus of a railway to San Carlos de la Rapita on the Mediterranean. Near Tortosa are rich quarries of marble and alabaster.

Tortosa, the Dertosa of Strabo and the Colonia Julia Augusta Dertosa of numerous coins, was a city of the Ilercaones in Hispania Tarraconensis. Under the Moors it was of great importance as the key of the Ebro valley. It was taken by Louis the Pious in 811 (after an unsuccessful siege two years before), but was soon recaptured. Having become a haunt of pirates, and exceedingly injurious to Italian commerce, it was made the object of a crusade proclaimed by Pope Eugenius III. in 1148, and was captured by Ramon Berenguer IV., count of Barcelona, assisted by Templars, Pisans and Genoese. An attempt to recapture the city in 1149 was defeated by the heroism of the women, who were thenceforth empowered by the count to wear the red sash of the Order of La Hacha (The Axe), to import their clothes free of duty, and to precede their bridegrooms at weddings. Tortosa fell into the hands of the duke of Orleans in 1708; during the Peninsular War it surrendered in 181 1 to the French under Suchet, who held it till 1814.

TORTURE (from Lat. torquere, to twist), the general name for innumerable modes of inflicting pain which have been from time to time devised by the perverted ingenuity of man, and especially for those employed in a legal aspect by the civilized nations of antiquity and of modern Europe. From this point of view torture was always inflicted for one of two purposes: (1) As a means of eliciting evidence from a witness or from an accused person either before or after condemnation; (2) as a part of the punishment. The second was the earlier use, its function as a means of evidence arising when rules were gradually formulated by the experience of legal experts.

Torture as a part of the punishment may be regarded as including every kind of bodily or mental pain beyond what is necessary for the safe custody of the offender (with or without enforced labour) or the destruction of his life — in the language of Bentham, an ” afflictive ” as opposed to a ” simple ” punishment. Thus the unnecessary sufferings endured in English prisons before the reforms of John Howard, the peine forte et dure, and the drawing and quartering in executions for treason, fall without any straining of terms under the category of torture.

The whole subject is now one of only historical interest as far as Europe is concerned. It was, however, up to a comparatively recent date an integral part pf the law of most countries (to which England, Aragon and Sweden 1 formed honourable exceptions) — as much a commonplace of law as trial by jury in England. 2 The prevailing view, no doubt, was that truth was best obtained by confession, the regina probationum. Where confession was not voluntary, it must be extorted. Speaking generally, torture may be said to have succeeded the ordeal and trial by battle. Where these are found in full vigour, as in the capitularies of Charlemagne, there is no provision for torture. It was no doubt accepted reluctantly as being a quasi judicium Dei, but tolerated in the absence of any better means of eliciting truth, especially in cases of great gravity, on the illogical assumption that extraordinary offences must be met by extraordinary remedies. Popular feeling too, says Verri, preferred, as causes of evil, human beings who could be forced to confess, rather than natural causes which must be accepted with resignation. Confession, as probatio probatissima and vox vera, was the best of all evidence, and all the machinery of law was moved to obtain it. The trials for witchcraft remain on record as a refutation of the theory.

The opinions of the best lay authorities have been almost unanimously against the use of torture, even in a system where it was as completely established as it was in Roman law. ” Tormenta,” says Cicero, 3 in words which it is almost impossible to translate satisfactorily, ” gubernat dolor, regit quaesitor, flectit libido, corrumpit spes, infirmat metus, ut in tot rerum angustiis nihil veritati loci relinquatur.” Seneca says bitterly, ” it forces even the innocent to lie.” St Augustine 4 recognizes the fallacy of torture. ” If,” says he, ” the accused be innocent, he will undergo for an uncertain crime a certain punishment, and that not for having committed a crime, but because it is unknown whether he committed it.” At the same time he regards it as excused by its

necessity. The words of Ulpian, in the Digest of Justinian, 5 are no less impressive: ” The torture (quaestio) is not to be regarded as wholly deserving or wholly undeserving of confidence; indeed, it is untrustworthy, perilous and decep- tive. For most men, by patience or the severity of the torture, come so to despise the torture that the truth cannot be elicited from them; others are so impatient that they will lie in any direction rather than suffer the torture; so it happens that they depose to contradictions and accuse not only themselves but others.” Montaigne’s 6 view of torture as a part of the punish- ment is a most just one: ” All that exceeds a simple death appears to me absolute cruelty; neither can our justice expect that he whom the fear of being executed by being beheaded or hanged will not restrain should be any more awed by the imagina- tion of a languishing fire, burning pincers, or the wheel.” He continues with the curious phrase: ” He whom the judge has tortured (gehennS) that he may not die innocent, dies inno- cent and tortured.” Montesquieu 7 speaks of torture in a most guarded manner, condemning it, but without giving reasons, and eulogizing England for doing without it. The system was condemned by Bayle and Voltaire with less reserve. Among

1 But even in these countries, whatever the law was, torture certainly existed in fact.

2 Primitive systems varied. There is no trace of it in Babylonian or Mosaic law, but Egyptian and Assyrian provided for it; and the story of Regulus seems to show that it was in use at Carthage.

3 Pro Sulla, c. 28. 4 De civ. Dei, bk. xix. c. 6.

6 Dig. xlviii. 18, 23. 6 Essay lxv. (Cotton’s trans.)

7 Esprit des lois, bk. vi. c. 17.

the Germans, Sonnenfels (1766), and, among the Italians, Beccaria, 1 Verri 2 and Manzoni 3 will be found to contain most that can be said on the subject. The influence of Beccaria in rendering the use of torture obsolete was undoubtedly greater than that of any other legal reformer. The great point that he makes is the unfair incidence of torture, as minds and bodies differ in strength. Moreover, it is, says he, to confound all relations to expect that a man should be both accuser and

accused, and that pain should be the test of truth, as though truth resided in the muscles and fibres of a wretch under torture. The result of the torture is simply a matter of calculation. Given the force of the muscles and the sensibility of the nerves of an innocent person, it is required to find the degree of pain necessary to make him confess himself guilty of a given crime. Bentham's 4 objection to torture is that the effect is exactly the reverse of the intention. " Upon the face of it, and probably enough in the intention of the framers, the object of this institution was the protection of innocence; the protection of guilt and the aggravation of the pressure upon innocence was the real fruit of it." The apologists of torture are chiefly among jurists. But theoretical objections to it are often urged by the authors of books of practice, as by Damhouder, von Rosbach, von Boden, Voet, and others named below under the head of The Netherlands. It is worthy of note as illustrative of the feeling of the time that even Bacon 6 compares experiment in nature to torture in civil matters as the best means of eliciting truth. Muyart de Vouglans 6 derives the origin of torture from the law of God. Other apologists are Simancas, bishop of Badajoz, 7 Engel, 8 Pedro de Castro, 9 and in England Sir R. Wiseman. 10

Greece. — The opinion of Aristotle was in favour of torture as a mode of proof. " It is," he says, " a kind of evidence, and appears to carry with it absolute credibility because a kind of constraint is applied." It is classed as one of the " artless persuasions " (&Tex voi Tr£o-ms). n " It was the surest means of obtaining evidence, says Demosthenes. 12 At Athens slaves, and probably at times resident aliens, were tortured, 13 in the former case generally with the master's consent, but torture was seldom applied to free citizens, 14 such application being forbidden by a psephism passed in the archonship of Scamandrius. After the mutilation of the Hermae in 415 B.C. a proposition was made, but not carried, that it should be applied to two senators named by an informer. In this particular case Andocides gave up all his slaves to be tortured. 15 Torture was sometimes inflicted in open court. The rack was used as a punish- ment even for free citizens. Antiphon was put to death by this means. 18 The torture of Nicias by the Syracusans is alluded to by Thucydides 17 as an event likely to happen, and it was only in order to avoid the possibility of inconvenient disclosures that he was put to death without torture. Isocrates and Lysias refer to torture under the generic name of (rxpe/SXoxrts, but it was generally called fiaaai'OL, in the plural, like tormenta. As might be expected,

torture was frequently inflicted by the Greek despots, and both Zeno and Anaxarchus are said to have been put to it by such irresponsible authorities. At Sparta the despot Nabis was accustomed, as we learn from Polybius, 18 to put persons to death by an instrument of torture in the form of his wife Apega, a mode of torture no doubt resembling the Jungfernkuss once used in Germany. At Argos, as Diodorus informs us (xv. 57), certain conspirators were put to the torture in 371 B.C. 19

I Dei Delitti e delle pene, c. xvi. 2 Osservazioni sulla tortura. 3 Storia delta Colonna infame. 4 Works, vii. 525.

5 Nov. Org., bk. i. aph. 98. In the Advancement of Learning, bk. iv. ch. 4, Bacon collects many instances of constancy under torture.

6 Institute du droit criminel (Paris, 1757).

7 De catholicis institutionibus liber, ad praecavendas et extirpandas haereses admodum necessarius (Rome, 1575).

8 De tortura ex f oris christianis non proscribenda (Leipzig, 1733). * Defensa de la tortura (Madrid, 1778).

10 Law of Laws, p. 122 (London, 1686).

II Rhet. i. 15, 26. 12 In Onetum, i. 874.

13 Usually by the diaetetae in the Hephaestaeum, Isocrates, Trapez. 361.

14 The opinion of Cicero (De partitionibus oratoriis, § 34), that it was so applied at Athens and Rhodes, seems, as far as regards Athens, not to be justified by existing evidence.

15 The demand for, or the giving up of, a slave for torture was called TrpoK\ri(TLs ets fiacravov.

16 In the Ranae of Aristophanes, v. 617, there is a list of kinds of torture, and the wheel is alluded to in Lysistrata, v. 846.

17 vii. 86. 18 xiii. 7.

19 For the whole subject, see Diet. Ant., s.v. Tormenta.

Rome. — The Roman system was the basis of all subsequent European systems which recognized torture as a part of their pro-

cedure, and the rules attained a refinement beyond anything approached at Athens. The law of torture was said by Cicero to rest originally on custom (mores majorum), but there is no allusion to it in the Twelve Tables. There are frequent allusions to it in the classical writers, 20 both of the republic and the empire. The law, as it existed under the later empire, is contained mainly in the titles De quaestionibus 21 of the Digest and the Code 22 — the former consisting largely of opinions from the Sentenliae receptae of Paulus, 23 the latter being for the most part merely a repetition of constitutions contained in the Theodosian Code. 24 Both substantive law and procedure were dealt with by these texts of Roman law, the latter, however, not as fully as in medieval codes, a large discretion being left to the judges. Torture was used both in civil and criminal trials, but in the former only upon slaves and freedmen or infamous persons (after Nov. xc. I, 1, upon ignoli and obscuri if they showed signs of corrup- tion) — such as gladiators — and in the absence of alia manifesta indicia, 2 * as in cases affecting the inheritance (res hereditariae). Its place in the case of free citizens was taken by the reference to the oath of the party. During the republic torture appears to have been confined to slaves in all cases, but with the empire a free man became liable to it if accused of a crime, though in most cases not as a witness. On an accusation of treason every one, whatever his rank, was liable to torture, for in treason the condition of all was equal. 26 The same was the case of those accused of sorcery (magi), who were regarded as humani generis inimiciP A wife might be tortured (but only after her slaves had been put to the torture) if accused of poisoning her husband. In accusations of crimes other than treason or sorcery, certain persons were protected by the dignity of their position or their tender age. The main exemptions were contained in a constitution of Diocletian and Maximian, and included soldiers, nobles of a particular rank, i.e. eminentissimi and perfectis- simi, and their descendants to the third generation, and decuriones and their children to a limited extent (tormenta moderata) — that is to say, they were subject to the torture of the plumbatae in certain cases, such as fraud on the revenue and extortion. In addition to these, priests (but not clergy of a lower rank), children under fourteen and pregnant women were exempt. A free man could be tortured only where he had been inconsistent in his depositions, or where there was a suspicion that he was lying. 23 The rules as to the torture of slaves were numerous and precise. It was a maxim of Roman law that torture of slaves was the most efficacious means of obtaining truth. 29 They could be

tortured either as accused or as witnesses for their masters in all cases, but against their masters only in accusations of treason, adultery, frauds oft the revenue, coining, and similar offences (which . were regarded as a species of treason), attempts by a husband or wife on the life of the other, and in cases where a master had bought a slave for the special reason that he should not give evidence against him. The privilege from accusa- tions by the slave extended to the master's father, mother, wife, or tutor, and also to a former master. On the same principle a freedman could not be tortured against his patron. The privilege did not apply where the slave was joint property, and one of his masters had been murdered by the other, or where he was the property of a corporation, for in such a case he could be tortured in a charge against a member of the corporation. Slaves belonging to the inheritance could be tortured in actions concerning the inheritance. The adult slaves of a deceased person could be tortured where the deceased had been murdered. In a charge of adultery against a wife, her husband's, her own and her father's slaves could be put to the torture. A slave manumitted for the express purpose of escaping torture was regarded as still liable to it. Before putting a slave to torture without the consent of his master, security must be given to the master for his value and the oath of calumny must be taken. 30 The master of a slave tortured on a false accusation could recover double his value from the accuser. The undergoing of torture had at one time a serious effect upon the after-life of the slave, for in the time of Gaius a slave who had been tortured could on manumission obtain no higher civil rights than those of a dediticius. 31 The rules of procedure were conceived in a spirit of as much fairness as such rules could be. Some of the most important were these: The amount of torture was at the discretion of the judge, but it was to be so

20 An instance is Pliny's letter to Trajan (Epist. x. 97), where he mentions having put to the torture two Christian deaconesses (ministrae). The words are confitentes iterum ac tertio interrogavi. This supports Tertullian's objection to the torture of Christians, torquemur confitentes (Apol. c. 2).

21 Quaestio included the whole process of which torture was a part. In the words of Cujacius, Quaestio est interrogatio quae fit per tormenta, vel de reis, vel de testibus qui facto intervenisse dicuntur.

22 Dig. xlviii. 18; Cod. ix. 41.

23 v. 14, 15, 16. 24 ix. 35.

25 Cod. ix. 8. 3. 26 Ibid. ix. 8, 4.

27 Ibid. ix. 18, 7. 28 Ibid. iv. 20, 13.

29 Ibid. i. 3, 8.

30 Ibid. ii. 59, 1,1. The demand of another man's slave for torture was postulare.

31 Gaius i. 13.

applied as not to injure life or limb. If so applied the judge was infamis. The examination was not to begin by torture; other proofs must be exhausted first. The evidence 1 must have advanced so far that nothing but the confession of the slave was wanting to complete it. Those of weakest frame and tenderest age were to be tortured first. Except in treason, the unsupported testimony of a single witness was not a sufficient ground for torture. The voice and manner of the accused were to be carefully observed. A spon- taneous confession, or the evidence of a personal enemy, was to be received with caution. Repetition of the torture could only be ordered in case of inconsistent depositions or denial in the face of strong evidence. There was no rule limiting the number of repeti- tions. Leading questions were not to be asked. A judge was not liable to an action for anything done during the course of the examina- tion. An appeal from an order to torture was competent to the accused, except in the case of slaves, when an appeal could be made only by the master. 2 The appellant was not to be tortured pending the appeal, but was to remain in prison. 3 The quaesitor asked the questions, the tortores applied the instruments. The principal forms of torture in use were the equuleus, or rack (mentioned as far back as Cicero), 4 the plumbatae, or leaden balls, the ungulae, or barbed hooks, the lamina, or hot plate, the mala mansio, h and the fidiculae, or cord compressing the arm. Other allusions in the Digest and Code, in addition to those already cited, may be shortly noticed. The testimony of a gladiator or infamous person (such as an accomplice) was not valid without torture. 6 This was no doubt the origin of the medieval maxims (which were, however, by no means universally recognized) — Vilitas

personae est justa causa torquendi testem, and Tortura purgatur infamia. Torture could not be inflicted during the forty days of Lent. 7 Robbers and pirates might be tortured even on Easter day, the divine pardon being hoped for where the safety of society was thus assured. 8 Capital punish- ment was not to be suffered until after conviction or confession under torture. 9 Withdrawal from prosecution (abolitio) was not to be allowed as a rule after the accused had undergone the torture. 10 In charges of treason the accuser was liable to torture if he did not prove his case. 11 The infliction of torture, not judicial, but at the same time countenanced by law, was at one time allowed to creditors. They were allowed to keep their debtors in private prisons, and most cruelly ill-use them, in order to extort payment. 12 Under the empire private prisons were forbidden. 13 In the time of Juvenal the Roman ladies actually hired the public torturers to torture their domestic slaves. 14 As a part of the punishment torture was in frequent use. Crucifixion, mutilation, exposure to wild beasts in the arena and other cruel modes of destroying life were common, especially in the time of the persecution of the Christians under Nero. 15 Crucifixion as a punishment was abolished by Constantine in 315, in veneration of the memory of Him who was crucified for mankind. On the other hand, where the interests of the Church were concerned the tendency was in favour of greater severity. Thus, by the Theodosian Code, a heretic was to be flogged with lead (contusus plumbo) before banishment, 16 and Justinian made liable to torture and exile any one insulting a bishop or priest in a church, or saying litany, if a layman. 17

1 The evidence on which the accused might be tortured was expressed in Roman law by the terms argumentum and indicium (used technically as early as Cicero, Verres, i. 10 and 17). The latter term, as will be seen, afterwards became one of the most important in the law of torture, but the analysis of indicium is later than Roman law. Indicium was not quite the same thing as semi- plena probatio, though the terms appear to be occasionally used as synonyms. Indicium was rather the foundation or cause of probatio, whether plena or semiplena. An indicium or a concurrence of indicia might, according to circumstances, constitute a plena or semiplena probatio. The phrase legitima indicia was sometimes used. In Sir T. Smith's work, c. 24 (see below), index means a prisoner acting as an approver under torture. Tormentum, tortura and quaestio appear to be equivalent terms. The medieval jurists derived the first of these

from torquere mentem, an etymology as false as testamentum from testatio mentis {Inst. ii. 10 pr.).

2 Dig. xlix. i. 15. 3 Cod. vii. 62, 12.

4 Milo, lvii.

6 Of doubtful meaning, but perhaps like the ” Little Ease ” of the Tower of London.

6 Dig. xxii. 5, 21, 2. 7 Cod. iii. 12, 6.

8 Ibid. iii. 12, 10. 9 Ibid. ix. 47, 16.

10 Ibid. ix. 42, 3. u Ibid. ix. 8, 3.

12 See, for instance, Livy vi. 36. 13 Cod. i. 4, 23; ix. 5.

14 Ibid. vi. 480.

15 As an example of such punishments, cf. the well-known lines of Juvenal (Sat. i. 155): —

” Taeda lucebis in ilia, Qua stantes ardent qui fixo,gutture fumant.” For other poetical allusions, see vi. 480, xiv. 21; Lucr. iii. 1030; Propert. iv. 7, 35.

16 xvi. 53.

17 Nov. cxxiii. 31. On the subject of torture in Roman law reference may be made to Wasserscheben, Historia quaestionum per tormenta apud Romanos (Berlin, 1836); H. Wallon. Histoire de I’esclavage duns Vantiquite (Paris, 1879); Mommsen, Romisches

The Leges barbarorum are interesting as forming the link of connexion between the Roman and the medieval systems. Through them the Roman doctrines were transmitted into the Roman law countries. The barbarian codes were based chiefly on the Theodosian Code. As compared with Roman law there seems to be a leaning towards humanity, e.g. the provision for redemption of a slave after confession by s. 40 of the Lex salica. After the edict of Gundobald in 501 the combat rather than the torture became the expression of the judicium Dei.

The Church. — As far as it could the Church adopted the Roman law. The Church generally secured the almost entire immunity of

its clergy, at any rate of the higher ranks, from torture by civil tribunals; 18 but in general, where laymen were concerned all persons were equal. In many instances councils of the Church pronounced against torture, e.g. in a synod at Rome in 384. 19 Torture even of heretics seems to have been originally left to the ordinary tribunals. Thus a bull of Innocent IV., in 1282, directed the torture of heretics by the civil power, as being robbers and murderers of souls, and thieves of the sacraments of God. 20 The Church also enjoined torture for usury. 21 A characteristic division of torture, accepted by the Church, but not generally acknowledged by lay authorities, was into spiritual and corporal, the latter being simply the imposition of the oath of purgation, the only form originally in use in the ecclesiastical courts. The canon law contains little on the subject of torture, and that little of a comparatively humane nature. It laid down that it was no sin in the faithful to inflict torture, 22 but a priest might not do so with his own hands, 23 and charity was to be used in all punishments. 24 No confession was to be extracted by torture 25 and it was not to be ordered indiciis non praecedentibus . w The principal ecclesiastical tribunal by which torture was inflicted in more recent times was the Inquisition. The code of instructions issued by Torquemada in Spain in 1484 provided that an accused person might be put to the torture if semiplena probatio existed against the accused — that is, so much evidence as to raise a grave and not merely a light presump- tion of guilt, often used for the evidence of one eye or ear witness of a fact. If the accused confessed during torture, and afterwards confirmed the confession, he was punished as convicted ; if he retracted, he was tortured again, or subjected to extraordinary punishment. One or two inquisitors, or a commissioner of the Holy Office, were bound to be present at every examination. Owing to the occurrence of certain cases of abuse of torture, a decree of Philip II. was issued, in 1558, forbidding the administration of torture without an order from the council. But this decree does not appear to have been fully observed. By the edict of the inquisitor-general Valdes, in 1561, torture was to be left to the prudence and equity of the judges. They must consider motives and circumstances before decreeing torture, and must declare whether it is to be employed in caput proprium, i.e. to extort a confession, or in caput alienum, i.e. to incriminate an accomplice. Torture was not to be decreed until the termination of the process and after defence heard, and the decree was subject to appeal, but only in doubtful cases, to the Council of the Supreme. It was also only in doubtful cases that the

inquisitors were bound to consult the council; where the law was clear (and of this they were the judges) there need be no consultation, and no appeal was allowed. On ratification twenty-four hours afterwards of a confession made under torture, the accused might be reconciled, if the inquisitors believed him to be sincerely repentant. If convicted of bad faith he might be relaxed, i.e. delivered to the secular power to be burned. The inquisitors had a discretion to allow the accused to make the canonical purgation by oath instead of undergoing corporal torture, but the rule which allows this to be done at the same time discountenances it as fallacious. It is remarkable that the rules do not allow much greater efficacy to torture. They speak of it almost in the terms of Roman law as dangerous and uncertain, and depending for its effects on physical strength. 27 Torture had ceased to be inflicted before the suppression of the Inquisition, and in 1816 a papal bull decreed that torture should cease, that proceedings should be public, and that the accuser should be confronted with the accused. The rules in themselves were not so cruel as the construction put upon them by the inquisitors. For instance, by Torquemada's instruc- tions torture could not be repeated unless in case of retractation. This led to the subtlety of calling a renewed torture a continuation,

Strafrecht, iii. 5 (Leipzig, 1899); Greenidge, Legal Procedure of Cicero's Time, p. 479 (Oxford, 1901).

18 See Escobar, Theol. Mor. tract, vi. c. 2. They were to be tor- tured only by the clergy, where possible, and only on indicia of special gravity.

19 Lea, Superstition and Force, p. 419 (3rd ed., Philadelphia,

1878).

20 Leges et constitutiones contra haerelicos, § 26.

21 Lecky, Rationalism in Europe, ii. 34.

22 Decretum, pt. ii. 23, 4, 45. 23 Ibid. pt. i. 86, 25.

24 Ibid. pt. ii. 12, 2, II. 25 Ibid. pt. ii. 15, 6, I.

26 Decretals, v. 41, 6.

27 The rules will be found in H. C. Lea, Hist, of the Inquisition of Spain (1906). See also Hist, of the Inquisition of the Middle Ages

(New York, 1888) by the same writer; R.Schmidt, Die Herkunft des Inquisitionsprocesses (Berlin, 1902).

and not a repetition. The rules of Torquemada and of Valdes are those of the greatest historical importance, the latter forming the code of the Holy Office until its suppression, not only in Spain, but in other countries where the Inquisition was established. But several other manuals of procedure existed before the final perfec- tion of the system by Valdes. The earliest is perhaps the instruc- tions for inquisitors (Directorium inquisitorum) compiled a century earlier than Torquemada by Nicholas Eymerico, grand inquisitor of Aragon about 1368. 1 Rules of practice were also framed two centuries later by Simancas, whose position as an apologist has been already stated. The textbook of procedure of the Italian Inquisi- tion was the Sacro arsenate. 2 In 1545 and 1550 instructions for the guidance of inquisitors were issued by Charles V. The liability of a judge for exceeding the law was not always recognized by the Inquisition to the same extent as by the lay tribunals. Llorente gives an instance of a warrant by an inquisitor to a licentiate order- ing the torture of an accused person, and protesting that, in case of death or fracture of limbs, the fact is not to be imputed to the licentiate. 3

Thus far of the law. In practice all the ingenuity of cruelty was exercised to find new modes of torment. 4 These cruelties led at times to remonstrance from the civil power. One example is the edict of Philip II. just mentioned. Another and an earlier one is an ordonnance of Philip the Fair, in 1302, bidding the Inquisition confine itself within the limits of the law. 6 At Venice the senate decreed that three senators should be present as inquisitors.

As the practice of torture became more systematized, it grew to be the subject of casuistical inquiry by churchmen to an extent far exceeding the scanty discussion of the question in the text of the canon law. It will be sufficient here to cite as an example the treat- ment of it by Liguori, who incorporates the opinions of many of the Spanish casuists. On the whole, his views appear to be more humane than the prevailing practice. The object of torture he defines very neatly as being to turn semiplena into plena probatio. For this proper indicia are necessary. He then proceeds to decide certain questions which had arisen, the most

interesting of which deal with the nature of the sin of which the accused and the judge are guilty in particular instances. A judge sins gravely if he does not attempt all milder means of discovering truth before resorting to torture. He sins in a criminal cause, or in one of notable infamy, if he binds the accused by oath to tell the truth before there is proof against him. It is the same if without oath he uses threats, terror or exhibition of torments to confound the witness. 6 If any one, to avoid grave torments, charges himself with a capital crime, he does not sin mortally. 7 It was a doubtful question whether he sinned gravely in such a case. Escobar at an earlier date supported the morally dangerous view that an inquisitor may follow a probable opinion in ordering torture, relinquishing a more probable. 8

England. — It is the boast of the common law of England that it never recognized torture as legal. One, perhaps the chief, reason for this position taken by the law is the difference of the nature of the procedure in criminal cases from that in general use in European countries. To use words more familiar in foreign jurisprudence, the English system is accusatorial as distinguished from inquisitorial. In the former the accuser has to prove guilt, in the latter the accused has to prove innocence. The common law of England has always shown itself averse from the inquisitorial system, and so (at least in theory) to the torture which may be regarded as an outcome of the system whose one end was to obtain a confession from the accused. The tendency of the small amount of statute law bearing on the subject is in the same direction. It was provided by Magna Carta, § 29, " that no free man . . . should be destroyed in any way unless by legal judgment of his equals or by the law of the land." On this Sir E. Coke comments, " No man destroyed, &c, that is, fore- judged of life or limb, disinherited, or put to torture or death." 9 The act of 27 Hen. VIII. c. 4 enacted that, owing to the frequent escape of pirates in trials by the civil law, " the nature whereof is that before any judgment of death can be given against the offenders they must plainly confess their offence (which they will never do without torture or pains)," such persons should be tried by jury before commissioners under the Great Seal. Finally, the Bill of Rights provided that cruel and unusual punishments ought not to be inflicted. The opinions of the judges have been invariably against torture in theory, however much some of them may have

1 An edition was published at Rome in 1558, and a compendium at Lisbon in 1 762, and by Marchena at Montpellier in 1 82 1.

2 It was by Father Masini, and went through numerous editions (complete or compendia) from 1558 to 1730. Among other manuals of practice were those of Carenas Caesar (1655), Moreltet (1762).

3 Llorente c. xiv.

4 Among others were the gradual pouring of water drop by drop on a particular spot of the body, the tormento de toca, or pouring of water into a gauze bag in the throat, which gradually forced the gauze into the stomach, and the pendola, or swinging pendulum, so graphically described in one of Edgar Poe's tales.

5 Ordonnances des rois, i. 346.

6 Theol. mor. bk. ix. § 202. ' Ibid. § 274.

8 Ibid. v. 3 and 7. 9 2 Inst. 48 b.

been led to countenance it in practice. The strongest authority is the resolution of the judges in Felton's case (1628), " that he ought not by the law to be tortured by the rack, for no such punishment is known or allowed by our law." 10 In accordance with this are the opinions of Sir John Fortescue, 11 Sir Thomas Smith 12 and Sir E. Coke. The latter says, " As there is no law to warrant tortures in this land, nor can they be justified by any prescription, being so lately brought in." 13 In spite of all this, torture in criminal proceedings was inflicted in England with more or less frequency for some centuries, both as a means of obtaining evidence and as a part of the punishment. But it should be remarked that torture of the former kind was invariably ordered by the Crown or council, or by some tribunal of extraordinary authority, such as the Star Chamber, not professing to be bound by the rules of the common law. In only two instances was a warrant to torture issued to a common law judge. 14

A licence to torture is found as early as the Pipe Roll of 34 Hen. II. 16 The Templars were tortured in 13 10 by royal warrant addressed to the mayor and sheriffs of London. 16 In this case it is recorded that torture was unknown in England, and that no torturer was to be found in the realm. 17 A commission was issued concerning the tortures at Newgate in 1334. 18 The rack in the Tower is said to have been introduced by the duke of Exeter in the reign of Henry VI., and to have been thence called

“the duke of Exeter’s daughter.” 19 In this reign torture seems to have taken its place as a part of what may be called extraordinary criminal procedure, claimed, and it may be said tacitly recognized, as exercisable by virtue of the prerogative, and continued in use down to 1640. 20 The infliction of torture gradually became more common under the Tudor monarchs. Under Henry VIII. it appears to have been in frequent use. Only two cases are recorded under Edward VI., and eight under Mary. 21 The reign of Elizabeth was its culminating point. In the words of Hallam, ” the rack seldom stood idle in the Tower for all the latter part of Elizabeth’s reign.” 22 The varieties of torture used at this period are fully described by Dr Lingard, 23 and consisted of the rack, the scavenger’s daughter, 24 the iron gauntlets or bilboes, and the cell called ” Little Ease.” The registers of the council during the Tudor and early Stuart reigns are full of entries as to the use of torture, both for state and for ordinary offences. 26 Among notable prisoners put to the torture were Anne Askew, the Jesuit Campion, Guy Fawkes 26 and Peacham (who was examined by Bacon ” before torture, in torture and after torture “). 27 The prevalence of torture in Elizabeth’s reign led to the well-known defence at- tributed to Lord Burghley, ” A declaration of the favourable dealing of Her Majesty’s commissioners appointed for the examination of certain traitors, and of tortures unjustly reported to be done upon them for matter of religion,” 1583. 28 The use of torture in England being always of an extraordinary and extra-judicial nature, it is

10 3 State Trials, 371.

11 De laudibus legum Angliae, c. 22.

12 Commonwealth of England, bk. ii. c. 27 (1583; ed. by L. Alston, 1906). It is curious that Sir T. Smith, with all his hatred of torture, was directed by a warrant under the queen’s seal alone (not through the council) to torture the duke of Norfolk’s servants in 1571. In a letter to Lord Burghley he pleaded for exemption from so hateful a task.

13 3 Inst. 35. Nevertheless, in the trials of Lord Essex and Southampton, Coke is found extolling the queen’s mercy for not racking or torturing the accused (1 State Trials, 1338). (See further authorities in Pollock and Maitland, Hist, of English Law, ii. 656.)

14 Jardine, Reading on the Use of Torture in the Criminal Law of

England (1837), p. 52.

15 L. O. Pike, Hist, of Crime in England, i. 427.

16 Rymer, Foedera, iii. 228, 232.

17 Walter of Hemingford, p. 256.

18 Pike I. 481. M 3 Inst. 34.

20 This is the date of the latest warrant in Jardine's work, but it was used on three Portuguese at Plymouth during the Commonwealth (Thurloe iii. 298).

21 It is to be noticed, as Jardine observes, that all these are cases of an ordinary nature, and afford no. ground for the assertions made by Strutt and Bishop Burnet that torture was used to heretics as heretics.

22 Const. Hist. i. 201.

23 Hist, of England, vol. viii. app. note v.

24 These two were exactly opposite in principle. The rack stretched the limbs of the sufferer; the scavenger's daughter compressed him into a ball.

25 Fifty-five of these will be found in the appendix to Mr Jardine's work. An ordinary robber of plate was threatened with torture in 1567. — Froude, Hist, of England, viii. 386.

26 It is not certain whether he was racked, but probably he was, in accordance with the king's letter: " If he will not otherwise confess the gentlest tortures are to be first used to him, and so on, step by step, to the most severe, and so God speed the good work."

27 Dalrymple, Memoirs and Letters of James I. p. 85 ; Macaulay's essay on the works of Bacon.

28 Lord Somers's Tracts, i. 189.

comparatively certain that it could hardly have been applied

with that observation of forms which existed in countries where it was regulated by law. There were no rules and no responsibility beyond the will of the Crown or council. This irresponsibility is urged by Selden 1 as a strong objection to the use of torture. The main differences between the infliction of torture in England and on the continent of Europe seem to be that English lawyers made no dis- tinction of those liable to it, never allowed torture of witnesses, and elaborated no subtle rules as to plena and semiplena probatio.

So far of what may be called torture proper, to which the common law professed itself a stranger. There were, however, cases fully recognized by the common law which differed from torture only in name. The peine forte et dure was a notable example of this. If a prisoner stood mute of malice instead of pleading, he was condemned to the peine, that is, to be stretched upon his back and to have iron laid upon him as much as he could bear, and more, and so to continue, fed upon bad bread and stagnant water through alternate days until he pleaded or died. 2 It was abolished by 12 Geo. III. c. 20. 7 and 8 Geo. IV. c. 28 enacted that a plea of " not guilty " should be entered for a prisoner so standing mute. A case of peine occurred as lately as 1726. At times tying the thumbs with whip-cord was used instead of the peine. This was said to be a common practice at the Old Bailey up to the 18th century. 3 In trials for witchcraft the legal proceedings often partook of the nature of torture, as in the throwing of the reputed witch into a pond to see whether she would sink or swim, in drawing her blood, 4 and in thrusting pins into the body to try to find the insensible spot. Confessions, too, appear to have been often extorted by actual torture, and torture of an unusual nature, as the devil was supposed to protect his votaries from the effects of ordinary torture.

Torture as a part of the punishment existed in fact, if not in name, down to a very recent period. Mutilation as a punishment appears in some of the pre-Conquest codes, such as those of Alfred, .VIII. c. 14) and' other acts, and on women for petit treason (abolished by 30 Geo. III. c. 48), the mutilation inflicted for violence in a royal palace by 33 Hen. VIII. c. 12, the punishment for high treason, which existed nominally until 1870, the pillory (abolished by 7 Will. IV. and 1 Vict. c. 23), the stocks, branks and cucking-stool, and the burning in the hand for felony (abolished by 19 Geo. III. c. 74). Corporal punishment now exists only in the case of juvenile offenders and of robbery with violence. It was abolished in the army by the Army Act 1881. 6

Cruelty in punishment did not entirely cease in prisons even after the Bill of Rights. See such cases as R. v. Huggins, 17 State Trials, 298; Castell v. Bambridge, 2 Strange' s Rep. 856.

Scotland. — Torture was long a recognized part of Scottish criminal procedure, and was acknowledged as such by many acts and warrants of the Scottish parliament and warrants of the Crown and the privy council. Numerous instances occur in the Register of the Privy Council? Two acts in 1649 dealt with torture; one took the form of a warrant to examine witnesses against William Barton by any form of probation, 8 the other of a warrant to a committee to inquire as to the use of torture against persons suspected of witchcraft. 9 The judges in 1689 were empowered by the estates to torture Chiesly of Dalrye, charged with the murder of the lord president Lockhart, in order to discover accomplices. In the same year the use of torture without evidence or in ordinary cases was declared illegal in the Claim of Right. The careful wording of this will be noticed: it does not object to torture altogether, but reserves it for cases where a basis of evidence had already been laid, and for crimes of great gravity, thus admitting the dangerous principle, founded on Roman law, that the importance of the crime is a reason for departing from the ordinary rules of justice. However great the crime, it is no more certain than in the case of a crime of less gravity that the person accused was the person who committed it. A warrant issued in the same year to put to the torture certain persons accused of conspiring against the government, and also certain dragoons suspected of corresponding with Lord Dundee. In 1690 an act passed reciting the torture of William Carstares, a minister, in 1683, and re-establishing his competency as a witness. 10 The last warrant appears to be one in 1690 for torturing a man accused of rape and murder. In 1708 torture in Scotland was finally abolished by 7

1 Ta ble Talk," Trial."

2 Stephen, Hist, of the Criminal Law, i. 297.

3 Stephen i. 300; Kelyng, Reports, p. 27.

4 The superstition was that any one drawing a witch's blood was free from her power. This is alluded to in Henry VI. pt. i. act i. sc. 5; " Blood will I draw on thee; thou art a witch."

5 1046. 6 44 Vict. c. 9, s 7. 7 E.g. i. 525, iv. 680, vl. 156. 8 c. 333.

- c. 370.

10 The thumbscrew with which Carstares had been tortured was afterwards presented to him as a remembrance by the privy council.

Anne c. 21, s 5. Many details of the tortures inflicted will be found in Pitcairn's Criminal Trials, the introduction to J. Maclaurins' R. Criminal Cases and J. H. Burton's Narratives from Criminal Trials. Among other varieties — the nature of some of them can only be guessed — were the rack, the pilniewinkis, the boot, 11 the caschie-laws, the lang irnis, the narrow-bore, the pynebankis, and worst of all, the waking, or artificial prevention of sleep. 12 The ingenuity of torture was exercised in a special degree on charges of witchcraft, notably in the reign of James VI., an expert both in witchcraft and in torture. The act of 1649 already cited shows that the principle survived him. Under the government of the dukes of Lauderdale and York torture as a practice in charges of religious and political offences reached its height. " The privy council was accustomed to extort confessions by torture; that grim divan of bishops, lawyers and peers sucking in the groans of each undaunted enthusiast, in hope that some imperfect avowal might lead to the sacrifice of other victims, or at least warrant the execution of the present." 13 With such examples before them in the law, it is scarcely to be wondered at that persons in positions of authority, especially the nobility, sometimes exceeded the law and inflicted torture at their own will and for their own purposes. There are several instances in the Register of the Privy Council of suits against such persons, e.g. against the earl of Orkney, in 1605, for putting a son of Sir Patrick Bellenden in the boots.

Ireland seems to have enjoyed comparative immunity from torture. It was not recognized by the common or statute law, and the cases of its infliction do not appear to be numerous. In 1566 the president and council of Munster, or any three of them, were empowered to inflict torture, " in cases necessary, upon vehement presumption of any great offence in any party committed against the Queen's Majesty." 14 In 1583 Hurley, an Irish priest, was tortured in Dublin by " toasting his feet against the fire with hot boots." 1E In 1627 the lord deputy doubted whether he had authority to put a priest named O'Cullenan to the rack. An answer was returned by Lord Killultagh to the effect that " you ought to rack him if you saw cause and hang him if you found reason." u The latest case of peine forte et dure seems

to have been in 1740.

British Colonies and Dependencies. — The infliction of torture in any British colony or dependency has usually been regarded as contrary to law, and ordered only by arbitrary authority. It is true that in the trial of Sir Thomas Picton in 1806, for subjecting, while governor of Trinidad, a woman named Luisa Calderon to the torture of the picquet, ” one of the grounds of defence was that such torture was authorized by the Spanish law of the island, but the accused was convicted in spite of this defence, and the final decision of the court of king’s bench, in 18 12, decreeing a respite of the defendant’s recognizances till further order, was perhaps not so much an affirmation of the legality in the particular instance as the practical expression of a wish to spare an eminent public servant. 18 As to India, the second charge against Warren Hastings was extortion from the begums of Oude by means of the torture of their servants. 19 In the present Indian Penal Code and Evidence Acts there are provisions intended, as Sir James Stephen says, 20 to prevent the practice of torture by the police for the purpose of extracting con- fessions from persons in their custody. 21 In Ceylon torture, which had been allowed under the Dutch government, was expressly abolished by royal proclamation in 1799.

In the Channel Islands confessions of persons accused of witch-craft in the 17th century were frequently obtained by torture. 22

United States. — One instance of the peine forte et dure is known. It was inflicted in 1692 on Giles Cory of Salem, who refused to plead when arraigned for witchcraft. 23 The constitution of the United States provides, in the words of the Bill of Rights, that cruel and unusual punishments are not to be inflicted. 24 This is repeated in the constitutions of most states. The infliction of cruel and unusual punishment by the master or officer of an American vessel on the high seas, or within the maritime jurisdiction of the United States, is punishable with fine or imprisonment, or both. 26 There have been a good many decisions on the question of cruel and unusual punishments; e.g. Wilkerson v. Utah, 99 U.S. Rep. 130;

11 Persons subjected to more than usual torture from the boot were said to be ” extremely booted.”

12 This seems to have been used in one case in England. Lecky, Rationalism in Europe, i. 122.

13 Hallam, Const. Hist. iii. 436. See Burnet, Hist, of Own Time, i. 583 ; and Scotland.

14 Froude, Hist, of England, viii. 386.

16 Ibid xi. 263. 16 Jardine, p. 54.

17 In the picquet the sufferer was supported only on the great toe (which rested on a sharp stake), and by a rope attached to one arm.

18 30 State Trials, 449, besides many pamphlets of the period.

19 See the Report of the Proceedings, vol. i.

20 Stephen, Indian Evidence Act, p. 126.

21 Sections 327-331 of code ; ss: 25-27 of act.

22 J. L. Pitts, Witchcraft in the Channel Islands, p. 9 (Guernsey,

1886). ”

23 Bouvier, Law Diet., s.v. ” Peine forte et dure.”

24 Amendments, art. viii. (1789).

25 Revised Stat. 5347.

Territory of New Mexico v. Ketchum, 65 Pacific Rep. 169 (death penalty for train robbery held not unconstitutional).

Continental European States. — These fall into four main groups, the Latin, Teutonic, Scandinavian and Slav states respectively. The principles of Roman law were generally adopted in the first and second groups.

Latin States. — In France torture does not seem to have existed as a recognized practice before the 13th century. From that period until the 17th century it was regulated by a series of royal ordonnances at first of local obligation, afterwards applying to the whole kingdom. Torture was used only by the royal courts, its place in the seigneurial courts being supplied by the judicial

combat. The earliest ordonnance on the subject was that of Louis IX. in 1254 for the reformation of the law in Languedoc. It enacted that persons of good fame, though poor, were not to be put to the question on the evidence of one witness. 1 Numerous other provisions were made between 1254 and 1670, when an ordonnance was passed under Louis XIV., which regulated the infliction of torture for more than a century. Two kinds were recognized, the question preparatoire and the question prealable. The first was used where strong evidence of a capital crime — strong, but of itself insufficient for conviction — was produced against the accused. The second was used to obtain a confession of accomplices after conviction. There was also a mitigated torm called the presentment, in which the accused was simply bound upon the rack in terrorem and there interrogated. No person was exempt on the ground of dignity, but exemption was allowed to youths, old men, sick persons and others. Counsel for the accused were usually not allowed. The question preparatoire was abolished by royal decree in 1780, but in 1788 the parliaments refused to register a decree abolishing the prealable. But torture of all kinds was abolished by an ordonnance in 1789. The Declaration of Right in 1791 (art. viii.) affirmed that the law ought not to establish any punishments other than such as are strictly and evidently necessary. In modern law the code penal enacts that all criminals shall be punished as guilty of assassination who for the execution of their crimes employ torture. 2 The code also makes it punishable to subject a person under arrest to torture. 3 The theory of semiplena probatio was worked out with more refinement than in other systems. In some parts of France not only were half-proofs admitted, but quarters and eighths of proofs. 4 Among the numerous cases of historical interest were those of the Templars in 1307, Villon about 1457, Dolet in 1546, the marquise de Brinvilliers in 1676 and Jean Calas in 1762. 5

The law as it existed in Italy is contained in a long line of authorities chiefly supplied by the school of Bologna, beginning with the glossatores and coming down through the post-glossatores, until the system attained its perfection in the vast work of Farinaccius, written early in the 17th century, where every possible question that could arise is treated with a revolting completeness. One of the earliest jurists to treat it was Cino da Pistoia, the friend of Dante. 6 He treats it at no great length. With him the theory of indicia exists only in embryo, as they cannot be determined by law but must be at the discretion

of the judge. Differing from Bartolus, he affirms that torture cannot be repeated without fresh indicia. The writings of jurists were supplemented by a large body of legis- lative enactments in most of the Italian states, extending from the constitutions of the emperor Frederick II. down to the 18th century. It is not until Bartolus (1314-1357) that the law begins to assume a definite and complete form. In his commentary on book xlviii. of the Digest he follows Roman law closely, but introduces some further refinements: e.g. though leading questions may not be asked in the main inquiry they are admissible as subsidiary. There is a beginning of classification of indicia. A very full discussion of the law is contained in the work on practice of Hippolytus de Marsiliis, 7 a jurist of Bologna, notorious, on his own admission, as the inventor of the torture of keeping without sleep. He defines the question as inquisitio veritatis per tormenta et cordis dolorem, thus recognizing the mental as well as the physical elements in torture. It was to be used only in capital cases and atrocious crimes. The works of Farinaccius and of Julius Clarus nearly a century later were of great authority from the high official positions filled by the writers. Farinaccius was procurator-general to Pope Paul V., and his discussion of torture is one of the most complete of any. 8 It occupies 251 closely printed folio pages with double columns. The length at which the subject is treated is one of the best proofs

1 Ordonnances des rois, i. 72. 2 s. 303. 3 s. 344.

4 See Pollock and Maitland, ii. 658, note.

5 On the French system generally see Imbertus, Instituliones forenses gallicae (Utrecht, 1649) ; N. Weiss, La Chambre ardente, 1540-1550 (Paris, 1889). A large number of authorities deal mainly with the ordonnance of 1670; Muyart de Vouglans, Inst, crim. (Paris, 1767), and Jousse, Traite de la justice crim. (Paris, 1771), are examples. F. Siegneux de Correvon, Essai stir Vusage, I'abus, et les inconveniens de la torture (Geneva, 1768), is one of the opponents of the system.

6 Cinus Pistorensis, Super codice, de tormentis (Venice, 1493).

7 Practica criminalis quae Averolda nuncupatur (Venice, 1532).

8 Praxis et theorica criminalis, bk. ii. tit. v. quaest. 36-51 (Frankfort, 1622).

of the science to which it had been reduced. The chief feature of the work is the minute and skilful analysis of indicia, jama, praesumplio, and other technical terms. Many definitions of indicium are suggested, the best perhaps being conjectura ex probabilibus et non necessariis orta, a quibus potest abesse Veritas sed non verisimilitudo. For every infliction of torture a distinct indicium is required. A single witness or an accomplice constitutes an indicium. But this rule does not apply where it is inflicted for discovering accomplices or for discovering a crime Other than that for which it was originally inflicted. Torture may be ordered in all criminal cases, except small offences, and in certain civil cases; such as denial of a depositum, bankruptcy, usury, treasure trove, and fiscal cases. It may be inflicted on all persons, unless specially exempted (clergy, minors, &c), and even those exempted may be tortured by command of the sovereign. There are three kinds of torture, levis, gravis and gravissima, the first and second corresponding to the ordinary torture of French writers, the last to the extraordinary. The extraordinary or gravissima was as much as could possibly be borne without destroying life. The judge could not begin with torture; it was only a subsidium. If inflicted without due course of law, it was void as a proof. The judge was liable to penalties if he tortured without proper indicia, if a privileged person, or if to the extent that death or permanent illness was the result. An immense variety of tortures is mentioned, and the list tended to grow, for, as Farinaccius says, judges continually invented new modes of torture to please themselves. Numerous casuistical questions are treated at length, such as, what kinds of reports or how much hearsay evidence constituted fame? Were there three or five grades in torture? Julius Clarus of Alessandria was a member of the council of Philip II. To a great extent he follows Farinaccius. He puts the questions for the consideration of the judge with great clearness. They are — whether (1) a crime has been committed, (2) the charge is one in which torture is admissible, (3) the fact can be proved other- wise, (4) the crime was secret or open, (5) the object of the torture is to elicit confession of crime or discovery of accomplices. The clergy can be tortured only in charges of treason, poisoning and violation of tombs. On the great question whether there are three or five grades, he decides in favour of five, viz. threats, taking to the place of torment, stripping and binding, lifting on the rack, racking. 9 Other Italian writers of less eminence have been referred to for the purposes of this article. The burden of their writings is practically the same, but they have not attained the systematic perfection of

Farinaccius. Citations from many of them are made by Manzoni (see below). Among others are Guido de Suzara, Paris de Puteo, Aegidius Bossius of Milan, Casonus of Venice, Decianus, Follerius and Tranquillus Ambrosianus, whose works cover the period from the 13th to the end of the 17th century. The law depended mainly on the writings of the jurists as interpreters of custom. At the same time in all or nearly all the Italian states and colonies 10 the customary law was limited, supplemented, or amended by legislation. That a check by legislative authority was necessary appears from the glimpses afforded by the writings of the jurists that the letter of the Taw was by no means always followed. The earliest legislation after the Roman law seems to be the constitutions of the emperor Frederick II. for Sicily promulgated in 1231. Torture was abolished in Tuscany in 1786, largely owing to the influence of Beccaria, whose work first appeared in 1764, and other states followed, but the puntale or piquet seems to have existed in practice at Naples up to 1859.

Several instances of the torture of eminent persons occur in Italian history, such as Savonarola, Machiavelli, Giordano Bruno, Cam- panella. Galileo appears to have only been threatened with the esame rigoroso. The historical case of the greatest literary interest is that of the persons accused of bringing the plague into Milan in 1630 by smearing the walls of houses with poison. An analysis of the case was undertaken by Verri n and Manzoni, 12 and puts in a clear light some of the abuses to which the system led in times of popular panic. Convincing arguments are urged by Manzoni, after an exhaustive review of the authorities, to prove the ground- lessness of the charge on which two innocent persons underwent the torture of the canape, or hempen cord (the effect of which was partial or complete dislocation of the wrist), and afterwards suffered death by breaking on the wheel. The main arguments, shortly stated, are these, all based upon the evidence as recorded, and the law as laid down by jurists. (1) The unsupported evidence of an accomplice was treated as an indicium in a case not one of those exceptional ones in which such an indicium was sufficient. The evidence of two witnesses or a confession by the accused was neces- sary to establish a remote indicium, such as lying. (2) Hearsay evidence was received when primary evidence was obtainable. (3) The confession made under torture was not ratified afterwards. (4) It was made in consequence of a promise of impunity. (5) It was of an impossible crime.

9 Practica criminalis finalis (Lyons, 1637).

10 It is obvious from the allusion at the end of Othello that Shake- speare regarded torture as possible in Cyprus when it was a Venetian colony.

11 Osservazioni sulla tortura.

12 Storia della Colonna infame. Neither writer alludes to Beccaria.

7»

TORTURE

In Spain, as in Italy, the law depended partly on the writings of jurists, partly on legislation. Roman law was carried through the Visigothic Code and the Fuero juzgo 1 (which repeats it almost word for word) down to the Siete partidas? This treatise, compiled by Alphonso the Wise about 1243, but not promulgated till 1256, amended the previously existing law in the direction of greater precision. Torment is denned as a manner of punishment which lovers of justice use, to scrutinize by it the truth of crimes committed secretly and not provable in any other manner. Repetition was allowed in case of grave crimes. There were the usual provisions for the infliction of torture only by a judge having jurisdiction, and for the liability of the judge for exceeding legal limits. Subsequent codes did little more than amend the Partidas in matters of pro- cedure. Torture is not named in the Ordenanzas reales of Ferdinand and Isabella (1485). The Nueva recopilacion of Philip II. enacted that torture was to be applied by the alcaldes on due sentence of the court — even on hidalgos in grave crimes — without regard to alleged privilege or custom. In the Novisima recopilacion °f 1775 the only provisions on the subject are that the alcaldes are not to condemn to torment without preceding sentence according to law, and that hidalgos are not to be tormented or suffer infamous punishment. In Aragon, while it was an inde- pendent state, torture was not in use to the same extent as in other parts of Spain. It was abolished in the 13th century by the General Privilege of 1283 except in the case of vagabonds charged with coin- ing. A statute of 1335 made it unlawful to put any freeman to the torture. 3 On the other hand, the Aragonese nobility had a power, similar to the peine forte et dure, of putting a criminal to death by cold, hunger and thirst. 4 The jurists dealing with the subject are not as numerous as in Italy, no doubt because Italian opinions were received as law in all countries whose systems

were based on Roman law. 5 Some of the Italian jurists too, like Clarus, were at that same time Spanish officials. The earliest Spanish secular jurist appears to be Suarez de Paz. 6 According to him the most usual tortures in Spain were the water and cord, the. pulley or strappado, the hot brick, and the tablillas, or thumbscrew and boot combined. Three was the greatest number of times that any torture could be applied. It might be decreed either on demand of the accuser or at will of the judge. The Roman rule of beginning with the weakest was amplified into a series of regulations that a son was to be put to the question before a father, a woman before a man, &c. The fullest statement of Spanish law is to be found in the work of Antonio Gomez, a professor at Salamanca. 7 With him no exceptions apply in charges of laesa majestas divina or humana. A judge is liable to different punishment according as he orders torture dolose or culpabiliter. Differing from Hippolytus de Marsiliis, Gomez holds that the dying accusation of a murdered man is not an indicium. A confession on insufficient indicia is void. His division of torture into tortura actualis and terror propinquus is the same as that of the French jurists into torture and presentment. The conclusions of the ecclesiastical writers of Spain, such as Eymerico and Simancas, were accepted wholly or partially by the secular writers, such as Alvarez de Velasco, 8 and the Peruvian, Juan de Hevia Bolafios, 9 who points out differences in the ecclesiastical and secular systems, e.g. the former brought up the accused for ratification in three days, the latter in twenty-four hours. A good deal of the Spanish law will be found in the proceedings against Sir Thomas Picton (see above). Torture in Spain seems to have been inflicted on Jews to an extraordinary extent, as it was also in Portugal, where the latest legislation as to torture seems to be of the year 1678. In 1790 it had become obsolete, 10 and in a work on criminal procedure four years later it is only referred to for the purpose of stating that when it did exist it was realis or verbalist

Teutonic States. — Germany (including Austria) is distinguished by the possession of the most extensive literature and legislation

1 vi. 4. 5-

2 Partida, vii. 30. It was one of the earliest books printed in Spain, the earliest edition appearing in 1491.

3 Cited Hallam, Middle Ages, iii. 76.

4 Du Cange, s.v. Fame necare.

6 In all the Latin countries the idea of torture had become a commonplace. The dramatists contain frequent allusions to it. In Lope de Vega's El Perro del hortelano (" The Dog in the Manger "), one of the characters says, " Here's a pretty inquisition!" to which the answer is, " The torture will be next applied." Moliere and Racine both make use of it. In L'Avare, act iv. sc. 7, Harpagon threatens to put his whole household to the question. In Les Plaideurs Dandin invites Isabelle to see la question as a mode of passing an hour or two. In England Bacon (Essay lvi.) says, " There is no worse torture than the torture of laws." The same idea occurs again in the Advancement of Learning, viii. 3, 13, " It is a cruel thing to torture the laws that they may torture men."

• Praxis ecclesiastica et saecularis, vol. i. pt. v. §. 3 (Salamanca,

1583)-

1 Variae resolutiones, p. 412 (Antwerp, 1593).

8 Judex perfectus (Lausanne, 1740).

9 Curia filipica (Madrid, 1825).

10 Repertorio geral das leis extravagantes, p. 381 (Coimbra, 1815). u Paschal Freirus, Inst. fur. crim. lusitani, p. 203 (Lisbon, 1794).

on the subject. The principal writers are Langer, von Rosbach and von Boden. In addition may be cited the curious Layenspiegel of Ulrich Tengler (1544), and the works of Remus, Casonus and Carpzow. 12 Legislation was partly for the empirej partly for its component states. Imperial legislation dealt with the matter in the Golden Bull (1356), the Ordinance of Bamberg (1507), the Carolina (1532) 13 and the Constitutio criminalis theresiana (1768). 14 The Carolina followed the usual lines, the main difference being that the infliction must be in the presence of two scabini and a notary, who wa_s to make a detailed record of the proceedings. The code of Maria Theresa defines torture as " a subsidiary means of eliciting truth." It could be applied only in cases where condemna- tion would have involved capital or severe corporal punishment. The illustrated edition was suppressed by Prince Kaunitz a few days after its appearance. Torture was formally abolished in the empire in 1776. In Prussia

it was practically abolished by Frederick the Great in 1740, formally in 1805. Even before its abolition it was in use only to discover accomplices after conviction. 15 In some other states it existed longer, in Baden as late as 1 83 1. It was carried to excess in Germany, as in the Netherlands and Scotland in charges of witchcraft.

The Netherlands. — The principal legislative enactment was the code of criminal procedure promulgated by Philip II. in 1570 and generally known as the Ordonnance sur le style. 11 ‘ One of its main objects was to assimilate the varieties of local custom, as the Nueva recopilacion had done in Spain three years earlier. The French ordonnance of 1670 is probably largely based on it. In spite of the attempt of the ordinance to introduce uniformity, certain cities of Brabant, it is said, still claimed the privilege of torturing in certain cases not permitted by the ordinance, e.g. where there was only one witness. 17

The law of 1670 continued to be the basis of criminal procedure in the Austrian Netherlands until 1787. In the United Provinces it was not repealed until 1798. The principal text- writers are Damhouder, 18 van Leeuwen 19 and Voet. Van Leeuwen lays down as a fundamental principle that no one was to be condemned to death without confession, and such confession, if attainable in no other way, ought to be elicited by torture. Witnesses could be tortured only if they varied on confrontation. One of the indicia not always recognized by jurists was previous conviction for a similar crime. Voet’s commentary ad Pandectas w is interesting for its taking the same view as St Augustine as to the uselessness of torture, and compares its effect with that of the trial by battle. At the same time he allows it to be of some value in the case of very grave crimes. The value of torture was doubted by others as well as Voet, e.g. by A. Nicholate 21 and by van Essen. 22 At the same time a writer was found to compose a work on the unpromising subject of the rack. 23

Scandinavian Countries. — There is a notice of torture in the Icelandic Code known as the Gragas (about 1 1 19). Judicial torture is said to have been introduced into Denmark by Valdemar I. in 1157. 24 In the code of Christian V. (1683) it was limited to cases of treason. 25 It was abolished by the influence of Struensee in 1771, but notwithstanding this he was threatened with it, though it was not actually inflicted, before his execution in 1772. In Sweden torture never existed as a system, and in the code of 1734 it was expressly forbidden. 26 It was however occasionally

inflicted, as in England, by extrajudicial authorities, called secret committees.

12 Extracts from these and other writers will be found in Lea, Superstition and Force, and in R. Quanter, Die Folter in der deutschen Rechtspflege sonst und fetzt (Berlin, 1900).

13 Chs. 33-44.

14 Art. 38 (Vienna, 1769).

15 This statement is made on the authority of a work attributed to Frederick himself, Dissertation sur les raisons d'Stablir ou d'abroger les lois (1748).

16 A list of the numerous commentaries on this code will be found in Nybels, Les Ordonnances criminelles de Philippe II. de 1570, p. 23 (Brussels, 1856).

17 Nybels, pp. 31, 33.

18 Pratique judiciaire en causes criminelles (Antwerp, 1564).

19 Censura forensis, pt. ii. bk. ii. chs. 8, 9 (Leiden, 1677).

20 On Dig. xlviii. 18. There are numerous editions of Voet, the sixth (generally found in libraries) is the Hague (1734).

21 Si la torture est un moyen sur a verifier les crimes (Amsterdam, 1 681). Also by an anonymous writer thirty years earlier, De Pijnbank wedersproken en bematigt (Rotterdam, 1651).

22 Jus ecclesiasticum universum (Louvain, 1720).

23 Hieronymi Magii Anglarenis de equuleo liber postumus (Amster- dam, 1664). There are several works dealing with torture in witchcraft proceedings. A large number of cases will be found in J. Scheltema, Geschiedenis der Hexen-processen (Haarlem, 1828). For torture in the 1 8th century see E. Hubert, La Torture aux Pays Bas autrichiens pendant la xviii" siecle (Brussels, 1897).

24 Baden, Dansk juridisk Ordbog, s.v. " Tortur " (Copenhagen.

1828).

n Kolderup-Rosenvinge, Udvalg af gamle Danske-Domme, bk. i. c. 20 (Copenhagen, 1848).

26 Cod. leg. svecicarum, pp. 233, 370 (Stockholm, 1 743).

The ” cave of roses,” where reptiles were kept for the purpose of torture, was closed by Gustavus III. in 1772.

Slav Countries. — The earliest mention of torture seems to be that of the mutilation provided for certain offences by the code of Stephen Dushan in 1349. In Russia torture does not occur in the recensions of the earlier law. It was possibly of Tatar origin, and the earliest mention of it in an official document is probably in the Sudebnik of Ivan the Terrible (1497). In the ordinance of 1556 there are elaborate regulations, which one learns from history were not always observed in periods of political disturbance, and torture seems to have been used even as a means of enforcing payment of debts. The reaction begins with Peter the Great and culminates with Catharine II., who was largely influenced by the opinions of Beccaria and Voltaire. In the instructions to the commission for framing a criminal code (1766), it is declared that all punishments by which the body is maimed ought to be abolished, 1 and that the torture of the rack violates the rules of equity and does not produce the end proposed by the laws. 2 It was formally abolished by Alexander I. in 1 801, and in 1832 the Svod Zakonov subjected to penalties any judge who presumed to order it. But even as late as 1847 it seems to have been inflicted in one or two exceptional cases. 3

Authorities. — For England Jardine’s is still the standard work. Much general information and numerous authorities will be found in Lipenius, Bibliotheca realis Juridica, s.v. ” Tortura ” (Frankfort, 1679), and in the more modern work of J. Helbing, Die Tortur (Berlin, 1902). For those who can obtain access to it the catalogue issued at the sale of M. G. Libri (1861) is valuable. He had collected most of the books on the subject. There are several publications dealing with cases of individuals in addition to the numerous ones on witchcraft trials, e.g. those of William Lithgow, the Amboyna case, Dellon and Van Halen. Lithgow’ s story has been republished (Glasgow, 1907). (J. W.)

TORUS, a Latin word, meaning a round swelling or protuberance, applied to a convex moulding in architecture, which in section is generally a semicircle. The earliest examples are found in Egypt, where it was carried up the angles of the pylon and temple walls and horizontally across the same. Its most frequent employment is in the bases of columns; in the Roman Doric order being the lowest moulding; in the Ionic orders there are generally two torus mouldings separated by a scotia with fillets. Both in Greek and Roman bases sometimes the torus is elaborately carved. (See Moulding.)

TORZHOK, a town of Russia, in the government of Tver, on the river Tvertsa, 21 m. by rail S.W. of the Likhoslavl, station of the St Petersburg & Moscow railway. Pop. (1900), 15,119. It dates from the nth century, and thename (market- place) shows that this dependency of Novgorod was a commercial centre. It was fortified with a stone wall, which only partially protected it from the attacks of Mongols, Lithuanians and Poles. Torzhok is celebrated in Russia for its embroidered velvet and embroidered leather-work, for the manufacture of travelling bags, and for its trade in corn and flour.

TOSCANELLA (anc. Tuscana, q.v.), a town of the province of Rome, Italy, 15 m. N.E. of Corneto by road, 545 ft. above sea-level. Pop. (1901), 4839. The medieval walls with their towers are still preserved. On the ancient citadel hill is the Romanesque church of S. Pietro, belonging to four different periods — 739, 1093 (the date of the reconstruction of the crypt), the middle of the 1 2th and the end of the 12th century. It has the shape of a Roman basilica, with a nave and two aisles and one apse. The elaborate facade with its rose window also belongs to the 12th century. S. Maria in the valley below dates from 1050 to 1206, and has a similar facade and a massive square campanile. In the town are two other Romanesque churches.

See G. T. Rivoira, Origini dell architettura Lombarda 1. 146 (Rome 1901).

TOSTIG (d. 1066), earl of Northumbria, was a son, probably the third, of Earl Godwine, and in 1051 married Judith, sister or daughter of Baldwin V., count of Flanders. In the year of his marriage he shared the short exile of his father, returning with him to England in 1052, and became earl of Northumbria after the death of Earl Siward in 1055. He was very intimate with his brother-in-law, Edward the Confessor, and in 1061 he visited

Pope Nicholas II. at Rome in the company of Aldred, archbishop of York. By stern and cruel measures Tostig

1 Art. 96. 2 Ibid. 192-197.

3 See the various histories of Russian law, such as Maceiovski, Lange and Zagoskin, under the heads of puitka or muchenie.

introduced a certain amount of order into the wild northern district under his rule; this severity made him exceedingly unpopular, and in 1065 Northumbria broke into open revolt. Declaring Tostig an outlaw and choosing Morkere in his stead, the rebels marched southwards and were met at Oxford by Earl Harold, who, rather against the will of the king, granted their demands. Tostig sailed to Flanders and thence to Nor- mandy, where he offered his services to Duke William, who was related to his wife and who was preparing for his invasion of England. He then harried the Isle of Wight and the Kentish and Lincolnshire coasts, and, after a stay in Scotland and possibly a visit to Norway, joined another invader, Harald III. Hardrada, king of Norway, in the Tyne. Together they sailed up the Hum- ber and at Gate Fulford, near York, defeated Earls Morkere and Edwine and entered York. But Harold, now king, was hurrying to the north. Taking the Norwegians by surprise at Stamford Bridge he destroyed their army on the 25th of September 1066, and in this battle both Tostig and the king of Norway were slain. Tostig's two sons appear to have taken refuge in Norway, and his widow Judith married Welf, duke of Bavaria. See E. A. Freeman, The Norman Conquest, vols. ii. and iii.

(1870-1876).

TOTANA, a town of eastern Spain, in the province of Murcia, on the Lorca-Murcia railway. Pop. (1900), 13,703. The town, which consists of two parts, the Barrio de Sevilla and Barrio de Triana, contains several handsome public buildings, among them the church of Santiago, with its three naves. Water is conveyed to Totana from the Sierra de Espufia by an aqueduct 7 m. long. Saltpetre is obtained among the hills, and there is a thriving trade in wheat, oranges, olives, almonds, and wine from the Sangonera valley. Other industries are»the manufac- ture of linen, leather and the earthenware jars called tinajas, which are used for the storage of oil and wine.

TOTEMISM. The word " totem " is used in too many varying

senses by students of early society and religion. The term came into the English language in the form of ” totam,” through a work of 1791, by J. Long, an interpreter between the whites and the Red Indians of North America. 4 Long himself seems to have used the word to denote the protective familiar, usually an animal, which each Indian selected for himself, generally through the monition of a dream during the long fast of lads at their initiation. Such selected (or, when bestowed by medicine-men or friends, ” given “) totems are styled ” personal totems ” and have no effect in savage law, nor are they hereditary, with any legal consequences.

In stricter terminology ” totem ” denotes the object, gene- rally of a natural species, animal or vegetable, but occasionally rain, cloud, star, wind, which gives its name to a kindred actual or supposed, among many savages and barbaric races in America, Africa, Australia and Asia and the isles. Each child, male or female, inherits this name, either from its mother (” female descent “) or from its father (” male descent “). Between each person and his or her name-giving object, a certain mystic rapport is supposed to exist. Where descent wavers, persons occasionally have, in varying degrees, the totems of both parents.

Religious Aspect of the Totem. — As a rule, by no means in- variable, the individual may not kill or eat the name-giving object of his kin, except under dire necessity; while less usually it is supposed to protect him and to send him monitory dreams. This is the ” religious ” or semi-religious aspect of the totem, or this aspect is, by some students, called ” religious.”

We also hear of customs of burying and lamenting dead ani- mals which are regarded with reverence by this or that ” family,” or ” clan.” This custom is reported among the Samoans, and one ” clan ” was said to offer first-fruits to its sacred animal, the eel; while the ” clan ” that revered the pigeon kept and fed a tame specimen. 5 But in Samoa, though the sacred animals of “clans ” or ” families ” are, in all probability, survivals of totemism, they are now regarded by the people as the vehicles

4 Long, Voyages and Travels of an Indian Interpreter (1791), p. 86.

5 Turner, Samoa, p. 71.

of ” clan ” or ” family ” gods, and therefore receive honours not paid to the hereditary totems of Australia and North America, which have nothing godlike. It is to be presumed that ” totem dances ” in which some Australian tribes exhibit, in ballets d’action, the incidents of a myth concerning the totem, are, in a certain sense, ” religious “; when they are not magical, and intended to foster and fertilize the species, animal or vegetable or other to which the totem belongs.

The magical performances for the behoof of the totem crea- tures may be studied in the chapters on ” Intichiuma ” in Messrs Spencer and Gillen’s Native Tribes of Central Australia, and Native Tribes of Northern Australia. Among the many guesses at the original purpose of totemism, one has been that the primal intention of totem sets of human beings was to act as magical co-operative stores for supplying increased quantities of food to the tribe. But this opinion has gone the way of other conjectures. The ” religious ” status of the totem is lowest among peoples where its influence on social regulations is greatest, and vice versa, a topic to which we recur.

There are also various rites, in various tribes, connecting the dead man with his totem at his funeral; perhaps at his initia- tion, when a boy, into the esoteric knowledge and rules of his tribe. Men may identify themselves with their totems, or, mark themselves as of this or that totem by wearing the hide or the plumage of the bird or beast, or by putting on a mask resembling its face. The degree of ” religious ” regard for the revered object increases in proportion as it is taken to contain the spirit of an ancestor or to be the embodiment of a god: ideas not found among the most backward savages.

The supreme or superior being of low savage religion or mythology is .never a totem. He may be able, like Zeus in Greek mythology, to assume any shape he pleases; and in the myths of some Australian tribes he ordained the institution of totemism. Byamee, among the Euahlayi tribe of north-west New South Wales, had all the totems in him, and when he went to his paradise, Bullimah, he distributed them, with the mar- riage rules, among his people. 1 In other legends, especially those of central and northern Australia, the original totem creatures, animal in form, with bestial aspect, were developed in a marine or lacustrine environment, and from them were evolved the

human beings of each totem kin. The rule of non-inter- marriage within the totem was, in some myths, of divine institu- tion; in others, was invented by the primitive wandering totemic beings; or was laid down by the wisdom of mere men who saw some unknown evil in consanguine unions. The strict regard paid to the rule may be called ” religious “; in so far as totemists are aware of no secular and social raison d’ etre of the rule it has a mysterious character. But whereas to eat the totem is sometimes thought to be automatically punished by sickness or death, this danger does not attach to marriage within the totem save in a single known case. The secular penalty alone is dreaded; so there seems to be no religious fear of offending a superior being, or the totem himself: no tabu of a mystic sort.

Social Aspect of the Totem. — The totem has almost always a strong influence on or is associated with marriage law, and except in the centre of Australia, and perhaps in the little-known West, men and women of the same totem may not intermarry, ” however far apart their hunting grounds,” and though there is no objection on the score of consanguinity.

This is the result, in Australia, of the custom, there almost universal, which causes each individual to belong, by birth, to one or other of the two main exogamous and intermarrying divisions of the tribe (usually called ” phratries “). The phra- tries (often known by names of animals, as Eagle Hawk and Crow, Crow and White Cockatoo) contain each a number of totem kins, as Dog, Wild Cherry, Wombat, Frog, Owl, Emu, Kangaroo, and so on, and (except among the Arunta ” nation ” of five tribes in Central Australia) the same totem kin never occurs in both phratries. Thus as all persons except in the Arunta nation, marry out of their own phratry, none can marry into his or her totem kin.

1 Mrs Langloh Parker, The Euahlayi Tribe.

In some parts of North America the same rule prevails, with this peculiarity that the phratries, or main exogamous divisions, are not always two, as in Australia, but, for example, among the Mohegans three— Wolf, Turtle, and Turkey. 2 In Wolf all the totems are quadrupeds; under Turtle they are various species of turtles and the yellow eel; and under Turkey all the totems are birds.

Cleajly this ranking of the totems in the phratries is the result of

purposeful design, not of accident. Design may also be observed in such phratries of Australian tribes as are named after animals of contrasted colours, such as White Cockatoo and Crow, Light Eagle Hawk and Crow. It has been supposed by Mr J. Mathew, Pere Schmidt and others that these Australian phratries arose in an alliance with connubium between a darker and a lighter race. 3 But another hypothesis is not less prob- able; and as we can translate only about a third of Australian phratry names, conjecture on this subject is premature.

Both in Australia and America the animals, as Eagle Hawk and Crow, which give their names to the phratries, are almost always totem kins within their own phratries. 4

The Moquis of Arizona are said to have ten phratries, by Captain Ulick Bourke in his Snake Dance of the Moquis, but possibly he did not use the term ” phratry ” in the sense which we attach to it.

Among the Urabunna of Southern Central Australia, and among the tribes towards the Darling River, a very peculiar rule is said to prevail. There are two phratries, and in each are many totem kins, but each totem kin may intermarry with only one totem kin which must be in the opposite phratry. 5 Thus there are as many exogamous divisions as there are totems in the tribes, which reckon descent in the female line; children in- heriting the mother’s totem only. Corroboration of these statements is desirable, as the tribes implicated are peculiarly ” primitive,” and theirs may be the oldest, extant set of marriage rules.

The existence of two or more main exogamous divisions, named or unnamed, is found among peoples where there are either no totem kins, or where they have fallen into the back- ground, as in parts of Melanesia, among the Todas and Meitchis of India and the Wanika in East Africa. 6

An extraordinary case is reported from South Australia where people must marry in their own phratry, while their children belong to the opposite phratry. 7 This awaits corroboration.

We now see some of the numerous varieties which prevail in the marriage rules connected with the totems. Even among a tribe whose members, it is reported, may marry into their own phratries, it appears that they must not marry within their own totem kins. This is, indeed, the rule wherever totemic societies

are found in anything approaching to what we deem their most archaic constitution as in south-east Australia and some tribes of North America.

Exogamy: The Arunta Abnormality. — Meanwhile, in Central Australia, in the Arunta ” nation,” the rule forbidding marriage within the totem kin does not exist. Totems here are not, as everywhere else, inherited from either parent, but a child is of what we may call ” the local totem ” of the place where its mother first became conscious of its life within her. The idea is that the spirits of a primal race, in groups each of one totem only (” Alcheringa folk”), haunt various localities; or spirits {ratapa) emanating from these primal beings do so; they enter into passing married Women, and are incarnated and born again. 8

2 Morgan, Ancient Society, p. 174.

3 Mathew, Eagle Hawk and Crow; Schmidt, Anthropos (1909).

4 See Lang, The Secret of the Totem, pp. 154, 170; and N. W. Thomas, Kinship and Marriage in Australia, pp. 9, 31.

5 Howitt, Native Tribes of South-East Australia, pp. 93, 181, 188’; Spencer and Gillen, Native Tribes of Central Australia, pp. 60, 61, Northern Tribes, p. 71; Lang, Anthropological Essays; Tylor’s Festr schrift, pp. 203-210.

6 Thomas, ut supra, p. 10. See, for numerous examples, T. G-Frazer, Totemism (1910).

7 M S. of Mrs Bates.

8 It is necessary to state here the sources of our information about the central, north, north-western and south-eastern forms of

Thus if a woman, whatever her own totem, and whatever her husband’s may be, becomes conscious of her child’s life in a known centre of Wild Cat spirits, her child’s totem is Wild Cat, and so with all the rest.

As a consequence, a totem sometimes here appears in what the

people call the ” wrong ” (i.e. not the original) exogamous division; and persons may marry within their own totem name, if that totem be in the ” right ” exogamous division, which is not theirs. Each totem spirit is among the Arunta associated with an amulet or churinga of stone; these are of various shapes, and are decorated with concentric circles, spirals, cupules, and other archaic patterns. These amulets are only used in this sense by the Arunta nation and their neighbours the Kaitish, ” and it is this idea of spirit individuals associated with churinga and resident in certain definite spots that lies at the root of the present

totemism. About the central Arunta tribe with its neighbours, the Urabunna, we have the evidence very carefully collected by Mr Gillen, a protector of the aborigines, and Professor Baldwin Spencer (Native Tribes of Central Australia). Concerning the peoples north from the centre to the Gulf of Carpentaria, the same scholars furnish a copious account in their Northern Tribes. These two explorers had the confidence of the blacks; witnessed their most secret ceremonies, magical and initiatory; and collected their legends. Their books, however, contain no philological information as to the structure and interrelation of the dialects, information which is rarely to be found in the works of English observers in Australia. As far as appears, the observers conversed with the tribes only in ” pidgin English.” If this be the case that lingua franca is current among some eighteen central-northern tribes speaking various native dialects. We are told nothing about the languages used in each case; perhaps the Arunta men who accompanied the expedition arranged a system of interpreters.

For the Dieri tribe, neighbours of the Urabunna, we have copious evidence in Native Tribes of South-East Australia by the late Mr A. W. Howitt, who studied the peoples for forty years; was made free of their initiatory ceremonies; and obtained intelligence from settlers in regions which he did not visit. We have also legends with Dieri texts and translations from the Rev. Mr Siebert, a mis- sionary among the Dieri. That tribe appears now to exist in a very dwindled condition under missionary supervision. The accounts of tribes from the centre to the south-east by Mr R. E. Mathew, are scattered in many English, Australian and American learned periodicals. Mr Mathew has given a good deal of information about some of the dialects. His statements as to the line of descent and on other points among certain tribes are at variance with those of Messrs Spencer and Gillen (see an article by Mr A. R. Brown in Man, March 1910). Mr

Mathew, however, does not enable us to test the accuracy of his informants among the northern tribes, which is unfortunate. For the Aranda (or Arunta) of a region apparently not explored by Messrs Spencer and Gillen, and for the neighbouring Loritja tribe, we have Die Aranda und Loritja Stdmme, two volumes by the Rev. C. Strehlow (Baer, Frankfurt am Main, 1907, 1908). Mr Strehlow is a German missionary who, after working among the Dieri and acquiring their language, served for many years among a branch of the Arunta (the Aranda), differing considerably in dialect, myths and usages from the Arunta of Messrs Spencer and Gillen. In some points, for example as to the primal ancestors and the spirits diffused by them for incarnation in human bodies, the Aranda and Loritja are more akin to the northern tribes than to Mr Spencer's Arunta. In other myths they resemble some south-eastern tribes reported on by Mr Howitt. Unlike the Arunta of Messrs Spencer and Gillen, but like the Arunta described by Mr Gillen earlier in The Horn Expedition, they believe in " a magnified non-natural man," Altjira, with a goose-foot, dwelling in the heavens. Unlike the self-created Atnatu of the Kaitish of Messrs Spencer and Gillen, he is not said to have created things, or to take any concern about human beings, as Atnatu does in matters of ceremonial. Mr Strehlow gives Aranda and Lortija texts in the original, with translations and philological remarks.

Mr Frazer, in his Totemism, makes no use of Mr Strehlow's information (save in a single instance). To us it seems worthy of study. His reason for this abstention is that, in a letter to him (Melbourne, March 10, 1908), Mr Spencer says that for at least twenty years the Lutheran Missions have taught the natives " that altjira means ' god ' ; have taught that their sacred ceremonies and secular dances are ' wicked '; have prohibited them, and have never seen them. Flour and tobacco, &c, are only given to natives who attend church and school. Natives have been married who, according to native customary law, belong to groups to which marriage is forbidden. For these reasons Mr Frazer cannot attempt " to filter the native liquor clear of its alien sediment," (Totemism, i. 186, note 2).

Against this we may urge that, as regards the goose-footed sky-dweller, Mr Strehlow reports less of his active interest in human affairs than Mr Gillen does concerning his " Great Ulthaana of the

totemic system of the Arunta," says Messrs Spencer and Gillen. 1 Every Arunta born incarnates a pre-existent primal spirit attached to one of the stone churinga dropped by primal totemic

beings, all of one totem in each case, at a place called an oknanikilla. Each child belongs to the totem of the primal beings of the place, where the mother became aware of the child's life.

Thus the peculiar causes which have produced the unique Arunta licence of marrying within the totem are conspicuously obvious.

Contradictory Theories about the Arunta Abnormal Totemism. — At this point theories concerning the origin of totemism begin to differ irreconcilably. Mr Frazer, Mr Spencer, and, apparently Dr Rivers, hold that, in Australia at least, totemism was originally " conceptional." It began in the belief by the women that pregnancy was caused by the entrance into them of some spirit associated with a visible object, usually animal or vegetable; while the child born, in each case, was that object. Hence that class of objects was tabued to the child; was its totem, but such totems were not hereditary.

Next, for some unknown reason, the tribes were divided into two bodies or segments. The members of segment A may not intermarry; they must marry persons of segment B, and vice versa. Thus were evolved the primal forms of totemism and exogamy now represented in the law of the Arunta nation alone. Here, and here alone, marriage within the totem is permitted. The theory is, apparently, that , in all other exogamous and totemic peoples, totems had been, for various reasons, made hereditary, before exogamy was enforced by the legislator in his wisdom. Thus, all over the totemic world, except in the Arunta nation, the method of the legislator was simply to place one set of totem kins in tribal segment A, and the other in segment B, and make the segments exogamous and intermarrying. Thus it was impossible for any person to marry another of 'the same totem. This is the theory of Mr Frazer.

Upholders of the contradictory system maintain that the Arunta nation has passed through and out of the universal and normal system of hereditary and exogamous totemism into its present condition, by reason of the belief that children are incarnations of pre-existing animal or vegetable spirits, plus the unique Arunta idea of the connexion of such spirits with their stone churinga. Where this combination of the two beliefs does not occur, there the Arunta non-hereditary and non-exogamous totemism does not occur. It would necessarily arise in any normal tribe which adopted the two Arunta beliefs, which are not " primitive."

Arguments against Mr Frazer' s Theory. — There was obviously a time, it is urged, when all totems were, as everywhere else,

heavens " among the Arunta. Mr Strehlow's being, Altjira, has a name apparently meaning " mystic " or sacred, which is applied to other things, for example to the inherited maternal totem of each native. His names for Altjira (god) and for the totemic ancestors (totem gods), are inappropriate, but may be discounted. Many other tribes who are discussed by Mr Frazer have been long under missionary influence as well as the Aranda. According to Mr Frazer the Dieri tribe had enjoyed a German Lutheran mission station (since 1866) for forty-four years up to 1910. About 150 Dieri were alive in 1909 (Totemism, iii. 344). Nevertheless the Dieri myths published by Mr Siebert in the decadence of the tribe, and when the remnant was under missionaries, show no " alien sediment." Nor do the traditions of Mr Strehlow's Aranda. Their traditions are closely akin, now to those of the Arunta, now to those of the northern tribes, now to those of the Euahlayi of Mrs Langloh Parker (The Euahlayi Tribe) in New South Wales, and once more to those of Mr Howitt's south-eastern tribes. There is no trace of Christian influence in the Aranda and Loritja matter, no vestige of " alien " (that is, of European) " sediment," but the account of Atnatu among the Kaitish reported on by Messrs Spencer and Gillen reads like a savage version of Milton's " Fall of the Angels " in Paradise Lost. For these reasons we do not reject the information of Mr Strehlow, who is master of several tribal languages, and, of course, does not encourage wicked native rites by providing supplies of flour, tobacco, &c, during the performances, as Mr Howitt and others say that they found it necessary to do. Sceptical colonists have been heard to aver that natives will go on performing rites as long as white men will provide supplies. 1 Native Tribes of Central Australia, p. 123.

in what the Arunta call "the right" divisions; Arunta, that is, were so arrayed that no totem existed in more than one division. Obliged, as now, to marry out of their own exogamous division (one of four sub-classes among the Arunta) into one of the four sub-classes of the opposite side, no man could then find in it a woman of his own totem to marry. But when Arunta ceased to be hereditary, and came to be acquired, as now, by the local

accident of the totem spirits — all, in each case, of one totem name, which haunt the supposed place of a child's conception — some totems inevitably would often get out of their original sub-class into another, and thus the same totems are in several divisions. But granting that a man of division A may legally marry a woman of division B, he is not now prevented from doing so because his totem (say Wild Cat) is also hers. His or hers has strayed, by accident of supposed place of conception, out of its " right " into its " wrong " division. The words " right " and " wrong " as here used by the Arunta make it certain that they still perceive the distinction, and that, before the Arunta evolved the spiritual view of conception, they had, like other people, their totems in each case confined to a single main exogamous division of their tribe, and therefore no persons could then marry into their own totems.

But when the theory of spiritual conception arose, and was combined, in the Arunta set of tribes alone (it is common enough elsewhere in northern and western Australia), with the churinga doctrine, which gave totems by accident, these two factors, as Messrs Spencer and Gillen say, became the causes — " he at the root " — of the present Arunta system by which persons may marry others of "the right" division, but of "the wrong" totem. That system is strictly confined to the group of tribes (Ilpirra, Loritja, Unmaterja, Kaitish, Arunta) which constitute " the Arunta nation." Elsewhere the belief in spiritual conception widely prevails, but not the belief in the connexion of spirits of individuals with the stone churinga of individuals. Consequently the Arunta system of marriage within the totem exists nowhere, and the non-exogamous non-hereditary totem exists nowhere, except in the Arunta region. Everywhere else hereditary totems are exogamous. 1

Thus the practice of acquiring the totem by local accident is absolutely confined to five tribes where the churinga doctrine coexists with it. That the churinga belief, coexistent with the spiritual theory of conception, is of relatively recent origin is a demonstrable fact. Had it always been present among the Arunta the inevitable result, in the course of ages, would be the scattering of the totems almost equally, as chance would scatter them among the eight exogamous divisions.

This can be tested by experiment. Take eight men, to represent the eight exogamous divisions, and set them apart in two groups of four. Take four packs of cards, 208 cards, to represent the

Arunta totems, which are over 200 in number. Deal the cards round in the usual way to each of the eight men ; each will receive 26 cards. It will not be found that group A has ” the great majority ” of spades and clubs, while group B has ” the great majority ” of diamonds and hearts, and neither group will have ” the great majority ” of court cards. Accident does not work in that way. But while accident alone now determines the totem to which an Arunta shall belong, nevertheless ” in the Arunta, as a general rule, the great majority of the members of any one totemic group belong to one moiety of the tribe; but this is by no means universal . . . ” — that is, of the totems the great majority in each case, as a rule, belongs to one or the other set of four exogamous sub-classes. 2

The inference is obvious. While chance has now placed only the small minority of each totem in all or several of the eight exogamous divisions, the great majority of totems is in one or another of the divisions. This great majority cannot come by chance, as Arunta totems now come; consequently it is but lately that chance has determined the totem of each individual. Had chance from the first been the determining cause, each totem

1 N.T.C.A. p. 257; cf. Frazer, Totemism, i. 200-201.

2 Northern Tribes, pp. 151 sqq.

would not be fairly equally present in each of the two sets of four exogamous divisions. But determination by accident has only existed long enough to affect ” as a general rule ” a small minority of cases. ” The great majority ” of totems remain in what is recognized as ” the right,” the original divisions, as elsewhere universally. Arunta myth sometimes supports, sometimes contradicts, the belief that the totems were originally limited, in each case, to one or other division only, and, being self- contradictory, has no historic value.

A further proof of our point is that the northern neighbours of the Arunta, the Kaitish, have only partially accepted Arunta ideas, religious and social. Unlike the Arunta they have a creative being, Atnatu, from whom half of the population descend; the other half were evolved out of totemic forms. 3 In the same way the Kaitish totems ” are more strictly divided between the two moieties ” (main exogamous divisions) ” of the tribe.” 4 Consequently a man may marry a woman of his own totem if she be in the right exogamous division. ” She is not actually

forbidden to him, as a wife becomes of this identity and totem, as she would be in the Warramunga neighbouring tribe . . .” ” It is a very rare thing for a man to marry a woman of the same totem as himself,” 5 naturally, for the old rule holds, in sentiment, and a totem is still very rarely in the wrong division. The Arunta system of accidental determination of the totem has as yet scarcely produced among the Kaitish any of its natural and important effects.

This view of the case seems logical: Arunta non-exogamous non-hereditary totemism is the result, as Messrs Spencer and Gillen show, of the theory of spiritual conception and the theory of the relation of the spirit part of each individual to his churinga. These two beliefs have already caused a minority of Arunta totems to get out of the original and into the wrong exogamous Arunta divisions. The process is not of old standing; if it were, all totems would now be fairly distributed among the divisions by the laws of chance. In the Kaitish tribe, on the other hand, the processes must be of very recent operation, for they have only begun to produce their necessary effects. The totemism of the Arunta is thus the reverse of ” primitive,” and has but slightly affected the Kaitish.

Precisely the opposite view of the facts is taken by Mr Frazer in his erudite and exhaustive work Totemism. In the Kaitish, he writes, ” we may detect the first stage in the transition from promiscuous marriage and fortuitous descent of the totem to strict exogamy of the totem clans and strict heredity of the totems in the paternal line.” 6 By “promiscuous marriage,” marriage within or without the totem, at pleasure, is obviously intended, for the Arunta do not marry ” promiscuously ” — do not marry their nearest kin.

How, on Mr Frazer's theory, was the transition from the condition of the Arunta to that of the Kaitish made? If the Kaitish were once in the actual Arunta stage of totemism, how did their totems come now to be much more strictly divided between the two moieties, though " the division is not so absolute as amongst the Urabunna in the south and the tribes farther north . . ."? How did this occur? The Kaitish have not made totems hereditary by law; they are acquired by local accident. They have not made a rule that all totems should, as among the more northern neighbours of the Arunta, be regimented so that no totem occurs in more than one division: to this rule there are exceptions. A man " is not actually forbidden " to marry a woman of his own totem provided she be of " the right division," but it is clear that he " does not usually do so." This we can explain as the result of a survival in manners of the old absolute universal prohibition.

Meanwhile our view of the facts makes all the phenomena seem natural and intelligible in accordance with the statement of the observers, Messrs Spencer and Gillen, that the cause of the unique non-hereditary non-exogamous totems of the Arunta is the combination of the churinga spiritual belief with the belief in spiritual conception. This cause, though now present among

3 Northern Tribes, pp. 153, 154, 175. 4 Ibid. p. 152.

6 Ibid. p. 175. 6 Totemism, i. 244.

the Kaitish, has, so far, operated but faintly. We have been explicit on these points because on them the whole problem of the original form of totemism hinges. In our view, for the reasons stated, the Arunta system of non-exogamous non-hereditary totemism is a peculiarity of comparatively recent institution. But Mr Frazer, and the chief observer of the phenomena, Mr Spencer, consider the Arunta system, non-exogamous and non- hereditary, to be the most archaic form of totemism extant.

As to non-hereditary, we find another report of the facts in Die Aranda und Loritja Stamme, by the Rev. Mr Strehlow, who has a colloquial and philological knowledge of the language of these tribes. As he reports, among other things, that the Aranda (Arunta) in his district inherit their mother's totems, in addition

to their " local totems," they appear to retain an archaic feature from which their local totem system and marriage rules are a departure. 1

The hereditary maternal totem is, in Mr Strehlow's region, the protective being (altjira) of each Arunta individual.

Are the Arunta " Primitive " or not? — In the whole totemic controversy the question as to whether the non-exogamous non-hereditary totemism of the Arunta or the hereditary and exogamous totemism of the rest of Australia and of totemic mankind, be the earlier, is crucial.

That Arunta totemism is a freak or " sport," it is argued, is made probable first by the fact that the Arunta inherit all things hereditable in the male line, whereas inheritance in the female descent is earlier. (To this question we return; see below, Male and Female Lines of Descent.) M. Van Gennep argues that tribes in contact, one set having female, the other male, descent, " like the Arunta have combined the systems." 2 But several northern tribes with male descent of the totem which are not in contact with tribes of female descent show much stronger traces of the " combination " than the Arunta, who intermarry freely with a tribe of female descent, the Urabunna; while the Urabunna, though intermarrying with the Arunta who inherit property and tribal office in the male line, show no traces of " combination." Thus the effects occur where the alleged causes are not present; and the alleged causes, in the case of the Urabunna and Arunta, do not produce the effects.

Next the Arunta have no names for their main exogamous divisions, these names being a very archaic feature which in many tribes with sub-classes tend to disappear. In absence of phratry names the Arunta are remote from the primitive. M. Van Gennep replies that perhaps the Arunta have not yet made the names, or have not yet borrowed them. This is also the view of Mr Frazer. As he says, the Southern Arunta lived under the rule of eight classes, but of these four were anonymous, till the names for them were borrowed from the north. The people can thus have anonymous exogamous divisions; the two main divisions, or phratries, of the Arunta may, therefore, from the first, have been anonymous.

To this the reply is that people borrow, if they can, what they need. The Arunta found names for their four hitherto anony-

mous classes to be convenient, so they borrowed them. But when once class-names did, as they do, all that is necessary, the Arunta had no longer any use for the names of the two primary main divisions: these were forgotten; there is nothing to be got by borrowing that; while four Arunta ” sub-classes ” are gaining their names, the ” classes ” (phratries or main divisions) have lost them. It is perfectly logical to hold that while things useful, but hitherto anonymous, are gaining names, other things, now totally useless, are losing their names. One process is as natural as the other. In all Australia tribes with two main divisions and no sub-classes, the names of the two main divisions are found, because the names are useful. In several tribes with named sub-classes, which now do the work previously thrown on the main divisions, the names of the main divisions are unknown: the main divisions being now useless, and superseded by the sub-classes. The absence of names of the two main divisions in the Arunta is merely a result, often found, of the rise of the sub-

1 Strehlow, ii. 57 (1908).

s Mythes et legendes d’Australie, p. xxxii.

classes, which, as Mr Frazer declares, are not primitive, but the result of successive later legislative acts of division. 3

Manifestly on this point the Arunta are at the farthest point from the earliest organization: their loss of phratry names is the consequence of this great advance from the ” primitive.”

All Arunta society rests on a theory of reincarnated spirits, a theory minutely elaborated. M Van Gennep asks ” why should this belief not be primitive? ” Surely neither the belief in spirits, nor the elaborate working out of the belief connecting spirits with manufactured stone amulets, can have been primitive. Nobody will say that peculiar stone amulets and the Arunta belief about spirits associated with them are primitive. To this M Van Gennep makes no reply. 4

The Arunta belief that children are spirit-children (ratapa) incarnated is very common in the other central and northern tribes, and, according to Mrs Bates, in Western Australia; Dr Roth reports the same for parts of Queensland. It is alleged by Messrs Spencer and Gillen that the tribes holding this belief deny any connexion between sexual unions and procreation. Mr Strehlow, on the other hand, says that in his region the older Arunta men

understand the part of the male in procreation; and that even the children of the Loritja and Arunta understand, in the case of animals. 5 (Here corroboration is desirable and European influence may be asserted.) Dr Roth says that the Tully River blacks of Queensland admit procreation for all other animals, which have no Koi or soul, but not for men, who have souls. (Their theory of human birth, therefore, merely aims primarily at accounting for the spiritual part of man.) 6

According to Mrs Balˆs, some tribes in the north of South Australia, tribes with the same ” class ” names as the Arunta, hold that to have children a man must possess two spirits (ranee). If he has but one, he remains childless. If he has two, he can dream of an animal, or other object, which then passes into his wife, and is born as a child, the animal thus becoming the child’s totem. This belief does not appear to apply to reproduction in the lower animals. It is a spiritual theory of the begetting of a soul incarnated. If a man has but one spirit, he cannot give one to a child, therefore he is childless.

It is clear that this, and all other systems in which reproduction is explained in spiritual terms, can only arise among peoples whose whole mode of thinking is intensely ” animistic.” It is also plain that all such myths answer two questions — (1) How does a being of flesh and spirit acquire its spiritual part? — (2) How is it that every human being is in mystical ropport with an animal, plant, or other object, the totem? Manifestly the second question could not arise and need answer before mankind were actually totemists. It may be added that in the south of Western Australia the name for the mythical ” Father of All ” (a being not there worshipped, though images of him are made and receive some cult at certain licentious festivals) and the name for ” father-stock ” is maman, which Mrs Bates finds to be the native term for membrum virile. All this appears to be proof of understand- ing of the male part in reproduction,, though that understanding is now obscured by speculation about spirits.

The question arises then, is the ignorance of procreation, where that ignorance exists, ” primitive,” and is the Arunta totemism also ” primitive,” being conditioned, as we are told it is, by the unique belief in some churingal Or is the ignorance due to attempts of native thinkers to account for the spirit in man as a pre-existing entity that has been from the beginning? The former view is that of Messrs Spencer and Gillen, and Mr Frazer. For the latter see Lang, Anthropological Essays presented to E. B. Tylor,

pp. 210-218. We can hardly call people primitive because they have struggled with the problem ” how has material man an indwelling spirit? ”

Theories of the Origin of Totemic Exogamy. — Since the word ” exogamy ” as a name for the marriage systems connected (as a rule) with totemism was used by J. F. McLennan in his

3 Totemism, i. 282, 283. 4 Van Gennep, pp. xxxiii-xxxv.

6 Loritja Stamme, p. 52, note 7.

6 Roth, Bulletin, No. 5, pp. 17, 22, 65, 81.

Primitive Marriage (1866), theories of the origin of exogamy have been rife and multifarious. All, without exception, are purely conjectural. One set of disputants hold that man (whatever his original condition may have been) was, when he first passed an Act of Exogamy, a member of a tribe. Howitt’s term for this tribe was ” the undivided commune.” It had, according to him, its inspired medicine-man, believed to be in communication with some superior being. It had its pro- bouleutic council of elders or ” headmen ” and its general assembly. Such was man’s political condition. 1 It is not dis- tinguishable from that of many modern Australian tribes. Other tribes, said by some to be the most primitive, the Arunta and their neighbours, pay no attention to the dictates of a superior being, and the Arunta of Spencer and Gillen seem to know no such entity, though as Atnatu, Tukura, Altjira, and ” the Great Ulthaana of the heavens,” he exists in a dwindled form among the Kaitish, Loritja and outlying portions of the Arunta tribe. In religion Howitt’s early men were already in advance of Mr Spencer’s Arunta. Socially, man, at this date, according to Howitt, at first left the relations of the sexes wholly unregulated; the nearest kinsfolk by blood coupled at will, though perfectly aware that they were, at least on the maternal side, actual brothers and sisters, parents and children.

Upholders of the first theory, that man lived promiscuously in a tribal state with legislative assemblies and then suddenly reformed promiscuity away, must necessarily differ in their opinion as to the origins of totems and exogamy from the friends of the second theory, who believe that man never was “pro-

miscuous," and given to sexual union with near kin. Why man, on the first theory — familiar as he was with unions of the nearest kin — suddenly abolished them is explained in four or five different ways. Perhaps the most notable view is Mr Frazer's; he easily confutes, in thirty-five pages, the other hypotheses. 2 Man saw, or thought he saw, injurious consequences to the wedded near- related couples, and therefore he prohibited, first, unions between mothers and sons, and brothers and sisters. 3 But, in his fourth volume, Mr Frazer sees conclusive objections to this view 4 and prefers another. Some peoples, far above the estate of savagery, believe that human incest blights and sterilizes the crops, women and animals. " If any such belief were entertained by the founders of exogamy, they would clearly have been perfectly sufficient motives for instituting the system, for they would perfectly explain the horror with which incest has been regarded and the extreme severity with which it has been punished." 5 That is to say, people had a horror and hatred of incest because they supposed that it blighted the crops and other things. Mr Frazer had previously written (iv. 108) " It is important to bear steadily in mind that the dislike of certain marriages must always have existed in the minds of the people, or at least of their leaders, before that dislike, so to say, received legal sanction by being embodied in an exogamous rule."

Again (iv. 112) " There had, for some reason unknown to us, been long growing up a strong aversion to consanguineous unions " — before any legislative bar was raised against them. This is insisted on. The prohibition " must have answered to certain general sentiments of what was right and proper " (iv. 121). But here the theorist has to explain the origin of the strong aversion, the general sentiment that unions of near kin are wrong and improper. But Mr Frazer does not seem to explain the point that most needs explanation. That " strong aversion," that " general sentiment," cannot have arisen from a growing belief that unions of close kin spoiled the crops or the natural resources of the country. That superstition could only arise as a consequence of the horror and aversion with which " incest " was regarded. Now no idea corresponding to " incest " could arise before unions of near kin were deemed abominable. When once such unions were thought hateful to gods and men, and an upsetting of the cosmic balance, then, but not till then, they might be regarded as injurious to the crops. All such beliefs are sanctions of ideas already in strong 1 N.T.S.E.A. pp. 89, 90. 3 Ibid. i. 165.

» Totemism, iv. 75-120. * Ibid. iv. 155, 156.

6 Ibid. iv. 158.

force. The idea that such or such a thing is wrong begets the prohibition, followed by the sanction — the belief that the practice of the thing is injurious in a supernormal way: where that belief exists. We do not know it in Australia, for example.

A belief that close sexual unions were maleficent cosmic influences could not possibly arise previous to, and could not then cause, “the dislike of certain marriages”; “the strong aversion to consanguineous unions ” — which existed already. This latest guess of Mr Frazer at the origin of the idea of ” incest ” — of the abomination of certain unions — is untenable. What he has to explain is the origin of the dislike, the aversion, the horror. Once that has arisen, as he himself observes, the prohibition follows, and then comes the supernormal sanction. Thus no theory of exogamous rules as the result of legislation to prevent the unions of persons closely akin, can produce, or has produced, any reason for the aversion to such unions arising among people to whom, on the theory, they were familiar. Mr Frazer has confuted the guesses of MacLennan, Morgan, Durkheim and others; but his own idea is untenable.

The Supposed Method of Reform. — On Mr Frazer’s theory the reformers first placed half of the mothers of the tribe, with their children, in division A; and the rest of the mothers, with their children, in division B. The members of each division (phratry) must marry out of it into the other, and thus no man could marry his sister or mother. (The father could marry his daughter, but in tribes with no exogamous explicit rule against the union, he never does.) Later the two divisions were bisected each into a couple of pairs (classes) preventing marriage between father and daughter; and another resegmentation prohibited the unions of more distant relations. These systems, from the simplest division into two phratries, to the more complex with two ” sub-classes ” in each phratry, and the most elaborate of all with four sub-classes in each phratry, exist in various tribes. Environment and climate have nothing to do with the matter. The Urabunna and the Arunta live in the same climate and environment, and inter-marry. The Urabunna have the most primitive, the Arunta have the most advanced of these organizations. While the rules are intended to prevent consanguineous marriages, the names of the ” sub-classes ” (when translatable, the names of animals) cannot

perhaps be explained. They have a totemic appearance.

Totems in Relation to Exogamy. — So far, in this theory nothing has been said of totems, though it is an all but universal rule that people of the same totem may not intermarry, even if the lovers belong to tribes separated by the breadth of the continent. In fact, according to the hypothesis which has been set forth, totems, though now exogamous, played no original part in the evolution of exogamy. They came in by accident, not by design, and dropped into their place in a system carefully devised.

Originally, on this theory, a totem came to a child, not as is usual now, by inheritance, but by pure accident; the mother supposing that any object which caught her attention at the moment when she first felt the life of her child, or any article of food which she had recently eaten, became incarnate in her, so that the emu (say) which she saw, or had eaten of, was her child. He or she was an Emu man or woman, by totem was an Emu.

Certain localities, later, were somehow associated each with one given object — cat, kangaroo, grub, or anything else, and now " local totems " (if the phrase may be used) took the place of " conceptional totems," as among the Arunta. The child inevitably was of the local totem and its supposed place of conception.

Finally all tribes except the Arunta " nation " made the totem hereditary, either from mother or father; and as the mother or father, an Emu, was in division A, so was the child, and he or she must marry out of that division into the other, B. 6

The objections taker, to this theory are now to be stated:

6 Frazer, Totemism, i. 157-167.

(i.) The theory can by no possibility apply to tribes with three or more main exogamous divisions or phratries, such as we find in North America. In a three-phratry tribe we are reduced to suppose that there were three sexes, or resort- to some other solution not perhaps compatible with the theory, (it.) We have no evidence that any totemic people, except the Navajoes, think the closest sexual unions injurious to the parties or their offspring. The theory is thus merely extracted from the facts — certain

unions are forbidden, therefore they must have been deemed injurious. Now, even if they were generally thought injurious, the belief would be a mere inference from the fact that they were forbidden, (iii.) The supposed original legisla- tive exogamous division produced a very different effect than that said to be aimed at, namely, the prohibition of marriage between brothers and sisters. It forbade to every man marriage with half the women of his tribe, most of whom were not, even in the wide native use of the term, his " tribal " sisters, that is, women in a man's phratry of the same status as his own sisters. Such relationships, of course, could not exist before they were created by the supposed Act of Division. It would have been easy to prohibit marriages of brothers with sisters directly, just as, though no exogamous rule forbids, the father, in tribes of female descent, is directly forbidden to marry his daughters. The natives can take a simple instead of a bewilder- ing path. To this natural objection Mr Frazer replies: 1 " If we assume, as we have every right to do, that the founders of exo- gamy in Australia recognized the classificatory system of rela- tionship, and the classificatory system of relationship only, we shall at once perceive that what they intended to prevent was not merely the marriage of a man with his sister, his mother, or his daughter in the physical sense in which we use these terms; their aim was to prevent his marriage with his sister, his mother and his daughter in the classificatory sense of these terms; that is they intended to place bars to marriage not between individuals merely but between the whole groups of persons who designated their group, not their individual relationships, their social, not their consanguineous ties, by the names of father and mother, brother and sister, son and daughter. And in this intention the founders of exogamy succeeded per- fectly." Mr Frazer's theory of the origin of exogamy appears now to waver. It was 2 that the primal bisection of the tribe was " deliberately devised and adopted as a means of preventing the marriage, at first, of brother with sisters. . . ." Here was the place to say, if it was then intended to say, that the Australians " recognized the classificatory system of rela- tionships only." As a matter of fact they recognize both the consanguine and the classificatory systems. It is not the case that " the savage Australian, it may be said with truth, has no idea of relationships as we understand them, and does not discriminate between his actual father and mother and the men and women who belong to the group, each member of which might have lawfully been either his father or his mother, as the case may be."

This statement is made inadvertently and unfortunately by Messrs Spencer and Gillen, 3 but it is contradicted by their own observations. An Arunta can tell you, if asked, which of all the men whom he calls ” father ” is his very own father. 4 The Dieri have terms for ” great ” (actual) and ” little ” (tribal) father, and so for other relationships. In Arunta orgies a woman’s ” tribal ” ” fathers ” and ” brothers ” and ” sons ” are admitted to her embraces; her actual father and brothers and sons are excluded. 5 Thus, if the prohibition be based on aversion to unions of persons closely akin by blood, as the actual father is excluded, the actual father, among the Arunta, is, or has been, amongst that people, regarded as near of blood to his daughters. The Arunta are ignorant, we are told, of the part of the male in procreation. Be it so, but there has been a time when they were not ignorant, and when the father was recognized as of the nearest kin by blood to his daughters. If

1 Totemism, i. 288.

- Northern Tribes, pp. 95 seq.

4 Central Tribes, p. 57.

2 Ibid. i. 163.

Totemism, i. 289.

1 Ibid. p. 97.

not, and if the prohibition is based on hatred of unions of close kin, why is the father excluded? Nothing, in short, can be more certain than that Australian tribes distinguish between ” social ” or ” tribal ” relations on the one hand, and close consanguine relations on the other. Among the Arunta office is inherited by a man from his mother’s husband, his father quern nuptiae demonstrant; not from any ” tribal ” father. 6

Mr Frazer 7 apparently meant in his earlier statement that brothers and sisters consanguine, and these only, were to be excluded from intermarriage, because he went on to say that science cannot decide as to whether the closest interbreeding is injurious to the offspring of healthy parents, however near in blood; and that very low savages could not discover what is hidden from modern science. He had therefore marriages of consanguine brothers and sisters present to his mind: ” the closest interbreeding.” Brothers and sisters were finally for-

bidden, on this theory, to intermarry, not because of any dread of injury to the offspring. ” The only alternative open to us seems to be to infer that these unions were forbidden because they were believed to be injurious to the persons engaged in them, even when they were both in perfect health.” 8 These ” incestuous unions ” are between brothers and sisters, mothers and sons. Here brothers and sisters consanguine, children of the same mother in each case, certainly appear to be intended. Who else, indeed, can be intended? But presently 9 we are to assume that the Australians, before they made the first exogamous division of the tribe ” recognized the classificatory system of relationship, and the classificatory system only.” They meant, now, to bar marriage between ” whole groups of persons,” related by “social, not consanguineous ties.” But this seems to be physically impossible. These ” whole groups ” never existed, and never could exist, as far as we can see, till they were called into being by the legislative division of the tribe into two exogamous phratries — which had not yet been made. How could a man call a whole group of women ” nupa,” as at present (the word being applied to his wife and to all women of the opposite phratry to his whom he might legally marry) before the new law had constituted such a group? In what sense, again, were all women of a certain status called my ” sisters ” (like my actual sisters) before the new law made a new group of them — in regard to marriage as sacred as my own sisters now were to me? It cannot be said that all women of my status were called, collectively, my ” sisters ” before the new division of the tribe and new rule arose, because previously, all women of my status in the tribe have been my ” sisters.” Who else could be collectively my ” sisters “? If to marry a ” sister ” were reckoned dangerous to her and to me, I must have been forbidden to marry all the women of my status in the tribe. How could a law which merely halved the number of my ” sisters ” remove the unknown danger from half of them? If any women except my actual sisters were, before the new rule, reckoned as socially my sisters, all women in the tribe of a certain status must have been so reckoned. If all dangerous, I must marry none of them. But by the new rule, I may marry half of them! Why have they ceased to be dangerous?

If the theory be that originally only brothers and sisters consanguine were thought dangerous to each other in sexual relations, and the superstition was later extended so as to include all ” classificatory ” brothers and sisters, who were in these days (before the exogamous division) classificatory brothers and

sisters? How and for what reason were some marriageable girls in the tribe classificatory sisters of a young man while others, equally young and marriageable, were not ? The classi- ficatory brothers and sisters must have been all the marriageable youth of both sexes in a generation, in the tribe.

But then if all the youth of a generation, of both sexes, were classificatory brothers and sisters, and if therefore their unions were dangerous to themselves, or to the crops, the danger could not be prevented by dividing them into two sets, and

6 See Proceedings of British Academy, iii. 4. Lang, “gOrigin of Terms of Human Relationships.”

7 Totemism, i. 163. 8 Ibid. i. 165. 9 Ibid. i. 288.

allowing each set of brothers to marry each set of sisters. The only way to parry the danger was to force all these brothers and sisters to marry out of the local tribe into another local tribe with the same superstition. When that was done, the two local tribes, exogamous and intermarrying, were constituted into the two-phratries of one local tribe. But that is not the theory of observers on the spot: their hypothesis is that a promiscuous and communistic local tribe, for no known or conceivable reason, bisected itself into two exogamous and intermarrying ” moieties.”

On the face of it, it is a fatal objection to the theory that when men dwelt in an undivided commune they recognized no system of relationships but the classificatory, yet were well aware of consanguineous relationships; were determined to prohibit the marriages of people in such relationships; and included in the new prohibition people in no way consanguineous, but merely of classificatory kin. The reformers, by the theory, were perfectly able to distinguish consanguineous kinsfolk, so that they might easily have forbidden them to intermarry; while if all the members of the tribe were not in the classificatory degrees of relationship, who were? How were persons in classifi- catory relationships with each other discriminated from other members of the tribe who were not? They were easily discrim- inated as soon as the phratries were instituted, but, we think, not before.

Term of Classificatory Relationships. — Here it is necessary to say a few words about ” classificatory ” terms of relationship. Among many peoples the terms or names which with us denote relationships of consanguinity or affinity, such as Father, Mother, Brother, Sister, Son, Daughter, Husband, Wife, are applied both to the individuals actually consanguineous in these degrees, and also to all the other persons in the speaker’s own main exogamous division or phratry who are of the same ” age-grade ” and social status as the Father, Mother, Brother, Sister, Son, Daughter, Husband, Wife, and so forth. As a man thus calls all the women whom he might legally have married by the same term as he calls his wife, and calls all children of persons of his own ” age-grade,” class and status by the same name as he calls his own children, many theorists hold this to be a proof of the origin of the nomenclature ” in a system of group marriage in which groups of men exercised marital rights over groups of women, and the limitation of one wife to one husband was unknown. Such a system would explain very simply why every man gives the name of wife to a whole group of women, and every woman gives the name of husband to a whole group of men,” and so on with all such collective terms of relationship. 1

Certainly this is a very simple explanation. But if we wished to explain why every Frenchman applies the name which he gives to his ” wife ” (femme) to every ” woman ” in the world, it would be rather simpler than satisfactory to say that this nomenclature arose when the French people lived in absolute sexual promiscuity. The same reasoning applies to English ” wife,” German Weib, meaning ” woman,” and so on in many languages. Moreover the explanation, though certainly very simple, is not ” the only reasonable and probable explanation.” Suppose that early man, as in a hypothesis of Darwin’s, lived, not in large local tribes with the present polity of such tribes in Australia, but in ” cyclopean families,” where the sire con- trolled his female mates and offspring; and suppose that he, from motives of sexual jealousy, and love of a quiet life, forbade amours between his sons and daughters. Suppose such a society to reach the dimensions of a tribe. The rules that applied to brothers and sisters, mothers and sons, would persist, and the original names for persons in such relationships in the family would be extended, in the tribe, to all persons of the same status: new terms being adopted, or old terms extended, to cover new social relationships created by social laws in a wider society.

A nother Theory of the Origin of Totemism and Exogamy. — How

this would happen may be seen in studying the other hypothesis
1 Totemism, i. 304.

of exogamy and totemism. 5 Man was at first, as Darwin sup- posed, a jealous brute who expelled his sons from the neighbour- hood of his women; he thus secured the internal peace of his fire circle; there were no domestic love-feuds. The sons there- fore of necessity married out — were exogamous. As man became more human, a son was permitted to abide among his kin, but he had to capture a mate from another herd (exogamy).

The groups received sobriquets from each other, as Emu, Frog, and so forth, a fact illustrated copiously in the practice of modern and English and ancient Hebrew villages. 3

The rule was now that marriage must be outside of the local group-name. Frog may not marry Frog, or Emu, Emu. The usual savage superstition which places all folk in mystic rapport with the object from which their names are derived gradually gave a degree of sanctity to Emu, Frog and the rest. They became totems.

Perhaps the captured women in group Emu retained and bequeathed to their children their own group-names; the children were Grubs, Ants, Snakes, &c. in Emu group. Let two such groups, Emu and Kangaroo, tired of fighting for women, make peace with connubium, then we have two phra- tries, exogamous and intermarrying, Emu and Kangaroo, with totem kins within them. (Another hypothesis is necessary if the original rule of all was, as among the Urabunna and other tribes, that each totem kin must marry out of itself into only one other totem kin. 4 But we are not sure of the fact of one totem to one totem marriage.) In short, the existence of the two main exogamous divisions in a tribe is the result of an alliance of two groups, already exogamous and intermarrying, not of a deliberate dissection of a promiscuous horde. 5

The first objection to this system is that it is not held by observers on the spot, such as Mr Howett and Mr Spencer. But while all the observed facts of these observers are accepted (when they do not contradict their own statements, or are not corrected by fresh observations), theorists are not bound to accept the hypotheses of the observers. Every possible respect is paid to facts of observation. Hypotheses as to a stage of society which no man living has observed may be accepted as freely

from Darwin as from Howitt, Spencer and L. Morgan.

It is next objected that ” the only ground for denying that the elaborate marriage-system” (systems?) “of the Australian aborigines has been devised by them for the purpose which it actually serves, appears to be a preconceived idea that these savages are incapable of thinking out and putting in practice a series of checks on marriage so intricate that many civilized persons lack either the patience or the ability to understand them . . . The truth is that all attempts to trace the origin and growth of human institutions without the intervention of human intelligence and will are radically vicious and foredoomed to failure.”, 6 But nobody is denying that the whole set of Australian systems of marriage is the result of human emotions, intelligence and will. Nobody is denying that, in course of time, the aborigines have thought out and by successive steps have elaborated their systems. The only questions are, what were the human motives and needs which, in the first instance, set human intelligence and will to work in these directions ; and how, in the first instance, did they work? The answers given to these questions are purely and inevitably hypothetical, whether given by observers or by cloistered students.

It is objected, as to the origin of totemism, that too much influence is given to accident, too little to design. The answer is that ” accident ” plays a great part in all evolution, and that,

2 Lang and Atkinson, Social Origins and Primal Law. Lang, Secret of the Totem.

3 Lang, Social Origins and Secret of the Totem. . 4 Anthropological Essays, pp. 206ˆ209.

6 This theory, already suggested by the Rev. J. Mathew, and Mr Daniel McLennan, occurred independently to M. Van Gennep, who, in Mythes et legendes d’Australie, suppressed his chapter on it, after reading The Secret of the Totem. The conclusions were almost identical with those of that work (Op. cit. pp. vi. xxxiv.). The details of the evolution, which are many, may be found in Social Origins and Primal Law, and revised in The Secret of the Totem.

8 Totemism, i. 280, 281.

in the opposed theory, the existence and actual exogamous function of totems is also accidental, arising from ignorance and a peculiar superstition. It is urged that no men would accept a nickname given from without by hostile groups. This is answered by many examples of cases in which tribes, clans, political parties, and, of course, individuals, have accepted sobriquets from without, and even when these were hostile and derisive. 1 It is asked, Why, on this theory, are there but two exogamous divisions in the tribe? The reply is that in America there may be three or more: that in the Urabunna there are as many exogamous divisions (dual) as there are totems, and that these, like the main exogamous divisions, go in pairs, because marriage is between two contracting parties. 2

It is maintained in this theory that Australian blacks, who are reflective and by no means illogical men, have long ago observed that certain marriages are rigorously barred by their social system, for no obvious reason. Thus a man learns that he must not marry in his own main exogamous division, say Eagle Hawk. He must choose a wife from the opposite division, Crow. She must belong to a certain set of women, in Crow, whose tribal status is precisely that, in Crow, of his own sisters, and his " little sisters " (the women of his sister's status) in Eagle Hawk. The reflective tribesman does not know why these rules exist. But he perceives that the marriageable women in his own main division bear the same title as his sisters by blood. He therefore comes to the conclusion that they are all what his own sisters manifestly are, " too near flesh," as the natives say in English; and that the purpose of the rule is to bar marriage to him with all the women who bear the name " sisters " that denotes close consanguinity. Presently he thinks that other kinsfolk, actual, or bearing the same collective title as actual kinsfolk of his, are also " too near flesh," and he goes on to bar them till he reaches the eight class model; or like some south-eastern tribes, drops the whole cumbrous scheme in favour of one much like our own.

The reflective savage, in short, acts exactly as the Church did when she extended to cousins the pre-existing Greek and Roman prohibitions against the marriages of very near kin; and, again, extended them still further, to exclude persons not consanguineous at all but called by the same title as real consanguines, " father," " mother " and " child " in " gossipred " — godfather, godmother, godchild.

The savage and ecclesiastical processes are parallel and illustrate each other. Probably when a tribe with two main exogamous and intermarrying divisions came into existence in the way which we have indicated, the names used in families for father, mother, daughter, son, husband, wife, brother, sister, were simply extended so as to include, in each case, all persons in the tribe who were now of the same status, socially, with the same rights, restrictions and duties, as had been theirs in the fire-circle before the tribe was made a tribe by the union of two exogamous and previously hostile intermarrying local groups; or two sets of such groups. The process is natural; the wide extension now given to old names of relationships saved the trouble of making new names. Thus we have found a reasonable and probable way of accounting for classificatory terminology without adopting the hypothesis that it arose out of "group- marriage " and asking " But how did group-marriage arise?"

There is no accident here, all is deliberate and reflective design, beginning with the purely selfish and. peace-loving design of the jealous sire. Meanwhile the totemic prohibition, " no marriage in the same totem name," has been retained and expanded even beyond the tribe, and " however remote the hunting grounds " of two persons, they may not intermarry if their totem name be the same.

Such are the two chief opposed theories of the origins of exogamy, and of the connexions of exogamy with totemism. The second does not enjoy the benefit of notice and criticism in Mr Frazer's Totemism.

1 The Secret of the Totem, pp. 128, 134.

8 For other arguments explaining the duality of the divisions see Van Gennep, ut supra, p. xxxiv. and note 1.

Relations of the Social and Religious Aspects of Totemism. — It is a curious fact (if it be accepted as a fact) that the social aspect of totemism — the prohibition to marry a person of the same hereditary totem name — is sometimes strongest where the " religious " prohibition against killing or eating the totem is weakest; while the highest regard is paid to the totem, or to the god which is supposed to inhabit the totem species, where there is no prohibition on marrying within the totem name. Thus in Australia, where (except in the centre, among the Arunta) almost all tribes prohibit marriages within the totem name, it is scarcely

possible to find an instance in which irreligious treatment of the totem, killing or eating it, is (as among many other totemic peoples) thought to be automatically or ” reli- giously ” punished by illness, death or miscarriage. Religion, in these cases, does not hold that the injured majesty of the totem avenges itself on the malefactor. On the other hand the Samoans, who pay no regard to the sacred animal of each community in the matter of not marrying within his name, believe that he will inflict death if one of his species be eaten— and if no expiatory rite be performed. 3 In Samoa, we saw, the so-called totem is the vehicle of a God; in Australia no such idea is found.

Meanwhile the offence of marrying within the totem name is nowhere automatically punished in any way except among the American Navajos, where, to make certain, the totem kin also inflicts secular penalties; 4 and it is part of the magic of the Intichiuma rites for the behoof of the totem that his kin should eat of him sparingly, as on all occasions they may do. In all other quarters, where marriage within the totem kin is forbidden, the penalty of a breach of law has been death or tribal excom- munication. The offence is secular. The Euahlayi, who never marry within the totem name, ” may and do eat their hereditary totems with no ill effects to themselves.” 6 This is very common in South Australia. As a rule, however, in Australia some respect is paid to the actual plant or animal, and some Northern tribes who inherit the paternal totem respect it almost as much as the maternal totem. As they also inherit property in the maternal line, it seems clear that they have passed from female to male descent, as regards the totem, but not as regards inheritance. 6

Male and Female Descent of the Totem. — It was the almost universal opinion of anthropologists that, in the earliest totemic societies, the totem was inherited from the mother, and that inheritance from the father was a later development. But when the peculiar totemism of the Arunta was discovered, and it was desired to prove that this non-exogamous totemism was the most primitive extant, it was felt to be a difficulty that the Arunta reckon descent of everything hereditable in the male, not the female line. If then, the Arunta were not primitive but advanced, in this matter as well as in their eight sub-classes and ceremonies, how could their totemism be primitive? It would have been easy to reply that a people might be ” primitive ” in some details though advanced in others — the fact is notorious. But to escape from the dilemma the idea was proposed that neither male nor female descent was more primitive than the

other. One tribe might begin with male, one with female descent. Nobody can prove that it was not so, but " whereas evidence of the passage from female to male reckoning may be observed, there is virtually none of a change in the opposite direction." 7

Thus the Worgaia and Northern neighbours of the Arunta, with male descent, have certainly passed through a system of female descent of the totem, and actually inherit property in the female line, while Strehlow's Aranda or Arunta inherit their mothers' totems. Moreover Howitt shows us at least one tribe

3 Turner, Samoa, p. 31, sqq.

4 Bourke, Snake Dance of the Moquis, p. 279.

6 Mrs Langloh Parker, The Euahlayi Tribe, p. 279.

6 See for Worgaia and Warramunga reverence of the mother's totem, though they inherit the father's, Spencer and Gillen, Northern Tribes, p. 166. That these tribes, though reckoning descent in the paternal line, inherit property in the maternal is certain, see pp. 523, 524.

'Thomas, ut supra, p. 15.

with female descent, the Dieri, actually in the process of diverging from female to male descent of the totem. " A step further is when a man gives his totem name to his son, who then has those of both father and mother. This has been done even in the Dieri tribe," which appears to mean that it is also done in other tribes. 1

A difficult case in marriage law is explained by saying that " possibly some man, as is sometimes the case, gave his Murdu (totem) to his son, who was then of two Murdus, and so could not marry a girl of one of his two totems." 2 We thus see how the change from female to male descent of the totem is " directly led to," as Mr Howitt says, 3 by a man's mere fatherly desire to have his son made a member of his own totem kin. On the other hand, we never read that with male descent of the totem a mother gives hers to son or daughter. All these facts make it hard to doubt (though absolute proof is necessarily impossible) that female

everywhere preceded male descent of the totem.

Proof of transition from female to male descent of the totem appears to be positive in some tribes of the south of South Australia. Among them each person inherits his mother's totem, and may not marry a woman of the same. But he also inherits his father's totem, which " takes precedence," and gives its name to the local group. No person, as apparently among the Dieri when a father has " given his totem " to a son, may marry into either his father's or his mother's totem kin (Mrs Bates).

Thus we have a consecutive series of evolutions: (a) All inherit the maternal totem only, and must not marry within it. This is the rule in tribes of south-east Australia with female descent. (6) Some fathers in this society give their totems to sons, who already inherit their maternal totems. Such sons can marry into neither the paternal nor maternal totems. This was a nascent rule among the Dieri. (c) All inherit both the paternal and the maternal totem, and may marry into neither (southern South Australia), (d) All inherit the religious regard for the maternal totem, but may marry within it, while they may not marry within the paternal totem (Worgaia and Warramunga of north central Australia), (e) The paternal totem alone is religiously regarded, and alone is exogamous (tribes of south- east Australia with male descent). (/) The totem is neither hereditary on either, side nor exogamous (Spencer's Arunta). (g) The maternal totem is hereditary and sacred, but not exogamous (Strehlow's Arunta).

In this scheme we give the degrees by which inheritance of the totem from the mother shades into inheritance of the totem from both parents (Dieri), thence to inheritance of both the maternal and paternal totem while the paternal alone regulates marriage (Worgaia and Warramunga), thence to exclusive inheritance of the paternal, without any regard paid to the maternal totem (some tribes of South Australia), and so on.

Meanwhile we hear of no tribe with paternal descent of the totem in which mothers are giving their own totems also to their children. We cannot expect to find more powerful presumptions in favour of the opinion that tribes having originally only maternal have advanced by degrees to only paternal descent of the totem. Mr Frazer says, " So far as I am aware, there is no evidence that any Australian tribe has exchanged maternal for paternal descent, and until such evidence is forthcoming we are justified in assuming that those tribes which now trace descent

from the father formerly traced it from the mother." 4

We have now provided, however, the evidence for various transitional stages from maternal to paternal descent, but have found no traces of the contrary process, nor more than one way of interpreting the facts. It is admitted by Mr Frazer that in several North American tribes the change from female to male descent has to all appearance been made. 5 Among the Delawares the initial process was much akin to that of the Dieri, who, in a tribe of female descent, " gives " his own totem to his sons. " The Delawares had a practice of sometimes naming a child into its father's clan," and a son thus became a member of his father's

1 N.T.S.E.A. p. 284. 2 Ibid. p. 167.

' Ibid. p. 284. * Totemism, i. 317. 6 Ibid. iii. 42, 58, 72, 80.

clan. This " may very well have served to initiate a change of descent from the female to the male line." 6 Howitt says precisely the same thing about the paternal practice of the Dieri. Thus there is no reason for denying that the change from female to male descent can be made by Australian as readily as by American tribes. We have given evidence for every step in the transition. The opposite opinion arose merely in an attempt to save the primitiveness of the Arunta, some of whom actually still make the maternal totem hereditary.

The change to male descent is socially very important. The totem kin of a man, for example, takes up his blood feud. Where the descent is female a " man may probably have some (totemic) kinsmen in the same group, but equally a considerable number of members of other totem kins." But it is clear that the rule of male descent gives far greater security to the members of a local group; for they are surrounded by kinsmen, local totem groups only occurring where male descent of the totem prevails, or is predominant. 7 The change from female to male descent of the totem, or the adoption of male descent from the first (if it ever occurred) is thus a great social advantage.

The Ways out of Totemism. — While Howitt believed (though later he wavered in his opinion) that female had always preceded male descent of the totem, he also observed that with male descent came in abnormal developments. One of these is that the people of a district with male descent are often known by the name of the region, or of some noted object therein (say wild

cherries). 8 They may even regard (or white observers suppose that they regard) some object as their " local totem," yet they marry within that so-called totem. But they take to marrying, not out of the hereditary totem kin, which becomes obsolescent, but out of their own region into some other given locality. Thus in the Kurnai tribe there were no inevitable hereditary totems, but thundung were given by the fathers to lads" when about ten years old or at initiation." 9 The animal thundung(eldsi brother) was to protect the boy, or girl (the girl's thundung was called banung). The names of the creatures, in each case, appear to have been given to their human brothers and sisters; the thundung name descended to a man's sons. " The names are perpetuated " (under male descent) " from generation to generation in the same locality." 10

Thus it appears that when a Kurnai wishes to marry he goes to a locality where he finds girls of banung names into which he may lawfully wed. So far he seems, in fact, to practise totemic exogamy; that he has to travel to a particular locality is merely an accident. Though the thundung and banung names are not inherited at birth by the children, they are given by the father when the child is old enough to need them. 11

On the whole, we seem to see, in tribes where male descent is of old standing, that the exogamous function of the totem becomes obsolete, but a shadow of him, as thundung, retains a sort of " religious " aspect and even an unappreciated influence in marriage law.

In Fiji and Samoa, in Melanesia 12 and British New Guinea, many types of contaminated and variegated survivals of totem- ism may be studied. In the Torres Islands 13 hero-worship blends with totemic survivals. As in parts of South Africa, where a tribe, not a kin, has a sacred animal, as in Fiji, he seems to be the one survivor of many totems, the totem of some dominant local

6 Totemism, -iii. 42.

7 Except among the Arunta, where, though totems come by change, local groups are usual. See Spencer and Gillen, Central Tribes, p. 9. How this occurs we can only guess. See Folk Lore, vol. xx., No. 2, pp. 229-231. Here it is conjectured that adults of the totem congregate for the purpose of convenience in performing Intichiuma, or magical services for the propagation of the totem as an article of food. For the nature of these rites,

common in the central and northern but unknown to the south-eastern tribes, see Central Tribes, pp. 167-212, and Northern Tribes, pp. 283-320. The Arunta totem aggregates are magical local societies.

8 Central Tribes, pp. 8, 9. 9 N.T.S.E.A. p. 146.

10 Ibid. p. 146. _ » Cf. Howitt, ibid. pp. 270-279.

12 Rivers, ” Totemism in Polynesia and Melanesia,” Journ. Anihrop. Inst. vol. xxxix.

13 Haddon, Cambridge Expedition, vol. v.

totem group, before which the other totems have fled, or but dimly appear, or are vehicles of gods, or, in Africa, of ancestral spirits. (These African tribal sacred animals are called Siboko 1 .) Some tribes explain that the Siboko originated in an animal sobrique, as ape, crocodile, given from without. 2 Sibokoism, the presence of a sacred animal in a local tribe, can hardly be called totemism, though it is probable that the totem of the leading totem kin, among several such totem kins in a tribe, has become dominant, while the others have become obsolete. On the Gold Coast of Africa as long ago as 1810, Bowdich 3 found twelve ” families,” as he called them, of which most were called by the name of an animal, plant or other object, more or less sacred to them. They might not marry a person of the same kindred name, and there can be little doubt that totemism, with exogamy, had been the rule. But now the rules are broken down, especially in the peoples of the coast. The survivals and other informa- tion may be found in the Journal of the Anthropological Institute (1906) xxxvi. 178, 188.

There are fainter traces of totemism in the Awemba between Lake Tanganyika and Lake Bangweolo. 4 A somewhat vague account of Bantu totems in British East Africa, by Mr C. W. Hobley, indicates that among exogamous ” clans ” a certain animal is forbidden as food to each ” clan.” 6 The largest collection of facts about African totemism, from fresh and original sources, is to be found in Mr Frazer’s book. For totemism in British Columbia the writings of Mr Hill Tout may be consulted. 6 The Thlinkit tribes have the institution in what appears to be its earliest known

form, with two exogamous phratries and female descent. Among the Salish tribes ” per- sonal ” totems are much more prominent. Mr Hill Tout, with Professor F. Boas, considers the hereditary exogamous totem to have its origin in the non-exogamous personal totem, which is acquired in a variety of ways. The Salish are not exogamous, and have considerable property and marked distinctions of rank. It does not, therefore, appear probable that their system of badges or crests and personal totems is more primitive than the totemic rules of the less civilized Thlinkits, who follow the form of the south-east Australian tribes. 7

Other very curious examples of what we take to be aberrant and decadant totemism in New Guinea are given by Mr Selig- mann {Man, 1908, No. 89), and by Dr Rivers for Fiji {Man, 1908, No. 75). Mr Seligmann {Man, 1908, No. 100) added to the information and elucidated his previous statements. The ” clans ” in British south-east New Guinea usually bear geo- graphical names, but some are named after one of the totems in the ” clan.” ” Every individual in the clan has the same linked totems,” of which a bird, in each case, and a fish seem to be predominant and may not be eaten. ” The clans are exogamous . . . and descent is in the female line.” It appears, then, that a man, having several totems, all the totems in his ” clan,” must marry a woman of another ” clan ” who has all the totems of her ” clan.”

Similar multiplicity of totems, each individual having a number of totems, is described in Western Australia (Mrs Bates). In this case the word ” totem ” seems to be used rather vaguely and the facts require elucidation and verification. In this part of Australia, as in Fiji 8 “pour la naissance . . . l’apparition du totem-animal avait toujours lieu.” In Fiji the mother sees the animal, which does not affect conception, and ” is merely an omen for the child already conceived.” But in Western Australia, as we have seen, the husband dreams of an animal, which is supposed to follow him home, and to be the next child borne by his wife If it is correctly stated that when the husband has dreamed of no animal, while nevertheless his wife has a baby, the husband spears the man whom he suspects of having dreamed of an animal, the marital jealousy

1 Frazer, “Totemism, South Africa,” Man (1901), No. iii.

2 See Secret of the Totem, pp. 25,26. 3 Mission to Ashanti.

4 Journ. Anlhrop. Inst. (1906), xxxvi. 154.

5 Ibid. (1903), xxxiii. 346-348. 6 Ibid. (1903-1904).

7 See discussion in Secret of the Totem for details and references.

8 Pere Schmidt, Man (1908), No. 84, quoting Pere de Marzan, Anthropos, ii. 400-405.

takes an unusual form and human life becomes precarious. But probably the husband has some reason for the direction of his suspicions. He never suspects a woman.

" The Banks' Islanders," says Mr Frazer, " have retained the primitive system of conceptional totemism." 9 On the other hand Dr Rivers, who is here our authority, writes " totemism is absent " from " the northern New Hebrides, the Banks' and the Terres groups." 10 In a place where totemism is absent it does not prima facie seem likely that we shall discover " the primitive system of conceptional totemism." The Banks' Islanders have no totemism at all. But they have a certain superstition applying to certain cases, and that superstition resembles Arunta and Loritja beliefs, in which Mr Frazer finds the germs of totemism. The superstition, however, has not produced any kind of totemism in the Banks' group of isles, at least, no totemism is found. " There are," writes Dr Rivers, " beliefs which would seem to furnish the most natural starting-point for totemism, beliefs which Dr Frazer has been led by the Australian evidence " (by part of the Australian evidence, we must say) " to regard as the origin of the institution." Thus, in Banks' Islands we have the starting-point of the institution, without the institution itself, and in many Australian tribes we have the institution — without the facts which are " the most natural starting-point." As far as they go these circumstances look as if " the most natural " were not the actual starting-point. The facts are these: in the Isle of Mota, Banks' group, " many individuals " are under a tabu not to eat, in each case, a certain animal or fruit, or to touch certain trees, because, in each case, " the person is believed to be the animal or fruit in question."

This tabu does not, as in totemism, apply to every individual; but only to those whose mothers, before the birth of the individuals, " find an animal or fruit in their loin-cloths." This, at least, " is usually " the case. No other cases are given. The women, in each case, are informed that their child " will have the qualities of the animal " (or fruit) " or even, it appeared would be himself or herself the animal " (or fruit). A coco-nut or a crocodile, a flying fox or a brush turkey, could not get inside a loin-cloth; the

animal and fruits must be of exiguous dimensions. When the animal (or fruit) disappears " it is believed that it is because the animal has at the time of its dis- appearance entered into the woman. It seemed quite clear that there was no belief in physical impregnation on the part of the animal nor of the entry of a material object in the form of the animal . . , but, so far as I could gather, an animal found in this way was regarded as more or less supernatural, a spirit animal and not one material, from the beginning."

" There was no ignorance of the physical role of the human father, and the father played the same part in conception as in cases unaccompanied by an animal appearance." The part played by the animal or fruit is limited to producing a tabu against the child eating it, in each case, and some community of nature with the animal or fruit. Nothing here is hereditary. The superstition resembles some of those of the Arunta, Loritja and Euahlayi. Among the Euahlayi the superstition has no influence; normal totemism prevails; among the Arunta nation it is considered to be, and Dr Rivers seems to think that it is, likely to have been the origin of totemism. In Mota, however, it either did not produce totemism, or it did; and, where the germ has survived in certain cases, the institution has disappeared — while the germinal facts have vanished in the great majority of totemic societies. Dr Rivers does not explain how a brush turkey, a sea snake or a flying fox can get into a woman's loin-cloth, yet these animals, also crabs, are among those tabued' in this way. Perhaps they have struck the woman's fancy without getting into her loin-cloth.

It is scarcely correct to say that " the Banks' Islanders have retained the primitive system of conceptional totemism." They only present, in certain instances, features like those which are supposed to be the germs of a system of conceptional

9 Man, iv. 128.

10 " Totemism in Polynesia and Melanesia," Journ. Anthrop. Inst, xxxix. 173, sqq.

totemism. In the case of the Arunta we have demonstrated that

hereditary and exogamous totemism of the normal type preceded the actual conceptional method of acquiring, by local accident, ” personal totems.” If the Banks’ Islanders were ever totemists they have ceased to be so, and merely retain, in cases, a superstition analogous to that which, among the Arunta, with the aid of the stone churinga, has produced the present unique and abnormal state of affairs totemic.

For totemism in India, see Dalton, Descriptive Ethnology of Bengal; for the north of Asia, Strahlenberg’s Description, &c. (1738) ; and in all instances Mr Frazer’s book.

Myths of Totem Origins. — The myths of savages about the origin of totemism are of no historical value. Not worshipping ancestral spirits, an Australian will not, like an ancestor- worshipping African, explain his totem as an ancestral spirit. But where, as in the north and centre, he has an elaborate philosophy of spirits, there the primal totems exude spirits which are incarnated in women.

In their myths as to the origin of totemism, savages vary as much as the civilized makers of modern hypotheses. Some claim descent from the totem object; others believe that an original race of animals peopled the world; animals human in character, but bestial, vegetable, astral or what not, in form. These became men, while retaining the rapport with their original species; or their spirits are continually reincarnated in women and are born again (Arunta of Messrs Spencer and Gillen) ; or spirits emanating from the primal forms, or from objects in nature, as trees or rocks, connected with them, enter women and are reincarnated (Arunta of Mr Strehlow and some Australian north-western tribes, studied by Mrs Bates). Other Australians believe that the All-Father, Baiame, gave totems and totemic laws to men. 1 There are many other explana- tory myths wherever totemism, or vestiges thereof, is found in Australia, Africa, America and Asia.

All the myths of savages, except mere romantic Marchen, and most of the myths of peoples who, like the Greeks, later became civilized, are ” aetiological,” that is, are fanciful hypotheses made to account for everything, from the universe, the skies, the sun, the moon, the stars, fire, rites and ceremonies, to the habits and markings of animals. It is granted that almost all of these fables are historically valueless, but an exception has been made, by scholars who believe that society was deliberately reformed

by an act bisecting a tribe into two exogamous divisions, for savage myths which hit on the same explanation. We might as well accept the savage myths which hit on other explanations, for example the theory that Sibokoism arose from animal sobriquets. Exceptions are also made for Arunta myths in which the primal ancestors are said to feed habitually if not exclusively on their own totems. But as many totems, fruit, flowers, grubs, and so on are only procurable for no longer than the season of the May-fly or the March-brown, these myths are manifestly fabulous.

Again the Arunta primal ancestors are said to have cohabited habitually with women of their own totem, though without prejudice against women of other totems whom they encountered in their wanderings. These myths are determined by the belief in oknanikilla, or spots haunted by spirits all of one totem, which, again, determine the totem of every Arunta. The idea being that the fabled primal ancestors male and female in each wandering group of miracle-workers were always all of one totem, it follows that, if not celibate, which these savages never are, they must have cohabited with women of their own totem, and, by the existing Arunta system, there is no reason why they should not have done so. In no other field of research is historical value attributed to savage legends about the inscrutable past that lies behind existing institutions.

We are thus confronted by an institution of great importance socially where it regulates marriages and the blood-feud, or where it is a bond of social union between kinsmen in the totem or members of a society which does magic for the behoof

1 Mrs Langloh Parker, The Euahlayi Tribe.

of its totem (central and north-western Australia), and is of some ” religious ” and mythical importance when, as in Samoa, the sacred animal is regarded as the vehicle of a god. Of the origin of these beliefs, which have practical effects in the evolution of society and religion, much, we saw, is conjectured, but as we know no race in the act of becoming totemic — as in all peoples which we can study totemism is an old institution, and in most is manifestly decaying or being transmuted — we can only form the guesses of which examples have been given. Others may be found in the works of Herbert .Spencer and Lord Avebury, and criticisms of all of them may be read in A. Lang’s Social Origins.

Whether or not survivals of totems are to be found in the animal worship of ancient Egypt, in the animal attendants of Greek gods, in Greek post-Homeric legends of descent from gods in various bestial disguises, and in certain ancient Irish legends, it is impossible to be certain, especially as so many gods are now explained as spirits of vegetation, to which folk-lore assigns carnal forms of birds and beasts.

Other Things called Totems. — As has been said, the name " totem " is applied by scholars to many things in nature which are not hereditary and exogamous totems. The " local totem " (so called) has been mentioned, also " linked totems."

Personal Totems. — This is the phrase for any animal or other object which has been " given " to a person as a protective familiar, whether by a sorcerer 2 or by a father, or by a congress of spaewives at birth; or whether the person selects it for him-self, by the monition of a dream or by caprice. The Euahlayi call the personal totem Yunbeai, the true totem they style Dhe. They may eat their real but not their personal totems, which answer to the hares and black cats of our witches.

Three or four other examples of tribes in which " personal totems " are " given " to lads at initiation are recorded by Howitt. 3 The custom appears to be less common in Australia than in America and Africa (except in South Australia, where people may have a number of "personal totems"). In one case the " personal totem " came to a man in a dream, as in North America. 4 Here it may be noted that the simplest and appar- ently the easiest theory of the origin of totemism is merely to suppose that a man, or with female descent a woman, made his or her personal totem hereditary for ever in his or her descendants. But nobody has explained how it happened that while all had evanescent personal totems those of a few individuals only become stereotyped and hereditary for ever.

Sex-Totems. — The so-called " sex totem " is only reported in Australia. Each sex is supposed by some tribes to have its patron animal, usually a bird, and to injure the creature is to injure the sex. When lovers are backward the women occasion- ally kill the animal patron of the men, which produces horse- play, and " a sort of jolly fight," like sky-larking and flirtation. 6 The old English " jolly kind of fight," between girls as partisans of ivy, and men as of the holly " sex-totem," is a near analogue. It need not be added that " sex-totems " are exogamous, in the nature of

things.

Sub-Totems. — This is the name of what are also styled ” multiplex totems,” that is, numerous objects claimed for their own by totem kins in various Australian regions. The Emu totem kin, among the Euahlayi tribe, claims as its own twenty-three animals and the north-west wind. 6 The whole universe, including mankind, was apparently divided between the totem kins. Therefore the list of sub-totems might be extended indefinitely. 7 These ” sub-totems ” are a savage effort at universal classification.

Conclusion. — We have now covered the whole field of controversy as to the causes and origins of totemic institutions. Australia, with North America, provides the examples of those institutions which seem to be ” nearest to the beginning,” and in Australia the phenomena have been most carefully and

2 The Euahlayi Tribe, p. 4 Ibid. p. 154.

6 The Euahlayi Tribe, p.

7 N.T.S.E.A. p. 454.

3 N.T.S.E.A. pp. 144-148. 6 Ibid. pp. 148-151.

elaborately observed among peoples the least sophisticated. In , North America most that we know of many great tribes, Iroquois, Hurons, Delawares and others, was collected long ago, and when precision was less esteemed, while the tribes have been much contaminated by our civilization. It has been unavoidably necessary to criticize, at almost every stage, the conclusions and hypotheses of the one monumental collection of facts and theories, Mr Frazer’s Totemism (iqio). Persons who would pursue the subject further may consult the books mentioned in the text, and they will find a copious, perhaps an exhaustive bibliography in the references of Mr Frazer’s most erudite volumes, with their minute descriptive account not only of the totemism, but of the environment and general culture of hundreds of human races, in Savagery and in the Lower and Higher Barbarism. (A. L.)

TOTILA (d. 552), king of the Ostrogoths, was chosen king after the death of his uncle Ildibad in 541, his real name being, as is seen from the coinage issued by him, Baduila. The work of his life was the restoration of the Gothic kingdom in Italy and he entered upon the task at the very beginning of his reign, collecting together and inspiring the Goths and winning a victory over the troops of the emperor Justinian, near Faenza. Having gained another victory in 542, this time in the valley of Mugello, he left Tuscany for Naples, captured that city and then received the submission of the provinces of Lucania, Apulia and Calabria. Totila's conquest of Italy was marked not only by celerity but also by mercy, and Gibbon says " none were deceived, either friends or enemies, who depended on his faith or his clemency." Towards the end of 545 the Gothic king took up his station at Tivoli and prepared to starve Rome into surrender, making at the same time elaborate preparations for checking the progress of Beli- sarius who was advancing to its relief. The Imperial fleet, moving up the Tiber and led by the great general, only just failed to succour the city, which must then, perforce, open its gates to the Goths. It was plundered, although Totila did not carry out his threat to make it a pasture for cattle, and when the Gothic army withdrew into Apulia it was from a scene of desola- tion. But its walls and other fortifications were soon restored, and Totila again marching against it was defeated by Belisarius, who, however, did not follow up his advantage. Several cities were taken by the Goths, while Belisarius remained inactive and then left Italy, and in 549 Totila advanced a third time against Rome, which he captured through the treachery of some of its defenders. His next exploit was the conquest and plunder of Sicily, after which he subdued Corsica and Sar- dinia and sent a Gothic fleet against the coasts of Greece. By this time the emperor Justinian was taking energetic measures to check the Goths. The conduct of a new campaign was entrusted to the eunuch Narses; Totila marched against him and was defeated and killed at the battle of Tagina in July

55 2 –

See E. Gibbon, Decline and Fall, edited by J. B. Bury (1898), vol. iv; T. Hodgkin, Italy and her Invaders (1896), vol. iv. and Kampfner, Totila, K'dnig der Ostgoten (1889).

TOTNES, GEORGE CAREW, or Carey, Earl of (1555-1629), English politician and writer, son of Dr George Carew, dean of Windsor, a member of a well-known Devonshire family, and Anne, daughter

of Sir Nicholas Harvey, was born on the 29th of May 1555, 1 and was educated at Broadgates Hall, Oxford, where he took the degree of M.A. in 1588. He distinguished himself on the field on several occasions and filled important military commands in Ireland. In 1584 he was appointed gentleman- pensioner to Queen Elizabeth, whose favour he gained. In 1 586 he was knighted in Ireland. Refusing the embassy to France, Sir George Carew was made master of the ordnance in Ireland in 1588, in 1590 Irish privy councillor; and in 1592 lieutenant- general of the ordnance in England, in which capacity he accompanied Essex in the expedition to Cadiz in 1596 and to

'According to his own statement, Archaeologia, xii. 401. In the introduction, however, to the Calendar of Carew MSS. the date of his birth is given as 1558, and his admission into Broadgates Hall in 1572, aged 15. In the preface to Carew's Letters to F.oe it is given as 1557-

the Azores in 1597. In 1598 he attended Sir Robert Cecil, the ambassador, to France. He was appointed treasurer at war to Essex in Ireland in March 1599, and on the latter's sudden departure in September of the same year, leaving the island in disorder, Carew was appointed a lord justice, and in 1600 president of Munster, where his vigorous measures enabled the new lord deputy, Lord Mountjoy, to suppress the rebellion. He returned to England in 1603 and was well received by James I., who appointed him vice-chamberlain to the queen the same year, master of the ordnance in 1608, and privy councillor in 1616; and on the accession of Charles I. he became treasurer to Queen Henrietta Maria in 1626. He sat for Hastings in the parliament of 1604, and on the 4th of June 1605 was created Baron Carew of Clopton, being advanced to the earldom of Totnes on the 5th of February 1626. In 1610 he revisited Ireland to report on the state of the country; and in 1618 pleaded in vain for his friend Sir Walter Raleigh. He died on the 27th of March 1629, leaving no issue. He married Joyce, daughter of William Clopton, of Clopton in Warwickshire.

Besides his fame as president of Munster, where his administration forms an important chapter in Irish history, Carew had a consider- able reputation as an antiquary. He was the friend of Camdenj of Cotton and of Bodley. He made large collections of materials relating to Irish history and pedigrees, which he left to his secretary, Sir Thomas Stafford, reputed on scanty evidence to be his natural son; while some portion has

disappeared, 39 volumes after coming into Laud's possession are now at Lambeth, and 4 volumes in the Bodleian Library. A calendar of the former is included in the State Papers series edited by J. S. Brewer and W. Bullen. His correspondence from Munster with Sir Robert Cecil was edited in 1864 by Sir John Maclean, for the Camden Society, and his letters to Sir Thomas Roe (1615-1617) in i860. Other letters or papers are in the Record Office; among the MSS. at the British Museum and calendared in the Hist. MSS. Com. Series, Marquess of Salisbury's MSS. Stafford published after Carew's death Pacata Hibernia, or the History of the Late Wars in Ireland (1633),, the authorship of which he ascribes in his preface to Carew, but which has been attributed to Stafford himself. This was reprinted in 1810 and re-edited in 1896. A Fragment of the History of Ireland, 3. translation from a French version of an Irish original, and King Richard II.... in Ireland from the French, both by Carew, are printed in Walter Harris's Hibernica (1757). According to Wood, Carew contributed to the history of the reign of Henry V. in Speed's Chronicle. His opinion on the alarm of the Spanish invasion in 1596 has also been printed.

See also the Life of Sir P. Carew, ed. by Sir J. Maclean (1857).

TOTNES, a market town and municipal borough in the Totnes parliamentary division of Devonshire, England, on the Dart, 29 m. S.S.W. of Exeter, by the Great Western railway. Pop. (1901), 4035. It stands on the west bank of the river, and is joined by a bridge to the suburb of Bridgetown. It was formerly a walled town, and two of the four gates remain. Many old houses are also preserved, and in High Street their overhanging upper stories, supported on pillars, form a covered way for foot-passengers. The castle, founded by the Breton Juhel, lord of the manor after the Conquest, was already dismantled under Henry VIII.; but its ivy-clad keep and upper walls remain. The grounds form a public garden. Close by are the remains of St Mary's Priory, which comprise a large Perpen- dicular gatehouse, refectory, precinct wall, abbot's gate and still-house. A grammar school, founded 1554, occupied part of the Priory, but was removed in 1874 to new buildings. The Perpendicular church of St Mary contains a number of interest- ing tombs and effigies dating from the 15th century onwards, and much excellent carved work. The guildhall is formed from part of the Priory. Vessels of 200 tons can lie at the wharves near the bridge. The industries include brewing, flour mill- ing, and the export of agricultural produce, chiefly corn and cider. Trout and salmon are plentiful in the river. The

town is governed by a mayor, 4 aldermen and 12 councillors. Area 1423 acres.

Totnes (Toteneis, Totton) was a place of considerable importance in Saxon times; it possessed a mint in the reign of ˆEthelred, and was governed by a portreeve. In the Domesday Survey it appears as a mesne borough under Juhel of Totnes, founder of the castle and priory; it had 95 burgesses within and 15 without the borough, and rendered military service according

to the custom of Exeter. In 121 5 a charter from John instituted a gild merchant with freedom from toll throughout the land. A mayor is mentioned in the court roll of 1386-1387, and a charter from Henry VII. in 1505 ordered that the mayor should be elected on St Matthew's day, and should be clerk of the market. The present governing charter was granted by Elizabeth in 1596, and instituted a governing body of a mayor, fourteen masters or councillors, and an indefinite number of burgesses, including a select body called " the Twenty-men." A fresh charter of incorporation from James II. in 1689 made no altera- tions of importance. The borough was represented in parlia- ment by one member in 1295, and by two members from 1298 until disfranchised by the act of 1867. A market on Saturday existed at least as early as 1255, and in 1608 is described as well stocked with provisions. The charter of Elizabeth granted a three days' fair at the feast of SS Simon and Jude (Oct. 28), and in 1608 fairs were also held on May day and at the feast of St James (July 25). The market day has been transferred to Friday, but the May and October fairs are continued. The town was formerly noted for serges, and in 1641 the inhabitants represented their distress owing to the decline of the woollen trade. The industry is now extinct. During the Civil War General Goring quartered his troops at Totnes, and Fairfax also made it his temporary station.

See Victoria County History; Devonshire; The History of Totnes, its neighbourhood and Berry Pomeroy Castle, (Totnes, 1825) ; William Cotton, A Graphic and Historical Sketch of the Antiquities of Totnes (London, 1858).

TOTONICAPAM, or Totonicapan, the capital of the depart- ment of Totonicapam, Guatemala, on the same high plateau as

Quezaltenango, the nearest railway station, from which it is 12 m. E.N.E. Pop. (1905) about 28,000. Totonicapam is inhabited mainly by Quiche Indians, employed in the making of cloth, furniture, pottery and wooden musical instruments. There are hot mineral springs in the neighbourhood. In 1838 Totonicapam was declared an independent republic, in which the adjoining departments of Solola. and Quezaltenango were included. This state existed for two years, and was then again merged in the republic of Guatemala. Totonicapam suffered greatly in the earthquake of the 18th of April 1902.

TOTTENHAM, an urban district in the Tottenham parlia- mentary division of Middlesex, England, forming a north suburb of London, 65 m. north of London Bridge, adjoining Edmonton on the south. Pop. (1901), 102,541. Its full name, not now in use, was Tottenham High Cross, from the cross near the centre of the township. The origin and significance of this cross are doubtful. The present structure was erected c. 1600, and ornamented with stucco in 1809. In the time of Isaak Walton there stood by it a shady arbour to which the angler was wont to resort. Formerly Tottenham was noted for its ” greens,” in the centre of one of which stood the famous old elm trees called the ” Seven Sisters “; these were removed in 1840, but the name is pre- served in the Seven Sisters Road. Bruce castle, on the site of the old mansion of the Bruces, but built probably by Sir William Compton in the beginning of the 16th century, was occupied by a boarding-school founded by Mr (afterwards Sir) Rowland Hill in 1827 on the system instituted by him at Hazle- wood, Birmingham. It became public property in 1892. The church of All Hallows, Tottenham, was given by David, king of Scotland (c. n 26) to the canons of the church of Holy Trinity, London. It retains Perpendicular portions, a south porch of brick of the 16th century and numerous ancient monu- ments and brasses. The grammar school was enlarged and endowed in 1686 by Sarah, dowager duchess of Somerset. The urban district formerly included Wood Green to the west, but this became a separate urban district in 1888 (pop. 34,233).

In the reign of Edward the Confessor the manor of Tottenham was possessed by Earl Waltheof . It was inherited by his daughter Maud., who was married first to Simon de St Liz and after- wards to David, son of Malcolm III., king of Scotland, who was created by Henry I. earl of Huntingdon, and received possession

of all the lands formerly held by Earl Waltheof. The manor thus

descended to William the Lion, king of Scotland, and was granted by him in 1184 to his brother David, earl of Angus and Galloway, the grant being confirmed in 1199 by King John of England, who created him earl of Huntingdon. He married Maud, heiress of Hugh, earl of Chester, and his son John inherited both earldoms. The son married Helen, daughter of Llewelyn, prince of Wales, by whom he was poisoned in 1237, dying without issue. She retained possession till 1254, when the manor was divided between his coheirs Robert de Brus, John de Baliol and Henry de Hastings, each division forming a distinct manor bearing the name of its owner. In 1429 they were reunited in the possession of John Gedeney, alderman of London.

William Bedwell, the Arabic scholar, was vicar of Tottenham, and published in 1632 a Brief e Description of the Towne of Tottenham, in which he printed for the. first time the burlesque poem, the Turna- ment of Tottenham.

TOTTENVILLE, a former village of Richmond county, New York, U.S.A., and since 1898 a part of New York City. It is on the southern shore of Staten Island in New York Bay and on Staten Island Sound, about 20 m. S.W. of the south extremity of Manhattan Island, and is the terminus of the Staten Island Rapid Transit railway. Marine engines, terra-cotta and boats are manufactured here, and there are oyster fisheries. The ” Billopp House ” here (still standing) was the scene of the con- ference, on the nth of September 1776, between Lord Howe, representing Lord North, and Benjamin Franklin, John Adams and Edward Rutledge, representing the Continental Congress, with regard to Lord North’s offer of conciliation. This house, originally called the ” Manor of Bentley,” was built by Captain Christopher Billopp (1638-1726), who sailed from England in an armed vessel, the ” Bentley,” in 1667, and, by circumnavigating Staten Island in 24 hours, made it, under the ruling of the duke of York, a part of New York. From the duke of York he received n 63 acres of land, including the present site of Tottenville. The village was long known as Bentley, but in 1869 was incorporated (under a faulty charter, revised in 1894) as Tottenville, apparently in honour of Gilbert Totten, a soldier in the War of Independence.

TOUCAN, the Brazilian name of a bird, 1 long since adopted into nearly all European languages, and apparently first given currency in England (though not then used as an English word) in 1668 2 by W. Charleton {Onomasticon, p. 115); but the bird, with its enormous beak and feather-like tongue, was described by

Oviedo in his Sumario de la historia natural de las Indias, first published at Toledo in 1527 (ch. 42),' and, to quote the translation of part of the passage in F. Willughby's Ornith- ology (p. 129)," there is no bird secures her young ones better from the Monkeys, which are very noisom to the young of most Birds. For when she perceives the approach of those Enemies, she so settles her self in her Nest as to put her Bill out at the hole, and gives the Monkeys such a welcome therewith, that they presently pack away, and glad they scape so." Indeed, so remarkable a bird must have attracted the notice of the earliest European invaders of America, the more so since its gaudy plumage was used by the natives in the decoration of their per- sons and weapons. In 1555 P. Belon (Hist. nat. oyseaux, p. 184) gave a characteristic figure of its beak, and in 1558 Thevet (Singularitez de la France antarctique, pp. 88-90) a long descrip- tion, together with a woodcut (in some respects inaccurate, but quite unmistakable) of the whole bird, under the name of " Toucan," which he was the first to publish. In 1 560 C. Gesner (I cones avium, p. 130) gave a far better figure (though

1 Commonly believed to be so called from its cry; but Skeat (Proc. Philolog. Society, May 15, 1885) adduces evidence to prove that the Guarani Tuca is from t%, nose, and cdng, bone,; i.e. nose of bone.

2 In 1656 the beak of an " Aracari of Brazil," which was a toucan of some sort, was contained in the Musaeum tradescantianum (p. 2), but the word toucan does not appear there.

3 The writer has only been able to consult the reprint of this rare work contained in the Biblioteca de autores espanoles (xxii. 473-515)1 published at Madrid in 1852.

still incorrect) from a drawing received from Ferrerius, and suggested that from the size of its beak the bird should be called Burhynchus or Ramphestes. This figure, with a copy of Thevet's and a detailed description, was repeated in the posthumous edition (1585) of his larger work (pp. 800, 801). By 1579 Ambroise Pare (CEuvres, ed. Malgaigne, iii. 783) had dissected a toucan that belonged to Charles IX. of France, and about the same time Lery (Voyage fait en la terre du Bresil, ch. xi.), whose

chief object seems to have been to confute Thevet, con- firmed that writer's account of this bird in most respects. In 1500 Aldrovandus (Ornithologia, i. 801-803), always ready to profit by Gesner's information, and generally without acknow- ledgment, again described and repeated the former figures of the bird; but he corrupted his predecessor's Ramphestes into Ramphastos, and in this incorrect form the name, which should certainly be Rhamphestes or Rhamphastas, was subsequently ■\dopted by Linnaeus and has since been recognized by system- atists. Into the rest of the early history of the toucan's discovery it is needless \o go. 1 Additional particulars were supplied by many succeeding writers, until in 1834 J. Gould completed his Monograph of the family 2 (with an anatomical appendix by R. Owen), to which, in 1835, he added some supplementary plates; and in 1854 he finished a second and much improved edition. The most complete compendium on toucans is J. Cassin's " Study of the Ramphastidae," in the Proceedings of the Philadelphia Academy for 1867 (pp. 100-124).

By recent systematists 5 genera and from 50 to 60 species of the family are recognized; but the characters of the former have never been satisfactorily defined, much less those of numerous subdivisions which it has pleased some writers to invent. There can be little doubt that the bird first figured and described by the earliest authors above named is the R. toco of nearly all ornithologists, and as such is properly regarded as the type of the genus and therefore of the family. It is one of the largest, measuring 2 ft. in length, and has a wide range throughout Guiana and a great part of Brazil. The huge beak, looking like the great claw of a lobster, more than 8 in. long and 3 high at the base, is of a deep orange colour, with a large black oval spot near the tip. The eye, with its double iris of green and yellow, has a broad blue orbit, and is surrounded by a bare space of deep orange skin. The plumage generally is black, but the throat is white, tinged with yellow and commonly edged beneath with red ; the upper tail-coverts are white, and the lower scarlet. In other species of the genus, 14 to 17 in number, the bill is mostly particoloured — green, yellow, red, chestnut, blue and black variously combining so as often to form a ready diagnosis ; but some of these tints are very fleeting and often leave little' or no trace after death. Alternations of the Drighter colours are also displayed in the feathers of the throat, breast and tail-coverts, so as to be in like manner characteristic of the species, and in several the bare space round the eye is yellow, green, blue or

lilac. The sexes are alike in coloration, the males being largest. The tail is nearly square or moderately rounded. In the genus Pteroglossus, the ” Aracaris ” (pronounced Arassari), the sexes more or less differ in appearance, and the tail is graduated. The species are smaller in size, and nearly all are banded on the belly, which is generally yellow, with black and scarlet, while except in two the throat of the males at least is black. One of the most remarkable and beautiful is P. beauharnaisi, by some authors placed in a distinct genus and called Beauharnaisius ulocomus. In this the feathers of the top of the head are very singular, looking like glossy curled shavings of black horn or whalebone, the effect being due to’the dilatation of the shaft and its coalescence with the consolidated barbs. Some of the feathers of the straw-coloured throat and cheeks partake of the same structure, but in a less degree, while the subterminal part of the lamina is of a lustrous pearly- white. 3 The beak is richly coloured,

1 One point of some interest may, however, be noticed. In 1705 Plot (N.H. Oxfordshire, p. 182) recorded a toucan found within two miles of Oxford in 1644, the body of which was given to the repository in the medical school of that university, where, he said, ” it is still to be seen.” Already in 1700 Leigh in his Lancashire (i. 195, Birds, tab. 1, fig. 2) had figured another which had been found dead on the coast of that county about two years before. The bird is easily kept in captivity, and no doubt from early times many were brought alive to Europe. Besides the one dissected by Par6, as above mentioned, Joh. Faber, in his additions to Hernandez’s work on the Natural History of Mexico (1651), figures (p. 697) one seen and described by Puteus (Dal Pozzo) at Fontainebleau.

2 Of this the brothers Sturm in 1 841 published at Nuremberg a German version.

3 This curious peculiarity naturally attracted the notice of the first discoverer of the species, Poeppig, who briefly described it in a letter published in Froriep’s Notizen (xxxii. 146) for December 1831.

being green and crimson above and lemon below. The upper plumage generally is dark green, but the mantle and rump are crimson, as are a broad abdominal belt, the flanks and many crescentic markings on the otherwise yellow lower parts. 4 The group or genus Selenodera, proposed by J. Gould in 1837 (Icones

avium, pt. 1), contains some 6 or 7 species, having the beak, which is mostly transversely striped, and tail shorter than in Pteroglossus. Here the sexes also differ in coloration, the males having the head and breast black, and the females the same parts chestnut; but all have a yellow nuchal crescent (whence the name of the group). The so-called hill-toucans have been separated as another genus, Audi- gena, and consist of some 5 or 6 species chiefly frequenting the slopes of the Andes and reaching an elevation of 10,000 ft., though one, often placed among them, but perhaps belonging rather to Ptero- glossus, the A. bailloni, remarkable for its yellow-orange head, neck and lower parts, inhabits the lowlands of southern Brazil. Another very singular form is A ._ laminirostris, which has affixed on either side of the maxilla, near the base, a quadrangular ivory-like plate, forming a feature unique in this or almost in any family of birds. The group Aulacorhamphus, or " groove-bills," with a considerable but rather uncertain number of species, contains the rest of the toucans.

The monstrous serrated bill that so many toucans possess was by G. L. L. Buffon accounted a grave defect of nature, and it must be confessed that no one has given what seems to be a satisfactory explanation of its precise use, though on evolutionary principles none will now doubt its fitness to the bird's requirements. Solid as it looks, its weight is inconsiderable, and the perfect hinge by which the maxilla is articulated adds to its efficiency as an instrument of prehension. W. Swainson (Classif. Birds, ii. 138) imagined it merely " to contain an infinity of nerves, disposed like net- work, all of which lead immediately to the nostrils," and add to the olfactory faculty. This notion seems to be borrowed from J. W. H. Trail (Trans. Linn. Society, xi. 289), who admittedly had it from Waterton, and stated that it was " an admirable contrivance of nature to increase the delicacy of the organ of smell;" but R. Owen's descrip- tion showed this view to be groundless, and he attributed the extraordinary development of the toucan's beak to the need of com- pensating, by the additional power of mastication thus given, for the absence of any of the grinding structures that are so characteristic of the intestinal tract of vegetable-eating birds — its digestive organs possessing a general simplicity of formation. The nostrils are placed so as to be in most forms invisible until sought, being obscured by the frontal feathers or the backward prolongation of the horny sheath of the beak. The wings are somewhat feeble, and the legs have the toes placed in pairs, two before and two

behind. The tail is capable of free vertical motion, and controlled by strong muscles, so that, at least in the true toucans, when the bird is preparing to sleep it is reverted and lies almost flat on the back, on which also the huge bill reposes, pointing in the opposite direction.

The toucans are limited to the new world, and by far the greater number inhabit the north of South America, especially Guiana and the valley of the Amazons. Some three species occur in Mexico, and several in Central America. One, R. vitellinus, which has its head- quarters on the mainland, is said to be common in Trinidad, but none are found in the Antilles proper. They compose the family Rham- phastidae of Coraciiform birds, and are associated with the wood- peckers (Picidae) and puff-birds and jacamars (Galbulidae) ; their nearest allies perhaps exist among the Capitonidae, but none of these is believed to have the long feather-like tongue which is so charac- teristic of the toucans, and is, so far as known, possessed besides only by the Momotidae (see Motmot). But of these last there is no reason to deem the toucans close relatives, and according to W. Swainson, who had opportunities of observing both, the alleged resemblance in their habits has no existence. Toucans in confine- ment feed mainly on fruit, but little seems amiss to them, and they swallow grubs, reptiles and small birds with avidity. They nest in hollow trees, and lay white eggs. (A. N.)

TOUCH (derived through Fr. toucher from a common Teu- tonic and Indo-Germanic root, cf. ” tug,” ” tuck,” O. H. Ger. zucchen, to twitch or draw), in physiology, a sense of pressure, referred usually to the surface of the body. It is often understood as a sensation of contact as distinguished from pressure, but it is evident that, however gentle be the contact, a certain amount of pressure always exists between the sensitive surface and the body touched. Mere contact in such circumstances is gentle pressure; a greater amount of force causes a feeling of resistance or of pressure referred to the skin; a still greater amount causes a feeling of muscular resistance, as when a weight is supported on the palm of the hand; whilst, finally, the pressure may be s« great as to cause a feeling of pain. The force may not be exerted

4 Readers of F. Bates’s Naturalist on the River Amazons will recollect the account (ii. 344) and illustration there given of his encounter with a flock of this species of toucan. His remarks on the other species with which he met are also excellent.

vertically on the sensory surface, but in the opposite direction, as when a hair on a sensory surface is pulled or twisted. Touch is therefore the sense by which mechanical force is appreciated, and it presents a strong resemblance to hearing, in which the sensation is excited by intermittent pressures on the auditory organ. In addition to feelings of contact or pressure referred to the sensory surface, contact may give rise to a sensation of temperature, according as the thing touched feels hot or cold. These sensations of contact, pressure or temperature are usually referred to the skin or integument covering the body, but they are experienced to a greater or less extent when any serous or mucous surface is touched. The skin being the chief sensory surface of touch, it is there that the sense is most highly developed both as to delicacy in detecting minute pressures and as to the character of the surface touched. Tactile impressions, properly so called, are absent from internal mucous surfaces, as has been proved in men having gastric, intestinal and urinary fistulae. In these cases, touching the mucous surface caused pain, and not a true sensation of touch.

In the article Nerve (Spinal) the cutaneous distribution of the organs of touch is dealt with.

The Amphibia and Reptilia do not show any special organs of touch. The lips of tadpoles have tactile papillae. Some snakes have a pair of tentacles on the snout, but the tongue is probably the chief organ of touch in most serpents and lizards. All reptiles possessing climbing powers have the sense of touch highly developed in the feet.

Birds have epithelial papillae on the soles of the toes that are no doubt tactile. These are of great length in the capercailzie (Tetrax

urogallus), ” enabling it to grasp with more security the frosted branches of the Nor- wegian pine trees ” (Owen). Around the root of the bill in many birds there are special tactile organs, assist- ing the bird to use it as a kind of sensitive probe for the de- tection in soft ground of the worms, grubs and slugs that constitute its food. Special bodies of this kind have been detected in the beak and tongue of the duck and goose, called the tactile corpuscles of F. S. Merkel, or the corpuscles of Grandry (fig. i).

Similar bodies have been found in the epidermis of man and mammals, in the outer root-sheath of tactile hairs or feelers. They consist of small bodies composed of a capsule enclosing two or more flattened nucleated cells, piled in a row. Each corpuscle is separated from the others by a transparent protoplasmic disk. Nerve fibres terminate either in the cells (Merkel) or in the protoplasmic intercellular matter (Ranyier, Hesse, Izquierdo). Another form of end-organ has been described by Herbst as existing in the mucous membrane of the duck's tongue. These corpuscles of Herbst are like small Pacinian corpuscles with thin and very close lamellae. Develop- ments of integument devoid of feathers, such as the " wattles " of the cock, the " caruncles " of the vulture and turkey, are not tactile in their function.

In the great majority of Mammalia the general surface of the skin shows sensitive- ness, and this is developed to a high degree on certain parts, such as the lips, the end of a teat and the generative organs. Where touch is highly developed, the skin, more especially the epidermis, is thin and devoid of hair. In the monkeys tactile papillae are found in the skin of the fingers and palms, and in the skin of the prehen- sile tails of various species (Ateles). Such papillae also abound in the naked skin of the nose or snout, as in the shrew, mole, pig, tapir and elephant. In the Ornithorhynchus the skin covering the mandibles is tactile (Owen). In many animals certain hairs acquire great size, length and stiffness. These constitute the vibrissae or whiskers. Each large hair grows from a firm capsule sunk deep in the true skin, and the hair bulb is supplied with sensory nerve filaments. In the walrus the capsule is cartilaginous in texture. The marine Carnivora have strong vibrissae which " act as a staff, in a way analogous to that held and applied by the hand of a blind man (Owen). Each species has hairs of this kind developed on the eyebrows, lips or cheeks, to suit a particular mode of existence, as, for example, the long fine whiskers of the night-prowling felines, and in the aye-aye, a monkey having nocturnal habits.

Fig. i.

-Tactile Corpuscles from duck's tongue. n, Nerve.

' Fig. 2. — Tactile Cor- puscle from the hand.

In the Ungulata the hoofs need no delicacy of touch as regards the discrimination of minute points. Such animals, however, have broad, massive sensations of touch, enabling them to

appreciate the firmness of the soil on which they tread, and under the hoof we find highly vascular and sen- sitive lamellae or papillae, contributing no doubt, not only to the growth of the hoof, but also to its sensitiveness. The Cetacea have numerous sensory papillae in the skin. Bats have the sense of touch strongly developed in the wings and external ears, and in some species in the flaps of skin found near the nose. There is little doubt that many special forms of tactile organs will be found in animals using the nose or feet for bur- rowing. A peculiar end-organ has been found in the nose of the mole, while there are " end-capsules " in the tongue of the ˆ

elephant and " nerve rings " in the ears n ■*»'

of the mouse.

F1G.3. — Tactile Corpuscles

from clitoris of rabbit.

n, Nerve.

End-Organs of Touch in Man. — In man three special forms of tactile end-organs have been described, and can be readily demon- strated.

1. The End-Bulbs of Krause. — These are oval or rounded bodies, from -gˆft to jˆ of an inch long. Each consists of a delicate capsule, composed of nucleated connective tissue

'Fig. 4. — End-Bulb from

human conjunctiva, o, Nucleated capsule.

b, Core.

c, Entering nerve-fibre terminating in the core at d.

Fig. 5. — End-Bulb from

conjunctiva of calf.

n, Nerve.

enclosing numerous minute cells. On tracing the nerve fibre, it is found that the nerve sheath is continuous with the capsule, whilst the axis cylinder of the nerve divides into branches which

lose themselves among the cells. W. Waldeyer and Longworth state that the nerve fibrils terminate in the cells, thus making these bodies similar to the cells described by F. S. Merkel {ut supra) . (See fig. 4.) These bodies are found in the deeper layers of the conjunctiva, margins of the lips, nasal mucous membrane, epiglottis, fungiform and circumvallate papillae of the tongue, glans penis and clitoris, mucous membrane of the rectum of man, and they have also been found on the under surface of the ” toes of the guinea-pig, ear and body of the mouse, and in the wing of the bat ” (Landois and Stirling). In the genital organs aggregations of end-bulbs occur, known as the ” genital corpuscles of Krause ” (fig. 3). In the synovial membrane of the joints of the fingers there are larger end-bulbs, each connected with three four nerve-filaments.

(2) The Touch Corpuscles of Wagner and Meissner. — These are oval bodies, about -gfo of an inch long by J of an inch in breadth. Each consists of a series of layers of connective tissue arranged transversely, and containing in the centre granular matter with nuclei (figs. 2, 3 and 6). One, two or three nerve fibres pass to the lower end of the corpuscle, wind transversely around it, lose the white substance of Schwann, penetrate into the corpuscle, where the axis cylinders, dividing, end in some way unknown. The corpuscles do not contain any soft core, but are apparently built up of irregular septae of connective tissue, in the meshes of which the nerve fibrils end in expansions similar to Merkel’s cells. Thin describes simple and compound corpuscles according to the number of nerve fibres entering them. These bodies are found abundantly

in the palm of the hand and sole of the foot, where there may be as many as 21 to every square millimetre (1 mm. = ■fa inch). They are not so numerous on the back of the hand or foot, mamma, lips and tip of the tongue, and they are rare in the genital organs.

3. The Corpuscles of Vater or Pacini. — These, first described by Vater so long ago as 1741, are small oval bodies, quite visible to the naked eye, from fa to fa of an inch long and

(From Landois and Stirling, after Biesiadecki.) Fig. 6. — Vertical

Section of the Skin of the Palm of the Hand.

a, Blood-vessel.

b, Papilla of the cutis vera.

c, Capillary.

d, Nerve-fibre passing to a touch-

corpuscle.

e, Wagner's touch-corpuscle.

/, Nerve-fibre, divided transversely, g, Cells of the Malpighian layer of the skin.

Fig. 7. — Vater'sor Pacini's Corpuscle.

a, Stalk.

b, Nerve-fibre entering it.

c, d, Connective-tissue en-

velope. e, Axis cylinder, with its end divided at /.

fa to fa of an inch in breadth, attached to the nerves of the hands and feet. They can be readily demonstrated in the mesentery of the cat (fig. 7). Each corpuscle consists of 40 to 50 lamellae or coats, like the folds of an onion, thinner and closer together on approaching the centre. Each lamella is formed of an elastic material mixed with delicate connective- tissue fibres, and the inner surface of each is lined by a single continuous layer of endothelial cells. A double-contoured nerve fibre passes to each. The white substance of Schwann becomes continuous with the lamellae, whilst the axis cylinder passes into the body, and ends in a small knob or in a plexus. Some- times a blood-vessel also penetrates the Pacinian body, entering along with the nerve. Such bodies are found in the sub- cutaneous tissue on the nerves of the fingers and toes, near joints, attached to the nerves of the abdominal plexuses of the sympathetic, on the coccygeal gland, on the dorsum of the penis and clitoris, in the meso-colon, in the course of the intercostal and periosteal nerves, and in the capsules of lymphatic glands.

Physiology of Touch in Man. — Such are the special end-organs

of touch. It has also been ascertained that many sensory nerves end in a plexus or network, the ultimate fibrils being connected with the cells of the particular tissue in which they are found. Thus they exist in the cornea of the eye, and at the junctions of tendons with muscles. In the latter situation ” flattened end-flakes or plates ” and ” elongated oval end- bulbs ” have also been found. A consideration of these various types of structure show that they facilitate intermittent pressure being made on the nerve endings. They are all, as it were, elastic cushions into which the nerve endings penetrate, so that the slight’ variation of pressure will be transmitted to the nerve. Probably also they serve to break the force of a sudden shock on the nerve endings.

Sensitiveness and Sense of Locality. — The degree of sensitiveness of the skin is determined by finding the smallest distance at which

the two points of a pair of compasses can be felt. This method first followed by Weber, is employed by physicians in the diagnosis

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Fig. 8. — Aesthesiometer of Sieveking.

of nervous affections involving the sensitiveness of the skin. The following table shows the sensitiveness in millimetres for an adult.

Mm.

Tip of tongue i-i

Third phalanx of finger, volar surface 2-2-3

Red part of the lip 4-5

Second phalanx of finger, volar surface 4~4 – 5

First phalanx of finger, volar surface 5—5-5

Third phalanx of finger, dorsal surface 6-8

Tip of nose 6-8

Head of metacarpal bone, volar 5-6-8

Ball of thumb 6-5-7

Ball of little finger 5‘5-6

Centre of palm 8-9

Dorsum and side of tongue; white of the lips; metacarpal

part of the thumb 9

Third phalanx of the great toe, plantar surface 11-3

Second phalanx of the fingers, dorsal surface 11-3

Back 1 1 -3

Eyelid 11-3

Centre of hard palate 13-5

Lower third of the forearm, volar surface 15

In front of the zygoma 15-8

Plantar surface of the great toe 15-8

Inner surface of the lip 20-3

Behind the zygoma 22-6

Forehead 22-6

Occiput 27-1

Back of the hand 31-6

Under the chin 33-8

Vertex 33-8

Knee 36-1

Sacrum (gluteal region) 44-6

Forearm and leg 45-1

Neck 54-1

Back of the fifth dorsal vertebra; lower dorsal and lumbar

region 54-1

Middle of the neck 67-7

Upper arm ; thigh ; centre of the back 67-7

These investigations show not only that the skin is sensitive, but that one is able with great precision to distinguish the part touched. This latter power is usually called the sense of locality, and it is influenced by various conditions. The greater the number of sensory nerves in a given area of skin the greater is the degree of accuracy in distinguishing different points. Contrast in this way the tip of the finger and the back of the hand. Sensitiveness increases from the joints towards the extremities, and sensitiveness is great in parts of the body that are actively moved. The sensibility of the limbs is finer in the transverse axis than in the long axis of the limb, to the extent of J on the flexor surface of the upper limb and I on the extensor surface. It is doubtful if exercise improves sensitiveness, as Francis Galton found that the performances of blind boys were not superior to those of other boys, and he says that " the guidance of the blind depends mainly on the multitude of collateral indications, to which they give much heed, and not their superiority to any one of them." When the skin is moistened with indifferent fluids sensibility is increased. Suslowa made the curious discovery that, if the area between two points distinctly felt be tickled or be stimulated by a weak electric current, the impressions are fused. Stretching the skin, and baths in water containing carbonic acid or common salt, increase the power of localizing tactile impressions. In experimenting with the com- passes, it will be found that a smaller distance can be distinguished if one proceeds from greater to smaller distances than in the reverse direction. A smaller distance can also be detected when the points of the compasses are placed one after the other on the skin than when they are placed simultaneously. If the points of the com- passes are unequally heated, the sensation of two contacts becomes confused. An anaemic condition, or a state of venous congestion, or the application of cold, or violent stretching of the skin, or the use of such substances as atropine, daturin, morphia,

strychnine, alcohol, bromide of potassium, cannabin and hydrate of chloral blunt sensibility. The only active substance said to increase it is caffein.

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Absolute sensitiveness, as indicated by a sense of pressure, has been determined by various methods. Two different weights are placed on the part, and the smallest difference in weight that can be perceived is noted. Weber placed small weights directly on the skin; Aubert and Kammler loaded small plates; Dohrn made use of a balance, having a blunt point at one end of the beam, resting on the skin, whilst weights were placed on the other end of the beam to equalize the pressure; H. Eulenberg invented an instrument like a spiral spring paper-clip or balance (the baraesthesiometer), having an index showing the pressure in grammes; F. Goltz employed an India-rubber tube filled with water, and this, to ensure a constant surface of contact, bent at one spot over a piece of cork, is touched at that spot by the cutaneous part to be examined, and, by rhyth- mically exerted pressure, waves analogous to those of the arterial pulse are produced in the tube ; and L. Landois invented a mercurial balance, enabling him to make rapid variations in the weight without giving rise to any shock. These methods have given the following general results, (i) The greatest acuteness is on the forehead, temples and back of the hand and forearm, which detect a pressure of 0-O02 gramme; fingers detect 0-005 to 0-015 gramme; the chin, abdomen and nose 0-04 to 0-05 gramme. (2) Goltz's method gives the same general results as Weber's experiment with the compasses, with the exception that the tip of the tongue has its sensation of pressure much lower in the scale than its sensation of touch. (3) Eulenberg found the following gradations in the fineness of the pressure sense: the forehead, lips, back of the cheeks, and temples appreciate differences of ˆ to ˆ (200: 205 to 300: 310 grammes). The back of the last phalanx of the fingers, the forearm, hand, first and second phalanges, the palmar surface of the hand, forearm and upper arm distinguish differences of ˆ to fa (200 : 220 to 200 : 210 grammes). The front of the leg and thigh is similar to the fore arm. Then follow the back of the foot and toes, the sole of the foot, and the back of the leg and thigh. Dohrn placed a weight of I gramme on the skin, and then determined the least additional weight that could be detected, with this result: third phalanx of finger 0-499 gramme;

back of the foot, 0-5 gramme; second phalanx, 0-771 gramme; first phalanx, 0-82 gramme; leg, I gramme; back of hand, 1-156 grammes; palm, 1-108 grammes; patella, 1-5 grammes; fore- arm, I -99 grammes; umbilicus, 3-5 grammes; and back, 3-8 grammes. (4) In passing from light to heavier weights, the acuteness increases at once, a maximum is reached, and then with heavy weights the power of distinguishing the differences diminishes. (5) A sensation of pressure after the weights have been removed may be noticed (after-pressure sensation), especially if the weight be considerable.

(6) Valentine noticed that, if the finger were held against a blunt-toothed wheel, and the wheel were rotated with a certain rapidity, he felt a smooth margin. This was experienced when the intervals of time between the contacts of successive teeth were less than from ilo t0 r,j;> of a second. The same experiment can be readily made by holding the finger over the holes in one of the outermost circles of a large syren rotating quickly: the sensations of individual holes become fused, so as to give rise to a feeling of touching a slit.

(7) Vibrations of strings are detected even when the number is about 1500 per second; above this the sensation of vibration ceases. By attaching bristles to the prongs of tuning-forks and bringing these into contact with the lip or tongue, sensations of a very acute character are experienced, which are most intense when the forks vibrate from 600 to 1500 per second.

Information from Tactile Impressions. — These enable us to come to the following conclusions. (1) We note the existence of some-thing touching the sensory surface. (2) From the intensity of the sensation we _ determine the weight, tension or intensity of the pressure. This sensation is in the first instance referred to the skin, but after the pressure has reached a certain amount muscular sensations are also experienced — the so-called muscular sense. (3) The locality of the part touched is at once determined, and from this the probable position of the touching body. Like the visual field, to which all retinal impressions are referred, point for point, there is a tactile field, to which all points on the skin surface may be referred. (4) By touching a body at various points, from the difference of pressure and from a comparison of the positions of various points in the tactile field we judge of the configuration of the body. A number of ” tactile pictures ” are obtained by passing the skin over the touched body, and the shape of the body is further determined by a

knowledge of the muscular movements necessary to bring the cutaneous surface into contact with different portions of it. If there is abnormal displacement of position, a false con- ception may arise as to the shape of the body. Thus, if a small marble or a pea be placed between the index and middle finger so as to 'touch (with the palm downwards) the outer side of the index finger and the inner side of the middle finger, a sensation of touching one round body is experienced ; but if the fingers be crossed, so that the marble touches the inner side of the index finger and the outer side of the middle finger, there will be a feeling of two round bodies, because in these circumstances there is added to the feelings of contact a feeling of distortion (or of muscular action) such as would take place if the fingers, for purposes of touch, were placed in that abnormal position. Again, as showing that our knowledge of the tactile field is precise, there is the well-known fact that when a piece

of skin is transplanted from the forehead to the nose, in the operation for removing a deformity of the nose arising from lupus or other ulcerative disease, the patient feels the new nasal part as if it were his forehead, and he may have the curious sensation of a natal instead of a frontal headache. (5) From the number of points touched we judge as to the smoothness or roughness of a body. A body having a uniformly level surface, like a billiard ball, is smooth ; a body having points irregular in size and number in a given area is rough ; and if the points are very close together it gives rise to a sensation, like that of the pile of velvet almost intolerable to some individuals. Again, if the pressure is so uniform as not to be felt, as when the body is immersed in water (paradoxical as this may seem, it is the case that the sensation of contact is felt only at the limit of the fluid), we experience the sensation of being in contact with a fluid. _ (6) Lastly, it would appear that touch is always the result of variation of pressure. No portion of the body when touching anything can be regarded as absolutely motionless, and the slight oscillations of the sensory surface, and in many cases of the body touched, produce those variations of pressure on which touch depends.

To explain the phenomenon of the tactile field, and more specially the remarkable variations of tactile sensibility above described, various theories have been advanced, but none are satisfactory. (See article " Cutaneous Sensations " by C. S. Sherrington in Schafer's Physiology, ii. 920). Research shows that the sensation of touch may be referred to parts of the skin which

do not contain the special end organs associated with this sense, and that filaments in the Malpighian layer (the layer immediately above the papillae of the true skin) may form the anatomical basis of the sense. The skin may be regarded, also, as an extensive surface containing nervous arrangements by which we are brought into relation with the outer world. Accordingly, touch is not the only sensation referred to the skin, but we also refer sensations of temperature (heat and cold), and often those peculiar sensations which we call pain.

Sensations of Temperature. — These depend on thermic irritation of the terminal organs, as proved by the following experiment of E. H. Weber: ” If the elbow be dipped into a very cold fluid, the cold is only felt at the immersed part of the body (where the fibres terminate) ; pain, however, is felt in the terminal organs of the ulnar nerve, namely, in the finger points; this pain, at the same time, deadens the local sensation of cold. ” If the sensation of cold were due to the irritation of a specific-nerve fibre, the sensation of cold would be referred to the tips of the fingers. When any part of the skin is above its normal mean temperature, warmth is felt; in the opposite case, cold. The normal mean temperature of a given area varies according to the distribution of hot blood in it and to the activity of nutritive changes occurring in it. When the skin is brought into contact with a good conductor of heat there is a sensation of cold. A sensation of heat is experienced when heat is carried to the skin in any way. The following are the chief facts that have been ascertained regarding the temperature sense: (1) E. H. Weber found that, with a skin temperature of from 15-5° C.to 35° C, the tips of the fingers can distinguish a difference of 0-25° C. to 0-2 ° C. Temperatures just below that of the blood (33°-27° C.) are distinguished by the most sensitive parts, even to 0-05° C. (2) The thermal sense varies in different regions as follows : tip of tongue, eyelids, cheeks, lips, neck, belly. The ” perceptible minimum ” was found to be, in degrees C: breast 0-4°; back, 0-9°; back of hand, 0-3°; palm, o-4°;arm, 0-2°; back of foot, 0-4°; thigh, 0-5°; leg, 0-6° to 0-2°; cheek, 0-4° ; temple, 0-3 °. (3) If two different temperatures are applied side by side and simultaneously, the impressions often fuse, especially if the areas are close together. (4) Practice is said to improve the thermal sense. (5) Sensations of heat and cold may curiously alternate; thus when the skin is dipped first into water at io° C. we feel cold, and if it be then dipped into water at 16 C. we have at first a feeling of warmth, but soon again of cold. (6) The same temperature applied to a large area is not

appreciated in the same way as when applied to a small one; thus " the whole hand when placed in water at 29-5° C. feels warmer than when a finger is dipped into water at 32 ° C. "

There is every reason to hold that there are different nerve fibres and different central organs for the tactile and thermal sensations, but nothing definite is known. The one sensation undoubtedly affects the other. Thus the minimum distance at which two com- pass points are felt is diminished when one point is warmer than the other. Again, a colder weight is felt as heavier, " so that the apparent difference of pressure becomes greater when the heavier weight is at the same time colder, and less when the lighter weight is colder, and difference of pressure is felt with equal weights of unequal temperature " (E. H. Weber). Great sensibility to differ- ences of temperature is noticed after removal, alteration by vesicants, or destruction of the epidermis, and in the skin affection called herpes zoster. The same occurs in some cases of locomotor ataxy. Removal of the epidermis, as a rule, increases tactile sensibility and the sense of locality. Increased tactile 'sensibility is termed hyperpselaphesia, and is a rare phenomenon in nervous diseases. Paralysis of the tactile sense is called hypopselaphesia, whilst its entire loss is apselaphesia. Brown-Sequard mentions a case in

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which contact of two points gave rise to a sense of a third point of contact. Certain conditions of the nerve centres affect the senses both of touch and temperature. Under the influence of morphia the person may 'feel abnormally enlarged or diminished in size. As a rule the senses are affected simultaneously, but cases occur where one may be affected more than the other.

Sensations of heat and cold are chiefly referred to the skin, and only partially to some mucous membranes, such as those of the alimentary- canal. Direct irritation of a nerve does not give rise to these sensations. The exposed pulp of a diseased tooth, when irritated by hot or cold fluids, gives rise to pain, not to sensations of temperature. It has now been ascertained that there are minute areas on the skin in which sensations of heat and cold may be more acutely felt than in adjoining areas; and, further, that there are points stimulated by addition of heat, hot spots, while others are stimulated by withdrawal of heat, cold spots.

A simple method of demonstrating this phenomenon is to use a solid cylinder of copper, 8 in. in length by J in. in thick- ness, and sharpened at one end to a fine pencil-like point. Dip the pointed end into very hot water, close the eyes, and touch parts of the skin. When a hot spot is touched, there is an acute sensation of burning. Such a spot is often near a hair. Again, in another set of experiments, dip the copper pencil into ice-cold water and search for cold spots. When one of these is touched, a sensation of cold, as if concentrated on a point, is experienced. Thus it may be demonstrated that in a given area of skin there may be hot spots, cold spots and touch spots.

Cold spots are more abundant than hot spots. The spots are arranged in curved lines, but the curve uniting a number of cold spots does not coincide with the curve forming a chain of hot spots. By Weber's method it will be found that we can discriminate cold spots at a shorter distance from each other than hot spots. Thus on the forehead cold spots have a minimum distance of 8 mm,, and hot spots 4 mm.; on the skin of the breast, cold spots 2 mm., and hot spots 5 mm.; on the back, cold spots 1-5 mm., and hot spots 4 to 6 mm.; on the back of the hand, cold spots 3 mm., and hot spots 4 mm.; on the palm, cold spots 8 mm., and hot spots 2 mm.; and on the thigh and leg, cold spots 3 mm., and hot spots 3-5 mm. Electrical and mechanical stimulation of the hot or cold spots call forth the corresponding sensation. No terminal organ for dis- crimination of temperature has yet been found. It will be observed that the sensation of heat or cold is excited by change of temperature, and that it is more acute and definite the more sudden the change. Thus discrimination of temperature is similar to discrimination of touch, which depends on more or less sudden change of pressure. The term cold means, physiologically, the sensation we experience when heat is abstracted, and the term heat, the sensation felt when heat is added to the part. Thus we are led to consider that the skin contains at least two kinds of specific terminal organs for sensations of touch and temperature, and two sets of nerve fibres which carry the nervous impulses to the brain. In all probability, also, these fibres have different central endings, and in their course to the brain run in different tracts in the spinal cord. This will explain cases of disease of the central nervous system in which, over certain areas of skin, sensations of touch have been lost while sensations of tem- perature and pain remain, or vice versa. Tactile and thermal impressions may influence each other. Thus a leg sent to "sleep" by pressure on the sciatic nerve will be

found to be less sensitive to heat, but distinctly sensitive to cold. In some cases of disease it has been noticed that the skin is sensitive to a temperature above that of the limb, but insensitive to cold. It is highly probable that just as we found in the case of touch (pressure), the terminal organs connected with the sense of temperature are the fine nerve filaments that have been detected in the deeper strata of the Malpighian region of the epidermis, immediately above the true skin, and it is also probable that certain epidermic (epithelial) cells in that region play their part in the mechanism. Sensations of a painful character may also, in certain circumstances, be referred to the viscera, and to mucous and serous surfaces. Pain is not a sensation excited by irritating the end organs either of touch or of temperature, nor even by irritating directly the filaments of a sensory nerve. Even if sensory nerves are cut or- bruised, as in surgical operations, there may be no sensations of pain; and it has been found that muscles, vessels and even the viscera, such as the heart, stomach, liver or kidneys, may be freely handled without giving rise to any feeling of pain, or indeed to any kind of sensation. These parts, in ordinary circumstances appear to be insensitive, and yet they contain afferent nerves. If the sensibility of these nerves is heightened, or possibly if the sensitiveness of the central terminations of the nerves is raised, then we may have sensations to which we give the name of pain. In like manner the skin is endowed with afferent nerves, distinct from those ministering to touch and to temperature, along which nervous impulses are constantly flowing. When these nervous impulses reach the central nervous system in ordinary circumstances they do not give rise to changes that reach the level of consciousness, but they form, as it were, the warp and woof of our mental life, and they also affect metabolisms, that is to say, nutritive changes in many parts of the body. They may also, as is well known, affect unconsciously such mechanisms as those of the action of the heart, the calibre of the blood-vessels and the movements of respiration.

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If, however, this plane of activity is raised, as by intermittent pressure, or by inflammatory action, or by sudden changes of temperature, as in burning, scalding, &c, such nervous impulses give rise to pain. Sometimes pain is distinctly located, and in other cases it may be irradiated in the nerve centres, and referred to areas of skin or to regions of the body which are not really the seat of the irritation. Thus irritation of the liver may cause pain

in the shoulder ; disease of the hip-joint often gives rise to pain in the knee ; and renal colic, due to the passage of a calculus down the ureter, to severe pain even in the abdominal walls. These are often termed reflex pains and their interpretation is of great importance to physicians in the diagnosis of disease. Their frequent occurrence has also directed attention to the distribution in the skin and termination in the brain of the sensory nerves. It is also notice- able that a sensation of pain gives us no information as to its cause; we simply have an agonizing sensation in a part to which, hitherto, we probably referred no sensations. The acuteness or intensity of pain depends partly on the intensity of the irritation, and partly on the degree of excitability of the sensory nerves at the time.

Pain. — In addition to sensations of touch and of temperature referred to the skin, there is still a third kind of sensation, unlike either, namely, pain. This sensation cannot be supposed to be excited by irritations of the end organs of touch, or of specific thermal end organs (if there be such), but rather to irritation of ordinary sensory nerves, and there is every reason to believe that painful impressions make their way to the brain along special tracks in the spinal cord. If we consider our mental condition as regards sensation at any moment, we notice numerous sensations more or less definite, not referred directly to the surface, nor to external objects, such as a feeling of general comfort, free or impeded breath- ing, hunger, thirst, malaise, horror, fatigue and pain. These are all caused by the irritation of ordinary sensory nerves in different localities, and if the irritation of such nerves, by chemical, thermal, mechanical or nutritional stimuli, passes beyond a certain maximum point of intensity the result is pain. Irritation of a nerve, in accord- ance with the law of ” peripheral reference of sensation,” will cause pain. Sometimes the irritation applied to the trunk of a sensory nerve may be so intense as to destroy its normal function, and loss of sensation or anaesthesia results. If then the stimulus be increased further, pain is excited which is referred to the end of the nerve, with the result of producing what has been called anaesthesia dolorosa. Pains frequently cannot be distinctly located, probably owing to the fact of irradiation in the nerve centres and subsequent reference to areas of the body which are not really the seat of irritations. The intensity of pain depends on the degree of excitability of the sensory nerves, whilst its massiveness depends on the number of nerve fibres affected. The quality of the pain is probably produced by the kind of irritation of the nerve, as affected by the

structure of the part and the greater or less continuance of severe pressure. Thus there are piercing, cutting, boring, burning, throbbing, pressing, gnawing, dull and acute varieties of pain. Sometimes the excitability of the cutaneous nerves is so great that a breath of air or a delicate touch may give rise to suffering. This hyperalgia is found in inflammatory affections of the skin. In neuralgia the pain is charac- terized by its character of shooting along the course of the nerve and by severe exacerbations. In many nervous diseases there are disordered sensations referred to the skin, such as alterna- tions of heat and cold, burning, creeping, itching and a feeling as if insects were crawling on the surface (formication) . This con- dition is termed paralgia. The term hypalgia is applied to a diminution and analgia to paralysis of pain, as is produced by anaesthetics.

Muscular Sense. — The sensory impressions considered in this article are closely related to the so-called muscular sense, or that sense or feeling by which we are aware of the state of the muscles of a limb as regards contraction or relaxation. Some have held that the muscular sense is really due to greater or less stretching of the skin and therefore to irritation of the nerves of that organ. That this is not the case is evident from the fact that disordered move- ments indicating perversion or loss of this sense are not affected by removal of the skin (Claude Bernard). Further, cases in the human being have been noticed where there was an entire loss of cutaneous sensibility whilst the muscular sense was unimpaired. It is also known that muscles possess sensory nerves, giving rise, in certain circumstances, to fatigue, and, when strongly irritated, to the pain of cramp. Muscular sensations are really excited by irritation of sensory nerves passing from the muscles themselves. There are specialized spindle-like bodies in many muscles, and there are organs connected with tendons which are regarded as sensory organs by which pressures are communicated to sensory nerve-filaments. We are thus made conscious of whether or not the muscles are contracted, and of the amount of contraction necessary to overcome resistance, and this knowledge enables us to judge of the amount of voluntary impulse. Loss or diminution of the muscular sense is seen in chorea and especially in locomotor ataxy. Increase of it is rare, but it is seen in the curious affection called anxietas tibiarum, a painful condition of unrest, which leads to a continual change in the position of the limbs (see Equilibrium).

(J. G. M.)

TOUL, a garrison town of north-eastern France, capital of an arrondissement in the department of Meurthe-et-Moselle, 21 m. W. of Nancy on the Eastern railway Pop. (1906), town 9523; commune, 13,663. Toul is situated in a plain on the left bank of the Moselle, which skirts the town on the S. and S. E., while on the N. it is bordered by the Marne-Rhine canal. It is princi- pally important as being the centre of a great entrenched camp close to the German frontier. Immediately after the Franco- German War the whole system of frontier defence was revised, and of all the new fortresses of the Meuse and Moselle Toul is perhaps the most formidable. The works were begun in 1874 by the construction of four outlying forts north, north-east and south of the town, but these soon became merely an inner line of defence. The principal defences now lie much farther out on all sides. The west front of the new line of forts occupies a long line of high ground (the watershed of the Meuse and the Moselle), the north front, about 4 m. from Toul, is in undulating country, while facing towards Nancy and forming the chord of the arc which the Moselle describes from Fontenay below to Villey-le-Sec above, is the strong east front, the outlying works of which extend far to the east (Fort Frouard and other works about Nancy) and to the south-east (Pont St Vincent). The south front extends from the Moselle at Villey-le- Sec south-westwards till it meets the southern end of the west front on the high ground overlooking the Meuse valley. The fort at Pagny on the Meuse to the south-west may be considered an outwork of this line of defence. The perimeter of the Toul defences proper is nearly 30 m., and their mean distance from the town about 6 m. Northward, along the Meuse, Toul is connected with the fortress of Verdun by the ” Meuse line ” of barrier forts, the best known of which are Gironville, Liouville and Troyon. South of Toul the country was purposely left unfortified as far as Epinal (q.v.) and this region is known as the Trouee d’Epinal.

The town itself forms an oval within a bastioned enceinte pierced by three gateways. It has two important churches. That of St Etienne (formerly a cathedral) has a choir and transept of the 13th century; the nave and aisles are of the 14th, and the facade, the finest part of the building, of the last half of the 15th. The

two western towers, which have no spires, reach a height of 246 ft. The two large lateral chapels of the nave are in the Renaissance style. The chief features of the interior are its stained glass and organ loft. South of the church there is a fine cloister of the end of the 13th century which was much damaged at the Revolution. The church of St Gengoult, which dates chiefly from the late 13th or early 14th century, has a facade of the 15th century and a cloister in the Flamboyant Gothic style of the 16th century. The hotel- de-ville occupies a building of the 18th century, once the epis- copal palace, and contains the library and museum. Toul is the seat of a sub-prefect and has a tribunal of commerce and a communal college among its public institutions. The industries include the manufacture of porcelain; trade is in wine and brandy.

Toul {Tullum) is one of the oldest towns of France; originally capital of the Leuci, in the Belgic Confederation, it acquired great importance under the Romans. It was evangelized by St Mansuy in the latter half of the 4th century, and became one of the leading sees of north-east Gaul. After being sacked successively by Goths, Burgundians, Vandals and Huns, Toul was conquered by the Franks in 450. Under the Merovingians it was governed by counts, assisted by elective officers. The bishops became sovereign counts in the 10th century, holding only of the emperor, and for a period of 300 years (13th to 16th centuries) the citizens maintained a long struggle against them. Together with Verdun and Metz the town and its domain formed the territory of the Trois-Eveches. Toul was forced to yield for a time to the count of Vaudemont in the 12th century, and twice to the duke of Lorraine in the 15th, and was thrice devastated by the plague in the 16th century. Charles V. made a solemn entry into the town in 1544, but in the following

year, at the instance of the cardinal of Lorraine, it placed itself under the perpetual protection of the kings of France. Henry II. took possession of the Trois-Eveches in 1552, but the territory was not officially incorporated with France till 1648. Henry IV. was received in state in 1603, and in 1637 the parlement of Metz was transferred to Toul. In 1700 Vauban reconstructed the fortifications of the town. In. 1790 the bishopric was suppressed and the diocese united to that of Nancy. Toul, which had then no modern defences, capitulated in 1870 after a bombardment of twelve days.

TOULON, a seaport and first-class fortress and naval station of

France, department of Var, capital of the arrondissement of Toulon, on the Mediterranean, 42 m. E.S.E. of Marseilles. Pop. (1886), 53,941; (1901), 101,602. The bay, which opens to the east, has two divisions, the Grande Rade and the Petite Rade; it is sheltered on the north and west by high hills, closed on the south by the peninsula of capes Side and Cepet, and protected on the east by a huge breakwater, the entrance, 1300 ft. wide, being defensible b> torpedoes. A ship coming from the open sea must first pass the forts of St Marguerite, of Cap Brun, of Lamalgue and of St Louis to the north, and the battery of the signal station to the south; before reaching the Petite Rade it must further pass under the guns of the battery of Le Salut to the east, and of the forts of Balaguier and L'Aiguillette to the west. The Bay of La Seyne lies west of the Petite Rade, and is defended by the forts of Six-Fours, Napoleon (formerly Furt Caire), and Malbousquet, and ths batteries of Les Arenes and Les Gaus. To the north of Toulon rise the defensive works of Mont Faron and Fort Rouge, to the east the forts of Artigues and St Catherine, to the north-east the formidable fort of Coudon, and to the south-east that of Colle Noire, respectively dominating the highway into Italy and the valley of Hyeres with the Bay of Carqueiranne. The town, enlarged to the north under the Second Empire, has on that side a fine modern quarter; but in the old town the streets are for the most part narrow, crooked and dirty, and to their insanitary state the cholera epidemic of 1884 was attributed. The chief buildings are the former cathedral of St Marie Majeure (from the 5th century Toulon was a bishop's see till 1801, when it was annexed to that of Frejus), the church of St Louis, the naval and military hospital, with a natural history collection and an anatomical museum attached, a naval school of medicine, a school of hydrography, and large barracks. In 1883-1887 a handsome Renaissance building was erected to accommodate the picture gallery and the town librarv. The monument in com- memoration of the centenary of the French Revolution was erected in 1890 in the Place de la Liberte, the finest in the new town. The imports are wine, corn, wood, coal, hemp, iron, sugar, coffee and fresh fish; the exports are salt, copper ore, barks for tanning and oils. The principal industries, apart from the arsenal, are shipbuilding, fishing, lace-making and wine-growing. Toulon possesses an observatory and a botanical garden. The interesting buildings and gardens of the hospital of St Mandrier stand on the peninsula of Cape Cepet, and near them is the lazaretto.

Toulon is the most important of the French dockyards, and is the

headquarters of the Mediterranean fleet. The arsenal, which was created by Louis XIV. — Vauban being the engineer of the works — lies on the north side of the Petite Rade. This is ap- proached from the Grande Rade by passages at the north and south ends of a long breakwater which extends from the direction of Le Mourillon towards the C6pet Peninsula. The water space within the moles amounts to about 150 acres, while the quays approach 4 m. in length. Outside in the Petite Rade is a splendid protected anchorage for a great fleet, the whole being commanded by many forts and batteries. There are four great basins ap- proached from the Petite Rade — the Vielle Darse, to the east, on the side of Le Mourillon ; the Darse Vauban, next tc it; and the Darse de Castigneau and the Darse Missiessy, farther to the v/est. In the Darse Vauban are three dry docks, two of them 246 ft. long, with a depth of water on the sill of about 20 ft. ; while the third is 283 ft. long, with a depth of over 24 ft. Three other dry docks are in the Darse de Castigneau, of which one is in two sections. The largest of the docks is 385 ft. long, and the depth of water on the sill in all these docks averages 30 ft. In the Darse Missiessy are

two dry docks, 426 ft. long, with a depth on the sill of over 32 ft. There are several building slips, and the yard is supplied with a gun foundry and wharf, fitting-shops, boiler works, victualling and other establishments, rolling mills and magazines. Le Mourillon is a subsidiary yard at Toulon, devoted chiefly to ship-building, and possessing large facilities, including five covered slips.

The Roman Telo Martius is supposed to have stood near the lazaretto. The town was successively sacked by Goths, Burgundians, Franks and Saracens. During the early middle ages, and till conquered by Charles of Anjou in 1259, it was under lords of its own, and entered into alli- ance with the republics of Marseilles and Aries. St Louis, and especially Louis XII. and Francis I. strengthened its fortifications. It was seized by the emperor Charles V. in 1524 and 1536- Henry IV. founded a naval arsenal at Toulon, which was further strengthened by Richelieu, and Vauban made the new dock, a new enceinte, and several forts and batteries. In 1707 the town was unsuccessfully besieged by the duke of Savoy, Prince Eugene and an English fleet. In 1720 there was an outbreak of the plague. In 1792 after great and sanguinary disorder, the royalists of the town sought the support of the English and Spanish fleets cruising in the neighbourhood.

The Convention having replied by putting the town " hors la loi," the inhabitants opened their harbour to the English. The army of the republic now (1793) laid siege to the town, and on this occasion Napoleon Bonaparte first made his name as a soldier. The forts commanding the town having been taken, the English ships retired after setting fire to the arsenal. The conflagration was extinguished by the prisoners, but not before 38 out of a total of 56 vessels had been destroyed. Under the Directory Toulon became the most important French military fort on the Mediterranean; here Napoleon organized the Egyptian campaign, and the expedition against Algiers set out from Toulon in 1830. The fortifications have been strengthened by Napoleon I., Louis Philippe, Napoleon III., and since 1870.

Battle of Toulon. — This naval battle took place on the nth of February 1744, near the port of Toulon. A British fleet of thirty sail of the line under command of Thomas Mathews, who combined the offices of naval commander-in-chief in the Mediterranean and envoy to the courts of Sardinia and the Italian princes, engaged a combined force of Spaniards under Don Jose Navarro and French under M. de Court. They were in all twenty-seven sail. The allies left Toulon on the 9th of February. Mathews was at anchor in Hyeres Bay to watch them, for though France and Great Britain were already engaged as allies on opposite sides in the War of the Austrian Succession, there had been no declaration of war between them. It was known that the allies meant to transfer Spanish troops to Italy to serve against the Austrians, and Mathews had no hesitation in attacking them, Great Britain being at war with Spain. He left Hyeres in very light wind with a heavy westerly swell, and with his fleet in confusion. The British ships were strag- gling over a distance of ten miles, but he put himself between the enemy and Toulon. Mathews was on bad terms with his second in command, Lestock, who commanded the rear division and showed little disposition to support his superior. By the morning of the I Ith the interval between the van and centre of the British fleet and its rear had increased in the light breezes, and also through the voluntary or involuntary misapprehension of Mathews's orders by Lestock. The allies were in a fairly well-formed line, heading to the south, and southward of the British. Mathews pursued, and at 1.30 p.m., when his leading ship was abreast of the centre ship of the allies, he attacked. Some hot fighting took place between Mathews and the Spaniards who formed the allied rear. The action was notable as the last occasion on which an attempt was

made to use a fireship on the open sea. One was sent against the " Real " (114), the Spanish flagship, but she was reduced to a sinking state by the fire of the Spaniards, and blew up prematurely, with the loss of all on board. At about five o'clock, the French in the van turned back to support the Spaniards, and Mathews drew off. One Spanish ship, the " Poder " (60), which had surrendered was recaptured, and then set on fire by the allies. Mathews made only a feeble attempt to renew the battle on the following days, and on the 13th returned towards the coast of Italy, which he said he had to defend. The British rear division had not come into action at all.

The battle, though a miserable affair in itself, is of great importance in naval history because of the pronouncement of doctrine to which it led. Mathews, who was dissatisfied with his subordinate, Lestock. suspended him from command and sent him home for trial. Several of the captains had behaved ill, and the failure of

a superior British fleet to gain a success over the allies caused extreme discontent at home. A parliamentary inquiry was opened on the 12th of March 1745, which on the 18th of April, after a confused investigation, ended in a petition to the king to order trials by court-martial of all the officers accused of misconduct. A long series of courts-martial began on the nth of September 1745, and did not end till the 22nd of October 1746. Several captains were sentenced to be dismissed the service. Lestock was acquitted, but Mathews was condemned and sentenced to dismissal. The finding of the court, which blamed the officer who actually fought, and acquitted the other who did not, puzzled and angered public opinion. The technical points were not appreci- ated by laymen. The real evil done by the condemnation of Mathews was not understood even in the navy. Mathews was blamed on the ground that he had not waited to engage till his van ship was abreast of the van ship of the enemy. By this declara- tion of principle the court confirmed the formal system of naval tactics which rendered all sea-fighting between equal or nearly equal forces so ineffective for two generations.

See Beatson, Naval and Military Memoirs, i. 197 seq. (London, 1804), a full and fair narrative. (D. H.)

TOULOUSE, LOUIS ALEXANDRE DE BOURBON, Count or

(1678-1737), third son of Louis XIV. and Mme de Montespan was born on the 6th of June 1678. At the age of five he was created admiral of France. He distinguished himself during the War of the Spanish Succession, and inflicted a severe defeat on Admiral Rooke near Malaga in 1704. He kept aloof from the intrigues of his sister-in-law, the duchess of Maine, and died on the 1st of December 1737. His son, Louis Jean Marie de Bourbon, due de Penthievre (172 5-1 793) , succeeded his father in his posts, among others in that of grand admiral. He served under Marshal de Noailles, and fought brilliantly at Dettingen (1743) and Fontenoy (1745). He then lived in retreat at Rambouillet and Sceaux, protecting men of letters, and particularly the poet Florian, and dispensing charity. He lost his son, the prince of Lamballe, in 1768, and survived his daughter-in-law, Louise Marie Therese of Savoy-Carignan, the friend of Marie Antoinette, who was killed by the populace on the 3rd of September 1792. He died on the 4th of March 1793; his daughter and heiress, Louise Marie Adelaide, married Philippe (Egalite), duke of Orleans.

TOULOUSE, a city of south-western France, capital of the department of Haute-Garonne, 443 m. S. by W. of Paris by the Orleans railway, and 159 m. S.E. of Bordeaux by the Southern railway. Pop. (1906), town, 125,856; commune, 149,438. Toulouse is situated on the right bank of the Garonne, which here changes a north-easterly for a north-westerly direction, describing a curve round which the city extends in the form of a crescent. On the left bank is the suburb of St Cyprien, which is exposed to the inundations of the river owing to its low situation. The river is spanned by three bridges — that of St Pierre to the north, that of St Michel to the south, and the Pont Neuf in the centre; the last, a fine structure of seven arches was begun in 1543 by Nicolas Bachelier, the sculptor, whose work is to be seen in many of the churches and mansions of the city. East and north of the city runs the Canal du Midi, which here joins the lateral canal of the Garonne. Between the Canal du Midi and the city proper extends a long line of boulevards leading southwards by the Allee St Etienne to the Grand Rond, a promenade whence a series of allees branch out in all directions. South-west the Allee St Michel leads towards the Garonne, and south the Grande Allee towards the Faubourg St Michel. These boulevards take the place of the old city walls. Between them and the canal lie the more modern faubourgs of St Pierre, Arnaud-Bernard, Matabiau, &c. The Place du Capitole, to which streets converge from every side,

occupies the centre of the city. Two broad straight thoroughfares of modern construction, the Rue de Metz and the Rue d'Alsace-Lorraine, intersect one another to the south of this point, the first running east from the Pont Neuf, the other running north and south. The other streets are for the most part narrow and irregular.

The most interesting building in Toulouse is the church of St Sernin or Saturnin, whom legend represents as the first preacher of the gospel in Toulouse, where he was perhaps martyred about the middle of the 3rd century. The choir, the oldest part of the

present building, was consecrated by Urban II. in 1096. The church is the largest Romanesque basilica in existence, being 375 ft. from east to west and 210 ft. in extreme breadth. The nave (12th and 13th centuries) has double aisles. Four pillars, supporting the central tower, are surrounded by heavy masonry, which somewhat spoils the general harmony of the interior. In the southern transept is the " portail des comtes," so named because near it lie the tombs of William Taillefer, Pons, and other early counts of Toulouse. The little chapel in which these tombs (ascribed to the nth century) are found was restored by the capitols of Toulouse in 1648. Another chapel contains a Byzantine Christ of late nth-century workmanship. The choir (nth and 12th centuries) ends in an apse, or rather chevet, surrounded by a range of columns, marking off an aisle, which in its turn opens into five chapels. The stalls are of 16th-century work and grotesquely carved. Against the northern wall is an ancient table d'autel, which an nth-century inscription declares to have belonged to St Sernin. In the crypts are many relics, which, however, were robbed of their gold and silver shrines during the Revolution. On the south there is a fine outer porch in the Renaissance style; it is surmounted by a representation of the Ascension in Byzantine style. The central tower (13th century) consists of five storeys, of which the two highest are of later date, but harmonize with the three lower ones. A restoration of St Sernin was carried out in the 19th century by Viollet-le-Duc.

The cathedral, dedicated to St Stephen, dates from three different epochs. The walls of the nave belong to a, Romanesque cathedral of the nth century, but its roof dates from the first half of the

13th century. The choir was begun by Bishop Bertrand de 1′ lie (c. 1272), who wished to build another church in place of the old one. This wish was unfulfilled and the original nave, the axis of which is to the south of that of the choir, remains. The choir was burned in 1690 but restored soon after. It is surrounded by seven- teen chapels, finished by the cardinal d'Orleans, nephew of Louis XL, about the beginning of the 16th century, and adorned with glass dating from the 15th to the 17th century. The western gate, flanked by a huge square tower, was constructed by Peter du Moulin, archbishop of Toulouse, from 1439 to 1451. It has been greatly battered, and presents but a poor approximation to its ancient beauty. Over this gate, which was once ornamented with the statues of St Sernin, St Exuperius and the twelve apostles, as well as those of the two brother archbishops of Toulouse, Denis (1 423-1 439) and Peter du Moulin, there is a beautiful 13th-century rose-window, whose centre, however, is not in a perpendicular line with the point of the Gothic arch below.

Among other remarkable churches may be noticed Notre-Dame de la Daurade, near the Pont Neuf, built on the site of a gth-century Benedictine abbey and reconstructed towards the end of the 18th century; and Notre-Dame de la Dalbade; perhaps existing in the nth, but in its present form dating from the 16th century, with a fine Renaissance portal. The church of the Jacobins, held by Viollet-le-Duc to be " one of the most beautiful brick churches constructed in the middle ages," was built towards the end of the 13th century, and consists of a nave divided into two aisles by a range of columns. The chief exterior feature is a beautiful octagonal belfry. The church belonged to a Dominican monastery, of which part of the cloister, the refectory, the chapter-hall and the chapel also remain and are utilized by the lycee. Of the other secular buildings the most noteworthy are the capitole and the museum. The capitole has a long Ionic facade built from 1750 to 1760. The theatre is situated in the left wing. Running along almost the whole length of the first floor is the salle des illustres adorned with modern paintings and sculptures relating to the history of the town. The museum (opened in 1795) occupies, besides a large modern building, the church, cloisters and other buildings of an old Augustinian convent. It contains pictures and a splendid collection of antiquities, notably a series of statues and busts of Roman emperors and others and much Romanesque sculpture. There is an auxiliary museum in the old college of St Raymond. The

natural history museum is in the Jardin des Plantes. The law courts stand on the site of the old Chateau Narbonais, once the residence of the counts of Toulouse and later the seat of the parlement of Toulouse. Near by is a statue of the jurist Jacques Cujas, born at Toulouse.

Tctilouse is singularly rich in mansions of the 16th and 17th centuries. Among these may be mentioned the Hotel Bernuy, a fine Renaissance building now used by the lycee and the H6tel d'Assezat of the same period, now the property of the Academie des Jeux Floraux (see below), and of the learned societies of the city. In the court of the. latter there is a statue of Clemence Isaure, a lady of Toulouse, traditionally supposed to have enriched the Academie by a bequest in the 15th century. The Maison de Pierre has an elaborate stone facade of 1612.

Toulouse is the seat of an archbishopric, of a court of appeal, a court of assizes and of a prefect. It is also the headquarters of the XVII. army corps and centre of an educational circum- scription {academie). There are tribunals of first instance and of commerce, a board of trade-arbitration, a chamber of commerce and a branch of the Bank of France. The educational institutions include faculties of law, medicine and pharmacy, science and

letters, a Catholic institute with faculties of thecyfc 6 y and letters, higher and lower ecclesiastical seminaries, lycees and training colleges for both sexes, and schools of veterinary science, fine arts and industrial sciences and music.

Toulouse, the principal commercial and industrial centre of Languedoc, has important markets for horses, wine, grain, flowers, leather, oil and farm produce. Its pastry and other delicacies are highly esteemed. Its industrial establishments include the national tobacco factory, flour-mills, saw-mills, engineering work- shops and factories for farming implements, bicycles, vehicles, artificial manures, paper, boots and shoes, and flour pastes.

Tolosa, chief town of the Volcae Tectosages, does not seem to have been a place of great importance during the early centuries of the Roman rule in Gaul, though in 106 b.c. the pillage of its temple by Q. S. Cepio, afterwards routed by the Cimbri, gave rise to the famous Latin proverb habet aurum Tolosanum, in allusion" to ill-gotten gains. It possessed a circus and an amphitheatre, but its most remarkable remains are to be found on the heights of

Old Toulouse (velus Tolosa) some 6 or 7 m. to the east, where huge accumulations of broken pottery and fragments of an old earthen vail mark the site of an ancient settlement. The numerous coins that have been discovered on the same spot do not date back farther than the 2nd century b.c, and seem to indicate the position of a Roman manufacturing centre then beginning to occupy the Gallic hill-fortress that, in earlier days, had in times of peril been the stronghold of the native tribes dwelling on the river bank. Tolosa does not seem to have been a Roman colony; but its importance must have increased greatly towards the middle of the 4th century. It is to be found entered in more than one itinerary dating from about this time; and Ausonius, in his Ordo nobilium urbium, alludes to it in terms implying that it then had a large population. In 419 it was made the capital of his kingdom by Wallia, king of the Visigoths, under whom or whose successors it became the seat of the great Teutonic kingdom of the West-Goths — a kingdom that within fifty years had extended itself from the Loire to Gibraltar and from the Rhone to the Atlantic. On the defeat of Alaric II. (507) Toulouse fell into the hands of Clovis, who carried away the royal treasures to Angouleme. Under the Merovingian kings it seems to have remained the greatest city of southern Gaul, and is said to have been governed by dukes or counts dependent on one or other of the rival kings descended from the great founder of the Frankish monarchy. It figures pro- minently in the pages of Gregory of Tours and Sidonius Apollinaris. About 628 Dagobert erected South Aquitaine into a kingdom for his brother Charibert, who chose Toulouse as his capital. For the next eighty years its history is obscure, till we reach the days of Charles Martel, when it was besieged by Sem'a, the leader of the Saracens from Spain (c. 715-720), but delivered by Eudes, " princeps Aquitaniae," in whom later writers discovered the ancestor of all the later counts of Toulouse. Modern criticism, however, has discredited this genealogy; and the real history of Toulouse recommences in 780 or 781, when Charlemagne appointed his little son Louis king of Aquitaine, with Toulouse for his chief city.

During the minority of the young king his tutor Chorson ruled at Toulouse with the title of duke or count. Being deposed at the Council of Worms (790), he was succeeded by William Courtnez, the traditional hero of southern France, who in 806 retired to his newly founded monastery at Gellone, where he died in 812. In the unhappy days of the emperor Louis the Pious and his children Toulouse suffered in common with the rest of western Europe. It

was besieged by Charles the Bald in 844, and taken four years later by the Normans, who in 843 had sailed up the Garonne as far as its walls. About 852 Raymond I., count of Quercy, succeeded his brother Fridolo as count of Rouergue and Toulouse; it is from this noble that all the later counts of Toulouse trace their descent. Raymond I.'s grandchildren divided their parents' estates; of these Ray- mond II. (d. 924) became count of Toulouse, and Ermengaud, count of Rouergue, while the hereditary titles of Gothia, Quercy and Albi were shared between them. Raymond II. 's grandson, William Taillefer (d. c. 1037), married Emma of Provence, and

handed down part of that lordship to his younger son Bertrand. 1 William's elder son Pons left two children, of whom William IV. succeeded his father in Toulouse, Albi, Quercy, &c; while the younger, Raymond IV. of St Gilles (c. 1066), made him- self master of the vast possessions of the counts of Rouergue, married his cousin the heiress of Provence, and about 1085 began to rule the immense estates of his elder brother, who was still living.

From this time the counts of Toulouse were the greatest lords in southern France. Raymond IV., the hero of the first crusade, assumed the formal titles of marquis of Provence, duke of Narbonne and count of Toulouse. W T hile Raymond was away in the Holy Land, Toulouse was seized by William IX., duke of Aquitaine, who claimed the city in right of his wife Philippa, the daughter of William IV., but was unable to hold it long (1008-1100). Raymond's son and successor Bertrand followed his father's example and set out for the Holy Land in 1109, leaving his great estates at his death to his brother Alphonse Jourdain. The rule of this prince was disturbed by the ambition of William IX. and his grand-daughter Eleanor, who urged her husband Louis VII. to support her claims to Toulouse by war. On her divorce from Louis and her marriage with Henry II., Eleanor's claims passed on to this monarch, who at last forced Raymond V. to do him homage for Toulouse in n 73. Raymond V., the patron of the troubadours, died in 1194, and was succeeded by his son Raymond VI., under whose rule Languedoc was desolated by the crusaders of Simon de Montfort, who occupied Toulouse in 121 5, but lost his life in besieging it in 1 218. Raymond VII., the son of Raymond VI. and Princess Joan of England, succeeded his father

in 1222, and died in 1249, leaving an only daughter Joan, married to Alfonso the brother of Louis IX. On the death of Alfonso and Joan in 1271 the vast inheritance of the counts of Toulouse lapsed to the Crown. 2 From the middle years of the 12 th century the people of Toulouse seem to have begun to free themselves from the most oppressive feudal dues. An act of Alphonse Jourdain (1141) exempts them from the tax on salt and wine; and in n 52 we have traces of a ” commune consilium Tolosae ” making police ordinances in its own name ” with the advice of Lord Raymond, count of Toulouse, duke of Narbonne, and marquis of Provence.” This act is witnessed by six ” capitularii,” four duly appointed judges (judices constituti) , and two advocates. Twenty-three years later there are twelve capitularii or consuls, six for the city and six for its suburbs, all of them elected and sworn to do justice in whatever municipal matters were brought before them. In 1222 their number was increased to twenty-four; but they were forbidden to touch the city property, which was to remain in the charge of certain ” communarii ” chosen by themselves. Early in the 14th century the consuls took the name of ” doinini de capitulo,” or, a little later, that of ” capitulum nobilium.” From the 13th century the consuls met in their own house, the ” palatium communitatis Tolosae ” or h6tel-de-ville. In the 16th century a false derivation changed the ancient consuls (domini de capitulo) into the modern ” capitouls ” (domini capitolii tolosani), a barbarous etymology which in its turn has, in the present century, transformed the old assembly house of Toulouse into the capitole. The

1 About 975 there was a partition of the estates which William Taillefer and his cousin Raymond II. of Auvergne held in common, — Albi, Quercy, &c, falling to William, and Gothia, &c, to Raymond.

2 List of the counts of Toulouse:

Chorson 778-790

William 1 790-806

Raymond Rafinel . c. 812-818 Berenger 818-835

Bernard 1 835-844

Warin 844-845

William II 845-850

Fridolo 850-852

Raymond 1 852-864

Bernard 864-875

Eudo 875-918

Raymond II. . . 9i8-c. 924

Raymond III. William Taillefer 1 Pons .... William IV. . . Raymond IV. Bertrand . Alphonse Jourdain Raymond V. . Raymond VI. Raymond VII. . Alfonso and Joan

924-c. 950 950-c. 1037 I 03 7- 1 060 060-c. 1093

1093-1096 109 6-1 109 1109-1148 1148-1194

I 194-1222

1 222-1 249 1249-1271

parlement of Toulouse was established as a permanent court in 1443. Louis XL transferred it to Montpellier in 1467, but restored it to Toulouse before the close of the next year. This parlement was for Languedoc and southern France what the parlement of Paris was for the north. During the religious wars of the 16th century the Protestants of the town made two unsuccessful attempts to hand it over to the prince de Conde. After St Bartholomew's Day (1572) 300 of the party were massacred. Towards the end of the 16th century, during the wars of the League, the parlement was split up into three different sections, sitting respectively at Carcassonne or Beziers, at Castle Sarrasin, and at Toulouse. The three were reunited in 1 596. Under Francis I. it began to persecute heretics, and in 1619 rendered itself notorious by burning the philosopher Vanini. In 1762 Jean Calas, an old man falsely accused of murdering his eldest son to prevent him becoming a Reman Catholic, was broken on the wheel. By the exertions of Voltaire his character was afterwards rehabilitated. The university of Toulouse owes its origin to the action of Gregory IX., who in 1229 bound Raymond VII. to maintain four masters to teach theology and eight others for canon law, grammar, and the liberal arts. Civil law and medicine ■ were taught only a few years later. The famous " Floral Games

” of Toulouse, in which the poets of Languedoc contended (May 1-3) for the prize of the golden amaranth and other gold or silver flowers, given at the expense of the city, were instituted in 1323-1324. The Academie des Jeux Floraux still awards these prizes for compositions in poetry and prose. In 1814 the duke of Wellington defeated Marshal Soult to the north-east of the town.

See L. Ariste and L. Brand, Histoire populaire de Toulouse depuis les origines jusqu’a ce jour (Toulouse, 1898). This work contains an exhaustive bibliography.

TOUNGOO, or Taung-ngu, a town and district in the Tenas- serim division of Lower Burma. The town is situated on the right bank of the river Sittang, 166 m. by rail N. from Rangoon. Pop. (1901), 15,837. From the 14th to the 16th century it was the capital of an independent kingdom. After the second Burmese War it was an important frontier station, but the troops were withdrawn in 1893. The district of Toungoo has an area of 6172 sq. m.; pop. (1901), 279,315, showing an increase of 32% in the preceding decade. Three mountain ranges traverse the district — the Pegu Yomas, the Karen, and the Nat-taung or ” Great Watershed ” — all of which have a north and south direction, and are covered for the most part with dense forest. The Pegu Yomas have a general elevation of from 800 to 1200 ft., while the central range averages from 2000 to 3000 ft. The rest of Toungoo forms the upper portion of the valley of the Sittang, the only large river in the district, the chief tributaries of which are the Shwa, Hkabaung, Hpyu Thank-ye-Kat and Yank-thua-wa, all navigable for a great portion of their course. Limestone appears in various places, and in the north-east a light grey marble is quarried for lime. The rivers form the chief means of communication during the rainy season. The rainfall in 1905 was 80-30 in. There are 14 railway stations in the district. Rice is the staple crop; there are promising plantations of coffee and rubber. Forests cover more than 5000 sq. m., of which 1337 sq. m. have been reserved, yielding a large revenue.

TOUP, JONATHAN [Joannes Toupius] (1713-1785), English classical scholar and critic, was born at St Ives in Cornwall, and was educated at a private school and Exeter College, Oxford. Having taken orders, he became rector of St Martin’s Exeter, where he died on the 19th of January 1785. Toup established his reputation by his Emendationes in Suidam (1760-1766, followed in 1775 by a supplement) and his edition of Longinus (1778), including notes and emendations by Ruhnken. The excellence of

Toup's scholarship was " known to the learned throughout Europe " (so epitaph on the tablet in the church of East Looe set up by the delegates of the Clarendon Press), but his overbearing manner and extreme self-confidence made him many enemies.

TOURACOU, the name, evidently already in use, under which in 1743 G. Edwards figured a pretty African bird, 1 and presumably that applied to it in Guinea, whence it had been brought alive. It is the Cuculus persa of Linnaeus, and Turacus

(Aft»r Schlegel.)

White-Crested Touracou (Turacus albicristatus) . or Corythaix persa of later authors. Cuvier in 1799 or 1800 Latinized its native name (adopted in the meanwhile by both French and German writers) as above, for which barbarous term J. K. W. Illiger, in 181 1, substituted a more classical word. In 1788 Isert described and figured (Beobacht. Gesellsch. naturf. Freunde, iii. 16-20, pi. 1) a bird, also from Guinea, which he called Musophaga violacca. Its affinity to the original Touracou was soon recognized, and both forms have been joined by modern systematists in the family Musophagidae, commonly Englished Plantain-eaters or Touracous.

To take first the Plantain-eaters proper, or the genus Musophaga, of which only two species are known. One, about the size of a crow, is comparatively common in museums, and has the horny base of its yellow bill prolonged backwards over the forehead in a kind of shield. The top of the head and the primaries, except their outer edge and tip, are deep crimson; a white streak extends behind the eye; and the rest of the plumage is glossy purple. The second species, M. rossae, which is rare, chiefly differs by wanting the white eye-streak. Then of the Touracous — the species origin- ally described is about the size of a jay, and has the head, crest (which is vertically compressed and tipped with red), neck and breast of grass-green, varied by two white streaks — one, from the gape to the upper part of the crimson orbit, separated by a black patch from the other, which runs beneath and behind the eye. The wing-coverts, lower part of the back, and tail are of steel-purple, the primaries deep crimson, edged and tipped with bluish black. Over a dozen other

congeneric species, more or less resembling this, have been described, and all inhabit some district of Africa. One, found in the Cape Colony and Natal, where it is known as the ” Lory ” (cf. xV. 7, note 1), though figured by Daubenton and others, was first differentiated in 1841 by Strickland (Ann. Nat. History, vii. 33) as Turacus albicristatus — its crest having a con- spicuous white border, while the steel-purple of T. persa is replaced by a rich and glossy bluish green of no less beauty. In nearly all the species of this genus the nostrils are almost completely hidden by the frontal feathers; but there are two others in which, though closely allied, this is not the case, and some systematists would place them in a separate genus Gallirex; while another species, the giant of the family, has been moved into a third genus as Cory- thaeola cristata. This differs from any of the foregoing by the absence of the crimson coloration of the primaries, and seems to lead to another group, Sckizorrhis, in which the plumage is of a still plainer type, anil, moreover, the nostrils here are not only exposed but in the form of a slit, instead of being oval as in all the

1 Apparently the first ornithologist to make the bird known was Albin, who figured it in 1738 from the life, yet badly, as ” The Crown-bird of Mexico.” He had doubtless been misinformed as to its proper country; but Touracous were called ” Crown-birds ” by the Europeans in West Africa, as witness Bosnian’s Description of the Coast of Guinea (2nd ed., 1721), p. 251, and W. Smith’s Voyage to Guinea (1745), p. 149, though the name was also given to the crowned cranes, Balearica.

rest. This genus contains about half-a-dozen species, one of which, S. concolor, is the Grey Touracou of the colonists in Natal, and is of an almost uniform slaty brown. A good deal has been written about these birds, which form the subject of a beautiful monograph — De Toerako’s afgebeld en beschreven — by Schlegel and Westerman, brcTught out at Amsterdam in i860; while further information is contained in an elaborate essay by Schalow (Journ. f. ornithologie, 1886, pp. 1-77). Still, much remains to be made known as to their distribution throughout Africa and their habits. They seem to be all fruit-eaters, and to frequent the highest trees, seldom coming to the ground. Very little can be confidently asserted as to their nidification, but at least one species of Schizorrhis is said to make a rough nest and therein lay three eggs of a pale blue colour. An extraordinary peculiarity attends the crimson coloration which adorns the primaries of so many of the Musophagidae. So long ago as 1 8 18,

Jules Verreaux observed (Proc. Zool. Society, 1 871, p. 40) that in the case of T. albicristatus this beautiful hue vanishes on exposure to heavy rain and reappears only after some interval of time and when the feathers are dry. 2

The Musophagidae form a distinct family, of which the Cuculidae are the nearest allies, the two being associated to torm the Cuculine as compared with the Psittacine division of Cuculiform birds (see Bird and Parrot). T. C. Eyton pointed out (Ann. Nat. History, 3rd series, vol. ii. p. 458) a feature possessed in common by the latter and the Musophagidae, in the " process attached to the anterior edge of the ischium," which he likened to the so-called " marsupial " bones of Didelphian mammals. J. T. Reinhardt has also noticed (Vidensk. meddels. naturhist. forening, 1871, pp. 326-341) another Cuculine character offered by the os uncina- tum affixed to the lower side of the ethmoid in the Plantain-eaters and Touracous; but too much dependence must not be placed on that, since a similar structure is presented by the frigate-bird (q.v.) and the petrels (q.v.). A corresponding process seems also to be found in Trogon (q.v.). The bill of nearly all the species of Muso- phagidae is curiously serrated or denticulated along the margin and the feet have the outer toe reversible, but usually directed backwards. No member of the family is found outside of the continental portion of the Ethiopian region. (A. N.)

TOURAINE, an old province in France, which stretched along both banks of the Loire in the neighbourhood of Tours, the river dividing it into Upper and Lower Touraine. It was bounded on the N. by Orleanais, W. by Anjou and Maine, S. by Poitou and E. by Berry, and it corresponded approximately to the modern department of Indre et Loire. Touraine took its name from the Turones, the tribe by which it was inhabited at the time of Caesar's conquest of Gaul. They were unwarlike, and offered practically no resistance to the invader, though they joined in the revolt of Vercingetorix in a.d. 52. The capital city, Caesarodunum, which was built on the site of the eastern part of the present city of Tours, was made by Valentinian the metropolis of the 3rd Lyon- naise, which included roughly the later provinces of Touraine, Brittany, Maine and Anjou. Christianity seems to have been introduced into Touraine not much earlier than the beginning of the 4th century, although tradition assigns St Gatien, the first bishop of Tours, to the 3rd. The most famous 01 its apostles was St Martin (jl. 375-400), who founded the abbey of Marmoutier, near Tours, and whose tomb

in the city became a celebrated shrine. Tours was besieged by the Visigoths in 428, and though it offered a successful resistance on this occasion it was included fifty years later in the territory of the Visigoths. The Tourangeans refused to adopt the Arian heresy of their conquerors, and this difference in religion materially assisted in 507 the conquest of the province by Clovis, whose orthodoxy was guaranteed by the miraculous intervention of St Martin. St Clotilda, wife of Clovis, spent the last years of her life in retreat at Tours. The possession of Touraine was constantly the subject of dispute between the Merovingian princes, and the province enjoyed no settled peace until the reign of Charlemagne. He established Alcuin as abbot of St Martin of Tours, and under his auspices the school of Tours became one of the chief seats of learning in

2 The fact of this colouring matter being soluble in water was incidentally mentioned at a meeting of the Zoological Society of London by W. B. Tegetmeier, and brought to the notice of Professor A. H. Church, who, after experiment, published in 1868 (Student and Intellectual Observer, i. 161-168) an account of it as ” Turacin, a new animal pigment containing copper.” Further information on the subject was given by Monteiro (Chem. News, xxviii. 201 ; Quart. Journ. Science, 2nd series, vol. iv. p. 132). The property is possessed by the crimson feathers of all the birds of the family.

the middle ages. In the 9th century Tours also became the ecclesiastical metropolis of Brittany, Maine and Anjou, and when the empire was divided by Louis the Pious into various districts or missatica, Tours was the centre of one of these, the boundaries of which corresponded roughly with those of the ecclesiastical jurisdiction of the city. Touraine suffered from the invasions of the Northmen, who massacred the monks of Marmoutier in 853, but never pillaged Tours. The administration of Touraine was entrusted, from Merovingian times onward, to counts appointed by the crown. The office became hereditary in 940 or 941 with Thibault the Old or the ” Tricheur.” His son Odo I. was attacked by Fulk the Black, count of Anjou, and despoiled of part of his territory. His grandson Thibault III., who refused homage to Henry I., king of France, in 1044, was entirely dispossessed by Geoffrey of Anjou, called the Hammer (d. 1060). The 7th count,

Fulk (d. 1 109), ruled both Anjou and Touraine, and the county of Touraine remained under the domination of the counts of Anjou (q.v.) until Henry II. of England deprived his brother Geoffrey of Touraine by force of arms. Henry II. carried out many improvements, but peace was destroyed by the revolt of his sons. Richard Coeur de Lion, in league with Philip Augustus, had seized Touraine, and after his death Arthur of Brittany was recognized as count. In 1204 it was united to the French crown, and its cession was formally acknowledged by King John at Chinon in 12 14. Philip appointed Guillaume des Roches hereditary seneschal in 1204, but the dignity was ceded to the crown in 13 12. Touraine was granted from time to time to princes of the blood as an appanage of the crown of France. In 1328 it was held by Jeanne of Burgundy, queen of France; by Philip, duke of Orleans, in 1344; and in 1360 it was made a peerage duchy on behalf of Philip the Bold, afterwards duke of Burgundy. It was the scene of dispute between Charles, afterwards Charles VII., and his mother, Isabel of Bavaria, who was helped by the Burgundians. After his expulsion from Paris by the English Charles spent much of his time in the chateaux of Touraine, although his seat of government was at Bourges. He bestowed the duchy successively on his wife Mary of Anjou, on Archibald Douglas and on Louis III. of Anjou. It was the dower of Mary Stuart as the widow of Francis II. The last duke of Touraine was Francis, duke of Alencon, who died in 1584. Plessis-les-Tours had been the favourite residence of Louis XL, who granted many privileges to the town of Tours, and increased its prosperity by the establishment of the silk-weaving industry. The reformed religion numbered many adherents in Touraine, who suffered in the massacres following on the conspiracy of Amboise; and, though in 1562 the army of Conde pillaged the city of Tours, the marshal of St Andre reconquered Touraine for the Catholic party. Many Huguenots emigrated after the massacre of St Bartholomew, and after the revocation of the Edict of Nantes the silk industry, which had been mainly in the hands of the Huguenots, was almost destroyed. This migration was one of the prime causes of the extreme poverty of the province in the next century. At the Revolution the nobles of Touraine made a declaration expressing their sympathy with the ideas of liberty and fraternity. Among the many famous men who were born within its boundaries are Jean le Meingre Boucicaut, marshal of France, Beroalde de Verville, author of the Moyen de parvenir, Rabelais, Cardinal Richelieu, C. J. Avisseau, the potter (1 796-1861), the novelist Balzac and the poet Alfred de Vigny.

See the quarterly publication of the Memoires of the Societe archeologique de Touraine (1842, &c.) which include a Dictionnaire geographique, historique et biographique (6 vols., 1878-1884), by J. X. Carre de Busserolle. There are histories of Touraine and its monuments by Chalmel (4 vols. Paris, 1828), by S. Bellanger (Paris, 1845), by Bourrasse (1858). See also Dupin de Saint Andre\ Hist, du protestantisme en Touraine (Paris, 1885); T. A. Cook, Old Touraine (2 vols. London, 1892).

TOURCOING, a manufacturing town of northern France in the department of Nord, less than a mile from the Belgian frontier, and 8 m. N.N.E. of Lille on the railway to

Ghent. Pop. (1906), 62,694 (commune, 81,671), of whom about one-third are natives of Belgium. Tourcoing is prac- tically one with Roubaix to the south, being united thereto by a tramway and a branch of the Canal de Roubaix. The public institutions comprise a tribunal of commerce, a board of trade arbitrators, a chamber of commerce, an exchange and a condi- tioning house for textiles. Together with Roubaix, Tourcoing ranks as one of the chief textile centres of France. Its chief industry is the combing, spinning and twisting of wool carried on in some eighty factories employing between 10,000 and 12,000 workpeople. The spinning and twisting of cotton is also important. The weaving establishments produce woollen and mixed woollen and cotton fabrics together with silk and satin drapery, swanskins, jerseys and other fancy goods. The making of velvet pile carpets and upholstering materials is a speciality of the town. To these industries must be added those of dyeing, the manufacture of hosiery, of the machinery and other apparatus used in the textile factories and of soap.

Famed since the 12th century for its woollen manufactures, Tourcoing was fortified by the Flemings in 1477, when Louis XL of France disputed the inheritance of Charles the Bold with Mary of Burgundy, but in the same year was taken and pillaged by the French. In 1794 the Republican army, under Generals Moreau and Souham, gained a decisive victory over the Austrians, the event being commemorated by a monument in the public garden. The inhabitants, 18,000 in 1789, were reduced by the French Revolution to 10,000.

TOURMALINE, a mineral of much interest to the physicist on account of its optical and electrical properties; it is also of some geological importance as a rock-constituent (see Schorl), whilst

certain transparent varieties have economic value as gem-stones. The name is probably a • corruption of turmali, or toramalli, the native name applied to tourmaline and zircon in Ceylon, whence specimens of the former mineral were brought to Europe by the Dutch in 1703. The green tourmaline of Brazil had, however, been known here much earlier; and coarse varieties of the mineral had passed for cen- turies under the German name of Schorl, an old mining word of uncertain origin, possibly connected with the old German Schor (refuse), in allusion to the occurrence of the mineral with the waste of the tin-mines. The German village of Schorlau may have taken its name from the mineral. It has been suggested that the Swedish form skorl has possible connexion with the word skor, brittle.

Tourmaline crystallizes in the rhombohedral division of the hexagonal system. The crystals have generally a prismatic habit, the prisms being longitudinally striated or even channelled. Trigonal prisms are characteristic, so that a transverse section becomes triangular or often nine-sided. By combination of several prisms the crystals may become sub-cylindrical. The crystals when doubly terminated are often hemimorphic or present dissimilar forms at the opposite ends; thus the hexagonal prisms in fig. 1 are terminated at one end by rhombohedral faces, 0, P, and at the other by the basal plane k'. Doubly- terminated crystals, however, are com- paratively rare ; the crystals being usually attached at one end to the matrix. It is notable that prismatic crystals of tour- maline have in some cases been curved and fractured transversely ; the displaced fragments having been cemented together by deposition of fresh mineral matter.

Fig. 1.

Tourmaline is not infre- quently columnar, acicular or fibrous; and the fibres may radiate from a centre so as to form the so-called " tourmaline suns." Crystals of tourmaline present no distinct cleavage, but break with a sub-conchoidal fracture; and whilst the general lustre of the mineral is vitreous, that of the fractured surface is rather pitchy. The hardness is slightly above that of quartz (7). The specific gravity varies according to chemical composition, that of the colourless varieties being about 3, whilst in schorl it may rise to 3-2. Tourmaline has a great range of colour, and in many cases the crystals are curiously parti-coloured. Occasionally, though rarely, the mineral is colourless, and is then known as achroite, a name proposed by R. Hermann in 1845, and derived from the Greek

axpoos (uncoloured) . Red tourmaline, which when of fine colour is the most valued of all varieties, is known as rubellite (q.v.). Green tourmaline is by no means uncommon, but the blue is rather rare

and is distinguished by the name indigolite, generally written indi- colite. Brown is a common colour, and black still more common, this being the usual colour of schorl, or common coarse tourmaline. Thin splinters of schorl may, however, be blue or brown by transmitted light.

The double refraction of tourmaline is strong. The mineral is optically negative, the ordinary index being about 1-64, and the extraordinary 1-62. Coloured tourmalines are intensely pleochroic, the ordinary ray, which vibrates perpendicular to the principal axis, being much more strongly absorbed than the extraordinary; hence a slice cut in the direction of the principal or optic axis trans- mits sensibly only the extraordinary ray, and may consequently be used as a polarizing medium. The brown tourmaline of Ceylon and Brazil is best adapted for this purpose, but the green is also used. Two plates properly mounted form the instrument used by opticians for testing spectacle-lenses, and are known as the ” tourmaline tongs.” In order to secure the best colour-effect when used as a gem-stone, the tourmaline should be cut with the table parallel to the optic axis.

It was in tourmaline that the phenomenon of pyroelectricity was first observed. On being heated in peat ashes its attractive power was observed by the Dutch, in the early part of the 18th century; and this curious character obtained for it the name of aschtrekker, or ash-drawer. J. R. Haiiy first pointed out the relation of pyroelec- tricity with hemimorphism. Tourmaline is also* piezoelectric, that is, it becomes electric by pressure. If a crystal be subjected to pressure along the optic axis, it behaves as though it were contracting by reduction of temperature. The mineral may also be rendered electric by friction, and retains the charge for a long time.

Tourmaline is a boro-silicate of singularly complex composition. Indeed the word tourmaline is sometimes regarded as the name of a group of isomorphous minerals rather than that of a definite

species. Numerous analyses have been made, and the results discussed by a large number of authorities. In the view of S. L. Penfield and H. W. Foote all tourmaline may be derived from a boro-silicic acid of the formula Haˆ Giˆi. It is believed that the hydrogen is present as hydroxyl, and that this may be partially replaced by fluorine. The tourmaline acid has probably the constitution His(B-OH) 2 Si40i9. Nine atoms of hydrogen are replaced by three of aluminium, and the remaining nine in part by other metals. Lithium is present in red tourmaline; magnesium dominates in brown; iron, manganese and sometimes chromium are found in green ; and much iron occurs in the black varieties. Four groups are sometimes recognized, characterized by the presence of (1) lithium, (2) ferrous iron, (3) ferric iron and (4) magnesium.

Tourmaline occurs commonly in granite, greisen, gneiss and crystalline schists. In many cases it appears to have been formed by pneumatolysis, or the action on the rocks of heated vapours containing boron and fluorine, as in many tin-bearing districts, where tourmaline is a characteristic mineral. Near the margin of a mass of granite the rock often becomes schorlaceous or tourmaliniferous, and may pass into ” tourmaline-rock,” which is usually an aggregate of tourmaline and quartz. Tourmaline is an essential constituent of the west of England rocks called luxullianite (luxul’y- anite) and trowlesworthite. It occurs embedded in certain meta- morphic limestones, where it is possibly due to fumarolic action. Microscopic crystals are common in clay-slate. By resistance to decomposition, tourmaline often survives the disintegration of the. matrix, and thus passes into sands, clays, marls and other sedimentary deposits.

Many of the finest crystals of tourmaline occur in druses in granitic rocks, such as those of San Piero in Elba, where some of the pale pink and green prisms are tipped with black, and have consequently been called ” nigger-heads. Lepidolite is a common associate of tourmaline, as at Rozena in Moravia. Tourmaline occurs, with corundum, in the dolomite of Campolongo, in canton Ticino, Switzerland. Fine black crystals, associated with apatite and quartz, were formerly found in granite at Chudleigh, near Bovey Tracey in Devonshire. The Russian localities for tourmaline are mentioned under Rubellite. Most of the tourmaline cut for jewelry comes from the gem-gravels of Ceylon. The green tour- maline has generally a yellowish or olive-green colour, and is known as ” Ceylon chrysolite.” Fine green crystals

are found in Brazil, notably in the topaz-locality of Minas Novas; and when of vivid colour they have been called ” Brazilian emeralds.” Green tour- maline is a favourite ecclesiastical stone in South America Blue tourmaline occurs with the green ; this variety is found also at Uto in Sweden (its original locality) and notably near Hazaribagh in Bengal. Certain kinds of mica occasionally contaia flat crystals of tourmaline between the cleavage-planes.

Many localities in the United States are famous for tourmaline. Magnificent specimens have been obtained from Mt Mica, near Paris, Maine, where the mineral was accidentally discovered in 1820 by two students, E. L. Hamlin and E. Holmes. It occurs in granite, with lepidolite, smoky quartz, spodumene, &c. ; and some of the prismatic crystals are notable for being red at one end and green at the other. Mt Rubellite at Hebron, and Mt Apatite at Auburn, are other localities in Maine which have yielded fine tour- maline. At Chesterfield, Massachusetts, remarkable crystals occur, some of which show on transverse section a triangular nucleus of

red tourmaline surrounded by a shell of green. Red and green tourmalines, with lepidolite and kunzite, are found in San Diego county, California. Fine coloured tourmalines occur at Haddam Neck, Connecticut; and excellent crystals of black tourmaline are well known from Pierrepont, New York, whilst remarkable brown crystals occur in limestone at Gouverneur in the same state. Canada is rich in tourmaline, notably at Burgess in Lanark county, Ontario, and at Grand Calumet Island in the Ottawa river. . Heemskirk Mountain, Tasmania, and Kangaroo Island, South Australia, have yielded fine coloured tourmaline fit for jewelry. Madagascar is a well-known locality for black tourmaline in large crystals.

Many varieties of tourmaline have received distinctive names, some of which are noticed above. Dravite is G. Tschermak’s name for a brown tourmaline, rich in magnesia but with little iron, occur- ring near Unter Drauburg in the Drave district in Carinthia. Taltalite was a name given by I. Domeyko to a mixture of tourmaline and copper ore from Taltal in Chile. The colourless Elba tourmaline was called apvrite by J. F. L. Hausmann, in allusion to its refractory behaviour before the blow-pipe ; whilst a black iron-tourmaline from Norway was termed aphrazite by J. B. d’Andrada, in consequence of its intumescence when heated. (F. W. R. *)

TOURNAI (Flemish Doornik), a city of Belgium, in the province of Hainaut, situated on the Scheldt. Pop. (igc-4), 36,744. Although in the course of its long history it has undergone many sieges and was sacked at various epochs by the Vandals, Normans, French and Spaniards, it preserves many monuments of its ancient days. Among these is the cathedral of Notre-Dame, one of the finest and best preserved Romanesque and Gothic examples in Belgium (for plan, &c, see Architecture: Romanesque and Gothic in Belgium). Its foundation dates from the year 1030, while the nave is Roman- esque of the middle of the 12th century, with much pointed work. The transept was added in the 13th century. The first choir was burned down in 12 13, but was rebuilt in 1242 at the same time as the transept, and is a superb specimen of pointed Gothic. There are five towers with spires, which give the outside an impressive appearance, and much has been done towards removing the squalid buildings that formerly con- cealed the cathedral. There are several old pictures of merit, and the shrine of St Eleuthere, the first bishop of Tournai in the 6th century, is a remarkable product of the silversmith's art. The belfry on the Grand Place was built in 1187, partly reconstructed in 1391 and finally restored and endowed with a steeple in 1852. The best view of the cathedral can be obtained from its gallery. The church of St Quentin in the. same square as the belfry is almost as ancient as Notre- Dame, and the people of Tournai call it the " little cathedral." In the church of St Brice is the tomb of Childeric discovered in 1655. Among the relics were three hundred small golden models of bees. These were removed to Paris, and when Napoleon was crowned emperor a century and a half later he chose Childeric's bees for the decoration of his coronation mantle. In this manner the bee became associated with the Napoleonic legend just as the lilies were with the Bourbons. The Pont des Trous over the Scheldt, with towers at each end, was built in 1290, and among many other interesting buildings there are some old houses still in occupation which date back to the 13th century. On the Grand Place is the fine statue of Christine de Lalaing, princess d'Epinoy, who defended Tournai against Parma in 1581. Tournai carries on a large trade in carpets (called Brussels), bonnet shapes, corsets and fancy goods generally. With regard to the carpet manufactory, it is said locally to date from the time of the Crusades, and it is presumed that the Crusaders learnt the art from the Saracens.

The history of Tournai dates from the time of Julius Caesar, when it was called civitas Nerviorum or castrum Turnacum. In the

reign of Augustus, Agrippa fixed the newly mixed colony of Suevi and Menapii at Tournai, which continued throughout the period of Roman occupation to be of importance. In the 5th century the Franks seized Tournai, and Merovaeus made it the capital of his dynasty. This it remained until the subdivision of the Frank monarchy among the sons of Clovis. When feudal possessions, instead of being purely personal, were vested in the families of the holder after the death of Charlemagne, Tournai was specially assigned to Baldwin of the Iron Arm by Charles

Plate.

KNIGHTS JOUSTING WITH CRONELLS ON THEIR LANCES. French MS. early XIV Century. (Royal MS. 14 E. iii.)

KNIGHTS JOUSTING. From a French MS. of the latter half of the XV Century. (Cotton MS. Nero D. ix.)

ENGLISH KNIGHTS RIDING INTO THE LISTS. From the Great Tournament Roll of 151 1; by permission of the Colleee of Arms.

the Bald, whose daughter Judith he had abducted, on receiving the hereditary title of count of Flanders. During the Bur- gundian period it was the residence of Margaret of York, widow of Charles the Bold; and the pretender Perkin Warbeck, whom she championed, if not born there, was the reputed son of a Jew of Tournai. In the early 16th century Tournai was an English possession for a few years and Henry VIII. sold it to Francis I. It did not long remain French, for in 1521 the count of Nassau, Charles V.'s general, took it and added it to the Spanish provinces. During the whole of the middle ages Tournai was styled the " seigneurie de Tournaisis," and pos- sessed a charter and special privileges of its own. Near Tournai was fought, on the nth of May 1745, the famous battle of Fontenoy. (D. C. B.)

TOURNAMENT, or Tourney (Fr. tournetnent, tournoi, Med. Lat. torneamentum, from tourner, to turn), the name popularly given in the middle ages to a species of mock fight, so called owing to the rapid turning of the horses (Skeat). Of the several medieval definitions of the tournament given by Du Cange {Glossarium,

s.v. ” Tourneamentum “), the best is that of Roger of Hoveden, who described tournaments as ” military exercises carried out, not in the spirit of hostility inullo interveniente odio), but solely for practice and the display of prowess (pro solo exercitio, atque ostenlalione virium).” Men who carry weapons have in all ages played at the game of war in time of peace. But the tournament, properly so called, does not appear in Europe before the nth century, in spite of those elaborate fictions of Ruexner’s Thurnierbuch which detail the tournament laws of Henry the Fowler. More than one chronicler records the violent death, in 1066, of a French baron named Geoffroi de Preulli, who, according to the testimony of his contemporaries, ” invented tournaments.” In England, at least, the tourna- ment was counted a French fashion, Matthew Paris calling it confiidus gallicus.

By the 12th century the tournament had grown so popular in England that Henry II. found it necessary to forbid the sport which gathered in one place so many barons and knights in arms. In that age we have the famous description by William FitzStephen of the martial games of the Londoners in Smith- field. He tells how on Sundays in Lent a noble train of young men would take the field well mounted, rushing out of the city with spear and shield to ape the feats of war. Divided into parties, one body would retreat, while another pursued striving to un- horse them. The younger lads, he says, bore javelins disarmed of their steel, by which we may know that the weapon of the elders was the headed lance. William of Newbury tells us how the young knights, balked of their favourite sport by the royal mandate, would pass over sea to win glory in foreign lists. Richard I. relaxed his father’s order, granting licences for tournaments, and Jocelin of Brakelond has a long story of the great company of cavaliers who held a tournament between Thetford and Bury St Edmunds in defiance of the abbot. From that time onward unlicensed tourneying was treated as an offence against the Crown, which exacted heavy fees from all taking part in them even when a licence had been obtained. Often the licence was withheld, as in 1255, when the king’s son’s grave peril in Gascony is alleged as a reason for forbidding a meeting. In 1299 life and limb were declared to be forfeit in the case of those who should arrange a tourney without the royal licence, and offenders were to be seized with horse and harness. As the tournament became an occasion for pageantry and feasting, new reason was given for restraint: a simple knight might beggar himself over a sport which risked costly horses and carried him

far afield. Jousters travelled from land to land, like modern cricketers on their tours, offering and accepting challenges. Thus Edward L, before coming to the throne, led eighty knights to a tournament on the Continent. Before the jousts at Windsor on St George's Day in 1344 heralds published in France, Scotland, Burgundy, Hainault, Flanders, Brabant and the domains of the emperor the king's offer of safe conduct for competitors. At the weddings of princes and magnates and at the crowning of kings the knights gathered to the joustings,

which had become as much a part of such high ceremonies as the banquet and the minstrelsy. The fabled glories of the Round Table were revived by princely hosts, who would assemble a gallant company to keep open house and hold the field against all comers, as did Mortimer, the queen's lover, when, on the eve of his fall, he brought all the chivalry of the land to the place where he held his Round Table. About 1292 the " Statute of Arms for Tournaments " laid down, " at the request of the earls and barons and of the knighthood of England," new laws for the game. Swords with points, were not to be used, nor pointed daggers, nor club nor mace. None was to raise up a fallen knight but his own appointed squires, clad in his device. The squire who offended was to lose horse and arms and lie three years in gaol. A northern football crowd would understand the rule that forbade those coming to see the tournament to wear harness or arm themselves with weapons. Disputes were to be settled by a court of honour of princes and earls. That such rules were needful had been shown at Rochester in 12 51, where the foreign knights were beaten by the English and so roughly handled that they fled to the city for refuge. On their way the strangers were faced by another company of knights who handled them roughly and spoiled them, thrashing them with staves in revenge for the doings at a Brackley tournament. Even as early as the 13th century some of these tournaments were mere pageants of horsemen. For the Jousts of Peace held at Windsor Park in 1278 the sword-blades are of whalebone and parchment, silvered; the helms are of boiled leather and the shields of light timber. But the game could make rough sport. Many a tournament had its tale of killed and wounded in the chronicle books. We read how Roger of Lemburn struck Arnold de Montigny dead with a lance thrust under the helm. The first of the Montagu earls of Salisbury died of hurts taken at a Windsor jousting, and in those same lists at Windsor the earl's grandson Sir William Montagu was killed by his own father. William Longespee in 1256 was so bruised that he

never recovered his strength, and he is among many of whom the like is written. Blunted or " rebated " lance-points came early into use, and by the 14th century the coronall or cronell head was often fitted in place of the point. After 1400 the armourers began to devise harness with defences specially wrought for service in the lists. But the joust lost its chief perils with the invention of the tilt, which, as its name imports, was at first a cloth stretched along the length of the lists. The cloth became a stout barrier of timber, and in the early 16th century the knight ran his course at little risk. Locked up in steel harness, reinforced with the grand-guard and the other jousting pieces, he charged along one side of this barrier, seeing little more through the pierced sight-holes of the helm than the head and shoulders of his adversary. His bridle arm was on the tilt-side, and thus the blunted lance struck at an angle upon the polished plates. Mishaps might befall. Henry II. of France died from the stroke of Gabriel de Montgomeri, who failed to cast up in time the truncheon of his splintered lance. But the 16th-century tournament was, in the main, a bloodless meeting.

The 15th century had seen the mingling of the tournament and the pageant. Adventurous knights would travel far afield in time of peace to gain worship in conflicts that perilled life and limb, as when the Bastard of Burgundy met the Lord Scales in 1466 in West Smithfield under the fair and costly galleries crowded with English dames. On the first day the two ran courses with sharp spears; on the second day they tourneyed on horseback, sword in hand; on the third day they met on foot with heavy pole-axes. But the great tournament held in the market-place of Bruges, when the jousting of the Knights of the Fleece was part of the pageant of the Golden Tree, the Giant and the Dwarf, may stand as a magnificent example of many such gay gatherings. When Henry VIII. was scattering his father's treasure the pageant had become an elaborate masque. For two days after the crowning of the king at Westminster, Henry and his queen viewed from the galleries of a fantastic palace set up beside the tilt-yard a play in which deer were pulled down by greyhounds in a paled park, in which the Lady Diana

and the Lady Pallas came forward, embowered in moving castles, to present the champions. Such costly shows fell out of fashion after the death of Henry VIII.; and in England the tournament remained, until the end, a martial sport. Sir Henry Lee rode as Queen Elizabeth's champion in the tilt-yard of Whitehall until his years forced him to surrender the gallant office to that earl of Cumberland who wore the Queen's glove pinned to the flap of his hat. But in France the tournament lingered on until it degenerated to the carrousel, which, originally a horseman's game in which cavaliers pelted each other with balls, became an unmartial display when the French king and his courtiers pranced in such array as the wardrobe-master of the court ballets would devise for the lords of Ind and Africk.

The tournament was, from the first, held to be a sport for men of noble birth, and on the Continent, where nobility was more exactly defined than in England, the lists were jealously closed to all Combatants but those of the privileged class. In the German lands, questions as to the purity of the strain of a candi- date for admission to a noble chapter are often settled by appeal to the fact that this or that ancestor had taken part in a tourna : ment. Konrad Griinenberg's famous heraldic manuscript shows us the Helmschau that came before the German tournament of the 15th century — the squires carrying each his master's crested helm, and a little scutcheon of arms hanging from it, to the hall where the king of arms stands among the ladies and, wand in hand, judges each blazon. In England several of those few rolls of arms which have come down to us from the middle ages record the shields displayed at certain tournaments. Among the illustrations of the article Heraldry will be seen a leaf of a roll of arms of French and English jousters at the Field of the Cloth of Gold, and this leaf is remarkable as illustrating also the system of " checques " for noting the points scored by the champions. (O.Ba.)

TOURNEFORT, JOSEPH PITTON DE (1656-1708), French botanist, was born at Aix, in Provence, on the 5th of June 1656. He studied in the convent of the Jesuits at Aix, and was destined for the Church, but the death of his father left him free to follow his botanical inclinations. After two years' collecting, he studied medicine at Montpellier, but was appointed pro- fessor of botany at the Jardin des Plantes in 1683. By the king's order he travelled through western Europe, where he made extensive collections, and subsequently spent three years in Greece and Asia Minor (1 700-1 702). Of this journey a de- scription in a series of letters

was posthumously published in 3 vols. (Relation d'un voyage du Levant, Lyons, 1717). His principal work is entitled Institutiones rei herbariae (3 vols. Paris, 1700), and upon this rests chiefly his claims to remem- brance as one of the most eminent of the systematic botanists who prepared the way for Linnaeus. He died on the 28th of December 1708.

TOURNEUR, CYRIL (c. 1 575-1626), English dramatist, was perhaps the son of Captain Richard Turner, water-bailiff and subsequently lieutenant-governor of Brill in the Netherlands. Cyril Tourneur also served in the Low Countries, for in 1613 there is a record made of payment to him for carrying letters to Brussels. He enjoyed a pension from the government of the United Provinces, possibly by way of compensation for a post held before Brill was handed over to the Dutch in 1616. In 1625 he was appointed by Sir Edward Cecil, whose father had been a former governor of Brill, to be secretary to the council of war. This appointment was cancelled by Buckingham, but Tourneur sailed in Cecil's company to Cadiz. On the return voyage from the disastrous expedition he was put ashore at Kinsale with other sick men, and died in Ireland on the 28th of February 1626. (M.Br.)

An allegorical poem, worthless as art and incomprehensible as allegory, is his earliest extant work; an elegy on the death of Prince Henry, son of James I., is the latest. The two plays on which his fame rests, and on which it will rest for ever, were published respectively in 1607 and 1611, but all students have agreed to accept the internal evidence which assures us that the later in date of publication must be the

earlier in date of composition. His only other known work is an epicede on Sir Francis Vere, of no great merit as poetry, but of some value as conveying in a straightforward and mascu- line style the poet's ideal conception of a perfect knight or " happy warrior," comparable by those who may think fit to compare it with the more nobly realized ideals of Chaucer and of Wordsworth. But if Tourneur had left on record no more memorable evidence of his powers than might be supplied by the survival of his elegies, he could certainly have claimed no higher place among English writers than is now occupied by the Rev. Charles Fitzgeoffrey, whose voluminous and fer- vent elegy on Sir Francis Drake is indeed of more actual value, historic or poetic, than either or than both of Tourneur's elegiac rhapsodies. The singular power, the singular originality and the singular

limitation of his genius are all equally obvious in The Atheist's Tragedy, a dramatic poem no less crude and puerile and violent in action and evolution than simple and noble and natural in expression and in style. The executive faculty of the author is in the metrical parts of his first play so imperfect as to suggest either incompetence or perversity in the workman; in The Revenger's Tragedy it is so magnificent, so simple, im- peccable and sublime that the finest passages of this play can be compared only with the noblest examples of tragic dialogue or monologue now extant in English or in Greek. There is no trace of imitation or derivation from an alien source in the genius of this poet . The first editor of Webster has observed how often he imitates Shakespeare; and, in fact, essentially and radically independent as is Webster's genius also, the sovereign influence of his master may be traced not only in the general tone of his style, the general scheme of his composition, but now and then in a direct and never an unworthy or imper- fect echo of Shakespeare's very phrase and accent. But the resemblance between the tragic verse of Tourneur and the tragic verse of Shakespeare is simply such as proves the natural affinity between two great dramatic poets, whose inspiration partakes now and then of the quality more proper to epic or to lyric poetry. The fiery impulse, the rolling music, the vivid illustration of thought by jets of insuppressible passion, the perpetual sustenance of passion by the implacable persist- ency of thought, which we recognise as the dominant and distinctive qualities of such poetry as finds vent in the utter- ances of Hamlet or of Timon, we recognise also in the scarcely less magnificent poetry, the scarcely less fiery sarcasm, with which Tourneur has informed the part of Vindice— a harder- headed Hamlet, a saner and more practically savage and serious Timon. He was a satirist as passionate as Juvenal or Swift, but with a finer faith in goodness, a purer hope in its ultimate security of triumph. This fervent constancy of spirit relieves the lurid gloom and widens the limited range of a tragic imagina- tion which otherwise might be felt as oppressive rather than inspiriting. His grim and trenchant humour is as peculiar in its sardonic passion as his eloquence is original in the strenuous music of its cadences, in the roll of its rhythmic thunder. As a playwright, his method was almost crude and rude in the headlong straightforwardness of its energetic simplicity; as an artist in character, his interest was intense but narrow, his power magnificent but confined; as a dramatic poet, the force of his genius is great enough to ensure him an enduring place among the foremost of the followers of Shakespeare.

(A. C. S.) Bibliography. — The complete list of his extant works runs: The Atheists Tragedie; or, The Honest Man's Revenge (161 1); A Funerall Poeme Upon the Death of the Most Worthie and True Soldier, Sir Francis Vere, Knight . . . (1609); "A Griefe on the Death of Prince Henrie, Expressed in a Broken Elegie . . .," printed with two other poems by John Webster and Thomas Haywood as Three Elegies on the most lamented Death of Prince Henry (1613) ; The Revengers Tragaedie (1607 and 1608) ; and an obscure satire, The Transformed Metamorphosis (1600). The only other play of Tourneur's of which we have any record is The Nobleman, the MS. of which was destroyed by John Warburton's cook. This was entered on the Stationers' Register (Feb. 15, 1612) as a " Tragecomedye called The Nobleman written by Cyrill Tourneur." In 1613 a letter from Robert Daborne to Henslowe states that he has commissioned Cyril Tourneur to write one act of the promised Arraignment of

London. " The Character of Robert, earl of Salisburye, Lord High Treasurer of England . . . written by Mr Sevill Turneur . . .," in a MS in possession of Lord Mostyn (Hist. MSS. Commission, 4th Report, appendix, p. 361) may reasonably be assigned to Tourneur. Although no external evidence is forthcoming, Mr R. Boyle names Tourneur as the collaborator of Massinger in The Second Maid's Tragedy (licensed 161 1).

The Revenger's Tragedy was printed in Dodsley's Old Plays (vol. iv., 1744, 1780 and 1825), and in Ancient British Drama (1810. vol. ii.). The best edition of Tourneur's works is The Plays and Poems of Cyril Tsurneur, edited with Critical Introduction and Notes, by J. Churton Collins (1878). See also the two plays printed with the masterpieces of Webster, with an introduction by J A. Symonds, in the" Mermaid Series " (1888 and 1903). No particulars of Tourneur's life were available until the facts given above were abstracted by Mr Gordon Goodwin from the Calendar of State Papers (" Domestic Series," 1628-1629, 1629-1631, 1631-1633) and printed in the Academy (May 9, 1891). A critical study of the relation of The Atheist's Tragedy to Hamlet and other revenge-plays is given in Professor A. H. Thorndike's " Hamlet and Contemporary Revenge Plays " (Publ. of the Mod. Lang. Assoc, Baltimore, 1902). For the influence of Marston on Tourneur see E. E. Stoll, John Webster . . . (1905, Boston,

Massachusetts); pp. 105-116. (M.Br.)

TOURNEUX, JEAN MAURICE (1849-), French man of letters and bibliographer, son of the artist and author J. F. E. Tourneux, was born in Paris on the 12th of July 1849. He began his career as a bibliographer by collaborating in new editions of the Supercheries litteraires of Joseph Querard and the Dictionnaire des anonymes of Antoine Barbier. His most important bibliographical work was the Bibliographie de I'histoire de Paris pendant la revolution franqaise (3 vols. 1890- 1901), which was crowned by the Academy of Inscriptions. This valuable work serves as a guide for the history of the city beyond the limits of the Revolution.

His other works include bibliographies of Prosper Merimee (1876), of Theophile Gautier (1876), of the brothers deGoncourt (1897) and others; also editions of F. M. Grimm's Correspondance litteraire, of Diderot's Neveu de Rameau (1884), of Montesquieu's Lettres persanes (1886), &c.

TOURNON, a town of south- western France, capital of an arrondissement in the department of Ardeche, on the right bank of the Rhone, 58 m. S. of Lyons by rail. Pop. (1906), town, 3642; commune, 5003. Tournon preserves a gateway of the 15th century and other remains of fortifications and an old castle used as town hall, court-house and prison and con- taining a Gothic chapel. The church of St Julian dates chiefly from the 14th century. The lycee occupies an old college founded in the 16th century by Cardinal Francois de Tournon. Of the two suspension bridges which unite the town with Tain on the left bank of the river, one was built in 1825 and is the oldest in France. A statue to General Rampon (d. 1843) stands in the Place Carnot. Wood-sawing, silk-spinning, and the manufacture of chemical manures, silk goods and hosiery are carried on in the town, which has trade in the wine of the Rhone hills. Tournon had its own counts as early as the reign of Louis I. In the middle of the 17th century the title passed from them to the dukes of Ventadour.

TOURNUS, a town of east-central France, in the depart- ment of Saone-et-Loire, on the right bank of the Saone, 20 m. N. by E. of Macon on the Paris-Lyons railway. Pop. (1906), 3787. The church of St Philibert (early nth century) once belonging to the Benedictine abbey of Tournus, suppressed in 1785, is in the Burgundian Romanesque style. The facade lacks one of the two flanking towers originally designed for it. The nave is roofed with

barrel vaulting, supported on tall cylin- drical columns. The choir beneath which is a crypt of the nth century has a deambulatory and square chapels. In the Place de l'Hotel de Ville stands a statue of J. B. Greuze, born in the town in 1725. There are vineyards in the surrounding dis- trict and the town and its port have considerable commerce in wine and in stone from the neighbouring quarries. Chair- making is an important industry.

TOURS, a town of central France, capital of the department of Indre-et-Loire, 145 m. S.W. of Paris by rail. Pop. (1906), town 61,507; commune, 67,601. Tours lies on the left bank of the Loire on a flat tongue of land between that river and the Cher a little above their junction. The right bank of the

Loire is bordered by hills at the foot of which lie the suburbs of St Cyr and St Symphorien. The river is crossed by two suspension bridges, partly built on islands in the river, and by a stone bridge of the second half of the 18th century, the Pont de Tours. Many foreigners, especially English, live at or visit Tours, attracted by the town itself, its mild climate and situa- tion in " the garden of France," and the historic chateaux in the vicinity. The Boulevard Beranger, with its continuation, the Boulevard Heurteloup, traverses Tours from west to east dividing it into two parts; the old town to the north, with its narrow streets and ancient houses, contains the principal buildings, the shops and the business houses, while the new town to the south, centring round a fine public garden, is almost entirely residential. The Rue Nationale, the widest and hand- somest street in Tours, is a prolongation of the Pont de Tours and runs at right angles to the boulevards, continuing under the name of the Avenue de Grammont until it reaches the Cher.

St Gatien, the cathedral of Tours, though hardly among the greatest churches of France, is nevertheless of considerable interest. A cathedral of the first half of the 12th century was burnt in n 66 during the quarrel between Louis VII. of France and Henry II. of England. A new cathedral was begun about 1 1 70 but not finished till 1547. The lower portions of the west towers belong to the 12th century, the choir to the 13th century; the transept and east bays of the nave to the 14th; the remaining bays, a cloister on the north, and the facade, profusely decorated in the Flamboyant style, to the 15th and 1 6th centuries, the upper part of the towers being in the Renaissance style of the 16th century. In the interior there is fine stained glass, that of the choir (13th century) being espe- cially remarkable. The tomb' of

the children of Charles VIII., constructed in the first years of the 16th century and attributed to the brothers Juste is also of artistic interest.

An example of Romanesque architecture survives in the great square tower of the church of St Julien, the rest of which is in the early Gothic style of the 13th century, with the exception of two apses added in the 16th century. Two towers and a Renaissance cloister are the chief remains of the celebrated basilica of St Martin built mainly during the 12th and 13th centuries and demolished in 1802. It stood on the site of an earlier and very famous church built from 466 to 472 by bishop St Perpetuus and destroyed together with many other churches in a fire in 998. Two other churches worthy of mention are Notre- Dame la Riche, originally built in the 13th century, rebuilt in the 16th, and magnificently restored in the 19th century; and St Saturnin of the 15th century. The new basilica of St Martin and the church of St Etienne are modern. Of the old houses of Tours the hotel Gouin and that wrongly known as the house of Tristan l'Hermite (both of the 15th century) are the best known. Tours has several learned societies and a valuable library, including among its MSS. a gospel of the 8th century on which the kings of France took oath as honorary canons of the church of St Martin. The museum contains a collection of pictures, and the museum of the Archaeological Society of Touraine has valuable antiquities; there is also a natural history museum.

The chief public monuments are the fountain of the Renaissance built by Jacques de Beaune (d. 1527), financial minister, the statues of Descartes, Rabelais and Balzac, the latter born at Tours, and a monument to the three doctors Bretonneau, Trousseau and Velpeau. Tours is the seat of an archbishop, a prefect, and a court of assizes, and headquarters of the IX. Army Corps and has tribunals of first instance and of commerce, a board of trade arbitration, a chamber of commerce and a branch of the Bank of France. Among its educational institutions are a preparatory school of medicine and pharmacy, lycees for both sexes, a training college for girlsfand schools of fine art and music. The industrial establishments of the town include silk factories and numerous important printing-works, steel works, irortfoundries and factories for automobiles, machinery, oil, lime and cement, biscuits, portable buildings, stained glass, boots and shoes and porcelain. A considerable trade is carried on in the wine of the district and in brandy and in dried fruits, sausages and confectionery, for which the town is well known. Three-

quarters of a mile to the south-west of Tours lie unimportant remains of Plessis-les-Tours, the chateau built by Louis XL, whither he retired before his death in 1483. On the right bank of the Loire 2 m. above the town are the ruins of the ancient and powerful abbey of Marmoutier. Five miles to the north-west is the large agricultural reformatory of Mettray founded in 1839.

Tours (see Touraine), under the Gauls the capital of the Turones or Turons, originally stood on the right bank of the Loire, a little above the present village of St Symphorien. At

first called Altionos, the town was afterwards known as Caesar o-dunum. The Romans removed the town from the hill where it originally stood to the plain on the left bank of the river. Behind the present cathedral, remains of the amphitheatre (443 ft. in length by 394 in breadth) built towards the end of the 2nd century might formerly be seen. Tours became Christian about 250 through the preaching of Gatien, who founded the bishopric. The first cathedral was built a hundred years later by StLitorius. The bishopric became an archbishopric when Gratian made Tours the capital of Lugdunensis Tertia though the bishops did not adopt the title of archbishop till the 9th century. About the beginning of the 5th century the official name of Caesarodunum was changed for that of Civitas Turo- norum. St Martin, the great apostle of the Gauls, was bishop of Tours in the 4th century, and he was buried in a suburb which soon became as important as the town itself from the number of pilgrims who flocked to his tomb. Towards the end of the 4th century, apprehensive of barbarian invasion, the inhabitants pulled down some of their earlier buildings in order' to raise a fortified wall, the course of which can still be traced in places. Their advanced fort of Larcay still overlooks the valley of the Cher. Affiliated to the Armorican confederation in 43 s, the town did not fall to the Visigoths till 473, and the new masters were always hated. It became part of the Frankish dominions under Clovis, who, in consideration of the help afforded by St Martin, presented the church with rich gifts out of the spoils taken from Alaric, confirmed and extended its right of sanc- tuary, and accepted for himself and his successors the title of canon of St Martin. At the end of the 6th century the bishopric was held by St Gregory of Tours. Tours grew rapidly in prosperity under the Merovingians, but abuse of

the right of sanctuary led to great disorder, and the church itself became a hotbed of crime. Charlemagne re-established discipline in the disorganized monastery and set over it the learned Alcuin, who established at Tours one of the oldest public schools of Christian philosophy and theology. The arts flourished at Tours in the middle ages and the town was the centre of the Poitevin Romanesque school of architecture. The abbey was made into a collegiate church in the nth century, and was for a time affiliated to Cluny, but soon came under the direct rule of Rome, and for long had bishops of its own. The suburb in which the monastery was situated became as important as Tours itself under the name of Martinopolis. The Normans, attracted by its riches, pillaged it in 853 and 903. Strong walls were erected from 906 to 910, and the name was changed to that of Chateauneuf. Philip Augustus sanctioned the communal privileges which the inhabitants forced from the canons of St Martin and the innumerable offerings of princes, lords and pilgrims maintained the prosperity of the town all through the middle ages. A 13th-century writer speaks with enthusiasm of the wealth and luxury of the inhabitants of Chateauneuf, of the beauty and chastity of the women and of the rich shrine of the saint. In the 14th century Tours was united to Chateau- neuf within a common wall, of which a round tower, the Tour de Guise, remains, and both towns were put under the same administration. The numerous and long-continued visits of Charles VII., Louis XI., who established the silk-industry, and Charles VIII. during the 15th century favoured the commerce and industry of the town, then peopled by 75,000 inhabitants. In the 15th and 16th centuries the presence of Jean Fouquet the painter of Michel Colomb and the brothers Juste the sculp- tors, enhanced the fame of the town in the sphere of art. In 1562 Tours suffered from the violence of both Protestants and Catholics, and enjoyed no real security till after the pact entered into at Plessis-les-'Tours between Henry III. and Henry of Navarre in 1589. In the 17th and 18th centuries Tours was the capital of the government of Touraine. Its manufactures, of which silk weaving was the chief, suffered from the revocation of the Edict of Nantes (1685). In 1772 its mint, whence were issued the " livres " of Tours {librae Turonenses) was suppressed. During the Revolution the town formed a base of operations of the Republicans against the Vendeans. In 1870 it was for a

time the seat of the delegation of the government of national defence. In 187 1 it was occupied by the Germans from the 10th of January to the 8th of March.

See P. Vitry, Tours et les chdteaux de Touraine (Paris, 1905) ; E. Giraudet, Histoire de la ville de Tours (Tours, 1873); Les Artistes tourangeaux (Tours, 1885).

TOURVILLE, ANNE-HILARION DE COTENTIN (or Cos- tantin), Comte de (1642-1701), French admiral and marshal of France, was the son of Cesar de Cotentin, or Costantin, who held offices in the household of the king and of the prince of Conde. He is said to have been born at Tourville in Normandy, but was baptized in Paris on the 24th of November 1642, was commonly known as M. de Tourville, and was destined by his family to enter the Order of Malta. From the age of fourteen to the age of twenty-five, he served with the galleys of the Order. At that time the knights were still fighting the Barbary pirates of Algiers and Tunis. The young Anne-Hilarion is said to have been distinguished for courage. His life during these years, however, is little known. The supposed Memoirs bearing his name were published by the Abbe de Magron in the 18th century and belong to the large class of historical romances which pro- fessed to be biographies or autobiographies. In 1667 he was back in France, and was incorporated in the corps of officers of the French Royal navy which Louis XIV. was then raising from the prostration into which it had fallen during his minority. The positions of French naval officer and knight of Malta were not incompatible. Many men held both. The usual practice was that they did not take the full vows till they were in middle life, and had reached the age when they were entitled to hold one of the great offices. Until then they were free to marry, on condition of renouncing all claim to the chief places. As Anne-Hilarion de Cotentin married a wealthy widow, the marquise de Popeliniere, in 1689 at which time he was made count of Tourville, he severed his connexion with the Order. Nor does he appear to have served with it at all after his return to France in 1667. He was at first employed in cruising against the Barbary pirates and the Turks. In the expedition sent against Crete in 1668-69 under command of the Due de Beau- fort he had command of the ” Croissant ” (44). The Due de Beaufort was killed, and the expedition was a failure. When the war with Holland in which France and England acted as allies began in 1670, Tourville commanded the ” Page ” (50), in the squadron of the comte d’Estrees (1624-1707) sent to co-operate with the duke of York. He was present at the battle of Solebay (June 7, 1672), and in the action on the coast of Holland in the following year, when Prince Rupert commanded the English fleet. When England withdrew from the alliance, the

scene of the naval war was transferred to the Mediterranean, where Holland was co-operating with the Spaniards. Tour villle served under Abraham Duquesne in his battles with De Ruyter. He particularly distinguished himself at the battle of Palermo on the 2nd of June 1676. By this time he was known as one of the best officers in the service of King Louis XIV. Unlike many employed by the king to command his ships in the earlier part of his reign, Tourville was a seaman. He had the reputation of being able to do all the work required in a ship, and he had made a study of naval warfare. The great treatise on naval tactics afterwards published under the name of his secretary, the Jesuit Hoste or l'Hoste, was understood to have been inspired by him. In 1683 he was chef d'escadre— rear admiral — with Duquesne in operations against the Barbary pirates, and he continued on that service with D'Estrees. By 1689 he had been promoted lieutenant-general des armees navales, and was named vice-admiral du Levant or of the East. In June of that year he took up the commandership-in-chief of the French naval forces in the war against England and her continental allies which had begun in the previous year. From this time till the failure of his resources compelled King Louis XIV. to withdraw his fleets from the sea, Tourville continued to com- mand the naval war in the Channel and the Atlantic. His conduct and example during this period were the source of the system of manoeuvring to gain an advantage by some method

other than plain fighting. The personal character of Tourville must be held to account largely for the timidity of the principles he established. Tourville's personal valour was of the finest quality, but like many other brave men, he was nervous under the weight of responsibility. It is no less clear that anxiety to avoid risking a disaster to his reputation was of more weight with him than the wish to win a signal success. He belonged to the type of men in whose minds the evil which may happen is always more visible than the good. In 1690 he had an oppor- tunity which might well have tempted the most cautious, and he missed it out of sheer care to keep his fleet safe against all conceivable chances, aided perhaps by a pedantic taste for formal, orderly movement. He was opposed in the channel by the allies, who had only fifty-six ships, while his own force, though it included some vessels of no serious value, was from seventy to

eighty sail strong. He was feebly attacked by Admiral Arthur Herbert, the newly created earl of Torrington, off Beachy Head on the 10th of July. The Dutch ships in the van were surrounded. The allies had to retreat in disorder, and Tourville followed in " line of battle " which limited his speed to that of his slowest ship. So his enemy escaped with comparatively little loss. In the following year he performed his famous " off shore cruise," in the Bay of Biscay. He moved to and fro in fine order avoiding being brought to battle, but also failing to inflict any harm on his opponent. In the mean- time the cause of King James II. was ruined in Ireland. In 1692 the Mediterranean fleet having failed to join him, he was faced by a vastly superior force of the allies. The French king had prepared a military force to invade England, and Tourville was expected to prepare the way. Having at least a clear indication that he was expected to act with vigour, if not piecise orders to fight against any odds, he made a resolute attack on the centre of the allies on the 29th of May off Cape Barfleur, and drew off before he was surrounded. This action which with the pursuit of the following days made up what is called the battle of La Hogue, from the Bay where some of the fugitive French ships were destroyed, or Barfleur, proved his readiness to face danger. But his inability to take and act on a painful decision was no less proved in the retreat. He hesitated to sacrifice his crippled flagship, and thereby detained his whole fleet. The result was that the " Soleil Royale " herself and fifteen other ships were cut off and destroyed at La Hogue. In 1693 he was again at sea with a great fleet, and had a chance to inflict extreme injury on the allies by the capture of the Smyrna convoy which included their whole Mediterranean trade for the year. He did it a great deal of harm outside the Straits of Gibraltar, but again he kept his fleet in battle order, and a large part of the convoy escaped. King Louis XIV. who had a strong personal regard for him, continued to treat him with favour. Tourville was made Marshal of France in 1693, but the growing exhaustion of the French treasury no longer allowed the maintenance of great fleets at sea. Tour- ville remained generally at Toulon, and had no more fighting. He died in Paris in 1701. His only son, a colonel in the army, was killed at Denain in 1712.

The English account of the battles of Beachy Head and La Hogue will be found in Ledyard's Naval History. Troude's Batailles navales de la France gives the French version of these and the other actions in which Tourville was concerned. Tourville is frequently mentioned in the Life of Duguesne by M. Jal. (D. H.)

TOUSSAINT L'OUVERTURE (or Louverture), PIERRE- DOMINIQUE (c. 1 746-1 803), one of the liberators of Haiti, claimed to be descended from an African chief, his father, a slave in Haiti, being the chief's second son. He was at first surnamed Breda, but this was afterwards changed to L'Ouverture in token of the results of his valour in causing a gap in the ranks of the enemy. From childhood he manifested unusual abilities and succeeded, by making the utmost use of every opportunity, in obtaining a remarkably good education. He obtained the special confidence of his master, and was made superintendent of the other negroes on the plantation. After the insurrection of 1791 he joined the insurgents, and, having acquired some knowledge of surgery and medicine, acted as

physician to the forces. His rapid rise in influence aroused, however, the jealousy of Jean Francois, who caused his arrest on the ground of his partiality to the whites. He was liberated by the rival insurgent chief Baisson, and a partisan war ensued, but after the death of Baisson he placed himself under the orders of Jean Francois. Subsequently he joined the Spaniards, but, when the French government ratified the act declaring the freedom of the slaves, he came to the aid of the French. In 1796 he was named commander-in-chief of the armies of St Domingo, but, having raised and disciplined a powerful army of blacks, he made himself master of the whole country, renounced the authority of France, and announced himself " the Buonaparte of St Domingo." He was taken prisoner by treachery on the part of France, and died in the prison of Joux, near Besancon, on the 27th of April 1803.

See Toussaint 1'Ouverture's own Memoires, with a life by Saint Rerny; (Paris, 1850); Gragnon-Laconte, Toussaint Louverture (Paris, 1887); Scholcher, Vie de Toussaint Louverture (Paris, 1889); and J. R. Beard, Life of Toussaint Louverture (1853).

TOW, the term given in textile manufacture to the short fibres formed during the processes of scutching and hackling, and also to the yarns which are made from these fibres. A special machine termed a carding engine or a tow card is used to form these fibres into a sliver, this sliver then passes to the drawing frames, and thereafter follows the same process as line yarns in flax spinning.

TOWANDA, a borough and the county-seat of Bradford county, Pennsylvania, U.S.A., on the west bank of the Susque- hanna river, about 50 m. N.W. of Wilkes-Barre. Pop. (1890), 4169;

(1900), 4663 (322 foreign-born); (1910) 4281. Towanda is served by the Lehigh Valley and the Susquehanna & New York railways. It is situated about 730 ft. above the sea, and is surrounded by high hills. Towanda contains the museum of the Bradford County Historical Society. The borough is in a farming, dairying and stock-raising region, and has various manufactures. The first settlement was made by William Means in 1786, the village was laid out in 1812, became the county- seat in the same year, was variously known for some years as Meansville, Overton, Williamson, Monmouth and Towanda, and in 1828 was incorporated as the borough of Towanda. Its name is an Indian word said to mean " where we bury the dead."

TOWCESTER, a market town in the southern parliamentary division of Northamptonshire, England, 8 m. S.S.W. of North-ampton, on the East & West Junction and the Northampton & Banbury Junction railways. Pop. (1901), 2371. It is pleasantly situated on the small river Tove, a left-bank affluent of the Ouse. The church of St Lawrence is a good Early English, Decorated and Perpendicular building, with a fine western Perpendicular tower. There are a considerable agricultural trade and a manufacture of boots and shoes.

Here was a Roman town or village situated on Watling Street. The site has yielded a considerable number of relics. In the 10th century a fortress was maintained here against the invading Danes. The site of both this and the Roman station is marked by an artificial mound known as Burg Hill, not far from the church, above the river. Towcester, with the whole of this district, witnessed a large part of the operations during the Civil War of the 17th century.

TOWEL, a cloth used for the purpose of drying the hands, face or body after bathing or washing. These cloths are made of different materials, known as " towellings," the two principal kinds are " huckaback," a slightly roughened material for chamber towels for face and hands, and Turkish towelling, with a much rougher surface, for bath towels; finer toweUirgs are made of linen or damask. The term has a particular eccle- siastical usage as applied to a linen altar cloth or to a rich cloth of embroidered silk, velvet, &c, covering the altar at all " such periods when Mass is not being celebrated."

The Mid. Eng. towaille comes through the O. Fr. touaille from the Low Lat. toacula, represented in other Romanic languages by Sp.

toalla, Ital. tovaglia; this is to be referred to the Teutonic verb meaning " to wash," O. H. G. twahan, M. H. G. dwahen, O. EnjJ. fywedn, and cf. Ger. Zwehle, provincial Eng. dwile, a dish-cloth.

TOWER (Lat. turris; Fr. tour, docker; Ital. tone; Ger. Thurm), the term given to a lofty building originally designed for defence, and, as such, attached to and forming part of the fortifications of a city or castle. Towers do not seem to have existed in Egypt, but in Mesopotamia from the earliest times they form the most important feature in the city walls, and are shown in the bas-reliefs of the Assyrian palaces at Nimroud and elsewhere. The earliest representation is perhaps that engraved on the tablet in the lap of Gudea the priest king of Lagash (2700 B.C.), whose statue, found at Tello, is now in the Louvre; the drawing is that of a large fortified enclosure, with gates, bastions and towers, corresponding with remains of similar structures of the same and later periods. In the dis- coveries made here, at Susa and at Dom Sargoukin, the towers were about 40 ft. square, projecting from 16. to 20 ft. in front of the curtain walls which connected them, and standing about 80 ft. apart. In Roman and Byzantine times this distance was increased, owing probably to the greater speed of pro- jectiles, and in the wall built by Theodosius at Constantinople the towers were 150 ft. apart (see also Castle and Fortifi- cation).

From the architectural point of view, the towers which are of chief interest are those of ecclesiastical and secular buildings, those in Italy being nearly always isolated and known as cam-panili (see Campanile). In England the earliest known are the Anglo-Saxon towers, the best examples of which are those at Earl's Barton, Monkwearmouth, Barnack, Barton-on-Humber and Sompting; they were nearly always square on plan and situated at the west end, in an axial line with the nave, their chief characteristics being the long-and-short work of the masonry at the quoins, the decoration of the wall with thin pilaster strips, and the slight setting back of the storeys as they rose. There are a few examples of central Anglo-Saxon towers, as at St Mary's, Dover; Breamore, Hants; and Dunham Major, Nor- folk; and, combined with western towers, at Ramsay and Ely; twin western towers existed at Exeter. Contemporary with these Saxon towers are many examples in France, but they are invariably central

towers, as at Germigny-des-Pres and at Querqueville in Normandy; in Germany the twin towers of Aix-la-Chapelle are the best known. As a rule the single western tower is almost confined to England, prior to the end of the nth century, when there are many examples throughout Germany. In Norman times in England, central towers are more common, and the same obtains in France, where, however, they are sometimes carried to a great height, as at Perigueux, where the wall decoration consists of pilasters in the lower storeys, and semi-detached columns above, probably based on that of the Roman amphitheatre there: otherwise the design of the Romanesque church towers is extremely simple, de- pending for its effect on the good masonry and the enrichment of the belfry windows. In later periods flat buttresses are introduced, and these gradually assume more importance and present many varieties of design; greater apparent height is given to the tower by the string courses dividing the second storeys, and by rich blank arcading on them, the upper storey with the belfry windows forming always the most important feature of the tower. In those towers which are surmounted by spires (g.v.) the design of the latter possesses sometimes a greater interest both in England and France. A very large number of the towers of English cathedrals and churches have flat roofs enclosed with lofty battlemented parapets and numerous pinnacles and finials; in France such terminations are not found, and in Germany the high pitched roof is prevalent every where, so that the numerous examples in England have a special interest; sometimes the angle buttresses are grouped to carry octagonal pinnacles, and sometimes, as at Lincoln and Salis- bury, octagonal turrets rise from the base of the tower.

Among the finest examples are those of Canterbury, Ely, York, Gloucester, Lincoln and Worcester cathedrals; among churches, those of the minster at Beverley ; St Mary's, St Neots (Huntingdon- shire) ; St Stephen's, Bristol, St Giles, Wrexham (Denbighshire — in many respects the most beautiful in England) ; St Mary Magdalene, Taunton; Magdalen College, Oxford, St Botolph, Boston, crowned

with an octagonal tower; St Mary's, Ilminster (Somersetshire) and Malvern (Worcestershire) ; and the isolated towers at Chichester, Evesham and Bury St Edmund's.

So far reference has been made only to central and western towers, the latter not always placed, like the Anglo-Saxon towers, in the axial line of the nave, but sometimes on the north or south

side of the west end; and as a rule these are only found in England. In France and Germany, however, they are greatly increased in number; thus in Reims seven towers with spires were contemplated, according to Viollet-le-Duc, but never completed; at Chartres eight towers, and at Laon seven, of which six are completed; in Germany the cathedrals of Mayence and Spires and two of the churches in Cologne have from four to seven towers; and at Tournai cathedral, in Belgium, are seven towers. In many of the churches in Norfolk and Suffolk the western tower is circular, owing probably to the fact that, being built with stone of small dimensions, the angles of the quoins would have been difficult to construct. In some of the French towns, isolated towers were built to contain bells, and were looked upon as municipal constructions; of these there are a few left, as at Bethune, Evreux, Amiens and Bordeaux, the latter being a double tower, with the bells placed in a roof between them.

The towers of secular, buildings are chiefly of the town halls, of which there are numerous examples throughout France and Belgium, such as those of the h6tel de ville at St Antonin (13th century) and Compiegne, both in France; at Lubeck, Danzig and Munster in Germany ; and Brussels, Bruges and Oudenarde in Belgium.

(R. P. S.)

TOWER OF LONDON, THE, an ancient fortress on the east side of the City of London, England, on the north bank of the river Thames. On a slight elevation now called the Tower Hill, well protected by the river and its marshes, and by woods to the north, there was a British stronghold. Tradition, however, pointed to Julius Caesar as the founder of the Tower (Shakespeare, Richard III., in., i; and elsewhere), and remains of Roman fortifications have been found beneath the present site. The Tower contains barracks, and is the repository of the regalia. It covers an irregular hexagonal area, and is surrounded by a ditch, formerly fed by the Thames, but now dry. Gardens surround it on the north and west, and an embankment borders the river on the south. Two lines of fortifications enclose the inner bail, in which is the magnificent White Tower or Keep, flanked by four turrets. This was built by Gundulf, bishop of Rochester, c. 1078. Its exterior was restored by Sir Christopher Wren, but within the Norman work is little altered. Here may be seen a collection of old armour and instruments of torture, the

rooms said to have been Sir Walter Raleigh's prison, and the magnificent Norman chapel of St John. Among the surrounding buildings are the barracks, and the chapel of St Peter ad Vincula, dating from the early part of the 14th century, but much altered in Tudor times. The B allium Wall, the inner of the two lines of fortification, is coeval with the keep. Twelve towers rise from it at intervals, in one of which, the Wakefield Tower, the Regalia or crown jewels are kept. The chief entry to the fortress is through the Middle Tower on the west, across the bridge over the moat, and through the By ward Tower. The Lion Gate under the Middle Tower took name from a menagerie kept here from Norman times until 1834. On the south, giving entry from the river through St Thomas Tower and the Bloody Tower, is the famous Traitor's Gate, by which prisoners of high rank were admitted. The chief historical interest of the Tower lies in its association with such prisoners. The Beauchamp Tower was for long the place of confinement, but dungeons and other chambers in various parts of the building are also associated with prisoners of fame. Executions took place both within the Tower and on Tower Hill. Many of those executed were buried in the chapel of St Peter ad Vincula, such as Sir Thomas More, Henry VIII.'s queens, Anne Boleyn and Katharine Howard, Lady Jane Grey and her husband Dudley, Sir Walter Raleigh, and the duke of Monmouth. The Tower was not only a prison from Norman 1 times until the 19th century, but was a royal residence at

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intervals from the reign of Stephen, if not before. The royal palace was demolished by order of Cromwell. The tower is under the governorship of a constable. The attendant staff, called Yeomen of the Guard or familiarly " Beefeaters," still wear their picturesque Tudor costume.

Authorities. — W. Hepworth Dixon, Her Majesty's Tower (London, 1869); Lord Ronald Sutherland Gower, The Tower of London (London, 1901).

TOWN, in its most general sense, a collection or aggregation of inhabited houses larger than a village. The O. Eng. tun (M. Eng. toun) meant originally a fence or enclosure, cf. Ger. zaun, hedge, hence an enclosed place. The Scottish and Northern English use of the word for a farmhouse and its buildings, a farmstead,

preserves this original meaning, and is paralleled by the Icel. tun, homestead, dwelling-house. A cognate Celtic form meaning a fastness, a strong place, appears in Gael, and Irish dun, Welsh, din, fortress, hill-fort (cf. Welsh dinas, town). This is familiar from the many Latinized names of places, e.g. Lugdunum, A ugustodunum, &c. In English law " town " is not a word defined by statute. For purposes of local government there are boroughs, urban districts and rural districts, but many urban districts are rural in character and the distinction is purely an administrative one (see Borough; City; Commune (Medieval); Municipium; England: Local Government, and the sections on local administration under various country headings). The meaning attached to the term " township " in the local administration 'of the United States is treated under United States: Local Government.

TOWNELEY (or Townley), CHARLES (1737-1805), English archaeologist and collector of marbles, was born at Towneley, the family seat, near Burnley in Lancashire, on the 1st of October 1737. He was educated at the college of Douai, and subsequently under John Turberville Needham, the physiologist and divine. In 1758 he took up his residence at Towneley, where he lived the ordinary life of a country gentleman until about 1765, when he left England to study ancient art, chiefly at Rome. He also made several excursions to the south of Italy and Sicily. In conjunction with Gavin Hamilton, the artist, and Thomas Jenkins, a banker in Rome, he got together a splendid collection of antiquities, which was deposited in two houses bought by him for the purpose in Park Street, Westminster, where he died on the 3rd of January 1805. His solitary publication was an account of an ancient helmet found at Ribchester. His marbles, bronzes, coins, and gems were purchased by the British Museum for about £28,000, and form part of the Graeco-Roman collection.

For an account of the antiquities see Sir Henry Ellis's The Townley Gallery (1836), and A. T. F. Michaelis's Ancient Marbles in Great Britain (1882).

TOWNLEY, JAMES (1714-1778), English dramatist, second son of Charles Townley, merchant, was born in London on the 6th of May 17 14. Educated at Merchant Taylors' School and at St John's College, Oxford, he took holy orders, being ordained priest on the 28th of May 1738. He was lecturer at St Dunstan's in the East, chaplain to the lord mayor, then under-master at Merchant Taylors' School until 1753, when he became grammar master at Christ's Hospital. In 1760 he became head master of Merchant

Taylors' School, where in 1762 and 1763 he revived the custom of dramatic performances. He retained his head- mastership until his death on the 5th of July 1778. He took a keen interest in the theatre, and it has been asserted that many of David Garrick's best productions and revivals owed much to his assistance. He was the author, although the fact was long concealed, of High Life below Stairs, a two-act farce pre- sented at Drury Lane on the 31st of October 1750; also of False Concord (Covent Garden, March 20, 1764) and The Tutor (Drury Lane, Feb. 4, 1765).

TOWNSHEND, CHARLES (1725-1767), English politician, was the second son of Charles, 3rd Viscount Townshend, who married Audrey (d. 1788), daughter and heiress of Edward Harrison of Ball's Park, near Hertford, a lady who rivalled her son in brilliancy of wit and frankness of expression. Charles was born on the 29th of August 1725, and was sent for his education

to Leiden and Oxford. At the Dutch university, where he matriculated on the 27th of October 1745, he associated with a small knot of English youths, afterwards well known in various circles of life, among whom were Dowdeswell, his subsequent rival in politics, Wilkes, the witty and unprincipled reformer, and Alexander Carlyle, the genial Scotchman, who devotes some of the pages of his Autobiography to chronicling their sayings and their doings. He represented Great Yarmouth in parliament from 1747 to 1 761, when he found a seat for the treasury borough of Harwich. Public attention was first drawn to his abilities in 1753, when he delivered a lively attack, as a younger son who might hope to promote his advancement by allying himself in marriage to a wealthy heiress, against Lord Hardwicke's marriage bill. Although this measure passed into law, he attained this object in August 1755 by marrying Caroline (d. 1794), the eldest daughter of the 2nd duke of Argyll and the widow of Francis, Lord Dalkeith, the eldest son of the 2nd duke of Buccleuch. In April 1754 Townshend was transformed from the position of a member of the board of trade, which he had held from 1749, to that of a lord of the admiralty, but at the close of 1755 his passionate attack against the policy of the ministry, an attack which shared in popular estimation with the scathing denunciations of Pitt, the supreme success of Single-Speech Hamilton, and the hopeless failure of Lord Chesterfield's illegiti- mate son, caused his resignation. In the administration which was formed in November 1756, and which was ruled by Pitt, the lucrative office of treasurer of the chamber was given to Townshend, and in the following spring he was summoned to the privy council.

With the accession of the new monarch in 1760 this volatile politician transferred his attentions from Pitt to the young king's favourite, Bute, and when in 1761, at the latter's instance, several changes were made in the ministry, Townshend was promoted to the post of secretary-at-war. In this place he remained after the great commoner had withdrawn from the cabinet, but in December 1762 he threw it up. Bute, alarmed at the growth in numbers and in influence of his enemies, tried to buy back Townshend's co-operation by sundry tempting promises, and at last secured his object in March 1763 with the presidency of the board of trade. When Bute retired and George Grenville accepted the cares of official life, the higher post of first lord of the admiralty fell to Townshend's lot, but with his usual impetuosity he presumed to designate one of his satellites, Sir William Burrell (1732-1796), to a place under him at the board, and the refusal to accept the nomination led to his exclusion from the new administration. While in opposition his mind was swayed to and fro with conflicting emotions of dislike to the head of the ministry and of desire to share in the spoils of office. The latter feeling ultimately triumphed; he condescended to accept in the dying days of Grenville's cabinet, and to retain through the " lutestring " administration of Lord Rockingham — " pretty summer wear," as Townshend styled it, " but it will never stand the winter " — the highly paid position of paymaster-general, refusing to identify himself more closely with its fortunes as chancellor of the exchequer. The position which he refused from the hands of Lord Rockingham he accepted from Pitt in August 1 766, and a few weeks later his urgent appeals to the great minister for increased power were favourably answered, and he was admitted to the inner circle of the cabinet. The new chancellor proposed the continuance of the land tax at four shillings in the pound, while he held out hopes that it might be reduced next year to three shillings, whereupon his predecessor, William Dowdeswell, by the aid of the landed gentlemen, carried a motion that the reduction should take effect at once. This defeat proved a great mortification to Lord Chatham, and in his irritation against Townshend for this blow, as well as for some acts of in- subordination, he meditated the removal of his showy colleague. Before this could be accomplished Chatham's mind became impaired, and Townshend, who was the most determined and influential of his colleagues, swayed the ministry as he liked, pledging himself to find a revenue in America with which to meet

the deficiency caused by the reduction in the land tax. His wife was created (August 1767) baroness of Greenwich, and his elder brother George, the 4th viscount, was made lord-lieutenant of Ireland. He himself delivered in the House of Commons many speeches unrivalled in parliamentary history for wit and recklessness; and one of them still lives in history as the " champagne speech." His last official act was to carry out his intention by passing through parliament resolutions, which even his colleagues deprecated in the cabinet, for taxing several articles, such as glass, paper and tea, on their importation into America, which he estimated would produce the insignificant sum of £40,000 for the English treasury, and which shrewder observers prophesied would lead to the loss of the American colonies. Soon after this event he died somewhat suddenly on the 4th of September 1767.

The universal tribute of Townshend's colleagues allows him the possession of boundless wit and ready eloquence, set off by perfect melody of intonation, but marred by an unexampled lack of judgment and discretion. He shifted his ground in politics with every new moon, and the world fastened on him the nick- name, which he himself adopted in his " champagne " speech, of the weathercock. His official knowledge was considerable; and it would be unjust to his memory to ignore the praises of his contemporaries or his knowledge of his country's commercial interests. The House of Commons recognized in him its spoilt child, and Burke happily said that " he never thought, did or said anything " without judging its effect on his fellow members.

A Memoir by Percy Fitzgerald was published in 1866. See also W. E. H. Lecky, History of England (1892); and Horace Walpole, Memoirs of the Reign of George III., edited by G. F. R. Barker (1894).

TOWNSHEND, CHARLES TOWNSHEND, 2nd Viscount (1674-1738), English statesman, was the eldest son of Sir Horatio Townshend, Bart. ic. 1630-1687), a zealous supporter of Charles II., who was created Baron Townshend in 1661 and Viscount Townshend of Raynham in 1682. The old Norfolk family of Townshend, to which h". belonged, is descended from Sir Roger Townshend (d. 1493) of Raynham, who acted as legal adviser to the Paston family, and was made a justice of the common pleas in 1484. His descendant, another Sir Roger Townshend (c. 1 543-1 590), had a son Sir John Townshend (1564-1603), a soldier, whose son, Sir Roger Townshend (1588- 1637), was

created a baronet in 1617. He was the father of Sir Horatio Townshend.

Charles Townshend succeeded to the peerage in December 1687, and was educated at Eton and King's College, Cambridge. He had Tory sympathies when he took his seat in the House of Lords, but his views changed, and he began to take an active part in politics as a Whig. For a few years after the accession of Queen Anne he remained without office, but in November 1708 he was appointed captain of the yeomen of the guard, having in the previous year been summoned to the privy council. He was ambassador extraordinary and plenipotentiary to the states-general from 1709 to 171 1, taking part during these years in the negotiations which preceded the conclusion of the treaty of Utrecht. After his recall to England he was busily occupied in attacking the proceedings of the new Tory ministry. Towns- hend quickly won the favour of George I., and in September 1 7 14, the new king selected him as secretary of state for the northern department. The policy of Townshend and his colleagues, after they had crushed the Jacobite rising of 171 5, both at home and abroad, was one of peace. The secretary disliked the interference of England in the war between Sweden and Denmark, and he promoted the conclusion of defensive alliances between England and the emperor and England and France. In spite of these successes the influence of the Whigs was gradually undermined by the intrigues of Charles Spencer, earl of Sunderland, and by the discontent of the Hanoverian favourites. In October 1716, Townshend's colleague, James Stanhope, afterwards ist Earl Stanhope, accompanied the king on his visit to Hanover, and while there he was seduced from his allegiance to his fellow ministers by Sunderland, George being led to believe that Townshend and his brother-in-law, Sir Robert Walpole, were caballing with the prince of Wales, their

intention being that the prince should supplant his father on the throne. Consequently in December 17 16 the secretary was dismissed and was made lord-lieutenant of Ireland, but he only retained this post until the following April.

Early in 1720 a partial reconciliation took place between the parties of Stanhope and Townshend, and in June of this year the latter became president of the council, a post which he held until February 1721, when, after the death of Stanhope and the forced retirement of Sunderland, a result of the South Sea bubble, he was again appointed secretary of state for the northern

department, with Walpole as first lord of the treasury and chancellor of the exchequer. The two remained in power during the remainder of the reign of George I., the chief domestic events of the time being the impeachment of Bishop Atterbury, the pardon and partial restoration of Lord Bolingbroke, and the troubles in Ireland caused by the patent permitting Wood to coin halfpence. Townshend secured the dismissal of his rival, John Carteret, afterwards Earl Granville, but soon differences arose between himself and Walpole, and he had some difficulty in steering a course through the troubled sea of European politics. Although disliking him, George II. retained him in office, but the predominance in the ministry passed gradually but surely from him to Walpole. Townshend could not brook this. So long, to use Walpole's witty remark, as the firm was Townshend and Walpole all went well with it, but when the positions were reversed jealousies arose between the partners. Serious differ- ences of opinion concerning the policy to be adopted towards Prussia and in foreign politics generally led to a final rupture in 1730. Failing, owing to Walpole's interference, in his efforts to procure the dismissal of a colleague and his replacement by a personal friend, Townshend retired on the 15th of May 1730. His remaining years were passed at Raynham, where he inte- rested himself in agriculture and was responsible for introducing into England the cultivation of turnips on a large scale and for other improvements of the kind. He died at Raynham on the 21st of June 1738.

Townshend was twice married — first to Elizabeth (d. 171 1), daughter of Thomas Pelham, ist Baron Pelham of Laughton, and secondly to Dorothy (d. 1726), sister of Sir Robert Walpole. He had eight sons. The eldest son, Charles, the 3rd viscount (1 700-1 764), was called to the House of Lords in 1723. The second son, Thomas Townshend (1701-1780), was member of parliament for the university of Cambridge from 1727 to 1774; his only son, Thomas Townshend (1733-1800), who was created Baron Sydney in 1783 and Viscount Sydney in 1789, was a secretary of state and leader of the House of Commons from July 1782 to April 1783, and from December 1783 to June 1789 again a secretary of state, Sydney in New South Wales being named after him; his grandson, John Robert Townshend (1805- 1890), the 3rd viscount, was created Earl Sydney in 1874, the titles becoming extinct at his death. Charles Townshend's eldest son by his second wife was George Townshend (1715-1769), who after serving for many years in the navy, became an admiral in 1765.

The third viscount had two sons, George, ist Marquess Townshend, and Charles Townshend, who are separately noticed.

For the 2nd viscount see W. Coxe, Memoirs of Sir Robert Walpole (1816); W. E. H. Lecky, History of England in the 18th Century (1892); and Earl Stanhope, History of England.

TOWNSHEND, GEORGE TOWNSHEND, ist Marquess (1724- 1807), eldest son of Charles, 3rd Viscount Townshend (1700- 1764), and brother of the politician Charles Townshend (q.v.), was born on the 28th of February 1724, his godfather being George I. Joining Cope's dragoons as a captain, he saw some service in the Netherlands in 1745, and as a member of the duke of Cumberland's staff was present at Culloden. Afterwards he accompanied the duke to the Netherlands, and was present at Lauffeld. By 1750 he had become lieutenant-colonel in the ist Foot Guards, but differences with the duke of Cumberland led to his retirement in that year. This difference soon became hostility, and, coupled with his dread of permanent armies, caused him to give vehement support to the Militia Bill. In

this matter his views and his methods of expressing them raised up a host of enemies. The retirement of the duke after the disastrous campaign in North Germany in 1757 brought Townshend back to active service as a colonel, and in 1758 he sailed for North America as one of Wolfe's three brigadiers. In the long and painful operations against Quebec he showed himself a capable officer, but his almost open dissatisfaction with Wolfe's methods sensibly added to the difficulty of the enterprise. At the battle of the Heights of Abraham the command, on the death of Wolfe and the wounding of Monckton, devolved upon Towns- hend, whose over-caution for a time imperilled the success of the British arms. The loss of Montcalm, however, had similarly paralyzed the French, and the crisis passed. Townshend sent home a despatch, announcing the fall of Quebec, which at once became the butt of the wits and the object of criticism of a more serious kind; and when, Monckton having taken over the com- mand in Canada, Townshend returned to England to enjoy, as he hoped, the hero-worship of the public, he was soon involved in bitter controversies. He succeeded to the title in 1764 on his father's death, and in 1767, through his brother's influence, was made

lord-lieutenant of Ireland. The story of his vice- royalty may be read in the article on him in the Diet. Nat. Biog., and in Lecky's History of England in the 18th Century (vol. iv.). Witfi the best will in the world, and in spite of excellent capacity, he came into continual conflict with the Irish House of Commons in his attempt to form an English party in Ireland, and he excited unmeasured abuse. In 1772 he was recalled. In 1787 he was created Marquess Townshend of Rainham. He died on the 14th of September 1807.

Townshend was twice married — first to Charlotte, Baroness de Ferrars (d. 1770) and secondly to Anne Montgomery (d. 1819). His eldest son George (1755-1811), who became the second marquess, had succeeded to the barony of de Ferrars in 1770 and had been created earl of Leicester in 1784. Although he was in turn master of the mint, joint postmaster-general and lord steward of the royal household, he did not take much part in politics, but showed a great taste for antiquarian studies. His elder son, George Ferrars Townshend, the 3rd marquess (1778-1855), was disinherited by his father for conduct which also compelled him to reside outside England. When he died at Genoa in December 1855 the earldom of Leicester became extinct. The marquessate, however, passed to a cousin, John Townshend (1 798-1 863), who became the 4th marquess. John James Dudley Stuart Townshend (b. 1866), who became the 6th marquess in 1899, came prominently before the public in 1906 in consequence of a judicial inquiry into his sanity, the decision being that he was not capable of managing his own affairs.

TOWNSVILLE, a town of Elphinstone county, Queensland, Australia, 870 m. direct N.W. of Brisbane. Pop. (1901), 12,717. It is the seat of the Anglican bishop of North Queensland and has a cathedral and several handsome buildings, including the supreme court and the custom-house. It is picturesquely situated partly on the slopes of Castle Hill and Melton Hill, and partly on the banks of Ross Creek, which is spanned by the Victoria Bridge, a swing bridge 550 ft. in length, worked by hydraulic power. The tidal harbour is enclosed by stone breakwaters, and large vessels enter and load frozen meat direct from the refrigerator cars. The port is an outlet for a wide area of pastoral country and for several goldfields, and has regular communication with all ports north and south by lines of steamers. The immigration barracks on Ross Island have accommodation for five hundred persons. The railway station is the terminus of the Northern line, which extends 236 m. to Hughenden. Townsville was founded in 1864

by John Medwin Black and named after his partner Captain Towns. A municipal charter was granted in 1866.

TOWTON, a village of Yorkshire, England, 2§ m. S. of Tad- caster, the scene of a battle fought on Palm Sunday, the 29th of March 146T, between the armies of York and Lancaster. The party of Lancaster had lately won the battle of St Albans, but, unable to gain admission into London, and threatened by the approach of Edward the young duke of York from the west of England, was compelled to fall back northward. York, having

been proclaimed as Edward IV. on the 2nd, 3rd and 4th of March 1460/1461, followed them up into Yorkshire, and on the 27th his leading troops surprised the passage of the Aire at Ferrybridge. The Lancastrians were encamped at Towton, some miles away, covering Tadcaster and York; but a force under Lord Clifford was promptly sent out, recaptured Ferrybridge by surprise, and cut to pieces the. Yorkist garrison. About the same time, how- ever, Edward's van, under Lord Fauconberg, an experienced soldier, crossed the Aire higher up, and Clifford was compelled to retire. He was closely pressed, and at Dintingdale, within a few furlongs of his own camps, was cut off and killed with nearly all his men. Edward's main body was now close at hand, and the Lancastrians drew up on their chosen battlefield early on the 29th. This field was an elevated plateau, with steep slopes, between the present Great North Road and the river Cock, cut in two by a depression called Towton Dale. On opposite sides of this depression stood the two armies, that of York facing north, their opponents southward. Both lines of battle were very dense. On a front of little more than a thousand yards the Lancastrian party had nearly 60,000 men. Edward's force (less than 50,000) was not all present, the rear " battle " under Norfolk being still distant. Snow and sleet blew in the faces of the Lancastrians and covered the field of battle. The skilful Fauconberg used this advantage to the utmost. Aided by the wind, his archers discharged flights of arrows against the enemy, who replied blindly and feebly, hampered by snow and wind. The Yorkists withdrew until the enemy had exhausted their quivers, and then advanced afresh. Their arrows soon stung the Lancastrians into a wild and disorderly charge. Suffering severe losses the latter closed with Edward's line of battle. No quarter was given by either party, and on the narrow front the numerical superiority of the Lancastrians counted for little. The long, doubtful and sanguinary struggle was only decided by the arrival of Norfolk's corps, which charged the enemy in flank. Driven backwards and inwards, the

Lancastrians were in a desperate position, for their only way of escape to Tadcaster crossed the swollen waters of the Cock by a single narrow and difficult ford, and when, after a stubborn struggle, they finally broke and fled, they were slaughtered in thousands as they tried to cross. At the close of the day the defeated army had ceased to exist. Twenty- five thousand Lancastrian and eight thousand Yorkist dead were buried in and about Towton. The neighbourhood of the battle- field contains many relics and memorials of this, the greatest battle hitherto fought on English soil. Particularly well pre- served is the tomb of Lord Dacre, a prominent Lancastrian, in Saxton churchyard.

See R. Brooke, Visits to English Battlefields (London, 1857); C. R. B. Barrett, Battles and Battlefields of England (London, 1896) ; H. B. George, Battles of English History (London, 1895).

TOXICOLOGY, the name of that branch of science which deals with poisons, their effects and antidotes, &c. For the general treatment of the subject and for the law relating to the sale thereof see Poisons, and for the criminal law see Medical Jurisprudence. The term " toxic," meaning poisonous, is derived from Gr. toˆov, bow, owing to the custom of smearing arrows with poison.

TOXODONTIA, a sub-order of extinct South American Tertiary ungulate mammals typified by the genus Toxodon, so named from the bow-like curvature of the molar teeth. They all show signs of distant kinship to the Perissodactyla, as regards both limb-structure and dentition; while some exhibit resemblance to the Rodents and Hyraxes— resemblances which, however, are probably to be attributed to parallelism in development.

Under the sub-order Toxodontia may be included not only the typical Toxodon, but the more aberrant Typotherium (fig. 1) of the Pleistocene of Buenos Aires and the smaller Pachyrucus and Hegeio- therium of the Patagonian Santa Cruz beds. All the members of the sub-order have tall-crowned and curved cheek-teeth, some or all of which generally have persistent pulps, while at least one pair of incisors in each jaw is rootless. The bodies of the cervical vertebrae have flat articular surfaces, the bones of the two rows of the carpus alternate, and in the tarsus the navicular articulates with the calcaneum, which, as in the Artiodactyla, is articulated to the fibula, while the astragalus, which is slightly grooved above,

is formed on the Perissodactyle plan. The number of toes varies between three and five, of which the middle one is the largest, and the femur may or may not have a third trochanter. The Typotheriidae and Pachyrucidae are remarkable among the Ungulates for

TOY, C. H.— TOYNBEE

(After Gervais.)

Fig. i. — Skull of Typotherium cristatum. from the Pampas Formation of Buenos Aires.

the retention of clavicles, and for their curious approximation in dentition and certain characters of the skeleton to the Rodentia. The dental formula of Typotherium is *'. \, c. %,p. ?, m. % ; that of the smaller Patagonian forms differs by the larger number (|) pi pre molars. The toes were unguiculate rather than ungulate in character, except the hind ones (four in number) of Typotherium. Certain allied Patagonian forms, such as Argyrohyraic, have been supposed to be related to the Hyraxes.

The Toxodontidae differ from the preceding families by the loss of the clavicles and the reduction of the digits to three in each foot. The typical genus Toxodon is represented by animals the size of a

(From British Museum [Nal. His.] Guide to the Fossil Mammalia.)

Fig. 2. — Skeleton of the Toxodon {Toxodon platensis). From

(About -ˆj nat. size.)

rhinoceros, of which the entire skeleton is now known (fig. 2). The teeth, of which the formula is i. f , c. f p. frf , m. J, all grow from per- sistent pulps; those of the cheek-series are very tall, highly curved, and with a simplified crown-structure. In the older Nesodon, on the other hand, the cheek-teeth are shorter-crowned, and depart less widely from a generalized Perissodactyle type, the total number of teeth being forty-four, and there being scarcely any gap in the series. Very remarkable changes occur in the dentition as age advances, most of the teeth eventually developing roots, although the second pair of incisors in each jaw was rootless. The complete

skeleton is not yet known, but it is ascertained that the femur differs from that of Toxodon in the retention of a third trochanter.

Toxodon is typified by T. platensis from the Pampean formation of Buenos Aires. Toxodontotherium and Xotodon are allied but rather older types. Nesodon is from the Santa Cruz beds of Patagonia, the typical N. imbricatus having a skull about a foot in length, but N. ovinus was a smaller animal, about the size of a sheep.

(R. L.*)

TOY, CRAWFORD HOWELL (1836-), American Hebrew scholar, was born in Norfolk, Virginia, on the 23rd of March 1836. He graduated at the university of Virginia in 1856, and studied at the university of Berlin in 1866-1868. In 1869-1879 he was professor of Hebrew in the Southern Baptist Theological Seminary (first in Greenville, South Carolina, and after 1877 in Louisville, Kentucky), and in 1880 he became professor of Hebrew and Oriental languages in Harvard University, where until 1903 he was also Dexter lecturer on biblical literature.

He wrote The Religion of Israel (1882); Quotations from the Old Testament in the New Testament (1884) ; Judaism arid Christianity (1890); and the Book of Proverbs (1899) in the "International Critical Commentary"; and edited a translation of Erdmann's commentary on Samuel (1877) in Lange's commentaries; Murray's Origin of the Psalms (1880); and, in Haupt's Sacred Books of the Old Testament, the Book of Ezekiel (Hebrew text and English version,

1899).

TOY (an adaptation of Du. tuig, tools, implements, .stuff, speltuig, playthings, i.e. stuff to play with, spelen, to play), a child's plaything, also a trifle, a worthless, petty ornament, a gew-gaw, a bauble. Children's toys and playthings survive from the most remote periods of man's life on the earth, though many so-called diminutive objects made andused by primitive man, sometimes classified as playthings, may have been work- men's models, votive offerings or sepulchral objects. A large number of wooden, earthenware, stone or metal dolls remain with which the children of ancient Egypt once played; thus in the British Museum collection there is a flat painted wooden doll with

strings of mud-beads representing the hair, a bronze woman doll bearing a pot, on her head, an earthenware doll carrying and nursing a child; some have movable jointed arms. There are also many toy animals, such as a painted wooden

calf, a porcelain elephant with a rider; this once had movable legs, which have disappeared. Balls are found made of leather stuffed with hair, chopped straw and other material, and also of blue porce- lain or papyrus. Jointed dolls, moved by strings, were evidently favourite play- things of the Greek and Roman children, and small modelsof furniture, chairs, tables, sets of jugs pain ted with scenes of children's life survive from both Greek and Roman times. Balls, tops, rattles and the implements of numerous games, still favourites in all countries and every age, remain to show how little the amuse- ments of children have changed.

See also Doll; Top; Play; and for the history of toys, with their varying yet unchanging fashions, see H. R. d'Allemagne, Histoire des Jouets, and F. N. Jackson, Toys of other Days (1908).

TOYNBEE, ARNOLD (1852-1883), English social reformer and economist, second son of Joseph Toynbee (1815-1866),

the Pampean Formation of Argentina.

TRABEATED—TRACERY

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a distinguished surgeon, was born in London on the 23rd of August 1852. He had originally intended to enter the army, but ill health and a growing love of books changed his plans, and he settled down to read for the bar. Here again the same causes produced a change of purpose, and he entered as a student at Pembroke College, Oxford. Finding himself by no means at ease in that college he migrated after two years to Balliol College. Continued ill health prevented his reading for honours, but he made so deep an impression on the authori- ties of his college that on taking his degree he was appointed lecturer and tutor to students preparing for the Indian civil service. He devoted himself to the study of economics and economic history. He was active also as a practical social reformer, taking part in much public work and delivering lectures in the large industrial centres on economic problems. He overtaxed his strength, and

after lecturing in London in January 1883 he had a complete break-down, and died of inflammation of the brain at Wimbledon on the 9th of March.

Toynbee had a striking influence on his contemporaries, not merely through his intellectual powers, but by his strength of character. He left behind him a beautiful memory, filled as he was with the love of truth and an ardent and active zeal for the public good. He was the author of some fragmentary pieces, published after his death by his widow, under the title of The Industrial Revolution. This volume deserves attention both for its intrinsic merit and as indicating the first drift of a changing method in the treatment of economic problems. He, however, fluctuated considerably in his opinion of the Ricardian political economy, in one place declaring it to be a detected ” intellectual imposture,” whilst elsewhere, apparently under the influence of Bagehot, he speaks of it as having been in recent times ” only corrected, re-stated, and put into the proper relation to the science of life,” meaning apparently, by this last, general sociology. He saw that the great help in the future for the science of economics must come from the historical method, to which in his own researches he gave preponderant weight. Toyn- bee’s interest in the poor and his anxiety to be personally acquainted with them led to his close association with the district of White-chapel in London, where the Rev. Canon S. A. Barnett (q.v.) was at that time vicar — an association which was commemorated after his death by the social settlement of Toynbee Hall, the first of many similar institutions erected in the East End of London for the purpose of uplifting and brightening the lives of the poorer classes.

See F. C. Montague’s Arnold Toynbee (Johns Hopkins University Studies, 1889); Lord Milner’s Arnold Toynbee: a Reminiscence (1901); and L. L. Price’s Short History of Political Economy in England lor a criticism of Toynbee as an economist.

TRABEATED, the architectural term given to those styles in which the architrave or beam (Lat. trabs) is employed instead of the arch, in the latter case the term ” arcuated ” being used. The principal trabeated styles are the Egyptian, Persian, Greek, Lycian, nearly all the Indian styles, the Chinese, Japanese and South American styles, in all cases owing their origin to the timber construction, for which reason the term post-and-lintel architecture is sometimes applied to it.

TRACERY, a late coined word from ” trace,” track, Lat. trahere, to draw; the term given in architecture (French equivalents are reseau, remplissage) to the intersecting rib- work in the upper part of a Gothic window; applied also to the interlaced work of a vault, or on walls, in panels and in tabernacle work or screens. The tracery in windows is usually divided into two sections, plate tracery and rib or bar tracery, the latter rising out of the former, and entirely superseding it in the geometrical, flowing and rectilineal designs. The windows of the Early English period were comparatively narrow slits, and were sometimes grouped together under a single enclosing .arch; the piercing of the tympanum of this arch with a circular light produced what is known as plate tracery, which is found in windows of the late 12th century, as in St Maurice, York, but became more common in the first half of the 13th century. In England the opening pierced in the head was comparatively small, its diameter never exceeding the width of one of the windows below, but in France it occupied the full width of the enclosing arch and was filled with cusping, and sometimes, as in Chartres, with cusping in the centre and a series of small quatrefoils round, all pierced on one plane face. In order further to enrich the mullions and arches of the window, they were moulded, as in Stowe church,

Kent; the other portions were pierced; and finally, to give more importance to the principal lights, additional depth was given to their mouldings, so that they gradually developed into bar or rib tracery, of which the earliest examples in England are those in Westminster Abbey (c. 1250) and Netley Abbey near Southampton. Henceforth that which is described in architecture as the ” element ” ruled the design of the window, and led to the development of geometrical tracery, in which the bars or ribs are all about equidistant from one another. In windows of three lights the heads of the windows .consisted of three circular openings, but with four lights they were grouped in two pairs, with a single circle over each and a larger one at the top in the centre. This led to increased dimensions being given to the moulding of the enclosing arches and the upper circle, forming virtually two planes in the tracery. In the great east window at Lincoln, with eight lights, there was a double subdivision and three planes, and here the upper circle was filled with semicircles, so that the openings were all about the same width. In France the upper circle always maintained its predominance, its subdivisions only retaining the scale. The next development, which would seem to have taken place in Gloucester Cathedral,

was the omission of portions of the enclosing circle, so as to allow the ribs to run one into the other, forming therefore lines of double curvature, and giving rise to what is known as flowing or flamboyant tracery, of which the great window in Carlisle Cathedral is the most important example. In this window there are nine lights, the four outer ones in each rib being grouped together; these were not sub- divided again, and consequently there are only two planes of tracery. The Perpendicular style which followed might, per- haps be considered as a reaction against the abuse of the flowing lines in masonry, were it not that in the earlier examples it appears timidly. At Edington church in Wiltshire (1361), in a five-light window, the centre light is wider than the others and its mullions run straight up into the arch mould. In New College chapel, Oxford (1386), the head of the window is sub- divided into narrow vertical lights, each half the width of those below, and this is followed in some counties, but not in all, in the east of England the flamboyant tracery being retained a century later. In St Mary's church, Oxford, with seven lights, all the mullions run straight up into the arch mould, and another feature is introduced, already found in New College chapel, and at a much earlier date in domestic work and in spire-lights, viz. the transom. In the later Perpendicular work another change takes place; the pointed arch struck from two centres is replaced by one struck from four centres, and this eventually in domestic work is superseded by the flat arch.

So far reference has been made only to that which may be called the " element " of the window. The enrichment of the lights with cusping gave additional beauty to them, took away the hard wire- drawn effect of the mouldings, and formed openings of great variety ; in some of the windows of the Decorated period the ball flower and other foliage is introduced into the mouldings. In French work the geometrical style lasted till the 14th century, and then there was a lapse in building, so that the flamboyant style which followed, and from which at one time it was assumed that the English mason had derived the style, was apparently taken up by the French after its abandonment in England ih favour of Perpendicular work. Germany and Spain have always followed in the wake of the French ; and in Italy, where architects preferred to decorate their walls with frescoes, the light from stained glass interfered with their effect, so that there was no demand for huge windows or their subdivision with mullions. At the same time there are many beautiful examples of

tracery in Italy, generally in marble, such as those of Giotto's Campanile and the cathedral at Florence, in the Ducal and other palaces at Venice, and in the triforium arcades of Pisa and Siena cathedrals; but they destroyed its effect by the insertion of small capitals to the mullions, which gave horizontal lines where they were not wanted, virtually dividing the window into two parts instead of emphasizing, as was done in the Perpendicular period, the vertically of the .mullions.

Among the most gloripus features in the Gothic architecture of France, England and Spain are the immense rose windows which were introduced, generally speaking, in the transepts of the cathedrals; the tracery of these follows on the lines of those of the windows, changing from geometrical to Decorated and afterwards to flam- boyant. In some respects perhaps the finest examples of plate- tracery were produced in the rose windows of the 13th century'-

Thus in France in the rose window of Chartres in the west front (1225), and in England in those of Barfreston in Kent (1180) and Beverley Minster in Yorkshire (1220), plate-tracery of such great beauty is found that it is unfortunate it should have been entirely superseded by rib-tracery. The rose window of Lincoln Cathedral in the north transept is a compromise between the two, as all the lights are cut out independently and in one plane, but there are mouldings round each connected with flowers; in its design and effect this window is far superior to the flamboyant circular window in the south transept. Sometimes a rose window is arranged in the upper portion of an ordinary window, as in the west front of Lichfield Cathedral, and this is constantly found in those of the transepts of the French cathedrals. In the south of Italy, at Bari, Bitonto and Troja, and at Orvieto and Assisi, farther north, thereare examples of rose windows, but inferior in design to French and English work, though elaborated with carving. The revival of the 16th century was fatal so far as tracery was concerned ; in the place of the flam- boyant work of the last phase of Gothic in France semicircular and elliptical curves with poor mouldings were introduced, and the elaborate cusping which gave such interest to the light was omitted altogether, as in St Eustache, Paris. There is, however, one remark- able example in the church of Le Grand Andely, in Normandy, dating

from the Henri II. period, in which a return was made to the tracery of the 13th century; but the introduction of Renaissance details in the place of the cusping is not altogether satisfactory, though the general design is fine.

The tracery decorating the vault of Gothic work began on the introduction of the fan vault at Gloucester (see Vauit) ; it was only a surface decoration, both rib and web being cut out of the same block of stone, and it received further development in the various phases which followed. In the later Perpendicular work the walls and buttresses were all panelled with blank tracery, the most com- plete example of which is found in Henry VII. 's chapel, Westminster Abbey.

In tabernacle work the tracery is purely of a decorative character, copied in miniature from the mullions, arch-moulds and crockets of Gothic work.

Some of the most beautiful examples of tracery are those on the rood screens of churches, either in stone as in the Jube of the Made- leine at Troyes, or in wood as in the rood screens of the churches in East Anglia and in Somersetshire; and with this must be included that which was introduced into the panelling of church doors, choir stalls and other church fittings; this was continued, first in the early Renaissance of the 16th century, the finest examples being those of the stalls of King's College, Cambridge, and afterwards in the Jacobean style, in the church at Croxcombe near Shepton Mallet, and the church of St John at Leeds, the two latter ranking as the best work of that late period. (R. P. S.)

TRACHELIUM (Gr. rpdxijXos, neck), the term in architecture given to the neck of the capital of the Doric and Ionic orders. In the Greek Doric capital it is the space between the annulets of the echinus and the grooves which marked the junction of the shaft and capital; in some early examples, as in the basilica and temple of Ceres at Paestum and the temple at Metapontum, it forms a sunk concave moulding, which by the French is called the gorge. In the Roman Doric and the Ionic orders the term is given by modern writers to the interval between the lowest moulding of the capital and the top of the astragal and fillet, which were termed the " hypotrachelium " (q.v.).

TRACHEOTOMY, the operation of opening the trachea or windpipe (see Respiratory System) and inserting a tube (canula)

to provide a means of breathing when the natural air-passage is obstructed. The operation is by no means easy when performed on a small child, for the wind-pipe is deeply placed amongst important structures. The chief anxiety is in connexion with haemorrhage, for the vessels are large and generally overfull on account of the impairment of the respira- tion. The higher the opening is made in the trachea the easier and safer is the operation.

TRACHIS, a city of ancient Greece, situated at the head of the Malian Gulf in a small plain between the rivers Asopus and Melas, and enclosed by the mountain wall of Oeta which here extended close to the sea and by mea-ns of the Trachinian Cliffs completely commanded the main road from Thessaly. The position was well adapted as an advanced post against invaders from the north, and furthermore guarded the road up the Asopus gorge into the Cephissus valley. Strangely enough, it is not recorded what part Trachis played in the defence of Thermopylae against Xerxes. Its military impor- tance was recognized in 427 B.C. by the Spartans, who sent a garrison to guard the Trachinian plain against the marauding

highland tribes of Oeta and built a citadel close by the Asopus gorge with the new name of Heraclea. The Spartans failed to safeguard Heraclea against the Oetaeans and Thessalians, and for a short time were displaced by the Thebans (420). After a bloody defeat at the hands of the neighbouring mountaineers (409) the Spartan governor quar- relled with the native settlers, whom he expelled in 399. Four years later Thebes used her new predominance in central Greece to restore the Trachinians, who retained Heraclea until 371, when Jason of Pherae seized and dismantled it. The fortress was rebuilt, and after 280 served the Aetolians as a bulwark against Celts and Macedonians. It was captured in 191 by the Romans, but restored to the Aetolian League until 146. Henceforth the place lost its importance; in Strabo's time the original site was apparently deserted, and the citadel alone remained inhabited.

Strabo p. 428; Herodotus vii. 198-203; Thucydides iii. 92, v. 51-52; Diodorus xiv. 38, 82; Livy xxxvi. 22-24. W. Leake, Travels in Northern Greece, iii. 24-31 (London, 1835) ; G. B. Grundy, Great Persian War, pp. 261-264 (London, 1901). (M. O. B. C.)

TRACHOMA, the name given to a chronic destructive form of inflammation of the conjunctiva of the eye (see Eye: Diseases) ,

or “granular conjunctivitis” (Egyptian ophthalmia). It is a contagious disease, associated with dirty conditions, and common in Egypt, Arabia and parts of Europe, especially among the lower class of Jews. Hence it has become important, in connexion with the alien immigration into the United King- dom and America, and the rejection of those who are afflicted with it. It is important that all cases should be isolated, and that the spread of the infection should be prevented.

TRACHYTE (Gr. rpaxvs, rough), in petrology, a group of volcanic rocks which consist mainly of sanidine (or glassy orthoclase) felspar. Very often they have minute irregular steam cavities which make the broken surfaces of specimens of these rocks rough and irregular, and from this character they have derived their name. It was first given by Haiiy to certain rocks of this class from Auvergne, and was long used in a much wider sense than that defined above, in fact it included quartz-trachytes (now known as liparites and rhyolites) and oligoclase-trachytes, which are now more properly assigned to andesites. The trachytes are often described as being the volcanic equivalents of the plutonic syenites. Their dominant mineral, sanidine felspar, very commonly occurs in two generations, i.e. both as large well-shaped porphyritic crystals and in smaller imperfect rods or laths forming a finely crystalline groundmass. With this there is practically always a smaller amount of plagioclase, usually oligoclase; but the potash felspar (sanidine) often contains a considerable pro- portion of the soda felspar, and has rather the characteristics of anorthoclase or cryptoperthite than of pure sanidine.

Quartz is typically absent from the trachytes, but tridymite (which likewise consists of silica) is by no means uncommon in them. It is rarely in crystals large enough to be visible without the aid of the microscope, but in thin slides it may appear as small hexagonal plates, which overlap and form dense aggregates, like a mosaic or like the tiles on a roof. They often cover the surfaces of the larger felspars or line the steam cavities of the rock, where they may be mingled with amorphous opal or fibrous chalcedony. In the older trachytes secondary quartz is not rare, and probably sometimes results from the recrystallization of tridymite.

Of the ferromagnesian minerals present augite is the most common. It is usually of pale green colour, and its small crystals are often very perfect in form. Brown hornblende and biotite

occur also, and are usually surrounded by black corrosion borders composed of magnetite and pyroxene. Some- times the replacement is complete and no hornblende or biotite is left, though the outlines of the cluster of magnetite and augite may clearly indicate from which of these minerals it was derived. Olivine is unusual, though found in some tra- chytes, like those of the Arso in Ischia. Basic varieties of plagioclase, such as labradorite, are known also as phenocrysts

in some Italian trachytes. Dark brown varieties of augite and rhombic pyroxene (hypersthene or bronzite) have been observed but are not common. Apatite, zircon and magnetite are prac- tically always present as unimportant accessory minerals.

The trachytes being very rich in potash felspar, necessarily contain considerable amounts of alkalis; in this character they approach the phonolites. Occasionally minerals of the fels- pathoid group, such as nepheline, sodalite and leucite, occur, and rocks of this kind are known as phonolitic trachytes. The soda-bearing amphiboles and pyroxenes so characteristic of the phonolites may also be found in some trachytes; thus aegirine or aegironic augite forms outgrowths on diopside crystals, and riebeckite may be present in spongy growths among the felspars of the groundmass (as in the trachyte of Berkum on the Rhine). Trachytic rocks are typically porphyritic, and some of the best- known examples, such as the trachyte of Drachenfels on the Rhine, show this character excellently, having large sanidine crystals of tabular form an inch or two in length scattered through their fine-grained groundmass. In many trachytes, however, the phenocrysts are few and small, and the ground- mass comparatively coarse. The ferromagnesian minerals rarely occur in large crystals, and are usually not conspicuous in hand specimens of these rocks. Two types of ground- mass are generally recognized: the trachytic, composed mainly of long, narrow, sub parallel rods of sanidine, and the orthophyric, consisting of small, squarish or rectan- gular prisms of the same mineral. Sometimes granular augite or spongy riebeckite occurs in the groundmass, but as a rule this part of the rock is highly felspathic. Glassy forms of trachyte (obsidians) occur, as in Iceland, and pumiceous varieties are known (in Teneriffe and elsewhere), but these rocks as contrasted with the rhyolites have

a remark- ably strong tendency to crystallize, and are rarely to any considerable extent vitreous.

Trachytes are well represented among the Tertiary and Recent volcanic rocks of Europe. In Britain they occur in Skye as lava flows and as dikes or intrusions, but they are much more common on the continent of Europe, as in the Rhine district and the Eifel, also in Auvergne, Bohemia and the Euganean Hills. In the neigh- bourhood of Rome, Naples and the island of Ischia trachytic lavas and tuffs are of common occurrence. In America trachytes are less frequent, being known in S. Dakota (Black Hills). In Iceland, the Azores, Teneriffe and Ascension there are Recent trachytic lavas, and rocks of this kind occur also in New South Wales (Cambe- warra range), East Africa, Madagascar, Aden and in many other districts.

Among the older volcanic rocks trachytes also are not scarce, though they have often been described under the names orthophyre and orthoclase-porphyry, while ” trachyte ” was reserved for Tertiary- and Recent rocks of similar com- position. In England there are Permian trachytes in the Exeter district, and Carboniferous trachytes are found in many parts of the central valley of Scotland. The latter differ in no essential respect from their modern representatives in Italy and the Rhine valley, but their augite and biotite are often replaced by chlorite and other secondary products. Permian trachytes occur also in Thuringia and the Saar district in Germany.

Closely allied to the trachytes are the Keratophyres, which occur mainly in Palaeozoic strata in the Harz (Germany), in the Southern Uplands of Scotland, in Cornwall, &c. They are usually por- phyritic and fluidal ; and consist mainly of alkali felspar (anortho- clase principally, but also albite and orthoclase), with a small quantity of chlorite and iron oxides. Many of them are lavas, but

for a lengthy monograph on a subject, dealing with it technically and authoritatively, whereas a tract is understood to be brief and rather argumentative than educational. There is, again, the rarer word tractate, which is not a tract, in the precise sense, so much as a short treatise.

The word ” tract ” has come to be used for brief discourses of a moral and religious character only, and in modern practice it seems to be mainly confined to serious and hortatory themes. An

essay on poetry, or the description of a passage of scenery, would not be styled a tract. In the Protestant world, the tract which Luther composed in 1520, on the Babylonish captivity, has been taken more or less as the type of this species of literature, which, however, existed long before his day, both in Latin and in the vernacular tongues of western Europe. It is difficult, if not impossible, in early history, to distinguish the tract from other cognate forms of moralizing literature, but it may perhaps be said that the homilies of yElfric (955- 1025?) are the earliest specimens of this class in English litera- ture. Four centuries later Wyclif issued a series of tracts, which were remarkable for their vigour, and exercised a strong influence on medieval theology. Bishop Reginald Pecock published many controversial tracts between 1440 and 1460. Sir Thomas More, John Fisher (d. 1535) and William Tyndale were prominent writers of controversial treatises. It was the Martin Marprelate agitation, in the reign of Elizabeth, which led from 1588 to 1591 to the most copious production of tracts in English literature; of these nearly thirty survive. On the Puritan side the principal writers were John Udall (1 560-1 592), Henry Barrowe (d. 1593), John Penry (1550-1593) and Job Throckmorton (1545-1601), the tracts being printed in the house of the last-mentioned; on the side of the Established Church the principal authors were Bishop Thomas Cooper (151 7-1 594) and the poets Lyly and Nash. An enormous collection of tracts was published between 171 7 and 1720 in elucidation of what is known as the Bangorian Controversy, set in motion by a sermon of Benjamin Hoadly, bishop of Bangor, on "The Nature of the Kingdom of Christ" (1717). Convocation considered this a treatise likely to impugn and impeach the royal supremacy in religious questions. A vast number of writers took part in the dispute, and Thomas Sherlock (1678-1761) fell into disgrace through the violence of his contributions to it. Convocation was finally obliged to give way.

The most famous collection of tracts published in the course of the 19th century was that produced from 1833 onwards by Newman, Keble and E. B. Pusey, under the title of " Tracts for the Times." Among these Pusey's " Tract on Baptism " (1835) and his " On the Holy Eucharist" (1836) had a profound effect in leading directly to the foundation of the High Church party, so much so that the epithet " Tractarian " was bar- barously coined to designate those who wished to oppose the spread of rationalism by a quickening of the Church of England. In 1841 Newman's " Tract No. XC." was condemned by the heads of houses in Oxford,

and led to the definite organization of the High Church forces. (X.)

Trad Societies are agencies for the production and distribution, or the distribution only, of Christian literature, more especially in

Si0 2

AUOs

Fe 2 O a

FeO

MgO

CaO

Na 2

K 2

H 2

Riebeckite trachyte, Hohenberg, Berkum, Rhenish Prussia .

Keratophyre, Hamilton Hill, Peebles, Scotland

Trachyte (Orthophyre) Garleton Hill, Haddington, Scotland. Trachyte, Monte Nuovo, Phlegraean Fields, near Naples, Italy Trachyte, Algersdorf, Bohemia

6606 64-38

6i-35

60-33 64-69

16-46 16-98 16-88 18-74 18-39

2-25 4-04 0-41

2-84

I-IO

5-01 1-29

3-44

0-19

0-28

0-44 0-38 0-49

o-79

1-08

2-39

i-i5

1-72

6-8i

‘7-57 5-26

7-15 4-61

5-52

4-3o

6-12

7-30 6-46

0-62 1-64

I -70

0-56

0-24

others are probably dikes or thin intrusions. As the analyses given above will show, they differ from trachytes mainly in being richer in soda. (J. S. F.)

TRACT (from Lat. tractare, to treat of a matter, through Provencal tractat and Ital. trattato), in the literary signification, a work in which some particular subject, or aspect of a subject, is treated. As far as derivation is concerned, a tract is identical with a

treatise, but by custom the latter word has come to be used

tract form. They vary in importance from the Society for Promoting Christian Knowledge (London), the Religious Tract Society (London) and the American Tract Society (New York)— all of which are publishing houses of recognized standing — to small and purely local organizations for distributing evangelistic and pastoral literature. It was not until the Evangelical Revival that tract work began to develop along its modern lines. Starting from the provision of simple evangelistic literature for home

use, the enterprise grew into the provision of Christian literature, not only for home use, but also for the mission fields of the world. With this growth there proceeded another develop- ment, the production of books and magazines being added to that of tracts. The title ” Tract Society ” has, in fact, become misleading, as suggestive of limitations which had but a brief existence and are no longer recognized by the more important agencies. On the ” other hand it must not be supposed that because the work has gone beyond the provision of tracts, these are no longer widely employed. Probably their use in various forms at home was never wider than it is to-day; whilst in India, China and elsewhere the attack of the Christian tracts is being met by the circulation of vernacular tracts in defence of the non-Christian faiths.

The Society for Promoting Christian Knowledge, founded in 1698, though most widely known as a publishing agency, assists in a wide variety of ways the work of the Church of England. On its publica- tion side, it is for its own Church both a Bible society and a tract society. Moreover, its publications include not only versions of the Holy Scriptures and of the Liturgy, but also theological and general literature in many forms. It has given much attention to providing good reading for children; whilst its tract catalogue is especially rich in works bearing on Christian evidences, Church seasons and the doctrines of the Anglican Church. To the foreign missions of the Church the S.P.C.K. has been a helper of the utmost value, more especially in regard to their medical missions and their use of Christian literature. In the latter case the help is given by grants of works produced either at home or by mission presses in the field. As early as 1 720 it was using Arabic ; but it has from time to time been of especial value

in helping to found a Christian literature in languages or dialects just reduced to writing. Thus whilst recent publications for the mission field include works in Arabic, Chinese and Urdu, they also include publications in Addo, Lunyoro and Sgau Karen.

The Religious Trad Society, founded in 1 799, and thus contemporary with the great missionary agencies and the Bible Society, is, like the last-named, an interdenominational organization. Its earliest publications were in English and were tracts. But it speedily undertook book publications and extended its field of operations. It began to provide tracts for China in 1813, and- as early as 1817 an auxiliary tract society was founded at Bellary in India by Some men of the 84th Regiment. In undertaking book publication, the society became one of the pioneers in the provision of sound and cheap literature; whilst by the issue of the Sunday at Home, the Leisure Hour, the Boy's Own Paper, the Girl's Own Paper, the Cottager and Artisan and other periodicals, it helped to lead the work in the provision of popular magazines. Like the S.P.C.K., the R.T.S. now produces general theological literature as well as tracts in a variety of forms, whilst it also gives especial attention to the provision of healthy reading matter for young people. Its grants of books and tracts are open to members of all Protestant denominations. The society aids Protestant communities on the Continent by maintaining depots at Madrid, Barcelona, Lisbon, Vienna, Budapest and Warsaw; whilst it also assists, by grants,

fublication work in France, Italy, Russia, Turkey and Scandinavia. n the mission field it works mainly through subsidiary tract societies locally organized. The chief of these tract and book societies are in India carried on at Calcutta, Madras, Bombay, Bangalore, Allahabad and Lahore; in China at Peking, Shanghai, Hong Kong, Canton, Hankow, Chung-king and Mukden; and in Japan at Tokio. The literature produced by these organizations ranges from com- mentaries on the Holy Scriptures to the simplest tracts and leaflets. In 1908 the society opened a special fund in aid of its Chinese work, and by this means the provision of Christian literature in book and tract form for Chinese readers has been greatly extended. Much literature for various foreign fields is also produced in Great Britain and distributed from the society's headquarters. As with the S.P.C.K., the R.T.S. has been of great service in providing (next to the Holy Scriptures) the earliest literature for some languages. Thus it has helped to provide tracts for the Miaos of west China and for the Baganda, together with the Pilgrim's Progress in Bemba and in

Ew6, two little-known African tongues. The languages in which works produced or aided by the society have appeared number about 300. In the distribution of its grants of tracts for home work nearly all the great evangelical organiza- tions have a share. In the administration of a subsidiary tract society all the evangelical agencies at work in its field are as a rule represented.

In addition to the work of these societies, the production and distribution of tracts at home is carried on by The Stirling Tract Enterprise, wh'ch also sends grants of its publications to India, Ceylon and Africa; by The Children's Special Service Mission, which also issues publications in Chinese, Japanese and some Indian languages; and by The Scripture Gift Mission, which sends its publi- cations into China and the East generally. In the mission field The Christian Literature Society for India (formerly the Christian

Vernacular Educational Society), established in 1858, has its head* quarters in London with auxiliary committees in India and Ceylon. It will always be associated with the name of Dr John Murdoch (d. Aug. 10, 1904), its secretary for nearly half a century. It works on similar lines to the tract societies, but includes a wider range of educational literature, in the provision of which it has been especially helpful to the mission schools of India.

The Christian Literature Society for China (formerly the Society for the Diffusion of Literature and General Knowledge among the Chinese) is incorporated (1909) in Shanghai, but has an advisory committee and an executive committee in London. It has been of great service in approaching the official and upper classes of China by its magazines and .books, as well as by the diffusion of more popular literature.

The American Tract Society (New York) works, both in regard to domestic and foreign enterprises, upon similar lines to those of the Religious Tract Society. Upper Canada has its tract society also and similar organizations exist on the continent of Europe.

(A. R. B.)

TRACTION (Lat. trahere, to draw), the act of drawing or hauling. As used in this article the term refers to the methods of employing animal and mechanical power for transporting persons or things from place to place in wheeled vehicles.

Animal Traction. — The oldest form of motive power is that of animals, those most commonly employed for draught purposes on ordinary roads being horses, mules, donkeys and oxen. On the continent of Europe dogs are often harnessed to light carts or barrows, but in England their use in this way was prohibited by the Cruelty to Animals Act of 1854. Camels and elephants are only rarely used as draught animals in special circumstances.

When men and animals carry burdens, or draw or propej loads in certain vehicles, it is difficult, and sometimes impossible, to determine the duty performed in foot-pounds of work, because of the uncertainty of the amount in pounds of the resistance overcome. In this case, for the purpose of comparing performances of the same kind with each other, a unit is employed called a foot-pound of horizontal transport, meaning the conveying of a load of 1 lb 1 ft. horizontally. The following table, given by W. J. Macquorn Rankine, gives some examples of the daily duty of men and horses in units of horizontal transport, L denoting the load in lb, V the velocity in feet per second, and T the number of seconds per day of working: —

L.

V.

T

3600′

LV.

LVT.

lb.

Feet

per

second.

Hours per day.

lb. con- veyed 1 ft.

lb. conveyed

1 ft.

Man — Walking unloaded , transport of own ‘(

Do. do

Wheeling load L in two-wheeled barrow, I returning empty; V = £ velocity . } Do. one-wheeled barrow, do. .

Conveying burden, returning unloaded

Carrying burden for 30 seconds only •{

Horse — Walking with cart always loaded . .

Walking with cart, going loaded, re- 7, turning empty; V = £ mean velocity) Carrying burden, walking .... Do. trotting ....

140 140

224

135 90

X40

252 126

1500 750 1500

270 180

5-o

60 16 16 2-5 16

ii-7

231

36

7‘2

20

3”6 7-2

10 10 10 10

7

6

10

4*

IO IO

7

700 840 373

225

225 2 33

1474*2

5400 5400

3000

972 1296

25,200,000.

30,240,000

13,428,000

8,100,006 5,670,000 5,032,800

194,400,000 87,480,000

108,000,006

.34,992,000 32,659,200-

For tramway service, horse, or occasionally mule, traction was formerly employed almost universally, but on account of limited speed and high cost it has been generally abandoned, except in a few localities, where the smallness of the line, ldw value of livestock, labour and feed, and long headway intervals, make it still profitable.

The tractive force required on a straight and level tramway is found to vary from y&s to ^o °f the load, according to the condition of the rails. On a tramway having grooved' rails in average condition it is about xoo- The resistance is thus, at the best, nearly double that on a railway, and sometimes as much as on a good paved road. This is due to the friction of the flange of the wheel in the grooved rail, and to the fact that the latter is always more or less clogged with dirt. The

clearance between the flange and the groove is necessarily small, as the former must have sufficient strength, and the latter must be narrow. The least inaccuracy of gauge, there- fore, causes extra friction, which is greatly increased on curves. By removing the flanges from two of the four wheels of the tramway car H. E. Tresca (1814-1885) found that the resistance was reduced from -x^-j- to j-J^- of the load. The resistance due to gravity is of course not lessened on a tramway; and if y^ T of the load be the tractive force required on the level, twice as much, or -gV of the load, will be required on a gradient of 1 in 100 and three times as much on a gradient of 1 in 50. To start a tramcar, four or five times as great a pull is required as will keep it in motion afterwards, and the constant starting after stoppages, especially on inclines, is destructive to horses. Horses employed on tramways are worked only a few hours a day, a day's work being a journey of 10 or 12 m., and much less on steep gradients. In London a tramcar horse bought at the age of five years had to be sold at a low price after about four years' work. On the Edinburgh tramways, in consequence of steep gradients, the horses lasted a less time, and had to be constantly shifted from steep to easier gradients. The cost of traction by horses is generally 6d. or yd. per mile for two horses, and more when the gradients are steep (see also Tramway).

Steam Traction.— -The most universally used form of motive power is the steam engine, which has been constructed to work on ordinary roads, on tramways and on railways. The road or traction engine comprises a boiler mounted on wheels, and a steam engine usually placed on top of the boiler. The front axle is pivoted so that it may be moved by means of a steering wheel geared to it, and the rear wheels are geared to the engine. The wheel rims are made wide to prevent them from sinking in loose

earth or muddy roads. The whole arrangement is similar to the ordinary wheeled portable boiler and engine with the addition of the steering wheel and a gear connexion from the engine to the rear wheels. The tractive power of these engines is high, but their speed low — usually 4 to 6 m. per hour.

A peculiar form of road motor is made by equipping the axles of a traction engine with the so-called ” Pedrail ” invented by B. J. Diplock. This is an arrangement whereby circular pads or ” feet,” fastened around the periphery of a wheel, come successively in contact with the ground, the motion approximating to a smooth, even stepping or walking along. Fourteen of these feet are placed

on the ground as the movement of the engine proceeds, and the engine itself rolls along on the rail portion of the cam which rests on the rollers beneath it. Ball and socket joints are used to connect the feet to the spokes so that they may rest on any conformation they may encounter. This machine has shown a remarkable ability to pass over obstacles and rough roads, and even to climb roadless hills. It gives a maximum of adhesion of the drivers, and it is claimed that it will pass over rough roads with the expenditure of less energy than will an ordinary wheeled traction engine. Its speed is necessarily low — about 4 m. per hour.

Fig. 2. — Chain Track Tractor.

The Hornsby ” Chain Track Tractor ” (fig. 2), patented by Mr David Roberts, is provided with two endless chains, one on each side, which constitute the track on which the machine travels. Each chain is carried on two sprocket wheels, placed at the extreme

(From The Scientific American.)

Position of the parts in overcoming Position of the parts on a level

obstacles. road.

Fig. 1. — Principle of the Pedrail’s operation, around a wheel, and each is attached at the end of a spoke, free to slide radially toward and from the hub of the wheel. Each spoke has fastened to it a helical spring which tends to draw it inwards. On each spoke there is also a roller, which bears against a cam-shaped piece placed inside the periphery of the wheel. The engine is sus-

pended by springs from the cam and is supported by it. The lower edge of the cam is practically straight and horizontal, the length of this straight portion being great enough to subtend an angle equal to the spacing of three spokes, or about 70 . By this means three of the feet are always resting on the roadway and support the engine, which really slides along on the rollers that are at any instant Under- neath the flat portion of the cam. The feet take successive positions

Fig. 3. — Links of Chain Track.

ends of the frame, and is formpd of a number of links (fig. 3) so connected that it is free to bend in one direction, as required to pass round the sprocket wheels, but is locked into a rigid bar by pressure acting in the opposite direction. On their outer surfaces these links bear pads or feet, while their inner surfaces compose a track upon which roll the middle or weight-bearing wheels. Power applied to one of the sprocket wheels exerts a pull on the chain, but this being held fast by the weight of the engine pressing the feet to the ground, the effect is to roll the engine along the track, and as this happens the feet at the rear end are one by one lifted off the ground, carried round the sprocket wheels, and relaid at the front of the machine. This construction not only renders.the whole weight available for adhesion, but also provides a long supporting base and thus enables the machine to pass over soft ground, loose sand, morasses, &c, in which an ordinary traction engine would certainly sink. Steering is effected by retarding or stopping the motion of the sprocket wheels on the side towards which it is desired to turn.

For tramway work steam is scarcely used at all now, though small locomotives — usually having their engines geared to the driving- wheels, instead of the connecting-rods being coupled direct to them — have been used in the past for this work. They were compactly designed and equipped with mufflers to deaden the sound of the exhaust, with other devices to decrease noise and smoke. In some instances, the engine and boiler were placed in the forward end of a car, a partition separating them from the main body of the car in which the passengers were carried.

For description of steam railway engines see Railways: Loco- motive Power, and Steam Engine.

Fireless Engines. — Fireless engines were first tried in New Orleans, and were in successful use on tramways in France and

Batavia, Java, for some years. The motive power was obtained from water heated under pressure to a very high temperature in stationary boilers and carried in a reservoir on the engine, where it gave off steam as the pressure and temperature were reduced. Two tons of water heated to give a steam-pressure of 250 lb to the square inch served for a run of 8 or 10 m., more than ˆ of the water and a pressure of 20 to 25 ib above the atmosphere being left on returning to the boiler station. Large boiler-power was required to reheat the engine reservoirs quickly, and this could be afforded for only a few engines; but, when worked on a sufficient scale, the tireless engines were claimed to be economical, the economy resulting from the generation of the steam in large stationary boilers.

Compressed Air. — Compressed air as a motive power offers the advantage of having neither steam nor the products of combustion to be got rid of. In W. D. Scott Moncrieff's engine, which was tried on the Vale of Clyde tramways in 1876, air was compressed to 310 lb per sq. in., and expanded in the cylinders from a uniform working pressure to that of the atniosphere. There is a considerable loss of heat during the expansion of the air which is attended with a serious loss of pressure, and in L. Mekarski's system, which was in use for the propulsion of tramcars at Nantes for a number of years, the loss of pressure was considerably lessened by heating the air during expansion. The air, at a pressure of 426 lb per sq. in., was stored in cylindrical reservoirs beneath the car, and before use was passed through a vessel three-quarters full of water heated to 300° F., by which it was heated and mixed with steam. The heat of the latter was absorbed by the air during its expansion, first to a working pressure which could be regulated by the driver, and then to atmospheric pressure in the cylinders. At Nantes the average cost for three years of propelling a car holding thirty- four persons was about 6d. per mile. Owing to the heat losses in compressing the air, and other considerable losses incident to its use, the compressed-air systems of traction have been found inefficient and have nearly all been replaced by the more flexible and efficient electric motqr.

Cable Traction. — Moving steel cables, propelled by steam engines, have been used for traction. The street railway cars

running from New York to Brooklyn, over the Brooklyn Bridge, were for many years propelled by a cable to or from which the cars could be attached or detached at will, and, though electric motors are now used on this line, the cables are still kept in place as a reserve in case of breakdown of the electrical system, and are used whenever an accident to the electrical plant occurs. Before the advent of electric traction, the tramways using cable propulsion were numerous and of great size, as at San Francisco, Chicago, Washington, Baltimore, Philadelphia and New York in America, at Highgate Hill (London) and Edinburgh in the United Kingdom, and at Melbourne in Australia. The Glasgow Subway is so equipped.

In the usual form, the motive power is transmitted from a station- ary engine by a rope of steel wire running always in one direction, up one track and down the other, in a tube midway between the rails, on pulleys (fig. 4) which are arranged so as to suit curves and changes of gradient as well as straight and level lines. Over the rope is a slot f in. wide, in which travels a flat arm of steel connecting the dummy car with the gripper (fig- 5) which grasps the cable. The flat arm is in three pieces, the two outer ones constituting a frame which carries the lower jaw of the gripper, with grooved rollers at each end of it, over which the cable runs when the gripper is not in action. The upper jaw is carried by the middle piece which slides within the outer frame, and can be depressed by a lever or screw, pressing the cable first on the rollers and then on the lower jaw until it is firmly held. The speed of the cable, which is generally 8 to 10 m. an hour, is thus imparted to the car p adually and without jerk. The arrangements for passing the pulleys, for changing the dummy and cars from one line to the other at the end of the road, for keeping the cable uniformly taut, and for crossings and junctions with other lines, are of considerable ingenuity. When the cars are cast off from the cable they must be stopped by hand brakes which, on steep gradients especially, must be of great power.

Fig. 4.— Cross-section of Cable Road.

5SSS55E

3SS2&S

Fig. 5. — Gripper.

Gasolene Engine Traction. — Explosive engines using gasolene

(petrol) have been used for motive power, and this is the principal form employed in the road motor car. Certain railways in Eng- land and America have experimented with cars having a gasolene engine placed in one end to propel the car, the greater part of which is left clear for the accommodation of passengers. These cars are intended for short runs and may in effect be classed as belonging to ex- tended tramway service. They have yielded en- couraging results.

Electric Traction. — Electric traction, as treated here, will refer to the operation of vehicles for the transportation of passengers and goods upon tracks, as distin- guished from what are known as telpherage sys- tems on the one hand (see Conveyors), and automobiles intended to run on common roads on the other (see Motor Vehicles).

Possibly the first elec tric motor was that made by the Abbe Salvatore

dal Negro in Italy in 1830. As early as 1835, Thomas Daven- port, a blacksmith of Brandon, Vermont, U.S.A., constructed and exhibited an automobile electric car, operated by batteries carried upon it. Robert Davidson, of Aberdeen, Scotland, began experimenting about 1838 with the electric motor as a means of traction, and constructed a very powerful engine, weighing five tons and carrying a battery of forty cells. This locomotive made several successful trips on Scottish railways, but was finally, wrecked by jealous employes of the railway while it was lying in the car sheds at Perth. In 1840 a pro- visional patent was granted in England to Henry Pinkus, which described a method of supplying electric energy to a moving train from fixed conductors. A little later, in 1845, French and Austrian patents granted to Major Alexander Bessolo described practically what is to-day the third-rail system. In 1847 Professor Moses G. Farmer, of Maine, U.S.A., built a model locomotive operated by electricity, which he exhibited at Dover, New Hampshire, and later at other places in New England. Shortly afterwards Professor C. G. Page, of the Smithsonian Institution in Washington, constructed an electric railway motor, which made a trip on the 29th of April 1851, from Washington, D.C., to Bladensburg, Maryland, over the Baltimore & Ohio railway. This machine carried 100 Grove's cells, and attained speeds as high as 19 m. an hour. Perhaps the beginning of modern electric traction may be said to date from 1879, when the firm of Siemens & Halske put in operation the first electric railway at the Industrial

Exposition in Berlin. In America it was not until a year later that real work began and T. A. Edison built an experimental line near his laboratory in Menlo Park, New Jersey. In 1880 a locomotive driven by accumulators was constructed and operated at a linen-bleaching establishment at Breuil-en-Auge, in France; and in 1881 a similar car was worked upon the Vincennes tramway line. On the 12th of May 1 88 1 the first commercial electric railway for regular service was opened for operations at Lichterfelde, in Germany. The

first really noteworthy road was that constructed in 1883 at the Giant's Causeway at Portrush, in the north of Ireland. This line was 6 m. long, and the power was obtained from turbine wheels actuated by a cascade on the river Rush. The method of supply was, curiously enough, the third rail.

In 1883 invention in electric railways seems to have taken a decided advance in America. It was in this year that the conflicting interests of Edison and S. D. Field were consolidated; and at the same time C. J. van Depoele and Leo Daft began their experimental work, which later resulted in numerous commercial railways. Next year E. H. Bentley and Walter Knight opened to the public in Cleveland, Ohio, U.S.A., a railway operated by an open-slot conduit, and for the first time worked in competition with horse traction on regular street railway lines. For the next two years much experimental work was done, but it may be said with fairness that the first of the thoroughly modern systems, in which a large railway was equipped and operated under service conditions by electricity, was the line built in Richmond, Virginia, U.S.A., by Frank J. Sprague in 1887. This railway had 13 m. of track, and started with an equipment of forty cars. It has been in continuous and successful commercial operation ever since. The original Richmond system was in all its essential particulars the overhead trolley system now in use. Many improvements have been made in the construction of the motors, the controllers, the trolleys and the various details of car equipment and overhead construction, but the broad principles have not been departed from. The success of the Richmond line called the attention of tramway managers to the advantages of electricity as a motive power, and its substitu- tion for other systems progressed with astonishing rapidity.

The pioneer application of electricity to heavy electric traction was that of the Baltimore & Ohio railway tunnel at Baltimore, Md., U.S.A., and the system was put into operation in 1895. This tunnel is about ij m. in length and passes under the city of Baltimore. Its route made the expense of ventilation prohibitive, and the smoke and gases from the locomotives made the use of the tunnel impossible without ventilation. The management therefore decided to attempt the use of electric locomotives to haul the trains through, despite the fact that there existed no prior applications of heavy electric motors for even far lighter service than that demanded by the conditions, namely, the propulsion of trains of over 2000 tons up a grade of 42 ft. to the mile. The engineering work and designing of the locomotives were undertaken by Dr Louis Duncan. The locomotives weigh 96 tons and have worked successfully since they were first put into commission. The electric service has been extended 6 m. from the mouth of the tunnel, making a total haul of nearly 8 m. for these locomotives. In 1907 many heavy electric locomotives using continuous current were constructed for the New York Central & Hudson River Railroad Company to operate a distance of about 5 m. from the New York terminus, and others for practically the same service, but using single-phase alternating currents, were put in for the New York, New Haven & Hartford Railroad Company.

It has been fully demonstrated that electricity is superior to its competitors — horses and moving cables — for tramway work. It is cheaper and more flexible. The relative cost of operation varies with the local conditions, but a fair average estimate would be that cable lines cost 25% more to operate than electric, and horse lines 100% more. The increased speed of the electric cars and the comfort rendered possible by larger vehicles always increase the receipts when horse traction is replaced by electric, while the latter, as compared with the cable, allows better and easier control of the car and a much greater possible speed variation. The installation of an overhead electric line costs less than a cable system, though the expense of a conduit electric line is about the same. By the extension of the urban tramway systems into the suburbs and the construc- tion of inter-urban lines, electricity has come into competition with steam. Here the conditions are different. For ordinary suburban service, the electric cars, running through the city streets and on the highways, cannot, in speed, compete with

steam trains operated on private rights of way. The fact that they

run more frequently and can take up passengers anywhere along the line gives them an advantage, and within limited distances they have taken a large proportion of suburban traffic from steam railways. For long-distance service, in order to compete with steam a speed much greater than that used on ordinary tram-lines must be adopted, while owing to the time spent on the car more attention must be paid to the comfort of the passenger. Speed and comfort being equal, the great advantage of electricity is that, when it is used, the most economical way of transporting a given number of passengers between two points is in a larger number of small trains; with steam the converse is true. A frequent service is a great attraction to passengers.

For freight service, especially on railways having heavy grades, electricity also possesses many advantages, due princi- pally to the peculiarity of the electric locomotive, which admits of its maintaining its tractive effort or so-called " draw-bar pull " when running at relatively high speeds. This steam loco- motives cannot do. Thus a steam locomotive weighing 100 tons may exert a draw-bar pull of say 45,000 lb at a speed of 6 m. per hour, while at 15 m. per hour the continuous draw-bar pull will not exceed about 25,000 lb. On the other hand, an electric locomotive weighing 75 tons and having a tractive effort of 34,000 lb at 6 m. per hour will exert a pull of about 27,000 lb at 25 m. per hour. From this it is clear that an electric locomo- tive may pull a heavier train at a fair speed than can a larger steam locomotive. This admits of more rapid movement of freight trains, and thus decreases the hauling cost. Another advantage the electric system has for freight service is the ability to couple several light locomotives in tandem, all under the control of one driver, and thus pull at a high speed larger trains than may now be drawn by steam locomotives of weights commercially admissible. Also, these lighter motors distribute the weight over the track instead of having it concentrated on a few wheels, and the heavy pounding due to the latter condition is obviated and the maintenance of the track and bridges reduced. Other savings arise from diminished fuel consumption, elimina- tion of water and coal stations with their attendants, and greatly reduced repairs on motive power. The chief disadvantage is the stoppage of all trains on a section if the source of current supply should fail. With proper precautions in design and construction this should be a remote possibility, and since electric rail haulage, in any form attempted up to the present, has shown a reduced cost for a given service as compared with steam traction, it is not

improbable that the future will witness great activity in the change from steam to electricity for long-distance railway work.

Systems of electric traction may be divided broadly into two classes, the one employing continuous, the other alternating currents to drive the motors. Both of these classes may be further divided with reference to the conducting system employed between the source of current and the motor. The system may also be divided according to operative units into three classes — the single car, the train pulled by one or more directly controlled locomotives or motor cars, and the train operated by two or more motor cars under a common secondary control. This last is called the " multiple unit system."

Continuous-Current Systems. — The applications of continuous current to electric traction comprise six principal varieties, with numerous modifications and combinations. In all of them the motors are operated under a constant, or approximately constant, potential difference. The system in which cars were connected in series by automatic switches, in limited use in the United States in 1888 and 1889, has now disappeared, and the parallel system of connexion, in which the cars are bridged across between the two conductors of a parallel system, maintained at a substantially constant voltage, has become practically universal.

The overhead conductor and track-return construction is the standard for street railway work in most of the cities . .

where electric traction is employed, though there are * el " " '_ some notable exceptions. In its present development the Z?" S ""* system may be said to have grown out of the work of Sprague in Richmond in 1887. Over the track is suspended a bare

wire, generally of hard-drawn copper, known as the trolley wire. The ' normal practice is to use a wire not less than 0-325 of an inch in diameter to assure permanence, since smaller wires wear out rapidly from the friction of the trolley and the burning of the surfaces of contact. The wire is usually of circular cross-section. Sometimes wires of other sections have been used, notably one having a cross- section similar to the figure ; 8, but the advantage

of these forms is problematical, while the difficulty attending their proper installation is considerable. In some cases the working-conductor, or trolley wire, is suspended at one side of the track, connexion with it being made by a side-bearing trolley, but its usual place is directly over the track, as this arrangement leads to simpler and more efficient construction of the trolleys and their accessory parts. For certain special cases, where very large currents are employed, the overhead conductor is made of bar metal or structural shapes. Inthe Boston (Massachusetts) subway, where the traffic is very heavy, a bar of rectangular section is used, supported at frequent intervals from the roof. In the Baltimore & Ohio railway tunnel at Baltimore, Md., the steel working-conductor originally consisted of two Z bars forming a trough, the current being collected by an iron shoe, but this form has been replaced by a sectional third rail. But what- ever the nature of the conductor, it is usually insufficient to carry the current necessary for the operation of the system without excessive loss. Recourse is therefore had to feeders or reinforcing conductors. These may be of any form, but are most frequently copper wires or cables of large section, connected at intervals of a few hundred feet to the working-conductor. They are sometimes carried on poles, but municipal ordinances frequently require their installation in underground conduits. In general, it is customary to divide the working-conductor into sections of from 1000 to 5000 ft. in length, insulated from one another and fed separately through manual or automatic cut-out switches, so that an accident causing a short-circuit or break in continuity on one section will not impair the operation of others.

In ordinary street railway construction two methods of suspending the trolley wire are in vogue. The most usual construction is to hang it from insulators attached to transverse wires running between pairs of poles set on opposite sides of the track. Bracket arms attached to poles are often used, especially on suburban lines; they are frequently double, or 1 T-shaped, and placed between the two tracks of a double-track line. In the standard construction for either variety of suspension, the insulators are bellˆshaped, and composed of some hard moulded or vitreous material. The trolley wire is supported by a clamp about 9 in. long, which embraces about three-quarters of its circumference. This clamp is usually made of bronze, and is now generally fastened to the trolley wire by a screw, causing the two parts of the clamp to close upon the wire as would the jaws of a vice, or is automatic, clamping the wire the more tightly as the

strain upon it increases. It was formerly con- sidered expedient to solder the wire into the clamp, but this practice is now generally abandoned. The insulating bell is so designed that its material is subjected only to compression stresses by the weight of the wire. It is provided at its upper part with a single catch for attachment to the transverse wire or to the bracket arm. If a span wire is used it is fastened to the poles, there being turn- buckles to tighten it, while a strain insulator on either side gives a double insulation between the trolley wire and the poles. With a bracket construction it was formerly the custom to attach the insulator directly to the bracket arm, but the blow of the trolley wheel broke great numbers of insulators, and it has therefore become the practice to adopt some more flexible method of attachment, a. number of different forms being in use. The poles between which the span wires are stretched, or to which the bracket arms are attached, are of wood or iron. They are firmly set in the ground, usually with concrete.

Another form of overhead construction for high speed service, brought out by the Westinghouse Company and known as the Catenary ” Catenary ” system (fig. 6), is designed to_ hold the Construe- contact or trolley wire in a horizontal position above thtn. th e track without any dip or sag. Essentially it is

by means of rigid iron hangers spaced about 10 ft. apart. A proper sag is given the supporting cable, and the lengths of the hangers vary so that the trolley wire is held horizontal without sag. The con- struction resembles a single supporting cable and suspended chord of a suspension bridge; The trolley wire, the hangers and the sus- pension cable are all mechanically connected together and in metallic contact, so that the whole system acts as a conductor. The support- ing cable is held by insulators at the points where it is supported on the brackets at the poles. For heavy work there the currents taken by the passing cars and locomotives are great, requiring a very large trolley wire, two supporting cables are strung from pole to pole and the trolley wire suspended below and between the two.

Rail Bonding.

Fig. 6. — Single Catenary Line, made up of a supporting cable made of stranded galvanized steel wire j-‘ s in. in diameter which is firmly fastened to brackets attached to the supporting poles and from which the trolley wire is suspended

Fig. 7. — Double Catenary Line.

In this case the hangers are triangular in form and hung with the apex of the triangle downward. The two , upper angles are fastened to the pair of supporting cables, while'to the lower angle is attached the trolley Wire. This arrangement is called the " dduble catenary " construction (fig. 7).

In order to provide a proper return path for the current, the track must be made electrically continuous. This is accomplished by bonding the individual lengths of rail together in some way, or by actually welding them together to form a continuous length. There are many types of rail- bonding. In most of them holes are drilled in the ends of adjacent rails, and a copper conductor inserted between them, its ends being in some way forced against the walls of the holes. In one type the bond is in the form of a hollow cylinder, the ends of which are inserted in the holes in the rails, a tapered steel pin being driven in so as to expand, the cylinder out against the rail. In another form the end of the bond is a solid cylinder, which is upset by hydraulic pressure, forcing it against the rail. A semi-plastic amalgam of mercury has been used to give a contact between the adjacent rails and the fish-plate connecting them. The most usual practice is to use a short bond covered and protected by the fish-plates. Tracks used for a return circuit are cross-bonded at intervals. If the track return has too great an electrical resistance it is reinforced by conductors connected to it at intervals and extending back to the power-house. Neglect to provide a proper return circuit has often caused a great loss of energy, and, in many places, excessive electro- lytic action on iron pipes, cable sheaths and other metallic bodies buried in the earth.' The lightning arresters provided on overhead Hnesare placed on the poles at intervals determined by the location of the line.

In a few places the municipal authorities, in order to avoid the disturbances on telephone lines due to the fluctuation of a trolley current, and the electrolysis of gas and water pipes which may arise from a grounded return, have required the erection of a double overhead system. In this each track has two trolley wires forming a complete metallic circuit. The largest system of this kind is in Cincinnati,- Ohio, U.S.A., where there are over 225 m. of tram-lines. The system has the advantages to which it owes its existence, but the multiplicity of wires at crossings, right-angle turnouts and switches is so complicated that automatic switching cannot be attempted. The man in charge of the car removes the

double trolley from the wires atsuch points, and replaces it when they are passed. The construction adopted; except in respect to the points mentioned, is practically similar to that already described for the track-return system.

A number of patents have been granted in various countries for electric traction systems in which one or both of the fixed conductors are installed in a conduit underground, communication pen-slot being had with them by means of an open slot, into conduit. which projects a current-taking device of some nature carried by the car as it moves along. A system of this character was installed at Blackpool, England, in 1885, and later one was very successfully operated in Budapest. The first large and important

Double Trolley.

installation of this character to be made was in Washington, D,C., U.S.A., where a considerable system of street railways was changed from horse operation to this new method. The success of this system, and of experiments made on Lenox Avenue, in New York City, led to the construction of many miles of railways of the conduit type in the latter city. It is also used extensively in London. (For details of the construction of the conduits, see Tramway.) This system is much more expensive to install than the overhead trolley system, but experience has shown that it can be as economi- cally operated. Most of the troubles that have occurred have been due to lack of experience, but on the whole they have not been more serious than those experienced with overhead systems.

The great expense of the open conduit has led numerous inventors to bring out systems of operating electric railways by means of _ . closed conduits or sectional third rails, in which the Comdult working-conductor is laid on the surface of the ground between the rails, and is connected with the source of current only as the car passes over each section. In this way the immediate section or portion of the working-conductor under the car is electrically active, but other sections are not, and all danger to the passage of street traffic is removed. Up to 1900, nearly one thousand patents for this type of street railway

construction, known also as the ” surface contact ” system, had been granted by the United States patent office alone. So far the system has been introduced in but few places, but its performance has been more than promising, and it is thought that it will be more extensively adopted in the future. Among the more important railways at present equipped with it may be mentioned one in Paris, using the Diatto system, and one at Monte Carlo, where the Westing- house system is installed. In both these the current is supplied by means of ” buttons ” or metallic disks laid flush with the surface of the street between the tracks, and connected through switches to a working-conductor. Under the car is installed a current- taking device in the shape of a long runner or skate, which runs over the buttons and is appropriately connected with a storage battery on the car, so that when it touches one of the buttons current is sent from the battery through a system of electro-magnets operating the switches which connect that particular button to the feeding system, and thus the runners are enabled to receive current for the operation of the motors on the car. The various systems differ in the method of connecting the contact rail or button with the live conductors; in some a magnet on the car works a mechanism to make the desired contact, in others a current from batteries on the car actuates a switch located near the track. (See Tramway.)

The third- rail system, which is a development of the overhead trolley and track-return system, has been applied to several large Thlrd-r II an< ˆ important railway installations, especially in the System United States, and in the prolongation of the Orleans ' railway in Paris from the Place Valhubert to the new station at the Quai d'Orsay. Its name almost sufficiently indicates its method of operation. A rail similar to the track-rails is laid upon insulators and forms the working-conductor. On the elevated railways in New York, Brooklyn, Boston and Chicago and the subway in New York, a pressure of about 600 volts is used between this rail and the track-rails which form the return circuit. Contact is made with the third rail by means of a bronze or cast-iron shoe, either resting upon the rail by its own weight, or pressed down upon it by springs. This is generally attached to some part of the truck of the car in preference to any part of the body of the car, so as to avoid any vibration or swaying due to the movement of the body upon its springs. The third-rail system has been adopted in many instances where large and powerful-trains are to be operated on private rights of way, but it is nowhere in use for electric traction upon highways or in streets

where there is any passing of foot passengers or vehicles. An excellent example of such construction may be found in the Albany & Hudson railroad, which connects the city of Albany with the city of Hudson, in New York state. Here the length of the road is about 32 m., the track being of standard gauge and laid with a 60-lb T-rail. A T-rail of the same size, raised about I ft. above the level of the running-rails, is used for the electrical conductor, and is installed on insulators situated 5 ft. apart on the ends of the cross-ties. All these rails are well bonded with copper bonds at the joints. At road crossings, which on this railroad are at grade, the third rail is omitted for a distance nearly equal to the length of a train. Appropriate cast-iron shoes, fixed to the trucks of the front and rear cars of a train, bridge the space, so that the forward shoes are running on the rail past the break before the rear shoes leave it. Upon this railroad motors of considerable size and power are used, and both passengers and freight in their original cars, as received from connecting steam railways, are transported. Other examples of third-rail construction occur in the extension of the Baltimore & Ohio railway tunnel at Baltimore, the New York Central Railway Company's New York terminal, the underground systems of the City & South London railway, the Waterloo & City railway, and the Central London railway in London, and the Versailles division of the Western railway of France. In some cases, as on the Metropolitan, the District, and several of the " tube " railways in London, the running-rails are not used for the return circuit, which is

Accumula- tors.

completed by a fourth rail similar to the conductor rail, laid outside the track.

One of the oldest forms of electric traction is by accumulators, x'n brief, its principle is that storage batteries, or accumulators, are carried on the car, which becomes a veritable automobile. It has been the usual practice to instal about 80 cells, giving a pressure of 160 to 175 volts at the motors; these are recharged after the car has run about 25 m. In general, the accumulators are not charged in place, but the car is supplied with a new set, fully charged, at the end of a run of about the length mentioned. The system has been installed in a very large number of places in Europe and America, but has never shown the gratify- ing commercial success which the direct-conduction systems exhibit, on account of the high cost and depreciation of storage batteries.

In some places, notably in Hanover, Germany, where legislative ordinances have forbidden the overhead conducting system in city streets, a combination has been used whereby accumu- lator cars run in the city districts from the energy stored in their batteries, and in the suburbs operate directly as overhead trolley cars, the batteries being charged at the same time from the over- head system.

Alternating Current Systems. — Alternating current systems are now being used, both single-phase and three-phase. In the former case the newly-developed single-phase motors, later to _ . be described,: are employed, while with three-phase ““ypnase. systems induction motors are used. The polyphase current is much used as a means of distributing energy from a central power- station over extended lines, of railways, but is generally converted into direct current through the agency of rotary converters, and fed to the lines as such. There are, however, a few railways working directly With induction motors upon a three-phase system of supply. Prominent among these may be mentioned the Valtellina railway in Italy and the Jungfrau railway in Switzerland. Upon these lines the rails are used as one of the three conductors, and two trolley wires are suspended above the track. The locomotive is provided with two trolleys, one running upon each wire, and con- sists simply of an induction motor coupled through appropriate gearing to the mechanism of the truck. For starting a large resistance is introduced into the rotor or secondary circuit of the motors by means of collecting rings placed on its shaft, upon which bear brushes. This resistance is cut out as the speed increases, until it is all withdrawn and the rotor is short-circuited, when full speed is attained. It has been found that potential differences of about 500 volts in each/phase can be safely handled, and it is claimed that the few railways which use polyphase currents have -shown gratifying’ results in practice. , ;

In the; early years of the 20th century single-phase alternating current motors for electric traction were developed, and single- phase systems were extensively installed both in Europe and in America. The simplest type of single-phase **W” motor is ‘a series motor provided with the usual commu- Piase. tator and brushes, in which the current passes through both the field coils and the armature coils. The armature and field windings being traversed by the same current, the reversal of the field magne- tization and that of the direction of current flow in the armature are coincident, so that the turning_ effort or torque, on the

armature current produced by the interaction of armature and field magne- tization is always in the same direction. Since the alternating current passes through both members of the motor, the armature and field cores are both laminated. In the later types of these motors the field coils are distributed and embedded in the field ring, so that the inner surface of the field ring presents a practically smooth surface to the armature. Troubles were at first experienced with commu- tation of the heavy alternating currents required for the operation of these motors, vicious sparking taking place at the brushes. This was overcome by the use of auxiliary or ” compensating ” coils, which are embedded in the field magnet ring, being placed between successive magnet coils. These compensating coils are usually connected in series with the main armature and field circuit. They may each, however, have their two ends joined together, (short-circuited), the currents in them being induced by the alternating magnetic flux of the fields.

Motors of the above types have the general characteristics of direct current series motors, and possess the same general relations between speed and torque that are such an important element in the success of direct current series motors. The efficiency of alter- nating current motors is not quite so good as that of direct current motors, on account of the rapid reversal of the iron magnetization in the field magnets, but their efficiency is high and their perform- ance in practical work has been excellent (fig. 8).

There is another type of single-phase motor that has been used in Europe, but not in America, which is commonly called the repul* sion motor. In these motors the armature is not directly included in the main circuit, but opposite points on the commutator are connected together through brushes. The working current is fed to the field magnets, and the rapid reversals of magnetization induce currents in the armature coils, Which currents, working with the field magnetization, cause rotation. Several types of repulsion motors have been developed, and in general their characteristics are similar to those of the plain series type, They have not, however, come

into extended commercial use. Single-phase motors for a given

power are much larger, heavier and more expensive than the ordinary direct current motors, owing to the low magnetic densities at which the iron is worked. The power factor is between 0-75 and 0-85.

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Fig. 8. — Characteristics of Series Single-phase Motor.

The advantages of the single-phase alternating system lie in the fact that it combines the simplicity of the overhead direct current con- struction with the possibility of exceedingly high voltage. Where heavy traffic is to be handled, and especially where that traffic is scattered, a direct current system, which up to the present has been limited in its voltage, is not commercially possible, as the amount of copper used for distribution and the excessive amount of apparatus required to convert high tension alternating current into low tension direct current, would make the cost prohibitive. In direct current

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WESTINGHOUSE RAILWAY MOTOR

500 VOLTS

GEAR RATIO, 16 TO 73 – 33″ WHEELS

CONTINUOUS CAPACITY 60 AMPERES AT 300 VOLTS

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Fig. 9.

systems for lines of any length, it is the custom to use alternating current of high potential and to reduce it to direct current of low potential at different points along the line. This involves rotary converters, which by their nature require attendance in the sub-stations, while if the traffic is scattered so that the load on the sub-

stations may at times be zero, and at other times may be very large, the capacity of the sub-stations must be equal to handling a maxi- mum load, so that the total capacity of each sub-station would be based on the maximum instead of on an average condition. With the single-phase alternating current system, on the contrary, only static transformers in sub-stations along the line are required, and with the high voltages available (voltages as high as 11,000 volts are used at present) the distances between these sub-stations can be greatly increased as compared with the direct current sub-stations, so that each sub-station feeding a much longer portion of the line would have a better average load than in the direct current case. The static transformers do not require attendance, and their efficiency is much higher than that of the rotary converters.

Electric motors for traction purposes have been highly elaborated and developed. At first they drove the car axles through belts or sprocket chains, the motor being sometimes attached M to the car, sometimes to the truck. At Richmond, moton – however, in 1887, the Sprague method of communicating the power from the motor axle to the car axle was put into practical operation, and

this has with slight modifications been retained. It consists of sleeving one end of the motor on the axle, suspending the other

Fig. 10. — Standard Railway Motor.

flexibly from the car body or truck, and driving from the armature through spur gearing. At first the motors were too small for the work demanded of them. Their high speed required a double reduction in gearing, their overheating caused continual burn-outs, and the sparking at the commutators necessitated constant repairs. These defects were gradually eliminated. The motors were made larger, the quality of the iron and insulation was greatly improved, and finally a four-pole motor requiring only a single-speed reduction by spur-gearing was produced. Since that time further improve- ments in material and design have been introduced, and the present motor has been evolved. Almost all the standard modern traction motors are of the same general design. They are series wound, i.e. the same current passes through both the armature and the fields. This gives a strong starting torque or tractive effort, the torque diminishing as the speed increases. This characteristic is particu- larly suitable for traction. Fig. 9 shows the relation between speed and tractive effort of a standard railway motor of large size and power. The armature is built up of carefully tested iron disks, which are deeply slotted to make room for the coils. These are wound and insulated separately, and placed in the slots in the armature core; sometimes they are held in place by binding wire, sometimes by wedges. The commutator is put in place, the coil connexions soldered to it, and the proper end-coverings put on. The magnet frame is made in two parts, of cast steel, enclosing the entire armature. A lid in the top easting gives access to the brushes, which are of carbon. The field coils are wound on forms and properly insulated. When in operation it is practically water

and dust proof, and with proper attention is a very durable piece of machinery (fig. 10). Although the standard design of motors is at present based on a single-reduction gearing, there are in operation traction-motors which are not geared.

On the locomotives used on the New York Central, the New York, New Haven & Hartford, and the Baltimore & Ohio railways in

America, the City & South London railway in England, the armatures surround the driving axles. In all the cases mentioned, except the Baltimore & Ohio railway, the armatures are set directly on and solid with the axles of the driving-wheels, while on the Baltimore & Ohio locomotives the motors are sleeved on the axles, there being a slight play between the sleeve and the axle, which allows a flexible support. The wheels are driven by arms projecting from the armature shaft.

There is no fixed method of rating the output of traction-motors. Most manufacturers, in giving a certain horse-power capacity, mean that at the given rating the motor will run an hour with a rise in temperature of a certain number of degrees, not that it can be run continuously at the power given. Another system of rating depends on the draw-bar pull which the motor can develop under normal conditions of voltage and speed. Uniformity is greatly needed.

One of the most important parts of the equipment of an electric car or locomotive is the controlling device. In the early days of Gurfro//ers.? lectr ‘ c tract ‘ on a number of different methods of regulat- ‘ ing the speeds of the cars were used, but they have been reduced to practically one standard method. In the old Sprague system there were at first no resistances outside of the motors them- selves, but the field coils of the motors were divided into sections, and by changing the relative connexions of these sections the total resistance of the circuit could be changed; at the same time the strength of the field for a given total current was either increased

Fig. ii. — Controller (open), or decreased. In other systems the fields and armatures of the motors were not changed in their relation to one another, but exter- nal resistances were cut out and in by the controller. Usually there are two motors on each car, and it is evident that if the speed of a car be changed within wide limits, all the other factors remaining constant, there will be a very considerable loss by either of these methods of regulating, unless the relative connexions of the motor armatures can be changed. This can be done by putting the two motors in series where low speed is desired, and in parallel where the speed is to be increased. This method was tried in the early days of electric traction at Richmond, and discarded, but it has been again taken up, and is now the standard method of regulation in ordinary tramway work. Roughly speaking, when the car is started the controller connects the two motors in series with an

external resist- ance, then cuts out the external resistance, then breaks the circuit, then connects the two motors in parallel. The external resistance is put again in series with them, and then is gradually cut out as the car speed increases. By this method a considerable range of speed is attained at a fair efficiency. Tke controller (fig. 11) consists of a cylinder having on it a number of copper segments so arranged that on rotating it different connexions are made between stationary fingers that bear on these segments. In the first types much diffi- culty was experienced from the burning of the segments and fingers, due to the sparking on breaking the circuit, but this has been to a large extent obviated by using magnetic blow-outs at the point of break. (A magnetic blow-out is simply a magnet so arranged that the arc caused by breaking the circuit takes place in the magnetic field.) There is a reversing lever on the controllers separate from the controller handle, and interlocking with the controller so that the reverse lever may not be moved except when the controller is in the “off” position.

When it is desired to run trains of cars and to accelerate them rapidly, it is sometimes necessary to have more than one car equipped with motors. In this case all the motors must be controlled from one point, and a number of ingenious devices have been evolved to accomplish such ” multiple control.” In general, each car has its own controller, and all the controllers are operated by electric power from switches on each platform of any of the motor cars.

A motor and controlling system designed to save and utilize the. power produced by a car running down an incline has been developed and is termed the ” regenerative system.” A car run- „ ning over a line having heavy grades must have sufficient ˆ ˆcˆtrnl energy given to it to overcome its frictional resistance ve on to motion and also to lift the weight of car and load from the bottom to top of each up-grade. On the return trip, the car ” coasts ” or runs down the grade without the consumption of current, but is restrained from attaining too high a speed by the brakes, thus wasting the energy existing by reason of the position of the car.

With the regenerative system the motors are caused to act as dynamos which are driven by the motion of the car axles when descending a grade, and, as they are connected to the line by the trolley or contacting device, the current thus generated is fed to the line and may assist other cars climbing grades at some other

point on the system. The delivery of electrical energy also puts a resis- tance on the car axles and produces a braking effect which almost automatically fixes the car speed. If the speed be too high, the excessive current generated will tend to retard the car and reduce its velocity, while if too low the small current produced will set up but little opposition to motion and the car will accelerate.

Obviously, series motors cannot be used for this service. The motors have shunt fields, and their speed is varied by varying the field strength. Motors of this type are larger, more costly and slightly less efficient than series machines, so that a regenerative system has no place on roads that have a fairly level contour. When, however, the grades are frequent and excessive, the power saved more than counterbalances these factors, and the system may prove a valuable one for such service.

For tramcars of ordinary sizes hand-brakes are used, these being generally spindle brakes, with leverage enough to handle the com- paratively heavy cars. When the size and speed of the car increases, however, these hand-brakes do not give Brakes. sufficient control, and power brakes have to be adopted. Of these there are several forms that have proved successful in practice. The one most extensively used in electric railways is the air-brake, which is similar in its mechanical operation to the air-brake used on steam railways. The compressed air required for the operation of the brake is obtained by means of an air-pump driven by an electric motor, the circuit of which is controlled by a switch actuated by the pressure of the air in the receiving tank. When this pressure rises to a predetermined value, the device acts and interrupts the supply of current to the motor, which is thus stopped. When the pressure falls below a determined minimum the device operates in the oppo- site direction, and the motor and pump start. Of electric brakes there are several varieties. One type consists of two iron disks, one keyed on the axle but capable of moving along it a short distance axially, and the other held firmly on the frame of the truck. By means of a coil, set in a recess of annular form turned in the face of the fixed disk, the disks are magnetized transversely, and are drawn together with greater or less pressure, dependent on the amount of current that is allowed to pass through the coil. It is customary to arrange the current connexions in this form of electric brake so that when the handle of the controller is turned beyond the stopping position the current is cut off from the source of supply, and the motor running as a dynamo furnishes the current to

work the brake.

The magnetic track-brake, which is sometimes'used on tramway cars, consists of a pair of steel shoes, suspended from the truck frame and hanging near and over the rail, a steel yoke connecting the two shoes together. On this yoke is wound a heavy magnetizing coil which, when energized, strongly magnetizes the two steel shoes and causes them to draw against and adhere to the track. Bracing links connect these track shoes with brake shoes on the wheel rims, and the drag of the track shoes thus applies pressure also to the wheel shoes. The downward pull of the track shoes gives a greater pressure of the wheels against the track than that due to the weight of the car, and the sliding or " skidding " of wheels, with the conse- quent production of flats, is avoided. A further braking effect comes from the use of the motors as dynamos, driven by the motion of the car, to supply current to the brake magnetizing coils. This therefore is one of the most effective brakes that has been devised. It has, however, not been very extensively used owing to its high cost and difficulties that arise from the track shoes running so close to the rails that any uneven places — frogs, switches, crossings and the like — may rub against them and give a braking effect at times when the car is accelerating or running. A pair of shoes is applied on both sides of the car, one pair being hung over either rail.

Another method of braking is by arranging the connexions of the two motors so that one acts as a dynamo driven by the motion

of the car and supplies current to the other, which works as a motor, tending to turn the wheeis in the direction opposite to that in which the car is moving. The production of current by the one motor and the reverse effort of the other give a powerful braking effect. The proper connexions are made by constructing the controllers with contacts additional to those required for motor control, which connect the machines in the desired manner when the controller handle is moved round past the " off " position.

Automatic brakes are always preferable to hand-brakes even though they cost much more, because the energy required to

propel an ordinary tramcar is from io to 25 % more with hand than with automatic brakes. The cause is the constant pressure of the brake shoes of a hand brake against the wheel rims, the shoes being so held by the operator to avoid having too long a hand movement in applying the brake. The maximum pressure possible for any brake should be about 90 % of the weight of the car on the braked wheels. Less than this amount will give an inefficient brake; more will produce sliding or ” skidding of the wheels, producing ” flats” on them, and also causing loss of retarding effect.

Of the numerous accessories necessary in the operation of electric railways one of the most important is the trolley. For an overhead Accessories. svstera tms consists in general of a metallic rod or tube mounted upon the top of the car and pressed upward against the trolley wire by springs. At the upper end of this trolley pole is generally placed a bronze wheel which runs along the under surface of the wire. On the continent of Europe considerable use has been made of bow-trolleys, which consist of light metallic bow-shaped structures, sustained in place by springs and running along on the under side of the wire against which they rub. The designs patented for trolleys are almost innumerable. Besides the trolleys, cars are ordinarily equipped with switches which are used to break the trolley circuit, with fuses or automatic circuit-breakers, with electric lamps, with lightning arresters, and with the necessary car wiring. The fuses or automatic circuit- breakers guard against an excess of current being passed through the motors, and when they are fitted the ordinary platform switch can be dispensed with. These automatic breakers can be set for any desired current.

The question of the generation and the distribution of the current belongs to this article only in so far as electric traction (feneration nas mtr °durcd peculiarities in the type of apparatus at Current. or tne met fc°ds of its use. In a continuous current station the current is generated at an approximately constant potential, varying from 500 volts to 700 volts on different systems. As the load is apt to fluctuate, except in large stations, within wide limits, the machinery must be designed to stand the most severe usage. The engines are more massive than would be necessary for constant loads, and the dynamos must be built to stand sudden overloads without destructive spark- ing; usually, indeed, they are considerably over-compounded, not so much for the sake of raising the voltage as to strengthen the field and prevent sparking on overload. When a number of machines are to

be run in parallel— as is usually the case — they are provided with ” equalizing” switches, which serve to throw the series fields in parallel. As a result, if one of the machines tends to increase its armature current beyond the proper amount, the current in the series fields does not increase with it, but retains its normal propor- tion. The armature reaction and resistance fall of potential, in this machine, would both tend to increase, thereby decreasing its armature potential, and therefore its current would return to its proper value. From the dynamos the current from each machine goes through an ammeter and automatic circuit-breaker to the main ” omnibus bare, then through the station ammeter to the feeder ” omnibus ” bars, then through ammeters and circuit-breakers to the feed-cables. As a rule, watt-meters are provided to measure the output of the station, and, if an overhead system is being supplied, lightning arresters are installed. Where continuous currents are used to operate cars at considerable distances from the generating stations, ” boosters ” are used. These are series-wound dynamos driven at a constant speed, through which is passed the current that is to feed the distant section of the line. Usually the characteristic of the booster is so calculated that the amount by which it raises the voltage for a given current just equals the fall of potential in the feeding-line for the same current. The result is that the potential at the end of the line will be the same as that at the station. The question of economy, as between putting in additional copper ‘and wasting energy in the booster, is easily calculated; the advantage is more and more on the side of the latter as the distance increases and the car service becomes more infrequent. It is necessary to the satisfactory operation of a system that the variations of voltage should not be too great, so boosters sometimes become a practical necessity, irrespective of the question of economy.

Accumulators are frequently installed in power stations to prevent the heavy load fluctuations which arise from starting and stopping of cars and ascending or descending grades. The generators give an approximately unvarying amount of current. When the load demand is less than that delivered by the generators, the excess current goes into the storage battery, and when the load is greater

than the power from the generators the additional current required comes from the battery. The generators, engines and boilers may thus be proportioned for the average instead of the maximum load requirements, and the sizes of these units are

thereby reduced.

As traction systems have been combined and extended, the area of operation of many of the companies has grown so that a number of direct -current stations are used for a single system. The limit of distance to which electric energy can be economically supplied at the comparatively low voltages employed is not great, and the advantage of having one or two large stations to supply a system, in place of a number of smaller ones, is evident. This fact has led to the use of high-potential alternating currents for the distribution of energy, the voltage being reduced at the points ! of consumption, and in most cases changed to a continuous current by rotary converters. If alternating currents are used for the car motors, the economical distribution of energy is greatly simplified, the rotary converters being eliminated and their first cost and losses and expense of operation saved. The expense of operating sub-stations containing rotary converters is necessarily large, and the capital outlay required for them is often greater than for the generating station.

As a rule, the cars used for electric traction have varied but slightly from the type of tramway car prevalent in different localities. The tendency, however, has been to increase their size. Cars For electric railway work, as distinguished from tram- way work, the cars generally follow the pattern that is standard on American steam lines. The trucks used for electric cars are made of steel, with heavy axles and suspension bars for carrying the electric motors. For smaller vehicles, a single four-wheel truck is vised, the wheel base being limited by the curvature of the track, but not as a rule exceeding 7! ft. For the longer and heavier cars, two four- wheeled bogie trucks are employed. If two motors are used on a double-truck car, and if the grades on theroad are very heavy, the trucks are made on the ” maximum traction ” pattern, in which one pair of wheels in each truck is of smaller diameter than the other and the greater part of the weight of the Car is on the larger motor- driven wheels. For very large high-speed cars, trucks are used of practically the same type and weight as are employed on steam railways. (See also Tramway.) – . ■ (L. Du.)

TRACY, ANTOINE LOUIS CLAUDE DESTUTT, Comte de (1754-1836), French philosopher, son of a distinguished soldier, was born in’Bourbannais on the 20th of July 1754. He belonged to a noble family of Scotch descent, tracing its origin to Walter Stutt, who in 1420 accompanied the earls of Buchan and Douglas

to the court of France, and whose family afterwards rose to be counts of Tracy. He was educated at home and at the univer- sity of Straissburg, where he was chiefly noted for his athletic skill. He went into the army, and when the Revolution broke took an active part in the provincial assembly of Bourbonnais. He was elected a deputy of the nobility to the states-general, where he sat alongside of his" friend La Fayette. In the spring of 1792 he received the rank of marechal de camp in command of the cavalry in the army of the north; but the influence of the extremists becoming predominant he took indefinite leave of absence, and settled at Auteuil, where, with Condorcet and Cabanis, he devoted himself to scientific studies. Under the Reign of Terror he was arrested and imprisoned for nearly a year, during which he studied Condillac and Locke, and aban- doned the natural sciences for philosophy. On the motion of Cabanis he was named associate of the Institute in the class of the moral and political sciences. He soon began to attract attention by the memoires which he read before his colleagues — papers which formed the first draft of his comprehensive work on ideology. The society of " ideologists " at Auteuil embraced, besides Cabanis and Tracy, Constantin Francois de Chassebceuf, Comte de Volney and Dominique Joseph Garat (1749-1833), professor in the National Institute. Under the empire he was a member of the senate, but took little part in its deliberations. Under the Restoration he became a peer of France, but protested against the reactionary spirit of the government, and remained in opposition. In 1808 he was elected a member of the French Academy in place of Cabanis, and in 1832 he was also named a member of the Academy of Moral Sciences on its reorganization. He appeared, however, only once at its conferences, owing to his age and to disappointment at the comparative failure of his work. He died at Paris on the 9th of March 1836.

Destutt de Tracy was the last eminent representative of the sensualistic school which Condillac (q.v.) founded in, France upon a one-sided interpretation of Locke. He pushed the sensualistic

principles of Condillac to their last consequences, being in full agree- ment with the materialistic views of Cabanis, though the attention of the latter was devoted more to the physiological,

that of Tracy to the psychological or “ideological” side of man. His ideology, he frankly stated, formed ” a part of zoology,” or, as we should say, of biology. To think is to feel. The four faculties into which he divides the conscious life — perception, memory, judgment, will — are all varieties of sensation. Perception is sensation caused by a present affection of the external extremities of the nerves; memory is sensation caused, in the absence of present excitation, by dis- positions of the nerves which are the result of past experiences; judg- ment is the perception of relations between sensations, and is itself a species of sensation, because if we are aware of the sensations we must be aware also of the relations between them ; will he identifies with the feeling of desire, and therefore includes it as a variety of sensation. It is easy to see that such conclusions ignore important distinctions, and are, indeed, to a large extent an abuse of language. As a psychologist de Tracy deserves credit for his distinction between active and passive touch, which developed into the theory of the muscular sense. His account of the notion of external existence, as derived, not from pure sensation, but from the experience of action on the one hand and resistance on the other, may be compared with the account of Bain and later psychologists.

His chief works are Elements d’ideologie (1817-1818; 2nd ed., 1824- 1825), in which he presented the complete statement of his earlier monographs; Commentaire sur V esprit des lots de Montesquieu (1806; 5th ed., 1828; Eng. trans., President Jefferson, 1811); Essai sur le genie et les ouvrages de Montesquieu (1808). See histories of philosophy, especially F. Picavet, Les Ideologues chs. v. and vi. (Paris, 189 1), and La Philosophie de Biran (Academie des sci. mor. et pol., 1889) ; G. H. Lewes, Hist, of Phil.

TRACY, BENJAMIN FRANKLIN (1830-), American lawyer and soldier, was born in Owego, New York, on the 26th of April 1830. He was educated at the Owegp academy, was admitted to the bar in 185 1, was district-attorney of Tioga county in 1853-1859, and was a member of the state Assembly in 1862. In 1862 he organized the 109th and the 137th regiments of New York Volunteer Infantry and (Aug. 28) was made colonel of the former. In September 1864 he became colonel of the 127th United States Colored Infantry; in 1864-1865 was in command of the prison camp at Elmira, New York, and in March 1865 was breveted brigadier-general of volunteers. He received a Congressional medal of honour in 1895 for gallantry at the Wilderness in May

1864. He was United States district- attorney for the eastern district of New York in 1866-1873, and an associate judge of the New York court of appeals in 1881- 1882. In 1 889-1 893 he was secretary of the navy in the cabinet of President Benjamin Harrison, and then resumed the practice of law in New York City. He was chairman of the commission which drafted the charter for Greater New York, and in 1897 .was defeated as Republican candidate for mayor of the city. In 1899 he was counsel for Venezuela before the Anglo- Venezuelan boundary arbitration commission in Paris.

TRADE (O. Eng. trod, footstep, from tredan, to tread; in M. Eng. the forms Ired, trod and trade appear, the last in the sense of a beaten track), originally a term meaning track or course, and so surviving in " trade-wind " (q.v.), a wind which always blows in one course; hence a way of life, business or occupation, and, specifically, the handicraft in which a man has been trained and which he makes his means of livelihood, or the mercantile business which he carries on for profit, as opposed to the liberal arts or professions. A further development of meaning makes the word synonymous with commerce, comprehending every species of exchange or dealing in commodities.

See Commerce ; Balance of Trade ; Free Trade ; Protection ; Tariffs; Trade Organization; and also the sections dealing with trade and commerce- under the various countries.

TRADE, BOARD OF. The greater part of such supervision of commerce and industry as exists in the United Kingdom is exercised by the " Committee of Privy Council for Trade " or, as it is usually called, the board of trade. As early as the 14th century councils and commissions had been formed from time to time to advise parliament in matters of trade, but it was not till the middle of the 17th century, under the Commonwealth, that any department of a permanent character was all erupted. Cromwell's policy in this respect was continued under the

Restoration, and in 1660 a committee of the privy council was appointed for the purpose of obtaining information as to the imports and exports of the country and improving trade. A few years later another committee of the council was appointed to act as intermediaries between the crown and the colonies,, or foreign plantations, as they were then called. This joint commission of trade and plantations was abolished in 1675, and it was not until twenty years later that it was revived under William III. Among

the chief objects set before this board were the inquiry into trade obstacles and the employment of the poor; the state of the silver currency was also a subject on which John Locke, its secretary, lost no time in making representations to the government. Locke's retirement in 1700 removed any chance of the board of trade advocating more enlightened opinions on commercial subjects than those generally held. It had only a small share in making the constitutions of the Amer- ican colonies, as oniy the Carolinas, Pennsylvania, Georgia and Nova Scotia were formed after the reign of Charles II. ; and in 1760 a secretary of state for the colonies was appointed, to whom the control drifted away. In 1780 Burke made his celebrated attack on the public offices, which resulted in the abolition of the board. In 1786, however, another permanent committee of the privy council was formed'by order in council, and with one or two small exceptions the legal constitution of the board of trade is still regulated by that order. Under it all the principal officers of state, including the first lords of the treasury and admiralty, the secretaries of state, and certain members of the privy council, among whom was the archbishop of Canterbury, obtained seats at the board ex officio; and ten unofficial members, including several eminent statesmen, were also placed on the committee. The duties of the revived board were made the same as t'hey were in the beginning of the century, but the growth of commerce necessarily threw new administrative duties upon it. The board of trade thus became a mere name, the president being practically the secretary of state for trade, and the vice- president became, in 1867, a parliamentary secretary, with similar duties to those of a parliamentary under-secretary of state. At present, besides the president, who has usually a seat in the cabinet, 1 and whose salary is £5000 a year, there is a parliamentary secretary with a salary of £1200, a permanent secretary (salary £150°, rising to £1800), and four assistant secretaries (each with a salary of £1200) for the harbour, marine, commercial, labour and statistical, and railway departments. There are also other important; officials in charge of different departments, as mentioned below.

I. The Commercial, Labour and Statistical Department is the real remains of the original board of trade, as it combines the charge of the trade statistics with the general consultative duties with which King Charles II. 's board was originally entrusted. The statistical work includes compiling abstracts, memoranda, tables and charts relating to the trade and industrial conditions of the

United King- dam, the colonies and foreign countries, the supervision of the trade accounts,, the preparation of monthly and annual accounts of ship- ping and navigation, statistics as to labour, cotton, emigration and foreign and colonial customs, tariffs and regulations. The commer- cial intelligence department collects and disseminates accurate information on general commercial questions, and collects and exhibits samples of goods of foreign origin competing with similar British goods. It keeps a register of British firms who may desire to receive confidential information relative to their respective trades and supplies that information free of charge. The labour statistics published by the department are exhaustive, dealing with hours of labour, the state of the labour market, the condition of. the working classes and the prices of commodities ; annual reports are also

1 Since 1882 there have been only two occasions on which the president of the board was not included in the cabinet. Frequent suggestions were made as to raising the status and salary of the president of the board, which up to 1900 was £2000. Lord Jersey's committee in 1904 suggested that the president should be put on the- same footing as a secretary of state, and be given the title of " minister of commerce and industry." In 1909 the Board of Trade Act repealed the Board of Trade (President) Act 1826, which limited the salary of the president, and enacted that the president should lie paid such annual salary as parliament might determine (£5000). The increased salarv came into operation in 1910, when a new president of the board came into office.

published of trade unions, of strikes and lock-outs and other important subjects. The staff comprises a controller-general (salary £1200 rising to £1500), a deputy controller-general and labour commis- sioner, a principal for statistics, a principal of the commercial depart- ment, an assistant labour commissioner, a chief staff officer for commercial intelligence, a chief labour correspondent, a special inquiry officer, and a staff of investigators and labour correspondents. The department also edits the Board of Trade Journal (started in 1886), giving items of commercial information, trade and tariff notices and various periodical returns. There are also branches which deal with the census of production, labour exchanges, &c.

2. The Railway Department was originally constituted in 1840, and performs multifarious duties under various railway acts, including the inspection of railways before they are open, inquiries into accidents, reports on proposed railways, approval of by-laws, appointment of arbitrators in disputes, as well as many duties under private railway acts. The inspection of tramways, their by-laws and ” provisional orders ” are all dealt with here, as are similar orders relating to gas and water schemes and to electric lighting. There is a special office of inspection of railways with a chief inspecting officer (salary £1400) and an assistant staff. Patents, designs and trade marks are now dealt with by the patent office under the charge of a controller-general (salary £1800), which is subordinate to the railway department, and copyright, art unions and industrial exhibitions are also among the matters dealt with by the department. Annual returns with regard to its business are published by the department.

3. The Marine Department was created a separate branch of the board of trade in 1850, about which time many new and important marine questions came under the board of trade, such, for example, as the survey of passenger steamers, the compulsory examination of masters and mates, the establishment of shipping offices for the engagement and discharge of seamen. Further work fell to the marine department by the act of 1853, which gave it the control of lighthouse funds, and to a certain extent of pilotage. The consoli- dating Merchant Shipping Act of 1854 and subsequent legislation so much increased the department that in 1866 it was divided into three, viz. the present marine department, which deals with ships and seamen, the harbour department and the finance department.

4. The Harbour Department was, as stated above, a branch of the marine department until 1866, so far as it is connected with the physical adjuncts of navigation, but various other matters have since been added, e.g. the charge of the foreshores belonging to the crown, formerly managed by the commissioners of woods and forests, and the protection of navigable harbours and channels, long under the control of the admiralty, provisional orders under the General Pier and Harbour Acts and under the Pilotage Acts, and the settle- ment of by-laws made by harbour authorities. Control over the lighthouse funds of the lighthouse authorities of the United King- dom, the registry of British ships, wreck, salvage and quarantine are all among the matters dealt with by this department, which also has charge of the standards

department for weights and measures.

5. Tlie Finance Department was, like the harbour department, separated in 1866 from the marine department. The accounts of all the branches of the board of trade are in its charge, including the subordinate offices. It also deals with the accounts of harbours, lighthouses and mercantile marine offices, and of the merchant seamen's fund, and with the consuls' accounts for disabled seamen abroad. Savings banks and seamen's money orders are also among the accounts and payments with which it is charged, and outside these marine matters it has to prepare for parliament the life in- surance companies' accounts and to take charge of the bankruptcy estate accounts.

6. The Bankruptcy Department was established under the 71st section of the Bankruptcy Act 1883. At its head is the inspector-general in bankruptcy (salary £1200). An account of the duties of the department will be found under Bankruptcy.

7. The Fisheries Department. — By an act of 1886 the powers of the home office over salmon and other fisheries were transferred to the board of trade, and a small department was consequently created charged with the care of those industries. But by an act of 1903 (3 Ed. VII. c. 31) the powers and duties of the board of trade under this department were transferred to the board of agriculture and fisheries.

TRADE MARKS. A " trade mark " may be defined as a symbol, consisting in general of a picture, a label or a word or words, applied or attached to the goods of a trader for the purpose of distinguishing them from the similar goods of other traders, and of identifying them as his goods, or as those of his successors, in the business in which they are produced or put forward for sale. A trade mark differs in its legal character both from a patent and from a copyright. In the case of a trade mark the property and the right to protection are in the device or symbol adopted to designate the goods to be sold, and not in the article which is manufactured and sold. The artirlc is open to the whole world to manufacture and sell, and all that the owner

of the trade mark is entitled to prevent is such use of his mark by other traders as will lead purchasers to buy, as his, goods which are not his. On the other hand, patent-right and copy- right protect the substance of the article; and any unauthorized manufacture of it in the former case, or reproduction of it in the

latter, while the protection lasts, is prohibited. The grounds, however, on which trade marks, patent-right and copyright obtain legal recognition, though they are to a certain extent dissimilar, have a common element. Patent-right and copy- right rest upon the view that the results of the original labour of the inventor and the author ought, as a matter alike of justice and of public policy, to be secured against piracy; while, as regards the proprietor of a trade mark, the question of originality does not arise so long as the mark is sufficiently distinctive really to identify his goods and, for purposes of registration, to satisfy the Trade Marks Acts. In truth, the registration of a trade mark is rather the recognition of a fact than the grant of a privilege (Kerly and Underhay, Trade Marks Act, 1905, p. 3). The law as to trade marks as well as that as to patents or copyright is based on a man's rights to have guaranteed to him the profit derivable from his Own property. " No man," said James (L.J.), in the case of the Singer Manufacturing Co. v. Loog (1880, 18 Ch. D., 412), "is entitled to present his goods as being the goods of another man, and no man is permitted to use any mark, sign or symbol, device or means, whereby, without making a direct false representation himself to a purchaser from him, he enables such purchaser to tell a lie or to make a false representation to somebody else who is the ultimate customer."

I. British Trade Marks before the Registration Acts. — The existing law in the United Kingdom cannot be properly appreciated unless the subject is approached in the first instance from the historical side. English trade-mark law practically commences with the first years of the 19th century. The use of trade marks was indeed of far earlier date, for in 1742 we find Lord Hardwicke declaring that " every particular trader had some particular mark or stamp," But in the very case in which Lord Hardwicke made that statement {Blanchard v. Hilt, 2 Atkyns, 484) he refused to protect the " Great Mogul " stamp on cards, being apparently under the influence of the notion that the legal recognition of trade marks would involve the creation of a new species of monopoly; and with regard to a case decided in the reign of James I. {Southern v. How, Cro. Jac. 471), in which a clothier had applied the mark of another clothier to his own inferior goods, the reports leave it doubtful whether the action was brought by the owner of the mark, or by a defrauded customer, in which latter event it would be merely an ordinary action for deceit. But although the actual law of trade marks cannot be traced farther back than the beginning of the 19th

century, Lord Eldon repeatedly granted injunctions to restrain one trader from fraudulently ” passing off ” his goods as those of another, and thus laid a foundation on which the present law has been built up. The stages through which its development passed possess considerable interest, and may be described quite briefly. The first reported case — apart from the doubtful one in the time of James I. above referred to — in which the infringement of a trade mark (a label on blacking) was restrained by the court of chancery was Day v. Day (Eden on Injunctions, ed. 1821, p. 314) in 1816. In 1824 the common law courts, in the case of Sykes v. Sykes (3 B. & C. 541), established the right of the owner of an infringed trade mark to damages. In 1833 it was held by the court of king’s bench that it was. not necessary for the plaintiff in an infringement action to prove that the defendant’s goods were inferior to his, or that he had suffered special damage by the infringement. Later this became a rule of equity as well as of law. On another point, however, the practice of the courts of common law and equity diverged for a time. It was decided by Lord Cottenham in 1838, in the leading case of Millington v. Fox (3 Mylne & Craig 338), that an injunction to restrain the infringement of a trade mark could be obtained, even although the defendant had acted without fraudulent intent. On the common law side, on the other hand, fraud was an essential ingredient in the cause of action, and

remained so till the fusion of law and equity by the Judicature Acts.

The effect of Lord Cottenham’s decision in the case of Milling- ion v. Fox clearly was to recognize a right of property in trade marks, and the action for infringement became a familiar species of litigation. Under the then existing law, however, the plain- tiff in such actions generally found himself in a very disadvan- tageous and unsatisfactory position. The basis of his action was the reputed association between his trade mark and his goods. This association the defendant — often a person of no means — ■ would deny, and it had to be proved as a fact by witnesses at a cost to the plaintiff which there was little hope of his recovering. Moreover, even if the trade mark proprietor secured a judgment in his favour, it carried with it no immunity from the obligation of again establishing his right to the mark against any

subsequent infringer who chose to dispute it. Thus — to take an interesting and pertinent illustration given in Kerly on Trade Marks (p. 6) — the case of Rodgers v. Nowill (22 L. J. Ch. 404) lasted five years and cost the plaintiff £2211, without giving him in the end any security that he might not have to incur equal delay and expense in proving his title to the exclusive use of the trade mark in proceeding against other defendants. To complete this state- ment of the shortcomings of the law before the Merchandise Marks Act 1862, it should be noted that the infringement of trade marks — except in cases where the seller of spuriously marked goods cheated the buyer — was not a criminal offence. The remedies obviously needed were the establishment of a system of registration of trade marks which would simplify the proof of a plaintiff's title, and the creation of a criminal law of false marking. 1 The first step in the accomplishment of the latter object was taken by the Merchandise Marks Act 1862.

II. Under the Registration Acts. — Provision was first made for the registration of trade marks by the Trade Marks Registration Act 1875. That statute made registration in the register of trade marks which it established prima facie evidence of the right of the registered proprietor to the exclusive use of the trade mark in connexion with goods of the class for which it was registered and used, and enacted that it should after the expiration of five years be conclusive proof of such right, provided that the proprietor of the mark remained the owner of the goodwill of the business in which it was used. This provision was carried as to the act of 1883 (s. 76). The act also provided that a person should not be entitled to institute any .proceeding to prevent the infringement of trade mark until it was registered, or (a later statutory modification) until, in the case of a mark in use before the passing of the act of 1875, registration of the mark as a trade mark had been refused. The act of 1875 was a con- siderable success, but no provision was made under it for the registration of words unless they either were old marks or were registered in combination with one or more of the " essential particulars " prescribed by the act, such as a distinctive device, heading, mark, label or ticket. These limitations excluded from registration most of the trade marks ordinarily in use.

The Patents Designs and Trade Marks Act 1883 remedied this defect besides altering the law in other important respects. The act of 1883 was amended in 1888 on the recommendation of a committee presided over by Lord Herschell. Neither the act of 1875 nor those of 1883 and 1888 altered the common law

definition of a trade mark, nor contained any definition of the term. The description in the acts of what was registrable as a trade mark led to much litigation, and the interpretations of the judges left commercial men dissatisfied on three points : (1) the number of good and valuable trade marks which were not registrable; (2) that on allowing registration the patent office insisted on disclaimers which hampered the owner in obtaining protection in the colonies and foreign countries; (3) that there was no effective period of limitation to attacks on

1 Further reference may be made, in regard to the subject of trade marks before the Registration Acts 1883-1888, to an admirable introductory chapter in Kerly on Trade Marks, and also to the report of the Merchandise Marks Committee 1862, and the annual reports of the commissioners at'd the comptroller-general of patents from 1876 to 1884 (and report).

registered trade marks, because though registration for five years was declared conclusive by s. 76 of the act of 1883, the powers of the court to rectify the register could be invoked even after the lapse of the five years {re Gestetner's Trade Mark, 1907, 2 Ch. 478). In re-enacting and enlarging the provisions of the act of 1875 the act of 1883 laid down certain essential particulars of one at least whereof a trade mark must consist to be regis- trable. These particulars will be considered later in dealing with the present law. The act of 1883 first provided for " word marks," and included among them " a fancy word or words not in common use " [s. 64, (1) (c)] .

The expression " fancy word," used in the act of 1883, gave rise to considerable difference of opinion. It was interpreted by the court of appeal' as equivalent to " obviously meaningless as applied to the article in question," or " obviously non-descriptive." In accordance with this interpretation, the words " gem " for guns, " melrose " for a hair restorer, " electric " for velveteen, and " washerine " for a soap were all held not to be registrable. On the recommendation, however, in 1887, of a committee appointed by the board of trade, and presided over by Lord Herschell, the expression " invented word " was substituted for " fancy word " by the act of 1888.

In 1905 and 1907 the legislation as to trade marks was amended and remodelled. A bill was introduced in 1905 at the instance of

the London Chamber of Commerce, and after consideration by a select committee became the Trade Marks Act 1905. This act repeals the bulk of the provisions of the Patents, &c, Acts of 1883 and 1888 with respect to trade marks, and embodies them with amendments (to be noticed later) in a separate statute. The only portions of the earlier acts left standing with respect to trade marks were ss. 83 and 84 (as amended in 1885 and 1888) with reference to the administration in the patent office of the law as to trade marks (1905, s. 74); ss. 103 and 104 of the act of 1883 (as amended in 188 sT relating to registration of trademarks, both as enacted in the acts of 1883 and 1885 and as applied by orders in council, are to be read as applying to trade marks registrable under the act of 1905 (s. 65). The sections of the Patents Acts of 1883, 1885 and 1888, thus preserved as to trade marks, were repealed by the Patents and Designs Act 1907. Sections 62 seq. of this act replace ss. 83 and 84 of the act of 1883, and retain the administration of trade mark law in the patent office; and s. 91 replaces ss. 103 and 104 of the act of 1883 as to international and colonial arrangements for mutual protection (inter alia) of trade marks. According to the rule laid down by the Interpretation Act 1889 the refer- ences in the act of 1905 to the acts of 1883, &c, are to be read as applying to the above-stated sections of the act of 1907.

The act of 1905 differs from the preceding acts in containing a definition of trade mark for the purposes of the act unless the context otherwise requires; viz. that it ” shall mean a mark used or proposed to be used upon or in connexion with goods for thepurposeof indicat- ing that they are the goods of the proprietor of such mark by virtue of manufacture, selection, certification, dealing with or offering for sale “; and ” mark ” is defined as including ” a device, brand, heading, label, name, signature, word, letter, numeral or any combination thereof ” (s. 3). The act, modifying to the extent indicated in italics the acts of 1883 and 1888, prescribes (s. 9) that a trade mark to be registrable must contain or consist of at least one of the following essential particulars;—

1. The name of a company, individual or firm represented in a special or particular manner (under the act of 1883 it has been held that the name must be in the nominative case, and that ordinary printing is not representation in a particular manner).

2. The signature of the applicant for registration or some prede- cessor in his business. It is not clear that this includes descriptive

trading styles.

3. An invented word or words.

4. A word or words having no direct reference to the character or quality of the goods, and not being according to its ordinary signifi- cation a geographical name or a surname.

5. Any other distinctive mark; out a name, signature, or word or words other than such as fall within the descriptions in the above para- graphs 1,2,3 ana ˆ 4 < s h a U not \ except by order of the board of trade or of the court, be deemed a distinctive mark. By distinctive is meant " adapted to distinguish the goods of the proprietor of the trade mark from those of other persons " : and " in determining whether a trade mark is so adapted the tribunal may in the case of a trade mark in actual use take into consideration the extent to which such

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TRADE MARKS

Invented Words.

user has rendered such trade mark in fact distinctive for the goods in respect of which it is registered or proposed to be registered." Where the mark is limited to specified colours, that fact may be taken into account in deciding whether the mark is distinctive (s. 10). There are certain special rules as to cotton marks.

Trade marks containing the essential particulars are not regis- trable if they contain any matter which would by reason of its being calculated to deceive or otherwise be disentitled to protection in a court of justice or would be contrary to law or morality, or any scandalous design (s. n). (See Eno v. Dunn, 1890, 15 App. Cas. 293, and the " Motricine " case, 1907, 2 Ch. 435.) Registration of the same matter as a trade mark under the act of 1905 and as a design under the Patents and Designs Act (1907) is possible (re U.S. Playing Card Co.'s Applic, 1907, W. N. 251).

Old marks are registrable, i.e. any special or distinctive word or words, letter, numeral or combination of letters or numerals,

used by the applicant or his predecessors in business before the 14th of August 1875, subject to the qualification that it has " continued to be used either in its original form or with additions or alterations not substantially affecting the same down to the date of the applica- tion for registration " (s. 9). In the case of new marks, but not of old marks, a trade mark is not registrable except by order of the court in respect of any goods or description of goods which is identical with a mark already on the register with respect to such goods or description of goods, or so nearly resembles such registered mark as to be calculated to deceive (s. 19).

Most controversy arose under the acts of 1883 and 1888 as to the meaning of the phrase " invented word " preserved in the act of 1905. An invented word need not be wholly meaningless, nor is it disqualified because words may have suggested it. Thus '■' mazawattee " was held to be an " invented word," although the latter part of it was a Sinhalese term meaning " estate," and there were estates in Ceylon having names ending with " wattee " from which tea came; and in a leading case on the construction of the clauses under consideration (Eastman Co.' s Trade Mark, L. Rep. 1898, A. C. 571), the word " solio " was held to be registrable as a trade mark for photographic printing paper under both clauses, although it was objected that " solio " was equivalent to " sunio." The expression " calculated to deceive " has been considered by the courts in very many cases. It is not merely or chiefly the retailer or dealer"who has to be kept in view when the question of the likeli- hood of deception is under consideration. The courts have regard also, and mainly, to the ultimate purchaser whom the trade mark may reach, and careless or unwary persons are considered as well as those who are careful and intelligent. The judge's eye is the ultimate test as to the degree of resemblance that is calculated to deceive, although expert evidence on the point is admissible. " Savonol " for soap (/. C. & /. Field Ltd. v. Wagel Syndicate Ltd., 1900, 17 R.P.C. 266), " tachytype " for typographical and composing machines (in re Linotype Co.'s A pplication, 1900, 17 R.P.C. 380), have been held to be invented words. But the following have been held not invented — " uneeda " (=you need a) in re National Biscuit Co. (1902 ; 1 Ch. 783) ; " absorbine " for an absorbent prepara- tion (Christy 6* Co. v. Tipper & Son, 1905, 21 R.P.C. 97, 775); " bioscope " (Warwick Trading Co. v. Urban, 1904, 21 R.P.C. 240) ; " cyclostyle " (re Gestetner's Trade Mark, 1907, 2 Ch. 478) ; and cf. in re Kodak and Trade Marks (1903, 20 R.P.C. 337).

Subsections (3) and (4), it should be noted, are independent: the former deals with newly-coined words, the latter deals with the existing words of- the English language, or of other languages likely to be known to the public. A word which is really ” invented ” may be registered, whether it is descriptive or not. An old word used in a new sense is not invented (Hommel v. Bauer & Co., 1904, 21 R.P.C. 576). The exact scope of clause (5) as to other distinctive marks has not been much discussed by the courts. Registration was allowed of the word ” apollinaris ” as a distinctive mark for the mineral waters of the applicants, on an undertaking to apply it only to water from the Neuenahr spring or district (in re Apollinaris Trade Mark, 1907, 2 Ch. 178). Under prior legislation the mark had been refused registration as being a geographical name (re Apollinaris Co.‘s Trade Mark, 1891, 2 Ch. 186).

Identical marks (except old marks) may not be registered in respect of the same goods, or goods of the same description, for Id tl I two different persons (s. 19) ; and where several appli- jHaris” cants make rival claims to identical marks the registrar may refuse to register until their rights have been deter- mined by the court or settled by agreement in manner approved by the registrar, or, on appeal, by the board of trade (s. 20). In the case of honest concurrent user or of other special circumstances making it proper so to do, the court may permit the registration of the same mark or of nearly identical marks for the same goods by more than one own,er, subject to such conditions or limitations, if any, as to mode or place of use or otherwise as the court may think it right to impose (s. 21).

New provisions were made in 1905 as to what are called ” associa- ted trade marks.” Where registration is sought for a mark so closely resembling a mark of the applicant already on the register for the same goods as to be calculated to deceive or cause confusion if used by any one but the applicant, the registration of the new mark

Cotton Marks,

may be conditional on entering both marks as associated trade marks (s. 24). This section applies only to marks closely resembling one already on the register for the same goods or des- cription of goods, and has nothing to do with identical ™ ,s< * ; ' ate

In the case of combined trade marks provision is made for registering as separate trade marks the part in which the applicant has exclusive rights, and as associated marks trade marks of which the exclusive portion forms a part (s. 25).

A series of trade marks of the same owner may be registered on one registration as associated marks (s. 26).

Provision is made for allowing the registration of marks used upon or in connexion with goods by an association (or person) which undertakes the examination of goods in respect .

of origin, material, mode of manufacture, quality, J ta ” dara ‘ accuracy, or other characteristic, and certifies the result ˆarks of the examination by marks used upon or in connexion with the goods. These marks cannot be registered unless the board of trade consider their registration of public advantage. Their registration is not conditional on the association or person being a trader or having goodwill in connexion with the examination or certification. The registration gives the association or person the rights of the owner of a registered trade mark, except that assignment and transmission needs permission of the board 01 trade (s.62).

In respect of cotton piece-goods, marks consisting of a line heading alone or a word alone are not registrable, and no word or line heading is treated as distinctive in respect of such goods. In respect of cotton yarn the same rule applies with respect to words, and no registration of any cotton mark gives any exclusive right to the use of a word, letter, numeral, line, heading or combination thereof [s. 64 (10)] .

By s. 68, which is a re-enactment of s. 105 of the Patents, &c, Act, 1883, it is made illegal for any person without the authority of the king to use the royal arms in any trade in such a manner .. , as to create the belief that he has authority so to do; r> Se ˆ a similar provision is embodied in the Merchandise i* y A „ Marks Act 1898 of the Isle of Man. Atms ‘

The central register of trade marks is kept at the Patent Office, Southampton Buildings, London, and is under the charge of the comptroller-general of patents, designs and trade marks, „ . . . who is appointed by and acts under the superintendence es ‘

of the board of trade, and has a deputy — the registrar of trade

marks. There is a branch registry at Manchester, whose chief officer is the keeper of cotton marks, which deals with all applications for the registration of trade marks for cotton goods falling within classes 23, 24, 25 in schedule 3 of the Trade Marks Rules 1906. The registry has been long established, but was not recognized by statute till 1905. Records are kept and are open to public inspection of all applications made since 1875, whether granted or refused.

There is a branch registry at Sheffield containing the marks for metal goods (" Sheffield marks ") registered by persons carrying on business in or within six miles of Hallamshire. The care of this register is vested in the Cutlers' Company, who are substituted for the comptroller as to registration of " Sheffield marks " (s. 63). Applications made to the company are notified to the registrar, and may not be proceeded with if he objects. Any person aggrieved by the registrar s objection may appeal to the court. Applications made to the registrar for metal marks are notified to the Cutlers' Company. Persons aggrieved by the decision of the Cutlers' Company have an appeal to the courts (s. 64).

In 1906 fourteen applications were made at the head registry which were all dealt with by the Cutlers' Company. That company, by arrangement made with the sanction of the treasury, retain all fees taken at Sheffield with respect to registration up to £400, and half of the fees received in excess of that amount (Pari. Pap,, 1907, No. 164, p. 9).

A trade mark must be registered in respect of particular goods or classes of goods (s. 8), and the classification in force is scheduled to the Trade Marks Rules 1906 (R. & O., 1906, No. 233). _^ Doubts as to the class to which the goods in question Hroceaure – belong are settled by the registrar. The procedure for obtaining registration is regulated by the act of 1905 and the rules above mentioned. The registrar has power to refuse applications or accept them absolutely or subject to conditions, amendments and modifications (s. 12). His discretion is not absolute, but subject to the provisions of the act (re Birmingham Small Arms Co.'s Application, 1907, 2 Ch. 396) ; and he must if required state his reasons, and his decision is subject to appeal to the board of trade or the court at the option of the applicant [s. 12 (3)] .

" New marks " may not be placed on the register except by order of the court for any goods or description of goods which are

identical with marks already on the register with respect to the same goods, &c, or so nearly resemble a registered mark as to be calculated to deceive (s. 19). The question whether particular goods are of the same description is not determined solely by reference to the statu- tory classification. ” The true test,” says Kerly (Trade Marks, I p. 181), ” would seem to be supplied by the question: Are the two sets of goods so commonly dealt in by the same trader that his

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customers, knowing his mark in connexion with one set, and seeing it upon the others, would be likely to suppose that it was used upon them also to indicate that they were his goods? ” Wine and spirits, beer, and even aperient drinks and baking powder, have been held to be ” goods of the same description.” When a trade mark contains (i) parts not separately registered as trade marks or (2) matter common to the trade or otherwise of a non-distinctive character, the registrar, or the board of trade or the court, in deciding whether the mark shall be entered or retained on the register, may impose as a condition that the owner shall disclaim all right to exclusive use of any part or parts of such trade mark or of all or any portion of such matter to the exclusive use whereof they deem him not to be entitled, or make any other disclaimer which they consider needful to define his rights under the registration (s. 15). Marks calculated to deceive are not entitled to protection (Eno v. Dunn, 1890, 15 App. Cas. 250).

Applications as accepted are advertised; the advertisements state the conditions, if any, imposed on acceptance (s. 13). Notice of opposition to the registration of a trade mark may be given under s. 14 of the act of 1905 (which replaces s. 69 of the act of 1883). The registrar after consideration decides whether the opposition is well or ill founded. His decision is subject to appeal to the High Court or by consent of the parties to the board of trade [1905, s. 14 (5)] . In 1906 there were 251 notices of opposition, of which 51 were heard. There were 4 appeals to the board of trade, all referred by the board to the court under s. 59 of the act.

There may be added to any one or more of the ” essential particu- lars ” above enumerated any letters, words or figures, or a combina- tion of these. But the right to the exclusive use of the added matter must be disclaimed. A man is not required,

however, to disclaim his own name, or trade name, or that of his place of business, if the name appears in the mark. The number of applications to register trade marks in 1884 was 7104, and the number of marks registered 4523. In 1906 the corresponding figures were 11,414 and 4731. These figures included 153 applications made to the Cutlers' Company at Sheffield (Pari. Pap., 1907, 164, 24th report).

The register may be corrected on the request of the registered owner of a trade mark as to errors or changes of address in the name

__,, of tne registered owner, or by cancelling entries of

jam"" mar ' cs or by striking out classes of goods for which

«/<*"" a mark is registered or by entering disclaimers or

Register * memoranda as to a mark, provided that they do not

' extend the rights given by the existing registration

(s. 33)- .

A registered trade mark may be altered or added to in matters not substantially affecting its identity (s. 34). Thus a firm on becoming a limited company has been allowed to add the word " limited " to its name upon a registered mark, but no alteration will be permitted in regard to any " essential particular." In the above cases the corrections or alterations are made by the registrar subject to appeal to the board of trade (ss. 32, 34). A registered trade mark may be taken off by order of the court on the application of a person aggrieved, on the ground that it was registered without a bona fide intention to use it in connexion with a particular class of goods, and that there has not been any such bona fide user, or that there has been no such bona fide user during the five years preceding the application. Non-user may be excused if proved to be owing to special circumstances and not to any intention not to use or to abandon the use of the mark (s. 37). (See re Hare's Trade Mark, 1907, 24 R.P.C. 263).

The register may be rectified by order of the court on the application of any person aggrieved, or in the case of fraud in regis- tration or transmission of the mark on the application of the registrar. The powers of rectification include correcting or expunging wrong entries, supplying errors and omissions and

defects (s. 35) :

Registration is effective for 14 years but is renewable (s. 28). The registration if valid gives the proprietor the exclusive right to Effect of t ‘ le use °^ *^ e mar ‘ c on or ‘ n connexion with the Rezistra’ 8 00 < ^ s ' n respect of which it is registered (1905, s. 39). tl J% This rule is subject to the following qualifications.

(a) Where two or more persons are registered owners of the same or substantially the same mark in respect of the same goods, no one of them shall as against any other of them have any right of exclusive user except so far as their respective rights have been defined by the court, (b) Registration of a trade mark does not entitle the proprietor to interfere with or restrain the user by any person of a similar mark upon or in connexion with goods upon or in connexion with which such person has by himself or his predecessors in business continuously used such trade mark from a date anterior to the use of the mark by the registered proprietor, or to object tc the registration of the other man’s similar mark for concurrent user.

In all legal proceedings relating to a registered trade mark registra- tion is prima facie evidence of validity, and after seven years from the original registration, or seven years from the passing of the act of 1905, whichever shall last happen, the original registration shall be taken to be valid in all respects unless it was obtained by fraud, or the mark offends against s. II of the act. This pro- vision as to validity limits the power which formerly existed of

getting rid of long registered marks by proceedings to rectify the register.

Registered trade marks are assignable and transmissible only with the goodwill of the business concerned in the goods for which they are registered, and are determinable with the goodwill (s. 22). Associated marks are assignable and transmissible only as a whole and not separately (s. 27). The owner of a registered mark may assign the right to use his registered mark in any British possession or protectorate or foreign country in connexion with any goods for which it is registered, together with the goodwill of the business therein of such goods (s. 22). Provision is made for apportioning marks where the goodwill of a business by dissolution of partnership or otherwise does not pass to a single successor (s. 23).

The assignments, &c, on proof of title, are recorded on the register (s. 33). It is a condition precedent to an action for the infringement of a new trade mark that the plaintiff should be the registered proprietor of the mark at the time when the action comes on for hearing. This last provision does not apply to an action for ” passing-off ” (vide infra). In actions for infringement, evidence of passing off, or that the infringing mark is calculated to deceive, is not necessary. The court decides on the probability of deception by inspecting and comparing the marks (Hennessyv. Keating, 1907, 24 R.RC. 485).

In the case of an old mark in use before the 14th of August 1875 proceedings may be taken if registration under the act of 1907 has been refused (s. 42).

The right to a trade mark lapses if the mark ceases to be distinctive and becomes publici juris ; if it is separated from the goodwill (a trade mark can only be assigned with the goodwill); if the mark is applied by the trader to spurious goods (as where boxes of cigarettes were so labelled, in conformity with an alleged custom of the trade, as to indicate that they were of Russian manufacture, which was not the fact ; or when the mark is abandoned) ; (temporary disuse, however, is not abandonment unless the mark has in the meantime become associated with the goods of another trader) ; or where, as in the ” linoleum ” case (7 Ch. D. 834) it has become the name of the goods, and so merely descriptive; or after fourteen years where registration is not renewed. In dealing with a claim for infringement the court must admit evidence of the usages of trade as to the get-up of the goods for which the mark is registered, and of any trade marks or get-up legitimately used with such goods by other persons (s- 43)-

The registrar has an uncontrolled discretion in the administration of the act, except in those cases’ in which an appeal is given from his acts or refusals to the court or the board of trade . –

(ss. 53, 54)- In cases of difficulty he consults the) aw ˆPPe”””* 6 officers (s. 56).

Actions or other proceedings with relation to 1 trade marks, so fai as they are for the court, may be brought in the High Court of Justice in England or’Ireland and in the Court of Session in Scotland (ss. 3, 69). In the case of marks registered on application at the Manchester branch, the chancery court of

Lancaster has concurrent jurisdiction with the High Court (s. 71). Actions for infringement of a trade mark are not within the jurisdiction of the county court (Bow v.Hart, 1905, 1 K.B. 592). An annual report is made by the comptroller-general of patents, &c, as to proceedings with reference to trade marks.

III. ” Passing-off “and Trade Name.ˆA trader has generally, besides his trade mark, numerous other symbols, which ha uses as indicia of his goods, e.g. the name of title under which he himself trades, the name under which his goods are known and sold, badges of property which are termed “trade name,” and the distinctive ” get-up ” of the goods as they appear in the market. These symbols enjoy the protection of the law, under certain conditions, equally with trade, marks. No trader is entitled to ” pass off ” his goods as those of another, and if he infringes this rule he is liable to an action for an injunction and damages, and these rights are preserved by the Trade Marks Act 1905 (s. 45). The right to be protected against ” passing-off ” is restricted to goods of the same description as those upon which the trader uses the ” get-up,” &c, imitated. Even if the ” pass- ing-off ” is done innocently it will be restrained (Millinglon v. Fox, 1838, 3 Mylne and Craig, 338). This case is described as not one of the use of a properly descriptive name, but rather a case of the same class as those in which a fancy or invented name is used (Cellular Clothing Co. v. Maxton, 1899, App. Cas. 326, 341). Although the first purchaser is not deceived, still if the article delivered to him bears words or marks such that it is ” calculated to deceive ” a purchaser from him, the use of them is illegal.

To this general rule there are several exceptions ;— – 1. No monopoly is allowed in names that are merely descriptive. But words which prima facie are descriptive, such as ” camel-haw belting,” for belting made of camel-hair (Reddaway v. Banham,

1896, App. Cas. 199), or ” Stone Ales ” for ales brewed at Stone {Montgomery v. Thompson, 1891, App. Cas. 217), may be shown to have acquired by long use a ” secondary distinctive meaning,” and, in fact, to mean the goods of a particular trader. And where a defendant is not selling the genuine goods indicated by the name, as where the composition of the goods is a secret, even if the name might otherwise be taken as merely that of the goods,

he cannot rely on the defence that the name is descriptive (Birmingham Vinegar Co. v. Powell, 1897, App. Cas. 710; the ” Yorkshire Relish Case ‘). If, however, the primary meaning of the word is simple and well known, it is extremely difficult to establish a secondary meaning exclusive of the primary one (Hommel v. Bauer & Co., 1905, 22 R.P.C. 43; ” Haematogen,” a preparation for forming blood, secondary meaning not established; cf. Fells v. Hedley & Co., 1904, 21 R.P.C. 91; ” Naphtha soap,” secondary meaning not established; Wurm v. Webster & Girling, 1904, 21 R.P.C. 373; “White Viennese Band,” secondary meaning not established; Cellular Clothing Co. v. Maxton, 1899, A.C. 326, ” cellular ” as applied to cloth, secondary meaning not established). But although a name may not, owing to the fact that it consists of well-known or descriptive words, be inherently entitled to protection, a distinctive scroll or device, in which it is embodied, may be so. Thus, in a case (Weingarten Brothers v. Bayer & Co., 1905, 21 Times L.R. 418; and see 19 Times L.R. 604) which sharply divided judicial opinion in England, the defendants were restrained from selling corsets in boxes bearing the name ” Erect Form Corsets ” scrolled thereon by the plaintiffs in a distinctive manner. No monopoly, of course, could be claimed in the words, but it was otherwise with the scroll. The use of a fancy name ” iron oxide tablets ” has been restrained where it was found likely to cause deception as being used to supersede in the market certain well-known ” Iron Ox ” tablets (Iron Ox Remedy Co. v. Co-operative Wholesale Society Ltd., 1907, 24 R.P.C. 425). (2) A trader cannot be prevented from trading under his own name, if he is using it honestly (bona fide) ; even though from its similarity to the name of another trader — even one previously well-established — it may injure the business of the latter (Burgess v. Burgess, 1853, 3 De Gex, M. & G. 896; Turton v. Turton, 1889, 42 Ch. D. 128; Dunlop Pneumatic Tyre Co. v. Dunlop Motor Co., 1007, App. Cas. 430). This right is recognized by the Trade Marks Act 1905, s. 44, which provides that registration of a trade mark under the act shall not interfere with any bona fide use by any person of his own name or place of business or that of any of his predecessors in business. But if a trader has never carried on such a business on his own account or in partnership with others, he cannot, by promoting and registering a joint-stock company with a title of which his name forms part, conferon the company the rights which he as an individual possesses in the use of his name (Fine Cotton Spinners, &c, Associa- tion Ltd. and John Cash & Sons Ltd. v. Harwood Cash & Co. Ltd., 1907, 2 Ch. 184). If a trader’s own

name has, before he entered the trade, become the trade name of some other person's goods, he would probably not be allowed to use it without taking steps to prevent deception. This rule does not debar him from using " any bona fide description of the character or quality of his goods " (1905, s. 44). A name can become universally known as referring to the goods of a particular maker, i.e. as having a secondary meaning. This does not give exclusive rights to use of the name, but only to prevent'other firms from using the goods so as to pass off their goods as those of the person whose name is in question (Joseph Rodgers & Sons Ltd. v. Hearnshaw, 1906, 23 R.P.C. 348).

It is provided by the Companies Act 1862 (s. 20), that no company shall be registered under a name identical with that by which a subsisting company is already registered, or so nearly resembling it as to be calculated to deceive, unless the subsisting company is in process of being wound up and consents to such registration; and provision is also made for a change of the name of any company which, through inadvertence or otherwise, is registered under a name coming within the statutory prohibition. It is to be observed (cf. Buckley, Companies Ads, 8th ed. p. 27) that (a) the Companies Act 1862 applies only to the case of taking the name of a subsisting company already registered, and not to a case where a new company proposes to register in the name of, or in a name closely resembling, the name of an old-established company which is not registered, or of a firm or individual trader; (b) that as soon as the new company is registered the act ceases to apply; and © that the act forbids registration irrespectively of the question whether the business proposed to be carried on by the new company is the same as that of the subsisting company or not. But the provisions of the Com-

f>anies Act on this subject are merely supplemental to the common aw, and any company trading in the United Kingdom may restrain persons from registering a new company to carry on a rival business under a name identical with or so similar as to be calculated to deceive, and a company already registered under such a name may be restrained from carrying on a rival business under it. The right to interfere depends not upon fraud but upon the tendency of the similarity to cause confusion, deception or mistake (Fine Cotton Spinners case above cited; Birmingham Small Arms Co. v. Webb, 1907, 24 R.P.C. 27; Star Cycle Co. v. Frankenburgs, 1907, 24 R.P.C. 405; re Reddaway & Co., 1907, 24 R.P.C. 203). In such proceedings evidence is admissible to show how the existing

company has used the name,- and what, by reason of its connecting that name with its goods, the public have come to attribute to it (Daimler Motor Car Co. v. London Daimler Co., 1907, 24 R.P.C. 379). A new company will not be allowed to take the whole name of a subsisting company, even although that name is of a descriptive character (Manchester Brewery Co. Ltd. v. North Cheshire and Manchester Brewery Co. Ltd., 1899, App. Cas. 83).

The purchaser of the goodwill of a business has the right to use the trade name under which the business is known, and to restrain others from using it or such imitations of it as may d; „i, < so * mislead the public. But he is not entitled by the use Aggj-agg. of the trade name to make the vendor liable, under the doctrine of " holding out," for debts of the business incurred after the sale. And if the vendor of the goodwill gave his name to the business, he cannot (in the absence of any restrictive condition in the agreement for sale) be prevented from beginning to trade in his own name again, unless it be shown that in so doing he is attempting to deceive the public into the belief that he is still the owner of the old business. In construing the words " calculated to deceive " (s. 20) the courts will adopt principles closely analogous to those applicable in " passing off " cases in which the question is raised whether a trade name or the description or get-up of a particular class of goods is or is not likely to deceive (British Vacuum Cleaner Co. v. New Vacuum Cleaner Co., 1907, 2 Ch. 312; Aerators Ltd. v. Tollett, 1902, 2 Ch. 319, 324). When the names of the two companies contain terms of common ordinary meaning descriptive of an article, s. 20 will be applied less readily than where the words said to create the confusion are of the character of fancy words relating rather to the maker than the article (Vacuum Cleaner Case).

IV. Merchandise Marks. — The first attempt to make the falsification of trade marks a criminal offence was in the Merchandise Marks Act 1862 (25 & 26 Vict. c. 88). That statute provided that the forgery of a trade mark with intent to defraud, and the false application of a trade mark to goods with the like intent, should be misdemeanours, but left upon the prosecutor the burden of establishing the fraudulent intent. The act contained no provision for summary prosecutions, and did not provide for the seizure of falsely-marked goods on importation from abroad. The international convention for the protection of industrial property, made at Paris in 1883, to which Great Britain acceded in 1884, contains a provision that all goods illegally bearing a trade mark or trade name may be seized on

importation into those states of the union where the mark or name has a right to legal protection, and that the seizure shall be effected at the request of either the proper public department or of the interested party, pursuant to the internal legislation of each country. The law had to be amended in order to carry out this article in the convention, and the Merchandise Marks Act 1887 was passed to effectuate this object and generally to make better provision for the protection of merchandise. It was subsequently amended in 1891 and 1894. The effect of the provisions of these statutes may be briefly stated. Any person is guilty of an offence, punishable on indictment or summary conviction by fine or imprisonment, who does any of the five following acts, unless he proves as regards the first four of them that he acted without intent to defraud (there is a special defence to No. v. which is noted below): (i). forges any trade mark, or makes, disposes of, or has in his possession for such purpose any die or instrument; (ii.) falsely applies any trade mark or a colourable imitation of any trade mark to goods; (iii.) applies any false trade description to goods; (iv.) causes any of the above offences to be committed; (v.) sells or exposes for sale, or has in his possession for sale, trade or manu- facture, any goods or things to which any forged trade mark or false trade description is applied, or any trade mark or colourable imitation of a trade mark is falsely applied, unless the defendant proves that, having taken all reasonable precautions, he had no ground to suspect the genuineness of the mark, &c, and also that on demand he gave to the prosecutor all the information in his power as to the person from whom he obtained the goods, &c, or proves that he otherwise acted " innocently." (See Thwaites & Co. v. McEvilly, 1903, 20 R.P.C. 663).

"Trade description" is defined as any descriptive statement or other indication as to the measurement, quantity (not quality, it should be observed), or weight, place or mode of production, or

the material of the goods, or as to their being subject to an existing patent, privilege or copyright; conventional or customary descriptions lawfully in use in August 1887 to indicate Tr ade tna) . tne g^^g are f a particular class or method of

Description. manu f ac t u re are allowed to be continued; but if

they contain the name of a place and are calculated to mislead as to the real place of production, the name of the latter must be added. The test of what is a trade description depends upon the understanding of the trade and not on scientific correctness (Fcwler v. Cripps, 1906, 1 K.B. 16).

On a prosecution for any of these offences, there is a power to forfeit the things found although no one is convicted. If the offender is indicted (it is in his option to be tried in this way) the punishment is fine and imprisonment, the latter not to exceed two years. On summary conviction the punishment is not to exceed, for a first offence, four, months' imprisonment, with or without hard labour, and a fine of £20; and for any subsequent offence six months' im- prisonment and a fine of £50. The importation is forbidden of goods by means of or in relation to which an offence against the acts has been committed, and also of all goods of foreign manufacture bearing any name or trade name being or purporting to be that of a manufacturer or trader within the country, unless it be accom- panied by a definite indication of the country where the goods were made or produced. There are also special provisions with regard to the marking of catch-cases. The commissioners of customs have power to make general orders for carrying out the Merchandise Marks Acts. (See Regulations of the 1st of December 1887, Stat. R. & O. Revised, 1904, vol. viii. tit. Merchandise Marks.) Prosecu- tions may be undertaken by the board of trade in cases appearing to affect the general interests of the country or of a section of the community, or of a trade, subject to regulations made on the 21st >f May 1892; and the board of agriculture and fisheries has a like power in the case of the produce of agriculture, horticulture and fisheries [act of 1894, s – I '< Board of Agriculture and Fisheries Act 1903, s. 1 (8); see the regulations of the 27th of October 1894, Stat. R. & O. Revised, vol. viii. tit. Merchandise Marks.] . Under the Sale of Food and Drugs Act 1899, and the Butter and Margarine Act 1907, the importation, except in containers showing their character, of margarine, margarine cheese, adulterated or im- poverished butter, milk-blended butter or condensed, separated or skimmed milk, is penalized, and it is provided that the commissioners of customs, in accordance with directions given by the treasury after consultation with the board of agriculture, shall take such samples of consignments ot imported articles of food as may be necessary for the enforcement of the law.

V. International Arrangements. — (The Trade Marks Act 1905

applies to the British Islands.) By the international conven- tion for the protection of industrial property (see Patents), which was signed at Paris in 1883, the signatory states (others have since acceded) agreed that the subjects or citizens of each state should, in all the other states, enjoy as regards trade marks and trade names the advantages that their respective laws then granted, or should thereafter grant, to their own subjects or citizens. So far as Great Britain is concerned the provisions made for carrying out this convention are contained in s. 65 of the Trade Marks Act 1905 and in s. 91 of the Patents and Designs Act igoy. 1 The effect of that section is to confer on an applicant for the protection of a trade mark in one of the other contracting states a priority over other applicants for registration in the United Kingdom during the space of four months. The section does not, however, exempt the applicant from the conditions and formalities incumbent on ordinary applicants for registration in Great Britain; nor does the fact that the foreign application has been successful of itself give the applicant a right to have his mark accepted for registration. Under the Convention of Madrid of the 14th of April 1891 (to which Great Britain is not a party) a trade mark may be registered as the result of a single application in the countries of all the signatory powers. Besides the general international conventions there are also particular arrangements between many states, e.g. Germany and Italy (Italian law of the 24th of December 1903). Guatemala and Salvador, also signatory parties, have withdrawn from the convention.

The following is a list of the British orders in council that have been issued, applying to foreign countries, s. 103 of the Patents, &c, Act 1883:—

1 This section supersedes ss. 103, 104 of the Patents, &c, Act 1883. The references to these sections in the Trade Marks Act 1905 must now be read as applying to s. 91 of the Patents, &c, Act 1907.

Foreign State.

Belgium

Brazil

Cuba

Denmark (including the Faroe

Islands)

Dominican Republic

Ecuador

France

Germany

Greece

Honduras

Italy

Japan

Mexico

Netherlands

,, (East Indian Colonies) .

,, (Curacoa and Surinam)

Norway (and Sweden) ....

Paraguay

Portugal

Rumania

Servia

Spain .

Sweden (and Norway)

Switzerland

Tunis

United States

Uruguay

Date of Order in Council.

June 26, 1884. June 26, 1884. January 12, 1905.

November 20, 1894. October 21, 1890. May 16, 1893. June 26, 1884. October 9, 1903. October 15, 1894. September 26,1901. June 26, 1884. October 7, 1899. May 28, 1889. June 26, 1884. November 17, 1888. May 17, 1890. July 9, 1885. September 24, 1886. June 26, 1884. August 5, 1892. June 26, 1884. June 26, 1884. July 9, 1885. June 26, 1884. June 26, 1884. July 12, 1887. 2 September 24, 1886.

All these orders in council are printed in the Statutory Rules and Orders Revised (ed. 1904), vol. ix., under the title " Patents, &c." By orders in council, made under the provisions of the Foreign Jurisdiction Acts, penalties have been imposed on British subjects committing offences against the Patents, &c, Act 1883-1888 (now represented by the Trade Marks Act 1905, and the Patents and Designs Act 1907) and the orders in council issued thereunder, and the Merchandise Marks Act 1887: China and Corea (1904), Egypt (1899), Morocco (1889), Muscat (1904), Ottoman Empire (1899), Persia, Persian coast and islands (1889-1901), Siam (1906) and Zanzibar (1906).

By s. 91 of the Patents and Designs Act 1907, 3 and s. 65 of the Trade Marks Act 1905, the king is empowered by order in council to apply the provisions of s.91 above mentioned, with such variations or additions as may seem fit, to any British possession. The follow- ing is a list of the orders in council that have been issued : —

British Possessions.

Date of Order in Council.

Trinidad and Tobago .... Australia (Commonwealth)

1

August 7, 1905. February 8, 1890. August 12, 1907. August 12, 1907.

The orders in council up to 1903 are printed in the Statutory Rules and Orders Revised (ed. 1904), vol. ix., under the title" Patents, &c." It should be added that the protection of the Merchandise Marks Act 1887, extends to any trade mark which,

either with or without registration, is protected by law in any British possession or foraign state to which the provisions of s. 103 of the act of 1883 or s. 91 of the act of 1907 are, under order in council, for the time being applic- able.

A foreigner suing in the United Kingdom for infringement of a trade mark, or for " passing off," is in the same position as a subject.

VI. Colonial and Foreign Trade Mark Laws. — The British colonies generally follow the model of the English Trade Marks Acts (1883-1888).

A ustralia.— Legislation on trade marks is one of the subjects which the Commonwealth of Australia Constitution Act 1900 (s. 9, pt. v. 51, xviii.) places within the exclusive competence of the Federal Parliament. By the Commonwealth Trade Marks Act 1905, s. 20. provision is made for registration of trade marks throughout the Commonwealth, and subject to this act and other Commonwealth legislation the common law of England as to trade marks is applied throughout the Common- wealth. Prior to this act most of the states had their own trade mark law (New South Wales, No. 19 of 1900; Tasmania, No. 9 of 1893; Victoria, No. 1146, 1890; Western Australia, Nos. 7

2 A treaty was also concluded between Great Britain and the United States on the 24th of October 1877, for the protection of trade marks.

' This section re-enacts the provisions of ss. 103, 104 of the Patents, &c, Act 1883.

'34

TRADE MARKS

of 1884, 5 of 1886, 4 of 1894). But the state Trade Marks Acts,

with certain savings, cease to apply to trade marks (1905, s. 6).

The Commonwealth act contains certain novel provisions: —

1. As to a Commonwealth trade mark to be applied to all goods included in or specified by a resolution passed by both houses, that in their opinion the conditions as to the remuneration of labour in connexion with their manufacture are fair and

reasonable (s. 78). The mark consists in a device or label bearing the words " Australian Labour Conditions."

2. As to workers' trade marks intended to protect the products of any individual Australian worker or association of such workers other than primary products of agricultural or pastoral industries (s. 74). Sections 115, 116 of the act contain provisions for international and intercolonial arrangements as to protection of trade marks based on ss. 103, 104 of the act of 1883. By the Commerce Trade Descriptions Act, No. 16 of 1905, the import into and export from Australia of falsely marked goods is prohibited.

In Canada the law as to trade marks (Rev. Stats, c. 63) and merchandise marks (c. 41 of 1888) has been regulated by Dominion acts, similar to English statute law. New Zealand has an act of 1889. The Hong-Kong ordinance, No. 18 of 1898, is a typical instance of an ordinance in a Crown colony [see also Ceylon, No. 9 of 1906, Jamaica (laws 17 of 1888 and 6 of 1889)]. In the Bahamas a trade marks law was passed on the 29th of May 1906, based on the imperial act of 1905. In the Straits Settlements there is no registration of trade marks, but the common law as to " passing off " is applied.

United States. — Provision for the registration of trade marks in the United States was first made by an act of Congress of 1870; but that enactment was subsequently declared invalid by the Supreme Court (U.S. v. Stejfens, 1879, 100 U.S. 82), on the ground that the constitution of the United States did not authorize legislation by Congress on the subject of trade marks, except such as had been actually used in commerce with foreign nations or with the Indian tribes. Congress legislated again on the subject in 1881 (act of the 3rd of March 1881, Revised Stats. U.S. ss. 4937-4947). The act of 1881 was repealed by an act of the 20th of February 1905 (s. 592), which, as modified by an act of the 4th of May 1906, now regulates the subject. A trade mark .may be registered by the owner if he is domiciled within the United States, including all territory under the juris- diction and control of the United States (s. 29), or resides or is located in any foreign country which by treaty, convention or law affords similar privileges to citizens of the United States (s. 1).

The right of persons domiciled in the United States was in 1906 extended to owners of trade marks who have a factory in the United States, so far as concerns the registration, &c, of trade marks used in the products of the factory (1906, s. 3). To obtain

registration the owner of the mark (whether firm, corpora- tion, association or natural person) must file in the patent office an application (a) specifying the name, domicile, location and citizenship of the applicant; (b) stating the class of merchandise and the particular description of goods in the class to which the mark is appropriated; ‘ (c) annexing -a drawing of the trade mark and as many specimens as may be required by the commissioner of patents; (d) giving a description of the trade mark (only when needed to express colours not shown in the drawing); and (e) specifying the mode in which the mark is applied and affixed to goods; (/) stating the time during which the m rk has been used (1906. c. 2081, s. r).

The application must be accompanied by a fee of $10, and be supported by a sworn declaration verifying the ownership and the drawing and description and stating that no one else has a right to use the mark, nor one so like it as might be calculated to deceive, and that the mark is in use in commerce among the several states or with foreign countries or with Indian tribes (1005 c. 592, s. 2).

Where the applicant resides or is located in a foreign country he must also show that the mark is registered in the foreign country, or that application has been made to register it there. Registration on behalf of foreign registrants is not made until foreign registration is proved nor unless application for United States registration is

1 By the law of 1006 (s. 21) the commissioner of patents is 1 to establish classes of merchandise.

1 By the law 01 1006 (s. 21) the comr directed to establish classes of merchandise.

made within four months of the application abroad (1905, c. 592, ss. 2, 4).

The United States policy is to require registration of all trade marks unless they (a) consist of or comprise scandalous or immoral matter ; (b) consist of or comprise the flag or insignia of the United States, or of any state or municipality, or of any foreign nation ; (c) are identical with another known or registered trade mark owned and used by another and appropriated to merchandise of the same description, or so nearly resemble such other marks as to be likely to cause

confusion or mistake in the mind of the public or to deceive purchasers; (d) consist merely in the name of an individual, firm, corporation or association, unless it is written, printed, impressed or woven in a particular or distinctive manner, or is associated with a portrait of the individual ; (e) consist merely in words or devices descriptive of the goods with which they are used, or of the character or quality of such goods, or merely of a geographical name or term ; (/) contain the portrait of a living individual unless his consent is evidenced by an instrument in writing.

Old marks may be registered irrespective of the above rules, no proof that they have been actually and exclusively used as a trade mark of the applicant or his predecessors from whom he derived title in such commerce as aforesaid for ten years before the 20th of April 1905. Applications made in proper form with the prescribed fee are at once examined in the patent office and if in order are gazetted to give opportunity for " interference."

Decisions of the examiners on applications or oppositions are subject to appeal to the commissioner of patents, and from him to the court of appeals for the District of Columbia (ss. 8, 9). The general jurisdiction in trade mark cases is given to the Federal courts below the Supreme Court, which has power by certiorari to review the decisions of circuit courts of appeal upon such cases (ss. 17, 18). The maximum protection given by registration is twenty years. The protection given to marks already registered in a foreign country lapses when the mark ceases to be protected in the foreign country (s. r2). Certificates of registration are issued under the seal of the patent office.

Provision is made to prevent importation of merchandise which copies or simulates the name of any domestic manufacture, manu- facturer or trader, or of a manufacturer or trader located in a country affording like privileges to the United State*, or which copies or simulates the trade mark registered in the United States, or which bears names or marks calculated to create the belief that it is made in the United States, or in any country oˆher than the true country of origin. United States traders who seek protection can have their names and marks recorded and communicated to the customs department (s. 27). At any time during the six months prior to the expiry of the term of twenty years the registration may be renewed on the same terms and for a like period. The right to the use of any registered trade mark is assignable (with the goodwill of the business in which it is used)

by an instrument in writing; and provision is made for recording such instruments in the patent office (s. 10).

France. — In France (laws of the 23rd of June 1857, and the 3rd of March 1890) trade. marks are optional, but may be declared compulsory for certain specified articles by decrees in the form of administrative orders. The decrees regulating registration are of the 27th of February 1891 and the 17th of December 1892. The following are considered trade marks: names of a distinctive character, appellations, emblems, imprints, stamps, seals, vignettes, reliefs, letters, numbers, wrappers and every other sign serving to distinguish the products of a manufacture or the articles of a trade. A fixed fee of one franc is charged for entering the minute by registration (dep6t) of each mark, and making a copy thereof, exclusive of stamp and registration fees. By legislation of the 1st of August 1905 and the nth of July 1906 provision is made for marking certain classes of commodities, mainly food products, to prevent falsification and the sale of foreign products as French.

Germany. — Under the German trade mark law of the 12th of May 1894 any person whatsoever can acquire protection for a trade mark, and all foreigners in Germany are placed on an exactly equal footing with Germans in the eyes of the law, so long as they have a domicile (Niederlassung) within the empire, i.e. a place of business or a resi- dence which involves the payment of German taxes. The registration of a trade mark expires ipso facto after ten years from its date, but may be renewed for a similar period. Germany acceded to the international convention on the 1st of May 1903.

In the Netherlands (law of the 30th of September 1893) two distinct forms of registration are in force: (a) registration merely for the Netherlands; (b) international registration, available for the states of the international union.

The following other foreign trade mark laws may also be noted: Austria-Hungary, law of 1890 (published in Vienna on the 6th of January and in Budapest on the 6th of April 1890), and amending law of the 30th of July 1895, which enactment protects additions to trade marks. Denmark (law of the nth of April 1890, and an amending law of the 19th of December 1898, which enables traders to register words or figures, provided that these are not indicative of the origin, kind, use, quality or price of the goods). Japan (law of the 1st of July, and regulations of the 20th of July

1899). Russia (law

of the 26th of February [9th of March] 1896). Switzerland (law of the 26tb of September 1890).

Authorities. — Sebastian, Trade Marks (4th ed.,. London, 1899; in this work the American cases are fully dealt with) ; Kerly, Trade Marks (London, 3rd ed., 1908); Kerly and Underhay, Trade Marks Act 190$ (London, 1906); Cartmell's Digest (London, 1876-1892); Sebastian, Digest (London; cases down to 1879); Gray, Merchandise Marks Act (London, 1888); Safford, Merchandise Marks (London, 1893). The reports of the Departmental Committee of 1887, and of the Select Committees of the House of Commons appointed in 1887 and 1890 to consider the law with regard to merchandise marks and false marks, and the annual Reports of the Comptroller-General, throw great light on both the history and the practical working of the law. For American law, see Browne, Treatise on Trade Marks (Boston, 1873); Cox, American Trade Mark Cases (Cincinnati, 187 1); Manual of Trade Mark Cases (Boston, 1881); Greeley, Foreign Patents and Trade Marks (Washington, 1899); Paul, Law 0} Trade Marks (St. Paul, Minn., 1903) ; and the reports of the com- missioner of patents. As to foreign trade mark laws generally, see the following : British Pari. Papers; Reports relative to Legislation in Foreign Countries (1879; Cd. 2284, 2420); Reports from H.M.'s Representatives Abroad, on Trade Marks, Laws and Regulations (1900; Cd. 104); Summaries of Foreign and Colonial Laws as to Merchandise Marks (1900; Cd. 358, p. 850 seq.).

(A.W.R.; W.F.C.)

TRADE ORGANIZATION. The development of commercial organization which attended the growth of trade and industry during the 19th century assumed two distinct phases. In the first we see the creation of associations of persons engaged in trade and industry for the purpose of protecting their interests and of facilitating and fostering commercial relations. In the second, governments elaborate departmental organizations for the supervision of commerial matters, and utilize their con- sular services as means of commercial intelligence and influence.

The associations belonging to the first category comprise three classes: —

a. Those which are themselves engaged in trade, like ordinary joint-stock companies, or which result from the combination of firms or individuals in the same or connected trades, for the purpose of facilitating or restricting production, limiting competition, regulating prices, &c.

b. Those which, without engaging in trade, aim at providing facilities for the transaction of commercial or financial operations. They chiefly take the form of exchanges, bourses, public sale rooms, &c, such as the Baltic, Lloyd's, the Stock Exchange, the Corn and Coal Exchanges, the Commercial Sale Rooms.

c. Non-trading bodies, in the nature of public institutions, whose objects are to protect the interests of trade.

When, at the close of the 18th century and early in the 19th, the power of the old trade gilds and corporations of merchants had been broken, both governments and commercial men soon realized that the ancient societies would not follow the commercial evolution, and that new organizations must be created to meet new requirements. Two systems were evolved, which, British and from their prototypes, are known as the British French and the French systems. In the former, trade Systems, organizations were left to develop themselves in their own way, and in whatever direction they might think tit, without any official interference. In the latter, on the contrary, the government constituted itself the creator of trade organizations, which it incorporated into the administrative system of the country, and to which it gave an official status as an integral part of the machinery of the state. The former have grown chiefly into associations for the promotion and defence of commercial interests, whilst the latter have mainly become sources of commercial information and means of action at the disposal of the government. While organizations on the British system are, as regards the government, purely advisory bodies whose opinion might or might not be asked in connexion with commercial matters, and whose duties are limited to the services which they are in a position to render to their members and to commerce generally, organizations on the French system not only must be consulted, in certain specified cases, by the government, especially in connexion with the drafting of com- mercial

legislation and of regulations affecting trade, but they have also administrative duties to perform, such as the control of public commercial institutions, of testing, standardizing and

conditioning establishments, port and dock works, &c. The British system obtains in the United Kingdom and the British colonies, in the United States and in Belgium, while the French has been adopted in most European countries, and in Japan.

I.— Great Britain and Colonies A. — Commercial Associations. In the United Kingdom commercial associations arose with the growth of trade, without any assistance from the state and free from all government restriction or control. The first in point of date were the ” commercial societies ” which were formed, chiefly during the last quarter of the 18th century, in Birmingham, Exeter, Halifax, Leeds, Liverpool and Manchester, and which exercised a not unimportant influence upon commercial developments at the close of the 18th and in the early years of the 19th centuries. The modern associations which superseded them divided themselves into four classes, viz: —

a. Chambers of commerce and associations which aim at becoming representative of general commercial interests;

b. Associations or institutes which represent particular trades or branches of trades ;

c. Trade protection societies; which look after the interests of retail as well as wholesale traders, and undertake to supply them with information as to the standing and credit of firms, expose swindlers, collect debts, &c. ; and

d. Non-representative associations rendering general commercial services.

a. Chambers of Commerce and General Associations. — Most of the chambers of commerce in the United Kingdom were formed during the latter half of the 19th century, although a few were in existence much earlier. The oldest British chamber ie the jersey chamber, which dates from 1768. The Glasgow chamber was founded in 1783. Dublin followed in 1785, Edinburgh in 1786, Manchester in 1794, Belfast in 1796, Birmingham in 1813, Newcastle-upon-Tyne in 1818, Liverpool in 1851, Sheffield in 1857, &c. The London chamber was the last of the chambers of impor- tance to be established; it dates only from 1 881.

The London Chamber of Commerce, which has over 3000 members, is one of the most representative associations of its kind, and the organization adopted has been very effective in securing _. , . . this. The chamber has been divided into trade sections, chamber °" of which there are at present forty-four, and members specify the sections to which they desire to belong. Each section has a separate organization, and is presided over by a chairman elected by itself, who may be helped by an elected committee if found advisable. The general council of the chamber confirms the election of chairmen of sections, and no action can be taken by the chamber on the recommendation of a section without authoriza- tion of the council. The chamber has placed itself in connexion with a number of mercantile associations which, whilst preserving their separate organizations and their independence of action, have found it advantageous to work in conjunction with it, either for general or for particular purposes, and to have a voice in its council. The more important of these are the Institute of Bankers, the Institute of Chartered Accountants, the Society of Accountants and Auditors, the General Ship Owners' Society, the General Produce Brokers' Association, the Federation of Grocers' Associations of the United Kingdom, the West India Committee, the Corn Trade Association, the United Planters' Association of Southern India, &c.

Particular reference should also be made to the Liverpool chamber, which, as regards division into trade sections and co-operation with independent associations, works on similar lines _,. to those of the London chamber. The African trade i; verooo i section of the Liverpool chamber has been prominent chamber in connexion with African questions, and since its foundation in 1884 has been the leading voice in all matters relating to West Africa.

The Association of Chambers of Commerce of the United Kingdom, which was formed in i860, contributed much to give chambers of commerce as a whole a national importance. This association, like the chambers themselves, was of course f J? hrs purely voluntary, and at its foundation only sixteen ° fCo %!" e chambers decided to join it. The association is main- _ tained by an annual subscription from the constituent chambers. It has been instrumental in passing many useful acts of parliament, and in otherwise influencing legislation upon com- mercial topics. The general meetings, which are held annually in March, in London, and at which delegates are present from all parts of the country, have come to be considered as a kind of parlia- ment of

trade, and representatives of the Board of Trade, the general post office, and the foreign and colonial offices are generally in attendance. Special meetings take place in September, and aie held in provincial towns on the invitation of the local chamber.

The association has limited its work to the United Kingdom, and has not taken advantage of the commercial development of the colonies to afford colonial interests an opportunity of voicing their needs in the metropolis. To supply this need the London Chamber of Commerce has, from time to time, organized congresses of chambers of commerce of the empire. Some of these congresses have been held in the colonies, the first being at Montreal in 1903.

The home organization of chambers of commerce is supplemented

by a few British chambers which have been established in foreign

countries. These institutions are self-supporting, and not,

zT . as seems often to be thought, branches of, or subsidized

‘ m °? n or controlled by home chambers. The British Chamber Abroad. j c ommerce m Paris, which is the oldest of them, dates fromi873, and was originally established by British merchants in Paris for the defence of their own trade interests. Its scope soon extended, however, and it admitted to ‘membership British firms trading with France although not resident in France, and in course of time became representative of general British commercial interests in the French markets. Other British chambers are to be found inGenoa, Alexan- dria, Barcelona, Constantinople and St Petersburg. In Brussels an Anglo-American chamber jointly represents British and American interests. Several countries are represented in London by chambers of commerce, whi’.e the American Chamber (Liverpool), „ . the Anglo-Belgian, the Anglo-Portuguese, the Aus-

™ re *h tralasian, the Italian, the Norwegian and the Swedish

Chambers In chambers are members of the Association of Chambers England. of Commerce of the United Kingdom. The

United States are represented in England by the American Chamber of Commerce in Liverpool.

Commercial organization in the colonies is very much on the same footing as it is in the United Kingdom. The most representative associations are the chambers of commerce, whose constitution and functions are similar to those of the

Colonial Chambers.

British chambers. In Canada the chambers, which are also sometimes called Boards of Trade, after the American custom, number over sixty, the most important being the Montreal and Toronto Boards of Trade and the Quebec Chamber of Commerce. The Canadian chambers have no association, but hold periodical conferences. There is, in addition, the Canadian Manufacturers' Association, with headquarters in Toronto and branches in all the provinces, which incorporates all the associations of manufacturers in the Dominion. The Australian chambers of commerce, which number some thirty, have joined into an association called the General Council of the Chambers of Commerce of the Commonwealth of Australia. In New Zealand, South Africa, India and many British colonies there are chambers of commerce in all the more important towns.

b. Associations Representing Particular Trades. — Associations representative of particular trades are almost innumerable. The London General Shipowners' Society, the Liverpool Shipowners' Association, the North of England Shipowners' and Steamship Owners' Associations may be mentioned as representative. The chambers of shipping and shipowners' associations joined forces in 1878 in order to establish the Chamber of Shipping of the United Kingdom, which does for them what the Association of Chambers of Commerce does for chambers of commerce. The Iron and Steel Institute affords a means of communication between members of the iron and steel trades, while the British Iron Trade Association is one of the most powerful. The nature of other associations is sufficiently indicated by their titles. In addition there are the Cotton Association, the Drapers' Chamber of Trade, the Fish Trade Association, the Sugar Refiners' Committee, various tea planters' associations, the Oil Seed Association, the Petroleum Defence Committee, the Mansion House Association on Railway and Canal Traffic, &c.

c. Trade Protection Societies. — These seem to be, on the whole,

more ancient bodies than chambers of commerce. In the early part of the 19th century they were already strongly organized, especially in the West Riding of Yorkshire. Outside of that district the Dublin Society was the most important. They number more than 100 throughout the United Kingdom.

The Manchester Guardian Society, which dates from 1826, occupies a position of special prominence in the Midlands, and may be taken as the model of such associations. Its objects are — the making of private inquiries as to the respectability and credit of traders, the detection and exposure of swindlers; the collection of debts; the winding-up of insolvent estates; the issue of notices of bills of sale, judgments, bankruptcies, &c; and generally the im- provement of laws and regulations affecting trade. The society has over 6000 members, and its usefulness may be gauged by the fact that it answers an average of 40,000 credit inquiries every year.

Trade protection societies formed themselves, as early as 1848, into an association, which was at first an association of secretaries, but in 1865 was transformed into an association of societies. The association issues a quarterly journal called the Trade Protection Journal.

B. — State Departmental Organizations. Although the British government allowed commercial organi- zations within its jurisdiction to grow independently of official

control, it does not follow that it took no interest in the protec- tion and promotion of British trade and the dissemination of commercial intelligence. As long ago as the reign of Charles II. the body which is now the British equivalent of what is known in most countries as the ministry of commerce, viz. the board of trade, was established. The commercial jurisdiction of the Board of Trade does not extend beyond the limits of the United Kingdom, but the Foreign Office, through the negotiation of commercial treaties and by means of the consular body, came into touch with international trade. With the develop- ment of the colonies, the colonial and India offices also found themselves called upon to act, to a certain extent, as guardians of commercial rights and channels for the dissemination of commercial intelligence. But when competition began to displace British goods from foreign markets, and when the British trader noticed the efforts which were being made by foreign governments for the promotion of trade, he came to the

conclusion that the British government was not doing anything for him.

Complaints were especially loud against the consuls, who were accused of systematically disregarding commercial interests, whilst their American, German, French and Belgian colleagues c . did not consider it below their dignity to take advantage s»~tLf r of their position, in order to promote the trade of the country they represented. British Consular Reports were also unfavourably compared with those issued by foreign consuls, notably the American. The result was that, in 1886, instructions were issued to the consular service which, for the completeness and fairness with which they deal with the subject, have frequently been quoted as models which might advantageously be followed (see Parlia- mentary Paper, Commercial, No. 16, 1886). The preparation of con- sular reports, however, continued to be most unfavourably criticised, and frequent instructions were issued by the foreign office in regard to them. The whole question was raised again in 1896, when, as the result of lengthy communications between the Foreign Office on the one hand, and the Association of Chambers of Commerce and the London chamber on the other, fresh instructions were sent to British consuls, reiterating the instructions of 1886.

The consular service has of late years been supplemented by the appointment of commercial attaches.

The pressure exercised by the chambers of commerce upon the government led to the appointment in 1897 of a departmental committee on the dissemination of commercial intelli- gence, which was charged with considering means of Commercial more adequately supplying traders with commercial “““wence information, of improving consular and colonial reports, ihe^toard ot and with reporting on the advisability of appointing j- ra(/ ew commercial agents to the colonies and establishing a com- mercial intelligence office. The chief result of the committee’s recom- mendations was the establishment of the commercial intelligence branch of the Board of Trade. It publishes the Board of Trade Journal weekly. Attached to the branch is an advisory committee, composed of representatives of the various government departments and of the Association of Chambers of Commerce.

The scope of the commercial intelligence branch was further increased, and its means of action strengthened, by the transfer

of the Imperial Institute to the Board of Trade, which was effected in 1902 by the passing of a private act of parliament.

The self-governing colonies are represented in London by agents-general (g.v.), while the commercial interests of the crown colonies are in the hands of the crown agents for the colonies.

II. — United States of America A. — Commercial Associations. American trade organizations have been developed mainly on the lines of the British system. Of the associations which come within the scope of this article, the most important are the chambers of commerce, which in certain cases are called boards of trade. Theoretically there is a distinction between the two, chambers of commerce being entrusted with the protection of general commercial interests, especially in connexion with foreign trade, whilst boards of trade look after local commercial questions. But in practice the difference is of no importance, as chambers of commerce take cognisance of local as well as international trade matters, and the boards of trade in no way limit the sphere of their activity to purely American questions.

The oldest American commercial organization is the New York Chamber of Commerce, which was founded in 1768, and incorporated by royal charter in 1770. In the words of its charter, its object was " to carry into execution, encourage and promote by just and lawful ways and means such measures as will tend to promote and

extend just and lawful commerce." It was the prototype of all the other chambers of commerce and boards of trade which have since been established in the United States, and which are said to exceed iooo in number. American trade organizations are associated in a National Board of Trade, which corresponds to the Association of Chambers ot Commerce of the United Kingdom. The objects of this institution are to secure unity and harmony of action in reference to commercial questions, and to obtain, through its representative character, more satisfactory consideration of the matters which it brings under the notice either of the Federal govern- ment or of the local state administrations. The expenses of the National Board of Trade are defrayed out of a fund formed by the subscriptions of the various

associations belonging to it. The United States has a number of chambers of commerce established in foreign countries. The first institution of this kind was started so long ago as 1801, when the American Chamber of Commerce in Liverpool was established. This chamber is the only one repre- senting American commercial interests in the United Kingdom, there being no association of this nature in London. The American Chamber of Commerce in Paris is one cf the most active, important and representative foreign associations on the continent of Europe. In some places where neither the American nor the British element is strong enough to maintain separate associations (notably in Brussels), they have joined hands to support an Anglo-American Chamber of Commerce, which is found to work fairly satisfactorily The American commercial museums, although of recent founda- tion, have attracted much notice owing to the practical and business-like manner in which they are conducted, and are considered. to be among the best equipped institutions of this nature. Those in Philadelphia and at San Francisco are the best known. The Philadelphia museum, which came first and is better known, was established by an ordinance of the municipality in 1894, an d is supported by subscriptions and by municipal subsidies, administered by a board of trustees, who are appointed for life and serve without remuneration. The work of the museum is supervised by an advisory board, composed of representatives of the principal commercial organizations in the United States. Its objects are to assist American manufacturers and merchants in securing wider foreign markets for their products, to aid them in forming connexions abroad, and to bring foreign buyers in touch with them. One of the chief ways in which this is done is by means of an index file of foreign customers supplied to American manufacturers, and vice versa. In addition to the regular service to members, the museum also maintains abroad, in various cities, index files covering some sixty American trades or trade divisions, containing the names of American manufacturers of standing, with full particulars of their various lines of manufacture. These files are generally entrusted to chambers of commerce, or similar commercial institutions, and are placed gratuitously at the disposal of foreign manufacturers and merchants. The Philadelphia museum has also a most valuable library and a museum of samples.

B. — Stale Departmental Organization.

The American state organization for dealing with commercial matters lacks the theoretical completeness of the organization of

most European states, but is nevertheless found to give satisfaction. Official control is exercised through various bureaus placed, for the most part, under the treasury department. The most important of these are: the interstate commerce commission, which deals with matters affecting the inland trade; the industrial commission, which looks chiefly after manufacturing; and the fishery bureau. Foreign commercial matters come within the cognisance of the bureau of foreign commerce, a section of the state department which also controls the consular body, and sees to the publication of their reports and to the dissemination of foreign commercial intelligence. The state department corresponds to the British foreign office.

The Pan-American Union, until 1910 called the Bureau of American Republics, was established in 1889, as a result of the Pan-American Conference called together in that year by the late James G. Blaine, secretary of state at that time. This bureau, which had its office in Washington, is supported by a contribution from all the republics of North, Central and South America, which is fixed at the rate of 1000 dollars a year per million inhabitants. Its object is the dissemination of trustworthy commercial information concerning the republics of the American continent, and in pursu- ance of this object it has issued a large variety of publications.

The American consular service has been frequently pointed out as a model to be followed in connexion with commercial matters. Consular America, contrary to the European practice, has no Service consuls de carriere. Her consular representatives are

appointed for a period of, as a rule, four years, and are selected in preference from commercial circles. Their work, as compared with that of British consuls, is rather limited, and they have nothing to monopolize their lime like the shipping interests with which the British consular body is entrusted in most countries. Since 1S9S the bureau of foreign commerce issues consular reports

daily, as fast as they are received, and circulates them in advance sheets, printed on one side of the paper only, like printers' proofs. They are afterwards republished in permanent form.

The American consular body, which numbers some 400 members, and is exclusively composed of American citizens, is distributed according to the commercial importance of towns.

III. — France A. — Commercial Associations. The French government was the- first to elaborate a regular system of trade organizations, which it endeavoured to make as complete as possible. This system comprises: —

a. Chambers of commerce;

b. Consultative chambers of arts and manufactures; and

c. Syndical chambers of trade and industry.

a. Chambers of Commerce. — Chambers of commerce owe their origin to the city of Marseilles, where, in 1599, the town council, which had hitherto looked after the commercial interests Oriehi

of the city, found it no longer possible to combine com- ‘

mercial with municipal functions, and established an association which it called the ” Chamber of Commerce ” to take up the commercial part of its duties. This seems to be the first time that the title was used. The new chamber soon became a most important body, and in 1650, during the minority of Louis XIV., leltres patentes were granted to it. It settled the law merchant and the customs of the port, was entrusted with the appointment of consuls and the control of French consulates in the Levant, fitted out expeditions against corsairs, owned fleets, sent embassies to the Barbaresque countries, organized commercial missions, &c. Its ordinary budget, art one time, amounted to over one million livres. Louis XIV. conceived the idea of a system of organizations which, whilst not being allowed to become so dangerously power- ful as that of Marseilles, would nevertheless be useful in other towns, and in 1700 he caused an arrete to be published, ordering the creation of chambers of commerce, which were entrusted with the nomination of deputies to the Royal Council of Commerce which had just been created in Paris. Chambers were consequently established in Lyons, Rouen, Toulouse, Montpellier, Bordeaux, La Rochelle, Lille, Bayonne, Amiens, &c. These bodies, however, did not exercise much influence under the monarchy. Including the Marseilles chamber, they were suppressedˆ with all trade gilds and other trade associations, in 1789. Napoleon re-established the chambers by decree of the 24th of December 1802, and endowed them with a constitution similar, in essential particulars, to the one they have at present, which has served as a model for chambers of commerce on the Continent, but he submitted them to a uni- form and narrow

administrative jurisdiction which practically deprived them of all initiative.

They are now regulated by the law of the 9th of April 1898, which codified, altered and completed previous legislation on the subject. Under this law, chambers of commerce can _, ... only be established by a decree countersigned by the , minister of commerce, upon the advice of the municipal council of the place where the chamber is to be, of the general council of the department, and of the existing chambers of com- merce of the district. The members of chambers of commerce used to be elected by the " Notables Commercants," who were a body of commercial electors selected by the prefects in accordance with the provisions of the Code of Commerce. They were abolished by law in 1 87 1, but those who were then entitled to the designation still continue to use it, which explains the words " Notable Com- mercant," so puzzling to foreigners in French commercial directories and on French business cards. At present, commercial houses pay- ing patente — which is a special tax upon people engaged in trade — elect the members of the chamber, the number of whom is fixed for each chamber by the minister of commerce.

Their functions, which are consultative and administrative, arc set out in part ii. of the law of 1898. The government is bound to take their opinion regarding the regulation of com- p uoc n oas mercial usages, the establishment of public institutions of a commercial or financial nature, and of tribunals of commerce, the improvement of transport and communications, the applica- tion of laws of a local character, the sale price of prison-made goods and the tariff for prison labour, and local public works, and loans or taxation in connexion therewith. On the other hand, they are allowed to submit observations to the government, with- out being asked, on proposed changes in the commercial or economic legislation of the country; on customs tariffs and regulations; on railway, canal and river rates; and on transport regulations. As regards their administrative functions, they may be authorized to establish and administer such institutions as bonded warehouses, public sale-rooms, fire-arm testing establishments, conditioning rooms for wool, silk, textiles, paper, &c, commercial, professional, or technical schools and museums, &c. They may be granted concessions for public works, and may undertake the carrying out of public services, especially in regard to the ports, docks, canals and navigable rivers in their district, and be authorized to issue loans for the purpose.

Previous to 1898 it was illegal for chambers of commerce to hold joint meetings for the discussion of matters of public interest, and they were not even allowed to correspond or consult in any way, except through the medium of the minister of commerce. The new law relaxed to a certain extent this prohibition, by authorizing direct correspondence and permitting chambers in a district to meet for the joint consideration of questions affecting their district, but for no other purpose. Such a thing as an association of chambers of commerce is still illegal in France.

When, in 1873, British merchants in Paris started a British chamber of commerce in the French capital, the French govern- Freach ment looked rather askance at the new venture, and M.

Chambers of Leon Say, when minister of commerce, even threatened Commerce ‘ lt w ‘ tn forcible dissolution unless the title ” Chamber Abroad. °f Commerce ” was dropped. This demand was not ultimately pressed, and the services rendered by the British chamber soon opened the eyes of the French government to the advantages which they might derive from the formation of similar institutions to represent French commercial interests abroad. In. 1883 the minister of commerce started the organization of such chambers, which endeavoured to combine to a certain extent the French and the British systems.

Foreign commercial interests are represented in Paris by seven foreign chambers of commerce, of which the British Chamber is the oldest. The others are the American, Austro- f* 1? .Hungarian, Belgian, Italian, Spanish and Russian ComlnerJe chambers. In 1896 these chambers formed them- mPari selves into an Association of Foreign Chambers of

Commerce, but the French government gave it to be understood that, as they did not allow associations of French chambers, they could not treat foreign bodies more favourably, and the association had to be dissolved.

b. Consultative Chambers of Arts and Manufactures.— These institutions, organized somewhat after the model of chambers of

commerce, represent manufacturing and industrial Coastlttf interests. They were established by Napoleon I. in * 1803, and

formed part of the complete system of

commercial organizations which he intended to give France. They are now regulated by decrees of 1852 and 1863, and are composed of twelve members elected for six years by merchants and manu- facturers inscribed upon an electoral list specially drawn up by the prefects. These chambers, of which there are some fifty in existence, are placed under the control of the minister of commerce, but instead of being kept out of the palentes, like chambers of commerce, they are supported by the municipality of the town where they are situated, which has also to provide them with offices rent free, and with clerical assistance. In addition to giving _ . advice in connexion with manufacturing and industrial

functions. matterSj ^ey have to look after and report upon im- provements in manufactures and machinery, new industrial pro- cesses, &c. They are especially useful in the preparation of local and international exhibitions. They are also entrusted with the nomination of the Consultative Committee of Arts and Manufactures, a body whose functions are to advise the ministers of commerce and finance, as well as those of the interior and of public works, as regards the regulation of dangerous trades and industries, patents and trade marks legislation, and the interpretation of customs regulations.

c. Syndical Chambers of Trade and Industry. — By the side of the official trade organizations other associations have grown up, which, although regulated by law, are in the nature of voluntary and self-supporting bodies, viz. the syndical chambers of trade and industry. The repeal in 1884 of the law of 1791, which pro- hibited the formation of trade or professional association, was the signal for the formation of those chambers, which soon acquired great influence. A few syndical chambers existed before that date, the oldest, the Chamber of Master Builders, dating back as far as 1809, but they were only tolerated, and their existence, being illegal, was most precarious.

The syndical chambers, which are divided into chambers of employers and chambers of employed, are the official organs and C a ilt representatives of the trade and professional syndicates tloa ”' authorized by the law of the 31st of March 1884, which was the work of M. Waldeck-Rousseau. Each syndicate has its separate chamber. They may be established without government authorization, but a copy of their rules and a list of their officials

must be sent to the prefect. Membership is strictly limited to persons of French nationality. The only way in which the government can dissolve them is by application to the courts of justice for an order of dissolution on the ground of infringement of the provisions of the law. In Paris, most of the syndical chambers have formed an association called the Union Nationale du Commerce et de l'lndustrie — Alliance des Chambres Syndicales. Another association, intended to take up the defence of the interests and rights of syndical chambers, has been formed under the title of Syndicat du Commerce et de l'lndustrie — Syndicat des Chambres Syndicales. The syndical chambers arc kept up by the subscrip- tions of their members, and have the right to hold real property, as have also the associations of chambers, which are kept up by subscriptions from the constituent chambers.

According to the law which authorized their formation, the objects of the syndical chambers are exclusively " the study and defence of economic, industrial, commercial and „ .. agricultural interests," and for this purpose they have " ons ' complete freedom of intercommunication and can hold congresses. They are authorized to establish for their members mutual benefit societies and pension and relief funds, to open employment agencies; to give legal advice to, and in certain cases to bring actions on behalf of their members, and to organize the settlement of disputes by arbitration. They take part in the election of judges of the tri- bunals of commerce and of the Conseils de Prud'hommes.

B. — -State Departmental Organization.

The state commercial departments and offices are chiefly centred round the ministry of commerce, to which is assigned the commercial part of the duties fulfilled in England by the board of trade. A ministry of commerce existed commerce. for short periods in 181 1 and in 1828, but it was ultimately suppressed in 1829, and from that date until 1886, when the department received its present form and separate existence, commerce was only represented in the French govern- ment by a subsidiary bureau attached sometimes to one ministry, sometimes to another. The ministry is divided into three main bureaus— the first entrusted with all matters connected with the home trade and industry, the second with foreign and colonial relations, and the third with the compilation of statistics.

Attached to the ministry of Commerce is a body called the Conseil Superieur du Commerce et de l'lndustrie, which acts as an advisory council to the minister. Its origin goes back to the council of commerce established by Louis XIV., but it is now regu- lated by a decree of 1882.

The Office National du Commerce Exterieur was established by a law of the 4th of March 1898, and is carried on jointly by the ministry of commerce and the chamber of commerce of Paris, the latter having provided it with an in- nni?f spallation at a cost of over 1,200,000 francs. The omxfor office, which has been founded for the promotion of Trad 11 French trade with foreign countries and the dis- e '

semination of commercial intelligence, fulfils duties, similar to those of the commercial intelligence branch of the board of trade. It also publishes the weekly Moniteur officiel du cbmmerce.

The Office Colonial, whose duties are especially to furnish in- formation concerning the French colonies, to promote emigration thither, and to foster a demand in France for the rtwfc ˆ produce of her colonies, was established by a decree J" , , of the 14th of March 1899. It is entrusted, in addition, w"*""- with a permanent exhibition of colonial produce and a museum of samples of goods supplied by or required in the colonies. The office is also in charge of a colonial garden at Vincennes, where experiments are made for the acclimatization of colonial plants and produce in France, and the cultivation of French produce in the colonies. The office publishes a monthly bulletin of miscel- laneous colonial information, and issues yearly commercial and other reports dealing with the colonies. It is a dependency of the ministry of the colonies.

French consuls are instructed to transmit to their government all information which they may consider useful for the prosperity of French trade. It is also their duty to spread, in the country where they reside, a knowledge of such French commercial and financial matters as they may consider most useful in the interests of their own country. The close relations which they are .

recommended to cultivate with the French commercial asuar community within their jurisdiction through the ery _ e ' local French chamber of commerce and the councillors of foreign trade are intended to enable them to keep in better touch with

commercial questions. They have had, however, to be frequently reminded of their commercial duties, and the French chambers of commerce have criticized them almost as much as the British chambers have British consuls. The most important instructions issued to consuls were contained in circulars from the minister for foreign affairs dated the 15th of March and the 24th of Apiii 1883. French consuls have to make a return to their government every fortnight — every month if the district is. not of great commer cial importance — showing, upon forms specially provided, the nature, quantity, origin or destination, prices wholesale and retail, and chief trade marks of the goods imported into and exported from the district, the results of puhlic sales of produce-, the conditions of transport, contemplated public works and tenders advertised, state of the labour market, artistic enterprises, commercial failures and rumours concerning important local firms, effect of foreign competition, imitation of French trade marks, &c. ‘ These returns are mostly of a confidential nature, and are not intended for publica- tion, but whenever the minister considers it advisable he causes information to be conveyed through the chambers of commerce, or other channels, to tho parties chiefly interested. . The ordinary- consular reports are published in weekly instalments in the Moni- teur officiel du commerce.

IV. Germany

A. — Commercial Associations. German trade organizations are of three kinds, viz. : —

a . Official organizations established by law, and called Handels-kammern, or chamber of commerce;

b. Semi-official associations; and

c. Voluntary or ” free ” associations.

a. Chambers of Commerce. — Contrary to the idea prevalent in England, official trade organizations in Germany are in a somewhat chaotic state. They have been established under more or less different conditions and systems in each state of the empire, and in certain districts still bear the imprint of foreign origin. They are under the control of the local state governments

and lack the homogeneity and unity of direction of the French official system.

Before proceeding to a general examination of the German regime, special mention must be made of the chambers of com- „ . merce of the old Hanseatic Confederacy which stand

c?" S nlza- a P art > an d whose duties, as well as constitution, differ tlon* ‘ ˆ rom those of trade organizations in the rest of Germany. The chambers of commerce in Hamburg, Bremen and Ltibeck are not only the successors of, but (con- trary to what happened in Germany as well as in other countries) have been evolved out of the old corporations which looked after the interests of the Hans traders in the olden days, and which, in the case of the Hamburg " Commerz- Deputation," tor instance, dated as far back as 1665.

The Hamburg Chamber of Commerce, whose present constitution dates from i860, is composed of twenty-four members elected for six years by the ancient " Versammlung eines ehrbaren Kaufmannes," that is to say, the merchants and commercial men whose names appear on the register of the " Honest Merchants " of the city. Its income is chiefly derived from special taxation, to which are added the proceeds of the sale of contract and transfer stamps, and also the amount paid every year for the re-registration of each " Honest Merchant." This latter source of income amounts to about 70,000 marks per annum. The chamber has to submit its accounts for approval to the Senate of the Republic.

In addition to the general duties of chambers of commerce in connexion with trade matters, the Hamburg chamber—the same may also be said of the other Hanseatic chambers — fulfils the combined functions of a chamber of shipping and of a port and docks board. It has the right of proposing judges and of nominating experts attached to the courts. The exchanges and public sale rooms of the city are under its control, and it publishes the official quotations, as well as a weekly price list of goods and pro- duce at the port of Hamburg. It is entitled to elect members to the " Biirgerschaft " or lower house of representatives, who are especially competent to deal with trade and shipping questions, customs duties and emigration. The chamber must be consulted by the " Biirgerschaft " with reference to all proposals affecting trade and navigation.

In Bremen the chamber is composed of twenty-four members elected by the ” Ausschuss des Kaufmanns-Konvents, ” which com- prises all the important commercial houses of the city. Two members go out every year, and no one can remain a member for more than eighteen years. The Bremen chamber is intimately con- nected with the Senate of the Republic, a standing committee of both being in existence to settle questions affecting trade and navigation.

The Liibeck chamber is composed of twenty members elected for six years by the associations representing the wholesale and retail trades. The president must be approved by the senate, and is sworn in as a state official. He holds office for two years, and is not paid for his services, but when he goes out of office is pre- sented with a sum of money subscribed by the townspeople. The Liibeck chamber is probably the wealthiest organization of its kind in Germany, and is entrusted with the administration of the property of the old corporation of the ” Vorstand der Kaufmann- schaft, ” which is very important. The senate must consult it not only in trade and navigation matters, but also with reference to all contracts entered into on behalf of the state.

Chambers of commerce in other parts of the German Empire are not so important, nor are their duties so varied, as in the Hanseatic rt. K*. 4 towns. The oldest ones were established by Napoleon Cbimew in l8 ° 2 in Cologne, Crefeld, Aachen, Stolberg and other towns which were then under the control of France, and they were submitted to the legislation which regu- lated the chambers organized in France at the same time. The model set up by the French was more or less closely followed in the subsequent establishment of institutions of this nature in other German states. The Berlin chamber was only constituted on the 1st of April 1902. A trade corporation called the ” Aelteste der Kaufmannschaft ” previously fulfilled, to a certain extent, the duties of a chamber of commerce. The new chamber rests on a broader basis than the old corporation, which, however, remains intact, though the sphere of its action has been restricted.

Broadly speaking, the German chambers are elected by the registered tradespeople and the merchants. Throughout the whole

of Germany chambers are under the strict supervision of the state minister of commerce, and cannot be established except with his permission. He fixes the number of members as well as the amount of the state allocation to the chamber. In Prussia and Bavaria the government is entitled to dissolve chambers whenever it considers it advisable to do so, and there is always a government commissioner in attendance at all meetings. In most cases the local government allows a fixed sum for the expenses of chambers of commerce, and if this amount is exceeded the electors who are on the commercial register have to make good the excess ■ by the striking of a special rate. In some states, e.g. Brunswick, Wiirttemberg and Baden, the electors cannot be called upon to pay for deficiencies more than an amount fixed by law. In Bavaria chambers get a subvention from the district and central funds._

The duties and powers of the German chambers are practically the same as those of the French chambers.

The German government did not, like the French, interfere with the liberty of association of chambers of commerce, and as a result German chambers have united, together with other trade corporations, in an association called the ” Deutsche Handelstag,” founded in 1861, and carried on in its present form since 1886.

The German government is understood to be opposed to the forma- tion of German chambers of commerce abroad, and as a German matter of fact there are no German chambers in Europe Chambers outside of Germany. A few have been established Abroad and in South America, but they are purely voluntary Foreign associations. No foreign chambers of commerce exist Chambers In in Germany. Germany.

b. Semi-Official Corporations. — Besides the chambers of commerce, there exist, chiefly in Prussia, various old-established and quasi-official corporations, whose views receive as careful consideration from the government as do those of chambers of commerce. The Berliner Aelteste der Kaufmannschaft is one of the most important of these corporations, but the Gewerbekammer of Memel, the Kaufmannische Verein of Breslau, the Vorsteher Amt der Kaufmannschaft of Koenigsberg also deserve mention. Others exist in Elbing, Stettin, Danzig, Tilsit and Magdeburg. They originated for the most part in ancient gilds or associations of

commercial firms, and were organized in their present form between 1820 and 1825.

c. Voluntary Associations. — -Germany possesses also a large number of influential commercial associations of a voluntary character called the ” Freie Vereine,” which, especially in recent years, have greatly contributed to the commercial development of the empire.

B. — State Departmental Organization. The German Empire has no ministry of commerce. As in the United States, commercial matters form only a department of the ministry of state. Most of the states of the empire have, how- ever, their own ministries of commerce, the oldest being the Prussian ministry of commerce and industry, which dates from

1848. ...

In Prussia, the minister of commerce is advised by the Volks- wirthschaftsrath, or council of national economy, an official body constituted in 1880 by the Emperor William I. The _ functions of this council, which assembles periodic- c” u” r ally under the presidency of the minister of commerce, ju’tf ? are also similar to those fulfilled in France by the Jˆ g” a Conseil Superieur du Commerce et de l’lndustrie. ‘

The German government has taken steps to facilitate the dis- semination of commercial intelligence by the establishment of commercial museums, which are variously called „ , .

” Handelsmuseen, ” ” Ausf uhrmusterlager ” or ” Ex-ˆ ™”™” portmusterlager. ” The first of these, which are on the _ model of the Vienna Handelsmuseum, was opened in Berlin in 1883. Others followed in Munich, Karlsruhe, Frankfort, Cologne, Dresden, Leipzig, Weimar, &c. They perform, to a certain extent, much the same functions as those performed in England by the com- mercial intelligence branch of the board of trade.

A perusal of the instructions given to German consuls with regard to commercial matters shows that the German consular body is in this respect very much in the same position as – the British consular body. If German consuls as a service”’ whole have been especially active and successful in promoting German commercial interests, it is not on account of the nature of the instructions received from their government, these instructions

being to all intents and purposes similar to those issued to British consuls, but because particular care was taken to select consuls from a class of men imbued with the desire of increasing the greatness of their country by the promotion of German trade.

Of distinctly commercial attaches, like those of Great Britain and Russia, Germany has none; but in addition to the consular body she is represented in foreign countries by five attaches A] , r i ca i tlira i or experts, whose duties are to study the movements °f Katies, agricultural produce, and interest themselves in agri- cultural matters generally. They cover Great Britain, France; Russia, the Danube district and the United States.

V. — Belgium

A. — Commercial Associations.

The important place which Belgium has taken in international trade has directed much attention to her commercial organization, which comes nearer to the British model than that of any other European country. Belgian chambers of commerce were on the French system until 1875, when all official ties between them and the government were broken, and full liberty was given to com- mercial associations to establish and govern themselves in their own way. The Belgian chambers have now no administrative functions of any kind, but the Belgian government never fails to consult them in matters likely to interest the commercial com- munity. The most important chambers are those of Antwerp, Brussels, Ghent, Liege, Charleroi, Verviers and Namur. Mention should also be made of the federations of industrial and com- mercial associations at Antwerp and at Brussels, and of the syndical union of Brussels. In some places there are Liberal and Conservative chambers of commerce.

In addition to institutions representative of the general interests of commerce and industry, the principal trades have also in the larger cities separate associations or syndicates. There are a large number of associations for the promotion of colonial trade, which have grown up since the establishment of the Congo Free State. A number of Belgian chambers of commerce also exisjt abroad, the first of which was established in New York in 1867.

B. — State Departmental Organization. The Belgian ministry of commerce, under whose control com- mercial matters are placed, dates only from 1895, previous to which time the department of commerce at the ministry for foreign affairs fulfilled the same functions. The ministry has established in Brussels a Commercial Museum, similar to those of Germany and Austria, to centralize commercial intelligence and facilitate its dissemination.

VI. — Othek Countries Austria-Hungary. — The control exercised by the government over commercial organizations in Austria and in Hungary is very close. The only institutions of this kind of any importance within the dual monarchy are the chambers of commerce. They are official bodies, regulated by the law of the 29th of June 1868, which is, as regards the functions of chambers, almost similar to the French law. But the Austrian chambers, in certain cases, have the right to elect members of parliament, which right depends upon taxation. Within the Trieste district one- third of the members of chambers of commerce may be foreigners.

Austria and Hungary have each a ministry of commerce, the former since 1853 and the latter since 1867, whose jurisdiction is strictly confined to internal trade matters in each country. Whenever important questions arise affecting common interests the Gemeinsame Zoll-Conferenz, or Common Customs Conference, is summoned. This conference is made up of representatives of the various ministries of both countries. Matters arising out of commercial relations with foreign countries are under the control of the commercial department of the imperial foreign office.

The Vienna commercial museum was the prototype of similar institutions. It was established in 1875, as a consequence of the Vienna International Exhibition of 1873, and was followed shortly afterwards by the establishment of a similar one in Budapest.

Italy. — The chambers of commerce and arts, which are regulated by the law of 1862, are official bodies. They are instituted, and may be dissolved, by royal decree, and their functions are almost similar to those performed by the French chambers. They are, however, at liberty to unite for the consideration of commercial and industrial questions of common interest, and are entitled to own property and to levy taxes for their maintenance.

An advisory council is attached to the ministry of commerce,

which dates from 1878. This council is called upon to give an opinion with reference to all matters connected with trade arid industry. There are also two commercial museums, one in Rome and one in Milan.

Spain. — Spanish chambers of commerce were organized by a royal decree of 1886, which places them under the control of the Ministro de Fomento. They are self-supporting bodies with unlimited membership, but have also an official standing. In order to belong to them one must be of Spanish nationality, be engaged in trade, have paid direct taxes to the state for at least five years for the business in connexion with which membership of the chamber is sought, and pay annually the amount of the subscription pro- vided by the regulations. The government must consult chambers of commerce upon treaties of commerce and navigation, tariff changes, the creation of commercial exchanges and the organization of commercial education. Owing to the peculiarity of their con- stitution the Spanish chambers are much more representative of the feelings of the commercial community, and much less under the strict control of the government, than similar institutions in other continental countries. Spain has no ministry of commerce proper, the duties of this office being performed by the commercial sub-department of the Ministro de Fomento, which dates from

1847.

Portugal. — In Portugal the organizations corresponding to chambers of commerce, which are called " commercial associations, " are voluntary associations kept up by the subscriptions of their members. The associations at Lisbon and Oporto are the only ones of importance.

Russia. — Attached to the department of trade and manufactures of the ministry of Finance, which in Russia does duty for the ministry of commerce, there is an official council of trade and manufactures which sits in St Petersburg, and is presided over by a representative of the ministry. A similar council is also in existence at Moscow. In addition to these there are six local bodies, called the " local committees of trade and manufactures, " entrusted with the care of commercial interests in Archangel, Odessa, Rostov-on-the-Don, Tver, Tikhvin and Ivanovo-Voznesensk. At Warsaw there is a " committee of manufactures. " The committees are purely consultative bodies.

Closer to what we know as chambers of commerce are the institutions called ” exchange committees. ” They are voluntary associations, chosen by a council elected for the purpose by the commercial community; they generally consist of twelve members elected for five years, and the president is appointed by the minister of finance. Two important commercial societies, although un- official, are recognized and frequently consulted by the govern- ment, viz. the Society for the Encouragement of Russian Trade and Industry, of St Petersburg, and the Society for the Encouragement of Navigation, of Moscow.

The Russian government is represented abroad by commercial attaches, who are known as ” agents of the Russian ministry of finance. ” The duties of these attaches are almost similar to those of the British commercial attaches, but they are entrusted with the promotion of Russian financial as well as commercial interests.

Japan. — Commercial matters in Japan come within the cognizance of the minister of state for agriculture and commerce. The chief commercial associations are the chambers of commerce, which are under the direct control of the minister. They are official bodies, with a constitution somewhat resembling that of the French chambers. The members must be Japanese subjects.

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TRADE UNIONS, combinations for regulating the relations between workmen and masters, workmen and workmen, or masters and masters, or for imposing restrictive conditions on the conduct of any industry or business.

I.— The United Kingdom By the English common law such

combinations were, with certain unimportant exceptions, regarded as illegal. They were considered to be contrary to public policy, and were History of treated as conspiracies in restraint of trade. Those British who were concerned in them were liable to be Aetf^atfon. criminally prosecuted by indictment or information, and to be punished on conviction by fine and imprisonment. The offence was the same whether it was committed by masters or by workmen. But although the common law applied mutatis mutandis to both of them alike, it was, practically speaking, in reference rather to the latter than to the former that its effects were developed arid ascertained. Although workmen, as indi- viduals, might lawfully consent or refuse to labour for any remuneration or for any time they pleased, the hostility of the common law to combinations effected the result that when two or more of them joined together, and agreed to labour only on certain stipulated terms, their agreements were not only null and void, but were criminal offences subject to punishment- It was immaterial whether the end they had in view was to deter- mine wages or to limit work ; or whether the means they adopted for promoting its attainment was a simultaneous withdrawal from employment, an endeavour to prevent other workmen from resuming or taking employment, or an attempt to control the masters in the management of their trade, the engagement of journeymen or apprentices, or the use of machinery or industrial processes; or whether in seeking to enforce their demands they

relied merely on advice and solicitation, or resorted to reproach and menace, or proceeded to actual violence. In any event their combination in itself constituted a criminal conspiracy, and rendered them amenable to prosecution and punishment.

From the reign of Edward I. to the reign of George IV. the operation of the common law was enforced and enlarged by between thirty and forty acts of parliament, all of which were more or less explicitly designed to prohibit and prevent the organization of labour. But the rise of the manufacturing system towards the end of the 18th century, and the revolution which accompanied it in the industrial arrangements of the country,

were attended by a vast and unexpected extension of the movement which the legislature had for so long essayed to suppress. Among the multitudes of workmen who then began to be employed in factories, trade unions in the form of secret societies speedily became numerous and active, and to meet the situation a more summary procedure than that which had hitherto been available was provided by an act passed in 1800. Act of isoo. ˆ this statute it was enacted that all persons

combining with others to advance their wages or decrease the quantity of their work, or in any way to affect or control those who carried on any manufacture or trade in the conduct and management thereof, might be convicted before one justice of the peace, and might be committed to the common gaol for any time not exceeding three calendar months, or be kept to hard labour in the house of correction for a term of two calendar months.

The discontent and disorder consequent upon the introduction of steam and improved appliances into British manufactures in the first quarter of the 19th century, in conjunction with a state of commercial depression and national distress, led to the nomination of a select committee by the House of Commons, to inquire into the whole question of what were comprehensively designated the " combination laws," in the session of 1824. The committee reported to the House that " those laws had not only not been efficient to prevent combinations either of masters Act of 1824. or workmen, but on the contrary had, in the opinion

of many of both parties, had a tendency to produce mutual irritation and distrust and to give a violent character to the combinations, and to render them highly dan- gerous to the peace of the community." They further reported that in their judgment " masters and workmen should be freed from such restrictions as regards the rate of wages and the hours of working, and be left at perfect liberty to make such agreements as they mutually think proper." They therefore recommended that " the statute laws which interfered in these particulars between masters and workmen should be repealed," and also that " the common law under which a peaceable meeting of masters or workmen might be prosecuted should be altered." In pursuance of their report, an act, 5 Geo. IV. c. 05, was at once brought in and passed. But the immediate results of the change which it effected were regarded as so inconvenient, formidable and alarming, that in the session of 1825 the House of Commons appointed another select committee to re-examine the various

problems, and review and reconsider the evidence submitted to their predecessors. They reported without delay in favour of the total repeal of the act of 1824, and the restora- tion of those provisions of the combination laws, whether statu- tory or customary, which it had been more particularly intended to abrogate. The consequence was an act passed in 1825 of Acto tiS2S. which the preamble declares that the act of 1824

had not been found effectual, and that combinations such as it had legalized were " injurious to trade and com- merce, dangerous to the tranquillity of the country, and especially prejudicial to the interests of all who were concerned in them." The effect of this act was to leave the common law of conspiracy in full force against all combinations in restraint of trade, except such as it expressly exempted from its operation, as it had been before the act of 1824 was passed. It comprised, however, within itself the whole of the statute law relating to the subject, and under it no persons were liable to punishment for meeting together for the sole purpose of consulting upon and

determining the rate of wages or prices which they, being present, would require for their work or pay to their workmen, or the hours for which they would work or require wprk in any trade or business, or for entering into any agreement, verbal or written, for the purpose of fixing the rate of wages or prices which the parties to it should so receive or pay. But all persons were subjected to a maximum punishment of three months' imprison- ment with hard labour who should by violence, threats or intimi- dation, molestation, or obstruction, do, or endeavour to do, or aid, abet or assist in doing or endeavouring to do, any of a series of things inconsistent with freedom of contract which the act enumerated and defijied.

In 1859, in order to remove certain doubts which had arisen as to the true import and meaning of the undefined words "molestation" and "obstruction," it was provided Act ofl8 g9 by an amending act that " no person, by reason merely of his endeavouring peaceably and in a reasonable manner, and without threat or intimidation, direct or indirect, to persuade others to cease or abstain from work, in order to obtain the rate of wages or the altered hours of labour agreed to by him and others, should be deemed to have been guilty of ' molestation ' or ' obstruction.' "

In spite of the partial recognition which trade unions had thus

received, they continued to be unlawful, although not necessarily criminal, associations. In certain cases, they were by statute exempted from penal con- isio°is76. sequences, and their members were empowered to combine for specified purposes, and to collect funds by volun- tary contributions for carrying them into effect. But in the estimation of the common law the special privileges which had been accorded to them under particular circumstances did not confer any general character of legality upon them, and where their rules were held to be in restraint of trade, as in the prohibition of piece-work or the limitation of the number of apprentices, they were still regarded as conspiracies. In this condition the law was when what became notorious as the " Sheffield and Manchester outrages " suggested the appoint- ment of the royal commission on trade unions, which investi- gated the subject from 1867 to 1869. The outcome was, first, a temporary measure for the more effectual protection of the funds of trade unions, passed in 1869, and, secondly, the two measures which, as amended and amending, are cited together as the " Trade Union Acts 187 1 and 1876."

Under these statutes, construed with the Conspiracy and Protection of Property Act 1875, the law relating to combi- nations, whether of workmen or of masters, entered upon a new phase. In connexion with Effects trade disputes no person can be prosecuted for conspiracy to commit an act which would not be criminal if committed by him singly. The purposes of a trade union are not to be deemed illegal merely because they are in restraint of trade, and the circumstance that they are in restraint of trade is not to render any member of it liable to prosecution, nor is it to avoid or make voidable any agree- ment or trust relating to it. No court, however, can enter- tain legal proceedings, with the object of directly enforcing or recovering damages for the breach of an agreement between the members of a trade union as such, concerning the con- ditions on which the members for the time being shall or shall not sell their goods, transact their business, employ or be employed, or the payment by any person of any subscrip- tion or penalty to a trade union, or for the application of the funds of a trade union to provide benefits or to furnish contributions to any employer or workman not a member of such trade union in consideration of such employer or workman acting in conformity with the rules or resolutions of such trade union, or to discharge any fine imposed upon any person by any court of justice or any agreement made between one trade union and another, or any bond to secure

such agreement. But such incapacity to sue on such agree- ments is not to be taken as constituting any of them illegal. Every person, however, commits a misdemeanour, and on

conviction is liable to a maximum fine of £20, or to a maximum imprisonment of three months with hard labour, who wilfully and maliciously breaks a contract of service or hiring, knowing or having reasonable cause to believe that the probable consequence of his so doing, either alone or in combination with others, will be to endanger human life or cause serious bodily injury, or to expose valuable property, whether real or personal, to destruction or serious injury; or, who, being employed by a municipal authority or by any company or contractor on whom is imposed by act of parliament, or who have otherwise assumed, the duty of supplying any place with gas or water, wilfully and maliciously breaks a contract of service or- hiring, knowing, or having reasonable cause to believe, that the probable consequence of his so doing, alone or in combination with others, will be to deprive the inhabitants of that place, wholly or in part, of their supply of gas or water; or who, with a view to compel any other person to do or to abstain from doing any act which such other person has a right to abstain from doing or to do, wrongfully and without legal authority uses violence to or intimidates such other person or his wife or children, or injures his property, or who per- sistently follows such person about from place to place, or who hides any tools, clothes or other property owned or used by such other person, or deprives him of or hinders him in the use thereof, or who watches or besets the house or other place where such person resides or works or carries on business or happens to be, or the approach to such house or place, or who follows such other person with two or more other persons in a disorderly manner in or through any street or road. Attending at or near the house or place where a person resides or works or carries on business, in order merely to obtain or communicate infor- mation was not watching or besetting within the statute, but this proviso has since been repealed. In regard to registration, trade unions are placed on a similar footing with friendly and provident and industrial societies, and they enjoy all the privileges, advantages and

facilities which those associations possess and command, except in so far as they differ by the fact that there is no legally enforceable contract between a trade union and its members, and that the right of a registered trade union to invest funds with the National Debt Commissioners is limited, and in a few other matters. On their side, how- ever, they have to comply with the same conditions, are sub- ject to the same liabilities, and are compelled to make the same periodical returns.

During the years following 1876 several important amend- ments of the law, other than special trade union legislation, and the decisions of the courts in various cases, led Legislation. U P to tne Important act of 1906. These affected principally the liability of trade union funds to be taken in execution for the wrongful acts of agents of the union, the statute law relating to picketing and other incidents of strikes, and the law of conspiracy as affecting trade unions.

The two latter points are dealt with in the article on Strikes and Lock-Guts, and it may suffice here to say that the clauses in the act of 1875 prescribing punishment for watching and beset- ting a house, &c, with the view of compelling any other person in the manner set forth, have been amended by the repeal of the proviso that " Attending at or near the house or place where a person resides, cr works, or carries on business, or happens to be, or the approach to such house or place, in order merely to obtain or communicate information, shall not be deemed a watching or besetting within the meaning of this section " by the enact- ment in the act of 1906 that : " It shall be lawful for one or more persons, acting on their own behalf or on behalf of a trade union or of an individual employer or firm in con- templation or furtherance of a trade dispute, to attend at or near a house or place where a person resides or works or carries on business or happens to be, if they so attend merely for the purpose of peacefully obtaining or communicating information, or of peacefully persuading any person to work or abstain from working."

The object was to include the right of peaceful persuasion

which had been supposed by parliament to be implied in the terms of the act of 1875. Further, the law of conspiracy- has been amended by enactments in the act of 1906 that: " Ah act done in pursuance of an agreement or combination by two or more persons shall, if done in contemplation or furtherance of a trade

dispute, not be actionable unless the act if done without any such agreement or combination would be action- able," and " An act done by a person in contemplation Or furtherance of a trade dispute shall not be actionable on the ground only that it induces some other person to break a con- tract of employment or that it is an interference with the trade, business or employment of some other person, or with the right of some other person to dispose of his capital or his labour as he wills."

The act of 1875, in the words of Lord Cairns, was framed on the principle that " the offences in relation to trade disputes should be thoroughly known and understood, and Leading that persons should not be subjected to the indirect Cases in the and deluding action of the old law of conspiracy," Law-courts. but no one during the discussion of the bill was thinking of the civil action. This matter became important when the dicta of various judges in the House of Lords in the case of Quinn v. Leathern showed that there might be an action for damages based on any conspiracy to injure or do harm, particularly when it is considered that the very essence of a strike is in one sense injury to those against whom it is directed, and these opinions became of the utmost import to trade unions when the Taff Vale case showed that the fact of procuring to strike might also involve trade union funds in liability, even where there had been no procuring to break contracts. This important decision arose through the amendment of general procedure under the Judicature Acts in 1881. The distinction was abolished between legal and equitable rules as regards parties to sue. and be sued, and in 1883 there was issued a General Order No. xvi. of the supreme court, rule 9 of which prescribed that where there are numerous parties having the same interest in one cause or matter, one or more of such persons may sue or be sued, or may be authorized by a court or judge to defend in such cause or matter, on behalf or for the benefit of all persons so interested. It was decided in Temperlon v, Russell in 1893 where three trade unions were made defendants to represent all the members, and the order did not apply in the case of a trade union, because the words of the order " numerous parties having the same interest in one cause or matter " could only be satisfied by parties who had, or claimed to have, a beneficial proprietary right which they were asserting or de- fending, from which it was inferred that they could not be sued at all, and in the report of the Royal Commission on Labour in 1894 the opinion was either assumed or expressly stated that they could not be sued in tort. In 1901

the House of Lords overruled Temperlon v. Russell in the case of the Duke of Bedford v. Ellis, holding that the General Order No. xvi. rule 9, was universal in its application. In the same year the Taff Vale case came before the House of Lords. In the first place, expounding the Trade Union Act 1871, they held unanimously that from the provisions in that act concerning registered trade unions there is to be legally in- ferred an intention of parliament that a trade union might be sued in tort in its registered name, with the conse- quence that trade union funds would be liable case. for any damages that might be awarded. Secondly — apart from the Trade Union Act — Lord Macnaghten and Lord Lindley expressed an unhesitating opinion that under the General Order No. xvi, as interpreted in Duke of Bedford v.. Ellis, any trade union, whether registered or not, could be sued in tort by means of a representative action. Trade unionists protested against the result as a decision of judges making a practically new law against trade unions and nullifying the settlement of their status made by the legislature in 1871, and in June 1903 a royal commission was again ap- pointed to inquire into the subject of trade disputes and trade

combinations and as to the law affecting them, and to report on the law applicable to the same and the effect of any modifi- cations thereof.

The majority of the commission reported in January 1906 in favour of an alteration in the law relating to picketing and conspiracy, but against any alteration of the law 1906. as l a ‘d down in the Taff Vale judgment. A

different view was, however, expressed in the Trade Disputes Act passed in the same year, whereby it was enacted with reference to trades union funds that ” an action against a trade union, whether of workmen or masters, or against any members or officials thereof on behalf of them- selves and all other members of the trade union in respect of any tortious act alleged to have been committed by or on behalf of the trade union, shall not be

entertained by any court, ” although ” nothing in this section shall affect the liability of the trustees of a trade union to be sued in the events provided for by the Trades Union Act 187 1, section 9, except in respect of any tortious act committed by or on behalf of the union in contemplation or in further- ance of a trade dispute. ” This act and the two previous acts are cited together as the Trade Union Acts 187 1 to 1906, and form the present statutory enactments upon the subject. In December 1909 one of the most important judgments in connexion with trade unions was delivered in the case of Osborne v. Amalgamated Society of Railway Servants. The litigation had extended over two years, ending in the House of Lords (December 21, 1909) upholding the decision of the court of appeal (L.R. 1909, ch. 163). The plaintiff, who had been a member of the Amalgamated Society of Railway Servants since 1892, sued his trade union to have it declared that one of its current rules, which provided, amongst other things, for parliamentary representation and the enforced levy of contributions from him and other members of the society, towards the payment of salaries or maintenance allowance to members of parliament pledged to observe and fulfil the conditions imposed by the Labour Party, was ultra vires and void. It was decided in the King’s Bench against the plaintiff, but the judgment was reversed by the court of appeal, whose decision was upheld by the House of Lords. This meant that the Labour Party in the House of Commons would have to find other ways and means than contributions from trade unionists to maintain their members’ in parliament. A voluntary levy was attempted, but did not meet with any success, and in 1910 agitation was set on foot by the Labour Party for the reversal of the ” Osborne judgment. ” They also announced in September their intention of making a change in the constitution of their party by elimin- ating the necessity of each member signing an acceptance of certain conditions, on the ground that the party had arrived at a state when it could trust to ordinary party loyalty to keep their members’ action in accordance with the policy of the party. It was also hoped that it would meet many objections raised against their agitation for the reversal of the Osborne judgment. The agitation had the result of in- creasing the force of the movement for payment of members, not only in the Liberal party but also among the more pro- gressive Conservatives.

Trade unions, in the sense in which the term is now under- stood, appear to be almost exclusively of modern growth. Though

combinations among various classes of Organization, workmen to improve their position have doubt- less been formed from time to time from an early period, such combinations, up to comparatively recent years, were mostly ephemeral, almost the only class among whom permanent associations of journeymen are known to have existed in the middle ages being the masons, whose con- federacies were prohibited by law in 1425. With this doubtful exception, there is little or. no trace of permanent combinations corresponding to the modern trade union before the 18th century. During the period when wages and conditions of employment were the subject of State regulation

(e.g. under the Statute of Apprentices of Elizabeth), combina- tions to exact higher rates or other conditions than those so fixed were naturally regarded as illegal conspiracies.

The craft gilds of the middle ages have sometimes been regarded as the true predecessors of trade unions, but the analogy must not be pressed too far. The structure, con- stitution and functions of a gild of craftsmen, aiming at the protection and regulation of the craft as a whole, were essen- tially different from those of a trade union, formed to protect one class of persons engaged in an industry against another. Nor is there any trace of direct continuity between gilds and trade unions, for the claim of certain Irish trade unions to be descended from gilds will not bear scrutiny (see Webb, History of Trade Unionism, appendix). The only true sense in which it can be said that there is a certain indirect historical filiation between gilds and trade unions is that, as pointed out by Brentano, some of the earliest trade unions -had for their original object the enforcement of the decaying Elizabethan legislation, which in its turn had taken the place of the obsolete regulation of industry by the craft gilds, so that among the rules and objects of such unions would naturally be some bearing a likeness to gild regulations.

The actual way in which trade unions first came into being probably varied very greatly. In some cases, as stated above, their origin can be definitely traced to associations for en- forcing the legal regulation of industry against the opposition of employers; in others, the meetings of journeymen belonging to the same trade for such purposes as sick or burial clubs became naturally the nucleus of secret combinations to raise wages. The growth of the ” capitalistic ” system of industry, under which the workman no longer owned the materials or instruments with which he worked, was one of the most potent causes of the

development of workmen's combinations. The efforts of trade unions to revive the enforcement of the Eliza- bethan legislation not only failed, but led to its repeal (1813- 18 14); but the laws against combinations, which had been made more stringent and more general by the acts of 1 799-1 800, remained unaltered until 1824. In spite of these acts, which made all combinations illegal, there is evidence that trade clubs of journeymen existed and were tolerated in many trades and districts during the first quarter of the 19th century, though they were always subject to the fear of prosecution if they took hostile action against employers; and in many cases strikes were suppressed by the conviction of their leaders under these acts or under the common law of conspiracy. The partial protection accorded to societies for the purpose of regulating wages and hours of labour by the law of 1825 led to a rapid multiplication and expansion of trade unions, and to an outburst of strikes, in which, however, partly owing to the widespread commercial depres- sion, the workmen were mostly unsuccessful. Thus the first impetus given to trade unions by the modification of the combination laws was followed by a collapse, which in its turn was followed (in the third decade of the century) by a succession of attempts on the part of workmen to establish a federal or universal combination, to embrace members not of one but of several trades. To this new 1 form of combination, which excited a good deal of alarm among employers, the term " trades union, " as distinct from trade union, was applied. All these general movements, however, proved short-lived, and the most extensive of them, the " Grand National Con- solidated Trades Union," which was formed in 1834 and claimed half a million adherents, only had an active existence for a few months, its break-up being hastened by the con- viction and transportation of six Dorchester labourers for the administration of unlawful oaths. In the years of depressed trade which followed, trade unionism once more declined, and the interest of workmen was largely diverted from trade combinations to more general political movements, e.g. Chartism, the Anti-Corn-Law agitation and Robert Owen's schemes of co-operation.

From 1845 we trace another revival of trade unions, the

characteristic tendency of this period being the amalgamation of local trade clubs to form societies, national in scope, but confined to single or kindred trades. High rates of contri- bution, and the provision of friendly as well as trade benefits, were among the features of the new type of union, of which the Amalgamated Society of Engineers, formed in 1851, was the most important example. The growth of unions of the new type was followed by a development of employers' associations in the 'sixties, and by a number of widespread strikes and lock-outs, and also by various efforts to promote arbitration and conciliation by the establishment of joint boards of employers and employed. (See Arbitration and Conciliation and Strikes and Lock-outs.)

A series of outrages at Sheffield and Manchester in 1865- 1866, in which officials of some local trade societies were impli- cated, led to the appointment in 1867 of a Royal Commission on Trade Unions, whose report was followed by the passage of the Trade Union Act of 1871, which as amended in 1876 and 1906 now governs the legal position of trade unions. Conferences of trade union representatives held in 1866 and 1867 to deter- mine their policy with respect to the royal commission of in- quiry, led to the gatherings of the trade union congress which are still held annually.

The period of inflated trade which began in 1871 caused, as usual, another rapid growth of trade combinations, of which the most characteristic feature was their extension to agricultural and general labourers. To meet this new development of com- bination, the National Federation of Associated Employers of Labour was formed in 1873. The years of depression, 1875- 1880, were marked by a series of unsuccessful strikes against reductions of wages, and by a general decline of trade unions, which did not again revive until nearly ten years later, when the new wave of prosperous trade brought with it an outburst of strikes, chiefly among unskilled labourers, for improved conditions, of which the most notable was the strike of the London dock labourers in 1889. These trade movements were accompanied by the formation of a large number of unions of a type more akin to those of 1 830-1 834 than to the more modern trade-friendly society with its high contributions and benefits. The " new unions " were chiefly among unskilled labourers; their rates of contributions were from id. to 3d. a week, and as a rule they only offered strike benefit. Another characteristic was the extent to which their leaders were per- meated with the

Socialistic doctrines which had then recently taken root in Great Britain, and whiqh led them to advocate positive state interference with industry in the interests of the labourers (e.g. the legal limitation of hours of labour).

The reports of the Royal Commission on Labour, which sat from 1891 to 1894, contain much valuable information on the state of facts and on the opinions of employers and workmen at this period.

From 1892 onwards the progress of trade unionism can be traced statistically. The depression of trade, 1892-1895, brought with it, as usual, some decline in trade unionism; but though many of the ” new unions” collapsed, some of the more im- portant have survived to the present time. The revival of trade which began in 1896 was naturally accompanied by an increase in the strength of trade unions; but the most marked characteristic of this period was the extension and consolidation of employers’ associations, of which perhaps the most notable is the Engineering Employers’ Federation, which was originally formed on the Clyde, but gradually extended to other districts and “became a national organiza- tion of great strength during its successful struggle with the Amalgamated Society of Engineers in 1897-1898. Among the other more important employers’ associations and federations of a national character may be mentioned the Ship- ping Federation, the Federated Coal Owners, the Ship-building Federation, the Federation of Master Cotton-Spinners’ Associations, the National Federation of Building Trade Em- ployers, and the Incorporated Federated Associations of Boot and Shoe Manufacturers.

In 1899 a general federation of trade unions was established which had in 1907 a membership of 650,000 in 117 affiliated societies. This federation links the trade unions of the United Kingdom with those of other countries by its affiliation with the international federation of trade unions, which em- braces the national federations of the principal European countries. During recent years there has been a noticeable tendency towards the creation of federations of trade unions, and the absorption of the smaller by the larger societies. Trade unions, both in their historical development and their present organization, present a very great variety of constitutions. The oldest type is that of the local trade club, con- sisting of a comparatively small number of men c ˆ nstHu ‘ following the same occupation in the same locality. A large number of unions have never progressed beyond

this primitive form of organization. The government is of the simplest kind, by a general assembly of all the members, while such officers as are required to carry on the necessary routine business of the society are chosen by rotation or even by lot.

Indisposition to concentrate power in the hands of per- manent officers and a tendency to divide the business of manage- ment equally among all the members, instead of delegating authority to a few chosen representatives, are leading character- istics of trade unions in this primitive form. The organization here described, even if adequate for ordinary current require- ments, is ill suited for conducting a contest with employers, and accordingly in times of strife an improvised " strike com- mittee " often comes into existence and practically governs the conduct of the dispute. No doubt this double constitution of the old trade, club as a loosely organized friendly society, converting itself at times into a more or less secret strike combination ruled by an irresponsible committee, is to be traced to the time when trade unions as such were illegal com- binations and had to carry out their objects under the guise of friendly societies. The Friendly Society of Ironfounders (established in 1809), though it has to a great extent out- grown its primitive constitution, retains in its name the mark of its origin, while the government of the London Society of Bookbinders, by mass meeting of its members, offers an example of the persistence of traditional methods under wholly changed conditions. The Sheffield trade clubs, responsible for the outrages which led to the appointment of the Trade Union Commission in 1867, and subsequently to the passage of the Trade Union Acts, conformed as a rule to the primitive type. At the present time over 750 trade unions are known to exist which are purely local in character, with no branches. The next step in trade union evolution seems to have generally been an alliance or federation of two or more local clubs be- longing to the same trade. This federation would make it necessary to provide some machinery for common management, the simplest and crudest expedient being for each of the allied clubs to act in rotation as the governing branch. Thus the government of the federation or " amalgamated society " was at any given time confided to the members of a single locality, and the seat of government was periodically shifted. Some federal societies (e.g. the Mutual Association of Journeymen Coopers) still retain this primitive form of government.

As the tendency developed for local clubs to unite, the necessity of permanent officials to cope with the growing business of the

amalgamation caused the institution of a paid secretary (usually elected by the whole body of members), and this led naturally to the fixing of the seat of administration at a particular centre instead of rotating among the branches. Some continuity of policy and of office tradition was thus made possible, but the executive committee almost invariably continued to consist of the local committee of the district where the seat of government happened to be. Thus up to 1892 the business of the Amalgamated Society of Engineers, a society with hundreds of branches all over the United Kingdom and even abroad, was conducted by a committee elected by the London branches. The Boilermakers continued a somewhat similar form of government up to 1895; and many great societies, e.g. the Amalgamated Society of

Carpenters and Joiners, continue a somewhat similar system to the present day.

The plan of entrusting the government of a national society to a local executive has obvious conveniences, where the society consists of a body of working men scattered over a large area and with no leisure for travelling. But the control exercised by a locally-elected committee over a general secretary deriving his authority not from them but from the vote of a much wider constituency, could hardly be expected to be very effective; while the expedients of referring all important questions to a vote of the whole body of members, and of summoning at periodical intervals special delegate meetings to revise the rules, have proved in practice but clumsy substitutes for the permanent control and direction of the executive officers by a representative council. Quite as ineffective in some cases has been the authority of a mere local executive over the committees of other districts. Accordingly, some of the largest " amalgamated " unions have now adopted a representative system of government. Thus in 1892 the Engineers revised their rules so as to provide for the election of the executive council by vote of all the members divided into eight equal electoral districts. The members of council so elected are permanent paid officials, devoting all their time to the work of the society. The general secretary, however, con- tinues to be chosen by the whole body of members, while

the responsibility of the council is also weakened by the institution of " district delegates " nominally responsible to them, but chosen by direct election in the various districts. (This division of authority and consequent weakness of responsibility was one of the causes of the state of things which led to the great engineer- ing dispute of 1897, and it also led to a deadlock in negotiations on the north-east coast in 1908, the executive being powerless to enforce its views.) The Boilermakers adopted the system of a permanent executive in 1895.

In the case of certain highly-localized industries, such as cotton and coal, the conditions have admitted of a somewhat different form of constitution from that described above. Thus the Amalgamated Association of Operative Cotton-Spinners is a federal organization, consisting of a number of local associations, all, however, situated within a comparatively small area. The governing bodies of the association are — (1) a quarterly meeting of about a hundred representatives of the districts; (2) an executive committee of thirteen chosen by the above represen- tative meeting, of whom seven must be working spinners and the other six are usually permanent district officials; (3) a sub- council to transact the ordinary daily work of the association, consisting of the six official members referred to above. The secretary is chosen by the representative meeting, and engages his own office assistants. Here we have the familiar features of representative institutions — a large legislative body, a small executive chosen by and responsible to this body, and a still smaller group of permanent officials to transact ordinary business.

Lastly, there are some large societies constituted not by the aggregation of local clubs or the federation of neighbouring associations, but originally founded as " national societies " divided into districts and branches for administrative conveni- ence. An example is the Amalgamated Society of Railway Servants, founded in 1872.

Besides the tendency of the national society with branches to swallow up the local trade club, there is a further tendency among the larger societies to form federations for certain common pur- poses. Such* federations are to be distinguished from national trade unions, inasmuch as their members are societies and not individuals, and as a rule their powers over their constituent organizations are limited to certain specific objects. On the other hand, they are more than merely

consultative bodies (such as local trades councils).

Some federations consist of unions in the same industry in different districts (e.g. the Miners' Federation). " Single trade " federations like this have usually considerable powers, including that of imposing levies.

In the rot ton-spinning trade, the trade union organization has a federal character, and the Amalgamated Association of

Operative Cotton-Spinners, in spite of its name, is, strictly speaking, a federation.

Other federations (e.g. in the building trade) are formed of allied trades in the same locality, and usually have little executive power. The Federation of Engineering and Shipbuilding Trades has among its objects the settlement of disputes between members of its constituent societies as to the limits of their work. Some federations aim at embracing societies in all kinds of industries, but as a rule such organizations have not proved long-lived. The most recent example is the " General Federation of Trade Unions," formed in 1899, referred to above.

Since 1866 a congress of delegates from trade unions has met annually for discussion, and a parliamentary committee elected by this congress watches over matters in which trade unions are interested during the ensuing year.

The principal object of every trade union is to protect the trade interests of its members, and to strengthen their position in bargaining with their employers with regard to the conditions under which they work. The chief means jhˆ,ˆ" by which they seek to attain these objects (apart from political methods such as the promotion of legislation or of administrative action by public authorities) are twofold: viz. the support of members when engaged in a collective dispute with employers by the payment of " dispute " benefit, and the insur- ance of members against loss from want of work by the payment of " unemployed " benefit, so as to enable them to refuse any terms of employment inferior to those recognized by the trade union. All trade unions in one form or another provide " dis- pute " benefit, but a separate " unemployed " benefit is by no means universal, though, except in certain groups of trades, it is usual among more powerful and well established societies. Thus in the mining, clothing, and even many branches of the building trade, comparatively little is spent

by trade unions on ” un- employed ” benefit, while, on the other hand, in the metal, engineering, shipbuilding, printing and other trades a large proportion of the total expenditure is devoted to this object (see Statistics below). In some important societies, such as the Amalgamated Society of Engineers, ” unemployed ” and ” dispute ” benefits are mixed up together, members engaged in a dispute receiving an addition of 5s. per week (known as ” contingent ” benefit) to the ordinary out-of-work pay (known as ” donation “).

Unemployed benefit may, of course, be regarded as a ” friendly ” benefit, i.e. a provision against one class of the casualties to which a workman is exposed — the loss of employment through slackness of trade. But in practice it also operates as a method of maintaining the ” standard ” rate of wages, members being entitled to it who could obtain employment, but only on con- ditions disapproved by the society or branch.

The conditions under which the members of a union are entitled to financial support in a strike vary in different societies, and are prescribed in the rules. Usually, though the initiative may come from the localities, the central executive must approve of the strike before it takes place, and may at any time declare it to be closed, though in some societies the central authority is often unwilling to take the responsibility of curbing its members by exercising its powers in this respect.

” Dispute ” and ” unemployed ” benefits are the only ones which are specially characteristic of trade unions, and as regards the latter benefit, it may be said that trade unions have hitherto been the only form of organization capable of meeting the difficulties arising from ” malingering.” Most of the more firmly established unions, however, add to their trade functions those of friendly societies, providing sick, accident, superannua- tion, and funeral benefits, or some of these. The position of a trade union, however, with regard to these benefits differs very materially from that of a friendly society. The trade union is under no legally enforceable contract with its members to provide the stipulated benefits: it can change their scale, or even abolish them, by vote of its members, and a member who has contributed for years in hope of receiving them has no legal redress. Again, a member excluded from the society for some ” trade ” reason

incidentally loses all claim to friendly benefits. The funds of a | trade union applicable to trade and friendly purposes are never I kept distinct (in the few cases in which some distinction is attempted, the society may ” borrow ” from the one fund in aid of the other in case of emergency); and a prolonged strike or depression of trade may so deplete the funds as to make it impossible for the society to meet its engagements as regards sickness or superannuation. Thus the friendly society operations of trade unions have strictly no actuarial basis, and in some cases the scale of contribution and benefit have been fixed with little regard to ultimate solvency.

On the other hand, the power of levying and varying the scale of contributions adds to some extent to the financial stability of the funds, and the provision of ” friendly ” as well as ” trade ” benefits by a trade union undoubtedly gives strength and continuity to the society, and increases its power of discipline over its members. Societies that only provide ” dispute ” pay are exposed to violent oscillations of membership, and also to a dangerous temptation to rush into an ill-considered strike owing to the mere accumulation of funds which can be used for no other purpose.

The statistics of trade union expenditure on benefits of various classes are given below. Of the 100 principal unions, all provide dispute benefit; 79 in the year 1905 provided unemployed benefit (including in some cases travelling pay); 79, sick or accident benefit; 37, superannuation benefit; and 87, funeral benefit; 32 unions providing all four classes of benefit.

One of the most important functions of trade unions in many industries is the negotiation of agreements with employers and employers’ associations for the regulation of the conditions of employment in those industries. While undoubtedly the power of withdrawing its members from employment in the last resort adds to the power of a trade union in such negotiations, many of the most important agreements by which the conditions of labour of large bodies of workmen are governed are habitually concluded, and from time to time revised, by conferences of representatives of the trade union and employers without any strike taking place. To the functions of trade unions as fighting

organizations and as friendly benefit societies should therefore be added that of providing the necessary machinery and basis for the conclusion of industrial agreements between bodies of workpeople and their employers (see Arbitration and Conciliation, and Strikes and Lock-outs).

While the broad objects of trade union policy are generally similar, their methods and features vary greatly in detail. Among the objects most frequently met with (besides those of raising wages and shortening hours, which may be said to be universal) are the enforcement of a ” minimum ” wage; the limitation of overtime; the restriction of numbers in the trade through the limitation of apprentices, or the regulation of the age of entrance; the restriction or regulation oi piecework (in trades accustomed to ” time ” work) ; the preservation for members of the trade of the exclusive right to perform certain classes of work claimed by other trades (leading to so-called “demarcation” disputes); resistance to the encroachment of labourers on work considered to be ” skilled ” (leading to disputes as to the class of persons to be employed on machines, &c.) ; and the securing of a monopoly of employment for members of the union by a refusal to work with non-unionists.

Number of

Membership

\ ear.

Unions.

of Unions. 1

1897

1292

1,622,713

1898

1261

1,659,480

1899

1255

1,820,755

1900

1244

1,928,035

1901

1238

1,939.585

1902

1203

1,925,800

1903

1187

1,903,596

1904

“53

1 ,864,374

‘90S •

1136

1,887.823

1906

1161

2,106.283

The statistics of trade unions are very complete for recent years, but for earlier years the records are so fragmentary that it is im-

possible to give exact figures showing the total growth statistlcj of trade unions over a long period. The table at foot of preceding column, based on the statistics published by the board of trade, shows the number and membership of all trade unions in the United Kingdom making continuous returns for each of the ten years 1897 to 1906.

The fluctuations in membership correspond in the main to the oscillations of trade, membership declining in the years of depression and increasing with the revival of trade. The decline in the number of separate unions is chiefly due to the growing tendency to amalga- mate into large societies.

The following table shows the distribution of trade unions among the various groups of trades in 1905:- —

Groups of Unions.

lb .2

Mining and quarrying .... Metal engineering and shipbuilding

Textile

Building

Railway, dock and other transport Public employment . . . Printing, bookbinding and paper . Clothing . . . .

Wood-working and furnishing General labour .....

All other unions

Total . . .

68 222

253 101

55 48 40

35 100

18 196

1 136

Membership in 1905.

Number.

495,968

339.282

239.539

205,383

162,563

72,182

62,368

60,407

40,115

96,094

113,922

1,887,823

Percentage of Total.

26 18

13 11

9 4 3 3

2

5 6

Includes a small number' of members abroad.

This table shows that the strength of trade unionism lies in the five first-named groups of trades— mining ; metal engineering and shipbuilding; textile; building; and railway, dock and other trans- port—which among them account for over three-quarters of the total membership.

In agriculture, trade unionism is at present practically non-existent, but in 1875 there were important unions of agricultural labourers, though at no time did they include any considerable proportion of the total agricultural population.

Taking the men belonging to all trade unions together, we find that their number does not amount to more than about one in five of the adult men who belong to the classes from which trade unionists are drawn. Only in a few groups do trade unionists form a high percentage of the total working population, e.g. coal-minjng and cotton manufacture. The number of women belonging to trade unions at the end of 1906 was 162,453, distributed among 156 unions, of which, however, only 28 consisted exclusively of women. The great bulk of women trade unionists are found in the cotton trade, in which they actually outnumber the male members. Of all the women employed in factories and workshops, about one in twelve belongs to a trade union.

The available statistics with regard to the financial resources of trade unions, and their expenditure on various objects, are not so complete as those of membership, as the board of trade figures only relate to 100 of the principal unions. As, however, these unions include nearly two-thirds of the total membership, the figures showing their financial position may be accepted as being representative of the whole number of societies. In 1906 the income of these 100 societies was £2,344,157 or .36s. 9|d. per head; and their expenditure £1,958,676 or 30s. 9d. per head; and at the end of the year the funds in hand amounted to £5,198,536 or 8ls. 7|d. per head.

The actual rates of contribution per member vary greatly among the unions— from 7s. up to £4 per annum. Generally speaking, the highest income per member is found among the unions in the metal, engineering and shipbuilding group, where in 1905 it averaged £3, 5 s – 7id., while the average in the mining unions was only £1, 4s. 1 jd., and among dock labourers still lower. The metal trades and the textile unions appear to hold the highest amount of funds compared with their membership, the amounts at the end of 1905 being £6, 3s. 8Jd. and £6, os. 3d. per head respectively in these groups, while in the building trade unions it was only 18s. 8Jd. and in some societies of unskilled labourers far less than this.

The main items of expenditure of trade unions are ” dispute ”

benefit, ” unemployed ” benefit, various friendly benefits (including sick and accident, superannuation and funeral), and working ex- penses. The proportions of expenditure on these various objects naturally vary greatly in different groups of unions, and also in different years, some of the items being affected largely by the general state of employment, and the occurrence or absence of im- portant disputes. On the basis, however, of an average of the ten years 1 897-1 906, the following analysis of the proportionate expendi- ture of the 100 principal unions on various classes of objects has been made: on disputes, 13-4%; on unemployed 22-1 %; on friendly

benefits (other than ” unemployed “), 42-5%; on working expenses 22% The 42-5% of expenditure on friendly benefits is made up of 19-1 % on sick and accident, 12-4% on superannuation and II % on funeral and other benefits.

The mining unions devoted 286% of their expenditure to the support of disputes (friendly benefits in this industry being largely provided by other agencies;, while the unions in the printing and bookbinding trades only used 3-9 % for this object, over three- quarters of their expenditure going to unemployed or friendly benefits. As illustrations of the variation in the expenditure by the same group of unions on a particular object from year to year, it may be stated that within the ten years’ period referred to the annual expenditure of the metal, engineering and shipbuilding group on disputes varied from £514,637 in 1897, the year of the great engineering dispute, to £13,266 in 1899. Again, the expenditure of the same group of unions on unemployed benefit varied from £80,512 in 1899 to £303,749 in 1904. The burden of superannuation payments by the 100 unions has steadily increased during the ten years from £137,813 in 1896 to £306,089 in 1906.

At the end of 1906 there were 89 federations, including societies with a gross membership of over a million and three-quarters, but a considerable deduction must be made from this total on account of duplication. In the same year 231 ” trades councils ” were known to exist, with an affiliated membership of over

895,000.

The number of employers' associations and federations known to exist in the United Kingdom in 1906 was 953, including 60 federations and national associations. Of the total number of associations 398 are in the building trades.

II. — Foreign and Colonial

Modern trade unionism has had its chief development in English-speaking Countries, and especially in the United Kingdom, where the conditions necessary for its growth have been present to the fullest extent. With some exceptions, such unions as are found elsewhere are either derived or copied from English organizations, or are associations with political objects. It is therefore unnecessary to give more than a brief summary of the position of trade unions in some of the principal countries and colonies outside the United Kingdom (for United States see IV. below).

Germany. — In Germany the majority of trade unions are of a political character, being closely connected with the Social Democratic party. These Socialist trade unions, termed " Gewerkschaften, " were started by a congress held at Berlin in 1868, under the auspices of Fritscher and Schweitzer, two followers of Lassalle. In 1878 many of them were dissolved under the law prohibiting socialistic organizations, but shortly after their place was taken by local unions termed " Fachvereine," which ostensibly abstained from politics, but which in various ways succeeded in evading the law and carrying on the work of the Gewerkschaften. In 1887 a general committee of the German Gewerkschaften was formed, and in 1890 the General Commission of Trade Unions in Germany was established. Later years of prosperous trade have been marked by a rapid growth in the strength of trade unions in Germany.

The Social Democratic (Gewerkschaften) trade unions included in 1907 a membership of 1,886,147 as compared with 743,296 in 1902 and 419,162 in 1897. Of the total number of members in 1907, 1,865,506 belonged to branches affiliated to central federations; the membership of non-federated local unions being returned as only 20,641. The income of the federated trade unions in 1907 was £2,569,839, or over 27s. per member as compared with £554,887 (or about 15s. per member) in 1902 and £204,185 (or about 10s. per member) in 1897, and the

expenditure in the same years to £2,156,126, £500,276 and £177,140 respectively. Of the 61 federa- tions in existence in 1907, 43 paid travelling 'benefit, 42 paid unem- ployed benefit, 47 paid sick benefit and 57 paid funeral, removal and special allowance.

Another group of trade unions in Germany, less important as regards number and membership than the above, are the " Gewerk- vereine," or non-political trade unions, sometimes known as " Hirsch- Duncker " unions, from the names of their founders. These unions were first formed in 1868, immediately after the Berlin congress referred to above. They were directly modelled on British trade unions. Since 1876 Social Democrats have been excluded. In their earlier years these unions suffered in membership from a series of unsuccessful strikes, and of late years they have been mostly benefit societies. In 1907 the Gewerkvereine embraced 108,889 members. Their income amounted to £77,068 in 1907 and their expenditure to £71,717.

Another group of unions, the Christian trade unions (Christliche Gewerkvereine), was formed in 1894. In 1907 the membership of this group was 354,760. The income of these unions

in 1907 was £225,821, and the expenditure £167,867. Besides these groups of unions there were a number of independent societies with a membership of 96,684 in 1907.

It will be seen that German trade unions of one type or another included a membership of nearly two and a half millions in 1907, their membership having more than doubled in the last five years.

France. — In France combinations of workmen as well as of employers were prohibited by the laws of the 14th of June and the 28th of September 1792, which overthrew the old gild or corpora- tion system. They were also penalized under various articles of the Penal Code, and it was not till 1864 that the prohibition was modified by law. At present the status of trade unions in France is regulated by the law of 1884, which repealed that of 1 791 and modified the articles of the Penal Code so far as regards professional syndicates of employers or workmen. Since then there has been a considerable growth of workmen's unions, which in 1906 numbered 5322 with a membership of 896,012. Of the unions in existence in 1906, 3675 with a membership of 752,362 belonged to 187 federations. There is, however, some

dupli- cation owing to the fact that some unions belong to more than one federation. In 1906 there were 260,869 members of unions in the transport, warehousing, &c, groups of trades, 103,835 in the metal, 73,126 in the mining and quarrying, 78,854 in the textile, 66,678 in the building, 51,407 in the agricultural, forestry, fishing and cattle breeding, 48,353 in the food preparation trades and the remainder in various other trades.

Austria. — Apart from the Austrian gilds, membership of which is compulsory for persons engaged in non-factory handicrafts and trades (under a law of 1883) and in mining (under a law of 1896), there are a certain number of trade unions in Austria, though freedom of combined action among workmen is less complete than in many other European countries. Such right of combina- tion as exists rests on the law of 1870, which removed the restric- tions imposed by the Penal Code on combinations for influencing the conditions of labour. The impulse given to the formation of unions by this law, and by the advantages gained for the work- men during the years of prosperous trade that immediately followed, received a severe check during the succeeding depres- sion of trade, when these advantages were mostly lost. Trade unionism did not revive until 1888, from which time the unions formed have mostly been on a Social Democratic basis, the majority being affiliated to a central organization in Vienna.

Since 1901 statistics relating to the trade unions of Austria have been published annually by the Central Trade Union Commission (Gewerkschafts-Kommission) at Vienna. In 1907 there were 5156 trade unions in particular trades, with a membership of 501,094, affiliated to the Social Democratic trade unions (Gewerkschaften). Of the total number of unions, 49 were central unions, 77 were district unions and 5030 were local unions. Of the total number of members 454,693 were males and 46,401 were females. The greatest member- ship, 84,085 in 1907, is shown to have been in the metal engineering and shipbuilding group of industries, the building trades coming next with 68,543 members. The transport trades showed a_ member- ship of 61,744, and the textile trades, 51,632. The chemical, glass and pottery trades included 54,469 members and the wood-working and furnishing group included 36,502 members. Food and tobacco trades accounted for 32,679, and mining and quarrying for 30,715 members.

The total receipts of the trade unions in 1907 amounted to £338,365 and the total expenditure to £2971,822, excluding receipts and ex- penditure for disputes. The expenditure on account of disputes, for which £136,822 was collected by special free organizations of the branch unions, amounted to £76,066 in 1907.

There are besides these unions a number of general unions not confined to one trade, and trade-clubs — educational associations discharging to a greater or less extent trade union functions. These associations have, however, been excluded from the statistics published by the Gewerkschafts Kommission as not being trade unions proper.

Hungary. — The trade union movement in Hungary is of very recent growth. The membership of unions affiliated to the Central Federation at the end of 1907 is, given in the VolkwirtschafUiche Mitteilungen aus Ungarn as 130,192, compared with 129,332 at the end of 1906. Independent local unions had a membership of 11,838 at the end of 1967. The largest groups of organized workers are in the building trade (35,630), metal workers (27,732), railway employees (17,192) and wood-workers (14,665).

Italy. — The Bolletino of the bureau of labour for August 1908 states that the membership of trade unions at the beginning of 1908 numbered 191,599 (in 2550 local unions). Included in the

membership of 1908 are 48,877 building trades workers, 40,000 railway employes and 17,110 metal-trade workers. The agricul- tural labourers' trade unions were stated to have a membership of 4 2 5;983 at the beginning of 1908 as compared with 273,698 at the beginning of 1907.

Denmark. — In 1907 there were 99,052 members of I249 trade unions in Denmark, and of these 78,081 were in unions affiliated to the National Federation. The largest unions in the Federation are those of the general labourers with 22,660 members; black- smiths and machinists with 8000 members; masons, 5300 members; railway employes, 4990 members; carpenters, 3855

members ; textile workers, 3700 members; and cabinet-makers, 3590 members.

Sweden. — In Sweden there were, in 1906, 126,272 members of 1596 trade unions, and of these 30,645 were factory workers (trades not specified), 24,485 were in unions connected with the metal trades, 10,706 were in the transport trades, 17,862 were in the wood- working trades, 7132 were in the food, &c, trades, 6602 were in the building trades, and 6005 were in the clothing trades.

Norway. — The trade union movement in Norway dates practically from 1884. At the end of 1906 there were 25,339 members of trade unions, as compared with 16,087 at the end of 1905. Of the member- ship in 1905, 5277 were iron and metal workers, 4910 journeymen (factory workers), and 11 17 printers.

Holland. — In 1893 a National Labour Secretariat was formed, to which, in 1899, 45 societies with 13,050 members were said to be affiliated. After a general strike in April 1903 the membership of trade unions in Holland decreased considerably, the Secretariat losing half its members and several trade unions dissolving. In 1906 it was stated in the International Report of the Trade Union Movement that a new national centre of unions had been formed with trade unions affiliated to it, having a membership of 26,227, while the old centre still continued with a membership of 5000. The Diamond Workers' Federation, with a membership of over 8000, was affiliated with the new national centre.

The total number of members of trade unions at the end of 1906 is given as 128,845, 33.125 °f these belonging to Christian organiza- tions, while 95,720 belonged to other organizations.

Belgium. — The status of trade unions in Belgium is regulated by the law of 1898, under which they can be incorporated, provided that their objects are non-political and are confined to the further- ance of the interests of particular trades. Belgian trade unions, nevertheless, are mostly political in character, the majority being connected either with the Socialist-Labour, Catholic or Liberal parties. The membership of the Socialist-Labour group of unions in 1905 was 94,151, of the Catholic unions 17,814, of the free trade unions 34,833 and of the Liberal unions 1685, making a grand total of 148,483.

Of the 94,000 members of the Socialist-Labour unions, 60,000 are employed in mining, 11,500 in the textile industry and 7800 in the metal industry. Of the 17,800 in the Catholic trade unions, 5300 are in the textile trades, and 3200 in the building trades. Of the 35,000 in the free trade unions, I 1,000 are in the textile industry, 6000 in the glass industry, 3600 in the applied art trades and 3300 in the printing and bookbinding trades.

Several organizations, e.g. the diamond workers, the printers' federation of Brussels, &c, are affiliated with the trade union com- mittee without, however, joining the political organization. The Catholic and Liberal associations also do not affiliate with the other organizations.

British Dominions and Colonies. — Trade unionism has only developed to any considerable extent in a few of the industrial centres of the self-governing dominions. A great number of the unions in Canada are branches of organizations having their head- quarters in the United States or in England. In July 1907 the Canadian Labour Gazette stated that of the 1593 local trade unions known to be in existence, 1346 were affiliated with central organizations of an international character. Besides these 1593 local trade unions, there were 8 congresses and national associa- tions of labour, 49 trade and labour councils and 31 federations of trade unions known to be in existence.

Between 1876 and 1890 all the principal Australian states passed statutes more or less resembling the Trade Union Acts of the United Kingdom. A similar law was passed in New Zealand in 1878, but in this dominion and in some of the Australian states trade unions can now become incorporated and acquire a special legal status by registration as industrial unions under the laws relating to industrial conciliation and arbitration. In New Zealand there were, in 1906, 261 unions of workers with a member- ship of 29,869 and 133 unions of employers with a membership of 3276. In the years immediately preceding 1890 certain Australian unions, especially among the shearers and the seamen and wharf labourers, acquired great strength, and their determined attempts to secure a monopoly of employment for members of

their organizations led to prolonged labour disputes in 1890 and 1 89 1 (see Strikes and Lock-Outs), which resulted in the defeat of the unions and a consequent diminution of their membership and influence. More recently the unions have revived. They are

encouraged by the laws relating to arbitration and concilia- tion, which (inter alia) permit preference for employment to be awarded to members of trade unions in certain circumstances.

Authorities. — For statistics of recent progress of trade unions, see reports on trade unions published by the board of trade (from 1887 onwards). Much information respecting trade unions is contained in the reports of the royal commission on trade unions (1867) and of the royal commission on labour (1891-1894). See also report of royal commission on trade disputes and trade combinations (1903-1906). The reports of the chief registrar of friendly societies give information with regard to trade unions registered under the Trade Union Acts. On the history and con- stitution of trade unions the fullest information is given in Webb's History of Trade Unionism and Industrial Democracy, both of which contain valuable bibliographical appendices which may be consulted as regards other sources of information respecting British trade unions. On trade unions abroad (besides the reports on foreign countries and the colonies of the royal commission on labour), see Kulemann's Die Gewerkschaftsbewegung (Jena, 1900), dealing with trade unions in all countries, and the board of trade " Abstract of Foreign Labour Statistics " and Labour Gazette, both of which give numerous references to the foreign official sources of information on trade unions, together with a summary of the statistics which they contain.

III. — Economic Effects of Trade Unionism There is no general consensus of opinion as to the extent to which trade unions can attain success in achieving the objects which they set before themselves, or as to how far their action is beneficial or otherwise to the general community. One of the principal objects of trade unions being to maintain and increase the rates of wages paid to their members, the first question would be practically solved if statistical evidence were available to connect the course of wages with the action of combinations. Such evidence, however, is inconclusive. The period of growth of trade unionism in Great Britain has certainly been on the whole a period of rising wages. But many other causes tending to raise wages have been operative over the same period, and some of the facts might be explained as much by the tendency of rising wages to strengthen combinations as by that of combinations to raise wages.

Again, the observed fact that the rise has not been confined to

industries in which organizations are strong might be explained either by the supposition that the rise brought about by trade unions has benefited a wider circle than their membership, or that the rise both within and outside the ranks of trade unions is due to causes other than their action. Perhaps the strongest statistical evidence of the power of trade unions to affect wages in particular districts is afforded by the local differences of wages in the same trade, which, it is contended, cannot be wholly explained by local differences of cost of living or industrial conditions, but which often correspond closely to differences of strength of trade union organization. This argument, however, does not touch the question of the effect of combination on the general level of wages.

Hardly more conclusive than the reasoning founded on statistics have been the attempts to solve the question by pure economic theory. During the prevalence of the old view of wages known as the " wage-fund " theory, combinations were usually held to be powerless to affect the general rate of wages, because they could not alter the proportion between capital and popula- tion, on which wages were thought to depend. The question however, was reopened by the change in theory which led econo- mists to regard wages as depending primarily on the productivity of industry, and secondarily (and within comparatively narrow limits) oh the relative power of bargaining as between the labourers or groups of labourers and the organizers of labour. According to this view, the effect of combinations on the rate of wages will ultimately depend, so far as the first and most important factor in the problem is concerned, on their effect on the general pro- ductiveness of industry. Prima facie, we might expect that trade unionism would, on the whole, restrict productiveness, and this

is undoubtedly a view widely held among employers. Strictly professional associations tend generally to become conservative so far as methods of work are concerned; and even trade unions which may not " officially " oppose the introduction of new pro- cesses and the use of machinery may nevertheless serve to focus and make effective the hostility felt by the artisan . towards

methods of business organization which seem to him likely to decrease the demand for his services or to alter the conditions of work to his detriment. In some trades also trade unions are charged with encouraging or permitting their members to restrict the amount of work performed by them in a given time, with the short-sighted object of making more work for others. Many unions have attempted also with varying degrees of success to keep up the value of their labour by creating an artificial scarcity by restricting the numbers entering the trade, and have in various ways sought to control the management of business to a degree which must restrict the freedom of experiment on which the attainment of the maximum productiveness of industry must depend. By the resort to strikes— an essentially wasteful method of settling differences with employers — they have also to some extent restricted production, though the loss directly due to this cause is often exaggerated (see Strikes and Lock-Outs). Moreover, by their insistence on the payment to all workmen of a fixed " minimum " wage they have diminished the field for the profitable employment of the old and less capable, and may to some extent have discouraged the expert workman from earning and receiving the full reward of his extra ability.

On the other hand, it is claimed that trade unions have in many cases acted in the interests of industrial peace by restrain- ing their members from ill-considered strikes, and that, by provid- ing a recognized channel through which the workmen's grievances may find expression, they have often assisted in adjusting differences which would otherwise have led to the interruption of production. In particular they have frequently formed a convenient basis on which to build a system of conciliation or arbitration boards by which strikes are prevented (see Arbitra- tion). It is also claimed that by protecting the "standard of life" of their members through the policy of securing a " minimum " rate of wages, trade unions may tend in the long run to build up a physically and industrially superior class of workmen, and thus ultimately increase the efficiency of industry.

The comparative weight of the above considerations differs according to the point of view from which the question is regarded. At any given time an individual employer may tend to feel most strongly the disadvantages of the restrictions under which he is placed by the action of a particular trade union, and may attach but little importance to the general effects, in the long run, on the national output of the pressure which such combinations exercise — which from the point of view of the

general well-being of the community is by far the most important consideration. Generally speaking, any action of trade unions tending to diminish the efficiency and industry of the individual workman is as injurious to the com- munity as to the individual employer, except in so far as such restriction may conceivably affect the health of the working community from over-strain. But the policy of " levelling up " the standard rate of wages, which may mean loss or ruin to a particular employer, may nevertheless act quite otherwise with respect to the national well-being, in so far as it tends to eliminate the " unfit" employer and to concentrate the industry in the hands of the more capable and more enterprising of the employ- ing class, and in the localities most suited for the purpose. The pressure of rising wages has undoubtedly acted as a stimulus to the invention of labour-saving devices and the adoption of economical methods, as is shown in America, where the highest wages are often seen concurrently with the lowest labour cost. Advocates of trade unionism sometimes lay much stress on this aspect of their operation. On the other hand, it must not be forgotten that competition, both as between different grades of employing ability and of local advantages, is now international, and that the concentration of an industry in the most suitable

localities and in the hands of the most capable organizers, which is claimed as a beneficial result of trade union action, may for any particular country mean the transference of the industry abroad; and this transference, especially in the case of indus- tries dependent on export to neutral markets, may involve a considerable national loss.

Apart from the effect of trade unions on the total amount of the " national dividend," their supporters claim that they are able to alter the mode of distribution of this dividend. It is not usually claimed that they are able to affect the proportion of the total product which is paid as rent or interest for the use of the instruments of production, but that they can alter the pro- portions in which the residue is shared between the organizers of labour and the manual labouring class, to the advantage of the latter. The methods by which trade unions seek to achieve this result require separate examination.

The first group of methods are those which aim at creating a scarcity of some particular kind of labour so as to alter the relation of demand and supply. The particular methods em- ployed for this purpose have been already sufficiently described.

With regard to all of them it may be remarked that they are ineffective as regards the raising of the general rate of wages throughout the country (i.e. the average income per head of the manual labour classes), seeing that an artificial scarcity of one sort of labour implies a redundancy of some other kind. As regards the rate of wages in particular occupations there is no doubt but that at least for a time such methods may cause a considerable rise of wages, only limited at first by the imperfection of the control exercised by the union over the number competing in the labour market and by the extent to which the rise in the cost of production so caused is checked by the competition of goods imported from abroad, or of alternative commodities, or by the loss of foreign markets, or the diminution of home demand. But as time goes on other forces of a more subtle kind tend to come into play which further limit the power of the combination to keep up wages through restricting the supply of labour. Besides the substitution of alternative com- modities, alternative processes of production may be invented, diminishing the demand for the services of the members of the exclusive trade union, while the artificial rise of wages is also likely to attract labour into the trade.

Generally speaking, it may be said that while the artificial restriction of the supply of workmen in a trade may raise wages for a time, it calls into play forces tending to restore the equilibrium of demand and supply by diminishing demand, and that these forces grow progressively stronger as time goes on, while the restrictive capacity of the combination usually tends to diminish. This is apart from the fact that restriction of the supply of labour entering a trade almost always involves the narrowing of the field of ability from which the trade can be recruited, and thus a lowering of the general standard of efficiency.

The other group of trade union methods which requires examination is that which aims at strengthening the economic position of the labourer by substituting collective for individual negotiations as regards wages, supported by a common reserve fund out of which the labourer may be maintained while waiting for his terms to be accepted. Undoubtedly these methods of mutual insurance and collective bargaining afford a powerful instrument for preventing " sweating " and for enabling the whole body of workmen to exact at the earliest moment and retain to the latest moment the full amount of the wages which a given state of trade and prices will enable the industry to support. The establishment of general working rules and standards of time or piece

wages throughout a trade or district may also serve to protect the better and more capable employers against their more inefficient or unscrupulous competitors, and thus tend towards the survival of the " fittest" among the employing class. It is always to be remembered that the effect of collective bargaining is not in the long run one-sided. Combinations of workmen beget counter-combinations of employers, and the conditions of important industries tend to be settled more and more by " treaties " concluded between powerful bodies of employers and employed.

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TRADE UNIONS

[UNITED STATES

Were the combinations on both sides which enter into these agreements conterminous with the entire trades which they represent, and especially if the trades were protected from foreign competition, the interests of the general unorganized mass of consumers might conceivably suffer from these agreements.

As regards the future prospects of trade unions in Great Britain it is difficult to prophesy. The hopes of those who look for a universal expansion of these organizations so as to include the whole or the majority of the members of the manual-labour classes are probably extravagant. Not less chimerical is the expectation of the opponents of trade unions that a few defeats at the hands of determined employers or employers' organizations will permanently cripple them and lead to their decay and extinc- tion. Probably for many years trade unions will include, as now, in their membership a powerful minority of the working classes, wielding an influence out of all proportion to their actual numbers. It is to be expected that experience and the spread of education may cause them gradually to abandon the rules and methods which interfere most with the economical application of labour and capital to industry.

Lastly, it may be pointed out that trade unionism has been the result of the growth of a class of manual workmen working for wages for employers who provide the materials and instru- ments of industry, and into whose ranks it is relatively difficult for the average workman to rise. It remains to be proved whether the class feeling which enables powerful trade unions to flourish can

permanently be fostered and maintained except among workmen who expect to remain workmen most of their lives. If these conditions should be materially altered, trade unionism in its present form must decay or undergo a profound alteration. (X.)

IV.— United States

Trade unions in the United States are best treated from the broad standpoint of labour organizations generally, i.e. associa- tions of wage-earners having for their general ‘purpose the improvement of their members, either through a lessened working day, increased wages, or more satisfactory rules and conditions of employment. They may or may not admit employers, but as a rule they do not admit them. Sometimes they are formed for a specific purpose, like the Eight-Hours League, but generally they have platforms comprehending all the demands which labour Labour usually makes. Labour organizations in the United Orgaaiza” States cannot be given a definite birthday. Prior to tktaa. x g 2 j there were very few of them. In colonial days

we have hints of their existence, but their purpose was partly political, and their membership often consisted of politicians. The purpose of the Caulkers’ Club, in the early days of Massa- chusetts, was ” to lay plans for introducing certain persons into places of trust and power.” Tradition has it that the word ” caucus ” was derived from this club. It is also said that Samuel Adams’s father, as early as 1724, was active in the club’s work. Thefe was probably a union of journeymen bakers in the city of New York in 1741 and of shoemakers in Philadelphia in 1792. The shipwrights of New York City were incorporated on the 3rd of April 1803, and the tailors and carpenters of that city were organized in 1806. The New York Typographical Society was in existence in 181 7, and was probably organized in the early years of the 19th century. Peter Force was its president for a time, and Thurlow Weed was a member. A strike occurred in Mr Weed’s office in 1821 on account of the employment of a non-union man, who was then designated a ” rat.” In 1823 was organized the Columbian Charitable Society of Shipwrights and Caulkers of Boston and Charlestown.

The period from 1825 to i860 may be called the formative period. About 18ˆ5, and for some years afterwards, there was a general discussion of socialistic theories, growing out Period. ˚f R˚b ert Owen’s experiments at New Lanark, in Scotland, and out of his communistic attempt at New Harmony, Indiana, in 1825. The

wave of philosophic transcen- dentalism also, which swept over the country between 1825 and 1840, affected not only social but industrial life. Labour papers began to be established. The Working Man's Advocate, published

in New York City in 1 82 5, was probably the very first American labour journal. Soon afterwards there appeared the Daily Sentinel and Young America, projected by two Englishmen, George Henry Evans and Frederick W. Evans. The chief demands advocated by these journals were the freedom of public lands, the breaking up of monopolies, the adoption of a general bankruptcy law, a lien for the labourer upon his work for his wages, the abolition of imprisonment for debt, equal rights for women with men, and the abolition of chattel and wage slavery. These demands were endorsed by over 600 newspapers. In 1830 a Working-man's Convention was held in Syracuse, New York, the outcome of which was the nomination of Ezekiel Williams for governor. In 1832 a delegated convention which met in the state house at Boston initiated the 10-hours movement. The Tribune (New York), under the leadership of Horace Greeley, was opened to the advocacy of Fourierism, and so on all hands the movement towards organization was helped. In 1845 the New England Working Man's Association was organized, and such men as Charles A. Dana, George Ripley, Albert Brisbane, Wendell Phillips, William Lloyd Garrison, Theodore Parker, and others participated in its meetings. The first industrial congress of the United States was convened in the city of New York on the 12th of October 1845, but little came of it. Other and more important labour congresses were held in that city and in Chicago in 1847 and 1850 respectively. During the latter part of the formative period, that is, from 1825 to i860, most of the great national trade unions that are now influential were projected and organized, though their great and rapid growth has been since the Civil War. The National Typographical Union was organized in 1852, its name being changed to International in 1862 in order to admit Canadian members; the National Union of Hat Finishers in 1854; the Iron Moulders' Union of North America on the 5th of July 1859; and in the same year the Machinists' and Blacksmiths' Union of North America. By i860 the national unions already formed numbered 26.

During the next few years, among other important organizations, were instituted what are known as the group of railway brotherhoods, the oldest and largest of which is the Hallway International Brotherhood of Locomotive Engineers. Brother- The

grand division was founded at Detroit, Michigan, hoods. on the 17th of August 1863, under the name of the Brotherhood of the Footboard. The society was reorganized under its present title at Indianapolis, Ind., on the 17th of August 1864. The second national association of railway employes that was organized was the Conductors' Brotherhood, formed at Mendota, Illinois, on the 6th of July 1868, by the conductors from various railways in the United States. This brotherhood was recognized, and a general governing board established, on the 1 5th of December of the same year. Ten years later the name of the organization was changed from the Conductors' Brotherhood to the Order of Railroad Conductors of America. The Brotherhood of Locomotive Firemen was organized at Port Jervis, N.Y., on the 1st of December 187/3. The Brotherhood of Railroad Trainmen was organized at Oneonta, N.Y., on the 23rd of September 1883. It was called the Brotherhood of Railroad Brakemen until the 1st of January 1890, when the present name was adopted. The Brotherhood of Railroad Trackmen is one of the younger and smaller organizations. The first efforts to found it were made in the spring of 1887, but its permanent organization took place a year later. The Brotherhood of Railroad Carmen of America was founded on the gth of September 1890, by the consolidation of the Carmen's Mutual Aid Association, the Brotherhood of Railroad Car Repairers, the Car Inspectors, Repairers and Oilers' Protective Association and the Brotherhood of Railroad Carmen of Canada. The Switchmen's Union of North America is the outgrowth of the Switchmen's Mutual Aid Association, the present organization dating from 1897. Several of these railway brotherhoods suffered materially in their membership and influence through the organization of the American Railway Union in 1893.

The Cigar-Makers' National Union dates from 1864, the Bricklayers' and Masons' International Union from the 17th of

October 1865, the United States Wool Hat Finishers' Association from 1869 and the National Union of Horseshoers of the United States from 1875. The Amalgamated Association of Iron and Steel Workers resulted, as its name signifies, from the consolida- tion

of various other orders and societies, the present order being organized at Pittsburg in August 1876. The consolidated societies were known previously to the new order linioa" 1 of things as the United Sons of Vulcan, the Associated Brotherhood of Iron and Steel Heaters, Rollers and Roughers of the United- States, and the Iron and Steel Roll Hands' Union. The oldest was the United Sons of Vulcan, originating in Pittsburg on the 1 7th of April 1858, and afterwards called the Iron City Forge. The organization is now known as the Amalgamated Association of Iron, Steel and Tin Workers. The Granite Cutters' National Union was organized in 1877, the Brotherhood of Carpenters and Joiners in 1881 and the Journey- men Bakers' National Union in 1886.

There have also been attempts to organize labour on a general or universal plan. The first of these was the Inter- national Association of Working-men, known as the " Inter- national," which was organized in London in the autumn of 1864. This society sought to associate working-men wherever manufacturing has been extended. The International grew for a while, but never at any time had a member- The later- s yp exceec j m g IO o,ooo and probably never over 50,000. It did not extend to the United States with much force; certainly no large number of the working-men of the country were involved in it, and branches were not organized in the union until 1870 or 1871.

The second attempt was the Noble Order of Knights of Labour of America, which was founded in Philadelphia on Thanks- giving Day 1869, through the efforts of Uriah S. Labour ° f Stephens and six associates, all garment-cutters. For several years the garment-cutters of Philadelphia had been organized as a trade union, but failed to maintain satisfactory rates of wages. Dissatisfaction prevailed, and resulted in the autumn of 1869 in the disbandment of the union. Stephens, who was a far-seeing man, and anticipated the dis- ruption of his union, had prepared the outlines of a plan for an organization embracing, as he said, " all branches of honourable toil." He advocated education, co-operation and an intelligent use of the ballot as the proper means for gradually abolishing the present wage-system. The order had a varied career. Mr Stephens, himself a Mason, brought into the ritual of the new order many of the features of speculative Masonry. The obligations were in the nature of oaths, taken with much solemnity upon the Bible, and the members were sworn to the strictest secrecy. The order was known for a long time as " Five Stars," that designation being used in printing and writing.

Many expressions taken from Greek literature were introduced into the ceremonies. The instructions given to every person admitted into the order are perhaps the best exponent of the nature of the ritual: —

Labour is noble and holy. To defend it from degradation; to divest it of the evils to body, mind and estate which ignorance and greed have imposed ; to rescue the toiler from the grasp of the selfish — is a work worthy of the noblest and best of our race. In all the multifarious branches of trade capital has its combinations; and, whether intended or not, they crush the manly hopes of labour and trample poor humanity in the dust. We mean no conflict with legitimate enterprise, no antagonism to necessary capital, but men, in their haste and greed, blinded bv self-interests, overlook the interests of others and sometimes violate the rights of those they deem helpless. We mean to uphold the dignity of labour, to affirm the nobility of all who earn their bread by the sweat of their brows. We mean to create a healthy public opinion on the subject of labour (the only creator of values), and the justice of its receiving a full, just share of the values or capital it has created. We shall, with all our strength, support laws made to harmonize the interests of labour and capital, and also those laws which tend to lighten the exhaustiveness of toil. To pause in his toil, to devote to his own interests [sir] , to gather a knowledge of the world's commerce, to unite, combine and co-operate in the great army of peace and industry, to nourish and cherish, huilrl and drvelop, the temple he lives in. is the highest and noblest duly of man to himself, to his fellow men and to his Creator.

The ritual was neither printed nor written, and in all probability there is not now in existence a copy of it. So long as the utmost secrecy was retained the order did not grow rapidly; gradually it lost its secrecy and worked on more general plans. From the best evidence that can be secured it is probable that the first local assembly of the Knights of Labour was organized as early as 1873 in Philadelphia. Attempts at outside organiza- tion had been unsuccessful. The second assembly consisted of ship carpenters and caulkers employed in Cramp's shipyard. After this the order spread quite rapidly, 20 assemblies being organized in Philadelphia during 1873. A district assembly, consisting of delegates from local assemblies in Philadelphia, met in that city on Christmas Day 1873 and organized District Assembly No. 1. The order increased during the years follow- ing this action, and in 1877 delegates were chosen to organize a general assembly.

These delegates met at Reading, Pennsylvania, on the 1st of January 1878, and organized the first general assembly, Mr Stephens, the founder, presiding as temporary chairman. Seven states were represented. General assemblies have been held each year since that time, and changes in the constitution or work of the order have been the subject of warm discussion. At the meeting of the first general assembly the membership must have been small, probably only a few thousand. It did not reach 50,000 till five years later. The general assembly of 1880, at Pittsburg, denounced strikes as injurious and not worthy of support except in extreme cases. At the fifth session, at Detroit, in 1881, the most important actions in the history of the order were taken, and from this session the rapid growth of the order may be dated. The assembly then declared that on and after the 1st of January 1882 the name and objects of the order should be made public. It also declared that women should be admitted upon an equal footing with men, and a strong committee was appointed to revise the constitution and the ritual. At the next general assembly, September 1882, in New York, the revised constitu- tion was adopted, as well as laws and regulations for support- ing strikes. After this the order began to grow rapidly. It antagonized the trade unions, the contention being that the order embraced higher and grander principles than those underlying the organization of the former. The trade unions in existence at that time struggled to preserve their organiza- tions against what they considered the encroachment of the Knights of Labour. The high-water mark of the order was probably during 1883, 1884, 1885 and 1886, when, accord- ing to the very best information, it numbered not less than 1,000,000 members. In 1900 its membership was estimated at about 130,000.

The order of the Knights of Labour is based on the federal plan, and has a hierarchy of assemblies — the local assembly, the district assembly, the state and the general assembly. The _ . officers of the local assembly consist of a master tˆ” Z ”’ workman, worthy foreman, venerable sage, recording secretary, financial secretary, treasurer, worthy inspector, almoner, statistician and some minor officers. These are elected semi-annually by ballot or by acclamation. The district assembly is composed of duly accredited delegates from at least five local assemblies, and is the highest tribunal of the Knights of Labour within its jurisdiction under the general laws of the order. It has the power to levy assessments for its maintenance upon all locals, and has also the power to establish locals in the territory

governed by it. The officers and their duties are similar to those of the local assembly, except that the master workman is called the district master workman. The constitution of the general assembly is a very imposing document, containing twenty articles. The assembly consists of representatives chosen by the district assemblies, and has full and final jurisdiction, being the highest tribunal of the order. It alone possesses the power and authority to make, amend or repeal the fundamental and general laws of the order, to decide finally all controversies arising, and to issue charters to state, district and local assemblies. The officers are elected at each annual session, and their titles correspond almost completely with those of the local and district assemblies, with the exception that the word ” general ” takes the place of ” dis- trict,” as ” general master workman,” &c. The general master workmen have been Uriah S. Stephens (the founder of the order), Terence V. Powderly, James R. Sovereign, John N. Parsons and Herirv A. Hicks. The order has a publication known as the Journal of the Knights of Labour, published at Washington, D.C.

The third attempt to bring into one order men employed in different vocations was the American Railway Union, American organized in Chicago on the 20th of June 1893. Railway It included all railway employes born of white Union. parents. It was organized for the protection of members in all matters relating to wages and their rights as employes, and affirmed that such employes were entitled to a voice in fixing wages and in determining conditions of employ- ment. The union won a great victory on the North-Western railway in April 1894, but its action in the great strikes in Chicago in 1894 cost it its life. Its membership reached at one time 150,000. The separate unions found that the co-operation of other unions was needed to perfect and extend their work, and attempts were made from time to time to organize a of Labour, federated body. The initial steps were taken in 1866, when the trades assemblies of New York City and Baltimore called a national labour congress, the 100 delegates sent by 60 secret and open organizations from different trade unions meeting on the 20th of August. In 1867 a second con- vention was called to meet in Chicago, the aim being

to form a Trades Union Congress like that existing in Great Britain. The National Labour Union held two conventions in 1868, the first in May and the other in September; it met again in Chicago in 1869, in Boston in 1870, in Philadelphia in 1871 and in Columbus, Ohio, in 1872. This closed the experience of the National Labour Union. During 1873, owing to the industrial depression, many of the trade unions were suspended. An industrial congress met in Rochester, N.Y., in April 1874, consisting of some of the leading trade unionists of the United States, and on the 14th of that month a convention was held representing the Sovereigns of Industry. The expectation was that the old National Labour Union should be taken up. The Industrial Brotherhood of the United States, another secret order, partaking largely of the character of the Knights of Labour, was represented in that convention. As might have been expected, the two ideas— that on which the Knights of Labour was organized and the trade union idea- — immediately became antagonistic, yet a platform containing most of the principles of the Knights of Labour was adopted. The movement ended with the Rochester meeting. The years 1875 and 1876 saw other attempts; but they were chiefly political in their character and the temporary orders then organized were disbanded. Be- tween 1876 and 1881 other attempts were made at federation. A call issued jointly by the Knights of Industry and a body known as the Amalgamated Labour Union, consisting of some dissatisfied members of the Knights of Labour, resulted in a convention held at Terre Haute, Ind., on the 2nd of August 1881. The chief purpose was to supplant the Knights of Labour by the creation of a new secret order. The membership of the convention, however, had trade union proclivities and did not believe in multiplying labour societies. The secret organization was not effected. Another convention was held in Pittsburg, on the 19th of November 1881, as the result of the following statement: — ■

We have numberless trades unions, trades assemblies or councils, Knights of Labour, and various other local, national and international labour unions, all engaged in the noble task of elevat- ing and improving the condition of the working classes. But great as has been the work done by these bodies, there is vastly more that can be done by a combination of all these organizations in a federa- tion of trades and labour unions.

It is claimed that the 107 delegates represented 262,000 workmen. Their deliberations resulted in the Federation of Organized Trades and Labour Unions of the United States and

Canada. Its platform differed but very little from that of the Knights of Labour, although it was in some respects more comprehensive. It demanded eight hours as a day's work; called for national and state incorporation of trade unions; favoured obligatory education of all children, and the prohibition of their employ- ment under (he age of fourteen; favoured the enactment of uniform apprentice laws; opposed bitterly all contract convict labour and the truck system for payment of wages; demanded

laws giving to working men a first lien on property upon which their labour had been expended; insisted upon the abrogation of all so-called conspiracy laws; advocated the establishment of a national bureau of labour statistics; urged the prohibition of the importation of foreign labour; opposed government contracts on public work; favoured the adoption by states of an employers' liability act; and urged all other labour bodies to vote only for labour legislators. The second convention was held at Cleveland, O., on the 21st of November 1882.

The American Federation of Labour is the largest labour organization in the United States. It was organized at Columbus, O., on the 8th of December 1886, under the name it now bears. In 1888 it was declared that it owed its existence to the Federa- tion of Organized Trades. &c, founded in 1881 at Pittsburg, and that the American Federation meetings or conventions should date from that year; hence it is generally stated that the Federation was founded in 1881. From the start in 1881 the Federation had a constitution, but it revised it at the convention held in Baltimore on the 16th of December 1887, under the name of the American Federation of Labour. The order is not secret, nor do individual members, through local trades unions or otherwise, owe any allegiance to it. Its object is the. encourage- ment and formation of local trades and labour unions and the closer federation of such societies through the organization of central trades and labour unions in every state, and the combination of such bodies into state, territorial or provincial organizations for the purpose of securing general harmony not only in the interests of the working masses, but of legislation. While it is a federation, it cannot be called a federal body, like the Knights of Labour, although there are local trade unions, trade assemblies in cities and state federations; nevertheless, there is not the hierarchical character of the other body. Most of the trade unions in the United States are affiliated with the American Federation. The great railway brotherhoods are not so affiliated, except the Amalgamated Association of Rail- road Employes of America, the

Order of Railroad Telegraphers and the Brotherhood of Railroad Trackmen.

The federation has affiliated with it 117 international unions, 37 state federations, 574 city central bodies and 661 local trade and federal labour unions. The international unions are made up of approximately 28,500 local unions. The average membership on which dues have been paid was 264,825 in 1897, and ten years later the number was 1,538,970.

The chief officers of the federation are a president, first, second, third, fourth, fifth and sixth vice-presidents, treasurer and secretary. Samuel Gompers of New York was the first president, holding that position till 1894, when he was defeated through the endeavours of the Socialist Labour Party, and John M'Bride elected. At the next session, however, he was re-elected. The numerical strength of the American Federation of Labour is probably not far from 1,600,000. It maintains a journal called the American Federotionisl, published at Washington, D.C. The doctrine of the federation relative to strikes is that each affiliated society has its own government, distinct from the government of the national con- vention, which has no power to order strikes, such matters being left to the affiliated societies, but is advisory and not conclusive in its action.

Unions are often organized for temporary purposes, their existence ceasing as soon as the purposes succeed or fail. The total number of members of all kinds of labour organizations cannot be stated. There are many strength. local societies and associations other than those belonging to the Knights of Labour or those affiliated with the American Federation of Labour, but which are distinctly labour bodies. According to the best possible classification there are 20,000,000 wage-earners in the United States, including men, women and children. The most liberal estimate of the membership of all labour organizations places the total at 2,000,000. This would be about 10% of the whole body of wage-workers; but in some occupations, like that of the printing trade, the organization probably includes from 75 to 90%.

The law relating to trade unions varies somewhat in the different states. Both the federal legislature and several of the st.-ites (Massachusetts, New York, Pennsylvania, Michigan, Maryland, Iowa, Kansas and Louisiana) have passed laws permitting the incorporation of unions. Michigan, Wyoming

and Nebraska have specially provided for incorporating assemblies of the Knights of Labour. Hardly any advantage, however, has been taken of these statutes. Some states have passed laws excepting trade unions from restrictions on combinations and conspiracies imposed by other statutes or the common law (e.g. New York), and especially from the operation of anti-trust laws (Michigan, Wisconsin, Nebraska, Montana, North Carolina and Texas). The Texas law, however, has been held unconstitutional. A number of states have passed laws, some of doubtful validity, prohibiting employers from making it a condition of employment that labourers should not belong to a union. Most states have adopted statutes legalizing union labels to indicate the products of members of trade unions

By act of Congress, associations of the nature of labour organizations, having branches in several states or territories, may, on filing articles of association for record in Washington, become corporations. American legislation generally is friendly to trade unions. Their purposes are regarded as lawful by the courts, but if they use unlawful means for their accomplishments, a remedy will be applied. Injury to property, intimidation by threats, personal violence, or boycotts enforced by terrorism, are such unlawful means. The liberty of action thus secured to organizations of labour is equally the right of the employer. Therefore, a statute making it an offence for one to require those whom he employs to withdraw from a trade union is unconstitutional and void (see Reports of American Bar Association, xxi. 367, 372). The courts recognize that membership in trade unions is a species of property, of which no one can be deprived except through a formal procedure in conformity with the rules of the organization. Some of the states, notably New York, have a statute pro- hibiting trade unions from making any discrimination in con- nexion with their admission requirements on account of membership in the state militia or national guard.

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(New York, 1908) ; Aldrich, ” The American Federation of Labour,” Economic Studies (August 1898); Wright, Industrial Evolution of the United States (Meadville, Pa., 1895); “Historical Sketch of the Knights of Labour,” Quart. Journ. of Economics (January 1887); ” The Amalgamated Association of Iron and Steel Workers,” Quart. Journ. of Economics (July 1893 and November 1901); J. R. Commons, Trade Unionism and Labor Problems; Hollander and Barnett, Studies in American Trade Unionism; Barnett, A Trial Bibliography of American Trade Union Publications. (C. D. W.)

TRADE WINDS, the name given to the winds which blow from the tropical belts of high pressure towards the equatorial belt of low pressure, from the north-east in the northern hemi- sphere and from the south-east in the southern. They are exceedingly regular, especially over the oceans, where there is no disturbing influence from the great land masses. They receive their name from this feature, the term ” trade ” being used in the otherwise obsolete sense of ” direction ” or ” course ” (cf. ” tread “). The area of their greatest influence may be taken to extend from about 3° to 35° N., and from the equator to 28 S., though these belts are actually somewhat narrower at any given season, as the whole system of surface winds over the globe moves north and south following the sun. The westerly winds prevalent in the belts respectively north of the northern tropical belt of high pressure, and south of the southern, are sometimes known as anti-trades, their direction being opposite to that of the trade winds.

TRAFALGAR, BATTLE OF. The British victory over the French off Cape Trafalgar, fought on the 21st of October 1805, was a sequel of the breakdown of Napoleon’s great scheme for the invasion of the British Isles (See Napoleonic Campaigns: Naval). When Villeneuve gave up in despair the attempt to enter the Channel, he steered for Cadiz, and anchored in that port on the 20th of August 1805. He found three British ships of the line, under the command of Vice-Admiral Cuthbert Collingwood, on the watch. Collingwood, resolved that the

allies should not drive him through the Straits of Gibraltar without being compelled to follow, retired slowly, and at a short distance ahead of the ships sent to pursue him. They, not being willing to be drawn into the Mediterranean, gave up the pursuit. The British officer then resumed his watch off Cadiz. On the 22nd of August be was joined by Rear- Admiral Sir Richard Bickerton

with four ships of the line, and on the 30th by Vice-Admiral Sir Robert Calder with 18. The allied fleet, consisting of 29 sail of the line which had come with Villeneuve, and five already at Cadiz, 34 in all, remained quiescent. The use to be made of it, or the measures to be taken for its destrucl ion, were matters of urgent consideration to Napoleon and to the British government. On the 14th of September Napoleon gave orders that the French and Spanish ships at Cadiz should put to sea at the first favourable opportunity, join seven Spanish ships of the line then at Cartagena, go to Naples, and land the soldiers they carried to reinforce his troops then in that king- dom, and should fight a decisive action if they met a British fleet of inferior numbers. Two Spanish ships of the line were to be counted as equal to one French. Their final destination was to be Toulon. On the 15th he decided that Villeneuve, whose " excessive pusillanimity " rendered him incapable of vigorous action, must be replaced by Admiral Rosily. Rosily received his orders on the 17th and left for Cadiz. The British government, determined to confine the allies to Cadiz, or beat them if they came out, sent Nelson to take command and prepared to despatch reinforcements. Nelson left Portsmouth on the 15th of September, and reached Cadiz on the 28th, bringing three ships of the line with him. He gave orders that no salute should be fired for him lest the enemy should learn that reinforcements had arrived. The bulk of the fleet — 23 sail— -was kept well out at sea, and five ships of the line under Rear-Admiral Louis were appointed to cruise close to Cadiz as an inshore squadron. On the 5th of October Louis was sent ‘ to Gibraltar to renew his provisions and water, and the watch was left to two frigates. Between the 7th and the 13th of October Nelson was joined by six ships of the line, making a total of 34. But Admiral Calder, having been summoned home to stand a court-martial, took his flagship with him on the 14th, and on the 17th another line-of-battle ship had to be detached to renew her stores. As Admiral Louis could not return before the battle of the 21st, Nelson had at his disposal 27 ships of the line in all. Napoleon’s order of the 14th of September reached Villeneuve on the 28th. He learnt also that Rosily was coming, but not that he himself was to be superseded. On the 5th of October he held a council of war of French and Spanish officers. They decided that the condition of their ships did not justify them in hoping for victory over the British fleet, but Napoleon’s orders were peremptory, and they agreed that a sortie must be made. Easterly winds were needed to facilitate the sailing of a large and awkward fleet from Cadiz, and till the 14th the wind was hard

from the west. Even when it fell the allies lingered. On the 18th of October Villeneuve heard that Rosily had reached Madrid, and of his own supersession. Stung by the prospect of being disgraced before the fleet, he resolved to go to sea before his successor could reach Cadiz.

The allies, aided by a light land breeze which blew from the east, though the wind at Sea was westerly, began to leave Cadiz Bay on the 19th. Their movements were at once known to the British look-out frigates, and were transmitted by signal to Nelson, who was cruising some thirty miles to the west. During the period of blockade he had instructed his captains as to how he meant to fight the approaching battle. The memorandum in which his instructions were embodied was dated the 9th of October. It was drawn up in view of the circumstances which' did not arise — that the enemy would come to sea with a strong easterly wind which would give him the weather gage; that he might be reinforced to a strength of over 50 ships of the line from Brest, Rochefort and Cartagena; that the British fleet might be raised by reinforcements to 40 ships. But the governing principles of the memorandum were independent of such details. They were that the order of sailing in which the

fleet was when the enemy was seen was to be the order of battle; that no time was to be wasted in forming a precise line; that the attack was to be made in two bodies, of which one, to be led by the second in command, Collingwood, was to be thrown on the rear of the enemy, while the other, led by Nelson himself, was to take care that the centre and van should not come to the assistance of the ships cut off. Nelson was careful to point out that " Something must be left to chance. Nothing is sure in a sea fight beyond all others "; and he left his captains free from . all hampering rules by telling them that " No captain can do very wrong if he places his ship alongside that of the enemy." In short the execution was to be as circumstances should dictate, subject to the guiding rule that the enemy's rear was to be cut off and a. concentration of superior force on an inferior sought for.

The uncertainties of naval warfare in the days of sailing ships were fully shown at Trafalgar. The allies, having left Cadiz on the 20th of October, were 33 sail of the line strong, one of the fleet

having been left behind. They sailed in five squadrons. Three were nearer the land than the other two. The leading squadron of the three was commanded by the Spanish admiral, Alava; Villeneuve followed; and the French admiral, Dumanoir, commanded the rear. The other two squadrons of six ships of the line each, commanded by the Spanish admiral, Gravina, and the French admiral, Magon, were parallel with, and outside' of the three. All headed for the Straits of Gibraltar in the westerly breezes, which had become very light. The British fleet of 27 sail in two divisions also headed for the Mediterranean. During the night of the 2oth-2ist of October several movements were made to gain position, and there was an inevitable tendency to straggle among vessels which did not all sail equally well and were moving in light winds. On the early morning of the 21st the allies were some twelve miles off Cape Trafalgar. The British fleet was some ten or twelve miles out at sea to the west of them. Seeing that a battle would now be forced on him, Villeneuve ordered his whole fleet to turn so as to bring their heads on Cadiz. He was painfully aware that the incomparably more expert British fleet would not be content to attack him in the old-fashioned way, coming down in a parallel line and engaging from van to rear. He knew that they would endeavour to concentrate on a part of his line. But Villeneuve was too conscious of the inexperience of his officers and men to think it possible to make counter movements with them. It has been said that the French and Spanish ships which had taken part in the late cruise to the West Indies and back must be considered as trained in the same sense as the British. But apart from the fact that these vessels formed little more than a half of the allied fleet, the comparison is childish. It could only have occurred to writers who, wishing to exalt the glory of Trafalgar, forget that the superior quality of the British fleet, the fruit of foresight, of good sense, and the strenuous work of a people, was itself the best of all claims to honour. A hasty cruise across the Atlantic and back was no equivalent for years of training. The blockades maintained by the British fleet had made it difficult for the allies to obtain stores and their ships were ill fitted. Their crews contained a minute proportion of men bred to the sea, and as they had to be taught the elements of seamanship on the few occasions when they got to sea, their gunnery was neglected. There was valour in the allied fleet, but there was neither skill nor confidence. Moreover the very light wind then blowing rendered manoeuvring all but im- possible for the most expert crews. Villeneuve could do nothing more than order his fleet to turn so as to bring the ships' heads on Cadiz, to form the

line, and await the enemy's attack. He, however, left his captains free to act for the best when the battle had begun, by telling them that whoever was not under fire was not at his post. The movement of conversion ordered at 6 o'clock a.m. was not executed till about 10 o'clock, and it was ill done. The three squadrons nearest the shore turned first, the rear beginning, to leave room for the others. Thus Dumanoir now led the van and Alava followed Villeneuve.

The two squadrons of Gravina and Magon, which had been outside, fell in behind Alava. No accurate line was formed. The allies drifted rather than sailed into a curve of some five miles long, stretching from north to south, concave on the west side, and more pronounced at the southern than at the northern end. Their ships did not follow one another, but were in many cases two, and in some cases three, abreast in groups. To some extent this was to their advantage, as the effective range of fire of the artillery of the day was barely 1200 yds., and as the power of concentrating the fire of guns out of ports was limited, the danger to an assailant bearing down was not great during his approach. The peril was that he would be engaged with two or three enemies when he had broken into the line, and this risk was increased by the accidental group formation of the allies.

The confidence and promptitude of the British fleet presented, a marked contrast to the passivity of the allies. When in the early morning the enemy was seen to the east, Nelson's fleet was in two divisions, somewhat scattered — his own of 12 sail of the line being to the westward and windward in the light breeze from W.N.W.; Collingwood's of 15 sail being to leeward and east. At 6.40 the signal wag made to form the order of sailing and prepare for battle. The enemy's movement of conversion was already seen, and it was obvious that unless he were rapidly stopped he might reach Cadiz Bay in safety. A few minutes before 7 o'clock the signal to bear up, No. 76, was made by Nelson. Much discussion has arisen as to whether this was an order to bear up together, or in succession; the first if exactly executed would have caused the British ships to approach the enemy in a line abreast (side by side) since all would have turned at once; the second would have caused them to approach in a fine ahead (one after the other) since they would have turned successively. The discussion is in reality futile, because the want of wind rendered it impossible to arrange exact formations, because it had been decided that no time should be wasted in dressing the line, and because Nelson's flagship, the " Victory " (100), and

Collingwood's flagship, the "Royal Sovereign" (100), were quick-sailing vessels, and both admirals moved at the best attainable speed. The slow ships could not keep up with them. The two squadrons went down heading to north of east, Collingwood to the right and leeward, Nelson to the north and windward, in two bodies without exact formation, according to the speed of the ships. Collingwood headed for the centre, and the pronounced curve at the south end of the allied line caused the ships of his division to come into action in a close approach to a parallel with the enemy. The " Royal Sovereign " was the first British ship to break into the enemy's line, which she did about midday and astern of Alava's flagship the " Santa Ana." She was alone for a few minutes, but the ships of Collingwood's division, as they sailed into the curve, were mostly able, by steering lo the right, to get into action very soon after their admiral. Nelson's division was headed by himself to cut through the enemy between his van and centre, and to bar his road to Cadiz. It was certainly in a nearer approach to a line ahead than Collingwood's. After making a demonstra- tion at the allied van, he broke into their line astern of the " Bucentaure " (100), the flagship of Villeneuve.

The exact movements of all the ships engaged could only be given in a very detailed account of the battle, but the main lines of the action are already indicated. To the allies it appeared that the British fleet assailed them in two lines con- verging on their centre, and that it then carried out a concen- tration on this part of their line. Though this is too simple— or too bald — a statement of the case, it does not go far from the truth. The allied formation was broken in two, and though the rear part was kept well in play by Collingwood's division, the severest blows fell on the central sections.

The battle, which began at midday, was terminated about five. Eighteen of the allies were taken. Their van, after long remaining quiescent, made a futile demonstration, and then sailed away. The four van ships which escaped with

Admiral Dumanoir were met and captured off Cape Ortegal on the 4th of November by a British squadron of five ships under Sir Richard Strachan. The stormy weather which followed the battle gave the enemy an opportunity to retake some of the prizes, and

others were lost. Four only were carried into Gibraltar by the British fleet — three French and one Spanish. Only eleven of the allied fleet succeeded in finding safety in Cadiz. The fragment of the French squadron remained there under Admiral Rosily till he was forced to surrender to the Spaniards in 1808 on the breaking out of the Peninsular War. The loss of life of the allies cannot be stated with precision. In the British fleet the reported loss in killed and wounded was 1690, of whom 1452 belonged to 14 out of the 27 ships of the line present — the inequality of loss being mainly due to the fact that it was as a rule these vessels which came earliest into action. For the circumstances of Nelson's death see the article Nelson.

Authorities. — Accounts of the battle of Trafalgar are to be found in all the naval, and most of the general, histories of the time. The most essential of the original authorities are collected by Sir N. Harris Nicolas in his Despatches and Letters of Vice-Admiral Lord Viscount Nelson, vol. vii. (London 1844-1846). The controversy as to the exact method on which the battle was fought, and the significance of the signal to bear down, is fully worked out with many references to authorities in The Times from the 14th of July to the 2 1 st of October 1905, both in a general correspondence and in a series of articles on " Trafalgar and the Nelson Touch," 16th, 19th, 22nd, 26th, 28th and 30th of September 1905; see also J. S. Corbett, The Campaign of Trafalgar (1910). (D. H.)

TRAFFIC, properly the interchange or passing of goods or merchandise between persons, communities or countries, commerce or trade. The term in current usage is chiefly applied collectively to the goods, passengers, vehicles and vessels passing to and fro over the streets, roads, sea, rivers, canals, railways, &c.

The origin of the word is obscure. It occurs in Fr. trafique, and trafiquer, Ital. traffico, trafficare, Sp. trafago, trafagar. Du Cange (Gloss. Med. el Inf. Lot.) quotes the use of traffigare from a treaty between Milan and Venice of 1380, and gives other variants of the word in medieval Latin. There is a medieval Latin word transfeeator, an explorer, spy, investigator (see Du Cange, op. cit., s.v.) which occurs as early as 1243, and is stated to be from transfegare, a corruption of transfretare, to cross over the sea (trans, across, fretum, gulf, strait, channel). Diez (Etymologisches Worterbuch der romanischen Sprachen) connects the word with Port, trasfegar, to decant, which he traces to Late Lat. vicare, to

exchange, Lat. vicis, change, turn. A suggestion (Athenaeum, app. 7, 1900) has been made that it is to be referred to a late Hebrew corruption (traffik) of Gr. Tpoira'Uds, pertaining to a trophy, applied to a silver coin with the figure of victory upon it and termed in Latin victoriatus.

TRAHERNE, THOMAS (i637?i674), English writer, was, according to Anthony a Wood, a " shoemaker's son of Hereford." He entered Brasenose College, Oxford, in 1652, and after receiving his degree in 1656 took holy orders. In the following year he was appointed rector of Credenhill, near Hereford, and in 1661 received his M.A. degree. He found a good patron in Sir Orlando Bridgeman, lord keeper of the seals from 1667 to 1672. Traherne became his domestic chaplain and also " minister " of Teddington. He died at Bridgeman's house at Teddington on or about the 27th of September 1674. He led, we are told, a simple and devout life, and was well read in primitive antiquity and the fathers. His prose works are Roman Forgeries (1673), Christian Ethics (1675), and A Serious and Patheticall Contemplation of the Mercies of God (1699). His poems have a curious history. They were left in MS. and presumably passed with the rest of his library into the hands of his brother Philip. They then became appar ently the possession of the Skipps of Ledbury, Herefordshire. When the property of this family was dispersed in 1888 the value of the MSS. was unrecognised, for in 1896 or 1897 they were discovered by Mr W. T. Brooke on a street bookstall. Dr Grosart bought them, and proposed to include them in his edition of the works of Henry Vaughan, to whom he was disposed to assign them. He left this task uncompleted, and Mr Bertram Dobell, who eventually secured the MSS., was able to establish the authorship of Thomas Traherne. The

discovery included, beside the poems, four complete "Cen- turies of Meditation," short paragraphs embodying reflexions on religion and morals. Some of these, evidently autobio- graphical in character, describe a childhood from which the " glory and the dream " was slow to depart. Of the power of nature to inform the mind with beauty, and the ecstatic harmony of a child with the natural world, the earlier poems, which contain his best work, are full. In their manner, as in their matter, they remind the reader of Blake and Words- worth. Traherne has at his best an excellence all his own, but there can be no reasonable doubt that he was familiar both with the poems of Herbert and of Vaughan. The poems on childhood may well have been inspired by Vaughan's lines entitled The Retreat. His poetry is essentially

metaphysical and his workmanship is uneven, but the collection contains passages of great beauty.

See Bertram Dobell's editions of the Poetical Works (1906) and Centuries of Meditation (1908).

TRAILL, HENRY DUFF (1842-1900), British author and journalist, was born at Blackheath on the 14th of August 1842. He belonged to an old Caithness family, the Traills of Rattar, and his father, James Traill, was stipendiary magistrate of Greenwich and Woolwich. H. D. Traill was sent to the Merchant Taylors' School. He rose to be head of the school and obtained a scholarship at St John's College, Oxford. He was destined for the profession of medicine and took his degree in natural sciences in 1865, but then read for the bar, being called in 1869. In 187 1 he received an appointment in the education office which left him leisure to cultivate his gift for literature. In 1873 ne became a contributor to the Pall Mall Gazette, then under the editorship of Frederick Greenwood. He followed Greenwood to the St James's Gazette when in 1880 the Pall Mall Gazette took for a time the Liberal side, and he continued to contribute to that paper up to 1895. In the meantime he had also joined the staff of the Saturday Review, to which he sent; amongst other writings, weekly verses upon subjects of the hour. Some of the best of these he republished in 1882 in a volume called Recaptured Rhymes, and others in a later collection of Saturday Songs (1890). He was also a leader-writer on the Daily Tele- graph, and acted for a time as editor of the (Sunday) Observer. In 1897 he became first editor of Literature, when that weekly paper (afterwards sold and incorporated with the Academy) was established by the proprietors of The Times, and directed its fortunes until his death. Traill's long connexion with journalism must not obscure the fact that he was a man of letters rather than a journalist. He wrote best when he wrote with least sense of the burden of responsibility. His playful humour and his ready wit were only given full scope when he was writing to please himself. One of his most brilliant jeux d'espril was a pamphlet which was published without his name soon after he had begun to write for the newspapers. It was called The Israelitish Question and the Comments of the Canaan Journals thereon (1876). This told the story of the Exodus in articles which parodied very cleverly the style of all the leading journals of the day, and was at once recognized as the work of a born humorist. Traill sustained this reputation with The New Lucian, which appeared in 1884 (2nd ed., with several new dialogues, 1900) ; but for the rest his

labours were upon more serious lines. He directed the production of a vast work on Social England in 1893-1898; he wrote, for several series of biographies, studies of Coleridge (1884), Sterne (1882), Wil- liam III. (1888), Shaftesbury (1886), Strafford (1889), and Lord Salisbury (1891); he compiled a biography of Sir John Franklin, the Arctic explorer (1896); and after a visit to Egypt he pub- lished a volume on the country, and in 1897 appeared his book on Lord Cromer, the man who had done so much to bring it back to prosperity. Of these the literary studies are the best, for Traill possessed great critical insight. He published two collections of essays: Number Twenty (1892), and The New Fiction (1897). In 1865 his Glaucus; a tale of a Fish, was produced at the Olympic Theatre with Miss Nellie Farren in the part of Glaucus. In conjunction with Mr Robert Hichens

he wrote The Medicine Man, produced at the Lyceum in 1898. He died in London on the 21st of February 1900.

TRAIN (M. Eng. trayn or trayne, derived through Fr. from Late Lat. trahinare, to drag, draw, Lat. trahere, cf. trail, trace, ultimately from the same source) , a general term applied to that which is drawn or trailed behind or after anything else, the hind part or rear of anything. It is thus used of the portion of a skirt, robe or cloak which is lengthened behind so that when allowed to fall it trails along the ground. In ceremonial pro- cessions and other state functions the duty of keeping raised the train of the sovereign's robes, or of the robes of great officials and dignitaries, is assigned to pages or to official train-bearers. The length of the train which ladies must wear at royal courts, drawing-rooms or other state functions is fixed by regulations from the lord chamberlain's office. The chief specific uses of the term are for the trail of a gun, that portion of the carriage which rests upon the ground when it is unlimbered, the line of gunpowder or other combustible material which is used to ignite a charge of explosives, and, figuratively, to an ordered series or sequence of events, thoughts, &c. The most familiar application is to a number of carriages, wagons or trucks coupled together and drawn by a locomotive engine on a railway (see Railways). A special use of the verb " to train," in the sense of to educate, to instruct, to bring into fit and proper con- dition, mental, moral or physical, is developed, as in " educate " (Lat. educate, literally,

to draw out), from the sense of draw- ing or bringing out the good qualities aimed at in a course of instruction; a specific use is that of training for a race or other form of athletics, i.e. getting into fit physical condition.

TRAJAN [Marcus Ulpius Trajanus] (a. d. 53-117), Roman emperor, was born at Italica, in Spain, on the 18th of September 52 (or 53). The family to which he belonged was probably Italian and not Iberian by Wood. His father began as a common legionary soldier, and fought his way up to the consulship and the governorship of Asia. The younger Trajan was rigorously trained by him, and imbued with the same principles and tastes. He was a soldier born and bred. No better representative of the true old hardy Roman type, little softened by either luxury or education, had come to the head of affairs since the days of Marius. His training was almost exclusively military, but his experience as an officer gave him an acquaintance with almost every important province of the empire, which was of priceless value to him when he came to the throne. For ten years he held a commission as military tribune, which took him to many lands far asunder; then he filled important posts in Syria and Spain. By the year 89 he had achieved a considerable military reputation. At that time L. Antonius Saturninus headed a rebellion in Germany, which threatened seriously to bring Domitian's rule to an end. Trajan was ordered in hot haste from Further Spain to the Rhine. Although he carried his troops over that long and arduous march with almost unexampled " rapidity, he only arrived after the insurrection had been put down. But his promptitude raised him higher in the favour of Domitian, and he was advanced to the consulship in 91. Of the next five years of his life we know nothing definite. It is not unlikely that they were spent at Rome or in Italy in the fulfilment of some official duties. When the revolution of 96 came, and Nerva replaced the murdered Domitian, one of the most important posts in the empire, that of consular legate of Upper Germany, was conferred upon Trajan. An officer whose nature, as the event showed, was interpenetrated with the spirit of legality was a fitting servant of a revolution whose aim it was to substitute legality for personal caprice as the dominant principle of affairs. The short reign of Nerva really did start the empire on a new career, which lasted more than three- quarters of a century. But it also demonstrated how impossible it was for any one to govern at all who had no claim, either personal or inherited, to the respect of the legions. Nerva saw that if he could not find an Augustus to control the

army, the army would find another Domitian to trample the senate under foot. In his difficulties he took counsel with L. Licinius Sura,

a lifelong friend of Trajan, and on the 27th of October in the year 97 he ascended the Capitol and proclaimed that he adopted Trajan as his son. The senate confirmed the choice and acknowledged the emperor's adopted son as his successor. After a little hesitation Trajan accepted the position, which was marked by the titles of imperator, Caesar and Germanicus, and by the tribunician authority. He immediately proceeded to Lower Germany, to assure himself of the fidelity of the troops in that province, and while at Cologne he received news of Nerva's death (Jan. 25, 98). The authority of the new emperor was recognized at once all over the empire. The novel fact that a master of the Romans should have been born or. Spanish soil seems to have passed with little remark, and this absence of notice is significant. Trajan's first care as emperor was to write to the senate an assurance like that which had been given by Nerva, that he would neither kill nor degrade any senator. He ordered the establishment of a temple and cult in honour of his adoptive father, but he did not come to Rome. In his dealings with the mutinous praetorians the strength of the new emperor's hand was shown at once. He ordered a portion of the force to Germany. They did not venture to disobey, and were distributed among the legions there. Those who remained at Rome were easily overawed and reformed. It is still more surprising that the soldiers should have quietly submitted to a reduction in the amount of the donative or gift which it was customary for them to receive from a new emperor, though the civil population of the capital were paid their largess (congiarium) in full. By politic management Trajan was able to represent the diminution as a sort of discount for immediate payment, while the civilians had to v/ait a considerable time before their full due was handed to them.

The secret of Trajan's power lay in his close personal relations with the officers and men of the army and in the soldierly qualities which commanded their esteem. He possessed courage, justice and frankness. Having a good title to military distinction himself, he could afford, as the unwarlike emperors could not, to be generous to his officers. The common soldiers, on the other hand, were fascinated by his personal prowess and his camaraderie. His features were firm and clearly cut; his figure was tall and soldierly. His hair was already grey before he came

to the throne, though he was not more than forty-five years old. When on service he used the mean fare of the common private, dining on salt pork, cheese and sour wine. Nothing pleased him better than to take part with the centurion or the soldier in fencing or other military exercise, and he would applaud any shrewd blow which fell upon his own helmet. He loved to display his acquaintance with the career of dis- tinguished veterans, and to talk with them of their battles and their wounds. Probably he lost nothing of his popularity with the army by occasional indulgence in sensual pleasures. Yet every man felt and knew that no detail of military duty, how- ever minute, escaped the emperor's eye, and that any relaxation of discipline would be punished rigorously, yet with unwavering justice. Trajan emphasized at once his personal control and the constitutionality of his sway by bearing on his campaigns the actual title of " proconsul, " which no other emperor had done. All things considered, it is not surprising that he was able, without serious opposition from the army, entirely to remodel the military institutions of the empire, and to bring them into a shape from which there was comparatively lit tie departure so long as the army lasted. In disciplinary matters no emperor since Augustus had been able to keep so strong a control over the troops. Pliny rightly praises Trajan as the lawgiver and the founder of discipline, and Vegetius classes Augustus, Trajan and Hadrian together as restorers of the morale of the army. The confidence which existed between Trajan and his army finds expression in some of the coins of his reign.

For nearly two years after his election Trajan did not appear in Rome. He had decided already what the great task of his reign should be — the establishment of security upon the dangerous north-eastern frontier. Before visiting the capital

he determined to put affairs in train for the attainment of this object. He made a thorough inspection of the great lines of defence between the Danube and the Rhine, and framed and partly carried out a vast scheme for strengthening and securing them.

The policy of opposing uncivilized tribes by the construction of the limes, a raised embankment of earth or other material, inter-

sected here and there by fortifications, was not his invention, but it owed in great measure its development to him. It is probable that the northernmost part of the great limes Germaniae, from the Rhine at Rheinbrohl, nearly midway between Coblenz and Bonn, to a point on the Main east of Frankfort, where that river suddenly changes its course from north to west, was begun by Domitian. The extension of this great barrier southwards to the point at which it met the limes Raetiae was undertaken by Trajan, though we cannot say how far he carried the work, which was not entirely completed till long after his time. We may without hesitation follow the opinion of Mommsen, who maintains that the limes was not intended, like Hadrian's Wall between the Tyne and the Solway, and like the great wall of China, to oppose an absolute barrier against incursions from the outside. It was useful as marking definitely the boundary of the Roman sway, and as assuring the Romans that no inroad could be made without intelligence being had of it beforehand, while the limes itself and the system of roads behind it enabled troops to be directed rapidly to any threatened point, and the fortified positions could be held against large numbers till reinforcements arrived. Great importance was no doubt attached to the perfection of the lines of communication bearing on the limes. Among a people of roadmakers, Trajan was one of the greatest, and we have definite evidence from inscriptions that some of the military roads in this region were constructed by him. The more secure control which the Romans now maintained over the territory within the limes tended to its rapid civilization, and the Roman influence, if not the Roman arms, soon began to affect powerfully the regions beyond.

After his careful survey of the Rhine end of the frontier defences, Trajan proceeded to strengthen them in the direction of the Danube. From the age of Tiberius onwards the Romans possessed the whole southern bank of the river from its source to the Euxine. But the precarious tenure of their possession had been deeply impressed on them by the disasters and humiliations they had undergone in these districts during the reign of Domitian. A prince had arisen among the Dacians, Decebalus by name, worthy to be placed at the head of all the great barbarian antagonists of Rome. Like Maroboduus, he was able to combine the forces of tribes commonly hostile to each other, and his military ability almost went the length of genius. Domitian attacked him but was compelled to make an ignominious peace. He agreed to pay to Decebalus an annual subsidy, and to supply

him with engineers and craftsmen skilled in all kinds of construction, but particularly in the erection of fortifications and defensive works. During the nine or ten years which had elapsed since the conclusion of this remarkable treaty the Dacian prince had immensely strengthened the approaches to his kingdom from the Roman side. He had also equipped and drilled his formidable army after the Roman fashion. It was impossible for a soldier like Trajan to endure the conditions accepted by Domitian; but the conquest of Dacia had become one of the most formidable tasks that had ever confronted the empire. Trajan no doubt planned a war before he left the Danube for Rome late in 99.

The arrival of the emperor had been awaited in the capital with an impatience which is expressed by Pliny and by Martial. 1 As he entered the city and went on foot to the Capitol the plaudits of the people were unmistakably genuine. During his stay in the city he riveted more firmly still the affections both of the senate and of the people. The reconciliation of the empire with liberty, inaugurated, as Tacitus says, by Nerva, seemed now to be securely achieved. Trajan was absolutely open and simple, and lived with men at Rome as he had lived with his soldiers while on service. He realized the senate's ideal of the citizen ruler. The assurance that no senator should suffer was renewed by oath. All the old republican formalities were most punctiliously observed — even those attendant on the emperor's election to the consulate, so far as they did not involve a restoration of the old order of voting at the comitia. The veneration for republican tradition is curiously attested by the reproduction of many republican types of coin struck

1 It has been conjectured, not improbably, that the Germania of Tacitus, written at this period, had for one of its aims the enlighten- ment of the Romans concerning the formidable character of the Germans, so that they might at once bear more readily with the emperor's prolonged absence and be prepared for the necessity of decisive action on the frontier.

by senatorial officers. Trajan seized every opportunity for emphasizing his view that the princeps was merely the greatest of the magistrates, and so was not above but under the laws. He was determined, he said, to be to his subjects such a ruler as he had desired for himself when a subject. Real power and influence were accorded to the senate, which had now, by the incorporation of members whose origin was provincial, become in a manner representative of the whole empire. Trajan

associated with the senators on equal terms, and enjoyed in their company every kind of recreation. All pomp was dis- tasteful to him and discarded by him. There was practically no court, and no intrigues of any kind were possible. The approach to his house was free, and he loved to pass through the city unattended and to pay unexpected visits to his friends. He thirsted for no senator's blood, and used severity against the delatores alone. There was but one insignificant conspiracy against him during his whole reign. Though not literary himself, Trajan conciliated the literary men, who at all times had close relations with the senate. His intimate, M. Licinius, p'ayed an excellent Maecenas to his Augustus. In his efforts to win the affections of Roman society Trajan was aided by his wife Plotina, who was as simple as her husband, benevolent, pure in character, and entirely unambitious. The hold which Trajan acquired over the people was no less firm than that which he maintained upon the army and the senate. Bis largesses, his distributions of food, his public works, and his spectacles were all on a generous scale. The exhibitions in the arena were perhaps at their zenith during his tenure of power. Though, for some unexplained reason, he abolished the mimes, so beloved of the populace, at the outset of his reign, he availed himself of the occasion of his first triumph to restore them again. The people were delighted by the removal of the imperial exedra (a large chamber with open front) in the circus, whereby five thousand additional places were provided. Taxa- tion was in many directions reduced, and the financial exactions of the imperial officers controlled by the erection of a special court. Elaborate precautions were taken to save Italy from famine; it is said that corn for seven years' consumption at the capital was retained in the granaries. Special encourage- ment was given to merchants to import articles of food. The corporation of bakers was organized and made more effective for the service of the public. The internal trade of Italy was powerfully stimulated by the careful maintenance and extension of the different lines of road. But the most striking evidence of Trajan's solicitude for his people's welfare is found in his institution of the alimenta, whereby means were provided for the rearing of poor and orphan children in Italy. The method had been sketched out by Nerva, but its great development was due to Trajan. The moneys allotted by the emperor were in many cases supplemented by private benevolence. As a soldier, Trajan realized the need of men for the maintenance of the empire against the outer barbarians, and he preferred that these men should be of Italian birth. He was only carrying a step farther the

policy of Augustus, who by a system of rewards and penalties had tried to encourage marriage and the nurture of children. The actual effect of Trajan's regulations is hard to measure; they were probably more effectual for their object than those of Augustus. The foundations were confiscated by Pertinax, after they had existed less than a century.

On the 1 st of September in the year 100, when Trajan was consul for the third time, Pliny, who had been designated consul for a part of the year, was appointed to deliver the " Panegyric " which has come down to us, and forms a most important source of our knowledge concerning this emperor. Pliny's eulogy of Trajan and his denunciation of Domitian are alike couched in extravagant phrases, but the former perhaps rests more uniformly on a basis of truth and justice than the latter. The tone of the " Panegyric " certainly lends itself to the supposition of some historians that Trajan was inordinately vain. That the emperor had an honest and soldierly satisfaction in his own well-doing is clear; but if he had had anything like the vanity of a Domitian,

the senate, ever eager to outrun a ruler's taste for flattery, would never have kept within such moderate bound's.

On the 25th of March in the year 101 Trajan left Rome for the Danube. Pretexts for a Dacian war were not difficult to find. Although there was no lack of hard fighting, victory in this war depended largely on the work of the engineer. The great military road connecting the posts in Upper Germany with those on the Danube, which had been begun by Tiberius, was now extended along the right bank of the river as far as the modern Orsova. The campaign of 101 was devoted mainly to road-making and fortification. In the following campaign, after desperate fighting to the north of the Danube in the mountainous region of Transylvania, Sarmizegethusa, the capital of Decebalus, was taken, and he was forced to terms. He agreed to raze all fortresses, to surrender all weapons, prisoners and Roman deserters, and to become a dependent prince under the suzerainty of Rome. Trajan came back to Italy with Dacian envoys, who in ancient style begged the senate to confirm the conditions granted by the commander in the field. The emperor now enjoyed his first Dacian triumph, and assumed the title of

Dacicus. At the same time he royally entertained the people and no less royally rewarded his brave officers. But the Dacian chief Could not school his high spirit to endure the conditions of the treaty, and Trajan soon found it necessary to prepare for another war. A massive stone bridge was built across the Danube, near the modern Turn Severin, by Apollodorus, the gifted architect who afterwards designed the forum of Trajan. In 105 began the new struggle, which on the side of Decebalus could now only lead to victory or to destruction. The Dacians fought their ground inch by inch, and their army as a whole may be said to have bled to death. The prince put an end to his own life. His kingdom became an imperial pro- vince; in it many colonies were founded and peopled by settlers drawn from different parts of the empire. The work done by Trajan in the Danubian regions left a lasting mark upon their history. The emperor returned to the capital in 106, laden with captured treasure. His triumph outdid in splendour all those that went before it. Games are said to have been held continu- ously for four months. Ten thousand gladiators are said to have perished in the arena, and eleven thousand beasts were killed in the contests. Congratulatory embassies came from all lands, even from India. The grand and enduring monument of the Dacian wars is the noble pillar which still stands on the site of Trajan's forum at Rome.

The end of the Dacian wars was followed by seven years of peace. During part of that time Pliny was imperial legate in the provinces cf Bithynia and Pontus, and in constant communi- cation with Trajan. The correspondence is extant and gives us the means of observing the principles and tendencies of the emperor as a civil governor.

The provinces (hitherto senatorial) were in considerable disorder, which Pliny was sent to cure. It is clear from the emperor's letters that in regard to nine out of ten of the matters which his anxious and deferential legate referred to him for his decision he would have been better pleased if the legate had decided them for him- self. Trajan's notions of civil government were, like those of the duke of Wellington, strongly tinged with military prepossessions. He regarded the provincial ruler as a kind of officer in command, who ought to be able to discipline his province for himself and only to appeal to the : commander-in-chief in a difficult case. In advising Pliny about the different free communities in the pro- vinces, Trajan showed the same regard for traditional rights and privileges which he had exhibited in face of the senate at Rome. At the same time, these

letters bring home to us his conviction that, particularly in financial affairs, it was necessary that local self-government should be carried on under the vigilant super- vision of imperial officers. The control which he began in this way to exercise, both in Italy and in the provinces, over the ” muni- cipia ” and ” liberae civitates,” by means of agents entitled (then or later) ” correctores civitatium liberarum,” was carried continually farther and farther by his successors, and at last ended in the com- plete centralization of the government. On this account the reign of Trajan constitutes a turning-point in civil as in military history. In other directions, though we find many salutary civil measures, yet there were no _ far-reaching schemes of reform. Many details in the administration of the law, and particularly of the criminal law, were improved. To cure corruption in the senate the ballot

was introduced at elections to magistracies. The finances of the state were economically managed, and taxpayers were most carefully guarded from oppression. Trajan never lacked money to expend on great works of public utility; as a builder, he may fairly be compared with Augustus. His forum and its numerous appendages were constructed on a magnificent scale. Many regions of Italy and the provinces besides the city itself benefited by the care and munificence which the emperor bestowed on such public improve- ments. His attitude towards religion was, like that of Augustus, moderate and conservative. The famous letter to Pliny about the Christians is, according to Roman ideas, merciful and considerate. It was impossible, however, for a Roman magistrate of the time to rid himself of the idea that all forms of religion must do homage to the civil power. Hence the conflict which made Trajan appear in the eyes of Christians like Tertullian the most infamous of monsters. On the whole, Trajan’s civil administration was sound, careful and sensible, rather than brilliant.

Late in 1 13 Trajan left Italy to make war in the East. The never-ending Parthian problem confronted him, : and with it were more or less connected a number of minor difficulties. Already by 106 the position of Rome in the East had been materially improved by the peaceful annexation of districts bordering on the province of Syria. The region of Damascus, hitherto a dependency, and the last remaining fragment of the Jewish kingdom, were incorporated with Syria; Bostra and Petra were permanently occupied, and a great portion of the Naba- taean kingdom was organized as the Roman province of Arabia. Rome

thus obtained mastery of. the most important positions lying on the great trade routes between East and West. These changes could not but affect the relations of the Roman with the Parthian Empire, and the affairs of Armenia became in 114 the occasion of a war. Trajan's campaigns in the East ended in complete though brilliant failure. In the retreat from Ctesiphon (t 1 7) the old emperor tasted for almost the first time the bitter- ness of defeat in the field. He attacked the desert city of Hatra, westward of the Tigris, whose importance is still attested by grand ruins. The want of water made if impossible to maintain a large force near the city, and the brave Arabs routed the Roman cavalry. Trajan , who narrowly escaped being killed, was forced to withdraw. A more alarming difficulty lay before him. Taking advantage of the absence of the emperor in the Far East, and possibly by an understanding with the leaders of the rising in Armenia and the annexed portions of Parthia, the Jews all over the East had taken up arms at the same moment and at a given signal. The massacres they committed were portentous. In Cyprus 240,000 men are said to have been put to death, and at Cyrene 220,000. At Alexandria, on the other hand, many Jews were killed. The Romans punished massacre by massacre, and the complete suppression of the insurrection was long delayed, but the Jews made no great stand against disciplined troops. Trajan still thought of returning to Mesopotamia and of avenging his defeat at Hatra, but he was stricken with sickness and compelled to take ship for Italy. His illness increasing, he landed in Cilicia, and died at Selinus early in August 1 17.

Trajan, who had no children, had continually delayed to settle the succession to the throne, though Pliny in the Panegyric" had pointedly drawn his attention to the matter, and it must have caused the senate much anxiety. Whether Hadrian, the relative of Trajan (cousin's son), was actually adopted by him or not. is impossible to determine; certainly Hadrian had not been advanced to any great honours by Trajan. Even his military service had not been distinguished. Plotina asserted the adoption, and it was readily and most fortunately accepted, if not believed, as a fact.

The senate had decreed to Trajan as many triumphs as he chose to celebrate. For the first time a dead general triumphed. When Trajan was deified, he appropriately retained, alone among the emperors, a title he had won for himself in the field, that of " Par- thicus." He was a patient organizer of victory rather than a strategic genius. He laboriously perfected the military machine,

which when once set in motion went on to victory. Much of the work he did was great and enduring, but the last year of his life forbade the Romans to attribute to him thˆt felicitas which they regarded as afl inborn quality of the highest generals. Each succeeding emperor was saluted with the wish that he might be ” better than Trajan and more fortunate than Augustus.” Yet the breach made in Trajan’s felicilds by the failure in the East was no greater than that made in the fehcitas of Augustus by his retirement from the right bank of the Rhine. The question whether Trajan’s Oriental policy was wise is answered emphatically by Mommsen in the affirmative.

It was certainly wise if the means existed which were necessary to carry it out and sustain it. But succeeding history proved that those means did not exist. The assertion of Mommsen that the Tigris was a more defensible frontier than the desert line which separated the Parthian from the Roman Empire can hardly be accepted. The change would certainly have created a demand for more legions, which the resources of the Romans were not sufficient to meet without danger to their possessions on other frontieis.

The records of Trajan’s reign are miserably deficient. Our best authority is the 68th book of Dio Cassius; then comes the ” Panegyric ” of Pliny, with his correspondence. The facts to be

fathered from other ancient writers are scattered and scanty, ‘ortunately the inscriptions of the time are abundant and important. Of modern histories which comprise the reign of Trajan the best in English is that of Merivale; but that in German by H. Schiller (Geschichte der romischen Kaiserzeit, Gotha, 1883) is more on a level with recent inquiries. There are special works on Trajan by H. Francke (Giistrow, 1S37), De la Berge (Paris, 1877), and Dierauer in M. Biidinger’s Untersuchungen zur romischen Kaisergeschichte, (Leipzig, 1868). A paper by Mommsen in Hermes, iii. pp. 30 seq., entitled ” Zur Lebensgeschichte des jiingeren Plinius,” is important for the chronology of Trajan’s reign. The inscriptions of the reign, and the Dacian campaigns, have been much studied in recent years, in scattered articles and monographs. (J. S. R.)

TRALEE, a market town and seaport, and the county town of Co. Kerry, Ireland, on the Ballymullen or Leigh River, about a mile from its mouth in Tralee Bay, and on the Great Southern & Western railway. Pop. (1901), 9687. A ship canal, permitting the passage of ships of 200 tons burden, connects it with Tralee Bay. Large vessels discharge at Fenit, 8 m. westward, where there is a pier connected with Tralee by rail. Coal, iron and timber are imported, and there is a considerable export of grain. There is a large trade in butter. Railways serve the neighbouring seaside watering-places of Ballybunnion and Castlegregory, and the coast scenery of this part is grand and varied. Four miles north-west of Tralee is Ardfert, with its cathedral, one of the oldest foundations in Ireland, now united to the see of Limerick. St Brendan was its original founder, and it had once a university. A neighbouring round tower fell in 1870. Seven miles north of this again is the fine round lower of Rattoo.

Tralee, anciently Traleigh, the " strand of the Leigh," owes its origin to the foundation of a Dominican monastery in 12 13 by John Fitz-Thomas, of the Geraldine family. During the reign of Elizabeth it was in the possession of Earl Desmond, on whose forfeiture it came into possession of the Dennys. At the time of the rebellion in 1641 the English families in the neighbourhood asked to be placed in the castle under the charge of Sir Edward Denny, but during his absence a surrender was made. The town was incorporated by James I., and returned two members to the Irish parliament. Though disfranchised at the Union in 1800, it obtained the privilege of returning one member in 1832, but in 1885 it was merged in the county division. It is governed by an urban district council.

TRALLES (mod. Giizel Hissar), an ancient town of Caria, Asia Minor, situated on the Eudon, a tributary of the Maeander. It was reputed an Argive and Thracian colony, and was long under Persian rule, of which we hear in the history of Dercyllidas' raid from Ephesus in 397 B.C. Fortified and increased by the Seleucids and Pergamenians, who renamed it successively Seleucia and Antiochia, it passed to Rome in 133. Though satirized in a famous line (Juv. Sat. iii. 70) as a- remote provincial place, it had many wealthy inhabitants in the Roman period and, to judge by objects discovered there, contained many notable works of art. Two of the best marble heads in the Constantinople museum came from Tralles; and both in the excavations conducted for that museum by Edhem Bey (1904), and by chance discoveries, fine-art products have come to light on the site. Rebuilt by

Andronicus II. about 1280, it was super- seded a few years later, after the Seljuk conquest, by a new town, founded by the amir Aidin in a lower situation (see Aidin). (D. G. H.)

TRAHORE, a market village and seaside resort of Co. Water- ford, Ireland, on the bay of the same name, 7 m. S. of the city of Waterford, and the terminus of the Waterford & Tramore railway. The situation is pleasant, and the neighbouring coast

exhibits bold cliff scenery. The bay is open to the south, and is dangerous to navigators, as in foggy weather it has been frequently mistaken for the entrance to Waterford Harbour. On the cliffs to the west are three towers, one having a curious iron figure known as the ” metal man,” erected as a warning to sailors. The bay is divided into an outer part and an inner lagoon (the Back Strand) by a spit of sand, with a strait, crossed by a ferry at its eastern extremity. A monu- ment commemorates the wreck of the troopship ” Seahorse ” in 1816.’ Four miles west is Dunhill Castle, well situated on a precipitous rock.

TRAMP, a vagrant, one who ” tramps ” or walks the roads begging from house to house or ostensibly looking for work, but with no home and habitually sleeping out or moving on from the casual ward of one workhouse to that of another (see Vagrancy) . The word is the shortened form of ” tramper,” one who tramps 01 walks with heavy tread. The term ” tramp ” is also used of a cargo steamer not running on a regular line but passing from port to port where freight may be picked up.

TRAMWAY, a track or line of rails laid down in the public roads or streets (hence the American equivalent ” street rail- way “), along which wheeled vehicles are run for the conveyance of passengers (and occasionally of goods) by animal or mechanical power; also a light roughly laid railway used for transporting coals, both underground and on the surface, and for other similar purposes. The word has been connected with the name of Benjamin Outram, an engineer who, at the beginning of the 19th century, was concerned in the construction of tram roads, and has been explained as an abbreviation for ” Outram way.” But this is clearly wrong, since the word is found much earlier. It appears to be of Scandinavian origin and primarily to mean a beam of wood, cf. Old Swedish Ir&m, trum, which have that sense. In a will dated 1555 reference is made to amending a “higheway or tram ” in Bernard Castle, where a log road seems to be in question. In Lowland Scottish ” tram ” was used both of a

beam of wood and specifically of such a beam employed as the shaft of a cart, and the name is still often given in England to the wheeled vehicles used for carrying coal in mining. ” Tram- way,” therefore, is primarily either a way made with beams of wood or one intended for the use of ” trams ” containing coal (see Railway).

Construction. — The first tramway or street railway designed for passenger cars with flanged wheels was built in New York in 1832. The construction of this tramway does not appear to have been a success, and it was soon discontinued. In 1852 tramways were revived in New York by a French engineer named Loubat, who constructed the track of flat wrought-iron rails with a wide, deep groove in the upper surface, laid on longitudinal timbers. The groove, which was designed for wheel flanges similar to those employed on railways, proved dangerous to the light, narrow-tired vehicles of the American type. To meet this difficulty a step-rail consisting of a flat plate with a step at one side raised about | in. above the surface was designed and laid at Philadelphia in 1855. When tramways were first introduced into England by G. F. Train in i860 a rail similar to that laid at Philadelphia was adopted. This rail (fig. 1) was made of wrought- iron and weighed 50 lb per yard. It was- 6 in. wide and had a step f in. above the sole. The rails were spiked to longitudinal timbers, which rested on transverse sleepers, and they were laid to a gauge of 4 ft. 8ˆ in. Tramways of this type were laid at Birkenhead in i860, at London in 1861, and in the Potteries (North Staffordshire) in 1863. The English public, however, would not tolerate the danger and obstruction caused by the step-rail, with its large area of slippery iron surface, and the tram- way laid in London had to be removed, while those at Birkenhead and the Potteries were only saved by being rel’aid with grooved rails. Thus, while the step-rail became the standard form used in the United States, the grooved-rail became generally adopted in Europe. From the tramway point of view the step-rail has many advantages. A groove collects ice and dirt, and on curves binds the wheel flanges, increasing the resistance to traction. A grooved rail is, however, far less of a nuisance to the

ordinary vehicular traffic, and it has come to be largely used in the principal cities of America.

After the passing of the Tramways Act of 1870 the construction of tramways proceeded rapidly in England. A flat grooved rail supported on a longitudinal timber and laid on a concrete bed was generally adopted. The paving consisted of stone setts from

(Figs. 2 and 3 from D. K. Clarke's Tramuays, their Construction and Working, by permission of Crosby Lockwood & Son.)

Fig. i. Fie. 2.

Early Tramway Rails.

Fig. 3.

4 to 6 in. in depth, laid on a thin bed of sand and grouted with cement, mortar or a bituminous mixture. With the exception of the design of the rail and the manner of supporting it on the concrete foundation, which has continually changed, this method of constructing the track has varied but little to the present day.

The flat section of rail which was wanting in vertical stiffness soon proved unsatisfactory. A fillet or flange was then added to each side, which, bedding into the supporting timber, not only increased the vertical strength but also prevented horizontal displacement of the rail. With the addition of the side flanges a greatly improved method of fixing the rail to the sleepers was adopted. The old vertical spike, which was a crude fastening, was replaced by a " dog " or double-ended side spike, one end of which was driven through a hole in the flange of the rail (fig. 2). This fastening was very strong and proved a great improvement.

The next change was the use of cast-iron chairs to support the rails, which were introduced by Kincaid in 1872. These led to a modification of the rail section, and instead of the two side flanges a rail with a central flange (fig. 3) which fitted into the cast-iron chairs was used. The chairs weighed about 75 lb each, and were spaced at intervals of about 3 ft. The Barker rail laid in Manchester in 1877 was somewhat similar to that shown in fig. 3, but a continuous cast-iron chair was used to support it.

The introduction of steam traction about 1880, with its heavier axle loads and higher speeds, was a severe test of the permanent way. The flat section laid on timber sleepers and the built-up rails of the Kincaid and Barker types began to be discarded in favour of the solid girder rail rolled in one piece. The solidity and depth of this section gave it great vertical stiffness, and its

introduction materially assisted in solving the problem of providing a smooth and serviceable joint.

The merits of the girder rail soon caused it to be generally adopted, and although the design has been greatly improved it remains to-day the standard form of tramway rail used throughout the world. At first difficulty was experienced in rolling the heavier sections with thin webs and wide bases, but the introduction of steel and improvements in the rolling mills overcame these troubles. The early girder rails laid about 1880 usually weighed from 70 to 80 lb per lineal yard, and were 6 or 65 in. deep. The groove varied from 1 to i| in., and the tread was about ij in. in width. The fish-plates were not designed to give any vertical support, and were merely used to keep the rail ends in line. The girder rails were either bedded directly on the foundation or spiked to timber sleepers which were buried in the concrete.

The form of head adopted for tramway rails in Europe has almost universally been one with the groove on one side. With this section the wheel flange forces out the dirt clear of the tread. In a few isolated cases a centre grooved rail has been used. As with railways, the adoption of many different gauges has led to much inconvenience. This want of uniformity in the gauge is in some parts of the country a great obstacle to the construction of inter-urban lines. London and the larger provincial towns

adopted the standard gauge of 4 ft. 85 in., but in many towns narrow gauges of 3 ft. or 3 ft. 6 in. were laid. Glasgow and a few other towns adopted the gauge of 4 ft. 7 f in. with a view of making the narrow grooved rail of the tramways available for railway wagons, but without any real success.

With the introduction of electric traction the weight and speed of the cars greatly increased, and experience soon proved that only the most substantial form of permanent way was capable of withstanding the wear and tear of the traffic. The early electric lines were laid with girder rails weighing about 75 lb per lineal yard. These proved to be too light, and, at the present time, rails weighing from 95 to no ft) per lineal yard are in general use. The large number of rail sections designed a few years ago gave considerable trouble to makers of rails. The issue in 1903 by the Engineering Standards Committee of a set of standard girder tramway rail sections was there- fore generally welcomed. The sections comprise rails of five different weights. Modified

sections for use on curves were also published, together with a standard form of specification. Fig. 4 shows the section of the 100 lb. B.S. rail (No. 3).

Tramway rails are generally ordered in 45 ft. lengths. Rails 60 ft. long are sometimes used, but they are difficult to handle, especially in narrow streets. The rail joints still prove the weakest part of the track. Numerous patents have been taken out for fish- plates and sole-plates of special design, but none has proved quite satisfactory. The ‘ ‘ Dicker ‘ ‘ joint, in which the head of the rail on the

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(Reproduced by permission of the Engineering Standards Committee.}

Fig. 4. — British Standard Tramway Rail, No. 3.

tread side is partly cut away and the fish-plate carried up so that the wheel runs on its top edge, and the ” anchor ” joint, in which a short piece of inverted rail is bolted or riveted to the undersides of the abutting rails, have been largely used. The latter makes a good stiff joint, but when buried in concrete it interferes with the bedding of the rail as a whole, often causing it to work loose in the centre. Various processes have also been introduced for uniting the ends of the rails by welding. Electric welding was first tried in the United States about 1893, and has since been considerably used in that country. In this process two specially prepared fish-plates are applied, one to each side of the joint. Each fish-plate has three bosses or projections, one in the centre opposite the joint and one near each end. By passing a heavy alternating current of low voltage between the opposite bosses the fish-plates are welded to the rail. The current is obtained- from the line by means of a motor- generator and static transformer. Another process which has been used considerably in the United States, and at Coventry and Norwich in England, is the cast-welded joint. To make this joint the rail ends are

enclosed in an iron mould filled with molten cast-iron, which makes a more or less perfect union with the steel rails. The

great drawback to these two processes is the costly and cumbersome apparatus required. The ” thermit ” process (.see WELDING) does not require any large initial outlay, and has been applied to welding the joints on both old and new tracks. The cost of making each joint is about £i.

Points and crossings are used on a tramway to deflect a car from one road to another. In the days of horse traction no movable switch was used, the car being guided by making the horses pull the leading wheels in the required direction. With the introduction of mechanical traction a movable switch was fitted in one of the cast- ings to act as a guide to the wheel flanges. On modern tramways the points consist of a pair of steel castings, one being a fixed or dummy point, and the other containing a movable switch. On a single track at passing places the cars in Great Britain always take the left- hand road, and a spring is fitted to hold the movable switch to lead in that direction. The bottom of the grooves at open points and cross- ings arc raised so that the car wheel runs on its flange over the break in the tread of the rail. Double switch points in which the two tongues are connected are sometimes laid. In recent years the size and weight of the castings and the length of the movable switches have considerably increased. Manganese steel is very generally used for the tongues and sometimes for the whole casting. Ordinary cast steel with manganese steel inset pieces at the parts which wear most quickly are a feature of the later designs. At some junctions the points are moved by electric power.

While the form of concrete foundation remains the same as that laid at Liverpool in 1868, far greater care is now given to the bedding of the rails. After the excavation has been completed the rails are set up in the trench and carefully packed up to the finished level. The concrete is then laid and packed under the rail, generally for a depth of 6 in. When the surface is to be paved with stone setts bedded on sand the concrete may be left rough, but where wood is to be laid the surface must be floated with fine mortar and finished to a smooth surface. Both hard and soft wood blocks are used for paving. Wood should not be used unless

the whole width of the carriage-way is paved. Many different qualities of stone setts have been laid. Hard granite such as that supplied from the quarries near Aberdeen is the most suitable.

In urban districts the road authorities almost always require the tramway surface, i.e. between the rails and for 18 in. on either side, to be paved. In country districts many tramways have been laid with only a sett edging along each rail, the remainder of the surface being completed with either ordinary or tarred macadam. This construction, however, is only suitable on roads with very light traffic. After a tramway is laid, especially in a macadamized road, the heavy vehicular traffic use the track, and the wear is very much greater than on other parts of the carriage-way.

Steam and Cable Tramways. — Horse traction, especially in hilly districts, has many limitations, and early in the history of tramways experiments were made both with steam cars and cable haulage. Although experimental steam cars were tried in England in 1873 the first tramways which regularly employed steam engines were French, though the engines were supplied by an English firm. About 1880 many improvements were made in the design of the engines employed, and this form of traction was adopted on several tramways in England. Beyond

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formed of concrete, with cast-iron yokes spaced at intervals of 4 ft. to support the slot beams. The conduit was 19 in. deep by 9 in. wide. The slot was | in. wide. The running rails were of the ordinary girder type bedded in concrete. Fig. 5 shows a cross-section of the track at a yoke. This form of construction is very similar to that employed in forming the tube on a modern electric conduit tramway. At Edinburgh and other places where a shallow conduit is used the supporting pulleys are placed in pits sunk below the general level of the tube. On the Birming- ham cable tramway, where the tube is 2 ft. 8 in. deep, pits are not required at the supporting pulleys. This reduces the difficulty of draining the conduit. The yokes in this case are made of steel T-bars spaced 4 ft. apart.

Electric Tramways. — Electricity is now the standard motive power for tramway service, and is applied in three main ways: (1) the overhead or trolley system; (2) the open conduit system ;

and (3) the surface contact or closed conduit system. (See also Traction.)

On a tramway worked on the overhead principle current is supplied to the cars by two overhead conductors or wires. Round copper wires varying in size from o (0-324 in.) to 0000 (0-40 in.) S.W. gauge are generally used. With feeding points Overhead at every mile, the o wire is electrically sufficient on most ‘ ro ” e y-roads, but from a mechanical point of view 00 wire is the smallest it is desirable to erect. Wires having figure 8 or elliptical grooved sections have been employed, and have the advantage of allowing the use of a mechanical clip ear which is clear of the trolley wheel. The ordinary round wire is usually supported by a gun-metal or gun-metal and iron ear grooved to fit the wire, which is soldered or sweated to it. In Great Britain the overhead conductors are re- quired by the board of trade to be divided into half-mile sections. The wires on adjoining sections are connected by section insulators. These consist of gun-metal castings in two parts, insulated from each other. The line wires are clamped to the metal ends. The continuity of the path of the trolley wheel is provided for on the underside of the insulator by fixing a hardwood strip between the ends or by the ribs on the castings with air gaps.

The trolley wires are supported by ears either from span wires which extend across the roadway between two poles or from bracket arms carried on a pole on one side only of the road. The span wires and short bracket suspension wires are also insulated, so that there is double insulation between the conductor and the pole. The overhead conductors are usually hung about 21 ft. above the rails. (For catenary suspensions see Traction.) The poles which carry the span wires and the Bracket arms are placed not more than 40 yds. apart and are generally placed at the edge of the kerb. They are built up of three sections of steel tubes, one overlapping the other; the joints are shrunk together while hot. A cast-iron case is used to improve the appearance of the pole, and cast-iron collars hide the joints. Standard specifications for poles have been issued by the Engineering Standards Committee.

When permission can be obtained the span wires are sometimes supported by rosettes attached to the walls of the houses on either side of the street. This method has been largely adopted in Germany,

Between Yoke (From T. Amall’s Permanent Way for Tramways

and Street Railways, by permission ol The Railway Engineer.)

Fig. 5. — Section Edinburgh Cable Conduit.

requiring a better constructed track it does not necessitate any modifications in the general design of the permanent way. The first cable tramway was constructed at San Francisco in 1873. In England the first cable system was a short length at Highgate in 1884. Cable tramways were also laid down at Edinburgh, Birmingham, Matlock and Brixton (London). Cable traction, with the expensive track construction it necessitates, and the limited speed of haulage, belongs to the past. Only gradients too severe to be worked by ordinary adhesion will in the future justify its use. The construction of the conduit or tube in which the cable runs adds very considerably to the cost of the permanent way. On the Edinburgh system the conduit was xxvii. 6

and by dispensing with the poles in the roadway it improves the appearance of the street.

Overhead conductors will not be tolerated in some cities, and to avoid the use of them open conduit and surface contact tramways have been introduced. In the conduit system the conductors are carried in a conduit or tube beneath the ~? e ° surface of the track, and the electric current is picked up Conduit, by means of a plough carried by the cars. Modern conduit tramways are divided into two kinds: those which have the conduit at the side under one running rail, and those which have it under the centre of the track. The only example of the former to be found in England is at Bournemouth, but it is used at Vienna, Brussels, Paris, Berlin and Budapest. Centre conduit construction has been adopted in London, Nice. Bordeaux, New York, Washington, &c. The advan- tages of the side slot system arc the reduction in the amount of metal

in the roadway, less breaking up of the pavement, and slightly cheaper cost of construction. Its chief disadvantage is the difficulty it introduces in’ connexion with po’nts and crossings. It is also objected that if the side slot is made the same width as the rail groove

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(From The Tramway and Railway .W orld.)

Fig. 6. — Section of Side Conduit. it becomes a danger to narrow-tired vehicles. The difficulty in regard to points and crossings is overcome by bringing the slot into the centre of the track at junctions and turn-outs. Fig. 6 shows a section of the side slot track laid at Bournemouth. The width of

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yard of construction of this type are : castiron, including both type! of yokes, 500 lb ; track rails, 214 lb ; slot rails, 1 16 lb ; conductor rails 42 lb ; and conduit plate, 16 lb — nearly 400 lb of rolled steel per yard After the rails, which are of a high girder type, are fastened in plac(thin plates of sheet steel are bent into the oval holes in the yoke; extending from yoke to yoke, and form the inner surface of the completed conduit. Around this is carefully laid a shell, 4 in. thick of Portland cement concrete. The yokes are furnished with lugs which serve to retain, temporarily, wooden boards forming a mould in which the concrete is rammed. Sectional wooden shapes serve to hold the thin steel lining in place while the concrete is hardening Around this concrete tube, and on each side of it, to form a basis for the street pavement, is laid a mass of coarser concrete. In each side of the special yokes is placed an insulator of porcelain, protected by a cast-iron shell and carrying a support for the conductor rail which is of T-shaped steel, weighing 21 lb per yard. It is in 30 ft lengths and is supported every 15 ft. by the insulators, the ends ol separate rails being matched at and held by an insulator support, This rail is, of course, bonded with copper bonds. Two such con-

J*. ,._ a ‘io- ^|

(From The Tramway and Railway World.)

Fig. 7. — Section of Centre Conduit (London County Council type), the slot is 1 in., which is the least width possible. In London J in. was first adopted as the width of the centre slot, but later this was increased to I in., so that in this particular there is not much to choose between the two systems. ‘ Fig,«7 shows a section of the London County Council track at one of the cast-iron yokes. These are spaced 3 ft. 9 in. apart, every second yoke being now continued out under the running rail which is fastened to it. There is no doubt that the extended yoke greatly increases the strength of the track. The slot beams weigh 60 lb per yard. The conductor bars are of mild steel, T-shaped. They weigh 22 lb per yard and are sup- ported on insulators at intervals of 15 ft. Each in- sulator is covered over in the roadway with a cast- iron frame and movable lid. There are two conductor rails — positive and negative— so that the whole circuit is insulated from earth. The conduit or tube is formed of cement concrete. The track between the rails is paved with granite setts in order that there may be no trouble with wood blocks swelling and closing the slot.

American practice in conduit construction has become fairly well standardized (fig. 8). The con- duit is oval in shape, its major axis being vertical, and is formed of concrete. An excavation about 30 in. deep and 5 ft. wide is made, and in this are laid cast-iron yokes weighing 410 lb each, and spaced 5 ft. apart centre to centre. Every third yoke contains bearings for a hand-hole plate, and weighs about 600 lb. These yokes surround the conduit proper and are provided with extensions on each side for the attachment of the rails. In the older construction the rails were laid directly upon the iron of the yokes, steel wedges and shims being used under them for the final alinement of the rails. In the more recent construction, on the Third Avenue railroad in New York City, a wooden stringer, 6 in. by 4 J in. in size, is laid along from yoke to yoke on the bearing surfaces, and the rail laid upon this. The rail is held down on the yoke by means of two bolts at each bearing-point, these bolts having turned-up heads which .embrace the tool of the rail. The slot rails, or Z bars forming I he two jaws of the | in. slot, are bolted to (lie upper part of il-rum J. H. Kid' the yokes. The weights of the metal used per linear jr 1G , g_

Fig. 8. — Cross-section of Open Conduit Road (American type).

ductor rails are installed in the conduit 6 in. apart, the flat faces corresponding to the upper surface of the T being placed towards each other. Elaborate provisions for drainage and inspection are also provided, depending upon the situation of the tracks and nature of the street. The current is fed to the conductor rails by heavy copper conductors of from 500,000 to 1,000,000 circular mils cross- section, insulated and lead-covered, laid in ducts alongside of or between the two tracks of double-track systems. Connexion is

V77////

:t's Fltrtric Tradivii, by permission of Whittater & Co) •Cross-section of Stud, Skates and Magnets.

Lorain System.

made between the cars and the conductor rails by means of a ” plough,” carried by a hard steel plate, which is channelled to re- ceive the insulated wires leading up to the controller on the car. The plough carries two cast-iron rubbing-blocks, which are pressed out- ward into contact with the conductor rails by springs, the two being, of course, very carefully insulated from each other and from the other metal-work of the plough. It has been found expedient in practice to reverse the polarity of the current used on these conduit roads from time to time, since electrolytic deposits, formed by small leakage currents in the vicinity of insulators, &c, are thus dissolved before they become a source of trouble.

Great difficulty is experienced with all conduits in keeping them clean and free from water. On the London tramways a sump has been formed at intervals of about 60 yds. into which the conduit drains. These sumps are connected with the sewers. The principal objection to the conduit system is its heavy first cost. The tracks alone in London are estimated to cost about £13,000 per mile of single track against about £8000 per mile for a track to be worked on the overhead system.

This high cost of construction has caused considerable attention to be directed by inventors to devising surface contact systems. Many of the designs which have been patented appear excellent in theory, but have been found un- trustworthy under working conditions. Among those worked commercially in England are (1) the Lorain system in opera- tion at Wolverhampton; (2) the Dolter system at Torquay, Hastings and Mexborough, and (3) the G.B. system at Lincoln. Of all these systems current is supplied from iron studs laid in the roadway be- tween the rails of the track to a skate carried on the car. The studs are placed 10 ft. to 15 ft. apart and contain a movable switch or contact, which is operated by the influence of a magnet carried under the car. In the Lorain system (fig. 9) connexion is made to the source of power through two carbon contact pieces. The lower carbon contact is carried on a soft iron strip which is connected to the supply cable by means of a flat copper ribbon spring. When the magnet passes from over a stud the iron armature and the lower carbon contact, which has been magnetically attracted, falls

vertically, assisted by the copper ribbon spring. In the Dolter system the contact box (fig. 10) contains a bell crank lever with a carbon contact at its lower end. The upper arm of this lever is of soft iron, which is attracted by the magnet carried under the car. When the lever is moved the carbon block at the lower end is brought into contact with the fixed carbon contact in the side of the box which is perma- nently connected to the supply cable. In the G.B. contact box (fig. 1 1) contact is made direct to a bare feeder cable carried in a pipe

Surface Contact.

(From The Tramway and Railway World.)

Fig. 11.— G. B. Stud.

(From J. H. Rider's Electric Traction, by permission of Whittaker & Co.)

Fig. 10.— Cross-section of Stud, Skates and Magnets. Dolter System

under. the boxes. The switch, consisting of a piece of galvanized iron, is suspended freely by means of an insulated phosphor bronze spring. At the lower end of this moving piece a carbon contact piece is attached. When the magnet carried by the car passes over a stud, the moving piece is magnetically attracted to the cable against the pull of the spring. In the Lorain and the Dolter systems the studs are raised slightly above the road surface — which is an

objectionable feature — and the current is collected by a skate, suspended under the car, touching the projecting surface. In the G.B. system the stud heads are kept flush with the pavement, and the collector consists of iron links spring suspended. As the collector passes over the box the links are magnetically attracted, and move down, making contact with the stud.

In all surface contact systems, short circuiting devices are provided to detect any studs which may remain live after the skate has passed, either by blowing a fuse or by ringing a bell, but it is questionable how much reliance can be placed on their efficiency under all conditions. The collecting skate and magnets carried by the cars on a surface con- tact tramway are of considerable weight, and the skate requires re- newal at frequent intervals.

An efficient system of street traction may be defined as one which, while giving a reasonable return on the capital invested, provides the public, without dis- figurement of the highway, with a quick and frequent service of comfortable cars.

When tramways were first intro- duced the . surface of the streets was often exceedingly rough. The tramcar running on rails was there- fore a great advance in comfort of travelling on the old stage carriage. Horse traction, however, limited the weight of the car and the speed of travelling. The sub- stitution of steam traction for horse traction was a great advance. Higher speeds and quicker acceleration

were obtained, and larger and more comfortable cars j4 f)L'!JJ, < *' B * iii t 1 m, • ■ 1 °* Different

could be worked. Ihe power, however, was limited, systems.

and the locomotives, built as light as possible, were expensive in first cost and maintenance. Cable traction, owing to the heavy first cost of the track, requires a great density of traffic to make it pay. The speed is limited both up and down hill to that of the cable. It has the advantage -that it can be safely worked on severe gradients, and once installed the wbrking'eosts are low.

Electric traction by accumulator cars was tried in Birmingham in 1890 and abandoned after some years of unsatisfactory working. The cars were costly to work and maintain. The storage batteries had to be re- charged at frequent intervals, and they rapidly dropped in capacity. There was little reserve of power, and the cells added considerably to the weight of the car.

Those forms of electric traction in which the power is supplied to the cars from an outside source haVe many advantages. Only the weight of the motors has to be carried. These are efficient over a wide range of speed, accelerate quickly, have a large reserve of power and are clean and silent. The electric conduit and surface contact tramways do not require any disfiguring over- head wires. They have, however, troubles of their own. The construction of the electric conduit is so expensive that its choice must necessarily be limited to large cities. The conductors are easily short-circuited. Gaps in the conductors must be left at the points and crossings. The cost of keeping the conduit clean is considerable. It has the advantage, however, of having both the posi- tive and negative conductors insulated. Surf ace contact

systems require studs or contact boxes to be placed in the road. In most systems these project above the surface of the street. The switches which they contain are hidden away from inspection. A failure of insulation or the sticking of a switch may allow a live stud to be unprotected in the roadway. The weight of the car and consequently the power required to move it is considerably increased by the skate, magnet and battery which have to be carried. For simplicity of working the overhead system easily comes

first. The conductors are out of reach, they can easily be doubly or trebly insulated, and with their insulators are open to inspection. The poles and wiring can be erected without closing or obstructing the street. The supply of power is not interfered with by heavy rain, snow or other climatic causes. Duplicate conductors are used, and repairs can be rapidly executed. The only objection is that of unsightliness, which, however, can be greatly reduced by good design.

The cost of establishing tramways to be worked on the various systems of traction mentioned above has varied considerably. The locality and the amount of street widening have considerable influence on the total. Horse tramways in the larger cities cost in the past about £15,000 1 per track mile complete with horses, cars, &c, tramways worked by steam power about £18,000 2 per track mile including locomotives and cars. The Edinburgh Corporation cable tramways cost £23,3l6 3 to establish complete with power- house, cars, &c. Of this figure, the cost of the permanent way construction amounted to £14,ˆ.31 . 3 The construction and equipment of the South London conduit tramways cost £25,106 3 per mile of single line; the permanent way, its electrical equipment and the distributing cables cost £15,895′ per track mile. More recent estimates appear to show that the average cost in London will be between £26,000 and £30,000 per track mile. In Glasgow the total cost of constructing and equipping the electric tramways on the overhead system, including the provision of a power station, cost £19,787* per track mile, and at Leeds £13,206. At Manchester, where current is provided by the lighting station, the complete cost works out at £12,498. 6 The cost of the permanent way, cables and electrical equipment per track mile varies from £6575 at Man-

chester to £9959 at Glasgow. The cost of laying down a surface contact electric tramway is about slightly more than that of constructing and equipping a track with overhead conductors. The cost of the permanent way and its electrical equipment together with the cables at Wolverhampton on the Lorain surface contact principle amounted to £8601 per track mile.

The working expenses of the various systems of traction are largely affected by the age of the tramway, the locality, and, in the case of electric lines, by the cost at which power is obtained. In Birmingham in 1890-1891 6 horse traction cost 9-79d. per car mile, steam traction io-99d. per mile, cable traction 6-33d. and electric accumulator traction cj-god. per car mile. Modern electric trolley lines generating their own current work at from 5d. to 6d. per car mile. Where current is purchased the costs vary from 6d. to 7ˆd. per car mile. The working costs of the London County Council conduit tramways worked on purchased current amounted to 8-02d. per car mile in the year 1905-1906.

Tramway Cars. — The modern tramway car is made up of two distinct parts, the body and the truck. The present type of double ended car with a platform at each end was first used on the American street railways about i860. The car body was supported directly on axle-boxes through helical steel or rubber springs.

When the early pioneers were experimenting in the United States with electric traction they attached the motor to the car body. This proved unsatisfactory, and resulted in the develop- ment of the modern truck. The truck may be described as a carriage or frame supported on the axle-boxes by springs and supporting by another set of springs the car body. The truck carries the motors and in itself resists all the strains of the driving mechanism.

Modern car bodies are mounted either on a single four-wheeled truck, with a fixed or rigid wheel-base, or on two four-wheeled bogies or swivelling trucks. Four-wheeled radial trucks have been tried on several tramways, but they have not proved satisfactory. The wheel-base of the fixed or rigid truck usually varies from 6 to 7 ft. The length of the wheel-base should be determined by the radius of the sharpest curve. To obtain steady running it should be made as long as possible. Two motors are generally fitted on a car.

Of the bogie or swivelling trucks the greater number now in use are of the ” maximum traction ” type. This truck is used to obtain

the greatest tractive effect from two motors when fitted to a car supported on eight wheels. Each bogie is a small four-wheeled

‘and 2 See Tramways: Their Construction and Working, by D. K. Clarke.

- Proc. Inst. Civ. Eng. 156, p. 179.

4 Tramway Accounts, year ended March 31, 1906.

5 Ibid., year ended March 31, 1905.

• See Tramways: Their Construction and Working, by D. K. Clarke.

truck in itself. It has one pair of its wheels driven by the single motor and of the standard size — about 30 in. — while the guiding or ” pony ” wheels are of small diameter. The weight of the car body is supported eccentrically on the truck, so that about 70 % to 80% is available for adhesion under the driving-wheels. While this form of truck has many merits, it also has many disadvantages. The small wheels easily leave the rails, while the adhesion of the driving-wheels compared with a four-wheeled car is considerably reduced. Quick acceleration is difficult, and on a greasy rail much energy is lost in slipping. The use of equal-wheeled bogies with a motor on every axle gets over the difficulty of the loss of adhesion but at a greatly increased cost. The current consumption is increased, the first cost is greater, and there are four instead of two motors to be maintained. Steei-tired wheels have largely replaced the cast-iron chilled wheel for many years used on tramcars.

While the various forms of trucks are common both to British and American practice, car body construction differs in many points. The single-deck car is universal outside the United Kingdom, where, although many single-deck cars are worked, the greater number are of the double-deck type. It is claimed that with small single-deck cars a quicker service can be maintained, as they are easier to load and unload and generally handier. On the other hand, the double-deck car seats more than double the number of passen- gers, requires the same number of men to work it, and takes but little more power to drive it. Experience has proved that the 58-passenger — 28 inside and 30 outside — double-deck car mounted on a four- wheeled truck is the type of rolling stock most suitable for British conditions. For heavy rush traffic or long

distance travel the larger bogie cars are convenient. They are, however, slow to start and stop, and a 72-passenger car is too much for one conductor to work efficiently. Another difference is due to the width of the cars. In the United States car bodies vary from 8 ft. to 9 ft. 6 in. in width. In Great Britain the width is limited by the Tramways Act of 1870 to 1 1 in. beyond the outer edge of the wheels, which, on the standard gauge, allows the maximum width to be 6 ft. 10 in. This limit has governed the arrangement of the seating in the cars. Inside, the ordinary side seat is almost invariably adopted. Cross seats have been used, but they leave a very narrow gangway — a great disadvantage at times of overcrowding. On the top deck, where the available width is greater and standing is never permitted, cross seats are universally fitted.

On the old horse cars a straight type of stairway was used. The reserved stairway, brought in about 1902, gave greater protection from accident and increased the seating accommodation on the top deck. It had, however, two great disadvantages. The stairway shut out the motorman's view on the left-hand side, and the stream of passengers descending met the stream of passengers leaving the inside of the car, causing delay. The reversed type of stairway has now been abandoned and the straight type, well protected by railings, is usually fitted.

In addition to the ordinary single-deck and double-deck types of cars which are in general use many other designs are to be found. Single-deck open cars of the "toast-rack" type with transverse seats are popular on many holiday lines. They have the advantage of being quickly filled and emptied. Centre vestibule cars are now seldom seen. It is inconvenient not to have the conductor at the back of the car where he can look out for passengers, and, if necessary, " nurse " the trolley. There is also danger of a passenger being struck by the axle-boxes of the rear bogie truck when leaving the car. The Californian type of car body, with the central part closed in and one or two double-sided transverse seats at each end, has been used on routes where low bridges do not allow of the use of double- deck cars. The carrying capacity of this type in wet weather when the exposed seats cannot be used is small. A demi or one-man car has been worked in some towns. It saves the wages of one man, but the average speed of the service is reduced. Top deck covers have in recent years been largely fitted. Their use practically doubles the covered seating capacity of the car and provides accommodation for smokers, a difficult matter on a single-deck car.

In Great Britain the board of trade requires all cars to be fitted with an efficient form of lifeguard. The gate and tray pattern, in which anything striking the vertical gate drops the tray, is that principally employed. In addition to the ordinary hand-brake which operates shoes on all the wheels, and the electric reverse switch, a large number of cars are fitted with some form of electric brake (see Traction).

Legislative Conditions in Great Britain. — The first tramways constructed in Great Britain were promoted by private enterprise under powers conferred by private acts of parliament. Considerable opposition was offered to pioneer schemes, but after a few private acts had been passed, parliament, in 1870, passed a general act providing for the laying of rails upon roads, and specify- ing the procedure for tramway promotion and the main relations between tramway undertakers and local authorities. The Tramways Act 1870, which is still in force, enabled promoters to apply to the board of trade for a provisional order which, when confirmed by parliament, possesses all the force of an act of

parliament. The procedure is therefore simpler and cheaper than private bill procedure. Under this act promoters are obliged to obtain, as a condition precedent to making application for a provisional order, the consent of local authorities in whose areas the proposed tramways are to run. This provision is referred to as the " veto clause." Where a line is laid in two or more districts and two-thirds of the line are in districts where the local authorities do consent, the board of trade may dispense with the consent of the remainder. When procedure by private bill is adopted a similar " veto " provision is made by Standing Order 22, which requires the consent of the local authority (and of the road authority where there is one distinct from the local authority) before the bill goes to first reading; in this case also the consent of authorities for two-thirds of a continuous line are deemed sufficient. The powers granted under the Tramways Act are in perpetuity, subject to the right of the local authorities (under the 43rd section) to purchase, at the end of twenty-one years or each septennial period following (or within three months after the promoters have discontinued working the tramway or have become insolvent), so much of the undertaking

as lies within their areas, on paying the then value of the properties suitable to and used for the undertaking, exclusive of any allowance for past or future profits or compensation for compulsory sale or any other consideration whatsoever, such value to be determined by an arbitrator appointed by the board of trade. Another part of the arrangement specified between the local authorities and the undertakers is that the undertakers shall pave the tramway track between the outer rails and for 18 in. beyond each outer rail. Mr G. F. Shaw-Lefevre (afterwards Lord Eversley), when introducing the bill in 1870, said that it " would give powers to the local authorities to construct tramways, but not, of course, to work them." The idea apparently was that local authorities should retain full control of the roads by constructing the tram- ways, and would make arrangements with lessees on terms which would secure reasonable fares and other conditions for the benefit of the travelling public. It was not until 1896 that parliament permitted local authorities to work tramways as well as own them, except in cases where lessees could not be obtained. The precedents for municipal working were created by private acts at a time when public opinion was in favour of that policy; and after the first few bills for municipal tramway working had been successful, other municipalities found practically no diffi- culty in obtaining the desired powers, although parliament had never adequately discussed, as a specific reform, the departure from the principle laid down by Mr Shaw-Lefevre in 1870. The conditions in fact proved more favourable to municipal than company promoters, since the local authorities, as soon as they aspired to work tramways as well as own them, used the power of veto against the proposals of companies.

The situation entered a more acute phase when electric traction was introduced on tramways. The Tramways Act provides, by section 34, that all carriages shall be moved by the power prescribed by the special acts or provisional order, and where no such power is prescribed, by animal power only. The mechanical power used must be by consent of the board of trade, and subject to board of trade regulations. Owing to the capital expenditure involved in electric traction, under- takings nearing the end of their twenty-one years' tenure found that it was not commercially feasible to carry out the change without an extension of tenure. The local authorities were reluctant to grant that extension, and they were also reluctant to give permission for the promotion of new lines.

The difficulties of the altered conditions created by the advent of electric traction were met to some extent by the Light Railways Act 1896. – This act contains no definition of a light railway, and it has been used largely for electric tramway purposes. Lord Morley, when piloting the bill through the Lords, said that ” light railway ” includes ” not merely all tramways but any railway which the board of trade thinks may justly be brought within the scope.” It certainly includes tramways in towns, and it might include large trunk lines throughout the country.” Accordingly it has been used for the construction

of many miles of tram lines’ on the public streets and also in some cases for extensions where the track leaves the public road, and is laid on land purchased for the purpose. These tracks are generally constructed with grooved girder rails, having a wide groove and a high check, so that the shallow flanged tramcar wheels can run on them with safety at high speeds. The rails are laid on cross sleepers and ballasted in the ordinary railway fashion. Fencing is erected, but level-crossing gates are often omitted, and cattle guards only are used to prevent animals straying on the track. These sleeper tracks on private ground are cheap to maintain if well constructed in the first instance. Speeds of 20 to 25 m. an hour have been sanctioned en electric lines of this character, worked by ordinary tramway rolling stock. There is no purchase clause in the Light Railways Act, but arrangements for purchase of the undertaking were usually made with the local authorities and the terms embodied in the order. The act contains no veto clause, section 7 stating that the commissioners are to ” satisfy themselves that all reasonable steps have been taken for consulting the local authori- ties, including road authorities, through whose areas the rail- way is intended to pass, and the owners and occupiers of the land it is proposed to take.” The Light Railway Commissioners, however, have interpreted the act in the spirit of the Tramways Act, so that for all practical purposes the veto remains. The new act differed from the Tramways Act in providing for the com- pulsory purchase of land under the Lands Clauses Acts— the Tramv/ays Act expressly stating that the promoters should not be empowered to acquire land otherwise than by agreement. The board of trade has held that the act does not apply to tramways wholly within one borough. County, borough and district councils as well as individuals and companies are empowered to promote and work light railways.

The passing of the act gave a great impetus to the construction of

tramways worked by electric traction. But owing, to the practical retention of the veto, there was not so much progress as was anticipated. Another cause of restriction was section 9, sub-section 3, which provides that if the board of trade con- siders that " by reason of the magnitude of the proposed under- taking, or of the effect thereof on the undertaking of any railway company existing at the time, or for any other special reason ' relating to the undertaking, the proposals of the promoters ought to be submitted to parliament," they should not confirm the order. In many cases railway companies, by pleading the competitive influence of proposed tramways promoted under the Light Railways Act, were able to force the promoters to apply to parliament or to drop the scheme. The latter alternative was frequently adopted, owing to the costs of parliamentary procedure being too heavy for the undertaking.

Commercial Results. — Interest in the commercial results of tram- way enterprise is practically limited to electric traction, since other forms of traction have been almost entirely superseded owing to their economical inferiority. The main advantages of electric traction over horse traction He in the higher speed, greater carrying capacity of cars, and the saving in power over a system in which only a small proportion of the power source is available at one time. Steam, compressed air and gas traction possess the disadvantages that each car has to carry the dead weight of power-producing machinery capable of maintaining speed up to the maximum grade. Cable traction has the disadvantages that the speed of the cars is limited by the speed of the cable, that the range and complexity of the system are restricted, and that construction is expensive. The electric system, in which power is generated at a central source and distributed to cars which take power in proportion to the work being done, possesses a higher degree of flexibility, convenience and economy than any other system. Electric tramways in Great Britain are mostly equipped on the overhead trolley system, though the conduit and the surface contact systems have been installed in a few instances. Roughly the capital expenditure required for the three systems is in proportion of 2, ij and 1, and both the conduit and the surface contact systems are more costly to maintain than the overhead system. A fourth system of electric traction, in which the cars are fitted with storage batteries charged at intervals, has been tried frequently and as frequently abandoned. The great weight of the batteries, the serious initial cost and high rate of deterioration prevented the attainment of

financial success.

The earliest development of electric road traction on a large scale took place in America and on the continent of Europe, and the

estimates for British tramways were therefore prepared from American and continental results. The following figures summarize a number of estimates made at this period ; the first table gives the figures for capital cost, and the second for operating expenses. The receipts were estimated at iod per car mile.

The financial results achieved are summarized in the next table :-

by electric traction companies

Permanent way, including

bonding . . Overhead equipment . Feeder cables . . Cars at £700 each Car sheds, sundries and

contingencies . . .

Capital cost

per mile of

single track.

• 5050

75°

400

2100

Year.

Number of

Aggregate capital.

Average ordinary

Average preference

Average loan and debenture

Total

companies.

capital.

capital.

capital.

average.

1 899-1 900

24

£

9,056,332

% 3-87

%’ 5-56

% 4-64

% 4-37

1900ˆ1901

37

15,021,137

4-27

5-53

4-57

4-65

1901-1902

62

28,322,117

4-07

4-44

4-53

4-29

1903

64

35.479,296

4-3i ;

5-n

4-47

4-57

1904

77

48,789,525

4-13

4-81

4-53

4-4i

1905

90

61,273,986

379

4-92

4-39

4-33

1906

117

77,202,373

3-47

4-81

4-18

4’i3

1907

Ti8

99,3J5,028

2-87

4-25

4.38

3-78*

Total

£9500

Operating expenses per car mile.

Electrical energy I -5od.

Wages of drivers and conductors i-io

Car shed expenses, wages and stores 0-55

General expenses . . . – . 0-90

Repairs and maintenance 1-25

Total

5-30d.

The estimates gave reason to expect that electric traction would mean cheaper fares and more frequent services at a higher speed, resulting in a considerable increase in traffic receipts per mile and a substantial reduction of -working expenses. The result of pioneer undertakings in South Staffordshire, Bristol and Coventry supported this expectation. Later experience, however, showed that the estimates were too optimistic. Taking the actual figures realized for the undertakings included in the above tables, the capital expenditure per mile of single track was £12,000 and the working expenses per car mile 6-3d. The expectations as to gross revenue have been generally realized, but the increase; in capital expenditure and working expenses over the estimates is typical of electric cram- ways in Great Britain. In the matter of wear and tear the estimates have also been too low. ‘ The reasons for the larger capital expendi- ture are (1) superior” track construction, (2) more elaborate overhead equipment, (3) use of larger cars, (4) higher cost of road paving and other improvements imposed upon tramway undertakings.

According to the official returns of tramways and light railways for the year 1905-1906, there were 312 tramway undertakings in the United Kingdom, and 175 of these belonged to local authorities. Out of the total of 1491 m. of line owned by local authorities, 1276 m. are worked by these authorities themselves, and. the remaining 215 m. by leasing companies. Local authorities working as well as owning their tramways made a net profit of £2,529,752, applying £663,336 to the reductionof tramway debt and £265,981 to the relief of rates, while carrying £623,617 to reserve and renewal funds. The following table summarizes the amounts expended by local authorities on electric traction :—

Year.

Municipalities.

£

1900

11

1,169,429

19OI

18

2,748,873

1902

47

io,5i9,543

1903

61

14,644,126

1904

92

21,295,771

1905

U5

27,876,320

1906

131

, 31,147,824

1907

131

35,965,920

The corresponding table for electric traction companies (including electric railways), detailing the amounts and

proportions of ordinary preference and loan and debenture capital, is as follows:ˆ

Year.

Number of under- takings.

Ordinary capital.

Percent, to total.

Preference capital.

Percent, to total.

Loan and Debenture

capital.

Percent. to total.

Total.

1896

1897 1898-1899 1899-1900 1900-1901 1901-1902

1903

1904

1905

1906

1907

17

3°～

51 66

75 125 126

156 159 170

173

£

5,041,375

6,584; 147

9,793,234

n-770,777

14,558,076

19,748,965

21,600,056

33,491,604

36,949,069

38,130,981

53,034,778

83 88 68 60 55

5o

49 54 47 41 45

i

412,776

124,850

1,640,780

3,834,761

5,904,998

9,748,891

11,170,319

13,219,487 22,853,948 25,206,988 30,642,266

7 2 11 20 23 24 25 22 29

27 26

£

630,521

727,176

2,972,126

4,033,992

5,686,785

10,024,327

11,296,714

14,895,418

19,410,384

29,522,581

34,372,4″

10

10

21

20

22

26

26

24

24 ,

32

£

6,084,672

7,436,173 14,406,140 19,639,530 26,149,859 39,522,183 44,067,089 61,606,509 79,213,401 92,860,550 118,049,455

The total expenditure on tramways arid light railways (omitting railways — main, branch and suburban) was £15,195,993 in 1896 and £58,177,832 in 1906.

One effect of the increased qost of expenditure per mile of track is to discourage extensions of rural and inter-urban lines where the traffic is not heavy. Proposals have been made to adopt the ” rail- less trolley ” (used in some places on the continent of Europe) for such extensions. In this system the cars run on ordinary wheels and take power from overhead trolley wires. But so far no such arrangement has been put into practice in Great Britain, and out- lying districts are generally dealt with by petrol or steam motor vehicles, running as feeders to the tramways and railways. The future commercial development of tramways lies more in the economics in working than in growth of track mileage. Owing, to the enormous volume of traffic a very slight alteration in one of the items of expense or revenue produces a large result in the aggregate. The addition of |d. per car mile to revenue or a corresponding reduction in expenses would, on the 240 millions of car miles run in 1905-1906, result in a gain of about £500,000 per annum, which is equal to nearly 1 % on the entire capital expenditure in respect of tramways and light railways. The tables given above show that the yield upon the capital Invested in electric traction is not high. The effect of increased capital expenditure has been accentuated by reductions in fares. In 1886 the average fare per passenger was i-6id. and in 1896 it was i-jjid., falling in 1906 as low as i-iod. Some systems carry passengers over 1\ m. for one penny, workmen being carried twice the distance for the same sum. Halfpenny fares are repre- sented as a boon to the working man, but they have been abandoned as a failure after several years’ trial on several systems, and in Glasgow it is found that halfpenny fares contribute only 20-4 % of the’ early morning traffic, while the penny fare contributes 72-3% of that traffic. The general manager of the Birmingham Corporation tramways reported against halfpenny fares on the basis of his ex- perience

as general manager of the London County Council tramways that all the halfpenny passengers there are carried at a loss. The adjustment of fares and stages to their proper value is a question now carefully studied by tramway managers along with many problems of economy in working. The close ‘adjustment of the service to the fluctuations in traffic is one source of economy which is being more seriously considered. Many systems have ;a(iopted top covers to cars in order to carry more passengers during wet weather. The adoption of these covers is not popular in fine weather ; it adds to the weight and wind-resistance of the cars, thus increasing current consumption, and it adds to the cost of construction and maintenance. Economy in electrical energy is, in, its broader aspects, secured by purchasing current from an outside source in preference to generating it at a special station. The average cost per unit of electricity for all tramway undertakings in the United Kingdom is i-o6d., but one tramway company which purchases its energy from a large power company pays only o-85d. per unit. In its narrower aspects economy in current may be secured by reducing waste car mileage — that is to say, eliminating the running of cars at times and places where they are riot required for an adequate service. Saving may also be effected by supervision of the driving of the cars, since the difference of as much as 20 % has been noted between different drivers. One tramway manager secured

substantial improvement By merely marking on the trolley standards the position which the controller handle should occupy in passing each point. The limitation of stops is an- other source of econbmy, the average cost per stop on a system having been found to beo-iyd. A slight increase in the rnaxir mum speed of tramcars would

‘Average reduced owing to inclusion of Metropolitan, and Metropolitan District railways’ capital.

also improve the net results by reducing the proportion of standing charges (wages, &c.) to the traffic capacity of the system without making the cost of maintenance or current more than slightly greater. A 15 % increase in average speed means a saving of Jd. per car mile. The development of parcels traffic is a source of revenue, and addi- tional receipts can be earned by the hiring-

out of cars for picnics and other special purposes. An important point is the proper selection of the size of car. A small four-wheeled car is suitable to continual traffic of compara- tively small volume, but when the traffic is heavy cars of larger capacity are advisable. A serious burden on tramways is the cost of insurance against accidents, although the number of serious accidents on electric tramways is exceedingly small in proportion to the number of passengers carried, the ratio of tramway accidents of all kinds being about one accident to every 15,000 passengers.

There are many adjoining towns having separate tramway under-takings which do not provide intercommunication. Experience has shown that a break of tramway facilities reduces the receipts by 20 to 50 % on the lines which have been severed ; and the terminal half-mile, except in populous districts, is the least remunerative section of a tramway route.

Statistics.— Each year the British board of trade issues a return of street and road tramways and light railways authorized by act or order, showing the amount of capital authorized, paid up and expended; the length of line authorized and the length open for public traffic ; the gross receipts, working expenditures, net receipts and appropriation of net receipts; the number of passengers conveyed ; the number of miles run by cars and the quantity of electrical energy used; together with the number of horses, engines and cars in use. The return published in January 1909 deals with the figures for local authorities up to the 31st of March 1908 and for companies up to the 31st of December 1907. The following comparative table summarizes the most important general figures for the United Kingdom provided by this official return: —

The following table gives a few totals, ratios, and percentages for the last two years of what may be called a period of electric traction, in comparison with a typical “steam” period {i.e. a period in which the use of steam power in tramways was at its maximum) and a typicai ” horse ” period : —

Electric period,

1907-1908.

Steam period,

1896.

Horse period,

1879-

Total number of passengers carried

Percentage of net receipts to total capital outlay . Percentage of working expenditure to gross receipts Passengers carried per mile of route open . Average fare per passenger

2,464-22

2,625,532,895

6-8i

62-64

1,065,4.62

i-09d.

1009

759,466,047

6-88

74-79 752,691

i-6id.

321-27 150,881,515

3-97

83-81

469,641

i-84d.

From the above figures it will be noticed that the capital cost per mile has increased as a result of the adoption of electric traction, while at the same time the percentage of the return on the capital has been reduced notwithstanding that the rate of working

expendi- ture has fallen and the number of passengers carried per mile has increased, the fares charged having been disproportionately reduced.

(E. Ga.)

TRANCE (through the French, from Lat. transitus, from transire, to cross, pass over), a term used very loosely in popular speech to denote any kind of sleeplike state that seems to pre- sent obvious differences from normal sleep; in medical and scien- tific literature the meaning is but little better defined. In its original usage the word no doubt implied that the soul of the entranced person was temporarily withdrawn or passed away from the body, in accordance with the belief almost universally held by uncultured peoples in the possibility of .such withdrawal. But the word is now commonly applied to a variety of sleeplike states without the implication of this theory; ordinary sleep- walking, extreme cases of melancholic lethargy and of anergic stupor, the deeper stages of hypnosis (see Hypnotism) , the

Years ended June 30.

Year ending Dec. 31 (com- panies) and March 31 (local authorities).

1878.

1886.

1902.

I 907- I 908

Total capital authorized

Total capital expended

Length of route open (miles)

Number of horses . . .

Number of locomotive engines

Number of cars . ... .

Total number of passengers carried. .

Quantity of electrical energy used, B.O.T. units

Gross receipts

Working expenditure

Net receipts

£6,586,111

M.207,350

269

9,222

H

1,124

146,001,223

£1,099,271 £868,315 £230,956

£17,640,488

£12,573,041

865

24-535

452

3.44°

384,157,524

£2,630,338

£2,021,556

£608,782

£24,435,427

£16,492,869

1,064

38,777

< 589

5.335

858,485,524

£4,560,126

£3.507,895 £1,052,231

£51,677.471

£31,562,267

1,-484

24,120

388

7.752

1,394.452,983

£6,679,291

£4.817,873 £1,861,418

£91,305,439 £68,199,918

2,464

5,288

‘ 64

10,908

2,625,532,895

431,969,119

£12,439,625

£7,792,663

£4,646,962

The total figures at the date of the return are summarized in the following table, which is accompanied by one showing the lengths of line worked by various methods of traction : —

cataleptic state, the ecstasy of religious enthusiasts, the self-induced dream-like condition of the medicine-men, wizards or priests of many savage and barbarous peoples, and the abnormal

Capital expenditure

on lines and works

open for traffic.

Total expendi- ture on capital account.

Length open for traffic.

No. of under- takings.

Double.

Single.

Total.

Tramways and light railways belonging to local authorities

Tramways and light railways belonging to com- panies and private individuals

Total United Kingdom

£

32,978,579

18,641,279 l

£

44,920,317 23,279,601

408

■Ch.

77 58

M.

505 435

Ch.

77 46

M.

1619

844

Ch.

74 24

. 177 128

51,619,858

68,199,918

1522

55

. 941

43

2464

18

305

Table showing lengths worked by various

methods of traction

:—

Method of traction.

England and Scotland.

Ireland.

Total.

Electric Steam . Cable . . . Gas motors Horse .

Total .

M.

1922 22 4

4

82

Ch.

66 67 49 2 60

M.

235

22 4

Ch.

35 72 28

M.

127

29

7

Ch.

69

45 5

M.

2286 52 27

4 94

Ch.

10 32 41 2

13

2037

4

262

55

164

39

2461

18

1 These figures include cost of buildings and equipment in respect of certain local authorities' lines worked in conjunction with other lines.

state into which many of the mediums of modern spiritualistic seances seem to fall almost at will; all these are commonly spoken of as trance, or trance-like, states. There are no well-marked and characteristic physical symptoms of the trance state, though in many cases the pulse and respiration are slowed, and the reflexes diminished or abolished. The common feature which more than any other determines the application of the name seems to be a relative or complete temporary indifference to impressions made on the sense-organs, while yet the entranced person gives evidence in one .way or another, either by the expression of his features, his attitudes and movements, his speech, or by subsequent relation of his experiences, that his

condition is not one of simple quiescence or arrest of mental life, such as characterizes the state of normal deep sleep and the coma produced by defective cerebral circulation by toxic substances in the blood or by mechanical violence done to the brain.

If we refuse the name trance to ordinary sletp-walking, to normal dreaming, to catalepsy, to the hypnotic state and to stupor, there remain two different states that seem to have equal claims to the name; these may be called the ecstatic trance and the trance of mediumship respectively.

The ecstatic trance is usually characterized by an outward appearance of rapt, generally joyful, contemplation, the sub- ject seems to lose touch for the time being with the world of things and persons about him, owing to the extreme concen- tration of his attention upon some image or train of imagery, which in most cases seems to assume an hallucinatory character (see Hallucination). In most cases, though not in all, the sub- ject remembers in returning to his normal state the nature of his ecstatic vision or other experience, of which a curiously frequent character is the radiance or sense of brilliant luminosity.

In the mediumistic trance the subject generally seems to fall into a profound sleep and to retain, on returning to his normal condition, no memory of any experience during the period of the trance. But in spite of the seeming unconscious- ness of the subject, his movements, generally of speech or writing, express, either spontaneously or in response to verbal interrogation, intelligence and sometimes even great intel- lectual and emotional activity. In many cases the parts of the body not directly concerned in these expressions remain in a completely lethargic condition, the eyes being closed, the muscles of neck, trunk and limbs relaxed, and the breathing stertorous.

Trances of these two types seem to have occurred sporadic- ally (occasionally almost epidemically) amongst almost all peoples in all ages. And everywhere popular thought has interpreted them in the same ways. In the ecstatic trance the soul is held to have transcended the bounds of space or time, and to have enjoyed a , vision of some earthly event distant in space or time, or of some supernatural sphere or being. The mediumistic trance, on the other hand, popular thought in- terprets as due to the withdrawal of the soul from tke body and the taking of its place, the taking possession of the body, by some other soul or spirit; for not

infrequently the speech or writing produced by the organs of the entranced subject seems to be, or actually claims to be, the expression of a personality quite other than that of the sleeper. It is noteworthy that in almost all past ages the possessing spirit has been regarded in the great majority of cases as an evil and non-human spirit; whereas in modern times the possessing spirit has usually been regarded as, and often claims to be, the soul or spirit of some deceased human being. Modern science, in accordance with its materialistic and positive tendencies, has rejected these popular interpretations. It inclines to see in the ecstatic trance a case of hallucination induced by prolonged and intense occu- pation with some emotionally exciting idea, the whole mind becoming so concentrated upon some image in which the idea is bodied forth as to bring all other mental functions into abey- ance. The mediumistic trance it regards as a state similar to deep hypnosis, and seeks to explain it by the application of the notion of cerebral or mental dissociation in one or other of its many current forms; this assimilation finds strong support in the many points of resemblance between the deeper stages of hypnosis and the mediumistic trance, and in the fact that the artificially and deliberately induced state may be connected with the spontaneously occurring trance state by a series of states which form an insensible gradation between them. A striking feature of the mediumistic trance is the frequent occurrence of ” automatic ” speech and writing; and this feature especially may be regarded as warranting the appli- cation of the theory of mental dissociation for its explanation, for such automatic speech and writing arc occasionally pro- duced by a considerable number of apparently healthy persons

while in a waking condition which presents little or no other symptom of abnormality. In these cases the subject hears his own words, or sees the movement of his hand and his own hand writing, as he hears or sees those of another person, having no sense of initiating or controlling the movements and no anticipatory awareness of the thoughts expressed by the movements. When, as in the majority of cases, such move- ments merely give fragmentary expression to ideas or facts that have been assimilated by the subject at some earlier date, though perhaps seemingly completely forgotten by him, the theory of mental dissociation affords a plausible and moderately satisfactory explanation of the movements; it regards them as due to the control of ideas or memories which somehow have become detached or loosened from the main system of ideas and

tendencies that make up the normal personality, and which operate in more or less complete detachment; and the application of the theory is in many cases further justified by the fact that the " dissociated " ideas and memories seem in some cases to become taken up again by, or reincorporated with, the normal personality.

But in recent years a new interest has been given to the study of the mediumistic trance by careful investigations (made with a competence that commands respect) which tend to re-establish the old savage theory of possession, just when it seemed to have become merely an anthropological curiosity. These investigations have been conducted for the most part by members of the Society for Psychical Research, and their most striking results have been obtained by the prolonged study of the automatic speech and writing of the American medium, Mrs Piper. In this case the medium passes into a trance state apparently at will, and during the trance the organs of speech or the hand usually express what purport to be messages from the spirits of deceased relatives or friends of those who are present. A number of competent and highly critical observers have arrived at the conviction that these messages often com- prise statements of facts that could not have come to the know- ledge of the medium in any normal fashion; and those who are reluctant to accept the hypothesis of " possession " find that they can reject it only at the cost of assuming the operation of tele- pathy (q.v.) in an astonishing and unparalleled fashion. During 1907-1908 the investigation was directed to the obtaining of communications which should not be explicable by the most extended use of the hypothesis of telepathic communication from the minds of living persons. The plan adopted was to seek for " cross-correspondences " between the communica- tions of the Piper " controls " and the automatic writings of several other persons which claimed to be directed by the same disembodied spirits; i.e. it was sought to find in the automatic writings of two or more individuals passages each of which in itself would be fragmentary and unintelligible, but which, taken in connexion with similar fragments contemporaneously pro- duced by another and distant writer, should form a significant whole; for it is argued that such passages would constitute irrefutable evidence of the operation of a third intelligence or personality distinct from that of either medium. The results published up to 1909 seem to show that this attempt met with striking success; and they constitute a body of evidence in favour of the hypothesis of

possession which no impartial and unprejudiced mind can lightly set aside. Nevertheless, so long as it is possible to believe, as so many of the most competent workers in this field believe, that dissociated fragments of a personality may become synthesized to form a secondary and as it were parasitic personality capable of assuming temporary control of the organs of expression, and so long as we can set no limits to the scope of telepathic communication between embodied minds, it would seem wellnigh impossible, even by the aid of this novel and ingenious plan of investigation, to achieve completely convincing evidence in favour of the hypothesis of " possession."

Literature. — F. Podmore, Modern Spiritualism (London, 1902); F. W. H. Myers, Human Personality and its Survival of Bodily Death (London, 1903) ; Morton Prince, The. Dissociation oj a Personality

(London, 1906). See also various articles in Grenzfragen des Nerven- und Seelenlebens, edited by L. Loewenfeld and H. Kurella (Wiesbaden, 1900), especially the article " Somnambulismus und Spiritismus "; also articles in Proceedings of the Society for Psychical Research, especially pts. liii., lv. and lvii., and in the Journ. of Abnormal Psychology, edited by Morton Prince (Boston, 1906-1909)'; also litera- ture cited under Automatism; Hypnotism; Medium; Telepathy and Possession. (\y. Mc D.)

TRANENT, a police burgh of Haddingtonshire, Scotland. Pop. (1901), 2584. It lies 9ˆ m. E. of Edinburgh by road and 1 m. S.E. of Prestonpans station on the North British railway. The town possesses the oldest coal-mining charter (1202-1218) in Great Britain, and the mines and quarries in the neighbour- hood provide the staple industry. A fragment of a parish church, said to have been built in the nth century, still stands. Of the palace of the Setons which stood in the parish there are no remains. It was demolished towards the close of the 18th century and a modern mansion was erected on its site.

In the neighbouring village of Ormiston, in 1885, a granite obelisk was erected in memory of Robert Moffat (1795-1883), a native, the South African missionary and father-in-law of Livingstone. At Ormiston Hall, a seat of the marquess of Linlithgow, there is a yew tree, beneath which the reformer

George Wishart (1513-1546) used to preach. Hard by is the village of Pencaitland, divided into an eastern and a western portion by the Tyne. The parish church in Easter Pencaitland probably dates from the 13th century. The aisle may belong to the original building, but the rest is of the 16th century, excepting the small belfry of the 17th century. The old house of Pencaitland stands in the grounds of Winton Castle, which' was erected by the 3rd earl of Winton in 1620 but forfeited by the 5th earl, who was involved in the Jacobite rising of 1715. Five miles south-east of Tranent is the village of Salton (or Saltown), where Gilbert Burnet, afterwards bishop of Salisbury, had his first charge (1665). At his death he bequeathed the parish 20,000 marks for the clothing and educating of poor children. He was tutor to Andrew Fletcher, who was born at Salton in 1655 and buried there in 1716. At Fletcher's instigation James Meikle, a neighbour- ing millwright, went to Holland to learn the construction of the iron-work of barley mills, and the mill which he erected at Salton after his return not only gave Salton barley a strong hold on the market, but was also for forty years the only mill of its kind in the British Isles. Meikle 's son Andrew (1719-1811), inventor of the threshing machine, carried on his trade of millwright at Houston Mill near Dunbar. Andrew Fletcher, also of Salton (1692-1766), nephew of the elder Andrew, became lord justice clerk in 1735 under the style of Lord Milton. By his mother's energy the art of weaving and dressing holland linen was introduced into the village. She travelled in Holland with two skilled mechanics who contrived to learn the secrets ot the craft. The British Linen Company laid down their first bleachfield at Salton under Lord Milton's patronage. Salton also lays claim to having been the birthplace of the poet William Dunbar.

TRANI, a seaport and episcopal see of Apulia, Italy, on the Adriatic, in the province of Bari, and 26 m. by rail W.N.W. of that town, 23 ft. above sea-level. Pop. (1901), 34,688. Trani has lost its old walls and bastions, but the 13th-century Gothic citadel is used as a prison. Some of the streets remain much as they were in the medieval period, and many of the houses dis- play more or less of Norman decoration. The cathedral (dedi- cated to St Nicholas the Pilgrim, a Greek assassinated at Trani in 1094 and canonized by Urban II.), on a raised open site near the sea, was consecrated, before its completion, in 1143; it is a basilica with three apses; a large crypt and a lofty tower, the latter erected in 1 230-1 239 by the architect whose name appears on the ambo in

the cathedral of Bitonto, Nicolaus Sacerdos. It has an arch under it, being supported partly on the side wall of the church, and partly on a massive pillar. The arches of the Romanesque portal are beautifully ornamented, in a manner suggestive of Arab influence; the bronze doors, executed by Barisanus of Trani in 1175, rank among the best of their period in southern Italy. The capitals of the pillars in the crypt are fine examples of the Romanesque. The interior of the cathedral has been barbarously modernized, but the crypt is fine. Near the harbour is the Gothic palace of the doges of Venice, which is now used as a seminary. The church of the Ognissanti has a Romanesque relief of the Annunciation over the door. S. Giacomo and S. Francesco also have Romanesque facades and the latter and S. Andrea have " Byzantine " domes. The vicinity of Trani produces an excellent wine (Moscato di Trani) ;

and its figs, oil, almonds and grain are also profitable articles of trade.

Irani is the Turenum of the itineraries. It first became a flourishing place under the Normans and during the crusades, but attained the acme of its prosperity as a seat of trade with the East under the Angevin princes. The harbour, however, has lost its importance.

TRANQUEBAR, a town of British India, in the Tanjore district of Madras, on the sea-coast, 18 m. N. of Negapatam. Pop. (1901), 13,142. A Danish factory was opened here as early as 1620. It was taken by the British in 1801, but restored in 1 8 14, and finally purchased, with the other Danish settlements in India, in 1845. In Danish times Tranquebar was a busy port, but it lost its importance when the railway was opened to Negapatam. It was the first settlement of Protestant missionaries in India, founded by Ziegenbalg and Plutschau (Lutherans) in 1706; and there is still a Lutheran mission high school and mission press.

TRANSBAIKALIA (sometimes also known as Dauria), a province of Eastern Siberia, lying E. of Lake Baikal, with the government of Irkutsk on the N.W. and N., the provinces of Amur and Manchuria on the E. and Mongolia on the S. Its area (232,846 sq. m.) is nearly as large as that of Austria- Hungary, but its population does not much exceed half a million.

Transbaikalia forms an intermediate link between Siberia, Mongolia and the northern Pacific littoral. The Yablonoi Mountains, which run north-east from the sources of the Kerulen to the bend of the Olekma in 56 N., divide the province into two quite distinct parts; to the west, the upper terrace of the high east Asian plateau, continued from the upper Selenga and the Yenisei (4000 to 5000 ft high) towards the plateau of the Vitim (3500 to 4000 ft.); and to the east the lower terrace of the same plateau (2800 ft.), forming a continuation of the eastern Gobi. Beginning at Lake Baikal, a valley, deep and broad, penetrates the north-western border-ridge of the plateau, and runs eastward up the river Uda, with an im- perceptible gradient, like a gigantic railway cutting enclosed between two steep slopes, and it sends another branch south towards Kiakhta. After having served, through a succession of geological periods, as an outlet for the water and ice which accumulated on the plateau, it is now utilized for the two highways which lead from Lake Raika' aWnss thp plateau (-jsno. 4000 ft.) to the Amur on the east and the Chinese depression on the south. Elsewhere the high and massive border-ridge on the north-western edge of the plateau can be crossed only by difficult footpaths. The border-ridge just mentioned, gapped by the wide opening of the Selenga, runs from south-west to north-east under different names, being known as Khamar-daban (6900 ft.) south of Lake Baikal, and as the Barguzin Mountains (7000 to 8000 ft.) along the east bank of the Barguzin river, while farther north-east it has been described under the names of the South Muya and the Chara Mountains (6000 to 7000 ft.). Resting its south-east base on the plateau, it descends steeply on the north-west to the lake and to the broad picturesque valleys of the Barguzin, Muya and Chara. Thick forests of larch, fir and cedar clothe the ridge, whose dome-shaped rounded summits {goltsy) rise above the limits of tree vegetation, but do not reach the snow-line (here above 10,000 ft.). _ The high plateau itself has the aspect of an undulating table-land, intersected by ranges, which rise some 1500 or 2000 ft. above its surface, and are separated by broad, flat, marshy vaileys, traversed by sluggish meandering streams. The better drained valleys have fine meadow lands, while the hills are clothed with forests (almost exclusively of larch and birch). Numberless lakes and ponds occur along the river courses. Tunguses hunt in the forests and meadows, but permanent agricultural settlements are impossible, corn seldom ripening on account of the early frost. The lower parts of the broad, flat valley of the Jida have, however, a few Cossack settlements, and

Mongolian shepherds inhabit the elevated grassy valleys about Lake Kosso-gol (5300 ft. above the sea). Quite different is the lower terrace of the plateau, occupied by the eastern Gobi and the Nerchinsk region, and separated from the upper terrace by the Yablonoi range. This last is the south- eastern border-ridge of the higher terrace. It rises to 8035 ft. in the Sokhondo peak, but elsewhere its dome-shaped summits do not exceed 5000 or 6000 ft. Numberless lakes, with flat undefined margins, feed streams which join the great north-going rivers or the Amur and the Pacific. Low hills rise above the edge of the plateau, but the slope is abrupt towards the south-east, where the foot-hills of the Yablonoi are nearly 1500 and 2000 ft. lower than on the north-west. Climate, flora and fauna change suddenly as soon as the Yablonoi has been crossed. The Siberian flora gives way to the Daurian flora, and this, is in turn exchanged for the Pacific littoral flora on the Manchurian plains and lowlands.

TRANSCASPIAN REGION

The lower terrace has the character of a steppe, but is intersected by a number of ranges, plications of Silurian and Devonian rocks, all running south-west to north-east, and all containing silver, lead, copper and auriferous sands. Agriculture can be easily carried on in the broad prairies, the only drawbacks being droughts, and frosts in the higher closed valleys of the Nerchinsk or Gazimur Mountains. The lower terrace is in its turn fringed by a border-ridge — the Great Khingan — which occupies, with reference to the lower terrace, the same position that the Yablonoi does in relation to the upper, and separates Siberia from northern Manchuria. This important ridge does Apt run from south to north, as represented on the old maps, but from south-west to north-east; it is pierced by the Amur near Aibazin, and joins the Okhotsk Mountains, which however do not join the Yoblonoi Mountains.

The rivers belong to three different systems — the affluents of Lake Baikal, of the Lena and of the Amur. Of the first the Selenga (800 m. long) rises in north-west Mongolia, one of its tributaries (the Egin-gol) being an emissary of Lake Kosso-gol. The Chikoi, Khilok and Uda are its chief tributaries in Transbaikalia. The Barguzin and the upper Angara enter Lake Baikal from the north-east. Of the tributaries of the Lena, the Vitim with its affluents (Karenga, Tsipa, and Muya) flows on the high plateau through un

inhabited regions, as also does the Olekma. The tributaries of the Amur are much more important. The Argun, which at a quite recent epoch received the waters of the Dalai-nor, and thus had the Kerulen for its source, is no longer in communication with the rapidly desiccating Mongolian lake, but has its sources in the Gan, which flows from the Great Khingan Mountains. It is not navigable, but receives the Gazimur and several other streams from the Nerchinsk mining district. The Shilka is formed by the union of the Onon and the Chita rivers, and is navigable from the town of Chita, thus being an important channel to the Amur.

Lake Baikal, with an area of 13,200 sq. m. (nearly equal to that of Switzerland), extends in a half crescent from south-west to north-east, with a length of nearly 400 m. and a width of 20 to 50 m. Its level is 1,500 ft. aboˆe the sea. 1 The wide delta of the Selenga narrows it in the middle, and renders it shallower in the east than in the west. The other lakes include the Gusinoye and Lake Ba-unt on the Vitim plateau. Many lakes yield common salt.

The high plateau is built up of granites, gneisses and syenites, overlain by Laurentian schists. Silurian and Devonian marine deposits occur only on the lower terrace. Since that epoch the region has not been under the sea, and only fresh-water Jurassic deposits and coal beds are met with in the depressions. During the Glacial period most of the high terrace and its border ridges were undoubtedly covered with vast glaciers. Volcanic rocks of more recent origin (Mesozoic?) are met with in the north-western border-ridge and on its. slopes, as well as on the Vitim plateau. During the Glacial period the fauna of the lowest parts of Trans-baikalia was decidedly arctic; while during the Lacustrine or post- Glacial periods this region was dotted over with numberless lakes, the shores, of. which were inhabited by Neolithic man. Only few traces of these survive, and they are rapidly drying up. Earth- quakes are very frequent oh the shores of Lake Baikal, especially at the mouth of the Selenga,' and they extend as far as Irkutsk, Barguzin and Selenginsk; in 1862 an extensive area was submerged by the lake. Numerous mineral springs, some of them of high repute, exist all over Transbaikalia. The most important are the hot alkaline springs (130 s F.) at Turka, at the mouth of the Barguzin, those of Pogromna on the Uda (very similar to the Seltzer springs), those of Molokova near Chita and those of Darasun in the Nerchinsk district.

The climate is, as a whole, exceedingly dry. The winter is cold and dry, the thermometer dropping as low as — 58° F. But the

snow is so trifling that the horses of the Buryats are able to procure food throughout the winter on the steppes, and in the very middle of the winter wheeled vehicles are used all over the west. To the east of the Yablonoi ridge the Nerchinsk district feels the influence of the North Pacific monsoons, and snow falls more thickly, especially in the valleys; but the summer is hot and dry. On the high plateau even the summer is cold, owing to the altitude and the humidity arising from the marshes, and the soil is frozen to a great depth. At Chita the daily range in summer and spring is sometimes as much as 33 to 46 In the vicinity of Lake Baikal there is a cooler summer; in winter exceedingly deep snow covers the mountains around the lake. 2

The estimated population in 1906 was 742,200. The Russian population is gathered around the mines of the Nerchinsk district, while the steppes are occupied by the Buryats. A string of villages has been planted along the Shilka between Chita and Stryetensk. The valleys of the Uda, the lower Selenga, and especially the Chikoi and the Khilok have been occupied since the beginning of the 19th century by Raskolniks, some of whom, living in a condition of prosperity such as is unknown in

1 There is uncertainty as to the absolute altitude (see Baikal). 1 See "• Das Klima von Ost-Siberien," by A. Woyeikow, in Meteorol. Zeitschrift (1884)/

Russia proper, rank amongst the finest representatives of the Russian race. The remainder of the steppe of the Uda is occupied by Buryats, while the forests and marshes of the plateau are the hunting grounds of the nomad Tunguses. South of the Khamar-daban the only settled region is the lower valley of the Jida. On the Upper Argun the Cossacks are in features, character, language and manners largely Mongolian. The Russians along the Chinese frontier constitute a separate voisko or division of the Transbaikal Cossacks. The Buryats number about 180,000, the Tunguses over 30,000. The province is divided into five districts, the chief towns of which are Chita, the capital, Barguzin, Nerchinsk, Selenginsk and Verkhneudinsk.

Although a good deal of land has been cleared by the settlers, nearly one-half of the entire area is still covered with forests. The principal varieties are fir, larch, aspen, poplar and birch, with Abies pectinata in. the north and the cedar in the south. Only about one-third of the surface is adaptable for cultivation, and of that only about one-tenth is actually under tillage.

Agriculture is carried on to a limited extent by the Buryats and in all the Russian settlements; but it prospers only in the valleys of West Transbaikalia, and partly in the Nerchinsk region, while in the steppes of the Argun and Onon even the Russians resort to pastoral pursuits and trade, or to hunting. Livestock rearing is extensively carried on, especially by the Buryats, but their herds and flocks are often destroyed in great numbers by the snowstorms of spring. Hunting is an important occupation, even with the Russians, many of whom leave their homes in October to spend six weeks in the taiga (forest region). The fisheries of Lake Baikal and the lower parts of its affluents are important. Enormous quantities of Salmo omul are taken every year ; and 5. thymalus, S. oxyrhynchus and 5. fluviatilis are also taken. Mining, and especially gold mining, is important, but the" production of gold has fallen off. Silver mines have only a very small output. Iron mining is gradually developing, and good coal mines are now being worked. Salt is raised from several lakes, and the extraction of Epsom salts has considerably developed. Manufactures, though insignificant, have increased. The trade is chiefly concentrated at Kiakhta. The Cossacks on the frontier traffic in brick-tea, cattle and hides with Mongolia. The export of furs is of considerable value.

Transbaikalia is crossed by the Trans-siberian railway from Mysovaya on Lake Baikal,, via Chita, to Stryetensk, and from Kaida- lovo, near Chita, to the Mongolian frontier; the latter section is continued across Manchuria to Vladivostok and Port Arthur. Regular steamer communication has been established along Lake Baikal, not only for the transport of passengers and goods between the two railway stations of Listvinichnoye and Mysovaya, but also with the object of developing the fishing industry, which is of great importance. Steamers ply up the Selenga river as far as Selenginsk, considerable cargoes of tea being transported along this line.

(P.A.K.; J.T.Be.)

TRANSCASPIAN REGION, a Russian territory on the E. of the Caspian, bounded S. by Khorasan and Afghanistan, N. by the Russian province of Uralsk, N.E. by Khiva 'and Bokhara and S.E. by Afghan Turkestan. Area, 212,545 sq. m. Some of the most interesting problems of geography, such as those relating to the changes in the course of the Jaxartes (Syr-darya) and the Oxus (Amu-darya), and the supposed periodical disappearance of Lake Aral, are connected with the Transcaspian deserts; and it is here

that we must look for a clue to the physical changes which transformed the Euro-Asiatic Mediterranean — the Aral-Caspian and Pontic basin — into a series of separate seas, and desiccated them, powerfully influencing the distribution of floras and faunas, and centuries ago com- pelling the inhabitants of Western and Central Asia to enter upon their great migrations. But down to a comparatively recent date the arid, barren deserts, peopled only by wandering Turkomans, were almost a terra incognita.

A mountain chain, comparable in length to the Alps, separates the deserts of the Transcaspian from the highlands of Khorasan. It begins in the Krasnovodsk peninsula of the Caspian, under the names of Kuryanyn-kary and Great Balkans, whose masses of granite and other crystalline rock reach an altitude of some 5350 ft, Farther south-east they are continued in the Little Balkans (2000 ft.) and the Kopepet-dagh or Kopet-dagh. The latter rises steep and rugged above the flat deserts over a stretch of 600 m. In structure it is homologous with the Caucasus chain ; it appears as an outer wall of the Khorasan plateau, and is separated from it by a broad valley, which, like the Rion and Kura valley of Transcaucasia, is drained by two rivers flowing in opposite directions — the Atrek, which flows north-west into the Caspian, and the Keshef-rud, which flows t6

the south-east and is a tributary of the Murghab. On the other side of this valley the Alla-dagh (Aladagh) and the Binalund border- ranges (9000 to 11,000 ft.) fringe the edge of the Khorasan plateau. Descending towards the steppe with steep stony slopes, the mountain barrier of the Kopet-dagh rises to heights of 6000-9000 ft. to the east bf Kyzyl-arvat, while the passes which lead from the Turkoman deserts to the valleys of Khorasan are seldom as low as 3500, and usually rise to 5000, 6000 and even 8500 ft., and in most cases are very difficult. It is pierced by only one wide opening, that between the Great and Little Balkans, through which the sea, which once covered the steppe, maintained connexion with the Caspian.

While the Alla-dagh and Binalund border-ranges are chiefly composed of crystalline rocks and metamorphic slates, overlain by Devonian deposits, a series of more recent formations — Upper and Lower Cretaceous and Miocene — crops out in the

outer wall of the Kopet-dagh. Here again we find that the mountains of Asia which stretch towards the north-west continued to be uplifted at a geologically recent epoch. Quarternary deposits have an extensive development on its slopes, and its foothills are bordered by a girdle of loess.

The loess terrace, called Atok (" mountain base "), 10 to 20 m. in width, is very fertile; but it will produce nothing without irrigation, and the streams flowing from the Kopet-dagh are few and scanty. The winds which impinge upon the northern slope of the mountains have been deprived of all their moisture in crossing the Kara-kum — the Black Sands of the Turkoman desert; and even such rain as falls on the Kopet-dagh (io| in. at Kyzyl-arvat) too often reaches the soil in the shape of light showers which do not penetrate it, so that the average relative humidity is only 56 as compared with 62 at even so dry a place as Krasnovodsk. Still, at those places where the mountain streams run closer to one another, as at Geok-tepe, Askhabad, Lutfabad and Kaaka, the villages are more populous, and the houses are surrounded by gardens, every square yard and every tree of which is nourished by irrigation.

North of this narrow strip of irrigated land begins the desert — the Kara-kum — which extends from the mountains of Khorasan to Lake Aral and the plateau of Ust-Urt, and from the Caspian to the Amu-darya, interrupted only by the oases of Merv and Tejefi. But the terrible shifting sands, blown into barkhans, or elongated hills, sometimes 50 and 60 ft. in height, are accumulated chiefly in the west, where the country has more recently emerged from the sea. Farther east the barkhans are more stable. Large areas amidst the sands are occupied by lakyrs, or flat surfaces paved with clay, which, as a rule, is hard but becomes almost impassable after heavy rains. In these takyrs the Turkomans dig ditches, drain- ing into a kind of cistern, where the water of the spring rains can be preserved for a few months. Wells also are sunk, and the "water is found in them at depths of 10 to 50, or occasionally 100 ft. and more. All is not desert in the strict sense; in spring there is for the most part a carpet of grass.

The vegetation of the Kara-kum cannot be described as poor. The typical representative of the sandy deserts of Asia, the saksaul (Anabasis ammodendron), has been almost destroyed within the last hundred years, and occurs only sporadically, but the borders of the spaces covered with saline clay are brightened by forests of tamarisk, which are inhabited by great numbers of the desert

warbler (Atraphornis aralensis) — a typical inhabitant of the sands- sparrows and ground-choughs (Podoces) ; the Houbara macqueeni, though not abundant, is characteristic of the region. Hares and foxes, jackals and wolves, marmots, moles, hedgehogs and one species of marten live in the steppe, especially in spring. As a whole, the fauna is richer than might be supposed, while in the Atok it contains representatives of all the species known in Turkestan, intermingled with Persian and Himalayan species.

The Uzboi.—A feature distinctive of the Turkoman desert is the very numerous shors, or elongated depressions, the lower portion of which are mostly occupied with moist sand. They are obviously the relics of brackish lakes, and, like the lakes of the Kirghiz steppes, they often follow one another in quick succession, thus closely resembling river-beds. As the direction of th'e shors is generally from the higher terraces drained by the Amu-darya towards the lowlands of the Caspian, they were usually regarded as old beds of the Amu-darya, and were held to support the idea of its once having flowed across the Turkoman desert towards what is now the Caspian Sea. It was formerly considered almost settled, not only that that river (see Oxus) flowed into the Caspian during histor- ical times, but that after having ceased to do so in the 7th century, its waters were again diverted to the Caspian about 1221. A chain of elongated depressions, bearing a faint resemblance to old river- beds, was traced from Urgenj to the gap between the Great and the Little Balkans; this was marked on the maps as the Uzboi, or old bed of the Oxus. 1 The idea of again diverting the Amu into the Caspian was thus set afloat, but the investigations of Russian engi- neers, especially A. E. Hedroitz, A. M. Konshin, I. V. Mushketov,

1 On the original Russian map of the Transcaspian, drawn immediately after the survey of the Uzboi had been completed, the Uzboi has not the continuity which is given to it on subsequent maps.

P. M. Lessar and Svintsov, 2 went to show that the Uzboi is no river-bed at all, and that no river has ever discharged its waters in that direction. The existence of an extensive lacustrine depres- sion, now represented by the small Sary-kamysh lakes, was proved, and it was evident that this depression, having a length of more than 130 m., a width of 70 m., and a depth of 280 ft. below the present level of Lake Aral, would have to be filled by the Amu before its waters could advance farther to the south- west. The sill of this basin being only 28 ft. below the present

level of Lake Aral, this latter could not be made to disappear, nor even be notably reduced in size, by the Amu flowing south-west from Urgenj. A more careful exploration of the Uzboi has shown that, while the deposits in the Sary-kamysh depression, and the Aral shells they contain, bear unmistakable testimony to the fact of the basin having once been fed by the Amu-darya, no such traces are foUnd along the Uzboi below the Sary-kamysh depression ; 3 On the contrary, shells of molluscs still inhabiting the Caspian are found in numbers all along it, and the supposed old bed has all the characteristics of a series of lakes which continued to subsist along the foothills of the Ust-Urt plateau* while the Caspian was slowly receding westwards during the post- Pliocene period. On rare occasions only did the waters of the Sary- kamysh, when raised by inundations above the sill just mentioned, send their surplus into the Uzboi. It appears most probable that in the 1 6th century the Sary-kamysh was confounded with a gulf of the Caspian; 4 and this gives much plausibility to Konshih's supposition t.iat the changes in the lower course of the Amu (which no geo'ogist would venture to ascribe to man, if they were to mean the alternative discharge of the Amu into the Caspian and Lake Aral) merely meant that by means of appropriate dams the Amu was made to flow in the I3th-i6th centuries alternately into Lake Aral and into the Sary-kamysh.

The ancient texts (of Pliny, Strabo, Ptolemy) about the Jaxartes and Oxus only become intelligible when it is admitted that, since the epoch to which they relate, the outlines of the Caspian Sea and Lake Aral have undergone notable changes, commensurate with those which are supposed to have occurred in the courses of the Central Asian rivers. The desiccation of the Aral-Caspian basin proceeded with such rapidity that the shores of the Caspian cannot possibly have maintained for some twenty centuries the outlines which they exhibit at present. When studied in detail, the general configuration of the Transcaspian region leaves no doubt that both the Jaxartes and the Oxus, with its former tributaries,' the Murghab and the Tejefi, once flowed towards the west; but the Caspian of that time was not the sea of our days; its gulfs penetrated the Turkoman steppe, and washed the base of the Ust-Urt plateau. (See Caspian and Aral.) : . .

Kelif- Uzboi.— There is also no doubt that, instead of flowing north-westward of Kelif (on the present Bokhara- Afghan frontier), the Amu once bent south to join the Murghab and Tejefi; the chain of depressions described by the Russian

engineers as the Kelif- Uzbof 6 supports this hypothesis, which a geographer cannot avoid making when studying a map of the Transcaspian region; but the date at which the Oxus followed such a course, and the extension which the Caspian basin then had towards the east, are uncertain.

In 1897 the population numbered 377,416, of whom only; 42,431 lived in towns; but, besides those of whom the census took account, there were about 25,000 strangers and troops.

2 Their original papers are printed in the Izvestia of the Russian Geographical Society, 1883 to 1887, also in the Journal of the Russian ministry of roads and communications.

3 According to A. E. Hedroitz and A. M. Konshin the old Tonu-darya bed of the Amu contains shells of molluscs now living in the Amu (Cyrena fluminalis, Dreissensia polymorpha and Anodonta). The Sary-kamysh basin is characterized by deposits containing Neritina liturata, Dreissensia polymorpha and Limnaeus, character- istic of this basin. Below the Sary-kamysh there are no deposits containing shells characteristic of the Amu; Anodontae are found quite occasionally on the surface, not in beds, in company with the Caspian Cardium (Didacna) Irigonoides, var. crassum, Cardium piramidatum. Dreissensia polymorpha, D. rostriformis, Hydrobia caspia, Neritina liturata and Dreissensia beardii ; the ‘ red clays containing these fossils extend for 130 m. east of the Caspian (Izvestia of Russ. Geog. Soc, 1883 and 1886).

4 As by Jenkinson, who mentions a freshwater gulf of the Caspian within six days’ march from Khwarezm (or Khiva), by which gulf he could only mean the Sary-kamysh depression.

5 The Turkomans call this southern ” old bed ” Unghyuz or Onguz (” dry old bed “), and there can be no doubt that when the Bolshoi- Chertezh of the 1 6th century (speaking from anterior information) mentions a river, Ughyuz or Ugus, flowing west from the Amu towards the Caspian, it is merely describing as a river what the very name shows to have been a dry bed, supposed to have been once occupied by a river. The similarity of the names Ongus and Ugu$ with Ogus and Ochus possibly helped , to accentuate, if not to give rise to, the confusion. Cf. N. G. Petrusevich, ” The South-east Shores of the Caspian,” in Zapiski of the Caucasian Geographical Society (1880), vol. xi. ‘ • ■

Included in the total were some 280,000 Turkomans, 60,000 Kirghiz, 12,00c Russians, 8000 Persians, 4250 Armenians, and seme Tatars. The estimated population in 1906 was 397,100. The province is divided into five districts, the chief towns of which are Askhabad, the capital; Krasnovodsk; Fort Alexan- drovskiy, in the district of Manghishlak, on the Caspian Sea; Merv and Tejen. Until a recent date the chief occupations of the Turkomans were cattle-rearing and robbery. Even those who had settled abodes on the oases of the Atok, Tejen and Merv were in the habit of encamping during the spring in the steppes, the khanates of Afghan Turkestan from Balkh to Meshhed being periodically devastated by them. The aspect of the steppe has, however, greatly changed since the Russian advance and the fall (1881) of the Turkoman stronghold of Geok-tepe. Their principal oases are situated along the Atok or loess terrace, the chief settlements being Askhabad, Kyzyl-arvat and Geok-tepe. The oasis of Merv is inhabited by Akhal-tekkes (about 240,000), mostly poor. In January 1887 they submitted to Russia. The oasis of Tejen has sprung up where the river Tejen (Heri-rud) terminates in the desert.

South-west Turcomania. — The region between the Heri-rud and the Murghab has the characteristics of a plateau, reaching about 2000 ft. above the sea, with hills 500 and 600 ft. high covered with sand, the spaces between being filled with loess. The Borkhut Mountains which connect the Kopet-dagh with the Sefid-kuh in Afghanistan reach 3000 to 4000 ft., and are cleft by the Heri-rud. Thickets of poplar and willow accompany both the Murghab and the Heri-rud. Pistachio and mulberry trees grow in isolated clumps on the hills; but there are few places available for cultivation, and the Saryk Turkomans (some 60,000 in number) congregate in only two oases — Yol-otan or Yelatan, and Penjdeh. The Sarakhs oasis is occupied by the Salor Turkomans, hereditary enemies of the Tekke Turkomans; they number about 3000 tents at Old Sarakhs, and 1700 more on the Murghab, at Chardjui, at Maimene (or Meimane), and close to Herat.

The Transcaspian Region is very rich in minerals. Rock-salt, petroleum, gypsum and sulphur are extracted. Nearly 300,000 acres are irrigated by the natives, and attempts are being made

by the government to increase the irrigated area; it is considered that over 5,000,000 acres of land could be rendered suitable for agriculture. Several hundred thousand trees are planted every year, and a forest guard has been established to prevent useless destruction of the saksaul trees, which grow freely in the steppes. A model garden and a mulberry plantation have been established at Askhabad in connexion with the gardening school. The land in the oases, especially those of the Atrek River, is highly cultivated. Wheat and barley are grown, in addition to sorghum (a species of millet), maize, rice, millet and sesame for oil. Raw cotton is extensively grown in the Merv district. Gardening and fruit-growing are well developed, and attempts are being made to encourage the spread of viticulture. Livestock breeding is the chief occupation of the nomad Turkomans and Kirghiz. Considerable fishing is carried on in the Caspian Sea, and seals are killed off the Manghishlak peninsula. The natives excel in domestic industries, as the making of carpets, travelling bags, felt goods and embroidered leather. The Russian population is mostly limited to the military and the towns. Wheat, flour, wool, raw cotton and dried fruit are exported; while tea, manufactured goods, timber, sugar, iron and paraffin oil are imported, as also rice and fruit from Bokhara, Turkestan and Persia. The Transcaspian railway, constructed across the province from Krasnovodsk to Merv, with a branch to Kushk, and from Merv to Bokhara and Russian Turkestan, has effected quite a revolution in the trade of Central Asia. The old caravan routes via Orenburg have lost their impor- tance, and goods coming from India, Persia, Bokhara and even China are now carried by rail. (For the history of the region see Merv.)

See the researchesof Andrusov, Bogdanovich, Konshin, Mushketov and Obruchev in the Memoirs, the Bulletin (Izvestia) and the Annuals of the Russian Geographical Society (1890-1900); P. M. Lessar, V ‘ Ancienne jonction de I’Oxus avec la mer Caspienne (1889) ; Zarudnoi (zoology) in Bulletin de la societe des naturalistes de Moscou (1889 seq.). (P. A. K.; J. T. Be.)

TRANSCAUCASIA, a general name given to the governments and provinces of Russian Caucasia, excluding the steppe provinces of Kuban and Terek and the steppe government of Stavropol. It thus includes the governments of Baku, Elisavetpol, Erivan, Kutais and Tiflis; the provinces of Batum, Daghestan and Kars; and the military districts of the Black Sea (Chernomorsk) and Zakataly. Its area is 95,402 sq. m., and the estimated population in 1906 was 6,114ˆ600. (See Caucasia and Caucasus.)

TRANSCENDENTALISM (Lat. trans, across, scandere, climb, whence transcendere, to pass a limit), in philosophy, any system which emphasizes the limited character of that which, can be perceived by the senses and is based on the view that true knowledge is intuitive, or supernatural. The term is specially applied to Kant's philosophy and its successors which hold that knowledge of the a priori is possible. It is traceable as far back as the schoolmen of whom Duns Scotus describes as " transcen- dental " those conceptions which have a higher degree of univer- sality than the Aristotelian categories. Thus ens (being) is more universal than God or the physical universe because it can be predicated of both. Kant distinguishes as " transcen- dent " the world of things-in-themselves as being without the limits of experience; while " transcendental " is his term for those elements which regulate human experience, though they are themselves beyond experience; such are the categories of space, time, causality.

In general use the term is applied rather promiscuously arid frequently by way of criticism to an attitude of mind which is imaginative, aloof from mundane affairs and unmoved by practical considerations. The most famous example of the pseudo-philosophic use of the term is for a movement of thought which was prominent in the New England states from about 1830 to 1850. Its use originated in the Transcendental Club (1836) founded by Emerson, Frederic Henry Hedge (1805-1890), and others. This movement had several aspects : philosophical, theological, social, economic. Its main theme was regeneration, a revolt from the formalism of both Unitarian and Calvinist theology and a widening literary outlook. It took its rise to a large extent in the study of German (and to a less extent French) philosophy and spread widely among the cultured classes. In 1840 the club began to issue an official organ, The Dial, and the settlement of Brook Farm (q.v.) followed in 1841. These enterprises themselves did not receive general support even among the Transcendentalist leaders, and the real signifi- cance of the movement was the stimulus which it gave to philanthropy, to the Abolition movement, and to a new ideal of individual character. The chief names associated with it, besides those of Emerson and Hedge, are those of A. B. Alcott (q.v.), Margaret Fuller (q.v.), George Ripley (q.v.), W. E. Channing (q.v.), and H. D. Thoreau (q.v.).

TRANSEPT (from Lat. trans, across, and septum, enclosure; synonymous terms in other languages are Fr. croisee, nef trans-

versee; Ital. crociata; Ger. Querbau, Querschijf), in architecture, the term given to the large and lofty structure which lies at right angles to the nave and aisles of a church. The first example is that which existed in the old St Peter's at Rome, but as a rule it is not found in the early basilicas. At the present day the transept might be better defined as that portion of a cruciform church which extends from north to south across the main body of the building and usually separates the choir from the nave; but to this there are some exceptions, as in Westminster Abbey, where the choir, with its rood screen, occupies the first four bays of the nave; in Norwich two bays; in Gloucester one bay; and Winchester one bay. In some of the English cathedrals there is an eastern transept, as in Canterbury, Lincoln, Salisbury and Worcester; at Durham that which might be regarded as an eastern transept is the chapel of the Nine Altars, and the same is found in Fountains Abbey. Four of the English cathedrals have aisles on east and west sides, viz. Ely, Wells, Winchester and York, while at Chester there are aisles to the south transept only, and at Lincoln, Peterborough and Salisbury on the east side only. In some cases the transept extends to the outer walls of the aisles only, but there are many instances in which it is carried beyond, as at Lincoln (225 ft. long), Ely (180 ft.), Peter- borough (180 ft.), Durham (175 ft.) and Norwich (172 ft.) ; in all these cases the transept is carried three bays beyond; in York (220 ft.), St Albans (170 ft.), Lichfield (145 ft.) and Canterbury, east transept (165 ft.), two bays beyond; and in Canterbury, western transept (130 ft.), Chichester (160 ft.) and Worcester (t30 ft.), only one bay on each side, the dimension in all cases being taken within the north and south walls of the transept.

TRANSFER— TRANSFORMERS

1 T3

TRANSFER (from Lat. transferre, to bear across, carry over), the handing over, removal or conveyance of anything from one person or place to another; also the subject of this transference or the form or method by which it is effected. The term is particularly used in law of the conveyance of property from one person to another, especially of the conveyance of real property (see Conveyancing). For the simplification of this process by means of registration of title, see Land Registration. For the transference of designs, drawings, &c, by means of transfer-paper to the surface of pottery and porcelain, see Ceramics; for their transfer to stones for printing, see Lithography.

TRANSFORMERS. An electrical transformer is the name given to any device for producing by means of one electric current another of a different character. The working of such an appliance is, of course, subject to the law of conservation of energy. The resulting current represents less power than the applied current, the difference being represented by the power dissipated in the translating process. Hence an electrical transformer corresponds to a simple machine in mechanics, both transforming power from one form into another with a certain energy-dissipation depending upon frictional losses, or something equivalent to them. Electrical transformers may be divided into several classes, according to the nature of the transformation effected. The first division comprises those which change the form of the power, but keep the type of the current the same; the second those that change the type of the current as well as the form of power. The power given up electrically to any circuit is measured by the product of the effective value of the current, the effective value of the difference of potential between the ends of the circuit and a factor called the power factor. In dealing with periodic currents, the effective value is that called the root-mean-square value (R.M.S.), that is to say, the square root of the mean of the squares of the time equidistant instantaneous values during one complete period (see Electrokinetics). In the case of continuous current, the power factor is unity, and the effective value of the current or voltage is the true mean value. As the electrical measure of a power is always a product involving current and voltage, we may transform the character of the power by increasing or diminishing the current with a corresponding decrease or increase of the voltage. A transformer which raises voltage is generally called a step-up transformer, and one which lowers voltage a step-down transformer.

Again, electric currents may be of various types, such as continuous, single-phase alternating, polyphase alternating, undirectional but pulsating, &c. Accordingly, transformers may be distinguished in another way, in accordance with the type of transformation they effect, (i) An alternating current transformer is an appliance for creating an alternating current of any required magnitude and electromotive force from another of different value and electromotive force, but of the same frequency. An alternating current transformer may be con- structed to transform either single-phase or polyphase currents. (2) A continuous current transformer is an appliance which effects a

similar transformation for continuous currents, with the difference that some part of the machine must revolve, whereas in the alternating current transformer all parts of the machine are stationary; hence the former is generally called a rotatory transformer, and the latter a static transformer. (3) A rotatory or rotary transformer may consist of one machine, or of two separate machines, adapted for converting a single-phase alternating current into a polyphase current, or a polyphase current into a continuous current, or a continuous current into an alternating current. If the portions receiving and putting out power are separate machines, the combination is called a motor-generator. (4) A transformer adapted for converting a single-phase alternating current into a unidirectional but pulsatory current is called a rectifier, and is much used in connexion with arc lighting in alternating current supply stations. (5) A phase transformer is an arrangement of static transformers for producing a polyphase alternating current from a single-phase alternating current. Alternating current transformers may be furthermore

divided into (a) single-phase, (b) polyphase. Transformers of the first class change an alternating current of single-phase to one of single-phase identical frequency, but different power; and transformers of the second class operate in a similar manner on polyphase currents. (6) The ordinary induction or spark coil may be called an intermittent current transformer, since it transforms an intermittent low-tension primary current into an intermittent or alternating high-tension current.

Alternating Current Transformer. — The typical alternating current transformer consists essentially of two insulated electric circuits wound on an iron core constituting the magnetic circuit. They may be divided into (1) open magnetic circuit static transformers, and (2) closed magnetic circuit static transformers, according as the iron core takes the form of a terminated bar or a closed ring. A closed circuit alternating current trans- former consists of an iron core built up of thin sheets of iron or steel, insulated from one another, and wound over with two insulated conducting circuits, called the primary and secondary circuits. The core must be laminated or built up of thin sheets of iron to prevent local electric currents, called eddy currents, from being established in it, which would waste energy. In practical construction, the core is either a simple ring, round or rectangular, or a double rectangular ring, that is, a core whose section is like the figure 8. To prepare the core, thin sheets of iron or very mild steel, not thicker than 014 of an inch, are

stamped out of special iron (see Electromagnetism) and care fully annealed.

The preparation of the particular sheet steel or iron used for this purpose is now a speciality. It must possess extremely small hysteresis loss (see Magnetism), and various trade names, such as ” stalloy,” ” lohys,” are in use to describe certain brands. Barrett, Brown and Hadfield have shown (Journ. Inst. Elec. Ene. Lond., 1902, 31, p. 713) that a silicon iron containing 2-87% of silicon has a hysteresis loss far less than that of the best Swedish soft iron. In any case the hysteresis loss should not exceed 3-0 watts per kilo- gram of iron measured at a frequency of 50 — and a flux-density of 10,000 lines per square centimetre. This is now called the ” figure of merit ” of the iron.

Examples of the shapes in which these stampings ‘are supplied are shown in fig. 1. The plates when annealed are varnished or covered with thin paper on one side, and then piled up so as to make an iron core, being kept together by bolts and nuts or by pressure plates. The designer of a transformer core has in view, first, economy in metal, so that there may be no waste fragments, and second, a mode of construction that facili- tates the winding of the wire circuits. These consist of coils of cotton- covered copper wire which are wound on formers and baked after being well saturated with shellac varnish. The primary and secondary circuits are sometimes formed of separate bobbins which are sandwiched in between each other; in other cases they are wound one over the other (fig. 2). In any case the primary and secondary coils must be symmetri- cally distributed. If they were placed on opposite sides of the iron circuit the result would be considerable magnetic leakage. It is usual to insert sheets or cylinders of micanite between the primary and secondary windings. The transformer is then well baked and placed in a cast-iron case sometimes filled in with heavy insulating oil, the ends of the primary and secondary circuits being brought out through water-tight glands. The most ordinary type of alternating current transformer is one intended to transform a small electric current produced by a large electromotive force (2000 to 10,000 volts) into a larger current of low electromotive force (100 to 200 volts). Such a step- down transformer may be obvi- ously employed in the reverse direction for raising pressure and reducing current, in which case it is a step-up transformer. A trans- former when manufactured has to be carefully tested to ascertain, first, its power of resisting break- down, and, second, its energy- dissipating qualities. With the first object, the

transformer is subjected to a series of pressure tests. If it is intended that the Fig primary shall carry a current

Fig. 1.

Core

Closed Circuit TrasM* former.

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produced by an electromotive force of 2000 volts, an insulation test must be applied with double this voltage between the primary and the secondary, the primary and the case, and the primary and the core, to ascertain whether the insulation is sufficient. To prevent electric discharges from breaking down the machine in ordinary work, this extra pressure ought to be applied for at least a quarter of an hour. In some cases three or four times the working pressure is applied for one minute between the primary and secondary circuits. When such an alternating current transformer has an alternating current passed through its primary circuit, an alternating magnetiza- tion is produced in the core, and this again induces an alternating secondary current. The secondary current has a greater or less electromotive force than the primary current according as the number of windings or turns on the secondary circuit is greater or less than those on the primary. Of the power thus imparted to the primary circuit one portion is dissipated by the heat generated in the primary and secondary circuits by the currents, and another portion by the iron core losses due to the energy wasted in the cyclical magnetization of the core ; the latter are partly eddy current losses and partly hysteresis losses.

In open magnetic circuit transformers the core takes the form of a laminated iron bar or a bundle of iron wire. An ordinary induc- tion coil is an instrument of this description. It has been shown, however, by careful experiments, that for alternating current trans- formation there are very few cases in which the closed magnetic circuit transformer has not an advantage. An immense number of designs of closed circuit transformers have been elaborated since the year 1885. The principal modern types are the Ferranti, Kapp, Mordey, Brush, Westinghouse, Berry, Thomson-Houston and Ganz. Diagrammatic representations of

the arrangements of the core and circuits in some of these transformers are given in fig. 3.

ABC

Fig. 3. — Diagrams of (A) Mordey (in section;, (B) Kapp and

(C) Ganz Transformers.

I, I Primary circuit; 2, 2 Secondary circuit.

Alternating current transformers are classified into (i.) Core and (ii.) Shell transformers, depending upon the arrangements of the iron and copper circuits. If the copper circuits are wound on the outside of what is virtually an iron ring, the transformer is a core transformer™if the iron encloses the copper circuits, it is a shell transformer. Shell transformers have the disadvantage generally of poor ventilaton for the copper circuits. Berry, however, has overcome this difficulty by making the iron circuit in the form of a number of bunches of rectangular frames which are set in radial fashion and the adjacent legs all embraced by the two copper circuits in the form of a pair of concentric cylinders. In this manner he secures good ventilation and a minimum expenditure in copper and iron, as well as the possi- bility of insulating the two copper circuits well from each other and from the core. An important matter is the cooling of the core. This may be effected either by ordinary radiation, or by a forced draught of air made by a fan or else by immersing the transformer in oil, the oil being kept cool by pipes through which cold water circulates immersed in it. This last method is adopted for large high-tension transformers.

The ratio between the power given out by a transformer and the power taken up by it is called its efficiency, and is best represented by a curve, of which the ordinate is the efficiency expressed as a percentage, and the corresponding abscissae represent the fractions of the full load as decimal fractions. The output of the transformer is generally reckoned in kilowatts, and the load is conveniently expressed in decimal fraction? of the full load taken as unity. The efficiency on one-tenth of full load is generally a fairly good criterion of the economy of the transformer as a transforming agency. “In large transformers the one-tenth load efficiency will reach 90% or more, and in small transformers 75 to 80%.

Efficiency.

The general form of the efficiency curve for a closed circuit transformer is shown in fig. 4. The horizontal distances represent fractions of full secondary load (represented by unity) , and the vertical distances efficiency in percentages. The efficiency curve has a maximum value corresponding to that degree of load at which the copper losses in the transformer are equal to the iron losses.

In the case of modern closed magnetic circuit transformers the copper losses are proportional to the square of the secondary current (I 2) or to gl 2 2 , where g = Ria 2 + R 2 ; Ri being the resistance of the primary and . R 2 that of the secondary circuit, while a is the ratio of the number of secondary and primary windings of the transformer. Let C stand. for the core loss, and V 2 for the secondary terminal potential difference (R.M.S. value). We can then write as an expression for the efficiency (ij) of the transformer (t? = I 2 V 2 / (C + gI 2 2 + I 2 V 2). It is easy to show that if G, V 2 and q are constants, but I 2 is variable, the above expression for i\ has a maximum value when C— gl 2 2 =0, that is, when the iron core loss C =the total copper losses glz 2 .

The iron core energy- waste, due to the hysteresis and eddy currents, may be stated in watts, or expressed as a fraction of the full load secondary output. In small trans- iron and formers of r to 3 kilowatts output it may amount Copper to 2 or 3% and in large transformers of 10 to 50 Losses. kilowatts and upwards it should be 1 or less than 1%. Thus the core loss of a 30-kilowatt transformer (one having a secondary output of 30,000 watts) should not exceed 250 watts. It has been shown that for the constant po- tential transformer the iron core loss is constant ■§ at all loads, but di- 5 minishes slightly as the ˆ core temperature rises, g On the other hand, the ˆ copper losses due to § the resistance of the !S copper circuits increase ˆ about 0-4% per degree C. with rise of tempera- ture. The current taken in at the primary side of the transformer, when the secondary circuit is unclosed, is called the magnetizing current, and the power then absorbed by the transformer is called the open circuit loss or magnetizing watts. The ratio of the terminal potential difference at the primary and secondary terminals is called the transformation ratio of the transformer. Every transformer is designed to give a certain transformation ratio, corresponding to some particular primary voltage. In some cases trans- formers are

designed to transform, not potential ‘difference, but current in a constant ratio. The product of the root-mean- square (R.M.S.), effective or’ virtual, values of the primary current, and the primary terminal potential difference, is called the apparent power or apparent watts given to the transformer. The true electrical power may be numerically equal to this product, but it is never greater, and is sometimes less. The ratio of the true power to the apparent power is called the power factor of the transformer. The power factor approaches unity in the case of a closed circuit transformer, which is loaded non- inductively on the secondary circuit to any considerable fraction of its full load, but in the case of an open circuit transformer the power factor is always much less than unity at all loads. Power factor curves show the variation of power factor with load. Examples of these curves were first given by J. A. Fleming, who suggested the term itself (see Jour. Inst. Elec. Eng. Lond. > 1892, 21, p. 606). A low power factor always implies a magnetic circuit of large reluctance.

The operation of the alternating current is then as follows: the periodic magnetizing force of the primary circuit creates a periodic magnetic flux in the core, and this being linked with the primary circuit creates by its variation what is called the back electromotive force in the primary circuit. The variation of the particular portion

Fraction of Full Load.

Fig. 4.— Typical Efficiency Curve of Closed Circuit Transformer.

of this periodic flux, linked with the secondary circuit, originates in this last a periodic electromotive force. The whole of the flux linked with the primary circuit is not interlinked with the secondary circuit. The difference is called the magnetic leakage of the trans- former. This leakage is increased with the secondary output of the transformer and with any disposition of the primary and secondary coils which tends to separate them. The leakage exhibits itself by # increasing the secondary drop. If a transformer is worked at a constant primary potential difference, the secondary terminal potential difference at no load or on open secondary circuit is greater than it is when the secondary is

closed and the transformer giving its full output. The difference between these last two differences of potential is called the secondary drop. This secondary drop should not exceed 2 % of the open secondary circuit potential difference.

The facts required to be known about an alternating current transformer fo appraise its value are (i) its full load secondary output or the numerical value of the power it is menu'*"' designed to transform, on the assumption that it will not rise in temperature more than about 6o° C. above the atmosphere when in normal use; (2) the primary and secondary terminal voltages and currents, accompanied by a statement whether the transformer is intended for producing a constant secondary voltage or a constant secondary current; (3) the efficiency at various fractions on secondary load from one-tenth to full load taken at a stated frequency; (4) the power factor at one-tenth of full load and at full load; (5) the secondary drop between full load and no load; (6) the iron core loss, also the magnetizing current, at the normal frequency; (7) the total copper losses at full load and at one-tenth of full load; (8) the final temperature of the transformer after being left on open secondary circuit but normal primary potential for twenty-four hours, and at full load for three hours.

The matters of most practical importance in connexion with an alternating current transformer are (1) the iron core loss, which affects the efficiency chiefly, and must be considered (a) as to its initial value, and (b) as affected by " ageing "or use; (2) the secondary drop or difference of secondary voltage between full and no load, primary voltage being constant, since this affects the service and power of the transformer to work in parallel with others; and (3) the temperature rise when in normal use, which affects the insulation and life of the transformer. The shellacked cotton, oil and other materials with which the transformer circuits are insulated suffer a deterioration in insulating power if continuously maintained at any temperature much above 80° C.to ioo° C. In taking the tests for core loss and drop, the temperature of the transformer should therefore be stated. The iron losses are reduced in value as tem- perature rises and the copper losses are increased. The former may be 10 to 15% less and the latter 20% greater than when the trans- former is cold. For the purpose of calculations we require to know the number of turns on the primary and secondary circuits, repre- sented by Ni and N2; the resistances of the primary and secondary circuits, represented by Ri and Rj; the volume (V) and weight (W) of the iron core; and

the mean length (L) and section (S) of the magnetic section. The hysteresis loss of the iron reckoned in watts per lb per 100 cycles of magnetization per second and at a maximum flux density of 2500 C.G.S. units should also be determined.

The experimental examination of a transformer involves the measurement of the efficiency, the iron core loss, and the secondary drop; also certain tests as to insulation and heating, and finally an examination of the relative phase position and graphic form of the various periodic quanti- ties, currents and electromotive forces taking place in the trans- former. The efficiency is best determined by the employment

of a properly constructed wattmeter (see Watt- meter). The trans- former T (fig. 5) should be so arranged that, if a constant potential trans- former, it is supplied with its normal working pressure at the primary side and with a load which can be varied, and which is obtained either by incandescent lamps, L, or resistances in the secondary circuit. A wattmeter, W, should be placed with its series coil, Se, in the primary circuit of the transformer, and its

Testing.

Fig. 5. — Arrangement for Testing Transformers.

shunt coil, Sh, either across the primary mains in series, with a suitable non-inductive resistance, or connected to the secondary circuit of another transformer, T 1 , called an auxiliary transformer, having its primary terminals connected to those of the transformer under test. In the latter case one or more incandescent lamps, L, may be connected in series with the shunt coil of the wattmeter so as to regulate the current passing through it. The current through the series coil of the wattmeter is then the same as the current through the primary circuit of the transformer under test, and the current through the shunt coil of the wattmeter is in step with, and proportional to, the primary voltage of the transformer. Hence the wattmeter reading is proportional to the mean power given up to the transformer. The wattmeter can be standardized and its scale reading interpreted by replacing the transformer under test by a non-inductive resistance or series of lamps, the power absorption of which is measured by the product of the amperes and volts supplied to it. In the secondary circuit of the trans- former is placed another wattmeter of a similar kind, or, if the load on the secondary

circuit is non-inductive, the secondary voltage and the secondary current can be measured with a proper alternating current ammeter, A2, and voltmeter, V2, and the product of these readings taken as a measure of the power given out by the transformer. The ratio of the powers, namely, that given out in the external secondary circuit and that taken in by the primary circuit, is the efficiency of the transformer.

In testing large transformers, when it is inconvenient to load up the secondary circuit to the full load, a close approximation to the power taken up at any assumed secondary load can be obtained by adding to the value of this secondary load, measured in watts, the iron core loss of the transformer, measured at no load, and the copper losses calculated from the measured Copper resistances when the transformer is hot. Thus, if C is the iron core loss in watts, measured on open secondary circuit, that is to say, is the power given to the transformer at normal frequency and primary voltage, and if Ri and R 2 are the primary and secondary circuit resistances when the transformer has the temperature it would have after running at full load for two or three hours, then the efficiency can be calculated as follows : Let O be the nominal value of the full secondary output of the transformer in watts, Vi and V2 the terminal voltages on the primary and secondary; side, Ni and N2 the number of turns, and Ai and A 2 the currents for the two circuits; then O/V2 is the full load secondary current measured in amperes, and N2N1 multiplied by O/V2 is to a sufficient approximation the value of the corresponding primary current. Hence WRj/W is the watts lost in the secondary circuit due to copper resistance, and 2 RiN 2 2 /V2 2 Ni 2 is the corre- sponding loss in the primary circuit. Hence the total power loss in the transformer (= L) is such that O 2 „ , /N 2 \ 2 O 2

L = C +

V s

! /N,\ 2 O 2

F Rz + \KJ v? Rl = c + (R2 + Riˆ OVW.

Therefore the power given up to the transformer is O-f-L, and the efficiency is the fraction 0/(0-|-L) expressed as a percentage. In this manner the efficiency can be determined with a considerable degree of accuracy in the case of large transformers without

actually loading up the secondary circuit. The secondary drop, however, can only be measured by loading the transformer up to full load, and, while the primary voltage is kept constant, measuring the potential difference of the secondary terminals, and comparing it with the same difference when the transformer is not loaded- Another method of testing large transformers at full load without supplying the actual power is by W. E. Sumpner's differential method, which can be done when two equal transformers are available (see Fleming, Handbook for the Electrical Laboratory and Testing Room, ii. 602).

No test of a transformer is complete which does not comprise some investigation of the " ageing " of the core. The slow changes which take place in the hysteretic quality . . of iron when heated, in the case of certain brands, give rise to a time-increase in iron core loss. Hence a trans- former which has a core loss, say, of 300 watts when new, may, Unless the iron is well chosen, have its core loss increased from 50 to 300% by a few months' use. In some cases specifications for transformers include fines and deductions from price fdr any such increase; but there has in this respect been great improve- ment in the manufacture of iron for magnetic purposes, and makers are now able to obtain supplies of good magnetic iron or steel with non-ageing qualities. It is always desirable, how- ever, that in the case of large sub-station transformers tests should be made at intervals to discover whether the core loss

has increased by ageing. If so, it may mean a very considerable increase in the cost of magnetizing power. Consider the case o'f a 30-kilowatt transformer connected to the mains all the year round; the normal core loss of such a transformer should be about 300 watts, and therefore, since there are 8760 hours in the year, the total annual energy dissipated in the core should be 2628 kilowatt hours. Reckoning the value of this electric energy at only one penny per unit, the core loss costs £10, 19s. per annum. If the core loss becomes doubled, it means an additional annual expenditure of nearly £11. Since the cost of such a transformer would not exceed £100, it follows that it would be economical to replace it by a new one rather than continue to work it at its enhanced core loss.

In Great Britain the sheet steel or iron alloy used for the transformer cores is usually furnished to specifications which state the maximum hysteresis loss to be allowed in it in watts per lb (avoirdupois) at a frequency of 50, and at a maximum flux-density during the cycle of 4000 C.G.S. units. When plates having a thick- ness / mils are made up into a transformer core, the total energy loss in the core due to hysteresis and eddy current loss when worked at a frequency n and a maximum flux-density during the cycle B is given by the empirical formulae

T = -oo32reB 1 – 55 io- 7 +(ˆB) 2 io- 16 , or

T l =o-88nBi 1 – M io- 9 + i-4(

The study of the processes taking place in the core and circuits of a transformer have been greatly facilitated in recent years by Curve the improvements made in methods of observing and Tracing. recording the variation of periodic currents and electromotive forces. The original method, due to Joubert, was greatly improved and employed by Ryan, Bell, Duncan and Hutchinson, Fleming, Hopkinson and Rosa, Callendar and Lyle; but the most important improvement was the introduction and invention of the oscillograph by Blondel, subsequently improved by Duddell, and also of the ondograph of Hospitalier (see Oscillograph). This instrument enables us, as it were, to look inside a transformer, for which it, in fact, performs the same function that a steam engine indicator does for the steam cylinder. 1 Delineating in this way the curves of primary and secondary current and primary and secondary electromotive forces, we get the following result: Whatever may be the form of the curve of primary terminal potential difference, or primary voltage, that of the secondary voltage or terminal potential difference is an almost exact copy, but

displaced 180 in phase. Hence the alternating current transformer reproduces on its second- ary terminals all the variations of potential on the primary, but changed in scale. The curve of primary current when the Fig. 6.-Transformer Curves transformer is an open secondary at no load. circuit is different in form and

«i, Primary voltage curve; phase, laggmg behind the primary j\, Primary current curve; e 2 , voltage curve (fig. 6); but if the Secondary voltage curve. transformer is loaded up on its

1 For a useful list of references to published papers on

alternating current curve tracing, see a paper by W. D. B. Duddell, read before the British Association, Toronto, 1897; also Electrician (1897), xxxix. 636; also Handbook for the Electrical Laboratory and Testing Room (J. A. Fleming), i. 407.

secondary side, then the primary current curve comes more into step with the primary voltage curve. The secondary current curve, if the secondary load is non-inductive, is in step with the secondary voltage curve (fig. 7). These transformer diagrams yield much information as to the nature of the operations proceeding in the transformer.

The form of the curve of primary current at no secondary load is a consequence of the hysteresis of the iron, combined with the fact that the form of the core flux-density curves of the transformer is always not far removed from a simple sine curve. If «i is at any moment the electromotive force, h the current ‘on the primary circuit, and ii is the flux-density in the core, then we have the fundamental relation ei = Riii + SNi dh/dt, where Ri is the re- sistance of the primary, and Ni the number of turns, and S is the cross-section of the core. In all modern closed ‘ circuit trans- formers the quantity Riii is very small compared with the quantity SNdb/dt except at one instant during the phase, and in taking the integral of the above equation, viz. in finding the value of Jeidl, the integral of the first term on the right-hand side may be neglected in comparison with the second. Hence we have approxi- mately bi = (SNi)~ l feidt. In other words, the value of the flux- density in the core is obtained by integrating the area of the primary voltage curve. In so doing the integration must be started from the time point through which passes the ordinate bisecting the area of the primary voltage curve. When any curve is formed such that its ordinate y is the integral of the area of another curve, viz. y = fy l dx, the first curve is always smoother and more regular in form than the second. Hence the process above described when applied to a complex periodic curve, which can by Fourier’s theorem be resolved into a series of simple periodic curves, results in a relative reduction of the magnitude of the higher harmonics compared with the funda- mental term, and hence a wiping out of the minor irregularities of the curve. In actual practice the curve of electromotive force of alternators can be quite sufficiently reproduced by employing three terms of the expansion, viz. the first three odd harmonics, and the resulting flux-density curve is always very nearly a simple sine curve.

We have then the follow- ing rules for predetermining the form of the current curve of thetransformerat no load,

Fig. 7. — Transformer Curves at full load. ei, Primary voltage curve ; i\, Primary current curve; e 2 , Secondary voltage curve; £21 Secondary current curve.

assuming that the hysteresis curve of the iron is given, set out in terms of flux-density and ampere-turns per centimetre, and also the form of the curve of primary electromotive force. Let the time base line be divided up into equal small elements. Through any selected point draw a line perpendicular to the base line. Bisect the area enclosed by the curve representing the half wave of primary electromotive force and the base line by another perpendicular. Integrate the area enclosed between the electromotive force curve and these two perpendicular lines and the base. Lastly, set up a length on the last perpendicular equal to the value of this area divided by the product of the cross-section of the core and the number of primary turns. The resulting value will be the core flux-density b at the phase instant corresponding. Look out on the hysteresis loop the same flux-density value, and corresponding to it will be found two values of the magnetizing force in ampere-turns per centimetre, one the value for increasing flux-density and one for decreasing. An inspection .of the position of the point of time selected on the time line will at once show which of these to select. Divide that value of the ampere-turns per centimetre by the product of the values of the primary turns and the mean length of the mag- netic circuit of the core of the transformer, and the result gives the value of the primary current of the transformer. This can be set up to scale on the perpendicular through the time instant selected. Hence, given the form of the primary electromotive force curve and that of the hysteresis loop of the iron, we can draw the curves representing the changes of flux-density in the core and that of the corresponding primary current, and thus predict the root- mean-square value of the magnetizing current of the transformer. It is therefore possible, when given the primary electromotive force curve and the hysteresis curve of the iron, to predetermine the curves depicting all the other variables of the transformer, provided that the magnetic leakage is negligible.

The elementary theory of the closed iron circuit transformer may be stated as follows: Let Ni, N 2 be the turns on the primary and secondary circuits, Ri and R 2 the resistances, S the section of the core, and 61 and b 2 the co-instantaneous values of the flux-

density just inside the primary and secondary windings. Then, if h and i-i and e\ and e 2 are the primary

Elementary Theory.

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and secondary currents and potential differences at the same instant, these quantities are connected by the equations

ei = Ri*‘i + SN

db,

at ‘

e 2 ‘

.SN,f-RA.

Hence, if &i = 62, and if Rit’i is negligible in comparison with SSidbjdt, and i = o, that is, if the secondary circuit is open, then eild = N1/N2, or the transformation ratio is simply the ratio of the windings. This, however, is not the case if £1 and 62 have not the same value; in other words, if there is magnetic leakage. If the magnetic leakage can be neglected, then the resultant magnetizing force, and therefore the iron core loss, is constant at all loads. Accordingly, the relation between the primary current (ti), the secondary current (t 2), and the magnetizing current (t),’ or primary current at no load, is given by the equation Nii’i — N 2 t’s = Nit. Then, writing b for the instantaneous value of the flux-density in the core, everywhere supposed to be the same, we arrive at the identity

e 1 t – i = e 2 t 2 + (Rit’i 2 + R2t” 2) + Sˆ(N 1 t 1 -N 2 j 2).

1 Sis equation merely expresses the fact that the power put into tl e transformer at any instant is equal to the power given out on tl e secondary side together with the power dissipated by the cc pper losses and the constant iron core loss.

The efficiency of a transformer at any load is the ratio of the m lan value, during the period, of the product eit’i to that of the pioduct e 2 ii. The efficiency of an alternating current

transformer is a function of the form of the primary electromotive force curve. Experiment has shown 1 that if a transformer is tested for efficiency o 1 various alternators having electromotive force curves of different f(rms, the efficiency values found at the same secondary load are nat identical, those being highest which belong to the alternator with the most peaked curve of electromotive force, that is, the curve having the largest form factor. This is a consequence of the fact that the hysteresis less in the iron depends upon the manner in which the magnetization (or what here comes to the same thing, the flux-density in the core) is allowed to change. If the primary electromotive force curve has the form of a high peak, or runs up suddenly to a large maximum value, the flux-density curve will be more square-shouldered than when the voltage curve has a lower form factor. The hysteresis loss in the iron is less when the magneti- zation changes its sign somewhat suddenly than when it does so more gradually. In other words, a diminution in the form factor of the core flux-density curve implies a diminished hysteresis loss. The variation in core loss in transformers when tested on various forms of commercial alternator may amount to as much as 10%. Hence, in recording the results of efficiency tests of alternating current transformers, it is always necessary to specify the form of the curve of primary electromotive force. The power factor of the transformer or ratio of the true power absorption at no load, to the product of the R.M.S. values of the primary current and voltage, and also the secondary drop of the transformer, vary with the form factor of the primary voltage curve, being also both in- creased by increasing the form factor. Hence there is a slight advantage in working alternating current transformers off an alternator giving a rather peaked or high maximum value electro- motive force curve. This, however is disadvantageous in other ways, as it puts a greater strain upon the insulation of the trans- former and cables. At one time a controversy arose as to the relative merits of closed and open magnetic circuit transformers. It was, however, shown by tests made by Fleming and by Ayrton on Swinburne's " Hedgehog " transformers, having a straight core of iron wires bristling out at each end, that for equal secondary outputs, as regards efficiency, open as compared with closed mag- netic circuit transformers had no advantage, whilst, owing to the smaller power factor and consequent large R.M.S. value of the magnetizing current, the former type had many disadvantages (see Fleming, " Experimental Researches on Alternate Current Transformers," Journ. Inst. Elec. Eng., 1892).

The discussion of the theory of the transformer is not quite so simple when magnetic leakage is taken into account. In all cases „ .. a certain proportion of the magnetic flux linked with L. ag kase l ˆ e P” mar y circuit is not linked with the secondary ™’ circuit, and the difference is called the magnetic leakage. This magnetic leakage constitutes a wasted flux which is non-effective in producing secondary electromotive force. It increases with the secondary current, and can be delineated by a curve on the transformer diagram in the following manner. The curves of primary and secondary electromotive force, or terminal potential difference and current, are determined experimentally, and then two curves are plotted on the same diagram which represent the variation of (d — Riti)/Ni and (e 2 + R 2 t 2)/N 2 ; these will represent the time differentials of the total magnetic fluxes S61 and Si 2 linked respectively with the primary and secondary circuits. . The above curves are then progressively integrated, starting from the time

1 See Dr G. Roessler, Electrician (1895), xxxvi. 150; Beeton, Taylor and Barr, Journ. Inst. Elec. Eng. xxv. 474 ; also J. A. Fleming, Electrician (1894), xxxiii. 580.

point through which passes the ordinate bisecting the area of each half wave, and the resulting curves plotted to express by their ordinates Sh and Sb 2 . A curve is then plotted whose ordinates are the differences S61 — Si 2 , and this is the curve of magnetic leakage.

The existence of magnetic leakage can be proved experimentally by a method due to Mordey, by placing a pair of thermometers, one of mercury and the other of alcohol, in the centre of the core aperture. If there is a magnetic leakage, the mercury bulb is heated not only by radiant heat, but by eddy currents set up in the mercury, and its rise is therefore greater than that of the alcohol thermometer. The leakage is also determined by observing the secondary voltage drop between full load and no load, and de- ducting from it the part due to copper resistance; the remainder is the drop due to leakage.. Thus if V 2 is the secondary voltage on open circuit, and W that when a current A 2 is taken out of the transformer, the leakage drop v is given by the equation

z , = (V 2 V2 1)|R 2 A 2 +RiA 2 (N 2 /Ni) 2).

The term in the large bracket expresses the drop in secondary

voltage due to the copper resistance of the primary and secondary circuits.

In drawing up a specification for an alternating current transformer, it is necessary to specify that the maximum secondary drop between full and no load to be allowed shall not exceed a certain value, say 2 % of the no-load secondary voltage ; also that the iron core loss as a percentage of the full secondary output shall not exceed a value, say, of 1 % after six months' normal work.

In the design of large transformers one of the chief points for attention is the arrangement for dissipating the heat gene- rated in their mass by the copper and iron losses. For every watt expended in the core and circuit, a Des jˆ ni surface of 3 to 4 sq. in. must be allowed, so that the heat may be dissipated. In large transformers it is usual to employ some means of producing a current of air through the core to ventilate it. In these, called air-blast transformers, apertures are left in the core by means of which the cooling air can reach the interior portions. This air is driven through the core by a fan actuated by an alternating current motor, which does not, however, take up power to a greater extent than about 1 or jJq -% of the full output of the transformer, and well repays the outlay.

In some cases transformers are oil-insulated, that is to say, included in a cast-iron box which is filled in with a heavy insulating oil. For this purpose an oil must be selected free from mineral acids and water: it should be heated to a high temperature before use, and tested for dielectric strength by observing the voltage required to create a spark between metal balls immersed

Dielectric

Dielectric

strength in

strength in

kilowatts per

kilowatts per

centimetre.

centimetre.

Glass

285

Lubricating oil . .

83

Ebonite ....

538

Linseed oil .

f7

Indiarubber .

492

Cotton-seed oil .

57

Mica

2000

Air film -02 cm.

Micanite ....

4OOO

thick ....

27

American linen paper

Air film l‘6 cm.

paraffined .

540

thick ....

48

in it at a distance of 1 millimetre apart. Oils, however, are inferior in dielectric strength or spark-resisting power to solid dielectrics, such as micanite, ebonite, &c, as shown by the above table of dielectric strengths (see T. Gray, Phys. Rev., 1898, p. 199).

Polyphase Transformers are appliances of similar construction to the single-phase trans- formers already described, but modified so as to enable them to transform two or more phase-related primary alternating cur- rents into similar secondary currents. Thus, a three-phase transformer may be constructed with a core, as shown in fig. 8. Each core leg is surrounded with a primary coil, and these are joined up either in star or delta fashion, and connected to the three or four f line wires. The secondary circuits are then •' connected in a similar fashion to three or four secondary lines. In the case of two- phase transmission with two separate pairs Fig. 8. — Brush Three- of leads, single-phase transformers may be phase Transformer.

TRANSFORMERS

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employed in each branch, but with two-phase three- wire supply, two- phase transformers must be supplied.

Phase Transformers are arrangements of static or rotary trans- formers intended to transform single-phase alternating currents into polyphase currents. An important system of phase transformation has been described by C. F. Scott. 1 It is known that if two alternat- ing electromotive forces differing in phase are connected in series, the resulting electromotive force will in general differ in phase and value from either of the components. Thus, if two alternating electromotive forces differing 90 ° in phase, and having magnitudes in the ratio of 1 : V3, are connected in series, the resulting electro- motive force will have a magnitude represented by 2, and the three can be represented by the sides of a triangle which is half an equilateral triangle. If then a two-phase alternator, D (fig. 9),

provides two-phase cur- rents, and if the two circuits are connected, as shown, to a pair of single-phase trans- formers, Ti

and T 2 , we can obtain three-phase alter- nating currents from the ar- rangement. The primaries of both transformers are the same. The secondary circuit of one transformer, T 2 , has, say, 100 turns, and a connexion is made to its middle point O, and this is connected to the secondary of the other transformer i which has 87 (= 50 V 3) turns. From the points A, B, C we can then tap off three-phase alternating cur- rents. The advantages of the Scott system are that we can transform two-phase alternating currents into three-phase for transmis- sion, and then by a similar arrangement retransform Fig. 9. — Scott's Arrangement for back again into two-phase Transformation of Two-phase to Three- for use. In this manner an phase Currents. economy of 25 % in copper

is effected, for instead of four transmission lines we have only three. The system adapts itself for the transmission of currents both for power in driving three-phase motors and for working incandescent lamps. A somewhat similar system has been designed by C. P. Steinmetz for producing three- phase currents from single-phase (see Electrician, xliis. 236). When a number of alternating electromotive forces are maintained in a closed circuit, the sum of all must be zero, and may be repre- sented by the sides of a closed polygon. The fundamental principle of Mr Steinmetz's invention consists in so choosing the number of these electromotive forces that the polygon must remain stable. Thus, if three single-phase alternators are driven independently at constant speed and excitation, and if they are joined in series, then three wires led away from the junction points will provide three-phase currents to a system from which lamps and motors may be worked.

Reference must be made to the continuous current transformer. The conversion of a continuous current supplied, say, at 100 volts, Continuous mto one navm S an electromotive force of 10 volts, Current can °^ course be achieved by coupling together on the

Trans- same bedplate a suitable electric motor and a dynamo.

formers. ˆhe combination is called a molor-dynamo set, and each machine preserves its own identity and peculiarity. The same result may, however, be accomplished by winding two separate armature circuits on one iron core, and furnishing each with its own commutator. The two circuits are interlaced or wound on together. An arrangement of this kind constitutes a rotatory or

rotary transformer, or continuous current transformer. It has the advantage of greater cheapness and efficiency, because one field magnet serves for both armature windings, and there is only one armature core and one pair of bearings; moreover, no shift or lead of the brushes is required at various loads. The armature reactions of the two circuits annul each other. Machines of this description are self-starting, and can be constructed to take in primary current at high pressures, say 1000 to 2000 volts, and yield another larger current of much lower voltage, say 100 or 150 volts, for use with electric lamps. They are used in connexion with public electric supply by continuous current in many places.

Another important class of rotatory transformer is that also called a rotatory converter, by means of which continuous current is translated into alternating current of one-, two- or three-phase, or vice versa. The action of such an appliance may best be under- stood by considering the simple case of a Gramme ring armature

1 Proceedings of the National Electric Light Association (Washing- ton, U.S.A., 1894); also Electrician (1894), xxxii. 640.

(see Dynamo) having, in addition to its commutator, a pair of in- sulated rings on its shaft connected with opposite ends of the arma- ture winding (fig. 10). If such a ring is placed in a bipole field magnet, and if a pair of brushes make contact with the commutator C and another pair with the two rings called slip rings, Si S 2 , and if continuous current at a constant voltage is supplied to the com- mutator side, then the armature will begin to revolve in the field, and from the brushes in contact with the slip rings we can draw off an alternating current. This reaches its maximum value when the points of contact of the rings with the armature circuit pass the axis of commutation, or line at right angles to the direction of the magnetic field, for it has at this moment a value which is double the steady value of the continuous current being poured into the armature. The maximum value of the electromotive force creating this alternating current is nearly equal to the electro- motive force on the continuous current side. Hence if A is the maximum value of the continuous current put into the armature and V is the value of the brush potential difference on the con- tinuous current side, then 2A is the maximum value of the out- coming alternating current and V is the maximum value of its voltage. Hence $2AV/2 = AV$ is the maximum value of the out- coming alternating current power, and if we neglect the loss in the armature for the

moment, the power given out is equal to the power put in. Hence, assuming a simple harmonic law of variation, the effective value of the alternating current voltage is V/V2, and that of the alternating current is 2AV2. This conclusion ”” follows at once from the fact that the mean value of the square of a sine function is half its maximum value, and hence the R.M.S. value is 1/V2 times the maximum

value. The outcoming alternating current has its zero value at the instant when the ends of the diameter of the axis to which the rings are connected are in the direction of the magnetic field of the transformer. Hence the power output on the alternating current side varies from a maximum value AV to zero. The rotatory transformer thus absorbs continuous current power and emits it in a periodic form; accordingly, there is a continual storage and emission of energy by the armature, and therefore its kinetic energy is periodically varying during the phase. The armature is also creating a back-electromotive force which acts at some instants against the voltage driving tl« current into the armature and at others is creating an electromotive force that assists the external impressed voltage in driving a current through the alternating current side. If we put on another pair of insulated rings and connect them to points of the insulated diameter at right angles to the points of connexion of the first pair of rings, we can draw off another alternating current, the phase I of which differs 90 from that of the first. Similarly, if we provide three rings connected to points removed 120 apart on the armature I circuit, we can tap off a three-phase alternating current. j Returning to the case of the single-phase rotatory transformer, we may notice that at the instant when the outcoming alternating current is zero the armature is wholly engaged in absorbing power and is acting entirely as a motor. When the alternating current is a maximum, the armature on the other hand is acting as a gene- rator and adds current to the current put into it. The ratio between the potential difference of the brushes on the continuous current side and the root-mean-square or effective value of the _ voltage between any pair of rings on the alternating current side is called the transformation ratio of the converter.

The following table, taken from a paper upon rotatory converters by S. P. Thompson (Proc. Inst. Elec. Eng., November 1898), gives the voltage ratio or conversion ratio in the case of various forms of rotatory transformer: —

Fig. 10. — Rotary Converter, continuous to two-phase.

Effective 1

Angle

voltage on

Number of slip

between

alternating 1

points of

Type of current

Voltage’

current side

connexions

generated.

ratio.

as percentage

to armatures.

of voltage on

continuous

current side.

2

180

Single-phase

V2:i

70-71

3

■ 120°

Three-phase Two-phase

2V2:V3

61-23

4

90°

V2:i

70-71

4

90

Four-phase

2:1

50

6

6o°

Three-phase

3V3:V3

61-23

6

6o°

Six-phase

2V2:i

35-35 1

Neglecting the energy losses in the armature, and assuming that the continuous current side of the transformer is supplied with 100 amperes, the following table, also taken from a paper by S. P. Thompson, shows the effective value of the current on the alternating side put out into each line: —

Number of slip rings.

Angle

between

points of

connexion

to armature.

Type of current generated.

Effective cur- rent put out on each line in amperes.

2 3 4 6

180

120

90°

6o°

Single-phase Three-phase Two-phase Six-phase

141-4 94-3 70-7 47-2

It is obvious that the same results of conversion can be obtained by coupling together two separate machines on the same shaft; thus we might obtain a single-phase alternating current from a continuous current by coupling together mechanically a continuous current motor and a single-phase alternator. Such a combination is generally called a motor-dynamo. In this case there are two field magnets and two separate armatures, and the

hysteresis eddy current and copper losses are all in duplicate. If, however, the same armature winding is made to serve both purposes, the resulting machine is called a rotatory or rotary converter. In the former combination the brushes of the continuous current part require to be set with the usual lead or lag according as that part is generator or motor, but in the latter the armature reactions nearly annul each other, and lead or lag is no longer necessary.

Rectifiers are devices for transforming an alternating (gener- ally single-phase) current into a continuous but pulsatory current. They may shortly be described as appli- ances for separating out each alternate current flux in an alternating current. An immense number of more or less imperfect methods of doing this have been proposed, and here we shall describe two which may be called respectively the mechanical and the electrolytic methods. Of the first class a good example is the Ferranti rectifier (fig. n). This consists of a synchronous alternating current motor which is started up and driven in step with the alternator supplying the current. The

press a pair of brushes. Another pair of brushes, so adjusted as to be in contact simultaneously with a pair of adjacent commutator segments, are in connexion with the alternator supplying the current to be commutated. The insulated rings are in connexion with the external circuit. It will easily be seen that when the commutator revolves at proper speed the currents delivered from the insulated rings are unidirectional. The Ferranti rectifier is much employed for rectifying alter- nating current for arc lighting purposes. With this object it is associated with a constant current transformer which converts alternating current supplied at constant potential to one supplied at constant current. This is achieved by taking advantage of the repulsive force existing between the primary and secondary circuits of a transformer. These are wound separately, and so balanced that any increase in the current presses them away from each other and so reduces the secondary current to normal value. Such an appliance is useful for rectifying currents up to 10 or 15 amperes.

The electrolytic rectifier is based upon the fact that if plates of aluminium and carbon are placed in an electrolyte, say a solution of alum or dilute acids which yield oxygen on electro- lysis, it is found that a current can be sent through the liquid from the

carbon to the aluminium, but that great counter- electromotive force is created to a current in the opposite direc- tion. Gratz and Pollak (Eleklrotechnische Zeitschrift, 1897, 25, P- 359) > taking advantage of this fact, have constructed a rectifying arrangement by arranging two series of carbon aluminium (CA1) cells with alum or hydro-potassic phosphate solution as electrolyte. In one set the order of the plates is (CA1), (CA1), &c, and in the other series (A1C), (A1C), counting from the same end. These series being connected in parallel, it follows that if an alternating current is sent through the parallel series all the currents in one direction pass through one battery and all those in the opposite direction through the other. Thus the constituents of the alternating current are separated out. By using very large cells so as to reduce the internal resistance, an efficiency of 95 % is said to be obtained.

There are many points in the operation of the electrolytic rectifier which have as yet been imperfectly explained. The action of the aluminium electrolytic rectifier, consisting as it does of an aluminium plate and a lead or carbon plate J heor y ot

Electrolytic Rectifier.

Fig. 11. — Ferranti Rectifier.

motor drives a commutator of insulated segments, each alternate segment being connected to two insulated rings, against which

placed in an aqueous electrolyte, is to oppose a great obstruction to a current passing out of the' aluminium plate, but little or no obstruction to the current passing into the aluminium plate, especially if the aluminium has been subjected to a previous treatment called formation. This unilateral conductivity is dependent on a certain voltage or potential differ- ence between the plates not being exceeded, but within these limits a plate of carbon and aluminium placed in a solution, say of hydro-sodic phosphate, acts as an electrical valve, allowing current to pass in one direction but not in another. An examination of the aluminium plate after it has been so used shows that its appear- ance has changed and that its surface is covered by a thin film, the thickness of which varies with the electrolyte and the time of formation. After a certain period of use this film is seen as a grey, dull coating traversed by dark lines. It is impossible that the unilateral conductivity can be due to a true electrolytic polariza- tion, because we know of no polarization of this latter kind

which exceeds three volts, and the film can be made to resist the flow of a current under an electromotive force of 140 to 200 volts. The resistance of this film has been measured and found to be very high, so high as to be practically an insulation. Light was thrown upon the subject by F. Kohlrausch's discovery of the polarization capacity of metallic electrodes, and this discovery was applied to develop the theory of the aluminium cell by Streintz (1888), Scott (1899) and others.

This theory was expounded by K. Norden {Electrician, xlviii. 107). According to this view, the deposit covering the aluminium electrode forms the dielectric of a condenser. One plate of the condenser is formed by the aluminium plate and the other, by an opposite layer of electrically-charged ions in the electrolyte. The dielectric film on the aluminium having been formed, the electro-motive force of the circuit then charges the resulting condenser to the value of its own voltage, but immediately the impressed electro- motive force is removed this condenser discharges itself. This con- denser theory receives support from the behaviour of the aluminium cell when placed in the circuit of an alternating current dynamo, for it is found that in these circumstances the current through the cell is in advance in phase of the difference of potential. The ques- tion then arises, What is the nature of this insulating film? The

first discoverer of the phenomenon (Buff) considered it to consist of silicon. Later Professor Beetz disproved this by experiment, and, with many others, assumed that a sub-oxide of aluminium was formed ; but this has never been demonstrated in a satisfactory manner. By forming a sufficient quantity of the film Dr K. Norden was able to obtain sufficient of the material to make a chemical analysis, and this revealed the fact that it consists of normal aluminium hydroxide, Al 2 (OH) 6 .

According to the facts above stated, one wave of the alternating current produces the insulating film by converting the surface of the aluminium into hydroxide, practically, therefore, blocking its own path very quickly by the creation of this film. If, then, the electromotive force reverses its direction the current immediately flows. According to Dr "Norden, the rapid removal of the insulat-ing film is due to the action of the electrolyte corroding or dis-

solving the weak points in the coating and thus breaking down its insulating power. The insulating film is therefore a conductor in one direction, but when the current is reversed and flows out of the aluminium plate the insulating film is renewed and is continually being repaired and kept in order. Thus different electrolytes yield aluminium valves having very different efficiencies.

Rectifying cells have been made by Poliak which will bear a voltage of over 140 volts, and which are said to have an efficiency of 75 %. The plates, however, must be removed when not in use, otherwise the film of hydroxide is destroyed by the electrolyte. One great practical difficulty in connexion with the aluminium rectifier is the tendency to heat in working.

The historical development of the discovery of this unilateral conductivity of an electrolytic cell with an aluminium electrode is as follows. The effect was first noticed by Buff in 1857, but was not applied technically until 1874, when Ducretet employed it in telegraphy. Beret in 1877 and Streintz in 1887 discussed the theory of the cell and sought for an explanation. In 1891 Hutin and Leblanc, in their study of alternating current, showed its uses in rectifying an alternating current. Poliak and Gratz laboured to give it a practically useful form. Poliak took out patents in 1895, and made a communication to the Academy of Sciences in Paris in June 1897; and Gratz presented a memoir at a meeting of the German Association of Electrochemists in Munich in 1897. M. Blondin has summarized all the, work so far done on the aluminium rectifier in two articles in L'Eclairage electrique (1898), xiv. 293, and xxviii. 117 (1901). The choice of an electrolyte is of great importance. Buff, Ducretet and Gratz employed dilute sulphuric acid, and the greatest difference of potential which could then be applied to the cell without breaking down its insulation in one direction was 20 volts. Poliak in 1896 found that when aqueous solutions of alkaline salts were used, and when the aluminium was subjected to a preliminary formation, the back electromotive force or what is equivalent to it could be raised to 140 or 20O volts. Poliak found that the best results were given by the use of phosphate of potassium or sodium. It appears, therefore, that the ions of K or Na effect the breaking down of the film of aluminium hydroxide more quickly than the ion of hydrogen. The practical form of aluminium rectifier, according to Poliak, consists of plates of thick aluminium and lead placed in a large deep glass vessel filled with a solution of potassium hydrogen phosphate.

In 1899 Albert Nodon of Paris began experimenting with an electric rectifier which is now on a commercial footing. It is known as the Nodon electric valve, and it is claimed that it will give an efficiency of 7 5 to 80 % when, used to transform single or polyphase currents into continuous currents. In the form used for transforming single- phase currents the valve is made up of 4 cells, each consisting of an iron cylinder with an insulating plug at the bottom through which is passed a cylinder formed of an alloy of zinc and

Nodon Valve.

(From the Electrical Times, by permission.) (From the Electrical Times, by permission.)

Fig. 12. — Section through Nodon Valve.

Fig. 13. — Method of connecting the cells.

aluminium. This cylinder is concentric with the iron tube and provided with a terminal at the lower end. The cell is filled with a saturated solution of ammonium phosphate, and a non-conducting shielding tube can be slid over the aluminium electrode to alter the exposed area.

The valve is shown in section in fig. 12, and the 4 cells are arranged in a Wheatstone's Bridge fashion, as shown in fig. 13. A and A 1 are the terminals to which the alternating current is supplied, C and C 1 the terminals from which the continuous current is drawn off. The electrolytic actions which take place in the cells are as follows : When the alternating current passes in the positive direction from the zinc-aluminium cylinder to the iron cylinder there is formed instantly on the former a film of aluminium hydroxide; this film, presenting an enormous resistance, opposes the passage of the current. On the other hand, if the current passes in the opposite direction the film is reduced instantly and the current now flows. When used with polyphase currents the valve comprises as many times two cells as there are wires in the distribution. The cells must stand a pressure varying from 50 to 140 volts, and for higher pressures two or more valves in series are employed.

The aluminium-iron electrolytic rectifier is not suitable for the rectification of very high frequency currents, because the chemical actions on which it depends involve a time element. V

acuam or It was, however, discovered by J. A. Fleming that an yaoour oscillation valve could be constructed for rectifying p e ˆ/// ere , electrical oscillations, as follows (see Proc. Roy. Soc. Lond., 1905, 74, p. 476): In a glass bulb similar to that of an incandescent lamp a carbon filament is fixed. Around the carbon filament, but not touching it, is placed a cylinder of nickel connected to an external terminal by means of platinum wire sealed through the glass. If the carbon filament is made incandescent by an insulated battery (and for this purpose it is convenient to have the filament adjusted to be fully incandescent at a pressure # of about 12 volts), then the space between the incandescent filament and the embracing cylinder possesses a unilateral conductivity such that negative electricity can pass from the incandescent filament to the cylinder but not in the opposite direction. Hence if the negative terminal of the filament and the terminal attached to the cylinder are connected to an oscillation transformer (see Induction Coil) which supplies a high frequency alternating oscillatory current, the flow of electricity in one direction is cut out and the oscillatory current is therefore converted into a con- tinuous current. Such valves have been employed by Fleming in connexion with wireless telegraphy. Wehnelt discovered that if a platinum wire was covered with oxide of barium or any of the oxides of rare earth metals, it possessed in the same manner, when used in a valve of the above type, an even greater power than incandescent carbon. The explanation of this action is to be sought for in the fact that incandescent carbon in a vacuum or incandescent earthy oxides copiously emit negative electrons.

A rectifier dependent upon the peculiar qualities of mercury vapour has been devised by Cooper-Hewitt for the transformation of polyphase currents into continuous currents. The three-phase transformer is made as follows: A large glass bulb (see fig. 14) has four iron electrodes sealed through the walls as positive electrodes and a negative electrode consisting of a pool of mercury in the bottom of the bulb connected with platinum wires sealed through the glass; the bulb is highly exhausted and contains only mer- cury vapour. The three iron electrodes are connected to the terminals of a star- connected polyphase transformer and one of them to the positive pole of a continuous current starting current, the con- nexions being shown as in fig. 15. The mercury vapour is a non-conductor for low voltages, but if a sufficiently high voltage is placed on the mercury bulb by means of the continuous current it begins to

conduct and if the three-phase current is then switched on the mercury vapour will allow the components of the three-phase current to pass when the mercury electrode is negative, not when it is positive. Hence for alternate cur- rent wave of the three-phase, supply is cut down and a continuous current can be Cooper-Hewitt Rectifier, drawn by the connexions as shown in

fig. 1 5 for the purposes of supplying secondary batteries, arc lamps, &c. Owing to the fact that the mercury vapour ceases to conduct when the electromotive force on it falls below a certain critical value the valve will not work with single-phase currents but will work with polyphase currents at all voltage from 100 to 1000 or more and can transform as much as 100 amperes. It is stated to have an efficiency of 88 to 89 %. (See The Electrician, 1903, 50, p. 510.)

Fig. 14.

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A mechanical polyphase rectifier or rotary devised by Bragstad and La Cour is described in Der Kaskadenumformer, by E. Arnold and J. L. La Cour, Stuttgart, 1904. It consists of a three-phase induction motor coupled direct to a continuous current dynamo, the armatures of the two machines being electrically connected so that the three-phase current created in the rotor of the induction

ˆ Transmission at y ao.ooo Volts

Glow Lamps

Storage Batteries

Arcs

i»Mi|i|i|i J ilililir

Motor

Continuous

- “Ciiff enV”

t-joo V.

Fig. 15.

motor enters the continuous current armature and creates around it a rotary field. The connexions are such that the rotating field turns in a direction opposite to that in which the armature is turning, so that the field is stationary in space. From the con- tinuous current armature can therefore be drawn off a continuous current and the device acts as a transformer of three-phase alternat- ing current to a continuous current.

The ordinary induction coil (q.v.) may be regarded as the trans- former for converting continuous current at low voltage into high voltage intermittent continuous current, but the difficulties of interrupting the primary current render it impossible to transform in this way more than a small amount of power. Where, however, high voltages are required, high potential transformers are used which are now built for the purpose of wireless telegraphy and the transformation of power to give secondary voltages up to 20,000, 30,000 or 60,000 volts. Transformers have even been built to give secondary' voltages of half a million volts capable of giving a 14 in. spark in air. These machines, however, must be regarded as more physical laboratory instruments than appliances for tech- nical work. For description of one such extra high potential trans- former see H. B. Smith, on " Experiments on Transformers for Very High Potentials," The Electrician (1904), 54, p. 358. A trans- former of this kind must invariably be an oil insulated transformer, as under extremely high voltage the air itself becomes a conductor and no solid insulator that can be put upon the wires is strong enough to stand the electric strain.

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(J. A. F.)

TRANSIT CIRCLE, or Meridian Circle, an instrument for observing the time of a star's passing the meridian, at the same time measuring its angular distance from the zenith. The idea of having an instrument (quadrant) fixed in the plane of the meridian occurred even to the ancient astronomers, and is ■mentioned by Ptolemy, but it was not carried into practice until Tycho Brahe constructed a large meridian quadrant. This instrument enabled the observer to determine simultaneously right ascension and declination, but it does not appear to have been much used for right ascension during the 17th century, the method of equal altitudes by portable quadrants or measures of the angular distance between stars with a sextant being preferred. These methods were, however, very inconvenient,

which induced Romer to invent the transit instrument about 1690. It consists of a horizontal axis in the direction east and west resting on firmly fixed supports, and having a telescope fixed at right angles to it, revolving freely in the plane of the meridian.- At the same time Romer invented the altitude and azimuth instrument for measuring vertical and horizontal angles, and in 1 704 he combined a vertical circle with his transit instru-ment, so as to determine both co-ordinates at the same time. This latter idea was, however, not adopted elsewhere, although the transit instrument soon came into universal use (the first one at Greenwich was mounted in 1721), and the mural quadrant continued till the end of the century to be employed for deter-mining declinations. The advantage of using a whole circle, as less liable to change its figure, and not requiring reversal in

order to observe stars north of the zenith, was then again recognized by Ramsden, who also improved the method of reading off angles by means of a micrometer microscope as described below. The making of circles was shortly afterwards taken up by Trough ton, who in 1806 constructed the first modern transit circle for Groombridge's observatory at Blackheath, but he afterwards abandoned the idea, and designed the mural circle to take the place of the mural quadrant. In the United King- dom the transit instrument and mural circle continued till the middle of the 19th century to be the principal instrument in observatories, the first transit circle constructed there being that at Greenwich (mounted in 1850) but on the continent the transit circle superseded them from the years 1818-1819, when two circles by Repsold and by Reichenbach were mounted at Gottingen, and one by Reichenbach at Konigsberg. 1 The firm of Repsold was for a number of years eclipsed by that of Pistor and Martins in Berlin, who furnished various observatories with first-class instruments, but since the death of Martins the Repsolds have again taken the lead, and have of late years made many transit circles. The observatories of Harvard College (United States), Cambridge and Edinburgh have large circles by Troughton and Simms, who also made the Greenwich circle from the design of Airy. 2

In the earliest transit instrument the telescope was not placed in the middle of the axis, but much nearer to one end, in order to prevent the axis from bending under the weight of the telescope. It is now always placed in the centre of the axis. The latter consists of one piece of brass or gun-metal with carefully turned cylindrical steel pivots at each end. Several recent instruments have been made entirely of steel, which is much more rigid than brass. The centre of the axis is shaped like a cube, the sides of which form the basis of two cones which end in cylindrical parts. The pivots rest on V-shaped bearings, either let into the mas- sive stone or brick piers which support the instrument or attached to metal frameworks bolted on the tops of the piers. In order to relieve the pivots from the weight of the instrument, which would soon destroy their figure, the cylindrical part of each end of the axis is supported by a hook supplied with friction rollers, and suspended from a lever supported by the pier and counterbalanced so as to leave only about 10 lb pressure on each bearing. Near each end of the axis is attached a circle or wheel (generally of 3 or 35 ft. diameter) finely divided to 2′ or 5′ on a slip of silver let into the face of the circle near the circumference.

The graduation is read off by means of microscopes, generally four for each circle at 90° from each other, as by taking the mean of the four readings the eccentricity and the accidental errors of graduation are to a great extent eliminated. 3 In the earlier instruments by Pistor and Mar- tins the microscopes were fixed in holes drilled through the pier, but afterwards they let the piers be made narrower, so that the microscopes could be at the sides of them, attached to radial arms starting from near the bearings of the axis. This is preferable, as it allows of the temporary attachment of auxiliary microscopes for the purpose of investigating the errors of graduation of the circle, but the plan of the Repsolds and of Simms, to make the piers short and to let the microscopes and supports of the axis be carried by an iron framework, is better still, as no part of the circle is

1 The most notable exception was the transit instrument and vertical circle of the Pulkovo observatory, specially designed by the elder Struve for fundamental determinations.

2 This instrument differs in many particulars from others: the important principle of symmetry in all the parts (scrupulously followed in all others) is quite discarded; there is only one circle; and the instrument cannot be reversed. There is a similar instrument at the Cape observatory.

3 On Reichenbach's circles there were verniers instead of microscopes, and they were attached to an alidade circle, the immovability of which was tested by a level.

exposed to radiation from the pier, which may cause strain and thereby change the angular distance between various parts of the circle. Each microscope is furnished with a micrometer screw, which moves a frame carrying a cross, or better two close parallel threads of spider's web, with which the distance of a division line from the centre of the field can be measured, the drum of the screw being divided to single seconds of n -. arc (o-i" being estimated), while the number of revolutions jˆSx are counted by a kind of comb the field of view. The ˆ — tj periodic errors of the screw

Transit Circle.

must be investigated and taken into account, and care must be taken that the microscopes are placed and kept at such a distance from the circle that one revolution will correspond to l', the excess or defect (error of run) being determined from time to time by measuring standard intervals of 2′ or 5′ on the circle.

The telescope consists of two slightly conical tubes screwed to the central cube of the axis. It is of great importance that this connexion should be as firm and the tube as stiff as possible, 1 as the flexure of the tube will affect the declinations deduced from the observations. The flexure in the horizontal position of the tube may be determined by means of two collimators or telescopes placed horizontally in the meridian, north and south of the transit circle, with their object glasses towards it. If these are pointed on one another (through holes in the central tube of the telescope), so that the wire-crosses in their foci coincide, then the telescope, if pointed first to one and then to the other, will have described exactly 180 , and by reading off the circle each time the amount of flexure will be found. M. Loewy has constructed a very ingenious apparatus 2 for determining the flexure in any zenith distance, but generally the observer of standard stars endeavours to eliminate the effect of flexure in one of the following ways: either the tube is so arranged that eyepiece and object-glass can be interchanged, whereby the mean of two observations of the same star in the two positions of the object-glass will be free from the effect of flexure, or a star is not only observed directly (in zenith distance Z), but also by reflection from a mercury trough (in zenith distance 180 — Z), as the mean result of the Z.D. of the direct and reflection observations, before and after reversing the instrument east and west, will only contain the terms of the flexure depending on sin 2Z, sin 4Z, &c. In order to raise the instrument a reversing carriage is provided which runs on rails between the piers, and on which the axis with circles and telescope can be raised by a kind of screw-jack, wheeled out from between the piers, turned exactly 180°, wheeled back, and gently lowered on its bearings.

The eye end of the telescope has in a plane through the focus a number of vertical and one or two horizontal wires (spider lines). The former are used for observing the transits of the stars, each wire furnishing a separate result for the time of transit over the middle wire by adding or subtracting the known interval between the latter and the wire in question. The intervals are determined by observing the time taken by a star of known declination to pass from one wire to the other, the pole star being

best on account of its slow motion. 3 Instead of vertical wires, the eye end may be fitted with Repsold's self-registering micrometer with one movable wire to follow the star (see Micrometer). The instrument is pro-

1 Reichenbach supplied his tubes with counterpoising levers like those on the Dorpat refractor (see Telescope).

- Comptes renins, lxxxvii. 24.

» The transits are either observed by " eye and ear," counting the second beats of the clock and comparing the distance of the star from the wire at the last beat before the transit over the wire with the distance at the first beat after the transit, in this way estimating the time of transit to o- 1″ ; or the observer employs a " chronograph,"

vided with a clamping apparatus, by which the observer, after having beforehand set to the approximate declination of a star, can clamp the axis so that the telescope cannot be moved except very slowly by a handle pushing the end of a fine screw against the clamp arm, which at the other side is pressed by a strong spring. By this slow motion, the star is made to run along one of the horizontal wires (or if there are two close ones, in the middle between them), after which the microscopes are read off. A movable horizontal wire or declination-micrometer is also often used. The field or the wires can be illuminated at the observer's pleasure ; the lamps are placed at some distance from the piers in order not to heat the instrument, and the light passes through holes in the piers and through the hollow axis to the cube, whence it is directed to the eye-end by a system of prisms. 4

The time of the star's transit over the middle wire is never exactly equal to the actual time of its meridian passage, as the plane in which the telescope turns never absolutely coincides with the meridian. Let the production of the west end of the axis meet the celestial sphere in a point of which the altitude above the horizon is b (the error of inclination), and of which the azimuth is go"— a (the azimuth being counted from south through west), while the optical axis of the telescope makes the angle 90 + c with the west end of the axis of the instrument, then the correction to the ob- served time of transit will be {a sin(<£— 8) + b cos (— 8) + c} / cos 8, where is the latitude of the station and 8 the declination of the star. This is called Tobias Mayer's formula, and is very con- venient if only a few

observations have to be reduced. Putting b sin (f> — a cos $ = n, we get Hansen's formula, which gives the correction = b sec j> + n (tan 8 — tan) + c sec 8, which is more convenient for a greater number of observations. The daily aberration is always deducted from c, as it is also multiplied by sec 8 (being 0-31 " cos $ sec ,8). The above corrections are for upper culmination; below the pole 180° — 8 has to be substituted for 5. The constant c is determined by pointing the instrument on one of the collimators, measuring the distance of its wire-cross from the centre wire of the transit circle by a vertical wire movable by a micrometer screw, reversing the instrument and repeating the operation, or (without reversing) by pointing the two collimators on one another and measuring the distance of first one and then the other wire-cross from the centre wire. The inclination b is measured directly by a level which can be suspended on the pivots. 6 Having thus found b and c, the observation of two stars of known right ascension will furnish two equations from which the clock error and the azimuth can be found. For finding the azimuth it is most advantageous to use two stars differing as nearly 90° in declination as possible, such as a star near the pole and one near the equator, or better still (if the weather permits it) two successive meridian transits of a close circumpolar star (one above and one below the pole), as in this case errors in the assumed right ascension will not influence the result.

The interval of time between the culminations or meridian transits of two stars is their difference of right ascension, 24 hours corresponding to 360° or I hour to 15°. If once the absolute right ascensions of a number of standard stars are known, it is very simple by means of these to determine the R.A. of any number of stars. The absolute R.A. of a star is found by observing the interval of time between its culmination and that of the sun. If the in- clination of the ecliptic (e) is known, and the declination of the sun (5) is observed at the time of transit, we have sin a tan « = tan 8, which gives the R.A. of the sun, from which, together with the observed interval of time corrected for the rate of the clock, we get the R.A. of the star. Differentiation of the formula shows that observations near the equinoxes are most advantageous, and that errors in the assumed e and the observed 5 will have no influence if the Aa is observed at two epochs when the sun's R.A. is A and 180 — A or as near thereto as possible. A great number of ob- servations of this kind will furnish materials for a standard cata- logue; but the right ascensions of many important catalogues have been found by

making use of the R.A.‘s of a previous catalogue to determine the clock error and thus to improve the individual adopted R.A.‘s of the former catalogue.

In order to determine absolute declinations or polar distances, it is first necessary to determine the co-latitude (or distance of the pole from the zenith) by observing the upper and lower culmination of a number of circumpolar stars. The difference between the circle reading after observing a star and the reading corresponding to the zenith is the zenith distance of the star, and this plus the co-latitude is the north polar distance or 90 ° — 8. In order to

and by pressing an electric key causes a mark to be made on a paper stretched over a uniformly revolving drum, on which the clock beats are at the same time also marked electrically. *

- The idea of illuminating through the axis is due to H. Ussher, professor of astronomy in Dublin (id. 1790).

6 To avoid the use of a very large level, the pivots of the new transit circle at Kiel are supplied with small ” riders ” carrying a wire-cross; these can in turn be observed through a horizontal telescope with a hanging mirror in front of its object-glass, whereby the difference in height of the two pivots above a horizontal line may be measured.

determine the zenith point of the circle, the telescope is directed vertically downwards and a basin of mercury is placed under it, forming an absolutely horizontal mirror. Looking through the telescope the observer sees the horizontal wire and a reflected image of the same, and if the telescope is moved so as to make these coincide, its optical axis will be perpendicular to the plane of the horizon, and the circle reading will be 1 80 ° + zenith point. In observations of stars refraction has to be taken into account as well as the errors of graduation and flexure, and, if the bisection of the star on the horizontal wire was not made in the centre of the field, allowance must be made for curvature (or the deviation of the star’s path from a great circle) and for the inclination of the hori- zontal wire to the horizon. The amount of this inclination is found by taking repeated observations of the

zenith distance of a star during the one transit, the pole star being the most suitable owing to its slow motion.

Attempts have been made in various places to record the transits of a star photographically; with most success at the Georgetown College Observatory, Washington (since 1889). A sensitive plate is placed in the focus of a transit instrument and a number of short exposures made, their length and the time they are made being registered automatically by a clock. The exposing shutter is a thin strip of steel, fixed to the armature of an electromagnet. The plate thus gives a series of dots or short lines, and the vertical wires are photographed on the plate by throwing light through the object-glass for one or two seconds. This seems to give better results than the method adopted at the Paris observatory, where the plate is moved by clock-work and the exposure is comparatively long, while the image of a fixed slit is photographed at different recorded instants.

Literature. — The methods of investigating the errors of a transit circle and correcting the results of observations for them are given in Briinnow's and Chauvenet's manuals of spherical astronomy. For detailed descriptions of modern transit circles, see particularly the Washington Observations for 1865, the Publications of the Wash- burn Observatory (vol. ii.) and Astronomische Beobachtungen zu Kiel (1905). The Greenwich circle is described in an appendix to the Greenwich Observations for 1852. Accounts of photographic transit instruments will be found in The Photochronograph (Washing- ton, 1891), Annates de V observatoire de Tokyo, tome iii. and Comptes rendus (July 16, 1906). (J. L. E. D.)

TRANSKEI, one of the divisions of the Cape province, South Africa, east of the Kei River, being part of the country known variously as Kaffraria ((?.».), " the Native Territories " (of the Cape) and the Transkeian Territories. The majority of the inhabitants are Fingo (q.v.).

TRANSLATION (Lat. trans, across, and latus, the participle of ferre, to carry), literally a carrying over or transference from one to another, and so from one medium to another. Among the more literal usages is the translation of Enoch in the Bible (Heb. xi. 5), or the ecclesiastical removal of a bishop to another see. But the commonest sense of the word is in connexion with the rendering of one language into another.

The characteristics of a good translation in the literary sense, and the history of the influence, through translations, of one literature on another, are worth more detailed notice. Dryden has prescribed the course to be followed in the execution of the ideal translation: ” A translator that would write with any force or spirit of an original must never dwell on the words of his author. He ought to possess himself entirely, and perfectly comprehend the genius and sense of his author, the nature of the subject, and the terms of the art or subject treated of; and then he will express himself as justly, and with as much life, as if he wrote an original; whereas, he who copies word for word loses all the spirit in the tedious transfusion.” Comparatively few translators have satisfied this canon. A writer capable of attaining the standard set up by Dryden is naturally more disposed to use his powers to. express his own views than those of his foreign predecessors. No doubt at all times, and in all countries, translations have usually been produced for utilitarian purposes, and not from artistic motives. In the first instance we may assume that translations were undertaken in a spirit of educational propaganda as a means of communicating new ideas and new facts to a somewhat uninstructed and uncritical public, indifferent as to matters of form. But, though the translator’s primary motive is didactic, he is insensibly led to reproduce the manner as well as the matter of his original as closely as possible. Montaigne warns aspirants of the difficulty in dealing with authors remarkable for the finish of their execution. ” II faict

bon,” he writes in the Apologie de Raimond Sebotide, ” traduire les aucteurs comme celuy-la ou il n’y a gueres que la matiere a repr6senter; mais ceux qui ont donne beaucoup a la grace et a l’elegance de langage ils sont dangereux a entreprendre nommement pour les rapporter 4 un idiome plus foible.” As it happens, however the task of translating foreign masterpieces has frequently been undertaken by writers of undisputed literary accomplishment whose renderings have had a permanent effect on the literature of their native country.

It was certainly the case when Rome, having conquered Greece, was captured by her captive. There is much point and little exaggeration in the statement that ” when the Greek nation became a province of Rome, the Latin literature became a province of the Greek “; and this peaceful victory was initiated by a series of translations made by writers of exceptional ability and, in some cases, of real genius. The first translator whose

name is recorded in the history of European literature is L. Livius Andronicus, a manumitted Greek slave who about 240 B.C., rendered the Odyssey into Saturnian verse. This transla- tion, of which some fragments are preserved, was long in use as a school text, for Horace studied it under the formidable Orbilius; but Andronicus appears to have recognized his mistake in using the native Latin measure as a vehicle of literary expression, and is said to have rendered Greek tragedies and comedies into metres corresponding to those of his Greek originals. The deci- sion was momentous, for it influenced the whole metrical develop- ment of Latin poetry. The example set by Andronicus was followed by Naevius and Ennius, both of whom laid the founda- tions of the Latin theatre by translating Greek plays — especially those of Euripides — and naturalized in Rome the hexameter, which, as practised later by Lucretius and Virgil, was destined to become " the stateliest measure ever moulded by the lips of man." The tradition of translating more or less freely was continued by Pacuvius, the nephew of Ennius, as well as by Plautus and Terence, whose comedies are skilful renderings or adaptations from the New Attic Comedy of Philemon, Diphilus and Menander. A persistent translator from the Greek was Cicero, who interpolates in his prose writings versified renderings of passages from Homer, Aeschylus, Sophocles and Euripides which prove the injustice of the popular verdict on his merits as a poet. Cicero not only translated the oration of Demosthenes On the Crown, but also made Latin versions of Plato's Timaeus (part of which survives), of Xenophon's Oeconomicus, and of the Phaenomena, an astronomical poem by Aratus of Soli, an Alexandrian imitator of Hesiod. This last performance was a tribute to the prevailing fashion of the moment, for the Alex- andrian poets had supplanted the early Greek school in favour among the literary circles of Rome. To the foregoing list may be added the great name of Catullus, whose Coma Berenices is translated from Callimachus, and Cornelius Gallus is mentioned as a translator of Euphorion. Complete translations became less and less necessary as a knowledge of Greek spread among the educated class. But the practice of translating fragments of Greek verse continued throughout the classic period of Latin literature, and the translations of Greek originals incorporated by Virgil were duly pointed out by Octavius Avitus.

The knowledge of Greek declined with the empire, and trans- lations were accordingly produced for the benefit of students who were curious concerning the philosophic doctrines of the

Athenians and the Neoplatonists. Porphyry's introduction to Aristotle's Categories was translated by Victorinus about the reign of Jub'an the Apostate; at the end of the 5th century this introduction was once more translated by Boetius, whose translations of Aristotle's Categories and other logical treatises began the movement which ended in establishing the Greek philosopher as the most profound and authoritative exponent of intellectual problems during the middle ages. Plato was less fortunate, for he was known to students chiefly by the Latin version of the Timaeus made by Chalcidius (it is said) for Hosius, the bishop of Cordova. Cassiodorus, the contemporary of Boetius, went farther afield when he ordered a Latin translation of Josephus to be prepared; but the interest in Aristotle extended to the

TRANSLATION

East, and in the 6th century he was translated into Syriac by Sergius cf Resaina. The Syrians acted as interpreters of Greek learning to the Arabs, and during the 8th and 9th centuries — ■ chiefly through the staff of translators organized at Bagdad by Honein ibn Ishak — the works of Plato and Aristotle, as well as those of Hippocrates and Galen, were translated into Arabic. These translations are of capital importance in the history of European thought. Many of them were introduced into Spain by the Arabs, and were rendered — in some cases through the intermediary of a Castilian-speaking Jew — into Latin at the college of translators founded in 1130 (or shortly afterwards) at Toledo by Raymund, archbishop of that city. Circulating widely throughout western Europe, these Latin translations supplied the learned with a third- or fourth-hand knowledge of Greek philosophy. When Albertus Magnus, St Thomas Aquinas, or any other early light of the schools refers to Aristotle, it must be borne in mind that he often had no more exact acquaintance with the text which he expounds or confutes than could be gathered from an indirect Latin version of an Arabic rendering of a Syriac translation of a Greek original. This accounts for many misunderstandings and errors which would otherwise be incomprehensible. Among the earliest European translators who made their way to Toledo were Adelard of Bath, who rendered an Arabic version of Euclid into Latin; the English- man known as Robert de Retines, afterwards archdeacon of Pamplona, the first translator of the Koran, which he did into Latin in 1141-1143 by order of Peter the Venerable; and Gerard of Cremona, who, towards the end of the 12th century, was responsible for over

seventy translations from the Arabic, including Ptolemy's Almagest and many of Aristotle's treatises, as well as works by Galen, Hippocrates and Avicenna. Early in the 13th century Michael Scot, who had begun his Arabic studies at Palermo, visited Toledo and (perhaps with the help of the Jew Andreas, if we are to believe the statement of Her- mann the German, repeated by Roger Bacon) translated into Latin various works of Aristotle, Avicenna, and — more especially — Averroes. These Latin translations by Michael Scot intro- duced Averroes to the notice of Western scholars, and the fact that they were used at the universities of Paris and Bologna gave the first impetus to the vogue of Averroistic doctrine which lasted from the time of St Thomas Aquinas to the rise of Martin Luther. At Toledo, between 1240 and 1256, Hermann tha German translated into Latin the commentaries of Averroes on Aristotle's Ethics, together with abridgments of the Poetic and the Rhetoric made respectively by Averroes and Alfarabi. But, at the very period of Hermann the German's residence at Toledo, a more satisfactory method of translation was begun. Within half a century of the conquest of Constantinople in 1 204 a visit to Spain was no longer indispensable for a would-be translator of Greek philosophical treatises. The original texts slowly became more available, and a Latin translation of Aris- totle's Ethics seems to have been made from the Greek by order of Robert Grosseteste, bishop of Lincoln, between 1 240-1 244. Towards the end of the century the indefatigable William of Moerbeke (near Ghent) — mentioned as " William the Fleming " by Roger Bacon — produced, amongst numerous other Latin renderings from the Greek, versions of Aristotle's Rhetoric and Politics which have commended themselves to more exact scholars of the modern German type. The Latin renderings from the Arabic were current till a much later date; but it was henceforth accepted, at least in principle, that translations of the Greek classics should be made direct from the original text. Meanwhile the work of translating foreign productions into the local vernacular had been begun in the north and west of Europe. Towards' the end of the 9th century an illustrious English translator appeared in the person of King Alfred, who rendered St Gregory the Great's Cura pastoralis into West Saxon " sometimes word for word, sometimes sense for sense." Alfred is also regarded, though with less certainty, as the translator of Bede's Historia ecclesiastica and the Historia adversus paganos of Orosius. The version of St Gregory's treatise is the most literal of the three; omissions are frequent in the

renderings of Bede and Orosius, and in all the diction is disfigured by latinisms. A larger conception of a translator's function is noticeable in Alfred's version of Boetius's De consolatione philosophiae, a famous Neoplatonic treatise which was the delight of the middle ages, and was translated later into German by Notker Labeo, into French by Jean de Meung, and twice again into English by Chaucer and by Queen Elizabeth respec- tively. In translating Boetius, Alfred deals more freely with his author, interpolates passages not to be found in the extant texts of the original, and yet succeeds in giving an adequate interpretation which is also an excellent specimen of English prose. If the alliterative verses found in one manuscript of Alfred's translation are accepted as his work, it is clear that he had no poetic faculty; but he has the credit of opening up a new path, of bringing England into contact with European thought, and of stimulating such writers as Werferth, bishop of Worcester — the translator of St Gregory's Dialogues — to proceed on the same line. Some forty years earlier John Scotus (Erigena) had won celebrity as a translator by his Latin renderings of works ascribed to the mysterious 5th century Neoplatonist who passes under the name of Dionysius the Areopagite. Towards the close of Alfred's reign some countrymen of Erigena bettered his example by producing Irish versions of Hippocrates and Galen at St Gallen. St Gallen became a centre of translation, and there, at the beginning of the nth century, Notker Labeo presided over a committee of interpreters who issued German renderings of certain treatises by Aristotle, Terence's Andria and Virgil's Eclogues. Far greater literary importance attaches to Syntipas, the title given by Michael Andreopulos to a collection of ancient Oriental tales which he translated from an intermediate Syriac version into Greek at the request of the Armenian duke of Melitene about the end of the nth century. These stories were retranslated into French verse and (by Jean de Haute-Seille) into Latin during the course of the 12th century under the respec- tive titles of the Sept sages de Rome and Dolopathos; they were utilized in the Cento novelle antiche, in the Libro dei sette say, and in the Decamerone, and were finally absorbed by every literature in Europe. Immense popularity was won by the Liber gestorum Barlaam el Josaphat, a Latin translation made in the nth or 12th century from the Greek, and recast in many European languages during the 13th century. The book is in fact a legendary life of Buddha adapted to the purposes of Christianity by a monk; but it was accepted as an historical record, the undiscerning credulity of the faithful informally canonized

Barlaam and Josaphat, and ultimately compelled the Latin Church to include these two fictitious beings as saints in the Martyr ologium romanum. This is perhaps the most curious result attained by any translation. The interest in Eastern apologues and moralizing stories, which was early shown in Marie de France's translation of Aesopic fables, was further demonstrated by the Castilian translations of Kalilah and Dimnah and Sindibad made about the middle of the 13th century, by (or at the command of) Alphonso the Learned and his brother the Infante Fadrique respectively.

The enthusiasm for these Oriental stories was communicated to the rest of Europe by John of Capua's Directorium humanae vitae (1270), a Latin translation of Kalilah and Dimnah; but, in the meanwhile, as the younger European literatures grew in power and variety, the field of translation necessaiily widened to such an extent that detailed description becomes impossible. Geoffrey of Monmouth's Historia regum Britanniae, which pur- ports to be a free version of an unnamed Breton book, is the source of the Arthurian legends which reappeared transformed in elaborate French versions, and were transmitted to the rest of Europe during the 12th and 13th centuries. During this period of French literary supremacy instances of bilingual faculty are not wanting in the form of translations: shortly after the middle of the 13th century Brunetto Latini translated passages of Cicero into Italian, and selections from Sallust into French. A hundred years later there are unmistakable indica- tions that the middle ages are departing, that the French suzerainty over literature is at an end, and that the advent of

the New Humanism is an accomplished fact. The early Renais- sance had already dawned in Italy: a renewed interest in the Latin classics (Greek was not yet generally cultivated by scholars) proved that there was a revival of learning in France. Livy was done into French by Bersuire, Seneca by Bauchant, Boccaccio by Laurent de Premier Fait, and a celebrated trans- lator appeared in the person of Nicolas Oresme, who, however, rendered Aristotle from a Latin version. In England Chaucer executed translations of Boetius and part of the Roman de la rose, and succeeded equally in interpreting the philosophic treatise and the allegorical poem. A still further advance is discernible in the book of travels

ascribed to Sir John Mande- ville: this work, which seems to have been originally written in French, is rendered into English with an exceptional felicity which has won for the translator the loose-fitting but not altogether inappropriate title of ” the father of English prose.” The English version of Mandeville is assigned to the beginning of the 15th century. About 1470 Sir Thomas Malory produced from French originals his Morte d’ Arthur, a pastiche of different texts translated with a consummate art which amounts to originality. Malory’s inspired version, together with the numerous renderings from the French issued (and often made personally) by Caxton, stimulated the public taste for romantic narrative, raised the standard of execution, and invested the translator with a new air of dignity and importance.

Yet the 1 5th century has a fair claim to be regarded as the golden age of translation. The Gothic version of the Bible, made by Ulfilas during the 4th century almost simultaneously with St Jerome’s Vulgate, is invaluable as the sole literary monument of a vanished language; the 14th century English version by Wycliffe and the 15th century English versions which bear the names of Tyndale and Coverdale are interesting in themselves, and are also interesting as having contributed to the actual Authorized Version of 1611. But they are incom- parably less important than Luther’s German translation of the Bible (1522-1534) which, apart from its significance as indicating the complete victory of the liberal middle class and the irreme- diable downfall of the feudal and ecclesiastical autocracy, supplanted minor dialects and fixed the norm of literary expres- sion in German-speaking countries. Luther, it has been truly said, endowed Germany with a uniform literary language, a possession which she had lost for nearly three hundred years. The effect of profane literature was speedily visible in Fischart’s translations of Rabelais’s Pantagruiline (1572) and the first book of Gargantua (1575). But before this date France had produced a prince of translators in Jacques Amyot, bishop of Auxerre. In 1548 Nicolas de Herberay had published a French translation of Amadis de Gaule which enchanted the polite world at the court of Henry II., had its day, and is forgotten. But Amyot’s translation of Plutarch (1559) remains an acknow- ledged masterpiece, surviving all changes of taste and all variations of the canon of translation. Montaigne writes: ” Je donne la palme avecque raison, ce me semble, a Jacques Amyot, sur tous nos escripvains Francois.” If ” escripvain ” be understood to mean ” translator,” this judgment is beyond appeal.

Lord Berners will not bear comparison with Amyot in achievement or influence; but. though less completely equipped and less uniformly happy in his choice of texts (for Amyot translated the Aethiopian History and Daphnis and Chloe as well as Plu- tarch), Lord Berners holds a distinguished place in the ranks of English translators. His renderings of Fernandez de San Pedro's Cdrcel de amor and of Guevara's Libro aureo are now read solely by specialists engaged in tracing English euphuism to its remoter sources,, and some of his other translations — the Boke of Duke Huon of Burdeux and Arthur of Little Britain — are too poor in substance to be interesting nowadays. But Lord Berners is justly remembered by his notable translation of Froissart (1523-152 5). Froissart offers fewer opportunities than Guevara for the display of that " fecundious art of rhetoric " in which the English translator thought himself deficient, and, with this temptation removed, Lord Berners is seen at his best. In his version of Froissart, apart from endless confusion of proper

names, he makes few mistakes of any real importance, and, if he scarcely equals his original in brio, he is almost invariably adequate in reproducing the French blend of simplicity with stateliness. Such translations as Phaer's Virgil (1557) and Golding's Ovid (1561) have not the historical importance of William Painter's Palace of Pleasure, a miscellaneous collection of stories rendered from the Italian, nor of Jasper Heywood's version of Seneca (1581) whose plays had exercised immense influence upon the methods of Gamier and Montchretien in France. Though Kyd translated Garnier's CornUie, the Senecan system was destined to defeat in England, and Heywood's translation did not even postpone the catastrophe. On the other hand Marlowe found the subject of his Tamburlaine in Painter's collection, and thus began the systematic exploitation of the Palace of Pleasure which was continued by his successors on the stage. A translator of the rarest excellence was forthcoming in Sir Thomas North, who rendered Guevara (1557) from the French (revising his second edition from the Spanish), and The M or all Philosophie of Doni — " a worke first compiled in the Indian tongue " — from the Italian (1570). But, good as they are, both these versions are overshadowed by the famous translation of Plutarch which North published in 1579. He may have referred occa- sionally to the Greek, or perhaps to some intermediate Latin rendering; but the basis of his work is Amyot, and his English is not inferior to the French in sonority and cadence of phrase. This retranslation of a translation is a masterpiece of

which fragments are incorporated with scarcely any change in Corio- lanus, Julius Caesar and Antony and Cleopatra; and touches from North have been noted also in the Midsummer Night's Dream and in Timon of Athens. Amyot greatly influenced the develop- ment of French prose, and his translation was the source of Racine's Mithridate; but, if we reflect that Shakespeare not only took some of his subjects from the English Plutarch and found nothing to amend in the diction of many passages, North's triumph may be reckoned as even more signal than Amyot's. Very little below North's translation of Plutarch comes John Florio's translation of Montaigne (1603), a fantastically ingenious performance which contributed a celebrated passage to The Tempest and introduced the practice of the essay into England. It is impossible to cope with the activity of English translators during the last half of the 16th century and the first half of the 17th. To this period belongs Chapman's impressive and resounding translation (1 598-1616) of Homer, which was to enrapture Keats two hundred years later. Adlington's version of Apuleius, Underdown's renderings of Heliodorus and Ovid, the translations of Livy, Pliny, Suetonius and Xenophon issued in quick succession by Philemon Holland are vivid and often extravagantly picturesque in their conveyance of classic authors into Elizabethan prose. With them must be named the translator of Tacitus (1591), Sir Henry Savile, who served later on the committee which prepared the Authorized Version of the Bible, and must therefore be counted amongst those who have exercised a permanent influence on English prose style. Thomas Shelton produced the earliest translation (161 2) of Don Quixote, a version which, in spite of its inaccuracies and freakishness, preserves much of the tone and atmosphere of the original. Mabbe's translation (1622) of Guzman de Alfarache was lauded by Ben Jonson, and widely read during the 17th century, and his version of the Celestina deserved a success which it failed to obtain. It compares most favourably with a version of Tasso (1600) by Edward Fairfax, who has been persistently overpraised. But the Puritanical instinct of the English people, powerful even when not in the ascendant, was an insuperable obstacle to the acclimatization of Spanish literature in England. The Leviathan has obscured Hobbes's fame as a translator, but he is known to scholars by his sound but crabbed rendering of Thucydides (1629), and by a wholly unnecessary version of Homer which he published at the very end of his career (1674). Sir Roger L'Estrange is responsible for translations of Seneca, Cicero and Josephus, which are usually lively enough to be readable and

unfaithful enough to be misleading; the most popular of his renderings is a translation of Quevedo's Suenos

(made through the French) which owes most of its vogue during the Restoration rather to its reckless indecency than to its intrinsic merit. Dryden's free translations of Juvenal (1693) and Virgil (1697) treat the original authors with a cavalier freedom, but at least they preserve the meaning, if not the conciseness and point, of the Latin.

Among the multitudinous English translations of the 18th century it is only necessary to mention Pope's versions of the Iliad (1715-1720) and the Odyssey (1725-1726), and Cowper's rendering of Homer, issued in 1791. These neat translations necessarily fail to convey any impression of Homer's epical grandeur, and they set a mischievous fashion of artificial " elegance " which has been too often adopted by their successors; but both Pope and Cowper conform faithfully to the mistaken canon of their age, and both have fugitive moments of felicity. A posthumous translation of Don Quixote bearing the name of Charles Jarvis appeared in 1742, has been reprinted times innumerable ever since, and has helped to make Cervantes's masterpiece known to generations of English-speaking people. Defective in point of exact scholarship, it has the merit of agreeable perspicuity, and there seems no reason to believe the remark, ascribed by Warburton to Pope, that Jarvis " translated Don Quixote without knowing Spanish ": the available evidence is strongly against this malicious theory. The most remarkable translations of the 18th century, however, appeared in Germany: these are the versions of the Odyssey (1781) and Iliad (1793) by Voss, and A. W. von Schlegel's rendering of Shakespeare (1797-1810), which gave a powerful impulse to the romantic movement on the Continent.

Byron's version of a Spanish ballad and Shelley's renderings of Calderon are interesting exhibitions of original genius voluntarily accepting a subordinate r61e. More importance attaches to Carlyle's translation of Wilhelm Meister (1824), a faithful rendering free from the intolerable mannerisms and tricks which the translator developed subsequently in his original writings. William Taylor had long before translated Burger's Lenore,

Lessing's Nathan and Goethe's Iphigenia; but such interest as the English nation has been induced to take in German litera- ture dates from the appearance of Carlyle's translation. If he did nothing more, he compelled recognition of the fact that Germany had at last produced an original genius of the highest class. Calderon found accomplished translators in Denis Florence MacCarthy (1848-1873) and in Edward FitzGerald (1853), who also attempted to render Sophocles into English; but these are on a much lower plane than the translation of the Rubaiydt (1859) of Omar Khayyam, in which, by a miracle of intrepid dexterity, a half-forgotten Persian poet is transfigured into a pessimistic English genius of the 19th century. Versions of Dante by Longfellow (whose translations of poems by minor authors are often admirable), of Latin or Greek classics by Conington, Munro, Jowett and Jebb, maintain the best traditions of the best translators. William Morris was less happy in his poetical versions of Virgil (1875) and the Odyssey (1887) than in his prose translations of The Story of Grettir the Strong (1869) and The Volsunga Saga (1870) — both made in collaboration with Magnusson — and in his rendering of Beowulf (1895). In his Lays of France (1872) Arthur O'Shaughnessy skirts the borders of translation without quite entering into the field; he elaborates, paraphrases and embroiders rather than translates the lots of Marie de France.

Most versions of modern foreign writers are mere hackwork carelessly executed by incompetent hands, and this is even more true of England than of France and Germany. But, with the development of literature in countries whose languages are unfamiliar, the function of the translator increases in importance, and in some few cases he has risen to his opportunity. Through translations the works of the great Russian novelists have become known to the rest of Europe, and through translations of Ibsen the dramatic methods of the modern stage have undergone a revolution. (J. F.-K.)

TRANSOM (probably a corruption of Lat. transtrum, athwart, in a boat; equivalents are Fr. traverse, croisillon, Ger. Losholz),

the architectural term given to the horizontal lintel or beam which is framed across a window, dividing it into stages or heights. In early Gothic ecclesiastical work transoms are only found in belfry unglazed windows or spire lights, where they were deemed necessary to strengthen the mullions in the absence of the iron stay bars, which in glazed windows served a similar

purpose. In domestic work, on account of the opening casements, they are more frequently found. In the later Gothic, and more especially the Perpendicular period, the introduction of transoms became very general in windows of all kinds.

TRANSUBSTANTIATION, the term adopted by the Roman Catholic Church to express her teaching on the subject of the conversion of the Bread and Wine into the Body and Blood of Christ in the Eucharist. Its signification was authoritatively defined by the Council of Trent in the following words: ” If any one shall say that, in the Holy Sacrament of the Eucharist there remains, together with the Body and Blood of Our Lord Jesus Christ, the substance of the Bread and Wine, and shall deny that wonderful and singular conversion of the whole substance of the Bread into (His) Body and of the Wine into (His) Blood, the species only of the Bread and Wine remaining — which con- version the Catholic Church most fittingly calls Transubstantia- tion— let him be anathema.” 1 The word Transubstantiation is not found earlier than the 12th century. But in the Eucharistic controversies of the 9th, 10th and nth centuries the views which the term embodies were clearly expressed; as, for example, by Radbertus Paschasius (d. 865), who wrote that ” the substance of the Bread and Wine is efficaciously changed interiorly into the Flesh and Blood of Christ,” and that after the consecration what is there is ” nothing else but Christ the Bread of Heaven.” 2 The words ” substantially converted ” appear in the formula which Berengarius was compelled to sign in 1079. Assuming that the Expositio canonis missae ascribed to St Pietro Damiani (d. 1072) is doubtful, we may take it that the first use of the word is in a passage of Hildebert de Savardin 3 (d. 1133), who brings it into an exhortation quite informally, as if it were in common use. 4 It is met with in a Decretal of Innocent III. 5 The fourth Council of Lateran fully adopted it (12 15). It is clear from the treatise of Radbertus Paschasius already quoted that the word ” substance ” was used for reality as distinguished from outward appearance, and that the word ” species ” meant outward appear- ance as opposed to reality. The terms, therefore, were not invented by St Thomas Aquinas, and are not mere scholastic subtlety. The definition of the Council of Trent was intended both to enforce the accepted Catholic position and to exclude the teaching of Luther, who, whilst not professing to be certain whether the ” substance ” of the Bread and Wine could or could not be said to remain, exclaimed against the intolerance of the Roman Catholic Church in defining the question. 6

For a full and recent exposition of the Catholic teaching on Transubstantiation the reader may consult De ecclesiae sacramentis, auctore Ludovico Billot, S.J. (Rome, Propaganda Press, 1896). The Abbe 1 Pierre Batifol, in his Etudes d'histoire et de theologie positive, 2 m " serie (Elaboration de la notion de conversion, and Conversion et transubstantiation) treats it from the point of view of development (V. Lecoffre, Paris, 1905). (* J. C. H.)

TRANSVAAL, an inland province of the Union of South Africa between the Vaal and Limpopo rivers. It lies, roughly, between 225° and 27° S. and 25 and 32 E., and is bounded S. by the Orange Free State and Natal, W. by the Cape province and the Bechuanaland Protectorate, N. by Rhodesia, E. by Portuguese East Africa and Swaziland. Save on the south-west the frontiers, for the main part, are well defined natural features. From the south-west to the north-east corners of the colony is 570 m.; east

1 Concil trident. Sess. XIII. Can. 2.

2 P. L. Migne. CXX. De corpore et sanguine Domini, cap. viii. 2, cf. xv. 2.

3 Sometimes called of Tours, or of Le Mans.

4 See Batifol, Etudes d'histoire et de theologie positive, 2 me serie. 6 Lib. III. Decretalium, tit. 41, n. 6.

6 De captivitate babylonica ecclesiae. De coena Domini. But Luther elsewhere professed Consubstantiation ; that is, in modern Lutheran phraseology, the " presence of our Lord's Body " in, with and under the bread.

PHYSICAL FEATURES]

to west its greatest extent is 397 m. The total area is 111,196 sq. m., a little less than the area of Great Britain and Ireland. The boundaries of the Transvaal have varied from time to time. The most important alteration was made in January 1903 when the districts of Utrecht and Vryheid, which then formed the south-eastern part of the country were annexed to Natal. The area thus lost to the Transvaal was 6970 sq. m. (For map see South Africa.)

Physical Features. — About five-sixths of the country lies west of the Drakensberg (q.v.), the mountain range which forms the inner rim of the great tableland of South Africa. For a few miles on the Natal-Transvaal frontier the Drakensberg run east and west and here is the pass of Laing's Nek. Thence the mountains sweep round to the north, with their precipitous outer slopes facing east. For some 250 m. within the province the mountains form a more or' less continuous range, the highest point being the Mauchberg (8725 ft.) in 24 20′ 10 S. 30 35 E., while there are several heights of 7000 or more feet. Eastward from the foot of the Drakensberg stretches a broad belt of low land beyond which rise the Lebombo hills running north and south along the parallel of 32 E. and approaching within 35 m. of the sea at Delagoa Bay. The Lebombo hills are flat topped but with a well-defined break on their seaward side. This eastern edge forms the frontier between Transvaal and Portuguese territory.

The country west of the Drakensberg, though part of the main South African tableland, is not uniform in character, consisting of (1) elevated downs, (2) their slopes, (3) the flat "bottom" land. The downs or plateaus occupy all the southern part of the country, sloping gradually westward from the Drakensberg. That part of the plateau east of Johannesburg is from 5000 to 6400 ft. high; the western and somewhat larger half is generally below 5000 ft. and sinks to about 4000 ft. on the Bechuanaland border. This plateau land is called the high veld, 1 and covers about 34,000 sq. m. The northern edge of the plateau follows an irregular line from somewhat north of Mafeking on the west to the Mauchberg on the east. This edge is marked by ranges of hills such as the Witwalers- rand, Witwatersberg and Magaliesberg; the Witwatersrand, which extends eastward to Johannesburg, forming the watershed between the rivers flowing to the Atlantic and Indian Ocean. Farther north, beyond the intervening slopes and low bush, are two elevated regions covering together over 4000 sq. m. They are the Water- berg, and, more to the east, separated from the Waterberg by the valley of the Magalakwane tributary of the Limpopo, the Zoutpans- berg. The Zoutpansberg has steep slopes and is regarded as the northern termination of the Drakensberg. An eastern offshoot of the Zoutpansberg is known as the Murchison Range. The low land between the high veld and the Waterberg and Zoutpansberg is traversed by the Olifants River, an east flowing tributary of the Limpopo.

The true high veld, extending east to west 120 m. and north to south 100 m., consists of rolling grass covered downs, absolutely

treeless, save where, as at Johannesburg, plantations have been made by man, the crest of the rolls being known as builts and the hollows as laagtes or vleys. The surface is occasionally broken by kopjes — either table-shaped or pointed — rising sometimes 100 ft. above the general level. Small springs of fresh water are frequent and there are several shallow lakes or pans — flat bottomed depressions with no outlet. The largest of these pans, Lake Chrissie, some 5 m. long by I m. broad, is in the south-eastern part of the high veld. The water in the pans is usually brackish. The middle veld is marked by long low stony ridges, known as rands, and these rands and the kopjes are often covered with scrub, while mimosa trees are found in the river valleys.

The banken veld, formed by the denudation of the plateau, is much broken up and is rich in romantic scenery. It covers about 27,000 sq. m., and has an average breadth of 40 m. In places, as between Mafeking and Johannesburg, the descent is in terrace-like steps, each step marked by a line of hills ; in other places there is a gradual slope and elsewhere the descent is abrupt, with out- lying hills and deep well-wooded valleys. The rocks at the base of the slopes are granite, the upper escarpments are of sedimentary rocks. Thence issue many streams which in their way to the ocean have forced their way through the ranges of hills which mark the steps in the plateau, forming the narrow passes or poorts char- acteristic of South African scenery.

As in the middle veld, rands and kopjes occur in the low or bush veld, but the general characteristic of this part of the country, which covers over 50,000 sq. m., is its' uniformity. The low veld east of the Drakensberg begins at about 3000 ft. above the sea and slopes to 1000 ft. or less until it meets the ridge of the Lebombo hills. The lowest point is at Komati Poort, a gorge through the Lebombo hills only 476 ft. above the sea. West and north of the Drakensberg the general level of the low veld is not much below that of the lowest altitudes of the middle veld, though the climatic

1 By the Boers the western and less elevated part of the plateau is known as the middle veld.

conditions greatly differ. North of the Zoutpansberg the ground falls rapidly, however, to the Limpopo flats which are little over 1200 ft. above the sea. Near the north-west foot of the Zoutpans-berg is the large saltpan from which the mountains get their

name. The low veld is everywhere covered with scrub, and water is scarce, the rivers being often dry in the winter season.

River Systems. — There are four separate river basins in the Trans- vaal. Of these the Komati (q.v.) and its affluents, and the Pongola and its affluents rise in the high veld and flowing eastward to the Indian Ocean drain but a comparatively small area of the province, of which the Pongola forms for some distance the south-eastern frontier. The rest of the country is divided between the drainage areas of the Vaal and Limpopo. The Vaal (q.v.) rises in the nigh veld in the Ermelo district not far from the source of the Komati and that of the Usuto tributary of the Pongola. The Vaal drains the greater part of the plateau, flowing westward towards the Atlantic. The waters of the northern escarpments of the plateau and of all the region farther north are carried to the Indian Ocean by the Limpopo (q.v.) and its tributaries the Olifants, Great Marico, Great Letaba, &c. Both the Vaal and the Limpopo in their main course have high steep banks. They carry an immense volume of water during the summer rains, but are very small streams in the winter, when several of their tributaries are completely dry. 2 None of the rivers is navigable within the limits of the province. The absence of alluvial deposits of any size is another characteristic of the Transvaal rivers. For a considerable distance the Vaal forms the frontier between the province and the Orange Free State and in similar manner the Limpopo separates the Transvaal from Bechuanaland and Rhodesia. Since the first advent of white colonists many springs and pans and small streams have dried up, this desiccation being attributed, not so much to decreased rainfall, as to the burning off of the grass every winter, so that the water, instead of soaking in, runs off the hard, baked ground into the larger rivers. (F. R. C.)

Geology. A broad ring of crystalline rocks (Swaziland schists) encircles the Transvaal except on the south, where the Karroo formation extends over the Vaal River. Within this nearly complete circle of crystalline rocks several geological formations have been deter- mined, of which the age cannot be more definitely fixed than that they are vastly older than the Karroo formation and newer than the Swaziland schists.

The following subdivisions have been recognized by Molengraaff: Karroo System, Transvaal System, Vaal River System, South African Primary Syjtem. Each of these systems is separated from the other by a strong unconformity.

South African Primary System. — The South African Primary System includes a complex of rocks as yet little understood. According to Molengraaff it includes the two following series : —

{An upper group including the auri- ferous conglomerates of the Rand: a lower group (Hospital Hill series) of quartzites, shales and conglom- erates. Barberton and Swaziland J Crystalline schists, quartzites, conglom-

Series. \ erates, intrusive granites.

Barberton Series. — Molengraaff considers the Barberton series to be the metamorphosed equivalent of the Hospital Hill series, while Hatch regards it to be older and to form a portion of his Archaean series (Swaziland schists) to which position it is here assigned. The chief outcrops are in the south-western Transvaal, around Zoutpansberg and in Swaziland. They show a great variety of type made up of slates, quartzites, occasional conglomerates, schists with large masses of intrusive granites and gneiss.

Witwatersrand Series. — It is now generally acknowledged that this important series consists of two main groups. Their chief occurrences are in the districts of Witwatersrand, Heidelberg, Klerksdorp and Venterskroon. The lower group (Hospital Hill slates) consists of quartzites and shales, resting on the eroded surface of the older granites and schists, and estimated to be from 10,000 to 12,000 ft. thick. There are occasional bands of conglom- erates, sometimes auriferous. In the absence of fossils their age cannot be determined. The upper group consists of conglomerates, grits and quartzites with a few bands of shales. It has obtained notoriety from the conglomerates along certain bands contain- ing gold, when they constitute the famous ” banket.” The thick- ness varies from 2300 to over 11,000 ft. The conglomerate beds occur in belts forming in descending order the Elsburg series, Kimberley series, Bird Reef series, Livingstone Reef series, Main Reef series. The richest in gold are to be found among the Main Reef series, which yields by far the greater part of the total output of gold from the Transvaal. The individual beds, seldom more than a few feet in thickness and sometimes only a few inches, are interstratified with an immense thickness of quartzites. The conglom- erates consist almost entirely of pebbles o f quartz set in a hard

2 At the Standerton gauge on the Vaal in 1905-1906, a year of extreme drought, the total flow was 8,017,000,000 cub. ft., of

which 7,102,000,000 was storm water.

matrix consolidated by the deposition of secondary silica. The conglomerate bands and quartzites contain large quantities of iron pyrites deposited subsequent to their formation, that in the conglom- erates containing the gold. Sericite in the form of scales and films characterizes those portions which have been faulted, squeezed or sheared. Sheets of diabase, apparently volcanic flows, and numerous dykes interfere with the regularity of the stratification. The theory of the subsequent infiltration of the gold is that generally accepted. No fossils have been discovered, and except that they represent some portion or portions of rocks of the Pre-Cape formation the age of the upper Witwatersrand beds, as well as that of the lower division, remains an open question. They may safely be considered to be among the oldest auriferous sediments of the world.

Vaal River System. — This consists largely of rocks of igneous origin, of which the amygdaloidal diabase of Klipriversberg forms the type. The other rocks include igneous breccias, shales, coarse conglomerates and grits. Near Reitzburg the coarse conglom- erates reach a thickness of 400 ft. and about 500 ft. at Kroom- draai. This system rests unconformably on the Witwatersrand series and is unconformably overlain by the Transvaal system. It must, however, be acknowledged that these relationships are very imperfectly understood. Compared with other formations they occupy restricted areas, being only met with south of Johannesburg, around Wolmaransstad, Lichtenburg and east of Marico.

Transvaal System. — This is a very definite sequence of rocks covering immense areas in the centre of the country. The following groups are recognized : Waterberg Series, Pretoria Series, Dolomite Series, Black Reef Series.

The Black Reef Series is composed of quartzites, sandstone, slates and conglomerate. It varies in thickness from 100 ft. in the southern Transvaal to 1000 ft. at Lydenburg. Thin bands of conglomerate, sometimes auriferous, occur near the base.

The Dolomite Series, known to the Dutch as " Olifants Klip," consists of a bluish-grey magnesian limestone with bands of chert. The thickness varies from 2600 ft. in the Witwatersrand area to 5000 ft. around Pretoria; and is about 2600 ft. about Lydenburg. It is worn by solution into caves and swallow-holes {Wonder garten). Gold, lead, copper and iron ores occur as veins. So far it has proved to be unfossiliferous. Dykes and intrusive rocks are common.

The Pretoria Series, formerly known as the Gatsrand series, consists of repeated alternations of flagstones and quartzites, shales and sheets of diabase. These follow conformably on the Dolomite series. In the. Marico district the shales become highly ferruginous and resemble the Hospital Hill slates of the Witwaters- rand series. Near Pretoria duplications of the beds, due to over- thrusting, are not uncommon.

The Waterberg Series lies unconformably on the Pretoria series. The colour is usually red, forcibly recalling the Old Red Sandstone and Trias of England. Sandstones, quartzites, conglomerates and breccia make up the formation. They occur to the north- east of Pretoria and occupy still wide areas in the Waterberg district.

A complex of igneous rocks of different ages covers immense areas in the central Transvaal. Various types of granite are the predominant variety. Syenites, gabbros, norites and volcanic rocks are also represented. The granite contains two varieties. One is a red granite intruded subsequently to the Waterberg sand- stones; another is a grey variety considered to be older than the Black Reef series and possibly older than the Witwatersrand series.

The Karroo System attains its chief development in the south-eastern Transvaal in the districts of Ermelo, Standerton and Wakkerstroom.

The latest classification of Molengraaff subdivides the beds as follows :— –

Hoogeveld Series = Beaufort beds of Cape Colony.

Contains coal-seams.

Ecca shales. Not present at Vereeniging.

Dwyka conglomerate. Sandstones and conglomerates with

coal-seams at Vereeniging.

The Dwyka conglomerate resembles the same bed in the Cape province. The boulders consist of very various rocks often of large size. Many of them show glacial striae. The direction of striae on the underlying quartzitic rocks, particularly well seen near the Douglas colliery, Balmoral, point to an ice movement from the north-north-west to south-south-east.

The Ecca series, as in the Cape, consists of sandstones and shales. Seams of coal lie near the base, some of them exceeding 20 ft. in thickness, but in this case layers of shaly coal are included. The overlying sandstones afford good building stones, and frequently, as at Vereeniging, yield many fossil plants. These include among others, Clossopteris browniana, Gangamopleris cyclopteroides, Sigil- laria Brardi, Bothrodendron Leslii, Noeggeralhiopsis Hislopi.

The Karroo beds lie almost horizontally, in marked contrast to the highly inclined older rocks. Their distribution, other than in the south-eastern districts, is imperfectly understood. Remnants have been found of their former existence in the neighbourhood of Pretoria; and portions of the Bush veld Sandstone have recently been relegated to the Karroo formation.

The diamond pipes probably represent some of the most recent rocks of the Transvaal. They may be of Cretaceous age or even later, and in any case belong to the same class as those of Kimberley. The recent deposits of the Transvaal may be considered to be insignificant. They include the gravels and alluviums of the present streams and the almost ubiquitous red sand of aeolian origin. 1 (W. G.*)

Climate. — Although lying on the border of and partly within the tropics, the Transvaal, owing to its high general elevation, and to the absence of extensive marshy tracts, enjoys on the whole a healthy invigorating climate, well suited to the European constitution. The climate of the high veld is indeed one of the finest in the world. The air is unusually dry, owing to the proximity of the Kalahari Desert on the west and to the interception on the east by the Drakensberg of the moisture bearing clouds from the Indian Ocean. The range of temperature is often considerable — in winter it varies from about 100° F. in the shade at I p.m. to freezing point at night. During summer

(Oct.-April) the mean temperature is about

J 3°; during winter about 53°. Nov.Jan. are the hottest and June uly the coldest months. The chief characteristic of the rainfall is its frequent intensity and short duration. During May to August there is practically no rain, and in early summer (Sept.Dec.) the rainfall is often very light. The heaviest rain is experienced between January and April and is usually accompanied by severe thunderstorms. On the eastern escarpment of the Drakensberg the rainfall is heavy, 50 or 60 in. in the year, but it diminishes rapidly towards the centre of the plateau where it averages, at Johannesburg about 30 in., 2 while in the extreme west as the Kala hari is approached it sinks to about 12 in. The winds in winter are uniformly dry while dust storms are frequent at all seasons — a fact which renders the country unsuitable for persons suffering from chest complaints. In the eastern part of the plateau snow occasionally falls, and frost at night is common during winter.

The banken veld district is also generally healthy though hotter than the plateaus, and malarial fever prevails in the lower valleys. Malarial fever is also prevalent throughout the low veld, but above 3000 ft. is usually of a mild type. Nearly all the country below that elevation is unsuitable for colonization ■ by whites, while the Limpopo flats and other low tracts, including the district between the Drakensberg and the Lebombo hills are extremely unhealthy, blackwater fever being endemic. In the low veld the shade tempera- ture in summer rises to 113° F., but the nights are generally cool, and down to 2000 ft. frost occurs in winter. The rainfall in the low country is more erratic than on the plateau, and in some districts a whole year will pass without rain.

Flora. — The general characteristic of the flora is the prevalence of herbaceous over forest growths ; the high veld is covered by short sweet grasses of excellent quality for pasturage; grass is mingled with protea scrub in the middle veld; the banken veld has a richer flora, the valley levels are well wooded, scattered timber trees clothe their sides and the hills are covered with aloe, euphorbia, protea and other scrub growths. Among the timber trees of this region is the bolkenhout of terblanz {Faurea Saligna) which yields a fine wood resembling mahogany. The scrub which covers the low veld consists mainly of gnarled stunted thorns with flattened umbrella shaped crowns, most of the species belonging to the sub- order mimoseae. A rare species is the acacia

erioloba Rameel doom, akin to the acacia giraffae of Bechuanaland. The wild seringa (Burkea africana) is also characteristic of the low veld and extends up the slopes of the plateau. The meroola (sclerocarya caffra) a medium sized deciduous tree with a rounded spreading top is found in the low veld and up the slopes to a height of 450c ft. It is common in the lower slopes of the rands of the low veld. Cotton and cotton-like plants and vines are also native to the low veld. Few of the low veld bushes are large or straight enough to furnish any useful wood, and timber trees are wholly absent from the level country. The forest patches are confined to the deep kloofs of the mountains, to the valleys of the larger rivers and to the sea-slopes of the Drakensberg and other ranges, where they flourish in regions exposed to the sea mists. These patches, called " wood-bushes," contain many hardwood trees of great size, their flora and fauna being altogether different from that immediately outside the wood. Common species in the woodbush are three varieties of yellow wood (Podocarpus), often growing to an enormous size, the Cape beech (myrsine), several varieties of the wild pear (Olinia) and of stinkwood (Oreodaphne) ironwood and ebony. The largest forest areas are in the Pongola district and the Haenertsburg and

1 For geology see : F. H. Hatch and G. S. Corstorphine, The Geology of South Africa (London, 2nd ed., 1909); G. A. F. Molengraaff, Geologie de la Republique Sud-africaine du Transvaal, Bull, de la Soc. Geol. de France, 4 serie, tome i., pp. 13-92 (1901). (Translation by J. H. Ronaldson, Edinburgh and Johannesburg, 1904) ; Reports and Memoirs, Geol. Survey (Transvaal, 1903, et seq.) ; H. Kynaston, The Geology of the Transvaal and the Orange River Colony, Handbook, British Association (Cape Town, 1905); Trans. Geol. Soc. S. Africa (Johannesburg).

2 Exceptionally very heavy rain is experienced on the Rand. In January 1907 seven inches of rain fell in 24 hours.

Woodbush districts north of the Olifants river. Mimosa and the wild wilge-boom (Salix capensis) are the common trees on the

banks and rivers, while the weeping willow is frequent round the farmsteads.

Many trees have been introduced and considerable plantations made, as for instance on the slopes between Johannesburg and Pre- toria. Among the most successful of the imported trees are citrus trees, the Australian wattle and the eucalyptus. Tobacco and the vine both flourish and most European fruits and vegetables thrive. Of native fruits the misple {Vangueria infausta), miscalled the wild medlar, is of excellent flavour. It is common on the rands and kopjes of the bush veld. Rose and other flowering shrubs and trees grow well on the banken veld and in the valleys. A large yellow tulip (Homerica pallida) is one of the most abundant flowers on moist vlei lands on the high veld and is occasionally met with in the low veld; slangkop (Urginea Burkei) with red bulbs like a beetroot is a low bush plant apparently restricted to the Transvaal and adjacent Portuguese territory. Both these and many other plants such as gift-blaar and drouk-gras are poisonous to cattle. These poisonous plants are found chiefly in the banken and low veld.

Fauna. — When first entered by white men the Transvaal abounded in big game, the lion, leopard, elephant, giraffe, zebra and rhinoceros being very numerous, while the hippopotamus and crocodile were found in all the rivers. The indiscriminate destruction of these animals has greatly reduced their numbers and except in the Pon- gola district, at one or two other places on the Portuguese frontier, and along the Limpopo the hippopotamus, rhinoceros and crocodile are now extinct in the province. A few elephants, giraffes and zebras (equus burchelli — the true zebra is extinct) are still found in the north and north-eastern districts and in the same regions lions and leopards survive in fair numbers. Other animals fairly numerous are the spotted hyena, long-eared fox, jackal, aard wolf, red lynx, wild cat, wild dog and wart hog. Many species of antelope are found, mostly in small numbers, including the kudu, hartebeest, the sable and roan antelope, the white tailed and the brindled gnu, waterbuck, red buck, duiker, blesbok, palla, springbuck (numerous), steinbok, grysbok and klipspringer. The Africander breed of cattle is a well-marked variety, and a characteristic native domestic animal. Whether originally imported from Europe by the Portu- guese or brought from the north by Africans is not certain. It is not found in a wild state and the auffalo (bos caffer) is almost if not quite extinct in the Transvaal. Among edentata the ant-bear, scaly ant-eater and porcupine are

plentiful. The spring hare (pedetes capensis) abounds. Baboons and other apes are fairly common and there are several species of snakes. The ostrich is found in the Marico and Limpopo districts, and more rarely else- where ; the great kori bustard and the koorhaan are common.

Insects abound, the greatest pest being the tsetse fly, common in the low veld. Six species of tick, including the blue tick common throughout South Africa, are found, especially in the low veld, where they are the means of the transmission of disease to cattle. Mos- quitoes, locusts and ants are also common.

The baba or cat fish and the yellow fish are plentiful in the rivers and the trout has been acclimatized.

To preserve the native fauna the low country on the Portuguese frontier has been made a game reserve. It is nearly 300 m. long with an average breadth of 50 m. Other reserves have been con- stituted in the north of the province.

Inhabitants. — The population of the Transvaal, on the 17th of April 1904, when the first complete census of the country was taken, was 1,269,951 (including 8215 British soldiers in garrison), 1 or 11-342 persons per sq. m. Of these 20-67%, namely 297,277, were European or white. Of the coloured population 937,127 were aboriginals; and 35,547 were of mixed or other coloured races. Of thewhites 178,244 (59-95%) were males. The white population is broadly divisible into the British and Dutch ele- ments, the percentage of other whites in 1904 being but 8-6. The Dutch, as their usual designation, Boers, implies, are mainly farmers and stock-raisers and are still predominant elsewhere than in the Witwatersrand and Pretoria districts. They speak the patois of Dutch known as the Taal. The British element is chiefly gathered in Johannesburg and other towns on the Rand and in Pretoria. The total white population in the Witwatersrand and in Pretoria in 1904 was 135,135, and the strength of the British in these districts is shown by the fact that only 20% was Transvaal born. Of those born outside the Transvaal 24-6% came from other British possessions in Africa and 24-92% from Great Britain or British colonies other than African. Of the non-British or Boer whites Russians form 3-01%, Germans 1-62% and Dutch (of Holland) 1-14%.

The natives are found chiefly in Zoutpansberg district,

1 For most purposes this military element is omitted in the census returns.

where there were 314,797 at the 1904 census, and the adjoining districts of Lydenburg and Waterberg, i.e. in the northern and north-eastern region of the country. The natives belong to the Bantu negro race and are represented chiefly by Basuto, Bechuana, Bavenda, and Xosa-Zulu tribes. None of these peoples has any claim to be indigenous, and, save the Bavenda, all are immigrants since c. 1817-1820, when the greater part of the then inhabitants were exterminated by the Zulu chief Mosi- likatze (see § History). After that event Basuto entered the country from the south, Bechuana from the west and Swazi, Zulu, Shangaan and other tribes from the east and south-east.

The Basuto, who number 410,020 and form 40% of the total population, are now found mostly in the central, northern and north- eastern districts, forming in Lydenburg about 67 , and in Zout- pansberg about 50 of the inhabitants. The Bechuana, who number 64,751, are almost confined to the western and south-western districts.

Next, numerically, to the Basuto and Bechuana peoples are the tribes known collectively as Transvaal Kaffirs, of whom there were 159,860 enumerated at the 1904 census. Altogether the Transvaal Kaffirs form 50 % of the inhabitants of Waterberg district, 30 % of Zoutpansberg district and 18 % of Middelburg district. Zulus number 75,601 and form 54 % of the population in Wakkerstroom district and 18% in Standerton district. Elsewhere they are very thinly repre- sented. Swazis form more than half the total population of the Barberton and Ermelo districts and are also numerous in Wakker- stroom. In Barberton, Lydenburg and Zoutpansberg districts Shangaan and other east coast tribes are settled, 80,834 being returned as born in the Transvaal. The Shangaan are members of a Bantu tribe from the Delagoa Bay region who took refuge in the Transvaal between i860 and 1862 to escape Zulu raids. They were for some time ruled by a Portuguese, Joao Albasini, who had adopted native customs. Since 1873 Swiss Protestant missionaries have lived among them and many of the Shangaans are Christians and civilized. Several other east coast tribes, such as the Bankuna, are of mixed Zulu and Shangaan blood. Among the mixed and other coloured races in the census returns figure 1592 Bushmen, 3597 Hottentots and 1 147 Koranna; these people are found chiefly in the south-western regions and are remnants of the true aboriginal

population.

Besides the tribes whose home is in the Transvaal considerable numbers of natives, chiefly members of east coast tribes, Cape Kaffirs and Zulus, go to the Witwatersrand to work in the gold and other mines. In all there were, in 1904, 135,042 Bantus in the country born elsewhere. Many east coast natives after working in the mines settle in the northern Transvaal. Of the aboriginal South Africans in the Transvaal, at the 1904 census, 77-69 % were born in the Transvaal. Among the aborigines the number of females to males was 114 to 100. (See further Kaffirs; Bechu- anas; Zululand; Bushmen; Hottentots ; and for languages, Bantu Languages).

The number of Asiatics in the Transvaal in April 1904 was 12,320, including 904 Malays, natives of South Africa, and 9986 British Indians. They were nearly all domiciled in the Witwatersrand and in the towns of Pretoria and Barberton, where they are engaged mainly in trade.

Administrative Divisions and Chief Towns. — The province is divided into sixteen magisterial districts. Zoutpansberg, 25,654 sq. m.; Waterberg, 15,503 sq. m.;Lydenburg, 9868 sq. m., occupy the north and north-eastern parts of the country and include most of the low veld areas. Barberton district, 5106 sq. m., is east central. Piet Retief district (in the south-east), 1673 sq. m., lies between Swaziland and Natal. Along the southern border, going east to west from Piet Retief, are the districts of Wakkerstroom, 2128 sq. m.; Standerton, 1959 sq. m.; Heidelberg, 2410 sq. m.; Potchefstroom, 4805 sq. m.; Wolmaransstad, 2169 sq. m., and, occupying the south-western corner of the province; Bloemhof, 3003 sq. m. In the west are the districts of Lichtenburg, 4487 sq. m.; Marico, 3626 sq. m. and Rustenberg, 951 1 sq. m. The central regions are divided into the districts of Witwatersrand, 1653 sq. m.; Pretoria, 6525 sq. m.; Middelburg, 4977 sq. m.; Carolina, 1877 sq. m.; Ermelo, 2995 sq. m. and Bethel, 1959 sq. m. It will be seen that twenty districts are enumerated, these being the divisions under the Boer government and still commonly used. In 1904 Bloemhof was officially included in Wolmaransstad; Bethel in Standerton; Piet Retief in Wakkerstroom, and Carolina in Ermelo. Each district is sub-divided into field-rcornetcies, the cornetcies being themselves divided, where necessary, into urban and rural areas. For parliamentary purposes the districts are divided into single member constituencies. The capital of the

province, and of the Union is Pretoria, with a population (1904) of 36,839 (of whom 21,114 were whites). Johannesburg, the centre of the gold-mining industry, had a population, within the municipal boundary, of 155,642 (83,363 whites). Other towns within the Witwatersrand district are Germiston (29,477), Boksburg (14,757) a r.d Roodepoort-Maraisburg (19,949), virtually suburbs of Johannesburg, and Krugersdorp (20,073) and Springs (5270), respectively at the western and east ends of the district. Besides Pretoria and the towns in the Wit- watersrand district, there are few urban centres of any size. Potchefstroom, in the south near the Vaal (pop. 9348), is the oldest town in the Transvaal. Klerksdorp (4276) is also near the Vaal, S.S.W. of Potchefstroom. Middelburg (5085"! is the largest town on the railway between Pretoria and Delagoa Bay; Barberton (2433), the centre of the De Kaap gold-fields, lies on the slopes of the Drakensberg overlooking the De Kaap valley. Communications. — Before 1888 the only means of communication was by road. In that year the government sanctioned the building of a " steam tramway " — a railway in all but name — from the Boksburg collieries to the Rand gold mines. In 1890 the construc- tion of the Transvaal section of the railway to connect Pretoria with Delagoa Bay was begun, the line from Lourengo Marques having been completed to Komati Poort in December 1887. The line to Pretoria was not opened until July 1895. Meantime, in September 1892, the Cape railway system had been extended to Johannesburg and in December 1895 the through line between Durban and Pretoria was completed. Since that date many other lines have been built. The majority of the railways are the property of and are worked by the state. With the exception of a few purely local lines they are of the standard South African gauge — 3 ft. 6 in. The lines all converge on Johannesburg. The following table gives the distances from that city to other places in South Africa 1 : — Inland Centres — ■

To Pretoria 46 miles.

„ Kimberley 310 „

,, Bloemfontein 263 „

„ Bulawayo (via Fourteen Streams) 979 „ ,, Salisbury (,, „) 1279 „

Seaports —

To Cape Town (via Kimberley) . . 957 „ „ ,, (via Bloemfontein) . 1013 „

,, Port Elizabeth 714 „

,, East London 665 „

,, Durban . . . _ . . . . 483 „

„ Lourengo Marques (via Pretoria) 396 ,,

Besides the lines enumerated the other railways of importance are : (1) A line from Johannesburg eastward via Springs and Breyten to Machadodorp on the Pretoria- Delagoa Bay railway. (2) A line, 68 m. long from Witbank, a station on the Pretoria-Delagoa Bay line, to Brakpan on the Springs line. By (1) the distance between Johannesburg and Lourengo Marques is 364 m., by (2) 370 m. A continuation of the Springs-Breyten line eastward through Swaziland to Delagoa Bay will give a second independent railway from that port to the Rand, some 60 m. shorter than the route via Pretoria, while from Breyten a line (90 m. long) runs south and east to Ermelo and Piet Retief. (3) A line from Krugersdorp to Zeerust (128 m.). (4) A line from Pretoria to Rustenburg (61 m.). (5) A line from Pretoria to Pietersburg (177 m.). This line was continued (1910) north-west to effect a junction with (6) the ” Selati ” railway, which, starting from Komati Poort, runs north-west and was in 1910 continued to Leydsdorp. North of the junction with the Pietersburg line the railway goes towards the Limpopo. (7) A line from Belfast on the Pretoria-Delagoa Bay railway to Lydenburg (65 m.). (8) A line from Potchefstroom to Lichtenburg (70 m.).

There is an extensive telegraphic system linking the towns of the province to one another, and, through the surrounding countries, with Europe and the rest of the world. There is inland communica- tion via Rhodesia with British Central Africa and Ujiji on Lake Tanganyika. The telegraph lines within the Transvaal have a length of about 3000 m. There is a well-organized postal service with about 400 offices. In connexion with the postal services to outlying districts there is a public passenger service by mailcarts. In the Pietersberg district zebras

are occasionally employed.

Mineral Resources. — The Transvaal, the principal gold producing country in the world, is noted for the abundance and variety of its mineral resources. The minerals chiefly mined besides gold are diamonds and coal, but the country possesses also silver, iron, copper, lead, cobalt, sulphur, saltpetre and many other mineral deposits.

Gold. — The principal gold-bearing reefs are found along the Witwatersrand (" The Rand ")• Probably connected with the Rand

1 For projected routes, shortening the journey between Europe and Johannesburg, see the Geog. Journ., Dec. 1910.

reefs are the gold-bearing rocks in the Klerksdorp, Potchefstroom and Venterskroon districts. Other auriferous reefs are found all along the eastern escarpment of the Drakensberg and are worked in the De Kaap (Barberton) district, on the Swaziland frontier, in the Lydenburg district, in the Murchison Range and in other places in the Zoutpansberg. Goldfields also exist in the Waterberg and on the western frontier in the Marico district (the Malmani fields). The total value of the gold extracted from mines in the Transvaal up to the end of 1909 was about £246,000,000.

a. The Witwatersrand and Neighbouring Mines. — The Rand reefs, first mined in 1886, cover a large area. The main reef, continuously traced, measures about 62 m. and runs in an east and west direction. The gold is found in minute particles and in the richest ores the metal is rarely in visible quantities before treatment. In many places the main reef lies at a great depth and some bore-holes are over 55°° ft. deep. The yield of the Rand mines, in 1887 but 23,000 oz.. rose in 1888 to 208,000 oz. In 1892 the yield was 1,210,000 oz. : in 1896 it exceeded 2,280,000 oz. and in 1898 was 4,295,000 oz. The war that followed prevented the proper working of the mines. In 1905 when a full supply of labour was again available the output was 4,760,000 oz., in which year the sum distributed in dividends to shareholders in the Rand mines was over £4,800,000. The total output from the Rand mines up to the end of 1908 was 56,477,240 oz. (see Gold, and Johannes- burg). The Klerksdorp and Potchefstroom goldfields, known also as the Western Rand, were proclaimed in 1887 and up to the close of 1908 had yielded 446,224 oz.

b. The De Kaap {Barberton) Fields. — Gold was discovered in this district of the Drakensberg in 1875, but it was not until 1884 that the fields attracted much attention. The mines are, in general, situated on the slopes of the hills and are easily opened up by adits. The reefs are narrower than those of the Rand, and the ore is usually very hard. The output, 35,000 oz. in 1889, was 121,000 oz. in 1896, but only 43,000 oz. in 1905. The total production (includ- ing the Komati and Swaziland fields) to the end of 1908 was 1,097,685 oz.

c. The Lydenburg and other Fields. — The Lydenburg fields, reported to have been worked by the Portuguese in the 17th century, and rediscovered in 1 869, though lying at an elevation of 4500 to 5000 ft. are alluvial — and the only rich alluvial goldfields in South Africa. The ground containing the gold is soil which has escaped denudation. Though several large nuggets have been found (the largest weighing 215 oz.), the total production is not great, the highest output obtained by washing being worth about £300,000 in one year. Besides the alluvial deposits a little mining is carried on, gold being present in the thin veins of quartz which cross the sandstone. The chief centres of the fields are Lydenburg, Pilgrims Rest and Spitzkop. The total output of the Lydenburg fields up to the end of 1908 is estimated at 1,200,000 oz. Farther north, in the Zoutpansberg and on its spurs are the little-worked mines generally known as the Low Country goldfields. Near Pietersburg in the Zoutpansberg is the Eersteling, the first mine worked in the Transvaal. Operations began in 1873 but in 1 880 the machinery was destroyed by the Boers. It was not until 1904 that prospecting in the neighbourhood was again undertaken. The fields in the Waterberg and along the Malmani river are very small producers. The total yield to the end of 1908 of the Zoutpansberg, Low Country and other minor fields was 160,535 oz –

Diamonds. — The chief diamond fields are in the Pretoria district. The ground was discovered to be diamondiferous in 1897, but it was not until 1903, when mining began on the Premier mine, situated 20 m. north-east of Pretoria, that the wealth of the fields was proved. The site of the Premier mine had been recognized as diamond-bearing in March 1898. The owner of the land, a Beer named Prinsloo, refused to allow experimental spade work, but after the conclusion of the Anglo-Boer War in 1902 sold his property for £55,000 to T. Cullinan (a Cape colonist and one of the chief contractors in the building of Johannesburg), whose faith in the richness of the ground was

speedily justified. In June 1903 mining began and the diamonds found in the first five months realized over £90,000. On the 27th of January 1905, the largest diamond in the world, weighing 3025! carats, over ij lb avoirdupois, was found in the mine and named the Cullinan. The Premier mine is of the same character as the diamond mines at Kimberley (see Diamond), and is considerably larger. The area of the " pipe " containing blue ground is estimated at 350,000 sq. yds.

Besides the Pretoria fields there are diamondiferous areas (alluvial diggings) in the Bloemhof district on the Vaal river north-east of Kimberley, and in other regions. In 1898 the output for the whole of the Transvaal was valued at £44,000. The output since the opening of the Premier mine has been: 1903-1904, £685,720; 1904-1905, £1,198,530; 1905-1906, £968,229; 1906-1907, £2,203,511; 1907-1908, £1,879,551; 1908-1909, £1,295,296.

Coal and other Minerals. — There are extensive beds of good coal, including thick seams of steam coal near the Rand and other gold- fields. Coal appears to have been first discovered in the neighbour- hood of Bronkhorst Spruit between the Wilge and Olifants rivers, where it was so near the surface that farmers dug it up for their own use. In 1887 coal was found at Boksburg in the East Rand, and a mine was at once started. The principal collieries are those

at Boksburg and at Brakpan, also on the East Rand, with a coal area of 2400 acres ; at Vereeniging and Klerksdorp, near the Vaal ; at Watervaal, 12 m. north of Pretoria ; and in the Middelburg district, between Pretoria and Lourencp Marques. Like that of Natal the Transvaal coal burns with a clear flame and leaves little ash. The mines are free from gas and fire damp and none is more than 500 ft. deep. The output in 1893, the first year in which statistics are available, was 548,534 tons (of 2000 lb); in 1898 it was 1,907,808 tons, and for the year ending 30th of June 1909 was 3,312,413 tons, valued at £851,150.

Iron and copper are widely distributed. The Yzerberg near

Marabastad in the Zoutpansberg consists of exceedingly rich iron ore, which has been smelted by the natives for many centuries. Silver is found in many districts, and mines near Pretoria have yielded in one year ore worth £30,000.

Salt is obtainable from the many pans in the plateaus, notably in the Zout(salt)pansberg, and was formerly manufactured in considerable quantities.

Agriculture. — Next to mining agriculture is the most important industry. At the census of 1904 over 500,000 persons (excluding young children), or 37 % of the population, were returned as engaged in agriculture. Some 25 % more women than men were so employed, this preponderance being due to the large number of Kaffir women and the few native men who work in the mealie fields. The chief occupation of the majority of the white farmers is stock-raising. The high veld is admirably adapted for the raising of stock, its grasses being of excellent quality and the climate good. Even better pasture is found in the low veld, but there stock suffers in summer from many endemic diseases, and in the more northerly regions is subject to the attack of the tsetse fly. The banken veld is also unsuited in summer for horses and sheep, though cattle thrive. Much of the stock is moved from the lower to the higher regions according to the season. Among the high veld farmers the breeding of merino sheep is very popular.

The amount of land under cultivation is very small in comparison with the area of the province. In 1904 only 951,802 acres, or 1-26 % of the total acreage was under cultivation, and of the cultivated land nearly half was farmed by natives. The small proportion of land tilled is due to many causes, among which paucity of popula- tions is not the least. Moreover while large areas on the high veld are suitable for the raising of crops of a very varied character, in other districts, including a great part of the low veld, arable farming is impossible or unprofitable. Many regions suffer permanently from deficient rainfall ; in others, owing to the absence of irrigation works, the water supply is lost, while the burning of the grass at the end of summer, a practice adopted by many farmers, tends to impoverish the soil and render it arid. The country suffers also from periods of excessive heat and general drought, while locusts occasionally sweep over the land, devouring every green thing. In some seasons the locusts, both red and brown, come in enormous swarms covering an area 5 rn. broad and from 40 to 60 m. long. The chief method employed for their destruction is spraying the swarms with

arsenic. The districts with the greatest area under cultivation are Heidelberg, Witwatersrand, Pretoria, Standerton and Krugersdorp. The chief crops grown for grain are wheat, maize (mealie) and kaffir corn, but the harvest is inadequate to meet local demands. Maize is the staple food of the Kaffirs. Since 1906 an important trade has also arisen in the raising of mealies for export by white farmers. Oats, barley and millet are largely grown for forage. Oats are cut shortly before reaching maturity, when they are known as oat-hay. The chief vegetables grown are potatoes, pumpkins, carrots, onions and tomatoes.

Fruit farming is a thriving industry, the slopes of the plateaus and the river valleys being specially adapted for this culture. At the census of 1904 over 3,032,000 fruit trees were enumerated. There were 163,000 orange trees and nearly 60,000 other citrus trees, 430,000 grape vines, 276,000 pine plants and 78,000 banana plants. Oranges are cultivated chiefly in the Rustenburg, Waterberg, Zoutpansberg and Pretoria districts, grapes in Potchefstroom, Pretoria and Marico, as well as in the Zoutpansberg and Waterberg, to which northern regions the cultivation of the banana is confined. In the tropical district of the Limpopo valley there is some cultiva- tion of the coffee-tree, and this region is also adapted for the growing of tea, sugar, cotton and rice. Tobacco is grown in every district, but chiefly in Rustenburg. Of the 3,032,000 lb of tobacco grown in 1904, Rustenburg produced 884,000 lb.

A department of agriculture was established in 1902, and through its efforts great improvements have been made in the methods of farming. To further assist agriculture a land bank was established by the government in 1907 and an agricultural college in 1910.

Land Settlement. — The land board is ‘a government department charged with the control of Crown lands leased to settlers on easy terms for agricultural purposes. Between 1902 and 1907 about 550 families were placed on the land, their holdings aggregating over 500,000 acres. The Crown lands cover in all about 21,500,000 acres. Large areas of these lands, especially in the northern districts, are used as native reserves.

Other Industries. — There are few manufacturing undertakings other than those connected with mining, agriculture and the develop- ment of Johannesburg. There is a large factory for the supply of

dynamite to the gold mines. The building and construction trade is an important industry on the Rand, where there are also brick-works, iron and brass foundries, breweries and distilleries. There are a number of flour mills and jam factories in various centres. A promising home industry, started under English auspices after the war of 1899-1902, is the weaving by women of rugs, carpets, blankets, &c, from native wool.

Export and Import Trade. — Before the discovery of gold the irade of the Transvaal was of insignificant proportions. This may be illustrated by the duties paid on imports, which in 1880 amounted to £20,306. In 1887 when the gold-mining industry was in its infancy the duty on imports had risen to £190,792, and in 1897, when the industry was fully developed, to £1,289,039. The Anglo-Boer War completely disorganized trade, but the close of the contest was marked by feverish activity and the customs receipts in 1902-1903 rose to £2,176,658. A period of depression followed, the average annual receipts for the next three years being £1,683,159. In 1908-1909 they were £1,588,960.

The chief exports are gold and diamonds. Of the total exports in 1908, valued at £33,323,000, gold was worth £29,643,000 and dia- monds £1,977,000. Next in value came wool (£226,000), horses and mules (£110,000), skins, hides and horns (£106,000), tobacco (£89,000), tin, coal, copper and lead. The gold and diamonds are sent to England via Cape Town; the other exports go chiefly to Delagoa Bay. The imports, valued at £16,196,000 in 1908, include goods of every kind. Machinery, provisions, largely in the form of tinned and otherwise preserved food, and liquors, clothing, textiles and hardware, chemicals and dynamite, iron and steel work and timber, and jewelry are the chief items in the imports. Of the imports about 50% comes from Great Britain and about 20% from British colonies (including other South African states). Half the imports reach the Transvaal through the Portuguese port of Lourenco Marques, Durban taking 25 % and the Cape ports the remainder. There is free trade between the Transvaal and the other British possessions in South Africa, and for external trade they all adhere to a Customs Union which, as fixed in 1906, imposes a general ad valorem duty of 15% on most goods save machinery, on which the duty is 3 %. A rebate of 3 % is granted on imports from Great Britain.

Constitution. — The existing constitution dates from 1910. The province is represented in the Union Parliament by eight senators and thirty-six members of the House of Assembly. For

parliamentary purposes the province is divided into single-member constituencies. Every adult white male British subject is entitled to the franchise, subject to a six months' residential qualification. 1 There is no property qualification. All electors are eligible to the assembly. Voters are registered biennially, and every five years there is an automatic redistribution of seats on a voters' basis.

Central Government. — At the head of the executive is a provincial administrator, appointed by the Union ministry, who holds office for five years and is assisted by an executive committee of four members elected by the provincial council. The provincial council consists of 36 members elected for the same constituencies and by the same electorate as are the members of the House of Assembly. The provincial council, which has strictly local powers, sits for a statutory period of three years. The control of elementary education was guaranteed to the provincial council for a period of five years from the establishment of the Union.

In May 1903 an inter-colonial council was established to deal with the administration of the railways in the Transvaal and Orange River Colony (known as the Central South African railways), the South African constabulary and other matters common to the Orange River and Transvaal colonies. This council was presided over by the governor of the Transvaal and formed an important part of the administrative machinery. By agreement between the two colonies the council was dis- solved in 1908. In 1910 the control of the railways passed to the harbours and railway board of the Union of South Africa.

Local Government. — The unit of administration is the field cornetcy. The semi-military organization of these divisions, which existed under the South African republic, has been abolished, and field-cornets, who are nominated by the pro-vincial government, are purely civil officials charged with the registration of voters, births and deaths, the maintenance of public roads, &c. The chief local authorities are the municipal bodies, many " municipalities " being rural areas centred round a small town. The municipal boards possess very

1 The number of electors at the first registration (1907) was 105,368.

wide powers of local government. The Witwatersrand municipalities are for certain purposes combined into one authority, and representatives of these municipalities, together with representatives of the chamber of mines, compose the Rand water board. The basis of municipal qualification is ownership of real property of the value of £100, or the tenancy of premises of the value of £300, or annual value of £24. Neither aliens nor coloured British subjects can exercise the franchise.

Finance. — In 1883, before the Rand gold mines had been found revenue and expenditure were about £150,000; in 1887, when the mines were beginning to be developed, the receipts were £668,000 and the expenditure £721,000; in 1889 the receipts had risen to £1,577,000 and the expenditure to £1,226,000. In 1894 the receipts first exceeded two millions, the figures for that year being: revenue £2,247,000, expenditure £1,734,000. The figures for the four follow- ing years were: —

	Revenue.	Expenditure.
1895	£3.539.ooo	£2,679,000
1896	£4,807,000	£4,671,000
1897	£4,480,000	£4,394,000
1898	£3.983.000	£3,971,000

The public debt of the Boer government was £2,500,000. _ In 1899 war broke out and the finances of the country were disorganized. The accounts of the colony began, for normal purposes, with the year ending 30th of June 1903, and ended in June 1910 on the establishment of the Union. In May 1903 a loan of £35,000,000, guaranteed by the imperial government and secured on the general revenues of the Transvaal and Orange River colonies, was issued to the extent of £30,000,000, the balance being raised about the middle of 1904. This loan bears interest at 3% per annum, with a sinking fund of 1 %, and as to the £30,000,000 was issued at par, the £5,000,000 being put up to tender and realizing an average price of £98, 10s. 3d. The principal head in the allocation of this loan was the purchase of the railways in the two colonies at a cost of £13,520,000, while

an additional £5.958,000 was devoted to the building of new lines, purchases of rolling stock, &c. The debt of the South African Republic was paid off; £542,000 went to make good the deficit on the administration for 1901-1902; the sum of £1,561,000 was paid to burghers of the Cape Colony and Natal as compensation for war losses; £3,000,000 was devoted to land settle- ment schemes and £2,000,000 to public works other than railways. The railways were treated as the common property of both colonies, and to administer them and other common services the inter-colonial council was created. In addition to the charges enumerated £5,000,000 were spent out of the loan on " repatriation and compensa- tion " of burghers who had suffered during the war. 1 In addition to the £35,000,000 guaranteed loan of 1903-1904 two small loans for land settlement and public works, together amounting to £254,800, were issued, and in 1907 an imperial guarantee was given for the raising of another loan, of £5,000,000, by the colonial government. The act authorizing the loan devoted £2,500,000 to the establishment of a land and agricultural bank, and £2,500,000 to railways, public works, irrigation and agricultural settlement and development. The loan was raised, as to £4,000,000, in January 1909, the average price obtained being £96, 3s. 7d.

The chief sources of revenue are customs, mining royalties, railways, native revenue (poll tax and passes), posts and tele- graphs, stamp and transfer duties, land revenue and taxes on trades and professions. A tax of 10% is levied on the annual net produce of all gold workings (proclamation of 1902) and the government takes 60% of the profits on diamond mines. In 1907 an excise duty was, for the first time, levied on beer. The principal heads of expenditure are on railways and other public works, including posts and telegraphs, justice, education, police, land settlement and agriculture generally, mines and native affairs. Since June 1910 the control of state finance passed to the Union parliament, but the Transvaal provincial council is empowered to raise revenue for provincial purposes by direct taxation and, with the consent of the Union government, to borrow money on the sole credit of the province.

In the five years 1902-1907 the average annual receipts and expenditure amounted to £4,500,000, exclusive of the sums received and expended on account of the loans mentioned. The inter-colonial council received and spent in the four years 1903-1907 over £21,500,000, including some £3,500,000 paid in from revenue by the Transvaal and Orange River colonies to make

good deficits. Fully two-thirds of the rev enue and

'Besides this £5,000,000 an additional sum of £9,500,000 was spent by the imperial government in relieving the necessities of those who had suffered during the war, but of this £9,500,000 the sum of £2,500,000 was in payment for goods received.

expenditure of the Council was derived from and spent upon the Transvaal, so that had the accounts of the two colonies been entirely distinct the figures of the Transvaal budget for 1903-1907 would have balanced at about £8,500,000 a year. In July 1907 when the control of the finances passed into the hands of the Transvaal legislature the credit balance on the consolidated fund was £960,000. In 1908 the inter-colonial council was dissolved, but the railways continued to be administered as a joint concern by a railway board on which the governments of both colonies were represented. This board in 1910 handed over its duties to the harbour and railway board of the Union. The Transvaal revenue (apart from railway receipts) in 1908- 1909 was £5,735,000, the corresponding expenditure £4,524,000. The budget figures for 1909-1910 were: revenue £5,943,000; expenditure £5,231,000. The diamond revenue yielded £235,000 and the gold profits tax £965,000. The balance handed over to the Union government was £1,015,000.

Justice. — The laws are based on Roman-Dutch law, as modified by local acts. Courts of first instance are presided over by magistrates, the whole colony being divided into sixteen magisterial wards. There is a provincial division of the Supreme Court of South Africa sitting at Pretoria (consisting of a judge president and six puisne justices) with original and appellate jurisdiction in civil and criminal matters. A local division of the Supreme Court, formerly known as the Witwatersrand high court (consisting of one or more judges of the Supreme Court) sits permanently at Johannesburg and has civil and criminal jurisdiction throughout the Rand. Circuit courts are held as occasion requires.

Police. — Pretoria and Johannesburg have their own police forces. The rest of the province is policed by the South African constabulary, a body 3700 strong, to which is also entrusted customs preventive work, fire brigade work and such like functions.

Education. — Since 1910 education other than elementary is

under the control of the Union parliament. The provincial council is responsible for elementary education. At the head of the permanent staff is a director of education. School boards and district committees- are formed, but their functions are almost entirely advisory. In accordance with the terms of the Education Act of 1907 of the Transvaal colony, state schools are provided for the free instruction of all white children in elementary subjects. Attendance at school between the ages of 7 and 14 is, with certain exceptions, compulsory. The medium of instruction in the lower standards is the mother tongue of the children. Above standard III. English is the medium of instruction. No religious tests are imposed on teachers and re- ligious teaching is confined to undenominational Bible teaching. No government grants are given to private schools. (In 1906 members of the Dutch community established a " Christian National Educa- tion " organization and opened a number of denominational schools.) Secondary education is provided in the towns and high schools are maintained at Pretoria, Johannesburg and Potchefstroom. There are University colleges at Pretoria and Johannesburg. Education of the natives is chiefly in the hands of the missionaries, but the government gives grants in aid to over 100 schools for natives. At the census of 1904 the natives able to read formed less than I % of the population. At the same census 95 % of the white population over 2 1 were able to read and write ; of the whites between the ages of 5 and 14 59 % could read and write.

State schools for white children were established by the Boer government, and in the last year (1898) before the British occupation there were 509 schools and 14,700 scholars, the education vote j that year being £226,000. In 1902 the property vested in various 1 school committees was transferred to government and control of j the schools vested in a department of state. In 1909 there were I 670 government elementary schools, with more than 42,000 scholars. [In 1907-1908 the education vote exceeded £500,000. ! Religion. — Of the total population 26-69% are Christians, and of the Christians 80% are whites. No fewer than 70% of the I people, including the bulk of the natives, are officially returned as j of " no religion." Of the 336,869 Christians 69,738 were natives. Nearly half of the white community, 142,540 persons, belong to one or other of the Dutch Churches in the Transvaal, but they have only 4305 native members. Of Dutch Churches the first and chief is the Nederduitsch Hervormde Kerk, founded by the Voor- trekkers

and originally the state Church. The others are the Neder- duitsch Gereformeerde Kerk, an offshoot of the Church of the same name at the Cape, and the Gereformeerde Kerk (the " Dopper " Church) with some 15,000 members and adherents in the Transvaal. The " Dopper " Church, an offshoot of the Separatist Re- formed Church of Holland, is distinguished from the other Dutch churches in being more rigidly Calvinistic and " Biblical," and in not using hymns. A " Scouts " Church was formed at the end of the war of 1 899-1902 by burghers who had previously acted as " National Scouts " and were ostracized by the synods of their former Churches. After some years of friction " National Scouts " were however readmitted, on terms, to their former membership.

HISTORY]

TRANSVAAL

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The Anglicans number 67,882 (including 13,033 natives), and are 19% of the European population. At the head of the community is the bishop of Pretoria. Next in numbers according to European membership among the Protestant bodies are Presbyterians, 19,821 (including 1194 natives), and Methodists 37,812 (including 20,648 natives). The Lutherans are the chief missionary body. Of a total membership of 24,175 only 5770 are European. The Protestant European community amounts altogether to 35% of the white population. The Roman Catholics number 16,453 (including 2005 natives) and form 5 % of the European population, and the Hebrews 15,478 or 5-34 % of the European inhabitants.

Defence. — A strong garrison of the British army is maintained in the province, the headquarters of all the imperial military forces in South Africa being at Pretoria. These forces are under the command of a lieutenant-general, who, however, acts under the supreme direction of the governor-general. The Transvaal forms a distinct district command under a major-general.

A volunteer force was established in 1904, for service within the Transvaal, or wherever the interests of the country might require. The force, disciplined and organized by a permanent staff of officers and non-commissioned officers of the regular army, is about 6500 strong, and consists of a brigade of artillery, four mounted, three composite and four infantry corps, a cyclist

corps, &c. There are also cadet companies some 3000 strong. (F. R. C.)

History

A. Foundation of the Republic. — At the beginning of the igth century the country now known as the Transvaal was inhabited, apparently somewhat sparsely, by Bavenda and other Bantu negroes, and in the south-west by wandering Bushmen and Hottentots. About 1817 the country was invaded by the chieftain Mosilikatze and his impis, who were fleeing from the vengeance of Chaka, king of the Zulus. The inhabitants were unable to withstand the attacks of the disciplined Zulu warriors — or Matabele, as they were henceforth called — by whom large areas of central and western Transvaal were swept bare. The remnants of the Bavenda retreated north to the Waterberg and Zoutpansberg, while Mosilikatze made his chief kraal at Mosega, not far from the site of the town of Zeerust. At that time the region between the Vaal and Limpopo was scarcely known to Europeans. In 1829, however, Mosilikatze was visited at Mosega by Robert Moffat, and between that date and 1836 a few British traders and explorers visited the country and made known its principal features. Such was the situation when Boer emigrants first crossed the Vaal.

The causes which led to the exodus of large numbers of Dutch farmers from Cape Colony are discussed elsewhere (see South Africa and Cape Colony). Here it is only necessary to state that the Voortrekkers were animated by an intense desire to be altogether rid of British control, and to be allowed to set up independent communities and govern the natives in such fashion as they saw fit. The first party to cross the Vaal consisted of 98 persons under the leadership of Louis Trichard and Jan van Rensburg. They left Cape Colony in 1835 and trekked to the Zoutpansberg. Here Rensburg's party separated from the others, but were soon afterwards murdered by natives. 1 Trichard's party determined to examine the country between the Zoutpansberg and Delagoa Bay. Fever carried off several of their number, and it was not until 1838 that the survivors reached the coast. Eventually they pro- ceeded by boat to Natal. Meantime, in 1836, another party of farmers under Andries Hendrik Potgieter had established their headquarters on the banks of the Vet river. Potgieter and some companions followed the trail of Trichard's party as far as the Zoutpansberg, where they were shown gold workings by the natives and saw rings of gold made by native

workmen. They also ascertained that a trade between the Kaffirs and the Portuguese at Delagoa Bay already existed. On returning to the Vet, Potgieter learned that a hunting party of Boers which had crossed the Vaal had been attacked by the Matabele, who had also killed Boer women and children. This act led to reprisals, and on the 17th of January 1837 a Boer commando surprised Mosilikatze's encampment at Mosega. inflicting heavy loss on the Matabele without themselves

1 Two small children were spared and brought up as Kaffirs. In 1867 they were given over to the Boer government by the Swazis, who had acquired them from their captors.

losing a man. In November of the same year Mosilikatze suffered further heavy losses at the hands of the Boers, and early in 1838 he fled north beyond the Limpopo, never to return. Potgieter, after the flight of the Matabele, issued a pro- clamation in which he declared the country which Mosilikatze had abandoned forfeited to the emigrant farmers. After the Matabele peril had been removed, many farmers trekked across the Vaal and occupied parts of the district left derelict. Into these depopulated areas there was also a considerable immigration of Basuto, Bechuana and other Bantu tribes.

The first permanent white settlement north of the Vaal was made by a party under Potgieter's leadership. That com- mandant had in March 1838 gone to Natal, and had endeavoured to avenge the massacre of Piet Retief and his com- rades by the Zulus. Jealous, however, of the preference shown by the Dutch farmers in Natal to another commandant (Gert Maritz), Potgieter speedily recrossed the Drakensberg, and in November 1838 he and his followers settled by the banks of the Mooi river, founding a town named Potchefstroom in honour of Potgieter. This party instituted an elementary form of government, and in 1840 entered into a loose confederation with the Natal Boers, and also with the Boers south of the Vaal, whose headquarters were at Winburg. In 1842, however, Potgieter's party declined to go to the help of the Natal Boers, then involved in conflict with the British. Up to 1845 Pot- gieter continued to exercise authority over the Boer communities on both sides of the Vaal. A determination to keep clear of the British and to obtain access to

the outer world through an independent channel led Potgieter and a considerable number of the Potchefstroom and Winburg burghers in 1845 to migrate towards Delagoa Bay. Potgieter settled in the Zoutpansberg, while other farmers chose as headquarters a place on the inner slopes of the Drakensberg, where they founded a village called Andries Ohrigstad. It proved fever-ridden and was abandoned, a new village being laid out on higher ground and named Lyden- burgin memory of their sufferings at the abandoned settlement.

Meantime the southern districts abandoned by Potgieter and his comrades were occupied by other Boers. These were joined in 1848 by Andries W. J. Pretorius (q.v.), who became commandant of the Potchefstroom settlers. When the British government decided to recognize the independence of the Transvaal Boers it was with Pretorius that negotiations were The Sana" conducted. On the 17th of January 1852 a con- River vention was signed at a farm near the Sand Convention. river in the Orange sovereignty by assistant commissioners nominated by the British high commissioner on the one hand, and by Pretorius and other Boers on the other. The first clause was in the following terms: —

The assistant commissioners guarantee in the fullest manner, on the part of the British government, to the emigrant farmers beyond the Vaal river, the right to manage their own affairs, and to govern themselves according to their own laws, without any interference on the part of the British government, and that no encroachment shall be made by the said government on the territory beyond to the north of the Vaal river, with the further assurance that the warmest wish of the British government is to promote peace, free trade, and friendly intercourse with the emigrant farmers now inhabiting, or who hereafter may inhabit, that country; it being understood that this system of non-interference is binding upon both parties.

At this time there were settled north of the Vaal about 5000 families of European extraction — about 40,000 persons, including young children. They had obtained independence, but they were far from being a united people. When Pretorius conducted the negotiations which led to the signing of the Sand River Convention he did so without consulting the volksraad, and Potgieter's party accused him of usurping power and aiming at domination over the whole country. However, the volks- raad, at a meeting held at Rustenburg on the 16th of March 1852,

ratified the convention, Potgieter and Pretorius having been publicly reconciled on the morning of the same day. Both leaders were near the end of their careers; Potgieter died in March and Pretorius in July 1853.

Whatever their internal dissensions the Boers were united

in regard to what they considered their territorial rights, and in the interval between the signing of the Sand River Convention and the death of Pretorius an incident occurred significant alike of their claims to jurisdiction over enormous areas and of their manner of treating the natives. Within a few weeks of the signing of the convention Pretorius had asked the British authorities to close the ” lower road ” to the interior, that is the route through Bechuanaland, opened up by Moffat, Living- stone and other missionaries. Pretorius alleged that by this means the natives were obtaining firearms. At the same time the Transvaal Boers claimed that all the Bechuana country belonged to them, a claim which the British government of that day did not think it worth while to contest. No boundary west- ward had been indicated in the Sand River Convention. The Barolong, Bakwena and other Bechuana tribes, through whose lands the ” lower road ” ran, claimed however to be independent, among them Sechele (otherwise Setyeli), at whose chief kraal — Kolobeng — Livingstone was then stationed. Sechele was regarded by the Boers as owing them allegiance, and in August 1852 Pretorius sent against him a commando (in which Paul Kruger served as a field cornet), alleging that the Bakwena were harbouring a Bakatla chief who had looted cattle belonging to Boer farmers. It was in this expedition that Livingstone’s house was looted. There was little fighting, but the commando carried off between two and three hundred native women and children — some of whom were redeemed by their friends, and some escaped, while many of the children were apprenticed to farmers. Sechele’s power was not broken, and he appealed for British protection, which was not then granted. The incident was, however, but the first step in the struggle for the possession of that country (see Bechuanaland). It served to strengthen the unfavourable impression formed in England of the Transvaal Boers with regard

to their treatment of the natives; an impression which was deepened by tidings of terrible chastisement of tribes in the Zoutpansberg, and by the Appren- tice Law passed by the volksraad in 1856 — a law denounced in many quarters as practically legalizing slavery.

On the death of Andries Pretorius his son Marthinus W. Pretorius (q.v.) had been appointed his successor, and to the younger Pretorius was due the first efforts to end the discord and confusion which prevailed among the burghers — a discord heightened by ecclesiastical strife, the points at issue being questions not of faith but of church government. In 1856 a series of public meetings, summoned by Pretorius, was held at different districts in the Transvaal for the purpose of dis- cussing and deciding whether the time had not arrived for substituting a strong central government in place of the petty district governments which had hitherto existed. The result was that a representative assembly of delegates was elected, Pat h f- empowered to draft a constitution. In December stroom this assembly met at Potchefstroom, and for three Assembly, weeks was engaged in modelling the constitution 1856. Q £ t jj e country. The name ” South African

Republic ” was adopted as the title of the state, and the new constitution made provision for a volksraad to which members were to be elected by the people for a period of two years, and in which the legislative function was vested. The administrative authority was to be vested in a president, aided by an executive council. It was stipulated that mem- bers both of the volksraad and council should be members of the Dutch Reformed Church, and of European blood. No equality of coloured people with the white inhabitants would be tolerated either in church or state. In reviewing an incident so important in the history of the Transvaal as the appointment of the Potchefstroom assembly it is of interest to note the gist of the complaint among ‘ the Boers which led to this revolution in the government of the country as it had previously existed. In his History of South Africa Theal says: ” The community of Lydenburg was accused of attempting to domineer over the whole country, without any other right to pre-eminence than that of being composed of the earliest inhabitants, a right which it had forfeited by its opposi-

tion to the general weal.” In later years this complaint was precisely that of the Uitlanders at Johannesburg. To conciliate the Boers of Zoutpansberg the new-born assembly at Potchef-

stroom appointed Stephanus Schoeman, the commandant-general of the Zoutpansberg district, commandant-general of the whole country. This offer was, however, declined by Schoerran, and both Zoutpansberg and Lydenburg indignantly repudiated the new assembly and its constitution. The execu- tive council, which had been appointed by the Potchefstroom assembly, with Pretorius as president, now took up a bolder attitude: they deposed Schoeman from all authority, declared Zoutpansberg in a state of blockade, and denounced the Boers of the two northern districts as rebels.

Further to strengthen their position, Pretorius and his party unsuccessfully endeavoured to bring about a union with the Orange Free State. Peaceful overtures having failed, Pretorius and Paul Kruger placed themselves at the head of a commando which crossed the Vaal with the object of enforcing ^^ union, but the Free State compelled their with- / drawal (see Orange Free State). Within the Marthinus Transvaal the forces making for union gained strength Pretorlus – notwithstanding these events, and by the year i860 Zoutpansberg and Lydenburg had become incorporated with the republic. Pretoria, newly founded, and named in honour of the elder Pretorius, was made the seat of government and capital of the country. The ecclesiastical efforts at unity had not been equally successful. The Separatist Reformed Church of Holland had sent out a young expositor of its doctrines named Postma, who, in November 1858, became minister of Rustenburg. In the following year a general church assembly endeavoured to unite all the congregations in a common government, but Postma's consistory rejected these overtures, and from that date the Separatist (or Dopper) Church has had an independent existence (see ante, § Religion). Paul Kruger, who lived near Rustenburg, became a strong adherent of the new church.

Pretorius, while still president of the Transvaal, had been elected, through the efforts of his partisans, president of the Orange Free State. He thereupon (in February i860) obtained six months' leave of absence and repaired to Bloemfontein, in the hope of peacefully bringing about a union between the two republics. He had no sooner left the Transvaal than the old Lydenburg party, headed by Cornells Potgieter, landdrost of Lydenburg, protested that the union would be much internal more beneficial to the Free State than to the people of Dissen- Lydenburg, and followed this up with the contention sions. that it was illegal for any one to be president of the South African

Republic and the Free State at the same time. At the end of the six months Pretorius, after a stormy meeting of the volksraad, apparently in disgust at the whole situation, resigned the presidency of the Transvaal. J. H. Grobelaar, who had been appointed president during the temporary absence of Pretorius, was requested to remain in office. The immediate followers of Pretorius now became extremely incensed at the action of the Lydenburg party, and a mass meeting was held at Potchef-stroom (October i860), where it was resolved that : (a) the volksraad no longer enjoyed its confidence; (b) that Pretorius should remain president of the South African Republic, and have a year's leave of absence to bring about union with the Free State; (c) that Schoeman should act as president during the absence of Pretorius; (d) that before the return of Pretorius to resume his duties a new volksraad should be elected.

If at this stage of their existence the real ambition of the Transvaal Boers was to found a strong and compact republican state, their conduct in opposing a scheme of union with the Orange Free State was foolish to a degree. The events of the year i860, as well as of all the years that followed down to British annexation in 1877, show that licence rather than liberty, a narrow spirit of faction rather than patriotism, were the dominant in- stincts of the Boer. Had the fusion of the two little republics which Pretorius sought to bring about, and from which apparently the Free State was not averse, actually been accomplished in i860, it is more than probable that a republican state on liberal

lines, with some prospect of permanence and stability, might have been formed. But a narrow, distrustful, grasping policy on the part of whatever faction might be dominant at the time invariably prevented the state from acquiring stability and security at any stage of its history.

The complications that ensued on the action of the Pretorius party subsequent to his resignation were interminable and complicated. Some of the new party were arraigned for treason and fined; and for several months there were two acting

presidents and two rival governments within the Transvaal. At length Commandant Paul Kruger called out the burghers of his district and entered into the strife. Having driven Schoeman and his followers from Pretoria, Kruger invaded Potchefstroom, which, after a skirmish in which three men were killed and seven wounded, fell into his hands. He then pursued Schoeman, who doubled on his opponent and entered Potchefstroom. A temporary peace was no sooner secured than Commandant Jan Viljoen rose in revolt and engaged Kruger's forces. Viljoen's commando, with which Pretorius was in sympathy, was known as the Volksleger, or Army of the People. Kruger's force called itself the Staatsleger or Army of the State. Pretorius in 1863 resigned his Free State presidency and offering himself as mediator (not for the first time) succeeded at length in putting a period to the confused series of intestine quarrels. In January 1864 a conference, which lasted six days, was held between the parties and an agreement was reached. This was followed by a new election for president, and once more Pretorius was called upon to fill that office. Kruger was appointed commandant-general.

Civil strife for a time was at an end, but the injuries inflicted on the state were deep and lasting. The public funds were exhausted; taxes were impossible to collect; and the natives on the borders of the country and in the mountains of the north had thrown off all allegiance to the state. The prestige of the country was practically gone, not only with the world outside, but, what was of still more moment, with her neighbour the Free State, which felt that a federation with the Transvaal, which the Free State once had sought but which it now forswore, was an The Charge ev ˆ av °ided and not an advantage lost. A charge of slavery frequently laid at the door of the Boers, at that time against the and since, was that of enslaving the black races. Boers. This charge was not without some justification. It

is true that laws prohibiting slavery were in existence, but the Boer who periodically took up arms against his own appointed government was not likely to be, nor was he, restrained by laws. Natives were openly transferred from one Boer to another, and the fact that they were described as apprentices by the farmers did not in the least alter the status of the native, who to all intents and purposes became the property of his master. These apprentices, mostly bought from slave traders when little children, formed, however, a very small proportion of the native population, and after some fifteen years' servitude were usually

allowed their freedom. Natives enjoying tribal government were not enslaved, but nothing could exceed in ferocity the measures taken to reduce recalcitrant tribes to submission. Educa- tion, as need hardly be said, was in the ‘sixties at a very low ebb, and nothing approaching the standard of a high school existed. The private tutor was a good deal in demand, but his qualifications were of the slightest. An unsuccessful European carpenter or other mechanic, or even labourer, not infrequently occupied this position. At the various churches such elementary schools as existed were to be found, but they did not profess to teach more than a smattering of the three ” R’s ” and the principles of Christianity.

In 1865 an empty exchequer called for drastic measures, and the volksraad determined to endeavour to meet their liabilities Zootpans- an(ˆ provide for further contingencies by the issue berg Native of notes. Paper money was thus introduced, and Rising, i n a very short time fell to a considerable discount.

In this same year the farmers of the Zoutpansberg district were driven into laagers by a native rising which they were unable to suppress. Schoemansdal, a village at the foot

of the Zoutpansberg, was the most important settlement of the district, and the most advanced outpost in European occupation at that time in South Africa. It was just within the tropics, and was situated in a well-watered and beautiful country. It was used as a base by hunters and traders with the interior, and in its vicinity there gathered a number of settlers of European origin, many of them outcasts from Europe or Cape Colony. They earned the reputation of being the most lawless white inhabitants in the whole of South Africa. When called upon to go to the aid of this settlement, which in 1865-1866 was sore pressed by one of the mountain Bantu tribes known as the Baramapulana, the burghers of the southern Transvaal objected that the white inhabitants of that region were too lawless and reckless a body to merit their assistance. In 1867 Schoemansdal and a considerable portion of the district were abandoned on the advice of Com- mandant-general Paul Kruger, and Schoemansdal finally was burnt to ashes by a party of natives. It was not until 1869 that peace was patched up, and the settlement arrived at left the mountain tribes in practical independence. Meanwhile the public credit and finances of the Transvaal went from bad to worse. The paper notes already issued had been constituted by law legal tender for all debts, but in 1868 their power of actual purchase was only

30% compared with that of gold, and by 1870 it had fallen as low as 25%. Civil servants, who were paid in this depreciated scrip, suffered considerable distress. The revenue for 1869 was stated as £31,511; the expenditure at £30,836.

The discovery of gold at Tati led President Pretorius in April 1868 to issue a proclamation extending his territories on the west and north so as to embrace the goldfield and all Efforts to Bechuanaland. The same proclamation extended obtain a Transvaal territory on the east so as to include part Sea P ort – of Delagoa Bay. The eastern extension claimed by Pretorius was the sequel to endeavours made shortly before, on the initia- tive of a Scotsman, to develop trade along the rivers leading to Delagoa Bay. It was also in accord with the desire of the Trans- vaal Boers to obtain a seaport, a desire which had led them as early as i860 to treat with the Zulus for the possession of St Lucia Bay. That effort had, however, failed. And now the proclamation of Pretorius was followed by protests on the part of the British high commissioner, Sir Philip Wodehouse, as well as on the part of the consul-general for Portugal in South Africa. The boundary on the east was settled by a treaty with Portugal in 1869, the Boers abandoning their claim to Delagoa Bay; that on the west was dealt with in 1871.

The Sand River Convention of 185 2 had not defined the western border of the state, and the discovery of gold at Tati to the north-west, together with the discovery of diamonds on the Vaal in 1867, offered Pretorius every inducement to extend his boundary. Although to-day the great diamond mines are south of the Vaal River, the early discoveries of diamonds were made chiefly on the northern bank of the Vaal, near the site of the town now known as Barkly West. This territory was claimed by the South African Republic, by Barolong and Batlapin ˆtard!' Bechuanas, by Koranas, and also by David Arnot, on behalf of the Griqua captain, Nicholas Waterboer. To settle the boundary question an arbitration court was appointed consisting of a Transvaal landdrost, A. A. O'Reilly, on behalf of the South African Republic, and John Campbell on behalf of the other claimants, with Lieutenant-Governor Keate of Natal as referee. The judges disagreed, and the final decision, afterwards known as the Keate award, was given by the referee on the 17th of October 187 1. The decision was in favour of Waterboer, who had, on the 25th of August 1870, before the appointment of the arbitration court, offered his territory to Great Britain, and it was understood by all the parties interested that that offer would be

accepted. The award, admittedly just on the evidence before Keate, placed, however, outside the territory of the republic the Bloemhof district, in which district Boer farmers were settled, and over which the Pretoria government had for some years exercised jurisdiction. A few days after the publication of the Keate award Sir Henry Barkly, the British high commissioner, issued proclamations taking over Waterboer's territory under the

title of Griqualand West (q.v.). The eastern boundary of the new territory was made to include the region between the Harts river and the Vaal, in which the diamond diggings were situated, but not the Bloemhof district. To this district Sir Henry Barkly asserted the British rights, but no steps were taken to enforce them and as a matter of fact the Bloemhof district continued to be part of the Transvaal.

The award caused a strong feeling of resentment among the Boers, and led to the resignation of President Pretorius and his executive. The Boers now cast about to find a man who should have the necessary ability, as they said, to negotiate on equal terms with the British authorities should any future dis- pute arise. With this view they asked Mr (afterwards Sir Burgers John) Brand, president of the Free State, to allow becomes them to nominate him for the presidency of the President, South African Republic. To this President Brand would not consent. He recognized that, even at this early stage of their history, the Transvaal Boers were filled with the wildest ideas as to what steps they would take in the future to counteract the influence of Great Britain. Brand intimated to many of the leading Transvaal Boers that in his opinion they were embarking on a rash and mistaken policy. He urged that their true interests lay in friendship with, not in hostility to, Great Britain and the British. Having failed with Brand, the Boers invited the Rev. Thomas Francois Burgers, a member of a well-known Cape Colony family and a minister of the Dutch Reformed Church, to allow himself to be nomi- nated. Burgers accepted the offer, and in 1872 was elected president. About this time gold reefs were discovered in the Zoutpansberg district near Marabastad, and a few gold seekers from Europe and Cape Colony began to prospect the

northern portions of the Transvaal. The miners and prospectors did not, however, exceed a few hundred for several years.

The appointment of Burgers to the presidency in 1872 was a new departure. He was able, active and enlightened, but he was a visionary rather than a man of affairs or sound judgment. Instead of reducing chaos to order and concentrat- ing his attention, as Brand had done in the Free State, on establishing security and promoting industry, he took up, with all its entanglements, the policy of intrigues with native chiefs beyond the border and the dream of indefinite expansion. In 1875 Burgers proceeded to Europe with the project of raising a loan for the construction of a railway to Delagoa Bay. He was empowered by the volksraad to raise £300,000, but with great difficulty he obtained in Holland the sum of £90,000 only, and that at a high rate of interest. With this inadequate sum some railway plant was obtained, and subsequently lay for ten years at Delagoa Bay, the scheme having to be abandoned for want of funds. On his return to the Transvaal in 1876 Burgers found that the conditions of affairs in the state was worse than ever. The acting-president had in his absence been granted leave by the volksraad to carry out various measures opposed to the public welfare; native lands had been indiscriminately allotted to adventurers, and a war with Sikukuni (Secocoeni), a native chief on the eastern borders of the country, was imminent. A commando was called out, which the president himself led. The expedition was an ignominious failure, and many burghers did not hesitate to assign their non-success to the fact that Burgers's views on religious questions were not sound. Burgers then proceeded to levy taxes, which were never paid; to enrol troops, which never marched; and to continue the head of a government which had neither resources, credit nor power of administration. In 1877 the Transvaal one-pound notes were valued at one shilling cash. Add to this condition of things the fact that the Zulus were threatening the Transvaal on its southern border, and the picture of utter collapse which existed in the state is complete.

B. First Annexation by Great Britain. — This condition of affairs coincided with the second movement in South Africa for a confederation of its various colonies and states, a movement of which the then colonial secretary, the 4th earl of Carnarvon, was a warm advocate. As to the Transvaal in particular,

it was felt by Lord Carnarvon " that the safety and prosperity of the republic would be best assured by its union with the British

colonies." Sir Theophilus Shepstone (q.v.) was given a commission, dated the 5th of October, 1876, instructing him to visit the Transvaal and empowering him, if it was desired by the inhabitants and in his judgment necessary, to annex the country to the British crown. Sir Theophilus went to Pretoria in January 1877, with an escort of twenty-five mounted police, and entered into conferences with the president and executive as to the state of the country. By this time Burgers was no longer blinded by the foolish optimism of a visionary who had woven finespun theories of what an ideal republic might be. He had lived among the Boers and attempted to lead their govern- ment. He had found their idea of liberty to be anarchy, their native policy to be slavery, and their republic to be a sham. His was a bitter awakening, and the bitterness of it found expres- sion in some remarkable words addressed to the volksraad:

" I would rather," said Burgers in March 1877, " be a policeman under a strong government than the president of such a state. It is you — you members of the Raad and the Boers — who have lost the country, who have sold your independence for a drink. You have ill-treated the natives, you have shot them down, you have sold them into slavery, and now you have to pay the penalty. . . . We should delude ourselves by entertaining the hope that matters would mend by-and-by. . . . Do you know what recently happened in Turkey? Because no civilized government was carried on there, the Great Powers interfered and said, ' Thus far and no farther.' And if this is done to an empire, will a little republic be excused when it misbehaves? . . If we want justice, we must be in a position to ask it with unsullied hands. ..."

After careful investigation Shepstone satisfied himself that annexation was the only possible salvation for the Transvaal. He had gone to Pretoria hoping that the Transvaal volksraad would accept Carnarvon's federation scheme; but the federation proposals were rejected by the raad. Shepstone was willing to find some way other than simple annexation' out of the diffi- culty, but none appeared to present itself. The treasury was empty, the Boers refused to pay their taxes, and there was no power to enforce them. A public debt of £215,000 existed, and government contractors were left unpaid. Sir Theophilus Shepstone, finding that the raad would not adopt any remedial measures, on the 12th of April 1877 issued a proclamation annex- ing the country. The proclamation stated (among other things) : " It is the wish of Her Most Gracious Majesty that it [the state] shall enjoy the fullest legislative privileges compatible with the

circumstances of the country and the intelligence of its people." The wisdom of the step taken by Shep- Brft/sfi stone has been called in question. For many years Annexation, subsequently the matter was so surrounded withV* 77, the sophistry of English party politics that it was difficult for Englishmen to form any impartial opinion. The history of the Transvaal is more complete and better understood to-day than it was in 1877, and no one who acquaints himself with the facts will deny that Shepstone acted with care and moderation. The best evidence in favour of the step is to be found in the publicly expressed views of the state's own president, Burgers, already quoted. Moreover, the menace of attack on the Zulu side was a serious one, however able the Boers may have been to meet a foe who fought in the open, and who had been beaten by them in previous wars. Even before annexation had occurred, Shepstone felt the danger so acutely that he sent a message to Cetywayo, the Zulu chief, warning him that British annexation was about to be proclaimed and that invasion of the Transvaal would not be tolerated. To this warning Cetywayo, who, encouraged by the defeat of the Boers at Sikukuni's hands, had already gathered his warriors together, replied: " I thank my father Somtseu [Shepstone] for his message. I am glad that he has sent it, because the Dutch have tired me out, and I intended to fight with them . . . and to drive them over the Vaal. ..." A still further reason for Shepstone's annexation, given by Sir Bartle Frere, was that Burgers had already sought alliance with European powers, and Shepstone had no reason to doubt that if Great Britain refused to interfere, Germany would intervene. Moreover, apart from the attitude

of President Burgers, which cannot be said to have been one of active opposition, a considerable number of the Boers accepted the annexation with complacency. Burgers himself left the Transvaal a disappointed, heart-broken man, and a deathbed statement published some time after his decease throws a lurid light on the intrigues which arose before and after annexation. He shows how, for purely personal ends, Kruger allied himself with the British faction who were agitating for annexation, and to undermine him and endeavour to gain the presidency, urged the Boers to pay no taxes. However this may be, Burgers was

crushed; but as a consequence the British government and not Paul Kruger was, for a time at least, master of the Transvaal. In view of his attitude before annexation, it was not surprising that Kruger should be one of the first men to agitate against it afterwards. The work of destruction had gone too far. The plot had miscarried. And so Kruger and Dr Jorissen, by whom he was accompanied, were the first to approach Lord Carnarvon with an appeal for revocation of the proclamation. Lord Carnarvon's reply was that the act of annexation was an irrevo- cable one. Unfortunately the train of events in England favoured the intrigues of the party who wished the annexation cancelled. In 1878 Lord Carnarvon resigned, and there were other evidences of dissension in the British cabinet.

Kruger, who since the annexation had held a salaried appointment under the British Government, again became one of a deputation to England. His colleague was Piet Joubert. They laid their case before Sir Michael Hicks Beach (who had succeeded Lord Carnarvon) but met with no success. Sir Michael, however, in a despatch dated September the 16th 1878, reiterated the intention of the British cabinet to grant the state " to the utmost practicable extent, its individuality and powers of self-government under the sovereignty of the queen." On the occasion of Kruger's second mission to endeavour to get the annexation revoked Sir T. Shepstone determined to dispense with his further services as a government servant, and terminated the engagement. In the beginning of 1879 Shepstone was recalled and Colonel Owen Lanyon, who had served in Bechuana- land and was then administrator of Griqualand West, was appointed administrator in the Transvaal. In the meantime, the Zulu forces which threatened the Transvaal had been turned against the British, and the disaster of Isandhlwana occurred. Rumours of British defeat soon reached the Transvaal, and AgHatioa encouraged the disaffected party to become bolder for lade- in their agitation against British rule. Thus Sir peadence. Bartle Frere wrote at the time: " All accounts from Pretoria represent that the great body of the Boer population is still under the belief that the Zulus are more than a match for us, that our difficulties are more than we can surmount, and that the present is the favourable opportunity for demanding their independence." In April Frere visited Pretoria and conferred with the Boers. He assured them that they might look forward to complete self-government under the Crown, and at the same time urged them to sink political differences and join hands with the British

against their com- mon enemy, the Zulus. The Boers, however, continued to agitate for complete independence, and, with the honourable exception of Piet Uys, a gallant Boer leader, and a small band of followers, who assisted Colonel Evelyn Wood at Hlobani, the Boers held entirely aloof from the conflict with the Zulus, a campaign which cost Great Britain many lives and £5,000,000 before the Zulu power was finally broken. In June Sir Garnet Wolseley went to South Africa as commander of the forces against the Zulus, and as high commissioner "for a time," in the place of Sir Bartle Frere, of the Transvaal and Natal. Meantime Frere's proposals to fulfil the promises made to grant the Boers a liberal constitution were shelved. After the " settle- ment " of the Zulu question, Sir Garnet Wolseley proceeded to Pretoria and Immediately organized an expedition against Sikukuni, who throughout the Zulu campaign had been acting under the advice of Cetywayo. Sikukuni's stronghold was captured and his forces disbanded.

Sir Garnet Wolseley now assured the Boers at a public gathering

that so long as the sun shone the British flag would fly at Pretoria. In May 1880 he returned to England, having established in the Transvaal a legislative council with powers so limited as to con- vince many of the Boers that there was no intention of fulfilling Shepstone's promises. Meanwhile events in Great Britain had once more taken a turn which gave encouragement to the dis- affected Boers. Already in November 1879 Gladstone had conducted his Midlothian campaign. In one speech, referring to Cyprus and the Transvaal, he said: " If those acquisitions were as valuable as they are valueless, I would repudiate them, because they were obtained by means dishonourable to the character of our country." And in another speech he said that the British had insanely placed themselves Effect of Mr in the strange predicament of the free subjects of a Gladstone's monarchy going to coerce the free subjects of a speeches in republic. Expressions such as these were trans- ngaa • lated into Dutch and distributed among the Boers, and they exercised a good deal of influence in fanning the agitation already going on in the Transvaal. So keenly were the Midlothian speeches appreciated by the Boers that the Boer committee wrote a letter of thanks to Gladstone, and expressed the hope that should a change in the government of Great Britain occur, " the injustice done to the Transvaal might find redress." In April 1880, this change in the British Government did occur. Gladstone became prime minister, and shortly afterwards Frere was recalled. Could events be more

auspicious for the party seeking retrocession? On being directly appealed to by Kruger and Joubert, Gladstone however replied that the liberty which they sought might be ” most easily and promptly conceded to the Transvaal as a member of a South African Confederation.” This was not at all what was wanted, and the agitation continued. Meanwhile in the Transvaal, concurrently with the change of prime minister and high commissioner, the administrator, Colonel Lanyon, began vigorously to enforce taxation among the Boers. Men who would not pay taxes to their own appointed governments, arid who were daily expecting to be allowed to return to that condition of anarchy which they had come to regard as the normal order of things, were not likely to respond willingly to the tax-gatherer’s demands. That many of them refused payment in the circumstances which existed was natural.

In November matters were brought to a head by the wagons of a farmer named Bezuidenhout being seized in respect of the non-payment of taxes, and promptly retaken from „ ,

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the sheriff by a party of Boers. Lanyon began to War tsg0i recognize that the position was becoming grave, and telegraphed to Sir George Colley, the high commissioner of South-East Africa, for military aid. This, however, was not immediately available, and on the 13th of December the Boers in public meeting at Paardekraal resolved once more to proclaim the South African Republic, and in the meantime to appoint a triumvirate, consisting of Kruger, Pretorius and Joubert, as a provisional government. Within three days of the Paardekraal meeting a letter was sent to the administrator demanding the keys of the government offices. Formal proclamation of the republic was made on the 16th of December (Dingaan’s Day) at Heidelberg. Hostilities forthwith began. Meanwhile pressure was put on the British prime minister to carry out the policy he had avowed while out of office. But it was not until Great Britain was suffering from the humiliation of defeat that he was convinced that the time for granting that retrocession had arrived. The first shots fired were outside Potchefstroom, which was then occupied by a small British garrison (see Potchefstroom) . On the 20th of December some 240 men under Colonel Anstruther, chiefly belonging to the 94th Regiment, while marching from Lydenburg to Pretoria, Were surprised at Bronkhorst Spruit, and cut up by the Boer forces. Half the men were killed and wounded; the other

half including some officers, were taken prisoners. Captain Elliot, one of the prisoners, who had been released on parole, was shot dead by Boers while crossing the Vaal, and Captain Lambert, another paroled prisoner who accompanied Elliot, was also shot,

but escaped. Pretoria, Rustenberg, Lydenburg, and other smaller towns had been placed in a position of defence under the directions of Colonel Bellairs, who remained in command at Pretoria, the garrison consisting of a small number of troops and the loyal inhabitants. Sir George Colley, with about 1400 men, marched towards the Transvaal frontier, but before reaching it he found, on the 24th of January 1881, that the Boers had already invaded* Natal and occupied Laing's Nek. He pitched his camp at Ingogo. Having been defeated at Laing's Nek, and suffered considerable loss in an engagement near Ingogo, Hw"^88i. Colley took a force to the top of Majuba, a mountain overlooking the Boer camp and the nek. He went up during the night, and in the morning was attacked and overwhelmed by the Boers (Feb. 27). Of the 554 men who constituted the British force on Majuba, 92 were killed and 134 wounded, Sir George Colley himself being amongst those who were slain.

Ten days previous to the disaster at Majuba Sir Evelyn Wood had arrived at Newcastle with reinforcements. On Colley's death he assumed command. Negotiations had been opened with the Boers before the attack on Majuba and the British cabinet refused to allow that disaster to influence their action. On the 6th of March a truce was concluded and on the 21st terms of peace were arranged between the Boer triumvirate and Sir Evelyn Wood. The most important of these terms were that the Transvaal should have complete internal self-government under British suzerainty and that a British resident should be stationed at Pretoria. Another article reserved to her majesty " the control of the external relations of the said state, including the conclusion of treaties and the conduct of diplomatic inter- course with foreign powers," and the right to march troops through the Transvaal. The boundaries of the state were defined, and to them the Transvaal was strictly to adhere. These terms practically conceded all that the Boers demanded, and were never regarded

as anything else than surrender either by the Boers or the loyalists in South Africa. The agreement had hardly been concluded when Sir Frederick Roberts arrived at the Cape with 10,000 troops, and after spending forty-eight hours there returned to England.

In the meantime, while the British general was making a treaty under the instructions of British ministers on the frontier, the beleaguered garrisons of Pretoria, Potchefstroom, and other smaller towns were gallantly holding their own. The news of the surrender reached Pretoria through Boer sources, and when first received there was laughed at by the garrison and inhabi- tants as a Boer joke. When the bitter truth was at length realized, the British flag was dragged through the dust of Pretoria streets by outraged Englishmen. Presently there assembled in Pretoria a commission to elaborate the terms of peace. On the one side were the Boer triumvirate, on the other Sir Evelyn Wood, Sir Hercules Robinson (Frere's successor in the high com- missionership), and Sir J. H. de Villiers, chief justice of Cape Colony, while President Brand of the Orange Free State gave the commission the benefit of his advice. The terms agreed upon were drawn up in the form of a convention and signed (Aug. 3). The preamble to the Pretoria Convention of 1881 Convention contained in brief but explicit terms the grant of self-government to the Boers, subject to British suzerainty. In later years, when the Boers desired to regard the whole of this convention (and not merely the articles) as cancelled by the London Convention of 1884, and with it the suzerainty, which was only mentioned in the preamble, Mr Chamberlain, a member of the cabinet of 1880-1885, pointed out that if the preamble to this instrument were considered cancelled, so also would be the grant of self-government.

The government of the state was handed over to the triumvirate on the 8th of August and was continued in their name until May 1883, when Kruger was elected president.

C. From the Retrocession to i8gg. — The retrocession of the Transvaal was a terrible blow to the loyalists. The Boers, on the other hand, found themselves in better plight than they had ever been before. Their native foes had been

crushed by British forces; their liabilities were consolidated

into a debt to Great Britain, to be repaid at convenience

and leisure — as a matter of fact, not even interest was paid for some time. If ever a small state was' well treated by a large one, the Transvaal was so in the retrocession of 1881. Unfortunately, this magnanimity was forthcoming after defeat It appeared as though a virtue had been made of a necessity, and the Boers never regarded it in any other light.

The new volksraad had scarcely been returned and the Pretoria Convention ratified (Oct. 25) before a system of government concessions to private individuals _, „

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was started. These concessions, in so far as they R£ g) me , prejudiced the commerce and general interests of the inhabitants, consisted chiefly in the granting of mono- polies. Among the first monopolies which were granted in 1882 was one for the manufacture of spirituous liquor. The system continued steadily down to 1890, by which time railways, dynamite, spirits, iron, sugar, wool, bricks, jam, paper and a number of other things were all of them articles of monopoly. In 1882 also began that alteration of the franchise law which subsequently developed into positive exclusion of practically all save the original Boer burghers of the country from the franchise. In 1881, on the retrocession, full franchise rights could be obtained after two years' residence; in 1882 the period of residence was increased to five years. Meanwhile the land- hunger of the Boers became stimulated rather than checked by the regaining of the independence of their country. On the western border, where the natives were of less warlike character than those on their southern and northern frontiers, intrigues were already going on with petty tribal chiefs, and the Boers drove out a portion of the Baroiongs from their lands, setting up the so-called republics of Stellaland and Goshen. This act called forth a protest from the 15th Lord Derby (now secretary of state for the colonies), stating that he could not recognize the right of Boer freebooters to set up govern- ments of their own on the Transvaal borders. This protest

had no effect upon the freebooters, who issued one proclamation after another, until in November 1883 they united the two new republics under the title of the ” United States of Stella- land.” Simultaneously with this ” irresponsible ” movement for expansion, President Kruger proceeded to London to interview Lord Derby and endeavour to induce him to dis- pense with the suzerainty, and to withdraw other clauses in the Pretoria Convention on foreign relations and natives, which were objectionable from the Boer point of view. Moreover, Kruger requested that the term “South African Republic” should be substituted for Transvaal State.

The result was the London Convention of the 27th of Feb- ruary 1884. In this document a fresh set of articles was substituted for those of the Pretoria Convention of 1881. In the articles of the new convention the boundaries were once more defined, concessions being made to the Transvaal on the Bechuanaland frontier, and to them the republic was bound to ” strictly adhere.” In what followed it must always be remembered that Lord Derby began by emphatically rejecting the first Boer draft of a treaty on the ground that London no treaty was possible except between equal sove- Conven- reign states. Moreover, it is undeniable that Lord a ° a ‘ ls84 ‘ Derby acted as though he was anxious to appear to be giving the Boers what they wanted. He would not formally abolish the suzerainty, but he was willing not to mention it ; and though, in substituting new articles for those of the Pretoria Convention he left the preamble untouched, ht avoided anything which could commit the Boer delegates to a formal recognition of that fact. On the other hand, he was most indignant when in the House of Lords he was accused by Lord Cairns of impairing British interests and relinquishing the queen’s suzerainty. He declared that he had preserved the thing in its substance, if he had not actually used the word; and this view of the matter was always officially maintained in the colonial office (which, significantly enough,

dealt with Transvaal affairs) whatever the political party in power. Unfortunately, the timid way in which it was done made as ineffaceable an impression on Kruger even as the surrender

after Majuba. Article 4 stated:

" The South African Republic will conclude no treaty or engagement with any state or nation, other than the Orange Free State, nor with any native tribe to the eastward or westward of the Republic, until the same has been approved by her Majesty the Queen."

The other article to which the greatest interest was subsequently attached was art. 14:

" All persons, other than natives, conforming themselves to the laws of the South African Republic (a) will have full liberty, with their families, to enter, travel, or reside in any part of the South African Republic ; (b) they will be entitled to hire or possess houses, manufactories, warehouses, shops and premises; (c) they may carry on their commerce either in person or by any agents whom they may think fit to employ; (d) they will not be subject, in respect of their persons or property, or in respect of their commerce or industry, to any taxes, whether general or local, other than those which are or may be imposed upon citizens of the said Republic."

Notwithstanding the precise fixing of the boundaries of the republic by the London Convention, President Kruger Territorial endeavoured to maintain the Boer hold on Goshen Expansion and Stellaland, but the British government on Efforts. tn ; s p { n t proved firm, and an expedition set out in 1884 under Sir Charles Warren, broke up the freebooters' two states, and occupied the country without a shot being fired (see Bechuanaland). The expedition cost Great Britain a million and a half, but the attempt at farther extension west- wards was foiled, and a little later treaties with Lobenguela and the grant to Cecil Rhodes and his co-directors of a charter for the British South Africa Company put a check on designs the Boers held to expand northward (see Rhodesia). On the eastern border a similar policy of expansion was followed by the Boers, and in this instance with more success. Follow- ing up the downfall of the Zulu power after the British conquest in 1879, several parties of Boers began intriguing with the petty chiefs, and in May 1884, in the presence of 10,000 Zulus, they proclaimed Dinizulu, the son of Cetywayo, to be king of Zulu- land (see Zululand). As a " reward " for their services to the Zulus, the Boers then took over from them a tract of country in which they established a " New Republic." In 1886 the " New Republic " with limits considerably narrowed, was

recognised by Great Britain, and the territory became incorporated with the Transvaal in 1888. Their eastern boundary, in the teeth of the spirit of the conventions, and with but scant observance of the letter, was by this means considerably extended. A similar policy eventually brought Swaziland almost entirely under their dominion (see Swaziland). At the same time President Kruger revived the project of obtaining a seaport for the state, one of the objects of Boer ambitions since i860 (vide supra). Kruger endeavoured to acquire Kosi Bay, to the north of Zululand and only 50 m. east of the Swazi frontier. Meanwhile, events occurring within the state augured ill for the future of the country. In 1884 a concession to a number of Hollander and German capitalists of all rights to make railways led to the formation of the Netherlands Rail- way Company. This company, which was not actually floated Economic ˆ I 887, was destined to exercise a disastrous in- Deveiop- fluence upon the fortunes of the state. Gold stents: Qold Jigging had hitherto enjoyed in the Transvaal but us ry. a p recar j ous existence. In 1883 the discovery of Moodie's Reef near the Kaap Valley led to a considerable influx of diggers and prospectors from the colonies and Europe, and by 1884 the Sheba Mine had been opened up, and Barberton, with a population of 5000 inhabitants, sprung into existence. In 1886 the Rand goldfields, which had just been discovered, were proclaimed and Johannesburg was founded. From that time the gold industry made steady progress until the Rand gold mines proved the richest and most productive goldfield in the world. As the industry prospered, so did the European population increase. The revenue of the state went up by leaps and bounds. At the end of 1886 Johannesburg

consisted of a few stores and some few thousand inhabitants. In October 1896 the sanitary board census estimated the population as 107,078, of whom 50,907 were Europeans. The wealth which was pouring into the Boer state coffers exceeded the wildest dreams of President Kruger and his followers. Land went up in value, and farms, many of them at comparatively remote distances from the goldfields, were sold at enormously enhanced prices. In fact, so attractive did this sale of land become to the Boers that they eventually parted with a third of the whole land area of the country to Uitlander purchasers. Yet in spite of the wealth which the industry of the Uitlanders was creating, a policy of rigid political exclusion and restriction was adopted towards them.

An attempt was made in 1888, after the conference held between

Cape Colony, the Orange Free State and Natal, to induce the Transvaal to enter a customs union. Q e i a t; oas Kruger would have none of it, although by so doing with the rest he could have obtained permission for a settlement of South at and railway to Kosi Bay. A convention to this nca ‘ effect was signed in August 1890, the Transvaal being allowed three years in which to take advantage of its provisions. Kruger’s design at this time was to bring the whole of the external trade of the state, which was growing yearly as the gold industry developed, through Delagoa Bay and over the Nether- lands railway. His hostility towards Great Britain and even Cape Colony led him to adopt a commercial policy both narrow and prejudicial to the interests of the gold industry. In the appointment of F. W. Reitz as president of the Orange Free State (January 1889) on the death of Sir John Brand, Kruger recognized a new opportunity of endeavouring to cajole the Free State. Brand had arranged, in the teeth of the strongest protests from Kruger, that the Cape railway should extend to Bloemfontein and subsequently to the Vaal river. Kruger now endeavoured to control the railway policy of the Free State, and induced that republic to agree to a treaty whereby each state bound itself to help the other whenever the inde- pendence of either should be threatened or assailed, unless the cause of quarrel was, in the eyes of the state called in to assist, an unjust one (see Orange Free State).

In 1890 a feeling of considerable irritation bad grown up among the Uitlanders at the various monopolies, but par- ticularly at the dynamite monopoly, which pressed „..

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solely and with peculiar severity upon gold miners. Restrictions.

Requests for consideration in the matter of the franchise, and also for a more liberal commercial policy in the matter of railways, dynamite and customs dues, began to be made. In response Kruger enacted that the period of qualification for the full franchise should now be raised to ten years instead of five. He at the same time instituted what was called a second chamber, the franchise qualifications for which were easier, but which was not endowed with any real power. During this year Kruger visited Johannesburg, and what was known as ” the flag incident ” occurred. He had by this time rendered himself somewhat unpopular, and in the evening the Transvaal flag, which flew over the land- drost’s house, was pulled down. This

incensed Kruger so much that for many years he continued to quote it as a reason why no consideration could be granted to the Uitlanders.

By 1892 the Uitlanders began to feel that if they were to obtain any redress for their grievances combined constitutional action was called for, and the first reform move- ment began. The Transvaal National Union was Gr //ˆ n e ces# formed. This consisted at the outset chiefly of mercantile and professional men and artisans. The mining men, especially the heads of the larger houses, did not care at this juncture to run the risk of political agitation. The Hon. J. Tudhope, an ex-minister in the Cape government, was elected chairman of the union. The objects of this body were avowed from the outset. They desired equal rights for all citizens, the abolition of monopolies and abuses, together with the maintenance of the state's independence. In the furthering of this policy Tudhope was supported by Charles Leonard and his brother

James Leonard, at one time attorney-general of Cape Colony. Both the Leonards, as well as many of their followers, were South Africans by birth. They, in common with the great bulk, of the Uitlanders, recognized that the state had every right to have its independence respected. But they asserted that a narrow and retrogressive policy, such as Kruger was following, was the very thing to endanger that independence. The soundness of these views and the legitimacy of Uitiander aspirations were recognized by a few Boer officials at Pretoria. Some prominent burghers even spoke at Uitiander meetings in favour of the Uitiander requests. At a later date, Chief Justice Kotze, when on circuit, warned the Boers that in its retrogressive action the government was undermining the grondwet or constitution of the state. It soon became evident that one course, and one only, lay open to President Kruger if he desired to avert a catastrophe. It was to meet in a friendly spirit those men who had by their industry converted a poor pastoral country into a rich industrial one, who represented more than half the inhabitants, who paid more than three- fourths of the revenue, and who were anxious to join him as citizens, with the rights of citizenship. He chose a

course diametrically opposite. In an interview accorded to seven delegates from the National Union, in 1892, he told Charles Leonard to ” go back and tell your people that I shall never give them anything. I shall never change my policy. And now let the storm burst.” In 1894 there occurred an incident which not only incensed the Uitlanders to fury, but called for British intervention. A number of British subjects resident in Comman- the Transvaal, in spite of their having no political deeriagin- status, were commandeered to suppress a native cident,l894. r j s ; n g This led to a pretest, and eventually a visit to Pretoria, from Sir Henry Loch the high commissioner. In the negotiations which followed, President Kruger at length agreed to extend ” most favoured nation ” privileges to British subjects in reference to compulsory military service, and five British subjects who had been sent as prisoners to the front were released. This result was not, however, achieved before President Kruger had done his utmost to induce Sir Henry Loch to promise some revision in favour of the Transvaal of the London Convention. Following this incident came a further alteration in the franchise law, making the franchise practically impossible to obtain. At a banquet given in honour of the German emperor’s birthday in Pretoria in January 1895, Kruger referred in glowing terms to the friendship of Germany for the Transvaal, which in the future was to be more firmly established than ever. This speech was public evidence of what was known to be going on behind

the scenes. The German consul at Pretoria at this Flirtation j unc t ure as a volatile, sanguine man, with

visionary ideas of the important part Germany was to play in the future as the patron and ally of the South African Republic, and of the extent to which the Bismarckian policy might go in abetting an anti-British campaign. Whether he deceived himself or not, he led President Kruger and the Boers to believe that Germany was prepared to go to almost any length in support of the Transvaal if any opportunity occurred. His in- fluence was an undoubted factor in the Kruger policy of that time. The Delagoa Bay railway being at length completed to Pretoria and Johannesburg, Kruger determined to take steps to bring

the Rand traffic over it. The Netherlands railway Incident. De 8 an by putting a prohibitive tariff on goods from

the Vaal river. Not to be coerced in this manner, the Rand merchants proceeded to bring their goods on from the Vaal by

wagon. Kruger then closed the drifts (or fords) on the river by which the wagons crossed. He only reopened them after the receipt of what was tantamount to an ultimatum on the subject from Great Britain.

In May 1895, on the urgent representations of Sir Henry Loch, the British government annexed Tongaland, including Kosi Bay, thus making the British and Portuguese boundaries contermi- nous on the coast of south-east Africa. In the previous month certain native territories between Tongaland and Swaziland had

been annexed by Great Britain. The Boers, who had failed to fulfil the conditions under which they might have secured Kosi Bay, nevertheless resented this action, which Boer Road took away from them all chance of obtaining a to the Sea seaport. Kruger telegraphed that " this annexation Blocked – cannot be regarded by this government otherwise than as directed against this republic. They must therefore regard it as an unfriendly act, against which they hereby protest." The protest was unheeded, the British government having realized the international complications that might ensue had the Transvaal a port of its own.

At this time the Uitlanders formed a majority of the popula- tion, owned half the land and nine-tenths of the property, and they were at least entitled to a hearing. When uitiander in August 1895 they forwarded one of their many Reform petitions praying for redress of their grievances Movem ent. and an extension of the franchise, their petition, with over 35,000 signatures, was rejected with jeers and insult. One member of the Raad, during a debate in the chamber, called upon the Uitlanders to " come on and fight " for their rights if they wanted them. The words were but the utterance of an individual Raad member, but they were only a shade less offensive than those used by Kruger in 1892, and they too accurately describe the attitude of the Boer executive. In September a meeting of the chambers of mines and commerce was held at Johannesburg, and a letter on various matters of the greatest importance to the mining industry was addressed to the Boer executive. It was never vouchsafed an answer. What the next step should be was freely discussed. Some urged an appeal to the Imperial government; but others, especially men of colonial birth and experience, objected that they would be leaning on a broken reed. That men who had still the memory of Majuba in their hearts should have felt misgiving is not to be wondered at. At this juncture (October 1895) came

overtures to the leading Uitlanders from Cecil Rhodes, then prime minister of Cape Colony, and from Dr Jameson, leading to the Jameson Raid. To one or two men this scheme, subsequently known as The the Jameson Plan, had been revealed in the pre- "Jameson vious June, but to the majority even of the small plan " group of leaders it was not known till October or November 1895. The proposition came in a tempting hour. Rhodes and Jameson, after considerable deliberation, came to the conclusion that they might advantageously intervene between Kruger and the Uitlanders. They induced Alfred Beit, who was an old personal friend of Rhodes, and also largely interested in the Rand gold mines, to lend his co-operation. They then submitted their scheme to some of the Uitiander leaders. Be- tween them it was arranged that Jameson should gather a force of 800 men on the Transvaal border; that the Uit- landers should continue their agitation; and that, should no satisfactory concession be obtained from Kruger, a com- bined movement of armed forces should be made against the government. The arsenal at Pretoria was to be seized; the Uitlanders in Johannesburg were to rise and hold the town. Jameson was to make a rapid march to Johannesburg. Mean- while, in order to give Kruger a final chance of making concessions with a good grace, and for the purpose of stating the Uitiander case to the world, Charles Leonard, as chairman of the National Union, issued a historic manifesto, which concluded as follows: —

We have now only two questions to consider: (a) What do we want? (6) How shall we get it? I have stated plainly what our grievances are, and I shall answer with equal directness the question, What do we want? We want: (1) the establishment of this republic as a true republic; (2) a grondwet or constitution which shall be framed by competent persons selected by representatives of the whole people and framed on lines laid down by them — a constitution which shall be safeguarded against hasty alteration; (3) an equitable franchise law, and fair representation; (4) equality of the Dutch and English languages; (5) responsibility to the heads of the great departments of the legislature; (6) removal of religious disabilities; (7) independence of the courts of justice, with adequate and secured remuneration of the judges ; (8) liberal and comprehensive education ;

(9) efficient civil service, with adequate provision for pay and pension ;

(10) free trade in South African products. That is what we want. There now remains the question which is to be put before you at the meeting of the 6th of January, viz. How shall we get it? To this question I shall expect from you an answer in plain terms according to your deliberate judgment.

The Jameson conspiracy fared no worse and no better than the great majority of conspiracies in history. It failed in its immediate object. Jameson did not obtain more than 500 men. Johannesburg had the greatest difficulty in smuggling in and distributing the rifles with which the insurgents were to be armed. The scheme to seize the Pretoria fort had to be abandoned, as at the time fixed Pretoria was thronged with Boers. Finally, to make confusion worse confounded, Jameson, becoming impatient of delay, in spite of receiving direct messages from the leaders at Johannesburg telling him on no account to move, marched into the Transvaal.

The policy of delay in the execution of the plot which the Uitlander leaders found themselves compelled to adopt was determined by a variety of causes. Apart from the difficulty of obtaining arms, a serious question arose at the eleventh hour which filled some of the Uitlanders with mistrust. The reform leaders in the Transvaal, down to and including the Johannesburg rising, had always recognized as a cardinal principle the maintenance of the independence of the staie. From Cape Town it was now hinted that the movement in which Jameson was to co-operate should, in Rhodes's view, be carried out under the British flag. A meeting of Uitlander leaders was hastily summoned on the 25th of December. Two messengers were that night despatched to interview Rhodes, who then gave the assurance that the flag question might be left to a plebiscite of the inhabitants of the Transvaal 1 (see Blue-book, 1897, 165, p. 21). It was determined nevertheless to postpone action; however, on the 29th of December, Jameson started, and the news of his having done so reached Johannes- burg from outside sources. A number of leading citizens were at once formed into a reform committee. In the absence of Collapse of Charles Leonard, who had been sent as one of the Jameson delegates to Cape Town to interview Rhodes, Raid. Lionel Phillips, a partner in Messrs Eckstein & Co.,

the largest mining firm on the Rand, was elected chairman. Phillips had been for three years in succession chairman of the chamber of mines, and he had persistently for several years tried to induce Kruger to take a reasonable view of the require- ments of the industry. Under the supervision of the reform committee, such arms as had been smuggled in were distributed, and Colonel Frank Rhodes was given charge of the armed men. A large body of police was enrolled, and order was maintained throughout the town. On the 2nd of January 1896 Jameson, who found himself at Doornkop in a position surrounded by Boers, surrendered. Jameson and his men were conveyed to Pretoria as prisoners, and subsequently handed over to the high commissioner (Sir Hercules Robinson, who had succeeded Sir Henry Loch in June 1895).

Significant of the attitude of Germany — whose "flirtation" with the Transvaal has been noted — was an open telegram sent by the emperor William II. the day after the surrender of Jameson congratulating Kruger that " without Telegram, "appealing to the help of friendly powers" he had repelled the raiders. The British

government rejoined by commissioning a flying squadron and by calling attention to the London Convention, reserving the supervision of the foreign relations of the Transvaal to Great Britain. In Johannes-

1 Jameson, speaking at Durban on the 9th of August 1910, declared that the raid was not racial in the sense usually understood, but an effort towards federation. During the raid he carried a letter containing the names of the proposed new executive, and had the raid succeeded it was proposed to make General Lukas Meyer (d. 1902) president. Jameson subsequently explained that Rhodes and he in designating ” an eminent Dutchman ” as president of ” the new provincial republic ” had had no communication with Meyer on the subject. Neither he (Jameson) nor Rhodes had any knowledge of a proposal, to which General Botha had publicly referred, that Charles Leonard should be president. (See the Cape Times Weekly Edilion, Sept. 7, 1910, p. 15.)

burg meanwhile the Kruger government regained control. The whole of the reform committee (with the exception of , a few who fled the country) were arrested on a charge of high treason and imprisoned in Pretoria. In April, at the trial, the four leaders — Lionel Phillips, Frank Rhodes, J. H. Hammond and George Farrar, who in conjunction with Charles Leonard had made the arrangements with Jameson — were sentenced to death, the sentence being after some months’ imprisonment commuted to a fine of £25,000 each. The rest of the committee were each sentenced to two years’ imprisonment, £2000 fine or another year’s imprisonment, and three years’ banishment. This sentence, after a month’s incarceration, was also com- muted. The fine was exacted, and the prisoners, with the exception of Woolls Sampson and W. D. (Karri) Davies, were liberated on undertaking to abstain from politics for three years in lieu of banishment. Messrs Sampson and Davies, refusing to appeal to the executive for a reconsideration of their sentence, were retained for over a year.

Sir Hercules Robinson was unfortunately in feeble health at the time, and having reached Pretoria on the 4th of January, he had to conduct negotiations under great physical TheSur- disadvantage. He had no sooner learnt of the raid reader of in Cape Town than he issued a proclamation through Johannes- Sir Jacobus de Wet, the British resident at Pretoria, urg ‘ warning all British subjects in Johannesburg or elsewhere from aiding and abetting Jameson. This was freely distributed among the public

of Johannesburg. While in Pretoria the high commissioner in the first instance addressed himself to inducing Johannesburg to lay down its arms. He telegraphed to the reform committee that Kruger had insisted " that Johannesburg must lay down arms unconditionally as a precedent to any discussions and consideration of grievances." On the following day, the 7th of January, Sir Hercules tele graphed again through the British agent, who was then at Johannesburg, saying: " That if the Uitlanders do not comply with my request they will forfeit all claims to sympathy from Her Majesty's government and from British subjects through- out the world, as the lives of Jameson and the prisoners are now practically in their hands." The two thousand odd rifles which had been distributed among the Uitlanders were then given up. With regard to the inducements to this step urged upon the reform committee by the high commissioner, it is only necessary to say with reference to the first that the grievances never were considered, and with reference to the second it subsequently appeared that one of the conditions of the surrender of Jameson's force at Doornkop was that the lives of the men should be spared. It was after the Johannesburg disarmament that Kruger had sixty-four members of the reform committee arrested, announcing at the same time that his motto would be " Forget and forgive." Sir Hercules Robinson, in response to a message from Mr Chamberlain, who had been secretary of state for the colonies since July 1895, urging him to use firm language in reference to reasonable con- cessions, replied that he considered the moment inopportune, and on the 15th of January he left for Cape Town. In 1897 he was succeeded in the high commissionership by Sir Alfred Milner.

In the period which intervened between the Jameson raid and the outbreak of the war in October 1899 President Kruger's administration continued to be what it had been; that- is to say, it was not merely bad, but it R a u. got progressively worse. His conduct immediately after Johannesburg had given up its arms, and while the reform committee were in prison, was distinctly disingenuous. Instead of discussing grievances, as before the Johannesburg disarmament he had led the high commissioner to believe was his intention, he proceeded to request the withdrawal of the London Convention, because, among other things, " it is in- jurious to dignity of independent republic." When Kruger found that no concession was to be wrung from the British government, he proceeded, instead of considering grievances, to add considerably to their number. The Aliens

and Aliens Immigration Laws, as well as the new Press Law, were passed in the latter part of 1896.

In 1897 a decision of Chief Justice Kotze was overruled by an act of the volksraad. This led to a strong protest from the judges of the high court, and eventually led to the dis- missal of the chief justice, who had held that office for over twenty years, and during the whole of that time had been a loyal and patriotic friend to his country. An industrial commission appointed during this year by President Kruger fared no better than the high court had done. The commission was deputed to inquire into and report on certain of the griev- ances adversely affecting the gold industry. Its constitution for this purpose was anomalous, as it consisted almost entirely of Transvaal officials whose knowledge of the requirements of the industry was scanty. In spite of this fact, however, the commission reported in favour of reform in various directions. They urged, among other things, due enforcement of the liquor law, more police protection, the abolition of the dynamite concession, and that foodstuffs should be duty free. These recommendations made by President Kruger's own nominees were practically ignored. In 1898, to strengthen his relations with foreign powers, Kruger sent the state secretary, Dr Leyds, 1 to Europe as minister plenipotentiary, his place on the Transvaal executive being taken by Mr Reitz, the ex-president of the Free State. At home Kruger continued as obdurate as ever. In January 1899 Mr Chamberlain pointed out in a despatch to President Kruger that the dynamite monopoly constituted a breach of the London Convention. To help the Transvaal government out of its difficulty, and to make one more effert towards conciliation, the financial houses of Johannesburg offered to lend the Transvaal government £600,000 wherewith to buy out the dynamite company, and so terminate the scandal and bring some relief to the industry. The offer was not accepted. Meantime Sir Alfred Milner had also endeavoured to induce the Transvaal government to grant the necessary reforms, but his efforts were equally unavailing (see Milner, Viscount). In March the Uitlanders, hopeless of ever obtain- ing redress from

President Kruger, weary of sending petitions to the Raad only to be jeered at, determined to invoke inter- vention if nothing else could avail, and. forwarded 4 petition to Queen Victoria. This petition, the outcome of the second Uitlander movement for reform, was

Petition to the Queen.

signed by 21,000 British subjects, and stated the Uitlander position at considerable length. The following extract conveys its general tenor: —

The condition of your Majesty's subjects in this state has become well-nigh intolerable. The acknowledged and admitted grievances, of which your Majesty's subjects complained prior to 1895, not only are not redressed, but exist to-day in an aggravated form. They are still deprived of all political rights, they are denied any voice in the government of the country, they are taxed far above the requirements of the country, the revenue of which is misapplied and devoted to objects which keep alive a continuous and well- founded feeling of irritation, without in any way advancing the general interest of the state. Maladministration and peculation of public moneys go hand in hand, without any vigorous measures being adopted to put a stop to the scandal. The education of Uitlander children is made subject to impossible conditions. The police afford no adequate protection to the lives and property of the inhabitants of Johannesburg; they are rather a source of danger to the peace and safety of the Uitlander population.

In response to this appeal, Mr Chamberlain, in a despatch dated the 10th of May, proposed a conference at Pretoria. Six days before Sir Alfred Milner had telegraphed to London a summary of the situation, comparing the position of the Uitlanders to that of helots and declaring the case for inter- vention to be overwhelming. Neither of these despatches was made public at the time. But on the very day Mr Cham- berlain wrote his despatch the friends of the Transvaal govern- ment in Cape Colony and the Orange Free State invited Sir

1 Dr W. J. Ueyds, a Hollander born in Java in 1859, went out to the Transvaal in 1884 as attorney-general and was, in 1887, made government commissioner for the Netherlands (S. A.) railway. In 1890 he became state secretary and in that position was regarded as Kruger's light-hand man.

Alfred Milner to meet President Kruger at Bloemfontein, hoping to be able to exert pressure on both parties and to arrange a settlement as favourable as possible to aioem- the Transvaal. The conference opened on the fontein 31st of May and closed on the 5th of June. It no Conference. sooner opened than it was evident that Kruger had come to obtain, not to grant, concessions. He offered, it is true, a seven years' franchise law in place of the five years' franchise which Sir Alfred Milner asked for. But apart from the relief suggested being entirely inadequate, it was only to be given on certain conditions, one of which was that all future disputes which might arise between the Transvaal and the Imperial government should be referred to a court of arbitration, of which the president should be a foreigner. No arrangement was possible on such terms. Meanwhile feeling was running high at Johannesburg and throughout South Africa. Meetings were held in all the large towns, at which resolutions were passed declaring that no solution of the Transvaal question would be acceptable which did not provide for equal political rights for all white men. Sir Alfred Milner urged the home government strongly to insist upon a minimum of reform, and primarily the five years' franchise; and Mr Chamberlain, backed by the cabinet, adopted the policy of the high com- missioner. (A. P. H.; F. R. C.)

D. The Crisis of i8gg. — A state of extreme diplomatic tension lasted all the summer. The British public, in whom there had always been the latent desire to retrieve the surrender to the Boers which had followed the disaster at Majuba, were at last awakened by the ministerialist press to the necessity of vindicating British influence in South Africa, and the government soon found that, in spite of a highly articulate Radical minority, the feeling of the country was overwhelmingly behind them. It was not then realized either by the public or the government how seriously, and with what considerable justification, the Boers believed in their ability, if necessary, to sweep the British " into the sea." President Kruger had every expectation of large reinforcements from the Dutch in the two British colonies; he believed that, whatever happened, Europe would not allow Boer independence to be destroyed; and he had assured himself of the adhesion of the Orange Free State, though it was not till the very last moment that President Steyn formally notified Sir Alfred Milner of this fact. The Boers profoundly despised the military power of Great Britain, and there was no reason why they, any more than Germany or France, should contemplate the possibility of the empire standing together as a

whole in such a cause. In England, on the other hand, it was thought by most people that if a firm enough attitude were adopted Mr Kruger would ” climb down,” and the effect of this error was shown partly in the whole course of the negotiations, partly in the tone personalty adopted by Mr Chamberlain. It was only later that it was seen that if Great Britain intended effectually to champion the Uitlander cause, the moment for a test of strength had inevitably arrived. Negotiations could only bring the conflict a little nearer, delay it a little longer, or supply an opportunity to either side to justify its action in the eyes of the world. The conditions of the problem were such that unless Great Britain were to accept a humiliating rebuff, any correspondence, however skilfully conducted, was bound to bring into greater prominence the standing causes of offence between the two sides. The exchange of despatches soon led to a complete impasse. The persistent attempt of the South African Republic to assert its full indepen- dence, culminating in a formal denial of British suzerainty, made it additionally incumbent on Great Britain to carry its point as to the Uitlander grievances, while, from Mr Kruger’s point of view, the admission of the Uitlanders to real political rights meant the doom of his oligarchical regime, and appeared in the light of a direct menace to Boer supremacy. The fran- chise, again, was an internal affair, in which the convention gave Great Britain no right to interfere, while if Great Britain relied on certain definite breaches of the convention, satisfaction for which was sought in the first place in such a guarantee of

amendment as the Uitlander franchise would involve, the Boer answer was an offer of arbitration, a course which Great Britain could not accept without admitting the South African Republic to the position of an equal. Here was material enough for an explosion, even if personal misunderstandings and aggravations, adding fuel to the fire, had not naturally occurred (or even been deliberately plotted) during the negotiations. But the truth was that the Boers thought they stood to gain by fighting, while the British, though not expecting war, and acting up till the last month or so on the assumption that serious military preparations were either unnecessary or sufficiently unlikely to be necessary

to make them politically inexpedient, had with no less confidence committed themselves to a policy which was impracticable on peaceful terms.

After July the tactics of the Boer executive were simply directed towards putting off a crisis till the beginning of October, when the grass would be growing on the veld, and meanwhile towards doing all they could in their despatches to put the blame on Great Britain. At last they drafted, on the 27th of September, an ultimatum to the British government. But, although ready drafted, many circumstances conspired to delay its presentation. Meanwhile, the British war office began to act. Certain departmental details were despatched to South Africa to form a working nucleus for military bases, and early in September the cabinet sanctioned the despatch to Natal from India of a mixed force, 5600 strong, while two battalions were ordered to South Africa from the Mediterranean. Sir George White was nominated to the chief command of the forces in Natal, and sailed on the 16th of September, while active preparations were set on foot in England to prepare against the necessity of despatching an army corps to Cape Town ; in which case the chief command was to be vested in Sir Redvers Buller. Fortunately, although the draft of an ultimatum was lying in the state secretary's office in Pretoria, the Boers, unprepared in departmental arrangements which are necessary in large military operations, were unable to take the field with the promptitude that the situation demanded. They con- sequently forfeited many of the advantages of the initiative.

The military strength of the two republics was practically an unknown quantity. It was certain that, since the troublous times of 1896, the Transvaal had greatly increased its arma- ments; but at their best, except by a very few, 1 the Boers were looked upon by British military experts as a disorganized rabble, which, while containing many individual first-class marksmen, would be incapable of maintaining a prolonged resistance against a disciplined army. As was to be subsequently shown, the hostilities were not confined to opposition from the fighting strength of the two little republics alone; the British had to face Dutch opposition in their own colonies. The total fighting strength of the Boer republics is difficult to ascertain exactly. General Botha stated that there were 83,000 burghers from 15 to 65 years of age on the commando lists. Lord Kitchener put the total number of combatants on the Boer side at 95,000 (Cd. 1790, p. 13). The British official History of the War gave the number as 87,000; another calculation, based on the number killed, taken

prisoner and surrendered, made the total 90,000. In the second (1901) rebellion of the Cape Dutch about 8000 joined the burgher forces. The number of Boers in the field at any one period was probably little more than 40,000. But the fact that it was to a large extent a struggle with a nation in arms doubled the numbers of the force that the Transvaal executive was able to draw upon. The bulk of the Dutch levies were organized on the burgher system — that is, each district was furnished with a commandant, who had under him field-cornets and assistant field-cornets, who administered the fighting capacity of the district. Each field-cornet, who, with the commandant, was a paid official of the state, was responsible for the arms, equipment and attendance of his commando.

1 Lord Wolseley foresaw the strength of the Boers. Writing on the 12th of September 1899 he said, ” If this war comes off it will be the most serious war England has ever had ” (see Military Life of the Duke of Cambridge, ii. 421).

The plan of campaign which found favour with the Boers, when they determined to put their differences with Great Britain to the test by the ordeal of the sword, was to attack all the principal British towns adjacent to their own borders; at the same time to despatch a field army of the necessary dimensions to invade and reduce Natal, where the largest British garrison existed. It is not too much to suppose that the executive in Pretoria had calculated that the occupation of Durban would inspire the entire Dutch nation with a spirit of unanimity which would eventually wrest South Africa from the British. On paper the scheme had everything to recom- mend it as the expedient most likely to bring about the desired end. But the departmental executive could not launch the Natal invading force as early as had been anticipated, and it was not until the 9th of October that the ultimatum was pre- sented to Sir (then Mr) Conyngham Greene, the British agent at Pretoria. The scheduled demands were as follow: —

” a. That all points of mutual difference shall be regulated by the friendly course of arbitration, or by what- The ever amicable way may be agreed upon by the ultimatum. government with Her Majesty’s Government.

” b. That the troops on the borders of this republic shall be instantly withdrawn.

” c. That all reinforcements of troops which have arrived in South Africa since the 1st of June 1899 shall be removed from South Africa within a reasonable time, to be agreed upon with this government, and with a mutual assurance and guarantee on the part of this government that no attack upon or hostilities against any portion of the posses- sions of the British Government shall be made by the republic during further negotiations within a period of time to be subsequently agreed upon between the governments, and this government will, on compliance therewith, be prepared to withdraw the armed burghers of this republic from the borders.

” d. That Her Majesty’s troops now on the high seas shall not be landed in any part of South Africa.”

To these demands the Transvaal government required an answer within 48 hours.

There could be only one reply, and on Wednesday, the nth of October 1899, at five o’clock p.m., a state of war existed between the British government and the two Boer republics. On the following day the Boer attack on an armoured train at Kraaipan, a railway station in Cape Colony south of Mafeking and close to the western frontier of the Transvaal, witnessed the first hostile shot of a bloody war, destined to plunge South Africa into strife for two years and a half. (H. Ch.)

E. The War of i8gp-igo2.—Foi the purposes of history the South African War may be conveniently divided into five distinct periods. The first comprises the Boer invasion, terminating with the relief of Ladysmith theWnr. on the 28th of February. The second, the period of Boer organized resistance, may be said to have finished with the occupation of Komati Poort in October 1900 (a month after Lord Roberts’s formal annexation of the Trans- vaal) and the flight of President Kruger. The third may be characterized as a period of transition; it marks the adoption in earnest of a guerrilla policy on the part of the enemy, and an uncertain casting about on the part of the British for a definite system with which to grapple with an unfore- seen development. This phase endured up to the failure of the Middelburg negotiations in March 1901. The next stage was that which saw the slow building up of the blockhouse system and the institution of small punitive columns, and may be considered to have extended until the close of 1901. The fifth, and last period — which, after all other expedients had failed, finally brought the

residue of uncaptured and unsurrendered burghers to submission — was the final development of the blockhouse system, wedded to the institution of systematic ” driving ” of given areas, which operations were in force until the 31st of May X902, when peace was ratified at Pretoria.

The first of these periods saw the severest fighting of the

campaign. It opened with the investment of Mafeking by a Transvaal force under P. A. Cronje and the envelopment of Kimberley by Free State commandos under General < inNaL°" S Wessels. But these were minor operations. The main Boer effort was made in Natal, where their forces were commanded by P. J. Joubert, while Lieut.-General Sir George White was the British commander-in-chief. The northern part of Natal presented two faces of a triangle to the two enemies, the short base being formed by the Tugela river. Close to the head of the triangle at Dundee and Glencoe was posted a small British force under Major-General Sir W. Penn Symons. Against this force there advanced a Boer force under Lukas Meyer from the east, and, more slowly, the foremost portion of the main Boer army from the north, while at the same time other Transvaalers descended upon the railway between Glencoe and Ladysmith, and the Free Staters from the passes of the Drakensberg advanced towards Ladysmith, the British centre of operations at which the reinforcements sent from India gathered. On the 20th of October the Dundee brigade vigorously and successfully attacked Talana Hill, and drove back Lukas Meyer, but this success was dearly bought. Symons was mortally wounded, and 226 officers and men were killed and wounded. Half the mounted men lost their way in attempting to pass the enemy's flank and were taken, and the brigade, threatened to its left rear by Joubert's advance and by the force that had seized the railway, only escaped being enveloped by retreating upon Ladysmith, where it arrived in an exhausted state on the 26th of October. Meanwhile Sir George White had discovered the Boer force on the railway, and, though anxious on account of the advance of the Free Staters, on the 21st, stimulated by the news of Talana, he sent out a force of all arms under General (Sir John) French to drive

the Boers from Elandslaagte and so to clear Symons's line of retreat. This was accomplished by French and his subordinate, Colonel (Sir) Ian Hamilton, in the action of Elandslaagte on the 21st of October (British losses, 258 all ranks). But on the 22nd the Free Staters' advance caused the victorious force to be recalled to Ladysmith, and the third action north of that town, Rietfontein (24th), was only a demonstration to cover the retirement of the Dundee force. By the 29th of October all the British forces at the front and their reinforcements had fallen in on Ladysmith, which the Transvaalers on the north and east and the Free Staters on the west side began to invest. Before the junction of the two allied wings was complete Sir George White attempted by a general attack to break up their line. The result of this decision was the battle of Lombard's Kop, outside Ladysmith, in which the whole of the available British force was engaged. The engagement was disastrous to the British, who had undertaken far too comprehensive an attack, and the Natal Field Force was obliged to fall back upon Ladysmith with the loss of 1 500 men, including a large number of prisoners belonging to the left column under Lieut. -Colonel F.R.C. Carleton,who were cut off at Nicholson's Nek and forced to surrender by a mixed force of Transvaalers and Free Staters under Christian de Wet. From that day the role of the Natal Field Force was changed from that of a mobile field army into that of a garrison, and two days later it was completely isolated, but not before General French had succeeded in escaping south by train, and the naval authorities had been induced by Sir George White's urgent appeals to send into the town a naval brigade with a few guns of sufficient range and calibre to cope with the heavy position artillery which Joubert was now able to bring into action against the town.

General Sir Redvers Buller, who had been appointed to the supreme command in South Africa as soon as it was perceived that war was imminent — his force being one army corps in three divisions, the divisional generals being Lord Methuen, Sir W. Gatacre and Sir C. F. Clery — arrived in Cape Town, ahead of his troops, on the day following Lombard’s Kop. The situation which presented itself was deli- cate in the extreme. In Natal practically the whole of the avail- able defence force was swallowed up by the steady success of the invasion; on the western frontier two British towns were isolated

Bullet’s Arrival.

and besieged; and Boer commandos were on the point of in-

vading Cape Colony, where the Dutch population seemed on the verge of rebellion. The army corps was about to arrive, practically as a whole unit, in South Africa; but it was evident that the exigencies of the situation, and the widely divided areas of invasion, would at least defer the execution of the plan which had been formed for an invasion of the Orange Free State from Cape Colony. The first duty was to effect the relief of the British forces which had been rendered immobile, and another duty imposed by political circumstances was to relieve Kimberley (where Cecil Rhodes was), while the prospect of rebellion forbade the complete denudation of the central part of the colony. Thus Sir Redvers Buller had no choice but to disintegrate the army corps. Clery and some brigades were sent to Natal ; Gatacre with less than a brigade, instead of a division, was despatched to Queenstown, Cape Colony; while Lord Methuen, with a division, was sent off to relieve Kimberley. As November wore on, the situation did not improve. Cape Colony was invaded; while in Natal a flying column of Boers, pushing down from the Tugela, for a short time isolated the newly-arrived force under General (Sir) H. J. T. Hildyard, which opposed Joubert's advance on Pietermaritzburg at Estcourt. The situation in Natal seemed so serious that on the 22nd of November Sir Redvers Buller left Cape Town and sailed for Durban. In the meantime Lord Methuen had commenced his march to the relief of Kimberley. He encountered resistance at Belmont on the 23rd, but attack- ing resolutely he drove the Boers out of their strong Failures of positions. Two days later he won another action at Methuen Enslin. Still persevering he moved on to the Modder, andaatacre. where he was seriously opposed by De la Rey and P. A. Cronje, the latter having posted down from Mafeking with 2000 men and arrived on the previous night. The Boers, who held a river line, kept the British attack at bay all day, but eventually fell back, relinquishing the position after dark, as their right had been turned by General Pole-Carew's brigade. It was a long arid wearing fight, in which the British lost 485 killed and wounded, and what was more serious, Lord Methuen (himself wounded) found that his force had exhausted its forward momentum, and that he would have to collect supplies and reinforcements on the Modder before fighting his next battle. The extent of the operations and the gravity of the situation now began to be felt in England; every available man was called up from the reserves, and the war office made what at the time appeared to be adequate provision for the waste which it was seen would occur. On the 30th of November the mobilization of a sixth division was

ordered, offers of colonial aid were accepted, and every facility provided for local recruiting in the South African ports. Thus in the early days of December confidence was considerably restored. Buller was arranging for the relief of Ladysmith, which had already shown its spirit by two successful sorties against the besiegers' batteries. In every theatre the British strength was consolidating. But the full significance of the situation presented by these two small nations in arms had not yet been appreciated. The confidence restored by the lull during the early part of December was destined to be roughly shattered. On the 10th of December Gatacre essayed a night march and attack upon the enemy's position at Stormberg, and, misled by his guides in unknown ground, was himself surprised and forced to return with a loss of 719. On the following day Lord Methuen delivered an attack upon Cronje's position be- tween the Upper Modder river and the Kimberley road, a line of kopjes called Spytfontein and Magersfontein. In a night attack on Magersfontein hill the Highland brigade came under heavy fire while still in assembly formation, and lost its general, A.G. Wauchope, and 750 men, and in the battle by day which followed the other brigades were unable to retrieve the failure, the total losses amounting to about 950. But even this could be suffered with equanimity, since Buller was about to bring his own force into play, and Buller, it was confidently supposed, would not fail. He had collected at Chieveley in Natal a brigade of mounted men, four brigades of infantry and six batteries of artillery, and he carried with him the trust alike of the army and the nation.

On the 15th of December Buller made his effort and failed. Behind the Tugela at Colenso were Louis Botha's forces Butter's covering the siege of Ladysmith, and, imperfectly Failure. acquainted with the topography, Buller sent a Lord Roberts force to turn Botha's left, in conjunction with a sent out. f ronta i attack. But the flank attack became entangled in mass in a loop of the river and suffered heavily, and two batteries that formed part of the frontal attack came into action within a few hundred yards of unsuspected Boer trenches, with the result that ten guns were lost, as well as in all some 1100 men. Buller then gave up the fight. The full nature of the failure was not realized by the

British public, nor the spirit in which the general had received the finding of fortune. He lost heart, and actually suggested to White the surrender of Ladysmith, believing this to be inevitable and desiring to cover White's responsibility in that event with his own authority; but White replied that he did not propose to surrender, and the cabinet at home, aware of Buller's despondency, appointed Field Marshal Lord Roberts to the supreme command, with Major- General Lord Kitchener as his chief of staff. A wave of military enthusiasm arose throughout the empire, and as the formation of a seventh division practically drained the mother-country of trained men, a scheme for the employment of amateur soldiers was formulated, resulting in the despatch of Imperial Yeomanry and Volunteer contingents, which proved one of the most striking features of the South African campaign. Pending the arrival of Lord Roberts and reinforcements, the situation in South Africa remained at a deadlock: the three besieged towns — Maf eking, Kimberley and Ladysmith— still held their own, but no headway was made by the relief columns; all they could do was to stand on the defensive. The only bright spot, as far as the British were concerned, was to be found in northern Cape Colony, where General French, with two cavalry brigades and details, by his skilful tactics and wonderful activity kept at arm's length a superior force of the enemy in the vicinity of Colesberg, an achievement the more noteworthy since he had pitted against him both De la Rey and De Wet, two of the three men of military genius produced by the war on the Boer side. On the 6th of January the Boers in Natal made a desperate attempt to storm Ladysmith. The garrison, though already weakened by priva- tion and sickness, made a stubborn resistance, and after one of the fiercest engagements of the war, repulsed the attack at Caesar's Camp and Wagon Hill with severe loss to the enemy, itself having 500 casualties.

When Lord Roberts arrived in Cape Town on the 10th of January 1900 the three garrisons were still invested, and the relieving forces were still maintaining their role of passive resist- ance, while at the same time restraining the Dutch in Cape Colony. The commander-in-chief's first duty was to create a field army out of the tangle of units in Cape Colony. In the meantime, Sir Redvers Buller, who had been reinforced by Sir Charles Warren and the 5th division, essayed a second attempt to cross the Tugela, by turning the Boer left. But much time was consumed and the plan underwent several modifications before its execu- tion began in

earnest on the 16th of January. Warren was placed in command of the main body, which crossed the Tugela at Trichardt's Drift on the 17th and 18th. The mounted troops engaged a Boer force north-west of the point of passage, but were brought back to take part in a general right wheel of the forces of the Tugela, pivoting on Trichardt's Drift. But meantime the mobile enemy, whose original flank had been turned, had gathered at the new centre of gravity, and the upshot of several days' fighting was the retreat of the British. They had penetrated the enemy's right centre by the seizure of Spion Kop, but the force there became the target for the concentrated attacks of the Boers, and, after suffering heavily, was withdrawn (Jan. 24, 1900), with a loss of 1700 men.

By the 1st of February Lord Roberts had matured his plans and begun to prepare for their execution. On the 3rd of February he ordered a demonstration against the right of the Boer position at Spytfontein-Magersfontein to cover the withdrawal

Sploa Kop.

of General French and the cavalry from before Colesberg, and the concentration of his army at Modder River, disregarding another set-back in Natal to Sir Redvers Buller, who had against his advice made a third attempt to relieve Ladysmith on the 5th of February, and failed to make good the purchase which he secured across the Tugela (Vaal Krantz).

Lord Roberts's plan was first to concentrate to his left, taking every measure to induce the Boers to believe that the original scheme of invasion by the centre would now be re- sumed, and in this purpose he succeeded so well that Advance* his field army with the necessary transport for a cross-country march was assembled between the Orange and the Modder without serious mishap. Cronje at the new centre of gravity was not reinforced, all available Boers drawing down towards Colesberg. The concentration effected, Cronje still believed that the relief of Kimberley was the object of the gathering behind Modder River, and therefore held on to his Magersfontein kopje. The relief of Kimberley was indeed urgent, for dissensions between Rhodes and the military authori- ties had become acute. But to this part of the task only the cavalry division assembled under French was assigned. The army itself was to force Cronje into the open and then advance on Bloemfontein from the west. Roberts began his operations on the nth of February. French started from Ramdam (near Graspan) eastward on that day, intending to make a wide

sweep round Cronje's immobile army. Skirmishing with De Wet in the first stages of their ride, the cavalry brigades crossed the Modder at Klip Drift on the 13th. Cronje sent only detach- ments to oppose them, but these detachments were broken through by a sword-in-hand charge of the whole division, and Kimberley was relieved on the 15th. The infantry, meeting with great difficulties in its crossing of the Riet at Waterval owing to the country and its own unwieldy transport, followed 15 to 2 days later. But Cronje had now realized his danger, and slipped away westward behind French and in „ . . front of the leading infantry at Klip Drift. This was deflected by Kitchener westward to follow up the Boer rearguard, and after some delay the remainder of the infantry, at first fronting northwards, swerved westward likewise, while French from Kimberley, with such of his men as he could mount on serviceable horses, headed off Cronje in the north-west. The result, after one premature and costly assault on Cronje's lines had been made by Kitchener, was the surrender of 4000 Boers at Paardeberg with their leader on the 29th of February, the anniversary of Majuba. At the same moment came in news at last of the relief of Ladysmith.

It was part of Roberts's purpose to relieve the pressure in Natal by his own operations. Buller began his fourth advance on the 14th of February, and though this was checked the foothold gained was not abandoned, ladysmith. and a fifth and last attempt (Pieter's Hill) was successful. Ladysmith was relieved on the 28th of February. It had fared worst of all the beleaguered garrisons, and its 22,000 inhabitants were almost at their last gasp when relief came. The casualties from shell-fire had been few, but those from sickness were very heavy. Buller's operations, too, had cost at Colenso 1100 men, at Spion Kop 1700, at Vaalkrantz 400, and now in the last long-drawn effort 1600 more — over 5000 in all. But the tide of war had changed. The Natal invaders fell back to the mountains which enclose the north of the colony; Oliver and Schoeman retired from Cape Colony before the small forces of Gatacre and Clements; and the presidents of the republics, realizing that the British Empire was capable of more resistance than they had calculated upon, put forward feelers aiming at the restoration of the status quo before the war. These proposals were rejected by Lord Salisbury: there could be no end now but a complete destruction of the Boer power.

The surrender of Cronje and the relief of Ladysmith for the time being paralysed the Boer resistance. Two half-hearted attempts

were made on the 7th and 10th of March, at Poplar Grove and Driefontein, to stem Lord Roberts's advance upon

Bloemfontein, President Kruger himself arriving on the scene to give confidence to his burghers; but the demoralization was so great that neither the military genius of the few Capture of nor t jje personal influence of the president could fontein. bolster up an adequate resistance, and on the 13th

of March 1900 Lord Roberts's army marched into the Free State capital. This great move was persevered in and accomplished, in spite of the fact that at the very outset of the cross-country march (February 13) the great body of transport which had been collected at Ramdam had been cut off by De Wet (who had stayed on the Riet after French had shaken him off). It was therefore only made possible at all by reducing the rations of the fighting men to a minimum and by undertaking the risks of changing the line of communi- cation three times. Naturally and necessarily the capture of Bloemfontein was followed by a period of reaction. It was not until the 29th of March that the new railway communi- cation recommenced to feed the army. In the meantime rebellion had broken out in the Prieska district of Cape Colony, which was promptly quelled by Lord Kitchener. The halt at Bloemfontein was marked by the publication of proclamations, offering protection to the burghers, which, however, the invaders had not yet the power to fulfil. The enforced halt was unfor- tunate; it not only resulted in a bad outbreak of enteric, but it gave the Boers time to recuperate, and by the beginning of April they again took the initiative. The death of their commandant-general, Piet Joubert, on the 28th of March, seemed to mark a change in the fortunes of the Republican army. Christian De Wet, who had first come into prominence as the captor of Lord Roberts's convoy at Waterval, and was now operating east and south-west of Bloemfontein in order to counteract the influence of Roberts's numerous flying columns which rode hither and thither offering peace, added to his laurels by ambushing Broadwood's mounted brigade and horse artillery at Sannah's Post, just outside Bloemfontein, on the 31st of March. Four days later he reduced a detachment at Reddersburg, and then went

south and invested Colonel Dalgety and a mixed force at Wepener, which was relieved after ten days by General Hunter's Ladysmith division, brought round to Aliwal North from Natal. These successes, if they retarded Roberts's progress, at least enabled him to rearrange his forces in accordance with the new

situation at leisure, and to re-establish his trans- Mafekinz. P ort > ra ˆ anc ˆ wheeled, and on the 1st of May the

main army moved northwards upon the Transvaal capital. The main advance was taken with one cavalry and three infantry divisions (the cavalry commanded by French, and the infantry divisions by Generals Tucker, Pole- Carew and Ian Hamilton). Rundle's division took the right of the advance; Methuen and Hunter moving from Kimberley, formed the left. Kelly Kenny, Colvile and Chermside held the communications based on Bloemfontein. A flying column de- tached from Hunter, under Mahon, in conjunction with Colonel H. C. 0. Plumer's Rhodesian levies from the north, on the 17th of May relieved Mafeking, where Colonel (Lieut. -General Sir) R. S. S. Baden-Powell had throughout shown a bold front and by his unconventional gaiety as well as his military measures had held off the assault until the last. The same day the Natal Field Force under Buller moved up into the Biggarsberg and occupied Dundee. On the 10th of May Lord Roberts had crossed the Sand River; on the 12th of May he entered Kroonstad. After a halt of eight, days at Kroonstad, the main army again moved forward, and, meeting but small resistance, marched without a halt into Johannesburg, which was occupied on the 31st of May,

the Orange Free State having been formally annexed Pretoria? by proclamation three days earlier. On the 30th of

May President Kruger fled with the state archives, taking up his residence at Waterval Boven on the Komati Poort Kne. The gold mines were now securely in the possession of the British, and on the 5th of June Lord Roberts's army occupied the capital of the Transvaal practically without resistance, setting free about 3000 British prisoners of war detained there. It had been anticipated that the occupation of both the

capitals would have brought the hostilities to a close, but this was not the case, and though after the 5th of June regular re- sistance was at an end, the army of occupation had still to face two years of almost unprecedented par- Hm" tisan warfare. On

the 8th of June Sir Redvers Buller, who had made a long halt after the relief of Ladysmith and reorganized his army and its line of communication, forced his way over Alleman's Nek, and on the following day occupied Laing's Nek, the Natal gate to the Transvaal, while the field marshal fought a widespread battle against Botha, De la Rey and Kemp at Diamond Hill, 20 m. east of Pretoria. The object of this action was to push back the Boers from the neighbourhood of Pretoria, but no sooner was this done than the north-western Transvaal became active, in spite of Hunter's and Baden-Powell's advance from Mafeking through this district. As the British line of operations now extended eastward from Pretoria, the advance of these Boers to the Magaliesberg threatened their rearward communications, and as Buller had moved far more slowly than the main army there was not as yet an alternative line through Natal. Most serious of all was the pressure between Bloemfontein and the Vaal, where the Free Staters, under De Wet and other commanders, had initiated the guerrilla as soon as Botha and the Transvaalers retired over the Vaal and ceased to defend them by regular operations. Large forces had been left behind during the advance on Johannesburg for the protection of the railway and the conquered terri- ˆarender tory, and these were now reinforced from Kimberley and elsewhere as well as from detachments of the main army. These, under Sir Archibald Hunter and Sir Leslie Rundle, successfully herded Prinsloo with 4000 Free Staters into the Brandwater Basin (July 29) — a very satisfactory result, but one seriously marred by the escape of De Wet, who soon afterwards raided the Western Transvaal and again escaped between converging pursuers under Kitchener, Methuen, Smith- Dorrien, Ian Hamilton and Baden-Powell.

Before this Lord Roberts had initiated a movement from Pretoria to sweep down to Komati Poort on the Portuguese frontier, in which Buller, advancing across country from the south, was to co-operate. On the 26th to 27th of August the combined forces engaged and defeated Botha in the action of Belfast or Bergendal, with the result that the enemy dispersed into the bush-veld north of the Middelburg railway. On the 30th of August the remainder of the British prisoners were released at Nooitgedacht. On the 6th of September Buller, crossing the track of the main army at right angles, occupied Lydenburg in the bush-veld, and five days later the aged presiˆ dent of the republic took refuge in Lourenco Marques. On the 13th of September Barberton was occupied Kruger. by French, and on the 25th Komati Poort by Roberts's

infantry. From October the military operations were confined to attempts to reduce guerrilla commandos which had taken the field. Mr Kruger, deserting his countrymen, left for Europe in a Dutch man-of-war, and General Buller sailed for Europe. The Boer leaders definitely decided upon a guerrilla and a wearing policy, deliberately dispersed their field army, and then swelled and multiplied the innumerable local com- mandos. On the 25th of the month the ceremony of annexing the Transvaal was performed at Pretoria.

In November the prevailing opinion was that the war was over, and Lord Roberts, who had been appointed commander-in-chief at home, left South Africa, handing over the command to j™.. Lord Kitchener. Then followed a long period of groping KKcheaer for a means to cope with the development of guerrilla j!Jf* * _j tactics, which for the next six months were at their zenith. t-4 > mmana. The railway communications were constantly damaged, isolated posts and convoys captured, and the raiders always seemed able to avoid contact with the columns sent in pursuit. De Wet, after escaping from Brandwater Basin, was hunted north-westward, and crossed into the Transvaal, where, joining the local guerrilla bands, he surrounded an infantry brigade at Fredrikstad. But, j > a /«fs bs unable to reduce it, and threatened on all sides, he De jy e < f turned back. On the 6th of November he was severely handled and his guns and wagons captured at Bothaville. But this misadventure only stimulated him. His emissaries roused the Free Staters west of Bloemfontein, and disaffection broke out io

Botha's

Successes,

Cape Colony to an alarming degree, while, as forerunners of the promised Invasion, scattered bodies of Free Staters crossed the Orange River to swell the rebellion. From Bothaville De Wet made for Thaba Nchu, where the Bloemfontein garrison held a cordon of posts. These were traversed on the 16th of November and the raiders passed on to Bethulie capturing Dewetsdorp and

500 men en route. Pursued closely and finding the rivers in flood De Wet hid some of his men under Kritzinger near the Orange and himself doubled back, traversing again the line of posts east of Bloemfontein. Kritzinger, Hertzog and bodies of Cape rebels raided Cape Colony as soon as they were able to cross the Orange, and Hertzog penetrated so far that he exchanged shots on the Atlantic coast with a British warship. All that the British forces under Sir Charles Knox and others could do was to localize the raids and to prevent the spread of rebellion. So far, however, energy and vigilance made them successful. Botha meanwhile held his own in the northern Transvaal, both against forces from Pretoria, Middelburg and Lydenburg, and against the Rhodesian Field Force under Sir F. Carrington, which had been sent up from Beira (by arrangement with the Portuguese) to southern Rhodesia. At the close of 1900 the commandos under the direct influence of Louis Botha attacked the railway posts on the Middelburg railway and captured Helvetia. De la Rey operated in the western Trans- vaal, and in concert with Beyers, whose presence in this region was not known to the British, he inflicted a sharp reverse on General R. A. P. Clements at Nooitgedacht in the Hekpoort valley on the 13th of December. Beyers then slipped away to the east, crossing the line between Johannesburg and Pretoria with impunity. Lord Kitchener called for more men, and on the 22nd of December the war office announced that 30,000 more mounted men would be despatched to the seat of war.

With the opening of 1901 Lord Kitchener tried new schemes. He withdrew all his detached garrisons except in the most important Coaceotra- centres > an d set himself to make his railway communica- Uon Policy ti° ns perfectly secure. He determined to make the area of operations a waste, and instituted the concentra- tion camps, into which he intended to bring the whole of the non- combatant inhabitants of the two republics. He despatched French with a large force to clear the south-eastern districts of the Transvaal and for the rest maintained a force to watch De Wet, and organized a defence force in Cape Colony, while using the residue of his mounted men to sweep the country of stock, forage and inhabitants. Although there were no great disasters, the new policy was not prolific in success. The enemy invariably dispersed before superior forces, and the removal of the women and children from the farms did not have the effect of disheartening the burghers as had been anticipated — it rather mended their vitality by relieving them of responsibility for their

families' welfare. Nor were the Boer leaders destitute of comprehensive schemes. Botha arranged to penetrate Natal, De Wet to make a second attempt on the Colony, in connexion with Hertzog and Kritzinger. On the 10th of February De Wet, with five guns and 3000 men, carried out his promised invasion of Cape Colony. Passing the Bloemfontein-Thaba Nchu line a third time, he crossed the Orange to join Hertzog and rouse the Cape Dutch. But this invasion failed. By judicious use of the railway Kitchener concentrated sufficient troops in the colony to cope with the attempt, and, after being hunted for eighteen days, De Wet escaped back into the Orange River Colony with the loss of all his guns, munitions of war and half his force. In the northern Transvaal a force under Sir Bindon Blood cleared the country, but could not prevent Viljoen from escaping eastward to join Botha. Botha's activity in the south-east caused Kitchener to despatch a large force under French thither. This swept the country up to the Swaziland border. But Botha escaped. On the 3rd of March, after various raids and adven- tures in company with Smuts and Kemp, De la Rey, the lion of the western Transvaal, essayed an attack upon Lichtenburg, in which he was heavily repulsed. Signs of weakness were now apparent, and as a result Louis Botha, acting with the authority ot Schalk Burger, the representative of President Kruger, opened negotiations with Kitchener. A meeting took place at Middelburg, Transvaal, on the 28th of February. These negotiations, however, broke down mainly over the treatment to be awarded to Cape rebels.

The hostilities now entered upon a new phase. The establishment of a line of defensive posts between Bloemfontein and Ladybrand, Blockhouse tn . ou S n De Wet had three times traversed it, had given Policy. Kitchener an idea, and he resolved upon the scheme of

fencing in areas by chains of blockhouses such as those already constructed for the protection of the railways. In the meantime, while these posts were under construction, the harrying of the commandos by mobile columns was continued. In March Babington, pursuing De la Rey after the latter's Lichtenburg mis-adventure, captured three guns and six maxims near Ventersdorp. In April Plumer occupied Pietersburg, the last remaining seat of government open to the enemy. Rawlinson captured a laager and guns at Klerksdorp, and, though neither De Wet nor De la Rey had lieen brought to book, matters had so far improved in May that municipal government was given to Johannesburg, and a certain number of mines were allowed to

recommence working. Kemp was Vfeated by Dixon at Vlakfontein, after a desperate encounter, iune brought little of moment, though the Boers scored two minor

successes, Kritzinger capturing the village of Jamestown in Cape Colony, and Muller reducing a force of Victorians at Wilmansrust, south of Middelburg. In July there were further evidences of weak- ness on the part of the Boers, and Botha applied for permission to communicate with Kruger. This was allowed, but, as Kruger advised a continuance of the struggle, the slow course of the war continued. In the meantime, the concentration camps were becom- ing filled to overflowing, and a steady stream of captures and surrenders were reducing the hostile power of the republics.

In August a proclamation was promulgated formally threatening the Boer leaders who should not surrender with permanent banish- ment from South Africa, but this proclamation had very little effect. Smuts, with a small force from the Magaliesberg, traversed Orange River Colony and stimulated the Cape rebels afresh. But September showed some slight improvement in the situation in Cape Colony, where French was in supreme command. On the 5th Scobell captured Lotter, who was subsequently executed for murder: though this was balanced a few days later by Smuts's successful attack on the 17th Lancers at Tarkastad. In the south-eastern Transvaal Botha made a new effort to invade Natal, but, although he captured 300 men and three guns in an action on the 17th of September at Blood River Poort near Vryheid, his plans were rendered abortive by his failure to reduce the posts of Mount Prospect and Fort Itala in Zululand, which he attacked on the 26th, and he only escaped with difficulty from the converging columns sent against him. Desultory fighting continued till the close of the year, the balance of success being with the British, though on the 30th of October Botha, returning from the south-east towards Pretoria, defeated Colonel Benson's column at Bakenlaagte, Benson being killed. About the same time, the force in front of De la Rey and Kemp in the west being depleted to find the troops for larger operations, the Boers made a fierce surprise attack on Colonel Kekewich's column at Moedville, in which Kekewich was wounded and his troops hard pressed for a time. De la Rey next attacked part of Methuen's column near Zeerust, but was repulsed (Oct. 24). Affairs again took an unsatisfactory turn in Cape Colony, and on the 8th of October the whole colony was placed under martial law. In November an unsuccessful attempt

was made by several columns to run De Wet to earth in the Lindley district, whither, after his second raid on Cape Colony, he had returned. But in December matters improved. The reverse at Bakenlaagte was repaired by a force under Bruce Hamilton. This swept the south-eastern Transvaal as French had done, and with no better effect, for Botha escaped. But the British commander thereupon began a constant succession of night marches and raids which practi- cally blotted out the resistance in the eastern Transvaal. The corps of National Scouts (formed of burghers who had taken the oath of allegiance) was inaugurated and the Johannesburg stock exchange reopened. By the end of the year the blockhouse system was complete, but this phase of the war was destined to close badly as De Wet on Christmas Eve captured a large force of Yeomanry at Tweefontein, west of Harrismith.

With 1902 the last phase of this protracted struggle commenced. The blockhouse system was practically finished, and Kitchener determined upon a new means of harassing the enemy, who still had a total of about 25,000 men .. D ri Ves ..t in the field. But the blockhouses had already begun to serve the purpose for which they were designed. In the past the mobile columns, of which there were over sixty in the field, had always been bound to the railway for supply; now convoys could be pushed out to them along whatever blockhouse line they touched. In January Bruce Hamilton continued his successful night marches, and late in the month General Ben Viljoen was captured in the Leydenburg district. The only set-back was the descent which Beyers made upon Pietersburg, breaking ‘into the concentration camp and carrying off a number of able-bodied refugees. Early in February Lord Kitchener commenced his first drive, and it was so successful that it was evident that the key to the situation had been found. First the country east of the line Bloemfontein-Vereeniging was swept four times over, then the method was employed in the Transvaal, east and west, and finally against the Cape rebels. There were a few small reverses, of which De la Rey’s successful rush upon Paris’s column and capture of Lord Methuen was the most important, but when some initial mistakes in the composition of the driving lines, which robbed the earlier drives of part of their effect, were made good, the system worked like a machine. The Boers were at last convinced of the futility of any attempt to prolong the struggle, and on the 23rd of March the representatives of the Boer governments came into Pretoria. Six weeks were spent in negotiation, and then a meeting of

delegates, under the presidency of General Kemp, was held at Vereeniging.

As a result of this conference articles of peace were signed at Pretoria on the 31st of May, and the South African war was a Peace of history of the past. The terms of peace may be Vereeniging. condensed into the following points: (1) Surrender of all burghers in the field, with all arms and munitions of war; (2) all burghers duly declaring themselves subjects of King Edward VII. to be repatriated; (3) no burghers who should surrender to be deprived of either their liberty or property; (4) no proceedings to be taken against burghers for any legitimate acts of war during the period of hostilities; (5) the Dutch language to be taught in public schools on the request cf parents, and to be allowed in courts of law;

(6) sporting rifles to be allowed upon the taking out of licences;

(7) the military administration to be superseded by civil administration as soon as possible, the civil administration to lead up to self-government; (8) the question of the native franchise not to be considered until after the introduction of self-government; (9) landed property not to be subjected to any special tax to defray the cost of the war; (10) a commission to be formed to facilitate the repatriation of the burghers, a grant of £3,000,000 being given as compensation for the destruction of farms.

In the whole war the British lost 5774 killed and 22,829 wounded, while the Boers lost about 4000 killed. The number of Boer prisoners in the hands of the British at the end of the war was about 40,000. (L.J.*; C.F.A.)

F. From the Annexation to 1911. — On the 4th of July 1900, a month after the occupation of Pretoria, a commission was issued to Lord Roberts authorizing him to annex the Transvaal. The proclamation of annexation was dated the 1st of September. Lord Roberts held the post of administrator of the colony until his departure for England in December following, when he was succeeded by Sir Alfred Milner, the high commissioner. It was not, however, until March 1901 that Milner, who resigned his

governorship of Cape Colony, arrived at Pretoria to in- augurate a civil administration. 1 Hostilities were still pro- ceeding, but in the areas under control Lord Milner (who was raised to the peerage in May) speedily set the machinery of government in motion. The civil administration of justice began in April; in October a reformed judicial system, with Sir J. Rose Innes as chief justice, was put into operation; in 1902 this was followed by the establishment of a supreme court. Besides law, the important departments of finance and mines were organized, and steps taken to remedy the grievances of the commercial and mining classes. ‘ Sir David Barbour, who had presided over a commission to inquire into the concessions granted by the late republic, presented a valuable report in June, and suggested a tax of 10 % on the profits of the gold mining industry, a suggestion carried out a year later (June 1902). Meantime Johannesburg had been given a town council, and some of the gold mines permitted to restart crushing (May 1901). In November of 1901 the main body of the Uitlanders were allowed to return to the Rand. TheWorkof They had fled the country immediately before Recoastruc- the outbreak of war and had been living at the <*"*• seaports. While thus caring for the urban areas

the administration was equally alive to the needs of the country districts. A commission which had been appointed to inquire into schemes of land settlement reported in June, and this was followed by the creation of a land board in December 1901. Lord Milner cherished the ideal of racial fusion by the establish- ment of British settlers on a large scale. He also recognized the necessity, if agriculture was to be developed, of an extensive system of irrigation, and Sir William Willcocks, formerly of the Egyptian Irrigation Department, was engaged to draw up a com- prehensive scheme, having in view also the needs of the gold mines. Another department taken in hand was that of education; and the success. which attended the opening of schools in the refugee camps was most striking. At the time the articles of peace were signed at Pretoria, more than 17,000 Boer children were

1 Milner became at the same time administrator of Orange River Colony. Several of the reforms adopted for the Transvaal applied to or affected the sister colony. (See Orange Free State.)

being educated in these camps under the supervision 01 Mr E. B. Sargant.

This work of reconstruction was carried out in face of many difficulties other than those inherent to the undertaking. More than one plot on the part of Boers who had taken the oath of allegiance was hatched in Johannesburg, the most serious, perhaps, being that of Brocksma, formerly third public prosecutor under the republic. On the 15th of September 1901 Brocksma and several others were arrested as spies and conspirators. Letters to Dr Leyds and to Dr Krause of a treason- able character were found in Brocksma's possession, and being found guilty of high treason he was shot (30th of September). Krause, who was then in London, was arrested, tried and convicted for attempting to incite to murder, and sentenced to imprisonment. In November another conspiracy, to seize Johannesburg with the help of General De la Rey,was discovered and frustrated. More injurious than plots of this nature was the political agitation carried on in Cape Colony and in Great Britain. This agitation was directed with particular virulence against the high commissioner, whose recall, it was asserted, would remove the chief obstacle to peace. Mr J. X. Merriman and Mr J. W. Sauer came to England in the summer of 1901 on a mission from the Cape Africanders, and received much encouragement from Radical politicians. Nevertheless, much had been done to establish order and restart commerce by the time peace was made.

After the signature of the articles of peace the work of reconstruction was accelerated. The end of the military government was signalled by the assumption (on the 21st of June) by Lord Milner of the title of governor of the Transvaal and by the creation of an executive council. The Boer leaders unreservedly accepted British sovereignty. Generals Botha, De Wet and De la Rey, however, paid a visit to England (August-September, 1902) in an unsuccessful endeavour to get the terms of peace modified in their favour; they received little encouragement from a tour they made on the continent of Europe. On their return to South Africa the Boer generals and their colleagues aided to some extent in the work of resettlement, but the seats offered to the Boers on the executive council were declined. The work of repatriation and resettlement was carried out by commissioners acting in conjunction with a central advisory committee at Pretoria. These supplied the people with food, shelter, stock and implements. The burgher and native con- centration camps were rapidly broken up; by December 1902 only 7600 out of 70,000 were left in the burgher camps.

At this period Mr Chamberlain determined to visit South Africa and use his personal influence to help forward the settle- ment of the country. After the almost total cessation of commerce during the war, there was in the last half of 1902 and the beginning of 1903 a great impetus to trade. When Mr Chamberlain reached the Transvaal in January 1903 the feeling among the British section of the community was optimistic. Mr Chamberlain was well received by the Boer leaders; it was, however, to the Rand magnates that he turned for financial help. That large sums were imperatively needed to accomplish the work of reconstruction was apparent. An agreement was reached whereby a loan of £35,000,000, guaranteed by the imperial government, was to be raised for the benefit of the Transvaal and the Orange River Colony; a further loan of £30,000,000 was to be issued in instalments of £10,000,000 and paid into the British exchequer as the Transvaal's contribution towards the cost of the war. The first instalment of this loan, to be issued in 1904, was guaranteed by the great mining firms of Johannesburg. With the proceeds of the first loan the debt of the South African Republic was paid off, the Transvaal and the Orange River Colony railways were bought by the state, and new railways and other public works were undertaken. The £3,000,000 granted by the articles of peace, and other consider- able sums, besides £7,000,000 from the loan, were expended on repatriation and compensation.

The efforts made by the administration to restore the Boers to the land, to develop the material resources of the country,

and to remove all barriers to the intellectual and moral develop- ment of the people, were soon, however, hampered by severe Economic commercial depression. One of the least results of Depression this depression was that the second war loan and Chinese arranged by Mr Chamberlain was never issued, Labour. Great Britain finally (in 1906) abandoning all her claims. The commercial depression was due to many causes; of these the most apparent was the shortage of labour at the Rand mines. When work restarted after the war, the mine owners offered the Kaffir workmen little more than half the wages paid in 1898; but this effort at economy was abandoned, and the old rates of pay

were restored in January 1903. Nevertheless, the labour available continued to be very much below the needs of the mines. The consequent small gold output meant a serious decrease of revenue, which was not compensated for by the heavy tax levied on the output of the Premier diamond mine, where operations began in 1903. Finally, to enable them to work their mines to their full capacity, the Rand houses asked for leave to import Chinese labourers. 1 Milner, anxious above everything else to obtain sufficient revenue to carry on his work of reconstruction, gave his consent to the experiment. The home government concurred, and during 1904-1906 over 50,000 Chinese were brought to the Rand on three-years' in- dentures. The objections to the introduction of the Chinese, urged in South Africa, in Great Britain and in other parts of the British Empire, are discussed under South Africa: History, § D.; here it need only be added that in the Transvaal the point upon which all parties were agreed was that no new racial or economic complications should be permitted; and these were guarded against by the restriction of the coolies to unskilled labour in the gold mines and by their compulsory repatriation. By the introduction of the Chinese the gold output from the mines was greatly increased, with the result that the Transvaal suffered less than any other part of South Africa from the restriction of commerce, which lasted for several years.

The discussions in the legislative council on the Chinese coolie question had been accompanied by a demand on the part of the Boers that such an important step should not be taken " without the constitutional approval of the white people of the Trans- vaal"; and after the importation of the coolies had begun, the agitation for the grant of representative institutions grew in volume. The British government was also of opinion that the time was near for the setting up of such institutions, and the pending grant of a constitution to the Transvaal was announced in parliament in July 1904. Meantime the existing (nominated) legislative council was dealing with another and a vital phase of the Asiatic question. There were in the Transvaal some 10,000 British Indians, whose right to " enter, travel or reside " in the country was secured by the London convention of 1884. Under republican rule these Indians — who were mainly small shopkeepers, but included some professional men of high stand- ing — had suffered many restrictions, and their cause had been Position of espoused by the British government. Nevertheless, British under British rule their situation was in no way

Indians. improved, and a determination was shown by the European inhabitants of the Transvaal further to restrict their privileges and at the same time to stop the immigration of other Indians. In this matter the Boer and British sections of the community were in agreement, and they had the support of the Transvaal government and of the other South African colonies. The problem was both economic and racial, and on both grounds South Africans showed a determination to exclude the competition of Indians and other Asiatics. Mr Alfred Lyttelton (who had succeeded Mr Chamberlain as secretary of state for the colonies) endeavoured to meet the wishes of the Transvaal by sanctioning legislation which would greatly restrict the immigration of Indians, but he would allow

1 A careful summary of the facts regarding the shortage of labour and of the economic situation in the Transvaal at that time, together with the debates in the legislative council, will be found in The Annual Register for 1903, from the pen of Mr H. Whates.

no tampering with the rights of Indians already in the colony. In 1907 the royal assent was given to bills restricting the immigration of Asiatics and providing for the registration of all Asiatics in the country.

In accordance with the promise made in 1904 a constitution for the Transvaal on representative lines was promulgated by letters patent on the 31st of March 1905; but there seif-aovern* was already an agitation for the immediate grant ment—the of full self-government, and on the accession to Botha office of the Campbell-Bannerman administration s ry ‘ in December 1905 it was decided to accede to it. New letters patent 2 were issued (December 12, 1906), and the first general election (February 1907) resulted in the return of a majority belonging to Hit Volk, a Boer organization formed for political purposes. (See further, South Africa: History, § D.) Sir Richard Solomon, 3 it was thought, might have formed a coalition cabinet, but he. was among the defeated candidates. Lord Selborne, who had during 1905 succeeded Lord Milner as high commissioner and governor of the Transvaal, en- trusted General Botha with the formation of a ministry. Botha chose as his colleagues Messrs J. C. Smuts (colonial secretary), Jacob de Villiers (attorney-general), H. C. Hull (colonial trea- surer), J. F. B. Rissik (minister “of lands and native affairs) and E. P. Solomon (minister of public works). These were all men of progressive, in some respects democratic, views, and in thus forming his cabinet General Botha showed his

determination not to be dominated by the ” back veld ” Boers. Botha was strengthened in his attitude by the firm action of the Progressive {i.e. the ex-Uitlander) party, which secured 21 seats (out of a total of 69) in the legislative chamber, entirely in the Rand and Pretoria districts, and was led by Sir George Farrar and Sir Percy Fitzpatrick. 4 The government, which obtained an imperial guarantee for a loan of £5,000,000, announced that while there would be no wholesale repatriation of Chinese, the labour ordinance under which they were recruited would not be renewed, and by February 1910 all the Chinese coolies had returned home. At the same time successful efforts were made by the ministry to increase the supply of Kaffir labour for the mines. In the re-establishment of the field cornets and in other directions a return was made to the republican forms of administration, and on the education question an agreement satisfactory to both the British and Dutch-speaking com- munities was reached. Ample facilities were given for the teaching of Dutch, but it was provided that no pupil should be promoted to a higher standard unless he (or she) was making satisfactory progress in the knowledge of English.

One of the first problems which confronted the Botha ministry was the attitude to be adopted towards the other British colonies in South Africa. Lord Milner, by the creation of an inter-colonial board — which administered the Movement. railways of the Transvaal and Orange River Colony and controlled the constabulary of both colonies — and in other ways (e.g. the inclusion of the Transvaal in the South Africa customs union), had endeavoured to pave the way for federation. Mr Chamberlain when in South Africa in 1903 had also put forward federation as the desired goal. The existence of the inter-colonial council hampered, however, the freedom of the Transvaal government, and steps were taken to determine it.

2 The letters patent provided, as to the Chinese coolies, that no further licences be issued for the introduction of indentured labour, and that none of the contracts be renewed.

3 Sir Richard Solomon (b. 1850) was attorney-general of Cape Colony 1898-1900, attorney-general of the Transvaal 1902, and acting lieutenant-governor of the Transvaal 1905. He resigned office to contest a seat for the Transvaal parliament. Subsequently he was agent-general for the Transvaal in London, and (1910) agent- general for the Union of South Africa.

4 Sir George Herbert Farrar (b. 1859) was a son of Charles Farrar, M.D., of Chatteris, England, and was a member of the Johannesburg Reform committee at the time of the Jameson Raid. He served in the war of 1899-1902, and was knighted in the last-named year. Sir James Percy Fitzpatrick (b. 1862) was a native of Cape Colony. He went to the Transvaal in 1884 and became honorary secretary to the Johannesburg Reform committee. He was the author of The Transvaal from Within; Jock of the Bushveld, &c.

Nevertheless, on economic as well as political grounds, the leaders of both parties in the Transvaal were prepared to consider favourably the proposals put forward by Dr Jameson at the close of 1906 for a closer union of all the self-governing colonies, and the first direct step to that end was taken at an inter-colonial conference held in May 1908. The history of this movement, which resulted in the establishment of the Union of South Africa on the 31st of May 1910, is given under South Africa: History, § D. Apart from this movement the most notable events in the Transvaal at this period were the development of agriculture, 1 the gradual revival of trade (the output of the gold mines in 1909 totalled £30,925,000, and at the end of the year 156,000 native labourers were employed), and the con- tinued difficulty with regard to British Indians. Ministers declared their determination to keep the Transvaal a white man's country. With the example of Natal before them as a warning, it was (they argued) to the whites a question of life and death, and unless registration were enforced they could not prevent the surreptitious entry of new-comers. Attempts at compromise made in 1908 ended in failure. For failing to register Mr M. V. Gandhi and other leaders were imprisoned; and large numbers of Indians were deported. Notwithstanding the remonstrances of the Indian government, the imperial authorities could not effectively intervene; a self-governing colony (in which whites alone possessed the franchise) must be allowed to take its own course. By the end of 1909 it was stated that 8000 Indians — most of whom claimed the right of domicile — had been compelled to leave the country, while 2500 had been imprisoned for failure to comply with the Registration Act. The establishment of the Union of South Africa removed from the competence of the Transvaal provincial council all legislation specially or differentially

affecting Asiatics. There- upon the Union ministry was urged by the British govern- ment to effect a permanent settlement acceptable to all parties. The ministry replied (July 23, 1910) that whatever policy might be adopted regarding Indians legitimately resident in South Africa, unrestricted Indian immigration into the Trans- vaal would not be permitted (see Blue-book Cd. 5363).

When the Union was established General Botha became prime minister, two of his colleagues, Messrs Smuts and Hull, also joining the Union ministry. A fourth minister — Mr Rissik — was appointed first administrator of the Transvaal province, while a fifth minister, Mr E. P. Solomon, became a senator of the Union parliament. The elections to the Union House of Assembly, held in September, were notable as showing the strength of the Progressive (or Unionist) party. General Botha was defeated at Pretoria East by Sir Percy Fitzpatrick, and at Georgetown — a Rand constituency — Mr Hull was beaten by Sir George Farrar. Both ministers, however, subsequently secured seats elsewhere.

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(F. R. C.)

TRANSVERSE RIB (Fr. arc doubleau), the term in archi- tecture given to the rib of a vault which is carried across the nave, dividing the same into bays. Although as a rule it was sunk in the barrel vault of the Thermae, it is found occasionally below it, as in the Piscina at Baiae and the so-called Baths of Diana (Nymphaeum) at Nimes. In the Romanesque and Gothic styles it becomes the principal feature of the vault, so much so that Scott termed it the master rib (see Vault).

TRANSYLVANIA 2 (Lat. Transsihania; Ger. Siebenburgen; Hung. Erdely; Rumanian, Ardeal), a former principality (Grossfiirstentum) occupying the extreme eastern portion of the kingdom of Hungary. It is bounded by Hungary proper on the W. and N., by Bukovina on the N.E. and by Rumania on the E. and S., and has an area of about 21,000 sq. m.

Transylvania has the form of an irregular circle, and is a high plateau of a mean altitude of 1000-1600 ft. above sea-level, sur- rounded on all sides by mountains. These are known under the general name of Transylvanian Mountains (q.v.), which are the south- eastern continuation of the Carpathian system, and fill the interior of the country with their ramifications. On the west or Hungarian side there are comparatively easy passes into the interior, but on the east and south frontiers the lofty mountains give Transylvania the aspect of a huge natural fortress. Among the highest peaks are Negoi (8345 ft.), Bucsecs (8230 ft.), Pietrosu (7544 ft.) and Konigstein (7352 ft.). There are numerous valleys, ravines and canons in the network of mountains covering the interior of the country . The principal plains are: in the valley of the Szamos near Des and Besztercze (Bistritz) ; in the middle course of the Maros the beautiful Hatszeg valley; the

fertile Cibin valley around Nagy-Szeben; the valley of the Aluta near Csik-Szereda, and the one extending from Reps to the Roteturm pass; and lastly the beautiful and fertile Burzenland in the vicinity of Brasso. The altitude of the valleys generally increases towards the east of Tran- sylvania, the lowest depression being found in the western part of the Maros valley. Almost in the centre of the country lies a fertile plain about 60 m. in length and 50 m. in breadth, called Mezoseg or

2 The Latin name appears first after the 12th century, and signifies “beyond the woods,” i.e. from Hungary; the Hungarian and Rumanian name both mean ” forest land.” The German name is usually derived from the seven principal fortified towns or ” burgs,” founded by the German colonists, though some authorities prefer to connect it with the Cibin Mountains on the south frontier.

the Transylvania plain. The principal rivers of Transylvania, which are either tributaries of the Theiss, or flow direct into the Danube, are: the Maros, which rises in the mountains forming the eastern wall of Transylvania, and taxing first a northern course flows through the country from east to west ; its principal affluents are the Gorgeny, the Great and Little Kokel or Nagy and Kis Kukullo, the Strell (Sztrigi) and the Cserna on the left, and on the right the Ampoly and the Aranyos, which is rich in auriferous sediments. The Aluta (Alt or Olt) rises not far from the Maros, but takes a southerly direction and pierces the Carpathians at the Roteturm pass, to enter Rumania ; its principal tributaries in Transylvania are the Vargyas, the Homorod, the Cibin and the Burzen. The Szamos, formed by the junction of the Great (Nagy) and Little (Kis) Szamos, whose principal affluent is the Bistritz; the Zsil or Jiul; and the White and the Swift Koros are the other principal rivers. The largest lake of Transylvania is the Czeger or Hodosser See, 13 m. long, situated near Szamos-Ujvar, while a great number of small but beautiful mountain lakes are found. The climate of Transylvania is healthy; hot summers alternate with very cold winters, but the rainfall is not great. Transylvania abounds in mineral springs of all kinds, especially saline and chalybeate, the principal ones being found at Borszek, Elopatak, Homorod, Rodna, Tusnad and Zaizon.

The principal occupations of the inhabitants are agriculture, cattle-rearing and mining. Of the total area of Transylvania 22-6% is arable land; 16-5% meadows and gardens; 9-5% pastures and C‘5% vineyards; while 37-3% is covered by forests and 13-5% is unproductive soil. The vegetation of Transylvania is luxuriant, except of course in the higher mountain zones. Fruits abound, as apples, pears, peaches, apricots, plums, cherries, chestnuts and almonds; mulberries are also cultivated. The vine flourishes best in the valley of the Maros. The chief crop is maize; but wheat, rye and other grains, potatoes, saffron, hemp, flax and tobacco are also grown. On the boundary mountains the trees are mainly coniferous; in the interior oaks, elms, beeches and ashes are conspicuous.

Bears, wolves, foxes, boars and various varieties of game are found, and on some of the mountains the chamois. There is abundant pasturage on which excellent cattle are reared; and in some districts buffaloes are bred for draught purposes. More important is the breeding of a sturdy race of horses, thousands of which are annually exported. The mountains maintain large flocks of sheep, of which two kinds are distinguished — with a fine short-stapled and a coarse long-stapled wool respectively. Silkworms are bred, and some silk is spun; and the export of honey and wax is not inconsiderable. Transylvania possesses the richest gold mines in Europe, and this metal is also “washed” in some of the streams, chiefly by gipsies. The gold is often found in conjunction with tellurium (first discovered in Transylvania in 1782) and is extracted principally at Nagyag, Kapnik-Banya, Zalatna and Vorospatak. In 1900 the value of the gold extracted was £300,000. Silver, copper, lead and iron are worked to some profit, while arsenic, alum, graphite, marble, porcelain, precious and building stones are also found. Coal is mined in the valley of the Zsil, but the abundance of timber has retarded its exploitation. Some of the saline springs yield salt enough to render their evaporation profitable. The principal places where salt is extracted are at Maros-Ujvar, D6s- Akna, Kolozs, Torda and Vizakna. In 1900 the value of the mineral products, except salt, was £1,000,000.

The industry of Transylvania, although not very developed, made some progress during the last quarter of the 19th century, and is mostly in the hands of the ” Saxons.” The principal branches are brewing, distilling, flour-milling, sugar, leather, paper, petroleum- refineries, cloth and earthenwares. The production of linen from flax and hemp is a home industry throughout

Transylvania. The commerce is fairly active, and is mainly in cattle, dairy products, wood and wooden articles, and petroleum.

The population in 1900 numbered 2,456,838. Until 1848 the chief influence and privileges, as well as the only political rights, were divided among the three ” privileged nations ” of the Hungarians, Szeklers and Saxons. The first are the descendants of the Magyar conquerors. The Szeklers are of disputed origin, but closely akin to the Magyars (see Szeklers). The Saxons are the posterity of the German immi- grants brought by King Geza II. (1141-1161) from Flanders and the lower Rhine to cultivate and repeople his desolated territories. At first these were known as Teutones, Teutonici Hospites and Flandrenses, but since the beginning of the 13th century the general name of ” Saxons,” as tantamount to ” Ger- mans,” has prevailed. They are generally the most advanced section of the population. Their literary language is High German, but their spoken language is more of the Low German character. The Hungarians and Szeklers together number 814,994, and the Saxons 233,019, but by far the most numerous element, though long excluded from power and political equality, is formed by the Rumanians, 1,397,282 in number, who are

spread all over the country. The gipsies of Transylvania, who are heard of under a voivode or prince of their own in 141 7, are estimated at 50,000 ; many of them have taken to agriculture or gold-washing. Jews, Armenians, Bulgarians, Ruthenians and Greeks are also represented in the medley of peoples. The Magyars are mostly Roman Catholics or Unitarians, the Germans Protestants, and the Rumanians adherents of the Greek Church ‘ Transylvania, which was completely incorporated with Hun- gary in 1868, forms since 1876 one of the seven large adminis- trative divisions into which Hungary was divided in that year. It was subdivided into fifteen countries, and contains the following principal towns: Kolozsvar, Brasso, Nagy- Szeben, Maros-Vasarhely, Besztercze, Fogaras, Torda, Segesvar, Gyula-Fehervar, Des, Szamos-Ujvar.

History. — Transylvania formed part of the Roman province of Dacia. After the withdrawal of the Romans the country became for centuries the prey of the various peoples who swept across it in their restless migrations. At the beginning of the 1 ith century (1004) Stephen I. of Hungary made himself master of the land, which was thenceforward governed as a Hungarian province by a voivode. As mentioned above, King Geza II. introduced German

colonists, who founded Nagy-Szeben (Her- mannstadt), and in 1211 King Andreas II. called in the German Teutonic orders, who settled in the Burzenland. These German colonists were granted special privileges, and founded many of the Transylvanian towns. As by the death of King Louis II. in 1526 the Hungarian crown fell to the house of Austria, the voivode John Zapolya succeeded in rendering him- self independent. He and his successors, who were generally elected by the people, were supported by the Turks against the House of Austria, while the difficult nature of their country pre- served them on the other hand from becoming too dependent on their powerful allies. After the defeat of the Turks at Vienna in 1683, their influence in Transylvania waned, and in 1699, by the peace of Carlowitz, the Porte acknowledged the suzerainty of Leopold I. of Austria over Transylvania. By the Leo- poldine diploma of 1691 Leopold had guaranteed the ancient rights and laws of the land, and united it formally with the Hungarian crown. In 1765 Maria Theresa made it a grand principality (Grossftirstentum). The efforts of the Rumanian inhabitants to secure recognition as a fourth " nation," and the opposition of the non-Magyar population to a closer union with Hungary, led to troubles early in the 19th century, culminating in 1848. In 1849 Transylvania was divided from Hungary by an imperial decree, and became an Austrian crown-land; but in i860 Transylvania became an autonomous province, with a – separate Diet, and a high executive power of its own. The Diet assembled in Nagy-Szeben in 1863 decreed the complete separa- tion from Hungary, the union with Austria, and the recognition of the Rumanians as the "fourth nation." But the Hungarian government did not recognize this Diet, and the Diet assembled at Kolozsvar in 1865, in which the Hungarians had the majority, decreed again the union with Hungary. By the compromise of 1867 Austria granted the union of Transylvania with Hungary, which was completed in 1868. Transylvania lost every vestige of autonomy, and was fully and completely incorporated with Hungary. Since that time the Magyarization of the principality has steadily been carried through, in spite of the bitter protests and discontent of both the Saxons and Rumanians. A Hungarian university was founded at Kolozsvar in 1872; and Hungarian is recognized as the official language.

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1899).

TRANSYLVANIAN MOUNTAINS, the general name of the mountain system which surrounds the Transylvanian highland or plateau on all four sides, and forms the south-eastern and southern continuation of the Carpathian system (q.v.). At the mouths of the Viso and the Golden Bistritza. where thf.

Eastern or Wooded Carpathians end, the range of mountains divides and sends ramifications in two directions, to the south and to the west. These chains which enclose Transylvania, giving it the general aspect of a great natural fortress, are the most eastern offshoots of the mountain system of central Europe, and guard the approach from the east to the great Hungarian plain. They slope gently towards the interior of Transylvania, but rather abruptly towards Rumania, and while the western wall possesses several large and easy passes, the eastern and southern walls are much more difficult to cross.

The eastern wall of the Transylvania quadrilateral is composed of two parallel ranges of mountains divided by the valleys of the Maros and Aluta. The outer range is composed of the following groups: the Gyergyo Mountains (including the Kelemen range) with the highest peaks Kelemenhavas (6600 ft.) and Pietrosul (6908 ft) ; the Csik Mountains with the highest peaks Nagy-Hagymas (5900 ft.) and the volcanic Bildos (3300 ft.) ; and the Bereczk Moun- tains with the highest peak Lakocza (5830 ft.). The inner range is composed of the following groups: the Gorgeny Mountains with the highest peak Mezohavas (5826 ft.) ; the Hargitta Mountains with the highest peak Hargitta (5900 ft.) ; and the Barota Mountains with the highest peak Kukukhegy (5120 ft.). Near the mouths of the Maros and the Aluta are situated the celebrated Gyorgyo valley, one of the most beautiful in the whole Transylvania, and the famous Borsz6k valley with its mineral springs.

The southern wall of the Transylvanian highland is occupied by

the Transylvanian Alps. They have a length of 230 m., and are the highest and wildest mountain range of the whole Transylvanian system, resembling the High Tatra in their bold and high peaks, their beautiful scenery, and their flora. The Transylvanian Alps rise to an altitude of 7200 ft. above the level of the Danubian (Rumanian) plain, and are divided into a considerable number of groups. From east to west these groups are: the Bodza Mountains with the highest peak Csukas (Ciucas, 6424 ft.) ; the Burzenland Mountains with the beautiful peaks of Bucsecs (8230 ft.), Konig- stein (7352 ft.) and Schuler (5910 ft.) ; the high Forgaras group, extending to the Roteturm pass, and containing Negoi (8345 ft.), the highest peak in the Transylvanian mountains, Butyan (8230 ft.) and Surul (7482 ft.). West of the Roteturm pass the Transylvanian Alps are also known under the name of the Hatszeg Mountains, and consist of the following groups: the Cibin Mountains with the highest peak Cindrel (7366 ft.) ; the Paringul Mountains with the highest peak Mandra (8260 ft.) ; the Vulkan Mountains, and the Hatszeg Mountains proper with the beautiful peak Retiezat (8125 ft.). The south-western part of the Transylvanian Alps is formed by the Cserna or Ruszka Mountains with the highest peak Verfu Petri (8140 ft.) whose offshoots, of a mean altitude of 3200-4700, known as the Banat Mountains, fill the Banat. The southern part of the Cserna Mountains, known as the Stretinye Mountains, extend to the Danube, and together with the Miroch Mountains, on the right side of the Danube, and belonging, therefore, to the Bafkan system, form the famous gorge of the Iron Gate near Orsova.

The western and northern wall of the Transylvanian quadrilateral do not present the character of an uninterrupted chain of mountains, but possess many low and easy passes towards the Hungarian plain. Going from south to north the principal groups are: the Transylvanian Ore Mountains with the basaltic mass of the Detunata (3768 ft.) near Abrudbanya; the Bihar Mountains, with romantic scenery and numerous caverns, with the highest peak the Cucurbeta (6045 ft.) ; to the east of this group are the Aranyos Mountains with the highest peak, the Muntelui Mare (5970 ft.), to the south-west of Kolozsvar; then come the Meszes group and the Kraszna Moun- tains. The northern wall is formed by the Lapos Mountains with the highest peak Ciblesiu (6020 ft.), and the Rodna Mountains with the highest peaks Muncsel (5835 ft.), Pietrosu (7544 ft.) and Ineu (7484 ft.). . ., .

Inside this mountainous quadrilateral lies the Transylvanian highland or plateau, which has a mean elevation of 1000-1600 ft. It is improperly called a plateau, for it does not possess anywhere extensive plains, but is formed of a network of valleys of various size:;, ravines and canons, united together by numerous small moun- tain ranges, which usually attain a height of 500-800 ft. above the altitude of the valley.

In the Transylvanian Mountains the principal passes are: the Rodna, the Borgo, the Tolgyes and the B6kas. Then come the Gyimes, the Uz and Oitoz, the Bodza or Buzeu, the Tomos or Predeal pass, crossed by the railway from Brasso to Bucharest, the famous Roteturm pass (1115 ft.) through the narrow gorge of the Aluta, crossed by the railway from Nagy-Szeben to Bucharest, the Vulkan, the Teregova pass, and the Iron Gate pass, both crossed by the railway from Temesvar to Craiova. All those passes lead from Transylvania into Rumania. From Transylvania into Hungary are the Banffy-Hunyad pass, crossed by the railway from Nagy- Varad to Kolozsvar, and the defile of the Maros crossed by the railway from Arad to Broos. In the interior of Transylvania are the Szent-Domokos pass near Csik-Szereda leading from the valley

of the Aluta to that of the Maros (near their respective mouths) and the pass of Csik-Szereda over the Hargitta Mountains.

TRAP (0. Eng. treppe or traeppe, properly a step, as that or which an animal places its foot and is caught, cf. Ger. Treppe flight of stairs), a mechanical device for the snaring or catching anything, and especially wild animals. Traps for animals are of great antiquity, and no savage people has ever been discovered, whatever its culture scale, that did not possess some variety of snare. In the most primitive form of trap no mechanism need be present, e.g. a cavity into which the animal walks, as the pitfall of the Arabs and Africans or the snow-hole of the Eskimos. Dr 0. T. Mason has divided traps into three classes: enclosing traps, which imprison the victim without injury; arresting traps, which seize the victim without killing it, unless it be caught by the neck or round the lungs; and killing traps, which crush, pierce or cut to death.

Enclosing traps include the pen, cage, pit and door-traps. Pen-traps are represented by the fences built in Africa into which ante- lopes and other animals are driven; and by fish-seines and pound- nets. Among cage-traps may be mentioned bird-cones

filled with corn and smeared with bird-lime, which adhere to the bird's head, blinding it and rendering its capture easy; the fish-trap and lobster-pot; and the coop-traps, of which the turkey-trap is an example. This consists of a roofed ditch ending in a cul-de-sac into which the bird is led by a row of corn-kernels. Over the further end a kind of coop is built ; the bird, instead of endeavouring to retrace its steps, always seeks to escape upward and remains cooped. Pitfalls include not only those dug in the earth, at the bottom of which knives and spears are often fixed, but also several kinds of traps for small animals. One of these consists of a box near the top of which a platform is hung, in such a way that, when the animal leaps upon it to secure the bait, it is precipitated into the bottom of the box, while the platform swings back into place. Another kind of pitfall is formed of a sort of funnel of long poles, into which birds fall upon alighting on a perfectly balanced bar, to which a dish of corn is made fast. The door-traps form a large and varied class, ranging in size from the immense cage with sliding door in which such beasts as tigers are caught, to the common box-trap for mice or squirrels, the door of which falls when the spindle upon which the bait is fixed is moved. The box-trap with a simple ratchet door ; allowing the animal or bird to push under the door or wires which fall back and imprison them, is alike an enclosing and an arresting trap. There are four general classes of arresting traps, the mesh, the set-hook, the noose and the clutch. The mesh-traps include the mesh and thong toils used of old for the capture of the lion and other large game, and the gill-net in the meshes of which fish are caught by the gills. To the set-hook division are reckoned the set-lines of the angler, several kinds of trawls and the toggle or gorge attached to a line, which the animal, bird or fish swallows only to be held prisoner. The noose-trap class is a very extensive one. The simplest examples are the common slip-noose snares of twine, wire or horsehair, set for birds or small mammals either on their feeding grounds or runways, the victim being caught by the neck, body or foot as it tries to push through the noose. When the noose is used with bait it is generally attached to a stout sapling, which is bent over and kept from springing back by some device of the " figure-4 " kind. This is constructed of three pieces of wood, one of the horizontal spindle on which the bait is placed, one of the upright driven into the ground, and the third the connecting cross-piece, fitted to the others so loosely that only the strain of the elastic sapling keeps the trap together. When the victim tries to secure the bait he dislodges the cross-piece and is caught by the noose, which is

spread on the ground under the bait. The Patagonians take the vicuna with one variety of this snare, and, before the moose (Cervus alces) was protected by law in North America, even that animal, weighing often 1200 ft, was caught in snares of wire and rope. There are two widely different types of clutch- traps: bird-lime and other tenacious substances, and jaw and clap- traps. The simplest form of the first is adhesive fly-paper. A common practice in Italy is to smear with bird-lime the branches in the neighbourhood of a captive owl, which results in the capture of numbers of birds, gathered to scold at their common enemy. Examples of the clap-trap are the clap-net, consisting of two nets laid flat on the ground and attached to cords in such a manner that they fly up and close when the draw-cord is pulled by a concealed trapper; and the various other spring-traps used by bird-catchers. The jaw-traps are the most important class of device for the capture of fur-bearing animals, and are the product of civilization. While rude specimens are known to have existed in the middle ages, the steel-trap as used to-day dates from the middle of the 18th century, and reached perfection in the latter half of the 19th, the ” New- house,” named from the American inventor, having been the first trap of high grade. Steel-traps consist of two jaws, with or without teeth, which are worked by powerful single or double springs and are ” sprung ” when the victim steps upon the ” pan,” which is

placed between the jaws and attached to a lever. They are made in many sizes, from the smallest, designed for rats, to the ” Great Bear Tamer,” weighing over 40 lb, with jaws of 16 in. in which lions, tigers and grizzly bears are trapped. The steel- trap is set and concealed in such a manner that the animal must step on its pan in passing over it to secure the bait. In trapping such wary animals as the sable, marten, mink, otter or beaver, great care is taken to obliterate all signs of the trap and of human presence, the scent of the hands being neutralized by smoking the traps or avoided by the use of gloves. In North America castoreum, musk, asafoetida, oil of anise and common fish-oil are used to entice the victims to the traps. Trails of some one of these scents are laid from different directions to the trap.

With the clutch-traps must also be reckoned the oldest form of steel-trap, now to be seen only in museums, the man-trap, which

was used first about the middle of the 18th century when the systematic preservation of game rendered protection against poachers a necessity. Such a trap, from Gloucestershire, is over 6 ft. long, has 19-in. serrated jaws and weighs 88 lb. Another form of man-trap, the spring-gun, belongs to the next category, the killing traps, which are divided into traps of weight, point and edge. The most important of the weight class is the dead-fall, of which the typical form consists of a pen over whose narrow entrance one or more logs are laid across a lighter log, which is balanced upon a spindle necessarily struck by the entering animal, causing the logs to fall upon its back. In some cases the bait is attached to the spindle itself. The dead-fall was always the favourite trap of the American Indians, and is in use among many aboriginal tribes in Africa and South America. A slab of stone is often used as a weight. The common mouse-trap which kills either by a blow or strangulation is a variety of dead-fall. Of point-traps may be mentioned those of the impaling and the missile classes. An example of the former is the stake or spear placed by Arab and African tribes at the bottom of pitfalls for big game. Another impaling trap common in Africa is the harpoon down-fall, generally used for the hippopotamus. It consists of a heavily weighted harpoon suspended in such a way that the animal, passing beneath, breaks a cord and precipitates the harpoon upon itself. Another example of impalement is the hawk- trap, consisting of a circle of stout sharp wires, in the centre of which a live fowl is placed. A bird of prey attempting to secure the fowl is impaled upon the wires. Of missile traps the most universal are the ancient springbow and its modern representative the spring- gun. This is fixed upon stakes, or against a tree, with a line attached to the trigger and stretched immediately in front of the muzzle. An animal pressing against the string pulls the trigger and discharges the piece into its own body. An arrangement of sticks holding the bait in front of the muzzle is sometimes substituted for the string. Of edge-traps a curious example is the wolf-knife of Western America, which consists of a very sharp blade embedded in frozen fat. One of the wolves, licking the fat, cuts its tongue and a flow of blood ensues, with the result that not only the wolf itself but its companions become infuriated by the smell and taste, and the wounded beast, and often many of the others, are killed and devoured. The Alaskan knife-trap for large game consists of a heavy blade attached to a lever, which, when released by the animal biting at the bait, flies over and kills the victim.

See Shifts and Expedients of Camp Life, by W. B. Lord (1871); Camp Life and the Tricks of Trapping, by W. H. Gibson (1902) ; O. T. Mason, ” Traps of the American Indians,” Annual Report, Smithsonian Institution, for 1901 ; The Story of the Trapper, by A. C. Laut (1903).

TRAPANI (anc. Drepanum), a city and episcopal see of Sicily, capital of the province of the same name, situated on the west coast, 3 m. W. of the Monte San Giuliano, which rises above it, 121 m. W. by S. of Palermo by rail, and 47 m. direct. Pop. (1906), town 47,578, commune 68,986. The ancient Drepanum (dptiravov, a sickle, from the shape of the low spit of land on which it stands) seems originally to have been the port of Eryx, and never to have been an independent city. It is represented by Virgil in the Aeneid as the scene of the death of Anchises, but first appears in history as an important Cartha- ginian naval station in the First Punic War (about 260 B.C.), part of the inhabitants of Eryx being transferred thither. Near Drepanum the Roman fleet was defeated in 250 B.C., while the struggle to obtain possession of it ended in the decisive Roman victory off the Aegates Islands in 241, which led to the conclusion of peace (see Punic Wars). It continued to be an important harbour, but never acquired municipal rights. Under the Norman kings, at the time of the first crusade, it became a place of importance; while it was a residence of the Aragonese kings. In the 16th and 17th centuries it was strongly fortified. In 1848 it was the first Sicilian city to rise against the Bourbons.

No remains of the classical period exist except a portion of the mole. There are some fine Gothic and baroque palaces,

and a few churches with interesting details. The Oratorio S. Michele contains wooden groups representing scenes from the Passion, executed in the 17th century and used for carrying in procession. On the tiled pavement of Sta Lucia is an interesting view of Trapani, showing the strong fortifications on the land side, which have been demolished to permit of the extension of the town in that direction. The Madonna dell’ Annunziata, about ij m. east of the town, founded in 1332, is now restored to its original style. The adjacent Cappella del Cristo Risorto contains a statue of the Virgin and Child in marble said to have been brought from Cyprus, to which an immense number of valuable offerings have been made, among them two bronze candelabra and a model of the city in silver; while the statue itself is hung with jewels, necklaces, cameos, rings, watches, &c. The modern

town is clean and well built, with a fine esplanade on the south. It is a harbour of considerable importance. It was entered by 144 vessels, representing a tonnage of 129,164 in 1906. The imports showed a value of £276,674, the most important items being wheat, coal and timber; while the exports amounted to £143,347, the chief items being salt, wine, salt fish and building-stone. There are also large salt-pans to the south of the city, extending along the coast as far as Marsala, which produce about 200,000 tons of salt annually, of which in 1906 121,192 tons were exported, chiefly to Norway, Sweden, Canada and the United States. The numerous windmills are used for grinding the salt. (T. As.)

TRAP-BALL, or Knur and Spell (M. Eng. knurre, knot; Dan. spil, spindle),' an old English game, which can be traced back to the beginning of the 14th century, and was commonly played in northern England as late as 1825, but has since been practically confined to children (bat, trap and ball). It was played with a wooden trap, by means of which a ball (knur) of hard wood about the size of a walnut was thrown into the air, where it was struck by the player with the " trip-stick," a bat con- sisting of two parts: the stick, which was of ash or lancewood and about 4 ft. long, and the pommel, a piece of very hard wood about 6 in. long, 4 in. wide and 1 in. thick. This was swung in both hands, although shorter bats for one hand were sometimes used. Originally the ball was thrown into the air by striking a lever upon which it rested in the trap; but in the later development of the game, usually called knur and spell, a spell or trap furnished with a spring was used, thus ensuring regularity in the height to which the knur was tossed. The object of the game was to strike the knur the greatest possible distance, either in one or a series of strokes.

TRAPEZE, or Trapese, a form of swing, consisting of a cross- bar suspended by ropes and used for gymnastic exercises, acrobatic displays and the like. The name was so applied in French (trapeze) from the resemblance of the apparatus to a " trapezium " or irregular four-sided figure. The Greek rpaxef uw is a diminutive of rpaweˆa, a table, literally a four-footed or four-legged object, being a shortened form of rtrpdxef a (rerpa-, four, and Tr«ˆa, foot).

TRAPEZOPHORON, the Greek term (from rpaweˆa, table, and epeiv, to bear) given to the leg or pedestal of a small side table, generally in marble, and carved with winged lions or griffins set

back to back, each with a single leg, which formed the support of the pedestal on either side. In Pompeii there was a fine example in the house of Cornelius Rufus, which stood behind the impluvium. These side tables were known as mensae vasariae and were used for the display of vases, lamps, &c. Sometimes they were supported on four legs, the example at Pompeii (of which the museums at Naples and Rome contain many varieties) had two supports only, one at each end of the table. The term is also applied to a single leg with lion's head, breast and forepaws, which formed the front support of a throne or chair.

TRAPPISTS, Cistercian monks of the reform instituted by Armand J. le B. de Ranee (q.v.), abbot of La Trappe, 1664. La Trappe was a Cistercian abbey near Soligny, in the diocese of Sees, in Normandy, founded 1140. It suffered grievously from the English wars and from commendatory

abbots, so that towards 1650 the community was reduced to half a dozen monks who had long ceased to comply with the obligations of their state, and were an open scandal to the neighbourhood. Armand Jean de Ranc6 became com- mendatory abbot at the age of ten, 1636; and on his con- version from a worldly life he began to interest himself in his abbey and conceived the project of restoring the monastic life therein, 1662. With this object he visited La Trappe, but the monks were recalcitrant and threatened his life; through the intervention of Louis XIV. he was able to pension them off; they were replaced by a community of Cistercians of the strict observance, and the monastic buildings, which had fallen into ruin, were repaired at de Ranee's expense. He himself then entered the novitiate in one of the reformed Cis- tercian abbeys, and on his profession he came to La Trappe as regular abbot, 1664. But he desired a return to the full programme of the primitive Cistercians. His influence with Louis XIV. and with the court of Rome secured him a free hand in carrying out changes without trammel from the Cis- tercian superiors, who looked askance at the project; and he was able to persuade his community to adopt a manner of life beyond the original Cistercian practice, and far beyond St Benedict's rule. Thus they abstained wholly from wine and fish, and rarely ate eggs; on certain days they had only bread and water, and on two days in the year they went barefooted; and they slept in their

day clothes: these practices are in contradiction to what St Benedict allowed. On the other hand manual labour occupied only 35 hours, but the church services 7 — herein reversing St Benedict's apportioning of the time. In short, the Trappist regime is probably the most penitential that has ever had any permanence in the Western Church. Yet it attracted vocations in such numbers that de Ranee had 300 monks under him. Through age and ill health he resigned his abbacy in 1695, and died five years later.

During the 18th century La Trappe continued faithful to de Ranee's ideas, but the observance spread only into two monasteries in Italy. It was the dispersal of the com- munity at the French Revolution that turned the Trappists into a congregation in the Cistercian order and finally into a separate order. Dom Augustine de Lestrange, the novice- master at the time of the suppression in 1790, kept' twenty of the monks together and obtained permission for them to settle at Val-Sainte in Fribourg, Switzerland. Here they made their life still stricter than that of La Trappe, and postu- lants flocked to them in such numbers that in two years' time colonies went forth to establish Trappist monasteries in England, Belgium, Piedmont, Spain and Canada; and in 1794 Dom Augustine was named by the Holy See Father Abbot of all these foundations, thus formed into a congregation. In 181 7 they returned to La Trappe, many new foundations were made, and by Dom Augustine's death in 1827 there were in all some seven hundred Trappist monks. In the course of the century three or four congregations arose — a Belgian, an Italian, and two in France — each with a vicar subject to the general of the Cistercians. In 1892 these congregations were united into a single Order of Reformed Cistercians, or of Strict Observance, with an abbot-general resident in Rome and independent of the general of the Cistercians of the Common Observance. In 1898 the Trappists recovered possession of Citeaux, the mother-house of the Cistercians, secularized since the Revolu- tion, and it was declared by Rome to be the head and mother house of the Reformed Cistercians, who thus were recognized as the authentic representatives of the primitive Cistercian movement.

The Trappists are a thriving and vigorous order. In 1905 they had 58 monasteries with 1300 professed choir monks and 1700 lay brothers. At the time of the recent expulsions (1903) they had twenty houses in France, and they have two or three in all the countries of western Europe, including England (Mount St

Bernard, near Leicester) and Ireland (Mount Mellery in Waterford and Roscrea); also in the United States

and in Canada. Besides they have a house in China, with over fifty Chinese monks; one each in Japan, Asia Minor, Palestine, Bosnia and Dalmatia, and four in various parts of Africa. The abbey of Mariannhill in Natal is devoted to the christian- izing and civilizing of the Kaffirs; there are numerous stations with elementary schools and chapels, and at the abbey is a high school and printing-press for books in the Zulu and Basuto languages. In heathen countries the Trappists now give themselves up to missionary work and the task of civilizing the natives.

The first Trappist nunnery was the abbey of Les Clairet, near Chartres, which de Ranee persuaded to adopt his reforms. Dom Augustine de Lestrange established another in 1796, and now there are fifteen with 350 choir nuns and 500 lay sisters. One is in England at Stapehill, near Wimborne, founded in 1802. The manner of life of the nuns is almost the same as that of the monks.

See the Lives of de Ranee. A minute account of the observance is in de Ranee's Reglemens de la Trappe (1701). The beginning of the reform is told by Helyot, Histoire des ordres religieux (1718), vol. vi. ch. I ; the developments under Dom Augustine de Lestrange are described in the supplementary matter in Migne's Dictionnaire des ordres religieux (1858). The whole subject is well treated by Max Heimbucher, Orden u. Kongregationen (1907), vol. i. § 48; and in Wetzer und Welte, Kirchenlexicon (2nd ed.), and Herzog, Realencyklo- padie (3rd ed.). A realistic and sympathetic picture of Trappist life is the redeeming feature of J. Huysman's En route. (E. C. B.)

TRAQUAIR, SIR JOHN STEWART, ist Eari. of (d. 1659), Scottish statesman, was the son of John Stewart, the younger, of Traquair in Peeblesshire, of a branch, originally illegitimate, of the house of Bucban, and was created Baron Stewart of Traquairin i628andearlof Traquairin 1633. He was appointed treasurer depute of Scotland and an extraordinary lord of session in 1630, and is said to have given the casting vote against the second Lord Balmerino at his trial in 1634, but afterwards obtained his pardon. From 1636 to 1641 he held the office of lord high treasurer of Scotland, and aided Charles I. in intro- ducing the liturgy. He endeavoured to prevent a conflict by impressing on the king the necessity of caution and the danger of extreme

measures against the rioters. He was, however, compelled to publish Charles's proclamation enforcing the use of the liturgy and forbidding hostile demonstrations on pain of treason (1638). This was followed by military measures in which Traquair assisted by secretly conveying munitions of war to Dalkeith Palace. He was, however, obliged to surrender the place with the regalia to the Covenanters (March 1639). After the treaty of Berwick he was appointed the king's com- missioner^ to the assembly at Edinburgh (August 1639), and he assented in writing to the act abolishing episcopacy, but prevented its ratification by adjourning the opening of parlia- ment. His apparent double-dealing made him suspected by both parties, and in 1641 the Scottish parliament issued a warrant for his arrest. In his absence he was sentenced to death, but, although the king secured the remission of this penalty, he was dismissed from his office of treasurer, and in 1644, for repairing to the court and opposing the covenant, he was declared an enemy to religion and fined 40,000 marks. His son, Lord Linton, whom he had sent to Montrose with a troop of horse, withdrew on the eve of the battle of Phiiip- haugh (September 1645) an d it has been supposed that Traquair betrayed Montrose's plans to Leslie. He was readmitted to parliament in 1646, raised cavalry for the " engagement " between the king and the Covenanters, and was captured at Preston (1648). He was released by Cromwell in 1654, and died on the 27th of March 1659. He was succeeded by his only son John (c. 1622-1666), whose descendants held the title until 1861, when on the death of Charles, the 8th earl, it became dormant or extinct.

See also Spalding, Memorialls (Spalding Club) ; Sir James Balfour, Annals (ed. Haig, 1824) ; Diet, Nat. Biog. vol. liv.

TRASIMENE, LAKE (Lat. Trasumenus Lacus; Ital. Lago Trasimeno), a lake of Umbria, Italy, 12 m. W. from Perugia, 843 ft. above sea-level, 30 m. in circumference, and

8 m. to 14 m. across. Having no natural outlet, it was formerly subject to sudden rises, which occasioned inundations, and these in turn malaria. An artificial outlet was completed in 1898 from the south-east corner of the lake to the Caina, a small tributary of the Tiber. The work, which is about 4 m. long, cost only about

£26,000. It is intended to leave about 2500 acres of land dry, and to convert another 2800 acres of marshy soil into cultivable land. The lake contains three small islands: Isola Maggiore, with a monastery, Isola Minore and Isola Polvese. Standing on a promontory jutting out into the lake is the town of Castiglione del Lago, which possesses a castle of the dukes of Cornia, built by Galeazzo Alessi, the architect of many of the Genoese palaces. Napoleon I. formed a project for draining the lake, which may ultimately be adopted. Here Hannibal disastrously defeated the consul C. Flaminius. Hannibal left his winter quarters in Cisalpine Gaul in the spring of 217 B.C. and crossed the Apennines, probably by the pass now known as the Passo dei Mandrioli (from Forli to Bib- biena in the upper valley of the Arno). His march was much hindered by marshes (probably those in the Arno valley between Bibbiena and Arezzo). The Roman army under Flaminius was stationed at Arezzo (anc. Arretium), and Hannibal marched past it. Flaminius followed, and Hannibal occupied the heights on the north of the lake between Terontola and Tuoro, commanding the road from Cortona to Perugia, and also those on the east of Tuoro, so that when the Roman army (which had encamped the night before outside the entrance to the small valley of the brook now called Sanguineto, west of Tuoro), unable in the mists of early morning to see the enemy's forces, had entered the valley, it was surrounded and there was no escape except by forcing a passage. The vanguard succeeded in making their egress on the east by Passignano, but the defeat of the rest of the army was complete, the Romans losing no fewer than 15,000 men.

See T. Ashby in Journal of Philology (1908), and refs. (T. As.)

TRASS, the local name of a volcanic tuff occurring in the Eifel, where it is worked for hydraulic mortar. It is a grey or cream-coloured fragmental rock, largely composed of pumiceous dust, and may be regarded as a trachytic tuff. It much resembles the Italian puzzolana and is applied to like purposes. Mixed with lime and sand, or with Portland cement, it is extensively employed for hydraulic work, especially in Holland; whilst the compact varieties have been used as a building material and as a fire-stone in ovens. Trass was formerly worked extensively in the Brohl valley and is now obtained from the valley of the Nette, near Andernach.

TRAU (Serbo-Croatian Trogir; Lat. Tragurium). a seaport of Dalmatia, Austria. Pop. (1900) of town and commune, 17,064.

Trau is situated 16 m. W. of Spalato by road, on an islet in the Trau channel, and is connected with the mainland and the adjoining island of Bua by two bridges. The city walls are intact on the north, where a 15th-century fort, the Castel Carnerlengo, overlooks the sea. Above the main gateway the lion of St Mark is carved, and the general aspect of Trau is Venetian. Its streets, which are too narrow for wheeled traffic, contain many interesting churches and medi- eval houses, including the birthplace of the historian Giovanni Lucio (Lucius ot Trau), author of De regno Dalmaliae et Croatiae (Amsterdam, 1666). The loggia, built by the Venetians, is a fine specimen of a 16th-century court of justice; and the cathedral is a basilica of rare beauty, founded in 1200 and completed about 1450. It was thus mainly built during the period of Hungarian supremacy; and, in consequence, its architecture shows clear signs of German influence. Among the treasures preserved in the sacristy are several interesting examples of ancient jewellers' work. Trau has some trade in wine and fruit. It is a steamship station, with an indifferent harbour.

Tragurium was probably colonized about 380 B.C. by Syracusan Greeks from Lissa, and its name is sometimes derived from Trogkilon a place near Syracuse. Constantine Porphyro- genitus writing in the 10th century, regards it as a corruption

of ayyvpiov, water melon, from a fancied similarity in shape. He states that Trau was one of the few Dalmatian cities which preserved its Roman character. In 998 it sub- mitted to Venice; but in 1105 it acknowledged the supremacy of Hungary, while retaining its municipal freedom, and receiving, in 1 108, a charter which is quoted by Lucio. After being plundered by the Saracens in n 23, it was ruled for brief periods by Byzantium, Hungary and Venice. In 1242 the Tatars pursued King Bela IV. of Hungary to Trau, but were unable to storm the island city. After 1420, when the sovereignty of Venice was finally established, Trau played no conspicuous part in Dalmatian history.

See T. G. Jackson, Dalmatia, the Quarnero, and Istria (Oxford, 1887); E. A. Freeman, Sketches from the Subject and Neighbour Lands of Venice (London, 1881); and G. Lucio, Memorie isioriche di Tragurio, or a detto Trail (Venice, 1673).

TRAUN, OTTO FERDINAND, Count von Abensperg und (1677-1748), Austrian field marshal, came of a noble family and was born on the 27th of August 1677 at Oldenburg. He was sent

to Halle to complete his education, but in 1693 left the university to serve with the Prussian contingent of the allied army in the Low Countries. He saw much service in the War of the Grand Alliance, and at its close entered the imperial army. The War of the Spanish Succession soon followed, and Traun served with distinction in Italy and on the Rhine till 1709, when he became lieutenant-colonel and aide-de-camp to Field Marshal Count Guido Starhemberg (1654-1737) in Spain". A year later, for specially distinguished services, he was made colonel, and in 1712 chief of a regiment of foot. Soon after the close of the war he was again actively employed, and at the action of Francavilla in Sicily (June 20, 17 19) he received a severe wound. For his services in this campaign in southern Italy he was promoted General-Feldwachtmeister in 1723. Ini727 he became governor of Messina, and in 1733 attained the rank of lieutenant field marshal. In 1734 he won a European reputation by his defence first of the pass of S. Germano and then of the half-ruined fortress of Capua, which he surrendered, marching out with the honours of war on the 30th of November. He was at once promoted Feldzeugmeister and employed in a difficult semi-political command in Hungary, after which he was made commander-in-chief in north Italy and interim governor-general of the Milanese, in which capacity he received the homage of the army and civil authorities on the accession of Maria Theresa in 1740. In the following year he was made a field-marshal. The Italian campaigns of the War of the Austrian Succession were successfully conducted by him up to 1743, when, on the death of Field-Marshal Count Khevenhiiller (q.v.), he was made the principal military adviser of Prince Charles of Lorraine (q.v.), who commanded the Austrians in Bohemia and on the Danube. In this capacity he inspired the brilliant operations which led up to the passage of the Rhine (see Austrian Succession, War of the) and the skilful strategy whereby Frederick of Prussia was forced to evacuate Bohemia and Moravia (1744) without a battle. Traun's last active service was the command of an army which was sent to Frankfurt to influence the election of a new emperor to succeed Charles VII. He died at Hermannstadt on the 18th of February 1748.

See Biographien k. k. Heerfuhrer, herausgegeben v. d. Direktion des k. und k. Kriegsarchiv; Thiirheim, F. M. Otto Ferdinand, Graf v. Abensperg und Traun.

TRAUNSTEIN, a town and summer resort of Bavaria, situated, at an elevation of nearly 2000 ft., on the river Traun, 73 m. by rail

S.E. of Munich. Pop. (1905), 7447. It distils salt from the brine of Reichenhall, whence (22 m. distant) it is brought in pipes. It has an historical museum, four churches (three of which are Roman Catholic), two fine foun- tains — a monument of the war of 1870-71 and one to King Maximilian II. There are saline baths and breweries. In the vicinity are Empfing, with baths of all kinds and a cold- water cure establishment on the Kneipp system. Traunstein received civic rights in 1375.

TRAUTENAU (Czech Trutnov), a town of Bohemia, 120 m. E.N.E. of Prague by rail. Pop. (1900), 14,777, mostly German. It is situated on the Aupa, a tributary of the Elbe, at the foot of the Riesengebirge, and possesses a beautiful church built in 1283 and restored in 1768. Trautenau is the centre of the Bohemian linen industry and has factories for the manufacture of paper and for the utilization of the waste products of the other mills. Trautenau was founded by German colonists invited to settle there by King Otto Kar II. of Bohemia, and received a charter as a town in 1340. It was the scene of two battles between the Prussians and Austrians on the 27th and the 28th of June 1866.

TRAVANCORE, a state of southern India, in political relation with Madras. Area, 7091 sq. m. In 1901 the population was 2,952,157, showing an increase of 15% in the preceding decade. The state stands sixteenth among the native states of India in area and third in population. Travancore extends more than 150 m. along the west coast as far as Cape Comorin, the southernmost point of the peninsula. The Western Ghats rise to an elevation of 8000 ft. and are clothed with primeval forest; they throw out spurs towards the coast, along which there is a belt of flat country of about 10 m. in width, covered with coco-nut and areca palms, which to a great extent constitute the wealth of the country. The whole surface is undulating, and presents a series of hills and valleys traversed from east to west by many rivers, the floods of which, arrested by the peculiar action of the Arabian Sea, spread themselves out into lagoons or backwaters, connected here and there by arti- ficial canals, and forming an inland line of smooth-water communi- cation for nearly the whole length of the coast. The chief river is the Periyar, 142 m. in length. Other important rivers are the Pambai and its tributary the Achenkoil, the Kallada, and the Western Tambraparni. Iron is abundant and

plum- bago is worked. Elephants are numerous, and tigers, leopards, bears, bison and various kinds of deer abound in the forests. Travancore has an abundant rainfall, with every variety of temperature. The principal ports are Alleppi, Quilon and Paravur ; but there is no real harbour. The state has a fine system of roads, and the Cochin-Shoranur and the Tinnevelly-Quilon railways pass through it. The Periyar irrigation project con- ducts water through the ghats in a tunnel to irrigate the Madras district of Madura, for which compensation of Rs. 40,000 is annually paid to Travancore. Trade is large and increasing, the chief exports being copra, coir and other coco-nut products, pepper, tea, sugar, areca-nuts, timber, hides, coffee, &c. The capital is Trivandrum. The revenue is £670,000 ; tribute, £80,000; military force, 1360 infantry, 61 cavalry and 30 artillery with 6 guns. The maharaja of Travancore claims descent from Cheraman Perumal, the last Hindu monarch of united Malabar, whose date is variously given from A.D. 578 to 825. Though he is a Kshatriya, the succession follows the local custom of inheritance through females; consequently his sanad of adoption authorizes him to adopt sisters' sons. For some generations the rulers have been men of education and character, and the state is conspicuous for good adminis- tration and prosperity. Education, and female education in particular, is more advanced than in any other part of India. The two dominant sections of the population are the Namburi Brahmins and the Nairs or military caste. Native Christians, chiefly of the Syrian rite, form nearly one-fourth of the whole, being more numerous than in any Madras district.

See V. Nagam Aiya, Travancore State Manual (Trivandrum,

1906).

TRAVE, a river of north Germany, rising in the Oldenburg principality of Liibeck, between Eutin and Ahrensbock. Flowing at first southwards through small lakes and marshes, it then turns west and, confined within flat and sandy banks, enters the Prussian province of Schleswig-Holstein. It now bends due south to Oldesloe, from which point it is navigable. Hence it takes an easterly course, and, entering the territory of the free city of Liibeck, receives from the right the Stecknitz, through which and the Stecknitz canal built by the merchants

of Liibeck in 1398) a direct water communication is maintained with the Elbe, and passing the city of Liibeck discharges itself into the Baltic at the port of Travemiinde after a course of 58 m.

Its lower course from Liibeck to the sea has been dredged to a depth of 25 ft., permitting sea-going vessels to lie alongside the wharves and quays.

TRAVELLER'S TREE, a remarkable tree, native of Mada- gascar and Reunion, with a straight stem reaching 30 ft. in height and bearing at the top a number of large long-stalked leaves which spread vertically like a fan. The leaf has a large sheath at the base in which water collects in such quantity as to yield a copious draught — hence the popular name. The plant is known botanically as Rarenala Madagascariensis and belongs to the same family as the banana (Musaceae).

TRAVEMUNDE, a seaport of Germany, in the free state of Liibeck, situated on the Baltic, at the mouth of the Trave. Pop. (1905), 2017. It has an Evangelical church, dating from the end of the 15th century, and is a much frequented watering- place. There are extensive herring fisheries. Travemiinde arose out of a stronghold placed here by Henry the Lion, duke of Saxony, in the 12th century to guard the mouth of the Trave, and the Danes subsequently strengthened it. It became a town in 13 1 7 and in 1329 passed into the possession of the free city of Liibeck, to which it has since belonged. Its fortifications were demolished in 1807.

TRAVERSE, in fortification, a mass of earth or other material employed to protect troops against enfilade. It is constructed at right angles to the parapet manned by the defenders, and is continued sufficiently far to the rear to give the protection required by the circumstances, which, moreover, determine its height. A traverse is sometimes utilized as a casemate. Ordi- nary field-works, not less than those of more solid construction, require traversing, though if the trenches, instead of being continuous, are broken into short lengths, they are traversed by the unbroken earth intervening between each length. (For traversing in surveying see Surveying.)

TRAVERSE CITY, the county-seat of Grand Traverse county, Michigan, U.S.A., on the Boardman river, between Boardman Lake and the west arm of Grand Traverse Bay, in the N.W. part of the lower peninsula. Pop. (1900), 9407, of whom 2068 were foreign-born; (1910, census), 12,115. It is served by the Pere Marquette, the Grand Rapids & Indiana and the Manistee & North-Eastern railwavs, and by steamboat line to Chicago and other lake ports. The climate, scenery and good fishing attract

summer visitors. The city has a public library and a library owned by the Ladies' Library Association, and is the seat of the Northern Michigan Asylum for the Insane (opened 1885). There are various manufactures, and in 1904 the total value of the factory product was $2,176,903. Traverse City was settled in 1847, incorporated as a village in 1881 and chartered as a city in 1895.

TRAVESTY (Fr. travestie, from travestir, to disguise, se traveslir, to change one's clothes; Lat. trans, across, and vestire, to clothe), a burlesque, particularly a grotesque imitation of a serious work of literature or art, in which the subject, characters, &c, are retained, but the style, language and treatment generally are exaggerated and distorted to excite ridicule (see also Burlesque).

TRAVNIK, the capital of a department of the same name in Bosnia; situated on the Lasva, a left-hand tributary of the Bosna, 44 m. by rail N.W. of Serajevo. Pop. (1895) about 6000. Travnik is mainly built round a steep mass of rock, crowned by an ancient citadel. Several mosques, palaces, arcades and a fine bazaar, left among its narrow lanes and wooden huts, bear witness to its former prosperity, and there are some good modern barracks and public buildings.

The old name of Travnik, Lasva, was last used in the 18th century. It is likely, from the number of Roman remains, that Travnik stands near the site of a Roman colony. It was a stronghold of the Bogomili during the 15th century, but its period of greatness dated from 1686, when the downfall of the Turks in Hungary caused the removal of the Bosnian

government from Banjaluka, which was dangerously near the Hungarian frontier, and the Turkish governors, officially styled " valis of Hungary," ruled in Travnik from 1686 to 1850.

Several interesting villages, none containing more than a few hundred inhabitants, are grouped together, near Travnik. Prozor, with its ruined citadel, which withstood the Turkish advance until the beginning of the 16th century, when almost the whole of Bosnia had been enslaved, was then the capital of the princes of Rama, a dis- trict lying north-west of the Narenta. The thermal

station of Kiseljak, where the Fojnica and Lepenica rivers meet, is a cluster of old- fashioned Turkish villas, with a casino, baths, barracks, hotels and park. In 1396, Tvrtko I. of Bosnia granted the privilege of silver-mining here to the Ragusans. Remains of old workings may still be seen. Kresevo, 5 m. N.N.E., is likewise rich in iron, cinnabar, quicksilver and the argentiferous load which was worked by the Saxons in the middle ages. The citadel of Zahor, or Gradina, now a ruin, guarded the mines. Bugojno, on the Vrbas, is a pic- turesque place, with a large cattle and horse trade. The Franciscan monastery of Fojnica, 18 m. east, is the largest and wealthiest founda- tion in Bosnia. Its Byzantine church is full of ancient ornaments and relics. The archives contain many valuable manuscripts, including a charter bestowed on the monks, in 1463 by the Sultan Mahomet II.

TRAWLING, SEINING AND NETTING. The innumerable kinds of fishing nets which may be distinguished, if all nets differ- ing in details of structure or use be placed in separate classes, fall naturally into two main groups, namely stationary nets and nets used in motion. The former group contains the most primitive nets, though nets of great complexity are now included in it; and the simplest fixed nets, themselves derived probably from dams of rushes or stones so placed as to lead fish in to a ” pound ” or enclosure, may with some confidence be considered as the ancestors of the great otter trawls now shot and towed daily from powerful steamers on fishing grounds more than a thousand miles from the market they work to supply. The more primitive fixed nets are of far less importance than movable nets (except in the capture of certain particular species), owing to the fact that they are necessarily confined to very shallow water. The main types of movable nets may therefore be treated first. All nets are constructed in accordance with what is known of the habits of the fish they are designed to capture; and as fishes may be roughly divided into those spending at least the greater part of their lives on or near the sea-bottom and those spending a great portion of their lives near the surface, two lines have been followed in the development of nets, some being designed to work on the bottom, others to work near the surface. The most important nets used in the capture of ” demersal ” or bottom-living fishes are trawls; the most important pelagic nets are drift-nets. The word trawling 1 was at one time applied to more than one method of fishing, but has, at all events in Europe, now become restricted to the operation of a flattened conical net or trawl, dragged along the sea-bottom. There are two trawls in

common use, the beam trawl and the otter trawl. They differ in the method adopted for extending the mouth of the net. The original form is the beam trawl.

The beam trawl may be described as a flattened conical net whose mouth is kept open when in use by a long beam supported The Beam at tne er, ds by iron runners, the trawl-heads. Elm Trawl ls generally preferred for the beam, selected if possible

from timber grown just to the proper thickness, that the natural strength of the wood may not be lessened by more trimming or chipping than is absolutely necessary. If the re- quired length and thickness cannot be obtained in one piece, two or even three pieces are scarfed together, and the joints secured by iron bands. The trawl-heads differ somewhat in form in different countries and in different localities. The usual form is heart- shaped, the " shoe " or part actually in contact with the ground when in use being straight, the after-side straight and sloping upwards from the hindmost point or " heel," and then curving down in a single unbroken arc, which forms the front of the head, to join the shoe. In the Barking pattern the head is stirrup- shaped; but this is now unusual. A square socket is bolted to the top of the head (taking the head to be in the position of use) to receive the end of the beam, and ring-bolts are put in at the extreme front of each head, to hold the ropes or wires by which the trawl

1 " Trawl " is from O. Fr. trauler, to go hither and thither; " troll," now used of drawing a line along the surface of the water from a boat, is from the variant O. Fr. troller, mod. troler, to lead, drag about.

is towed, and, within the point of the heel, for the purpose of allowing the mouth of the net to be seized or lashed to the trawl-head at a point close to the ground. The shoe of the trawl-head is in the full-sized trawls made of double thickness, to resist wear,

When the net is spread out in the position it would take up when working, the upper part or back has its straight front edge fastened to the beam, but the corresponding lower part or belly The Net is cut away in such a manner that the front margin forms a deep curve extending from the shoe of one trawl-head to that of the other, the centre of the curve or " bosom," as it is called, being at a considerable distance behind the beam. The usual rule in English trawls is for the distance between the beam and the centre of the bosom to be about the same as the length of the

beam. In French trawls this distance is generally much less; but in all cases the beam and back of the net must pass over a considerable space of ground when the trawl is at worK before the fish are disturbed by much of the lower margin of the net. This lower edge of the mouth of the trawl is fastened to and protected by the " ground-rope," which is made of an old hawser " rounded " or covered with small rope to keep it from chafing, and to make it heavier. The ends of the ground- rope are fastened at each side by a few turns round the back of the trawl-heads, just above the shoe, and the rope itself rests on the ground throughout its entire curve. The fish which may be dis- turbed by it have therefore no chance of escape at either the sides or top of the net unless they can pass through the meshes, and as the outlet under the beam is a long way past them, and is steadily moving on, sooner or later they mostly pass over the ground-rope and find their way into the funnel-shaped end of the net, from which a small valve of netting prevents their return.

It must not be supposed, of course, that all fishes entering a trawl are retained in it. Numerous investigations have been made into the size and number of the various species of fish which get through the meshes of the trawl, by lacing small-meshed netting over the ordinary net, and examining the fish remaining in this outer net. Fish are found to escape all parts of the net, but chiefly the " bat- ings, " i.e. the part of the net where it is narrowing to the " cod end " ; and as the chance of escape depends on the size and shape of the fish, and the mesh of the net, it is naturally found that the maximum size of the individuals which can escape in any numbers differs in different species. If small fish are on the ground, the total number escaping is, however, in all cases very large, frequently greatly exceeding the number caught. This is for the most part desirable, the fish being of a size to render them of but little value to the fishermen or to the public. It is in any case inevitable, since a full-sized trawl made entirely of small-mesh would offer so great a resistance to the water as to be unworkable.

The ground-rope bears directly on the ground, and to prevent the possibility of the fish passing under it, the rope should have some weight in it so as to " bite " well, or press the ground closely. It is, however, always made of old material, so that it may break in case of getting foul of rocks or such other chance obstruction as may be met with on the generally smooth ground where the trawl can only be worked with advantage. If in such a contingency the rope were so strong and good as not to break,

there would be serious danger of the tow-rope snapping, and then the whole apparatus might be lost ; but the ground-rope giving way enables the net to be cleared and hauled up with probably no more damage to it than the broken rope and perhaps some torn netting. The remaining part of the trawl, extending from the bosom to the extreme end, forms a complete bag gradually diminishing in breadth to within about the last 10 ft., which part is called the " cod or purse," and is closed by a draw-rope or " cod- line " at the extremity when the net is being used. To avoid the abrasion of the under part of the cod-end pressed by the weight of fish against the stones and shells of the sea-bottom, stout pieces of old net are laced across beneath it in parallel strips. These strips thus trail beneath the trawl and protect it. They constitute the" rubbers "or" false belly." The cod-end is the general receptacle for the various fishes which enter the net; and when the trawl is hauled up and got on board the vessel, the draw-rope is cast off and the fish all fall out on the deck.

It has been mentioned that the body of the net tapers away to the entrance to the purse. It is at this point the opening of the pockets are placed ; and they are so arranged that the fish Pockets having passed into the purse, and then seeking to escape by returning along its sides, are pretty sure to go into the pockets, which extend for a length of about 15 or 16 ft. along the inner side of the body of the net, and there, the more they try to press for- ward, the more tightly they become packed, as the pockets gradu- ally narrowaway to nothing at their upper or front extremity. These pockets are not separate parts of the trawl, but are made by merely lacing together the back and belly of the net, beginning close to the margin or side nearly on a level with the bosom, and then being carried on with slowly increasing breadth backward as far as the entrance to the purse. At this point the breadth of the net is divided into three nearly equal spaces, the central one being the opening from the main body of the net into the purse, or general receptacle for the fish, which must all pass through it, and those on each side being the mouths of the pockets facing the opposite direction. The central

passage has a valve or veil of netting called the " flapper," which only opens when the fish press against it on their way into the purse. To understand clearly the facilities offered to the fish to enter the pockets, it is necessary to remember that the trawl, when at work, is towed along, with just sufficient force to expand the net by the resistance of the water. But this resistance directly acts only on the interior of the body of the net between the pockets and then on the purse ; it does not at first expand the pockets, but tends rather to flatten them, because they are virtually outside the general cavity of the trawl and their openings face the father end of it. The water, however, which has expanded the body of the net, then passes under or through the flapper or valve, and enters the purse, which, being with a much smaller mesh than the rest of the net, offers so much resistance that it cannot readily escape in that direction ; return currents are consequently formed along the sides, and those currents open the mouths of the pockets, which, as before mentioned, are facing them; and the fish, in their endeavours to escape, and finding these openings, follow the course of the pockets until they can go no farther. The whole of the net is therefore well expanded, but it is so by the pressure of the water in one direction through the middle, and in the opposite direction at the sides or pockets.

The dimensions of a full-sized beam trawl, such as has been described above are from 45 to 50 ft. along the beam and about Si ea d IO ° ˆ t- m 'ength- Trawls of practically all smaller M 'sh s ' zes down to some 30 ft. are to be found, but except

e ' for shrimp trawls the large sizes predominate almost

to the exclusion of smaller nets. The trawl-heads support the beam at about 3 or 3i ft. above the ground. The meshes of the net behind the beam (the square) are about 5 in. from knot to knot, when drawn out taut. In the batings, the part of the net in which the narrowing mostly occurs, they decrease gradually from 4 to about 3 in. ; in cod end they are i\ in. In the hope of protecting the small fish from capture some local authorities enforce within their jurisdiction a minimum size of mesh for trawls, as for other nets. According to certain recent by-laws of the Lancashire and

Western Sea Fisheries District Committee, for instance, every trawl used in their waters, except for the capture of shrimps and certain specified fish, must allow a square wooden ga-ige of a certain 3ize to pass easily through its meshes when these are wet. The difficulties in the way of the efficacy of such restriction are that a mesh which would allow the escape of fish of but little value of one species might allow the escape of very valuable individuals of another kind; and that both local and national authorities alike have powers of jurisdiction over such narrow strips of coastal water, that in the absence of an international agreement on the matter, the ground affected by the regulations is exceedingly small in comparison with the ground untouched. The same remarks apply to the similar regulations as to length of beam and circum- ference of nets.

Considerable skill is needed to work a beam trawl successfully. A knowledge of the ground and of the direction and time of the W tkln t ‘^ e ‘ s essential ; for the trawl is towed with the stream, th Nei* a ^ tt ‘ e faster than it is running, so that there may be e ” just sufficient resistance to expand the net. The regu- lation of speed, seeing that beam trawls are worked only from sailing vessels, is a matter of difficulty; when, however, there is a sufficiency of wind much can be done by an adjustment of the length of tow rope. Lowering the trawl is also a matter of difficulty especially when wind and tide are contrary, as in that case the vessel tends to drift over the net : the apparatus is first got into position by paying out the rope attached to the trawl-heads in such proportions that the beam takes its proper position while close to the surface. These ropes, called ” bridles, ” are some 15 fathoms long: they meet and are shackled to the trawl warp, a manilla rope of 6 in. circumference, of which 150 fathoms are generally carried. The trawl being in proper position, the warp is allowed to run out and the trawl lowered to the bottom, the vessel slowly moving on meanwhile; usually the length of warp which is below the surface in towing is a few fathoms over three times the depth of water. The art of shooting the trawl lies in causing it to alight on its runners or shoes, with the net freely trailing behind: should the net be twisted, or the trawl alight on its beam, the trawl has been shot ” foul, ” and must be hauled and shot again. While towing, an experienced fisherman can tell by pressing his hand firmly on the warp outside the ship’s bulwark whether the progress of the trawl over the bottom is satisfactory, any irregular progress over rough ground revealing itself in the character of the vibration of the warp. The trawl

usually remains on the bottom for a whole tide, or six hours, and will in this time have passed over some 15 m. of ground. Hauling, a most lengthy and laborious process if carried out by hand-windlass, is in practically all modern fishing smacks carried out by a small steam capstan, the ” steam man ” as it is frequently called, a most efficient instrument with very compact engine housed under a small iron cover on the capstan’s top. When the trawl comes alongside the heavy beam is secured by its two h;ads, the net is hauled over the side bit by bit, by hand, until the cod end is reached, when a rope is passed round it above the bulging end which contains the catch, and then over a ” tackle “or

pulley, and so the cod end is hoisted inboard. The knot of the cod- line is untied, and the fish, mixed with various invertebrate animals, star-fish and rooted forms (confounded in the one term ” scruff “), falls to the deck.

A small trawl is often used from an open boat for shrimping. It closely resembles a beam trawl, but has no pockets. The usual dimensions of this net are about 15 ft. beam and 20 „. . ■ total length, of which about 4 ft. are taken by the cod _ m . end. The mesh is about half an inch square, but _ ”’* where no restrictions are enforced it decreases to a considerably smaller size as the cod end is approached. The beam when in use is about a foot and a half above the ground.

Shank nets are also similar to beam trawls in general shape, but differ in that the mouth is kept open by a rectangle of wood. Frequently the lower margin of the trawl’s mouth is shank Nets not in contact with the ground, being attached to a bar of wood which is fixed parallel to the bottom of the wooden rectangle and a few inches above it. A fish or prawn is thus disturbed by the bottom bar of the wood, and either jumps over it and below the net and so escapes, or over both bottom bar and middle bar into the net. The theory of the net’s action is that the fish tends most frequently to take the former course, the crustacean the latter; and there is some evidence that this is partially realized in practice. Shank nets are sometimes worked from carts, when they are known as ” Trollopers.”

Owing to their fine netting and the very shallow water in which they work, shrimp trawls are exceedingly destructive to very small fish. Johnstone 1 has found for instance that in a two mile haul of a shrimp trawl on the Lancashire coast 567 small plaice

are caught on an average, beside great numbers of whiting, dabs, soles and other fish. In most parts of the English coast regulations are in force as to the mesh, size of beam and length of haul cf shrimp nets, and shrimpers working on the beach are ordered to sort their catch at the water's edge, returning as many young fish alive as possible. The proportion saved by these means is not known with accuracy; it is much greater in the case of short hauls than in longer ones. A shrimp trawl is usually kept down from half an hour to an hour, or when not subject to regulation rather longer. It is seldom towed for a longer period than 2 hours, the speed being somewhat under two miles per hour on an average, though subject to variation.

The beam trawl has been described at some length because its structure is somewhat more simple than that of the trawl now in more general use; the importance of the net o ecay0 f as an engine of capture has undoubtedly declined Beam greatly within the past generation. Some interest- Trawling ing figures collected by the British Board of *" ^*° Agriculture and Fisheries prove this incontestably. Trawling In 1893 the number of first-class British sailing from trawlers was 2037, and their average net tonnage steamets – 57'4; in 1900 they numbered 925, with a net tonnage of 41-1, and from that year up to 1906 (the last year quoted in these returns) they never again reached a thousand in number or a tonnage of 40 tons net; on the other hand, there were in no one of the years quoted as few as 800 first-class sailing trawlers registered, nor did the average tonnage sink below 37, about which figure it remained constant. It is obvious therefore that about 1894 beam trawling began to decline, and that after a time this decline lost most of its power, the number of boats and size of boats having sunk to a condition in which they fulfilled a certain function, which for some years has remained fixed. The new factors which brought about this change went hand in hand. They were the invention of the otter trawl and the increasing use of steam in fishing vessels. The otter trawl has no rigid and heavy beam, but relies on the force with which it is towed through the water to keep it open, and it is a far more efficient instrument for the capture of all but small flat fish than the beam trawl. Owing to the second of these facts its employment inevitably spread, and owing to the first a sailing vessel needing at least a moderate breeze to give it the requisite speed for keeping a large net open was unsuitable for working it. Thus the introduction of the otter trawl un- doubtedly hastened the replacement of sails by steam as motive power for the great fishing fleets. That the adoption of

steam would have occurred in any case is almost certain. The con- version of drift-net fishing vessels from sail to steam has gone on rapidly, though no radical change of gear has taken place, and presumably the same would have occurred in the case of trawlers had the otter trawl never have introduced. There 1 Johnstone, British Fisheries, p. 283 (London, 1905).

were, for instance, nearly 200 steam fishing vessels of various descriptions working from English and Welsh ports in 1883; and the desire to exploit new and more distant grounds had un- doubtedly become powerful by 1894, and accounted to some extent for the increase of steam trawling about that time. Never- theless this increase is so sudden, that its occurrence at the time of the adoption of the otter trawl can scarcely be a coinci- dence. In 1893 there were 480 steam trawlers working from English and Welsh ports: in 1899 there were over a thousand. The subsequent history of British trawling is dominated by the steamers. Garstang has calculated from a study of market statistics that a steamer (between the years 1889 and 1898) caught on the average between four and seven times as much in a year as a sailing smack. Against this competition the smacks could not succeed; if it was profitable for the steamers to fish they could gradually eliminate the smacks, as has occurred at Grimsby. The line fishery also decreased owing to the increas- ing transfer of the haddock and some other fisheries to the trawlers. The change from masts and sails to steam has, how- ever, never been complete. The increased cost of building and running steamers made the handling of large catches a necessary condition of their profitable employment. A sailing trawler costs from £500 to £1200 to build: £1000 would probably be a fair average. A first-class steam trawler of the present day costs £10,000 or more, quite ten times as much, and about £5000 a year to run; and although the cost was less in the early years of steam trawling there was always an approach to these pro- portions. On the other hand their rapidity and independence of wind made distance between fishing ground and port of landing a matter of minor consequence. These causes, combined with a very general belief in the exhaustion of the home-grounds — there seems no doubt that at all events the catch per vessel declined — led to the growth in size and power of the steamers, which were used for distant waters and the exploitation of new grounds. Thus in 1906

there were only 200 more steam trawlers than in 1899, but the average tonnage in the same period increased from 54 to nearly 62. To this increase in power and range of action of the steamers must be attributed the great increase in the quantity of trawled fish landed, since the engine of capture, the trawl, has changed but little since 1894: but another result occurred, namely a partial division of the area trawled between sail and steam. The grounds within easy reach of the English ports were left chiefly in the hands of the " smacks," the catches never being really very great, though possessing a high proportion of " prime " (i.e. valuable species of) fish. The persistence of Lowestoft and Ramsgate as smack ports speak for this. The longer voyages of the smacks, on the other hand, were gradually discontinued, and the distant grounds besides a multitude of new grounds were opened up by the steamers. Grimsby, Hull, Aberdeen, Milford, increased enor- mously in importance, and now send vessels to the north of Russia, to the coast of Africa and far into the Atlantic. Steam trawling died at Yarmouth, the place of its birth; sailing trawlers disappeared from Grimsby, one of their greatest strongholds, but a port near cheap coal, deep water, and a market for fish from more distant grounds.

The Otter Trawl. Principle of Action.

Fig. 1. — Diagrammatic; showing an Otter trawl in use. (For the sake of clearness, the size of the otter-boards is exaggerated, and the length of the warps and size of the ship diminished.)

The essential features of the otter trawl are that the mouth is kept open by two large wooden boards, whose position when in use corresponds to that of the trawl heads in a beam trawl no beam being used. The action of these boards resembles that of a kite. A kite dragged through still air, owing to the position ot the point of attach- ment of the string, takes up an oblique position, in which it is acted on by forces in two directions, viz. that exerted through the string, pulling forward, and that exerted by the resistance of the air in front of the kite, which, being perpendicular to the kite's surface, acts in an upward and backward direction. The resultant ot these two forces necessarily acts in a direction between them, and the kite accordingly ascends. Constrain the kite to move in a horizontal plane, and the same forces would cause it to move not upwards, but to the side. A trawl board is practically a kite made to move on its side.

The trawl boards resemble massive wooden doors strengthened

by iron bands. In action they move with their short edges vertical and their long edges horizontal, one in each case in contact with the sea bottom : the front bottom corner of each board is rounded off, so that the board resembles a sleigh runner. Four strong chains, which meet in one iron ring, are attached to each board by ring- bolts, and to each ring a wire warp, by which the trawl is towed, is shackled. The ringbolts are about the same distance from the centre of the board, but the two chains attached to the after-ring- bolts of the board ate longer than the two fore-chains. The trawl board when towed thus takes up an oblique position as regards the line in which it is towed, though remaining vertical to the ground. The force with which it is towed urges it forward , the resistance of the water urges it in a direction perpendicular to its surface, viz. backwards and to the side ; it accordingly moves in an intermediate direction, going forward by tending to diverge from the line of towing. Meanwhile the other trawl-board is diverging in a similar manner but in the opposite direction, and the mouth of the net, being attached to the hinder end of the boards, is thus pulled both right and left until stretched to its utmost, and the net is thus held open. The margin of the net which forms its upper lip is lashed to a rope called the headline : and the resistance of the water to the net's progress causes this to assume an arched form, the centre of the headline being probably some 10 or 15 ft. from the ground.

It has been calculated by Fulton, who experimented on the subject, that the distance between the boards of an otter trawl of 90 ft. headline is about 60 ft., owing to this arching upwards and backwards of the upper margin of the net. The loss in the spread of the net is, however, compensated for very largely, as far as certain round fish are concerned, by the increase in height of the mouth, the fish which are swimming near but not actually on the bottom tending to "strike upward" when disturbed. Indeed, the raising of the headline is accentuated occasionally by glass spheres or other buoyant objects to its centre ; corks are still used in this way, but otherwise the practice has not been generally adopted in commercial trawling.

The earliest use of the otter board appears to have been due to Hearder, an electrician and inventor who designed it about i860. It was Httle used except by amateurs working by steam yachts (to whom doubtless the ease with which it could be stowed away recommended it), until the late 'eighties, when Danish fishermen used otter boards to spread their plaice seines. In 1894 a patent was taken out by Scott of Granton for an otter trawl which

differed from the most modern forms chiefly in possessing rigid bars or brackets instead of chains. Chains replaced the bars in the form used by Nielsen, a Dane, in 1895. Although numerous variants have since arisen, no essential difference in the trawl has been generally adopted.

The trawl boards, or as they are frequently called ” doors, are of deal, 8 to 9 ft. long, and 4 to 5 ft. high ; they are liberally shod and strengthened with iron, and are about 3 in. thick. _ . . The net is fastened to eyes placed at the top and bottom ctJˆJiSe of the after-end of the board but not to any intermediate fheBoards point. This is to allow the part of the water swirling past the board to escape: the entry of the whole of the water upon which the net’s mouth advances would cause too great a resistance.

Two warps are used, one to each trawl board. These are composed of wire rope 2j in. round, and when the trawl is inboard lie coiled up on the separate drums of a steam winch. _.. warns As wire can be run off or wound in on either drum ˆ p ‘

separately, the adjustment of the lengths is much simplified. In the larger trawlers a thousand fathoms of warp is carried on each drum, and the warp is designed to stand a breaking strain of 23 tons.

The main form of net is that of the beam trawl. We have, as in that net, a coarse meshed netting used near the mouth, a decrease in size of mesh as the net narrows, and a bag The Net. or cod end whose end is fastened by a cod line passed through its final meshes. The only essential difference lies in the net behind the headline. This has not, as in the beam trawl, a straight margin, but a curved one, the pointed sides of the net being termed the top wings” of the trawl, the corresponding parts of the bottom being in both trawls the bottom wings. The ground

rope resembles that in the beam-trawl, but is in some cases furnished with chains or ” dangles ” or with ” bobbins.” Bobbins are heavy cylindrical wooden rollers, threaded on the wire warp which forms the core of the ground rope : they are of two sizes (the larger a foot through) placed alternately to ensure freedom of rotation. Their object is to surmount or crush obstacles which,

by catching the ground rope, might capsize the trawl boards and destroy the success of the haul ; they are accordingly used only on rough ground. The chains are fastened to the ground rope in loops, to give it weight, and are used on very soft ground to ensure the trawl's effectually dislodging the fish. The headline is a rope some 3 in. in circumference.

The meshes are, from knot to knot when drawn taut, from 55 to nearly 6 in. in the square and wings, 5 to 4.3 in. above, and 5 to rather over 3 in. below in the extreme back of the under batings called the " belly," about 2\ in. in the cod end.

The successful shooting of the net is a matter of great skill. The paying out of the net, the lowering of the boards, the running out Wo k'nv °^ unec l ua l lengths of the two warps to square the theNet trawl into proper position and the subsequent lowering of the whole to the bottom, resemble the corresponding operations with the beam trawl. The fore warp is then drawn close to the quarter of the vessel and shackled to the after-warp close to the vessel's side, and the vessel proceeds on her course at a speed of some 2j or 2j m. per hour. The length of haul made varies enormously. On a ground where fish is very abundant, as in the early days of Iceland fishing, it may be half an hour or less : on the Eastern Grounds, off Denmark, where the great English fleets usually work, it is about 3 hours. When about to haul, the fore warp is released from the shackle and the vessel is immediately steered towards the side from which the trawl has been towed, while the warps are rapidly wound in; the warps thus speedily come to stand at right angles to the vessel. If this were not the case they might probably foul the vessel's propeller, with very serious and possibly fatal consequences to her safety. The trawl boards, having been drawn right up to their powerful iron supports or gallows, remain suspended there if the trawl is to be re-shot while the net is emptied ; they are otherwise lowered between the gallows and the bulwark, and secured. The hauling in of the catch occurs as in the beam-trawl. Trawlers carry a trawl en each side of the deck, and in continuous trawling these are worked alternately. On each side of the deck a square enclosure called a pound is made for the reception of the fish falling from the cod end, by fitting planks turned on their sides into stanchions grooved for their reception. The fish is sorted into baskets in the pound, cleaned and packed in trunks in ice in the hold or fish-room.

A noteworthy method of trawling is the custom of 50 or 60 boats

fishing together in a fleet. All these vessels will trawl as Fleet directed by an ” admiral,” in proximity to a ” mark-

Flshnr boat,” whose position is known to the owners from day to day, and the fish is daily fetched to market by fast ” carriers.” There are four such fleets of British vessels work- ing in the North Sea. It is also worthy of mention that wireless telegraphy has recently been fitted to several German trawlers and drifters, which can thus communicate with the fishery protection cruisers, who pass on information concerning the fishery, and with the shore. The practice will doubtless spread, although as yet the distance over which a message can be sent by these vessels is very small.

The use of steam has not only increased the radius of action of the vessel, but by facilitating the process of hauling enables trawling Deaths to ˆ e carr ‘ e d out in greater depths. The sailing worked vessels rarely work in greater depths than 30 fathoms. The steam vessels work frequently (e.g. south of Ireland) in over 200 fathoms. Commercial trawling in 500 fathoms is not unknown, and the Irish research vessel ” Helga ” works in as much as 800 fathoms.

The movable nets resembling trawls are seines, from which trawls were in all probability developed. The seine is an extremely ancient net, used by Phoenicianˆ Greeks and other Mediterranean peoples, the word seine being derived from the Greek name (aayrivri) for the appli- ance. In essence it is a long strip of netting with a buoyed headline and weighted ground rope. It is taken out in a boat some little distance from the shore, paid out during the boat’s progress, and the lines attached to the ends being then brought back to the shore, the net is hauled up on the beach. From this simple form, which is still in use for the capture of smelts and other small fish, numerous develop- ments have occurred. Before mentioning the details of a few of the chief of these it may be said that the changes mainly con- sist in the formation of a purse or pocket in the middle of the net, somewhat resembling the cod end of a trawl, and in the working of the net from boats or ships instead of from the sea.

Seines.

The boat is anchored during the hauling, the net being drawn to it. A net with a wide spread, furnished with a purse, drawn over the sea bottom to a boat, is obviously very near a trawl in its

action. When in the late ‘eighties Danish fishermen fastened otter boards to their plaice-seines, and allowed the boat to drift, the seine was dragged by, not to the boat, and when Petersen used a similar arrangement, presently to be described, dragged like a trawl, the evolution of a trawl from a seine was practically complete. Some such process, with the use of a beam instead of otter boards, probably occurred in the past and resulted in the beam trawl.

Pilchard seines, as the most elaborate forms of simple seines, may be briefly described. The pilchards approach certain parts of the Cornish coast, notably St Ives and Penzance, in _,. . . shoals which are eagerly awaited; and when they are seines sufficiently near two boats start out on the fishery. One carries a short seine, the stop net, which has previously been joined to the large seine, and shoots this net as it rows towards shore. The other rows along the shore, shooting its net as it goes. Ultimately the boats turn to meet each other, and when they do so the ends of the long seine are joined, the stop net removed, and the circle of netting towed to the beach until its ground rope touches the bottom. The p’lchards are then removed at leisure by a smaller seine called a tuck-net — seine being a word which in the west of England is confined to nets worked from the beach. This net is very deep in the middle, and as the foot rope is drawn well in in hauling, a floor is formed for it as it approaches the boat from which it is worked, a simple form of purse or bag resulting. The pilchards are dipped out in large baskets. In a good catch this process of ” tucking ” out the fish may be carried on for some days. The long seine used may be 200 fathoms long, and is about 6 fathoms deep at the ends and 8 fathoms in the middle. The tuck-net is about 80 fathoms long, 8 deep at the ends and 10 fathoms in the middle. The meshes are larger at the ends or wings than in the middle, as in the trawl, bringing a tuck-net from 30 down to 42 the yard.

The seine is far more used in the United States than in the British Islands, its operations being so successful that complaints have in some cases been made that local fisheries for certain _ species have been entirely destroyed owing to the – ? e diminution of the fish which it has brought about. e nes.

It is used jn water of any depth, for the purpose of catching mackerel. Rings are fastened to the ground rope, and by means of a rope passed through these rings the lower margin of the net is drawn together, converting the circle of netting into a complete

basin- shaped purse. The slack of the net is then gradually drawn in, the fish collecting in the last of the net (the fullness or ” bunt “) to be reached. Purse seines are also used in Japan, where there is also in use a net which is a combination of seine and pound-net. A long wall of netting forms a ” leader ” to the fish, and ends in an oval enclosure formed by a purse seine with incompletely closed ends. Two anchored boats, to which the seine is lashed, keep it extended. On hauling, the opening is closed and the slack of the net hauled into one boat, which approaches the other, until the final portion containing the fish is brought to the surface.

The pockets of seines, though answering the same purpose as those of trawls in preventing the escape of the fish, „ _ . resemble not the pockets but the cod end of the latter . t S net. In the filets de bmuf of the Mediterranean the J^Jtets ” pocket is a very long bag, trailing behind the arms of the seine, and constricted for some distance before joining it. It is without ” flapper ” or other valve.

(After Drechsel.)

Fig. 2. — Diagram of a Danish Plaice-seine at work.

Most efficient pocketed seines are used in Denmark for the capture of eels and plaice. In both these nets the depth increases rapidly as soon as the extreme wings are left, and is very great in the

middle. Thus when in action but little of the net is vertical; the ground and head ropes, though not parallel, tend to become so, and the net trails in a curve behind them. Seen from above, the whole front margin of the net is semicircular, but the net itself is shaped like the hinder part of a trawl : in fact, did the headline of a trawl lie not in front but exactly over the ground rope, the two nets would be almost identical.

The eel drag-seine is worked from a boat, in shallow water. The

extreme ends or wings are attached to two short spars, which _ . _ in nse are upright, and each of these is furnished with

. rag ” a line top and bottom which meet and are attached se ne * to the ropes by which the net is hauled in. The total

length of the net is about 140 ft. from wing to wing, the length of the bag 30 ft., the depth at mouth is 20 ft. opening, the depth at the ends 6 or 8 ft.

The eel drift-net resembles the preceding, but is not drawn to an anchored boat, but drifts with the boat; it has accordingly to be made much smaller, its arms being each about 24 ft. — or a total length of 50. The wings were some- times kept apart by the use of a floating spar, ..o the ends of which the seine was attached by short ropes, the spar itself being towed. A funnel-shaped valve leads into the bag.

Petersen’s trawl was designed by Dr Petersen for use in deep water, and for the capture of rapidly moving animals. It is es- sentially a drift-seine of the preceding pattern, worked Petersen s w jth two small otter boards instead of a beam, and Trawl. furnished with but a single warp, to which the otter

boards are attached by shorter ropes or bridles. When used in very deep water these are prevented from twisting by attaching at the point of their junction with the warp a glass float and a leaden weight. This net is undoubtedly highly suitable for great depths. It is probably the ” trawl ” which it has been reported has been repeatedly used in the great depth of 2900 fathoms from the Norwegian research vessel ” Michael Sars,” in the course of the cruise in the Atlantic carried out in 1910 by Sir John Murray and Dr Hjort. It is practically a small otter trawl with the square cut out, leaving only wings, back part of batings and cod end, which last is entered by a funnel of netting. The meshes, in the net first constructed by Dr Petersen, were about a centimetre square in the wings and 8 millimetres square in the bag. The arms were each 24 ft. long, the bag about 16 ft. The boards were 29 in. by 32 in., and | in. thick. Glass floats are frequently used with this trawl, to keep up the headline.

The Danish plaice-seine resembles the eel-seine in form, but is much larger, each arm being about 180 ft. long; the bag is 20 ft. i) 1 u long. The drag lines are also much longer, sometimes

p, jce-selne reacmn g to 1200 fathoms. These nets are worked ‘ from a very large number of boats, Esbjerg being the chief North Sea port engaged in the fishery. The vessels are yawl rigged, of the size of all but the largest smacks, and each is now furnished with a motor-boat. The boat takes the net to a considerable distance from the parent vessel, which is anchored, and shcots it in a wide curve. The drag lines are then brought back to the smack for hauling. By this method plaice are captured alive, and are kept in large floating fish-boxes until required.

Next in importance to trawling among the English fisheries is the use of drift-nets for mackerel, herrings and pilchards. It is undoubtedly the most common method of net- fishing on the coasts of the British islands, but no- where is it so general as in Scotland. There are, however, great drift fisheries on the eastern and southern coasts of England, and an important mackerel fishery mainly at the western end of the channel, though owing to a high import duty on mackerel levied by France this is now of far less importance. The value of the mode of fishing technically known as ” drifting or driving ” will be understood when it is remembered that it is the only method by which such fishes as herrings, mackerel and pil- chards, which generally swim at or near the surface, can be readily caught in the open sea, at any distance from land, and in any depth of water, so long as there is sufficient for the floating of the nets in the proper position. The term “drift-net” is de- rived from the manner in which the nets are worked. They are neither fixed nor towed within any precise limits of water, but are cast out or ” shot ” at any distance from the land where there are signs of fish, and are allowed to drift in whichever direction the tide may happen to take them, until it is thought desirable to haul them in. The essential principle of the working of the drift-net is that it forms a long wall or barrier of netting hanging for a few fathoms perpendicularly in the water, but extending for a great length horizontally, and that the fish, meeting these nets and trying to pass them, become meshed; they force their heads and gill-covers through the meshes, but

Drift Nets.

can go no farther; and as the gill-covers catch in the sides of the mesh, the fish are unable to withdraw and escape. Whether it be mackerel, herring or pilchard, the manner in which the net works is the same; the variations which exist relate only to the differences in habits and size of the fish sought after.

The nets used are light cotton nets, each about 30 yards long and 10 or 12 deep, and when designed for herring have a mesh of about an inch square, pilchard nets being smaller and mackerel nets larger in mash. These nets are laced end to end in a long row, the whole row, called a “fleet” or “train” of nets being, in the case of the large herring boats, as much as 35 miles long. One of the long edges of the net is fastened to a rope corked at regular intervals, whose purpose is to keep that part uppermost. This edge is called the ” back ” of the net. The corks are, however, not sufficient to keep the whole net from sinking, and this is done by buoys called ” bowls, ” which are attached to the back rope at intervals. It is always a matter of uncertainty at what depth the fish may be found, and a deal of judgment is needed in deciding what length of rope should be used in attaching the buoys. In the herring fishery of the English east coast the British boats usually work in somewhat shallower water than the foreign drifters, and set their nets at about 4 fathoms from the surface, the foreigners, lying outside them, using deeper-set nets. It is found convenient to colour certain of the bowls distinctively to indicate their position in the ” fleet. ” Otherwise they are coloured to show ownership.

Drift-net fishing is with rare exceptions only carried on at night. The time for beginning is just before sunset, and the nets are then got into the water by the time it is dark. A likely place to fish is known (though there is much uncertainty in the matter) by signs recognizable only to the practised eye. An obvious one is the presence of many sea-birds, or of the fish themselves. But besides these the appearance and even the smell of the water furnishes a guide. In the- case of the mackerel these signs have been shown by G. E. Bullen (Journ. Marine Biol. Assoc, viii. 269) to be due to the character of the microscopic organisms in the water, some of which furnish the food of the mackerel, others of which it avoids. If fish is believed to be present the vessel is sailed slowly before the wind and if possible across the tide; then the net is shot or thrown out over the vessel’s quarter, the men being distributed at regular stations, some hauling up the net from below, others throwing it over and taking care that it falls so that the foot is clear of the corked back; others, again, looking after the warp which has to be paid out at the same time, and seeing that the seizings are made fast to it in their proper places. When it is all overboard, and about 15 or 20 fathoms of extra warp, called the ” swing-rope, ” given out, the vessel is brought rcund head to wind by the warp being carried to the bow; the sails are then taken in,

the mast lowered, a small m'zen set to keep the vessel with her head to the wind, and the regu- lation lights are hoisted to show that she is fishing. A few of the hands remain on deck to keep a look out, and the vessel and nets are left to drift wherever the wind and tide may take them. It is very rarely that there is an absolute calm at sea ; and if there is the faintest breath of air stirring the fishing boat will of course feel it more than the buoys supporting the nets; she will consequently drift faster, and being at the end of the train, extend the whole fleet of nets. In rough weather, as the strain may be greater, more rope is used. The first net in the train is often hauled after an hour to enable the men to judge whether the position is a good one. When the whole are hauled, the nets are taken in and the fish shaken out in the same orderly way as in shooting, each man having his own proper duty.

The sailing drifter is fast disappearing, giving place to the steam drifter. These vessels, though costing far more (£2500 to £3000 against £400 only) catch more fish, have a greater radius of action, reach market more quickly and are independent of weather. It has been calculated that a thousand square feet of herring netting used by a steamer catch 43J cwt. of herring, while a sailing vessel catches 20 cwt. with the same area of netting; and the steamer-caught fish, being more quickly delivered, fetches a better price. It may be noted that of recent years herring have been caught at the bottom in considerable quantities by the trawl. The fishing of herring is thus increasing in variety of method, as well as in intensity. Such sailing boats as tend to remain are long shore boats, and such drifters as have been fitted with petrol motors.

Stationary nets, being of very small importance relatively to the preceding, must be dismissed more shortly. They are of four main kinds, viz.: stake nets, fi e i S °" ary pound and kettle nets, stow and bag nets, trammel- nets and hose nets.

Stake nets are usually set between tide-marks, or in shallow water, and, as their name implies, are kept up by stakes placed at intervals. They are generally set across the direction of the tide. They act as gill nets, and are chiefly used Stake Nets. in America. In some cases a conical bag instead of a flat net occupies the space between every two stakes, forming a series of simple bag nets. This form is used on the German shores of the North Sea.

In another modification the net is supported on the stakes, which is some 200 ft. long, does not act as a gill net but as a ” leader, ” . and one of its ends passes through a narrow opening Pound and j ntQ a c ; rcu j ar enclosure surrounded by a similar Kettle Nets. wa jj of sta ˆ e(ˆ ne tting. The bag net and fly net for the capture of the salmon are merely elaborated forms of this type. The pound is roofed by netting, in the fly net, and in the bag net, which is floated — not staked — floored also. It is wedge-shaped, narrowing gradually from the entrance end, and divided incompletely by oblique internal walls or valves of netting into side compartments.

The bag net just described is practically a floating stake net. A simpler form is used in the Elbe, consisting of a pyramidal net Net wnose rnouth is held open by its sides being attached s. tQ S p ars> weighted at one end and buoyed at the other. This is the simplest form of stow net. The stow net is used in the Thames and Wash ; it is specially designed for the capture of sprats, although many young herrings are sometimes caught, and it is worked most extensively at the entrance of the Thames. The stow net is a gigantic funnel-shaped bag having nearly a square mouth, 30 ft. from the upper to the lower side, and 21 ft. wide. It tapers for a length of about 90 ft. to a diameter of 5 or 6 ft., and further diminishes to about half that size for another 90 ft. to the end of the net. The whole net is therefore about 180 ft. or 60 yards long. The upper and lower sides of the square mouth are kept extended by two horizontal wooden spars called ” balks,” and the lower one is weighted so as to open the mouth of the net in a perpen- dicular direction when it is at work. The size of the meshes varies from 1 1 in. near the mouth to § in. towards the end, where, however, it is again slightly enlarged to allow for the greater pressure of the water at that part. The mode of working the net is very simple. Oyster smacks are commonly used in this fishery, although shrimping boats are also employed in it in the Thames. The smack takes up a position at the first of the tide where there are signs of fish, or in such parts of the estuary as are frequented by the sprats during that part of the season; she then anchors, and at the same moment the net is put overboard and so handled that it at once takes its proper position, which is under the vessel. It is kept there by a very simple arrangement. Four ropes leading, one from each end of the two balks, and therefore from the four corners of the mouth of the net, are united at some little distance in front, forming a double bridle,

and a single mooring rope leads from this point of union to the vessel's anchor; so that the same anchor holds both the vessel and the net. The net is kept at any desired distance from the bottom by means of two ropes, one from each end of the upper balk to the corresponding side of the smack, where it is made fast. The open mouth of the net is thus kept suspended below the vessel, and the long mass of netting streams away astern with the tide. The strain of this immense bag-net by the force of the tide is often very great, but if the vessel drags her anchor, the net being made fast to the same mooring, both keep their relative positions. Here they remain for several hours till the tide slackens, the vessel's sails being all taken in and only one hand being left on deck to keep watch. The way in which the fish are caught hardly requires explanation. The sprats, swimming in immense shoals, are carried by the tide into the open mouth of the net and then on to the small end, where they are collected in enormous numbers; from this there is no escape, as the crowd is constantly increasing, and they cannot stem the strong tide setting into the net. The first thing to be done in taking in the net is to close the mouth, and this is effected by means of a chain leading from the bow of the vessel through an iron loop in the middle of the upper balk down to the centre of the lower one, and by heaving in this chain the two balks are brought together and ultimately hoisted out of the water under the vessel's bowsprit. The net is then brought alongside and overhauled till the end is reached, and this is hoisted on board. The rope by which it is closed having been cast off, the sprats are then measured into the hold of the vessel by about three bushels at a time, until the net has been emptied. The quantity of sprats taken in this manner by many scores of fishing craft during the season, which lasts from November to February, is in some years simply enormous; the markets at Billingsgate and elsewhere are inundated with them, and at last in many years they can only be disposed of at a nominal price for manure; and in this way many hundreds of tons are got rid of. The stow boats do not generally take their fish on shore, but market boats come off to them and buy the fish out of the vessel's hold, and carry it away. The mode of working is the same in the Solent and the Wash as that we have described in the Thames and large quantities of sprats are landed by the Southampton boats.

" Whitebait," or young sprats, mixed with some young herring and other small fish, are caught in the Thames by a net which is practically nothing else but a very small stow net, and it is

worked in essentially the same manner. An interesting form of stow net is used in the Channels of the Frisian Island, chiefly during the rush of the ebb-tide, for the capture of rays (principally Raja clavata, the Thornback) which are highly valued by the Dutch. It consists of a net shaped like an otter trawl, furnished with otter boards,

Trammel Nets.

which are attached to ropes passed to the ends of long booms which project from the sides of the vessel using the net, and also to the two anchors by which the former is anchored.

The remaining stationary nets to be mentioned partake of the nature of traps. The trammel net consists of three nets joined together at the top, bottom and sides. The whole system of nets hangs vertical, the head line being buoyed and the ground line weighted. The two outer nets are much smaller than the inner net, but of wide-meshed netting, whereas the inner net is of very small mesh. “Consequently, a fish meeting an outer net passes through it, strikes the fine-meshed net and forces it before it through one of the meshes of the farther wide-meshed net ; it is thus in a small pocket from which it cannot escape.

The hose net is a long cylindrical net from which trap-like pockets open. The main cavity is kept open by rigid rings. The hose nets are set between tide marks, at low water, so that the tide runs through them ; and they are emptied at Hose Net. next low tide.

While unimportant compared with the huge quantity of fish landed from sea-going vessels, the catch of the in-shore nets described is of importance in respect of the kinds of fish taken, whitebait and pilchards, for instance, being not otherwise obtained, while salmon, though taken in rivers as well as in estuaries and along the coast, is very rarely captured at sea.

Authorities. — Brabazon, The Deep-Sea and Coast Fisheries of Ireland (1848); Holdsworth, Deep-Sea Fishing and Fishing Boats (London, 1874) ; Z. L. Tanner, Bulletin United States Fishery Commission (1896), vol. xvi. ; Garstang, ibid., vol. vi.; Kyle, Journal of the Marine Biological Association of the United Kingdom, new series, vol. vi. (London) ; Cunningham, ibid., vol. iv. ; Petersen, Report of the Danish Biological Association, vol. viii. (Copenhagen, 1899) ; Hjort, Report on Norwegian Fishery

and Marine Investigation, vol. i. (Christiania, 1900) ; Mittheilungen-. Deutscher Seefischer- Verein, various numbers; Fulton, Reports of the Scottish Fishery Board, 19th Report (1900); and in other numbers; Report and Minutes of Evidence of the Committee, ‘ ‘ appointed to inquire into the scientific and statistical investigations now being cerried on in rela- tion to the fishing industry of the United Kingdom.” (London, 1908). _ (J. O. B.)

TRAY, a flat receptacle with a raised edge used for a variety of purposes, chiefly domestic. The tray takes many forms — oblong, circular, oval, square — and is made in a vast number ol materials, from papier mache to the precious metals. Dukt Charles of Lorraine had a pen-tray of rock crystal standing on golden feet; Marie Antoinette possessed a wonderful oval tray, silver gilt and enamelled, set with 144 cameos engraved with the heads of sovereigns and princes of the house of Austria, and their heraldic devices. The tea-tray is the most familiar form; next to it comes the small round tray, usually of silver or electro- plate, chiefly used for handing letters or a glass of wine. When thus employed it is usually called a ” waiter.” The English tea-trays of the latter part of the 18th century were usually oval in shape and sometimes had handles; mahogany and rosewood were the favourite materials. Sheraton and Shearer, among other cabinet-makers of the great English period, are credited with trays of this type. These were succeeded in the early and mid-Victorian period by trays of japanned iron, which possessed no charm but had the virtue of durability. Sheffield plate snuffer-trays of satisfying simplicity were made in large numbers, and are now much sought after.

TRAZ-OS-MONTES (i.e. across the Mountains>, an ancient frontier province in the extreme N.E. of Portugal, bounded on the N. and E. by Spain, S. by the river Douro which separates it from Beira, and W. by the Gerez, Cabreira and Marao Moun- tains, which separate it from Entre-Minho-e-Douto. Pop. (1900), 427,358; area, 4,163 sq. m. For administrative purposes Traz-os-Montes was divided in 1833 into the districts of Braganza (q.v.) and Villa Real (q.v.). The surface is generally moun- tainous, although there are tracts of level land in the veigas or cultivated plains of Chaves and Miranda do Douro, and in the cimas or plateau region of Mogadouro. The highest peak is Marao (4642 ft.). The province belongs to the basin of the Douro and is chiefly drained by its tributaries the Tua, Tamega and Sabor. Its inhabitants belong to the old Portuguese stock, and resemble the

Spaniards of Galicia in physical type, dialect and character. The Paiz do Vinho (see Oporto) is the chief wine-growing district in Portugal; other products are silk, maize, wheat, rye, hemp, olive oil and honey. There are important mineral springs and baths at Vidago and Pedras

Salgadas. The principal towns are Braganza, Chaves and Villa Reai.

TREACLE, the thick viscid syrup obtained in the early- processes of refining sugar, the uncrystallizable fluid obtained in the process of procuring refined crystallized sugar being known as ” golden syrup ” and the drainings from the crude sugar as ” molasses ” (see Sugar: Manufacture). The word was pro- perly and first used for a medical compound of varying ingre- dients which was supposed to be a sovereign remedy against snake bites or poison generally. A well-known specific was Venice treacle, Theriaca Andromachi, a compound of a large number of drugs reduced to an electuary, 1 a medicinal com- pound prepared with honey, which dissolves in the mouth. The old French triacle, of which “treacle,” earlier “triacle,” is an adaptation, is a corruption of theriaque, Latin theriaca, Greek OripiaKa {sc. 4>apnaKa) , literally drugs used as an antidote against the bite of poisonous or wild animals {6r\pix>v, dim. of 0ijp, wild beast). The word ” triacle ” came to be used ot any remedy or antidote. The composition of electuaries with honey or syrup naturally transferred the name to the most familiar syrup, that obtained from the drainings of sugar.

TREAD-MILL, a penal appliance introduced by Sir William Cubitt in 1818 and intended by him as a means of employing criminals usefully. It was a large hollow cylinder of wood on an iron frame, round the circumference of which were a series of steps about 7J in. apart. The criminal, steadying himself by hand-rails on either side, trod on these, his weight causing the mill to revolve and compelling him to take each step in turn. In the brutalizing system formerly in vogue the necessary resistance was obtained by weights, thus condemning the offender to useless toil and defeating the inventor’s object. The tread-mill, however, was subsequently utilized for grinding corn, pumping water and other prison purposes. The speed of the wheel was regulated by a

brake. Usually it revolved at the rate of 32 ft. per minute. The prisoner worked for 6 hours each day, 3 hours at a time. He was on the wheel for 15 minutes and then rested for 5 minutes. Thus in the course of his day's labour he climbed 8640 ft. Isolation of prisoners at their work was obtained by screens of wood on each side of the mill, con- verting the working space into a separate compartment. Each prisoner was medically examined before going to the mill.

By the Prison Act 1865 every male prisoner over 16, sentenced to hard labour, had to spend three months at least of his sentence in labour of the first class. This consisted primarily of the tread-mill, or, as an alternative, the crank. The latter consisted of a small wheel, like the paddle-wheel of a steamer, and a handle turned by the prisoner made it revolve in a box pa r tly filled with gravel. The amount of gravel regulated the hard labour; or the necessary resistance was obtained by a brake, by which a pressure, usually of 12 ft), was applied. The prisoner had to make 8000 or 10,000 revolutions during his 6 hours' work, according to his strength, the number being registered on a dial. The crank too, however, was subsequently made to serve useful purposes. Both tread-mill and crank have gradually been abolished; in i8g5 there were 39 tread-mills and 29 cranks in use in English prisons, and these had dwindled down to 13 and 5 respectively in 1901. They are now disused.

The fundamental idea of Cubitt's invention, i.e. procuring rotary motion for industrial purposes by the weight of men or animals, is very old. " Tread-wheels," of this type, usually consist of hollow cylinders, round the inner surface of which a horse, dog or man walks, foothold being kept by slabs of wood nailed across at short intervals.

TREASON (Fr. trahison, Lat. traditio), a general term for the crime of attacking the safety of a sovereign state or its head. The law which punishes treason is a necessary consequence of the idea of a state, and is essential to the existence of the state. Most, if not all, nations have accordingly, at an early period of their history, made provision by legislation or otherwise for its punishment. The principle is universal, though its

1 Electuary (Lat. electuarium), is probably derived from Gr. bcXaˆi?, used in the same sense, from UXelxav, to lick out.

application has led to differences of opinion. What would have

been a capital crime at Rome under Tiberius may be no offence at all in England. It is to the advantage of the state and the citizen that what is treason and what is not should be clearly defined, so that as little as possible discretionary power, apt to be strained in times of popular excitement, should be left to the judicial or executive authorities. The importance of this was seen by Montesquieu. Vagueness in the crime of treason, says he, is sufficient to make the government degen- erate into despotism. 2 At the same time, it may be observed that despotic governments have not always left the crime un- defined. The object of Henry VIII., for instance, was rather to define it as closely as possible by making certain acts treason which would not have been so without such definition. In both ancient and modern history treason has generally been a crime prosecuted by exceptional procedure, and visited with afflictive as distinguished from simple punishments (to use the terminology of Bentham).

Roman Law. — In Roman law the offences originally falling under the head of treason were almost exclusively those committed in military service, such as in England would be dealt with under the Army Act. The very name perduellio, the name of the crime in the older Roman law, is a proof of this. Perduelles were, strictly, public enemies who bore arms against the state; and traitors were regarded as having no mere rights than public enemies. The Twelve Tables made it punishable with death to communicate with the enemy or to betray a citizen to the enemy. Other kinds of perduellio were punished by interdiction of fire and water. The crime was tried before a special tribunal, the duumviri perduellionis, perhaps the earliest permanent criminal court existing at Rome. At a later period the name of perduellio gave place to that of laesa majestas, deminuta or minuta majestas, or simply majestas. The lex Julia majestatis, to which the date of 48 B.C. has been conjecturally assigned, continued to be the basis of the Roman law of treason until the latest period of the empire, and is still, with the law of perduellio, the basis of the law of British South Africa as to treason. The original text of the law appears to have still dealt with what were chiefly military offences, such as sending letters or messages to the enemy, giving up a standard or fortress, and desertion. With the empire the law of majestas received an enormous development, mainly in the reign of Tiberius, and led to the rise of a class of professional informers, called delator es? The conception of the emperor as divine 4 had much to do with this. It became a maxim that treason was next to sacrilege 6 in gravity. The law as it

existed in the time of Justinian is contained chiefly in the titles of the Digest 6 and Code 7 ” Ad legem Juliam majestatis.” The definition given in the Digest (taken from Ulpian) is this: ” majestatis crimen illud est quod adversus populum Romanum vel adversus securitatem ejus committitur.” Of treasons other than military offences, some of the more noticeable were the raising of an army or levying war without the command of the emperor, the questioning of the emperor’s choice of a successor, the murder of (or con- spiracy to murder) hostages or certain magistrates of high rank, the occupation of public places, the meeting within the city of persons hostile to the state with weapons or stones, incitement to sedition or administration of unlawful oaths, release of prisoners justly confined, falsification of public documents, and failure of a provincial governor to quit his province at the expiration of his office or to deliver his army to his successor. The intention {voluntas) was punishable as much as an overt act (ejfectus).* The reported opinions, as to what was not treason

2 Esprit des lots, bk. xii. c. 7.

3 See Merivale, History of the Romans under the Empire, iii. 467, v. 141.

4 ” Principes instar deorum esse ” are the words of Tacitus. 6 This crime was called laesa majestas divina in later law.

6 xlviii. 4.

7 ix. 8.

8 A similar provision was contained in the Golden Bull of Charles IV. c. 24. In English law, with the one exception of a statute of s 397 (2I Ric. II. c. 3) repealed in the first year of Henry IV.,

show the lengths to which the theory of treason was carried. It was not treason to repair a statue of the emperor which had decayed from age, to hit such a statue with a stone thrown by chance, to melt down such a statue if unconsecrated, to use mere verbal insults against the emperor, to fail jn keeping an oath sworn by the emperor or to decide a case contrary to an imperial constitution. Treason was one of the publica judicia, i.e. one of

those crimes in which any citizen was entitled to prosecute. The law deprived the accused in a charge of treason of his ordinary remedy for malicious prosecution, and also took from him the privilege (which those accused of other crimes generally possessed) of immunity from accusation by women or infamous persons, from liability to be put to the torture, and from having his slaves tortured to make them testify against him (see Torture). The punishment from the time of Tiberius was death (usually by beheading) 1 and confiscation of property, coupled with complete civil disability. A traitor could not make a will or a gift or emancipate a slave. Even the death of the accused, if guilty of treason of the gravest kind, such as levying war against the state, did not extinguish the charge, but the memory of the deceased became infamous, and his property was forfeited as though he had been convicted in his lifetime.

English Law.— The law of England as to treason corresponds to a considerable extent with Roman law; in fact, treason is treated by Blackstone as the equivalent of the crimen laesae majestatis. The history of the crime in the two systems agrees in this that in both the law was settled by legislation at a com- paratively early period, and subsequently developed by judicial construction. In both, too, there were exceptional features distinguishing this crime from other offences. 2 For instance, at common law treason was not bailable (except by the king's bench) nor clergyable, could not be cleared by sanctuary, and did not admit of accessories before or after the fact, for all were principals, nor could a married woman plead coercion by her husband. To stand mute and refuse to plead did not save the lands of the accused, as it did in felony, so that the peine forte et dure (see Torture) was unnecessary in treason. These severities were due to the conception of treason as a breach of the oath of allegiance. Other differences introduced by statute will be mentioned later. In some cases a statute simply affirmed the common law, as did the Treason Act 1351 to a great extent, and as did an act of 1534, depriving those accused of treason of the benefit of sanctuary. How far the Roman law was con- sciously imitated in England it is impossible to determine. It was certainly not adopted to its full extent, for many acts were majestas which were never high treason, even in the most despotic periods. Treason was the subject of legislation in many of the pre-Conquest codes. The laws of Alfred 3 and ˆEthelred 4 punished with death any one plotting against the life of the king. The Leges Henrici Primi " 5 put anyone slaying the king's messenger in the king's mercy. The

crime was shortly defined by Glanvill, 6 and at a greater length by Britton, 7 and by Bracton, 8 who follows Roman law closely.

The offence of high treason was not precisely defined by the common law (1 Hale, 76), and until the passing of the Treason Act 135 1 depended much on the opinions of the king and his judges. That statute appears to be the answer to a petition of the Commons in 1348 (1 Hale, 87), praying for a definition of the offence of accroaching royal power, a charge on which several persons — notably Gaveston and the Despensers — had suffered. The offences made high treason by the statute which still remain

an overt act has always been necessary. The difficulty of proving a mere intention is obvious. In French and German law the overt act (Attentat or Unternehmen) is as indispensable as in English.

1 To harbour a fugitive enemy was punishable only by deportation, Dig., xlviii. 19, 40.

2 The position of treason as a special crime prosecuted by special procedure is one common to most legal systems at some period of their existence. For instance, in Germany, by a constitution of Henry VII. the procedure was to be summary, sine strepitu et figura judicii.

3 c. 4. * v. 30. 6 lxxix. 2.

6 xiv. 1. 7 cc. 20, 21, 22. 8 de Corona 11 86.

are these: (1) to compass or imagine 9 the death of the king, 1 * the queen or their eldest son and heir; (2) to violate the king's companion, or his eldest daughter unmarried, or the wife of his eldest son and heir; (3) to levy war against the king in his realm, or be adherent to the king's enemies in his realm, giving them aid and comfort in the realm or elsewhere (perduellio) ; (4) to slay the chancellor, treasurer, or the king's justices of the one bench or the other, justices in eyre, or justices of assize, and all other justices assigned to hear and determine, being in their places doing their offices. In all cases of treason not specified in the statute the justices before whom the case came are to tarry without going to judgment until the cause has been showed and declared before the king and his parliament whether it ought to be judged treason or felony. The statute, so far as it defines the offence of high treason, is still law.

The statute also treated as high treason forgery of the great or

privy seal, counterfeiting the king's coin and importing counterfeits thereof. These offences are now felonies. It also defined petty treason (now merged in wilful murder) as the slaying of a master by his servant, a husband by his wife, or a prelate by a man secular or religious owing him allegiance. The act of 1351 protects only the king's life, and its insufficiency was supplemented in periods of danger by legislation, often of a temporary nature. Under Richard II. many new offences were made treason, 11 but the acts creating these new treasons were repealed at the earliest opportunity by the parliaments of his successors. The reign most prolific in statutory additions to the law of treason was that of Henry VIII. Legislation in this reign was little more than a register of the fluctuating opinions of the monarch. Thus, by one act of 1 534 it was treason not to believe Mary illegitimate and Elizabeth legitimate; by another act of 1536 it was treason to believe either legitimate; by an act of 1543 it was treason not to believe both legitimate. Another act of this reign (1545) shows that a class of men like the Roman delatores must have been called into existence by all the new legislation. The act made it felony to make anonymous charges of treason without daring to appear in support of them before the king or council. These acts were repealed in 1553 (1 Mar. st. 1. c. 1. s. 1.) and the act of 1351 was made the standard of the offence.

Besides the acts of 1351 and 1553 the following statutes are still in force with respect to the substantive law of treason. By an obscurely penned statute of 1495 (11 Hen. VII. c. 1. s. 1) persons serving the king for the time being in war are not to be convicted or attainted of treason; see Steph., Dig. Cr. Law (6th ed.), article 56. This statute has been held not to apply in British South Africa.

By an act of 1571 (13 Eliz. c. 2) as a counterblast to papal attacks on the right of Elizabeth to the English crown, it was declared that persons using in England papal bulls offering absolution and reconcili- ation to persons forsaking their due obedience to the English crown should be punishable as traitors. The penalties were abolished in 1846, but the acts against which the statute was aimed were declared to be still unlawful (see Steph., Dig. Cr. Law, 6th ed., p. 45H.). By an act of 1702 (1 Anne st. 2. c. 21 s. 3) it is treason to endeavour to hinder the next successor to the crown from succeeding, and by the Succession to the Crown Act 1707 it is treason maliciously, advisedly and directly by writing or printing to maintain and affirm that any person has a right to the crown otherwise than according to the Acts of Settlement and

Union, or that the crown and parliament cannot pass statutes for the limitation of the succes- sion to the crown.

By an act of 1796, made perpetual in 1817, the definition of treason is extended so as to include plots within or without Great Britain to cause the death or destruction, or any bodily harm tending to the death, destruction, maiming, or wounding, imprisonment or restraint of the king, if such plots are expressed by publishing any printing or writing, or by any overt act or deed. Since that date no new forms of treason have been created. There are many in- stances of offences temporarily made treason at different times. A

9 These words, according to Luders {Law Tracts, note ad fin.), mean to attempt or contrive.

10 This by act of 1553 includes a queen regnant.

11 One reason for making offences treason rather than felony was no doubt to give the Crown rather than the lord of the fee the right to the real estate of the criminal on forfeiture. Had the offences been felony the king would have had only his year, day and waste on the estate escheating to the lord, as was the case in treason before the Statute of Treasons.

few of the more interesting may be briefly noticed. It was treason to attempt to appeal or annul judgments made by parliament against certain traitors (1398) ; to break a truce or safe-conduct (1414-1450) ; to hold castles, fortresses or munitions of war against the king (1552) ; to adhere to the United Provinces (1665) ; to return without licence if an adherent of the Pretender (1696); to correspond with the Pretender (1701); and to compass or imagine the death of the prince regent (1817). In addition to these, many acts of attainder were passed at different times. One of the most severe was that against Catherine Howard (1541), which went as far as to make it treasonable for any queen to conceal her ante-nuptial incontinence. Other acts were those against Archbishop Scrope, Owen Glendower, Jack Cade, Lord Seymour, Sir John Fenwick, James Stuart and Bishop Atterbury. In one case, that of Cromwell, Ireton and Bradshaw, an act of attainder was passed after the death of those guilty of the treason

(1660), and their bodies were exhumed, beheaded and exposed. Acts of indemnity were passed to relieve those who had taken part in the suppression of rebellion from any possible liability for illegal proceedings. Three such acts were passed in the reign of William III. (1 689-1 690). Similar acts were passed after the Irish rebellion of 1798.

The punishment of treason at common law was barbarous in the extreme. 1 The sentence in the case of a man was that the Punish- offender be drawn on a hurdle to the place of execu- ment. tion, that there he be hanged by the neck but not till

he be dead, and that while yet alive he be disembowelled and that then his body be divided into four quarters, the head and quarters to be at the disposal of the Crown. 2 Until 1790 at common law a woman was drawn to the place of execution and there burned. In that year hanging was substituted for burning in the case of female traitors. In 1814 the part of the sentence relating to hanging and to disembowelling was altered to hanging until death supervened. Drawing and beheading and quartering after hanging were abolished in 1870. There is no legislation authorizing the execution of traitors within the walls of a prison as in the case of murder (see Capital Punishment). The act of 1814 in the case of men enables the Crown, by warrant under the sign manual, countersigned by a secretary of state, to change the sentence to beheading. Attainder and forfeiture for treason are abolished by the Forfeitures Act 1870, except where the offender has been outlawed. 3 The maximum penalty for a felony under the act of 1848 is penal servitude for life. In every pardon of treason the offence is to be particularly specified therein (see Pardon).

Trials for treason in Great Britain and Ireland were at one time frequent and occupy a large part of the numerous volumes of the State Trials. Some of the more interesting may be mentioned. Before the Statute of Treasons were those of Gaveston and the Despensers in the reign of Edward II. on charges of accroaching the royal power. After the statute were those (some before the peers by trial or impeachment, most before the ordinary criminal courts) of Empson and Dudley, Fisher, More, the earl of Surrey, the duke of Somerset, Anne Boleyn, Lady Jane Grey, Sir Thomas VVyatt, Cranmer, the queen of Scots, Sir Walter Raleigh, Strafford, Laud, Sir Henry Vane and other regicides, William Lord Russell, Algernon Sydney, the duke of Monmouth, and those implicated in the Pilgrimage of Grace, the Gunpowder, Popish,

Rye House and other plots. Cases where the proceeding was by bill of attainder have been already mentioned. Occasionally the result of a trial was confirmed by statute. In some of these trials, as is well known, the law was considerably strained in order to insure a conviction. Since the Revolution there have been the cases of those who took part in the risings of 1715 and 1745, Lord George Gordon in 1780, Thomas Hardy and Home Tooke in 1794, the Cato Street conspira- tors in 1820, Thomas Frost in 1840, Smith O'Brien in 1848, and in 1903 Arthur Lynch, for adhering to, aiding and comforting the king's enemies in the South African war. 4 The bulk of the treason

1 The exceptional character of the punishment, like that of the procedure, may be paralleled from Germany. The punishment of traitors by Frederick II. by wrapping them in lead and throwing them into a furnace is alluded to by Dante, Inferno, xxiii. 66.

2 See the sentence in full in Latin in R. v. Walcot, 1696, I Eng. Rep. 87.

3 Proceedings after the death of an alleged traitor might at one time have been taken, but only to a very limited extent as compared with what was allowed in Roman and Scots law. Coke (4 Rep. 57) states that there might have been forfeiture of the land or goods of one slain in rebellion on view of the body by the lord chief justice of England as supreme coroner.

4 1903, 1 K.B. 446. He was sentenced to death. The sentence was commuted to penal servitude for life. Lynch was released on licence after one year in prison a r -d has since been pardoned.

trials are reported in Howell's State Trials and the New Series of State Trials. The statute of 1351 as interpreted by the judges in these cases is still the standard by which an act is determined to be treason or not. The judicial interpretation has been sometimes strained to meet cases scarcely within the contemplation of the framers of the statute, e.g. it became established doctrine that a conspiracy to levy war against the king's person or to imprison or depose him might be given in evidence as an overt act of compass- ing his death, and that spoken words, though they could not in themselves amount to treason, might constitute an overt act, and so be evidence. Besides decisions on particular cases, the judges at different times came to general resolutions

which had an appre- ciable effect on the law. The principal resolutions were those of 1397 (confirmed 1398), of 1557, and those agreed to in the case of the regicides at the Restoration and reported by Sir John Kelyng. The effect of this legislation, according to Sir James Stephen, is that such of the judicial constructions as extend the imagining of the king's death to imagining his death, destruction or any bodily harm tending to death or destruction, maim or wounding, imprison- ment or restraint, have been adopted, while such of the constructions as make the imagining of his deposition, conspiring to levy war against him, and instigating foreigners to invade the realm, have not been abolished, but are left to rest on the authority of decided cases. The legislation in force in 1878 as to treason and kindred offences was collected by the late Mr R. S. Wright and its substance embodied in a draft consolidation bill (Pari. Pap. 1878 H. L. 178), and in 1879 the existing law was incorporated in the draft criminal codes of 1879. The code draws a distinction between treason and treasonable crimes, the former including such acts (omitting those that are obviously obsolete) as by the Treason Act 1351 and subse- quent legislation are regarded as treason proper, the latter including the crimes contained in the Treason Felony Act 1848.

In the words of the draft (§ 76) " treason is (a) the act of killing Her Majesty, or doing her any bodily harm tending to death or destruction, maim or wounding, and the act of imprisoning or re-straining her; or (b) the forming and manifesting by an overt act an intention to kill Her Majesty, or to do her any bodily harm tending to death or destruction, maim or wounding, qr to imprison or to restrain her; or © the act of killing the eldest son and heir-apparent of Her Majesty, or the queen consort of any king of the United Kingdom of Great Britain and Ireland ; or id) the forming and manifesting by an overt act an intention to kill the eldest son and heir^apparent of Her Majesty, or the queen consort of any king of the United Kingdom of Great Britain and Ireland ; or (e) conspiring with any person to kill Her Majesty, or to do her any bodily harm tending to death or destruction, maim or wounding, or conspiring with any person to imprison or restrain her ; or (/) levying war against Her Majesty either with intent to depose Her Majesty from the style, honour and royal name of the Imperial Crown of the United Kingdom of Great Britain and Ireland or of any other of Her Majesty's dominions or countries ; or in order by force or constraint to compel Her Majesty to change her measures or counsels, or in order to

intimidate or over- awe both Houses or either House of Parliament; or (g) conspiring to levy war against Her Majesty with any such intent or for any such purpose as aforesaid ; or (h) instigating any foreigner with force to invade this realm or any other of the dominions of Her Majesty ; or (i) assisting any public enemy at war with Her Majesty in such war by any means whatsoever; or (j) violating, whether with her consent or not, a queen consort, or the wife of the eldest son and heir-apparent for the time being of the king or queen regnant."

No amount of residence abroad exempts a British subject from the penalty of treason if he bears arms against the king, 5 unless he has become naturalized as the subject of a foreign state before the outbreak of the war in which he bears arms. To become naturalized as the subject of an enemy during a war is in itself an act of treason. It is well established that an alien resident within British territory owes local allegiance to the Crown and may be indicted for high treason, and there are numerous instances of prosecution of foreigners for treason. Such are the cases of Leslie, bishop of Ross, ambassador to Elizabeth from the queen of Scots (1584), the marquis de Guiscard in Queen Anne's reign and Gyllenborg, the ambassador from Sweden to George I. (17 17). Proceedings against ambassadors for treason have never gone beyond imprisonment, more for safe custody than as a punishment. In 1781 La Motte, a Frenchman resident in England, was convicted of holding treasonable communi- cations with France, and in Canada American citizens were tried for treason for aiding in the rebellion of 1837-1838 (Forsyth, 200). Assistance by a resident alien to invaders of British territory is high treason even if the territory in question is in military occupation by the forces of the foreign power.

Of the modes of trying high treason two are obsolete, viz. (1) by appeal in the common law courts, which ceased by Court and the effect of statutes between 1322 and 1399 and Place of were finally abolished in 1819; (2) before the con- Trial. stable and marshal. The last instance of this mode of trial was an

6 Aeneas Macdonald's case, 18 St. Tr. 857; R. v. Lynch (1903) I K.B. 446 — see Mayne, Ind. Or. Law (1896), pp. 459, 460. 6 De Jager's case (1907) App. Cas. 326.

it

award of battle in 1631 in the case of Lord Reay. 1 Four modes of trying high treason still remain, viz. impeachment, trial of a peer by his peers, trial by court-martial and trial by jury on indictment before the High Court or a court of assize or a special commission. The offence is not triable at quarter sessions.

At common law and under the Great Charter a peer, and, by an act of 1442, a peeress in right of her husband, are triable for treason before the House of Lords, or, when parliament is not sitting, in the court of the lord high steward. The last trial of a peer for treason was that of Lord Lovat in 1 746-1 747 (18 Howell's St. Tr. 529). In the reign of Edward IV., and perhaps later, treason was at times tried by martial law. The issue of commissions of martial law in time of peace was in 1628 declared illegal by the Petition of Right. But the prerogative of the Crown to deal by martial law with traitors in time of war or open rebellion within the realm or in a British possession still exists. 2

Treasons committed within the admiralty jurisdiction or out of the realm were originally triable only by the admiral or the constable and marshal according to the civil law, but were made triable accord- ing to the courts of the common law by the Offences at Sea Act 1536, and by acts of 1543, 1552 s and 1797. Provision is made for the trial in British possessions of treasons committed in the admiralty jurisdiction (Offences at Sea Act 1806).

Treasons committed within the realm are tried in the High Court, the central criminal court or another court of assize, or by special commission, except in the case of peers. In two acts dealing with Ireland (of 1809 and 1833) it was provided that nothing in the acts was to take away the undoubted prerogative of the Crown for the public safety to resort to the exercise of martial law against open enemies and traitors, while actual war or insurrection is raging (see Martial Law). 4 Treason by persons subject to military law is triable by court-martial under the Army Act (1881) ss. 4, 41 (a), where the offence cannot with reasonable convenience be tried in a civil court, and treason by persons subject to naval discipline by court-martial under the Naval Discipline Act (1866) s. 7. The procedure in such trials is regulated by the acts.

In certain cases of treason the procedure on the trial is the same as upon a charge of murder. Those cases, which are statutory Proced re exce P t ‘ ons ‘ rom the statutory procedure prescribed for the trial of high treason and misprision thereof, are : (a) Assassination or killing of the king, or any heir or successor of the king, or any direct attempt against his life or any direct attempt against his person whereby his life may be endangered or his person may surfer bodily harm (1800, 1814); (b) attempts to injure in any manner the person of the king (1842).

In all other cases of treason the procedure is regulated by acts of 1695, 1708 and 1825. A copy of the indictment must be delivered to the accused ten days at least before his arraignment, with a list of the witnesses for the prosecution (1708) and a list of the petty jury, except in the High Court, where the petty jury list is to be delivered ten days before the trial (1825). 5 The accused is entitled to be defended by counsel, and on application to the court may have two counsel assigned to him (1695), a right extended in 1746 to impeach- ments for treason. Witnesses for the defence have- since 1702 been examinable upon oath. The accused may by the Criminal Evidence Act 1898 consent to be called as witness for the defence. It is doubtful whether the wife or husband of the accused is a compellable witness for the Crown (Archb. Crim. Pleading, 23rd ed., 398).

Prosecutions for treason must be begun within three years of the offence, except in cases of attempts to assassinate the king. The rules as to the indictment are stricter than in the case of felony and misdemeanour, much of the modern statutory power of amendment not extending to indictments for the graver offence. No evidence may be given of any overt act {vote defait) not expressly stated in the indictment. The accused is entitled to peremptory challenge of thirty-five of the jurors summoned for the petty jury; but they need not now be freeholders. The accused can be convicted only on his own confession in open court, or by the oath of two witnesses either both to the same overt act charged, or one to one overt act and the other to another overt act of the same treason. If two or more treasons of different kinds are charged on the same indictment, one witness to prove one treason and another to prove another are not sufficient for a lawful conviction. Persons charged with treason are not admitted to bail except by order of a secretary of state or by the High Court (k.b.d.) or a judge thereof in vacation (Indictable Offences Act 1848, s. 23). Witnesses for the defence are examined on oath and their attendance is secured in the same way as that of witnesses

for the Crown (1695, 170).

1 A case of treason out of the realm as to whichalonetheconstable and marshal had jurisdiction (3 Howell's St. 7 > .l).

2 See case of D. F. Marais (1902, App. Cas. 109).

3 There is no trace of recourse to the act of 1552. In 1903 Arthur Lynch was tried under the act of 1543 for high treason in South Africa, and Lord Maguire in 1645 for treason in Ireland (4 St. Tr. 653).

4 The decisions of courts of martial law appear not to be review- able by ordinary civil courts (re Marais, 1907, App. Cas. 109).

5 In these respects persons accused of treason are in a better position than those accused of felony.

Misprision of treason consists in the concealment or keeping secret of any high treason, (a) This offence was in 1552 declared to be high treason (5 and 6 Edw. VI. c. II, s. 8), but the ... . . former law was restored in 1553-1554 (1 Mary st. i. c. 1 m ' s P" sloa s.i ;l &2 Ph.and Mary c. 10, s.7). The definition is vague ° Ireasoa – and the exact scope of the offence uncertain, but in strictness it does not include acts which in the case of felony would constitute an accessory after the fact. In the Queensland Code of 1899 (s. 38) every person is guilty of a crime who, knowing that any person intends to commit treason, does not give information thereof with all reasonable despatch to a justice or use other reasonable en- deavours to prevent the commission of that crime. The procedure for the trial of misprision of treason is the same as in the case of high treason. The punishment is imprisonment for life and forfeiture of the offender's goods and of the profits of his lands during his life. (Steph. Dig. Cr. Law, 6th ed., 121, 401.) The forfeitures are not abolished by the Forfeitures Act 1870. There is no case of prosecution of this offence recorded during the last century.

The necessity of prosecutions for treason has been greatly lessened by a series of statutes beginning in 1744 which provide for the punishment as felonies of certain acts which offences might fall within the definition of treason, e.g. akin to piracies (1744, 18 Geo. II. c. 30), incitement to Treason. mutiny (1797), unlawful oaths, including oaths to commit treason (1797, 1812), and aiding the escape of prisoners of war (1812). By the Treason

Act 1842 it is a high misdemeanour, punishable by penal servitude for seven years, wilfully to discharge, point, aim or present at the person of the king any gun or other arms, loaded or not, or to strike at or attempt to throw anything upon the king's person, or to produce any firearms or other arms, or any explosive or dangerous matter, near his person, with intent to injure or alarm him or to commit a breach of the peace. 6 The offence is one of the few for which flogging may be awarded.

By the Treason Felony Act 1848, s. 1., it was made a felony within or without the United Kingdom to plot (a) to deprive or depose the king from the style, &c, of the imperial crown of the United Kingdom, (b) to levy war against the king in any part of the United Kingdom in order by force or constraint to change his measures or counsels or to put force or constraint on or to intimidate or overawe either or both houses of parliament, (c) to move or stir any foreigner with force to invade the United Kingdom or any of the king's dominions. The plot to be within the act must be expressed by publishing in printing or writing or by an overt act or deed. " Open and advised speaking," originally included as an alternative, was removed from the act in 1891. For other offences more or less nearly connected with treason reference may be made to the articles: Libel; Oaths; Petition; Riot; Sedition.

The act of 1848 does not abrogate the Treason Act of 1351, but merely provides an alternative remedy. But with the exception of the case of Lynch in 1903, all prosecutions in England for offences of a treasonable character since 1 848 have been for the felony created by the act of 1848. The trials under the act, mostly in Ireland, are collected in vols. 6, 7 and 8 of the New Series of Stale Trials. The procedure in the case of all the offences just noticed is governed by the ordinary rules as to the trial of indictable offences, and the accused may be convicted even though the evidence proves acts constituting high treason.

Scotland. — Treason included treason proper, or crimes against the Crown or the state, such as rebellion, and crimes which, though not technically treasonable, were by legislation punished as treason. Scottish procedure was as a rule less favourable to the accused than English. In one matter, however, the opposite was the case. Advocates compellable to act on behalf of the accused were allowed him by 1587, c. 57, more than a century before the concession of a similar indulgence in England. At one time trial in absence and even after death was allowed, as in Roman law.

In the case of Robert Leslie, in 1540, a summons after death was held by the estates to be competent, and the bones of the deceased were exhumed and presented at the bar of the court. 7 The act of 1542, c. 13 (rep. 1906), confined this revolting procedure to certain treasons of the more heinous kind.

6 This act was passed in consequence of a series of assaults on Queen Victoria. See 4 St. Tr. N. S. 1382; 7 St. Tr. N. S. 1130, and 8 St. Tr. N. S. 1.

7 In the one instance in England — that of Cromwell, Ireton and Bradshaw — where the bodies of alleged traitors were exhumed after death they were not brought to the bar of a court as in Scotland.

By the Treason Act 1708 trial in absence — the last instance of which had occurred in 1698 — was abolished. The same act assimilates the law and practice of treason to that of England by enacting that no crime should be treason or misprision in Scotland but such as is treason or misprision in England. The act further provides for the finding of the indictment by a grand jury as in England and that the trial is to be by a jury of twelve, not fifteen as in other crimes, before the court of justiciary, or a commission of oyer and terminer containing at least three lords of justiciary. To slay a lord of justiciary or lord of session sitting in judgment, or to counterfeit the great seal, is made treason. The act also contains provisions as to forfeiture, ‘ qualification of jurors and procedure, which are not affected by the Criminal Procedure (Scotland) Act 1887. The punishment is the same as it was in England before the Forfeitures Act 1870, which does not extend to Scotland; and attainder and forfeiture are still the effects of condemnation for treason in Scotland.

One or two other statutory provisions may be briefly noticed. By acts of 1706 and 1825 the trial of a peer of Great Britain or Scotland for treason committed in Scotland is to be by a commission from the Crown, on indictment found by a grand jury of twelve. Bail in treason-felony is only allowed by consent of the public prosecutor or warrant of the high or circuit court of justiciary (Treason Felony Act 1848, s. 9). The term lese-majesty was some- times used for what was treason proper {e.g. in 1524,

c. 4, making it lese-majesty to transport the king out of the realm, repealed in 1906), sometimes as a synonym of leasing-making. This crime (also called verbal sedition) consisted in the engendering discord between king and people by slander of the king. 2 The earliest act against leasing-making eo nomine was in 1524. The reign of James VI. was pre-eminently prolific in legislation against this crime. It is now of no practical interest, as prosecutions for leasing-making have long fallen into desuetude. At one time, however, the powers of the various acts were put into force with great severity, especially in the trial of the earl of Argyll in 1 681. The punishment for leasing-making, once capital, is now, by acts of 1825 and 1837, fine or imprisonment or both.

Ireland. — The Treason Act 1351 was extended to Ireland by Poyning's law, but at the union there were considerable differences between the Irish and the English law. The law and practice of Ireland as to treason were assimilated to those of England by acts of 1821 (1 & 2 Geo. IV. c. 24), 1842 (5 & 6 Vict.c. 51), 1848(11 &12 Vict.c. 12, s. 2), and 1854(17 & 18 Vict, c 56).

Prior to 1854 the provisions as to procedure in the English treason acts did not apply to Ireland (Smith O'Brien's case, 1848, 7 5/. Tr. N. S. 1). A series of enactments called the " Whiteboy Acts" (passed by the Irish and the United Kingdom parliaments between 1775 and 1831) was intended to give additional facilities to the executive for the suppression of tumultuous risings, and powers for dealing with " dangerous associations" are given by the Criminal Law and Procedure (Ireland) Act 1887. Prosecutions for treason in Ireland were numerous in 1 848. Since that date numerous prosecutions have taken place under the Treason Felony Act 1848.

British Possessions. — Numerous temporary acts were passed in India at the time of the Mutiny, one of the most characteristic being an act of 1858 making rebellious villages liable to confiscation. By the Indian Penal Code, s. 121, it is an offence punishable by death or transportation for life and by forfeiture of all property to wage or attempt to wage war against the king. By s. 125 it is an offence punishable by transportation for life (as a maximum) to wage or attempt to wage war against any Asiatic government in alliance or at peace with the king or to abet the waging of such war. By s. 121 A., added in 1870, it is an offence punishable by transportation for life (as a maximum) to conspire within or without British India to commit an offence against s. 121 or to deprive the king of the sovereignty of British India or of

any part thereof, or to overawe by criminal force or the show of criminal force the government of India or any local government in India. Other cognate offences are included in the same chapter (vi.) of the Criminal Code.

The Penal Codes of Canada (1892, ss. 65-73) and New Zealand (1893, ss. 77-82) closely follow the provisions of the English draft code of 1879. Prosecutions for treason have been rare in Canada. Those of most note were in 1 837, after the rebellion (see the Canadian Prisoners case, 1839, 9 Ad(olphus) El(les) [731]) and of Riel after

1 The provisions in the act as to forfeiture (now repealed) were, according to Blackstone {Comm. iv. 384), the result of a compromise between the House of Lords, in favour of its continuance and the House of Commons, supported by the Scottish nation, struggling to secure a total immunity from this disability.

1 It is called by Hallam " the old mystery of iniquity in Scots law."

the Red River rising in 1884 (see Riel v. R. 1885, 10 App. Cas.

6 75)-

The Commonwealth parliament of Australia has not legislated on the subject of high treason, which is in Australia governed by the laws of the constituent states, i.e. by the law of England as it stood when they were colonized, subject to local legislation. In the codes of Queensland (1899) and West Australia (1902) the offence is definec* in a form which is little more than a redrafting of the English statutes. The provisions of the Treason Felony Act 1848 have been adapted by legislation to New South Wales (1900), Queensland (1899), Western Australia (1902) and Tasmania (1868). In Victoria there is legislation as to procedure but none as to the substantive law of treason. In Mauritius the offence is regulated by the Penal Code of 1838, arts. 50-61 {Mauritius Laws Revised, 1903, i. 372).

In the Asiatic colonies treason is defined on the lines of the Indian Penal Code, i.e. Ceylon, Straits Settlements, and Hong-Kong.

In the West Indies the law of treason is defined by code in Jamaica and in British Guiana (the code superseding the Dutch Roman law).

In South Africa the law of treason is derived through Holland from the Roman law. It includes the crimen perduellionis, i.e. disturbing the security or independence of the state with hostile intent. This is spoken of as high treason, as distinct from the crimen laesae majestatis, in which the hostile intent need not be proved, and from vis publica, i.e. insurrection and riot involving danger to public peace and order. By a Cape law of 1853 passed during the Griqualand rebellion it is made treason to deliver arms or gunpowder to the king's enemies.

The Treason Felony Act 1848 was also adopted in Natal in

1868.

During the South African War of 1899-1902 many trials took place for treason, chiefly under martial law, including cases of British subjects who had joined the Boer forces. In some cases it was contended that the accused had been recognized by the British authorities as a belligerent (Louw. 1904, 21 Cape Supreme Court Reports, 36). The decisions of the ordinary courts are collected in Nathan, Common Law of South Africa, iv. 2425 (London, 1907). The decisions of courts-martial were not reviewable by the ordinary courts and are also protected by acts of indemnity. A striking feature of colonial legislation is the great number of such acts passed after rebellions and native risings. Instances of such acts occur in the legislation of Canada, Ceylon, the Cape of Good Hope, Natal, New Zealand, St Vincent and Jamaica. The most important in the history of law is the Jamaica Act of 1866, indemnifying Governor Eyre for any acts committed during the suppression of the rising in the previous year. It was finally held that this act protected Eyre from being civilly sued or criminally prosecuted in England for acts done during the outbreak {Phillips v. Eyre, 1 87 1, L. R. 6 Q. B. I). The validity of an act passed in 1906 after disturbances among the Kaffirs of Natal was unsuccessfully challenged in 1907 (Tilonko's case, 1907, App. Cas. 93).

United States. — The law is based upon that of England. By art. 3, s. 3 of the constitution " treason against the United States shall consist only in levying war against them, or in adhering to their enemies, giving them aid and comfort. No person shall be convicted of treason unless on the testimony of two witnesses to the same overt act, or on confession in open court. The Congress shall have power to declare the punishment of treason; but no attainder of treason shall work corruption of blood or forfeiture,

except during the life of the person attainted." By art. 2, s. 4 impeachment for and conviction of treason is a ground for removing the president, vice-president and other civil officers. The punishment by an act of 1790 was declared to be death by hanging. But during the Civil War an act (July 17, 1862) was passed, providing that the punishment should be death, or, at the discretion of the court, imprisonment at hard labour for not less than five years, and a fine of not less than 10,000 dollars to be levied on the real and personal property of the offender, in addition to disability to hold any office under the United States. The act of 1862 and other acts also deal with the crimes of inciting or engaging in rebellion or insurrection, criminal correspondence with foreign governments in relation to any disputes or contro- versies with the United States, or to defeat the measures of the government of the United States, seditions, conspiracy, recruiting soldiers or sailors and enlistment to serve against the United States. The act of 1790 further provides for the delivery to the prisoner of a copy of the indictment and a list of the jurors, for defence by counsel, and for the finding of the indictment within three years after the commission of the treason (see Story, Consti- tution of the United States, Rev. Stat. U.S. p. 1041). Treason against the United States cannot be inquired into by any state

court, but the states may, and some of them have, their own constitutions and legislation as to treasons committed against themselves, generally following the lines of the constitution and legislation of the United States. In some cases there are differences which are worth notice. Thus the constitution of Massachusetts, pt. i, § 25, declares that no subject ought in any case or in any time to be declared guilty of treason by the legislature. The same provision is contained in the constitutions of Vermont, Connecticut, Pennsylvania, Alabama and others. In some states the crime of treason cannot be pardoned; in others, as in New York, it may be pardoned by the legislature, and the governor may suspend the sentence until the end of the session of the legislature next following conviction. In some states a person convicted of treason is disqualified for exercising the franchise. In New York conviction carries with it forfeiture of real estate for the life of the convict and of his goods and chattels.

France. — By the Code Penal treason falls under the head of crimes against the safety of the state (bk. iii. tit. i. c. 1). It is a capital offence for a Frenchman to bear arms against France (s. 75) or to plot with a foreign power or its agents to commit hostilities or under- take war against France whether war follows or not (s. 76), or to intrigue with the enemies of the state for facilitating their entry into French territory, or to deliver to them French ships or fortresses, or to supply them with munitions of war, or aid the progress of their arms in French possessions or against French forces by sea or land

Germany. — The Strafgesetzbuch distinguishes between high treason (Hochverrat) and treason (Landesverrat) . The offences denominated high treason are (1) murder or attempt to murder the emperor or a federal sovereign in his own state, or during the stay of the offender in the sovereign's state (s.8o) ; (2) undertaking to kill, take prisoner, or deliver into an enemy's power, or make incapable of government a federal sovereign ; to change by violence the constitution of the empire or a state thereof or the successor to the throne therein; to incor- porate by force the federal territory or the territory of any such state with a foreign or another federal state (s. 81). The code treats as treason, but does not punish by death, the offences included in the French code (ss. 87-89), and under certain cir- cumstances punishes alien residents for these offences (s. 91). The code also punishes insults on the emperor and federal sovereigns (ss. 95, 97) under the name of Majestdtsbeleidigung.

Italy. — Treason in the Penal Code 1888 (tit. i. c. 1) includes direct acts to subject Italy or rny part thereof to foreign domination or to diminish its independence or break up its unity (s. 104), to bear arms against the state (s. 105)) or intrigue with foreign states with the object of their levying war against Italy or helping them in such war (s. 106), or to reveal political or military secrets affecting the national independence (s. 107).

Spain. — The Spanish code distinguishes between treason (lesa majestad) and rebellion (rebelion). Under the former are included assassination, or attempts on the life or personal liberty of the king (arts. 158, 159), or insults to the king (161, 162), and provisions are made as to attacks on the heir or consort of the sovereign (163, 164). Under rebellion are included violent attempts to dethrone the king or to interfere with the allegiance to him of his forces or any part of the realm (243). (W. F. C.)

TREASURE TROVE, the legal expression for coin, bullion, gold or silver articles, found (Fr. trouvi) hidden in the earth, for which no owner can be discovered. In Roman law it was called thesaurus, and defined as an ancient deposit of money (vetus depositio pecuniae) found accidentally. Under the emperors half went to the finder and half to the owner of the land, who might be the emperor, the public treasury (fiscus), or some other proprietor. Property found in the sea or on the earth has at no time been looked on as treasure trove. If the owner cannot be ascertained it becomes the property of the finder (see Lost Property). As the feudal system spread over Europe and the prince was looked on as the ultimate owner of all lands, his right to the treasure trove became, according to Grotius, jus commune et quasi gentium, in England, Germany, France, Spain and Denmark. In England for centuries the right to treasure trove has been in the Crown, who may grant it out as a franchise. It is the duty of the finder, and indeed of any one who acquires knowledge, to report the matter to the coroner, who must forth-with hold an inquest to find whether the discovery be treasure trove or no. Although the taking of the find is not larceny until this be done, the concealment is an indictable offence still punish- able in practice, and formerly was held " akin both to treason and to larceny." In the statute De officio coronatoris 1276

(4 Edw. I. c. 2) the coroner is enjoined to inquire as to treasure trove both as to finders and suspected finders, " and that may be well perceived where one liveth riotously and have done so of long time." The Coroners Act of 1887 continues this power as heretofore. In Scotland the law is the same, but the concealment is not a criminal offence; it is there the duty of the king's and lord treasurer's remembrancer, with the aid of the local procurator fiscal, to secure any find for the Crown, whose rights in this respect have been pushed to some length. Thus in 1888 a prehistoric jet necklace and some other articles found in Forfarshire were claimed by the authorities, though they were neither gold nor silver. The matter was finally compromised by the deposit of the find in the National Museum. By a treasury order of 1886 provision is made for the preservation of suitable articles so found in the various national museums and payment to the finders of sums in respect of the same. Also if the things are not required for this purpose they are to be returned to the finder. In India the Treasure Trove Act (16 of 1878) makes elaborate provision on the subject. It defines treasure as " anything of value hidden in the soil." When treasure over Rs. 10

is discovered, the finder must inform the collector and deposit the treasure or give security for its custody. Conceal- ment is a criminal offence. An inquiry is held upon notice; if declared ownerless the finder has three-fourths and the owner of the ground one-fourth. The government, however, has the right of pre-emption.

In the United States the common law, following English precedent, would seem to give treasure trove to the public treasury, but in practice the finder has been allowed to keep it. In Louisiana French codes have been followed, so that one-half goes to finder and one-half to owner of land. Modern French law is the same as this, as it is also in Germany, in Italy and in Spain. In the latter country formerly the state had three- quarters, whilst a quarter was given to the finder. In Austria a third goes to the finder, a third to the owner of the land, and a third to the state, and provision is made for the possible purchase of valuable antiquities by the state. In Denmark treasure trove is known as " treasure of Denmark," and is the property of the king alone. In Russia the usage varies. In one or two of the governments, in Poland and the Baltic provinces, the treasure is divided between the owner of the land and the finder, but throughout the rest of Russia it belongs exclusively to the owner of the land. This was also the law amongst the ancient Hebrews, or so Grotius infers from the parable of the treasure hid in a field (Matt. xiii. 44).

See Blackstone's Commentaries; Chitty's Prerogatives of the Crown; R. Henslowe Wellington, The King's Coroner (1905-1906); Rankine on Landowner ship; Murray, Archaeological Survey of the United Kingdom (1896), containing copious references to the litera- ture of the subject. (F. Wa.)

TREASURY, a place for the storage of treasure (Fr. trSsor, Lat. thesaurus, Gr. drjcravpos, store, hoard); also that depart- ment of a government which manages the public revenue. The head of the department was an important official in the early history of English institutions. He managed the king's hoard or treasury, and under the Med. Latin name of thesaurarius, i.e. treasurer, grew into increased importance in times when the main object of government seemed to be to fill the king's purse. He received the title of lord high treasurer (q.v.) and ranked as the third great officer of state. In course of time the English treasury grew into two departments of state (see Exchequer). Since 17 14 the office of lord high treasurer has been in com- mission, and his duties have been administered by a board, consisting of a first lord, a

chancellor and four or more junior lords. The board itself never meets, except on extraordinary occasions, although until the commencement of the 19th century it was its practice to meet almost daily to discuss matters of financial detail. There were originally separate treasury boards for England, Scotland and Ireland, but the English and Scottish were united by the act of union, and that of Ireland was joined with the English in 1816. The first lord of the treasury (see Ministry) takes practically no part in the duties of the board.

the office being to all intents and purposes a sinecure; it is usually held by the prime minister of the day. Indeed from 1783 to 1885 it was invariably so held, but in the latter year there was a departure from the practice, and again in 1887, 1891 and 1895. The junior lords of the treasury are also political rather than financial officers, acting as assistant whips in the House of Commons. There are two joint secretaries to the treasury, one of whom, the patronage secretary, is merely a political officer, acting as chief whip; the other is termed financial secretary and is the chancellor of the exchequer's chief assistant. All the above officers are members of the House of Commons and of the government. The salaries of the first lord of the treasury and of the chancellor of the exchequer are £5000 per annum; of the joint secretaries £2000 per annum each; of three of the junior lords £1000 per annum each, the other junior lords being unpaid. The vast bulk of the work of the treasury department is performed by the permanent staff, at whose head is the permanent secretary and auditor of the civil list, with a salary of £2500 per annum. The chancellor of the exchequer (see Ministry), as finance minister of the Crown, is the officer who is responsible to parliament for the carrying out of the business of the treasury. He performs practically the ancient duties of under-treasurer and presents the annual budget of revenue and expenditure.

The treasury department of the United States is responsible for the finances of the government and the control of the currency. Its genesis was a treasury office of accounts estab- lished in 1776 for the purpose of examining and auditing accounts. In 1779 it was reorganized, but was abolished in 1 781, on the election of Robert Morris as superintendent of finances, and in 1789 the present executive department of the treasury was established by

act of Congress. Its scope is more varied and complex than that of any other United States govern- ment department. It is presided over by a secretary, who is a member of the cabinet and has a salary of $12,000 per annum. He is assisted by three assistant secretaries, two of them having salaries of S5000 and the third a salary of $4500. The treasury department looks after the revenue administration of the United States, and has for this purpose a customs service division and an internal revenue division. There is also the division of the treasury, in the strictest sense of the word; bureaus of auditing and accounting, of currency and of banking and certain miscel- laneous bureaus, as the life-saving service, the public health and marine hospital service, the supervising architect and the bureau of engraving and printing.

TREATIES. A treaty is a contract between two or more states. The Latin term " tractatus," and its derivatives, though of occasional occurrence in this sense from the 13th century onwards, only began to be commonly so employed, in lieu of the older technical terms " conventio publica," or " foedus," from the end of the 17th century. In the language of modern diplomacy the term " treaty " is restricted to the more impor- tant international agreements, especially to those which are the work of a congress; while agreements dealing with subordinate questions are described by the more general term " convention." The present article will disregard this distinction.

The making and the observance of treaties is necessarily a very early phenomenon in the history of civilization, and the theory of treaties was one of the first departments of international law to attract attention. Treaties are recorded on the monu- ments of Egypt and Assyria; they occur in the Old Testament Scriptures; and questions arising under mivdrJKai and foedera occupy much space in the Greek and Roman historians. 1

Treaties have been classified on many principles, of which it will suffice to mention the more important. A " personal treaty," having reference to dynastic interests, is contrasted with a " real treaty," which binds the nation irrespectively

1 For the celebrated treaty of 509 B.C. between Rome and Carthage, see Polybius iii. 22 ; and, on the subject generally, Barbeyrac's full but very uncritical Histoire des anciens traitez, (1739); Miiller-Jochmus, Geschichte des Vblkerrechts im Alterthum (1848) ; E. Egger, litudes historiques sur les traites publics chez les grecs el chez les romains (new ed., 1866).

of constitutional changes; treaties creating outstanding obligations are opposed to ” transitory conventions,” e.g. for cession of territory, recognition of independence, ˆ ,asslfl < Mm and the like, which operate irrevocably once for all, leaving nothing more to be done by the contracting parties; and treaties in the nature of a definite transaction (Rechts- geschdfl) are opposed to those which aim at establishing a general rule of conduct (Rechtssatz) . With reference to their objects, treaties may perhaps be conveniently classified as (1) political, including treaties of peace, of alliance, of cession, of boundary, for creation of international servitudes, of neutralization, of guarantee, for the submission of a controversy to arbitration; (2) commercial, including consular and fishery conventions, and slave trade and navigation treaties; (3) confederations for special social objects, such as the Zollverein, the Latin monetary union, and the still wider unions with reference to posts, tele- graphs, submarine cables and weights and measures; (4) relating to criminal justice, e.g. to extradition and arrest of fugitive seamen; (5) relating to civil justice, e.g. to the protection of trade-mark and copyright, to the execution of foreign judgments, to the reception of evidence, and to actions by and against foreigners; (6) promulgating written rules of international law, upon topics previously governed, if at all, only by unwritten custom, with reference e.g. to the peaceful settlement of inter- national disputes, or to the conduct of warfare.

It must be remarked that it is not always possible to assign a treaty wholly to one or other of the above classes, since many treaties contain in combination clauses referable to several of them.

The analogy between treaty-making and legislation is striking when a congress agrees upon general principles which are afterwards accepted by a large number of states, as, for instance, in the case of the Geneva conventions for improving the treatment of the wounded. Many political treaties containing ” transi- tory conventions,” with reference to recognition, boundary or cession, become, as it were, the title-deeds of the nations to which they relate. 2 But the closest analogy of a treaty is to a contract in private law.

The making of a valid treaty implies several requisites. (1) It must be made between competent parties, i.e. sovereign states. A ” concordat,” to which the pope, as a spiritual authority, is one of the parties, is therefore not a treaty, nor is a convention

between a state and an individual, nor a convention between the rulers of two states with reference to their private affairs. Semi-sovereign states, such as San Marino or Egypt, may make conventions upon topics within their limited competence. It was formally alleged that an infidel state could not be a party to a treaty. The question where the treaty-making power resides in a given state is answered by the municipal law of that state. In Great Britain it resides in the executive (see the parliamentary debates upon the cession of Heligoland in 1890); sometimes, however, it is shared for all purposes, as in the United States, or for certain purposes only, as in many countries of the European continent, by the legislature, or by a branch of it. (2)There must be an expression of agreement. This is not (as in private law) rendered voidable by duress; e.g. the cession of a province, though extorted by overwhelming force, is nevertheless unimpeachable. Duress to the individual negotiator would, however, vitiate the effect of his signature. (3) From the nature of the case, the agreement of states, other than those the government of which is autocratic, must be signified by means of agents, whose authority is either express, as in the case of plenipotentiaries, or implied, as in the case of e.g. military and naval commanders, for matters, such as truces, capitulations and cartels, which are necessarily confided to their discretion. When an agent acts in excess of his implied authority, he is said to make no treaty, but a mere ” sponsion,” which, unless adopted by his govern- ment, does not bind it, e.g. the affair of the Caudine Forks

2 Cf. Sir Edward Hertslet’s very useful collections entitled: The Map of Europe by Treaty (4 vols., 1875-1891), and The Map of Africa by Treaty (2 vols., 1894).

Requisites,

(Livy ix. 5) and the convention of Closter Seven in 1757. (4) Unlike a contract in private law, a treaty, even though made in pursuance of a full power, is, according to modern views, of no effect till it is ratified. It may be remarked that ratification, though hitherto not thought to be required for ” declarations,” such as the Declaration of Paris of 1856, was expressly stipulated for in the case of those signed at the peace conferences of 1899

and 1907. (5) No special form is necessary for a treaty, which in theory may be made without writing. It need not even appear on the face of it to be a contract between the parties, but may take the form of a joint declaration, or of an exchange of notes. Latin was at one time the language usually employed in treaties, and it continued to be so employed to a late date by the emperor and the pope. Treaties to which several European powers of different nationalities are parties are now usually drawn up in French (the use of which became general in the time of Louis XIV.), but the treaties of Aix-la-Chapelle of 1748 and 1784 contain, as does the final act of the congress' of Vienna, a protest against the use of this language being considered obligatory. French is, however, exclusively used in the treaties constitut- ing the great " international unions "; and bilingual treaties are sometimes accompanied by a third version in French, to be decisive in case of alleged variances between the other two. A great European treaty has usually commenced " In the name of the Most Holy and Indivisible Trinity," or, when the Porte is a party, " In the name of Almighty God." (6) It is sometimes said that a treaty must have a lawful object, but the danger of accepting such a statement is apparent from the use which has been made of it by writers who deny the validity of any cession of national territory, or even go so far as to lay down, with Fiore, that " all should be regarded as void which are in any way opposed to the development of the free activity of a nation, or which hinder the exercise of its natural rights." (7) The making of a treaty is sometimes accompanied by acts intended to secure its better performance. The taking of oaths, the assigning of " conservatores pacis " and the giving of hostages are now obsolete, but revenue is mortgaged, territory is pledged, and treaties of guarantee are entered into for this purpose.

A " transitory convention " operates at once, leaving no duties to be subsequently performed, but with reference to conventions Duration °^ otner kinds questions arise as to the duration of the obligation created by them; in other words, as to the moment at which those obligations come to an end. This may occur by the dissolution of one of the contracting states, by the object-matter of the agreement ceasing to exist, by full performance, by performance becoming impossible, by lapse of the time for which the agreement was made, by contrarius consensus or mutual release, by " denunciation " by one party under a power reserved in the treaty. By a breach on either side the treaty usually becomes, not void, but voidable. A further cause of the

termination of treaty obligations is a total change of circumstances, since a clause “rebus sic stantibus” is said to be a tacit condition in every treaty. 1 Such a con- tention can only be very cautiously admitted. It has been put forward by Russia in justification of her repudiation of the clauses of the Treaty of Paris neutralizing the Black Sea, and of her engagements as to Batoum contained in the Treaty of Berlin. The London protocol of 1871, with a view to prevent such abuses, lays down, perhaps a little too broadly, ” that it is an essential principle of the law of nations that no power can liberate itself from the engagements of a treaty, nor modify the stipulations thereof, unless with the consent of the contracting powers, by means of an amicable arrangement.” Treaties are in most cases suspended, if not terminated, by the outbreak of a war between the contracting parties (though the Spanish decree of the 23rd of April 1898 went too far when it asserted that the war with the United States had terminated ” all conventions that have been in force up to the present between the two countries “), and are therefore usually revived in express terms in the treaty of peace.

1 Cf. Bynkershoek, Quest, sur pub. vol. ii. ch. 10.

The rules for the interpretation of treaties are not so different from those applicable to contracts in private law as to need here a separate discussion.

Collections of treaties are either (i.) general or (ii.) national, i. The first to publish a general collection of treaties was Leibnitz, whose Codex juris gentium, containing documents from 1097 to 1497, ” ea quae sola inter liberos populos legum sunt loco ” c jj ec n oas appeared in 1693, and was followed in 1700 by the Mantissa. The Corps universel diplomatique du droit des gens of J. Dumont, continued by J. Barbeyrac and Rousset in thirteen folio volumes, containing treaties from A.D. 315 to 1730, was published in 1726-1739. Wenck’s Corpus juris gentium recentissimi (3 vols. 8vo, 1781-1795) contains treaties from 1735 to 1772. The 8vo Recueil of G. F. de Martens, continued by C. de Martens, Saalfeld, Murhard, K. F. Samwer, K. Hopf, F. Stoerk and H. Triepel, com- menced in 1791 with treaties of 1761, and is still in progress. The series in 1910 extended to eighty-eight volumes; that for 1910 being the third of the Nouveau recueil general (23 mo serie). See also the Recueil international des traites de xx’ siecle (1904, sqq.), by Descamps en Renault, and the following periodical publications: Das Staats- archiv, Sammlung der officiellen Actenstiicke zur Geschichte der Gegenwart (Leipzig,

commencing in 1 861) ; Archives diplomatiques (Stuttgart, since 182 1); Archives diplomatiques, recueil mensuel de diplomatic et d'histoire (Paris, since 1861); and Hertslet's British and Foreign State Papers, from the Termination of the War of 1814 to the Latest Period, compiled at the Foreign Office by the Librarian and Keeper of the Papers (London, since 1819, and still in progress).

ii. The more important collections of national treaties are those of MM. Neumann and de Plasson from 1855, and of the commission for modern history from 1903, for Austria; Beutner for the German Empire, 1883; C. Calvo for " l'Amdrique latine, " 1862-1869; de Clercq for France, 1864-1908; De Garcia de la Vega for Belgium, 1850, &c, Lagemans and Breukelman for the Netherlands, 1858, &c. ; Soutzo for Greece, 1858; Count Solar de la Marguerite for Sardinia, 1836-1861 ; Olivart for Spain, 1890, &c. ; Da Castro for Portugal, 1856-1879; Rydberg for Sweden, 1877; Kaiser, 1861, and Eichmann, 1885, for Switzerland; Baron de Testa, 1864, &c, Aristarchi Bey 1873-1874, and Effendi Noradounghian, 1897-1903, for Turkey; F. de Martens for Russia (the 9 vols, published 1874-1907 contain the treaties made by Russia with Austria, Germany, Great Britain and France respectively) ; W. F. Mayers for China, 1877. . The official publication for Italy begins in 1864 (see also the collection by Luigi Palma, 1879, &c), for Spain in 1843, for Denmark in 1874. The treaties of Japan were published by authority in 1899. Those of the United States are contained in the Statutes at Large of the United States, and in the Treaties, Conventions, etc., between the United Stales of America and Other Powers, 1776-1900 (Wash- ington, 1910) ; also in the collections of J. Elliott (1834) and H. Minot (1844-1850) ; see also Mr Bancroft Davis's Notes upon the Treaties of the United States with other Powers, preceded by a list of the Treaties and Conventions with Foreign Powers, chronologically arranged and followed by an Analytical Index and a Synoptical Index of the Treaties (1873). In England no treaties were pub- lished before the 17th century, such matters being thought " not fit to be made vulgar. " The treaty of 1604 with Spain was, how- ever, published by authority, as were many of the treaties of the Stuart kings. Rymer's Foedera was published, under the orders of the government, in twenty volumes, from 1704ˆ to 1732 ; but for methodical collections of the earlier British treaties we are indebted to private enterprise, which produced three volumes in 1710-1713, republished with a fourth volume in 1732. Other three volumes appeared in 1 772-1 781, the collection commonly known as that of C. Jenkinson (3

vols.) in 1785 and that of G. Chalmers (2 vols.) in 1795. The recent treaties made by Great Britain, previously dis- persed through the numbers of the London Gazelle or embedded in masses of diplomatic correspondence presented to parliament at irregular intervals, are now officially published as soon as ratified in a special 8vo. ” Treaty Series ” of parliamentary papers commenced in 1902. J. Macgregor published (1841-1844) eight volumes of commercial treaties, but the great collection of the commercial treaties of Great Britain is that of L. Hertslet, librarian of the foreign office, continued by his son, Sir Edward Hertslet, and later holders of the same office, entitled A Complete Collection of the Treaties and Conventions and Reciprocal Regulations at present subsisting between Great Britain and Foreign Po-wers, and of the Laws and Orders in Council concerning the same, so far as they relate to Commerce and Navigation, the Slave Trade, Post Office, &c, and to the Privileges and Interests of the Subjects of the Contracting Parties (24 vols., 1820-1907). Sir Edward Hertslet also commenced in 1875 a series of volumes containing Treaties and Tariffs regulating the Trade between Britain and Foreign Nations, and Extracts of Treaties between Foreign Powers, containing the Most Favoured Nation Clauses applicable to Great Britain. Both of these publica- tions are still continued. He also published, in 1891, Treaties, &c, concluded between Great Britain and Persia, and between Persia and Foreign Powers; and, in 1896, a similar work on treaties with China The treaties affecting British India are officially set out, with historical notes, in A Collection of Treaties,

Engagements and Sannuds relating to India and Neighbouring Countries, by C. V. Aitchison. This work, with the index, extends to eight volumes, which appeared at Calcutta in 1862-1866. A continuation by A. C. Talbot was published in 1876, and it was brought up to date by the government of India in 1909. Useful lists of national collections of treaties will be found in the Revue de droit international for 1886, pp. 169-187, and in the Marquis Olivart’s Catalogue de ma bibliotheque (1899-1910).

It may be worth while to add a list of some of the more impor- tant treaties, now wholly or partially in force, some of which are List of discussed under separate headings, especially those important to which Great Britain is a party, classified accord-

Treaties. j n g t0 their objects, in the order suggested above.

i. The principal treaties affecting the distribution of territory between the various states of Central Europe are those of Westphalia (Osnabriick and Miinster), 1648; Utrecht, 1713; Paris and Hubertusburg, 1763; for the partition of Poland, 1772, 1793; Vienna, 1815; London, for the separation of Belgium from the Netherlands, 1831, 1839; Zurich, for the cession of a portion of Lombardy to Sardinia, 1859; Vienna, as to Schleswig- Holstein, 1864; Prague, whereby the German Confederation was dissolved, Austria recognizing the new North German Con- federation, transferring to Prussia her rights over Schleswig- Holstein, and ceding the remainder of Lombardy to Italy, 1866; Frankfort, between France and the new German Empire, 1871. The disintegration of the Ottoman Empire has been regulated by the Great Powers, or some of them, in the treaties of London, 1832, 1863, 1864, and of Constantinople, 1881, with reference to Greece; and by the treaties of Paris, 1856; London, 1871; Berlin, 1878; London, 1883, with reference to Montenegro, Rumania, Servia, Bulgaria and the navigation of the Danube. The encroachments of Russia upon Turkey, previous to the Crimean War, are registered in a series of treaties beginning with that of Kuchuk-Kainarji, 1774, and end:ng with that of Adrianople in 1829. The independence of the United States of America was acknowledged by Great Britain in the treaty of peace signed at Paris in 1 783 . The boundary between the United States and the British possessions is regulated in detail by the treaties of Washington of 1842, 1846, 1871, 1903 and 1908. The territorial results of the war of 1898 between the United States and Spain are registered in the treaty of 1899, and those of the Russo-Japanese War in the treaty of Portsmouth of 1905. Various causes of possible misunderstanding between Great Britain and France were removed by the convention of 1904; and a similar treaty was concluded with Russia in 1908. The navigation of the Suez Canal is regulated by a treaty of 1888, and that of the future Panama Canal by one of 1901. The boun- daries of the territories, protectorates and spheres of influence in Africa of Great Britain, Germany, France, Italy, Belgium and Portugal have been readjusted by a series of treaties, especially between the years 1885 and 1894. Switzerland, Belgium, Corfu and Paxo and Luxemburg are respectively neutralized by the treaties of Vienna, 1815, and of London, 1839, 1864, 1867. A list of treaties of guarantee supposed to be then in force, to which Great Britain is a party, beginning with a treaty made with Portugal in 1373, was

presented to parliament in 1859. Treaties of alliance were made between Great Britain and Japan in 1902 and 1905.

ii. For the innumerable conventions, to which Great Britain is a party, as to commerce, consular jurisdiction, fisheries and the slave trade, it must suffice to refer to the exhaustive and skilfully devised index to vols. 1-2 1 of Hertslet's Commercial Treaties, published in 1905 as vol. 22 of the series.

iii. The social intercourse of the world is facilitated by conventions, such as those establishing the Latin monetary union, 1865; the international telegraphic union, 1865; the universal postal union, 1874; the international bureau of weights and measures, 1875; providing for the protection of submarine cables in time of peace, 1884; the railway traffic union, 1890. Such treaties, now very numerous, are somewhat misleadingly spoken of by recent writers (L. von Stein and F. de Martens) as constituting a " droit administratif international."

iv. For the now operative treaties of extradition to which

Great Britain is a party, it will be sufficient to refer to the article Extradition. It may be observed that all of them, except the treaty of 1842, now, however, varied by one of .1889, with the United States, are subsequent to, and governed by, the provisions of zi & 34 Vict. c. 52, The Extradition Act 1870. Before the passing of this general act it had been necessary to pass a special act for giving effect to each treaty of extradition. The most complete collection of treaties of extradition is that of F. J. Kirchner, L' Extradition, Recueil, &°c. (London, 1883).

v. General conventions, to which most of the European states are parties, were signed in 1883 at Paris for the protection of industrial, and in 1886 at Bern for the protection of literary and artistic, property, and, from 1899 onwards, a series of general treaties, to none of which is Great Britain a party, have been signed at the Hague, as the result of conferences, invited by the government of the Netherlands, for solving some of the more pressing questions arising out of " the conflict of laws."

vi. Quasi-legislation by treaty has been directed mainly to encouraging the settlement of international disputes by peaceful methods, and to regulating the conduct of warfare.

The first peace conference, held at the Hague in 1899, devoted

much time to producing the generally accepted ” Convention for the Pacific Settlement of International Disputes.” An impor- tant achievement of this convention was the establishment at the Hague of an international tribunal, always ready to arbitrate upon cases submitted to it; and the convention recommended recourse not only to arbitration, but also to good offices and mediation, and to international commissions of inquiry. This convention has now been superseded by the revised and amplified edition of it adopted by the second peace conference in 1907. The provisions of neither convention are obligatory, but merely ” facultative,” amounting only to recommendations. Great efforts were made, especially in 1907, but without success, to draft a generally acceptable convention, making resort to arbitra- tion compulsory, at any rate with reference to certain classes of questions. In the meantime, however, agreements of this nature between one power and another have multiplied rapidly within the last few years (see Arbitration).

Certain bodies of rules intended to mitigate the horrors of war have received the adhesion of most civilized states. Thus the declaration of Paris, 1856 (to which, however, the United States, Venezuela and Bolivia have not yet formally acceded), prohibits the use of privateers and protects the commerce of neutrals; the Geneva conventions, 1864 and 1906, give protection to the wounded and to those in attendance upon them ; the St Peters- burg declaration, 1868, prohibits the employment of explosive bullets weighing less than 400 grammes; and the three Hague declarations of 1899 prohibit respectively (1) the launching of projectiles from balloons, (2) the use of projectiles for spreading harmful gases, and (3) the use of expanding bullets. The second • Hague conference, of 1907, besides revising the convention made by the first conference, of 1899, as to the laws of war on land, produced new conventions, dealing respectively with the opening of hostilities; neutral rights and duties in land warfare; the status of enemy merchant ships at the outbreak of war; the con- version of merchant ships into ships of war; submarine mines; bombardment by naval forces; the application of the Geneva principles to naval warfare; the rights of maritime capture; the establishment of an international prize court; and neutral rights and duties in maritime warfare. These conventions, as well as a republication of the first Hague declaration, which had in 1907 expired by efflux of time, have been already largely ratified.

It were greatly to be wished that the official publication of

treaties could be rendered more speedy and more methodical than it now is. The labours of the publicist would also be much lightened were it possible to consolidate the various general collections of diplomatic acts into a new Corps diplomatique universel, well furnished with cross references, and with brief annotations showing how far each treaty is supposed to be still in force.

Literature. — In addition to the works already cited in the course of this article the following are for various reasons important-

Joh. Lupus, De confederatione principum (Strassburg, 151 1, the first published monograph upon the subject) ; Bodinus, Disserlatio de contractibus summarum potestatum (Halle, 1696); Neyron, De vi foederum inter gentes (Gottingen, 1778); Neyron, Essai historique et politique sur les garanties, &c. (Gottingen, 1797); Wachter, De modis tollendi pacta inter gentes (Stuttgart, 1780); Dresch, Ueber die Dauer der Vdlkervertrdge (Landshut, 1808); C. Bergbohm, Staats- vertrdge und Gesetze als Quellen des Volkerrechts (Dorpat, 1877); Jellinek, Die rechtliche Natur der Statenvertrdge (Vienna, 1880); D. Donati, Trattati internazionali net diritto costituzionale (1907) ; Holzendorff, Handbuch des Volkerrechts (1887) vol. iii. ; Fleischmann, V blkerrechtsquellen in Auswahl herausgegeben, (1905) ; de Lapradelle, Recueil des arbitrages internationaux (1905); J. B. Moore, History and Digest of the International Arbitrations to which the United States has been a Party (1898) 6 vols. For a list of the principal ” con-cordats,” see Calvo, Droit international theorique et pratique t. i. On the history of the great European treaties generally, see the Histoire abregee des traites de paix entre les puissances de V Europe, by Koch, as recast and continued by Scholl (1817 and 1818), and again by Count de Garden in 1 848-1 859, as also the Recueil manuel of De Martens and Cussy, continued by Geffcken. For the peace of West- phalia, Putter’s Geist des westphdlischen Friedens (1795) is useful; for the congress of Vienna Kliiber’s Aden des Wiener Congresses (1815-1819) and Le Congres de Vienne et les traites de 1815 precede des conferences de Dresde, de Prague et de Chatillon, suivi des Congres d’ Aix-la-Chapelle, Troppau, Laybach et Verone, by Count Angeberg. The last-mentioned writer has also published collections of treaties relating to Poland, 1762-1862; to the Italian question, 1859; to

the Congress of Paris, 1856 and the revision of its work by the Conference of London, 1871; and to the Franco-German War of 1870-71. For the treaties regulating the Eastern question see The European Con- cert in the Eastern Question, by T. E. Holland (1885) and La Turquie et le Tanzimat, by E. Engelhardt (1882-1884). (T. E. H.)

TREATISE, a written composition, dealing fully and systematically with the principles of some subject of serious importance. The M. Eng. tretis, O. Fr. tretis, or treitis, is a doublet of " treaty," which also meant a discourse or account. Both words are to be referred to Lat. tractare, to treat, handle, frequentative of trahere, tractus, to draw. " Treatise " thus would mean, by etymology, something well handled, nicely made.

TREBIA (mod. Trebbia) , a river of Cisalpine Gaul, a tributary of the Padus (Po) into which it falls some 4 m. west of Placentia (Piacenza). It is remarkable for the victory gained on its banks by Hannibal over the Romans in 218 B.C. The latest investi- gations make it clear that Polybius's account, according to which the battle took place on the left bank of the river, is to be preferred to that of Livy (see W. J. Kromayer in Anzeiger der phil. hist. Klasse der k. Akademie der Wissenschaften, Vienna, October 14, 1908). Its valley is followed past Bobbio by the modern highroad from Piacenza to Genoa (88 m.).

TREBINJE, a town of Herzegovina, situated 9 m. N. E. of Ragusa, on the small river Trebinjcica, and on a branch of the railway from Metkovic to Castelnuovo, near Cattaro. Pop. (1895), about 1700. Trebinje is built in alow-lying oasis among the desolate limestone mountains, close to the Dalmatian and Montenegrin frontiers. Its half-ruined wall and citadel testify to its former strategic importance. Trebinje was built by the Slavs, probably on the site of a Roman town laid waste by the Saracens in 840. In the tenth century Constantine Porphyro- genitus mentions it as Terbunia. It commanded the road from Ragusa to Constantinople, traversed, in 1096, by Raymond of Toulouse and his crusaders. Under the name of Tribunia or Travunja (the Trebigne of the Ragusans), it belonged to the Servian Empire until 1355- In 1483 it was captured by the Turks.

TREBIZOND (Gr. Trapezus), a city of Asia Minor, situated on the Black Sea, near its south-eastern angle. From the time of its foundation as a Greek colony to the present day it has always been a considerable emporium of commerce, and it was for two

centuries and a half the capital of an empire. Its importance is due to its command of the point where the chief trade route from Persia and Central Asia to Europe, over the table-land of Armenia by Bayezid and Erzerum, descends to the sea. Its safety also was secured by the barrier of rugged mountains (7000 to 8000 ft.) which separates its district from the rest of Asia Minor. So complete is the watershed that no streams pass through these ranges, and there is hardly any communication in this direction between the interior of Asia Minor and the coast. For the same

reason, together with its northern aspect, the climate is humid and temperate, unlike that of the inland regions, which are exposed to great extremes of heat in summer and cold in winter. The position which was occupied by the Hellenic and medieval city is a sloping table of ground (whence the original name of the place, Trapezus, the " Table-land "), which falls in steep rocky precipices on the two sides, where two deep valleys, descending from the interior, run parallel at no great distance from one another down to the sea. The whole is still enclosed by the Byzan- tine walls, which follow the line of the cliffs and are carried along the sea-face; and the upper part of the level, which is separated from the lower by an inner cross wall, forms the castle; while at the highest point, where a sort of neck is formed between the two valleys, is the keep which crowns the whole. On each side, about half-way between the keep and the sea, these ravines are crossed by massive bridges, and on the farther side of the western- most of these, away from the city, a large tower and other fortifi- cations remain. The area of the ancient city is now called the Kaleh, and is inhabited by the Turks; eastward of this is the extensive Christian quarter, and beyond this again a low promon- tory juts northward into the sea, partly covered with the houses of a well-built suburb, which is the principal centre of commerce. The harbour lies on the eastern side of this promontory, but it is an unsafe roadstead, being unprotected towards the north-east and having been much silted up, so that vessels cannot approach within a considerable distance of the shore. From here the caravans start for Persia, and at certain periods of the year long trains of camels may be seen, and Persian merchants conspicuous by their high black caps and long robes. The route which these caravans follow is a chaussee as far as Erzerum, but this in places is too much broken to admit of the transit of wheeled vehicles. The railway by Batoum to Baku by way of Tiflis has tended greatly to turn the channel "of commerce from Trebizond into Russian territory, since it helps to open the

route to Erivan, Tabriz and the whole of Persia. The total population ot the place amounts to about 40,000, of whom 22,000 are Moslems and 18,000 Christians. Great Britain and all the larger European states have consulates there.

The vilayet, of which Trebizond is the chief town, consists of a long irregular strip of coast country, the eastern half of which is deeply indented and mountainous.

History. — The city of Trapezus was a colony of Sinope, but it first comes into notice at the time of the Retreat of the Ten Thousand, who found repose there. Notwithstanding its commercial importance, the remoteness of its position prevented it from being much known to fame either in the Hellenic or the early medieval period; its greatness dates from the time of the fourth crusade (1204), when the Byzantine Empire was dismembered and its capital occupied by the Latins. During the confusion that followed that event Alexius Comnenus escaped into Asia, and, having collected an army of Iberian mercenaries, entered Trebizond, where he was acknowledged as the legitimate sove- reign, and assumed the title of Grand Comnenus. Though only twenty-two years of age, Alexius was a man of ability and resolute will, and he succeeded without difficulty in making himself master of the greater part of the southern coast of the Black Sea. The empire thus founded continued to exist until 1461, when the city was taken by Mahommed II. The cause of this long duration, and at the same time the secret of its history, is to be found in the isolated position of Trebizond and its district, between the mountains and the sea, which has already been described. By this means it was able to defy both the Seljuks and the Ottomans, and to maintain its independence against the emperors of Nicaea and Constanti- nople. But for the same reason its policy was always narrow, so that it never exercised any beneficial influence on the world at large. It was chiefly in the way of matrimonial alliances that it was brought into contact with other states. The imperial family were renowned for their beauty, and the princesses of this race were sought as brides by Byzantine emperors of the dynasty of the Palaeologi, by Western nobles, and by Mahommedan princes; and the connexions thus formed originated a variety of

diplomatic relations and friendly or offensive alliances. The palace of Trebizond was famed for its magnificence, the court for its luxury and elaborate ceremonial, while at the same time it was frequently a hotbed of intrigue and immorality. The Grand Comneni were also patrons of art and learning, and in consequence of this Trebizond was resorted to by many eminent men, by whose agency the library of the palace was provided with valuable manuscripts and the city was adorned with splendid buildings. The writers of the time speak with enthusiasm of its lofty towers, of the churches and monasteries in the suburbs, and especially of the gardens, orchards and olive groves. It excited the admir- ation of Gonzales Clavijo, the Spanish envoy, when he passed through it on his way to visit the court of Timur at Samarkand (Clavijo, Historia del gran Tamorlan, p. 8a); and Cardinal Bessarion, who was a native of the place, in the latter part of his life, when the city had passed into the hands of the Mahomme- dans, and he was himself a dignitary of the Roman Church, so little forgot the impression it had made upon him that he wrote a work entitled "The Praise of Trebizond" CEyKccfuopTpaireˆovvTOs) , which exists in manuscript at Venice. Little was known of the history of the empire of Trebizond until the subject was taken in hand by Professor Fallmerayer of Munich, who discovered the chronicle of Michael Panaretus among the books of Cardinal Bessarion, and from that work, and other sources of information which were chiefly unknown up to that time, compiled his Gcschichte des Kaiserthums von Trapezunt (Munich, 1827). From time to time the emperors of Trebizond paid tribute to the Seljuk sultans of Iconium, to the grand khans of the Mongols, to Timur the Tatar, to the Turkoman chieftains, and to the Ottomans; but by means of skilful negotiations they were enabled practically to secure their independence. We find them also at war with many of these powers, and with the Genoese, who endeavoured to monopolize the commerce of the Black Sea. The city was several times besieged, the most formidable attack being that which occurred in the reign of AndronicusL, the second emperor, when the Seljuks, under the command of Melik, the son of the great sultan Ala-ed-din, first assaulted the northern wall in the direc- tion of the sea, and afterwards endeavoured to storm the upper citadel by night. They failed, however, in both attempts; and in the latter, owing to the darkness, and to the occurrence of a violent storm which suddenly swelled the torrents in the ravines, their force was thrown into inextricable confusion, and they were compelled to abandon their camp and make the best- of their

escape from the country. So great was the strength of the fortifications that Mahommed II. might have experienced much difficulty in reducing it, had it not been for the pusillanimous conduct of David, the last emperor, who surrendered the place almost unconditionally.

Ancient Memorials. — Several interesting monuments of this period remain at Trebizond in the form of churches in the Byzantine style of architecture. One of these is within the area of the old city, viz. the church of the Panaghia Chrysokephalos, or Virgin of the Golden Head, a large and massive but exces- sively plain building, which is now the Orta-hissar mosque. On the farther side of the eastern ravine stands a smaller but very well proportioned structure, the church of St Eugenius, the patron saint of Trebizond, now the Yeni Djuma djami, or New Friday mosque. Still more important is the church of Haghia Sophia, which occupies a conspicuous position over- looking the sea, about 2 m. west of the city. The porches of this are handsomely ornamented, and about 100 ft. from it rises a tall campanile, the inner walls of which have been covered in parts with frescoes of religious subjects, though these are now much defaced. But the most remarkable memorial of the middle ages that exists in all this district is the monastery of Sumelas, which is situated about 25 m. from Trebizond, at the side of a rocky glen, at a height of 4000 ft. above the sea. Its position is most extraordinary, for it occupies a cavern in the middle of the face of a perpendicular cliff 1000 ft. high, where the white buildings offer a marked contrast to the brown rock which forms their setting. It is approached by a zigzag path at the side of the cliff, from which a flight of stone

steps and a wooden staircase give access to the monastery. The valley below is filled with the richest vegetation, the under-growth being largely composed of azaleas and rhododendrons. An antiquity of 1 500 years is claimed for the foundation of the monastery, but it is certain that the first person who raised it to importance was the emperor Alexius Comnenus III. of Trebi-zond; he rebuilt it in 1360, and richly endowed it. The golden bull of that emperor, which became thenceforth the charter of its foundation, is still preserved; it is one of the finest specimens of such documents, and contains portraits of Alexius himself and his queen. The monastery also possesses the firman of Mahommed II. by which he accorded his protection to the monks when he became master of the country.

Bibliography. — J. Ph. Fallmerayer, Geschichte des Kaiserthums von Trapezunt (Munich, 1827); also Fragmente aus dem Orient, vol. i. (Stuttgart, 1845); C. Texier, Asie Mineure (Paris, 1862); C. Texier and R. P. Pullan, Byzantine Architecture (London, 1864); G. Finlay, History of Greece, vol. iv. (Oxford, 1877); H. F. Tozer, Turkish Armenia and Eastern Asia Minor (London, 1881). (H. F. T.)

TREBLE (a doublet of ” triple,” three-fold, from Lat. triplus, triple; cf. ” double ” from duplus), the term applied, in music, to the high or acute part of the musical system, as opposed to and distinguished from the ” bass,” the lower or grave part. The middle C is the practical division between the parts. The word is also used as equivalent to the ” soprano ” voice, the highest pitch or range of the human voice, but generally it is confined to a boy’s voice of this quality, ” soprano ” being used of the corresponding female voice. The treble-clef is the G-clef on the second line. The origin of this application of the term ” treble,” triplus, threefold, to the highest voice or part is due to the fact that in the early plain-song the chief melody was given to the tenor, the second part to the alto (discantus) and where a third part (triplum) was added it was assigned to the highest voice, the soprano or treble.

TREBUCHET, a medieval siege engine, employed either to batter masonry or to throw projectiles over walls. It was developed from the post-classical Roman onager (wild ass), which derived its name from the kicking action of the machine. It consisted of a frame placed on the ground to which a vertical frame of’ solid timber was rigidly fixed at its front end; through the vertical frame ran an axle, which had a single stout spoke. On the extremity of the spoke was a ctip to receive the projectile. In action the spoke was forced down, against the tension of twisted ropes or other springs, by a windlass, and then suddenly released. The spoke thus kicked the crosspiece of the vertical frame, and the projectile at its extreme end was shot forward. In the trebuchet the means of propulsion was a counter-weight. The axle which was near the top of a high strutted vertical frame served as the bridge of a balance, the shorter arm of which carried the counter-weight and the longer arm the carrier for the shot. An alternative name for the trebuchet is the mangonel (mangonneau) .

TREBULA, the name of five ancient towns in Italy. (1) Trebula in Samnium, a town of the Caraceni, on the left bank of the Sangro,

some 20 m. below Castel di Sangro;the church of the Madonna degli Spineti near Quadri marks the site. It appears to have been a municipium, but we only know of its existence in Hadrian's time. (2) Trebula in Campania, between Saticula and Suessula. The site is probably identical with the hills bearing the modern name Tripaola (about 1000 ft. above sea level) above the entrance to the valley of Maddaloni. It is possibly this Trebula the citizens of which received Latin rights in 303 B.C. Its territory extended as far as the Via Appia, and its place was taken in imperial times by the Vicus Nova- nensis, on the road itself, near Suessula. (3) Trebula Balli- ensis (mod. Treglia), also in Campania, 22 m. north of Capua, in the mountains, about 1000 ft. above sea-level. It revolted to Hannibal and was reduced to obedience by Fabius. Remains of walls, aqueduct and tombs exist. Its territory was men- tioned in the projected distributions of land in Cicero's time: and its wine was well thought of under Nero. It was a muni- cipium. (4) Trebula Mutuesca in the Sabine country, 2 m.

east of the point where the Via Caecilia diverges from the Via Salaria. It lies about i m. south-west of the modern Monte- leone, and an amphitheatre and other remains are visible. In a dedication made there by the consul Mummius in 146 B.C. it is spoken of as a vicus, but when the praefecturae were abolished it became a municipium. The post station of Vicus Novus on the Via Salaria (mod. Osteria Li Massacci) belonged to its territory (see N. Persichetti in Romische Mitteilungen, 1898, P- J 93) • (5) Trebula Suffenas is generally placed 6 m. south of Reate (mod. Ricti) on the Via Quinctia, but is with considerable probability identified with Ciciliano, 10 m. east of Tivoli, 2030 ft. above sea-level, by O. Cuntz (Jahreshefte des oesterr. arch. Instituts, 1899, ii. 89), who combines the evidence of inscriptions and of the description in Martial (v. 71), with a new interpreta- tion of the Itineraries. There are remains of an ancient road, with substructures in rough polygonal work ascending to it in zigzags. (T. As.)

TREDEGAR, an urban district in the western parliamentary division of Monmouthshire, England, on the Sirhowy river, 24 m. north of Cardiff, on a joint line of the London & North- western and the Rhymney railways. Pop. (1901), 18,497. It stands at an

elevation of about 1000 ft., and owes its existence to the establishment in the beginning of the 19th century of the works of the Tredegar Iron and Coal Company, which employ most of the large industrial population. The place gave the title of Baron Tredegar (c. 1859) to Sir Charles Morgan Robinson Morgan, Bart. (1792-1873), whose grandfather, Sir Charles Gould, Bart., married the heiress of John Morgan of Tredegar and changed his name to Morgan. He was M.P. for Brecknock in 1835-1847. He married a granddaughter of the 1st Lord Rodney. His son Godfrey (b. 1830), who succeeded to the barony, was created Viscount Tredegar in 1905; he had served in the Crimea and taken part in the famous Balaclava charge.

TREDGOLD, THOMAS (1788-1829), English engineer, was born at Brandon, near Durham, on the 22nd of August 1788, and at the age of fourteen was apprenticed to a carpenter. In 1808 he went to Scotland, and after working there as a journeyman for five years, obtained employment in London with an architect. He began to practice as a civil engineer on his own account in 1823, but much of his time was devoted to the preparation of his engineering text-books, which gained a wide reputation. They included Elementary Principles of Carpentry (1820), almost the first book of its kind in English; Practical Treatise on the Strength of Cast Iron and other Metals (1824) ; Principles of Warm- ing and Ventilating Public Buildings (1824); Practical Treatise on Railroads and Carriages (1825); and The Steam Engine (1827). He died in London on the 28th of January 1829.

TREE, SIR HERBERT BEERBOHM (1853-), English actor and manager, was born in London, on the 17th of Decem- ber 1853, the son of Julius Beerbohm, a London merchant of German parentage; his half-brother, Max Beerbohm (b. 1872), became well known as a dramatic critic, a miscellaneous writer and caricaturist. Taking the stage name of Beerbohm Tree he made his first professional appearance in London in 1876. After some years of varied experience he made a striking success in 1 884 as the curate in The Private Secretary, but he was making himself well known meanwhile in dramatic circles as an admir- able actor in many roles. In September 1887 he became lessee and manager of the Haymarket theatre, London, where his representations of melodramatic ” character ” parts, as in Jim the Penman, The Red Lamp, and A Man’s Shadow, were highly successful. His varied talents as an actor were displayed, however, not only in a number of modern dramas, such as H. A. Jones’s Dancing Girl, but also in romantic parts such as Grin-

goire, and in the production of so essentially a literary play as Henley's Beau Austin; and in classic parts his ability as a comedian was shown in The Merry Wives of Windsor, in which he played Falstaff, and as a tragedian in Hamlet; his presentations of Shakespeare were notable too as carrying forward the methods of realistic staging inaugurated at the Lyceum under Irving. In 1897 Mr Tree moved to the new Her Majesty's (afterwards

His Majesty's) theatre, opening with Gilbert Parker's Seats of the Mighty; but his chief successes were in Stephen Phillips's poetical dramas, and in his splendid revivals of Shakespeare (especially Richard II. and the Merchant of Venice). The magnificence of the mounting, the originality and research shown in the " business " of his productions, and his own versatility in so many different types of character, made his management memorable in the history of the London stage; and on the death of Sir Henry Irving he was generally recognized as the leader in his profession. His wife (Maud Holt), an accomplished actress, and their daughter Viola, were also prominently associated with him. In 1907 he took his company to Berlin at the invitation of the German emperor, and gave a selection from his repertoire with great success. In the same year he established a school of dramatic art, for the training of actors, in London; and in this and other ways he was prominent in forwarding the interests of the stage. He was knighted in 1909.

TREE (O. Eng. treo, treow, cf . Dan. trae, Swed. trad, tree, tr'd, timber; allied forms are found in Russ. drevo, Gr. SpOs, oak, and Sopv, spear, Welsh derw, Irish darog, oak, and Skr. daru, wood), the term, applied in a wide sense, to all plants which grow with a permanent single woody stem or trunk of some height, branching out at some distance from the ground. There is a somewhat vague dividing line, in popular nomenclature, between " shrubs " and " trees," the former term being usually applied to plants with several stems, of lower height, and bushy in growth. The various species to which the name " tree " can be given are treated under their individual titles, e.g. oak, ash, elm, &c; the articles Fir and Pine treat of two large groups of conifers; general information is provided by the articles Plants and Gymnosperms; tree cultivation will be found under Forests and Forestry and Horticulture; and the various types of tree whose wood is useful for practical purposes under Timber. Apart from this general meaning of the word, the chief trans- ferred use is that for a piece of wood used "for various specific purposes, as a framework, bar, &c, such as the tree of a saddle, axle-tree, cross-tree, &c.

TREE-CREEPER, one of the smallest of British birds, and, regard being had to its requirements, one very generally distri- buted. It is the Cerlhia familiaris of ornithology, and is remark- able for the stiffened shafts of its long and pointed tail-feathers, aided by which, and by its comparatively large feet, it climbs the trunks or branches of trees, invariably proceeding upwards or outwards and generally in a spiral direction, as it seeks the small insects that are hidden in the bark and form its chief food. When in the course of its search it nears the end of a branch or the top of a trunk, it flits to another, always alighting lower down than the place it has left, and so continues its work. Inconspicuous in colour — for its upper plumage is mostly of various shades of brown mottled with white, buff and tawny, and beneath it is of a silvery white — the tree-creeper is far more common than the incurious suppose; but, attention once drawn to it, it can be frequently seen and at times heard, for though a shy singer its song is loud and sweet. The nest is neat, generally placed in a chink formed by a half-detached piece of bark, which secures it from observation, and a considerable mass of material is commonly used to stuff up the opening and give a sure founda- tion for the tiny cup, in which are laid from six to nine eggs of a translucent white, spotted or blotched with rust-colour.

The tree-creeper inhabits almost the whole of Europe as well as Algeria and has been traced across Asia to Japan. It is now recog- nized as an inhabitant of the greater part of North America, though for a time examples from that part of the world, which differed slightly in the tinge of the plumage, were accounted a distinct species (C. americana) and even those from Mexico and Guatemala (C. mexi- cana) have lately been referred to the same. It therefore occupies an area not exceeded in extent by that of many passerine birds and is one of the strongest witnesses to the close alliance of the so-called Nearctic and Palaearctic regions.

Allied to the tree-creeper, but without its lengthened and stiff tail-feathers, is the genus Tichodroma, the single member of which is the wall-creeper (T. muraria) of the Alps and some other mountain- ous parts of Europe and Asia. It is occasionally seen in Switzerland, fluttering like a big butterfly against the face of a rock conspicuous

from the scarlet-crimson of its wing-coverts and its white spotted primaries. Its bright hue is hardly visible when the bird is at rest, and it then presents a dingy appearance of grey and black. It is a species of wide range, extending from Spain to China; and, though but seldom leaving its cliffs, it nas wandered even so far as England. Merrett (Pinax, p. 177) in 1667 included it as a British bird, and the correspondence between Marsham and Gilbert White {Proc. Norf. and Norw. Nat. Socitty, ii. 180) proves that an example was shot in Norfolk, on the 30th of October 1 792; while another is reported (Zoologist, 2nd series, p. 4839) to have been killed in Lancashire on the 8th of May 1872.

The passerine family Certhiidae contains a number of genera of birds to which the general name “creeper” is applied; they occur in North America, Europe and Asia, the greater part of Africa, and Australia and New Guinea. (A. N.)

TREE-FERN. In old and well-grown specimens of some of the familiar ferns of temperate climates the wide-spreading crown of fronds may be observed to rise at a distance often of a good many inches above the ground, and from a stem of consider- able thickness. The common male fern Lastraea (Filix-mas) affords the commonest instance of this; higher and thicker trunks are, however, occasionally presented by the royal fern (Osmunda regalis), in which a height of 2 ft. may be attained, and this with very considerable apparent thickness, due, however, to the origin and descent of a new series of adventitious roots from the bases of each annual set of fronds. Some tropical members and allies of these genera become more ‘distinctly tree-like, e.g. Todea; Pteris also has some sub-arboreal forms. Oleandra is branched and shrub-like, while Angiopteris and Mar- atlia may also rise to 2 ft. or more. But the tree-ferns proper are practically included within the family Cyatheaceae. This includes seven genera (Cyalhea, Alsophila, Hemitelia, Dicksonia, Thyrsopteris, Cibotium and Balantium) and nearly 300 species, of which a few are herbaceous, but the majority arboreal and palm-like, reaching frequently a height of 50 ft. or more, Also- phila excelsa of Norfolk Island having sometimes measured 60 to 80 ft. The fronds are rarely simple or simply pinnate, but usually tripinnate or decompound, and may attain a length of 20 ft., thus forming a splendid crown of foliage. The stem may occasionally branch into many crowns.

The genera are of wide geographical range, mostly within the tropics; but South Australia, New Zealand, and the southern

Pacific islands all possess their tree-ferns. In Tasmania Alsophila australis has been found up to the snow-level, and in the humid and mountain- ous regions of the tropics tree-ferns are also found to range up to a considerable altitude. The fronds may either contribute to the apparent thickness of the stem by leaving more or less of'their bases, which become hardened and persistent, or they may be articulated to the stem and fall off, leaving characteristic scars in spiral series upon the stem. The stem is frequently much increased in apparent thickness by the downgrowth of aerial roots, forming a black coating several inches or even a foot in thickness, but its essential structure differs little in principle from that familiar in the rhizome of the common bracken (Pteris). To the ring or rather netted cylinder of fibrovascular bundles characteristic of all fernstems scattered internal as well as external bundles arising from these are superadded and in a tree-fern the outer bundles give off branches to the descending roots from the region where they pass into the leaves.

Tree-ferns are cultivated for their beauty alone; a few, however, are of some economic applications, chiefly as sources of starch. Thus the beautiful Alsophila excelsa of Norfolk Island is said to be threatened with extinction for the sake of its sago-like pith, which is greedily eaten by hogs; Cyathea medullaris also furnishes a kind of sago to the natives of New Zealand, Queensland and the Pacific islands. A Javanese species of Dicksonia (D. chrysotricha) furnishes silky hairs, which have been imported as a styptic, and the long silky or rather woolly hairs, so abundant on the stem and frond-leaves in the various species of Cibotium have not only been put to a similar use, but in the Sandwich Islands furnish wool for stuffing mattresses and cushions, which was formerly an article of export. The " Tartarian lamb," or Agnus scythicus of old travellers' tales in China and Tartary, is simply the woolly stock of Cibotium Barometz, which, when dried and inverted, with all save four of its frond-stalks cut away, has a droll resemblance to a toy sheep.

TREE FROG. Many different groups of tailless Batrachians (see Frog) are adapted to arboreal life, which is indicated by expansions of the tips of the fingers and toes, adhesive disks which assist the animal in climbing on vertical smooth surfaces. These disks do not act as suckers, but adhere by rapid and intense pressure of the distal phalanx and special muscles upon the lower

surface, which is also provided with numerous glands producing a viscous secretion.

The best-known tree frog is the little Hyla arborea of continental Europe, rainette of the French, Laubfrosch of the Germans., often kept in glass cylinders provided with a ladder, which the frog is supposed to ascend or descend in prevision of the weather. But recent experiments conducted on scientific principles show that not much reliance can be placed on its prophecies. This frog is one of the smallest of European Batrachians, rarely reaching 2 in. in length; its upper parts are smooth and shiny, normally of a bright grass-green, which may change rapidly to yellow, brown, olive or black; some specimens, deprived of the yellow pigment which contributes to form the green colour, are sky-blue or turquoise blue; the lower parts are granulate and white.

The family Hylidae, of which the European tree frog is the type, is closely related to the Bufonidae or true roads, being distinguished from them by the presence of teeth in the upper jaw and by the claw- like shape of the terminal phalanx of the digits. It is a large family, represented by about three hundred species, two hundred and fifty of which belong to the genus Hyla, distributed over Europe, temperate Asia, North Africa, North and South America, Papua and Australia. Close allies of Hyla are the Nototrema of Central and South America, in which the female develops a dorsal broad pouch in which the young undergo part or the whole of their metamorphoses. The genus Phyllomedusa, also from Central and South America, are quadrumanous; the inner finger and the toe being opposable to the others, and the foot being very similar to the hand. These frogs deposit their spawn between the leaves of branches overhanging water, into which the tadpoles drop and spend their larval life.

TREE KANGAROO, any individual of the diprotodont mar- supial genus Dendrolagus (see Marsupialia) . Three species are inhabitants of New Guinea and the fourth is found in North Queensland. They differ greatly from all other members of the family (Macropodidae), being chiefly arboreal in their habits, and feeding on bark, leaves and fruit. Their hinder limbs are shorter than in the true kangaroos, and their fore limbs are longer and more robust, and have very strong curved and pointed claws. The best-known species, Lumholtz' tree kangaroo (Dendrolagus lumholtzi), is found in North Queensland. It was named by Professor Collett in honour of its discoverer, who described it as living on the highest parts of the mountains, in

the densest scrub and most inaccessible places. It is hunted by the blacks with trained dingoes; the flesh is much prized by the blacks, but the presence of a worm between the muscles and the skin renders it less inviting to Europeans.

TREE-SHREW, any of the arboreal insectivorous mammals of the genus Tupaia. There are about a dozen species, widely distributed over the east. There is a general resemblance to squirrels. The species differ chiefly in the size and in colour and length of the fur. Nearly all have long bushy tails. Their food consists of insects and fruit, which they usually seek for in the trees. When feeding they often sit on their haunches, holding the food, after the manner of squirrels, between their fore paws. The pen-tailed tree-shrew (Ptilocercuslowi) , from Borneo, Sumatra and the Malay Peninsula, is the second generic representative of the family Tupaiidae. The head and body, clothed in blackish-brown fur, are about 6 in. long; the tail, still longer, is black, scaled and sparsely haired for the upper two-thirds, while the lower third is fringed on each side with long hairs, mostly white. One shrew from Borneo and a second from the Philippines have been referred to a separate genus under the name Urogale everetti and U ■ cylindrura, on account of their uniformly short-haired, in place of varied, tails. (See Insectivora.)

TREE-WORSHIP. Primitive man, observing the growth and death of trees, the elasticity of their branches, the sensitiveness and the annual decay and revival of their foliage, anticipated in his own way the tendency of modern science to lessen the gulf between the animal and the vegetable world. When sober Greek philosophers (Aristotle, Plutarch) thought that trees had perceptions, passions and reason, less profound thinkers may be excused for ascribing to them human conceptions and supernatural powers, and for entertaining beliefs which were entirely rational and logical from primitive points of view. These beliefs were

part of a small stock of fundamental ideas into which scientific knowledge of causation did not enter, ideas which persist in one form or another over a large portion of the world, and have even found a place in the higher religions, inevitably conditioned as these positive faiths are by the soil upon which they flourish. 1 In

fact, the evidence for tree-worship is almost unmanageably large, and since comparative studies do not as yet permit a concise and conclusive synopsis of the subject, this article will confine itself to some of the more prominent characteristics.

Numerous popular stories reflect a firmly rooted belief in an intimate connexion between a human being and a tree, plant or flower. Sometimes a man's life depends upon the Human Life. *-ree an(ˆ su ff ers when it withers or is injured, and we encounter the idea of the external soul, already found in the Egyptian " Tale of the Two Brothers " of at least 3000 years ago. Here one of the brothers leaves his heart on the top of the flower of the acacia and falls dead when it is cut down. Some- times, however, the tree is an index, a mysterious token which shows its sympathy with an absent hero by weakening or dying, as the man becomes ill or loses his life. These two features very easily combine, and they agree in representing a — to us — mysterious sympathy between tree- and human-life, which, as a matter of fact, frequently manifests itself in recorded beliefs and customs of historical times. 2 Thus, sometimes the new-born child is associated with a newly planted tree with which its life is supposed to be bound up ; or, on ceremonial occasions (betrothal, marriage, ascent to the throne), a personal relationship of this kind is instituted by planting trees, upon the fortunes of which the career of the individual depends. Sometimes, moreover, boughs or plants are selected and the individual draws omens of life and death from the fate of his or her choice. Again, a man will put himself into relationship with a tree by depositing upon it something which has been in the closest contact with himself (hair, clothing, &c). This is not so unusual as might appear; there are numerous examples of the conviction that a sympathetic relationship continues to subsist between things which have once been connected {e.g. a man and his hair), and this may be illus- trated especially in magical practices upon material objects which are supposed to affect the former owner. 3 We have to start then with the recognition that the notion of a real inter-connexion between human life and trees has never presented any difficulty to primitive minds.

The custom of transferring disease or sickness- from men to trees is well known. 4 Sometimes the hair, nails, clothing, &c, of a sickly person are fixed to a tree, or they are forcibly inserted in a hole in the trunk, or the tree is split and the patient passes through the aperture. Where the tree has been thus injured, its recovery and that of the patient are often associated. Different

explanations may be found of such customs which naturally take rather different forms among peoples in different grades of

1 In this as in other subjects of comparative religion (see Serpent-Worship), the comparative and historical aspects of the problems should not be severed from psychology, which investigates the actual mental processes themselves. A naive rationalism or intellectualism which would ridicule or deplore the modern retention of " primitive" ideas has to reckon with the psychology of the modern average mental constitution ; a more critical and more sympathetic attitude may recognize in religious and in other forms of belief and custom the necessary consequences of a continuous development linking together the highest and the lowest conceptions of life.

2 See the evidence collected by E. S. Hartland, The Legend of Perseus (1894-1896), ii. ; J. G. Frazer, The Golden Bough (1900), iii. 351 sqq., 391 ; and in general, A. E. Crawley, The Idea of the Soul

(1909).

'There appears to be a fundamental confusion of association, likeness and identity, which on psychological grounds is quite intelligible. It is appropriate to notice the custom of injuring an enemy by simply beating a tree-stump over which his name had previously been pronounced (A.B. Ellis, The Ewe-speaking Peoples of the Slave Coast of West Africa, 1890, p. 9,8). The folk-lore of the " name" is widespread and of great antiquity, and certain features of it show that a thing (individual or object) and its name were not easily disconnected, and that what affected the one affected the other. In this case, by pronouncing the name the tree-stump for all intents and purposes became the enemy. * Hartland ii. 142 sqq.; Frazer, iii. 26 sqq.

civilization. Much depends upon the theory of illness. In India, for example, when the patient is supposed to be tormented by a demon, ceremonies are performed to provide it with a tree where it will dwell peacefully without molesting the patient so long as the tree is left unharmed. 5 Such ideas do not enter, of course, when the rite merely removes the illness and selfishly endangers the health of those who may approach the tree. 6 Again, sometimes it is clearly felt that the man's personality has been mystically united with some healthy and sturdy tree, and in this case we may often presume that such trees already possessed

some peculiar reputation. The custom finds an analogy when hair, nail-clippings, &c, are hung upon a tree for safety's sake lest they fall into the hands of an enemy who might injure the owner by means of them.

In almost every part of the world travellers have observed the custom of hanging objects upon trees in order to establish some sort of a relationship between the offerer and the tree. Such trees not infrequently adjoin a well or are accom- o/jv^g. " panied by sacred buildings, pillars, &c. Throughout Europe, also, a mass of evidence has been collected testifying to the lengthy persistence of " superstitious " practices and beliefs concerning them. The trees are known as the scenes of pilgrim- ages, ritual ambulation, and the recital of (Christian) prayers. Wreaths,' ribbons or rags are suspended to win favour for sick men or cattle, or merely for " good luck." Popular belief associates the sites with healing, bewitching, or mere " wishing "; and though now perhaps the tree is the object only of some vague respect, there are abundant allusions to the earlier vitality of coherent and systematic cults. 7 Decayed or fragmentary though the features may be in Europe, modern observers have found in other parts of the world more organic examples which enable us, not necessarily to reconstruct the fragments which have survived in the higher religions and civilizations, but at least to understand their earlier significance. In India, for example, the Kprwas hang rags on the trees which form the shrines of the village-gods. In Nebraska the object of the custom was to propitiate the super- natural beings and to procure good weather and hunting. In South America Darwin recorded a tree honoured by numerous offerings (rags, meat, cigars, &c.) ; libations were made to it, and horses were sacrificed. 8 If, in this instance, the Gauchos regarded the tree, not as the embodiment or abode of Walleechu, but as the very god himself, this is a subtle but very important transference of thought, the failure to realize which has not been confined to those who have venerated trees.

Among the Arabs the sacred trees are haunted by angels or by jinn; sacrifices are made, and the sick who sleep beneath them receive prescriptions in their dreams. Here, as frequently elsewhere, it is dangerous to pull a bough. spirits? 1 This dread of damaging special trees is familiar: Cato instructed the woodman to sacrifice to the male or female deity before thinning a grove {De re rustica, 139), while in the Homeric poem to Aphrodite the tree nymph is wounded when the tree is injured, and dies when the trunk falls. 9 Early Buddhism decided that

trees had neither mind nor feeling and might lawfully be cut; but it recognized that certain spirits might reside in them, and this the modern natives of India firmly believe. Propitiation is made before the sacrilegious axe is laid to the holy trees; loss of life or of wealth and the failure of rain are feared should they be wantonly cut; and there are even trees which it is dangerous to climb. 10 The Talein of Burma prays to the tree before he cuts it down, and the African woodman will place a fresh sprig upon the

6 W. Crooke, The Popular Religion and Folk-lore of Northern India (1896), ii. 92 sqq.; cf. p. 96, where the demon, the cause of sterility, is removed to trees.

6 Cf. E. B. Tylor, Primitive Culture (1903), ii. 149 seq., G. L. Gomme, Ethnology in Folk-lore (1892), 141 seq.

7 Hartland ii. 175 sqq.; Gomme, pp. 85, 94 seq., 102 sqq., and the literature at the end of this article.

8 Tylor ii. 223 seq.

See generally Frazer i. 170 sqq., Tylor i. 475 sqq., ii. 219 seq. For the survival of the idea of modern Greece, see J. S. Lawson, Modern Greek Folk-lore (1910), p. 158 seq.

10 Crooke ii. 77, 87, 90 sqq.

stump as a new home for the spirit. In the Gold Coast the silk-cotton and odum (poison) trees are especially sacred as the abode of the two deities, who are honoured by sacrifices — even of human victims; these indwelt trees must not be cut, and, since all trees of these species are under their protection, they can be felled only after certain purificatory ceremonies. 1 In general the evidence shows that sacred trees must not be injured unless they {i.e. their spirits) have been appeased, or means taken to provide the occupant with another abode. That the difference between the sacred object and the sacred occupant was not always clearly drawn is quite intelligible from those beliefs of much less rudimentary religions which confuse the unessential with the essential.

Again, when the jungle-races of India clear the forests, they leave

behind certain trees which are carefully protected lest the sylvan gods should abandon the locality (Crooke ii. 90). These trees' embody the local deities much in the same way as the north European homestead had a tree or a small grove for the guardian-spirit or " lord of the home," and they resemble the tree tutelary genius of old German villages and the Japanese trees which are the terrestrial dwelling-places of the guardian of the hamlets. 2 Such beliefs as these are more significant when trees are associated with the spirits of the dead. Trees were planted around graves in Greece, and in Roman thought groves were associated with the manes of the pious. The Baduyas of the central provinces of India worship the souls of their ancestors in groves of Saj trees, and this may be supplemented by various modern burial usages where the dead are buried in trees, or where the sacred tree of the village enshrines the souls of the dead forefathers. Thus among the natives of South Nigeria each village has a big tree into which the spirits of the dead are supposed to enter; when a woman wants a child or when a man is sick, sacrifice is made to it, and if the " Big God " Osowo who lives in the sky is favourable the request is granted. 3

Often the tree is famous for oracles. Best known, perhaps, is the oak of Dodona tended by priests who slept on the ground. Forms of The tall oaks of the old Prussians were inhabited Cult. D y gods who gave responses, and so numerous are

the examples that the old Hebrew " terebinth of the teacher " (Gen. xii. 6), and the "terebinth of the diviners" (Judg. ix. 37) may reasonably be placed in this category. Important sacred trees are also the object of pilgrimage, one of the most noteworthy being the branch of the Bo tree at Ceylon brought thither before the Christian era. 4 The tree-spirits will hold sway over the surrounding forest or district, and the animals in the locality are often sacred and must not be harmed. Thus, the pigeons at the grove of Dodona, and the beasts around the north European tree-sanctuaries, were left untouched, even as the modern Dyak would allow no interference with the snake by the side of the bush which enshrined a dead kinsman. 5 Sacred fires burned before the Lithuanian Perkuno and the Roman Jupiter; both deities were closely associated with the oak, and, indeed, the oak seems to have been very commonly used for the perpetual holy fires of the Aryans. 6 The powers of the tree-deities, though often especially connected with the elements, are not necessarily restricted, and the sacred trees can form the centre of religious, and sometimes, also, of national life. Such deities

are not abstract beings, but are potent and immediate, and the cultus is primarily as utilitarian as the duties of life itself. They may have their proper ministrants- (a) the chief sanctuary of the old Prussians was a holy oak around which lived priests and a high priest known as " God's mouth"; (b) in Africa there are

1 A. B. Ellis, op. cii. pp. 49 sqq. ; cf. further Frazer i. 180, 182 sqq. 2 Tylor ii. 225; II. M. Chadwick, "The Oak and the Thunder-god," Journ. of the Anthrop. Inst. (1900), pp. 30, 32, 43.

3 C. Partridge, The Cross River Natives (1904), p. 273; cf. further Crooke ii. 85, 91 ; Tylor ii. 10 seq. ; Frazer i. 178 sqq. ; J. G. Forlong, Faiths of Man, iii. 446.

4 Tylor ii. 218, and for other examples, pp. 224, 226;W. R. Smith, Religion of the Semites (1894), p. 185.

5 Frazer i. 179, cf. 230.

6 Ibid. 168; see his Lectures on the Early History of the Kingship (1905), pp. 209, 281.

sacred groves into which the priest alone may enter, and © among the Kissil-Bashi (or Kizilbashes) of the Upper Tigris and Euphrates, the holy tree of the village stands in an enclosure to which only the father-priest has access. 7 The trees may be the scene of religious festivals, and — what sometimes goes with these — of periodical fairs and markets. Among the Lousiade group in British New Guinea the religious feasts are held under the sacred tree and a portion is laid aside for the spirit-occupants. That the invisible spirit naturally enjoyed only the spiritual part of the offerings is a belief which may have been shared by others than the African negro. 8 Human sacrifice is known on the Slave Coast and in the Punjab; it was practised among the Druids, and at Odin's grave at Upsala. It is also said that the pollution of old Prussian sacred groves and springs by the intrusion of Christians was atoned for by human victims. Indeed, to judge from later popular custom and tradition, and from the allusion in ancient writers, various grisly rites and acts of licentiousness (such as the more advanced Hebrew prophets denounced) were by no means unusual features in the cults of trees and vegetation. 9

Although trees have played so prominent a part in the history of religions, the utmost caution is necessary in any attempt to

estimate the significance of isolated evidence and its Forms of relation to the contemporary thought. Let it suffice Develop- to notice that in West Equatorial Africa the death of meot – the sacred tree near the temples leads to the abandonment of the village, that in Rome the withering of the sacred fig-tree of Romulus in the Forum caused the greatest consternation. One can now understand in some measure why so much importance should be attached to a venerated tree, but these examples will illustrate the different historical and religious conditions which require study in any investigation of tree-worship. Unfortunately one constantly reaches the point where the ancient writer or the modern observer has failed to record the required information. Moreover, we do not encounter tree-cults at their rise: in every case we arrest the evidence at a certain stage of development. It is often impossible to determine why certain trees are sacred; sometimes it may be that the solitary tree is the survivor of a forest or grove, or it has attracted attention from its curious or uncanny form, or again it stands on a spot which has an immemorial reputation for sanctity. The persistence of sacred localities is often to be observed in the East, where more rudimentary forms of tree-cults stand by the side of or outlive higher types of religion. 10 The evolution of sacred trees and of religious beliefs and practices associated therewith have not always proceeded along parallel lines. As ideas advanced, the spirits associated with trees were represented by posts, idols, or masks; altars were added, and the trunk was roughly shaped to represent the superhuman occupant. There is reason to believe that the last-mentioned transformation has frequently happened in the development of iconography. Indeed, the natives of the Antilles suppose that certain trees instructed sorcerers to shape their trunks into idols, and to instal them in temple-huts where they could be worshipped and could inspire their priests with oracles.”

7 (a) Chadwick 32; (b) Tylor ii. 224; (c) The Standard, Sept. 19, 1904. For an African tree-god with priesthood and ” wives, see Ellis, op. cit. p. 50.

8 Tylor ii. 216 (citing Waitz, Anthrop. ii. 188).

9 See Golden Bough, i. 171 seq.; Lucan, Phar. iii. 405; P. H. Mallet, Northern Antiquities, i. 113. Chadwick 32; and, for the survivals, Golden Bough iii. 345.

10 So in Asia Minor where a tree hung with rags stands by a rock

with an ancient ” Hittite ” representation of the god of vegetation (W. M. Ramsay, The Expositor, Nov., 1906, p. 461 seq.). ” Hittite ” religion has long passed away, but the locality preserves its sacred character and presents a form of cult older than the ” Hittite ” civilization itself (cf. also the persistence of the veneration of trees in Palestine in spite of some four thousand years of history). There has not been a reversion to ancient forms of cult in their organic entirety, but with the weakening and loss of the positive influences in the course of histcry, there has been no progression, and the communities live in simpler conditions and at a simpler stage of mental evolution and they are ” childlike ” rather than ” senile ” or ” decadent.”

11 Tylor, ii. 216. Here one may observe: (a) the virtues of the tree as a whole will be retained — as in the case of the relic of a medieval saint — in any part of it (cf. ibid. 217; the offshoots of the oak of

The development of the beliefs relating to the spirit-occupants themselves would take us along quite another line of inquiry. When the tree-spirit was conceived to be of human shape the numerous stories which associate trees with men or deities of flesh and blood would easily arise; and just as Indian natives have gods which are supposed to dwell in trees, so in higher religions we find a Zeus or a Dionysus Endendros, gods, ” occupants of trees,” who have been identified with one or other of the leading members of a recognized pantheon. 1

The vicissitudes of the old tree-spirits are influenced by the circumstances of history. Syrian writers speak of a ” king of the forest ” and of a tall olive tree to the worship of which , shud/s’ C ‘ S ‘ S atan seduced the people. But. these ” trees of the demons ” were hewn down by zealous Syrian Chris- tians. So also the caliph Omar cut down the tree at liodaibaya visited by pilgrims, lest it should be worshipped, and the Council of Nantes (a.d. 895) expressly enjoined the destruction of trees which were consecrated to demons. Tradition has preserved some recollections of the overthrow of tree-cult in Europe. Bonifacius destroyed the great oak of Jupiter at Geismar in Hesse, and built of the wood a chapel to St Peter. (A similar continuity was maintained near Hebron when Constantine destroyed the idols

and altars beneath the oak or terebinth of Abraham at Mamre and replaced them by a basilica.) On the Heinzenberg near Zell the Chapel of Our Lady stands where the old tree uttered its complaint as the woodman cut it down; and at Kil- dare (cilldara, church of the oak), "Saint" Brigit or Bridget built her church under an oak tree. 2 On the other hand, at Samosata, the sacred tree worshipped in Christian times, was honoured as the wood of Christ's cross, and this growth of a new tradition to justify or at least to modify an old survival recurs in Palestine where the holy trees, whether adjoining a venerated tomb or not, are often connected with the names of saints or prophets and sometimes with appropriate traditions.

It is impossible to do more than indicate the outlines of an intricate subject which concerns the course of certain fundamental ideas, their particular development so far as trees are concerned, and the more accidental factors which have influenced these two lines within historical times. Several important aspects have been inevitably ignored, e.g. the marriage of trees and tree-spirits, the annual festivals at the growth and decay of vegetation, and the evidence for the association of prominent deities with tree-spirits. For these features and for other general information see especially the works of J. G. F'razer {Golden Bough; Lectures on Kingship; Adonis, Altis and Osiris; Totemism and Exogamy), other literature cited in the course of this article, and the numerous works dealing with primitive religious and other customs. Among the most useful monographs are those of C. Boetticher, Der Baumkultus d. Hellenen (1856); W. Mannhardt, Der Baumkultus der Cermanen und ihrer Nachbar- stamme (1875), Antike Wald- und Feldkulte (1877), and, for intro- ductory study, Mrs J. H. Philpot, The Sacred Tree, or the Tree in Religion and Myth (1897). (S. A. C.)

TREFOIL (Lat. trifolium, three-leaved plant, Fr. trefle, Ger. Dreiblatt and Dreiblattbogen) , the term in Gothic architecture given to the ornamental foliation or cusping introduced in the heads of window-lights, tracery, panellings, &c, in which the centre takes the form of a three-lobed leaf, one of the earliest examples being in the plate tracery at Winchester (1 222-1 235); see Quatrefoil.

TREGELLES, SAMUEL PRIDEAUX (1813-1875), English theologian, was born, at Wodehouse Place, near Falmouth, on the 30th of January 1813. His parents were Quakers, and he himself for

many years was in communion with the (Darbyite) Plymouth Brethren, but afterwards became a Presbyterian.

Dodona; the sacred oak of which the Argo was built); also (b) it was believed that the divine essence could be made to enter — tran- substantiated as it were — into an image (cf. Rameses II. and his idols; see Breasted, Egypt. Hist. Doc. iii. 179, note; and for analo- gies see Folk-Lore, viii. 325).

1 Even the Hebrews knew of the good-will of ” Him who dwelt in the bush” (Deut. xxxiii. 16). For ideas associating Yahweh (Jehovah) with trees, see J. G. Frazer, Anthrop. Essays to E. B. Tylor (1907), p. 125 seq.

2 See Chadwick 33, 35; Frazer, Lectures, 225; and Hartland ii. 181, 184 (who refers to the tree-worship taken over by St Maree and St Etto). Even the temples of Dodona and of Jupiter Capi- tolinus stood on the sites of older tree-worship.

For a while he worked at the ironworks, Neath Abbey, Glamorgan, and then set up as a private tutor in Falmouth, finally devoting himself to a laborious student life, until he was incapacitated by paralysis in 1870. He received the LL.D. degree from St Andrews and a pension of £200 from the civil list. He died at Plymouth on the 24th of April 1875.

Most of his numerous publications had reference to his great critical edition of the New Testament (1857-1872; see Bible; New Testament, Textual Criticism). They include an Account of the Printed Text of the Greek New Testament (1854), a new edition of T. H. Home’s Introduction (i860), and Canon Muratorianus: Earliest Catalogue of Books of the New Testament (1868). As early as 1844 he published an edition of the Book of the Revelation, with the Greek text so revised as to rest almost entirely upon ancient evidence. Tregelles wrote Heads of Hebrew Grammar (1852), translated Gesenius’s Hebrew Lexicon, and was the author of a little work on the Jansenists (1851) and of various works in exposition of his special eschatological views (Remarks on the Prophetic Visions of Daniel, 1852, new ed., 1864).

TREXJUIER, a port of western France, in the department of C6tes- du-Nord, 36 m. N.W. of St Brieuc. by road. Pop. (1906), 2605. The port is situated about 5! m. from the English Channel at the confluence of two streams that form the Treguier river; it carries

on fishing and a coasting and small foreign trade. The cathedral, remarkable in having three towers over the transept, one of which is surmounted by a fine spire, dates from the 14th and 15th centuries. It contains the sumptuous modern mausoleum of St Yves (d. 1303), a canon of the cathedral, the building of which was largely due to him. To the south of the church there is a cloister (latter half of the 15th century) with graceful arcades. There is a statue of Ernest Renan, a native of the town. Saw-milling, boat-building and flax- stripping are carried on, together with trade in cereals, cloth, potatoes, &c.

Treguier (Trecorum), which dates from the 6th century, grew up round a monastery founded by St Tugdual. In the 9th century it became the seat of a bishopric, suppressed in 1790. "TREILHARD, JEAN BAPTISTE (1742-1810), French revolu- tionist, was born at Brives (Correze). In Paris he gained reputa- tion as an avocat at the parlement, and was a deputy to the states-general in 1789. In the Constituent Assembly he showed great capacity in dealing with the reorganization of the Church and the nationalization of ecclesiastical property. Ineligible, like all the members of the Constituent Assembly, for the Legis- lative Assembly, he became president of the criminal tribunal of Paris, but failed through lack of firmness. The department of Seine-et-Oise elected him to the Convention, where he attached himself to the group known as the Mountain (q.v.) and voted for the death of Louis XVI. He was a member of the committee of public safety, and became president of the Convention on the 27th of December 1792. Under the Directory he entered the Council of the Five Hundred (of which he was president during the month of Nivose, year IV.), was a member of the Tribunal of Cassation, plenipotentiary at the Congress of Rastatt, and became a director in the year VI. After the coup d'itat of 18 Brumaire he became president of the tribunal of appeal and councillor of state. He took an important part in drafting the civil code, the criminal code, the code of civil procedure and the commercial code. He died on the 1st of December 1810, a senator and count of the empire.

See Bonnal de Ganges, " Representants du peuple dignitaires par Napoleon . . . Treilhard," in the Revue du monde catholique (7th series, vol. iii., 1900) ; Guyot d'Amfreville, Vie de J. B. Treilhard (Limoges, 1879).

TREITSCHKE, HEINRICH VON (1834-1896), German his- torian and political writer, was born at Dresden on the 15th of September 1834. He was the son of an officer in the Saxon army

who rose to be governor of Konigstein and military gover- nor of Dresden. Young Treitschke was prevented by deafness from entering the public service. After studying at Leipzig and Bonn, where he was a pupil of Dahlmann, he established himself as a privaldozent at Leipzig, lecturing on history and politics. He at once became very popular with the students, but his political opinions made it impossible for the Saxon government to appoint him to a professorship. He was at that

time a strong Liberal; he hoped to see Germany united into a single state with a parliamentary government, and that all the smaller states would be swept away. In 1863 he was appointed professor at Freiburg; in 1866, at the outbreak of war, his sympathies with Prussia were so strong that he went to Berlin, became a Prussian subject, and was appointed editor of the Preussische Jahrbiicher. A violent article, in which he demanded the annexation of Hanover and Saxony, and attacked with great bitterness the Saxon royal house, led to an estrangement from his father, who enjoyed the warm friendship of the king. It was only equalled in its ill humour by his attacks on Bavaria in 1870. After holding appointments at Kiel and Heidelberg, he was in 1874 made professor at Berlin; he had already in 187 1 become a member of the Reichstag, and from that time till his death in 1896 he was one of the most prominent figures in the city. On Sybel's death he succeeded him as editor of the Historische Zeitschrift. He had outgrown his early Liberalism and become the chief panegyrist of the house of Hohenzollern. He did more than any one to mould the minds of the rising generation, and he carried them with him even in his violent attacks on all opinions and all parties which appeared in any way to be injurious to the rising power of Germany. He supported the government in its attempts to subdue by legislation the Socialists, Poles and Catholics; and he was one of the few men of eminence who gave the sanction of his name to the attacks on the Jews which began in 1878. As a strong advocate of colonial expansion he was also a bitter enemy of Great Britain, and he was to a large extent responsible for the anti-British feeling of German Chauvinism during the last years of the 19th century. In the Reichstag he had originally been a member of the National Liberal party, but in 1879 he was the first to accept the new commercial policy of Bismarck, and in his later years he joined the Moderate Conserva-

tives, but his deafness prevented him from taking a prominent part in debate. He died at Berlin on the 28th of April 1896.

As an historian Treitschke holds a very high place. He approached history as a politician and confined himself to those periods and characters in which great political problems were being worked out: above all, he was a patriotic historian, and he never wandered far from Prussia. His great achievement was the History of Germany in the Nineteenth Century. The first volume was published in 1879, and during the next sixteen years four more volumes appeared, but at his death he had only advanced to the year 1847. The work shows extreme diligence, and scrupulous care in the use of authorities. It is discursive and badly arranged, but it is marked by a power of style, a vigour of narrative, and a skill in delineation of character which give life to the most unattractive period of German history; notwithstanding the extreme spirit of partisanship and some faults of taste, it will remain a remarkable monument of literary ability. Besides this he wrote a number of biographical and historical essays, as well as numerous articles and papers on contemporary politics, of which some are valuable contributions to political thought.

The most important of the essays have been collected under the title Historische und politische Aufsalze (4 vols., Leipzig, 1896); a selection from his more controversial writings was made under the title Zehn Jahre deutscher Kdmpfe; in 1896 a new volume appeared, called Deutsche Kdmpfe, neue Folge. After his death his lectures on political subjects were published under the title Politik. He brought out also in 1856 a short volume of poems called Vater- Idndische Gedichte, and another volume in the following year. The only works translated into English are two pamphlets on the war of 1870, What we demand from France (London, 1870), and The Fire- test of the North German Confederation (1870).

See Schiemann, Heinrich v. Treitschkes Lehr- und Wanderjakre, 1836-1866 (Munich, 1896) ; Gustav Freitag und Heinrich v. Treitschke im Briefwechsel (Leipzig, 1900); Deutsche Rundschau (Oct. 1896); and article by J. W. Headlam, Hist. Rev. (Dec. 1897). (J. W. He.)

TRELAWNY, EDWARD JOHN (1792-1881), English sailor and friend of Shelley and Byron, was born in London on the 13th of November 1792, the son of an army officer. After a short term in

the navy and a naval school, he shipped for India, but deserted at Bombay. For several years he led an adven- turous life in India, but about 1813 returned to England, married and settled down. In was early in 1822 that he met Shelley and Byron at Pisa and passed nearly every day with one or

both of them until the drowning of Shelley (q.v.) and Williams on the 8th of July. He it was who superintended the recovery and cremation of the bodies, snatching Shelley's heart from the flames, and who added the lines from the Tempest to Leigh Hunt's " Cor Cordium"; and, finally, who supplied the funds for Mrs Shelley's return to England. In 1823 he set out with Byron for Greece, to aid in the struggle for independence. Distressed by his companion's dilatoriness, Trelawny left him and joined the insurgent chief Odysseus and afterwards married his sister Tersitza. While in charge of the former's fortress on Parnassus he was assaulted by two Englishmen and nearly killed. Returning to England, he lived for a time in Cornwall with his mother and afterwards in London, where his romantic associations, picturesque person and agreeable manners made him a great social favourite. Permission having been refused him to write the life of Shelley, he began an account of his own life in the Adventures of a Younger Son (1835), followed much later by a second part: Recollections of Shelley and Byron (1858). This gives an admirable portrait of Shelley, and a less truthful one of Byron. He married a third time, but the irregu- larity of his life estranged him from his wife, and he died at Sompting, near Worthing, on the 13th of August 1881. His ashes were buried in Rome by the side of those of Shelley. The old seaman in Millais's picture, "The North- West Passage," in the Tate Gallery, London, gives a portrait of him.

See the Letters of Edward J. Trelawny, edited with Introduction by H. Buxton Forman, C.B. (1910).

TRELAWNY, SIR JONATHAN, Bart. (1650-1721), English prelate, was a younger son of Sir Jonathan Trelawny, bart. (1624-1685), a member of a very old Cornish family, and was born at Pelynt in Cornwall on the 24th of March 1650. Educated at Westminster School and at Christ Church, Oxford, Trelawny took holy orders in 1673, and in 1685, his elder brother having died in 1680, became third baronet in succession to his father. Having rendered good service to James II. during Monmouth's rebellion, Trelawny was consecrated bishop of Bristol on the 8th of November 1685. He was loyal to King James until the first

declaration of indulgence in April 1687, when, as a bishop, he used his influence with his clergy against the king, and, as a Cornish landowner, resisted the attempt to assemble a packed parliament. In May 1688 Trelawny signed the petition against the second declaration of indulgence, and in the following month was imprisoned in the Tower of London with Archbishop Sancroft and five other bishops, sharing their triumphant acquittal. In spite of Burnet's assertion, it is probable that Trelawny did not sign the invitation to William of Orange, although he cer- tainly welcomed his army into Bristol. Before this James II., anxious to regain the bishop's support, had nominated him to the see of Exeter; but Trelawny lost nothing, as this appointment was almost at once confirmed by William III. Unlike five of his colleagues among the " seven bishops," Trelawny took the oaths of allegiance to William and Mary; but he was soon estranged from the new king and sided with the princess Anne, who showed him some favour after she became queen. In 1707 Trelawny was appointed bishop of Winchester and became prelate of the Order of the Garter, but henceforward he took very little part in politics. He died at his residence at Chelsea on the 19th of July 1721, and was buried at Pelynt. His wife was Rebecca (d. 1710), daughter of Thomas Hele of Bascombe, Devon, by whom he had a family of six sons and six daughters. His eldest son, John, the 4th baronet, died without sons in 1756, and the present baronet is descended from the bishop's brother, Henry (d. 1702). Another of his sons was Edward Trelawny (1699-1754), governor of Jamaica from 1738 to 1752. When bishop of Exeter, Trelawny, as visitor of Exeter College, Oxford, deprived the rector of his office, a sentence which was upheld on appeal by the House of Lords; and when bishop of Winchester he completed the rebuilding of Wolvesey Palace. Trelawny is the hero, or one of the heroes, of the refrain : —

" And shall Trelawny die, Here's twenty thousand Cornishmen Will know the reason why."

These words were sung by the men of Cornwall, who seem to have assembled during the bishop's short imprisonment in 1688. It is probable, however, that a similar threat was heard in 1628, when John Trelawny (1 592-1665), grandfather of the bishop, was imprisoned by the House of Commons for opposing the

election of Sir John Eliot to parliament. The " Song of the Western Men," which contains the above refrain, was composed in 1825 by R. S. Hawker.

TREMATODES, or flukes (as they are called from their fish-like shape) , one of the three classes that compose the phylum Platyelmia (q.v.). They are flattened organisms provided with two or more suckers, hence their name (rpr] fiaTu8i] s, pierced with holes), and are exclusively parasitic both in their earlier and mature stages of life. Their structure has undergone little degeneration in connexion with this habit, and may be compared organ for organ with that of the Planarians (q.v.). The chief peculiarities that distinguish Trematodes from their free-living allies, the Turbellaria, are the development of adhering organs for attachment to the tissues of the host; the replacement of the primitively ciliated epidermis by a thick cuticular layer and deeply sunk cells to ensure protection against the solvent action of the host; and (in one large order) a prolonged and peculiar life-history. The only organs that exhibit any sign of degeneration are those of sense, but in the ectoparasitic Trematodes simple eye-like structures are present and perhaps serve as organs of tem- perature. The class as a whole is linked to the Turbellaria not only by its similarity of structure, but by the intermediation of the singular class the Temnocephaloidea (see Planarians), which in habit and in organization form an almost ideal annectant group.

External Characters. — The body, which varies in length from a few millimetres to a couple of feet, is usually oval and flattened. In certain genera the margins are infolded either along their whole length (the male of Schistostomum haematobium ; fig. 9, A) or anteriorly only (Holostomidae). The anterior third of the body is attenuated and sharply marked off from the bulbous trunk in Didymozoon.

tion may occur, e.g. in Udonella.

The ventral surface is characterized by one or more suckers and apertures. The mouth lies usually in the centre of the anterior

and sub-terminal sucker or between two adoral suckers, but in Gasterostomum and its allies it is mid-ventral. A second sucker of variable size and shape lies behind the oral one. In the ectoparasitic Trematodes this post-oral sucker is a complex disk placed near the hinder end and provided with suckerlets, hooks

and a musculature arising from a special skeleton. In the majority of endoparasitic forms it is merely a muscular disk just behind the mouth; but in the Aspidocotylea this sucker forms a muscular ribbed sole extending over the greater part of the ventral surface

The anterior and posterior ends of the body are well defined. The former is specially modified in a few genera in a manner analogous to the ” proboscis ” of certain Rhabdocoel Turbellaria. Thus in the recently discovered arctic genus Prosorhynchus the muscular and glandular extremity is protrusible, but in the allied Gasterostomum this organ is represented by a sucker with fimbriated or tentacular margins. Another form, Khopalophorus, has two cephalic tentacles that are retractile and covered with hooks. The chief genital pore is placed anteriorly between the oral sucker and the ventral one, and is posterior only in Holostomidae, Gasterostomidae and a few Distomidae. Usually this aperture is median, but occasionally asymmetrical. Both male and female gonoducts open through a com- mon atrium to the exterior by this pore, but in three bisexual genera the male and female ducts are developed in separate individuals (Bilharzia, Didymozoon, Koellikcria) . A single or paired accessory gonopore is met with in many Trematodes just as in certain Turbel- laria (e.g. Cylindrostomum, Trigonoporus) . This accessory pore is not of uniform significance. In ectoparasitic Trematodes it is paired and usually ventral (fig. 4 B, v), but the two apertures may run into one, and may also open dorsally (Hexacotyle) . In this group, the accessory gonopore is the opening of the ” vagina,” in contradis- tinction to the median and atrial opening of the uterus which is a ” birth-pore.” In most endoparasitic Trematodes the accessory gonopore is a median and dorsal structure. It is the opening of Laurer’s canal and is homologous not with that of the ” vagina ” just mentioned, but with a totally distinct structure — the ” yolk- receptacle ” — which in ectoparasitic forms discharges into the gut instead of to the exterior (see fig. 3).

The excretory pore is terminal and posterior in endoparasitic forms: paired, anterior and dorsal in the ectoparasitic class.

Parasitic Habits.— The Trematodes with few exceptions select a vertebrate for their host. Speaking generally each species of parasite has a particular host, upon the blood of which it nourishes

Trematodes never exhibit segmentation, though a superficial annula- » tself and matures its reproductive organs. This strange partiality is

(From Cambridge Natural History, vol. ii. ” Worms, &c,” by permission of Macmillan & Co., Ltd.)

Fig. 1. — A Group of Trematodes. A, Nematobothrium filarina, two specimens (o and b) from the Tunny. B, Udonella caligorum, attached to the ova of the copepod Caligus. C, Epibdella hippoglossi (from Halibut) ; ms, the two adoral suckers with the mouth (m) between them; ps, ventral sucker; ov, ovary, te testes. D, Octoboihrium merlangi; ms, oral sucker; int. intestine; sc; posterior suckers; yk, yolk-glands.

now to some extent intelligible. It has been shown in the mammals that blood-relationship, in the strict and literal sense, holds good. The blood of most species behaves differentially towards precipitants, and it is therefore conceivable that when blood is used as food and is elaborated into special compounds for the nutrition of the reproductive organs of a parasite, these specific or larger differences in the blood of animal hosts may prevent the ripening of the gonads of a widely diffused parasite and only one particular kind of blood prove suitable. It would seem that the Trematodes present various degrees of such adaptation, for whilst some- — e.g. the common liver- fluke (Distomum hepaticum) — mature equally well in the bile-ducts of a man as in those of a sheep or rabbit, others and in fact the majority are restricted apparently to one host. It must, however, be borne in mind that a Trema- tode may develop in an ” aberrant ” manner in one host and “normally” in another; and unless we knew the initial stock, the two forms would be regarded as distinct species, each with its own host.

The position of the Trematode on its host is of far-reaching importance. If ectoparasitic and attached to the skin, apertures or gills, the Trematode adopts more elaborate adhesive organs and undergoes a less complex development than are required for the endoparasitic members of the class. The latter are almost invariably swallowed by their host in an immature state with its food, and front the stomach or intestine they work their way into th« lungs, liver, body-cavity or blood vessels. These endo-parasites have a peculiar larval development, the results of which are to increase their numbers and enhance the opportunity of their gaining the necessarily remote station in some fresh

individual host. It is usual to consider the ectoparasitic habit as leading up to the endoparasitic one. From what we know of the Platyelmia, however, it is more probable that the two are quite independent and have been evolved separately.

The influence of Trematodes on their hosts is a varied one. Probably all of them secrete an active poison by the aid of their glands, but the effects of these substances are not readily perceptible. In addition to this, they constitute a drain upon the blood which may result in anaemia. If pre- sent in large numbers they may give rise to obstruction of the liver-ducts or to inflammation of other tissues. The most important of the Trematodes in its effect on man is Schistostomum (Bilharzia). This parasite is one of the plagues

of Africa. In Egypt 30% of the natives are affected by haematuria which arises from congestion of the bladder consequent upon the attacks of this animal. The noxious influence of Trematodes is, moreover, not confined to their mature phase of life. The rapid multiplication that takes place in the larval stage of nearly all endoparasitic forms affects the tissues of the " intermediate " host in which they live. In most cases this is a mollusc, and the larvae bore their way into the most diverse organs, often accumulating to such an extent as to give a distinctly orange colour to an otherwise colourless tissue, and to cause the demolition of particular structures e.g. the liver and gonad. Perhaps the most remarkable of these effects is that produced by the larvae of Gasterostomum. These organisms live in cockles, oysters and other lamellibranchs and they so affect the gonads of these molluscs as to castrate and sterilize their host. A different but still more interesting result is produced by these Trematode larvae on certain lamellibranchs. The produc- tion of pearls by oysters and mussels is common knowledge, but it is only recently that the origin of pearls has been traced and admitted to be due to inflammation set up by a parasite. In the case of the pearl oyster this parasite is a cestode larva, but in the less valuable but no less genuine pearl produced by Mytilus, &c, the nucleus is a Trematode-larva (Jameson).

Structure. — The anatomical structure of the Trematodes is fairly uniform (Braun). The body is enveloped by a thick striated

protective cuticle which is frequently raised into hooks or spines. In Distomum acanthocephalum the cuticle forms circlets of large and small hooks at the anterior end, somewhat as in Cestodes. The epidermis has lost its connected epithelial character and its cilia, and the isolated cells have become sunk inwards retaining their

Fig. 2.

A, Fasciola hepatica, from the ventral surface; the alimentary and nervous systems only shown on the left side of the figure, the excretory only on the right ; a, right main branch of the intestine; c, a diverticulum; g, lateral ganglion; n, lateral nerve; 0, mouth; p, pharynx; 5, ventral sucker; cs, cirrus sac; d, left anterior dorsal excretory vessel ; m, main vessel ; v, left anterior ventral trunk ; x, excretory pore.

B, anterior portion more highly magnified (from Marshall and Hurst, after" Sommer) ; cs, cirrus sac; d, ductus ejaculatorius ; /, female aperture; 0, ovary; od, oviduct; p, penis; s, shell-gland; t, anterior testis; u, uterus; va, vp, vasa deferentia; vs, vesicula seminalis ; y, yolk-gland ; yd, its duct.

C, genital sinus and neighbouring parts (from Sommer) ; o, ventral sucker; b, cirrus sac; c, genital pore; d, evaginated cirrus sac; e, end of vagina; /, vasa deferentia; g, vesicula seminalis; h, duc- tus ejaculatorius; 1, accessory gland.

D, a flame-cell from the excretory apparatus, highly magnified (from Fraipont).

F, og£ of Fasciola hepatica. (from Thomas).

attachment to the innermost cuticular layer by slender processes. This layer also forms the attachment for the muscles, of which there are two enveloping coats, a circular and a longitudinal layer and also dorso-ventral fibres. The muscles are remarkable for two reasons. They occasionally exhibit striation and originate from large branched cells, the nucleus and unmodified part of which form conspicuous elements. The digestive system consists of a simple or bifurcated sac, opening through the mouth by means of a " pharynx bulbosus," adapted to act primarily as a sucker, and secondarily, when drawing blood, as an aspirator. Between the blind gut and the cuticle is a reticular branched tissue which forms the chief substance of the body. This is the

mesenchyma. As in other Platyelmia the elements of this tissue undergo the most varied differentiation. The main mass of it forms a spongy vacuo- lated matrix, but some of the cells become glandular and open by pores on the surface of the cuticle, others become “flame-cells” (fig. 2, D) and canaliculi of the excretory system as in Turbellaria, others again muscle-cells. Embedded in the matrix lies the com- plex genital apparatus composed usually of both male and female reproductive organs (fig. 2, B). The former consist of one pair or more of vesicular testes communicating by fine ducts with a vesicula seminalis. From this point a glandular tube runs to the genital atrium and during the last part of its course is converted into an eversible hooked ” cirrus ” or penis. The female organs consist of distinct ovaries and yolk-glands, the ducts of which uniti in the neighbourhood of a ” shell-gland ” or ” ootype.” Here the two elements, ovum and yolk-cells, are surrounded by a shell of operculate or of spindle-capped types. Coincidently, to allow of fertilization and the escape of excess of yolk, and of spermatozoa, other accessory ducts open at this point. Thus in ectoparasitic Trematodes, the paired vagina transmits spermatozoa to the egg : and a canal carries off yolk from this point of junction either to the gut for resorption or to the exterior for exudation. This duct (Laurer’s canal) is sometimes rudimentary and ends blindly beneath the skin. The fertilized ova, provided with yolk and a shell, are next transferred to the ” uterus ” along which they travel to the exterior. In the endoparasitic trematodes the uterus is the only passage by which fertilization can be effected, and in cases of cross and self- impregnation this duct is physiologically a vagina. Lastly the nervous system is well developed and consists of a pair of well-marked and interconnected ganglia placed near the anterior end and dorsal to the oesophagus. From these ganglia, nerve-tracts provided with ganglion-cells are given off. Of these there are three on each side of the body: a large ventral tract, smaller lateral strands and dorsal ones. From these tracts a plexus of nerve-fibres is developed in connexion with the musculature and cuticle.

The Trematodes are divided into three orders, primarily distin- guished by the character of their suckers, viz.: Heterocotylea, Aspidocotylea and Malacocotylea.

Order I. Heterocotylea. — Ectoparasitic Trematodes, in which a large posterior adhesive apparatus is present and is usually accom- panied by a pair of suckers placed anteriorly in relation to the mouth. The large posterior organ of attachment is usually

wheel-shaped and provided with hooks; but the ridges may become separated

tWMMˆs/ww,,,· · ·ˆ l }. iM ˆ < , ˆ mm ,

Fig. 3. — Diagrammatic projections to show the relations of the female reproductive ducts; A, in the Malacocotylea; B, in the Heterocotylea. The ovary (a) leads into (bb) the oviduct, which is joined at (g) by the duct of the yolk-glands (h). In B it is also joined by a paired vagina (kk) and by the ” vitello-intestinal duct ” (Laurer’s canal), /. (c) Shell-glands; (d) ootype; (e) uterus; (g) median-vitello-duct ; (t, i) intestine.

into a number of independent suckers set on a disc or ” cotylophore.” Eye-spots are general and the nervous system maintains a primitive diffused condition. The excretory system opens to the exterior by a pair of dorsal pores at the level of the pharynx. The eggs are comparatively few, and development is direct, the embryo after reaching its host remaining attached to it for life.

All the members of this order are parasitic on aquatic vertebrates and in rare cases derive their food from a vertebrate host indirectly by means of another invertebrate parasite (e.g. Udonella occurs on parasitic Crustacea). They are transparent leaf-like organisms and may often be found attached to the skin, mouth, nostrils or gills of fish ; on the skin and bladder of Amphibia ; and on those of certain Reptilia. Polystomum integerrimum (fig. 5) occurs commonly in the ” bladder ” of frogs and toads; Diplozoon on the skin of the minnow; Gyrodactylus (figs. 5, 6) on the gills of various fresh- water fish ; and a large number of genera occur on the skin, cloaca and gills of Elasmobranchs and other marine fish. They ingest the mucus and, to some extent, the blood of their host by the aid of a sucking pharynx through which the food passes into the bifurcated ali- mentary sac and its branched caeca.

The life-history of this order offers many points of interest. The eggs are stalked and provided with chitinoid often operculate shell. Each shell contains a single ovum and a mass of yolk-cells. In most cases the eggs are attached to the host, but in Polystomum the eggs are laid in water. The egg of Gyrodactylus

develops in the body of the parent.

(From Lankester's Treatise on Zoology, pt. iv.)

Fig. 4. — Schematic figures of a Heterocotylean Trematode to illustrate its structure (after Benham).

B,

Dorsal view showing the ner- vous system and digestive system; a, mouth; b, pharynx; c, d, e, gut; k, post-genital union of two limbs of gut; /, excretory pore; g, vaginal pore; h, j, k, brain and nerves; /, dorsal nerves; m, ventral nerves; n, adoral sucker; o, posterior sucker; p, hooks on posterior sucker; r, vitello-intestinal duct.

Ventral view showing the

reproductive system ; C, Cirrus ; H, hooks on the ven- tral sucker; I, small piece of the intestine to show its connexion with the repro- ductive organs by the narrow duct that passes from it to the union of the vaginae; M, mouth; O, ovary; S, oral sucker; SC, sucker; SH, shell-giand; T, Testis; U, uterus; V, vaginal pore ; Y , yolk- gland.

The further history of the animal is only known in a few cases. Polystomum hatches out six weeks after ovi-position as a minute (■3 mm. long) larva capable of swimming freely for a short time by the aid of five girdles of ciliated cells. If in the course of the first twenty-four hours this larva meet with a tadpole it attaches itself at once and undergoes further development. If unsuccessful it dies. In the former case the larva c.reeps along the tadpole until it reaches the branchial opening into which it darts, fixes its sucker, and then throws off its cilia. Its further development takes place partly in the branchial chamber and partly in the bladder, which it reaches by travelling the whole length of the alimentary canal. In the former position the suckers are developed and growth pro- ceeds for 8 to 10 weeks until the metamorphosis of its host. In the bladder it remains for three years before attaining maturity. Some- times the Polystomum-lzLrva. attaches itself to a young tadpole, and in that case grows so rapidly as to become mature in five weeks. These Polystomum deposit their eggs in the branchial chamber and die at the metamorphosis of their host. They differ structurally

from the normal form in being capable of self-fertilization only,

and in the shape and details of their spermatozoa

Fig. 5.

A, Diplozoon paradoxum ; two united specimens.

B, Polystomum integerrimum. (X about 100; after Zeller.)

C, Microcotyle mormyri.

D, E, Two views of the chitinous framework of a sucker of Axine

belones; highly magnified (after Lorenz).

F, Aspidogaster conchicola. (Xabout 25; after Aubert.)

G, Gyrodactylus elegans. (Xabout 80; after Wagener.)

The life-history of Diplozoon (fig. 5) is remarkable in that two larvae (the so-called Diporpae) unite and fuse permanently into an X-shaped organism. Unless this occurs, the develop- ment of the larvae is soon arrested. The ciliated stage is only capable of free life for five or six hours, and if at the end of that time it has not encountered and attached itself to a minnow, it dies. If successful, the larva throws off its cilia and develops a dorsal papilla, a median ventral sucker- and an additional pair of lateral suckers. Then the Diporpa stage is attained. This stage is capable of isolated existence for two or three months but remains imma- ture. Should it, however, encounter another Diporpa, the mid- ventral sucker of either is applied to the dorsal papilla of the other, and complete fusion takes place across the junction. The com- pound organism now develops two sets of inter-connected genitalia and becomes a Diplozoon.

Gyrodactylus produces only one large egg at a time and this develops in situ into an embryo: but within this embryo another appears before the first leaves the parent. This anomalous phenomenon is still obscure, for we do not yet know whether the second embryo is developed sexually or asexually from the first. Von Linstow has indeed suggested that Gyrodactylus is a larval form capable of reproduction by an asexual method. i

Order 2. Aspidocotylea. — Endoparasitic Cambridge Natural History, Trematodes provided with a large vo1 – •’■ ” Worms, &c,” by per- ventral sucker which is almost co-exten- j™J f a oi Macmillan & c °- sive with the lower surface of the body ■ ‘

and is divided into rectangular compart- FlG – 6 – — Gyrodactylus ments. The alimentary sac is simple elegans from the fins of and devoid of caeca. The development the Stickleback; emb. em- is direct. bryo.

fAfter v. Nordmann. From

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These Trematodes occur in the alimentary canal and adjacent organs of Mollusca, the gall-bladder of Chimaera, and the intestine of Chelonia and of certain fish. Aspidogaster conchicola is a form not uncommon in Anodon, Unio and certain fresh-water Gastropods. When young it is found in the intestine, but becomes mature in " Keber's organ " and the pericardium. An allied form (A. margarit- iferae) occurs in the pericardium of the Ceylon pearl-oyster (9).

This order differs in several points from the preceding one. The excretory system is highly developed and opens at the posterior ex- tremity by a paired muscular bladder. The testis is a single compact organ. From the oviduct a long duct full of yolk passes back- wards almost to the hinder end of the body and ends blindly in a globular dilatation just below the skin. This structure is regarded as the homologue of a canal (Laurer's canal) which in the Heterocotylea opens into the .... ., ... n intestine and so gets rid of the excess of yolk. ilˆlˆfˆJ'Z The life-history of. the order is almost un- it iv.) known, but at the time of hatching the young

7. — Aspido- Aspidocotylean has an oral sucker at the conchicola; anterior extremity and an equally simple aspect; a, post-oral one at the other, thus resembling b, marginal the members of the next order. Subsequently

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Fig. gaster ventral mouth;

sense organs. the body grows backwards and the ventral

sucker comes to occupy a relatively more anterior position. Concomitantly its cavity is sub-divided by transverse ridges into a single row and later on into paired rows of compartments. A curious form (Stichocotyle) described in an immature condition

by Cunningham from the lobster and Nor- way lobster probably belongs to this order.

Order 3. Malacocotylea (Distomae, Leuck: Digenea v. Ben.). Endoparasitic Trematodes with a variable adhesive apparatus. The oral sucker may alone be present (Monostomidae), more usually a second is developed on the under surface, but may be mid-ventral (Distomidae) or terminal. It is posterior (Amphistomidae), or anterior (Gasterostomidae). In addition to these suckers the sides of the anterior region may become infolded and give rise to an accessory adhesive organ (Holostomidae). In all these families spines and glandular papillae may be super-added. The intestinal sac has become bifid and is usually devoid of branches. The excretory system is highly developed ; the larger collecting ducts are elaborately looped and open posteriorly by a single terminal aperture. A canal (Laurer's canal) leads from the oviduct or yolk-duct to the dorsal surface. The development is indirect. From the egg a larva arises. This enters a temporary host. Here it gives rise by a peculiar process to numerous individuals of a second larval form, and these usually produce a third form from which the minute immature Trematode is developed. In this manner a single egg may give rise to a large number of sexual individuals. The larvae usually live 'in Molluscs, the mature worm in vertebrates, and the immature but meta- morphosed Trematode in either host and also in pelagic and littoral marine and fresh-water invertebrates.

The Malacocotylea occur in all classes of vertebrates. They are usually found in the alimentary canal or its appendages but occasionally work their way into the serous cavities, nervous system and blood vessels. Fourteen species belonging to five genera have been found in man, but only one [Schistostomum (Bilharzia) hae- matobium] is of serious medical importance, the others being rare and occasioned by want of cleanliness and close association with infected domestic animals. Domestic animals suffer periodically to a much greater extent. The liver-fluke {Distomum hepaticum) unlike most Trematodes flourishes in a wide range of hosts and infects man, horse, deer, oxen, sheep, pig, rabbit and kangaroo. Sheep, how ever, suffer most from this parasite and from the allied D. magnum. The former fluke is found in Europe, North Africa, Abyssinia, North Asia, South America, Australia and the Hawaiian Islands-, the latter in the United States. Wet summers are followed by an acute outbreak of liver-rot amongst sheep and this, together with the effects of other diseases that accompany wet seasons, cause "the

death of vast numbers of sheep, the numbers from both sources being estimated in bad years at from i§ to 3 millions in England alone. The anatomy of Distomum hepaticum is fully described in many accessible memoirs [Sommer (10), Marshall and Hurst, Braun (3)] . It has been shown that this parasite feeds upon the blood, not the bile of its host, though it occurs mainly in the bile ducts.

The life-histories of the Malacocotylea form the most interesting feature of the order. The majority of species are hermaphrodite and many are capable of self-impregnation. In these, the male organs ripen before the ova and spermatozoa may pass into the uterus before the external pore is formed (Looss). A few species, however, are bisexual, e.g. Schistostomum (Bilharzia) haematobium in which the male is larger than the female and encloses the latter in a ventral canal; Koellikeria filicolle Rud (Distomum okenii, K611) which also occurs in pairs, a large female and a small male being found together encysted in the branchial chamber of Brama raji:

and Didymozoon thynni (Monostomum bipartitum) which occurs in pairs fused for the greater part of their length and only free anteriorly ; the larger individual is the female.

The egg consists of a fertilized ovum and a mass of yolk-cells. Segmentation takes place during its passage down the uterus. The result of this process is a minute ovoid embryo consisting of a solid mass of cells surrounded by a follicle of flattened yolk-cells. The central mass soon becomes differentiated into an outer epidermal and a dermal layer of flat-cells. Some of the central cells remain in clumps as “germ-balls,” others form a mesenchyma in which ” flame-cells ” arise; others again give rise to muscles; and at the thicker end of the body, rudiments of the brain and digestive system are observable. A pair of ” eye-spots ” develops immediately over the brain. If the egg with its contained embryo falls into water

f \

c,

(All irom Marshall and Hurst, after Thomas.)

Fig. 8. — Five stages in the life-history of Fasciola hepatica; all

highly magnified. , The free-swimming embryo. B, A sporocyst

containing young

rediae. C, A young redia, the digestive tract shaded. D, An

adult redia, containing a daughter-redia, two almost mature

cercariae, and_ germs. E, A free cercaria. The letters have

the same significance throughout.

Nearly ripe cercariae; cc, cystogenous cells; dr, daughter-redia;

dt, limbs of the digestive tract; /, head-papilla; h, eye-spots;

h', same degenerating; V, germinal cell; /, cells of the anterior

row; m, embryo in optical section, gastrula stage; n, pharynx

of redia; 0, digestive sac; oe, oesophagus. p, Lips of redia; a, collar; r, processes serving as rudimentary

feet; s, embryos; t, trabecula crossing body-cavity of redia;

u, glandular cells; v, birth-opening; w, w', morulae; y, oral

sucker; y', ventral sucker; z, pharynx, with the faeces of the host the larva hatches out and swims freely for a time. In dry localities or in the absence of the intermediate host (usually a mollusc) this larva soon dies. If, however., it en- counters the host the larva bores its way in, and attacks the liver, mouth or gonad in which it comes to rest. In all Malacocotylea except the Holostomidae the ensuing: change is a degenerative one. The cilia are lost", the eye-spots disappear, the digestive sac vanishes and the. larva becomes a sac or "sporocyst" full of germ-cells. The origin of these cells is a moot point. According to some writers (Leuckart) they are derived from undifferentiated blastomeres, other authorities (Thomas, Biehringer, Heckert) trace them to the parietal cells of the larva. These cells aggregated in masses become the bodies of another generation of larvae within the sporocyst. By a series of changes similar to those by which the primary larva arose from a segmented egg, so do these secondary larvae or " rediae " arise from the germ-cells or germ-balls within the sporocyst. The structure of a redia, however, is an advance on that of its parent. Though not possessing eyes or cilia, it has a pharynx and short straight digestive sac ; and its mesenchymatous cavities are filled with

germ-balls in various stages of development.

The movements and activity of the redia cause it to burst the wall of the sporocyst. It escapes into the adjacent tissue and there gives rise either to one or more generations of rediae or at once to a new type of organism — the cercaria. What determines the origin of the cercaria rather than a new generation of rediae is unknown. It originates from germ-balls by a differentiation similar in general to that already described, though profoundly different in detail. The cercaria is just visible to the naked eye and has an oval or dis- coidal body and usually a long tail of variable form. The tail may be a simple hollow muscular process or provided with stiff bristles set in transverse rows, or divided into two equally long pro- cesses, or finally it may form a large vesicular structure The body contains in miniature all the organs of the adult fluke, including the gonads and in addition " eye-spots," a stylet, rod-cells and cystogenous cells. The latter structures are only employed for an interval before the final host is entered.

The number of cercariae produced by the pullulating rediae in a single water-snail is immense, and as they are emitted at a given period or a few successive periods, the snail at these times appears enclosed in a cloud of whitish flocculent matter. The cercaria swims freely for a time and either encysts directly on grass or weeds or it enters a second host which may be another mollusc, an insect, crustacean or fish, and then encysts. In this process it is aided by the stylet with which it actively bores its way, throws off its tail

Fig. 9.

A, Schistostomum (Bilharzia) haematobium, the thin female in the

gynaecophoric canal of the stouter male, (after Leuckart).

B, Distomum macrostomum, showing the digestive and the greater

part of the genital apparatus with the cirrus protruded.

C, Snail (Succinea), the tentacles deformed by Leucochloridium.

(Natural size.)

D, Leucochloridium removed from the tentacle. (Natural size;

after

Zeller.)

E, Bucephalus polymorphus. (Highly magnified ; after Ziegler.)

F, Portion of a sporocyst containing Bucephali in process of develop-

ment. (X about 50: after Lacaze-Duthiers.)

and then, surrounding itselfjjpith the secretion of its cystogenous cells, comes to rest. The further development of the cercaria is dependent on the weed or animal in which it lies being eaten by the final host which is usually a predaceous fish or one of the higher vertebrates. When that occurs, the cyst is dissolved and the minute fluke works its way down the alimentary canal into some part of which it inserts its suckers and commences to feed on the blood of its host. Occasionally the fluke migrates into the blood vessels and may reach the lungs, kidneys, urethra and bladder. In the course of a few months it attains full size and maturity and probably in most cases dies in the course of a year after having given rise to another generation of larvae.

A few special cases of this general description of the life-history may be mentioned. The liver-fluke (Distomum hepaticum) passes

through its larval stages in the water snail Limnaea truncatula in Europe; in L. oahuensis in the Hawaiian Islands; in L. viator in South America and in L. humilis in North America: and is eaten by sheep during its encysted stage attached to herbage. Distomum macrostomum, which occurs in various birds, produces a very curious sporocyst in the body of the snail Succinea putris. This sporocyst assumes a branched structure and penetrates into the tentacles of the snail (fig. 9, c, d). In this situation it becomes much swollen and banded with colours, and produces a large number of ecaudate cercariae. The attention of birds is speedily attracted to the snail by this appearance and by the peculiar movements which the worm executes, and the passage of the parasite into its final host is advan- tageously effected. In many cases it appears that only the brilliantly coloured tentacle is pecked off by the bird, and as the snail can easily regenerate a new one, this in turn becomes infected by a fresh branch of the sporocyst ramifying through the snai! and thus a new supply of larvae is speedily provided (Heckert).

The life-history of Schistostomum haematobium is still unknown, but the difficulty in obtaining developmental stages in any of the numerous intermediate hosts that have been tried suggests that the ciliated larvae may develop directly in man and either gain access to him by the use of impure water for drinking or may perforate his skin when bathing. Experiments on monkeys have, however, given negative results.

The life-history of the Holostomidae differs from that of the Distomidae in an important regard. These Trematodes live chiefly in the intestine of aquatic birds or reptiles. The ciliated larva escapes from the egg into the water and enters an intermediate host (leech, mollusc, arthropod, batrachian or fish) where it undergoes a metamorphosis into a second stage in which most of the adult organs are present. In this condition they remain encysted as immature flukes until eaten by their final host.

The cycle of development taken by the Malacocotylea has been generally regarded as an alternation of one or more asexual genera- tions with a sexual one. The question, however, is complicated by the uncertain nature of the germ-cells in the sporocysts and rediae. Some authors looking upon these as parthenogenetic ova regard the developmental cycle as one composed of an alternation of parthenogenetic and of sexual generations. Others again consider that the whole cycle is a metamorphosis which, beginning in the Heterocotylea as a direct development, has become complicated in the Holostomidae by a larval history, and finally in the Mala- cocotylea has acquired additional complexity by the intercalation of two larval forms, and is thus spread over several generations.

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TREMOLITE, a member of the amphibole group of rock-form- ing minerals (see Amphibole). It is a calcium and magnesium metasilicate, $CaMg_3(SiO_3)_4$, crystallizing in the monoclinic system with an angle of 5 5° 49′ between the perfect prismatic cleavages. It occurs sometimes as distinct crystals, but more usually as long bladed and fibrous forms. The colour is white or grey, but when iron is present it is green, then forming a passage to actinolite. The hardness is 55 and the specific gravity 3-0. Tremolite is a characteristic mineral of crystalline limestones, especially dolomitic limestones, but also occurs as an alteration-product of olivine in basic igneous rocks. Typical specimens have long been known from the white crystalline dolomite of Campolongo in the St Gotthard region, Switzerland, near to which is the Tremola Valley, after which the mineral was named in 1796. Fine crystals are found in crystalline limestone at Gouverneur, Pierrepont and other places in New York, and at several localities in Sweden. (L. J. S.)

TRENCH, RICHARD CHENEVIX (1807-1886), Anglican archbishop and poet, was born at Dublin on the 9th of September 1807. He went to school at Harrow, and graduated at Trinity College, Cambridge, in 1829. In 1830 he visited Spain. While incumbent of Curdridge Chapel near Bishops Waltham in Hamp- shire, he published (1835) The Story of Justin Martyr and Other

Poems, which was favourably received, and was followed in 1838 by Sabbation, Honor Neale, and other Poems, and in 1842 by Poems from Eastern Sources. These volumes revealed the author as the most gifted of the immediate disciples of Wordsworth, with a warmer colouring and more pronounced ecclesiastical sympathies than the master, and strong affinities to Tennyson, Keble and Monckton Milnes. In 1841 he resigned his living to become curate to Samuel Wilberforce, then rector of Alverstoke, and upon Wilberforce’s promotion to the deanery of West- minster in 1845 he was presented to the rectory of Itchenstoke. In 1845 and 1846 he preached the Hulsean lecture, and in the

former year was made examining chaplain to Wilberforce, now bishop of Oxford. He was shortly afterwards appointed to a theological chair at King's College, London. In 1851 he established his fame as a philologist by The Study of Words, originally delivered as lectures to the pupils of the Diocesan Training School, Winchester. His purpose, as stated by himself, was to show that in words, even taken singly, " there are boundless stores of moral and historic truth, and no less of passion and imagination laid up " — a truth enforced by a number of most apposite illustra- tions. It was followed by two little volumes of similar char- acter — English Past and Present (1855) and A Select Glossary of English Words (1859). All have gone through numerous editions and have contributed much to promote the historical study of the English tongue. Another great service to English philology was rendered by his paper, read before the Philological Society, " On some Deficiencies in our English Dictionaries" (1857), which gave the first impulse to the great Oxford New EnglishBictionary . His advocacy of a revised translation of the New Testament (1858) aided to promote another great national undertaking. In 1856 he published a valuable essay on Calderon,with a translation of a portion of Life is a Dream in the original metre. In 1841 he had published his Notes on the Parables, and in 1846 his Notes on the Miracles, popular works which are treasuries of erudite and acute illustration.

In 1856 Trench was raised to the deanery of Westminster, probably the position which suited him best. Here he instituted evening nave services. In January 1864 he was advanced to the more dignified but less congenial post of archbishop of Dublin. A. P. Stanley had been named, but rejected by the Irish Church, and, according to Bishop Wilberforce's correspondence, Trench's appointment was favoured neither by the prime minister nor the lord-lieutenant. It was, moreover, unpopular in Ireland, and a blow to English literature; yet the course of events soon proved it to have been most fortunate. Trench could do nothing to prevent the disestablishment of the Irish Church, though he resisted with dignity. But, when the disestablished communion had to be reconstituted under the greatest difficulties, it was found of the highest importance that the occupant of his position should be a man of a liberal and genial spirit. This was the work of the remainder of Trench's life; it exposed him at times to considerable misconstruction and obloquy, but he came to be appreciated, and, when in November 1884 he resigned his arch-

bishopric from infirmity, clergy and laity unanimously recorded their sense of his " wisdom, learning, diligence, and munificence." He had found time for Lectures on Medieval Church History (1878); his poetical works were rearranged and collected in two volumes (last edition, 1885). He died in London, after a lingering illness, on the 28th of March 1886.

See his Letters and Memorials (2 vols., 1886).

TRENCHARD, SIR JOHN (1640-1695), English politician, belonged to an old Dorset family, his father being Thomas Trenchard (1615-1671), of Wolverton, and his grandfather Sir Thomas Trenchard (1.582-1657), also of Wolverton, who was knighted by James I. in 1613. Born at Lytchett Matravers, near Poole, on the 30th of March 1640, and educated at New College, Oxford, John Trenchard entered parliament as member for Taunton in 1679, and associated himself with those who proposed to exclude the duke of York from the throne. He attended some of the meetings held by these malcontents and was possibly concerned in the Rye House plot; at all events he was arrested in July 1683, but no

definite evidence was brought against him and he was released. When Monmouth landed in the west of England in June 1685 Trenchard fled from England, but was pardoned through the good offices of William Penn and returned home two years later. Again he entered parliament, but he took no active part in the Revolution of 1688, although he managed to secure the good will of William III. He was knighted by the king and made chief justice of Chester, and in 1692 he was appointed a secretary of state. He and the government incurred much ridicule through their failure to prove the existence of a great Jacobite plot in Lancashire and Cheshire in which they had been led to believe. Sir John died on the 27th of April 1695. His wife was Philippa (d. 1743), daughter of George Speke (d. 1690) of White Lackington, Somerset.

Another member of the Trenchard family was the writer, John Trenchard (1662-1723), erroneously referred to by Macau- lay as a son of Sir John Trenchard. Educated at Trinity College, Dublin, Trenchard inherited considerable wealth and was thus able to devote the greater part of his life to writing on political subjects, his point of view being that of a Whig and an opponent of the High Church party. His chief works are A Short History of Standing Armies in England (1698 and 1731) and The Natural

History of Superstition (1709). With Thomas Gordon (d. 1750) he produced a weekly periodical, The Independent Whig, and with the same colleague he wrote a number of letters to the London Journal and to the British Journal under the pseudonym of Cato. These letters were published in four volumes in 1724 and the collection has often been reprinted. Trenchard died on the 17th of December 1723.

TRENCHER (M. Eng. trenchour, trenchere, &c.,0. Fr. trencheoir trenchoier, a place on which to cut up food, from trencher, mod. trancher, to cut, probably from Lat. truncare, lop, cut off, or from transccare, to cut across), a platter, being a flat piece of wood, in its earliest form square, later circular, on which food was carved or cut up and served. These wooden ” trenchers ” took the place of earlier ones which were thick slices of coarse bread; these, after being soaked with the gravy and juices from the meat and other food were eaten or thrown to the alms basket for the poor. The wooden trencher went out of use on the introduction of pottery and later of porcelain plates. At Winchester College, the old square beechwood trenchers are still in use. The potters of the 18th century made earthenware plates very flat and with a shallow rim; these were known as ” trencher plates.” ” Trencher salt-cellars ” were the small salts placed near each person for use, as opposed to the ornamental ” standing ” salts.

For ” trench,” a ditch, and ” entrenchment,” see Fortification

AND SlEGECRAFT.

TRENCK, FRANZ, Freiherr von der (1711-1749), Aus- trian soldier, was born on the 1st of January 1711, of a military family. Educated by the Jesuits at Oedenburg, he entered the Imperial army in 1728 but resigned in disgrace three years later. He then married and lived on his estates for some years. Upon the death of his wife in 1 73 7 he offered to raise an irregular corps of ” Pandours ” for service against the Turks, but this offer was refused and he then entered the Russian army. But after serving against the Turks for a short time as captain and major of cavalry he was accused of bad conduct, brutality and disobedience and condemned to death, the sentence being commuted by Field Marschal Miinnich to degradation and imprisonment. After a time he returned to Austria, where his father was governor of a small fortress, but there too he came into conflict with every one and actually ” took sanctuary ” in a convent in Vienna. But Prince Charles of Lorraine, interesting himself in this strange

man, obtained for him an amnesty and a commission in a corps of irregulars. In this command, besides his usual truculence and robber manners, he displayed conspicuous personal bravery, and in spite of the general dislike into which his vices brought him his services were so valuable that he was promoted lieu- tenant-colonel (1743) and colonel (1744). But at the battle of Soor he and his irregulars plundered when they should have been fighting and Trenck was accused (probably falsely) of having allowed the king of Prussia himself to escape. After a time he

was brought before a court-martial in Vienna, which convicted him of having sold and withdrawn commissions to his officers without the queen's leave, punished his men without heed to the military code, and drawn pay and allowance for fictitious men. Much was allowed to an irregular officer in all these respects, but Trenck had far outrun the admitted limits, and above all his brutalities and robberies had made him detested throughout Austria and Silesia. A death sentence followed, but the com- position of the court-martial and its proceedings were thought to have been such as from the first forbade a fair trial, and the sentence was commuted by the queen into one of cashiering and imprisonment. The rest of his life was spent in mild captivity in the fortress of Spielberg, where he died on the 4th of October

1749.

His cousin, Friedrich, Freiherr von der Trenck (1726-1794), the writer of the celebrated autobiography, was born on the 16th of February 1726 at Konigsberg, his father being a Prussian general. After distinguishing himself for his quickness and imagination at the university of Konigsberg, he entered the Prussian army in 1742, and soon became an orderly officer on Frederick's own staff. But within a year he fell into disgrace because of a love affair — whether real or imaginary — with the king's sister Princess Amalie, and when in 1743 his Austrian cousin presented him with a horse and opened a correspondence, Frederick had him arrested, a few days after the battle of Soor, and confined in the fortress of Glatz, whence in 1746 he escaped. Making his way home and thence to Vienna, in the vain hope of finding employment under his now disgraced cousin, he finally met a Russian general, who took him into the Russian service But,

receiving news that owing to his cousin's death he had become the owner of the family estates, he returned to Germany almost immediately He was made a captain of Austrian cavalry, but never served, as his time was fully taken up with litigation connected with the inherited estates. In 1754 he visited Prussia, but was there arrested and confined in Magdeburg for ten years, making frequent attempts, of incred- ible audacity, to escape from the harshness of his gaolers. But after the close of the Seven Years' War, Maria Theresa requested that he should, as being a captain in her service, be at once released. Trenck then spent some years in Aix-la-Chapelle, managing an agency for Hungarian wines and publishing a newspaper, and on the failure of these enterprises he returned to his Hungarian estates. Here he composed his celebrated autobiography and many other writings. He visited England and France in 17 74-1 777, and was afterwards employed by the government in diplomatic or secret service missions. After the death of Frederick the Great he was allowed to enter Prussia, and stayed in Berlin for two years. In 1788 he visited Paris, where he was the hero of society for a moment; next year he returned to Hungary in order to collect his writings in a uniform edition, but in 1791 he returned to Paris to be a spectator of the Revolution, and after living in safety throughout the Terror he was at last denounced as an Austrian spy and guillotined on the 25th of July 1794.

His autobiography, which has been translated into several languages, first appeared in German at Berlin and Vienna (13 vols.) in 1787. Shortly afterwards a French version, by his own hand, was published at Strassburg. His other published works are in eight volumes and appeared shortly after the autobiography at Leipzig. A reprint of the autobiography appeared in 1910 in " Reclam's Universal Series."

See Wahrmann, Leben und Thaten des Franz, Freiherr von der Trenck and Friedrich Freiherrn von der Trencks Leben, Kerker und Tod (both published at Leipzig in 1837).

TRENDELENBURG, FRIEDRICH ADOLF (1802-1872),

German philosopher and philologist, was born on the 30th of November 1802 at Eutin, near Lubeck. He was educated at the universities of Kiel, Leipzig and Berlin. He became more and more attracted to the study of Plato and Aristotle, and his doctor's dissertation (1826) was an attempt to reach through Aristotle's criticisms a more accurate knowledge of the Platonic

philosophy {Platonis de ideis el numeris doctrina ex Aristotele Ulustrata). He declined the offer of a classical chair at Kiel,

and accepted a post as tutor to the son of an intimate friend of Altenstein, the Prussian minister of education. He held this position for seven years (1826-1833), occupying his leisure time with the preparation of a critical edition of Aristotle's De anima (1833; 2nd ed. by C. Belger, 1877). In 1833 Altenstein appointed Trendelenburg extraordinary professor in Berlin, and four years later he was advanced to an ordinary professorship. For nearly forty years he proved himself markedly successful as an academical teacher, during the greater part of which time he had to examine in philosophy and pedagogics all candidates for the scholastic profession in Prussia. In 1865 he became involved in an acrimonious controversy on the interpretation of Kant's doctrine of Space with Kuno Fischer, whom he attacked in Kuno Fischer und sein Kant (1869), which drew forth the reply Anti-Trendelenburg (1870). He died on the 24th of January 1872.

Trendelenburg's philosophizing is conditioned throughout by his loving study of Plato and Aristotle, whom he regards not as oppon- ents but as building jointly on the broad basis of idealism. His own standpoint may almost be called a modern version of Aristotle thus interpreted. While denying the possibility of an absolute method and an absolute philosophy, as contended for by Hegel and others, Trendelenburg was emphatically an idealist in the ancient or Platonic sense; his whole work was devoted to the demonstration of the ideal in the real. But he maintained that the procedure of philosophy must be analytic, rising from the particular facts to the universal in which we find them explained. We divine the system of the whole from the part we know, but the process of reconstruction must remain approximative. Our position forbids the possibility of a final system. Instead, therefore, of constantly beginning afresh in speculation, it should be our duty to attach ourselves to what may be considered the permanent results of historic developments. The classical expression of these results Trendelenburg finds mainly in the Platonico-Aristotelian system. The philosophical question is stated thus : How are thought and being united in knowledge ? how does thought get at being? and how does being enter into thought? Proceeding on the principle that like can only be known by like, Trendelenburg next reaches a doctrine peculiar to himself (though based upon Aristotle) which plays a central part in his speculations. Motion is the fundamental fact common to being and thought ; the actual motion of the external world has

its counter- part in the constructive motion which is involved in every instance of perception or thought. From motion he proceeds to deduce time, space and the categories of mechanics and natural science. These, being thus derived, are at once subjective and objective in their scope. It is true matter can never be completely resolved into motion, but the irreducible remainder may be treated like the TrpuTij i5\ij of Aristotle as an abstraction which we asymptotically approach but never reach. The facts of existence, however, are not adequately explained by the mechanical categories. The- ultimate interpretation of the universe can only be found in the higher category of End or final cause. Here Trendelenburg finds the dividing line, between philosophical systems. On the one side stand those which acknowledge none but efficient causes- — which make force prior to thought, and explain the universe, as it were, a tergo. This may be called, typically, Democritism. On the other side stands the ” organic ” or teleological view of the world, which interprets the parts through the idea of the whole, and sees in the efficient causes only the vehicle of ideal ends. This may be called in a wide sense Platonism. Systems like Spinozism, which seem to form a third class, neither sacrificing force to thought nor thought to force, yet by their denial of final causes inevitably fall back into the Democritic or essentially materialistic standpoint, leaving us with the great antagonism of the mechanical and the organic systems of philosophy. The latter view, which receives its first support in the facts of life, or organic nature as such, finds its culmination and ultimate verification in the ethical world, which essentially consists in the realization of ends. Trendelenburg’s Naturrecht may, therefore, be taken as in a manner the completion of his system, his working out of the ideal as present in the real. The ethical end is taken to be the idea of humanity, not in the abstract as formulated by Kant, but in the context of the state and of history. Law is treated throughout as the vehicle of ethical requirements. In Trendelenburg’s treatment of the state, as the ethical organism in which the individual (the potential man) may be said first to emerge into actuality, we may trace his nurture on the best ideas of Hellenic antiquity.

Trendelenburg was also the author of the following: Elementa logices Aristotelicae (1836; 9th ed., 1892; Eng. trans., 1881), a selec- tion of passages from the Organon with Latin translation and notes, containing the substance of Aristotle’s logical doctrine, supplemented by Erlduterungen za. den FJementen der

Aristotelischen Logik (1842; 3rd ed. 1876); Logische Untersuchungen (1840; 3rd ed. 1870), and Die logische Frage in Hegels System (1843), important factors in the reaction against Hegel ; Historische Beitrage zur Philosephie

(1846-1867), in three volumes, the first of which contains a history of the doctrine of the Categories; Das Naturrecht aufdem Grunde der Ethik (i860); Liicken im Volkerrecht (1870), a treatise on the defects of international law, occasioned by the war of 1870. A number of his papers dealing with non-philosophical, chiefly national and educational subjects, are collected in his Kleine Schrifien (1871). On Trendelenburg's life and work see H. Bonitz, Zitr Erinnerung an F.A.T. (Berlin, 1872); P. Kleinert, Grabrede (Berlin, 1872); E- Bratuschek, Adolf Trendelenburg (Berlin, 1873); C. von Prantl, Geddchtnissrede (Munich, 1873); G. S. Morris in the New Englander (1874), xxxiii.

TRENT (Lat. Tridenlum; Ital. Trento; Ger. Trient), the capital of the south or Italian-speaking portion of the Austrian province of Tirol, It stands on the left bank of the Adige where this river is joined by the Fersina, and is a station on the Brenner railway, 35 m. S. of Botzen and 56ˆ m. N. of Verona. It has a very picturesque appea.rance, especially when ap- proached from the north, with its embattled walls and towers filling the whole breadth of the valley. A conspicuous feature in the view is the isolated rocky citadel of Doss Trento (the Roman Verruca), that rises on. the right bank of the Adige to a height of 308 ft. above the city and is now very strongly fortified, as are various other positions near Trent giving access to Trent from the east (Val Sugana) or the west (valley of the Sarca). With its numerous palaces, substantial houses, broad streets, and spacious squares, Trent presents the aspect of a thoroughly Italian city, and its inhabitants (24,868 in 1900, including a garrison of over 2000 men) speak Italian only — it is the centre of the region called Italia Irredenta by fervent Italian patriots. The Duomo or cathedral church (dedicated to San Yigilio, the first bishop) was built in four instalments between the nth and 15th centiuies, and was restored in 1882-1889. More interesting historically is the church of Santa Maria Maggiore, built in 1514-1539, and the scene of the sessions of the famous Ecumenical Council (as to which, see below) which lasted, with several breaks, from 1545 to 1563; near it, in the

open, a column was erected in 1845, on the occasion of the three hundredth anniversary of the opening of the Council. To the east of the city rises the Castello del Buon Consiglio, for centuries the residence of the prince-bishops, but now used as barracks. There is a huge town hall, which also houses the museum and the very extensive town library. Trent lives rather on its historical souvenirs than on its industries, which are not very extensive, viticulture, silk-spinning and the preparation of salami (a strongly spiced kind of Italian sausage) being the chief. Ecclesiastically Trent is a suffragan see of the archbishopric of Salzburg. Opposite the railway station a statue of Dante was erected in 1896, for he is believed to have visited this region about 1304.

Trent was originally the capital of the Tridentini, and is mentioned in the Antonine Itinerary as a station on the great road from Verona to Veldidena (Innsbruck) over the Brenner. It was later ruled by the Ostrogoths (5th century) and the Lombards (6th century) after the conquest of whom by the Franks (774) Trent became part of the kingdom of Italy. But in 1027 the emperor Conrad II. bestowed all temporal rights in the region on the bishop (the see dates from the 4th century) and transferred it to Germany, an event which fixed all its later history. The Venetian attacks were finally re- pulsed in 1487, and the bishop retained his temporal powers till 1803 when they passed to Austria, to which (save 1805-1814, when first the Bavarians and then Napoleon held the region) they have ever since belonged, the Trentino being annexed formally to Tirol in 1814. (W. A. B. C.)

TRENT, COUNCIL -OF. The Council of Trent (1545-1563) has a long antecedent history of great significance for the fortunes of the Catholic Church. During the 15th and the earlier half of the 16th century, the conception of an ” ecumenical council ” remained an ideal of which the realization was expected to provide a solution for the serious ecclesiastical difficulties which were then prevalent. True, the councils of Constance and Basel had fallen short of the desired goal; but confidence in the unknown quantity persisted and took deeper root as the

popes of the Renaissance showed themselves less and less inclined to undertake the reforms considered necessary in wide circles of the Church. The papacy indeed did not recognize the jurisdiction of the ecumenical council, and in 1459 Pius II. had prohibited any appeal to such a tribunal under penalty of

excommunication. This, however, had no effect on public opinion, and the council continued to be invoked as the supreme court of Christianity. So in 1518, for instance, the university of Paris demanded the convocation of a general council, to which it referred its solemn protest against the papal encroach- ments on the privileges of the French Church. Thus, when Luther took this very step in the same year, and repeated it later, his action was not devoid of precedent. Again in 1529 the evangelical estates of Germany made a formal appeal in the Diet of Spires, and, in the preface to the Augsburg Confession of 1530, requested a "general, unfettered council of Christendom." The same demand was formulated by Charles V. The emperor indeed — though, as a statesman, he had found himself in frequent opposition to the papal policy of his day — had never enter- tained the slightest doubt as to the truth of Catholic doctrine, and had rendered inestimable services to the Church in the perilous years which followed the emergence of Protestantism. Still he could not blind himself to the fact that ecclesiastical life stood in urgent need of reform; and the only method of effecting an alteration in the existing regime was by means of a council. Consequently he declared himself in favour of con- vening a general assembly of the church — a project which he pursued with the greatest energy. True, the passive resist- ance of the Curia was so stubborn that the decisive step was postponed time and again. But the goal was finally attained, and this result was essentially the work of Charles. Actually, the meeting came too late: the Evangelical Church had gathered strength in the interim, and the council failed to exercise the decisive influence anticipated on the relations between Catholicism and Protestantism. In 1536 its convocation seemed imminent. Pope Paul III., who in the conclave had already admitted the necessity of a council, convened it on the 2nd of June 1536, for the 23rd of May 1537, at Mantua. He then altered the date to the 1st of November of the same year. Later it was summoned to meet at Vicenza on the 1st of May 1538, only to be postponed till the Easter of 1539. Finally, he adjourned the execution of the project sine die. Charles met this dilatory policy by arranging colloquies between Protestant and Catholic at Worms and Regensburg, the result being that the Curia became afraid that the emperor might take the settlement of the religious question into his own hands. This consideration forced Paul III. to compliance, and fresh .writs were issued convoking the council, first for Whitsuntide, 1542, then for the 1st of November of the same year. In consequence, however, of the hostilities between Charles and the French king Francis I., the

conference was so scantily attended that it was once more prorogued to the 6th of July 1543, before it had come into active existence. Not till the peace of Crespy, 1 544, when the emperor showed some disposition to attempt an accommodation of the ecclesiastical feud in a German Diet, did the pope resolve to translate his numerous promises into deeds. The bull Laelafe Hierusalem (November 19, 1544) fixed the meeting of the council for the 15th of March 1545, in Trent, and assigned it three tasks: (1) the pacification of the religious dispute by doctrinal decisions, (2) the reform of ecclesiastical abuses, (3) the discussion of a crusade against the infidels. The selection of the town of Trent, the capital of the Italian Tirol, and part of the empire had a two- fold motive: on the one hand it was a token of concession to the emperor, who wished the synod to be held in his dominions; on the other, there was no occasion to fear that an assembly, meeting on the southern border of Germany, would fall under the imperial influence.

The opening of the council was deferred once again. To- wards the end of May 1545, twenty bishops were collected at Trent; but there was no sign of action, and the papal legates — Del Monte, Corvinus and Reginald Pole — delayed the in- auguration. The cause of this procrastinating policy was that

the emperor and the pope were at cross purposes with regard to the mode of procedure. In the eyes of Paul III. the council was simply the means by which he expected to secure a con- demnation of the Protestant heresy, in hopes that he would then be in a position to impose the sentence of the Church upon them by force. For him the question of ecclesiastical reform pos- sessed no interest whatever. In contrast to this, Charles demanded that these very reforms should be given precedence, and the decisions on points of dogma postponed till he should have compelled the Protestants to send representatives to the council. The pope, however, alarmed by the threat of a collo- quy in Germany, recognized the inadvisability of his dilatory tactics, and at last ordered the synod to be opened (December

13, 1545)-

Since there was no definite method by which the deliberations of

ecumenical councils were conducted, special regulations were necessary; and those adopted were of such a nature as to assure the predominance of the Roman chair from the first. As the voting was not to be by nations, as at Constance, but by individuals, the last word remained with the Italians, who were in the majority. In order to enhance this superiority the legates as a rule denied the suffrage to those foreign bishops who desired to be represented by procurators; and a number of Italian prelates were enabled to make their appearance at Trent, thanks to special allowances from the pope. The dispute as to the order of precedence among the subjects for deliberation was settled by a compromise, and the questions of dogma and ecclesiastical abuses were taken simultaneously, the consequence being that in the decisions of the council the doctrinal and reformatory decrees rank side by side. In pursuance of a precedent established by the last Lateran Council, the sessions were divided into two classes: those devoted to discussion (congregationes generates), and those in which the results of the discussion were put to the vote and formally enacted (sessiones publicae). To ensure a thorough consideration of every proposition, and also to facilitate the exercise of the papal influence on the proceedings, the delegates were split into three groups {congregationes), each group debating the same question at the same time. This arrangement, however, only endured till 1546. Since these sections were only brought into conjunction by the legates, and met under their presidency, the pontifical envoys in effect regulated the whole course of the deliberations. They claimed, moreover, the right of determining the proposals submitted, and were throughout in active and constant communication with Rome — a circumstance which provoked the bon mot of the French deputy (1563), that when the rivers were flooded and the Roman post delayed the Holy Ghost postponed his descent. These precautions nullified any possible disposition on the part of the council to enter on dangerous paths; and in addition the clause ” under reservation of the papal authority ” was affixed to all enactments dealing with ecclesiastical irregularities— thus leaving the pope a free hand with regard to the practical execution of any measures proposed. Contrary to the emperor’s wish, the council began its labours in the region of dogma by defining the doctrines of the Church with reference to the most important controversial points — a procedure which frustrated all his projects for a reconciliation with the Protestants. On the 8th of April 1546 the doctrine of the Holy Scriptures and tradition (sessio iv.) was proclaimed; on the 17th of June 1546,

the doctrine of original sin (sessio v.); on the 13th of January 1547, the doctrine of justification (sessio vi.): and on the 3rd of March 1547, the decree concerning the sacraments in general, and baptism and confirmation in particular (sessio vii.). On the nth of March, however, the council was transferred to Bologna on the pretext that an epidemic was raging in Trent (sessio viii.), though, at the imperial command, part of the bishops remained behind. But on the 2nd of June the council of Bologna resolved (sessio x.) to adjourn its labours. The emperor's demands that the council should again be removed to Trent were vain, till on the 24th of April 1547, the battle of Muhlberg decided the struggle with the Schmalkaldic league, formed by the Evangelical princes of Germany, in his favour. His hands

were now free, and he utilized his military successes to balance his account with the Church. At the Diet of Augsburg he secured the enactment of a modus vivendi, leavened by the Catholic spirit, between the adherents of either religion; and this provisory settlement — the so-called Interim of Augsburg — was promulgated as a law of the empire (June 3, 1548), and declared binding till the council should reassemble. The Protestants, it is true, received certain concessions — the non-celibacy of the priesthood and the lay chalice— but the Roman hierarchy, the old ceremonial, the feast-days and the fasts, were reinstated. Since the bishops who had remained in Trent abstained, at the emperor's request, from any display of activity qua synod, the outbreak of a schism was avoided. But the confusion of ecclesiastical affairs had grown worse confounded through the refusal of the pope to continue the council, when the death of Paul III. (November 10, 1549) gave a new turn to events.

Pope Julius III., the former legate Del Monte, could not elude the necessity of convening the council again, and, though personally he took no greater interest in the scheme than his predecessor in office, caused it to resume its labours on the 1st of May 1551 (sessio xi.), under the presidency of the legate, Cardinal Crescentio. The personnel of the synod was, for the most part, different; and the new members included the Jesuits, Laynez and Salmeron. More than this, the general character of the second period of the council was markedly distinct from that of its earlier stages. The French clergy had not a single dele- gate, while the Spanish bishops maintained an independent attitude under the aegis of the emperor, and Protestant deputies were on this occasion required to appear at Trent. The German Protestants who, in the first phase of the council, had held aloof

from its proceedings, since to have sent representatives to this assemblage would have served no good purpose, had now no choice but to obey the imperial will. Charles V. was anxious to assure them not merely of a safe conduct, but also of a certain hearing. But in this he ran counter to the established facts: the Catholic Church had already defined its attitude to the dogmas above mentioned, and the Curia showed no inclination to question these results by reopening the debate. Thus the participation of the Protestants was essentially superfluous, for the object they had at heart — the discussion of these doc- trines on the gound of Holy Writ — was from the Catholic stand- point an impossible aspiration. The Wiirttemberg deputies had already submitted a creed, composed by the Swabian reformei Johann Brenz, to the council, and Melanchthon was under way with a confessio saxonica, when there came the revolt of the Elector Maurice of Saxony (March 20, 1 552), which compelled the emperor to a speedy flight from Innsbruck, and dissolved the conclave. lis dogmatic labours were confined to doctrinal decrees on the Lord's Supper (sessio xiii. October n, 1551), and on the sacraments of penance and extreme unction (November 2 5> I 5S I) sessio xiv.). On the 28th of April 1552, the sittings were suspended on the news of the elector's approach.

Ten years had elapsed before the council reassembled for the third time in Trent; and on this occasion the circumstances were totally changed. During the intervening period, the religious problem in Germany had received such a solution as the times admitted by the peace of Augsburg (1555); and the equality there guaranteed between the Protestant estates and the Catholic estates had left the former nothing to hope from a council. Thus the motive which till then had governed the emperor's policy was now nullified, as there was no necessity for seeking a reconciliation of the two parties by means of a conference. The incitement to continue the council came from another quarter. It was no longer anxiety with regard to Protestantism that exercised the pressure, but a growing con- viction of the imperative need of more stringent reforms within the Catholic Church itself. Pope Paul IV. (1551ˆ559), the protector of the Inquisition, and the opponent of Philip II. of Spain as well as of the emperor Ferdinand, turned a deaf ear to all requests for a revival of the synod. The regime of Pius IV. (1559-1566) was signalized by an absolute reversal of the papal policy: and it was high time. For in France and Spain —

the very countries where the Protestant heresy had been most vigorously combated — a great mass of discontent had accumulated; and France already showed a strong inclination to attempt an independent settlement of her ecclesiastical difficulties in a national council. Pius IV. saw himself constrained to take these circumstances into account. On the 29th of November 1560 he announced the convocation of the council; and on the 18th of January 1562 it was actually reopened (sessio xvii.). The presidency was entrusted to Cardinal Gonzaga, assisted by Cardinals Hosius, bishop of Ermeland, Seripando, Simonetta, and Marc de Altemps, bishop of Constance. The Protestants indeed were also invited but the Evangelical princes, assembled in Naumburg, withheld their assent — a result which was only to be expected. In order to enhance the synod's freedom of action, France and the emperor Ferdinand required that it should rank as a new council, and were able to adduce in support of their claim the fact that the resolutions of the two former periods had not yet been formally recognized. Pius IV., however, designated it a continuation of the earlier meetings. Ferdinand, in addition to regulations for the amendment of the clergy and the monastic system, demanded above all the legalization of the marriage of the priesthood and the concession of the " lay chalice," as he feared further defections to Protestantism. France and Spain laid stress on the recognition ef the divine right of the episco- pate, and its independence with regard to the pope. These episcopal tendencies were backed by a request that the bishops should reside in their sees — a position which Pius IV. acknow- ledged to be de iure divino; though, as it would have implied the annihilation of the Roman Curia, he refused to declare it as such. In consequence of these reformatory aspirations, the position of the pope and the council was for a while full of peril. But the papal diplomacy was quite competent to shatter an opposition which at no time presented an absolutely unbroken front, and by concessions, threats and the utilization of political and politico-ecclesiastical dissensions, to break the force of the attack. In the third period of the council, which, as a result of these feuds, witnessed no session from September 1562 to July 156.3, doctrinal resolutions were also passed concerning the Lord's Supper sub utraque specie (sessio xxi., July 16, 1562), the sacrifice of the Mass (sessio xxii., September 27, 1562), the sacrament of ordination (sessio xxiii., July 15, 1563), the sacrament of marriage (sessio xxiv., November n, 1563), and Purgatory, the

worship of saints, relics and images (December. 3, 1563). On the 4th of December 1563 the synod closed.

The dogmatic decisions of the Council of Trent make no attempt at embracing the whole doctrinal system of the Roman Catholic Church, but present a selection of the most vital doctrines, partly chosen as a counterblast to Protestantism, and formulated throughout with a view to that creed and its objec- tions. From the discussions of the council it is evident that pronounced differences of opinion existed within it even on most important subjects, and that these differences were not reconciled. Hence came the necessity for reticences, equivoca- tions and temporizing formulae. Since, moreover, the council issued its pronouncements without any reference to the decisions of earlier councils, and omitted to emphasize its relation to these, it in fact suppressed these earlier decisions, and posed not as continuing, but as superseding them.

The reformatory enactments touch on numerous phases of ecclesiastical life — administration, discipline, appointment to spiritual offices, the marriage law (decretum de reformatione matrimonii " Tametsi," sessio xxiv.), the duties of the clergy, and so forth. The resolutions include many that marked an advance; but the opportunity for a comprehensive and thorough reformation of the life of the Church — the necessity of which was recognized in the Catholic Church itself — was not em- braced. No alteration of the abuses which obtained in the Curia was effected, and no annulment of the customs, so lucra- tive to that body and deleterious to others, was attempted. The question of the annates, for instance, was not so much as broached.

The Council of Trent in fact enjoyed only a certain appearance

of independence. For the freedom of speech which had been accorded was exercised under the supervision of papal legates, who maintained a decisive influence over the proceedings and could count on a certain majority in consequence of the over- whelming number of Italians. That the synod figured as the responsible author of its own decrees (sancta oecumenica et generalis tridentina synodus in) spiritu sancto legitime con- gregata) proves very little, since the following clause reads praesidentibus apostolicae sedis legatis; while the legates and the pope expressly refused to sanction an application of the words of the Council of Constance — universalem ecclesiam repraesentans. The whole course of the council was determined

by the pre- supposition that it had no autonomous standing, and that its labours were simply transacted under the commission and guidance of the pope. This was not merely a claim put forward by the Roman see at the time: it was acknowledged by the attitude of the synod throughout. The legates confined the right of discussion to the subjects propounded by the pope, and their position was that he was in no way bound by the vote of the majority. In difficult cases the synod itself left the decision to hirn, as in the question of clandestine marriages and the administration of the Lord's Supper sub utraque specie. Further, at the close of the sessions a resolution was adopted, by the terms of which all the enactments of the council de morum reformatione atque ecclesiastica disciplina were subject to the limitation that the papal authority should not be prejudiced thereby (sessio xxv. cap. 21). Finally, every doubt as to the papal supremacy is removed when we consider that the Triden- tine Fathers sought for all their enactments and decisions the ratification (confirmatio) of the pope, which was conferred by Pius IV. in the bull Benedictus Deus (January 26, 1564). Again, in its last meeting (sessio xxv.), the synod transferred to the pope a number of tasks for which their own time had proved inadequate. These comprised the compilation of a catalogue of forbidden books, a catechism, and an edition of the missal and the breviary. Thus the council presented the Holy See with a further opportunity of extending its influence and diffus- ing its views. The ten rules de libris prohibitis, published by Pius IV. in the bull Dominici gregis custodiae (March 24, 1564), became of great importance for the whole spiritual life of the Roman Catholic Church: for they were an attempt to exclude pernicious influences, and, in practice, led to a censorship which has been more potent for evil than good. These regulations were modified by Leo XIII. in his Constitution Ojficiorum ac munerum (January 24, 1897). Acting on a suggestion of the council (sessio xxiv. c. 2; sessio xxv. c. 2), Pius IV. published a short conspectus of the articles of faith, as determined at Trent, in the bull Injunctum nobis (November 13, 1564). This so- called Professio fidei tridentinae, however, goes beyond the doctrinal resolutions of the synod, as it contains a number of clauses dealing with the Church and the position of the pope within the Church — subjects which were deliberately ignored in the discussions at Trent. In 1877 this confession — binding on every Roman Catholic priest — was supplemented by a pro- nouncement on the dogma of papal infallibility.

The great and increasing need of a manual for the instruction of the people gave rise in the first half of the 16th century to numerous catechisms. At the period of the council, that composed by the Jesuit Peter Canisius, father-confessor of the emperor Ferdinand, enjoyed the widest vogue. ‘ It failed, however, to receive the sanction of the synod, which preferred to undertake the task itself; and, as that body left its labours unfinished, the pope was entrusted with the compilation of a textbook. Pius V. appointed a commission (Leonardo Marini, Egidio Foscarari, Francisco Fureiro and Murio Calini) under the presidency of three cardinals, among them Charles Borromeo; and this commission discharged its duties with such rapidity that the Caiechismus a decreto concilii tridenlini ad parochos was published inRomeas earlyas the year 1568. Thebook is designed for the use of the cleric, not the layman. The Missale romamim, moreover, underwent revision: also the Breviarium romanum, the daily devotional work of the Roman priest. The

necessity of still further improvements in the latter was forcibly urged in the Vatican Council.

The numerical representation of the Council of Trent was marked by considerable fluctuations. In the first session (December 13, 1545) the spiritual dignitaries present — omitting the 3 presiding cardinals — consisted of one other cardinal, 4 arch- bishops, 21 bishops and 5 generals of orders. On the other hand, the resolutions of the synod were signed at its close by the 4 presidents, then by 2 cardinals, 3 patriarchs, 25 archbishops, 166 bishops, 7 abbots, 7 generals of orders and 19 procurators of archbishops and bishops. In this council — as later in the Vatican — Italy was the dominant nation, sending two-thirds of the delegates; while Spain was responsible for about 30, France for about 20, and Germany for no more than 8 members. In spite of the paucity of its numbers at the opening and the unequal representation of the Church, which continued to the last, the oecumenical character of the council was never seriously questioned. On the motion of the legates, the resolutions were submitted to the ambassadors of the secular powers for signature, the French and Spanish envoys alone withholding their assent. The recognition of the council’s enactments was, none the less, beset with difficulties. So far as the doctrinal

decisions were concerned no obstacles existed; but the reformatory edicts — adhesion to which was equally required by the synod — stood on a different footing. In their character of resolutions claiming to rank as ecclesiastical law they came into conflict with outside interests, and their acceptance by no means implied that the rights of the sovereign, or the needs and circumstances of the respective countries, were treated with sufficient consideration. The consequence was that there arose an active and, in some cases, a tenacious opposition to an indiscriminate acquiescence in all the Tridentine decrees. Under Charles IX. and Henry IV. the situation was hotly debated in France: but these monarchs showed as little com- plaisance to the representations and protests of the Curia as did the French parlemetit itself; and only those regulations were recognized which came into collision neither with the rights of the king nor with the liberties of the Gallican Church. In Spain, Philip II. allowed, indeed, the publication of the Tridentinum, as also in the Netherlands and Naples, but always with the reservation that the privileges of the king, his vassals and his subjects, should not thereby be infringed. The empire, as such, never recognized the Tridentinum. Still it was pub- lished at provincial and diocesan synods in the territories of the spiritual princes, and also in the Austrian hereditary states.

In his official confirmation Pius IV. had already strictly prohibited any commentary on the enactments of the council unless undertaken with his approval, and had claimed for himself the sole right of interpretation. In order to supervise the practical working of these enactments, Pius created (1564) a special department of the Curia, the Congregatio cardinalium concilii Iridentini inter prelum; and to this body Sixtus V. entrusted the further task of determining the sense of the conciliar decisions in all dubious cases. The resolutiones of the congregation — on disputed points — and their declarationes — on legal questions — exercised a powerful influence on the subsequent development of ecclesiastical law.

The Council of Trent attained a quite extraordinary signifi- cance for the Roman Catholic Church; and its pre-eminence was unassailed till the Vaticanum subordinated all the labours of the Church in the past — whether in the region of doctrine or in that of law-— to an infallible pope. On the theological side it fixed the results of medieval scholasticism and gleaned from it all that could be of service to the Church. Further, by pro- nouncing on a series of doctrinal points till then undecided it elaborated the

Catholic creed; and, finally, the bold front which it offered to Protestantism in its presentation of the orthodox faith gave to its members the practical lead they so much needed in their resistance to the Evangelical assault. The regulations dealing with ecclesiastical life, in the widest sense of the words, came, for the most p.art, to actual fruition, so that, in this direc- tion also, tb« council had not laboured in vain. For the whole

Roman Catholic Church of the 16th century its consequences are of an importance which can scarcely be exaggerated: it showed that Church as a living institution, capable of work and achievement; it strengthened the confidence both of her members and herself, and it was a powerful factor in heightening her efficiency as a competitor with Protestantism and in restoring and reinforcing her imperilled unity. Indeed, its sphere of influence was still more extensive, for its labours in the field of dogma and ecclesiastical law conditioned the future evolution of the Roman Catholic Church. As regards the position of the papacy, it is of epoch-making significance — not merely in its actual pronouncements on the papal see, but also in its tacit subordination to that see, and the opportunities of increased influence accorded to it.

There were three periods of the council, separated by not inconsiderable intervals, each of an individual character, con- ducted by different popes, but forming a single unity — an indivisible whole, so that it is strictly correct to speak of one Council of Trent, not of three distinct synods.

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TRENT, the chief river in the midlands of England, the third in length in the country, exceeded only by the Thames and Severn. It rises in the north of Staffordshire, and discharges through the Humber into the North Sea, having a course of about 170 m., and a drainage area of 4052 sq. m. The source is on Biddulph Moor, which rises to a height of 1100 ft. The course of the river is at first southerly, and it skirts the manu- facturing district of the Potteries, passing Stoke-upon-Trent. Immediately below this town the valley widens, and the fall of the river, from a point 15

m. from the source to the mouth, is only 338 ft. Passing Stone, the course becomes south-easterly, and the united waters of the Sow and the Penk are received on the right. Near Rugeley the direction becomes easterly, and near Alrewas the Trent receives the Tame on the right, and turns to the north-east. Much of the valley above this point is well wooded and picturesque, though the flanking hills are gently sloping, and of no great elevation. The river now passes

Burton-upon-Trent, in this part of its course forming the boundary between Staffordshire and Derbyshiie. The fall from Burton to the mouth, a distance of 109 m., is 148 ft. The valley opens out as the stream, dividing into several channels at Burton and receiving on the left the Dove, enters Derbyshire. It then separates that county from Leicestershire and Notting- hamshire, receives in quick succession the Denvent (left), Soar (right) and Erewash (left), enters Nottinghamshire, and passes Nottingham, 81J m. from the mouth. The next important town is Newark, which, however, the main channel of the river passes at a considerable distance to the west; the Devon joins here on the right, and the fall from this point to the mouth, a distance of 57! m., is only 18 ft. The valley becomes flat, though the river is rather deeply entrenched in some parts. Forming the boundary between Nottingham and Lincolnshire, the Trent passes Gainsborough (265 m. from the mouth), receives the Idle on the left, and, entering Lincolnshire and skirting the Isle of Axholme, joins the Yorkshire Ouse near Faxfleet. The lower part of the valley resembles the Fens in character, and is drained by many artificial channels. The northward turn at Newark is of interest inasmuch as it is con- sidered that the river from this point formerly flowed towards Lincoln, and, following a depression in the escarpment there, passed down the valley at present occupied by the Witham to the Wash. It is suggested that the waters were diverted to the Humber by a stream within that system cutting back southward and tapping the Trent in the vicinity of Newark; and in high flood the Trent has been known to send water across the low parting to the Witham (see Avebury, Scenery of England, ch. xi.). The- highest tides are felt about 40 m. up river, and the phenomenon of an ” eagre ” (bore or tidal wave) is seen rising on spring tides to a height of 4 or 5 ft., 15 m. above the mouth of the river.

The Trent is navigable for a distance of 94J m. from its junction with the Ouse, to a point a short distance above the junction of the Derwent, the Trent Navigation Company having a general control of the navigation down to Gainsborough, the line of which passes through Nottingham by canals. On the river itself there are eight locks. Below Gainsborough the navigation is open, and vessels drawing 9 ft. can reach this point on spring tides. From the Derwent mouth the Trent and Mersey Canal follows the Trent valley upward, and gives connexion with the entire inland navigation system of the midlands and west of England. Short canals give access to Derby and the Erewash valley; the Leicester Navigation, following the Scar, connects with the Crand Junction canal; and the GranthamCanalcarriesa little traffic between that town and Notting- ham. The Fossdyke, distinguished as the oldest navigable waterway still in use in England, as it was originally of Roman construction, connects the Trent with Lincoln and the Witham, and lower down the Sheffield and South Yorkshire canal joins the river from the west at Keadby. There is also a canal, little used, to Chesterfield.

TRENTE ET QUARANTE (called also Rouge et Noir), a game of French origin played with cards and a special table. It is one of the two games played in the gambling rooms at Monte Carlo, roulette being the other. The diagram illustrates one half of the table, the other half precisely corresponding to it. Two croupiers sit on each side, one of them being the dealer; behind the two on the side opposite to the dealer a supervisor of the game has his seat. Six packs of fifty-two cards each are used; these are well shuffled, and the croupier asks any of the players to cut, handing him a blank card with which to divide the mixed packs. There are only four chances at trente et quarante: rouge or noir, known as the grand tableau; couleur or inverse, known as the petit tableau. At Monte Carlo the stakes are placed on the divisions indicated on the table, the maximum being 12,000 francs and the minimum 20 francs which must be staked in gold. The dealer, who has placed all the cards before him, separates a few with the blank card, takes them in his left hand and invites the players to stake with the formula, “Messieurs, faites votre jeu!” After a pause he exclaims ” Le jeu- est fait, rien ne va plus ! ” after which no stake can be made. He then deals the cards in a row until the aggregate number of pips is something more than thirty, upon which he deals a second row, and that which comes nearest to thirty wins, the top row being always distinguished as noir, and the lower

I!”

OR ARGENT

as rouge. In announcing the result the word trente is always omitted, the dealer merely announcing un, trois, quatre, as the case may be, though when forty is turned up it is described as quarante. The words noir and inverse are also never used, the announcement being rouge gagne or rouge perd, couleur gagne or couleur perd. Gain or loss over couleur and inverse depends upon the colour of the first card dealt. If this should be also the colour of the winning row, the player wins. Assuming, for example, that the first card dealt is red, and that the lower row of the cards dealt is nearest to thirty, the dealer will announce ” Rouge gagne et le couleur.” If the first card dealt is red, but the black V ‘ or top row of cards is nearest Diagram of Half of Trente et to thirty, the dealer announces Quarante Table Rouge perd et le couleur.” N » Noir – Q >

Grand tableau. Inverse.

It frequently happens that both R ‘ Rou § e – J’ rows of cards when added together give the same number. Should they both, for instance, add up to thirty-three, the dealer will announce ” Trois apres,” and the deal goes for nothing except in the event of their adding up to thirty-one. Un apres {i.e. thirty-one) is known as a refait; the stakes are put in prison to be left for the decision of the next deal, or if the player prefers it he can withdraw half his stake, leaving the other half for the bank. Assurance against a refait can be made by paying 1% on the value of the stake with a minimum of five francs. When thus insured against a refait the player is at liberty to withdraw his whole stake. It has been calculated that on an average a refait occurs once in thirty-eight coups. After each deal the cards are pushed into a metal bowl let into the table in front of the dealer. When he has not en’ough left to complete the two rows, he remarks ” Les cartes passent”; they are taken from the bowl, reshuffled, and another deal begins.

TRENTON, a city and the county-seat of Grundy county, Missouri, U.S.A., on the E. fork of the Grand River, in the north central part of the state, about 100 m. N.E. of Leavenworth. Pop. (1890), 5039; (1900), 5,396, including 192 foreign-born and 200 negroes; (1910), 5656. It is served by the Chicago, Rock Island & Pacific (which has repair shops here) and the Quincy, Omaha & Kansas City railways. It has a picturesque situation, and is laid out over a high uneven bluff. The city is a trading centre for a prosperous farming region, and coal is mined in the vicinity. Trenton was platted in 1841, became the county-seat in the same year, and was incorporated as a town in 1857. In 1893 it received a city charter under a general state law. In 1900-1903 it was the seat of Ruskin College, an institution founded by Walter Vrooman (b. 1869), a native of Missouri, and the organizer of the Ruskin Hall Workingmen’s College, Oxford, England. The college was removed to Glen Ellyn, Illinois, in 1903 and after 1906 to Ruskin, Florida.

TRENTON, the capital of New Jersey, U.S.A., and the county- seat of Mercer county, on the eastern bank of the Delaware river, about 33 m. N.E. of Philadelphia, and about 59 m. S.W. of New York. Pop. (1890), 57,458; (1900), 73,307, of whom 16,793 were foreign-born (including 41 14 Germans, 3621 English, 3292 Irish, and 1494 Hungarians), and 32,879 were of foreign parentage (both parents foreign-born), including 8873 of German parentage, 8324 of Irish parentage, 5513 of English parentage,

and 2243 of Hungarian parentage; (1910 census), 96,8ˆ. Area, 9 sq. m. Trenton is served by the Pennsylvania (main line and Belvidere division) and the Philadelphia & Reading railway systems, by inter-urban electric railways, and by small freight and passenger steamers on the Delaware river; the Delaware & Raritan Canal connects with

the Raritan river at New Brunswick. Trenton is at the head of navigation on the Delaware river, which falls 8 ft. here. Riverside park extends along its water front for about 3 m., and on the outskirts of the city lies Cadwalader park (100 acres), containing a zoological garden. In the centra of the city, marking the spot where Washington planted his guns at the battle of Trenton, stands the Battle monument, a Roman- Doric column of granite, 150 ft. high, hollow and fluted, its cap forming an observatory, with a statue of Washington by William R. O'Donovan (b. 1844). In Perry Street, mounted on a granite pedestal, is the " Swamp Angel," the great gun used by Federal troops in the marshes near Charleston, South Carolina, during their attack on that city in August 1863. There are many buildings in the city which are rich in historic associations. Chief among these is the barracks, erected by the colony in 1758 to mitigate the evils of billeting, and occupied by British troops during the Seven Years' War, and at different times by British, Hessian and American troops during the War of Independence. Other interesting landmarks are " Woodland " (formerly called " Bloomsbury Court "), built early in the 18th century by William Trent, and said to have sheltered, at various times, Washington, Lafayette and Rochambeau; the " Hermitage," erected some time before the War of Inde- pendence; and " Bow Hill," in the suburbs of the city, a quaint old colonial mansion which for some time before 1822 was a home of Joseph Bonaparte. Among the public buildings are the state capitol, the post office building, the county court house, the city hall, the second regiment armoury, public library (containing about 42,000 volumes in 1909), and the building (1910) given by Henry C. Kelsey to the city for the school of industrial arts (founded in 1898). Here also are the state normal and model schools (1855), the state library, housed in the capitol, the state school for deaf mutes, the state home for girls, one of the two state hospitals for the insane (opened in 1848), the state arsenal — the building being the old state prison — the state prison (1836), St Francis

hospital (1874), Mercer hospital (1892), the William McKinley memorial hospital (1887), the city hospital, two children's day nurseries, the Friends' home, the Union industrial home (for destitute children), the Florence Crittenton home (1895), the indigent widows' and single women's home (1854), the Har Sinai charity society, the home for friendless children, and the society of St Vincent de Paul. Trenton is the see of Protestant Episcopal and Roman Catholic bishops.

Trenton is an important industrial centre. Its proximity to the coal fields of Pennsylvania and to the great markets of New York and Philadelphia, and its excellent transportation facilities by rail and by water, have promoted the development of its manufactures. The city is the greatest centre for the pottery industry in the United States. In 1905 there were 40 establishments for the manufacture of pottery and terra- cotta, employing 4571 labourers; and their total product was valued at $5,882,701 — or 9-2% of the value of the pottery product of the United States, and 18% of the value of all the city's factory products, in this year. The chief varieties of this ware are vitrified china, belleek china, semi-porcelain, white granite and c. c. ware, vitrified porcelain for electrical supplies, porcelain bath tubs and tiles, and terra-cotta. Clay for the " saggers," or cases in which the wares are fired, is mined in the vicinity, but the raw materials for the fine grades of pottery are obtained elsewhere. Some pottery was made in Trenton by crude and primitive methods near the beginning of the 19th century, but the modern methods were not introduced until 1852, when yellow and Rockingham wares were first made here. In 1859 the-manufacture of white granite and cream- coloured ware was successfully established. The fine exhibits from the Trenton potteries at the Centennial Exhibition in Philadelphia in 1876 greatly stimulated the demand for these wares and increased the competition among the manufacturers; and since that date there has been a marked development in both the quantity and the quality of the product. In Trenton, also, are manufactured iron, steel and copper wire, rope, cables

and rods — the John A. Roebling's Sons Company has an immense wire and cable manufactory here — iron and steel bridge building materials and other structural work, plumbers' supplies (manu- factured by the J. L. Mott Company), and machinery of almost every character, much of it being exported to foreign countries. Much rubber ware is also manufactured. In 1905 Trenton contained 312 factories, employing 14,252

labourers, and the total value of the factory products was $32,719,945.

The charter, as amended, provides for a mayor elected for two years and a common council of two members from each ward elected for two years. Other elected officers are: city clerk, comptroller, treasurer, counsel, receiver of taxes, engineer, inspector of buildings, overseer of poor, street commissioner and sealer of weights and measures. The municipality owns the water works and the sewer system; the water supply is obtained from the Delaware and is stored in a reservoir having a capacity of about 1 10,000,000 gallons.

The settlement of Trenton began in 1680 with the erection by Mahlon Stacy, a Quaker colonist of Burlington, of a mill at the junction of the Assanpink creek 1 with the Delaware river. By 1685 a number of colonists had settled at this point, which became known as " The Falls " on account of the rapids in the Delaware here. In 17 14 Stacy sold his plantation at " The Falls " to William Trent (c. 1655-1724), speaker of the New Jersey Assembly (1723) and chief justice of the colony (1723-1724), in whose honour the place came to be called Trent- town or Trenton. In 1745 Trenton received a royal charter incorporating it as a borough, but in 1750 the inhabitants voluntarily surrendered this privilege, deeming it " very pre- judicial to the interest and trade " of the community. In 1783 the New Jersey delegates in Congress proposed that Trenton be made the seat of the general government, but as this measure was opposed by the Southern delegates, it was agreed that Congress, pending a final decision, should sit alternately at Annapolis and Trenton. Congress accordingly met in Trenton in November 1784, but soon afterwards removed to New York, where better accommodation could be obtained. Trenton became the capital of the state in 1790, was chartered as a city in 1792, and received new charters in 1837, 1866, and 1874. The borough of South Trenton was annexed in 1850; the borough of Chambersburg and the township of Millham in 1888; the borough of Wilbur in 1898; and parts of the town- ships of Ewing and Hamilton in 1900.

See The City of Trenton, N.J., a Bibliography (1909), prepared by the Trenton Free Library; John O. Raum, History of the City of Trenton (Trenton, 1871); George A. Wolf, Industrial Trenton (Wilmington, Del., 1900) ; F. B. Lee, History of Trenton (Trenton,

1895)-

TRENTON AND PRINCETON, BATTLES OF (1776-1777). These battles in the War of American Independence are noted as the first successes won by Washington in the open field. Following close upon a series of defeats, their effect upon his troops and the population at large was marked. After the cap- ture of Fort Washington on Manhattan Island, on the 16th of November 1776, the British general, Sir William Howe, forced the Americans to retreat through New Jersey and across the Delaware into Pennsylvania. Howe then went into winter quarters, leaving the Hessian general, Rahl, at Trenton on the river with a brigade of 1200 men. Although Washington's army had dwindled to a mere handful and was discouraged by the year's disasters, it could still be trusted for a promising exploit. Ascertaining that the Hessians at Trenton were practically unsupported, the American general determined to attempt their capture. On the night of the 25th of December 1776 he recrossed the Delaware through floating ice to a point 9 m. above the enemy, whom he expected to reach at dawn of the following day, the 26th. Dividing his force of 2500 men

1 The name Assanpink is a corruption of an Indian word said to mean " place of stone implements." In gravel deposits in and near Trenton many stone implements, human skulls and remains of extinct animals have been found, and according to some scientists they are evidences of Glacial man, a conclusion disputed by others. (See America, vol. i. p. 817) –

into two divisions under Generals Sullivan and Greene, he approached the town by two roads, surprised the Hessian outposts, and then rushed upon the main body before it could form effectively. The charge of the American troops and the tire of their artillery and musketry completely disconcerted the enemy. All avenues of retreat being closed and their general mortally wounded, the latter to the number of 950 quickly surrendered and were marched back into Pennsylvania on the same day. The American loss was five or six wounded.

Elated by this success and eager to beat up the enemy's advanced posts at other points, Washington again crossed the Delaware on the 30th of December and occupied Trenton. Hearing of this move Lord Cornwallis at Princeton, 10 m. north of Trenton,

marched down with about 7000 troops upon the Americans on the 2nd of January 1777, and drove them across the Assanpink, a stream running east of the town. The Americans, who encamped on its banks that night, were placed in a precarious position, as the Delaware, with no boats at their disposal at that point, prevented their recrossing into Pennsylvania, and all other roads led towards the British lines to the northward. Washington accordingly undertook a bold manoeuvre. Fearing an attack by Cornwallis on the next morning, he held a council of war, which confirmed his plan of quietly breaking camp that night and taking a by-road to Princeton, then cutting through any resistance that might be offered there and pushing on to the hills of northern New Jersey, thus placing his army on the flank of the British posts. His tactics succeeded. At Princeton (q.v.) he came upon three British regiments which for a time held him at bay. The 17th foot especially, under Colonel Mawhood, twice routed the American advanced troops, inflicting severe loss, but were eventually driven back toward Trenton. The other regiments retreated north toward New Brunswick, and Washington continued his march to Mor-istown, New Jersey. He had broken through Howe's lines and placed himself in an advan- tageous position for recruiting his army and maintaining a strong defensive in the next campaign. These two affairs of Trenton and Princeton put new life into the American cause, and established Washington in the confidence of his troops and the country at large.

See W. S. Stryker, The Battles of Trenton and Princeton (Boston,

1898).

TREPIDATION (from Lat. trepidarc, to tremble), a term meaning, in general, fear or trembling, but used technically in astronomy for an imagined slow oscillation of the ecliptic, having a period of 7000 years, introduced by the Arabian astronomers to explain a supposed variation in the precession of the equinoxes. It figured in astronomical tables until the time of Copernicus, but is now known to have no foundation in fact, being based on an error in Ptolemy's determination of precession.

TRESCOT, WILLIAM HENRY (1822- 1898), American diplomatist, was born in Charleston, South Carolina, on the 10th of November 1822. He graduated at Charleston College in 1840, studied law at Harvard, and was admitted to the bar in 1843. In 1852-1854 he was secretary of the U.S. legation in London. In June i860 he was

appointed assistant secretary of state, and he was acting secretary of state in June-October, during General Lewis Cass's absence from Washington, and for a few days in December after Cass's resignation. His position was important, as the only South Carolinian holding anything like official rank, because of his intimacy with President Buchanan, and his close relations with the secession leaders in South Carolina. He opposed 1 the re-enforcement of Fort Sumter, used his influence to prevent any attack on the fort by South Carolina before the meeting of the state's convention called to consider the question of secession, and became the special agent of South Carolina in Washington after his resigna-

1 His " Narrative. . .concerning the Negotiations between South Carolina and President Buchanan in December i860," written in February 1861, edited by Gaillard Hunt, appeared in the American Historical Review, xiii. 528-556 (1908).

tion from the state department in December. He returned to Charleston in February 1861; was a member of the state legislature in 1862-1866, and served as colonel on the staff of General Roswell S. Ripley during the Civil War; and later returned to Washington. He was counsel for the United States before the Halifax Fishery Commission in 1877; was commissioner for the revision of the treaty with China in 1880; was minister to Chile in 1881-1882; in 1882 with General U.S. Grant negotiated a commercial treaty with Mexico; and in 1 889-1 890 was a delegate to the Pan-American Congress in Washington. He died at Pendleton, South Carolina, his country place, on the 4th of May 1898.

His writings include The Diplomacy 0} the Revolution (1852), An American View of the Eastern Question (1854) and The Diplomatic History of the Administrations of Washington and Adams (1857).

TRESHAM, FRANCIS (c. 1567-1605), English Gunpowder Plot conspirator, eldest son of Sir Thomas Tresham of Rushton, Northamptonshire (a descendant of Sir Thomas Tresham, Speaker of the House of Commons, executed by Edward IV. in 147 1), and of Muriel, daughter of Sir Thomas Throckmorton of Ccughton, was born about 1567, and educated at Oxford. He was, like his father, a Roman Catholic, and his family had already suffered for their religion and politics. He is described as " a wild and unstayed man," was connected intimately with many of those

afterwards known as the Gunpowder Plot con- spirators, being cousin to Catesby and to the two Winters, and was implicated in a series of seditious intrigues in Elizabeth's reign. In 1596 he was arrested on suspicion together with Catesby and the two Wrights during an illness of Queen Elizabeth. In 1601 he took part in Essex's rebellion and was one of those who confined the Lord Keeper Egerton in Essex House on the 8th of February. He was imprisoned and only suffered to go free on condition of a fine of 3000 marks paid by his father. He was one of the promoters of the mission of Thomas Winter in 1602 to Madrid to persuade the king of Spain to invade England. On the death of Elizabeth, however, he, with several other Roman Catholics, joined Southampton in securing the Tower for James I.

Tresham was the last of the conspirators to be initiated into the Gunpowder Plot. According to his own account, which receives general support from Thomas Winter's confession, it was revealed to him on the 14th of October 1605. Inferior in zeal and character to the rest of the conspirators, he had lately by the death of his father, on the nth of September 1605,' inherited a large property and it was probably his financial support that was now sought. But Tresham, as the possessor of an estate, was probably less inclined than before to embark on rash and hazardous schemes. Moreover, he had two brothers- in-law, Lords Stourton and Monteagle, among the peers destined for assassination. He expressed his dislike of the plan from the first, and, according to his own account, he endeavoured to dissuade Catesby from the whole project, urging that the Romanist cause would derive no benefit, even in case of success, from the attempt. His representations were in vain and he consented to supply money, but afterwards discovered that no warning was to be given to the Roman Catholic peers. All the evidence now points to Tresham as the betrayer of the plot, and it is known that he was in London within 24 hours of the despatch of the famous letter to Lord Monteagle which revealed the plot (see Gunpowder Plot). In all probability he had betrayed the secret to Monteagle previously, and the method of discovery had been settled between them, for it bears the marks of a prearranged affair, and the whole plan was admirably conceived so as to save Monteagle's life and inform the govern- ment, at the same time allowing the conspirators, by timely warning, opportunity to escape (see Monteagle, William Parker, 4th baron). Tresham avoided meeting any of the con- spirators as he had agreed to do at Barnet, on the 29th of October, but en the 31st he was visited

by Winter in London, and summoned to Barnet on the following day. There he met Catesby and Winter, who were prepared to stab him for his betrayal, but were dissuaded by his protestations that he knew

nothing of the letter. His entreaties that they would give up the whole project and escape to Flanders were unavailing. After the arrest of Fawkes on the night of the 4th Tresham did not fly with the rest of the conspirators, but] remained at court and offered his services for apprehending them. For some days he was not suspected, but he was arrested on the 1 2th. On the 13th he confessed his share in the plot, and on the 29th his participation and that of Father Garnet in the mission to Spain. Shortly afterwards he fell ill with a com- plaint from which he had long suffered. On the 5th of December a copy of the Treatise of Equivocation, in which the Jesuit doctrine on that subject was treated, was found amongst his papers by Sir Edward Coke (see Garnet, Henry). From the lessons learnt here he had evidently profited. On the 9th of December he declared he knew nothing about the book, and shortly before his death, with the desire of saving his friend, he withdrew his statement concerning Garnet's complicity in the Spanish negotiations, and denied that he had seen him or communicated' with him for 16 years. His death took place on the 22nd. His last transparent falsehoods had removed any thoughts of leniency in the government. He was now classed with the other conspirators, and though he had never been convicted of any crime or received sentence, his corpse was decapitated and he was attainted by act of parliament. Tresham had married Anne, daughter of Sir John Tufton of Holtfield in Kent, by whom he had two daughters. His estates passed, notwithstanding the attainder, to his brother, afterwards Sir Lewis Tresham, Bart.

TRESPASS (O. Fr. trcspas, a crime, properly a stepping across, from Lat. trans, across, and passus, step, cf. "transgression," from transgredi, to step across), in law, any transgression of the law less than treason, felony or misprision of either. The term includes a great variety of torts committed to land, goods or person, distinguished generally by names drawn from the writs once used as appropriate to the particular transgression, such as vi et armis, quare clausum fregit de bonis asportatis, de uxore

abducta cum bonis viri, quare filium et heredem rapuit, &c. Up to 1694 the trespasser was regarded, nominally at any rate, as a criminal, and was liable to a fine for the breach of the peace, commuted for a small sum of money, for which 5 Will, and Mar. c. 12 (1693) substituted a fee of 6s. 8d. recoverable as costs against the defendant. Trespass is not now criminal except by special statutory enactment, e.g. the old statutes against forcible entry, the game acts, and the private acts of many railway companies. When, however, trespass is carried suffi- ciently far it may become criminal, and be prosecuted as assault if to the person, as nuisance if to the land. At one time an important distinction was drawn between trespass general and trespass special or trespass on the case, for which see Tort. The difference between trespass and case was sometimes a very narrow one: the general rule was that where the injury was directly caused by the act of the defendant the proper remedy was trespass, where indirectly case. The difference is illustrated by the action for false imprisonment: if the defendant himself imprisoned the plaintiff the action was trespass; if a third person did so on the information of the defendant it was case. A close parallel is found in Roman law in the actio directa under the lex Aquilia for injury caused directly, the actio utilis for that caused indirectly. One of the reasons for the rapid extension of the action on the case, especially that form of it called assumpsit, was no doubt the fact that in the action on the case the defendant was not allowed to wage his law (see Wager).

In its more restricted sense trespass is generally used for entry on land without lawful authority by either a man, his servants or his cattle. To maintain an action for such trespass the plaintiff must have possession of the premises. The quantum of possession necessary to enable him to bring the action is often a question difficult to decide. In most instances the tenant can bring trespass, the reversioner only case. Remedies for trespass are either judicial or extra-judicial. The most minute invasion of private right is trespass, though the damages

may be nominal if the injury was trivial. On the other hand, they may be exemplary if circumstances of aggravation were present. Pleading in the old action of trespass was of a very technical nature, but the old-fashioned terms alia enormia, replication de injuria, new assignment, &c, once of such frequent occurrence in the reports, are of merely historical interest since the introduction of a simpler system of pleading, unless in those American states where the old pleading has not been reformed.

The venue in trespass was formerly local, in case transitory. In addition to damages for trespass, an injunction may be granted by the court. The principal instances of extra-judicial remedies are distress damage feasant of cattle trespassing, and removal of a trespasser without un- necessary violence, expressed in the terms of Latin pleading by molliter manus imposuit.

Trespass may be justified by exercise of a legal right, as to serve the process of the law, or by invitation or license of the owner, or may be excused by accident or inevitable necessity, as deviation from a highway out of repair. Where a man abuses an authority given by the law, his wrongful act relates back to his entry, and he becomes a trespasser ab initio, that is, liable to be treated as a trespasser for the whole time of his being on the land. Mere breach of contract, such as refusal to pay for wine in a tavern which a person has lawfully entered, does not constitute him a trespasser ab initio. A trespass of a permanent nature is called a continuing trespass; such would be the permitting of one's cattle to feed on another's land without authority.

In Scots law trespass is used only for torts to land. By the Trespass (Scotland) Act 1865 trespassers are liable on summary conviction to fine and imprisonment for encamping, lighting fires, &c, on land without the consent and permission of the owner.

TRES TABERNAE (Three Taverns), an ancient village of Latium, Italy, a post station on the Via Appia, at the point where the main road was crossed by a branch from Antium. It is by some fixed some 3 m. S.E. of the modern village of Cisterna just before the Via Appia enters the Pontine marshes, at a point where the modern road to Nihfa and Norba diverges to the north-east, where a few ruins still exist (Grotte di Nottola), $s m – from Rome. It is, however, more probable that it stood at Cisterna itself, where a branch road running from Antium by way of Satricum actually joins the Via Appia. Ulubrae, mentioned as a typical desert village by Roman writers, lay in the plain between Cisterna and Sermoneta. Tres Tabernae is best known as the point to which St Paul's friends came to meet him on his journey to Rome (Acts xxviii. 15). It became an episcopal see, but this was united with that of Velletri in 592 owing to the desertion of the place.

The name occurs twice in other parts of Italy as the name of post stations.

•TRESVIRI, or Triumviri, in Roman antiquities, a board of three, either ordinary magistrates or extraordinary com- missioners.

1. Tresviri capitales, whose duty it was to assist the higher officials in their judicial functions, especially criminal, were first appointed about 289 B.C., unless they are to be identified with the tresviri nocturni (Livy ix. 46, 3), who were in existence in 304. They possessed no criminal jurisdiction or jus prensionis (right of arrest) in their own right, but acted as the representatives of others. They kept watch over prisoners and carried out the death sentence (e.g. the Catilinarian conspirators were strangled by them in the Career Tullianurn); took accused or suspected persons into custody; and exercised general control over the city police. They went the rounds by night to maintain order, and had to be present at outbreaks of fire. Amongst other things they assisted the aediles in burning forbidden books. It is possible that they were entrusted by the praetor with the settlement of certain civil processes of a semi-criminal nature, in which private citizens acted as prosecutors (see G. Gotz in Rheinisches Museum,' xxx, 162). They also had to collect the sacramenta (deposit forfeited by the losing party in a suit) and examined the plea of exemption put forward by those who refused to act as jurymen. Caesar increased their number to four, but Augustus reverted to three. In imperial times most of their functions passed into the hands of the praefectus vigilum.

2. Tresviri epulones, a priestly body (open from its first institution to the plebeians), assisted at public banquets. Their number was subsequently increased to seven, and by Caesar to ten, although they continued to be called septemviri, a name which was still in use at the end of the 4th century a.d. They were first created in 196 B.C. to superintend the epulum Jovis on the Capitol, but their services were also requisitioned on the occasion of triumphs, imperial birthdays, the dedication of temples, games given by private individuals, and so forth, when entertainments were provided for the people, while the senate dined on the Capitol.

3. Tresviri monetales were superintendents of the mint. Up to the Social War they were nominated from time to time, but afterwards became permanent officials. Their number was

increased by Caesar to four, but again reduced by Augustus. As they acted for the senate they only coined copper money under the empire, the gold and silver coinage being under the exclusive control of the emperor. The official title was ” tresviri aere argento auro flando feriundo.”

4. Tresviri reipublicae constituendae was the title bestowed upon Octavianus, Lepidus and Antony for five years by the lex Titia, 43 B.C. The coalition of Julius Caesar, Pompey and Crassus has also been wrongly called a ” triumvirate,” but they never had the title tresviri, and held no office under that name.

See T. Mommsen, Romisches Staatsrecht (1888), ii. 594-601, 638, 601, 718; J. Marquardt, Romische Staatsverwaltung (1885), iii. 347.

TREVELYAN, SIR GEORGE OTTO, Bart. (1838-), British author and statesman, only son of Sir Charles Trevelyan, was born on the 20th of July 1838 at Rothley Temple, Leicester- shire. His mother was Lord Macaulay’s sister. He was educated at Harrow and at Trinity College, Cambridge, where he was second in the classical tripos. In 1861 he wrote his Horace at the University of Athens, a topical drama in verse, parts of which are said to have offended Whewell and lost Trevelyan a fellowship. The following year he went out as a civil servant to India, where he spent several years. During his stay he contributed ” Letters of a Competition Wallah ” to Macmillan’s Magazine (republished 1864). Cawnpore, an account of that terrible tragedy, was published in 1865. During the same year he was elected to parliament for Tynemouth in the Liberal interest. In 1867 he wrote The Ladies in Parlia- ment, a humorous political brochure in verse. At the general election of 1868 he was returned for the Hawick burghs, which he continued to represent until 1886. When the first Gladstone ministry was formed, in December 1868, Trevelyan was ap- pointed civil lord of the Admiralty, but resigned in July 1870 on a point of conscience connected with the government Edu- cation Bill. He advocated a sweeping reform of the army, including the abolition of the purchase of commissions, and both in and out of parliament he was the foremost supporter for many years of the extension of the county franchise. In the session of 1874 he brought forward his Household Franchise (Counties) Bill, which was lost on the second reading; it was not till ten years later that the agricultural labourer was en- franchized. Among other causes which he warmly supported were women’s suffrage, a thorough reform of

metropolitan local government, and the drastic reform or abolition of the House of Lords. He was also in favour of the direct veto and other temperance legislation. In 1876 he published The Life and Letters of Lord Macaulay, one of the most admirable and most delightful of modern biographies; and in 1880 he published The Early History of Charles James Fox. In the latter year he was appointed parliamentary secretary to the Admiralty. This office he held until May 1882, when, after the assassination of Lord Frederick Cavendish, he became for two years chief secretary for Ireland. From November 1884 to June 1885 he was chancellor of the duchy of Lancaster. In February 1886 he became secretary for Scotland, but resigned on the 26th of March on account of his disagreement with some of Mr Gladstone's Irish Home Rule proposals. The same year he succeeded his father in the baronetcy. At the general

election of 1886 Sir George Trevelyan lost his seat for Hawick. As a representative of the Unionist party he took part in the Round Table Conference, and, being satisfied with the modifications made by Mr Gladstone in his Home Rule scheme, he formally rejoined the Liberal party. In August 1887 he re-entered the House of Commons as member for the Bridgeton division of Glasgow; and from 1892 to 1895 he was secretary for Scotland. Early in 1897 he resigned his seat in parliament and retired into private life. In 1899 he published the first volume of a History of the American Revolution, which was completed (3 vols.) in 1905; in the latter year, as Interludes in Prose and Verse, he republished his eajrly classical jeux d' esprit and Indian pieces. He had married in 1869 Caroline Philips, whose father was M.P. for Bury. His eldest son, Charles Philips Trevelyan (b. 1870), became Liberal M.P. for the Elland division of Yorkshire in 1899, and in 1908 was appointed parliamentary secretary to the Board of Education. The third son, George Macaulay Trevelyan (b. 1876), became well known as a brilliant historical writer, notably with two books on Garibaldi (1907 and 1909).

TREVET (or Trivet), NICHOLAS (c. 12S8-C. 1328), English chronicler, was the son of Sir Thomas Trevet (d. 1283), a judge, and became a Dominican friar. After studying at Oxford and in Paris, he spent most of his subsequent years in writing and teaching, and died about 1328. His chief work is his Annates sex regum Angliae, a chronicle of English history cover- ing the period between 1135 and 1307; this is valuable for the later part of the reign of Henry III. and especially for that of Edward I., who was the author's contemporary. A member of the same family

was Sir Thomas Trivit (d. 1383), a soldier of repute, who saw a good deal of service in France, and died in October 1383.

The Annates were published in Paris in 1668, in Oxford in 1719, and were edited by Thomas Hog for the English Historical Society in 1845. Manuscripts are at Oxford and in the British Museum. Trevet's other historical works are Catalogue regum anglo-saxonum durante heptarchia, and Les Cronicles qe frere N. Trevet escript a dame Marie (" Marie " was Edward I.'s daughter Mary). From the latter Chaucer is believed to have obtained his Man 0} Law's Tale. Trevet also wrote a number of works of a theological and philological character.

TREVI (anc. Trebiae), a town of the province of Perugia, Italy, 30 m. S.E. of Perugia and 5 m. S. of Foligno by rail. Pop. (1901), 5708. The town stands on a steep hill 1355 ft. above sea-level. Several of its churches are architec- turally interesting, especially the Madonna delle Lacrime (1487) outside the town, the elegant early Renaissance architecture of which resembles that of the Madonna del Calcinaio at Cortona, and most of them (and also the municipal picture gallery) contain paintings by artists of the Umbrian school — notably Lo Spagna, a pupil of Perugino. S. Emiliano has a group of three altars decorated with fine sculptures by Rocco da Vicenza (15 21). The ancient town is believed to have been situated 1 3 m. to the north-west, but little is known of it, and no remains save inscriptions exist.

TREVIGLIO, a town of Lombardy, Italy, in the province of Bergamo, 14 m. by rail S. by W. of that town, 410 ft. above sea-level. Pop. (1901), 5899 (town); 14,897 (commune). It has a fine church (S. Martino) containing pictures by Butinone, and Zenale (1436-1526), both natives of the town, and having a lofty campanile of the 13th and 14th centuries. It has important silk works, wool-spinning, and other manu- factories. It is a junction for Verona, Cremona and Bergamo, and steam tramways run to Monza, Lodi, &c.

TREVIRANUS, GOTTFRIED REINHOLD (1776-1837), Ger- man naturalist, was born at Bremen on the 4th of February 1776. He studied medicine at Gottingen, where he took his doctor's degree in 1796, and a year later he was appointed professor of medicine and mathematics in the Bremen Lyceum. He died at Bremen on the 16th of February 1837.

In the first of his larger works, Biologie; oder die Philosophie der

lebenden Natur, which appeared from 1802-1805, Treviranusˆgave clear expression to the theory of ” descent with modification.” He believed that simple forms (Protists), which he termed ” zoophytes,”

were ” the primitive types from which all the organisms of the higher classes had arisen by gradual development,” and he laid down as a fundamental proposition ” that all living forms are the results of physical iafluences which are still in operation, and vary only in degree and direction.” Like many after him, he directed attention to the influence of the male elements in fertilization as a source of variation, but laid emphasis only on the intra-organismal power of adaptation to surroundings. Whatever opinion be entertained in regard to the priority and the importance of the contribution made by Treviranus to the theory ot evolution, it is at least certain that he was a learned naturalist and an acute thinker. His most impor- tant later work of a synthetic nature was entitled Erscheinungen und Gesetze des organischen Lebens (1831).

His younger brother, Ltjdolph Christian Treviranus (1770-1864), studied medicine at Jena, and was successively professor of medicine at Bremen lyceum (1807), professor of natural history at Rostock (1812), professor of botany and director of the botanical garden at Breslau (1816), and professor of botany at Bonn (1830).

TREVISO (anc. Tarvisium), a town and episcopal see of Venetia, Italy, capital of the province of Treviso, 49 ft. above sea-level. Pop. (1901), 16,933 (town); 36,433 (commune). It is situated on the plain between the Gulf of Venice and the Alps, 18 m. by rail N. of Venice, at the confluence of the Sile with the Botteniga. The former flows partly round its walls, the latter through the town; and it has canal communi- cation with the lagoons. It is an old town, with narrow irregular colonnaded streets and some interesting old frescoed houses. The cathedral of San Pietro, dating from 1141 and restored and enlarged in the 15th century by Pietro Lombardo, with a classical facade of 1836, has five domes. It contains a fine “Annunciation ” by Titian (1519), an important “Adoration of the Shepherds” by Paris Bordone (born at Treviso in 1500), and frescoes by Pordenone. There are also

sculptures by Lorenzo and Battista Bregno and others. The Gothic church of San Niccolo (1310-1352) contains a fine tomb by Tullio Lombardo, and a large altarpiece by Fra Marco Pensa- bene and others; in the church and adjoining chapter-house are frescoes by Tommaso da Modena (1352), some frescoes by whom (life of S. Ursula) are also in the Museo Civico. The Monte de Picta. contains an " Entombment " by an artist of the school of Pordenone (wrongly attributed to Giorgione). The churches of S. Leonardo, S. Andrea, S. Maria Maggiore, and S. Maria Maddalena also contain art treasures. The Piazza dei Signori contains picturesque brick battlemented palaces — the Salone del Gran Consiglio (1184) and the Palazzo del Commune (1268). Treviso is the seat of various manufactures — iron- works and pottery, macaroni, cotton-spinning and rice-husking, paper, printing, brushes, brickyards, flourmills — and is the centre of a fertile district.

The ancient Tarvisium was a municipium. It lay off the main roads, and is hardly mentioned by ancient writers, though Pliny speaks of the Silis as flowing " ex montibus Tarvisanis." In the 6th century it appears as an important place and was the seat of a Lombard duke. Charlemagne made it the capital of a marquisate. It joined the Lombard league, and was in- dependent after the peace of Constance (1183) until in 1339 it came under the Venetian sway. From 1318 it was for a short time the seat of a university. In the 15th century its walls and ramparts (still extant) were renewed under the direction of Fra Giocondo, two of the gates being built by the Lombardi. Treviso was taken in 1797 by the French under Mortier (duke of Treviso). In March 1848 the Austrian garrison was driven from the town by the revolutionary party, but in the following June the town was bombarded and compelled to capitulate.

TREVITHICK, RICHARD (1771-1833), English engineer and inventor, was born on the 13th of April in the parish of Illogan, Cornwall, and was the only son of Richard Trevithick (1735-1797), manager of the Dolcoath and other important Cornish mines. He attended his first and only school at Cam- borne, and was in general a slow and obstinate scholar, though he showed considerable aptitude for figures. He inherited more than the average strength for which his family was

famous; he stood 6 ft. 2 in. in height, and his feats in wrest- ling and in lifting and throwing weights were unexampled in the district. At the age of eighteen he began to assist his father, and,

manifesting great fertility of mechanical invention, was soon recognized as the great rival of James Watt in improvements on the steam-engine {q.v.). His earliest in- vention of importance was his improved plunger pole pump (1797) for deep mining, and in 1798 he applied the principle of the plunger pole pump to the construction of a water-pressure engine, which he subsequently improved in various ways. Two years later he built a high-pressure non-condensing steam- engine, which became a successful rival of the low-pressure steam-vacuum engine of Watt. He was a precursor of George Stephenson in the construction of locomotive engines. On Christmas Eve 1801 his common road locomotive carried the first load of passengers ever conveyed by steam, and on the 24th of March 1802 he and Andrew Vivian applied for a patent for steam-engines in propelling carriages. In 1803 another steam vehicle made by him was run in the streets of London, from Leather Lane along Oxford Street to Paddington, the return journey being made by Islington. He next directed his attention to the construction of a steam locomotive for tramways, with such success that in February 1804 at Pen-yr darran in Wales he worked a tramroad locomotive which was able to haul twenty tons of iron; a similar engine was supplied to the Wylam colliery (Newcastle) in the following year. In 1808 he constructed a circular railway in London near Euston Square, on which the public were carried at the rate of twelve or fifteen miles an hour round curves of 50 or 100 ft. radius. Trevithick applied his high-pressure engine with great success to rock boring and breaking, as well as to dredging. In 1806 he entered into an engagement with the board of Trinity House, London, to lift ballast from the bottom of the Thames, at the rate of 500,000 tons a year, for a payment of 6d. a ton. A little later he was appointed to execute a driftway under the Thames, but the work was abandoned owing to the water breaking in. He then set up workshops at Limehouse, for the construction of iron tanks and buoys. He was the first to recognize the importance of iron in the construction of large ships, and in various ways his ideas also influenced the construction of steamboats. In the application of steam to agriculture his name occupies one of the chief places. A high- pressure steam threshing engine was erected by him in 18 12 at Trewithen, while in the same year, in a letter to the Board of Agriculture, he stated his belief that every part of agri- culture might be performed by steam, and that such a use of the steam-engine would ” double the population of the king- dom and make our markets the cheapest in the world.” In 1814 he entered on an agreement for the construction of engines for mines in Peru, and

to superintend their working removed to Peru in 18 16. Thence he went in 1822 to Costa Ricˆ. He returned to England in 1827, and in 1828 petitioned parliament for a reward for his inventions, but without success. He died, penniless, at Dartford on the 22nd of April 1833.

A Life of Richard Trevithick, with an account of his Inventions was published in 1872 by his third son, Francis Trevithick (1812-1877).

TREVOR, SIR JOHN (1626-1672), English politician, was a son of Sir John Trevor (d. 1673) of Trevelyn, Denbighshire. His father was a member of parliament under James I. and Charles I., and sat also in the parliaments of Oliver and of Richard Cromwell, and was a member of the council of state during the Commonwealth. One of his uncles was Sir Sackvill Trevor (d. c. 1640), a naval officer, who was knighted in 1604; and another was Sir Thomas Trevor (1 586-1656), the judge who decided in favour of the Crown in the famous case about the legality of ship-money, and was afterwards impeached and fined. Sir John Trevor was returned to parliament in 1646 as member for Flintshire. After filling several public positions under the Commonwealth and Protectorate he was a member of the coun- cil of state appointed in February 1660 and under Charles II. he rose to a high position. Having purchased the office of secretary of state he was knighted and entered upon its duties

towards the end of 1668, just after he had helped to arrange an important treaty between England and France. He married Ruth, daughter of the great John Hampden, and died on the 28th of May 1672.

His second son, Thomas, Baron Trevor (1658-1730), was knighted in 1692 as solicitor-general and in 1695 became attorney-general. In 1 701 he was appointed chief justice of the common pleas, and in 171 2 he was created a peer as Baron Trevor of Bromham. On the accession of George I. in 17 14 he was deprived of the justiceship, but from 1726 to 1730 he was lord privy seal. Three of his sons succeeded in turn to his barony, and a fourth son, Richard Trevor (1707-1771), was bishop of St Davids from 1744 to 1752, and then bishop of Durham. Robert, 4th Baron

Trevor and 1st Viscount Hampden (1706-1783), represented his country at the Hague from 1739 to 1746, during which time he maintained a regular correspondence with Horace Walpole. He took the additional name of Hampden in 1754, on succeeding to the estates of that family, and in 1776, twelve years after he had become Baron Trevcr, he was created Viscount Hampden. From 1759 to 1765 he was joint post- master-general. He wrote some Latin poems which were pub- lished at Parma in 1792 as Poemata Hampdeniana. His second son, John Hampden-Trevor (1749-1824), British minister at Munich from 1780 to 1783 and at Turin from 1783 to 1798, died only three weeks after he had succeeded his brother Thomas as 3rd Viscount Hampden, the titles becoming extinct.

Another member of this family was Sir John Trevor (1637- 1717), Speaker of the House of Commons (1685). A partisan of James II., he was deprived of his office on the accession of William III., but in 1690 he was again a member of parliament, becoming Speaker for the second time in 1690 and master of the rolls in 1693. In 1695 he was found guilty of accepting a bribe and was expelled from the House of Commons, but he re- tained his judicial position until his death on the 20th of May 1 71 7. Through his daughter Anne Sir John was the ancestor of the Hills, marquesses of Downshire, and of the family of Hill- Trevor, Viscounts Dungannon from 1766 to 1862.

TREVOUX, a town of eastern France, chief town of an arron- dissement in the department of Ain, 16 m. N..of Lyons on the Paris-Lyons railway. Pop. (1906), 1934. The town is situated on the slope of the left bank of the Saone, which is here crossed by a suspension bridge and is dominated by two towers, remains of a feudal castle of the 12th century. The fortifications date from the 14th century, and the church from the same period. The law- court is a building of the 17th century, and was once the seat of the parlement of Dombes. Trevoux has a sub-prefecture and a tribunal of first instance. Gold and silver wire-drawing, introduced into the town by Jews in the 14th century, and the manufacture of apparatus for wire-drawing, are its chief industries.

Trevoux (Trevos) was hardly known before the nth century, after which it was included in the domain of the lords of Thoire- Villars, from whom it acquired its freedom. It was bought by the Bourbons in 1402, became the capital of the Dombes, and had its own mint. In 1603 a well-known printing works was established

there, from which in the 18th century the Journal de Trevouse and a universal dictionary known as the Dictionnaire de Trtooux were issued by the Jesuits.

TRIAL, in English law, the hearing by a court of first instance of the issues of fact and law involved in a civil or criminal cause. The term is inappropriate to rehearing by an appellate court. Trial follows upon the completion of the steps necessary to bring the parties before the court and to adjust the issues upon which the court is to adjudicate, which may be summed up in the term pleading (g.v.). In England the trial is usually in open court, and it is rare to try cases in camera, or to attempt to exclude the public from the hearing. The essential part of the trial is that there should be full opportunity to both sides for evidence and argument on the questions in dispute. At present in England, as distinguished from the rest of Europe, the evidence is ordinarily taken viva voce in court, and affidavits and depositions are sparingly accepted, whereas under the xxvn. Q

continental system the bulk of the proofs in civil cases are reduced to writing before the hearing.

The modes of trial have altered with legal development in English as in Roman law (see Action). Many forms of trial, notably those by ordeal, by wager of battle or of law (see Ordeal and Wager), and by grand assize, have become obso- lete, and new forms have been created by legislation in order to meet altered circumstances of society. Up to a very recent date the tendency of the Roman and English systems was in opposite directions. In the former and in systems founded on it, such as the Scottish and French, trial by the judge became the rule, in the latter trial by judge and jury. In England the method of trial of issues of fact arising under the common law was by jury and a bench of judges. In truth the trials were the sittings of commissioners sent to inquire and report with the aid of the neighbourhood on questions of crime and civil wrongs in a county; the practice is summed up in the old phrase ad quaestionem juris judices respondeant, ad quaestionem facti juratores. In courts which administered equity or derived their law or procedure from the civil or canon law no jury was used, and the judges determined both law and fact. The system of trial before a full bench of judges even with a jury is now used on the European continent, but has been superseded in England by trial before a single judge with a jury except in the rare cases of trial at bar. This latter mode of trial is a survival of the mode

universal in the superior courts before the writ of nisi prius, and is now only used in the king's- bench division, when claimed by the Crown as of right or in cases of unusual importance and difficulty. Recent instances are the trial in 1904 of Arthur Lynch for treason in South Africa, and in 1905 of questions raised on a petition of right in respect of a claim to make the Crown responsible on the conquest of the Transvaal for acts of the Transvaal government before or during the war.

The necessity for trial by jury has been removed in many cases by legislation and rules of court (see Jury; Summary Jurisdiction), and the present English practice is summarized in the following statement.

In the High Court of Justice in England and Ireland several modes of trial are now used : —

1. Trial by judge with a jury used in the king's bench division and in probate and matrimonial cases. There is a right to have a jury as a matter of course in actions of defamation, false imprison- ment, malicious prosecution, seduction and breach of promise of marriage. In other cases, subject to exceptions to be noted, a jury can be obtained on the application of either party.

2. Trial by a judge without a jury is invariable in the chancery division and now common in the other divisions. Cases in the chancery division are not tried with a jury unless a special order is made (Ord. 36, r. 3) ; and the High Court in cases in which trial without jury could be ordered without consent (1875) still retains the power of so trying them, and has also acquired power to direct trial without a jury of any issue requiring prolonged examination of documents or accounts or scientific or local investigation.

3. Trial with assessors, usual .in admiralty cases (the assessors being nautical) but rare in other divisions.

4. Trial by an official referee in certain cases involving much detail (R.S.C.O. 36). In the county court the ordinary mode of trial is by the judge alone, but a jury of eight is allowed in certain cases on application, and in the admiralty jurisdiction marine assessors can be called in. In other local civil courts the trial is often by jury, as in the mayor's court of London, sometimes without, as in the vice-chancellor's court of the university of Oxford. In all civil cases the parties can by a proper

submission have a trial before an arbitrator selected by or for them. As regards criminal cases the right to trial by due process of law before condemnation is given by art. 29 of Magna Carta ; and the trial must be by jury unless a statute otherwise provides (see Court-Martial; Summary Jurisdiction).

The parties may be represented by lawyers, solicitor or counsel or both, according to the court, in county courts by accredited lay agents, or may conduct their case in person. The trial is carried on by stating to the court the pleadings if any and by opening the plaintiff's case. This is followed by the evidence of the witnesses, who are sworn and examined and cross-examined. On the comple- tion of the plaintiff's case and evidence, the defendant's case is stated and evidence adduced in support of it. The plaintiff or his lawyer has as a rule the reply or last word, though in some courts, described as single speech courts, no reply is given. At the conclusion the judge sums up the law and facts of the case to the jury, if there is one, and their verdict is returned, or if there is no jury

gives judgment, stating his conclusions on the law and facts involved.

There remain certain modes of trial not obsolete but rarely used. Such are impeachment of the House of Commons before the House of Lords ; and in the case of a charge of treason or felony by a person having privilege of peerage, trial on indictment before the House of Lords, or in vacation before the court of the lord high steward. Trials by certificate, by inspection and by record, are obsolete.

The decisions on a trial at first instance are reviewed by appeal (q.v.), or in trial cases heard before a jury by application for a new trial, where the judge has not directed the jury correctly as to the law or has permitted them to consider inadmissible evidence, or the jurors have in their verdict acted without evidence or against the weight, i.e. the quality not the quantity of the evidence. Under the Criminal Appeal Act 1907 the decisions in criminal trials on indictment, whether on matters of law or of fact or on mixed ques- tions of law or fact, are reviewable by the court of criminal appeal ; but that court has no

power to order a retrial of the case before a jury.

Scotland. — -Jury trial was introduced into Scotland for certain classes of civil cases in the 19th century but is not much used. In criminal cases it is used where summary jurisdiction has not been ‘conferred.

Ireland. — The law of Ireland as to trials is in substance the same as in England, except as to appeals in criminal cases.

United States. — In the United States the system of trial is that of the English common law as varied by Federal and state legislation.

(W. F. C.)

TRIANGLE, in geometry, a figure enclosed by three lines; if the lines be straight the figure is called a plane triangle; but if the figure be enclosed by lines on the surface of a sphere it is a spherical triangle. The latter are treated in Trigonometry; here we summarize the more important properties of plane triangles. In a plane triangle any one of the angular points can be regarded as the vertex; and the opposite side is called the base. The three sides and angles constitute the six elements of a triangle; it is customary to denote the angular points by capital letters and refer to the angles by these symbols; the sides are usually denoted by the lower case letter corresponding to that of the opposite angular point. Triangles can be classified according to the relative sizes of the sides or angles. An equilateral tri- angle has its three sides equal; an isosceles triangle has only two sides equal; whilst a scalene triangle has all its sides unequal. Also a right-angled triangle has one angle a right angle, the side opposite this angle being called the hypothenuse; an obtuse-angled triangle has one angle obtuse, or greater than a right angle; an acute-angled triangle has three acute angles, i.e. angles less than right angles. The triangle takes a prominent place in book i. of Euclid; whilst the relation of the triangle to certain circles is treated in book iv. (See Geometry: § Euclidean.)

The following is a summary of the Euclidean results. The angles at the base of an isosceles triangle are equal and conversely; hence it follows that an equilateral triangle is also equiangular and con- versely (i. 5, 6). If one side of a triangle be produced then the exterior angle is greater than either of the two interior opposite angles (i. 16), and equal to their sum (i. 32); hence the

sum of the three interior angles equals two right angles. (In i. 17 it is shown that any two angles are less than two right angles.) The greatest angle in a triangle is opposite the greatest side (i. 18, 19). On the identical equality of triangles Euclid proves that two tri- angles are equal in all respects when the following parts are equal each to each (a) two sides, and the included angle (i. 4), three sides (i. 8, cor.), two angles and the adjacent side, and two angles and the side opposite one of them (i. 26). The mensuration is next treated. Triangles on the same base and between the same parallels, i.e. having the same altitude, are equal in area (i. 37) ; similarly triangles on equal bases and between the same parallels are equal in area (i. 38). If a parallelogram and triangle be on the same base and between the same parallels then the area of the parallelogram is double that of the triangle (i. 41). These propositions lead to the result that the area of a triangle is one half the product of the base into the altitude. The penultimate proposition (i. 47) establishes the beautiful theorem, named after Pythagoras, that in a right-angled triangle the square on the hypothenuse equals the sum of the squares on the other two sides. Two important propositions occur in book ii. viz. 12 and 13; these may be stated in the follow- ing forms: If ABC is an obtuse-angled triangle with the obtuse angle at C and a perpendicular be drawn from the angular point A cutting the base BC produced in D, then AB 2 {i.e. square on the side subtending the obtuse angle) = BC 2 + CA 2 + 2BCCD (ii. 12); in any triangle (with the same construction but with the side AC subtending an acute angle B, we have AC 2 = AB 2 + BC 2 -2CBBD (see Trigonometry).

Book iv. deals with the circles of a triangle. To inscribe a circle in a given triangle is treated in iv. 4; to circumscribe a circle to a given triangle in iv. 5. The centre of the first circle is the intersection of the bisectors of the interior angles; if the meet of the bisectors of two exterior angles be taken, a circle can be drawn' with this point as centre to touch two sides produced and the third side ; three such circles are possible and are called the escribed circles. The centre of the circum circle is the intersection of the perpendiculars from the middle-points of the sides. Concerning the circum circle we observe that the feet of the perpendiculars drawn from any point on its circumference to the sides are collinear, the line being called Simson's line. We may here notice that the perpendiculars from the vertices of a triangle to the opposite sides are concurrent ; their meet is called the orthocentre, and the triangle obtained by joining the feet of the

perpendiculars is called the pedal triangle. Also the lines joining the middle point of the sides to the opposite vertices, or medians, are concurrent in the centroid or centre of gravity of the triangle. There are several other circles, points and lines of interest in connexion with the triangle. The most important is the ” nine point circle,” so called because it passes through (a) the middle points of the sides; (b) the feet of the perpendiculars from the vertices to the opposite sides ; and © the middle points of the lines joining the orthocentre to the angular points. This circle touches the inscribed and escribed circles. For the Brocard points and circle, Tucker’s circles — with the particular forms cosine circle, triplicate ratio (T.R.) circle, Taylor’s circle, McCay’s circles, &c, see W. J. M’Clelland, Geometry of the Circle; or Casey, Sequel to Euclid.

TRIANGLE, in music (Fr. triangle, Ger. Triangel, Ital. triangolo), an instrument of percussion of indefinite musical pitch, consisting of a triangular rod of steel, open and slightly curved at one corner. The triangle, suspended by a loop, is played by means of a steel stick with a wooden handle. Varied rhythmical effects and different grades of forte and piano can be obtained. A sort of tremolo or roll can be produced by striking each end of the tri- angle alternately in rapid succession. When the triangle is scored for on a separate staff, the treble clef is used, but it is more often included with the bass drum on the bass stave. The tone of the triangle is clear and ringing, but it should have no definite pitch. The small triangles are the best. Beethoven, Mozart, Weber and other great masters employed the instrument.

TRIASSIC SYSTEM, in geology, the lowest or youngest system of the Mesozoic era; it occupies a position above the Permian and below the Jurassic system of rocks. The principal forma- tions of the type region, Germany, are the Bunter, Muschelkalk and Keuper; these were for the first time grouped together

Triassic Period

Hypothetic*! distribution of Land & Sea

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under the systematic name ” Trias ” by F. von Alberti (1834). A description of the rocks in these formations will be found under their respective headings. For a long time this German development of the strata was regarded as typical of the period; later, however, the discovery of another more fossiliferous phase in the Alps and Mediterranean region, and subsequently in Asia and elsewhere, led geologists to take a different view of the system as a whole. It was clearly seen that there existed two distinct phases of Triassic rock-building, the one con- tinental (terrestrial and lagoonal), the other marine (pelagic).

TRIASSIC SYSTEM

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The original Trias of the ” Germanic ” area (including Great Britain) must be understood as a special local expression of the continental Trias, while the thoroughly marine type represents the normal aspect of sedimentation. Similarly, the fauna of the marine Trias is the standard for comparison with the life of other geological systems. The term Trias — indicative of the three- fold grouping in Germany — thus loses its original significance when applied to the world-wide deposits of the period; its use, however, is continued by general consent.

Continental Trias. — The records of the terrestrial and lagoonal conditions during this period are to be found in the coarse conglomer- ates, red and mottled sandstones, marls and clays with their accom- panying beds of dolomite and limestone, and layers of gypsum, anhydrite, rock-salt and coal. The coarser breccias and con- glomerates appear to represent ancient screes and shore deposits, and in part at least their formation may have been due to torrential action. The remarkable oblique bedding in many of the sandstones, coupled with the fact that the sand grains are often very perfectly rounded, points to the transporting action of wind. Even the pebbles occasionally exhibit the dreikanter form, familiar in our modern deserts. But the marls, muds and many sandy beds were certainly deposited in sheets of water, which were evidently shallow and subject to frequent periods of desiccation. Of this we have evidence in the great abundance of reptilian foot-prints, of rain pits, ripple

marks, and sun cracks upon what were once surface muds and sands. That the drying up of the water sheets repeatedly produced a highly saline condition is shown by the common occurrence of rock-salt, gypsum and anhydrite. In short, the physical conditions under which the continental Trias was formed appear to have been similar to those obtaining at the present day in the Caspian region.

In Europe the earlier deposits of the continental Trias occupy a compact area covering nearly the whole of Germany, whence they may be followed into central and northern England, Heligoland, Upper Silesia and the Vosges. Another tract lay over what are now the western Alps and south-east France; also in the Pyrenees, Balearic Islands, Sardinia, Sicily and southern Spain, and on to the north coast of Africa. In the Carpathians the same rocks appear, and they cover a large area in north-east Russia (Tartarian), and north-west Siberia. Later, the Muschelkalk limestones point to a temporary influx of the sea involving most of the above regions except Britain and Russia. Three encroachments of the sea are indicated, each followed by a period of excessive evaporation and contraction ; these happened in the time of the Roth, the Lower and the Upper Muschelkalk. Finally the last influx, that of the Rhaetic Sea, not only spread much beyond the limits of the earlier incursions but remained as the forerunner of the succeeding Jurassic waters. In North America the continental Trias appears with a close resemblance to that of western Europe along the Atlantic coastal strip from Prince Edward's Island, through New Brunswick, Nova Scotia, Connecticut, New York, Pennsylvania,- Virginia, to North Carolina. These are the rocks of the Newark series. South- wards it may be traced in Honduras, the Andes, Brazil, Argentina and Chile. Another large area in the western interior, Wyoming and New Mexico, is occupied by " red beds " (600-2000 ft., in part Permian) with gypsum and rock-salt. In southern Africa the upper part of the Karoo formation appears to represent Triassic time — the Stormberg beds (Permo-Trias) and the Beaufort beds (Rhaetic). In India the Panchet beds of the Gondvvana system and in New South Wales the Hawkesbury series (Wianametta shales with coals and iron-stone, Hawkesbury sandstone, and at the base the Narraburra beds) belong to about the same horizon. In New Zealand the Otapiri, Wairoa and Oreti series appear to contain fossils indicating a transition from Permian to Rhaetic.

The Marine or Open-sea Trias. — This type of Triassic deposit is frequently referred to under the titles " Alpine," " Mediterranean

” or ” Pelagic.” It first came into notice through the discovery of fossils in the neighbourhood of Recoaro and St Cassian on the southern side of the Alps, and these rocks were subsequently corre- lated with those at Hallstatt on the northern side. On both sides of the Alps rocks of this age flank the central core, but they are better developed, thicker and less altered towards the east than towards the west. In the western Alps Triassic beds can be only dimly recognized amongst the masses of schists called the Schistes-lustrh and Bundnerschiefer. In the eastern Alps, however, although there are sandy and conglomeratic members, such as the Werfen beds and Lunz sandstone, yet the most striking feature, in contrast with the continental Trias, is the prevalence of calcareous and dolomitic strata, to which must be added the enormously greater abundance of organic remains. The Alpine Trias varies in lithological character so rapidly from point to point, and has furthermore been subjected to so much dislocation, that great difficulty has been experienced in correlating the beds in different areas and in placing them in their proper order of sequence. The result of this difficulty has been the production of a nomenclature so unwieldy that no attempt at a detailed exposition is possible in the space here available. The principal members of the Alpine Trias will be found in their correct

relative positions in the table. One of the most striking aspects of the Alpine Trias, on both the northern and southern sides, is the great development of dolomite which is so prominent a feature in the scenery of southern Tirol (Drei Zinnern, &c). Some of these rocks contain the remains of corals, still more bear the fossils of calcareous algae, and although the view originally advanced by F. v. Richthofen that they represent Triassic coral reefs has been strongly opposed, it still seems to be the most reasonable explanation of their origin. The rocks of the marine Trias generally are argilla- ceous beds and dark limestones; in the Alpine regions many of the latter have been marmorized. The well-known white marble of Carrara in the Apuan Mountains is a metamorphosed Triassic lime- stone. The same type of Trias occurs also in south Italy (Longo- bardian), in Sicily, Barcelona, Balearic Islands, Crete, Bosnia, East Hungary, and the Carpathian Mountains by Bukovina and Dobrudja.

The Alpine-Mediterranean Trias sea evidently had a prolongation into Western Asia, for in Asia Minor, Armenia and Bokhara rocks with closely related fossils have been found. In Central Asia Triassic rocks are known in Afghanistan (sandstones with coal),

Russian Turkestan, and in the Pamir. In India the lower Trias of the Salt Range presents the most typical example of the marine deposits of this stage. The Himalayan Trias more perfectly represents the upper portion of the system. Triassic limestones are found also in Kashmir and Hazara, and shales in Baluchistan. The marine Trias is known in Burma, Tongking, China and north-east Tibet; also in Japan, Siberia and in the arctic regions of Spitsbergen and Bear Island. In the Australasiatic region the marine Trias is found in the Sunda Islands, Sumatra, Roth and Timor and in New Caledonia.

Climate, Vulcanism. — There seems little room for doubt that the climate of Triassic times was, over large tracts of the northern continental region, dry and arid in character, certain features in the flora tending to support this view. On the other hand, the southern continental deposits, with Glossopteris and its allies, is more suggestive of a moist climate. There is no evidence of the glacial condition of the preceding Permian period. The Triassic period was one of rest so far as crustal movements were concerned. Volcanic activity, however, was exhibited on a large scale in the north-western part of North America, the great batholith of the Coast Range being nearly 1000 m. long; in British Columbia and Alaska large bodies of igneous rock are supposed to belong to this period. On the eastern side of the continent the diabase and dolerite lava flows, veins and sills of the famous Palisades of the Hudson valley belong to the Newark system. In Europe and Asia igneous rocks are scarce, but tuffs, porphyrites, &c, occur in the Schlern district (Upper Cassian age) and at Falzarego Strasse, Trarenanzes (Wengen horizon), in the Alpine region.

Life of the Triassic Period. — The plant life of this period exhibits on the whole a closer relationship with the Jurassic than with the preceding Palaeozoic formations. Flowering plants are unknown in the Triassic deposits and the dominant forms are all gymnosperms, the prevailing types being ferns and fern-like plants, cycadeans, conifers and equisetums. The Palaeozoic calamites, sigillarias and lepidodendrons became extinct early in this period; but in the southern hemisphere the Glossopteris flora still held on in consider- able force. Amongst the ferns were Lepidopteris , Sagenopteris, Danaeopteris, with the Carboniferous genera Sphenopteris, Pecopteris and others. Equisetites and Schizoneura became common. Char- acteristic conifers were Voltzia, Araucarites, Brachyphyllum. The Cycadeans were represented by Pterophyllum, Cycadites, Podozamiles, &c. Baiera

was the representative of the ginkgos. Calcareous algae were important rock builders in some of the Triassic seas (Gyroporella, Diplopora). Fish remains are not generally common in the Trias; teeth and scales are crowded together in the " bone beds " in the Rhaetic and between the Keuper and Muschelkalk; in the marine Trias of the Alpine region skeletons are much more common. They are abundant also in the bituminous shales of the Connecticut Valley and in the Hawkesbury series of New South Wales. Selachians are represented by species of Hybodus, Acrodus and Palaeobates; dipnoids by Ceratodus and Gosfordia. The ganoids, with Palaeozoic as well as younger forms, include Gyrolepis, Semionotus, Dictyopyge, Graphiurus, Belonorhynchus and Pholidopleuras. Bony fish were very feebly represented. The amphibian labyrinthodonts (Stegocephalia) were numerous, their bones being found in the " bone beds " and in the Bunter and Keuper sandstones and their equivalents in North America, South Africa and India (Laby- rinthodont, Mastodonsaurus , Trematosaurus, Capitosaurus) . Their footprints are often very abundant, e.g. Cheirotherium. The reptiles of the Triassic deposits, unlike the amphibians, which are Permian in character, show a closer relationship with Jurassic forms ; one of the most interesting facts in the life-history of the group is the development during this period of sea-going forms such as at a later geological period played so prominent a part. Early crocodilian reptiles are represented by Belodon, Mystriosuchus, Slagonolepis , Parasuchus; and Rhyncocephalia by Telcrpeton and Hyperodapedon. Ichthyopterygians were represented by Mixosaurus, Nothosaurus, Cymatosaurus ; early dinosaurs (carnivorous) by Zcnclodon, Anchisaurus, Thecodontosaurus, Palaeosaurtis; the remarkable theromorphs (anomodonts), by Elginia, Dicynodon, Geikia, Gordonia.

Turtles became well established during this period (Psammochelys, Ch-elyzoon). Of great interest is the discovery of the earliest traces of mammals in the Trias of Europe, South Africa and North America. The imperfect remains (teeth and jaw-bones) do not admit of any certainty in deciphering their relationships. Microlestes from the Rhaetic of England and Wiirttemberg and Dromatherium from North America are perhaps the best known; Tritylodon from South Africa may also be added. Among the lower forms of marine life foramini- fera

and sponges play a subordinate part. Corals, which with the calcareous algae built considerable reefs in some regions, at this time began to assume a modern aspect, and henceforth the Hexacorallids took the place of the Palaeozoic Tetracorallid forms (Stylophyllum, Pinacophyllum, Thecosmilia). Crinoids were locally very numerous individually (Encrinus liliiformis, Dadocrinus gracilis). Urchins were not very common, but an important change from the Palaeozoic to the Mesozoic type of shell took place about this [time. Brachiopods were important ; rostrate forms like Terebratula and Rhynchonella from this time onward became more prevalent than broad hinged genera. Pelecypods were abundant, Myophoria, Halobia, Daonella, Pseudomonotis, Avicula, Gervillia and many others. Gasteropods also were numerous; at the beginning of the period, as in other groups, many Palaeozoic forms lingered on, but one of the main changes about this time was the development and expansion of siphonostomous forms with canaliculate shells. Quite the most important Mollusca were the Cephalopods. In the early Trias there still remained a few of the Palaeozoic genera, Orthoceras,

Hungariles, and forms which linked up the goniatites with the ammonites, which henceforth took the lead in numbers and variety. Prionolobus, Aspidites, Celtites, Meekoceras, Tirolites, Ply chiles, Tropites, Ceratites, Arcestes, Psiloceras and Flemingites are a few of the prominent Triassic genera. The nautiloids were fairly well represented, but they exhibit no such marked development from Palaeozoic to Mesozoic types as is shown among the ammonoids.

In the tabulated synopsis of the Triassic system given below it has been impossible to include many of the names of groups and subordinate divisions. Some of these, such as the term ” Noric ” (Norian), have been used in a variety of ways. A clear account of the history of the study of the Trias will be found in K. A. von Zittel’s History of Geology and Palaeontology (Eng. trans., London

1901).

References. — The literature of the Trias is very voluminous. A full account, with full references as to date of publication, in Lethaea Geognostica, ed. by F. Freeh, Theil II.; Das Mesozoicum, Bd. i. ” Einleitung des Mesozoicum und der Trias” (F. Freeh); ” Continentale Trias” (E. Philippi and J. Wysogorski), 1903; 2nd Lieferung, “Die asiatische Trias” (F. Noetling), 1905; 3rd

Lieferung, ” Die Alpine Trias des Mediterran-Gebietes ” (G. von Hathaber), Stuttgart, 1905. (J. A. H.)

TRIAZINES, in organic chemistry, a series of cyclic com- pounds, containing a ring system composed of three carbon and three nitrogen atoms. Three series are possible, the positions of

Continental Trias.

Marine Trias of the Alpine and Indian Types.

German Trias.

England.

North Alpine Region.

South Alpine Region.

Alpine Zone Fossils.

India.

America.

Rhaetic or

Magalodon

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Rhaetic

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Daonella beds

Sandstones with plants, Richmond, Virginia

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TRIAZOLES— TRIBALLI

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the various units of the ring system being illustrated in the annexed formulae: —

n/\c c/\c n/\n

cJn nIJn Cˆ/C

N N N

a-Triazines, 0-Triazines, Cyanidines.

Few simple derivatives of the a-series are known, those which have been prepared result by such reactions as the condensation of aminoguanidine or a similar type of compound (e.g. semi-carbazide) with ortho-diketones (J. Thiele, Ann., 1898, 302, p.

200):

/NH-NH 2 OC-C 6 H 5 /NH-N.

HN:C< + I -» HN:C< >C-C 6 H 5 ;

Wolff has obtained a chloro-derivative by the action of potassium cyanide on diazoacetophenone and subsequent treatment with acid. The phen-a-triazines are more numerous, and are obtained either by the action of concentrated acids on the formazyl compounds (E. Bamberger, Ber., 1893, 26, p. 2786): —

Ordinary temperature

C.H s N:N->

,N:N

‘ C-COC 6 H 6 —> C 6 H 6 NH2+C 6 H4 \N:C-COCoH 6 ;

by the reduction of symmetrical acyl-ortho-nitrophenyl hydrazines (e.g. N0 2 C 6 H 4 NH-NH-CHO); or in the form of dihydro derivatives by the condensation of aldehydes with ortho-amino-azo compounds (H. Goldschmidt and Y. Rosell, Ber., 1890, 23, p. 487), or from the aminoazo compound and a mustard oil, the resulting thiocarbanilido derivative being heated with acetic acid (M. Busch, Ber., 1899, 32, p. 2960):-

C;H

//

N-C(SH):N-C 6 H 5

V.”-NH-C 7 H 7 C. Harries {Ber., 1895,

-> C7H6:

N-C:NC 6 H 6

+H 2 S.

N-N-C 7 H 7 28, p. 1223) has also shown that oj-phenylhydrazino-acetic esters, when heated with formamide and substituted formamides under pressure, yield dihydrotri- azines: —

CO=R , R ,-.„ rHO . CO-NR’-CH .

CH 2 -N(C 6 H S)NH 2 +K iNH CMU ~* CH,-N(C,H,)-N The phen-a-triazines are yellow-coloured crystalline compounds of a somewhat basic character.

Derivatives of /3-triazines are formed by the action of nitrous acid on ortho-aminobenzylamines (M. Busch, Ber.’, 1892, 25, p. 445), or in small quantity by the action of nitrous acid on ortho-aminobenzoylphenylhydrazines (A. Konig and A. Reissert, Ber.. 1899, 32, p. 782), the chief product in this latter reaction being an isoindazolone:

XHs-XHCH, /CH 2 -NH-C,H S /CH 2 -NC,H 6

Cell/ -}CoH< ->C 6 H 4 < I

\H : -HC1 \:NC1 \N==N

The best drawn series of the triazines is the symmetrical or cyanidine series, members of which result from the condensation of acid anhydrides with aromatic amidines (A. Pinner, Ber., 1892, 25, p. 1624):

7 ,NH ..N-Cr-C.H,

2C 6 H 5 -Cf -f(CH 3 CO) 2 -> C 6 H 6 -Cf >N ;

Ns T H 2 X N :C/ CH 3

or by the condensation of aromatic nitriles with acid chlorides in the presence of aluminium chloride (Eitner and Krafft, Ber., 1892, 25, p. 2263). In using benzoyl chloride in this reaction the con- densation is found to proceed better if a little ammonium chloride be added :

2C.H,CN+C.H..C0C1 -> C *f ^^t

N-C(C,H,):N

The cyanidines behave as weak bases.

Mention may be made here of cyanuric acid, H3C3N3O3, which

contains the same ring system as the cyanidines. It was first prepared by C. Scheele and is formed when urea is strongly heated or when cyanuric chloride is treated with water. It is usually repre- sented by the inset formula and is closely related to cyanic acid and cyamelide, the

relationships existing between the three compounds being shown

in the diagram (see also A. Hantzsch, Ber., 1906, 39, p. 139):

HOC

//

N>

C5-OH

\:C/OH

Cyanic acid, CNOH,

Cyamelid (CNOH)

HO [ions ‘ Cyanuric acid’

Decomposes easily

C0 2 +NH 3

Decomposes with difficulty.

High temperature

TRIAZOLES (pyrro-a and /3’diazoles), in organic chemistry, a series of heterocyclic compounds containing the ring complex (annexed formula). Derivatives were obtained by J. A. Bladin HC=^~N\ (Ber., 1892, 25, p. 183) by the action of acetic

I yNH anhydride on dicyanophenylhydrazine. (formed

N : CH from cyanogen and phenylhydrazine), the

resulting acetyl derivative losing water and yielding phenyl-methylcyanotriazole, which, on hydrolysis, gives the free acid. By eliminating carbon dioxide, phenylmethyltriazole results. In a similar manner, formic acid and dicyanophenylhydrazine yields a phenyl-triazole carboxylic acid, in which the phenyl group may be nitrated, the nitro group reduced to the amino group, and the product oxidized to a triazole carboxylic acid, which, by elimination of carbon dioxide, yields the free triazole:

H0 2 C-C=N\ H0 2 C-C=N x H0 2 C-C=N

I >NPhˆ I >NC 6 H4NH 2 -> I NH.

NiCIK N:CH/ N:CH

They also result when the acidylthiosemicarbazides are strongly heated, the mercapto-triazoles so formed being converted into triazoles on oxidation with hydrogen peroxide (M. Freund, Ber., 1896, 29, p. 2483); by the condensation of hydrazides with acid amides; arid by the distillation of the triazolones (see below) with phosphorus pentasuiphide. The triazoles behave as weak bases, the imido-hydrogen being replaceable by metal. The keto-dihydrotriazoles or triazolones are obtained by the action of hydrazines on acetyl urethane (A. Andreocci, Ber., 1892, 25, p. 225). These compounds may be considered as 5-triazolones, a series of isomeric 3-triazolones resulting from the condensation of phenyl- semicarbazide with aromatic aldehydes in the presence of an oxidant. The diketotetrahydrotriazoles, or urazoles, are formed by condensing urea derivatives with hydrazine salts, urazole itself resulting by the action of urea or biuret on hydrazine or its salts. It behaves as a strong acid and on treatment with phosphorus pentachloride at high temperatures gives triazole.

HC— N N CO'NH x CO-NH\

i >NH, I >NH, I >NH.

HN-CO 7 N=CH/ NH-CO'

5-Triazolone. 3-Triazolone. Urazole.

Isomeric triazoles of the following constitutions are known: —
HC:N\ N:CH V N=N\

I >NH I >NH I >NH

HC:1SK N:CH/ HC:CH/

Osotriazole (aa'). Iminotriazole (/3/3'). a/3-Triazole.

The osotriazolcs are obtained by heating the osazones of orthodike-

tones with mineral acids; by the action of acetic anhydride on the

hydrazoximes of orthodiketones, or by condensing diazo-methane

with cyanogen derivatives (A. Peratones and E. Azzarello, R. Acad.

Lincei, 1907 [v.], 16, pp. 237, 318). They are feeble bases which

distil unchanged. The ring is very stable to most reagents. The

iminobiazoles are formed by conversion of diacylhydrazines into

iminochlorides which with ammonia or bases yield the required

triazoles (R. Stolle, Journ. prak. Client., 1906 [ii.], 74, pp. 1, 13).

M. Busch (Ber., 1905,38, pp. 856,4049) has isolated a series of bridged

ring compounds which he describes as erejo-iminodihydrotriazoles,

■Mp. the triphenyl derivative (annexed formula) being

op/ \cH P re P are d by condensing triphenylaminoguani-

I ˆNPriˆll ˆ' ne w ' t ˆ 1 f° rm ' c ac id. The nitrate of this base

It 11 (known as nitron) is so insoluble that nitrates

.r. . . , j may be gravimetrically estimated with its help. Tnphenyl-endo- Th * se ˆ combine > w ; th the aIkyl iodides

ufazole to yield q uaternar y ammonium salts.

TRIBALLI, in ancient geography, a Thracian people whose earliest home was near the junction of the Angrus and Brongus

(the east and west Morava), and included towards the south ” the Triballian plain ” (Herodotus iv. 49), which corresponds to the plain of Kossovo in Turkey. In 424 B.C. they were attacked by Sitalces, king of the Odrysae, who was defeated and lost his life in the engagement. On the other hand, they were overcome by the Autariatae, an Illyrian tribe; the date of

this event is uncertain (Strabo vii. 317). In 376 a large band of Triballi crossed Mt Haemus and advanced as far as Abdera; they were preparing to besiege the city, when Chabrias appeared off the coast with the Athenian fleet and compelled them to retire. In 339, when Philip II. of Macedon was return- ing from his expedition against the Scythians, the Triballi refused to allow him to pass the Haemus unless they received a share of the booty* Hostilities took place, in which Philip was defeated and nearly lost his life (Justin ix. 3), but the Triballi appear to have been subsequently subdued by him. After the death of Philip, the Triballi having taken up arms again, Alex- ander the Great in 334 crossed the Haemus and drove them to the junction of the Lyginus with the Danube. Their king Syrmus took refuge in Peuce (Peuke, an island in the Danube), whither Alexander was unable to follow him. The punishment inflicted by him upon the Getae, however, induced the Triballi to sue for peace (Arrian, Anabasis, i. 1, 4; 2, 2-4; 4, 6). About 280 a host of- Gauls under Cerethrius defeated the Getae and Triballi (Justin xxv. 1; Pausanias x. 19, 7). Nevertheless, the latter for some fifty years (135-84) caused trouble to the Roman governors of Macedonia. In the time of Ptolemy their territory is limited to the district between the Ciabrus (Tzibritza) and Utus (Vid), in the modern Bulgaria, their chief town being Oescus (Oictkos TpifiaWwv). Under Tiberius mention is made of Treballia in Moesia, and the Emperor Maximin (235- 237) had been commander of a squadron of Triballi. The name occurs for the last time during the reign of Diocletian, who dates a letter from Triballis. The Triballi are described as a wild and warlike people (Isocrates, Panathenaicus, 227), and in Aristophanes (Birds, 1 565-1693) a Triballian is introduced as a specimen of an uncivilized barbarian.

See W. Tomaschek, ” Die alten Thraker ” in Sitzungsberichte der k. Akad. der Wissenschaften, cxxviii. (Vienna, 1893).

TRIBE (Lat. tribus, from tres, three), a word which is believed to have originally meant a " third part " of the people, in reference to the three patrician orders or political divisions of the people of Ancient Rome, the Ramnes, Tities and Luceres, representing the Latin, Sabine and Etruscan settlements. Its ethnological meaning has come to be any aggregate of families or small communities which are grouped together under one chief or leader, observing similar customs and social rules, and tracing their descent from one common ancestor. Examples of such " enlarged families " are the twelve tribes of Israel. In general the tribe is the earliest form of political organization, nations being gradually constituted by tribal amalgamation. (See Family.)

TRIBERG, a town and health resort of Germany, in the grand duchy of Baden, in the Black Forest, pleasantly situated on the Gutach and surrounded by well-wooded hills, 2250 ft. above the sea, 35 m. by rail S.E. of OfTenburg. Pop. (1905), 3717. It has four churches, one of them Anglican. Triberg is one of the chief centres of the Black Forest clock-making industry. Straw-plaiting, saw-milling, brewing, and the manufacture of wooden wares are also carried on, and the town has a permanent industrial exhibition. Triberg is what is called a Lujtkurort, a place to which convalescents resort after a course of baths elsewhere. Near the town is the fine waterfall formed by the Gutach. Triberg came into the possession of Austria in 1654 and into that of Baden in 1806.

TRIBONIAN, the famous jurist and minister of Justinian, was born in Pamphylia in the latter part of the 5th century. Adopting the profession of an advocate, he came to Constan- tinople and practised in the prefectural courts there, reaching such eminence as to attract the notice of the emperor Justinian, who appointed him in 528 one of the ten commissioners directed to prepare the first Codex of imperial constitutions. In the edict creating this commission (known as Haec quae) Tribonian is named sixth, and is called " virum magnificum, magisteria dignitate inter agentes decoratum " (see Haec quae and Summa reipublicac, prefixed to the Codex.) When the commission of sixteen eminent lawyers was created in 530 for the far more

laborious and difficult duty of compiling a collection of extracts from the writings of the great jurists of the earlier empire, Tribonian was made president and no doubt general director of this board. He had already been raised to the office of quaestor, which at that time was a sort of ministry of law and justice, its

holder being the assessor of the emperor and his organ for judicial purposes, something like the English lord chancellor of the later middle ages. The instructions given to these sixteen commissioners may be found in the constitution Deo auctore (Cod. i. 17, 1), and the method in which the work was dealt with in the constitution Tanta (Cod. i. 17, 2), great praise being awarded to Tribonian, who is therein called ex- quaestor and ex-consul, and also as magister officiorum. This last constitution was issued in December 533, when the Digest was promulgated as a law-book. During the progress of the work, in January 532, there broke out in Constantinople a dis- turbance in the hippodrome, which speedily turned to a terrible insurrection, that which goes in history by the name of Nika, the watchword of the insurgents. Tribonian was accused of having prostituted his office for the purposes of gain, and the mob searched for him to put him to death (Procop. Pers. i. 24-26). Justinian, yielding for the moment, removed him from office, and appointed a certain Basilides in his place. After the suppression of the insurrection the work of codifica- tion was resumed. A little earlier than the publication of the Digest, or Pandects, there had been published another but much smaller law-book, the Institutes, prepared under Justinian's orders by Tribonian, with Theophilus and Dorotheus, professors of law (see Preface to Institutes). About the same time the emperor placed Tribonian at the head of a fourth commission, consisting of himself as chief and four others — Dorotheus, professor at Beyrut, and three practising advocates, who were directed to revise and re-edit the first Codex of imperial con- stitutions. The new Codex was published in November 534 (see constitution Cordi nobis prefixed to the Codex). With it Tribonian's work of codification was completed. But he remained Justinian's chief legal minister. He was reinstated as quaestor some time after 534 (Procop. Pers. i. 25; Anecd. 20) and seems to have held the office as long as he lived. He was evidently the prime mover in the various changes effected in the law by the novels of Justinian (Novellae constilutiones) , which became much less frequent and less important after death had removed the great jurist. The date of his death has been variously assigned to 545, 546 and 547. Procopius says (Anecd. 20) that, although he left a son and many grandchildren, Justinian confiscated part of the inheritance.

The above facts, which are all that we know about Tribonian, rest on the authority of his contemporary Procopius and of the various imperial constitutions already cited. There are, however,

two articles in the Lexicon of Suidas under the name ” Tribonianos.” They appear to be different articles, purporting to refer to different persons, and have been generally so received by the editors of Suidas and by modern legal historians. Some authorities, how- ever, as for instance Gibbon, have supposed them to refer to the same person. The first article is unquestionably meant for the jurist. It is based on Procopius, whose very words are to some extent copied, and indeed it adds nothing to what the latter tells us, except the statement that Tribonian was the son of Macedonianus, was bird Stxriyopwv ruv virapx&v, and was a heathen and atheist, wholly averse to the Christian faith. The second article says that the Tribonian to whom it refers was of Side (in Pamphylia), was also awd bui- qybpuv t&v birapxotv, was a man of learning and wrot/” various books, among which are mentioned certain astronomical treatises, a dialogue On Happiness , and two addresses to Justinian. None of these books relate to law; and the better opinion seems to be that there were two Tribonians, apparently contemporaries, though possibly some of the attributes of the jurist have been, by a mistake of the compilers or transcribers of the Lexicon of Suidas, extended to the man of letters of the same name.

The character which Procopius gives to the jurist, even if touched by personal spite, is entitled to some credence, because it is con- tained in the Histories and not in the scandalous and secret Anecdota. It is as follows: “Tribonian was a man of great natural powers, and had attained as high a culture as any one of his time; but he was greedy of money, capable of selling justice for gain, and every day he repealed or enacted some law at the instance of people who purchased this from him according to their several needs. ... He

was pleasant in manner and generally agreeable, and able by the abundance of his accomplishments to cast into shade his faults of avarice ” (Pers. i. 24, 25). In the Anecdola Procopius adds as an illustration of Justinian’s vanity the story that he took in good faith an observation made to him by Tribonian, while sitting as assessor, that he (Tribonian) greatly feared that the emperor might some day, on account of his piety, be suddenly carried up into heaven. This agrees with the character for flattery which the

minister seems to have enjoyed. The charge of heathenism we find in Suidas is probable enough ; that is to say, Tribonian may well have been a crypto-pagan, like many other eminent courtiers and litterateurs of the time (including Procopius himself), a person who, while professing Christianity, was at least indifferent to its dogmas and rites, cherishing a sentimental recollection of the older and more glorious days of the empire.

In modern times Tribonian has been, as the master workman of Justinian's codification and legislation, charged with three offences — bad Latinity, a defective arrangement of the legal matter in the Code and Digest, and a too free handling of the extracts from the older jurists included in the latter compilation. The first of these charges cannot be denied ; but it is hard to see why a lawyer of the 6th century, himself born in a Greek-speaking part of the empire, should be expected to write Latin as pure as that of the age of Cicero, or even of the age of Gaius and the Antonines. To the second charge also a plea of guiltv must be entered. The Code and Digest are badly arranged according to our notions of scientific arrangement. These, however, are modern notions. The ancients generally cared but little for what we call a philosophic distribution of topics, and Tribonian seems to have merely followed the order of the Perpetual Edict which custom had already established, and from which custom would perhaps have refused to permit him to depart. He may more fairly be blamed for not having arranged the extracts in each title of the Digest according to some rational principle; for this would have been easy, and would have spared much trouble to students and practitioners ever since. As to the third complaint, that the compilers of the Digest altered the extracts they collected, cutting out and inserting words and sentences at their own pleasure, this was a process absolutely necessary according to the instructions given them, which were to prepare a compilation representing the existing law, and to be used for the actual adminis- tration of justice in the tribunals. The so-called Emblemata (inser- tions) of Tribonian were therefore indispensable, though, of course, we cannot say whether they were always made in the best way. Upon the whole subject of the codification and legislation in which Tribonian bore a part, see Justinian.

Tribonian, from the little we know of him, would seem to have been a remarkable man, and in the front rank of the great ones of his time. There is nothing to show that he was a profound and philosophical jurist, like Papinianor Ulpian. But he was an

energetic, clear-headed man, of great practical force and skill, cultivated, accomplished, agreeable, flexible, possibly unscrupulous, just the sort of person whom a restless despot like Justinian finds useful. His interest in legal learning is proved by the fact that he had collected a vast legal library, which the compilers of the Digest found valuable (see const. Tanta).

The usual criticisms on Tribonian may be found in the Anti-Tribonianus (1567) of Francis Hotman, the aim of which is shown by its alternative title, Sive discursus in quo jurisprudential Tribon- ianeae sterilitas et legum patriarum excellentia exhibetur; and an answer to them in J. P. von Ludewig, Vita Justiniani et Theodorae, nee non Triboniani. (J. Br.)

TRIBUNE (Lat. tribunus, connected with tribus, tribe), a name assigned to officers of several different descriptions in the constitution of ancient Rome. The original tribunes were no doubt the commanders of the several contingents of cavalry and infantry which were supplied to the Roman army by the early gentilician tribes — the Tities, the Ramnes and the Luceres. In the historical period the infantry in each legion were commanded by six tribunes, and the number six is probably to be traced to the doubling of the three tribes by the incorporation of the new elements which received the names of Tities secundi, Ramnes secundi, Luceres secundi. The tribuni celcrum or commanders of the horsemen no longer existed in the later times of the republic, having died out with the decay of the genuine Roman cavalry. 1 So long as the monarchy lasted these tribunes were doubtless nominated by the commander-in-chief, the king; and the nomination passed over on the establishment of the republic to his successors, the consuls. But, as the army increased, the popular assembly insisted on having a voice in the appointments, and from 362 B.C. six tribunes were annually nominated by popular vote, while in 311 the number was raised

1 In the legends of the foundation of the republic Brutus is represented as having exercised authority, when the king was banished, merely by virtue of holding the office of tribunus celerum.

to sixteen, and in 207 to twenty-four, at which figure it remained. The tribunes thus elected sufficed for four legions and ranked as magistrates of tht Roman people, and were designated tribuni militum a populo, while those who owed their office to the consuls bore the curious title of tribuni rufuli. The name was

traced to a commander Rutilius Rufus (Liv. 7, 5; and Fest. Ep. 260), but was more probably derived from the dress (Mommsen, Staats- recht, 1, 434). The rights of the assembly passed on to the emperors, and " the military tribunes of Augustus " were still contrasted with those nominated in the camp by the actual commanders. The obscure designation tribunus aerarius (tribune of the treasury) had also, in all probability, a connexion with the early organization of the army. The officer thus designated may have been the levier of the tributum, the original property tax, and was at any rate the paymaster of the troops. The soldier who was defrauded of his pay was allowed to exact it from this tribune by a very summary process. There was still another and important class of tribunes who owed their existence to the army. In the long struggle between the patri- cian and plebeian sections of the population, the first distinctions in the public service to which the plebeians forced their way were military, and the contest for admission to the consulate was, in large part, a contest for admission to the supreme command of the national forces. In 445 B.C., the year in which mixed marriages of patricians and plebeians were for the first time permitted, power was given to the senate (then wholly patrician) of determining from year to year whether consuls or military tribunes with consular authority {tribuni militares consulari potestate or imperio) should be appointed. But, even when the senate decided in favour of electing tribunes, no election was valid without the express sanction of the senate superadded to the vote of the centuriate assembly. If it happened to be too invidious for the senate openly to cancel the election, it was possible for the patricians to obtain a decision from the sacred authorities to the effect that some religious practice had not been duly observed, and that in consequence the appointment was invalid. According to tradition, recourse was had to this device at the first election, a plebeian having been successful. Forty-five years elapsed after the creation of the office before any plebeian was permitted to fill it, and it was held by very few down to the time at which it was abolished (367 B.C.) and the plebeians were fully admitted to the consulate. The number of consular tribunes elected on each occasion varied from three to six; there was no year without a patrician, and to the patrician members were probably confined the most highly esteemed duties, those relating to the administration of the law and to religion.

But by far the most important tribunes who ever existed in the Roman community were the tribunes of the commons {tribuni

plebis). These were the most characteristic outcome of the long struggle between the two orders, the patrician and the plebeian. When in 494 B.C. the plebeian legionaries met on the Sacred Mount and bound themselves to stand by each other to the end, it was determined that the plebeians should by themselves annually appoint executive officers to stand over against the patrician officers — two tribunes (the very name commemorated the military nature of the revolt) to confront the two consuls, and two helpers called aediles to balance the two patrician helpers, the quaestors. The ancient traditions concerning the revolution are extremely confused and contradictory, and have caused endless discussions. The commonest story is that the masses assembled on the Sacred Mount bound themselves by a solemn oath to regard the persons of their tribunes and aediles as inviolable, and to treat as forfeited to Diana and Ceres, the plebeian divinities, the lives and property of those who offered them insult. That this purely plebeian oath was the real ultimate basis of the sanctity which attached to the tribunate during the whole time of its existence can hardly be believed. The revolution must have ended in something which was deemed by both the contending bodies to be a binding compact, although the lapse of time has blotted out its terms. The historian Dionysius may have been only technically wrong in supposing

that peace was concluded between the two parties by the fetial priests, with the forms adopted by Rome in making treaties with a foreign state. If this were fact, the ” sacrosanctity ” of the tribunes would be adequately explained, because all such formal foedera were ” sacrosanct.” But, notwithstanding that the plebeians may safely be assumed to have been conscious of having to a large extent sprung from another race than the patricians and their retainers, it is not likely that the feeling was sufficiently strong to permit of the compact taking the form of a treaty between alien powers. Yet there must have been a formal acceptance by the patricians of the plebeian conditions; and most probably the oath which was first sworn by the insur- gents was afterwards taken by the whole community, and the ” sacrosanctity ” of the plebeian officials became a part of the constitution. There must also have been some constitutional definition of the powers of the tribunes. These rested at first on an extension of the power of veto which the republic had

introduced. Just as one consul could invalidate an order of his colleague, so a tribune could invalidate an order of a consul, or of any officer inferior to him. There was no doubt a vague understanding that only orders which sinned against the just and established practice of the constitution should be annulled, and then only in cases affecting definite individuals. This was technically called auxilium. The cases which arose most commonly concerned the administration of justice and the levying of troops.

Although the revolution of 494 gave the tribunes a foothold in the constitution, it left them with no very definite resources against breaches of compact by the patricians. The traditional history of the tribunate from 494 to 451 B.C. is obscure, and, so far as details are concerned, nearly worthless; but there is a thread running through it which may well be truth. We hear of attacks by patricians on the newly won privileges, even of the assassination of a tribune, and of attempts on the part of the plebeians to bring patrician offenders to justice. The assembled plebeians attempt to set up a criminal jurisdiction for their own assembly parallel to that practised by the older centuriate assembly, in which the nobles possess a preponde- rating influence. Nay, more, the plebs attempts something like legislation; it passes resolutions which it hopes to force the patrician body to accept as valid. As to details, only a few are worth notice. In the first place, the number of tribunes is raised to ten, how we do not know; but apparently some consti- tutional recognition of the increase is obtained. Then an altera- tion is made in the mode of election. As to the original mode, the ancient authorities are hopelessly at variance. Some of them gravely assert that the appointment lay with the assembly of the curiae — the most ancient and certainly the most patrician in Rome, even if we allow the view, which, in spite of great names, is more than doubtful, that the plebeians were members of it at any time when it still possessed political importance. The opinion of Mommsen about the method of election is more plausible than the others. It was in accordance with the Roman spirit of order that the tribunes, in summoning their assemblies, should not ask the plebeians to come en masse as individuals, and vote by heads, but should organize their supporters in bands. The curia was certainly a territorial district, and the tribunes may have originally used it as the basis of their organization. If tribunes were elected by plebeians massed curiatim, such a meeting would easily be mistaken in later times for the comitia

curiata. At any rate, a change was introduced in 471 by the Publilian Law of Volero, which directed that the tribunes should be chosen in an assembly organized on the basis of the Servian or local tribe, instead of the curia. This assembly was the germ of the comitia tributa. The question by what authority the Law of Volero was sanctioned is difficult to answer. Possibly the law was a mere resolution of the plebeians with which the patricians did not interfere, because they did not consider that the mode of election was any concern of theirs. In the first period of the tribunate the tribunes almost certainly agitated to obtain for their supporters a share in the benefits of the state domain. And, whatever view may be taken of the movement which led

to the decemvirate, an important element in it was of a certainty the agitation carried on by the tribunes for the reduction of the law of Rome to a written code. Until they obtained this it was impossible for them effectually to protect those who appealed against harsh treatment by the consuls in their capacity of judges.

During the decemvirate the tribunate was in abeyance. Jt was called into life again by the revolution of 449, which gave the tribunes a considerably stronger position. Their personal privileges and those of the aediles were renewed, while sacrosanctity was attached to a body of men called judices decemviri, who seem to have been the legal assistants of the tribunes. The road was opened up to valid legislation by the tribunes through an assembly summoned by them on the tribe-basis (concilium plebis), but in this respect they were submitted to the control of the senate. The growth of the influence of this assembly over legislation belongs rather to the history of the comitia (q.v.) than to that of the tribunate. After the Hortensian Law of 287 B.C. down to the end of the republic the legislation of Rome was mainly in the hands of the tribunes. The details of the history of the tribunate in its second period, from 449 to 367 B.C., are hardly less obscure than those which belong to the earlier time. There was, however, on the whole, undoubtedly an advance in dignity and importance. Gradually a right was acquired of watching and interfering with the proceedings of the senate, and even with legislation. Whether the absolute right of veto had been achieved before 367 may well be doubted. But the original auxilium, or right of protecting individuals, was, during this period, undergoing a very remarkable expansion. From forbidding a single act of a magistrate in relation to a single person, the tribunes advanced to forbidding by anticipation all acts of a

certain class, whoever the persons affected by them might prove to be. It therefore became useless for the senate or the comitia to pass ordinances if a tribune was ready to forbid the magistrates to carry them out. Ultimately the mere announcement of such an intention by a tribune was sufficient to cause the obnoxious project to drop ; that is to say, the tribunes acquired a right to stop all business alike in the deliberative assembly, the senate, and in the legislative assemblies, the comitia. The technical name for this right of veto is intercessio. To what extent the tribunes during the time from 449 to 367 took part in criminal prosecutions is matter of doubt. The XII. Tables had settled that offenders could only be punished in person by the centuries, but tradition speaks of prosecutions by tribunes before the tribes where the penalty sought was pecuniary. The two main objects of the tribunes, however, at the time of which we are speaking were the opening of the con- sulate to plebeians and the regulation of the state domain in the interests of the whole community. Both were attained by the Licinio-Sextian Laws of 367.

Then a considerable change came over the tribunate. From being an opposition weapon it became an important wheel in the regular machine of state. The senate became more and more plebeian, and a new body of nobility was evolved which comprised both orders in the state. The tribunes at first belonged to the same notable plebeian families which attained to the consulate. The old friction between senate and tribunes disappeared. It was found that the tribunate served to fill some gaps in the constitution, and its power was placed by common consent on a solid constitutional basis. From 367 to 1 34 B.C. (when Tiberius Gracchus became tribune) the tribunate was for the most part a mere organ of senatorial govern- ment. As the change made by the Gracchi was rather in the practice than in the theory of the tribunate, it will be convenient at this point to give a definite sketch of the conditions and privileges attaching to the office.

Even after the difference between patrician and plebeian birth had ceased to be of much practical consequence in other directions, the plebeian character was a necessity for the tribune. When the patricians P. Sulpicius Rufus and, later, P. Clodius (the antagonist of Cicero) desired to enter on a demagogic course, they were com- pelled to divest themselves of their patrician quality by a peculiar legal process. Even the patricians who became so by mere fiat of the emperors were excluded from the tribunate. The other necessary qualifications were for the most

part such as attached to the other Roman magistracies— complete citizenship, absence of certain conditions regarded as disgraceful, fulfilment of military duties. The minimum age required for the office was, as in the case of the quaestorship, twenty-seven. The tribunate, however, stood outside the round of magistracies, the conditions of which were regulated by the Villian Law of 180 B.C. The election took place in a purely plebeian assembly, ranged by tribes, under the presidency of a tribune selected by lot. The tribune was bound by law to see a complete set of ten tribunes appointed. Technically, the tribunes were reckoned, not as magistrates of the Roman people, but as magistrates of the Roman plebs ; they therefore had no special robe of office, no lictors, but only messengers (viatores), no official chair, like the curule seat, but only benches (subsellia) . Their right to summon the plebs together, whether for the purpose of listening to a speech (in which case the meeting was a contio) or for passing ordinances (comitia tributa), was rendered absolute by the " laws under sacred sanction "

(leges sacratae), which had been incorporated with the constitution on the abolition of the decemvirate. The right to summon the senate and to lay business before it was acquired soon after 367, but was seldom exercised, as the tribunes had abundant means of securing what they wanted by pressure applied to the ordinary presidents — the consuls or the praetor. When an interregnum came about and there were no "magistrates of the Roman people," the plebeian tribunes became the proper presidents of the senate and conductors of ordinary state business. At the end of the republic there were interregna of several months' duration, when the tribunes held a position of more than usual importance. A' tenure of the tribunate did not, until a comparatively late period (probably about the time of the Second Punic War), confer a claim to a permanent seat in the senate. The candidates for the office were mainly young men of good family who were at the beginning of their political career, but the office was often filled by older men of ambition who were struggling upwards with few advantages. The plebeian aediles very soon after 367 became dissociated from the tribunes and asso- ciated with the curule aediles, so that in the political hierarchy they really ranked higher than those who were originally their superior officers.

The real kernel of the tribune's power consisted in his intercessio, or right of invalidating ordinances, whether framed by the senate or proposed by a magistrate to the comitia, or issued by a magistrate in pursuance of his office. From 367 B.C. down to the time of the Gracchi the power of veto in public matters was, on the whole, used in the interests of the aristocratic governing families to check opposi- tion arising in their own ranks. A recalcitrant consul was most readily brought to obedience by an exercise of tribunician power. But, although modern readers of the ancient historians are apt to carry away the idea that the tribunate was an intensely political office, it is safe to say that the occasions on which tribunes found it possible to play a prominent part in politics were extremely few, even in the late republic. On the other hand, the tribunes found a field for constant activity in watching the administration of justice and in rendering assistance to those who had received harsh treat- ment from the magistrates. The tribunes were, in fact, primarily legal functionaries, and constituted in a way the only court of appeal in republican Rome. It was to this end that they were forbidden to pass a whole night away from the city, except during the Latin festival on the Alban Mount, and that they were expected to keep their doors open to suppliants by night as well as by day. They held court by day in the Forum close by the Porcian basilica, and frequently made elaborate legal inquiries into cases where their help was sought. Naturally this ordinary humdrum work of the tribunes has left little mark on the pages of the historians, but we hear of it not infrequently in Cicero's speeches and in other writings which deal with legal matters. According to the general principle of the constitution, magistrates could forbid the acts of magistrates equal to or inferior to themselves. For this purpose the tribunes were deemed superior to all other officers. If a tribune exercised his veto no other tribune could annul it, for the veto could not be itself vetoed, but it was possible for another tribune to protect a definite individual from the consequences of disobedience. The number of the tribunes (ten) made it always possible that one might balk the action of another, except at times when popular feeling was strongly roused. In any case it was of little use for a tribune to move in any important matter unless he had secured the co-operation or at least the neutrality of all his colleagues. The veto was not, however, absolute in all directions. In some it was limited by statute; thus the law passed by Gaius Gracchus about the consular provinces did not permit a tribune to veto the annual decree of the senate concerning them. When there was a

dictator at the head of the state, the veto was of no avail against him. One of the important political functions of the tribunes was to conduct prosecutions of state offenders, par- ticularly ex-magistrates. These prosecutions began with a sentence pronounced by the tribune upon the culprit, whereupon, exercising the right given him by the XII. Tables, the culprit appealed. If the tribune sought to inflict punishment on the culprit's person, the appeal was to the assembly of the centuries; if he wished for a large fine, the appeal was to the assembly of the tribes. As the tribune had no right to summon the centuries, he had to obtain the necessary meetings through the urban praetor. In the other event he himself called together the tribute assembly and proposed a bill for fining the culprit. But the forms of trial gone through were very similar in both cases.

It is commonly stated that a great change passed over the tribunate at the time of the Gracchi, and that from their day to the end of the republic it was used as an instrument for setting on foot political agitation and for inducing revolutionary changes. This view is an inversion of the facts. The tribunate did not create the agitation and the revolutions, but these found vent through the tribunate, which gave to the democratic leaders the hope that acknowledged evils might be cured by constitutional means, and in the desperate struggle to realize it the best democratic tribunes strained the theoretic powers of their office to their ruin. For the bad tribunes did not hesitate to use for bad ends the powers which had been strained in the attempt to secure what was good. But herein the tribunate only fared like all other parts of the republican constitution in its last period. The consuls and the senate were at least as guilty

as the tribunes. After a severe restriction of its powers by Sulla and a restoration by Pompey, which gave a twenty years' respite, the essential force of the tribunate was merged into the imperial constitution, of which indeed it became the principal constituent on the civil side. The ten tribunes remained, with very restricted functions. The emperors did not become tribunes, but took up into their privileges the essence of the office, the " tribunician authority." This distinction between the principle of the office and the actual tenure of the office was a creation of the late republic. Pompey, for example, when he went to the East, was not made proconsul of all the Eastern provinces, but he exercised in them a "proconsular authority" which was equal to that of the actual proconsuls — an authority which was the germ of the imperial authority on its military side. Similarly the emperor, as

civil governor, without being tribune, exercised powers of like quality with the powers of the tribune, though of superior force. By virtue of his tribunician authority he acquired a veto on legislation, he became the supreme- court of appeal for the empire, and to his person was attached the ancient sacrosanctity. Augustus showed the highest statesmanship in founding his power upon a metamorphosed tribunate rather than upon a metamorphosed dictatorship, upon traditions which were democratic rather than upon traditions which were patrician and optimate. The tribunes continued to exist till a late period, with gradually vanishing dignity and rights; but it is not necessary here to trace their decay in detail.

The name " tribune " was once again illuminated by a passing glory when assumed by Cola di Rienzi. The movement which he headed was in many respects extremely like the early movements of the plebeians against the patricians, and his scheme for uniting Italy in one free republic was strangely parallel with the greatest dream of the Gracchi.

The history of the tribunate is interwoven with that of Rome, and must, to a large extent, be sought for in the same sources. The principles attaching to the office are profoundly analysed by Mommsen in his Staatsrecht, and are clearly set forth by E. Herzog in his Geschichte u. System der rOmischen Staatsverfassung (Leipzig, 1884). (J. S. R.)

TRIBUNE (med. Lat. Iribuna, from classical Lat. tribunal), in architecture, the term given to the semicircular apse of the Roman basilica, with a raised platform, where the presiding magistrate sat; subsequently applied generally to any raised structure from which speeches were delivered and to the private box of the emperor at the Circus Maximus. In Christian basilicas the term is retained for the semicircular recess behind the choir, as at S. Clemente in Rome, S. Apollinare in Classe, Ravenna, S. Zeno at Verona, S. Miniato near Florence, and other churches. The term is also loosely applied to various other raised spaces in secular as well as ecclesiastical buildings, in the latter sometimes in the place of " pulpit," as in that of the refectory of St Martin des Champs at Paris. It is also given to the celebrated octagon room of the Uffizi at Florence, and sometimes to a gallery or triforium.

TRIBUTE (Lat. tributum, a stated payment, contribution), a sum of money or other valuable thing paid by one state or person to

another state or person, either as an acknowledgment of submission, or as the price of peace or protection. Hence, in a secondary sense, an offering to mark respect or gratitude. Revenue by means of tribute was one of the most characteristic forms of the financial systems of ancient states. In imperial Athens large revenues were derived from the states of the Delian league (q.v.), while in both Carthage and Rome inferior or dependent districts and races were laid under contribution to a very considerable extent (see Finance).

The word tribute was also applied in the Roman republic to (1) certain extraordinary taxes, as opposed to the ordinary vectigalia. Such, in particular, were certain property taxes, raised to meet the expenses of war. They were levied on all citizens alike, in proportion to the extent of a man's fortune, and varied according to the total amount of revenue to be raised. (2) To the ordinary stipendium or tax of fixed amount paid either in money or in kind, on pro- perty, trades, or as a poll-tax, raised in the Roman provinces (see Province).

TRICHINOPOLY, a city and district of British India, in the Madras presidency. The city is on the right bank of the river Cauvery, 250 m. by rail S.W. from Madras. Pop. (1901), 104,721. The fori which forms the nucleus of the city measures about 1 m. by J m.; its defences have been removed. Within it rises the Rock of Trichinopoly, 273 ft. above the city, and so completely isolated as to provide a remarkable view over the surrounding plains. It is ascended by a covered stone staircase, entered by a carved gateway, and profusely ornamented. At

intervals up this stair are chambers connected with the temple on the rock. Buddhist inscriptions and carvings in some of them are attributed to the 5th or 6th century. Near the foot of the rock is a fine masonry tank called the Teppakulam, and the palace of the nawab, of which the fine domed audience hall is now used as a town-hall. In Trichinopoly is St Joseph's first-grade college, maintained by the Jesuit mission and occu- pying, among other buildings, a house formerly the residence of Clive. Another first-grade college is maintained by the Society for the Propagation of the Gospel; it has grown out of schools founded by the missionary Schwarz. The Roman Catho- lics have a fine

cathedral. Trichinopoly is important as a trading centre, especially as being a railway junction. It has special in- dustries in goldsmiths' work and modelling in pith; the well- known Trichinopoly cigars are chiefly manufactured from tobacco grown outside the district at Dindigul. Trichinopoly and its neighbourhood was the scene of much hard fighting between the English and the French during the Carnatic wars between 1749 and 1 761.

The District of Trichinopoly has an area of 3632 sq. m. The surface is generally flat, though diversified by masses of crystalline rock, of which the Trichinopoly Rock in the fort is a well-known example. The only mountains are the Pachamalais, which rise to 2500 ft. and extend into Salem district. The Cauvery and its branch, the Coleroon, are the only rivers of any importance. The climate is very hot and not liable to great variations; the annual average rainfall is about 34 in. The principal crops are rice, millets, other food-grains and oil-seeds, with a little cotton and tobacco. The main line of the South Indian railway traverses the district, with a branch to Erode. In 1901 the population was 1,444,770, showing an increase of 5 % in the decade. The district came into the hands of the British along with the rest of the Carnatic in 1801.

See Trichinopoly District Gazetteer (Madras, 1907).

TRICHINOSIS, or Trichiniasis, a disease, in man and other animals, caused by infection by the parasite trichina or trichinella spiralis. The presence of encysted trichinae in the muscles was discovered by Sir James Paget (q.v.) in 1835, and they were named by Sir R. Owen; but it was not until some years after that the clinical characters of the acute disease caused by the invasion of the parasite were discovered. This discovery was made in i860 by Friedrich von Zenker (1825-1898) on examining the abdominal muscles of a patient who died at Dresden, with symp- toms taken to be those of typhoid fever, the case being after- wards accounted one of trichinosis on the post mortem evidence. Epidemics of this disease occur from time to time, especially in north Germany, from the eating of uncooked swine's flesh, in which trichinae are not uncommon. Out of 6329 cases in Ger- many during the years 1881 to 1898, 5456 occurred in states where raw pork is a common article of food. And, from the point of view of public health, the hog is the animal which is the main source of infection, others — except rats — being only rarely infested with the parasite. The greatest care is now taken to

examine the carcases of swine for trichinae, a piece of the diaphragm of every animal being searched with the microscope by an inspector specially appointed, and the trichinous hogs being condemned. But it has not been found that this microscopic examination serves as an effective check; indeed it is apt to create a false feeling of security. Over 3 2 % of the German cases of trich- inosis between 1881 and 1898 were traced to meat so inspected and passed as free from trichinae. In America accordingly microscopic examination is not considered to give any guarantee of soundness from trichinae, in spite of a government mark " inspected and passed " (see B. H. Ransom, Circular 108 of U.S. Dep. of Agriculture, 1907). The symptoms in man are occa- sioned by the presence of the free parasites in the intestine, by the development of young trichinae from the eggs, and most of all by the migration of the parasites from the intestinal canal to the muscles, where they become quiescent. This cycle occupies from four to six weeks. Lime-salts become deposited in the capsule, the calcification rendering the cyst visible, and this change usually takes five or six months. When consumed in

small quantity, the parasites may give rise to no marked symptoms, and they are sometimes found accidentally in muscular fibre in the bodies of those who had probably experienced no definite symptoms from their invasion. In the more acute and serious cases, sometimes ending fatally, the early symptoms are nausea, failure of appetite, diarrhoea and fever; later, when the migration to the muscles begins, there is more fever, stiffness, pain and swelling in the limbs, swelling of the eyelids, continued exhausting diarrhoea, perspirations and sometimes delirium. During convalescence there is desquamation of the cuticle. The discovery by T. R. Brown of a marked leucocytosis with an extraordinary increase of eosinophiles now enables a diagnosis to be made in cases where the symptoms are obscure. If the diagnosis be made early in the case, brisk purgatives, particularly calomel, are the best treatment; if the parasites are already on their way to the muscles, the only thing left to do is to support the patient's strength. There need, however, be no fear of infection at all if the meat be thoroughly cooked and cured before eaten. This is the only effective precaution.

TRICK, a crafty or fraudulent device, deceitful artifice or stratagem, hence an exhibition of skill, especially in sleight of hand or jugglery, the term being also used of a peculiar trait or manner of speech, character or physical habit. A specific use is

that for the cards played at a single round, which are taken up and count towards the winning of the game. The origin of the word is ultimately to be found in Lat. tricae, trifles, hindrances, wiles, whence tricari, to delay, shuffle, play tricks, which has also given ” intricate,” ” extricate,” ” intrigue.” The M. Eng. trichen, to cheat or trick, was adapted from the O. Fr. trickier, trechier, whence came trecherie, Eng. ” treachery,” a betrayal of faith, perfidy or trickery of the grossest kind. There has been also a confusion, which has influenced the meaning and form of ” trick,” with the Dutch trekken, to pull, draw, cf. the South African Dutch trek, a journey, migration, properly the action of drawing a vehicle or travelling by ox-wagon. ” Trick ” or ” tricking ” is thus used, in heraldry, as the technical term for the drawing of a coat of arms in monochrome, giving the tinctures by the conventions of vertical, horizontal or diagonal lines, &c.

TRICLINIUM, in Roman antiquities, a set of three couches (lecli) arranged round a four-sided dining table, one side of which was left open to provide free access for the attendant slaves. These couches were distinguished as the highest (A, leclus summus), the middle (B, lectus medius) and the lowest (C, lectus imus) ; the guests who reclined on B had A on their left and C on their right. Each couch was usually occupied by three persons, whose left arm rested on a cushion, the right hand being thus disengaged for purposes of eating. The nine places were allotted in accordance with strict etiquette. A and B were reserved for the guests (B for the most distinguished), C for the host and his family. In A and C the chief place was 1 ; in B it was 3. which

a

e

(0

a £ S a

“5

3

2

1

B

1 summus

imus 3

2 medius

c

A

medius 2

3 imus

summus 1

was consequently the place of honour at the banquet. It was called locus consularis (vrariKOs) , probably as being next to the host. Another explanation is that, since it was on the open and unsupported side of the couch, it was chosen in order that, if a consul happened to be present among the guests, he might be able to receive communications, sign documents or transact business with the least inconvenience. It the locus classicus in Horace (Satires, ii. 8, 20-23), which describes the banquet given by Nasidienus in honour of Maecenas, the host appears

to have resigned his place to Nomentanus, as being more capable of entertaining the guest of the evening. In later republican times, after the introduction of round tables of citrus wood, the three couches were replaced by one of crescent shape (called sigma from the form C of the Greek letter; also stibadium and accubitum), which as a rule was only intended to hold five persons. The two corner seats (carnua) were the places of honour, that on the right being considered superior. The remaining seats were reckoned from left to right, so that the least important seat was on the left side of the most important. The use of the sigma continued till the middle ages. The dining-room itself was also called triclinium, and in the houses of wealthy Romans there were seve&al triclinia suited to the different seasons of the year. See Marquardt, Das Privatleben der Romer (1886), p. 302.

TRICOUPIS (or Tricoupi), CHARILAOS (1832-1896), Greek statesman, was born at Nauplia in 1832. After studying law and literature in Athens and in Paris, he was sent to London in 1852 as an attache of the Greek legation. By 1863 he had risen to be charge d'affaires, but he aimed rather at a political than a diplomatic career. In 1865, therefore, after he had concluded the negotiations for the cession by Great Britain to Greece of the Ionian Islands, he entered the Greek chamber of deputies, and in the following year was made foreign minister, at the early age of thirty-four. In 1875 he became prime minister for a few months, but had no opportunity even to begin carrying out the policy which he had in mind. This policy was to develop the resources of his country so as to create an army and a fleet, and thus to give Greece the power to acquire a leading place among the nations of south-eastern Europe. It was not until 1882 that he was able to take measures to this end. In that year he became prime minister for the third time (his second period of office, two years earlier, had lasted only for a few months), and at once set about the task of putting Greek finance upon a firmer basis, and of increasing the pros- perity of the country by making roads, railways and harbours. He was defeated at the general election in 1885, but in the following year he resumed office, and again took up the labour of economic and financial reform. His difficulties were now increased by the large expenditure which had been incurred for military preparations while he had been out of office as the result of the union effected between Bulgaria and eastern Rumelia. The Greeks had demanded from Turkey a compensa- tion for this shifting of the balance of power, and had prepared to enforce their demand by an appeal to arms. The Great Powers, however, had interfered, and by blockading the Piraeus had compelled Greece to remain quiet. Tricoupis, nevertheless, believed that he could in a few years raise the value of Greek paper currency to par, and upon that assumption all his calcula- tions were based. Unfortunately for himself and his country, he was not able to make his belief good. His dexterity in finance called forth general admiration, and his schemes for the construction of roads and railways met with a certain amount of success. But at last he was obliged to recognize that the warnings offered to him had been sound. Greece could not meet her obligations. Tricoupis tried to make terms with the creditors of his nation, but he failed in this also. The first taxation which he proposed aroused great hostility, and in January 1895 he resigned. At the general election , four months later, he and his party were defeated. He at once retired from public life, and soon

afterwards the disease declared itself which eventually proved fatal. He died at Cannes on the nth of April 1896. The faults of excessive ambition and of a far too sanguine optimism, which marked Tricoupis' character, could not prevent him from being regarded, even during his lifetime, as the foremost Greek statesman of his time. He was not a favourite with the populace, nor was he beloved so much as respected by his followers. By nature he was reserved — his nickname was " the Englishman " — and he had no sympathy with the arts of the demagogue. But, both in the ranks of his own party and by the nation at large, his abilities and his force of character were unquestioned. It was his misfortune that the

circumstances of the time did not allow his wide schemes for the benefit of his country to be carried into effect. (H. H. F.)

TRICOUPIS, SPYRIDION (1788-1873), Greek author and statesman, son of the primate of Missolonghi, was born on the 20th of April 1788. After studying in Paris and London he became private secretary to the fifth earl of Guilford, who resided in the Ionian Islands. He was a friend of Lord Byron, and pronounced his funeral oration in the cathedral of Misso- longhi (1824). During the Greek War of Independence he occupied several important administrative and diplomatic posts, being a member of the provisional government in 1826 and of the national convention at Troezen in 1827, and president of the council and minister of foreign affairs in 1832. He was thrice Greek minister ia London (1835-1838, 1841-1843 and 1850- 1861), and in 1850 envoy-extraordinary to Paris. After the Revolution he became minister of foreign affairs and of public instruction, and held portfolios in several subsequent short- lived ministries. He died on the 24th of February 1873.

A collection of his earlier religious and political orations was published in Paris in 1836. His chief work is a history of the Greek insurrection, 'laropia tˆs eWrivtKrjs tnavatn cureus (4 vols., London, 1853-1857; 2nd ed., 1862). He also wrote a martial poem, '0 Sij/xos. Iloiij/ia likexruLbv (Paris, 1821).

TRICYCLE (from prefix tri, three, and Gr. kvkKos, circle, wheel). The tricycle, as a machine for pleasure riding, has steadily diminished in relative importance since the advent of the safety bicycle (see Cycling). In its modern form it is a chain-driven rear-driver. The driving axle is provided with a differential gear, which allows of both wheels being driven whether the tricycle is

moving in a straight or in a curved path. There are four rows of balls, two near the middle resisting the pull of the driving chain and two near the road wheels supporting the vertical load. Two types of driving axle are in use. In one the axle is supported from a parallel frame tube by four short brackets. In the other type, the Starley- Abingdon axle, the frame tube is concentric with the axle, and the middle portion is enlarged to form a casing for the chain- wheel, with two apertures for the chain to pass through. The other mechanical details are nearly all similar to those on a bicycle.

Carrier tricycles, for tradesmen's delivery purposes, are made in two types, one with an extended wheel base and the carrier behind the rider, the other with a single rear driving wheel, the two steering wheels and the carrier being mounted in front on a transverse tube or frame which is jointed to the rear frame at the steering head. The second arrangement gives the simplest possible form of tricycle, but it is unsuited for touring purposes.

Tricars. — The tricar or motor tricycle was first made by removing the front wheel of a motor bicycle and replacing it by a frame carrying two side steering wheels and a seat. With a powerful engine this arrangement gives a light vehicle from which good performances are obtained on roads with easy gradients. On steeper gradients the power must be increased, and the belt drive with only one speed is inadequate. The modern tricar is on different lines, resembling a small motor car on three wheels. The engine is 6 to 10 h.p., preferably with two cylinders, air or water cooled, with clutch and gear- box giving two or three speeds, sometimes also a " reverse " speed. The transmission is usually by a chain from the engine shaft to the gear-box, thence by another chain to the rear road wheel. The frame or chassis is supported on the three road wheels by springs. The steering gear is on the same general lines as that of a motor car. The weight of a tricar of 7 to 10 h.p. is between 700 and 1000 lb. It is a much faster vehicle, especially uphill, than a small car of equal price. The rear tire, however, is subject to severer working conditions than the two driving wheel tires of a small car, and must be of adequate strength, or trouble will be frequent.

The tricar cannot be said to have attained to the same degree of trustworthiness and freedom from breakdown as the motor bicycle or motor car. The rear tire is difficult to remove, in case of puncture. The chain drive, direct from a small chain-wheel on the engine shaft, is faulty in principle. The engine shaft running

often at 2000 revolutions per minute, the chain is necessarily noisy,

and is subject to continual gradual stretching, necessitating frequent readjustment. In all respects, except speed, the tricar is inferior to the small car. (A. Sp.)

TRIDENT (Lat. tridens, Iri-, Ires, three and dens, tooth), a three-toothed or three-pronged fork or spear. It is and has been from primitive times the typical instrument for spearing fish, the Scottish " leister " (Norw. Ijoster), and was thus taken as the badge or emblem of the Greek Poseidon, the god of the sea. In Homer (cf. II. xii. 27; Od. Iv. 506 seq.) Poseidon is armed with the Tplaxva. (another word is rptodovs, cf. Pind. 01. ix. 45). The trident as the symbol of the sovereignty of the sea is found as early as Archilochus (c. 700 B.C.); a more familiar example is to be found in Aristophanes (Eq. 839). The emblematical figure of Britannia holds the trident as mistress of the sea. In the gladiatorial shows of ancient Rome the retiarius was armed with a trident as a weapon.

TRIDYMITE, a mineral consisting of silicon oxide or silica, Si0 2 , but differing from quartz in crystalline form. The crystals are small, thin hexagonal plates or scales, which are usually twinned together in groups of three; hence the name of the mineral, from Greek rpiZvpxts, triplet. The apparent hexa- gonal plates are themselves pseudo-symmetric twins of optically biaxial material, and the exact crystalline form is doubtful. The plates are colourless and transparent and have a vitreous lustre. The hardness is 7 and the specific gravity 2-3 (that of quartz being 2-65). Unlike quartz, it is soluble in a boiling solution of sodium carbonate. Tridymite occurs in the cavities of acid volcanic rocks (rhyolite, trachyte and andesite); the best-known localities are Cerro San Cristobal near Pachuca in Mexico, the Euganean Hills near Padua, and the Siebengebirge on the Rhine. Probably identical with tridymite is the form of silica known as asmanite, found in the meteorite which fell at Breitenbach in the Erzgebirge; Bohemia. (L. J. S.)

TRIER (French Treves), an ancient city of Germany, formerly the capital of an archbishopric and electorate of the empire, and now

the seat of a Roman Catholic bishop and the chief town of a governmental department in the Prussian province of the Rhine. Pop. (1885) 33,019, (1905) 46,709 (86% Roman Catholics). It is situated on the right bank of the Moselle, about 6 m. from the frontier of Luxemburg and 69 m. S.W. of Coblenz, on the main lines of railway from Coblenz to Metz and from Cologne to Saarbriicken. The city lies in a fertile valley shut in by vine-clad hills, and the picturesque red sandstone buildings of the old town are interspersed with orchards and gardens. On the north, east and south boulevards with gardens follow the line of the medieval walls, which have mostly disappeared. The Roman city extended much farther south and east.

Trier contains more important Roman remains than any other place in northern Europe. Perhaps the oldest remains are some of the piers and buttresses of the bridge over the Moselle, which may date from about 28 B.C. The well-preserved amphitheatre just outside the modern town to the south-east was probably built in the reign of Trajan or Hadrian. Its eastern side is built into the hill, its longer diameter is 76 yds., and it accommodated seven or eight thousand spectators. In 306 the emperor Constantine the Great caused multitudes of Frankish prisoners to be thrown to the beasts here, and in 313 made a similar spectacle of the captive Bructeri. The most remarkable Roman building in Trier is the Porta Nigra, the north gate of the city, a huge fortified gateway, 115 ft. long, 75 to 93 ft. high and 29 ft. deep, built of sandstone blocks blackened with age (whence the name), and held together with iron clamps. The age of this building is very uncertain; it has been assigned to dates ranging from the 1st to the 4th century a.d. It is also called the Simeonstor, after a Greek hermit who inhabited it. On his death in 1035 Archbishop Poppo converted the gate into two churches, one above the other, but all the additions except the apse have now been removed. In the south-east corner of the city are the picturesque ruins of the Roman imperial palace, and near the bridge are the extensive substructures of the 4th- century Roman baths, 660 ft. in length. On the Constantins-

platz stands the magnificent brick basilica, probably of the age of Constantine, though the south and east walls are modern. Having been converted into a palace for the Frankish kings and their deputies, it passed in 1197 to the archbishops, and was restored (1846-1856) and turned into a Protestant church. The adjoining barracks were formerly the elector's palace. Another Roman basilica forms the nucleus of the cathedral. Built under the

emperors Valentinian I. and Gratian as a quadri- lateral hall with four huge granite columns (now removed) in the centre, it was converted into a church about the close of the 4th century, and restored by Bishop Nicetius about 550. It is the most important pre-Carolingian church in Germany. Archbishop Poppo and his successors in the nth and 12th centuries extended the cathedral westwards and added an apse at each end. The vaulting of the nave and aisles and the beautiful cloisters were added in the 13th century. In the vaults are buried twenty-six archbishops and electors. Among the monuments are those of the electors Richard von Greiffen- klau (d. 1531) and Johann von Metzenhausen (d. 1540), fine examples of German Renaissance work. The most famous of the relics preserved in the cathedral is the " Holy Coat of Trier," believed by the devout to be the seamless robe of the Saviour, and said to have been discovered and presented to the city by the empress Helena. Since 1512 it has been periodi- cally exhibited. The exhibition of 1844, which was attended by more than a million pilgrims, aroused protests, resulting in the formation of the sect of German Catholics (q.v.). In 1 89 1 nearly two million pilgrims viewed the coat, and eleven miraculous cures were claimed. The cloisters connect the cathedral with the church of Our Lady (Liebfrauenkirche) , a beautiful building in the form of a circle intersected by a cross, with a lofty vault, built 1127- 1143, and said to be the oldest Gothic church in Germany.

The earliest churches were without the walls. Of these St Matthias in the south, now represented by a 12th-century building, has a Christian cemetery of the Roman age.

In the market-place is the market cross, said to date from 958, and a beautiful Renaissance fountain, the Peter sbmnnen, erected in 1595. Close by are the Steipe or Rotes Haus, formerly the town hall, of the 15th century, and the Frankenturm or propugnaculum, of the 10th century, said to be the oldest stone domestic building in Germany.

The Provincial Museum (1885-1889) contains many Roman and medieval antiquities. The town library contains about 100,000 volumes, including some valuable examples of early printing. Among its most treasured MSS. are the codex aureus, a copy of the gospels presented to the abbey of St Maximin by Ada, a reputed sister of Charlemagne, and the codex Egberti of the 10th century.

At Igel near Trier is a very remarkable Roman column, 83 ft.

high, adorned with sculptures. It dates from the 2nd century, and was the family monument of the Secundini. At Nennig is a fine Roman mosaic pavement.

The industries of Trier include iron-founding, dyeing and the manufacture of machinery. There is a school of viticulture and a very considerable trade in Moselle wines, especially during the annual auctions.

History.— Trier had had two periods of greatness, firstly as the favourite residence of Constantine the Great and his suc- cessors in the west, and secondly as the capital of a powerful spiritual electorate.

The Treveri or Treviri, from whom the city derived its name, were one of the most powerful tribes among the Belgae, and according to Julius Caesar, who conquered them in 56 B.C., possessed the best cavalry in Gaul. Attempts have been made to show that they were of German origin (see Belgae), but although they were doubtless subject to Germanic influences, they spoke a Celtic language. Their chiefs, Indutiomarus, who raised a rebellion against the Romans in 54 B.C., and his suc- cessor Cingetorix have Celtic names, and St Jerome, who had lived in Trier, declares that their language in his day (c. 370) resembled that of the Galatians. An insurrection under Julius

Florus in a.d. 21 was soon quelled. The Roman city, Augusta Treverorurn, was probably fortified by Augustus about 14 B.C., and organized as a colony about a.d. 50 in the reign of Claudius, but is not mentioned before the war of Civilis in 69 (Tacitus, Hist. iv.). At first the Treveri resisted the appeal of Civilis and his Batavi to join the revolt, and built a defensive wall from Trier to Andernach, but soon after the two Treverans, Tutor and Classicus, led their fellow tribesmen, aided by the Lingones (Langres), in the attempt to set up a ” Gallic empire.” After a brief struggle the rebels were overthrown at Trier by Cerealis, and 113 senators emigrated to Germany (70) . Towards the end of the 3rd century, the inroads of the Franks having been repelled by the emperor Probus, the city rapidly acquired wealth and importance. Mainly on account of its strategic position, Diocletian on his reorganization of the empire made Trier the

capital not only of Belgica Prima, but of the whole ” diocese ” of Gaul. For a century, from Maximian to Maximus (286-388), it was (except under Julian, who preferred to reside in Paris) the administrative centre from which Gaul, Britain and Spain were ruled, so that the poet Ausonius could describe it as the second metropolis of the empire, or ” Rome beyond the Alps.” Constantine the Great, who generally resided here from 306 to 331, and his successors also, beautified the city with public works, and villas arose upon the hill-sides.

The Church added a lustre of a different kind. Legend associated Trier with the martyrdom of part of the Theban legion (c. 286) and with the relics found by St Helena in the Holy Land. St Agritius (d. 332) is the first historical bishop. Four great saints of the 4th century are connected with the city. It was the scene of the first banishment of St Athanasius in 336. A baseless legend relates that he composed the Qui- cunque Vidt while hiding here in a cistern. St Ambrose, one of the greatest sons of Trier, was born here about 340. St Jerome’s mind was first seriously directed to religion while studying at Trier about 370, and St Martin of Tours came in 385 to plead with the tryant Maximus for the lives of the heretic Priscillian and his followers.

The Franks, who had thrice previously sacked the city, gained permanent possession of it about 455. Although some Frankish kings resided here, it gradually yielded place to Metz as a Frankish capital. The great bishop St Nicetius (528-566), who was banished for rebuking the vices of king Clotaire I. and eulogized by the poet Venantius Fortunatus, repaired the cathedral, and built a splendid castle for himself. The city passed to Lorraine in 843, and to the East Frankish king- dom in 870. It was sacked by the Northmen in 881. Hetti, who occupied the see from 814 to 847, is said to have been the first archbishop of Trier, and Radbod acquired the rights of the counts of Trier in 898, thus founding the temporal power of the see. Robert claimed in vain the right to crown the German king Otto I. in 936, on the ground of the priority of his see, and in the 10th century Archbishop Dietrich I. obtained the primacy over Gaul and Germany.

The temporal power of the archbishops was not gained without opposition. The German kings Otto IV. and Conrad IV. granted charters to the city, which however admitted the jurisdiction of its archbishop, Baldwin of Luxemburg, in 1308. This prince, a brother of the emperor Henry VII., ruled from 1307 to 1354, and was the real founder of the power of Trier. His predecessor

Diether III. of Nassau had left his lands heavily encumbered with debt. Baldwin raised them to great pros- perity by his energy and foresight, and chiefly as a result of the active political and military support he rendered to the emperors Henry VII., Louis the Bavarian and Charles IV. enlarged his dominions almost to their ultimate extent. He assumed the title of archchancellor of Gaul and Aries (or Bur- gundy), and in 13 15 admitted the claim of the archbishop of Cologne to the highest place after the archbishop of Mainz among the spiritual princes of the empire. Thenceforward the elector of Trier held the third place in the electoral college. After Baldwin's death the prosperity of Trier was checked by wars and disputes between rival claimants to the see, and in

1456 the estates united for the purpose of restoring order, and secured the right of electing their archbishops.

Throughout the middle ages the sancta civitas Trevirorum abounded in religious foundations and was a great seat of monastic learning. The university, founded in 1473, existed until" 1797. The elector Richard von Greiffenklau (1467-1531) successfully opposed the Reformation, and inaugurated the exhibitions of the holy coat, which called forth the denuncia- tions of Luther, but have continued since his day to bring wealth and celebrity to the city. In the latter half of the 16th century the direction of education fell into the hands of the Jesuits.

During the Thirty Years' War the elector Philip Christopher von Sotern favoured France, and accepted French protection in 163 1. The French in the following year expelled both Spaniards and Swedes from his territories, but in March 1635 the Spaniards recaptured Trier and took the elector prisoner. He remained in captivity for ten years, but was reinstated by the French in 1645 and confirmed in his possessions by the peace of Westphalia. The French again temporarily took Trier in 1674 and 1688.

The last elector and archbishop, Clement Wenceslaus (1768-1802), granted toleration to the Protestants in 1782, established his residence at Coblenz in 1786, and fled from the French in 1794. By the peace of Luneville in 1801 France annexed all the territories of Trier on the left bank of the Rhine, and in 1802 the elector abdicated. A new bishopric was created for the French department of the Sarre, of which Trier was the capital. The Treveran territories on the right bank of the Rhine were secularized and given to Nassau-Weilburg in 1803, and in 1814

nearly the whole of the former electoral dominions were given to Prussia. A bishopric was again founded in 1821, with nearly the same boundaries as the old archbishopric, but it was placed under Cologne. The area of the former electoral principality was 3210 sq. m., and its population in the 1 8th century was from 250,000 to 300,000. Roughly speaking, it was a broad strip of territory along the lower Saar and the Moselle from its confluence with that river to the Rhine, with a district on the right bank of the Rhine behind Ehrenbreitstein. The chief towns in addition to Trier were Coblenz, Cochem, Beilstein, Oberwesel, Lahnstein and Sayn. Far more extensive was the territory under the spiritual authority of the* arch- bishop which included the bishoprics of Metz, Toul and Verdun, and after 1777 also those of Nancy and St Die.

See E. A. Freeman's article "Augusta Treverorurn " in the British Quarterly Review for July 1875; Hettner, Das romische Trier (Trier, 1880); J. N. von Wilmowsky, Der Dom zu Trier in seinen drei Hauptperioden (Trier, 1874); S. Beissel, Geschichte der trierer Kirchen (Trier, 1888) ; " Gesta Treverorurn " (ed. G. Waitz), in Mon. Germ. hist, viii., xxiv. ; J. N. von Hontheim, Historia trevirensis diplo- matica et pragmatica (3 vols., Augsburg, 1750); Marx, Geschichte 4es Erzstifts Trier (5 vols., Trier, 1858-1864); Leonardy, Geschichte des trierischen Landes und Volkes (Saarlouis, 1871); Woerl, Fuhrer durch die Stadt Trier (8th ed., Leipzig, 1898). (A. B. Go.)

TRIESTE (Ger. Triest; Slav. Trst; the Roman Tergeste, q.v.), the principal seaport of Austria, 367 m. S.W. of Vienna by rail. Pop. (1900), 132,879, of which three-fourths are Italians, the remainder being composed of Germans, Jews, Greeks, English and French. Trieste is situated at the north- east angle of the Adriatic Sea, on the Gulf of Trieste, and is picturesquely built on terraces at the foot of the Karst hills. The aspect of the town is Italian rather than German. It is divided into the old and the new town, which are connected by the broad and handsome Via del Corso, the busiest street in the town. The old town, nestling round the Schlossberg, the hill on which the castle stands, consists of narrow, steep and irregular streets. The castle, built in 1680, is believed to occupy the site of the Roman capitol. The new town, which lies on the flat expanse adjoining the crescent-shaped bay, partly on ground that has been reclaimed from the sea, has large and regularly built streets, and several large squares adorned with artistic monuments. The cathedral of San Giusto was formed as it now stands by the union in the 14th

century of three adjacent early Christian buildings of the 6th century;

the tower incorporates portions of a Roman temple. The church of Santa Maria Maggiore, built in 1627-1682, is a charac- teristic specimen of Jesuit architecture; the church of Sant' Antonio Nuovo, built in 1827-1849, is in the Greek style, as also •the Greek Orthodox church, built in 1782, which is one of the handsomest Byzantine structures in the whole of Austria. Among the most prominent secular buildings are: the Tergesteo, a huge edifice containing a cruciform arcade roofed with glass, where the exchange is established, besides numerous shops and offices; the town-hall, rebuilt in 1874, with the handsome hall of the local Diet; the imposing old exchange, now the seat of the chamber of commerce; the palatial offices of the Austrian Lloyd, the principal shipping company; the commercial and nautical academy, with its natural history museum, containing the complete fauna of the Adriatic Sea; and finally the municipal museum, Revoltella, are all worth mentioning. The Museo Lapidario contains a collection of Roman antiquities found in or near the town. It is an open-air museum, installed in a disused burial-ground, and is situated near the castle. The Arco di Riccardo, which derives its name from a popular delusion that it was connected with Richard Coeur-de-Lion, is believed by some to be a Roman triumphal arch, but is probably an arch of a Roman aqueduct.

At the head of the industrial establishments of Trieste stand the two ship-building yards of the Austrian Lloyd and of the Stabili- mento Tecnico Triestino, which are the largest of their kind in Austria. The Stabilimento Tecnico is also fitted up for the con- struction of war-ships. They are equipped with all the latest technical innovations, and employ over 5000 workmen. Petroleum refineries, iron-foundries, chemicals, soap-boiling, silk-spinning and the pro- duction of ships' fittings, as marine steam boilers, anchors, chains, cables, are the other principal branches of industry. Several marble quarries are worked in the neighbourhood, and there are some large cement factories. Good wine, fruit and olive oil are the most important natural products of the country round Trieste.

The great importance of Trieste lies in its trade. It is the first port of Austria, and the principal outlet for the over-sea trade of the monarchy. It may be said nearly to monopolize the trade of the Adriatic, and has long eclipsed its ancient rival Venice. It owes its development to its geographical situation in the north-east, angle of the Adriatic Sea at the end of the deeply indented gulf, and to its harbour, which was more accessible to large vessels than that of Venice. Besides, it was declared a free imperial port in 1719, and was therefore released from the obstructions to trade contained in the hampering legislation of the period. It was deprived of this privilege in 1891, when only the harbour was declared to be outside the customs limit. But during the last thirty years of the 19th century the increase in its trade was the lowest in comparison with the increase in the other great European ports. This was due in the first place to the lack of adequate railway communica- tion with the interior of Austria, to the loss of part of the Levant trade through the development of the Oriental railway system, to the diversion of traffic towards the Italian and German ports, and finally to the growing rivalry of the neighbouring port of Fiume, whose interests were vigorously promoted by the Hungarian govern- ment. But in the 20th century a more active policy was inaugur- ated. New and direct services were started to East Africa , Central America and Mexico; the service to India and the Far East, as well as that to the Mediterranean ports, was much improved; and lastly, Trieste was made the centre of the large emigration from Austria to America by the inauguration (June 1904) of a direct emigrant service to New York. But the most important measure, designed to give a great impetus to the trade of Trieste, and to the over-sea trade of Austria generally, was the construction of the so-called second railway connexion with Trieste, begun in 1901. This measure provided for the construction of a railway over the Tauern Mountains between Schwarzach in Salzburg and Mollbrucken in Carinthia; and of a railway over the Karawanken between Trieste and Klagen- furt, with a branch to Villach. The total length of both lines is 100 m. The Karawanken railway, a direct connexion with Bohemia and the northern industrial provinces of Austria, is calculated to counteract the gravitation of traffic towards the German ports; while the Tauern railway constitutes the shortest route to the interior of Austria and to the south of Germany. By the new line the distance between Salzburg, for instance, and Trieste, is lessened by 160 m.

In order to accommodate the increase in traffic resulting from the

above improvements, important works for the extension and develop- ment of the harbour were undertaken, and part of them were com- pleted in 1910. The capacious harbour, consisting of two parts, the old and the new, is protected by extensive moles and breakwaters. The new harbour was constructed in 1867-1883, at a cost of £1,500,000. The new additions to the harbour, which are

situated at the south end, were designed to give more than double the receiving capacity of the port, and were estimated to cost £3,625,000. The bulk of the over-sea trade of Trieste is done with the Levant, Egypt, India and the Far East, Italy, Great Britain and North and South America. Its most important trade by land, besides Austria, is done with Germany, Trieste being the entrepSt for Germany's commerce with India and the Mediterranean countries. The principal articles imported are cotton and cotton goods, coffee-, coal, cereals, hides, fruit and tobacco ; the principal articles exported are wool and woollen goods, sugar, paper, timber, machinery and various manufactured goods.

About 4 m. north-west of Trieste on the very edge of the sea is the famous castle of Miramar, built in 18 54-1 8 56 in the Norman style, for the archduke Maximilian, the ill-fated emperor of Mexico. It belongs now to the emperor of Austria, and its beautiful gardens are open to the public. About 4 m. north- east of Trieste is the village of Opcina, which possesses an obelisk 1 146 ft. high, from which a beautiful view is obtained.

The town of Trieste, with its adjoining territory of a total area of 36 sq. m., forms a separate Austrian crown land. It had in 1900 a population of 178,672, of which 77 % were Italians, 18% Slovenes and 5% Germans. The municipal council of Trieste constitutes at the same time the local Diet of the crown land, and is composed of 54 members. To the Reichsrat ffieste sends five deputies. Trieste is the seat of a Roman Catholic bishop, and the seat of the administration for the Kiistenland or littoral, composed of the crown lands of Trieste, Gorz and Gradisca, and Istria.

History. — At the time of the foundation of Aquileia by the Romans, the district which now includes Trieste was occupied by Celtic and Ulyrian tribes; and the Roman colony of Tergeste (q.v.) does not seem to have been established till the reign of Vespasian. After the break-up of the Roman dominion Trieste

shared the general fortunes of Istria and passed through various hands. From the emperor Lothair it received an independent existence under its count-bishops, and it maintained this position down to its capture by Venice in 1203. For the next 180 years its history consists chiefly of a series of conflicts with this city, which were finally put an end to by Trieste placing itself in 1382 under the protection of Leopold III. of Austria. The overlordship thus established insensibly developed into actual possession; and except in the Napoleonic period (1797- 1805 and 1809-1813) Trieste has since remained an integral part of the Austrian dominions. It was an imperial free port from 1719 until 1891. The harbour was blockaded by an Italian fleet from May until August 1848. During the Italian and Hungarian revolutions Trieste remained faithful to Austria, and received the title of Cilia Fedelissima. In 1867 Trieste and the adjoining territory was constituted into a separate crown land. In 1888 a monument was erected in commemoration of the 500th anniversary of the connexion of the town with Austria.

Giulio Caprin, Trieste (Bergamo, 1906) ; Mainati's Croniche ossia memorie stor.- sacro- profane di Trieste (7 vols., Venice, 1817-1818); Lowenthal, Gesch. der Stadt Triest (Trieste, 1857); Delia Croce, Storia di Trieste (ibid., 1879); Scussa, Storia cronografica di Trieste (ibid., new ed., 1885-1886); Neumann-Spallart, Osterreichs maritime Entwicklung und die Hebung von Triest (Stuttgart, 1882); Die bsterreich-ungarische Monarchie: Das Kiistenland (Vienna, 1891); Montanelli, 77 Movimento storico delta popolazione di Trieste (1905); Hartleben, Fuhrer durch Triest und Umgebung (5th ed., Vienna, 1905).

TRIFORIUM, an architectural term, the origin of which is unknown but probably derived from " thoroughfarum," as it was used as a passage from one end of the building to the other. The derivation from Lat. tres, tri, three, and/ori.s„door, entrance, does not seem appropriate. The earliest examples are those in the pagan basilicas, where it constituted an upper galley for conversation and business; in the early Christian basilicas it was usually reserved for women, and the same applied to those in the Greek Byzantine Church. In Romanesque and Gothic buildings it is either a spacious gallery over the side aisles or is reduced to a simple passage in the thickness of the walls; in either case it forms an important architectural division in the

nave of the cathedral or church, and being of less height gives more importance to the ground storey or nave arcade. In consequence of its less height it was usually divided into two arches, which were again subdivided into two smaller arches and these subdivisions increased the scale. On account of the richness of its mouldings and carved ornament in the sculpture introduced in the spandrils, it became the most highly decorated feature of the interior, the triforium at Lincoln being one of the most beautiful compositions of Gothic architecture. Even when reduced to a simple passage it was always a highly enriched feature. In the 15th-century churches in England, when the roof over the aisles was comparatively flat, more height being required for the clerestory win'dows, the triforium was dispensed with altogether. In the great cathedrals and abbeys the triforium was often occupied by persons who came to witness various ceremonies, and in early days was probably utilized by the monks and clergy for work connected with the church.

From the constructive point of view, the triforium sometimes served very important functions, as under its roof exist arches and vaults carried from the nave to the outer wall, to which they trans- mitted the thrust of the nave vault; even when the flying buttress was frankly adopted by the Gothic architect and emphasized by its architectural design as an important feature, other cross arches were introduced under the roof to strengthen it.

TRIGLYPH (Gr. rpeis, three, and y\v

TRIGONOMETRY (from Gr. rpiywvov, a triangle, p-trpov, measure), the branch of mathematics which is concerned with the measurement of plane and spherical triangles, that is, with the determination of three of the parts of such triangles when the numerical values of the other three parts are given. Since any plane triangle can be divided into right-angled triangles, the solution of all plane triangles can be reduced to that of right-angled triangles; moreover, according to the theory of similar triangles, the ratios between pairs of sides of a right- angled triangle depend only upon the magnitude of the acute angles of the triangle, and may therefore be regarded as functions of either of these angles. The primary object of trigonometry, therefore, requires a classification and numerical tabulation of these functions of an angular magnitude; the science is, however, now

understood to include the complete investigation not only of such of the properties of these functions as are necessary for the theoretical and practical solution of triangles but also of all their analytical properties. It appears that the solution of spherical triangles is effected by means of the same functions as are required in the case of plane triangles. The trigonometrical functions are employed in many branches of mathematical and physical science not directly concerned with the measurement of angles, and hence arises the importance of analytical trigonometry. The solution of triangles of which the sides are geodesic lines on a spheroidal surface requires the introduction of other functions than those required for the solution of triangles on a plane or spherical surface, and there- fore gives rise to a new branch of science, which is from analogy frequently called spheroidal trigonometry. Every new class of surfaces which may be considered would have in this ex- tended sense a trigonometry of its own, which would consist in an investigation of the nature and properties of the functions necessary for the measurement of the sides and angles of triangles bounded by geodesies drawn on such surfaces.

History

Trigonometry, in its essential form of showing how to deduce the values of the angles and sides of a triangle when other angles and sides are given, is an invention of the Greeks. It found its origin in the computations demanded for the reduction of astronomical observations and in other problems connected

with astronomical science; and since spherical triangles specially occur, it happened tha't spherical trigonometry was developed before the simpler plane trigonometry. Certain theorems were invented and utilized by Hipparchus, but material progress was not recorded until Ptolemy collated, amended and developed the work of his predecessors. In book xi. of the Almagest the principles of spherical trigonometry are stated in the form of a few simple and useful lemmas; plane trigonometry does not receive systematic treatment although several theorems and problems are stated incidentally. The solution of triangles necessitated the construction of tables of chords — the equivalent of our modern tables of sines; Ptolemy treats this subject in book i., stating several theorems relating to multiple angles, and by ingenious methods successfully deducing approximate results. He did not invent the idea of tables of chords, for, on the authority of Theon, the principle had been

stated by Hipparchus (see Ptolemy).

The Indians, who were much more apt calculators than the Greeks, availed themselves of the Greek geometry which came from Alexandria, and made it the basis of trigonometrical calculations. The principal improvement which they introduced consists in the formation of tables of half-chords or sines instead of chords. Like the Greeks, they divided the circumference of the circle into 360 degrees or 21,600 minutes, and they found the length in minutes of the arc which can be straightened out into the radius to be 3438. The value of the ratio of the circumference of the circle to the diameter used to make this determination is 62832 : 20000, or 7r = 3-i4i6, which value was given by the astronomer Aryabhata (476-550) in a work called Aryabhaiya, written in verse, which was republished 1 in Sanskrit by Dr Kern at Leiden in 1874. The rela- tions between the sines and cosines of the same and of complementary arcs were known, and the formula sin 50. = V{i7i9(3438-cosa)J was applied to the determination of the sine of a half angle when the sine and cosine of the whole angle were known. In the Surya-Siddhanta, an astronomical treatise which has been translated by Ebenezer Bourgess in vol. vi. of the Journal of the American Oriental Society (New Haven, i860), the sines of angles at an interval of 3 45′ up to 90 are given; these were probably obtained from the sines of 6o° and 45° by continual application of the dimidiary formula given above and by the use of the complementary angle. The values sin I5° = 890’, sin 7 3o’ = 449’_, sin 3 45′ = 225′ were thus obtained. Now the angle 3 45′ is itself 225’; thus the arc and the sine of fe of the circumference were found to be the same, and consequently special importance was attached to this arc, which was called the right sine. From the tables of sines of angles at intervals of 3 45′ the law expressed by the equation sin (« + 1.225’) -sin (re. 225’) = sin (re. 225’)

I A • (» • 225’)

sin (re 1 .225’) -sin 22 £

was discovered empirically, and used for the purpose of recalculation. Bhaskara (fl. 1 150) used the method, to which we have now returned, of expressing sines and cosines as fractions of the radius; he obtained the more correct values sin 3° 45′ = 100/1529, cos 3 45′ =466/467, and showed how to form a table, according to degrees, from the values sin i° = 10/573, cos l0 = 6568/6569, which are much more accurate than Ptolemy’s

values. The Indians did not apply their trigonometrical knowledge to the solution of triangles; for astronomical purposes they solved right-angled plane and spherical triangles by geometry.

The Arabs were acquainted with Ptolemy's Almagest, and they probably learned from the Indians the use of the sine. The celebrated astronomer of Batnae, Albategnius (q.v.), who died in a.d. 929-930, and whose Tables were translated in the 12th century by Plato of Tivoli into Latin, under the title De scientia stellartim, employed the sine regularly, and was fully conscious of the advantage of the sine over the chord; indeed, he remarks that the continual doubling is saved by the use of the former. He was the first to calculate sin from the equation sin 0/cos 4> = k, and he also made a table of the length of shadows of a vertical object of height 12 for altitudes i°, 2°, ... of the sun; this is a sort of cotangent table. He was acquainted not only with the triangle formulae in the Alma- gest, but also with the formula cos a = cos b cos c + sin b sin c cos A for a spherical triangle ABC. Abu'1-Wafa of Bagdad (b. 940) was the first to introduce the tangent as an independent function: his " umbra " is the half of the tangent of the double arc, and the secant he defines as the " diameter umbrae." He em- ployed the umbra to find the angle from a table and not merely as an abbreviation for sin/cos; this improvement was, however, afterwards forgotten, and the tangent was reinvented in the 15th century. Ibn Yunos of Cairo, who died in 1008, showed even more skill than Albategnius in the solution of problems in spherical trigonometry and gave improved approximate formulae for the calculation of sines. Among the West Arabs, Geber (q.v.), who live d

'See also vol. ii. of the Asiatic Researches (Calcutta).

at Seville in the nth century', wrote an astronomy in nine books, which was translated into Latb in the 12th century by Gerard of Cremona and was published in 1534. The first book contains a trigonometry which is a considerable improvement on that in the Almagest. He gave proofs of the formulae for right-angled spherical triangles, depending on a rule of four quantities, instead of Ptolemy's rule of six quantities. The formulae cos B = cos b sin A, cos c — cot A cot B, in a triangle of which C is a

right angle had escaped the notice of Ptolemy and were given for the first time by Geber. Strangely enough, he made no progress in plane trigonometry. Arrachel, a Spanish Arab who lived in the 12th century, wrote a work of which we have an analysis by Purbach, in which, like the Indians, he made the sine and the arc for the value 3 45′ coincide.

Georg Purbach (1423-1461), professor of mathematics at Vienna, wrote a work entitled Tractatus super propositiones Ptolemaei de sinubus el chordis (Nuremberg, 1541). This treatise consists of a development of Arrachel's method of interpolation for the calcula- tion of tables of sines, and was published by Regiomontanus at the end of one of his works. Johannes Mtiller (1436-1476), known as Regiomontanus, was a pupil of Purbach and taught astronomy at Padua; he wrote an exposition of the Almagest, and a more im- portant work, De triangulis plants et sphericis cum tabulis sinuum, which was published in 1533, a later edition appearing in 1561. He reinvented the tangent and calculated a table of tangents for each degree, but did not make any practical applications of this table, and did not use formulae involving the tangent. His work was the first complete European treatise on trigonometry, and contains a number of interesting problems; but his methods were in some respects behind those of the Arabs. Copernicus (1473-1543) gave the first simple demonstration of the fundamental formula of spherical trigonometry ; the Trigonometria Copernici was published by Rheticus in 1542. George Joachim (1514-1576), known as Rheticus, wrote Opus palatinum de triangulis (see Tables, Mathematical), which contains tables of sines, tangents and secants of arcs at intervals of 10″ from 0° to 90°. His method of calculation depends upon the formulae which give sin na and cos na in terms of the sines and cosines of (n — i)a and (n — 2)a; thus these formulae may be regarded as due to him. Rheticus found the formulae for the sines of the half and third of an angle in terms of the sine of the whole angle. In 1599 there appeared an important work by Bartholomew Pitiscus (1561-1613), entitled Trigonometriae sen De dimensione triangulorum; this contained several important theorems on the trigonometrical functions of two angles, some of which had been given before by Finck, Landsberg (or Lansberghe de Meuleblecke) and Adriaan van Roomen. Frangois Viete or Vieta (1540-1603) employed the equation (2 cos i4 >) 3 — 3(2 cos \4 >) = 2 cos # to solve the cubic x 3 — 3a 2 x = a 2 6(a > Ji) ; he obtained, however, only one root of the cubic. In 1593 Van Roomen proposed, as a

problem for all mathematicians, to solve the equation

45J'-3795>' 3 +956343' 5 – ••• +945y 41 -45/ 3 +y 6 = C. Vieta gave y = 2 sin ˆ~, where C = 2 sin <£, as a solution, and also twenty-two of the ether solutions, but he failed to obtain the negative roots. In his work Ad angulares sectiones. Vieta gave formulae for the chords of multiples of a given arc in terms of the chord of the simple arc.

A new stage in the development of the science was commenced after John Napier's invention of logarithms in 1614. Napier also simplified the solution of spherical triangles by his well-known analogies and by his rules for the solution of right-angled triangles. The first tables of logarithmic sines and tangents were constructed by Edmund Gunter (1581-1626), professor of astronomy at Gresham College, London; he was also the first to employ the expressions cosine, cotangent and cosecant for the sine, tangent and secant of the complement of an arc. A treatise by Albert Girard (1590- 1634), published at the Hague in 1626, contains the theorems which give areas of spherical triangles and polygons, and applications of the properties of the supplementary triangles to the reduction of the number of different cases in the solution of spherical triangles. He used the notation sin, tan, sec for the sine, tangent and secant of an arc. In the second half of the 17th century the theory of infinite series was developed by John Wallis, Gregory, Mercator, and afterwards by Newton and Leibnitz. In the Analysis per aequationes numero terminorum infinitas, which was written before 1669, Newton gave the series for the arc in powers of its sine; from this he obtained the series for the sine and cosine in powers of the arc; but these series were given in such a form that the law of the formation of the coefficients was hidden. James Gregory discovered in 1670 the series for the arc in powers of the tangent and for the tangent and secant in powers of the arc. The first of these series was also discovered independently by Leibnitz in 1673, and published without proof in the Acta eruditorum for 1682. The series for the sine in powers of the arc he published in 1693; this he obtained by differentiation of a series with undetermined coefficients.

In the 18th century the science began to take a more analytical form; evidence of this is given in the works of Kresa in 1720 and Mayer in 1727. Friedrich Wilhelm v. Oppel's Analysis triangulorum (1746) was the first complete work on analytical trigonometry. None of these mathematicians used the notation

sin, cos, tan, which is the more surprising in the case of Oppel, since Leonhard Euler

had in 1744 employed it in a memoir in the Acta eruditorum. Jean Bernoulli was the first to obtain real results by the use of the symbol V — 1; he published in 17 12 the general formula for tan ntf> in terms of tan , which he obtained by means of transformation of the arc into imaginary logarithms. The greatest advance was, however, made by Euler, who brought the science in all essential respects into the state in which it is at present. He introduced the present notation into general use, whereas until his time the trigonometrical functions had been, except by Girard, indicated by special letters, and had been regarded as certain straight lines the absolute lengths of which depended on the radius of the circle in which they were drawn. Euler's great improvement consisted in his regarding the sine, cosine, &c, as functions of the angle only, thereby giving to equations connecting these functions a purely analytical interpretation, instead of a geometrical one as heretofore. The exponential values of the sine and cosine, De Moivre's theorem, and a great number of other analytical properties of the trigono- metrical functions, are due to Euler, most of whose writings are to be found in the Memoirs of the St 'Petersburg Academy. Plane Trigonometry.

1. Imagine a straight line terminated at a fixed point 0, and initially coincident with a fixed straight line OA , to revolve round 0,

and finally to take up any

position OB. We shall sup- Conception ˆ -~\ B

pose that, when this revolv- ofAn 2′ es ing straight line is turning ^^JLto. in one direction, say that

opposite to that in which the hands of ,

a clock turn, it is describing a positive f rz |A

angle, and when it is turning in the other

direction it is describing a negative

angle. Before finally taking up the

position OB the straight line may have

passed any number of times through the

position OB, making any number of B

complete revolutions round in either pi G . Ig

direction. Each time that the straight

line makes a complete revolution round we consider it to have described four right angles, taken with the positive or negative sign , according to the direction in which it has revolved ; thus, when it stops in the position OB, it may have revolved through any one of an infinite number of positive or negative angles any two of which differ from one another by a positive or negative multiple of four right angles, and all of which have the same bounding lines OA and OB. If OB' is the final position of the revolving line, the smallest positive angle which can have been described is that described by the revolving line making more than one-half and less than the whole of a complete revolution, so that in this case we have a positive angle greater than two and less than four right angles. We have thus shown how we may conceive an angle not restricted to be less than two right angles, but of any positive or negative magnitude, to be generated.

2. Two systems of numerical measurement of angular magnitudes are in ordinary use. For practical measurements the sexagesimal system is the one employed : the ninetieth part of a right „ . ˆ angle is taken as the unit and is called a degree; the V,"™/™* degree is divided into sixty equal parts called minutes ; meat -f ' and the minute into sixty equal parts called seconds; Anmlar angles smaller than a second are usually measured as jftJzBJtudes decimals of a second, the "thirds," "fourths," &c, not

being in ordinary use. In the common notation an angle, for example, of 120 degrees, 17 minutes and 14-36 seconds is written 120 17′ 14-36". The decimal system measurement of angles has never come into ordinary use. In analytical trigonometry the circular measure of an angle is employed. In this system the unit angle or radian is the angle subtended at the centre of a circle by an arc equal in length to the radius. The constancy of this angle follows from the geometrical propositions — (1) the circumferencei of different circles vary as their radii ; (2) in the same circle angles ai the centre are proportional to the arcs

which subtend them. It thus follows that the radian is an angle independent of the particular circle used in defining it. The constant ratio of the circumferenC of a circle to its diameter is a number incommensurable with unity, usually denoted by t. We shall indicate later on some of th< methods which have been employed to approximate to the value of this number. Its value to 20 places is 3-l4I59 26 535 8 9793 2 3 8 46; its reciprocal to the same number of places is 0-3 1 83098861 8379067 1 53. In circular measure every angle is measured by the ratio which it bears to the unit angle. Two right angles are measured by the number it, and, since the same angle is 180 , we see that the number of degrees in an angle of circular measure is obtained from the formula 180X0/71-. The value of the radian has been found to 41 places of decimals by Glaisher (Proc. London Math. Soc. vol. iv.) ; the value of i/jt, from which the unit can easily be calculated, is given to 140 places of decimals in Grunerts Archiv (1841), vol. i. To 10 decimal places the value of the unit angle is 57° 17′ 44-8062470964". The unit of circular measure is too large to be convenient for practical purposes, but its use introduces a simplification into the series in analytical trigonometry, owing to the fact that the sine of

an angle and the angle itself in this measure, when the magnitude of the angle is indefinitely diminished, are ultimately in a ratio of equality.

3. If a point moves from a position A to another position B on a straight line, it has described a length AB of the straight line. It „. . is convenient to have a simple mode of indicating in £*°. . which direction on the straight line the length AB has an l'nflnite ˆ een described ; this may be done by supposing that a Straight P om t moving in one specified direction is describing Line a positive length, and when moving in the opposite

direction a negative length. Thus, if a point moving from A to B is moving in' the positive direction, we consider the length AB as positive; and, since a point moving from B to A is moving in the negative direction, we consider the length BA as negative. Hence any portion of an infinite straight line is con- sidered to be positive or negative according to the direction in which we suppose this portion to be described by a moving point; which

direction is the positive one is, of course, a matter of convention.

If perpendiculars AL, BM be drawn from two points, A, B on an >' straight line, not necessarily in the same plane with AB, the

length LM, taken with the positive or negative sign

,l,?'L s , according to the convention as stated above, is called

of straight thc pro j ect ; on f AB on t h e given straight line; the

»ˆh S /.(h«, projection of BA being ML has the opposite sign to the

eacnoiner. pro j ection of AB If tw0 po i nts A, B be joined by a

number of lines in any manner, the algebraical sum of the projections of all these lines is LM — that is, the same as the projection of AB. Hence the sum of the projections of all the sides, taken in order, of any closed polygon, not necessarily plane, on any straight line, is zero. This principle of projections we shall apply below to obtain some of the most important propositions in trigonometry.

4. Let us now return to the conception of the generation of an angle as in fig. 1. Draw BOB' at right angles to and equal to AA'. Definition ˆ° s ˆ a " su PP ose tnat tne direction from A' to A is the „f 7v,w.„„ >. positive one for the straight line AOA', and that from metrical Functions.

B'

Fig. 2.

to B for BOB'. Suppose OP of fixed length, equal to OA, and let PM, PN be drawn perpendicular to A' A, B'B respectively; then OM and ON, taken with their proper signs, are the projections of OP on A' A and B'B. The

ratio of the projection of OP on B'B to the absolute length of OP is dependent only on the magnitude of the angle POA, and is called the sine of that angle; ' the ratio of the projection of OP on A' A to the length OP is called the cosine of the angle POA . The ratio of the sine of an angle to its cosine is called the tangent of the angle, and that of the cosine to the sine the cotangent of the angle ; the reciprocal of the cosine is called the secant, and that of sine the cosecant of the angle. These functions of an angle of

magnitude a are denoted by sin a, cos a, tan o, cot a, sec a, cosec a respectively. If any straight line RS be drawn parallel to OP, the projection of RS on either of the straight lines A' A, B'B can be easilv seen to bear to RS the same ratios which the corresponding projections of OP bear to OP; thus, if a be the angle which RS makes with A' A, the projections of RS on A' A, B'B are RS cos a and RS sin a respectively, where RS denotes the absolute, length RS. It must be observed that the line SR is to be considered as parallel not to OP but to OP", and therefore makes an angle ir+a with A' A ; this is consistent with the fact that the projections of SR are of opposite sign to those of RS. By observing the signs of the projections of OP for the positions P, P', P", P"' of P we see that the sine and cosine of the angle POA are both positive; the sine of the angle P'OA is positive and its cosine is negative; both the sine and the cosine of the angle P"OA are negative; and the sine of the angle P"'OA is negative and its cosine positive. If a be the numerical value of the smallest angle of which OP and OA are boundaries, we see that, since these straight lines also bound all the angles 2nir--a, where n is any positive or negative integer, the sines and cosines of all the,-e angles are the same as the sine and cosine of a. Hence the sine of any angle 2/ix+a is positive if a is between o and ir and negative if a is between ir and 27r, and the cosine of the same angle is positive if a is between o and {ir or \ir and 2ir and negative if a is between \ir and -i!ir.

In fig. 2 the angle POA is a, the angle P"'OA is a, P'OA is 7t — a, P"OA is 7r|-a, POB is \ir — a. By observing the signs of the projections we see that

sin(— a) = — sin a, sinf/ir — a) ~sin a, sin (ir+a)-* — sin a, cos(— 0) =cos a, coslr — a) «= —cos a, cos(ir-f-a) *» —cos a, sin(J-jr — a) =cos a, cos(Jir — a) =sin o. Also sin(iir-fa) =sin(ir — {ir — a) = sin(iir — a) = cos a,

coi({ir--a) = — cos(x— jit — a) = — cos({ir — a) = —sin a.

From these equations we have tan(— 0) = — tan o, tan(ir— a) = — tan a,tan (tt+o)= — tan a, tan(|ir — a) =cot a, tan {{ir--a} — —cot a, with corresponding equations for the cotangent.

The only angles for which the projection of OP on B'B is the same as for the given angle POA are the two sets of angles bounded by OP, OA and OP', OA; these angles are 2nir-{-a and 2wj—f (ir — a), and are all included in the formula rir+(— i) r a, where r is any integer'; this therefore is the formula for all angles having

the same sine as a. The only angles which have the same cosine as a are those bounded by OA , OP and OA , 0P f “, and these are all included in the formula 2»x ± a. Similarly it can be shown that nir--a includes all the angles which have the same tangent as a.

From the Pythagorean theorem, the sum of the squares of the projections of any straight line upon two straight lines at right angles to one another is equal to the square on the p e / a f/ ns projected line, we get sin 2 a + cos 2 a = I, and from this between by the help of the definitions of the other functions we trigono- deduce the relations I + tan 2 a = sec 2 a, I + cot 2 a = metrical cosecV. We have now six relations between the six Functions. functions; fthese enable us to express any five of these functions in terms of the sixth. The following table shows the values of the trigonometrical functions of the angles o,{ir, ir, |ir, 2ir, and the signs of the functions of angles between these values; / denotes numerical increase and D numerical decrease: —

Angle .

0...{ir

{ir

{■K...TT

IT

7T...|>7r

:?*-

3ir...27T

2ir

Sine .

+/

I

+D

-/

— I

-D

Cosine

1

＋L＞

-I

— I

-D

＋1

I

Tangent .

＋1

±00

-D

＋1

±oo

-D

Cotangent

±00

＋L＞

-I

±00

＋D

-I

±00

Secant

1

+1

±00

-D

— I

-I

±00

+D

I

Cosecant .

±00

+D

I

+1

± 00

-D

— I

-I

±00

The correctness of the table may be verified from the figure by con- sidering the magnitudes of the projections of OP for different positions.

The following table shows the sine and cosine of some angles for which the values of the functions may be obtained geometrically :—

sine

cosine

7T

12

7T

15° 18°

V6～-V2

4

V6＋V2

4

75°

72

5

IT

2

T

V10＋2V5

10

4

4

5

7T

“6

IT

1

30° 36°

1

2

_i3

2

V5 + 1

4

6o°

54°

1

— ir

3

Vio — 2V5

4

1

1

7T

45°

\2

V2

45°

1

— ir

, 4

cosine

sine

4

These are obtained as follows. (1) \ir. The sine and cosine of this angle are equal to one another, since sin Va l” es of i7r = cos {{ir — \ir); and since the sum of the squares trigoao- of the sine and cosine is unity each is i/V 2. (2) %ir and \ir. 1I etr J?f Consider an equilateral triangle; the projection of one ˆunctions side on another is obviously half a side ; hence the cosine ? r some of an angle of the triangle is { or cos iir = {, and from a X es ‘ this the sine is found. (3) x/io, x/5, 271-/5, 3?r/io. In the triangle constructed in Euc. iv. 10 each angle at the base is \ir, and the vertical angle isj?r. If a be a side and b the base, we have by the construction a(a — b) = b-; hence 26 = 0 (V5 — 1); the sine of ir/io is bJ2a or KV5 — 1), and cos \ir is aj2b = \ (V5 + l)-

(4) ˆo ir, /oir. Consider a right-angled triangle, having an angle Jtt.

Bisect this angle, then the opposite side is cut by the bisector in the ratio of V3 to 2 ; hence the length of the smaller segment

is to that of the whole in the ratio of V3 to V3 + 2, therefore

tan 1 1 2 jt = {V3/(V3 + 2)} tan Jx or tan -, 1 – 2 7r = 2-V3, and from this

we can obtain sin jW and cos ˆ»7r.

5. Draw a straight line OD making any angle A with a fixed

straight line OA, and draw OF making

an angle B with OD this Formalae

angle being measured post- for slne and

lively in the same direction Cosl „ eof

as A ; draw FJb. a perpen- Sum gni}

dicular on DO (produced if DlffereBce ot

necessary). The projection _ , , „

of OF on OA is the sum of ˆ» Angles.

the projections of OE and EF on OA. E

Now OE is the projection of OF on DO, i

and is therefore equal to OF cos B, and EF is the projection of OF

on a straight line making an angle + iv with OD, and is therefore

equal to OF sin B ; hence

OF cos (A+B)=OE cos A EF cos (%■*■ A)

— OF (cos A cos B — sin A. sin 5),

or cos (A +B) =cos A cos 5 — sin 4 sin B.

The angles A, B are absolutely unrestricted in magnitude, and thus

this formula is perfectly general. We may change the sign of B, thus

cos (A— B)=cosA cos (— B) — sin A sin (— B),

or cos (A — B) = cos A cos B+sin A sin B.

If we projected the sides of the triangle OEF on a straight line making

an angle +J?r with OA we should obtain the formulae

sin 04 ±B) = sin A cos 5=*= cos A sin B,

which are really contained in the cosine formula, since we may put

Jx— B for B. The formulae

, . _. tan A ± tan B . , , DN cot /I cot B =f i tanM*g)- IaFtan ˆ tan g , cot (*4 ± B) = cQt g±cot A

are immediately deducible from the above formulae. The equations sin C-fsin D = 2 sin h(C + D) cos £(C-Z >), sin C-sin Z? = 2 sin i(C-Z >) cos'i(C + I >), cos*9-t-cos C = 2 cos \(C + D) cos |(C— Z?), cos D— cos C = 2 sin KC-h-D) sin i(C— D), may be obtained directly by the method of projections. Take two equal straight lines OC, OD, making angles C, D, with OA, and draw OE perpendicular to CD. The angle which OE makes with OA is i(C + D) and that which DC makes is \(w--C--D); the angle COE is i(C-D). The sum of the pro- jections of OD and DE on OA is equal to that of OE, and the sum of the projections of OC and CE is equal to that of OE; hence the sum of the pro- jections of OC and OD is twice that of OE, or cos C + cos D — 2 cos \{C--D) cos i(C — D). The difference of the "\ projections of OD and OC an OA p is equal to twice that of ED, hence

' ■*■ we have the formula cos D — cos C

= 2 sin \{C--D) sin J(C— D). The other two formulae will be obtained by projecting on a straight line inclined at an angle + k* to OA.

As another example of the use of projections, we will find t he su m of the series cos o + cos (a + |8) + cos (a + 2/3)-)- . . . + cos (a + w — 1/3). Suppose an unclosed polygon each angle of which is x— /3 to be inscribed in a circle, and let A, As, *4 2 , A 3 , . . ., A n be w + i consecutive angular points; let D be the diameter of the circle; and suppose a straight line drawn making an angle a with *4*4i, then a + /3, a-f-2/3, . . . are the angles it makes with A\ A2, w e ha ve by projections

P)

Sum of Series of Cosines In Arithmetical Progression.

A 2, A a , . . . AA n cos (a-H»

Formulae for Sloe and Cosine of Sum of Angles.

AAi [cos a + cos a + ff + ... + cos a + {n — l)jS}, also AAi = D sin §/3, AA n = D sin |»/3;

hence the sum of the series of co sines is

cos {a--%n — 1 /S) sin Jnˆ cosec J|S. By a double application of the addition formulae we may obtain the formulae

sin (Ai + A^ + As) = sin *4i cos *4 2 cos *4 3 + cos *4i sin ^2 cos A z --cos A\ cos *4j sin Ai

— sin *4i sin *4 2 sin /1 3; cos (*4i + *42-r-*4 3) = cos Ai cos *4 2 cos *4 3

—cos *4i sin /I2 sin *4 3 — sin *4i cos *42 sin *4 3

— sin *4i sin A% cos ^3-

We can by induction extend these formulae to the case of n angles. Assume sin (A1 + A2 + . . . + A„) = Si—S 3 + Si,— . . . cos(Ai + A t + . . . + A„) = S -S i + S i – . . . where S r denotes the sum of the products of the sines of r of the angles and the cosines of the remaining » — r angles; then we have sin {A1 + A2 + . . . + A n + A„ + 1) = cos A„ + i{S!— S3 + S5— . . .)

+ sin An + i(So — S2 + Si~- . . .). The right-hand side of this equation may be written

(5i cos , 4„ + t + 5 sin . 4^.1) — (5 3 cos ^4„ + i-f5 2 sin v4„ + i) + . . ., or S-S' 3 + . . .

where S' r denotes the quantity which corresponds for n + l angles to S r for n angles ; similarly we may proceed with the cosine formula. The theorems are true for n — 2 and » = 3; thus they are true generally. The formulae

cos 2*4 = cos 2 A — sin 2 *4 = 2 cos 2 A — 1 = 1 — 2 sin 2 A,

sin 2/1 = 2 sin A cos A , tan 2 A =

Formulae for Multiple and Sub- Multiple Angles.

I— tan 2 A

sin3.4 = 3 sin /I —4 sin 3 A, cos 3*4 = 4 cos 3 A – n(n — i)(n — 2)

3!

■3 cos A,

sin nA = n cos" -1 A sin A —

-cos n_3 *4 sinM +

-1)

(rt-2r)

*j (ft — I ˆ

cos nA = cos”*4 ˆ-— j — – cos n ~ 2 A sin 2 *4 +

2!

+ (->

, n(n — i) . . . (» — 2r + i) 2r!

cos”” * ˆ4 sin* ˆ +

may all be deduced from the addition formulae by making the

angles all equal. From the last two formulae we obtain by division

«(«- i)(»- 2) , , ,.. «(“- r) ...(»- 2/> ,,.

3 , ■ tan3 A + ...+(1) (2 , +l) i

tan nA ˆ

2!

tan« A + ...+(– J>

w(w – 1). . .(« – 2r+l)

tan* A + .

In the particular case of w = 3 we have tan 3*4

3 tan A —tan 3 A _

1—3 tan 2 A

The values of sin \A , cos \A , tan \A are given in terms of cos A by the formulae

cos A\l , A , ,ˆ„ /i-fcos *4\

sin \ A = { — \

)v (LzS2LAy

tan i

cos \A-{- :— cos *4\

D'(i±ˆi) ? ,

c 1 / i— cos *4 \ ?

sin i*4 =

tan i*4 =

i'-

-o)(S -b)(S – C)j 3 ,

(2r + i)!

cos »-2r-l ˆ s i n 8r+l ˆ t

+cos *4y

where ˆ> is the integral part of *4/27r, g the integral part of A \2it---,

and r the integral part of A/tt.

Sin 1*4 , cos |*4 are given ,(in terms of sin A by the formulae 2 sin §*4 = (-i)?'(l+sin 4) + (-l)«'(I -sin *4)i, 2 cos|*4 = (i)#'(i +sinˆ)*(-lK(i-sin A)i,

where p' is the integral part of A/2tt + j and q' the integral part of

*4/2x-i

6. In any plane triangle *4BC we will denote the lengths of the sides BC, CA, AB by a, b, c respectively, and the angles B*4C, *4BC, A CB by A, B, C respectively. The fact that the projec- - tions of b and c on a straight line perpendicular to the ^^? e side a are equal to one another is expressed by the equa- J ranges. tion b sin C = c sin B\ this equation and the one obtained by projecting c and a on a straight line perpendicular to a may be written a/sin *4=&/sin B=c/sin C. The equation a — b cos C+c cos B expresses the fact that the side o is equal to the sum of the

projections of the sides b and c on itself; thus we obtain the equations

a = b cos C--c cos Bl b = c cos *4 --a cos C S c = a cos B-j-6 cos *4J

If we multiply the first of these equations by —a, the second by b, and the third by c, and add the resulting equations, we obtain the formula b 2 +c 2 — a 2 = 2bc cos A or cos A = (6 2 +c 2 — a 2)/2fcc, which gives the cosine of an angle in terms of the sides. From this expression for cos A the formulae

where 5 denotes %(a-\rb-{-c), can be deduced by means of the dimidiary formula.

From any general relation between the sides and angles of a triangle other relations may be deduced by various methods of transformation, of which we give two examples.

a. In any general relation between the sines and cosines of the angles A, B, C of a triangle we may substitute pA+qB+rC, rA--pB +qC, qA+rB+pC for A, B, C respectively, where p, q, r are any quantities such that p+q+r + i is a positive or negative multiple of 6, provided that we change the signs of all the sines. Suppose p--q--r + l ~6n, then the sum of the three angles 2«tt – {pA +qB +rC), 2Mtt – 0*4 +pB +qC), 2Mtt – (qA +rB +pC) is tt ; and, since the given relation follows from the condition *4-fB + C = x, we may substitute for A, B, C respectively any angles of which the sum is x; thus the transformation is admissible.

0. It may easily be shown that the sides and angles of the triangle formed by joining the feet of the perpendiculars from the angular points A, B, C on the opposite sides of the triangle *4BC are respectively a cos *4, b cos B, c cos C, x — 2*4, x — 2B, x — 2C; we may therefore substitute these expressions for a, b, c, A, B, C respectively in any general formula. By drawing the perpendiculars ofthis second triangle and joining their feet as before, we obtain a triangle of which the sides are — a cos A cos 2*4,-6 cos B cos 2B, — c cos C cos 2C and the angles are 4*4 — x, 4B — x, 4C— x; we may therefore substitute these expressions for the sides and angles of the original triangle; for example, we obtain thus the formula

. _ a 2 cos 2 A cos 2 2*4 -5 2 cos 2 B cos 2 2B-c 2 cos 2 C cos 2 2C cos 4 ~ 2bc cos B cos C cos 2B cos 2C

This transformation obviously admits of further exten- sion. Solution of

(1) The three sides of a triangle *4BC being given, Triangles. the angles can be determined by the formula

L tan \A = io+| log (s-b) + i log (s-c)-i log s-$ log (s~d) and two corresponding formulae for the other angles.

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Circles of a Triangle.

(2) The two sides a, b and the included angle C being given, the angles A , B can be determined from the formulae

A+B = t-C, L tan l(A-B)=\og (a -6) -log (a +6) + £ cot -JC. and the side c is then obtained from the formula log e = log a+L sin C—L sin A,

(3) The two sides a, b and the angle A being given, the value of sin B may be found by means of the formula

L sin B=L sin A+log b — log a; this gives two supplementary values of the angle B, if b sin A < a. If b sin .4 > a there is no solution, and if b sin A = o there is one solution. In the case b sin A < a, both values of B give solutions provided b > a, but the acute value only of B is admissible if b < a. The other side c can be then determined as in case (2).

(4) If two angles A, B and a side a are given, the angle C is de- termined from the formula C — ic—A—B and the side b from the formula log 6= log a+L sin B—L sin A.

The area of a triangle is half the product of Areas of a s ˆ e j nto t jj e p er p e ndicular from the opposite Triangles angle on that side; thus we obtain the expressions aadQuadri- ibcs . jnAt {s{s _ a) (j _J) (j _ c) } ■ f or the are a of a

ra *’ triangle. A large collection of formulae for the area of a triangle are given in the Annals of Mathematics for 1885 by M. Baker.

Let a, b, c, d denote the lengths of the sides AB, BC, CD, DA

respectively of any plane quadrilateral and A + C = 2a; we may obtain an expression for the area S of the quadrilateral in terms of the sides and the angle a.

We have 2S = ad sin A + bc sin(2a— A)

and %(a > + d?-&-c*) = ad cos A-bc cos (2a- A);

hence ± S ! + \(a? + tP-b' l -c-y- = o:d + b li c , '—2abcd cos 20. If 25 = a + b + c + d, the value of 5 may be written in the form 5 = \s(s — a)(s — b)(s— c)(s— d)— abed cos 2 a|*. Let R denote the radius of the circumscribed circle, r of the in- scribed, and n, n, r % of the escribed circles of a triangle Radii of Or- ABC; the values of these radii are given by the follow- cumscribed, i ng formulae: — Inscribed R = abc US = a/2 sin A ,

a " d ^. S "f ed r = S/* = (s-a)tan \A = \R sin \A sin \B sin \C, ' " r l = S/(s — a) = s tan J < 4 = 4-R sin \A cos \B cos \C.

Spherical Trigonometry. . We shall throughout assume such elementary propositions in spherical geometry as are required for the purpose of the investiga tion of formulae given below.

A spherical triangle is the portion of the surface of a sphere bounded by three arcs of great circles of the sphere. If BC, CA, AB denote these arcs, the circular measure of the fShZ an s'es subtended by these arcs respectively at the of spherical centre f t j, e sphere are the sides a, b, c of the spherical image. triangle ABC; and, if the portions of planes passing through these arcs and the centre of the sphere be drawn, the angles between the portions of planes intersecting at A,B, C respectively are the angles A, B, C of the spherical triangle. It is not necessary to consider triangles in which a side is greater than w, since we may replace such a side by the remaining arc of the great circle to A aclat d wm 'ch 't belongs. Since two great circles intersect Triaovles eacn other in two points, there are eight triangles of ' which the sides are arcs of the same three great circles. If we consider one cf these triangles ABC as the fundamental one, then one of the others is equal in all respects to ABC, and the remaining six have each one side equal to, or common with, a side of the triangle ABC, the opposite angle equal to the corre- sponding angle of ABC, and the other sides and angles supple- mentary to the corresponding sides and angles of ABC. These rriangles may be called the associated triangles of the fundamental one ABC. It follows that from any general formula

containing the sides and angles of a spherical triangle we may obtain other formulae by replacing two sides and the two angles opposite to them by their supplements, the remaining side and the remaining angle being unaltered, for such formulae are obtained by applying the given formulae to the associated triangles.

If A', B' ', C are those poles of the arcs BC, CA, AB respectively v, hich lie upon the same sides of them as the opposite angles A, B, C, then the triangle A'B'C is called the polar triangle of the triangle ABC. The sides of the polar triangle are ir — A, ir — B, 7t — C, and the angles ir — fl, ir — b, ir—c. Hence from any general formula connecting the sides and angles of a spherical triangle we may obtain another formula by changing each side into the supplement of the opposite 7n angle and each angle into the supple- ment of the opposite side. C — ˆ~-ˆLˆ 8 – Let O be the centre of the sphere

C on which is the spherical triangle

p IG – ABC. Draw AL perpendicular to OC

and AM perpendicular to the plane

OBC. Then the projection of OA on OB is the sum of the projections of OL, LM, MA on the_ same straight line. Since AM has no projection on any straight line in the p unia . plane OBC, this gives angles. mental

OA cos c-OL cos a + LM sin a. Equations

Now OL = OA cos b, LM = AL cos C-OA sin b cos C; between therefore cos c = cos o cos o + sin a sin b cos C. Sides and

We may obtain similar formulae by interchanging the Angles. letters a, b, c, thus

cos a— cos b cos c + sin 6 sin c cos A) cos b = cos c cos a + sin e sin a cos B y (1)

cos c = cos a cos &-j-sin a sin b cos C) These formulae (1) may be regarded as the fundamental equations connecting the sides and angles of a spherical triangle ; all the other relations which we shall give below may be deduced analytically from them ; we shall, however, in most cases give independent proofs. By using the polar triangle transformation we have the formulae

cos A = —cos B cos C+sin B sin C cos a cos B = —cos C cos A +sin C sin A cos b cos C= —cos A cos .B-j-sin A sin B cos c

(2)

In the figures we have AM = AL sin C = r sin b sin C, where r

denotes the radius of the sphere. By drawing a perpendicular

from A on OB, we may in a similar manner show that AM =

r sin c sin B,

therefore sin B sin c=sin C sin 6.

By interchanging the sides we have the equation

sin A sin B sin C sin a ~ sin b ~ sin c

(3)

If we eliminate cos b

we shall find below a symmetrical form for k. between the first two formulae of (1) we have

cos a sin 2 e = sin b sin c cos A +sin c cos c sin a cos B therefore cot a sin c = (sin i/sin a) cos A +cos c cos B

= sin B cot A -f-cos c cos B. We thus have the six equations

cot a sin b=cot A sin C+cos b cos C cot b sin a = cot B sin C +cos a cos C cot b sin c =cot B sin A -j-cos c cos A cot c sin b =cot C sin A +cos b cos A cot c sin a = cot C sin J3+cos a cos B cot a sin c = cot A sin iJ+cos c cos B- When C = §x formula (1) gives

cos c = cos a cos b sin b=sin B sin c) sin a = sin A sin c \ tan o=tan A sin b = tan c cos B\ tan b =tan B sin a =tan c cos A \ cos c = cot A cot B cos A =cos A sin B cos B=cos b sin A

and (3) gives

from (4) we get

The formulae and

(4)

(7)

w

(r)

follow at once from (a), (/3), (7). These are the formulae which are used for the solution of right-angled triangles. Napier gave mnemonical rules for remembering them.

The following proposition follows easily from the theorem in equation (3) : If AD, BE, CF are three arcs drawn through A , B, C to meet the opposite sides in D, E, F respectively, and if these arcs pass through a point, the segments of the sides satisfy the relation sin BD sin CE sin AF = sin CD sin AE sin BF; and conversely if this relation is satisfied the arcs pass through a point. From this theorem it follows that the three perpendiculars from the angles on the opposite sides,' the three bisectors of the angles, and the three arcs from the angles to the middle points of the opposite sides through a point.

9. If D be the point of intersection of the three bisectors of the angles A, B, C, and if DE be drawn perpendicular to BC, it may be shown that BE = f(o + c – 6) and CE = i(a + b-c), and that the angles BDE, ADC are supplementary. We have

sin c sin ADB sin b sin ADC

also

sin BD sin \A sin CD

sin BD sin CD sin CDE sin BDE

each pass

Formula} tor Sine and Cosine of Half Angles.

therefore sin 2 \A

sin \A But sin BD sin BDE = sin BE

= sin \{a--c therefore

sin b sin c

-b), and sin CD sin CD£ = sin C£ = sin \(a+b-c) A \ sin |(a+c — b) sin J (a +b—c)

■ j.

sin b sin c J

Apply this formula to the associated triangle of which -k—A, ir — B, C are the angles and ir — a, ir — b, c are the sides; we obtain A j sin |(6 +c— a) sin \{a + b+c) } j ,,^

the formula

I

sin sin c

By division we have

A S sin |(a-f-c — b) sin -|(a+&

-c))i

sin Hb+c-a) sin l(a +b+c) J (7)

and by multiplication

sinA=2jsin(a+6+c) sin %(b+c — a)sin – 2 (c+a — ft) sin J(a +ft-c))i sin J sin c = jl — cos 2 a — cos 2 6 — cos 2 c +2 cos o cos icoscjj sin J sin c. Hence the quantity k in (3) is)i — cos 2 a — cos 2 fc — cos 2 c+2 cosacos b cos cjj/sina sin 6 sin c. (8) Of Half- Apply the polar triangle transformation to the formulae sides. (5), (6), (7) (8) and we obtain

s a = (cos \(A + C-B) cos \{A+B-C) i

‘ 2 \ sin B sin C

. a_ (cos Kfl+C) cos j(+B + C) i sln 2 – I sin 5 sin C 1

a_ (cos i(g + C^) cos HA+B + C

aU 2~ I

(9) (10)

(11)

cos i(A + C-B) cos i(4+5-C If k' = [i — cos 2 A — cos 2 B— cos 5 C— 2 cos ˆ4 cosBcosC)j/sinˆ4sin5sinC, we have. kk' ' = 1 (12)

10. Let £ be the middle point of AB; draw £D at right angles to AB to meet AC in Z>; then DE Delambre's ˆ' sects tne angle ADB. Formulae ˆ et ˆ bisect the angle

DCB and draw FG per- pendicular to BC, then

ˆ£CG = 90°-|C.

From the triangle CFG we have cos CFG — cos CG sin £CG, and) B from the triangle FEB cos EFB = cos £B sin £B£. Now the angles CFG, EFB are each supplementary to the angle DFB, therefore

cosJ(a — 6)cosiC = sinj(/l-r-B)cosJc. (13)

Also sin CG = sin CF sin CFG and sin £B = sin BF sin EFB; therefore sinj(fl — J)cosJC = sinj(ˆ4 — B)sinjc. (14)

Apply the formulae (13), (14) to the associated triangle of which a, v — b, tc—c, A, ir—B, ir — C are the sides and angles, we then have

sin|(a+ft)sin|C»=cos|(4 — B)sinjc (15)

cosJ(a+6)sin|C = cosJ(ˆ +B)cosic. (16)

The four formulae (13), (14), (15) (16) were first given by Delambre in the Connaissance des Temps for 1808. Formulae equivalent to these were given by Mollweide in Zach's Monatliche Correspondent for November 1808. They were also given by Gauss {Theoria motus, 1809), and are usually called after him.

11. From the same figure we have

Napier's tan FG=tan FCG sin CG = tan FBG sin BG\

Analogies, therefore cotˆCsin§(a — ft)tanJG4 — B)sini(a+ft),

ˆ \/ a d\ sin §(a — ft) ˆ. „ or tan\(A — 5)= „ : „ ;;„ , ˆ cotiC.

“sin -j(a+6)

Apply this formulae to the associated triangle (*■- B, 71- — C), and we have

cos 5 (a — b)

•a, b, ir — c,

tan \{A +B) —

{cot \C.

(17)

-A,

(18)

cos i(a+J) If we apply these formulae (17), (18) to the polar triangle, we have

tan « a -* Kin ?&+£) *» * c (I9)

tanˆ+B)- ˆ|jj;|j taai C . (20)

The formulae (17), (18), (19), (20) are called Napier’s ” Analogies “; they were given in the Mirif. logar. canonis descriptio.

12. If we use the values of sin \a, sin \b, sin \c, cos \a, cos \b, cos \c, given by (o), (10) and the analogous formulae obtained by

interchanging the letters we obtain by multiplication SchmelsserS s ; n i acos i &sin C = sin kcos i(B + C-A) J Formulae. ‘I

cos fa cos §6 sin C = cos §e cos – 2 (-4 +5 — C) \ .

sin jasin fftsin C = cos§ccos l(A+ B + C))

These formulae were given by Schmiesser in Crelle’s Journ., vol.x. The relation sin b sin c-j-cos b cos c cos A=sm B sin C— cos B cos C cos a was given by Cagnoli in his Trigonometry (1786), CaxoolTs anc * was re(i» s covered by Cayley (Phil. Mag., 1859). Formulae. I – t foIIows from (‘)■ (2) and (3) thus: the right-hand side of the equation equals sin B sin C+cos a (cos A — sin B sin C cos o) =sin B sin C sin 2 a+cos o cos A, and this is equal to sin b

sin c + cos A (cos a — sin b sin c cos A) or sin 6 sin c + cos i cos c cos A

13. The formulae we have given are sufficient to determine three parts of a triangle when the other three parts are given ; moreover such formulae may always be chosen as are adapted _ ,

to logarithmic calculation. The solutions will be unique rJi°u except in the two cases (1) where two sides and the angle IrUm £ les – opposite one of them are the given parts, and (2) where two angles and the side opposite one of them are given.

Suppose a, b, A are the given parts. We determine B from the formula sin 5= sin b sin .A /sin a; this gives two supplementary values of B, one acute and the other Ambiguous obtuse. Then C and c are determined from the Cases> equations

- iˆ:#fˆ)-Kˆ 5),tan ic =|ˆ±| tan Ka _ S) .

Now tan \C, tan \c, must both be positive; hence A—B and a — b must have the same sign. We shall distinguish three cases. First, suppose sin ft sin a, there is no solution when sin b sin A >sino; but if sin b sin ˆ4sin a. Thirdly, if sin 6 = sin a then B=A or ir = A. If a is acute, a — J is zero or negative, hence A—B is zero or negative; thus there is no solution unless A is acute, and then there is one. Similarly, if a is obtuse, A must be so too in order that there may be a solution. If a = 6 = Jx, there is no solution unless A = \tt, and then there are an infinite number of solutions, since the values of C and c become indeterminate.

The other case of ambiguity may be discussed in a similar manner, or the different cases may be deduced from the above by the use of the polar triangle transformation. The method of classification

according to the three cases sin &-= sin a was given by Professor

Lloyd Tanner {Messenger of Math., vol. xiv.).

14. If r is the angular radius of the small circle inscribed in the triangle ABC, we have at once tan r = tan %A sin (s — a), where as = a +b+c; from this we can derive the formulae

tan r = n cosec s = %N sec \A sec \B sec \C= R a

sin a sin \B sin \C sec \A (21) Circles where n, N denote the

expressions Related to

(sin s sin (s-o) sin (s-b) sin (s-c)}i, Triangles.

j-cos_5cos (S-A) cos {S-B) cos (5-C)||. The escribed circles are the small circles inscribed in three of the associated triangles; thus, applying the above formulae to the triangle (a, x — b, tt—c, A, Tr—B,ir — C), we have for n, the radius of the escribed circle opposite to the angle A , the following formulae tan ri = tan \A sin s = n cosec (s — a) = JiVsec \A cosec \B cosec \C = sin a cos \B cos JC sec \A. (22)

_ The pole of the circle circumscribing a triangle is that of the circle inscribed in the polar triangle, and the radii of the two circles are complementary ; hence, if R be the radius of the circumscribed circle of the triangle, and R lt R 2 , R the radii of the circles circum- scribing the associated triangles, we have by writing fn- — R for r, iir—Ri for n, ir — a for A, &c, in the above formulae cot R = cot \a cos (S— .4) = \n cosec \a cosec \b cosec Jc =-A r sec 5 = sin A cos \b cos \c cosec \a (23)

cot R\ = — cot \a cos S= = \n cosec Ja sec \b sec \c = N sec (S—A) = sin A sin |6 sin \c cosec \a. (24)

The following relations follow from the formulae just given: — 2tani? =cot ri+cot J-2+cot r 3 — cot r, 2tani?i = cot r - (-cot r.-j-cot r 3 — cot r u tan r tan n tan r 2 tan r 3 = « 2 , sin 2 s = cotr tan r t tan r 2 tan r 3 , sin 2 (s— a) =tan r cot ri tan r, tan r 3 .

15. If E=A+B + C-w, it may be shown that E multiplied by the square of the radius is the area of Formulae the triangle. We give some of the more important expressions for the quantity E, which is called the spherical excess. We have

cos j(A +B) _ cos f (a + b) sin \{A + B) _ cos \(q – b)

sin \C ~ cos \c ana cos \C _ coT^ ‘ sin \(C – E) cos |(a ‘+ b) cos |(C – E) cos j(a – b)

for

Spherical

Excess.

hence

sin iC sin \C

cos je sin \(C — E

cos \c — cos \(q + b)

sin \C + sin KG – E) = cos jc + cos |(o -f £)'

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therefore

tan \E * 1 × 1/ \ tztf\{C-E) = tan » s tan ˆ s ˆ

Similarly tan \E tan 2 \(C-E)= tan \(s-a) tan §(s-fc); therefore

tan |E = (tan £j tan \(s-a) tan H* — &) tan |(s — c)}\ (25) This formula was given by J. Lhuilier.

Also sin iCcosˆE-cos-JCsin \E = ˆ~r~ sin k. C ;

cos *C cos *E+sin JC sin i£= J & ■ cos JC; whence, solving for cos \E, we get

cos i£:

i+cosa+cos 6-|-cos c

4 cos jo cos j6 cos Jc ˆ '

This formula was given by Euler (Nova acra, vol. x.). If we find sin %E from this formula, we obtain after reduction

sin iE =

"2 cos \a cos \b cos |c a formula given by Lexell (Acta Petrop., 1782).

From the equations (21), (22), (23), (24) we obtain the following formulae for the spherical excess : — sin 2 j£ = tan R cot Ri cot R 2 cot P s 4(cot n+cot r 2 +cot r 3)

(cot r-cot ri + cot r 2 + cot r 3) (cot r + cot d— cot r 2 + cotr 3)X (cot r + cot n + cot r 2 + cot r s).

The formula (26) may be expressed geometrically. Let M, N be the middle points of the sides AB, AC. Then we find cos MN

1 + cos a + cos b + cos c 4 cos j6 cos \c ‘

hence cos J£ = cos MN sec ha.

A geometrical construction has been given for E by Gudermann (in Crelle’s Journ., vi. and viii.). It has been shown by Cornelius Keogh that the volume of the parallelepiped of which the radii of the sphere passing through the middle points of the sides of the triangle are edges is sin \ E.

Pmncrii** l ^’ ^ et ABCD be a spherical quadrilateral inscribed

« ?Z? i in a sma11 circle; let a, b, c, d denote the sides AB, BC,

OuJdri. CD ‘ DA respectively, and *, y the diagonals AC, BD.

lateral * 4 can eas ~y De shown by joining the angular points

/ascribed of the quadrilateral to the pole of the circle that

in Small A + C = B + D. If we_ use the last expression in (23)

Circle ^ or tne ra d” °f tne circles circumscribing the triangles

BAD, BCD, we have

sin A cos h,a cos \d cosec jy = sin C cos \b cos JC cosec \y;

whence si “/ . = j n C iy

cos $0 cos jc cos Ja cos \d

This is the proposition corresponding to the relation A + C = irlor a plane quadrilateral. Also we obtain in a similar manner the theorem

sin \x sin jy

sin B cos 36 sin ˆ4 cos j < 2

analogous to the theorem for a plane quadrilateral, that the diagonals are proportional to the sines of the angles opposite to them. Also the chords AB, BC, CD, DA are equal to 2 sin \a, 2 sin \b, 2 sin \c, 2 sin \d respectively, and the plane quadrilateral formed by these chords is inscribed in the same circle as the spherical quadrilateral ; hence by Ptolemy's theorem for a plane quadrilateral we obtain the analogous theorem for a spherical one

sin \x sin sy = sin \a sin §e + sin \b sin \d.

It has been shown by Remy (in Crelle's Journ., vol. iii.) that for any quadrilateral, if z be the spherical distance between the middle points of the diagonals,

cos a + cos 6 + cos e-f-cos d = \ cos \x cos \y cos \z. This theorem is analogous to the theorem for any plane quadrilateral, that the sum of the squares of the sides is equal to the sum of the squares of the diagonals, together with twice the square on the straight line joining the middle points of the diagonals.

A theorem for a right-angled spherical triangle, analogous to the Pythagorean theorem, has been given by Gudermann (in Crelle's Journ., vol. xlii.).

Analytical Trigonometry. 17. Analytical trigonometry is that branch of mathematical analysis in which the analytical properties of the trigonometrical Perlodl-functions are investigated. These functions derive their city of importance in analysis from the fact that they are the sim-

Functlons. P* est s ' n sb' periodic functions, and are therefore adapted to the representation of undulating magnitude. The sine, cosine, secant and cosecant have the single real period 2v; i.e. each is unaltered in value by the addition of 2t to the variable. The tangent and cotangent have the period ir. The sine, tangent, cosecant and cotangent belong to the class of odd functions; that is, they change sign when the sign of the variable is changed. The cosine and secant are even functions, since they remain

unaltered when the sign of the variable is reversed.

The theory of the trigonometrical functions is intimately connected with that of complex numbers — that is, of numbers of the form * + iy(i = V — 1). Suppose we multiply together, by the connexion rules of ordinary algebra, two such numbers we have W uh Theory (xi + iyi) (x 2 + iy 2) = (x 1 × 2 —yiy 2) + t(*0‘2 + x 2 yj. of Complex

We observe that the real part and the real factor of the Quantities. imaginary part of the expression on the right-hand side of this equation are similar in form to the expressions which occur in the addition formulae for the cosine and sine of the sum of two angles ; in fact, if we put Xi = n cos 61, y y = n sin U x 2 = r 2 cos 2 , y 2 = r 2 sin 8 2 , the above equations becomes

ri(cos 0i +. sin fli) Xr 2 (cos 2 + i sin 6 2) = r^fcos 8 1 +8 2 + l sin 0i + 9 2).

We may now, in accordance with the usual mode of representing complex numbers, give a geometrical interpretation of the meaning of this equation. Let Pi be the point whose co-ordinates referred to rectangular axes Ox, Oy are Xi, yi ; then the point Pi is employed to represent the number tfi + tyi. In this mode or representation real numbers are measured along the axis of x and imaginary ones along the axis of y, additions being performed according to the parallelogram law. The points A, Ax represent the numbers ±1, the points a, a t the numbers ±1. Let P 2 represent the expression x 2 --iy 2 and P the expression U”i + iyi) (x 2 + ty 2) . The quanti- ties n, U r 2 , 2 are the polar . coordinates of Pi and P 2 respec- tively, referred to as origin and Ox as initial line; the above equation shows that n r 2 and 0i + 0 2 are the polar co-ordinates of P; hence OA : OPi : : 0P 2 – OP and the angle POP 2 is equal to the angle Pi OA. Thus we have the following geometrical construc- tion for the determination of the point P. On 0P 2 draw a triangle similar to the triangle POP 2 is positive ; then the vertex P represents the product of the numbers repre- sented by Pi, P s . If x 2 + iy 2 were to .be divided by *i + iyi the triangle OP’P 2 would be drawn on the negative side of Pj, similar to the triangle

18. If we extend the above to n complex numbers by

continual repetition of a similar operation, we have — (cos 0! 4- 1 sin 9i) (cos 2 + 1 sin 2) . . . (cos 0„ + t sin 0„) De Moivr ‘ = cos (0, = 2 + . . . + 0„)) , sin (0 X + 2 + . . ‘ ^ rtoaren – If 0i = 02 = . . . = 0„ = 0 1 , this equation becomes = cos n0 + i sin n0; this shows that cos +1 of (cos n$ + i. sin »0)n. If

Fig. 8.

that cos each of

B/n + t these

sin 0/n is quantities

■ + 0»),

(cos 0 + i sin 0)”

sin is a value

now we change 8 into 0/n, we see

a value of (cos 0 + t sin 0)n; raising to any positive integral power m,

cos m0/n + i sin m0jn is one value of (cos + i sin 0)^. Also cos (— m0/n) + 1 sin (— m 0/n) ■■

“cos m6 j-n + 1 sin m$/n’

hence the expression of the left-hand side is one value of (cos 04- 1 sin 0) ””». We have thus De Moivre’s theorem that cos k0 + i sin k6 is always one value of (cos 0 + t sin 0)*, where k is any rational number. This theorem can be extended to the case in which k is irrational, if we postulate that a value of (cos 0 + t sin 0)* denotes the limit of a sequence of corresponding values of (cos 0 + i sin 0)*„ where k,, k 2 . . .k s . . . is a sequence of rational numbers of which k is the limit, and further observe that as cos *0 + i sin k0 is the limit of cos k a 0 + i sin kS.

The principal object of De Moivre’s theorem is to enable us to find all the values of an expression of the form (a + ib) mln , where m and n are positive integers prime to each other. If a = r cos 0, b = r sin 0, we require the values of

TbenRoois r™’» (cos 8 + t sin 0)-”’«. One value is immediately fur- o/at « m P’« nished by the theorem ; but we observe that since the Q” aatlt y expression cos 0 + t sin 6 is unaltered by add ing any m ultiple of 2irto 0, the n/mth power of r™’” (cos m# + 2s-rln + i sin m.e--2svjn) is a + ib, if i is any integer; hence this expression is one of the values required. Suppose that for two values *i and s 2 of s the va lues of this express ion are the same; then we must have m.0 + 2Si?r/»— m.0 + 2s 2 7rfn; a multiple of 2tt, or si — s 2 must be a multiple of n. Therefore, if we give s the values o, 1, 2, . .n — 1 successively, we shall get n different values of (a + 16)”’”’, and these will be repeated if we give i other values; hence all the values of

Fig. 9.

(a-f-ii) m ”’» are obtained by givin g 5 the values o, 1, 2, , . . n — 1 in the expression r’” 1 ” (cos m . + 2sir/n + ‘ sin m.8 + 2sr/n), where r — (a 2 + i 2)J and = arc tan 6/a.

We now return to the geometrical representation of the complex numbers. If the points Bi, B 2 , Bz,...B n represent the expres-;

sion x--iy, (x + ty) 2 , (x + iy) 3 , ‘ . . . (x + iy) n respectively, the triangles OAB u OB1B1, . . . OBn-iBn are all similar. Let (x--iy) n = a-- ib, then the con- verse problem of finding the Mth root of a--A is equivalent * to the geometrical problem of describing such a series of tri- angles that OA is the first side of the first triangle and 0B n the second side of the nth. Now it is obvious that this geometrical problem has more solutions than one, since any number of complete revolutions round may be made in travel- ling from Bi to B„. The first solution is that in which the vertical angle of each triangle is B n OA/n; the second is that in which each is (B n OA 2ir)/re, in this case one complete revo- lution being made round O; the third has (B n OA 4?r)/» for the vertical angle of each triangle; and so on. There are n sets of triangles which satisfy the required conditions. For simplicity we will take the case of the determina- tion of the values of (cos \ 1 sin 0)i. Suppose B to represent the expression cos 6 1 sin 0. If the angle AOPi is \8, Pi represent the root cos j0 <. sin Id; the angle A OB is filled up by the angles of the three similar triangles AOPi, PiOpi, piOB. Also, if Pi, Pz be such that the angles PiOP % P1OP3 are § r, f w respectively, the two sets of triangles AOP PiOpi, pzOB and AOP*, PiOfh, p 3 p ptOB satisfy the conditions of similarity

„ and of having OA, OB for the bounding

riG. 10. sides; thus Pi, P3 represent the roots

cos J(0+2jr)-b sin *i(0-f-2?r),* cos 1(9+4ˆ)+' sin 1(0+4*0 respectively. If B coincides with A, the problem is reduced to that of finding the three cube roots of unity. One will be repre- sented by A and the others by the two angular points of an equilateral triangle, with A as one angular point, inscribed in the circle.

The problem of determining the values of the Mth roots of unity is equivalent to the geometrical problem of inscribing a regular The th P°ly? on °f n sides in a circle. Gauss has shown in his Hoots of Disquisitiones arithmeticae that this can always be done Unity ˆ * ne corn P ass and ruler only when n is a prime of the

form 2"+l. The determination of the nth root of any complex number requires in addition, for its geometrical solution, the division of an angle into n equal parts.

19. We are now in a position to factonze an expression of Factoriza- the form x n — (a+ib). Using the values which we tlons. have obtained above for (a+ib)'!", we have

= f =0 L*'" (cos -j—Hsm £)] .

(1)

If i=o, = 1, this becomes

s=n— 1

d T 2-"r ■ 2«r1

P x-cos — — isin —

i = o L n m J

= (-l)(+ l)-P_ (x-cos — ± 1 sin — J

s = i«-l / 2?ir \

= (x— i)(x + i)P (x 2 — 2x cos + + 1) (»even). (2)

s = j \ n I

s = i(n-l) / 2Slr \

x*— i = (x — l)P x 2 — 2X cos-— + 1) (reodd). (3)

s = l \ n 1

If in (1) we put a = — 1, i = o, and therefore = x, we have

- > d = ” 1 T 2. + I1T . 2i-f-l7rT

○ +1 ,- L* _cos ~ — ism— ~ J

j = i(n-2)r 2S + In 1

= P x 2 — 2xcos — ! hi (neven). (4)

s = 0 L n £

“ + i = (+ i)P U 2 -2»cos2iiH + I (nodd). (5)

s = 0 L “J

Also x 2 ” — 2x n y” cos n$ + y*

= (x n — y cos «0 + ’ sin #0)(x”— y”cos «0 — 1 sin «9)

i D = B_1 7 6 + 2ST . 8 + 2Stt\

= f = o l x – J ‘ C0S -¥ ± ‘ *sln* l^J

I x 2 — 2 × 31 cos 0-| --f I . (6)

= p

H—1I

Airy and Adams have given proofs of this theorem which do not involve the use of the symbol 1 (see Camb. Phil. Trans., vol. xi).

A large number of interesting theorems may be derived from De Moivre's theorem and the factorizations which we have deduced from it ; we shall notice one of them. Deˆui >

In equation (6) put y = i/x, take logarithms, and then ■n ea Z * differentiate each side with respect to x, and we get

2n(x-

-2n— 1 y*~Vn— 1

-2 COSW0 + *

2{X-

3)

■ = o

JC 2 — 2 COS0-) -x~*

Put x- = a/b, then we have the expression «(o 2 "-t 2 ")

20"i"COS W0 + 6 2 ")

for the sum of the series

s = n— 1 1

S = .

5 = 0 a 2 -2a&cos0 + — 1& 2 n '

20. Denoting the complex number x + fy by 2, let us consider the series 1 + z + z 2 / 2 ! + • ■ • + «"/« ! + . . . This series converges uniformly and absolutely for all values of z whose _ moduli do not exceed an arbitrarily chosen positive ' aeEx " number R. Consequently the function E{z), defined P on * ntM as the limiting sum of the above series, is continuous eres – in every finite domain. The two series representing £(zi) and E{z%), when multiplied together give the series represented by £(zi + z 2). In accordance 'with a known theorem, since the series for

J5(zi) £(22) are absolutely convergent, we have .EfzOX-Efc) =£(zi-t-z 2). From this fundamental relation, we deduce at once that j£(z)j™ = E{nz), where n is any positive integer. The number E{l), the sum of the convergent series i+i-)-i/2!-f-i/3!. ..., is usually denoted by e; its value can be shown to be 2-718281828459. ... It is known to be a transcendental number, i.e. it cannot be the root of any algebraical equation with rational coefficients ; this was first established by Hermite. Writing z = I, we have E(n)=e", where re is a positive integer. If z has as a value a positive fraction p/q, we find that{£(*/g) '> = E{p) =e v ; hence E(p/q) is the real positive value of e": Again E(-p/g)XE(p/g) =E(o) = 1, hence E(-p/q) is the real positive value of e~P>' q . It has been thus shown that for any real and rational number *, the value of E{x) is the principal value of e x . This result can be extended to irrational values of x, if we assume that e x is for such a value of x defined as the limit of the sequence e 11 , e m , ...where x \, x 2> . . . is a sequence of rational numbers of which x is the limit, since E(xi), E(x 2) converges to E(x).

Next consider (i-r-z/m)" 1 , where m is a positive integer, by the binomial theorem,

(I +3"'= I + , y] m = a sin , then

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£(z) = limˆ.o, jp™(cos m+i sin m)\, by De Moivre's theorem.

Since p-= (i+£)"j 1 + = e*. lim m _co j 1 +

we have lim m -.x,p m

mUm+xJTjm)

less than V*re+x/V>K, then liraˆ

jm(V»+x/V«) 2 – [2 ■ Let r be a fixed number

i+;

5JM

im

lies

Values of Trigono- metrical Functions.

between 1 and lim*,.,,, J H — ˆ-j { , or between 1 and ei/ 2 ˆ. hence

since r can be taken arbitrarily large, the limit is I. The limit of m or m t&rr l \yl(x--m)\ is the same as that of my/ (x+m) which is y. Hence we have shown that £(z) =e x (cos y--i sin y).

21. Since E{x--iy) = i*(cos y+sin y, we have cos y--i sin y = £(iy), and cos y — i sin y = E(— iy). Therefore cos y = h [E(iy)

+£(-fy)|, sin y = \i\E(iy)-E(-iy)\; and using

v*°l„* the series denned by £ (» and E(-iy), we find that ” ”"" ” cos y = 1 — y 2 /2 ! + y/4 ! — . . . , sin y = y — y 3 /3 !

+ y /5 !—..., where y is any real number. These are the well-known expansions of cos y, sin y in powers of the circular measure y. Where z is a complex number, the symbol e’ may be defined to be such that its principal value is £(z); thus the principal values of e’”, e~ iy are E(iy), £(— fy). The above expressions for cos y, sin y may then be written cos y = \{e iyJ re~ iy), sin y = \i{e iy — er iy). These are known as the exponential values of the cosine and sine. It can be shown that the symbol e* as defined here satisfies the usual laws of combination for exponents.

22. The two functions cos z, sin z may be defined for all com- plex or real values of z by means of the equations cos y = fj£(z) +

. E(— z)j, sin z = (±){E (z)— £(— 2) |, where E(z) represents

nfiti the sum – Iunction of l + z+z 2 /2! + . . . + z”/re! + . . .

t Tri F° r rea l values of z this is in accordance with the

o r gono- orc j; nar y definitions, as appears from the series obtained above for cos y, sin y. The fundamental properties of cos z, sin z can be deduced from this definition. Thus cos z + i sin z = E(z), cos z — i sin z = £(— iz); therefore cos 2 z + sin 2 z = £(iz). E(— iz) = 1. Again cos (zi + zi) is given by } 2 \E(iz l + iz 2) + E(— iZi— iz 2)) = J j£(J3i)£ (iz 2) + £(— izi)£ (— tzj)| or J|E(»z,) + £(-M 1)}(£(i2 2) + £(-jz 2)) + l!£(Jz 1)-£(»z 1)} J£(iz 2) — £(— t'z 2)j, whence we have cos (81 + 22) = cos % cos z 2 — sin Zi sin Zj. Similarly, we find that sin (Zi + z 2) = sin Zi cos z 2 + cos Zi sin z 2 . Again the equation £(z) = I has no real roots except z = o, for e" > i, if z is real and > o. Also E(zj = l has no com plex root a + iff, for a — iff would then also be a root, and £(2a) = £(a + i/S)£(a — 1/3) = I, which is impossible unless a = 0. The roots of £(z) = l are therefore purely imaginary (except z = o); the smallest numerically we denote by 2 **■, so that £(2tV) = i. We have then £(2iVr) = |£(2iir)| r = i, if r is any integer; therefore 2i7rr is a root. It can be shown that no root lies between 2iirr and 2(r + i)iV; and thus that all the roots are given by z = = < = 2t7rr. Since E(y + 2iir) = £(z)£(2«V) = £(z), we see that £(z). is periodic, of period 2iV. It follows that cos z, sin z are periodic, of periods 2v. The number here introduced may be identified with the ratio of the circumference to the diameter of a circle by considering the case of real values of z.

23. Consider the binomial theorem

metrical Functions.

(a + b)" = a" na"- l b n (—jˆ a"

+

«(re-i)...(n-r + i)

Expansion

of Powers

ofSlaes

and Cosines

In Series of p utting a = e .e h = e – i e we obtain

Sines and

Cosines of

Multiple

Arc*

2524.

•&+. ■ -+b n .

(2 cos 6) n = 2 cos nB--n2 cos n~-2d

+

n(n— 1)

2 !

2 cos re — 40+. . .

, n(n— 1). . . (n — r-j-i) , ■.. .

-\ — * — ji — -2 cos [n — 2r)6 + .

When re is odd the last term is 2— . . 3 , *'

and when n is even it is

w(re-i). . .(jn + i) Ik !

cos 0,

If wc put a=e l9 , b — — e l8 , we obtain the formula

(— i)J»(2sine)" = 2 cosre0 — 2»cos(» — 2)6 +

re (re — 1)

2 cos (re — 4)0— ...

+ <-0"

T «(n— 1). . .(re — r+i)

2 cos(re — 2r)0.

._ ,^ ra(w-i)...(j» + i)

when » is even, and

(

i) i(n – l) (2sin0)”= 2sinn8-n.2sin(»-2)0+^ — ^2 sin(n-4)6>..

+ (-)

- nfw— 1) . . |(» + 3)

sin

when » is odd. These formulae enable us to express any positive integral power of the sine or cosine in terms of sines or cosines ol multiples of the argument. There are corresponding formulae when n is not a positive integer.

Cons ider the identity log(l -£x)+log(l -qx) = Expansion \og(l—p+qx+pqx 2). Expand both sides of this of Sines and equation in powers of *, and equate the coefficients of Cosines of x n , we then get Multiple

P»+r = (P+q)»-n{p+q)-*p q towrsof

,n{n-3) „),„- w . Sines and

T 2! W^1> P!T—. Cosines of

., Sn{n — r— i)(w — r — 2). . . (n — 2r + i) Arc –

(p+q)”*p T ¥+.. If we write this series in the reverse order, we have

#«+a»=2(i)2 [ta)i %{pgW l (£±2) 2

-^^^^te)^(^) , ...(-i)5* (, +a).]

when n is even, and

r+ 9 ” = 2 (-r)V [„(-! (,/-i- 3 (to) 3

+ y to)? (*?) +. . . +(-.)t 1W]

when n is odd. If in these three formulae we put p = e l «, g

= «-■», we obtain the following series for cos n8 : —

2 cos w0 = (2 cos 6) n — n{_2 cos 9)”- i! + “T 3 H 2 cos B) n ~ 4 — . . .

+ (-1)’

\ r n(n — r— i){n — r — 2). . . {n — 2r + i)

(2 cos fl)”- 2 ˆ ... (7)

when n is any positive integer ; (-i)fcos, e = I eos 2 9+ˆˆ!)cosˆ w2 (” 2 -ˆ (ro2 – 42) cose e

2! 4′ Ol

+ . . . + (l)22» 1 COS “6

(8)

when n is an even positive integer;

(ifr cos n8 = n cos /del > ˆ cosˆ + ˆ = iˆl3!)cosˆ-

O’ O*

B-l

... + (— l)2 2 “-1 COS “0 (9)

when « is odd. If in the same three formulae we put p = e < - e , q— — e-'«, we obtain the following four formulae: —

(-i)22cosn0 = (2sinfl)”M(2sine)”+ :: r ˆ (2 sinS)”- 1 . . . + (_ I), n(»‘—0ˆ-(n-2r-i) (2 ˆ $)n ˆ r + {n ev£n) . (jo)

(—1) 2 2 sin n0 = the same series (re odd);

/.’ , n

(11)

.0!

sin 6

+ . . . + 2″ _1 sin “0 (re even) ; (12)

. e . . re(re 2 -i 2) . ,„ . w(» 2 – i 2)(n 2 -3 2) . .„ sin n$ = n sin 9 i = — – sin 3 \ — ‘) *-!■ sin 5 9 — . . .

5!

w-l

+ (-1) 2 2”” 1 sin”0 (» odd).

.P-g

(13)

Next consider the identity — —^ — = -, — ; — ^ — ; ;.

I — px I — qx l — (p + q)x + pqx*

Expand both sides of this equation in powers of x, and equate the coefficients of x” -1 , then we obtain the equation

^E-f = (P+q)”’ 1 – (.n-2)(p+q)*-*pq

+ (»-3)(»-4) (f)+g)n – 6 ^_ ^

._. (_ i) „ (»- > – I)(,r 2)...(n- 2 r) (/)+g) .^ tygr + If, as before, we write this in the reverse order, we have the series i-^[n(thl) {pq f l _*&=*> (to) \ pq f 3 + re (re 2 -2 2)(re 2 -4!) ^ ^r» + , , . + (_ ^ (p + g) „_ t]

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when n is even, and

2

n z3

2

when n is odd. If we put p-e iS , q = e — ‘ 9 , we obtain the formulae

2

(/> +g)»-‘]

2!

(2 cos 9) n ~ 5

sinn9 = 3 infl j (2cos0)”- l “ 3 +

+ (_ l)r (»-r-D(»-r-2 . . .(«-2r) (2 cos e)n ˆ + J (I4)

where n is any positive integer ;

i l . . f «(n 2 – (— i) sinn0 = sin9< rccosfl –

2 2) ,„ , n [n” — 2-) (» 2 — d 2) , — cos 3 0-| — ˆ rj ˆ-ˆcos 5

+ (— i) 2 (2 cos

0)»-» J (n

even) ;

(— 1) 2 sin n0 = sin

(« 2 j.—

cos 2 e+

(» 2 -i 2) (» 2 -3 2)

4!

+ (-i) 2 (2 cos 9)”

If we put the series

n~2

I (» odd), in the same three formulae p = eˆ

(15)

cos 4 9 – . . .

(16)

we obtain

•[‘

(1) 2 sinn0 = cos0 sin n_1 0— («— 2)sin n_3 9|-

(»-3)(«-4)

PHI. Trans, for 1776, and afterwards by Euler in Nova acta for 1793. Euler gives an .equation deduced in the same manner from the identity ir = 20 arc tan |+8 arc tan -/ s . The calculation of x has been carried out to 707 places of decimals : see Proc. Roy. Soc. vols. xxi. and xxii. ; also Circle.

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27. We shall now obtain expressions for sin x and cos x as infinite products of rational factors. We have

Factoriza- tion of Sine and Cosine.

. X . X + 7T , . X . X+IT

sin x = 2 sin -sin = 2 3 sin-sin

22 4 4

. X+27T . X + .Vr

sin — – — sin — r ;

4 4

proceeding continually in this way with each factor, we obtain

sin x = 2 n_1 ■

X . x--ir . x + 2-Tr

sin -sin sin .

n n n

. x+n — iT .sin ,

where n is any positive integral power of 2. Now

. x+rir . x--n — rir

x--rir . nr — x

and

. x + irnr x

sin — =cos-.

n n

Hence the above may be written

sin x = 2”~ 1 sin- (sin 2 sin 2 -) (sin 2 — — sin 2 -1 . . .

n\ n n) \ n n)

x\ x – 1 cos—, n) n

where k = Jn = 1. Let x be indefinitely small, then we have

. 2”~’ . , -7T . , 2ir . kir

I =—— sin 2 – sin 2 — . . . sin 2 — ;

n n n n ‘

hence

. x x I sin 2 x/n\ I sin 2 x/n \ I sin 2 x/n \ sin x = n sin- cos 1 1 — — 5 — 7 I (1 — 1— = — r 1 . . . (1 — ■ , 1 , 1 . n n\ sin 2 v/nj \ sin’ 2jt/«/ \ sin 2 kv/nj

We may write this

. x x I sin 2 x/n\ I sin 2 x/n \ „ sin x = n sin – cos — I I — r-s — — I ... I i — 1—5 — rj 1 R,

n n\ sin 2 ir/n/ \ sin 2 rmr/n/ ‘

where R denotes the product

/ sin 2 x/n \ I sin 2 x/n \ I sin 2 x/n \

\ sin 2 m-j-iir/n/ \ sin 2 m--2ir/nl ‘ ‘ ‘ \ sin 2 kirjn/ ‘

and m is any fixed integer independent of n. It is necessary, when we make n infinite, to determine the limiting value of

the quantity

R; then, since the limit of

sin m-r/n .

n sin x/n cos x/n

. sin x , ,

is — – — and that of

mir/n

is unity, we have

X \ T 3 / \ 2 2 7T 2 / \ ni'ir 2 / m»»

The modulus of R — 1 is less than

V I+ sin 2 m + iir/»/ V + sin 2 m+lw/n) ' ' ' \ I+ sin 2 kr/ n) -I '

where p = mod. sin x/n. Now e P >l+Ap', i f A is positive; hence mod. (R — i) is less than exp. (pˆcosec 2 m-fiir/n-f- ... + cosec 2 kr/n) — i, or than exp. ip 2 n 2 {i/(m--i) 2 + . . . + l/k 2 \ — 1, or than exp. (fn* / ˆm* J — I . Now pˆsin 2 a/w.cosh 2 0/n+cos 2 a/n. sinh 2 p/n, if x = a+i'0; or p 2 =sin 2 a/n+sinh 2 /3/». Hence lim,, = t> , p 2 n 2 = o 2 +/3 2 , lim B = 0(, pn =mod. x. It follows that

mod.,, = o> (U — 1) is between o and exp. ((mod. 4) 2 / xm 2] — 1 , and

the latter may be made arbitrarily small by taking m large enough. It has now been shown that sin x = x(i — xVir 2)(i — x 2 /2 2 ir 2) ... (1 — x 2 /m 2 ir 2) (l+e m), where mod. e ra decreases indefinitely as m is increased indefinitely. When m is indefinitely increased this becomes

sin x = * (1 -g) (, -£j) . . . -*V (, -jgj) . (25)

This has been shown to hold for any real or complex value of x. The expression for cos x in factors may be found in a similar manner

, , ... 7T — 2X 31T — 2X

by means of the equation cos x = 2 sin — – — cos * , or may

be deduced thus

ˆ-(-# (-£)(-£)••■

-v” (4ˆ 2 \

„ =0 V 1 (2n + i) 2 W-

(26)

If we change x into ix, we have the formulae for sinh x, cosh x as infinite products —

sinh x = xP i-tt-J , cosh x = P (1 +7 — \, ,) .

In the formula for sin x as an infinite product put x = \ir, we

then get ˆJ-rTTTg I if w ˆ stop after 2« factors in the numerator and denominator, we obtain the approximate equation

. ..*- i 2 3-5 2

2.4.6. . .

“2 2 2 .4 2 .6 2

(2W-I) 2

(2n) 2

(2» + l)

-. r – 2W _ I —ˆ nv r where n is a large integer. This expression was obtained in a quite different manner by Wallis (Arith- metica infinitorum, vol. i. of Opp.). 28. We have

“*(‘ + £) ‘

or cos y + sin y cot x

= 0 + 9 (i + ˆ-j (1 + ˆ,) (I + F fc) (i + ˆ) ...

Equating the coefficients of the first power of y on both

sides we obtain the series

sin (x sin x

Series for Cot, Cosec, Tan and Sec.

1 1 J

cotx = x+xT

r X — 7T X+27T X — 23T ‘ ‘

(27)

From this we may deduce a corresponding series for cosec x, for, since cosec x = cot ˆx — cot x, we obtain

cosec x — – —

1 – + ˆ— +- ‘

X JC+7T a: — 7r x--2ir x — 2ir X+37T x — $ir

+ .

(28)

cos (x-fˆv) By resolving — 7£ˆ~ mto factors we should obtain in a similar

manner the series

2

X — 2X 1T+2X 37T — 2X 3X+2X 57T — 2X

and thence

‘*(= +§)•

-tan x =

;+

7T — 2X 7T + 2X 31T — 2X

-3lrT2-s+— (3)

These four formulae may also be derived from the product formulae for sin x and cos x by taking logarithms and then differentiat- ing. Glaisher has proved them by resolving the expressions for cos x/sin x and i/sin x ... as products into partial fractions (see Quart. Journ. Math., vol. xvii.). The series for cot x may also be obtained by a continued use of the equation cot x = §(cot |x+ cot i (*+«■)) (see a paper by Dr Schroter in Schlomilch's Zeitschrift, vol. xiii.).

Various series for ir may be derived from the series (27), (28), (29), (30), and from the series obtained by differentiating them one or more times. For example, in the formulae (27) and (28), by putting x = w/n we get

w(i 1 . 1 1.1

ir = » tan – 1 1 :

n(n — i n-f-i 2» — 1 2n-

+ !■•

1 =

Series tor it derived from Series /or Cot and Cosec.

1 1 1 1,1

7t = m sin — i 1 H 1 i — . .

n{ '«— 1 re + i 2n — 1 ' 2n + i

If we put « = 3, these become

-=3V5(i-2-+H+H+...),

/- 2 { l + 2 —4-5 + 7 + *■■■)■ By differentiating (27) we get

2 _ I I I 1 1 , 1 1 I 1 cosec *- x 2i-(x+7r)2 + (x _ 7r)2 + (T +2T)2 + (x ._ 2T)2 +. ■ ■ ;

putx = g, and weget7r 2 = 9| i+^+j 2 ^ . . . j .

These series, among others, were given by Glaisher (Quart. Journ. Math. vol. xii.).

29. We have sinh tx = txP (l \ —A , cosh 7rX=P(l + /- * „ j ;

if we differentiate these formulae after taking loga- rithms we obtain the series

. coth TX-rˆ = ., 1 ..■, +

i+z

2X 2 I 2 -f.X 2T 2 2 -|-X 2T 3 2 +x'

tanh jtx

S+-

Sums of

Certain

Series.

1 + ' +- J

i+..

2x -" i 2 -(-x 2T 3 2 +x 2 ˆ5 2 -(-x 2

These series were given by Kummer (in Crelk's Journ. vol. xvii.)

The sum of the more general series ˆˆn + nˆ + ˆnˆn

+ . . . , has been found by Glaisher {Proc. Lond. Math. Soc, vol. vii.)

If U m denotes the sum of the series rs+rˆ+ˆs-r' • • ., V r " that

of the series pj + rs+rˆ + . . ., and W m that of the series

t T i i

Sums of — — rs+rs — rs + ..., we obtain by taking loga-

Powers of 3 5 7

Reciprocals rithms in the formulae (25) and (26)

of Natural / x \ 2 x i x \ 4 j aa 6

Numbers. log (* cosec .r) = l/ 2 |^-j +- [/, 1^- I +- U t ^- I + ■ ■ ■ .

.og(sec.)^ : (f) 2 +2 V (()Vi(f)V.., and differentiating these series we get

1 1

- cot x =

2 2X

U, u t

%*.

(31) (32)

1 V, Vi v %

- tan x = -l2H+— i 2 i x 3 +— 2 6 .r 5 + . . .

2 W' IT 7T6

In (31) * must lie between ±ir and in (32) between ± fx. Write equation (30) in the form

sec x = S(— i)" / , 1 1 ,., -,'

and expand each term of this series in powers of x 2 , then we get

2 2 W, . 2 4 WV 2 , 2W5X 4

H—

+

-+.

(33)

where x must lie between =fc§7r. By comparing the series (31), (32), (33) with the expansions of cot x, tan x, sec x obtained otherwise,

we can calculate the values of U 2 , U t ... Vi, Vi... and Wi, W 8

When £/„ has been found, V„ may be obtained from the formula

2 n V" = (2"-l)U n .

For Lord Brounker's series of t, see Circle. It can be got at once

Continued b y putting = 1,6=3, c = 5 in Euler's

Factors ˆ, I I , I 1 a 1 V 1

tn „ theorem = — r\ — — ... = — i, r — r – r...

tor*. a b'c a+b—a+c—b+

Sylvester gave (Phil. Mag., 1869) the continued fraction

I-T-i— L. ' 2 2 -3 3-4 2 I + i+ 1+ 1+ i+"

which is equivalent to Wallis's formula for r. This fraction was originally given by Euler (Comm. Acad. Petropol. vol. xi.) ; it is also given by Stern (in Crelle's Journ. vol. x.).

30. It may be shown by means of a transformation of the series

sin x x x x x

Continued for cos x and ' that tan x = — – -— _ ■—— •— – . . .

for Trigono- This may be also easily shown as follows. Let metrical y = cosV*, and let y' , y"... denote the differential Functions, coefficients of y with regard to x, then by forming these we can show that \xy" --2y' --y =0, and thence by Leibnitz's theorem we have

4jt3<»+2)4-(4«+2)ji(» I).y») = o.

y Therefore —, =

hence — 2ˆx cot V*

4£. y” =

y’ly”’ y(n+1 >

4* nx

2(2n + 1)— y n+ i)ˆ n+2) Ax

— 6 — — 10 — — 14 – Replacing V* by x we have tan x=-
—_ -ˆ -z—. . . Euler gave the continued fraction

tan nx

n tan x (n 2 — 1) tan 2 * (n 2 — 4) tan 2 r (n 2 — 9) tan 2 *

1-3- 5- 7-

this was published in Mem. de I’acad. de St Petersb. vol. vi. Glaisher has remarked (Mess, of Math. vols, iv.) that this may be derived by forming the differential equation

(1 – x 2)yˆ m ˆ— {2m + i),ryC” +1 > + (n 2 – wˆyC”) = o, where y = cos (n arc cos x), then replacing * by cos x, and proceeding as in the former case. If we put ra=o, this becomes

tan x tan 2 .r 4 tan 2 × 9 tan 2 x

whence we have

arc tan x ■

i+3+ 5+ 7 +

x x 2 4*? qx 2 . n 2 × 2 1+3+5+ 7.+ ” + 2» + i +■••

31. It is possible to make the investigation of the properties of the simple circular functions rest on a purely analytical basis other than _ , the one indicated in § 22. The sine of x would be

Purely r y fa

Analytical defined as a function such that, if * = I -77 — – — «. Treatment J iS (I — T)

otCircular tnen y = s ; n ,,. tne n Uan tity \ would be defined to Functions. J ‘ J 2

/I dy j (1 — vi ‘ ^’ e snou ‘d then have

- — x = I 1 / _ .■■ • Now change the variable in the integral to z, where y* + ^ = i, we then have – — x = 1 “■ . , •_ 2 y and

z must be defined as the cosine of x, and is thus equal to sin (!*• — x), satisfying the equation sin 2 rc + cos 2 x = l. Next consider the differential equation

dy , dz _

V(i-3- 2) + V(i-2 2) -0 – This is equivalent to

_d{yV(i-3 2) + zV(i-y)) = o; hence the integral is

yV(i — z 2) + aV(i— y 1) = a constant. The constant will be equal to the value u of y when z = o; whence y^ (i-~z 2)--ziJ (l—y 2) —u.

The integral may also be obtained in the form

yz — V (1 — y 2) V (1 — z 2) = V (1 —u 2). ‘y dy „ C dz C u du

Let

+ :

■Si

-sv.

vci-yy H “; v(i-z 2) T ~joV(i-« 2)’

we have a + /3 = 7, and sin f = sin a cos /3 + cos a sin 0, cos t = cos a cos |8 — sin sin 18, the addition theorems. By means of the addition theorems and the values sin 5ir = l, cos |ir = o we can prove that sin (\tr--x) — cos x, cos (iir + x) = — sin x; and thence, by another use of the addition theorems, that sin (ir--x) = —sin x cos (tt--x) = —cos x,

from which the periodicity of the functions sin x, cos x follows: —

We have also J ˆ773ˆ2) = -<■ lo g«(V(i -f)+iy} ;

V (1 — y 2) + <-y\ + log e { V (1 — z 2) + iz) = a constant

whence log,.

Therefore j V (1 – y 2)\ + ly{ V (1 – z 2) +13} = V (1 – u 2) + iu,

since «=y when z = o; -whence we have the equation

(cos a + 1 sin a) (cos /S + t sin £) = cos (a + 0) + 1 sin (a + /3), from which De Moivre's theorem follows.

References.ˆ — Further information will be found in Hobson's Plane Trigonometry, and in Chrystal's Algebra, vol. ii. For further information on the history of the subject, see Braunmuhl's Vor- lesungen iiber Geschichte der Trigonometrie (Leipzig, 1900). (E. W. H.)

TRIGONON, a small triangular harp, occasionally used by the ancient Greeks and probably derived from Assyria or Egypt. The trigonon is thought to be either a variety of the sambuca or identical with it. A trigonon is represented on one of the Athenian red-figured vases from Cameiros in the island of Rhodes, dating from the 5th century B.C., which are preserved in the British Museum. The triangle is here an irregular one, consisting of a narrow base to which one end of the string was fixed, while the second side, forming a slightly obtuse angle with the base, consisted of a wide and slightly curved sound-board pierced with holes through which the other end of the strings passed, being either knotted or wound round pegs. The third side of the triangle was formed by the strings themselves, the front pillar, which in. modern European harps plays such an important part, being always absent in these early Oriental instruments. A small harp of this kind having 20 strings was discovered at Thebes in 1823. (K. S.)

TRIKKALA (anc. Trika), a town of Greece, capital of the department of Trikkala, and the see of an archbishop, 38 m. W. of Larissa. In winter, when great numbers of Vlach

herds- men take up their quarters in the town, its population exceeds that of Larissa. It has the appearance of a Mussulman town on account of its mosques (only two of which are in use) and it is a centre of trade in wheat, maize, tobacco and cocoons. The town was in ancient times a celebrated seat of the worship of Aesculapius. Pop. (1889), 14,820; (1907) 17,809; of the department, 90,548.

TRILEMMA (Gr. rpeis, three, ArijU/m, something taken), in logic, an argument akin to the dilemma (q.v.), in which there are three possibilities. By getting rid of two, the third is proved, provided the original three exhaust the number. The terms " tetralemma " (four possibilities) and " polylemma " (many) have also been used.

TRILOBITES, extinct Arthropoda, formerly classified with the Crustacea, but of late years relegated to the Arachnida (q.v.), which occurred abundantly in seas of the Cambrian and Silurian periods, but disappeared entirely at the close of the Palaeozoic epoch. Both their origin and the causes which led to their extinction are quite unknown. Widely diver- gent forms make their appearance suddenly in the Cambrian period amongst the earliest known fossils; and the high per- fection' of structure to which they had at that time attained

implies the antecedent existence of much simpler types, and refers the origin of life to a date immeasurably distant from that at which we have actual proof of the existence of animal and vegetable organisms.

However different in structure Trilobites may be, they all agree in possessing a head-shield usually semi-circular in shape, which results from the fusion of apparently five segments, and bears, except in some blind forms, a pair of large reniform compound eyes like those of the king-crab (Xiphosura). This head-shield is suc- ceeded by a varying number of free segments, each of which con- sists of a medium convex tergal piece and a pair of arched lateral plates, the pleura, of which there is one on each side. The terga and pleura of each individual segment overlap those

of the segment that serially succeeds it. The mid-region of the body, composed of jointed segments, is followed by a larger or smaller region con- sisting of fused segments and termed the pygidium or caudal shield, which in some cases is as large as the head-shield itself, in other cases much smaller. When the pygidium is large and composed of many segments, the number of free body segments is correspond- ingly reduced, and vice versa. It is with respect to this number of segments that respectively constitute the pygidium and the mid- region of the body that Trilobites differ most markedly from each other; and it is a singular fact that the extremes in structural organization in this particularto be met with in the Trilobita are found side by side in strata of Cambrian age. In Paradoxides, for example, there are about twenty freely movable segments followed by a very short and small pygidium, whereas in Agnostus the freely movable segments are reduced to two and the pygidium is as large as the cephalic shield. In this genus the number of segments composing the pygidium is obscured, as also it is in the genus Illaenus, which has as many as ten movable segments pre- ceding the large semi-circular pygidium; but in such forms as Ogygia and Asaphus, which have about eight free segments, the sutural lines on the pygidium indicate that it is composed of about a dozen or more segments. Somewhat resembling Agnostus is Microdiscus, with four movable segments and a large pygidium consisting of about five fused segments, the lines of union between the latter being clearly indicated.

The tergal and pleural elements of the pygidium are generally well marked. They are also well marked on the cephalic shield, the tergal elements being represented by a median axial elevated area showing indistinct signs of segmentation, and a lateral unseg- mented plate, the gena, which carries the eyes. The postero- lateral angles of the gena are commonly produced into spiniform processes, which may project backwards beyond the middle of the body as in Paradoxides, or considerably beyond its posterior termina- tion as in Trinucleus or Ampyx. The latter is further remarkable for having the median area of the head-shield, the flabellum, produced into an anteriorly directed spike.

For many years only the dorsal surface of Trilobites was known, nothing having been ascertained of the ventral surface and appen- dages. Comparatively recently, however, specimens have been obtained with the ventral surface exposed, revealing the number and structure of the limbs. A pair of the latter was articulated to the sides of a moderately wide dorsal plate on each segment of the body, and similar limbs were attached to the ventral surface of the head-shield behind the mouth. Each of these limbs was two- branched, the external branch consisting of a slender fringed flagellum possibly respiratory in function, and the inner of a normal jointed ambulatory leg. These two branches arose from a common basal segment or coxa, the inner surface of which was produced into a strong process underlying the external area. In the region of the mouth the basal segments were armed with teeth and subserved the purpose of mastication. As in all Arachnida there is only a single pair of appendages in front of the mouth, and these were one- branched, long and filiform and acted as antennae. Under the pygidium or caudal shield the appendages were much shortened, and their main branch consisted of broader and flatter segments than those of the preceding limbs.

Such was the structure of the appendages in Trilobites belonging to the genus Triarthrus; but considering the great structural differ- ences that obtain between Triarthrus and many other genera, it would be rash to assume that there were not corresponding differ- ences in the structure of the limbs. It must not indeed be assumed that those of the first

pair were in all cases antenniform.

It is probable that no .satisfactory classification of the Trilobites will be proposed until the limbs of most of the genera have been examined. Up to the present time all attempts to arrange the genera in natural and definable groups have failed to meet with general approval; and this criticism must be extended to Beecher's subdivision of the class into three orders, named Hypoparia, Proparia and Opisthoparia, based upon the form and position of a groove, the so-called genal suture, which marks the lateral portion of the head-shield. In the majority of Trilobites this groove passes backwards from the anterior or anterolateral edge of this plate to its posterior or postero-lateral border, dividing it into an inner'portion continuous with the flabellum and fused tergal regions, and an outer portion bearing the eye. Those genera, like

Paradoxides, Olenus, Asaphus, Phillipsia and others, in which this groove cuts the posterior edge of the head-shield on the inner side of its angle are referred to the Opisthoparia ; those, like Dalman- ites and Phacops, in which it cuts the lateral border in front of the posterior angle, belong to the Proparia. But in certain genera, like Conocoryphe, Calymmene and Triarthrus, it cuts the margin of the head-shield so close to the posterior angle that the distinction between the two groups practically breaks down. To the Hypoparia belongs a comparatively small number of genera, like Trinucleus and Aquastus, in which this groove or genal suture is beneath the margin of the head-shield and does not appear upon its upper surface.

In external form Trilobites are not unlike Isopod Crustaceans, especially the terrestrial species commonly called " woodlice "; and until the nature of their appendages was known, it was thought by some authorities that the two groups might be re- lated. Like the woodlice they were capable of rolling themselves up into a ball, many specimens having been found fossilized in this state, with the pygidium pressed tightly against the head-shield. There is very little doubt that they lived at the bottom of the sea, feeding upon worms or other soft marine organisms, crawling slowly about the sandy or muddy bottom and burying themselves beneath its surface when danger threatened. That these animals were widely

distributed in former times is proved by their occurrence at the present day in palaeozoic fossiliferous strata both of the northern hemi- sphere and of Australia; and despite the fact that their remains have not been found in rocks of the Mesozoic or Kainozoic epochs, it was conceived to be possible that living specimens might be dredged from the sea-floor during the exploration of the ocean depths undertaken by the ” Challenger ” expedi- tion. Needless to say this faint hope was not borne out by results. (R. I. P.)

TRIM, a market town and the county town of Co. Meath, Ireland, on the upper waters of the Boyne, 30 m. N.W. by W. from Dublin on a branch of the Midland Great Western railway. Pop. (1901), 1513. The county buildings are here; monthly fairs are held, and there is considerable trade in corn and flour; but the chief interest of the town lies in its historical associations and remains, enhanced by a beautiful situation. It was the seat of a very early bishopric. A Norman tower, called the Yellow Steeple, is supposed to mark the site of St Patrick’s Abbey of St Mary. Two gates remain from the old town walls. King John’s Castle (incorrectly so called, as this monarch only resided here on the occasion of a visit) was originally founded by Hugh de Lacy in n 73, but a later date is assignable to the greater part of the magnificent moated building, of which the keep, flanking turrets, drawbridge, portcullis and barbican, still testify to its former strength, which was augmented by its frontage to the river. Other smaller fortified buildings are Talbot’s and Scurlogstown Castles; the former erected by Sir John Talbot, lord lieutenant of Ireland in 141 5 — afterwards earl of Shrewsbury, the latter dating from 1180. About a mile east of the town, the ruins of the abbey of St Peter and St Paul occupy both banks of the river. These include the transitional- Norman cathedral on the north bank, and a castle, guarding the crossing of the river, on the south, together with a chapel and other remains. North of the town ruins may be seen of a Domini- can friary of the 13th century. The tower of the old parish church dates from 1449. In the annals of Trim many famous names have a place; Humphrey of Gloucester and Henry of Lancaster were imprisoned here by Richard II. before Henry came to the throne; and Richard, duke of York, and father of Edward IV. held court at the castle, where also several Irish parliaments met until the middle of the 15th century, and a

mint was established in 1469. The residence in a house in Dublingate Street of the famous duke of Wellington is commemorated by a Corinthian column and statue. Trim is governed by an urban district council. It was incorporated by Edward III., and returned two members to the Irish parliament until the Union in 1800.

TRIMMER, JOSHUA (1795-1857), English geologist, was born at North Cray in Kent, on the nth of July 1795. He was son of Joshua Kirby Trimmer of Brentford, and grandson

of Mrs Sarah Trimmer (1741-1810), authoress of the Story of the Robins (1786). At the age of nineteen he was sent to North Wales to manage a copper-mine for his father; subsequently he was placed in charge of a farm in Middlesex, where he acquired a knowledge of and an interest in soils; in 1825 he became mana- ger (for his father) of slate quarries near Bangor and Carnarvon, and in this district he remained for many years. He discovered the marine shells in the drift of Moel Tryfaen. During the years 1850-1854 he was engaged on the Geological Survey, and surveyed parts of the New Forest in Hampshire. He died in London on the 16th of September 1857.

He published memoirs on the Origin of the Soils which cover the Chalk of Kent; On the Geology of Norfolk, as Illustrating the Laws of the Distribution of Soils (1847); and Proposals for a Geological Survey, specially directed to Agricultural Objects (1850); in this respect he was a pioneer in agricultural geology. He was author also of a useful work Practical Geology and Mineralogy (1841). Obituary by J. E. Portlock, in Quart. Journ. Geol. Soc. (1858).

TRIMONTIUM, the name of a Roman fort at Newstead, near Melrose, Scotland, close under the three Eildon Hills (whence the name Irium montium). It was an advanced post of the Romans towards Scotland both about 80 a.d. and after, and again (after an interval of evacuation) from about a.d. 140—180. Excavations during the last four years have yielded finds of almost unique importance. These include the foundations of several successive forts, one

above the other, which throw much light on the character of the Roman military post; an unparalleled collection of Roman armour, including ornate helmets, and a good series of coins and datable pottery. The whole illustrate the history of the Roman army and that of Roman Scotland very remarkably and to an extent equalled by no Scottish site as yet explored.

See the report pubiished for the Society of Antiquaries of Scotland bytheexcavatorMrJamesCurle. (F. J. H.)

TRINCOMALEE, a town and former naval station on the north-east coast of Ceylon, 100 m. N.E. by N. of Kandy. Pop. (1901), 11,295. It is built on the north side of the bay of Trin- comalee, on the neck of a bold peninsula separating the inner from the outer harbour. There is a lighthouse on the extremity of Foul Point at the southern side of the bay, and another on the summit of Round Island. The inner harbour is landlocked, with a safe anchorage and deep water close to the principal wharves; the outer harbour has an area of about 4 sq. m. with a depth of about 70 fathoms. With its magnificent harbour— one of the five or six greatest natural harbours in the world — it used to be the headquarters of the admiral com- manding on the East Indian station, with a garrison of infantry and British artillery. The breadth of the streets and esplanades somewhat atones for the mean appearance of the houses, but the town generally has a gloomy and impoverished aspect. Pearl oysters are found in the lagoon of Tambalagam to the west of the bay. A steamer from Colombo calls weekly with and for passengers and cargo. Average annual rainfall, 62ˆ in.; average temperature, 81-2° F. Some tobacco, rice, and palm are grown in the district.

Attention was directed to the importance of Trincomalee as a naval base in 1896, when a commission of officers recommended its being turned into a modern fortress. The work was com- menced in 1898 and finished in 1904. All the batteries were rebuilt and fitted with modern appliances. The whole area was connected with cable and telephone communication, and armed with the latest type of guns; and the fortress was supposed to be impregnable; but in the following year the station was abandoned, the naval yard closed, and the military garrison withdrawn. A man-of-war is still kept in Trincomalee Harbour, to work

the defences.

The town was one of the first settlements of the Tamil race in Ceylon, who at a very earlyperiod erected on a height at the extremity of the peninsula, now crowned by Fort Frederick, a vemple dedicated to Konatha, or Konasir, named the " temple of a thousand columns." The building was desecrated and destroyed in 1622, when the town was taken by the Portuguese, who made use of the materials for the erection of the fort. The

town was successively held by the Dutch (1639,', the FrencH (1673), the Dutch (1674), the French (1782), and the Dutch (1783). After a siege of three weeks it surrendered to the British fleet in 1795, and with other Dutch possession? in Ceylon was formally ceded to Great Britain by the Treaty 01 Amiens in

1802.

TRING, a market town in the Watford parliamentary division of Hertfordshire, England, 31 j m. N.W. by W. from London by the London and North Western railway. Pop. of urban district (1901), 4349. It lies on the western slope of the Chil tern Hills, close to the entrance to a narrow valley which pierces them, and forms one of the highways through them to London, carrying the railway, the Grand Junction Canal, and a main road. The church of St Peter and St Paul shows fine Per- pendicular work, especially in the ornate interior of the nave. Industries include straw-plaiting and the weaving of canvas and silk. The Rothschild Museum, erected in 1889, contains an extensive natural history collection. Living wild animals are also kept in a neighbouring paddock and cages. The road which passes through Tring and along the face of the hills represents the ancient Icknield Way, and there may have been a Romano-British village on the site of Tring.

TRINIDAD, the most southerly and, with the exception of Jamaica, the largest of the British West Indian Islands. Pop. (1901), 236,397. It is situated 6 m. E. of the coast of Venezuela, between io° 3′ and io° 50′ N. and 6o°39'and62° W. Its average length is 48 m., its breadth 35 m. and its area 1754 sq. m. In shape it is almost square, but it throws off two peninsulas westward from its north and south

corners. Corozal Point projecting from its north-western and Icacos Point from its south-western extremity enclose the Gulf of Paria. To the west of Corozal Point lie several islands, of which Chaca- chacare, Huevos Monos and Monos Gaspar Grande are the most important. The surface is level or undulating, excepting in the north and south where there are ranges of hills, with eastern and western axes, prolongations of the Venezuelan coast ranges. Of these the northern is the more elevated ridge, its highest point being Tucuche Peak (3100 ft.). The southern hills attain an elevation of 600 ft. A small ridge runs east to west by south through the centre of the island, from Manzanilla Point to San Fernando, having an isolated elevation in Mt Tamana (1028). The hills of the northern and southern ranges are furrowed by innumerable ravines, and are clad to their summits with dense forests. There are numerous small streams, none navigable, and all flowing either east or west.

In its geology, as well as in its flora and fauna. Trinidad differs little from the mainland, with which it was probably at one time connected. There are four mineral springs and several mud volcanoes, but the two most striking natural features are the Maracas Falls, and the Pitch Lake. The Maracas Falls are situated at the head of a valley of the same name, to the north-east of Port of Spain, where the river leaps in a foaming torrent over a sheer wall of rock, 312 ft. high. The Pitch Lake lies some 38 m. by water south-east of the capital, in the ward of La Brea. It is circular in form, about 3 m. in circumference, and 104 acres in extent. Underground forces acting on the pitch cause it to rise in unequal masses, which are rounded off like huge mushrooms, separated from one another by narrow fissures, in which the rainwater collects and forms pools. Near the centre of the lake the pitch is always soft and can be observed bubbling up in a liquid state. When the sun is hot the lightest footfall leaves an impression and the pitch emits an unplea- sant odour. The soil of the surrounding district is charged with asphalt, but is very fertile, while the road to the neighbouring port of La Brea, running on a bed of asphalt, moves slowly towards the sea like a glacier The lake is worked by a company which exports the asphalt to the United States; paying rdyalty to the local govern- ment on every ton exported.

The mountain range which runs along the north coast is formed of clay-slates, micaceous and talcose schists, and crystalline and compact limestones, constituting the group called the Caribbean series, the age of which is unknown. The rest of the island it composed of Cretaceous, Tertiary and Quaternary strata. The Cretaceous beds rise to the surface in the centre and are flanked to north and south by the later deposits. Owing to the rarity of satisfactory sections the relations of the various divisions of the Tertiary formation are still somewhat obscure ; but they are grouped by J. B. Harrison into (1) Nariva and San Fernando beds, = Eocene

and Oligocene; (2) Naparima marls = Miocene and (3) Moruga series = Pliocene and Pleistocene. The Naparima marls consist of a lower division containing Globigerina and an upper division with Radiolaria and diatoms and are clearly of deep-sea origin. The bitumen of the Pliocene and Pleistocene deposits appears to have been formed by the decomposition of vegetable matter. Salses or mud volcanoes occur upon the island, but there is no evidence of true volcanic action in Tertiary or recent times, except the presence of occasional bands of pumiceous earth in some of the Tertiary deposits, and the pumice in these cases was probably derived from a distance.

The presence of oil in large quantities in Trinidad had been sus- pected for many years, and early in the 20th century the govern- ment undertook a geological survey to determine the probabilities of an industry. This survey revealed the presence of a series of anticlines at payable depths in the southern division of the island, and experimental borings by three companies at La Brea and Point Fortin in the south-west and Guayaguayare in the south-east proved the presence of oil in large quantities. In 1910 the commercial exploitation of Trinidad oil was being rapidly pushed forward.

The soil of the island is exceedingly rich, and well adapted to the growth of tropical products, especially of sugar and cocoa, which are its staples. The planting of new lands is

rapidly progressing, the greater part of the unsold crown lands (various blocks of which have been formed into forest or water reserves) being covered with forests, containing a valuable supply of timber. Poisonous and medicinal herbs grow everywhere. Owing to the variety of its resources, Trinidad has suffered less from general depression than the other islands in the British West Indies. It exports cocoa, sugar, rum, molasses, coffee, tobacco, coco-nuts, fruit, timber, dye- woods, balata gum, india-rubber and asphalt. Large quantities of tonga-beans, the produce of the mainland, are cured in bond at Port of Spain. The manufacture of bitters (Angostura and others) is an important industry, as is also the raising of stock. In addition Trinidad has a large carrying trade with the neighbouring republics, and rivals St Thomas (q.v.) as a centre of distribution for British and American merchandise through the West Indies and Venezuela.

Lying in the tract of the trade winds and being practically a part of the rnainland, Trinidad is immune from the vicissitudes of climate to which the other Antilles are exposed. It is never visited by hurricanes and its seasons are regular, wet from May to January, with a short dry season in October known as the Indian summer and lasting usually about four weeks, and dry from end of January to middle of May. The average annual rainfall is 66-26 in. and the mean temperature is 78-6° F. A volunteer force was established in 1879, and now consists of infantry, garrison artillery and three companies of Light Horse stationed in Port of Spain, San Fernando and St Joseph. Elementary education is given chiefly in the state-aided schools of the different denominations, but there are a number of entirely secular schools managed by the government. The Presbyterian schools are conducted by a Canadian mission. Instruction is free, but in some few schools fees are paid. Agricul- ture is a compulsory subject in all the primary schools. Higher education is provided by the Queen's Royal College, a secular institution, to which the Presbyterian Naparima College and the Roman Catholic St Mary's College are affiliated. Attached to these colleges are four scholarships of the annual value of £150 for four years, tenable at any British university. The religious bodies, both Christian and pagan are exceedingly numerous. The Roman Catholics (with an archbishop at Port of Spain) and the

Anglicans, with the bishop of Trinidad at their head, are the more powerful Ixidies. Of the inhabitants of the island, one-third are East Indians. Immigration from India is conducted under government control, and the prosperity of Trinidad is largely due to the contract labour obtained under this system. Of the rest the upper classes are Creoles of British, French and Spanish blood, while the lower classes are of pure or mixed negro origin, with a few Chinese. English is spoken in the towns and in some of the country districts, but in the north and generally in the cocoa-growing areas a French patois prevails, and in several districts Spanish is still in use. English money is legal tender, as also is the United States gold currency. Accounts are kept in dollars by the general public, but in sterling by the government. There is a complete system of main and local roads constructed or under construction ; there are about 90 m. of railways, and practically all the towns of any size can be reached from Port of Spain by rail. Steamers ply daily between Port of Spain and the islands at the northern entrance to the Gulf of Paria and between San Fernando (the southern terminus of the railway) and the south-western ports of the island, while two steamers of the Royal Mail Company under contract connect Port of Spain with the other parts of Trinidad and Tobago. Port of Spain is also in direct communication with Southampton.

The colony (Trinidad and Tobago) is administered by a governor assisted by an executive council and a legislative council of twenty members of whom ten are officials sitting by virtue of office and ten are unofficials nominated by the Crown. Port of Spain, the capital, is situated on the west coast on the shores of the Gulf of Paria. It is considered one

of the finest towns in the West Indies, its streets are regular and well shaded, its water supply abundant, and an excellent service of tramways connects the various quarters of the town. It has two cathedrals, a fine block of public buildings containing the principal government departments, the courts of justice and the legislative council chamber, many other large government buildings, a public library, and many good shops, while one of its most beautiful features is its botanical garden, in which the residence of the governor is situated. The harbour is an open roadstead, safe and sheltered, but so shallow that large ships have to lie at anchor half a mile from the jetties.

It is, never- theless, the place of shipment not only for the produce of the entire island but also for that of the Orinoco region. The popu- lation is about 55,000. The other towns are San Fernando (pop. 7613), also on the Gulf of Paria, about 30 m. south of the capital; and Arima (pop. 4076), an inland town 16 m. by rail east of Port of Spain.

Trinidad was discovered by Columbus in 1496. It remained in Spanish possession (although its then capital, San Jose de Oruna, was burned by Sir Walter Raleigh in 1595) until 1797, when a British expedition from Martinique caused its capitula- tion. It was finally ceded to Great Britain by the Treaty of Amiens in 1802.

See F. Eversley, The Trinidad Reviewer (London, 1900) ; Stark's Guide-book and History of Trinidad (London); the Journal of the Royal Colonial Institute, passim; and for geology, G. P. Wall and J. G. Sawkins, Report on the Geology of Trinidad (London, i860) ; J. B. Harrison and A. J. Jukes-Browne, " The Oceanic Deposits of Trinidad " (British West Indies), Quart. Journ. Geol. Soc. (London, 1899), lv. 177-189; R- J- L. Guppy, " The Growth of Trinidad, ' Trans. Canadian Inst. (1905), viii. 137-149, with plate. The last paper gives a list of all the more important works and papers on the geology of the island.

TRINIDAD, an uninhabited island in the South Atlantic, 680 m. E. of the coast of Espirito Santo, Brazil, in 20 30′ s! 29° 30′ W., 4 m. long by 2 broad. It is of volcanic formation, and has springs of fresh water. As a possible coaling and tele- graph station in mid-ocean, it formed a subject of contention between Brazil and Great Britain in 1895. The dispute was settled in favour of Brazil, which claimed on the ground of its discovery by Tristan da Cunha early in the 16th century, while Great Britain relied on its occupation by the astronomer Halley in the name of England in the year 1700. About 30 m. east are the three islets of Martin Vaz so named from the Portuguese mariner who discovered them about 15 10.

TRINIDAD, a city and the county-seat of Las Animas county, Colorado, U.S.A., in the south part of the state, about 100 m. S. of Pueblo. Pop. (1890) 5523; (1900) 5345 (659 foreign-born); (1910) 10,204. Trinidad is served by the Denver & Rio Grande, the Colorado & Southern, the

Colorado & Wyoming, and the Atchison, Topeka & Santa Fe railways and by electric railways to the neighbouring coal-mining towns. The city is regularly laid out on a hilly site, on both sides of the Purgatory (or Las Animas) river, near a picturesque canyon and mountain district, including the Stonewall Valley, and at the foot of the Raton Mountains, of which the highest peak, Fisher's (or Raton) Peak (9586 ft.), is 10 m. south of Trinidad. The city has a Carnegie library, a Federal building, an opera house, an amuse- ment park, and the San Rafael hospital, under the charge of the Sisters of Charity. A steam heating plant pipes heat to many shops, offices and residences. Trinidad is in a coal and coke and stock-raising region, and alfalfa, frijole and sugar beets are produced in large quantities in the surrounding region, much of which is irrigated. Dry farming has been successfully carried on at an experiment farm, established in 1906, 12 m. north of the city. Trinidad has railway shops, foundry and machine shops, and coking ovens, ships large quantities of coal, has a wool- scouring mill, and various manufactures. The municipality owns and operates the waterworks. Trinidad was incorporated as a town in 1876, and in 1879 became a city of the second class.

TRINIDAD, a town near the southern coast of Cuba, in Santa Clara Province, about 45 m. south-east of Cienfuegos, and 3 m. from its seaport, Casilda, which lies due south.

Pop. (1907), 11,197. There is a small local railway, not con-nected (in 1909) with the central trunk line of the island. The city lies on the slope of La Vigia hill (900 ft.) amid higher moun- tains, and on the banks of the Jayoba (San Juan) river. The streets are narrow, broken and tortuous, and the general aspect of the town is medieval. There are some attractive buildings and a very fine market square. The fine scenery in the neighbourhood, and the climate, which is possibly the healthiest in Cuba, make the place a favourite resort for natives and foreigners. Casilda (pop. in 1907, 1246) has a land- locked, shallow harbour; but Masio Bay, a trifle farther distant, accommodates larger craft; and there are excellent deep-water anchorages among the quays off the coast. The Manati river is navigable for about 7 m.

inland, and is used as an outlet for sugar and molasses crops. These and honey are the chief exports; tobacco and various vegetables and fruits are of minor importance. Trinidad is one of the seven original cities of Cuba established by Diego Velasquez. It was founded in 1 514 on the coast, but after being attacked by pirates was removed inland. It was thrice sacked by English buccaneers — in 1642, 1654 and 1702; and in the following years, up to and for a time after the peace of Utrecht (1713), it maintained ships and soldiers. Indeed, throughout the first half of the 18th century it was on a continuous war footing against English corsairs, making reprisals on British ships and thriving at the same time on a large contraband trade with Jamaica and other foreign colonies. In 1818 Casilda was opened to legal commerce under the national and foreign flags.

TRINITARIANS, a religious order founded in 1198 by St John of Matha and St Felix of Valois, for the liberation of Christian prisoners and slaves from captivity under the Moors and Saracens. The two founders went to Rome and there obtained the approbation of Innocent III., 1198. The rule was the Augustinian, supplemented by regulations of an austere character. The habit was white, with a red and blue cross on the breast. The Trinitarians are canons regular, but in England they were often spoken of as friars. The first monastery and head house of the order was at Cerfroy near Soissons. Among the earliest recruits were some Englishmen, and the first to go on the special mission of the order were two Englishmen, who in 1 200 went to Morocco and returned thence to France with 186 liberated Christian captives. This success excited great enthusiasm and led to the diffusion of the order all over Western Christendom. At the beginning of the 18th century there were still 250 houses, and it is stated that there had been 800; this, however, includes 43 in England, where Dugdale says he could find traces only of a dozen: so that the high figures are probably apocryphal. The first house in England was at Mottenden, in Kent, founded in 1224. The ordinary method of freeing captives was by paying their ransom and for this purpose vast sums of money were collected by the Trinitarians; but they were called upon, if other means failed, to offer themselves in exchange for Christian captives. Many thousands were liberated by their efforts. In

the 17 th century a reform called the Barefooted Trinitarians was initiated, which became a distinct order and is the only one that survives. There are now less than 500 members. Their headquarters are at San Crisogono in Rome. They devote themselves to the ransoming of negro slaves, especially children, and a great district in Somaliland has been since 1904 entrusted to them as a field for missionary work. There were Trinitarian nuns and a Third Order.

The chief modern book on the Trinitarians is Deslandres, L'Ordre francais des Trinitaires (2 vols. 1903). Sufficient information will be found in Helyot, Histoire des ordres religieux (1714), vol. ii. chs. 45-50; and in Max Heimbucher, Orden u. Kongregahonen (1907), ii. §57- (E. C. B.)

TRINITY HOUSE, CORPORATION OF, an association of English mariners which originally had its headquarters at Dept- ford in Kent. In its first charter, received from Henry VIII. in 1514, it was described as the "guild or fraternity of the most glorious and undividable Trinity of St Clement." The first

master appointed was the founder of the corporation, Sir Thomas Spert, comptroller of the navy to the king, and commander of the " Harry Grace de Dieu." Deptford having been made a royal dockyard by Henry VIII., and being the station where outgoing ships were supplied with pilots, the corporation rapidly developed its influence and usefulness. By Henry VIII. it was entrusted with the direction of the new naval dockyard. From Elizabeth, who conferred on it a grant of arms in 1573, it received authority to erect beacons and other marks for the guidance of navigators along the coasts of England. In 1604 a select class, was constituted called Elder Brethren, the other members being called Younger Brethren. By the charter of 1609 the sole management of affairs was conferred on the Elder Brethren; the Younger Brethren, however, having a vote in the election of master and wardens. The practical duties of the fraternity are discharged by the acting Elder Brethren, 13 in number, of whom 2 are elected from the royal navy and 11 from the merchant service; but as a mark of honour persons of rank and eminence are admitted as honorary Elder Brethren. In 1647 the corporation was dissolved by

parliament, but it was reconstructed in 1660, and the charter was re- newed by James II. in 1685. In 1687 a by-law of the Trinity House for the first time required an agreement in writing between the master and crew of a ship. A new hall and alms- houses were erected at Deptford in 1765; but for some time the offices of the corporation had been transferred to London, where for a while they had a house in Water Lane, Lower Thames Street, and in 1795 their headquarters were removed to Trinity House, Tower Hill, built from the designs of Samuel Wyatt. By an act of 1836 they received powers to purchase from the Crown, as well as from private proprietors, all interests in coast lights. For the maintenance of lights, buoys, &c, they had power to raise money by tolls, the surplus being devoted to the relief of old and indigent mariners or their near relatives. In 1853 the control of the funds collected by the corporation was transferred to the board of trade, and the money over which the brethren were allowed independent control was ultimately reduced to the private income derived from funded and trust property. Their practical duties in erection and maintenance of lighthouses, buoys and beacons remain as important as ever. Similar functions are carried out by the Northern Lighthouse Board and the Irish Lighthouse Board, for Scotland and Ireland respectively. They have also the care and supervision of pilots. Other Trinity Houses established under charter or act of parliament for the appoint- ment and control of pilots are at Hull and Newcastle. The Elder Brethren of Trinity Masters also act as nautical assessors in the high court of admiralty. The corporation has a large wharf and repair shop at the mouth of the river Lea, where most of the work in connexion with buoying the Thames is carried out.

See W. H. Mayo, Trinity House, London, Past and Present (London, 1905); C. R. B. Barrett, The Trinity House of Deptford Strond (1893).

TRINITY SUNDAY, the Sunday next after Whitsunday. A festival in honour of the Trinity had been celebrated locally at various dates before Pope John XXII. in 1334 ordered its general observance on the octave of Whitsunday. According to Gervase of Canterbury, it had been introduced into England by Thomas Becket, archbishop of Canterbury, in 1162. It has, however, never been reckoned among the great festivals of the Church. From Trinity Sunday onwards

all Sundays until the close of the ecclesiastical year are reckoned as ” after Trinity.” In the Roman Church these Sundays are also reckoned as ” after Pentecost.” In the latter case they are described as dominicae trinitatis, not to be confused with dominicae post Irinitatis; e.g. Dominica sexta post trinitatis is the same as Dominica septima Irinitatis.

TRINODA NECESSITAS, the name used by modern historians to describe the threefold obligation of serving in the host (fyrd), repairing and constructing bridges (bryc-geweorc) , and the construction and maintenance of fortresses (burhbot), to

which all freeholders were subject in Anglo-Saxon times. The obligations are usually mentioned in charters as the sole excep- tions to grants of immunities; sometimes, however, a fourth obli- gation (singulare praetium contra alium) is reserved, as in the charter granted by Wiglaf of Mercia on the 28th of December S31 (Cod. dip. i. 294). Ceolwulfs charter of 822 to Arch- bishop Wilfred is remarkable, as the military service is there restricted to expeditiones contra paganos ostes (ibid. i. 272). The threefold obligation is first mentioned in a Latin charter (expeditione pontis arcisue constructione) of doubtful authen- ticity, which professes to have been granted by Eadbald of Kent in a.d. 616 (Cod. dip. v. 2), but it is not until the 8th century that it appears in documents which are generally admitted to be genuine. Although there were correspond- ing obligations in the Frankish Empire which were called by Charles the Bald (antiquam et aliarum gentium eonsuetudinem) , Stubbs held that the arguments which refer them to a Roman origin want both congruity and continuity.

The phrase ” trinoda necessitas ” is not to be found in the Anglo- Saxon laws and charters ; and Selden was probably the first historian of eminence who used it. ” These three exceptions,” he says, ” are noted by the term of a three-knotted necessity in an old charter wherein King Cedwalla granted to Wilfrid, the first bishop of Shelsey in Sussex, the

village of Paganham." This charter is an 11th-century copy of a lost original, but the words to which Selden referred are plainly written as trimoda necessitas not trinoda necessitas. Du Cange gives two examples of the word trimoda in medieval Latin, in which language it meant "triple"; but he cites no medieval example of trinoda; and in classical Latin the form is unknown, while trinodis (ternodus, " triple-knotted ") occurs only rarely (Ovid. Her. iv. 115; Fast. i. 575).

See Du Cange, Glossarium; W. Stubbs, The Constitutional History of England, i. 86, 87; J. M. Kemble, Codex anglo-saxonicus , passim; Selden, English Janus (London, 1682), p. 43; Walter de Gray Birch, Cartularium saxonicum, passim; Facsimiles of Ancient Charters in the British Museum, pt. iv. Cotton MS. Augustus, ii. 86. (G. J. T.)

TRINOVANTES (commonly Trinobantes) , a powerful British tribe about 50 B.C. -a.d. 50 dwelling north and north-east of London, rivals and neighbours of the Catuvellauni. When Caesar invaded Britain 54 B.C. they joined him against their domestic rivals and it is possible (though not certain) that half a century after Caesar's departure they succumbed to them. Certainly they were conquered by Rome in a.d. 43 and joined in Boadicea's revolt in 61. In the tribal division of Roman Britain given by Ptolemy their land included Camulo- dunum (Colchester), but nothing more is known of them. But their name plays a part in medieval legends and romances. There it was interpreted as Troy Novant, the " new Troy," and connected with the names of the Trojans Brutus and Corineus who were reputed to have given their names to Britain and Cornwall. (F. J. H.)

TRIOLET, one of the fixed forms of verse invented in medieval France, and preserved in the practice of many modern litera- tures. It consists of eight short lines on two rhymes, arranged a b a a a b a b , and in French usually begins on the masculine rhyme. The first line reappears as the fourth line, and the seventh and eighth lines repeat the opening couplet; the first line, therefore, is repeated three times, and hence the name. No more typical specimen of the triolet could be found than the following, by Jacques Ranchin (c. 1690): —

" Le premier jour du mois de jnai Fut le plus heureux de ma

vie : Le beau dessein que je formais, Le premier jour du mois de mai ! Je Vous vis et je vous aimais. Si ce dessein vous plut, Sylvie, Le premier jour du mois de mai Fut le plus heureux de ma vie."

This poem was styled by Menage " the king of triolets." The great art of the triolet consists in using the refrain-line with such naturalness and ease that it should seem inevitable, and yet in each repetition slightly altering its meaning, or at least its relation to the rest of the poem. The triolet seems to have been invented in the 13th century. The earliest example known occurs in the Cliomadis of Adenez-le-Roi

(1 258-1 297). The medieval triolet was usually written in lines of ten syllables, and the lightness of touch in the modern speci- mens was unknown to these perfectly serious examples. One of the best-known is that of Froissart, " Mon cceur s'ebat en odorant la rose." The rules are laid down in the Art et Science de Rhethorique (1493) of Henry de Croi, who quotes a triolet written in words of one syllable. According to Sarrasin, who introduces the triolet as a mourner in his Pompe funcbre de Voiture, it was that writer who " remis en vogue " the ancient precise forms of verse, " par ses balades, ses trio- lets et ses rondeaux, qui par sa mort (1648) retournaient dans leur ancien decri." Boileau threw scorn upon the deli- cate art of these pieces, and mocked the memory of Clement Marot because he " tourna des triolets," but Marmontel recognized the neatness and charm of the form. They continued to be written in France, but not by poets of much pretension, until the middle of the 19th century, when there was a great revival of their use.

The earliest triolets in English are those of a devotional nature composed in 1651 by Patrick Carey, a Benedictine monk at Douai, where he probably had become acquainted with what Voiture had made a fashionable French pastime. In modern times, the triolet was re-introduced into English by Robert Bridges, in 1873, with his —

" When first we met, we did not guess

That Love would prove so hard a master;

Of more than common friendliness

When first we met we did not guess.

Who could foretell the sore distress,

This irretrievable disaster,

When first we met? — we did not guess

That Love would prove so hard a master.”

Since then the triolet has been cultivated very widely in English, most successfully by Austin Dobson, whose ” Rose kissed me to-day,” ” I intended an Ode ” and ” In the School of Coquettes ” are masterpieces of ingenuity and easy grace. In later French literature, triolets are innumerable; perhaps the most graceful cycle of them is ” Les Prunes,” attached by Alphonse Daudet to his Les Amoureuses in 1858; and there are delightful examples by Theodore de Banville. In Germany the triolet has attracted much attention. Those which had been written before his day were collected by Friedrich Rass- mann, in 1815 and 1817. But as early as 1795 an anthology of triolets had been published at Halberstadt, and another at Brunswick in 1796. Rassmann distinguished three species of triolet, the legitimate form (which has been described above), the loose triolet, which only approximately abides by the rules as to number of rhymes and lines, and single- strophe poems which more or less accidentally approach the true triolet in character. The true triolet was employed by W. Schlegel, Hagedorn, Riickert, Platen and other romantic poets of the early 19th century. In many languages the triolet has come into very frequent use to give point and brightness to a brief stroke of satire; the French newspapers are full of examples of this. The triolet always, or at least since medieval times, has laboured under a suspicion of frivolity, and Rivarol, in 1788, found no more cutting thing to say of Conjon de Bayeux than that he was ” si recherche pour le triolet.” But in the hands of a genuine poet who desires to record and to repeat a mood of graceful reverie or pathetic humour, the triolet possesses a very delicate charm.

See Friedrich Rassmann, Sammlung triolettischer Spiele (Leipzig, 1817). (E. G.)

TRIPHENYLMETHANE, (C 6 H 6) 3 CH, a hydrocarbon, impor- tant as being the parent substance of several series of exceedingly valuable dyestuffs, e.g. rosanilines and malachite greens derived from aminotriphenylmethanes, and aurins and phthaleins de- rived from oxytriphenylmethanes. It is obtained by condensing benzal chloride with mercury diphenyl (Kekul6 and Fran- chimont, Ber., 1872, 5, p. 907); from benzal chloride or benzo- trichloride and zinc dust or aluminium chloride; from chloroform or carbon tetrachloride and benzene in the presence of aluminium chloride; and deamidating di- and tri-aminotriphenylmethane

with nitrous acid and alcohol (0. and E. Fischer, Ann., 1881, 206, p. 152). The last reaction is most important, for it established the connexion between this hydrocarbon and the rosanilines. Tri- phenylmethane is a white crystalline solid, melting at 92 and boiling at 358 . It separates from benzene and thiophene with one molecule of the ” solvent of crystallization.” On oxidation it gives triphenylcarbinol, (C 6 H 5)3C-OH, and reduction with hydriodic acid and red phosphorus gives benzene and toluene. It combines with potassium to give (C 6 H 5)3CK, which with carbon dioxide gives potassium triphenylacetate, (C 6 H 5)3C C0 2 K. Fuming nitric acid gives a paratrinitro substitution derivative which on reduction gives paraleucaniline ; the salt of the carbinol formed on oxidizing this substance is the valuable dye rosaniline.

Considerable interest is attached to the remarkable series of hydrocarbons obtained by Gomberg (Ber., 1900, 33, p. 3150, et seq.) by acting on triphenylmethane chloride (from triphenylmethane carbinol and phosphorus pentachloride, or from carbon tetra- chloride and benzene in the presence of aluminium chloride) and its homologues with zinc, silver or mercury. Triphenylmethane chloride yields triphenylmethyl ; ditolylphenylmethyl and tritolyl- methyl have also been prepared. They behave as unsaturated compounds, combining with oxygen to form peroxides and with the halogens to form triarylmethane halides. Triphenylmethyl also combines with ethers and esters, but

the compounds so formed are unsaturated. In the solid state triphenyl is colourless, crystal- line and bimolecular. It was thought that it might be identical with hexaphenylethane, but the supposed synthesis of this sub- stance by Ullmann and Borsum (Ber., 1902, 35, p. 2877) appeared to disprove this, although it showed that triphenylmethyl readily isomerized into their product, under the influence of catalysts. A.E. Tschitschibabin (Ber., 1908, 41, p. 2421), however, has shown that Ullmann and Borsum's preparation was para-benzhydrol- tetraphenylmethane (C 6 H 6) 2 CH-C6H.rC(C6H.,)3; and the view that solid triphenylmethyl is hexaphenylethane has much in its favour. Another remarkable fact is that these substances yield coloured solutions in organic solvents; triphenylmethyl gives a yellow solu- tion, whilst ditolylphenyl and tritolylmethyls give orange solutions which on warming turn to a violet and to a magenta, the changes being reversed on cooling. Several views have been published to explain this fact. A summary is given by Tschitschibabin (Journ. prak. Chetn., 1907 (ii.), 74, p. 340). It appears probable that the solutions contain a quinonoid modification (see Gomberg and Cone, Ann., 1909, 370, p. 142).

TRIPOD (Gr. rpiirovs, Lat. iripus), in classical antiquities, any " three-footed " utensil or article of furniture. The name is specially applied to the following: (1) A seat or table with three legs. (2) A stand for holding the caldron used for boiling water or cooking meat; when caldron and stand were made in one piece, the name was given to the complete ap- paratus. (3) A sacrificial tripod, or altar, the most famous of which was the Delphic tripod, on which the Pythian priestess took her seat to deliver the oracles of the god, the seat being formed by a circular slab on the top, on which a branch of laurel was deposited when it was unoccupied by the priestess. Another well-known tripod was the " Plataean," made from a tenth part of the spoils taken from the Persian army after the battle of Plataea. This consisted of a golden basin, sup- ported by a bronze serpent with three heads (or three serpents intertwined), with a list of the states that had taken part in the war inscribed on the coils of the serpent. The golden bowl was carried off by the Phocians during the Sacred War; the stand was removed by the emperor Constantine to Con- stantinople, where it is

still to be seen in the Atmeidan (hippo- drome), but in a damaged condition, the heads of the serpents having disappeared. The inscription, however, has been almost entirely restored (see Frazer on Pausanias, v. 299 seq.). Such tripods were usually of bronze and had three ” ears ” (rings which served as handles). They also frequently had a central upright as support in addition to the three legs. Tripods are frequently mentioned in Homer as prizes in athletic games and as complimentary gifts, and in later times, highly decorated and bearing inscriptions, they served the same purpose. They were also used as dedicatory offerings to the gods, and in the dramatic contests at the Dionysia the victorious choregus (a wealthy citizen who bore the expense of equipping and training the chorus) received a crown and a tripod, which he either dedicated to some god or set upon the top of a

marble structure erected in the form of a small circular temple in a street in Athens, called the ” street of tripods,” from the large number of memorials of this kind. One of these, the ” monument of Lysicrates,” erected by him to commemorate his victory in a dramatic contest in 335 B.C. is still in existence (see Frazer, ii. 207).

See C. 0. M tiller, De tripode delphico (1820); F. Wieseler, Ueber den delphischen Dreifuss (1871); E. Reisch, Griechische Weih- geschenke (1890), and his article ” Dreifuss ” in Pauly-Wissowa, Realencyclopadie der classischen Altertumswissenschaft, v, pt. 2 (1905).

TRIPOLI, a Turkish vilayet (regency) of North Africa. It is bounded N. by the Mediterranean (between n° 40′ and 2 5 12′ E.) and has a coast-line of over 1100 m. Tripoli comprises at least five distinct regions — Tripoli proper, the Barca plateau (Cyrenaica) , the Aujila oases, Fezzan (q.v.) and the oases of Ghadames and Ghat — which with the inter- vening sandy and stony wastes occupy the space between Tunisia and Egypt, extend from the Mediterranean south- wards to the Tropic of Cancer, and have a collective area of about 400,000 sq. m., with a population estimated at from 800,000 to 1,300,000. Towards the south and east the frontiers are undefined. But on the west side the conventional line laid down by agreement with France in 1886 was more accurately determined in 1892, when the terminal point on the Mediter- ranean was shifted from

Borj-el-Biban to Ras Ajir, 18 m. to the south-east, in 33° 12′ N. n° 40′ E. From this point the line passes along the Wad Magla and across the Erg (sand) dunes in such a way as to leave Ghadames to Turkey. In consequence of frontier collisions the boundary as far as Ghadames was precisely defined in 19 10. South of that point the rival claims of France and Turkey remained in dispute.

For some distance east of Tunisia the seaboard is low and sandy, and is often regarded as a part of the Sahara, which, however, begins only some 80 m. farther south, beyond the Jebels Nefusi, Yefren and Ghurian p e gtmvi (Gharian). The " Jebel," as this system is locally called, terminates eastwards in the Tarhona heights of the Horns (Khoms) coast district, has a mean altitude of about 2000 ft. and culminates in the Takut (Tekuk) volcano (2800 ft.) nearly due south of the capital. It is not a true mountain range, but rather the steep scarp of the Saharan plateau, which encloses southwards the Jefara coast plains, and probably represents the original coast-line. The Ghurian section is scored in places by the beds of intermittent coast streams, and on its lower slopes is clothed with a rich sub-tropical vegetation. South of these escarpments, the vast Hammada el-Homra, the " Red Hammada," an interminable stony table-land covering some 40,000 sq. m., occupies the whole space between Tripoli proper and the Fezzan depression. The now uninhabited and water- less Hammada formerly drained through several large rivers, such as the Wadis Targelat (Uani, Kseia), Terrgurt, Sofejin, Zemzem and Bel, north-eastwards to the Gulf of Sidra (Syrtis major). Southwards the table-land is skirted by the Jebel Welad Hassan, the Jebel es-Suda, the Jebel Morai-Yeh, and other detached ranges, which have a normal west to east trend in the direction of the Aujila oases, rising a little above the level of the plateau, but falling precipitously towards Fezzan. The Jebel es-Suda (Black Mountains), most conspicuous of these ranges, with a mean altitude of 2800 ft., takes its name from the blackened aspect of its limestone and sandstone rocks, which have been subjected to volcanic action, giving them the appearance of basalt. Eastwards this range ramifies into the two crescent-shaped chains of the Haruj el-Aswad and Haruj el-Abiad ("Black" and "White" Haruj), which rise some 700 ft. above the Red Hammada, and enclose an extensive Cretaceous plateau.

Rocks of Cretaceous age cover, indeed, an immense area of the northern part of the vilayet, recent eruptive rocks being represented by the lavas and ashes of the craters of Takut and Manterus. The later palaeozoic formations occur in Fezzan.

Beyond the barren Ghadama district in the north of the Hammada the dreary aspect of the wilderness is broken by

several tracts under grass, corn and date-palms, and containing some permanent reservoirs in the beds of the Wadis Sofejin and Zemzem, where the plateau falls from a mean height of 2000 ft. to 1000 and 530 ft. respectively. But it again rises rapidly southwards to a somewhat uniform level of 1600 or 1700 ft., and here the main caravan route from Tripoli to Murzuk and Lake Chad traverses for a distance of fully 130 m. a monotonous region of sandstone, underlying ■ clays, marls, gypsum and fossiliferous silicious deposits. In its northern section this part of the Hammada, as it is locally called in a pre-eminent sense, is relieved by a few patches of herbage, scrub and brushwood, with a little water left in the rocky cavities by the heavy showers which occasionally fall.

North-eastwards the Neddik pass over the Jebel Morai-Yeh leads down to the remarkable chain of low-lying oases, which, _ from the chief member of the group, is commonly

Degression. ca ” e d the Aujila depression. Collectively the oases present the aspect of a long winding valley, which is enclosed on the north side by the southern escarpments of the Barca plateau, expands at intervals into patches of perennial verdure and shallow saline basins, and extends from the Wadi el-Fareg, near the Gulf of Sidra, through the Bir Rassam, Aujila, Jalo, Faredgha, and Siwa oases, to the Natron lakes and the dried-up branch of the Nile delta known as the Bahr bila-Ma (waterless river). The whole region presents the aspect of a silted-up marine inlet, which perhaps in Pliocene times penetrated some 300 m. south-east- wards in the direction of the Nile. Nearly all the fossil shells found in its sands belong to the fauna now living in

the Mediterranean, and Siwa is 98 ft. below sea-level. This is true also of its eastern extensions, Sittra (80) and the Birket el-Kerun in the Fayum (141). But Aujila and Jalo stand 130 and 296 ft. respectively above sea- level, so that the idea entertained by the explorer Gerhard Rohlfs of transforming the chain of oases into a marine gulf, and thus converting the Barca plateau into an island or peninsula in the midst of the Mediterranean waters, and in fact flooding the Libyan desert, must share the fate of Colonel Frangois Roudaire's equally visionary scheme in respect of the Western Sahara.

The Barca plateau, which consists largely of strata of tertiary formation, falls in terraces down to the Aujila depression, and presents an unbroken rampart of steep cliffs towards Mf 3 ™ 3 t' ie Mediterranean, is by far the most favoured region Pateau. Q j j.^ v ji a y e (- j^ s many natural advantages of climate, soil and vegetation led to the establishment of several Greek colonies, the oldest and most famous of which was that of Cyrene (q.v.), dating from about 630 B.C. From this place the whole region took the name of Cyrenaica {q.v.) and was also known as Pentapolis, from its "five cities" of Cyrene, Apollonia, Arsinoe, Berenice and Barca. The elevated plateau of Cyrenaica, which encloses the Gulf of Sidra on the west, is separated southwards by the Aujila depression from the Libyan desert, and projects northwards far into the Mediterranean, might seem, like the Atlas region in the west, to belong geologically rather to the European than to the African mainland. It has a mean altitude of considerably over 2000 ft., and in the Jebel Akhdar (Green Mountains) attains a height of nearly 3500 ft. East- wards the Barca uplands merge gradually in the less elevated Marmarica plateau, which nowhere rises more than 1800 ft. above sea-level, and disappears altogether in the direction of the Nile delta. The most easterly spot on the coast belonging to Tripoli is the head of the Gulf of Solum; from this point the frontier line separating the regency from the Egyptian dominions runs south so as to leave the Siwa oasis on the Egyptian side of the line.

South of the Aujila depression the land rises steadily to a height of nearly 1200 feet in the Kufra oases, which lie between 21° and 24° E., north of the Tropic of Cancer and due east of Fezzan. The group consists of five distinct oases

in the heart of the Libyan desert — Taizerbo, Zighen, Bu-Zeima, Erbena and Kebabo — which extend for a distance of 200 m. north- west and south-east, and have a collective area of 7000 sq. m. and a population of 6000 or 7000 Arabo-Berber nomads. Good water is ob- tained in abundance from the underground reservoirs, which lie within a few feet of the surface, and support over a million date-palms. Kufra, that is, ” Infidels ” (in reference to the now extinct pagan Tibu aborigines), is a centre of the Seniissite brotherhood, whose zaivya (convent) at Jof, in Kebabo, ranks in importance with that of Jarabub, their chief station in Cyrenaica. This circumstance, together with the great fertility of the group and its position midway on the caravan route between Cyrenaica and Wadai, imparts excep- tional importance to these oases. Formerly the Turks did not exer- cise authority in Kufra, the influence of the Senussi being paramount. Kufra, moreover, is outside the limits usually assigned to Tripoli. But in 1910 Ottoman troops were in occupation of the oases.

Ghat stands 2400 feet above the sea, on the Wadi Aghelad in

the Igharghar basin, and consequently belongs, not to the Fezzan

„. . depression, but to the Saharan plateau. The Aghelad, or

” Passage,” trends north to the Iasawan valley along the

east foot cf the Tasili plateau, that is, the divide between the waters

which formerly flowed north to the Mediterranean, west to the Atlantic, and south to the Niger and Chad basins. Ghat, which is skirted eastwards by the Akakus range, is a sandy plain dotted over with clumps or groves of date-palms. In the centre is an open space where is held a great annual fair, and to this, combined with its position on one of the caravan routes across the desert, the oasis owes all its importance. For several years, at the end of the 19th and beginning of the 20th centuries, the only caravan route

used from the Niger countries to Tripoli was by way of Ghat, disturbances in Bornu and raids by Tuareg having closed all other routes. There is, in the oasis, a population of perhaps 10,000, nearly all Ihajenen Tuareg, about half of whom live in the town of Ghat (350 m. south of Ghadames and 250 south-west of Murzuk), which appears to be a relatively modern place, successor to Rapsa, a great commercial centre and military station under the Roman Empire.

Ghadames, on the contrary, is ancient, being the Cydamus of the Garamantes, the capture of which by L. Cornelius Balbus Minor led to the overthrow of their empire. The oasis, . which stands on the cretaceous Tinghert plateau 300 m. al,a < ' ames – south-west of Tripoli, and 1200 ft. above the sea, is enclosed by a circular rampart over 3 m. in circumference. The town, which occupies the south-west corner of the enclosure, has a population of about 7000. Owing to its perennial springs and artesian wells, the oasis yields an abundance of dates, figs, apricots and vegetables, besides some wheat, barley and millet. It occupies a highly advan- tageous position at the converging-point of several caravan routes, and has extensive trading relations with the markets of Tripoli, Tunisia and the Sudan.

Climate. — The climate of Tripoli is very variable ; cold nights often succeed warm days. The rainfall in the northern regions varies from 5 in. to 15 in. a year — December, January and February being the rainy season. The mean temperature on the coast lands is 68°; it is very much higher in the Hammada, where rain seldom falls.

Flora and Fauna. — The flora in the greater part of the regency is Saharan, the date-palm being the characteristic tree. The gum- yielding acacia, the tamarisk, sapan, mastic and pistachio are found in the wadis, and shi (wormwood) grows in clusters on the stony plateaus. In the Barca plateau and in parts of the coast belt the flora is more varied, resembling that of the Mediterranean countries generally. In these regions the laurel, myrtle and other evergreens are fairly common, and the oak, cypress, pine, carob and other trees occur, notably the olive, found also in the oases. Other fruit trees are the almond, fig, pomegranate, quince and apricot. Vines flourish in a few districts.

The larger wild animals are scarcely represented in Tripoli. The wild boar is found in Jebel Akhdar, the hyena, fox and jackal in the deserts. The mouflon, gazelle, hares, rabbits and marmots are among the commoner animals. Reptiles include the horned viper and the gecko. The characteristic animal is the camel, found only in the domesticated state. Horses and cattle are bred, but the horses are not numerous; goats and a fat-tailed variety of sheep are kept in large numbers. Birds include the ostrich, vultures, hoopoes, wood pigeons and doves. Bees are numerous and honey forms an article of export.

The explorations of Henri Duveyrier, Victor Largeau, Erwin von Bary and H. S. Cowper during the second half of the 19th century showed that Tripoli was not only inhabited inhabi- by primitive man, but was the seat of a flourishing taats. Neolithic culture, comparable to and in many respects resem- bling that of Iberia, Brittany and the British Isles. As in other parts of Mauretania, many now arid and uninhabitable wastes are strewn with monolithic and other remains, which occur in great variety of form and in vast numbers, as many as 10,000, chiefly of the menhir type, having been enumerated in the Mejana steppe alone. All kinds of megalithic structures are found — dolmens and circles like Stonehenge, cairns, under- ground cells excavated in the live rock, barrows topped with huge slabs, cup stones, mounds in the form of step pyramids, and sacrificial altars. Most remarkable are the " Senams," or tri- lithons of the Jebel Msi'd and other districts, some still standing, some in ruins, the purpose of which has not been determined. They occur either singly or in rows, and consist of two square uprights 10 ft. high standing on a common pedestal and supporting a huge transverse beam. In the Terrgurt valley " there had been originally no less than eighteen or twenty megalithic trilithons, in a line, each with its massive altar placed before it " (Cowper). There is reason to believe that the builders of these prehistoric monuments are represented by the Berber people, who still form the substratum, and in some places the bulk, of the in- habitants of Tripoli proper. But even here the Berbers have for the most part been driven to the Ghurian and Tarhona uplands by the Arab nomads, who now occupy the Jefara flats

about the capital, and are in almost exclusive possession of Cyrenaica, Marmarica, and the Aujila oases. In Fezzan the Saharan Berbers (Tinylkum Tuareg) are dominant, but are here largely intermingled with Negro or Negroid intruders from the Sudan. But even in the uplands many of the Berbers have been Arabized, and Cowper describes the people of the Tarhona heights as ” pure-bred Arabs.” Other early intruders are the Jews, some of whom arrived from Egypt in the time of the Ptolemies, and still lead the life of troglodytes in the lime- stone caves of the Ghurian escarpments. They are also numerous in the large towns, where there are also colonies of Turks, and Maltese, Italian, Cretan and other South European traders and artisans.

On the other hand, no trace can be now detected either of the Greeks who colonized Cyrenaica in the 7th century B.C., Tripoli and or °f tne Phoenicians who at a still earlier date other founded the three great cities of Oea, Sabrata and

Towns. Leptis Magna {q.v.), from which the western region projecting seawards between the two Syrtes took the name of Tripolitana. Later, when Oea, which stood between the two others, was made the capital of the province it was called Tripolis, the ” Three Cities,” as it were, rolled into one, and this name it has retained since Roman times, being now distinguished from the Tripolis of Syria as West Tripolis, the Tarabulus el-Gharb of the Turks and Arabs. Tripoli {q.v.), the capital of the province, is thus one of the oldest places in the world, and no doubt owes its stability in large measure to its position over against Sicily at the northern terminus of three great historic caravan routes, one of which runs due south to Lake Chad through Fezzan and Bilma, that is, across the narrowest part of the Sahara; another runs south-west through Ghadames and Ghat to Timbuktu and Kano, and the third south by east through Sokna to Wadai and Darfur. East of Tripoli are the small seaports of Homs (Khoms) and Lebda.

In Barca the largest town is Bengazi (17.11.) , the ancient Berenice, at the southern extremity of a headland which formerly enclosed a spacious natural haven on the north-east side of the Gulf of Sidra. But the harbour has been

partly filled up by the ruins of a large fortress, and is inaccessible to vessels drawing over 6 or 7 ft. East of Bengazi are Merj, the ancient Barca (q.v.), and the exposed roadstead of Derna {q.v.). Marsa-Susa, the ancient Apollonia, lies under the Ras Sem headland, and was the emporium of the neighbouring city of Cyrene (Ain Shahat-Grenna). The Turkish government displayed much activity in this fertile and healthy district in the period 1897- 1903. To it were removed many of the Moslem inhabitants of Crete dissatisfied with the autonomous regime established in that island in 1898.

Agriculture and Trade. — Tripoli proper is purely an agricultural and trading country; it possesses no manufactures of importance, nor exploited mineral wealth save salt. The uncertainty of the rain- fall, the apparent increasing poverty of the soil and the heavy taxation of the peasants reduced agriculture at the close of the 19th century to a lower point than theretofore recorded. The cultivation of wheat was largely supplanted by that of barley — the staple food of the peasantry, whilst esparto grass, a fibre growing wild in the rural districts within the cereal zone, acquired the chief place among local exports. The importation of foreign flour, begun in 1 881, assumed large dimensions in providing for the deficiencies occasioned by ever-recurring failures of the wheat and barley harvests. Besides wheat and barley the principal products of the country are esparto grass, olives, saffron, figs and dates — these last being perhaps the finest in North Africa. Fruit also is abundant in certain parts, including oranges and lemons, and so are many kinds of vegetables. There is a lucrative sponge fishery, a monopoly of Greek traders, over 100 barques being engaged in the industry.

Trade, before the suppression of the oversea slave traffic, was largely in negroes, brought across the Sahara with other Sudan produce, for the Turkish market. It now consists chiefly in the export of esparto, barley in years of plenty, eggs, cattle, sponges, mats and henna, all articles of local production, and, from Central Africa, ivory, ostrich feathers, tanned goat-skins and a little gold dust. The cattle go mainly to Malta, the esparto, barley, eggs and ivory mostly to England, the feathers to Paris and London, and the skins to New York. The henna and mats are sent to

Turkey, Egypt, Tunis and Malta. The exports of esparto grass vary with

the success or failure of the cereal crops; thus in 1903 the value 01 barley exported was £70,800, and of esparto £76,400. In 1904 the exports of barley fell to £3,200 and those of esparto rose to £126,000. From Bengazi hundreds of thousands of sheep are exported to Egypt, Malta and Crete. With Egypt there is an overland as well as sea trade. The caravan trade, which in the forty years ending 1901 had an annual average value of £114,000, is so costly that only articles yielding considerable profit can be carried ; the desert trade is, moreover, being deflected to the Niger and the Guinea coast. Tripoli imports, chiefly, food-stuffs (flour, rice, sugar, tea) cotton goods, tobacco, metals and hardware About two-thirds of the imports are from Great Britain. Exclusive of Bengazi the value of trade, imports and exports combined, was for the last thirty years of the 19th century some £770,000 per annum. The trade of Bengazi and Derna, chiefly with Great Britain and Malta, largely increased at the beginning of the 20th century. For the five years 1902-1906 the average annual value of imports was £214,000, of exports £455,700. From these ports the chief exports are sheep and goats, oxen, wool and skins, barley and camels — the last sent overland to Alexandria. Food-stuffs, tea, olive oil and cotton goods are the chief imports. There is an active' contraband trade with Greece and Malta in firearms and gunpowder.

Barley is the chief food of the people both in Tripoli proper and in Bengazi. The nomad Arabs possess thousands of camels, cattle and sheep. They weave rough woollen garments, make reed matting, carpets of alternative strips of woven goat and woven camel hair, and manufacture butter. Olive and date-palm trees are cultivated in large numbers. Tea has become a favourite beverage both in the regency and with the Sudanese. Tea, sugar and cottons form the staple articles of exchange with the Sudanese for their produce.

Communications. — The town of Tripoli is connected by telegraph cable with Malta, and telegraph lines run inland from that town to Murzuk, Bengazi, Derna and other towns in the regency, and to Gabes in Tunisia. A wireless telegraphic apparatus connects Derna and Rhodes. There

are regular sailings between Malta and Tripoli and between Tunis and Tripoli. Italian vessels also call regularly at Bengazi and Derna. The shipping trade is mostly in the hands of Italians — who have more than half the total tonnage— and French, British shipping coming third. Inland communication is almost entirely by camel caravans.

Administration. — ThemW or governor-general, who exercises chief authority both civil and military, is appointed by the sultan of Turkey and holds office at his majesty's pleasure. The system of government, executive and judicial, resembles that of other Turkish provinces, but with some modifications in the direction of local autonomy. Bengazi or Barca is a separate sub-province with an administration responsible direct to Constantinople. Revenue is derived chiefly from customs, tithes and a poll tax called verghi. Owing to expenditure on the army, some 10,000 Turkish troops being stationed in the regency, the receipts from revenue are generally below the cost of administration. The receipts in the period 1900- 1905 averaged about £150,000 a year and the expenditure £170,000, of which amount some £100,000 was on military requirements.

History. — The early history of Cyrenaica and Tripoli is distinct though similar. Cyrenaica was first colonized by Greeks, afterwards it fell under the sway of the Ptolemies and from them passed to the Romans (see Cyrenaica). Tripoli, on the other hand, was originally a Phoenician colony {vide ante, Towns). Later it was dependent on Carthage and followed its fortunes. From the Romans the province received its present name. In the 5th century both Tripoli and Cyrenaica were conquered by the Vandals, whose power was destroyed by the Byzantine general Belisarius in the following century. In the middle of the 7 th century the whole country was overrun by the Arabs, and Christianity gave place to Islam. From this period, for many centuries, Tripoli was subject to the successive rulers of Tunisia. It was pillaged in 1146 by the Normans of Sicily. In 13 21 the Beni Ammar established an independent dynasty, which lasted with an interval (1354-1369), during which two sovereigns of the Beni Mekki reigned, until 1401 when Tripoli was reconquered by the Tunisians. In 1510 Ferdinand the Catholic of Spain took Tripoli, and in 1528 it

was given to the knights of St John, who were expelled in 1553 by the Turkish corsairs Dragut and Sinan. Dragut, who afterwards fell in Malta, lies buried in a much venerated frubba close to one of the mosques. After his decease the connexion between Tripoli and Constantinople seems to have been con- siderably weakened. But the Tripolitan pirates soon became the terror and scourge of the Mediterranean; half the states of Europe seem at one time or other to have sent their fleets to bombard the capital. In 1714 Ahmed Pasha Caramanli achieved practical independence and he and his descendants

governed Tripoli as a regency, the claims of the Porte being recognized by the payment of tribute, or ” presents.” In the early part of the 19th century the regency, owing to its piratical practices, was twice involved in war with the United States. In May 1801 the pasha demanded from America an increase in the tribute ($83,000) which the government of that country had paid since 1796 for the protection of their com- merce from piracy. The demand was refused and a naval force was sent from America to blockade Tripoli. The war dragged on for four years, the Americans in 1803 losing the , frigate ” Philadelphia,” the commander (Captain William Bainbridge) and the whole crew being made prisoners. The most picturesque incident in the war was the expedition under- taken by William Eaton (q.v.), with the object of replacing upon the Tripolitan throne an exiled pasha, elder brother of the reigning sovereign, who had promised to accede to all the wishes of the United States. Eaton at the head of a motley assembly of 500 men marched across the desert from Alexandria, and with the aid of American ships succeeded in capturing Derna. Soon afterwards (June 3, 1805) peace was con- cluded, the reigning pasha relinquishing his demands but receiving $60,000 (about £12,000) as ransom for the “Phila- delphia” prisoners. In 181 5, in consequence of further out- rages, Captains Bainbridge and Stephen Decatur, at the head of an American squadron, again visited Tripoli and forced the pasha to comply with the demands of America. In 1835 the Turks took advantage of a civil war to reassert their direct authority, and since that

date Tripoli has been an integral part of the Ottoman Empire, rebellions in 1842 and 1844 being unsuccessful. After the occupation of Tunisia by the French (1881) the Turks increased their garrison in Tripoli considerably. After the Anglo-French agreement of 1889 recognizing the central Sahara as within the French sphere, various disputes arose as to the extent of the Tripolitan hinterland, which the French endeavoured to circumscribe (see Tunisia). The French, on their part, believed that their opponents in Wadai and else- where in the central Sudan received support from the Turks.

The khouan (ikhwdn) or semi-religious semi-political Moslem fraternities are powerful in Tripoli. The most remarkable is that of the Senussites. The explorers Rohlfs, Nachtigal and Duveyrier found their passage barred by Senussite agents. (See Senussi.)

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TRIPOLI {Tarabulus el-Gharb, i.e. Tripoli of the West), capital of the Turkish vilayet of Tripoli, North Africa, situated in 32 53′ 40″ N. and 13° 11′ 32″ E. on a promontory stretching out into the Mediterranean and forming a small crescent-shaped bay which shelters the harbour from the north winds. Its crenellated enceinte wall has the form of an irregular pentagon. A line of small ancient forts is supposed to protect one side of the harbour, and the citadel the other. This citadel, dating from the time of the Spanish occupation, now serves as the residence of the governor. The harbour has a depth of water

varying from 15 to 24 ft.; steamers drawing 21 ft. can anchor inside, but shoals render the entry difficult. At the quayside the depth of water is from 2 to 5 ft. only. The desert almost touches the western side of the city, while on the east is the verdant oasis of Meshia, where are still to be seen the tombs of the Caramanlian sultanas and the twelve-domed fcubba of Sidi Hamonda. The aspect of the city is picturesque; the houses (many possessing beautiful gardens) rise in terraces from the seashore. The Turkish quarter contains numerous mosques whose minarets and cupolas break the monotony of the flat-roofed and whitewashed houses. The Grand mosque and the Pasha mosque (originally a church built by the Spaniards) both have octagonal minarets. By the harbour are several houses built in European style, but the general aspect of the city is Oriental. Many of the streets are arcaded; the suks or markets are the scene of much animation. Near the port stands a Roman triumphal arch. This arch, quadri- frontal in form, is made entirely of white marble, the blocks being held together with cramps, and is richly embellished with sculpture. It was begun in the reign Of the emperor Antoninus, according to a still unmutilated dedicatory inscrip- tion, and finished in that of Marcus Aurelius. In the arch, now partly buried in debris, a cabaret has been installed.

A few small manufactures of carpets and silks as well as ” Cordova leather ” are carried on, but Tripoli is essentially a trading town, being the chief Mediterranean gateway to the Sahara. The population, about 60,000, is very mixed — Berber, Arab, Turk, Jew, Maltese, Italian and Negro. The Maltese inhabitants number about 4000, the Italians 1000 and the Jews 8000. The local trade is almost entirely in the

hands of the Jews and Maltese; the shipping in the port is largely Italian.

See H. M. de Mathuisieulx, A travers la Tripolitaine (Paris, 1903).

TRIPOLI, or Tarabulus (anc. Tripolis), the chief town of a sanjak of the same name in the Beirut vilayet of Syria, situated about 2 m. inland from its port, al-Mina. The ancient Phoenician city, which we know only by its Greek name of Tripolis, was the seat in Persian times of the federal council of Sidon, Tyre and Aradus, each of which cities had its separate quarter in the " triple town." In the 2nd and 1st centuries B.C., under Seleucid and Roman influences suc- cessively, it struck autonomous coins. These are succeeded by imperial coins ranging from 32 B.C. to a.d. 221. About 450, and again in 550, it was destroyed by earthquake. The Arabs took it in 638 after a prolonged siege, the inhabi- tants withdrawing by sea. Moawiya recruited the population by a colony of Jews and gave it fortifications and a garrison against the naval attacks of the Greeks, who, notwithstanding, retook it for a brief space in the time of Abdalmalik. It was again taken by the Greeks in the war of 966-69 and was besieged by Basil II. in 995, after which date it was held by a "garnson in the pay of the Fatimite caliphs of Egypt, who treated the city with favour and maintained in it a trading fleet. At this time, according to the description of Nasir Khosrau, who visited it in 1047, it lay on the peninsula of Al-Mina, bathed on three sides by the sea, and had about 20,000 inhabitants and important industries of sugar and paper-making. Of the great sea-walls and towers there are still imposing remains. From this date till it was taken by the crusaders, after a five years' siege, in 1109, the ruling family was that of 'Ammar, which founded a library of over 100,000 volumes. Under the crusaders Tripoli continued to- flourish, exported glass to Venice, and had 4000 looms. In 1289 it was taken and destroyed by the sultan Kola'un of Egypt, and a new city was begun on the present site, which rapidly rose to importance. Its medieval prosperity has obliterated most relics of remoter antiquity. Tripoli had a troubled existence during the period of Ottoman weakness (the 18th and early 19th centuries), being frequently in dispute between the pasha of Aleppo and the rebel pashas of Acre. After the Egyptian conquest of Syria it was made the capital of a

province in 1834; but in 1840 it reverted to the minor position which it now holds. It is connected by a

carriage road with Horns and by a steam tramway with Beirut, and is the natural outlet of the upper Orontes valley; but its inland trade has been greatly damaged by the Homs-Aleppo railway. From its own district, however, it exports silk, tobacco, oil, soap, sponges, eggs and fruit, and is a prosperous and growing place with a large Christian element in its popu- lation (about 30,000, the port-town included). It is served regularly by the Levantine lines of steamers. (D. G. H.)

TRIPOLITSA, officially Tripolis, a town of Greece, capital of the nomarchy of Arcadia, and the seat of an archbishop, situated in a plain over 2,000 ft. above sea-level, 22 m. S.W. of Argos. The name has reference to the three ancient cities of Mantineia, Pallantium and Tegea, of which Tripolitsa is the modern representative. It does not stand on any ancient site. Before the war of independence it was the capital of the Morea and the seat of a pasha, with about 20,000 inhabitants; but in 182 1 it was taken and sacked by the insurgents, and in 1825 its ruin was completed by Ibrahim Pasha. The town has since been rebuilt, and contains 10,789 inhabitants (1907).

TRIPTOLEMUS, in Greek mythology, the inventor of agri- culture, first priest of Demeter, and founder of the Eleusinian mysteries. His name is probably connected with the ” triple ploughing” (rpis, iroktiv), recommended in Hesiod’s Works and Days and celebrated at an annual festival. It may be noted that in some traditions he is called the son of Dysaules (possibly identical with diaulos, the ” double furrow ” traced by the ox), and that, according to the Latin poets (e.g. Virgil, Georgics, i. 19), he is the inventor of the plough. 1 Later, as the god of ploughing, he is confounded with Osiris, and on a vase-painting at St Petersburg he is represented leaving Egypt in his dragon- drawn chariot on his journey round the world. According to the best known Attic legend (Apollodorus, i. 5, 2) Triptolemus was the son of Celeus, king of Eleusis, and

Metaneira. Demeter, during her search for her daughter Persephone, arrived at Eleusis in the form of an old woman. Here she was hospitably received by Celeus, and out of gratitude would have made his son Demophon immortal by anointing him with ambrosia and destroying his mortal parts by fire; but Metaneira, happening to see what was going on, screamed out and disturbed the goddess. Demophon was burnt to death, and Demeter, to console his parents, took upon herself the care of Triptolemus, instructed him in everything connected with agriculture, and presented him with a wonder- ful chariot, in which he travelled all over the world, spreading the knowledge of the precious art and the blessings of civiliza- tion. In another account (Hyginus, Fab. 147) Triptolemus is the son of Eleusinus, and takes the place of Demophon in the above narrative. Celeus endeavoured to kill him on his return, but Demeter intervened and forced him to surrender his country to Triptolemus, who named it Eleusis after his father and instituted the festival of Demeter called Thes- mophoria. In the Homeric hymn to Demeter, Triptolemus- is simply one of the nobles of Eleusis, who was instructed by the goddess in her rites and ceremonies. The Attic legend of Eleusis also represented him as one of the judges of the under- world. His adventures on his world-wide mission formed the subject of a play of the same name by Sophocles. In works of art Triptolemus appears mounted on a chariot (winged or drawn by dragons, symbols of the fruitfulness of the earth), with Demeter and Persephone handing him the implements of agriculture. His attributes were a sceptre of ears of corn, sometimes a drinking-cup, which is being filled by Demeter. His altar and threshing-floor were shown on the Rarian plain near Eleusis; hence he is sometimes called the son of Rarus.

See the Homeric hymn to Demeter, 153, 474; Ovid, Melam. v. 642-661; Virgil, Georgics. i. 19, and Servius ad he; Hyginus, Astronom. ii. 14; Dion Halic. i. 12; Preller, Griechische Mythologie (4th ed., 1894).

TRIPTYCH (Gr. Tplirrvxos, three-fold, made in three layers, rpt-, rptts, three; irrvxk, a fold, -KTvcauv, to fold, double over),

1 Other suggested derivations are from rpiffa, ai\ai (A\ai), the " grain crusher," or from rdXt/juK (= " triple fighter,"

see Demeter).

a painting, carving or other decorative design, executed on three compartments or panels, so constructed that the two wings may fold on hinges over the centre-piece; the backs of the wing-pieces are often also painted, carved or otherwise decorated. The subject of the side-pieces are usually appropriate and subsidiary to that of the centre. The trip- tych is most frequently designed as an altar-piece. An earlier use of the term is for a set of three wooden or ivory writing- tablets, hinged or otherwise fastened together, the central tablet being waxed on both sides for the impression of the stilus or writing implement, the outer tablets only on the inside. The three tablets thus formed a small book.

TRISECTRIX, a curve which is a variety of the limacon (q.v.) of Pascal, and named from its property of trisecting an angle. The polar equation is $r = 1 + 2 \cos 6$ and the form of the curve is shown in the figure. To trisect an angle by means of this curve, describe a circle with centre O and radius OE, and let the given angle which is to be trisected be laid off from OE and cut the circle at S; let the chord ES cut the tri- sectrix in J. Then OJ trisects the given angle.

TRISTAN, or Tristram, one of the most famous heroes of medieval romance. In the earlier versions of his story he is the son of Rivalin, a prince of North West Britain, and Blancheflor, sister to King Mark of Cornwall. Rivalin is killed in battle, and Blancheflor, after giving birth to a son, dies of grief. The boy is brought up as his own by Roald, or Rual, seneschal of the kingdom, who has him carefully trained in all chivalric and courtly arts. With the possible exception of Horn, Tristan is by far the most accomplished hero in the whole range of knightly romance; a finished musician, linguist and chess-player, no one can rival him in more knightly arts, in horsemanship or fencing. He has, besides, the whole science of ” venerie ” at his finger-tips; in fact Tristan is the ” Admirable Crichton ” of medieval romance, there is nothing he cannot do, and that superlatively well— it must be regretfully admitted that he is also a most accomplished liar! Attracted by his gifts, pirates from the North Sea kidnap the boy, but terrified by the storms which subsequently beset them, put him ashore on the coast of Cornwall, whence he finds his way to the

court of his uncle King Mark. Here we have a first proof of his talent for romancing; for alike to two pilgrims who show him the road and to the huntsmen of Mark's court (whom he instructs in the rightful method of cutting up and disposing the quarry), Tristan invents different, and most detailed, fictions of his land and parentage. He becomes a great favourite at court, and when Roald, who has sought his young lord far and wide, at last reaches Tintagel, Mark welcomes the revelation of Tristan's identity with joy. Cornwall is at this time' in subjection to the king of Ireland, Gormond, and every third year must pay tribute; the Irish champion, Morolt, brother to the queen, arrives to claim his toll of thirty youths and as many maidens. The Cornish knights (who in Arthurian romance are always represented as hopeless cowards), dare not contest his claim but Tristan challenges him to single combat, slays him and frees Cornwall from tribute. Unfortunately he himself has been wounded in the fight, and that by a poisoned weapon; and none but the queen of Ireland, Is61t, or Iseult, possessed the secret of healing. Tristan causes himself to be placed in a boat with his harp, and'eommitted to the waves, which carry him to the shores of Ireland. There he gives himself out for a minstrel, Tantris, and as such is tended and healed by Queen Iseult and her daughter of the same name. When recovered he makes a plausible excuse for leaving Ireland (pretending he has left a wife in his native land) and returns to Cornwall. His uncle receives him with joy, but the barons of the court are bitterly jealous and plot his destruction. They persuade Mark that he should marry, and Tristan, who has sung the praises of the princess Iseult, is despatched to Ireland to demand her hand, a most dangerous errand, as Gormond, incensed at

the death of Mor61t, has sworn to slay any Cornish knight who sets foot in Ireland. Tristan undertakes the mission, though he stipulates that he shall be accompanied by twenty of the barons, greatly to their disgust. His good fortune, however, does not forsake him; he lands in Ireland just as a fierce dragon is devastating the country, and the king has pro- mised the hand of the princess to the slayer of the monster. Tristan achieves this feat, but, overcome by

the venom exhaled from the dragon's tongue, which he has cut out, falls in a swoon. The seneschal of the court, a coward who has been watching for such an opportunity, cuts off the dragon's head, and, pre- senting it to the king, claims the reward, much to the dismay of Iseult and her mother. Suspecting that the seneschal is not really the slayer of the dragon, mother and daughter go secretly to the scene of the combat, find Tristan, whom they recognize as the minstrel, Tantris, and bring him back to the palace. They tend him in secret, but one day, through the medium of a splinter from his sword, which had remained fixed in Morolt's skull, and been preserved by the queen, the identity of Tantris and Tristan is made clear. The princess would slay him, but is withheld by her mother, who sees they have need of Tristan's aid to unmask the seneschal. This is done in the presence of the court; Tristan is pardoned, formally declares his errand, and receives the hand of Iseult for his uncle King Mark.

Tristan and Iseult set sail for Cornwall, Iseult accompanied by her waiting-woman, Brangaene (who, in some versions, is also a kinswoman), to whose care the queen, skilled in magic arts, confides a love-potion. This is intended to be drunk by king and queen on their bridal night and will ensure their undying love for each other. Unhappily, on the voyage, by some mistake (accounted for in different ways), Tristan and Iseult drink the love drink, and are forthwith seized with a fatal passion each for the other. From this moment begins a long-drawn-out series of tricks and subterfuges, undertaken with the view of deceiving Mark, whose suspicions, excited by sundry of his courtiers, from time to time get beyond his control, and are as often laid to rest by some clever ruse on the part of his nephew, or his wife, ably seconded by Brangaene. In the poems, Mark is, as a rule, represented in a favourable light, a gentle, kindly man, deeply attached to both Tristan and Iseult, and only too ready to allow his suspicions to be dispelled by any plausible explanation they may choose to offer.- At the same time the fact that the lovers are the helpless victims of the fatal force of a magic spell is insisted upon, in order that their career of falsehood and deception may not deprive them of sympathy.

One episode, in especial, has been most charmingly treated by the poets. Mark, in one of his fits of jealousy, banishes

Tristan and Iseult from the court; the two fly to the woods, where they lead an idyllic life, blissfully happy in each other's company. Mark, hunting in the forest, comes upon them sleeping in a cave, and as Tristan, who knows that the king is in the neighbourhood, has placed his sword between them, is convinced of their innocence. Through a cleft in the rock a ray of light falls upon Iseult's face, Mark stops up the crevice with his glove (or with grass and flowers), apd goes his way, determined to recall his wife and nephew. He does so, and the same drama of plot and counter-plot is resumed. Event- ually Mark surprises the two under circumstances which leave no possible room for doubt as to their mutual relation; Tristan flies for his life and takes refuge with Hoel, duke of Britanny. After some time, hearing nothing of Queen Iseult, and believing himself forgotten, he weds the duke's daughter, Iseult of the white hand, but weds her only in name, remaining otherwise faithful to Iseult of Ireland. Later on he returns to Cornwall in disguise, and has more than one interview with his mistress. Ultimately, while assisting his brother-in-law in an intrigue with the wife of a neighbouring knight, Tristan is wounded by a poisoned arrow; unable to find healing, and being near to death, he sends a messenger to bring Queen Iseult to his aid; if successful the ship which brings her is to have a white

sail, if she refuses to come, a black. Iseult of the white hand overhears this, and when the ship returns, bringing Iseult to her lover's aid, either through jealousy or by pure inadvertence (both versions are given), she tells Tristan that the sail is black, whereon, despairing of seeing his love again, the hero turns his face to the wall and dies. Iseult of Ireland lands to find the city in mourning for its lord; hastening to the bier, she lays herself down beside Tristan, and with one last embrace expires. (One dramatic version represents her as finding the wife seated by the bier, and ordering her away, " Why sit ye there, ye who have slain him ? Arise, and begone ! ") The bodies are sent to Cornwall, and Mark, learning the truth, has a fair chapel erected and lays them in tombs, one at each side of the building, when a sapling springs from the heart of Tristan, and reaching its boughs across the chapel, makes its way into the grave of Iseult. However often the tree may be cut down it never fails to grow again. (In some versions it is

respectively a vine and a rose which grow from either tomb and interlace midway.)

We need have little wonder that this beautiful love-story was extremely popular throughout the middle ages. Medieval literature abounds in references to Tristan and Iseult, and their adventures were translated into many tongues and are found depicted in carvings and tapestries. Probably the story was first told in the form of short lais, each recounting some special episode, such as the lai known as the chevrejeuille; how old these may be it is impossible to say. Professor Zimmer, in his examination of the story, sees reason to believe that the main incidents may repose on a genuine historic, tradition, dating back to the oth or 10th century, the period of Viking rule in Ireland. The name of Iseult's father, Gormond, is distinctly Scandinavian; she, herself, is always noted for her golden hair, and it is quite a misrendering of the tradition to speak of her as a dark-haired Irish princess. In the German tradition she is die lichte, Iseult of Britanny die schwarze Is61t; it is this latter who is the Celtic princess. The name Tristan is now generally admitted to be the equivalent of the Pictish Drostan, and on the whole, the story is now very generally allowed to be of insular, probably of British, origin.

Some time in the 12th century the story was wrought into consecutive poems. The latest theory, championed with great skill by M. Bedier, is that there was one poem, and one only, at the root of the various versions preserved to us, and that that poem, composed in England, probably by an Anglo- Norman, was a work of such force and genius that it determined for all time the form of the Tristan story. The obvious objection to this view is that a work of such importance, composed at so comparatively late a date, is scarcely likely to have perished so completely as to leave no trace; if there were one poet held as an authority, the name of that poet would surely have been mentioned. Moreover the evidence of the author of the principal Tristan poem preserved to us points in another direction. This poet was an Anglo-Norman named Thomas; and, although little over 3000 lines of his poem have been preserved, we have three translations; a German, by Gottfried von Strassburg; a Scandinavian, by a certain Brother Robert; and an English, by Thomas, sometimes

identified with Thomas of Ercildoune, though this is doubtful. With the help of the extant fragments and these translations we can form a very good idea of the character and content of Thomas's work, a task now rendered far more easy by M. Bedier's skilful recon- struction (cf. vol. i. of his edition of Thomas). It was certainly a work of great merit and charm. As authority Thomas cites a certain Breri, who has now been identified with the Bleheris quoted as authority for the Grail and Gawain stories, and the Bledhericus referred to by Giraldus Cambrensis as famosus illefabulator. This is what Thomas says: —

" Seignurs, cest cunte est mult divers,

E pur 50 l'uni par mes vers

E di en tant cum est mester

E le surplus voil relesser.

Ne vol pas trop en uni dire !

Ici diverse la matyre.

Entre ceus qui solent cunter E del cunte Tristran parler, II en cuntent diversement : Of en ai de plusur gent. Asez sai que chescun en dit E co qu'il unt mis en escrit, Mes sulun 50 que j'ai 01 Nel dient pas sulun Breri Ky solt les gestes e les cuntes De tuz les reis, de tuz les cuntes, Ki orent este en Bretaingne."

(Thomas, i, 377).

These are not the words of a man who is following a complete and authoritative poem; judging from the context of the other references to Bleheris he was rather a collector and versifier of short episodic tales, and it seems far more natural to under- stand Thomas as having wrought into one complete and con- secutive form the various poems with which the name of Breri was associated, than to hold that that, or a similar, work had already been achieved by another.

Thomas's work, fortunately, fell into the hands of a true poet in the person of Gottfried von Strassburg, whose Tristan und Isolde is, from a literary point of view, the gem of medieval German literature. Gottfried is a far greater master of style than Wolfram von Eschenbach, and his treatment of some of the episodes, notably the sojourn in the woods, is most exquisite. He did not live to complete his poem, but happily he carried it up to the point where the original fragments tegin, so that we can judge very fairly what must have been the effect of the whole, the style of the two poets being very similar. Inspir- ing as the Tristan story is, it seems improbable that it should have been handled, and that within a comparatively short period, by three writers of genius, and that of these three the first, and greatest, should have utterly disappeared! The translators of Thomas do not fail to quote him as their source, why then has no one quoted the original poet?

Besides the version of Thomas, we have a fragment by a certain Beroul, also an Anglo-Norman, and a German poem by Eilhart von Oberge, both of which derive from a common source. There also exists in two manuscripts a short poem, La Folie Tristan, relating how Tristan, disguised as a fool, visits the court of King Mark. This poem is valuable, as, presuming upon the sufficiency of his disguise, Tristan audaciously gives a resume of his feats and of his relations with Iseult, in this agreeing with the version of Thomas. The "Gerbert" con- tinuation of the Perceval contains the working over of one of two short Tristan poems, called by him the Luite Tristran; the latter part, probably a distinct poem, shows Tristan, in the disguise of a minstrel, visiting the court of Mark. Here the tradition is more in accordance with Beroul.

Besides the poems, we possess the prose Tristan, an enormous compilation, akin to the prose Lancelot, where the original story, though still to be traced, is obscured by a mass of later Arthurian adventures. The interest here centres in the rivalry between Tristan and Lancelot, alike as knights and lovers, and in the later redaction, ascribed to Helie de Borron, the story is spun out to an interminable length.

Certain points of difference between the poetical and the prose versions should be noted. Tristan is here the son of

Meliadus, king of Loonois; his father does not die, but is decoyed away by an enchantress, and the mother, searching for her husband, gives birth to her child in the forest and dies. Meliadus marries again, and the second wife, jealous of Tristan, tries to kill him. Mark has another nephew, Andret, who is Tristan's enemy throughout the romance. Mark himself is a cowardly, treacherous and vindictive character. Some of the early printed editions follow the original version of Tristan's death, now found in one manuscript only (b.n. 103), the majority represent him as having been stabbed in the back by Mark in the presence of the queen, as we find in Malory, who drew the larger portion of his compilation from the prose Tristan. It should be noted that Tristan is never more than superficially connected with Arthur, an occasional visitor at his court; though in its later form ranked among the

Arthurian romances, the Tristan is really an independent story, and does not form a part of the ordinary cyclic redaction. The Italian prose text, La Travola ritonda differs from the French in adhering to the original version, and is classed by N. Bedier among the derivatives from Thomas. Like the story of Perceval that of Tristan has been made familiar to the present generation by Richard Wagner's noble music drama, Tristan und Isolde, founded upon the poem of Gottfried von Strassburg; though, being a drama of feeling rather than of action, the story is reduced to its simple elements; the drinking of the love-potion, the passion of the lovers, their discovery by Mark and finally their death.

Bibliography. — Thomas, Roman de Tristan, ed. J. Bedier (2 vols., Societe des anciens textes franqais, 1902, 1905); Beroul, Roman de Tristan (ed.E. Muret.same series, 1903) ; E. Kolbing, Die nordische und die en glisc he Version der Tristansaga (1877, 1883), pt.i., Tristrams Saga, pt. ii., Sir Tristrem. " La Folie Tristan " was published by F. Michel in his Tristan (1835), a collection of all the extant fragments of Tristan poems; " Tristan Menestrel " from the Perceval, ed. J. L. Weston and J. Bedier (Romania, vol. xxxv., Oct. 1906). Gottfried's Tristan und Isolde has been several times published ; the best editions are those of Bechstein (1890) and Golther (1889) ; modern German versions by Kurz, Simrock and Hertz; English prose rendering, J. L. Weston, 2 vols. {Arthurian Romances, No. ii.). Cf. also Piquet, L '

Originalite de Gottfried de Strassburg (1905). Eilhart von Oberge, Tristan, ed. Lichtensteift (1877); La Tavola ritonda, ed. Polidori, (3vols., 1864-1865). There is no modern edition of the prose romance, but a detailed analysis of the contents, compiled from the numerous manuscripts in the Paris Library, was published by E. Loseth in Le Roman en prose de Tristan (1890). The general reader will find Gaston Paris's study of the legend in Poemes et legendes du moyen age most interesting; also Joseph Bcdier's popular retelling of the tale Tristan et Iseult. For Wagner's version cf. J. L. Weston, Legends of the Wagner Drama. For an exhaustive study of the Tristan legend and literature, see the recent work by Professor Golther; also an examination of the Welsh fragments by Ivor John in the Grimm Library. (J. L. W.)

TRISTAN DA CUNHA, the general name for a group of three small volcanic islands belonging to Great Britain, situated in the South Atlantic, the summit of the largest being in 37° 5′ 5°" S., 12 16′ 40″ W. They are about 2000 m. W. of the Cape of Good Hope and about 4000 m. N.E. of Cape Horn and lie somewhat north of a line drawn between the two capes. St Helena lies about 1500 m. N.N.E. of the group. The islands rise from the submarine elevation which runs down the centre of the Atlantic and on which are likewise situated Ascension, St Paul's Rocks and the Azores; the average depth on this ridge is from 1600 to 1700 fathoms, while depths of 3000 fathoms are found on each side of it, The depth between the islands is in some places over 1000 fathoms.

Tristan, the largest and northernmost island, has an area of 16 sq. m., is nearly circular in form, about 7 m. in diameter, and has a volcanic cone (7640 ft.), usually capped with snow, in the centre. Precipitous cliffs, 1000 to 2000 ft. in height, rise directly from the ocean on all sides, except on the north-west, where there is an irregular plain, 100 ft. above the sea, and 2! m. in length and J m. in breadth. A stream crosses the northern end of the plateau, falling over the cliff edge in a fine cascade. The crater of the central cone contains a fresh- water lake about 150 yds. in diameter. This and other crater lakes are said never to be frozen over.

Inaccessible Island, the westernmost of the group, is about

20 m. from Tristan. It is quadrilateral in form, the sides being about 2 m. long, and its area is about 4 sq. m. The highest point (1840 ft.) is on the west side; all round there are perpendicular cliffs about 1000 ft. in height. At the base of the cliffs in some places are narrow fringes of beach a few feet above the sea-level.

Nightingale Island, the smallest and most southern of the group, is 10 m. from Inaccessible Island. Its area is not more than I sq.m. Its coasts, unlike those of the other two islands, are surrounded by low cliffs, from which there is a gentle slope up to two peaks, the one 1 100 ft., the other 960 ft. high. There are two small islets — Stoltenkoff (325 ft.) and Middle (150 ft.) — and several rocks adjacent to the coast.

The rocks of Tristan da Cunha are felspathic basalt, dolerite, augite-andesite, sideromelane and palagonite; some specimens of the basalt have porphyritic augite. 1 The caves in Nightingale Island indicate that it has been elevated several feet. On al most

1 On the occurrence in Tristan da Cunha of rock of continental type (gneiss) see E. H. L. Schwarz of the Geological Survey, Cape Colony, in the Transactions South African Philosoph. Soc,. No. 16 of

1905.

all sides the islands are surrounded by a broad belt of kelp, the gigantic southern seaweed (Macrocystis pyrifera), through which a boat may approach the rocky shores even in stormy weather. There is no good anchorage in rough weather.

The beaches and lower lands are covered with a dense growth of tussock grass (Spartina arundinacea) , 8 to 10 ft. in height. It shelters vast numbers of penguins (Eudyptes chrysocoma), which there form their rookeries. There is one small tree (Phylica nitida), which grows in detached patches on the lower grounds. Indepen- dently of introduced plants, fifty-five species have been collected in

the group, twenty-nine being flowering plants and twenty-six ferns and lycopods. A majority of the species are characteristic of the present general flora of the south temperate zone rather than any particular part of it : botanically the group is generally classed with the islands of the Southern Ocean. A finch {Nesospiza acunhae), a thrush (Nesocichla eremita), and a water-hen (Gallinula nesiotis) are the only land birds — the first two being peculiar to the islands. In addition to the penguins numerous other sea birds nest on the islands, as petrels, albatrosses, terns, skuas and prions. One or two land shells, a few spiders, several Coleoptera, a small lepidopter and a few other insects are recorded, but no Orthoptera or Hymenop- tera. There appear to have been no indigenous mammals or reptiles. Seals frequent Nightingale and Inaccessible Islands, and the whale (Balaena australis) is found in the adjacent waters.

The prevailing winds are westerly. December to March is the fine season. The climate is mild and on the whole healthy, the temperature averaging 68° Fahr. In summer, 55° in winter — some- times falling to 40°. Rain is frequent ; hail and snow falloccasionally on the lower grounds. The sky is usually cloudy. The islands have a cold and barren appearance. The tide rises and falls about 4 ft.

History. — The islands were discovered in 1506 by the Portuguese admiral Tristan, or more correctly Tristao da Cunha, 1 after whom they are named, during a voyage to India. There- after the islands (which were uninhabited) were occasionally visited by outward bound ships to the Indies. Dutch vessels brought back reports on the islands in 1643, and in 1656 Van Riebeek, the founder of Cape Town, sent a ship from Table Bay to Tristan to see if it was suitable for a military station, but the absence of a harbour led to the project being abandoned. Later in the 17th century ships were sent from St Helena by the English East India Company to Tristan to report on a proposed settlement there, but that project also came to naught. A British naval officer who visited the group in 1760 gave his name to Nightingale Island. John Patten, the master of an English merchant ship, and part of his crew lived on Tristan from August 1790 to April 1701, during which time they captured 5600 seals; but the first permanent inhabitant was one Thomas Currie, who landed on the island in 1810. At

this time American whalers frequented the neighbouring waters and, in the same year, an American named Lambert ” late of Salem, mariner and citizen thereof ” and a man named Williams made Tristan their home. Lambert declared himself sovereign and sole possessor of the group (which he renamed Islands of Refreshment) ” grounding my right and claim on the rational and sure ground of absolute occupancy.” Lambert’s sovereignty was short lived, as he and Williams were drowned while out fishing in May 181 2. Currie was joined, however, by two other men and they busied themselves in growing vegetables, wheat and oats, and in breeding pigs. War having broken out in this year between the United States and Great Britain the islands were largely used as a base by American cruisers sent to prey on British merchant ships. This and other considerations urged by Lord Charles Somerset, then governor of Cape Colony, led the British government to authorize the islands being taken possession of as dependencies of the Cape. The formal proclamation of annexation was made on the 14th of August 1816. A small garrison was maintained on Tristan until

1 Tristan da Cunha (fl. 1 460-1 540) was nominated first viceroy of Portuguese India in 1504, but was unable to serve owing to temporary’ blindness; in 1506 he was placed in command of a fleet which operated on the east coast of Africa and in the Indies, Alphonso d’Albuquerque {q.v.) having charge of a squadron under da Cunha. After discovering the islands which now bear his name, da Cunha landed in Madagascar, subsequently visiting Mozambique, Brava (where he reduced the Arab power) and Sokotra, which he conquered. He also distinguished himself in the Indies in various actions. In ˆ514 he was ambassador to Pope Leo X. to pay homage for the new conquests of Portugal, and was, later on, made a member of the / ortuguese privy council.

November of the following year. At their own request William Glass (d. 1853), a corporal in the Royal Artillery, with his wife and two children and two masons were left behind, and thus was begun the present settlement. From time to time additional settlers arrived or shipwrecked mariners decided to temain; in 1827 five coloured women from St Helena were induced to migrate to Tristan to become the wives of the five bachelors then on the island.

Later coloured women from Cape Colony married residents in the island. Other settlers are of Dutch, Italian and Asiatic origin. Thus the inhabitants are of mixed blood, but the British strain greatly predominates. Over the little community Glass (1817-1853) ruled in patriarchal fashion. Be- sides raising crops, the settlers possessed numbers of cattle, sheep and pigs, but their most lucrative occupation was seal fishing. The island was still frequented by American whalers, and in 1856 out of a total population of about 100 twenty-five emigrated to the United States. The next year forty-five of the inhabitants removed to Cape Colony; whither the younger or more restless members of the community have since gone — or else taken to a seafaring life. The inhabitants had of necessity made their settlement on the plain on the north-west of Tristan; here a number of substantial stone cottages and a church were built. It is named Edinburgh in memory of a visit in 1867 by the duke of Edinburgh. In October 1873 the islands were carefully surveyed by the " Challenger," which removed to Cape Town two Germans, brothers named Stoltenhoff, who had been living on Inaccessible Island since November 1871. This was the only attempt at colonization made on any save the main island of the group.

After the death of Glass the head of the community for some time was an old man-of-war's man named Cotton, who had been for three years guard over Napoleon at St Helena; Cotton was succeeded by Peter William Green, a native of Amsterdam who settled in the island in 1836. During Green's " reign " the economic condition of Tristan was considerably affected by the desertion of the neighbouring seas by the whalers; this was largely due to the depredations of the Confederate cruisers " Alabama " and " Shenandoah " during the American Civil War, many whaling boats being captured and burnt by them. As a result the number of ships calling at Tristan considerably diminished and trade languished. In 1880 the population appears to have attained its maximum — 109. In 1885 a serious disaster befell the islanders, a lifeboat which went to take pro- visions to a ship in the offing was lost with all hands — fifteen men — and only four adult males were left on the island. At the same time a plague of rats — survivors of a shipwrecked vessel — wrought much havoc among the crops. Plans were made for the total removal of the

inhabitants to the Cape, but the majority preferred to remain. Stores and provisions were sent out to them by the British government. The ravages of the rats have rendered impossible the growing of wheat; the wealth of the islanders now consists in their cattle, sheep, potatoes and apple and peach trees. The population in 1897 was only 64; in 1901 it was 74, and in 1909, 95. They manage their own affairs without any written laws, the project once entertained of providing them with a formal constitution being deemed unnecessary. The inhabitants are described as moral, religious, hospitable to strangers, well mannered and industrious, healthy and long lived. They are without in- toxicating liquors and are said to commit no crimes. They are daring sailors, and in small canvas boats of their own building voyage to Nightingale and Inaccessible islands. They knit garments from the wool of their sheep; are good carpenters and make serviceable carts. From time to time ministers of the Church of England have lived on the island and to their efforts is mainly due the education of the children. In 1906 the islanders passed through a period of distress owing to great mortality among the cattle and the almost total failure of the potato crop. The majority again refused, however, to desert the island, though offered allotments of land in Cape Colony. Similar proposals had been made and declined several times since the question was first mooted in 1886. In 1905 a lease of

Nightingale, Inaccessible and Gough islands, for the purpose of working the guano deposits, was granted by the British government.

Gough Island. — Gough Island or Diego Alvarez lies in the South Atlantic in 40° 20′ S., 9 44′ W., and is 250 m. S.S.E. of Tristan da Cunha and some 1500 m. west by south of Cape Town. It is of volcanic origin, is rugged and mountainous, the highest peak rising to 4380 ft. The island is about 8 m. long by 4 m. broad and has an area of 40 sq. m. Precipitous cliffs, from 200 to 1000 ft. high, characterize the coast. They are divided by picturesque valleys, which, in some instances, have been cut down to sea-level and afford landing-places. Streams fall over the cliffs into the sea in

fine cascades. The island is visited by vast numbers of penguins and contains valuable guano deposits. It is also the home of numerous seals. The rainfall is heavy and vegetation abundant. The island is believed to have been discovered by the Portuguese in the 16th century. Originally called Diego Alvarez, it derives its other name from a Captain Gough, the commander of a British ship which visited it in 1731. It has been claimed as a British possession since the annexation of Tristan da Cunha. In 1904 Gough Island was visited by the Antarctic exploring ship " Scotia " of the Bruce expedition, which discovered a rich marine fauna, two new buntings and three new species of plants. It has no permanent population.

A comprehensive account of Tristan da Cunha appeared in The Cape Times (January-March 1906), in a series of articles by W. Hammond Tooke, the commissioner sent to the islands by the Cape government in 1904. See also Transactions of the Linnean Society for 18 19 (contains a report of an ascent of the summit by Captain Dugald Carmichael in 181 7); A. Earle, Narrative of a . . . Residence in New Zealand . . . together with a Journal of a Residence in Tristan d'Acunha (London, 1832); Mrs K. M. Barrow, Three Years in Tristan da Cunha (London, 1910) ; H. N. Moseley, Notes by a Naturalist on the "Challenger" (new ed., London, 1892); F. and G. Stoltenhoff " Two Years on Inaccessible," in Cape Monthly Mag. (December 1873). Among papers relating to Tristan da Cunha published by the British government, see especially reports issued in 1897, 1903, 1906 — which gives a detailed account of the island and islanders — and 1907. For the discovery of Tristan see The Commentaries of the Great Afonso Dalboquerque (Hakluyt Society's Series, 1875, vol. 53). For Gough Island, see R. N. R. Brown of the " Scotia " expedition, " Diego Alvarez or Gough Island," in Scottish Geog. Mag. (August 1905); Brown and others, " The Botany of Gough Island," in Journ. Linnean Soc. (Botany) (1905), and The Voyage of the " Scotia " ch. xii. (London, 19G6). The Africa Pilot, pt. ii. (5th ed., 1901), contains descriptions both of Tristan da Cunha and Gough Island.

TRISTAN L'HERMITE, FRANCOIS (1601-1655), French diamatist, was born at the chateau de Soliers in the Haute Marche about 1601. His adventures began early, for he killed his enemy in a duel at the age of thirteen, and was

obliged to flee to England. The story of his childhood arid youth he embroiders in a burlesque novel, the Page disgracii. He was in succession poet to Gaston d'Orleans, to the duchesse de Chaulnes and the duke of Guise. He died on the 7th of September 1655. His first tragedy, Mariamne (1636), was also his best. It was followed by Penthee (1637), La Mori de SSneque (1644), La Mort de Crispe (1645) and the Parasite (1653). He was also the author of some admirable lyrics. Three of his best plays are printed in the Thedtre francais of 1737.

TRITHEMIUS, JOHANNES (1462-1516), German historian and divine, was born at Trittenheim on the Moselle, on the 1st of February 1462. His name was originally " von Heidenberg," but according to the fashion of the times he adopted the name of his birthplace. After an unhappy childhood, he studied at Heidelberg, and at the age of twenty entered the Benedictine monastery of Sponheim near Kreuznach, of which, in 1485, he became abbot. He established an excellent library, and through his strict discipline and consummate scholarship soon raised the monastery to an educational institution of a high order. In 1506 he resigned, and was appointed soon after abbot of the monastery of St Jakob at Wiirzburg; and in this city he died on the 13th of December 1516. Trithemius was, though an accomplished scholar, untrustworthy as a chronicler, and his Annates hirsaugienses (1514), Annates de origine Fran- corum, as well as his Chronologia mystica (1516) are, on this account, of doubtful value. More reliance can, however, be placed on his De scriploribus ecclesiasticis (1494) and the Catalogus illustrium virorum Germaniae (1491). He also wrote a fanatical book against sorcery, Antipalus maleficiorum (1508).

See Silbernagel, /. Trithemius (1868; 2nd ed., 1885); Schneegans. Abt Joh. Trithemius und Kloster Sponheim (1882); and F. X. Wegele, in Allgemeine deutsche Biographic

TRITON, in Greek mythology, son of Poseidon and Amphitrite, the personification of the roaring waters. According to Hesiod (Theog. 930), he dwelt with his parents in a golden palace in the depths of the sea. The story of the Argonauts places his home on the coast of Libya. When the Argo was driven ashore on the Lesser Syrtes the crew carried the

vessel to Lake Tritonis, whence Triton, the local deity, guided them across to the Mediterranean (Apollonius Rhodius iv. 1552). He was represented as human down to the waist, with the tail of a fish. His special attribute was a twisted seashell, on which he blew to calm or raise the waves. Its sound was so terrible, when loudly blown, that it put the giants to flight, who imagined it to be the roar of a mighty wild beast (Hyginus, Poet, astronom. ii. 23). When Misenus, the trumpeter of Aeneas, challenged him to a contest of blowing, Triton in his jealousy flung him into the sea. In course of time Triton became the name for individuals of a class, like Pan and Silenus, and Tritons (male and female) are mentioned in the plural, usually as forming the escort of marine divinities. The beings called Centauro-Tritons or Ichthyocentaurs were of a triple nature, with the forefeet of a horse in addition to the human body and fish tail. Pausanias (ix. 21) gives a detailed description of the ordinary Triton. It is probable that the idea of Triton owes its origin to the Phoenician fish-deities.

See Preller, Griechische Mythologie (4th ed., 1894); F. R. Dressier, Triton und die Tritonen (Wurzen, 1892).

TRIUMPH (triumphus), amongst the ancient Romans, the highest honour bestowed upon a victorious general. Originally it was only granted on certain conditions, which were subse- quently relaxed in special cases. Only those who had held the office of dictator, consul or praetor were entitled to the distinc- tion; the war must have been brought to a definite conclusion, resulting in an extension of the boundaries of the state; at least 5000 of the enemy must have been slain; the victory must have been gained over a foreign enemy, victories in civil war or over rebels not being counted. The power of granting a triumph rested with the senate, which held a meeting outside the city walls (generally in the temple of Bellona) to consider the claims put forward by the general. If they were considered satisfactory special legislation was necessary to keep the general in possession of the imperium on his entry into the city. Without this, his command would have expired and he would have become a private individual the moment he was inside the city walls, and would have had no right to a triumph. Consequently he remained outside the pomoerium until the special ordinance was passed; thus Lucullus on his

return from Asia waited outside Rome three years for his triumph.

The triumph consisted of a solemn procession, which, starting from the Campus Martius outside the city walls, passed through the city to the Capitol. The streets were adorned with garlands, the temples open, and the procession was greeted with shouts of Io trimnphe 1 At its head were the magistrates and senate, who were followed by trumpeters and then by the spoils, which included not only arms, standards, statues, &c, but also representations of battles, and of the towns, rivers and moun- tains of the conquered country, models of fortresses, &c. Next came the victims destined for sacrifice, especially white oxen with gilded horns. They were followed by the prisoners who had not been sold as slaves but kept to grace the triumph; when the procession reached the Capitol they were taken off to prison and put to death. The chariot which carried the victorious general (triumphator) was crowned with laurel and drawn by four horses. The general was attired like the Capi- toline Jupiter in robes of purple and gold borrowed from the treasury of the god; in his right hand he held a laurel branch, in his left an ivory sceptre surmounted by an eagle. Above his head the golden crown of Jupiter was held by a slave who reminded him in the midst of his glory that he was a mortal man. Last came the soldiers shouting Io triumphe and singing

TRIUMPHAL ARCH

Plate I.

Photo, AUnari.

Fig. i. -ARCH OF HADRIAN, ATHENS.

Fig. 2.— ARCH OF TRAJAN, BENEVENTO.

Photo, Anderson.

Fig. i— ARCH OF TRAJAN, ANCONA.

Fig. 4— ARCH OF TITUS, ROME.

Plate IL

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songs both of a laudatory and scurrilous kind. On reaching the temple of Jupiter on the Capitol, the general placed the laurel branch (in later times a palm branch) on the lap of the image of the god, and then offered the thank-offerings. A feast of the magistrates and senate, and sometimes of the soldiers and people, concluded the ceremony, which in earlier times lasted one day, but in later times occupied several. Generals who were not allowed a regular triumph by the senate had a right to triumph at the temple of Jupiter Latiaris on the Alban Mount. Under the empire only the emperors celebrated a .triumph, because the generals commanded under the auspices of the emperors (not under their own) merely as lieutenants (legati); the only honour they received was the right of wearing the triumphal insignia (the robes of purple and gold and the wreath of bay leaves) on holidays. After the time of Trajan, when all consuls were allowed to wear the triumphal dress on entering office and in festal processions, the only military reward for a successful general was a statue in some public place. The last triumph recorded is that of Diocletian (a.d. 302). A naval or maritime triumph was sometimes allowed for victories at sea, the earliest being that celebrated by C. Duilius in honour of his victory over the Carthaginians in 260 B.C.

See Mommsen, Romisches Staatsrecht (1887), i. 126-136; Marquardt, Romische Staatsvenvallung (1884), ii. 582-593; H. A. Gotl, De triumphi romani origine, permissu, apparatu,

via (1854); S. Peine, “De ornamentis triumphalibus ” (1885), in C. E. Ascherson’s Berliner Siudien, ii.

TRIUMPHAL ARCH, the term given to arches erected to commemorate some special victory, but here extended to include those built a’s memorial arches to some benefactor of the Roman Empire, such as those at Rimini, Ancona and Benevento; arches erected as monumental entrances to towns, as at Nimes and Autun; arches on bridges, as at Chamas in France and Alcantara in Spain; and lastly those which preceded the entrance to a forum or sacred enclosure, or formed part of a colonnaded street, as in Syria. There is every reason to suppose that in early times in Greece and Etruria temporary erections, such as those of the present day, were set up on the occasion of the public entry, after a great victory, of some emperor or general; but the Romans would seem to have been the first to erect such struc- tures in stone or marble, to enrich them with sculpture, and to raise aloft on their summit the quadriga or four-horsed chariot with statues and trophies. The time involved in the construc- tion of such a memorial, and more especially that which would be required for its enrichment with sculpture, rendered it im- possible that they should be set up on the occasion of the trium- phal entry itself, and it is known that the arch of Titus was not erected till some time after his death by his successor Domitian. There is always some difficulty in deciding between triumphal and memorial arches, as they were virtually similar in design, equally enriched with sculpture, generally surmounted with a quadriga and statues, and as a rule were isolated structures. The earlier arches were pierced with a single arch and were comparatively simple in design, being decorated by pilasters or semi-detached columns only; the existence of chariots and statues on their summit is known only from coins or gems, on which such features are always shown. The arch of Titus in Rome (fig. 4), a.d. 81, is the first one enriched with bas-relief sculpture, in this case representing the triumphs of Titus with the seven-branched candlestick and the golden table brought from Jerusalem. The next sculptural arch of triumph is that built ai Benevento (fig. 2) in South Italy (a.d. 112) by Trajan, recording the Dacian victories: The triumphal arch (fig. 5) of Septimius Severus (a.d. 203) has a central and two side arches, the bas-reliefs on it representing the Parthian

victories; and the last important arch in Rome is that of Constantine (fig. 6), which had also three arches, and was embellished with bas-reliefs, representing the Dacian victories, which were taken from the arch of Trajan on the Via Appia and others of Constantine's time, representing the conquest of Maxentius.

Passing to other countries, we have the triumphal arches at St Remy and at Orange (fig. 8) ; those at Carpentras and Cavail- bn, also in France, which were probably of later date, as possibly

also the triple arch at Reims. The triumphal arch with three arches at Fano in Italy is said to have been commenced by Augustus, but completed by Constantine, who probably added the two side arches and decorated it with inferior sculpture. At Timgad (Thamugada) in North Africa is a triumphal arch with central and two side arches, probably of Hadrian's time, and one with triple arches at Sbeitla (Suffetula), also in North Africa, and another example at Saintes in France, built on a bridge.

Of memorial arches the earliest are the examples of Rimini (fig. 7) and Aosta, erected to Augustus, and later the arch at Ancona (fig. 3) erected to Trajan (a.d. 112) as a record of the construction of the port there. At Pola, in Istria, is an archway erected in memory of the Sergii. Of less important examples in Rome are the arches of Dolabella (a.d. 10), Drusus (a.d. 23), Gallienus (a.d. 262), the silversmith's arch (a.d. 204); in Verona, the Porta dei Borsari and the Porta de Leoni, erected by Gallienus (a.d. 265); at Aix-les-Bains in France, an arch of late 3rd century; and at Lambessa, in North Africa, the arches of Commodus (a.d. 187) and of Septimius Severus (a.d. 200). In Spain there are two monumental arches erected by Trajan at Alcantara, in the centre of the bridge built by him (a.d. 108), and the arch of Santiago at Merida; a third example exists in the Arco di Bara at Tarragona.

Quadriportal archways are those which were built in the centre of four cross roads, such as the arch of Janus in Rome, built by Constans (a.d. 350), the arch of Caracalla at Tebesse (Thevesti) in North Africa, and many examples in Syria, of which the arch at Ladikiyah (Laodicea ad Mare) is in perfect preservation.

The colonnaded streets in Syria were entered through magnifi- cent archways, of which the finest examples are those at Palmyra and Gerasa. As entrance gateways to towns there are many examples which were sometimes built as memorial arches, but formed part of the city walls, such as the entrance gate at Susa in Italy, erected in memory of Augustus (8 B.C.), decorated with reliefs of the Suovetaurelia (sacrifices); the Porte d'Avroux and Porte St Andre at Autun, and the Porte d'Auguste at Nimes, in France; the Porte d'Auguste at Perugia in Italy and the Porta Nigra at Treves in Germany; to these should be added the three entrance gateways to the palace of Spalato (a.d. 303), one of these, the Porta Aurea, or Golden Gate, showing in its enriched design certain decadent forms which led to the Byzantine and Renaissance styles; lastly there are the arched entrances- to sacred or civil enclosures, such as the example at Sbeitla (Suffetula) in North Africa, the arch of Hadrian at Athens (fig. 1), built to his memory by his successors, and the archway of the Propylaea at Damascus.

The triumphal arch found no place in medieval architecture, but in Renaissance works there are many examples, of which the triumphal entrance arch of King Alfonso at Naples (a.d. 1470) comes first. Of isolated structures, there are in Paris the Porte St Martin (1647), St Denis (1684), arch of Carrousel in the Tuileries (1808), and the Arc de 1'Etoile in the Champs Elysees, completed in 1830; in Berlin the Brandenburger Thor (1790); in Munich the Siegesthor (1843) and Metzger Thor (1880); in Milan the Arch of Peace, commenced by Napoleon in 1807 and completed in 1857 by the Austrians (an interesting example, as it still preserves the chariot and horses and statues which formerly crowned all triumphal arches); and in London the Marble Arch, originally built in front of Buckingham Palace, but removed to the north-east angle of Hyde Park in 1843, and the Wellington Arch at Hyde Park Corner, without the statue of the duke on horseback, afterwards set up at Aldershot. (R. P. s.)

TRIVANDRUM, or Trevandrum, a city of southern India, capital of the state of Travancore, situated 2 m. from the sea- coast. Pop. (1001), 57,882. It is the residence of the rnaharaja, and contains an observatory and a museum, besides several other fine buildings. The chief fame of the

place, however, centres upon the shrine of Sri Ananta Padmanabhaswami, a great resort of pilgrims, round which the city grew up. The

best houses and chief public buildings stand on hilly terraces. The city contains the maharaja's college, a Sanskrit college, a high school, a school for girls, an industrial school of arts, and a hospital and medical school. There is little trade, but a speciality of wood-carving. Trivandrum has a small seaport, but the vessels that touch here have to anchor at some consider- able distance from the shore, and the port itself is not fitted for any great commercial development.

TRIVET, a small metal tripod for holding cooking vessels hear a fire. The word is also applied to a round, square or oval openwork plate, usually of steel or brass, fixed to the bars of a grate by a socket for keeping hot plates, dishes, or food.

TRIVIUM (Lat. for cross-road, i.e. where three roads meet, from tres, three, and via, road), in medieval educational systems, the curriculum which included grammar, rhetoric and logic. The trivium and the quadrivium (arithmetic, music, geometry and astronomy) together made up what are known as the seven liberal arts (see Education: Schools). From the word in its original sense is derived the adjective " trivial " (post- Aug. Lat. trivialis), that which can be seen at the cross-roads, i.e. unimportant, commonplace. In botany and zoology the " trivial " name is the adjectival name which follows the genus name in a binominal system of nomenclature, as canina, perennis, in Rosa canina, Bellis perennis.

TRNOVO, or Tirnovo, an episcopal city and the capital of a department of Bulgaria; 124 m. E.N.E. of Sofia, on the river Yantra, and on the Sofia- Varna railway, at the junction of the branch line from Rustchuk. Pop. (1906), 12,171. The city consists of two divisions 1 — the Christian quarter, situated chiefly on a high rocky plateau, and the so-called Turkish quarter, on the lower ground; but many of the

Turkish inhabi- tants emigrated after 1878. On the Tsarevetz Hill above the city are the remains of the ancient citadel. The Husarjaini mosque is used as a military powder and dynamite factory. In the Christian quarter there are some interesting churches of the middle ages, notably that of the Forty Martyrs, in which the Bulgarian tsars were crowned. Numerous antiquarian remains have also been discovered. There are a gymnasium and a high-class girls' school. The city possesses large dye- works, and important manufactures of copper utensils.

Trnovo was the ancient capital of Bulgaria, and from 1186 until its capture by the Turks, 17th of July 1394, the residence of the Bulgarian tsars. From the beginning of the 13th century it was also the seat of the patriarchate of Bulgaria, until the suppression of the patriarchate in 1767. In 1877 it was taken from Turkey by the Russians, and in 1879 Prince Alexander of Battenberg was here elected prince of Bulgaria. On the 5th of October 1908 the independence of Bulgaria was proclaimed here by King Ferdinand, in the church of the Forty Martyrs.

TROCHAIC (from Gr. rpoxalos, Tpoxaitbs; Lat. trochaeus), the name of a metre very commonly used by the Greeks and Romans in their tragedies and comedies. Its character- istic foot is a trochee consisting of two syllables, one long, one short (-J). The usual form, in which the Greeks employed the measure, was the trochaic tetrameter catalectic, the scheme of which is as follows: —

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— WW

— V www

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W WW – WW

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The trochaic metre is rapid in movement and breathless, and is generally used to depict strong emotions or to tell an exciting narrative. It is, however, very closely related to the ordinary iambic metre; in fact, by subtracting the first foot and a half of the longer line, we find ourselves left with a pure iambic line as used by the tragedians.

In modern times, the trochaic measure has been adopted by the prosody of England, Germany and Scandinavia. The swift and hurrying movement of it, which we see reflected in its derivation, as the Greek name is certainly to be traced back

to the verb rpkxuv, to run, has made it a favourite with oi>x lyrical poets. In the early English writers on versification the foot is called a trocheus.

TROCHU, LOUIS JULES (1815-1896), French general, was born at Palais (Belle-Ile-en-Mer) on the 12th of March 1815. Educated at St Cyr he received a commission in the Staff Corps in 1837, was promoted lieutenant in 1840, and captain in 1843. He served as a captain in Algeria under Marshal Bugeaud, who, in recognition of his gallantry in the battles of Sidi Yussuf and Isly,. made him his aide-de-camp and entrusted him with important commissions. He was promoted major in 1845, and colonel in 1853. He served with distinction throughout the Crimean campaign, first as aide-de-camp to Marshal St Arnaud, and then as general of brigade, and was made a commander of the Legion of Honour and general of division. He again

distinguished himself in command of a division in the Italian campaign of 1859, where he won the grand cross of the Legion of Honour. In 1866 he was employed at the ministry of war in the preparation of army reorganization schemes, and he published anonymously in the following year U ArmSe franqaise en 1867, a work inspired with Orleanist sentiment, which ran through ten editions in a few months and reached a twentieth in 1870. This brochure brought him into bad odour at court, and he left the war office on half-pay, and was refused a command in the field at the outbreak of the Franco-German War. After the earlier disasters in 1870, he was appointed by the emperor first commandant of the troops of Chalons camp, and soon afterwards (Aug. 17) governor of Paris and commander-in-chief of all the forces destined for the defence of 'the capital, including some 120,000 regular troops, 80,000 mobiles, and 330,000 National Guards. He worked energetically to put Paris in a state of defence and throughout the siege showed himself a master of the passive defensive. At the revolution of the 4th of September he became president of the government of national defence, in addition to his other offices. His " plan " for defending the city raised expectations doomed to disappointment; the successive sorties made under pressure of public opinion were unsuccessful, and having declared in one of his proclamations that the governor of Paris would never capitulate, when capitulation became inevitable he resigned the governorship of Paris on the 22nd of January 1871 to General Vinoy, retaining the presidency of the government until after the armistice in February. He was elected to the National Assembly by eight departments, and sat for Morbihan. In October he was elected president of the council general for Morbihan. In July 1872 he retired from political life, and in 1873 from the army. He published in 1873 Pour la veritt et pour la justice, in justification of the government of national defence, and in 1879 L'Armee franqaise en i8yg, par wn officier en retraiie, a sort of supplement to his former work of 1867. He died at Tours on the 7th of October 1896.

TROGEN, a neat and clean little town in the Ausser Rhoden half of the Swiss canton of Appenzell. By light railway it is 6 m. from St Gall, or by carriage road 7 m. from Heiden (the chief goats' whey cure resort in the canton), or 9 m. from

Alt- statten in the Rhine valley. It is built on the side of a steepish hill, and in 1900 had 2496 inhabitants, mostly Protestant and German-speaking. In the square before the parish church the Lands gemeinde or primitive democratic assembly of Ausser Rhoden meets in the even years (in other years at Hundwil, not far from Herisau) on the last Sunday in April. Like other towns in Appenzell, Trogen is engaged in the manufacture (in the houses of the workpeople) of embroidery and muslins.

TROGLODYTES (rparyXofiurai, from rparyXr;, hole, Sua>, creep), " cave-dwellers," a name applied by ancient writers to different tribes in various parts of the world. Strabo speaks of them in Moesia, south of the Danube (vii. 318), in the Caucasus (xi. 506), but especially in various parts of Africa from Libya (xvii. 828) to the Red Sea. The troglodyte Ethiopians of Herodotus (iv. 183) in inner Africa, very swift of foot, living on lizards and creeping things, and with a speech like the screech of an owl, have been identified with the Tibbus of Fezzan.

According to Aristotle (Hist. An viii. 12) a dwarfish race of Troglodytes dwelt on the upper course of the Nile, who possessed horses and were in his opinion the Pygmies of fable. But the best known of these African cave-dwellers were the inhabitants of the "Troglodyte country" (TporyXoSim/o?) on the coast of the Red Sea, as far north as the Greek port of Berenice, of whom an account has been preserved by Diodorus (iii. 31) and Photius (p. 454 Bekker) from Agatharchides of Cnidus, and by Artemidorus in Strabo (xvi. 776). They were a pastoral people, living entirely on the flesh of their herds, or, in the season of fresh pasture, on mingled milk and blood. But they killed only old or sick cattle (as indeed they killed old men who could no longer follow the flock), and the butchers were called "un- clean"; nay, they gave the name of parent to no man, but only to the cattle which provided their subsistence. This last point seems to be a confused indication of totemism. They went almost naked; the women wore necklaces of shells as amulets. Marriage was unknown, except among the chiefs — a fact which agrees

with the prevalence of female kinship in these regions in much later times. They practised circumcision or a mutilation of a more serious kind. Their burial rites were peculiar. The dead body, its neck and legs bound together with withies of the shrub called paliurus, was set up on a mound, and pelted with stones amidst the jeers of the onlookers, until its face was com- pletely covered with them. A goat's horn was then placed above it, and the crowd dispersed with manifestations of joy. It is supposed that the Horim or Horites, the aboriginal inhabitants of Mount Seir, if their name is correctly interpreted "cave-dwellers," were a kindred people to the Troglodytes on the other side of the Red Sea.

TROGON, a word apparently first used as English 1 by G. Shaw (Mus. Leverianum, p. 177) in 1792, and now for many years accepted as the general name of certain birds forming the family Trogonidae . of modern ornithology. The trogons are birds of moderate size: the smallest is hardly bigger than a thrush and the largest less bulky than a crow. In most of them the bill is very wide at the gape, which is invariably beset by recurved bristles. They seize most of their food, whether caterpillars or fruits, on the wing, though their alar power is not exceptionally great, their flight being described as short, rapid and spasmodic. Their feet are weak and of a unique structure, the second toe, which in most birds is the inner anterior one, being reverted, and thus the trogons stand alone, since in all other birds that have two toes before and two behind it is the outer toe that is turned backward. The plumage is very remark- able and characteristic. There is not a species which has not beauty beyond most birds, and the glory of the group culminates in the quezal (q. v.). But in others golden green and steely blue, rich crimson 2 and tender pink, yellow varying from primrose to amber, vie with one another in vivid coloration, or contrasted, as happens in many species, with a warm tawny or a sombre slaty grey — to say nothing of the delicate freckling of black and white, as minute as the markings of a moth's wing — the whole set off by bands of white, producing an effect hardly equalled in any group. The plumage is further remarkable for the large size of its contour-feathers, which are extremely soft and so loosely seated as to come off in scores at a touch, and there is no down. The tail is generally a very

characteristic feature, the rectrices, though in some cases pointed, being often curiously squared at the tip, and when this is the case they are usually

1 Trogonem (the oblique case) occurs in Pliny (H. N. x. 16) as the name of a bird of which he knew nothing, save that it was mentioned by Hylas, an augur, whose work is lost; but some would read Trygo'nem (turtle-dove). In 1752 MShring (Av. Genera, p. 85) applied the name to the "Curucui" (pronounced "Suruqua," vide Bates, Nat. A mazons, i. 254) of Marcgrav (Hist. nat. Brasiliae, p. 2ii), who described and figured it in 1648 recognizably. In 1760 Brisson (Ornithologie, iv. 164) adopted Trogon as a generic term, and, Linnaeus having followed his example, it has since been universally accepted.

- Anatole Bogdanoff determined the red pigment of the feathers of Pharomacrus auriceps to be a substance which he called "zooxan- thine" (Comptes rendus, Nov. 2, 1857, xlv. 690).

barred ladder-like with white and black. 3 According to J. Gould, they are larger and more pointed in the young than in the old, and grow squarer and have the white bands narrower at each succeeding moult. He also asserts that in the species which have the wing coverts freckled, the freckling becomes finer with age. So far as has been observed, the nidification of these birds is in holes of trees, wherein are laid without any bedding two roundish eggs, generally white, but certainly in one species (quezal) tinted with bluish green.

The trogons form a very well-marked family, belonging to the coraciiform birds, and probably to be placed in that assemblage near the colies (see Mouse Bird) and swifts (q.v.). The remains of one, T. gallicus, have been recognized by A. Milne-Edwards (Ois.foss. de la France, ii. 395, pi. 177, figs. 18-22) from the Micoene of the Allier. This fortunate discovery seems to account for the remarkable distribution of the trogons at the present day. While they chiefly abound, and have developed their climax of magnifi- cence, in the tropical parts of the New World, they yet occur in the tropical parts of the Old. The species now inhabiting Africa, forming the group Hapaloderma, can hardly be separated generi- cally from

those of the Neotropical Trogon, and the difference between the Asiatic forms, if somewhat greater, is still comparatively slight. It is plain then that the Trogons are an exceptionally persistent type; indeed in the whole class few similar instances occur, and perhaps none that can be called parallel. The extreme development of the type in the New World just noticed also furnishes another hint. While in some of the American trogons (Pharo- macrus, for instance) the plumage of the females is not very much less beautiful than that of the males, there are others in which the hen birds retain what may be fairly deemed a more ancient livery, while the cocks flaunt in brilliant attire. Now the plumage of both sexes in all but one 4 of the Asiatic trogons, Harpactes, resembles rather that of the young and of those females of the American species which are modestly clothed. The inference from this fact would seem to be that the general coloration of the Trogons prior to the establishment, by geographical estrangement, of the two types was a russet similar to that now worn by the adults of both sexes in the Indian region, and by a portion only of the females in the Neotropical. The Ethiopian type, as already said, very closely agrees with the American, and therefore would be likely to have been longer in connexion therewith. Again, while the adults of most of the American trogons (Pharomacrus and Euptilotis excepted) have the edges of the bill serrated, their young have them smooth or only with a single notch on either side near the tip, and this is observable in the Asiatic trogons at all ages. At the same time the most distinctive features of the whole group, which are easily taken in at a glance, but are difficult to express briefly in words, are equally possessed by both branches of the family, showing that they were in all likelihood — for the possibility that the peculiarities may have been evolved apart is not to be overlooked — reached before the geographical sundering of these branches (whereby they are now placed on opposite sides of the globe) was effected.

About sixty species of trogons are recognized, which J. Gould in the second edition of his Monograph of the family (1875) divides into seven genera. Pharomacrus, Euptilotis and Trogon inhabit the mainland of tropical America, no species passing to the north- ward of the Rio Grande nor southward of the forest district of Brazil while none occur

on the west coast of Peru or Chile. Priono- telus and Tmetotrogon, each with one species, are peculiar respectively to Cuba and Haiti. The African form Hapaloderma has two species, one found only on the west coast, the other of more general range. The Asiatic trogons, Harpactes (with eleven species accord- ing to the same authority), occur from Nepal to Malacca, in Ceylon, and in Sumatra, Java and Borneo, while one species is peculiar to some of the Philippine Islands. (A. N.)

TROGUS, GNAEUS POMPEIUS, Roman historian from the country of Vˆcontii in Gallia Narbonensis, nearly contem- porary with Livy, flourished during the age of Augustus. His grandfather served in the war against Sertorius with Pompey, through whose influence be obtained the Roman citizenship; hence the name Pompeius, adopted as a token of gratitude to his benefactor. His father served under Julius Caesar in the capacity of secretary and interpreter. Trogus himself seems to have been a man of encyclopaedic knowledge. He wrote, after Aristotle and Theophrastus, books on the natural history of animals and plants, frequently quoted by the elder Pliny. But his principal work was Historiae Philippicae in forty-four

3 In the trogon of Cuba, Prionotelus, they are most curiously scooped out, as it were, at the extremity, and the lateral pointed ends diverge in a way almost unique among birds.

4 Or two species if N. macloti be more than a local form of H. reinwardti.

books, so called because the Macedonian empire founded by Philip is the central theme of the narrative. This was a general history of the world, or rather of those portions of it which came under the sway of Alexander and his successors. It began with Ninus, the founder of Nineveh, and ended at about the same point as Livy (a.d. 9). The last event recorded by the epitomator Justin (q.v.) is the recovery of the Roman standards captured by the Parthians (20 B.C.). He left untouched Roman history up to the time

when Greece and the East came into contact with Rome, possibly because Livy had sufficiently treated it. The work was based upon the writings of Greek historians, such as Theopompus (also the author of a Philippica) , Ephorus, Timaeus, Polybius. Chiefly on the ground that such a work was beyond the powers of a Roman, it is generally agreed that Trogus did not gather together the information from the leading Greek historians for himself, but that it was already combined into a single book by some Greek (very probably Timagenes of Alexandria). His idea of history was more severe and less rhetorical than that of Sallust and Livy, whom he blamed for putting elaborate speeches into the mouths of the characters of whom they wrote. Of his great work, we possess only the epitome by Justin, the prologi or summaries of the 44 books, and fragments in Vopiscus, Jerome, Augustine and other writers. But even in its present mutilated state it is often an important authority for the ancient history of the East. Ethnographical and geographical excursuses are a special feature of the work.

Fragments edited by A. Bielowski (1853) ; see also, A.H.L.Heeren, De Trogi P.fontibus et auctoritate (prefixed to C. H. Frotscher's edition of Justin); A. Enmann on the authorities used by Trogus for Greek and Sicilian history (1880); A. von Gutschmid, Lfber die Fragmente des Pompeius Trogus (1857); M. Schanz, Geschichle der romischen Litteratur (2nd ed., 1899), ii., where all that is known of Timagenes is given; Teuffel-Schwabe, Hist, of Roman Literature, § 258; and article Justin.

TROIA, a town and episcopal see of Apulia, Italy, in the province of Eoggia, situated 1440 ft. above sea-level, 7 m. N.W. of the station of Giardinetto-Troia, which is 16 m. S.W. of Foggia. Pop. (1001), 6674. Troia occupies the site of the ancient Aecae, 12 m. S. of Luceria, on the Via Traiana, a town which fell to Hannibal after the victory of Cannae, but was won back by the Romans in 214. Under the empire it appears to have become a colony. Troia was itself founded in 1017 by the Greek prefect Basilius Bugianus. The cathedral dates from 1107, but the upper part of the facade with its curious sculptures, fine rose- window and polychromatic decoration, the choir apse and the interior were restored early in the 13th century. The latter has been somewhat spoilt by recent decorations. The bronze doors, partly in relief and partly in niello, of n 19 and n 27

respectively, were cast in Beneventum by Oderisius Berardus. The small domed church of S. Basilio has an ambo of 1158.

TROi'LUS, in Greek legend, son of Priam (or Apollo) and Hecuba. His father, when upbraiding his surviving sons for their cowardice, speaks in the Iliad (xxiv. 257) of Troilus as already slain before the action of the poem commences. Accord- ing to a tradition drawn from other sources and adopted by Virgil (Aen. i. 474), when a mere boy he fell by the hand of Achilles. In another account, he was dragged to death by his own horses. His death formed the subject of a lost tragedy by Sophocles. There is no trace in classical writers of the story of Shakespeare's Troilus and Cressida, the materials for which were derived from Chaucer's poem of the same name, Lydgate's History, Sege, and Destruction of Troy, Caxton's Recuyell of the Historyes of Troy (trans, from Norman French of Raoul le Fevre) , Chapman's translation of Homer, and perhaps a play on the subject by Dekker and Chattle.

TROITSK, a towrt of eastern Russia, in the government of Orenburg, situated in a fertile steppe, 315 m. N.E. of Orenburg, and 77 m. S. of Chelyabinsk, on the Siberian highway. Pop. (1885), 18,497; (1900), 23,293. It has grown rapidly in modern times. The Troitskiy fort, erected in 1743, became a centre for trade with the Kirghiz steppe and Turkestan, and in that trade Troitsk is now second only to Orenburg. Cotton, silk, and especially horses and cattle are imported, while leather, cotton,

woollen and metal wares are exported. An active trade in corn for the Ural gold mines is carried on. The place has ironworks and tanneries.

TROLLE, HERLUF (1516-1565), Danish naval hero, was born on the 14th of January 1516 at Lillo. At the age of nineteen Trolle went to Vor Frue Skole at Copenhagen, subsequently completing his studies at Wittenberg, where he adopted the views of Melanchthon, with whom he was in intimate corre- spondence for some years. His marriage with Brigitte, the daughter of Lord Treasurer Mogens Gjbe, brought him a rich inheritance, and in 1557 he took his seat in the senate. Both Christian III. and Frederick II. had a very high opinion of Trolle's trustworthiness and ability

and employed him in various diplomatic missions. Trolle was, indeed, richly endowed by nature, and his handsome face and lively manners made him popular everywhere. His one enemy was his wife's nephew Peder Oxe, the subsequently distinguished finance minister, whose narrow grasping ways, especially as the two men were near neighbours, did not contribute towards family harmony. It was Trolle whom Frederick' II. appointed to investigate the charges of malversation brought against Oxe. Both Trolle and his wife were far renowned for their piety and good works, and their whole household had to conform to their example or seek service elsewhere. A man of culture, moreover, he translated David's 31st Psalm into Danish verse. He also promoted literature and learning by educating poor students both at home and abroad, endowing Latin schools and encourag- ing historical research,' In 1559 Trolle was appointed admiral and inspector of the fleet, a task which occupied all his time and energy. In 1563 he superseded the aged Peder Skram as admiral in' chief . On the 10th of May he put to sea with twenty- one ships of the line and £ve smaller vessels and, after uniting with a Liibeck squadron of six liners, encountered, off the isle of Oland, a superior Swedish fleet of thirty-eight ships under Jacob Bagge. Supported by two other Danish ships Trolle attacked the Swedish flagship " Makalos " (Matchless), then the largest battleship in northern waters, but was beaten off at nightfall. The fight was renewed at six o'clock the following morning, when the " Makalos " was again attacked and forced to surrender, but blew up immediately afterwards, no fewer than 300 Liibeck and Danish sailors perishing with her. But the Swedish admiral was captured and the remnant of the Swedish fleet took refuge at Stockholm. Despite the damage done to his own fleet and flagship " Fortuna " by this great victory, Trolle, on the 14th of August, fought another but indecisive action with a second Swedish fleet under the famous Swedish admiral Klas Horn, and kept the sea till the 13th of October. Trolle spent the winter partly at his castle of Herlufsholm com- pleting his long cherished plan of establishing a school for all classes, and partly at Copenhagen equipping a new fleet for the ensuing campaign. On the 1st of June 1565 he set sail with twenty-eight liners, which were reinforced off Femern by five Liibeck vessels. Klas Horn had put to sea still earlier with a

superior fleet and the two admirals encountered off Fehmarn on the 4th of June. The fight was severe but indecisive, and both commanders finally separated to repair their ships. Trolle had been severely wounded in the thigh and shoulder, but he would not let the ship's surgeon see to his injuries till every one else had been attended to. This characteristic act of unselfishness was his undoing, for he died at Copenhagen on the 25th of June, seventeen days after they had put him ashore.

TROLLHATTAN, a town of Sweden in the district {Ian) of Elfsborg, 45 m. by rail N. by E. of Gothenburg. Pop. 6000. It lies on the left (east) bank of the Gota at the point where that river descends 108 ft. in the course of nearly a mile by the famous falls of Trollhattan (six in number) and several rapids. The scenic setting of the falls is not striking, but the great volume of water, nearly 18,000 cub. ft. per second, renders them most imposing. The narrowed river here surrounds several islands, on either side of one of which (Toppo) are the first falls of the series, Toppo and Tjuf. These are 42 ft. in height. The water- power is used in rolling-mills, a cellulose factory and other works.

Several " giant's caldrons " are seen in the exposed bed of a former channel. Below the falls are valuable salrnon fisheries. To the east of the river the Berg canal, part of the Gota canal system, ascends in a series of eleven new locks (Akersvass) completed in 1844. An old series of locks (1800) is in use for small vessels. There are also ruins of an abortive attempt made to lock the falls in 1755- (See Gota.)

TROLLOPE, ANTHONY (1815-1882), English novelist, was born in London, on the 24th of April 181 5. His father, Thomas Anthony Trollope (1780-1835), a barrister who had been fellow of New College, Oxford, was reduced to poverty by unbusiness- like habits and injudicious speculation, and in 1829 Anthony's mother, Frances Milton Trollope (1780-1863), went with her husband to the United States to open a small fancy-goods shop in Cincinnati. The enterprise was a failure, but her three years' stay in that country resulted in a book on the Domestic Manners of the

Americans (1832), of which she gave an unflattering account that aroused keen resentment. Returning to England her husband was compelled to flee the country in order to escape his creditors, and Mrs Trollope thereafter supported him in Bruges until his death by her incessant literary work. She published some books of travel, most of which are coloured by prejudice, and many novels, among the best known of which are The Vicar of Wrexhill (1837) and the Widow Barnaby (1839), studies in that vein of broad comedy in which lay her peculiar gift. She wrote steadily for more than twenty years, until her death, at Florence, on the 6th of October 1863. (See Frances Trollope, her Life and Literary Work, by her daughter-in-law 1895.) Her eldest son Thomas Adolphus Trollope (1810- 1892), was educated at Winchester and Oxford, and spent most of his life in Italy. He wrote a number of works on Italian subjects, among them Homes and Haunts of Italian Poets (1881), in collaboration with his second wife, Frances Eleanor Trollope, herself a novelist of no mean ability. He was a voluminous author, and perhaps the quantity of his work has obscured its real merit. Among his novels are La Beata (1861) Gemma (1866), and The Garstangs of Garstang Grange (1869). (See his autobiography, What I Remember 1887.)

Anthony Trollope was the third son. By his own account few English men of letters have had an unhappier childhood and youth. He puts down his own misfortunes, at Harrow, at Winchester, at Harrow again, and elsewhere, to his father's pecuniary circumstances, which made his own appearance dirty and shabby, and subjected him to various humiliations. But it is permissible to suspect that this was not quite the truth, and that some peculiarities of temper, of which in after life he had many, contributed to his unpopularity. At any rate he seems to have reached the verge of manhood as ignorant as if he had had no education at all. After an experience as usher in a private school at Brussels he obtained, at the age of nineteen, by favour (for he could not pass even the ridiculous examination then usual) a position in the London post office. Even then his troubles were not over. He got into debt; he got into ridiculous entanglements of love affairs, which he has very candidly avowed; he was in constant hot water with the authorities; and he seems to have kept some very queer

company, which long afterwards stood him in good stead as models for some of his novels. At last in August 1841 he obtained the appointment of clerk to one of the post office surveyors in a remote part of Ireland with a very small salary. This, however, was practically quadrupled by allowances; living was cheap; and the life suited Trollope exactly, being not office work, which he always hated, but a kind of travelling inspectorship. In the discharge of his duties he evinced a business capacity quite unsuspected by his former superiors. Here he began that habit of hunting which, after a manner hardly possible in later conditions of official work, he kept up for many years even in England. Within three years of his appointment he became engaged to Rose Heseltine, whom he had met in Ireland but who was of English birth. They were married in June 1844. His headquarters had previously been at Banagher; he was now transferred to Clonmel.

Trollope had always dreamt of novel-writing, and his Irish

experiences seemed to supply him with promising subjects. With some assistance from his mother he got published his first two books, The Macdermols of Bally cloran (1847) and The Kelly s and the O'Kellys (1848). Neither was in the least a success, though the second perhaps deserved to be, and a third, La Vendee (1850), besides being a much worse book than either, was equally a failure. Trollope made various literary attempts, but for a time ill fortune attended all of them. Meanwhile he was set on a new kind of post office work, which suited him even better than his former employment — a sort of roving com- mission to inspect rural deliveries and devise their extension, first in Ireland, then throughout the west of England and South Wales. That he did good work is undeniable; but his curious conception of official duty, on his discharge of which he prided himself immensely, is exhibited by his confessions that he " got his hunt- ing out of it," and that he felt " the necessity of travelling miles enough " — he was paid by the mileage — " to keep his horses." It was during this work that he struck the vein which gave him fortune and fame. A visit to Salisbury Close inspired him with the idea of The Warden (1855). It brought him little immediate profit, nor was even Barchester Towers, which followed in 1857, very profitable, though it contains his freshest, his most original, and, with the exception of The Last Chronicle of Barset, his best work.

The two made him a reputation, however, and in 1858 he was able for the first time to sell a novel, The Three Clerks, for a substantial sum, £250. A journey on post office business to the West Indies gave him material for a book of travel, The West Indies and the Spanish Main (1859), which he frankly and quite truly acknowledges to be much better than some subsequent work of his in the same line. From this time his production, mainly of novels, was incessant, and the sums which he received were very large, amounting in one case to as much as £3525 for a single book, and to nearly £70,000 in the twenty years between 1859 and 1879. All these particulars are given with great minuteness by himself, and are characteristic. The full high tide of his fortunes began when the Cornhill Magazine was established. He was asked at short notice to contribute a novel, and wrote in 1861 Framley Parsonage, which was extremely popular; two novels immediately preceding it, The Bertrams (1859) and Castle Richmond (1860I had been much less successful.

As it will be possible to notice few of his other works, the list of them, a sufficiently astonishing one, may be given here: Doctor Thome (1858); Tales of All Countries (3rd series 1863); Orley Farm; North America (1862); Rachael Ray (1863); The Small House at Allington, Can You Forgive Her? (1864); Miss Mackenzie (1865); The Belton Estate (1866); The Claverings, Nina Balatka, The Last Chronicle of Barset (1867); Linda Tressel (1868); Phineas Finn, He Knew He Was Right (1869); The Struggles of Brown, Jones and Robinson, the Vicar of Bullhampton, An Editor's Tales, The Com- mentaries of Caesar (1 870) ; Sir Harry Hotspur of Humblethwaite, Ralph the Heir (1871); The Golden Lion of Granpere (1872); The Eustace Diamonds, Australia and New Zealand (1873); Phineas Redux, Harry Heathcote of Gangoil, Lady Anna (1874) ; The Way We Live Now (1875); The Prime Minister (1876); The American Senator (1877); Is He Popenjoy? South Africa (1878); John Caldigate, An Eye for an Eye, Cousin Henry, Thackeray (1879) ; The Duke's Children, Cicero (1880); Ayala' s Angel, Dr Wortle's School (1881); Frau Froh- mann, Lord Palmerston, The Fixed Period, Kept in the Dark, Marion Fay (1882); Mr Scarborough's Family, The Land Leaguers (1883); and An Old Man's Love (1884), and several volumes of short stories.

How this enormous total was achieved in spite of official work (of which, lightly as he took it, he did a good deal, and which he did not give up for many years), of hunting three times a week in the season, of whist-playing, of not a little going into general society, he has explained with his usual curious minuteness. He reduced novel-writing to the con- ditions of regular mechanical work — so much so that latterly he turned out 250 words every quarter of an hour, and wrote at this rate three hours a day. He divided every book before hand into so many days' work and checked off the amount as he wrote.

A life thus spent could not be very eventful, and its events may be summed up rapidly. In 1858 he went to Egypt on post office business, and at the end of 1859 he got himself

transferred from Ireland to the eastern district of England. Here he took a house, at Waltham. He took an active part in the establishment of the Fortnightly Review in 1865; he was editor of St Paul's for some time after 1867; and at the end of that year he resigned his position in the post office. He stood as a parliamentary candidate for Beverley and was defeated; he received from his old department special missions to America and elsewhere — he had already gone to America during the Civil War. He went to Australia in 1871, and before going broke up his household at Waltham. When he returned he established himself in London, and lived there until 1880, when he removed to Harting, on the confines of Sussex and Hampshire. He had visited South Africa in 1877 and travelled elsewhere. He died of paralysis on the 6th of December 1882.

Of Trollope's personal character it is not necessary to say much. Strange as his conception of official duty may seem, it was evidently quite honest and sincere, and, though he is said to have been as an official popular neither with superiors nor inferiors, he no doubt did much good work. Privately he was much liked and much disliked— a great deal of real kindness being accom- panied by a blustering and overbearing manner, and an egotism, not perhaps more deep than other men's, but more vociferous. None of his

literary work except the novels is remarkable for merit. His Caesar and Cicero are curious examples of a man's undertaking work for which he was not in the least fitted. Thackeray exhibits, though Trollope appears to have both admired Thackeray as an artist and liked him as a man, grave faults of taste and judgment, and a complete lack of real criticism. The books of travel are not good, and of a kind not good. Nina Balatka and Linda Tressel — stories dealing with Prague and Nuremberg respectively — were published anonymously and as experiments in the romantic style. They have been better thought of by the author and by some competent judges than by the public or the publishers. The Struggles of Brown, Jones and Robinson was still more disliked, and is certainly very bad as a whole, but has touches of curious originality in parts. Trollope seldom creates a character of the first merit; at the same time his characters are always alive. Dr Thome, Mr Harding, who has the courage to resign his sinecure in The Warden, Mr Crawley, Archdeacon Grantley, and Mrs Proudie in the same ecclesiastical series, are distinct additions to the personae of English fiction. After his first failures he never produced any- thing that was not a faithful and sometimes a very amusing transcript of the sayings and doings of possible men and women. His characters are never marionettes, much less sticks. He has some irritating mannerisms, notably a trick of repetition of the same form of words. He is sometimes absolutely vulgar — • that is to say, he does not deal with low life, but shows, though always robust and pure in morality, a certain coarseness of taste. He is constantly rather trivial, and perhaps nowhere out of the Barset series (which, however, is of itself no in- considerable work) has he produced books that will live. The very faithfulness of his representation of a certain phase of thought, of cultivation, of society, uninformed as it is by any higher spirit, in the long run damaged, as it had first helped, the popularity of his work. But, allowing for all this it may and must still be said that he held up his mirror steadily to nature, and that the mirror itself was fashioned with no inconsiderable art.

Trollope wrote an' Autobiography, edited by his son Henry M. Trollope in 1883, explaining his literary methods with amusing frankness. See also Sir L. Stephen's Studies of a Biographer (1898), James Bryce's Studies in Contemporary

Biography (1903), and Henry James's Partial Portraits (1

cone resting on a triangular base. In the days of Michael Praetorius (1618), the length of the Trummscheit was 7 ft. 3 in. and the three sides at the base measured 7 in., tapering to 2 in. at the neck. These measurements varied considerably, as did also the shape of the body and the number of strings. In some cases the base of the body was left open, and in others there were sound-holes. The bridge, from its curiously irregular shape, was known as the " shoe "; it was thick and high at the one side on which rested the string, and low and narrow at the other which was left loose so that it vibrated against the belly with every movement of the bow, producing a trumpet- like timbre. It is to this feature, in conjunction with its general resemblance in contour to the marine speaking-trumpet of the middle ages, that the name of the instrument is doubtless due.

There was at first but one string, generally a D violoncello string, which was not stopped by the fingers in the usual way, but played only in harmonics by lightly touching it with the thumb at the nodal points. The heavy blow, similar to that of the violoncello, is used between the highest positions of the left hand at the nodal points and the nut of the head. In a Trummscheit in the collection of the Kgl. Hochschule, at Charlottenburg (No. 772 in catalogue) the frets are lettered A,D,F,A,D,F,G,A,B,C,D. Sometimes an octave string, half the length of the melody string, and even two more, respectively the twelfth and the double octave, not resting on the bridge but acting as sympathetic strings, were added to improve the timbre by strengthening the pure harmonic tones without increasing the blare due to the action of the bridge. In Germany, at the time when the trumpet was extensively used in the churches, nuns often substituted the tromba ˆmarina, whence the name Nonnengeige. In France, the Grande Ecurie du Roi comprised five trumpets-marine_ and cromornes among the band in 1662, when the charge was mentioned for the first time in the accounts; and in 1666 the number was increased to six. The instrument fell into disuse during the first half of the 1 8th century, and was only to be seen in the hands of itinerant and street musicians. (K. S.)

TROMBONE (Fr. trombone, Ger. Posaune, Ital. trombono), an important member of the brass wind family of musical instruments formerly known as sack fad. The trombone is characterized by the slide, consisting of two parallel cylindrical tubes, over which two other cylindrical tubes, communicating at their lower extremities by means of a short semicircular

TROMBA MARINA, or Marine Trumpet (Fr. trompetle marine; Ger. Marine Trompete, Trompetengeige, Nonnengeige, Tympanischiza or Trummscheit), a triangular bowed instru- ment about 6 ft. in length, which owes its characteristic timbre to the peculiar construction of the bridge. The tromba marina consists of a body and neck in the shape of a truncated

Fig. 1. — Tenor Trombone (Besson & Co.).

pipe, slip without loss of air. The outer tube, therefore, slides upon the inner, and as it is drawn downwards by the right hand opens a greater length of tube proportional to the depth of pitch required. When the slide is closed the instrument is at its highest pitch. To the upper end of one of the inner tubes is fastened the cup-shaped mouthpiece and to the end of the other tube is fixed the bell-joint. This joint, on the proper proportions of which depend in a greater measure the acoustic properties of the trombone, consists of a length of tubing with conical bore widening out into a large bell and doubled back once upon itself in a plane at right angles to that of the slide. The bell-joint is strengthened by two or three stays, and the slide also has two, one between the inner immovable tubes and the other on the outer sliding tubes, by means of which the slide is drawn out and pushed in.

Sound is produced on the trombone, as on the horn, by means of the lips stretched like a vibrating reed across the cup mouthpiece from rim to rim; the acoustic principles in- volved are the same for both instruments. By overblowing, i.e. by the varying tension of the lips and pressure of breath, the harmonic series is obtained, which is effective between the second and the tenth harmonics, the fundamental being but rarely of practical use.

There are seven positions of the slide on the trombone,

each

giving a theoretical fundamental tone and its upper partials a semitone lower than the last, and corresponding to the seven shifts on the violin and to the seven positions on valve instru- ments. These seven positions are found by drawing out the slide a little more for each one, the first position being that in which the slide remains closed. The performer on the trombone is just as dependent on an accurate ear for finding the correct positions as a violinist.

The table of harmonics for the seven positions of the tenor trombone in B? is appended; they furnish a complete chromatic compass of two octaves and a sixth.

.. „ ˆ bfi_-Q –

Position I. (g—

(with closed slide), sicˆs ®- -—ˆBerˆ*—: :._. :

II.

III.

IV.

V.

VI.

VII.

=#=

IF

Ie

±BTZ

ˆbˆzrfe

w

!=^f

Jta„

— fe

I

f

b=>~

±EZ

-±&1

^

These notes represent all the notes in practical use, although it is possible to produce certain of the higher harmonics. The instru- ment being non-transposing, the notation represents the real sounds.

The four chief trombones used in the orchestra are the following : — ■

to

The Alto in E flat or F,

•§E

1

t?(g. or (fe)

to

The Tenor-Bass in B flat.

£

>- or(fe)

to

or (h-2.)

The Bass in F or G (with double slide in E flat).

He

j£_ ˆ

74-

est)

The Contra-Bass in B flat. An octave below the Tenor-Bass.

m

=£

:tor

sr

S va bassa The compass given above is extreme and includes the notes obtained by means of the slide; the notes in brackets are very difficult; the fundamental notes, even when they can be played, are not of much practical use. The contra-bass trombone, although not much in request in the concert hall, is required for the Nibelungen Ring, in which Wagner has scored effectively for it.

The quality of tone varies greatly in the different instruments and registers. The alto trombone has neither power nor richness of tone, but sounds hard and has a timbre between that of a trumpet and a French horn. The tenor and bass have a full rich quality suitable for heroic, majestic music, but the tone depends greatly on the performer's method of playing; the modern tendency to produce a harsh, noisy blare is greatly to be deplored.

Besides the slide trombone, which is most largely used, there are the valve trombones, and the double-slide trombones. The former

are made in the same keys as the instruments given above and are constructed in the same manner, except that the slide is replaced by three pistons, which enable the performer to obtain a greater technical execution ; as the

tone suffers thereby and loses its character- istic timbre, the instruments have never become popular in England.

Fig. 2.

The double-slide trombone' (fig. 2)— patented by Messrs Rudall Caite & Co. but said to have been originally invented by Halary in 1830 — ■ is made in Bb, G bass and Eb contrabass. In these instruments each of the branches of the slide is made half the usual length. There are four branches instead of two and the two pairs lie one over the other, each pair being connected at the bottom by a semi- circular tube and the second pair similarly at the top as well. The usual bar or stay suffices for drawing out both pairs of slides simul- taneously, but as the lengthening of the air column is now doubled in proportion to the shift of the slide, the extension of arm for the lower positions is lessened by half, which increases the facility of execution but calls for greater nicety in the adjustment of the slide, more especially in the higher positions.

The history of the evolution of the trombone from the buccina is given in the article on the Sackbut (q.v.), the name by which the earliest draw or slide trumpets were known in England. The Germans call the trombone Posaune, formerly buzaun, busine, pusin or pusun in the poems and romances of the 12th and 13th century, words all clearly derived from the Latin buccina. The modern designation " large trumpet " comes from the Italian, in which trotnba means not only trumpet, but also pump and elephant's trunk. It is difficult to say where or at what epoch the instrument was invented. In a psalter (No. 20) of the nth century, preserved at Boulogne, there is a drawing of an instrument which bears a great resemblance to a trombone deprived of its bell. Sebastian Virdung, Ottmar Luscinius, and Martin Agricola say little about the trombone, but they give illustrations of it under the name of busaun which show that early in the 16th century it was almost the same as that employed in our day. It would not be correct to assume from this that the trombone was not well known at that date in Germany, and for the following reasons. First, the art of trombone playing was in the 15th century in Germany mostly in the hands of the members of the town bands, whose duties included playing on the watch towers, in churches, at pageants, banquets and

festivals, and they, being jealous of their privileges, kept the secrets of their art closely, so that writers, such as the above, although acquainted with the appearance, tone and action of the instrument would have but little opportunity of learning much about the method of producing the sound. Secondly, German and Dutch trombone players are known to have been in request during the 15th century at the courts of Italian princes. 1 Thirdly, Hans Neuschel of Nuremberg, the most celebrated performer and maker of his day, had already won a name at the end of the 15th century for the excellence of his " Posaunen," and it is recorded that he made great improvements in the construction of the instrument in 1498, 2 a date which probably marks the transition from sackbut to trombone, by enlarging the bore and turning the bell-joint round at right angles to the slide. Finally in early German translations of Vegetius's De re militari (1470) the buccina is described (bk. in., 5) as the trumpet or posaun which is drawn in and out, showing that the instrument was not only well known, but that it had been identified as the descendant of the buccina.

By the 16th century the trombone had come into vogue in England, and from the name it bore at first, not sackbut, but shakbusshe, it

1 E. Van der Straeten, Les Musiciens nSerlandais p. 26.

2 See G. von Retberg " Zur Gesch. d. Musik-instrumente " in Anzeiger fur Kunde der de-utschen Vorzeit p. 241. (Nuremberg, i860), See also letters from Jorg Neuschell 1540-1545 in Monatshefte f. Mustkwissenschaft, ix. p. 149 seq.

is evident that the instrument had been introduced from Spain and not from France (where it bore the name of saquebute), as some have assumed from the more frequent use of the word sackbut. The band of musicians in the service of Henry VIII. included ten sackbut players, and under Elizabeth, in 1587, there were six English instrumentalists then enjoyed a certain reputation and

were sought for by foreign courts; thus in 1604 Charles III. of Lorraine sought to tecruit his sackbut players from English bands. 1 Praetorius 2 classes the trombones in a complete family, the relative tonalities of which were thus composed: 1 Alt-Posaun, 4 Gemeine rechte Posaunen, 2 Quart-Posaunen, I Octav-Posaun— eight in all. The Alt-posaun was in D. With the slide closed, it gave the first of the accompanying harmonics : —

^

3 =

= #F

X

£

The gemeine rechte Posaunen, or ordinary trombones, were in A. Without using the slide they gave the subjoined sounds : —

_ 0 *-

1 = 1

The Quart-Posaun was made either in E, the fourth below the gemeine rechte Posaun, or in D, the lower fifth. In the latter case it was exactly an octave below the Alt-Posaun. The Octav-Posaun was in A. It was constructed in two different fashions: either it had a length double that of the ordinary trombone, or the slide was shortened, the length of the column of air being still maintained by the adaptation of a crook. The first system, which was invented by Hans Schreiber four years before the work of Praetorius appeared, gave the instrumentalist a slide by which he could procure in the lower octave all the sounds of the ordinary trombone. The second system, which Praetorius had known for years, was distinguished from the first, not only by modifications affecting the form, but also by a larger bore. Mersenne 3 calls the trombone trompelte harmo- nique, or tuba tractilis. He describes carefully the seven positions and gives the diatonic scale for the first octave, but he does not, like Praetorius, mention the pitch of the trombones in use in his day. He established this fact,

however, that it was customary in France, as in Germany, to lower the instrument a fourth below the pitch of the ordinary trombone by means of a tortil, a kind of crook with a double turn that was fitted between the bell and the slide, ” in order,” he said, ” to make the bass to hautbois concerts.” This system, so simple and rational, might have been expected always to serve for the basis of the technique of the instrument ; but from the middle of the 18th century the art of playing the trom- bone became the object of purely empiric teaching. Owing to the decline in the popularity of the trombone during the 18th century in England, France, Germany and Italy, writers of that period are sometimes at a loss to describe the working and effect of theslide, as were the early 16th-century authors. J. J. Eisel, and after him Jacob Lotter, whose work is a rechauffe of Eisel’s, mention four principal positions, ” the others not being of much importance.” The lowering of the pitch effected by means of these four positions, however, is almost equal to that of the seven positions of the modern trombone. The tenor or ordinary trombone is given as an example. It stood in the first position in A. The second position, equal to the modern third produced the harmonic series of the fundamental G one tone lower than the first position. The third position gave F again a tone lower and corresponding to our sixth position. The fourth position, which extended so far outward “that the arm could hardly reach it,” gave E as fundamental. The intermediate semitones, instead of being considered as positions, are treated as accidentals, lowering or raising any note obtained in one of the positions by draw- ing out, or pushing in, the slide approximately an extra two-fingers breadth. It would not be correct to state without qualification that four positions only were used on the trombone in the 18th century.

Samuel Wesley, who has left notes on the scales of various instru- ments, in his own hand (Add MS. 3501 1 fol. 166 Brit. Mus.), has added under the scales of the trombones — bass, tenor and alto — the remark ” sacbut or double trumpet, the scale of which is wanting.”

Of all wind instruments the trombone has perhaps been least modified in form; changes have occasionally been attempted, but for the most part with only trifling success. The innovation which has had the most vogue dates from

the end of the 18th century; it consisted in bending the tube of the bell in a half circle above the head of .the executant, which produced a very bizarre effect. It also gave rise to very serious inconveniences : by destroy- ing the regularity of the proportions of the bell it prejudicially affected the quality of tone and intonation of the instrument. For a long time the curved bell with its serpent's mask known as the

1 See A. Jacquot, La Musique en Lorraine, p. 61.

- Organographia (Wolfenbiittel, 1619).
- Harmonic universelle (Paris, 1636).

Bucin — a term borrowed from the French in this instance — wa» maintained in military music, and it is not so very long since it was completely given up. By giving a half turn more to the bell tube its opening was directed to the back of the executant; but this

Fig. 3. — Contrabass Trombone (Boosey & Co.).

form, in fashion for a little while about 1830, was not long adhered to, and the trombone reassumed its primitive form, which is still maintained. As appears from a patent deposited by Stolzel and Blilmel at Berlin on the 12th of April 1818 the application of ventils or pistons was then made for the first time. 4 The ventils, at first two in number, effected a definite lengthening of the instrument. The first augmented the length of the tube by a tone, lowering by as much the natural harmonics. The second produced a similar effect for a semitone, and the simultaneous employment of the two pistons resulted in the depression of a tone and a half. The principle, therefore, of the employment of ventils or pistons is the same as that which governs the use of slides (see Valves). Notwithstanding the increased facility obtained by the use of pistons, they are very far from having gained the suffrage of all players : many prefer the slide, believing that it gives a facility of emission that they can- not obtain with a piston trombone. The flat tonalities having been preferred for military music since the beginning of the 19th century the pitch of each variety of trombones has been raised a semitone. At present six trombones are more or less in use, viz. the alto trombone in F, the alto in Eb (formerly in D),

the tenor in Bb (formerly in A), the bass in G, the bass in F (formerly in E), the bass in Eb (formerly in D), and the contrabass in Bb. This transposition has no reference to the number of vibrations that may be officially or tacitly adopted as the standard pitch of any country or locality. A trombone an octave lower than the tenor has recently been re- introduced into the orchestra, principally by Wagner. The different varieties just cited are constructed with pistons or slides, as the case may be.

Further information on the trombone will be found in the mono- graphs by the Rev. F. W. Galpin, "The Sackbut: its Evolution and History," Proc. Mus. Assoc. (1906-1907) ; by Victor Mahillon, Le Trombone, son histoire, sa theorie, sa construction (Brussels, London, 1907). Before his recent death Professor George Case had in preparation an important work on the trombone. (V. M.; K. S.)

TROMP, the name of two famous Dutch admirals.

1. Martin Harpertzoon Tromp (1597-1653) was born at Brielle, South Holland, in 1597. At the age of eight he made a voyage to the East Indies in a merchantman, but was made piisoner and spent several years on board an English cruiser. On making his escape to Holland he entered the navy in 1624, and in 1637 was* made lieutenant-admiral. In February 1639 he surprised, off the Flemish coast near Gravelines, a large Spanish fleet, which he completely destroyed, and in the following September he defeated the combined fleets of Spain and Portugal off the English coast — achievements which placed him in the first rank of Dutch naval commanders. On the outbreak of war with England Tromp appeared in the Downs in command of a large fleet and anchored off Dover. On the approach of Blake he weighed anchor and stood over towards France, but suddenly altered his course and bore down on the English fleet, which was much inferior to his in numbers. In the engagement which followed (May 19, 1652) he had rather the worst of it and drew off with the loss of two ships. In November he again appeared in command of eighty ships of war, and a convoy of 300 merchantmen, which he had under- taken to guard past the English coast. Blake resolved to attack him, and, the two fleets coming to close quarters near Dungeness on the 30th of November, the English, after severe losses, drew off in the darkness

and anchored off Dover, retiring next day to the Downs, while Tromp anchored off Boulogne

4 This was mentioned in the Leipzig Allg. musik. Ztg. (1815), the merit of the invention being assigned to Heinrich 'Stolzel of Pless in Silesia.

till the Dutch merchantmen had all passed beyond danger. The statement that he sailed up the Channel with a broom at his masthead in token of his ability to sweep the seas is probably mythical. In the following February (1653), while in charge of a large convoy of merchantmen, he maintained a running fight with the combined English fleets under Blake, Penn and Monk off Portland to the sands of Calais, and, though baffling to some extent the purposes $f the English, had the worst of the encounter, losing nine ships of war and thirty or forty merchantmen. On the 3rd of June he fought an indecisive battle with the English fleet under Richard Dean in the Channel, but the arrival of reinforcements under Blake on the following day enabled the English to turn the scale against him and he retired to the Texel with the loss of seventeen ships. Greatly discouraged by the results of the battle, the Dutch sent commissioners to Cromwell to treat for peace, but the proposal was so coldly received that war was immediately renewed, Tromp again appearing in the Channel towards the end of July 1653. In the hotly contested conflict which followed with the English under Monk on the 29th Tromp was shot by a musket bullet through the heart. He was buried with great pomp at Delft, where there is a monument to his memory in the old church.

2. Cornelius Van Tromp (1620-1691), the second son of the preceding, was born at Rotterdam on the 9th of September 1629. At the age of nineteen he commanded a small squadron charged to pursue the Barbary pirates. In 1652 and 1653 he served in Van Galen's fleet in the Mediterranean, and after the action with the English fleet off Leghorn on the 13th of March 1653, in which Van Galen was killed, Tromp was promoted to be rear-admiral. On the 13th of July 1665 his squadron was, by a hard stroke of ill-

fortune, defeated by the English under the duke of York. In the following year Tromp served under De Ruyter, and on account of De Ruyter's complaints of his negligence in the action of the 5th of August he was deprived of his command. He was, however, reinstated in 1673 by the stadtholder William, afterwards king of England, and in the actions of the 7th and of the 14th of June, against the allied fleets of England and France, manifested a skill and bravery which completely justified his reappointment. In 1675 he visited England, where he was received with honour by King Charles II. In the following year he was named lieutenant-admiral of the United Provinces. He died at Amsterdam, on the 29th of May 1691, shortly after he had been appointed to the command of a fleet against France. Like his father he was buried at Delft. See H. de Jager, Het Geslacht Tromp (1883). TROMSO, a seaport of Norway, capital of the amt (county) and stift (diocese) of the same name on the north-western coast. Pop. (1900), 6955. It stands on the eastern shore of a low fertile islet between Kvalo and the mainland, in 69 38′ N., 18 55′ E. (the latitude is that of Disco, Greenland). The vegetation of the island (mountain ash and birch) is remarkably luxuriant. The buildings, mostly of wood, include the town-hall and a museum, which contains a good zoological collection. Sealskins and other furs, and whale and seal oil, are exported, and the herring fishery is very productive. Imports are coal, textiles, salt, grain and flour. Mean temperature of year 36-4° F.; February 25 ; July 51-8°. Tromso was founded in 1794. A number of Lapps usually encamp in the neighbouring Tromsdal during summer. The coast scenery, with its islands and "snowy mountains, is wild and beautiful.

TRONCHET, FRANCOIS DENIS (1726-1806), French jurist, was born in Paris on the 23rd of March 1726. He was an avocat at the parlemeht of Paris, and gained a great reputation in a consultative capacity. In 1789 he was elected deputy to the states-general. In the Constituent Assembly he made him- self especially conspicuous by his efforts to obtain the rejection of the jurisdiction of the jury in civil cases. In the king's trial, he was chosen by Louis as counsel for the defence, and per- formed this difficult and dangerous task with high ability and courage. During the Directory he was deputy at the Council

of the Ancients, where he unsuccessfully opposed the resolution that judges be nominated by the executive directory. Under the Consulate he was president of the tribunal of cassation, and collaborated in preparing the final scheme for the civil code. He had a marked influence on the code, and succeeded in introducing common law principles in spite of the opposition of his colleagues, who were deeply imbued with Roman law. He died on the 10th of March 1806, being the first senator of the empire to be buried in the Pantheon.

See Francois de Neuf chateau, Discours sur Tronchet (Paris, undated) ; Coqueret, Essai sur Tronchet (Caen, 1867).

TRONDHJEM, or Throndhjem (sometimes written in the German form Drontheim), a city and seaport of Norway, chief town of the slift (diocese) of Trondhjem and the amt (county) of South Trondhjem, 384 m. by rail N. of Christiania. Pop. (1900), 38,156. It lies on the south side of the broad Trondhjem Fjord on a low peninsula between the fjord and the River Nid, its situation, though picturesque, lacking the peculiar beauty of that of Christiania or Bergen. The latitude is ,63° 26′ N., that of southern Iceland. In front of the town is the islet of Munkholm, formerly a monastery and now a fortress; on the high ground to the east is the small stronghold of Christiansten. The houses are principally of wood, and the streets are wide, as a precaution against the spreading of fire. The principal building is the cathedral, standing finely on a slightly elevated open site, and dating in part from the close of the nth century, but chiefly belonging to the 12th and 13th centuries (c. 1161- 1248). Its extreme length is 325 ft. and its extreme breadth 124 ft.; but in the 14th, 15th and 17th centuries it suffered greatly from repeated fires, and after the last of these the nave was completely abandoned and soon became a heap of ruins. The whole building, however, had been extensively and judiciously restored, and is the finest church in Norway and the scene of the coronation of the Norwegian sovereigns. It is cruciform, with a central tower, and has an eastern octagon which may have been copied from the corona of Canterbury Cathedral, as Eystein, archbishop of Trondhjem (1160-1188) and an active builder, was in England during his episcopate. The cathedral contains rich work in Norman style, and also much that is comparable with the best Early English. In the

museums at Trondhjem there are interesting zoological and antiquarian collections, also exhibits illustrative of the fisheries and other industries. The port, which has regular communica- tion with all the Norwegian coast towns — Hull, Newcastle, Hamburg, &c. — carries on an extensive trade in timber, oil, fish, copper, &c. The industries include shipbuilding, saw- milling, wood-pulp and fish-curing works and machine shops. Imports (coal, grain, salt, machinery, &c.) come chiefly from Great Britain. A considerable portion of the exports pass into Sweden by the Meraker railway.

Trondhjem, originally Nidaros, was founded by Olaf Tryg- gvason, who built a royal residence and a church here in 996. It was made an archbishopric in 1152. The city attained its highest development about the latter half of the 13th century, by which time it had become an important pilgrimage centre and had as many as fifteen churches. It sustained frequent sieges, as well as devastating conflagrations. Its importance declined about the time of the Reformation when it ceased to be a resort of pilgrims.

TROON, a police burgh, seaport and watering-place of Ayrshire, Scotland. Pop. (i9or), 4764. It is situated 6 m. N. by W. of Ayr, and 35 m. S.W. of Glasgow by the Glasgow & South- western railway. It has the best natural harbour in the county, with over a mile of quayage, a breakwater 3000 ft. long, and two graving docks. Shipbuilding is the leading industry, and there is a rope and sail factory. The town contains a public hall and library and reading-room. The municipality controls the waterworks and gasworks. Fullarton House, 1 m. south-east, is a # seat of the duke of Portland; and at Auchans, about 3 m. west, Susannah, countess of Eglinton, in 1773 entertained Dr Johnson. Adjoining this estate stands the ruined castle of the Dundonalds.

3° 6

TROOP— TROPINE

TROOP (an adaptation of Fr. troupe, O. Fr. trope; cf. ItaJ. troppa, truppa; Med. Lat. truppus; the origin is doubtful; suggestions have been made that it represents a German conception of Latin turba, crowd, or is an adaptation of

Norw. torp, flock), a company or assemblage of persons, the term being usually applied in the plural to a body of soldiers of varying strength and of different arms. Specifically, a " troop " is one of the smaller units into which a regiment of horse-soldiers is divided, forming a subdivision of a squadron. Roughly speak- ing, it consists of sixteen files, and does not exceed from 30 to 40 sabres; in some armies, however, a maximum limit of 60 sabres are found (see Cavalry). For the military ceremony known as " trooping of the colours," see Colours, Military.

TROPHY (Gr. Tpbiraxov, from rpeircc, put to flight; Lat. tropaeum), in classical antiquities, in the strict sense a memorial of victory set up on the field of battle at the spot where the enemy had been routed. It consisted of captured arms and standards hung upon a tree (preferably an olive or an oak) and booty heaped up at its foot, dedicated to the god to whom the victory was attributed, especially Zeus Tropaeus. If no suitable tree was at hand, a lopped trunk was fixed in the ground on an eminence. The tree or trunk bore an inscription containing the names of the god and the combatants, a list of the booty and of the chief incidents of the battle or the entire war. In the case of a naval victory the trophy, composed of the beaks of ships (sometimes an entire ship), was generally set up on the nearest beach and consecrated to Poseidon. It was regarded as a sacrilege to destroy a trophy, since it was dedicated to a god; but, on the other hand, one that had fallen to pieces through lapse of time was not restored, to prevent feelings of resentment being kept alive. For the same reason trophies of stone or metal were forbidden by law, although this rule was not always observed. To facilitate reconciliation with their conquered foes, neither the Macedonians nor the Romans in early times erected such trophies. The usual custom was to take home the spoils, and to use them for decorating public buildings and private houses. The first example of a trophy set up after the Greek fashion occurs in 121 B.C., when Domitius Ahenobarbus celebrated his victory over the Allobroges in this manner. Although instances are not uncommon in latertimes, the Romans still showed a preference for setting up the memorials of vic- tory in Rome rather than on the field of battle. These were decorated with the spoils, and were themselves called trophies; such were the trophies of Marius recording his victories over

Jugurtha and the Cimbri and Teutones. In later republican and imperial times enormous columns, on which the chief incidents of a battle or war were represented in bas-relief, were frequently erected, the most famous and most perfect example being the column of Trajan (see Rome: Archaeology, ” The Imperial Forums “).

TROPIC-BIRD, so called of sailors from early times, 1 because as W. Dampier (Voyages, i. 53) among many others testifies, it is ” never seen far without either Tropick “; hence, indulging a pretty fancy, Linnaeus bestowed on it the generic term, con- tinued by modern writers, of Phaethon, in allusion to its attempt to follow the path of the sun. 2 There are certainly three well- marked species of this genus, but their respective geographical ranges have not yet been definitely laid down. All of them can be easily known by their totipalmate condition, in which the

1 More recently sailors have taken to call it ” Boatswain-bird ” — a name probably belonging to a very different kind. (See Skua.)

2 Occasionally, perhaps through violent storms, tropic-birds wander very far from their proper haunts. In 1700 Leigh, in his Nat. Hist. Lancashire (i. 164, 195, Birds, pi. i., fig. 3), described and figured a ” Tropick Bird ” found dead in that county. Another is said by Mr Lees (Zoologist, 2nd series, p. 2666) to have been found dead at Cradley near Malvern — apparently before 1856 (J. H. Gurney, jun., op. cit., p. 4766) — which, like the last, would seem (W. H. Heaton, op. cit., p. 5086) to have been of the species known as P. aethereus. Naumann was told (Rhea, i. 25) of its supposed occurrence at Heligoland, and Colonel Leg-ge (B. Ceylon, p. 1174) mentions one taken in India 170 m. from the sea. The case cited by Degland and Gerbe (Ornith. europienne, ii. 363) seems to be that of an albatross.

four toes of each foot are united by a web, and by the great length of the two middle tail-quills, which project beyond the rest, so as to have gained for the birds the name of ” Rabijunco,” ” Paille-en-queue “and” Pijlstaart “among mariners of different nations. These birds fly to a great distance from land and seem to be attracted by ships, frequently hovering round or even settling on the mast-head. Their flight is performed by rapid strokes, unlike $e

action of other long-winged sea-fowl, and they are rarely seen on the water.

The yellow-billed tropic-bird, P. flavirostris or candidus, appears to have habitually the most northerly, as well, perhaps, as the widest range, visiting Bermuda yearly to breed there, but also occurring numerously in the southern Atlantic, the Indian, and a great part of the Pacific Ocean. In some islands of all these three it breeds, sometimes on trees, which the other species are not known to do. However, like the rest of its congeners, it lays but a single egg, and this is of a pinkish white, mottled, spotted, and smeared with brownish purple, often so closely as to conceal the ground colour. This is the smallest of the group, and hardly exceeds in size a large pigeon; but the spread of its wings and its long tail make it appear more bulky than it really is. Except some black markings on the face (common to all the species known), a large black patch partly covering the scapulars and wing-coverts, and the black shafts of its elongated rectrices its ground colour is white, glossy as satin, and often tinged with roseate. Its yellow bill readily distinguishes it from its larger congener P. aethereus, but that has nearly all the upper surface of the body and wings closely barred with black, while the shafts of its elongated rectrices are white. This species has a range almost equally wide as the last; but it does not seem to occur in the western part of the Indian Ocean. The third and largest species, the red-tailed tropic-bird, P. rubricauda or phoenicurus, not only has a red bill, but the elongated and very attenuated rectrices are of a bright crimson red, and when adult the whole body shows a deep roseate tinge. The young are beautifully barred above with black arrow-headed markings. This species has not been known to occur in the Atlantic, but is perhaps the most numerous in the Indian and Pacific oceans, in which last great value used to be attached to its tail-feathers to be worked into ornaments. 5

That the tropic-birds form a distinct family, Phaethontidae, of the Steganopodes (the Dysporomorphae of Huxley), was originally maintained by Brandt, and is now generally admitted, yet it cannot be denied that they differ a good deal from the other members of the group 4 ; indeed St G. Mivart in the Zoological Transactions (x. 364) hardly allowed Fregala and Phaethon to be steganopodous at all ;

and one curious difference is shown by the eggs of the latter, which are in appearance so wholly unlike those of the rest. The osteology of two species has been well described and illustrated by Alph. Milne-Edwards in A. Grandidier's fine Oiseaux de Mada- gascar (pp. 701-704, pis. 279-2810). (A. N.)

TROPINE, CsHuNO, a base formed together with tropic acid, C9H10O3, in the hydrolysis of the alkaloid atropine (K. Kraut, Ann., 1863, 128, p. 280; 1865, 133, p. 87). It crystallizes in plates which melt at 63° C. and boil at 233 C; it is very hygroscopic and easily soluble in water. It is an optically inactive, strongly alkaline tertiary base. On heating with sodium in amyl alcoholic solution it it sransformed into a stereo- isomer, identical with the ˆ-tropine obtained by hydrolysing tropa-cocaine with hydrochloric acid. It possesses alcoholic properties, since it forms esters, the so-called " tropeines." On distillation with caustic baryta or soda lime it decomposes into methylamine and tropilidine, C7H8 (A. Ladenburg, Ann. 1883, 217, p. 74), the same hydrocarbon being also obtained when it is destructively methylated, a certain amount of tropi- line, C7H10O, being produced simultaneously When heated with fuming hydrochloric acid to 150-180 C. it yields tro- pidine, C 8 H 13 N, and with hydriodic acid similarly forms an

3 A fourth species, P. indir.us, has been described from the Gulf of Oman, but doubt has been expressed as to its validity (Legge, pp. 1 173, 1 1 74).

4 Sulidae (Gannet), Pelecanidae (Pelican), Plotidae (Snake-bird). Phalacrocoracidae (Cormorant,) and Fregatidae (Frigate-bird).

iodo-compound, C 8 H 15 Nl2, which, on reduction with zinc and hydrochloric acid, is converted into hydrotropidine, CgHi 5 N. It yields various oxidation products. With an alkaline solu- tion of potassium permanganate it yields tropigenine, C7H13NO; with chromic acid in the presence of acetic acid it yields tropinone, C 8 Hi 3 NO; and with chromic acid in the

presence of sulphuric acid it yields tropinic acid, C 6 HiiN(C02H) 2 .

Tropidine, C 8 Hi 3 N, is a liquid having an odour resembling that of conine. It is a strong tertiary base, and is an unsaturated compound, forming addition products with the halogen acids. Hydrotropidine, C 8 Hi 5 N, is also a liquid. Its hydrochloride on dis- tillation loses methyl chloride and yields norhydrotropidine, C7H13N, a compound which is a secondary base, and whose hydro- chloride when distilled over zinc dust yields a-ethylpyridine. Tropinic acid, C 6 HnN(C0 2 H) 2 , obtained as above, is inactive; it was resolved by J. Gadamer (Arch. Pharm., 1901, 239, p. 663) by means of its cinchonine salt. It is a dibasic acid, and the methiodide of its dimethyl ester on fusion with caustic alkalis yields n-adipic acid. It is apparently a derivative of N — methyl pyrrolidine, since it may be oxidized ultimately to N — methyl succinimide. Tropigenine, C7H13NO, is a secondary base.

The most important of the oxidation products of tropine is tropinone, CsHuNO, which is a ketone containing the grouping —CH 2 COCH 2 — since it yields a di-isonitroso derivative, a dibenzal derivative, and also forms mono- and di-oxalic esters. It is a strong base and has a powerful reducing action. Its constitution is determined by the above facts and also because tropinic acid on destructive methylation yields a diolefine dicarboxylic acid which on reduction is converted into M-pimelic acid. These data point to tropine possessing an unbranched chain of seven carbon atoms and incidentally determine the constitution of the other various oxidation products, &c. (R. Willstatter, Ber., 1895-1901). These compounds may consequently be represented as

H 2 C CH— CH 2 H 2 C-CH— CH 2 H 2 C-CH-CH 2 -C0 2 H H 2 C-CH— CH,

I I

NMe CHOH

H 2 C-CH— CH 2 H 2 C-CH— CH 2 H 2 C-CH-C0 2 H

Tropine

III II

NMe CO NMe NMe CH

J.I L I I I

H 2 C-CH— CH

Tropinone Tropinic acid Tropidine.

On the synthesis of tropine, see R. Willstatter, Ber., 1901, 34, pp. 130, 3163.

Tropic acid, C 9 Hi O 3 , the other decomposition product of atropine, is a saturated hydroxy -acid which is readily converted into atropic acid, C 9 H 8 2 , by dehydrating agents. This latter acid is shown by all its reactions to be C 6 H 5 C(:CH 2)-C0 2 H, a fact which is confirmed by its synthesis from acetophenone by the action of phosphorus pentachloride, followed by the decomposition of the resulting chloride with an alcoholic solution of potassium cyanide and subsequent hydrolysis of the nitrile so formed. These results show that tropic acid must be either C 6 H 5 -CH(CH 2 OH)-C0 2 H or C 6 H s C-(OH)(CH 3)-C0 2 H, and since the latter compound has been prepared from acetophenone by the addition of the elements of hydrocyanic acid, followed by subsequent hydrolysis and is an isomer of tropic acid, it follows that tropic acid must be represented by the former of the two formulae. Hence the alkaloid atropine, being a tropine-tropate, must have the annexed formula —

H 2 CCH— CH 2

CH 2 OH

NMe CHOCOCH

I I

H 2 C-CH—CH 2

Atropine.

CfiHs

TROPPAU (Polish, Oppava; Czech, Opava), the capital of the Austrian duchy and crown land of Silesia, 180 m. N.E. of Vienna by rail. Pop. (1900), 26,725. It is situated on the Oppa river, close to the Prussian frontier, and is a well-built town with extensive suburbs. The industries comprise the manufacture of cloth, industrial machines, sugar-refining, jute fabrics and brewing. Troppau was founded in the 13th century; but almost its only claim to historical mention is the fact that in 1820 the monarchs of Austria, Russia and Prussia met here to deliberate on the tendencies of the Neapolitan revolution. This congress of Troppau, however, left nearly the whole matter to be considered and decided at Laibach. The former principality of Troppau is now divided between Austria and Prussia, the latter holding the lion's share.

TROPPAU, CONGRESS OF, a conference of the allied sovereigns or their representatives to discuss a concerted policy with regard to the questions raised by the revolution in Naples of July 1820. At this congress, which met on the 20th of October

1820, the emperor Alexander I. of Russia and Francis I. of Austria were present in person; King Frederick William III. of Prussia was represented by the crown prince (afterwards Frederick William IV.). The three eastern powers were further represented by the ministers responsible for their foreign policy: Austria by Prince Metternich, Russia by Count Capo dTstria, Prussia by Prince Hardenberg. Great Britain, on the other hand, which objected on principle to the suggested concerted action against the Neapolitan Liberals, sent no plenipotentiary, but was represented by Lord Stewart, ambas- sador in Vienna. France, too, though her policy was less clearly defined, had given no plenary powers to her representatives. Thus from the very first was emphasized that division within the concert of the powers which the outcome of the congress was to make patent.

The characteristic note of this congress was its intimate and informal nature; the determining fact at the outset was Metternich's discovery that he had no longer anything to

fear from the ” Jacobinism ” of the emperor Alexander. In a three hours’ conversation over a cup of tea at the little inn he had heard the tsar’s confession and promise of amendment: ” Aujourd’hui je deplore tout ce que j’ai dit et fait entre les annees 1814 et 1818 . . . Dites-moi ce que vous voulez de moi. Je le ferai ” (Metternich to Esterhazy, Oct. 24, 1820, F. O. Austria Bom. Sep. Dec. 1820). His failure to convert Castlereagh to his views was now of secondary importance; the ” free ” powers being in accord, it was safe to ignore the opinions of Great Britain and France, whose governments, what ever their goodwill, were fettered by constitutional forms.

In a series of conferences — to which the representatives of Great Britain and France were not admitted, on the excuse that they were only empowered to ” report,” not to ” decide ” — was drawn up the famous preliminary protocol signed by Austria, Russia and Prussia on the 19th of November. The main pronouncement of the ” Troppau Protocol ” is as follows: ” States, which have undergone a change of government due to revolution, the result of which threaten other states, ipso facto cease to be members of the European Alliance, and remain excluded from it until their situation gives guarantees for legal order and stability. If, owing to such alterations, immediate danger threatens other states the powers bind themselves, by peaceful means, or if need be, by arms, to bring back the guilty state into the bosom of the Great Alliance.”

No effort was made by the powers to give immediate effect to the principles enunciated in the protocol; and after its promulgation the conferences were adjourned, it being decided to resume them at Laibach in the following January (see Laibach).

For authorities see the bibliography to ch. i. ” The Congresses,” by W. Alison Phillips, in the Cambridge Mod. Hist. x. 787.

TROSSACHS, THE (Gaelic, ” the bristled country,” a crude allusion to its physical features), a defile in the south-west of Perthshire, Scotland. It is a narrow, beautifully wooded glen, of no great depth, extending from Loch Achray to Loch Katrine, and continued thence by a strip on the north-eastern shore to a point above the now submerged Silver

Strand opposite to Ellen's Isle— a total distance of 2 J m. It is situated 8 m. W. of Callander and 5 m. N. of Aberfoyle, with both of which places there is daily communication by coach during the tourist season. It lies between the steep green slopes of Ben Venue (2393 ft.) on the S.W. and the precipitous craigs of Ben A'an (1750 ft.) on the N.E. Characterized by lovely scenery, owing to its harmonious blending of wood; water, rock and hill, the region has been famous ever since the appearance of Sir Walter Scott's The Lady of the Lake and Rob Roy. Before the construction of the road that now winds through the pass, Sir Walter says that the only access to the lake was by means of a ladder formed out of the branches and roots of trees. A rustic pier has been built at the Trossachs end of Loch Katrine for the convenience of tourists, and a large hotel stands on the northern shore of Loch Achray, near the beginning of the pass.

TROTZENDORFF (or Trocedorfius) , VALENTIN FRIED-LAND (1490-1556), German educationist, called Trotzendorff from his birthplace, near Gorlitz, in Prussian Silesia, was born on the 14th of February 1490, of parents so poor that they could not keep him at school. The boy taught himself to read and write while herding cattle; he made paper from birch bark and ink from soot. When difficulties were overcome and he was sent for education to Gorlitz, his mother's last words were " Stick to the school, dear son." The words determined his career: he refused all ecclesiastical promotion, and lived and died a schoolmaster. He became a distinguished student, learned Ciceronian Latin from Peter Mdssellanus and Greek from Richard Croke, and after graduation was appointed assistant master in the school at Gorlitz. There he also taught the rector and other teachers. When Luther began his attack on indul- gences, Trotzendorff resigned his position and went to study under Luther and Melanchthon, supporting himself by private tuition. Thence he was called to be a master in the school at Goldberg in Silesia, and in 1524 became rector. There he re- mained three years, when he was sent to Liegnitz. He re- turned to Goldberg in 1531 and began that career which has made him the typical

German schoolmaster of the Reformation period. His system of education and discipline speedily attracted attention. He made his best elder scholars the teachers of the younger classes, and insisted that the way to learn was to teach. He organized the school in such a way that the whole ordinary discipline was in the hands of the boys themselves. Every month a " consul," twelve " senators " and two " cen- sors " were chosen from the pupils, and over all Trotzendorff ruled as " dictator perpetuus." One hour a day was spent in going over the lessons of the previous day. The lessons were repeatedly recalled by examinations, which were conducted on the plan of academical disputations. Every week each pupil had to write two " exercitia styli," one in prose and the other in verse, and Trotzendorff took pains to see that the subject of each exercise was something interesting. Jhe fame of the Goldberg School extended over all Protestant Germany, and a large number of the more famous men of the following generation were taught by Trotzendorff. He died on the 20th of April 1556.

See Herrmann, Merkwurdige Lebensgeschichte eines beriihmten Schulmanns, V. F. Trotzendorffs (1727) ; Frosch, V. F. Trotzendorff, Rektor zu Goldberg (1818); Pinzger, V. F. Trotzendorff (with the Goldberg portrait, and a complete list of his writings, 1825); Koehler, V. F. Trotzendorff, ein biographischer Versuch (1848). The biographical facts appear to be derived from a funeral or memorial oration delivered by Balthasar Rhau in the university of Wittenberg on the 15th of August 1564, and published in an edition of Trotzendorffs Rosarium (1565).

TROUBADOUR, the name given to the poets of southern France and of northern Spain and Italy who wrote in the langue d'oc from the 12th to the 14th centuries. In Provencal the word is spelt Irobaire or trovador, and is derived from the verb trobar, to find, or to invent (Fr. trouver). The troubadour was one who invented, and originally improvised, poetry, who " found out " new and striking stanzaic forms for the elaborate lyrics he com- posed. In later times, the word has been used for romantic and sentimental persons, wh6 dress in what is supposed to be medieval fashion, and who indite trivial verses to the sound of a lute; but this significance does less than justice to the serious artistic aims of the original and historic

troubadours of Provence.

The earliest troubadour of whom anything definite is known is Guilhem IX. (b. 1071), count of Poitiers and duke of Aquitaine, whose career was typical of that of his whole class, for, according to his Provencal biographer, " he knew well how to sing and make verses, and for a long time he roamed all through the land to deceive the ladies." The high rank of this founder of the tradition was typical of its continuation; by far the largest number of the troubadours belonged to the noble class, while no fewer than twenty-three of their number were reigning princes. Among them is a king of England, Richard I., who is believed to have written in langue d'oil as well as in langue d'oc, and who

has left at least one canzo, that written in prison, which is of remarkable beauty. These noble troubadours were distinguished by their wealth and independence from those who made their song their profession, and who wandered from castle to castle and from bower to bower. But whether dependent or indepen- dent, the poets exercised a social influence which was extremely remarkable, and had been paralleled by nothing before it in the history of medieval poetry. They had great privileges of speech and censure, they entered into questions of politics, and above all they created around the ladies of the court an atmosphere of cultivation and amenity which nothing had hitherto approached. The troubadour was occasionally accompanied in his travels by an apprentice or servant, called a joglar, whose business was to provide a musical setting for the poet's words; sometimes it was not the troubadour himself, but his joglar, who sang the songs. It was a matter of jealous attention to the troubadour to keep his name and fame clear of the claims of the joglar, who belonged to a lower caste; although it is true that some poets of very high talent rose from being joglars and attained the rank of troubadours. The latter were lookefl upon with deep admiration, and their deeds and sayings, as well as their verses, were preserved and were even embroidered with fiction.

There were recognized about four hundred troubadours, during the whole period in which they flourished, from Guilhem de Poitiers down to Guiraut Riquier (c. 1 230-1 294). Several MS. collections of biographies have been

preserved, and from these we gain some idea of the careers of no fewer than in of the poets. In this respect, the troubadours possess an immense advantage over the trouveres of northern France, of whose private life very little is any longer known. Early in the living history of the troubadours their personal adventures came to be thought worthy of record. One of themselves, Uc of St Cyr (c. 1200-1240), interested himself in " the deeds and words of goodly men and women," and in the collection of lives he seems to claim to be, in several instances, the biographer. At the beginning of the 14th century it became the practice to preface the MS. works of each poet by a life of him, and even where the text seems to be quite independent, it is noticeable that there is little variation in the biography. One late troubadour, Rambaud of Orange, left a commentary on his own poems, and Guiraut Riquier one on those of a fellow troubadour, Guiraut of Calanson (1280). All this proves the poetry of Provence to have passed early into the critical stage, and to have been treated very seriously by those who were proficient in it. This is further shown by the respect with which the Provencal poets are mentioned by Dante, Petrarch and the authors of the Novelle Critiche.

The principal source of the lives of the troubadours is a collection, evidently written by various hands, which was made to- wards the middle of the 13th century. Of these we have said that Uc of Saint Cyr was certainly one of the authors. Another source of information is the Vies des plus celebres et anciens poetes pro- vencaux, published by Jehan de Notredame or Nostradamus, in 1575. This work professed to be founded on the MSS. of a learned monk, who was librarian of the monastery of St Honorat, in the island of Lerins, and died there in 1408. He was known by no other name than that of the Monk of the Golden Isles. This book, unfortunately, lies under more than a suspicion of forgery. Nostra- damus no doubt possessed valuable documents, but he did not hesitate to deal with them in a highly fantastic way. His Vies des poetes has yet to be examined by careful and searching criticism. Even the genuine biographies, and they are numerous and above suspicion, are often embroidered with fantastic and whimsical statements which make a severe demand upon the credulity of a modern reader.

The verse form most frequently employed by the troubadours was the sirvenlis, a term which is earliest met with in the second half of the 12th century. The early critics believed this word to be derived from servir, and to mean that the poem was made by a servant ; but Paul Meyer has contested this derivation, and holds that a sirventes is a poem composed by a sirvent, that is to say a soudoyer or paid man-at-arms. The troubadours also employed the ballada, which was a song with a long refrain, not much like the formal ballade of the north of France; the pastourella; and the alba. This last took its name from the cir- cumstance that the word alba (dawn) was repeated in each

stanza. This was a morning-song, as the serena, a later inven- tion, was an evensong. The planh was a funeral elegy, com- posed by the troubadour for the obsequies of his protector, or for those of the lady of his devotion. Most interesting of all, perhaps, was the tenson, which was a lyrical dialogue between two persons, who discussed in it, as a rule, some point of amorous casuistry, but sometimes matters of a religious, metaphysical or satirical nature. The notion that the troubadours cultivated epic or dramatic poetry is now generally discarded; they were in their essence lyrical (see Provencal Literature).

The biographies of the troubadours, which, in spite of their imperfection and conventionality of form, throw an unparalleled light upon medieval literary life, may perhaps be most conveni- ently treated in connexion with the courts at which each group of them flourished. It is in Poitou that we trace them first, where Guilhem, count of Poitiers, who reigned from 1087 to 1 1 27, was both the earliest patron and the earliest poet of the school. This prince was the type of medieval gallantry, sudden and violent in arms, brilliant and impudent in wit, with women so seductive as to be esteemed irresistible. He led an army of 300,000 men in the crusade of 1101, being then thirty years of age; he returned in dismal disarray, supported in his defeat by the arts of love and song. His levity was the wonder and delight of his contemporaries; William of Malmesbury, who speaks much

of him, tells us of Guilhem's project to found a religious house at Niort for the worship of Venus. Guilhem of Poitiers was handsome, bold and of easy- access; Gottfried of Vendome says that he moved among other men as a god among mortals for the beauty of his body and the magnanimity of his soul. The surviving poems of the great count are simple in form; he does not attempt the technical subtleties of later poets; but he laboured at the art, and he was anxious to be thought a professional, not an amateur writer. His songs are highly personal and betray the author's variety, sensuality, wit and skill as a versifier.

The son of the earliest of the troubadours is known neither as a poet nor as a patron of poets, but the daughter of Guilhem IX. carried on her father's tradition. This was Eleanor of Guienne, at whose court Bernart of Ventadour rose to eminence. This poet was an exception to the rule that the troubadours belonged to the princely class. He seems to have been the son of a kitchen-scullion in the castle of Eble II., viscount of Venta- dour. Eble was himself a poet, valde gratiosus in cantilenis, but his compositions have wholly disappeared; he was early impressed, we know not how, by the talents of his serving- boy, and he trained him to be a poet. The wife of Eble, the viscountess Agnes of Montlucon, who was extremely beautiful, encouraged the suit of the youthful Bernart; indeed, they had secretly loved one another from their childhood. The poems which this passion inspired are among the most admirable lyrics which have come down to us from the middle ages. The husband at last discovered the intrigue between his wife and the poet, and exiled Bernart from Ventadour, although, as it would seem, without violence. The troubadour took shelter with Eleanor of Guienne, who became in 1152 the queen-consort of Henry II. of England, himself a protector of poets. It has been supposed that Bernart accompanied the royal pair to London. He after- wards proceeded to the court of Raymond V. at Toulouse, where he is said to have remained until the death of that prince in 1 194, when he withdrew to a cloister at Dalou in Poitou. He must at that time have been a very old man.

The son of Henry II., Henry Curtmantle, was the patron of another eminent troubadour. Bertran de Born, viscount of Hautefort in Perigord, had become a vassal of England by the marriage of Eleanor. He is the member of his class

about whom we possess the most exact historical information. Dante saw Bertran de Born in hell, carrying his severed head before him like a lantern, and compared him with Achitophel, who excited the sons of David against their father. This referred to the subtle intrigues by which the troubadour had worked on the jealousy existing between the three sons of the king of England. The death of Prince Henry (1183) produced from Bertran de Born two planks, which are among the most sincere and beautiful

works in Provencal literature. The poet was immediately afterwards besieged in his castle of Hautefort by Richard Coeur de Lion, to whom he became reconciled and whom he accom- panied to Palestine. He grew devout in his old age, and died about 1205. As a soldier and a condottiere, as the friend and enemy of kings, and as an active factor in the European politics of his time, Bertran de Born occupies an exceptional position among the troubadours.

There were poetesses in the highly refined society of Provence, and of these by far the most eminent was Beatrix, countess of Die, whose career was inextricably interwoven with that of another eminent and noble troubadour, Rambaut III., count of Orange, who held his court at Courthezon, a few miles south of Orange. Rambaut said that since Adam ate the apple no poet had been born who could compete in skill with himself, but his existing lyrics have neither the tenderness nor the ingenuity of those of his illustrious lady-love. The poems of Beatrix are remarkable for a simplicity of form rare among the poets of her age. One of the earliest troubadours, Cercamon, was at the court of Guilhem IX. of Poitiers, and was the master of perhaps the most original of all the school, namely the illus- trious Marcabrun (c. 1120-1195)1 from whose pen some forty poems survive. He was a foundling, left on the door-step of a rich man in Gascony, and no one knew anything about his descent. Marcabrun was an innovator and a reformer; to him the severity of classical Provencal style is mainly due, and he was one of the first to make use of that complexity and obscurity of form which was known as the trobar clus. He was also original in his attitude to love; he posed as a violent misogynist — ” I never loved and I was never loved ” — and he expressed, in the accents of amorous poetry, an aversion to women. ” Famine, pestilence and war do less evil upon earth than the love of

woman ” is one of his aphorisms. He was in the service of Richard Cceur de Lion, and after 1167 in that of Alfonso II. of Aragon. Marcabrun was the object of much dislike and attack, and it is said that he was murdered by Castellane of Guian, whom he had satirized. This, however, is improbable, and it is rather believed that Marcabrun survived to a great age. For one of his contemporaries he mitigated the severities of his satiric pen; he expresses great affection for ” that sweet poet,” Jaufre Rudel, prince of Blaye, whose heart turned, like the disk of a sunflower, towards the Lady of Tripoli. Little else than that famous adventure is known about the career of this ultra-romantic troubadour, except that he went as a crusader to the Holy Land, and that his surviving poems, which are few in number, have so mystical a tone that Jaufre Rudel has been suspected of being a religious writer who used the amorous language of his age for sanctified purposes, and whose ” Princess Far-away ” was really the Church of Christ. If so, the statement that he died in the arms of the Lady of Tripoli would merely mean that he passed away, perhaps at Antioch, in the odour of sanctity. Peire d’ Alveona (Peter of Auvergne), like Marcabrun, was of mean birth, son of a tradesman in Clermont-Ferrand, but he was handsome and engaging, and being the first troubadour who had appeared in the mountain district, ” he was greatly honoured and feted by the valiant barons and noble ladies of Auvergne.” . . . ” He was very proud and despised the other troubadours.” It is believed that Peire’s poems were produced between n 58 and 1180. He flourished at the court of Sancho III., king of Castile, and afterwards at that of Ermengarde, viscountess of Narbonne.

It is doubtless owing to the vehement and repeated praise which was given by Dante, in the Inferno and elsewhere, to Arnaut Daniel that this name remains the most famous among those of the troubadours. Yet not very much is known of the personal history of this poet. He was a knight of Riberac, in Perigord, and he attached himself as a troubadour to the court of Richard Cceur de Lion. Dante had been made ac- quainted with the highly complicated and obscure verse of Arnaut Daniel by Guido Guinicelli, and thus to the historian of literature a most valuable link is provided between medieval and modern poetry. Dante calls Daniel the ” smith,” the

finished craftsman, of language, and it is evident that it was the brilliant art of the Provencal's elaborated verse which delighted the Italian. In the De vulgari eloquentia Dante returned to the praise of Arnaut Daniel, as the greatest of all those who have sung of love, and Petrarch was not less enthu- siastic. His invention of forms of verse (see Sestina), in par- ticular, dazzled the great Italians. But the seventeen sirventes which have survived scarcely sustain the traditional idea of the supremacy of Arnaut Daniel as a poet, while their lack of historical and personal allusions deprives them of general interest. Dante was curiously anxious to defend Arnaut Daniel as being a better artist than his immediate rival, Giraut de Bornelh, whose " rectitude " Dante admits, in the sense that Giraut was a singer of gnomic verses of a high morality, but prefers the poetry of Daniel; critical posterity, however, has reversed this verdict. Giraut came from the neighbourhood of Limoges, passed over into Spain about 1180, and became famous in the courts of Pedro II. of Aragon and other Spanish monarchs. He disappears about 1230. There is a curious anecdote of his having incurred the hatred or the cupidity of the viscount of Limoges, who robbed him of his library and then burned his house to the ground. Giraut laments, in his poems, the brutality of the age and the lawlessness of princes. A troubadour of the same district of south-western France was Arnaut de Mareuil, to whom is attributed the introduction into Provencal poetry of the amatory epistle. He settled at the courts of Toulouse and Beziers, where he sang, in mystical terms, his passion for the countess Adalasia, in whose affections he had a dangerous rival in the person of Alfonso II., king of Aragon. Arnaut de Mareuil fled for his life to Montpellier, where he found a protector in Count William VIII., but he continued to address his sirventes to. Adalasia. As that princess died in 1199, and as no planh to her memory is found among the works of Arnaut de Mareuil, it is conjectured that by that time he was already dead.

Peire Vidal of Toulouse was the type of the reckless and scatterbrained troubadour. His biographer says that he was " the maddest man in all the world." His early life was a

series of bewildering excursions through France and Spain, but he settled down at last at Marseilles, where he made a mortal enemy of Azalais, the wife of Viscount Barral de Baux, from whom he stole a kiss (1180). Vidal fled to Genoa, but he con- tinued to address the viscountess in his songs. At the entreaty of her husband, Azalais forgave the poet, and Peire Vidal returned to Marseilles. He committed a thousand follies; among others, being in love with a lady called Louve (she-wolf), the poet dressed himself as a wolf, and was hunted by a pack of hounds in front of the lady's castle. Starting on a crusade, he stopped at Cyprus, where a Greek girl was presented to him as being of the imperial family. He married her, assumed the title of emperor, and carried a throne about with him from camp to camp. According to a late poem, his eccentric adven- tures closed in Hungary about the year 1215. Folquet of Mar- seilles was a troubadour of Italian race, the son of a merchant Df Genoa; Dante met Folquet in paradise, and gives an interest- ing notice of him. He was a rival with Peire Vidal for the favours of the beautiful Azalais; and he was one of the trouba- dours who gathered around the unfortunate Eudoxia, empress of Montpellier, until the close of her singular and romantic adventure (1187). He wrote a very touching planh on the death of the viscount Barral de Baux in 1192. Soon after this, disgusted with love, Folquet took holy orders, became the abbot of the rich Cistercian house of Torronet in Provence, and in 1205 became bishop of Toulouse. Here he threw in his lot with Simon de Montfort and disgraced himself by his fanatic rage against the Albigenses, of whom a contemporary says that he slew 500,000 persons, acting " more like Antichrist than like an envoy of Rome." Folquet died in 1231 in the abbey of Grandselve, in his diocese. It is in the sirventis of Folquet that critics have seen the earliest signs of that decadence which was so rapidly to destroy Provencal poetry.

Gaucelm Faidit came from TJzerche, in the Limousin. He

seems to have been a wandering minstrel of gay and reckless habits, and to have been accompanied by a light-o'love, Guil lelma Monja, who was the object of much satire and ridicule. In Gaucelm we probably see, if we can credit his story, the troubadour at his lowest social level. He made, however, Maria of Ventadour, who was probably a scion of the princely and neighbouring house of that name,

the object of his songs, and he addresses her in strains of unusual pathos and delicacy. Gaucelm Faidit ultimately proceeded to Italy, to the court of the marquis Boniface of Montferrat, a prince who greatly encouraged the troubadours and who in 1201 undertook the conduct of a crusade. Gaucelm, who was still celebrating the perfections of Maria of Ventadour, accompanied him to the East. He wrote several canzones in the Holy Land and Syria, returned safely to Uzerche, and disappears about 1240. We possess sixty of his poems. Another troubadour, Raimbaut of Vaquieres, passed the greater part of his life at the same court of Montferrat; he devoted himself to the Lady Beatrix, sister of the marquis. It is believed that he died in the Holy Land in 1207. The most celebrated of the Italian troubadours was Sordello, born at Mantua, at the beginning of the 13th century, who owes his fame rather to the benevolence of later poets, from Dante to Robert Browning, than to the originality of his adventures or the excellence of his verse.

We have now mentioned the troubadours who were most famous in their own time, and on the whole modern criticism has been in unison with contemporary opinion. There are, however, still one or two names to be recorded. The English historian of the troubadours, Dr Hueffer, gave great prominence to the writings of a poet who had previously been chiefly heard of in connexion with a romantic adventure, Guillem de Cabestanh (or Capestang). This was a knight of Roussillon, who made love to Seremonda, countess of Castel-Roussillon. The lady's husband, meeting the poet out hunting, slew him' in a paroxysm of jealousy and, having cut out his heart, had it delicately cooked and served to his wife's dinner. When Seremonda had eaten her lover's heart, her husband told her what she had done, and she fainted away. Coming to her senses she said: " My Lord, you have served to me so excellent a dish that I will never eat of another," and she threw herself out of window and was killed. The importance of this story lies in the fact that the cruelty of the count of Castel-Roussillon was the cause of universal scandal in all good society. Feeling grew so strong that the surrounding nobles rose against the murderer, with Alfonso, king of Spain, at their head, hunted him down and killed him. The bodies of the lady and the troubadour were

buried side by side, with great pomp, in the cathedral of Per- pignan, and became the objects of pilgrimage. Doubt has, of course, been thrown on the veracity of this romantic story, but at all events it testifies to the fact that the troubadour enjoyed, or was expected to enjoy, all the privileges of toleration and exemption. A burlesque or satiric troubadour, who disregarded the laws of gallantry and wrote satires of great virulence against the ladies and thejr lovers, remains anony- mous, and is spoken of as the monk or prior of Montaudon.

The classic period of the troubadours lasted until about 12 10, and was contemporaneous with the magnificence of the nobles of the south of France. The wealth and cultivated tastes of the seigneurs, and the peace which had long surrounded them, led them into voluptuous extravagances and sometimes into a madness of expenditure. From this the troubadours reaped an immediate advantage, but when the inevitable reaction came they were the first to suffer. The great cause, however, of the decadence and ruin of the troubadours was. the struggle between Rome and the heretics. This broke out into actual war in June 1209, when the northern barons, called to a crusade by Pope Innocent III., fell upon the Albigenses and pillaged Beziers and Carcassonne. Most of the protectors of the trouba- dours were, if not heretics, indulgent to the heretical party, and shared in their downfall. The poets, themselves, were not immediately injured, and no doubt their habits and their art kept them immune from the instant religious catastrophe,

but the darkness began to gather round them as the ruin of Languedoc became more and more complete, culminating with the siege of Toulouse in 1218. The greatest name of this period, which was the beginning of the end, is that of Peire Cardenal, of Le Puy. He was protected by Jacme I., king of Aragon, having apparently fled from Narbonne and then from Toulouse in order to escape from the armies of Simon de Montfort. He was the inventor and the principal cultivator of the moral or ethical sirventes; and he was the author of singularly out- spoken satires against the clergy,

continuing the tradition of Marcabrun. The biographer of Cardenal certifies that he lived to be nearly one hundred years of age. Another and a still more violent troubadour of this transitional time was Guillem Figueira, the son of a Toulouse tailor, an open heretic who attacked the papacy with extraordinary vigour, supported and protected by Raimon II. Figueira was answered, strophe by strophe, by a female troubadour, Gormonda of Montpellier. The ruin of the southern courts, most of which belonged to the conquered Albigensi party, continued to depress and to exas- perate the troubadours, whose system was further disintegrated by the establishment of the Inquisition and by the creation of the religious orders. The genial and cultured society of Provence and Languedoc sank rapidly into barbarism again, and there was no welcome anywhere for secular poets.

The last of the French troubadours was Guiraut Riquier (c. 1 230-1 294), who was born at Narbonne, and addressed his earliest poems to Phillippa of Anduza, the viscountess of that city. She does not seem to have encouraged poetry, and Guiraut Riquier left Narbonne, first appealing to St Louis, without success. He then turned to Spain, and found protection at the court of Alfonso X. the Learned. This monarch, himself a great poet, welcomed the crowd of troubadours who were now flying from the troubles of southern France. It was the ambition of Alfonso to be himself a troubadour, but the Pro- vencal pieces which bear his name are now attributed to Riquier and to Nat de Mons; the king's genuine poems are those written in Galician. Riquier remained in the court of Castile until about 1279, when he returned to France and settled in Rodez with the count of that town, Henri II. This prince was almost the last seigneur in the south or centre of France who gathered a school of poets around him, and at Rodez the troubadours enjoyed for a few years their latest gleams of success and recog- nition. Riquier, in a sirventSs of about 1285, gives pathetic expression to his sense of the gathering darkness, which makes it useless and almost unbecoming for a troubadour to practise his art, while of himself he mournfully confesses: " Song should express joy, but sorrow oppresses me, and I have come into the world too late." Guiraut Riquier passed away about 1294, and left no successor behind him.

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TROUBRIDGE, SIR THOMAS, Bart. (c. 1758-1807), English admiral, was educated at St Paul's School, London, and entered the navy in 1773. Having seen some service in the East Indies, he was taken prisoner by the French in 1794, but his captivity was

only a short one and in February 1797 he commanded his ship, the " Culloden," at the battle of Cape St Vincent. In the follow- ing July he assisted Nelson in the unsuccessful attack on Santa Cruz, and in August 1798, when getting into position foi the attack on the French fleet, the " Culloden " ran aground and was consequently unable to take any part in the battle of the Nile. He then served in the Mediterranean and was created a baronet in 1799; from 1801 to 1804 he was a lord of the admiralty, being made a rear-admiral just before his retirement. In 1805 Troubridge was given a command in the East and he went out in the " Blenheim." In January 1807 in this ship, an old and

damaged one, he left Madras for the Cape of Good Hope, but off the coast of Madagascar the " Blenheim " foundered in a cyclone and the admiral perished. His only son, Sir Edward Thomas Troubridge, bart. (d. 1852), entered the navy in 1797 and was present at the battle of Copenhagen. From 1831 to 1847 he was member of parliament for Sandwich and from 1835 to 1841 he was a lord of the admiralty. His son, Sir Thomas St Vincent Hope Cochrane Troubridge, bart. (1815-1867), entered the army in 1834, and was severely wounded at the battle of Inkerman,

TROUGHTON, EDWARD (1753-1835), English . instrument maker, was born in the parish of Corney in Cumberland in October 1753. He joined his elder brother John in carrying on the business of making mathematical instruments in Fleet Street, London, and continued it alone after his brother's death, until in 1826 he took W. Simms as a partner. He died in London on the 12th of June 1835.

Troughton was very successful in improving the mechanical part of most nautical, geodetic and astronomical instruments, but complete colour-blindness prevented him from attempting ex- periments in optics. The first modern transit circle was con- structed by him in 1806 for Stephen Groombridge; but Troughton was dissatisfied with this form of instrument, which a few years afterwards was brought to great perfection by G. von Reichenbach and J. G. Repsold, and designed the mural circle in its place. The first instrument of this kind erected at Greenwich in 1812, and ten or twelve others were subsequently constructed for other observatories; but they were ultimately superseded by Troughton 's earlier design, the transit circle, by which the two co-ordinates of an object can be determined simultaneously. He also made transit instruments, equatorials, &c; but his failure to construct an equatorial mounting of large dimensions, and the consequent lawsuit with Sir James South, embittered the last years of his life.

TROUSERS, the name given to the article of dress worn by men, covering each leg separately and reaching from the waist to the foot. The word in its earlier forms is always found without the second r, e.g. trouses, Irouzes, trooze, cf. the Lowland Scots word " trews," and is an adaptation of the French trousses, trunk-hose, breeches, the plural of trousse, a bundle, pack, truss, from trousser, to pack,

bundle up, tuck, tie up, girth, of which the origin is doubtful. In English the word ” trousers,” when it first appears, was used of the leg-gaiments of the Irish, who wore their breeches or trunk-hose and stockings in one piece, a custom to which there are many allusions in 17th-century literature. Knee-breeches and top-boots for out-of-door wear or stockings for indoor use lasted till the beginning of the 19th century as the regular costume for men. Pantaloons, loose trousers reaching to above the ankle, were worn in Venice by the poorer classes in the 17th century (for the origin of the name see Pantaloon). The characters of the Italian comedy made the style of garment familiar in France, but it was only seen in the fantastic costumes of the ballet. During the reign of Louis XVI. loose pantaloons became fashion- able for the morning deshabille of men. Their adoption by the supporters of the Revolution was the origin of the name of sans-culottes applied to the revolutionaries. Beau Brummel, in England, was probably the first to make the ” pantaloon ” popular. A striking feature of his dress were the tight-fitting black trousers reaching to the ankle, where they were buttoned. From this developed the true trousers, cut over the boot at the instep, at first open at the bottom and fastened by loops, later strapped tight under the boot. It is said that the duke of Wellington introduced this latter form after the Peninsular War. They were not recognized as correct for evening wear,

and strong opposition was taken against them by the clergy and at the universities (see Costume).

TROUT (Salmo trutta), a fish closely related to the salmon. Most modern ichthyologists agree in regarding the various North European forms of trout, whether migratory or not, as varieties or races of a highly variable and plastic species, to be distinguished from the salmon by a few more or less constant characters, the most readily ascertainable of which resides in the smaller scales on the back of the caudal region of the body, these being 14 to 16 (rarely 13) in an oblique series between the posterior border of the adipose fin and the lateral line, and in the greater length of

the folded anal fin as compared to the depth of the caudal peduncle. The gill-rakers are also usually fewer, 16 to 18 on the anterior branchial arch. The young may be distinguished from salmon-parr by the greater length of the upper jaw, the maxillary bone extending beyond the vertical of the centre of the eye, and in specimens 6 in. long often to below the posterior of the eye. The young are brown or olive above, silvery or golden below, with more or less numerous black and red spots in addition to the parr marks, and, contrary to what is observed in the salmon, black spots are usually present below the lateral line. Except for the gradual disappearance of the parr marks, this coloration is retained in the form known as the brook trout or brown trout (S. fario), which is non-migratory, and varies much in size according to the waters it inhabits, in some brooks not growing to more than 8 in., whilst in larger rivers and lakes it may attain a weight of 20 lb or more. The coloration of the young is more strongly departed from in the races known as sea trout (S. trutta) and sewin (S. eriox or cambricus), anadromous forms resembling the salmon in habits, and assuming in the sea a silvery coat, with, however, as a rule, more black spots on the sides below the lateral line.

The principal British races of trout are the following: the northern sea trout (S. trutta, sensu stricto), silvery, losing the teeth on the shaft of the vomer in the adult, and migratory like the salmon; the southern sea trout (S. eriox or cambricus), similar to the preceding, but with the hind margin of the gill- cover more or less produced, the lower bone (suboperculum) projecting beyond the end of the upper (operculum) ; the brown trout {S. fario), non-migratory, usually retaining the teeth on the shaft of the vomer, brown or olive with black and red spots, rarely more silvery, with numerous black spots; the Lochleven trout (S. levenensis) , distinguished from the preceding by a more silvery coloration, frequent, absence of red spots and a pink or red flesh; the estuary trout (5. gillivensis and S. orcadensis), large brown trout living in salt water without assuming the silvery coloration; the Gillaroo trout (5. stomachicus) , in which the membranes of the stomach are conspicuously thicker than in the other trout, more so in adult examples than in young ones. But all these forms are ill-defined and subject to such variations when transported

from one locality to another as to render their recognition a matter of insuperable difficulty. The instability of the characters on which S. levenensis is based has been conclusively shown by the experiments conducted by Sir James Maitland at Howietoun. Large specimens of migratory trout are often designated as bull-trout, but no definition has ever been given by which this form could be established, even as a race.

Other European varieties are the trout of the Lake of Geneva (5. lemanus), of the Lake of Garda (S. carpio), of Dalmatia (S. dentex), of Hungary (5. microlepis) , of the Caspian Sea (S. caspius), &c. The size of trout varies much according to the waters in which they live, the anadromous forms nearly equalling the salmon in this respect, specimens of over 4 ft. and weighing up to 50 lb being on record.

The habitat of 5. trutta extends over the whole of Europe, the Atlas of Morocco and Algeria, Transcaucasia, Asia Minor and northern Persia. By the agency of man the species has been thoroughly established in Tasmania and New Zealand, where it thrives in an extraordinary manner, and attains a very large size.

Closely allied species are found in North America, west of the Rocky Mountains, the best known being the rainbow trout (S. irideus or shasta), which has been introduced into many parts of Europe as well as the eastern states of North America, New Zealand and South Africa. It is more hardy than the English trout, and accommodates itself in almost stagnant waters, and has thus proved a success in many ponds which were regarded as fit for coarse fish only; but in many places it has caused disappointment by going down to the sea, whence it is not known ever to return. It is a handsome trout, bluish or purplish above, silvery or golden below, more or less profusely spotted with black on the body and fins, and with an orange or red lateral band. Its range extends from Alaska to North Mexico. The rainbow trout merges into a larger form, S. gairdneri, which resembles the British sea trout.

A remarkable European trout is the short-snouted trout, S. obtusirostris, a non-migratory species from Dalmatia, Herzegovina, Bosnia and Montenegro. It has a small mouth

with a feeble dentition, resembling that of the grayling. A closely allied form, S. ohridanus, has recently been discovered in Macedonia. (G. A. B.)

TR0UV13RE, the name given to the medieval poets of northern and central France, who wrote in the langue d'oil or langue d'oui. The word is derived from the French verb trouver, to find or invent. The trouveres flourished abundantly in the 12th and 13th centuries. They were court-poets who devoted themselves almost exclusively to the composition and recitation of a particular kind of song, for which the highest society ci that day in France had an inordinate fondness. This poetry, the usual subject of which was some refinement of the passion of love, was dialectical rather than emotional. As Jeanroy has said, the best trouveres were those who " into the smallest number of lines could put the largest number of ideas, or at least of those commonplaces which envelop thought in its most impersonal and coldest form." The trouveres were not, as used to be supposed, lovers singing to their sweethearts, but they were the pedants and attorneys of a fantastic tribunal of sentiment. This was more monotonous in the hands of the trouveres than it had been in those of the troubadours, for the latter often employed their art for purposes of satire, religion, humour and politics, which were scarcely known to the poets of the northern language.

The established idea that the poetry of the trouveres was entirely founded upon imitation of that of the troubadours, has been ably combated by Paul Meyer, who comes to the con- clusion that the poetry of the north of France was essentially no less original than that of the south. The passage of Raoul Glaber, in which he says that about the year 1006 southern men began to appear in France and in Burgundy, " as odd in their ways as in their dress, and having the appearance of jongleurs," is usually quoted, but although this is valuable contemporary evidence, it proves neither what these " jon- gleurs " brought from the south nor what the poets of the north could borrow from them. The first appearance of trouveres seems to be much later than this, and to date from 1137, when Eleonore of Aquitaine, who was herself the granddaughter of an illustrious troubadour, arrived in the court, of France as the queen of Louis VII. It is recorded that she continued to speak her native language, which would be the Poitiers

dialect of the langue d'oc. She was queen for fifteen years (1137-1152), and this, no doubt, was the period during which the southern influence was strongest in the literature of northern France. There is not any question that the success: /e crusades tended to produce relations between the two sections of poetical literature. The great mass of the existing writings of the trouveres deals elaborately and artificially with the passion of love, as it had already been analysed in the langue d'oc. But those who are most inclined to favour the northern poets are obliged to confess that the latter rarely approach the grace and delicacy of the troubadours, while their verse shows less ingenuity and less variety. The earliest trouveres, like Cuene de Bethune and Huges de Berze, in writing their amatory lyrics, were

certainly influenced by what troubadours had written, espe- cially when, like Bertrand de Born, these troubadours were men who wandered far and wide, under the glory of a great social prestige. We should know more exactly what the nature of the Provencal influence was if the songs of all the trouveres who flourished before the middle of the 12th century had not practically disappeared. When we become conscious of the existence of the trouveres, we findCuenede Bethune in possession of the field, a poet of too much originality to be swept away as a mere imitator. At the same time, even Paul Meyer, who has been the great asserter of the independence of the poetry of northern France, is obliged to admit that if, at the end of the 1 2th century and throughout the 13th, several literary centres were formed where an amatory poetry, full of conventional grace, was held in high honour, it was because several princely courts in the south had set the example. In this sense it cannot be denied that the whole art of the trouveres was secondary and subsidiary to the art of the troubadours.

The poetical forms adopted by the trouveres bore curious and obscure names, the signification of which is still in some cases dubious. As a rule each poem belonged to one of three classes, and was either a rotruenge, or a serveniois, or

an eslrabot. The rotruenge was a song with a refrain; the serventois was, in spite of its name, quite unlike the sirventes of the troubadours and had a more ribald character; the estrabot was allied to the strambotto of the Italians, and was a strophaic form ” composed of a front part which was symmetrical, and of a tail which could be varied at will ” (Gaston Paris). But scholars are still uncertain as to the positive meaning of these expressions, and as to the theory of the verse-forms themselves.

The court poetry of the trouveres particularly flourished under the protection of three royal ladies. Marie, the regent of Champagne, was the practical ruler of that country from 1181 to 1 197, and she encouraged the minstrels in the highest degree. She invited Ricaut de Barbezieux to her court, rewarded the earliest songs of Gace Brule, and discussed the art of verse with Chretien of Troyes. Her sister, Aelis or Alice, welcomed the trouveres to Blois; she was the protector of Gautier d’Arras and of Le Chatelain de Couci. A sister of the husbands of these ladies, another Aelis, who became the second queen of Louis VII. in 1 160, received Cuene de Bethune in Paris, and reproved him for the Picard accent with which he recited his poetry. At the end of the 12th century we see that the refinement and elegance of the court-poets was recognized in the north of France by those who were responsible for the education of princes. A trouvere, Gui de Ponthieu, was appointed tutor to William III. of Macon, and another, Philippe of Flanders, to Philippe Auguste. The vogue of the trouveres began during the third crusade; it rose to its greatest height during the fourth crusade and the attack upon the Albigenses. The first forty years of the 13 th century was the period during which the courtly lyrical poetry was cultivated with most assiduity. At first it was a purely aristocratic pastime, and among the prin- cipal trouveres were princes such as Thibaut IV. of Navarre, Louis of Blois and John, king of Jerusalem. About 1230 the taste for court poetry spread to the wealthy bourgeoisie, espe- cially in Picardy, Artois and Flanders. Before its final decline, and after the courts of Paris and Blois had ceased to be its patrons, the poetry of the trouveres found its centre and enjoyed its latest successes at Arras. It was here that some of the most original and the most skilful of. all the trouveres, such as Jacques Bretel and Adam de la Halle,

exercised their art. Another and perhaps still later school flourished at Reims.

About 1280, having existed for a century and a half, the poetical system suddenly decayed and disappeared ; the very names of the court-poets were forgotten. During this time the song, chanson, had been treated as the most dignified and honourable form of literature, as Dante explains in his De vulgari eloquentia. But the song, as the trouvSres under- stood it, was not an unstudied or emotional burst of verbal melody; it was, on the contrary, an effort of the intelligence, a piece of wilful and elaborate casuistry. The poet was

invariably a lover, devoted to a married lady who was not his wife, and to whose caprices he was bound to submit blindly and patiently, in an endless and resigned humility. The progress of this conventional courtship was laid down according to certain strict rules of ceremonial; love became a science and a religion, and was practised by the laws of precise etiquette.

The curious interest of the trouveres, for us, lies in the fact that during an age when the northern world was ignorant and brutal, sunken in a rude sensuality, the trouvSres advanced a theory of morals which had its absurd and immoral side, but which demanded a devotion to refinement and a close attention to what is reserved, delicate and subtle in personal conduct. They were, moreover, when the worst has been admitted about their frigidity and triviality, refiners of the race, and they did much to lay the foundation of French wit and French intelli- gence. The trouveres have not enjoyed the advantage of the troubadours, whose feats and adventures attracted the notice of contemporary biographers. Little is known about their lives, and they pass across the field of literary history like a troop of phantoms. Close students of this body of somewhat monotonous poetry have fancied that they detected a personal note in some of the leaders of the movement. It is certainly obvious that Cuene (or Conon) de B6thune had a violence of expression which gives life to his chansons. The delicate grace of Thibaut of Champagne, the apparent sincerity of Le Chatelain de Couci, the descriptive charm of Moniot of Arras, the irony of Richard of Fournival, have been celebrated by critics who have

perhaps discovered differences where none exist. It is more certain that Adam de la Halle, the hunchback of Arras, had a superb gift of versification. The rondel (published in E. de Coussemaker's edition, 1872) beginning " A Dieu courant amouretes, Car je m'en vois Souspirant en terre estrange ! "

marks perhaps the highest point to which the delicate, frosty art of the trouveres attained. Music took a prominent place in all the performances of the trouveres, but in spite of the erudition of de Coussemaker, who devoted himself to the sub- ject, comparatively little is known of the melodies which they used. But enough has been discovered to justify the general statement of Tiersot that " we may conclude that the musical movement of the age of the trouveres was derived directly from the most ancient form of popular French melody." A pre- cious MS. in the Faculty of Medicine of Montpellier contains the music of no fewer than 345 part-songs attributed to trouveres, and an examination of these enables a " pitiless arranger " to divine the air, the primitive, simple and popular melody.

The principal authorities on the poetry and music of the trou- veres are : H.'Binet, Le Style de la lyrique courtoise en France aux xii me et xiii me siedles (Paris, 1891); Gaston Paris, Les Origines de la poisie lyrique en France au moyen Age (Paris, 1892) ; A. Jeanroy, Les Ori- gines de la poesie lyrique en France au moyen Age (Paris, 1889); Julian Tiersot, Histoire de la chanson populaire en France; E. de Coussemaker, Art harmonique aux xii me et xiii m ' siicles (Paris, 1865). The works of the principal trouveres have been edited : those of Le Chatelain de Coucy by F. Michel (1830); of Adam de la Halle by E. de Coussemaker (1872) ; of Conon de Bethune by Wallenskold (Helsingfors, 1891); of Thibaut IV., king of Navarre, by P. Tarbe' (1851). (E. G.)

TROUVILLE, a seaside town of north-western France, in the department of Calvados, on the English Channel, 34 m. N.E. of Caen by rail. Pop. (1906), 5684. Trouville is situated on the slopes of well-wooded hills at the mouth of the Touques on its right bank opposite Deauville. Its fine stretches of sand and excellent bathing, a spacious casino and beautiful villas, are among the attractions which make it the most frequented French resort on the channel. Deauville is well known for its race- course and villas, exceeding those of Trouville in luxury, but except during the race fortnight in

August (la grande quinzaine) it is quiet and comparatively deserted. The port shared with Deauville and formed by the Touques is entered by a channel between jetties with a depth at high tide of 185 ft. This leads on the one side to a tidal harbour, on the other to an outer and an inner basin. Timber, coals and cement are imported. The

London & South Western Railway Company have a daily steamboat service from Havre to Trouville in connexion with their Southampton and Havre boats. Besides trawling and the provisioning of ships, in which Deauville is also engaged, Trouville carries on boat-building and has rope and briquette works.

TROVER (0. Fr. trover, to find, mod. trouver), or ” trover and conversion,” the name of a form of action in English law no longer in use, corresponding to the modern action of conversion. It was brought for damages for the detention of a chattel, and differed from detinue in that the latter was brought for the return of the chattel itself. The name trover is due to the action having been based on the fictitious averment in the plaintiff’s declaration that he had lost the goods and that the defendant had found them. The necessity for this fictitious averment was taken away by the Common Law Procedure Act 1852. An action of trover lay (as an action of conversion still lies) in every case where the defendant was in possession of a chattel of the plaintiff and refused to deliver it up on request, such re- fusal being prima facie evidence of conversion. The damages recoverable are usually the value of the chattel converted. In an action for detention of a chattel (the representative of the old action of detinue), the plaintiff may have judgment and exe- cution by writ of delivery for the chattel itself or for its value at his option. An action for conversion or detention must be brought within six years. The corresponding action in Scots law is the action of spuilzie. It must be brought within three years in order to entitle the pursuer to violent profits, otherwise it prescribes in forty years.

TROWBRIDGE, a market town in the Westbury parliamen-

tary division of Wiltshire, England, 975 m. W. by S. of London by the Great Western railway. Pop. of urban district (1001), 11,526. It is unevenly built on a slope at the foot of which flows the Biss or Mere, a tributary of the Avon. The parish church of St James is a fine Perpendicular building, with a lofty spire, and a beautiful open-work roof over the nave. It was rebuilt on the original plan in 1848. George Crabbe, the poet, was rector from 1813 to 1831.

Trowbridge (Trubrig, Trobrigg, Trowbrigge) was probably mentioned in Domesday under the name of Straburg, a manor held by one Brictric together with Staverton and Trowle, now both included within its limits. The first reference to the " town " of Trowbridge occurs early in the 16 th century; previous to that date mention is made of the manor and castle only. The latter, round which the town probably grew up, is said to have been built by the de Bohuns, who obtained possession of the manor by marriage with the daughter of Edward de Sarisbury. Later it passed to William de Longespee, son of Henry II., to the Lancasters, to the protector Somerset (by grant of Henry VIII.) and then to the Rutlands, and Trow- bridge is now a non-corporate town. In 1200 John granted a weekly market on Tuesday, Thursday and Saturday; also a yearly fair on the 24th, 25th and 26th of July, on which days it continued to be held until at the end of the 18th century it was changed to the 5th, 6th and 7th of August. The manufacture of woollen cloths has long been the staple trade of Trowbridge. It was introduced before the 16th century, for Leland, writing in the reign of Henry VIII., says: " The town flourisheth by drapery." In 1731 the trade was of some note, and by 1813 had attained such proportions that the whole area of the castle site was sold for the erection of dyeworks, cloth manufactories and other industrial buildings.

TROWEL (Med. Eng. truel, O. Fr. truelle, Low Lat. truella, a variant of trulla y diminutive of trua, stirring spoon, ladle, Gr. ropvvrj, from the root tar, to turn round and round; cf. ropevs, borer), a tool or implement, varying in shape according to the use to which it is put, but consisting of a blade of iron or steel fitted with a handle. The bricklayers' or plasterers' trowel, used for mixing, spreading and smoothing the mortar or plaster, has a flat, triangular, oval or rectangular blade; the gardeners' trowel, for digging

plants, laying or mixing mould, &c, has a semi-cylindrical blade. Highly ornamental trowels

made of, or decorated with, the precious metals are presented to royal,, official or other personages who formally lay the foundation stones of buildings.

TROY, JEAN FRANCOIS DE (1679-1752), French painter, was born at Paris in 1679. He received his first lessons from his father, himself a skilful portrait painter, who afterwards sent his son to Italy. There his amusements occupied him fully as much as his studies; but his ability was such that on his return he was at once made an official of the Academy, and obtained a large number of orders for the decoration of public and private buildings, executing at the same time a quantity of easel pictures of very unequal merit. Amongst the most considerable of his works are thirty-six compositions painted for the hotel of De Live (1729), and a series of the story of Esther, designed for the Gobelins whilst De Troy was director of the school of France at Rome (1738-1751) — a post which he resigned in a fit of irritation at court neglect. He did not expect to be taken at his word, and was about to return to France when he died on the 24th of January 1752. The life-size painting (Louvre) of the "First Chapter of the Order of the Holy Ghost held by Henry IV.," in the church of the Grands Augustins, is one of his most complete performances, and his dramatic composition, the " Plague at Marseilles," is widely known through the excellent engraving of Thomassin. The Cochins, father and son, Fessard, Galimard, Bauvarlet, Herisset, and the painters Boucher and Parrocel, have engraved and etched the works of De Troy.

TROY and TROAD. I. The Troad.— The Troad (17 Tpcˆas), or the land of Troy, the north-western promontory of Asia Minor. The name " Troad " is never used by Homer— who calls the land, like the city, Tpofoj — but is already known to Herodotus. The Troad is bounded on the N. by the Hellespont and the westernmost part of the Propontis, on the W. by the Aegean Sea and on the S. by the Gulf of Adramyttium. The eastern limit was variously defined by ancient writers. In the widest acceptation, the Troad was identified with the whole of western and south-western Mysia, from the Aesepus, which flows into the Propontis, a little west of Cyzicus, to the Caicus, which flows into the

Aegean south of Atarneus. But the true eastern boundary is undoubtedly the range of Ida, which, starting from near the south-east angle of the Adramyttian Gulf, sends its north-western spurs nearly to the coast of the Propontis, in the region west of the Aesepus and east of the Granicus. Taking Ida for the eastern limit, we have the definition which, as Strabo says, best corre- sponds with the actual usage of the name Troad. Ida is the key to the physical geography of the whole region; and it is the peculiar character which this mountain-system imparts to the land west of it that constitutes the real distinctness of the Troad from the rest of Mysia. Nature has here provided Asia Minor with an outwork against invaders from the north-west; and as the Troad was the scene of the struggle between Agamem- non" and Priam, so it was in the Troad that Alexander won the battle which opened a path for his further advance.

Natural Divisions. — The length of the Troad from north to south — taking a straight line from the north-west point, Cape Sigeum (Yeni Shehr), to the south-west point, Cape Lectum (Baba Kale) — is roughly 40 m. The breadth, from the middle point of the west coast to the main range of Ida, is not much greater. The whole central portion of this area is drained by the Menderes (anc. Scamander), which rises in Ida and is by far the most important river of the Troad. The basin of the Menderes is divided by hills into two distinct parts, a southern and a northern plain. The southern ˆ—anciently called the Samonian plain — is the great central plain of the Troad, and takes its modern name from Bairamich, the chief Turkish town, which is situated in the eastern part of it near Ida. From the north end of the plain the Menderes winds in large curves through deep gorges in metamorphic rocks, and issues into the northern plain, stretching to the Hellespont. This is the plain of Troy, which is 7 or 8 m. long, and 2 or 3 m. broad on the average. The hills on the south are quite low, and towards the east the acclivities are in places so gentle as to leave the limits of the plain indefinite. Next to the basin of the Menderes, with its two plains, the best marked feature in the river-system of the Troad is the valley of the Tuzla (anc. Satniois). The Tuzla rises in the western part of Mt Ida, south of the plain of Bairamich, from which its valley is divided by hills; and, after flowing for many miles almost parallel with the south coast of the Troad, from which, at

Assus, it is less than a mile distant, it enters the Aegean about 10 m. north of Cape Lectum. Three alluvial plains are comprised in its course. The easternmost of these, into which the river issues from rugged mountains of considerable height, is long and narrow. The next is the broad plain round Assus, which was a fertile source of supply to that city. The third is the plain at the embouchure of the river on the west coast. This was anciently called the Halesian ("AXˆaiov) plain, partly from the maritime salt-works at Tragasae, near the town of Hamaxitus, partly also from the hot salt-springs which exist at some distance from the sea, on the north side of the river, where large formations of rock-salt are also found. Maritime salt-works are still in operation at the mouth of the river, and its modern name (Tuzla = salt) preserves the ancient association. A striking feature of the southern Troad is the high and narrow plateau which runs parallel with the Adra- myttian Gulf from east to west, forming a southern barrier to the valley of the Tuzla. This plateau seems to have been formed by a volcanic upheaval which came late in the Tertiary period, and covered the iimestone of the south coast with two successive flows of trachyte. The lofty crag of Assus is like a tower standing detached from this line of mountain-wall. The western coast is of a different character. North of the Tuzla extends an undulating plain, narrow at first, but gradually widening. Much of it is covered with the valonia oak (Quercus aegilops), one of the most valuable products of the Troad. Towards the middle of the west coast the adjacent ground becomes higher, with steep acclivities, which sometimes rise into peaks; and north of these, again, the seaboard subsides towards Cape Sigeum into rounded hills, mostly low.

Natural Products. — The timber of the Troad is supplied chiefly by the pine forests on Mt Ida. But nearly all the plains and hills are more or less well wooded. Besides the valonia oak, the elm, willow, cypress and tamarisk shrub abound. Lotus, galingale and reeds are still plentiful, as in Homeric days, about the streams in the Trojan plain. The vine, too, is cultivated, the Turks making from it a kind of

syrup and a preserve. In summer and autumn water-melons are among the abundant fruits. Cotton, wheat and Indian corn are also grown. The Troad is, indeed, a country highly favoured by nature — with its fertile plains and valleys, abundantly and continually irrigated from Ida, its numerous streams, its fine west seaboard, and the beauty of its scenery. Under Turkish rule, the natural advantages of the land suffice to mitigate the poverty of the sparse population, but have scarcely any positive result.

Early History. — In the Homeric legend, with which the story of the Troad begins, the people called Troes are ruled by a king Priam, whose realm includes all that is bounded by " Lesbos, Phrygia, and the Hellespont " (7/. xxiv. 544); i.e. the whole " Troad," with some extension of it, beyond Ida, on the north- west. According to Homer, the Achaeans under Agamemnon utterly and finally destroyed Troy, the capital of Priam, and overthrew his dynasty. But there is an Homeric prophecy that the rule over the Troes shall be continued by Aeneas and his descendants. From the " Homeric " hymn to Aphrodite, as well as from a passage in the 20th book of the Iliad (75-353) — a passage probably later than the bulk of the book — it is certain that in the 7th or 6th century B.C. a dynasty claiming descent from Aeneas reigned in the Troad, though the extent of their sway is unknown. The Homeric tale of Troy is a poetic creation, for which the poet is the sole witness. The geographical com- pactness of the Troad is itself an argument for the truth of the Homeric statement that it was once united under a strong king. How that kingdom was finally broken up is unknown. Thracian hordes, including the Treres, swept into Asia Minor from the north-west about the beginning of the 7th century B.C., and it is probable that, like the Gauls and Goths of later days, these fierce invaders made havoc in the Troad. The Ionian poet Callinus has recorded the terror which they caused farther south.

Greek Settlements. — A new period in the history of the Troad begins with the foundation of the Greek settlements. The earliest and most important of these were Aeolic. Lesbos and Cyme in Aeolis seem to have been the chief points from which the x\eolic colonists worked their way into the Troad. Command- ing positions on the coast, such as Assus and Sigeum, would naturally be those first

occupied; and some of them have been in the hands of Aeolians as early as the 10th century B.C. It appears from Herodotus (v. 95) that about 620 B.C. Athenians occupied Sigeum, and were resisted by the Aeolic colonists from Mytilene in Lesbos, who had already established themselves in that neighbourhood. Struggles of this kind may help to account

for the fact noticed by Strabo, that the earlier colonies had often migrated from one site in the Troad to another. Such changes of seat have been, he observes, frequent causes of confusion in the topography.

The chief Greek towns in the Troad were Ilium in the north, Assus in the south and Alexandria Troas in the west. The site of the Greek Ilium is marked by the low mound of Hissarlik (" place of fortresses ") in the Trojan plain, about 3 m. from the Hellespont. Exactly at what date it was founded on the top of earlier remains is uncertain (perhaps the 7th century); but it was not a place of any importance till the Hellenistic age. When Xerxes visited the Trojan plain, he " went up to the Pergamon of Priam," and afterwards sacrificed to the Ilian Athena (Herod, vii. 42). Ilion is mentioned among the towns of the Troad which yielded to Dercyllidas (399 B.C.), and as captured by Charidemus (359 B.C.). It possessed walls, but was a petty place, of little strength. In 334 B.C. Alexander, on landing in the Troad, visited Ilium. In their temple of Athena the Ilians showed him arms which had served in the Trojan War, including the shield of Achilles. Either then, or after the battle of Granicus, Alexander directed that the town should be enlarged, and should have the rank of " city," with political independence, and exemption from tribute. The battle of Ipsus (301 B.C.) added north-western Asia Minor to the dominions of Lysimachus, who executed the intentions of Alexander. He gave Ilium a wall 5 m. in circumference, incorporating with it some decayed towns of the neighbourhood, and built a handsome temple of Athena. In the 3rd century B.C. Ilium was the head of a federal league (kolvSv) of free Greek towns, which probably included the district from Lampsacus on the Hellespont to Gargara on the Adramyttian Gulf. Twice in that century Ilium was visited by Gauls. On the first occasion (278 B.C.) the Gauls, under Lutarius, sought to establish a stronghold at Ilium, but speedily abandoned it as being too weak.

Forty years later (218 B.C.) Gauls were brought over by Attalus I. to help him in his war against Achaeus. After deserting his standard they proceeded to pillage the towns on the Hellespont, and finally besieged Ilium, from which, how- ever, they were driven off by the troops of Alexandria Troas. At the beginning of the 2nd century B.C. Ilium was in a state of decay. As Demetrius of Scepsis tells us, the houses " had not even roofs of tiles," but merely of thatch. Such a loss of pros- perity is sufficiently explained by the incursions of the Gauls and the insecure state of the Troad during the latter part of the 3rd century. The temple of the Ilian Athena, however, retained its prestige. In 192 B.C. Antiochus the Great visited it before sailing to the aid of the Aetolians. In 190 B.C., shortly before the battle of Magnesia, the Romans came into the Troad. At the moment when a Roman army was entering Asia, it was politic to recall the legend of Roman descent from Aeneas. Lucius Scipio and the Ilians were alike eager to do so. He offered sacrifice to the Ilian Athena; and after the peace with Antiochus (189 B.C.) the Romans annexed Rhoeteum and Gergis to Ilium, " not so much in reward of recent services, as in memory of the source from which their nation sprang." The later history of Ilium is little more than that of Roman benefits. A disaster befell the place in 85 B.C., when Fimbria took it, and left it in ruins; but Sulla presently caused it to be rebuilt. Augustus, while confirming its ancient privileges, gave it new territory. Caracalla (a.d. 21 1-2 17) visited Ilium, and, like Alexander, paid honours to the tomb of Achilles. In the 4th century, as some rhetorical " Letters " of that age show, the Ilians did a profitable trade in attracting tourists by their pseudo-Trojan memorials. After the 4th century the place is lost to view. But we find from Constantine Porphyrogenitus (911-959) that in his day it was one of the places in the Troad which gave names to bishoprics.

Other Ancient Sites. — Many classical sites in the Troad have been identified with more or less certainty. (For Alexandria Troas and Assus, see separate articles. Neandria seems to be rightly fixed by F. Calvert at Mount Chigri, a hill not far from Alexandria Troas, remarkable for the fine view of the whole Troad which it commands. Cebrene has been conjecturally placed in the eastern part of the plain of Bairamich. Palaeoscepsis was farther east

on the slopes of Ida, while the new Scepsis was near the site of Bairamich itself. At the village of Kulakli, a little south of the mouth of the Tuzla, some Corinthian columns and other fragments mark the temple of Apollo Smintheus (excavated in 1866 by Pullan) and (approximately) the site of the Homeric Chryse. Colonae was also on the west coast, opposite Tenedos. Scamandria occupied the site of Eneh, in the middle of the plain of Bairamich, and Cenchreae was probably some distance north of it. The shrine of Palamedes, mentioned by ancient writers as existing at a town called Poly medium, has been discovered by J. T. Clarke on a site hitherto unvisited by any modern traveller, between Assus and Cape Lectum. It proves to have been a sacred enclosure (temenos) on the acropolis of the town; the statue of Palamedes stood on a rock at the middle of its southern edge. Another interesting discovery has been made by Clarke, viz. the existence of very ancient town walls on Gargarus, the highest peak of Ida.

(R. C. J.; D. G. H.)

II. The Site of Troy. — Troy is represented now by the important ruins on and about the mound of Hissarlik which underlie those already referred to as surviving from the Hellenistic Ilion. Hissarlik is situated about 35 m. both from the Dardanelles and from Yeni Keui, which lies on the Aegean coast north of Besika Bay. The famous academic dispute concerning the pre- cise site, which began about a.d. 160 with Demetrius of Scepsis, may now be regarded as settled. After the full demonstration, made in 1893, that remains of a fortress exist on the mound of Hissarlik, contemporary with the great period of Mycenae, and larger than the earlier acropolis town first identified by Schliemann with Ilion, no reasonable person has continued to doubt that this last site is the local habitation of the Homeric story. The rival ruins on the Bali Dagh have been shown to be those of a small hill fort which, with another on an opposite crag, commanded the upper Menderes gorge. It is inconceivable that this fort should have been chosen by poets, generally familiar with the locality, as the scene of the great siege, while in the plain between it and

the sea there had lain from time immemorial, and lay still in the Mycenaean age, a much more important settlement with massive fortified citadel.

No site in the Troad can be brought into complete accordance with all the topographical data to be ingeniously derived from the text of Homer. The hot and cold springs that lay just without the gate of " Troy " (II. xxii. 147) are no more to be identified with Bunarbashi, which wells out more than a mile from the Bali Dagh ruins, than with the choked conduits, opened by Schliemann in 1882, to the south of Hissarlik. But the broader facts of geography are recognizable in the modern plain of the Menderes. The old bed of that river is the Scamander, and its little tributary, the Dumbrek Su, is the Simois. In their fork lies Hissarlik or Troy. In sight of it are, on the one side, the peak of Samothrace (xiii. 11-14); on the other, the mass of the Kaz Dagh Ida (viii. 52). Hissarlik lies in the plain (xx. 216) less than 4 m. both from the Hellespontine and the Aegean coasts, easily reached day by day by foes from the shore, and possible to be left and regained in a single night by a Trojan visiting the camp of the Greeks (vii. 381-421).

In summarizing what has been found to exist on the mound of Hissarlik in the excavations undertaken there since 1870, it is not advisable to observe the order of the finding, since Schliemann's want of experience and method caused much confusion and error in the earlier revelations. No certainty as to the distinction of strata or their relative ages was possible till Wilhelm Dorpfeld obtained entire control in 1891, after the original explorer's death. There are in all nine strata of ancient settlement.

1. On the virgin soil of the hillock, forming the core of the mound, scanty remains appear of a small village of the late Aegean neolithic period, at the dawn of the Bronze Age, contemporary with the upper part of the Cnossian neolithic bed. This includes what were originally supposed by Schliemann to be two successive primitive settlements. Thin walls of rough stones, bonded with mud, are preserved mainly in the west centre of the mound. No ground plan of a house is recoverable, and there is no sign of an outer fortress wall. In this stratum were found implements in obsidian and other stones, clay whorls, a little worked ivory, and much dark monochrome pottery,

either of a rough grey surface or (in the finer examples) treated with resin, highly hand-polished, and showing simple geometric decoration, which was incised and often filled in with a white substance.

2. Superposed on these remains, where they still exist, but comprehending a much larger area, lies a better constructed and preserved settlement. This has been twice rebuilt. It was enclosed

by a massive fortress wall of rudely squared Cyclopean character, showing different restorations, and now destroyed, except on the south side of the mound. Double gates at the south-east and south-west are well-preserved. The most complete and most im- portant structures within the citadel lie towards the north. These are two rectangular blocks lying north-west to south-east, side by side, of which the southern and larger shows a megaron and vesti- bule of the type familiar in " Mycenaean " palaces, while the smaller seems a pendant to the larger, like the " women's quarters " at Tiryns and Phylakopi (see Aegean Civilization). Other blocks, whose plans are difficult to bring into inter-relation in their present state of ruin, are scattered over the area, but mainly in the south-west. This is the fortress proclaimed by Schliemann in 1873 to be the Pergamos of Troy. But we know that, while his identifi- cations of Homeric topographical details in these ruins were fanciful, a much larger fortress succeeded to this long before the period treated of in the Iliad. The settlement in the second stratum belongs, in fact, to a primitive stage of that local civilization which preceded the Mycenaean; and it is this latter which is recalled by the Homeric poems. The pottery of the second stratum at Hissarlik shows the first introduction of paint, and of the slip and somewhat fantastic forms parallel to those of the pre-Mycenaean style in the Cyclades. The beaked vases, known as schnabelkannen, are characteristic, and rude reproductions of human features are common in this ware, which seems all to be of native fabrication. Bronze had come into use for implements, weapons and utensils; and gold and silver make up a hoarded treasure found in the calcined ruins of the fortification wall near one of the gates. But the forms are primitive and singular, and the workmanship is very rude, the pendants of the great diadems being cut out of very thin plate gold. Disks, bracelets and pendants,

showing advanced spiraliform ornament, found mainly in 1878, and then ascribed to this same stratum, belong undoubtedly to a higher one, the sixth or " Mycenaean." Rough fiddle-shaped idols, whorls, a little worked ivory and some lead make up a find, of whose early period comparison of objects found elsewhere leaves no sort of doubt. This treasure is now deposited in Berlin.

3, 4, 5. This primitive " Troy " suffered cataclysmal ruin (traces of conflagration are everywhere present), and Hissarlik ceased for a time to have any considerable population. Three small village settlements, not much more than farms, were successively erected on the site, and have left their traces superposed one on another, but they yielded no finds of importance.

6. The mound, however, stood in too important a relation to the plain and the sea to remain desolate, and in due time it was covered again by a great fortress, while a city spread out below. The latter has not yet been explored. The remains of this period on the acropolis, however, have now been examined. A portion of them was first distinguished clearly by Dorpfeld in 1882, but owing to the confusion caused by Schliemann's drastic methods of trenching, the pottery and metal objects, really belonging to this stratum, had come to be confused with those of lower strata; and some grey monochrome ware, obviously of Anatolian make, was alone referred to the higher stratum. To this ware Schliemann gave the name " Lydian," and the stratum was spoken of in his Troja (1884) as the " Lydian city."

In 1893, however, excavations were carried out on the south of the mound in the hitherto undisturbed ground outside the limits of the earlier fortress; and here appeared a second curtain wall of massive ashlar masonry showing architectural features which characterize the " Mycenaean " fortification walls at Mycenae itself, and at Phylakopi in Melos. With this wall was associated not only the grey ware, but a mass of painted potsherds of unmistakably " Mycenaean " character; and further search in the same stratum to west and east showed that such sherds always lay on its floor level. The inevitable inference is that here we have a city, contemporary with the mass of the remains at Mycenae, which imported " Mycenaean " ware to supplement its ownruder products. The area of its citadel is

larger than the citadel of the second stratum ; its buildings, of which a large megaron on the south-west and several houses on the east remain, are of much finer construction than those which lie lower. This was the most important city yet built on the mound of Hissarlik. It belonged to the ” Mycen- aean ” a#e, which precedes the composition of the Homeric poems, and is reflected by them. Therefore this is Homer’s Troy,

Its remains, however, having been obliterated on the crown of Hissarlik, almost escaped recognition. When some centuries later a third important city, the Hellenistic Ilion, was built, all the accumulation on the top of the mound was cut away and a terrace made. In this process the then uppermost strata of ruins wholly vanished, their stones being taken to build the new city. The Mycenaean town, however, which had been piled stage upon stage to the summit, descended on the south side a little down the face of the mound; and the remains of its fortifications and houses at that point, lying below the level cut down to by the Hellenistic terrace-makers, were covered by the depositing of rubbish from the crown and again built over. Thus we find them now on the southern slope of the mound only, but have no difficulty in estimat- ing their original extent. Many tombs and a large lower city of this era will doubtless be explored ere long.

7. To ” Mycenaean ” Troy succeeded a small unfortified settle- ment, which maintained itself all through the Hellenic age till the Homeric enthusiasm of Alexander the Great called a city again into being on Hissarlik.

8. The Hellenistic Ilion, however, has left comparatively little trace, having been almost completely destroyed in 85 B.C. by Fimbria. Portions of fortifications erected by Lysimachus are visible both on the acropolis (west face chiefly) and round the lower city in the plain. A small Doric temple belongs to the foundation of this city, and a larger one, probably dedicated to Athena, seems to be of the Pergamene age. Of its metopes, representing Helios and a gigantomachia, important fragments have been recovered.

Coins of this city are not rare, showing Athena on both faces, and some inscriptions have been recovered proving that Hellenistic Ilion was an important municipality.

9. Lastly about the Christian era, arose a Graeco-Roman city, to which belong the theatre on the south-east slope of the hill and the ornate gateway in the same quarter, as well as a large building on the south-west and extensive remains to north-east. This seems to have sunk into decay about the 5th century A.D.

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III. The Legend of Troy. — According to Greek legend, the oldest town in the Troad was that founded by Teucer, who was a son of the river Scamander and the nymph Idaea. Tzetzes says that the Scamander in question was the Scamander in Crete, and that Teucer was told by an oracle to settle wherever the " earth-born ones " attacked him. So when he and his company were attacked in the Troad by mice, which gnawed their bow-strings and the handles of their shields, he settled on the spot, thinking that the oracle was fulfilled. He called the town Sminthium and built a temple to Apollo Smintheus, the Cretan word for a mouse being sminthius. In his reign Dardanus, son of Zeus and the nymph Electra, daughter of Atlas, in consequence of a deluge, drifted from the island of Samothrace on a raft or a skin bag to the coast of the Troad, where, havrhg received a portion of land from Teucer and married his daughter Batea, he founded the city of Dardania or

Dardanus on high ground at the foot of Mt Ida. On the death of Teucer, Dardanus succeeded to the kingdom and called the whole land Dardania after himself. He begat Erichthonius, who begat a son Tros by Astyoche, daughter of Simois. On succeeding to the throne, Tros called the country Troy and the people Trojans. By Callirrhoe, daughter of Scamander, he had three sons — Ilus, Assaracus and Ganymede. From Ilus and Assaracus sprang two separate lines of the royal house— the one being Ilus, Laomedon, Priam, Hector; the other Assaracus, Capys, Anchises, Aeneas. Ilus went to Phrygia, where, being victorious in wrestling, he received as a prize from the king of Phrygia a spotted cow, with an injunction to follow her and found a city wherever she lay down. The cow lay down on the hill of the Phrygian Ate; and here accordingly Ilus founded the city of Ilion. It is stated that Dardania, Troy and Ilion became one city. Desiring a sign at the foundation of Ilion, Ilus prayed to Zeus and as an answer he found lying before his tent the Palladium, a wooden statue of Pallas, three cubits high, with her feet joined, a spear in her right hand, and a distaff and spindle in her left. Ilus built a temple for the image and worshipped it. By Eurydice, daughter of Adrastus, he had a son Laomedon. Laomedon married Strymo, daughter of Scamander, or Placia, daughter of Atreus or of Leucippus. It was in his reign that Poseidon and Apollo, or Poseidon alone, built the walls of Troy. In his reign also Heracles besieged and took the city, slaying Laomedon and his children, except one daughter Hesione and one son Podarces. The life of Podarces was granted at the request of Hesione; but Heracles stipulated that Podarces must first be a slave and then be redeemed by Hesione; she gave her veil for him; hence his name of Priam (Gr. irpiaoBai, to buy). Priam married first Arisbe and afterwards Hecuba, and had fifty sons and twelve daughters. Among the sons were Hector and Paris, and among the daughters Polyxena and Cassandra. To recover Helen, whom Paris carried off from Sparta, the Greeks under Agamemnon besieged Troy for ten years. At last they contrived a wooden horse, in whose hollow belly many of the Greek heroes hid themselves. Their army and fleet then withdrew to Tenedos, feigning to have raised the siege. The Trojans conveyed the wooden horse into Troy; in the night the Greeks stole out, opened the gates to their friends, and Troy was taken.

See Homer, //. vii. 452 seq., xx. 215 seq., xxi. 446 seq.; Apollo- dorus ii. 6, 4, iii.. 12; Diodorus iv. 75, v. 48; Tzetzes, Schol. on Lycophron, 29, 72, 1302; Conon, Narrat. 21; Dionysius Halicarn.

Antiq. Rom. i. 68 seq. The Iliad deals with a period of fifty-one days in the tenth year of the war. For the wooden horse, see Homer, Od. iv. 271 seq. ; Virgil, Aen. ii. 13 seq.

The Medieval Legend. — The medieval romance of Troy, the Roman de Troie, exercised greater influence in its day and for centuries after its appearance than any other work of the same class. Just as the chansons de geste of the 10th century were the direct ancestors of the prose romances which afterwards spread throughout Europe, so, even before Heliodorus and Achilles Tatius, there were quasi-histories, which reproduced in prose, with more or less exact- ness, the narratives of epic poetry. Long previous to the 'Hpcoi'/tis of Flavius Philostratus {fl. 3rd century A.D.) the Trojan War had been the subject of many a prose fiction.Mignified with the title of history; but to remodel the whole story almost in the shape of annals, and to give a minute personal description of the persons and characters of the principal actors, were ideas which belonged to an artificial stage of literature. The work of Philostratus is cast in the form of a dialogue between a Phoenician traveller and a vine-grower at Eleus, and is a discourse on twenty-six heroes of the war. A ficti- tious journal (Ephemeris), professing to give the chief incidents of the siege, and said to have been written by Dictys of Crete, a follower of idomeneus, is mentioned by Su'idas, and was largely used by John Malalas and other Byzantine chroniclers. This was abridged in Latin prose, probably in the 4th century, under the title of Dictys Cretensis de bello Trojano libri VI. It is prefaced by an introductory letter from a certain L. Septimius to Q. Aradius Rufinus, in which it is stated that the diary of Dictys had been found in his tomb at Cnossus in Crete, written in the Greek language, but in Phoenician characters. The narrative begins with the rape of Helen, and in- cludes the adventures of the Greek princes on the return voyage. With Dictys is always associated Dares, a pseudo-historian of more recent date. Old Greek writers mention an account of the destruc- tion of the city earlier than the Homeric poems, and in the time of Aelian (2nd century A.D.) this Iliad of Dares, priest of Hephaestus at

Troy, was believed to be still in existence. Nothing has since been heard of it; but an unknown Latin writer, living between 400 and 600, took advantage of the tradition to compile Daretis Phrygii de excidio Trojae historia, which begins with the voyage of the Argo. It is in prose and professes to be translated from an old Greek manu- script. Of the two works that of Dares is the later, and is inferior to Dictys. The matter-of-fact form of narration recalls the poem of Quintus Smyrnaeus. In both compilations the gods and every- thing supernatural are suppressed; even the heroes are degraded. The permanent success, however, of the two works distinguishes them among apocryphal writings, and through them the Troy legend was diffused throughout western Europe. The Byzantine writers from the 7th to the 12th century exalted Dictys as a first-class authority, with whom Homer was only to be contrasted as an in- ventor of fables. Western people preferred Dares, because his history was shorter, and because, favouring the Tro|ans, he flattered the vanity of those who believed that people to have been their ancestors. Many MSS. of both writers were contained in old libraries; and they were translated into nearly every language and turned into verse. In the case of both works, scholars are undecided whether a Greek original ever existed (but see Dictys Cretensis). The Byzantine grammarian, Joannes Tzetzes {fl. 12th century), wrote a Greek hexa- meter poem on the subject (Iliaca). In 1272, a monk of Corbie translated ” sans rime L’Estoire de Troiens et de Troie (de Dares) du Latin en Roumans mot a mot ” because the Roman de Troie was too long. Geoffrey of Waterford put Dares into French prose; and the British Museum has three Welsh MS. translations of the same author — works, however, of a much later period.

The name of Homer never ceased to be held in honour; but he is invariably placed in company with the Latin poets. Few of those who praised him had read him, except in the Latin redaction, in 1 100 verses, by the so-called Pindarus Thebanus. It supplied the chief incidents of the Iliad with tolerable exactness and was a text- book in schools.

For a thousand years the myth of descent from the dispersed heroes of the conquered Trojan race was a sacred literary tradition throughout western Europe. The first Franco-Latin chroniclers traced their history to the same origin as that of Rome, as told by the Latin poets of the

Augustan era ; and in the middle of the 7th century Fredegarius Scholasticus (Rer. gall, script, ii. 461) relates how one party of the Trojans settled between the Rhine, the Danube and the sea. In a charter of Dagobert occurs the statement, " ex nobilis- simo et antiquo Trojanorum reliquiarum sanguine nati." This statement is repeated by chroniclers and panegyrical writers, who also considered the History of Troy by Dares to be the first of national books. Succeeding kings imitated their predecessors in giving official sanction to their legendary origin: Charles the Bald, in a charter, uses almost the same words as Dagobert, " ex praeclaro et antiquo trojanorum sanguine nati." In England a similar tradition had been early formulated, as appears from Nennius's Historia britonum and Geoffrey of Monmouth. The epic founder of Britain was Brutus, son, or in another tradition, great-grandson, of Aeneas, in any case of the royal house of Troy. The tradition, repeated in Wace's version of Geoffrey, by Matthew Paris and others, persisted to the time of Shakespeare. Brutus found Albion un- inhabited except by a few giants. He founded his capital on the

banks of the Thames, and called it New Troy. Otto Frisingensis (12th century) and other German chroniclers repeat similar myths, and the apocryphal hypothesis is echoed in Scandinavian sagas. About 1050 a monk named Bernard wrote De excidio Trojae, and in the middle of the 12th century Simon Chevre d'Or, canon of the abbey of Saint-Victor, Paris, followed with another poem in leonine elegiacs on the fall of the city and the adventures of Aeneas, in which the Homeric and Virgilian records were blended.

We now come to a work on the same subject, which in its own day and for centuries afterwards exercised an extraordinary influence throughout Europe. About the year 1 184 Benoit de Sainte-More (q.v.) composed a poem of 30,000 lines entitled Roman de Troie. It forms a true Trojan cycle and embraces the entire heroic history of Hellas. The introduction relates the story of the Argonauts, and the last 2680 verses are devoted to the return of the Greek chiefs

and the wanderings of Ulysses. With no fear of chronological discrepancy before his eyes, Benoit reproduces the manners of his own times, and builds up a complete museum of the 12th century — its arts, costumes, manufactures, architecture, arms, and even religious terms. Women are repeatedly introduced in unwarranted situations; they are spectators of all combats. The idea of personal beauty is different from that of the old Greeks; by Benoit good humour, as well as health and strength, is held to be one of its chief characteristics. The love-pictures are another addition of the modern writer. The author speaks enthusiastically of Homer, but he derived his information chiefly from the pseudo-annals of Dictys and Dares, more especially the latter, augmented by his own imagination and the spirit of the age. It is to Benoit alone that the honour of poetic invention is due, and in spite of its obligation for a groundwork to Dictys and Dares we may justly consider the Roman de Troie as an original work. From this source subsequent writers drew their notions of Troy, mostly without naming their authority and generally without even knowing his name. This is the masterpiece of the pseudo-classical cycle of romances: and in the Latin version of Guido delle Colonne it passed through every country of Europe.

The De hello trojano of Joseph of Exeter, in six books* a genuine poem of no little merit, was written soon after Benoit's work or about the years 1187-1188. At first ascribed to Dares Phrygius and Cornelius Nepos, it was not published as Joseph's until 1620 at Frankfort. It was directly drawn from the pseudo-annalists, but the influence of Benoit was considerable. Of the same kind was the Troilus of Albert of Stade (1249), a version of Dares, in verse, characterized by the old severity and affected realism. But these Latin works can only be associated indirectly with Benoit, who had closer imitators in Germany at an early period. Herbort of Fritzlar reproduced the French text in his Lied von Troye (early 13th century), as did also Konrad von Wurzburg (d. 1287) in his Buch von Troye of 40,000 verses, which he himself compared to the " boundless ocean." It was completed by an anonymous poet. To the like source may be traced a poem of 30,000 verses on the same subject by Wolfram von Eschenbach ; and Jacques van Maerlant reproduced Benoit's narrative in

Flemish. The Norse or Icelandic Trojumanna saga repeats the tale with some variations.

In Italy Guido delle Colonne, a Sicilian, began in 1270 and finished in 1287 a prose Historia trojana, in which he reproduced the Roman de Troie of Benoit, and so closely as to copy the errors of- the latter and to give the name of Peleus to Pelias, Jason's uncle. As the debt was entirely unacknowledged, Benoit at last came to be con- sidered the imitator of Guido. The original is generally abridged, and the vivacity and poetry of the Anglo-Norman trouvere disappear in a dry version. The immense popularity of Guido's work is shown by the large number of existing MSS. The French Bibliotheque Nationale possesses eighteen codices of Guido to thirteen of Benoit, while at the British Museum the proportion is ten to two. Guido's History was translated into German about 1392 by Hans Mair of Nordlingen. Two Italian translations were made: by Filippo Ceffi (1324) and by Matteo Beliebuoni (1333). In the 14th and the commencement of the 15th century four versions appeared in England and Scotland. The best known is the Troy Book, written between 1414 and 1420, of John Lydgate, who had both French and Latin texts before him. An earlier and anonymous rendering exists at Oxford (Bodleian MS. Laud Misc. 595). There is the Gest Hystor- iale of the Destruction of Troy (Early Eng. Text Soc, 1869-1874), written in a northern dialect about 1390; a Scottish version (15th century) by a certain Barbour, not the poet, John Barbour; and The Seege of Troy, a version of Dares (Harl. MS. 525 Brit. Mus.). The invention of printing gave fresh impetus to the spread of Guido's work. The first book printed in English was The Recuyell of the Hystoryes of Troye-, a translation by Caxton from the French of Raoul Lefevre. The Recueil des histoires de Troyes was " compose par venerable homme Raoul le Feure prestre chappellain de mon tres redoupte seigneur monseigneur le due Phelippe de Bourgoingne en l'an de grace 1464," but probably printed in 1474 by Caxton or Colard Mansion at Bruges. It is in three books, of which the first deals with the story of Jupiter and Saturn, the origin of the Trojans, the feats of Perseus, and the first achievements of Hercules; the second book is wholly taken up with the " prouesses du fort Hercu- iez"; the third, " traictant de la generalle destruction de Troyes qui vint a l'ocasion du rauissement de dame

Helaine," is little else

than a translation of that portion of Guido delle Colonne which relates to Priam and his sons. Two MSS. of the Recueil in the Bibliotheque Nationale wrongly attribute the work to Guillaume Fillastre, a voluminous author, and predecessor of Lefevre as secre- tary to the duke. Another codex in the same library, Histoire ancienne de Thebes et de Troyes, is partly taken from Orosius. The Bibliotheque Nationale possesses an unpublished Histoire des Troyens et des Thebains jusqu'd, la mort de Turnus, d'aprbs Orose, Ovide et Raoul Lefebre (early 16th century), and the British Museum a Latin history of Troy dated 1403. There were also translations into Italian, Spanish, High German, Low Saxon, Dutch and Danish; Guido even appeared in a Flemish and a Bohemian dress.

Thus far we have only considered works more or less closely imitated from the original. Boccaccio, passing by the earlier tales, took one original incident from Benoit, the love of Troilus and the treachery of Briseida, and composed Filostrato, a parable of his own relations with the Neapolitan princess who figures in his works as Fiammetta. This was borrowed by Chaucer for his Boke of Troilus and Cresside, and also by Shakespeare for his Troilus and Cressida (1609). One reason why the Round Table stories of the 1 2th and 13th centuries had a never-ceasing charm for readers of the two following centuries was that they were constantly being re-edited to suit the changing taste. The Roman de T/oie experi- enced the same fate. By the 13th century it was translated into orose and worked up in those enormous compilations, such as the Mer des histoires, &c, in which the middle ages studied antiquity. It reappeared in the religious dramas called Mysteries. Jacques Millet, who produced La Destruction de Troie la Grande between 1452 and 1454, merely added vulgar realism to the original. Writers of chap-books borrowed the story, which is again found on the stage in Antoine de Montchretien's tragedy of Hector (1603) — a last echo of the influence of Benoit.

Bibliography. — The Troy legend is dealt with in the elaborate work of A. Joly, Benoit de Sainte-More et le Roman de Troie (1870- 1871) ; G. Korting, Der altfranz. Roman de Troie (1883) ; F. Settegast, Benoit de Ste-More

(Breslau, 1876) ;G. C.Frommann,.ffer6

TROY, a city and the county-seat of Rensselaer county, New York, U.S.A., at the head of tidewater on the eastern bank of the Hudson river, opposite the mouth of the Mohawk, about 6 m. N. of Albany and about 148 m. N. of New York City. Pop. (1880), 56,747; (1890), 60,956; (1900), 60,651, of whom 14,384 were foreign-born (7348 being Irish, 1796 German and 1498 English) and 400 were negroes; (1910, census), 76,813. Troy is served by the Boston & Maine, the New York Central & Hudson River and the Delaware & Hudson railways, and by inter- urban electric lines connecting with Saratoga and Lake George on the north, Albany on the south and Schenectady and the cities of the populous Mohawk Valley on the west; it is at the head of river steamboat navigation on the Hudson, and has water communication by means of the Erie and Champlain canals with the Great Lakes and Canada. The site is a level oblong tract extending along the Hudson for 7 m. and reaching back a mile or so from the river to highlands which rise to a height of 400 ft., with Mt Ida (240 ft. above tidewater) forming a picturesque background. The older part of the city and the principal business and manufacturing district occupies the low lands; the newer part, chiefly residential, is built upon the heights. The northern part of the city was the village of Lansingburg (pop. 1900, 12,595) until 1901, when with parts of the towns of Brunswick and North Greenbush it was annexed to

Troy. Opposite Troy on the west bank of the Hudson, and connected with it by bridges, are Cohoes, Watervliet and YVaterford. Industrially and commercially they virtually form a part of Troy. Troy is the seat of Rensselaer Polytechnic Insti- tute, founded in 1824 by Stephen van Rensselaer as a ” school of theoretical and practical science,” incorporated in 1826, and reorganized in 1849 a s a general polytechnic institute. It is the oldest school of engineering in the country, and has always maintained a high rank of efficiency. The large gifts (about $1,000,000) to the school made by Mrs Russell Sage in 1907 enabled it to add courses in mechanical and electrical engineer- ing to

its course in civil engineering. The institute had 55 instructors and 650 students in 19 10. The Emma Willard School, founded as the Troy Female Seminary in 1821 by Mrs Emma Willard (1787-1870), 1 is one of the oldest schools for women in the United States. Other educational institutions include Troy Academy (1834), a non-sectarian preparatory school; La Salle Institute (conducted by the Brothers of the Christian Schools); St Joseph's Academy (Roman Catholic) and St Peter's Academy (Roman Catholic). Noteworthy buildings of a public and semi-public character include the post office, the public library, containing in 1910 43,500 volumes, the Troy Savings Bank building, the city hall, the Rensselaer county court house, a Y.M.C.A. building and St Paul's Episcopal, the Second Presbyterian and St Mary's (Roman Catholic) churches. An area of 175 acres is comprised in the city's parks, the largest of which are Prospect Park and Beman Park. In Oakwood cemetery, 400 acres, are the grave of General George H. Thomas, and a monolithic shaft to the memory of General John Ellis Wool (1784-1869), who served with distinction in the War of 181 2 and in the Mexican War, and in the Civil War commanded for a time the Department of Virginia. In Washington Square there is a Soldiers' and Sailors' Monument, 93 ft. high. Altro Park, on an island a short distance down the river, is a pleasure resort in summer.

Two rapid streams, Poesten Kill and Wynants Kill, flowing into the Hudson from the east, through deep ravines, furnish good water-power, which, with that furnished by the state dam across the Hudson here, is utilized for manufacturing purposes. In 1905 the value of Troy's factory product was $31,860,829. Of this $11,271,708 was the value of collars and cuffs (89-5% of the value of the total American product), an industry which gave employment to 49-3% of the wage-earners in. Troy, and paid 42-1% of the wages. Closely allied with this industry was shirt-making, with an output valued at $4,263,610. Troy is the market for a fertile agricultural region, and the principal jobbing centre for a large district in north-eastern New York and eastern Massachusetts.

The site of Troy was part of the Van Rensselaer manor grant of 1629. In 1659 it was bought from the Indians, with the consent of the patroon, by Jan Barentsen Wemp, and

several families settled here. In 1707 it passed into the hands of Derick van der Heyden, who laid out a large farm. During this early period it was known variously as Ferryhook, Ashley's Ferry and Van der Heyden's Ferry. In 1777 General Philip Schuyler established his headquarters on Van Schaick's Island in the Mohawk and Hudson, then the principal rendezvous of the army which later met Burgoyne at Saratoga. After the close of the war there was an influx of settlers from Rhode Island, Connecticut, New Hampshire and Vermont; a town was laid out on the Van der Heyden farm, and in 1789 the name of Troy was selected in town meeting; and in 1791 the town of Troy was formed from part of Rensselaer wyck. The county-seat was established here in 1793, and Troy was incorporated as a village in 1794 and was chartered as a city in 1816. The first newspaper, The

1 Emma Hart was born in Berlin, Connecticut, became a teacher in 1803, and in 1809 married Dr John Willard of Middlebury. Vermont, where she opened a boarding school for girls in 1814. In 1819 she wrote A Plan for Improving Female Education, submitted to the governor of New York state; and in 1821 she removed to Troy. Her son took charge of the school in 1838. She prepared many textbooks and wrote Journal and Letters from France and Great Britain (1833). See the biography (1873) by John Lord.

Farmer's Oracle, began publication in 1797. In 1812 a steamboat line was established between Troy and Albany. Troy benefited financially by the War of 181 2, during which contracts for army beef were filled here. The opening of the Erie Canal in 1825 contributed greatly to Troy's commercial importance. During the Civil War army supplies, ammunition and cannon, and the armour-plate and parts of the machinery for the " Monitor " were made here. The first puddling works were opened in 1839, and Troy was long the centre of the New York iron and steel industry; in 1865 the second Bessemer steel works in the United States were opened here. Troy has three times been visited by severe conflagrations, that of June 1820 entailing a loss of about $1,000,000, that of August 1854 about the same, and that of May 1862, known as " the Great Fire," the destruction of over 500 buildings, and a property loss of some $3,000,000.

See Arthur J. Weise, History of the City of Troy (Troy, 1876), and Troy's One Hundred Years (Troy, 189 1).

TROY, a city and the county-seat of Miami county, Ohio, U.S.A., on the west bank of the Great Miami river, about 65 m. W. of Columbus. Pop. (1890), 4494; (1900), 58-81 (234 foreign- born); (1910), 6122. Troy is served by the Cleveland, Cin- cinnati, Chicago & St Louis and the Cincinnati, Hamilton & Dayton railways, and by the Dayton & Troy and the Spring- field, Troy & Piqua electric inter-urban lines. The Miami and Erie Canal, formerly important for traffic, is now used only for power. The principal public buildings include the court house and the city hall, and there are a public library (housed in the city hall) and a children's home. Troy is situated in a good general farming region, of which tobacco is an important crop; and there are various manufactures. The municipality owns and operates the waterworks and electric-lighting plant. The first settlement was made in 1807, and Troy was first chartered as a city in 1890.

TROYES, a town of France, capital of the department of Aube, 104 m. E.S.E. of Paris on the Eastern railway to Belfort. Pop. (1906), 51,228. The town is situated in the wide alluvial plain watered by the Seine, the main stream of which skirts it on the east. It is traversed by several small arms of the river, and the Canal de la Haute-Seine divides it into an upper town, on the left bank, and a lower town on the right bank. The streets are, for the most part, narrow and crooked. It is surrounded by a belt of boulevards, outside which lie suburbs. The churches of the town are numerous, and especially rich in stained glass of the Renaissance period, from the hands of Jean Soudain, Jean Macadre, Linard Gonthier and other artists.

St Pierre, the cathedral, was begun in 1208, and it was not until 1640 that the north tower of the facade was completed. With a height to the vaulting of only 98 ft. it is less lofty than other impor- tant Gothic cathedrals of France. It consists of an apse with seven apse chapels, a choir with double aisles, on the right of which are the treasury and sacristy, a transept without aisles, a nave with double aisles and side chapels and a vestibule. The west facade belongs to the 1 6th century with the exception of the upper portion of the north tower; the south tower has

never been completed. Three portals, that in the centre surmounted by a fine flamboyant rose window, open into the vestibule. The stained glass of the interior dates mainly from the 15th and 16th centuries. The treasury contains some fine enamel work and lace. The church of St Urban, begun in 1262 at the expense of Pope Urban IV., a native of the town, is a charming specimen of Gothic architecture, the lightness and delicacy of its construction rivalling that of churches built a century later. The glass windows, the profusion of which is the most remarkable feature of the church, date, for the most part, from the years 1265 to 1280. The church of La Madeleine, built at the beginning of the 13th century, and enlarged in the 16th. contains a rich rood-screen by Giovanni Gualdo (1508) and fine stained-glass windows of the 16th century. The church of St Jean, though hidden among old houses, is one of the most picturesque in Troyes. The choir is a fine example of Renaissance architecture and the church contains a high altar of the 17th century, stained glass of the 16th century and many other works of art. St Nicholas is a building of the 16th century with a beautiful vaulted gallery in the interior. The church of St Pantaleon of the 16th century and that of St Nizier, mainly of the same period, contain remarkable sculptures and paintings. St Remi (14th, 15th and 16th centuries) and St Martin-es-Vignes (1 6th and 17th centuries), the latter notable for its 17th-century windows, are also of interest. The old abbey of St Loup is occupied by a

museum containing numerous collections. The H6tel Dieu of the 1 8th century is remarkable for the fine gilded iron railing of its courtyard. Most of the old houses of Troyes are of wood, but some of stone of the 16th century are remarkable for their beautiful and original architecture. Amongst the latter the hdtels de Vauluisant, de Mauroy and de Marisy are specially interesting. The prefecture occupies the buildings of the old abbey of Notre- Dame-aux-Nonnains ; the H6tel-de-ville dates from the 17th century; the savings bank, the theatre and the lycSe are modern buildings. A marble monument to the Sons of Aube commemorates the war of 1870-71.

Troyes is the seat of a bishop and a court of assize. Its public institutions include a tribunal of first instance, a tribunal of com- merce, a council of trade arbitrators, a chamber of commerce and a branch of the Bank of France. A lycie, an ecclesiastical college, training colleges for male and female teachers, and a school of hosiery are its chief educational institutions. There are also several learned societies and a large library. The dominant industry in Troyes is the manufacture of cotton, woollen and silk hosiery, which is exported to Spain, Italy, the United States and South America; printing and dyeing of fabrics, tanning, distilling, and the manufac- ture of looms and iron goods are among the other industries. The market gardens and nurseries of the neighbourhood are well known. There is trade in the wines of Burgundy and Champagne, in industrial products, in snails and in the dressed pork prepared in the town.

History. — At the beginning of the Roman period Troyes (Augustobona) was the principal settlement of the Tricassi, from whose name its own is derived. It owed its conversion to Christianity to Saints Savinian and Potentian, and in the first half of the 4th century its bishopric was created as a suffragan of Sens. St Loup, the most illustrious bishop of Troyes, occu- pied the episcopal seat from 426 to 479. He is said to have per- suaded Attila, chief of the Huns, to leave the town unpillaged, and is known to have exercised great influence in the Church of Gaul. The importance of the monastery of St Loup, which he founded, was overshadowed by that of the abbey of nuns known as Notre-Dame-aux-Nonnains, which possessed large schools and enjoyed great privileges in the town, in some points exercising authority even over the bishops themselves. In 892 and 898 Troyes suffered from the depredations of the Normans, who on the second occasion reduced the town to ruins. In the early middle ages the bishops were supreme in Troyes, but in the 10th century this supremacy was transferred to the counts of Troyes (see below), who from the nth century were known as the counts of Champagne. Under their rule the city attained great pros- perity. Its fairs, which had already made it a prominent com- mercial centre, flourished under their patronage, while the canals constructed at their expense aided its industrial development. In the 1 2th century both the counts and the

ecclesiastics joined in the movement for the enfranchisement of their serfs, but it was not till 1230 and 1242 that Thibaut IV. granted charters to the inhabitants. A disastrous fire occurred in 1188; more disastrous still was the union of Champagne with the domains of the king of France in 1304, since one of the first measures of Louis le Hutin was to forbid the Flemish merchants to attend the fairs, which from that time declined in importance. For a short time (1419-1425), during the Hundred Years' War, the town was the seat of the royal government, and in 1420 the signing of the Treaty of Troyes was followed by the marriage of Henry V. of England with Catherine, daughter of Charles VI., in the church of St Jean. In 1429 the town capitulated to Joan of Arc. The next hundred years was a period of prosperity, marred by the destruction of half the town by the fire of 1524. In the 1 6th century Protestantism made some progress in Troyes but never obtained a decided hold. In 1562, after a short occu- pation, the Calvinist troops were forced to retire, and on the news of the massacre of St Bartholomew fifty Protestants were put to death. The revocation of the Edict of Nantes in 1685 was a severe blow to the commerce of Troyes, which was not revived by the re-establishment of the former fairs in 1697. The population fell from 40,000 to 24,000 between the beginning of the 16th century and that of the 19th century.

See T. Boutiot, Histoire de Troyes et de la Champagne miridionale (4 vols., Troyes, 1870-1880); R. Koechlin and J. J. Marquet de Vasselot, La Sculpture a Troyes et dans la Champagne miridionale au seizieme siecle (Paris, 1900). (R. Tr.)

Counts of Troyes. The succession of the counts of Troyes from the 9th to the 10th century can be established in the

following manner. Aleran, mentioned in 837, died before the 25th of April 854. Odo (or Eudes) I. appears as count on the 25th of April 854, and seems to have been stripped of his dignities in January 859. Raoul, or Rudolph, maternal uncle of King Charles the Bald, was count of Troyes in 863 and 864, and died on the 6th of January 866. Odo I. seems to have entered again into possession of the countship of Troyes after the death of Raoul, and died himself on the 10th of August 871. Boso, afterwards king of Provence, received the countship in ward after the death of Odo I. A

royal diploma was granted at his request, on the 29th of March 877, to the abbey of Montier-la- Celle in Troyes. Odo II., son of Odo I., became count of Troyes on the 25th of October 877. Robert I., brother of Odo II., was count from 879. He married Gisla, sister of kings Louis III. and Carloman, and was killed by the Northmen in 886. Aleaume, nephew of Robert I., is mentioned in 893. Richard, son of the viscount of Sens Gamier, is styled count of Troyes in a royal diploma of the 10th of December 926. He was living in 931. Herbert I., already count of Vermandois, succeeded Richard, and died in 943. Robert II., one of the five sons of Herbert of Vermandois, is called count of Troyes in an act of the 6th of August 959, and died in August 968. Herbert II. the Old, younger brother of Robert II., succeeded him and died between 980 and 983; Herbert III. the Young, nephew and successor of Herbert II., died in 995. Stephen I., son and successor of Herbert III., was alive in 1019. His successor was his cousin, Odo II., count of Blois. From the nth century the counts of Troyes, whose domains increased remark- ably, are commonly designated by the name of counts of Champagne.

See H. d'Arbois de Jubainville, Histoire des dues et des comtes de Champagne (1859), vol. i. ; F. Lot, Les Verniers Carolingiens, (1891), pp. 370-377; A. Longnon, Documents relatifs au comti de Champagne et de Brie (1904), ii. 9, note. (A. Lo.)

TROYON, CONSTANT (1810-1865), French painter, was born on the 28th of August 1810 at Sevres, near Paris, where his father was connected with the famous manufactory of china. Troyon was an animal painter of the first rank, and was closely associated with the artists who painted around Barbizon. The technical qualities of his methods of painting are most masterly; his drawing is excellent, and his composi- tion always interesting. It was only comparatively late in life that Troyon found his metier, but when he realized his power of painting animals he produced a fairly large number of good pictures in a few years. Troyon entered the ateliers very young as a decorator, and until he was twenty he laboured assiduously at the minute details of porcelain ornamentation; and this kind of work he mastered so thoroughly that it was many years before he overcame its limitations. By the time he reached twenty-one he was travelling the country as an

artist, and painting landscapes so long as his finances lasted. Then when pressed for money he made friends with the first china manu- facturer he met and worked steadily at his old business of decorator until he had accumulated enough funds to permit him to start again on his wanderings.

Troyon was a favourite with Roqueplan, an artist of distinction eight years his senior, and he became one of his pupils after receiving certain tuition from a painter, now quite unknown, named Riocreux. Roqueplan introduced Troyon to Rousseau, Jules Dupre, and the other Barbizon painters, and in his pictures between 1840 and 1847 he seemed to endeavour to follow in their footsteps. But as a landscapist Troyon would never have been recognized as a thorough master, although his work of the period is marked with much sincerity and met with a certain success. It may be pointed out, however, that in one or two pure landscapes of the end of his life he achieved qualities of the highest artistic kind; but this was after lengthy experience as a cattle painter, by which his talents had become thoroughly developed.

In 1846 Troyon went to the Netherlands, and at the Hague saw Paul Potter's' famous "Young Bull." From the studies he made of this picture, of Cuyp's sunny landscapes, and

branch's noble masterpieces he soon evolved a new method of painting, and it is only in works produced after this time that Troyon's true individuality is revealed. When he became conscious of his power as an animal painter he developed with rapidity and success, until his works became recognized as masterpieces in Great Britain and America, as well as in all countries of the Continent. Success, however, came too late, for Troyon never quite believed in it himself, and even when he could command the market of several countries he still grumbled loudly at the way the world treated him. Yet he was decorated with the Legion of Honour, and five times received medals at the Paris Salon, while Napoleon III. was one of his patrons; and it is certain he was at least as financially successful as his

Barbizon colleagues.

Troyon died, unmarried, at Paris on the 21st of February 1865, after a term of clouded intellect. All his famous pictures are of date between 1850 and 1864, his earlier work being of comparatively little value. His mother, who survived him, instituted the Troyon prize for animal pictures at the Ecole des Beaux Arts. Troyon's work is fairly well known to the public through a number of large engravings from his pictures. In the Wallace Gallery in London are " Watering Cattle " and " Cattle in Stormy Weather "; in the Glasgow Corporation Gallery is a "Landscape with Cattle"; the Louvre contains his famous " Oxen at Work " and " Returning to the Farm "; while the Metropolitan Museum of Art and other galleries in America contain fine examples of his pictures. His " Vallee de la Toucque, Normandy," is one of his greatest pictures; and at Christie's sale-room in 1902 the single figure of a cow in a landscape of but moderate quality fetched £7350. Emile van Marcke (1827-1801) was his best-known pupil.

See H. Dumesnil, Constant Troyon: Souvenirs intimes (Paris, 1888); A. Hustin, "Troyon," L'Art, pp. 77 and 85 (Paris, 1889); Albert Wolff, " Constant Troyon," La Capitate de I' art (Paris, 1886) ; D. C. Thomson, The Barbizon School of Painters (London, 1890) ; " Constant Troyon," The Art Journal (1893), p. 22. (D. C. T.)

TRUCE OF GOD, an attempt of the Church in the middle ages to alleviate the evils of private warfare. Throughout the 9th and 10th centuries, as the life-benefices of the later Carolingian kings were gradually transformed into hereditary fiefs, the insecurity of life and property increased, for there was no central power to curb the warring local magnates. The two measures which were adopted by the Church to remedy these conditions — the pax ecclesiae or Dei and the treuga or treua Dei — are usually both referred to as the Truce of God, but they are distinct in character. The latter was a develop- ment of the former.

The pax ecclesiae is first heard of in the year 990 at three synods held in different parts of southern and central France — at Charroux, Narbonne and Puy. It enlisted the immediate support of the regular clergy, particularly the

vigorous congrega- tion of Cluny, and of William V. of Aquitaine, the most powerful lord of southern France, who urged its adoption at the Councils of Limoges (994) and Poitiers (999). The peace decrees of these various synods differed considerably in detail, but in general they were intended fully to protect non-combatants; they forbade, under pain of excommunication, every act of private warfare or violence against ecclesiastical buildings and their environs, and against certain persons, such as clerics, pilgrims, merchants, women and peasants, and against cattle and agricultural implements. With the opening of the nth century, the pax ecclesiae spread over northern France and Burgundy, and diocesan leagues began to be organized for its maintenance. The bishop, or count, on whose lands the peace was violated was vested with judicial power, and was directed, in case he was himself unable to execute sentence, to summon to his assistance the laymen and even the clerics of the diocese, all of whom were required to take a solemn oath to observe and enforce the peace. At the Council of Bourges (1038), the archbishop decreed that every Christian fifteen years and over should take such an oath and enter the diocesan militia. The idea that peace is a divine institution seems to

have given rise to a new name for the peace, the pax Dei, or peace of God.

The treuga or treva Dei, the prohibition of every act of private warfare during certain days, goes back at least to the Synod of Elne, held in the Pyrenees in 1027, which suspended all warfare from noon on Saturday till prime on Monday. Like the pax ecclesiae it found ardent champions in the regular clergy, especially in Odilo (962-1049), the fifth abbot of Cluny, and soon spread over all France. It penetrated Piedmont and Lombardy in 1041 and Normandy in 1042. By this time the truce extended from the Wednesday evening to the Monday morning in every week and also, in most places, lasted during the seasons of Lent and Advent, the three great vigils and feasts of the Blessed Virgin, and those of the twelve apostles and a few other saints. The treuga Dei was decreed for Flanders at the Synod of Therouanne (1063) and was instituted in southern Italy in 1089, probably through Norman influence. The

bishop of Liege introduced it in Ger- many in 1082, and three years later a synod held at Mainz in the presence of the emperor Henry IV. extended it to the whole empire. It does not appear to have secured a firm footing in England, although its general provisions were in- corporated in the laws of the land (1130-1154). The popes took the direction of the matter into their own hands towards the end of the nth century as they realized the necessity of promoting peace among Christians in order to unite them successfully in the crusades against the Mahommedans; and the first decree of the Council of Clermont (1095), at which Urban II. preached the first crusade, proclaimed a weekly truce for all Christendom, adding a guarantee of safety to all who might take refuge at a wayside cross or at the plough. The Truce of God was reaffirmed by many councils, such as that held at Reims by Calixtus II. in 11 19, and the Lateran councils of 1123, 1139 and 1179. When the treuga Dei reached its most extended form, scarcely one-fourth of the year remained for fighting, and even then the older canons relating to the pax ecclesiae remained in force. The means employed for its en- forcement remained practically the same: spiritual penalties, such as excommunication, special ecclesiastical tribunals, sworn leagues of peace, and assistance from the temporal power. The Council of Clermont prescribed that the oath of adherence to the truce be taken every three years by all men above the age of twelve, whether noble, burgess, villein or serf. The results of these peace efforts were perhaps sur- prisingly mediocre, but it must be borne in mind that not only was the military organization of the dioceses always very imperfect, but feudal society, so long as it retained political power, was inherently hostile to the principle and practice of private peace. The Truce of God was most powerful in the 1 2th century, but with the 13th its influence waned as the kings gradually gained control over the nobles and substituted the king's peace for that of the Church.

A few bishops, notably Gerard of Cambrai (1013-1051), seem from the first to have opposed the peace laws of the Church as encroaching on royal authority, but the lay rulers usually co-operated with the ecclesiastical authorities in encouraging and maintaining the Truce of God. In fact, the emperor Henry II. and the French king Robert the Pious discussed the subject of universal peace

under church auspices at Monzon in 1023. By the 12th century, however, the eccle- siastical measures had proved ineffectual in coping with private warfare, and secular rulers sought independently to diminish the number and atrocity of private wars within their own domains. The provisions of the Truce of God were often incorporated bodily in municipal and district statutes such as the laws of Barcelona (1067). The emperor Henry IV. approved (1085) the extension of the truce to the whole land, and in 1 103 royal laws entirely prohibiting private warfare in the empire replaced the Truce of God. In France royalty ac- quired little by little a preponderant influence over feudalism and used its increased prestige to substitute for the Truce of God the peace of the state. Louis VI., Louis VII. and Philip Augustus

gradually obtained recognition not only from the petty lords of their own domain but from most of the magnates of the king- dom. Thanks to the moral support and material resources which it found in the ecclesiastical lords of central and northern France, and to the growing popular desire for the suppression of feuds, royalty was able to support its pretension to the general government of the kingdom. Confirming what was doubtless an older custom, Philip Augustus decreed the quarantaine-le-roi, which suspended every act of reprisal for at least forty days; and in 1257 Louis IX. absolutely forbade all private wars in the crown lands. By the beginning of the 14th century the royal authority had sufficient force to ensure the maintenance of the Landesfriede. In England, where the Truce of God does not seem to have acquired a firm footing, state law against private warfare obtained practically from the time of the Norman conquest. At least from Henry I. it became an axiom that the law of the king's court stood above all other law and was the same for all.

See L. Huberti, Studien zur Rechtsgeschichte der Gottesfrieden und Landfrieden, Bd. i. Die Friedens-Ordnungen in Frankreich (Ansbach, 1892); A. Luchaire, " La Paix et la tr6ve de Dieu," in E. Lavisse's Hisloire de France, II. 2, pp. 133-138 (Paris, 1901); E. Semichon, La

Paix et la treve de Dieu (2nd ed. 1869); E. Mayer, Deutsche und franzosische Verfassungsgeschichte (1899), vol. i. ; J. Fehr, Der Gottzs- friede und die katholische Kirche des Mittelalters (Augsburg, 1861); A. Kluckhohn, Geschichte des Gottesfriedens (Leipzig, 1857); K. J. von Hefele, Conciliengeschichte, 2nd ed., vol. 4; Du Cange, Glossarium, s.v. Treuga. The principal French documents on the subject are published in Huberti's book, and those of Germany, Italy and Aries are edited by L. Weiland in the Monumenta Germaniae his- torica, constitutiones i. 596 sqq. (C. H. Ha.)

TRUCK. (1) A name for barter, or commodities used in barter or trade. The word came into English from the French troq, mod. troc; troquer, to barter, is borrowed from Spanish trocar, for which several origins have been suggested, such as a Low Latin travicare, the supposed original of " traffic " (q.v.), or some latinized form of Greek rpoiros, turn; it may, on the other hand, be connected with the Greek rpoxbs, wheel. " Truck," in this sense, is chiefly used now in the sense of the payment of the wages of workmen in kind, or in any other way than the unconditional payment of money, a practice known as the " truck system." Colloquially, " truck " is used in the general sense of " dealing," in such expressions as " to have no truck with anyone." The " truck system " has taken various forms. Sometimes the workman has been paid with " portion of that which he has helped to produce," whether he had need of it or not, but the more usual form was to give the workman the whole or part of his wages in the shape of commodities suited to his needs. There was also a practice of paying in money, but with an express or tacit understanding that the workman should resort for such goods as he required to shops or stores kept by his employer. The truck system led in many cases to grave abuses and was made illegal by the Truck Acts, under which wages must be paid in current coin of the realm, without any stipulations as to the manner in which the same shall be expended. (See Labour Legislation.) (2) From the Late Latin trochus, wheel, Greek rpoxos, we get " truck " in the sense of a wheeled vehicle, such as the hand-barrows used for carrying luggage at a railway station; and the word is used generally for all that portion of railway rolling- stock which is intended for the carriage of goods (see Railways: Rolling-stock). The term is also used of a

circular disk of wood at the top of a ship's mast, generally provided with sheaves for the signal halyards.

TRUCKLE, a verb meaning to submit servilely or fawningly to another's bidding, to yield in a weak, feeble or contemptible way. The origin is the " truckle bed," a small bed on wheels which could be pushed under a large one. In early times servants or children slept in such beds, placed at the foot of their masters' and parents' bed, but the name first appears as a university word, and was derived direct from Latin trochlea, a wheel or pulley-block, Greek rpoxos, wheel (rpexeti', to run).

TRUEBA, ANTONIO DE (1S10-1889), Spanish novelist, was born on the 24th of December 1819 at Montellano (Biscay),

where he was privately educated. In 1835 he was sent to learn business at Madrid; but commerce was not to his taste, and, after a long apprenticeship, he turned to journalism. In 1851 he hit the popular taste with El Cid Campeador and El Libro delos cantares; for the next eleven years he was absorbed by journalistic work, the best of his contributions being issued under the titles of Cuentos populares (1862), Cuentos de color de rosa (1864). and Cuentos campesinos (1865). The pleasant simplicity and idyllic sentimentalism of these collections delighted an uncritical public, and Trueba met the demand by supplying a series of stories conceived in the same ingenuous vein. In 1862 he was appointed archivist and chronicler of the Biscay provinces; he was deprived of the former post in 1870, but was reinstated after the restoration. He died at Bilbao on the 10th of March 1889.

TRUFFLE (from Med. Jr. trufle, a variant of truffe, generally taken to be for tafie, from Lat. tuber, an esculent root, a tuber, cf. Ital tartufo, truffle, from Lat. torae tuber; another Ital. form tartufola gave Ger. Tartoffel, dissimilated to Kartofel, potato), the name of several different species of subterranean fungi which are used as food. The species sold in English markets is Tuber aestivum; the commonest species of French markets is T. melanosporum, and of Italian the garlic-scented T. magna tum. Of the three, the English species is the least desirable, and the French is possibly the best. The truffle used for Perigord pie {patt de foie gras) is T. melanosporum, regarded by some as a dark

variety of our British species, T. brumale. When, howevei the stock of T. melanosporum happens to be deficient, some manufacturers use inferior species, such as the worthless or dangerous Choeromyces meandriformis. Even the rank and offensive Scleroderma vulgare (one of the puff- ball series of fungi) is sometimes used for stuffing turkeys, sausages, &c. Indeed, good truffles, and then only T. aestivum, are seldom seen in English markets. The taste of T. melanosporum can be detected in Perigord pie of good quality. True and false truffles can easily be distinguished under the microscope.

Tuber aestivum, the English truffle, is roundish in shape, covered with coarse polygonal warts, black in colour outside and brownish and veined with white within; its average size is about that of a small apple. It grows from July till autumn or winter, and prefers beech, oak and birch woods on argillaceous or calcareous soil, and has sometimes been observed in pine woods. It grows gregariously, often in company with T. brumale and (in France and Italy) T, melanosporum, and sometimes appears in French markets with these two species as well as with T. mesentcricum. The odour of T. aestivum is very strong and penetrating; it is generally esteemed powerfully fragrant, and its taste is considered agreeable. The common French truffle, T. melanosporum, is a winter species. It is a valuable article of commerce and is exported from France in great quantities. The tubers are globose, bright brown or black in colour, and rough with polygonal warts; the mature flesh is blackish grey, marbled within with white veins. It is gathered in autumn and winter in beech and oak woods, and is frequently seen in Italian markets. The odour of T. melanosporum is very pleasant, especially when the tubers are young, then somewhat resembling that of the strawberry; with age the smell gets very potent, but is never considered really unpleasant. The common Italian truffle, T. magnatum, is pallid ochreous or brownish buff in colour, smooth or minutely papillose, irregularly globose, and lobed; the interior is a very pale brownish liver colour veined with white. It grows towards the end of autumn in plantations of willows, poplars and oaks, on clayey soil. Sometimes it occurs in open cultivated fields. The odour of the mature fungus is very potent, and is like strong garlic, onion or decaying cheese. T. brumale, referred to above,

grows in Britain. It is a winter truffle, and is found chiefly under oaks and abele trees from October to December. Jt is black in colour, globose, more or less regular in shape, and is covered with sharp polygonal warts; the mature flesh is blackish grey marbled with white veins. The odour is very strong and lasts a long time; the taste is generally esteemed agreeable. Choeromyces meandri- formis, which occurs in Britain, is sometimes sold for 7". magnatum, the colour of the flesh of both species being somewhat similar. Scleroderma vulgare, the " false truffle," is extremely common on the surface of the ground in woods, and is gathered by Italians and Frenchmen in Epping Forest for the inferior dining-rooms of London where continental dishes are served. It is a worthless, offensive, and possibly dangerous fungus. A true summer truffle, T. mesentcricum, found in oak and birch woods on calcareous clay soil, is frequently eaten on the Continent. It is esteemed equal

to T. aestivum, of which it is regarded as a variety and probably grows in Britain. Another edible species, T. macrosporum, also grows in Britain, in clayey places under young beeches and oaks, on the borders of streams and roads, and sometimes in fields ; more rarely it grows in plantations of willow and poplar. It has a strong scent of onions or garlic somewhat similar to T. aestivum, but it is less esteemed on account of its toughness and its small size.

Terfezia leonis, a famous truffle of Italy, Algeria, Sardinia, &c, resembles externally a potato. It grows in March, April and May. Some persons eat it in a raw state, sliced and dipped in oil or egg. It is not scented, and its taste is generally considered insipid or soapy. Me.lanoga.sler variegatus, an ally of the puff-balls, and therefore (like Scleroderma) not a true truffle, is sometimes eaten in England and France. It has been, and possibly still is, occasionally sold in England under the name of " red truffle." It is a small ochreous- brown species with a strong aromatic and pleasant odour of bitter almonds. When the plant is eaten raw the taste is sweet and sugary, but when cooked it is hardly agreeable. The odour belong- ing to many truffles is so potent that their places of growth can be

readily detected by the odour exhaled from the ground. Squirrels, hogs and other animals commonly dig up truffles and devour them, and pigs and dogs have long been trained to point out the places where they grow. Pigs will always eat truffles, and dogs will do so occasionally ; it is therefore usual to give the trained pig or dog a small piece of cheese or some little reward each time it is successful. Truffles are reproduced by spores, which serve the same pur- pose as seeds in flowering plants ; in true truffles the spores are borne in transparent sacs (asci), from four to eight spores in each ascus. The asci are embedded in vast numbers in the flesh of the truffle.

Spores of the Chief European Truffles.

1, Tuber aestivum. 5, T. magnatum.

2, T. brumale. 6, Choeromyces meandriformis.

3, T. melanosporum. 7, Scleroderma vulgare.

4, T. mesentericum. 8, Melanogaster variegatus.

In false truffles the spores are free and are borne on minute spicules or supports. The spores of the chief European truffles, true and false, enlarged five hundred diameters, are shown in the accompanying illustration. Many references to truffles occur in classical authors. The truffle Elaphomyces variegatus was till quite recent times used, under the name of Hart's nut or Lycoperdon nut, on account of its supposed aphrodisiac qualities.

TRUJILLO, or Teuxillo, a seaport on the Atlantic coast of Honduras, in 15° 54′ N. and 86° 5′ W. Pop. (1905), about 4000. The harbour, an inlet of the Bay of Honduras, is sheltered on the north by the promontory of Cape Honduras; it is deep and spacious, but insecure in westerly winds. Maho- gany, dye-woods, sarsaparilla, cattle, hides and fruit are ex- ported; grain, flour, hardware and rum are imported. Trujillo was founded in 1524, and became one of the most prosperous ports of the new world, and the headquarters of a Spanish naval squadron. During the 17th century it was frequently and successfully raided by buccaneers, and thus lost much of its commerce. Still more has in modern times been diverted to Puerto Cortes and the

Bay Islands.

TRUJILLO, or Truxillo, a city of northern Peru, the see of a bishopric, and capital of the department of Libertad, about 315 m. N.N.W. of Lima and 15 m. from the Pacific coast, in lat. 8° 7′ S., long. 79° 9′ W. Pop. (1906, estimate), about 6500. The city stands on the arid, sandy plain (Mansiche, or Chimu), which skirts the coast from Paita south to Santa, a few miles north of the Moche or Chimu river, and at the northern entrance to the celebrated Chimu Valley. North and east are the ruins of an old Indian city commonly known as the Grand Chimu, together with extensive aqueducts and reservoirs. The city is partly enclosed by an old adobe wall built in 1686, and its buildings are in great part also constructed of adobe. The public institutions include a

university, two national colleges, one of which is for girls, an episcopal seminary, a hospital and a theatre.

Trujillo was once an important commercial centre and the metropolis of northern Peru, but the short railways running inland from various ports have taken away its commercial importance. The port of Salaverry (with which Trujillo is .connected by rail) is about 10 m. south-east, where the national government has constructed a long iron pier. Railways also extend northward to Ascope and eastward to Laredo, Galindo and Menocucho, and a short line runs from Roma, on the Ascope extension, to the port of Huanchaco. The only important manufactures of Trujillo are cigars and cigarettes.

Trujillo was founded in 1535, by Francisco Pizarro, who gave it the name of his native city in Spain. Its position on the road from Tumbez to Lima gave it considerable political and com- mercial importance, and some reflection of that colonial distinc- tion still remains. It suffered little in the War of Independence, but was occupied and plundered by the Chileans in 1882.

Of the ancient aboriginal city, or group of towns, whose ruins and burial-places cover the plain on every side of Trujillo, comparatively little is definitely known. The extent of these ruins, which cover an area 12 to 15 m. long by 5 to 6 m. wide, demonstrate that it was much the largest

Indian city on the southern continent. The principal ruins are 4 m. north of Trujillo, but others lie more to the eastward and still others southward of the banks of the Moche. The great aqueduct, which brought water to the several large reservoirs of the city, was 14 m. long and in some places in crossing the Chimu Valley it had an elevation of 60 ft.

The name of Grand Chimu is usually given to the ruined city, this being the title applied to the chief of the people, who were called the Chimu, or Yuncas. They were a race wholly distinct from the Incas, by whom they were finally conquered. They spoke a different language and had developed an altogether different civilization, and it is not unreasonable to presume that they were related to some earlier race of southern Mexico. Specimens of skilfully wrought ornaments of gold and silver, artistically made pottery, and finely woven fabrics of cotton and wool (alpaca), have been found in their huacas, or burial-places. Bronze was known to them, and from it tools and weapons were made. Their extensive irrigation works show that they were painstaking agriculturists, and that they were successful ones may be assumed from the size of the population maintained in so arid a region. Since the Spanish conquest their huacas have been opened and rifled, and many of the larger masses of ruins have been extensively mined in search of treasure, but enough still remains to impress upon the observer the magnitude of the city and the genius of the people who built it. Nothing is known of their history or of their political institutions, but these remains of their handiwork bear eloquent testimony that they had reached a degree of development in some respects higher even than that of the Incas.

See E. G. Squier, Peru (New York, 1877); and Charles Wiener, Perou et Bolivie (Paris, 1882).

TRUJILLO, a town of Spain, in the province of Caceres; on a hill 25 m. east of Caceres, and on the river Tozo, a sub-tributary of the Tagus. Pop. (1900), 12,512. The surrounding country is rugged, but produces wheat, wine, oils and fruit, besides livestock of all sorts, and much phosphorite. There are valuable forests close to the town. In the oldest part of Trujillo are the remains of a castle said to be of Roman origin, but rebuilt by the Moors and restored in

modern times. The Julia tower is also said to be Roman, like much of the fortifi- cations. The Roman name for the town was Turgalium. The principal parish church, Santa Maria, is a fine Gothic structure of the 15th century. Trujillo was a town of impor- tance in the middle ages. Pizarro, the conqueror of Peru, was born here about 1471, and built a palace, which still stands, in the main square of the town.

TRUMBALL, SIR WILLIAM (1639-1716), English politician, was a grandson of William Trumball (d. 1635), who was for sixteen years English resident at Brussels and afterwards a clerk of the privy council. Educated at St John's College, Oxford, young Trumball became a fellow of All Souls and settled down as a practising lawyer in Oxford and in London. He was made chancellor of the d : ocese of Rochester and was sent to Tangier on public business in 1683, one of his companions

on this errand being the diarist Pepys. In 1684 Trumball was knighted by Charles II. and in 1685 he was sent as envoy to France, where he worked hard on behalf of the English Protestants there who were threatened by the Revocation of the Edict of Nantes. In 1685 he became a member of Parliament, in 1687 he went as ambassador to Constantinople, and in 1694 he was made a lord of the treasury. From May 1695 until December. 1697 he was a secretary of state under William III. He died on the 14th of December 1716. His son, William Trumball (1 708-1 760), had an only daughter, who became the wife of the Hon. Martin Sandys. She was thus the ancestress of the later marquesses of Downshire.

Many of Trumball's letters are in the British Museum and in the Record Office, London. Trumball was on friendly terms with Pierre Bayle and with Dryden, whom he advised to translate Virgil. He was also very intimate with Pope, whom he influenced in several ways, especially in urging him to make a translation of Homer.

TRUMBULL, JAMES HAMMOND (1821-1897), American

scholar, was born in Stonington, Connecticut, on the 20th of December 1821. He studied at Yale, but ill-health prevented his graduation. He was state librarian in 1854-1855, assistant- secretary of state of Connecticut in 1847-1852 and in 1858- 1861, and secretary of state in 1861-1866; and was a prominent member of the Connecticut Historical Society, of which he was president in 1 863-1 889, the National Academy of Science, to which he was elected in 1872, and of other learned societies. He died in Hartford on the 5th of August 1897. He wrote Historical Notes on some Provisions of the Connecticut Statutes (1860-1861) and The True Blue Laws of Connecticut (1876), and edited The Colonial Records of Connecticut (3 vols., 1850- 1859). He is better known, however, as a student of the Indian dialects of New England.

He edited Roger Williams's Key to the Language of America (1866), and wrote The Composition of Indian Geographical Names (1870), The Best Methods of Studying the Indian Languages (1871), Indian Names of Places in . . . Connecticut with Interpretations (1881) and other works on similar subjects.

TRUMBULL, JOHN (1750-1831), American poet, was born in what is now Watertown, Connecticut, where his father was a Congregational preacher, on the 24th of April 1750. At the age of seven he passed his entrance examinations at Yale, but did not enter until 1763; he graduated in 1767, studied law there, and in 1 771-1773 was a tutor. In 1773 he was admitted to the bar, in 17 73-1 7 74 practised law in Boston, working in the law- office of John Adams, and after 1774 practised in New Haven. He was state attorney in 1789, a member of the Connecticut Assembly in 1792 and 1800, and a judge of the Superior Court in 1801-1819. The last six years of his life were spent in Detroit, Michigan, where he died on the 10th of May 1831. While studying at Yale he had contributed in 1769-17 70 ten essays, called "The Meddler," imitating The Spectator, to the Boston Chronicle, and in 1770 similar essays, signed "The Correspondent " to the Connecticut Journal and New Haven Post Boy. While a tutor he wrote his first satire in verse, The Progress of Dulness (17 7 2-1 7 73), an attack in three poems on educational methods of his time. His great poem, which ranks him with Philip Freneau and Francis

Hopkinson as an American political satirist of the period of the War of Independence, was McFingal, of which the first canto, ” The Town-Meeting,” appeared in 1776 (dated 1775). This canto, about 1500 lines, contains some verses from ” Gage’s Proclamation,” published in the Connecticut Courant for the 7th and the 14th of August 1775; it portrays a Scotch Loyalist, McFingal, and his Whig opponent, Honorius, evidently a portrait of John Adams. This first canto was divided into two, and with a third and a fourth canto was published in 1782. After the war Trumbull was a rigid Federalist, and with the ” Hartford Wits ” David Humphreys, Joel Barlow and Lemuel Hopkins, wrote the Anarchiad, a poem directed against the enemies of a firm central government.

See the memoir in the Hartford edition of Trumbull’s Poetical Works (3 vols., 1820); James Hammond Trumbull’s The Origin of ” McFingal ” (Morrisania, New York, 1868); and the estimate in M. C. Tyler’s Literary History of the American Revolution (New York,

1897).

TRUMBULL, JOHN (1756-1843), American artist, was born at Lebanon, Connecticut, on the 6th of June 1756, the son of Jonathan Trumbull (1710-1785), governor of Connecticut. He graduated at Harvard in 1773, served in the War of Inde- pendence, rendering a particular service at Boston by sketching plans of the British works, and was appointed second aide-de- camp to General Washington and in June 1776 deputy adjutant- general to General Gates, but resigned from the army in 1777. In 1780 he went to London to study under Benjamin West, but his work had hardly begun when the news of the arrest and execution of Major Andre, who was deputy adjutant-general in the English army, suggested the arrest of Trumbull as having been an officer of similar rank in the Continental army; he was imprisoned for seven months. In 1784 he was again in London working under West, in whose studio he painted his ” Battle of Bunker Hill ” and ” Death of Montgomery,” both of which are now in the Yale School of Fine Arts. In 1785 Trumbull went to Paris, where he made portrait sketches of French officers for ” The Surrender of Cornwallis,” and began, with the assistance of Jefferson, ” The Signing of the Declaration of Independence,” well-

known from the engraving by Asher B. Durand. These paintings, with " The Surrender of Burgoyne," and " The Resignation of Washington," were bought by the United States government and placed in the Capitol at Washington. Trumbull's " Sortie from Gibraltar " (1787), owned by the Boston Athenaeum, is now in the Boston Museum of Fine Arts, and a series of historical paintings, the " Trumbull Gallery," by far the largest single collection of his works (more than 50 pictures), has been in the possession of Yale College since 1831, when Trumbull received from the college an annuity of $1000. His portraits include full lengths of General Washington (1790) and George Clinton (1791), in the city-hall of New York — where there are also full lengths of Hamilton and of Jay; and portraits of John Adams (1797), Jonathan Trumbull, and Rufus King (1800); of Timothy Dwight and Stephen Van Rensselaer, both at Yale; of Alexander Hamilton (in the Metropolitan Museum of Art, New York City, and in the Boston Museum of Fine Arts, both taken from Ceracchi's bust) ; a portrait of himself painted in 1833; a full length of Washington, at Charleston, South Carolina; a full length of Washington in military costume (1792), now at Yale; and portraits of President and Mrs Washington (1794), in the National Museum at Washington. Trumbull's own portrait was painted by Stuart and by many others. In 1794 Trumbull acted as secretary to John Jay in London during the negotiation of the treaty with Great Britain, and in 1796 he was appointed by the commissioners sent by the two countries the fifth commissioner to carry out the seventh article of the treaty. He was president of the American Academy of Fine Arts in 1816-1825. He died in New York on ih.2 10th of November 1843.

See his Autobiography (New York, 1841) ; J. F. Weir, John Trum- bull, A brief Sketch of His Life, to which is added a Catalogue of his Works (New York, 1901) ; and John Durand, " John Trumbull," American Art Review, vol. ii. pt. 2, pp. 181-191 (Boston, 1881).

TRUMBULL, JONATHAN (1710-1785), American political leader, was born at Lebanon, Connecticut, on the 1 2th of October 1 7 10. He graduated at Harvard in 1727, and began the study of theology, but in 1731 engaged in business with his father. He next studied law, was elected to the Assembly in 1773, and held public office almost

continuously afterward. He served for seven years in the Assembly, being Speaker for three years, for seventeen years as county judge of Windham county, for twenty-two years (after 1740) as governor's assistant, for two years as deputy-governor (1 767-1 769), and for three years (1 766-1 769) as chief justice of the colony. In 1769 he was elected governor and continued in office until his voluntary retirement in 1784. During the War of Independence he was a valued counsellor of Washington. The story that the term " Brother Jonathan," a sobriquet for the United States, origi- nated in Washington's familiar form of addressing him seems to be without any foundation. After the war Trumbull was a strong Federalist. He died in Lebanon on the 17th of August 1785

His public papers have been printed in the Massachusetts Histori- cal Society's Collections, 5th series, vols, ix.-x. (Boston, 1885-1888), and 7th series, vols, ii.-iii. (1902). See I.W. Stuart, Life of Jonathan Trumbull, sen. (Boston, 1859).

His son Jonathan (1740-1809) graduated at Harvard in 1759, served in the War of Independence as paymaster-general of the northern department in 1775-1778 and as a military secre- tary of Washington in 1778-1783, and was a member of the national House of Representatives in 1789-1795, serving as Speaker in 1791-1793, and of the United States Senate in 1795- 1796; he was lieutenant-governor of Connecticut in 1796-1798, and governor in 1798-1809. Another son, Joseph (1737-1778), was a member of the first Continental Congress (1774-1775), became commissary-general of stores of the Continental army in July 1775 and commissary-general of purchases in June 1777, resigned in August 1777, and from November 1777 to April 1778 was commissioner for the board of war. A grandson of the first Jonathan, Joseph (1782-1861), was a Whig represen- tative in Congress in 1834-1835 and in 1839-1843, and was governor of Connecticut in 1849-1850.

TRUMBULL, LYMAN (1813-1896), American jurist and political leader, was born at Colchester, Connecticut, on the 12th of October 1813, and was a grandson of Benjamin

Trumbull (1735-1820), a Congregational preacher and the author of a useful Complete History of Connecticut (2 vols., 1818). He taught in Georgia, studied law, and was admitted to the bar in 1837. Removing to Belleville, Illinois, in the same year, he was elected to the state House of Representatives as a Democrat in 1840, and in 1841-1843 was secretary of state of Illinois. In 1848-1853 he was a justice of the state Supreme Court, and in 1855-1873 was a member of the United States Senate. Elected as an Anti-Nebraska Democrat, he naturally joined the Re- publicans, and when this party secured control in the Senate he was made chairman of the important judiciary committee, from which he reported the Thirteenth Amendment to the Constitution of the United States abolishing slavery. Through- out the Civil War he was a trusted counsellor of the president. In the impeachment trial of President Andrew Johnson he was one of the seven Republicans who voted to acquit, and he after- wards returned to the Democratic party. After 1873 he practised law in Chicago, was the Democratic candidate for governor of Illinois in 1880, became a Populist in 1894, and defended the railway strikers in Chicago in the same year. He died in Chicago on the 25th of June 1896.

TRUMP (1) (O. Fr. trompe), originally the name of a musical instrument, of which ” trumpet ” is a diminutive; the term is now chiefly used in the sense of the sound of a trumpet, or a sound resembling it, such as is’ made by an elephant. It has been usually accepted that the Romanic forms (cf . Span, and Port, trompa) represent a corruption of Latin tuba, tube. On the other hand a distinct imitative or echoic origin is sometimes assigned. (2) In the sense of a playing card belonging to the suit which beats all other cards of other suits for the period during which its rank lasts, “trump” is a corruption of ” triumph.” The name was first used of a game of cards, also known as ” ruff,” which was the parent of the modern game of whist. There are traces in English of an early confusion with a term meaning to deceive or trick, cf. ” trumpery,” properly deceit, imposture, hence idle talk, gossip, now chiefly used as an adjective, worthless, trivial. This is an adaptation of French tromper, to deceive, which, according to the generally received explanation, meant ” to play on the trumpet,” se tromper de quelqu’un being equivalent to play with a

person, hence to cheat.

TRUMPET (Fr. trompetie, clairon; Ger. ,Trompete, Klarino, Trummet; Ital. tromba, trombetta, clarino), in music, a brass wind instrument with cup-shaped mouthpiece and a very character- istic tone. It consists of a brass or silver tube with a narrow cylindrical bore except for the bell joint, forming from \ to \ of the whole length, which is conical and terminates in a bell of moderate diameter. The tube of the trumpet is doubled round upon itself to form a long irregular rectangle with rounded

corners. A tuning slide consisting of two U-shaped cylindrical tubes fitting into each other is interpolated between the bell joint and the long cylindrical joint to which the mouthpiece is attached. The mouthpiece consists of a hemispherical cup with a rim across which the lips stretch. The shape of the cup, and more especially of the bottom, in which is pierced a hole com-‘ municating with the main bore, is of the greatest importance on account of its influence on the tone quality and on the production of the higher harmonics (see Mouthpiece). The shallower and smaller the cup the more easily are the higher harmonics pro- duced; the sharper the angle at the bottom of the cup the more brilliant and incisive is the timbre, given, of course, the correct style of blowing. The diameter of the cup varies according to the pitch and to the lip-power of the player who chooses one to suit him. See Horn for the laws governing the acoustic proper- ties of brass tubes and the production of sound by means of the lips stretched like a vibrating membrane across the mouthpiece.

There are three principal kinds of trumpets : (I) the natural trumpet , mainly used in cavalry regiments, in which the length of the tube and pitch are varied by means of crooks; (2) the slide and double-slide trumpets, in which a chromatic compass is obtained, as in the trombone, by double tubes sliding upon one another without loss of air; (3) the valve trumpet, similar in its working to ali other valve instruments. The first and second of these alone give the true trumpet timbre; the tone of the valve trumpet approximates to that of the cornet, nevertheless, it is now almost universally used.

In the trumpet the notes of the harmonic series from the

3rd to the 10th or 1 6th upper partials are produced by the varied tension of the lips and pressure of breath called overblowing. The funda- mental and the second harmonic are rarely obtainable, and are therefore left out of consideration ; the next octave from the 4th to the 8th harmonics contains only the 3rd, 5th and minor 7th, and is therefore mainly suitable for fanfare figures based on the common chord. The diatonic octave is the highest and its upper notes are only reached by very good players on trumpets of medium pitch. Examination of the scoring for the trumpet before any satisfactory means of bridging over the gaps in the compass had been found, shows how little the composers, and especially Bach, allowed them- selves to be daunted by the limited resources at their disposal. A curious phenomenon has been observed l in connexion with the harmonic series of the trumpet, when the instrument is played by means of a special clarino mouthpiece (a shallow one enabling the performer to reach the higher harmonics), in which the passage at the bottom of the cup inaugurated by the sharp angle (known as the grain in French) is prolonged in cylindrical instead of conical bore for a distance of about 10 cm. (4 in.) right into the main tube. This peculiar construction of the mouthpiece, which might be considered insignificant, so upsets the acoustic properties of the tube that extra notes can be interpolated between the legitimate notes of the harmonic series thus : —

Fig. 1. — Military Trumpet in F (Besson).

P = E?

EEj^i = J^^ = fe

:&e.

4 5 6 7 8

The black notes represent the extra notes, which in the next octave transform the diatonic into a chromatic scale.

This phenomenon may perhaps furnish an explanation of some peculiarities in the scoring of Bach and other composers of his day, and also in accounts of certain performances on the trumpet which have read 2 as fairy

tales. It is probable that the clarino mouthpiece was one of the secrets of the gilds which has remained undiscovered till now. D. J. Blaikley writes 3 : ” I had an oppor- tunity yesterday of trying the trumpet mouthpiece as describecf by Mahillon with the ‘ grain ‘ or ‘ throat,’ as we would call it, ex- tended for about 10 cm. and terminating abruptly. With such a mouthpiece, used by itself without any trumpet, I could easily get

notes

from H

:toi

-| that is to say, that a continuous

glide ranging over that compass can be made, the pitch at any moment being determined by the lip-pressure, rather than by the small air-column. When such a distorted mouthpiece is fitted to a

1 See V. Mahillon, La Trompette, son histoire, sa theorie, sa con- struction (Brussels and London, 1907, pp. 29-30).

2 See Fetis, Biographie universelle des musiciens, ” Fantini.” 8 Letter to the present writer, 6th of February 1909.

trumpet, we have a resonator whose proper tones are disturbed and all the notes sounded are capable of being much modified in pitch by the lips. For instance, we may regard the ‘ d ‘ as either No. 4 sharpened or No. 5 flattened, merely by lip-action, and other notes in the same way.”

The compass of the three kinds of trumpets in real sounds is as follows: —

?or the natural trumpet with crooks—

I

cˆ = to:

(b#-)

For the slide or double-slide trumpet with all chromatic semitones —

^

#«=»

£:

£

This instrument is a non-transposing one, the music being sounded as written.

For the valve trumpet — 3?”

V

The material of which the tube is made has nothing to do with the production of that brilliant quality of tone by which the trumpet is so easily distinguished from every other mouthpiece instrument; the difference is partly due to the distinct form given to the basin of the mouthpiece, as stated above, but principally to the proportions of the column of air determined by the bore. The difference in timbre between trumpet and trombone is accounted for by the wider bore and differently shaped mouthpiece of the latter instrument.

Tonguing, both double and triple, is used with great effect on the trumpet: this device consists in the articulation with the tongue of the syllables te-ke or ti-ke repeated in rapid succession for groups of two or four notes and of te-ke-ti for triplets.

We have no precise information as to the form which the lituus, one of the ancestors of the modern trumpet, assumed during the middle ages, and it is practically unrepresented in the miniatures and other antiquities, though there is a miniature in the Bible, presented in 850 to Charles the Bald, which places the lituus in the hands of one of the companions of King David. We are not, however, warranted in concluding from this that the Etruscan instrument was in use in the 9th century. The lituus or

cavalry trumpet of the Romans seems to have vanished with the fall of the Roman Empire, for although the name occasion- ally finds a place in Latin vocabularies, the instrument and name are both unrepresented in the development of musical instruments of western Europe: its successor, the cavalry trumpet of the 15th and succeeding centuries, was evolved from the straight busine, an instrument traced, by means of its name no less than by the delicate proportions of its tube and the shape of the bell, to the Roman buccina (q.v.). The straight busines, if we may judge from the presentments made by various artists, were not all made with bores of the same calibre, some having the wider bore of the trombone, others that of the trumpet. They abound in the illuminated MSS. of the nth to the 14th centuries. The uses to which they are put, as the instruments of angels, of heralds, of trumpeters on horseback and on foot, at court banquets and functions of state, form additional proof of their identity. Fra Angelico (d. 1455) painted angels with trumpets having either straight or zigzag tubes, the shortest being about 5 ft. long. The perfect representation of the details, the exactness of the proportions, the natural pose of the angel players, suggest that the artist painted the instrument from real models.

The credit of having bent the tube of the trumpet in three parallel branches, thus creating its modern form, has usually been claimed for a Frenchman named Maurin (1498-1515). But the transformation was really made much earlier, probably in the Low Countries or north Italy; in any case it had already been accomplished in the bas-reliefs of Luca della Robbia intended to ornament the organ chamber of the cathedral of Florence where a trumpet having the tube bent back as just described is very distinctly figured. From the beginning of the 16th century we have numerous sources of information. Virdung 2 cites three

1 In the Bibliotheque Nationale at Paris, reproduced in facsimile by Count Auguste de Bastard (Paris, 1883).

2 Musica getulscht und auszgezogen (Basel, 151 1).

kinds of mouthpiece instruments — the Felttrumet, the Clareta, and the Thurner Horn; unfortunately he does not mention their distinctive characters, and it is impossible to

make them out by examination of his engravings. Probably the Felttrumet and the Clareta closely resembled each other; but the compass of the former, destined for military signals, hardly went beyond the eighth proper tone, while the latter, reserved for high parts, was like the clarino (see below). The Thurner Horn was probably a kind of clarino or clarion used by watchmen on the towers. The Trummet and the Jager Trommet are the only two mouthpiece instruments of the trumpet kind cited by Praetorius. 3 The first was tuned in D at the chamber pitch or ” Cammerton,” but with the help of a shank it could be put in C, the equivalent of the ” chorton ” D, the two differing about a tone. Sometimes the Trummet was lowered to B and even Bl?. The Jager Trommet, or ” trompette de chasse,” was composed of a tube bent several times in circles, like the posthorn, to make use of a comparison employed by Praetorius himself. His drawing does not make it clear whether the column of air was like that of the trumpet; there is therefore some doubt as to the true character of the instru- ment. The same author further cites a wooden trumpet (holzern Trommet), w r hich is no other than the Swiss Alpenhorn or the Nor- wegian luur. The shape of the trumpet, as seen in the bas-reliefs of Luca della Robbia, was retained for more than three hundred years: the first - alterations destined to revolutionize the whole technique of the instrument were made about the middle of the 1 8th century. Notwithstanding the imperfections of the trumpet during this long period, the performers upon it acquired an astonishing dexterity.

The usual scale of the typical trumpet, that in D, is

B50

E

i*

4

£

= < 2C

:t = t =

2 3 4 6 6 7 8 9 10 11 12 13 14 15 16

Praetorius exceeds the limits of this compass in the higher range, for he says a good trumpeter could produce the subjoined notes. This opinion is shared by Bach, ˆ a _ _& j fcˆ ””

!g_

who, in a trumpet solo which ends the cantata ” Der Himmel lacht,” wrote up to the twentieth B& ‘ — mr

harmonic. So considerable a com- j, ‘ ‘

pass could net be reached by one, 17 18 19 20 21

instrumentalist: the trumpet part had therefore to be divided, and each division was designated by a special name. 4 The part that was called principal went from the fifth to the tenth of these tones. The higher region, which had received the name of ” clarino,” was again divided into two parts: the first began at the eighth proper tone and mounted up towards the extreme high limit of the compass, according to the skill of the executant; the second, beginning at the sixth proper tone, rarely went beyond the twelfth. Each of these parts was confided to a special trumpeter, who executed it by using a larger or a smaller mouthpiece. Some of the members of the harmonic series also received special names ; the fundamental or first proper note was called Flattergrob, the second Grobstimme, the third Faulstimme, the fourth Mittetstimme.

Playing the clarino differed essentially from playing the military trumpet, which corresponded in compass to that called principal. Compelled to employ very small mouthpieces to facilitate the emission of very high sounds, clarino players could not fail to alter the timbre of the instrument, and instead of getting the brilliant and energetic quality of tone of the mean register they were only able to produce more or less sonorous notes without power and splendour. Apart from this inconvenience, the clarino presented numerous deviations from just intonation. Hence the players of that time failed to obviate the bad effects inevitably resulting from the natural imperfection of the harmonic scale of the trumpet in that

extreme part of its compass; in the execution, for instance, of the works of Bach, where the trumpet should give sometimes

j3# # the instrumentalist could

, and sometimes JCI = l!cz = . only command the eleventh

fc) — proper tone, which is neither

V the

ˆ

one nor the other of these. Further, the thirteenth proper tone, for which r, ■ *-

is written, is really too flat, and but little can be done jf £

to remedy this defect, since it entirely depends upon the ˆ .

laws of resonance affecting columns of air. tf ”

3 Organographia (Wolfenbiittel, 1619).

4 Musicus airrodiSoKTos oder der sich selbst informirende Musicus (Eisel, Erfurt, 1738).

Since the abandonment of the clarino (about the middle of the 1 8th century) our orchestras have been enriched with trumpets that permit the execution of the old clarino parts, not only with perfect justness of intonation, but with a quality of tone that is not deficient in character when compared with the mean register of the old principal instrument. The introduction of the clarinet or the so-called little clarino, although it is a wood wind instrument played with a reed, is one of the causes which led to the abandonment of the older instalment and may explain the preference given by the composers of that epoch to the mean register of the trumpet. The clarino having disappeared before Mozart’s day, he had to change the trumpet parts of Handel and Bach to allow of their execution by the performers of his own time. It was now

that crooks began to be frequently used. Trumpets were made in F instead of in D, furnished with a series of shanks of increasing length for the tonalities of E, Eb, D, Db, C, B, Bb, and sometimes even A.

The first attempts to extend the limited resources of the instru- ment in its new employment arose out of Hampel's Inventions- Horn, in which, instead of fixing the shanks between the mouth- piece and the upper extremity, they were adapted to the body of the instrument itself by a double slide, upon the two branches of which tubes were inserted bent in the form of a circle and gradually lengthened as required. This system was applied to the trumpet by Michael Woegel (born at .Rastatt in 1748), whose " invention trumpet " had a great success, notwithstanding the unavoidable imperfection of a too great disparity in quality of tone between the open and closed sounds. It is a curious fact that the sackbut or early trombone was merely a trumpet with a slide, or a draw trumpet, and that it was known as such in England, Scotland, Spain, Holland and Italy. Yet as soon as the powerful family of tenor and bass trombones had been created, the slide trumpet seems to have lost its identity and to have become merged in the alto trombone from which it differed mainly in the form of the bent tube. The slide trumpet appears to have been re-invented in the 1 8th century according to Johann Ernst Altenburg, or as some

sQce

Se

u

4 = ™«iJ

Fig. 2. — Modern Slide Trumpet F to C (Besson).

writers put it, " the slide was adapted to it from the trombone." It was mentioned in 1700 by Kuhnau. 1 Any one wishing to be convinced of this re-incarnation may compare the modern slide- trumpet with the original slide-trumpet or alto sackbut in the Grimiani Breviary? a MS. of the 15th century, and with E. van der Straeten's reproduction 3 of an old engraving by Galle and Stradan

from the Encomium Musices in which the forms are identical except that in the modern slide-trumpet the bell reaches the level of the U-shaped bottom of the slide.

(From the Encomium Musices.)

Fig. 3. — Slide Trumpet 16th century.

The slide trumpet is still used in England in a somewhat modified form. The slide is a short one allowing of four positions. In 1889 a trumpet was constructed by Mr W. Wyatt with a double slide which gave the trumpet a complete chromatic compass. This instrument, which has the true brilliant trumpet tone, requires delicate manipulation, for the shifts are necessarily very short. About 1760 Kolbel, a Bohemian musician, 4 applied a key to the bugle, and soon afterwards the trumpet received a similar addition. By opening this key, which is placed near the bell, the instrument was raised a diatonic semitone, and by correcting errors of intona- tion by the tension of the lips in the mouthpiece the following diatonic succession was obtained. M 1 1 This invention was

— improved in 1 801 by

— Weidinger, 6 trum- peter to the imperial

court at Vienna, who increased the number of keys and thus made

1 Der musikalische Quacksalber, p. 83.

2 Brit. Mus. Facsimile, 61, pi. 9.

3 La Musique aux Pays-Bas, vi. 252.

4 Versuch eitier Anleitung zur heroisch-musikalischen Trompeter- und Pauker-Kunst, p. 12 (Halle, 1795).

‘ See Allg. musikal. Ztg. (November 1802), p. 158; (January 1803) p. 245; and E. Hanslicks, Gesch. des ConceHwesens in Wien (1869), p. 119.

^

£

the trumpet chromatic throughout its scale. 6 The instrument shown in fig. 4 is in G; the keys are five in number, and as they open one after another or in combination it is possible to connect the second proper tone with the third by chromatic steps, and thus produce the following succession :—

tr = t- = t-ztr-. : ± — rt— d— zr~

The number of keys was applied to fill up the gaps between the extreme sounds of the interval of a fifth; and a like result was arrived at more easily for the intervals of the fourth, the major third, &c, furnished by the proper tones of 3, 4, 5, &c. But, though the keyed trumpet was a notable improvement on the invention trumpet, the sounds obtained by means of the lateral openings of the tube did not possess the qualities which distinguish sounds caused by the resonance of the air-column vibrating in its entirety. But in 1815 Stolzel made a genuine chromatic trumpet by the invention of the Ventile or piston. 7 The natural-trumpet is now no longer employed except in cavalry regiments. 8 It is usually in Eb. The bass trumpet in Eb, which is an octave lower, is sometimes, but rarely, used. Trumpets with pistons are generally constructed in F, with crooks in E and Et >. In Germany trumpets in the high Bb with a crook in A are very often

used in the orchestra. They are easier for

cornet a piston players than the trumpet in F.

trumpet in Bb with combined tuning and transposing slides, for

changing into the key of A, known as the ” Proteano ” trumpet,

Fig. 4. — Keyed Trumpet.

A quick change

TransDosina Slide TuninaSlide

Fig. 5. — Proteano Trumpet in Bb and A (Besson).

has been patented by Messrs Besson & Co. The transposing slide always remains at the correct length, and change of the tuning slide does not necessitate readjustment of the former. This com- bination slide is fitted to the ordinary valve trumpet as well as to the trumpet with ” enharmonic ” valves. Mahillon constructed for the concerts of the Conservatoire at Brussels trumpets in the high D, an octave above the old trumpet in the same key. They permit the execution of the high trumpet parts of Handel and J. S. Bach. The bass trumpet with pistons used for Wagner’s tetralogy is in Eb, in unison with the ordinary trumpet with crooks of D and C ; but, when constructed so as to allow of the production of the second proper tone as written by this master, this instrument belongs rather to the trombones than to the trumpets.

(V. M.; K. S.)

TRUMPET, Speaking and Hearing. The speaking trum- pet, though some instrument of the kind appears to have been in earlier use, is connected in its modern form with the name of Athanasius Kircher and that of Sir Samuel Morland, who in 1670 proposed to the Royal Society of London the question of

6 Robert Eitner made a curious confusion between the keyed and valve trumpets (Klappen-und Ventil-Trompete). In an article entitled Wer hat die Ventil-Trompete

erfunden? (Monatshefte fur Musikwissenschaft, p. 41, Berlin, 1881) he deprives Stolzel of the credit of the invention of the valve in favour of Weidinger, ridicul- ing the notion that the keyed and the valve trumpets were not one and the same thing. Following up the idea in his Tonkunstler Lexikon, he leaves out Stolzel's name and ascribes to Weidinger the invention of the valve, with a reference to his article.

7 For this ingenious mechanism, see Valve; also Gottfried Weber, Uber Ventilhorn und Trompete mit 3 Ventilen, Caecilia xvii. 73-104 (Mainz, 1835); and Allg. musikal. Ztg. xxiii. 411 (Leipzig, 1821); also A. Ung, " Verbesserung der Trompete und ahnlicher Instrumente," ibid. (1815), xviii. 633.

8 For accounts of the early use of the trumpet as a signalling and cavalry instrument in the British army, see Sir Roger Williams, A Brief Discourse of War, -p. 9, &c. (London, 1590); Grose, Military Antiquities, ii. 41 ; Sir S. D. Scott, The British Army, ii. 389-400 (London, 1868); and H. G. Farmer, Memoirs of the Royal Artillery Band (London, 1904).

the best form for a speaking trumpet. Lambert, in the Berlin Memoirs for 1763, seems to have been the first to give a theory of the action of this instrument, based on an altogether imaginary analogy with the behaviour of light. In this theory, which is still commonly put forWard, it is assumed that sound, like light, can be propagated in rays. This, however, is possible only when the aperture through which the wave-disturbance passes into free air is large compared with the wave-length. If the fusiform mouth of the speaking trumpet were half a mile or so in radius, Lambert's theory might give an approximation to the truth. But with trumpets whose aperture is only a foot in diameter at the most the problem is one of diffraction.

In the hearing trumpet, the disturbance is propagated along the converging tube much in the same way as the tide-wave is propaˆ gated up the estuary of a tidal river. In speaking

and hearing trumpets alike all reverberation of the instrument should be avoided by making it thick and of the least elastic materials, and by covering it externally with cloth. (See Sound.)

TRUMPETER, or Trumpet-Bird, the literal rendering in 1747, by the anonymous English translator of De la Condamine's travels in South America (p. 87), of that writer's " Oiseau trompette " (Mem. de V Acad, des Sciences, 174s, p. 473), a bird, which he says was called " Trompetero " by the Spaniards of Maynas on the upper Amazons, from the peculiar sound it utters. He added that it was the " Agami " of the inhabitants of Para and Cayenne, 1 wherein he was not wholly accurate, since those

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(After Mitchell.)

White- winged Trumpeter (Psophia leucoptera). birds are specifically distinct, though, as they are generically united, the statement may pass. But he was also wrong, as had been P. Barrere (France equinoxiale, p. 132) in 1741, in identifying the " Agami " with the " Macucagua " of Marcgrav, for that is a Tinamou (q.v.); and both still more wrongly accounted for the origin of the peculiar sound just mentioned, whereby Barrere was soon after led (Ornith. Spec. Novum, pp. 62, 63) to apply to the bird the generic and vulgar names of Psophia and " Petteuse," the former of which, being unfortu- nately adopted by Linnaeus, has ever since been used, though in 1766 and 1767 Pallas (Miscellanea, p. 67, and Spicilegia, iv. 6), and in 1768 Vosmaer (Descr. du Trompette Americain, p. 5), showed that the notion it conveys is erroneous. Among English writers the name " Trumpeter " was carried on by Latham and others so as to be generally accepted, though an author may occasionally be found willing to resort to the native " Agami," which is that almost always used by the French.

P. L. Sclater and O. Salvin in their Nomenclator (p. 141) admit 6 species of Trumpet-Birds: (1) the original Psophia crepitans of Guiana; (2) P. napensis of eastern Ecuador (which is very likely

1 Not to be confounded with the " Heron Agami " of Buffon (Oiseaux, ii. 382), which is the Ardea agami of other writers.

the original " Oiseau trompette " of De la Condamine) ; (3) P. ochroptera from the right bank of the Rio Negro ; (4) P. leucoptera from the right bank of the upper Amazons; (5) P. viridis from the right bank of the Madeira; and (6) P. obscura from the right bank of the lower Amazons near Para. And they have remarked in the Zoological Proceedings (1867, p. 592) on the curious fact that the range of the several species appears to be separated by rivers, a statement confirmed by A. R. Wallace (Geoer. Distr. Animals, ii. 358) ; and in connexion therewith it may be observed that these birds have short wings and seldom fly, but run, though with a peculiar gait, very quickly. A seventh species P. cantatrix, from Bolivia, has since been indicated by W. Blasius (Joum. f. Ornith., 1884, pp. 203-210), who has given a monographic summary of the whole group very worthy of attention. The chief distinctions between the species lie in colour and size, and it will be here enough to describe briefly the best known of them, P. crepitans. This is about the size of a large barndoor fowl; but its neck and legs are longer, so that it is a taller bird. The head and neck are clothed with short velvety feathers ; the whole plumage is black, except that on the lower front of the neck the feathers are tipped with golden green, changing according to the light into violet, and that a patch of dull rusty brown extends across the middle of the back and wing-coverts, passing into ash-colour lower down, where they hang over and conceal the tail. The legs are bright pea-green. The habits of this bird are very wonderful, and it is much to be wished that fuller accounts of them had appeared. The curious sound it utters, noticed by the earliest observers, has been already mentioned, and by them also was its singularly social disposition towards man described; but the information supplied to Buffon (Oiseaux, iv. 496-501) by Manoncour and De la Borde, which has been repeated in many works, is still the best we have of the curious way in which it becomes semi-domesticated by the Indians and colonists and shows strong affection for its owners as well as for their living property — poultry or sheep — though in this re- claimed condition it seems never to breed. 2 Indeed

nothing can be positively asserted as to its mode of nidification ; but its eggs, according to C. E. Bartlett, are of a creamy white, rather round, and about the size of bantams'. C. Waterton in his Wanderings (Second Journey, chap, iii.) speaks of falling in with flocks of 200 or 300 " Waracabas," as he called them, in Demerara, but added nothing to our knowledge of the species; while the contributions of Trail (Mem. Wern. Society, v. 523-532) and as Dr Hancock (Mag. Nat. History, 2nd series, vol. ii. pp. 490-492) as regards its habits only touch upon them in captivity.

To the trumpeters must undoubtedly be accorded the rank of a distinct family, Psophiidae; but like so many other South-American birds they seem to be the less specialized descendants of an ancient generalized group — perhaps the common ancestors of the Rallidae and Gruidae. The structure of the trachea, though different from that described in any Crane (q.v.), suggests an early form of the structure which in some of the Gruidae is so marvellously developed, for in Psophia the windpipe runs down the breast and belly im- mediately under the skin to within about an inch of the anus, whence it returns in a similar way to the front of the sternum, and then enters the thorax. Analogous instances of this forma- tion occur in several other groups of birds not at all allied to the Psophiidae. (A. N.)

TRUNK (Fr. tronc, Lat. truncus, cut off, maimed), properly the main stem of a tree from which the branches spring, espe- cially the stem when stripped of the branches; hence, in a transferred sense, the main part of a human or animal body without the head, arms or legs. It is from this last sense that the term " trunk-hose " is derived. These were part of the typical male costume of the 16th century, consisting of a pair of large puffed and slashed over-hose, reaching from the waist to the middle of the thigh, the legs clad in the long hose being thrust through them; the upper part of the body was covered by the jerkin or jacket reaching to the thigh (see Costume). The word "trunk" as applied to the elongated proboscis of the elephant is due to a mistaken confusion of French trompe, trump, with " trunk " meaning the hollow stem of a tree. A somewhat obscure meaning of French tronc, i.e. an alms-box, has given rise to the general use of " trunk " for a form of

travellers' luggage.

TRURO, THOMAS WILDE, ist Baron (1782-1855), lord chancellor of England, was born in London on the 7th of July

2 In connexion herewith may be mentioned the singular story told by Montagu (Orn. Diet., Suppl. Art. " Grosbeak, White-winged "), on the authority of the then Lord Stanley, afterwards president of the Zoological Society, of one of these birds, which, having apparently escaped from confinement, formed the habit of attending a poultry- yard. On the occasion of a pack of hounds running through the yard, the trumpeter joined and kept up with them for nearly three miles!

1782, being the second son of Thomas Wilde, an attorney. He was educated at St Paul's School and was admitted an attorney in 1805. He subsequently entered the Inner Temple and was called to the bar in 1817, having practised for two years before as a special pleader. Retained for the defence of Queen Caroline in 1820 he distinguished himself by his cross- examination and laid the foundation of an extensive common law practice. He first entered parliament in the Whig interest as member for Newark (1831-1832 and 1835-1841), afterwards representing Worcester (1 841-1 846) . He was appointed solicitor- general in 1839, and became attorney-general in succession to Sir John (afterwards Baron) Campbell in 184 1. In 1846 he was appointed chief justice of the common pleas, an office he held until 1850, when he became lord chancellor, and was created Baron Truro of Bowes, Middlesex. He held this latter office until the fall of the ministry in 1852. He died in London on the nth of November 1855. His son Charles (1816-1891) succeeded as 2nd baron, but on the death of his nephew the 3rd baron in 1899 the title became extinct.

Lord Truro was the uncle of James Plaisted Wilde, Baron Penzance (1816-1899), who was appointed a baron of the court of exchequer in i860, and was judge of the court of probate and divorce from 1863 to 1872. In 1875 he was

appointed dean of the court of arches, retiring in 1899. He was created a peer in 1869, but died without issue, and the title became extinct.

TRURO, the chief town of Colchester county, Nova Scotia, on the Salmon river, near the head of Cobequid Bay, 61 m. from Halifax by rail. Pop. (1901), 5993. It is an important junction on the Intercolonial and Midland railways, and the thriving centre of a lumbering and agricultural district. There are numerous local industries, such as engine and boiler works, carriage factory and milk-condensing factory. It also contains the county buildings and the provincial normal school. The Victoria (or Joseph Howe) Park in the vicinity is of great natural beauty.

TRURO, an episcopal city and municipal borough in the Truro parliamentary division of Cornwall, England, n m. N. of Falmouth, on the Great Western railway. Pop. (1901), 11,562. It lies in a shallow valley at the junction of the small rivers Kenwyn and Allen in Truro river, a branch creek of the great estuary of the Fal. It is built chiefly of granite, with broad streets, through the chief of which there flows a stream of water. The episcopal see was founded in 1876, covering the former archdeaconry of Cornwall in the diocese of Exeter; the area including the whole of the county of Cornwall, with a small portion of Devonshire. The cathedral church of St Mary was begun in 1880 from the designs of John Loughborough Pearson, and is among the most important modern ecclesiastical buildings in England. The architect adopted the Early English style, making great use of the dog-tooth ornament. The form of the church is cruciform, but it is made irregular by the incorporation, on the south side of the choir, of the south aisle of the parish church, this portion retaining, by Act of Parlia- ment of 1887, all its legal parochial rights. The design of the cathedral includes a lofty central and two western towers with spires, and a rich west front and south porch; with a cloister court and octagonal chapter-house on the north. Among other noteworthy modern institutions may be mentioned the theo- logical library presented by Bishop Phillpotts in 1856, housed in a Gothic building (1871). The grammar school possesses exhibitions to Exeter College, Oxford. Truro has considerable trade in connexion with the tin mines of the neighbourhood. There are tin-smelting works, potteries, and manufactures of boots,

biscuits, jam and clothing. Small vessels can lie at the quays, though the harbour is dry at low water; but large vessels can approach within three miles of the city. The borough is under a mayor, 6 aldermen and 18 councillors. Area, n 27 acres.

At the time of the Domesday Survey Truro (Trueret, Treurok, Treueru) was a comparatively small manor held by Jovin of Count Robert of Mortain. Its municipal charter dates from

Richard Lucy the chief justiciar who held the demesne lands and under whom the free burgesses had apparently a grant of sake and soke, toll and team and infangenethef. Regi- nald earl of Cornwall, by an undated charter, added to these privileges exemption from the jurisdiction of the hundred and county courts and from toll throughout the county. Henry II. confirmed the grant of his uncle the said Reginald. In 1304 Truro was constituted a coinage town for tin. In 1378 the sheriff reported that the town was so impoverished by pesti- lence, hostile invasions and intolerable payments made to the king's progenitors that it was almost uninhabited and wholly wasted. A similar complaint was preferred in 1401 in consequence of which the fifteenth and tenth amounting to £12 was for the three years ensuing reduced to 50s. The charter of incorporation granted in 1589 provided for a mayor, recorder and steward and a council of twenty capital burgesses and four aldermen. Under it the mayor and burgesses were to enjoy the liberties of infangenethef, utfangenethef, sake, soke, toil, team, thefbote, backberindthef and ordelf; also freedom from toll passage, pontage, murage, fletage, picage, anchorage, stallage, lastage and tollage of Horngeld throughout England except in London; they were, moreover, to be entitled in respect of their markets to pontage, keyage, &c. The assize of bread and ale and wine and view of frankpledge were also granted and a court of piepowder was to regulate certain specified fairs. In 1835 the number of aldermen was increased to six. From 1295 to 1885 Truro enjoyed separate parliamentary representation, returning two members. The charter of 1589 provided that the burgesses should have power by means of the common council to elect them. Such was the procedure from 1589 to 1832 when the burgesses recovered the privilege. Under the Redistribution of Seats Act of 1885 the representa- tion of

Truro was merged in the county. No fairs or markets are mentioned prior to 1589 when two markets, on Saturdays and Wednesdays, were provided, also three fairs. Both markets and two of the three fairs are held.

See Victoria County History: Cornwall; Canon. Donaldson, Bishopric of Truro (1902).

TRUSS (from O. Fr. trusser, trosser, torser, trousser, to pack, bind, gird up, Low Lat. tortiare, formed from tortus, twisted, torquere, to twist; cf. " torch " and " trousers," also trousseau, a bride's outfit, literally a small pack or bundle), a pack or bundle, applied specifically to a quantity of hay or straw tied together in a bundle. A truss of straw contains 36 lb, of old hay 56 lb, of new hay 60 lb. A load contains 36 trusses. The term is also used generally of a supporting frame or structure, especially in the construction of a roof or a bridge. It is thus used as the name of a surgical appliance, a belt with an elastic spring keeping in place a pad used as a support in cases of hernia (q.v.).

TRUST COMPANY, the name given to a form of fiduciary corporation, originally adopted in the United States under state laws to accomplish financial objects not specially provided for under the national banking system. The function which gives a trust company its name is to execute trusts for indi- viduals, estates and corporations. In the United States, however, these functions have been extended to include many of those of commercial banks receiving deposits payable on demand and subject to check. The relations between trust com- panies and their depositors are based, however, upon different principles from those between the bank and its client (see Banks and Banking). The larger trust companies prefer deposit accounts which, even when subject to check, are not actively drawn upon. The fact that they pay interest on such deposits absolves them from the obligation to extend accommodation by way of loans, except upon collateral security. Hence out of the difference in their relations'with depositors grows a differ- ence in the character of their investments, which are Usually in loans on stock exchange securities and not on commercial paper discounted. In New York they are prohibited from directly discounting commercial paper, but not from buying it. The rate of interest paid on demand deposits is usually

2% for small accounts, and 3% for large accounts; for time deposits it is sometimes more.

In the administration of estates lor private individuals, the trust company has taken the place to a large extent of individual attorneys. The trust company has the advantage of corporate responsibility, which involves continuous life, and of proper offices, fire-proof safes, and special employees in each department devoting their time and attention exclusively to their special functions. Investments for estates are limited by law, like savings bank investments, to certain classes of securities, and a trust company has little temptation to violate such laws. It is customary, moreover, for investments of trust funds to be made by authority of the board of directors, thus protecting the estate against the uncertainties of individual judgment.

The trust company has found a special field in America as agent of railway and industrial corporations in the issue, transfer and exchange of securities. For these purposes it has an organized system, tested by experience, more perfect in its operation and less expensive than each corporation could organize for itself separately. As trustee for the bondholders under a railway mortgage, for instance, it becomes the duty of the trust company, in case of default in pay- ment of interest on the bonds, to take steps to foreclose the mortgage and protect the bondholders. Trust companies have sometimes been named as receivers of failed banks.

The big industrial combinations in America have contributed to the business of the trust companies as registrars or transfer agents for capita! stock, agents for the issue of bonds and payment of interest thereon, agents for underwriting and distributing new securities, and depositories of securities and cash under plans of reorganization or while held in escrow. In the case of the reorganization of the tobacco companies, in the autumn of 1904, securities aggregating about $600,000,000 passed through the hands of the trust company charged with the work; and while this was the largest single opera- tion of its

kind, it is typical of many similar operations resulting from the activity in the creation of new companies in America which bring business to trust companies. _ The attractions offered by the trust company to the non-commer- cial depositor by the payment of interest on his deposit built up the deposit balances of trust companies rapidly after 1896. Their competition in this respect with national banks soon led to an effort to compel trust companies to keep cash reserves against their deposits. This demand was resisted for a while, but in 1903 a rule was made by the New York Clearing House requiring trust companies to keep certain reserves. The alternative was to withdraw from the Clearing House, and this all but a few did. The New York legislature, however, at the session of 1906, passed an act requiring trust companies in New York city to establish within fixed dates reserves of 15% of their deposits, of which only 5% was required to be currency, 5 % might be on deposit in another banking institu- tion, and 5 % might be kept in certain classes of bonds.

The experience of the panic of 1907 developed several weaknesses in the position of the trust companies, and in New York led a special commission appointed by Governor Hughes to recommend much stronger reserves. The fact that the trust companies relied upon the national banks to meet the heavy demands upon them for cur- rency doubled the strain imposed on the national banks of New York city, and the isolation of the trust companies through their withdrawal from the Clearing House in 1903 made it difficult to bring about co-operation in support of those which were subjected to severe runs. Between the 22nd of August and the 19th of Decem- ber 1907 the deposits of the trust companies of New York declined by the sum of more than $275,000,000 while deposits in national banks increased about $50,000,000.

The number, resources and activities of trust companies have shown a rapid development. In New York the general law under which companies can be formed without a special act dates only from 1887, but several companies ante-date this law. The following figures l from reports made to the comptroller of the currency speak for themselves : —

1 The table, it may be observed, represents only the

number of companies reporting and not the number actually in existence. Kirkbride and Sterrett, for example, give the number of trust companies in the United States on the 1st of January 1905 as 1427, or more than twice the number given here for 1905. On this point the comptroller of the Treasury in 1905 said: " In order to obtain this information [from institutions other than national banks] the comptroller is necessarily dependent upon the courtesy of officers of different states, and upon individual banks in states the laws of which states do not provide for compilation of data of this character . . . Each year one or more states formerly without adequate provision for obtaining and compiling reports of banks incorporated under their laws, have through legislative enactment, placed such banks under the supervision of an official whose duty it is to receive and tabulate the reports so required, which information is placed at the disposal of the comptroller. Every year this office is thereby enabled to publish official, and hence more reliable statistics. ..."

Trust Companies of the United States.

30th June.

Number.

Capital.

Individual Deposits.

1891

171

$ 79,292,889

$

355,330,o8o

1897

251

106,968,253

566,922,205

1900

290

126,930,845

1,028,232,407

1901

334

137.361.704

1,271,081,174

1902

417

179.732,581

1,525.887,493

1903

53i

232,807,735

1.589,398,796

1904

585

237,745.488

1,600,322,325

1905

683

243.133.622

1,980,856,737

1906

742

268,384,337

2,008,937,790

1907

794

276,146,081

2,061,623,035

Approximately half of the deposits in United States trust companies are in the state of New York, the number of such companies in New York about the 30th of June 1907, being 88, with a capital of $67,850,000, and deposits of $1,020,678,220. The next highest states in amount of deposits were Pennsylvania, with 328 companies, with capital of $103,953,067 and deposits of $381,397,305; and Massachusetts, with 46 companies, with capital of $16,677,000 and deposits of $179,278,436.

See Kirkbride and Sterrett, The Modern Trust Company (New York, 1905). (c. A. C.)

TRUST and TRUSTEES, in the law of equity. In Roman and English law alike that legal relation between two or more persons implied in the word trust was of comparatively late growth. The trust of English law is probably based upon a combination of . the Roman conceptions of usus and fideicom- missum. To usus is perhaps due the name as well as the idea of that right over property, co-ordinate with the right of the nominal owner, possessed by the person having the use. To fideicommissum appears to be due the name as well as the idea of that confidence reposed in another which is the essence of the modern trust. Usus was in Roman law a personal servitude, or right of one person over the land of another, confined to his personal wants and without the right to the produce and profits which ususfructus carried. It has little in common with the use of English law but the name and the conception of a dual ownership. The fideicommissum is more important (see

Roman Law). By the legislation of Justinian the law of legala was practically assimilated to that of fideicommissa. The only thing that distinguished the one from the other was the mode in which the gift was made: if by words of direct bequest it was a legatum, if by precatory words, a fideicom- missum. It may be noticed, as an illustration of the course afterwards taken by the law in England, that fideicommissa in favour of the Church were so far favoured over others that if paid over by mistake they could not be recovered. In addition to usus and fideicommissum, the Roman division of ownership into quiritary and bonitary (to use words invented at a later time) may perhaps to some extent have suggested the English division into legal and equitable estate. The two kinds of ownership were amalgamated by Justinian. The gradual manner in which the beneficiary became subject to the burdens attaching to the property of which he enjoyed the benefit was a feature common to both the Roman and the English system.

Use in Early English Law. — The use or trust 2 is said to have been the invention of ecclesiastics well acquainted with Roman law, the object being to escape the provisions of the laws against Mortmain by obtaining the conveyance of an estate to a friend on the understanding that they should retain the use, i.e. the actual profit and enjoyment of the estate. Uses were soon extended to other purposes. They were found valuable for the defeat of creditors, the avoiding of attainder and the charging of portions. A use had also the advantage of being free from the incidents of feudal tenure : it could be alienated inter vivos by secret conveyance, and could be devised by will. In many cases the feoffee 3 to uses, as he was called, or the person seised to the use of another, seems to have been specially

2 Use seems to be an older word than trust. Its first occurrence in statute law is in 7 Ric. II. c. 12, in the form oeps. In Littleton " confidence " is the word employed. The Statute of Uses seems to regard use, trust and confidence as synonymous. According to Bacon, it was its permanency that distinguished the use from the trust.

3 Feoffment, though the usual, was not the only mode of convey- ance to uses. The preamble of the Statute of Uses mentions fines and recoveries, and other assurances.

chosen on account of his rank and station, which would enable him to defy the common law and protect the estate of his cestui que use, or the person entitled to the beneficial enjoyment. The act of I Ric. II. c. 9 was directed against the choice of such persons. This alienation of land in use was looked upon with great disfavour by the common law courts, in whose eyes the cestui que use was only a tenant at will. Possibly the ground of their refusal to recognize uses was that the assizes of the king's court could only be granted to persons who stood in a feudal relation to the king. The denial of the right followed the denial of the remedy. The use was on the other hand supported by the court of chancery, and execution of the confidence reposed

in the feoffee to uses was enforced by the court in virtue of the general jurisdiction which as a court of con- science it claimed to exercise over breach of faith. Jurisdiction was no doubt the more readily assumed by ecclesiastical judges in favour of a system by which the Church was generally the gainer. A double ownership of land thus gradually arose, the nominal and ostensible ownership — the only one acknowledged in the courts of common law — and the beneficial ownership protected by the court of chan- cery. The reign of Henry V. to a great extent corresponds with that of Augustus at Rome, as the point of time at which legal recognition was given to what had previously been binding only in honour. The means of bringing the feoffee to uses before the court was the writ of subpoena, said to have been invented by John de Waltham, bishop of Salisbury and master of the rolls in the reign of Richard II. By means of this writ the feoffee to uses could be compelled to answer on oath the claim on his cestui que use. The doctrine of the court of chancery as to the execution of a use varied according as there was transmutation of possession or not. In the former case it was unnecessary to prove consideration; in the latter, generally a case of bargain and sale, the court would not enforce the use unless it was executed in law — that is, unless there was a valuable considera- tion, even of the smallest amount. Where no consideration could be proved or implied, the use resulted to the feoffor. This theory led to the insertion in deeds (especially in the lease of the lease and release period of conveyancing) of a nominal consideration, generally five shillings. Lands either in possession, reversion or remainder could be granted in use. Most persons could be feoffees to uses. The king and corporations aggregate were, however, exceptions, and were entitled to hold the lands discharged of the use. On the accession of Richard III., who from his position of authority had been a favourite feoffee, it was necessary to pass a special act (i Ric. III. c. 5), vesting the lands of which he had been feoffee either in his co-feoffees or, in the absence of co-feoffees, in the cestui que use. The practical convenience of uses was so obvious that it is said that by the reign of Henry VII. most of the land in the king- dom was held in use. The freedom of uses from liability to forfeiture for treason must have led to their general adoption during the Wars of the Roses. 1 The secrecy with which a use could be transferred, contrary as

it was to the publicity required for livery of Seisin (q.v.) at common law, led to the interference of the legislature on several occasions between the reign of Richard II. and Henry VIII., the general tendency of the legislation being to make the cestui que use more and more subject to the burdens incident to the owner- ship of land. One of the most important statutes was the Statute of Mortmain (15 Ric. II. c. 5), forbidding evasion of the Statute De Religiosis of Edward I. by means of feoffments to uses. Other acts enabled the cestui que use to transfer the use without the concurrence of the feoffee to uses (1 Ric. III. c. 1), made a writ of formedon maintainable against him (1 Hen. VII. c. 1), rendered his heir liable to wardship and relief (4 Hen. VII. c. 17), and his lands liable to execution (19 Hen. VII. c. 15). At length in 1535 the famous Statute of Uses (27 Hen. VIII. c. 10) was passed. 2 The preamble of the statute enumerates the mischiefs which it was considered that the universal prevalence of uses had occasioned, among others that by fraudulent feoffments, fines, recoveries and other like assurances to uses, confidences and trusts lords lost their feudal aids, men their tenancies by the curtesy, women their dower, manifest perjuries in trials were committed, the king lost the profits of the lands of persons attainted or enfeoffed to the use of aliens, and the king and lords their rights of year, day and waste, and of escheats of felons' lands. To remedy this state of things it was enacted, inter alia, that, where any person was seised of any here- ditaments to the use, confidence or trust of any other person by any means, the person having such use, confidence or trust should be seised, deemed and adjudged in lawful seisin, estate and posses- sion of such hereditaments. Full legal remedies were given to the cestui que use by the statute. He was enabled to distrain for a rent-charge, to have action, entry, condition, &c. The effect of this enactment was to make the cestui que use the owner at law as well as in equity (as had been done once before under the excep- tional circumstances which led to I Ric. III. c. 5), provided that

1 The use, as in later times the trust, was, however, forfeited to the Crown on attainder of the feoffee or trustee for treason.

2 It was adopted in Ireland exactly a century later by 10 Car. I. c. 1 (Ir.). The law of uses and trusts in Ireland is

practically the same as that in England, the main differences being in procedure rather than in substantive law.

the use was one which before the statute would have been enforced by the court of chancery. For some time after the passing of the statute an equitable as distinct from a legal estate did not exist. But the somewhat narrow construction of the statute by the common law courts in Tyrrel's case 3 (1557) enabled estates cognisable only in equity to be again created. In that case it was held that a use upon a use could not be executed; therefore in a feoffment to A and his heirs to the use of B and his heirs to the use of C and his heirs only the first use was executed by the statute. The use of B being executed in him, that of C was not acknowledged by the common law judges; but equity regarded C as beneficially entitled, and his interest as an equitable estate held for him in trust, corresponding to that which B would have had before the statute. The position taken by the Court of Chancery in trusts may be compared with that taken in Mortgage (q.v.). The Judicature Act 1873, while not going as far as the Statute of Uses and com- bining the legal and equitable estates, makes equitable rights cognisable in all courts. From the decision in Tyrrel's case dates the whole modern law of uses and trusts. In modern legal language use is restricted to the creation of legal estate under the Statute of Uses, trust is confined to the equitable estate of the cestui que trust or beneficiary.

Uses since 1535. — The Statute of Uses is still the basis of con- veyancing. A grant in a deed is still, after the alterations in the law made by the Conveyancing Act 1 881, made "to and to the use of A." The statute does not, however, apply indiscriminately to all cases, as only certain uses are executed by it. It does not apply to leaseholds or copyholds, or to cases where the grantee to uses is anything more than a mere passive instrument, e.g. where there is any direction to him to sell the property. The seisin, too, to be executed by the statute, must be in another than him who has the use, for where A is seised to the use of A it is a common law grant. The difference is important as far as regards the doctrine of Possession (q.v.). Constructive possession is given by a deed operating under the statute even before entry, but not by a common law grant, until actual receipt of rent by the grantee. The operation' of the

Statute of Uses was supplemented by the Statute of Inrolments and that of Wills (see Will). The Statute of Inrolments (27 Hen. VIII. c. 16) enacted that no bargain and sale should pass a freehold unless by deed indented and enrolled within six months after its date in one of the courts at Westminster or with the custos rotulorum of the county. As the statute referred only to freeholds, a bargain and sale of a leasehold interest passed without enrolment. Conveyancers took advantage of this omission (whether intentional or not) in the act, and the practical effect of it was to introduce a mode of secret alienation of real property, the lease and release, which was the general form of conveyance up to 1845. (See Con- veyancing.) Thus the publicity of transfer, which it was the special object of the Statute of Uses to effect, was almost at once defeated. In addition to the grant to uses there were other mode* of conveyance under the statute which are now obsolete in practice, viz., the covenant to stand seised and the bargain and sale. Under the statute, as before it, the use has been found a valuable means of limiting a remainder to the person creating the use and of making an estate take effect in derogation of a former estate by means of a shifting or springing use. At common law a freehold could not be made to commence in futuro; but this end might be attained by a shifting use, such as a grant (common in marriage settlements) to A to the use of B in fee simple until a marriage, and after the celebration of the marriage to other uses. An example of a springing use would be a grant to A to such uses as B should appoint and in default of and until appointment to C in fee simple. The difficulty of deciding where the seisin was during the suspension of the use led to the invention of the old theory of scintilla juris, or continued possibility of seisin in the grantee to uses. This theory was abolished , by 23 & 24 Vict. c. 38, which enacted that all uses should take effect by force of the estate and seisin originally vested in the person seised to the uses. The most frequent instances of a springing use are powers of appointment, usual in wills and settlements. There has been much legislation on the subject of powers, the main effect of which has been to give greater facilities for their execution, release or abandonment, to aid their defective execution, and to abolish the old doctrine of illusory appointments.

Trusts. — A trust in English law is defined in Lewin's Law of Trusts, adopting Coke's definition of a use, as " a confidence reposed in some other, not issuing out of the land, but as a thing collateral, annexed in privity to the estate of the land, and to the person touching the land, for which cestui que trust has no remedy but by subpoena in Chancery." The term trust or trust estate is also used to denote the beneficial interest of the cestui que trust. The term truster is not used, as it is in Scotland, to denote the creator of the trust. A trust has some features in common with contract (q.v.); but the great difference between them is that a contract can only be enforced by a party or one in the position of a party to it, while a trust can be, and generally Dyer's Reports, 155a.

is, enforced by one not a party to its creation. It has more resemblance to fideicommissum. But the latter could only be created by a testamentary instrument, whilst a trust can be created either by will or inter vivos; nor was there any trace in Roman law of that permanent legal relation which is suggested by the position of trustee and cestui que trust. The heir, too, in Roman law was entitled, from a.d. 70 to the reign of Justinian, to one-fourth of a heredilas fideicommissaria as against the beneficiary, while the very essence of the trust is its gratuitous character. Trusts may be divided in more than one way, according to the ground taken as the basis of division. One division, and perhaps the oldest, as it rests on the authority of Bacon, is into simple and special, the first being where the trust is simply vested in a trustee and the nature of the trust left to construction of law, the second where there is an act to be per- formed by the trustee. Another division is into lawful and unlawful, and corresponds to Bacon's division into intents or confidences and frauds, covins, or collusions. A third division is into public and private. A division often adopted in modern textbooks and recognized by parliament in the Trustee Act 1850, is into express, implied and constructive. An express trust is determined by the person creating it. It may be either executed or executory, the former where the limitations of the equitable interest are complete and final, the latter where such limitations are

intended to serve merely as minutes for perfecting the settle- ment at some future period, as in the case of marriage articles drawn up as a basis of a marriage settlement to be in conformity with them. An implied trust is founded upon the intention of the person creating it; examples of it are a resulting trust, a precatory trust, and the trust held by the vendor on behalf of the purchaser of an estate after contract and before conveyance. In this case the vendor is sometimes called a trustee sub modo and the purchaser a cestui que trust sub modo. A constructive trust is judicially created from a consideration of a person's conduct in order to satisfy the demands of justice, without reference to intention. The distinction between an implied and a constructive trust, is not always very consistently main- tained. Thus the position of a vendor towards a purchaser after contract is sometimes called a constructive trust. The present law governing trusts rests upon the doctrines of equity as altered by legislation. The law was consolidated by the Trustee Act 1893 and some subsequent amending statutes. Its great importance has led to its becoming one of- the most highly developed departments of equity.

Who may be a Trustee or Cestui que Trust. — The modern trust is considerably more extensive in its operation than the ancient use. Thus the Crown and corporations aggregate can be trustees, and personalty can be held in trust. Provision is made by the Municipal Corporations Act 1882, for the administration of charitable and special trusts by municipal corporations. There are certain persons who for obvious reasons, even if not legally disqualified, ought not to be appointed trustees. Such are infants, lunatics, persons domiciled abroad, felons, bankrupts and cestuis que truslent. The appointment of any such person, or the falling of any existing trustee into such a position, is generally ground for application to the court for appointment of a new trustee in his place. Any one may be a cestui que trust except a corporation aggregate, which cannot be a cestui que trust of real estate without a licence from the Crown. For the Public Trustee, see below.

Creation and Extinction of the Trust. — A trust may be created either by act of a party or by operation of law. Where a trust is created by act of a party, the creation at common law need not be in writing. The Statute of Frauds

altered the common law by enacting that all declarations or creations of trusts or confidences of any lands, tenements or hereditaments shall be manifested and proved by some writing, signed by the party who is by law enabled to declare such trust, or by his last will in writing, or else they shall be utterly void and of none effect. Trusts arising or resulting by implication or construction of law are excepted, and it has been held that the statute applies only to real estate and chattels real, so that a trust of personal chattels may still be declared by parol. The declaration of a trust by the Crown must be by letters patent. Trusts created by will must conform to the requirements of the Will Act (see Will). Except in the case of charitable trusts, the cestui que trust must be a definite person. A trust, for instance, merely for keeping up family tombs is void. Alteration of the trust estate by appointment of a new trustee could up to 186a only be made where the instrument creating the trust gave a power to so appoint,

or by order of the court of chancery. But now by s. 10 of the Trustee Act 1893 (superseding Lord St Leonards's Act of i860 and the Conveyancing Act 1 881), the surviving or continuing trustee or trustees, or the personal representative of the last surviving or continuing trustee, may nominate in writing a new trustee or new trustees. On such appointment the number of trustees may be increased. Existing trustees may by deed consent to the discharge of a trustee wishing to retire. Trust property may be vested in new or continuing trustees by a simple declaration to that effect. Also a separate set of trustees may be appointed for any part of the property held on distinct trusts. Trusts created by operation of law are those which are the effect of the application of rules of equity. They include resulting and constructive trusts. A result— ing trust is a species of implied trust, and consists of so much of the equitable interest as is undisposed of by the instrument creating the trust, which is said to result to the creator and his representatives. An example is the purchase of an estate in the name of the purchaser and others, or of others only. Here the beneficial interest is the purchaser's. An example 01 a constructive trust is a renewal of a lease by a trustee in his own name, where the trustee is held to be constructively a trustee for those interested in the beneficial term. Besides being duly created, it is necessary

for the validity of the trust that it should be a lawful one. An unlawful trust is one which contravenes the policy of the law in any respect. Examples of such trusts are trusts for a corporation without licence, for a perpetuity, and for purposes subversive of morality, such as trusts for illegitimate children to be hereafter born. Superstitious uses also fall under this head. There are also certain trusts which are avoided by statute under particular circumstances, such as settle- ments in fraud of creditors (see Bankruptcy). The law cannot be evaded by attempting to constitute a secret trust for an unlawful purpose. If an estate be devised by words prima facie carrying the beneficial interest, with an understanding that the devisee will hold the estate in trust for such a purpose, he may be compelled to answer as to the secret trust, and on acknowledgment or proof of it there will be a resulting trust to the heir-at-law. In the case of an advowson suspected to be held for the benefit of a Roman Catholic patron, there is a special enactment to the same effect (see Quare Impedit). The rules of equity in charitable trusts are less strict than those adopted in private trusts. Charitable trusts must be lawful, e.g. they must not contravene the Statutes of Mortmain; but a wider latitude of construction is allowed in order to carry out the intentions of the founder, and they will not be allowed to fail for want or uncertainty of objects to be benefited. The court, applyingthe doctrine of cy pres (q.v.), will, on failure of the original ground of the charity, apply the funds as nearly as possible in the same manner. On this principle gifts originally made for purely charitable purposes have been extended to educational purposes. Further, trustees of a charity may act by a majority, but ordinary trustees cannot by the act of a majority (unless specially empowered so to do) bind a dissenting minority or the trust property. A trust estate is subject as far as possible to the rules of law applic- able to a legal estate of a corresponding nature, in pursuance of the maxim, ” Equity follows the law.” Thus trust property is assets for payment of debts, may be taken in execution, passes to creditors in bankruptcy, and is subject to dower and curtesy, to the rules against perpetuities, and to the Statutes of Limitation. This assimilation of the legal and equitable estates has been produced partly by judicial decisions, partly by legislation. A trust is extin- guished, as it is created, either by act of a

party or by operation of law. An example of the former mode of extinction is a release by deed, the general means of discharge of a trustee when the pur- poses of the trust have been accomplished. Extinction by operation of law takes place when there is a failure of the objects of the trust : e.g. if the cestui que trust die intestate without heirs or next of kin, the property, by the Intestates Estates Act 1884, escheats in the same manner as if it were a legal estate in corporeal hereditaments. Equitable interests in real estate abroad are as a rule subject to the lex loci rei sitae, and an English court has no jurisdiction- to enforce a trust or settle a scheme for the administration of a charity in a foreign country. An English court has, however, jurisdiction to administer the trusts of a will as to the whole real and personal estate of a testator, even though only a very small part of the estate, and that wholly personal, is in England. This was decided by the House of Lords in a well-known case in 1883 (Ewine v. Orr-Ewine. L.R. 9, AC. 34)..

Rights and Duties of the Trustee. — The principal general properties of the office of trustee are these: (1) A trustee having once accepted the trust cannot afterwards renounce. (2) He cannot delegate it, but an inconvenience which formerly attached to dealings with trustees and trust property, in consequence partly of this rule, and partly of the liability of persons dealing with trustees to see that money paid to them was properly applied, was largely obviated by s. 17 of the Trustee Act 1893 (replacing s. 2 of the Trustee Act 1888), which in effect provides that a trustee may appoint a solicitor to be his agent to receive and give a discharge for any money or valuable consideration or property receivable by the trustee under the trust, by permitting the solicitor to have the custody of and to produce a deed having in the body thereof or endorsed thereon a

receipt for the consideration money or other consideration, the deed being executed or the endorsed receipt being signed by the trustee; and a trustee is not chargeable with breach of trust by reason only of his having made or concurred in making any such appointment ; and the

producing of any such deed by the solicitor is a sufficient authority to the person liable to pay for his paying to the solicitor without the solicitor producing any separate or other direction or authority in that behalf from the trustee. (3) In the case of co- trustees the office must be exercised by all the trustees jointly. (4) On the death of one trustee there is survivorship: that is, the trust will pass to the survivors or survivor. (5) One trustee shall not be liable for the acts of his co-trustee. (6) A trustee shall derive no personal benefit from the trusteeship. The office cannot be renounced or delegated, because it is one of personal confidence. It can, however, be resigned, and legislation has given a retiring trustee large powers of appointing a successor. The liability of one trustee for the acts or defaults of another often raises very difficult questions. A difference is made between trustees and executors. An executor is liable for joining in a receipt pro forma, as it is not necessary for him to do so, one executor having authority to act without his co-executor; a trustee can show that he only joined for conformity, and that another received the money. The rule of equity by which a beneficiary who consented to a breach of trnst was liable to indemnify the trustees to the extent of his interest has taken definite statutory shape in s. 45 of the Trustee Act 1893 (replacing s. 6 of the Trustee Act 1888), which enacts that when a trustee commits a breach of trust at the instigation or request, or with the consent in writing of a beneficiary, the High Court may, if it thinks fit, and notwithstanding that the beneficiary is a married woman entitled for her separate use and restrained from anticipation, make such order as to the court seems just for impounding all or any part of the interest of the beneficiary in the trust estate by way of indemnity to the trustee. The rule that a trustee is not to benefit by his office is subject to some exceptions. He may do so if the instrument creating him trustee specially allows him remuneration, as is usually the case where a solicitor is appointed. The main duties of trustees are to place the trust property in a proper state of security, to keep it (if personalty) in safe custody, and to properly invest and distribute it. A trustee must be careful not to place himself in a position where his interest might clash with his duty. As a rule he cannot safely purchase from his cestui que trust while the fiduciary relation exists between them. Investments by trustees

demand special notice. The Trustee Act 1893 has consolidated the law on this point, and provides, as it were, a code or charter of investment authorizing trustees, unless expressly forbidden by the instrument (if any) creating the trust, to invest trust funds in various modes, of which the more important are as follows: In any of the parliamentary stocks or public funds or government securities of the United Kingdom; on real or heritable securities in Great Britain or Ireland ; in stock of the Bank of England or the Bank of Ireland ; in India 3§% stock and India 3% stock; in any securities, the interest of which is for the time being guaranteed by parliament; in consolidated stock created by the London County Council; in the debenture or rent-charge or guaranteed or preference stock of any railway company in Great Britain or Ireland incorporated by special act of parliament, and having during each of the ten years last past before the date of investment paid a dividend at the rate of not less than 3% on its ordinary stock; in the debenture stock of any railway company in India, the interest on which is paid or guaranteed by the secretary of state in council of India ; in the ” B ” annuities of the Eastern Bengal, the East Indian and the Sind, Pun- jab and Delhi railways; and aiso in deferred annuities — comprised in the register of holders of annuity Class D, and annuities comprised in the register of annuitants Class C of the East Indian Railway Company; in the stock of any railway company in India upon which a fixed or minimum dividend in sterling is paid or guaranteed by the secretary of state in council of India, or, upon the capital of which the interest is so guaranteed; in the debenture or guaranteed or preference stock of any company in Great Britain or Ireland estab- lished for the supply of water for profit, and incorporated by special act of parliament or by royal charter, and having during each of the ten years last past before the date of investment paid a dividend of not less than 5% per annum on its ordinary stock; in nominal or inscribed stock issued, or to be issued, by the corporation of any municipal borough having, according to the returns of the last census prior to the date of investment, a population exceeding 50,000; or by any county council under the authority of any act of parliament or provisional order; in any of the stocks, funds or securities for the time being authorized for the investment of cash under the control or subject to the order of the High Court. Trustees

may from time to time vary any such investments for others of an authorized nature. The statutory power to invest on real securities does not, of course, authorize the purchase of realty ; but by s. 5 of the Trustee Act 1893 a power to invest in real securities (in the absence of express provision to the contrary) authorizes investment on mortgage of leasehold property held for an unexpired term of not less than 200 years and not subject to a greater rent than one shilling a year, or to any right of redemption or condition of re-entry except for non-payment of rent.

The position of trustees in respect of what was frequently an undue personal responsibility for the administration of their trust has been much improved by s. 8 of the Trustee Act 1888 (not repealed by the Trustee Act 1893) and s. 3 of the Judicial Trustees Act 1896. Sub-section (l) of the former enactment (with some omissions) runs as follows: ” In any action or other proceeding against a trustee or any person claiming through him, except where the claim is founded upon any fraud or fraudulent breach of trust to which the trustee was party or privy, or is to recover trust property, or the proceeds thereof still retained by the trustee,’ or previously received by the trustee and converted to his use, the following provisions shall apply: (a) All rights and privileges conferred by any statute of limitations shall be enjoyed in the like manner and to the like extent as if the trustee or person claiming through him had not been a trustee or person claiming through him. (6) If the action or other proceeding is brought to recover money or other property, and is one to which no existing statute of limitations applies, the trustee or person claiming through him shall be entitled to the benefit of, and be at liberty to plead the lapse of time as a bar to such action or other proceeding in the like manner and to the like extent as if the claim had been against him in an action of debt for money had and received.” The statutory period of limitation which trustees are thus permitted to plead is the six years fixed as the period of limitation for actions of debt by the Limitation Act 1623. It has been decided on the above section that in the case of a breach of trust consisting of an improper investment of the trust funds, time begins to run in favour of the trustee from the date of the investment. Sub-section (3) of the Judicial Trustees Act 1896 provides that ” if it appears to the court that a trustee, whether appointed

under that act or not, is or may be personally liable for any breach of trust, whether the transaction alleged to be a breach of trust occurred before or after the passing of that act, but has acted honestly and reasonably, and ought fairly to be excused for the breach of trust and for omitting to obtain the directions of the court in the matter in which he committed such breach, then the court may relieve the trustee either wholly or partly from personal liability for the same." Owing to the generally reduced rate of interest obtainable for money invested on trust securities, the court has in several instances, and even as against defaulting trustees, charged them with interest at 3 % per annum (instead of 4 %, which was formerly the recognized rate) upon sums found due from them to the trust estate.

Under the old law trustees could not safely advance on mortgage more than two-thirds of the actual value of agricultural land or one-half of the value of houses. This " two-thirds rule " is now made statutory by s. 8 of the Trustee Act 1893, which enacts that " A trustee lending money on the security of any property on which he can lawfully lend shall not be chargeable with breach of trust by reason only of the proportion borne by the amount of the loan to the value of the property at the time when the loan was made, provided chat it appears to the court that in making the loan the trustee was acting upon a report as to the value of the property made by a person whom he reasonably believed to be an able practical surveyor or valuer instructed and employed independently ' of any owner of the property, whether such surveyor or valuer carried on business in the locality where the property is situate or elsewhere, '■ and that the amount of the loan does not exceed two equal third parts of the value of the property as stated in the report, and that the loan was made under the advice of the surveyor or valuer ex- pressed in the report." The same section protects trustees for not investigating the lessor's title when lending on the leasehold security, and for taking a shorter title than they might be otherwise entitled to on the purchase or mortgage of any property, if they act with prudence and caution. By s. 9 (replacing s. 5 of the Trustee Act 1888) trustees who commit a breach of trust by lending more than the proper amount on any property are excused from making good any more than the excess of the actual loan over the sum which

they might have properly lent in the first instance.

Rights and Duties of the Cestui que Trust. — These may be to a great extent deduced from what has been already said as to the correlative duties and rights of the trustee. The cestui que trust has a general right to the due management of the trust property, to proper accounts and to enjoyment of the profits. He can as a rule only act with the concurrence of the trustee, unless he seeks a remedy against the trustee himself.

Judicial Trustees. — The Judicial Trustees Act 1896, inaugurated a semi-official system of trusteeship which was new in England, but had been known in Scotland for upwards of 150 years. The general scope of the act is indicated by s. I (1), which runs as follows: " Where application is made to the court by or on behalf of the person creating or intending to create a trust, or by or on behalf of a trustee or beneficiary, the court may, in its discretion, appoint a person (in this act called a judicial trustee) to be a trustee of that trust, either jointly with any other person or as sole trustee, and if sufficient cause is shown, in place of all or any existing trustees." The act and the rules made under it (the Judicial Trustees Rules 1897) provide that judicial trustees shall be under the control and supervision of the court as officers thereof, and may be paid for their services out of the trust property. The trust accounts are to be

audited annually, and a report thereon made to the court, which has power to order inquiries into transactions connected with the administration of the trust. A judicial trustee may be required to give security, and in any case has to keep the trust account with a bank approved by the court, and deposit title-deeds and other documents of title in such custody as the court directs. Communica- tions between judicial trustees and the court with reference to their duties are permitted to be made with little or no formality, and strict proof of facts may be waived in proper cases. The act may, in short, be described as an attempt to provide for an official check upon the administration of

trusts, while, avoiding the formality and expense incident to the procedure in an administration action.

Public Trustee. — A step further was taken by the Public Trustee Act 1906, which established the office of public trustee. By the act he is a corporation sole, with perpetual succession and an official seal and may sue and be sued under his official title. He may, if he thinks fit, act in the administration of estates of small value; as custodian trustee, or as an ordinary trustee; he may be appointed a judicial trustee, or administrator of a convict's property. The law of trusts generally is applicable to him and he can act either alone or jointly with other persons. He has an absolute discretion as to whether he will accept or not any trust, but cannot decline acceptance on the ground only of the small value of the trust pro- perty. He cannot accept any trust which involves the management or carrying on of a business, except in certain cases authorized under rules appended to the act. He cannot accept a trust under a deed of arrangement for the benefit of creditors, nor of an insolvent estate, nor one exclusively for religious or charitable purposes. His powers and duties are dealt with by the act under three headings: (1) In the administration of small estates. — On the application of any person entitled to apply to the court (i.e. the High Court, and as respects trusts within its jurisdiction, the county court) for an order for administration of any estate, the gross value of which is proved to the satisfaction of the public trustee to be less than £1000, he may administer the estate, and must do so if the persons beneficially entitled are persons of small means, unless he sees good reason for refusing. By declaration in writing signed and sealed by him the trust property other than stock vests in him, and the right to transfer or call for the transfer of any stock forming part of the estate, pro- vided that he does not exercise the right of himself transferring stock without the leave of the court; this general provision also does not apply to copyhold, in respect of which he has the same powers to convey them as if he had been appointed under s. 33 of the Trustee Act 1893. Power is given to the court to order, for reasons of economy, that an estate being administered by the court be adminis- tered by the public trustee. (2) As custodian trustee. — The public trustee, if he consents to act, may be appointed custodian trustee on an application to the court,

or by the testator, settlor or other creator of any trust or by a person having power to appoint new trustees. When he is so appointed the trust property is transferred to him as if he were the sole trustee, but the management of the trust property and any discretionary power remain vested in the other trustees. His relations with the managing trustees are further defined by the act. (3) As an ordinary trustee. — The public trustee may be appointed trustee, executor, &c, of any will or settlement or instrument of any date either under his official title or other sufficient designation. In a will a sentence to the following effect would be sufficient. " I appoint the Public Trustee executor and trustee of this my will." Where the public trustee has been ap- pointed a trustee of any trust, a co-trustee may retire from the trust under s. 11 of the Public Trustee Act 1893 notwithstanding that there are not more than two trustees, and without such consents as are required by that section. The consolidated fund of the United Kingdom is liable to make good all sums required to discharge any liability which the public trustee, if he were a private trustee, would be personally liable to discharge, except where neither the public trustee nor his officers has contributed to it, and which neither he nor any of his officers could by reasonable diligence have averted. A person aggrieved by any act or omission or decision of the public trustee in relation to any trust may apply to the court, and the court may make such order in the matter as it sees fit. The act contains provisions for the investigation and audit of trust accounts, which may take place on the application of any trustee or beneficiary; if the parties do not agree upon a solicitor and public accountant for the purpose, they are appointed by the public trustee, who has entire discretion over the source from which the expenses are to be defrayed. The fees payable under the act are fixed by the Public Trustee (Fees) Order; they are of two kinds: fees on capital and fees on income. The object of the department is not to make a profit, but merely to pay expenses. Full information as to the machinery and procedure of the office and the requirements necessary to obtain the services of the public trustee are obtainable on applica- tion to the Public Trustee Office, Clement's Inn, London.

Scotland. — The history of the law differs considerably from that of England, though perhaps the position of the

Scottish trustee is now not very different from that of the trustee in England. The Statute of Uses did not apply to Scotland, since neither that nor any similar legislation was necessary in a system in which law and equity were administered by the same tribunals. Trusts seem to have existed from time immemorial, and have been frequently

regulated by statute. The policy of the English Statute of Frauds was no doubt intentionally imitated in the Act 1696, c. 25, enacting that no action of declarator of trust should be sustained as to any deed of trust made for thereafter, except upon a declaration or back- bond of trust lawfully subscribed by the person alleged to be trustee and against whom or his heirs or assignees the declarator should be intended, or unless the same were referred to the oath of the party simpliciter. The act does not apply to all cases, but only to those in which by the act of parties documents of title are in the name of a trustee, but the beneficial interest in another. The person creating the trust is called the truster, a term unknown in England. On the other hand the term cestui que trust is unknown in Scotland. The office of trustee is prima facie gratuitous, as in England, it being considered to fall under the contract of mandate. Some of the main differences between English and Scottish law are these. There is no presumption in Scotland of a resulting trust in favour of a purchaser. A trust which lapses by the failure of a beneficiary goes to the Crown as ultimus heres. The office of trustee is not a joint office, therefore there is no right of survivorship, and on the death of a trustee the survivors are incompetent to act, unless a certain number be declared or presumed to be a quorum, or the office be conferred on trustees and the accedors and survivors of them. Sometimes the concurrence of one trustee is rendered absolutely necessary by his being named sine qua non. The Court of Session may appoint new trustees, but generally appoints a judicial factor. There has been a considerable amount of legislation, chiefly in the direction of extending the powers of trustees and of the cotrt in trust matters. The powers of investment given to trustees are much the same as those allowed in England.

United States. — In New York and many other States uses and trusts have been abolished (with certain exceptions), and every estate, subject to those exceptions, is deemed a legal right cognis- able in courts of law. Some of these

exceptions are implied trusts and express trusts to sell land for the benefit of creditors, to sell, mortgage or lease lands for the benefit of legatees, or for the purpose of satisfying any charge thereon, to receive the rents and profits of lands and apply them to the use of any person during the life of such person or any shorter term, or to receive such rents and profits, and accumulate the same within the limits allowed by the law. Some states allow the creation of trusts (other than those arising by implication or operation of law) only by means of will or deed. Where the trust is of real estate, the deed must generally be registered. Forms of deeds of trust are given in the Statutes of Virginia and other states. The English doctrine of cy pres is being adopted in many states. A public trustee as a corporation sole exists in some states. A trustee under American law is generally entitled to compensation for his services. Spendthrift trusts, i.e. those under which the enjoyment of income bequeathed by will in such a way as to prevent creditors of the beneficiary from reaching it before it gets into his hands, are generally supported (Nichols v. Eaton, 91 United States Reports, 713). A " voting trust " is a concerted transfer of their shares in a corporation by a majority of the share-holders to trustees to hold and vote on them for a specified period for the purpose of securing the adoption or continuance of a certain line of corporate action. Any shareholder may recede from such an arrangement and reclaim his stock.

Authorities. — The principal authority is Lewin'sZau; of Trusts; other treatises are those of Godefroi and Underhill. For American Law see Perry On Trusts. The principal authority on charitable trusts is Tudor. For the history may be consulted Bacon, Law Tracts; Reading, On the Statute of Uses; Gilbert, On Uses; Sanders, On Uses and Trusts; Spence, Equitable Jurisdiction, i. 435; Digby, Hist, of the Law of Real Property, chs. vi., vii.

TRUSTS, in Economics. The word " trusts," as used here, includes all those aggregations of capital engaged in productive industry that, by virtue- of their industrial strength, have or are supposed to have some monopolistic power. Legal mono- polies, as such, and natural monopolies are excluded, although it is frequently true that the trusts are aided by and sometimes control natural monopolies. Trusts are here considered to be identical with the so-called

” capitalistic monopolies.” As ” trusts ” started in America, the subject will be considered here first from the point of view of American experience.

While it is probably true that trusts are a product of evolu- tion, it is desirable to analyse and explain that conception in some detail if we are to understand their industrial significance. Competition, especially among industries managed on a great scale, often makes modern business unprofitable. Commercial men have been thus compelled in some way to modify former methods of doing business. So long as most industries were run on a small scale, the differences in the ability and the facilities of the various competitors were so great that only those at the lower end of the scale of excellence were forced out of the busi- ness — this to the general advantage of industrial society. The

great mass of producers remained vigorously competing with one another, some making larger, others smaller profits, but all except a few at the lower margin making at least a living. Under modern business conditions competitors are often, rela- tively speaking, few in number, of substantially equal ability, and controlling substantially equal facilities for managing the business economically. Consequently, in such circumstances, modern competition differs greatly from that form which was familiar to the earlier economists. Among competitors of such great resources, the struggle may last long after the business has become unprofitable to all before any will fail. Among competitors so nearly equal in strength, the entire industry may be very seriously injured by competition before enough are forced out to affect materially the severity of the competition.

The dictum of Stephenson, that ” where combination is possible, competition is impossible,” has a much wider appli- cation now than in the early days of railways. The modern facilities for the transportation of goods, for the rapid trans- mission of intelligence by fast mail, and especially for the in- stantaneous exchange of information by the telegraph and telephone, have made it possible to

manage easily a large busi- ness, however widely separated its different plants or estab- lishments may.be. In the middle of the 19th century or there- abouts, on account of the lack of these facilities, management of such institutions would often have been impossible. Many of the advantages of combinations are entirely dependent upon these modern facilities, and on that account these facilities may be said to be an occasion, if not a cause, of the trusts.

If the product of an industry is of such a nature that its quality is substantially uniform and can be readily tested by Two Kinds purchasers, especially if the goods are such that of Trust they are ordinarily sold in large quantities, the industries, competition between rival establishments must almost of necessity be a competition in price. Sugar refining, oil refining, the distilling of spirits, the manufacture of salt, are such industries. The standard quality is readily tested, and the manufacturer who can offer the standard product at the lowest price effects a sale. Industries manufacturing comparatively inexpensive articles for the retail trade, put them up in packages which become well known to customers; and those industries whose goods are sold under brands or trade-marks, or in some other form so that they are familiar to buyers, afford an example of competition of an entirely different kind. When the reputation of a certain brand of goods of this nature becomes established, consumers make no further efforts to test its quality, and the retail price often becomes a customary price. If a manufacturer of such goods finds his trade injured by a rival, his most effective means of competition will often be, not a lowering of the price, but an increase of the outlay on advertising. Soap, baking-powder, photographic cameras for general use, and of late years certain brands of coffee, patent medicine, and other drugs of similar nature, are examples of this class. Those industries in which the competition becomes a matter of cutting of prices can by combination remove rivals from the field, and then put prices up to a remunerative rate. Competitors in industries of the second class by combination can save many of the costs of selling, and thus without any increase in the price of the product may save enough of the cost to make the business profitable.

Some of the advantages of combination over competition which have led to the organization of trusts may be

enumerated : —

1. The cost of selling may be greatly lessened. As has been intimated, competition in the case of industries of the second class Savings named above leads to very expensive advertising in from Com- of der to effect sales. An examination of the pages of blnatlon. anv °f tne American magazines, with a thought as to the amount charged for the use of these advertising pages (from one hundred to as high as even four hundred dollars, or from £20 to £80, per page for a single insertion in some of the magazines with the largest circulation) will convince one of the cost of such competitive advertising. The expense involved in making attrac- tive show-windows in stores or shops, and in calling the attention of the public to popular wares by posters scattered about the

country and by legends painted on rocks, on buildings along the lines of railways, &c, are other common examples.

2. The salaries of commercial travellers, together with their hotel and travelling expenses, are of a similar nature. This com- petitive advertising in many cases does not increase to any note- worthy extent the consumption of the products in question, but merely attracts customers from one manufacturer to another. Combination among establishments that do this costly advertising saves a large part of the expense without lessening materially the quantity of goods sold.

3. If different manufacturing establishments, scattered through- out the country, are brought under one management, it will be possible for orders for goods to be received at one central office, and then to be distributed to the federated establishments, so that goods can be despatched to customers in each case from the nearest establishment. In this way freight expenses may be very greatly lessened, cross freights over the same territory being substantially eliminated. A single establishment supplying all of its customers would often be compelled to deliver much longer distances at greatly increased expense.

4. The entire profit of an establishment frequently depends upon the skill of the manager. When many different

establishments are organized into one, it is possible to select the most skilful manager of all and Jo put him in charge of the combination, thus securing in many cases, if the trust includes practically all of the establish- ments in the entire industry, the ablest manager in the country for them all. It is of course true that as an establishment increases in size, or as a combination increases the number of its branches, especially if they are widely scattered, it becomes impossible for the manager to give his personal supervision to the details of manage- ment of each institution. An executive officer of the highest skill, however, will so select his subordinates, so direct their work, and so infuse into them his own spirit, that, under careful inspection, comparatively little will be' lost from his inability to be present personally in each separate establishment. In the larger combina- tions frequent reports, often daily, are made from each concern, giving in detail the quantity of the output, the quality of the goods, the exact cost of the different processes of manufacture; so that it is possible to compare continually each of them with all of the others ; to detect the special weakness of each, and in this way to remedy any slight defects in any one establishment, and to bring all nearly up to the highest level of productive capacity.

5. Each business manager is likely to have some special excellence in his methods of management. One will be particularly skilful in the technique of manufacturing; another in the organization of the business; a third in selling goods, and so on. By combining many establishments into one, it is possible so to distribute this managerial skill that each superintendent will be given the depart- ment for which he is peculiarly fitted, and the whole establishment will thus get the benefit, not merely of the best executive ability at the head, but also of the best managing skill at the head of each separate department. In many cases it is probable that as much is saved in this way as in any other.

6. Besides this distribution of skill of the managers, it is sometimes equally beneficial to distribute the various products of the combina- tion among the different plants. For example, in the manufacture of hoop and bar iron the products are turned out in great varieties of size, probably from seventy-five to a hundred. Wholesale dealers in

sending their orders to the mills are likely to call for from ten to fifty different kinds. If these orders go to an establishment which has but one large mill, it may be necessary, in order to execute the order, to change the rolls in the mill several times, causing thus a waste of power, of time and of energy. If several establishments are combined, each can be equipped for certain sizes. When, in these circumstances, a large order is received, to each establishment will be sent that part of the order which it is especially equipped to fulfil, and thus, without any changes of rolls or stoppage of machinery, the separate sizes can be made. The same principle holds of course in nearly all lines of work, in some to a greater degree than in others; but in the manufacture of hoop and bar iron a saving from this source amounting to from a dollar to a dollar and a half, or from 4s. to 6s., per ton is sometimes made.

7. The advantage of unifying in one establishment the manu- facture of products somewhat allied in nature appears also in selling goods. If customers can buy all of the various kinds of related goods in one establishment, much of their time and energy will be saved. Some of the larger combinations, therefore, in order to make this saving for their customers and thus to be sure of retaining their orders, add to their plant facilities for making products which a smaller establishment could hardly manufacture. For example, the Distilling Company of America, which controls probably 90 % of the entire product of corn spirits, found it to its advantage to add to its plant several rye distilleries, and to purchase a number of the leading brands of whiskies for consumption as beverages, in order that they might supply the needs along different lines of practically all dealers in spirits and whiskies, in this way saving for themselves many customers who otherwise might have been lost.

8. The mere size of an establishment and its ability to supply at any time on short notice any order, however large, gives it also an advantage in retaining custom. A concern that controls only

from 5 to 10% of the entire output of a country in any special line of goods might at times find it impossible to supply goods promptly. Large customers who might thus be embarrassed are more ready to deal regularly with an establishment controlling 75 to 90% of the output, if they can in this way be sure of having their orders attended to promptly. It is stated that the American Sugar Refin- ing Company on this account has been able to secure, with consider- able regularity, one-sixteenth of a cent a pound more on its refined sugars than the independent refiners, the latter being frequently compelled to cut their prices to that extent in order to make sales.

Q. Owing to the fact that the introduction of goods into new markets, especially into foreign markets, is a matter of time, ex- penditure of energy, and of money, the large establishment with great capital has in this particular also a decided advantage. The Standard Oil Company, and American Tobacco Company, and other similar establishments, have thus been able to open up new markets in Europe, in Japan, China and other portions of the Far East more readily by far than individual producers along those lines could have done. This stimulus to the foreign trade acts also beneficially to the domestic trade, inasmuch as the exportation of part of the product tends to keep prices somewhat higher at home, and as the added demand for the raw material influences its price, thus creates a demand for labour along many lines.

10. The combination also frequently saves for its stockholders considerable sums from its wiser dealing with credits, and this in a way also that is beneficial to the entire business community. When competition is very severe among different establishments, the managers, in order to increase their sales, will not infrequently grant credit somewhat unwisely. The combination controlling a large part of the market is not so tempted, and moreover has the power to bring needed pressure to bear upon delinquent debtors more readily, so that losses from bad debts are much less frequent.

Besides the special savings that serve as reasons for the forma- tion of combinations, certain special favours at times lead to their formation.

1 . The protective tariff is most frequently cited as such a favour. By the protection which a protective duty gives against foreign

competition, it doubtless often furnishes the occasion Special f or tne f orma tion of trusts. If a large amount of capital Favours to j g tempted into the industry through the profits pro- Comblna- ^^^ Dv t he tariff, and therefore competition among ns ‘ the various establishments becomes fierce, it is much

easier for them to form a combination with the certainty of good profits, provided the domestic competition can be overcome, if they are certain that foreign competition also is to be excluded. On the other hand, it would hardly be right to speak of the tariff as in this case the direct cause. In other industries not protected by the tariff the same fierce competition leads to the formation of combinations. The tariff is simply an encouraging condition. The removal of the tariff would not destroy the combination unless it destroyed the industry at the same time; but, on the other hand, the removal of a protective tariff might very easily prevent the abuses of exorbitant prices which might be exacted by a combination pro- tected by the tariff.

2. It is doubtless true that combinations have a good many times been encouraged by special discriminating rates of freight granted by the railways or other transportation agencies. There is, of course, a certain economic advantage to the railways in having goods despatched in large quantities by consigners who are able to supply their own cars, loading and unloading facilities, &c. Rail- ways on that account often prefer to deal with large firms, and, other things being equal, are willing to give them some special rates. These concerns also are likely to have rather better credit than the smaller ones, so that dealing with them ensures prompt pay and cheaper collection of accounts. The competition among the different railways also for the freights which an important customer can furnish leads to cutting of the rates in their favour. These special rates, however, whether justified from the business point of view or not, are beyond any question from the social point of view, often a very grave injury. A manufacturer who receives these special favours can build up a business substantially monopol- istic in its extent,

whereas his rival of equal or even of greater ability, and equally skilful as a manufacturer, would be ruined if he did not receive like rates. The injustice of such discriminations and their evil effects on the community have been recognized by legislatures and courts in America, and they are practically universally for- bidden. It remains beyond question true that they are, notwith- standing, very frequently granted.

In recent years in the United States there can be little question that the formation of the great combinations has been much encouraged by the opportunities, which promoters were able to seize, of making for themselves large profits. The movement towards combination was so fully recognized and the advantages in many cases so palpable, that a well-informed and skilful promoter was often able to persuade a large proportion of the manufacturers in some special industry to combine. In preparing the plan for such combination, the

Promotion.

promoter has in many cases seen to it that he himself first bought the properties which he could very shortly turn over to the combination at high rates of profit; or else he has been able to persuade the new corporation to issue large amounts of stock, of which considerable proportions were given to him in return for his services. It has been true in many cases that these securities have been speculative in nature, but nevertheless the promoter has often reaped in this way large rewards. The possi- bility of this profit has doubtless stimulated his activity in urging the combinations.

Associated with the promoter in the organization of these com- binations have usually been bankers or other financiers who stood ready, for an amount of stock or other promised profit sufficiently large to compensate them for their risk, TheUBderm to furnish to the combinations cash sufficient to start writer ‘ the business and to provide other needed capital. Usually the form of underwriting employed has been this : A promoter engaged in the formation of a combination and needing a certain fixed sum in cash, would make an arrangement with a bank to sell to it at a price agreed upon such portions of a named amount of

stock as were not disposed of to other customers before a certain fixed date. For example, the bank might agree to furnish one million dollars in cash (£200,000) in return for say four millions of stock (£800,000), or to purchase itself at a fixed price all the remainder of the $ 4,000,000 stock unsold at the date agreed upon, the bank itself to become the sales agent. In those circumstances the bank would naturally use its best endeavours to sell the' four millions of stock to other customers at the price agreed upon, say twenty-five dollars, or £5, per share. So far as it failed of disposing of the entire amount, it would take the remainder itself. For taking these risks, naturally the bank has almost invariably asked a very high commission, and not infrequently it has been asserted that the managers of the banks have been given a special bonus for themselves privately, in addition to the rates of profits granted the bank.

These large amounts of stock that are paid to the promoter and the financier for the purpose of bringing about the organization of a large trust, lead, of course, to what is called over-,. _ . capitalization. What the proper basis of capitalization 'f~?° for a manufacturing industry should be, is a matter that «*(! **" cannot perhaps easily be determined by a definite prin ° * ciple which shall be applicable in every case. The laws that have been most strict on the subject attempt to limit the capitalization to the " actual cash value " of the business, by that being understood at times simply the cost of the plant itself with the running cash capital needed. On the other hand, most business men think that it is a wiser plan, and on the whole equally just, to capitalize a business on the basis of its earning capacity, regardless of what the plant may have cost. When, as has been frequently the case of late years, in addition to this cash value of the plant and the cash itself which may have been paid in, large sums of stock are issued also for properties which may be in themselves highly over-valued, and for the services of the promoter, the financier and others, we can see that the capitalization must be far above what may ordinarily be considered a paying basis. On the other hand, if the element of monopoly enters into the business to any noteworthy extent, the prices of the product may be kept so high that fair dividends may be paid even on this high capitalization.

That the tendency towards increasing the capital has been very strong there can be no question, and a penalty is apt to be paid for this somewhat reckless financiering. As soon as a slight depression in business comes, so that it is perfectly evident not merely that dividends cannot be paid on the common stock, but that in all probability both the deferred stock and the bonds, if any have been issued, will also have to go without interest, it may be necessary to reorganize many of these combina- tions and to start them anew on a much lower capitalization.

When the person organizing the combination is himself an active business man, and has the intention of himself directing the affairs of the combination, another The element besides that of personal profit very fre- industrial quently enters into the problem. Most strong Maa "X er – men like to take responsibility and to be dominant in affairs. When, owing to the advantages of combination that have been enumerated above, the prospect of a virtual monopoly seems certain, provided due skill in management is exercised, it is natural that the manager should wish to bring about the combination in order that he may himself have the satisfaction of being in substantially absolute control of the entire industry in a country, or possibly even in the world. The ambition thus to dominate in a great industry is akin to that of a statesman, and there can be little question that this pride of power and the desire to control the destinies of others has been a more or less conscious element in the formation

of many of the most successful and most skilfully managed combinations.

i. The form of combination which has ordinarily been first adopted has been some kind of agreement with reference The Forms to maintaining prices, or to paying wages, or to of Com- dividing the territory for the distribution of the bination. product or similar questions. Experience has shown that, generally speaking, such agreements are not likely to be kept in good faith for a long period.

2. In order to make the combination more permanent in its nature, the form of the trust, technically so called, was adopted. Under this form of combination, the stockholders of the various constituent companies of the trust place their stock in the hands of a small board of trustees, giving to these trustees an irrevo- cable power of attorney to vote the stock as they see fit, or in accordance with specific instructions given at the beginning. The title to the stock itself remains in the original holder, with the right to sell or pledge or dispose of it as he sees fit, but without the power of recalling his right to vote. In return for this stock thus deposited with the trustees, the trustees have ordi- narily issued trust certificates, which are in themselves negoti- able and take the place of the stock. Inasmuch as the holding of the voting power of the majority of the stock of each of the different constituent companies gave to the trustees absolute power of election of directors, and consequently the power of guiding harmoniously the affairs of all of the plant entering into the combination regardless of the will of the stockholders, the United States courts held that the corporations entering into such an agreement had gone beyond their powers, and that such a trust was illegal. Owing chiefly to these hostile decisions of the courts, this form of trust was abandoned, and new forms, which still, however, leave the power of unified direction in the hands of a few men, were adopted.

3. After the trusts were declared illegal, it was usual, when a combination was formed, to organize a new corporation which bought all of the properties of the constituent members of the trust. These constituent companies then dissolved, and the one great corporation owning all of the properties remained.

4. The form that now seems to be much in favour approaches in its general nature more closely to that of the original trust. Under this form a corporation is organized for the special purpose of buying and owning all, or a controlling share, of the stocks of each one of the constituent companies. The separate companies are then managed technically independently, the dividends of the separate corporations are all paid to the parent corporation as the stockholder owning all of the stocks, and these dividends are the source of profits of the new corporation. The officers in this parent corporation, of course, vote the

stocks of the separate companies, and thus absolutely control.

From the savings which it is possible for the combinations to make, it would seem possible for them to pay higher rates

of wages to those remaining in their employment and Wages. than it was possible for the constituent companies

to do. In certain instances, especially when the combination has first been made, wages have been increased. On the whole, however, it is probable that as yet the wage- earners have succeeded in getting an increase of wages in cir- cumstances substantially similar to those under which their wages would be increased by single corporations. An increase of wages comes only through pressure on their part. Under a prosperous condition of industry it is possible, without materially lowering profits, to increase the wages.

Certain classes of employes, especially superintendents and commercial travellers, are less needed by the combinations, and consequently the total sum of wages paid to these classes by the combination is less than that formerly paid by the constituent companies. On the other hand, the number of employes of these classes being less than before, the average wage has, in certain cases at least, been increased. Owing to the fact that competitive selling is in certain cases largely done away with, it has in some, perhaps in many, cases been possible for fewer travelling salesmen, of less skill and with lower wages, to do the

Prices.

work than before the combination, so that not merely has the total expense been lessened, but also the average salary paid to those retained in the business.

In case of disputes arising between the combination and the operatives, the position of the combination is stronger than that of an individual corporation. It is possible to close one or two works where troubles have arisen, and to transfer orders to the other works without any material injury to the business, provided the closing of the one or two

establishments is not for too long a period. Such instances have occurred. On the other hand, labour organizations are also rapidly increasing in strength, and their leaders are of the opinion that within a comparatively short time they will be so thoroughly organized in all of the chief industries that a strike can be instituted and supported not merely in one or two establishments, but throughout the entire industry. Whenever this condition of affairs shall have been reached, the employes will be substantially on an equality with their employers in such cases of conflict, so that the advantage now resting with the combination will be largely removed. In certain industries this condition seems already to have been reached.

From the sources of savings that were enumerated before, it is evident that it would be possible for a combination either to increase the prices paid for raw materials, or to lower the prices of its finished products. Experience, how- ever, seems to show beyond question that whenever the combina- tions are powerful enough to secure a monopolistic control it has usually been the policy 10 increase the prices above those which obtained during the period of competition preceding the forma- tion of the combination. Inasmuch, however, as an attempt to increase prices to any great extent, so as to secure very high profits, would certainly result in tempting new capital into the field, it has been the general experience that prices have either been increased only comparatively little after the combination was formed, or else that competition entering the field has com- paratively soon forced a lowering of prices to substantially the former competitive rates. It should be noted, however, that inasmuch as combinations have very frequently been formed only after a period of competition so fierce that practically all the competitors were running at a ‘oss, it is hardly just to speak of a combination placing its prices above ” competitive rates ” unless one defines what is meant exactly by that expression. Whenever they have put their prices above the competitive rates existing just before the combination, it may mean that they have put their prices back to rates that will allow medium profits instead of losses, and not above rates that would be normal in the case of small competitors. (

It will have been noted from what has been said that the

excellences of the combination consist largely in the savings that have already been enumerated. The evils are: (1) The losses to investors through the acts of the /jemed/ esf promoters and financiers at the time of the organiza- tion of the combinations, and through the speculation in the stocks which is at times carried on by the directors of the com- binations themselves. (2) The losses to the wage-earners from the power that sometimes exists of forcing wages rather lower than it would be possible for a single corporation or manufacturer to do, and also from the discharge of certain classes of employ6s whose services are no longer needed, such as commercial travellers. It should be remarked of the latter case, however, that the injury is a personal one to those men that are discharged, but that it results in a saving to the community, and, therefore, presumably to the wage-earning class as a whole in the long run. (3) A further injury at times to the consumer arises, as has been suggested, from the increase in price. Other evils come through the power that is sometimes exercised by combina- tions in the corruption of legislatures; in the control over industries of such a nature that it tends to destroy the spirit of individual activity and independence on the part of many persons who would otherwise enter business independently; and evils also come through the increased force of any improper or dishonourable business practices, since this added force for evil

is given to any combination by virtue of its greater influence in the community. It is not intended to convey the impression that managers of combinations are less moral than other business men, but merely that whenever they are dishonourable in their practices the influence reaches more widely.

The chief remedies for these evils enumerated would seem to be more rigid laws with reference to the methods of incorpora- tion and to the responsibility of directors to stockholders and to the public. This can perhaps best be

brought about through greater publicity in both of these directions, probably under the inspection of government officials. The other line of remedies would seem to be the removal of special favours granted to these combinations either by the government or by railways or other bodies so situated that they can distribute favours to the larger combinations.

The movement towards consolidation of industries in the United States began to be noticeable soon after the Civil War Tbe (1861-65), but it had not reached noteworthy

Movement proportions, excepting in connection with the rail- Towards ways, until within the last twenty years of the 19th century. During the later years many con- solidations were made, the largest number during the years 1898-1900. From what has been said earlier, it is evident that certain classes of industries, especially those that require the investment of fixed capital to large amounts, are especially adapted for combination. Very little tendency towards consolidation is found in the farming industry, and, relatively speaking, little in industries that require the investment of but small capital. It is perhaps, however, not too much to say that in nearly all lines of industry which from their nature are adapted for consolidation combinations more or less firm have been made during the last few years. It is probable that as time passes we shall have many of these combinations reorganized, and that in many lines of industry there will be further consolidation of present combinations.

Experience has shown that when combinations are made in industries that from their nature do not seem well suited for consolidation, failure follows. In many individual instances corporation lawyers, who have had much practice in forming combinations, advise their clients in lines of business especially fitted for competition not to enter a combination, but to remain independent, assuring them that an individual is able to compete in such lines of industry with any combination, however large. Such advice, of course, would not be given were the industry one which was well adapted for consolidation.

Great Britain. — The tendency towards consolidation has been for several years very noticeable in Great Britain,

although the form has been rather that of a pool or ring than that Experience. ˆ a trust or of a single large corporation. In the coal and milling industries there have been agree- ments; and, particularly in London and other distributing centres, these selling combinations have been able at times to control the market. This has also been true with reference to certain kinds of provisions, such as the bacon imported from Denmark.

Of late years there has been a marked tendency towards the formation of large corporations that buy up a very large pro- portion of competing manufacturing plant, and in this way secure at least a temporary monopoly of the market. The Salt Union was formed along these lines, but this has not proved successful, owing probably to the fact that new sources of supply were dis- covered. The dyeing industries in Bradford and in Yorkshire have been consolidated, so that in certain respects they have an absolute monopoly of the business, and in most directions of over 90% of it. The calico printers, the fine cotton spinners, the thread manufacturers, the bleachers, and others connected with the cotton manufacturing industries in Great Britain, have nearly all been brought together into large corporations which control from 90% upwards of the entire business. Similar combinations in cement, wall-paper, soap, tobacco and other trades have been formed. Most of these large corporations have been in existence for such a short time that one cannot yet

judge accurately regarding their permanent success. Many of them seem to have been over-capitalized and their dividends have not always met shareholders' anticipations. There has been no active popular movement against consolidation in Eng- land, and the government has passed no laws opposed to it. Parliament, however, has passed stringent amendments to tbe Companies Acts, changes enforcing publicity regarding the organization of all limited liability companies and their methods of management. The amended law is expected to prevent most of the abuses of the combinations.

Germany. — Germany seems to be peculiarly the home of combinations so far as Europe is concerned. In 1897 Liefmann, writing regarding combinations in Germany, was able to mention combinations which were international in

their scope in forty- one different branches of industry. Of combinations that were confined to Germany alone he mentioned 345, although many of them were in the same line of industry; for example, he found 80 combinations in different branches of the iron industry, 82 in the chemical industries, 38 in the textiles, and so on. Of that number he thought that definite information could be secured, but he was of the opinion that very many more of less importance existed, and had excluded from his reckoning all of those that were purely local, as for example those among the breweries in the different cities, as well as those among firms engaged merely in trade. The form of combination in Germany is ordinarily that merely of contracts among independent establishments {Cartels, Kartells) regulating the amount of output for each, and in certain cases also the prices. As in Austria and in France, a central selling bureau for all the members of the combination is frequently found. The most successful combinations have been those among the coal-miners in western Germany and the four or five in the leading branches of iron manufacture, also in western Germany. Others of somewhat similar rank have been organized, one, for example, in the sugar industry, which includes both refiners and producers, and another among the manufac- turers of spirits. The former, following that among the Austrian sugar manufacturers, is somewhat peculiar in that the refiners guarantee to the producers of raw sugar a fixed price for their output so far as the sugar is intended for the home market, the refiners expecting to recoup themselves from the consumers through the monopolistic power which they possess. The law does not seem to be hostile to these combinations. Contracts that are immoral in their nature are, of course, non-enforceable. But the courts have, on the whole, not taken an attitude inimical to the larger combinations, and the government seems at times to have been inclined to favour them. In one or two cases where the government is itself a producer, as of soda, it is a member of a combination. Indeed, a Prussian minister in a speech in the Landtag has expressed himself favourably regarding the coal and iron combinations. The facts seem to show that the coal combination, at any rate, has used its power of fixing prices in a conservative way, and it has at times held prices somewhat lower than they probably would have been had free competition existed in that industry. So long as the combinations are managed

conservatively, and so long as the government is able to secure a careful supervision over them, it is not to be expected that there will be much hostility in Germany on the part of the government.

France. — The number of combinations in France is probably much less than in Great Britain or Germany. In the penal code there has been a provision for many years against monopoly brought about by unfair means, and in one or two rather promi- nent instances there seem to have been convictions under this article. Consequently, the agreements that have been made, so far as they are intended to control prices, are usually kept secret. There have been, however, notably in the case of the iron industries, agreements made among the leading manufac- turers, under which the proportion of output assigned to each was fixed. A single selling bureau has also in such cases been established, which receives all orders and fixes the prices for all of the different establishments concerned. So far this form of organization, although in certain localities it seems to have

secured monopolistic power has not been successfully attacked in the courts. For several years it has been supposed that a similar agreement existed among the sugar refiners. They themselves, however, acknowledge only an agreement regarding the amount of the output which shall be assigned to each, and deny any agreement as to prices. Of course an agreement regarding output would be likely to have a material effect upon prices. Somewhat similar combinations exist among the petroleum refiners, the porcelain makers, and some few others. The government has taken no active steps in the matter, but popular opinion seems to be awakening somewhat.

Austria. — In Austria the development of combinations has been very marked. The most successful combination, on the whole, as well as one of the earliest, has been that of the iron industry. The sugar industry, however, including both refiners and producers of the raw sugar, and the petroleum industry, are also combinations of great power. The form of

these com- binations is ordinarily that of an agreement regarding both out- put and prices. In some instances a central selling bureau fixes the prices, in others the market is divided, while in others still other forms of agreements of many kinds which serve to secure a monopoly are found. The movement has spread very rapidly indeed, until, in the opinion of many writers in Austria, practically all branches of industry, in which agreements for the lessening of competition will prove advantageous, are now largely controlled by combinations. The courts of Austria have, on the whole, shown themselves hostile to the movement. Con- tracts for the division of the market, for the assignment of fixed proportions of the entire output to different establishments, the fixing of prices, &c, are declared void and will not be enforced by the courts. This adverse action, however, does not seem to have affected very materially the tendency towards combina- tion, although it has perhaps tended somewhat to encourage the formation of large corporations which should purchase all of the separate plant in any one industry. This tendency, again, is checked by the fact that the corporation law requires publicity in business, and that the taxes are heavier on corporations than on private firms, both as regards the legal rate and the certainty of Collection. A government commission has recommended recognition of the combinations by law and their careful super- vision and regulation by government authority. (J. W. J.)

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TRUXTUN, THOMAS (1755-1822), American naval officer, was born at Jamaica, Long Island, on the 17th of February 1755. He went young to sea, and during the War of Indepen- dence was first persuaded to serve in a royal ship. But having been wounded in an action with a privateer manned by his countrymen, it is said that he declared he would never fight them again. Henceforth he commanded a succession of priva- teers sent out to cruise against British trade and transports — the ” St. James,” the ” Mars,” the ” Independence.” He had the reputation of being uniformly successful in all engagements

with British vessels. When the independence of the United States was recognized he returned to trade with a high reputation as a seaman. He was the author of a treatise on longitude and latitude, of a ” System of masting a 44-gun frigate,” and was an advocate for the foundation of a national navy. When the United States navy was reconstituted in 1798 he was one of the original corps of six captains. During the last years of the 18th and first of the 19th century American commerce was sub- ject to much intolerable interference on the part of the French as well as of the British naval officers. It was against the first that Truxtun rendered the services which have made him a prominent personage in the history of the United States navy. In February 1799 he was captain of the United States ” Constellation” (36) and on the 19th of that month he captured the French ” LTnsur- gente ” (36). In the following year, and while still in command of the” Constellation,” he fought the French ” Vengeance” (40), and drove her into

Curacao. The crippled state of his own ship, which had lost her mainmast, prevented him from taking possession of the enemy. In 1802 he was to have sailed in com- mand of the squadron sent against the Barbary pirates, but a difference having occurred between him and the navy depart- ment in regard to the appointment of a captain to his flagship, his remonstrance against the official decision of the authorities was treated as a resignation, which it was apparently not meant to be, and he was not employed any further. He died at Philadelphia on the 5th of May 1822.

TRYON, DWIGHT WILLIAM (1849-), American artist, was born at Hartford, Connecticut, on the 13th of August 1849. At the age of twenty-five he left his position as a clerk in a Hart- ford publishing house to devote himself entirely to art, and two years afterwards went to Paris, where he became a pupil of the Ecole des Beaux Arts, under J. de la Chevreuse, Charles Daubigny and A. Guillemet. A skilful landscape painter, New England provided his best subjects. He first exhibited at the Salon in 1881, and in the same year returned to the United States, settling first in New York City; in 1882-1886 he was director of the Hartford School of Art, and in 1886 became professor of art at Smith College. He became a member of the Society of American Artists (1882), a National Academician (1891), and a member of the American Water Color Society. He won numerous medals and prizes at important exhibitions, among his pictures being “Daybreak,” “Moonlight” and “Early Spring, New England.”

TRYON, SIR GEORGE (183 2-1893), British admiral, a younger son of Thomas Tryon, of Bulwick Park, Northamptonshire, was born on the 4th of January 1832. He entered the navy in 1848, on board Lord Dundonald’s flagship on the North Ameri- can station; was subsequently in the “Vengeance” with Lord Edward Russell in the Black Sea; was landed for service with the naval brigade; and was made a lieutenant in November, but dated back to the 21st of October 1854. From 1855 to 1858 he was in the ” Royal Albert” flagship of Sir Edmund Lyons; and from 1858 to i860 in the royal yacht, which gave him his promotion to commander on the 25th of October i860. From 1861 to 1864 he was commander of the ” Warrior,” the first British sea-going ironclad; from 1864 to 1866 he commanded the ” Surprise” gun- vessel in the Mediterranean; and was

promoted to be captain on the nth of April 1866. In 1867 he was sent out as director of transports and store ships for the Abyssinian expedition, a post which involved a great deal of hard work in a sweltering and unhealthy climate. He discharged his duties exceedingly well, but his health broke down, and he returned to England a helpless invalid. From 187 1 to 1873 he was private secretary to Mr Goschen, then first lord of the admiralty; and from 1874 to 1877 commanded the " Raleigh " in India with the Prince of Wales, and later in the Mediterranean. In the years 1878-1881 he had command of the " Monarch," one of the Mediterranean fleet under Sir Geoffrey Hornby and Sir Beauchamp Seymour, afterwards Lord Alcester. He was subsequently for two years secretary of the admiralty; and for three years more, on his promotion in April 1884 to the rank of rear-admiral, commander- in-chief on the Australian station. On his return in June 1887

he was made K.C.B.; afterwards he was for three years super- intendent of reserves, in which capacity it fell to him to com- mand one of the opposing fleets during the summer manoeuvres, when he showed marked ability and originality of ideas. In 1889 he was promoted to be vice-admiral; and in August 1801 was appointed to command the Mediterranean fleet, which under him — following the example of his old chief, Sir Geoffrey Hornby — became very distinctly an evolutionary and, in that sense, experimental squadron. Some of his methods were afterwards said to be dangerous; but those which were most severely criticized do not appear to have had anything to do with the lamentable accident which ended Tryon's career. On the 22nd of June 1893, the fleet being then off Tripoli onthe coast of Syria, in two columns, Try on made the signal to invert the course, the ships turning inwards in succession. By a fatal error, the psychological cause of which has never been explained, he ignored the patent fact that the two columns were so near each other that the manoeuvre, as ordered, must entail the most serious risk, if not certainty, of collision. And, in fact, the two leading ships did come into collision, with the result that the " Victoria," Tryon's flagship, was cut open and sank in a few

minutes. Tryon and 358 officers and men were drowned.

See the Life, by Rear-Admiral C. C. Penrose-FitzGerald.

TRYON, THOMAS (1 634-1 703), English humanitarian, was born at Bilbury near Cirencester on the 6th of September 1634. He had but little schooling, spending his youth first in spinning and carding and then as a shepherd. In 1652 he went to London, apprenticed himself to a hatter, and accepted his master's Anabaptist principles until he read the works of Jacob Behmen. He now lived a very ascetic life, though he married and became a prosperous merchant. In 1682 he began to publish his views in support of vegetarianism and abstinence from alcohol and tobacco. He detested war, and in this and his mysticism resembled the early Quakers. He died on the 21st of August 1703.

His best known book, The Way to Health (1691), which much impressed Benjamin Franklin, was a second edition of Health's Grand Preservative; or, The Women's Best Doctor (London, 1682). He wrote on many other subjects, e.g. the education of children, the treatment of negro slaves, the way to save wealth, and dreams and visions. Some scanty autobiographical memoirs were pub- lished in 1705.

TRYON, WILLIAM (1729-1788), American colonial governor, was born at Norbury Park, Surrey, England, in 1729. In 1 7 57, when he was a captain of the First Foot Guards, he married a London heiress with a dower of £30,000. In 1764 he was appointed lieutenant-governor of North Carolina, upon Arthur Dobbs's death in 1 7 6 5 became governor pro tern. , and in December of the same year received his commission as governor. Like many other pre-Revolutionary officials in America, he has generally been pictured by American writers as a tyrant. In reality, however, he seems to have been tactful and considerate, an efficient administrator, who in particular greatly improved the colonial postal service, and to have become unpopular chiefly because, through his rigid adherence to duty, he obeyed the instructions of his superiors and rigorously enforced the measures of the British government. By refusing to allow meetings of the Assembly from the 18th of May 1765 to the 3rd of November 1766, he prevented North Carolina from sending representatives to the Stamp Act

Congress in 1765. To lighten the stamp tax he offered to pay the duty on all stamped paper on which he was entitled to fees. With the support of the law-abiding element he suppressed the Regulator uprising in 1768-71, caused partly by the taxation imposed to defray the cost of the governor's fine mansion at New Bern (which Tryon had made the provincial capital), and executed seven or eight of the ringleaders, pardoning six others. From 1771 nominally until the 22nd of March 1780 he was governor of New York. While he was on a visit to England the War of Independence broke out, and on the 19th of October 1775, several months after his return, he was compelled to seek refuge on the sloop of

war " Halifax " in New York Harbour, but was restored to power when the British took possession of New York City in September 1776, though his actual authority did not extend beyond the British lines. In 1777, with the rank of major-general, he became commander of a corps of Loyalists, and in 1779 invaded Connecticut and burned Danbury, Fairfield and Norwalk. In 1780 he returned to England, and in 1782 was promoted to be lieutenant-general. He died in London on the 27th of January 1788.

See Marshal D. Haywood, Governor William Tryon and his Administration in the Province of North Carolina (Raleigh, North Carolina, 1903).

TRYPANOSOMES, or Haemoflageixates, minute Pro- tozoan parasites, characterized by the possession of one or two flagella and an undulating membrane, and specially adapted for life in the blood of a vertebrate. 1 Of late years considerable progress has taken place in our knowledge of these organisms, research upon them having been stimulated by the realization of their extreme importance in medical parasitology. Not only has the number of known forms been greatly multiplied, but the study of the biology and life-history of the parasites has been attended in some cases with remarkable and unexpected results.

Historical. — The first observation of a trypanosome is usually ascribed to Valentin (53), who in 1841 announced his discovery of certain amoeboid parasites in the blood of a trout. In the two or three years following several other observers recorded the occur- rence of similar haematozoa

in various fishes. The generic name of Trypanosoma was conferred by Gruby in 1843 upon the well- known parasite of frogs. E. Ray Lankester (18) subsequently described this same form (under the name of Undulina ranarum)

A B

(From Lankester.)

Fig. i. 2 — Undulina ranarum, Lankester, 1871. In B the nucleus

is shown.

and was the first to indicate the presence of a nucleus in the cell-body. To Mitrophanow (1883-1884) and Danilewsky (1885-1889) we owe the first serious attempts to study the com- parative anatomy of these haematozoa. Trypanosomes were first met with in cases of disease by Griffith Evans, who in 1880 found them in the blood of horses suffering from surra in India. In 1894 (Sir) David Bruce discovered the celebrated South African parasite (T. brucei) in cattle and horses laid low with nagana or the tsetse-fly disease; and this worker subsequently demonstrated, in a brilliant manner, the essential part played by the tsetse-fly in transmitting the parasites. The credit for first recognizing a trypanosome in human blood, and describing it as such, must undoubtedly be assigned to G. Nepve'u (1 898) . Trypanosomes were next seen in human blood

1 Trypanophis, although lacking (so far as is known) a haemal habitat, is included here, since it is undoubtedly closely related to Trypanoplasma.

2 The illustrations in this article are from H. M. Woodcock's " Trypanosomes," in the Quarterly Journal of Microscopical Science,

Occurrence.

in Senegambia in 1901, in a European suffering from

intermittent fever. Forde discovered the parasites, but was uncertain of their nature; he shewed them to E. Dutton, who (n) gave this form the name of Trypanosoma gambiense. A year later A. Castellani (6) found the organisms (most probably the same species) in the cerebro-spinal fluid of patients suffering from sleeping-sickness in Uganda; and it has since been conclusively proved by Sir David Bruce and D. Nabarro (4) that they are the true cause of that dreadful malady.

More important,' from the standpoint of protozoology, than these interesting medical discoveries have been the investigations by A. Laveran and F. Mesnil (20-24), L. Leger (30-35), S. Prowazek (47), F. Schaudinn (50) and others, upon numerous tolerated (i.e. non-pathogenic) forms; these researches supply, indeed, practically all the material facts on which to base an account of the Haemoflagellates at the present day.

Trypanosomes are harboured by members of all the chief classes of vertebrates with the exception of cyclostomes. By far the greater number of hosts are furnished by ' fishes, birds and mammals. Among batrachians the parasites have been found, up till now, only in frogs; and among reptiles their occurrence has only been observed in one or two solitary instances (T. damoniae, fig. 3 J). Data with regard to the frequency with which individual species occur, in any kind of host, are as yet somewhat scanty; in one or two cases the parasites are fairly common, T. lewisi, for example, being met with in a considerable percentage of sewer-rats throughout the world.

In considering the occurrence of Trypanosomes in mammals, careful distinction must be drawn between natural or true hosts, which are tolerant of the parasites, and casual ones, which are unaccustomed and unadapted to them. A Trypano- some usually produces markedly harmful effects upon gaining an entry into animals which have never been, by their dis- tribution, liable to its invasion previously. Such a state of affairs is produced by the march of civilization into the " hinter- lands " of the various colonies, when man, together with the numerous domesticated animals which accompany him, is brought into proximity to big game, &c, and, what is equally important, into the zone of the particular blood-sucking

insects which prey upon the same.

Very many of the common domestic mammals can be successfully infected (either thus accidentally or else on purpose) with different ” pathogenic ” Trypanosomes, to which they succumb more or less readily, but they cannot be regarded as the natural hosts of those Trypanosomes. In dealing with disease-causing forms, the more narrowly the original source of the parasite concerned is defined, the closer do we get to the true vertebrate host or hosts. In the case of the nagana- parasite, various Antilopidae (e.g. the gnu, bushbuck and koodoo) can certainly lay a strong claim to the honour. The capybara, again, is most probably the native host of T. equinum of mal de caderas of horses in South America. Simi- larly with regard to the many other pathogenic Trypanosomes now known, there is undoubtedly, in each case, some indi- genous wild animal tolerant of that particular form, which serves as a ” latent source of supply ” to strange mammals.

The transmission of the parasites from one vertebrate individual to another is effected, in the great majority of cases, 1 Trans- ˆy a blood-sucking invertebrate, and by this means mission; alone. The ” carrier ” of a Trypanosome of warm- AHernathn blooded vertebrates is, in all instances so far de- Hosts. scr jbed, an insect, generally a member of the Dip- tera; in the case of parasites of cold-blooded vertebrates the same r61e is usually played by an ichthyobdellid leech (piscine forms), but possibly, now and again, by an Ixodes (amphibian or reptilian forms).

Until lately it remained quite uncertain, however, whether the invertebrate merely conveys the Trypanosomes or whether

1 Trypanosoma equiperdtim, the cause of dourine in horses and asses, is apparently only conveyed by the act of coitus. This direct mode of transmission is most likely a secondary acquirement.

it is a true alternate host, one i.e. in which definite stages of the parasite’s life-cycle are undergone. Schaudinn (50), who investigated certain avian Trypanosomes, considered the latter view to be correct, and believed that the carrier — in this in- stance a gnat — is indeed the definitive host,

i.e. the one in which sexual conjugation occurs. Many other workers have since studied the subject and, so far as the parasites of fishes are concerned, there can be little doubt, thanks to the researches of E. Brumpt (50), L. Leger (32, 33) and others, that leeches are true alternate hosts for these forms, in which certain phases of the life-cycle are normally undergone.

We cannot write quite so confidently with regard to the relation of the various pathogenic Trypanosomes to Tsetse-flies (Glossinae). In the first place experiment has shown that biting-flies, other in all probability than the true, natural hosts, may at times transmit the parasites — as it were — accidentally, if, after feeding on an infected animal, they are allowed to bite a fresh one within a limited time. One very helpful factor in determining which is the principal carrier of any form is the coincidence of the zone of a particular insect with that of any disease. By this means it has been ascertained with practical certainty that, among the family of Tsetse- flies (Glossinae) for instance, at least four species are the natural carriers of different Trypanosomes. Of these perhaps the best-known is G. palpalis, of Equatorial Africa, whose bite transmits the human parasite (T. gambiense). Nevertheless, the fact, commented upon by several observers, that even here an infected fly is only infectious for a comparatively short period suggests that this species of fly, at any rate, is not the true alternate host in which the life-cycle of that particular Trypanosome is completed. However, indications furnished by Koch (16a) point in this connexion to G. fusca. Lastly, before leaving this interesting and important subject, F. Stuhlmann's work (540) on developmental phases of T. brucii, the nagana parasite in G. fusca and G. tachinoides, does render it probable that the pathogenic forms also have true invertebrate hosts.

Schaudinn had fully described the relations of certain avian Trypanosomes to their invertebrate host, Culex pipiens (females). The distribution of the parasites in the gnat is closely Habitat: connected with the process of digestion. The Try- Effects on panosomes ultimately overrun practically all parts aoat – of the body, sometimes not even the ova escaping. Thus true hereditary infection of a succeeding generation of gnats may be brought about. The life of the parasites while in the insect is characterized by

an alternation of active periods, during which multiplication goes on, with resting-periods, when the Trypanosomes become attached to the epithelial cells of the host. According to S. Prowazek (47), the behaviour of T. lewisi in a louse (Haematopinus) is, in its main features, similar.

On gaining an entry into the blood of a vertebrate the organisms pass rapidly into the general circulation, and are thus carried all over. Considering them first in a tolerant host, the trend of observation is to show that they are never abundant, but on the contrary usually somewhat scarce. One reason for this scarcity is to be sought in cpnnexion with the fact that multiplicative stages are very rarely met with, at any rate in the general circulation. The parasites are frequently more numerous in the spleen, bone-marrow, kidneys, &c, than else- where, and it has been found that multiplication goes on rather more actively in the capillaries of these organs.

The Trypanosomes, in the active phase, are of course always free in the blood plasma (interglobular). In the majority of cases it is very uncertain whether they actually come into relation with the blood corpuscles or not. Schaudinn has stated, however, that Trypanomorpha becomes, in certain phases, attached to a red blood-corpuscle (ectoglobular) , and, in others, penetrates inside one and eventually destroys it (endoglobular) ; while his other avian parasite, Trypanosoma ziemanni, appar- ently draws up into itself the white corpuscle (leucocyte) to which it becomes attached. In addition, there are two or three

obervations to hand which shew that piscine, amphibian and mammalian Trypanosomes may also become attached. Prob- ably most forms possess a resting, attached phase at some period or other, in the invertebrate, if not in the vertebrate host.

Considering now the Trypanosomes in an unaccustomed, mammalian host, they may either remain infrequent or rare

(sometimes, indeed, being unnoticed until shortly before death), or, on the other hand, they may soon become numerous and go on increasing (fig. 2). In the latter case the disease is acute

and rapidly fatal; in the former

“- jr •* “ > w ‘* ‘ s more chronic and lasts much

\ ss a ,»t %. longer, often several months.

The main features of trypano-

somosis, or illness caused by a

Trypanosome, show a general

I agreement, whichever variety is

considered; one symptom may

d.’-\— 3£ˆ y i‘-i r r\ (/ k e ‘ ° course i more marked than

another in any particular case. Death is due either to weakness and emaciation (in chronic cases),

(After Doflein.) Qr tQ block j of the cerebral

Jrlum 2 ˆ r ZfrinTinThe ˆ™ \ the parasites (where blood of a rat eight days after these are abundant), or to dis- inoculation. organization of the nervous

?’ £? ras ?’ tes – , system (paraplegic and sleeping-

b, Blood-corpuscles. ˆ giˆess cases).

In post-mortem examination, the most obvious pathological lesion is hypertrophy of the spleen, which may be very pro- nounced; the lymphatic glands in the neck, inguinal region, &c, are also often greatly swollen. These are undoubtedly the organs which react most strongly to the parasites, and their enlarged condition is to a great extent due to their enhanced activity in elaborating blood-corpuscles and leucocytes to cope with the enemy. Ingestion and dissolution of the Trypano- somes by phagocytes has frequently been observed; and it is probable also that the haematopoietic organs secrete some substance which exerts

a harmful action on the parasites, and causes them to undergo involution and assume weird-looking ” amoeboid ” and ” plasmodial ” forms.

A peculiar feature in the behaviour of the parasites, which is most probably caused by unfavourable biological conditions Aggiomern- in the host, is that known as agglomeration. The aoa ‘ process is readily brought about artificially by the

addition of sera or chemical solutions to blood containing the parasites. Agglomeration consists in the grouping or union together of several Trypanosomes around a common centre; this leads to the formation of rosette-like clusters, or even of large masses composed of several rosettes. The end by which the parasites join is typically, in the case of Trypanosoma, the non-flagellate (anterior) end. If a favourable change in the surrounding medium sets in, the Trypanosomes are able to undergo the reverse process, namely disagglomeration; the parasites liberate themselves and the rosette is dissolved.

Trypanosomes vary greatly with regard to size; even in ont and the same species this variation is often noticeable, especially under Morphology, different conditions of life. The common Trypanosoma rotatorium of frogs (fig. 4, A and B) is, taking it all in- all, one of the largest forms so far described. Its length (inclusive of the flagellum) varies from 40-60 m, while its greatest width (including the undulating-membrane) is from 8-30 n; in the very wide individuals breadth is gained more or less at the expense of length. Conversely, T. gambiense, the human parasite (fig. 3 C), is one of the smallest forms known, its average size being about 21-23 M by lf-2 n. .

There is equally great diversity in respect of form. Typically, the body is elongated and spindle-shaped ; it is usually more or less curved or falciform (fig. 3, A-D), and tends to be slightly compressed laterally. It may be, however, anything from extremely slender or vermiform (fig. 3, H) to squat and stumpy (fig. 3, G, 4, A). Moreover, apart from the fact that a full-grown adult, ready to divide, is in many cases much plumper than a young adult (cf, T. lewisi, fig. 6, A and B), there can be no doubt that considerable polymorphism also sometimes occurs (e.g. T.

rotatorium). In many cases, at any rate, this indicates a difference in sexuality; and it is particularly necessary to bear this factor in mind when considering

the avian Trypanosomes, where, perhaps, the extremes of form are to be met with. ‘That one and the same species may appear entirely different in different phases of the life-history is manifest on comparing, for instance, the chief ” forms ” of Trypanosoma

Fig. 3. — Representative Mammalian, Avian and Reptilian Trypano- somes, to illustrate the chief morphological characters.

A, Trypanosoma lewisi, after Bradf . and Plimmer.

B, T. brucei, after Lav. and MesniL

C, T. gambiense (blood, T-fever), after Bruce and Nabarro.

D, T. equinum, after Lav. and Mesnil.

E, Trypanomorpha (Trypanosoma) noctuae, after Schaud.

F, Trypanosoma avium, after Lav. and Mesnil.

G, Hanna’s Trypanosome from Indian pigeons. H, T. ziemanni, after Schaud.

J, T. damonia, after Lav. and Mesnil.

eg, Chromatoid grains; v, vacuole; l.s, fold or striation.

ziemanni described by Schaudinn. The asexual or indifferent type (fig. 3, H) is extremely thread-like, greatly resembling, in fact, a Spirochaete; on the other hand, both male and female individuals have the form of a very wide spindle.

In Trypanoplasma and Trypanophis there are two flagella, inserted into the body very close to the anterior end (fig. 4, F and G). One flagellum is entirely free and directed forwards; the other at once turns backwards and is attached to the convex or dorsal side of the body for the greater part of its length. _ In all other Trypano- somes there is only one flagellum, which is invariably attached to

the body in the same manner as the posterior one of biflagellate forms. This flagellum, however, is most probably not to be con- sidered homologous in all cases. (See Woodcock, loc. cit.)

In Trypanomorpha (fig. 3, E), which is to be derived from a Her- petomonadine type, the single, anterior flagellum of the ancestral parasite has been drawn backwards along one side of the body and now originates in the posterior half. Hence in this genus the end bearing the free part of the flagellum is the anterior one. The genus Trypanosoma, in which are included at present the great majority of Trypanosomes, is rather to be regarded as derived from a Heteromastigine ancestor, such as Trypanoplasma, by the loss of the anterifir flagellum. Hence in this type the single flagellum represents the posteriorly-directed one of Trypanoplasma, and the end at which it becomes free is the hinder end. The point of origin of the flagellum in Trypanosoma is usually near the anterior end, but may vary considerably (cf. figs.) ; and its free portion may be very short or lacking.

Along the dorsal side runs the characteristic fin-like expansion of the body, the undulating-membrane, which is the organella principally concerned in locomotion. This always begins at the place where the attached flagellum emerges from the body ; and its free edge is really constituted by the latter, which forms a flagellar border. The membrane is usually more or less sinuous in outline, and is sometimes thrown into broad folds (fig. 3, F and J). Distally it thins away concurrently with the body.

The body appears to be in all cases naked. A differentiation of the peripheral cytoplasm in the form of an ectoplasmic layer has been described in one or two instances, and it seems Minute probable that in most Trypanosomes there is such a Structure. i ayer although only poorly developed, as a rule, around the body generally. On the other hand, the undulating-membrane is largely if not entirely an ectoplasmic development. This is usually much clearer and more hyaline than the general cytoplasm. In many forms

deep-staining grains or granules, of a chromatoid nature and of varving size, are to be seen in the cytoplasm. In

only is there an intimate correspondence in this respect between the two principal organellae, but the flagellar apparatus itself is really of nuclear origin and remains closely connected with the kinetonucleus (cf. fig. 7). In most cases, however, little beyond the position and general appearance of the nuclei has been so far made known. The trophonucleus is usually situated somewhere about the middle of the body. The kinetonucleus is typically near the anterior end; but in a few instances it lies more centrally (e.g. T. inopinatum, T. rotalorium, fig. 4, A-C) ; in Trypanomorpha it is in the posterior half of the body (fig. 3, E).

In certain forms the occurrence of prominent myo- nemes or muscle-fibrillae has been described, and, more- over, a nuclear origin assigned to them also. In Try- panomorpha they are confined to the undulating-membrane (fig. 3, E), but in other cases — Trypanosoma ziemanni, T. lewisi, T. brucei, and T. soleae — they are arranged laterally, half running down each side of the body (fig. 4, J). In Trypanoplasma borreli there is only a single myoneme on either side.

All Trypanosomes are capable of binary longitudinal fission, and this appears to be the chief method of multi- plication. The division of the nuclear appa- ratus is the first to take place (fig. 5, A). The ««>»*■ kinetonucleus more often leads the way, but ‘ sometimes either kinetonucleus or trophonucleus may do so indifferently. The duplication of the flagellum begins at its proximal end, that which is in relation with the kinetonucleus. Until recently the process has been con- sidered as an actual longitudinal splitting of the flagellum, following upon the separation of the two daughter-kineto- nuclei. Both Schaudinn (in the case of Trypanomorpha) and Prowazek (in the case of Trypanosoma lewisi and T. brucei), have found, however, that the new flagellum is developed quite independently and laid down alongside the old one. It is at present somewhat uncertain, therefore, in what cases actual splitting occurs. The same applies equally to the formation of the undulating-membrane. If the flagellar border splits, the membrane doubtless divides also; but where the

flagellum is a new formation the membrane will be too. The division of the cytoplasm in most forms is equal or sub-equal, and two approximately equal daughter-Trypanosomes result (fig. 5, C). In some instances (e.g. T. equinum, T. equiperdum) the longitudinal fission is apparently multiple, three or even four descen- dants being produced simultaneously.

FlG. 4. — Representative Amphibian and Piscine Trypanosomes. A,B, Trypanosoma rotatorium, after Lav. and Mesnil.

C, T. inopinatum, after Serg.

D, T. karyozeukton, after Dutt. and Todd.

E, T. nelspruifense, after Lav. and Mesnil.

F,G, Trypanoplasma borreli (living and stained), after L6ger.

H, T. cyprini, after Plehn.

J, Trypanosoma soleae, after Lav. and Mesnil.

K, T. granulosum, after Lav. and Mesnil.

L, T. remaki, var. magna, after Lav. and Mesnil.

h, Clear zone or halo around kineto- nucleus.

rh, Chain of chromatic rodlets run- ning from trophonucleus to kinetonucleus.

a.fl, Anterior flagellum ;

r.fl, Posterior flagellum; s, Longitudinal striations nemes) ; v. Cytoplasmic vacuole.

most cases these granules are, if not confined to, chiefly distributed in the posterior (flagellate) half of the body (figs. 3, B, D and E, 4, E and G). In certain Trypanosomes a well-defined, usually oval vacuole is often, though not constantly, to be observed, situated at a varying distance from the anterior end (figs. 3 and C, G, 4, F). There is no reason to doubt that this vacuole is a normal cell - constituent, for it has been described in parasites in quite

normal surroundings and conditions.

A Trypanosome always possesses two distinct nuclear bodies, one the trophonucleus, regulating the trophic life of the cell, the other, the kinetonucleus, directing its locomotor activities. The recent investigations of Schaudinn and Prowazek (11. c) have shown that, in some forms at any rate, the finer structure and detailed development of the nuclear apparatus is extremely complex. Not

(After Lav. and Mesnil.) Fig. 5. — Stages in Binary Longitudinal Fission of

Trypanosoma brucei. T. lewisi differs from most Trypanosomes in that the cytoplasm divides in a very unequal manner (fig. 6). The process is more comparable to budding, since the (myo- larger or parent-individual may produce, successively, more than one ” daughter ” ; moreover, the daughter-individuals may subdivide before separating, the whole family remain- ing attached by the non-flagellate (anterior) end (fig. 6, F). In this type of division it may be noted that the kinetonucleus comes to lie alongside the trophonucleus, or even passes to the other side of it (i.e. nearer the flagellar end). Easily derivable from this method is the other one characteristic of T. lewisi, viz. seg- mentation. The chief difference is that in the latter no parent- individual is distinguishable, a rosette of many equal daughter- parasites being formed.

The small Trypanosomes resulting from either of these modes of division differ from typical adults by their stumpy, pyriform shape, the position of the kinetonucleus near the flagellar end of the body, and the absence, during the first part of their youth, of an undulating-membrane. At this period they have, in fact, what may be termed a ” pseudo-Herpetomonadine ” aspect. These young individuals can themselves multiply by equal binary fission, giving

rise to little fusiform parasites; with growth, these gradually assume the adult appearance.

Comprehensive researches (1905, seq.) have made it

evident that Trypanosomes have a much more varied and complex develop- Develoo- ment an0 – life-history than was previously supposed. meat lad This has now been found to be the case in widely- Llte-c d differing parasites, occurring in widely-different hosts. ” * The following examples have been investigated : Trypanosoma lewisi (also, but much less completely, T. brucei), 1 among mammalian forms, described by Prowazek (47) ; T. ziemanni and Trypanomorpha noctuae, among avian parasites, described by Schaudinn (50) ; Trypanosoma inopinatum, among batrachian forms, described by A. Billet (la and 2), T. barbatulae and Trypano- plastna varium, described by Leger (32 and 33), and T. borreli, by

(A-E, after Lav. and Mesnfl ; F, after Wasiel and Senn.)

Fig. 6. — Unequal Division and ” Budding ” process in T. lewisi. m, Parent-individual; d, Daughter-individual;’ d’, Daughter- individual dividing.

G. Keysselitz (16), from fishes; also several other piscine Trypano- somes have their development phases in leeches worked on by Brumpt (5a). In addition, a Trypanosome whose vertebrate host is yet unknown {T. grayi) has been studied in detail by Minchin (41a).

It is impracticable here to consider fully all the various develop- mental phases and modifications of the life-cycle described as occur- ring in the above parasites. In view, however, of the great interest excited by Schaudinn’s work on avian parasites, as well as on account of the far-jeaching importance of his conclusions to the study of the Haematozoa, a brief summary of his celebrated research is necessary.

According to Schaudinn’s account, he was dealing with two separate Trypanosome parasites of the Little Owl (Athene noctua), viz. Trypanomorpha (Trypanosoma) noctuae and Trypanosoma (Spirochaete) ziemanni. The latter organism, in certain phases, very closely resembles a Spirochaete. In the blood of the owl resting, intracellular phases of both parasites alternate with active trypaniform ones; and, when in the former condition, Schaudinn considers that the parasites are identical with what have been formerly regarded as distinct Haemosporidia, Halteridium and a

Leucocytozoon respectively. In other words, he considers that these two Haemosporidian forms are really only phases in the life-history of particular Trypanosomes. To this life-cycle belongs the formation of sexual individuals and their conjugation on arrival in the gnat (Culex) ; the process is described as agreeing in the main, in both cases, with what has already been made known by Mac- Callum for another species of Halteridium. The male gametes, it may be noted, are said to possess the essential characters of a Trypanosome. The motile copula or ookinete formed in the gnat gives

1 T. brucei has also been studied in a Tsetse-fly (G. fusca) by Stuhlmann (54a).

rise to one of three types of Trypanosome individual: indifferent, male or female. The development of an indifferent ookinete into an indifferent Trypanosome is shown in fig. 7, from which it will be seen that the cytological details are very complex. The indifferent parasites exhibit an alternation of resting, attached phases with active periods, during which they multiply actively and become very abundant in the insect. The male forms, which are very small and the homologues of the microgametes developed in the blood, appear to die off soon. The female Trypanosomes, on the other hand, grow to a large size, laying up a store of reserve nutri- ment. They are very sluggish and do not divide. They are the most resistant to unfavourable conditions of environment, and are able, by a process of parthenogenesis, to give rise to ordinary, indifferent forms again, which can repopulatethe gnat.

So far as regards the remarkable connexion between Trypanosomes and Haemosporidia indicated by Schaudinn, this has met with a great deal of criticism on the part of Novy and McNeal among others, and it must be admitted that up to 1909 no definite corrobora- tion can be said to have been brought forward. Again, the spiro- chaetiform Trypanosoma (T. ziemanni) described may have been really a true Spirochaete, i.e. a Bacterium. In short, it is quite possible Schaudinn did not sufficiently distinguish between the life-cycles of four distinct parasites of the Little Owl : a Trypano- some, a Spirochaete, a Halteridium and a Leucocytozoon; though, on the other hand, this is by no

means proved. However this may be, the research of subsequent workers — e.g. Brumpt (5a), Leger (32, 33), Keysselitz (16), Prowazek (47), Minchin (41b) and others — has undoubtedly shown that much of Schaudinn's scheme of the life-history of a Trypanosome is well-founded. It is certain, for instance, that the three types of form which he discovered, viz. indifferent, male or female, can be recognized in many cases, often in the vertebrate, but always more sharply differentiated in the invertebrate. Moreover, it is very probable that conjugation' occurs soon after the arrival of the parasites in their specific inverte- brate host; and this act may perhaps give rise to an aflagellar copula, which is gregariniform and comparable to an ookinete. Different investigators, it may be noted, have described various

(After Schaudinn.)

Fig. 7. — Development of an Ookinete (of Halteridium) into an indifferent Trypanosome (Trypanomorpha). A-D shows the formation of the two nuclear elements (tropho- nucleus and kinetonucleus) from the definitive nucleus (synkaryon) of the ookinete.

E-H shows the formation of the myonemes and the flagellar border (flagellum) of the undulating membrane, by means of a greatly elongated nuclear-spindle.

t.chr, Trophonuclear chromo- t.c, some. m,

k.chr, Kinetonuclear do. f.b,

c, Centrosomic granule.

a.s, First axial spindle. a.s 2 , a.s 3 , Second and third do. c. 3 , t, Trophonucleus.

k, Kinetonucleus. k.c, Kinetonuclear centrosome.

Trophonuclear centrosome.

Myonemes.

Flagellar border of undu- lating-membrane (3rd axial spindle).

Its proximal centrosome (its distal one vanishing as such).

complicated nuclear changes and divisions undergone by Trypano- somes; these are considered, in many cases, to represent some kind of parthenogenesis.

A very interesting modification of the life-cycle of a Trypanosome which must be mentioned has been made known by Minchin, in his account of T. grayi, in a tsetse-fly (G. palpalis). Unfortunately the vertebrate host of this form is not yet known. Certain indi- viduals of a particular character form definite rounded cysts in the rectum of the fly ; in this condition, the only sign of Trypanosome structure is afforded by the two nuclei, which remain separate. These cysts are doubtless for dispersal by way of the anus, and the vertebrate host is in all likelihood infected by the mouth and ali- mentary canal. This reveals a quite novel mode by which infection with a Trypanosome may be brought about; so far, however, T. grayi remains the only known example.

As remarked in the section on morphology, the Trypanosomes Classifies- as a whole are preferably regarded as including tioa. t wo entirely distinct groups, Monadina and Hetero-

mastigia.

Sub-order Monadina

Family: Trypanomorphidae, Woodcock. — Haemoflagellates de- rived from a uniflagellate, Herpetomonadine form, in which the point of insertion of the single (anterior) flagellum into the body has travelled backwards from the anterior end for a greater or less distance, the flagellum itself having become, concurrently, attached to the body for a portion of its length by means of an undulating membrane.

Genus Trypanomorpha, Woodcock, 1906. — With the characters of the family. The only species yet known is the type species, T. noctuae (Celli and San Felice). [Syn.

Trypanosoma n. (C. & S.F.), Schaud. =Halteridium n. (C. & S.F.)] . See figs. 3, E, 7. Vertebrate host, Athene noctua, Little Owl; invertebrate host, Culex pipiens.

There are, in addition, other forms, which are probably to be placed in this family, but which are not yet sufficiently well known For their systematic position to be settled. It is, for instance, quite likely that certain Herpetomonadine parasites described by L6ger (29, 34) from various blood-sucking insects are really only stages in the life of a Haemoflagellate. Some of these are placed by Leger in a newly discovered genus, Crithidia.

Sub-order Heteromastigina

Family: Trypanosomatidae, Doflein. — Flagellates, in the great majority of instances haemal parasites, derived from a biflagellate, Bodo-hke type, in which the posteriorly-directed (trailing) flagellum is always present and attached to the body by an undulating membrane, of which it constitutes the thickened edge. The other, the anterior flagellum, may or may not persist.

Genus Trypanoplasma, Lav. and Mesnil, 1902. — The anterior flagellum is present. Both flagella are inserted close together, near the anterior end of the body. Two sub-groups may be' distin- guished. In one, exemplified by T. borreli (fig. 4, F and G) from the rudd and minnow, the anterior flagellum is well-developed, and the free parts of both are of about equal length. In the other, exemplified by T. cyprini (fig. 4, H) from carp, the anterior flagellum is much shorter than the free part of the posterior one, and evidently tending to disappear. Known invertebrate hosts for different species are Hemidepsis and Piscicola, leeches.

Genus Trypanophis, Keysselitz, 1904. — The body resembles that of Trypanoplasma in general appearance, but the locomotor appa- ratus does not appear to be so well-developed, especially in T. grobbeni. The anterior flagellum is longer than the free part of the posterior one. The species included are not, so far as is known, haemal parasites. T. grobbeni occurs in the coelenteric cavity of various Siphonophora.

An interesting form, " Trypanoplasma " intestinalis, which

re- sembles both the above genera, occurs in the alimentary canal of Box boops. Probably this is not a haemal parasite, and lacks an alternate host.

Genus Trypanosoma, Gruby, 1843. — (Principal synonyms: Un- dulina, Lank., 1871; Herpetomonas, Kent, 1880, only in part; Paramoecioides, Grassi, 1881; Haematomonas , Mitrophan, 1883.) There is no anterior flagellum. The point of insertion of the at- tached (posterior) flagellum into the body, and, consequently, the commencement of the undulating membrane may be almost any- where in the anterior half of the body, but is usually near the extremity.

Among the more important and better-known forms are the following : —

Parasitic in mammals: T. lewisi (Kent), the well-known natural Trypanosome of rats (figs. 3, A, 6, A) ; T. brucii, Plim. and Bradf ., the cause of nagana among cattle, horses, &c, in South Africa (fig. 3, B) ; T. evansi, Steel, the cause of surra to horses in Indo- Burmah; T. equiperdum, Dofl., the cause of dourine in horses in Algeria and other regions of the Mediterranean littoral ; T. equinum, Voges, causing mal de caderas or ” hip-paraplegia ” in South America (fig. 3, D) ; T. theileri, Lav., a very large form, the cause of

galziekte or bile-sickness to cattle in the Transvaal; and T. gam- biense, Dutton (syn. T. ugandense, Castellani, T. castellanii, Kruse), the cause of human trypanosomosis in central Africa, which becomes sleeping-sickness when the organisms penetrate into the cerebro-spinal fluid (fig. 3, C).

Parasitic in birds: T. avium (Danil., Lav. emend.), probably the form to which Danilewsky’s original investigations related, para- sitic in owls and (according to Novy and McNeal) also in other birds (fig. 3, F) ; T. johnstoni, Dutt. and Todd, a very spirochaetiform type, from little birds (Estrelda) in Senegambia; and Hanna’s peculiar wide species from Indian birds, with a remarkably tapering anterior end (fig. 3, G). Lastly, there is T. ziemanni, Lav., [syn. Spirochaete z. (Lav.), Schaud, ” Haemamoeba ” 2., Lav., the ” Leuco- cytozoon ” of Danil.] , from various owls, and Culex pipiens, whose life-history has been described by Schaudinn (fig. 3, H). (As above mentioned, this form may not be a true Trypanosome.)

Only one reptilian form is well known, T. damoniae, Lav. and Mesn., from a tortoise, Damonia reevesii (fig. 3, J). Parasitic in batrachia: T. rolatorium, Mayer (syn. Amoeba r., Mayer, July 1843, T. sanguinis, Gruby, November 1843, Undulina ranarum, Lank., 1871), the best-known parasite of frogs, which exhibits remarkable polymorphism (fig. 4, A and B) ; T. mega and T. karyo- zeukton, Dutt. and Todd, even larger than T. r. (fig. 4, D), with peculiar cytological differentiation, may be only sub-species; T. inopinatum, Sergent, and T. nelspruitense, Lav., also from frogs (fig. 4, C). Parasitic in fishes: T. remaki, Lav. and Mesnil, from pike, a relatively small form (fig. 4, L); T. barbatulae, Leger, from loach ; T. granulosum, Lav. and Mesnil, a very long vermiform parasite, from eels (fig. 4, K) ; T. soleae, Lav. and Mesnil, from soles, with a relatively small flagellum (fig. 4, J); and T. scyllii and T. rajae, from those Elasmobranchs, both very large forms, described by Lav. and Mesnil.

Undoubtedly closely allied to the Haemoflagellates, although no actual trypaniform phase has yet been observed, are the important parasites usually known as the ” Leish- _. man-Donovan ” bodies, without some consideration Leishmaa- of which an account of the Haemoflagellates would Donovan- hardly be complete. These bodies are constantly ˆ r ˆ. bt found in certain tropical fevers (e.g. dum-dum fever, kala-azar) particularly prevalent throughout Indo-Burma, of which they are generally held to be the cause. They were discovered by W. Leishman in 1900, but before his first account of them (36) was published they were also seen quite inde- pendently by C. Donovan. Moreover, organisms very similar to these (morphologically, indeed, the two sorts appear scarcely distinguishable) are found in various sores or ulcers (e.g. Delhi boil, Oriental sore, ” bouton d’Alep “) to which people in different parts of the East are liable. These were first described by J. H. Wright (58).

The chief distinction between the parasites in the two cases is in their habitat. In the one case they are entirely restricted to the neighbourhood of the boil or ulcer, whereas in the other there is a general infection of the body, the organisms spreading to all parts and being met with in the spleen, liver, bone-marrow, &c, and (rarely) in the peripheral circulation. The parasites are either free or

intracellular. In the latter case they invade cells of a leucocytic or phagocytic character as a rule; Leishman's form is particularly abundant in large macrophageal cells originating from the vascular endothelium of the spleen (fig. 8, I. M).

The parasites themselves are very minute and usually ovoid or pyriform in shape (fig. 8, I. a), the latter being, perhaps, the most typical. The splenic type is somewhat smaller than Wright's parasite; the former, when pear-shaped, is from 3J to 4 /x in length by i| to 2 ft in width, the latter being about 4 11 by 3 n (fig. 8, III.). The body is probably not limited by any distinct membrane. The cytoplasm is finely granular and fairly uniform in character. The most interesting point about the morphology is the fact that two chromatic bodies, of very unequal size, are almost invariably to be recognized. The larger nuclear body, which corresponds to the trophonucleus of a Trypanosome, is usually round or oval; the smaller one, representing a kinetonucleus, has the form either of a little rod or of a round grain, and is generally separate from the larger nucleus.

The parasites multiply in two ways— (a) by binary fission, and (b) by multiple division or segmentation. The principal stages in the first method are well known (fig. 8, I. b) ; they offer strong resemblance to the process in Piroplasma. Multiple division has not yet been so satisfactorily made out. It appears to con- form more or less to the radial or rosette type of multiplication, enlarged rounded parasites, with a varying number of nuclei (up to about eight) uniformly arranged near the periphery, having been often noticed (fig. 8, I. c and IV. b). The details of the process are somewhat differently described, however, by different observers.

Laveran and Mesnil (27) gave the name Piroplasma donovani to

Irishman's form, 1 and there is no doubt that the parasites are closely allied to that type of organism. This does not, however, preclude in any way the supposition that they —

equally with certain other Haemosporidia — represent, nevertheless, only a phase of a complete life-cycle; and this supposition has in fact been definitely proved to be true by the work of Rogers (48). Rogers cultivated the parasites obtained from cases of kala-azar in artificial media, and found that what were unmistakably flagellate

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Fig. 8.

I. Piroplasma (Leishmanial donovani, Lav. and Mesnil.

a, Typical pear-shaped or oval forms ; b, various stages in longi- tudinal division; c, nuclear division preparatory to multiple fission; d, endoglobular forms, in red blood-corpuscles (p —- pigment grains) ; e, bacillary form of the parasite in a corpuscle; M, large macrophageal cell with many parasites (after Donovan).

II. Uninuclear leucocyte (L) containing several parasites (after Lav.

and Mesnil).

III. P. (Heleosoma) tropicum (Wright).

a, Single individuals; b, dividing forms (from Mesnil, mostly after Wright).

IV. P. donovani in cultures of different ages.

a, Ordinary forms of varying sizes ; b c, stages in multiple division ; d, binary fission; e, f, g, flagellate forms (after Rogers), stages developed in the cultures at different intervals (fig. 8, IV. e, f, g). These forms were elongated and spindle-like; and to one end of the body, near which the smaller nuclear element was situated, a well-developed flagellum was attached. Since then many other workers have obtained similar stages [see Leishman and Statham (38), Christophers (7)] ; but however slender and Trypanosome- like the flagelliform parasites may appear,

up till now no indica- tions of an undulating membrane have been seen, and the kineto- nuclear element is never far from the insertion of the flagellum.

Nevertheless, the general appearance and structure of these motile forms so greatly resemble that of a Herpetomonad, or of the ” pseudo-Herpetomonadine ” forms of a Trypanosome which are obtained in cultures, that it cannot be doubted that the ” Leish- man- Donovan-Wright ” bodies are closely connected with the Haemoflagellates. That being so, it is quite possible that, in normal conditions and circumstances, these parasites also possess, at some period of the life-cycle, a trypaniform phase. Nothing definite is yet known with regard to the transmission of the parasites by an alternate invertebrate host, although there is presumptive evidence in favour of this supposition. 2

A word or two must be said in conclusion with reference to s – the supposed connexion of the Spirochaetae with the

Connexion Trypanosomas. In Schaudinn’s great memoir he of the Spiro- regarded Trypanosoma ziemanni as possessing, in chaetae with certain phases, the actual characteristics of a Trypano- Spirochaete as then known; and, further, he was inclined to think that other Spirochaetae {e.g. S. obermeieri of relapsing fever) were also only phases in the

1 R. Ross (49), regarding the parasites as a quite different kind of Sporozoan, termed them Leishmania; and Wright named his variety from tropical ulcers Heleosoma tropicum.

2 Patton (Set. Mem. India, No. 27, 1907) has brought forward evidence to show that the bed-bug (Cimex macrocephalus) is the invertebrate host.

life-cycle of a particular Haemoflagellate. As a result of his more recent investigations on S. plicatilis (the type-species of Ehrenberg) and other forms (51), he finds, however, that this is not the case, but that the organisms exemplified by 5. plicatilis are to be widely separated from the Trypanosomes, and placed rather with the Bacteria. In addition, it is most probable that, at any rate, certain other spirilliform parasites, e.g. S. balbianii, S. refringens, agree

fundamentally in structure with the type-species.

On the other hand, evidence has lately been brought forward to show that certain parasites which greatly resemble a Spiro- chaete are really related to the Trypanosomes. This is the case with the celebrated organism first described by Schaudinn and E. Hoffmann (52) from essential syphilitic lesions, and now known as Treponema (Spirochaete) pallida, Schaud. F. Krzysztalowicz and M. Siedlecki have published an important account (17) of this parasite, which they consider possesses a true trypaniform phase, and for which they have proposed the name Trypanosoma luis. This view requires, however, corroboration. Nevertheless the resemblance between the biology of this organism in relation to syphilis (as regards mode of infection, habitat, &c.) and that of Trypanosoma equiperdu'm, the cause of dourine or " horse-syphilis," may not be without significance.

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TSAIDAM, or more correctly Tsadum, a depression, or self-contained shallow basin in the N.E. of Tibet, crossed by 37 N. and stretching from 92° to 97°. It is separated from the high plateau of Tibet by the Burkhan-Buddha range, and on the N.E. it is bounded by the eastward continuation of the Astin- tagh ranges, which there consist of four, namely, the lower and upper ranges, and a subsidiary chain flanking the lower range on the north and another subsidiary chain

flanking the upper range on the south (see Kuen-Lun).

The valleys which divide the east ranges of the Kuen-Lun system terminate, or rather merge in, the sandy desert basin of Tsaidam; amongst them the Kakir valley between the upper Astin-tagh and the Akato-tagh and the Kum-kol valley between the Kalta-alagan and the range I. of the Arka-tagh (see Kuen-Lun). Tsaidam lies at an altitude of 11,400 ft. or about 3000 ft. lower than the Kum- kol lakes, and receives from the valley in which they lie the river Chulak-akkan or Tsagan tokhoy, which rises probably on the north slope of the Shapka-monomakha Mountain, one of the culminating summits in the region north of the Arka-tagh range. " It is very possible that the north-west of Tsaidam, which is perfectly

unknown, is broken up into several separate basins. The south-east part of the same great expanse also appears to consist of several smaller basins rather than of one single great basin, each possessing its own salt lake; but then these smaller basins are undoubtedly separated from one another by remarkably low and insignificant thresholds or swellings. " l The north-east part of the basin con- sists of a network of basins, which admit of being grouped in four divisions — Sartiing or Serteng, Makhai, Tsadam or Tsaidam, and Kurlyk or Tosun. The characteristic feature of each of these is that which is found in so many of the valleys of the Tibetan border- land, namely, a pair of linked lakes, one containing salt water and the other fresh water. The only inhabitants of Tsaidam are Mongols — Siirtang Mongols in the north and Tajinur Mongols in the south. The south-east part of the region is drained by the Holuzun-nor or Bain-gol, an affluent of the upper Hwang-ho or Yellow River of China. The Sartiing basin is drained by the Khalting-gol and its tributary the Holuin-gol, which rise in the Humboldt and Ritter Mountains and empty into the lake of Sukhain-nor.

TSANA, a lake of North-East Africa, chief reservoir of the Abai or Blue Nile. Tsana lies between n° 36′ and 12 16′ N. and 37° 2′ and 37 40′ E., filling a central depression in the Abyssinian highlands. It is about 5690 ft. above the sea, but from 2500 to 3000 ft. below the mountain plateau which encircles it. Its greatest length is 47 m., its greatest breadth 44 m., and it covers, approximately 1100 sq. m., having a

drain- age area, including the lake surface, of some 5400 sq. m. In shape it may be compared to a pear, the stem being repre- sented by the escaping waters of the Abai. The shores of the lake are well defined, generally flat, and bordered by reeds, but at places the mountains descend somewhat abruptly into the water. Elsewhere the land rises in gentle undulations, except at the mouths of the larger tributary streams, where are alluvial plains of considerable size. At the south-east end the lake forms a bay about eleven miles long, and from three to eight miles across, and from this bay the Abai issues. The whole of the coast-line is considerably indented and. many narrow promontories jut into the lake. The island of Dek (8 m. long by 4 broad) is in the south-western part of the lake. Near it is the smaller island of Dega, whilst numerous islets fringe the shores.

Lake Tsana is fed by three large rivers and by many petty streams. The chief tributary is the Abai, which enters the lake at its south- west corner through a large papyrus swamp. This river, and the Abai or Blue Nile which issues from the lake, are regarded as one and the same stream and a current is observable from the inlet to the outlet. Next in importance of the affluents are the Reb and Gumara, which run in parallel courses and enter the lake on its eastern side. The outlet of the lake is marked by openings in a rocky ledge, through which the water pours into a lagoon-like expanse. Thence it issues by two or three channels, with a fall of about 5 ft. in a succession of rapids. These channels unite within a couple of miles into one river — the Abai with a width of 650 ft. After passing a large number of rapids in the first sixteen miles of its course the Abai enters a deep gorge by a magnificent fall— the Fall of Tis Esat — the water being confined in a channel not more than 20 ft. across and falling 150 ft. in a single leap. The gorge is spanned by a _ stone bridge built in the 17th century. From this point the Abai makes its way through the mountains to the plains of Sennar, as described in the article Nile.

The average annual rainfall in the Tsana catchment area is estimated at 31 ft., and- the volume of water received by the lake yearly at 6,572,000,000 of cubic metres. More than half of this amount is lost by evaporation, the amount discharged into the river being placed at 2,924,000,000 cubic metres. The seasonal altera- tion of the lake level is

not more than 5 ft. The rainy season lasts from the beginning of June to the end of September. During this period the discharge from the lake is, it appears, little greater than in the dry season, the additional water received going to raise the lake level. Thus the rise in the Blue Nile, in its lower course, would seem to be independent of the supply it derives from its source.

Tsana has been identified with the Coloe Talus of the ancients, which although placed 12° too far south by Ptolemy was described by him as a chief reservoir of the Egyptian Nile and the source of the Astapos, which was certainly the Blue Nile. In 1625 it was visited by the Portuguese priest Jeronimo Lobo, and in 1771 by James Bruce. Dr. Anton Stecker, in 1881, made a detailed examination of the lake, enabling the carto- graphers to delineate it with substantial accuracy. By the Portuguese of the 17th century the lake was styled Dambia,

1 Sven Hedin, Scientific Results of a Journey in Central Asia, 1890-1902, iii. 344 (Stockholm, 1905-1907).

and this name in the slightly altered form of Dembea was in use until towards the close of the 19th century. By many Abyssinians the lake is called Tana, but the correct Amharic form is Tsana.

See Nile and Abyssinia, and the authorities there cited. The British Blue Book, Egypt, No. 2, 1904, contains a special report (with maps) upon Lake Tsana by Mr C. Dupuis, of the Egyptian Irrigation Service. In the Boll. soc. geog. italiana for December 1908 Captain A. M. Tancredi gives the results (also with maps) of an Italian expedition to the lake. (W. E. G. ; F. R. C.)

TSAR, or Czar, the title commonly given both abroad and in Russia itself to the sovereign of Russia, whose official style is, however, ” Emperor and Autocrat ” (Imperator i Samov- lastityel). In its origin the word tsar seems to have connoted the same as imperator, being identical with the German Kaiser in its derivation from the Latin Caesar. In

the old Slavonic Scriptures the Greek fiaaChtm is always translated tsar, and this title was also given to the Roman Emperor. The old Russian title for a sovereign was knyaz, prince, or veliky knyaz, grand prince. The title tsar was first adopted by the Slavonic peoples settled in the Balkan peninsula, who were in close touch with the Eastern emperor; thus it was used by the medieval Bulgarian kings. It penetrated into Russia as a result of the growing intercourse between old Muscovy and Constantinople, notably of the marriage alliances contracted by Russian princes with the dynasty of Basil the Macedonian; and it was assumed by the Muscovite princes who revolted from the yoke of the Mongols. The other tsars were gradually ousted by those of Moscow, and the modern Russian emperors inherit their title of tsar from Ivan III. (1462-1505), or perhaps rather from his grandson Ivan IV. (1533-1584) who was solemnly crowned tsar in 1547.

Throughout, however, the title tsar was used, as it still is in popular parlance, indifferently of both emperors and kings, being regarded as the equivalent of the Slavonic krol or kral (Russ. korol, Magyar, kiraly), a king, which had been adopted from the name of Charle- magne (Germ. Karl, Lat. Carolus Magnus). This use beingequivocal, Peter the Great, at the peace of Nystad (November2, 1721), assumed the style of imperator, an exotic word intended to symbolize his imperial dignity as the equal of the western emperor. This new style was not, however, recognized by the powers until the time of Catherine II., and then only on the express understanding that this recognition did not imply any precedency or superiority of the Russian emperor over other sovereigns. Henceforth, what- ever popular usage might be, the title tsar was treated officially as the equivalent of that of king. Thus the Russian emperor is tsar (king) of Poland and of several other parts of his dominions. Thus, too, the prince of Bulgaria, on assuming the royal style, took the title of tsar of Bulgaria.

The title ” White Tsar, ” applied to the Russian emperor and commonly quoted as though it had a poetic or mystic meaning, is a translation of a Mongol word meaning ” independent ” (cf . the feudal ” blanch tenure, ” i.e. a tenure free from all obligation of personal service).

The wife of the tsar is tsaritsa. In former times the title

tsarevich (king's son) was borne by every son of a tsar; but the word has now fallen out of use. The heir to the throne is known as the tsesarevich or cesarevich (g.n.), i.e. son of Caesar, the other Imperial princes bearing the old Russian title of veliky knyaz (grand duke; q.v?).

TSARITSYN, a town of Russia, in the government of Saratov, situated on the right bank of the Volga, where it suddenly turns towards the south-east, 40 m. distant from the Don. Pop. (1900), 67,650. Tsaritsyn is the terminus of a railway which begins at Riga and, running south-eastwards, intersects all the main lines which radiate from Moscow to the south. It is also connected by rail with Kalach on the Don, where merchandise from the Sea of Azov is disembarked. Corn from middle Russia for Astrakhan is transferred from the rail- way to boats at Tsaritsyn; timber and wooden wares from the upper Volga are unloaded here and sent by rail to Kalach; and fish, salt and fruits sent from Astrakhan by boat up the Volga are here unloaded and despatched by rail to the interior of Russia. The town has grown rapidly since the completion of the railway system, and has a large trade in petroleum from Baku. Tsaritsyn is also the centre of the trade in the mustard of Sarepta, Dubovka and the neighbourhood. The fisheries are important. The buildings of the town include

a public library, and the church of St John (end of 16th century), a fine specimen of the architecture of its period. Here are iron, machinery and brick works, tanneries, distilleries, and factories for jam, mustard and mead. Market gardening is an important industry.

A fort was erected here in the 16th century to prevent the incursions of the free Cossacks and runaway serfs who gathered on the lower Volga, as also the raids of the Kalmucks and Cir- cassians. In 1606 Tsaritsyn took part in the rising in favour of the false Demetrius, and Stenka Razin took the town in 1670. The Kalmucks and Circassians of the Kuban attacked it repeatedly in the 17th century, so that it had to be fortified by a strong earthen and palisaded wall, traces of which are still visible.

TSARSKOYE SELO, a town of north Russia, in the govern- ment of St Petersburg, and an imperial residence, 1 5 m. by rail south of the capital. Pop. (1885), 15,000; (1897),

22,353. The town stands on the Duderhof Hills and consists (1) of the town proper, surrounded by villages and a German colony, which are summer resorts for the inhabitants of St Petersburg; and (2) of the imperial parks and palaces. The former is built on a regular plan, and its houses nearly all stand in gardens. The cathedral of St Catherine is a miniature copy of that at Constantinople. The imperial parks and gardens cover 1680 acres; the chief of them is the " old " garden, containing the " old palace," built (1724) by Rastrelli and gorgeously decorated with mother-of-pearl, marbles, amber, lapis lazuli, silver and gold; the gallery of Cameron adorned with fine statues and entrance gates; numerous pavilions and kiosks; and a bronze statue (1900) of the poet Pushkin. A second palace, the Alexander, was built by Catherine II. in 1792, and has in its park an historical museum and an arsenal.

When Peter the Great took possession of the mouth of the Neva, a Finnish village, Saari-mois, stood on the site now occupied by the town, and its Russified name Sarskaya was changed into Tsarskoye when Peter presented it to his wife Catherine. It was especially embellished by the tsaritsa Elizabeth. Under Catherine II., a town, Sophia, was built close by, but its inhabitants were transferred to Tsarskoye Selo under Alexander I. The railway connecting the town with St Petersburg was the first (1838) to be constructed in Russia.

TSCHAIKOVSKY, PETER ILICH (1840-1893), Russian composer, born at Votkinsk, in the province of Vyatka, on the 7th of May 1840, was the son of a mining engineer, who shortly after the boy's birth removed to St Petersburg to assume the duties of director of the Technological Institue there. While studying in the school of jurisprudence, and later, while holding office in the ministry of justice, Tscha'ikovsky picked up a smattering of musical knowledge sufficient to qualify him as an adept amateur performer. But the seriousness of his musical aspira- tion led him to enter the newly founded Conservatorium of St Petersburg under Zaremba, and he was induced by Anton Rubinstein, its principal, to take up music as a profession. He therefore resigned his post in the ministry of justice. On quitting the Conservatorium he was awarded a silver medal for his thesis, a cantata on Schiller's " Ode to Joy." In 1866 Tschaiikovsky became practically the first chief of the

recently founded Moscow Conservatorium, since Serov, whom he succeeded, never took up his appointment. In Moscow Tschaiikovsky met Ostrovskiy, who wrote for him his first operatic libretto, The Vojevoda. After the Russian Musical Society had rejected a concert overture written at Rubinstein's suggestion, Tschaiikovsky in 1866 was much occupied on his Winter Day Dreams, a symphonic poem, which proved a failure in St Petersburg but a success at Moscow. In 1867 he made an unsuccessful debut as conductor. Failure still dogged his steps, for in January 1869 his Vojevoda disappeared off the boards after ten performances, and sub- sequently Tschai'kovsky destroyed the score. The Romeo and Juliet overture has been much altered since its production by the Russian Musical Society in 1870, in which year the composer once more attempted unsuccessfully an operatic production,

St Petersburg rejecting his Undine. In 1871 Tschaikovsky was busy on his cantata for the opening of the exhibition in celebration of the bicentenary of Peter the Great, his opera The Oprischnik, and a textbook of harmony, which latter was adopted by the Moscow Conservatorium authorities. At Moscow in 1873 his incidental music to the Snow Queen failed, but some success came next year with the beautiful quartet in F. During these years Tschaikovsky was musical critic for two journals, the Sovremennaya Lietopis and the Russky Vestnik. On the death of Serov he competed for the best setting of Polovsky's Wakula the Smith, and won the first two prizes. Yet on its production at St Petersburg in November 1876 this work gained only a succes d'estime. Since then it has been much revised, and is now known as The Little Shoes. Meanwhile the Second Symphony and the Tempest fantasia had been heard, and the pianoforte concerto in B flat minor completed. This was first played by von Biilow in Boston, Massachusetts, some time later, and was entirely revised and republished in 1889. At last something like success came to Tschaikovsky with the production of The Oprischnik, in which he had incorporated much of the best of The Vojevoda. The Third — or Polish — Symphony, four sets of songs, the E-flat quartet (dedicated to the memory of Lamb), the ballet " The

Swan Lake," and the " Francesca da Rimini " fantasia, all belong to the period of the late 'seventies — the last being made up of operatic fragments. Tschaikovsky in 1877 first began to work on the opera of Eugen Onegin. With the production of this work at the Moscow Conservatorium in March 1879 real success first came to him. The story, by Pushkin, was a familiar one, and the music of Tschaikovsky was not so extravagant in its demands as had been the music of his earlier operas.

Meanwhile the more personal side of the composer's career had been given a romantic touch by his acquaintance with his lifelong benefactress, Mme von Meek, and his deplorable fiasco of a marriage. In 1876 he had aroused the interest of Nadezhda Filaretovna von Meek (183ˆ1894), the wife (left a widow in 1876) of a wealthy railway engineer and contractor. She had a large fortune and she began by helping the com- poser financially in the shape of commissions for work, but in 1877 this took the more substantial shape of an annual allow- ance of £600. The romance of their association consisted in the fact that they never met, though they corresponded with one another continually. In 1890 Mme von Meek (who died two months after the composer, of progressive nervous decline) , imagining herself — apparently a pure delusion — to be ruined, discontinued the allowance; and though Tschaikovsky was then no longer really in need of it, he failed to appreciate the patho- logical reason underlying Mme von Meck's condition of mind, and was deeply hurt. The wound remained unhealed, and the correspondence broken, though on his death-bed her name was on his lips. Her connexion with his life was one of its dominating features. His marriage was only a brief and misguided incident. Tschaikovsky married Antonina Ivanovna Milyukova on the 6th of July 1877, but the marriage rapidly developed into a catastrophe, through no fault of hers but simply through his own abnormality of temperament; and it resulted in separation in October. He had become taciturn to moroseness, and -finally quitted Moscow and his friends for St Petersburg. There he fell ill, and an attempt to commit suicide by standing chin-high in the river in a frost (whereby he hoped to catch his death from exposure) was only frustrated by his brother's tender care.

With his brother, Tschaikovsky went to Clarens to recuperate. He remained abroad for many months, moving restlessly from one place to another.' In 1878 he accepted (but later resigned) the post of director of the Russian musical department at the Paris Exhibition, completed his Fourth Symphony and the Italian Capriccio, and worked hard at his " 1812 " overture, more songs, the second pianoforte concerto, and his " Liturgy of St Chrysostom," an interesting contribution to the music of the Eastern Church. The work was confiscated for some time by the intendant of the imperial chapel, on the ground that it

had not received the imprimatur of his predecessor Bortniansky in due accordance with a ukaz of Alexander I. Bortniansky was dead, but his successor was obstinate. Finally the work was saved from destruction by an official order. Tschaikovsky returned only for a short time to Moscow. Thence he went to Paris. In 1879 he wrote his Maid of Orleans (produced in 1880) and his first suite for orchestra. In 1881 died Nichplas Rubinstein — to whose memory Tschaikovsky dedicated the trio in A minor. During the next five years Tschaikovsky travelled, and worked at Manfred and Hamlet, the operas Mazeppa and Charodaika, the Mozartian suite and the fine Fifth Symphony. During a great part of the time he lived in retirement at Klin, where his generosity to the poor made him beloved. His operas The Queen of Spades and the one-act lolanthe were feeble by comparison with his earlier works; more effective, however, were the ballets Sleeping Beauty and Casse-noisette. In 1893 Tschaikovsky sketched his Sixth Symphony, now known as the Pathetic, a work that has done more for his fame in foreign lands than all the rest of his works. This was the year in which the composer conducted a work of his own at Cambridge on the occasion of his receiving the honorary degree of Doctor of Music. In the same year, on the 6th of November, he died from an attack of cholera at St Petersburg.

Tschaikovsky's work is unequal. In dramatic compositions he lacked point precisely as Anton Rubinstein lacked point. But in the invention of broad, sweeping melody Tschaikovsky was far ahead of his compatriot. Among his songs and smaller pianoforte works, as in his symphonies and quartets, are passages of exquisite beauty. The best of Tschaikovsky's work is more distinctly Russian than that of

most of his compatriots; it is not German music in disguise, as is so much of the music by Rubinstein and Glazounow, and it is not incoherently ferocious, like so much of the music by Balakirev.

See Mrs Rosa Newmarch's Tchaikovsky (1900) supplemented in 1906 by her condensed English edition of the Life and Letters, which appeared in Russian in 1901 in three volumes, edited by Modeste Tschaikovsky, the composer's brother.

TSCHUDI, or Schudy, the name of one of the most distinguished families of the land of Glarus, Switzerland. It can be traced back as a peasant, not a noble, race to 1289, while after Glarus joined the Swiss Confederation in 1352 various members of the family held high political offices at home, and were distinguished abroad as soldiers and in other ways.

In literature, its most eminent member was Giles or Aegidius Tschudi (1505-1572), who, after having served his native land in various offices, in 1558 became the chief magistrate or landatn- mann, and in 1559 was ennobled by the emperor Ferdinand, to whom he had been sent as ambassador. Originally inclined to moderation, he became later in life more and more devoted to the cause of the counter-Reformation. It is, however, as the historian of the Swiss Confederation that he is best known; by incessant wanderings and unwearied researches amongst original documents he collected material for three great works, which therefore can never wholly lose their value, though his researches have been largely corrected by those of more recent students. In 1538 his book on Rhaetia, written in 1528, was published in Latin and in German — De prisca ac vera Alpina Rhaetia, or Die uralt wahrhafftig Alpisch Rhatia. The historical reputation of Giles Tschudi has suffered very much owing to recent researches. His inventions as to the early history of the Swiss Confederation are described under Tell. His statements and documents relating to Roman times and the early history of Glarus and his own family had long roused suspicion. Detailed examination of late years has proved beyond the shadow of a doubt that he not merely claimed to have copied Roman inscrip- tions that never existed, and amended others in a most arbitrary fashion, but that he

deliberately forged a number of documents with a view to pushing back the origin of his family to the 10th century, thus also entirely misrepresenting the early history of Glarus, which is that of a democratic community, and not (as he pretended) that of a preserve of several aristocratic families. Tschudi's historical credit is thus hopelessly ruined, and no

document printed or historical statement made by him can henceforward be accepted without careful verification and examination. These discoveries have a painful interest and importance, since down to the latter part of the 19th century Swiss historical writers had largely based their works on his investigations and manuscripts.

for a summary of these discoveries see G. v. Wyss in the Jahrbuch of the Historical Society of Glarus (1895), vol. xxx., in No. 1 (1894), of the Anzeiger f. schweizerische Geschichte, and in his Geschichte d. Historiographie in d. Schweiz (1895), pp. 196, 201, 202. The original articles by Vogelin (Roman inscriptions) appeared in vols, xi., xiv. and xv. (1886- 1890) of the Jahrbuch f. schweizer Geschichte, and that by Schulte (Glarus) in vol. xviii. (1893) of the same periodical. For the defence, see a weak pamphlet, Schulte u. Tschudi (Coire, 1898), by P. C. v. Planta.

Tschudi's chief works were not published until long after his death. The Beschreibung Gattiae Comatae appeared under Gallati's editorship in 1758, and is mainly devoted to a topographical, historical and antiquarian description of ancient Helvetia and Rhaetia, the latter part being his early work on Rhaetia revised and greatly enlarged. This book was designed practically as an introduction to his magnum opus, the Chronicon helveticum, part of which (from 1001 to 1470) was published by J. R. Iselin in two stately folios (r 734 -I 736); the rest consists only of rough materials. There exist two rather antiquated biographies of Tschudi by I. Fuchs (2 vols., St Gall, 1805) and C. Vogel (Zurich, 1856), but his extensive complete correspondence has not yet been printed.

Subjoined is a list of other prominent members of the family. Dominic (1 596-1 654) was abbot of Muri and wrote a painstaking work ; Origo et genealogia gloriosissimorum comitum de Habsburg (1651). Joseph, a Benedictine monk at Einsiedeln, wrote a useful history of his abbey (1823). The family, which became divided in religious matters at the Reformation, also includes several Protestant ministers: John Henry (1670-17 29), who wrote Beschreibung des Lands Glarus (17 14); John Thomas (1714-1788), who left behind him several elaborate MSS. on the local history of Glarus; and John James (1722-1784), who compiled an elaborate family history from 900 to 1500, and an account of other Glarus families. John Louis Baptist (d. 1784), who settled in Metz and contributed to the Encyclopedic, and Frederick (1820-1886), the author of Das Thierleben der Alpen- welt (1853), were distinguished naturalists. Among the soldiers may be mentioned Christopher (1571-1629), a knight of Malta and an excellent linguist, who served in the French and Spanish armies; while the brothers Louis Leonard (1700-1779) and Joseph Anthony (1703-1770) were in the Neapolitan service. Valentine (1499-1555), the cousin of Giles, was, like the latter, a pupil of Zwingli, whom he afterwards succeeded as pastor of Glarus, and by his moderation gained so much influence that during the thirty years of his ministry his services were attended alike by Romanists and Protestants. The best-known member of the family in the 19th century was Iwan (1816-1887), author of an excellent guide-book to Switzerland, which appeared first (1855) under the name of Schweizet ftihrer, but is best known under the title (given in 1872 to an entirely recast edition) of Der Tourist in der Schweiz. (W. A. B. C.)

TSENG KUO-FAN (1811-1872), Chinese statesman and general, was born in 181 1 in the province of Hunan, where he took in succession the three degrees of Chinese scholarship. In 1843 he was appointed chief literary examiner in the province of Szechuen, and six years later was made junior vice-president of the board of rites. When holding the office of military examiner (1851) he was compelled by the death of his mother to retire to his native district for the regulation mourning. At this time the Taiping rebels were overrunning Hunan in their conquering career, and had possessed themselves of the cities and

strongholds on both shores of the Yangtse-kiang. By a special decree Tseng was ordered to assist the governor of the province in raising a volunteer force, and on his own initiative he built a fleet of war junks, with which he attacked the rebels. In his first engagement he was defeated, but, happily for him, his lieutenants were more successful. They .recovered the capital, Chang-sha, and destroyed the rebel fleet. Following up these victories of his subordinates, Tseng recaptured Wuchang and Hanyang, near Hankow, and was rewarded for his success

by being appointed vice-president of the board of war. In 1853 other triumphs led to his being made a baturu (a Manchu order for rewarding military prowess) , and to his being decorated with a yellow riding-jacket. Meanwhile, in his absence, the rebels retook Wuchang and burnt the protecting fleet. The tide quickly turned, however, and Tseng succeeded in clearing the country round the Poyang lake, and subsequently in ridding the province of Kiangsu of the enemy. His father died in 1857, and after a brief mourning he was ordered to take supreme command in Cheh-kiang, and to co-operate with the governor of Fukien in the defence of that province. Subsequently the/rebels were driven westwards, and Tseng would have started in pursuit had he not been called on to clear the province of Ngan-hui of rebel bands. In i860 he was appointed viceroy of the two Kiang provinces and Imperial war commissioner. At this time, and for some time previously, he had been fortunate in having the active support of Tso Tsung-t'ang, who at a later period recovered Kashgar for the emperor, and of Li Hung-Chang. Like all true leaders of men, he knew how to reward good service, and when occasion offered he appointed the former to the governorship of Cheh-kiang and the latter to that of Kiangsu. In 1862 he was appointed assistant grand secretary of state. At this time the Imperial forces, assisted by the " Ever-victorious Army," had checked the progress of the rebellion, and Tseng was able to carry out a scheme which he had long formulated of besieging Nanking, the rebel headquarters. While Gordon, with the help of Li Hung-Chang, was clearing the cities on the lower waters of the Yangtse-kiang, Tseng drew closer his besieging lines around the doomed city. In July 1864 the city fell into his iiands, and he was rewarded with the rank and title of marquis and the right to wear the double-

eyed peacock's feather. After the suppres- sion of the Taipings the Nienfei rebellion, closely related to the former movement, broke out in Shantung, and Tseng was sent to quell it. Success did not, however, always attend him on this campaign, and by Imperial order he was relieved of his command by Li Hung-Chang, who in the same way succeeded him in the viceroyalty of Chihli, where, after the massacre of Tientsin (1870), Tseng failed to carry out the wishes of his Imperial master. After this rebuff he retired to his viceroyalty at Nanking, where he died in 1872.

Tseng was a voluminous writer. His papers addressed to the throne and his literary disquisitions are held in high esteem by the scholars of China, who treasure as a memorial of a great and un- corrupt statesman the edition of his collected works in 156 books, which was edited by Li Hung-Chang in 1876. (R. K. D.)

TSETSE-FLY (Tsetse, an English rendering of the Bantu nsi-nsi, a fly), a name applied indiscriminately to any one of the eight species of Glossina, a genus of African blood-sucking Diptera (two- winged flies, see Diptera), of the family Muscidae. Tsetse-flies are of great economic and pathological importance as the disseminators of tsetse-fly disease (nagana) and sleeping sickness. These maladies are caused by minute unicellula animal parasites (haematozoa) of the genus Trypanosoma (see Trypanosomes) ; and recent investigations have shown that, under normal conditions, the particular species of Trypanosoma concerned (T. brucei, in the case of nagana, and T, gambiense in that of sleeping sickness) are introduced into the blood of sus- ceptible animals or man only by the bite of one or other of the species of tsetse. (See Parasitic Diseases). The names of the recognized species of tsetse-flies are as follows: Glossina palpalis (see fig.); G. pallicera; G. morsitans; G. tachinoides; G. pallidipes; G. longipalpis; G. fusca; and G. longipennis. A ninth so-called species, described in 1905 from specimens from Angola, is not really distinct from G. palpalis but appears to be identical with the sub-species G. palpalis wellmani.

In appearance tsetse are somewhat narrow-bodied flies, with a prominent proboscis, which projects horizontally in front of the head, and with the wings in the resting position closed flat one over the other like the blades of a pair of

scissors (see fig., B). The latter characteristic affords an infallible means for the recognition of these insects, since it at once serves to distinguish them from any blood-sucking flies with which they might otherwise be confused. The coloration of tsetse-flies is sombre and inconspicuous; the brownish

or greyish-brown thorax usually exhibits darker longitudinal markings, and when the insect is at rest the abdomen or hinder half of the body is entirely concealed by the brownish wings. In some species the abdomen is of a paler colour and marked with sharply defined, dark brown bands, which are interrupted on the middle line. The length of the body, exclusive of the proboscis, which measures about a line to a line and a half, varies according to the species from 6 or 8 millimetres in the case of G. tachinoides, to about 1 1 J millimetres in that of G. fusca or longipennis ; the closed

wings, however, project beyond the body and thus increase its apparent length. G. palpalis, the disseminator of sleeping sickness (see fig.), is about 9I millimetres in length and is the darkest of all the tsetse-flies, tjiough the dark brown abdomen has pale lateral triangular markings and usually at least an indication of a pale longitudinal median stripe. In all tsetse-flies the proboscis in the living insect is entirely concealed by the palpi, which are grooved in their inner sides and form a closely fitting sheath for the piercing organ; the base of the proboscis is expanded beneath into a large onion-shaped bulb, which is filled with muscles.- The head of the insect contains a muscular pharynx by means of which the blood from the wound inflicted by the proboscis (labium) is pumped into the alimentary canal and the so-called sucking-stomach. The tip of the proboscis is armed with a complicated series of chitinous teeth and rasps, by means of which the fly is enabled to pierce the skin of its victim ; as usual in Diptera the organ is closed on the upper side by the labrum, or upper lip, and contains the hypopharynx or common outlet of the paired salivary

glands, which are situated in the abdomen. The proboscis of tsetse-flies is without the paired piercing stilets (mandibles and maxillae) possessed by other blood- sucking Diptera, such as the female horse-flies and mosquitoes.

For the anatomy of the tsetse see E. A. Minchin, Proc. Roy. Soc. lxxvi. 531-547.

Tsetse-flies are restricted to Africa, where they occur in suitable localities throughout the greater portion of the tropical region, although not found either in the Sahara or in the veld country of the extreme south. For practical purposes the northern limit of Glossina, as at present known, may be shown on the map by drawing a line from Cape Verde to the Nile a little to the south-east of El Obeid, and thence to the coast of Somaliland at 4° N. ; while the southern boundary of the genus may similarly be represented by the Cunene river, in the south of Angola, and a line thence to the north-eastern end of St Lucia lake, in Zululand. Within the area thus defined tsetse-flies are not found continuously, however, but occur only in small tracts called" belts " or " patches," which, since cover and shade are necessities of life to these insects, are always situated in forest, bush or banana plantations, or among other shady vegetation. In South and Central Africa, at any rate, " fly-belts " are usually met with in damp, hot, low-lying spots on the margins of water-courses, rivers and lakes, and seldom far from water of some kind. It appears, however, that in this respect the habits of the different species show a certain amount of variation; thus, while G. palpalis exhibits an especial fondness for water and haunts more or less dense cover at the water's edge, recent observations in German East Africa show that G- fusca is in no way connected with water, but is much more frequently encountered at a distance from it. Similarly; the oft-repeated assertion that there is a definite connexion between tsetse-flies and big game, especially the buffalo {Bubalus caffer), in that the former are dependent upon the latter for their continued existence, is certainly not true as regards G. palpalis, although in South Africa there can be no question that the ex- termination of big game has been followed or accompanied by the disappearance of tsetse from many localities in which they formerly abounded.

As a rule tsetse-flies are most active during the warmer

hours of the day, but they frequently bite at night, especially by moonlight. The blood-sucking habit is common to both sexes, and the abdomen, being capable of great expansion, is adapted for the periodical ingestion of an abundant food-supply. The act of feeding, in which the proboscis is buried in the skin of the victim nearly up to the bulb, is remarkably quick, and in thirty seconds or less the abdomen of the fly, previously flat, becomes swollen out with blood like a berry. Stuhlmann's experiments with G. fusca show that the insect is able to ingest considerably more than (sometimes more than twice) its own weight of blood, which would appear to be the only food, and must be drawn from the tissues of a victim. Specimens of G. fusca, even though fasting and kept for days in absolutely dry air, could never be induced to imbibe water, sugar-cane juice or extra- vasated blood. The reproduction of tsetse-flies is highly remarkable; instead of laying eggs or being ovovivi- parous the females deposit at intervals of about a fortnight or three Weeks a single full-grown larva, which forthwith buries itself in the ground to a depth of several centi- metres, and assumes the pupal state. The practical importance of this peculiar life-history is very great, since larvae thus protected cannot easily be destroyed. It is important to note that although sleeping sickness (of which the chief foci are at present the Congo Free State and Uganda) has hitherto been associated with one particular species of Glossina, it has been shown experi- mentally both that other tsetse-flies are able to transmit the parasite of the disease, and that G. palpalis can convey kindred parasites which are fatal to domestic animals. Since, moreover, it is believed that at least five species of Glossina are carriers of nagana, it may well be that all tsetse-flies can disseminate both nagana and sleeping sickness. (E. E. A.)

TSHI, Tchwi, Chi, or Oji, a group of Negro peoples of the Gold Coast (q-v.). The chief of these are the Ashanti, Fanti, Akim and Aquapem. Their common language is the Tshi, from which they gain their family name.

TSU-SHIMA (" the island of the port "), an island belonging to Japan, situated about midway between Korea and the island of Iki, so that the two islands were used as places of call in former times by vessels plying between Japan and Korea. Tsu-shima lies about 34 20′ N., 129 20′ E. The

nearest point of the Korean coast is 48 m. distant. It has an area of 262 sq. m. and a population of 30,000. It is divided at the waist by a deep sound (Asaji-ura), and the southern section has two hills, Yatachi-yama and Shira-dake, 2130 ft. and 1680 ft. high respectively, while the northern section has Ibeshi-yama and Mi-take, whose heights are 11 28 ft. and 1598 ft. The chief town is Izu-hara. The Mongol armada visited the island in the 13th century and com- mitted great depredations. In 1861 an attempt was made by Russia to obtain a footing on the island. The name of the battle of Tsu-shima is given to the great naval engagement of the 27th and 28th of May 1905, in which the Russian fleet under Admiral Rozhdestvensky was defeated by the Japanese under Admiral Togo.

TUAM, a market town and episcopal city of Co. Galway, Ireland, 20 m. directly N.N.E. of Galway on the Limerick & Sligo branch of the Great Southern & Western railway. Pop. (1901), 3012. Anabbeywas founded here towards the end of the 5th century, and in the beginning of the 6th an episcopal see by St Jarlath. The Protestant archbishopric of Tuam was lowered to a bishopric on the death of Archbishop Power Le Poer Trench in 1839, and united with that of Killala and Achonry. It is, however, a Roman Catholic archbishopric. The Protestant cathedral is also the parish church, and was to a great extent re- built c. 1861 from plans by Sir Thomas Deane. Only the chancel of the old church remains, but its red sandstone arch is a remark- ably fine example of Norman work; it dates from the middle of the -1 2th century. The modern Roman Catholic cathedral is Perpendicular in style and cruciform in plan. The interior is elaborately decorated. The cross of Tuam, re- erected in modern times, bears inscriptions in memory of Turlogh O'Conor, king of Ireland, and O'Hoisin, successively (1128) abbot of St Jarlath's Abbey and archbishop (1152) of Tuam, when the see was raised. St Jarlath's Roman Catholic college, usually called the New College, is a seminary founded in 1814 for the education of priests. To the west are the archbishop's palace and a convent of

Presentation nuns. The town has a considerable retail trade, and is a centre for the disposal of agricultural produce. Tuam received its first charter from James I. Before the union in 1800 it returned two members to the Irish Parliament.

TUAREG, or Tawarek (more properly Tawarik, the collective form of tarki, from Arabic terek, to give up), the name given to the western and central Saharan Berber peoples, in reference possibly to their abandonment of Christianity or their early home in Mauretania. They call themselves Imoshagh (" the noble people "), another form of Amazigh. They inhabit the desert from Tuat to Timbuktu and from Fezzan to Zinder. The Tuareg country covers about 1,500,000 sq. m., less than 3000 acres of which are cultivated. There are only some half- dozen commercial places in the whole Sahara to which the Tuareg resort. These are the centres from which the trade routes radiate, Wargla, Timbuktu, Ghat, Ghadames, Murzuk and Insalah.

The Tuareg, at any rate the noble class, are regarded as among the purest of the Berber stocks, but with the adoption of Islam they have become largely Arabized in manners and customs, though the nomad Tuareg preserve in singular purity the Tama- shek dialect of the Berber language. Their general colour is the reddish yellow of southern Europeans, the uncovered parts of the body being, however, darker through exposure. Their hair is long, black, and silky, beards black and thin; eyes black, sometimes blue; noses small; hands delicate, but bodies muscular. They are a tall people, the chiefs being especially noted for their powerful build. They dress generally in a black tunic (some tribes wear white), trousers girt with a woollen belt, and wear as turban a cloth called litham, the end of which is drawn over the face, allowing nothing to be seen but the eyes and the tip of the nose. The purpose of this is to protect the throat and lungs from the sand. These cloths are dark blue or white: the former being worn most by the nobles, the latter by the common people. To this difference of colour is due the terms " black " and " white " Tuareg. The Tuareg seldom remove their masks or face-cloths. Even abroad they wear them, and have been seen so dressed in the streets of Paris. The Arabs call them " People of the Veil."

The Tuareg are divided into five main tribes or confederations of tribes: the Azgar (Asjer) about Ghat and Ghadames; the Kelui around Air; the Hoggar (Ahaggar) in the mountains of that name and in the centre of the Sahara ; the Awellimiden in the desert north and east of Timbuktu; and the Arrerf Ahnet, a recent offshoot of the Hoggars living in the Adrar'n Ahnet region north-west of the Hoggar massif. Owing to their nomadic life their political organization is not so democratic as that of other Berber peoples; chiefs and the members of the popular assembly are nominally elective; practically, however, the office of chief is hereditary in a ruling family. On a chief's death the office goes, with-the approval of the tribesmen, to the eldest son of his eldest sister, in no case to any of his sons. The Tuareg are nominally Mahommedans, and belong to the Malikite section of the Sunnites. The Senussite sect, however, has many adherents, but more because of the Tuareg hatred of foreigners than from devoutness. A very few perform, by way of Tripoli, the pilgrimage to Mecca. They have not many mosques, and these are merely small stone enclosures a few feet high, with a niche at one end towards Mecca. There are a number of desert monasteries, huge camps pitched in a circle. Here the marabout lives surrounded by his followers, shifting the " monas- tery " as the requirements of his flocks compel. In these monasteries many Tuareg children receive their education.

Socially the Tuareg are divided into five classes, viz. : Thaggaren or nobles; Marabouts or priests; Imghad or serfs; Ireghenaten or cross-breeds; and the slaves. The nobles are all pure-blooded, and provide the tribal chiefs. They do no manual work, but almost live in the saddle, either convoying those caravans which have paid blackmail for safe passage, or making raids on trade-routes or even outlying Arab settlements. Before the French occupation they sometimes penetrated into the very heart of Algeria and Tunisia. Among the Imghad serfdom is hereditary, and whole tribes are vassals to the nobles. They cannot be sold or freed like slaves, though they may be inherited. Most of them have practical inde- pendence and act as " squires " to the nobles on their pillaging expeditions. The cross-breeds are the descendants of mixed marriages between the nobles and serfs. These follow their mother's status. The slaves are chiefly Sudanese negroes. They are well treated and are

practically members of the Tuareg family, but the Tuareg never intermarry with them. The Tuareg weapons are a straight two-edged sword about 4 ft. long, a dagger bound

to the left forearm by a leather ring, and a slender iron lance some 9 ft. long barbed for about a foot. On his right arm the Tuareg warrior wears a heavy stone to give increased weight to his lance and sword-play or to parry blows. Muskets are common, no noble or freedman being without one. Besides this the Tuareg carry leathern shields. In hunting, wooden missiles like boomerangs are used. Among the low-caste hill tribes of Hoggar bows and arrows are the only weapons.

Little is known of the history of the Tuareg. The name is that given them by the Arabs. They are the descendants of those Berbers who were driven into the desert by the great Arab invasion of North Africa in the nth century. Ibn Khaldun in the 14th century locates them to the south and west of Tunisia. They were constantly at war with the Arabs on the north, and the Negro peoples of the Sudan on the south. For their relations with the French, with whom they came into contact after the conquest of Algeria, see Sahara.

Authorities. — H. Duveyrier, Les Touaregs du Nord (Paris, 1864); Lieut. Hourst, The Exploration of the Niger (Eng. trans., London, 1898), pp. 199-249; W. J. Harding King, A Search for the Masked Tuaregs (London, 1903); M. Benhazera, Six Mois chez les Touareg du Ahaggar (Algiers, 1908) ; Lieut. C. Jean, Les Touareg du sud-est: I' Air, lew role dans la politique saharienne (Paris, 1909) ; E. Doutte, Magie et religion dans I'Afrique du nord (Algiers, 1909) ; " Essai de transcription methodique des noms de lieux touareg " in Bull. soc. geog. d' Alger (1908).

TUAT, a Berber word – 1 sometimes applied generally to all the oases in the western part of the Algerian Sahara, i.e. between 2 W. and 25° E. 26 and 30 N., sometimes restricted to a par- ticular group which borders the east side of Wad Mzaud between 26|° and 275° N. According to the first usage Tuat includes the oases of Gurara in the north and Tidikelt in the south with the important centre of Insalah. The three groups are spoken of col- lectively by the French as the Tuat archipelago. The district is comparatively fertile, being formed of recent alluvium extending along the

base of the Tademait plateau (Cretaceous) , and produces dates and some cereals and vegetables. The wadi Saura (known in its lower course as the Messaud) , formed by the junction of the wadis Zusfana and Ghir, marks the north-western boundary of the oases. After the winter rains in the Atlas it carries a consider- able body of water in its upper course, but lower down its channel is choked by sand. Works were undertaken (1909) by the French to keep open the channel as it passes Tuat proper. At Gurara water is obtained from springs brought to the surface by the outcrop of impervious Devonian rocks. There is an extensive sebkha or salt lake at Gurara. The oases support a comparatively large population. The separate ksurs or hamlets, of which the district is said to contain over 300, are in Tuat proper placed close together. The political centre of Tuat is the oasis of Timmi, which has some forty ksurs. All the ksurs are strongly fortified, the walls of the citadels being of immense thickness. The whole region has been formed into an administrative unit known as territoire des oasis sahariennes, and comprising a native commune subdivided into the annexes of Tuat, Gurara and Tidikelt. In 1906 the commune had a population of 134 Europeans and 49,873 2 natives, of whom 112 enjoyed municipal rights. There were four places with over 2000 inhabitants: Adrar (Timmi), 2686, and Zaniet-Kunta, 3090 , in Tuat; Insalah, 2837, m Tidikelt; andTimimun, 2330, in Gurara. Nine other places had between 1000 and 2000 inhabitants. By race (excluding the troops) there were 19,654 Arabs, 5470 Berbers, 4374 negroes, 191 Jews (professing Islam) and 19,412 persons of mixed blood. The district is of importance as commanding the routes southwards to Timbuktu from both Morocco and Algeria, and it is thus a great centre of trade. The oases appear to have been inhabited from a very early period. According to tradition numbers of Jews migrated thither in the 2nd century a.d. They Were the predominant element in the oases when the conquests of Sidi Okba drove the Zenata south (7th century). These Berbers occupied Tuat and, to a large extent, absorbed the Jewish popu- lation. The Arabs took possession of the oases in the 10th century and imposed Islam upon the people. Thereafter the region was governed by Zenata Berbers or by Arab chieftains. In the 14th

1 The etymology of the word is doubtful; it is used in the

sense of an inhabited district' — hence an oasis.

2 By a clerical error the native population in the census returns is given as 60,497.

century the sultan of Morocco occupied the oases, which remained in political dependence upon Morocco. In the 17th century, how- ever, the sovereignty of the sultan had become almost nominal and this state of quasi-independence continued. The treaty of 1845 between Morocco and France left the question of the possession of Tuat, Gurara and Tidikelt unsettled. After the murder in 1881 of the members of the Flatters mission— a French expedition sent into the Sahara — a measure concerted at Insalah, several of the Tuat headmen sought Moroccan protection, fearing the vengeance of France. A chief calling himself the Moroccan pasha established himself at Timmi, but Morocco took no active step to assert her sovereignty. In 1899 a French scientific mission, under Colonel Flamand, was despatched to the oasis of Tidikelt. The French were attacked by the natives (Dec. 28, 1899), whom they defeated, and the next day Insalah was occu- pied. This was the beginning of a serious campaign in which the French suffered severe losses, but by March 1901 the whole of the fortified places in the three oases had been captured. To cut off the oases from Morocco the town of Igli, 140 m. north-west of Gurara, was also annexed by the French (April 5, 1900). Igli (pop. 1057 in 1906) occupies an important position, being placed at the junction of the wadi Zusfana and the wadi Ghir. The French were not, however, left in peaceable possession of their newly acquired territory. Attacks by the nomad tribes, Moroccan and others, were made on the line of communications, and during 1003 the French troops suffered serious losses. To punish the tribes the town of Figig was bombarded by the French (June 8, 1903). On the 2nd of September following a band of nomads attacked, at a place called El Mungar, the escort of a convoy going to Taghit. After maintaining the fight 7! hours the French were reinforced and their enemies drew off. Out of 115 combatants the French lost 38 killed and 47 wounded.

To consolidate their position the French authorities determined to connect the oases with the Algerian Sahara proper by carriage roads and railways. One road goes north-east to El Golea, 150 m. distant from Insalah; another north from Igli to a post called Beni Ounif, 2% m. south of Figig, to which point the railway from Ain Sefra,' in the Oranese Sahara, was carried in* 1903. The continuation of this railway to Igli was begun in the

following year.

Major A. G. Laing visited the Tuat territory in 1825 on his way to Timbuktu, but his papers were lost. The next European to visit Tuat was Gerhard Rohlfs, who described his explorations and investigations in Tagebuch seiner Reise durch Marokko nach Tuat, 1864 (Gotha, 1865) and Reise durch Marokko . . . Exploration der Oasen von Tafilet, Tuat und Tidikelt . . . (Bremen, 1868). A. G. P. Martin's Les Oasis sahariennes (Algiers, 1908) gives an account of the history and economic condition of the oases. Consult also Commandant E. Laquiere, Les Reconnaissances du General Scrviere dans les oasis sahariennes (Paris, 1902), a valuable mono- graph by an officer who took part in the operations in 1900-1901 ; E. F. Gautier, Sahara algerien (Paris, 1908), and various contribu- tions by G. B. M. Flamand in LaGeographie and Annates geographiques for 1900, Comptes rendus (1902), Bull. geog. hist, et descriptive (1903), &c. (F. R. C.)

TUBA, in music. The tubas — bombardon, helicon, euphonium (Fr. tuba, sax-tuba, bombardon; Ger. Tuben, Tenorbass, Bombardon, Kontrabasstuba, Helikon;Ital. basstuba, bombardone) — are a family of valved instruments of powerful tone forming the tenor and bass of the brass wind. In the orchestra these instru- ments are called tubas; in military bands euphonium (tenor), bombardon and helicon (bass).

The modern tubas owe their existence to the invention of valves or pistons (Ger. V entile) by two Prussians, Stolzel and Blumel, in 181 5. The tubas are often confounded with the baritone and bass of the saxhorns, being like them the outcome of the application of valves to the bugle family. There is, however, a radical difference in construction between the two types: given the same length of tubing, the

fundamental octave of the tubas is an octave lower than that of the saxhorns, the quality of tone being besides immeasurably superior. This difference is entirely due to the proportions of the truncated cone of the bore and consequently of the column of air within. By increasing the calibre of the bore in proportion to the length of the tube it was found that the fundamental note or first sound of the harmonic series was easily xxvn. 12

obtained in a full rich quality, and by means of the valves, with this one note as a basis, a valuable pedal octave is obtained, absent in the saxhorns. Prussia has not adopted these modifica- tions; the bass tubas with large calibre, which have long been introduced into the military bands of other countries and retained in that country, are founded on the original model invented in

BB[> Bombardon or Contrabass Tuba (Besson). 1 83S by Wieprecht and Moritz, a specimen of which is preserved in the museum of the Brussels Conservatoire. The name ” bass tuba ” was bestowed by Wieprecht upon his newly invented bass with valves, which had the narrow bore afterwards adopted by Sax for the saxhorns. The evolution of the modern tubas took place between 1835 and 1854 (see Valves).

The instruments termed Wagner tubas are not included among the foregoing. The Wagner tubas are really horns designed for Wagner in order to provide for the Nibelungen Ring a complete quartet having the horn timbre. The tenor tuba corresponds to the tenor horn, which it outwardly resembles, having its tube bent in rectangular outline and being played by means of a funnel- shaped mouthpiece. The bore of the Wagner tenor and tenor- bass tubas, in Bb and F, is slightly larger than in the horn, but much smaller than in the real tubas. The bell, funnel-shaped as in the German tubas, is held to the right of the performer, the valves being fingered by the left hand. There are four valves, lowering the pitch respectively 1 tone, 5 tone, \ tone, 2 tones (or 2§ tones). The harmonic series is the same for both instruments, the notation being as for the horn in C.

B flat Tenor.

Real Sounds.

§E

J?fC-

F Bass.

±B=b*=fz

1=

i£

-a tt ˆr-fe

N.B. — The black notes are difficult to obtain strictly in tune as open notes.

By means of the valves the compass is extended downwards an octave for each instrument. The timbre of the tenor tuba is only slightly more metallic and less noble than that of the French horn with valves. Many motives in the Ring are given Out by the quartet of horns and Wagner tubas.

The modern tuba finds its prototype as well as the origin of the name in the Roman tuba (the Greek salpinx), definite information concerning which is given by Vegetius. 1 Compared with the other military service instruments of the Romans, the buccina and cornu, the tuba was straight and was used to sound the charge and retreat, and to encourage and lead the soldiers during action ; it was sounded at the changing of the guard, as the signal to begin and leave off work, &c. The tuba is represented, together with the buccina and cornu, on Trajan's column in the scenes described by Vegetius.

During the middle ages the tuba was as great a favourite as the busine (see Buccina and Trumpet), from which it may readily be distinguished by its marked conical bore and absence of bell. It is recorded that King Frederick Barbarossa gave an order on the 14th of January 1240 in Arezzo for four tubas of silver and for slaves to be taught to play upon them. 2 During the middle ages the Latin word tuba is variously translated, and seems to have puzzled the compilers of vocabularies, who often render it by trumba (Fr. trompe). ■ (K. S.)

1 De re militari, iii. 5 and ii. 7.

2 Dr Alwin SchuJtz, Hofisches Leben, i. 560, note 3.

TUBE (Lat. tuba), a pipe or hollow cylinder. Tubes play an important part in engineering and other works for the conveyance of liquids or gases, and are made of diverse materials and dimensions according to the purpose for which they are intended, metal pipes being of the greatest consequence. Accord- ing to the process of manufacture metal tubes may be divided into seamed and seamless. One of the earliest uses of seamed wrought-iron tubes was for gun-barrels, and formerly these were made by taking a strip of wrought iron, bending it so that the edges overlapped and then welding by hammering, with or without the aid of grooved swages. The development of gas lighting increased the demand for tubes, and in 1824 James Russell introduced the butt-welded tube, in which the edges of the skelp are not made to overlap, but are brought into closest possible contact and the welding is effected in a double swage, having corresponding grooves of the diameter of the tube required; this method required no mandrel as did those previously in use. The following year saw another improve- ment in making these pipes, when Cornelius Whitehouse effected a butt weld by drawing the bent skelp through a die. Stronger tubes are obtained by using grooved rollers instead of a die, the skelp being mounted on a mandrel. This is the method commonly adopted at the present day for making this class of tube. Seamed tubes, especially of copper and brass, are made by brazing or soldering the edges of the skelp. Another method is to bend the edges so that they interlock, the contact being perfected by rolling. Seamless tubes, which are stronger than those just described, are made by drawing a bloom of the metal perforated by an axial hole or provided with a core of some refractory material, or, in certain cases, by forcing the plastic metal by hydraulic pressure through an appropriate die. The seamless steel tube industry is now of great dimen- sions owing to the development of steam engineering. Another type of seamless tube is the cast-iron tube, usually of large diameter and employed for gas and water mains;

these pipes are made by casting.

TUBERCULOSIS. The word ” tuberculosis,” as now used, signifies invasion of the body by the tubercle bacillus, and is applied generally to all morbid conditions set up by the presence of the active parasite. The name is derived from the ” tubercles ” or ” little lumps ” which are formed in tissues invaded by the bacillus; these were observed and described long before their real nature or causation was known. (For an account of the organism, which was discovered by Koch in 1882, see Parasitic Diseases.) The bacillus attacks every organ and tissue of the body, but some much more frequently than others. The commonest seats of tuberculous disease are the lungs, lymphatic glands, bones, serous membranes, mucous membranes, intestines and liver. Before the discovery of the bacillus its effects in different parts of the body received separate names and were classified as distinct diseases. For instance, tuberculosis of the lung was called ” consumption ” or ” phthisis,” of the bones and lymphatic glands ” struma ” or ” scrofula,” of the skin ” lupus,” or the intestinal glands ” tabes mesenterica.” Some of these names are still retained for convenience, but the diseases indicated by them are known to be really forms of tuberculosis. On the other hand, there are ” tubercles ” which are not caused by the tubercle bacillus, but by some other source of irritation, including various parasitic organisms, some of which closely resemble the tubercle bacillus. To these forms of disease, which are not as yet well understood, the term pseudo-tuberculosis has been given. Lastly, the word ” tubercular ” is still sometimes applied to mere lumpy eruptions of the skin, which have no connexion with tuberculosis or pseudo-tuberculosis.

Pathology.— The effects of tuberculosis on the structures attacked vary greatly, but the characteristic feature of the disease is a breaking-down and destruction of tissue. Hence the word ” phthisis,” which means ” wasting away ” or ” decay,” and was used by Hippocrates, accurately describes the morbid process in tuberculosis generally, as well as the constitutional effect on the patient in consumption. According to the most

recent views, the presence and multiplication of the bacilli excite by irritation the growth of epithelioid cells from the

normal fixed cells of the tissue affected, and so form the tubercle, which at first consists of a collection of these morbidly grown cells. In a typical tubercle there is usually a very large or ” giant ” cell in the centre, surrounded by smaller epithelioid cells, and outside these again a zone of leucocytes. The bacilli are scattered among the cells. In the earliest stages the tubercle is microscopic, but as several of them are formed close together they become visible to the naked eye and constitute the condi- tion known as miliary tubercle, from their supposed resem- blance to millet seeds. In the next stage the cells forming the tubercle undergo the degenerative change known as ” casea- tion,” which merely means that they assume in the mass an appearance something like cheese. In point of fact, they die. This degeneration is believed to be directly caused by a toxin produced by the bacilli. The further progress of the disease varies greatly, probably in accordance with the resisting power of the individual. In proportion as resistance is small and pro- gress rapid the cheesy tubercles tend to soften and break down, forming abscesses that burst when superficial and leave ulcers, which in turn coalesce, causing extensive destruction of tissue. In proportion as progress is slow the breaking-down and de- structive process is replaced by one in which the formation of fibrous tissue is the chief feature. It may be regarded as Nature’s method of defence and repair. In tuberculosis of the lungs, for instance, we have at one end of the scale acute phthisis or ” galloping consumption,” in which a large part or even the whole of a lung is a mass of caseous tubercle, or is honeycombed with large ragged cavities formed by the rapid destruction of lung tissue. At the other end we have patches or knots of fibrous tissue wholly replacing the original tubercles or enclos- ing what remains of them. Such old encapsuled tubercles may undergo calcareous degeneration. Between these extremes come conditions which partake of the nature of both in all degrees, and exhibit a mixture of the destructive and the healing processes in the shape of cavities surrounded by fibrous tissue. Such intermediate conditions are far more common than either extreme; they occur in ordinary chronic phthisis. The term ” fibroid phthisis ” is applied to cases in which the process is very chronic but extensive, so that considerable cavities are formed with much fibrous tissue, the contraction of which draws in and flattens the chest-wall. Tuberculosis

commonly attacks one organ or part more than another, but it may take the form of an acute general fever, resembling typhoid in its clinical features. ” Acute miliary tuberculosis ” is a term generally used to indicate disseminated infection of some particular organ — usually the lungs or one of the serous membranes — in which the disease is so severe and rapid that the tubercles have not time to get beyond the miliary state before death occurs. Tuberculosis is exceedingly apt to spread from its original seat and to invade other organs. The confusing multiplicity of terms used in connexion with this disease is due to its innumer- able variations, and to attempts to classify diseases according to their symptoms or anatomical appearances. Now that the cause is known, and it has become clear that different forms of disease are caused by variations in extent, acuteness and seat of attack, the whole subject has become greatly simplified, and many old terms might be dropped with advantage.

Tuberculosis in the Lower Animals. — Most creatures, including worms and fishes, are experimentally susceptible to tuber- culosis, and some contract it spontaneously. It may be called a disease of civilization. Domesticated animals are more sus- ceptible than wild ones, and the latter are more liable’ in captivity than in the natural state. Captive monkeys, for instance, commonly die of it, and of birds the most susceptible are farmyard fowls, but it is practically unknown in animals in the wild state. In cattle coming chiefly from the plains {United States Bureau of Animal Industry Reports, 1 900-1005) the number found diseased was only 0-134% in 28,000,000. Of the domesti- cated animals, horses and sheep are least, and cattle most, affected; pigs, dogs and cats occupy an intermediate position.

The percentage of tuberculous animals recorded at the slaughter- houses of Berlin in 1892-1893 was as follows: Cows and oxen, 15-1; swine, 1-55; calves, o-n; sheep, 0-004. Similar records at Copenhagen in 1890-1893 give the following result: Cows and oxen, 17-7; swine, 15-3; calves, 0-2; sheep, 0-0003. The order of the animals is the same,

and it is confirmed by other slaughter- house statistics; but the discrepancies between the figures indicate considerable variation in frequency, and only allow general conclusions to be drawn. A striking fact is the compara- tively small amount of tubercle in calves. It shows, as Nocard has pointed out, that heredity cannot play an important part in the transmission of bovine tuberculosis. The infrequency of the disease in sheep is attributed to the open-air life they lead, and no doubt that is an important factor. The more animals and persons are herded together and breathe the same air in a confined and covered space, the more prevalent is tuberculosis among them. Stefansky found the disease in 5% of the rats caught in Odessa, and Lydia Rabinowitch obtained similar results in rats caught in Berlin. But there are evidently degrees of natural resistance also. Horses are more confined than cattle in the United Kingdom, yet they are far less affected; and on the other hand, cattle running free in the purest air may take the infection from others. Professor McEacharn of Montreal states that he has seen tuberculosis prevalent in ranch cattle, few of which were ever under a roof, ranging on the foothills of the Rocky Mountains in Montana. In cows and monkeys the lungs are chiefly affected; in horses and pigs the intestine and abdominal organs.

The relation between human and animal tuberculosis has been much debated. The bacillus in man very closely resembles that found in other mammalia, and they were considered identical until Koch threw doubt on this view at the British Congress on Tuberculosis in 1901. The British govern- ment thereupon appointed a royal commission to inquire into the relations of human and animal tuberculosis. The second interim report of the commission was issued in 1907, and the conclusions arrived at in it are: ” That there seems to be no valid reason for doubting the opinion, never seriously doubted before 1901, that human and bovine bacilli belong to the same family. On this view the answer to the question, Can the bovine bacillus affect man? is obviously in the affirmative. The same answer must also be given to those who hold the theory that human and bovine tubercle’ bacilli are different in kind, since the ‘ bovine kind ‘ are readily to be found as the causal agents of many fatal cases of human tuberculosis.” The commission also found that there is an essential unity not only in the

nature of the morbid processes induced by human and bovine tubercle bacilli, but also in the morphological characteristics exhibited by the tubercle bacilli which cause these processes. The conclusions of the members of the Paris Congress on Tuberculosis, held in 1905, are: " That human tuberculosis can be transferred to the bovine animal, and that what is termed the bacillus of bovine origin can be discovered in the human subject, and that there is a possibility that they may be varieties of one species."

The distribution of tuberculosis is universal, and it is coincident with * In ftaly the mortality given is for all forms of tuberculosis.

uncivilized races is due to their' open-air life and to the sanitary advantages derived from the comparatively frequent changes of the sites of their camps and villages. Segregation of these races in fixed areas has shown an increased incidence of tuberculosis, and when living under civilized conditions they fail to exhibit any natural immunity. Altitude has an apparent influence on the frequency of phthisis, the rarity of the disease at high altitudes in Switzerland having been demonstrated, and a like protective influence is enjoyed by certain elevated districts in Mexico, notwithstanding the insanitary conditions of the towns thereon. The protection afforded by the altitude is alleged to be due to the dryness of the atmosphere, its freedom from impurities and the increased solar radiation. While no race is exempt from tuberculosis, certain races afford a greater case incidence. E. Baldwin states that the mortality from con- sumption in recently immigrated races in the United States is much greater than in those of longer residence. It was found that among those whose mothers were of foreign birth the rate was — in Russians 71-8, Germans 167, Scottish 172-5, French 187-7 an d Irish 339-6, while in native-born Americans it was H2-8. The well-known susceptibility of the Irish has been attributed to the moisture of the climate, under-feeding, and the residual inferiority of a population drained by the emigration of a large number of able-bodied adults. That there is some added factor is shown by the fact that the above mortality of 339 in those having Irish mothers, in 1901, was greater by 31% than that of the Irish in Ireland at the same period. The Jews are said to show a relative

immunity, but the matter requires further investigation. The factor which seemingly has the most constant influence on the mortality from tuberculosis is density of population. A high rate of mortality occurs in connexion with overcrowding and bad ventilation in cities, and it is proved that the death-rate from this disease is considerably lower in the country than in the towns. In addition, when we consider that it does not occur in epidemics or at certain seasons, but is constantly active, it will easily be seen that no other disease is so destructive to the human race. At the Tuberculosis Congress, held in Paris in 1905, it was stated by Kayserling that one-third of all deaths and one-half the sickness amongst adults in Germany was due to tuberculosis.

In 1908 the mortality from all forms of tuberculosis in England and Wales was, according to the registrar-general's returns, 56,080, less by 3455 than the average of the previous five years, being equal to io-8% of the mortality from all causes, while in Ireland in 1909 14% of the total mortality was assigned to it.

The following table gives the comparative mortality' from pulmonary tuberculosis for certain fixed years together with the estimated population of certain selected countries :- —

Estimated Population in Years.

Mortality from Pulmonary Tuberculosis.

1892.

1900.

1907.

1892.

1900.

1907.

England and Wales Ireland .... German Empire . France .... Norway .... Italy .... Holland .... Belgium .... Switzerland .

29,760,842 4,633,808

47,125,446

38,360,000 2,010,000

30,665,662 4,645,660

6,195,355 3,002,263

32,249,187 4,468,501

52,624,706

38,900,000 2,211,300

32,346,366

5,159,347 6,693,548 3,299,939

34,945,600 4,377,064

61,994,743 39,222,000 2,305,700 33,776,087 5,709,755 7,317,561 3,525,290

43,323

10,048

113,720

31,080

3,358 ^

39,715*

8,906 10,491

5,785

42,987

10,076 108,827

34,357 4,249 .

41,733 8,451

9,U7

6,692

39,839 8,828

97,555 40,304 4,656 41,968* 7,403 7,377 6,063

Distribution the existence of the human race in the habitable and regions of the globe. Its comparative absence in

Mortality. tne Arctic regions seems more due to the sparsity of population than to climatic effect. Indeed, it has been shown that climate has much less effect in its prevalence than has been formerly thought to be the case, the conclusion of Hirsch being that " the mean level of the temperature has no significance for the frequency or rarity of phthisis in any locality." The nature of the occupations and the density of population in any given area tend to its increase or otherwise, and the comparative immunity enjoyed by

We thus see there is a general tendency to decrease in the death- rate, with the possible exception of France and Norway. In England the decrease has been most marked, having fallen from 3457 per million living in 1851-1860, or 15-6% of all deaths, to 1583 per. million living, or a mortality of 10-8% of the death-rate from all causes for all ages and. sexes. Death-rate of Tuberculosis per million living in England and Wales.

i860.

1870.

1880.

1890.

1900.

1908.

Males

Females .... Both Sexes

3300 3300 3300

3300 3000 3150

2900 2500 2700

2700 2100 2400

2200 1600 1900

1800

I350

1583

35 6

TUBERCULOSIS

In English counties containing populations of 100,000 or over the highest rates were — in 1908 — London, 1806; Lancashire, 1848; Northumberland, 1947 ; Carnarvonshire, 2025 ; and Carmarthen- shire, 2328 per million living. Of the fifteen counties in England and Wales with the highest tuberculosis mortalities, no fewer than seven are Welsh. Cardiganshire, with 2270 for both sexes, has a rate nearly double that of England.

According to the United States census of 1900, the death-rate from tuberculosis in the area chosen for registration which embraced ten registration states, namely, Connecticut, Maine, District of Columbia, Massachusetts, Michigan, New Hampshire, New Jersey, New York, Rhode Island and Vermont, and 153 registration cities outside these states, was: —

Number of Deaths from Tuberculosis.

Death-rate per 100,000.

1890 1900

48,236 54-898

The returns of the mortality statistics of the United States for the year 1908 cover an area of 17 states, the district of Columbia and 74 registration cities, representing an aggregate population of 45,028,767, or 51-8 % of the total estimated population of the United States.

Mortality from Tuberculosis in the United States in given areas.

1 by phthisis at ages under 5 years, more liable at the age of 5-20, and again less liable at subsequent ages." These observations, it must be noted, refer only to consumption. The comparative immunity of the very young does not exterid to all forms of tuberculous disease. On the contrary, tuberculosis of the bowels and mesenteric glands (tabes mesenterica), tuberculous peritonitis and tuberculous meningitis are pre-eminently diseases of childhood. The tables at foot of page show in detail the relative incidence of pulmonary phthisis at different ages, and the steady diminution of the disease in England and Wales since 1850.

Occupation has a marked influence on the prevalence of pul- monary tuberculosis. The comparative mortality figures for various occupations are taken from the supplement to the registrar-general's 65th annual Report, and show the incidence of pulmonary phthisis, agriculturists being taken at 100 for purposes of comparison. Occupied Males: England and Wales. Highest. Lowest.

Tin miner 816 Coal miner 89

Copper miner 574

Scissors maker . . . 533

File maker 387

General shopkeeper . . 387

Brush maker 325

Furrier 316

Printer 300

Chimney sweep . . . 284

Hatter 280

Annual

Tuberculosis

Pulmonary

Number Tuberculosis fall

Average,

(all forms),

Phthisis,

forms) per 100,000 of the

1001-1005.

62,83s.

55,2Si-

population, 103-2.

I904

66,797

58,763

201-6

1905

65,352

56,770

193-6

I906

75,512

65,341

184-2

I907

176,650

66,374

183-6

J 908

78,289

67,376

173-9

In the United States tuberculosis of the lungs forms from 86 to 87 % of all cases. The death-rate, as we see, is steadily decreasing. It is, however, difficult to estimate the ravages of the disease in that country owing to the fact that rather less than half the United States is still unprovided with an adequate system of registration.

The following was the death-rate from tuberculosis (all forms) per 100,000 of the population of the chief cities of the United States during 1908: —

New Orleans 298-3

Sacramento, California 294-3

Washington 264-0

Baltimore 249-9

Jersey City 241-1

New York 234-4

Philadelphia 234-1

Saratoga Springs, New York . . 232-2

Indianapolis 222-6

Boston, Massachusetts 219-1

St Louis 188-3

Chicago 1807

Kansas City I7 2 ‘9

Cleveland, Ohio 142-4

Pittsburg, Pennsylvania . . . 139-2

Detroit 122-5

St Paul, Minnesota ni-8

The returns in the United States show a high rate of mortality from tuberculosis amongst the coloured population, the negro being particularly susceptible to pulmonary phthisis; the death-rate from this cause is nearly double that amongst whites.

Age and Sex. — The most complete in- formation under this heading is derived from the English records. ” In both sexes,” says Dr Tatham, ” the real liability to phthisis begins somewhere between the fifteenth and the twentieth year. Among males it attains its maxi- mum at age 45-55, when it reaches 3173 per million living. Among females it attains its maximum (2096) at age 35-45. In both sexes the rate rapidly declines after the attainment of its maximum. Practically the incidence of pulmonary phthisis is upon the ages from 15 to 75 years, very old people and young children being comparatively exempt. Ac- cording to recent experience, females seem to be rather less liable than males to death

Chemical manufacturer 98 Carpenter, joiner . .150

Artist 156

Blacksmith. . . . 158 Worsted manufacturer 159

Baker 165

Bricklayer .... 194 Cotton manufacturer . 197 Tailor 248

The high incidence in the first group will be seen chiefly to affect those occupations where there is dust (scissors and file makers and furriers). The high mortality amongst general shopkeepers can only be ascribed to continuous indoor occupation. Coal miners enjoy an unexplained immunity.

Dr Von Korosy has tabulated the result of seventeen years' observation in Budapest, which is an excessively tuberculous town. His figures include both males and females above fifteen years of age, and extend to 106,944 deaths. The field of observation is evidently very different from those which furnished the statistics already given. His results are: (1) Males — printers 606, butlers 520, shoemakers 494, dyers 493, millers 492, joiners 485, tinkers and locksmiths 484, masons 467, labourers 433, tailors 418, bakers 398, drivers 370, servants 360, carpenters 339; officials 336, butchers 333, innkeepers 272, merchants 253, lawyers 205, physicians 118, capitalists 106; (2) Females — servants 353, day labourers (? char-women) 333, washerwomen 314, gardeners 269, capitalists 42. The inmates of lunatic asylums, who are classed among the

England and Wales

Tuberculous Phthisis. — Mortality in several Periods, 1851-18Q9.

Annual Rate per Million Living.

Males.

Period.

Ages.

All

Under

Ages.

5

Years.

5—

10 —

15—

20 —

25—

35—

45—

55—

65-

1851-1860

2579

1329

525

763

2399

4052

4031

4004

3830

333′

2389

1861-1870

2467

990

431

605

2190

3883

4094

4166

3861

3297

2024

1871-1880

2209

783

340

481

1675

3092

3699

4120

3860

3195

1924

1881-1885

1927

584

274

372

1381

2467

3246

3726

3567

2937

1800

1886-1890

1 78 1

521

234

318

1212

2222

2842

3436

3446

2904

1845

1891-1895

1634

467

197

260

1075

2026

2548

3268

3205

2686

1572

1 896-1 899

1521

403

140

195

908

1841

2341

3110

3173

2627

1530

1 900- 1 904

1479

366

149

182

799

1643

2147

2811

3130

2560

1309

1903-1907

1385

359

138

163

743

1472

2022

2573

2945

2498

1316

1908

1310

205

134

161

676

1858

2114

1964

2000

1830

1061

Females.

Period.

Ages.

All

Under

Ages.

5

Years.

5—

10 —

15—

20 — ■

25—

35—

45—

55—

65—

1851-1860

2774

1281

620

1293

35i6

4288

4575

4178

3121

2383

1635

1861-1870

2483

947

477

1045

3112

3967

4378

3900

2850

2065

1239

1871-1880

2028

750

375

846

2397

3H0

3543

3401

2464

1777

1093

- 1881-1885

1738

553

350

749

2006

2596

3070

2927

2197

1541

995

1 886-1 890

1497

483

307

658

1626

2075

2552

2563

1936

1490

966

1891-1895

1303

421

260

561

1428

1740

2155

2305

1742

1294

800

1 896-1 899

1 141

334

201

410

1 165

1547

1862

2096

1597

1242

787

1 900- 1 904

1042

3i6

203

417

1002

1274

T593

1807

1481

1136

670

1903–1907

975

308

194

391

959

1 194

1488

1643

1382

1075

666

1908

93i

229

192

441

1270

1438

1761

1407

1 156

Heredity.

” unoccupied,” suffer excessively from tubercle. According to Dr Mott, pathologist to the London County Council, tuberculous lesions are found in more than one-third of the bodies of inmates examined post mortem. The majority contract the disease in the asylums.

Medical opinion has undergone a great change with regard to the influence of heredity. The frequent occurrence of con- sumption among members of the same family used to be ex- plained by assuming the existence of a tuberculous “diathesis” or inherent liability to consumption which ” ran in families ” and was handed down from one generation to another. As the real nature of the disease was not understood, the inherited diathesis was regarded as a sort of latent or potential consumption which might develop at any time and could hardly be avoided. The children of consumptive parents had the ” seeds ” of the disease in them, and were thought to be doomed with more or less certainty. Great importance was therefore attached to heredity as a factor in the incidence of tuberculosis. The discovery that it is caused by a specific parasitic infection placed the question in a different light, and led to a more careful examination of the facts, which has resulted in a general and increasing tendency to minimize or deny the influence of heredity. At the Berlin Congress on Tuberculosis in 1899 Virchow pronounced his disbelief in the theory on patho- logical grounds. ” I dispute this heredity absolutely,” he said. ” For a course of years I have been pointing out that if we ex- amine the bodies of infants newly born, who have had no life apart from the mother, we find no tuberculosis in them. I am convinced that what looked like tuberculosis in the newly born was none of it tuberculosis. In my opinion there is no authenticated case of tubercle having been found in a dissected newly-born infant.” Observations on animals similarly tend to disprove

the existence of congenital tuberculosis (Nocard). The theory that the germs may remain latent in the offspring of tuberculous parents (Baumgarten) is unsupported by evidence. The occurrence of disease in such offspring is ascribed to infection by the parents, and this view is confirmed by the fact that the incidence in consumptive families is greater on female children, who are more constantly exposed to home infection, than on the male (Squire). The statistical evidence, so far as it goes, points in the same direction. It is even denied that the children of consumptives are specially pre- disposed.

Recognition of the communicability of tuberculosis has directed attention to the influence of conditions in which people live massed together in close proximity. The pre-DeasHyof va i en ce of the disease in large centres of popula- andOve°* ^ on nas already been noted, and the influence of crowding, aggregation is no doubt considerable; but it does not always hold good. The distribution in England and Wales does not correspond with density of population, and some purely rural districts have a very high mortality. Broadly, however, the rural counties have a low mortality, and those containing large urban populations a high one. In France in the department of the Oise, in purely industrial villages, the mortality from pulmonary phthisis is from 56 to 61 per 1 0,000; in. a village in which part of the population worked in the fields and part in factories the mortality was 46 per 10,000; and in purely agricultural villages it ranged from o to 10 per io,ooo.

The following table is taken from the Supplement to the Registrar- General's 65th Report for England and Wales : —

diseases in relation to overcrowding, the same authority found that ' ' while associated with overcrowding is a tendency of the population to die from disease generally, this tendency is especially manifested in the case of phthisis, and is not manifested in the case of every disease."

Other Conditions. — Poverty, insufficient food and insanitary dwellings are always more or less associated with overcrowding, and it is difficult to distinguish the relative influence of these factors. An analysis of 553 deaths

_n Edinburgh according to rentals in 1899 gave these results: under £10, 230; from £10 to £20, 190; above £20, 106 (Littlejohn) ; but the corre- sponding population is not stated. An investigation of selected houses in Manchester gave some interesting results (Coates). The houses were divided into three classes: (1) infected and dirty; (2) infected but clean; (3) dirty but not infected; infected meaning occupied by a tuberculous person. Dust was taken from all parts of the rooms and submitted to bacteriological tests. The conclusions may be summarized thus: The effects of overcrowding were not apparent ; a large cubic space was found to be of little avail if the ventilation was bad; the beneficial effects of light and fresh air were markedly shown even in the dirtiest houses; ordinary cleanliness was found not sufficient to prevent accumulation of infectious material in rooms occupied by a consumptive; no tuberculous dust was found in dirty houses in which there was no consumption. The upshot is to emphasize the importance of light and air, and to minimize that of mere dirt. This is quite in keeping with earlier in- vestigations, and particularly those of Dr Tatham on back-to- back houses. Darkness and stuffiness are the friends of the tubercle bacillus.

So much has the question of cleanliness, and of housing in a sani- tary district, to do with the prevalence of the disease, that the follow- ing table taken from the Report of the Registrar-General for Ireland for the year 1909 shows the marked class incidence in all forms of tuberculosis.

Distribution of Tuberculosis Mortality by Classes in Ireland, IQOQ.

Professional and independent class

Middle class, civil service and smaller officials ....

Large traders, business mana- gers ‘

Clerks

Householders in 2nd-class localities

Artisans

Petty shopkeepers and other traders

Domestic servants ....

Coach and car drivers, and vanmen

Hawkers, porters and labourers

All forms of Tuberculosis.

1-41

1-82

1-59 2-92

2-52 2-94

3-85

i-3i

4-24 4-83

Pulmonary Other forms of Phthisis. Tuberculosis.

0-64

1-30

1-04 2-33

1-85 2-23

3-00 1-04

3-06

2-88

077 0-52

o-55

0-59

0-67 0-71

0-85 0-27

1-18

i-95

In relation to the last two classes the effect of exposure and also of alcoholic excess must be added to overcrowding and privation. The low rate noticeable for domestic servants must be ascribed to the better food and housing they enjoy while in situations. In Hamburg the mortality was 10-7 per 10,000 in those whose income rose above 3500 marks, 39-3 where the income was 900 to 1200 marks, and 60 per 10,000 where the income fell below that figure.

It is now generally accepted that tubercle bacilli may enter the body by various paths. At the International Congress on Tuberculosis held in Vienna in 1907 Weichselbaum summarized the channels of infection in pulmonary tuberculosis as follows:

All occupied Males.

Occupied Males (London).

Occupied Males (industrial districts).

Occupied Males (agricultural districts).

All Causes .... Tuberculous Phthisis.

1900-1902.

1 890-1 892.

1900-1902.

1 890-1 892.

1 900-1 902.

1 890-1 892.

1900-1902.

1890-1892.

100 100

119 122

119 156

H3

183

121 “5

156 147

72 71

86 90

It will be noted that the rate in the agricultural districts is low compared to the industrial districts or purely urban district chosen. There is obviously a close relation between density of population and the prevalence of phthisis. Comparing phthisis with other

(1) By inhalation directly into the bronchioles and pulmonary alveoli, or by way of the bronchial glands through the blood and lymph channels into the lung. (2) Through the mucous

membrane of the nose, mouth or tonsils into the neighbouring lymphatic glands, and thence through the blood or lymph p th t * nt0 t ˆ le l un S s – (3) By ingestion of tubercle bacilli infection. mt0 the lower part of the gastro-intestinal tract in the food; thence the bacilli may pass through the lining membrane, infect the neighbouring glands and pass by the blood or lymph stream to the lungs. (4) By penetration of other mucous membranes (such as the conjunctival or urogenital) or through the skin. (5) Possible, though very rare, placental infection.

Tubercle bacilli may not produce any anatomical lesion at the point of entrance, or they may remain latent for a very long time ; and it has been experimentally proved that they may pass through mucous membranes and leave no trace of

their progress. As reported to the Royal Commission, the introduction of bacilli into the alimentary canal is not necessarily followed by the development of tuberculosis. The writings of Von Behring have led to renewed attention being paid to intestinal infection, particularly through the milk supply. Von Behring suggests that the bacillus itself may become modified in the human body.

Measures for the prevention of tuberculosis may be divided

into two classes: (1) general; (2) special. Great attention

_ ., has been paid to the latter since the infectious
Prevention. . *, ,. , ,. . . _,, ,

nature of the disease was established. The former

include all means by which the conditions of life are improved among the mass of the people. The most important of these are probably housing and food supply. The reduction of the disease recorded in England is attributed to the great changes which have gradually taken place in such conditions' since, say, 1850. Wages have been raised, food cheapened, housing im- proved, protection afforded in dangerous trades, air spaces provided, locomotion increased, the ground and the atmo- sphere have been cleaned and dried by sanitary means. In addition to these general measures is the provision of consump- tion hospitals, which act by segregating a certain amount of disease. Yet all these things, beneficial as they may be, do not wholly account for the reduction, for, if the records can be trusted, it was in progress before they had made any way or had even been begun. This observation, coupled with the appar- ently general tendency to diminution among civilized races, suggests the operation of some larger agency. The theory of acquired resistance, which has been already mentioned, would explain the diminution; and it is also in keeping with other facts, such as the great susceptibility of savage races, which have not been long exposed to tuberculosis, and the results of labora- tory experiments in artificial immunity. The point is of great importance, and deserves careful attention; for if the theory be correct, the special measures for preventing tuberculosis, which are occupying so much attention, may eventually have unexpected results. Their general aim is

the avoidance of infection, and they include (1) the provision of special institu- tions — hospitals, sanatoria and dispensaries; (2) the prevention of spitting; (3) the notification of consumption; (4) the administrative control of tuberculosis in animals; (5) the dissemination of popular knowledge concerning the nature of the disease.

The greatest stress is laid upon the prevention of spitting, because the germs are contained in the sputum of consumptive persons, and are scattered broadcast by expectoration. The sputum quickly dries, and the bacilli are blown about with the dust. There is no question that infection is so conveyed. The Manchester scientific experiments, mentioned above, are only one series out of many which prove the infectivity of dust in the proximity of consumptive persons, and they are confirmed by actual experience. Several cases are recorded of healthy persons having contracted the disease after occupying rooms in which consumptive persons had previously lived. It is a legitimate inference that spitting in public is an important means of disseminating tuberculosis, though it may be noticed that international prevalence by no means corresponds with this disgusting practice, which is a perfect curse in Great

Britain, and far more common both there and in the United States than on the continent of Europe. Prohibition of spitting under a statutory penalty is attended with certain difficulties, as it is obviously impossible to make any distinction between tuberculous and other persons; but it has been applied in New York and elsewhere in America, and some local authorities in Great Britain have adopted by-laws to check the practice. Another means of controlling dangerous sputa is more practi- cable, and probably more effective, namely, the use of pocket spittoons by consumptive persons. Convenient patterns are available, and their use should always be insisted on, both in public and in private. The most effective way of destroying the sputa is by burning. For this purpose spittoons of papier m&che and of turf have been successfully used in the Vienna hospitals (Schrotter). When glass spittoons are used the contents can be sterilized by disinfectants and passed down the drain.

Notification is of great service as an aid to practical

measures of prevention. It has been applied to that purpose with good results in several cities and states in America, and in some towns in Great Britain. New York has made the most systematic use of it. Voluntary notification was adopted there in 1894, and in 1897 it was made compulsory. The measures linked with it are the sanitary supervision of infected houses, the education of the people and the provision of hospitals. In England, Manchester has led the way. Voluntary notification was adopted there in 1899: it was at first limited to public institu- tions, but in 1900 private practitioners were invited to notify their cases, and they heartily responded. In Sheffield notifi- cation was made compulsory by a local act in 1904 for a limited period, and was found so valuable that the period was extended in 1910. The objects aimed at are to visit homes and instruct the household, to arrange and provide disinfection, to obtain information bearing on the modes of infection, to secure bacterio- logical examination of sputum, and to collect information to serve as a basis of hospital provision. Disinfection is carried out by stripping off paper, previously soaked with a solution of chlorinated lime (13 oz. to the gallon), and washing the bare walls, ceiling, floor and everything washable with the same solution. This is found effective even in very dirty houses. In clean ones, where the patients have not been in the habit of spitting about the rooms, it is sufficient to rub the walls with bread-crumb and wash the rest with soap and water. Clothing, bedding, &c, are disinfected by steam. The advantages of these sanitary measures are obvious. Notification is no less important as a step towards the most advantageous use of hospitals and sanatoria by enabling a proper selection of patients to be made. It is compulsory throughout Norway, and is being adopted elsewhere, chiefly in the voluntary form. In 1908 the Prevention of Tuberculosis (Ireland) Act was passed, which conferred on local authorities the right to make notifi- cation compulsory in their districts, and provided that certain sections of the Public Health (Ireland) Act 1878 and the Infec- tious Diseases Prevention Act 1890 should apply to tuberculosis. By this act also the county councils were enabled to establish hospitals and dispensaries for the treatment of tuberculosis and were empowered to borrow money or levy a poor rate for the erection of sanatoria for the treatment of persons from their respective counties suffering from the

disease.

The prevalence of tuberculosis in cattle is of importance from the point of view of prevention of the probability that abdominal tuberculosis, which is a very fatal form of the disease in young children, and has not diminished in prevalence like other forms, is caused by the ingestion of tuberculous milk. Whether it be so or not, it is obviously desirable that both meat and milk should not be tuberculous, if it can be prevented without undue interference with commercial interests. Preventive measures may be divided into two classes. They may deal merely with the sale of meat and milk, or they may aim at the suppression of bovine tuberculosis altogether. The former is a comparatively easy matter, and may be summed up in the words " efficient inspec- tion." The latter is probably impracticable. If practicable,

it would be excessively costly, for in many herds one half the animals or even more are believed to be tuberculous, though not necessarily the sources of tuberculous food. Unless the danger is proved to be very much greater than there is any reason to suppose, " stamping out " may be put aside. Efficient inspection involves the administrative control of slaughter- houses, cowsheds and dairies. The powers and regulations under this head vary much in different countries; but it would be useless to discuss them at length until the scientific question is settled, for if the reality of the danger remains doubtful, oppres- sive restrictions, such as the compulsory slaughter of tuberculous cows, will not have the support of public opinion. Whatever measures may be taken for the public protection, individuals can readily protect themselves from the most serious danger by boiling milk; and unless the source is beyond suspicion, parents are recommended, in the present state of knowledge, so to treat the milk given to young children.

A great deal has been done in most countries for the dis- semination of popular knowledge by forming societies, holding conferences and meetings, issuing cheap literature,

and so forth. It is an important item in the general campaign against tuberculosis, because popular intelligence and support are the most powerful levers for setting all other forces in niotion. In Ireland, where an attempt had been made to deal with the question by arousing the interest of all classes, tuberculosis exhibitions have been held in nearly every county, together with lectures and demonstrations organized by the Women's National Health Association; and an organized attempt was made in the autumn of 1910 in England, by a great educational campaign, to compel the public to realize the nature of the disease and the proper precautions against it.

The improved outlook in regard to the arrest or so-called " cure " of tuberculosis is mainly derived from the improved Diagnosis methods of diagnosis, thus enabling treatment to ™ > d be undertaken at an earlier and therefore more

Treatment. f avoura ble stage of the disease. The physical signs in early stages of the lung affection are often vague and inconclusive. A means of diagnosis has therefore been sought in the use of tuberculin. The methods are three: (1) The subcutaneous injection method of Koch; (2) the cutaneous method of Von Pirquet; (3) the conjunctival method of Wolff- Eisner and Calmette. The first method depended on the re- action occurring after an injection of " old tuberculin." It is unsuitable in febrile conditions, and has now been relegated to the treatment of cattle, where it has proved invaluable. In Von Pirquet's method a drop of old tuberculin diluted with sodium chloride is placed on a spot which has been locally scarified. The presence of tuberculosis is demonstrated by a local reaction in which a hyperaemic papule forms, surrounded by a bright red zone. Reaction occurs in tuberculosis of the bones of joints and skin. Von Pirquet in 1000 cases obtained a reaction in 88% of the tuberculous, and 10% of those clinically non-tuberculous. In the latter there may have been latent cases of tuberculosis. In the conjunctival or opthalmo-reaction of Calmette and Wolff-Eisner the instillation of a drop of a dilute solution of tuberculin into the conjunctiva is followed in the tuberculous subject by conjunctivitis. The reaction generally appears in from 3 to 12 hours, but may be delayed to 48. In a series of cases observed by Audeoud a positive reaction was obtained in 95% of 261 obviously tuberculous cases and in 8-3 % of 303 cases which

presented no clinical symptoms. Very advanced cases fail to react to any of these tests, as do general miliary tuberculosis and tuberculous menin- gitis. As well as the three methods mentioned above the occurrence of a " negative phase " in the phagocytic power of the leucocytes following an injection of Koch's tuberculin T.R. may be said to be diagnostic of tuberculosis. Another valuable aid in diagnosis is that of the X-rays. By their help a pulmonary lesion may be demonstrated long before the physical signs can be obtained by ordinary examination.

To discuss at all fully the treatment of the various forms of tuberculosis or even of consumption alone would be quite

beyond the scope of this article. It must suffice to mention the more recent points. The open-air treatment of consump- tion has naturally ˆattracted much attention. Neither the curability of this disease nor the advantages of fresh air are new things. Nature's method of spontaneous healing, explained above, has long been recognized and understood. There are, indeed, few diseases involving definite lesions which exhibit a more marked tendency to spontaneous arrest. Every case, except the most acute, bears signs of Nature's effort in this direction; and complete success is not at all uncommon, even under the ordinary conditions of life. Perhaps it was not always so: the ominous character popularly attributed to consumption may once have been justified, and the power of resistance, as we see it now, may be the result of acquired immunity or of the gradual elimination of the susceptible. However this may be, the natural tendency to cure is undoubtedly much assisted by the modern system of treatment, which makes pure air its first consideration. The principle was known to Sydenham, who observed the benefit derived by consumptives from horse exercise in the open air; and about 1830 George Boddington proposed the regular treatment of patients on the lines now generally recognized. The method has been most systematically developed in Germany by the provision of special sanatoria, where patients can virtually five in the open air. The example has been followed in other countries to a certain extent, and a good many of these establishments have been provided in Great Britain and elsewhere; but they are, for the most part, of a private character for the reception of paying patients. Germany has extended these advantages to the working classes on a large

scale. This has been accomplished by the united efforts of friendly and philanthropic societies, local authorities, and the state; but the most striking feature is the part played by the state insurance institutes, which are the outcome of the acts of 1889 and 1899, providing for the compulsory insurance of workpeople against sickness and old age. The sanatoria have been erected as a matter of business, in order to keep insured members off the pension list, and they are supported by the sick clubs affiliated to the institutes. They number forty-five, and can give three months' treatment to 20,000 patients in the year. The clinical and economic results are said to be very encouraging. In about 70% of the cases the disease has been so far arrested as to enable the patients to return to work.

In England, where more than 14 millions of the population belong to friendly societies, it is estimated that the sick pay of consumptive members costs three times as much as the average sick pay to members dying of other causes. An effort has been made by the National Association for the Establishment and Maintenance of Sanatoria for Workers Suffering from Tuber- culosis to establish such sanatoria, together with training for suitable work during convalescence, the gradual resumption of wage-earning being resumed while in touch with the medical authorities.

The important features of the sanatorium treatment are life in the open air, independently of weather, in a healthy situation, rest and abundance of food. The last has been carried to rather extravagant lengths in some institutions, where the patients are stuffed with food whether they want it or not. The sanatorium movement on the German model is rapidly extending in all countries. For those who are able to do so advantage may be taken of the combined sanatorium and sun treatment. In certain high altitudes in Switzerland, which are favoured by a large amount of sunshine and a small percentage of moisture, much benefit has been derived from the exposure of the un- clothed body to the sun's rays. The power of the sun in high altitudes is so great that the treatment can be continued even when the snow is on the ground. Not only is the sun-treatment applicable to pulmonary tuberculosis, but also to the tuber- culosis of joints, even in advanced cases. The treatment has to a great extent replaced surgical procedure in

tuberculosis of joints, but it requires to be persevered in over a considerable period of time. It should be remembered that the benefits of fresh air are not confined to sanatoria. If the superstitious

dread of the outer air, particularly at night, could be abolished in ordinary life, more would be done for public health than by the most costly devices for eluding microbes. Not only con- sumption, but the other respiratory diseases, which are equally destructive, are chiefly fomented by the universal practice of breathing vitiated air in stuffy and overheated rooms. The cases most suitable for the treatment are those in an early stage. Other special institutions for dealing with consumption are hospitals, in which England is far in advance of other countries, and dispensaries; the latter find much favour in France and Belgium.

In Great Britain the pioneer work as regards the establish- ment of tuberculosis dispensaries was the establishment of the Victoria Dispensary for Consumption in Edinburgh in 1887, where the procedure is similar to that in Dr Calmette's dispen- saries in France. In connexion with the dispensary home visits are made, patients suitable to sanatoria selected, advanced cases drafted to hospitals, bacteriological examinations made, cases notified under the voluntary system, and the families of patients instructed. There is an urgent need for the multi- plication of such dispensaries throughout the United Kingdom. The recent act providing for the medical inspection of schools has done much to sort out cases of tuberculosis occurring in children, and to provide them with suitable treatment and prevent them from becoming foci for the dissemination of the disease. In Germany special open-air schools, termed forest- schools, are provided for children suffering from the disease, and an effort is being made in England to provide similar schools.

Of specific remedies it must suffice to say that a great many substances have been tried, chiefly by injection and inhalation, and good results have been claimed for some of

them. The most noteworthy, is the treatment by tuberculin, first introduced by Koch in 1890, which, having sunk into use as a diagnostic reagent for cattle, received a new lease of life owing to the valu- able work done by Sir Almroth Wright on opsonins. The tuberculins most in use are Koch's " old " tuberculin T.O., consisting of a glycerin broth culture of the tubercle bacilliˆ and Koch's T.R. tuberculin, consisting of a saline solution of the triturated dead tubercle bacilli which has been centrifuged. This latter is much in use, the dosage being carefully checked by the estimation of the tuberculo-opsonic index. The injections are usually unsuitable to very advanced cases.. Marmorek's serum, the serum of horses into which the filtered young cul- tures of tubercle bacilli have been injected, and in which a tuberculo-toxin has been set free, has proved very successful. Behring's Tulase is a tuberculin preparation formed by a pro- cess of treating tubercle bacilli with chloral, and Bereneck's tuberculin consists of a filtered bouillon culture treated with orthophosphoric acid. The variety of cases to which these treatments are suitable can only be estimated from a careful consideration of each on its own merits.

In the treatment of tuberculous lesions, the surgeon also plays his part. Tuberculosis is specially prone to attack the spongy bone-tissue, joints, skin {lupus) and lymphatic glands— especially those of the neck. Recognizing the infective nature of the disease, and knowing that from one focus the germs may be taken by the blood-stream to other parts of the body, and so cause a general tuberculosis, the surgeon is anxious, by removing the primary lesion, to cut short the disease and promote imme- diate and permanent convalescence. Thus, in the early stage of tuberculous disease of the glands of the neck, for instance, these measures may render excellent service, but when the disease has got a firm hold, nothing short of removal of the glands by surgical operation is likely to be of any avail. The results of this modern treatment of tuberculous disease of the skin and of the lymphatic glands has been highly gratifying, for not only has the infected tissue been completely removed, but the resulting scars have been far less noticeable than they would have been had less radical measures been employed. One rarely sees now a network of scars down the neck of a child, showing how a chain of

tuberculous glands had been allowed to

work out their own. cure. A few years ago, however, such con- ditions were by no means unusual.

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TUBEROSE. The cultivated tuberose {Polianthes tuberosa) is a plant allied to the Mexican agaves, and is a native of the same country. The tuberous root-stock sends up a stem 3 ft. in height, with numerous lanceolate leaves and terminal racemes of waxy white funnel-shaped very fragrant flowers. Each flower is about 1 1 in. long, with a long tube and a six-parted limb. The stamens are six in number, emerging from the upper part of the tube, and bear linear anthers. The ovary is three- celled, and the ovoid fruit is crowned by the persistent flower. The plant is largely grown in the United States and at the Cape of Good Hope for export to England, as it is found that imported bulbs succeed better than those grown in the United Kingdom. The double-flowered form is that principally grown. Cultivated plants require a rich soil, considerable heat, and, at first, abundance of water.

TUBINGEN, a town of Germany, in the kingdom of Wurttem- berg, picturesquely situated on the hilly and well-wooded banks of the Neckar, at its junction with the Ammer and Steinlach, 22 m. south of Stuttgart by road and 43 m. by rail. Pop. (1905), 16,809. The older town is irregularly built and un- attractive, but the newer suburbs are handsome. The most conspicuous building is the old

ducal castle of Hohentubingen, built in 1507-1535 on a hill overlooking the town, and now con- taining the university library of 460,000 volumes, the observa- tory, the chemical laboratory, &c. Among the other chief buildings are the quaint old Stiftskirche (1469-1483), a Gothic building containing the tombs of the rulers of Wurttemberg, the new aula and numerous institutes of the university, all of which are modern, and the town-hall dating from 1435 and restored in 1872. The university possesses a very important library. A monument was erected in 1873 to the poet Johann Ludwig Uhland (1787-1862), who was born and is buried here, and another, in 1881, to the poet Johann Christian Friedrich Holderlin (1770-1843). Tubingen's chief claim to attention lies in its famous university, founded in 1477 by Duke Eber- hard of Wurttemberg. Melanchthon was a lecturer here (1512-1518). The university adopted the reformed faith in 1534, and in 1537 a Protestant theological seminary, a resi- dential college— the so-called Stift— was incorporated with it. In 1817 a Roman Catholic theological faculty was added, with a seminary called the Konvikt, and there are now also faculties of law, medicine, philosophy, political economy and natural science. The leading faculty has long been that of theology, and an advanced school of theological criticism, the founder and chief light of which was F. C. Baur, is known as the Tubingen school. The university was attended in 1908 by 1891 students and had a teaching staff of over 100. The commercial and manufacturing industries of the town are slight. Printing, book-selling, the manufacture of surgical and scientific instruments, chemicals, gloves and vinegar, and the cultivation of hops, fruit and vines are among the leading occupations of the inhabitants. The country in the neighbourhood of Tubingen is very attractive; one of the most interesting points is the former Cistercian monastery of Bebenhausen, founded in 1185, and now a royal hunting-chateau.

Tubingen is mentioned as a strong fortress in 1078, and was ruled from 1148 by counts palatine. In 1342 it was purchased by the count of Wurttemberg, whose descendants afterward! acquired the title of duke. The treaty of Tubingen is the name

given in German history to an arrangement made in 1514 between Duke Ulrich and his subjects, by which the latter acquired various rights and privileges on condition of relieving the former of his debts. The town was captured by the Swabian League in 1519, by Turenne in 1647, and again in 1688 by the French, who destroyed the walls.

See Eifert, Geschickte und Beschreibung der Stadt und Universitat Tubingen (Tubingen, 1849) ; Maier, Die Musenstadt Tubingen (Tubin- gen, 1904) ; Tubingen und seine Umgebung (Tubingen, 1887-1889).

TUBUAI, or Austral Islands, an archipelago in the south Pacific Ocean, between 21° 49′ and 27° 41′ S., 144 22′ and 154° 51′ W., to the south of the Society Islands, with a total land area of no sq. m., belonging to France. They form a curved broken chain from north-west to south-east which includes four principal islands: Tubuai (area 40 sq. m.), Vavitao or Ravaivai, Rurutu or Oheteroa, Rapa or Oparo, and Rimitara, with Maretiri or the Bass Islands, and other islets. Tubuai, Vavitao and Rapa are volcanic and reach considerable elevations (2100 ft. in Rapa). The islands are well watered and fertile, producing coco-nut palms, arrowroot and bananas; but they lie too far south for the bread fruit to flourish. The natives belong to the Polynesian race; they were once much more numerous than now, the present population not exceeding 2000. A Tahitian dialect is spoken in the western islands; in Rapa, however, which with the Bass Islands lies detached from the rest, to the south, the language is akin to that of the Rarotongans in the Cook Islands. There are remarkable ancient stone platforms and walls, massively built, on the summits of some of the peaks in Rapa; they resemble the terraces in Easter Island (Rapanui), which is believed to have been peopled from Rapa. The scattered islands of the Tubuai archipelago were discovered at different times. Captain Cook visited Rurutu in 1769 and Tubuai in 1777 ; Rapa was discovered by George Vancouver in 1791, Vavitao perhaps in 1772 by the Spaniards who attempted to colonize Tahiti, and certainly by Captain Broughton in 1791. The islands never attracted much attention from Europeans, and the French protection and sub- sequent annexation were carried out spasmodically between the middle of the 19th

century and 1889.

TUCKER, ABRAHAM (1705-17 74), English moralist, was born in London, of a Somerset family, on the 2nd of September 1705, son of a wealthy city merchant. His parents dying during his infancy, he was brought up by his uncle, Sir Isaac Tillard. In 1 721 he entered Merton College, Oxford, as a gentleman com- moner, and studied philosophy, mathematics, French, Italian and music. He afterwards studied law at the Inner Temple, but was never called to the bar. In 1727 he bought Betchworth Castle, near Dorking, where he passed the remainder of his life. He took no part in politics, and wrote a pamphlet, " The Country Gentleman's Advice to his Son on the Subject of Party Clubs " i.1755), cautioning young men against its snares. In 1736 Tucker married Dorothy, the daughter of Edward Barker of East Betchworth, cursitor baron of the exchequer. On her death in 1754, he occupied himself in collecting together all the letters that had passed between them, which, we are told, he transcribed twice over under the title of " The Picture of Artless Love." From this time onward he occupied himself with the composition of his chief work, The Light of Nature Pursued, of which in 1763 he published a specimen under the title of " Free Will." The stric- tures of a critic in the Monthly Review of July 1763 drew from him a pamphlet called Man in Quest of Himself, by Cuthbert Comment (reprinted in Parr's Metaphysical Tracts, 1837), " a defence of the individuality of the human mind or self." In 1765 the first four volumes of his work were published under the pseudonym " Edward Search." The remaining three volumes appeared posthumously. His eyesight failed him completely in 1771, but he contrived an ingenious apparatus which enabled him to write so legibly that the result could easily be transcribed by his daughter. In this way he completed the later volumes, which were ready for publication when he died on the 20th of November 1774.

His work embraces in its scope many psychological and more strictly metaphysical discussions, but it is chiefly in connexion with ethics that Tucket's speculations are remembered. In some impor-

tant points he anticipates the utilitarianism afterwards systematized by Paley, who expresses in the amplest terms

his obligations to his predecessor. ” Every man’s own satisfaction ” Tucker holds to be the ultimate end of action; and satisfaction or pleasure is one and the same in kind, however much it may vary in degree. This universal motive is further connected, as by Paley, through the will of God, with the ” general good, the root where out all our rules of conduct and sentiments of honour are to branch.”

The Light of Nature was republished with a biographical sketch by Tucker’s grandson, Sir H. P. St John Mildmay (1905), 7 vols, (other editions 1834, 1836, &c), and an abridged edition by W. Hazlitt appeared in 1807. See James Mackintosh, Dissertation on the Progress of Ethical Philosophy (Edinburgh, 1832) ; and specially Sir Leslie Stephen, English Thought in the 18th Century, iii. 1 19-130.’

TUCKER, CHARLOTTE MARIA (1 821-1893), English author, who wrote under the pseudonym “A.L.O.E.” (a Lady of England), was born near Barnet, Middlesex, on the 8th of May 1821, the daughter of Henry St George Tucker (17 71-18 51), a distinguished official of the East India Company. From 1852 till her death she wrote many stories for children, most of them allegories with an obvious moral, and devoted the proceeds to charity. In 1875 she left England for India to engage in missionary work, and died at Amritsar on the 2nd of December 1893.

TUCKER, JOSIAH (1712-1799), English economist and divine, the son of a small Welsh farmer, was born at Laugharne, Carmar- thenshire, in 1 71 2. He was educated at St John’s College, Oxford, and became successively a curate and rector in Bristol. This led him to take considerable interest in politics and trade, and during the greater portion of a long life he poured out a succession of pamphlets on these matters. He was appointed dean of Gloucester in 1758. He died on the 4th of November 1799, and was buried in Gloucester Cathedral. His Important Questions on Commerce (1755) was translated into French by Turgot.

TUCSON (possibly from Piman styuk-son, ” dark or brown spring,” pronounced Tooson), a city and the county-seat of Pima county, Arizona, U.S.A., on the Santa Cruz river, in the S.E. part of the state, about 130 m. S.E. of Phoenix. Pop.

(1880), 7007; (1890), 5150; (1900), 7531 (2352 foreign-born, chiefly from Mexico); (r9io), 13,193. It is served by the Southern Pacific and the Twin Buttes railways, the latter connecting with the mines of the Twin Buttes district, about 27 m. south by east, and with the Randolph lines in Mexico. The city lies about 2360 ft. above the sea in a broad valley sheltered by mountains 5000-9000 ft. high. Its climate, characteristic of southern Arizona, attracts many invalids and winter visitors. Tucson is the seat of the university of Arizona (1891; non-sectarian, coeducational), which is organ- ized under the Morrill Acts; in 1909 it had 40 instructors and 201 students. At Tucson also are a desert botanical laboratory (owning a tract of some 1000 acres about 1 m. west of the city) established by the Carnegie Institution of Washington, St Joseph's Academy (Roman Catholic) ; a Roman Catholic cathe- dral; the Tucson Mission (Presbyterian), a boarding school for Indians, the San Xavier Mission for Indians (Roman Catholic) and a Carnegie library. In 1900 Tucson became the see of a Roman Catholic bishop. The surrounding country is arid and unproductive except where irrigated; but the soil is very rich, and Tucson is the centre of one of the oldest farming and ranching districts of the state. The Southern Pacific railway has division headquarters and repair shops here.

Tucson is first heard of in history in 1699, conjecturally, as an Indian rancheria or settlement; and in 1763 certainly as a visita, in that year temporarily abandoned, of the Jesuit mission of San Xavier del Bac, founded between 1720 and 1732, 9 m. south of what is now Tucson; in 1776 it was made a presidio (San Augustin del Tugison), or military outpost, and although a* few Spaniards may possibly have lived there before, the foundation of Tucson as a Spanish town dates from this time. It was never after abandoned during the Indian wars. In 1848 it had 760 in- habitants. The abandonment by the Mexicans in 1848 of the mis- sion towns of Tamacacori (a visita of Guevavi, a mission founded in the first third of the 18th century) and the presidio at Tubac (established before 1752) increased its importance. Tucson lay within the territory acquired by the United States by the Gadsden Purchase in 1853; it was occupied by the United States in 1856. Fort Lowell, 7 m. north-east of the city, was built as a protection

against the Apache Indians in 1873; it was abandoned in 1891. In the earlier days of Territorial history Tucson was the political centre of Arizona. Here were held in August 1856 a convention that demanded a Territorial government from Congress, another in April i860 that organized a provisional government indepen- dently of Congressional permission, and others in 1861 that attempted to cast in the lot of Arizona with the Confederate states. Tucson was occupied by the Confederates in February 1862 and by the Union forces in May. It was the Territorial capital from 1867 to 1877. Its prosperity fluctuated with the fortunes of the surrounding mining country. Tucson was incorporated as a town in 1877, and chartered as a city in 1883.

TUCUMAN, a northern province of Argentina, bounded N. by Salta, E. by Santiago del Estero, S. and W. by Catarnarca. Area, 8926 sq. m. Pop. (1895), 215,742; (1904, estimated) 263,079. The Sierra de Aconquija is on the western frontier of the province and there is also broken country in the north, but in the east the country is flat, alluvial and very fertile. The only large river is the Sali, or Duke, which receives a large number of small streams from the Sierra de Aconquija and flows through Santiago del Estero to the Porongos lagoons on the frontier of Cordoba. The exports are sugar, rum (aguardiente), timber, hides, leather, fruit and Tan cheese made in an upland valley of the Aconquija.

TUCUMAN, or San Miguel de Tucuman, a city of Argentina, capital of the province of Tucuman, on the right bank of the Sali, or Dulce river, 780 m. by rail N.W. of Buenos Aires, in lat. 26° 50′ S., long. 64 35′ W. Pop. (1895), 34,3°5; (1904, esti- mated) 55,000. The climate is warm and enervating, with no great seasonal variation during the year except in the rainfall, which falls almost wholly between September and April. The tempera- ture averages about 67 , with a maximum of 104 . Malarial diseases, especially ” chucho ” (fever and ague), are common. Tucuman is laid out in regular squares, and still retains many of its old characteristics, low buildings enclosing large courts (patios), with large rooms, thick walls, and tile roofs. The more noteworthy edifices and institutions of Tucuman are the ” matriz ” church, Merced church, cabildo, national college, normal school, the Belgrano theatre, hospital,

public library, courts of justice, post office, and sundry charitable institutions. Tucuman was founded in 1565 by Diego Villaruel at the con- fluence of the Sali and Monteros rivers, but frequent inundations led to a removal to its present site in 1585. In 1680 it succeeded Santiago del Estero as the capital of the province of Tucuman, then under the government of the Spanish viceroy at Lima. The province of Tucuman then extended from Jujuy south to Cordoba. In 1776 the viceroyalty of La Plata was created and Tucuman was transferred to its jurisdiction. In 1816 a conven- tion of delegates from the La Plata provinces met in Tucuman and signed (July 9th) an act of independence, which formally dissolved all ties with the mother country.

TUDELA, a town of northern Spain, in the province of Navarre, on the Saragossa-Logrofio and Tudela-Tarazona railways, and on the right bank of the river Ebro, which is here joined by its tributary the Queiles. Pop. (1900), 9499. The Ebro is here crossed by a massive and ancient bridge of 19 arches. Most of the public buildings, such as the town-hall, bull-ring, hospitals and schools, are modern; but there is a Romanesque collegiate church, Santa Maria, which was founded in 1 13 5 and consecrated in 1 188. This church is one of the most perfect in northern Spain, the sculptured doorways and cloisters being especially fine. There are many sawmills in the town, and an active timber trade; the manufactures of cloth, linen, spirits, preserved fruit, pottery, &c, and the trade in grain, wine and oil are of less importance. Tudela, the Roman Tulela, was occupied by the Moors in the JSth century, and taken from them by Alphonso I. of Aragon in n 14. The town was an episcopal see from 1783 to 1851. In 1808 the Spanish forces under Generals Castafios and Palafox were twice defeated here by the French under Marshal Lannes.

TUDOR (Family). The house of Tudor, which gave five sovereigns to England, is derived by all the Welsh genealogists from Ednyfed Vychan of Tregarnedd in Anglesey, who is named

in 1232 as steward of Llywelyn, prince of North Wales, and seven years later, as an arbitrator in a convention to which Davydd, the son of Llywelyn, was a party. His pedigree has been traced from Marchudd ap Cynan and beyond him, according to the veracious Lewys Dwnn, from Brutus, the

great-grandson of Aeneas. Gronw, or Gronwy, one of his younger sons, had Tre- castell for his portion. Tudor, son of Gronw, who lived to be called Tudor Hen or the old Tudor, founded the Carmelite friary in Bangor and was grandfather of Tudor Vychan ap Gronw of Trecastell, who is said to have assumed the style of a knight, and to have had that rank confirmed to him by Edward III.

This Tudor Vychan was the father of four sons, of whom the eldest, Gronw Vychan, was in favour with the Black Prince and with Richard II. He was forester of Snowdon and steward of the bishop of Bangor's lordship in Anglesey. He died in 1382, an infant son being heir to his lands in Penmynydd, whose sister carried them to her husband Gwylym ap Gmffydd of Penrhyn. Gronw Vychan,, whom a bard calls " a pillar of the court: the ardent pursuer of France," was probably the warrior whose effigy remains in the church at Penmynydd.

Gronw's brothers Gwylym and Rhys served Richard II. as captains of archers. Their youngest brother, Meredydd ap Tudor, escheator of Anglesey in 1392 and, like Gronw, an officer of the household of the bishop of Bangor, is said to have slain a man and fled to the wild country about Snowdon. He was the father of Owen ap Meredydd, commonly called Owen Tudor, a squire who appears at the court of the infant king Henry VI. By all accounts he was a goodly young man: the chroniclers dwell upon the beauty which attracted the queen mother. She gave the handsome squire a post in her household. About 1428 or 1429, it must have been common knowledge that the presump- tuous Welshman and the daughter of Charles VI. of France were living as man and wife. There is no direct evidence for their marriage. An act had but lately been passed for making it a grave offence to marry with the queen dowager without the royal consent: this act is said to have been afterwards cut out from the statute book. Richard III. denounced his rival Richmond as the son of a bastard, but it must be remembered that Richard was ready to foul the memory of his own mother in order to say the same of the young Edward V. But no one yet has found time or place of Owen Tudor's marriage with Catherine of France.

Five children were born to them, the sons being Edmund and Jasper and another son who became a monk. In 1436, a

date which suggests that Bedford had been Owen's protector, the influence of Gloucester was uppermost. In that year the queen dowager was received within Bermondsey Abbey, where she died in the following January. Her children were taken from her, and Owen Tudor " the which dwelled with the said queen" was ordered to come into the king's presence. He had already seen the inside of Newgate gaol, and he would not obey without a safe conduct. When he had the safe conduct sent him he came up from Daventry and went at once to sanctuary at Westminster, whence even the temptations of the tavern would not draw him. Allowed to go back to Wales, he was retaken and lodged again in Newgate. He broke prison again, with his chaplain and his man, the sheriffs of London having a pardon in 1438 for the escape from gaol of " Owen ap Tuder, esquire," and he returned to his native Wales. When Henry VI. came of full age he made some provision for his step-father, who took the red rose and fought manfully for it. But Mortimer's Cross was his last battle (Feb. 4, 1460/1). He fell into the hands of the Yorkists, who beheaded him in Hereford market place and set up his head on the market cross. Thither, they say, came a mad woman who combed the hair and washed the face of this lover of a queen, setting lighted wax torches round about it.

His eldest son Edmund of Hadham, born about 1430 at Hadham in Herts, one of his mother's manors, was brought up with his brothers by the abbess of Barking until he was about ten years old. The king then took them into his charge. Edmund was a knight in 1449 and in 1453 he was summoned as earl of Richmond, his patent, dated the 6th of March 1452/3, giving

him precedence next to the dukes. He was declared of legiti- mate birth, and in 1455 the royal favour found him a wife in the Lady Margaret, daughter of John Beaufort, duke of Somerset. But he died the next year, and his only child, afterwards Henry VII., was born on the 28th of January 1456/7, three months after his death.

Edmund's younger brother, Jasper Tudor, survived him many years. Jasper was knighted in 1449 and, about the date of Edmund's patent, was created earl of Pembroke. He bore the royal arms of France and England, differenced with a blue border charged with the royal martlets of the Confessor's fabulous shield, and the same was formerly to be seen upon his Garter stall-plate of 1459. He fought at St Albans in 1455 for the king who had advanced him, and two years later we find him strengthening the defences of Tenby. In 1460 he seized and took Denbigh, where the queen joined him after Northampton. He shared the defeat in 1461 at Mortimer's Cross, where his father the Welsh squire was taken and beheaded, and left the country in 1462. In 1465 he made a last descent upon Wales, to be driven off by William Herbert, who was rewarded with his earldom of Pembroke, already forfeited by attainder. But he was an obstinate and loyal partisan. He came back again with Warwick in 1470 and was hurrying to join the queen when Tewkesbury was fought and lost. After many adventures he carried off his young nephew Richmond to Brittany. The two came back together in 1485. After Bosworth, Jasper was created duke of Bedford and restored to his earldom, the earl-marshalship being given him in 1492. He lived to fight at Stoke in 1487 against Lincoln and Simnel his puppet and to be one of the leaders of the host that landed in France in 1492. He died in 1495 leaving no issue by his wife Catherine, the widow of the second duke of Buckingham and a daughter of Richard Widvile, Earl Rivers. But his bastard daughter Ellen is said to have been mother of Stephen Gardiner, bishop of Winchester. (O.Ba.)

TUDOR FLOWER, or Cresting, an architectural ornament much used in the Tudor period on the tops of the cornices of screen work, &c, instead of battlements. It consists generally of a flat, upright leaf standing on stems.

TUDOR PERIOD, in architecture, the later development of medieval architecture which followed the Perpendicular and, although superseded by the Elizabethan and the Renaissance styles, still retained its hold on English taste, portions of the additions to the various colleges of Oxford and Cambridge being still carried out in the Tudor style down to the middle of the 18th century. In church architecture the principal examples are Henry VII. 's Chapel at Westminster (1503), King's College Chapel, Cambridge,

and St George's Chapel, Windsor; and the old schools at Oxford; and in domestic work, Eltham Palace, Kent; Oxburgh Hall, Norfolk; King's College, Aberdeen; Layer Marney Hall, Essex; the manor house at East Barsham, Norfolk; and Ford's Hospital, Coventry. It was a further debasement of the Perpendicular style, and the four-centred arch was its principal feature; some of the most remarkable examples of the bow- window belong to this period; the mouldings are more spread out and the foliage becomes more natural.

TUFF (ItalJw/o), a rock consisting of volcanic ashes, the ejecta- menta of craters in a state of eruption. The products of a volcanic eruption may be classified into three groups: (a) steam and other gases, (b) lavas, (c) ashes. The ashes have not been burnt in any way though they resemble cinders in appearance: they are merely porous, slaggy pieces of lava which have been tossed into the air by outbursts of steam and have become vesicular by the expansion of the gases within them while they were still plastic.

Among the loose beds of ash which cover the slopes of many volcanoes, three classes of materials are represented. In addition to true ashes (a) of the kind above described, there are lumps of the old lavas and tuffs (b) forming the walls of the crater, &c, and which have been torn away by the violent outbursts of steam, pieces of sedimentary rocks © from the deeper parts of the vol- cano, which were dislodged by the rising lava, and are often intensely baked and recrystallized by the heat to which they

have been subjected. In some great volcanic explosions nothing but materials of the second kind were emitted, as at Bandaisan in Japan in 1888. There have been many eruptions also at which the quantity of broken sedimentary rocks mingled with the ashes is very great; as instances we may cite the volcanoes of the Eifel and the Devonian tuffs, known as " Schalsteins," in Germany. In the Scotch coalfields some old volcanoes are plugged with masses consisting entirely of sedimentary debris: in such a case we must suppose that no lava was ejected, but the cause of the eruption was the sudden liberation and expansion of a large quantity of steam. These accessory or adventitious materials, however, as distinguished from the true ashes,

tend to occur in angular fragments; and when they form a large part of the mass the rock is more properly a ” volcanic breccia ” than a tuff. The ashes vary in size from large blocks twenty feet or more in diameter to the minutest impalpable dust. The large masses are called ” bombs “; they have mostly a rounded, elliptical or pear-shaped form, owing to rotation in the air while they were still viscous. Many of them have ribbed or nodular sur- faces, and sometimes (at Volcano and Mont Pele) they have a crust intersected by many cracks like the surface of a loaf of bread. Any ash in which they are very abundant is called an agglomerate (q.v.).

In those layers and beds of tuff which have been spread out over considerable tracts of country and which are most frequently encountered among the sedimentary rocks, smaller fragments preponderate greatly and bombs more than a few inches in dia- meter may be absent altogether. A tuff of recent origin is generally loose and incoherent, but the older tuffs have been, in most cases, cemented together by pressure and the action of infiltrating water, making rocks which, while not very hard, are strong enough to be extensively used for building purposes (e.g. in the neighbourhood of Rome). If they have accumulated sub-aerially, like the ash beds found on Etna or Vesuvius at the present day, tuffs consist almost wholly of volcanic materials of different degrees of fineness with pieces of wood and vegetable matter, land shells, &c. But many volcanoes stand near the sea, and the ashes cast out by them are mingled with the sediments that are gathering at the bottom of the waters. In this way ashy muds or sands or even in some cases ashy limestones are being formed. As a matter of fact most of the tuffs found in the older forma- tions contain admixtures of clay, sand, and sometimes fossil shells, which prove that they were beds spread out under water.

During some volcanic eruptions a layer of ashes several feet in thickness is deposited over a considerable district, but such beds thin out rapidly as the distance from the crater increases, and ash deposits covering many square miles are usually very thin. The showers of ashes often follow one another after longer or shorter intervals, and hence thick masses of tuff, whether of subaerial or of marine origin, have mostly a stratified character. The coarsest materials or

agglomerates show this least distinctly; in the fine beds it is often developed in great perfection.

Apart from adventitious material, such as fragments of the older rocks, pieces of trees, &c, the contents of an ash deposit may be described as consisting of more or less crystalline igneous rocks. If the lava within the crater has been at such a tempera- ture that solidification has commenced, crystals are usually present. They may be of considerable size like the grey, rounded leucite crystals found on the sides of Vesuvius. Many of these are very perfect and rich in faces, because they grew in a medium which was liquid and not very viscous. Good crystals of augite and olivine are also to be obtained in the ash beds of Vesuvius and of many other volcanoes, ancient and modern. Blocks of these crystalline minerals (anorthite, olivine, augite and hornblende) are common objects in the tuffs of many of the West Indian volcanoes. Where crystals are very abundant the ashes are called " crystal tuffs." In St Vincent and Martinique in 1902 much of the dust was composed of minute crystals enclosed in thin films of glass, because the lava at the moment of eruption had very nearly solidified as a crystalline mass. Some basaltic volcanoes, on the other hand, have ejected great quantities of

black glassy scoria which, after consolidation, weather to a red soft rock known as palagonite ; tuffs of this kind occur in Iceland and Sicily. In the Lipari Islands and Hungary there are acid (rhyolitic) tuffs, of pale grey or yellow colour, largely composed of lumps and fragments of pumice. Over a large portion of the sea bottom the beds of fine mud contain small, water-worn, rounded pebbles of very spongy volcanic glass; these have been floated from the shore or cast out by submarine volcanoes, and may have travelled for hundreds of miles before sinking; it has been proved by experiment that some kinds of pumice will float on sea- water for more than a year. The deep sea-deposit known as the " red clay " is largely of volcanic origin and might be suitably described as a " submarine tuff-bed."

For petrographical purposes tuffs are generally classified according to the nature of the volcanic rock of which they consist; this is the same as the accompanying lavas if any of these were emitted during an eruption, and if there is a change in the kind of lava which is poured out, the tuffs also indicate this equally clearly. Rhyolite tuffs contain pumiceous, glassy fragments and small scoriae with quartz, alkali felspar, biotite, &c. In Iceland, Lipari, Hungary, Nevada, New Zealand, recent tuffs of this kind occur. The broken pumice is clear and isotropic, and when the particles are very small they have often crescentic, sickle-shaped, or biconcave outlines, showing that they are produced by the shattering of a vesicular glass; this is sometimes described as ash-structure. In the ancient rocks of Wales, Charnwood, the Pentland Hills, &c, similar tuffs are known, but in all cases they are greatly changed by silicification (which has filled them with opal, chalcedony and quartz) and by devitrification. The frequent presence of rounded corroded quartz crystals, such as occur in rhyolitic lavas, helps to demonstrate their real nature. Trachyte luffs contain little or no quartz but much orthoclase and oligoclase felspar with often biotice, augite and hornblende. In weathering they often change to soft red or yellow " clay-stones, " rich in kaolin with secondary quartz. Recent trachyte tuffs are found on the Rhine (at Siebengebirge) , in Ischia, near Naples, Hungary, &c. Andesitic luffs are exceedingly common. They occur along the whole chain of the Cordilleras and Andes, in the West Indies, New Zealand, Japan, &c. In the Lake district, North Wales, Lome, the Pentland Hills, the Cheviots and many other districts of Britain, ancient rocks of exactly similar nature are abundant. In colour they are red or brown; their scoriae fragments are of all sizes from huge blocks down to minute granular dust. The cavities are filled up with many secondary minerals, such as calcite, chlorite, quartz, epidote, chalcedony: but in micro- scopic sections the nature of the original lava can nearly always be made out from the shapes and properties of the little crystals which occur in the decomposed glassy base. Even in the smallest details these ancient tuffs have a complete resemblance to the modern ash beds of Cotopaxi, Krakatoa and Mont Pel6e. Basaltic tuffs are also of wide spread occurrence both in districts where volcanoes are now active and in lands where eruptions have long since ended. In the British Isles

they are found in Skye, Mull, Antrim and other places, where there are Tertiary volcanic rocks; in Scotland, Derbyshire, Ireland among the carboniferous strata ; and among the still older rocks of the lake district, southern uplands of Scotland and Wales. They are black, dark green or red in colour; vary greatly in coarseness, some being full of round spongy bombs a foot or more in diameter, and, being often submarine, may contain shale, sand- stone, grit and other sedimentary material, and are occasionally fossiliferous. Recent basaltic tuffs are found in Iceland, the Faeroes, Jan Mayen, Sicily, Vesuvius, Sandwich Islands, Samoa, &c. When weathered they are filled with calcite, chlorite, serpentine and, especially where the lavas contain nepheline or leucite, are often rich in zeolites, such as analcite, prehnite, natrolite, scolecite, chabazite, heulandite, &c. Ultra-basic tuffs are by no means fre- quent ; their characteristic is the abundance of olivine or serpentine and the scarcity or absence of felspar. In this class the peridotite, breccias or kimberlites of the diamond-fields of South Africa may perhaps be placed (see Diamond). The principal rock is a dark bluish green serpentine (blue-ground) which when thoroughly oxidized and weathered becomes a friable brown or yellow mass (the ” yellow-ground “). Besides olivine and augite (chrome diopside) there occur crystals of hypersthene, brown mica, garnet (Cape ruby), magnetite, ilmenite and kyanite, together with crystal- line blocks of garnet, augite and olivine (which some petrographers have called eclogites). Many lumps of shale are embedded in the breccia, and some have supposed that the diamonds are due to the ultra-basic magma dissolving carbon, which subsequently crystal- lized as the rock cooled down. Many of the crystals are broken, and as the rock fragments also are angular, rather than rounded, the kimberlite is more properly an ultra-basic breccia than a tuff.

In course of time other changes than weathering may overtake tuff deposits. Sometimes they are involved in folding and become sheared and cleaved. Many of the green slates of the lake district in Cumberland are fine cleaved ashes. In Charnwood forest also the tuffs are slaty and cleaved. The green colour is due to the large development of chlorite. Among the crystalline schists of many

regions green beds or green schists occur, which consist of

quartz, hornblende, chlorite or biotite, iron oxides, felspar, &c, and are probably recrystallized or metamorphosed tuffs. They often accompany masses of epidiorite and hornblende-schists which are the corresponding lavas and sills. Some chlorite-schists also are probably altered beds of volcanic tuff. The " Schalsteins " of Devon and Germany include many cleaved and partly recrystallized ash-beds, some of which still retain their fragmental structure though their lapilli are flattened and drawn out. Their steam cavities are usually filled with calcite, but sometimes with quartz. The more completely altered forms of these rocks are platy, green chloritic schists ; in these, however, structures indicating their original volcanic nature only sparingly occur. These are intermediate stages between cleaved tuffs and crystalline schists.

Tuffs are not of much importance in an economic sense. The peperino, much used at Rome and Naples as a building stone, is a trachyte tuff. Puzzuolana also is a decomposed tuff, but of basic character, originally obtained near Naples and used as a cement, but this name is now applied to a number of substances not always of identical character. In the Eifel a trachytic, pumiceous tuff called trass (q.v.) has been extensively worked as a hydraulic mortar.

(J- S. F.)

TUGELA ("Startling"), a river of south-east Africa, the largest in Natal. It drains, with its tributaries, an area of about 8000 sq. m. The river valley is some 190 m. in length, the river, which has an exceedingly sinuous course is fully 300 m. long. It rises, at an altitude of nearly 11,000 ft. in the Drakensberg mountains on the eastern face of the Mont aux Sources, down which it leaps in a nearly perpendicular fall of 1800 ft.

The river, which starts its race to the ocean with a north-east course, soon bends more directly east, and, with many windings north and south, maintains this general direction across the table- land of north Natal until its junction with the Buffalo river, when it turns south. On its northern bank in its upper course are the heights of Spion Kop and Vaal Kranz, and on its southern bank, 56 m. east in a direct line from its source, is the village of Colenso, all three places being the scene of ineffectual attempts (Dec. 1899- Feb.

1900) by the British troops under General Sir Redvers Buller to dislodge the Boers who blocked the road to Ladysmith. Below Colenso are more waterfalls, and above the river is Pieter's Hill, the storming of which by the British, on the 27th of February 1900 at length led to the relief of Ladysmith. Six miles lower down the Tugela receives the Klip, which rises in the Drakensberg near Van Reenen's Pass and flows by Ladysmith. Another northern tributary is the Sunday's river, which rises in the Biggarsberg. From the south the river is increased by several affluents, the chief being the Mooi (Beautiful) river. The Tugela-Mooi confluence is 44 m. south-east of Colenso at the base of the Biggarsberg. Seven miles farther down the Tugela joins the Buffalo river, the united stream retaining, however, the name Tugela. The Buffalo has its origin in the Drakensberg near Majuba Hill and flows south with, also, a general trend to east. In its course, which is very winding, it receives numerous tributaries, one of them being the Ingogo, a small stream whose name recalls the fight on its banks on the 8th of February 1881, between British and Boers. The chief affluents are the Ingagani (from the south-west) and the Blood (from the north-east), the last-named so called after the defeat of the Zulu king Dingaan, on the 16th of December 1838, by the Boers under Andries Pretorius, when the river ran red with the blood of the Zulus. Eighteen miles in a direct line below the Blood con- fluence is Rorke's Drift, or ford across the river, and some 12 m. south-east of the drift is the hill of Isandhlwana, both places rendered famous in the Zulu War of 1878-79. The junction with the Tugela is 30 m. in a direct line, farther south, the Buffalo river in that distance passing through a wooded and hilly region.

Below the confluence of the two streams the Tugela flows south- east in a deep channel between lofty cliffs, or through wild, stone- strewn valleys until it reaches the narrow coast belt. Its mouth is nearly closed by a sand bar, formed by the action of the ocean. The Tugela is thus useless for navigation. About 6 m. above the mouth are two forts, Pearson and Tenedos, built by the British in 1879, during the war with the Zulus, to guard the passage of the river. Generally fordable in the winter months, the Tugela is, after the heavy rains of summer, a deep and rapid river. It is crossed, some 5 m. above the forts, by a railway bridge

— the longest bridge in South Africa. From the junction of the Blood river with the Buffalo, that stream and subsequently the Tugela form the boundary between Natal and Zululand.

TUGGURT, a town in the Wadi Ghir, Algerian Sahara, 127 m. S. of Biskra. Tuggurt, which has a population (1906) of 2073, was formerly surrounded by a moat, which the French filled up. The town is entered by two gates. Just within the northern gate is the market place, which contains the chief mosque. The surrounding oasis is very fertile. It has about 9000 inhabitants and contains about 200,000 date palms. From Tuggurt a road 75 m. long leads across the desert north-east to El Wad (.q.v.).

Some 12 m. south-west at the desert end of the Wadi Ghir is the oasis and town of Temacin (pop. 2 1 20) , one of the chief centres of the Mussulman fraternity of Tidianes.

TUG-OF-WAR, a contest between two teams composed of one or more persons, each team striving to pull the other in its own direction by means of a rope held by the hands alone. Some rules allow the ” anchor-men,” who hold the ends of the rope, to fasten it to their persons. A ribbon or handkerchief is tied round the middle of the rope, and others at a distance, usually, of one yard on each side of it. That team loses which allows itself to be pulled more than one yard from its original position. The British army teams are usually composed of ten men each, but the number varies in different parts of the world. The rules of the modern Olympic Games recognize teams of five. When a tug-of-war takes place out of doors the men, or at least the ” anchors,” are allowed to dig holes in the ground for their feet; when indoors cleats are bolted to the floor as braces.

TUGUEGARAO, a town and the capital of the province of Cagayan, Luzon, Philippine Islands, on the Grande de Cagayan River, about 60 m. from its mouth. Pop. (1903), 16,105. Many of Tuguegarao’s buildings — government, religious, business and residential — are of stone or brick. There are a Dominican college for boys, a convent school

for girls, and good public schools, including a high school. The river is navigable to Tuguegarao for vessels of light draught ; the Cagayan Valley is the great tobacco-producing region of the Philippines; and Tuguegarao is an im- portant shipping point for tobacco. Local business is largely in the hands of Chinese merchants; Spanish and German companies control the exportation of tobacco. The town was settled in 1774, and the old church and bell tower are still standing. The local dialects are Cagayan, and, of less importance, Ilocano and Tagalog.

TUKE, the name of an English family, several generations of which were celebrated for their efforts in the cause of philan- thropy.

William Tuke (1732-1822) was born at York on the 24th of March 1732. His name is connected with the humane treatment of the insane, for whose care he projected in 1792 the Retreat at York, which became famous as an institution in which a bold attempt was made to manage lunatics without the excessive restraints then regarded as essential. The asylum was entirely under the management of the Society of Friends. Its success led to more stringent legislation in the interests of the insane.

His son Henry Tuke (1755-1814) co-operated with'his father in the reforms at the York Retreat. He was the author of several moral and theological treatises which have been translated into German and French.

Henry's son Samuel Tuke (1784-1857), born at York on the 31st of July 1784, greatly advanced the cause of the amelioration of the condition of the insane, and devoted himself largely to the York Retreat, the methods of treatment pursued in which he made more widely known by his Description of the Retreat near York, Sic. (York, 18 13). He also published Practical Hints on the Construction and Economy of Pauper Lunatic Asylums (18 15). He died at York on the 14th of October 1857.

Samuel's son James Hack Tuke (1819-1896) was born at York on the 13th of September 1819. He was educated at the Friends' school there, and after working for a time in his father's wholesale tea business, became in 1852 a partner in the banking firm of Sharpies and Co., and went

to live at Hitchin in Hertford- shire. For eighteen years he was treasurer of the Friends' Foreign Mission Association, and for eight years chairman of the Friends' Central Education Board. But he is chiefly remem- bered for his philanthropic work in Ireland, which was in a great measure the result of a visit to Connaught in 1847, and of the scenes of distress which he there witnessed. In 1880, accompanied by W. E. Forster, he spent two months in the West of Ireland distributing relief which had been privately subscribed by Friends in England. Letters descriptive of the state of things he saw were published in The Times, and in his pamphlet, Irish Distress and its Remedies (1880), he pointed out that Irish distress was due to economic rather than political

difficulties, and advocated state-aided land purchase, peasant proprietorship, light railways, government help for the fishing and local industries, and family emigration for the poorest peasants. From 1882 to 1884 he worked continuously in Ireland super- intending the emigration of poor families to the United States and the Colonies. The failure of the potato crop in Ireland in 1885 again called forth Tuke's energy, and on the invita- tion of the government, aided by public subscription, he pur- chased and distributed seed potatoes in order to avert a famine. To his reports of this distribution and his letters to The Times, which were reprinted under the title The Condition of Donegal (1889), were due in a great measure the bill passed for the con- struction of light railways in 1889 and the Irish Land Act which established the Congested Districts Board in 1891. He died on the 13th of January 1896.

See Report of the Select Committee of the House of Commons (1815- 181 6); Dr Conolly, Treatment of the Insane without Mechanical Restraints (1 856) ; Dr Hack Tuke, Chapters in the History of the Insane in the British Isles (1882).

Daniel Hack Tuke (1827-1895), younger brother of James Hack Tuke, was born at York on the 19th of April 1827. In 1845 ne entered the office of a solicitor at Bradford, but in 1847 began work at the York Retreat. Entering St Bartholomew's Hospital in London in 1850, he became a member of the Royal College of Surgeons in 1852, and graduated M.D. at Heidelberg in 1853. In 1858, in

collaboration with J. C. Bucknill, he published a Manual of Psychological Medicine, which was for many years regarded as a standard work on lunacy. In 1853 he visited a number of foreign asylums, and later returning to York he became visiting physician to the York Retreat and the York Dispensary, lecturing also to the York School of Medicine on mental diseases. In 1859 ill health obliged him to give up his work, and for the next fourteen years he lived at Falmouth. In 1875 he settled in London as a specialist in mental diseases. In 1880 he became joint editor of the Journal of Mental Science. He died on the 5th of March 1895.

Among his works were Illustrations of the Influence of the Mind on the Body (1872); Insanity in Ancient and Modern Life (1878); History of the Insane in the British Isles (1882); Sleepwalking and Hypnotism (1884); Past and Present Provision for the Insane Poor in Yorkshire (1889); Dictionary of Psychological Medicine (1892).

TUKULOR (Tuculers), the name, by some said to be the French tout-couleur, for the negro half-castes of Senegal, who are principally of Fula-Wolof descent. By others the word is identified with Tacurol, an old name of the country, which took the form of Tacurores in the Portuguese writers of the 16th century. The Tukulor are settled chiefly in the Damga, Futa, Toro and Dimar districts of Senegal, and are remarkable for their fanaticism as Mahommedans. An intelligent, energetic and fierce people, they offered strenuous opposition to the conquest of their country by the French in the latter half of the 19th century. ; TULA, a government of central Russia, bounded by the governments of Moscow on the N., Ryazan on the E., Tambov and Orel on the S., and Kaluga on the W. Area, 11,950 sq. m.; pop. (1906 estimate), 1,662,600. It is intersected from S.W. to N.E. by a gently undulating plateau, 950 to 1020 ft. in altitude, which separates the drainage area of the Oka from that of the Don.

The government is divided into twelve districts, the chief towns of which are Tula, Bogoroditsk, Alexin, Byelev, Epifan, Efremov, Kashira, Krapivna, Novosil, Odoyev, Chern and Venev. Only 2.4 % of the aggregate area is considered as unavailable for cultiva- tion, the remainder being distributed as follows: peasants, 48!; nobility, 32!; other

private landowners, II %; crown, towns, &c., 2 %. Agriculture is the chief occupation. Petty trades and domestic industries (e.g. the making of tea-urns, brass wares, har- moniums, &c.) have always flourished. The principal factory establishments are machinery works, hardware factories, flour-mills, sugar works and distilleries. Coal is extracted, as also pyrites and iron ore. Metallurgy is a growing industry.

Before the Slav immigration the territory of Tula was inhabited by Mordvinians in the north and by Meshcheryaks in the south. The Slavs who occupied the Oka were soon compelled to pay tribute to the Khazars. Subsequently the territory on the Oka belonged to the principality of Chernigov. In the 14th century part fell under the rule of Ryazan and

Moscow, while the rest was under Lithuanian dominion till the 15 th century.

TULA, a town of Russia, capital of the government of the same name, 1 20 m. by rail S. of Moscow, in the broad but low, marshy and unhealthy valley of the Upa. Pop. (1882), 63,500; (1901), 109,352. It is an old town of Old Russia, but its growth began only towards the end of the 18th century after the manufacture of arms had commenced. The chief branch of industry is the making of rifles; next in importance comes the manufacture of samovars (tea-urns) . Tula is an episcopal see of the Orthodox Greek Church. The public buildings include two cathedrals and an industrial museum.

The town is first mentioned in 1 147 ; but its former site seems to have been higher up the Tulitsa. Its wooden fort was replaced in 1514-1521 by a stone kreml, or citadel, which still exists. Tsar Boris Godunov founded a gun factory here in 1595, and in 1632 a Dutchman, Winius, established an iron foundry. Tsar Michael Alexis and Peter the Great, especially the last-named, took great interest in the gun factories, and large establishments were built in 1705’and 17 14.

TULCEA, or Tultcha, the capital of the department of Tulcea, Rumania, on the right bank of the Danube, 42 m. from its mouth at Sulina. Pop. (1900), 18,800; including many Russians, Turks, Greeks and Jews. There is no railway within 20 m., and the sur- rounding country is barren and desolate. The principal commerce is in fish and grain. Wool is also exported to France, and hides to Turkey. Sheep-farming is carried on among the mountains.

TULIP {Tulipa), a genus of bulbous herbs belonging to the Liliaceae. The species are found wild along the northern shores of the Mediterranean, in the Levant, Armenia, Caucasus, Northern Africa, Persia, and sporadically across North and Central Asia to Japan. The cup-shaped flowers have six regular segments in two rows, as many free stamens, and a three-celled ovary with a sessile stigma, which ripens into a leathery many-seeded capsule. The species are numerous, and are distinguished one from another by the scales of the bulb being woolly or smooth on the inner surface, by the character of the flower-stalks, by the filaments being hairy or otherwise, and by other characters. Owing to the great beauty of the flowers they have been favourites in Euro- pean gardens for two or three centuries, and have been crossed and recrossed till it has become almost impossible to refer the plants to their original types. The early flowering " Van Thol " tulips, the segments of which are mostly scarlet with yellow edges, are derived from T. suaveolens, a native of the Caspian region. T. Gesneriana, a native of Armenia and central Russia, is the origin of some of the later flowering varieties. T. pubes- cens, which is probably a hybrid between the two species just named, is the source of some of the early flowering kinds known as Pottebakker, &c. T. oculus-solis and T. Clusiana are lovely species, natives of southern Europe, and T. silvestris ,.with elegant yellow flowers, is a doubtful native of England. More recently, owing to the exertions of Russian naturalists, a large number of new species have been discovered in Turkestan, and introduced into Europe. Some of these are very beautiful, and render it probable that by intercrossing with the older species still further difficulties will be presented in the way of identification. These difficulties are further enhanced by the fact that, quite apart from any cross-breeding, the plants, when subjected to cultivation, vary so greatly in the course of

two or three years from the original species from which they are directly descended that their parent- age is scarcely recognizable. This innate power of variation has enabled the florist to obtain, and ultimately to ” fix,” so many remarkable varieties. At the present day tulips of all kinds are much more extensively grown than at any previous period. Not only are millions of bulbs cultivated in Holland for export every year, but thousands are now also grown for the same purpose in the Channel Islands, more particularly in Guernsey. Of late years tulips have become very popular in America, and an extensive trade is now done between the U.S.A. and Europe. The enormous prices once given for rare varieties of tulip bulbs no longer obtain, though, even now, two and three guineas are asked for special bulbs. It must, how-

ever, be remembered that the ” tulipomania ” of the 17th century was really a form of gambling, in which admiration of the flower and interest in its culture were very secondary matters. Tulips were introduced into the Low Countries in the 16th century from Constantinople and the Levant.

The florists’ varieties of tulips, which have sprung from Tulipa Gesneriana, are arranged in separate classes named bizarres, bybloemens and roses, according to their colour and marking. Tulips are readily raised from seeds, and the seedlings when they first flower (after about 7 years cultivation) are of one colour — that is, they are self-coloured. Judged by the florists’ rules, they are either good or bad in form, and pure or stained (white or yellow) at the base; the badly formed and stained flowers are thrown away, while the good and pure are grown on, these being known as ” breeder ” tulips. The breeder bulbs and their offsets may grow on for years producing only self-coloured flowers, but after a time, which is varied and indefinite, some of the progeny ” break,” that is, produce flowers with the variegation which is so much prized. The flower is then said to be ” rectified “; it is a bizarre when it has a yellow ground marked with purple or red, a bybloemen when it has a white ground marked with violet or purple, or a rose when it has a white ground marked with rose colour. One of the most important of the properties of a fine florists’ tulip is that the cup should form, when expanded, from half to a third of a hollow ball, the six divisions of the perianth being broad at the ends, and smooth at the edges, so that

the divisions may scarcely show on indenture. Another is that the ground colour should be clear and distinct, whether white or yellow. The least stain at the base of the flower, technically called the " bottom," would render a tulip comparatively value- less. What are called " feathered " flowers are those which have an even close feathering, forming an unbroken edging of colour all round, " flamed " flowers being those which have a beam or bold mark down the centre, not reaching to the bottom of the cup.

Tulips flourish in any good garden soil that has been deeply dug or trenched and manured the previous season. To secure perfect drainage and greater warmth a fair quantity of sand or grit should be present. Fresh manure should be avoided, but the remains from an old hot-bed or mushroom bed may be incorporated. The best time to .plant is in September and October, the bulbs being buried about 6 in. deep and the same distance apart. The best effects are produced in formal beds by planting the same variety in each, to secure the plants being of the same height and in flower simul- taneously. In mixed flower borders, mixed varieties may be planted. After planting the space between the rows of tulips may be planted with such plants as forget-me-nots, wallflowers, silenes, violas, double white arabis, polyanthuses, &c, to obtain beautiful colour combinations in spring.

Propagation. — Tulips are usually increased by offsets, which most varieties produce in fairly large numbers. These are taken off and sown in drills, like seed. They are usually strong enough to flower the third year from this sowing. Some varieties produce offsets sparingly and must be increased by seed — a slow and uncertain method. New varieties are raised from seed. (The colour variation in the flowers of seedlings is discussed above.) Seeds are sown in boxes or cold frames, in light sandy soil, and the young plants are allowed to remain undisturbed until the second year. They are then lifted and treated like offsets, being sown thinly in beds out of doors. They usually flower in about the seventh year. The soil in which tulips are propagated should be sandy, free working and thoroughly drained. A warm sheltered position is a necessity.

Cultivation Out of Doors. — Planting is best effected during Sep- tember, October and early November. It is usual

thoroughly to dig and manure the ground in preparation. Holes 6 to 8 in. apart and 5 in. deep are then made with a dibber. Sometimes a little loose earth or sand is put in to the depth of about 1 in., and the bulbs laid singly thereon, the holes being closed by the dibber and the whole raked over. Valuable varieties are planted at about the same depth, with a trowel, a little sand being placed around them.

Unless seed is required, the young capsules shculd be removed as soon as the perianth has withered, to conserve the strength of the bulb. The plants should be left until the leaves begin to wither, unless it becomes necessary to lift them to make way for other plants. When lifted they should be laid thinly in a well shaded, airy spot to dry. . The tops can then be removed and the bulbs sorted and stored thinly in trays in a cool dry place. Rare bulbs may be wrapped singly in tissue paper for storing.

In Pots and Forcing. — -The early flowering varieties should be potted as early in September as practicable, later batches foi succession being potted during October. Pots 5 and 6 in. in diameter

are the most convenient. The tops should be covered with | in. of soil, and about half an inch left for water. The soil should be a light and fairly rich compost, comprising about 2 parts loam, 1 part decayed manure or horse droppings that have been thoroughly sweetened, 1 part leaf mould and half a part of sand. Pot firmly, and plunge the pots in several inches of ashes out of doors, to protect the bulbs from frost. As soon as growth commences at the top and a fair amount of roots are formed they may be introduced into gentle heat, in batches according to the need and the amount of stock available. For market a slightly different method is adopted. The bulbs are placed in long shallow boxes, plunged in soil or ashes in the open air, and are later introduced as required into heat in semi-darkness, and are afterwards transferred to benches in the forcing houses where they flower. Bulbs which have been forced are of no further value for that particular purpose. If planted in

borders and shrubberies, however, they will continue to bear fairly good blossoms in the open air for several seasons.

Varieties. — The following varieties are among the most useful for bedding and pot culture.

Early Single Flowering Kinds: — ■

Name.

Colour.

Height.

Due van Thol Adelaine

Various ....

6 in.

7 11

Rose Carmine ....

Artus ....

Dark Scarlet

8 „

Bacchus

Dark Crimson .

T

Belle Alliance

Crimson Scarlet ....

8 ,,

Canary Bird Chrysolora . . . . Cottage Maid

Yellow ....

10-12

9 .,

12 ,,

Yellow

Pink and White

Duchess de Parma .

Orange Crimson ....

10 ,,

Gold Finch . . . .

Golden Yellow

12 ,,

Joost van Vondel

Crimson, flaked White .

9 11

Keisers Kroon .

Scarlet and Yellow, superb

La Reine . . . .

flower ....

10 ,, 9 ,.

White (when forced) and Pink.

Lac van Rhijn .

Rosy Violet ....

9 11

Ophir d'Or . . . .

Golden Yellow

8 „

Pottebakker

Scarlet, White, Yellow vars.

12 ,,

Primrose Queen Proserpine . . . .

Primrose.

9 11 9 11

Rosy Carmine, superb flower .

Rose Gris de lin

White and Pink .

9 „

9 .,

10 ,,

Thomas Moore .

Terra-cotta

White Hawk . . .

Pure White ....

Yellow Prince

Yellow ....

8 „

Early Double Flowering

Kinds: —

Name.

Colour.

Height.

Due van Thol

Red, edged Yellow .

6 in.

Alba Maxima

Pure White . . .

9 .,

9 „

9 .1 9 ..

8 „

Couronne d'Or .

Yellow and Orange .

Gloria Solis ....

Orange Crimson .

Imperator rubrorum

Crimson Scarlet

La Candeur ....

Pure White .

Leonardo da Vinci .

Crimson and Gold .

Tournesol . . . .

Scarlet and Yellow .

8 „

Late Single Flowering Kinds: —

These are tall-growing hardy kinds, suitable for herbaceous borders where they can be left undisturbed. With them may be associated what are now popularly known as ” Darwin ” tulips, beautiful long-stemmed kinds with self colours, and the ” Cottage ” or ” May-flowering ” tulips, all easily grown in ordinary garden soil.

Name.

Bouton d’Or Caledonia . Columbus .

Fulgens .

Colour.

Golden Yellow. Orange Scarlet. Yellow and

Vermilion. Violet Crimson.

Name.

Gesneriana Gesneriana

lutea Picotee The Fawn .

Colour.

Bright Scarlet.

Yellow.

White, edged Pink.

Dove Colour.

Parrot Tulips. — This late flowering group is supposed to be derived from the curious green and yellow striped T. viridiflora. The flowers are mostly heavy and drooping, petals brightly coloured, the edges being curiously notched and waved.

Name.

Rubra Major Mark Graaf . Perfecta .

Colour.

Dark Red.

Yellow, striped

Scarlet. Yellow, Scarlet

and Green.

Na

Lutea Major . MonstreRouge

Colour.

Yellow, Crimson

and Green. Crimson.

TULIP-TREE, Liriodendron tulipifera (Nat. Ord. Magnoliaceae), a North American tree of great beauty, with peculiarly four-lobed,. truncate leaves and solitary tulip-like sweet-scented flowers, variegated with green, yellow and orange. It is hardy in England, but while young it requires protection from cold, cutting winds. In habit it resembles a somewhat stiff-growing plane tree, and becomes fully as large. It does not flourish in the atmosphere of towns. It thrives best in deep sandy loam, and is propagated by seeds.

TULL, JETHRO (1674-1741), English agricultural writer and farmer, was born at Basildon, Berkshire, in 1674, probably in March. He entered St John's College, Oxford, in 1601, and was called to the bar at Gray's Inn in 1699 but never practised. In that year he married and began farming on his father's land at Howberry, near Wallingford, and here about 1 701 he invented and perfected his machine drill and began experiments in his new system of sowing in drills or rows sufficiently wide apart to allow for tillage by plough and hoe during almost the whole period of growth. In 1709 he moved to a farm near Hungerford and from 1711 to 1714 travelled in France and Italy, making careful observations of the methods of agriculture in those countries which aided and confirmed his theories as to the true use of manure and the importance of " pulverizing " the soil. He did not publish any account of his agricultural experiments or theories until 1731, when his Horse-hoeing

Husbandry appeared. This was followed by The Horse-hoeing Husbandry, or an Essay on the Principles of Tillage and Vegetation, by J. T., in 1733. He was attacked in the agricultural periodical The Practical Husbandman and Farmer and accused of plagiarizing from such earlier writers as Sir A. Fitzherbert, Sir Hugh Plat (1552-1611?), Gabriel Plattes (fl. 1638) and John Worlidge (fl. 1669-1698). Tull answered in various smaller works forming additions to his main work. He died on the 21st of February 1741.

Many editions of his Horse-hoeing Husbandry were published sub- sequently, and in 1822 William Cobbett edited it. It was translated into French, notably by H. L. Duhamel Dumonceau (1700-1782), the naturalist and agriculturalist, in 1753-1757 (see Agriculture).

TULLAMORE, a market town and the county town of King's County, Ireland, on the Grand Canal and a branch of the Great Southern & Western railway, by which it is 58 m. W. by S. of Dublin. Pop. (190.1), 4639. The town is the seat of the county assizes, has a court house and other county buildings, and is governed by an urban district council. There is con- siderable trade in agricultural produce, and brewing and distilling are carried on. Charleville park is a fine demesne, and there are several small ruined castles in the neighbourhood, notably Shragh Castle, dating from 1588.

TULLE, a town of central France, capital of the department of Correze, 58 m. S.S.E. of Limoges by rail. Pop. (1906), of the town, 11,741; of the commune, 17,245. The town extends along the narrow valley of the Correze, its streets here and there ascending the hill-slopes on either side by means of stairways. Tulle is the seat of a bishop. Of its 12th-century cathedral, once attached to an abbey, only the porch and nave remain, the choir and transept having been destroyed in 1793, but there is a tower of the 13 th century with a fine stone steeple of the 14th century. The neighbouring cloister (12th and 13th century) has been restored. The abbot's house (15th century) has a carved door- way and well-preserved windows. Other curious old houses are to be seen in the vicinity of the cathedral. The prefecture of Tulle is a sumptuous building of 1869 surrounded by gardens. The town has tribunals of first

instance and of commerce, a lycee for boys, training colleges for both sexes, a chamber of commerce and a branch of the Bank of France. Its principal industry is the manufacture of small-arms, established in 1690, and now carried on by the state under the direction of the artillery authorities. At its busiest times the factory has employed 3000 hands. The well-known cascades of Gimel formed by the Montane are near Tulle.

Tulle (Tutela) owed its importance in the middle ages to the abbey of St Martin, founded in the 7th or 8th century. The

abbacy was raised to the rank of bishopric in 13 17. The town was taken by the English in 1346 and was subsequently ravaged by the Black Death. It was again conquered by the English in 1369; but, when the inhabitants succeeded in freeing them- selves, they were exempted from all imposts by Charles V. The Protestants tried in vain to seize Tulle in 1577, but were successful in 1585.

TULLE, a term restricted in England to a fine bobbin-net of silk, used for veils, scarves, millinery purposes, and trimmings of ladies' dresses, &c. The French used the word to mean all machine-made lace the basis of which is the intertwisted net- work made on the bobbin-net machine. The word is derived from the town of Tulle in France.

TULLOCH, JOHN (1823-1886), Scottish theologian, was born at Bridge of Earn, Perthshire, in 1823, and received his university education at St Andrews and Edinburgh. In 1845 he became minister of St Paul's, Dundee, and in 1849 of Kettins, in Strath- more, where he remained for six years. In 1854 he was appointed principal of St Mary's College, St Andrews. The appointment was immediately followed by the appearance of his Burnet prize essay on Theism. At St Andrews, where he held also the post of professor of systematic theology and apologetics, his work as a teacher was distinguished by several features which at that time were new. He lectured on comparative religion and treated doctrine historically, as being not a fixed product but a

growth. From the first he secured the attachment and admiration of his students. In 1862 he was appointed one of the clerks of the General Assembly, and from that time forward he took a leading part in the councils of the Church of Scotland. In 1878 he was chosen moderator of the Assembly. He did much to widen the national church. Two positions on which he repeatedly insisted have taken a firm hold — first, that it is of the essence of a church to be comprehensive of various views and tendencies, and that a national church especially should seek to represent all the elements of the life of the nation; secondly, that sub-scription to a creed can bind no one to all its details, but only to the sum and substance, or the spirit, of the symbol. For three years before his death he was convener of the church interests committee of the Church of Scotland, which had to deal with a great agitation for disestablishment. He was also deeply interested in the reorganization of education in Scotland, both in school and university, and acted as one of the temporary board which settled the primary school system under the Educa- tion Act of 1872. He died at Torquay on the 13th of February

1886.

Tulloch's best-known works are collections of biographical sketches of the leaders of great movements in church history, such as the Reformation and Puritanism. His most important book, Rational Theology and Christian Philosophy (1872), is one in which the Cambridge Platonists and other leaders of dispassionate thought in the I7th century are similarly treated. He delivered the second series of the Croall lectures, on the Doctrine of Sin, which were afterwards published. He also published a small work, The Christ of the Gospels and the Christ of History, in which the views of Renan on the gospel history were dealt with; a monograph on Pascal for Blackwood s Foreign Classics series ; and a little work, Beginning Life, addressed to young men, written at an earlier period.

See the Life by Mrs OJiphant.

TULLUS HOSTILIUS, third legendary king of Rome (672- 640 B.C.). His successful wars with Alba, Fidenae and Veii shadow forth the earlier conquests of Latian territory and the first extension of the Roman domain beyond the walls

of Rome. It was during his reign that the combat between the Horatii and Curiatii, the representatives of Rome and Alba, took place. He is said to have been struck dead by lightning as the punish- ment of his pride.

Tullus Hostilius is simply the duplicate of Romulus. Both aie brought up among shepherds, carry on war against Fidenae and Veii, double the number of citizens, organize the army, and disappear from earth in a storm. As Romulus and Numa represent the Ramnes and Tities, so, in order to complete the list of the four traditional elements of the nation, Tullus was made the representative of the Luceres, and Ancus the founder of the Plebs. The distinctive event of this reign is the destruc-

tion of Alba, which may be regarded as an historical fact. But when and by whom it was destroyed is uncertain — probably at a later date, by the Latins, and not by the Romans, who would have regarded as impious the destruction of their traditional mother-country.

See Livy i. 22-31; Dion. Halic. iii. 1-35; Cicero, de Republica, ii. 17. For a critical examination of the story see Schwegler, Romische Geschichte, bk. xii. ; Sir G. Cornewall Lewis, Credibility of early Roman History, ch. n; W. Ihne, Hist, of Rome, vol. i. ; E. Pais, Storia di Roma, vol, i. (1898) ; O. Gilbert, Geschichte und Topographie der Stadt Rom im Altertum, ii. (1885); G. F. Schomann, ” De Tullo Hostilio rege romano ” in his Opuscula, i. 18-49; also Rome: Ancient History.

TULSA, a city (and co-extensive township) and the county-seat of Tulsa county, Oklahoma, U.S.A., on the Arkansas river, about no m. N.E. of Guthrie. Pop. (1900), 1390; (1907), 7298(638 negroes); (1910) 18,182. Tulsa is served by the Atchi- son, Topeka & Santa F6, the St Louis & San Francisco, the Midland Valley, the Missouri, Kansas & Texas, and the Arkansas Valley & Western railways. The city is situated on the old boundary line between Indian Territory and Oklahoma Territory, where the boundaries of the Cherokee, Creek and Osage nations intersected. It is on an elevation from the rolling prairie, which commands a fine view over the valley of the Arkansas. Tulsa is the seat of Henry Kendall College (Presbyterian , 1894) , removed hither from Muskogee in 1907; it was named in honour of

Henry Kendall (1815-1892), who from 1861 until his death was secre- tary of the board of Home Missions of the Presbyterian Church. The city is a trading centre for a rich oil, gas and coal region and a grain, cotton and live-stock country. Natural gas is used for manufacturing purposes; among the manufactures are glass and cotton-seed oil products. Tulsa was founded in 1887, was first chartered as a city in 1902, and in 1908 adopted a commission form of government.

TULSI DAS (1532-1623), the greatest and most famous of Hindi poets, was a Sarwariya Brahman, born, according to tradition, in a.d. 1532, during the reign of Humayun, most probably at RajSpur in the Banda District south of the Jumna. His father's name was Atma Ram Sukal Dube; that of his mother is said to have been Hulasi. A legend relates that, having been born under an unlucky conjunction of the stars, he was aban- doned in infancy by his parents, and was adopted by a wandering sadhu or ascetic, with whom he visited many holy places in the length and breadth of India; and the story is in part supported by passages in his poems. He studied, apparently after having rejoined his family, at Sukarkhet, a place generally identified with Soron in the Etah district of the United Provinces, but more probably the same as Varahakshetra 1 on the Gogra River, 30 m. W. of Ajodhya (Ayodhya). He married in his father's lifetime, and begat a son. His wife's name was Ratnawali, daughter of Dlnabandhu Pathak, and his son's Tarak. The latter died at an early age, and Tulsl's wife, who was devoted to the worship of Rama, left her husband and returned to her father's house to occupy herself with religion. Tulsi Das followed her, and endeavoured to induce her to return to him, but in vain; she reproached him (in verses which have been preserved) with want of faith in Rama, and so moved him that he renounced the world, and entered upon an ascetic life, much of which was spent in wandering as a preacher of the necessity of a loving faith in Rama. He first made Ajodhya (the capital of Rama and near the modern Fyzabad) his headquarters, frequently visiting dis- tant places of pilgrimage in different parts of India. During his residence at Ajodhya the Lord Rama is said to have appeared to him in a dream, and to have commanded him to write a Ramayana in the language used by the common people. He began this work in the year 1574, and

had finished the third book (Aranya-kdnd) , when differences with the VairagI Vaish- navas at Ajodhya, to whom he had attached himself, led him to migrate to Benares, where he settled at Asl-ghat. Here he died

1 This is the view of Baijnath Das, author of the best life of Tulsi Das. At Soron there is no tradition connecting it with the poet. Varahakshetra and Sukar-khet have the same meaning (Varaha — Siikara, a wild boar).

in 1623, during the reign of the emperor Jahanglr, at the great age of 91.

The period of his greatest activity as an author synchronized with the latter half of the reign of Akbar (1556-1605), and the first portion of that of Jahanglr, his dated works being as follows: commencement of the Ramayan, 1574; Ram-satsai, 1584; Parbatt-mangal, 1586; Rdmdgyd, 1598; Kabitta Ramayan, between 1612 arid 1614. A deed of arbitration in his hand, dated 161 2, relating to the settlement of a dispute between the sons of a land-owner named Todar, who possessed some villages adjacent to Benares, has been preserved, and is reproduced in facsimile in Dr Grierson's Modem Vernacular Literature of Hindustan, p. 51. Todar (who was not, as formerly supposed, Akbar's finance minister, the celebrated Raja Todar Mall) was his attached friend, and a beautiful and pathetic poem 1 by Tulsl on his death is extant. He is said to have been resorted to, as a venerated teacher, by Maharaja Man Singh of Jaipur (d. 1618), his brother Jagat Singh, and other powerful princes; and it appears to be certain that his great fame and influence as a religious leader, which remain pre-eminent to this day, were fully established during his lifetime.

Tulsfs great poem, popularly called Tulsl-krit Ramayan, but named by its author Ram-cliarit-mdnas, " the Lake of Rama's deeds," is perhaps better known among Hindus in upper India than the Bible among the rustic population in England. Its verses are everywhere, in this region, popular proverbs ; an apt quotation from them by a stranger has an

immediate effect in producing interest and confidence in the hearers. As with the Bible and Shakespeare, his phrases have passed into the common speech, and are used by every one (even in Urdu) without being conscious of their origin. Not only are his sayings proverbial : his doctrine actually forms the most powerful religious influence in present-day Hinduism; and, though he founded no school and was never known as a guru or master, but professed himself the humble follower of his teacher, Narhari-Das, 2 from whom as a boy in Sukar-khet he heard the tale of Rama's doings, he is everywhere accepted as an inspired and authoritative guide in religion and conduct of life. _ ...

The poem is a rehandling of the great theme of Valmlki, but is in no sense a translation of the Sanskrit epic. The succession of events is of course generally the same, but the treatment is entirely different. The episodes introduced in the course of the story are for the most part dissimilar. Wherever Valmlki has condensed, Tulsl Das has expanded, and wherever the elder poet has lingered longest, there his successor has hastened on most rapidly. It consists of seven books, of which the first two, entitled " Childhood " (Bal-kand) and " Ayodhya " (Ayodhya-kand), make up more than half the work. The second book is that most admired. The tale tells of King Dasarath's court, the birth and boyhood of Rama and his brethren, his marriage with Sita, daughter of Janak king of Bidˆha, his volun- tary exile, the result of Kaikeyl's guile and Dasarath's rash vow, the dwelling together of Rama and Sita, in the great central Indian forest, her abduction by Ravan, the expedition to Lanka and the overthrow of the ravisher, and the life at Ajodhya after the return of the reunited pair. It is written in pure Baiswari or Eastern Hindi, in stanzas called chaupals, broken by dohas or couplets, with an occasional sbrafhd and chhand— the latter a hurrying metre of many rhymes and alliterations. Dr Grierson well describes its movement: — . .

"Asa work of art, it has for European readers prolixities and episodes which grate against occidental tastes, but no one can read it in the original without being impressed by it as the work of a great genius. Its style varies with each subject. There is the deep pathos of the scene in which is described Rama's farewell to his mother: the rugged language depicting the horrors of the battle- field— a

torrent of harsh sounds clashing against each other and reverberating from phrase to phrase; and, as occasion requires, a sententious, aphoristic method of narrative, teeming with similes drawn from nature herself, and not from the traditions of the schools. His characters, too, live and move with all the dignity of an heroic age. Each is a real being, with a well-defined personality. Rama, perhaps too perfect to enlist all our sympathies; his impetuous and loving brother Lakshman; the tender, constant Bharat; Sita, the ideal of an Indian wife and mother; Ravan, destined to failure, and fighting with all his demon force against his destiny — the Satan of the epic — all these are characters as lifelike and distinct as any in occidental literature." . ,

A manuscript of the Ayodhya-kand, said to be in the poet s own hand, exists at Rajapur in Banda, his reputed birthplace. One of the Bal-kand, dated Sambat 1661, nineteen years before the poet s

1 See Indian Antiquary, xxii. 272 (1893).

- Narhari-Das was the sixth in spiritual descent from Ramanand, the founder of popular Vaishnavism in northern India (see article Hindostani Literature).

death, and carefully corrected, it is alleged by Tulsi Das himself, is at Ajodhya. Another autograph is reported to be preserved at Malihabad in the Lucknow district, but has not, so far as known, been seen by a European. Other ancient MSS. are to be found at Benares, and the materials for a correct text of the Ramayan are thus available. Good editions have been published by the Khadga Bilas press at Bankipur (with a valuable life of the poet by Baijnath Das), and by the Nagari Pracharini Sabha at Allahabad (1903). The ordinary bazar copies of the poem, repeatedly reproduced by lithography, teem with interpolations and variations from the poet'c language. An excellent translation of the whole into English wai made by the late Mr F. S. Growse, of the Indian Civil Service (5th edition, Cawnpore, 1 891).

Besides the " Lake of Rama's deeds," Tulsi Das was the author of five longer and six shorter works, most of them dealing with tht theme of Rama, his doings, and devotion to him. The former are (1) the Dohabali, consisting of 573

miscellaneous doha and sorafha verses; of this there is a duplicate in the Ram-satsai, an arrange- ment of seven centuries of verses, the great majority of which occur also in the DohabaB and in other works of Tulsl; (2) the Kabitta Ramayan or Kabittabali, which is a history of Rama in the kabitta, ghandkshari, chhappai and sawaiya metres; like the Rdm-charit- manaS, it is divided into seven kands or cantos, and is devoted to setting forth the majestic side of Rama's character; (3) the Git- Rdmayan, or GUdbali, also in seven kands, aiming at the illustration of the tender aspect of the Lord's life; the metres are adapted for singing; (4) the Krishndivali or Krishna gitdbali, a collection of 61 songs in honour of Krishna, in the Kanauji dialect: the authenticity of this is doubtful ; and (5) the Binay Paltrika, or " Book of petitions, ' a series of hymns and prayers of which the first 43 are addressed to the lower gods, forming Rama's court and attendants, and the remainder, Nos. 44 to 279, to Rama himself. Of the smaller com- positions the most interesting is the Vairagya Sandipani, or " Kind- ling of continence," a poem describing the nature and greatness of a holy man, and the true peace to which he attains. This work has been translated by Dr Grierson in the Indian Antiquary, xxii.

198-201.

Tulsl's doctrine is derived from Ramanuja through Ramanand. Like the former, he believes in a supreme personal God, possessing all gracious qualities (saguna), not in the quality-less (nirguna) neuter impersonal Brahman of Sankaracharya ; this Lord Himself once took the human form, and became incarnate, for the blessing of mankind, as Rama. The body is therefore to be honoured, not despised. The Lord is to be approached by faith (bhakti) — dis- interested devotion and surrender of self in perfect love, and all actions are to be purified of self-interest in contemplation of Him. " Show love to all creatures, and thou wilt be happy; for when thou lovest all things, thou lovest the Lord, for He is all in all." The soul is from the Lord, and is submitted in this life to the bondage of works (karma) ; " Mankind, in their obstinacy, keep binding them- selves in the net of actions, and though they know and hear of the bliss of those who have faith in the Lord, they attempt not the only; means of release. Works are a spider's thread, up and down which she continually travels, and which is never broken; so works lead a soul downwards to

the Earth, and upwards to the Lord." The bliss to which the soul attains, by the extinction of desire, in the supreme home, is not absorption in the Lord, but union with Him in abiding individuality. This is emancipation (mukli) from the burthen of birth and rebirth, and the highest happiness. 3

Tulsl, as a Smarta Vaishnava and a Brahman, venerates the whole Hindu pantheon, and is especially careful to give Siva or Mahadeva, the special deity of the Brahmans, his due, and to point out that there is no inconsistency between devotion to Rama and attachment to Siva {Ramayan, Lankakand, Doha 3). But the practical end of all his writings is to inculcate bhakti addressed to Rama as the great means of salvation — emancipation from the chain of births and deaths — a salvation which is as free and open to men of the lowest caste as to Brahmans.

The best account of Tulsl Das and his works is contained in the papers contributed by Dr Grierson to vol. xxii. of the Indian Anti- quary (1893). In Mr Growse's translation of the Ram-charit-Manas will be found the text and translation of the passages in the Bhakta- maid of Nabhaji and its commentary, which are the main original authority for the traditions relating to the poet. Nabhaji had himself met Tulsi Das; but the stanza in praise of the poet gives no facts relating to his life.; these are stated in the (ikd or gloss of Priya Das,, who wrote in A.D. 1712, and much of the material is legendary and untrustworthy. Unfortunately, the biography of the poet, called Gosdin-charitra, by Benlmadhab Das, who was a personal follower and constant companion of the Master, and died in 1642, has disappeared, and no copy of it is known to exist. In the introduction to the edition of the Rdmdyan by the Nagari Pracharini Sabha all the known facts of Tulsl's life are brought together and critically discussed. For an exposition of his religious position,

3 The summary given above is condensed from the translation by Dr Grierson, at pp. 229-236 of the Indian Antiquary, vol. xxii ; , of the fifth sarga of the Satsai, in which work Tulsi unfolds his system of doctrine.

and this place in the popular religion of northern India, see Dr Grier- son's paper in the Journal of the Royal Asiatic Society, July 1903, pp. 447-466. (C. J. L.)

TULU, or Tuluva, a language of the Dravidian family, found chiefly in the South Kanara district of Madras. It has no litera- ture, nor has it been adopted for official use even where it is spoken by the majority of the population. In 1901 the total number of speakers of Tulu exceeded half a million.

TUMBLER, that which " tumbles," i.e. falls or rolls over or down. The O. Eng. tumbiare, of which Mid. Eng. tumblere is a frequentative form, appears also in Du. luimelen, Ger. taumeln, to stagger, tumble about; Fr. tomber, to fall, is Teutonic in origin. As applied to a person, "tumbler" is another word for an acrobat, one who shows his agility by turning somer- saults, standing on his head, walking or dancing on his hands, &c. It is interesting to note that Herodias' daughter Salome is described as a tumbestere in Harl. MS., 1701, f. 8, quoted by Halliwell (Diet, of Archaic Words), and in the margin of Wycliffe's Bible (Matt. xiv. 6) tumblide is given as a variant of daunside (danced). Similarly, in early pictures of her dancing before Herod, she is represented sometimes as stand- ing on her head. The common drinking-glass known as a " tumbler," which now is the name given to a plain cylindrical glass without a stem or foot, was originally a glass with a rounded or pointed base, which could only stand on being emptied and inverted (see Drinking Vessels, Plate I., fig. 3).

TUMBLE-WEED, a botanical term for a plant which breaks loose when dry, and is blown about, scattering its seeds by the way.

TUMKUR, or Toomkoor, a town and district of southern India, in the west of Mysore state. The town has a station on the Madras & Southern Mahratta railway, 43 m. N.W. from Bangalore. The area of the district is 4158 sq. m. It consists chiefly of elevated land intersected by river valleys. A range of hills rising to nearly 4000 feet crosses it from north to south, forming the waterparting between the systems of the Krishna and the Cauvery. The principal

streams are the Jayamangala and the Shimsha. The mineral wealth of Tumkur is consider- able; iron is obtained in large quantities from the hill-sides; and excellent building-stone is quarried. The slopes of the Devaraj'-durga hills, a tract of 18 sq. m., are clothed with forests, in which large game abounds, including tigers, leopards, bears and wild hog. The climate of Tumkur is equable-and healthy; the annual rainfall averages 39 in.

The population in 1001 was 679,162, showing an increase of 17% in the decade. The cultivated products consist chiefly of millets, rice, pulses and oil seeds. The chief industries are the making of coarse cotton cloths, woollen blankets and ropes.

TUMMEL, a river of Perthshire, Scotland. Discharging from Loch Rannoch, it flows eastward to a point near the Falls of Tummel, where it bends to the S.E., a direction which it maintains until it falls into the Tay, just below Logierait, after a course of 58 m. from its source in Stob Ghabbar (3565 ft.). Its only considerable affluent is the Garry, 24 m. long, an impetuous river which issues from Loch Garry (2! m. long, J m. wide, and 1334 ft. above the sea). About midway in its course the Tum- mel expands into Loch Tummel (2$ m. long, j m. wide, 128 ft. deep, and 500 ft. above the sea), between which and the con fluence with the Garry occur the Pass and Falls of the Tummel, which are rather in the nature of rapids, the descent altogether amounting to 15 ft. The scenery throughout this reach is most picturesque, culminating at the point above the eastern extremity of the loch, known as Queen Victoria's View. The chief places of interest on the_ river are Kinloch Rannoch; Dunalastair, a rocky hill in well-wooded grounds, the embellishment of which was largely due to Alexander Robertson of Struan (1670-1749), the Jacobite and poet, from whom the spot takes its name ("the stronghold of Alexander"); Foss; Faskally House (beautifully situated on the left bank); Pitlochry; and Ballin- luig.

TUMOUR (Lat. tumor, a swelling), a term applied, from the earliest period of medical literature, to any swelling of which

the nature and origin were unknown. Thus used in its most literal sense, the word is of purely clinical derivation and

has no pathological significance of any kind. Consequently a very heterogeneous collection of swellings have been described as tumours, including such diverse conditions as an abscess, a tuber- cular gland, the enlarged spleen of malaria or a cancer. With the progress of bacteriology and the improved technique of histology it has been found possible, however, to separate these various ” swellings ” into certain groups: (1) Inflammatory or Infective Tumours; (2) Tumours due to Hypertrophy; (3) Cysts; (4) Spontaneous Tumours, or Tumours proper. The tendency of modern convention is to restrict the use of the term ” tumour ” to the last group, but for the sake of completeness it is necessary to touch briefly on the distinguishing features of the first three groups.

1. Inflammatory or Infective Tumours. — These have certain characteristics which separate them sharply from other classes of tumour. In the first place all of them are due to the irritative action of some micro-organism (see Pathology). Inflammation due to microbial action always follows a typical course. First, a number of wandering cells derived from the blood, the lymph or the connective tissues make their way to the site of irritation, and thus produce the red, painful swelling with which every one is familiar. A struggle now ensues between these cells and the invading bacteria; if the victory rests with the former, the inflammation gradually subsides, and the swelling disappears in course of time. But if the bacteria gain the upper hand a number of the cells are killed, undergo lique- faction and are converted into pus, so that an abscess results. Thus an inflammatory swelling may be solid or fluid according to the severity of the irritant. The common inflammatory bacteria — > staphylococcus and streptococcus — cause suppuration in the majority of cases, but there are a few organisms such as streptothrix, spirochaeta pallida, and in many instances the tubercle bacillus, which set up an inflammation of an extremely chronic type, rarely progressing to the formation of pus, but leading rather to the develop- ment of a hard, solid mass of very slow growth, that may persist for months or even years.

To the naked eye these solid inflammatory swellings may closely simulate the spontaneous tumours with which they have been often confused, but a microscopical examination

will correct the mistake in nearly every case. For the minute structure of the infective tumours, whatever their situation, is almost identical; they consist merely of an irregular collection of inflammatory cells; and this of itself "is sufficient to mark them off quite distinctly from the group of tumours proper, which, as will presently be seen, vary widely in structure according to the tissue from which they spring, and show a resemblance to the parent type at once characteristic and peculiar. To this statement there is one exception, for a form of malignant tumour, known as a sarcoma, may bear a very deceptive likeness to an inflammatory swelling.

2. Hypertrophic Tumours.— A tissue or organ is said to be hyper- trophied when it is increased in size but remains normal in structure. The most familiar example is the hypertrophy of the skeletal muscles that follows increased use, or the hypertrophy of the heart muscle which helps to compensate the faulty action of the valves. But neither of these constitutes a hypertrophic tumour. For an instance of this we must turn to the enlargement of the spleen that occurs in malaria and certain forms of anaemia, of the thyroid gland in goitre, and of the lymphatic glands in Hodgkin's disease. In each of these conditions there is merely an increase of apparently normal tissue, and from a microscopical examination of the hypertrophied organ it would be impossible to say that it was other than healthy.

The enlargement of the spleen and of the thyroid in these cases are overshadowed by certain changes in the blood and in the nervous system which constitute a distinct disease; but in Hodgkin's disease there are no specific symptoms apart from the swelling of the glands, and it has been suggested that this may be due either to the action of some micro-organism which has hitherto escaped detection, or to a widely diffused growth of a sarcomatous type. If the former supposition be correct these glandular swellings must be classed with the infective tumours; if the latter they should be regarded as spontaneous tumours. There is, at present, no agreement on this point, and they have, therefore, been described here as hyper- trophic tumours.

3. Cysts. — A cyst may be defined as a collection of fluid sur- rounded by a wall or capsule. The nature of the fluid varies accord- ing to the site and origin of the cyst ; the

cyst-wall is usually composed of a tough layer of fibrous tissue. Cysts arise by the dilatation of a pre-existing space with fluid ; and when, as often happens, the cyst- wall is tensely stretched by the pressure of the fluid within, they may easily be mistaken for solid tumours.

The number and variety of cysts are very great, and they are only mentioned here on account of the errors in diagnosis for which they are often responsible. For further details the reader should consult the special textbooks.

TUMOUR

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4. Spontaneous Tumours, or Tumours Proper (synonyms: Neoplasm, New Growth). — The following definition of a spontaneous tumour suggested by Ziegler is perhaps the most satisfactory: “A neo- plasm or tumour is a new formation of tissue, which is atypical in structure, serves no useful purpose to the whole economy, and the growth of which has no typical termination. ” In this definition the words ” new formation of tissue ” exclude the cystic swellings; the attribute “atypical in structure” excludes hypertrophies; and the final clause ” the growth of which has no typical termina- tion ” excludes all swellings of an inflammatory nature which pro- gress, however slowly, towards either suppuration or resolution and recovery.

These tumours arise by the exaggerated and abnormal prolifera- tion of a single cell, or a group of cells. They increase in size solely by the multiplication of their own cells, and the only contribution which the surrounding tissues make to the progress is the formation of a ” stroma, ” or supporting framework of fibrous tissue; and even that is wanting in many cases. Inasmuch as the newly-formed cells of the tumour take on the likeness of the parent from which they are sprung, it follows that the minute structure of such a tumour, whatever its situation, will be a more or less exact copy of that of the tissue whence it originated. A tumour growing from the skin will therefore imitate the cell-structure of the normal skin; the resemblance of a breast tumour to the healthy breast is often so close as to make it a hard task to distinguish the one from the other ; whilst the similarity of bony and cartilaginous tumours to

true bone and cartilage is evident to all.

This imitation of the parent type by the spontaneous tumours is one of their most remarkable characteristics, and provides a reliable criterion by which they may be separated from the inflamma- tory new growths, which are all built up on the same general plan. Consequently it is almost always possible to determine the origin of a tumour from an examination of its histological appearances ; and conversely we know that an epithelial tumour will never spring from a connective tissue nor a connective tissue tumour from an epithelium.

Another outstanding feature of the neoplastic tumours is that they lead an entirely independent existence subject to none of the restraints to which the normal cell must needs submit. These normal cells are, indeed, possessed of certain limited powers of multiplication, by which they are enabled to replace the slight loss of tissue which the wear and tear of life perpetually entails; or, again, they can on occasion make good a greater loss of substance, as in the healing of an ulcer, or the regeneration of a skin wound. But these powers are confined within certain well-marked bounds, which may not be transgressed. Contrast with this the tumour cell, emancipated from all control and owning to no restraint. It is true that the simple tumours often remain stationary after attain- ing a certain size, but the general tendency of all tumours is towards persistent and unlimited growth, and the cancer" cell continues its career unchecked by everything save death.

The spontaneous tumours are seen in every tissue and organ of the body, though in some they are relatively infrequent. Nor are they confined to man, for they have been found throughout the vertebrate kingdom. It is often stated that a higher state of civilization has inflicted on European races a greater susceptibility to tumour formation. As to this, reliable evidence is hard to obtain, but such a statement would seem to be only partially true, and the apparent immunity of certain native races is to some extent due to lack of sufficient observations.

It is usual to separate these tumours into two groups: the Non- malignant, Innocent or Benign, and the Malignant or Cancerous. Of these two groups the latter are the more

familiar and have attracted much more attention and study than the former, on account of the danger to life which they involve, but in point of numbers they are greatly outweighed by the first group. Two or more non- malignant tumours, of the same or different varieties, are often found in the same individual; but with the cancers this is a rare occurrence, and such growths are usually single.

The non-malignant tumours are usually rounded in shape. In size they vary enormously; a fibroid tumour may be as small as a pea; a fatty tumour may weigh forty pounds. Often they cease growing after attaining a certain size, but there are very many exceptions to this, and it is seldom possible to predict the subsequent course of one of these growths. They possess, however, four con- stant characteristics by which they may be distinguished from the malignant variety.

1. A non-malignant tumour, whatever its size, remains localized to the part from which it originates. It is not an " infiltrating" growth, that is to say it does not eat its way into the surrounding tissues, but rather pushes them aside, and so may be called "expan- sive. " Moreover, it is separated from them by a thin but usually well-marked layer of fibrous tissue known as the " capsule " of the tumour, which seems to be formed as the result of a slight inflamma- tion that the presence of the tumour always causes among the healthy tissues surrounding it, and may be regarded as a protest on their part against the invasion of the tumour.

2. Non-malignant tumours are not of themselves dangerous to life. They may, however, cause a great deal of pain and even

death, when situated in some sensitive or delicate organ. For instance, a small tumour may cause intense pain by pressing on a nerve, or dropsical swelling of a limb by obstructing a vein, or death from suffocation by blocking the larynx. Nevertheless it remains true that any evil effects are due not to the nature of the tumour, but to its situation, whereas a cancer causes death whatever' its position.

3. These tumours never reproduce themselves in distant parts of the body. More than one may be present in the

same individual, but each arises independently, and the widespread dissemination so typical of a cancerous growth is never seen.

4. An innocent growth never recurs after operation. The boundaries of the growth are so well defined that complete removal is usually easy, and the operation is a simple and satisfactory proceeding.

Malignant Tumours, or Cancers. — There are two varieties of malignant tumour: the Sarcomata, arising from the connective tissues; the Carcinomata, arising from epithelial tissues. It is customary to describe them both as cancers. The main features of these tumours are as follows: —

1. The Infiltrating Nature of a Malignant Tumour.— A cancer follows a course very different from that of an innocent tumour. Its growth has no appointed termination, but continues with unabated vigour until death ; moreover, it is more rapid than that of the innocent tumours, and so does not permit of the formation of a capsule by the neighbouring tissues. In consequence such a tumour shows no well-defined boundary, but from its margin fine tendrils of cancer cells make their way in all directions into the surrounding parts, which gradually become more and more involved in the process. Thus a cancer of the breast will attack both the skin covering it and the underlying muscle and bone ; a cancer of the intestine will eat its way into the liver, spleen and kidney, until these organs become to a great extent replaced by cancer cells, and can no longer perform their proper functions.

2. Formation of Secondary Growths, or Metastases. — In addition to this spread of growth by direct extension, another characteristic of malignant tumours is a tendency to dissemination, that is, to reproduce themselves in various parts of the body far removed from the original site; so that it is not unusual to find after death that a cancer of the breast has given rise to secondary, or metastatic, deposits in the lymphatic glands, the lungs, the ribs and other bones, the brain and the abdominal organs. These secondary deposits are due to the tumour cells making their way through the walls of the small lymph and blood vessels and becoming detached by the force of the circulation, by which they are carried to some distant part of the body,

there to continue their career of uncon^ trolled growth*

The sarcomata and carcinomata differ somewhat as regards the path of dissemination. The former are vascular tumours, well supplied with blood-vessels ; consequently dissemination usually occurs by way of the blood-stream rather than by the lymphatic circulation, and the commonest site for the secondary deposits of sarcoma is the lung. The carcinomata are less vascular, and the tendency of the growth is to invade the small lymph channels, so that the first signs of metastases are to be looked for in the lymphatic glands; at a later date these deposits may be spread throughout the body, particularly in the liver and other abdominal organs, the lungs and the bones.

The formation of metastases is of the utmost importance from a clinical point of view, as the success of an operation depends on the removal of all the secondary deposits as well as of tlje original growth. For instance, a few months after the first appearance of a cancer of the breast the axillary lymph glands will be found to be hard and enlarged. This means that some of the cells of the primary growth have been carried in the lymph stream to these glands, and have begun to grow there; consequently any operation for the removal of the cancer of the breast must include the removal of these glands. If the breast tumour only be taken away the growth will continue unchecked in the glands. It is a matter of great difficulty to determine by the naked eye or the touch whether a gland is infected or not. In many cases where there is no evident enlargement the microscope will show the presence of cancer cells; and a certain opinion can only be given after a microscopical examination.

In operations for cancer of the breast or tongue the modern practice is to regard the lymphatic glands of the axilla or neck respectively as infected in every case, however early it be, and to remove them accordingly. In other parts of the body where the glands are inaccessible, the only solution of the difficulty is to urge the removal of the tumour at the earliest possible moment, before lymphatic infection has had time to occur.

The frequency and rapidity of metastasis formation varies greatly. As a general rule cancer of the breast is more liable

than other forms of growth to be followed by widespread secondary deposits. On the other hand, in cases of cancer of the skin secondary infection is usually confined to the neighbouring lymphatic glands, and seldom occurs in any of the internal organs.

3. Termination of Malignant Tumours. — In one or two well authenticated cases a malignant tumour has disappeared of its

own accord without any treatment, and a natural cure may be said to have occurred. But these form such an infinitesimal proportion of the whole that they do not affect the general truth of the statement that the universal tendency of a malignant tumour is to cause death.

Although the separation of the new growths into two groups is supported by certain fairly definite characteristics, both clinical and histological, yet it seems likely that the difference between them is one of degree rather than of kind. There is every reason to believe that the same perverted impulse may give rise either to an innocent or a cancerous growth, the issue depending in part on the intensity of the impulse, and in part on the resisting powers of the tissues in which the incipient tumour cells lie. Such a hypothesis is supported by the analogy of the microbial infections, where the final outcome of life or death depends no less on the defensive mechanism of the individual than on the virulence of the infecting organism. Again, it is beyond doubt that occasionally a tumojur, which for years has been void of the least taint of malignancy, may become converted into an active cancer. Moreover, certain tumours seem to lie on the border line, for example, rodent ulcers and cancers of the parotid gland. These are malignant in that they are undoubtedly infiltrating tumours, they are innocent in that they never form metastatic deposits. Therefore it seems that malignancy or the reverse is not to be regarded as an absolute and constant attribute of any par- ticular tumour or class of tumours, but rather as an expression of the balance struck in the conflict between the opposing forces

of the tumour and its host.

Histology of Tumours. — On examining a microscopical preparation of an epithelial tumour it is found to be built up of two distinct elements. There are the epithelial cells, which form the essential part of the tumour; there is a network of fibrous connective-tissue cells, which acts as a supporting framework to the epithelial elements, and is known as the stroma of the tumour. This twofold structure is seen in all the epithelial tumours, both non-malignant and malignant, and in the case of the latter it is a general rule that the greater the proportion of epithelial to connective-tissue elements the faster will the tumour grow. On the other hand in the connective- tissue tumours (with the exception of the sarcomata) this compound structure is absent and there is only one type of cell present ; thus a fatty tumour consists merely of fat cells ; a bony tumour of bone cells, and so on.

To understand clearly the differences and likenesses that obtain between the malignant and the non-malignant new growths it is necessary to compare the histology of the two groups.

Figs, la, lb represent an innocent tumour (adenoma) of the breast. Figs. 2a, 26 a cancer (spheroidal-celled carcinoma) of the breast. Fig. 3 an innocent tumour (papilloma) of the skin. Fig. 4 a cancer of the skin.

Fig. ia. — Diagram to show the relations of an innocent tumour (adenoma) of the breast.

a, Tumour; 6, normal breast tissue; c, underlying muscular tissue. a-

Fig. 16. — Microscopical appearances of an adenoma of the breast.

(Drawn from an actual specimen.)

a, Tumour cells; b, fibrous connective tissue.

In the adenoma the individual cells bear the closest resemblance to the glandular cells of the normal breast from which they are derived. In addition they tend to follow the normal very closely in their arrangement, so that

at times it is difficult or impossible to

decide which is tumour and which is healthy breast substance. Finally the growth is surrounded by a well defined capsule of fibrous tissue.

Fig. 2a. — Diagram to show the relations of a malignant tumour (spheroidal cell carcinoma) of the breast. Note the indrawing of the nipple by the growth and the infiltration of the underlying muscle.

a, Tumour; b, normal breast tissue; c, muscle.

Fig. 2b. — Microscopical appearances of a carcinoma of the breast.

(Drawn from an actual specimen.)

a, Tumcur cells ; b, stroma.

In the carcinoma, the individual resemblance ‘ is present, though

less conspicuous, as many of the cells are irregular in size and shape.

But the similarity of the arrangement is very hard to make out or

even absent. The cells are arranged in disorderly masses ; they are

not enclosed by any semblance of a capsule, but tend to transgress

their proper boundaries and invade the underlying muscles. Figs.

3 and 4 show analogous changes in an innocent and in a malignant

tumour of the skin.

Fig. 3. — Non-malignant tumour (papilloma) of the skin. The tumour is formed by an outward proliferation of the cells of the epidermis, but these cells show no tendency to invade the underlying connective tissue or muscle.

(Semidiagrammatic.)

a, Normal skin. d, Muscular tissue.

b, Epithelium or epidermis. e , Papilloma.

c, Connective tissue.

Speaking generally it may be said that the cells of an adenoma are fully differentiated and typical of the normal, whereas the cells of a carcinoma show less perfect differentiation, are in some degree atypical and resemble rather the actively growing cells found at an early stage of embryonic life. But it is in the cells of a sarcoma that the widest departure from type is seen. A sarcoma is a malignant growth arising from connective tissue, but the resemblance to adult

tbnnective tissue is almost non-existent and the cells are essen- tially of an embryonic type. These differences between the innocent and the malignant cell bear out the well-established phy- siological rule that the less the functional development of a cell or tissue the greater its power of growth. The primitive impulse is growth, which gives place at a later stage to the development of function.

Fig. 4. — Malignant tumour (epithelioma, squamous-celled carcinoma) of the skin. The cells of the epidermis have proli- ferated both outwardly and inwardly and have invaded and re- placed the underlying tissues. An ulcer has been formed on the surface by the necrosis of the superficial cells. (Semidiagrammatic.)

In theory it is always possible to distinguish with certainty between an innocent tumour and a cancer by means of the microscope. In practice this is, unfortunately, not the case. There are some tumours whose histological appearances seem to be on the border- line between the two conditions, and often these are the very cases in which the clinical features give no direct clue to their nature. In such circumstances it is only by taking into consideration every detail, both clinical and pathological, that an opinion can

be formu- lated, and even then it remains to some extent a matter of guess- work.

The Causation of Tumours. — An enormous number of suggestions as to the causation of tumours have been put forward from time to time. Many of these were at the outset quite untenable, and reference can only be made here to the more important.

First in point of time came Virchow's hypothesis that tumours arise as the' direct result of irritation or injury. Many examples of such a sequence of events are familiar to everybody. A cancer of the lip or tongue will often follow the irritation of a clay pipe or a jagged tooth ; a tumour of the breast is often attributed to a blow. But, on the other hand, there must be innumerable instances in which such a cause of irritation has not been followed by a tumour; and it is necessary to discount the natural anxiety of mankind to seek a cause for every unexplained occurrence, so that a slight injury which under ordinary circumstances would be forgotten is branded as the undoubted cause of any tumour that may subsequently make its appearance. As a complete explanation Virchow's hypothesis is insufficient, but it is quite probable that irritation may have an accessory or predisposing influence in tumour formation, and that it may be enough finally to upset the balance of a group .of cells, which for some other reason were already hovering on the brink of abnormal growth.

There is one peculiar form or irritation that demands special attention, that is exposure to the X rays. It is beyond doubt that exposure to these rays will cause cancerous ulceration of the skin; though what is the constituent of the rays that produces this effect is not known. Fortunately the danger can be obviated by the use of rubber gloves.

Cohnheim's Hypothesis of Embryonic Remnants. — According to Cohnheim more cells are produced in embryonic life than are required for the development of the body, and a remnant is left unappro- priated. Owing to their embryonic nature, these cells possess an exaggerated power of proliferation, and if at a later period of life this should be roused into activity by some mechanical or other form of stimulus, their rate of growth will outstrip that of the adult cells and a tumour will develop. As with

Virchow's so with Cohnheim's hypothesis. It is at best only a partial explanation which may be applicable to a small proportion of tumours; and it could never account for X-ray cancer, or the inoculability of mouse cancer.

The Parasitic hypothesis is still a matter of keen debate. In some degree cancer with its localized primary growth and widespread secondary deposits resembles certain infective diseases of microbial origin, such as pyaemia, where from a small primary site of infection the bacteria become disseminated throughout the body. From this analogy it was argued that tumour formation was due to the activity

of some parasite. But if the mode of dissemination of a cancer and of a micro-organism be carefully examined this analogy is found to be false. When a micro-organism lodges in a gland or other part of the body, by its irritative action it stimulates the cells of that gland to increased activity, and any swelling that occurs is produced by the proliferation of those cells. But when a group of cancer-cells is deposited in a gland the subsequent growth arises entirely from the multiplication of those cancer-cells, and the gland cells take no part whatever in its formation.

A very large number of organisms both animal and vegetable have been described as occurring in tumours; and some of these have been cultivated on artificial media outside the body; but to none of them can any direct causal relationship with cancer be attributed. One of the best authenticated, a small coccus, known as Micrococcus neoformans can certainly be cultivated from many tumours malig- nant and innocent, and it has been suggested that it may be respon- sible for the slight inflammatory changes*that occur in the neighbour- hood of most new growths. The final and critical test of the con- nexion of an organism with some diseased condition is the production of a similar condition in animals by inoculation of that organism, and this experiment has signally failed with all the suggested cancer parasites. Another very cogent argument against the infective hypothesis is the fact that although tumours of identical structure are found throughout the vertebrate kingdom, it has never yet been found possible artificially to transmit these tumours from one species to another. If they were of an infective nature it is almost incon- ceivable that the gap between two allied

species should be such an insuperable bar to transmission.

Quite recently Borrel of the Pasteur Institute has stated that certain animal parasites from the skin are often to be found buried in the cell masses of cancers of the skin and breast, and he thinks that these parasites may be the carriers of some as yet unknown cancer virus, just as the mosquito is the carrier of malaria.

Ribbert has suggested that tumour formation may be due to ” alteration of tissue tension.” In his opinion the various cells of the body are normally held in a state of equilibrium by some con- dition of mutual interdependence amongst themselves. Should this equilibrium be disturbed some of these cells may escape from the controlling influence usually exercised upon them by their neighbours, and become endowed with greatly enhanced powers of growth.

Adami considers that every cell possesses two distinct properties, a property of function and a property of growth, and he regards these as incompatible, that is to say, a cell cannot at the same time be carrying out a specific function and also undergoing active growth. He believes that on occasion some of these cells may abandon their ” habit of work ” and assume a ” habit of growth,” and this will lead to the development of a tumour.

Neither of the two latter explanations brings us very much nearer the solution of the question — they merely place the unknown factor one step farther back; but they serve to emphasize the biological aspect of the problem. At the present time the general weight of evidence seems to favour the idea that tumour formation is due to some intrinsic cause, whereby the normal processes of growth are disturbed, rather than to any extrinsic cause such as microbial infection. Therefore it is from a careful study of the laws of growth, and from research directed along broad biological lines that the best results are to be looked for in the future.

Classification of Spontaneous Tumours. — So little is known as to the nature of these tumours that a satisfactory classification on a scientific basis is not yet within reach. The following is merely suggested as convenient : —

I. — Connective-tissue Tumours. Innocent. Malignant.

Lipoma (fatty tumour).

Fibroma (fibrous tumour). Sarcoma.

Myoma (muscular tumour). Endothelioma.

Osteoma (bony tumour). Chondroma (cartilaginous tumour). Odontoma (tumour in connexion with teeth). Myxoma (mucoid tumour). Neuroma (tumour in connexion with nerves). Glioma (neuroglial tumour). Endothelioma (endothelial tumour). Angioma (tumour composed of blood vessels).

II. — Epithelial Tumours.

Innocent. Malignant.

Papilloma. Carcinoma.

Adenoma. Rodent Ulcer.

I. Connective-tissue Tumours. 1 — Lipoma (fig. 5). — Of the connec- tive-tissue group the fatty tumours are the most common. They often arise from the layer of fat beneath the skin, and a usual site for these subcutaneous lipomata is the back of the trunk, though at times they are found on the limbs and elsewhere. They

1 Figs. 5, 6, 7, 8, 9, 14, 15 and 17 have been redrawn from Bland Sutton's Tumours, by permission; figs. 10, 11, 12 and 13 are from Rose & Carless, Surgery, by permission.

are soft, painless swellings, sometimes of great size; though usually single, as many as a dozen may be present in the same individual. Lipomata are also found in the abdominal cavity, growing from the subperitoneal layer of fat.

Fig. 5. — Lipoma of the palm."

What is known as a diffuse lipoma (fig. 6) consists of a generalized overgrowth of the subcutaneous fat of the neck,

and this may be so extensive as to obliterate the outline of the jaw.

Fig. 6. — Diffuse lipoma of the neck.

Fibroma (fig. 7). — Of tumours containing fibrous tissue, by far the most important are the fibroids of the uterus. A better name

for these tumours would be Fibromyomata, as they always contain a varying proportion of muscle fibres. They originate in the wall of the uterus, but generally come to project either internally into the cavity of the uterus, or externally into the peritoneal cavity; and often their sole connexion with the uterine wall is a stalk or pedicle formed from the capsule of the tumour. Fibromyomata of the uterus are most com- mon from 35 to 45 years of age; in girls under 20 they are almost unknown. They may attain a great size and are often multiple. They seem to be equally common in married and unmarried Fig. 7. — Uterus in sagittal section women. Not every fibroid is showing interstitial and submucous a source of danger or discom- fibroids. f° rt . for in the majority of

cases they are discovered by chance or not until after death. On the other hand they may give

rise to severe symptoms, and that in many different ways. First, they may cause haemorrhage prolonged over years so that the health is entirely ruined. Secondly, they may become inflamed and septic, and lead to severe blood-poisoning. Next, for some unknown reason, a fibroid tends to prevent conception, whilst, should pregnancy occur, labour is greatly impeded. Finally, it seems to be established that a fibroid may occasionally become converted into a sarcoma.

Examples of pure fibrous tissue tumours are the small multiple growths of the subcutaneous tissue, known as Painful subcutaneous nodule, and the irregular outgrowth from the gum known as Epulis.

A Myoma is composed of unstriped muscle fibres. It is a rare tumour sometimes found in the oesophagus, stomach and bladder.

Osteoma (fig. 8). — Bony tumours not infrequently arise from the bones of the head or face. They grow very slowly, and are so hard

Fig. 8. — Osteoma of the left frontal sinus (seen from below).

that surgical removal may be very difficult. They also occur as irregular outgrowths from the bones of the limbs, and are then known as Exostoses (fig. 9). A common site for these is the inner and lower end of the femur, at the point of attachment of the adductor muscle, and such a tumour seems to originate from an ossification of the tendon of this muscle.

Fig. 9. — Exostosis of the femur produced by the ossification of the Fig. 10. — Multiple chondromata tendon of the adductor magnus. of the fingers.

Chondroma (fig. 10). — Cartilaginous tumours are often found in children and- young people growing from the bones of the limbs in the neighbourhood of the joints. They

are frequently multiple, especially in the hands and feet. These tumours grow slowly and are quite painless. Should removal be necessary, it is usually an easy matter.

Odontoma. — Several varieties of this tumour have been described arising in connexion with the teeth and due to delayed or faulty development. They may cause great deformity of the jaw.

A Myxoma is composed of loose, gelatinous connective tissue similar to that found in the umbilical cord. Some nasal polypi seem to be of this nature, but true myxomatous tumours are rare. It is, however, not uncommon for a fibroma or a sarcoma to be converted by degeneration into myxomatous-like tissue.

Neuroma.— A pure neuroma is very uncommon, but a tumour known as a Pseudo-neuroma (fig. 11) is often found in the course of a nerve. This is formed by a localized overgrowth of the fibrous tissue of the nerve sheath.

Glioma. — This variety of tumour arises from the neuroglia, the

supporting tissue of the brain and spinal cord, gliomata are only found in these two structures.

Endothelioma. — Of

Consequently

Fig. 1 1 . — Pseudo-neuroma : fibrous tumour growing from nerve sheath, and causing the fibres to be stretched over it.

late years a small class of tumour has been described as originating apparently from the endothelium lining the lesser blood and lymph channels. Many of the recorded examples have been connected with the mouth, the tongue, the palate or the parotid gland. Some of these tumours are quite innocent, others are typically malignant.

An Angeioma consists of a mesh- work ol blood-vessels

bound to- gether by a small amount of fat and fibrous tissue. Two varieties are described: (a) The simple naevus, or port-wine stain, scarcely deserves to be called a tumour. It appears as a reddish-blue discolour- ation of the skin due to over growth and dilatation of the under- lying blood-vessels. This condition is most commonly found on the face or scalp, and may be of congenital origin. (b) In the cavernous naevus the vascular hypertrophy is on a larger scale, and may produce a definite pulsating tumour. Here, again, the head is the usual situation.

Sarcoma. — This is the malignant type of the connective-tissue tumour. The general arrangement of a sarcoma shows a mass of

atypical cells loosely bound to- gether by a small amount of connective tissue. The cells vary greatly in size and shape in different tumours, and in accordance with the prevailing type the following varieties of sarcoma have been described: (i.) round-cell sarcoma, (ii.) spindle-cell sarcoma, (iii.) mela- notic sarcoma, (iv.) myeloid sar- coma. The first two groups contain the great majority of all sarcomata, and may occur in almost any part of the body, but they are especially liable to attack the bones (fig. 12). A sarcoma of bone may be either periosteal when it grows from the periosteum covering the outer surface of the bone, or endosteal when if lies in the medullary cavity. A peculiar form of sarcoma is found in the parotid and other salivary glands. The cells are usually spindle – shaped, and among them lie scattered masses of cartilage and fibrous tissue. These tumours are seldom very malignant, and dissemination is rare (fig. 13). The melanotic sarcoma is of a brown or black colour owing to the presence of granules of pigment (melanin) in and among the tumour cells. A melanotic sarcoma may arise from a pigmented wart or mole, or

Fig. 12. — Ossifying periosteal sarcoma of fibula.

Fig. 13. — Malignant tumour of the parotid gland.

from the pigmented layers of the retina. The primary growth is usually small, but dissemination occurs with great rapidity

throughout the body. The myeloid sarcoma, or myeloma (fig. 14), is composed of very large cells like those of bone-marrow from which it is probably derived. It is only found in the interior of bones, chiefly in those of the arm and leg. The degree of malignancy is low, dissemination never occurs, and recurrence after operation is rare.

Fig. 14. — Lower end of a femur in longitudinal section, showing a

myeloma.

II. — Epithelial Tumours.

Papilloma. — The familiar example of a papilloma is the simple wart, which is formed by a proliferation of the squamous epithelium of the skin (fig. 3). It seems probable that some warts are of an infective nature, for instances of direct contagion are not uncommon. Occasionally warts are pigmented, and are then liable to be the seat of a melanotic sar- coma. Papillomata are also found in the bladder (fig. 15), as long delicate filaments growing from the bladder wall. These consist of a connective- tissue core covered by a thin layer of epithelium.

A denoma. — (Figs. 1 a and 16). The glandular tumours are of very com- mon occurrence in the breast, the ovary and the intestinal canal. The structure of an adenoma of the breast has already

Fig. 15. — Villous papilloma of the bladder.

been described {vide supra), and the structure of other adenomata is on the same general plan. The main features of an innocent glandular tumour are: (a) the presence of a rounded, painless swelling with a well-defined margin; (6) the swelling is freely movable in the surrounding tissues, and if it lies close beneath the skin it is not attached thereto ; (c) there is no enlargement of the neighbouring lymphatic glands.

Carcinoma. — The following varieties of carcinoma are described :—

i. Squamous-cell carcinoma (fig. 4) , arising from those parts of the body covered by squamous epithelium, namely

the skin, the mouth, the pharynx, the upper part of the oesophagus and the bladder.

ii. Spheroidal-cell carcinoma (figs. ia and 26), arising from spheroidal epithelium, as in the breast, the pylorus, the pancreas, the kidney and the prostrate.

iii. Columnar-cell carcinoma (figs. 16 and 17), arising from columnar epithelium, as in the intestine.

The general histology of these tumours corresponds to that of a spheroidal-cell carcinoma already described (vide supra), the only variation between the three groups being in the shape of the cells. The clinical characteristics of a carcinoma, whatever its situation, are: (a) the presence of a swelling which has no well defined margin, but fades away into the surrounding tissues to which it is fixed; (b) when the tumour lies near the skin (e.g. a carcinoma

of the breast) it becomes fixed to this at an early date; (c) the tumour is painful and tender, the degree of pain varies widely,

Fig. 17. — Cancer of the sigmoid flexure of the colon.

(Redrawn from Ziegler's Pathological Anatomy, by permission of Macraillan & Co.) Fig. 16. — Section through advancing margin of columnar; cancer of stomach.

and in the early stages there may be none ; (d) the neighbouring lymphatic glands soon become enlarged and tender, show- ing that they are the seat of metastatic deposits; (e) in squamous carcinoma of the skin, ulceration speedily occurs.

Rodent Ulcer. — This shows itself as a slowly progressing ulceration of the skin, and is especially common on the face near the eye or ear. The condition is one of purely local malignancy, and.dissemination does not occur. It is believed to be a carcinoma of the sebaceous glands of the skin. (L. C.*)

TUMULUS, a Latin word meaning a heap or mound, also used in classical writings in the secondary sense of a grave. In Roman epitaphs we meet with the formula tumulum faciendum curavit, meaning the grave and its monument; and on the inscribed monumental stones placed over : the early Christian graves of Gaul and Britain the phrase in hoc lumulo jacet expresses the same idea. But among archaeologists the word is usually restricted in its technical modern application to a sepulchral mound of greater or less magnitude. The mound may be of earth, or of stones with a covering of earth, or may be entirely composed of stones. In the latter case, if the tumulus of stones covers a megalithic cist or a sepulchral chamber with a passage leading into it from the outside, it is often called a dolmen. (See Stone Monuments, Barrow and Cairn.) The custom of constructing sepulchral tumuli was widely prevalent throughout the prehistoric ages and is referred to in the early literature of various races as a fitting commemoration of the illustrious dead. Prehistoric tumuli are found abundantly in almost all parts of Europe and Asia from Britain to Japan. They occur with frequency also in northern Africa, and in many parts of North and South America the aboriginal populations have practised similar customs. Sepulchral tumuli, however, vary so much in shape and size that the external appearance is no criterion of age or origin. In North America, especially in the Wisconsin region, there are numerous mounds made in shapes resembling the figures of animals, birds or even human forms. These have not been often found to be sepulchral, but they are associated with sepulchral mounds of the ordinary form, some of which are as much as 300 ft. in diameter and 90 ft. in height.

Perhaps the largest tumulus on record is the tomb of Alyattes, king of Lydia, situated near Sardis, constructed in his own life- time, before 560 B.C. It is a huge mound, 1180 ft. in diameter and 200 ft. high. In south-eastern Europe, and especially in southern Russia, the sepulchral tumuli are very numerous and often of great size, reaching occasionally to 400 ft. in cir- cumference and over 100 ft. “in- height. These are mostly of the period of the Greek colonies of the Tauric Chersonese, dating from about the 5th century B.C. to about the 2nd century a.d., and their contents bear striking testimony to the wealth and culture of the people who reared them.

Authorities.— DuncanMcPherson,M.D. ,A ntiquitiesofKertchand Researches in the Cimmerian Bosphorus (London, 1857) ; CyrusThomas, ” Burial Mounds of the Northern Sections of the United States,” Fifth Annual Report of the Bureau of Ethnology to the Smithsonian Institution (Washington, 1 887) : Kondakoff, Tolstoi and Reinach, Antiquites de la Russie m&ridionale (Paris, 1891). (J. An.)

TUN, a town in the province of Khorasan, Persia, situated about 150 m. S. of Nishapur in 34 N., 58° 7′ E., at an elevation of 1200 ft. The town, which has a population of 7000, is sur- rounded by a wall, 20 ft. in height, raised on, a high rampart of mud. It has three gates, handsome bazaars, good caravan- serais and numerous large gardens and fields producing opium, tobacco and cotton. Some silk is also grown.

TUNBRIDGE WELLS, a municipal borough and inland watering-place’ of England, chiefly in the Tollbridge parliamen- tary division of Kent, but extending into the eastern division of Sussex, 34J m. S.E. by S. of London by the South Eastern & Chatham railway, served also by a branch of the London Brighton & South Coast line. Pop. (1891), 29,296; (1901), 33>373- It owes its popularity to its chalybeate spring and its beautiful situation in a hilly wooded district. The wells are situated by the Parade (or Pantiles), a walk associated with fashion since the time of their discovery. It was paved with pantiles in the reign of Queen Anne. Reading and assembly rooms adjoin the pump-room. The town is built in a picturesquely irregular manner, and a large part of it consists of districts called ” parks ” occupied by villas and mansions. On Rusthall Common about a mile from the town is the curiously shaped mass of sandstone known as the Toad Rbck, and a mile and a half south-west is the striking group called the High Rocks. The Tunbridge Wells sanatorium is situated in grounds sixty acres in extent. Five miles south-east of Tunbridge Wells is Bay ham Abbey, founded in 1200, where ruins of a church, a gateway, and dependent buildings adjoin the modern Tudor mansion. Three miles south, in Sussex, the village of Frant stands on a hill which is perhaps the finest of the many view-points in this district, commanding a wide prospect over some of the richest woodland scenery in England. The vicinity of Tun- bridge

Wells is largely residential. To the north lies the urban district of Sg.tjthborotjgh (pop. 6977). There is a large trade in Tunbridge Ware, which includes work-tables, boxes, toys, &c, made of hard woods, such as beech, sycamore, holly, and cherry, and inlaid with mosaic. Tunbridge Wells was incorporated in 1889, and is governed by a mayor, 8 aldermen and 24 coun- cillors. Area, 3991 acres.

The town owes its rise to the discovery of the medicinal springs by Dudley, Lord North, in 1606. Henrietta Maria, wife of Charles I., retired to drink the waters at Tunbridge Wells after the birth of her eldest son Charles. Soon after the Restoration it was visited by Charles II. and Catherine of Braganza. It was a favourite residence of the princess Anne previous to her accession to the throne, and from that time became one of the chief resorts of London fashionable society. In this respect it reached its height in the second half of the 18th century, and is specially associated with Colley Cibber, Samuel Johnson, Cumberland the dramatist, David Garrick, Samuel Richardson, Sir Joshua Reynolds, Beau Nash, Miss Chudleigh and Mrs Thrale. The Tunbridge Wells of that period is sketched with much graphic humour in Thackeray's Virginians.

TUNDRA (a Russian word, signifying a marshy plain), in physical geography, the name applied to the treeless and often marshy plains which border the arctic coasts of Europe, Asia

and North America. The Russian tundra, apart from the arctic conditions of climate and flora, may be compared with the steppes farther south.

TUNGABHADRA, a river of southern India, the chief tributary of the Kistna. It is formed by the junction of two streams, the Tunga and the Bhadra, which both rise in Mysore in the Western Ghats. The united river for nearly all its course forms the boundary between Madras and the dominions of the nizam of Hyderabad. On its right bank stood the capital of the ancient Hindu dynasty of Vijayanagar, now a wilderness of ruins. From of old its

waters have been utilized for irrigation. Near its confluence with the Kistna it supplies the Kurnool- Cuddapah Canal. A project has been recently under con- sideration to dam the river higher up, and there construct an artificial lake that would have an area of 160 sq. m., the cost of this scheme being roughly estimated at nearly £6,000,000.

T'UNG-CHOW, a sub-prefectural city in Chih-li, the metro- politan province of China, on the banks of the Peiho in 39 54′ N. 116° 41′ E., 12 m. E. of Peking. Its population is estimated at about 50,000.

T'ung-Chow marks the highest point at which the Peiho is navi- gable, and here merchandise for Peking is transferred to a canal. The city, which is faced on its eastern side by the river, and on its other three sides is surrounded by populous suburbs, is upwards of 3 m. in circumference. The walls are about 45 ft. in height and about 24 ft. wide at the top. They are being allowed to fall into decay. Two main thoroughfares -connect the north and south gates and the east and west gates. The place derives its importance from the fact that it is the port of Peking. Like most Chinese cities, T'ung-Chow has appeared in history under various names. By the founder of the Han dynasty (206 B.C.) it was called Lu-Hien; with the rise of the T'ang dynasty (618 a.d.) its name was changed to Huan-Chow; and at the beginning of the 12th century, with the advent of the Kin dynasty to power, Huan-Chow became T'ung-Chow. It was at T'ung-Chow that Sir Harry Parkes, Sir Henry Loch and their escort were treacherously taken prisoners by the Chinese when they were sent forward by Lord Elgin to negotiate terms of peace after the troubles of i860. During the Boxer outbreak in 1900 T'ung-Chow was occupied by the allied armies, and a light railway connecting the city with Peking was constructed by German military engineers.

TUNGSTEN [symbol W, atomic weight 184-0 (0 = i6)] , a metallic chemical element found in the minerals wolfram, an iron and manganese tungstate, scheelite, a calcium tungstate, stol- zite, a lead tungstate, and in some rarer minerals. Its presence in scheelite was detected by Scheele and Bergman in 1781, and in 1783 Juan, Jose and d'Elhuyar showed the same substance occurred in wolfram; they also obtained the metal. Tungsten may be prepared from wolfram by heating the powdered ore with sodium

carbonate, extracting the sodium carbonate with water, filtering and adding an acid to precipitate tungstic acid, H a W0 4 . This is washed and dried and the oxide so obtained reduced to the metal by heating with carbon to a high tempera- ture (Hadfield, Journ. Iron and Steel Inst., 1903, ii. 38). On a small scale it is obtained by reducing the trioxide in a current of hydrogen, or the chloride by sodium vapour, or the oxide with carbon in the electric furnace; in the last case the product is porous and can be welded like iron. In the form of a powder, it is obtained by reducing the oxide with zinc and extracting with soda, or by dissolving out the manganese from its alloys with tungsten. The metal may be used uncombined, but large quantities of ferrotungsten are made in the electric furnace; other alloys are prepared by acting on a mixture of the oxides with aluminium. Tungsten has been applied in the manufacture of filament electric lamps. The metal has a crystalline structure, and melts at about 2800 . The powdered metal burns at a red heat to form the trioxide; it is very slowly attacked by moist air. It combines with fluorine with incandescence at ordinary temperatures, and with chlorine at 250-300°; carbon, silicon, and boron, when heated with it in the e'ectric furnace, give crystals harder than the ruby. It is soluble in a mixture of nitric

and hydrofluoric acids, and the powdered metal, in aqua regia, but slowly attacked by sulphuric, hydrochloric and hydrofluoric acids separately; it is also soluble in boiling potash solution, giving a tunstate and hydrogen.

Tungsten dioxide, WO2, formed on reducing the trioxide by hydro- gen at a red heat or a mixture of the trioxide and hydrochloric acid with zinc, or by decomposing the tetrachloride with water, is a brown strongly pyrophoric powder, which must be cooled in hydrogen before being brought into contact with air. It is slightly soluble in hydrochloric and sulphuric acids, giving purple solutions. It dissolves in potash, giving potassium tungstate and hydrogen, and is readily oxidized to the trioxide.

Tungsten trioxide, W0 3 , occurs in nature as wolframine, a yellow mineral found in Cumberland, Limoges, Connecticut and in North Carolina. It is prepared as shown above, or by other methods. It is a canary-yellow powder, which becomes a dark orange on heating; the original colour is

regained on cooling. On exposure to light it assumes a greenish tinge. A crystalline form was obtained by Debray as olive-green prisms by igniting a mixture of sodium tungstate and carbonate in a current of hydrochloric acid gas, and by Nordenskjold by heating hydrated tungstic acid with borax. Partial reduction of tungsten trioxide gives blue or purple-red products which are intermediate in composition between the dioxide and trioxide. Tungsten trioxide forms two acids, tungstic acid, H2WO4, and metatungstic acid, H 2 W40i 3 ; it also gives origin to several series of salts, to which the acids corresponding are unknown. Thus we have salts of the following types M 2 0(W0 3)„, where »=i, 2, 3, 4, 5, 6, 7, 8, and also (M 2 0)„, (W0 3)„, where m, n — 2, 5; 3, 7; 4, 3; 5, 12; M standing for a monovalent metal. The (M20) 5 (W0 3)j2or M10W12O41 salts are called paratungstates. Tungstic acid, H2WO4, is obtained as H2W04-H 2 by precipitating a tungstate with cold acid; this substance has a bitter taste and its aqueous solution reddens litmus. By using hot acid the yellow anhydrous tungstic acid is precipitated, which is insoluble in water arid in all acids except hydrofluoric. It may be obtained in a flocculent form by exposing the hexachloride to moist air. Meta- tungstic acid, H 2 W40i3-7H 2 0, is obtained by decomposing the barium salt with sulphuric acid or the lead salt with hydrochloric acid. It forms yellow octahedra, which become anhydrous at 100°, and are converted into the trioxide on ignition. It is readily soluble in water, and on boiling the aqueous solution a white hydrate Is first deposited which after a time is converted into the trioxide. Graham obtained a colloidal tungstic acid by dialysing a dilute solution of sodium, tungstate and its equivalent of hydrochloric acid ; on concentrating in a vacuum a gummy product is obtained, which still remains soluble after heating to 200°, but it is converted into the trioxide on heating to redness. When moistened it becomes adhesive. The solution has a bitter taste and does not gelatinize, even under the influence of boiling acids.

Of the salts, the normal tungstates are insoluble in water with the exception of the alkaline tungstates; they are usually amorphous, but some can be obtained in the crystalline form. The meta- tungstates of the alkalis are obtained by boiling normal tungstates with tungstic acid

until the addition of hydrochloric acid to the filtrate gives no precipitate. The most important tungstate is the so-called tungstate of soda, which is sodium paratungstate, NaioWi204i-28H 2 0. This salt is obtained by roasting wolfram with sodium carbonate, lixiviating, neutralizing the boiling filtrate with hydrochloric acid and crystallizing at ordinary temperatures. The salt forms large monoclinic prisms; molecules containing 25 and 21 H 2 separate from solutions crystallized at higher tempera- tures. The salt is used as a mordant in dyeing and calico printing, and also for making textiles non-inflammable. Several other sodium tungstates are known, as well as potassium and ammonium tungstates. Many salts also occur in the mineral kingdom : for example, scheelite is CaW04, stolzite is PbW04, farberite is FeWQ 4 , wolfram is (Fe,Mn)W0 4 , whilst hubnerite is MnWOi.

By partial reduction of the tungstates under certain conditions products are obtained which are insoluble in acids and alkalis and present a bronze-like appearance which earned for them the name of tungsten bronzes. The sodium compound was first obtained by Wonler on reducing sodium tungstate with hydrogen; coal-gas, zinc, iron or tin also effect the reduction. It forms golden cubes which are unattacked by alkalis or by any acid except hydrofluoric. It appears to be a mixture of which the components vary with the materials and methods used in its production (Philipp, Ber., 1882, l f>_< P- 499)- A blue bronze, NaAVsOu, forming dark blue cubes with a red reflex, is obtained by electrolysing fused sodium para-tungstate; a purple-red variety, Na 2 W 3 9 , and a reddish yellow form result when sodium carbonate and sodium _ tungstate are heated respectively with tungsten trioxide and tinfoil. Similar potassium tungsten bronzes are known.

Tungstic acid closely resembles molybdic acid in combining with phosphoric, arsenious, arsenic, boric, vanadic and silicic acids to form highly complex acids of which a great many salts exist. Of the phosphotungstic acids the most important is phosphoduo- decitungstic acid, H3PWi20 4 o-»H»0, obtained in quadratic pyra- mids by crystallizing mixed solutions of orthophosphoric and

metatungstic acids. Two sodium salts, viz. NajHPWuCWnHaO and NaaPWijOM-tHjO, are obtained by heating sodium hydrogen phosphate with a tungstate. The most important silicotungstic acids are silicodecitungstic acid HsWioSi036-3H 2 0, tungstosilicic acid, H8Wi2Si042-2oH 2 0, and silicoduodecitungstic or silicotungstic acid, H8Wi2Si042-29H 2 0. On boiling gelatinous silica with ammo- nium polytungstate and evaporating with the occasional addition of ammonia, ammonium sihcodecitungstate is obtained as short rhombic prisms. On adding silver nitrate and decomposing the precipitated silver salt with hydrochloric acid, a solution is obtained which on evaporation in a vacuum gives the free acid as a glassy mass. If this be dissolved in water and the solution concentrated, some silicic acid separates and the filtrate deposits triclinic prisms of tungstosilicic acid. Silicotungstic acid is obtained as quadratic pyramids from its mercurous salt which is prepared from mercurous nitrate and the salt formed on boiling gelatinous silicic acid with a polytungstate of an alkali metal.

Pertungstic Acid, HW0 4 . — The sodium salt, NaWO<-H a O, is obtained by evaporating in a vacuum the product of boiling a solution of sodium paratungstate with hydrogen peroxide. Its solution liberates chlorine from hydrochloric acid and iodine from potassium iodide.

Halogen Compounds. — Although the trioxide is soluble in hydro- fluoric acid, evaporation of the solution leads to the recovery of the oxide unchanged. A double salt of the oxyfiuoride, viz. 2KF-W0 2 F 2 H 2 0, is obtained as crystalline scales by dissolving nor mal potassium tungstate in hydrofluoric acid and adding potassium hydroxide till a permanent precipitate is just formed. Other oxyfluorides are known. The hexafluoride, WFe, is a very active gaseous compound, which attacks glass and metals, obtained from tungsten hexachloride and hydrofluoric acid (Ruff and Eisner, Ber., 1905, 38, p. 742). Oxyfluorides of the formulae WOF 4 and WO2F2 are also known. Tungsten forms four chlorides, viz. WClj, WC1.,, WCU, WC1 6 . The dichloride, WC1 2 , is an amorphous grey powder obtained by reducing the hexachloride at a high temperature in hydrogen, or, better, by heating the tetrachloride in a current of carbon

dioxide. It changes on exposure to air and dissolves slightly in water to give a brown solution, the insoluble portion gradually being converted into an oxide with evolution of hydrogen. The tetrachloride, WC1 4 , is obtained by partial reduction of the higher chlorides with hydrogen; a mixture of the penta- and hexa-chloride is distilled in a stream of hydrogen or carbon dioxide, and the pentachloride which volatilizes returned to the flask several times. This gives the tetrachloride as a greyish- brown crystalline powder. It is very hygroscopic and with cold water gives the oxide and hydrochloric acid. On heating it gives the di- and penta-chlorides. At a high temperature hydrogen reduces it to the metal partly in the form of a black pyrophoric powder. The pentachloride, WCU, is obtained as a product in the preparation of the tetrachloride. It forms black lustrous crystals, or when quickly condensed, a dark green crystalline powder. It melts at 248° and boils at 275-6°; the vapour density corresponds to the above formula. It is more hygroscopic than the tetrachloride; and when treated with much water the bulk is at once decomposed into the blue oxide and hydrochloric acid, but an olive-green solution is also produced. The hexachloride, WCU, is obtained by heating the metal in a current of dry chlorine in the absence of oxygen or moisture, otherwise some oxychloride is formed ; a sublimate of dark violet crystals appear at first, but as the hexachloride increases in quantity it collects as a very dark red liquid. When perfectly pure, the hexachloride is stable even in moist air, but the presence of an oxychloride brings about energetic decomposition; similarly water has no action on the pure compound, but a trace of the oxychloride occasions sudden decomposition into a greenish oxide and hydrochloric acid. It melts at 275° find boils at 346-7° (7595 mm.). Vapour density deter-minations indicate that dissociation occurs when the vapour is Seated above the boiling point.

Several oxychlorides are known. The monoxychloride, WOCh, is obtained as red acicular crystals by heating the oxide or dioxy- chloride in a current of the vapour of the hexachloride, or from the trioxide and phosphorus pentachloride. It melts at 210-4° an d boils at 227-5 forming a red vapour. Moist air brings about the immediate formation of a yellowish crust of tungstic acid. The dioxychloride, WO2CI2, is obtained as a light lemon-yellow

sublimate on passing chlorine over the brown oxide. It is unaffected by moist air or cold water, and even when boiled with water the decom- position is incomplete. Tungsten combines directly with bromine to give, when the bromine is in excess, the penta- and not a hexa- bromide. This substance forms crystals resembling iodine, which melt at 276° and boil at 333°. It slowly evolves bromine on stand- ing, and is at once decomposed by water into the blue oxide and hydrobromic acid. The dibromide, WBr_2, is a non-volatile bluish- black powder obtained by reducing the pentabromide with hydrogen. By passing bromine vapour over red-hot tungsten dioxide a mixture of $W0_2Br_2$ and $WOBr_4$ is obtained, from which the latter can be removed by gently heating when it volatilizes. The dioxybromide forms light red crystals or a yellow powder; it volatilizes at a red heat, and is not acted upon by water. The monoxybromide

forms brownish-black needles, which melt at 277° and boil at 327-5; it is decomposed by water. The di-iodide is obtained as green metallic scales on passing iodine over red-hot tungsten.

Tungsten disulphide, WS_2, is obtained as soft black acicular crystals by the action of sulphur, sulphuretted hydrogen or carbon bisulphide on tungsten. The trisulphide, WS_3, is obtained by dissolving the trioxide in ammonium sulphide or by passing sulphuretted hydrogen into a solution of a tungstate and precipitat- ing by an acid in both cases. When dry it is a black mass which yields a liver-coloured powder. It is sparingly soluble in cold water, but is easily dissolved by potassium carbonate or ammonia. By dissolving it in a hydrosulphide a sulphotungstate is produced; these salts can also be obtained by passing sulphuretted hydrogen into a solution of a tungstate.

A nitride, W_2N_3, is obtained as a black powder by acting with ammonia on the oxytetrachloride or hexachloride; it is insoluble in sodium hydroxide, nitric and dilute sulphuric acids; strong sulphuric acid, however, gives ammonia and tungstic acids. Ammonia does not react with tungsten or the dioxide, but with trioxide at a red heat a substance of the formula $W_5H_6N_3O_5$ is obtained, which is insoluble in acids and alkalis and on ignition decomposes, evolving nitrogen, hydrogen and ammonia. Phosphorus combines

directly with the metal to form W3P4; another phosphide, W 2 P, results on igniting a mixture of phosphorus pentoxide and tungsten trioxide.

The atomic weight has been determined by many investigators; the chief methods employed being the analysis and synthesis of the trioxide and the analysis of the hexachloride. The former was employed by Pennington and Smith and Desi (Zeit. anorg. Chem., 1895, 8, pp. 198, 205) who obtained the value 183-42.

TUNGUSES, a widespread Asiatic people, forming a main branch of the Mongol division of the Mongol-Tatar family. They are the Tung-hu of the Chinese, probably a corrupt form of tonki or donki, that is, ” men ” or ” people.” The Russian form Tungus, wrongly supposed to mean ” lake people,” appears to occur first in the Dutch writer Massa (16 12); but the race has been known to the Russians ever since they reached the Yenisei. The Tungus domain, covering many hundred thou- sand square miles in central and east Siberia and in the Amur basin, stretches from the Yenisei eastwards to the Pacific, where it occupies most of the seaboard between Korea and Kamchatka. It also reaches the Arctic Ocean at two points, in the Nisovaya tundra, west of the Khatanga River, and in a comparatively small enclosure in the Yana basin over against the Lyakhov (New Siberia) Archipelago. But the Tunguses proper are chiefly centred in the region watered by the three large eastern tributaries of the Yenisei, which from them take their names of the Upper, Middle or Stony, and Lower Tunguska. Here the Tunguses are known to the Samoyedes by the name of Aiya or ” younger brothers,” implying a comparatively recent immi- gration (confirmed by other indications) from the Amur basin, which appears to be the original home both of the Tunguses and of the closely allied Manchus. The Amur is still mainly a Tungus river almost from its source to its mouth : the Oroches (Orochus), Daurians, Birars, Golds, Manegrs, Sanagirs, Ngat- kons, Nigidals, and some other aboriginal tribes scattered along the main stream and its affluents — the Shilka, Sungari and Usuri — are all of Tungus stock and speech. On the Pacific the chief subdivisions of the race are the Lamuts, or ” sea people,” grouped in small isolated hunting communities round the west coast of the Sea of Okhotsk, and farther south the Tazi between the Amur delta and Korea. The

whole race, exclusive of Manchus, numbers probably little more than 50,000, of whom some 10,000 are in the Amur basin, the rest in Siberia.

The Tungus type is essentially Mongolic, being characterized by broad flat features, small nose, wide mouth, thin lips, small black and somewhat oblique eyes, black lank hair, dark olive or bronze complexion, low stature, averaging not more than 5 ft. 4 in.; they are distinguished from other Mongolic peoples by the square shape of the skull and the slim, wiry, well-proportioned figure. This description applies more especially to the Tunguska tribes, who may be regarded as typical Tunguses, and who, unlike most other Mongols, betray no tendency to obesity. They are classed by the Russians, according to their various pursuits, as Reindeer, Horse, Cattle, Dog, Steppe and Forest Tunguses. A few have become settled agriculturists; but the great bulk of the race are still essentially forest hunters, using the reindeer both as mounts and as pack animals. Nearly all lead nomad lives in pursuit of fur-bearing animals, whose skins they supply to Russian and Yakut traders in exchange for provisions, clothing and other necessaries

of {ife. The picturesque and even elegant national costume shows in its ornamentation and general style decided Japanese influence, due no doubt to long-continued intercourse with that nation at some period previous to the spread of the race from the Amur valley to Siberia. Many of the Tungus tribes have been baptized, and are, therefore, reckoned as ” Greek Christians “; but Russian orthodoxy has not penetrated far below the surface, and most of them are still at heart Shamanists and nature-worshippers, secretly keeping the teeth and claws of wild animals as idols or amulets, and observing Christian rites only under compulsion. But, whether Christians or pagans, all alike are distinguished above other Asiatics, perhaps above all other peoples, for their truly noble moral qualities. All observers describe them as “cheerful under the most depressing circumstances, persevering, open-hearted, trustworthy, modest yet self-reliant, a fearless race of hunters, born

amidst the gloom of their dense pine forests, exposed from the cradle to every danger from wild beasts, cold and hunger. Want and hardships of every kind they endure with surprising fortitude, and nothing can induce them to take service under the Russians or quit their solitary woodlands ” (Keane’s Asia, p. 479). Their numbers are steadily decreasing owing to the ravages of small-pox, scarlet fever, and especially famine, their most dreaded enemy. Their domain is also being continually encroached upon by the aggressive Yakuts from the north and east, and from the south by the Slavs, now settled in compact bodies in the province of Irkutsk about the upper course of the Yenisei. It is remarkable that, while the Russians often show a tendency to become assimilated to the Yakuts, the most vigorous and expansive of all the Siberian peoples, the Tunguses everywhere yield before the advance of their more civilized neighbours or become absorbed in the surrounding Slav communities. In the Amur valley the same fate is overtaking the kindred tribes, who are disappearing before the great waves of Chinese migration from the south and Russian encroachments both from the east and west.

See L. Adam, Grammaire de la langue toungouse (Paris, 1874); C. Hickisch, Die Tungusen (St Petersburg, 1879); L. Schrenck, Reisen und Forschungen im Amurlande (St Petersburg, 1881-1891); Mainov, Niekotorya dannyia (Irkutsk, 1898).

TUNIC (O. Eng. tunice, tunical, taken, before the Norman con- quest, directly from Lat. tunica, of which the origin is unknown), properly the name given in Latin to the principal undergarment of men and women, answering to the chiton {\ituv) of the Greeks, and covered by the outer garment, the palla (Gr. Ifiartov), in the case of women, and by the peculiar Roman garment, the toga, in the case of men. The male tunica differed from the Xtrcov in usually having short sleeves (see further Costume: § Ancient Greek and Roman). The term, more often in the form ” tunicle ” (Lat. dim. tunicula), is applied, in ecclesiastical usage, to a vestment worn over the alb by the sub-deacon in the celebration of the Mass. In general current usage it is used of any loose short garment, girt at the waist and reaching from the neck to some distance above the knee. It is thus the name of the fatigue coat of a soldier of the British army. There are numerous uses of ” tunic ” or ” tunica ” in

anatomy, zoology and botany in the sense of a covering or integument.

TUNICATA. This group of marine animals was formerly regarded as constituting, along with the Polyzoa and the Brachiopoda, the invertebrate class Molluscoidea. It is now known to be a degenerate branch of the Chordata, and to be more nearly related to the Vertebrata than to any group of the Invertebrata. The Tunicata are found in all seas, from the littoral zone down to abyssal depths. They occur either fixed or free, solitary, aggregated or in colonies. The fixed forms are the " simple " and " compound " Ascidians. The colonies are produced by budding and the members are conveniently known as Ascidiozooids. Some Tunicata undergo alternation of genera- tions, and most of them show a retrograde metamorphosis in their life-history.

History '

More than two thousand years ago Aristotle gave a short account of a simple Ascidian under the name of Tethyum. Schlosser and Ellis, in a paper on Botryllus, published in the Philosophical Tran- sactions of the Royal Society for 1756, first brought the compound Ascidians into notice; but it was not until the commencement of the 19th century, as a result of the careful anatomical investigations of G. Cuvier (1) upon the simple Ascidians and of J. C. Savigny (2) upon the compound, that the close relationship between these two

1 Only the more important works can be mentioned here. For a more detailed account of the history of the group and a full biblio- graphy see (17) and (35) in the list of works at the end of this article.

groups of the Tunicata was conclusively demonstrated. Lamarck (3) in 1816 instituted the class Tunicata, which he placed between the Radiara and the Vermes in his system of classification. The Tunicata included at that time, besides the simple and the compound Ascidians, the pelagic forms Pyrosoma, which had been first made known by F. Peron in 1804, and Salpa, described by P. Forskal in 1775.

A. v. Chamisso, in 1819, made the important discovery that Salpa in its life-history passes through the series of changes

which were afterwards more fully described by J. J. S. Steenstrup in 1842 as ” alternation of generations “; and a few years later Kuhl and Van Hasselt’s investigations upon the same animal resulted in the discovery of the alternation in the directions in which the wave of contraction passes along the heart and in which the blood circulates through the body. It has since been found that this observation holds good for all groups of the Tunicata. In 1826 H. Milne-Edwards and Audouin made a series of observations on living compound Ascidians, and amongst other discoveries they found the free-swimming tailed larva, and traced its development into the young Ascidian.

In 1845 Carl Schmidt (6) first announced the presence in the test of some Ascidians of ” tunicine,” a substance very similar to cellu- lose, and in the following year Lowig and A. v. Kolliker (7) confirmed the discovery and made some additional observations upon this substance and upon the structure of the test in general. T. H. Huxley (8), in an important series of papers published in the Transactions of the Royal and Linnean Societies of London from 1851 onwards, discussed the structure, embryology and affinities of the pelagic Tunicates Pyrosoma, Salpa, Doliolum and Appendicularia. These important forms were also investigated about the same time by C. Gegenbaur, C. Vogt, H. Miiller, A. Krohn and F. S. Leuckart. The most important epoch in the history of the Tunicata is the date of the publication of A. Kowalevsky’s celebrated memoir upon the development of a simple Ascidian (9). The tailed larva had been previously investigated; but its minute structure had not been sufficiently examined, and the meaning of what was known of it had not been understood. It was reserved for Kowalevsky in 1866 to demonstrate the striking similarity in structure and in development between the larval Ascidian and the vertebrate embryo. He showed that the relations between the nervous system, the notochord and the alimentary canal are the same in the two forms, and have been brought about by a very similar course of embryonic development. This discovery clearly indicated that the Tunicata are closely allied to Amphioxus and the Vertebrata, and that the tailed larva repre- sents the primitive or ancestral form from which the adult Ascidian has been evolved by degeneration, and this led naturally to the view usually accepted at the present day, that the group

is a degenerate side-branch from the lower end of the phylum Chordata, which includes the Tunicata (Urochorda), Balanoglossus, &c. (Hemichorda), Amphioxus (Cephalochorda) and the Vertebrata. Kowalevsky's great discovery has since been confirmed and extended to all other groups of the Tunicata by C. v. Kupffer (12), A. Giard (13 and 15), and others.

In 1872 H. Fol (14) added largely to the knowledge of the Appen- diculariidae, and Giard (1 5) to that of the compound Ascidians. The most important additions which have been made to the latter since have been those described by Von Drasche (16) from the Adriatic and those discovered by the " Challenger" and other expeditions (I7)-, The structure and the systematic arrangement of the simple Ascidians have been mainly discussed of recent years by J. Alder and A. Hancock (18), C. Heller (19), H. de Lacaze-Duthiers (20), M. Traustedt (21), L. Roule, R. Hartmeyer, C. P. Sluiter, W. Michaelsen and W. A. Herdman (17, 22). In 1874 Ussoff (23) investigated the minute structure of the nervous system and of the underlying gland (first discovered by Hancock), and showed that the duct communi- cates with the front of the branchial sac or pharynx by an aperture in the dorsal (or " olfactory ") tubercle. In 1880 C. Julin (24) drew attention to the similarity in structure and relations between this gland and the hypophysis cerebri of the vertebrate brain, and insisted upon their homology. M. M. Metcalf has since added to our knowledge of these structures. The Thaliacea have of late years been the subject of several very important memoirs. The researches of F. Todaro, W. K. Brooks (25), W. Salensky (26), O. Seeliger, Korotneff and others have elucidated the embryology, the gemmation and the life-history of the Salpidae; and K. Grobben, Barrois (27), and more especially Uljanin (28), have elaborately worked out the structure and the details of the complicated life- history of the Doliolidae. Finally, we owe to the successive memoirs of J. Hiort, O. Seeliger, W. E. Putter, E. van Beneden, C. Julin, C. P. Sluiter, R. Hartmeyer and others the description of many new forms and much information as to the development and life-history of the group.

The new forms described from Puget Sound and Alaska have drawn renewed attention to the similarity of the fauna in that region of the North Pacific and the fauna of north-

west Europe. There is probably a common circumpolar Tunicate fauna which sends extensions downwards in both Atlantic and Pacific. As the result of the careful quantitative work of the German Plankton expedi- tion, A. Borgert thinks that the temperature of the water has more to do with both the horizontal and the vertical distribution of pelagic

Tunicata in the sea than any other factor. It is probable that the occasional phenomenal swarms of Doliolum which have been met with in summer in the North Atlantic are a result of the curious life-history which, in favourable circumstances, allows a small number of budding forms to produce from the numerous minute buds an enormous number of the next generation. The great increase in the number of species known from nearly all seas during the last twelve or fifteen years of the 19th century enables us now to form a truer estimate of the geographical distribution of the group than was possible when the " Challenger " collections were described, and shows that the Tunicata at least give no support to the " bi-polar theory " of the distribution of animals.

Anatomy As a type of the Tunicata, Ascidia menttda, one of the larger species of the simple Ascidians, may be taken. This species is

_ . _ , found in most of the external 7ˆ 1. 1

Characters. European seas in shal- low water. It has an irregularly ovate form, of a dull grey colour, and is attached to some foreign object by one end (fig. 1). The opposite end of the body has a terminal opening sur- rounded by eight rounded lobes. This is the mouth or branchial aperture, and it indicates the anterior end of the animal. About half-way back from the anterior end is the atrial or cloacal aperture, surrounded by six lobes and placed upon the dorsal edge. When the Ascidian is living and undisturbed, water is being constantly drawn in through the branchial aperture and passed out through the atrial. If coloured particles be placed in the water near the

apertures, they are seen to be sucked into the body through the branchial aperture, and after a short time some of them are ejected with considerable force through the atrial aperture. The current of water passing in is for respiratory purposes, and it also conveys food into the animal. The atrial current is mainly the water which has been used in respi- ration, but it also contains all excretions from the body, and at times the ova and spermatozoa. or the embryos.

The outer grey part of the body, which is attached at- or near its . , posterior end and pene- es ‘ trated by the two aper- bran- tures, is the “test.” This is a firm gelatinous cuticular secretion upon the outer surface of the ectoderm, which is a layer of flat cells. Although at first produced as a cuticle, the test soon becomes organized by the migration into it of cells derived from the mesoderm. A. Kowalevsky has shown that cells of the mesenchyme of the larva make their way through

Fig. 1. — Ascidia menttda,

the right side.

at, Atrial aperture; br,

chial aperture; t, test.

from

m

m

tin Ye

(From Herdman, ” Challenger

Fig. 2. — Diagrammatic section of part of Mantle and Test of an

Ascidian, showing the formation of a vessel and the structure of the test.

m, Mantle. blc, Bladder cell. mc, Mantle cells.

e, Ectoderm. s, s’, Blood sinus in mantle y, Septum of ves-

tc. Test cell. being drawn out

tm, Matrix. into test

the ectoderm to the exterior during the metamorphosis, and become the first cells of the young test. Some of the cells in the adult test may, however, be ectodermal in origin (see fig. 2). These test cells may remain as rounded or fusiform or stellate cells embedded in the gelatinous matrix, to which they are constantly adding by secretions on their surfaces; or they may develop vacuoles which become larger and fuse so that each cell has an ovate clear cavity (a bladder cell), surrounded by a delicate film of protoplasm with the nucleus still visible at one point; or they may form pigment granules in the protoplasm ; or, lastly, they may deposit carbonate of lime, so that one or several of them together produce a calcareous spicule in the test. Only the unmodified test cells and the bladder cells are found in Ascidia mentula (fig. 3).

lc…,c

;..k

set.

(From The Cambridge Natural History, vol. vii., “Fish;s, &c.” By permission of Macmillan & Co., Ltd.)

Fig. 3.— Section through the surface layer of Test of Ascidia mentula.

bl, Bladder cells; tc, test cell; tk, terminal knobs of vessels; v, vessels of test.

Calcareous spicules are found chiefly in the Didemnidae amongst compound Ascidians; but pigmented cells may occur in the test of almost all groups of Tunicata. The matrix in which these structures are embedded is usually clear and apparently homogeneous; but in some cases it becomes finely fibrillated, especially in the family Cynthiidae. It is this matrix which contains tunicine. At one point on the left side near the posterior end a tube enters the test, and then splits up into a number of branches, which extend in all directions and finally terminate in rounded enlargements or bulbs, situated chiefly in the

outer layer of the test. These tubes are known as the ” vessels ” of the test, and they contain blood. Each vessel is bounded by a layer of ectoderm cells lined by connective tissue (fig. 4, B), and is divided into two tubes by a septum of connective tissue. The septum does not extend into the terminal bulb, arid consequently the two tubes communicate at their ‘ ends (fig. 4, A). The vessels are formed by an outgrowth of a blood i ‘ (derived originally from the blas- tocoele of the embryo) from the body wall (mantle) into the test, the wall of the sinus being formed by connective tissue and pushing out a covering; of ectoderm in y k Terminal bulb, front of it (fig. 2, s). Ihe test is

turned inwards at the branchial and atrial apertures to line two funnel-like tubes — the branchial siphon leading to the branchial sac, and the atrial siphon leading to the atrial or peribranchial cavity.

The body wall, inside the test and the ectoderm, is formed of a layer (the somatic layer of mesoderm) of connective tissue, enclosing muscle fibres, blood sinuses, and nerves. This layer (the mantle) has very much the shape of the test outside it, but at the two apertures it is drawn out to form the branchial and «*_„//- atrial siphons (‘fig. 5). In the walls of these siphons „.,!,„ the muscle fibres form powerful circular bands, the ? . ˆ sphincter muscles. Throughout the rest of the mantle a ” E the bands of muscle fibres form a rude irregular netˆ es *

work. They are numerous on the right side of the body, and almost totally absent on the left. The muscles are all formed of very long fusiform non-striped fibres. The connective tissue of the mantle is chiefly a clear gelatinous matrix, containing cells of various shapes; it is frequently pigmented, giving brilliant red or yellow colours to the body, and is penetrated by numerous lacunae, in which the blood flows. Inside the mantle, in all parts of the body, except along the ventral edge, there is a cavity — the atrial or peribranchial cavity — which opens to the exterior by the atrial aperture. This cavity is lined by a layer of cells derived originally from the ectoderm 1

1 According to E. van Beneden and Julin (30) only the outer wall of the atrium is lined with epiblast, the inner wall being derived from the hypoblast of the primitive branchial

sac.

Fig. 4.

A, A vessel from the test.

B, Diagrammatic transverse sec- tion of a vessel.

ec, Ectoderm. c t, Connective tissue. s,.?',The two tubes. y, Septum.

ˆ- e > nu

and directly continuous with that layer through the atrial aperture (fig. 6) ; consequently the mantle is covered both , , . externally and internally by

if I ,ln ectodermal cells.

I \ iˆ\Aˆ / There is no true body

cavity or coelom in the mesoderm ; and yet the Tuni- cata are Coelomata in their structure and affinities, al- though it is very doubtful whether the enterocoele which has been described in the development is really found. In any case the coelom if formed is after- wards suppressed, and in the adult is only represented by the pericardium and its derivatives and the small cavities of the renal and re- productive organs.

The branchial aperture (mouth) leads into the bran- _ ... chial siphon Sr (buccal cavity or

Neighbour- st ° mo S aeum) '

lag Organs.? nd t hls °P e . ns

into the anterior

end of a very large cavity (the branchial sac) which extends nearly to the posterior end of the body (see figs. 5 and 6). This branchial sac is an enlarged and modified pharynx, and is therefore properly a part of the ali- mentary canal.

The oeso- phagus opens from it far back on the dorsal edge (see below) . The wall of the branchial sac is pierced by a large number of vertical slits — the stig- mata — placed in numerous transverse rows (secondary or subdivided gill-slits). These slits place the branchial sac in communication with the peribranchial or atrial cavity, which lies outside it (fig. 6). Between the stigmata the wall of the branchial sac is traversed by blood-vessels, which are arranged in three regular series (fig. 7) — (1) the transverse vessels, which run horizontally round the wall I. ov.

a-’’’’’

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pi/.— –

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FlG.

5. — -Diagrammatic dissection

of A. mentula to show the anatomy.

at.

Atrial aperture.

br,

Branchial aperture.

a,

Anus.

brs,

Branchial sac.

dl,

Dorsal lamina.

dt.

Dorsal tubercle.

end,

Endostyle.

***■**

Heart.

i,

Intestine.

m,

Mantle.

ng,

Nerve ganglion.

a.

Oesophagus.

tea,

Oesophageal aperture.

ov.

Ovary.

pbr.

Peribranchial cavity.

r,

Rectum.

St,

Stomach.

t,

Test.

tn.

Tentacles.

vd,

Vas deferens.

ngi,

Subneural gland.

s 9 ren.

and open at their dorsal and ventral ends into large longi- tudinal vessels, the dorsal and ventral sinuses; (2) the fine longitudinal vessels, which run vertically between adjacent trans- verse vessels and open into them, and which bound the stigmata; and (3) the internal longitudinal bars, which run vertically in

Trough (From Herdman, “Challenger ” Report.)

Fig. 7. — A, Part of branchial sac of Ascidia from inside. B, Transverse section of same. tr, Transverse vessel. Connecting duct. Horizontal membrane. Internal longitudinal bar.

(A and B are drawn to different scales.)

cd,

hm,

il,

sac

Iv, Fine longitudinal vessels. p,p’, Papillae. sg, Stigmata.

(QJtiOfabs,

(From The Cambridge Natural History, vol. vii., ” Fishes,

&c.” By permission of Macmillan & Co., Ltd.)

FlG. 6. — Semi-diagrammatic transverse sectionof A scidia, passing through the atrial aperture, seen from anterior surface, left side uppermost.

At, Atrial aperture. mb,

all, Atrial lobe. ov,

Brs, Branchial sac. pbr,

cl, Cloaca. r,

con, Connective. ren,

dbls, Dorsal blood-sinus. sg,

dl. Dorsal lamina. sph,

end, Endostyle. t,

gd, Genital ducts. tr,

ii’, Intestine. ty,

Iv, Interstigmatic vessel. vbls,

m, Mantle.

Muscle-bundles.

Ovary.

Peribranchial cavity.

Rectum.

Renal vesicles.

Stigmata.

Atrial sphincter.

Test.

Transverse vessel.

Typhlosole.

Ventral blood-sinus.

a plane internal to that of the transverse and fine longitudinal vessels. These bars communicate with the transverse vessels by short side branches where they cross, and at these points are prolonged into the lumen of the sac in the form of hollow papillae. The edges of the stigmata are richly set with cilia, which drive the water from the branchial sac into the peribranchial cavity, and so cause the currents that flow in through the branchial aperture and out through the atrial.

Along its ventral edge the wall of the branchial sac is continuous externally with the mantle (fig. 6), while internally it is thickened to form two parallel longitudinal folds bounding a . . groove, the “endostyle” or ventral furrow (figs. 5, osye, 6, 8, end.\ corresponding to the hypopharyngeal groove of Amphioxus and the median part of the thyroid gland of Vertebrata. The endoderm cells which line the endostyle are greatly enlarged at the bottom, where they bear very long cilia, and on parts of the sides of the furrow so as to form projecting glandular pads (fig. 8, gl.). It is generally sup- •&>&■■

posed that this organ

is a gland for the pro- duction of the mucous secretion which is spread round the edges of the branchial sac and catches the food particles in the pass- ing current of water. It has, however, been pointed out that there are comparatively few gland cells in the epi- thelium of the endo- style, and that it is w . possible that this fur- Fig. 8. — Transverse section of the endo- row is merely a ciliated style of an Ascidian. path along which the fo % Branchial sac; end., lips of endo- mucous secretion (pro- sty i e; gl., glandular tracts; m.b., muscle duced in part by the bands; pbr., peribranchial cavity; sg, subneural gland) is st ; gma ; v . v< ventral vessel, conveyed posteriorly along the ventral edge of the branchial sac. There are sensory bipolar cells in the lateral walls of the endostyle. At its anterior end the edges of the endostyle become continuous with the Pert hanr right and left halves of the posterior of two circular ■ f j* – ciliated ridges — the peripharyngeal bands — which

run ** ° parallel to one another round the front of the branchial sac. The dorsal ends of the posterior peripharyngeal band bend posteriorly (enclosing the epibranchial groove), and then join to p or sai form the anterior end of a fold which runs along the L am te a . dorsal edge of the branchial sac as far as the oeso- phageal aperture. This fold is the dorsal lamina (figs. 5, 6, dl).

It probably serves to direct the stream of food particles entangled in a string of mucus from the anterior part of the dorsal lamina to

the oesophagus. In many Ascidians this organ, instead Dorsal Q f being a continuous membranous fold as in A. mentula, Langue s. j s represented by a series of elongated triangular pro- cesses — the dorsal languets — one attached in the dorsal median line opposite to each transverse vessel of the branchial sac. The anterior peripharyngeal band is a complete circular ridge, having no connexion with either the endostyle or the dorsal lamina. In front of it lies the prebranchial zone, which separates the branchial sac behind from the branchial siphon in front. The prebranchial zone is bounded anteriorly by a muscular band — the posterior edge of the sphincter muscle — which bears a circle of long delicate

processes, the tentacles (figs. 5, 9, 10, tn). These project Tentacles. i nwar d s at right angles so as to form a network across the entrance to the branchial sac. Each tentacle consists of con- nective tissue covered with epithelium (endoderm), and contains

two or more cavities which are continuous with blood sinuses in

_ , the mantle. In the

Subneural dorsal median] me near Oland. the anterior end of the

body, and embedded in the mantle on the ventral surface of the nerve ganglion, there lies a small glandular mass— the

subneural gland — which, as Julin has shown (24), there is reason to regard as the homologue of the hypophysis cerebri of the vertebrate brain. Julin and E. van Beneden have suggested that the function of this organ may possibly be renal. The subneural gland, which was first noticed by Hancock, com- municates anteriorly, as Ussoff (23) pointed out, by means of a narrow duct with the front of the branchial sac (pharynx). The opening of the duct is enlarged to form a funnel- shaped cavity, which may be folded upon itself, convoluted, or even broken up into a number of smaller openings, so as to form a complicated projec- tion, called the dorsal tubercle, situated in the dorsal part of the prebranchial zone. (fig. 9). The dorsal tubercle in A mentula is somewhat horseshoe-shaped (fig. 10); it varies in form in most Asci- dians according to the genus and species, and in some cases in the individual also. The function of the neural gland must still be regarded as doubtful. The secretion is formed by the degeneration and disintegra- tion of cells proliferated from the walls of the duct or its branches, and no concretions are found. The

Dorsal Tubercle,

Fig. 9. — : Diagrammatic sec- tion through anterior dorsal part of A. mentula, showing the relations of the nerve ganglion, subneural gland, &c. n, Nerve. »', Myelon.

pp, Peripharyngeal band. sgl, Subneural gland. sgd, Its duct.

/, Test lining branchial siphon. ,

ciliated funnel of the dorsal tubercle is a sense-organ, innervated by a large nerve from the ganglion ; it may be a sense-organ for testing the quality of the water entering the branchial sac.

The single elongated ganglion in the median dorsal line of the mantle between the branchial and atrial siphons is the only nerve-

centre in A. mentula and most other Tunicata. It is the n>ervoas degenerate remains of the anterior part of the cerebro- System. spinal nervous system of the tailed larval Ascidian (see below). The posterior or spinal part has

entirely disappeared in roost Tunicata. It persists, however, in the Appendiculariidae and traces of it are found in some Ascidians (e.g. Clavelina). The ganglion gives off distributory nerves at both ends, which run through the

mantle to the neighbourhood of the apertures, where Sense- they divide and subdivide. The only sense-organs are Organs. , tne pigr me nt spots between the branchial and atrial lobes, the tentacles at the base of the branchial siphon, the dorsal tubercle, and possibly the languets or dorsal lamina. These are all in a lowly developed condition. Nerve-endings have also been found in the endostyle, the peripharyngeal bands and other parts of the wall of the pharynx. The larval Ascidians, on the other hand, have well developed intracerebral optic and otic sense-organs; and in some of the pelagic Tunicata otocysts and pigment spots or eyes are found in connexion with the ganglion. Atrial tentacles (which may also be sensory) have now been found in a number of the gregarious Cynthiidae and Polystyelidae. The mouth and the pharynx (branchial sac) have already been

described. The remainder of the alimentary canal

Alimentary Canal.

is a bent Ascidians

tube which in lies embedded

A.

menlula and the mantle

most other the left

side of the body, and projects into the peribranchial cavity. The

oesophagus leaves the branchial sac in the dorsal middle line near the posterior end of the dorsal lamina (see fig. 5, ma). It is a short curved tube which leads ventrally to the large fusiform thick-walled stomach. The intestine emerges from the ventral end of the stomach, and soon turns anteriorly, then dorsally, and then

Fig. 10. — Dorsal Tubercle and neighbouring organs of A. mentula. Lettering as before. egr, Epibranchial groove; z, prebranchial zone, posteriorly so as to form a curve — the intestinal loop — open pos- teriorly. The intestine now curves anteriorly again, and from this point runs nearly straight forward as the rectum, thus completing a second curve — the rectal loop — open anteriorly (see fig. 5). The wall of the intestine is thickened internally to form the typhlosole, a pad which runs along its entire length. The anus opens into the dorsal part of the peribranchial cavity near to the atrial aperture. The walls of the stomach are glandular; and a system of delicate tubules with dilated ends, which ramifies over the outer wall of the intestine and communicates with the cavity of the stomach by means of a duct, is probably a digestive gland.

A mass of large clear vesicles which occupies the rectal loop, and may extend over the adjacent walls of the intestine, is a renal organ without a duct. Each vesicle is the modified remains of a part of the primitive coelom or body cavity, and is Excretory

formed of cells which eliminate nitrogenous waste

Organs.

matters from the blood circulating in the neighbouring blood lacunae and deposit them in the cavity of the vesicle, where they form a concentrically laminated concretion of a yellowish or brown colour. These concretions contain uric acid, and in a large Ascidian are very numerous. The nitrogenous waste products are thus deposited and stored up in the renal vesicles in place of being excreted from the body. In other Ascidians the renal organ may differ from the above in its position and structure; but in no case has it an excretory duct, unless the subneural gland is to be regarded as an additional renal organ.

The heart is an elongated fusiform tube placed on the ventral and posterior edge of the stomach, in a space (the pericardium) which is part of the original coelom or body cavity, the, rest of which exists merely in the form of lacunae and

Blood Vascular

of the cavities , of the reproductive organs and renal „ vesicles in the adult Ascidian. The walfof the heart is.J^\ a man formed of a layer of epithelio-muscular cells, the inner e JD * ends of which are cross-striated; and waves of contraction pass along it from end to end, first for a certain number of beats in one direction and then in the other, so as to reverse the course of circulation periodically. At each end the heart is continued into a vessel (see fig. 11), which is merely a large sinus or lacuna lined with a delicate endothelial layer. The sinus leaving the ventral end of the heart is called the branchio-cardiac vessel, 1 and the heart itself is merely the differentiated posterior part of this sinus and is there- fore a ventral vessel. The branchio-cardiac vessel, after giving off a branch which, along with a corresponding branch from the cardio- visceral vessel, goes to the test, runs along the ventral edge of the branchial sac externally to the endostyle, and communicates laterally with the ventral ends of all the transverse vessels of the branchial sac. The sinus leaving the dorsal end of the heart is called the cardio- visceral vessel, and this, after giving off to the test the branch above mentioned, breaks up into a number of sinuses, which ramify over the alimentary cana! and the other viscera. These visceral lacunae finally communicate with a third great sinus, the

1 On account of the periodic reversal of the circulationnone of the vessels can be called arteries or veins.

viscero-branchial vessel, “which runs forward along the dorsal edge of the branchial sac externally to the dorsal lamina and joins the dorsal ends of all the transverse vessels of the branchial sac. Besides these three chief systems, there are numerous lacunae in all parts

dorsal at m b,r.

ant

vv. ventral

Fig. 11. — Diagram of the Blood Circulation in an Ascidian. The

test is solid black. at. Atrial aperture. da, Dorsal aorta.

br, Branchial aperture. ht, Heart.

bv, Branchio-visceral vessel. vv, Ventral or branchio-cardiac

cv, Cardio-visceral system. vessel.

of the body, by means of which anastomoses are established between the different currents of blood. All these blood spaces and lacunae are to be regarded as derived from the blastocoele of the embryo, and not, as has been usually supposed, from the coelom (30). When Coarse of tne neart contracts ventro-dorsally the course of the Circulation, circulation is as follows: the blood which is flowing ‘ through the vessels of the branchial sac is collected in an oxygenated condition in the branchio-cardiac vessel, and, after receiving a stream of blood from the test, enters the heart (ht). It is then propelled from the dorsal end of the heart into the cardio-visceral vessels, and so reaches the test and digestive and other organs; then, after circulating in the visceral lacunae, it passes into the branchio-visceral vessel in an impure condition, and is distributed to the branchial vessels (fig. 1 1 , da) to be purified again. When the heart on the other hand contracts dorso-ventrally, this course of the circulation is reversed. As the test receives a branch from each end of the heart, it follows that it has afferent and efferent vessels whichever way the blood is flowing. In some Ascidians the vessels in the test become very numerous and their end branches terminate in swollen bulbs close under the outer surface of the test. In this way an accessory respiratory organ is probably formed in the superficial layer of the test. The blood corpuscles are chiefly colourless and amoeboid ; but in most if not all Ascidians there are also some pigmented corpuscles in the blood. These are generally of an orange or reddish brown tint, but may be opaque white, dark indigo-blue, or even of other colours. Precisely similarly pigmented cells are found throughout the connective tissue of the mantle and other parts of the body.

A. menttcla is hermaphrodite, and the reproductive organs lie, with the alimentary canal, on the left side of the body. The ovary is a ramified gland which occupies the greater

part of d P ˆt' tne ' ntes t' na l '°°P (see fig. 5). It contains a cavity auctive which, along with the cavities of the testis, is derived rgans. f rom a p art of the original coelom, and the ova are formed from its walls and fall when mature into the cavity. The oviduct is continuous with the cavity of the ovary and leads forwards alongside the rectum, finally opening near the anus into the peri- branchial cavity. The testis is composed of a great number of delicate branched tubules, which ramify over the ovary and the adja- cent parts of the intestinal wall. Those tubules terminate in ovate swellings. Near the commencement of the rectum the larger tubules unite to form the vas deferens, a tube of considerable size, which runs forwards alongside the rectum, and, like the oviduct, terminates by opening into the peribranchial cavity close to the anus. The lumen of the tubules of the testis, like the cavity of the ovary, is a part of the original coelom, and the spermatozoa are formed from the cells lining the wall. In some Ascidians reproductive organs are present on both sides of the body, and in others (Polycarpa) there are many complete sets of both male and female systems, attached to the inner surface of the mantle on both sides of the body and projecting into the peribranchial cavity. 1

Embryology 2 and Life-History We owe to W. E. Castle (1896) the most complete account which has yet been given of the early stages of development in an Ascidian. His careful study of the cell lineage in Ciona has made it clear that some of the conflicting statements of his predecessors arose from incorrect orientation of the embryos. One of the most important of his conclusions is that the mesoderm of Ascjdians, and probably that of the archaic Vertebrates, is derived from both primary layers, ectoderm and endoderm. Further, he finds that Ciona produces both ova and spermatozoa at the same time, but self- fertilization very rarely occnrs. The eggs are laid just before dawn,

1 For structure of other forms, see below.

2 For reproduction by gemmation see under " Classification " below.

and the larva is hatched during the following night. The test cells adhering to the young homogeneous test have, it is now well known, no connexion with the cells found later

in the adult test. The larvae are free-swimming for from one to several days. They avoid the light. The spermatozoon enters at the ventral hemisphere, and that point determines the median plane and the posterior end of the embryo. The ventral is the animal pole. The cleavage is from the beginning bilateral. The first cleavage plane is vertical, and separates the right and left halves of the embryo. The four smaller dorsal cells with yolk give rise to the endodermal hemisphere; the four larger, more protoplasmic, cells form the ventral ectodermal hemisphere. The cells of the latter hemisphere divide more rapidly, and form the future aboral surface. When the dorsal hemisphere has twenty-two cells the ventral has fifty-four. The gastrulation is a combination of epiboly and invagination. The ventral ectoderm grows over, so as to envelop the dorsal hemisphere, while the latter sinks down and becomes saucer-shaped. In the centre of the dorsal surface ten cells form the future endoderm. Round these comes a ring of cells, the chordamesenchyme ring, from which the notochord and mesenchyme arise. Outside this ring is a row of cells, the neuro-muscular ring. The more anterior of these cells form the medullary plate, the more posterior the longitudinal musculature of the larva. The remainder of the cells (in the 112-cell stage) form ectoderm. By growth at the anterior end the blastopore gets pushed posteriorly, and the anterior chorda cells are covered up, and come to lie in the dorsal wall of the archenteron, sixteen cells in two rows, one over the other. The blastopore closes in the posterior part of the dorsal surface. In front of it is the medullary plate, with a con- tinuation backwards at the sides of the blastopore. This region forms the trunk of the larva, the part posterior to it being drawn out to form the tail. The chorda cells pass back into the tail, while the mesenchyme cells shift forwards into the trunk. The muscle cells, derived from the neuro-muscular ring, lie behind the blastopore, and form the muscles of the tail. The closure of the medullary canal takes place from the blastopore forwards, and then the nerve cord is grown over by ectoderm. After closure of the blastopore the mesenchyme cells lie as lateral masses in the trunk; later they become the blood corpuscles and the mantle cells, &c.

Castle also discusses some important theoretical questions. He points out that, in Ciona at least, the chorda-

mesenchyme ring takes part along with endoderm in the primary invagination, and so belongs to the primary endoderm ; while the rest of the mesoderm, the muscle cells of the neuro muscular ring, are carried in by a secondary invagination, and belong to the outer layer of the young gastrula, or primary ectoderm. He considers that the chorda must be regarded as a mesodermal organ. He agrees with former obser- vers in seeing no trace of enterocoele formation, and he doubts whether any Chordata are Enterocoela. He does not believe in distinguishing those Metazoa with a mesoderm from those with a " mesenchyme." He considers that embryology gives no support to the Annelid hypothesis as to the origin of Chordates.

A long-continued discussion as to the origin, nature and fate of certain cells, the " testa-zellen," which make their appearance between the young embryo and its follicle (fig. 12), has ended in

(After Pizon.)

Fig. 12. — Portion of Mature Ovum of Ascidian, showing F, follicle, and /, r, " test-cells."

practical agreement that these small, cells are derived trom the follicle-cells, and have nothing to do with the test. In Salpa, how- ever, certain follicle-cells enter the embryo, and perform important functions in guiding the development for a time.

In most Ascidians the eggs are fertilized in the peribranchial cavity, and undergo most of their development before leaving the parent; in some cases, however, the eggs are laid, and Embryology. fertilization takes place in the surrounding water. The segmentation is complete and regular (fig. 13, A) and results in the formation of a spherical blastula, which then undergoes invagination (fig. 13, B). The embryo elongates, and the blastopore or invagination opening comes to be placed on the dorsal edge near the posterior end (fig. 13, C). The hypoblast cells lining the archenteron are columnar in form, while the epiblast cells are more cubical (fig. 13, B, C, D). The dorsal surface of the embryo now becomes flattened and then depressed to form a longitudinal groove,

extending forwards from the blastopore to near the front of the body. 1 This ” medullary groove ” now becomes converted into a closed

canal by its side walls growing up, arching over, and coalescing in the median dorsal line (fig. 13, D). This union of the laminae dorsales to form the neural canal commences at the posterior end behind the blastopore and gradually extends forwards. Conse- quently the blastopore comes to open into the posterior end of the neural canal (fig. 13, D), while the anterior end of that cavity remains

Ocular organ of larva. Gelatinous investment of

embryo. Muscle cells of tail. mes, Mesenteron. me, Mesoderm cells.

Cerebral vesicle at anterior end of neural canal.

(After Kowalevsky.)

Fig. 13. — Stages in the Embryology of a Simple Ascidian. A to F, Longitudinal vertical sections of embryos, all placed with the dorsal surface uppermost and the anterior end at the right.

A, Early blastula stage, during segmentation.

B, Early gastrula stage.

C, Stage after gastrula, showing commencement of notochord.

D, Later stage, showing formation of notochord and of neural canal.

E, Embryo showing body and tail and completely formed neural canal.

F, Larva just hatched; end of tail cut off.

G, Transverse section of tail of larva.

adp, Adhering papillae of larva, nee, Neurenteric canal.

at, ‘ Epiblastic (atrial) involution, oc,

au, Auditory organ of larva. g,

ar, Archenteron.

be, Blastocoele. m

bp, Blastopore.

ch, Notochord.

ep, Epiblast. nv,

hy, Hypoblast.

nc, Neural canal.

open to the exterior. In this way the archenteron communicates indirectly with the exterior. The short canal leading from the neural canal to the archenteron is known as the neurenteric canal (fig. 13, D, nee). Previous to this stage some of the hypoblast cells at the front edge of the blastopore and forming part of the dorsal wall of the archenteron (fig. 13, C, ch) have become separated off, and then arranged to form an elongated band, two cells wide, under- lying the posterior half of the neural canal (fig. 13, D, E, ch). This is the origin of the notochord. Outgrowths from the sides of the archenteron give rise to laterally placed masses of cells, which are the origin of the mesoblast. These masses show no trace of meta- meric segmentation. The cavities (reproductive and renal vesicles) which are formed later in the mesoblast represent the coelom. Consequently the body cavity of the Tunicata is a modified form of enterocoele. The anterior part of the embryo, in front of the notochord, now becomes enlarged to form the trunk, while the posterior part elongates to form the tail (fig. 13, E). In the trunk the anterior part of the archenteron dilates to form the mesenteron, the greater part of which becomes the branchial sac; at the same time the anterior part of the neural canal enlarges to form the cerebral vesicle, and the opening to the exterior at the front end of the canal now closes. In the tail part of the embryo the neural canal remains as a narrow tube, while the

remains of the wall of the archenteron — the dorsal part of which becomes the notochord— are

converted into lateral muscle bands (fig. 13, G) and a ventral cord of ceils, which eventually breaks up to form blood corpuscles. As the tail grows longer, it becomes bent round the trunk of the embryo inside the egg-membrane. About this period the epiblast cells begin to form the test as a cuticular deposit upon their outer surface. The test fs at first devoid of cells and forms a delicate gelatinous investment, but it shortly afterwards becomes cellular by the migration into it of test cells formed by proliferation from the epiblast. 1

The embryo is hatched about two or three days after fertilization, in the form of a tadpole-like larva, which swims actively through the sea by vibrating its long tail. The anterior end of the body is provided with three adhering papillae (fig. 13, ˆ rv F, adp.) in the form of epiblastic thickenings. In the age ‘

free-swimming tailed larva the nervous system, formed from the walls of the neural canal, becomes considerably differentiated. The anterior part of the cerebral vesicle remains thin-walled (fig. 13, F), and two unpaired sense-organs develop from its wall and project into the cavity. These are a dorsally and posteriorly placed optic organ, provided with retina, pigment layer, lens and cornea, and a ventrally placed auditory organ, consisting of a large spherical partially pigmented otolith, attached by delicate hair-like processes to the summit of a hollow crista acoustica (fig. 13, F, au). The posterior part of the cerebral vesicle thickens to form a solid ganglionic mass traversed by a narrow central canal: this becomes the ganglion of the adult Ascidian. The wall of the neural canal behind the cerebral vesicle becomes differentiated into an anterior thicker region, placed in the posterior part of the trunk and having a superficial layer of nerve fibres, and a posterior narrower part which traverses the tail, lying on the dorsal surface of the notochord, and gives off several pairs of nerves to the muscles of the tail. Just in front of the anterior end of the nervous system a dorsal involution of the epiblast breaks through into the upturned anterior end of the mesenteron and thus forms the mouth opening. Along the ventral edge of the mesen- teron, which becomes

the branchial sac, the endostyle is formed as a narrow groove with thickened side walls. It probably corresponds to the median portion of the thyroid body of Vertebrata. A curved outgrowth from the posterior end of the mesenteron forms the alimen- tary canal (oesophagus, stomach and intestine), which at first ends blindly. An anus is formed later by the intestine opening into the left of two lateral epiblastic involutions (the atria), which rapidly become larger and fuse dorsally to form the peribranchial cavity. Outgrowths from the wall of the branchial sac meet these epiblastic involutions and fuse with them to give rise to the first formed pair of stigmata, which thus come to open into the peribranchial cavity ; and these alone correspond to the gill clefts of Amphioxus and the Vertebrata.

Fig. 14. — Sketches of Ascidian Larvae. A, Ascidia; S, Styela; M, Anurella; C, Compound Ascidian.

Fig. 14 shows a few characteristic forms of Ascidian ” tadpoles,” or free-swimming larvae. A and S are typical simple Ascidians; M is the aberrant tailless form found in some Molgulidae ; and C is the larva of a typical compound Ascidian.

After a short free-swimming existence the fully developed tailed larva fixes itself by its anterior adhering papillae to some foreign object, and then undergoes a remarkable series of retro- „ gressive changes, which convert it into the adult B t* is to Ascidian. The tail atrophies, until nothing is left but A . ˆ p orm some fatty cells in the posterior part of the trunk. The adhering papillae disappear and are replaced functionally by a growth of the test over neighbouring objects. The nervous system with its sense organs atrophies until it is reduced to the single small ganglion, placed on the dorsal edge of the pharynx, and a slight nerve cord running for some distance posteriorly (van Beneden and Julin). Changes in the shape of the body and a further growth and differentiation of the branchial sac, peribranchial cavity and other organs now produce gradually the structure found in the adult Ascidian.

The most important points in connexion with this process of development and metamorphosis are the following: (1) In the

1 Some of the first test cells are also probably derived from the epithelium of the egg follicle.

Ascidian embryo all the more important organs (e.g. notochord, neural canal, archenteron) are formed in essentially the same manner as they are in Amphioxus and other Chordata. (2) The free-swimming tailed larva possesses the essential characters of the

(From The Cambridge Natural History, vol. vii., ” Fishes, &c.” Macmillan & Co., Ltd.)

By permission of

Fig. 15.— Metamorphosis ‘of an Ascidian (modified from

Kowalevsky and others).

A, Free-swimming tailed larva. B, The metamorphosis — larva

attached. C, Tail and nervous system of larva degenerating.

D, Further degeneration and metamorphosis of larva into E, the

young fixed Ascidian.

at, Atrial invagination. m, Mouth.

ch, Notochord. mes, Mesenteron.

hy, Hypoblast cells. nc, Neural canal.

i, Intestine.

nv, Neural vesicle with sense-organs.

Structure of

Appendicu-

laria.

(From The Cambridge Natural History, vol. vii., ‘”’ Fishes,” &c. By permission of Macmillan & Co., Ltd.)

Fig. 16. — Sketch of the chief kinds of Tunicata found in the sea. XXVII. 13

Chordata, inasmuch as it has a longitudinal skeletal axis (the noto- chord) separating a dorsally placed nervous system (the neural canal) from a ventral alimentary canal (the archenteron) ; and therefore during this period of its life-history the animal belongs to the Chordata. (3) The Chordate larva is more highly organized than the adult Ascidian, and therefore the changes by which the latter is produced from the former may be regarded as a process of degeneration (31). The important conclusion drawn from all this is that the Tunicata are the degenerate descendants of a group of primitive Chordata (see below).

Classification and Characters of Groups Order i. — Larvacea

Free-swimming pelagic forms provided with a large locomotory appendage (the tail), in which there is a skeletal axis (the urochord). A relatively large test (the ” house “) is formed with characters great rapidity as a secretion from the ectoderm ; it is /£arvacea. merely a temporary structure, which is cast off and replaced by another. The branchial sac is simply an enlarged pharynx with two ventral cili- ated openings (stigmata) leadin to the exterior. There is no separate peribranchial cavity. The nervous system consists of a large dorsally placed ganglion and a long nerve cord, which stretches backwards over the alimentary canal to reach the tail, along which it runs on the left side of the urochord. The anus opens ventrally on the surface of the body in front of the stigmata. No reproduction by gemmation or metamorphosis is known in the life-history.

This is one of the most inter- esting groups (fig. 16) of the Tunicata, as it shows more com- pletely than any of the rest the char- acters of the original ancestral forms. It has undergone little or no degeneration, and con- sequently corresponds more nearly to the tailed- larval condition than to the adult forms of the other groups. The order includes a single family, the Appendiculariidae, all the members of which are minute and free- swimming. They occur on the

surface of the sea

in most parts of the world. They possess the power to form with great rapidity an enormously large investing gelatinous layer (fig. 11), which corresponds to the test of other groups. This was first described by von Mertens and by him named ” Haus.” It is only loosely attached to the body and is frequently thrown off soon after its formation and again reformed. H. Lohmann has made a careful study of the mode of formation of this ” house ” from certain large ecto- derm cells, the ” oikoplasts,” and he considers that it probably fulfils the following functions: Its complicated apparatus of passages with partial septa form a finely perforated network, through which a relatively large volume of water is strained so as to entrap microscopic food particles ; it helps in locomotion by its hydrostatic effect, and it is also a protection to the animal, which may escape from enemies by throwing off the house, which is many times its own size. The tail in the Appendiculariidae is attached to the ventral surface of the body (fig. 18), and usually points more or less anteriorly. The supposed traces of vertebration in the muscle bands and the nerve cord are probably artifacts, and do not indicate true metameric segmentation. Near the base of the tail there is a distinct elongated ganglion (fig. 18, ng). The anterior (cerebral) ganglion has connected with it an otocyst, a pigment spot, and a tubular process opening into the branchial sac and representing the dorsal tubercle and associated parts of an ordinary Ascidian. The branchial aperture or mouth leads into the branchial sac or pharynx. There are no tentacles. The endostyle is short. There is no dorsal lamina, and the peripharyn- geal bands run dorsally and posteriorly. The wall of the branchial sac has only two ciliated apertures (fig. 19). They are homologous with the primary stigmata of the typical Ascidians and the gill clefts of vertebrates. They are placed

(After Fol.)

Fig. 17. — Oikopleura cophocerca in ” House,” seen from right side, magnified. The arrows indicate the course of the water.

Lateral reticulated parts of 1 House.”

x,

11

far back on the ventral surface, one on each side of the middle line, and lead into short funnel-shaped tubes which open on the surface of the body behind the anus (fig. 18, at). These tubes correspond to the right and left atrial involutions

Fig. 18. — Semi-diagrammatic view of Appendicularia from the right.

a,

Anus.

ov,

Ovary.

at,

One of the atrial apertures.

pp,

Peripharyngeal band.

app,

Tail.

ng,

Cerebral ganglion.

br,

Branchial aperture.

ng’,

Caudal ganglion.

brs,

Branchial sac.

ng”

Enlargement of nerve cord

dt,

Dorsal tubercle.

in tail.

end.

Endostyle.

so.

Sense-organ (tactile) on

h,

Heart.

lower lip.

i,

Intestine.

sg,

Ciliated aperture in

m,

Muscle band of tail.

pharynx.

n,

Nerve cord in body.

St,

Stomach.

«’,

Nerve cord in the tail.

tes,

Testis.

oe,

Oesophagus.

«,

Urochord.

ot,

Otocyst.

w,

Its cut end.

which, in an ordinary Ascidian, fuse to form the peribranchial cavity. The heart, according to Lankester, is formed of two cells, which are placed at the opposite ends and connected by delicate contractile protoplasmic fibrils. The large ovary and testis are placed at the posterior end of the body. The remainder of the structural details can be made out from figs. 18 and 19.

n ” v n. ch

Fig. 19. — Transverse Section of Oikopleura ; anterior part of body and tail.

At,

b.s,

br.s,

ec,

en,

Atrial passage.

Blood sinus.

Branchial sac (pharynx).

Ectoderm.

Endoderm.

n.ch, R, sg, t,

Nerve.

Notochord.

Rectum.

Stigma.

Test.

The family Appendiculariidae comprises amongst others the following genera: Oikopleura (Mertens), and Appendicularia (Cham.), in both of which the body is short and compact and the tail relatively long, while the endostyle is straight; Megalocercus (Chun) containing M. abyssorum, a huge deep-sea form from the Mediterranean (30 mm. long); Fritillaria (Quoy and Gaimard), in which the body is long and composed of anterior and posterior regions, the tail relatively short, the endostyle recurved, and an ectodermal hood is formed over the front of the body; and Kowalevskia (Fol), a remarkable form described by Fol (14), in which the heart and endostyle are said to be absent, while the branchial sac is provided with four rows of ciliated tooth -like processes.

Order II. — Thaliacea

Free-swimming pelagic forms which may be either simple or compound, and the adult of which is never provided with a tail or a notochord. The test is permanent and may be either fhaUace well developed or very slight. The musculature of a *

the mantle is in the form of more or less complete circular bands, by the contraction of which locomotion is effected. The branchial sac has either two large or many small apertures, leading to a single peribranchial cavity, into which the anus opens. Blastogenesis takes place from a ventral endostylar stolon. Alternation of generations occurs in the life-history, and may be complicated by polymorphism. The Thaliacea comprises two groups Cyclomyaria and Hemimyaria.

Sub-order 1. — Cyclomyaria.

Free-swimming pelagic forms which exhibit alternation of genera- tions in their life-history but never form permanent colonies. The body is cask-shaped, with the branchial and atrial aper- tures at the opposite ends. The test is more or less well Characters developed. The mantle has its musculature in the form ofc yc'°' of circular bands surrounding the body. The branchial "V*™- sac is fairly large, occupying the anterior half or more of the body. Stigmata are usually present in its posterior part only. The peri- branchial cavity is mainly posterior to the branchial sac. The alimentary canal is placed ventrally close to the posterior end of the branchial sac. Hermaphrodite reproductive organs are placed ventrally near the intestine.

This group forms one family, the Doliolidae, including three genera, Doliolum (Quoy and Gaimard), Dolchinia (Korotneff) and Anchinia (C. Vogt).

Doliolum, of which about a dozen species are known from various seas, has a cask-shaped body, usually from 1 to 2 cm. in length. The terminal branchial and atrial apertures (fig. 20) are „<-„& / lobed and the lobes are provided with sense organs. _ .. /™ ° The test is very slightly developed and contains no ° ° cells. The mantle has eight or nine circular muscle bands sur- rounding the body. The most anterior and posterior of these form the branchial and atrial sphincters. The wide branchial and atrial apertures lead

into large branchial and peribranchial cavi- ties, separated by the posterior wall of the branchial sac, which is pierced by stigmata; consequently there is a free passage for the water through the body along its long axis, and the animal swims by contracting its ring-like muscle bands, so as to force out the contained water posteriorly. Stigmata may also be found on the lateral walls of the branchial sac, and in that case there are corresponding anteriorly directed diverticula of the peribranchial cavity. There is a distinct endostyle on the ventral edge of the branchial sac and a peripharyn- geal band surrounding its anterior end, but there is no representative of the dorsal lamina on its dorsal edge. The oesophagus commences rather on the ventral edge of the posterior end of the branchial sac, and runs backwards to open into the stomach, which is followed

irl

Fig. 20. — Doliolum denticulatum, sexual generation, from the left side. Lettering as for fig. 18. m 1 — to 8 , Muscle bands. pbr, Peribranchial cavity.

ng, Nerve ganglion. all, Atrial lobes.

sg, Stigmata. so, Sense organs.

sgl, Subneural gland. brl, Branchial lobes.

by a curved intestine opening into the peribronchial cavity. The alimentary canal as a whole is to the right of the middle line. The hermaphrodite reproductive organs are to the left of the middle line alongside the alimentary canal. They open into the peribronchial cavity. The ovary is nearly spherical, while the testis is elongated, and may be continued anteriorily for a long distance. The heart is placed in the middle line ventrally, between the posterior end of the endostyle and the oesophageal aperture. The nerve ganglion lies about the middle of the dorsal edge of the body, and gives off many nerves. Under it is placed the subneural gland, the duct of which runs forward and opens into the anterior end of the branchial sac by a simple aperture, surrounded by the spirally twisted dorsal end of

the peripharyngeal band (fig. 20., dt).

The ova of the sexual generation produce tailed larvae; these

develop into forms known as ” nurses,” which are asexual, and are

characterized by the possession of nine muscle bands,

/DIM an auditor y sac on the left side of the bod y- a ventrally- o uollo urn. pj acec j s t] on near th e heart, upon which buds are pro- duced and a dorsal outgrowth near the posterior end of the body. The nurse after producing the buds becomes a degenerate form with very wide muscle bands. The buds’ give rise eventually to the sexual generation, which is polymorphic, having three distinct forms, in two of which the reproductive organs remain undeveloped. The buds while still very young migrate from their place of origin on the stolon, divide by fission, and become attached to the dorsal outgrowth of the body of the nurse, where they develop. The three forms pro- duced are as follows. (1) Nutritive forms (trophozooids), which remain permanently attached to the nurse and serve to provide it with food; they have the body elongated dorso-ventrally, and the musculature is very slightly developed. (2) Foster forms (phoro- zooids), which, like the preceding, do not become sexually mature, but, unlike them, are set free as cask-shaped bodies with eight muscle bands and a ventral outgrowth, which is formed of the stalk by which the body was formerly united to the nurse. On this outgrowth the (3) forms (gonozooids) which become sexually mature are attached while still young buds, and after the foster forms are set free these reproductive forms gradually attain their complete development and are eventually set free and lose all trace of their connexion with the foster forms. They resemble the foster forms in having a cask-shaped body with eight muscle bands, but differ in having no outgrowth or process, and in having the reproductive organs fully developed. 1

Anchinia, of which only one species is known, A. rubra, from the Mediterranean, has the sexual forms permanently attached to portions of the dorsal outgrowth from the body of the unknown nurse. The body is elongated dorso-

ventrally. The test is well developed and contains branched cells. The mus- culature is not so well developed as in Doliolum. There are two circular bands at the anterior end and two at the posterior, and two on the middle of the body. The stigmata are confined to the obliquely placed posterior end of the branchial sac. The alimentary canal forms a U-shaped curve. The reproductive organs are placed on the right side of the body. The life-history is still imperfectly known. As in the case of Doliolum the sexual generation is poly- morphic, and has three forms, two of which remain in a rudimentary condition so far as the reproductive organs are concerned. In Anchinia, however, the three forms do not occur together on one stolon or outgrowth, but are produced successively, the reproductive forms of the sexual generation being independent of the " foster forms " (see Barrois, 27).

Sub-order 2. — Hemimyaria.

Free-swimming pelagic forms which exhibit alternation of genera- tions in their life-history and in the sexual condition form colonies. Characters ˆhe body is more or less fusiform, with the long axis ofHemh antero-posterior, and the branchial and atrial apertures my aria. nearly terminal. The test is well developed. The musculature of the mantle is in the form of a series of transversely-running bands, which do not form complete indepen- dent rings as in the Cyclomyaria. These transverse muscles are probably to be regarded as branchial and atrial sphincters which have spread over the body. The branchial and peribronchial cavities form a continuous space in the interior of the body, opening externally by the branchial and atrial apertures, and traversed obliquely from the dorsal and anterior end to the ventral and pos- terior by a long narrow vascular band, which represents the dorsal lamina, the dorsal blood-vessel, and the neighbouring part of the dorsal edge of the branchial sac of an ordinary Ascidian. The alimentary canal is placed ventrally. It may either be stretched out (ortho-enteric) so as to extend for some distance anteriorly, or — as is more usual— be concentrated (caryo-enteric) to form along with the reproductive organs a rounded opaque mass near the posterior end of the body known as the visceral mass or " nucleus." The embryonic development is direct, no tailed larva being formed.

This sub-order contains one family, the Salpidae, includingthesingle

Saloldae g enils Salpa (Forskal), which, however, may be divided

” into two well-marked groups of species — (1) those, such as

5. pinnata, in which the alimentary canal is stretched out along the

1 For further details see Uljanin (28) and Neumann, Doliolum, in Deutsch. Tief-See Exped. (Jena, 1905).

ventral surface of the body, and (2) those, such as S. fusiformis (fig. 21, A), in which the alimentary canal forms a compact globular mass, the ” nucleus,” near the posterior end of the body. About fifteen species

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A B

Fig. 21. — Salpa runcinata-fusiformis. A, Aggregated form : em, Embryo; gem, Gemmiparous stolon; m,

Mantle; vise, Visceral mass (nucleus). Muscle bands. Lettering as before.

B, Solitary form: 1-9,

altogether are known ; they are all pelagic forms and are found in

nearly all seas. Each species occurs in two forms — the solitary

asexual [proles solitaria) and the

aggregated sexual (proles gregaria) —

which are usually quite unlike one

another. The solitary form (fig. 21,

B) gives rise by internal gemmation ife.!i!“fK’Jfi!lKW// ySfF”\ — <**

to a complex tubular stolon, which

contains processes from all the more

important organs of the parent body

and which becomes segmented into

a series of buds or embryos. As

the stolon elongates, the embryos

near the free end which have become

advanced in their development are

set free in groups, which remain

attached together by processes of the

test, each enclosing a diverticulum

from the mantle so as to form Fig. 22. — Posterior part of

” chains ” (fig. 22). Each member solitary form of Salpa demo-

of the chain is a Salpa of the sexual cratica-mucronata, showing a

or aggregated form, and when mature chain of embryos nearly ready

may — either still attached to its to be set free.

neighbours or separated from them gem, Young aggregated Salpae

(fig. 21, A) — produce one or several forming the chain.

embryos, which develop into the st, Stolon.

solitary Salpa. Thus the two forms m, Muscle band of the niantle.

alternate regularly.

The more important points in the structure of a typical Salpa are shown in fig. 23. The branchial and atrial apertures are at opposite ends of the body, and each leads into a large cavity, st . . the branchial and peribronchial sacs, which are in free ojj ureot communication at the sides of the obliquely-running pa ” dorsal lamina or ” gill.” The test is well developed and adheres closely to the surface of the mantle. The muscle bands of the mantle do not completely encircle the body. They are present

•.”””< /T

v 1 f« pi *! 5 6 i 7 8

Fig. 23. — Semi-diagrammatic representation of Salpa from left side. Lettering as before. emb, Embryo. t’, Thickening of test over nucleus.

m, Mantle. dl, Gill or branchia.

/, Languet. i-u. Muscle bands of mantle.

dorsally and laterally, but the majority do not reach the ventral surface. In many cases neighbouring bands join in the median dorsal line (fig. 21). The anterior end of the dorsal lamina is pro- longed to form a prominent tentacular organ, the languet, projecting into the branchial sac. The nerve ganglion (which represents the ganglion of the Ascidian along with the subneural gland), dorsal lamina, peripharyngeal bands and endostyle, are placed in their

usual positions; but in place of any distinct subneural gland there are two lateral neural glandular masses first

described by Metcalf. These have no connexion with the ciliated funnel, but open by lateral ducts into the branchial cavity. Median and lateral eyes are also found in connexion with the ganglion. The large spaces at the sides of the dorsal lamina (often called the gill or branchia of Salpa), by means of which the cavity of the branchial sac is placed in free com- munication with the peribranchial cavity, are to be regarded as gigantic stigmata formed by the suppression of the lateral walls of the branchial sac. Fig. 23 represents an aggregated or sexual Salpa which was once a member of a chain, since it shows a testis and a developing embryo. The ova (always few in number, usually only one) appear at a very early period in the developing chain Salpa, while it is still a part of the gemmiparous stolon in the body of the solitary Salpa. This gave rise to the view put forward by Brooks (25), that the ovary really belongs to the solitary Salpa, which is therefore a female producing a series of males by asexual gemmation, and depositing in each of these an ovum, which will afterwards, when fertilized, develop in the body of the male into a solitary or female Salpa. This idea would of course entirely destroy the view that Salpa is an example of alternation of generations. The sexual or chain Salpa, although really hermaphrodite, is always protogynous ; i.e. the female elements or ova are produced at an earlier period than the male organ or testis. This prevents self-fertilization. The ovum is fertilized by the spermatozoa of an older Salpa be- longing to another chain, and the embryo 1 is far Development advance(j ; n ; ts development before the testis is formed. of salpa. Follicular cells, known as kalymmocytes, migrate into the ovum and for a time play an important part in moulding the development and nourishing the blastomeres. At an early period in its development a part of the embryo becomes separated off, along with a part of the wall of the cavity in which it lies, to form the ” placenta,” in which the embryonic and the maternal blood streams circulate in close proximity (or actually coalesce during one period) and so allow of the passage of nutriment to the developing embryo. At a somewhat later stage a number of cells placed at the posterior end of the body alongside the future nucleus become filled up with oil-globules to form a mass of nutrient material— the elaeo- blast — which is used up later on in the development. Many sugges- tions have been made as to the homology of the elaeoblast. The most

probable is that it is the disappearing rudiment of the tail kmnd in the larval condition of most Ascidians. Addendum. The family Octacnemidae includes the single remarkable genus Octacnemus, found during the ” Challenger ” expedition, and first described by Moseley (29). It is now known in both a °<*? c,,e " solitary and an aggregated form, and was regarded by miaae. Herdman as a deep-sea representative of the pelagic Salpidae, possibly fixed ; or, better, as related to the primitive fixed forms from which Salpidae have been derived. Metcalf, however, has shown that the aggregated form of 0. patagoniensis, which he has described, is more nearly related to the Clavelinidae amongst Ascidiacea. The body is somewhat discoid, with its margin pro- longed to form eight tapering processes (fig. 24), on to which the muscle bands of the mantle are continued. The alimentary canal

a, At, br.s, g-s,

Anus.

Atrial aperture. Branchial sac. Gill slit.

Metcalf).

m, Mouth.

p.br, Peribranchial cavity.

st, Stolon.

there is an aggregated form (fig. 24, B) consisting ot individuals united by a stolon composed of test and body-walls. Order III. — Ascidiacea Fixed or free-swimming simple or compound Ascidians which in the adult are never provided with a tail and have no trace of a notochord. The free-swimming forms are colonies, the Ascldlacea ˆ simple Ascidians being always fixed. The test is perma- nent and well developed ; as a rule it increases with the age of the individual. The branchial sac is large and well developed. _ Its walls are perforated by numerous slits (stigmata) opening into the peribranchial cavity, which communicates with the exterior by the atrial aperture. Many of the forms reproduce by gemination, and in most of them the sexually-produced embryo develops into a tailed larva.

The Ascidiacea includes three groups— the simple Ascidians, the compound Ascidians and the free-swimming colonial Pyrosoma. Sub-Order 1. — Ascidiae simplices. Fixed Ascidians which are solitary and very rarely reproduce by gemmation; if colonies are formed, the members are not buried in a common investing mass, but each has a distinct test c/ mD / e of its own. No strict line of demarcation can be drawn Asc ˆ laas between the simple and the compound Ascidians, and one of the families of the former group, the Clavelinidae (the social Ascidians), forms a transition from the typical simple forms, which never reproduce by gemmation, to the compound forms, which always do. The Ascidiae Simplices may be divided into the following families: —

Family I., Clavelinidae. — Simple Ascidians which reproduce by gemmation to form small colonies in which each ascidiozooid has a distinct test, but all are connected by a common blood system, and by prolongations of " epicardiac tubes " from the branchial sacs. Buds formed on stolons which are vascular outgrowths from the posterior end of the body, containing prolongations from the ecto-derm, mesoderm and endoderm of the ascidiozooid. Branchial sac not folded; internal longitudinal bars usually absent; stigmata straight ; tentacles simple. This family contains, amongst others, the following three genera: Ecteinascidia (Herdman), with internal longitudinal bars in branchial sac ; Clavelina (Savigny) , with intestine extending behind branchial sac; and Perophora (Wiegmann), with intestine alongside branchial sac.

Family II., Ascidiidae. — Solitary fixed Ascidians with gelatinous test ; branchial aperture usually eight-lobed, atrial aperture usually six-lobed. Branchial sac not folded ; internal longitudinal bars usually present ; stigmata straight or curved ; tentacles simple. This family is divided into three sections : —

Sub-family 1, Hypobythinae. — Branchial sac with no internal longitudinal bars. One genus, Hypobythius (Moseley).

Sub-family 2, A scidinae.— Stigmata straight. Many genera, of which the following are the more important: Ciona (Fleming), dorsal languets present; Ascidia (Linnaeus, =

Phallusia, Savigny), dorsal lamina present (see figs. I to 10) ; Rhodosoma (Ehrenberg), anterior part of test modified to form operculum; Abyssascidia (Herdman), intestine on right side of branchial sac.

Sub-family 3, Corellinae. — Stigmata curved. Three chief genera: Corella (Alder and Hancock), test gelatinous, body sessile; Corynascidia (Herdman), test gelatinous, body pedunculated; Chelyosoma (Brod. and Sow.), test modified into horny plates.

Family III., Cynthiidae. — Solitary fixed Ascidians, usually with leathery test; branchial and atrial apertures both four-lobed. Branchial sac longitudinally folded (fig. 26) ;_ stigmata straight; tentacles simple or compound. This family is divided into three sections : —

Sub-family 1, Styelinae. — Not more than four folds on each side of branchial sac (fig. 26, S) tentacles simple. The more important genera are: Styela (Macleay), stigmata normal, and Bathyoncus (Herdman), stigmata absent or modified.

Fig. 24. — Octacnemus. A, Solitary form (after Herdman). B, Aggregated form (after

Mpt-ralP

forms a compact nucleus (fig. 24, A) ; the endostyle is very short ; and the dorsal lamina is also reduced. The reproduction and life- history are entirely unknown. Octacnemus bythius was found by the ” Challenger ” expedition in the South Pacific at depths of 1070 and 2160 fathoms, and Metcalf has since described a new species, 0. patagoniensis from 1050 fathoms off the Patagonian coast, in which

(After Herdman, ” Challenger ” Report.)

Fig. 25. — Culeolus willemoesi.

A, Entire body, natural size. B, Part of branchial sac magnified.

br f, Slight fold of branchial sac. at, Atrial aperture. i I, Internal longitudinal bar.

br. Branchial aperture. mh, Mesh.

sp, Calcareous spicules in vessels.

tr, Transverse vessels.

Sub-family 2, Cynthinae.-~More than eight folds in branchial sac (fig. 26, C) ; tentacles compound ; body sessile. The chief genus is Cynthia (Savigny), with a large number of species.

Sub-family 3, Bolteninae. — More than eight folds in branchial sac; tentacles compound; body pedunculated (fig. 25, A). The chief genera are: Boltenia (Savigny), branchial aperture four-lobed, stigmata normal; and Culeolus (Herdman), branchial aperture with less than four lobes, stigmata absent or modified (fig. 25, B). This last is a deep-sea genus discovered by the ” Challenger ” expedition (see 17).

Family IV., Molgulidae. — Solitary Ascidians, sometimes not fixed; branchial aperture six-lobed, atrial four-lobed. Test usually incrusted with sand. Branchial sac longitudinally folded ; stigmata more or less curved, usually arranged in spirals ; tentacles compound. The chief genera are: Molgula (Forbes), with distinct folds in the branchial sac, and Eugyra (Aid. and Hanc), with no distinct folds, but merely broad internal longitudinal bars in the branchial sac. In some of the Molgulidae (genus Anurella, Lacaze-Duthiers, 20) the embryo (fig. 14, M) does not become converted into a tailed larva, the development being direct, without metamorphosis. The embryo when hatched assumes gradually the adult structure, and never shows the features characteristic of larval Ascidians, such as the urochord and the median sense-organs. Bourne has described an aberrant Molgulid, Oligotrema, from the Loyalty Islands, with a reduced branchial sac and enlarged pinnate muscular branchial lobes, apparently used for catching food!

-Diagrams showing Transverse Sections of Typical Branchial Sacs.

A, Unfolded type. S, Styela, with four folds on each side. C, Cynthia, with eight folds on one side and seven on the other. D.L., Dorsal lamina; End, endostyle; I, II, &c, folds.

Fig. 27. — Types of Stomach amongst Compound Ascidians. P, Plain. F, Folded. A, Areolated.

i, Intestine; ce, oesophagus; st, stomach.

Figs. 26 and 27 illustrate some details of structure of branchial sac and of stomach in various simple and compound Ascidians, which are made use of in classification, and in the definitions of genera and larger groups.

Sub-Order 2.—Ascidiae Compositae.

Fixed Ascidians which reproduce by gemmation, so as to form colonies in which the ascidiozooids are buried in a common invest- Comoouad m & mass an d have no separate tests. This is probably Ascidians a somewhat artificial assemblage formed of two or three groups of Ascidians which produce colonies in which the ascidiozooids are so intimately united that they possess a common test or investing mass. This is the only character which distinguishes them from the Clavelinidae, but the property of repro- ducing by gemmation separates them from the rest of the Ascidiae Simphces. The Ascidiae Compositae may be divided into seven families, which fall into two well-marked groups: (1) the Chalaro- somata, including the first five families, with extended body, divided into two or three regions, and more nearly related to the Clavelinidae; and (2) the Pectosomata, including the Botryllidae and Polystyelidae, with a compact body, not divided into regions, and evidently related to the Cynthiidae amongst simple Ascidians.

Family I., Distomidae. — Ascidiozooids divided into two regions,

thorax and abdomen; testes numerous; vas deferens not spirally coiled. The chief genera are : Distoma (Gaertner) ; Distaplia (Delia Valle); Colella (Herdman), forming a pedunculated colony (see fig. 28, A) in which the ascidiozooids develop incubatory pouches, connected with

the peribronchial cavity, in which the embryos undergo their development (17); and Chondrostachys (Macdonald).

Family II., Coelocormidae. — Colony not fixed, having a large axial cavity with a terminal aperture. Branchial apertures five- lobed. This includes one species, Coelocormus huxleyi (Herdman), which is, in some respects, a transition form between the ordinary compound Ascidians (e.g. Distomidae) and the Ascidiae Luciae (Pyrosoma).

Family III., Didemnidae. — Colony usually thin and incrusting test containing stellate calcareous spicules. Testis single, large;

(After Herdman, " Challenger " Report.) FlG. 28. — Colonies of Ascidiae Compositae. (Natural size.)

A, Colella quoyi. D, Botryllus, showing arrangement

B, Leptochnum neglectum. of ascidiozooids in circular

C, Pharyngodictyon mirabile. systems, each of which has a

central common cloaca.

vas deferens spirally coiled. The chief genera are — Didemnum (Savigny), in which the colony is thick and fleshy and there are only three rows of stigmata on each side of the branchial sac; and Leptoclinum (Milne-Edwards), in which the colony is thin and incrusting (fig. 28, B) and there are four rows of stigmata on each side of the branchial sac.

Family IV., Diplosomidae. — Test reduced in amount, rarely containing spicules. Vas deferens not spirally coiled. In Diplosoma (Macdonald), the most important genus, the larva is gemmiparous.

Family V., Polyclinidae. — Ascidiozooids divided into three regions— thorax, abdomen and post-abdomen. Testes numerous; vas deferens not spirally coiled. The chief genera are: Pharyngo- dictyon (Herdman), with stigmata absent or modified, containing one species, Ph. mirabile (fig. 28, C), the only compound Ascidian known from a depth of 1000 fathoms; Polyclinum (Savigny), with a

smooth- walled stomach; Aplidium (Savigny), with the stomach wall longitudinally folded (fig. 27) ; and Amaroucium (Milne- Edwards), in which the ascidiozooid has a long post-abdomen and a large atrial languet.

Family VI., Botryllidae.— Ascidiozooids having the intestine and reproductive organs alongside the branchial sac. Dorsal lamina present; internal longitudinal bars present in branchial sac. The chief genera are: Botryllus (Gaertn. and Pall.), with simple stellate systems (fig. 28, D), and -Bo/ryMo«fos(Milne-Edwards), with elongated or ramified systems. It is well known that in the family Botryllidae, amongst compound Ascidians, the ectodermal vessels containing

(After Pizon.J

Fig. 29.— Young Colony of Botryllus, showing Buds and Ampullae. a, Ampullae; B2 B3, B4, Successive generations of buds; e, Stomach; i, Intestine; vp, Vessels of the test.

blood, which ramify through the common test and serve to connect the vascular systems of the various members of the colony, have numerous large ovate dilatations, the ampullae, upon their terminal twigs (fig. 29). Various functions have been assigned to these ampullae in the past, and Bancroft has shown that in addition to acting as storage reservoirs for blood, organs for the secretion of test matrix, and accessory organs of respiration, they are also organs for blood propulsion. The ampullae execute co-ordinated pulsations, the co-ordination being due to variations in the blood-pressure. It was actually found that the ampullae could keep up the circula- tion for some time in a portion of a colony independently of the hearts of the ascidiozooids. All the hearts in a colony of Botryllus contract simultaneously and in the same direction. The reversal of the circulation may be regarded as due to the engorgement of the ampullae in the superficial parts of the colony. These when distended overcome the resistance of the heart’s action, and cause it to stop and then reverse.

Family VII., Polyslyelidae. — Ascidiozooids not grouped in sys- tems. Branchial and atrial apertures four-lobed. Branchial sac may be folded; internal longitudinal bars present. The chief genera are: Thylacium (Carus), with ascidiozooids projecting above general surfaceof colony; Goodsiria (Cunningham), with ascidiozooids completely imbedded in investing mass; and Chorizocormus (Herd- man), with ascidiozooids united in little groups which are connected by stolons. Several of the species show transitions between the other Polystyelidae and the Styelinae amongst simple Ascidians.

Gemmation and Growth of Colonies. — A number of new obser- vations have been made in recent years upon the budding of com- pound Ascidians, some of which are very puzzling and contradictory in their results. Metschnikoff, Kowalevsky, Giard, Hjort, Pizon, Seeliger, Ritter, van Beneden and Julin have all in turn added to our knowledge of the details of development and life-history, of the various processes of gemmation and of the formation of colonies. It is impossible as yet to reconcile all the conflicting accounts, but the following points at least seem pretty clear.

Gemmation may be very different in its details in closely related compound Ascidians. There are, however, two main types of budding, to one or other of which most of the described methods may be referred. There is first the ” stolonial ” or ” epicardiac ” type, seen in the Chalarosomata, typically in Distomidae and Polyclinidae, and comparable with the gemmation in Clavelinidae, Pyrosomidae and Thaliacea outside this group. Secondly, there is the ” parietal ” or ” peribranchial ” type, seen in the Pectoso- mata, typically in the Botryllidae. The remarkable process of gemmation seen in the families Didemnidae and Diplosomidae may probably be regarded as a modification of the stolonial type. The double embryo in the Diplosomidae is probably to be interpreted as precocious budding (rather than as embryonic fission), due to acceleration in development (tachygenesis). The type of budding, and even details such as the length of the stolon, have much to do with differences in the nature and appearance of the colonies pro- duced. The stolon, which has a wall continuous with the body-wall of the parent, contains an endodermal element in the form of the so- called ” epicardium,” and also a prolongation of the ovary,

_or at least a string of migrating germ-cells, so that the reproductive elements are also handed on. Still, it is clear from recent researches

(After Pizon.)

Fig. 30. — Young buds of Botryllus sectioned to show the separation

of the branchial (vb) from the peribranchial (cp) cavities.

cm, Borsal tube. gh, Germ cells.

m, Mesoderm cells. ect, Ectoderm.

that the development of the bud (blastozooid) and that of the embryo (oozooid) do not proceed along parallel lines. It is impossible to harmonize the facts of gemmation with the germ-layer theory,

Ascldlae Luclae.

and attempts to explain budding in Ascidians as a process of re- generation, by which the organs of the parent or their germ-layers give rise to the corresponding organs in the bud, have signally failed. Figs. 29 and 30 show the buds in the Botryllidae, after Pizon, who has followed day by day the changes of growth in young colonies of Botryllidae, tracing the rise of successive generations of buds and the degeneration of their parents. The buds are parietal, arising from the walls of the peribranchial cavities (fig. 29), and at an early period they acquire the structure shown in fig. 30, where there are two vesicles undergoing further subdivision and differentia- tion, but investigators still differ as to whether the inner, which gives rise to the branchial sac and alimentary canal, is not produced along with the outer from the ectoderm of the parent.

A remarkable case of polymorphism has been found by M. Caullery in the buds of the compound Ascidian Colella. Some of the buds have an abundant store of reserve materials in their _ . outer layer of cells, while others are without this supply. zj e ‘**? ue * The former are placed deeply in the stalk, develop slowly, Gemmation and probably serve to regenerate the colony when the _j ,t e head portion has been removed or has died down. In p

orma ti oa these cases where the ectoderm has taken on the function /rolonies of storing the reserve material, it is found that all the organs of the bud are formed from the cells of the endodermic vesicle. The first ascidiozooid of the colony produced by the tailed larva does not form sexual reproductive organs, but reproduces by gemma- tion so as to make a colony. Thus there is alternation of generations in the life-history. In the most completely formed colonies (e.g. Botryllus) the ascidiozooids are arranged in groups (systems or coenobii), and in each system are placed with their atrial apertures towards one another, and all communicating with a common cloacal cavity which opens to the exterior in the centre of the system (fig. 28, D).

Sub-Order J. — Ascidiae Luciae. Free-swimming pelagic colonies having the form of a hollow cylindef closed at one end. The ascidiozooids forming the colony are em- bedded in the common test in such a manner that the branchial apertures open on the outer surface and the atrial apertures on the inner surface next to the central cavity of the colony. The ascidi- ozooids are produced by gemmation from a rudimentary larva (the cyathozopid) developed sexually. This sub-order includes a single family, the Pyrosomidae, contain- ing one well-marked Sirac(are fenus Pyrospma of p (Peron), with half a soma- dozen species. They are found swimming near the sur- face of the sea, chiefly in tropical latitudes, and are brilliantly phos- phorescent. A fully developed Pyro- soma colony may be from an inch or two to upwards of twelve feet in length. The shape of the colony is seen in fig. 31. k tapers slightly towards the closed end, which is rounded. The opening at the opposite end is reduced in size by the presence of a membranous prolongation of the common test (fig. 31, B). The branchial aper- tures of the ascidiozooids are placed upon short papillae projecting from the general surface, and most of the ascidiozooids have long conical processes of the test projecting

outwards beyond their branchial

apertures (figs. 31, 32 and 33). A, Side viewof entire colony. There is only a single layer of b, End view of open extremity, ascidiozooids in the Pyrosoma

colony, as all the fully developed ascidiozooids are placed

with their antero-posterior axes at right angles to the surface and communicate by their atrial apertures with the central cavity of the colony (fig. 32). Their dorsal surfaces are turned towards the open end of the colony. The more important points in the structure of the ascidiozooid of Pyrosoma are shown in fig. 33. A circle of tentacles, of which one, placed ventrally (fig. 33, tn), is larger than the rest, is found just inside the branchial aperture. From this point a wide cavity, with a few circularly placed muscle bands running round its walls, leads back to the large branchial sac, which occupies the greater part of the body. The stigmata are elongated transversely and crossed by internal longitudinal bars. The dorsal lamina is represented by a series of eight languets (/). The nerve ganglion (on which is placed a small pigmented sense organ), the subneural gland, the dorsal tubercle, the peripharyngeal

Fig. 31.— Pyrosoma elegans.

(Natural size.)

bands, and the endostyle are placed in the usual positions. On each side of the anterior end of the branchial sac, close to the peripharyngeal bands, is a mass of rounded gland cells which are the source of the phosphorescence. The alimentary canal is placed

ya»

at, br, asc,

(Partly after Savigny.) Fig. 32. — Part of a Longitudinal Section through wall of Pyrosoma, showing arrangement of ascidiozooids, magnified. Atrial apertures. em, Embryos in various stages.

Branchial apertures. /, Test.

Young ascidiozooid of a future t.p, Processes of test, colony produced by budding br.s, Branchial sac. from cy, cyathozooid. y.as,Young ascidiozooid.

posteriorly to the branchial sac, and the anus opens into a large peribronchial (or atrial) cavity, of which only the median posterior part is shown (p.br.) in fig. 33. The reproductive organs are developed in a diverticulum of the peribranchial cavity, and consist of a lobed testis and a single ovum at a time. The development takes place in a part of the peribranchial cavity (fig. 32, em). The segmentation n . .is meroblastic, and an elongated embryo is formed on

o//Vro-‘ ,en surface of a mass of yolk. The embryo, after the

soma ‘ formation of an alimentary cavity, a tubular nervous system, and a pair of laterally placed atrial tubes, divides into an anterior and a posterior part. The anterior part then segments into four pieces, which afterwards develop into the first ascidiozooids of the colony, while the posterior part remains in a rudimentary condition, as the ” cyathozooid “; it eventually atrophies. As the four ascidiozooids increase in size, they grow round the cyatho-zooid and soon encircle it (fig. 32, asc and cy). The cyathozooid absorbs the nourishing yolk upon which it lies, and distributes it

cm,

gs,

t>

in

(Partly after Keferstein.) Fig. 33. — Mature Ascidiozooid of Pyrosoma, from left side, Lettering as before. Cellular mass, the seat of m.b, Muscle band, phosphorescence. n.gl, Subneural gland,

to the ascidiozooids by means of a heart and system of vessels which have been meanwhile formed. When the cyathozooid atrophies and is absorbed, its original atrial aperture remains and deepens to become the central cavity of the young colony, which now consists of four ascidiozooids placed in a ring, around where the cyathozooid was, and enveloped in a common test. The colony gradually increases by the formation of buds from these four original ascidio- zooids.

Phylogeny The accompanying diagram (fig. 34) shows graphically the probable origin and course of evolution of the various groups of Tunicata, and therefore exhibits their relations to one anothe r „ . much more correctly than any system of lineat ^^ classification can do. The ancestral Proto-Tunicata are here regarded ‘ as an offshoot from the Proto-Chordata — the common

•»««

**«i* H

Fig. 34.

Posterior cellular mass. Gemmiparous stolon.

pig, Pigment spot on ganglion. t.p, Process of test.

ancestors of the Tunicata (Urochorda), Amphioxus (Cephalochorda) and the Vertebrata. The ancestral Tunicata were probably free- swimming forms, not very unlike the existing Appendiculariidae, and are represented in the life-history of nearly all sections of the Tunicata by the tailed larval stage. The Larvacea are the first offshoot from the ancestral forms which gave rise to the two lines of descendants, the Proto-Thaliacea and the Proto-Ascidiacea. The Proto-Thaliacea then split into the ancestors of the existing Cyclomyaria and Hemimyaria. The Proto-Ascidiacea gave up their pelagic mode of life and became fixed. This ancestral process is repeated at the present day when the free-swimming larva of the simple and compound Ascidians becomes attached. The Proto- Ascidiacea, after the change, are probably most nearly represented by the existing genus Clavelina. They have given rise directly or indirectly to the various groups of simple and compound Ascidians and the Pyrosomidae. These groups form two lines, which appear to have diverged close to the position of the family Claveliriidae. The one line leads to the more typical compound Ascidians, and includes the Polyclinidae, Distomidae, Didemnidae, Diplosomidae, Coelocormidae, and finally the Ascidiae Luciae or Salpiformes. The second line gave rise to the simple Ascidians, and to the Botryl-lidae and Polystyelidae, which are, therefore, not closely allied to the other compound Ascidians. The later Proto-Ascidiacea were probably colonial forms, and gemmation

was retained by the Clave- linidae and by the typical compound Ascidians (Distomidae; &c.) derived from them. The power of forming colonies by budding was lost, however, by the primitive simple Ascidians, and must, therefore, have been regained independently by the ancestral forms of the Botryllidae and the Polystyelidae. If this is a correct inter- pretation of the course of evolution of the Tunicata, we arrive at the following important conclusions. (1) The Tunicata, as a whole, form a degenerate branch of the Proto-Chordata ; (2) the Ascidiae Luciae {Pyrosoma) are much more closely related to the typical compound Ascidians than to the other pelagic Tunicata, viz. the Larvacea and the Thaliacea ; and (3) the Ascidiae Compositae form a polyphyletic group, the sections of which have arisen at several distinct points from the ancestral simple Ascidians.

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1 By Dohrn and others their point of origin is placed considerably farther up on the stem of the Chordata, thus causing the Tunicata to be regarded as very degenerate Vertebrata (see 31).

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TUNICLE (Lat. tunicella), a liturgical vestment of the Christian church, proper to subdeacons. It is practically the same vest- ment as the dalmatic {q.v.).

TUNING FORK, a small bar of cast steel with tolerably defined edges, bent into a fork with two prongs, with a handle of the same metal extending from the bend of the fork and serving as a sound-post to transmit the vibrations to any resonance board or body convenient for reinforcing

the sound. The fork is set in vibration by striking one of the prongs against a hard substance, or pressing the prongs together if they are light ones, or if heavy drawing a bow across. The tuning fork was invented by John Shore, royal trumpeter in 1711, sergeant trumpeter at the entry of George I. in 1714, and lutanist to the Chapel Royal in 17 15. It is used for determining musical pitch (see Pitch), and also in certain physical experiments (see Sound).

TUNIS, capital of Tunisia, the largest city in North Africa outside Egypt, in 36 48′ N., io° 12′ E. Tunis is situated on an isthmus between two salt lakes, the marshy Sebkha-el-Sejumi to the south-west, and the shallow el-Bahira (little sea), or Lake of Tunis, to the north-east. An artificially deepened channel through the Bahira into the Gulf of Tunis has converted the city into a seaport (see below). North-west and south-west the city is commanded by hills, on which are forts, that on Sidi bel Hassan to the south dating from the middle ages. The city, which was formerly strongly fortified, is built in the shape of an amphitheatre, with the kasbah, or citadel, at its highest point. The old town (Medina), the walls of which have in great part disappeared, lies between two suburbs, the Ribat-el-Sowika on the north and the Ribat Bab-el-Jezira on the south. These suburbs were also surrounded by a wall, now pulled down, leaving the gates of the city isolated. An outer wall, however, encloses the Medina and its suburbs. Beyond the Bab-el-Bahar (sea-gate), now called Porte de France, on the level ground by the Bahira, is the marine town, or Quartier Franc, built since the French occupation in 1881. No attempt has been made by the French to modernize the ancient city.

The European Quarter. — From the landing stage a short street leads into the broad Avenue Jules Ferry or de la Marine running east to west and ending in the Place de la Residence, on the north side of which is the Roman Catholic cathedral and on the south side the palace of the French resident-general, with a large garden. The main thoroughfare is continued west- wards by the Avenue de France, which leads to the Porte de France. Beyond the gate is the small Place de la Bourse, in which is the British consulate. From the Porte electric trams run to the harbour and also in a circle round the native city. From the Place de la Residence cross-roads run north

and south. The northern road, the Rue de Rome, led to the Gare du Nord, the station for Carthage, Goletta and La Marsa. This line was replaced in 1908 by an electric tramway built along the northern bank of the canal connecting Tunis and Goletta. The southern road, the Rue-es-Sadikia, leads to the Gare du Sud, the station for Susa,- Kairawan, &c, and also for Algiers. The Avenue Jules Ferry is intersected by a north-to south street running in a straight line over two miles. The northern section is called the Avenue de Paris; the southern Avenue de Carthage. By these avenues, served by electric trams, access is gained to the suburbs of the city. In the Avenue de France or Avenue Jules Ferry are the chief hotels and cafes, the casino-theatre, the principal banks and the finest shops. In the Rue d'ltalie, running south from the Avenue de France, are the post office, market buildings, and French Protestant church. There is an English church in the Rue d'Espagne. Behind the cathedral is a disused cemetery with a chapel, where the Christian slaves are supposed to have worshipped. The coffins in the vaults have been removed to the Chapel of St Louis at Carthage. Among them was that of M. de Lesseps, French consul-general (d. 1832), father of the maker of the Suez Canal. Next to the cemetery is the old Greek church. North of the Avenue de France is a district, inhabited chiefly by Maltese, which has obtained the name of Malta-es-Segheira (Little Malta).

The Native Town. — To the visitor from Europe the attraction of Tunis lies in the native city, where, in the Rue al Jezira, along which runs electric trams, he can see hundreds of camels in the morning bearing charcoal to market; where he may witness the motley life of the bazaars, or, by the Bab-Jedid, watch the snake-charmers and listen to the Moorish story- tellers. Christians are forbidden to enter the mosques. From various points the traveller can look over the city, with its great citadel, its many minarets and its flat-topped houses. Many of the dwellings of the richer residents are adorned with arcades, the marble columns of which were taken from the ruins of Carthage. The Porte de France is the threshold of the ancient city. Two narrow streets climb the hill towards the citadel. That to the right, the Rue de la Kasbah, opens into a small square (Suk-el-Islam or Place de la Kasbah), on the left of which is the Dar-el-Bey (palace of the bey), while

beyond it rise the walls of the citadel. That to the left leads to the chief mosque of the city, the Jamaa-al-Zeituna (mosque of the Olive Tree), founded in a.d. 698. It has many domes and a spacious cloister, and its central court can be seen from the neighbouring streets. Attached to the mosque is a college attended' by several hun- dreds of Moslem youths. The Dar-el-Bey contains numerous rooms beautifully decorated in the Moorish style of the 18th century; and the judgment hall has a domed roof adorned with the delicate arabesque plaster-work known as Nuksh hadida. The kasbah, which forms the western side of the Suk-el-Islam, includes within the circuit of its walls a mosque built about a.d. 1232 by Abu Zakariya the Hafsite. Of the ancient kasbah nothing but the walls remain, the old buildings having been demolished to make way for barracks for the French troops. Besides being a fortress the kasbah formerly contained a palace of the beys, barracks for janissaries and bagnios for the Christian slaves. When in July 1535 the Spaniards under Charles V. attacked Tunis, the Christians in the kasbah, said to number 10,000, rose against their keepers and helped to secure the victory of the emperor. The Spaniards during their occupancy of Tunis strengthened the kasbah and built an aqueduct to supply it with water. Immediately north of the kasbah are the buildings of the Sadiki College, and north of the college is the Palais de Justice, a building completed in 1901. It stands between the line of the ancient wall and the enceinte. Its walls are decorated with faience taken from an ancient Tunisian palace. North-east of the Palais de Justice, which like the Sadiki College is built in the Moorish style, rises the great dome, surrounded by smaller cupolas, of the largest mosque in the city, that named after Sidi Mahrez, a renowned saint of the 5th century of the Mahommedan era, whose tomb makes it a

sanctuary for debtors. East of the mosque, which dates from the 17th century, and just without the inner city walls, here demolished, is the Protestant cemetery of St George, used during the 17th, 18th and the greater part of the 19th centuries. Here are buried several British consuls. Here also was the grave of John Howard Payne, author of " Home,

Sweet Home ” and consul for the United States, who died at Tunis in 1852. In 1883 the body was disinterred and removed to America, but a monument has been placed on the spot similar to that erected over the new tomb at Washington.

The Bazaars. — The native city to the north of the Rue de la Kasbah includes the Jewish quarter and the synagogue. The Jews of Tunis adopt a special costume, the women wearing gaily coloured vests and close-fitting white trousers. Beyond the Jewish quarter, in the Ribat-el-Soweika, is the Place el Halfa-Ouine, a favourite rendezvous of the poorer Moslem population, wherein are many native cafes. South of the Rue de la Kasbah is the bazaar quarter. Here the streets are very narrow and tortuous, some being vaulted and many covered in with planking. They are known as suks (markets), and each suk is devoted to one particular trade. Beyond paving the streets the French have made no altera- tion in the suks, which retain their original character unimpaired. The shops consist of small cubes, open in the front, in which the trader squats cross-legged amidst his wares. The principal suks are el-Attarin (market of the perfumers), ei-Farashin (carpets and cloths), el-Serajin (saddlery) and el-Birka (jewelry). The suk el-Birka was formerly the slave market. Near by are the green- tiled domes and walls enriched with rose-coloured marbles of the mausoleum of the beys.

Public Institutions, &c. — Tunis is furnished with well-equipped hospitals and a large asylum for aged people kept by the Little Sisters of the Poor. The principal educational establishments, besides that of the mosque of the Olive Tree, are the Sadiki College, founded in 1875, for free instruction in Arabic and European subjects, the Lycee Carnot in the Avenue de Paris, formerly the College of St Charles (founded by Cardinal Lavigerie), open to Chris- tians and Moslems alike, and the normal school, founded in 1884 by the reigning bey, for the training of teachers in the French language and European ideas. The Dames de Sion have a large establishment for the teaching of small children of both sexes, and there is a secondary school for girls. All the schools are well attended. About a mile and a half north of the centre of the European quarter, on the slopes of a hill rising 270 ft., is the Pare du Belvedere covering some 240 acres and commanding extensive views.

Water is supplied to the city, with its numerous fountains, from Jebel Zaghwan (vide infra) by the Roman aqueduct repaired, at a cost of half a million sterling, by the bey Mahommed al-Sadik (d. 1882).

The Port. — The canal which traverses the shallow Bahira, and connects Tunis with the Mediterranean, is nearly seven miles long. By means of breakwaters it is continued beyond the coast-line and is at its mouth 328 ft. wide. It has a uniform depth of 21 1 ft., but its width within the lake is reduced to 98 ft. In the centre, however, the canal is widened to 147 ft. to allow vessels to pass. There is a harbour at the entrance (see Goletta). That at the Tunis end of the canal is 1312 ft. long by 984 ft. broad, and is of the same depth as the canal. The canal was begun in 1885 and was opened to navigation in June 1893. An additional basin, south- cast of the main harbour, was opened in 1905 and is used for the exportation of phosphates. Of the ships using the harbour more than half are French, and one-third Italian, British vessels coming next. British goods, however, are largely carried in French bottoms, and next to France the United Kingdom and Malta take most of the trade of the port. The exports are chiefly phosphates and other minerals, cereals, olive oil, cattle, hides, sponges and wax. The imports are cotton goods, flour, hardware, coal, sugar, tea, coffee, &c. The figures of trade and shipping are included in those of the trade of the regency (see Tunisia), of which Tunis and Goletta take about a third.

Population. — The population of the city at the census of 1906 was returned at 227,519. The ” natives ” — Arabs, Berbers, ” Moors,” Turks and negroes — were estimated at 100,000, Tunisian Jews at 50,000, French 18,000, Italians 52,000, Maltese 6000. Greeks 500 and Levantines 1000. The French language is predominant in the European quarter.

Environs: The Bardo Palace, Zaghwan, &c. — The environs of Tunis are picturesque and afford many beautiful views, the finest being from the hill on the south-east, crowned by a French fort, and from the Belvedere already mentioned. About a mile and a quarter from the Btib Bu Saadun, the north-west gate of the city, is the ancient palace called the Bardo, remarkable for the ” lion court,” a terrace to which access is gained by a flight of steps guarded by marble lions, and for some apartments in the Moorish style. The

finest of these apartments, containing beautiful arabesque

plaster work, formed the old Harem, and are now part of theMusˆe Alaoui, which occupies a considerable portion of the Bardo. In this museum M. Paul Gauckler, the director of the department of art and antiquities in the Tunisian government, has formed a magnificent collection of Carthaginian and Roman antiquities, especially Roman mosaics. In the Mus6e Arabe, which occupies an adjacent small palace built about 1830, are treasures illustrative of the Arab-Berber or Saracenic art of Tunisia.

South-east of the city, along the valley of the Wadi Melain, are hundreds of large stone arches, magnificent remains of the Roman aqueduct from Zaghwan to Carthage. At Zaghwan (38 m. by rail from Tunis), over the spot whence the spring which supplies the aqueduct issues from the hill, are the ruins of a beautiful Temple of the Waters. The spring is now diverted direct into the aqueduct and is not visible at the surface. Between Zaghwan and Tunis, , and accessible by the same railway, is Wadna, the Roman Uthina, where, besides numerous other ruins, are the fairly preserved arches of a large amphitheatre. The ruins of Carthage (q.v.) lie a few miles north of Goletta.

History. — Tunis is probably of greater antiquity than Carthage, of which city however it became a dependency, being repeatedly mentioned in the history of the Punic Wars. Strabo speaks of its hot baths and quarries. The importance of Tunis dates from the Arab conquest, when, as Carthage sank, Tunis took its place commercially and politically. It became the usual port for those going from the sacred city of Kairawan to Spain, and was one of the residences of the Aghlabite dynasty (800-909). In the 10th century it suffered severely, being repeatedly pillaged in the wars of the Fatimite caliphs Al-Qaim and Abu Tahir Isma'il el Mansur with the Sunnite leader Abu Yazid and the Zenata Berbers.

For its later fortunes, see Tunisia, of which regency, since the accession of the Hafsites, Tunis has been the capital.

TUNISIA (Regency of Tunis), a country of North Africa, under the protection of France, bounded N. by the Mediterranean, W. by Algeria, E. by Tripoli and S. by the Sahara.

Tunisia reaches farther north than any other part of Africa, Ras-al-Abiadh (Cape Blanc) 1 being in 37 20′ N. On the south the boundary of the Tunisian Sahara is undetermined, but it may be roughly placed at 31° N. This would give, therefore, a greatest length of something like 440 m. The country lies between n u 40′ E. and 7 35′ E. The average length is about 300 m., and the average breadth 150 m.; consequently the area may be estimated at 50,000 sq. m. (For map, see Algeria.)

Physical Features. — Geographically speaking, Tunisia is merely the eastern prolongation of the Mauretanian projection of northern Africa, of that strip of mountainous, fertile and fairly well-watered, country north of the Sahara desert, which in its flora and its fauna, and to some extent in its human race, belongs rather to Europe than to Africa. Tunisia is divided into the following four fairly distinct regions: —

I. On the north and north-west the Aures mountains of Algeria are prolonged into Tunisia, and constitute the mountainous region of the north, which lies between the Majerda river and the sea, and also includes the vicinity of the city of Tunis and the peninsula of the Dakhelat el Mawin, which terminates in Ras Addar (Cape Bon). This first division is called by the French ” the Majerda Mountains.” It includes within its limits the once famous district of the “Kroumirs,” 2 a tribe whose occasional thefts of cattle across the frontier gave the French an excuse to invade Tunisia in 1881. The highest point which the mountains attain in this division of Tunisia is about 4125 ft., near Ain Draham in Kroumiria. The country, however, about Bizerta is very mountainous, though the summits do not attain a greater altitude than about 3000 ft. The district between Bizerta and the Gulf of Tunis is a most attractive country, resembling greatly the mountain- ous regions of South Wales. It is well watered by streams more or less perennial. The principal river, the Majerda, is formed by the junction of the Wad Malleg and the Wad Kkallad. It and its

1 It is possible that Ras-ben-Sekka, a little to the west of Cape Blanc, may be actually the most northerly point.

2 The French seem systematically unable to master certain

sounds foreign to their own language, or sounds which they suppose to be foreign. Thus the ” w,” though constantly represented in French by ” ou,” is continually changed by them into ” v ” when they transcribe foreign languages, just as the Greek x and the German and Scottish ” ch ” is almost invariably rendered by the French in Algeria and Tunis as ” kr.” Add to this the insertion of vowel sounds where they are lacking in the Arabic and you derive from the real word Khmir the modern French term of Kroumir. In like manner sebkha, a salt lake, is constantly written by the French as sebkra.

jributaries rise in the Majerda and Aures mountains. Flowing north-east the Majerda forms an extensive plain in its lower course, reaching the sea near the ruins of Utica. Vegetation is abundant, and recalls that of the more fertile districts of southern Spain and of Italy. On the higher mountains the flora has a very English character, though the actual species of plants may not be the same.

2. The central plateau region, stretching between the Majerda valley and the mountains of Gafsa. The average elevation of this country is about 2000 ft. The climate, therefore, in parts is ex- ceedingly cold and bleak in winter, and as it is very wind-swept and parched in summer by the terrible gibli or ” sirocco ” it is much less attractive in appearance than the favoured region on the northern littoral. Although it is almost always covered with some kind of vegetation, trees are relatively rare. A few of the higher mountains have the Aleppo pine and the juniper; elsewhere only an infrequent wild terebinth is to be seen. In these two regions the date palm is never met with growing naturally wild. Its pre- sence is always due to its having been planted by man at some time or another, and therefore it is never seen far from human habitations. These central uplands of Tunisia in an uncultivated state are covered with alfa or esparto grass ; but they also grow considerable amounts of cereals — wheat in the north, barley in the south. The range of the Saharan Atlas of Algeria divides (roughly speaking) into two at the Tunisian frontier. One branch extends northwards up this frontier

and north-eastwards across the central Tunisian table-land, and the other continues south-eastwards between Gafsa and the salt lakes of the Jerld. The greatest altitudes of the whole of Tunisia are attained on this central table-land, where Mt Sidi AH bu Musin ascends to about 5700 ft. About 30 m. south of the city of Tunis is the picturesque mountain of Zaghwan, approxi- mately 4000 ft. in altitude, and from whose _ perennial springs comes the water-supply of Tunis to-day as it did in the time of the Carthaginians and Romans. North-east of Zaghwan, and nearer Tunis, is the Jebel Resas, or Mountain of Lead, the height of which is just under 4000 ft.

3. The'Sahel. This well-known Arab term for coast-belt (which in the plural form reappears as the familiar " Swahili " of Zanzibar) is applied to a third division of Tunisia, viz. the littoral region stretching from the Gulf of Hammamet to the south of Sfax. It is a region varying from 30 to 60 m. in breadth, fairly well watered and fertile. In a less marked way this fertile coast region is con- tinued southwards in an ever-narrowing belt to the Tripolitan frontier. This region is relatively flat, in some districts slightly marshy, but the water oozing from the soil is often brackish, and in places large shallow salt lakes are formed. Quite close to the sea, all along the coast from Hammamet to Sfax, there are great fertility and much cultivation ; but a little distance inland the country has a rather wild and desolate aspect, though it is nowhere a desert until the latitude of Sfax has been passed.

4. The Tunisian Sahara. This occupies the whole of the southern division of Tunisia, but although desert predominates, it is by no means all desert. At the south-eastern extremity of Tunisia there is a clump of mountainous country, the wind-and-water-worn fragments of an ancient plateau, which for convenience may be styled the Matmata table-land. Here altitudes of over 3000 ft. are reached in places, and in all the upper parts of this table-land there is fairly abundant vegetation, grass and herbage with low junipers, but with no pine trees. Fairly high mountains (in places verging on 4000 ft.) are found between Gafsa and the salt lakes of the Jerid.

These salt lakes are a very curious feature. They stretch with only two short breaks in a line from the

Mediterranean at the Gulf of Gabes to the Algerian frontier, which they penetrate for a con- siderable distance. They are called by the French (with their usual inaccuracy of pronunciation and spelling) “chotts”; the word should really be the Arabic shat, an Arab term for a broad canal, an estuary or lake. These shats however are, strictly speaking, not lakes at all at the present day. They are smooth depressed areas (in the case of the largest, the Shat el Jerid, lying a few feet below the level of the Mediterranean), which for more than half the vear are expanses of dried mud covered with a thick incrustation of white or gr«y salt. This salt covering gives them _. shat . at a distance the appearance of big sheets of water.

e ‘ During the winter, however, when the effect of the rare

winter rains is felt, there may actually be 3 or 4 ft. of water in these shats, which by liquefying the mud makes them perfectly impassable. Otherwise, for about seven months of the year they can be crossed on foot or on horseback. It would seem probable that at one time these shats (at any’rate the Shat el Jerid) were an inlet of the Mediterranean, which by the elevation of a narrow strip of land on the Gulf of Gabes has been cut off from them. It is, however, a region of past volcanic activity, and these salt depressions may be due to that cause. Man is probably the principal agent at the present day in causing these shats to be without water. All round these salt lakes there are numerous springs, gushing from the sandy hillocks. Almost all these springs are at a very hot temperature, often at boiling point. Some of them are charged with salt, others are perfectly fresh and sweet, though boiling hot. So abundant is

their volume that in several places they form actual ever-flowing rivers. Only for the intervention of man these rivers would at all times find their way into the adjoining depressions, which they would maintain as lakes of water. But for a long period past the freshwater streams (which predominate) have been used for irrigation to such a degree that very little of the precious water is allowed to run to waste into the lake basins; so that these latter receive only a few salt streams, which deposit on their surface the salt they contain and then evaporate. This abundant supply of fresh’ warm water maintains oases of extraordinary

luxuriance in a country where rain falls very rarely. Perennial streams of the description referred to are found between the Algerian frontier and Gabes on the coast. The town at Gabes itself is on the fringe of a splendid oasis, which is maintained by the water of an ever- running stream emptying itself into the sea at Gabes after a course of not more than 20 m.

All this region round the shats has been called the " Jerid " from the time of the Arab occupation. " Jerid " means in Arabic a "palm frond" and inferentially "a palm grove." _. , , The fame of this Belad-el- Jerid, or "Country of the The Jem ' Date Palms," was so exaggerated during the 17th and 18th centuries that the European geographers extended the designation from this small area in the south of Tunisia to cover much of inner Africa With this country of Jerid may be included the island of Jerba, which lies close to the coast of Tunisia in the Gulf of Gabes. The present writer believes that the date palm was really indigenous to this district of the Jerid, as it is to countries of similar descrip- tion in southern Morocco, southern Algeria, parts of the Tripoli- taine, Egypt, Mesopotamia, southern Persia and north- western India; but that north of the latitude of the Jerid the date did not grow naturally in Mauretania, just as it was foreign to all parts of Europe, in which, as in true North Africa, its presence is due to the hand of man. To some extent it may be said that true North Africa lies to the north of the Jerid country, which, besides its Saharan, Arabian and Persian affinities, has a touch about it of real Africa, some such touch as may be observed in the valley of the Jordan. In the oases of the Jerid are found several species of tropical African mammals and two or three of Senegalese birds, and the vegetation seems to have as much affinity with tropical Africa as with Europe. In fact, the country between the Matmata highlands and the strait separating Jerba from the mainland is singularly African in the character and aspect of its flora. To the south of the Jerid the country is mainly desert — vast unexplored tracts of shifting sand, with rare oases. Nevertheless, . all this southern district of Tunisia bears evidence of once having been- subject to a heavy rainfall, which scooped out deep valleys in the original table-land, and has justified the present existence of im- mense watercourses — watercourses which are still, near their origin, favoured

with a little water.

Hot and mineral springs may be almost said to constitute one of the specialities of Tunisia. They offered a singular attraction to the Romans, and their presence in remote parts of the M . country no doubt was often the principal causeof Roman ™ nera ‘ settlement. Even at the present day their value is pr ngs ‘ much appreciated by the natives, who continue to bathe in the ruined Roman baths. The principal mineral springs of medicinal value are those of Korbus and Hammam Lif (of remarkable efficacy in rheumatic and syphilitic affections and certain skin diseases), of the Jerid and Gafsa, of El Hamma, near Gabes, and of various sites in the Kroumir country.

Climate.— The rainfall in the first geographical division is pretty constant, and may reach a yearly average of about 22 in. Over the second and third divisions the rainfall is less constant, and its yearly average may not exceed 17 in. The mean annual tempera- ture at Susa is 75 F., the mean of the winter or rainy season 6o° and of the hot season 97 . At Tunis the temperature rarely exceeds 90 , except with a wind from the Sahara. The prevailing winds from May to September are east and north-east and during the rest of the year north-west and east. A rainy season of about two months usually begins in January ; the spring season of verdure is over in May ; summer ends in October with the first rains. Violent winds are common at both equinoxes. In the Tunisian Sahara rain is most uncertain. Occasionally two or three years may pass without any rainfall; then may come floods after a heavy down- fall of a few weeks. Perhaps if an average could be struck it would amount to 9 or 10 in. per annum.

[Geology. — The greater part of Tunisia is composed of sandstones, marls and loosely stratified deposits belonging to the Pliocene and Quaternary periods. The oldest strata, consisting of gypsiferous marls, are referred to the Muschelkalk and show an alternation of lagoon with marine conditions. The Lias and Oolite forma- tions are well represented, but the Sequanian and Kimmeridgian subdivisions are absent. Lower Cretaceous rocks, consisting of thick limestones, shales and marls, occur in Central Tunisia. The fossils show many notable affinities with those in the Lower Cre- taceous of the Pyrenees. Limestones and

marls represent the stages Cenomanian to Upper Senonian. The fossils of the Cenomanian have affinities with those in the Cenomanian of Spain, Egypt, Madagascar, Mozambique and India. The Senonian consists of a

central facies with Micraster peini; a meridional fades with Ostrea; and a northern facies developed round Tunisia with large forms of Inoceramus and echinoids. Phosphatic deposits are well developed among the Lower Eocene rocks. The Middle Eocene is characterized by the presence of Ostrea bogharensis and the Upper Eocene by highly fossiliferous sandstones and marls. The Oligocene and Miocene formations are present, but the Upper Miocene is confined to the coast. Quaternary deposits cover much of the desert regions. 1]

Minerals. — Coal has been discovered in the Khmir (" Kroumir ") country, but the principal mines at present worked in Tunisia are those of copper, lead and zinc. Zinc is chiefly found in the form of calamine. Iron is worked in the Kef district. Valuable deposits of phosphates are present, chiefly in the south-west of Tunisia, in the district of Gafsa. Marble is found in the valley of the Majerda (at Shemtu), at Jebel Ust (about 35 m. south of Tunis), and at Jebel Dissa, near Gabes. The marbles of Shemtu are the finest pink Numidian marbles, which were much esteemed by the Cartha- ginians and Romans. It has been sought to work again the ancient quarries of Shemtu, but it was found that the marble had been spoilt by ferruginous and calcareous veins.

Flora. — The flora of Tunisia is very nearly identical with that of Algeria, though it offers a few species either peculiar to itself or not found in the last-named country. On the whole its character is less Saharan than that of parts of Algeria, for the influences of the desert do not penetrate so far north in Tunisia as they do in Algeria. There are very few patches of real forest outside the Khmir country, though it is probable that in the time of the Romans the land was a good deal more covered with trees than at the present day. Some authorities, however, dispute this, in a

measure, by saying that it was not naturally forested, and that the trees growing represented orchards of olives or other fruit trees planted by the Romans or romanized Berbers. But in the Majerda Mountains there are dense primeval forests lingering to the present day, and consisting chiefly of the cork oak (Quercus ruber), and two other species of oak (Quercus mirbeckii and Q. kermes), the pistachio or terebinth tree, the sumach (Rhus pentaphila), and other species of Rhus which are widely spread. In the mountains of Khmiria and the central plateau there are also the alder, the poplar, the Aleppo pine, the caroub, the tamarisk, the maple, the nettle-tree, several willows and junipers. The jujube-tree (Zizyphus) is found at various places along the eastern littoral. The retama shrub is met with in sandy districts, especially in the Sahara, but also right up to the north of Tunisia. The wild olive, the wild cherry, two species of wild plums, the myrtle, the ivy, arbutus, and two species of holly are found in the mountains of Khmiria, at various sites at high elevation near Tunis and Bizerta, and along the 1 mountainous belt of the south-west which forms the frontier region between Tunisia and Algeria. The present writer, riding up to these frontier mountains from the thoroughly Saharan country round Gafsa, found himself surrounded by a flora very reminiscent of Switzerland or England. On the other hand, the flora of the shat region, of the south-eastern littoral, and of the Kerkena islands opposite Sfax, is thoroughly Saharan, with a dash, as it were, in places of an African element. The date palm grows wild, as has been already related, in Jerba. The only other species of palm found wild in Tunisia is the Chamaerops humilis, or dwarf palm, which is found on the mountains of the north at no very great altitude. The wild flowers of the north of Tunisia are so extremely beautiful during the months of February, March and April as to constitute a distinct attraction in themselves. 2

‘See.L. Pervinquiere, L’ Etude geologique de la Tunisie centrale (Paris, 1903) ; G. Rolland, ” Carte geologique du littoral nord de la Tunisie,” Bull. soc. geol. de la France (1888), vol. xvii. ; H. H. Johnston, ” A Journey through the Tunisian Sahara,” Geog. Journ. (1898), vol. xi.; Carte geologique de la regence de Tunis, 1:800,000 with notes (Tunis, 1892).

2 List of Plants commonly met with in northern Tunisia :—

Adonis microcarpa, DC. Nigella damascena, L. Fumaria spicata, L. Cistus halimifolius, L. Silene rubella, L. Oxalis cernua, Thunb. Geranium tuberosum, L. Malva sylvestris, L. Telragonolobus purpureus, Moench. Retama retam, Webb. ” Fedia cornucopiae, Gaertn. Helichrysum Stoechas, DC. Centaurea (Seridia), sp. Urospermum Dalechampi, Desf. Scorzonera alexandrina, Boiss. Stachys hirta, L. Stachys, sp. not identified. Anagallis collina, Schousb. Convolvulus tricolor, L. Solenanthus lanatus, DC.

Lycium europaeum, L. Solanum sodomaeum, L. Celsia cretica, L. Linaria, sp. allied to L. reflexa,

Desf. Linaria triphylla, L, var. Orobanche, sp. Trixago apula, Stev. Cynomorium coccineum. Plantago albicans, L. “Euphorbia serrata, L. Ophrys fusca, Link. Orchis papilionacea, L. Romulea bulbocodium, Sebast. and

Mauri. Gladiolus byzantinus, Mill. Ornithogalum umbellatum, L. Allium roseum, L. A sphodelus fistulosus, _L. Muscari comosum, Mill,

Fauna.— The fauna of Tunisia at the present day is much im- poverished as regards mammals, birds and reptiles. In 1880 the present writer saw lions killed in the north-west of Tunisia, but by 1902 the lion was regarded as practically extinct in the regency, though occasional rumours of his appearance come from the Khmir Mountains and near Feriana. Leopards of large size are still found in the north-west of central Tunisia. The cheetah lingers in the extreme south of the Jerid; so also does the caracal lynx. The pardine lynx is found fairly abundantly in the west of Tunisia in the mountains and forest. The striped hyena is scattered over the country sparsely. The genet and the common jackal are fairly abundant. The common ichneumon is rare. The zorilla, another purely African species, is found in the south of Tunisia. The Barbary otter is present in the Majerda and in some of the salt lakes. The Tunisian hedgehog is peculiar to that country and to Algeria. There is a second species (Erinaceus deserti) which is common to all North Africa. In the south of Tunisia, especially about the shats, the elephant-shrew (Macroscelides) is found, ail animal of purely African

affinities. Tunisia does not appear to possess the Barbary ape, which is found in Algeria and Morocco. Natives of Morocco and of the Sahara oases occasionally bring with them young baboons which they assert are obtained in various Sahara countries to the south and south-west of Tunisia. These baboons appear to belong to the Nubian species, but they cannot be considered indigenous to any part of Tunisia. The porcupine and a large Octodont rodent (Ctenodactylus), the jerboa (two species), the hare, and various other rodents are met with in Tunisia. The wild boar inhabits the country, in spite of much persecution at the hands of " chasseurs." The forested regions shelter the hand- some Barbary red deer, which is peculiar to this region and the adjoining districts of Algeria. In the extreme south, in the Sahara desert, the addax antelope is still found. The hartebeest appears now to be quite extinct; so also is the leucoryx, though formerly these two antelopes were found right up to the centre of Tunisia, as was also the ostrich, now entirely absent from the country. In the marshy lake near Mater (north Tunisia), round the mountain island of Jebel Ashkel, is a herd of over 50 buffalpes; these are said to resemble the domestic (Indian) buffalo of the Levant and Italy, and to have their origin in a gift of domestic buffaloes from a former king of Naples to a bey or dey of Tunis. Others again assert the buffaloes to have been there from time immemorial; in which case it is very desirable that a specimen should be submitted for examination. [An allied form with gigantic horns is found fossil in Algeria.] They are the private property of the bey, who very properly preserves them. Far down in the Sahara, to the south of Tunisia, the Arabs report the existence of a wild ass, ap- parently identical with that of Nubia. Roman mosaics show representations not only of this ass, but of the oryx, hartebeest, and perhaps of the addax. The dorcas gazelle is still common in the south of Tunisia ; but perhaps the most interesting ruminant is the magnificent udad, or Barbary sheep, which is found in the sterile mountainous regions of south Tunisia. The birds have been ably illustrated by Mr Whitaker in the Ibis magazine of the British Ornithological Union. They are, as a rule, common to the south Mediterranean region. A beautiful little bird almost peculiar to the south of Tunisia and the adjoining regions of Algeria, is a specieˆ of bunting (Fringilla), called by the Arabs bu-habibi. 3 This little bird, which is about the

size of the linnet, has the head and baqk silvery blue, and the rest of the plumage chocolate red-brbwn. It is of the most engaging tameness, being fortunately protected by popular sentiment from injury. It inhabits the Jerid, and extends thence across the Algerian frontier. Among reptiles the Egyptian cobra seems to be indigenous in the south, where also is found the dreaded horned viper. Some nine or ten other species of snakes are present, together with an abundance of lizards, including the Varanus, and most species of Mediterranean tortoises are represented. The coasts are very rich in fish, and the tunny fisheries of the north are one of the principal sources from which the world's supply of tunny is derived.

Inhabitants. — The natives of Tunisia at the present day belong mainly to two stocks, which may be roughly classified as the Berber (q.v.) and the Arab (q.v.), about two-thirds being of Berber and the remaining third of Arab descent. But the Berbers of to-day are little more than an incomplete fusion of some four earlier and once independent stocks. These four divisions taken in the order of their assumed priority of invasion or habitation are: (1) the " Neanderthal " type, which is found in the districts of the shats and the adjoining Matmata table-land in the south, and in the " Kroumir" country of the

Schiunt sericeum, Vahl. Arum italicum, Mill.

Echium maritimum, Willd. Lagurus ovatus, L.

Anchusa italica, Retz.

To this list should also be added the common wild tulip, the Italian cyclamen, the common scarlet poppy, the fennel, wild carrot and many varieties of thistle, some of gorgeous colouring.

' " Father of my friend."

north-west; 1 (2) ordinary Berbers, dolichocephalous, and of brown complexion, found over the greater part of Tunisia, espe- cially in the east and south centre; (3) the

short-headed Berbers, found in part of the Matmata country, part of the Sahara, the island of Jerba, the Cape Bon Peninsula, and the vicinity of Susa, Kairwan, and Sfax; (4) Berbers of a blond type, that is to say, with a tendency to brown or yellow moustaches, brown beard and head hair, and grey eyes. These are met with in the west and north-west of Tunisia, and in one patch on the coast of the Cape Bon Peninsula, near Nabeul.

The Arabs of more or less unmixed descent are purely nomads. They are met with in a long strip of country south of the Majerda, between the Algerian frontier and the sea-coast north of Susa; also inland, to the south-west of Susa, and near Kef; also in another long strip between the vicinity of Sfax on the north and the Jerld on the south. They are descended from the second Arab invasion which began in the nth century (see History). The extreme south of Tunis is ranged over by Berber Tawareq 2 or Tamasheq. Berber dialects are still spoken in Tunisia in the island of Jerba, in the Matmata country, and in the Tunisian Sahara. Elsewhere to a remarkable degree the Arabic language has extinguished the Berber tongue, though no doubt in vulgar Tunisian a good many Berber words remain. Short vocabularies of the Berber spoken in the Tunisian Sahara have been published by Sir H. H. Johnston in the Geog. Journ. (1898), vol. xi., and by Mr G. B. Michell in the Journ. African Soc. (1903). The Berbers are organized in tribes with purely democratic government and laws of their own, which are not those of the Koran.

On the north-eastern littoral of Tunisia the population is very mixed. The inhabitants of the Cape Bon Peninsula show evident signs of Greek blood arising from Greek invasions, which began in prehistoric times and finished with the downfall of the Byzantine Empire in North Africa. The presence of the Romans, and the constant introduction of. the Italians, first as slaves, and quite recently as colonists, has also added an Italian element to the north Tunisian population. But from the fact that the bulk of the Tunisian population belongs to the Iberian section of the Berbers, and to this being no doubt the fundamental stock of most Italian peoples, the intermixture of the Italianized Berber with his African brother has not much affected the physique of the people, though it may haye slightly tinged their mental characteristics.

The Phoenicians have left no marked trace of their presence; but inasmuch as they were probably of nearly the same race as the Arabs, it would not be easy to distinguish the two types. Arab and Berber have mingled to some extent, though no considerable fusion of the two elements has taken place. In fact, it is thought by some French students of the country that the Arab element will probably be eliminated from Tunisia, as it is the most unsettled. It is considered that these nomads will be gently pushed back towards the Sahara, leaving cultivable Tunisia to the settled Berber stock, a stock fundamentally one with the peoples of Mediterranean Europe.

The inhabitants of the coast towns belong, in large, part, to the class generally known as ” Moors.” The pure Turks and the Kuluglis (sons of Turkish fathers by Moorish women or slave girls) are no longer numerous. Among the ” Moors ” the descendants of the Andalusian refugees form an exclusive and aristocratic class.

The present population of Tunisia numbers approximately 2,000,000, and consists of: —

Berbers, more or less of pure race, say . . . 620,000 Arabs, „ „ ,, . . . 500,000

Mixed Arab and Berber peoples, say 520,006

1 In this Matmata country are the celebrated Troglodytes, people living in caves and underground dwellings now, much as they did in the days when the early Greek geographers alluded to them. See ” A Journey in the Tunisian Sahara,” by Sir H. H. Johnston, in the Geog. Journ. (June 1898).

1 Tawareq (Tuareg) is the Arab designation of the Libyan or Desert Berbers. It is the plural form of Tarqi, ” a raider.” The Tawareq call themselves by some variant of the root Masheq — Tamasheq, Imoshogh, &c.

; ‘ Moors ” (chiefly the population of the principal cities, of mixed Roman, Berber, Spanish, Moor and Christian races), say 110,000

Sudanese negroes and natives of Morocco, Tripoli

and Turkey, say 40,000

Jews (mostly natives of Tunis, indeed, some descended from families settled at Carthage before the destruction of Jerusalem) . . . 68,000

Europeans (Christians) 3 163,000

Towns.— Besides the capital, Tunis, the chief towns of Tunisia are Sfax, Susa and Kairwan. These places are noticed separately, as are also Goletta (formerly the port of Tunis), Bizerta (a naval port and arsenal), Kef, Porto Farina, and the ruins at Carthage and Sbeitla (Sufetula). Other towns of Tunisia are, on the east coast, Nabeul, pop. about 5000, the ancient Neapolis, noted for the mild- ness of its climate and its pottery manufactures; Hammamet with 3700 inhabitants; Monastir (the Ruspina of the Romans), a walled town with 5600 inhabitants and a trade in cereals and oils; Mahdiya or Mahdia (q.v. ; in ancient chronicles called the city of Africa and sometimes the capital of the country) with 8500 inhabitants, the fallen city of the Fatimites, which since the French occupation has risen from its ruins, and has a new harbour (the ancient Cothon or harbour, of Phoenician origin, cut out of the rock is nearly dry but in excellent preservation); and Gabes (Tacape of the Romans, Qabis of the Arabs) on the Syrtis, a group of small villages, with an aggregate population of 16,000, the port of the Shat country and a dep6t of the esparto trade. The chief town of the Majerda basin is Beja (pop. 5000), the ancient Vaga, an important corn market. The principal mosque at Beja was originally a Christian basilica, and is still dedicated to Sidna Aissa (our Lord Jesus). Gafsa, in the south of Tunisia, is a most interesting old Roman town, with hot springs. It is in railway communication with Sfax. West of Gafsa are immense beds of phosphates. Almost all the towns of Tunisia were originally Roman or romanized Berber settlements; consequently 1jie remains of Roman buildings form a large part of the material of which their existing structures are composed.

Antiquities and Art. — The principal Roman and other ruins in the regency are the aqueducts near the capital (Tunis) and the temple at Zaghwan, described under Tunis city; the great reservoir near Carthage (q.v.); the

amphitheatre at El Jem (see SusA); the temples and other ruins of Sbeitla (q.v.); the ruins of Dugga, near Tebursuk, in the north-west of the regency (the amphitheatre of Dugga, the ancient Thugga, is a magnificent spectacle); the baths, amphitheatre and temples of Feriana (the ancient Thelepte); the whole route between Feriana (which is in the south of Tunisia, 33 m. north-west of Gafsa) and Tebessa in Algeria is strewn on both sides with Roman ruins; the old houses and other ruins at and near Thala; the baths and other ruins of Gafsa; the baths at Tuzer, El Hamma and Gabes. There is an interesting Phoenician burial-ground near Mahdia. There are Roman ruins, scarcely known, in the vicinity of Beja and the country of the Mogods (the district behind Cape Serrat). In short, Tunisia is as much strewn with Roman remains as is Italy itself.

Saracenic art has perhaps not attained here the high degree it reached in western Algeria, Spain and Egypt; still it presents much that is beautiful to see and worthy to be studied. .One of the most ancient, as it is one of the loveliest fragments, strange to say, is found at Tuzer, in the Jerid, the mahrab of a ruined mosque. 4 There are some very beautiful doorways to mosques and other specimens of Moorish art at Gabes. Examples of this art found at Tunis and Kairwan have been noticed under those headings. But the visible remains of Saracenic art in Tunis and its vicinity are of relatively recent date, the few mosques which might offer earlier examples not being open to inspection by Christians. It may be noted, however, as a general condition that the native towns and villages of Tunisia, where they have not been spoiled by the shocking tastelessness of Mediterranean Europe, are exceedingly picturesque, and offer exceptional attractions to the painter.

Industries. — Agriculture is the principal industry. Oats, wheat and barley are the chief crops in the north. In the central region

• Of recent introduction for the most part, consisting (census of 1906) of 81,156 Italians, 34,610 French, 10,330 Maltese, about 1000 Greeks and the remainder British, German, Austrian, &c. The French army of occupation (20,360 men) is not included in these figures.

1 Since this was written the mahrab in question has been removed 1 to Paris.

the olive is largely cultivated, in the south the date-palm. Viti- culture is also of importance; almonds, oranges, lemons, &c, are also grown for export. The alfa and cork industries employ large numbers of persons, as do also the sardine, anchovy and tunny fisheries. The fisheries are in the hands of Italians, Maltese and Greeks. There are large herds of cattle and flocks of sheep and goats. About 60,000 acres are cultivated by French immigrants and about 15,000 acres by Italians.

Among native industries may be mentioned the spinning and weaving of wool for clothing, carpet-weaving, the manufacture of pottery, slippers and matting, saddle-making and leather em- broidery. Silk-weaving, formerly important, is declining.

In 1907 the number of mines working was 32. The export of phosphates rose from 445,000 tons in 1904 to 1,267,000 tons in 1908. The export of coal in that year was 74,000 tons, and copper ore 937 tons (vide supra, § Minerals).

Commerce. — The commerce of Tunisia has thriven under the French protectorate, having risen from an annual total of about £1,700,000 in 1881 to £8,687,000 in 1908. British trade with Tunisia has nearly tripled since the establishment of the French protectorate. It stood at over £600,000 in annual value during the year 1898. In 1908 the total trade with Great Britain and Malta amounted to £914,000. In the same year the imports from France exceeded £2,750,000 and the exports to France £1,685,000. From Algeria the imports were £656,000; to Algeria the exports were £185,000. The principal exports are olive oil, wheat, esparto grass, barley, sponges, dates, fish (especially tunny), hides, horses, wool, phosphates, copper, zinc and lead. The imports consist mainly of European manufactured goods (especially British cotton), machinery, flour, alcohol, sugar, timber, coal and petroleum. About half the shipping trade is in the hands of the French ; in 1908, of the total

tonnage of ships entered, 4,155,009, French vessels represented 1,905,000 tons, Italian vessels 1,422,000 tons and British vessels 299,000 tons.

Communications. — The French have made since 1882 about 2000 m. of good roads. The first railway built (1871-1872) was that between Goletta and Tunis. This line, with the extensions to La Marsa and Bardo, is 2iJ m. in length. It was constructed by an English company, which in 1880 sold it to an Italian company, despite the keen competition of French rivals (see History, below). The conversion of Tunis into a seaport (1893) destroyed the impor- tance of this line, which was then sold to the French Bone-Guelma Company (Bone-Guelma et Prolongements) , which owns the majority of the railways in Tunisia.

The second railway connects the capital with the frontier of Algeria, where, at Suk Ahras, it joins the main line to Constantine, Algiers, &c. This line was built by the Bone-Guelma Company. The concession was obtained in 1877, and the line, 191 m. long, was finished in 1880. A branch line (8 m.) connected Beja with this railway, and another (11 m.) ran from Tunis to Hamman-el- Enf, a favourite seaside resort of the Tunisians.

For the next twelve years there was a pause in railway construc- tion followed by trie opening, in 1892, of the line between Susa and Moknine (30 m.). Then came the continuation of the line from Hamman-el-Enf to Hammamet and along the Sahel to Susa (93 m.), and the building of a line from Susa to Kairwan, 31 m. (the last- named line superseded a horse-tramway built by the French army during the campaign of 1881). A branch line to Bizerta (435- m.) from Jedeida on the main Algeria-Tunis line was also built as well as one from Tunis to Zaghwan (44 m.). A short line, branching from the Tunis-Zaghwan line, was carried south-west to Pont du Fahs. These with a few short branch lines were built between 1892 and 1900 by the Bone-Guelma Company. In 1906 was opened a con- tinuation of the line from Pont du Fahs to Kef and thence south- west to Kalaat-es-Senam, a place midway between Kef and Tebessa, the centre of the Algerian phosphate region. A branch from the Kef line runs to the phosphate mines of Kalaa-Jerda.

Another railway (completed by 1900) runs from Sfax, along the coast to Mahres, thence inland to Gafsa and the phosphate mines of Metalwi. This line, 151 m. long, was for some years isolated from the general Tunisian system. The total mileage of the Tunisian railways was computed to be 1060 m. by the finishing of the Susa- Sfax, Gabes-Tebessa lines in 1909. Extensions of the railway system are contemplated to Gabes and, beyond, to the Tripolitan frontier. In the south communication is maintained chiefly by camel caravans.

Posts and Telegraphs.— The whole of Tunisia is covered with a network of telegraph lines (2500 m.), and there are telephones working in most of the large towns. The telegraph system pene- trates to the farthest French post in the Sahara, is connected with the Turkish system on the Tripolitan frontier and with Algeria, and by cable with Sicily, Malta, Sardinia and Marseilles. There is an efficient post office service, with about 400 post offices.

Finance. — The principal bank is the Banque de Tunisie. The coinage formerly was the caroub and piastre (the latter worth about 6d.), but in 1891 the French reformed the Coinage, sub- stituting the franc as a unit, and having the money minted at Paris. The values of the coinage are pieces of 5 and 10 centimes in bronze, of 50 centimes, 1 franc and 2 francs in silver, of 10 francs and 20 francs in gold. The inscriptions are in French and Arabic.

The public debt was consolidated in 1884 into a total of £5,702,000, guaranteed by France, and bearing 4% interest. In 1888 it was converted into a loan paying 3 J % interest, and in 1892 another conversion reduced the rate of interest to 3 . In 1902 a new loan of £1,800,000 was issued at 3. At the beginning of 1907 the total Tunisian debt was £9,287,260; in that year the government was authorized to contract another loan of £5,000,000 at 3% (£3.000,000 being guaranteed by France) for railways, roads and colonization. The weights and measures are those of France. The revenue for the year 1900 was £1 ,456,640, and the expenditure was £1,452,597. In 1910 receipts and expenditure balanced at about £1,888,000 each. The principal sources of revenue are direct taxation, stamp and death duties, customs, port and lighthouse dues, octroi and tithes, tobacco, salt and gunpowder monopolies, postal and

telegraph receipts, and revenue from the state domains (lands, fisheries, forests, mines). The civil list paid to the Bey of Tunis amounts to £36,000 per annum, and the endowment of the princes and princesses of the beylical family to £31,200 a year more.

Administration. — From a native's point of view Tunisia still appears to be governed by the Bey of Tunis, his Arab ministers and his Arab officials, the French only exercising an indirect— though a very real — control over the indigenous population (Mahommedans and Jews). But all Christians and foreigners are directly governed by the French, and the native administration is supervised by a staff of thirteen French controleurs and their French and Tunisian subordinates. Seven of the departments of state have Frenchmen at their head, the other two, Tunisians: thus the larger proportion of the Bey's ministers are French. France is directly represented in Tunisia by a minister resident-general, and by an assistant resident. The French resident-general is the virtual viceroy of Tunisia, and is minister for foreign affairs. Besides Mussulman (native) schools there were in the regency, in 1906, 158 public schools, 5 lycees and colleges and 21 private schools. At these schools were 22,000 pupils (13,000 boys), all save 3500 Mussulmans being Europeans or Jews.

History. — The history of Tunisia begins for us with the establishment of the Phoenician colonies (see Phoenicia and Carthage). The Punic settlers semitized the coast, but left the Berbers of the interior almost untouched. The Romans entered into the heritage of the Carthaginians and the vassal kings of Numidia, and Punic speech and civilization ihe gave way to Latin, a change which from the time Province of of Caesar was helped on by Italian colonization; to "Atrka." this region the Romans gave the name of " Africa," apparently a latinizing of the Berber term " Ifriqa," " Ifrigia " (in modern Arabic, Ifriqiyak).

Rich in corn, in herds, and in later times also in oil, and possessing valuable fisheries, mines and quarries, the province of Africa, of which Tunisia was the most important part, attained under the empire a prosperity to which Roman remains in all parts of the country still bear witness. Carthage was the second city of the Latin part of the empire, " after Rome the busiest and perhaps the most

corrupt city of the West, and the chief centre of Latin culture and letters." In the early history of Latin Christianity Africa holds a more important place than Italy. It was here that Christian Latin literature took its rise, and to this province belong the names of Tertullian and Cyprian, of Arnobius and Lactantius, above all of Augustine. Lost to Rome by the invasion of the Vandals, who took Carthage in 439, the province was recovered by Belisarius a century later (533-34), and remained Roman till the Arab invasions of 648-69. The conqueror, 'Oqba-bin-Nafa, founded the city of Kairwan (673) which was the residence of the governors of " Ifriqiyah " under the Omayyads and thereafter the capital of the Aghlabite princes, the conquerors of Sicily, who ruled in merely nominal dependence on the Abbasids.

The Latin element in Africa and the Christian faith almost disappeared in a single generation; 1 the Berbers of the

t 1 The North African Church was not utterly swept away by the Moslem conquest, though its numbers at that time were Very greatly diminished, and thereafter fell gradually to vanishing point, partly by emigration to Europe. Its episcopate in the 10th century still numbered thirty members, but in 1076 the Church could not provide three bishops to consecrate a new member of the episcopate, « and for that purpose Gregory VII. named two bishops to act with the archbishop of Carthage. In the 13th century the native episcopate had disappeared. Abd ul-Mumin, the Almohade con- queror of Tunisia, compelled many of the native Christians to embrace Islam, but when Tunis was captured by Charles V. in 1535, there were still found in the city native Christians, the last remnants of the

mountains, who had never been latinized and never really christianized, accepted Islam without difficulty, but showed Arab Con- tne ' r stubborn nationality, not only in the character quest and of their Mahommedanism, which has always been Berber mixed up with the worship of living as well as Dynasties. (j ea(j sa ints (marabouts) and other peculiarities, but also in political movements. The empire

of the Fatimites (q.v.) rested on Berber support, and from that time forth till the advent of the Turks the dynasties of North Africa were really native, even when they claimed descent from some illustrious Arab stock. When the seat of the Fatimite Empire was removed to Egypt, the Zirites, a house of the Sanhaja Berbers, ruled as their lieutenants at Mahdia, and about 1050 Mo'izz the Zlrite, in connexion with a religious movement against the Shi'ites, transferred his very nominal allegiance to the Abbasid caliphs. The Fatimites in revenge let loose upon Africa about a.d. 1045 a vast horde of Beduins from Upper Egypt (Beni Hilal and Solaim), the ancestors of the modern nomads of Barbary. All North Africa was ravaged by the invaders, who, though unable to found an empire or overthrow the settled government in the towns, forced the agricultural Berbers into the mountains, and, retaining from generation to generation their lawless and predatory habits, made order and prosperity almost impossible in the open parts of the country until its effective occupations by the French. The Zirite dynasty was finally extinguished by Roger I. of Sicily, who took Mahdia in 1148 and established his authority over all the Tunisian coast. Even Moslem historians speak favourably of the Norman rule in Africa; but it was brought to an early end by the Almohade caliph Abd ul-Mumin, who took Mahdia in 1 160.

The Almohade Empire soon began to decay, and in 1336 Abu Zakariya, prince of Tunis, was able to proclaim himself

independent and found a dynasty, which subsisted Hafsites, l '^ tte advent of the Turks. The Hafsites (so called

from Abu. Hafs, the ancestor of Abu Zakariya, a Berber chieftain who had been one of the intimate disciples of the Almohade mahdi) assumed the title of Prince of the Faithful, a dignity which was acknowledged even at Mecca, when in the days of Mostansir, the second Hafsite, the fall of Bagdad left Islam without a titular head. In its best days the empire of the Hafsites extended from Tlemjen to Tripoli, and they received homage from the Merinids of Fez; they held their own against repeated Frankish invasions, of which the most notable were that which cost St Louis of France his life (1270), and that of the duke of Bourbon (1390), when English troops took part in the unsuc- cessful siege of Mahdia. They adorned Tunis with mosques, schools

and other institutions, favoured letters, and in general appear to have risen above the usual level of Moslem sovereigns. But their rule was troubled by continual wars and insurrections; the support of the Beduin Arabs was imperfectly secured by pensions, which formed a heavy burden on the finances of the state; 1 and in later times the dynasty was weakened by family dissensions. Leo Africanus, writing early in the 16th century, gives a favourable picture of the " great city " of Tunis, which had a flourishing manufacture of fine cloth, a prosperous colony of Christian traders, and, including the suburbs, nine or ten thousand hearths; but he speaks also of the decay of once flourishing provincial towns, and especially of agriculture, the

once powerful Church. Traces of Christianity remained among the Kabyles till after the conquest of Granada (1492), when the in- flux of Andalusian Moors from Spain completed the conversion of those tribes. It may be added that down to the early years of the 19th century it was alleged that some of the Tuareg tribes in the Sahara professed Christianity (see e.g. Hornemann's Travels). For the North African Church after the Moslem conquest, see . Migne, Pat. lot.; and Mas Latrie, Afrique septentrionale. Their information is summarized in the introduction to vol. ii. of Azurara's Discovery and Conquest of Guinea, Hakluyt Society's edition (1899).— Ed.]

1 In the 13th and 14th centuries the Hafsites also paid tribute to Sicily for the freedom of the sea and the right to import Sicilian corn — a clear proof of the decline of Tunisian agriculture.

greater part of the open country lying waste for fear of the Arab marauders. Taxation was heavy, and the revenue very considerable: Don Juan of Austria, in a report to Philip II., states that the land revenue alone under the last Hafsite was 375)935 ducats, but of this a great part went in tribute to the Arabs.

The conquest of Algiers by the Turks gave a dangerous neighbour to Tunisia, and after the death of Mohammed the Hafsite in 1525 a disputed succession supplied Khair- ad-Din Barbarossa with a pretext for occupying the conauest city in the name of the sultan of Constantinople. Al-Hasan,

the son of Mahommed, sought help from the emperor, and was restored in 1535 as a Spanish vassal, by a force which Charles V. commanded in person, while Andrea Doria was admiral of the fleet. But the conquest was far from complete, and was never consolidated. The Spaniards remained at Goletta and made it a strong fortress, they also occupied the island of Jerba and some points on the south-east coast; but the interior was a prey to anarchy and civil war, until in 1570 'All-Pasha of Algiers utterly defeated Hamid, the son and suc- cessor of Hasan, and occupied Tunis. In 1573 the Turks again retreated on the approach of Don Juan, who had dreams of making himself king of Tunis; but this success was not followed up, and in the next year Sultan Selim II. sent a strong expedition which drove the Spaniards from Tunis and Goletta, and reduced the country to a Turkish province. Nevertheless the Spanish occupation left a deep impression on the coast of Tunis, and not a few Spanish words passed into Tunisian Arabic. After the Turkish conquest, the civil administration was placed under a pasha; but in a few years a military revolution trans- ferred the supreme power to a Dey elected by the janissaries, who formed the army of occupation. The government of the Deys lasted till 1705, but was soon narrowed or overshadowed by the authority of the Beys, whose Beys. proper function was to manage the tribes and collect tribute. From 1631 to 1702 the office of Bey was hereditary in the descendants of Murad, a Corsican renegade, and their rivalry with the Deys and internal dissensions kept the country in constant disorder. Ibrahim, the last of the Deys (1702-1705), destroyed the house of Murad, and absorbed the beyship in his own office; but, when he fell in battle with the Algerians, Hussein b. 'All, the son of a Cretan rene- gade, was proclaimed sovereign by the troops under the title of " Bey," and, being a prince of energy and ability, was able to establish the hereditary sovereignty, which has lasted without change of dynasty to the present time. 2

Frequent wars with Algiers form the chief incidents in the internal history of Tunisia under the Beys. Under Deys and Beys alike Tunisia was essentially a pirate state. Occasionally acts of chastisement, of which the bombardment of Porto Farina by Blake in 1655 was the most notable, and repeated treaties, extorted by -European

powers, checked from time to time, but did not put an end to, the habitual piracies, on which indeed the public revenue of Tunis was mainly dependent. The powers were generally less concerned for the captives than for the acquisition of trading privileges, and the Beys took advantage of the commercial rivalry of England and France to play off the one power against the other. The release of all Christian slaves was not effected till after the bombardment of Algiers; and the definite abandonment of piracy may be dated from the presentation to the Bey in 1819 of a collective note of the powers assembled at Aix-la-Chapelle. The government had not elasticity enough to adapt itself to so profound a change in its ancient traditions; the finances became more and more hopelessly embarrassed, in spite of ruinous taxation; and attempts at European innovations in the court and army made matters only worse, so long as no attempt was made to improve

2 Muhammad VI. es Sadok, the reigning Bey at the time of the

French occupation, died in October 1882, and was succeeded by

his brother Ali IV. This prince reigned until 1902, the throne

then passing to his son Muhammad VII. el Hadi, who died in 1906,

I when his cousin Muhammad VIII. en Nasr (b. 1855) became Bey.

the internal condition of the country. In the third quarter of the 19th century not more than a tenth part of the fertile land was under cultivation, and the yearly charge on the public debt exceeded the whole annual revenue. In these circum- stances only the rivalry of the European powers that had interests in Tunisia protracted from year to year the inevitable revolution. The French began to regard the dominions of the Bey as a natural adjunct to Algeria, but after the Crimean War Turkish rights over the regency of

Tunis were revived. . After the Franco-German War the embarrassed Bey turned towards Great Britain for advice, and a British protectorate — suggested by the proximity of Malta — was not an impossibility under the remarkable influence of the celebrated Sir Richard Wood, British diplomatic agent at the court of Tunis from 1855 to 1879. The railways, lighthouses, gas and waterworks and other concessions and industries were placed in British hands. But in 1878, at the Congress of Berlin, Lord Salisbury agreed to allow France a ” free hand ” in Tunisia in return for French acquiescence in the British lease of Cyprus.

After 1862, however, the kingdom of Italy began to take a deep interest in the future of Tunisia. When the country Occupation went bankrupt in 1869, a triple control was estab- byihe lished over Tunisian finances, with British, French French. and Ita jj an “controllers.” In 1880 the Italians bought the British railway from Tunis to Goletta. This and other actions excited the French to act on the secret under- standing effected with the British foreign minister at the Berlin Congress. In i88r a French force crossed the Algerian frontier under pretext of chastising the independent Khmir or Kroumir tribes on the north-east of the regency, and, quickly dropping the mask, advanced on the capital and com- pelled the Bey to accept the French protectorate. The actual conquest of the country was not effected without a serious struggle with Moslem fanaticism, especially at Sfax; but all Tunisia was brought completely under French jurisdiction and administration, supported by military posts at every important point. In 1883 the new situation under the French protectorate was recognized by the British government with- drawing its consular jurisdiction in favour of the French courts, and in 1885 it ceased to be represented by a diplomatic official. The other powers followed suit, except Italy, which did not recognize the full consequences of the French protectorate until 1896. In 1884 a thorough reform of the government and administration of the country was begun under the direction of a succession of eminent French residents-general. In 1897 Great Britain surrendered her commercial treaty with Tunisia and agreed (subject to a special temporary privilege regarding cotton goods) to allow her commerce and all other relations with Tunisia to be subjected to the same conditions as those affecting all such

relations between Britain and France.

The French protectorate over Tunisia, based on the treaty signed by the Bey at Bardo on the 12th of May 1881 and con- Reiations firmed by the treaty of La Marsa (June 8, 1883), was with not recognized by Turkey, which claimed the regency

Turkey. as p art { ˆg Ottoman dominions. The protests of the Porte were ignored by the French, and in 1892 Turkey so far recognized the actual situation as to determine the Tunisia- Tripoli frontier as far south as Ghadames. South of that point the Saharan frontiers of Algeria, Tunisia and Tripoli remained undefined. Working eastward from Tunisia and Algeria the French occupied several points to which Turkey laid claim. Thus the oasis of Janet, S.S.W. of Rhat, was occupied in 1906. The action of France led to counter-action by Turkey and to. various frontier incidents. Janet was re- occupied by Ottoman troops in the summer of 1910, but in deference to French protests the troops were withdrawn pending the delimitation of the frontier. At the same time Turkey maintained the claim that Tunisians were Ottoman subjects.

Frontier troubles had however little effect on the remainder of the protectorate. In 1904-1905 there were famines and some native discontent in the south of Tunisia; but in general the country has prospered amazingly under the French protec-

torate. The native dynasty has been strengthened rather than weakened, and Tunisia may be pointed out as the best and wisest example of French administration over an alien land and race. Though on a smaller scale it is worthy to be set as a pendant to the British work in Egypt.

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I'Afrique, by Pelissier and Remusat, Paris, 1845, in Expl. scient. de I'Algtrie, vol. vii. ; Arabic text, Tunis, 1286 a.h.) deals especially with Tunisia and goes down to 1 68 1. Especially valuable and lucid are the following works: Ernest Merrier, Histoire de I'Afrique septentrionale {Berberie) (3 vols., Paris, 1891), and Histoire de I etablissement des Arabes dans I'Afrique septentrionale selon les auteurs arabes (Paris, 1875); Stanley Lane Poole, The Barbary Corsairs (" Story of the Nations Series," London, 1890), deals in part with the history of Tunisia. Other works which should be studied are: Dr Thos. Shaw's Travels ('757); Leo Africanus's description of Africa in Ramusio and in Purchas's Pilgrims; Rousseau, Annates tunisiennes (Algiers, 1864); the late Sir R. Lambert Playfair, In the Footsteps of Bruce (London, 1887); A. M. Broadley, Tunis, Past and Present (Edinburgh, 1882); Guerin, Voyage archeologique (Paris, 1862); D'Herisson, Mission archeologique en Tunisie (Paris, 1884); E. D. Schoenfield, A us den Staaten aer Barbaresken (Berlin, 1902); Sir Harry Johnston, The Colonization of Africa (Cambridge, 1905); Gaston Loth, La Tunisie et I'ceuvre du protector at francais (Paris, 1907) ; Professor Arthur Girault, Princtpes de colonisation et de legislation coloniale, vol. iii. (3rd ed., Paris, 1908). Lists of all the rulers of Tunisia will be found in A. M. H. J. Stokvis, Manuel d'histoire, vol. i. (Leiden, 1898). The geography of Tunisia was first treated scientifically by E. Pelissier in the 16th volume of his Explor. scient. de I'Algerie (Paris, 1853) ; and by C. Tissot, Explor. scient. de la Tunisie: Geog. comparie de la province romaine d'Afrique (2 vols., Paris, 1 884-1 888); also in Murray's Handbook, by Sir R. L. Playfair (1887). The works of Canon Tristram on the Sahara describe southern Tunisia in the 'sixties of the 19th century. Two important articles on Tunisia appeared in Nos. 22 and 23 of the Revue generate des sciences (Paris, Nov. 30 and Dec. 15, 1896). Still more valuable is La, Tunisie francaise, in two volumes, a government publication (Paris, 1896). An article on the Tunisian Sahara, the Tunisian Cave-Dwellers and Berber Languages, &c, by Sir H. H. Johnston, was published in the Geog. Journ. for June 1898. Other articles by the same author appeared in the Graphic during the years 1899, 1900 and 1902. An interesting dissertation on the question of the Berber race is given in Professor A. H. Keane's Man, Past and Present. Numerous other works in English and

French have been published on Tunisia from the tourist's point of view; the best of these is by Douglas Sladen, Carthage and Tunis (2 vols., 1908). Gaston Boissier, L Afrique romaine (1895), is a «picturesque but somewhat super- ficial apercu of the principal Roman ruins. Flaubert's Sdlammbo ought always to be read by those who visit Carthage and Tunisia, It was mainly written at La Marsa, near Carthage. See also H. S. Ashbee, Bibliography of Tunisia (London, 1889). (H. H. J.)

TUNNEL (Fr. tonnel, later tonneau, a diminutive from Low Lat. tonna, tunna, a tun, cask), a more or less horizontal under- ground passage made without removing the top soil. In former times any long tube-like passage, however constructed, was called a tunnel. At the present day the word is sometimes popularly applied to an underground passage constructed by trenching down from the surface to build the arching and then refilling with the top soil; but a passage so constructed, although indistinguishable from a tunnel when completed, is more cor- rectly termed a " covered way," and the operations " cutting " and " covering," instead of tunnelling. Making a small tunnel, afterwards to be converted into a larger one, is called " driving a heading," and in mining operations small tunnels are termed " galleries," " driftways " and " adits." If the under- ground passage is vertical it is a shaft; if the shaft is begun at the surface the operations are known as "sinking"; and it is called a " rising " if worked upwards from a previously constructed heading or gallery.

Tunnelling has been effected by natural forces to a far greater extent than by man. In limestone districts innumerable swallow-holes, or shafts, have been sunk by the rain water following joints and dissolving the rock, and from the bottom of these shafts tunnels have been excavated to the sides of

hills in a manner strictly analogous to the ordinary method of executing a tunnel by sinking shafts at intervals and driving headings therefrom. Many rivers find thus a course under- ground. In Asia Minor one of the rivers on the route

of the Mersina railway extension pierces a hill by means of a natural tunnel, whilst a little south at Seleucia another river flows through a tunnel, 20 ft. wide and 23 ft. high, cut 1600 years ago through rock so hard that the chisel marks are still dis- cernible. The Mammoth Cave of Kentucky and the Peak caves of Derbyshire are examples of natural tunnelling. Mineral springs bring up vast quantities of matter in solution. It has been estimated that the Old Well Spring at Bath has discharged since the beginning of the 19th century solids equivalent to the excavation of a 6 ft. by 3 ft. heading 9 m. long; and yet the water is perfectly clear and the daily flow is only the 150th part of that pumped out of the great railway tunnel under the Severn. Tunnelling is also carried on to an enormous extent by the action of the sea. Where the Atlantic rollers break on the west coast of Ireland, or on the seaboard of the western Highlands of Scotland, numberless caves and tunnels have been formed in the cliffs, beside which artificial tunnelling operations appear insignificant. The most gigantic subaqueous demolition hitherto carried out by man was the blowing up in 1885 of Flood Rock, a mass about 9 acres in extent, near Long Island Sound, New York. To effect this gigantic work by a single instantaneous blast a shaft Was sunk 64 ft. below sea-level, from the bottom of which 4 m. of tunnels or galleries were driven so as to completely honeycomb the rock. The roof rock ranged from 10 ft. to 24 ft. in thickness, and was supported by 467 pillars 15 ft. square; 13,286 holes, averaging 9 ft. in length and 3 ins. in diameter, were drilled in the pillars and roof. About 80,000 cub. yds. of rock were excavated in the galleries and 275,000 remained to be blasted away. The holes were charged with no tons of " rackarock," a more powerful explosive than gunpowder, Which was fired by electricity, when the sea was lifted 100 ft. over the whole area of the rock. Where natural forces effect analogous results, the holes are bored and the headings driven by the chemical and mechanical action of the rain and sea, and the explosive force is obtained by the expansive action of air locked up in the fissures of the rock and compressed to many tons per square foot by impact from the waves. Artificial breakwaters have often been thus tunnelled into by the sea, the compressed air blowing out the blocks and the waves carrying away the debris.

With so many examples of jiatural caves and tunnels in existence it is not to be wondered at that tunnelling was one of the earliest works undertaken by man, first for dwellings and tombs, then for quarrying and mining, and finally for water-supply, drainage, and other requirements of civilization. A Theban king on ascending the throne began at once to drive the tunnel which was to form his final resting-place, and per- severed with the work until death. The tomb of Mineptah at Thebes was driven at a slope for a distance of 350 ft. into the hill, when a shaft was sunk and the tunnel projected a farther length of about 300 ft., and enlarged into a chamber for the sarcophagus. Tunnelling on a large scale was also carried on at the rock temples of Nubia and of India, and the architectural features of the entrances to some of these temples might be studied with advantage by the designers of modern tunnel fronts. Flinders Petrie has traced the method of underground quarrying followed by the Egyptians opposite the Pyramids. Parallel galleries about 20 ft. square were driven into the rock and cross galleries cut, so that a hall 300 to' 400 ft. wide was formed, with a roof supported by rows of pillars 20 ft. square and 20 ft. apart. Blocks of stone were removed by the workmen cutting grooves all round them, and, where the stone was not required for use, but merely had to be removed to form a gallery, the grooves were wide enough for a man to stand up in. Where granite, diorite and other hard stone had t.o be cut ihe work was done by tube drills and by saws supplied with corundum, or other hard gritty material, and water — the drills leaving a core of rock exactly like that of the modern diamond

drill. As instances of ancient tunnels through soft ground and requiring masonry arching, reference may be made to the Vaulted drain under the south-east palace of Nimrod and to the brick arched tunnel, 12 ft. high and 15 ft. wide, under the Euphrates. In Algeria, Switzerland, and wherever the Romans went, remains of tunnels for roads, drains and water-supply are found. Pliny refers to the tunnel constructed for the drainage of Lake Fucino as the greatest public work of the time. It wa» by far the longest tunnel in the world, being more than 3J m. in length, and was driven under Monte Salviano, which necessitated shafts no less than 400 ft. in depth. Forty shafts and a number of " cuniculi," or inclined galleries, were sunk, and the

excavated material was drawn up in copper pails, of about ten gallons capacity, by windlasses. The tunnel was designed to be 10 ft. high by 6 ft. wide, but its actual cross-section varied. It is stated that 30,000 labourers were occupied eleven years in its construction. With modern appliances such a tunnel could be driven from the two ends without intermediate shafts in eleven months.

No practical advance was made on the tunnelling methods of the Romans until gunpowder came into use. Old engravings of mining operations early in the 17th century show that excavation was still accomplished by pickaxes or hammer and chisel, and that wood fires were lighted at the ends of the headings to split and soften the rock in advance (see fig. 1).

(From Agricola's De re metallica, Basel, 1621.)

Fig. 1. — Method of mining, 1621.

Crude methods of ventilation by shaking cloths in the headings and by placing inclined boards at the top of the shafts are also on record. In 1766 a tunnel 9 ft. wide, 12 ft. high and 2880 yds. long was begun on the Grand Trunk Canal, England, and completed eleven years later; and this was followed by many others. On the introduction of railways tunnelling became one of the ordinary incidents of a contractor's work; probably upwards of 4000 railway tunnels have been executed.

Tunnelling under Rivers and Harbours. — In 1825 Marc Isambard Brunei began, and in 1843 completed, the Thames tunnel between Rotherhithe and Wapping now used by the East London railway. He employed a peculiar " shield," made of timber, in several independent sections. Part of the ground penetrated was almost liquid mud, and the cost of the tunnel was about £1300 per lineal yard. In 1818 he took out a patent for a tunnelling process, which included a shield, and which mentioned cast iron as a surrounding wall. His shield fore- shadowed the modern shield, which is substituted for the ordinary timber work of the tunnel, holds up the earth of excavation, affords space within its shelter for building the permanent walls, overlaps these walls in telescope fashion, and is moved forward by pushing against their front ends. The

advantages of cast-iron walls are that they have great strength

in small space as soon as the segments are bolted together, and they can be caulked water-tight.

In 1830 Lord Cochrane (afterwards 10th earl of Dundonald) patented the use of compressed air for shaftrsinking and tun- nelling in water-bearing strata. Water under any pressure can be kept out of a subaqueous chamber or tunnel by sufficient air of a greater pressure, and men can breathe and work therein — for a time — up to a pressure exceeding four atmo- spheres. The shield and cast-iron lining invented by Brunei, and the compressed air of Cochrane, have with the aid of later inventors largely removed the difficulties of subaqueous tunnel- ling. Cochrane's process was used for the foundation of bridge piers, &c, comparatively early, but neither of these devices was employed for tunnelling until half a century after their inven- tion. Two important subaqueous tunnels in the construction of which neither of these valuable aids was adopted are the Severn and the Mersey tunnels.

The Severn tunnel (fig. 16), 4I m. in length for a double line of railway, begun in 1873 and finished in 1886, Hawkshaw, Son, Hayter & Richardson being the engineers and T. A. Walker the contractor, is made almost wholly in the Trias and Coal Measure formations, but for a short distance at its eastern end passes through gravel. At the lowest part the depth is 60 ft. at low water and 100 ft. at high water, and the thickness of sandstone over the brickwork is 45 ft. Under a depression in the bed of the river on the English side there is a cover of only 30 ft. of marl. Much water was met with throughout. In 1879 th e works were flooded for months by a land spring on the Welsh side of the river, and on another occasion from a hole in the river bed at the Salmon Pool. This hole was subse- quently filled with clay and the works completed beneath. Two preliminary headings were driven across the river to test the ground. " Break-ups " were made at intervals of two to five chains and the arching was carried on at each of these points. All

parts of the excavation were timbered, and the greatest amount excavated in any one week was 6000 cub. yds. The total amount of water raised at all the pumping stations, is about 27,000,000 gallons in twenty-four hours.

The length of the Mersey tunnel (fig. 15) between Liverpool and Birkenhead between the pumping shafts on each side of the river is one mile. From each a drainage heading was driven through the sandstone with a rising gradient towards the centre of the river. This heading was partly bored out by a Beaumont machine to a diameter of 7 ft. 4 in. and at a rate attaining occasionally 65 lineal yds. per week. All of the tunnel excavation, amounting to 320,000 cub. yds., was got out by hand labour, since heavy blasting would have shaken the rock. The minimum cover between the top of the arch and the bed of the river is 30 ft. Pumping machinery is provided for 27,000,000 gallons per day, which is more than double the usual quantity of water. Messrs Brunlees & F.ox were the engineers, and Messrs Waddell the contractors for the works, which were opened in 1 886, about six years after the beginning of operations.

In 1869 P. W. Barlow and J. H. Greathead built the Tower foot-way under the Thames, using for the first time a cast-iron lining and a shield which embodied the main features of Brunei's design. Barlow had patented a shield in 1864, and A. E. Beach one in 1868. The latter was used in a short masonry tunnel under Broadway, New York City, at that time. In 1874 Greathead designed and built a shield, to be used in connexion with compressed air, for a proposed Woolwich tunnel under the Thames, but it was never used. Compressed air was first used in tunnel work by Hersent, at Antwerp, in 1879, in a small drift with a cast-iron lining.

In the same year compressed air was used for the first time in any important tunnel by D. C. Haskin in the famous first Hudson River tunnel, New York City. This was to be of two tubes, each having internal dimensions of about 16 ft. wide by 18 ft. high. The excavation as fast as made was lined with thin steel plates, and inside of these with brick. In June 1880 the northerly tube had reached 360 ft. from the Hoboken shaft, but a portion near the latter, not of full size, was being enlarged.' Just after a change of shifts the compressed air blew a hole through the soft silt in the roof at this spot, and the water entering drowned the twenty

men who were working therein. From time to time money was raised and the work advanced. Between 1888 and 1891 the northerly tuniiel was extended 2000 ft. to about three-fourths of the way across, with British capital and largely under the direction of British engineers — Sir Benjamin Baker and E. W. Moir. Compressed

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air and a shield were used, and the tunnel walls were made of bolted segments of cast iron. The money being exhausted, the tunnel was allowed tp fill with water, and it so remained for ten years: Both tubes were completed in 1908.

The use o£ compressed air in the Hudson tunnel, and of annular shields arid cast-iron lined tunnel in constructing the City & South London railway (1886 to 1890) by Great-head, became widely known and greatly influenced subaqueous and soft-ground tunnelling thereafter. The pair of tunnels for this railway from near the Monument to Stockwell, from 10 ft. 2 in. to 10 ft. 6 in. interior diameter, were constructed mostly in clay and without the use of compressed air, except for a comparatively short distance through water-bearing gravel. In this gravel a timber heading was made, through which the shield was pushed. The reported total cost was £840,000. Among the tunnels constructed after the City & South London work was well advanced, lined with cast-iron segments, and constructed by means of annular shields and the use of compressed air, were the St Clair (Joseph Hobson, engineer) from Sarnia to Port Huron, 1889-1890, through clay, and for a short distance through water-bearing gravel, 6000 ft., 18 ft. internal diameter; and the notable Blackwall tunnel under the Thames (Sir Alexander Binnie, engineer, and S. Pearson & Sons, contractors), through clay and 400 ft. of water-saturated gravel, 1892-1897, about 3116 ft. long, 24 ft. 3 in. in internal diameter. The. shield, 19 ft. 6 in. long, contained a bulkhead with movable shutters, as foreshadowed in Baker's pro- posed shield (fig. 2). Numerous tunnels of small diameter have been similarly con- structed under the Thames and Clyde for electric and cable ways, several for sewers in Melbourne, and two under the Seine at Paris for sewer siphons.

The Rotherhithe tunnel, under the Thames, for a road- way, with a length of 4863 ft. between por- tals, of which about 1400 ft. are directly under the river, has the largest cross-section of any sub- aqueous tube of this Fig. 2.— B. Baker's pneumatic shield, type in the world (see fig. 3). It was begun in 1904 and finished in 1908, Maurice Fitzmaurice being the engineer of design and construction, and Price & Reeves the contractors. It penetrates sandy and shelly clay overlying a seam of limestone beneath which are pebbles and loamy sand. A preliminary tunnel for exploration, 12 ft. in diameter, was driven across the river, the top being within 2 ft. of the following main tunnel. The top of the main tunnel excavation in the middle of the river was only 7 ft. from the bed of the Thames, and a temporary blanket of filled earth, usually allowed in similar cases, was prohibited owing to the close proximity of the docks. The maximum progress in one day was 12-5 ft., and the average in six days 10-4 ft. The air compressors were together capable of supplying 1,000,000 cub. ft. of air per hour.

Some tunnels of marked importance of this type — to be operated solely with electric cars — have been built under the East and Hudson rivers at New York. Two tubes of 15 ft. interior diameter and 4150 ft. long penetrate gneiss and gravel directly under the East River between the Battery and Brooklyn. They were begun in 1902, with Wm. B. Parsons and George S. Rice as engineers, and were finished in December 1907, under the direction of D. L. Hough of the

Detroit Kiver Tunnel. 2 tubes.

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Scale of Feet o 10 20

River Seine, Pari*, i tube

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Fig. 3. — Cross Sections ol Tunnels under Rivers and Harbours.

New York Tunnel Company. They carry subway trains. In one of the blow-outs of compressed air a workman was blown through the gravel roof into the river above. He lived until the next day. Two other tubes of the same size built also through gneiss and gravel between 1905 and 1907 by the Degnpn Contracting Company, with R. A. Shatter as the contractors' engineer, go from 42nd Street to Long Island City.

Four much larger tubes (see fig. 3) built in 1904 to 1909, for the Pennsylvania railroad, with Alfred Noble as chief engineer, S. Pearson & Son as contractors, and E. W. Moir as general manager, cross from 32nd and 33rd Streets to Long Island. The maximum average progress per day (one heading) for the best month's work was: rock, 4-1 ft.; rock and earth, 3-8 ft.; earth, with full sand face, 12-8 ft. The best methods of prevent- ing blow-outs were found to consist of employing clay blankets (sometimes 25 ft. thick) on the river bed, which could be carried up to 20 ft. depth of water, and of filling the pores of the sand and gravel with blue lias lime or cement grout. The maximum air pressure was 38 lb per sq. in. In the case of sand face with poor leaky cover the usual practice was to make the air pressure equal to that of water from the surface down to about a quarter the distance below the top of the shield. The average amount of free air supplied per man per hour was approximately 2300 cub. ft. On the Hudson river side two tubes of the same size as those in the East river are for the Pennsylvania trains to New Jersey. Two tubes from Morton Street to New Jersey, begun by Haskin, already referred to, are for subway trains, and so are the most southerly of all on the Hudson side, viz. the two from Cortlandt Street to under the Pennsylvania station in Jersey City.

The two tubes from Morton Street were completed under the direction of Charles M. Jacobs, who was also chief engineer of the four other Hudson River tubes. The contractors for the Hudson tubes for the Pennsylvania road were the O'Rourke Contracting Company. Skilful treatment was required to overcome the difficulties on the New York

side of the Hudson in all the tubes where the face excavation was partly in rock and partly in soft earth. Most of their length, however, was through silt, and in this the tunnelling was the easiest and most rapid that has ever been carried out in subaqueous work, 50 lineal ft. per day being sometimes accomplished. A large proportion of the silt which under ordinary processes would be taken into the tunnel through the shield, carried to the shore and got rid of by expensive methods, was by the latter process merely displaced as the shield with nearly or quite closed diaphragm was pushed ahead.

The East Boston tunnel, the first important example of a shield-built monolithic concrete arch, from the Boston Sub- way to East Boston, is 1-4 m. long, 3400 ft. being under the harbour. One mile was excavated by tunnelling with roof shields about 29 ft. wide, through clay containing pockets of sand and gravel. The engineer was H. A. Carson, and the contractors the Boston Tunnel Construction Company and Patrick McGovern.

Some 25 m. of waterworks brick-lined tunnels have been built since 1864, mostly in clay, under the Great Lakes, without the use of shields, though in the later ones compressed air was utilized. A large portion of the latest Cleveland tunnel, 9 ft. interior diameter, was built at the rate of 17 ft. per day at a cost of about $18 per ft. During this work three explosions of inflammable gases occurred, in which nineteen men were killed and others were injured. Later a fire at the shaft in the lake caused the death of ten men. Work was thereafter com- pleted under the engineering direction of G. H. Benzenberg. Less serious accidents, principally explosions of marsh gas, occurred in many of the other tunnels. In one case (at Mil- waukee under Benzenberg) drift material was penetrated, with large boulders and coarse and fine gravel, and without any sand or clay filling, apparently in direct communication with the lake bottom. At times the necessary air pressure was 42 lb per sq. in.

Subaqueous Tunnels made by sinking Tubes, Caissons, &“c — In 1845 De la Haye, in England, doubtless having in mind the

tedious and difficult work of the Thames tunnel, proposed

to make tunnels under water by sinking large tubes on a previously prepared bed and connecting them together. Since then many inventors have proposed similar schemes. In 1866 Belgrand sank twin plate-iron pipes, 1 metre diameter and 156 metres long, under the Seine at Paris for a sewer siphon, and there have since been numerous examples of sunk cast-iron subaqueous water-pipes. It is believed that the first tunnel of this class, large enough for men to move upright in, was by H. A. Carson, assisted by W. Blanchard and F. D. Smith, in 1893-1894, in the outer portion of Boston harbour, for the metropolitan sewer outlet. The later tubes were about 9 ft. exterior diameter, in sections each 52 ft. long, weighing about 210,000 lb, made of brick and concrete, with a skin of wood and water-tight bulk- heads at each end. A trench was dredged in the harbour bed and saddles were accurately placed to support the tubes. The latter, made in cradles above water alongside a wharf, were lowered by long vertical screws moved by steam power, and were towed § to I m. to their final positions. After sufficient water had been admitted they were lowered to their saddles by travel- ling shears on temporary piles. The temporary joints between consecutive sections were made by rubber gaskets between flanges which were bolted together by divers. The later opera- tions were backfilling the trench over the pipes, and in each section pumping out the water, removing its bulkheads, and making good the masonry between consecutive bulk- heads, this masonry being inside the flanges. This work, about 1500 ft. in length, was done without contractors, by labourers and foremen under the immediate control of the engineers, and was found perfectly tight, straight and sound. <£3

The double-track railroad tunnel at Detroit, made in 1906-1009, under the direction of an advisory board consisting of W. J. Wilgus (chairman), H. A. Carson and W. S. Kinnear (the last-named being chief engineer), is 15 m. long, with a portion directly under the river of | m. The method used under the river (proposed by Wilgus) is an important variation on the Boston scheme. A trench was dredged with a depth equal to the thickness of the tunnel below the river bed and about 70 ft. below the river surface, and grillages were accurately placed in it to support the ends of thin steel tube-forms, inside of which concrete was to be

moulded and outside of which de- posited. These tubes, each about 23 ft. in diameter and 262′ 5 ft. long, were in pairs (one tube for each track) , and were connected sidewise and surrounded by thin steel diaphragms 12 ft. apart. Planking, to limit the concrete, was secured outside the diaphragms (see fig. 3). The forms were made tight, bulkheaded at their ends, floated into place, sunk by admitting water, set on the grillages, and the ends of successive pairs connected together by bolts through rubber gaskets and flanges. The succeeding pair of tubes was not lowered until concrete had been deposited through the river around the tubes of the preceding pair. The following steps were to re- move the water from one pair of tubes, mould inside a lining of concrete 20 in. thick, remove the contiguous bulkheads, and repeat again and again the processes described until, the subaqueous tunnel was complete.

The New York Rapid Transit tunnel under Harlem river, built 1904-1905, has two tubes, each about 15 ft. diameter and 400 ft. long, with a surrounding shell of cast iron itself surrounded by concrete. The outside width of concrete is about 33 ft. Its top is 28 ft. below high water and about 3 ft. below the bed of the river. D. D. McBean, the sub-contractor, dredged a trench in the river to within 7 or 8 ft. of the required depth. He then enclosed a space of the width of the tunnel from shore to mid-stream with 12-in. sheet piling, which was evenly cut off some 2 ft. above the determined outside top of the tunnel. On top of this piling he sank and tightly fitted a flat temporary roof of timber 3 ft. thick in sections, and covered this with about s ft. of dredged mud. Water was expelled from this subaqueous chamber by compressed air, after which the re- maining earth was easily taken out, and the iron and concrete

tunnel walls were then built in the chamber. For the remaining part of the river the foregoing process was varied by cutting off the sheet piling at mid-height of the tunnel and making the upper half of the tunnel, which was built above and lowered in sec- tions through the water, serve as the roof of the chamber in which the lower half of the

tunnel was built.

The tunnels of the Metropolitan! railway of Paris (F. Bien-veniie, engineer-in-chief) under the two arms of the Seine, between Place Chatelet and Place Saint Michel, were made by means of compressed-air caissons sunk beneath the river bed,

were next made by the aid of temporary small caissons sunk through about 26 ft. of earth under the river. The tops of the side walls were made even with the end walls. A steel rect- angular coffer-dam (figs. 5 and 6) was sunk to rest with rubber or clay joint on these surrounding walls. The coffer-dam had shafts reaching above the surface of the water, so that the earth core was easily taken out (after removing the water) in free air. The adjacent chambers under the caissons were then connected together. Three caissons, of a total length of 396 ft., were used under the larger arm, and two, of an aggregate length

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‘ountain Tunnels for Railways.

Tunnel.

Location.

Length.

(miles)

Internal Width and Height.

Material penetrated.

Average

progress per

day = 24 hrs.

(lin. yds.).

Approximate

cost per

lin. yd.

Mont Cenis (1 tunnel) . St Gotthard (1 tunnel) Arlberg (1 tunnel) .

Simplon (2 tunnels)

Modane, France and Bardonecchia, Italy.

Goschenen and Airolo in Switzerland.

Innsbruck and Bludenz in Tirol.

Brigue, Switzerland and Iselle, Italy.

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12 3

26 ft. 3 in. X 24 ft.

7 in. (horseshoe). 26 ft. 3 in. X 24 ft.

7 in. (horseshoe).

25 ft. 3 in. wide

16 ft. 5 in. X 19 ft. 6 in. each (min.).

Granitic Granitic

Gneiss, mica schist, limestone and disintegrated mica schist rock.

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907

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1 226

143 108

148

L. Chagnaud being the contractor. They were built of plates: of sheet steel and masonry, with temporary steel diaphragms in the ends, filled with concrete, making a cross wall with a level top about even with the outside top of the tunnel and about 2 ft. below the bottom of the Seine. The caissons were sunk on the line of the tunnel so that adjacent ends (and the walls just described) were nearly 5 ft. apart with— at that stage —a core of earth between them. Side walls joining the end walls and thus enclosing the earth core on four sides (fig. 4)

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(From Engineering News, New York.)

Fig. 4. — -Perspective showing manner of enclosing space between tunnel caissons for the Metropolitain under the Seine at Paris.

H.W.

of 132 ft., under the smaller arm of the Seine. The cost of the tunnel was 7000 francs per lineal metre.

William Sooy Smith published in Chicago, in 1877, a description of a scheme for building a tunnel under the Detroit river by sinking caissons end to end, each caisson to be secured to the adjoining one by tongued and grooved guides, and a nearly water-tight connexion between the two to be made by means of an annular inflated hose.

Tunnelling through Mountains.— Where a great thickness of rock overlies a tunnel through a mountain, it may be necessary to do the work wholly from the two ends without intermediate shafts. The problem largely resolves itself into devising the most expeditious way of excavating and removing the rock. Experience has led to great advances in speed and economy, as may be seen from examples in the above table.

In 1857 the first blast was fired in connexion with the Mont Cenis works; in 1861 machine drilling was introduced; and in 1 87 1 the tunnel was opened for traffic. With the exception of about 300 yds. the tunnel is lined throughout with brick or stone. During the first four years of hand labour the average progress was not more than 9 in. per

day on each side of the Alps; but with compressed air the end was five times greater.

rock-drills the rate tosvards

(From Engineering News, New York.)

Fig. 5. — Transverse Section.

Fig. 6. — Longitudinal Section. Coffer-dam superimposed over joints between caissons in tunnels for the Metropolitain

under the Seine at Paris.

In 1872 the St Gotthard tunnel was begun, and in 1881 the first locomotive ran through it. Mechanical drills were used from the beginning. Tunnelling was carried on by driving in advance a top heading about 8 ft. square, then enlarging this sideways, and finally sinking the excavation to invert level (see figs. 7 and 8). Air for working the rock-drills was compressed to seven atmospheres by turbines of about 2000 horse-power.

The driving of the Arlberg tunnel was begun in 1 880 and the work was completed in little more than three years. Themainheading was driven along the bottom of the

tunnel and shafts were opened up 25 to 70 yds. apart, from which smaller headings were driven right and left. The tunnel was enlarged to its full section at different points simultaneously in lengths of 8 yds., the excavation of each occupying about twenty days, and the masonry fourteen days. Ferroux percussion air-drills and Brandt rotary hydraulic drills were used, the performance of the latter being especially satisfactory. After each blast a fine spray of water was injected, which assisted the ventilation

Figs. 7 and 8. — Method of excavation in St Gotthard Tunnel.

materially. In the St Gotthard tunnel the discharge of the air-drills was relied on for ventilation. In the Arlberg tunnel over 8000 cub. ft. of air per minute were thrown in by ventilators. To keep pace with the miners, 900 tons of excavated material had to be removed, and 350 tons of masonry introduced, daily at each end of the tunnel, which necessitated the transit of 450 wagons. The cost per lineal yard varied according to the thickness of masonry lining and the distance from the mouth of the tunnel. For the first thousand yards from the entrance the prices per lineal yard were £11 8s. for the lower heading; £7 12s. for the upper one; £30 10s. for the unlined tunnel; £45 for the tunnel with a thin lining of masonry; and £1 24 5s. with a lining 3 ft. thick at the arch, 4 ft. at the sides, and 2 ft. 8 in. at the

invert.

The Simplon tunnel was begun in 1898 and completed in 1905. It is over 30 % longer than the St Gotthard, and the greatest depth below the surface is 7005 ft. A novel method was introduced in the shape of two parallel bores (56 ft. apart, connected at intervals of 660 ft. by oblique galleries), which greatly facilitated ventilation, and resulted in increased economy and rapidity of construction, while ensuring the health of the men. One of these galleries was made large enough for a single- track railroad, and the second is to be enlarged and similarly used. The death-rate in the Simplon tunnel was decreased as compared with the St Gotthard from 800 in eight years to 60 in seven years. Had one wide tunnel been made instead of two narrow ones, it would have been difficult to maintain its integrity; even with the narrow cross-secticn employed the floor was forced up at points in the solid rock from the great weight above, and had to be secured by building heavy inverts of masonry. Temperatures were reduced to 89 F. by spraying devices, although the rock temperatures ranged from 129 to 130° F. At one point 4374 yds. from the portal of Iselle the " Great Spring " of cold water was struck; it yielded 10,564 gallons per minute at 600 lb pressure per sq. in., and reduced the temperature to 55-4° F., the lowest point recorded. A spring of hot water was met on the Italian side which discharged into the tunnel 1600 gallons per minute with a temperature of 1 1 3° F. The maximum flow of cold water was 17,081 gallons per minute, and of hot water 4330 gallons per minute. These springs often necessitated a temporary abandonment of the work. Water power from the Rhone at the Swiss and from the Diveria at the Italian end provided the power for operating all plant during the construction of most of the work. Among the able engineers connected with this work must be mentioned Alfred Brandt, a man of remarkable energy and ability, whose drills were used with much success. He died early in the work, of injuries received from falling rock.

A group of tunnels — the Tauern, Barengraben, Wocheiner and Bosriick — was undertaken by the Austrian government in

connexion with new Alpine railroads to increase the commercial territory tributary to the seaport of Trieste,

which at one time was' greater than Hamburg. The principal tunnel of this group is under the main body of the Tauern mountain. The bottom drifts met on the 21st of July 1907. The difficulties resulted mostly from mountain debris and springs. There are four minor tunnels between Schwarzach, St Veit, and the north portal of the Tauern, and nineteen between the south portal and the south slope at Mollbriicken.

The electric railway from the Eiger glacier to near the summit of the Jungfrau includes a tunnel i£ m. long, 3-6 metres wide and 3-8 metres high, with a midway station, from which a large part of northern Switzerland can be seen. From the Jungfrau terminus, at an elevation of 13,428 ft., the summit, 242 ft. higher, will be reached by an elevator.

The Hoosac tunnel was the first prominent tunnel in America. It was begun in 1855 and finished in 1876, after many interrup- tions. It was memorable for the original use in America of air-drills and nitroglycerin. The Pennsylvania railroad tunnels crossing New York City under 32nd and 33rd Streets are of un- usual size. Owing. to the close proximity of large buildings and other structures special methods were adopted for mining the rock to lessen the vibrations by explosions. At 33rd Street and 4th Avenue the tunnels pass directly under two of the Rapid Transit system, above which there is another belonging to the Metropolitan Traction Company, so that there are three tunnels at different levels under the street.

Among other rock tunnels may be mentioned the Albula, through a granite ridge of the Rhaetian Alps, for a single-track narrow-gauge railroad, 3-6 m. long; tunnels on the Midland railway, near Totley in Derbyshire, over 3-5 m. long, largely in shale, and at Cowburn, over 2 m. long, in shale and harder rock, each 27 ft. wide and 20-5 ft. high inside; the Suram, on the Trans-Caucasus railway, for double track, 2-47 m. long, through soft rock; the tail-race tunnel for the Niagara Falls Water Power Company, 1-3 m. long, 19 ft. wide and 21 ft. high, through argillaceous shale and limestone, costing about $1,250,000; the Tequixquiac outlet to the drainage system for the city of Mexico, costing $6,760,000; the Cascade, Washington, part of the Great Northern railroad system, saving 9 m. in distance; and the

Gunnison, irrigating 147,000 acres in Colorado.

Tunnelling in Towns. — Where tunnels have to be carried through soft soil in proximity to valuable buildings special precautions have to be taken to avoid settlement. A successful example of such work is the tunnel driven in 1886 for the Great Northern Railway Company under the Metropolitan Cattle

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Paris Metropolitain Tunnel, longitudinal horizontal

Market, London. This was done by the crown-bar method, the bars being built in with solid brickwork. The subsidence in the ground was from i to about 35 in. Several buildings were tunnelled under without any structural damage.

London has now some 90 m. of tunnels for railways, mostly operated by electric traction. Most of those which have been constructed since 1890 have been tunnelled by the use of cylin- drical shields and walls of cast iron. Shields about 23 ft. in diameter were used in constructing the stations on the Central London railway, and one 32 ft. 4 in. in diameter and only 9 ft. 3 in. long was used for a short distance on the Clapham extension of the City and South London railway.

general, the upper half of the tunnel was executed first (figs. 9 and 10) and the lower part completed by underpinning.

Figs, n, 12 and 13 illustrate a case of tunnelling near impor- tant buildings in Boston in 1896, with a roof-shield 29 ft. 4 in. in external diameter. The vertical sidewalls were first made in small drifts, the roof-shield running on top of these, and the core was taken out later and the invert or floor of the tunnel put in last. Each hydraulic press of the shield reacted against a small continuous cast-iron rod imbedded in the brick arch. In some large sewerage tunnels in Chicago the shields were pushed from a wall of oak planks, 8 in. thick, surrounding the brick walls of the

sewer.

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Fig. 10. — Paris Mfetropolitain Tunnel, longitudinal vertical section.

Paris has an elaborate plan for underground railways some 50 m. in length, a considerable number of which have been constructed since 1898 under the engineering direction of F. Bienveniie. Instead of using completely cylindrical shields and cast-iron walls, as in London, roof-shields (boudiers de voute) were employed for the construction of the upper half of the tunnel, and masonry walls were adopted throughout. In

Ventilation oj Tunnels. — The simplest method for ventilating a railway tunnel is to have numerous wide openings to daylight at frequent intervals. If these are the

full width of the tunnel, at least 20 ft. in length, and not farther apart than 200 yds., it can be naturally ventilated. Such arrange- ments are, however, frequently impracticable, and then recourse must be had to mechanical means.

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Fig. 11. — Boston Subway, first and second phasesT

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Fig. 12. — Boston Subway, third phase.

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Fig. 13.— Boston Subway, longitudinal vertical section through shield.

The first application of mechanical or fan ventilation to railway tunnels was made in the Lime Street tunnel of the London and North-Western railway at Liverpool, which has since been replaced by an open cutting. At a later date fans were applied to the Severn and Mersey tunnels.

The principle ordinarily acted upon, where mechanical ventilation has been adopted, is to exhaust the vitiated air at a point midway between the portals of a tunnel, by means of a shaft with which is connected a ventilating fan of suitable power and dimensions. In the case of the tunnel under the river Mersey (fig. 14) such a shaft could not be provided, owing to the river being overhead, but a ventilating heading was driven from the middle of the river

(at which

point entry into the tunnel was effected) to each shore, where a fan 40 ft. in diameter was placed. In this way the vitiated air is drawn from the lowest point of the railway, while fresh air flows in at the stations on each side to replenish the partial vacuum, as indicated by arrows in the accompanying longitudinal section of the tunnel. The principle was that fresh air should enter at each station and ” split ” each way into the tunnel, and that thus the atmosphere on the station platforms should be maintained in a condition of purity.

The fans in the Mersey tunnel are somewhat similar to the well- known Guibal fans, with the exception of an important alteration in the shutter. With the Guibal shutter, the top of the opening

(From a diagram in Proc. Inst. Civ. Eng.)

Fig. 14. — Longitudinal Section of the Mersey Tunnel, showing Method of Ventilation.

into the chimney from the fan has a line parallel to that of the fan- shaft and of the fan-blades, and, as a consequence, as each blade passes this shutter, the stoppage of the discharge of the air is instan- taneous, and the suaden change of the pressure of the air on the face of the blade whilst discharging and the reversal of the pressure, due to the vacuum inside the fan-casing, cause the vibration hitherto inseparable from this type of ventilator. As an illustration of the effect of the pulsatory action of the Guibal shutters the following figures may be given: a fan having ten arms and running, say, sixty revolutions per minute, and working twenty-four hours per day, gives (10 X 60 X 60 X 24 =) 864,000 blows per day transmitted from the tip of the fan-vanes to the fan-shaft ; the shaft is thus in a constant state of tremor, and sooner or later reaches its elastic limit, and the consequent injury to the general structure of the fan is obvious. This difficulty is avoided by cutting a A -shaped opening in the shutter, thus gradually

decreasing the aperture and allowing the air to pass into the chimney in a continuous stream instead of intermittently. The action of this regulating shutter increases the durability and efficiency of the fans in an important degree. In towns like Liverpool and Birkenhead any pulsatory action would be readily felt by the inhabitants, but with the above. arrangement it is difficult to detect any sound whatever, even when standing dose to the buildings containing the fans. The admission of the air on both sides is found in practice to conduce to smooth running and to the reduction of the side-thrust which occurs when the air is admitted on one side only. The fans are five in number: two are 40 ft. in diameter by 12 ft. wide, and two 30 ft. in diameter by loft. wide, one of each size being erected at Liverpool and at Birken- head respectively. In addition, there is a high-speed fan 16 ft. in diameter in Liverpool which throws 300,000 cub. ft.

The following table gives the result of experiments made with the ventilating fans of the Mersey railway: —

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60

60

2-30

2062

123,720

Bold Street,

Liverpool .

16 2

Total

300,000

1

951.4 20

The central point of the Severn tunnel (fig. 15) lies toward the Monmouthshire bank of the river, and ventilation is effected from that point by means of one fan placed on the surface at Sudbrooke, Monmouth, at the top of a shaft which is connected with a horizontal

Ventilating Fan

40*12 /

Monmouthshire [®) | ThVstLS ” ! Gloucestershire

7

I J miles

‘♦-■-Wota/ length vf Tunnel 4 miles 624 tjurds w

Fig. 15. — Section of Severn Tunnel (Fox). heading leading to the centre. This fan, which is 40 ft. in diameter by 12 ft. in width, removes from the tunnel some 400,000 cub. ft. per minute, and draws in an equivalent volume of fresh air from the two ends.

About 1896 an excellent system was introduced by Signor

Saccardo, the well-known Italian engineer, which to a great extent has minim- ized the difficulty of ventilating long tunnels under mountain-ranges where shafts are not available. This system, which is not applicable to tunnels in which underground stations exist, is illustrated in fig. 16, which represents its application to the single-line tunnel through the Apennines at Pracchia. This tunnel is one of fifty- two single-line tunnels, with a gradient of I in 40, on the main line between Florence and Bologna, built by Thomas Brassey. There is a grecft deal of traffic which has to be worked by heavy locomotives. Before the installation of a ventilating system under any condition of wind the state of this tunnel, about 3000 yds, in length, was bad ;

but when the wind was blowing in at the lower end at the same time that a heavy goods or passenger train was ascending the gradient the condition of affairs became almost insupportable. The engines, working with the regulators full open, often emitted, large quantities of both. smoke and steam, which travelled concurrently with the train. The goods trains had two engines, one in front and another at the rear, and when, from the humidity in the tunnel, due to the

Fan

1 In the case of this circular drift-way a velocity of 4000 ft minute was subsequently attained.

2 Quick-running fan.

per

(From the Proc. Insl. Civ. Eng.)

Fig. 16. — Diagram illustrating the Saccardo System for Ventilating Tunnels.

steam, the wheels slipped and possibly the train stopped, the state of the air was indescribable. A heavy train with two engines, conveying a royal party and their suite, arrived on one occasion at the upper exit of the tunnel with both enginemen and both fire- men insensible; and on another occasion, when a heavy passenger train came to a stop in the tunnel, all the occupants were seriously affected.

In applying the Saccardo system, the' tunnel was extended for 15 or 20 ft. by a structure either of timber or brickwork, the inside line of which represented the line of maximum construction, and this was allowed to project for about 3 ft. into the tunnel. The space between this line and the exterior constituted the chamber into which air was blown by means of a fan. Considering the length of tunnel it might at first be thought there would be some tendency for the air to return through the open mouth, but nothing of the kind happened. The whole of the air blown by the fan, 164,000 cub. ft. per minute, was augmented by the induced current yielding 46,000 cub. ft. per minute, making a total of 210,000 cub. ft.; and this volume was blown down the gradient against the ascending train, so as to free the driver and men in charge of the train from the products of combustion at the earliest possible moment. Prior to the installation of this system the drivers and firemen had to be clothed in thick woollen garments, pulled on over their ordinary clothes, and wrapped round and round the neck and over the head; but in spite of all these precautions they sometimes arrived at the upper end of the tunnel in a state of insensibility. The fan, however, immensely improved the condition of the air, which is now pure and fresh. 3

In the case of the St Gotthard tunnel, which is 9I m. in length and 26 ft. wide with a sectional area of 603 sq. ft., the Saccardo system was installed in 1899 with most beneficial results. The railway is double-tracked and worked by steam locomotives, the cars being lighted by gas. The ventilating plant is situated at Goschenen at the north end of the tunnel and consists of two large fans operated by water power. The quantity of air passed into the narrow mouth of the tunnel is 413,000 cub. ft. per minute at a velocity of 686 ft., this velocity being much reduced as the full section of the tunnel is reached. A sample of the air taken from a carriage contained 10-19 parts of carbonic acid gas per 10,000 volumes.

In the Simplon tunnel, where electricity is the motive power, mechanical ventilation is installed. A steel sliding door is arranged at each entrance to be raised and lowered by electric power. After the entrance of a train the door is lowered and fresh air forced into the tunnel at considerable pressure from the same end by fans.

The introduction of electric traction has simplified the problem of ventilating intra-urban railways laid in tunnels at a greater or less distance below the surface, since the absence of smoke and products of combustion from coal and coke renders necessary only such a quantity of air as is required by the passengers and staff. For supplying air to the shallow tunnels which form the under- ground portions of the Metropolitan and District railways in London, oren staircases, blow-holes and sections of uncovered track are relied on. When the lines were worked by steam locomotives they afforded notorious examples of bad ventilation, the proportion of

carbonic acid amounting to from 15 or 20 to 60, 70 and even 89 parts in 10,000. But since the adoption of electricity as the motive power the atmosphere of the tunnels has much improved, and two samples taken from the cars in 1905 gave II 27 and 14-07 parts of carbonic acid in 10,000.

When deep level “tube” railways were first constructed in London, it was supposed that adequate ventilation would be obtained through the lift-shafts and staircases at the stations, with the aid of the scouring action of the trains which, being of nearly the same cross-section as the tunnel, would, it was supposed, drive the air in front of them out by the openings at the stations they were approaching, while drawing fresh air in behind them at the stations they had left. This expectation, however, was disappointed, and it was found necessary to employ mechanical means. On the Central London railway, which runs from the Bank of England to Shepherd’s Bush, a distance of 6 m.,the ventilating plant installed in 1902 consists of a 300 h.p. electrically driven fan, which is placed at Shepherd’s Bush and draws in fresh air from the Bank end of the line and at other intermediate points. The fan is 5 ft. wide and 20 ft. in diameter, and makes 145 revolutions a minute, its capacity being 100,000 cub. ft. a minute. It is operated from I to 4 a.m., and the openings at all the intermediate stations being closed it draws fresh air in at the Bank station. The tunnel is thus cleared out about 2 j times each night and

the air is left in the same condition as it is outside. The fan is also worked during the day from 11 a.m. to 5 p.m., the intermediate doors being open; in this way the atmosphere is improved for about half the length of the line and the cars are cleared out as they arrive at Shepherd's Bush. Samples of the air in the tunnel taken when the fan was not running contained 7 07 parts of carbonic acid in 10,000, while the air of a full car contained 10 7 parts. The outside air at the same time contained 44 parts. A series of tests made for the London County Council in 1902 showed that the air of the cars contained a minimum of 9 60 parts and a maximum of 147 parts. In some of the later tube railways in London — such as the Baker Street and Waterloo, and the Charing Cross and Hampstead lines — electrically driven exhaust fans are provided at about half-mile intervals; these each extract 18,500 cub. ft. of air per minute from the tunnels, and discharge it from the tops of the station roofs, fresh air being conveyed to the points of suction in the tunnels.

The Boston system of electrically operated subways and tunnels is ventilated by electric fans capable of completely changing the air in each section about every fifteen minutes. Air admitted at portals and stations is withdrawn midway between stations. In the case of the East Boston tunnel, the air leaving the tunnel under the middle of the harbour is carried to the shore through longitudinal ducts (fig. 3) and is there expelled through fan-chambers.

In the southerly 5 m. of the New York Rapid Transit railway, which runs in a four-track tunnel of rectangular section, having an area of 650 sq. ft., and built as close as possible to the surface of the streets, ventilation by natural means through the open stair- cases at the stations is mainly relied upon, with satisfactory results as regards the proportions of carbonic acid found in the air. But when intensely hot weather prevails in New York the tunnel air is sometimes 5° hotter still, due to the conversion of electrisal energy into heat. This condition is aggravated by the fine diffusion through the air of oil from the motors, dust from the ballast and particles of metal ground off by the brake shoes, &c.

Volume of Air Required for Ventilation. — The consumption of coal by a locomotive during the passage

through a tunnel having been ascertained, and 29 cub. ft. of poisonous gas being allowed for each pound of coal consumed, the volume of fresh air required to maintain the atmosphere of the tunnel at a standard of purity of 20 parts of carbon dioxide in 10,000 parts of air is ascertained as follows: The number of pounds of fuel consumed per mile, multiplied by 29, multiplied by 500, and divided by the interval in minutes between the trains, will give the volume of air in cubic feet which must be introduced into the tunnel per minute. As an illustration, assume that the tunnel is a mile in length, that the consumption of fuel is 32 lb per mile, and that one train passes through the tunnel every five minutes in each direction; then the volume of air required per minute will be

32 lb X 29 cub, ft. X 5 oo = l85)6oo cub . ft . 2 j minutes.

Corrosion of Rails in Tunnels.- — Careful tests made in the Box and Severn tunnels of the Great Western railway, to ascertain if possible the loss that takes place in the weight of rails owing to the presence of corrosive gases, gave the following results : —

Box Tunnel (i m. 66 chains in length).

Percentage of Wear per annum.

lb per yard Down line, gradient falling I in 100 — % per annum.

At east mouth 0-439 = 0-377

28 chains from east mouth 1 -800 = 1 540

48 chains from east mouth 2-110 = 1-810

1 m. 8 chains from east mouth 2880 = 2.480

At west mouth 0-640 = 0-ˆ5-1

Up line, gradient rising 1 in 100 —

At east mouth 0-620 = 0-575

I m. 8 chains from east mouth I -500 = 1 380

I m. 28 chains from east mouth . . ‘ . . .1 520 = 1 310 At

west mouth 0680 = 0-587

‘ Severn Tunnel (4 m. 28ˆ chains in length). Percentage of Wear per annum.

lb per yard

Down line, outside and quite clear of tunnel, % per annum.

Bristol end, gradient falling I in 100 . . . 0-280 = 0-240 Up line, outside and quite clear of tunnel,

Newport end, gradient falling 1 in 90 . . 0-440 = 0-390

At Bristol mouth, gradient falling I in 100 1 200 = I 020 33 chains from Bristol mouth, gradient falling

I in 100 2-160 = 1-860

3 m – 75i chains from Bristol mouth, gradient

rising I in 90 1 900 = I 630

At Newport mouth 0-310 = 0-270

Down and up line under main-shaft level . . 3-200 = 2-750

It will be seen that the maximum wear and corrosion together reached the extraordinary weight of i\ lb per yard of rail per year — a very serious amount that involved great expenditure The wear occurred over the whole of the rail, but the top, over which the engine and train passed, wore at a greater rate, presumably on account of the surface being kept bright and the gases being able to act on it. The Great Western Company tried the experiment in the Severn tunnel of boxing up the rails, so that the ballast approached their surface within I in. or I \ in. It was found, however, that — in the case, at any rate, of the limestone ballast— the cure was almost worse than the disease, the result being a maximum wear of 2j lb and an average wear of just under 2 lb per yard of rail per year. The average on the open line would be about 0-25 lb in the same time.

See Proc. Inst. Civ. Eng. ; also works on tunnelling by Drinker, Simms, Stauffer and Prelini, and on tunnel shields, &c, by Copper- thwaite. (H. A. C.)

TUNNEL VAULT, the term in architecture given to the semicircular or elliptical vault over underground passages, in contradistinction to the wagon or barrel vault of edifices above ground.

TUNNY (Thunnus thyhnus), one of the largest fishes of the family of mackerels, belongs to the genus of which the bonito {Th. pelamys) and the albacores (Th. albacora, Th. alalonga, &c.) are equally well-known members. From the latter the tunny- is distinguished by its much shorter pectoral fins, which reach backwards only to, or nearly to, the end of the first dorsal fin. It possesses nine short finlets behind the dorsal, and eight behind the anal fin. Its colour is dark bluish above, and greyish, tinged and spotted with silvery, below. The tunny is a pelagic fish, but periodically approaches the shore, wandering in large shoals, within well-ascertained areas along the coast. It not infrequently appears in small companies or singly in the English Channel and in the German Ocean, probably in pursuit

Tunny.

of the shoals of pilchards and herrings on which it feeds. The regularity of its appearance on certain parts of the coasts of the Mediterranean has led to the establishment of a systematic fishery, which has been carried on from the time of the Phoeni- cians to the present day. Immense numbers of tunnies were caught on the Spanish coast and in the Sea of Marmora, where, however, this industry has much declined. The Sardinian tunnies were considered to be of superior excellence. The greatest number is now caught on the north coast of Sicily, the fisheries of this island supplying most of the preserved tunny which is exported to other parts of the world. In ancient times the fish were preserved in salt, and that coming from Sardinia, which was specially esteemed by the Romans, was known as

Salsamentum sardicum. At present preference is given to tunny preserved in oil. Many of the fishes, especially the smaller ones, are consumed fresh. The tunny occurs also in

the Pacific and is much sought for by anglers on the coast of southern California, where tuna-fishing has become a fashionable sport; but several other species seem to take its place in the Indo-Pacific ocean. It is one of the largest fishes, attaining to a length of ten ft. and to a weight of more than a thousand pounds.

In connexion with the extremely active life of these fishes allusion should be made to the fact, first ascertained in 1839 by John (brother of Sir Humphry) Davy, that the temperature of the blood of a tunny may be considerably higher than that of the surrounding water, a discovery which disposed of the time- honoured division of vertebrate animals into warm-blooded and cold-blooded.

The variations and movements of the tunny and albacores were studied with special care by King Carlos of Portugal, who published in 1899 a large illustrated memoir entitled A Pesca do atwm no Algarve in 1898 (Lisbon). This memoir is accompanied by excel- lent figures of the different species of Thunnus and charts of their distribution in the Atlantic.

TUNSTALL (or Tonstall), CUTHBERT (1474-1559), English prelate, was an illegitimate son of Thomas Tunstall of Thurland Castle, Lancashire, his legitimate half-brother, Brian Tunstall, being killed at Flodden in 15 13. Cuthbert seems to have studied at Oxford, at Cambridge and at Padua, and he became a dis- tinguished scholar, winning favourable comment from Erasmus. Having held several livings in quick succession, he became chan- cellor to William Warham, archbishop of Canterbury, In 151 1, and he was soon employed on diplomatic business by Henry VIII. and Wolsey, being sent to Brussels in 15 15 and to Cologne in 1 519, while he was at Worms during the famous Diet of, 1521. In 1 5 16 he had been made master of the rolls; in 1521 he became dean of Salisbury, in 1522 bishop of London, and in 1523 keeper of the privy seal. For Henry VIII. he negotiated with Charles V. after his victory at Pavia in 1525 and he helped to arrange the Peace of Cambrai in 1529. In 1530 he succeeded Wolsey as bishop of Durham. Tunstall's religious views now gave some anxiety. He adhered firmly to the traditional teaching of the Church, but after some slight hesitation he accepted Henry as its head and publicly defended this position. In 1537 the bishop was appointed president of the new council of the

north, but although he was often engaged in treating with the Scots he found time to take part in other public business and to attend parlia- ment, where in 1539 he participated in the discussion on the bill of six articles. Although he disliked the religious policy pur- sued by the advisers of Edward VI. and voted against the first act of uniformity in 1549, he continued to discharge his public duties without molestation until after the fall of the protector Somerset; then in May 1551, he was placed in custody. A bill charging him with treason was introduced, but the House of Commons refused to pass it; he was, however, deprived of his bishopric in October 1552. On the accession of Mary in 1553 he was released and was again bishop of Durham, but during this reign he showed no animus against the Protestants. When Elizabeth came to the throne he refused to take the oath of supremacy, and he would not help to consecrate Matthew Parker as archbishop of Canterbury. He was arrested, and was still a prisoner at Lambeth when he died on the 18th of November

1559-

Among Tunstall's writings are De veritate corporis et sanguinis domini nostri Jesu Christi in eucharistia (1554) ; and De arte suppulandi libri quattuor (1522). The bishop's correspondence as president of the council of the north is in the British Museum.

TUNSTALL, a market town of Staffordshire, England, on the northern outskirts of the Potteries district, included in the parliamentary borough of Newcastle-under-Lyme, 4 m. N.W. from Stoke-upon-Trent by the North Staffordshire railway. Pop. of urban district (1901), 19,492. The town is of modern growth. The Victoria Institute (1889) includes a library and schools of art and science. The neighbourhood is full of collieries, ironworks and potteries. Kidsgrove, Chatterley and Talk-o'th' hill are large neighbouring villages; the mines at the last-named

were the scene of a terrible explosion in 1866, by which nearly a hundred lives were lost. There are brick and tile works in Tunstall. The town is included in the large parish of Wol- stanton, and in the borough of Stoke-on-Trent (q.v.) under the " Potteries Federation "scheme (1908).

TUPIS (Comrades), a tribe and stock of South American Indians of Brazil. They call all other peoples Tapuyas (foreigners) . Their original home is believed to have been on the Amazon, and from its mouth they spread far southwards along the Brazilian coast. When hard pressed by the Portuguese they retreated to the Andes. Martius gives the Tupi nation a wide range, from the Atlantic to the Andes, and from Paraguay to the Amazon. Of this stock are the Omaguas, Cocomas and other Peruvian tribes. Latham makes the Tupis members of the Guarani stock. The " Lingoa Geral " or trade language between Portuguese and Amazon Indians is a corruption of the Tupi tongue.

TUPPER, SIR CHARLES, Bart. (182 i-), British colonial statesman, son of the Rev. Charles Tupper, D.D., was born at Amherst, Nova Scotia, on the 2nd of July 1821, and was educated at Horton Academy. He afterwards studied for the medical profession at Edinburgh University, where he received the diplomas of M.D. and L.R.C.S. In 1855 he was returned to the Nova Scotia Assembly for Cumberland county. In 1862 he was appointed, by act of parliament, governor of Dalhousie College, Halifax; and from 1867 till 1870 he was president of the Canadian Medical Association. Mr Tupper was a member of the executive council and provincial secretary of Nova Scotia from 1857 to i860, and from 1863 to 1867. He became prime minister of Nova Scotia in 1864, and held that office until the Union Act came into force on the 1st of July 1867, when his government retired. He was a delegate to Great Britain on public business from the Nova Scotia government in 1858 and 1865, and from the Dominion government in March 1868. Mr Tupper was leader of the delegation from Nova Scotia to the Union conference at Charlottetown in 1864, and to that of Quebec during the same year; and to the final colonial conference in London, which assembled to complete the terms of union, in 1 866- 1 86 7. On that occasion he received a patent of rank and precedence from Queen Victoria as an executive councillor of Nova Scotia. He was sworn a member of the privy council of Canada, June 1870, and was president of that body from that date until the 1st of July 1872, when he was appointed minister of inland, revenue. This office he held until February 1873, when he became minister of customs under Sir John Macdonald, resigning with the ministry at the close of

1873. On Sir John's return to power in 1878, Mr Tupper became minister of public works, and in the following year minister of railways and canals. At this time he was made K.C.M.G. Mr Tupper was the author of the Public Schools Act of Nova Scotia, and had been largely instrumental in moulding the Dominion Confederation Bill and other important measures. Sir Charles represented the county of Cumberland, Nova Scotia, for thirty-two years in succession — first in the Nova Scotia Assembly, and subsequently in the Dominion parliament until 1884, when he resigned his seat on being appointed high commissioner for Canada in London. Shortly before the Canadian Federal elections of February 1887, Sir Charles re-entered the Conservative cabinet as finance minister. By his efforts the Canadian Pacific railway was enabled to float a loan of $30,000,000, on the strength of which the line was finished several years before the expiration of the contract time. He resigned the office of finance minister in May 1888, when he was reappointed high commissioner for the Dominion of Canada in London. Sir Charles was designated one of the British plenipotentiaries to the Fisheries Convention at Washington in 1887, the result of which conference was the signing of a treaty in February 1888 (rejected by the U.S. Senate) for the settlement of the matters in dispute between Canada and the United States in connexion with the Atlantic fisheries. He was created a baronet in September 1888. When the Dominion cabinet, under Sir Mackenzie Bowell, was reconstituted in January 1896 Sir Charles Tupper accepted office, and in the following April he

succeeded Bowell in the premiership. On both patriotic and commercial grounds he urged the adoption of a preferential tariff with Great Britain and the sister colonies. At the general election in the ensuing June the Conservatives were severely- defeated, and Sir Charles Tupper and* his colleagues resigned, Sir Wilfrid Laurier becoming premier. The Conservative party now gradually became more and more disorganized, and at the next general election, in November 1900, they were again defeated. Sir Charles Tupper, who had long been the Conserva- tive leader, sustained in his own constituency of Cape Breton his first defeat in forty years.

TUPPER, MARTIN FARQUHAR (1810-1889), English writer, the author of Proverbial Philosophy, was born in London on the 17th of July 1810. He was the son of Martin Tupper, a doctor, who came of an old Huguenot family. He was educated at Charterhouse and at Christ Church, Oxford, where he gained a prize for a theological essay, Gladstone being second to him. He was called to the bar at Lincoln's Inn, but never practised. He began a long career of authorship in 1832 with Sacra Poesis, and in 1838 he published Geraldine, and other Poems, and for fifty years was fertile in producing both verse and prose; but his name is indissolubly connected with his long series of didactic moralisings in blank verse, the Proverbial Philosophy (1838-1867), which for about twenty-five years enjoyed an extraordinary popularity that has ever since been the cause of persistent satire. The first part was, however, a comparative failure, and N. P. Willis, the American author, took it to be a forgotten work of the 17th century. The commonplace character of Tupper's reflections is indubitable, and his blank verse is only prose cut up into suitable lengths; but the Proverbial Philosophy was full of a perfectly genuine moral and religious feeling, and contained many apt and striking expressions. By these qualities it appealed to a large and uncritical section of the public. A genial, warm-hearted man, Tupper's humane instincts prompted him to espouse many reforming movements; he was an early supporter of the Volunteer movement, and did much to promote good relations with America. He was also a mechanical inventor in a small way. In 1886 he published My Life as an Author; and on the 29th of November 1889 he died at Albury, Surrey.

TURBAN, the name of a particular form of head-dress worn by men of Mahommedan races. The earlier forms of the word in English are turbant, turband, and tolibanl or tulipant, the latter showing that variant of the original which survives in the name of the flower, the tulip. All these forms represent the French adaptation of the Turkish tulbend, a vulgarism for dulbend, from Persian dulband, a sash or scarf wound round the head. The Moslem turban is essentially a scarf of silk, fine linen, cotton or other material folded round the head, some- times, as in Egypt, round the tarbush or close-fitting felt cap; sometimes, as in Afghanistan, round a conical cap; or, as among certain

races in India, round the skull-cap or kullah. Races, professions, degrees of rank, and the like vary in the style of turban wom; distinctions being made in size, methods of folding, and colour and the like (see India: Costume). At the end of the 1 8th and beginning of the 19th century, a species of head- dress somewhat resembling the true turban in outward form was worn by ladies of western nations, chiefly for use indoors.

TURBERVILLE (or Turbervile), GEORGE (is4o?-i6io?), English poet, second son of Nicholas Turberville of Whitchurch, Dorset, belonged to an old Dorsetshire family, the D'Urbervilles of Mr Thomas Hardy's novel, Tess. He became a scholar of Winchester College in 1554, and in 1561 was made a fellow of New College, Oxford. In 1562 he began to study law in London, and gained a reputation, according to Anthony a Wood, as a poet and man of affairs. He accompanied Thomas Randolph in a special mission to Moscow to the court of Ivan the Terrible in 1568. Of his Poems describing the Places and Manners of the Country and People of Russia (1568) mentioned by Wood, only three metrical letters describing his adventures survive, and these were reprinted in Hakluyt's Voyages (1589). His Epitaphs, Epigrams, Songs and Sonets appeared " newly corrected with additions " in 1367. In the same year he published translations

of the Heroycall Epistles of Ovid, and of the Eglogs of Mantuan (Gianbattista Spagnuoli, called Mantuanus), and in 1568 A Plaine Path to Perfect Vertue from Dominicus Mancinus. The Book of Falconry or Hawking and the Noble Art of Venerie (printed together in 1575) may both be assigned to Turberville. The title page of his Tragical Tales (1587), which are translations from Boccaccio and Bandello, says that the book was written at the time of the author's troubles. What these were is unknown, but Wood says he was living and in high esteem in 1594. He probably died before 161 1. He is a disciple of Wyat and Surrey, whose matter he sometimes appropriated. Much of his verse is sing-song enough, but he disarms criticism by his humble estimate of his own powers.

His Epitaphs &c. were reprinted in Alexander Chalmers's

English Poets (1810), and by J. P. Collier in 1867.

TURBET I HAIDARI, a district of the province of Khorasan in Persia, bounded N. by Meshed, E. by Bakharz, S. by Khaf and W. by Turshiz. It has a population of about 30,000, com- posed chiefly of members of the Turki Karai tribe and Beluchis. The Karais were settled here by Timur in the 14th century and now provide a battalion of infantry and 1 50 cavalrymen to the army. The district contains about 150 villages and hamlets, most of them situated in its more fertile eastern part, and pays a yearly revenue of £14,000. Much silk was formerly produced, now very little, but there are large crops of grain.

Turbet 1 Haidari, the capital of the district, is 76 m. nearly S. of Meshed, in 35° 17′ N., 59° n' E., at an elevation of 4100 ft. The town is picturesquely situated on the bank of a deep and wide ravine in the midst of lofty hills, and surrounded by clusters of villages. Its population amounts to 8000 souls. There is a well-stocked bazaar and a number of Russian traders have estab- lished themselves here since 1903, when the place was connected with Meshed on one side and with Seistan on the other side by a telegraph line which, nominally Persian, is worked and main- tained by a Russian staff. A British consul has resided here since 1905, and there is alsoa post-office.

The place was formerly known as Zavah and derives its present name from the turbet or tomb of a holy man named Kutb ed din Haidar, the founder of the ascetic sect of dervishes known as the Haidaris. He died c. 1230 and is buried in a large domed building a short distance outside the town.

TURBINE (Lat. turbo, a whirlwind, a whirling motion ,or object, a top), in engineering, a machine which applies the energy of a jet of water or steam to produce the rotation of a shaft. It consists essentially of a wheel or chamber provided with a number of blades or vanes upon which the fluid jet impinges; the impelled fluid causes the blades to rotate and also the shaft to which they are attached. Water turbines are treated under Hydraulics, and steam turbines under Steam Engine.

TURBOT 1 {Rhombus maximus or Psetta maxima), one of

the largest and most valuable of the flat-fishes or Pleuronectidae. The turbot, which rarely exceeds a length of two feet, has great width of body, and is scaleless, but is covered with conical bony tubercles. The eyes are on the left side of the body, the lower being slightly in advance of the upper; the mouth is large and armed with teeth of uniformly minute size. The turbot is found all round the coasts of Europe (except in the extreme north), pre- ferring a fiat sandy bottom with from 10 to 50 fathoms of water. The broad banks off the Dutch coast are a favourite resort. It is a voracious fish, and feeds on other fish, crustaceans and molluscs. It seems to constantly change its abode, wandering northward during the summer, and going into deeper water in the cold season. The eggs of the turbot, like those of the majority of flat-fishes, are pelagic and buoyant. They are small and very numerous, varying from five to ten millions in fish of 18 to 21 B> weight. The young fish are symmetrical and swim

1 The word ” turbot ” is of great antiquity, perhaps of Celtic origin ; it is preserved in French in the same form as in English, and is composed of two words, of which the second is identical with the “but in halibut and with the German “Butte,” which signifies flat-fish. The German name for the turbot is ” Steinbutte.”

vertically like the young of other Pleuronectids, but they reach a much larger size before metamorphosis than species of other genera, specimens from J in. to i in. in length being frequently taken swimming at the surface of the water and not completely converted into the adult condition. Specimens one year old are from 3 to 45 in. long, some perhaps larger. About i860 it was estimated that the Dutch supplied turbot to the London market to the value of £80,000 a year. In 1900 the total weight of turbot landed on English and Welsh coasts for the year was according to the Board of Trade returns 60,715 cwt. valued at £252,680. The turbot is also common, though not abundant, in the Mediterranean, and is replaced in the Black Sea by an allied species with much larger bony tubercles {Rh. maeoticus). Both species grow to a large size, being usually sold at from

5 to 10 lb; but the common turbot is stated to attain to a weight of 30 lb.

TUREEN, a deep dish or bowl, round or oval in shape, and with a cover, made to serve soup at table. The word is a corruption of the more correct " terrine," an earthenware vessel (Med. Lat. terrineus, made of earth, terra). The corruption is due to mis- spelling in early cookery-books, and an absurd story that the name arose from Marshal Turenne once drinking his soup from his helmet was invented to account for it.

TURENNE, HENRI DE LA TOUR D'AUVERGNE, Vicomte de (1611-1675), marshal of France, second son of Henri, duke of Bouillon and sovereign prince of Sedan, by his second wife Elizabeth, daughter of William the Silent, prince of Orange, was born at Sedan on the nth of September 161 1. He was educated in the doctrines of the Reformed religion and received the usual training of a young noble of the time, but physical infirmity, and particularly an impediment of speech (which he never lost), hampered his progress, though he showed a marked partiality for history and geography, and especial admiration of the exploits of Alexander the Great and Caesar. After his father's death in 1623, he devoted himself to bodily exercises and in a great measure overcame his natural weakness. At the age of fourteen he went to learn war in the camp of his uncle, Maurice of Nassau, and began his military career (as a private soldier in that prince's bodyguard) in the Dutch War of Independence. Frederick Henry of Nassau, who succeeded his brother Maurice in 1625, gave Turenne a captaincy in 1626. The young officer took his part in the siege warfare of the period, and won special commendation from his uncle, who was one of the foremost commanders of the time, for- his skill and courage at the celebrated siege of Hertogenbosch (Bois-le-Duc) in 1629. In 1630 Turenne left Holland and entered the service of France. This step was dictated not only by the prospect of military advancement but also by his mother's desire to show the loyalty of the Bouillon dominions to the French crown. Cardinal Richelieu at once made him colonel of an infantry regiment. He still continued to serve at frequent intervals with the prince of Orange, who was the ally of France, and his first serious service under the French flag was at the siege of La Motte in Lorraine by Marshal de la Force (1634),

where his brilliant courage at the assault won him immediate promotion to the rank of marechal de camp (equivalent to the modern grade of major-general). In 1635 Turenne served under Cardinal de la Valet te in Lorraine and on the Rhine. The siege of Mainz was raised but the French army had to fall back on Metz from want of provisions. In the retreat Turenne measured swords with the famous imperialist General Gallas, and distinguished himself greatly by his courage and skill. The reorganized army took the field again in 1636 and captured Saverne (Zabern), at the storming of which place Turenne was seriously wounded. In 1637 he took part in the campaign of Flanders and was present at the capture of Landrecies (July 26) and in the latter part of 1638, under Duke Bernhard of Saxe-Weimar (1608-1639), he directed the assault of Breisach (reputed the strongest fortress on the upper Rhine), which surrendered on the 17th of December. He had now gained a. reputation as one of the foremost of the younger generals of France, and Richelieu

next employed him in the Italian campaign of 1630/-40 under " Cadet la Perle," Henri de Lorraine, count of Harcourt (1601- 1666). On the 19th of November 1639 ne fought in the famous rearguard action called the battle of the " Route de Quiers," and during the winter •revictualled the citadel of Turin, held by the French against the forces of Prince Thomas of Savoy. In 1640 Harcourt saved Casale and besieged Prince Thomas's forces in Turin, which were besieging in their turn another French force in the citadel. The latter held out, while Prince Thomas was forced to surrender on the 17th of September 1640, a fourth army which was investing Harcourt's lines being at the same time forced to retire. The favourable result of these complicated operations was largely due to Turenne, who had by now become a lieutenant-general. He himself com- manded during the campaign of 1641 and took Coni (Cuneo), Ceva and Mondovi. In 1642 he was second in command of the French troops which conquered Roussillon. At this time the conspiracy of Cinq Mars (see France:- History) in which Turenne's elder brother, the duke of Bouillon, was implicated, was discovered.

The earlier career of Turenne was markedly influenced by the relations of the principality of Sedan to the French crown; sometimes it was necessary to advance the soldier

to conciliate the ducal family, at others the machinations of the latter against Richelieu or Mazarin prevented the king's advisers from giving their full confidence to their general in the field. Moreover his steady adherence to the Protestant religion was a further element of difficulty in Turenne's relations with the ministers. Cardinal Richelieu nevertheless entrusted him with the command in Italy in 1643 under Prince Thomas (who had changed sides in the quarrel). Turenne took Trino in a few weeks, but was recalled to France towards the end of the year. He was made a marshal of France (December 19) and was soon sent to Alsace to reorganize the " Army of Weimar " — the remnant of Duke Bernhard of Saxe- Weimar's troops — which had just been severely defeated at Tuttlingen (November 24-25, 1643). He was at this time thirty-two years of age and had served under four famous commanders. The methodical prince of Orange, the fiery Bernhard, the soldierly Cardinal de la Valette and the stubborn and astute Harcourt had each contributed much to the completeness of Turenne's training, and he took the field in 1644 prepared by genius and education for the responsibilities of high command.

The work of reorganization over, Marshal Turenne began the campaign in June by crossing the Rhine at Breisach, but was almost instantly joined by an army under the due d'Enghien (afterwards the great Conde), who, as a prince of the royal house, took the chief command of the united armies of " France " and "Weimar." The four famous campaigns which followed brought to an end the Thirty Years' War (q.v.). The chief event of the first of these was the desperately-fought battle of Freiburg against Count Mercy's Bavarians (August 3, 5 and 9, 1644), after which Philipsburg was successfully besieged. Before the capitulation Enghien withdrew and left Turenne in command. The marshal opened the cam- paign of 1645 w ith a strong forward movement, but was surprised and defeated by Mercy at Mergentheim (Marienthal) on the 2nd of May. Enghien was again sent to the front with the army of France and Turenne's army was greatly increased by the arrival of a Swedish force and a contingent from Hesse-Cassel. The Swedes soon departed, but Enghien was at the head of 20,000 men when he met the Bavarians in a battle even more stubbornly contested than, Freiburg. Mercy was

killed and his army decisively beaten at Allerheim near Nordlingen (August 3, 1645).

Ill-health forced Enghien to retire soon afterwards, and Turenne was for the third time left in command of the French army. He was again unfortunate against the larger forces of the imperialists, but the campaign ended with a gleam of success in his capture of Trier (Treves). In the following year (1646) he obtained more decided successes, and, by separating the Austrians from the Bavarians, compelled the

elector of Bavaria to make peace (signed March 14, 1647). In 1647 he proposed to attack the thus weakened army of the emperor, but was ordered into Flanders instead. Not only was the opportunity thus lost but a serious mutiny broke out araongst the Weimar troops, whose pay was many months in arrear. The marshal's tact and firmness were never more severely tried nor more conspicuously displayed than in his treatment of the disaffected regiments, among whom in the end he succeeded in restoring order with little bloodshed. He then marched into Luxemburg, but was soon recalled to the Rhine, for in 1648 Bavaria had returned to her Austrian alliance and was again in arms. Turenne and his Swedish allies made a brilliant campaign, which was decided by the action of Zusmarshausen (May 17), Bavaria being subse- quently wasted with fire and sword until a second and more secure pacification was obtained. This devastation, for which many modern writers have blamed Turenne, was not a more harsh measure than was permitted by the spirit of the times and the circumstances of the case.

The peace of Westphalia (1648) was no peace for France, which was soon involved in the civil war of the Fronde (see France: History). Few of Turenne's actions have been more sharply criticized than his adhesion to the party of revolt. The army of Weimar refused to follow its leader and he had to flee into the Spanish Netherlands, where he remained until the treaty of Rueil put an end to the first war of the Fronde. The second war began with the arrest of Conde and

others (January 1650), amongst whom Turenne was to have been included; but he escaped in time and with the duchesse de Longueville held Stenay for the cause of the " Princes " — Conde, his brother Conti, and his brother-in-law the due de Longueville. Love for the duchess seems to have ruled Turenne's action, both in the first war, and, now, in seeking Spanish aid for the princes. In this war Turenne sustained one of his few reverses at Rethel (December 15, 1650); but the second conflict ended in the early months of the following year with the collapse of the court party and the release of the princes.

Turenne became reconciled and returned to Paris in May, but the trouble soon revived and before long Conde again raised the standard of revolt in the south of France. In this, the third war of the Fronde, Turenne and Conde were opposed to each other, the marshal commanding the royal armies, the prince that of the Frondeurs and their Spanish allies. Turenne displayed the personal bravery of a young soldier at Jargeau (March 28, 1652), the skill and wariness of a veteran general at Gien (April 7), and he practically crushed the civil war in the battle of the Faubourg St Deiiis (July 2) and the reoccupation of Paris (October 21). Conde and the Spaniards, however, still remained to be dealt with, and the long drawn out campaigns of the "Spanish Fronde" gave ample scope for the display of scientific generalship on the part of both the famous captains. In 1653 the advantage was with Turenne, who captured Rethel, St Menehould and Muzon, while Conde's sole prize was Rocroy. The short cam- paign of 1654 was again to the advantage of the French; on the 25th of July the Spanish were defeated at Arras. In 1655 more ground was gained, but in 1656 Turenne was defeated at Valenciennes in the same way as he had beaten Conde at Arras. The war was eventually concluded in 1657 by Turenne's victory at the Dunes near Dunkirk, in which a corps of English veterans sent by Cromwell played a notable part (June 3-14); a victory which, followed by another successful campaign in 1658, led to the peace of the Pyrenees in 1659.

On the death of Cardinal Mazarin in 1661 Louis XIV. took the reins of government into his own hands and one of his first acts was to appoint Turenne " marshal-general of the camps and armies of the king." He had offered to revive the office of constable of France (suppressed in 1627) in

Turenne's favour if the marshal would become a Roman Catholic. Turenne declined. Born of Calvinist parents and educated a Protestant, he had refused to marry one of Richelieu's nieces in 1639 and subsequently rejected a similar proposal of Mazarin.

He had later married a daughter of the Protestant Marshal de la Force, to whom he was deeply attached. But he sincerely deplored the division of the Christian church into two hostile camps. He had always ˆdistrusted the influence of many dissident and uncontrolled sects; the history of Independency in the English army and people made a deep impression on his mind, and the same fear of indiscipline which drove the English Presbyterians into royalism drew Turenne more and more towards the Roman Catholic Church. How closely both he and his wife studied such evidence as was available is shown by their correspondence, and, in the end, two years after her death, he was prevailed upon by the eloquence of Bossuet and the persuasions of his nephew, the abbe de Bouillon, to give in his adhesion to the Orthodox faith (October 1668). In 1667 he had returned to the more congenial air of the " Camps and Armies of the King," directing, nominally under Louis XIV., the famous " Promenade militaire " in which the French overran the Spanish Netherlands. Soon afterwards Conde, now reconciled with the king, rivalled Turenne's success by the rapid conquest of Franche Comte, which brought to an end the War of Devolution in February 1668.

In Louis XIV.'s Dutch War of 1672 (see Dutch Wars) Turenne was with the army commanded by the king which overran Holland up to the gates of Amsterdam. The terms offered by Louis to the prince of Orange were such as to arouse a more bitter resistance. The dikes were opened and the country round Amsterdam flooded. This heroic measure completely checked Turenne, whom the king had left in command. Europe was aroused to action by the news of this event, and the war spread to Germany. Turenne fought a successful war of manceuvre on the middle Rhine while Conde covered Alsace. In January 1673 Turenne as- sumed the offensive, penetrated far into Germany, and forced the Great Elector of Brandenburg to make peace; later in the year, however, he was completely out- manoeuvred by the famous imperial general Mbntecucculi, who evaded his opponent, joined the Dutch and took the important place of

Bonn. In June 1674, however, Turenne won the battle of Sinzheim, which made him master of the Palatinate. Under orders from Paris the French wasted the country far and wide, and this devastation has usually been considered the gravest blot on Turenne's fame, though it is difficult to say that it was more unjustifiable than other similar incidents in medieval and even in modern war. In the autumn the ajlies again advanced, and though Turenne was again outmanoeuvred, his failure on this occasion was due to the action of the neutral city of Strassburg in permitting the enemy to cross the Rhine by the bridge at that place. The battle of Enzheim followed; this was a tactical victory, but hardly affected the situation, and, at the beginning of December, the allies were still in Alsace. The old marshal now made the most daring campaign of his career. A swift and secret march in mid-winter from one end of the Vosges to the other took the allies by surprise. Sharply following up his first successes, Turenne drove the enemy to Turkheim, and there inflicted upon them a heavy defeat (January 5, 1675). In a few weeks he had completely recovered Alsace. In the summer campaign he was once more opposed to Montecucculi, and after the highest display of " strategic chess-moves " by both commanders, Turenne finally compelled his opponent to offer battle at a disadvantage at Sassbach. Here, on the 27th of July 1675, he was killed by almost the first shot fired. The news of his death was received with universal sorrow. Turenne's most eloquent countrymen wrote his doges, and Montecucculi him- self exclaimed: " II est mort aujourd'hui un homme qui faisait honneur a. l'homme." His body was taken to St Denis and buried with the kings of France. Even the extreme revolutionists of 1793 respected it, and, when the bones of the sovereigns were thrown to the winds, the remains of Turenne were pre- served at the Jardin des Plantes until the 22nd of September 1800, when they were removed by order of Napoleon to the church of the Invalides at Paris, where they still rest.

4.14

TURF— TURGA1

Turenne was one of the great captains whose campaigns Napoleon recommended all soldiers to " read and re-read." His fame as a general was the highest in Europe at a period

when war was studied more critically than ever before, for his military character epitomized the art of war of his time (Prince de Ligne). Strategic caution and logistic accuracy, combined with brilliant dash in small combats and constancy under all circumstances of success or failure may perhaps be considered the salient points of Turenne's genius for war. Great battles he avoided. " Few sieges and many combats " was his own maxim. And, unlike his great rival Conde, who was as brilliant in his first battle as in his last, Turenne improved day by day. Napoleon said of him that his genius grew bolder as it grew older, and a modern author, the due d'Aumale (Histoire des princes de la maison de CondS), takes the same view when he says: " Pour le connaltre il faut le suivre jusqu'a Sulz- bach. Chez lui chaque jour marque un progress." In his personal character Turenne was little more than a simple and honourable soldier, endowed with much tact, but in the world of politics and intellect almost helpless in the hands of a skilful intriguer or casuist. His morals, if not beyond reproach, were at least more austere than those prevalent in the age in which he lived. He was essentially a commander of regular armies. His life was spent with the troops; he knew how to win their affection; he tempered a severe discipline with rare generosity, and his men loved him as a comrade no less than they admired him as a commander. Thus, though Conde's genius was far more versatile, it is Turenne whose career best represents the art of war in the 17th century. For the small, costly, and highly trained regular armies, and the dynastic warfare of the age of Louis XIV., Turenne was 1 the ideal army leader. ■

The most notable of the numerous portraits of Turenne are those of P. de Champagne at Versailles, and of Senin (dated 1670) in the Jones collection at South Kensington, London. Of the older memoirs of Turenne the most important are those of " Du Buisson," La Vie du vicomte de Turenne — the author is apparently Gatien de Sandraz de Courtilz (Paris, the Hague, and Cologne, 1688-1695); Abbe Raguenet, Histoire du vicomte de Turenne (Paris, 1741) and especially Ramsay, Histoire d'Henry de la Tour d'Auvergne, vicomte de Turenne (Paris, 1 735), the second volume of which contains the marshal's memoirs of 1643-1658. These memoirs, of which the Prince de Ligne wrote that " ce ne sont pas de conseils, ce sont des ordres . . . ' faites ' . . . '

allez,' &c." — were written in 1665, but were first published (Memoires sur la guerre, tires des originaux, &c.) in 1738, reprinted in Michaud, Memoires sur I'histoire de France, 3rd series, vol. iii., and Liskenne and Sauvan's Bibliotheaue historique et militaire, vol. iv. (Paris, 1846). A manuscript Maximes de M. de Turenne (1644) exists in the Staff Archives at Vienna, and of other documentary collections may be mentioned Grimoard, Collections de leltres et memoires trouves dans la portefeuille de M,. de Turenne (Paris, 1782); Recueil de lettres ecrites au vicomte de Turenne par Louis XIV. et ses ministres, &c. (Paris, 1779); Correspondence inedite de Turenne avec Le Tellier et Louvois, ed. Barthelemy (Paris, 1874). See also the Observations on the Wars of Marshal Turenne, dictated by Napoleon at St Helena (1823) ; Puysegur, La Guerre par principes et regies (Paris, 1748); Precis in Bibliotheque international d'hist. milit. (Brussels, 1883) ; Duruy, Histoire de Turenne (Paris, 1880) ; Roy, Turenne, sa vie et les institutions mililaires de son temps (Paris, 1884); Hardy de Perini, Turenne et Conde (Paris, 1907); Neuber, Turenne als Kriegstheoretiker und Feldherr (Vienna, 1869) ; Sir E. Cust, Lives of the Warriors of the lyth Century (London, 1867); T. O. Cockayne, Life of M. de Turenne (founded on Ramsay's work; London, 1853) ; G. B. Malleson, Turenne. Marshal Turenne, by " the author of the Life of Sir Kenelm Digby " (London, 1907), is a valuable work by a civilian, and is based in the main on Ramsay's work, the memoirs of Cardinal de Retz, James, duke of York, &c, and on Napoleon's commentaries. A remarkable parallel between Turenne and Conde, in Saint-Evremont's eloge of the latter, will be found in Carrion-Nisas, Essai sur I' histoire general de I'art militaire, ii. 83 (Paris, 1824). (C. F. A.)

TURF, the top or surface of earth when covered with grass, forming a coherent mass of mould or soil in which the roots of grasses and other plants are embedded. This is capable of being cut out in solid mat-like blocks, known by the same name. Similarly " peat " {q.v.) when cut in pieces for fuel or other purposes is also styled " turf." The term is applied widely to any stretch or sward of trimmed grass-land, and thus by metonymy, to horse-racing and all connected with it,

from the owning and running of race-horses to betting. The word " turf " is common to Teutonic languages, cf. Du. turf,

Ger. Tor}, Dan. torv, &c. It has been connected with Skt. darbha, grass, so called from being matted or twisted together, darbh, to wind. The Teutonic word was adapted in Med. Lat., as turba (cf. Fr. tourbe, Ital. torba), whence was formed turbaria, turbary, the right of digging and cutting turf in common with the owner of the land. (See Commons.) TURGAI, a province of Russian Central Asia, formerly a part of the Kirghiz steppe, and now included in the governor- generalship of the Steppes, bounded by the province of Uralsk and the governments of Orenburg and Tobolsk on the W. and N., by Akmolinsk on the E., and by Syr-darya and the Sea of Aral on the S. This territory, which has an area of 176,219 sq. m. — nearly as large as that of Caucasia and Transcaucasia taken together — belongs to the Aral-Caspian depression. It has, however, the Mugojar Hills on its western border and includes a part of the southern Urals; and from Akmolinsk it is separated by a range of hills which run between the two largest rivers of the Kirghiz steppe — the Turgai and the Sary-su. In the north it includes the low belt of undulating land which stretches north-east from the Mugojar Hills and separates the rivers belonging to the Aral basin from those which flow towards the Arctic Ocean, and beyond this range it embraces the upper Tobol. The remainder is steppe land, sloping gently towards the Sea of Aral.

The Mugojar Hills consist of an undulating plateau nearly 1000 ft. in altitude, built up of Permian and Cretaceous deposits and deeply trenched by rivers. They are not the independent chain which our maps represent them to be: 1 they merely continue the Urals towards the south, and are connected with the Ust-Urt plateau by a range of hills which was formerly an island of the Aral-Caspian Sea. Their northern extremity joins the undulating plateau (400 to 600 ft.), built up of sandstones and marls, which separates the tributaries of the Tobol from those of the river Ural, and falls by a range of steep crags — -probably an old shore-line of the Aral basin — towards the steppes. The steppe land of Turgai is only some 300 ft. above the sea-level, and is dotted with lakes, of which the Chalkar-teniz, which receives the Turgai and its tributary the Irgiz, is the largest. The Turgai was, at a recent epoch, a large river flowing into the Sea of Aral and receiving an extensive system of tributaries, which are now lost in the sands before joining

it. Re- mains of aquatic plants buried in the soil of the steppe, and shells of Mytilus and Cardium, both still found in the Sea of Aral, show that during the Glacial period this region was overflowed by the waters of the Aral-Caspian Sea.

The climate of Turgai is exceedingly dry and continental. Orsk, a town of Orenburg, on its north-western border, has a January as cold as that of the west coast of Novaya Zemlya (-4 F.), while in July it is as hot as July in Morocco (73) ; the corresponding figures for Irgiz, in the centre of the province, are 7 and 77 At Irgiz and Orsk the annual rainfall is somewhat under 10 in. and 12 in. respectively (3 in. in summer). The west winds are parched before they reach the Turgai steppes, and the north-east winds, which in winter bring cold, dry snows from Siberia, raise in summer formid- able clouds of sand. A climate so dry is of course incompatible with a vigorous forest growth. There is some timber on the southern Urals, the Mugojar Hills and the water-parting of the Tobol; else- where trees are rare. Shrubs only, such as the wild cherry (Cerasus chamaecerasus) and the dwarf almond (Amygdalus nana) grow on the hilly slopes, while the rich black-earth soil of the steppe is chiefly clothed with feather grass (Stipa pennata), the well-known ornament of the south Russian steppes. In spring the grass vegetation is luxu- riant, and geese and cranes are attracted in vast numbers from the heart of the steppe by the fields of the Kirghiz. The jerboa (Dipus jaculus) and the marmot (Spermophilus rufescens) are characteristic of the fauna; another species of marmot (Arctomys bobac) and the steppe fox (Canis cor sac) are common; and the saiga antelope of Central Asia is occasionally met with. Farther south the black earth disappears and with it the feather grass, its place being taken by its congener, Stipa capillata. Trees disappear, and among the bushes along the banks of the rivers willows and the pseudo-acacia or Siberian pea tree (Caragana microphyla) are most prevalent. In the middle parts of the province the clayey soil is completely clothed with wormwood (Artemisia fragrans and A. monogyna), with a few grassy plants on the banks of the rivers and lakes (Lasiagrostis splendens, Alhagi camelorum and A-kirghizorum, Obiona portula- coides, Halimodendrum argenteum) ; while large areas consist of shifting sands,

saline clays clothed with various Salsolaceae, and the desiccated beds of old lakes. Such lakes as still exist,

1 See P. S. Nazarov, in " Recherches zoologiques dans les steppes des Kirghizes," in Bull. soc. des natur. de Moscow (1886), No. 4.

notwithstanding the rapid desiccation now going on, are surrounded by thickets of reeds — the retreat of wild boars. Turgai is thus the borderland between the flora of Europe and that of Central Asia.

The population was estimated in 1906 at 511,800, composed mainly of Kirghiz, though Russians have immigrated in large numbers. The province is divided into four districts, the chief towns of which are Turgai, the capital; Ak-tyubinsk in the district of Iletsk; Irgiz and Kustanaisk in the Nikolayevsk district, a prairie town which has grown with great rapidity. Agriculture is mainly carried on by the Russian settlers in the Nikolayevsk district, where the crops do not suffer so much from droughts as they do elsewhere. But the Kirghiz have also begun to cultivate the soil, and in 1900 there were in all 612,200 acres under cereals.

The principal crops are rye, wheat, oats, barley and potatoes. Livestock breeding is the leading occupation of the Kirghiz. Camels are bred and kept by the nomads both for their own personal use and for the transport of goods between Bokhara, Khiva and Russian Turkestan. Considerable quantities of cattle and various animal products are exported to Orenburg, Orsk and Troitsk, and to Ust- Uisk and Zverinogolovsk, where large fairs are held. The Kirghiz of the southern parts migrate in winter to the better sheltered parts of the province of Syr-darya, while in the summer some 30,000 kibitkas (felt tents) of nomads come from the neighbouring provinces to graze their cattle on the grassy steppes of Turgai. Salt is obtained from the lakes. There are a few oil-works, tanneries and flour-mills, and the Kirghiz are active in the making of carpets and felt goods. Education is a little more advanced than in the other

steppe pro- vinces; the system of “migratory schools” has been introduced for the Kirghiz.

See Y. Talferov, The Turgai Province (1896), in Russian.

(P. A. K; J. T. Be.)

TURGOT, ANNE ROBERT JACQUES, Baron de Laune (1727-1781), French statesman and economist, was born in Paris on the 10th of May 1727. He was the youngest son of Michel Etienne Turgot, ” provost of the merchants ” of Paris, and Madeleine Francoise Martineau, and came of an old Norman family. He was educated for the Church, and at the Sorbonne, to which he was admitted in 1749 (being then styled abbe de Bru- court), he delivered two remarkable Latin dissertations, On the Benefits which the Christian Religion has conferred on Mankind, and On the Historical Progress of the Human Mind. The first sign we have of his interest in economics is a letter (1749) on paper money, written to his fellow student the abbe de Cic6, refuting the abbe Terrasson’s defence of Law’s system. He was fond of verse-making, and tried to introduce into French verse the rules of Latin prosody, his translation of the fourth book of the Aeneid into classical hexameters being greeted by Voltaire as ” the only prose translation in which he had found any enthusiasm.” In 1750 he decided not to take holy orders, giving as his reason, according to Dupont de Nemours, ” that he could not bear to wear a mask all his life.” In 1752 he be- came substitut, and later conseiller in the parlement of Paris, and in 1753 maitre des requites. In 1754 he was a member of the chambre royale which sat during an exile of the parlement; in 1755 and 1756 he accompanied Gournay, then intendant of commerce, in his tours of inspection in the provinces, and in 1760, while travelling in the east of France and Switzerland, visited Voltaire, who became one of his chief friends and supporters. In Paris he frequented the salons, especially those of Mme Graffigny— whose niece, Mile de Ligniville (” Minette “), afterwards Mme Helvetius and his lifelong friend, he is supposed at one time to have wished to marry — Mme Geoffrin, Mme du Deffand, Mile de Lespinasse and the duchesse d’Enville. It was during this period that he met the leaders of the ” physiocratic ” school, Quesnay and Gournay, and with them Dupont de Nemours, the abbe Morellet and other economists. All this

time he was studying various branches of science, and languages both ancient and modern. In 1753 he translated the Questions sur la commerce from the English of Josias Tucker, and wrote his Lettre sur la toUrance, and a pamphlet, Le Conciliateur, in support of religious tolerance. Between 1755 and 1756 he composed various articles for the Encyclopedic, and between 1757 and 1760 an article on Valeurs et monnaies, probably for the Dictionnaire du commerce of the abbe Morellet. In 1759 appeared his Eloge de Gournay.

In August 1761 Turgot was appointed intendant of the generality of Limoges, which included some of the poorest and most over-taxed parts of France; here he remained for 13 years. He was already deeply imbued with the theories of Quesnay and Gournay (see Physiocratic School), and set to work to apply them as far as possible in his province. His first plan was to continue the work, already initiated by his predecessor Tourny, of making a fresh survey of the land {cadastre), in order to arrive at a juster assessment of the taille; he also obtained a large reduction in the contribution of the province. He pub- lished his Avis sur I'assiette et la repartition de la taille (1762- 1770), and as president of the Societe d' agriculture de Limoges offered prizes for essays on the principles of taxation. Quesnay and Mirabeau had advocated a proportional tax {impdt de quotite), but Turgot a distributive tax {impdt de repartition). Another reform was the substitution for the corvee of a tax in money levied on the whole province, the construction of roads being handed over to contractors, by which means Turgot was able to leave his province with a good system of roads, while distributing more justly the expense of their construction. In 1769 he wrote his Memoire sur les prets a interlt, on the occasion of a scandalous financial crisis at Angouleme, the peculiar interest of which is that in it the question of lending money at interest was for the first time treated scientifically, and not merely from the ecclesiastical point of view. Among other works written during Turgot's intendancy were the Memoire sur les mines et carrieres, and the Mimoire sur la marque des fers, in which he protested against state regulation and interference and advocated free competition. At the same time he did much to encourage agriculture and local industries, among others establishing the manufacture of porcelain. During the

famine of 1770-1771 he enforced on landowners ” the obligation of relieving the poor ” and especially the metayers dependent upon them, and organized in every province ateliers and bureaux de chariit for providing work for the able-bodied and relief for the infirm, while at the same time he condemned indiscriminate charity. It may be noted that Turgot always made the cures the agents of his charities and reforms when possible. It was in 1770 that he wrote his famous Lettres sur la libertl du commerce des grains, addressed to the comp- troller-general, the abbe Terray. Three of these letters have disappeared, having been sent to Louis XVI. by Turgot at a later date and never recovered, but those remaining demon- strate that free trade in corn is to the interest of landowner, farmer and consumer alike, and in too forcible terms demand the removal of all restrictions.

Turgot’s best known work, Reflexions sur la formation et la dis- tribution des richesses, was written early in the period of his inten- dancy for the benefit of two young Chinese students. Written in 1766, it appeared in 1769-1770 in Dupont’s journal, the EpMmerides du citoyen, and was published separately in 1776. Dupont, how- ever, made various alterations in the text, in order to bring it more into accordance with Quesnay’s doctrines, which led to a coolness between him and Turgot (see G. Schelle, in Journal des economises, July 1888). A more correct text is that published by L. Robineau (” Turgot,” in Petite bibliotheque economique, 1889), and is followed by Professor W. J. Ashley in his translation (Economic Classics, New York, 1898), but the original MS. has never been found.

After tracing the origin of commerce, Turgot develops Quesnay’s theory that the land is the only source of wealth, and divides Society into three classes, the productive or agricultural, the salaried (stipendiee) or artisan class, and the landowning class (classe dis- ponible). After discussing the evolution of the different systems of cultivation, the nature of exchange and barter, money, and the functions of capital, he sets forth the theory of the impdt unique, i.e. that only the produit net of the land should be taxed. In addition he demanded the complete freedom of commerce and industry. 1

1 For the controversy as to how far Adam Smith (q.v.) was in- fluenced by Turgot, see S. Feilbogen, Smith und Turgot (1892); also E. Cannan's introduction to Smith's Lectures on Justice, Sac. (Clarendon Press, 1896) ; and H. Higgs's review of the latter in the Economic Journal, Dec. 1896. The question may still be considered an open one. See also Neymarck, i. 332, footnote, for the French authorities. Condorcet's statement that Turgot corresponded with Smith is disproved by a letter of Smith to the due de la Rochefou- cauld, published in the Economic Journal (March 1896), p. 165, in which he says, " But tho' I had the happiness of his acquaintance

Turgot owed his appointment to the ministry to Maurepas, . the " Mentor " of Louis XVI., to whom he was warmly recom- mended by the abbe Very, a mutual friend. His appointment as minister of the marine on the 20th of July 1774 met with general approval, and was hailed with enthusiasm by the philosophes. A month later he was appointed comptroller- general (August 24). His first act was to submit to the king a statement of his guiding principles: "No bankruptcy, no increase of taxation, no borrowing." Turgot's policy, in face of the desperate financial position, was to enforce the most rigid economy in all departments. All departmental expenses were to be submitted for the approval of the comptroller- general, a number of sinecures were suppressed, the holders of them being compensated, and the abuse of the " acquits au comptant " was attacked, while Turgot appealed person- ally to the king against the lavish giving of places and pensions. He also contemplated a thorough-going reform of the ferme gentrale, but contented himself, as a beginning, with imposing certain conditions on the leases as they were renewed— such as a more efficient personnel, and the abolition for the future of the abuse of the croupes (the name given to a class of pensions) , a reform which Terray had shirked on finding how many persons in high places were interested in them, and annulling certain leases, such as those of the manufacture of gunpowder and the administration of the messageries, the former of which was handed over to a company with the scientist Lavoisier as

one of its advisers, and the latter superseded by a quicker and more comfortable service of diligences which were nicknamed ” turgo- tines.” He also prepared a regular budget. Turgot’s measures succeeded in considerably reducing the deficit, and raised the national credit to such an extent that in 1776, just before his fall, he was able to negotiate a loan with some Dutch bankers at 4%; but the deficit was still so large as to prevent him from attempting at once to realize his favourite scheme of substi- tuting for indirect taxation a single tax on land. He suppressed, however, a number of octrois and minor duties, 1 and opposed, on grounds of economy, the participation of France in the War of American Independence, though without success.

Turgot at once set to work to establish free trade in corn, but his edict, which was signed on the 13th of September 1774, met with strong opposition even in the conseil du roi. A striking feature was the preamble, setting forth the doctrines on which the edict was based, which won the praise of the philosophes and the ridicule of the wits; this Turgot rewrote three times, it is said, in order to make it ” so clear that any village judge could explain it to the peasants.” The opposition to the edict was strong. Turgot was hated by those who had been interested in the speculations in corn under the regime of the abbe Terray — among whom were included some of the princes of the blood. Moreover, the commerce des bles had been a favourite topic of the salons for some years past, and the witty Galiani, the opponent of the physiocrats, had a large following. The oppo- sition was now continued by Linguet and Necker, who in 1775 published his treatise Sur la Ugislation et le commerce des grains. But Turgot’s worst enemy was the poor harvest of 1774, which led to a slight rise in the price of bread in the winter and early spring of 1774-1775. In April disturbances arose at Dijon, and early in May took place those extraordinary bread-riots known as the ” guerre des farines,” which may be looked upon as a first sample of the Revolution, so carefully were they organized. Turgot showed great firmness and de- cision in repressing the riots, and was loyally supported by the king throughout. His position was strengthened by the entry of Malesherbes into the ministry (July 1775).

All this time Turgot had been preparing his famous ” Six

Edicts," which were finally presented to the conseil du roi (Jan. 1776). Of the six edicts four were of minor importance, and, I flattered myself, even of his friendship and esteem, I never had that of his correspondence," but there is no doubt that Adam Smith met Turgot in Paris, and it is generally admitted that The Wealth of Nations owes a good deal to Turgot.

1 For an account of Turgot's financial administration, see Ch. Gomel, Causes financieres, vol. i.

but the two which met with violent opposition were, firstly, the edict suppressing the corvees, an'd secondly, that suppressing the jurandes and maitrises, the privileged trade corporations. In the preamble to the former Turgot boldly announced as his object the abolition of privilege, and the subjection of all three orders to taxation; the clergy were afterwards excepted, at the request of Maurepas. In the preamble to the edict on the jurandes he laid down as a principle the right of every man to work without restriction. 2 He obtained the registra- tion of the edicts by the lit de justice of the 1 2th of March, but by that time he had nearly everybody against him. His attacks on privilege had won him the hatred of the nobles and the parlements, his attempted reforms in the royal house- hold that of the court, his free trade legislation that of the " financiers," his views on tolerance and his agitation for the suppression of the phrase offensive to Protestants in the king's coronation oath that of the clergy, and his edict on the jurandes that of the rich bourgeoisie of Paris and others, such as the prince de Conti, whose interests were involved. The queen disliked him for opposing the grant of favours to her proteges, and he had offended Mme de Polignac in a similar manner (see Marquis de Segur, Au Couchant de la monarchic, p. 305-

306).

All might yet have gone well if Turgot could have retained the confidence of the king, but the king could not fail to see that Turgot had not the support of the other ministers. Even his friend Malesherbes thought he was too rash, and was, moreover, himself discouraged and wished to resign. The alienation of Maurepas was also increasing. Whether through jealousy of the ascendancy which Turgot had acquired over the king, or through the natural

incompatibility of their characters, he was already inclined to take sides against Turgot, and the reconciliation between him and the queen, which took place about this time, meant that he was henceforth the tool of the Polignac clique and the Choiseul party.- About this time, too, appeared a pamphlet, Le Songe de M. Maurepas, generally ascribed to the comte de Provence (Louis XVIII.), containing a bitter caricature of Turgot.

Before relating the circumstances of Turgot's fall we may briefly resume his views on the administrative system. With the physiocrats, he believed in an enlightened absolutism, and looked to the king to carry through all reforms. As to the parlements, he opposed all interference on their part in legislation, considering that they had no competency outside the sphere of justice. He recognized the danger of the recaP of the old parlement, but was unable effectively to oppose it since he had been associated with the dismissal of Maupeou and Terray, and seems to have underestimated its power. He was opposed to the summoning of the states-general advo- cated by Malesherbes (May 6, 1775), possibly on the ground that the two privileged orders would have too much power in them. His own plan is to be found in his Memoire sur les municip allies, which was submitted informally to the king. In Turgot's proposed system landed proprietors alone were to form the electorate, no distinction being made between the three orders; the members of the town and country munici- paliUs were to elect representatives for the district municipalites, which in turn would elect to the provincial municipalites, and the latter to a grande municipality, which should have no legislative powers, but should concern itself entirely with the administration of taxation. With this was to be combined a whole system of education, relief of the poor, &c. Louis XVI. recoiled from this as being too great a leap in the dark, and such a fundamental difference of opinion between king and minister was bound to lead to a breach sooner or later. Turgot's only choice, however, was between "tinkering " at the existing system in detail and a complete revolution, and his attack on privilege, which might have been carried through by a popular minister and a strong king, was bound to form part of any effective scheme of reform.

2 Turgot was opposed to all labour associations of

employers or employed, in accordance with his belief in free competition.

The immediate cause of Turgot's fall is uncertain. Some speak of a plot, of forged letters containing attacks on the queen shown to the king as Turgot's, of a series of notes on Turgot's budget prepared, it is said, by Necker, and shown to the king to prove his incapacity. Others attribute it to the queen, and there is no doubt that she hated Turgot for supporting Vergennes in demanding the recall of the comte de Guines, the ambassador in London, whose cause she had ardently espoused at the prompting of the Choiseul clique. Others attribute it to an intrigue of Maurepas. On the resignation of Malesherbes (April 1776), whom Turgot wished to replace by the abbe Very, Maurepas proposed to the king as his suc- cessor a nonentity named Amelot. Turgot, on hearing of this, wrote an indignant letter to the king, in which he reproached him for refusing to see him, pointed out in strong terms the dangers of a weak ministry and a weak king, and complained bitterly of Maurepas's irresolution and subjection to court intrigues; this letter the king, though asked to treat it as con- fidential, is said to have shown to Maurepas, whose dislike for Turgot it still further embittered. With all these enemies, Turgot's fall was certain, but he wished to stay in office long enough to finish his project for the reform of the royal house- hold before resigning. This, however, he was not allowed to do, but on the 12th of May was ordered to send in his resigna- tion. He at once retired to la Roche-Guyon, the chateau of the duchesse d'Enville, returning shortly to Paris, where he spent the rest of his life in scientific and literary studies, being made vice-president of the Academie des Inscriptions et Belles- lettres in 1777. He died on the 1 8th of March 1781.

In character Turgot was simple, honourable and upright, with a passion for justice and truth. He was an idealist, his enemies would say a doctrinaire, and certainly the terms " natural rights," " natural law," &c, frequently occur in his writings. His friends speak of his charm and gaiety in intimate intercourse, but among strangers he was silent and

awkward, and produced the impression of being reserved and disdainful. On one point both friends and enemies agree, and that is his brusquerie and his want of tact in the management of men; Oncken points out with some reason the " schoolmasterish " tone of his letters, even to the king. As a statesman he has been very variously estimated, but it is generally agreed that a large number of the reforms and ideas of the Revolution were due to him ; the ideas did not as a rule originate with him, but it was he who first gave them prominence. As' to his posi- tion as an economist, opinion is also divided. Oncken, to take the extreme of condemnation, looks upon him as a bad physio- crat and a confused thinker, while Leon Say considers that he was the founder of modern political economy, and that " though he failed in the 18th century he triumphed in the 19th."

Bibliography. — G. Schelle, Turgot (Paris, 1909); and Marquis de Segur, Au Couchant de la monarchie (Paris, 1910), contain much that is based- on recent research. The principal older biographies are those of Dupont de Nemours (1782, enlarged in his edition of Turgot's Works, 1807-181 1), and Condorcet (1786); the best modern ones are those of A. Neymarck (Paris, 1885), Leon Say (Paris, 1887); and W. W. Stephens (London, 1895). See generally, Oncken, Geschichte der Nationalokonomie, vol. ii. ch. 1 ; Schelle, Dupont de Nemours etl'ecole physiocratique (1888) ; Henry Higgs, The Physiocrats (1897) ; R. P. Shepherd, Turgot and the Six Edicts (1903), in Columbia Univ. Studies, vol. xviii. No. 2.

TURGUENIEV, IVAN (1818-1883), Russian novelist, the descendant of an old Russian family, was born at Orel, in the government of the same name, in 1818. His father, the colonel of a cavalry regiment, died when our author was sixteen years of age, leaving two sons, Nicholas and Ivan, who were brought up under the care of their mother, the heiress of the Litvinovs, a lady who owned large estates and many serfs. Ivan studied for a year at the univer sity of Moscow, then at St Petersburg, and was finally sent in 1843 to Berlin. His education at home had been conducted by German and French tutors, and was altogether foreign, his mother only speaking Russian to her servants, as became a great lady of the old school. For his first acquaintance with the literature of his country the future novelist was in-

debted to a serf of the family, who used to read to him verses from the Rossiad of Kheraskov, a once celebrated poet of the eighteenth century. Turgueniev's early attempts in literature, consisting of poems and trifling sketches, may be passed over here; they were not without indications of genius, and were favourably spoken of by Bielinski, then the leading Russian critic, for whom Turgueniev ever cherished a warm regard. Our author first made a name by his striking sketches " The Papers of a Sportsman " (Zapiskt Okhotnika), in which the miserable condition of the peasants was described with start- ling realism. The work appeared in a collected form in 1852. It was read by all classes, including the emperor himself, and it undoubtedly hurried on the great work of emancipation. Tur- gueniev had always sympathized with the muzhiks; he had often been witness of the cruelties of his mother, a narrow-minded and vindictive woman. In some interesting papers recently contributed to the "European Messenger" (Viestnik evropy) by a lady brought up in the household of Mme Turgueniev, sad details are given illustrative of her character. Thus the dumb porter of gigantic stature, drawn with such power in Mumu, one of our author's later sketches, was a real person. We are, moreover, told of his mother that she could never understand how it was that her son became an author, and thought that he had degraded himself. How could a Turgueniev submit himself to be criticized?

The next production of the novelist was " A Nest of Nobles " (Dvorianskoe gniezdo), a singularly pathetic story, which greatly increased his reputation. This appeared in 1859, and was fol- lowed the next year by " On the Eve " (Nakanunge) — a tale which contains one of his most beautiful female characters, Helen. In 1862 was published " Fathers and Children " (Otzi i Dicti), in which the author admirably described the nihilistic doctrines then beginning to spread in Russia. According to some writers he invented the word nihilism. In 1867 appeared " Smoke " {Dim), and in 1877 his last work of any length, " Virgin Soil " (Nov). Besides his longer stories, many shorter ones were produced, some of great beauty and full of subtle psychological analysis, such as Rudin, " The Diary of a Useless Man " (Dnevnik lishnago chelovieka) , and others. These were afterwards collected into three volumes. The

last works of the great novelist were ” Poetry in Prose ” and ” Clara Milich,” which appeared in the ” European Messenger.” Turgueniev, during the latter part of his life, did not reside much in Russia; he lived either at Baden Baden or Paris, and chiefly with the family of the celebrated singer Viardot Garcia, to the members of which he was much attached. He occasionally visited England, and in 1879 the degree of D.C.L. was conferred upon him by the university of Oxford. He died at Bougival, near Paris, on the 4th of September 1883.

Unquestionably Turgueniev may be considered one of the great novelists, worthy to be ranked with Thackeray, Dickens and George Eliot; with the genius of the last of these he has many affinities. His studies of human nature are profound, and he has the wide sympathies which are essential to genius of the highest order. A melancholy, almost pessimist, feeling pervades his writings, a morbid self-analysis which seems natural to the Slavonic mind. The closing chapter of ” A Nest of Nobles” is one of the saddest and at the same time truest pages in the whole range of existing novels.

The writings of Turgueniev have been made familiar to persons unacquainted with Russian by French translations. There are many versions in English, among which we may mention the translation of the ” Nest of Nobles ” under the name of ” Lisa,” by Ralston, and ” Virgin Soil,” by Ashton Dilke. There is also a complete and excellent translation by Mrs Garnett.

(W. R. M.) TURI, a Pathan tribe on the Kohat border of the North- West Frontier Province of India. The Turis inhabit, the_ Kurram valley, which adjoins the western end of the Miranzai valley and number nearly 1 2,000. Though now speaking Pushtu and ranking as Pathans, they are by origin a Turki tribe, of the Shiah sect, who subjected the Bangash Afghans some time early in the

eighteenth century. They are strong, hardy, and courageous, and make first-rate horsemen. Their early

dealings with the British government were inclined to turbulence, and they were concerned in the Miranzai expeditions of 1851 and 1855 (see Miranzai). But the only expedition specially sent against them was the Kurram expedition of 1856 (see Kurram). Since then they have settled down and engaged in trade. During the Second Afghan War they supplied Sir Frederick Roberts with guides and provisions. In 1892 they voluntarily accepted British administration, and they now furnish a large part of the tribal militia in the Kurram Valley.

TURIN, a city of Piedmont, Italy, capital of the province of Turin, formerly of the kingdom of Sardinia until i860, and of Italy till the removal of the seat of government to Florence in 1865. Pop. (1906), 277,121 (town), 361,720 (commune), with a garrison of 8500, the town being the headquarters of the I. army corps. The area of the city is 4155 acres, and its octroi circle measures nearly 9 m. Its geographical position is excellent; built upon alluvial soil 784 ft. above sea-level at a short distance from the Alps, it stands upon the river Po, which here runs from south to north just above the confluence of the Dora Riparia. The streets and avenues, almost all of which are straight, cut each other at right angles, forming blocks of houses, here as else- where called " islands." As viewed from the east the city stands out boldly against the Alps. Taken as a whole it is modern in aspect, but its regularity of form is in reality derived from the ancient Roman town of Augusta Taurinorum, which formed its nucleus. The mean temperature at Turin (1871- 1900) is 53 F. (winter 35 , summer 71), with an average maximum of 90°, and an average minimum of 17°. Mists are frequent in the winter mornings, and to a less degree in autumn. Snow falls on an average only on seven days per annum. The rainfall averages 34 in.

The cathedral of St John the Baptist is a cruciform Renaissance building dating from 1492-1498, by the Florentine Meo da Caprina. The site was first occupied by a church erected, it is said, by the Lombard duke Agilulf (7th century). Behind the high altar of the cathedral (from which it is separated by a glass screen) is the chapel of the Sudario or Sindone, built (1657-1694) by Guarini as a royal burial-place. The " sudario " from which it takes its name is asserted to be the shroud in which Joseph of Arimathea

wrapped the body of Jesus. La Beata Vergine della Consolata, another of Guarini's works, has a tower which originally belonged to the church of St Andrew, founded by the monk Bruning in 1014, and attracts attention by Vincenzo Vela's beautiful kneeling statues of Queen Maria Teresa and Queen Maria Adelaide, as well as by the image of the Madonna, which has the credit of having warded off the cholera in 1835. Other churches of some note are San Filippo Neri (1672-1772), the dome of which fell in just as it was approaching completion under the hands of Guarini and was restored by Juvara, and La Gran Madre de Dio, erected to commemorate the return of the royal family in 1814. Of the secular buildings the more interesting are the Palazzo Madama, first erected by William of Montferrat at the close of the 13th century on the Roman east gate of the town, remains of the towers of which were incorporated in it, and owing its name to the widow of Charles Emmanuel II., who added the west facade and the handsome double flight of steps from Juvara's designs; and the extensive royal palace begun in the 17th century. Many of the palaces have fine pillared court- yards of the baroque period, some of which are the work of Guarini. For the Porta Palatina and other remains of the ancient city walls see below. The citadel, erected in 1 565, has been almost entirely demolished. There is practically nothing of the Renais-sance period except the cathedral. The Castello del Valentino is a building partly in the French style of the middle of the 16th century. The university, founded in 1400 by Lodovico di Acaja, has faculties of jurisprudence, medicine and surgery, literature and philosophy, and the mathematical, physical and natural sciences. The number of students is about 2500. The old university buildings erected in 1713 by the Genoese architect Ricca proved too small; and new buildings, fitted more especially

for the medical and scientific departments, have been erected. The original building contains the valuable library (now national), many of the treasures of which were destroyed by fire in 1906, and a collection of Roman afitiquities. The academy of sciences was founded in 1757. It occupies a building erected in 1687 by Guarini as a Jesuit college. The museum of antiquities and the picture gallery, of which it has the custody, are both of high interest — the former for the local antiquities of Piedmont and Sardinia

(notably from Industria) and for the Egyptian treasures collected by Donati and Drovetti, and the latter for its Van Dycks and pictures by north Italian masters. There is a museum of zoology and mineralogy in Palazzo Carignano (another of Guarini's buildings), and the royal palace contains the royal armoury (a fine collection made by Charles Albert in 1833) and the royal library with its rich manuscript collection and its 20,000 drawings, among which are sketches by Raphael, Michelangelo, and Leonardo da Vinci. The civic museum has a great variety of artistic and literary curiosities, among them a remarkable collection of autographs and the Lombard missal (1490).

There are many modern public monuments — considerably more than in other Italian towns — and some of them are fine. The Mole Antonelliana, built by Alessandro Antonelli, is the most important example of modern architecture in Turin. It belongs to the munici- pality, and is used for the Risorgimento Museum. It is the highest brick edifice in Europe, its summit being 510 ft. above ground. It is a square edifice with a large dome and lofty spire, the dome being raised upon a hall with three galleries, one above the other, so that from the floor to the top of the dome is over 300 ft.

Among the hospitals is that called by the name of its founder, Cottolengo, a vast institution providing for more than 5000 persons; there are also the Ospedale Maggiore di San Giovanni, the Ospedale Mauriziano, and many other hospitals for special diseases, as well as asylums and charitable institutions of all kinds.

The industries comprise metallurgy, machine-making, chemicals, silk and cotton weaving, tanning and leather-working. The manu- facture of motor-cars has become of great importance, and Turin is the chief seat of the industry in Italy, nearly 5000 workmen being employed. Chocolate, liqueurs and vermouth are also made here. The application of electricity is widely developed on account of the proximity of Alpine valleys rich in torrents. The supply of drinking water is furnished by three aqueducts.

The opening of the St Gothard tunnel exercised a prejudicial influence upon the traffic of the network of railways of which Turin is the centre, and Milan, owing to

its nearness both to this and to the Simplon, has become the most important railway centre of Italy. Turin has, however, the advantage of being the nearest to the Mont Cenis, while the completion of the line through Cuneo over the Col di Tenda affords direct communication with the French Riviera. Main lines run also from Turin toVercelli and thence to Novara and Milan (the direct route) , to Casale Monferrato, to Alessandria (and thence to Piacenza or Genoa), to Genoa via Asti and Acqui, to Br4 and Savona, and branch lines to Lanzo, Torre Pellice, Aosta, Rivoli, Rivarolo, &c, and steam tramways in various directions.

For administrative purposes the city is divided into two municipal police sections and into seven government districts or ma.niame.nti. The military organization is proportionate in importance to the strategical position of Turin near the French frontier. There is a military arsenal with laboratories, a military academy for artillery and engineer officers, a war school, and a military hospital.

Among the surroundings of Turin the Hill of Superga (2300 ft. above the sea) merits special mention. Victor Amadeus II. erected there a votive basilica in memory of the liberation of Turin frpm the French in 1706. . King Charles Albert and other kings and princes of the Savoy dynasty are buried in the crypt. Not far from Turin are also the castles of Moncalieri, Stupinigi, Rivoli, Racconigi, Agle, Venaria, and the ancient monastery of the Sagra di San Michele (753 metres above sea-level), famous for its view of the Alps as tat as the beginning of the Lombard plain.

Turin was always a place of importance and military strength, in spite of numerous vicissitudes, till at length it was made the chief town of Piedmont by Amadeus, first duke of Savoy. Under Emmanuel Philibert it became the usual residence of the ducal family, and in 1515 the bishopric was raised to metropolitan rank by Leo X. Between 1536 and 1562 Turin was occupied by the French, and in 1630 it lost 8000 of its citizens by the plague. The French were masters once more from 1640 to 1706, and again from 1798 till 1814, when Piedmont was restored to the house of Savoy. From i860 to 1865 Turin was the capital of Italy.

The ancient Augusta Taurinorum was a city of Gallia

Cisalpina, the chief town of the Taurini. The natural advantages of its site and its position with relation to the pass over the Alpis

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Cottia (Mont Genevre; see Cottii Regntjm) made it important in early times, though it cannot have been very strongly fortified, inasmuch as Hannibal, after crossing the Alps in 218 B.C., was able to take it after a three days' siege. It became a colony either under the triumvirs or under Augustus, and it was then no doubt that it was fortified. It was partly burned down in a.d. 69, but continued to be prosperous, as may be gathered from the remains of its fortifications and from the many inscriptions which have been discovered there. The Roman town formed a rectangle 2526 ft. by 2330; the line of the walls, which were 21 ft. high, 7 ft. thick at ground level and 3 ft. at the top, is well known, inasmuch as they were standing till about 1600; and the north gate, the Porta Palatina, still exists; it has a double opening, and two orders of arches above, and is flanked by two sixteen-sided brick towers. The east gate, similar in character, still exists in part within the Palazzo Madama. The north-west corner tower is also in part preserved, and traces of other parts of the enceinte have been found. The interior of the town was divided by seven streets from east to west and eight from north to south into 72 insulae; and the ancient pavement and the drains below it are frequently found under the streets of the central portion of the modern town, indicating that they follow the ancient lines (sec especially Notizie degli Scavi, 1902, p. 277). In the great extensions which the city has undergone since. 1600, the old rectangular arrangement has been followed. Remains of a theatre have been discovered beneath the Palazzo Vecchio, demolished in 1899 (A. Taramelli, in Notizie degli Scavi, 1900,

P-3)- ...

See C. Promis, Storia dell' antica Torino (Turin, 1869); A. d'Andrade, Relazione dell' ufficio regionale per la conservazione del monumenti del Piemonte e della Liguria, 7 seq. (Turin, 1899).

(T. As.)

TURKESTAN, a name conventionally employed to designate the regions of Central Asia which lie between Siberia on the N. and Tibet, India and Afghanistan on the S., the western limit being the Caspian Sea and the eastern Mongolia and the Desert of Gobi. Etymologically the term is intended to indicate the regions inhabited by Turkish races. How far this name was appropriate in the past need not be considered here; at present the regions called Turkestan not only contain races which do not belong to the Turk family, but it excludes races which do, e.g. the Turks of the Ottoman Empire. Nevertheless the term, in its dual application of West Turkestan and East .or Chinese Turkestan, has long been established, and in default of any better designations cannot very well be dispensed with.

I. — West Turkestan West Turkestan is very nearly, though not quite, coincident with the territories which Russia possesses and controls in Asia, Siberia excepted. Thus it includes (1) the governor-generalship of Turkestan, embracing the provinces of Ferghana, Samarkand, Semiryechensk, and Syr-darya; the provinces of Akmolinsk and Semipalatinsk, and sometimes that of Turgai belonging to the governor-generalship of the Steppes; the Transcaspian region; and the semi-independent states of Bokhara and Khiva. Its total area amounts approximately to 1,290,000 sq. m.

Physical Geography. — Physically this region is divided into two sharply contrasted parts, the mountainous and highland country in the east and the flat steppes and deserts in the west and north. The former are sufficiently described under the heading Tian-Shan. It will be enough to say here that the mountainous region belongs to the great orographical flange which runs from south-west to north-east along the north-western margin of the great plateau of Central Asia. Hence it consists (1) partly of ranges, mostly snow-capped, which stretch from south-west to north-east, and which in several cases terminate en tchelon on the verge of the desert, and (2) partly of ranges which strike away from the above at various angles, but in a predominantly north-western direction. The latter, including such ranges as the Chingiz-tau, Chu-Ili Mountains, Kandyk-tau and Khan-tau, the Ferghana range,

the Kara-tau and the Nura-tau, are geologically of later origin than the great border ranges of the Tian- shan proper, e.g. Trans-Alai, Alai, Kokshal-tau, Alexander range, Terskei Ala-tau, Kunghei Ala-tau, Trans-Ili Ala-tau and Dzungarian Ala-tau. The Tarbagatai Mountains, still farther north, are often classified as belonging to the Altai system. Generally speaking, the ranges of both categories run at 10,000 to 20,000 ft., though

altitudes as high as 23,000 ft. are attained by individual peaks, such as Mt Kaufmann and Khan-tengri. Most of the loftier summits are capped with perpetual snow, and on some of them, e.g. Khan- tengri (Mushketov, Semenov, Inylchik) and the Kok-Su Mountains (Fedchenko, Shurovsky), south of Peak Kaufmann, there are well-developed glaciers. Nearly all these border ranges rise abruptly and to great heights from the plains on the north or north-west, but have a much shorter and easier descent on the south or south- east. Hence the passes lie at great altitudes, ranging from about 9000 to 14,000 ft. On the other hand the fact of the ranges radiating outwards towards the west, and the further fact that they are in more than one place penetrated by deep depressions (e.g. Dzungaria, Kulja, Issyk-kul, Ferghana) for a considerable distance towards the east, greatly facilitate access to the loftier plateau lands of Central Asia, and have from time immemorial been the highways of human intercourse between East and West.

Like the highlands of Siberia, those of Turkestan are fringed by a girdle of plains, having an altitude of 1000 to 1500 ft., and these again are skirted by an immense lowland area reaching Lowland only 400, 300 and 150 ft. above sea-level, or even plains. sinking below the level of the ocean. Some geographers divide them into two sections — the higher plains of the Balkash (the Ala-kul and Balkash drainage areas) and the Aral-Caspian depres- sion, which occupies nearly two-thirds of the whole and has been ably described by I. V. Mushketov under the appropriate name of Turanian basin — the Kara-tau Mountains, between the Chu and the Syr-darya rivers, being considered as the dividing line between the two. The Balkash plains, more than 1000 ft. above the sea, and covered with clay, with a girdle of loess at their foot, are well drained by the 1 11 and other feeders of Lake Balkash and support the numerous flocks and herds

of the Kirghiz. To the south-west the clayey soil becomes saline. There is the Famine Steppe (Btk- pak-dala), while in the Ak-kum steppe, which surrounds Lake Kara- kul, large areas consist of nothing but sands, partly shifting. The plains and lowlands of the Turanian basin are subdivided by a line drawn from north-east to south-west along a slight range of hills running from the sources of the Ishim towards the south-east corner of the Caspian (Bujnurd and Elburz edge of Khorasan). This low- range, which most probably separated the lowlands of the Aral- Caspian region (submerged during the Post-Pliocene period) from the higher plains which had emerged by the end of the Tertiary period, now divides the Transcaspian steppes from the somewhat different higher plains. In the Turanian basin the contrast between desert and oasis is much stronger than in the Balkash region. Fer- tile soil, or rather soil which can be rendered fertile by irrigation, is limited to a narrow terrace of loess along the foot of the mountains, and is surrounded by barren deserts. Even where the loess stretches out over terraces at some distance from the mountains, as in the south-east of the Transcaspian region, it can be cultivated only when irrigated. Two rivers only— the Syr and the Amu — succeed in getting across the desert and reaching the Sea of Aral. But their former tributaries no longer run their full course: the glacier-fed Zarafshan dries up amid the gardens of Bokhara soon after emerging from the highlands; and the Tejen and the Murghab lose themselves in the recesses of the Kara-kum desert. The only tributaries which the Amu retains are those whose whole course is within the high- lands. In the north such formerly important tributaries of the Syr-darya as the Chu, with its sub-tributary the Sary-su, now dry up some hundreds of miles before reaching the main stream.

The whole area is now undergoing geological changes on a vast scale. Rivers have changed their courses, and lakes their outlines. Far away from their present shores the geologist finds Desiccation indubitable signs of the recent presence of lakes in the shells they have left amid the sands. Traces of former rivers and channels, which were the main arteries of prosperous regions within the period of written history, have now disappeared. Of the highly developed civilizations which grew up and flourished in Bactria, Bokhara and Samarkand the last survivals are now

undergoing rapid obliteration with the simultaneous desiccation of the rivers and lakes. The great " Blue Sea " of Central Asia, the Sea of Aral, which at a recent epoch (Post-Glacial) extended south-west as far as Sary-kamysh, and the shells of which are found north and east of its present shores 50 to 200 ft. above its present level (157 ft. above the ocean, and 248 above the Caspian), now occupies but a small portion of its former extent. It fills a shallow depression which is drying up with astonishing rapidity, so that the process of desiccation can be shown on surveys separated by intervals of only ten years; large parts of it, like Aibughir Gulf, have' dried up since the Russians took possession of its shores. The whole country is dotted over with lakes, which are rapidly disappearing under the hot winds of the deserts.

Geology} — Like the highlands of eastern Asia, those of Turkestan are mostly built up on Pre-Cambrian gneisses and metamorphic slates, resting upon granites, syenites, old orthoclase porphyries, and the like. These upheavals date from the remotest geological ages; and since the Primary epoch a triangular continent having its

1 R. Pumpelly and others, Explorations in Turkestan (Washington, 1905), contains references to the geological literature to the date of publication.

apex turned towards the north-east, as Africa and America have theirs pointing southward, rose in the middle of what now con- stitutes Asia. It is only in the outer foldings of the highlands that Palaeozoic fossiliferous deposits are found- — Silurian, Devonian, Carboniferous and Permo-Carboniferous. Within that period the principal valleys were excavated, and their lower parts have been filled up subsequently with Jurassic, Cretaceous and Tertiary deposits. One of the most striking instances of this is the very thick Cretaceous and Tertiary deposits which cover the bottom of the valley of the Vakhsh (right tributary of the Amu) and are continued for about 300 m. to the north-east, as far as the Alai valley — probably along the edge of the Pamir plateau. The deposits of the Secondary period have

not maintained their horizontal position. While upheavals having a north-eastern strike continued to take place after the Carboniferous epoch, 1 another series of upheavals, having a north-western strike, and occasioned by the expansion of diabases, dolerites, melaphyres and andesites, occurred later, sub- sequently at least to the close of the Tertiary period, if not also before it, dislocating former chains and raising rocks to the highest levels by the addition of new upheavals to the older ones. Through- out the Triassic and Jurassic periods nearly all Turkestan remained a continent indented by gulfs and lagoons of the south European Triassic and Jurassic sea. Immense fresh-water lakes, in which were deposited layers of plants (now yielding coal) , filled up the depressions of the country. Cretaceous and Tertiary deposits occur extensively along the edge of the highlands. Upper and Middle Cretaceous, containing phosphates, gypsum, naphtha, sul- phur and alum, attain thicknesses of 2000 and 5000 ft. in Hissar. Representatives of all the Tertiary formations are met with in Turkestan ; but while in the highlands the strata are coast-deposits, they assume an open sea character in the lowlands, and their rich fossil fauna furnishes evidence of the gradual shallowing of that sea, until at last, after the Sarmathian period, it became a closed Medi- terranean. During the Post-Pliocene period this sea broke up into several parts, united by narrow straits. The connexion of Lake Balkash with the Sea of Aral can hardly be doubted; but this portion of the great sea was the first to be divided. While the Sea of Aral remained in connexion with the Caspian, the desiccation of the Lake Balkash basin, and its break-up into smaller separate basins, were already going on. The Quaternary epoch is repre- sented by vast morainic deposits in the valleys of the Tian-shan. About Khan-Tengri glaciers descended to a level of 6800 ft. above the sea,* and discharged into the wide open valleys or syrts. It is most probable that, when allowance has been made for the oblitera- tion of glacial markings, and the region has been better explored, it will appear that the glaciation of Turkestan was on a scale at least as vast as that of the Himalayas. In the lowlands the Aral-Caspian deposits, which it is difficult to separate sharply from the later Tertiary, cover the whole of the area. They contain shells of mol- luscs now inhabiting the Sea of Aral, and in their petrographical features are exactly like those of the lower

Volga. The limits of the Post-Pliocene Aral-Caspian sea have not yet been fully traced. It extended some 200 m. north and more than 90 m, east of the present Aral shores. A narrow strait connected it with Lake Balkash. The Ust-Urt plateau and the Mugojar Mountains pre- vented it from spreading north-westward, and a narrow channel connected it along the Uzboi with the Caspian, which sent a broad gulf to the east, spread up to the Volga, and was connected by the Manych with the Black Sea basin. Great interest, geological and historical, thus attaches to the recent changes undergone by this basin. Since the theory of geological cataclysms was abandoned, and that of slow modifications of the crust of the earth accepted, new data have been obtained in the Aral-Caspian region to show that the rate of modification after the close of the Glacial period, although still very slow, was faster than had been supposed from the evidence of similar changes now going on in Europe and America. The effects produced by desiccating agencies are beyond all comparison more powerful than those which result from the earthquakes that are so frequent in Turkestan. All along the base of the highlands, from Khojent to Vyernyi, earthquakes are frequent; 3 but their effects lie beyond the scope of our observational methods.

Climate.— The climate of West Turkestan is exceedingly dry and continental. Although the country is approximately comprised within the latitudes of Sicily and Lyons, it has a south Norwegian January and a Persian summer. Temperatures of more than 100° F. in the shade are common, and the heat is rendered still more unbearable by the reflection from a soil destitute of vegetation. The winter is for the most part so cold that the average temperature of January is below the freezing point, and even reaches 0° F. Snow falls for several months on the lower Syr-darya, and, were it not blown away by the winds, sledge-communication would be possible. This river is frozen for an average of 123 days every year in its lower parts and nearly 100 days at Perovsk. At Tashkent there is snow during two months and temperatures of — io° F. have been observed; on the other hand the maximum observation

1 1. V. Mushketov's Turkestan (pp. 35, 681) seems to justify this conclusion.

‘See I. Ignatyev, in Izvestia of Russ. Geog. Soc. (1887), vol. xxiii. * Ibid.; also Orlov in Mem. of Kazan Naturalists (1873), vol. iii.

is 108 . To the south of Khojent the winter becomes more clement. Absence of rain is the distinctive feature of the climate. Although it rains and snows heavily on the mountains, only 11 in. of rain and snow fall throughout the year at Tashkent, at the base of the highlands; and the steppes of the lower Amu have less. A few showers are all that fall from the almost invariably cloudless sky above the Transcaspian steppes.

Fauna. — The fauna of Turkestan belongs to the zoo-geographical domain of northern Asia, and is only differentiated by the presence of species which have disappeared from the peripheral parts of the Old World and now find a refuge in the remotest regions of the uninhabited plateau. From the Palaeoarctic region it is distin- guished by the presence of Himalayan species. The distinctive animal of the Pamir plateau is the magnificent Ovis poll (con- jectured to be the ancestor of the common sheep). In the alpine tracts of the Tian-shan, on the borders of the Pamir, their horns and skulls are frequently met with, but’ there the place of the species is now taken by Ovis karelini. The wild horse, which occurred in Poland a few centuries ago, was discovered by Prezhe- valsky in the highlands of Dzungaria. The wild camel inhabits the lonely plateaus south of the Ala-shan. The other mammals of Turkestan are mostly those which are met with elsewhere in north Asia. The Himalayan bear (Ursus isabellinus) has its home on the Pamir, and the smaller Leuconyx up to the highest levels on the Tian- shan. Antelopes, Lepus lehmanni, Lagomys rutilus, various species of Arvicolae, and the Himalayan long-tailed marmot (Arctomys caudatus), the most characteristic inhabitant of the alpine meadows, are the only mammals of the Pamir proper. In the alpine region are found the badger (Meles taxus), the ermine (Putorius ermineus) and six other Mustelidae, the wild dog (Canis alpinus), the common and the black-eared fox (C. melanotis), while the corsac fox (C. corsac) is met with only on the plains. Two species of lynx, the cheetah (Felis jubata) , F. manul, and F. irbis, must be added to the above. The tiger is met with only on the lower Amu-darya, except when it wanders to the alpine region in pursuit of

the maral deer (Cervus maral). The jackal is characteristic of the steppes; it banishes the wolves and foxes. Hares are represented by several species, Lepus lehmanni being the most characteristic. Both the common and the long-tailed marmot {A . baibacinus and A . caudatus) live at the foot of the mountains, as well as four species of Spermo- philus, three of voles, two of the mouse and three pi the hamster. The Meriones (four species) and the jerboa (five species) are only met with in the steppe region. Of ruminants, beside the sheep (0. poli, 0. karelini, 0. nigrimontana, 0. heinsii), we find one moufflon (Musi- mon vignei), formerly known only in the Himalayas, the Chinese antelope (Antilope subgutturosa) and the saiga antelope in the steppes, the Siberian ibex and another goat, the yak, the zebu or Indian ox, the common ox, the camel and the dromedary. The wild boar is common in the reed thickets along the rivers and lakes, where it stays during the winter, migrating to the high- lands in summer. The hedgehog and porcupine are common in the plains.

No -fewer than 385 species of avifauna are recorded, most of them being middle-European and Mediterranean. A large number were formerly known only in the Himalayas, or in Persia, while others have their origin in East Asia. The commonest are mostly European acquaintances. The insect fauna is truly multitudinous. Among the Lepidoptera of the Pamir there is an interesting mixture of Tian-shan with Himalayan species. G. E. Grum-Grshimailo found on the Pamir the butterfly Colias nastes, a species characteristic of Labrador and Lapland ; like the alpine plants which bear witness to a Glacial period flora in the Himalayas, this butterfly is a survival of the Glacial period fauna of the Pamir. 4 Of 50 species of molluscs found in Turkestan quite one half are peculiar to the region.

Flora.— As a whole the flora of Turkestan is identical with that of Central Asia, which was formerly continued by geo-botanists as far west as the steppes of Russia, but which must now be considered as a separate region subdivided into two — the Central Asian proper and that of -the Gobi. It has its own habitus, notwithstanding the number of species it has in common with Siberia and south-east Russia on the one hand and with the Himalayas on the other, and this habitus is due to the dryness of the climate and the consequent changes undergone by the soil. Towards the

end of the Glacial period the Tian-shan Mountains had a flora very like that of northern Caucasia, combining the characteristics of the flora of the European Alps and the flora of the Altai, while the prairies had a flora very much like that of the south Russian steppes. During the Stone Age the human inhabitants lived in forests of maple, white beech and apple trees. But the gradual desiccation of the country resulted

4 For ampler information, see N. A. Syevertsov's " Vertical and Horizontal Distribution of Turkestan Animals," in Izvestia of the Moscow Soc. of Amateurs of Nat. Science (1873) ; A. P. Fedchenko's " Travels in Turkestan " (vols, xi., xix., xxi., xxiv. and xxvi. of the same Izvestia), forming a series of monographs by specialists which deal with separate divisions of the animal and vegetable kingdom (the flora by E. A. Regel) ; Oshanin's Zoo-Geographical Problems in Turkestan (Tashkent, 1880); G. E. Grum-Grshimailo's " Flora and Fauna of Pamir," in Izvestia of Russ. Geog. Soc. (1886) ; Works of the Aral-Caspian Expedition.

in the immigration from the Central Asian plateau of such species as could adapt themselves to the dry climate and soil, in the dis- appearance of European and Altaic species from all the more arid parts of the region, in the survival oi steppe species, and in the adaptation of many of the existing species to the needs of an arid and extreme climate and a saline soil. l The Pamir vegetation and that of the Aral-Caspian steppes constitute two types with numberless intermediate gradations.

There is no arboreal vegetation on the Pamir, except a few willows and tamarisks along the rivers. Mountain and valley alike are carpeted with soft grass, various species of Festuca predominating. In the immediate vicinity of water the sedge (Carex physoides) grows, and sporadic patches of Allium. To these may be added a few Ranunculaceae, some Myosotis, the common Taraxacum, one species of Chamomilla, and a few Leguminosae. In the north and west the Stipa of the Russian steppes supersedes Festuca and

affords splendid pasture for the herds of the Kara-Kirghiz. In the gorges and on the better-watered slopes of the mountains the herbaceous vegetation becomes luxuriant. Besides the above-named there are many other Gramineae, such as Lasiagrostis splendens, the whole seas of Scabiosae. Eremurus, 6 to 7 ft. in height, forms thickets along with Scorodosma foetida. The northern slopes of the Alai chain are richer in trees. Up to 12,000 ft. full-grown specimens occur of the archa or juniper (Juniperus pseudo-Sabina), characteristic of the whole northern slopes of the Turkestan highlands, the poplar, spruces, cedars, a very few birches (B. Sogdiana), and. a copious undergrowth of shrubs familiar in European gardens, such as Rhodo- dendron chrysanthum, Sorbus aucuparia (rowan), Berberis heteropoda (berberry), Lonicera Tatarica (honeysuckle) and Crataegus (haw- thorn). Farther east and north comes the Turkestan pine (Picea Schrenkiana) , while at lower levels there grow willows, black and white poplars, tamarisk, Celtis, as well as Elaeagnus (wild olive), Hippophae rhamnoides (sallow thorn), Rubus fructicosus (blackberry), Prunus spinosa (blackthorn) and P. Armeniaca (apricot). Thecharac- teristic poplar, Populus diversifolia, and the dwarf Acer Lobelii— very different from the European maple — also occur.

The above applies to most of the highlands of the Tian-shan. The drier southern slopes are quite devoid of arboreal vegetation. On the northern slopes, at the higher levels, Juniperus pseudo-Sabina is the only tree that grows on the mountains, and luxuriant meadow grasses cover the syrts. Lower down, at 7500 to 8000 ft. the coniferous zone begins, characterized by the Picea Schrenkiana. Of course the juniper and a few other deciduous trees also occur. The richest zone is that which comes next, extending downwards to 5000 and 4500 ft. There woods of birch, several species of poplar, the maple (Acer Semenovii) , and thick underwoods spread over the mountain slopes. Orchards of apple and apricot surround the villages.. The mea,dows are clothed with a rich vegetation — numberless Paeoniae, Scabiosae, Convolvulaceae, Campanulae, Eremurus, Umbelliferae, Gallium, Rosaceae, Altheae, Glycyrrhizae, Scorodosma foetida and Gramineae. But as soon as the soil loses its fertile humus it produces only a few Phlomis, Alhagi camelorum, Psantmae, Salsolaceae,

Artemisiae, Peganum and some poppies and Chamomillae, but only, in the spring. The invading steppe plants appear everywhere in patches in the Turkestan meadows.

The ” culture ” or ” apricot ” zone is followed by the prairie belt, in which black-earth plants (Stipa and the like) struggle for exis- tence against invading Central Asian forms. And then come the lowlands and deserts with their moving sandy barkhans, shors and takyrs (see Transcaspian Region). Two species of poplar (P. pruinosa and P. diversifolia), Elaeagnus angustifolia, the ash, and a few willows grow along the rivers. Large areas are wholly destitute of vegetation, and after crossing 100 m. of such a desert the traveller will occasionally come upon a forest of saksaul (Anabasis Ammoden- dron). Contorted stems, sometimes of considerable thickness, very hard, and covered with a grey cracked bark, rise out of the sand, bearing green plumes with small greyish leaves and pink fruit. Sometimes the tree is a mere knot peeping above the sand with a sheaf of thin branches. In spring, however, the steppe assumes quite another aspect, being clothed, except where the sands are shifting, with an abundance of vegetation. Persian species pene- trate into Bokhara and the region of the upper Amu.

Vegetable Products. — As already stated the climate of Turkestan varies considerably. from north to south. In Akmolinsk and Semir- yechensk most of the kinds of corn which characterize Middle Russia are grown. South of the Chu and the Syr-darya gardening is a considerable industry; and, although rye and wheat continue to be the chief crops, the cultivation of the apple, and especially of the apricot, acquired importance. Attempts are also made to cultivate the vine. The inhabitants of the neighbourhood of Tashkent and Samarkand, as well as those of the much more northern but better sheltered Kulja oasis, add the cultivation of the almond, pome- granate and fig. Vines are grown and cotton planted in those districts. Finally, about Khojent and in Ferghana, where the climate is milder still, the vine and the pistachio tree cover the hills, while agriculture and horticulture have reached a high degree of perfec-

1 See Krasnov’s researches in Izvestia of Russ. Geog. Soc (1887), vol. xxiii.

tion. Successful attempts are being made to grow the tea-plant in the Transcaspian region. Large numbers of oleaginous plants are cultivated, such as sunflower.

Agriculture. — The arable land, being limited to the irrigated terraces of loess, occupies little more than 2 % of the whole area of West Turkestan. The remainder is divided between pasture land (less than 44%) and desert (54%). Owing to a very equitable distribution of irrigation water in accordance with Moslem law, agriculture and gardening have reached a high stage of development in the oases. Altogether close upon 4,000,000 acres are irrigated, and the crops are usually taken every year. Wheat, barley, millet, pease, lentils, rice, sorghum, lucerne and cotton are the chief agricul- tural products. Carrots, melons, vegetable marrows, cucumbers and onions are extensively grown. Rye and oats are cultivated at Kazalinsk and Kopal. Corn is exported. Owing to the irri- gation, total failure of crops and consequent famines are unknown, unless among the Kirghiz shepherds. The kitchen gardens of the Mahommedans are, as a rule, admirably kept. Potatoes are grown only by the Russians. The cultivation of cotton is extending rapidly — from 1300 acres in 1883 to 531,000 acres in 1902, of which 402,000 acres were, in Ferghana. Sericulture, a growing industry, is chiefly carried on in Ferghana, whence silk cocoons are an impor- tant item of export, the output having doubled between 1892 and 1903 (3869 tons). Livestock breeding is extensively pursued. The flocks of sheep on the Kirghiz steppe are so large that the proprietors themselves do not know their exact numbers.

Minerals. — The mineral wealth of Turkestan is considerable. Traces of auriferous sands have been discovered at many places, but the percentage of gold is too poor to make the working remunerative. Silver, lead and iron ores occur in several localities; but the want of fuel is an obstacle to their exploitation. The vast coal-beds of Kulja and some inferior ones in Samarkand are not seriously worked. The petroleum wells of Ferghana and the beds of graphite about Zairam- nor are neglected. There are abundant deposits of gypsum, alum, kaolin, marble and similar materials. Asphalt is obtained in Ferghana. Notwithstanding the salt springs of Ferghana and Syr-darya, the salt lakes of the region, and the rock-salt strata of the Alexander Mountains, salt is imported.

Industry and Trade. — Turkestan has no manufacturing industry carried on by means of machinery, except distilleries and establish- ments for dressing raw cotton. These last have greatly increased in number; over a score are driven by steam and about a hundred by water. But there is a great variety of artisan work, such as copper and brass, paper, knives (at Bokhara), silver filigree, shoes, caps (at Samarkand and Andijan) and carpets; but most of these have been for some time declining and now stand at a rather low level. Trade is very actively, carried on. Tashkent and Bokhara are the chief commercial centres, the principal articles of export to Russia, via Orenburg and Semipalatinsk, being raw cotton and silk, cattle and their products, while manufactured wares are imported in return. There is also an import and export trade to and from Urumchi and China, via Kulja and Ak-su. ■'■■-,

Population. — Turkestan has been the theatre of so many migrations and conquests that its present population could not fail to be very mixed. Both Aryans and Mongols have their representatives there, the former settled for the most part, the latter chiefly nomad. The Ural-Altaians are numerically the predominant element, and consist of Turkomans, Kirghiz, Uzbegs and Sarts. The Turkomans inhabit chiefly' the Trans- caspian region. They number less than- a quarter of a million. The Kara-Kalpaks (" Black Bonnets ") number about 104,000. They are supposed to be recent immigrants to Syr-darya, having come from the former Bulgarian Empire on the middle Volga. Their language andi habits are the same as those of the Kirghiz; but for the last century and a half they have had some acquain- tance with agrculture. Their pacific temper exposed them to the raids of the Kirghiz, who compelled them first to settle in Dzun- garia, then to move their dwellings several times, and ultimately (in 1742) to recognize the sovereignty of Russia. Even since that time they have been driven by the persecution of their old enemies to cross the Aral-Caspian steppes and seek refuge near Astrakhan. The real masters of the steppes and highlands of Turkestan are the Kirghiz, of whom there are two branches— the Kazak (Cossack) Kirghiz, who number about 3,787,000, and the Kara (Black) Kirghiz or Burut, who number nearly 202,000. The Uzbegs, who played a predominant political part in Turkestan before the Russian

conquest, are of Turko-Tatar origin and speak a pure Jagatai (Turkish) dialect; but they are mixed to a great extent with Persians, Kirghiz and Mongols. They are sub-divided into clans, and lead a semi-nomadic life,, preserving most of the attractive features of their Turkish congeners — especially their honesty and independence. They number some 726,500 in

all. When settled they are mostly designated Sarts — a name which has reference more to manner of life than to anthropo- logical classification, although a much stronger admixture of Iranian blood is evident in the Sarts, who also speak Persian at Khojent and Samarkand. Their numbers amount to very nearly 1,000,000. Taranchi or Taranji (" labourer " in Chinese) is the name given to those Sarts who were settled in the Kulja region by the Chinese government after the rising of 1 7 58. They constitute about two-fifths of the population of Kulja. The origin of the Dzungans is somewhat problematical. They number nearly 20,000, and inhabit the valley of the Hi in Kulja and partly are settled in Russian Turkestan. They are Mahommedans, but have adopted Chinese manners of life. The Mongol branch is represented in Turkestan by Kalmucks (191,000) and Torgutes (Torgod) in the north-east and in Kulja, where they are inter- mingled with Solons, Sibos and Chinese. The Aryan Tajik, the aborigines of the fertile parts of Turkestan, were subdued by the Turko-Mongol invaders and partly compelled to emigrate to the mountains, where they are now known as Galchas. They number over 350,000 and constitute the intellectual element of the country and are the principal owners of the irrigated land — the Uzbegs being their labourers — merchants, and mollahs or priests. They are Sunnite Mussulmans. The other representatives of Aryan race in Turkestan are a few (8000) Persians, mostly liberated slaves; Indians (300), who carry on trade and usury in the cities; a few Gipsies (800), and the Russians. Among these last two distinct elements must be noticed — the Cossacks, who are settled on the borders of the Kirghiz steppe and have assumed many Kirghiz habits, and the peasant-settlers, who are beginning to colonize the valley of the Hi and to spread farther south. Inclusive of the

military, the Russians number about 100,000. The total population numbers approximately

9,000,000.

Notwithstanding immigration, the Russians still constitute a very small proportion of the population, except in the pro- vince of Semiryechensk, where the Cossacks, the peasants, and the artisans in towns number 130,000, and, with the Russian troops, constitute 14% of the aggregate population. The only other province containing any considerable number of Russians is Syr-darya, where there are about 10,000 settlers (less than 1% of the population). About 12,000 Russians are settled in Bokhara and about 4000 in Khiva. The total estimated population of Russian Turkestan in 1906 was

5,746,600.

There are several populous cities in Russian Turkestan. Its capital, Tashkent, in the Syr-darya province, had 156,414 inhabitants in 1897, and other cities of importance are Samar- kand (58,104), Marghilan (42,855 in Old Marghilan, and 8977 in New Marghilan) in Ferghana, Khojent (31,881) in Syr-darya, Khokand (86,704), Namangan (61,388) and Andijan (49,682) in Ferghana.

Education. — In the way of education nearly everything has still to be done ; but a technical school and an experimental agricultural station with a school have been opened at Tashkent.

Railways. — Turkestan possesses only two railway systems; the Transcaspian line and the Orenburg-Tashkent line. The former, built in 1880-1888, starts at Krasnovodsk on the Caspian and runs east-south-east between the Kara-kum desert and the Kopet-dagh Mountains until it reaches the oasis of Tejen. Then it turns north- east via Merv to Bokhara and Samarkand, the total distance being 940 m. From Samarkand it is continued east-north-east via Khojent to Andijan (330 m.), sending off on the way a branch to Tashkent (94 m.). This last city was in 1905 connected by rail via Perovsk, Kazalinsk, and Irgiz with Orenburg (1149 m.).

General Condition. — Populous cities adorned with fine monuments of Arabian architecture, numerous ruins of cities decayed, grand irrigation canals now lying dry, and written monuments of Arabian literature testify to a time when civilization in Turkestan stood at a much higher level than at present. This period was during the first centuries after its conversion to Islam. Now all is in decay. The beautiful mosques and madrasas (theological colleges) are dilapidated ; no astronomers study the sky from the tops of their minarets; and the scholars of the madrasas waste their time on the most_ deplorably puerile scholasticism. The inspiration of early belief has disappeared ; the ruling motive of the mollahs (priests) is the thirst for personal enrichment, and the people no longer follow the khojas or theologians.

The agricultural labourer has preserved the uprightness, diligence and sohriety which characterize the Turkish peasant; but the richer inhabitants of the cities are grossly sensual.

It remains, however, an open question whether the Russians will be able to bring new vigour to the country and awaken intellectual life. The followers of Islam, whose common law and religion know only of a temporary possession of the land, which belongs wholly to the Prophet, cannot accept the principles of unlimited property in land which European civilization has borrowed from Roman law ; to do so would put an end to all public irrigation works and to the system by which water is used according to each family's needs, and so would be fatal to agriculture. The Russians have abolished slavery ; and their rule has put an end to the interminable intestine struggles which had weakened and desolated the whole region. The barbarous tortures and executions which rendered Khiva notorious in the East are no longer heard of ; and the continual appeals of the khojas for " holy " war against their rivals find no response. But the Russian rule has imposed many new taxes, in return for which Turkestan only gets troops of Russian merchants and officials, who too often accept the worst features of the depraved Mussulman civilization of the higher classes of the country. Schools are being diligently built; but the wants of the natives are subordinated to the supposed necessities of Russification. A consulting hospital for Mahommedan

women has been opened by women graduates in medicine at Tashkent.

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II. — East Turkestan East or Chinese Turkestan, sometimes called Kashgaria, is a region in the heart of Asia, lying between the Tian-shan ranges on the north and the Kuen-lun ranges on the south, and stretching east from the Pamirs to the desert of Gobi and the Chinese province of Kan-su (98 E.). The country belongs to China, and to the Chinese is known as Sin-kiang; but administratively the Chinese province of Sin-kiang crosses over the Tian-shan and includes the valleys of Kulja or Hi and Dzungaria on the north.

Physical Geography. — Along with the desert of Gobi East Tur- kestan occupies the lower terrace of the great central Asian plateau, which projects from the Himalayas north-east towards the Bering Straits. But though it is in reality an elevated plateau, with a general altitude of 4600 down to 2675 ft., it' is nevertheless a depression when compared with the girdle of mountains which surround it on every side except the east, and even on that side it is shut in by

the crumbling remains of a once mighty moun- tain system, the Pe-shan (see Gobi). The region as a whole slopes very gently towards the Lop district, where the lake, or rather marsh, of Kara-koshun, in 39 51′ N. and 89 24′ E.,Jies at an altitude of 2675 ft. This is not, however, the absolutely lowest point in East Turkestan: that is found in the local depres- sion of Turfan-Lukchun, south-east of Urumchi, between the Chol- tagh and the Bogdo-ola ranges of the Tian-shan.. The deepest part of that depression lies 56-426 ft. below the level of the sea ; but this remarkable pit in the surface is of very limited area, for within less than 30 m. to the north the level rises up to 250 ft. (at the town of Turfan) and to 3500 ft. in the Chol-tagh only 12 m. to the south, while at Pichang, 60 m. east, it is 3400 ft. above the sea, and immediately behind Turfan the jargoz Mountains run up to an altitude of 10,000 ft. There are also two other depressions which lie at a lower altitude than the Kara-koshun, but they lie, one (Kulja or Hi) among the Tian-shan ranges and the other (Dzungaria) beyond them. The town of Kulja, which stands about the middle of the Chinese part of the valley of the Hi river, has an altitude of 2165 ft., but the valley of Dzungaria ranges at 900 to 3000 ft., and in the lakes (e.g. Ebi-nor) which dot its surface it descends to 820 ft. The mountain ranges which shut off East Turkestan from the rest of the world rank among the loftiest and most difficult in Asia, and indeed in the world. The Kuen-lun on the south rise steeply from the flat deserts of the Takla-makan and Kum-tagh by successive terraces until they reach

an elevation of 19,000 to 20,000 ft. on the summit of the Tibetan plateau. The passes in them range generally at altitudes of 10,000 ft. to 18,300 ft. (e.g. Kyzyl-davan, 16,000 ft. ; Sughet-davan, 17,825 ft. ; a pass in the Arka-tagh 18,300 ft.). On the west East Turkestan is generally approached from India by the famous pass of Karakorum (18,300 ft.), from Ferghana and West (Russian) Turkestan by the passes of Kyzyl-art (14,015 ft.) and Terek (12,730 ft.), and the mountains on this side attain to altitudes of 25,780 ft. in theMuz- tagh-ata or Tagarma, of 23,000 ft. in the Kaufmann Peak, in the Trans- Alai range, and of 19,680

ft. in the Alai range. The Tian-shan Mountains skirt East Turkestan on the north-east, where the Kok- shal-tau range rises to 16,000 to 18,000 ft. and is crossed by passes (e.g. Bedel and Jan-art) which reach 13,000 to 14,500 ft., and on the north, where the mountain knot of Khan-tengri has an altitude of 22,800 ft. and the Bogdo-ola and Karlyk ranges run up to 15,000 to 18,000 ft., while the passes (e.g. Muz-art on the north-east shoulder of Khan-tengri) climb up to 8000 to 12,000 ft. But here two natural gaps or gateways, those of Urumchi at 2790 ft. and Otun-koza at 2390 ft., facilitate communication between the basins of the Tarim and the Hi (Dzungaria). The Pe-shan swelling, with its flanking ranges of the Chol-tagh and Kuruk-tagh, which, by gradually approaching the Nan-shan section of the Kuen-lun in about 98 ” E., narrow the desert, are a good deal lower, namely 5000 to 9000 ft.

Within this mountain girdle lies the basin of the Tarim, extending over an area of 354,000 sq. m., but of this 51-2% consists of arid and almost impassable deserts, namely the Takla-makan (

Climate. — The climate is characterized by great extremes and a wide range of temperature, not only between summer and winter, but sometimes also in the course of twenty-four hours. In the desert of Gobi the thermometer descends as low as —19-3° F. in January, and in the desert of Cherchen as low as — 26 in the same month, and snow falls in winter even in the heart of the latter desert. At Yanghi-kol (40 52′ N. and 86° 51′ E.), beside the lower Tarim,

the January mean is —1-3° F., the June mean 88°, and the lowest minimum recorded — 14 (February). In both the desert of Gobi and in the desert of Lop a diurnal range of 44° has been observed. The lower Tarim begins to freeze early in November. As regards the summer temperature, as early as the 12th of March a reading of 70-5° has been obtained in the desert of Lop, and as high as 90 at Charkhlik early in May. In June beside the lower Tarim the ther- mometer has registered 104° before a buran, 77 ° during its continu- ance, and 48-7° at night. At Kashgar (alt. 4275 ft.) the mean temperature for the year is 55-4°, the January mean 21-2°, and the July mean 81.5°; at Yarkand (alt. 4165 ft.) the annual mean is 54-0°, the January mean 20.3°, and the July mean 81-4°. In the Lukchun depression

(55 ft. below sea-level), which is situated at approxi- mately the centre of the Asiatic continent (42° 42′ N. and 89 42′ E.), the climate is fairly typical of Central Asia, the mean for the year being 55-5°, for January 16-7° and for July 89.6°; in other words, while the summer is as hot as in the Sahara, the winter is as cold as at St Petersburg. Minimal observations of —4-0° and -4-5° have been taken at Yarkand and Lukchun respectively, and maximal observations of 103.2° and 109-5° at the same two places. The atmosphere in the desert regions is remarkably dry, and though a little rain falls occasionally on the lower slopes of the mountains, scarcely any falls in the desert, at the most a smart shower at intervals of several years. At Kashgar the annual rainfall amounts to less than 18 in. During a large part of the year, and more especially in spring, the atmosphere is heavily charged with sand, and blinding sandstorms (burans) are of frequent occurrence.

Fauna. — In the more arid regions animal life is naturally not abundant. The tiger and wild boar haunt the thickets beside the Tarim, wild duck and wild geese throng its waters, and more especially the waters of its marginal and deltaic lakes. There also the wild swan is found. Antelopes, hares and occasionally the lynx, fox, deer, rats, vultures, crows, ravens, hawks, with lizards are other denizens of the borders of the deserts. The wild camel frequents the scattered oases along the margins of the desert and roams into the desert itself. Gadflies and mosquitoes are a veritable plague around the lakes of the lowlands in the hot weather. In the higher mountainous parts animal life is more abundant, the typical forms being the wild yak, the kulan or wild ass, the arkhari or wild sheep, the orongo and other antelopes, the marmot, wolf, hare partridge and bear. Fish are plentiful in the lower Tarim and in its lakes.

Vegetable Products. — In the desert regions vegetation is, of course, extremely scanty, being restricted almost entirely to the tamarisk, Elaeagnus, tussock grass, and a few Salsolaceae. Poplars and in some places willows grow along the river-sides, and dense reed brakes, often 6 to 10 ft. high, fill the lakes and dot the quieter reaches of the river beds. But as the slopes of the mountains are ascended the rainfall becomes more copious and grass makes its appearance, together with a few species of arboreal vegetation, such as the juniper. What cultivation there is, is

confined to the oases which nestle at the foot of the mountains all round the Tarim basin. The soil in them is of great fertility wherever it is irrigated, and despite the supineness of the Chinese authorities, irrigation is very exten- sively practised in nearly all the oases. Excellent crops of wheat, barley, maize, sesame, millet, cotton, opium, tobacco and rice are grown, and several of the oases, e.g. Khotan, Kashgar, Korla, Turfan and Hami, are famous for their orchards, in which cucumbers, the mulberry, apple, pear, apricot, peach, melon, grape, pome- granate and walnut ripen to perfection.

Population. — The people who inhabit the plains and mountain slopes of East Turkestan consist partly of Aryans and partly of races of Ural-Altaic stock, and are partly of mixed blood. In Dzungaria they are Dzungans or Dungans, a Turko-Tatar tribe who nominally profess Mahommedanism, and in Kulja they are Kirghiz, Tatars, Mongols, Dungans and others. The agricultural population of the oases are principally of Turkish stock, power- fully influenced by Aryan blood. The townsmen are more dis- tinctly Turkish, i.e. Sarts and Uzbegs. The language universally spoken is Jagatai Turkish. Kirghiz graze the slopes of the Tian- shan. The trade is mostly in the hands of the Chinese, natives of West Turkestan (known as Andijanis from the town of Andijan) and Hindus. The total population, excluding Kulja and Dzungaria, is estimated by A. N. Kuropatkin at 1,200,000, by M. V. Pyevtsov at 2,000,000, and by Sven Hedin at 1,800,000 to 2,000,000. The last named distributes it thus — 1,500,000 rural, 200,000 urban, and 100,000 shepherds. The principal towns and their populations are Yarkand, 100,000; Khotan, 40,000; Kash- gar, 33,000; Ak-su, 15,000; Keriya, 12,000; and Kulja, 20,000. The population of Dzungaria is estimated at 600,000 and of Kulja at 150,000. The prevailing religion all over East Turkestan is Mahommedanism. The country “belongs politically to China, and Chinese fill all the higher administrative positions and form

the garrisons in the towns. The region is divided into the

adminis- trative districts of Kashgar, Yarkand, Ak-su and Urumchi. The capital is the town of Urumchi.

Industries. — In addition to agriculture, the breeding of livestock, more especially sheep, camels, horses and asses, fishing in the waters of the lower Tarim, and the transportation of merchandise are all important means of livelihood. East Turkestan contains several minerals, such as gold, mined to a very small extent in the Kuen-lun Mountains; lead found in the country west of Kashgar and once worked in the Kuruk-tagh, and copper and petroleum near Kashgar; coal exists in abundance in the Kulja valley and is found at Ak-su, Korla, Kara-shahr, Turfan and Hami on. the northern verge of the deserts. Salt is obtained from stagnant lakes and from certain parts of the desert. Jade, which is very highly valued by the Chinese for making into ornaments, vases, cups, &c, has been extracted from time immemorial, and is still extracted to-day at Khotan. In a region like East Turkestan, where the settlements are so scattered and the population so thin, the arts and crafts are prosecuted necessarily on only a local scale. Nevertheless certain ot the oases are famous individually for one or more handicrafts: for instance, Khotan for its silks, white carpets and felt goods; Kashgar and Turfan for cottons, Kucha and Kara-shahr for leather and saddlery, Ak-su for felts and leather and metal goods, Yarkand for silks, carpets and felts, and Urumchi and Uch-Turfan for sulphur.

Trade and Communications. — A considerable amount of trade is done in the export of wool, hides, cotton, carpets, silks, felts, cereals (wheat, barley, maize, rice), sheep, fruit and vegetables, and in tea, silver, porcelain and opium imported from China, cloth and groceries from India, and cloth, cottons, silks, sugar, matches and leather from West Turkestan and Russia. The entire trade with India does not exceed £200,000 per annum. Traffic is carried on principally by means of caravans of camels, horses, asses and oxen. The caravan routes mostly followed between China and the more populous centres (Kashgar and Yarkand) of East Turkestan start from An-si-chow and Sa-chow respectively, converge upon Hami on the north side of the Pe-shan swelling, and continue westward along the south foot of the Tian-shan Mountains through the oases of Turfan, Kara-shahr, Korla, Kucha, Ak-su and Uch-turfan. From. Hami other routes proceed to Barkul and to the main

caravan road which skirts the southern edge of the Dzungarian valley and leads to Vyernyi in the Russian province of Semiryechensk. A similar branch route strikes off at Turfan and cuts through the Tian-shan ranges at Urumchi. Ak-su is an important trading town. From it three routes start for West Turkestan; the one principally used climbs over the Bedel pass (13,000 ft.) in the Kokshal-tau and makes a detour round the east and along the north side of the Issyk-kul, while the others cross over the Muz-art pass (12,000 ft.), on the north- east shoulder of Khan-tengri, and the Terek pass (12,730 ft.) respec- tively, the latter into Ferghana. Kashgar has connexion with Ferghana and Bokhara over the Kyzyl-art pass (14,015 ft.) and down the Alai valley. Yarkand and Khotan communicate with India over the lofty pass of Karakorum (18,300 ft.) and through Leh in Ladak, and thence over the difficult pass of Zoji-la .(11,500 ft.). There is another route between Kashgar and China along the southern edge of the desert via Lop-nor, but it is not much used. A telegraph line was constructed between Lanchow in the Chinese province of Kan-su and Turfan in 1893.

History. — It appears very probable that at the dawn of history East Turkestan was inhabited by an Aryan population, the ancestors of the present Slav and Teutonic races, and that a civilization not inferior to that of Bactria had already developed at that time in the region of the Tarim. 1 Our knowledge, how- ever, of the history of the region is very fragmentary until about the beginning of the Christian era. When the Huns (Hiung-nu) occupied west and east Mongolia in 177-165 B.C., they drove before them the Yue-chi (Yutes, Yetes or Ghetes), who divided into two hordes, one of which invaded the valley of the Indus, while the other met the Sacae in East Turkestan and drove them over the Tian-shan into the valley of the Ili. Thus by the beginning

1 Such is the conclusion reached by C. Lassen, Indische Alter- thumskunde (4 vols., Bonn, 1844-1861), and supported by M. Grigoriev (Ritter's Asien in Russ. trans.; addenda to " East Turkestan"). In connexion with the objection based upon the sub-boreal character of the regions which were the cradle of the Aryans, as proved by the so-called palaeontology of the Aryan languages, it may be observed that by the end of the Glacial, and during the

earlier Lacustrine (Post-Glacial) period, the vegetation of Turkestan and of Central Asia was quite different from what it is now. It was Siberian or north European. The researches by M. Krasnov (in Izvestia of Russ. Geog. Soc, St Petersburg, 1887, vol. xxiii.) as to the characteristics of the former flora of the Tian- shan, and the changes it has undergone in consequence of the extremely rapid desiccation of Central Asia, must be carefully borne in mind in all speculations founded upon the testimony of language as to the original home of the Aryans.

of our era the Tarim region had a mixed population, of Aryans and Ural-Altaians, some being settled agriculturists and others nomads. There were also several independent cities, of which Khotan was the most important. One portion of the Aryans emigrated and settled in what is now Wakhhan (on the Pamir plateau), the present language of which seems very old, dating anterior to the separation of the Vedic and Zend languages. Between 120 and 101 B.C. the Chinese extended their rule west- wards over East Turkestan as far as Kashgar, But their dominion seems to have been merely nominal, for it was soon shaken off. By the end of the 5th century the western parts fell under the sway of the " White Huns " (Ephthalites, or Tochari), while the eastern parts were under Tangut (Thygun) dominion. The Chinese, however, still retained the region about Lop-Nor. Buddhism penetrated into the country at an early date, and possessed famous monasteries there in the 5th and 7th centuries. There were also at the same time followers of Zoroastrianism, of Nestorian Christianity, and even of Manichaeism. An active trade was carried on by means of caravans, corn and silk especially being mentioned at a very early date. The civilization and political organization of the country were dominated by the Chinese, but were also influenced to some extent by Graeco- Bactrian civilization, which had probably secured a footing in the country as early as the 3rd century B.C. Our information as to the history of this region from the 2nd century to the first half of the 7th is slight, and is derived chiefly from the Journeys of the Chinese pilgrims, Fa-hien in 399-415, Song-yun and Hwei-seng in 518-521, and Hsiian-Tsang in 629-645. By this time Buddhism had reached its culminating point: in Khotan there were 100 monasteries and 5000 monks, and the Indian sacred literature was

widely diffused. But already there were tokens of its decay; even then the eastern parts of the Tarim basin seem to have been growing less and less populous. To the east of Khotan, cities which were prosperous when visited by Song-yun. had a century later fallen into ruins.

Little is known about these regions during the 7th, 8th and 9th centuries. In the 7th century the Tibetan king, Srong-btsan, with the help of the western Turks, subjugated the western part of the Tarim basin. During the following century the Mahom- medans under Kotaiba ibn Moslim, after several excursions into West Turkestan, invaded (712-13) East Turkestan, pene- trating as far as Turfan and even China. The Chinese supremacy was not shaken by these invasions. But, on the outbreak of internal disturbances in China, the Tibetans took possession of the western provinces of China, and intercepted the communica- tions of the Chinese with Kashgaria, so that they had to send their troops through the lands of the Hui-khe (Hoei-ke, or Hoei-hu). In 790 the Tibetans were masters of East Turkestan; but their rule was never strong, and towards the 9th century we find the country under the Hoi-he. Who these people were is somewhat uncertain. According to Chinese documents they came from the Selenga; but most Orientalists identify them with the Uighurs. In the opinion of M. Grigoriev, 2 the Turks who succeeded the Chinese in the western parts of East Turkestan were the Karlyk Turks, who extended farther south-west up to Kashmir, while the north-eastern parts of the Tarim region were subdued by the Uighurs. Soon Mongol hordes, the Kara-Kitais, entered East Turkestan (nth century), and then penetrated into West Turkestan. During the following century the Mongol conqueror Jenghiz Khan overran China, and Turkestan and Kashgaria fell under his rule in 1220, though not without strenuous resistance followed by massacres. The Mongol rule was, however, not very heavy, the Mongols merely exacting tribute. In fact, Kashgaria- flourished under them, and the fanaticism of Islam was consider- ably abated. Women again acquired greater independence, and the religious toleration then established permitted Christianity and Buddhism to spread freely. This state of affairs lasted until the 14th century, when Tughlak Timur, who extended his dominions to the Kuen-lun, accepted Islam. He transferred his capital from

Ak-su to Kashgar, and had a summer residence on the banks

2 See Ritter's Asien: " East Turkestan " (Russ. trans.), ii. 282; also A. N. Kuropatkin's Kashgaria (1883).

of the lake Issyk-kul. His son reigned at Samarkand, but was overthrown by Timur (Tamerlane), the Mongol sovereign of Samarkand, who, to put an end to the attacks of the wild Tian- shan tribes, undertook in 1389 his renowned march to Dzungaria, which was devastated, East Turkestan also suffering severely.

The reintroduction of Islam was of no benefit to the Tarim region. In the 14th and 15th centuries Bokhara, and Samarkand became centres of Moslem scholarship, and sent great numbers of their learned doctors to Kashgaria. Rubruquis, who visited East Turkestan in 1254, Marco Polo between 1271 and 1275, and Hoi's in 1680, all bore witness to great religious tolerance; but this entirely disappeared with the invasion of the Bokharian mullahs or Mahommedan priests. They created in East Turkestan the power of the khojas, or " theologians," who afterwards fomented the many intestine wars that were waged between the rival factions of the White and the Black Mountaineers. In the 17th century a powerful Kalmuck confederation arose in Dzungaria, and extended its sway over the Ili and Issyk-kul basins, having its capital on the Ili. To this power or to the Kirghiz the " Whites " and " Blacks " alternately appealed in their struggles, in which Yarkand supported the latter and Kashgar the former. These struggles paved the way for a Chinese invasion, which was supported by the White khojas of Kashgar. The Chinese entered Dzungaria in 1758, and there perpetrated an appalling massacre, the victims being estimated at one million. The Kalmucks fled, and Dzungaria became a Chinese province, with a military colonization of Sibos, Solons, Dahurs, Chinese criminals and Moslem Dzungars. The Chinese next re-conquered East Turkes- tan, marking their progress by massacres and transporting 12,500 partisans of independence to the Ili (Kulja) valley.

Hereupon the dissentient khojas fled to Khokand in West Turkestan, and there gathered armies of malcontents and fanatic followers of Islam. Several times they succeeded in overthrowing the Chinese rule — in 1825, in 1830 and in 1847 — but their successes were never permanent. After the " rebellion of the seven khojas " in 1847 nearly 20,000 families from Kashgar, Yarkand and Ak-su fled to West Turkestan through the Terek-davan pass, many of them perishing on the way; In 1857 another insurrection broke out ; but a few months later the Chinese again took Kashgar. In the course of the Dzungarian outbreak of 1864 the Chinese were again expelled; and Yakub Beg became master of Kashgar in 1872. But five years later he had again to sustain war with China, in which he was defeated, and East Turkestan once more became a Chinese province.

Antiquities. — In 1896 Dr Sven Hedin discovered in the desert not far from the town of Khotan, in a locality known as Borasan, objects in terra-cotta, bronze images of Buddha, engraved gems, coins and MSS. ; the objects, which display artistic skill, give indi- cations of having been wrought by craftsmen who laboured to re- produce Graeco-Indian ideals in the service of the cult of Buddha, and consequently date presumably from the 3rd century B.C., when the successors of Alexander the Great were founding their kingdoms in Persia, Khwarezm (Khiva), Merv, Bactria (Afghan- istan) and northern India, and from that date to the 4th or 5th century a.d. At the same time the same explorer excavated part of the ruins of the ancient city of Takla-makan (near the Keriya-darya), which had been overwhelmed by the moving sands of the desert. There he found mural paintings, some of which represented local lake or river scenes, carved woodwork, fragments of pottery, gypsum images of Buddha, and traces of gardens. These discoveries were followed by others made by Dr M. Aurel Stein in the same part of East Turkestan, though at other localities, namely, at Yotkan, the ancient capital of the kingdom of Khotan, and at Dandan-uiliq, Endere, Karadong, Rawak and other places, all lying east and north-east of the town of Khotan. His " finds" consisted of pottery, images, statues, coins, seals, frescoes, MSS. written in Sanskrit, Brahmi and Chinese characters, wooden tablets in the Kharoshti script, furniture and things appear to date from the Christian era, and continue down century. Again,

in another part

various cereals. These very beginning of the to the end of of the country,

the 8th namely,

in the heart of the desert of Lop, in approximately 40 40′ N. and 90 E., Dr Sven Hedin was fortunate enough to discover early in 1901 the ruins of the ancient city of Lou-Ian or Shanshan, which was destroyed, apparently by a desert storm or by aii inundation, or perhaps by both, towards the end of the 3rd century a.d. Among the objects found on this site were documents testifying to the name of the locality and furnishing materials for fixing the date.

A little before the date of these last discoveries, others of a somewhat similar nature were made by D. A. Klements in the Lukchun depression already mentioned. Here in 1898 the explorer discovered the ruins of ancient monasteries, dating from the beginning of the Christian era down to the 13th and 1 6th centuries. Among these ruins Klements found several very interesting MSS., some of them written in the language of the Uighurs, an ancient Turkish race, and others in tongues unknown. Finally, in 1904, Dr von Le Coq, when excavating the sand-buried ruins of Kara-khoja,. between Turfan and Lukchun, discovered extremely valuable MSS., some written on Chinese paper, some on white leather, and some on wood, besides Buddhistic wall-paintings. The MSS. are written in ten different alphabets, and of the languages employed two are entirely unknown. The excavators also brought to light a vast number of human corpses in the garb of Buddhist monks. Other finds were subsequently made by the same explorer, in conjunction with Professor A. Grunwedel, at Kucha and Korla, two other oases at the south foot of the Tian-shan Mountains.

In 1906-1908 Dr Stein made a second and more important journey, principally for the purpose of antiquarian research, though he also carried out important geographical investigations, with the assistance of a native surveyor, in the Eastern Pamirs (about Mustagh-ata), in the Nissa valley south of Khotan, and elsewhere. His archaeological investigations Were carried on chiefly in the

following localities: (i.) at and about Tashkurghan. (ii.) North-east of Khotan, where a large Buddhist temple, with relievos derived from Graeco-Buddhist models, were investigated and numerous MSS. and wooden tablets were discovered, in- scribed in Sanskrit, Chinese, Tibetan and the Brahmi script of Khotan, the arid conditions, here as elsewhere, having caused these and other perishable objects to remain remarkably well preserved. (iii.)At Niya, east of Keriya, where many Kharoshti documents on wood were [recovered, sometimes retaining their clay seals of Greek type and wooden covers as envelopes, together with implements, furniture, &c. (iv.)At Miran, near the western extremity of Lop-nor, where Buddhist shrines with frescoes, &c, were investigated, (v.) At Lop-nor itself, where Chinese and Kharoshti records on paper, wood and silk were recovered, and flint implements and other evidences of prehistoric occupation were discovered, (vi.) At and about the oasis of Tung-hwang, east of Lop-nor. Here the explorer traced a Chinese wall with watch-towers, guard-stations, &c, for a considerable distance, and made an important archaeological collection. Evidence of settlement back to the close of the 2nd century a.d. was obtained, and also of commercial traffic from the distant west in the shape of records in Indian, Kharoshti and Brahmi scripts and an un-known script resembling Aramaic. The sacred grottoes known as the Halls of the Thousand Buddhas, south-east of Tung-hwang, were visited, with their frescoes and cave temples, and a large number of documents and examples of early Chinese art were recovered. Dr Stein also investigated sites in the neighbourhood of Kara-shahr and others to the north-east of the great desert.

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TURKESTAN, or Hazret, a town of Russian Turkestan, in the province of Syr-darya, on the railway from Orenburg to Tashkent, from which it lies 165 m. to the N.N.W. Pop. (1897), 11,592. It lies on the right bank of the Syr-darya river, 20 m. from it, at an altitude of 833 ft. It has a very old mosque of the saint Hazret-Yassavi, which attracts many pilgrims. It is an important dep6t for hides, wool and other produce of cattle- breeding. The town was captured by the Russians in 1864.

TURKEY. The Turkish or Ottoman Empire comprises Turkey in Europe, Turkey in Asia, and the vilayets of Tripoli and Barca, or Bengazi, in North Africa; and in addition to those provinces under immediate Turkish rule, it embraces also certain tributary states and certain others under foreign administration. Turkey in Europe, occupying the central portion of the Balkan Peninsula, lies between 38 46′ and 42 50′ N. and 19 20′ and 29 10′ E. It is bounded on the N.W. by Montenegro and Bosnia, on the N. by Servia and Bulgaria,

on the E. by the Black Sea and the Bosporus, on the S. by the Sea of Marmora, the Dardanelles, the Aegean Sea and Greece, and on the W. by the Ionian and Adriatic Seas. Turkey in Asia, fronting Turkey in Europe to the south-east, and lying between 28 and 41 N. and 25 and 48 E., is bounded on the N. by the Black Sea, on the N.W. by the Bosporus, the Sea of Marmora and the Dardanelles, on the W. by the Aegean Sea, on the E. by Persia and Transcaucasia, and on the S. by Arabia and the Mediterranean. So far as geo- graphical description is concerned, the separate articles on Asia Minor, Albania, Armenia, and other areas mentioned below — constituting the Turkish Empire — may be consulted. (For maps of Asiatic Turkey , see Arabia; Armenia; Asia Minor; Palestine; Syria.)

The possessions of the sultan in Europe now consist of a strip of territory stretching continuously across the Balkan Peninsula from the Bosporus to the Adriatic (29 10′ to 19° 20′ E.), and lying in the east mainly between 40° and 42* and in the west between 39° and 43 N. It corresponded roughly to ancient Thrace, Mace- donia with Chalcidice, Epirus and a large part of Illyria, constituting the present administrative divisions of Stambul (Constantinople, including a small strip of the opposite Asiatic coast) , Edirne (Adria- nople), Salonica with Kossovo (Macedonia), Iannina (parts of Epirus and Thessaly), Shkodra (Scutari or upper Albania). To these must be added the Turkish islands in the Aegean usually reckoned to Europe, that is, Thasos, Samothrace, Imbros and, in the extreme south, Crete or Candia. In December 1898, however, Crete was granted practical independence, under the protection of Great Britain, France, Italy and Russia (see Crete), and the suzerainty of the sultan is purely nominal.

Asiatic Turkey.— The mainstay of the Ottoman dynasty is the Asiatic portion of the empire, where the Mahommedan religion is absolutely predominant, and where the naturally vigorous and robust Turki race forms in Asia Minor a compact mass of many millions, far outnumbering any other single ethnical element and probably equalling all taken collectively. Here also, with the unimportant exception of the islands of Samos and Cyprus and the somewhat privileged district of Lebanon, all the Turkish possessions constitute vilayets directly controlled by the

Porte. They comprise the geo- graphically distinct regions of the Anatolian plateau (Asia Minor), the Armenian and Kurdish highlands, the Mesopotamian lowlands, the hilly and partly mountainous territory of Syria and Palestine and the coast lands of west and north-east Arabia. Asiatic Turkey is conterminous on the east with Russia and Persia; in the south- west it encloses on the west, north and north-east the independent part of Arabia. Towards Egypt the frontier is a line drawn from Akaba at the head of the Gulf of Akaba north-westwards to the little port of El Arish on the Mediterranean. Elsewhere Asiatic Turkey enjoys the advantage of a sea frontage, being washed in the north-west and west by the Euxine, Aegean and Mediterranean, in

the south-west by the Red Sea, and in the south-east by the Persian Gulf.

Turkey's Arabian possessions comprise, besides El-Hasa on the Persian Gulf, the low-lying, hot and insalubrious Tehama and the south-western highlands (vilayets of Hejaz and Yemen) stretching continuously along the east side of the Red Sea, and including the two holy cities of Mecca and Medina.

African Territories.— Turkey in Africa has gradually been reduced to Tripoli and Barca. Egypt, though nominally under Turkish suzerainty, has formed a practically independent principality since 1841, and has been de facto under British protection since

1881.

Population. — The total population of the Turkish Empire in 1910, including Egypt and other regions nominally under the sultan's suzerainty, was 36,323,539, averaging 25 to the square mile; in the provinces directly under Turkish government, 25,926,00×3.

The following towns have over 50,000 inhabitants each: Con- stantinople, 1,150,000; Smyrna, 250,000; Bagdad, 145,000; Damas- cus, 145,000; Aleppo, 122,000; Beirut, 118,000; Adrianople, 81,000; Brusa, 76,000; Jerusalem, 56,000; Caesarea Mazaca (Kaisarieh), 72,000; Kerbela, 65,000; Monastir, 53,000; Mosul, 61,000; Mecca, 60,000; Horns, 60,000; Sana, 58,000; Urfa, 55,000; and Marash,

52,000.

Race and Religion. — Exact statistics are not available as regards either race or religion. The Osmanlis or Turks (q.v.) are supposed to number some 10 millions, of whom i| million belong to Turkey in Europe. Of the Semitic races the Arabs — over whom, however, the Turkish rule is little more than nominal — number some 7 millions, and in addition to about 300,000 Jews there is a large number of Syrians. Of the Aryan races the Slavs — Serbs, Bulgarians, Pomaks and Cossacks— and the Greeks predominate, the other representatives being chiefly Albanians and Kurds. The proportion borne to one another by the different religions, as estimated in 1910, is: 50% Mussulman, 41% Ortho- dox, 6% Catholic, 3% all others (Jews, Druses, Nestorians, &c). In the European provinces about two-thirds of the popu- lation are Christian and one-third Mahommedan. Full and fairly accurate statistics are available for a considerable portion of Asiatic Turkey. Out of a population of 13,241,000 (1896) in Armenia, Kurdistan and Asia Minor, 10,030,000 were returned as Mahommedans, 1,144,006 as Armenians, 1,818,000 as other Christians, and 249,000 as Jews. There are also about 300,000 Druses and about 200,000 Gipsies. The non-Mussulman popu- lation is divided into millets, or religious communities, which are allowed the free exercise of their religion and the control of their own monasteries, schools and hospitals. The communities now recognized are the Latin (or Catholic), Greek (or Orthodox), Armenian Catholic, Armenian Gregorians, Syrian, and United Chaldee, Maronite, Protestant and Jewish. The table on the following page, for which the writer is indebted to the kindness of Carolidi Effendi, formerly professor of history in the university of Athens, and in 19 10 deputy for Smyrna in the Turkish, parlia- ment, shows the various races of the Ottoman Empire, the regions which they inhabit, and the religions which they profess.

Administration. — Until the revolution of 1908, with a very short interval at the beginning of the reign (1876) of the deposed sultan Abd-ul-Hamid, the government of Turkey had been essen- tially a theocratic absolute monarchy. It was subject to the direct personal control of the sultan, who was himself a temporal autocrat, which he now is not, and the most generally recognized caliph, that is, ”

successor," of the Prophet, and consequently the spiritual head of by far the greater portion of the Moslem world — as he still is. Owing principally to the fact that the system of the caliph Omar came to be treated as an immutable dogma which was clearly not intended by its originator, and to the peculiar relations which developed therefrom between the Mussulman Turkish conquerors and the peoples (principally Christian) which fell under their sway, no such thing as an Ottoman nation has ever been created. It has been a juxta- position of separate and generally hostile peoples in territories bound under one rule by the military sway of a dominant race. Various endeavours have been made since the time of Selim III. (1 789-1807), who initiated them, to break down the barriers to the formation of a homogeneous nation. The most earnest and

Races.

Regions inhabited.orVilayets.

Religions.

Albanians .

Iannina, Scutari of Albania,

Mussulman,

Kossovo, Monastir

Orthodox, Catholic

Bulgarians .

Salonica, Kossovo, Monastir

Orthodox (dis- senting)

Servians .

Kossovo

Orthodox

Greeks .

Constantinople, Adrianople,

Orthodox and

Salonica, Monastir, Kos-

partly Greco

sovo, Janina, Archipelago,

catholic

Vilayets of Asiatic Turkey,

(Hudavendighiar, Aidin,

Konia, Angora, Kastamuni,

Trebizond, Sivas, Adana

Syria, Aleppo, Sanjak of

Jerusalem) Crete

Kutzo-Vlachs (See

Monastir, Iannina

Orthodox

Macedonia)

Turks

The whole of European Tur- key, Vilayets of Asia Minor, (Bitlis, Van, Mamuret-ul- Aziz, part of Mosul and cer- tain islands of Vilayet of the Archipelago, of Cyprus, Crete)

Mussulman

Lazes

Trebizond and throughout

Mussulman and

the whole of Eastern Asia

Orthodox

Minor

Kurds .

Erzerum, Sivas,Seert,Angora, Mosul

Mussulman

Circassians .

Spread over the whole of Asia Minor

Mussulman

Avchar .

Adana, Angora, Sivas

Mussulman

Arabs

Adana, Aleppo.Sy ria, Bagdad , Sanjak of Jerusalem, Hejaz, Yemen, Beirut, Basna

Mussulman

Armenians .

Constantinople and spread

Gregorian and

over the other Vilayets of

Catholic

Turkey in Europe; also

Sivas, Angora, Trebizond,

Adana, Erzerum, Bitlis,

Mamuret-ul-Aziz, Mosul,

Aleppo, Van

Jews

Spread through Turkey in Europe and Asia, and large- ly congregated in the San- jak of Jerusalem, and in the Vilayets of Bagdad, Mosul, Syria, Beirut.

Jew

Samaritans .

Only in the Sanjak of Nap- luze (Vilayet of Beirut)

Samaritan Jew

Gipsies .

Spread throughout the whole empire

Mussulman

Chaldaeans or

Bagdad, Mosul and partly

Nestorian

Nestorians,

Aleppo, Beirut and Mamu-

Christian

speaking partly

ret-ul-Aziz

Syrochaldaic

and partly

Arabic (Syro-

chaldaic in

their churches)

Melchites, or

Beirut, Aleppo, Syria

United Ortho-

Syrian Greco-

dox

Catholics

(Greek in feel-

ing, speaking Arabic)

Jacobite Syrians,

Beirut, Syria, Aleppo, Mosul,

Monophysite

speaking Ara-

Mamuret-ul-Aziz

and Jacobite

bic and partly Syrian (Syrian

in their churches)

Monites (speak-

Mt Lebanon, Beirut

Monophysite

ing Arabic and

(Catholic

in their churches

monothelite)

Syrian)

Druses

Mt Lebanon.SanjakofHauran

Druse

Mendaites or

Basra

Sabaean: or of

Ben-i-Yahya

the sect of the son of John the Baptist (Ben-i-Yahya) whomthey re- gard as their only prophet.

Yezzites .

Mosul, Bagdad, Basra

Yezzite(Mahom- medan sect)

important of these attempts under Abd-ul-Mejid (1839-1861) proved, however, for various reasons abortive. So also did the ” Midhat Constitution ” promulgated by Abd-ul-Hamid almost immediately after his accession to the throne, owing largely to the reactionary spirit at that time of the ‘ Ulema and of the sultan’s immediate advisers, but almost, if not quite, in equal measure to the scornful reception of the Constitution by the European powers. The ‘Ulema form a powerful corporation, whose head, the Sheik-ul-Islam, ranks as a state functionary almost co-equal with the grand vizier. Until quite recent times the conservative and fanatical spirit of the ‘Ulema had been one of the greatest obstacles to progress and reform in a political system in which spiritual and temporal functions were intimately interwoven. Of late years, however, there has been a gradual assimilation of broader views by the leaders of Islam in Turkey, at any rate at Constantinople, and the revolution of 1908, and’ its affirmation in the spring of 1909, took place not only with their approval, but with their active assistance. The theoretical absolutism of the sultan had, indeed, always been tempered not only by

tra- ditional usage, local privilege, the juridical and spiritual precepts of the Koran and the Sunnet, and their ‘Ulema interpreters, and the privy council, but for nearly a century by the direct or indirect pressure of the European powers, and during the reigns of Abd-ul-Aziz and of Abd-ul-Hamid by the growing force of public opinion. The enthusiastic spirit of reform which heralded the accession of the latter sultan never altogether died out, and from about the last decade of the 19th century has been rapidly and effectively growing in force and in method. The members and sympathizers of the party of reform who styled themselves ” Young Turks,” working largely from the European centres and from the different points in the Turkish Empire to which the sultan had exiled them for the purpose of repression — their relentless persecution by the sultan thus proving to be his own undoing — spread a powerful propaganda throughout the Turkish Empire against the old regime, in the face of that persecution and of the open and characteristic scepticism, and indeed of the hostile action*, of some of the European powers. This movement came to a head in the revolution of 1908. In July of that year the sultan Abd-ul-Hamid capitulated to the Young Turks and restored by Irade (July 24) the constitution which he had granted in December 1876 and suspended on the 14th of February 1878. A reactionary movement started in April 1909 was promptly suppressed by the Young Turks through the military occupation of Constantinople by Shevket Pasha and the dethronement of Abd-ul-Hamid, who was succeeded by his younger brother Reshad Effendi under the title of Mahommed V. A new constitution, differing from that of Abd-ul-Hamid only in some matters of detail, was promulgated by imperial Irad6 of the 5th of August 1909.

In temporal matters the sultan is a constitutional monarch, advised by a cabinet formed of executive ministers who are the heads of the various departments of state, and who are respon- sible to the elected Turkish parliament. All Turkish subjects, of whatever race or religion, have equal juridical and political rights and obligations, and all discrimination as to military service has been abolished. The sultan remains the spiritual head of Islam, and Islam is the state religion, but it has no other distinctive or theocratic character. The grand vizier (sadr-azam), who is nominated

by the sultan, presides ex officio over the privy council (mejliss-i-khass) , which, besides the Sheikh-ul-Islam, comprises the ministers of home and foreign affairs, war, finance, marine, commerce and public works, justice, public instruction and ” pious foundations ” (evkaf), with the grand master of ordnance and the president of the council of state.

For administrative purposes the immediate possessions of the sultan are divided into vilayets (provinces), which are again subdivided into sanjaks or mutessarifliks (arrondissements), these into kazas (cantons) , and the kazas into nahies (parishes or communes). A vali or governor-general, nominated by the sultan, stands at the head of the vilayet, and on him are directly dependent the kaimakams, mutassarifs, deftardars and other administrators of the minor divisions. All these officials unite

in their own persons the judicial and executive functions, under the ” Law of the Vilayets,” which made its appearance in 1861, and purported, and was really intended by its framers, to confer on the provinces a large measure of self-government, in which both Mussulmans and non-Mussulmans should take part. It really, however, had the effect of centralizing the whole power of the country more absolutely than ever in the sultan’s hands, since the Valis were wholly in his undisputed power, while the ex officio official members of the local councils secured a perpetual Mussul- man majority. Under such a system, and the legal protection enjoyed through it by Ottoman functionaries against evil con- sequences of their own misdeeds, corruption was rife throughout the empire. Foreigners settled in the country are specially protected from exactions by the so-called Capitulations (q.v.), in virtue of which they are exempt from the jurisdiction of the local courts and amenable for trial to tribunals presided over by their respective consuls. Cases between foreigners of different nationalities are heard in the court of the

defendant, and between foreigners and Turkish subjects in the local courts, at which a consular dragoman attends to see that the trial is conducted according to law. (See further, as regards Turkish administra- tion, the account given under History below, regarding the reforms instituted under the sultan Abd-ul-Mejid in 1839.)

Education. — The schools are of two classes: (1) public, under the immediate direction of the state; and (2) private, conducted either by individuals or by the religious communities with the permission of the government, the religious tenets of the non-Mussulman population being thus fully respected. State education is of three degrees: primary, secondary and superior. Primary education is gratuitous and obligatory, and superior education is gratuitous or supported by bursaries. For primary education there are three grades of schools: (1) infant schools, of which there is one in every village; (2) primary schools in the larger villages; (3) superior primary schools. Secondary education is supplied by the grammar school, of which there is one in the capital of every vilayet. For superior education there is (1) the uni- versity of Constantinople, with its four faculties of letters, science, law and medicine; and (2) special schools, including (a) the normal school for training teachers, (6) the civil imperial school, (c) the school of the fine arts and (d) the imperial schools of medicine.

Public instruction is much more widely diffused throughout the empire than is commonly supposed. This is due partly to the Christian communities, notably the Maronites and others in Syria, the Anatolian and Rumelian Greeks, and the Armenians of the eastern province and of Constantinople. Under tlie reformed constitution (Aug. 5, 1909) education is free, and measures have been taken largely to extend and to co-ordinate the'education of all " Ottomans," without prejudice to the religious educational rights of the various religious communities. Primary education is obliga- tory. Among the Christians, especially the Armenians, the Greeks of Smyrna and the Syrians of Beirut, it has long embraced a consider- able range of subjects, such as classical Greek, Armenian and Syriac, as well as modern French, Italian and English, modern history, geogra- phy and medicine. Large sums are freely contri- buted for the establish- ment and support of good

schools, and the cause of national education is seldom forgotten in the legacies of patriotic Anatolian Greeks. Much educational work has also been done by American colleges, especially in the northern provinces of Asia Minor, in conjunction with Robert College (Constantinople).

Army. — In virtue of the enactments of May 1880, of November 1886, of February 1888 and of December 1903, military service had been obligatory on all Mussulmans, Christians having been excluded but under obligation of paying a " military exoneration tax " of £T50 for 135 males between the ages of 15 and 75. Under the new regime this system, which had greatly cramped the military strength and efficiency of the Ottoman Empire, has been changed, and all " Ottomans " are now subject to military service. Under_ certain conditions, however, and on payment of a certain exoneration tax, exemption may still be purchased. The revision of the whole military system was undertaken in 1910, especially as regards enrolment and promotion of officers, but, as things then stood, the term of service was twenty years (from the age of 20 to the age of 40), for all Ottoman male subjects: active service (muasaff) nine years, of which three with the colours (nizam), in the case of infantry,

four in the case of cavalry and artillery; six and five respectively in the reserve (ikhtiat) ; Landwehr (redif) nine years ; territorial (mustahfiz) two years. In case of supreme necessity all ■ males up to 70 years of age can be called upon to join the colours. There are certain recognized rights to exemption from military service, euch as some court officials, state officials, students in normal schools, medicine and law colleges, &c. The redifs form the principal part of the army in time of war, and are divided into two classes: Class I. comprises all men in the service who have completed their time with the nizam. In peace-time it is composed of weak cadres, on which falls the duty of guarding magazines and stores, and of carrying through musketry instruction and drill of the rank and file of the ikhtiat and the redif. Class II. was first established in 1898 under the name of ilaweh, and became " redif, class II." in 1903. This class is distributed in very weak cadres in time of peace. In time of war, it is completed by all troops not serving with the nizam, the redif class I. or the mustahfiz. As the organization proceeded, and stronger cadres were

formed, the redif class II. would become completely absorbed in class I. The mustahfiz have no cadres in peace-time.

The army is divided into seven army -corps (ordus), each under the command of a field marshal, and the two independent commands of Tripoli (Africa) and the Hejaz. The headquarters of the ordus are I., Constantinople; II., Adrianople; III., Salonica; IV., Erzerum; V., Damascus; VI., Bagdad; VII., Yemen; 15th division, Tripoli; 16th division, Hejaz. Only the first six army-corps have, however, their proper establishment : the seventh ordu and the commands of Tripoli and the Hejaz have only garrison troops, and are fed by drafts from the first six ordus. Each ordu territory, from I. to VI., is composed of 8 redif brigade districts of 2 regimental districts of 4 battalion districts apiece, each ordu thus counting 64 battalion districts. The total strength of the Ottoman army in 1904 was returned at 1,795,350 men all told, made up as follows: (1) Active (4 years' service) 230,408 (called), reserve (ikhtiat) 251,511 (called), total 481,919; (2) nizam (class I., completely trained) 237,026 (called); (3) redif (class II., not completely trained), from 21-29 years old, 585,846; from 30-38 years old, 391,563; total 977,409 (uncalled) ; (4) mustahfiz, trained 53,715 (called), untrained 40,286 (uncalled), total 94,001.

The strength of the different arms is given as follows : — Infantry. — 79 nizam infantry regiments I to 80 (4 is missing), each regiment consisting of four battalions of four companies apiece. Allowing for certain battalions unformed, there are altogether 309 nizam battalions; 20 separate chasseur battalions, of four companies each ; 4 special chasseur battalions stationed on the Bulgarian frontier — total, 333 battalions in the first line. There are 96 infantry battalions of redif class I.; each regiment composed of 4 battalions — total 384 battalions. (In 1904 the 4th battalion of the 94th regiment, and regiments 95 and 96 had not yet been formed, but, it was stated, had by 1910 been made good.) The projected strength of redif class II. was 172 regiments of 4 battalions each — total, 688 battalions. At the. end of 1904 the organization of this class was stated as completed in Turkey in Europe at 40 battalions with a total of 1 60 regiments: how far the organization had pro- gressed in 1910 in Asiatic Turkey was

not known.

The following table shows the war strength of battalions, and the total war strength of the infantry arm: —

Class.

War Strength of Battalions.

— , ,,j

Total War Strength of Infantry.

Officers.

N.C.O.‘s and Men,

Draft Animals.

Rifles.

Officers.

N.C.O’s and Men.

Draft Animals.

Rifles.

Special Chasseurs

Nizam

Redif I

Redif II

Mustahfiz ....

26 24

24

24

8-15

800 700 900 800 400-600

200 106 106 106

650 650 850 750 400-600

520

7,896

10.320

16,512

1 ,760

,16,000 230,300 337,500

550,400 98,000

4,000

: 34.874 39,750 72,968

13,000 213,850 318,750 515,000

98,000

The troops are armed principally with Mauser repeating rifles (models 1887 and 1890) of which there are 1,120,000 issued and in store; there are also 510,000 Martini-Henry rifles in reserve.

Cavalry. — Cavalry of the Guard: I regiment ” Ertogrul ” or 5 squadrons, 2 regiments of hussars of 5 squadrons each, and I regiment of lancers of 5 squadrons. Nizam Cavalry: 38 regiments of 5 squadrons each, or 190 squadrons in all.

Redif Cavalry. — 12 regiments of 4 squadrons each, or 48 squadrons in all, attached to the first three ordus. It was further proposed to appoint one regiment of redif cavalry to each redif division. On war footing the strength of a squadron of cavalry is 6 officers, 100 men, 80 horses (Ertogrul — 140 men, 135 horses). The nizam cavalry is incorporated with the first six ordus. one cavalry division of 3 brigades of 2 regiments each being appointed to each ordu. The redif cavalry is not organized with large units, and in time of war would be employed as divisional troops. The total war strength of the cavalry is 54 regiments (210

squadrons) ; 1580 officers, 26,800 men, 21,900 horses. The cavalry is armed with repeating carbines (the N.C.O.‘s with repeating revolvers) and swords.

Artillery. — From ancient times the artillery has formed ai

altogether independent command in the Turkish army. The grand master of ordnance is co-equal with the minister of war, and his department is classed separately in the budget; the artillery estab- lishments, parts of the infantry and of the tecnnical corps, and even hospitals are placed under his direct orders. The artillery is divided into (a) field artillery, horse artillery, mountain artillery and howit- zer regiments; (6) fortress artillery; (c) artillery depfits. All artillery troops are nizam : there is no second line. On principle an ordu would have with it 30 batteries of field artillery, 3 batteries of horse artillery and 3 batteries of mountain artillery, or in all 36 batteries with 216 guns, all batteries being 6 guns strong. But the unequal strength of the ordus and political and other reasons have prevented this organization from being carried out.

On war-footing each field battery has 4 officers, 100-120 N.C. officers and men, 100-125 horses and draught animals, 3-9 ammunition wagons; each horse battery, 4 officers, 120 N.C. officers and men, 100 horses, &c, 3 ammunition wagons ; each mountain battery, 3 officers, 100 N.C. officers and men, 87 horses, &c. ; each howitzer battery, 4 officers, 120 N.C. officers and men, 100 horses, &c, 3 ammunition wagons.

In 1904 the total strength of the artillery was given as 198 field batteries (1188 guns), 18 horse batteries (108 guns), 40 mountain batteries (240 guns) and 12 howitzer batteries (72 guns) : total 268 batteries (1608 guns). The guns are of various Krupp types. The ammunition train counts 1254 wagons. On a war-footing the strength 01 the artillery troops is 1032 officers and 29,380 men.

Technical Troops. — These are formed into battalions of

pioneers, railway troops, telegraph troops, sappers and miners, &c. ; in all 1 1 battalions (55 companies) numbering 245 officers and 10,47c men. Other non-combatant troops, such as military- train, medical corps, &c, are undergoing reorganization. (For the history of the Turkish army, see Army, § 98.)

Navy. — The Turkish sea-power, already decayed owing to a variety of causes (for the effect of the revolt of the Greek islanders see Greek Independence, War of), was shattered by the catas- trophe of Sinope (1853). Abd-ul-Aziz, however, with the aid of British naval officers, succeeded in creating an imposing fleet of ironclads constructed in English and French yards. Sultan Abd-ul- Hamid, on the other hand, pursued a settled policy of reducing the fleet to impotency, owing to his fear that it might turn against him as it had turned against Abd-ul-Aziz. He added, it is true, a few torpedo boats and destroyers, but he promptly had them dismantled on arrival at Constantinople. These now refitted, a cruiser ordered from Cramp's shipyard (America) and another from W. G. Armstrong, Whitworth & Co., and the battleship " Messudiyeh " (9100 tons displacement) reconstructed by the firm of Ansaldo (Genoa) in 1902, and re-armed by Vickers, Sons & Maxim, formed the only really effective war-ships at the disposal of Turkey in 1910, although a few armoured ships in addition might still serve for coast defence at a pinch, and a few more for training ships. Taking all into account, the available strength of the fleet might be put at 7 armour-clad ships, of which the " Messu- diyeh " was one, the six others varying in displacement from 2400 to 6400 tons; two cruisers (unarmoured) of 3800 tons displacement; some 18 gunboats; 12 destroyers, 16 first-class torpedo boats and 6 second-class torpedo boats. There were also two Nordenfeldt submarine boats of doubtful efficiency.

Up to 1908 the personnel was found by yearly drafts of two to three thousand men from army recruits designated by the minister of war; the term of service was 12 years, of which 5 were in the first line, 3 in the reserve, 4 in the coastguard. The peace cadres (including 2 battalions of marines and 4 battalions of mechanics) were supposed to comprise 12,500 men on peace-footing, to be increased on declara- tion of war to 37,000; but these cadres were mainly on paper.

Under the ” new regime ” the Turkish government displayed commendable energy in reconstructing and reorganizing the sea- power of the empire. New construction to an amount of £T5,ooo,ooo, repayable over ten years at the rate of £Tsoo,ooo a year by national subscription guaranteed by the government, had by 1910 been voted by parliament. The programme of construction which this initial expenditure was to cover was fixed at two battleships of about 16,000 tons displacement, one armoured cruiser of about 12,000 tons displacement, some few auxiliary vessels (destroyers and gunboats), and a floating dock to lift about 17,000 tons. The main armament of the battleships was to be three pairs of 12-in. guns in three turrets, and three pairs of 9-2-in. in three turrets. The secon- dary armament was to be sixteen 4-in. Q.F. guns, and a few smaller guns (boat and field). The armoured cruiser was to carry four pairs of 9-2-in. guns in four turrets as main armament, and fourteen 4-in. Q.F. guns, and a few boat and field guns as secondary armament. British naval officers were engaged for training the personnel, and to assist in the reorganization of the fleet.

Communications. — A considerable hindrance to the development of the empire’s resources has been the lack of an adequate system of communications; but although it is still deficient in good roads, much has been done of late years to develop railways, extend canals and improve river communications. From 1250 in 1885, of which 903 were in Europe and 347 in Asia, the mileage of railways had increased to some 4440 in 1909, of which 1377 are in Europe, 1810 in Asia Minor, 418 in Syria and 835 fall to the share of the Hejaz railway,

including the Ed-Dera-Haifa branch. The construction of this last line is one of the most remarkable achievements of the reign of Abd-ul-Hamid. It may be said to be an absolutely autocthonous enterprise, no recourse having been had to foreign capital to find the means requisite for construction and equipment, which were provided by means of a ” national subscription ” — not entirely voluntary — and from other sources which, although the financial methods were not strictly orthodox, were strictly Turkish. The line was designed, surveyed and constructed by Turkish engineers — employing Otto- man navvies and labourers — in a highly efficient and economical manner,

the average cost per mile having been £3230, although considerable engineering difficulties had to be overcome, especially in the construction of the Haifa branch. The line, stations, sheds and stores are all solidly built, and the rolling stock is sufficient and of the best quality (see further under Finance, below) .

Production and Industries. — The Ottoman Empire is renowned for its productiveness, but enterprise and skill in utilizing its capabilities are still greatly lacking. For the introduction of im- provements something, however, was done by the creation in 1892 of a special ministry of agriculture, to which is attached the department of mines and forests, formerly under the minister of finance. Since the year named an agricultural bank has been established, which advances money on loan to the peasants on easy terms. Schools of agriculture have been opened in the chief towns of the vilayets, and' in connexion with those schools, and elsewhere throughout the empire, model farms have been instituted, where veterinary instruction can also be obtained.

To prevent the gradual destruction of the forests by unskilful management and depredations, schools of forestry have been founded, and means have been taken for regulating the cutting of wood and for replanting districts that have been partially denuded. About 21 millions of acres are under wood, of which over 3 millions are in European Turkey.

Wheat, maize, oats, barley and rye are the chief agricultural products. The culture of cotton is making rapid progress, immi- grants who receive a grant of land being obliged to devote one-fourth of it to cotton culture. Tobacco is grown all over the empire, the most important market for it being Smyrna. Opium is mainly grown in Anatolia. All the more common fruit-trees flourish in most districts. In Palestine and elsewhere there is a large orange trade, and Basra, in Turkish Arabia, has the largest export of dates in the world. The vine is largely cultivated both in Europe and Asia, and much Turkish wine is exported to France and Italy for mixing purposes. The chief centres of export are Adrianople (more than half), Constantinople and Smyrna, the others being Brusa, Beirut, Ismid, Mytilene and Salonica. Under the auspices of the Ottoman public debt

administration silk culture is also carried on with much success, especially in the vilayets of Brusa and Ismid. In 1888 a school of sericulture was founded by the public debt administration for the rearing of silkworms according to the Pasteur method. The production of salt is also under the direction of the public debt administration. About a fourth of the salt produced is exported to foreign countries, and of this about three-fourths goes to British India. Since 1885 great attention has been paid to the sponge fisheries of Tripoli, the annual value of which is about £30,000. With its extensive sea-coast, and its numerous bays and inlets, Turkey has many excel'ent fishing-grounds, and the industry, the value of which is estimated at over £200,000 a year, could be greatly developed. Its general progress may be seen in the increase of the fishery revenue — derived from duties, permits, &c. — of the public debt administration. Among other important productions of the Ottoman Empire are sesame, coleseed, castor oil, flax, hemp, aniseed, mohair, saffron, olive oil, gums, scammony and liquorice. Attar of roses is produced in large quantities both in European and Asiatic Turkey, and to aid in furthering the industry numerous rose plants are distributed gratuitously. The empire is rich in minerals, including gold, silver, lead, copper, iron, coal, mercury, borax, emery, zinc; and only capital is needed for successful exploitation. The silver, lead and copper mines are mainly worked by British capital. The more special industries of Turkey are tanning, and the manufacture of muslin, velvet, silk, carpets and ornamental weapons.

Shipping and Commerce. — The figures obtainable with respect to shipping are approximate, the statistical data not being altogether complete. In 1890-1891 the number of steamers that entered and cleared Turkish ports was 38,601, and of sailing vessels 140,726, the total tonnage of both classes of vessels being 30,509,861 . In 1 897-1 898 the number of steamers was 39,680 of 32,446,320 tons, the number of sailing vessels being 134,059 of 2,207,137 tons, thus giving a total tonnage of 34,653,457. In 1904-1905 the number of steamers was 49i 2 3S °f 44,180,000 tons, and of sailing vessels 133,706, with a ton- nage of 2,506,000 tons, the total tonnage being thus 46,686,000 tons. In 1909 the total tonnage was 43,060,515. About a third of the tonnage belongs to British vessels. The number of steam- ships

belonging to Turkey in 1899-1900 was 177 of 55,938 tons, as

compared with 87 of 46,498 tons in 1897-1898, the number of sailing vessels in the same years being respectively 2205 of 141,055 tons and 1349 of 252,947 tons. The following tables show the total value of exports and imports arranged according to countries of origin or destination for 1905-1906 and 1908-1909; the same information for the year 1905-1906 with respect to the principal ports of the empire, and the tonnage of vessels cleared thereat during the year 1908- 1909; and the value of the principal articles imported and exported for the year 1905-1906.

Value of Principal Articles Imported and Exported for the year igo$-iQo6.

Nature of Goods.

Barley

Rice

Opium

American Cloth

Grapes

Figs .

Cotton

Valonia

Crude Iron and Iron Bars ... Sheepskins and Goatskins

Carpets, &c

Flour

Cotton Thread

French Beans, Chick Peas and Beans

Cashmere Cloth

Coffee .

Madapollam

Ores

Wool

Woollen Fabrics

Cotton Print (Calico) . Tiftik (Silk-waste) . . Cocoons .... Petroleum .... Sugar

Imports.

1 944,950

1,404,803

432,091

506,353

995.165

1,287,243

561,246 830,325

9i6,7i5

785,622 2,014,968

909,735 2,263,928

Exports.

£

658,462

639,630

2,065,642

79i,473

449,628

548,442

528,282 478,991

508,441

486,037 439,066

441,282

801,755 970,169

Value of Goods Imported into, and Exported from, together with Number and Tonnage of Vessels cleared at, Principal Ports of Turkish Empire.

Table indicating the

number of Vessels,

Value of the Goods im-

(Steamships and Sail-

ported into, or exported from, Turkey, during

Boats), and Tonnage,

cleared at the follow-

Port.

the year 1905-1906.

ing ports of the Otto- man Empire, in the year 1908-1909.

Imports.

Exports.

Number of Vessels

Tonnage.

Constantinople

£

8,470,095

£

1,381,432

17,792

16,214,947

Dependencies of Constantinople

673,699

2,453,758

—

—

Smyrna .

3.724.525

5,722,273

5,888

2,989,863

Beirut.

3.568,437

1,578,691

3,076

1,740,312

Salonica .

3,m,957

1,650,552

2,962

1,151,273

Prevesa .

358,586

259,585

—

—

Yemen

603,731

259,553

—

—

Jidda ....

801,927

26,154

—

—

Adrianople

587,653

585,810

—

—

Bagdad .

1,510,430

777,402

—

—

Alexandretta

1,669,231

887,326

685

676,137

Tripoli in Africa

565,331

328,164

575

376,214

Trebizond

1,507,771

1,083,515

1,389

776,698

Scutari, Albania .

257,397

135,850

—

Erzerum .

103,280

96,405

—

—

Basra.

—

—

—

—

Kavala .

—

—

1,410

283,256

Samsun .

—

—

1,064

976,803

Tripoli in Syria . Jaffa ... .

—

—

1,306

919,222

—

—

1,241

1,210,261

Chios.

—

—

2,732

915,880

Aivali. . .

—

—

1,489

124,804

Dedeagatch * Total . . .

—

- —

404

50,469

27,514,050

17,256,470

Value of the Goods Imported from or Exported to Principal Countries during the years ipos~lQo6 and I(X)8-IQ0(>.

Country of Origin or Destination.

Imports from

‘ ‘■

Exports to

1905- 1906

1908-1909

1905-1906

1908-1909

Amount

%

Amount

%

Amount

%

Amount

%

Austria-Hungary

Italy

Spain

Switzerland .... United States . .

Denmark

Japan

Holland

Franoe

Greece

Egypt

Bulgaria

Samos

Tunis

Other Countries

£

9,641,931 1,162,538

5,715,914

2,145,789

118

643,641

63.324

252,247

865,040

33

1.596,631

697,631

1,821

89,329

524,116

2,341,086

2,928

492,037

812,466

409,727 1,210

54,495

35-05 4-22

20-77 7.79

2-34 0-23 0-92 3-15

5-8o

2-54

o-33

1-91

8-51

O-OI

1-79 2-96

1-49

0-19

£

8,256,793

1,697,957

3,574,724

2,150,064

15,588

485,887

105,026

360,446

762,543

2,187,868 1,107,120

2,374 441,050

555,972

2,956,643

6,633

347.287 1,019,952 1,188,981

181,965

47.524 119.738

29-96 616

12-96 7.79 0-06 1-77

o-39

1-30 2-76

7-94 4-01

O-OI

i-6o

2-OI

10-72

0-02 1-26

3-70

4-31 066 0-17

o-44

£

5.552,703 1,076,929 1,874,827

872,641 21,827

57,443

640

431,684

427,998

201

520,916

350,876

214

172,220

509,688

4,220,006

24,686

476,829

663,139

32-18

6-24

10-87

5-06

0-13

. 0-33

2 50

2-48

3-02 2-03

o-99

2-96 24-46 0-15 2-76

‘3-84

£

4,506,344

1,008,750

2,173,453

883,358

17,332

82,530

3,056

616,951

152,517

504,291 336,663

86,602

220,489

3,187,376

20,228

382,484

1,453,274

498,414

10,319

2,363

27,833

27-86 6-23

13-43 5-46

O-IO

0-51

0-02

3-8i

094

3-13

2-08

o-53

i-36

19-72

0-12

2-37 8-98

3-09 0-08

O-OI

0-17

£27,514,052

100-0O

£27,572,135

100-00

£17,255,467

100-00

16,174,627

IOO-OO

The revenues produced by the customs duties for the five years 1905-1906 to 1909-1910 are as follows: —

Year.

Export Duties.

Import Duties.

Total.

1 905-1 906 1906-1907 1907-1908 1908-1909 1909-1910

£

160,037

151,677 143,210 143,378 162,252

£

1,928,957 2,260,382

2,704,347

. 3,138,534

3,533,405

£

3,088,994 2,412,059

2,847,557 3,281,912

3.695.657

Finance

Preliminary Sketch. — From the outset of their history the Osmanli Turks adapted to their own needs most of the political, economic and administrative institutions which existed before them. Primarily their system was based on the great principles enunciated by the immediate successors of the Prophet, especially by Omar, involving the absolute distinction between, and impartiality of treatment of, the Mussulman conquerors and the

1 As Dedeagatch is gaining, and will gradually gain, importance, it has been included in this table.

races which they conquered; and from this point of view a careful study of the financial history of Turkey will afford most valuable insight into the Eastern Question.

In reward for the brilliant services rendered him by Ertoghrul (the father of Osman) and by Osman himself, Ala-ud-din, the last of the Seljuk sultans, conferred certain provinces in fief upon these two great warriors. They in their turn distributed the lands so acquired among their sons and principal emirs on strictly feudal principles, the feudatory lands being styled ziamet and timar, a system long continued by their successors in regard to the territories which they conquered. The conquered peoples fell into an inferior caste, made to work for, and to pay for the subsistence of, their conquerors, as under the Arab domination; the principal taxes exacted from them were the kharaj, a tax of indeterminate amount upon realty, based on the value of lands owned by unbe- lievers — (in contradistinction to the tithe [ashdr] which was a tax of fixed amount upon lands owned by believers) — and levied in pay- ment of the privilege of gaining means of existence in a Mussulman country, and the jiziye, a compulsory payment, or poll-tax, to which believers were not subjected, in lieu of military service. The conquerors were feudatories of the reigning prince or sultan, and their

payments consisted principally in providing fighting forces to make up the armies of the prince. The kharaj, the jiziye, and the whole feudal system disappeared in theory, although its spirit, and indeed in some respects its practice, still exists in fact, during the reforming period initiated by Sultan Selim III., culminating in the Tanzimat-i-Khairiye (1839) of Abd-ul-Mejid, and the Hatt-i- Humayun issued by the same sultan (1856). The administration of the state revenues was managed by a government department known as the Beit-ul-Mal or Maliye, terms generally employed throughout Islamic countries since the commencement of Islam. But the entire financial authority resided in the sultan as keeper, by right, of the fortune of his subjects. The public revenues were passed under three principal denominations: (1) the public treasury; (2) the reserve, into which was paid any surplus of revenues over expenses from the treasury ; (3) the private fortune (civil list) of the prince. Expenditure, as under the Seljuk sultans, was defrayed partly in cash, partly in ” assignations ” (havale).

The Osmanh sultans, as also the Mamelukes and the Seljuks, were accustomed to give largesse to their military forces on their accession to the throne, or on special occasions of rejoicing, a custom which still is practised in form, as for instance on the first day of the year, or the birthday of the Prophet (mevMd). Largesse was especially given on the field of victory, and was, moreover, liberally distributed to stifle sedition and mutiny among the troops, the numerical strength of which was continually increased as the empire enlarged its borders. This vicious system, grafted as it was upon an inefficient administration, and added to the weight of a continually depreciated currency, debased both by ill-advised fiscal measures and by public cupidity, formed one of the principal causes of the financial embarrassments which assailed the treasury with ever increasing force in the latter part of the 16th and during the 17th and 1 8th centuries. The Turkish historian, Kutchi Bey, attributes the origin of the decline of the empire to the reign of Suleiman the Magnificent (1520-1566), when the conversion of many emiriyi lands into vakufs was effected, and the system of farming out revenues first introduced. Impoverished by these different causes, as well as by prodigal extravagance in interior expenditure, by shameless

venality among the ruling classes, and by continual wars, of which the cost, whether they were successful or not, was enormous, the public treasury was frequently empty. So long as the reserve was available it was drawn upon to supply the void ; but when that also was exhausted recourse was had to expedients, such as the borrowing, or rather seizure, of the vakuf revenues (1622) and the sale of crown properties ; then ensued a period of barefaced confiscation, until, to restore public confidence in some measure, state budgets were published at intervals, viz. the partial budget of Ainy-Ali (in 1018 or a.d. 1609), the budget of Ali Aga (in 1064, or 1653) and that of Eyubi Effendi (in 1071, or 1660). At this time (1657-1681) the brilliant administration of the two Kuprilis restored temporary order to Ottoman finance. The budget of Eyubi Effendi is particularly interesting as giving the statement of revenue and expenditure for an average year, whereas the budget of Ainy-Ali was a budget of expenditure only, and even in this respect the budget of Eyubi Effendi is far more detailed and complete. The budget of Ali Aga is almost identical with that of Eyubi Effendi, and is worthy of special note for the conclusions which accompanied it, and which although drawn up 250 years ago, described with striking accuracy some of the very ills from which Turkish finance was suffering throughout the reign of Abd-ul-Hamid.

Apart from unimportant modifications, the form of the budget must have remained unchanged until the organic reforms of Selim III., while its complete transformation into European shape dates only from the year 1278 (1862), when Fuad Pasha attached a regular budget to his report on the financial situation of the empire. Since that time there had been no further change worth noting until the “new regime” was established in 1908. Although the publication of the budget had only taken place at very irregular intervals, it must also be observed that the published budgets were by no means

accurate. From the time of Eyubi Effendi until the end of the grand vizierate of Ibrahim Pasha (1730), the empire experienced periodical relief from excessive financial distress under the series of remarkable grand viziers who directed the affairs of state during that time, but the recovery was not permanent. Ottoman arms met with almost systematic reverses; both the ordinary and the

reserve treasuries were depleted; a proposal to contract a foreign loan (1783) came to nothing, and the public debt (duyun-i-umumiye) was created by the capitalization of certain revenues in the form of interest bearing bonds (sehims) issued to Ottoman subjects against money lent by them to the state (1785). Then came forced loans and debased currency (1788), producing still more acute distress until, in 179 1, at the close of the two years' war with Russia, in which the disaster which attended Ottoman arms may be largely ascribed to the penury of the Ottoman treasury, Selim III., the first of the " reforming sultans, " attempted, with but little practical success, to introduce radical reforms into the administrative organiza- tion of his empire. These endeavours were continued with scarcely better result by each of the succeeding sultans up to the time of the Crimean War, and during the whole of the period the financial embarrassment of the empire was extreme. Partial relief was sought in the continual issue of debased currency (beshlik, altilik and their subdivisions), of which the excess of nominal value over intrinsic value ranged between 33 and 97 %, and finally paper money (kaime) which was first issued in 1839, bearing an interest of 8 , reduced in 1842 to 6, such interest being paid on notes of 500 piastres, but not on notes of 20 or 10 piastres, which were issued simultaneously. Finally, usage of paper money was restricted to the capital only, and in 1842 this partial reform of the paper currency was followed by a reform of the metallic currency, in the shape of an issue of gold, silver and copper currency of good value. The gold coins issued were 500, 250, 100, 50, and 25 piastres in value, the weight of the 100-piastre piece (Turkish pound), 7-216 grammes, 9161 fine The silver coins were of 20, 10, 5, 2, 1 and 3 piastre in value, the 20-piastre piece weighing 24-055 grammes, -830 fine. The copper money was in pieces of a nominal value of 40, 20, 10, 5 and I paras, 40 paras being equal to * piastre. In 1851 further attempts were made to withdraw the paper money from circulation, but these were interrupted by the Crimean War, and the government was, on the contrary, obliged to issue notes of 20 and 10 piastres. Finally, at the outbreak of the Crimean War Turkey was assisted by her allies to raise a loan of £3,000,000 in London, guaranteed by Great Britain and France; in 1855 an organic law was issued regulating the budget, and in the same year a second guaranteed loan of

£5,000,000 was contracted in Great Britain. In 1857 an interior loan of 150,000 purses in bonds (esham-i-mumtaze), repayable in three years and bearing 8% interest, was raised; the term of repayment was, how- ever, prolonged indefinitely. In the same year another series of bonds (hazine tahvili), bearing 6% interest, and repayable in 1861, was issued; in 1861 the term of reimbursement was prolonged until 1875. In 1858 a third loan was contracted in Great Britain for £5,000,000, and thereafter foreign loans followed fast on one another in i860, 1862, 1863, 1864, 1865, 1869, 1872, 1873 and 1875, not to mention the two Egyptian tribute loans raised on Egyptian credit in 1871 and 1877. In 1859 the settlement of palace debts gave rise to the issue of 1,000,000 purses of new interior bonds (esham-i-jedide) spread over a period of three years, repayable in twenty-four years, and bearing interest at 6 %. Further 6 % bonds, repayable in ten years, and styled serguis, were issued in the same year. Seeing the rapid increase of the financial burdens of the state, a commission of experts, British, French and Austrian, was charged, (i860) with setting the affairs in order, and with their assistance Fuad Pasha drew up the budget accompanying his celebrated report to the sultan in 1862. Meanwhile kaime was being issued in great quantities (about 60,000 purses a month) and fell to a discount (December 1861.) of 75%- In 1862 further sehims were issued, and these and the loan of 1862 (£8,000,000) were devoted to the withdrawal of the kaime. Later, however, the kaime was again issued in very large amounts, and the years succeeding 1872 up to the Russian War (1877) presented a scarcely interrupted course of extravagance and financial disorder, the result of which is described below.

The Budget was supposed to be drawn up according to an excellent set of regulations sanctioned by imperial decree, dated the 6th of July 1290 (1875), of which the first article absolutely prohibited the increase, by the smallest sum, of any of the expenses, or the abandon- ment of the least iota of the revenues fixed by the budget. Under these regulations the revenues were divided into two categories, viz. the direct and the indirect. The first category included the ” imposts ” properly so called, the fixed contributions {redevances fixes) to be paid by the ” privileged provinces,

” and the military exoneration tax. In the second were comprised tithes, mine-royalties, forests and domains, customs, sheep-tax, tobacco, salt, spirits, stamps and ” various. ” The expenses were also divided into two categories — (i) ” Periodic and fixed ” expenditure, which admitted of neither reduction nor delay ; and (2) the credits allowed to the various departments of state, which might be increased or diminished according to circumstances. The expenditure of the first category was made up of the service of foreign loans, of the general debt, of the dotations replacing ziamet and timarat (military fiefs) and of fixed contributions such as vakufs. In the second category were

included the imperial civil list, the departments of the Sheikh-ul- Islamat and of religious establishments, the ministries of the interior, war, finance, public instruction, foreign affairs, marine, commerce (including mines and forests), and public works, and, finally, of the grand master of ordnance. For every province (vilayet) a complete budget of receipts and expenditure was drawn up by its defterdar (keeper of accounts) under the supervision of the vali (governor) ; this budget was forwarded to the minister of finance, while each state and ministry of department received communica- tion of the items appertaining to it. Each ministry and department then sent in a detailed budget to the Sublime Porte before the end of November of each year. (The Turkish financial year is from the 1st of March to the 28th of February o.s.). The Sublime Porte for- warded these budgets, with its own added thereto, to the minister of finance, who thereupon drew up a general budget of receipts and expenses and addressed it to the Sublime Porte before the 15th of December. This was summarily considered by the council of ministers and then referred to the budget commission, which was to be composed not only of State functionaries, but of private persons ” worthy of confidence, and well versed in financial matters, ” and which was invested with the fullest powers of investigation and inquiry. The report drawn up by the commission on the results of its labours was

submitted to the Council of Ministers, which then finally drew up a general summary of the definitive budget and submitted it by mazbata (memorandum) for the imperial sanction. When this sanction had been accorded the budget was to be published. The remaining regulations set forth the manner in which extra-budgetary and extraordinary expenses were to be dealt with, and the manner in which the rectified budget, showing the actual revenues and expenditure as proved at the close of the year was to be drawn up with the assistance of the state accounts department (divan-i-mouhassebat) . This rectified budget, accom- panied by an explanatory memorandum, was examined by the budget commission and the Council of Ministers, and submitted for the imperial sanction, after receiving which it was ordered that both be published. Special instructions and regulations determined the latitude left to each department in the distribution of the credits accorded to it among its various heads of expenditure, the degree of responsibility of the functionaries within each department and the relations regarding finance and accounts between each department and its dependencies. These regulations provide carefully and well for all contingencies, but unfortunately they were only very partially carried out. It may indeed be said that it was only the previsionary budget (anglice, the estimates) that received any approximately proper care on the lines laid down, while the rule that both the estimates and the definite budget (at the close of each year) should be published was almost wholly honoured in the breach; until 1909, when the Constitution had been re-established the budget had only twice been published, in 1880 and 1897, since the regulations were put into force. Not only were the budgets not published, but no figures whatever were allowed to transpire in regard to the true position of the Turkish treasury — which laid the accuracy of even the limited number of budgets published open to suspicion.

All this has now been changed, and the above regulations are conscientiously carried out with the differences in procedure necessary for compliance with constitutional methods, and with the submission of the Budget to the houses of parliament. The Budget is now published in full detail and that for the year 1326 (1910-1911), with the explanatory memorandum which prefaces it, is an

admirable work, mercilessly exposing the financial shortcomings and sins of the previous system, or rather want of system, while unshrinkingly facing the difficulties which the present government* has inherited. The account thus presented to us of what the previous confusion was, underlines and attests the summary exposition of it given in the last edition of this work. It was there stated that, on the most favourable estimate, the normal deficit of the Turkish treasury was £T2, 725,000, (upwards of £T, 1,700,000 below the truth as now declared) and the following observations were appended: —

" This budget represents the normal situation of Ottoman finance; it does not tally with the budget published in 1897, which was prepared with a special object in view, and was obviously full of inaccuracies, nor indeed does it agree with figures which could be officially obtained from the Porte. It is, however, compiled from the best sources of information, and it exaggerates nothing. The formidable deficit is met principally in three ways. (1) By leaving the salaries of state officials and the army unpaid. In many parts of the empire the soldiers rarely receive more than eight months' pay in the year, although in Constantinople the arrears are not so large. The reverse is the case with the civil officials, whose salaries in the provinces are paid more regularly than in Constantinople, owing to their being charged on the provincial budgets; the average arrears are from two to three months in Constantinople, and from one to three in the provinces. The arrears in civil and military salaries average annually about £Tl,750,ooo. (2) By means of loans, both

public and from individuals. By financial expedients of this kind payments were effected by the treasury in fifteen years (1881-1896) amounting to £Ti 1,666,000 or at the rate of nearly £T8oo,ooo per annum. (3) By anticipating the revenues of future years. This is the method so frankly condemned by Ali Aga, as was seen above, in 1 653. Delegations (havale) are granted on the provincial treasuries for one or two years in advance, sometimes for a series of years, in order to pay pressing debts too heavy to be met in a single payment. No better description of the financial distress and disorder of the empire can be given than that set forth in the official report of the budget commission of 1888. " It has hitherto been considered

necessary owing to financial embarrassment, to commence financial years with unbalanced budgets. Later, without taking into consideration the effective amounts in cash at the disposal of the vilayets, considerable sums were drawn upon them, by means of havales, out of proportion to their capacity. For these reasons, during the last two or three months of the financial year, the vilayets have not a para to remit to the central administration, and it has been considered imperatively necessary to draw on the revenues of the following year. Thus, especially during the last two years, urgent extraordinary expenses have been perforce partially covered by the proceeds of the ordinary revenues, the revenues of 1303 (1887) were already considerably anticipated in the course of 1302 (1886). The former year naturally felt the effect of this, and the tithes which should have been encashed in the last months of the year were discounted and spent several months in advance. Moreover, in order to meet to some extent the deficit arising as well from the accumulation of arrears of state departments since 1300 (1884) as, to a large degree, from gross deficiencies' due to the neglect of the civil officials of the government to encash the revenues— to meet, further, the needs of the central administration, and above all, the urgent military expenses of the empire, and to provide a guarantee for bankers and merchants in business relations with the government and the treasury, part of the revenues of 1304ˆ were perforce spent in I 5°3- " This commission proved the deficit of the year to be ˆ4,370,000. It set out also at length the very defective and dis- orderly condition of the state accounts. During the finance ministry of Agop Pasha (1889 to 1894) a good deal was done to set matters in order, but most of the ground then gained has since been lost."

To this may be added a short extract from the Explanatory Preface to the Finance Bill for the year 1910-ro.11. After point- ing out the immense difficulties which he had had to encounter owing to the absence of any regular accounts, and above all of any of " those statistics which constitute the soul, indeed the very life of a public administration," and that it was therefore impossible for him to pretend that he had been able to free him- self altogether from the effects of the past, the minister continues, " every time we have endeavoured to have recourse to the previous elements of appreciation, we found ourselves faced by the

chaos which characterized former years. We have sometimes ascer- tained things so strange that we cannot forbear expressing our astonishment at the idea that a great power such as ours could maintain itself under such conditions." M. Ch. Laurent, the financial adviser to the Turkish government, stated in a lecture on Turkish Finance, delivered in Paris on the 22nd of April 19 10, that the Ministry of Finance has now been largely reorganized. Officials, he says, with grand titles and no responsible duties have been abolished, and departments with responsible chiefs created. The agents of the finance ministry, instead of being mere clerks, are now employed in " the assessment and collection of taxes, the control of expenditure, the preparation and execution of the budget, the estimates of the necessary cash required at different points of the empire — all that, in fine, constitutes the real financial administration of a great empire." Laurent points out that direct taxes furnish 54% of the revenues of the empire, that agriculture is accordingly very heavily taxed, and that the tax on realty is both excessive and unfairly administered. The summary history given above of the origin of the system of taxation prevailing in Turkey explains how this came about. Reform of this system, and, further, very necessary reforms of the methods of collection of the wines and spirits revenue (which is protection turned upside down, the home-growers being far more heavily taxed than im- porters), and of the customs (in which almost every possible administrative sin was exemplified), were also undertaken. Three bills, moreover, were presented to parliament, the first regulating Public Accountancy, the second regulating the Central Accounts Department, and the third the service of the Treasury. By this last the centralization of receipts and

expenditure and the movement of funds in the provinces were to be confided to the Imperial Ottoman Bank, which extended and perfected its own organization for the purpose.

Passing now to the examination of the budget, it should be ob- served that the method of estimating the revenues — a matter of great difficulty owing to the previous want of method — is described by Laurent as follows: ” For every nature of receipts the total effective collections for the five last known years were set out, the averages were taken of these and the increase or decrease of the yearly average of those same years was worked out and added to or deducted from the figure previously obtained. The only exception made to this rule was in the case of revenues showing a yearly increase, such as Post Office revenue, tobacco, salt, for which were taken the figures of 1323 (1907) increased by a certain average.” The expenditure was arrived at in the manner previously described — and when the general budget came to be made up the severest pruning was found necessary, the original demands of the various ministries and depart- ments having resulted in a deficit of upwards of £T9,ooo,ooo. It is thought better here, for the sake of clearness, to reserve observations on revenues specially assigned to the international administration of the Ottoman Public Debt, and on the expenditure of that adminis- tration, and to deal with that subject separately, while, however, including the total figures of both in the general figures in order to reproduce exactly the totals shown in the budget of the empire. The principal items of revenue and expenditure are as follows, the figures being taken from the published budget above-mentioned.

Revenue. Direct Taxes. 1 — The tax on realty {vcrghi) is estimated to yield £T2, 599,420. Duties on profession (temettii) consist (a) of a fixed duty leviable at rates declared in a schedule forming part of the special law (Dec. 8, 1907) regulating the tax, and (b) of a propor- tional duty at the rate of 3 % on the value of buildings occupied by companies or individuals in the prosecution of their business; of 3 % on salaries (subject to certain deductions) of employes of such companies and individuals; and on government contractors and revenue farmers, at the rate of 3 % of 10 % of the value of contracts filled and of revenues farmed. The law is defective and unfair in its incidence, and it is not applicable to foreigners. The government promised in 1910 to remedy the law with the assent of the Great Powers, and, if successful in its negotiations, to present an amended law. The duties are estimated to produce

£T593,io7; other profes- sional duties £Ti 10,887 — together ˆ503,994. A ” Military Exonera- tion tax ” is levied on male Ottoman subjects between the ages of 15 and 75 to the amount of £T50 for 135 persons — certain exceptions such as priests, religious orders, &c, are allowed. The estimated revenue from this source is £Tl, 289,612. ” Prestations ” are pay- ments in lieu of services (apart from military service) to the state, such as maintenance of highways, &c. — in effect, purchase of exonera- tion from forced labour. These duties vary in different parts of the empire: in the vilayets of Constantinople, Bagdad and Adrianople, and in the sanjaks of Bigha and Tchatalja the day's workis calculated at 5 piastres (about lid.); in the vilayets of Aleppo, Trebizond, Angora, Iannina, Konia, Sivas and Kastamuni at 4 piastres (about 9d.) ; and in most other parts of the empire at 3 piastres (about 7d.). These taxes were formerly levied either in cash or in kind: it has now been decided to levy them in cash only, although this change was expected to cause some arrears. Allowing for these, the estimated revenue is 553,938. The ” tax on sheep, camels, buffaloes and hogs" (aghnam, meaning literally "sheep," but for taxing purposes the other animals are included under the same name), formed origi- nally part of the ” tithe." It was transformed long since into a fixed amount per head of the animals taxed, which amount varies accord- ing to the region in which the tax is levied, the highest tariff being in the sanjak of Jerusalem (7! piastres) and the lowest in the Yemen (1 piastre). The estimated receipts are, from sheep £Ti, 790,720, from camels and buffaloes £Ti44,520, Jand from hogs £T8890, or together £Ti, 814,152. ” Tithes" are the direct descendant of the kharaj already alluded to above. It should here be noted that, from the fiscal point of view, the reforms instituted at the commence- ment of the 19th century may be summarized thus. In permanent remuneration of certain services to be rendered to the state, the sovereign assigned to civil or military functionaries territorial regions for the purpose, and with the power, of collecting land taxes imposed by Mussulman and Imperial law, i.e. the kharaj or tithe, and transfer and succession duties. The tithes were originally based on one-tenth of the agricultural produce of the country, but this propor- tion was gradually raised under the euphemistic pretence of ” public instruction," but really, under financial pressure, to 12 % and again in 1900 for military ” equipments ” (Tejhlzat-i-'Askeriyeh) by a further J% to 12%. This last surtax, which produces about £Too,ooo per annum, was specially affected to a loan, known as the ” Tejhizat-i-'Askerieh of 1905," of £T2, 640,000, by virtue of a con- tract between the government and the Deutsche Bank (April 17,

1 It should be noted that the classification of the revenues included respectively under the ” direct ” and ” indirect ” categories has now been quite properly changed, the sheep-tax, tithes, mining royalties and forest royalties being comprised under ” direct taxes ; stamps and registration

duties are placed in a special category, and salt and tobacco under ” monopolies.”

I9°5)- The estimated receipts from the ” Tithes ” (including tobacco and silk, both hypothecated to the Public Debt Administra- tion) are £1*6,731,107. The remaining taxes under the category ” direct ” are the forest-dues (generally speaking 15 % of the value of wood cut), estimated to produce £1130,094; the mining dues (being a fixed duty of 10 piastres per 10,000 sq. metres of the super- ficial area covering the mine, and a proportional duty varying from 1 % to 20 % of the gross value of metal contained in the ore, accord- ing to the kind of metal and the method of extraction of the ore), £1*45,141; and tax-papers (Tezkeres), £1*58,434. The total “direct taxes ” (inclusive of tobacco and silk tithes) are thus estimated to amount to £” [“13,725,892.

Section II. of the budget is composed entirely of revenues from stamp-duties. Of these, commercial stamps are among the revenues specifically hypothecated to the Public Debt Administration, £T46o,079; the others, consisting of legal stamps of various kinds, registration and transfer-duties, &c, are estimated to produce £T653,373 forming a combined total of £1*1,113,452.

Under Section III. fall the ” indirect contributions ” as now reclassified. The first revenue specified among these in the budget is that accruing from the wine and spirit duties, which is again among those assigned to the Public Debt, £1*283,079. Licenses for sale of Tumbeki, a variety of Persian tobacco used for the narghile, £T204&. By far the most important ” indirect ” revenue is that produced by the customs, consisting of import, export and transit duties, and various unspecified receipts. Under the old commercial treaties which lapsed about 1 890 — but which have been maintained ” pro- visionally ” in force until one or other of the great powers consents to set a term to the negotiation of fresh treaties — an ad valorem duty of 8 % was imposed on all articles imported into the Turkish empire. In 1905 financial resources had to be found for the special administra- tion of the three European vilayets as insisted upon by the powers, and to this end the Porte initiated negotiations with the latter to increase the import duties by 3 %. As is usual in Turkey, this opportunity was seized for

the demand of redress of grievances by such powers as considered they had any, and the negotiations were protracted until July 1907, when France finally gave in her adhesion. Since then the import duties have been collected at the rate of 1 1 % ad valorem under the supervision of the Public Debt Administration, the bondholders having certain rights, under the decree of Muharem, described below, over any increase of revenue arising from modifica- tion of the commercial treaties. By the provisions of the " Annex Decree," also described below, three-quarters of the additional revenue is assigned to the Turkish government, and one-quarter to the Public Debt Administration to swell the sinking-fund. Fresh negotiations were also undertaken to increase the import- duties by a further 4% in order to balance the deficit shown in the budget. In the year 1910-1911 the import duties were estimated to produce £1*3,980,395, the transit duties £1*20,276, and the export duties (1 % ad valorem, which it was hoped the government might soon afford to abolish) £1*168,993 — total customs revenue, £T4,2 17,752. The remaining " indirect contribu- tions " are port and lighthouse dues, £Tl48,426. Sanitary taxes, £T20,5i9, and fisheries and sporting licenses affected to the service of the public debt, £Ti53,990. The revenues figuring under " indi- rect contributions " thus reach a total of £1*4,825,812.

Monopolies form Section IV. of the budget, and include in the first place the salt revenue (£Ti, 227,750), which is assigned to the Public Debt Administration, and tobacco revenues of which the larger part, £1*865,737, is assigned to the same administration, the total (includ- ing share of Tumbeki profit) producing £1*965,754; the remaining monopolies are: fixed payment from the Tumbeki Company, £T40,ooo; explosives, £Tio6,323; seignorage (Mint), £1*10,466; and posts and telegraphs, £1912,129. The " Monopolies " thus render a total revenue of £1*3,262,424.

Section V. includes receipts from commercial and industrial undertakings belonging to the state. These are the Hejaz railway, £Ti 52,000; the Dolma-Bagtche gas-works, £1*59,130; technical school, £T8536; the Tigris and Euphrates steamships, £1*62,513; and mines (Heraclea coal and other), £Tl20,7lo; forming a combined total of £1402,889.

Section VI. is composed of receipts from ” State Domains ” of which a large proportion was formerly included in the civil list. Under the deposed sultan the Civil List Administration had encroached in every direction not only on the revenues properly accruing to the state, but upon private and upon state property in most parts of the empire. Thus it is explained in the preface to the budget that the revenues ” proceeding from the deposed sultan ” are not classed together under one heading, but ifhat they have been apportioned to the various sections under which they should fall ” whether taxes on house property or property not built upon, tithes, aghnam, forests, mines, cadastre, sport, military equipment, private domains of the state, various receipts, proceeds of sales, rents ” — a truly comprehensive list which by no means set a limit to the private resources of Abd-ul-Hamid II., who looked upon the customs also as a convenient reserve on which he could, and did, draw when his privy purse was short of money. Apart from the sources of revenue specified above, of which the amounts actually transferred from the civil list are not stated, Section VI. is estimated to produce £T5i3,65l. In the previous budget there

had been a special heading, ” Proceeds of Domains transferred from the Civil List,” estimated to produce £T620,233, which may have been intended to include all the various receipts above enumerated.

Section VII., formed of the tributes of dependencies of which the two principal are the Egyptian, £T765,ooo, and that of Cyprus, £Tl02,590 (assigned to the public, debt) comprises a total revenue of XT871 ,316. Finally, various receipts of which the principal separately specified are government share of railway receipts (Oriental railways and Smyrna-Cassaba railway), £T20i,7io, and “subscriptions” for the Hejaz railway, £T264,6oo, form Section VIII.

The total revenues of the empire are thus estimated to

produce £T25, 848,332, and seeing the careful and moderate manner in which the estimates have been framed, this may be looked upon rather as a minimum than a maximum. The minister of finance stated in his budget speech to parliament, delivered on the 23rd of April 1910, that the revenues for the year 1909-1910, which had been estimated to produce £T25,ooo,ooo, had as a matter of fact produced £T26, 500,000.

Expenditure. Ministry of Finance. — The first item of expendi- ture shown in the budget is the service of the public debt, amount- ing to £T8, 288,394. The Public Debt Administration plays so considerable a part in the finances of the Ottoman Empire, and its history is of such importance that a special section of this article will be devoted to it below. Under the budgetary heading " Public Debt " is included, as it should be, all expenditure in connexion not only with the public debt proper, but also with advances from banks and others, railway guarantees, an account of which will also be found below, and all capitalized liabilities, as far as known, contracted by the state.

It is explained in the preface to the budget that one of the abuses of the previous regime had been to obtain advances from credit establishments at high rates of interest varying from 7 % to 9 %, when it was found impossible to issue a public loan. The rates on these advances have now been generally reduced to 6 % with the exception of that on the advances from the lighthouse administra- tion, which refused to allow any reduction below 7 %. In the years 1908-1909 the advances were reduced by £T688,ooo, in addition to repayments allowed for in the budget, and the credit agreed for the year 1909-1910 is £T663,ooo, as compared with £Ti, 160,000 for the previous year. In the year 1910-1911 the outstanding advances were to be so far paid off that the credits to be opened under this head would be still further reduced by £Tsoo,ooo.

The civil list has been reduced to the definite amount of £T443,88o, wh ; ch, without the consent of parliament, cannot be increased. The sultan receives an annual allocation for himself and household of £T240,ooo, the crown prince one of £T24,ooo, and a sum of £Ti53,ooo is assigned to the Imperial princes and the sultanas. The

deposed sultan was allowed £Ti2,ooo a year, and a similar amount was set aside to provide dowries for two sultanas who were just about to be married. The debts of the former are stated in the preface to the budget to be very large, and as payments are effected fresh creditors present themselves with undeniable vouchers in their hands, causing much embarrassment to the minister of finance: no figures, however, are given. The Finance Bill provides that these debts are to be paid out of supplementary credits.

Under the reformed constitution every senator is entitled to a salary of £Tioo per month, any remuneration which he may receive from the government for other services to be deducted from the senatorial allowance which, however, it may of course exceed. Deputies are allowed £T300 for each session of parliament, and £T50 per month in addition should the session exceed its legal duration. They are further allowed travelling expenses from and to their constituencies on the basis of rules governing journeys of function- aries receiving a monthly salary of JT50. The amount reserved in the budget for these purposes is £Ti8i,87I.

The ministry of finance absorbs £T2 ,989,600. In this are in- cluded the expenses of the administration of both the central and provincial departments of the finance ministry, the mint, charitable allowances, expenses and presents in connexion with the holy cities (£Tl2l,4io), pension funds of state officials (£T628,038), administrative allowance made to the agricultural bank (£T225,38o) and various other expenses. Various administrative reforms were in hand in 1910-191 1 , by which it was expected considerably to reduce the credits demanded by the finance ministry — especially those in connexion with the holy cities. Special attention was called by the minister to the fact that the system of contributions of officials to the pension funds has been modified, the deduction from salaries being now 10 % instead of 5 %, and the contributions to the funds being made as to one-third by the treasury, and two-thirds by the officials, instead of the reverse as formerly, the economy effected is about £T300,ooo. * A credit of £Ti7,i24 is allowed for the central accounts department. The total credits for the ministry of finance are, then, as follows: Ottoman public debt, £T8, 288,394; House of Osman, £T443,88o; legislative corps, £Ti8i,87i;

treasury, £T2,989,6oo; central accounts department, £Ti7,i24; forming an aggregate of £Ti 1,920,869.

Indirect contributions, or more familiarly ” customs,” are allowed a credit of £T5i2,67o. The minister of finance points out the immense importance of the thorough reorganization of the customs administration. The services of a first-rate English expert (Mr R. F. Crawford) were obtained, and much has been done at Constan- tinople, but the provincial customs offices are still lamentably defective. These were immediately to be taken in hand, and considerable sums are being voted for repairs of existing customs buildings and the construction of new buildings. The reforms already accomplished have resulted in a marked increase in the customs revenues.

Posts and telegraphs, which absorbed a credit of £T782,839 in 1910-1911, have also long been in urgent need of extension and better administration. An additional credit of £T90,ooo was granted, as compared with the previous year, and increased expenditure was foreshadowed for the future; on the other hand, it was confidently expected that the post office receipts would increase in far more rapid ratio than the expenditure.

The ministry of the interior was estimated to require £Ti, 157,230. This sum covered ” immigration expenses,” i.e. assistance given in settling Mussulmans immigrating from provinces detached from the Ottoman Empire. There can be no doubt that this expenditure is remunerative, since many rich regions of Asia Minor have long suffered from want of population.

Military expenditure, including the three departments of war, is as follows: the army (excluding artillery), £T8, 280,452; ordnance, £T356,439; and gendarmerie, £ˆ,694,778. As regards the first of these, it is curious to observe that the budget decree of 1880 strin- gently limited the peace strength of the Ottoman army to 100,000 men, ” including officers and generals,” in order to put a stop to the rapidly increasing military expenditure; but this was merely the expression of a pious wish, at a time when European financial good will was indispensable, that expenditure might be kept down. No real attempt has ever been made to observe the decree, and indeed observance

has been impossible seeing the dangers which never cease to menace the empire. To some extent the real level of military expenditure has been masked by the separation of certain payments into “extraordinary” expenditure, a course which, it is understood, has not been followed in the budgets of the ” new regime,” and which will not be revived. It should however, be remarked that out of an “extraordinary” budget, which will be mentioned below, sums of ˆ709,305 and of £T27,827 were allocated to the ministry of war and the ordnance department respectively in 1909. It is not expected that military expenditure can be much reduced, except in the direction of supply contracts, which have been the cause in the past of iniquitous waste of means.

The official budget shows a credit for admiralty expenditure of £Ti, 000,327, which is apparently less than that for the previous year by some £T220,ooo. This, however, is not a real decrease, salaries of functionaries not on the active list having been removed to the region of supplementary credits, as are those of civil departments. As a matter of fact, the marine budgets of the two years are almost identical. The vote of £Tsoo,ooo a year for ten years for the re- construction of the Ottoman navy by ” national subscription,” as already mentioned, was not included in the official budget, nor was there any allusion to it in the prefatory memorandum. The minister of finance did, however, allude to it in his budget speech, (April 23, 1910), and stated that four destroyers purchased in Germany had been paid for from the national subscription only, without touching the ordinary state revenues. It should be added that the Greek War (1897) revealed to the sultan the decrepit state into which the Ottoman navy had fallen, and considerable ” extra- ordinary ” expenditure — much of which was wasted— has been incurred since (and including) 1902 to put the least out-of-date warships into a serviceable condition.

The ministry of commerce and of public works absorbed £T883,i6i a reduction of some £Tl8o,ooo on the previous year. The govern- ment acknowledges the unavoidable necessity of greatly extending and improving the internal communications of the country, but cannot see its way to doing so satisfactorily out of the ordinary resources of the country. This question was being seriously studied, and it

was hoped that a comprehensive scheme would be presented ere long. The Hejaz railway figures in the budget for £1*550,180, and it is explained that this will not only cover working expenses, but also the final completion of the line.

Floating Debt.- — This is really an accretion of undetermined liabilities which has been indefinitely, and probably alternately, advancing and receding for a great number of years, and which no previous minister of finance, or Turkish government, had the courage to face. Now and then it has been dealt with piecemeal, when some particular class of creditors has become too pressing, but it is more than probable that the piece got rid of has been more or less rapidly replaced by fresh liabilities occasioned by budgetary deficits, or by the mere accumulation of interest on debts allowed to run on.

In March 1897 the floating debt was calculated by a financial authority in the Fortnightly Review to amount to upwards of £T55,ooo,ooo, which might be compressed to £T25,ooo,ooo since a Targe proportion was certainly composed of salaries in arrear and other items of a similar kind which the government would never, under any circumstances, make. good. Laurent tells us that the present government having found it absolutely impossible to arrive at even an approximate estimate of this ” occult debt,” recourse was had, in order to fix it, to the creditors themselves, and a short act of parliament was passed declaring all debts prescribed which should not be claimed by a fixed date. In consequence of this 560,000 claims were received, and a first examination showed that the aggregate amount reached by these claims was not less than £Ti3,ooo,ooo. Considering the dilatory methods of Orientals, even when they are creditors, it is doubtful whether this sum adequately covers the whole of the claims outstanding, and it may be found difficult, even for a parliament, to refuse claims which should equitably be admitted and which may be preferred later. High authority

in Constanti- nople put the true amount of the floating debt in 1910-1911 at the amount previously estimated, viz. £T25, 000,000. _ No provision was then made in the budget to meet these liabilities, nor ‘did the minister in his prefatory memorandum make any allusion to them ; in his budget speech, however, he announced that a scheme for dealing with them would be presented with the budget for 191 1-1912 . Under the heading ” Floating Debt ” in the budget for 1910-1911 are placed the advances before described.

No other items in the budget call for special remark, but in order that the information given may be complete, each head of expenditure is shown separately below, and the budget for 1010- 191 1, as first placed before the Turkish parliament, presents the following picture, from which it may be observed that the public debt absorbs 26% of the revenue, war servic6 38% and civil services 36%.

Expenditure.

£T

Public debt . . . 8,288,395

. Civil list 443,880

Legislative corps . 181,870

Finance 2,989,600

Accounts (central) . 17,124

Customs 512,670

Posts and telegraphs 782,840

Cadastre . . . 109,820

Grand vizierate . . 25,096

Council of state . . 33.050

Interior 1,157,230

Public security . . 400,405

Foreign affairs . . 213,400

War 8,280,453

Ordnance 356,440

Gendarmerie . . . 1,694,778

Marine 1,000,328

Sheikh-ul-lslamat . 483,341

Justice . . . 751,580

Public instruction . 744,086 Forests, mines and

agriculture . . 370,520 Public works and

commerce . . . 883,160

Hejaz railway . . 550,180

Revenue.

(See above for details of general headings here given.) £T

" Direct contribu- tions " . . . .

Stamps and regis- tration duties .

" Indirect contribu- tions " .

Monopolies .

State undertakings, commercial and industrial .

Domains ....

Tributes ....

Various receipts . -.

13.725.892

l,H3.452

4,825,812 3,262,424

Total Deficit

402,889

513.651

871,316

-. 1.132,896

ˆ25,848,332 £14,421,914

Total

ˆ30,270,246

Total .

ˆ30,270,246

This deficit was increased, by the action of parliament, to £Tg, 678,000. Almost immediately after the budget was drawn up a change of government took place, and largely owing to this fact the parliamentary budget commission introduced various modifications on the expenditure side of the account, which increased the estimated deficit to the account just mentioned. 1 The principal increase is due to the war departments, according to the budget speech of the minister of finance (April 23, 1910), although he states that some

1 On the 25th of June 1910 the chamber finally passed the budget for 1910-191 1. The figures were as follows: —

Ordinary expenditure, £T32,997,ooo; extraordinary expenditure, £T2,696,ooo; revenue £T26,oi 5,000, leaving a deficit of £T9,678,ooo, which was brought up to over £Tlo,50o,ooo by special credits for the pension fund, the payment of debts incurred by Abd- ul-Hamid and indemnities to officials. On the other hand, the minister of finance reckoned that the revenue would probably show an increase of £Ti, 500,000, while about £T2,ooo,ooo of expenditure would remain undisbursed, which, with a reserve of £T2,ooo,ooo from 1909, would reduce the deficit to roughly £T5,ooo,ooo.

increase is apparent in all departments. The actual figures of the increase are not, however, given; Exaggerated importance must not be attributed to the swollen deficit. The demands of the various departments of state had been much cut down, and according to the minister of finance's own statement much of the reduction was merely unavoidable expenditure deferred ; the fact that some of this expen- diture, which had been jealously scrutinized, was to be undertaken at once, meant that demands on future years would be relatively re- duced. A loan of £T7,040,ooo was arranged with a German group headed by the Deutsche Bank. This loan followed upon one of £Ti, 700,000 in 1908, and another of £T7,ooo,ooo in 1909 (of which the service is provided by the revenues assigned to the Russian War in- demnities amounting to £T350,ooo per annum, of which payment has been deferred for forty years), the year 1909 having shown a realized deficit of about that amount — a condition of affairs which would appear alarming were it not that the Turkish Empire was passing through absolutely abnormal times, and was attempting to convert the unstable morass of disorder, ineptitude and corruption left by the previous system into a solid foundation for good and orderly constitutional government. With the two previous loans above mentioned, £T5, 500,000 capital liabilities were paid off, the work of reorganization had made considerable progress, and £T2 ,000,000 remained in hand at the beginning of 1910-1911 to continue it. As before stated reorganization was quickly followed by a marked increase of revenue, and it seemed probable that the forecast of the minister of finance that within a comparatively short time that increase would amount to £T5, 000,000 was not excessive. Nego- tiations were undertaken to increase the customs import duties by a further additional 4%. This measure would produce about £Ti,2 50,000 per annum.

Further expenditure was voted in the course of 1909, to be met by an extraordinary budget. On the receipts side of this budget were comprised the Austrian indemnity for the annexation of Bosnia and Herzegovina (£T2, 500,000), cash and securities belonging to the deposed sultan (£Ti, 600,000), sale of old guns (£T30o,ooo), sale of lands and other property recovered from civil list encroachments (£Tgo8,ooo), and finally the unexpected balance of the

proceeds of the 1908 loan (£T655,ooo), the whole forming an aggregate total of ˆ5,963,000. It was intended to assign to the war department £T3, 804,918, to the grand master of ordnance £T358,lo8, to the admiralty ˆ93,912, and to the ministry of finance £T2,443,202 for the payment of the war indemnities in Thessaly and other urgent liabilities, the estimated aggregate extraordinary expenditure thus amounting to £T6, 700,140. Some of the assets above mentioned proved, however, not to be easily realizable. Ready buyers were not found for the state lands, and the sale of the ex-sultan's securities was disputed by the German Reichsbank with which they were deposited, while the government did not consider it good policy to sell the Anatolian railway shares, which it seized at Yildiz, so that only £T450,ooo were encashed by the ministry of finance from these sources. Of the sums really received the ministry of finance expended some £T3, 000,000, in payment of the Greek indemnity, in repayment of £T 1, 000,000 of advances to the treasury and by assigning the credit voted to the ordnance department, and it was stated that these payments exhausted the extraordinary resources so far as it has been possible to realize them.

Collection of Taxes. — The Ottoman Empire possesses a very com- plete system of local self-government within certain limits. Every village or town district has a kind of mayor (mukhtar) appointed by election and approved by the official provincial authorities, and a " council of ancients " whose members are elected directly. The taxes are collected by means of the mukhtars, termed for this purpose kabz-i-mal (receiver of treasure), and under the supervision of gen- darmes specially named, termed tahsildar (collectors). The official authorities provide lists of all the taxes to be collected to the tahsil- dars, who hand them, against formal receipt, to the kabz-i-mals. The latter are bound to pay in to the local authorities all sums collected in five days in town districts, and in fifteen days in villages, if under 1500 piastres; sums of 1500 piastres and over are paid in at once. The tahsildars check the accounts of the kabz-i-mals, and, if they discover peculation, send them at once to be dealt with by the chief official authorities of the caza (department) ; all the electors of a mukhtar are, ipso facto, joint sureties for him. If the tax-payer declines to pay his due, he is brought

before the proper authorities by the tahsildar; if he persists in his refusal, all his goods, except those indispensable for his dwelling and the pursuit of his trade, are sold by auction, without recourse to a judgment by tribunal. If he has no goods which may be seized, he may be summarily imprisoned for a term not exceeding 91 days: two imprisonments for the same debt are not permitted. The military exemption tax is not collected as above, but by the spiritual chiefs of the various religious communities. None of the above regulations apply to Constanti- nople, where no military exemption tax is imposed, and where sepa- rate official regulations for the collection of taxes are in force. The system of farming out the revenues is admitted, and is almost invariably followed in the case of the tithes. When this is done, the revenues to be farmed are put up to public auction and sold to the highest bidder, provided he can prove himself amply solvent and produce sufficient sureties. Elaborate regulations are in force for this method of collection to secure the state receiving its full due

from the farmers, who, on the other hand, are entitled to full official assistance to enforce their rights.

Assessment of Taxes. — For the purposes of assessment the taxes may be divided roughly into two classes: (i) variable taxes; (2) non- variable taxes. Under the first head would be included proportional taxes dependent upon the value of the property taxed; under the second, taxes whose amount does not depend upon that value. The first class contains such revenues as the emlak verghi-si (duty on realty), ‘ashar (tithes), temettu (professional tax), &c. In all such cases the taxable values are fixed by a commission of experts, some- times chosen by the tax-payers themselves, sometimes by the official authorities; in all cases both tax-payers and authorities are repre- sented on the commissions, whose decisions may be appealed against, in last resort, to the council of state at Constantinople, whose deci- sion is final. Revenues composing the second class such as the tapu (registration tax) do not vary, unless by

special decree, and the assessment is automatic.

The systems, both of assessment and collection, were equitable and far from oppressive in theory. In practice they left almost everything to be desired. The officials, already too numerous and underpaid, frequently, as has been stated above, found such pay as they had far in arrear. They were therefore naturally open to bribery and corruption, with the result that, while the rich often got off almost scot free, the poor were unduly taxed, and often cruelly oppressed by the tax collectors and farmers of revenue. In all departments there ensued, thus, an alarming leakage of revenue, amounting, it was credibly estimated, to quite 40%. The new government energetically proceeded to remedy this state of affairs.

International Administration of the Ottoman Debt. — In conse- quence of the piling up of the exterior public debt as described above, it amounted after the issue of " general debt " in 1875 to £Ti 90, 7 50,000, and swallowed up annually upwards of £Tio,ooo,ooo, or nearly half the revenue of the empire as it was then constituted. The revolt of various disaffected provinces brought matters to a climax; in September 187s one-half of the service of the interest was suspended, paper certificates known as " Ramazans " (since they were issued in the Arabic month of that name) being issued for that half in lieu of cash, and in the following March it was suspended altogether. After the war with Russia, in order to obtain credit from the Imperial Ottoman Bank and local financiers, who refused any further accommoda- tion unless their previous and further advances were amply secured, revenues known as the " six indirect contributions " were handed over to a committee of local bankers (by decree of Nov. 22, 1879), to be administered and collected directly by them. These " six indirect contributions " were the revenues from tobacco, salt, wines and spirits, stamps (com- mercial), certain specified fisheries, and the silk tithe in specified provinces. Two years later, partly in view of the recommenda- tions of the Congress of Berlin, partly to overcome insuperable difficulties in obtaining any kind of credit, the sultan authorized the Sublime Porte to issue an invitation to the various bond- holders' committees in Europe to send delegates to Constanti- nople for the purpose of negotiating a resumption of payments. These " committees " were the "

Council of Foreign Bondholders ” for Great Britain, the Imperial Ottoman Bank and its ” group ” for France, Herr S. Bleichroder for Berlin, the Credit-Anstalt and its ” group ” for Austria-Hungary, and the Chamber of Commerce and of Arts of Rome for Italy. The Dutch bondholders placed their interests in the hands of the British council. Russia declined to countenance the negotiations in any way. Delegates from the various committees assembled in Constantinople in the early summer of 1881. The commission formed by them in conjunction with the delegates of the Sublime Porte is more generally known as the ” Valfrey-Bourke commission,” from the leading parts played by the Right Hon. R. Bourke (Lord Conne- mara), the British delegate, and M. Valfrey, the French delegate. The outcome of the negotiations was the issue of an imperial decree, known as the ” Decree of Muharrem,” owing to its bearing the date (Turkish style) of the 28th of Muhar- rem (Dec. 20) 1881. By this decree the outstanding capital of the exterior debt, to which were added the Ramazan certifi- cates above mentioned, and all interest fallen due, making a grand total of £252,800,000, was scaled down to £106,437,234 (ˆ117,080,958). On this reduced capital a minimum interest of 1 % was to be paid, the rate of interest to be increased by quarters per cent, as the revenues set aside for the service of the reduced

debt permitted. For purposes of sinking fund the old loans were combined into four groups: 1 group i. containing the 1858 and 1862 loans, with a reduced nominal capital of ˆ7,902,259; group ii. the i860, 1863, 1864 and 1872 loans, with a reduced nominal capital of ˆ11,265,153; group iii. the 1865, 1869 and 1873 loans, with a reduced nominal capital of ˆ33,915,762, and group iv. the ” general debt,” of which the last issue was in 1875, with a reduced nominal capital of ˆ48,365,236, and the ” lottery bonds ” (railway loan), with a reduced nominal capital of £Ti 5,632,548, the total of group iv. being thus ˆ63,997,784. As security for the service of the new reduced debt it was provided that an international council should be formed, composed of one delegate each from the bondholders of the United Kingdom, France, Germany, Austria-Hungary, Italy and Turkey, and one representing the ” priority bondholders,” a term which will be explained later. On this council the Turkish government has the right of naming an imperial commissioner with ” consul- tative voice,” i.e. no voting

power, but the right to express his opinion on the proceedings of the council, who would make all reports he considered necessary to his government. The govern- ment was empowered also to name controllers to whom all the accounts of the administration should be open for inspection on demand. In all other respects the council, provided that it kept within the limits of the laws the administration of which was entrusted to it, was to be entirely independent of the Ottoman government, free to appoint and dismiss its own officials from highest to lowest, and to carry on its administration on such lines as it thought best. Proposals made by the council for the modifi- cation and improvement of the existing laws and regulations which concerned it were to receive an answer from the govern- ment within six months; this provision has remained a dead letter. Any difference between the government and the council, if not possible of adjustment, was to be settled by arbitration.

To this council, with these extended powers, was handed over the . absolute administration, collection and control of the " six indirect contributions " above enumerated, for the benefit of the bond- holders, and in addition, it was to encash for the same purpose bills on the customs, to be drawn half-yearly in its favour by the minister of finance, amounting annually to £Tl8o,ooo, representing the tax on Tumbeki (£T50,ooo) and the surplus revenue of Cyprus (£Tl30,ooo) ; and the Eastern Rumelian annuity, originally fixed at £T245,ooo, but gradually reduced by force of circumstances, until after frequent suspensions of payment it reached in 1897 the level of £T 1 14,000, and has, since the declaration of Bulgarian indepen- dence, been definitely stopped. In order to assist the young king- dom of Bulgaria, which could only with great difficulty and with much damage to its resources have found means to indemnify Turkey for this serious breach of treaty engagements, the Russian government intervened, and proposed as compensation to the Turkish govern- ment the deferment for forty years of the annual payment (£T350,ooo) of the 1877 war indemnity. This proposal was accepted by the Turkish government, which undertook to continue the annual payment of £T 114,000 to the public debt administration until the extinction of the debt. The public debt council consented with good grace, although

the minister of finance, by omitting to consult that council during the progress of negotiations, lost sight of the fact that a sum of £“187,823 was due to the public debt administra- tion on account of arrears of the Eastern Rumelian annuity up to December 1887, and that a further sum of £T430,74i was due by the Bulgarian to the Turkish government itself in compensation for the Rustchuk-Varna railway under the Treaty of Berlin. As pointed out by Sir Adam Block, the representative of the British and Dutch bondholders, in his report for 1908-1909, the above arrangement would have been prejudicial to the bondholders had the public debt not been ” unified ” (as described below) since, however, as a result of that unification, the ceded revenues now produced a sum more than sufficient for the service of the debt, it was only the surplus of revenue reverting to the government which was affected. There were further handed over, under the Muharrem decree, to the public debt council, the tribute of Bulgaria, the amount of which has never even been fixed, but as compensation for which the tobacco tithe up to a yearly amount of £T 100,000 was ceded to the council in the same conditions as the ” six indirect contributions “; the proportional shares (generally known as the ” contributive

1 For simplicity’s sake, the lottery bonds having a special treat- ment different from that of the rest of the loans, these groups, when the new bonds of the reduced debt were exchanged against the oW bonds of the original loans, became ” series” thus: Series A, group i.; series B, group ii. ; series C, group iii. ; series D, group iv. and lottery bonds.

parts “) of the Ottoman public debt to be borne by Bulgaria, Servia, Greece and Montenegro, which according to the Treaty of Berlin were to be adjudged by the representatives of the Great Powers at Constantinople, one of whom (the Russian) never succeeded in obtaining his instructions, and which therefore have never been fixed; and, finally, the excess of revenue resulting from a revision of the

commercial treaties. The ceded revenues, exclusive of tha ” contributive parts ” and the excess from commercial treaties, were estimated by Bourke, in his report to the bondholders on the decree of Muharrem, at £1,812,562 (£Ti,993,8l8). A substantial reduction however, had to be made in favour of the 5% ” priority bonds, ” which were bonds issued to the local banks before mentioned in satisfaction of their claims, and formed an annual first charge of £T590,ooo on the whole of the revenues ceded to the bondholders; the capital amount of the ” priority bonds ” was £T8, 169,986, which was to be extinguished by 1906. Four-fifths of the net product of the revenues, after deduction of the first charge of £T590,ooo, was to be applied to the service of the interest on the new reduced debt, and provided that the four-fifths were sufficient to allow the distribu- tion of 1% interest, one-fifth was to be devoted to sinking fund; but this latter fifth was to be reduced, if necessary, by an amount sufficient to maintain the rate of interest at 1 . The interest on bonds amortized was to be added to the funds available for sinking fund. The sinking fund was to work as follows: First J on the whole reduced capital was to be applied to group i. ; if there were any surplus this was to be applied to group ii., until that also received the same full i%, and so on for group iii. and group iv., until the wnole sinking fund amounted to 1 % on the reduced capital. It was to be applied by redemption at the best price possible on the market, until that price stood at £T66-66, when, if the rate of interest served were 1%, it was to proceed by drawings; if the interest were anything more than I %, and less than 3 %, the limit of price for redemption was to be raised to £T75 ; if the interest were between 3 % and 4% inclusive, the limit was to be raised to par. Any surplus of revenue beyond that necessary to provide 4 % interest and I % sinking fund was to be handed over to the government. The lottery bonds receive a special treatment both in regard to interest and sinking fund ; full information as to the intricate arrangements made for these bonds will be found in the decree of Muharrem and the published reports of the council of administration of the Ottoman public debt. In 1890 the sinking fund was increased by the conver- sion of the ” priority loan ” into a 4% loan and the extension of the term of its redemption for 15 years. In this manner an annuity of ˆ159,500 was set free, of which £Tii,ooo per annum was allotted as ”

extraordinary sinking fund ” to series A and ˆ49,500 per annum each to series B, C and D ; the lottery bonds were originally excluded from this arrangement, and special compensation was granted to these later. Each series receives the benefit of the interest on bonds belonging to it amortized by this special annuity. Thus, in the financial year 1900-1901 the total amount of the fund had risen from £Ti59,500 to ˆ231,500.

The arrangement set forth in and sanctioned by the decree of Muharrem on the whole worked admirably. Gradually, however, it became apparent that it would be desirable to give Turkish state securities, of which those governed by the decree of M uharrem formed the principal part, a better standing in European financial markets than was possible for bonds bearing so low a rate of interest; to obliterate thus, as far as possible, the effects of the past bankruptcy; and, further, to give the Turkish government a joint interest with the bondholders in the progress of the ceded revenues. The French bondholders, who hold by far the largest proportion of Turkish securities, took the principal initiative in this matter, and, after protracted negotiations with the Turkish government and the other ” syndicates of bondholders, they succeeded, in 1903, in obtaining the following modifications of the original decree of Muharrem.

Series B, C and D (series A having already been completely redeemed by the action of the sinking fund) were replaced by the creation of new 4% bonds to a nominal amount of ˆ32,738,772, with a sinking fund of 0-45% per annum, bearing identical rights and privileges, and ranking immediately after, the priority bonds. The rates at which the series were respectively exchanged against the new unified bonds were £100 series B against £70 unified, £100 series C against £42 unified and £100 series C against £37, 10s. unified. Bonds of the old series not presented for exchange within a period of fifteen years are prescribed. The amortization is to proceed by purchase when the unified bonds are below par, and when at or above par, by drawings. Coupons and drawn bonds not presented within six and fifteen years respectively of their due dates of payment are prescribed. Interest on amortized bonds goes to swell the sinking fund. When the net product of the ceded revenues amounts to £T2, 157,375, the surplus is divisible as to 75% to the Turkish government and 25% to

the public debt administration. A variation from this was provided as soon as the priority bonds should become extinct; but these bonds having since been repaid (as mentioned below) by a further issue of unified bonds, this variation lapses. The above 25 % is to be employed as additional sinking fund for the unified debt and lottery bonds, in the proportion of 60 % and 40 % respectively. A reserve fund was created of which the nucleus was the sum already standing

to the credit of the " Reserve fund for increasing the rate of in- terest " (£Ti, 113,865), plus £T30o,ooo at least in cash by the issue of sufficient unified bonds to produce that amount and the sum of £T 1 50,000 to be paid by the government to the public debt at the rate of £Ti5,ooo per annum. It should be added that the total issue was made sufficient to reserve also £Tl, 460,000 for expenses, after taking into account £100,000 in cash paid by the government to the public debt administration out of the said issue. The reserve fund was created primarily to make good any deficiency in the revenues below the amount required to pay the interest due. If such drafts upon the reserve fund become necessary, they are to be made good in the following years out of the surplus above mentioned. The reserve fund is increased by the interest it may earn, but when the capital amount of the fund reaches £T2,ooo,ooo the interest earned is merged in the general receipts of the public debt administration. As soon as the unified debt is reduced to £Ti6,ooo,ooo the reserve fund is to be reduced to £Ti, 000,000, the surplus over this last amount being paid to the government. The unified bonds and coupons are exempt from all Turkish taxation existing or to come. Further special stipulations regarding the Turkish lottery bonds were made, but these are, as before, omitted. They will be found in art. x. of the " Annex-Decree " of September 1-14, 1903, which gave the modifications to the Muharrem decree here described force of law. Finally the Imperial Ottoman government reserved to itself the right of paying off the whole unified debt at par at any moment, and all the dispositions of the decree of Muharrem not modified by the new " Annex- Decree " were formally confirmed and main- tained. In 1906 a further modification took place in the shape of the final and complete repayment of the priority bonds by the additional issue of

£Tg, 537,000 of unified bonds for the purpose, taken firm by the Ottoman bank at 86. The rate at which the exchange was effected was par with a cash bonus of 6%. The previous annuity required for the service of these bonds having been ˆ430,500, and the additional charge for the service of the unified debt as a result of the operation being ˆ424,396, while the government received £Tl,272,6oo in cash for its own purposes, there was a slight immediate advantage to be found in it : as, how- ever, the priority debt would have been completely extinguished in 1932, the financial wisdom of the change is not apparent.

The ceded revenues administered directly by the public debt council have shown remarkable expansion, and may be fairly looked upon as exemplifying what would occur in the general revenues of the empire when good and honest administration and regular payment of officials finally took the place of the care- lessness, corruption and irregularity which existed up to the change of regime. The council has not limited its duties to the collection of the revenues placed under its administration, but has taken pains to develop commercially the revenues capable of such development. A large and remunerative export trade in salt to India is now established, whereas formerly not one grain found its way there; the first steps in this direction were taken in 1892 when works were begun to place the great rock-salt salines of Salif, on the coast of the Red Sea, on a commercial footing. The gross receipts from this export trade amounted in the year 1908-1909 to £ˆ99,564, and the profits approximately to £Ti 2,000, in spite of the contest between Liverpool and Spanish salt merchants on the Calcutta market, which led to a heavy cutting of prices. Pains, moreover, have been taken by the public debt council to develop the sale of salt within the empire. These efforts have been rewarded by the increase of the salt revenue from £T635,ooo in 1881-1882, the year preceding the establishment of the council, to £Ti,o75,88o in 1907-1908. Again, in the early years of the administration (1885), the Pasteur system of selection of silk-worms' eggs for the rearing of silk- worms was introduced, and an " Institute of Sericulture " on modern lines was erected (1888) at Brusa for gratuitous instruc- tion in silk-rearing to students from all parts of the empire. Up to the end of 1907-1908, 919 students had received the diploma of the

institute, and 465 silk-growers in addition had passed through the course of instruction. These men, returning to their various districts, impart to others the instruction they have received, and thus spread through the regions adapted to seri- culture the proper methods of selection and rearing. As a result some 60,000,000 mulberry trees were planted in Turkey during 1890-1910, involving the plantation of about 130,000 acres, and new magnaneries and spinning factories sprang up in every direction ; while the revenue (silk tithe) increased in the regions administered by the council from £Ti7,ooo in 1881-1882 to

£Ti25,ooo in 1906-1907, the value of the silk crop in those regions having thus advanced by over £Ti,ooo,ooo. But the regions not under its administration benefited at least equally by the methods above described. Thus the total value of the silk tithe in Turkey increased in the period named from about £T2o,ooo to ˆ276,500, and the total annual value of the crop from about £T20o,ooo to £T2, 765,000, or by nearly 22 millions pounds sterling.

Table A gives the produce of the revenues in 1881-1882, the last year of the administration of the ” Galata Bankers,” the average product of the first, second, third, fourth and fifth quinquennial periods since the public council was established, and of the year 1907-1908.

Table B shows the total indebtedness of the Ottoman Empire, exclusive of tribute loans.

Tobacco Regie. — From the beginning of the year 1884 the tobacco revenue has been worked as a monopoly by a company formed under Ottoman law, styled ” La R6gie Imperiale Cointeressee des Tabacs Ottomans.” This company has the absolute monopoly of the manu- facture and of the purchase and sale of tobacco throughout the Ottoman Empire, with the exception of the Lebanon and Crete, but exportation remains free. It is bound to purchase all tobacco not exported at prices to be agreed between

itself and the cultivators ; if no agreement can be arrived at, the price is fixed by experts. It is obliged also to form entrep6ts for the storage of the crops at reasonable distances from each other, and, on certain conditions, to grant advances to cultivators to aid them in raising the leaf. The cultivators, on the other hand, may not plant tobacco without permits from the regie, although the power of refusing a permit, except to known smugglers or persons of notoriously bad conduct, seems to be doubtful ; nor may they sell to any purchaser, unless for export, except to the regie, while they are bound to deposit the whole of the tobacco crops which they raise in any one year in the entrep6ts of the regie before the month of August of the year following,

Table A. — Showing Revenues ceded to Ottoman Public Debt Administration at Various Periods to IQ07-IQ08.

Heads of Revenue.

Last year of

Galata Bankers,

1881-1882.

Average for

First Five Years

of Council of

Public Debt,

1882-83, 1886-87.

Average for

Second Five Years

of Council of

Public Debt,

1887-88, 1801-02.

Average for

Third Five Years

of Council of

Public Debt,

1892-93, 1896-97.

Average for

Fourth Five Years

of Council of

Public Debt.

1897-98, 1901-2.

Average for

Fifth Five Years

of Council of

Public Debt,

1902-3, 1906-7.

1907-8.

Six Indirect Contributions: — *

Salt

Spirits

Silk

Extra Budgetary Receipts f

£T

881,563 634.936 129.833 177.163

26,064

17,118

£T

822,633 651,057

146,822

198,356 34,356 24,145

£T

755,489 702,150

185,930 229,059

44-307 39.398

£T

788,384 755,978

212,815 258,848

44,337 56,393

£T

725,641

861,406 221,856 269,482

47,294

69,012 2,797

£T

815.923

987,417

321,193

273,893

53,032

98,731

25,757

£T

899.352

1,123,886

366,255

283,301

69,549 131,218

Total of Six Indirect Contri-

1,866,677

1,937,369

1.956,333

2,116,755

2,197,488

2,575.946

2,873,561

Tobacco Tithe

Eastern Rumelian Annuity Excess of Cyprus Revenues Tax on Tumbeki ....

not collected

..

11

72,340

150,040

130,000

50,000

81,866 126,688

113.557 50,000

104,688

129,222

102,596

50,000

99,276

88,682

102,596

50,000

172,473 159,628 102,596

50,000

210,068

114,020

102,596

50,000

Total Gross Revenue

1,866,677 378,789

2.339,749

388,000

2,328,444 392,403

2,503,261 346,143

2,538,042 418,537

3,060,643 522,798

3,350,245* 572,850

Total Net Revenue ....

1,487,888

1.951,749

1,936,041

2,157,118

2,119,505

2,537,845

2,777.395

- Exclusive of £T50,ooo representing the retrocession of the reftish (Egyptian tax, abolished in 1895) to the regie.

t Up to 1902-1903 the extra-budgetary receipts and fines had been carried to account of the respective revenues concerned; after that date they were placed under a special heading. After 1905-1906 extra-budgetary receipts relating to expenditure previously effected have been deducted from " General Expenses."

+ The 3 % customs surtax is not included in this table. It came into force on the 13th of July 1907, and produced during the remainder of the financial year ˆ544,987; 25% of this revenue is ceded to the public debt; the remainder reverts to the government.

Table B. — -Position of the Ottoman Public Debt on the 1st of March 1326 {March 14, 1910).

Designation of Loans.

4) O J

•5-5-S

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fs * £ o c « C .S ° §EiS

.O .O 2 at 33 „ S

ˆ >-£tO;Ha

‘Unified Debt 4% ! . . Turkish Lottery Bonds 1 4% Loan 1890

5% ” ”

4%

4%

4%

A °/

4 /o

4%

A 0/

4 /o

14%

1896

1903 Fisheries . Bagdad 1st Series

2nd „ . .

1904

1905 Military Equipment

1901-1905 1908

4% Loan 1893 Tumbeki

4% –

1894

4% ..

1902 l

4% ..

1855

4% „

1891

3*% ..

1894

,4% „

1909

Total

Nominal Capital issued.

£T

42,275,772 15.632,548 4.999,500 3,272,720 2,640,000 2,376,000 4,752,000 2,750,000 2,640,000 5,306,664 4,711,124

91,356,328 1,010,010 1,760,000 8,600,020 5,500,000 6,948,612

9,033,574 7,000,004

131,198,548

Annuities.

£T

1,887,375 270,000

249,975 180,000 118,800 97,120 200,000 123,750 118,800 238,800 212,000

3,696,620 50,000 76,560 390,000 167,869 308,686 362,174 350,000

5.401,909

Nominal Capital

redeemed at 1st

Marchi326(i9io).

£T 2,345,oio

3,599,592

1,509,200

289,300

105,424

15,642

8,426

57,090

83,556

123,420

8,136,660 239,800 136,202 367,180

1,303,280 777,700 852,808

11,813,630

Nominal Capital in circulation on 1st Marchi326(i9io).

£T

39,930,762 12,032,956 3,490,300 2,983,420 2,534,576 2,360,358

4,743,574 2,692,910 2,556,444

5,183,244 4,711,124

83,219,668 760,210 1,623,798 8,232,840 4,196,720 6,170,912 8,180,766 7,000,004

119,384,918

1 The capital in circulation for these loans, established on the 1st of March 1326 (1910), is approximate.

and may not move any tobacco from the place where they cultivate it without the regie's express authority. In order to facilitate supervision, a minimum area of one-half of a

deunum (a deunum = about one-fourth of an acre) is fixed for ground upon which tobacco may be cultivated; in the suburban districts of Constantinople and some other towns, and in enclosures surrounded by walls and attached to dwelling-houses, it is altogether prohibited. For its privileges the regie has to pay a rent of £T750,ooo per annum to the government (assigned to bondholders), " even if it has no revenues at all," and after the payment of a dividend of 8 % to its shareholders, and certain other deductions, it has to share profits with the govern- ment and the bondholders according to a sliding scale agreed upon between the three parties. The regie did badly during the first four years of its existence, owing principally to two causes: (i) its ineffectual power to deal with contraband to which the system described above leaves the door wide open; (2) the admission of other than Turkish tobaccos into Egypt, which deprived it at once of about £Tioo,ooo per annum. So great were its losses that in the year 1887-1888 it was obliged to write them off by reducing its capital from £2,000,000 to £1,600,000. At the same time it was granted an extension of penal powers, and the losses on reftieh (duty on tobacco exported to Egypt) were to be partially borne by the public debt administration. Things went better with it from that time until 1894-1895, when, owing to internal troubles in the empire, and the consequent fear of creating worse disorders, by the strict enforcement of the monopoly, the government withdrew most of its support, and contraband enormously increased. The following table shows the movement of the revenue of the regie from the year 1887-1888 to 1908-1909 inclusive: —

Average for 5 years.

Gross receipts from all sources.

Total expenses, in- cluding fixed charges.

Net revenue.

1887-1892 1892-1897 1897-1902 1 902- 1 907

1,924,264 2,330,786 2,098,537 2,511,921

£T

1,735,896 2,037,190 1,898,646 2,104,739

£T

188,368 *293,596

*i99,89i

407,182

Year 1907-8

,, 1908-9

2,660,895 2,597,909

2,146,864 2,167,795

514,031 430,114

- There was a heavy fall in the receipts in the four years 1895-1896 to 1898-1899 inclusive. The climax was reached in 1897-1898 when the net revenue amounted to only £63,975 as compared with £T352,ooo in 1894-1895, and it did not revert to its previous level until 1902-1903. This was the result of the Armenian massacres, the wholesale emigration of Armenians of all classes, the accompany- ing profound political unrest throughout the country, and the great extension of contraband which ensued from it.

Negotiations were initiated in 1910 for the prolongation of the concession of the tobacco monopoly, which reaches its term in I9I3-

Railway Guarantees. — Up to 1888 the only railways existing in the Turkish Empire (exclusive of Egypt) were, in Europe, the Constantinople-Adrianople-Philippopolis line and the Salonica- Mitrovitza line (finished in 1872) ; and in Asia Minor, the Smyrna- A'idin (completed in 1866), the Smyrna-Cassaba (completed in 1866) , the Constantinople-Ismid (completed in 187 2) , the Mersina- Adana (completed in 1886). The want of railways in Asia Minor was urgently felt, but no capitalists were willing to risk their money in Turkish railways without a substantial guarantee, and a guarantee of the Turkish government alone was not considered substantial enough. In 1888 it

was proposed by the public debt administration to undertake the collection of specified revenues to be set aside for the provision of railway guarantees, the principle to be followed being, generally, that such revenues should consist of the tithes of the districts through which the railways would pass, and that the public debt should hand over to guaranteed railway companies the amounts of their guarantees before transmitting to the imperial government any of the pro- ceeds of the revenue so collected. The government adopted this proposal, and laid down as a principle that it would guarantee the gross receipts per kilometre of guaranteed railways, such gross receipts to be settled for each railway on its own merits. Considerable competition ensued for the railway concessions under this system. The first granted was for the extension of the Constantinople-Ismid railway to Angora to a group of German and British capitalists in 1888. The Germans having bought out the British rights, this concession became a purely German

affair, although a certain proportion of the capital was found in London. Since that time various other concessions have been granted to French and German financial groups, principally the Imperial Ottoman Bank group of Paris and the Deutsche Bank group of Berlin.

The systems of guarantee above described are clearly faulty, since theoretically the railway company which ran no trains at all would, up to the limit of its guarantee, make the largest profits. The concessionnaire companies have, however, wisely taken the view that it is better to depend upon their own revenues than upon any government guarantee, and have done their best to develop the working value of the lines in their charge. The economic effect of the railways upon the districts through which they run is apparent from the comparative values of the tithes in the regions traversed by the Anatolian railway in 1889 and 1898 in which years it so happened that prices were almost at exactly the same level, and again in 1908-1909, when they were only slightly higher. Thus in 1889 they produced £ˆ145,378, in 1898 £T2i5,47o, and in 1908-1909 £T28i,9i9.

A different system, still more uneconomic than the kilometric guarantee pure and simple, was adopted in the case of the Bagdad railway. In January 1902 the German

group holding the Anatolian railway concession was granted a further concession for extending that railway from Konia, then its terminus, through the Taurus range and by way of the Euphrates, Nisibin, Mosul, the Tigris, Bagdad, Kerbela and Nejef to Basra, thus establishing railway communication between the Bosporus and the Persian Gulf. The total length, including branches to Adana, Orfa (the ancient Edessa) and other places was to exceed 1550 m.; the kilometric guarantee granted was 15,500 francs (£620). It should be noted that this concession was substituted for one negotiated by the same group, and projected to pass through Diarbekr. This raised strong objections on the part of Russia, and led to the Black Sea Basin agreement reserving to Russia the sole right to construct railways in the northern portion of Asia Minor. The Anatolian railway company, apparently unable to handle the concession above described, initiated fresh negotia- tions which resulted in the Bagdad railway convention (March 5, 1903). This convention caused much excitement and irrita- tion in Great Britain, owing to the encroachment of German influence sanctioned by it on territories bordering the Persian Gulf, hitherto considered to fall solely within the sphere of British influence. Attempts were made by the German group, assisted by their government, to secure the participation of both Britain and France in the concession. These were successful in France, the Imperial Ottoman Bank group agreeing to undertake 30% of the finance without, however, any countenance from the French government — the ” Glarus Syndicate ” being formed for apportioning interests. The British government seemed, at one time, rather to favour a British participation, but when the terms of the convention were published, the strongest objection was taken to the constitution of the board of directors Which established German control in perpetuity, while it was evident from the general tenor of the convention that a political bias informed the whole; in the end public feeling ran so high that any British participation became impossible.

The financial advantages, however, granted by the Turkish government were singularly favourable to the concessionnaires and onerous to itself. The kilometric guarantee of 15,500 francs (£620) was split into two parts, 4500 francs (£180) being granted as the fixed working

expenses of the line, all receipts in excess of which amount were to be credited to the Turkish government in reduction of the remaining 11,000 francs (£440) which took the form of an annuity to be capitalized as a 4 % state loan redeemable in 99 years, that being the period fixed for the duration of the conces- sion. The line was to be constructed in sections of 200 kilometres (125 m.) each, and as the complete plans and drawings of each were presented at the times and in the order specified in the convention, the government was to deliver to the concessionnaires government securities representing the capitalization of the annuity accruing to that section. The capital sum per section was fixed, in round figures, at 54,000,000 francs (£2,160,000), subject to adjustment when the section was completed and its actual length definitely measured up. A minimum net price of 81 J % was fixed for the realization of these securities on the market. The bonds are secured

on the surplus of the revenues assigned to the guarantee of the Anatolian railway collected by the Public Debt Administration, on the excess revenue, after certain deductions, accruing to the government under the " Annex-Decree to the Decree of Muharrem " above described, on the sheep tax of the vilayets of Koniah, Adana and Aleppo, and on the railway itself. The first series (54,000,000 francs or £2,160,000), was duly handed over to the concessionaires in 1903, and was floated in Berlin at 86-4% realizing the sum of £1,868,000. The division of the line into equal sections of 200 kilometres apiece produced at once a somewhat ridiculous result. The little town of Eregli, some 190 kilometres distant from Konia, presented the only excusable locality for the terminus of the first section, and even that place is 90 kilometres distant from Karaman, the last town of any importance for some hundreds of miles on the way to the Euphrates valley, the country between the two towns being desolate and sparsely inhabited. But the Bagdad Railway Company 1 (the share capital of which is £600,000 half paid up), naturally anxious to earn the whole of the capitalized subvention, completed the construction

of the entire 200 kilometres. The line was thus continued to a station taking its name from Bulgurlu, a small straggling village four miles away, between which and Eregli there is not a single habitation. But even this did not quite complete the distance, and the line was carried on for still another kilometre and there stopped, ” with its pair of rails gauntly pro- jecting from the permanent way ” (Fraser, The Short Cut to India, 1909). The outside cost of construction of the first section, which lies entirely in the plains of Konia, is estimated to have been £625,000; the company retained, therefore, a profit of at least I \ millions sterling on this first part of the enterprise. In the second section the Taurus range is reached, after which the construction becomes much more difficult and costly. On the 2nd of June 1908 a fresh convention was signed between the government and the Bagdad Railway Company providing, on the same financial basis, for the extension of the line from Bu’.gurlu to Helif and of the con- struction of a branch from Tel-Habesh to Aleppo, covering a total aggregate length of approximately 840 kilometres. The principle of equal sections of 200 kilometres was thus set on one side. The payments to the company were to be made in two lump sums forming ” series 2 and 3 ” of the ” Imperial Ottoman Bagdad railway loan,” series 2 amounting to £4,320,000, which was delivered to the company on the signature of the contract, and series 3 to £4,760,000. The Bagdad railway must for much time be a heavy

Ottoman Railways worked at end of 1908.

Designation of Main Lines.

Turkey in Europe : — Oriental Railways 2 Salonica-Monastir . Salonica-Constantinople

Total European Turkey

Turkey in Asia : —

Hamidie Railway of the

Hejaz 3 Anatolian Railway.

BagdadRailway(Konia- Bulgurlu section) 4

Mudania-Brusa Smyrna-Aidin . Smyrna-Cassaba

Length in

Miles(including

branch lines).

Damascus-Hama . Mersina- Adana 6 Jaffa-Jerusalem

Total Asiatic Turkey

Grand Total

815 137 317

1269

932 635

124

26 320 322

361

42

54

2816

Amount Kilometric Guarantees.

4085

£ Nil

572 620

Nil. Varies from £270 to £600.

£620 : Annuity £440

Working Expenses

£180.

Nil. Nil.

For main-line and j Burnabat and Man- j isa-Soma branches the government guarantees £92,400 as half the annual receipts. For the Alashehr-Karahissar extension, there is a kilometric guarantee

of £755-

520

Nil. Nil.

Results of 1908 according to the Nationality of the Capital.

Nationality of the Capital.

Ottoman

German

English Austro- German

French

Various

Companies or Societies.

Lengths Worked.

Hejaz Railway

Salonica-Monastir Railway

Bagdad Railway .

Mersina- Adana Railway . Anatolia —

Haidar Pasha-Angora Eskishehr-Konia Hamid ie-Adabazar

Aidin Railway.

Oriental Railways ‘ Salonica-Constantinople J unc- tion

Smyrna Kassaba and Exten- sions

Damascus-Hama and Exten- sions (Rayak-Aleppo) . Jaffa-Jerusalem Mudania-Brusa . . . .

per Company.

Totals

Miles.

932 137 124

42

635 320

815 317 322

361

54 26

per Nation- ality.

4.085

Miles.”

932

- 938

320 815

1.054 26

Gross

Receipts

for the

Year 1908.

Guarantees

paid by

the State

for the

Year 1908

4.085

£

150,435

129,854

14.578

36,400

209,105 102,570

4,877 293,104

607,619 113.505 223,643

269,934 44,366

15.039

2,215,029

108,155

117,030 118,755

199,728 146,980 94,801

Rents paid to

the State for the

Year 1908.

Totals

per

Companies

243

785.449

115.679

115,922

£

150,435

129,611

122,733

36,400

552,337 293,104 491,940 313,233

364.735 44,366

15.039

2,884,556

Totals per

Nation- alities.

£

150,435

841,081

293,104 491,940

1.092,957 15.039

2,884,556 697

Average receipts per mile

per Nation- ality.

£

161

885

916

604

1.037 579

weight on the Turkish budget, the country through which it passes — with the exception of the sections passing from Adana to Osmanieh, through the Killis-Aleppo-Euphrates district (that is, the first point at which the line crosses the Euphrates some 600 m. from Bagdad), and to a lesser extent through the plains of Seruj and Harran— being very sparsely populated, while the financial system adopted offers no inducement to the concessionaire company to work for

1 Specially formed by the Anatolian railway group for the execu- tion, which the Anatolian Railway Company guarantees under the Bagdad Railway Convention, of the Bagdad railway concession.

increasing earnings. It should be mentioned that the Bagdad Railway Company has sublet the working of the line to the Ana- tolian Railway Company at the rate of £148 per kilometre, as against the £180 per kilometre guaranteed by the Turkish government

2 The line from Mustafa-Pasha to Vakarel now lies in the king- dom of Bulgaria.

3 Constru ;ted and worked by the State.

4 Extension of Anatolian Railway.

6 The Anatolian Railway group (German) has obtained control of this little railway, which was originally British.

FINANCE1

TURKEY

44 1

— an additional indication, if any were needed, of the thrift- lessness of the latter in the matter. Moreover, the Anatolian railway receives, under the original Bagdad

railway convention (l) an annuity of £14,000 per annum for thirty years as com- pensation for strengthening its permanent way sufficiently to permit of the running of express trains, and (2) a second annuity of £14,000 in perpetuity to compensate it for running express trains — this to begin as soon as the main Bagdad line reaches Aleppo.

It was stated in the preface to the budget of 19 10 that the government would grant no more railway concessions carrying guarantees. The amount inscribed for railway guarantees in the budget of 1910 was £746,790. The tables on p. 440 show the respective lengths of the various Ottoman railways open and worked at the end of 1908 and the amount of kilometric guaran- tees which they carried — and the lengths, &c, of railways worked by the various companies according to the nationality of the concessionaire groups.

Banks. — At the close of the Crimean War a British bank was opened in 1856 at Constantinople under the name of the Ottoman Bank, with a capital of £500,000 fully paid up. In 1863 this was merged in an Anglo-French bank, under a concession from the Turkish government, as a state bank under the name of the Imperial Ottoman Bank, with a capital of £2,700,000, increased in 1865 to £4,050,000 and in 1875 to £10,000,000, one-half of which is paid up. The original concession to the year 1893 was in 1875 extended to 1913, and in 1895 to 1925. The bank acts as banker to the government, for which it has a fixed annual commission, and it is obliged to make a permanent statutory advance to the govern- ment of £Tl, 000,000, against the deposit by the government of marketable securities bearing interest at a rate agreed upon. The bank has the exclusive privilege of issuing bank-notes payable in gold. Its central office is in Constantinople, and it is managed by a director-general and advisory committee appointed by com- mittees in London and Paris.

The National Bank of Turkey (a limited Ottoman Company) is a purely British concern with a capital of £1,000,000, founded by imperial firman of the nth of April 1909, under the auspices of Sir Ernest Cassel. It is understood that it was originated at the | unofficial instigation of both the British and Ottoman governments, | with the idea of forming a

channel for the more generous investment I of British capital in Turkey under the new regime, so that British financial interests might play a more important part in the Otto- man Empire than has been the case since the state bankruptcy of 1876. This bank brought out the Constantinople municipal loan of 1909 (£1,000,000). Other banks doing business in Constantinople are the Deutsche Bank, the Deutsche-Orient Bank, the Credit Lyon- nais, the Wiener Bank- Verein, the Russian Bank for Commerce and Industry, the Bank of Mitylene, the Bank of Salonica and the Bank of Athens.

Monetary System. — The monetary system presents a spectacle of perplexing confusion, which is a remnant of the complete chaos which prevailed before the reforms initiated in 1844 by Sultan Abd-ul-Mejid. The basis of the system adopted was the double standard with a fixed relation of I to 15-09, and free coinage. The unit was the piastre (= 2jd.), nominally subdivided into 40 paras. The gold pound (18s. 2d.) was equivalent to 100 piastres; the gold

Eieces struck were £T5, £Ti, £TJ and £TJ; the standard is 0-916! ne, and the weight 7-216 grammes. The silver coinage consisted of the mejidie (weight 24-055 grammes, 0-830 fine), equivalent to 20 piastres, and its subdivisions 10, 5, 2, 1, and | piastre pieces. The altilik, beshlik and metallik currencies struck, the first and last in the reign of Mahmud II. and Abd-ul-Mejid, and the second in the reign of Mahmud only, were not included in the reform; these were debased currencies bearing a nominal value, the altilik of 6, 3 and if piastres, the beshlik of 5 and 2j piastres, the metallik of I, i and { piastres; they represented the last degree of an age- long monetary depreciation, the original piastre having had a value of about 5s. 7d., which had fallen to 2|d. The heavy depreciation in silver causing large losses to the government, free coinage was suspended in 1880, and the nominal value of the mejidie was reduced by decree to 19 piastres (105-26 piastres thus = £Tl), while in the same year the debased currencies were reduced, altilik,

piece to i piastre, the ˆpiastre piece to J piastre, the j-piastre piece to 5 piastre — these values representing approximately the intrinsic value of the silver, at mejidie

standard, contained in the debased coins. The copper coinage (113,000,000 piastres) and the paper currency (kaime) (1,600,000,000 piastres) referred to in the above sketch were withdrawn in 1880 by repudiation. The 20-piastre mejidie currency, in spite of the further enormous depreciation of silver since 1880, has scarcely varied in the Constantinople market, but has always remained at a discount of about 3 % (between 108 and 109 piastres to the pound) under government rate; this is doubtless due to the fact that the demand and supply

of the coins in that market are very evenly balanced. The parity thus working out at 102-60, gold continued to be held away from the treasury, and in 1909 the government decided to accept the Turkish pound at the last named rate. The fractional mejidie coins (5, 2 and I piastres) are quoted at a sepatate rate in the market, usually at a premium over the 20-piastre piece. In the last twelve years of the 19th century the altilik currency was almost entirely withdrawn, and replaced by fractional mejidie ; a large proportion of the beshlik has also been withdrawn, but the metallik has not been touched. These debased currencies are usually at a premium over gold owing to the extreme scarcity of fractional coinage. The standard of the altilik is about 0-440 fine, that of the beshlik is 0-185 to 0-225 nne > that of the metallik is 0-170 fine. Foreign gold coins, especially the pound sterling (par value no piastres) and the French 20-franc piece (par value 87! piastres) have free currency. Throughout Arabia and in Tripoli (Africa) the principal money used is the silver Maria Theresa dollar tariffed by the Ottoman government at 12 piastres. The Indian rupee and the Persian kran are widely circulated through Mesopotamia; in Basra transactions are counted in krans, taking as a fixed exchange £Tl = 34 – l5 krans. The general monetary confusion is greatly intensified by the fact that the piastre unit varies for almost every province; thus, while the pound at Constantinople is counted at 108 piastres silver, it is at about 127 piastres for one kind of transaction and 180 for another in Smyrna, 135 piastres at Adrianople, 140 at Jerusalem, and so forth, accounts being kept in " abusive piastres," which exist no longer. In some towns, e.g. Adrianople, small change is often supplemented by cardboard tickets, metal discs, &c, put into circulation by private establishments or individuals of good credit.

A commission (the successor of many) was instituted at the ministry of finance in 1910, to draw up proposals for setting this confusion in order. In his 1910 budget speech the minister of finance, J avid Bey, demanded authority to create a new aluminium coinage of 5, 10, 20 and 40 para pieces, of which he would issue, in the course of three years, a nominal amount of ˆTl,ooo,ooo to those provinces in which there was a great scarcity of small coins. The amounts of Turkish gold, silver and debased coinage in circulation are approximately £Ti6,500,ooo, in gold, £T8,700,ooo (940,000,000 piastres at 108) in silver mcjidies and fractions, and 200,000,000 piastres in beshlik and metallik.

Tenure of Property. — Real property is held in one of four various ways: either mulk, emiriye, vakuf or khaliye. (1) Mulk is the absolute property of its owner, and can be disposed of by him as he wills without restrictions, save those enumerated lower down {General Dispositions) as general for all the four classes. Mulk property is governed chiefly by the Sheri (sacred law). A duty of 10 per mille on its estimated value has to be paid on trans- fer by sale, donation or testament; 5 per mille on transfer by inheritance; and a registration duty on expenses of transfer. (2) Emiriye is practically " public domains." The state may grant land of this category to private persons on payment by the latter of the value of the proprietary right — the tithes, ground-rent (should there be private buildings upon it), and the land-tax. It is administered by imperial functionaries called arazi-memuru; it is with the consent of the latter only that the proprietary rights can be sold. These rights are of simple possession, but they are transmissible in certain degrees to the heirs of the possessor. Emi- riye cannot be mortgaged, but can be given as security for debt on condition that it be restored when the debt has been repaid. The creditor may demand the arazi-memuru to proceed to a forced sale, but the arazi-memuru is not obliged to comply with that de- mand ; no forced sale may take place after the decease of the debtor. Emiriye is not transmissible by will, but may be transferred by dona- tion, which returns to the donor should he outlive the beneficiary. Should a proprietor of emiriye plant trees or vines, or erect buildings upon it, with the consent of the state, they are considered as mulk; an annual tax

representing the value of the tithes on the portions of emiriye thus utilized is levied. The emiriye then becomes mulk, with certain restrictions as to transfer dues. A transfer duty of 5 % on the estimated value of emiriye is paid on transmission by sale, inheritance or donation, of 2j % on the amount of the debt in case of mortgage or release from mortgage, and of 10 % on expenses of registration. A different scale is established for emiriye with moukataa (rent paid for emiriye with mulk property established upon it). (3) Vakuf is " all property dedicated t& God, of which the revenue is consecrated to His poor "; or " pro-, perty of which the usufruct, such as tithe, taxes and rents, is attributed to a work of charity and of public interest." When once a property has been registered as vakuf it can never be withdrawn. There are two classes of vakuf: (a) Land so declared either directly by the sovereign or in virtue of imperial authority; (b) lands transformed by their proprietors from mulk into vakuf. The laws and regulations concerning vakuf are too intricate to be described; generally it may be said that they form a great obstruction to dealing with a large proportion of the most valuable property in Turkey, and therefore to the prosperity of the country. The vakuf s are administered by a special ministerial department (evkaf nazareti), whose property, on behalf of the state, they theoretically

are. The effect of the original system was that a vakuf property became the inalienable property of the state, and the original proprietor a mere tenant. All fundamental repairs thus fell to the charge of the state, which could not afford to effect them, and the vakuf revenues decreased so rapidly that already in the reign of Sclim I. (1511-1520) a serious effort was made to deal with the difficulty. But this resulted in so heavy a burden upon the public that the law had again to be altered to extend hereditary rights, and to admit a system of mortgage which was assimilated to that for emiriye ; but the evils were little more than palliated. The curious gilds called guedik must here be mentioned. They were established at a time when industry was not

free, and the govern- ment fixed the number of artisans of every kind of trade in each town, no one having the right to increase that number. The guedik, then, had the right to erect buildings on vakuf property and supply it with the tools, &c, necessary to exercise a trade. The ancient guediks have not been abolished, the government not daring to deprive them of their privileges; but since the Tanzimat no new ones have been created, industry being declared free. The various special dues payable on vakuf form too long a list to be inserted; the highest is 30 per mille. (4) Kkaliye. This property is also styled mevad. It consists of uncultivated or rough lands, such as mountains, stony ground, &c, which are useless without clearance, to which no possession is claimed, and which are at such a distance from the nearest dwelling that the human voice cannot be made to reach them from that dwelling. Any one can obtain a gratuitous permit to clear and cultivate such lands ; the laws governing ordinary agricultural lands then apply to them. The permit is withdrawn if the clearance is not effected within three years. If the clearance is effected without the necessary permit, the land is nevertheless granted on application, and on the payment of the lapu or sum paid by the proprietor to the state for the value of the land.

General Dispositions. — By the " protocol of the 7th Sefer 1284 a.h. " foreigners may enjoy the rights of proprietorship on the same conditions as Ottoman subjects throughout the empire, save in the Hejaz. The transmission of property from a foreigner to his heirs is therefore governed by the Ottoman laws, and not those of the country to which he belongs. The real property of a Mussulman does not pass by inheritance to non-Mussulman heirs, but may pass to his Mussulman heirs of a foreign nationality, and vice versa. Property of an individual who has abandoned Ottoman nationality without legal authority so to do does not pass to heirs, whether Ottoman or foreign, but devolves to the state ; if legal authority has been granted the government under which the foreign heirs live must have accepted the protocol above cited. An heir who has voluntarily caused the death of the person from whom he should inherit loses all rights of succession. It is not proposed to trace the formalities of transfer and transmission of real property here; they will be found in

vol. iii. of the Dustur (Ottoman Code). Minerals are worked according to the law of the 14th Sefer 1324 (March 26, 1906). Mines can only be exploited in virtue of an imperial irade. The concessions are to be for 99 years with the exception of chrome, emery, boracite and other minerals found only in the form of deposits, which may be granted for not less than 40 years or more than 99 years. They may be disposed of under certain conditions to third parties, and they may be in- herited. Immovable property, working plant, tools and fixtures, cannot be seized for payment of debts. For the discovery of mines, special permits of research, on which there is a fee of £Ts to £Tl5, are necessary; full details of the requisite formalities are given in the law. No researches are permitted in boroughs and villages or in forests, pasturages, &c, if it be considered that they would interfere with public convenience. Two permits are not granted for the same mineral within the same area, until the first has lapsed. Specimens may be sent to Europe for expert examination up to an aggregate weight of 2000 tons, on paying the requisite duties. Explosives are under the control of the local authorities. In order to obtain permits foreigners must first have adhered to the law of 1293 (a.h.). The original discoverer of a mine is entitled to a certain indemnity for " right of discovery " to be paid by the con- cessionaire of that mine, should the discoverer be unable to work it. To obtain a concession, formalities detailed in the law must be complied with, under a penalty of £Tioo to £Tiooo. Should a different mineral from that specified in the imperial firman for a mining concession be discovered in a free state, a fresh firman is necessary to exploit it. Discovered mines not registered by the government, or not worked for a period of 99 years before the pro- mulgation of the law of the 26th of March 1906, are considered as non- discovered. On the promulgation of the firman for the exploitation of a mine, a fee of £T5° to £Tioo becomes payable. Two categories of rent, fixed and proportional, are payable to the state by mine- owners. The fixed rent is 10 piastres per jerib (about 10,000 square metres), to be paid whether the mine is worked or not. The proportional rent is from I % to 5 % on the gross products of mines of vein formation, and from 10% to 20% on those of mines of deposit formation; the percentages are calculated on the value of the mineral after deduction of freight, &c. to Europe and of treatment. The proportional

rents are fixed by the Mines Adminis- tration according to the wealth, area and facility of working of

the mine, and are inserted in the imperial firman governing the mine, and must be paid before the minerals are exported. Yearly returns, under a penalty of £T5 to £T25, of the results of working have to be rendered to the Mines Administration. If payments due to the government are not made within two months of due date, the mines may be seized by the authorities and sold to the highest bidder. The working of the mine must begin within two years of the date of the delivery of the mine to the concessionaire. Certain specified plans must be delivered annually, under penalty of £T5 to £T25, to the Mines Administration, and, under similar penalties, all information and facilities for visiting the mines in detail must be afforded to government inspectors. Should a mine-owner, in the course of developing his mine, damage the mine of a neighbouring owner, he must pay him an agreed indemnity. With the exception of the engineer and foreman, the employes must be Ottoman subjects. No part of the subterranean working of a mine may be abandoned without official permission obtained according to formalities specified in the law. Owners of the land in which a mine is located have a prior right to work such mine under imperial firman, on the obtention of which a duty of £T4 is payable ; if they do not work it the concession may be granted to others, on payment of a certain compensation to the landowner. The research of a mine in no way impairs the rights of ownership of the land in which the mine is located. If a mining concession is granted within lands which are private property or which are ” real vakuf lands ” (arazi- i-mevkufe-i-sahiha) only one-fifth of the proportional rent is payable to the state, the other four-fifths reverting to the land-owner or the vakufs, as the case may be. As to ancient coins, and all kinds of treasure of which the proprietor is unknown, reference must be made to the Dustur, No. 4, p. 89.

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History

Legend assigns to Oghuz, son of Kara Khan, the honour of being the father of the Ottoman Turks. Their first appearance in history dates from a.d. 1227. In that year a horde, variously estimated at from two to four thousand souls, with their flocks and their slaves, driven originally from their Central Asian homes by the pressure of Mongol invasion, and who had sought in vain a refuge with the Seljukian sultan Ala-ud-din Kaikobad of Konia, were returning under their chief Suleiman Shah to their native

land. They were crossing the Euphrates, not far from the castle of Jaber, when the drowning of their leader by accident threw confusion into their ranks. Those who had not yet crossed the river refused, in face of this omen, to follow their brethren; the little band, numbering 400 warriors (according to others, consist- ing of 2000 horsemen) decided to remain under Ertoghrul, son of the drowned leader. Ertoghrul first camped at Jessin, 123&-128S east °^ Erzerum; a second appeal to Ala-ud-din was more successful — the numbers of the immigrants had become too insignificant for their presence to be a source of danger. The lands of Karaja Dagh, near Angora, were assigned to the new settlers, who found there good pasturage and winter quarters. The help afforded by Ertoghrul to the Seljukian monarch on a critical occasion led to the addition of Sugut to his fief, with which he was now formally invested. Here Ertoghrul died in 1 288 at the age of ninety, being succeeded in the leader- ship of the tribe by his son Osman. When, ex- 128&-U26 nauste d by the onslaughts of Ghazan Mahmud Khan, ruler of Tabriz, and one of Jenghiz Khan's lieu- tenants, the Seljukian

Empire was at the point of dissolution, most of its feudatory vassals helped rather than hindered its downfall in the hope of retaining their fiefs as independent sovereigns. But Osman remained firm in his allegiance, and by repeated victories over the Greeks revived the drooping glories of his suzerain. His earliest conquest was Karaja Hissar (1295), where first the name of Osman was substituted for that of the sultan in the weekly prayer. In that year Ala-ud-din Kaikobad II. conferred on him the proprietorship of the lands he had thus conquered by the sword, and presented him at the same time with the horse-tail, drum and banner which constituted the insignia of independent command. Osman continued his vic- torious career against the Greeks, and by his valour and also through allying himself with Keusse Mikhal, lord of Harman Kaya, became master of Ainegeul, Bilejik and Yar Hissar. His marriage with Mai Khatun, the daughter of the learned sheikh Edbali, has been surrounded by poetical legend; he married his son Orkhan to the beautiful Greek Nilofer, daughter of the lord of Yar Hissar, whom he carried off from her destined bridegroom on her marriage-day; the fruits of this union were Suleiman Pasha and Murad. In 1300 the Seljukian Empire crumbled away, and many small states arose on its ruins. It was only after the death of his protector and benefactor Sultan Ala-ud-din II. that Osman declared his independence, and accordingly the Turkish historian dates the foundation of the Ottoman Empire from this event. Osman reigned as independent monarch until 1326. He pursued his conquests against the Greeks, and established good govern- ment throughout his dominions, which at the time of his death included the valleys of the Sakaria and Adranos, extending southwards to Kutaiah and northwards to the Sea of Marmora. Infirmity had compelled him towards the end of his life to depute the chief command to his younger son Orkhan, by whom in 1326 the conquest of Brusa was at last effected after a long siege.

Orkhan's military prowess secured for him the succession, to the exclusion of his elder brother Ala-ud-din, who became his grand vizier. At that time a number of 1326ˆ1359 principalities had replaced the Seljukian state. Though Yahsha Bey, grandson of Mahommed Kara- man Oghlu, had declared himself the successor of the Seljukian sultans, the princes of Aidin, Sarukhan, Menteshe, Kermian,

Hamid, Tekke and Karassi declined to recognize his authority, and considered themselves independent, each in his own dominions. Their example was followed by the Kizil Ahmedli Emir Shems-ed-din, whose family was afterwards known as the house of Isfendiar in Kastamuni. The rest of the country was split up among Turcoman tribes, such as the Zulfikar in Marash and the Al-i-Ramazan in Adana. At his accession Orkhan was practically on the same footing with these, and avoided weakening himself in the struggle for the Seljukian inheritance, preferring at first td consolidate his forces at Brusa. There he continued to wrest from the Greeks the lands which their feeble arms were no longer able to defend. He took Aldos,

Nicomedia, Hereke, and, after a siege, Nicaea; Tarakli and Gemlik fell to his arms, and soon the whole of the shore of the Marmora up to Kartal was conquered, and the Byzantines retained on the continent of Asia Minor only Ala Shehr and Biga. These acquisitions were made between 1328 and 1338; in the latter year Orkhan achieved his first conquest from Mussulman hands by the capture of Karassi, the pretext being the quarrel for the succession on the death of the prince, Ajlan Bey.

At this period the state of the Byzantine Empire was such as to render its powers of resistance insignificant; indeed the length of time during which it held out against the Turks is to be attri- buted rather to the lack of efficacious means at the disposal of its assailants than to any qualities possessed by its defenders. In Constantinople itself sedition and-profligacy were rampant, the emperors were the tools of faction and cared but little for the interests of their subjects, whose lot was one of hopeless misery and depravity. On the death of the emperor Andro- nicus III. in 1341 he was succeeded by John Palaeologus, a minor; and Cantacuzenus, the mayor of the palace, appealed to Orkhan for assistance to supplant him, giving in marriage to the Ottoman prince his daughter Theodora. Orkhan lent the desired aid; his son Suleiman Pasha, governor of Karassi, crossed into Europe, crushed Cantacuzenus's enemies, and penetrated as far as the Balkans, returning laden with spoil. Thus the Turks learnt the country of the Greeks and their weakness. In 1355 Suleiman crossed over from Aidinjik and captured the fortress of Gallipoli, which was at once converted into a Turkish stronghold; from this base Bulair,

Malgara, Ipsala and Rodosto were added to the Turkish possessions. Suleiman Pasha was killed by a fall from his horse near Bulair in 1358; the news so affected his father Orkhan as to cause his death two months later. The institution of the Janissaries (q.v.) holds a prominent place among the most remarkable events of Orkhan's reign, which was notable for the encouragement of learning and the foundation of schools, the building of roads and other works of public utility.

Orkhan was succeeded by his son Murad. After capturing Angora from a horde of Turkomans encamped there who were attacking his dominions, at first with some success, in 1361 Murad prepared for a campaign in Europe. 1359-1389. At that time the Greek emperor's rule was con- fined to the shores of the Marmora, the Archipelago and Thrace. Salonica, Thessaly, Athens and the Morea were under independent Greek princes. The Bulgarians, Bosnians and Servians had at different periods invaded and conquered the territories inhabited by them; the Albanians, original natives of their land, were governed by princes of their own. When, on the death of Cantacuzenus, John Palaeo- logus remained sole occupant of the imperial throne, Murad declared war against him and conquered the country right up to Adrianople; the capture of this city, the second capital of the emperors, was announced in official letters to the various Mussul- man rulers by Murad. Three years later, in 1364, Philippopolis fell to Lala Shahin, the Turkish commander in Europe. The states beyond the Balkan now began to dread the advance of the Turks; at the instigation of the pope an allied army of 60,000 Serbs, Hungarians, Walachians and Moldavians attacked Lala Shahin. Murad, who had returned to Brusa, crossed over to Biga, and sent on Haji Ilbeyi with 10,000 men; these fell by night on the Servians and utterly routed them at a place still known as the " Servians' coffer." In 1367 Murad made Adrianople his capital and enriched it with various new buildings. He continued to extend his territories in the north and west; the king of Servia and the rulers of Kiustendil, Nicopolis and Silistria agreed to pay tribute to the conquering Turk. Lala Shahin Pasha was appointed feudal lord of the district of Philippopolis, and Timur Tash Pasha became beylerbey of Rumelia; Monastir, Perlepe, and parts of Bosnia and Herzegovina were next taken, and the

king of Servia consented to furnish to Murad a fixed contingent of auxiliary troops, besides paying a money tribute. In 1381 Murad's son Yilderim Bayezid married Devlet Shah Khatun,

daughter of the prince of Kermian, who brought him in dowry Kutaiah and its six dependent provinces. In the same year Bey Shehr and other portions of the Hamid principality were acquired by purchase from their ruler Hussein Bey, as the Karamanian princes were beginning to cast covetous eyes on them; but the Karamanians were unwilling to resign their claims to be heirs of the Seljukian sultans, and not until the reign of Mahommed II. were they finally suppressed. Ali Bey, the prince at this time, took advantage of Murad's absence in Europe to declare war against him; but the Ottoman ruler returning crushed him at the battle of Konia. Meanwhile the king of Bosnia, acting in collusion with the Karamanian prince, attacked and utterly defeated Timur Tash Pasha, who lost 15,000 out of an army of 20,000 men. The princes and kings who had consented to pay tribute were by this success encouraged to rebel, and the Servian troops who had taken part in the battle of Konia became insub- Brdinateˆ Indignant at the severity with which they were pun- ished, Lazarus, king of Servia, joined the rebel princes. Murad thereupon returned to Europe with a large force, and sent Chen- dereli Zade Ali Pasha northwards; the fortresses of Shumla, Pravadi, Trnovo, Nicopolis and Silistria were taken by him; Sisman III., rebel king of Bulgaria, was punished and Bulgaria once more subjugated. Ali Pasha then joined his master at Kos- sovo. Here Lazarus, king of Servia, had collected an army of 100,000 Serbs, Hungarians, Moldavians, Walachians and others. On the 27th of August 1389 the greatest of the battles of Kossovo was fought. A lightning charge of Yilderim Bayezid's dispelled the confidence of the enemy, scattering death and dismay in their ranks. The king of Servia was killed and his army cut to pieces, though the Turks numbered but 40,000 and had all the disadvantage of the position. After the battle, while Murad was reviewing

his victorious troops on the field, he was assassinated by Milosh Kabilovich, a Servian who was allowed to approach him on the plea of submission.

Murad maintained a show of friendly relations with the emperor John Palaeologus, while capturing his cities. A review held by him in 1387 at Yeni Shehr was attended by the emperor, who, moreover, gave one of his daughters in marriage to Murad and the other two to his sons Bayezid and Yakub Chelebi. These princes were viceroys of Kermian and Karassi respectively; the youngest son, Sauji Bey, governed at Brusa during his father's absence. Led away by evil counsellors, Sauji Bey plotted with Andronicus, son of the emperor, to dethrone their respective fathers. The attempt was foiled; Andronicus was blinded by his father's orders and Sauji was put to death (1387).

After being proclaimed on the field of Kossovo, Bayezid's first care was to order the execution of his brother Yakub Chelebi, and so to preclude any repetition of I3g"t40 3 ' Sauji's plot. The young prince Andronicus, who had not been completely blinded, sent secretly to Bayezid and offered him 30,000 ducats to dethrone his father John Palaeologus and make him emperor. Bayezid consented; later on John Palaeologus offered an equivalent sum and, since he engaged to furnish an auxiliary force of 12,000 men into the bargain, Bayezid replaced him on the throne. By the aid of these auxiliaries the fort of Ala Shehr was captured (1392), Manuel Palaeologus, son of the emperor, being allowed, in common with many other princes, the privilege of serving in the Turkish army, then the best organized and disciplined force extant. The principalities of Aldin, Menteshe, Sarukhan and Kermian were annexed to Bayezid's dominions to punish their rulers for having joined with the Karamanian prince in rebellion. The exiled princes took refuge with the Kizil Ahmedli, ruler of Kastamuni, who persuaded the Walachians to rebel against the Turks. By a brilliant march to the Danube Bayezid subjugated them; then returning to Asia he crushed the prince of Karamania, who had made head again and had defeated Timur Tash Pasha. Bayezid now consolidated his Asiatic dominions by the capture of Kaisarieh, Sivas and Tokat from Tatar invaders, the relics of Jenghiz Khan's hordes. Sinope, Kastamuni and Samsun were surrendered by the prince of Isfendiar, and the conquest of Asia Minor

seemed assured.

On the death of John Palaeologus in 1391 his son Manuel, who was serving in the Turkish army, fled, without asking leave, to Constantinople, and assumed the imperial dignity. Bayezid determined to punish this insubordination – Constantinople was besieged and an army marched into Macedonia, capturing Salonica and Larissa (1395). The siege of the capital was, how- ever, unsuccessful; the pope and the king of Hungary were able to create a diversion by rousing the Christian rulers to a sense of their danger. An army of crusaders marched upon the Turkish borders; believing Bayezid to be engaged in the siege of Constanti- nople, they crossed the Danube without precaution and invested Nicopolis. While the fortress held out with difficulty Bayezid fell upon the besiegers like a thunderbolt. The first onslaught of the Knights of the Cross did indeed rout the weak irregulars placed in the van of the Turkish army, but their mad pursuit was checked by the steady ranks of the Janissaries, by whom they were completely defeated (1396). King Sigismund of Hungary barely escaped in a fishing boat; his army was cut to pieces to a man; among the prisoners taken was Jean Sans Peur, brother of the king of France. To the usual letter announcing the victory the caliph in Egypt replied saluting Bayezid with the title of ” Sultan of the lands of Rum.”

After the victory of Nicopolis the siege of Constantinople was resumed, and the tower of Anatoli Hissar, on the Asiatic side of the Bosporus, was now built. However, by sending heavy bribes to Bayezid and his vizier, and by offering to build a mosque and a Mussulman quarter, and to allow Bayezid to be named in the weekly prayer, Manuel succeeded in inducing Bayezid to raise the siege. The mosque was destroyed later on and the Mussulman settlers driven out. Between 1397 and 1399 Bayezid overran Thessaly, while in Asia his lieutenant Timur Tash was extending his conquests. Meanwhile Timur (Tamer- lane) had started from Samarkand on his victorious career. With incredible rapidity his hosts spread and plundered from Bagdad to Moscow. After devastating Georgia in 1401 he marched against the Turks. Some of the dispossessed princes of Asia Minor had repaired to Timur and begged him to reinstate them ; accordingly Timur sent to Bayezid to request that this might be done. The tone of the demand

offended Bayezid, who rejected it in terms equally sharp. As a result Timur's countless hordes attacked and took Sivas, plundering the town and massacring its inhabitants. Then, to avenge an insult sustained from the ruler of Egypt, Timur marched south- wards and devastated Syria, thence turning to Bagdad, which shared the same fate. He then retraced his steps to the north- west. Bayezid had taken advantage of his absence to defeat the ruler of Erzingan, a proteg6 of Timur. All attempts to arrange a truce between the two intractable conquerors were in vain. They met in the neighbourhood of Angora. Timur's army is said to have numbered 200,000, Bayezid's force to. have amounted to about half that figure, mostly seasoned veterans. The sultan's five sons were with the army, as well as all his generals; 7000 Servian auxiliaries under Stephen, son of Lazarus, took part in the battle (1402). Prodigies of valour on the part of Bayezid's troops could not make up for the defec- tion of the newly-absorbed levies from Aldin, Sarukhan and Menteshe who went over to their former princes in Timur's camp. The rout of the Turkish army was complete. Bayezid, with many of his generals, was taken prisoner. Though treated with some deference by his captor, who even promised to reinstate him, Bayezid's proud spirit could not endure his fall, and he died eight months later at Ak Shehr.

After the disaster of Angora, from which it seemed impossible that the Ottoman fortunes could ever recover, the princes fled each with as many troops as he could induce to j„

to the insulting tone adopted towards him by Bayezid and to the entreaties of the dispossessed princes of Asia Minor. Most of the latter were reinstated, with the object of reducing the Turkish power. Timur did not cross into Europe, and con- tented himself with accepting some trifling presents from the Greek emperor. After capturing Smyrna he returned to Samarkand (1405). Some years of strife followed between the sons of Bayezid, in which three

of them fell; Mussa, seizing Adrianople, laid siege to Constantinople, and Manuel Palaeo- logus, the emperor, appealed for aid to Mahommed, the other son, who had established himself at Brusa.

In 1413 Mahommed defeated Mussa, and thus remained sole heir to Bayezid's throne; in seven or eight years he succeeded Mahom- in regaining all the territories over which his father med 1., had ruled, whereas Timur's empire fell to pieces 1413-1421. a(. ˆ (jggˆjj f jt s founder. Two years after his accession Mahommed overcame a rebellion of the prince of Kara- mania and recaptured his stronghold Konia (1416), and then, turning northwards, forced Mircea, voivode of Walachia, who in the dispute as to the succession had supported Prince Mussa, to pay tribute. The Turkish dominions in Asia Minor were extended, Amasia, Samsun and Janik being captured, and an insurrection of dervishes was quelled. In 1421 the sultan died. His services in the regeneration of the Turkish power can hardly be over-estimated; all agree in recognizing his great qualities and the charm of his character; even Timur is said to have admired him so much as to offer him his daughter in marriage. The honour was declined, and Mahommed took a bride from the house of Zulfikar. Amid the cares of state he found time for works of public utility and for the support of literature and art; he is credited with having sent the first embassy to a Christian power, after the Venetian expedition to Gallipoli in 1416, and the Ottoman navy is first heard ol in his reign.

At the time of Mahommed's death his eldest son Murad was at Amasia; and, as the troops had lately shown signs of insubordi- nation, it was deemed advisable to conceal the news 'i42iˆi4s'i °ˆ tne su l tan ' s death and to send a part of the army across to Asia. The men, however, refused to march without seeing their sultan, and the singular expedient was resorted to of propping up the dead monarch's body in a dark room and concealing behind it an attendant who raised the hands and moved the head of the corpse as the troops marched past. Shortly after Murad's accession the emperor Manuel, having applied in vain for the renewal of the annual subsidy paid him by the late sultan for retaining in safe custody Mustafa, an alleged son of Bayezid, released the pretender. Adherents flocked to him, and for a whole year Murad was engaged in

suppressing his attempts to usurp the throne.

At last the armies of sultan and pretender met at Ulubad (Lopadion) on the Rhyndacus in Asia Minor; Mustafa's troops fled at the first onset; Lampsacus, where the pretender took refuge, was captured with the aid of the Genoese galleys under Adorno. Mustafa, who had crossed the strait and fled north- wards, was taken, brought to Adrianople, and hanged from a tower of the serai (1422). Murad now laid siege to Constanti- nople to avenge himself on the emperor, and on the 24th of August the desperate valour of the defenders succeeded in driv- irg back an assault led by a band of fanatical dervishes. The siege was raised, however, not owing to the bravery of the defence, but because the appearance of another pretender, in the person of Murad's thirteen-year-old brother Mustafa, under the pro- tection of the revolted princes of Karamania and Kermian, called the sultan to Asia. Mustafa, delivered up by treachery, was hanged (1424) ; but Murad remained in Asia, restoring order in the provinces, while his lieutenants continued the war against the Greeks, Albanians and Walachians. By the treaty signed on the 22nd of February 1424, shortly before his death, the emperor Manuel II., in order to save the remnant of his empire, agreed to the payment of a heavy annual tribute and to surrender all the towns on the Black Sea, except Selymbria and Derkos, and those on the river Strymon. Peace was also made at the ;ame time with the despot of Servia and the voivode of

Walachia, on the basis of the payment of tribute. By 1426 the princes of Kermian and Karamania had submitted on honour- able terms; and Murad was soon free to continue his conquests in Europe. Of these the most conspicuous was that of Salonica. Garrisoned only by 1 500 Venetians, the city was carried by storm (March 1, 1428); the merciful precedent set by Mahommed I. was not followed, the greater part of the inhabitants being massacred or sold into slavery, and the principal churches converted into mosques.

The capture of Salonica had been preceded by renewed troubles with Servia and Hungary, peace being concluded with both in 1428. But these treaties, each of which marked a fresh Turkish advance, were short-lived. The story of the next few years is but a dismal record of aggression and of

reprisals leading to fresh aggression. In 1432 the Turkish troops plundered in Hungary as far as Temesvar and Hermannstadt, while in Servia Semendria was captured and Belgrade invested. In Tran- sylvania, however, the common peril evoked by the Turkish incursion and a simultaneous rising of the Vlach peasantry had knit together the jarring interests of Magyars, Saxons and Szeklers, a union which, under the national hero, the voivode Janos Hunyadi (q.v.), was destined for a while to turn the tide of war. In 1442 Hunyadi drove the Turks from Hermannstadt and, at the head of an army of Hungarians, Poles, Servians, Walachians and German crusaders, succeeded in the ensuing year in expelling them from Semendria, penetrating as far as the Balkans, where he inflicted heavy losses on the Turkish general. Meanwhile, again confronted by a rebellion of the prince of Karamania, Murad had crossed into Asia and reduced him to submission, granting him honourable terms, in view of the urgency of the peril in Europe. On the 12th of July 1444 a ten years' peace was signed with Hungary, whereby Walachia was placed under the suzerainty of that country; and, wearied by constant warfare and afflicted by the death of his eldest son, Prince Ala-ud-din, Murad abdicated in favour of his son Mahom- med, then only fourteen years of age, and retired to Magnesia (1444). The pope urged the king of Hungary to take advantage of this favourable opportunity by breaking the truce solemnly agreed upon, and nineteen days after it had been concluded a coalition was formed against the Turks; a large army headed by Ladislaus I., king of Hungary, Hunyadi, voivode of Walachia, and Cardinal Cesarini crossed the Danube and reached Varna, where they hoped to be joined by the Greek emperor. In this emergency Murad was implored to return to the throne; to a second appeal he gave way, and crossing over with his Asiatic army from Anatoli Hissar he hastened to Varna. The battle was hotly contested; but, in spite of the prowess of Hunyadi, the rout of the Christians was complete; the king of Hungary and Cardinal Cesarini were among the killed. Murad is said to have abdicated a second time, and to have been again recalled to power owing to a revolt of the Janissaries. In 1446 Corinth, Patras and the north of the Morea were added to the Turkish dominions. The latter years of Murad's reign were troubled by the successful resistance offered to his arms in Albania by Scanderbeg

(q.v.). In 1448 Hunyadi, now governor of Hungary, collected the largest army yet mustered by the Hungarians against the Turks, but he was defeated on the famous field of Kossovo and with difficulty escaped, while most of the chivalry of Hungary fell. Little more than two years later Murad died at Adrianople, being succeeded by his son Mahommed.

After suppressing a fresh revolt of the prince of Karamania, the new sultan gave himself up entirely to the realization of the long-cherished project of the conquest of Con- Mahom- stantinople. He began by building on the European medil. the side of the Bosporus the fort known as Rumeli ˆ£J£JJJ r ‘ Hissar, opposite that built by his grandfather Bay- ezid. Tradition avers that but forty days were needed for the completion of the work, six thousand men being employed night and day; guns and troops were hurriedly put in, and all naviga- tion of the Bosporus was stopped. After completing his preparations, which included the casting of a monster cannon and the manufacture of enormous engines of assault, Mahommed

began the siege in 1453. Constantine Palaeologus, the last occu- pant of the imperial throne, took every measure that the courage of despair could devise for the defence of the doomed city; but his appeal to the pope for the aid of Western Christendom was frustrated through the bigoted, anti-Catholic spirit of the Greeks. The defenders were dispirited and torn by sedition and dissen- sions, and the emperor could rely on little more than 8000 fighting men, while the assailants, 200,000 strong, were animated by the wildest fanatical zeal. The siege had lasted fifty-three days when, on the 29th of May 1453, a tremendous assault was successful; the desperate efforts of the Greeks were unavailing, Constantine himself falling among the foremost defenders of the breach. The sultan triumphantly entered the palace of the emperors, and the next Friday’s prayer was celebrated in the church of St Sofia (see Roman Empire, Later).

After some days' stay in Constantinople, during which he granted wide privileges to the Greeks and to their patriarch, the sultan proceeded northwards and entirely subdued the southern parts of Servia. A siege of Belgrade was unsuccessful, owing to the timely succour afforded by Hunyadi (1456). Two years later internal dissensions in Servia brought about the conquest of the whole country by the Turks, only Belgrade remaining in the hands of the Hungarians. The independent princes of Asia Minor were now completely subjugated and their territories finally absorbed into the Turkish dominions; Wala- chia was next reduced to the state of a tributary province. Venice having adopted a hostile attitude since Turkey's con- quests in the Morea, greater attention was devoted to the fleet; Mytilene was captured and the entrance to the straits fortified. The conquest of Bosnia, rendered necessary by the war with Venice, was next completed, in spite of the reverses inflicted on the Turks by the Hungarian king Matthias Corvinus, the son of Janos Hunyadi. The Turks continued to press the Venetians by land and sea; Albania, which under Scanderberg had for twenty-five years resisted the Ottoman arms, was overrun; and Venice was forced to agree to a treaty by which she ceded to Turkey Scutari and Kroi'a, and consented to pay an indem- nity of 100,000 ducats (Jan. 25, 1478). The Crimea was next conquered and bestowed as a tributary province on the Tatar khan Mengli Girai. Mahommed now endeavoured to strike a blow at Rhodes, the stronghold of the Knights of St John, preparatory to carrying out his long-cherished plan of conquering Italy. A powerful naval expedition was fitted out, but failed, an armistice and treaty of commerce being signed with the grand master, Pierre d'Aubusson (1479). But a land attack on southern Italy at the same time was successful, Otranto being captured and held for a time by the Turks. In 1481 the sultan was believed to be projecting a campaign against the Circassian rulers of Syria and Egypt, when he died at Gebze. He is said to have been of a merry and even jocular disposition, to have afforded a generous patronage to learning, and, strange to say for a sultan, to have been master of six languages.

Mahommed II. was the organizer of the fabric of Ottoman administration in the form which it retained practically un- changed until the reforms of Mahmud II. and Abd-ul-Mejid.

He raised the regular forces of the country to a total exceeding 100,000; the pay of the Janissaries was by him increased, and their ranks were brought up to an effective of upwards of 12,000. He established the system whereby the lands conquered by the arms of his troops were divided into the different classes of fiefs, or else assigned to the maintenance of mosques, colleges, schools and charitable institutions, or converted into common and pasturage lands. Many educational and benevolent founda- tions were endowed by him, and it is to Mahommed II. that the organization of the ulema, or legist and ecclesiastical class, is due.

Upon Bayezid II. succeeding to his father a serious revolt of the troops took place, which led to the institution of the regular payment of an accession donative to the Janissaries. At the outset of the reign Bayezid's brother, Prince Jem, made a serious attempt to claim the throne; he was defeated, and eventually took

refuge with the knights of Rhodes, whom Bayezid bribed to keep him in safe custody. The unfortunate prince was led from one European stronghold to another, and, after thirteen years' wandering, died at Naples in 1494 (see Bayezid II.). Freed from the danger of his brother's attacks, the sultan gave himself up to devotion, leaving to his ministers the conduct of affairs in peace and war. But, though of an unambitious and peace-loving temper, the very conditions of his empire made war inevitable. Even when peace was nominally in existence, war in its most horrible forms was actually being waged. On the northern frontier border raids on a large scale were frequent. Thus, in 1492 the Turks made incursions into Carinthia as far as Laibach, and into Styria as far as Cilli, committing unspeak- able atrocities; in 1493 they overran both Styria and Croatia. The Hungarians retaliated in kind, burning and harrying as far as Semendria, torturing and murdering, and carrying off the saleable inhabitants as slaves. In 1494 a crushing victory of the emperor Maximilian drove the Turks out of Styria, which they did not venture again to invade during his reign. In 1496 the temporary armistice between the Poles and Turks, renewed in 1493, came to an end, and John Albert, king of Poland, seized the occasion to invade

Moldavia. The efforts of Ladislaus of Hungary to mediate were vain, and the years 1497 and 1498 were marked by a terrible devastation of Poland by the Ottomans; only the bitter winter, which is said to have killed 40,000 Turks, prevented the devastation from being more complete. By the peace concluded in 1500 the sultan's dominions were again ex- tended. Meanwhile, in June 1499, war had again broken out with Venice, mainly owing to the intervention of the pope and emperor, who, with Milan, Florence and Naples, urged the sultan to crush the republic. On the 28th of July the Turks gained over the Venetians at Sapienza their first great victory at sea; and this was followed by the capture of Lepanto, at which Bayezid was present, and by the conquest of the Morea and most of the islands of the archipelago. By the peace signed on the 24th of December 1502, however, the status quo was practically restored, the sultan contenting himself with receiving Santa Maura in exchange for Cephalonia.

Meanwhile in Asia also the Ottoman Empire had been consolidated and extended; but from 1501 onwards the ambitious designs of the youthful Shah Ismail in Persia grew more and more threatening to its security; and though Bayezid, intent on peace, winked at his violations of Ottoman territory and exchanged friendly embassies with him, a breach was sooner or later inevitable. This danger, together with the growing insubordination of the aged sultan's sons, caused his ministers to urge him to abdicate in favour of Selim, the younger but more valiant. This prince pushed his audacity so far as to attack his father's troops, but the action merely increased his popu- larity with the Janissaries, and Bayezid, after a reign of thirty-one years, was obliged to abdicate in favour of his forceful younger son; a few days later he died. This reign saw the end of the Mussulman rule in Spain, Turkey's naval power not being yet sufficient to afford aid to her co-religionists. It also saw the first intercourse between a Russian tsar and an Ottoman sultan, Ivan III. exchanging in 1492 friendly messages with Bayezid through the Tatar khan Mengli Girai; the first Russian ambassador appeared at Constantinople three years later.

When he had ruthlessly quelled the resistance offered to his accession by his brothers, who both fell in the struggle for the throne, Selim undertook his campaign in Persia, _.. .

having first extirpated the Shia heresy, the prevalent 1512-1520. sect of Persia, in his dominions, where it threatened to extend. After an arduous march and in spite of the mutinous behaviour of his troops, Selim, crushed the Persians at Chaldiran (1515) and became master of the whole of Kurdistan. He next turned against the Mameluke rulers of Egypt, crushed them, and entering Cairo as conqueror (1517), obtained from the last of the Abbasid caliphs, 1 Motawakkil, the title of caliph (q.v.)

‘After the fall of the caliphs of Bagdad (1258), descendants of the Abbasids took refuge in Cairo and enjoyed a purely titular authority under the protection of the Egyptian rulers.

for himself and his successors (see Egypt : History; Mahommedan Period). The sultan also acquired from him the sacred banner and other relics of the founder of Islam, which have since been preserved in the Seraglio at Constantinople. Egypt, Syria and the Hejaz, the former empire of the Mamelukes, were added to the Ottoman dominions. Towards the end of Selim’s reign the religious revolt of a certain Jellal, who collected 200,000 adherents, was the cause of much trouble; but he was eventually routed and his force dispersed near Tokat. While preparing an expedition against Rhodes to avenge the repulse sustained forty years before by Mahommed II., the sultan died at Orash- keui, near Adrianople, at the spot where he had attacked his father’s troops. His reign of eight years had almost doubled the extent of the Turkish dominions.

He was succeeded by his son Suleiman ” the Magnificent,”

in whose long and eventful reign Turkey attained the highest

point of her glory. Selim’s Asiatic conquests had

Su/etoan/., f c . ,. / . •

1520-1566. ‘ e ‘ t ms successor i ree t0 enter upon a campaign in Europe, after the suppression of a revolt of the governor of Damascus, who had thought to take advantage of the new sultan’s accession to restore the independent rule of the Circassian chiefs. In 1521 war was declared against the king of Hungary on the pretext that he had sent no congratulations on Suleiman’s accession. Belgrade was besieged and captured, a conquest which Mahommed II. had failed to effect. In the next year an expedition was undertaken against Rhodes, the capture of which had become doubly important since the acquisi- tion of Egypt. The siege, which was finally conducted by the sultan in person, was successful after six months’ duration; the forts of Cos and Budrum were also taken. The European war was now renewed; in 1526 the sultan, marching from Bel- grade, crossed the Danube and took Peterwardein and Esseg; on the field of Moha.cs he encountered and defeated the Hun- garians under king Louis II., who was killed with the flower of the Hungarian chivalry (see Hungary: History). Budapest hereupon fell to the Turks, who appointed John Zapolya king of Hungary (1528). But the crown of Hungary was claimed by the archduke Ferdinand, brother of the emperor Charles V., as being king Louis’s brother-in-law. This brought Turkey into collision with the great emperor. Moreover, Francis I. of France, who had just been defeated by Charles, sent to the sultan am- bassadors and messages dwelling on the danger of allowing Charles’s power to become too great, and imploring the assis- tance of Suleiman as the only means of preserving the balance of power in Europe. Meanwhile Ferdinand’s troops captured Budapest, driving out Zapolya, who at once appealed to Suleiman for aid. Suleiman decided against Charles, and marched north (1529). Zapolya joined the Turks at Moha.cs, and a joint attack was made on Budapest. After five days’ siege the Austrians were driven out, and Zapolya was reinstated on the throne of Hungary. The Turks then marched on Vienna, which was bombarded and closely invested, but so valiant was the resist- ance offered that after three weeks the siege was abandoned (Oct. 14, 1529). Suleiman now prepared for a campaign in Germany and sought to measure himself against Charles, who, however, withdrew from his approach, and little was done save to ravage Styria and Slavonia. In 1533 a truce was arranged, Hungary being divided between Zapolya and Ferdinand.

During the Hungarian campaign the Shia sectaries had been encouraged to revolt, and the Persians had overrun Azerbaijan and recaptured Tabriz. Suleiman, therefore, turned his arms against them, reaching Bagdad in 1534, and capturing the whole of Armenia. The naval exploits of Khair-ed-din Pasha (see Barbarossa) are among the glories of the reign, and led to hostilities with Venice. After capturing Algiers, an attack by this famous admiral on Tunis was repulsed with the aid of Spain, but in the Mediterranean he maintained a hotly- contested struggle with Charles's admiral, Andrea Doria. Venice was in alliance with Charles, and her possessions were consequently attacked by Turkey by land and by sea, many islands, including Syra and Tinos, falling before

Barbarossa's assaults. Corfu was besieged, but unsuccessfully. At Preveza Barbarossa defeated the papal and Venetian fleets under Doria. In 1540 the fort of Castelnuovo, the strongest point on the Dalmatian coast, was taken by the Vene- tians and recaptured by Barbarossa. Peace was then made on the terms that Turkey should retain her conquests and Venice should pay an indemnity of 300,000 ducats. Friendly relations had subsisted between Suleiman and Ferdinand during the expedition to Persia; but on the death of Zapolya in 1539 Ferdinand claimed Hungary and besieged Budapest with a large force. Suleiman determined to support the claims of Zapolya's infant son, John Sigismund, and in 1541 set out in person. At the end of August he appeared before Budapest, the siege of which had already been raised by the defeat of the Austrians; the infant John Sigismund was carried into the sultan's camp, and the queen-mother, Isabella, was peremptorily ordered to evacuate the royal palace, though the sultan gave her a diploma in which he swore only to retain Budapest during the minority of her son. On the 2nd of September Suleiman entered the city, and to the ambassadors of Ferdinand, who came to offer a yearly sum if the sultan would recognize his claim to Hungary, he replied that he had taken possession of it by the sword and would negotiate only after the surrender of Gran, Tata, Vise- grad and Szekesfehervar. The war now continued vigorously by sea and land. The great expedition of the emperor Charles V. against Algiers ended in failure, his fleet being destroyed by a sudden storm (Oct. 31, 1541);

and his diplo- matic efforts to wean Barbarossa from his allegiance to the sultan fared no better. In 1542 a formal alliance was concluded between Suleiman and Francis I. ; the Ottoman fleet was placed at the disposal of the king of France, and in August 1543, the Turks under Barbarossa, and the French under the duke of Enghien, laid siege to Nice. The town surrendered; but the citadel held out until, on the 8th of September, it was relieved by Andrea Doria. Meanwhile on land Suleiman had taken full advantage of the European situation to tighten his grip on Hungary. The attempt of the imperialists, under Joachim of Brandenburg, to retake Budapest (September 1542), failed ignominiously; and in the following year Suleiman in person conducted a campaign which led to the conquest of Siklos, Gran, Szekesfehervar and Visegrad (1544). Everywhere the churches were turned into mosques; and the greater part of Hungary, divided into twelve sanjaks, became definitively a Turkish province. A truce, on the basis of uti possidetis, signed at Adria- nople on the 19th of June 1547 for five years, between the sultan, the emperor and Ferdinand I. king of Hungary, recognized the Turkish conquests in Hungary; while, for the portion left to him, Ferdinand consented to pay an annual tribute of 30,000 ducats. John Sigismund was recognized as independent prince of Transylvania and of sixteen adjacent Hungarian counties, Queen Isabella to act as regent during his minority.

Suleiman was now free to resume operations against Persia. In the spring of 1548 he set out on his eleventh campaign, which ended in the capture of Erzerum (August 16) and the conquest of Armenia and Georgia. But the Persian War dragged on, with varying fortune, for years, till after Suleiman had ravaged Persia it was concluded by the treaty — the first between shah and sultan — signed at Amasia on the 29th of May isss-_

Meanwhile the war in Hungary had been resumed. Neither side had been careful to observe the terms of the treaty of 1547; the Turkish pashas in Hungary had raided Ferdinand's do- minions, while Ferdinand had been negotiating with Frater Georgy (see Martinuzzi) with a view to freeing Transylvania from the Ottoman suzerainty. When the sultan discovered that Martinuzzi, who was all-powerful in Transylvania, had actually arranged to hand over the country to Ferdinand, he threw the Austrian

ambassador into prison, and in September 1 55 1 sent an army, 80,000 strong, under Mahommed Sokolli over the Danube. Several forts, and the important town of Lippa on the Marosch, fell at once, and siege was laid to Temes- var. This was raised after two months, and Martinuzzi took

advantage of the retirement of the Turks to raise an army and recapture Lippa. Before the surrender of the city, however, he was murdered by Ferdinand's orders on strong suspicion of treachery. The campaign of 1552 was disastrous for the Austrians; the Turks, under the command of Ahmed Pasha, defeated them at Szegedin and captured in turn Veszprem, Temesvar, Szolnok and other places. Their victorious career was only checked, in October, by the raising of the siege of Erlau. In the spring of 1553 the victories of the Persians called for the sultan's presence in the East; a truce for six months was now concluded between the envoys of Ferdinand and the pasha of Budapest, and Austrian ambassadors were sent to Constantinople to arrange a peace. But the negotia- tions dragged on without result; the war continued with hideous barbarities on both sides; and it was not until the 1st of June 1562 that it was concluded by the treaty signed at Prague by Ferdinand, now emperor. Suleiman kept the possessions he had won by the sword, Temesvar, Szolnok, Tata and other places in Hungary; Transylvania was assigned to John Sigis- mund, the Habsburg claim to interference being categorically denied; Ferdinand bound himself to pay, not only the annual tribute of 30,000 ducats, but all the arrears that had meanwhile accumulated. Even this treaty, however, was but an apparent settlement. A year passed before the Latin and Turkish texts of the treaty were harmonized; and meanwhile irregular fighting continued on all the borders. In 1564 Ferdinand died, and was succeeded by Maximilian II. The new emperor attacked Tokaj, which was in Turkish possession; the tribute had been allowed again to fall into arrears; and to all this was added that Mahommed Sokolli, the new grand vizier (1565), pressed for new war to wipe

out the disgrace of the failure of the Ottoman attack on Malta (May-September 1565). In May 1566 the war broke out, Suleiman, now seventy-two years old, again leading his army in person. In August he laid siege to Szigetvar with 100,000 men; but on the 5th of September, while preparations were being made for a final assault, the sultan died. His death was, however, kept secret, and on the 8th the fortress fell.

The reign of Suleiman the Magnificent marked the zenith of the Ottoman pcwer. At the time of his death the Turkish Empire extended from near the frontiers of Germany to the frontiers of Persia. The Black Sea was practically a Turkish lake, only the Circassians on the east coast retaining their independence; and as a result of the wars with Persia the whole Euphrates valley, with Bagdad, had fallen into the sultan's power, now established on the Persian Gulf. The Venetians had been driven from the Morea ard the islands of the Archi- pelago; and, except a strip of the Dalmatian coast and the little mountain state of Montenegro, the whole of the Balkan peninsula was in Turkish hands. In the Mediterranean, Crete and Malta yet survived as outposts of Christendom; but the northern coasts of Africa from Egypt to Morocco acknowledged the supremacy of the sultan, whose sea power in the Mediterranean had become a factor to be reckoned with in European politics, threatening not only the islands, but the very heart of Christen- dom, Italy itself, and capable — as the alliance with France against Charles V. had shown — of being thrown with decisive weight into the balance of European rivalries.

The power of the Ottomans at sea was maintained during this period by a series of notable captains, such as Khair-ed-din t ti h an< * *" s son Hassan, Piale, Torgud, Sali Reis and Sea power, i" R 3 – Of these the two first are separately noticed (see Barbarossa). Piale, a Croatian who had been brought up in the imperial harem and succeeded Sinan as capudan-pasha, crowned a series of victories over the galleys of Andrea Doria by the capture of the island of Jerba, off Tripoli (July 31, 1560). For this he was rewarded with the hand of one of the sultan's grand-daughters. He later became the second vizier of the empire, and, as a supporter of Sokolli, was in power till his death in 1575. Torgud, also the son of Christian parents, was a native of the sanjak of Mentesha in Asia Minor, and began his career

as a soldier in

the Ottoman sea service. After spending some time as a Genoese galley-slave, he turned corsair and became the terror of the Mediterranean coasts. He seized Mahdia, a strong post on a tongue of land about 43 m. south of Susa in Tunisia, and made this the centre of his piracies till, during his absence raiding the Spanish coasts, it was bombarded and destroyed by an expedition sent by Charles V. (September 10, 1550). Torgud was now summoned to Constantinople to answer for piracies committed on the friendly galleys of Venice; but he sailed instead to Morocco, and there for two years defied the sultan's authority. But Suleiman, who needed the aid of the corsairs against Malta, pardoned him, and he was given the command of the expedition against Tripoli, which he captured. He now turned against Corsica, captured Bastia (August 1553) and on his return to Constantinople, laden with booty and slaves, chastised the insurgent Albanians. He was rewarded by Suleiman with the governorship of Tripoli, which he held till his death. He was killed during the unsuccessful attack on Malta, which he commanded (1565). Sali Reis, also by birth a Christian of Asia Minor, was likewise successful as a corsair; he distinguished himself especially at the capture of Tunis, and succeeded Hassan Barbarossa as beylerbey of Algiers.

Other captains carried the Turkish arms down the Arabian and Persian gulfs far out into the Indian Ocean. Of these the most remarkable was Piri Reis, nephew of Kamil Reis, the famous corsair who, under Bayezid II., had swept the Aegean and Mediterranean. Piri sailed into the Persian Gulf, took Muscat, and laid siege to Ormuz. But the approach of the Portuguese fleet put him to flight; some of his vessels were wrecked; and on his return by way of Egypt he was arrested at Cairo and executed. He had compiled a sea-atlas (the Bahrije) of the Aegean and Mediterranean seas, every nook and cranny of which he had explored, with an account of the currents, soundings, landing-places, inlets and harbours.

Another literary seaman of this period was Sidi Ali, celebrated under his poetic pseudonym of Katibi (or Katibi Rumi, to distinguish him from the Persian poet of the same name). He was no more successful than Piri or his successor

Murad in fighting the elements and the Portuguese in the Persian Gulf; but he was happier in his fate. Driven, with the remnant of his ships, into the Indian Ocean, he landed with fifty com- panions on the coast of India and travelled back to Turkey by way of Sind, Baluchistan, Khorassan and Persia. He wrote an account of this three years' journey, for which he was re- warded by Suleiman with an office and a pension. He was the author also of a mathematical work oh the use of the astrolabe and of a book (Muhit, " the ocean ") on the navigation of the Indian seas.

At the close of Suleiman's reign the Turkish army numbered nearly 200,000 men, including the Janissaries, whose total he almost doubled, raising them to 20,000. He im- proved the laws and institutions established by s«rfe™aoX his predecessors and adapted them to the require- ments of the age; to him are due important modifications in the feudal system, aimed at maintaining the fiefs in a really effective condition. The codes of law were by him revised and improved, and he was the first sultan to enter into relations with foreign states. In 1534 Jean de La Foret, a knight of St John of Jerusalem, came to Constantinople as first per- manent French ambassador to the Porte, and in February 1535 were signed the first Capitulations (q.v.) with France.

A short sketch of the administration and state of the country at this time may find place here. Successively transferred from Brusa to Adrianople and thence to Constantinop'e, the seat of government was at first little more than the camp 21ˆ n, f n of a conqueror. After the conquest of the imperial ˆ'iJjLh- city the sultans began to adopt the pomp and splendour £° . of eastern sovereigns, and largely copied the system, t * 1, ""> " ready to hand, of the Byzantine emperors. Affairs of state were at first discussed at the imperial divan, where the great dignitaries were convened at appointed hours. Until the reign of Mahommed the Conqueror the sultan presided in person ; but a rough Anatolian peasant penetrating one day to the council and exclaiming, "Which of you might be the sultan? I've come to make a complaint ! " it

was thought that in future it would be more consonant with the imperial dignity for the sovereign to remain concealed behind a grating where, unseen, he could hear all that was said. Towards the middle of Suleiman's reign even this practice was abandoned, and the sultans henceforth attended the divans only on the dis- tribution of pay to the troops or the reception of a foreign ambas- sador, which occasions were usually made to coincide. The divan accompanied the sultan on military expeditions.

As established by Mahommed II., the officials of the state were divided into four classes: (i) administrative; (2) ecclesiastical; (3) secretarial and (4) military. The administration of kazas, or cantons, was usually entrusted to the cadis and the holders of the more important fiefs; the sanjaks, or departments, were ruled by ala'i beys or mir-i-livas (colonels or brigadiers) , pashas with one horse- tail ; the vilayets, or provinces, by beylerbeys or mir-i-mirans (lord of lords), pashas with two horse-tails; these were all originally military officers, who, in addition to their administrative functions, were charged with the duty of mustering and commanding the feudal levies in war time. Above them were the beylerbeys of Anatolia and Rumelia, who served under the orders of the commander-in-chief. The title of vizier was borne by six or seven persons simultaneously ; the grand vizier was the chief of these and exercised supreme authority, being invested with the sultan's signet. He often com- manded an army in person, and was then given the title of serdar- i-ekrem (generalissimo) ; one of the subordinate viziers remained behind as kaimmakam, or locum tenens. The duties of the other viziers were limited to attending the divan; they were called kubbe or cupola viziers from the fact that the council met under a cupola; they were pashas with three horse-tails, and were attended by large retinues, having generally achieved distinction as beylerbeys. These officers were usually chosen from among the more promising of the youths selected by the devshurme, or system of forced levy for manning the ranks of the Janissaries: hence so many of the statesmen of Turkey were of non-Mussulman origin. Besides these members of the secretarial class, such as nishanjis and defterdars, as well as regular army officers, and occasionally members of the ecclesiastical class, or

ulema, rose to the rank of vizier.

The highest dignitaries of the ecclesiastical class were at first the kazaskers, or military judges, of Europe and Asia ; later the office of Sheikh-ul-Islam was created as the supreme authority in matters relating to the Church and the sacred law. Promotion was regular, but was obtainable only by entering at an early age one of the medresses or colleges; the student, after passing through the suc- cessive degrees of danishmend, mulazim and muderris, became first a molla, then a judge, rising to the higher ranks as fortune and opportunity offered. In the time of Bayezid II. the post of nakib- ul-eshraf, or registrar of the sherif s, or descendants of the Prophet, was created.

The secretarial class consisted of six categories: the nishanjis, the defterdars, the reis, the defter emini, the shakk-i-sani (or second class) defterdars and the shakk-i-salis (or third class) defterdars. The first named were charged with the duty of revising and duly executing the decisions of the divan respecting the assignment of lands to warriors and the apportioning of conquered • territories. They were men of great culture, and many historians, poets and writers belong to this clˆss. The defterdar was practically the minister of finance. The reis was the secretary-general of the divan, and in more modern times became minister for foreign affairs. The defter emini kept the registers for the nishanji, whose place he took on emergency, the others acted as secretaries and clerks.

The military class was divided into two categories: (1) the regular paid troops who were quartered in barracks and were known as ” slaves of the palace “; (2) the feudal levies who received no pay and were called upon to serve only in war-time. The Janissaries (q.v.) belonged to the first category. The rigid regulations for admission to their ranks were soon relaxed : at the close of the Persian war in 1590 their total amounted to 50,000. The regular troops comprised also armourers (jebeji), from 6000 to 8000 men, and six squadrons of cavalry; these were recruited in the same way as the Janissaries, and their numbers were raised by Murad III. to 20,000. There were also bostanjis, or forest-guards, numbering about 5000, besides local troops in distant and frontier provinces, and about 20,000 akinjis, or light troops, in Europe, who carried out forays in the

enemies' country.

The fiefs were not hereditary, and were held directly from the sultan. On the conquest of a country the lands were apportioned by the nishanjis, who first computed the tithe revenueof each village, its population, woods, pasturage, &c. ; and divided it into the three classes of fiefs (khas, ziamet and timar) , or into vakuf (pious endow- ments) or pasturage. Any estate with a revenue exceeding 100,000 aspres was a khas, and was conferred on a prince or on a high dignitary as long as he held his post ; for each 5000 aspres of revenue one armed warrior had to be furnished in war. Fiefs with a revenue of from 20,000 to 100,000 aspres were called ziamets and were conferred on similar terms on inferior officers, usually for life or during good behaviour. Fiefs with a revenue of from 3000 to 20,000 aspres were timars, furnishing one armed warrior for every 3000 aspres' revenue ; the grant of a fief was conditional on obligatory residence. The peasants owning the land remained undisturbed in their

proprietorship, paying to their feudal lord the tithe, as well as the fixed duties on transfer, &c. Abuses in the system first began in the time of Khosrev Pasha, Suleiman's grand vizier.

The governors of the more distant provinces enjoyed a consider- able amount of independence, which in the case of the Barbary states was more or less complete; these entered into treaties with foreign powers, and by their piratical outrages frequently caused the Porte considerable embarrassment. The sherif of the Hejaz, Abu-'l-berekat, made submission to Sultan Sehm I. After the subjugation of the Yemen, the absorption of the holy places was also attempted, and in Suleiman's reign judges were ap- pointed thither from Constantinople. But it was found politic to continue the office of the grand sherif of Mecca in the sherifian family.

The princes of the Crimea were invested with many of the prero- gatives of independence, e.g. that of coining money; the ruler of Transylvania was allowed to retain the royal title, nor were Turkish troops quartered in the country. The

Danubian principalities were also ruled by native princes until the Phanariote period (see Phanariotes).

On the 17th of February 1568, two years after the accession of Suleiman's son Selim, peace was concluded with Austria on the basis of the former terms, the emperor Maximilian having sent ambassadors to congratulate 1566-1574. the new sultan on his accession. A disastrous attack on Astrakhan, with the object of carrying out Sokolli's plan for uniting the Don and the Volga, first brought the Turks into collision with the Russians. Expeditions against the Yemen and Cyprus were successful, but the loss of Cyprus, accompanied as it was by the barbarous murder of the Venetian commander, Marco Antonio Bragadino, by the seras- kier pasha Mustafa's orders, in violation of the terms of the capitulation of Famagusta (August 1571), roused the bitter resentment of the Venetians, previously incensed by Turkish raids on Crete. Already, on the 25th of May, had been concluded the holy league between the pope, Venice and Spain for a new crusade against the infidel, in spite of the efforts of France to prevent the adhesion of the republic. Preparations were hurried on and at the end of September the great allied fleet, under Don John of Austria, sailed into the archipelago. On the 7th of October was fought the naval battle of Lepanto, which broke for ever the tradition of the invincibility of the Turks at sea. The immediate results of the battle were not, however, as decisive as might have been expected. In June 1572 a fresh Ottoman fleet of 250 sail took the sea; and the jealousy of the allies and the incompetence of their commanders made any repetition of their former victory impossible. After a series of indecisive engagements Venice broke from the league and, under the mediation of France, concluded a treaty with the Porte practically on the basis of uti possidetis (March 7, 1 573)- With Spain the war continued, and on the 24th of August 1574 Tunis — which had been taken by Don John of Austria in 1572 — was recaptured by the Turks, who from this new base proceeded, under Sinan Pasha and Kilij Ali, to ravage Sicily. 1 In the same year Selim II. died. Known in history as the " Sot," he had allowed his able grand vizier Mahommed Sokolli to rule the country.

The character of Murad III., who succeeded his father Selim II. at the age of twenty-eight, was not calculated to arrest

the progress of decay within the Ottoman Empire. He was a weakling, swayed by his favourites in the Murad m„ harem, especially by his Venetian wife Safie; and, 1574-1595. though he kept Sokolli in office, he was suspicious of the too powerful vizier, whose wise influence he allowed his minions to undermine. Thus eminent servants of the state such as Mustafa Pasha, Sokolli's nephew — who for twelve years had ruled the sanjak of Budapest with con- spicuous enlightenment and success — were deposed or executed to make way for the nominees of the harem. In even weightier matters the opinion of the grand vizier was slighted. Thus it was against his advice that, at the beginning of 1578, advantage was taken of the disorders arising on the death of Shah Tahmasp of Persia to attack

1 It was ten years before a formal truce was signed with Spain (1584) ; two hundred years passed before the signature of a definitive treaty of peace and commerce (Sept. 14, 1782).

that country. The war lasted for twelve years, during which Tiflis, Shirvan and Daghestan were taken; finally Shah Abbas established himself on the Persian throne and in 1590 made peace with Turkey, who retained her con- quests in Georgia, Azerbaijan and Shirvan. But this short- sighted policy is criticized by Turkish historians, who censure Murad III. for thus weakening the neighbouring Mussulman states such as Persia and Daghestan, thereby facilitating Russia's future expansion at their cost. Sokolli's assassination, on the nth of October 1378, had meanwhile thrown the country into disorder. There was now no authority left to hold in check the corrupt influences of the harem. The avenues to power were through bribery and yet more unspeakable paths; the fiefs which formed the basis of the feudal array were bestowed on favourites' favourites, or sold to the highest bidder, and the sultan himself shared in the corrupt plunder. At last that final expedient of weak

governments, the debasing of the coinage, led to a crisis. In 1589 mutinies of troops took place all over the empire, and in the two following years there were several risings of the Janissaries at Constantinople, the pretext being everywhere that the soldiers were being robbed of their pay. At this juncture a fresh crisis in the relations with Austria arose. The peace concluded in 1568 and thrice renewed (in 1573, 1576 and 1584) had not prevented the continuance of raids and forays, from either side of the frontier, that at times assumed the dimensions of regular campaigns. The climax came in 1593. All through the preceding year Hassan " Tilli," beylerbey of Bosnia, had raided in Croatia, taking border fortresses and driving off the inhabitants into slavery. In June 1593, with an army of 30,000 men, he laid siege to Sissek; the Austrian and Hungarian levies hurried to its relief; and on the 22nd the Turks were routed with immense slaughter on the banks of the Kulpa, Hassan himself, with many other beys and two of the imperial princes, being among the slain. Though not yet formally declared, the " long war " was now in full progress. In August, Sinan Pasha, the grand vizier — now eighty years of age — took command of the troops for the Hungarian War and left Constantinople, dragging with him the Austrian ambassador in chains. The capture of Veszprem and of Raab (1594) and the failure of the archduke Matthias to take Gran seemed to promise another rapid victory of the Ottoman arms; but Sinan was ill-supported from Constanti- nople, the situation was complicated by the revolt of Walachia and Moldavia, and the war was destined to last, with varying fortunes, for fourteen years. On the 16th of January 1595 Murad III. died.

In spite of the internal corruption which, under Murad III., heralded the decay of the empire, the prestige of the Ottomans in Europe was maintained during his reign. Even the emperor had to be content to be treated by the sultan as an inferior and tributary prince; while France had to suffer, with no more than an idle protest, the insult of the conversion of Catholic churches at Constantinople into mosques. In spite of frequent causes of friction, good relations were maintained with Venice, through the influence of the sultana Safie, and the capitulations with the republic of St Mark were renewed in 1589. Those with France were also renewed (July 6, 1581); and capitulations

were signed for the first time with the grand duke of Tuscany (1578) and with England (1580). 1 In the following year permanent diplomatic relations were established by England with the Porte by the despatch of William Harebone as ambassador, Queen Elizabeth urging as her special claim to the sultan's friendship their common mission to fight " idolators."

The new sultan, Mahommed III., Murad's son, succeeded to the throne at a moment when the Turkish arms were suffering reverses in Hungary and in the revolted Danubian provinces; Mahom- the Janissaries, too, were ill-content and mutinous, medin., and to put an end to their murmurings Mahommed 1S95-1603. was p ersuac j e(i by Sinan Pasha to lead them to the war in person. The immediate effect was good; Erlau was

1 They were renewed with England in 1593, 1603, 1606, 1622, 1624, 1641, 1662 and 1675.

captured in October 1596, and a three days' battle in the plain of Keresztes (Oct. 23 to 26) ended in the disastrous rout of the allied troops under the archduke Maximilian and Sigismund, prince of Transylvania. But the Turks did not profit much by their victory. The new grand vizier, Cicala, by his severity to the soldiers, mainly Asiatics, who had shown cowardice in the battle, drove thousands to desert; and the sultan, who had himself little stomach for the perils of cam- paigning, returned to Constantinople, leaving the conduct of the war to his generals. The campaign of 1 598 began with the loss of Raab, and continued unfavourable to the Turks, who lost Totis, Veszprem and Papa, and were hard pressed in Buda- pest. In October want of supplies and a mutiny of the Janis- saries compelled the commander-in-chief to retreat into winter quarters at Belgrade. In 1599 the first peace overtures were made, but came to nothing; and the confused fighting of this and the following year culminated in the capture of Kanizsa by the Turks (September 1600). The attempt of the archduke Ferdinand, at the head of 30,000 men, to retake it a year later was defeated. In August 1602 Szekesfehervar again fell into the hands of the Turks; in November the siege of Buda by the archduke Matthias, who had taken Pest by storm, was raised by the grand vizier Hassan.

Trouble had, however, meanwhile broken out in other parts of the Ottoman dominions. The deserters from Cicala's army, distributed in armed bands throughout Asia Minor, had become centres round which all the elements of discontent gathered, and formed the mainstay of the Jellali sectaries who, at this time, rose in insurrection and ravaged Anatolia. In Con- stantinople, early in 1603, there was, moreover, a serious rising of the spahis; and, finally, in September Shah Abbas of Persia took advantage of what is known in Turkish history as " the year of insurrections " to declare war and reconquer Tabriz. In the midst of this crisis, on the 22nd of December 1603, Sultan Mahommed III. died, and was succeeded by his elder son, Ahmed I., a boy of fourteen.

Though negotiations for peace were at once begun, it was not till three years after Ahmed's accession that the peace of Sitva- torok, concluded on the nth of November 1606, at last put an end to the war in Europe. By this fJlIUVlL' treaty the annual tribute payable by Austria was abolished, but an indemnity of 200,000 florins was paid "once for all " by the emperor, who was henceforth to be given his proper imperial title (padishah) in Turkish official documents. The peace of Sitvatorok (or Zeideva,, as it is also called) marks the close of Turkey's period of conquest. No longer haughtily imposed on the vanquished, as was the case with former treaties, it was submitted to the examination and discussion of both parties before being signed. It freed Austria from the humiliating tribute to which the treaty of 1547 had subjected her, and established relations between the two monarchs on a footing of equality. It was thus the first manifest sign of Turkey's decadence from the glory of Suleiman I.'s reign, when King Ferdinand stooped to call the sultan's vizier his brother, For the remainder of the reign the Persian War was continued fitfully, a treaty of peace, signed in 1611, not being observed.

In 1617 the sultan died, and was succeeded by his brother Mustafa; but the latter being declared incompetent to reign, his brother Osman took his place on the throne. ,, , . .

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Ine war in Fersia was terminated by the renewal 1617-1618 in 1618 of the treaty of 1611, whereby all the con- and

quests effected by Murad III. and Mahommed III. ?g,g?5jl" were given up. Peace, however, left the rebellious Janissaries leisure to engage in plots against the sultan, and in order to occupy them and to remove them from the capital advantage was taken of the king of Poland having intervened in the affairs of Transylvania and the principalities to declare war against him. Osman marched against Khotin, but failed to capture it, and his unpopularity with the army was increased by rumours that he designed to collect such troops as were loyal to him, under pretence of going on

pilgrimage to Mecca, In order to destroy the Janissaries and reform the country. They therefore rose and dethroned him, soon afterwards putting him to death. For a few months Mustafa was replaced on the throne; when he abdicated in Mustafa 1 favour of nis ne P new Murad IV. Turkey seemed to 1622-1623,' be at the point of dissolution. Profiting by the ant mutiny of the army, the Persians invaded Turkey,

Murad iv„ ca p tur i n g Bagdad; at Constantinople and in the 1623-1640. provmces a j ike anarc hy was everywhere prevalent. This continued until the new sultan had acquired age and experience; but, nine years after his accession, he successfully crushed the military rebels, and thereafter ruled with a severity amounting to bloodthirsty cruelty. In 1638 he marched in person against the Persians and succeeded in recapturing Bagdad. Peace was made in 1639, leaving the Turco-Persian frontier practically as it now stands. In the next year the sultan died at the age of thirty-one, being succeeded by his brother Ibrahim. In his reign the Cossacks were driven from Azov and the expedition against Crete was begun, the immediate

cause being the plunder of a Turkish vessel by 'i640 h 'i64S. Maltese corsairs who took their capture to Crete.

War was therefore declared against Venice, to whom Crete belonged (1644), and continued in the island for twenty-

five years.

The anarchy and misgovernment of Turkey now reached such a pitch that Ibrahim was dethroned and murdered, and Mabom- his son Mahommed IV. was proclaimed in his mod iv., stead. For the first eight years of his reign suc- 164&-1687. cess i ve grand viziers were unable to restore order to the country. In 1656 Mahommed Kuprili (g.v.) became grand vizier, and by dint of firmness and resolution repaired the falling fortunes of the country. The fleet was restored, and recaptured Lemnos and other islands which had passed into the hands of the Venetians; the revolts caused by Kuprili's severity were put down, and tranquillity was re- established in Transylvania. After five years' tenure of office the grand vizier died and was succeeded by his son, Ahmed Kuprili. In 1663 the disturbances which had broken out again in Transylvania led to war with Austria. Ahmed Kuprili attacked the Austrians, at first with success, but was routed by Montecuculi at the battle of St Gotthard Abbey and eventually consented to the treaty of Vasvar (Aug. 10, 1664), by which a twenty years' truce was agreed upon; Transylvania was evacuated by both parties, but remained tributary to Turkey. The Kuprilis, both father and son, had by their haughty and uncompromising demeanour done much to alienate the old-standing friendship with France, and at the battle of St Gotthard 6000 French, under Coligny, fought on the Austrian side. The result was that the Turks in retaliation deprived the Catholics, always under the protection of France, of some of their privileges in connexion with the holy places, which were now granted to the Orthodox Church. Meanwhile the Cretan campaign continued, and here also France lent her aid to the Venetians; this assistance could not, however, prevent the capture of Candia in 1669; on the 5th of September of that year Morosini, the Venetian commander, signed a treaty of peace with the Turks by which, after twenty-five years' warfare, they were placed in possession of the fortress of Candia, and with it of the effective rule over the whole island, Venice retain- ing only the fortresses of Suda, Grabusa and Spinalonga, and the islets along the coast.

Dissensions among the Cossacks led to the recognition by Turkey of Doroshenko, the hetman of the Sari Kamish, as ruler of the Ukraine; the Zaporog Cossacks, his antagonists,

applied for aid to Russia. However, Michael Wiesnowiecki, king of Poland, considering the Ukraine as under his protection, sought to intervene, with the result that Turkey declared war against him (1672). The Turks captured Kamenets, Lemberg and Lublin. Hereupon the Poles sued for peace, and a treaty was signed at Buczacs (Oct. 18, 1672) whereby Podolia was ceded to Turkey, the Ukraine was left to the Cossacks, and Poland agreed to pay to Turkey an annual tribute of 22,000

sequins. But John Sobieski, who succeeded shortly afterwards to the throne of Poland, refused to abide by the terms of this treaty; the war was renewed and continued for four years, when the treaty of Buczacs was reaffirmed at Zuravno by both parties, the tribute clause alone being abrogated (Oct. 16, 1676). A few days later Ahmed Kuprili died.

Doroshenko now deserted the Turkish alliance for the Russian; in consequence an expedition was sent into the Ukraine which was both costly and useless. In 1678 the Turks succeeded in taking Cehrin, but their losses were very heavy, and on the 8th of January 1681 a treaty was signed at Radzyn whereby the territory in dispute was ceded to Russia. A revolt of the Hungarian Protestants, in consequence of the persecuting policy of the house of Habsburg, now led to a renewal of the war between Turkey and Austria, due in part to the over- weening ambition of Kuprili's successor, Kara Mustafa, who desired to immortalize his tenure of office by some great exploit, and who cherished dreams of founding for himself a western Moslem Empire. The war is blamed by Turkish historians as unjustifiable and untimely, the country needing reform. A vast Turkish army marched to the walls of Vienna and closely beleaguered the imperial city, from which the emperor and his court fled. All hope seemed lost, when by a brilliant feat of arms John Sobieski, king of Poland, drove away the besiegers in hopeless confusion and saved the cause of Christianity, 1683. This was the signal for a general coalition against Turkey; Venice, Poland and the pope allied themselves with the Aus- trians ; Russia, Tuscany and Malta joined in the attack. Turkey now sought for a rapprochement with France, and endeavoured to bring about her intervention in return for concessions as regards the holy places. But the French had just before

bombarded Algiers and Tripoli, even menacing Chios (Scio), where some pirates had put in with French captives; and the mediation of France was not very actively exercised. One after another the Hungarian forts were captured by the Austrians; the Venetians were equally successful in Greece and the Morea; the Russians pressed on the Crimea, and Sobieski besieged Kamenets. The troops now mutinied and deposed the sultan, placing his brother Suleiman on the throne. But the disorder in the army and the administration continued, and the advance of the Austrians and the Venetians met

with little opposition. In this emergency Mustafa „ , .

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Kuprili (g.v.) was appointed grand vizier (1689). Hjgˆiggi.

His prudent measures at once re-established some degree of order in the army and the fleet, while he sought by a wise tolerance to improve the position and conciliate the sympathies of the non-Moslem subject races. At first eminently successful, he drove the Austrians across the Danube, recapturing Nish, Vidin, Semendria and Belgrade; repulses were also inflicted on the Venetians and the Russians. In the course of the campaign the sultan died, being succeeded by his brother Ahmed. The successes of the Turks were not maintained, the Austrians inflicting on them a crushing defeat at Slankamen, where Mustafa Kuprili was killed, and driving them from Hungary. After four years of disaster Ahmed died; he was succeeded by his nephew t69i-i69S. Mustafa. The tide of success now turned again in favour of the Turks, who recaptured Karansebes and Lippa, and at Lugos exterminated by the weight of over- whelming numbers an Austrian force under Field-marshal Count Friedrich von Veterani (1630-1695), the hero of many victories over the Turks, who was killed in the battle. Elsewhere, too, the Ottoman arms were victorious; in February the Venetians suffered a double defeat in the road- stead of Chios, and the island fell into the hands of the Turks. But Prince Eugene's genius restored the Austrian fortunes, and the Turks were utterly routed at Zenta on the Theiss, losing more than 15,000 men (1697). 1695-1703." Russia, driven from Azov in 1695, succeeded in capturing it in the following year; Venice continued to

press the Turks; in this condition of affairs Hussein Kuprili (q.v.) was called to office; England and Holland urged Turkey to

make peace, and after long negotiations a series of treaties were concluded in January 1699 at Karlowitz, that with Poland being signed on the 16th and those with Austria and Venice on the 26th. The main provisions of these were, that Turkey retained the Banat, while Austria kept Transyl- vania; Poland restored the places captured in Moldavia, but retained Kamenets, Podolia and the Ukraine; Venice restored her conquests north of Corinth, but kept those in the Morea and Dalmatia. On the 4th, Russia concluded a two years' armistice, but remained in possession of Azov, which was formally ceded to her by the definitive treaty of peace signed at Constantinople on the 13th of June 1700. The peace of Karlowitz marks the definitive termina- tion of Turkey's power of offence in Europe. Apart from the heavy losses which it imposed on her, it constitutes a fresh departure in her history, as putting an end to her splendid isolation and rendering her dependent on the changes of Euro- pean politics. It is noteworthy also as being the first occasion on which representatives of the mediating powers took part in the peace negotiations. The grand vizier's efforts to take advantage of the peace to introduce order in the country were unavailing; he was driven from office, and disorders ensued which led to the sultan's abdication.

The troubles were not ended by the accession of Ahmed III., and many high dignitaries of state were sacrificed to the law- lessness and insubordination of the Janissaries. /7(W-%jo" Meanwhile Turkey found herself again involved with Russia. After the defeat of Charles XII. of Sweden at Poltava, this monarch took refuge in Turkey, and was allowed to reside at Bender. The Russians pursued him into Turkish territory; which led to a Turkish declara- tion of war (1710). The Turks succeeded in surrounding Peter the Great near the Pruth, and his army was menaced with total destruction, when the Turkish commander, the grand vizier

Baltaji Mahommed Pasha, was induced by the presents and entreaties of the empress Catherine to sign the preliminary treaty of the Pruth (July 21, 17 n), granting terms of peace far more favourable than were justified by the situation of the Russians. These were: the cession to Turkey of Azov with all its guns and munitions, the razing of all the forts recently built on the frontier by Russia, the renunciation by the tsar of all claim to interfere with the Tatars under the dominion of the Crimea or Poland, or to maintain a representative at Constantinople, and Russia's consent to Charles's return to Sweden. 1 It was long, however, before the latter relieved Turkey of his presence. During the campaign Peter had entered into alliance with the hospodars of Moldavia and Walachia, respectively Demetrius Cantemir and Constantine Brancovano, from whom he had received material assistance. These were naturally dismissed after the defeat of the Russians; the former made good his escape to Russia, the latter was executed. The sultan determined henceforth to appoint Greeks to the princi- palities as more likely to be subservient to his will than the natives hitherto appointed. This system was continued until the Greek insurrection of 182 1.

Russia having thus lost all the advantage gained by the peace of Karlowitz, Venice was next taken in hand, she having invaded the Bosnian frontier and incited the Montenegrins to revolt, besides capturing Turkish ships in the Mediterranean. These acts were held to be infractions of the treaty, and war was declared (17 15). The result was the stamping out of the insurrection in Montenegro and the capture of the whole of the Morea. The fleet also took Tinos and Cerigo, as well as the three forts still remaining to the Venetians in Crete. Turkey's action, and the preparations being made for the siege of Corfu, now brought about the intervention of Austria. Charles VI., weary of the war for the Spanish succession, had shortly before concluded the peace of Rastadt (1715) and was anxious that Venice should not be too hardly pressed. He therefore urged Turkey to give up to Venice certain places in Dalmatia as a

1 The definitive treaty was signed at Constantinople on the 16th of April 1712 (renewed June 5, 1713).

compensation for the loss of the Morea. The Porte was at

first disposed to comply, but the party of resistance finally prevailed. War was declared against Austria (1716); the fleet sailed for Corfu and the army crossed the Save from Belgrade to Semlin. Near Peterwardein a great battle was fought, in which the Austrians completely routed the Turks; pursuing their advantage they took Temesvar and overran the Banat; in 1 7 17 they captured Belgrade, the Turks retreating to Adrian- ople. England and Holland now urged their mediation, and after negotiations the treaty of Passarowitz (Pozharevats in Servia) was signed (July 21, 17 18); Venice ceded the Morea to Turkey but kept the strongholds she had occupied in Albania and Dalmatia; Belgrade, Temesvar and Walachia as far as the Olt were retained by Austria.

Meanwhile relations with Russia continued strained. The peace of 1712 had been concluded only for a term of years, and the neglect of the tsar to carry out its provisions had all but led to a fresh outbreak of hostilities when the intervention of the other powers led in 17 13 to the renewal of the treaty; and in November 1 7 20 it was superseded by a treaty of " per- petual peace," signed at Constantinople. But, though the questions at issue between Russia and Turkey in Poland and the northern littoral of the Black Sea were thus for the time settled, the aggressive designs of Russia in the Caucasus and in Persia soon caused a renewal of anxiety at Constantinople. Again war all but broke out; but, through the intervention of France, a treaty of partition was signed at Constantinople on the 23rd of June 1724, whereby the shores of the Caspian from the junction of the Kur and the Arras (Araxes) northwards should belong to Russia, while the western provinces of Persia should fall to the share of Turkey. These provinces had not yet been conquered by Turkey; and, when a part of them had been taken, a treaty was concluded with the Afghan Ashraf Shah, who had risen to supreme power in Persia, by which Turkey should retain them on condition of recognizing him as shah (Oct. 23, 1727). But Nadir Kuli Khan came forward as the champion of Shah Tahmasp II., the rightful ruler, and drove the Turks from these provinces, capturing Tabriz. This news caused consternation at Constantinople; the inevit- able revolt of the Janissaries followed, headed this time by one Patrona Khalil, and the sultan was forced to abdicate in favour of his nephew Mahmud. With difficulty

the rebellion was suppressed; in 1733 the war with Persia was resumed, and after three years of fighting Nadir lr f“gˆ” succeeded in 1736 in inducing Turkey to recognize him as shah of Persia and to restore the territory captured since the reign of Murad IV.

Russia’s designs on Poland now brought about war. On the death of Augustus II., king of Poland (1733), France had put forward as candidate Stanislaus Leszczynski, war of Louis XV. ‘s father-in-law. Austria and Russia Polish supported Augustus III., elector of Saxony, and Suecess ‘ OD – the empress Anne marched an army into Poland and compelled the election of her candidate, though Russia had bound herself by the treaty of 1711 and again by that of 1720 to abstain from all interference with Poland. France thereupon declared war against Russia and her ally Austria, and her envoy, the marquis de Villeneuve, urged Turkey to join by representing the danger of allowing Russian influence to extend. Turkey had cause of complaint against Russia for refusing to allow the Crimean troops to march through Daghestan during the Persian campaign, and on the 28th of May 1736, war was declared, in spite of the efforts of England and Holland. The Russians had not waited for the formal declaration of war; and on the very day that this was notified by the hanging out of the horse-tails before the Seraglio at Constantinople a Russian army under Marshal Munnich stormed the ancient wall that guarded the isthmus of the Crimea. While Munnich conducted a systematic devastation of the peninsula, forces were detached under his lieutenants Leontiev and Lascy to attack Kinburn (Kiiburun) and Azov. Both these places fell; and in July of the following year Munnich captured Ochakov.

Meanwhile the western sea-powers had made earnest efforts to restore peace, and in August 1737 the plenipotentiaries of the combatant powers met at Niemirov to arrange terms under their mediation. But Austria, which had made a great show of seconding their efforts, now

began to unmask her real aims, which were to take advantage of Turkey's embarrass- ments to push her own claims in the principalities and the Balkan Peninsula. To the refusal of the sultan's representatives to concede any of her demands, Austria replied by revealing the existence of an alliance with Russia, which she threatened to make actively offensive if her terms were refused. In November the conferences broke up; in the spring of the following year Austrian divisions advanced simultaneously into Bosnia, Servia and Walachia; and in July the main army, under the prince of Lorraine, crossed the frontier and captured Nish. In spite of this initial success, however, the campaign proved disastrous to the Austrians; and France, which had meanwhile come to terms with the emperor, endeavoured to mediate a peace in conjunction with Sweden and Holland. But the Ottomans, though the negotiations continued throughout 1738, were in no hurry to come to terms; for the tide of war had turned against both Austrians and Russians; Ochakov and Kinburn were recaptured; and the victorious Turks crossed the Danube and penetrated far into the Banat. Not till the middle of 1739 would they consent to negotiate seriously for peace. The con- ferences were opened at the close of July in the camp of the grand vizier, who was pressing Belgrade hard and demanded the surrender of the city as a sine qua non. This was conceded; on the 1st of September, under the mediation of the French ambassador Villeneuve, the preliminaries were signed; on the 4th the grand vizier made his formal entrance into the city, where on the 18th the definitive treaties with Austria and Russia were signed. By the former Austria gave up Belgrade and the places on the right bank of the Save and the Danube which she had gained by the treaty of Passarowitz, together with the Austrian portions of Walachia. The treaty with Russia provided that Azov should be razed and its terri- tory devastated to form a barrier, Russia having the right to erect a new fortress at Cherkask, an island in the Don, near Azov, and Turkey to build one on the border of Kuban near Azov. But Taganrog was not to be refortified, and Russia was to have no war-ships on the sea of Azov or the Black Sea. The Kabardias, great and little, were to remain independent, to serve as a barrier between the two empires. By the 12th article the Ottoman government agreed " amicably to discuss " the question of recognizing the tsar's

claim to the imperial title, and by the 13th admitted his right to send to Constantinople representatives of whatever rank he might judge fitting (Noradounghian, Recueil, i. 258).

Scarcely two years after the signature of the treaty of Belgrade sinister rumours reached Constantinople from Persia, where Nadir Shah, on his return from India, was planning an attack on Mesopotamia. The war, which broke out in 1743, was waged with varying fortunes, and the peace by which it was concluded on the 5th of September 1746, beyond stipu- lating for a few privileges for Persian pilgrims to the holy places, altered nothing in the settlement arranged ten years before with Murad IV. In the war of the Austrian Succession, which followed the accession of Maria Theresa to the Habs- burg throne, Turkey, in spite of the urgency of France, would take no share, and she maintained the same attitude in the disorders in Persia following the death of Nadir Shah.

In 1754 the Sultan Mahmud died. He was succeeded by

. ,„ his brother Osman, whose three years' reign

Osman III., – 1 j i_ i- • 1 , ■,

175*-17S7. was marked by no political event of special

importance. Osman III. was succeeded by his

cousin Mustafa. At the outset of his reign negotiations

„ . . ,„ were actively pursued for the conclusion of a

Mustafa 111., ... „ . , ,,.

17S7-I773. treat y with Prussia, to counteract the alliance

between France and Austria contracted in 1756;

and these resulted in the signature of Capitulations, or a treaty

of friendship and commerce (March 22, 1761). The attitude

of the northern powers, however, and especially of Russia, towards Poland was beginning to excite the sultan's

liveliest suspicions; and these the accession, in 1762, of the masterful Catherine II. to the Russian throne was not calculated to allay. In 1763, Catherine took advantage of the death of Augustus III. of Poland to force her favourite, Stanislaus Poniatowski, on to the vacant throne. From the committee of patriots at Warsaw complaints and warnings were carried to Constantinople; and the cession of Podolia was offered as the price of a Turkish attack on Russia. The sultan, though inclined to take up the cause of the Polish dissidents, was slow to move, and contented himself for a while with protests and threats. But the aggressive policy of Russia in the direction of the Caspian and Black Seas became more and more evident; complaints reached the Porte of a violation of the neutrality of Kabardia, of a seditious propaganda in Moldavia by Russian monks ; and of Russian aid given to the malcontents in Servia and Montenegro. Added to all this was the news of the continual Russian military aggressions in Poland, against which the Catholic confederation of Bar continued to appeal for aid. At last, on the 6th of October 1768, on the refusal of the Russian minister to give guarantees for the withdrawal of the Russian troops from Poland and the abandonment of Russia's claim to interfere with the liberties of the republic, war was declared and the Russian representative was imprisoned in the Seven Towers.

The war that followed marks an epoch in the decay of the Ottoman Empire and in the expansion of Russia. When, in the spring of 1769, the first serious campaign was opened by a simultaneous attack by three Russian armies on the princi- palities, the Crimea and the buffer state of Kabardia, the Turks, in spite of ample warning, were unprepared. They were hampered, moreover, by an insurrection , in the Morea, where a Russian expedition under Orlov had stirred up the Mainotes, and by risings in Syria and Egypt. It was not, however, till September that the fall of Khotin in Bessarabia marked the first serious Russian success. The following year was more fatal. In May the Ottoman fleet was attacked and destroyed off Cheshme, and the Russian war-ships threatened to pass the Dardanelles. In June Romanzov's victory at Kartal made him master of the principalities, and by November the fortresses of Izmail and Kilia, guarding the passage of the Danube, and those of Akkerman and Bender on the Dniester had fallen into the

hands of the Russians. The campaign of 1 77 1, which opened with a gleam of success in the capture of Giurgevo, proved yet more disastrous to the Turks, the Russians passing the Danube and completing the conquest of the Crimea. Prussia and Austria now offered their mediation; and in June conferences were opened at Focshani, which led to no result. In the following year a conference, from which the Austrian and Prussian representatives were excluded, was opened at Bucharest (November 1772). In February 1773 the Russian plenipotentiary delivered his ultimatum, of which the most important demands were the cession of Kerch, Yenikale and Kinburn, the free navigation of the Black Sea and Archipelago for Russian trading and war vessels, and the recognition of the tsar's right to protect the Orthodox subjects of the sultan. These conditions were submitted to Constantinople, and rejected after a stormy debate in the divan. The conference of Bucharest now broke up, and the war continued. The successful defence of Varna and Silistria seemed to justify the stubbornness of the Porte.

On the 24th of December 1773 Mustafa III. died, and was succeeded by his brother Abd-ul-Hamid I., a weakling, from whose character nothing could be expected to Abd-ul- retrieve the now desperate fortunes of the war. Hamidi., The exhaustion of the treasury was evidenced by 1773-1789. the absence of the usual donative to the troops; and the demoralization in both army and court made further resis- tance useless. At the beginning of July the Russians, under Kamenskiy, were before Shumla; and a few days later the grand vizier and his army, their communications with the

capital severed, were surrounded in the fortress. Negotia- tions for peace were now opened and on the 21st of July — chosen by the Russian plenipotentiary as the anniversary of the humiliating convention of the Pruth — the treaty of Kuchuk Kainarji was signed. Its terms were the most onerous as yet imposed on the Ottoman sultans. The Tatars

Treaty or from the frontier of Poland to the shores of the Kuchuk Caspian, including those of the Crimea and Kuban, Kainarji, were declared independent under their own khan of the race of Jenghiz, saving only the religious rights of the sultan as caliph of Islam. Russia, however, retained the fortresses of Kerch, Yenikale and Kinburn, with the desert country between the Bug and the Dnieper, while Ochakov was left to the Turks. Bessarabia, with the fortresses of Akkerman, Izmail and Kilia, was restored to Turkey. Moldavia and Walachia were likewise restored, but under conditions which practically raised them to the position of semi-independent principalities under Russian protection (art. xvi.). Azov and its district were annexed to Russia, and the two Kabardias were transferred subject to the consent of the khan of the Crimea. Russia undertook to evacuate Mingrelia and Georgia. The recognition of the imperial title (padishah) was at last conceded to the Russian tsars.

Commerce and navigation in the Black Sea and the Mediterranean were free to both countries. Turkey was to pay a war indemnity of 15,000 purses, the Russian fleet was to withdraw and the islands captured by it to be restored. By article vii. of the treaty the Sublime Porte undertook " to pro- tect the Christian religion and its churches " and conceded to the ministers of Russia the specific right to " make representations in favour of the new church " which, under article xiv. of the same treaty, the Russian government was empowered to build, in addition to the embassy chapel " in the street named Bey Oglu." This article is of great historical importance as forming the basis of the later claim of Russia to possess by treaty the right to protect the Orthodox subjects of the Porte. 1 Poland, the original cause of the war, was not even mentioned in the treaty, having been partitioned in 1772.

After yielding to these hard conditions, Turkey took advantage of her respite to strengthen the frontier defences and to put down the rebellions in Syria and Egypt; some effort was also expended on the hopeless task of reforming the Janissaries. It was not long before Russia showed that it was not the in- dependence but the absorption of the Crimea which she desired. In 1779 a rupture on this account was only averted through the mediation of the French ambassador, coupled with the fact that Turkey was in no condition to enter upon hostilities, owing to the

outbreak of plague in her army. The Porte, unable to resist, was obliged to consent to the convention of Ainali Kavak (March 10, 1779) whereby the Russian partisan, Shahin Girai, was recognized as khan of the Crimea, the admission of Russian vessels to navigate Turkish waters was reaffirmed and Russia's right of intervention in the affairs of the Danubian principalities was formally recognized. Five years later Potemkin induced the chiefs of the Crimea and Kuban to hold a meeting at which the annexation of their country to Russia was declared, Turkey giving her consent by a convention, signed at Constantinople, on the 8th of January 1784, by which the stipulations as to the liberty of the Tatars contained in the treaty of Kuchuk Kainarji and the convention of Ainali Kavak were abrogated. In 1786 Catherine made a triumphal progress through the Crimea in company with her ally, Joseph II., who had succeeded to the imperial throne on the death of his mother. These events and the fric- tion caused by mutual complaints of infringements of the treaty stirred up public opinion in Turkey, and the British ambassador lent his support to the war party. In 1788 war was declared, but Turkey's preparations were inadequate and the moment was ill-chosen, now that Russia and Austria were in alliance, a fact of which Turkey became aware only when the horse-

1 See G. F. de Martens, Recueil des traitis, 1st series, vol. ii. p. 286, also Noradounghian, Recueil, p. 319.

tails were planted for the campaign. The Turks drove back the Austrians from Mehadia and overran the Banat (1789); but in Moldavia Romanzov was successful and captured Jassy and Khotin. After a long siege Ochakov fell to Potemkin, and all its inhabitants were massacred. This news affected the sultan so deeply as to cause his death.

Selim, the late sultan's nephew, who succeeded, made strenuous preparations for continuing the war, but his generals were incompetent and his army mutinous; expeditions for the relief of Bender and Akkerman tj89-isoj. failed, Belgrade was taken by the Austrians, Izmail was captured by Suvorov, and the fall of Anapa com- pleted the series of Turkey's disasters. Sultan Selim was anxious to restore his country's prestige by a victory before making peace, but the condition of his troops rendered this hope

unavailing; while Prussia, though on the 31st of January 1790 she had signed an offensive treaty with Turkey, 2 gave her no help during the war. Accordingly a treaty was signed with Russia at Jassy (Jan. 9, 1792) by which the Crimea and Ochakov were left to Russia, the Dniester was made the frontier in Europe, and the Asiatic frontier remained unchanged. Joseph II. had died, and his successor, Leopold II., was averse from the Russian alliance. Through the mediation of England, Holland and Prussia, Turkey and Austria concluded on the 4th of August 1 791 the treaty of Sistova, by which Belgrade and the other conquests made by Austria were restored.

The conclusion of peace was welcomed by Selim as the oppor- tunity for carrying out reforms, of which he thoroughly realized the necessity in every branch of the administration, and especi- ally in the army, to whose defects the disasters of the state were due. Accordingly it was decided to form troops known as nizam-i-jedid, affiliated to the Janissaries so as to disarm the jealousy of the latter, properly drilled and wearing a dis- tinctive uniform. The fleet was reorganized, military schools were established, and skilled instructors were obtained from Europe. These reforms excited much opposition, which was at first unheeded. Meanwhile Turkey came into conflict with France. Throughout all the vicissitudes of the ,

The War with France.

Revolution the relations between the two states had remained unimpaired, and Turkey had been one of the first countries to recognize the republic. Bonaparte's sudden occupation of Egypt (1798) came therefore as a complete surprise. This expedition was in reality directed against English rule in India. Nelson's destruction of the French fleet at the battle of the Nile disconcerted Bonaparte's plans; he hoped to pursue his designs through Syria, and laid siege to Acre, which, however, successfully held out. Turkey now joined Great Britain and Russia against France. 3 The Russian and Turkish fleets attacked and took the Ionian Islands, which had become French by the Jreaty of Campo Formio, and certain towns, hitherto unconquered, on the Albanian coast. An expeditionary force was also sent against Bona- parte, now practically blockaded in Egypt. This was routed and driven into the sea at Abukir (July 15,

1799). For the subsequent operations in Egypt, which ended in its evacuation by the French after the British victory at Alexandria, see Egypt: History.

Meanwhile in Turkey disorder prevailed in almost every province of the empire, and the local governors in many places became entirely independent, oppressing the people under their rule and often driving them to. dˆˆz." revolt. This was notably the case in Servia, where the temporary domination of Austria, to which the treaty of Sistova (1791) put an end, had had the effect of awakening the national spirit of the people. But no armed manifestation of revolt had taken place until the lawless and savage conduct of the Janissaries, who had made themselves masters of the country, assisted by the notorious governor of Vidin, Pasvan Oglu,

2 Text in Martens, Recueil, 2nd series, vol. iv. p. 466.

3 The treaty of alliance with Russia was signed on the 23rd of December 1798, that with Great Britain on the 5th of January

1799.

and his band of outlaws, drove the peaceful rayas to rebel. The insurgents chose as their captain one George Petrovich, nicknamed Kara Georgi (i.e. Black George), and under his able leadership succeeded in capturing Belgrade and in breaking the power of the Janissaries. The Porte also sent an army against Pasvan Oglu, but after reducing him to submission reinstated him in his government. A serious outbreak took place at Adrianople in 1804, where 20,000 of the new troops had been sent, ostensibly to put down the revolt in Servia, but really to try to bring about the reform of the European provinces. So strong was the opposition that the troops were recalled, and the anti-reform party was greatly strengthened. The Wahhabi movement in Nejd now began to assume serious proportions. These religious sectaries attacked and plundered all Mussulmans not

conforming to their peculiar tenets; they overran Kerbela and the Hejaz, sacking the holy cities and closing the pilgrim routes. Only in the reign of Mahmud II. were they put down (see Wahhabis).

In 1802, by a treaty of peace signed at Paris on the 25th of June, France resumed her former terms of friendship with Complies- Turkey. Russia, desirous of deriving some return tioas with for the support which she had given the sultan Russia. during his rupture with the French, induced the Porte to address to her a note in which the right of interven- tion in the affairs of the principalities, conferred on her by the treaty of Kainarji and reaffirmed in the convention of Ainali Kavak, was converted into a specific stipulation that the hospodars should be appointed in future for seven years and should not be dismissed without the concurrence of the Russian ambassador at Constantinople. In pursuance of this agreement Constantine Ypsilanti was appointed to Walachia and Alex- ander Muruzi to Moldavia — both devoted to Russian interests. Their intrigues in favour of the Greek and other revolutionary movements induced the Porte to dismiss them in 1806, contrary to the arrangement of 1802. Russia and England hereupon used threatening language, and Turkey replaced the hospodars. But war was nevertheless declared on the 27th of December 1806, and Russia occupied the principalities. The British ambassador sought by every means in his power to induce Turkey to give way to Russia, going so far as to guarantee the withdrawal of the Russian troops from Moldo- Walachia if the Porte remained at peace, and threatening that if Turkey persisted in her opposition England would join with Russia against her. But France's influence, backed by the strong personality of her ambassador, General Sebastiani, was suffi- cient to enable the sultan to withstand these arguments, and the British ambassador broke off relations and withdrew to the fleet at Tenedos (February 1807). Helped by a strong south wind, the British war-ships passed up the straits and anchored off the Seven Towers. An ultimatum was presented order- ing Turkey within twenty-four hours to dismiss the French ambassador, hand over the Turkish fleet, and make peace with Russia. With Sebastiani's encouragement the Porte resisted these demands; in one day a thousand guns were ranged along

both sides of the Bosporus; and after a stay of ten days the British fleet was ordered to leave, and was considerably damaged by the fire of the forts while passing down.

Meanwhile the sultan's whole efforts were directed towards the reform of the country; the newly -instituted militia was Revolt in every respect a success; it grew in numbers, against a nd hopes were entertained that it would gain Seiim. popularity. But the Janissaries and the corrupt officials were fundamentally opposed to the scheme, and the conservatives joined with them against such reforms of European origin. The rulers of the provinces shared these views; the consequence was disquiet and confusion throughout the empire. At this difficult moment the army was obliged to march to the Danube, leaving the government in the hands of men hostile to reform. In 1807 the garrisons of the Black Sea forts at the entrance of the straits rose in rebellion, headed by one Kabakji Mustafa, and killed their officers. The sultan sought to appease them by pacific means, but the movement

spread to the Janissaries, who insisted upon the abolition of the new troops. But even this concession did not satisfy them; they dethroned Selim and proclaimed his nephew Mustafa. The new sultan was obliged to abolish all the reforms, and during practically the whole of his iso7-w08." fourteen months' reign the Tanissaries were in rebellion, even while facing the Russians. All officers who were partisans of the reforms were obliged to take refuge in flight; and Turkey's position would have been desperate but for the conclusion of the peace of Tilsit (July 7, 1807) between Russia and France, to which Turkey also became a party. The army hereupon retired to Adrianople, and the powerful pasha of Rustchuk, Mustafa Bairakdar, who had distinguished him- self by his resistance to the Russians, and who thoroughly shared Selim's desire for reform, was now induced by the many officers who held similar views to march on Constantinople to restore Selim to the throne. But he arrived too late; Selim had already been killed; the unworthy Mustafa, was put to death, and Mahmud, the sole survivor of the house of Osman, became sultan. Mustafa Bairakdar, who ^^"Zin" was now raised to the dignity of grand vizier, suc- ceeded in inspiring the Janissaries with a wholesome respect, due to their dread of the 10,000 irregulars known as kirjalis by whom he was accompanied.

The remnants of the abolished new troops were collected and formed into regiments affiliated to the Janissaries under the name of seymen-i-jedid; the dignitaries of state were called upon to take an oath of fidelity and loyalty. The feast of Ramazan hereupon occurring, the grand vizier unwisely allowed his own troops to disperse. Taking advantage of this opportunity, the Janissaries rose by night and besieged the house of the grand vizier, who eventually blew himself up in the arsenal. Fighting became general and extended to the fleet, which bombarded the capital. The Janissaries slaughtered all the " new troops " whom they met, and finally extorted an amnesty from the terrified government.

After the peace of Tilsit an armistice had been agreed upon with Russia (Aug. 24, 1807). Turkey was at this time the only neutral state in Europe; it was of vital im- treaty of portance that she should not be absorbed into the Bucharest; Napoleonic system, as in that case Russia would Troubles la have been exposed to a simultaneous attack from Servla ' France, Austria, Turkey and Persia. Accordingly, though France made every attempt to induce Turkey to adopt her side, the young Stratford Canning succeeded in causing the resumption of the peace negotiations at Bucharest, broken off through Russia's terms being considered too onerous, and followed by the capture of Izmail and Bender. The British diplomatist secured his first triumph in the signature of the treaty of Bucharest (May 28, 181 2) whereby Khotin, Bender, Kilia and Akkerman were left to Russia; the frontier was fixed at the Pruth; the Asiatic boundary was slightly modified. The treaties as to the principalities were renewed; and though Servia was restored to the direct rule of Turkey it was stipulated that clemency was to be observed in the Porte's dealings with the country, which was given the power of regulating its own affairs.

The vagueness of these latter provisions at once gave rise to disputes, and in 1813 the Turkish troops occupied the country. The new pasha of Belgrade appointed one Milosh Obrenovich headman of his own district, but a few years later Milosh raised a successful revolt, drove out the Turks, and re-established Servian semi-independence. Karageorge, who had fled to Austria in 181 2, was induced to return, but Milosh caused him to be murdered, and in 181 7 was by

a popular vote named hereditary prince of Servia.

The affairs of Servia, however, were not the only question left unsettled by the treaty of Bucharest. In the course of the war with Persia Russia had received permission from the Ottoman government to use, for a limited time, the easy road from the Black Sea to Tiflis by way of the valley of the Rion (Phasis) for the transport of troops and supplies, and this permission had been several times renewed. Wishing to make

this important privilege permanent, Russia by secret articles of the Treaty of Bucharest had secured the cession of this dis- trict, in return for an undertaking to destroy the forts of Kilia and Izmail on the Danube. But the sultan refused to ratify these articles, and the relations between Russia and Turkey were therefore determined by the patent treaty only, which positively stipulated for the evacuation by the Russians of every spot occupied by them on Turkish soil in Asia. When the Russians showed no signs of withdrawing from the valley of the Rion, the sultan threatened to renew the war, the sole result of which was to reveal the determination of the tsar not to be bullied into concessions. The dispute, at first of little importance, developed in seriousness during the next year or two, owing to the avowed intention of Russia, which by conquest or treaties with independent chiefs had acquired all the high land between the Caspian and the Black Sea, to take possession of the low lands along the coast, between Anapa and Poti, of which the sultan claimed the sovereignty.

Such was the situation when the question of a European guarantee of Turkey was raised at the Congress of Vienna. In view of the multiple dangers to which the Otto- Vienaa. man Empire was exposed, both from without and from within, and of the serious consequences to the world's peace which would result from its break-up, there was a strong feeling among the powers in favour of such a

guarantee, and even the emperor Alexander was willing to agree to it in principle. But nothing could be done until the Porte should have come to terms with Russia as to the Treaty of Bucharest; for, as the British ambassador, Sir Robert Liston, was instructed to point out to the Ottoman government, " it is impossible to guarantee the possession of a territory of which the limits are not determined." With the consent of the tsar, it was proposed to submit the questions at issue to the decision of Great Britain, France and Austria ; and the Porte was informed that, in the event of its accepting this arrangement, the powers would at once proceed to guarantee the integrity of the Ottoman Empire. But the sultan could not bend his pride to suffer foreign intervention in a matter that touched his honour, and the return of Napoleon from Elba threw the Eastern Question into the background. The Ottoman Empire thus remained outside the European concert; Russia main- tained her claim to a special right of isolated intervention in its affairs; and the renewal of war between Russia and Turkey was only postponed by the preoccupation of Alexander with his dream of the " Confederation of Europe."

Meanwhile, within the Ottoman Empire there was every sign of a rapidly approaching disintegration. In Egypt Mehemet Ali had succeeded in establishing himself as quasi- independent ruler of the country. By his action during Napoleon Bonaparte's invasion, and later when the British fleet after leaving Constantinople in 1807 proceeded to Egypt, he had to some extent acquired the goodwill of the Turkish government. In 181 1 he was called upon by the Porte to put down the Wahhabi insurgents (see Arabia, vol. ii. p. 268), his success in this matter, and especially in the recovery of the holy cities, adding greatly to his prestige.

Sultan Mahmud now devoted himself to breaking the over-grown power of the local governors, which had for many years practically annihilated that of the central authority. Their extortions impoverished the whole country, yet the abolition of the system might perhaps have been carried out more gradually and with greater precaution, and Turkey more than once felt the want of their aid, questionable as its value often was. Thus Greek Ali (q.v.),~ Pasha of Iannina, the most famous of Revolt. these, though insubordinate and inclined to intrigue with foreign powers

in the hope of making himself indepen- dent, had used his influence to keep the Greeks quiet; and it was only after his power had been broken in 182 1 that the agitation of the Hetairia issued in widespread dangerous revolt. The first hope of emancipation from the Turkish yoke had been founded by the Greeks on Peter the Great, who had planned the expulsion of the Turks from Europe and had

Egypt

caused the inscription " Petrus I., Russo-Graecorum Monarcha " to be placed beneath his portrait engraved at Amsterdam. Catherine II. following in his footsteps, aspired to found a Greek empire, the throne of which was to be occupied by her nephew, Constantine, specially so baptized, and brought up by Greek nurses (see Constantine Pavlovich). During the war of 1770 the Greeks had risen in an abortive rebellion, promptly crushed by the Turks. But the idea of liberation continued to grow, and about 1780 the Society of Friends (‘Eraipla twv 4>i\t.KG)v) was founded at Bucharest by the fervent patriot and poet, Constantinos Rhigas (q.v.). The secret organization, temporarily checked by Rhigas’s arrest and execution in 1798, was revived at Odessa in 1814; it extended throughout Turkey, and in 1820 the insurrection took shape, a favourable opportunity being afforded by the outbreak of hostilities between Ali Pasha and the Porte. (See Greek Independence, War of.)

On the 6th of March 1821 Prince Alexander Ypsilanti, son of the hospodar Constantine, and a general in the Russian service, crossed the Pruth, proclaiming the revolt of the Greeks against the sultan and the intention to restore the Greek Empire of the East. But in the principalities, where the Vlach peasants regarded the Phanariots as worse oppressors than the Turks, the movement had little chance of success; it was doomed from the moment that the emperor Alexander disavowed Ypsilanti’s claim to his support (see Alexander I.). After some initial successes the Greeks were finally routed at the battle of Dragashani (June 19, 1821). It was far otherwise with the insurrection which broke out at the beginning of April in the Morea. The Mussulman population of the Morea, taken unawares, was practically exterminated during the fury of the first few days; and, most fatal of all, the defection of the Greeks of

the islands crippled the Ottoman navy by depriving it of its only effective sailors. The barbarous reprisals into which Sultan Mahmud allowed himself to be carried away only accentuated the difficulty of the situation. The execution of the patriarch Gregorios, as technically responsible for the revolt, was an outrage to all Christendom; and it led at once to a breach of diplomatic relations with Russia.

To prevent this breach developing into war was now the chief study of the chanceries. Public opinion throughout Europe was violently excited in favour of the Greeks; and this Philhellenic sentiment was shared even by some of the statesmen who most strenuously deprecated any interference in their favour. For at the outset Metternich was not alone in main- taining that the war should be allowed to burn itself out " beyond the pale of civilization." The mutual slaughter of barbarians in the Levant seemed, even to George Canning, a lesser evil than a renewed Armageddon in Europe; and all the resources of diplomacy were set in motion to heal the rupture between Turkey and ■ Russia. In spite of the emperor Alexander's engagements to the Grand Alliance and the ideal of European peace, this was no easy matter; for the murder of the patriarch was but the culmination of a whole series of grievances accumulated since the Treaty of Bucharest. Moreover, the Porte was thrown into a suspicious mood by the contrast between the friendly language of the western powers and the active sympathy of the western peoples for the Greeks, who were supported by volunteers and money drawn from all Europe. But, though the sultan remained stubborn, the emperor Alexander, who since the Congress of Laibach had been wholly under Metternich's influence, resisted the clamour of his people for war, and dismissed his Greek minister Capo dTstria (q.v.). The Congress of Verona (1822) passed without any serious developments in the Eastern Question.

The stubborn persistence of the Greeks, however, dashed Metternich's hope that the question would soon settle itself, and produced a state of affairs in the Levant which necessitated some action. In the instructions drawn up, shortly before his death, for his guidance at Verona, Castlereagh had stated the possibility of the necessity for recognizing the Greeks as belli- gerents if the war continued. The atrophy of the Ottoman

sea-power had left the archipelago at the mercy of the Greek war- brigs; piracy flourished; and it became essential in the interests of the commerce of all nations to make some power responsible for the policing of the narrow seas. On the 25th of March 1823 accordingly, Canning announced the recognition by Great Britain of the belligerent character of the Greeks.

This roused the emperor Alexander to action, since it seemed as though Great Britain was aiming at ousting Russian influence in the Levant. He suggested a joint intervention of the powers; but the conference, which met at St Petersburg in April 1824, came to nothing, since Turkey and the Greeks alike refused to be bound by its decisions, and Canning would not hear of coercion being applied to either. The sole outcome of the conference was the offer in March 1825 of the joint mediation of Austria and Russia, which the Porte rejected.

Meanwhile Mahmud, realizing the impossibility of crushing the Greek revolt unaided, had bent his pride to ask the help of Mehemet Ali, who was to receive as his reward Crete, the Morea and the pashaliks of Syria and Damascus. The Egyptian fleet and disciplined army were now thrown into the scale; and from the moment when Ibrahim Pasha landed at Modon (Feb. 24, 1825), the fate of the Greeks seemed sealed. The Morea was quickly overrun; in April 1826 Missolonghi fell, after a heroic defence; in June 1827 Athens was once more in the hands of the Turks. Crowds of Greek captives were being sent as slaves to Cairo; and, should the powers not intervene, there was every prospect of Greece being depopulated and colo- nized with Mussulman negroes and fellahin.

At the close of 1825 an isolated intervention of Russia had seemed probable. A great army was assembled in the south of Russia, and the emperor Alexander had gone to place himself at its head when he died (Dec 22, 1825). It was to prevent such an intervention that Canning seized the

opportunity of the accession of Nicholas I. to send the duke of Wellington to St Petersburg in order to concert joint measures. The result was the protocol of St Petersburg of the 4th of April 1826, by which Great Britain was empowered to offer to the Ottoman government a settlement of the Greek question based on the establishment of Greece as a vassal and tributary state. Should the Porte refuse, the two powers were to take the earliest opportunity, either separately or in common, of establishing a reconciliation on the basis of the protocol.

Russia, meanwhile, had seized the occasion to send to Constantinople an ultimatum demanding satisfaction for her own particular grievances; the Porte resented the intrusion of new Convention demands before the others had been dealt with, °' and hurried on preparations for war. The reform

Akkerman. Q £ tne armV) noweverj involved the destruction of the Janissaries (q.v.), and though their massacre on the 15th of June left the sultan free to carry out his views with regard to the army, it left him too weak to resist the Russian demands. On the 7th of October, accordingly, these were conceded by the Convention of Akkerman. Its terms were: the confirmation of the Treaty of Bucharest and the opening of the navigation of the Black Sea to the Russian flag; a stipulation that the hospodars of Walachia and Moldavia should be elected by the boyars for seven years, their election being confirmed by the Porte which, however, had no power to dismiss them without the concurrence of the Russian ambassador at Constantinople; finally, Servia's autonomy was recognized, and, save in the fortresses, no Mussulman might reside there.

The Greek question was however, not yet settled. Months passed without any action being taken under the protocol Agreement °* tne 4 tn °f April; and Russia suspected Great of the Britain of merely using the protocol to prevent her

Powers as wn isolated intervention. The situation was how-
to Greece. eyer ma t e rially altered by the end of August
1826; for the Greeks, driven to desperation, had formally
invited the mediation of England, thereby removing
Canning's objection to an unasked intervention. He now
invited the co-operation of Russia in representations to the
Porte on

the basis of the protocol, and, in the event of its refusal to
come to terms, suggested certain measures of coercion. The
tsar consented, and proposed that the coercion should take
the form of a pacific blockade of the Morea, so as to force
Ibrahim, by cutting off his supplies, to evacuate the
country. To this Great Britain agreed in principle; for
Canning clearly saw the need for yielding on the question
of a joint intervention, if the isolated intervention of Russia
were to be prevented. In the conference of the five powers
of the Grand Alliance opened at London in the early
summer of 1827, however, a divergence of views at once
became apparent. Austria and Prussia pro- tested against
any coercion of the Porte " to serve revolutionary ends "
and, failing to carry their views, withdrew from the con-
ference. France thereupon proposed to convert the protocol
of the 4th of April into a treaty; Russia and Great Britain
agreed; and on the 6th of July the Treaty of London was
signed by the three powers. , 1 >

By the patent articles of the treaty the powers agreed to
secure the autonomy of Greece under the suzerainty of the
sultan, but without any breach of friendly relations with
Turkey. By additional secret articles it was agreed that, in
the event of the Porte not accepting the offered mediation,
consuls should be established in Greece, and an armistice
proposed to both belligerents and enforced by all the means
that should " suggest themselves to the prudence " of the
high contracting powers. In general it was allowed that
these means should be the " pacific blockade " proposed by
the tsar. Instructions to this effect were sent to the admirals
commanding in the Levant.

The armistice, accepted by the Greeks, was refused by
Ibrahim, pending instructions from Constantinople, though
he consented to keep his ships in the harbour of Nava- N .

rino. The Greeks, having put themselves in the right with the powers, were free to continue the war; and the destruction of a Turkish flotilla off Salona on the 23rd of September followed. Ibrahim, taking this as a breach of the convention, set sail from Navarino northwards, but was turned back by Sir Edward Codrington, the British admiral. Then, the Russian and French squadrons having joined, it was deter- mined to put further pressure on the Egyptian commander, and the allied fleets, on the morning of the 20th of October, stood into the bay of Navarino. A chance scuffle led to a battle, and by the evening the Turkish and Egyptian fleets had ceased to exist (see Navarino, Battle or).

The effect on the passionate sultan of this ” unparalleled outrage on a friendly power in time of peace ” is easy to imagine. In spite of the weak efforts of the British government to palliate the significance of this ” untoward incident,” Turkey broke off diplomatic relations with the three powers concerned, and on the 20th of December Mahmud, giving full vent to his rage, issued a hatt-i-sherif denouncing the cruelty and perfidy of the Christian powers, declaring the convention of Akkerman null and void, and summoning the faithful to a holy war. The struggle that followed was, however, destined once more to be a duel between Russia and Turkey. Great Britain, when Canning was no longer at the helm of state, had reverted to the traditional policy of preserving Ottoman integrity at all costs; the invitation of the tsar to accept the logical consequences of Navarino was refused; and Russia was left to settle her account with Turkey.

The war that followed proved once more the wonderful resisting power of the Turks. In spite of the confusion due to the destruction of the Janissaries and army reforms as yet hardly begun, it cost the tzar two War with hardly fought campaigns before the audacious “**’*• strategy of General Diebitsch enabled him to dictate the terms of the treaty of Adrianople (Sep. 14, 1829). Meanwhile the other powers had taken advantage of the reverses of the Russian arms to discount the effect of their ultimate victory by attempting to settle the Greek question. In July 1828 France had been commissioned to oust Ibrahim from the Morea; and though by a convention, concluded on the 9th of

August by Codrington with Mehemet Ali, the principle of evacuation by the Egyptian troops had already been settled before the arrival of the French expedition, the Morea remained for the time in French occupation. On the 16th of November a protocol of the London conference placed the Morea, with the neighbouring islands and the Cyclades, under the guarantee of the powers; and on the 22nd of March 1829 another protocol extended the frontier thus guaranteed to the line Arta-Volo and included the island of Euboea. According to this instrument Greece was to be erected into a tributary state, but autonomous, and governed by an hereditary prince chosen by the powers. The Treaty of Adrianople, by which the Danubian principali- ties were erected into practically independent states, the treaty rights of Russia in the navigation of the Bosporus penitence. anc ‘ Dardanelles confirmed, and the districts of Anapa and Poti in Asia ceded to the tsar, included also a settlement of the Greek question on the terms of the protocol of the 22nd of March. This fact, which threatened to give to Russia the whole prestige of the emancipation of Greece, spurred the other powers to further concessions. The acceptance of the principle of complete independence, once more warmly advocated by Metternich, seemed now essential if Greece was not to become, like the principalities, a mere dependency of Russia. On the 3rd of February 1830 was signed a protocol embodying the principle of an independent Greece under Leopold of Coburg as ” sovereign prince.” This was ultimately expanded, after the fall of the Wellington ministry, into the Treaty of London of the 7th of May 1832, by which Greece was made an independent kingdom under the Bavarian prince Otto. (See Greece: History.)

Before the final settlement of the Greek question a fresh crisis had arisen in the affairs of Turkey. Her lessened prestige Syria ˆad already received a severe blow from the bom-

bardment and capture of Algiers by the French in 1830, and

her position was further embarrassed by revolts in Bosnia and Albania, when news reached Constantinople that Mehemet Ali had invaded Syria (Nov. 1, 1831), nominally in order to punish his enemy Abdullah, pasha of Acre, really in order to take by force of arms the pashaliks of Syria and Damascus promised as a reward for his services in Greece. An account of the collapse of the Turkish power before Mehemet Ali, and of the complicated diplomatic developments that followed, is given in the article Mehemet Ali. Here it must suffice to say that the recognition of Mehemet Ali's claims, forced on the sultan by France and Great Britain, was followed in 1833 by the signature cf the Treaty of Unkiar Skelessi, which seemed to place Turkey wholly in the power of Russia, after which Sultan Mahmud concentrated his energies on creating a force strong enough to crush his rebellious vassal.

At last, in 1839, his eagerness would no longer be restrained, and without consulting his ministers, and in spite of the warnings of all the powers, he determined to renew the war. On the 21st of April the Ottoman army, which had been massed under Hafiz Pasha at Bir on the Euphrates, crossed the stream, by the sultan's orders, and advanced on Damascus. On the 23rd of Jun2 it was attacked by Ibrahim at Nezib and annihilated. As for Mahmud, the news of the disaster reached Constantinople when he was unconscious and dying. Early on the 1st of July he was dead, and his son Abd-ul-Mejid, a lad of eighteen, reigned in his stead (see Mahmud II.).

The Eastern Question had now suddenly once more entered an acute phase. The news of Nezib was immediately followed Abd-ui- by that of the treason of Ahmed Pasha, the Ottoman Mejid, admiral, who, on the plea that the sultan's coun- 1839-1861. se] i ors W ere sold to Russia, had sailed to Alexandria and handed over the fleet to Mehemet Ali. With an inexpe- rienced boy on the throne, divided and untrustworthy counsels in the divan, and the defences of the empire shattered, the house of Osman seemed doomed and the Turkish Empire about to dissolve into its elements. If Russia was to be

prevented from using the Treaty of Unkiar Skelessi for her own purposes, it was essential that the powers should con- cert measures to deal with the situation. The story ■ of the

diplomatic negotiations that followed is told elsewhere (see Mehemet Ali). Here it may suffice to say that the desire of the emperor Nicholas to break the entente between Great Britain and France led him to waive his special claims under the Treaty of Unkiar Skelessi, and that in the ultimate concert by which the question was settled France, which throughout supported Mehemet Ali, had no part. The intervention of the powers, based on the convention of London of the 15th of July 1840, led to the withdrawal of Ibrahim from Syria, and the establishment by the firman of the 13th of February 1841 of Mehemet Ali as hereditary pasha of Egypt under conditions intended to safeguard the sovereign rights of the Ottoman sultan. On the 10th of July the four signatory powers of the convention of London signed a protocol recording the closure of the incident {protocole de cloture), and on the 13th France united with them in signing another protocol (protocole des detroits) by which the powers engaged to respect the principle proclaimed by the sultan as to the closing of the Dardanelles to foreign warships.

The severe crisis through which the Ottoman Empire had passed accentuated the need for strengthening it by a drastic reform of its system. For such an experiment, Reform though hampered by continual insurrections within Policy in and troubles without, Mahmud had done some-Turkey. thing to pave the way. The destruction of the tanzimat. Janissaries and the suppression of the quasi-indepen- dent power of the direbeys had removed the worst disturbing elements; the government had been centralized; a series of enactments had endeavoured to secure economy in the adminis- tration, to curb the abuses of official power, and ensure the impartiality of justice; and the sultan had even expressed his personal belief in the principle of the equality of all, Mussulman and non-Mussulman, before the law. It was therefore no sudden revolution when, on the 15th of November 1839 Abd-ul-Mejid signalized his accession by promulgating the Tanzimat, or Hatt- i-Sherlf of Gulhane, a decree abolishing the arbitrary and un- limited power hitherto exercised by the state and its officials, laying down the doctrine of the perfect equality of all Ottoman subjects of whatever race or creed, and providing for the regular, orderly and legal government of the country and the security of life, property and honour for all

its inhabitants. Yet the feelings of dismay and even ridicule with which this proclama- tion was received by the Mussulmans in many parts of the country show how great a change it instituted, and how strong was the opposition which it encountered among the ruling race. The non-Mussulman subjects of the sultan had indeed early been reduced to such a condition of servitude that the idea of their being placed on a footing of equality with their Mussulman rulers seemed unthinkable. Preserved merely as taxpayers necessary to supply the funds for the maintenance of the dominant and military class, according to a foreign observer in 1571, they had been so degraded and oppressed that they dared not look a Turk in the face. Their only value was from a fiscal point of view, and in times of fanaticism or when anti- foreign sentiment ran high even this was held of little account, so that more than once they very nearly became the victims of a general and state-ordered massacre. Thus Sultan Ibrahim was dissuaded from such a step in 1644 only by the refusal of the Sheikh-ul-Islam to sanction the proceeding. The humane and tolerant measures provided for in the ” nizam-i-jedid,” or new regulations for the better treatment of the Christians enacted by Mustafa Kuprili during his grand vizierate (1689-1691), did for a time improve the position of the rayas. But the wars with Russia and other Christian powers, and the dif- ferent risings of the Greeks and Servians, helped to stimulate the feelings of animosity and contempt entertained towards them by the ruling race; and the promulgation of the Tanzimat undoubtedly heralded for the subject nationalities the dawn of a new era.

HISTORY]

TURKEY

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The reforms introduced by Sultan Mahmud and by the Tanzi- mat necessitated the remodelling of nearly all the departments Remodelling of state – Towards the end of Mahmud II.‘s reign otthe ministries had been instituted, and a council of

Administra- ministers had been established, presided over by Uon- the grand vizier. In 1837 the ” council of the

Sublime Porte ” and the ” supreme council of legal affairs ” were established: the latter was the tribunal to which were referred all complaints against officials or claims pending between the state and private individuals; the council of the Sublime Porte was in 1839 transferred to the ministry of commerce; the supreme council of legal affairs after under- going various modifications was in 1868 absorbed in the council of state. In 1837 a ” council of public works ” was instituted, converted ten years later into a separate ministry. In 1835 the ” ministry of administration ” was formed; two years later its title was changed to ministry of the interior. Regulations prescribing the duties of the local governors and officials of all ranks were drawn up only in 1865 and 1870, but since Mahmud’s time their functions were exclusively civil and administrative. A regular hierarchical order was elaborated for the official classes, both civil and military, whereby the rank of each person was clearly defined.

The military reorganization dates from the destruction of the Janissaries (June 15, 1826). On that day Aga Hussein Pasha was appointed ” Seraskier (commandant) of the victorious Mahommedan troops”; at first only two divisions were estab- lished, quartered respectively at Constantinople and Scutari. In 1833 the reserves were instituted, and three years later reserve commandants were appointed in six principal provinces. In 1843 the corps d’armee of Constantinople, Rumelia, Anatolia and Arabia were formed, and a military council was appointed. In 1847 a recruiting law was promulgated, reducing the period of service (until then unlimited in point of time), to five years. Military schools were founded. For the reorganization carried out from 1908 to 1 910 see section Army, above.

After the Greek revolution the system of manning the navy from the Christian natives of the archipelago and the Mediter- ranean littoral was abandoned, and recruits for the navy are now selected under the ordinary law. A naval school and a modern factory and arsenal were established. The direction of the police, formerly left to the Janissaries, was formed into a ministry, and a body of gendarmerie was instituted. For the financial reforms see the section Finance, above.

The ministry of public instruction was established in 1857;

until the reign of Selim III. (when a few military schools were established) p . .. the only schools had been the colleges of the Ulema and Education. guc ˆ pre p arator y schools as had been founded by private munificence. In 1838 the council of education had been created and several secondary state schools were founded. In i860 the regulations for public education were promulgated; schools were everywhere opened, and in 1882 a portion of the receipts from certain vakufs were appropriated to their maintenance. As all the prepara- tory schools founded by the state were for Mussulman children only (the various Christian communities maintaining their own schools), idadi or secondary schools were established in 1884 for the instruction of children of all confessions. In 1868 the Imperial Lycee of Galata Serai was founded; most of the later generation of officials received their education there. Special state schools of medicine, arts, science, crafts, &c, have been created successively, and in 1901 a university was founded. Educational affairs in the provinces are now superintended by special officials.

After the promulgation of the reforms, the judicial duties of the Imperial Divan, which with other functions also exercised those of a kind of supreme court of appeal, were transferred Justice. tQ t ˆ e Sheikh-ul-Islam. The codification of the civil law, which soon became necessary, was effected by the promulga- tion in 1859 of the Mejelle, or civil code. Commercial and criminal codes, as well as codes of procedure, were drawn up, largely on the basis of the Code Napoleon. The rules regulating the Ulema were amended, a school for judges was fornded, and the Sheikh-ul-Islam was charged with the duty of revising all judgments. In 1865 the court cf cassation was founded.

In 1835 the Reis-ul-Kuttab, to whom the superintendence of foreign affairs was entrusted, received the designation of minister Foreizn ˆ or !ore ‘S n affairs. Turkey had originally maintained Relations n0 representatives abroad, and appointed such only for special occasions as e.g. the signature of a treaty or the announcement of a new sultan’s accession. Selim III. was the

first sultan who entered into regular relations with foreign powers, and employed permanent ambassadors ; the practice was discontinued at the time of the Greek

revolution and the consequent rupture with the powers. Later, during the Egyptian negotiations, ambassadors were accredited to London, Paris and Vienna. Sultan Abd-ul-Aziz's journey to Europe and the return visits paid by foreign princes strengthened Turkey's relations with foreign states.

The ministry of the Evkaf or pious foundations was established in 1827 and extended ten years later. Such foundations had been created from the earliest times, and the execution of the testator's wishes was generally left to his descendants, under the supervision of some high official designated in the act of endowment. In case of failure in the line of succession an administrator was appointed by the state. But many such foundations fell into disorder, and the ministry was created to exercise the requisite supervision.

Though the provisions of the Tanzimat were not fully observed, they afforded convincing proof that reform was entirely practicable in Turkey. Reforms were effected in every direction; the finances and the army were 5ˆ.ˆ° reorganized, military instructors being procured from Europe; the administration was gradually centralized, and good relations were cultivated with the powers, the only serious international controversy arising in 1848-1849 over the refusal by Turkey, with the support of England, to surrender the Hungarian and Polish insurgents who had taken refuge within her borders. It cannot indeed be said that complete tranquillity prevailed throughout the country meanwhile; disturbances in the principalities and in the Lebanon gave serious trouble, while in 1842 the unsettled state of the Turco-Persian frontier nearly led to war. By the mediation of England and Russia the Treaty of Erzerum was signed (1847) and a frontier commission was appointed. But as the frontier was not definitely demarcated the door was left open for controversies which have occurred frequently up to the present day.

Turkey's progress in the path of reform was viewed with some uneasiness in Russia, the cardinal principle of whose policy since 1829 had been to maintain her own Russian influence at Constantinople by keeping the Otto- Policy since man government weak. In favour of this view ,829 ' the traditional policy of Peter the Great and Catherine II.

had been deliberately given up, and by the secret convention signed at Miinchengratz on the 18th of September 1833 the emperor Nicholas had agreed with his brother sovereigns of the revived ” Holy Alliance ” to maintain the integrity of Turkey, where Russian influence seemed to have been rendered supreme and permanent by the Treaty of Unkiar Skelessi. The crisis which ended in 1841, however, materially altered the situation from the Russian point of view. By his concert with the other powers in the affair of Mehemet Ali, the tsar had abdicated his claim to a unique influence at Constantinople, and he began to revive the idea of ending the Ottoman rule in Europe, an idea which he had only unwillingly abandoned in 1829 in response to the unanimous opinion of his advisers. In 1844 he took advantage of his visit to England to propose to British ministers a plan of partition, under which Great Britain was to receive Egypt and Crete, Constantinople was to be erected into a free city, and the Balkan states were to become autonomous under Russian protection. This pro- posal, as might have been expected, only served to rouse sus- picions as to Russia’s plans; it was politely rejected, and the whole Eastern Question slumbered, until, early in 1850, it was awakened by an incident trivial enough in itself, but pregnant with future trouble: a quarrel of Catholic and Orthodox monks about the holy places in Palestine.

By the Capitulations signed on the 28th of May 1740 on behalf of Sultan Mahmud I. and Louis XV. ” emperor of France, ” not only French pilgrims to Jerusalem, but all members of ” Christian and hostile nations ” visiting pi a e ce °. r the Ottoman Empire, had been placed under the protection of the French flag, and by a special article the Frank, i.e. Roman Catholic, ecclesiastics had been guaranteed certain rights in the holy places. These stipulations of the treaty, which were in effect a confirmation of the firman granted in 1620 by Murad IV. to Louis XIII., had fallen into oblivion

during the age of Voltaire and the turmoil of the Revolution; and meanwhile, every advance of Russia had been marked by further encroachments of the Orthodox clergy in Palestine on the ancient rights of their Latin rivals. The quarrels of these monks might have been left to the contempt they deserved, had not Napoleon III. seen in the situation an opportunity at once for conciliating the clericals in France and for humili- ating Russia, which had given to his title but an equivocal recognition. His ambassador, accordingly, handed in at Con- stantinople a formal demand for the restitution of the Catholics in all their property and rights. The Ottoman government, seeking to gain time, proposed a " mixed commission " of inquiry ; and to this France agreed, on condition that no documents later than 1740 should be admitted as evidence. To this suggestion, which would have excluded the Treaty of Kuchuk Kainarji, the emperor Nicholas replied by a haughty demand that nothing should be altered in the status quo. It was now clear that no less an issue was involved than a contest between France and Russia for paramount influence in the East, a con- test into which Great Britain would inevitably be dragged. The British government did its best to help the Porte to evolve a compromise on the questions immediately at issue, and in March 1852 a firman was issued, which to Protestants and Mahommedans might well seem to have embodied a reasonable settlement. Concessions were made to one side and the other; and the question of the right of " protection " was solved by the Turkish government itself undertaking the duty. But neither Napoleon nor Nicholas desired a settlement. The French emperor wanted a war for dynastic reasons, the tsar because he conceived his honour to be involved, and because he judged the moment opportune for expelling the infidel from Europe. France, he believed, would never come single-handed to the assistance of Turkey; Austria would be bound at least to benevolent neutrality by " gratitude " for the aid given in 1849; the king of Prussia would sympathize with a Christian crusade; Great Britain, where under the influence of John Bright and Richard Cobden the " peace at any price " spirit seemed to be in the ascendant, would never intervene. Nicholas even hoped for the active sympathy of Britain. Lord Aberdeen made no secret of his dislike for the Turks, and openly expressed his disbelief in the reality of their reforms; and in

January 1833 the tsar, in conversation with Sir Hamilton Seymour, the British ambassador at St Petersburg, spoke of the Ottoman Empire as " the Sick Man," and renewed the proposals for a partition made in 1844.

Early in 1853 the Russian army was mobilized, and Prince Menshikov, a bluff soldier devoted to the interests of Orthodoxy and tsardom, was sent to present the emperor's ultimatum at Constantinople. He demanded the recognition of the status quo in the holy places, and of the tsar's right, under the Treaty of Kuchuk Kainarji, to the protectorate of all Orthodox Chris- tians in the Ottoman dominions. The Porte, in alarm, turned to Great Britain for advice and assistance. Lord Stratford de Redcliffe, who reached his post at Constantinople shortly after the arrival of Menshikov, at once grasped the essential facts of the situation. The question of the holy places was insignificant in itself — it might be settled if France were granted political compensation elsewhere; that of the protectorate claimed by Russia over the Christians involved the integrity of the sultan's sovereignty. With great address he succeeded in persuading Menshikov to present the two demands separately. On the 22nd of April the French, Russian and British ministers came to an agreement on the question of the holy places; with the result that, when the question of protectorate was raised, Menshikov found himself opposed by the ambassadors of all the other powers. On the 5th of May, nevertheless, in obedience to his peremptory instructions, he presented his ultimatum to the Ottoman government, which, backed now by all the other powers, rejected it. On the 22nd Menshikov and the whole of the Russian diplomatic staff left Constan- tinople; and it was announced that, at the end of the month, the tsar's troops would enter the Danubian principalities. On

the 22nd of June the Russian army, under Prince Gorchakov, crossed the Pruth, not — as was explained in a circular to the powers — for the purpose of attacking Turkey, but solely to obtain the material guarantees for the enjoyment of the privileges conferred upon her by the existing treaties. The news of this aggression roused intense excitement in England; but the British government still exerted itself to maintain peace. In August a conference of the four powers assembled at Vienna, but the settlement they proposed, which practically conceded everything

demanded by Russia except the claim to the protectorate, though accepted by the tsar, was rejected by the Porte, now fallen into a mood of stubborn resentment at the Russian invasion. At the beginning of October Turkey formally declared war; on the 22nd the French and British fleets passed the Dardanelles. Lord Aberdeen still hoped to secure peace, and the Russian government was informed that no casus belli would arise so long as Russia abstained from passing the Danube or attacking a Black Sea port. To the emperor Nicholas this was tantamount to a declaration of war; and in effect it was so. On the 30th of November the Russian fleet attacked and destroyed a Turkish squadron in the harbour of Sinope; on the 3rd of January the combined French and British fleets entered the Black Sea, commissioned to " invite " the Russians to return to their harbours.

The emperor Nicholas had been singularly misled as to the state of public opinion in Europe. The news of the affair of Sinope, rather wanton slaughter than a battle, Crimean raised excitement in England to fever heat; while War. the excellent bearing and consistent successis of the Turkish troops during the first months of the campaign on land excited the admiration of all Europe. The belief in the rejuvenation of Turkey seemed to be justified; and when, on the 27th of March 1854, Great Britain and France declared war on Russia, the action of the governments was supported by an overwhelming public opinion,. As regards Austria, too, the emperor Nicholas was no less mistaken. If she maintained neutrality, it was due to no impulse of gratitude, and it was far from " benevolent." As the Russians withdrew from the Danubian principalities, Austrian troops occupied them, and by a convention with the Porte the Austrian government undertook to resist by arms any attempt of the Russians to return. So far as the extreme claims of the tsar were concerned, neither Austria nor Prussia was willing to concede them, and both had joined with France and Great Britain in presenting, on the 12th of December 1853, an identical note at St Petersburg, drawn up at the Conference of Vienna, reaffirming the principles of the treaty of 1841. Save for the benevolent neutrality of Prussia, therefore, which enabled her to obtain supplies from the north, Russia was pitted single-handed against a coalition of Turkey, Great Britain and

France, to which Sardinia was added later.

The events of the war that followed are told elsewhere (see Crimean War). The main operations were confined to the Crimea, where the allied troops landed on the 14th of September 1854, and they were not concluded, in spite of the terrible exhaus- tion of Kussia, till in December 1855 the threatened active inter- vention of Austria forced the emperor Alexander II. to come to terms. These terms were ultimately embodied in the Treaty of Paris of the 30th of March 1856. Its provisions, held by some to be so unduly favourable to Russia as to justify the question whether she had not been victorious in the war, were as follows: Russia abandoned all pretensions to exercise a protectorate over the Christians in Turkey, or to an exclusive right of interference in the Danubian principalities, to which Bessarabia was restored; the navigation of the Danube was made free and placed under the supervision of an international commission; the Black Sea was closed to warships, while open to the commercial flags of all countries; the Asiatic frontier between the two empires remained unchanged; Turkey was admitted to the concert of Europe, and all the contracting parties agreed to respect her independence and the integrity of her territory; moreover, the provisions of the Tanzimat were reaffirmed in a fresh decree of the sultan, which was incorporated in the treaty, and further provided for a

large measure of local autonomy for the Christian communities. It was stipulated that Turkey's promises of reform gave no power the right of interference on behaif of the Christians.

The Treaty of Paris was regarded as opening a new era in the progress of Turkey. Admitted on equal terms to the European family of nations, the Ottoman government had TAe/Vew gj ven a so i emn guarantee of its intention to make the long-promised reforms a reality. But it soon became apparent that the time was scarcely come for

liberal measures; and fanatical outbreaks at Jidda (1858) and in Syria (i860) gave proof that the various sections of the popu- lation were not yet prepared to act together in harmony. The Syrian disturbances brought about a French occupa- tion, which Fuad Pasha, ably seconded by Ahmed Vefyk Effendi, the Turkish ambassador in Paris, contrived to restrict, and to terminate as soon as possible. The immediate local result was the institution, by a reglement, 1 signed at Con- stantinople on the 6th of September 1864, of autonomy for the Lebanon under a Christian governor appointed by the powers with the concurrence of the Porte, an arrangement which has worked satisfactorily until the present day. In 1859 the Danu- bian principalities, deliberately left separate by the Congress of Paris, carried out their long-cherished design of union by electing Prince Cuza both in Moldavia and in Walachia, a contingency which the powers had not taken into account, and to which in the end they gave a grudging assent (see Rumania).

On the 25th of June 1861 Sultan Abd-ul-Mejid died, being succeeded by his brother Abd-ul-Aziz. The new sultan's reign marked, if not the beginning, at least the high tide **m'-J87&!* of that course of improvident and unrestrained expenditure, facilitated by the enthusiasm created in Europe by Turkey's admission to the ranks of the powers which loosened for her the purse-strings of the foreign in- vestor. The viceroy of Egypt, Ismail Pasha, followed his suzerain's example in this respect, and was lavish in his bribes to his imperial overlord to obtain the extension of his own privileges and the establishment in Egypt of succession from father to son; these concessions were granted to him by the firmans of the 27th of May 1866 and the 8th of June 1867, in the latter of which the viceroy is addressed for the first time as " khedive." Abd-ul-Aziz is said to have yielded the more readily as being desirous of bringing about a similar altera- tion in the succession in Turkey, in favour of his own eldest son, Prince Yussuf Izz- ed-din; public opinion was, however, opposed to so sweeping a change, and the succession to the throne in Turkey still goes to the eldest surviving member of the house of Osman. Though the foreign relations of Turkey remained untroubled, disturbances in Servia, Montenegro and Crete continued throughout the " sixties." Servia had long resented the occupation of her fortresses by Turkish

troops; frequent collisions arising from this source resulted in June 1862 in the bombardment of Belgrade; some slight concessions were then made to Servia, but it was not until 1867 that, through the mediation of England and other powers, she succeeded in obtain- ing the withdrawal of the Turkish garrisons. The Cretan insurrection rose to a formidable height in 1868-69, and the active support given to the movement by Greece brought about a rupture of relations between that country and Turkey. The revolt was suppressed, the Turko-Greek conflict was settled by a conference of the powers in Paris, and Crete received a charter of local self-government which for a time pacified the island. 2

Abd-ul-Aziz had visited the Paris Exhibition of 1867 and had paid his respects to Queen Victoria, who conferred on him the order of the Garter.- In 1869 the visit was returned by many sovereigns and princes on their way to the opening of the Suez Canal, among these being the empress Eugenie. An impor- tant event not to be passed over without mention is the grant on the 10th of March 1870 of the firman instituting the Bul- garian exarchate, thus severing the Bulgarian Church from

1 Text in Holland, p. 212.

‘ ” Correspondence . . . respecting the rupture of diplomatic relations between Turkey and Greece, &c,” in State Papers, lix. 584, &c, Protocols of Conferences, p. 813, &c.

the jurisdiction of the Greek patriarch of Constantinople. This concession, given under strong pressure from Russia, aroused the deepest resentment of the Greeks, and was the principal factor in the awakening of the Bulgarian national spirit which subsequent events have done so much to develop. Russian influence at Constantinople had been gradually increasing, and towards the end of 1870 the tsar took advantage of the temporary disabling of France to declare himself no longer bound by those clauses of the Treaty of Paris which restricted Russia’s liberty of possessing warships on the Black Sea. An international conference convoked in London early in 1871 laid down the principle that treaty engagements were binding, and then proceeded to abrogate this particular engagement. Russia and Turkey thus regained full liberty as regards their naval

forces and armaments in the Euxine; the passage of the straits remained interdicted to ships of war.

A reform not unworthy of notice was effected by the law promulgated on the 18th of June 1867 whereby foreigners were for the first time allowed to hold landed property throughout the Ottoman Empire (save in the Hejaz) on condition of their being assimilated to Ottoman subjects, i.e. divested of their right to the protection of their own authorities in every respect concerning such property.

Meanwhile in Turkey national bankruptcy was brought within measurable distance by the sultan's extravagance and the incompetence of his ministers; it was staved off only by loans contracted almost annually to pay the interest on their predecessors. External influences and latent fanaticism were active; a serious insurrection broke out in Bosnia and Herze- govina in 1875, and- the efforts to quell it almost exhausted Turkey's resources; the example spread to Bulgaria, where abor- tive outbreaks in September 1875 and May 1876 led to those cruel measures of repression which were known as '.' the Bulgarian atrocities," 3 Mussulman public feeling was inflamed, and an attempt at Salonica to induce a Christian girl who had embraced Islam to return to her faith caused the murder of two foreign consuls by a fanatical mob. The finances of Turkey now col- lapsed, and the inevitable bankruptcy was declared, whereby more than through any other cause she lost such Deposition sympathies as she possessed in western Europe. ofAbd-ul- Turkey's distress was Russia's opportunity; the Azlz ' sultan fell entirely under the influence of General Ignatiev, the tsar's ambassador, and it became evident that the country was hastening to its dissolution. A conspiracy to bring about a change was hereupon formed by certain prominent statesmen, whose leaders were Midhat Pasha, Mehemed Rushdi Pasha and Mahmud Damad Pasha, the husband of a princess of the blood, sister to Prince Murad. These succeeded in gaining over the Sheikh-ul-Islam, and in obtaining from him a fetva for the deposition of Abd-ul-Aziz.

In virtue of this judgment of the supreme legal authority, and with the aid of the fleet, Abd-ul-Aziz was deposed, being shortly afterwards found dead, apparently by his own hand. Murad V. reigned in his stead. But the change of

sultans brought no relief to the troubled state: Servia and Montenegro declared war, and in less than three months it had become evident that Murad was incapable of governing.

Murad's brother Abd-ul-Hamid was accordingly proclaimed sultan on the 31st of August 1876. The diplomacy of Europe had been searching in vain since the autumn Accession of 1875 for the means of inducing Turkey to institute ofAM-ut- effective administrative reforms and to grant to f ldu " its European provinces that autonomy which now appeared essential. But the new sultan was as averse from accepting any of the formulae proposed as were his pre- decessors: Servia and Montenegro were with great difficulty pacified, but it was plain that Russia, whose Slavonic and Orthodox sympathies had been strongly aroused, would soon begin hostilities herself. Turkey now made a show of going even beyond the demands formulated by Europe, -and the international conference which met at Constantinople during

3 See Mr Baring's reports in Pari. Papers (1878), lxxxi.

the last days of 1876 was startled by the salvo of artillery which heralded the promulgation of a liberal constitution, not for the European provinces only, but for the whole empire, and the institution of a Turkish parliament. The decisions of the con- ference, moderate though they were, in the end requiring merely the nomination of an international commission to investigate the state of the European provinces of Turkey, and the appointment by the sultan, with the approval of the Russo- powers, of governors-general for- five years, were Turkish rejected by the Porte. The statesmen of Europe "" still continued their efforts to avert a conflict, but

to no purpose. On the 24th of April 1877 Russia declared war and her troops crossed the Turkish frontiers. Hostilities were conducted both in Europe and Asia for nearly a year.

Rumania joined the Russians, and in Europe no effective opposition was encountered by the invaders until the assaults on Plevna and the Shipka Pass, where the valiant resistance of the Turks won for them the admiration of Europe. By November the defence of the Turks in Asia Minor had entirely collapsed. Plevna surrendered on the 9th of December 1877 after a heroic struggle under Osman Pasha. Thereafter the Russians advanced practically unchecked (see Russo-Turkish Wars) . An armistice and preliminaries of peace were signed on the 31st of January 1878 at Adrianople, and a definitive treaty was concluded at

San Stefano on the 3rd of March 1878. Its terms SaaStefano were: the creation of an autonomous tributary

principality of Bulgaria extending from the Black Sea to the Aegean; the recognition by Turkey of the independence of Rumania, Servia and Montenegro, with increased territories; the payment of a war indemnity; the introduction of reforms in Bosnia and Herzegovina; the cession to Russia of Bessarabia and the Dobruja; the opening of the passage of the straits at all times to the merchant vessels of neutral states; and the razing of the fortresses on the Danube.

Great Britain had throughout the war preserved strict neutrality, but, while making it clear from the outset that she could not assist Turkey, had been prepared for emergencies. Turkey's severity in repressing the Bulgarian insurrection had raised up in England a storm of public opinion against her, of which the Liberal opposition had taken the fullest advantage; moreover the suspension of payments on the Ottoman debt had dealt Turkey's popularity a blow from which it had never recovered. But upon the approach of the Russians to Constantinople the British reserves were called out and the fleet was despatched to the Bosporus. Accordingly, and as her line of retreat might be threatened by Austria, Russia consented to a revision of the Treaty of San Stefano at a congress to be held at Berlin. Congress 0/ Before the meeting of this congress, which assembled Berlin, on the 13th of June 1878, the powers principally 1878. interested had arrived at an understanding as to

the modifications to be introduced in the treaty, and by a conven- tion concluded with Turkey on the 4th of June 1878 England had undertaken to defend the Asiatic dominions of the sultan by force of arms, provided that his majesty carried out all the necessary reforms, to be agreed upon later, and assigned to England the island of Cyprus, which was however to be restored if Turkey fulfilled her engagements as to reforms and if Russia gave back to her Kars, Ardahan and Batum. On the 13th of July 1878 the Treaty of Berlin was signed: the Great Bulgaria of the San Stefano Treaty was diminished to an autonomous province north of the Balkans, the south-eastern portion, no longer extending to the Aegean, was formed into a self-governing tributary province styled Eastern Rumelia; Turkey abandoned all pretension to suzerainty over Montenegro; Servia and Rumania received their independence (but the last named was made to cede Bessarabia to Russia, receiving instead the Dobruja) ; the Asiatic frontier was readjusted, Kars, Ardahan and Batum becoming Russian. It was further provided that Bulgaria should pay to Turkey an annual tribute, and should moreover (as well as the other Balkan states receiving accessions of terri- tory at Turkey's expense) bear a portion of the Ottoman debt. The sums payable by the different countries were to be fixed

by the powers; but no effect has so far been given to this reason- able stipulation, which may now be looked upon as null and void. Turkey undertook to pay to Russia a war indemnity of 300,000,000 roubles, and the status of the straits remained unchanged. Measures of reform in Armenia were also provided for, as also the convocation of an international commission for drawing up a reform scheme for the European provinces left to Turkey. The organic law for Crete was to be carried out, and special laws enacted for other parts of Turkey. Bosnia and Herzegovina were handed oˆer to the administration of Austria; Montenegro and Greece received accessions of territory to which only strong pressure coupled with a naval demonstra- tion induced Turkey to consent three years later.

Peace once restored, some attempt was made by Turkey in the direction of complying with her engagements to institute reform. Financial and military advisers were procured from Germany. English officers were engaged to reform the gen- darmerie, and judicial inspectors of foreign

nationality were to travel through the country to redress abuses. It was not long before the unsubstantial character of all these undertakings became apparent; the parliament was dissolved, the constitution was suspended and its author exiled. Egyptian affairs next threatened complications. In May 1879 the misgovernment of Ismail Pasha and the resulting financial crisis rendered the deposition of the khedive inevitable; in order to anticipate the action of England and France, who would otherwise have expelled the erring viceroy, the sultan deposed him himself; the succession devolved upon his son Mahommed Tewfik Pasha. (For the subsequent history of the Egyptian question rhe see Egypt: History.) The revolt of Arabi Pasha Egyptian in 1 88 1 broke up the Anglo-French condominium in Question. Egypt and led to outrages at Alexandria followed by a bombard- ment on the nth of July 1882. The occupation of the country by Great Britain gradually took a more permanent form, and though negotiations were more than once entered into with Turkey with a view to its termination, these either proved abortive or were rendered so (as e.g. the Drummond-Wolff convention of 1887) by the action of other powers. The Anglo- French agreement of 1904 left England in undisputed mastery.

The financial straits of Turkey after the war became so acute that the sultan was compelled to consent to a measure p h .. n bt of foreign control over the finances of the country; the administration of the public debt being established in December 1881. (See Finance, above.)

In 1885 the practically bloodless revolution of Philippopolis on the 18th of September united Bulgaria and Eastern Rumelia, severed by the Treaty of Berlin. A conference held at Constan- tinople sanctioned the union on terms which were rendered acceptable to the sultan; but Said Pasha, who had assisted the sultan in centralizing at Yildiz Kiosk the administration of the country, and who had become grand vizier, was a strong adherent of the policy of armed intervention by Turkey, and the conse- quence was his fall from office. His successor in the grand vizierate, Kiamil Pasha, was soon called upon to deal with Armenian unrest, consequent on the non-execution of the reforms provided for in the Treaty of Berlin and the Cyprus Convention, which first found vent about 1890. But Kiamil Pasha was not subservient enough to his imperial master's will, and

his place was taken by a military man, Jevad Pasha, from whom no independence of action was to be apprehended.

It is from this period that the German ascendancy in Constantinople is noticeable. Railway concessions were given to Germans over the heads of British applicants already aerman in possession of lines from which they were expro- Activity la priated, thus affording the nucleus of the Bagdad Tarke y- railway (of which Germany obtained the concession in Novem- ber 1899). (See Bagdad, vol. iii. p. 197.)

From 1890 Crete was frequently the scene of disturbance; the Christian communities in other parts of Turkey began to chafe under the attempted curtailing of their privileges; about Christmas 1893 the Greek patriarch caused all the Orthodox churches to be closed as a protest: and the Armenian agitation

Armenian Troubles.

entered upon a serious phase. The Kurds, the constant oppressors of that people, had received official recognition and almost complete immunity from the control of the civil law by being formed into a yeo- manry frontier-guard known as the Hamidian cavalry. The troubles arising from this cause and from greater energy in the collection of taxes led the Armenians in outlying and mountainous districts to rise against the authorities. The repression ” of these revolts in the Sassun district in the autumn of 1894 was effected under circumstances of great severity by Turkish troops and Kurdish irregulars. A commission composed of British, French and Russian officials held an inquiry into the events which had occurred, and early in 1805 England, France and Russia entered actively into negotia- tions with a view to the institution of reforms. The scheme propounded by the three powers encountered great objections from the Porte, but under pressure was accepted in October 1895. Its acceptance was however the signal for

a series of massacres in almost every town of importance throughout Asia Minor, which there is but too strong evidence for suspecting were com- mitted with the connivance of the authorities, and in which upwards of 200,000 persons are computed to have perished. In 1896 Lord Salisbury induced the other powers to unite in urging the execution of tbe reforms, but no agreement could be come to for the use of coercion, and Europe could but look on and protest. Changes of ministry at Constantinople were powerless to bring about an improvement, and early in 1896 Cretan affairs became so serious as to call for the intervention of the powers. In September yet another Cretan charter of self-government was promulgated. Shortly before, a revolutionary attack by an Armenian band on the Ottoman bank 'at Constantinople brought about a general massacre of Armenians in the capital (where a widespread revolutionary organization undoubtedly existed), in which at least 3000 victims fell, and the persecution of Armenians became the order of the day.

The neglect of the Porte to carry out all the stipulations of the Cretan arrangement of 1896 led to a renewal of the disturbances, and Greece began to take steps for the invasion of ofi897. tne island; in February 1897 Colonel Vassos sailed from the Piraeus with an armed force, intending to proclaim the annexation of Crete to Greece, and Greek troops were massed on the Thessalian frontier. Diplomacy busied itself with fruitless attempts to avert hostilities; on the 17th of April 1897 war was declared by Turkey. The resistance offered by Greece was feeble in the extreme: Europe was obliged to intervene, and Turkey gained a rectifica- tion of frontier and a war indemnity of £4,000,000, besides the curtailment by the treaty eventually signed of many privi- leges hitherto enjoyed by Hellenic subjects in Turkey. But Europe was determined that the Cretan question should be definitely settled, at least for a period of some years, and, after an outbreak at Candia, in which the lives of British troops were sacrificed, the four powers (Germany and Austria having with- drawn from the concert) who had taken over the island en depot handed it over in October 1898 to Prince George of Greece as high commissioner (see Crete: History).

Crete being thus removed from the scope of her action, Turkey found ample occupation in the almost constant

turbulence of the Yemen, of Albania and of Macedonia. After 1892 the revolts, frequently renewed, of the so-called imam of Sana, necessitated the despatch of large and costly expeditions to Arabia, in which thousands of Turkish, troops have fallen in guerrilla warfare or through the inhospit- able climate; in Albania disturbance became almost endemic, owing to the resistance offered by the intractable population to successive attempts of the central authorities to subject the country to regular taxation and the operation of the laws.

Unsettled claims by French citizens led to a breaking off of relations and the occupation of Mitylene by France in November 1 901; the rupture was of short duration and Turkey soon gave way, according complete satisfaction both in this matter and on certain other French demands. In 1901 and 1902 Turkish

Revolts la Arabia.

encroachments on the hinterland of Aden brought about a dangerous state of tension between Great Britain and Turkey, which had its parallel in 1906 in similar trespasses Disputes by the Ottoman authorities on the Egyptian land with France frontier near Akaba. In both cases Turkey eventually ana Bri**!”- yielded; a similar question arose in 1906 with France over the boundaries of the African possessions of the two countries.

But Macedonia was Turkey’s chief source of anxiety. That country, left by the Treaty of Berlin with its status unaltered, was in a continued condition of disturbance. The Chris- tian population, who in common with their Mussul-p aes< y 0/I- man fellow subjects suffered from the defective methods of government of their rulers, had at least before them the example of their brethren — Greeks, Bulgarians or Servians — dwelling in independent kingdoms under Christian governments on the other side of the frontier. The hope of eventual emancipation was stimulated by sedulous propa- gandists from each of these countries; from time to time armed bands of insurgents were manned and equipped in the small neighbouring states, with or without the co-operation of the governments. So long as Stambolov, the energetic Bulgarian statesman, was alive he succeeded in keeping the Bulgarian element quiet, and the peace of the

country was less liable to disturbance. But for some years the three rivals in Macedonia, to which a fourth, the Rumanian element, must be added, were in constant strife (see Macedonia). A serious Bulgarian insurrection in Macedonia in the autumn of 1903 induced Austria and Russia to combine in formulating the Miirzsteg reform programme, tardily consented to by Turkey, by which Austrian and Russian civil agents were appointed to exercise a certain degree of control and supervision over the three vilayets of Salonica, Monastir and Kossovo. It was also arranged that foreign officers should be named to reorganize the gen- darmerie. An Italian officer, General De Giorgis, was appointed to the chief command in the reorganization, and the three vilayets were apportioned among the great powers into districts, in each of which was appointed a staff officer with a number of subordinate officers of his nationality under his orders. The work of reorganization was efficiently carried out, and the gen- darmerie school at Salonica, under British supervision, showed excellent results. But the achievements of the two civil agents were less noteworthy; and in 1905 it was agreed that, in view of the financial necessities of the provinces, the other great powers should each appoint delegates to a financial commission with extensive powers of control in fiscal matters. The Porte opposed the project, and an international naval demonstration and the occupation of Mytilene by the powers became necessary before Turkey gave way in December 1905. Even so it proved im- possible to fulfil the Miirzsteg programme, though the attempt was prolonged until 1908. The Austro-Russian entente had then come to an end; and after a meeting between King Edward VII. and the tsar Nicholas II. at Reval, a new scheme of reforms was announced, under the name of the " Reval pro- gramme." The enforcement of these reforms, however, was postponed sine die owing to the revolution which transformed the Ottoman Empire into a constitutional state; and the powers, anticipating an improvement in the administration of Macedonia by the new government, withdrew their military officers in the summer of 1908.

The Young Turkish party had long been preparing for the overthrow of the old regime. Their central organization was in Paris and their objects were known throughout Europe,

but except at Yildiz Kiosk their power was Turks" almost everywhere underrated. The Porte strove by every means at its disposal to thwart their activity; but elsewhere they were regarded as a body of academic enthusiasts, more noisy than dangerous, who devoted their scanty funds to the publication of seditious matter in Paris or Geneva, and sought to achieve the impossible by importing western institutions into a country fit only to be ruled by the sheriat and the sword. Such was the opinion held even by experienced diplomatists and by historians. It was strengthened by the fact that the Young

Turks had deliberately abstained from violent action. They had, in fact, learned from events in Russia and Poland that sporadic outbreaks on a small scale would inevitably discredit their cause, and that a successful revolution would require the support of the army. To gain this, an extensive propaganda was carried on by secret agents, many of whom were officers. At the beginning of 1908 a favourable opportunity for action arrived. The Otto- man troops in Arabia were mutinous and unpaid; the Albanians, long the mainstay of Turkish military power in the west, had been Irritated by unpopular taxes and by the repressive edicts which deprived them of schools and a printing-press; foreign inter- ference in Crete and Macedonia was resented by patriotic Moslems throughout the empire. In these circumstances the head- quarters of the Young Turks were transferred from Paris to Salonica, where a central body, known as the committee of union and progress, was established (1908) to organize the revolution. Most of its members were military officers, prominent among them being Majors Enver Bey and Niazi Bey, who directed the propaganda in Albania and Macedonia. By midsummer the Albanian leaders and the greater part of the Turkish army in Europe had sworn fidelity to the constitution.

On the 25th of May an insurrection broke out in Samos, owing to a dispute between the Samian Assembly and Kopassis Effendi, " prince," or governor of the island. After

the port of Vathy had been bombarded by Ottoman war-ships the revolt was easily crushed.

This affair however was of little more than local importance, and the Young Turks were not directly concerned in it. They The struck their first blow on the 22nd of July 1908,

Revolution when Niazi Bey and his troops raised the standard 0/ 1908. f revo it at Resna, a town on the road from Monastir to Ochrida. On the 23rd the committee of union and progress, under the presidency of Enver Bey, proclaimed the constitution in Salonica, while the second and third army corps threatened to march on Constantinople if the sultan refused to obey the proclamation. On the 24th the sultan yielded, and issued an trade, restoring the constitution of 1876, and ordering the election of a chamber of deputies. Various other reforms, notably the abolition of the spy system and the censorship, were announced soon afterwards. Some of the more unpopular officials associated with the old regime were assassinated, among them Fehim Pasha, the former head of the espionage department, who had been exiled to Brusa in 1907 at the request of the British and German ambassadors. Otherwise the revolution was effected almost without bloodshed; for a time the insurgent bands disappeared in Macedonia, and the rival ” nationalities ” — Greek, Albanian, Turk, Armenian, Servian, Bulgarian and Jew — worked harmoniously together for the furtherance of common constitutional aims. On the 6th of August Kiamil Pasha, an advanced Liberal, became grand vizier, and a new cabinet was formed, including a Greek, Prince Mavrocordato, an Armenian, Noradounghian, and the Sheikh-ul-Islam.

The success of the Young Turks created a serious situation for the statesmen of Austria-Hungary and Bulgaria. A regene- rated Ottoman Empire might in time be strong enough Bulgaria! 1 to demand the evacuation of Bosnia and Herzegovina, and to maintain or extend the nominal suzerainty over Bulgaria which the sultan had exercised since 1878. Accord- ingly, at the beginning of October 1908, the emperor Francis Joseph informed the powers signatory to the treaty of Berlin that the annexation of Bosnia and Herzegovina to the Dual Monarchy had become necessary,

and this decision was formally announced in aa imperial rescript dated the 7th of October. The independence of Bulgaria was proclaimed on the 5th. The Ottoman government protested to the powers, but it wisely limited its demands to a claim for compensation. Austria- Hungary had from the first undertaken to withdraw its garrisons from the sanjak of Novibazar — an important concession; after prolonged negotiations and a boycott of all Austrian goods exported to Turkey, it also agreed to pay £2,200,000 as compensation for the Turkish crown lands seized in Bosnia

and Herzegovina. This arrangement was sanctioned by the Ottoman parliament, which assented to the annexation on the 6th of April 1909 and recognized the independence of Bulgaria on the 19th of April, the Russian government having enabled Bulgaria to pay the indemnity claimed by Turkey on account of the Eastern Rumelian tribute and railways (see Bulgaria: History). On the 3rd of February 1910 the Porte accepted a Bulgarian proposal for a mixed commission to delimit disputed sections of the Turco-Bulgarian frontier, and in March King Ferdinand visited Constantinople.

Meanwhile the Young Turks were confronted with many difficulties within the empire. After the first fervour of enthu- siasm had subsided the Christian nationalities The Re- in Macedonia resumed their old attitude of mutual action in the jealousy, the insurgent bands began to reappear, Provinces. and the government was in 1909-1910 forced to undertake the disarmament of the whole civil population of the three vilayets. In Albania serious discontent, resulting in an insur- rection (May-September 1909), was caused by the political rivalry between Greeks and Albanians and the unwillingness of the Moslem tribesmen to pay taxes or to keep the peace with their neighbours, the Macedonian Serbs. In Asia Minor the Kurdish troops under Ibrahim Pasha revolted, and, although they were defeated with the loss of their commander, the Kurds continued to attack indiscriminately the Turks, Nestorians and Armenians; disturbances also broke out among the other reactionary Moslems of this region, culminating in a massacre of the Armenians at Adana. In Arabia Ratib Pasha, the Turkish commander-in-chief, joined the enemies of the new regime; he was

defeated and captured in the autumn of 1908, but in the following year frequent raids upon the Hejaz railway were made by Bedouin tribesmen, while a Mahdist rebellion broke out and was crushed in Yemen.

More serious than any of these local disturbances was the counter-revolution in Constantinople itself, which began with the revolt of Kiamil Pasha, the grand vizier, against The Con- the authority of the committee of union and pro- staniinople gress. Kiamil Pasha was forced to resign (Feb. 14, Counter- 1909) and was succeeded by Hilmi Pasha, ex- high revo ‘ uilon ‘ commissioner of Macedonia. Strife then arose between the committee and the Liberal Union, a body which mainly represented the Christian electorate, and on the 5th of April Hassan Fehmi Effendi, who edited the Serbesti, the official organ of the union, was assassinated. He was an Albanian, and his fellow countrymen in the Constantinople garrison at once made common cause with the opponents of the committee. Mutinous troops seized the parliament house and the telegraph offices; the grand vizier resigned and was succeeded by Tewfik Pasha (April 14); and delegates were sent by the Liberal Union, the association of Ulema and other bodies to discuss terms with the committee. But Abd-ul-Hamid had issued a free pardon to the mutineers, and the committee had now decided that the new regime -would never be secure while the sovereign favoured reaction. They refused to treat with the delegates, and despatched 25,000 men under Mahmud Shevket to Constantinople.

The senate and chamber met at San Stefano, and, sitting jointly as a National Assembly, issued a proclamation in favour of the committee and its army (April 22, 1909), by which Constantinople was now invested. Part Re’gime. of the garrison remained loyal to the sultan, but after five hours of severe fighting Shevket Pasha was able to occupy the capital (April 25). The National Assembly met in secret session two days later, voted unanimously for the deposition of Abd-ul-Hamid II., and chose his younger brother Mahommed Reshad Effendi (b. Nov. 3, 1844) as his successor, with the style of Mahommed V. Abd-ul-Hamid II. was removed to Salonica on the 28th, and on the 10th of May the new sultan was formally invested with the sword of Osman. Hilmi Pasha again became grand vizier, but resigned on the 28th of December 1909, when he was

succeeded by Hakki Bey. On the 5th of August 1909 the new constitution described above was

promulgated by imperial trade; parliament was prorogued for three months on the 27th, and during the recess the committee of union and progress met at Salonica and modified its own rules (Oct. 23), ceasing thenceforward to be a secret association. This was regarded as an expression of confidence in the reformed parliament, which had laid the foundation of the important financial and administrative reforms already described. On the 13th of September 1909 the Macedonian international commission of finance met for the last time; its members were reappointed to a higher finance board for the whole empire, under the presidency of Djavid Bey. Ch. Laurent had already been nominated financial adviser to the empire (Sept. 16, 1908), while Sir William Willcocks became head of the irrigation department; the reorganization of the army was entrusted to the German General von der Goltz, that of the navy to Admiral Sir Douglas Gamble (resigned Feb. 1, 1910).

The evacuation of Crete by the four protecting powers was followed in 1909 by renewed agitation. Turkey was willing Crete, to concede the fullest local autonomy, but not to

Greece and abandon its sovereign rights over the island. In Rumania, jyjy I0O 9, however, the Greek flag was hoisted in Canea and Candia, and it was only lowered again after the war-ships of the protecting powers had been reinforced and had landed an international force. The Cretan administrative com- mittee swore allegiance to the king of the Hellenes in August, and again, after a change of government, at the end of December 1909. This situation had already given rise to prolonged negotiations between Greece and Turkey. It also contributed towards the conclusion of an entente between Turkey and Rumania in the summer of 1910. Both of these powers were interested in preventing any possible accession of territory to the

Bulgarian kingdom; and Rumania (q.v.) had for many years been a formidable opponent of Hellenism among the Macedonian Vlachs. Greece and Crete were thus confronted with what was in effect a defensive alliance between Turkey and Rumania. The Cretans had insisted upon their demand for union with Greece and had elected three representatives to sit in the Greek national assembly. Had this act been ratified by the government at Athens, a war between Greece and the Ottoman Empire could hardly have been avoided; but a royal rescript was issued by the king of the Hellenes on the 30th of September 1910, declaring vacant the three seats to which the Cretan representatives had been elected; the immediate danger was thus averted.

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2. Monographs: Much information on modern Turkish history and politics will be found in the works dealing primarily with topo- graphy, finance, law and defence, which have been cited above. See also S. Lane-Poole, Life of Lord Stratford de Redcliffe (2 vols., London, 1888) ; A. Vandal, Memoir es du marquis de Nointel (French ambassador at Constantinople from 1670 to 1678) ; E. Engelhardt, La Turquie et le Tjinzimat (Paris, 1882) ; E. Driault, La Question a" orient depuis ses origines jusqu'a nos jours (Paris, 1898); V. Berard, La Turquie et I'Hellenisme (Paris, 1897); idem, Le Sultan, V Islam et les

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3. Official Publications and Collections of Treaties: Sir E. Herts- let s Treaties Regulating the Trade, &c, between Great Britain and Turkey (London, 1875) presents a summary of all the principal treaties between Turkey and other states ; see also Gabriel Eff endi Noradounghian, Recueil d'actes internationaux de V empire ottoman, 1300-1789, t. i. (Paris, 1897). Much valuable information is to

be obtained from parliamentary papers. These are too numerous for detailed mention, but the following periods may be cited as the most interesting: 1833-1841 (Egyptian question); 1849-1859 (Crimean War and the events by which it was preceded and followed) ; 1868-1869 (Cretan insurrection); 1875-1881 (Bosnian and Herzego- vinian insurrection, Russo-Turkish War, Berlin treaty and subse- quent events) ; 1885-1887 (union of Eastern Rumelia with Bulgaria) ; 1889-1890 (Cretan disturbances); 1892-1899 (Armenian and Cretan affairs) ; 1902-1907 (Macedonia) ; I 908-1910 (revolution and reform). Some analysis of the unpublished documents in the record office, for the period 1815-1841, by W. Alison Phillips, will be found in the bibliographies to chs. vi. and xvii. of vol. x. of the Cambridge Modern History. (X.)

Literature.

In all literary matters the Ottoman Turks have shown them- selves a singularly uninventive people, the two great schools, the old and the new, into which we may divide their literature, being closely modelled, the one after the classics of Persia, the other after those of modern Europe, and more especially of France. The old or Persian school flourished from the founda- tion of the empire down to about 1830, and still continues to drag on a feeble existence, though it is now out of fashion and cultivated by none of the leading men of letters. These belong to the new or European school, which, in spite of the bitter opposition of the partisans of the old Oriental system, has suc- ceeded, partly through its own inherent superiority and partly through the talents and courage of its supporters, in

expelling its rival from the position of undisputed authority which it had occupied for upwards of five hundred years. For the present purpose it will be convenient to divide the old school into three periods, which may be termed respectively the pre-classical, the classical and the post-classical. Of these the first extends from the early days of the empire to the accession of Suleiman I., 1301-1520 (700-926); the second from that event to the accession of Mahmud I., 15 20-1 730 (926-1143); and the third from that date to the accession of ‘Abd-ul-‘AzIz, 1 730-1861

(1143-1277).

The works of the old school in all its periods are entirely Persian in tone, sentiment and form. We find in them the same beauties and the same defects that we observe in the production of the Iranian authors. The formal elegance and ?f Der ff conventional grace, alike of thought and of expression, J’* arac * er < " so characteristic of Persian classical literature, pervade ˆHenf"™ the works of the best Ottoman writers, and they are " "

likewise imbued, though in a less degree, with that spirit of mysticism which runs through so much of the poetry of Iran. But the Ottomans did not stop here: in their romantic poems they chose as subjects the favourite themes of their Persian masters, such as Leyli and Mejnun, Khusrev and Shirin, Yusuf and Zuleykha, and so on; they constantly allude to Persian heroes whose stories occur in the Shah-Nama and other store- houses of Iranian legendary lore; and they wrote their poems in Persian metres and in Persian forms. The mesnevi, the kasida and the ghazel — all of them, so far at least as the Ottomans are concerned , Persian — were the favourite verse-forms of the old poets. A mesnevi is a poem written in rhyming couplets, and is usually narrative in subject. The kasida and the ghazel are both mono- rhythmic ; the first as a rule celebrates the praises of some great man, while the second discourses of the joys and woes of love. Why. Persian rather than Arabian or any other literature became the model of Ottoman writers is explained by the early history of the race (see Turks). Some two centuries before the arrival of the Turks in Asia Minor the Seljuks, then a mere horde of savages, had overrun Persia, where they settled and adopted the civilization of the people they had subdued.

Thus Persian became the language of their court and government, and when by-and-by they pushed their conquests into Asia Minor, and founded there the Seljuk Empire of Rum, they carried with them their Persian culture, and diffused it among the peoples newly brought under their sway. It was the descendants of those Persianized Seljuks whom the early Otto- mans found ruling in Asia Minor on their arrival there. What had happened to the Seljuks two centuries before happened to the Otto- mans now: the less civilized race adopted the culture of the more civilized; and, as the Seljuk Empire fell to pieces and the Ottoman came gradually to occupy its place, the sons of men who had called themselves Seljulfs began thenceforth to look upon themselves as Ottomans. Hence the vast majority of the people whom we are accustomed to think of as Ottomans are so only by adoption, being really the descendants of Seljuks or Seljukian subjects, who had derived from Persia whatever they possessed of civilization or of literary taste. An extraordinary love of precedent, the result apparently of conscious want of original power, was sufficient to keep their writers loyal to their early guide for centuries, till

at length the allegiance, though not the fashion of it, has been changed in our own days, and Paris has replaced Shiraz as the shrine towards which the Ottoman scholar turns. While conspicuously lacking in creative genius, the Ottomans have always shown them- selves possessed of receptive and assimilative powers to a remarkable degree, the result being that the number of their writers both in prose and verse is enormous. Of course only a few of the most prominent, either through the intrinsic merit of their work or through the influence they have had on that of their contemporaries, can be mentioned in a brief review like the present. It ought to be premised that the poetry of the old school is greatly superior to the prose.

Ottoman literature may be said to open with a few mystic lines, the work of Sultan Veled, son of Maulana Jelal-ud-

Din, the author .. of the great Persian poem the Mathnawi. Sultan Veled

V*”.. flourished during the reign of ‘Osman I., though he Period ‘ not res ‘de in the territory under the rule of that

prince. Another mystic poet of this early time was ‘Ashik Pasha, who left a long poem in rhyming couplets, which is called, inappropriately enough, his Divan. The nocturnal expe- dition across the Hellespont by which Suleiman, the son of Orkhan, won Galipoli and therewith a foothold in Europe for his race, was shared in and celebrated in verse by a Turkish noble or chieftain named Ghazi Fazil. Sheikhi of Kermiyan, a contemporary of Mahommed Land Murad II., wrote a lengthy and still esteemed mesnevi on the ancient Persian romance of Khusrev and Shirin ; and about the same time Yaziji-oghlu gave to the world a long versified history of the Prophet, the Mubammediya. The writers mentioned above are the most important previous to the capture of Constanti- nople ; but there is little literature of real merit prior to that event. The most notable prose work of this period is an old collection of stories, the History of the Forty Vezirs, said to have been compiled by a certain Sheikh-zada and dedicated to Murad II. A few years after Constanti- nople passed into the hands of the Ottomans, some ghazels, the work of the contemporary Tatar prince, Mir ‘All Shir, who under the nom de plume of Nevayi wrote much that shows true talent and poetic feeling, found their way to the Ottoman capital, where they were seen and copied by Ahmed Pasha, one of the viziers of Mahommed II. The poems of this statesman, though possessing little merit of their own, being for the most part translations from Nevayi, form one of the landmarks in the history of Ottoman literature. They set the fashion of ghazel-writing ; and their appearance was the signal for a more regular cultivation of poetry and a greater attention to literary style and to refinement of language. In Sinan Pasha (d. 1420), another minister of Mahommed the Conqueror, Ottoman prose found its first exponent of ability ; he left a religious treatise entitled Tazarru’dt (Supplications), which, notwithstanding a too lavish employment of the resources of Persian rhetoric, is as remark- able for its clear and lucid style as for the beauty of many of the thoughts it contains. The most noteworthy writersof the Conqueror’s reign are, after Ahmed and Sinan,

the two lyric poets Nejati and ZatI, whose verses show a considerable improvement upon those of Ahmed Pasha, the romantic poets Jemall and Hamdi, and the poetesses Zeyneb and Mihrl. Like most of his house, Mahommed II. was fond of poetry and patronized men of letters. He himself tried versifica- tion, and some of his lines which have come down to us appear quite equal to the average work of his contemporaries. Twenty-one out of the thirty-four sovereigns who have occupied the throne of 'Osman have left verses, and among these Selim I. stands out, not merely as the greatest ruler, warrior and statesman, but also as the most gifted and most original poet. His work is unhappily for the greater part in the Persian language; the excellence of what he has done in Turkish makes us regret that he did so little. The most prominent man of letters under Selim I. was the legist Kemal Pasha-zada, frequently called Ibn-Kemal, who distinguished himself ' in both prose and verse. He left a romantic poem on the loves of Yusuf and Zuleykha, and a work entitled Nigaristan, which is modelled both in style and matter on the Gulistan of Sa'di. His contemporary, Mesihl, whose beautiful verses on spring are perhaps better known in Europe than any other Turkish poem, deserves a passing mention.

With the accession of Sellm's son, Suleiman I., the classical period begins. Hitherto all Ottoman writing, even the most highly Classical finished, had been somewhat rude and uncouth; but Period now a mar ked improvement becomes visible alike in the

manner and the matter, and authors of greater ability begin to make their appearance. Fuzuli (d. 1563), one of the four great poets of the old school, seems to have been a native of Bagdad or its neighbourhood, and probably became an Ottoman subject when Suleiman took possession of the old capital of the caliphs. His language, which is very peculiar, seems to be a sort of mixture of the Ottoman and Azerbaijan dialects of Turkish, and was most probably that of the Persian Turks of those days. Fuzuli showed far more originality than any of his predecessors; for, although his work is naturally Persian in form and in general character, it is far from being a mere echo from Shiraz or Isfahan. He struck out a new line for himself, and was indebted for his inspiration to no previous writer, whether Turk or Persian. An intense and passionate ardour breathes in his verses,

and forms one of the most remarkable as well as one of the most attractive characteristics of his style ; for, while

few even among Turkish poets are more artificial than he, few seem to write with greater earnestness and sincerity. His influence upon his successors has scarcely been as far-reaching as might have been expected — a circumstance which is perhaps in some measure owing to the unfamiliar dialect in which he wrote. Besides his Divan, he left a beautiful mesnevi on the story of Leyli and Mejnun, as well as some prose works little inferior to his poetry. Baki (d. 1599) of Constantinople, though far from rivalling his contemporary Fuzuli, wrote much good poetry, including one piece of great excel- lence, an elegy on Suleiman I. The Ottomans have as a rule been particularly successful with elegies ; this one by Baki has never been surpassed. Ruhi, Lami'I, Nev'i, the janissary Yahya Beg, the mufti Ebu-Su'ud and Selim It. all won deserved distinction as poets. During the reign of Ahmed I. arose the second of the great poets of the old Ottoman school, Nef'i of Erzerum, who owes his pre- eminence to the brilliance of his kasldas. But Nef'i could revile as well as praise, and such was the bitterness of some of his satires that certain influential personages who came under his lash induced Murad IV. to permit his execution. Nef'i, who, like Fuzuli, formed a style of his own, had many to imitate him, of whom SabrI Shakir, a contemporary, was the most successful. Na'ili, Jevri and Fehim need not detain us; but Nabi (d. 1712), who flourished under Ibrahim and Mahommed IV., calls for" a little more attention. This prolific author copied, and so imported into Ottoman literature, a didactic style of ghazel-writing which was then being introduced in Persia by the poet Sa'ib; but so closely did the pupil follow in the footsteps of his master that it is not always easy to know that his lines are intended to be Turkish. A number of poets, of whom Seyyid Vehbi, Raghib Pasha, Rahmi of the Crimea, Kelfm and Sami are the most notable, took Nabi for their model. Of these, Sami is remarkable for the art with which he constructed his ghazels. Among the writers of this time who did not copy Nabi are Sabit, Rasikh and Talib, each of whom endeavoured, with no great success, to open up a new path for himself. We now reach the reign of Ahmed III., during which flourished Nedim, the greatest of all the poets of the old school. Little appears to be known

about his life further than that he resided at Constantinople and was alive in the year 1727 (a.h. 1140). Nedim stands quite alone : he copied no one, and no one has attempted to copy him. There is in his poetry a joyousness and sprightliness which at once distinguish it from the work of any other Turkish author. His ghazels, which are written with great elegance and finish, contain many graceful and original ideas, and the words he makes use of are always chosen with a view to harmony and cadence. His kasldas are almost equal to his ghazels; for, while they rival those of Nef'i in brilliancy, they surpass them in beauty of diction, and are not so artificial and dependent on fantastic and far- fetched conceits. The classical period comes to an end with Nedim; its brightest time is that which falls between the rise of Nef'i and the death of Nedim, or, more roughly, that extending from the accession of Ahmed I. 1603 (1012), to the deposition of Ahmed III.,

1730(1143)- .

We will now glance at the prose writers of this period. Under the name of Humdyun Ndma (Imperial Book) 'All Chelebi made a highly esteemed translation of the well-known Persian classic Anvdr-i Suheyli, dedicating it to Suleiman I. Sa'd-ud-DIn (d. 1599), the preceptor of Murad III., wrote a valuable history of the empire from the earliest times to the death of Selim I. This work, the Tdj-ut-Tevarikh (Crown of Chronicles) , is reckoned, on account of its ornate yet clear style, one of the masterpieces of the old school, and forms the first of an unbroken series of annals which are written, especially the later among them, with great minuteness and detail. Of Sa'd-ud-Din's successors in the office of imperial historiographer the most remark- able for literary power is Na'lma. His work, which extends from 1591 (1000) to 1659 (1070), contrasts strongly with that of the earlier historian, being written with great directness and lucidity, combined with much vigour and picturesqueness. Evliya, who died during the reign of Mahommed lV., is noted for the record which he has left of his travels in different countries. About this time Tash-k6pri- zada began and 'Ata-ullah continued a celebrated biography of the legists and sheikhs who had flourished under the Ottoman monarchs. Hajl Khalifa, frequently termed Katib Chelebi, was one of the most famous men of letters whom Turkey has produced. He died in 1658 (1068),

having written a great number of learned works on history, biography, chronology, geography and other subjects. The Persianizing tendency of this school reached its highest point in the productions of Veysl, who left a Life of the Prophet, and of Nergisi, a miscellaneous writer of prose and verse. Such is the intentional obscurity in many of the compositions of these two authors that every sentence becomes a puzzle, over which even a scholarly Otto- man must pause before he can be sure he has found its true meaning. The first printing-press in Turkey was established by an Hungarian who had assumed the name of Ibrahim, and in 1728 (1 141) appeared the first book printed in that country ; it was Vankuli's Turkish translation of J evheri's Arabic dictionary.

Coming now to the post-classical period, we find among poets worthy of mention Beligh, Nevres, Hishmet and Sunbuli-zada Vehbi, each of whom wrote in a style peculiar to himself. Three poets of note — Pertev, Neshet and Sheikh Ghalib — flourished under Selim III. The last-named is the fourth great poet of the old

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school. Husn u 'Ash\ (Beauty and Love), as his great poem is called, is an allegorical romance full of tenderness and imaginative power. Ghalib's style is as original as that of Fuzuli, Nefi or Nedlm. The most distinguished prose writers of this period are perhaps Rashid, the imperial historio- grapher, 'Asim, who translated into Turkish two great

lexicons, the Arabic Ramus and the Persian Burhdn-i Ka(i', and Kani, the only humorous writer of merit belonging to the old school. When we reach the reign of Mahmud II., the great transition period of Ottoman history, during which the civilization of the West began to struggle in earnest with that of the East, we find the change which was coming over all things Turkish affecting literature along with the rest, and preparing the way for the appearance of the new school. The chief poets of the transition are Fazil Bey, Wasif, notable for his not altogether unhappy attempt to write verses _in the spoken language of the capital, 'Izzet Molla, Pertev Pasha, 'Akif Pasha, and the poetesses Fitnet and Leyla. In the works of all of these, although we occasionally discern a hint of the new style, the old Persian manner is still supreme.

More intimate relations with western Europe and a pretty general study of the French language and literature, together with

the steady progress of the reforming tendency fairly School. started under Mahmud II., resulted in the birth of the

new or modern school, whose objects aretruth and simplicity. In the political writings of Reshld and 'Akif Pashas we have the first clear note of change; but the man to whom more than to any other the new departure owes its success is ShinasI Effendi, who employed it (1859) for poetry as well as for prose. The European style, on its introduction, encountered the most violent opposition, but now it alone is used by living authors of repute. If any of these does write a pamphlet in the old manner, it is merely as a tour de force, or to prove to some faithful but clamorous partisan of the Persian style that it is not, as he supposes, lack of ability which causes the modern author to adopt the simpler and more natural fashion of the West. The whole tone, sentiment and form of Ottoman literature have been revolutionized by the new school: varieties of poetry hitherto unknown have been adopted from Europe; an altogether new branch of literature, the drama, has arisen; while the sciences are now treated and seriously studied after the, system of the West. Among writers of this school who have won distinction are Ziya Pasha, Jevdet Pasha, the statesman and historian, Ekrem Bey, the author of a beautiful series of miscellaneous poems, Zemzema,

Hamid Bey, who holds the first place among Ottoman dramatists, and Kemal Bey (d. 1878), the leader of the modern school and one of the most illustrious men of letters whom his country has produced. He wrote with conspicuous success in almost every branch of literature — history, romance, ethics, poetry and the drama; and his influence on the Young Turk party of later days was profound. (For the Turkish language see Turks.) (E. J. W. G.)

The magnum opus in English on Turkish poetry is E. J. W. Gibb's History of Ottoman Poetry (5 vols., 1900-8, vol. v. ed. E. G. Browne).

TURKEY, an abbreviation for Turkey-Cock or Turkey-Hen as the case may be, a well-known large domestic gallinaceous bird. How it came by this name has long been a matter of discussion, for it is certain that this valuable animal was introduced to Europe from the New World, and in its introduction had nothing to do with Turkey or with Turks, even in the old and extended sense in which that term was applied to all Mahommedans. But it is almost as unquestionable that the name was originally applied to the bird which we know as the guinea-fowl (q.v.), and there is no doubt that some authors in the 16th and 17th centuries curiously confounded these two species. As both birds became more common and better known, the distinction was gradually perceived, and the name " turkey " became restricted to that from the New World— possibly because of its repeated call-note — to be syllabled turk, lurk, turk, whereby it may be almost said to have named itself (cf. Notes and Queries, 6th series, vol. iii. pp. 23, 369) . But even Linnaeus could not clear himself of the confusion, and unhappily misapplied the name Meleagris, undeniably belonging to the guinea-fowl, as the generic term for what we now know as the turkey, adding thereto as its specific designation the word gallopavo, taken from the Gallopava of C. Gesner,

who, though not wholly free from error, was less mistaken than some of his contemporaries and even, successors. 1

The turkey, so far as we know, was first described by Oviedo in his Sumario de la natural historia de las Indias 2 (cap. xxxvi.), said to have been published in 1527. He, not

unnaturally, includes both curassows and turkeys in one category, calling both ” Pavos ” (peafowls) ; but he carefully distinguishes between them, pointing out among other things that the latter make a wheel (hacen la rueda) of their tail, though this was not so grand or so beautiful as that of the Spanish ” Pavo,” and he gives a faithful though short description of the turkey. The chief point of interest in his account is that he speaks, of the species having been already taken from New Spain (Mexico) to the islands and to Castilla del Oro (Darien), where it bred in a domestic state among the Christians. Much labour has been given by various naturalists to ascertain the date of its introduction to Europe, to which we can at present only make an approximate attempt ; 3 but after all that has been written it is plain that evidence concurs to show that the bird was established in Europe by 1530 — a very short time to have elapsed since it became known to the Spaniards, which could hardly have been before 1518, when Mexico was discovered. The possibility that it had been brought to England by Cabot or some of his successors earlier in the century is not to be overlooked, and reasons will presently be assigned for supposing that one of the breeds of English turkeys may have had a northern origin ; 4 but the often-quoted distich first given in Baker’s Chronicle (p. 298), asserting that turkeys came into England in the same year — and that year by reputation 1524 — as carps, pickerels and other commodities, is wholly untrustworthy, for we know that both these fishes lived in the country long before, if indeed they were not indigenous to it. The earliest documentary evidence of its existence in England is a ” constitution ” set forth by Cranmer in 1541, which Hearne first printed (Leland’s Collectanea, 2nd ed., vol. vi. p. 38). This names ” Turkey-cocke ” as one of the ” greater fowles ” of which an ecclesi- astic was to have ” but one in a dishe,” and its association with the crane and swan precludes the likelihood of any confusion with the guinea-fowl. Moreover the comparatively low price of the two turkeys and four turkey-chicks served at a feast of the serjeants- at-law in 1555 (Dugdale, Origines, p. 135) points to their having become by that time abundant, and indeed by 1573 Tusser bears witness to the part they had already begun to play in ” Christmas husbandlie fare.” In 1555 both sexes were characteristically figured by Belon (Oyseaux, p. 249), as was the cock by Gesner in the same year, and these are the

earliest representations of the bird known to exist.

As a denizen of the poultry-yard there are at least two distinct breeds, though crosses between them are much commoner than purely-bred examples of either (see Poultry). That known as the Norfolk breed is the smaller of the two, and is said to be the less hardy. Its plumage is black. The chicks also are black, with occasionally white patches on the head. The other breed, called the Cambridge, is much more variegated in colour, and some parts of the plumage have a bright metallic gloss, while the chicks are generally mottled with brownish grey. This has been much crossed with the American Bronze, the largest of all, which has the beautiful metallic plumage of the wild bird, with the

1 The French Coq and Poule d'Inde (whence Dindon) involve no contradiction, looking to the general idea of what India then was. One of the earliest German names for the bird, Kalekuttisch Hun (whence the Scandinavian Kalkon), must have arisen through some mistake at present inexplicable; but this does not refer, as is generally supposed, to Calcutta, but to Calicut on the Malabar coast (cf. Notes and Queries, 6th series, vol. x. p. 185).

2 Purchas (Pilgrimes, iii. 995) in 1625 quoted both from this and from the same author's Hystoria general, said to have been published a few years later.

3 The bibliography of the turkey is so large that there is here no room to name the various works that might be cited. Recent research has failed to add anything of importance to what has been said on this point by Buffon (Oiseaux, ii. 132-162), Pennant (Arctic Zoology, pp. 291-300)— an admirable summary — and Broderip (Zoological Recreations, pp. 120-137) — not tnat a " their statements can be wholly accepted. Barrington's essay (Miscellanies, pp. 127- 151), to prove that the bird was known before the discovery of America and was transported thither, is an ingenious piece of special pleading which his friend Pennant did him the real kindness of ignoring.

4 In 1672 Josselin (New England's Rarities, p. 9) speaks of the settlers bringing up " great store of the wild kind '_' of

turkeys, ” which remain about their houses as tame as ours in England.” The bird was evidently plentiful down to the very seaboard of Massachusetts, and it is not likely to have been domesticated by the Indian tribes there, as, according to Hernandez, it seems to have been by the Mexicans. It was probably easy to take alive, and, as we know, capable of enduring the voyage to England.

Mexican form of which it quite agrees in colour. White, pied and buff turkeys are also often seen, and if care be taken they are commonly found to ” breed true.” Occasionally turkeys, the cocks especially, occur with a top-knot of feathers, and one of them was figured by Albin in 1738. It has been suggested with some appearance of probability that the Norfolk breed may be descended from the northern form, Meleagris gallopavo or ameri- cana, while the Cambridge breed may spring from the southern form, the M. mexicana of Gould {Proc. Zool. Society, 1856, p. 61), which indeed it very much resembles, especially in having its tail- coverts and quills tipped with white or light ochreous — points that recent North American ornithologists rely upon as distinc- tive of this form. If this supposition be true, there would be reason to believe in the double introduction of the bird into England at least, as already hinted, but positive information is almost wholly wanting. 1 The northern form of wild turkey, whose habits have been described in much detail by all the chief writers on North American birds, is now extinct in the settled parts of Canada and the eastern states of the Union, where it was once so numerous; and in Mexico the southern form, which would seem to have been never abundant since the conquest, has been for many years rare. Farther to the south, on the borders of Guatemala and British Honduras, there exists a perfectly dis- tinct species, M. ocellata, whose plumage almost vies with that of a peacock in splendour, while the bare skin which covers the head is of a deep blue studded with orange caruncles (Proc. Zool. Society, 1861, pi. xl.).

The genus Meleagris is considered to enter into the family Phasianidae, in which it forms a subfamily Meleagrinae,

peculiar to North and Central America. The fossil remains of three species have been described by Professor Marsh — one from the Miocene of Colorado, and two, one much taller and the other smaller than the existing species, from the post-Pliocene of New Jersey. Both the last had proportionally long and slender legs. (A. N.)

TURKI, strictly speaking an Arabic or Persian adjective formed from Turk, used by European writers in two rather different senses. (1) It is applied to tribes or languages which are Turkish as opposed to Aryan, Semitic, &c. (2) It is used as the special designation of the tribes and languages of Kashgaria and Eastern Turkestan. (See Turks.)

TURKOMAN, a name applied to certain Turkish tribes still nomad or only recently settled in Transcaspia and northern Afghanistan and Persia. (See Turks.)

TURKS AND CAICOS ISLANDS, a group in the British West Indies. They belong geographically to the Bahamas and lie between 21 and 2 2° N. and 71 and 72 37′ W. They are of coral and sand formation, their combined area being 169 sq. m. The Turks Islands, taking their name from a species of cactus having the appearance of a turbaned head, are nine in number, but Grand Turk (10 sq. m.) and Salt Cay (5! sq. m.) are the only two of any size. The town of Grand Turk, on the west of the island of that name, is the seat of government and a port of registry. Salt Cay has a good harbour.

The Caicos Islands lie to the north-west of Turks Islands and are seven in number. Cockburn Harbour on South Caicos, 22 m. from Grand Turk, is the principal settlement and a port of entry. The climate, though somewhat relaxing, is healthy, but there is a scarcity of drinking water, the average annual rainfall being only 27! in. The mean temperature is 82 F., but owinr; to the sea breezes the climate is never oppressive. Salt raking is the staple industry. Sisal hemp is grown, sponges are found in some quantities off the coast and there are four sponge-curing factories on the Caicos Islands. Pink pearls are occasionally found. The exports, chiefly to the United States, include salt, sponges and sisal hemp. Grand Turk is in cable communication with Bermuda and with Kingston, Jamaica, some 420 m. to the S.W.

The islands were uninhabited when, about 1678, the Bermudians began to visit them to rake the salt found in the ponds. These visits became annual and permanent settlements were made. In

1 For results of a comparison of the skulls of wild and domesticated turkeys, see Dr Shufeldt, in Journ. of Comp. Medicine and Surgery (July 1887).

1 7 10 the British were expelled by'the Spaniards, but they returned and the salt trade (largely with the American colonies) continued to be carried on by the Bermudians despite attacks by Spaniards and French, and counter-claims to the islands by the British authorities at the Bahamas, who about 1765 made good their claim. In 1799 the islands were given representation in the Bahamas Assembly, and they remained part of that colony until 1848, when on the petition of the inhabitants they were made a separate colony under the supervision of the governor of Jamaica. This arrangement proving financially burdensome the islands were in 1873 definitely annexed to Jamaica. They are governed by a commissioner assisted by a nominated legislative board. The census of 1901 showed a total population of 5287, of whom 342 were whites, the rest being negroes or mulattoes; 17 51 of the inhabitants lived in Grand Turk Island.

See J. N. Bellin, Description geographique des debouquements au nord de St Dominique (1768); the Jamaica Handbook (London, yearly) and Sir C. P. Lucas, Historical Geography of the British Colonies, vol. ii. (2nd ed., Oxford, 1905).

TURKS. The words " Turk " and " Turkish " are used in three senses, political, linguistic and ethnological. Politically, Turk means a Mahommedan subject of the sultan of Turkey. In the East at any rate it is not employed in speaking of Christians, and its application to Arabs, Albanians, Kurds, &c, living in Turkey, though not unusual, is hardly correct. The linguistic use of the name, by which it designates a well-marked division of the Ural-Altaic languages and their speakers, is the most satis- factory. The languages in question are easily identified and defined (see below), and there can be little doubt that they were spoken by the vast majority of the people called Turks since the 6th

century of the Christian era. Ethnographically, the use of the word presents difficulties, for it is not easy to differentiate the Turks by physique or customs from allied tribes such as the Finno-Ugrians, Mongolians and Manchus. The Bashkirs, who are probably of Finno-Ugrian stock, speak a Turkish language, and the Magyars, who speak a Ugrian language, have many Turkish characteristics. At the present day there is no difficulty in making a practical distinction between Turks and Mongols. The former speak Turkish languages, are Moslems by religion, live almost entirely in the western half of Asia and fall within the Arabic, and to some extent the European, sphere of influence; the latter speak Mongolian languages, are Buddhists by religion, live in the eastern half of Asia and fall within the sphere of Chinese influence. Yet both Turkish and Mongol traditions represent the two nations as descended from two brothers: Jenghiz Khan, the founder of the Mongol power, must have had large numbers of Turks in his armies, for the chief traces left in Europe of the Mongol invasions are the settlements of Turkish-speaking Tatars in Russia; and the name of his son, Jagatai, is commonly used for a Turkish dialect and khanate in the regions of the Oxus. In Central Asia the distinctions between tribes, nations and races are unusually fluid: we are dealing with predatory nomads for ever fighting with one another or with the settled populations round them. The conquerors enslaved the men and married the women of the conquered, a successful leader attracted round his standard men of different tribes and languages. The corps of janissaries instituted by the Turks in Europe is no doubt an illustration of what happened during many centuries in Asia. The Turks after taking Constantinople claimed from the Christian population a certain number of male children, who were brought up as Turkish soldiers with few ties or principles except obedience to their officers. There was thus a large class, of Turkish speech and Turkish habits, who had absolutely no Turkish blood in their veins. In addition to this, intermarriage has taken place to so large an extent that the modern Turks are almost entirely European in physique. Similarly, no doubt, among the hordes of Central Asia the youths of conquered tribes were absorbed and assimilated by the conquerors and lost their original language. Such transformations were facili- tated by the fact that there was no great difference in the manners and

customs of these tribes. They were all nomadic, mostly horsemen, and rapacious. As they settled down from time

to time they borrowed a good deal from their more civilized neighbours, but their natural manner of life was simple and untrammelled. The Turkish-speaking tribes were apparently the most mobile and adventurous. Starting from the confines of China they reached India, Algeria and the walls of Vienna. They probably formed a large contingent in the hordes of Jenghiz and of the Huns, and perhaps the Petchenegs, Avars and Comans all belonged to this group. In comparison with them the Mongol and Manchu-speaking tribes, though conquerors in the East on no mean scale, seem stationary and inactive, while the Finno-Ugrians are nomad hunters rather than warriors. To the honour of the Turks it must be said that, bad as is their administration when judged by European standards and especially when applied to Europeans, the empires of the Seljuks, Osmanlis and Moguls which they founded rise far above the ordinary standard of ephemeral Oriental dynasties.

The effect of Turkish invasions has been in the main destruc- tive, but they have also played a considerable part in transport- ing both ideas and commodities from one end of the old world to the other. The achievement by which they are best known — the transplantation of Mahommedanism on to European soil — is a remarkable, though not successful, feat of this kind. But they are also largely responsible for the introduction of Mahommedanism into India, for carrying Nestorian Christianity and Persian fire-worship into China, and for the overland intercourse between China and India which fostered if it did not introduce Chinese Buddhism. They exported Chinese silk to Byzantium, and the most ancient Buddhist temple in Japan contains Persian objects which must have been brought across Asia by their caravans.

Divisions. — At the present day the name Turk is applied primarily to the people who have conquered Constantinople and the regions known as Turkey, but the following may be classed as Turkish in the sense of

belonging to the same group linguistically and to some extent racially:—

1. The Yakuts are a Siberian tribe who inhabit the country near the banks of the middle and lower Lena, including Yakutsk and Verkhoyansk on the Yana. Their language is purely Turkish, though differing considerably from the more western Turkish idioms, but they have largely intermingled with the Tunguses. They are said to be industrious and skilful alike as artisans, traders and agriculturists. They are nominal Christians, but preserve much of their old nature worship.

2. Tatar (q.v.) or Tartar is a popular name which in its most correct sense is applied to Turkish-speaking Moslems in Russia, who number over three millions and are mostly remnants of the Mongol invasion which took place in the 13th century. But it is also extended rather loosely to various tribes in Siberia and elsewhere who speak Mongolian, Finnish or other languages.

The following classes of Tatars speak Turkish languages : (a) The Kazan Tatars, numbering perhaps a million. Their centre is in the government of Kazan, but they extend down both banks of the Volga as far as the government of Saratov, (b) The Astrakhan Tatars, numbering only about 10,000. (c) The Bashkirs, whose headquarters are in the government of Ufa. They appear to be a tribe of Finnish origin who have adopted a Turkish language. (d) The Tatars of the Crimea, sometimes called the Krim or Nogai Tatars, who occupied the Crimea in the 13th century and had a considerable empire from the 15th to the 17th century. There are also Nogai Tatars in the Caucasus and Kuban country, (e) There are considerable bodies of Tatars in Rumania and Bulgaria, who appear to be Nogais who have emigrated from the Crimea, Bes- sarabia and other parts of Russia. (/) The Tatars of the Caucasus seem to be for the most part Azerbaijan Turks mingled with Armenian, Georgian, Lesghian and other blood. But the name is often loosely applied to any Mahommedan Caucasian tribe.

3. Kirghiz (q.v.),' nomadic tribes amounting to about three million souls who are found chiefly in Asiatic Russia. They fall into two chief divisions, (a) The Kazaks, who inhabit the northern and eastern parts of the Aral-Caspian basin,

including the government of Orenburg. They do not call themselves Kirghiz, and apparently the name has been given them by the Russians in order not to confuse them with the Cossacks, (b) The Kara- Kirghiz, who are the less numerous division, live in Dzungaria, in the Altai, about lakes Balkash and Issyk-kul, and extend southwards to the Pamirs and the sources of the Oxus. Some

of them inhabit Chinese territory. Both divisions live chiefly on the produce of their herds. Their chief drink is koumiss, or fermented mare's milk.

4. The Kara-Kalpaks (q.v.) or Black-caps, who inhabit the south-eastern shores of the sea of Aral, are sometimes classed with the Kirghiz, but seem to be a separate branch of the Turki stock. They are a feeble race, apparently in process of extinction, and now number only about 50,000.

5. Uzbeg is a political and not an ethnological denomination. It is derived from Uzbeg Khan of the Golden Horde (1312-1340), and was subsequently used at the beginning of the 1 6th century to designate the adherents of Shaibani Khan. Finally it was employed as the name of the ruling tribes in the Central Asian khanates (much like Osmanli in Turkey), in opposition to Kirghiz and Sarts, as well as to non-Turkish tribes. The Uzbegs are accordingly a mixed race, but the elements of which they are composed are mostly Turkish. Their numbers have been esti- mated at about two millions. They are mostly agriculturists or dwellers in cities, not nomads.

6. Sari is the name commonly given to the Turkish-speaking urban population of the Central Asian khanates. It is opposed to Tajik, which denotes the agricultural, Iranian-speaking population, but both words are used very loosely and have come to mean little more than town and country people. Sart and Uzbeg are also opposed in the meanings of common people and aristocracy, but many Sarts claim Uzbeg descent. The word is hardly suitable for scientific use, but is employed by Russian writers as the name of the Turkish language spoken in Bokhara, Samarkand and Ferghana.

7. The various Turkish tribes found on the eastern slopes of the Tian Shan, in Kashgar, Yarkand, Khotan, &c, are the

descendants of the ancient Uighurs or Oulghours. These people were probably the most eastern branch of the Turks who remained behind when the first westward movements were made, but subsequently moved westward themselves. They ruled in Kashgaria from the 10th to the 12th centuries, and, like other branches of the Turks, adopted Mahommedanism. They continued, however, to use a variety of the Syriac alphabet introduced by Nestorian missionaries, and a book, the Kudatku Bilik, composed in their language about 1065, is extant. The Taranchis, an agricultural tribe of the Hi basin, seem also to belong to this group. The Turkish spoken in Kashgaria, &c, is often distinguished as Turki.

8. Mogul, Moghul or Mughal, appears to be the same word as Mongol, but is commonly restricted to the tribes who invaded northern India from Ferghana in 1526 under Baber (or Babar) and established the Mahommedan Empire of Delhi. Memoirs written by Baber in Jagatai Turkish are extant.

9. The Koibals and Karagasses of the upper Yenisei are perhaps of Finnish stock, but they speak languages akin to the Kashgarian Turki. They are sometimes called Tatars.

10. Turkoman or Turkman is the name usually given to the nomadic tribes who inhabit the country between the Caspian and the Oxus. They appear to be a branch of the Western Turks and not essentially different from the Osmanlis or Azer- baijanis, except that until the Russian occupation of Merv they remained in the condition of predatory horse-riding nomads, much feared by their neighbours as ” man-stealing Turks.”

They are divided into many tribes, of which the principal are (a) The Chaudors in the north-western part of the Ust-Urt and near the Kara-boghaz Gulf, (b) The Yomuts or Yamuds extending from Khiva across the Ust-Urt and along the shore of the Caspian to Persia, (c) The Goklans or Goklens settled in the Persian province of Astarabad. They are said to be the most civilized and friendly of all the Turkomans, (d) The Tekkes, who were the most important tribe when the Russians conquered Trans- caspia. They are first heard of in the peninsula of Mangishlak, but were driven out by the Kalmuks in 171 8, and subsequently

occupied the Akhal and Merv oases. The Russians inflicted a crushing defeat on them at Geok-Tepe in 1881. (e) The Sakars inhabit the left bank of the Oxus near Charjui. (/) The Sariks are found in the neighbourhood of Panjdeh and Yulatan. (g) The Salors, an old and important tribe, suffered much in the course of fights with the Tekkes and in 1857 migrated to Zarabad in Persian territory near the Hari-rud. (h) The Ersaris are now chiefly found

near Khoja Salih. They were once a very important tribe on the upper Oxus. (i) The Ali-elis live near Andkhui.

ii. The Turkish nomads scattered over Persian territory are often known by the name of Azerbaijanis or Adharbaijanis, though this name is strictly applicable only to the inhabitants of the province of Azerbaijan (q.v.), of which Tabriz is the capital. They are the descendants of various bodies of Turks who have wandered into Persia at various times, but more particularly of the Ghuzz tribes (the Oufoi of the Greeks) who invaded it during the Seljuk period. They are also known as Hat or Iliyat, meaning tribes, and each tribe has its own chieftain or Ilkhani appointed by the shah.

Among the tribes are (i) The Kajars, who dwelt in Transcaucasia until Abbas the Great (1585-1628) forced a portion of them to settle near Astarabad. The present dynasty of Persian Shahs comes from this tribe. (2) The Afshars or Awshars are a very numerous tribe in the province of Azerbaijan. Another division of them is found in the Anti-taurus. (3) The Shekakis and Shah-seven. The latter is a political name which has become hereditary, " those who love the shah," i.e. partisans of the Safawi dynasty (1499- 1736), and of the Shiite faith. (4) The Karakoyunlu living near the town of Khoi. In the south of Persia are found (5) the Abul- werdis, (6) the Kara-Gozlu, (7) the Baharlu, (8) the Inamlu and (9) the Kashkai. These last perhaps include the Khalaches or Khalaj who were already settled near Herat before the arrival of the Seljuks, and from whom sprang the Indian dynasty known as Khalji(i290-i32o).

12. The Turks now inhabiting the Turkish Empire fall into various categories and have entered it at various times.

a. The Osmanlis or Ottomans. This word is loosely used to mean any Mahommedan subject of the sultan, though even then it is not generally extended to Arabs and Albanians. Used more strictly it means the clan of Osman and their descendants as opposed to Seljuks and other Turks. The name is genealogical rather than ethnic; for though the exploits of the Osmanlis have given them an importance in modern history far exceeding that of all the other tribes, they are not distinguished from them in language or customs. According to tradition the clan came from Khorasan, supported the Seljuks and received in return the fief of Eskishehr. In the 14th century they took Brusa from the Byzantine Empire and established a kingdom there which withstood the shock of Timur's invasion (1402). In 1453 they captured Constantinople. Until recently Turkish Mahommedans always employed the words Osmanli and Osmanlija to describe themselves and their language, and avoided the expressions Turk and Turkche as signifying semi-civilized tribes, but in the last twenty years the older words have again come into use as national designations.

b. There must be many Turks in the Ottoman dominions who have no claim to be called Osmanlis in the strict sense. Byzantine authors mention a colony of 30,000 Turks on the river Vardar in Macedonia as early as the gth century, and many Turks in Europe are still called Koniots or Konariots and claim to be descendants of the Seljuks. After the defeat of the emperor Romanus at Manzikert (1071) Turkomans and Turks of every description poured into Asia Minor. The Tatars of the Dobrudja also seem to be an ancient settlement.

c. The Kizil-Bash, or red-heads, who are found in the plains of Asia Minor about Angora, Tokat and Karahissar, differ somewhat from the surrounding Turkish population in both physique and customs. They appear to be immigrants from Persian territory, where some of them still remain. They are industrious agriculturists and their women enjoy unusual freedom. They call themselves Eski- Turk or old Turks, and have a secret religion in which Shiite tenets seem to be combined with elder pagan (or possibly Christian) elements.

d. In various parts of western and southern Asia Minor, particularly the plains of Cilicia, are nomadic Turkoman tribes called by the Turks Yilruk or Gyochebe. They are even found near Smyrna. They are a peaceful race, with fair complexions and a fine physique, and are great camel breeders. Though they do not appear to have a religion of their own like the Kizil Bash, they are only nominally Mahommedans.

Besides the peoples mentioned above, a number of extinct tribes may have been Turkish-speaking, though in the absence of linguistic

records no certain conclusion is possible. Such are the Huns Ephthalites, Avars, Bulgars, Khazars, Comans and Petchenegs. The name Hun is perhaps identical with the Chinese Hiung-nu or with the Turkish word for ten, on or un, meaning the ten tribes. Of the Avars really nothing is known: they were an extremely bar- barous people who made no settlements and disappeared as suddenly as they came. They have been identified with the Jwen-Jwen of the Chinese. The name of the Khazars has a Turkish sound : they were a relatively civilized people and had a kingdom in the neigh- bourhood of Astrakhan and the north Caspian which lasted for several centuries. The original Bulgarians were certainly not Slavs, though they acquired a Slavonic language, but it is more probable that they were Finno-Ugrians than Turks. The Petchenegs, also called Ilcn-fiea/cai or TLaTˆtvaKiraL in Greek and Bisseni in Latin, are said to have been driven into Europe from the lower Ural by the Ghuzz (Oiifoi) at the end of the 9th century, and wandered about the northern frontiers of the Byzantine Empire for about 300 years. Perhaps some of them settled in Hungary and Bulgaria. They were, like the Avars, very barbarous and were probably Turks, for Anna Comnena says they spoke the same language as the Comans. This dialect is known by the so-called Codex Cumanicus. Coman or Kuman is a name given by Europeans to the tribes who occupied Moldavia and the adjacent regions in the middle ages. Rubruquis speaks of the Coman Kipchaks, and it is probable that the Comans were a hybrid Turkish tribe.

History. — The invasions and conquests of the later Turkish dynasties form an important part of the history of the world and are treated in such articles as Turkey; Seljuks; Timur;

Moguls. Here it is proposed to sketch the earlier wanderings and agglomerations (for they can hardly be called kingdoms) of Turkish tribes in eastern and central Asia. Much new in- formation on this subject has been made accessible in the last twenty years by the discovery near the river Orkhon, to the south of Lake Baikal, of Turkish inscriptions dating from the 8th century a.d., and by the publication of materials furnished by Chinese writers. But authorities are still not entirely agreed as to the chronology of the events recorded or the identity of the names which appear in Turkish, Greek and Chinese forms, so that the following summary is for many periods tentative.

From 1400 B.C. onwards, but especially about 200 B.C., Chinese history contains notices of warlike nomads called Hiung-nu or Hsiung-nu, who were a danger to the empire. Their political power broke up in the early centuries of this era before the advance of the Sien-pi and Tobas, who appear to have been Tun- guses, and from whom arose the Wei dynasty of northern China. In a.d. 433 a Hiung-nu clan called Asena or A-shih-na, disliking the rule of the Wei, moved eastwards and sought the protection of a people called Jeu-Jen or Jwen-Jwen, who were also a kind of Hiung-nu. They are the Geougen of Gibbon and others, and their identity with the Avars has been affirmed and disputed with equal confidence. The Asena served the Jwen-Jwen as workers in iron and lived not far from the modern city of Shan- Tan in Kan-suh. In this neighbourhood was a hill called from its shape Turku, Diirkii or T'u-chiieh, meaning helmet, and this is said be to the origin of the national name which has become so celebrated. The name Tu-Kiue (Tou-Kiue) or Turk is first used by the Chinese in recording the events of a.d. 545, and the follow- ing years, when the Turks, or descendants of the Asena, revolted against the Jwen-Jwen. These latter were crushed and disappear from history, at least under that name. The victorious Turks advanced across their territory, came into collision with the Hephthalites or Ephthalites, whom they defeated, and are heard of on the Oxus about a.d. 560. The period 546-582 marks the first brilliant epoch of early Turkish history. The tribes were not divided and made the most astonishing advance under Tumen (who took the title of Hi-Khan), his brother Itsami or She-ti-mi (perhaps the

Stembis of Greek writers), his son Mokan and Istami's son Tardu or Ta-t'eu. Though fifty years before only a servile clan in China, they sent an embassy in 567 to the East Roman emperor Justin II., as related by Menander Protector (C. Muller: Fragm. hist, graec, vol. iv.). The object of this mission was to open up commercial relations, especially in the silk trade, with the West, and to co-operate with the Greeks against the Persians, because the latter wished to make the Persian Gulf the only outlet for the silk trade, and with that object to hamper the communications of the Turks with Western powers. The ruler who sent this embassy is called in Greek

Sflziboulos or Dilziboulos, corresponding to the Sinjibu of Arab chroniclers and perhaps representing Sin-jabgu in old Turkish, the latter part being a title. He has been identified with Istami. Justin sent as envoy to him in return a certain Zemark, who visited the khan at Ektel or Ektag (? Ak-dagh), and several subsequent embassies were exchanged. In 598 the khan Tardu wrote to the emperor Maurice, and in 620-28 the Turks assisted Heraclius in his campaigns against Persia. Meanwhile the Turks had themselves split into two divisions with separate princes. A tendency towards division, very natural in so loose and extended a community, had been visible for some time, and the rupture was precipitated in 582 by the jealousy of Ta-lo-pien or Dalobian, who was angry at not being chosen khan. For a century and a half or so we hear of two khanates: the northern Turks, riving near Lake Baikal and the southern tributaries of the Yenisei, and the western 1 Turks, who appear to have had two headquarters, one near Urumchi and one near Aulieata, north of Tashkent. But their conquests, or at least their successful raids, extended very much farther to the west and south. In 630 the Chinese pilgrim Yuan Chwang (Hsiian Tsang) was well received by their khan, T'ung-she-ho, who exercised some kind of authority from Turfan to Merv. The Chinese followed a consistent policy of spreading dissension among these dangerous tribes and of supporting the factions which were weak or distant against those who were strong or near. Accordingly they were friendly to the western Turks until

they had conquered the northern Turks. This western branch lasted until about 750 as a political name. From about 550 till 650 they were independent, and, as mentioned, allies of the east Roman Empire against the Persians. But about 650 the politics of the Nearer East were transformed by the conquests of the Arabs following on the preaching of Mahomet. After subduing Persia in 639 they spread to Transoxiana. At the same time dissension prevailed among the western Turks themselves: the five tribes called Nu-she-pi, who lived west of Issyk-kul, quarrelled with the five tribes called Tu-lu living to the east of it. The Chinese fomented the quarrel, and in 659 were able to declare that they annexed the whole territory of the western Turks, including at least Dzungaria, Tashkent, Ferghana, Bokhara, Khulm, Badakshan, Ghazni, Bamian, Udyana, Wakhan and Karateghin. But it would seem that neither the Turkish occupation nor the Chinese annexation of most of these countries was effective". From 650 to 750 the possession of them was disputed not only by the Turks and Chinese but by the Tibetans in the east and the Arabs in the west. In the west, the campaigns of Qotaiba b. Moslim or Kutaiba (705-14) completed the Mahommedan conquest of Transoxiana (see Caliphate, sect. B § 6). In the east the really effective power seems to have been exercised by a new Turkish tribe called Turgash, who had capitals at Tokmak and in Hi.

For the history of the northern Turks 1 our only authorities are the Orkhon inscriptions and Chinese writers. The half-century following on the division was prosperous for the north- ern as well as for the western Turks, and they menaced China; but in '630 the Chinese conquered them. This is the Chinese servitude mentioned in the inscriptions. In 682 Kutluk (also called Elteres, which seems to be a title) re-established a Turkish state on the Orkhon. He was succeeded by his brother Kapagan (or Me-Chuo), who subdued the Turgash, or perhaps merely drove them southwards, early in the 8th century, and was succeeded by Bilga Kagan of the inscriptions.

This northern khanate was destroyed by a coalition of the Karluk, Uighur and Basmal in 744. These peoples, like the Turgash, appear to have been Turkish; for though Turk was originally the name of the clan whose destinies in its northern and western branches have just been sketched,

yet there is no objection to the usage by which it is extended to the descendants

1 No better name seems forthcoming, but western Turks is a most inconvenient designation because it is also used (and equally correctly) to signify the Osmanlis and Seljuks as opposed to the Turks of Transoxiana and Kashgar.

of similar clans with similar customs and as far as is known similar languages. A succession of these pressed forwards from the east. When first heard of, the Karluk inhabited the country on the Irtysh and the Urungu, and subsequently occupied Teles and Tokmak. The Uighurs belonged to the group of tribes known as Tolos or T'ie-le and established themselves at Balasaghun (also known by the forms Kara-Balghasun, Kara- Balgassun and Balagasun: see Karakorum). This brings us to the middle of the 8th century. For the next two hundred years the Turkish element in Central Asia, though it must have been numerous, does not cut any figure in history, which is filled with the chronicles of Arab and Persian dynasties (see Caliphate; Samanids), but in the 10th century we begin to hear of it again. Turkish adventurers founded the dynasty of Ghaznevids at Ghazni, and there was a Uighur kingdom in the east comprising Kashgar and Khotan. Boghra Khan, the ruler of this kingdom, was converted to Islam at the end of the 10th century, and it continued under various branches of Uighurs until 11 20. An interesting memorial of this period is the book Kudatku Bilik (see below). More important politi- cally is the rise of the Seljuks. They were the princely family of the Kabaks, who were a section of the group of tribes called Ghuzz (Oghuz, Oiifot), and are heard of in Transoxiana about 985. Their chieftains Toghrul and Chakir drove the Ghaznevids to India and established themselves as protectors of the Abbasid caliph, who formally ceded his temporal power to them. (For the history of the dynasty see Seljuks.) Alp Arslan, the son of Chakir, defeated the Byzantines at Manzikert (1071), and prepared the way for the Ottoman conquests. His son Malik Shah ruled over nearly all the modern Turkey in Asia, and as far as the frontiers of China. On his death in 1092 his empire broke up into several pieces. Konia became the capital of the sultanate of Asia Minor and various Seljuk dynasties established themselves in Kerman, Irak and Syria. A new Turkish power was founded by the khans of Khiva,

who are known as the Khwarizm-shahs. They were originally vassals of the Seljuks, with the title of tasdar or ewer-bearer, but became independent and conquered Khorasan and Irak. They had, however, to contend with yet another new arrival from the east, the Kara- Kitais. These also were probably Turks, and were pushed westwards from' China by the Kins. They conquered Kashgar, Khotan, Yarkand and later Transoxiana, pushing the Ghuzz tribes before them into Persia and Afghanistan. Their prince bore the title of gur-khan, and the Khwarizm shahs did homage to him till 1208, when they unsuccessfully revolted. But all these squabbling principalities were swept away in 12 19 by the extraordinary wave of invasion which surged across Asia to Europe under Jenghiz Khan (q.v.). After the death of Jenghiz his conquests were divided, and Transoxiana, Kashgar, Badak- shan, Balkh and Ghazni were given to his second son Chagatai or Jagatai. Jenghiz and his family must have been Mongols, but the name Jagatai passed to the population and language of the countries about the Oxus. It does not appear that they ever ceased to be Turkish in speech and customs. The hordes of Jenghiz must have comprised a considerable Turkish element; the Mongols had no inclination to settle in cities, and Jagatai himself lived near Kulja in the extreme east of his dominions. Though the cities in western Central Asia suffered severely the people were not Mongolized, and Mahommedan learning even flourished. But otherwise the whole history of the Jagatai khanate, which lasted from 1234 to 1370, is a con- fused record of dissensions with frequent intervals of anarchy. In 1321 it split into two khanates, Transoxiana and Dzungaria, and in 1370 collapsed before Timur. This great conqueror (1333-1404), who like Jenghiz had an extraordinary power of collecting and leading the hordes of Central Asia, was a native of the district of Samarkand and a Turk by descent. He con- quered successively Dzungaria (1370), Persia and the Caucasus (1390), the Kipchaks on the Volga (1395), and Northern India (1398). He then invaded Syria and Asia Minor, where he de- feated but did not annihilate the Osmanlis. The house of Timur did not retain his more distant conquests, but they ruled at

Samarkand until 1499 with the usual struggles between different branches of the family. Their possessions included, at least from time to time, the northern parts of Afghanistan and Persia, as well as Transoxiana and Turkestan. They were one of the most enlightened and cultivated of Turkish dynasties. They beautified the cities of Central Asia and were patrcns of literature. The literary languages were as a rule Arabic or Persian; Turkish was used more rarely and chiefly for poetry.

The Timurids were overthrown and succeeded by the Shaibani dynasty, a branch of the house of Juji, Jenghiz Khan's eldest son, to whom his father had assigned dominions in the region north of the kingdom of Jagatai. About 1465 a number of this clan migrated into the Jagatai khanate. They were given territory on the Chu River and were known as Uzbegs. About 1500 their chief, Mahommed Shaibani or Shahi Beg, made himself master of Transoxiana and founded the Uzbeg power. The chief opponent of the Uzbegs in their early days was Baber, who represented the house of Timur in the fifth generation, but he ultimately led his armies in another direction and invaded India (1526), where he founded the Mogul Empire, a far more important state than the principalities of the Oxus. The Shaibanis continued to rule in these latter till 1583, and were followed by the houses of Astrakhan and Mangit; but it is not necessary to continue here the complicated chronicles of these dynasties.

The Osmanlis, or house of Osman, the founders of the present Turkish Empire, appear to have been a clan similar to the early Seljuks or the present Turkomans of Transcaspia, who migrated into Asia Minor from Khorasan and made the neighbourhood of Brusa their headquarters. Their conspicuous position in history is mainly due to the fact that they attained pre-eminence very late and in districts very near Europe. Except for the invasion of Timur they did not suffer from the attacks of other Turks and they were able to concentrate their strength on the conquest of the decrepit Byzantine Empire.

Customs, Civilization, Religion, &c. — The Turks are imitative rather than original, and, in all their branches, have assimilated to some extent the nearest civilization whenever they have settled down. Up to the 7th century

their only culture consisted of some scraps of Chinese and Indian civilization. Subsequently both the eastern and western states which they founded adopted Perso- Arabic civilization and Mahommedanism. The Osmanlis have also been affected by Byzantine and west European influences.

Chinese historians and the Turkish inscriptions of the Orkhon and Yenisei give us a good deal of information respecting the earlier condition of these tribes. We are told that the Hiung-nu lived on horseback and moved about from place to place in search of fresh pasture. They possessed horses, cattle and sheep and also camels. They had no towns or villages and no agriculture and they never stayed long in one camp, but during their halts a special piece of land was assigned to each tribe and each tent. They were ignorant of writing. The children were taught to ride and shoot, and the adults were expert archers. Their food was flesh and milk and their clothing the skins of animals. They were polygamous and a son married his deceased father's wives, except his own mother. It is expressly stated that old people were despised and neglected, but this barbarous trait disappeared from the manners of the later Turks.

Of the Turks in the 6th century the Chinese writers give a rather more flattering account. They had numerous grades of rank, and when their khan was invested with the supreme power he was carried in a carpet. When troops were levied or taxes collected, the required amount was carved on a piece of wood marked with a golden arrow as a sign of authority. Their punishments were severe. Marriage was by arrangement with the parents, not capture. The dead were kept for some time after death and the mourners gashed their faces. They sacrificed to heaven and to the spirits of their ancestors. Their amusements included singing antiphonally, playing dice and drinking koumiss till they were drunk. They had a written alphabet (derived from India or Syria) and a duodenary cycle in which the years were designated by the names of animals. Somewhat similar accounts are given of the Kerkur or Kirghiz and of the Kankli or Kankali. These were perhaps the ancestors of the Uighurs and moved about in carts with high wheels: they are described as a barbarous undis- ciplined people, but capable of concerted action.

In the Orkhon inscriptions of the early part of the 8th century a somewhat more civilized branch of the Turks gives an account of itself which tallies with the Chinese descriptions. No Turkish cities are mentioned, only tribes and localities. War is the national occupation. The sovereign or kagan fights himself, and it is interest- ing to see that the names of the various chargers which he mounted are carefully recorded. The spirit of tribal patriotism and desire

ior glory which animate these compositions are very noticeable and also the implied obligation of the rulers to see to the prosperity of the people. The existence of the tombs and of inscriptions in Chinese characters as well as in an alphabet of Aramaic origin, and the mention of gold, silver, silk and precious objects show that the builders had looted, so to speak, a certain amount of fragmentary civilization from their neighbours. The chief deity is Heaven or Tangri (still used in Osmanli Turkish as the equivalent of Allah), who gives the kingdom to the kagans and cares for the name and reputation of the Turkish people. There are also spirits of the earth and waters. All this is very like the earliest Chinese religion. Funeral ceremonies were evidently elaborate and the cycle of years named after animals was used for chronology.

The Chinese pilgrim Husan Tsang was entertained by She-hu (perhaps a title), kagan of the Western Turks, near Tokmak about a.d. 630. He left an account of the barbaric splendour of his recep- tion and alludes to the number of horses, the gold embroidery of the kagan's tent, the silk robes of his retinue, and the use of wine and music. He says the Turks were fire-worshippers and would not sit on wooden seats.

It is probable that before they were converted to Islam the Turks practised in a desultory manner Buddhism, fire-worship and Nes- torian Christianity, though they never wholly accepted any of them. An interesting trace of Buddhism remains in the names Shaman and Shamanism. It would appear that the Indian word Sramana or Samana was applied to the wizards and exorcizers of the older Turkish superstition. Recent investigations have discovered the existence of a considerable Buddhist civilization at Khotan, but at the time when it flourished it would appear that the

mass of the population was of Iranian affinities and that the Turkish element was small.

The Kudatku Bilik (about 1065) gives a picture of life in Eastern Turkestan after the conversion to Islam, but still showing many traces of Chinese influence. But after this period nearly all the Turks (except a few obscure tribes like the Yakuts) adopted the Perso-Arabic civilization. Some however, such as the Kirghiz, Turkomans and Yuruks of Asia Minor, have not yet abandoned the nomadic life. The Turks seem to be everywhere characterized by their innate sense of discipline and their submissiveness to their own authorities; councils or assemblies have rarely assumed importance among them; sovereigns and even dynasties (except the house of Osman) have often been removed by violence, but.the despotic form of government has never failed to secure obedience. But equally important, as explaining their military successes, is the fact, noticed alike by ancient Chinese historians and modern European officers, that the ordinary Turkish soldier has in military matters an unusual resourcefulness and power of initiative which, without impairing discipline, renders him independent of his officers.

Language. — The Turkish or Tatar-Turkish languages belong to the Ural-Altaic family. Both nominal and verbal forms are built up solely by the addition of suffixes, and the law of vowel harmony is strictly observed. Hard and soft vowels cannot occur in the same word, and there is a tendency to assimilate the vowels of the suffix to those of the root; thus pederiniz, your father, but dostunuz, your friend. From the Mongol-Manchu languages the Turkish group is distinguished by its much more developed system of inflexion, particularly in the verbs, by its free use of pronominal suffixes, and by its more thoroughly agglutinative character. The stem with its suffixes forms a single compound word, whereas in Mongol the suffixes often seem quasi-indepen- dent. In all these features Turkish resembles the Finno-Ugric languages, but it diverges from them in having a much simpler system of cases and different phonetics, in the absence of many peculiarities such as the incorporation of the pronominal object in the verb, and in the development of some special forms, such as the expression of negation by inserting a suffix after tjie verbal root (yazdim, I wrote, yazmadim, I did not write). The gram- matical forms are more

agglutinative and less inflexional than in Finnish; though they are single words, the root does not change and the elements can be easily separated, which is not always the case in Finnish. Compare the Turkish gyordunuz, ” you saw,” from the root gyor, with the equivalent Finnish naitte from nake. The fusion between the root and suffixes is much more thorough in the latter. Turkish thus stands midway between Mongol and Finnish in its development of the agglutinative principle. Also, though compounds are not unknown in Turkish (e.g. demiryol, railway) they are much rarer than in Finnish or Hungarian.

Despite the apparent divergence between Turkish and Mongol, due perhaps partly to the influence of Chinese on the latter, the affinity between them seems real, though not superficial. The pronouns, case suffixes, and construction of sentences all show a

general similarity, and the verb in Buriat, which differs from other Mongol languages, exhibits a development parallel to Turkish.

The want of resemblance in vocabulary between the three classes of languages is remarkable. The numerals, for instance, in Turkish, Mongol and Finno-Ugric are entirely different, and con- siderable changes have to be assumed before the identity of words can be proved. A comparison of Turkish words with Mongol equivalents makes it probable that the former are in many instances contractions: thus dagh, mountain, yol, road, corre- spond to the Mongol dabaga, yabudal and perhaps represent an earlier tavagh and yavol. The best-known Turkish languages, particularly Osmanli, have borrowed an enormous number of Arabic and Persian words which disguise the characters of the native vocabulary and to some extent affect the grammar.

Compared with the Finno-Ugric group, the Turkish languages are remarkably uniform. Indeed, allowing for the lapse of time and the importation of foreign words, it is hardly an exaggeration to say that from ‘the Lena to Constantinople, from the Orkhon inscriptions till now, we

have merely one language in different dialects. The native vocabulary and grammar remain sub- stantially the same. The linguistic type is evidently strongly individual and persistent, and its separation from Mongol, &c, is probably very ancient.

Radlov divides the Turkish languages or dialects into four groups, according to their phonetic system, (i) Eastern: Altai, Baraba, Lebed, Tuba, Abakan, Kiiarik, Soyon, Karagass and Uighur. (2) Western : Kirghiz, Bashkir, Irtysh and Volga dialects. (3) Central Asiatic: Jagatai, Taranji, &c. (4) Southern: Turkmani, Azerbai- jani, Krirrmi, Anadoli and Osmanli. But this classification does not seem entirely satisfactory. As one passes across Asia from the Yakuts, through Kashgar, Turkestan and Azerbaijan to Constanti- nople, the pronunciation of the Turkish languages becomes decidedly softer, the suffixes become more intimately united with the words to which they are appended (approaching though not attaining the unity of Finnish inflexions), and the verbal forms grow more numer- ous and more complicated. Thus in the east we find nin, ni, go as suffixes for the genitive, accusative and dative, and man for that of the first personal pronoun (e.g. durman, I stand or I am) correspon- ding to -in, -i, -a and -im in Osmanli, which have clearly assumed the character of inseparable terminations more completely than the older forms. Osmanli possesses more copious verbal forms than the other dialects, some of which (such as the future in ajak) seem to be recent formations. On the other hand, the dialects of Turkestan use in speaking, though not in writing, forms which indicate a process of composition followed by contraction, more remarkable than any change which has taken place in the west. For instance, wopti, a contraction of bolup irdi, is said to be currently used in Khokand for ” has become.” Yakut (which can still be best studied in Boht lingk’s excellent grammar of 1851) is the dialect which is most distinct from the others, but does not appear always to preserve the oldest forms Thus it has lost the genitive, which is replaced by a pronominal jieriphrasis (e.g. oriis bas-a, horse head-his, i.e. horse’s head), and has verbal forms like bisabin, I cut, bispappin, I do not cut, apparently standing for bisarbin, bispatbin. The negative suffix is pa not ma. The resemblance between the Turkish dialects is increased by the fact that they are nearly all

written in a somewhat artificial and standardized form which imperfectly represents the variety existing in conversational speech.

Several alphabets have been employed to write Turkish. (1) Arabic characters are everywhere used by Mahommedan Turks, almost without exception; yet this alphabet is extremely ill suited to represent Tt^kish sounds. It cannot distinguish the hard and soft vowels, so that oldu, ” he was ” is written in the same way as oldii, ” he died.” In some cases the consonants indicate the charac- ter of the vowels which are to be supplied after them, hard consonants being followed by hard vowels and soft by soft. Thus the word spelt with the letters kaf, re, he is pronounced as kara, but that spelt with kef, re, he as kerre. Further the orthography often follows an antiquated pronunciation and the letters have many sounds. Thus the single letter kef can be used to express k, ky, g, gy, y, v, w and n. The result is that pure Turkish words written in Arabic letters are often hardly intelligible even to Turks and it is usual to employ Arabic synonyms as much as possible because there is no doubt as to how they should be read. Osmanli documents are oiten little more than a string of Arabic words with Turkish terminations.

2. The Uighurs and Eastern Turks used in the middle ages a short alphabet of fourteen letters derived from a Syriac source and prob- ably introduced among them by Nestorian missionaries; similar characters may also have been employed by Manichaeans. The Mongol and Manchu alphabets represent further variations of this writing. Though very like the modern Nestorian, it is in some respects more nearly allied to the Estrangelo and Syro-Palestinian alphabets of the 6th and 7th centuries. The most important

document in this alphabet is a MS. preserved at Vienna of the Kudatku Bilik, ” The Blessed or Fortunate Knowledge,” a poem composed at Kashgar about 1065. A colophon states that the MS. was written at Herat in 1465, and that it is a copy of one written in 1085. Inscriptions in a similar alphabet have also been found in China.

3. The most interesting forms of Turkish writing are those used on the inscriptions found in Siberia near the Yenisei

and Orkhon rivers. For some time it has been known that stones bearing inscrip- tions as well as roughly carved figures and hunting scenes were to be tound on the upper waters of the Yenisei, particularly near its tributary the Abakan in the district of Minusinsk. They are greatly venerated by the Soyotes inhabiting the region. They were first discovered by Messerschmidt in 1722, and some of them were repre- sented in the plates of Strahlenberg's Das nord. und ostliche Theil von Europa und Asia (1730). They were generally attributed to Scythians or Chudes. The knowledge of them did not much advance until the researches of Castren (1847) and the Finnish Society of Archaeology, which in 1889 published the text of thirty-two, chiefly from the Uibat, Ulukem, Altynkul and Tes. Even more interesting are the monuments discovered in 1889 and known as the Orkhon or Kosho-Tsaidam inscriptions, as they were found in Mongolia to the south of Lake Baikal, between the river Orkhon and Lake Kosho-Tsaidam. The most important are a mortuary inscription in Turkish and Chinese, bearing a date corresponding to 733, in honour of Kiil-tegin, and another recounting the exploits of Bilga Kagan. A. third inscription at Kara-Balgassun probably dates from 800-805. The inscriptions were deciphered and translated by Thomsen and Radlov, and Donner examined the origin of the alphabet. He came to the conclusion that the Yenisei alphabet is rather older than that of the Orkhon inscriptions, and that both are derived from the Aramaic alphabet and most nearly allied to the variety of it used on the coins of the Assacid dynasty. In the 3rd century A.D. a section of the Kirghiz, who subsequently moved northwards, were in West Sogdiana and in touch with the Yiie-Chi, who had been for some time in contact with Persia. The old Turkish characters bear a superficial resemblance to runes; the Yenisei letters have the simplest shapes, those of Kara-Balgassun the most complicated. But they are mostly traceable to Aramaic prototypes and have no connexion with Scandinavia. The vowels are generally omitted, even at the beginning of words, and, as in the modern Turkish method of using the Arabic alphabet, their quality is often indicated by the consonants, many of which have two forms, one used with soft the other with hard vowels. Thus bar and bar are differentiated not by the vowels but by the consonants employed to write them.

4. Turkish-speaking Armenians and Greeks often write it in their own alphabets. Turkish newspapers printed in Armenian charac- ters are published in Constantinople, and Greek characters are similarly employed in several parts of Asia Minor.

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(C. El.)

TURLE, JAMES (1802-1882), English organist and composer, was born at Taunton, Somerset, and started as a choir boy at Wells Cathedral. In 1817 he became a pupil in London of the organist at Westminster Abbey, and after acting as deputy for some years he succeeded to this post himself in 1831 and held it till his death. He and Sir John Goss, the organist at St Paul's, had been fellow-pupils in London as boys. Turle was a great organist in his day, and composed a good deal of church music which is still well known. His son Henry Frederic Turle (1835- 1883) was editor of Notes and Queries.

TURMERIC (from Fr. terre mtrite, turmeric, Lat. terra merita, deserved, i.e. excellent earth; Skeat suggests that it is a barbarous corruption, perhaps of Arabic karkam, kurkwm, saffron or cur- cuma), the tuberous root of Curcuma longa, L., an herbaceous perennial plant belonging to the natural order Zingiberaceae. It is a native of southern Asia, being cultivated on a large scale both on the mainland and in the islands of the Indian Ocean. Turmeric has been used from a remote period both as a condi- ment and as a dyestuff, and to a more limited extent as a medicine (now obsolete). In Europe it is employed chiefly as a dye, also as an ingredient in curry powder and as a chemical test for alkalies. The root is prepared by cleaning it and drying it in an oven. There are several varieties (Madras, Bengal, Gopalpur, Java, China and Cochin turmeric), differing chiefly in size and colour and to a slight degree in flavour. Some of these consist exclusively of the ovate central tubers, known as " bulbs," or " round turmeric," and others of the somewhat cylindrical lateral tubers, which are distinguished in trade as " fingers," or " long turmeric." Both are hard and tough, but break with a

short resinous or waxy fracture, which varies in tint from an orange brown to a deep reddish brown. The colour is due to curcumin, C14H16O7, of which the drug contains about 0-3%. When pure it forms yellow crystals having a vanilla odoun and exhibiting a fine blue colour in reflected light. It is soluble in alcohol, in chloroform and in alkaline solutions, but only sparingly in water. Paper tinged with a tincture of turmeric exhibits on the addition of an alkali a reddish brown tint, which becomes violet on drying. This peculiarity was pointed out by H. A. Vogel in 1815, and since that date turmeric has been utilized as a chemical test for detecting alkalinity. It is of no therapeutic value. In Sierra Leone a kind of turmeric is obtained from a species of Carina.

TURNEBUS, ADRIANUS [Adrien Turnebe] (1512-1565), French classical scholar, was born at Les Andelys in Normandy. At the age of twelve" he was sent to Paris to study, and attracted great notice by his remarkable abilities. After having held the post of professor of belles-lettres in the university of Toulouse, in 1547 he returned to Paris as professor (or royal reader) of Greek at the College Royal. In 1552 he was entrusted with the printing of the Greek books at the royal press, in which he was assisted by his friend, Guillaume Morel (q.v.). He died of consumption on the 12th of June 1565. His works chiefly consist of philological dissertations, commentaries (on Aeschylus, Sophocles, Theophrastus, Philo and portions of Cicero), and translations of Greek authors into Latin and French. His son, fitienne, published his complete works, in three volumes (Strassburg, 1600), and his son Adrien his Adversaria, containing explanations and emendations of numerous passages in classical authors.

See Oratio funebris by Leger du Chesne (Leodegarius a Quercu) prefixed to the Strassburg edition ; L. Clement, De Adriani Turnebi praefationibus et poematis (1899); J- E. Sandys, History of Classical Scholarship (1908) iii.

TURNER, CHARLES (1773-1857), English engraver, was born at Woodstock in 1773. He entered the schools of the Royal Academy in 1795ˆ and, engraving in stipple in the manner of Bartolozzi, he was employed by Alderman Boydell. His finest plates, however, are in mezzotint, a method in which he engraved J.M.W. Turner's " Wreck "

and twenty-four subjects of his Liber studiorum, Reynolds's " Marlborough Family," and many of Raeburn's best portraits, including those of Sir Walter Scott, Lord Newton, Dr Hamilton, Professors Dugald Stewart and John Robinson, and Dr Adam. He also worked after Lawrence,

Shee and Owen. He was an admirable engraver, large, broad and masterly in touch; and he reproduced with great fidelity the characteristics of the various painters whose works he translated into black and white. In 1828 he was elected an associate of the Royal Academy. He died on the 1st of August 1857.

TURNER, SIR JAMES (1615-1686), Scottish soldier and military writer, was educated with a view to his entering the Church, but early showed his preference for the profession of arms by enlisting in the Swedish army, then the most famous training- school in Europe. He saw considerable service in the Thirty Years' War, and in 1640 returned to Scotland as a captain. It was not long before he secured employment, and as a major he accompanied the Scottish army in its invasion of England in the same year, successfully avoiding the imposition of the " Covenant " as a test. With Lord Sinclair's regiment Major Turner served in Ulster, and subsequently, after failing to join Montrose's army, accompanied the Scottish army until Naseby practically ended the Civil War. Turner was often with Charles I. during his detention at Leslie's headquarters, and continually urged him to escape.. Up to this time he had served against the king, but always with some repugnance, and he welcomed the opportunity when in 1648 the cause of the king and the in- terests of the Scottish nation for the moment coincided. In the disastrous campaign which followed Turner was at Hamilton's headquarters, and it was owing to the neglect of his advice that the rout of Preston took place. Taken in the final surrender at Uttoxeter, he spent some time in captivity, but in 1649 was re- leased and sent abroad. He was unable for want of means to reach Montrose in time to join in the final venture of the noblest of the Royalist commanders, but he landed in Scotland on the day before Dunbar, and in the grave crisis that followed was a welcome ally. As a colonel and adjutant-general of foot he was with Charles II. at Worcester. In that battle he

was captured, but regained his liberty, and after many adventures escaped to the Continent, where for some years he was engaged in various Royalist intrigues, conspiracies and attempted insurrections. At the Restoration he was knighted, and in 1662 he became a major in the Royal Guards. Four years later, as a district com- mander in Scotland, he was called upon to deal severely with Covenanter disturbances. Though not, it appears, unjust, his dragooning methods eventually led to his being deprived of his command. The rest of his life was spent in retirement. A pension was granted to him by James II. in 1685. In 1683 he had published his Pallas armata, Military Essayes of the Ancient Grecian, Roman and Modern Art of War, one of the most valuable authorities for the history of military sciences.

TURNER, JOSEPH MALLORD WILLIAM (1775-1851), English painter, was born in London on the 23rd of April 1775. His father, William Turner, a native of Devonshire, kept a barber's shop at 26 Maiden Lane, in the parish of St Paul's, Covent Garden. Of the painter's mother, Mary Marshall or Turner, little is known; she is said to have been a person of ungovernable temper and towards the end of her life became insane. Apparently the home in which Turner spent his child- hood was not a happy one, and this may account for much that was unsociable and eccentric in his character. The earliest known drawing by Turner, a view of Margate Church, dates from his ninth year. It was also about this time that he was sent to his first school at New Brentford. Of education, as the term is generally understood, he received but little. His father taught him to read, and this and a few months at New Brentford and afterwards at Margate were all the schooling he ever had; he never mastered his native tongue, nor was he able in after life to learn any foreign language. Notwithstanding this lack of scholarship, one of his strongest characteristics was a taste for associating his works with personages and places of legendary and historical interest, and certain stories of antiquity seem to have taken root in his mind very strongly.

By the time Turner had completed his thirteenth year his schooldays were over and his choice of an artist's career settled. In 1 788-1 789 he was receiving lessons from Palice, " a floral drawing master; " from T. Malton, a perspective

draughtsman;

and from Hard wick, an architect. He also attended Paul Sandby's drawing school in St Martin's Lane. Part of his time was employed in making drawings at home, which he exhibited for sale in his father's shop window, two or three shillings being the usual price. He coloured prints for engravers, washed in backgrounds for architects, went out sketching with Girtin, and made drawings in the evenings for Dr Munro " for half a crown and his supper." When pitied in after life for the miscellaneous character of his early work, his reply was " Well! and what could be better practice? " In 1789 Turner became a student of the Royal Academy. He also worked for a short time in the house of Sir Joshua Reynolds, with the idea, apparently, of becoming a portrait painter; but, the death of Reynolds occurring shortly afterwards, this intention was abandoned. In 1790 Turner's name appears for the first time in the catalogue of the Royal Academy, the title of his solitary contribution being " View of the Archbishop's Palace, Lambeth." About 1792 he received a commission from Walker, the engraver, to make drawings for his Copper- Plate Magazine, and this topographical work took him to many interesting places. The natural vigour of his constitu- tion enabled him to cover much of the ground on foot. He could walk from 20 to 25 m. a day with ease, his baggage at the end of a stick, making notes and memoranda as he went. He rose early, worked hard all day, wasted no time over his simple meals, and his homely way of living made him easily contented with such rude accommodation as he chanced to find on the road. A year or two after he accepted a similar commission to make drawings for the Pocket Magazine, and before his twentieth year he had travelled over many parts of England and Wales. None of these magazine drawings is remarkable for originality of treatment or for artistic feeling.

Up to this time Turner had worked in the back room above his father's shop. His love of secretiveness and solitude had already begun to show itself. An architect who often employed him to put in backgrounds to his drawings says, "

he would never suffer me to see him draw, but concealed all that he did in his bedroom." On another occasion, a visitor entering unannounced, Turner instantly covered up his drawings, and, in reply to the intimation,

" I've come to see the drawings for ," the answer was, " You

shan't see 'em, and mind that next time you come through the shop, and not up the back way." Probably the increase in the number of his engagements induced Turner about this time to set up a studio for himself in Hand Court, not far from his father's shop, and there he continued to work till he was elected an associate of the Royal Academy (1799).

Until 1792 Turner's practice had been almost exclusively confined to water colours, and his early works show how much he was indebted to some of his contemporaries. There are few of any note whose style he did not copy or adopt. His first exhibited oil picture appeared in the Academy in 1793. In 1794- 1795 Canterbury Cathedral, Malvern Abbey, Tintern Abbey, Lincoln and Peterborough Cathedrals, Shrewsbury, and King's College Chapel, Cambridge, were among the subjects exhibited, and during the next four years he contributed no less than thirty- nine works to the Academy. In the catalogue of 1798 he first began to add poetic quotations to the titles of his pictures; one of the very first of these — a passage from Milton's Paradise Lost —is in some respects curiously prophetic of one of the future characteristics of his art: —

" Ye mists and exhalations that now rise From hill or steaming lake, dusky or grey Till the sun paints your fleecy skirts with gold, In honour of the world's great author rise." This and several other quotations in the following years show that Turner's mind was now occupied with something more than the merely topographical element of landscape, Milton's Paradise Lost and Thomson's Seasons being laid under frequent contri- bution for descriptions of sunrise, sunset, twilight or thunder- storm. Turner's first visit to Yorkshire took place in 1797. It seems to have braced his powers and possibly helped to change the student into the painter. Until then his work had shown very little of the artist in the higher sense of the term: he was little more than a painstaking and tolerably accurate

topographer; but

even under these conditions he had begun to attract the notice of his brother artists and of the critics. England was, at the time, at a low point both in literature and art. Among the artists De Loutherbourg and Morland were almost the only men of note left. Hogarth, Wilson, Gainsborough and Reynolds had passed away. Beechey, Bourgeois, Garvey, Farington — names well- nigh forgotten now — were the Academicians who painted land- scape. The only formidable rivals Turner had to contend with were De Loutherbourg and Girtin, and after the death of the latter in 1802 he was left undisputed master of the field.

It is not, therefore, surprising that the exhibition of his works in 1798 was followed by his election to the associateship of the Royal Academy. That he should have attained to this position before completing his twenty-fourth year says much for the wisdom and discernment of that body, which further showed its recognition of his talent by electing him an Academician four years later. Turner owed much to the Academy. Ruskin says, ” It taught him nothing.” Possibly it had little to teach that he had not already been able to learn for himself; at all events it was quick to see his genius and to confer its honours, and Turner, naturally generous and grateful, never forgot this. He enjoyed the dignity of Academician for nearly half a century, and during nearly the whole of that period he took an active share in the direction of the Academy’s affairs. His speeches are described as ” confused, tedious, obscure, and extremely difficult to follow ” ; but at council meetings he was ever anxious to allay anger and bitter controversy. His opinions on art were always listened to with respect; but on matters of business it was often difficult to know what he meant. His friend Chantrey used to say, ” He has great thoughts, if only he could express them.” When appointed professor of perspective to the Royal Academy in 1808, this painful lack of expression stood greatly in the way of his usefulness. Ruskin says, ” The zealous care with which Turner endeavoured to do his duty is proved by a series of large drawings, exquisitely tinted, and often completely coloured, all by his own hand, of the most difficult perspective subjects, illustrating not only directions of line, but effects of light, with a care and comple- tion which would put the work of any ordinary

teacher to utter shame." In teaching he would neither waste time nor spare it With his election to the associateship of the Academy in 1799 Turner's early struggles may be considered to have ended. He had emancipated himself from hack work, had given up making topographical drawings of castles and abbeys for the engravers — drawings in which mere local fidelity was the principal object — and had taken to composing as he drew. Local facts had become of secondary importance compared with effects of light and colour. He had reached manhood, and with it he abandoned topographical fidelity and began to paint his dreams, the visionary faculty — the true foundation of his art — asserting itself, nature being used to supply suggestions and materials.

His pictures of 1 797-1 799 had shown that he was a painter of no ordinary power, one having much of the poet in him, and able to give expression to the mystery, beauty and inexhaustible fullness of nature. His work at this period is described by Ruskin as " stern in manner, reserved, quiet, grave in colour, forceful in hand."

Turner's visit to Yorkshire in 1797 was followed a year or two later by a second, and it was on this occasion that he made the acquaintance, which afterwards ripened into a long and staunch friendship, of Fawkes of Farnley Hall. From 1803 till 1820 Turner was a frequent visitor at Farnley. The large number of his drawings still preserved there — English, Swiss, German and Italian, the studies of rooms, outhouses, porches, gateways, of birds shot while he was there, and of old places in the neighbourhood — prove the frequency of his visits and his affection for the place and for its hospitable master. A caricature, made by Fawkes, and " thought by old friends to be very like," shows Turner as " a little Jewish- nosed man, in an ill-cut brown tail-coat, striped waistcoat, and enormous frilled shirt, with feet and hands notably small, sketching on a small piece of paper, held down almost ' level with his waist." It is evident from all the accounts

given that Turner's personal appearance was not of a kind

to command much attention or respect. This may have pained his sensitive nature, and led him to seek refuge in the solitude of his painting room. Had he been inclined he had abundant opportunity for social and friendly intercourse with his fellow men, but he gradually came to live more and more in a state of mental isolation. Turner could never make up his mind to visit Farnley again after his old friend's death, and his voice would falter when he spoke of the shores of the Wharfe.

Turner visited Scotland in 1800, and in 1801 or 1802 he made his first tour on the Continent. In the following year, of the seven pictures he exhibited, six were of foreign subjects, among them " Bonneville," " The Festival upon the Opening of the Vintage of Macon," and the well-known " Calais Pier " in the National Gallery. The last-named picture, although heavily painted and somewhat opaque in colour, is magnificently composed and full of energy.

In 1802, the year in which Turner became a Royal Academician, he took his father, who still carried on the barber business in Maiden Lane, to live with him. The old man lived in his son's house for nearly thirty years, making himself useful in various ways. It is said that he used to prepare and strain his son's canvases and varnish them when finished, which may explain a saying of Turner's that " his father used to begin and finish his pictures for him." He also attended to the gallery in Queen Anne Street, showed in visitors, and took care of the dinner, if he did not himself cook it. Turner was never the same man after his father's death in 1830, living a life of almost complete isolation.

In 1804 Turner made a second tour on the Continent, and in the following year painted the " Shipwreck " and " Fishing Boats in a Squall " (in the Ellesmere collection), seemingly in direct rivalry of Vandervelde, in 1806 the " Goddess of Discord in the Garden of the Hesperides " (in rivalry of Poussin), and in 1807 the " Sun rising through Vapour " (in rivalry of Claude). 1 The last two are notable works, especially the " Sun." In after years it was one of the works he left to the nation, on the special condition of its being hung beside the Claudes in the National Gallery. In this same year (1807) Turner commenced his most serious rivalry. Possibly it arose out of a desire to break down

Claude worship — the then prevailing fashion — and to show the public that there was a living artist not unworthy of taking rank beside him. That the Liber studiorum was suggested by the Liber veritalis of Claude, and was intended as a direct challenge to that master, is beyond doubt. There is, however, a certain degree of unfairness to Claude in the way in which the challenge was given. Claude made drawings in brown of his pictures as they left the easel, not for publication, but merely to serve as private memoranda. Turner's Liber drawings had no such purpose, but were intended as a direct appeal to the public to judge between the two artists. The first of the Liber drawings was made in the autumn of 1806, the others at intervals till about 1815. They are of the same size as the plates and carefully finished in sepia. He left over fifty of these to the National Gallery. The issue of the Liber began in 1807 and continued at irregular intervals till 18 19, when it stopped at the fourteenth number. Turner had resolved to manage the publishing business himself, but in this he was not very successful. He soon quarrelled with his engraver, F. C. Lewis, on the ground that he had raised his charges from five guineas a plate to eight. He then employed Charles Turner, who agreed to do fifty plates at the latter sum, but, after finishing twenty, he too wished to raise his price, and, as a matter of course, this led to another quarrel. Reynolds, Dunkarton, Lupton, Say, Dawe and other engravers were afterwards employed — Turner himself etching

1 This spirit of rivalry showed itself early in his career. He began by pitting himself against his contemporaries, and afterwards, when his powers were more fully developed, against some of the old masters, notably Vandervelde and Claude. During these years, while he kept up a constant rivalry with artists living and dead, he was continuing his study of nature, and, while seemingly a mere follower of the ancients, was accumulating that store of knowledge which in after years he was to use to such purpose.

and mezzotinting some of the plates. Each part of the Liber contained five plates, the subjects, divided into " historical," " pastoral," "' marine," &c., embracing the whole range of land scape art. Seventy-one plates in all were published (including one as a gilt of the artist to his subscribers); ten other plates — ■ more or less completed — intended for the fifteenth and sixteenth numbers were

never published, the work being stopped for want of encouragement. Absence of method and business habits may account for this. Turner is said to have got up the numbers in his own house with the help of a female servant. The plates, which cost the subscribers only five shillings apiece, were so little esteemed that in the early quarter of the 19th century they were sometimes used for lighting fires. So much has fashion, or public taste, changed since then that a fine proof of a single plate has sold for £210. The merit of the plates is unequal ; some — for example, ” Solway Moss,” ” Inverary Pier,” ” Hind Head Hill,” ” Ben Arthur,” ” Rizpah,” ” Junction of the Severn and Wye ” and ” Peat Bog ” — are of great beauty, while a few are compara- tively tame and uninteresting. Among the unpublished plates ” Stonehenge at Daybreak,” ” The Stork and Aqueduct,” ” The Via Mala,” ” Crowhurst,” and ” Moonlight off the Needles ” take a high place. The Liber shows strong traces of the influence of Cozens and Girtin, and, as a matter of course, of Claude. In most of the designs the predominant feeling is serious; in not a few, gloomy, or even tragic. A good deal has been written about Turner’s intention, and the ” lessons ” of the Liber studiorum. Probably his only intention in the beginning was to show what he could do, to display his art, to rival Claude, perhaps to educate public taste, and at the same time make money. If lessons were intended they might have been better conveyed by words. ” Silent always with a bitter silence, disdaining to tell his meaning ” — such is Ruskin’s explanation ; but surely Turner had little reason for either silence or contempt because the public failed to see in landscape art the means of teaching it great moral lessons. The plates of the Liber contain an almost complete epitome of Turner’s art. It is sup- posed that his original intention had been that the Liber should consist of one hundred plates, and drawings for that number exist, but there was no public demand for them. Already in this work are seen strong indications of one of his most remarkable charac- teristics — a knowledge of the principles of structure in natural objects; mountains and rocks are drawn, not with topographical accuracy, but with what appears like an intuitive feeling for geological formation; and trees have also the same expression of life and growth in the drawing of stems and branches. This instinctive feeling in Turner for the principles of organic structure is treated of at

considerable length in the fourth volume of Modem Painters, and Turner is there contrasted with Claude, Poussin, and some of the Dutch masters, greatly to their disadvantage.

After 1797 Turner was little concerned with mere topographical facts : his pictures might be like the places represented or not; much depended on the mental impression produced by the scene. He preferred to deal with the spirit, rather than with the local details of places. A curious example of the reason- ableness accompanying his exercise of the imaginative faculty is to be found in his creations of creatures he had never seen, as, for example, the dragon 2 in the " Garden of the Hesperides " and the python in the "Apollo," exhibited in 1811, Both these monsters are imagined with such vividness and reality, and the sense of power and movement is so completely expressed, that the spectator never once thinks of them as otherwise than repre- sentations of actual facts in natural history. It needs but a little comparison to discover how far Turner surpassed all his con- temporaries, as well as all who preceded him, in these respects. The imaginative faculty he possessed was of the highest order, and it was further aided by a memory of the most retentive

2 " The strange unity of vertebrated action and of a true bony contour, infinitely varied in every vertebra, with this glacial outline, together with the adoption of the head of the Ganges crocodile, the .fish-eater, to show his sea descent (and this in the year 1806, when hardly a single fossil saurian skeleton existed within Turner's reach), renders the whole conception one of the most curious exertions of the imaginative intellect with which I am acquainted in the arts " (Ruskin, Mod. Painters, v. 313).

and unerring kind. A good illustration of this may be seen at Farnley Hall in a drawing of a " Man-of-War taking in Stores." Some one, who had never seen a first-rate, expressed a wish to know what it looked like. Turner took a blank sheet of paper one morning after breakfast, outlined the ship, and finished the drawing in three hours, young

Fawkes, a son of the house, sitting beside him from the first stroke to the last. The size of this drawing is about 16 in. by n in. Ruskin thus describes it:—

" The hull of a first-rate occupies nearly one half of the picture to the right, her bows toward the spectator, seen in sharp perspective from stem to stern, with all her port-holes, guns, anchors and lower rigging elaborately detailed, two other ships of the line in the middle distance drawn with equal precision, a noble breezy sea, full of delicate drawing in its waves, a store ship beneath the hull of the larger vessel and several other boats, and a complicated cloudy sky. all drawn from memory, down to the smallest rope, in a drawing- room of a mansion in the middle of Yorkshire."

About the year 1811 Turner paid his first visit to Devonshire, the county to which his family belonged, and a curious glimpse of his simple manner of life is given by Redding, who accom- panied him on some of his excursions. On one occasion they spent a night together in a small road-side inn, Turner having a great desire to see the country around at sunrise.

" Turner was content with bread and cheese and beer, tolerably good, for dinner and supper in one. In the little sanded room we conversed by the light of an attenuated candle and some aid from the moon until nearly midnight, when Turner laid his head upon the table and was soon fast asleep. Three or four hours' rest was thus obtained, and we went out as soon as the sun was up to explore the surrounding neighbourhood. It was in that early morning Turner made a sketch of the picture ' Crossing the Brook.' " In another excursion to Borough Island, " the morning was squally and the sea rolled boisterously into the Sound. Off Stakes Point it became stormy; our Dutch boat rode bravely over the furrows. Two of the party were ill. Turner was all the while quiet, watching the troubled scene. Bolt Head, to seaward, against which the waves broke with fury, seemed to absorb his entire notice, and he scarcely spoke a syllable. While the fish were getting ready Turner mounted nearly to the highest point of the island rock, and seemed writing rather than drawing. The wind was almost too violent for either purpose."

This and similar incidents show how careless of comfort Turner was, and how devoted to his art. The tumult and discomfort by which he was surrounded could not distract his powers of observation; and some thirty years later there is still evidence of the same kind. In the catalogue of the exhibition of 1842 one of his pictures bears the following title, " Snow-Storm: steam-boat off a harbour's mouth making signals in shallow water, and going by the lead. The author was in that storm the night the ' Ariel ' left Harwich."

From 1813 till 1826, in addition to his Harley Street residence, Turner had a country house at Twickenham. He kept a boat on the river, also a pony and gig, in which he used to drive about the neighbouring country on sketching expeditions. The pony, for which Turner had a great love, appears in his well-known " Frosty Morning " in the National Gallery. He appears to have had a great affection for animals, and one instance of his tender- ness of heart is given by one who often joined him in the amuse- ment of fishing, of which Turner was very fond. " I was often with him when fishing at Petworth, and also on the banks of the Thames. His success as an angler was great, although with the worst tackle in the world. Every fish he caught he showed to me, and appealed to me to decide whether the size justified him to keep it for the table or to return it to the river; his hesitation was often almost touching, and he always gave the prisoner at the bar the benefit of the doubt."

In 18 13 Turner commenced the series of drawings, forty in number, for Cooke's Southern Coast. This work was not completed till 1826. The price he at first received for these drawings was £7, 10s. each, afterwards raised to £13, 2s. 6d.

" Crossing the Brook" appeared in the Academy of 181 5. It may be regarded as a typical example of Turner's art at this period, and marks the transition from his earlier style to that of his maturity. It represents a piece of Devonshire scenery, a view on the river Tamar. On the left is a group of tall pine-

trees, beautifully designed and drawn with great skill and know- ledge of structure; in the foreground a couple of

children, with a dog carrying a bundle in its mouth across the brook; and beyond, a vast expanse of richly-wooded country, with glimpses of a winding river, an old bridge, a mill, and other buildings, and, in the far distance, the sea. Both in design and execution this work is founded upon Claude. Some critics consider it one of Turner's greatest works; but this is open to question. 1 It can hardly be called a work in full colour: it is limited to greys and quiet greens for the earth and pale blues for the sky. . It is a sober but very admirable picture, full of diffused daylight, and in the painting of its distance better than any master who had preceded him. The fascination of the remote, afterwards so distinctive an element in Turner's pictures, shows itself here. Perhaps nothing tests the powers or tries the skill of the land- scape painter more severely than the representation of distant effects. They come and go so rapidly, are often in a high key of light and colour, and so full of mystery and delicacy, that anything approaching to real imitation is impossible. Only the most retentive memory and the most sensitive and tender feeling will avail. These qualities Turner possessed to a remark- able degree, and as his powers matured there was an ever-increasing tendency in his art to desert the foreground, where things were definite and clear, in order to dream in the infinite suggestivenessand space of distances. " Dido Building Carthage " also belongs to this period. It hangs beside the Claudes in the National Gallery. It pertains to the old erroneous school of historical painting. Towering masses of Claudesque architec- ture piled up on either side, porticoes, vestibules, and stone pines, with the sun in a yellow sky, represent the Carthage of Turner's imagination. With all its faults it is still the finest work of the class he ever painted. Carthage and its fate had a strange fascination for him. It is said that he regarded it as a moral example to England in its agricultural decline, its increase of luxury, and its blindness to the insatiable ambition of a power- ful rival. He returned again to this theme in 1817, when he exhibited his " Decline of the Carthaginian Empire: Hostages Leaving Carthage for Rome " — a picture which Ruskin describes as " little more than an accumulation of academy student's outlines coloured brown."

In 1818 Turner was in Scotland making drawings for the

Provincial Antiquities, for which Sir Walter Scott supplied the letterpress, and in 18 19 he visited Italy for the first time. One of the results of this visit was a great change in his style, and from this time his works became remarkable for their colour. Hitherto he had painted in browns, greys and blues, using red and yellow sparingly. He had gradually been advancing from the sober grey colouring of Vandervelde and Ruysdael to the mellow and richer tones of Claude. His works now begin to show a heightened scale of colour, gradually increasing in richness and splendour and reaching its culminating point in such works as the " Ulysses," " Childe Harold's Pilgrimage," " The Golden Bough," and "The Fighting Tem6raire." All these works belong to the middle period of Turner's art (1820-1839), when his powers were entirely developed and entirely unabated. Much of his mcst beautiful work at this period is to be found in his water-colour drawings: those executed for Whitaker's History of Richmond. shire (1810-1821), for Cooke's Southern Coast (1814-1826), for The Rivers of England (1824), for England and Wales (1829-1838), Provincial Antiquities (1826), Rogers's Italy (1830), Scott's Works (1S34), and The Rivers of France (1833-1835) are in many instances of the greatest beauty. Of the Richmondshire drawings Ruskin says, " The foliage is rich and marvellous in composition, the rock and hill drawing insuperable, the skies exquisite in complex form."

But perhaps one of the greatest services Turner rendered to the art of England was the education of a whole school of

1 " Crossing the Brook " was a great favourite with Turner. It was painted for a patron, who, dissatisfied with it, left it on the painter's hands. The price asked (£500) seems to have been part of the objection. Turner subsequently refused an offer of £1600 for it.

engravers. His best qualities as a teacher came from the union of strength and delicacy in his work; subtle and delicate tonality- was almost a new element for the engraver to deal with, but with Turner's teaching and careful supervision his engravers by degrees mastered it

more or less successfully, and something like a new development of the art of engraving was the result. No better proof can be found of the immense advance made than by comparing the work of the landscape engravers of the pre- Turnerian period with the work of Miller, Goodall, Willmore, Cooke, Wallis, Lupton, C. Turner, Brandard, Cousen, and others who worked under his guidance. The art of steel engraving reached its highest development in England at this time. Rogers's Italy (1830) and his Poems (1834) contain perhaps the most beautiful and delicate of the many engravings executed after Turner's drawings. They are vignettes, 1 a form of art which Turner understood better than any artist ever did before — perhaps, we might add, since. " The Alps at Daybreak," " Columbus Discovering Land," and " Datur Hora Quieti " may be given as examples of the finest.

In 1828 Turner paid a second visit to Italy, this time of considerable duration, on the way visiting Nimes, Avignon, Marseilles, Genoa, Spezzia and Siena, and in the following year he exhibited the " Ulysses Deriding Polyphemus," now in the National Gallery. It marks the beginning of the central and best period of Turner's power. This work is so well known that description is hardly needed. The galley of Ulysses occupies the centre of the picture; the oars are being thrust out and the sailors flocking up the masts to unfurl sail, while Ulysses waves the blazing olive tree in defiance of the giant, whose huge form is seen high on the cliffs above; and the shadowy horses of Phoebus are traced in the slanting rays of the rising sun. The impression this picture leaves is one of great power and splendour. The painting throughout is magnificent, especially in the sky. Leslie speaks of it as "a poem, of matchless splendour and beauty." From this period onward till about 1840 Turner's life was one of unceasing activity. Nothing is more astonishing than his prodigious fertility; he rose early, worked from morning till night, entirely absorbed in his art, and gradually became more and more solitary and isolated. Between 1829 and 1839 he sent fifty-five pictures to the Royal Academy, painted many others on private commission, made over four hundred drawings for engravers, besides thousands of studies and sketches from nature. His industry accounts for the immense quantity of work he left behind him. There is not the slightest evidence

to show that it arose from a desire to make money, which he never cared for in comparison with his art. He has been accused, perhaps not without some cause, of avarice and meanness in his business dealings, and many stories are told to his discredit. But in private he often did generous things, although owing to his reserved disposition his virtues were known only to a few. His faults on the other hand — thanks to the malice, or jealousy, of one or two individuals — were freely talked about and, as a matter of course, greatly exaggerated. ” Keep it, and send your children to school and to church,” were the words with which he declined repayment of a considerable loan to a poor drawing-master’s widow. On another occasion, when interrupted in his work, he roughly chid and dismissed the applicant, a poor woman ; but she had hardly left his door before he followed her and slipped a £5 note into her hand. His tenants in Harley Street were in arrears for years, but he would never allow his lawyer to distrain; and if further proof of his generosity were needed his great scheme for bettering the condition of the unfortunate in his own profession should suffice. On one occasion he is known to have taken down a picture of his own from the walls of the Academy to make room for that of an unknown artist.

1 ” Of all the artists who ever lived I think it is Turner who treated the vignette most exquisitely, and, if it were necessary to find some particular reason for this, I should say that it may have been because there was nothing harsh or rigid in his genius, that forms and colours melted into each other tenderly in his dream-world, and that his sense of gradation was the most delicate ever possessed by man ” (Hamerton;.

The first of Turner’s Venetian pictures (” Bridge of Sighs, Ducal Palace and Custom House, Venice, Canaletti Painting “) appeared in the Academy in 1833. Compared with the sober, prosaic work of Canaletti, Turner’s pictures of Venice appear like poetic dreams. Splendour of colour and carelessness of form generally characterize them. Venice appeared to him ” a city of rose and white, rising out of an emerald sea against a sky of sapphire blue.” Many of these Venetian pictures belong to his later manner, and some of them, ” The State Procession bearing Giovanni Bellini’s Pictures to the Church of the Redeemer ” (exhibited in the Royal Academy, 1841), ” The Sun of Venice Going to Sea ”

(1843), ” Approach to Venice ” (1844), . and “Venice, Evening, Going to the Ball” (1845), t0 hi s latest. As Turner grew older his love of brilliant colour and light became more and more a characteristic. In trying to obtain these qualities he gradually fell into an unsound method of work, treating oil as if it had been water-colour, using both indiscriminately on the same canvas, utterly regardless of the result. Many of his finest pictures are already in a ruined state, mere wrecks of what they once were.

” The Fighting Temeraire Tugged to her Last Berth to be Broken Up ” was exhibited in the Academy of 1839. By many it is considered one of his finest works. Turner had all his life been half a sailor at heart: he loved the sea, and shipping, and sailors and their ways; many of his best pictures are sea pieces; and the old ships of Collingwood and Nelson were dear to him. Hence the pathetic feeling he throws around ” The Fighting Teme- raire.” The old three-decker, looking ghostly and wan in the evening light, is slowly towed along by a black, fiery little steam tug — a contrast suggesting the passing away of the old order of things and the advent of the new; and behind the sun sets red in a thick bank of smoke or mist. ” The Slave Ship,” another important sea picture, was exhibited in the following year, and in 1842 ” Peace: Burial at Sea,” commemorative of Wilkie.

Turner had now reached his sixty-seventh year, but no very marked traces of declining power are to be seen in his work. Many of the water-colour drawings belonging to this period are of great beauty, and, although a year or two later his other powers began to fail, his faculty for colour remained unimpaired almost to the end. He paid his last visit to the Continent in 1843, wandering about from one place to another, and avoiding his own countrymen, an old and solitary man. At his house in Queen Anne Street they were often ignorant of his whereabouts for months, as he seldom took the trouble to write to any one. Two years later (1845) his health gave way and with it both mind and sight began to fail. The works of his declining period exercised the wit of the critics. Turner felt these attacks keenly. He was naturally kind-hearted and acutely sensitive to censure. ” A man may be weak in his age,” he once remarked, ” but you should not tell him so.”

After 1845 all the pictures shown by Turner belong to the period of decay — mere ghosts and shadows of what once had been. In 1850 he exhibited for the last time. He had given up attending the meetings of the Academicians; none of his friends had seen him for months; and even his old house- keeper had no idea of his whereabouts. Turner's mind had evidently given way for some time, and with that love of secrecy which in later years had grown into a passion he had gone away to hide himself in a corner of London. He had settled as a lodger in a small house in Chelsea, overlooking the river, kept by his old Margate landlady, Mrs Booth. To the children in the neighbourhood he was known as " Admiral Booth." His short, sailor-like figure may account for the idea that he was an impoverished old naval officer. He had been ill for some weeks, and when his Queen Anne Street housekeeper at last discovered his hiding-place she found him sinking, and on the following day, the 19th of December 1851, he died. He was buried in St Paul's Cathedral, in deference to a wish he had himself expressed. He left the large fortune he had amassed (about £140,000) to found a charity for the " maintenance and support of male decayed artists, being born in England, and of English parents only, and of lawful issue." His pictures he

bequeathed to the nation, on condition that they were exhibited in rooms of their own, and that these rooms were to be called " Turner's Gallery." The will and its codicils were so confused that after years of litigation, during which a large part of the money was wasted in legal expenses, it was found impossible to decide what Turner really wanted. A compromise was effected in which the wishes of everybody, save those of the testator, were consulted, his next-of-kin, whom he did not mean to get a single farthing, inheriting the bulk of his property. The nation got all the pictures and drawings, and the Royal Academy £20,000.

If Turner had died early his reputation as an artist would have been very different from what it ultimately became. He would not have been recognized as a colourist. It was only after the year 1820 that colour began to assert itself

strongly in his work. He painted for many a year in greys and greens and browns, went steadily through ” the subdued golden chord,” and painted yellow mists and suns rising through vapour; but as time went on that was no longer enough, and he tried to paint the sun in his strength and the full glories of sunshine. The means at the painter’s disposal are, however, limited, and Turner, in his efforts after brilliancy, began to indulge in reckless experiments in colour. He could not endure even the slightest restraints which technical limitations impose, but went on trying to paint the unpaintable. As a water-colour painter Turner stands pre-eminent; he is unquestionably the greatest master in that branch of art that ever lived. If his work is compared with that of Barrett, or Varley, or Cozens, or Sandby, or any of the earlier masters, so great is Turner’s superiority that the art in his hands seems to be lifted altogether into a higher region.

In 1843 a champion, in the person of John Ruskin, arose to defend Turner against the unjust and ignorant attacks of the press, and what at first was intended as a ” short pamphlet, reprobating the manner and style of these critics,” grew into the five volumes of Modem Painters. Ruskin employed all his eloquence and his great critical faculty to prove how immeasur- ably superior Turner was to all who had ever gone before, hardly restricting his supremacy to landscape art, and placing him among the ” seven supreme colourists of the world.”

Like most men of note, Turner had his enemies and detractors, and it is to be regretted that so many of the stories they set in circulation against his moral character should have been repeated by one of his biographers, who candidly admits having ” spared none of his faults,” and excuses himself for so doing by ” what he hopes ” is his ” undeviating love of truth.” The immense quantity of work accomplished by Turner during his lifetime, work full of the utmost delicacy and refinement, proves the singularly fine condition of his nervous system, and is perhaps the best answer that can be given to the charge of being excessively addicted to sensual gratification. In his declining years he possibly had recourse to stimulants to help his failing powers, but it by no means follows that he went habitually to excess in their use. He never lost an opportunity of doing a kind- ness, and under a rough and cold exterior there was

more good and worth hidden than the world imagined. ” During the ten years I knew him,” says Ruskin, ” years in which he was suffering most from the evil-speaking of the world, I never heard him say one depreciating word of any living man or man’s work; I never saw him look an unkind or blameful look; I never knew him let pass, without sorrowful remon- strance, or endeavour at mitigation, a blameful word spoken by another. Of no man, but Turner, whom I have ever known could I say this.” Twice during his earlier days there are circumstances leading to the belief that he had the hope of marriage, but on both occasions it ended in disappointment, and his home after his father died was cheerless and solitary.

Two biographies of Turner have been written, one by Thornbury, the other by P. G. Hamerton. The work of the latter deserves the highest commendation ; it gives a clear and consistent history of the great artist, and is characterized by refined thought and critical insight. An excellent little book by W. Cosmo Monkhouse may also

be noticed. Books upon Turner continue to appear, although it is scarcely to be expected that they can add to the facts already known about him. Turner and Ruskin . an exposition of the work of Turner from the writings of Ruskin, edited with a biographical note on Turner by Frederick Wedmore, in two volumes, with ninety-one illustrations, was published by George Allen in 1900. Perhaps the’ most important recent work upon his art is Sir Walter Armstrong’s Turner (1901), which deals at considerable length with the events of his life, and with his pictures in oil and his drawings in water-colour. It also gives so far as possible a list of his oil pictures, and for the first time a pretty full list of his water colours, although the great painter’s works in both media are so numerous that it would be impossible to say that either is complete. See also J. M. W. Turner, by W. L. Wyllie, A.R.A. (1905). The great authority on the Liber Studiorum is W. G. Rawlinson (Turner’s Liber Studiorum, 2nd ed., 1906). (G. Re.)

TURNER, NAT (1800-1831), the negro leader of a slave insurrection in Virginia, known as the ” Southampton Insur- rection,” was born in Southampton county, Virginia, in 1800. From his childhood he claimed to see visions and hear voices, and he became a Baptist preacher of great

influence among the negroes. In 1828 he confided to a few companions that a voice from heaven had announced that ” the last shall be first,” which was interpreted to mean that the slaves should control. An insurrection was planned, and a solar eclipse in February 1831 and peculiar atmospheric conditions on the 13th of August were accepted as the signal for beginning the work. On the night of the 2 1 st of August 1831, with seven companions, he entered the home of his master, Joseph Travis, and murdered the inmates. After securing guns, horses and liquor they visited other houses, sparing no one. Recruits were added, in some cases by compul- sion, until the band numbered about sixty. About noon on the 22nd they were scattered by a small force of whites, hastily gathered. Troops, marines and militia were hurried to the scene, and the negroes were hunted down. In all thirteen men, eighteen women, and twenty-four children had been butchered. After hiding for several weeks Nat was captured on the 30th of October and was tried and hanged, having made,, meanwhile, a full confession. Nineteen of his associates were hanged and twelve were sent out of the state. The insurrection, which was attributed to the teachings of the abolitionists, led to the enactment of stricter slave codes.

See S. B. Weeks, ” Slave Insurrections in Virginia,” in Magazine of American History, vol. xxxi. (New York, 1891), and W. S. Drewry, The Southampton Insurrection (Washington, 1900).

. TURNER, SHARON (1768-1847), English historian, was born in Pentonville, London, on the 24th of September 1768. His parents came from Yorkshire. He was educated at a private school kept by Dr Davis in Pentonville, and was articled to a solicitor in the Temple in 1783, and when his master died in 1789 he continued the business. He remained in business at first in the Temple, and later in Red Lion Square till 1829, when failing health compelled him to retire. He settled for a time at Winchmore Hill, but afterwards returned to London, and died in his son’s house on the 13th of February 1847. In early boyhood he had been attracted by a translation of the ” Death Song of Ragnar Lodbrok,” and was led by this boyish interest to make a study of early English history in Anglo-Saxon and Ice- landic sources. He devoted all the time he could spare from his business to the study of Anglo-Saxon documents in

the British Museum. The material was abundant and had hitherto been neglected. When the first volume of his History of England from the earliest times to the Norman Conquest appeared in 1799, it was at once recognized as a work of equal novelty and value. The fourth volume appeared in 1805. He also published a continuation {History of England during the Middle Ages), a Modem History of England, a Sacred History of the World, and a volume on Richard III. (1845), and he was the author of pamphlets on the copyright laws (1813).

His son, Sydney Turner (1814-1879), educated at Trinity College, Cambridge, took orders, was known as a strong partisan of reformatory schools, and died rector of Hempstead in Gloucestershire.

TURNER, WILLIAM (d. 1568), English divine, botanist and I physician, was born at Morpeth in Northumberland, and was

educated at Pembroke Hall, Cambridge, where he was elected junior fellow in 1530. He learnt Greek from Nicholas Ridley, and, hearing Hugh Latimer preach, threw in his lot with the new faith. In 1 538 he published his Libellus de re herbaria, and in 1540 set out to preach in different places. For doing this without a licence he suffered imprisonment, and on his release travelled in Holland, Germany, Italy and Switzerland, always increasing his knowledge of botany and medicine, collecting plants, and writing books on religion which were so popular in England that they were forbidden by proclamation in July 1546. On the accession of Edward VI. he became chaplain and physician to the duke of Somerset and in 1550 prebendary of York. In November 1550 he was made dean of Wells, but in 1553 was deprived, and during Queen Mary's reign lived at various places in Germany, mostly along the Rhine. Returning to England in 1558 he regained his deanery, and did all he could to disparage episcopacy and ceremonial, and to bring the Anglican Church into conformity with the Reformed Churches of Germany and Switzerland. On the complaint of his bishop, Gilbert

Berkeley, he was suspended for Noncon- formity in 1564. He passed his last days in Crutched Friars, London, and died on the 7th of July 1568. Turner was a sound and keen botanist, and introduced lucerne into England. He was a racy writer, a man of undoubted learning, and a vigorous controversialist.

TURNHOUT, a town of Belgium, in the province of Antwerp, 26 m. N.E. of that city. Pop. (1904), 22,162. It carries on an active industry in cloth and other manufactures. There is a breeding establishment for leeches. The h&tel de ville was formerly a palace of the dukes of Brabant. Two miles west of Turnhout is the curious penal or reformatory colony of Merxplas (pop. in 1904, 2827). The system of this establish- ment is to allow certain approved prisoners to follow their usual occupations within a denned area. The persons detained have complete liberty of movement, subject to the two condi- tions that they are under the supervision of guardians and are not allowed to cross the boundaries of the settlement. They also wear a distinct dress, and each prisoner bears a number.

TURNIP, Brassica campestris, var. Rapa, a hardy biennial, found in cornfields in various parts of England. It has been cultivated from a remote period for its fleshy roots. The tender growing tops are also used in spring as a green vegetable. The so-called ” root ” is formed by the thickening of the primary root of the seedling together with the base of the young stem (hypocotyl) immediately above it. The great mass of the ” root ” consists of soft ” wood ” developed internally by the cambium layer and composed mainly of thin-walled, unlignified, wood-parenchyma. The stem remains short during the first year, the leaves forming a rosette-like bunch at the top of the ” bulb “; they are grass-green and bear rough hairs. In the second season the bud in the centre of the rosette forms a strong erect branched stem bearing somewhat glaucous smooth leaves. The stem and branches end in corymbose racemes of small, bright yellow flowers, which are succeeded by smooth, elongated, short-beaked pods.

The varieties of turnip are classified according to their shape as (1) long varieties, with a root three or more times as long as broad, (2) tankard or spindle-shaped varieties,

with a root about twice as long as broad; (3) round or globe varieties with an almost spherical root; (4) flat varieties with a root broader than long; there are also many intermediate forms. Turnips are also grouped according to the colour of the upper part of the root which comes above ground, and according to the colour of the flesh, which is white or yellow. The yellow-fleshed varieties, many of which are probably hybrids between the turnip and swede, are more robust, of slower growth and superior feeding value to the white-fleshed turnips, and are less injured by frost.

The swede-turnip, Brassica campestris, var. Napo-brassica, differs from the turnip proper in having the first foliage-leaves glaucous, not grass-green, in colour, and the later leaves smooth and glaucous; the root bears a distinct neck with well-marked leaf-scars, the flesh is yellow or reddish-orange, firmer and more

nutritious, and the roots keep much better during winter. The flowers are larger and buff-yellow or pale orange in colour and the seeds are usually larger and darker than in the turnip.

Turnips should be grown in a rich friable sandy loam, such as will produce medium-sized roots without much aid from the manure heap, and are better flavoured if grown in fresh soil. In light dry soils well decomposed hotbed or farmyard manure is the best that can be used, but in soils containing an excess of organic matter, bone dust, superphosphate of lime, wood-ashes or guano, mixed with light soil, and laid in the drills before sowing the seed, are bene- ficial by stimulating the young plants to get quickly into rough leaf, and thus to grow out of reach of the so-called turnip fly or turnip flea (Phyllotreta). To get rid of this pest, it has been found beneficial to dust the plants with quicklime, and also to draw over the young plants nets smeared with some sticky substance like treacle, by which large numbers will be caught and destroyed. It has been also recom- mended as a palliative to sow thick in order to allow for a percentage of loss from this and other causes, but this is inadvisable, as over- crowding is apt to render the plants weak. As a preventive, gas-lime may be scattered over the surface after the seed has been sown. Lime is also effective against the disease known as ” finger and toe ” (g.ti.).

The first sowing should be made on a warm border, with the pro- tection of a frame or matted hoops, in January or February; the second on a well-sheltered border in March, after which a sowing once a month will generally suffice. In May and June the plot should be in a cool moderately shaded position, lest the plants should suffer from drought. The principal autumn and winter sowings, which are the most important, should be made about the end of June in the northern districts, and in the beginning of July in warmer districts ; a small sowing may be made at the end of August to come in before the spring-sown crops are ready. If the weather is showery at the time of sowing, the seed speedily germinates, and the young plants should be kept growing quickly by watering with, rain or pond water and by surface stirrings. The drills for the earliest sorts need not be more than 15 in. apart, and the plants may be left moderately thick in the row ; the late crops should have at least 2 ft. between the rows, and be thinned to 12 in. in the row, a free circulation of air about them being very important in winter. As a provision against prolonged periods of severe weather it has been recommended to lay the finest roots in rows, covering them well with soil, and leaving intact the whole of the foliage. The very latest sown crops of half-grown roots will prolong the supply until the earliest spring-sown crops are fit for use.

TURNPIKE, a pike or pointed bar or stake which turns or revolves, hence the name given to a form of barrier consisting of three or more horizontal bars, with one end sharpened, revolving on a pivot. Such barriers were used across roads, and, when tolls were exacted from passengers along highways to raise the money for the upkeep of the roads, the name, though not the form, was given both to the toll-gates set up at different places where the tolls were collected, and to the highways repaired under the system (see Highway).

A ” turnstile,” consisting of a vertical post with projecting, revolving arms, is another form of barrier, placed by the side of a gate across a road, or across a path to prevent the passage of all except foot passengers, or at the entrance to any building, park or other place as a means of controlling the admission of people, of collecting admission money and the like.

TURNSTONE, the name long given 1 to a shore-bird, from its habit of turning over with its bill such stones as it can to seek its food in the small crustaceans or other animals lurking beneath them. It is the Tringa inter pres 2 of Linnaeus and Strepsilas inter pres of most later writers, and is remarkable as being perhaps the most cosmopolitan of birds; for, though properly belonging to the northern hemisphere, there is scarcely a sea-coast in the world on which it may not occur: it has been obtained from Spitzbergen to the Strait of Magellan and from Point Barrow to the Cape of Good Hope and New Zealand — examples from the southern hemisphere being, however, almost invariably in a state of plumage that shows, if not immaturity, yet an ineptitude for reproduction. It also, though much less commonly, resorts

1 The name seems to appear first in F. Willughby's Ornithologia (p. 231) in 1676; but he gave as an alias that of Sea-Dottrel, under which name a drawing, figured by him (pi. 58), was sent to him by Sir Thomas Browne.

2 Linnaeus (Oel. och Gothlandska Resa, p. 217), who first met with this bird on the island of Gottland (July I, 1741), was under the mistaken belief that it was there called Tolk (-interpres). But that name properly belongs to the Redshank (q.v.), from the cry of warning to other animals that it utters on the approach of danger.

to the margins of inland rivers and lakes; but it is very rarely seen except near water, and salt water for preference.

The turnstone is about as big as an ordinary snipe; but, compared with most of its allies of the group Limicolae, to which it belongs, its form is somewhat heavy, and its legs are short. Still it is brisk in its movements, and its variegated plumage makes it a pleasing bird. Seen in front, its white face, striped with black, and broad black gorget attract attention as it sits, often motionless, on the rocks; while in flight the white of the lower part of the back and white band across the wings are no less conspicuous even

at a distance. A nearer view will reveal the rich chestnut of the mantle and upper wing-coverts, and the combination of colours thus exhibited suggests the term ” tor- toise-shell ” often applied to it — the quill-feathers being mostly of a dark brown and its lower parts pure white. The deeper tints are, however, peculiar to the nuptial plumage, or are only to be faintly traced at other times, so that in winter the adults — and the young always — have a much plainer appearance, ashy-grey and white being almost the only hues observable. From the fact that turnstones may be met with at almost any season in various parts of the world, and especially on islands as the Canaries, Azores, and many of those in the British seas, it has been inferred that these birds may breed in such places. In some cases this may prove to be true, but in most evidence to that effect is wanting. In America the breeding-range of this species has not been defined. In Europe there is good reason to suppose that it includes Shetland ; but it is on the north-western coast of the Con- tinent, from Jutland to the extreme north of Norway, that the greatest number are reared. The nest, contrary to the habits of most Limicolae, is generally placed under a ledge of rock which shelters the bird from observation, 1 and therein are laid four eggs, of a light olive-green, closely blotched with brown, and hardly to be mistaken for those of any other bird. A second species of turnstone is admitted by some authors and denied by others. This is the S. melanocephalus of the Pacific coast of North America, which is on the average larger than S. interpres, and never exhibits any of the chestnut colouring.

Though the genus Strepsilas seems to be rightly placed among the Charadriidae (see Plover), it occupies a somewhat abnormal position among them, and in the form of its short pointed beak and its variegated coloration has hardly any very near relative. (A. N.)

TURNU MAGURELE, the capital of the department of Teleor- man, Rumania; 2! m. N.E. of the confluence of the Olt and Danube, at the terminus of a branch railway. Pop. (1000), 8668. A ferry plies across the Danube to the Bulgarian fortress of Nico- polis. Large quantities of grain are shipped in lighters to Braila. There are some vestiges of a Roman bridge across the Danube, built (c. a.d. 330) by Constantine the Great.

TURNU SEVERIN, the capital of the department of Mehedintzi, Rumania, on the main Walachian railway, and on the left bank of the river Danube, below the Iron Gates cataracts. Pop. (1900), 18,628. It is a modern commercial town, having a school of arts and crafts, several churches, and large government yards for the building of river steamers, lighters and tug-boats. There is a considerable trade in livestock, preserved meat, petroleum and cereals. The town, which was originally called Drobetae by the Romans, took its later name of Turris Severi, or the " Tower of Severus," from a tower which stood on a small hill surrounded by a deep fosse. This was built to commemorate a victory over the Quadi and Marcomanni, by the Roman emperor Severus (a.d. 222-235). Near Turnu Severin are the remains of the cele- brated Trajan's bridge, the largest in the Roman Empire, built in a.d. 103 by the architect Apollodorus of Damascus. The river is about 4000 ft. broad at this spot. The bridge was composed of twenty arches supported by stone pillars, several of which are still visible at low water.

TURPENTINE (in M. Eng. turbentine, adapted through the O. Fr. turbentine or terebentine from Lat. terebinthina, sc. resina, resin of the terebinth, Gr. repefiivdos or TcpixivBos), the oleo-resins which exude from certain trees, especially from some conifers —

'There is little external difference between the sexes, and the brightly contrasted colours of the hen-bird seem to require some kind of concealment. xxvn. 16

such as Pinus sylvestris— and from the terebinth tree, Pistacia terebinthus, L. It was to the product of the latter, now known as Chian turpentine, that the term was first applied. The tere- binth tree and its resin were well known and highly prized from the earliest times. The tree is a native of the islands and shores of the Mediterranean, passing eastward into Central Asia; but the resinous exudation found in commerce is collected in the island of Chios. Chian turpentine is a tenacious semi-fluid transparent body, yellow to dull brown in colour, with an agreeable resinous odour and little taste. On exposure to the air it becomes dry, hard and brittle. In their natural characters, turpentines are soft solids or semi-fluid bodies, consisting of resins dissolved in turpentine oil, the chief

constituent of which is pinene. They are largely used in the arts, being separated by distillation into rosin or colophony (see Rosin) , and oil or spirit of turpentine.

Crude or common turpentine is the commercial name which embraces the oleo-resin yielded by several coniferous trees, both European and American. The principal European product, some- times distinguished as Bordeaux turpentine, is obtained from the cluster pine, Pinus Pinaster, in the Landes department of France. Crude turpentine is further yielded by the Scotch fir, P. sylvestris, throughout northern Europe, and by the Corsican pine, P. Laricio, in Austria and Corsica. In the United States the turpentine- yielding pines are the swamp pine, P. australis, and the loblolly, P. Taeda, both inhabiting North and South Carolina, Georgia and Alabama. Venice turpentine is yielded by the larch tree, Larix europaea, from which it is collected principally in Tirol. Strass- burg turpentine is obtained from the bark of the silver fir; but it is collected only in small quantities. Less known turpentines are obtained from the mountain pine, P. Pumilio, the stone pine, P. Cembra, the Aleppo pine, P. halepensis, &q. The so-called Canada balsam, from Abies balsamea, is also a true turpentine.

Oil of Turpentine, or Turps, as a commercial product is obtained from all or any of these oleo-resins, but on a large scale only from crude or common turpentine. The essential oil is rectified by redis- tillation with water and alkaline carbonates, and the water which the oil carries over with it is removed by a further distillation over calcium chloride. Oil of turpentine is a colourless liquid of oily consistence, with a strong characteristic odour and a hot disagree- able taste. It begins to boil at about 155° C, and its specific gravity is between o-86o and o-88o. It rotates the plane of polarized light both to right and left in varying degrees according to its sources, the American product being dextrorotatory and the French laevo- rotatory. It is almost insoluble in water, is miscible with absolute alcohol and ether, and dissolves sulphur, phosphorus, resins and caoutchouc. On exposure to the air it dries to a solid resin, and absorbing oxygen gives off ozone — a reaction utilized in the disinfec- tant called ” Sanitas.” Agitated with successive quantities of sul- phuric acid and distilled in a current of steam, it yields terebene, a mixture of dipentene

and terpinene mainly, which is used in medicine. Chemically, oil of turpentine is a more or less complex mixture of hydrocarbons generically named terpenes (q.v.). Oil of turpentine is largely used in the preparation of varnishes and as a medium by painters in their “flat ” colours.

Pharmacology and Therapeutics. — Oil of turpentine {Oleum terebinthinae) is administered internally as an anthelmintic to kill tapeworm. Applied externally it possesses, in higher degree than any of its fellows, the properties of the volatile oils. It acts as a rubefacient, an irritant and a counter-irritant. It is also an antisep- tic and, in small quantities, a feeble anaesthetic. It is absorbed by the unbroken skin. The drug is largely employed as a counter- irritant, the pharmacopoeial liniments being very useful applications. Such conditions as myalgia, bronchitis, ” chronic rheumatism ” and pleurisy are often relieved by its use. It may also be employed as a parasiticide in ringworm and similar conditions.

In large doses oil of turpentine causes purging and may induce much haemorrhage from the bowel ; it should be combined with some trustworthy aperient, such as castor oil, when given as an anthel- mintic. It is readily absorbed unchanged and has a marked con- tractile action upon the blood vessels. This gives it the rare and valuable property of a remote haemostatic, erroneously supposed to be possessed by so many useless drugs. It must not be used to check haemorrhage from the kidneys (haematuria) owing to its irri- tant action on those organs, but in haemoptysis (haemorrhage from the lungs) it is often an invaluable remedy. In large doses it has a depressant action on the nervous system, leading even to coma and total abolition of reflex action. The drug is excreted partly by the bronchi — which it tends to disinfect — and partly in the urine, which it causes to smell of violets. Glycuronic acid also appears in the urine. A small portion of the drug is removed by the skin, in which it may give rise to an erythematous rash. It must not be given to the subjects of Bright’s disease.

Perhaps the most valuable of all the medicinal applications of turpentine, and one which is rarely, if ever, mentioned in therapeutic textbooks — owing to the fact that gynaecology has been so ex- tremely specialized — is in

inoperable cancer of the uterus. Quite

90% of these cases are seen too late for operation, and nearly all recur after operation. The exhausting pain, the serious haem- orrhages, and the abdominal septicity associated with a repulsive odour and the absorption of toxic products, which are the chief and ultimately fatal symptoms of that disease, are all directly combated by the administration of oil of turpentine. So beneficial is the action that for years there prevailed the unfortunately erroneous belief that Chian turpentine is actually curative in this condition. But it undoubtedly prolongs life, lessens suffering, and by checking the growth of bacteria upon the cancer reduces the fetid odour and the symptoms of septic intoxication.

Old turpentine and French oil of turpentine are antidotes to phosphorus, forming turpentine-phosphoric acid, which is inert.

TURPIN (d. c. 800), archbishop of Reims, was for many years regarded as the author of the legendary Historia de vita Caroli Magni el Rolandi, and appears as one of the twelve peers in a number of the chansons de geste. He is probably identical with Tilpin, archbishop of Reims in the 8th century, who is alluded to by Hincmar, his third successor in the see. According to Flodoard, Charles Martsl drove Rigobert, archbishop of Reims, from his office and replaced him by a warrior clerk named Milo, afterwards bishop of Trier. The same writer represents Milo as discharging a mission among the Vascones, or Basques, the very people to whom authentic history has ascribed the great disaster which befell the army of Charlemagne at Roncesvalles. It is thus possible that the warlike legends which have gathered around the name of Turpin are due to some confusion of his identity with that of his martial predecessor. Flodoard says that Tilpin was originally a monk at St Denis, and Hincmar tells how after his appointment to Reims he occupied himself in securing the

restora- tion of the rights and properties of his church, the revenues and prestige of which had been impaired under Milo's rule. Tilpin was elected archbishop between 752 and 768, probably in 753; he died, if the evidence of a diploma alluded to by Mabillon may be trusted, in 794, although it has been stated that this event took place on the 2nd of September 800. Hincmar, who composed his epitaph, makes him bishop for over forty years, and from this it is evident that he was elected about 753, and Flodoard says that he died in the forty-seventh year of his archbishopric. Tilpin was present at the Council of Rome in 769, and at the request of Charlemagne Pope Adrian I. sent him the pallium and confirmed the rights of his church.

The Historia Caroli Magni was declared authentic in 1122 by Pope Calixtus II. It is, however, entirely legendary,- being rather the crystallization of earlier Roland legends than the source of later ones, and its popularity seems to date from the latter part of the 12th century. Gaston Paris, who made a special study of the Historia, considers that the first five chapters were written by a monk of Compostella in the nth century and the remainder by a monk of Vienne between 1109 and n 19. The popularity of the work is attested by the fact that there are at least five French translations of the Historia dating from the 13th century and one into Latin verse of about the same time. According to August Potthast there are about fifty manuscripts of the story in existence. The Historia was first printed in 1566 at Frankfort; perhaps the best edition is the one edited by F. Castets as Turpini historia Karoli magni et Rotho- landi (Paris, 1880). It has been translated many times into French and also into German, Danish and English. The English translation is by T. Rodd and is in the History of Charles the Great and Orlando, ascribed to Turpin (London, 1812). See G. Paris, De pseudo-Turpino (Paris, 1865), and Histoire poetique de Charlemagne, new ed. by P. Meyer (1905); and V. Friedel, " Etudes compostellanes " in Otia Merceiana (Liverpool, 1899).

TURPIN, FRANCOIS HENRI (1709-1799), French man of letters, was born at Caen. He was first a professor at the univer- sity of his native town, then went to seek his fortunes in Paris, where he made some stir in philosophical circles, and especially in that of the magnificent Helvetius; but he was only enabled with difficulty to earn a livelihood

by putting his pen at the ser- vice of the booksellers. He translated, or rather adapted from the English, Edward W. Montague's Histoire du gouvernement des anciennes republiques (1769), and wrote a continuation of Father Pierre Joseph d'Orleans, Histoire des revolutions d' Angleterre (1786). His Histoire naturelle et civile du royaume de Siam (1771) is an interesting but faulty adaptation of the observations of a vicar-apostolic who had lived for a long time in that country, and who accused Turpin of having misrepresented his ideas. His chief work, La France illustre, ou Le Plutarque franqais, contains

the biographies of generals, ministers, and eminent officers 0} the law (5 vols., 1777-1790), in which, however, as La Harpe said, he showed himself to be " ni Plutarque ni Francais." He also wrote an Histoire des hommes publics tire's du tiers Hat

(1789).

TURPIN, RICHARD [Dick] (1706-1739), English robber, was born in 1706 at Flempstead, near Saffron Walden, Essex, where his father kept an alehouse. He was apprenticed to a butcher, but, having been detected at cattle-stealing, joined a notorious gang of deer-stealers and smugglers in Essex. This gang also made a practice of robbing farmhouses, terrorizing the women in the absence of their husbands and brothers, and Turpin took the lead in this class of outrage. On the gang being broken up Turpin went into partnership with Tom King, a well-known high- wayman. To avoid arrest he finally left Essex for Lincolnshire and Yorkshire, where he set up under an assumed name as a horse dealer. He was convicted at York assizes of horse-stealing and hanged on the 7th of April 1739. Harrison Ainsworth, in his romance Rookwood, gives a spirited account of a wonderful ride by Dick Turpin on his mare, Black Bess, from London to York, and it is in this connexion that Turpin's name has been generally remembered. But as far as Turpin is concerned the incident is pure fiction. A somewhat similar story was told about a certain John Nevison, known as " Nicks," a well-known highwayman in the time of Charles II., who to establish an alibi rode from Gad's Hill to York (some 190 m.) in about 15 hours. Both stories are possibly only different versions of an old north road myth.

TURQUOISE, a mineral much used as an ornamental stone for the sake of its blue or bluish-green colour. It is generally held that the name indicates its source as a stone from Turkey, the finest kinds having come from. Persia by way of Turkey, whence it was called by the Venetians who imported it turchesa, and by the French turquoise. The old form turkis, used by Tennyson, agrees with the German Turkis. Some authorities have suggested that the word may be a corruption of the Persian name of the stone piruzeh. Turquoise is a crypto-crystalline mineral, occurring in small reniform nodules or as an incrustation, or in thin seams and disseminated grains. Its mode of occurrence suggests its formation by deposition from solution, and indeed it is sometimes found in stalactitic masses. The typical colour is a delicate sky- blue, but the blue passes by every transition into green. In some cases the colour deteriorates as the stone becomes dry, and may be seriously affected by exposure to sunlight; whilst with age there is often a tendency to become green, as seen in examples of ancient turquoise. The mineral is always opaque in mass, but generally translucent in thin splinters. Turquoise takes a fair polish, but the lustre is feeble, and inclines to be waxy; the hard- ness is nearly 6, the specific gravity between 2‘6 and 2-8.

Much discussion has arisen as to the chemical composition of turquoise. It is commonly regarded as a hydrous aluminium phosphate having the composition 2A1 2 3 - P205-5H 2 or rather Al 2 HP04 4 , coloured with a variable proportion of a copper phosphate, or perhaps partly with an iron phosphate. Pro- fessor S. L. Penfield, however, has been led by careful analysis of turquoise from Nevada to propose the general formula: [Al(OH) 2 ,Fe(OH) 2 ,Cu(OH),H] 3 P0 4 . Hence turquoise may be regarded chemically as derived from orthophosphoric acid by replacement of the hydrogen by the univalent radicles Al(OH) 2 , &c. An ingenious counterfeit of turquoise has been formed by compressing a precipitate of cupriferous aluminium phosphate.

Turquoise is usually cut as an ornamental stone in circular or elliptical form, with a low convex surface. In the East, where it is used not only for personal ornament but for the decoration of dagger-handles, horse-trappings, &c, the pieces are not unusually of irregular shape; and when worn

as amulets the turquoise is often engraved with Oriental inscriptions, generally passages from the Koran, the incised characters being gilt or inlaid with gold wire. The turquoise has always been associated with curious superstitions, the most common being the notion that it changes colour with variations in the state of the owner's health or even in sympathy with his affections. It is commonly held to be a " lucky stone."

In Persia, where the finest turquoise is found, the mines have been worked for at least eight centuries. The workings have been described by General Houtum Schindler, an Austrian, who was at one time in charge of the mines. The principal locality is north-west of the village of Madan, on the southern slopes of Mt Ali-Mirsai, a peak near Nishapur, in the province of Khorasan. Here the turquoise occurs in narrow seams in a brecciated trachyte-porphyry. It is found also in some other localities in Persia and in Turkestan. Jean Baptiste Ta vernier (1 605-1 689) states that the best turquoise, reserved for the sole use of the shah, was obtained from the Vieille Roche, whilst inferior stones were got from the Nouvelle Roche. These terms still survive, for turquoise of fine colour is sometimes said in trade to be from the " oid rock," and that of pale tint or of unstable colours is described as from the " new rock." The latter is sometimes not true Oriental turquoise, but the material called " bone-turquoise " or odontolite, and known also as " occidental turquoise." This is merely fossil bone or ivory coloured by iron phosphate (vivianite) or perhaps stained in some cases by cupriferous solutions, and is readily distinguished from true turquoise by showing organic structure under the microscope. Bone-turquoise occurs in Europe; and it may be noted that mineral turquoise also is known from certain localities in Saxony and Silesia, but the quantity is very limited and the quality poor, so that it has no commercial impor- tance. Chrysocolla has been sometimes mistaken in various parts ot the world for turquoise.

In 1849 turquoise was found by Major C. Macdonald in Wadi Maghara and Wadi Sidreh in the Sinaitic Peninsula ;

and a large series of the specimens was shown in the Great Exhibition of 1 851. Accor- ding to H. Bauerman, who described the locality geologically, the turquoise occurs in a red sandstone, in the form of embedded nodules and as an incrustation lining the joint-faces. The turquoise was worked for some time by Macdonald, and many years afterwards workings were resumed on a systematic scale by an English company, but without great success. Relics of extensive ancient mining operations for turquoise show that the rock was at one time worked with flint implements. The locality was examined by Professor Flinders Petrie in 1905.

In ancient Mexico much use was made of turquoise as an inlay for mosaic work, with obsidian, malachite, shell and iron pyrites. Such work is illustrated by fine specimens in the ethnographical gallery of the British Museum and elsewhere. Relics of extensive workings are found in the mountains of Los Cerillos near Santa Fe in New Mexico, where mining for turquoise is now actively carried on. One of the hills in which old workings occur has been called Mt Chalchihuitl, since it is believed that the turquoise was known by the name chalchihuitl, which in some places was applied also to jade. Another of the Cerillos hills in which workings have been opened up is called Turquoise Hill. The matrix at Los Cerillos is described by D. W. Johnson as an altered angite-andesite, in which the turquoise occurs in thin veins and in small nodules in patches of kaolin. It appears probable that the alumina of the turquoise was derived from the alteration of felspar, and the phosphorus from apa- tite in the rock, whilst the copper was brought up by heated vapours which altered the andesite. Turquoise is found also at Turquoise Mountain, Cochise county, Arizona, and at Mineral Park, Mohave county, in the same state; it occurs in the Columbus district, southern Nevada; in Fresno county, California; and near Idaho, Clay county, Alabama. Mexican turquoise is known from the state of Zacatecas. Turquoise was discovered in 1894 near Bodalla, in New South Wales; and it has also been found in Victoria.

Turquoise is sometimes termed by mineralogists callaite, since it is believed to be the callais of Pliny — a stone which he describes as resembling lapis lazuli, but paler, and in colour more like the shal- low sea. The callaina of Pliny was a pale green stone from beyond India, whilst his

callaica was a kind of turbid callaina. The name callainite was suggested by Professor J. D. Dana for a bright green mineral which was found in the form of beads, with stone hatchets, in ancient graves near Mane-er-H'roek (Rock of the Fairy), near Locmariaquer in Brittany, and which A. Damour sought to identify with Pliny's callais. The mineral in question seems to be identical with variscite, a hydrous aluminium phosphate named by A. Breithaupt, and occurring as a beautiful green amor- phous mineral, sometimes polished as an ornamental stone; fine examples occur in Utah. Somewhat allied to turquoise is the blue mineral called lazulite (to be distinguished from lazurite, see Lapis Lazuli), which has the formula (Fe 2 Mg)Al 2 (OH) (P0 4), and has occasionally been used as an ornamental stone. (F. W. R.*)

TURRET (from O. Fr. lourette, diminutive of tour, tower, mod. Fr. tourelle), a small tower, especially at the angles of larger buildings, sometimes overhanging and built on corbels, when it is often called a " bartizan " (q.v.), and sometimes rising from the ground.

TURRETIN, or Turretini, the name of three Swiss divines.

Benoit Turretin (1588-1631), the son of Francesco Turretini, a native of Lucca, who settled in Geneva in 1570, was born at Zurich on the 9th of November 1588. He was ordained a pastor in Geneva in 161 2, and became professor of theology in 1618.

In 1620 he represented the Genevan Church at the national synod of Alais, when the decrees of the synod of Dort were introduced into France; and in 162 1 he was sent on a successful mission to the states-general of Holland, and to the authorities of the Hanseatic towns, with reference to the defence of Geneva against the threatened attacks of the duke of Savoy. He published in 1618- 1620 (2 vols.) a defence of the Genevan translation of the Bible, Fine Verteidigung der genfer Bibeliibersetzung (Defense de la fidelite des traductions de la Bible faites a Geneve), against P. Cotton's Geneve plagiaire. He died on the 4th of March 1631.

Francois Turretin (1623-1687), son of the preceding, was born at Geneva on the 17th of October 1623. After studying

theology in Geneva, Leiden and France, he became pastor of the Italian congregation in Geneva in 1647; after a brief pastorate at Lyons he again returned to Geneva as professor of theology in 1653, having modestly declined a professorship of philosophy in 1650. He was one of the most influential supporters of the Formula Consensus Helvetica, drawn up chiefly by Johann Heinrich Heidegger (1633-1698), in 1675, and of the particular type of Calvinistic theology which that symbol embodied, and an opponent of the theology of Moses Amyraut and the school of Saumur. His Institutio Iheologicae elencticae (3 vols., Geneva 1680-1683) has passed through frequent editions, the last reprint having been made in Edinburgh in 1847-1848. He was also the author of volumes entitled De satisfactione Christi disputationes (Geneva, 1666) and De necessaria secessione nostra ab ecclesia romana (Geneva, 1687). He died on the 28th of September 1687.

Jean Alphonse Turretin (1671-1737), son of the preceding, was born at Geneva on the 13th of August 1671. He studied theology at Geneva under L. Tronchin, and after travelling in Holland, England and France was received into the " Venerable Compagnie des Pasteurs " of Geneva in 1693. Here he became pastor of the Italian congregation, and in 1697 professor of church history, and later (1705) of theology. During the next forty years of his life he enjoyed great influence in Geneva as the ad- vocate of a more liberal theology than had prevailed under the preceding generation, and it was largely through his instrumen- tality that the. rule obliging ministers to subscribe to the Formula Consensus Helvetica was abolished in 1706, and the Consensus itself renounced in 1725. He also wrote and laboured for the promotion of union between the Reformed and Lutheran Churches, his most important work in this connexion being Nubes testium pro moderato et pacifico de rebus theolog-icis judi- cio, et instituenda inter Protestantes concordia (Geneva, 1729). Besides this he wrote Cogitationes et dissertationes theologicae, on the principles of natural and revealed religion (2 vols., Geneva, 1737; in French, Traitt de la veritf de la religion chrUienne) and commentaries on Thessalonians and Romans. He died on the 1st of May 1737.

See E. de Bude 1 , Francois et J. Alphonse Turretini (2 vols., 1880). and Lettres inedites a Jean Alphonse Turretini (3

vols., 1887-1888); F. Turretini, Notice biographique sur Benedict Turretini (1871); C. Borgeaud, Histoire de I'universite de Geneve (1900).

TURRIFF, a municipal and police burgh of Aberdeenshire, Scotland. Pop. (1901), 2273. It lies near the Deveron, 385 m. N.W. of Aberdeen by the Great North of Scotland railway, via Inveramsay. In the choir of the ancient church, now in ruins, is a fresco painting of St. Ninian. On the 14th of May 1639 the national struggle for civil and religious liberty was inaugurated in the county with the skirmish known as the Trot of Turriff. Some 4 m. south are the remains of the castle of Towie Barclay, the seat of the old family of the Barclays.

TURRIS LIBISONIS (mod. Porto Torres, q.v.), an ancient seaport town of Sardinia, situated at the north-western extremity of the island, and connected with Carales by two roads, which diverged at Othoca, one (the more important) keeping inland and the other following the west coast. It was probably of purely Roman origin, founded apparently by Julius Caesar, as it bears the title Colonia Julia; and in Pliny's time it was the only colony in the island. It is noteworthy that it apparently belonged to one of the urban tribes, the Collina; Puteoli, which belonged to the Palatina is the only other

exception to the rule that municipia and coloniae were not enrolled in the urban tribes. A Roman bridge of seven arches, somewhat restored in modern times, the ruins of a temple (now known as II Palazzo del Re Barbaro), which an inscription found there shows to have been restored (a.d. 247-249) by the praefectus of the province, together with the basilica, an aque- duct, various buildings (S. Valero Usni in Notizie degli scavi (1882), 121, A. Taramelli,ibid. (1904), 145) and some rock tombs, still exist.

The inscriptions from Turris Libisonis are given by Th. Mommsen in Corp. inscr. lat, x. 826; V. Dessi in Notizie degli scavi (1898), 260; A. Taramelli, ibid. (1904), 141. One of them (C.I.L. No. 7954) mentions the construction of a

fountain basin, another the construc- tion of a quay (ripa turritana) : substructions may still be seen under water when the sea is clear. (T. As.)

TURSHIZ, a district of the province of Khorasan in Persia, lying E. of the great salt desert. It has a population of nearly 20,000 and pays a yearly revenue of about £7000. It produces and exports wool, cotton, silk and much dried fruit, of the latter particularly raisins and Alu Bukhara, " Bokhara prunes." The chief place and capital of the district is Sultanabad, gener- ally called Turshiz, like the district, situated 225 m. south-east by east from Shahrud and 100 m. south-west from Meshed, in 35° 10′ N. 58° 34′ E., at an elevation of 2200 ft. It is surrounded by a dilapidated wall and has a population of about 8000.

TURTON, an urban district in the Westhoughton parlia- mentary division of Lancashire, England, 4 m. N. of Bolton, on the Lancashire & Yorkshire railway. Pop. (1901), 12,355. Its modern growth is the result of the development of the cotton trade in its various branches; and there are large stone quarries in the vicinity. There remains in the township a curious building named Turton Tower, dating principally from the 16th century, and containing some fine contemporary woodwork.

TUSCALOOSA, a city and the county-seat of Tuscaloosa county, Alabama, U.S.A., in the west-central part of the state, on the Black Warrior river, about 55 m. S.W. of Birmingham and about 100 m. N.W. of Montgomery. Pop. (1900), 5094; (local census, 1908), 7140 (3551 negroes); (1910 U.S. census), 8407. It is served by the Alabama Great Southern and the Mobile & Ohio railways. The Black Warrior river, formerly not navigable beyond Tuscaloosa, has been improved by the United States government, and there are three locks in or near the city. Tuscaloosa lies between the foothills of the Appalachians to the north-east and the low alluvial valley of the Black Warrior. It has many old-fashioned residences and gardens, and a fine Federal building. It is the seat of the university of Alabama; of the Alabama Central Female College (Baptist, 1858), which occupies the old state capitol; of the Tusca- loosa Female College (Methodist Episcopal, South, i860); of Stillman Institute (Presbyterian, 1876; originally the Tuscaloosa Institute for the Education of Coloured

Ministers; named in honour of its founder, Dr Charles A. Stillman, in 1897); and of Alabama Bryce Hospital for the Insane (1861). The university of Alabama was founded by an act of the state legislature of 1820, the United States government having donated 46,080 acres of public lands for this purpose in the preceding year; in 1831 the university was opened at Tuscaloosa, then the state capital. On the 4th of April 1865 all the buildings of the university, except the observatory, were burned by a body of Federal cavalry, and the university was closed thereafter until 1869; in 1884 the United States govern- ment gave another 46,080 acres of public lands in restitution, and in 1907 the state legislature appropriated $445,000 for new buildings. The university is a part of the public, school system of the state, and is governed by a board of trustees, consisting of the governor and the superintendent of education of the state, of two members from the congressional district in which the university is situated, and of one member from each of the other congressional districts of the state. The university includes, besides a college and a graduate school, departments of engineer- ing, law, medicine (formerly the Medical College of Alabama, established in 1859) and pharmacy (the two last in Mobile),

and a summer school for teachers, and in 1908-9 had 60 instructors and 887 students. In the city there are several manufacturing establishments, principally cotton and lumber mills; and in the immediate vicinity there are important coal, coke and iron interests — there is a large iron furnace, pipe foundry and coking plant at Holt, about 4 m. north-east of the city.

Tuscaloosa derives its name from an Indian chief, who, after a desperate battle with De Soto at Mauvilla (the site of which is not definitely known) in 1540, is said to have hanged himself in order to escape capture, and is commemorated by a granite monolith in the Court House Square; the name is said to mean ” black warrior.” The first settlement of whites was made in 1815. The city was chartered in 1819, and in 1826-1846 it was the capital of Alabama.

TUSCANA (mod. Toscanella, q.v.), an ancient town of Etruria, about 15 m. N.E. of Tarquinii. It is hardly mentioned in ancient literature; it was a station on the road

from Blera to Saturnia, a prolongation of the Via Clodia. On the hill of S. Pietro are remains of walling of the Roman period. A number of Etruscan tombs were found by the Campanari brothers in the 19th century, and their valuable contents are in various European museums.

TUSCANY (Toscana). a territorial division of Italy, consisting of the western part of the centre of the peninsula, bounded N.W. by Liguria and Emilia, E. by the Marches and Umbria, S.E. by the province of Rome and W. by the Mediterranean. It con- sists of eight provinces, Arezzo, Firenze (Florence), Grosseto, Livorno (Leghorn), Lucca, Massa-Carrara, Pisa and Siena, and has an area of 9304 sq. m. Pop. (1901), 2,566,741. The chief railway centre is Florence, whence radiate lines to Bologna (for Milan and the north), Faenza, Lucca, Pisa and Leghorn, and Arezzo for Rome. Siena stands on a branch leaving the Florence-Pisa line at Empoli and running through the centre of Tuscany to Chiusi, where it joins the Florence-Rome railway. The line from Rome to Genoa runs along the coast throughout the entire length of Tuscany, and at Montepescali throws off a branch joining the Empoli-Chiusi line at Asciano, and at Follonica another to Massa Marittima.

Except towards the coast and around Lucca, Florence and Arezzo, where the beds of prehistoric lakes form plains, the country is hilly, being intersected with sub-Apennine spurs. The most fertile country in Tuscany is in the valley of the Arno, where the plains and slopes of the hills are highly culti- vated. In strong contrast with this is the coast plain known as the Maremma, 850 sq. m. in extent, where malaria has been prevalent since the depopulation of the country in the middle ages. Here in the first half of the 19th century the grand duke Leopold II. of Tuscany began an elaborate system of drainage, which was gradually extended until it covered nearly the whole of the district. The greater part of the Maremma now affords pasture to large herds of horses and half wild cattle, but on the drier parts corn is grown, the people coming down from the hills to sow and to reap. The hill country just inland, especially near Volterra, has poor soil, largely clayey, and subject to land slips, but is rich in minerals. But for the Maremma, Tuscany is one of the most favoured regions of Italy. The climate is temperate, and the rainfall not excessive. The

Apennines shelter it from the cold north winds, and the prevailing winds in the west, blowing in from the Tyrrhenian Sea, are warm and humid, though Florence is colder and more windy than Rome in the winter and hotter in summer, owing to its being shut in among the mountains. Wheat, maize, wine (especially the red wine which takes the name of Chianti from the district S.S.W. of Florence), olive oil, tobacco, chestnuts and flowers are the chief products of Tuscany. Mules, sheep and cattle are bred, and beeswax is produced in large quantities. But the real wealth of Tuscany lies in its minerals. Iron, mercury, boracic acid, copper, salt, lignite, statuary marble, alabaster and Sienese earth are all found in considerable quantities, while mineral and hot springs abound, some of which (e.g. Montecatini and Bagni di Lucca) are well known as health resorts. The industries of Tuscany are exceedingly varied and carried on

with great activity. There are universities at Pisa and Siena. Viareggio and Leghorn are much frequented for sea-bathing, while the latter is a prosperous port.

The main art centres of Tuscany are Florence, Pisa and Siena, the headquarters of the chief schools of painting and sculpture from the 13th century onwards. While the former city, however, bore as prominent a part as any in Italy in the Renaissance, the art of Pisa ceased, owing to the political decline of the city, to make any advance at a comparatively early period, its impor- tance being in ecclesiastical architecture in the 12th, and in sculpture in the 13th century. Siena, too, never accepted the Renaissance to the full, and its art retained an individual character without making much progress.

The language of Tuscany is remarkable for its purity of idiom, and its adoption by Dante and Petrarch probably led to its becoming the literary language of Italy. (See Italian Language, vol. xiv. p. 895.)

See E. Repetti, Dizionario geografico fisico storico della Toscana (6 vols., Florence, 1834-1846). See also G. Dennis,

Cities and Ceme- teries of Etruria (2 vols., London, 1883). On medieval and Renais- sance architecture and art there are innumerable works. Among those on architecture may be mentioned the great work of H. von Geymuller and A. Widmann, Die Architektur der Renaissance in Toscana. (T. As.)

History. — Etruria (q.v.) was finally annexed to Rome in 351 B.C., and constituted the seventh of the eleven regions into which Italy was, for administrative purposes, divided by Augustus. Under Constantine it was united into one province with Umbria, an arrangement which subsisted until at least 400, as the Notitia speaks of a " consularis Tusciae et Umbriae." In Ammianus Marcellinus there is implied a distinction between " Tuscia suburbicaria " and " Tuscia annonaria," the latter being that portion which lies to the north of the Arno. After the fall of the Western empire Tuscia, with other provinces of Italy, came successively under the sway of Herulians, Ostrogoths, and Greek and Lombard dukes. Under the last-named, " Tuscia Langobardorum," comprising the districts of Viterbo, Corneto and Bolsena, was distinguished from " Tuscia Regni," which lay more to the north. Under Charlemagne the name of Tuscia or Toscana became restricted to the latter only. One of the earliest of the Frankish marquises was Boniface, either first or second of that name, who about 828 fought with success against the Saracens in Africa. Adalbert I., who succeeded him, in 878 espoused the cause of Carloman as against his brother Louis III. of France, and suffered excommunication and im- prisonment in consequence. Adalbert II. (the Rich), who married the ambitious Bertha, daughter of Lothair, king of Lorraine, took a prominent part in the politics of his day. A sub- sequent marquis, Hugo (the Great), became also duke of Spoleto in 989. The male line of marquises ended with Boniface II. (or III.), who was murdered in 1052. His widow, Beatrice, in 1055 married Godfrey, duke of Lorraine, and governed the country till her death in 1076, when she was succeeded by Matilda {q.v.), her only child by her first husband. Matilda died in 11 14 without issue, bequeathing all her extensive possessions to the Church. The consequent struggle between the popes, who claimed the inheritance, and the emperors, who maintained that the countess had no right to dispose of imperial fiefs, enabled

the principal cities of Tuscany gradually to assert their indepen- dence. The most important of these Tuscan republics were Florence, Pisa, Siena, Arezzo, Pistoia and Lucca.

The Return of the Medici. — After the surrender of Florence to the Imperialists in August 1530 the Medici power was re-established by the emperor Charles V. and Pope Clement VII., although certain outward forms of republicanism were preserved, and Alessandro de' Medici was made duke of Florence, the dignity to be hereditary in the family. In the reign of Cosimo III. Siena was annexed (1559); the title of grand duke of Tuscany was conferred on that ruler in 1 567 by Pope Pius V. and recog- nized in the person of Francis I. by the emperor Maximilian II. in 1576. Under a series of degenerate Medici the history of Tuscany is certainly not a splendid record, and few events of importance occurred save court scandals. The people became

more and more impoverished and degraded, a new and shoddy nobility was created and granted wide privileges, and art and letters declined. Giovan Gastone was the last Medicean grand duke; being childless, it was agreed by the treaty of Vienna that at his death Tuscany should be given to Francis, duke of Lorraine, husband of the archduchess Maria Theresa, afterwards empress. In 1737 Giovan Gastone died, 1 and Francis II., after taking possession of the grand duchy, appointed a regency under the prince of Craon and departed for Austria never to return. Tuscany was governed by a series of foreign regents and was a prey to adventurers from Lorraine and elsewhere; although the administration was not wholly inefficient and introduced some useful reforms, the people were ground by taxes to pay for the apanage of Francis in Vienna and for Austrian wars, and reduced to a state of great poverty. Francis, who had been elected emperor in 1745, died in 1765, and was succeeded on the throne of the grand duchy by his younger son, Leopold I.

Leopold resided in Tuscany and proved one of the most capable and remarkable of the reforming princes of the 18th century. He substituted Tuscans for foreigners in government Ttle offices, introduced a system of free trade in food- Reforms of stuffs (at the suggestion of the Sienese Sallustio Leopold 11. Bandini), promoted agriculture, and

reclaimed wide areas of marshland to intensive cultivation. He reorganized taxation on a basis of equality for all citizens, thereby abolishing one of the most vexatious privileges of the nobility, reformed the administration of justice and local government, suppressed torture and capital punishment, and substituted a citizen militia for the standing army. His reforms in church matters made a great stir at the time, for he curbed the power of the clergy, suppressed some religious houses, reduced the mortmain and rejected papal interference. With the aid of Scipione de' Ricci, bishop of Pistoia, he even attempted to remove abuses, reform church discipline and purify religious worship; but Ricci's action was condemned by Rome. Ricci was forced to resign, and the whole movement came to nothing. (See Pistoia, Synod of.) The grand duke also contemplated granting a form of constitution, but his Teutonic rigidity was not popular and many of his reforms were ahead of the times and not appreciated by the people. At the death of his brother, Joseph II., in 1790, Leopold became emperor, and repaired to Vienna. After a brief regency he appointed his second son, Ferdinand III., who had been born and brought up in Tuscany, grand duke.

During the French revolutionary wars Ferdinand tried to maintain neutrality so as to avoid foreign invasions, but in 1799 a French force entered Florence and was welcomed by a small number of republicans. The occupation. grand duke was forced to fly, the " tree of liberty " was set up, and a provisional government on French lines established. But the great mass of the people were horrified at the irreligious character of the new regime, and a counter-revolution, fomented by Pope Pius VII., the grand ducalists and the clergy, broke out at Arezzo. Bands of armed peasants marched through the country to the cry of " Viva Maria!" and expelled the French, not without committing many atrocities. With the assistance of the Austrians, who put an end to disorder, Florence was occupied and the grand ducalists established a government in the name of Ferdinand. But after Napoleon Bonaparte's victory at Marengo the French returned in great force, dispersed the bands, and re-entered Florence (October 1800). They too committed atrocities and sacked the churches, but they were more warmly welcomed than before by the people, who had experienced Austro-Aretine rule. Joachim Murat

(afterwards king of Naples) set up a provisional government, and by the peace of Luneville Tuscany was made a part of the Spanish dominions and erected into the kingdom of Etruria under Louis, duke of Parma (1801). The new king died in 1803, leaving an infant son, Charles Louis, under the regency of his widow, Marie Louise of Spain. Marie Louise ruled with

!The history of Tuscany from 1530 to 1737 is given in greater detail under Mepjci.

reactionary and clerical tendencies until 1807, when the emperor Napoleon obliged Charles IV. of Spain to cede Tuscany to him, compensating Charles Louis in Portugal.

From 1807 to 1809, when Napoleon's sister, Elisa Baciocchi, was made grand duchess, Tuscany was ruled by a French administrator-general; the French codes were introduced, and Tuscany became a French department. French ideas had gained some adherents among the Tuscans, but to the majority the new institutions, although they produced much progress, were distasteful as subversive of cherished traditions. After Napoleon's defeats in 1814 Murat seceded from the emperor and occupied Tuscany, which he afterwards handed over to Austria, and in September Ferdinand III. returned, warmly welcomed by nearly everybody, for French rule had proved oppressive, especially on account of the heavy taxes and the drain of con- scription. At the Congress of Vienna he was formally reinstated with certain additions of territory and the reversion of Lucca. On Napoleon's escape from Elba Murat turned against the Austrians, and Ferdinand had again to leave Florence temporarily; but he returned after Waterloo, and reigned until his death in 1824.

The restoration in Tuscany was unaccompanied by the excesses which characterized it elsewhere, and much of the French legisla- tion was retained. Ferdinand was succeeded by his Restoration. son > Leopold II., who continued his father's policy of benevolent but somewhat enervating despotism, which produced marked effects on the Tuscan

character. In 1847 Lucca was incorporated in the grand duchy. When the political excitement consequent on the election of Pius IX. spread to Tuscany, Leopold made one concession after another, and in February 1848 granted the constitution. A Tuscan contingent took part in the Piedmontese campaign against Austria, but the increase of revolutionary agitation in Tuscany, culminating in the proclamation of the republic (Feb. 9, 1849), led to Leopold's departure for Gaeta to confer with the pope and the king of Naples. Disorder continuing and a large part of the population being still loyal to him, he was invited to return, and he did so, but accepted the protection of an Austrian army, by which act he forfeited his popularity (July 1849). In 1852 he formally abrogated the constitution, and three years later the Austrians departed. When in 1859 a second war between Piedmont and Austria became imminent, the revolutionary agitation, never completely quelled, broke out once more. There was a division of opinion between the moderates, who favoured a constitutional Tuscany under Leopold, but forming part of an Italian federation, and the popular party, who aimed at the expulsion of the house of Lorraine and the unity of Italy under Victor Emmanuel. At last a compromise was arrived at and the grand duke was requested to abdicate in favour of his son, grant a constitution, and take part in the war against Austria. Leopold having rejected these demands, the Florentines rose as one man and obliged him to quit Tuscany (April 27, 1859). A provisional government, led by Ubaldino Beruzzi and afterwards by Bettino Ricasoli, was established. It declared war against Austria and then handed over its authority to Boncompagni, the Sar- dinian royal commissioner (May 9). A few weeks later a French force under Prince Napoleon landed in Tuscany to threaten Austria's flank, but in the meanwhile the emperor Napoleon made peace with Austria and agreed to the restoration of Leopold and other Italian princes. Victor Emmanuel was obliged to recall the royal commissioners, but together with Cavour he secretly encouraged the provisional governments to resist the return of the despots, and the constituent assemblies of Tuscany, Romagna and the duchies voted for annexation to Sardinia. A Central Italian military league and a customs union were formed, and Cavour having overcome Napoleon's opposition by ceding Nice and Savoy, the king accepted the annexations

and appointed his kinsman, Prince Carignano, viceroy of Central Italy with Ricasoli as governor-general (March 22, i860). Valoa with The Sardinian parliament which met in April con- the Italian tained deputies from Central Italy, and after the Kingdom, occupation of the Neapolitan provinces and Sicily the kingdom of Italy was proclaimed (Feb. 18, 1861). In

1865, in consequence of the Franco-Italian convention of September 1864, the capital was transferred from Turin to Florence, where it remained until it was removed to Rome in

1871.

Since the union with Italy, Tuscany has ceased to constitute a separate political entity, although the people still preserve definite regional characteristics. It has increased in wealth and education, and owing to a good system of land tenure the peasantry are among the most prosperous in Italy.

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TUSCARORA, a tribe of North American Indians of Iroquoian stock. Their former range was on the Neuse river, North Caro- lina. Here in 1700 they lived in fifteen villages and were esti- mated at 6000. In 1 71 1, as a protest against the encroachments on their territory, they declared war on the white settlers. After two years they were defeated and fled north to the Iroquois, in whose famous league they became the sixth nation, settling on the territory of the Oneida Indians, in New York state. In the War of American Independence some of the tribe fought for the English and some against them. The remnant of them is divided between reservations in Canada and New York, and numbers about 700.

TUSCULUM, an ancient city of Latium, situated in a command- ing position on the north edge of the outer crater ring of the Alban volcano, i§ m. N.E. of the modern Frascati. The highest point is 2198 ft. above sea-level. It has a very extensive view of the Campagna, with Rome lying 15 m. distant to the north-west. Rome was approached by the Via Latina (from which a branch road ascended to Tusculum, while the main road passed through the valley to the south of it), or by the Via Tusculana (though the antiquity of the latter road is doubtful).

According to tradition, the city was founded by Telegonus) the son of Ulysses and Circe. When Tarquinius Superbus was expelled from Rome his cause was espoused by the chief of Tusculum, Octavius Mamilius, who took a leading part in the formation of the Latin League, composed of the thirty principal cities of Latium, banded together against Rome. Mamilius commanded the Latin army at the battle of Lake Regillus (497 B.C.), but was killed, and the predominance of Rome among the Latin cities was practically established. According to some accounts Tusculum became from that time an ally of Rome, and on that account frequently incurred the hostility of the other Latin cities. In 381 B.C., after an expression of complete submission to Rome, the people of Tusculum received the Roman franchise, but without the vote, and thenceforth the city con- tinued to hold the rank of a municipium. Other accounts, however, speak of Tusculum as often allied with Rome's enemies — last of all with the Samnites in 323 B.C. Several of the chief Roman families were of Tusculan origin, e.g. the gentes Mamilia, Fulvia, Fonteia, Juventia and Porcia; to the last-named the celebrated Catos belonged. The town council kept the name of senate, but the title of dictator gave place to that of aedile. Notwithstanding this, and the fact that a special college of Roman equites was formed to take charge of the cults of the gods at Tusculum, and especially of the Dioscuri, the citizens resident there were neither numerous nor men of distinction. The villas of the neighbourhood had indeed acquired greater importance than the not easily accessible town itself, and by the end of the Republic, and still more during the imperial period, the territory of Tusculum was one of the favourite places of residence of the wealthy Romans. The number and extent of the remains almost defy

description, and can only be made clear by a map. Even in the time of Cicero we hear of eighteen owners of villas there. Much of the territory (including Cicero's villa), but not the town itself, which lies far too high, was supplied with water by the Aqua Crabra. On the hill of Tusculum itself are remains of a small theatre (excavated in 1839), with a

reservoir behind it, and an amphitheatre. Both belong probably to the imperial period, and so does a very large villa (the sub- structures of which are preserved), by some attributed, but wrongly, to Cicero, by others to Tiberius, near the latter. Be- tween the amphitheatre and the theatre is the site of the Forum, of which nothing is now visible, and to the south on a projecting spur were tombs of the Roman period. There are also many remains of houses and villas. The citadel— which stood on the highest point an abrupt rock — was approached only on one side, that towards the city, and even here by a steep ascent of 1 50 ft. Upon it remains of the medieval castle, which stood here until 1 191, alone are visible. The city walls, of which some remains still exist below the theatre, are built of blocks of the native -" lapis Albanus " or peperino. They probably belong to the republican period. Below them is a well-house, with a roof formed of a pointed arch — generally held to go back to a somewhat remote antiquity, but hardly with sufficient reason.

The most interesting associations of the city are those con- nected with Cicero, whose favourite residence and retreat for study and literary work was at, or rather near, Tusculum. It. "was here that he composed his celebrated Tusculan Disputa- tions and other philosophical works. Much has been written on the position of his villa, but its true site still remains doubtful. The theory, which places it at or near Grotta Ferrata, some distance farther to the west, has most evidence to support it. Although Cicero (Pro Sestio, 43) speaks of his own house as being insignificant in size compared to that of his neighbour Gabinius, yet we gather from other notices in various parts of his works that it was a considerable building. It comprised two gymnasia

(Div. i. 5), with covered porticus for exercise and philosophical discussion (Tusc. Disp. ii. 3). One of these, which stood on higher ground, was called " the Lyceum," and contained a library (Div. ii. 3); the other, on a lower site, shaded by rows of trees, was called " the Academy." The main building con- tained a covered porticus, or cloister, with apsidal recesses (exedrae) containing seats (see Ad Fam. vii. 23). It also had bathrooms (Ad Fam. xiv. 20), and contained a number of works of art, both pictures and statues in bronze and marble (Ep. ad Alt. i. 1, 8, 9, 10). The central atrium appears to have been small, as Cicero speaks of it as an atriolum (Ad Quint. Fr. iii. 1). The cost of this and the other house which he built at Pompeii led to his being burdened with debt (Ep. ad Alt. ii. 1). Nothing now exists which can be asserted to be part of Cicero's villa with any degree of certainty. During the imperial period little is recorded about Tusculum; but soon after the transference of the seat of empire to Constantinople it became a very important stronghold, and for some centuries its counts occupied a leading position in Rome and were specially influential in the selection of the popes. During the 12th century there were constant struggles between Rome and Tusculum, and towards the close of the century (1191) the Romans, supported by the German emperor, gained the upper hand, and the walls of Tusculum, together with the whole city, were destroyed.

See L. Canina, Descr. dell' antico Tusculo (Rome, 1841); A. Nibby, Dintorni di Roma, iii. 293 (2nd ed., Rome, 1841); H. Dessau in Corp. inscript. lat. pp. 252 sqq. (Berlin, 1887); F. Grossi-Gondi, // Tuscolano nell' eta classica (Rome, 1907); T. Ashby in Papers of the British School at Rome, iv. 5 (London, 1907, 1909). (T. As.)

TUSKEGEE, a town and county-seat of Macon county, Alabama, U.S.A., in the east part of the state, about 40 m. E. of Montgomery. Pop. (1900) 2170; (1910) 2803. It is served by the Tuskegee railway, which connects it with Chehaw, 5 m. distant, on the Western railway of Alabama. The city manufactures cotton seed. Tuskegee is chiefly known for its educa- tional institutions — the Tuskegee Normal and Industrial Institute and the Alabama Conference Female College (Methodist Episcopal Church, South; opened 1856). The former was founded in 1880 by an act of the state legislature as the Tuskegee State Normal School, and was

opened in July 1881 by Booker T. Washington for the purpose of giving an industrial education to negroes; in 1893 it was incorporated under its present name. In 1899 the national Congress granted to the school 25,000 acres of mineral lands, of which 20,000 acres, valued at $200,000,

were unsold in 1909. Andrew Carnegie gave $600,000 to the institute in 1903, and the institute has a Carnegie library (1902), with about 15,000 volumes in 1909. In 1909 the endowment was about $1,389,600, and the school property was valued at about $1,117,660. It had in 1909 a property of 2345 acres (of which 1000 were farm lands, 1145 pasture and wood lands, and 200 school campus), and 100 buildings, many of brick, and nearly all designed and constructed, even to the making of the bricks, by the teachers and students. The state of Alabama appro- priated $2000 for teachers' salaries in 1880, increased the appropriation to $3000 in 1884, and for many years gave $4500 annually; the school receives $10,000 annually from the John F. Slater Fund, and the same sum from the General Education Board. The institute comprises an academic department (in which all students are enrolled) with a seven years' course, the Phelps Hall bible training school (1892), with a three years' course, and departments of mechanical industries, industries for girls, and agriculture. The department of agriculture has an experiment station, established by the state in 1896, in which important experiments in cotton breeding have been carried on. There are a farm, a large truck garden, an orchard, and a bakery and canning factory. Forty different industries are taught. Cooking schools and night schools are carried on by the institute in the town of Tuskegee. In 1908-1909 the enrolment was 1494 students, of whom about one-quarter were women, and there were 167 teachers, all negroes. Tuition in the institute is free; board and living cost $8.50 a month; day students are allowed to "work-out" $i.so-$3.oo a month of this amount, and night students may thus pay all their expenses. At Tuskegee under the auspices of the institute are held the annual negro conferences (begun in 1891) and monthly farmers' institutes (begun in 1897); and short courses in agriculture (begun in 1904) are conducted. Farmers' institutes are held throughout the South by teachers of the school. In 1905 the institute took up the work of rural school extension. A model negro village

(South Greenwood) has been built west of the institute grounds on land bought by the institute in 1901. Affiliated with the institute and having its headquarters in Tuskegee is the National Negro Business League (1900). The success of the institute is due primarily to its founder and principal, Booker T. Washing- ton, and to the efficient board of trustees, which has included such men as Robert C. Ogden and Seth Low. Tuskegee was settled about 1800.

See Booker T. Washington, Working With the Hands (New York, 1904) ; and Thrasher, Tuskegee, Its Story and Its Work (Boston,

1900).

TUSSAUD, MARIE (1760-1850), founder of "Madame Tussaud's Exhibition " of wax figures in London, was born in Berne in 1760, the daughter of Joseph Grosholtz (d. 1760), an army officer. Her uncle, a doctor of Berne, John Christopher Curtius, had attracted the attention of the prince de Conti by his beautiful anatomical wax models, and had been induced to move to Paris, abandon his profession, and practise wax modelling as a fine art. His house became the resort of many of the talented men of the day, and here he brought his niece at the age of six, and taught her to model in wax. She became such an adept that she early modelled many of the great people of France, and was finally sent for to stay at the palace at Versailles to instruct the sister of Louis XVI., Mme Elizabeth, in the popular craze. It was from Curtius's exhibition that the mob obtained the busts of Necker and the duke of Orleans that were carried by the procession when on the 12th of July 1789 the first blood of the French Revolution was shed. During the terrible days that followed Marie Grosholtz was called upon to model the heads of many of the prominent leaders and victims of the Revolution, and was herself for three months a prisoner, having fallen under the suspicion of the committee of public safety. In 1794 she married a Frenchman named Tussaud, from whom she was separated in 1800. Her uncle having died in the former year, after some difficulty she secured per- mission from Napoleon to leave France, and she took with her to London the nucleus of her collection from the cabinet de cirt

in the Palais Royal, and the idea of her ” Chamber of Horrors ” from Curtius’s Caverne des Grands Voleurs, in the Boulevard du Temple. Her wax figures were successfully shown in the Strand on the site of the Lyceum theatre, and through the provinces, and finally the exhibition was established in per- manent London quarters in Baker Street in 1833. Here Mme Tussaud died on the 16th of April 1850. She was succeeded by her son Francis Tussaud, he by his son Joseph, and he again by his son John Theodore Tussaud (b. 1859). The exhibition was moved in 1884 to a large building in Marylebone Road.

TUSSER, THOMAS (c. 1524-1580), English poet, son of William and Isabella Tusser, was born at Rivenhall, Essex, about 1524. At a very early age he became a chorister in the collegiate chapel of the castle of Wallingford, Berkshire. He appears to have been pressed for service in the King’s Chapel, the choristers of which were usually afterwards placed by the king in one of the royal foundations at Oxford or Cambridge. But Tusser entered the choir of St Paul’s Cathedral, and from there went to Eton College. He has left a quaint account of his privations at Wallingford, and of the severities of Nicholas Udal at Eton. He was elected to King’s College, Cambridge, in 1543, a date which has fixed the earliest limit of his birth- year, as he would have been ineligible at nineteen. From King’s College he moved to Trinity Hall, and on leaving Cam- bridge went to court in the service of William, 1st Baron Paget of Beaudesart, as a musician. After ten years of life at court, he married and settled as a farmer at Cattiwade, Suffolk, near the river Stour, where he wrote his Hundreth Good Pointes of Husbandrie (1557, 1561, 1562, &c). He never remained long in one place. For his wife’s health he removed to Ipswich. After her death he married again, and farmed for some time at West Dereham. He then became a singing man in Norwich Cathedral, where he found a good patron in the dean, John Salisbury. After another experiment in farming at Fairsted, Essex, he removed to London, whence he was driven by the plague of 1572-1573 to find refuge at Trinity Hall, being matri- culated as a servant of the college in 1573. At the time of his death he was in possession of a small estate at Chesterton, Cambridgeshire, and his will proves that he was not, as has sometimes been stated, in

poverty of any kind, but had in some measure the thrift he preached. Thomas Fuller says he ” traded at large in oxen, sheep, dairies, grain of all kinds, to no profit”; that he ” spread his bread with all sorts of butter, yet none would stick thereon.” He died on the 3rd of May 1580. An erroneous inscription at Manningtree, Essex, asserts that he was sixty-five years old.

The Hundreth Good Pointes was enlarged to A Hundreth good pointes of husbandry, lately maried unto a hundreth good poyntes of huswifery . . . the first extant edition of which, ” newly corrected and amplified,” is dated 1570. In 1573 appeared Five hundreth pointes of good husbandry . . . (reprinted 1577, 1580, 1585, 1586, 1590, &c). The numerous editions of this book, which contained a metrical autobiography, prove that the homely and practical wisdom of Tusser’s verse was appreciated. He gives directions of what is to be done in the farm in every month of the year, and minute instruc- tions for the regulation of domestic affairs in general. The later editions include A dialogue of wyvynge and thryvynge (1562). Modern editions are by William Mavor (1812), by H. M. W. (1848), and by W. Payne and Sidney J. Heritage for the English Dialect Society (1878).

TUTBURY, a town in the Burton parliamentary division of Staffordshire, England, 45 m. N.W. of Burton-upon-Trent, picturesquely situated on the river Dove, a western tributary of the Trent, which forms the county boundary with Derby- shire. Pop. (1901), 1971. The station of the Great Northern and North Staffordshire railways is in Derbyshire. The fine church of St Mary has a nave of rich Norman work with a re- markable western doorway; there are Early English additions, and the apsidal chancel is a modern imitation of that style. There are ruins of a large, castle standing high above the valley; these include a gateway of 14th-century work, strengthened in Caroline times, a wall enclosing the broad ” Tilt Yard,” and portions of dwelling rooms. Glass is the staple manufacture. Alabaster is found in the neighbourhood.

The early history of Tutbury (Toteberie, Stutesbury, Tuttebiri, Tudbury) is very obscure. It is said to have been a seat of the Mercian kings. After the Conquest it was granted to Hugh d’Avranches, who appears to have built the first

castle there. At the time of the Domesday Survey the castle was held by Henry de Ferrers, and " in the borough round it were 42 men living by their merchandize alone." Tutbury was the centre of an honour in Norman times, but the town remained small and unimportant, the castle and town continuing in the hands of the Ferrers until 1266, when, owing to Robert de Ferrers 's participation in the barons' revolt, they were forfeited to the Crown and granted to Edmund Crouchback, earl of Lancaster. They are still part of the duchy of Lancaster. Tutbury Castle was partially rebuilt by John of Gaunt, whose wife, Constance of Castile, kept her court there. Later it was, for a time, the prison of Mary Queen of Scots. During the Civil War it was held for the king but surrendered to the parliamentary forces (1646), and was reduced to ruins by order of parliament (1647). Richard III. granted to the inhabitants of Tutbury two fairs, to be held respectively on St Katharine's day and the feast of the Invention of the Cross; the fair on the 15th of August was famous until the end of the 18th century for its bull coursing, said to have been originally introduced by John of Gaunt.

In 1831 a large treasure of English silver coins of the 13th and 14th centuries was discovered in the bed of the river, and a series was placed in the British Museum. This treasure was believed to have been lost by Thomas, the rebellious earl of Lancaster, who was driven from Tutbury Castle by Edward II. in 1322.

See Mosley, History of Castle, Priory and Town of Tutbury (1832) ; Victoria County History : Stafford.

TUTICORIN, a seaport of British India in the Tinnevelly district of Madras. Pop. (1901), 28,048. It is the southern terminus of the South Indian railway, 443 m. S.W. of Madras city. In connexion with this railway a daily steamer runs to Colombo, 149 m. distant by sea. Tuticorin is an old town, long in possession of the Dutch, and has a large Roman Catholic population. It used to be famous for its pearl fisheries, which extended from Cape Comorin to the Pamban Channel between India and Ceylon; but owing to the deepening of the Pamban Channel in 1895 these banks no longer produce the pearl oysters in such remunerative quantities, though conch shells are still found and exported to Bengal. As a set-off to this, Tuticorin has advanced

greatly as a port since the opening of the railway in 1875, though it has only an open roadstead, where vessels must anchor two and a half miles from the shore; it is the second port in Madras and the sixth in all India. The exports are chiefly rice and livestock to Ceylon, cotton, tea, coffee and spices. There are factories for ginning and pressing cotton and a cotton mill.

TUTOR (Lat. tutor, guardian, tueri, to watch over, protect), properly a legal term, borrowed from Roman law, for a guar- dian of an infant (see Roman Law and Infant). Apart from this usage, which survives particularly in Scots law, the word is chiefly current in an educational sense of a teacher or in- structor. It is thus specifically applied to a fellow of a college at a university with particular functions, connected espe- cially with the supervision of the undergraduate members of the college. These function's differ in various universities. Thus, at Oxford, a fellow, who is also a tutor, besides lecturing, or taking his share of the general teaching of the college, has the supervision and responsibility for a certain number of the undergraduates during their period of residence; at Cambridge the tutor has not necessarily any teaching functions to perform, but is more concerned with the economic and social welfare of the pupils assigned to his care. In American universities the term is applied to a teacher who is subordinate to a professor, his appointment being for a year or a term of years.

TUTTLINGEN, a town of Germany, in the kingdom of Wtirt- temberg, on the left bank of the Danube, which is here crossed by a bridge, 37 m. by rail N.E. of Schaffhausen, and at the

junction of lines to Stuttgart and Ulm. Pop. (1905), 14,627. The town is overlooked by the ruins of the castle of Honberg, which was destroyed during the Thirty Years' War, and has an Evangelical and a Roman Catholic church, several schools, and a monument to Max Schneckenburger (18 10- 1840), the author of Die Wacht am Rhein. Its chief manufactures are shoes, cutlery, surgical instruments and

woollen goods, and it has a trade in fruit and grain.

Tuttlingen is a very ancient place, and is chiefly memorable for the victory gained here on the 24th of November 1643 by the Austrians and Bavarians over the French. It was almost totally destroyed by fire in 1803. It has belonged to Wtirt- temberg since 1404.

TUXEDO, a town of Orange county, New York, U.S.A., about 40 m. N.N.W. of New York City, near the New Jersey state line. Pop. (1890), 1678; (1900), 2277; (1905), 2865; (19 10), 2858. Tuxedo is served by the Erie railway. About i£ m. west of the railway station is Tuxedo Lake, which with 13,000 acres of surrounding country was taken for debt in 1814 by the elder Pierre Lorillard, who built a shooting-box here and sold wood from the land. The second Pierre Lorillard (1833-1901) formed the Tuxedo Park Association for the development of the tract, and on the 1st of June 1886 the Tuxedo Club and Tuxedo Park were opened; here there has grown up a remarkable collection of private establishments for the enjoyment of country life by certain wealthy families, who form a social club to whom the privileges are restricted. The area covers a variety of wild and cultivated scenery, and is beautifully laid out and utilized; there are golf links, a tennis and racket club, and game preserves, with excellent trout and bass fishing in the lake.

TUY, a city of north-western Spain, in the province of Ponte- vedra, on the right bank of the river Mino (Portuguese Minho), opposite Valenca do Minho, which stands on the left bank in Portuguese territory. Pop. (1900), 11,113. Tuy is the southern terminus of the railways to Santiago de Compostela and Corunna; Valenca do Minho is the northern terminus of the Portuguese railway to Oporto. Near Tuy rises the Monte San Cristobal, whose far-spreading spurs constitute the fertile and picturesque Vega del Oro. To the east is the river Louro, a right-hand tributary of the Mino abounding in salmon, trout, lamprey, eels and other fishes; and beyond the Louro, on the railway to Corunna, are the hot mineral springs of San Martin de Caldelas. Tuy is a clean and pleasant city with well-built houses, regular streets and many gardens. The cathedral, founded in the 12th century, but largely restored between the 15th and 19th, is of a massive and fortress-like architecture. Its half-ruined cloister and noble eastern facade date from the 14th century. There are several large convents and ancient parish churches, an old episcopal palace, hospitals, good schools, a theatre, and a very handsome bridge over the Mino built in 1885. The industries of Tuy include tanning, brewing, the distillation of spirits and the manufacture of soap. The city has also a brisk agricultural trade.

During part of the 7th century Tuy was the Visigothic capital. It was taken from the Moors by Alphonso VII. in the 12th century. As a frontier fortress it played an important part in the wars between Portugal and Castile.

TVER, a government of central Russia, on the upper Volga, bounded by the governments of Pskov and Novgorod on the W. and N. respectively, Yaroslavl and Vladimir on the E. and Moscow and Smolensk on the S. It has an area of 24,967 sq. m. Lying on the southern slope of the Valdai plateau, and intersected by deep valleys, it has the aspect of a hilly region, but is in reality a plateau 800 to 1000 ft. in altitude. Its highest parts are in the west, where the Volga, Southern Dvina and Msta rise in marshes and lakes. The plateau is built up chiefly of Carboniferous limestones, Lower and Upper, underlain by Devonian and Silurian deposits, which crop out only in the denudations of the

lower valleys. The whole is covered by a thick sheet of boulder-clay, the bottom-moraine of the Scan- dinavo-Russian ice-sheet, and by subsequent Lacustrine

deposits. A number of asar or eskers occur on the slopes of the plateau. Ochre, brick, and pottery clays, as also lime-stone for building, are obtained, and there are chalybeate springs. The soil, which is clayey for the most part, is not fertile as a rule.

Nearly the whole of Tver is drained by the upper Volga and its tributaries, several of which (Vazuza, Dubna, Sestra, Tvertsa and the tributaries of the Mologa) are navigable. The Vyshnevol- otsk system of canals connects the Volga (navigable some 60 m. from its source) with the Baltic, and the Tikhvin system connects the Mologa with Lake Ladoga. The Msta, which flows into Lake Ilmen, and its tributary the Tsna drain Tver in the north-west, and the Southern Dvina rises in Ostashkov. This network of rivers highly favours navigation : corn, linseed, spirits, flax, hemp, timber, metals and manufactured wares to the annual value of £1,500,000 are shipped from, or brought to, the river ports of the government. Lakes, ponds and marshes are numerous in the west and north-west, Lake Seliger — near the source of the Volga — and Lake Mztino being the most important. The forests — coniferous in the north and deciduous in the south — are rapidly disappearing, but still cover 32 % of the surface. The climate is continental ; the average yearly temperature at Tver (41 “-5 F.) is the same as that of Orel and Tambov (Jan. 11°, July 67).

The population was estimated in 1906 as 2,053,000, almost entirely Great Russian, but including about 117,700 Karelians. The government is divided into twelve districts, the chief towns of which are Tver, Byezhetsk, Kalyazin, Kashin, Kor- sheva, Ostashkov, Rzhev, Staritsa, Torzhok, Vesyegonsk, Vyshniy Volochok and Zubtsov. Nearly 2,000,000 acres are under cereals. The principal crops are rye, wheat, oats, barley and potatoes. The sowing of grass is spreading, owing to the efforts of the zemstvos or local councils, and improved machinery is being introduced. Livestock breeding is also important, and dairy produce is exported. Manufactures have grown rapidly. Cotton-mills, flour-mills, tanneries, sugar-refineries, iron-foundries and distilleries are the chief establishments. The government of

Tver is also the seat of important village industries, of which a remarkable variety is carried on, nearly every district and even every village having its own speciality. The principal of these are weaving, lace-making, boat-building, and the making of boots, saddlery, coarse pottery, sacks, nets, wooden wares, nails, locks, other hardware and agricultural implements and felt goods.

TVER, a town of Russia, capital of the government of the same name, 104 m. by rail N.W. of Moscow, on both banks of the Volga (here crossed by a floating bridge) at its confluence with the Tvertsa. The low right bank is protected from inun- dations by a dam. Pop. (1885), 39,280; (1900), 45,644. Tver is an archiepiscopal see of the Orthodox Greek Church. The oldest church dates from 1564, and the cathedral from 1689. A public garden occupies the site of the former fortress. The city possesses a good archaeological museum, housed in a former imperial palace. The industries have developed greatly, espe- cially those in cotton, the chief works being cotton and flour mills, but there are also machinery works, glass works, saw- mills, tanneries, railway carriage works and a steamer-building wharf. Among the domestic industries are nail-making and the manufacture of hosiery for export to Moscow and St Peters- burg. The traffic of the town is considerable, Tver being an ‘ intermediate place for the trade of both capitals with the governments of the upper Volga.

Tver dates its origin from n 80, when a fort was erected at the mouth of the Tvertsa to protect the Suzdal principality against Novgorod. In the 13th century it became the capital of an independent principality, and remained so until the end of the 15th century. Michael, prince of Tver, was killed (1318) fight- ing against the Tatars, as also was Alexander his son. It long remained an open question whether Moscow or Tver would ultimately gain the supremacy in Great Russia, and it was only with the help of the Tatars that the princes of the former eventually succeeded in breaking down the independence of Tver. In i486, when the city was almost entirely burned down by the Muscovites, the son of Ivan III. became prince of Tver; the final annexation to Moscow followed four years later. In 1570 Tver had to endure, for some reason now

difficult to understand, the vengeance of Ivan the Terrible, who ordered the massacre of 90,000 inhabitants of the principality. In 1600-1612 the city was plundered both by the followers of the second false Demetrius and by the Poles.

TWAIN, MARK, the nom de plume of Samuel Lang- horne Clemens (1835-1910), American author, who was born on the 30th of November 1835, at Florida, Missouri. His father was a country merchant from Tennessee, who moved soon after his son's birth to Hannibal, Missouri, a little town on the Mississippi. When the boy was only twelve his father died, and thereafter he had to get his education as best he could. Of actual schooling he had little. He learned how to set type, and as a journeyman printer he wandered widely, going even as far east as New York. At seventeen he went back to the Mississippi, determined to become a pilot on a river- steamboat. In his Life on the Mississippi he has recorded graphically his experiences while " learning the river." But in 1861 the war broke out, and the pilot's occupation was gone. After a brief period of uncertainty the young man started West with his brother, who had been appointed lieutenant- governor of Nevada. He went to the mines for a season, and there he began to write in the local newspapers, adopting the pen name of " Mark Twain," from a call used in taking soundings on the Mississippi steamboats. He drifted in time to San Francisco, and it was a newspaper of that city which in 1867 supplied the mcney for him to join a party going on a chartered steamboat to the Mediterranean ports. The letters which he wrote during this voyage were gathered in 1869 into a volume, The Innocents Abroad, and the book immediately won a wide and enduring popularity. This popularity was of service to him when he appeared on the platform with a lecture — or rather with an apparently informal talk, rich in admirably delivered anecdote. He edited a daily newspaper in •Buffalo for a few months, and in 1870 he married Miss Olivia L. Langdon (d. 1904), removing a year later to Hartford, where he established his home. Roughing It was published in 1872, and in 1874 he collaborated with Charles Dudley Warner in The Gilded Age, from which he made a play,

acted many hundred times with John T. Raymond as " Colonel Sellers." In 1875 he published The Adventures of Tom Sawyer, the sequel to which, ˆHuckleberry Finn, did not appear until 1884. The result of a second visit to Europe was humorously recorded in A Tramp Abroad (1880), followed in 1882 by a more or less historical romance, The Prince and the Pauper; and a year later came Life on the Mississippi. The Adventures of Huckle- berry Finn, the next, of his books, was published (in 1884) by a New York firm in which the author was chief partner. This firm prospered for a while, and issued in 1889 Mark Twain's own comic romance, A Connecticut Yankee at King Arthur's Court, and in 1892 a less successful novel, The American Claimant. But after a severe struggle the publishing house failed, leaving the author charged with its very heavy debts. After this disaster he issued a third Mississippi Valley novel, The Tragedy of Pudd'nhead Wilson, in 1894, and in 1896 another historical romance, Personal Recollections of Joan of Arc, wherein the maid is treated with the utmost sympathy and reverence. He went on a tour round the world, partly to make money by lecturing and partly to get material for another book of travels, published in 1897, and called in America Following the Equator, and in England More Tramps Abroad. From time to time he had collected into volumes his scattered sketches; of these the first, The Celebrated Jumping Frog of Calaveras County, appeared in 1867, and the latest, The Man that Cor- rupted Hadleyburg, in 1900. To be recorded also is a volume of essays and literary criticisms, How to Tell a Story (1897). A complete edition of his works was published in twenty-two volumes in 1899-1900 by the American Publishing Company of Hartford. And in this last year, having paid off all the debts of his old firm, he returned to America. By the time he died his books had brought him a considerable fortune. In later years he published a few minor volumes of fiction, and a series of severe and also amusing criticisms of Christian Science (pub-

lished as a book in 1907), and in 1906 he began an autobiography in the North American Review. He had a great reception in England in 1907, when he went over to receive from Oxford the degree of Doctor of Literature. He died at Redding, Connecticut, on the 21st of April 1910. Of his four daughters only one, who married the Russian

pianist Gabrilowitch, sur- vived him. Mark Twain was an outstanding figure for many years as a popular American personality in the world of letters. He is commonly considered as a humorist, and no doubt he is a humorist of a remarkable comic force and of a refreshing fertility. But the books in which his humour is broadly displayed, the travels and the sketches, are not really so significant of his power as the three novels of the Mississippi, Tom Sawyer, Huckleberry Finn and Pudd'nhead Wilson, wherein we have preserved a vanished civilization, peopled with typical figures, and presented with inexorable veracity. There is no lack of humour in them, and there is never a hint of affectation in the writing; indeed, the author, doing spontaneously the work nearest to his hand, was very likely unconscious that he was making a contribution to history. But such Huckleberry Finn is, beyond all question; it is a story of very varied interest, now comic, now almost tragic, frequently poetic, unfailingly truthful, although not always sustained at its highest level. And in these three works of fiction there are not only humour and pathos, character and truth, there is also the largeness of outlook on life such as we find only in the works of the masters. Beneath his fun-making we can discern a man who is fundamentally serious, and whose ethical standards are ever lofty. Like Cervantes at times, Mark Twain reveals a depth of melancholy beneath his playful humour, and like Moliere always, he has a deep scorn and a burning detestation of all sorts of sham and pretence, a scorching hatred of humbug and hypocrisy. Like Cervantes and like Moliere, he is always sincere and direct.

After Mark Twain's death, his intimate friend, W. D. Howells, published in 1910 a series of personal recollections in Harper's Magazine. (B. M.)

TWEED, a river in the south of Scotland. It rises in the south-west corner of Peeblesshire, not far from the Devil's Beef Tub (in Dumfriesshire) in the hill country in which the Clyde and Annan also rise. The stream flowing from Tweed's Wall, about 1500 ft. above the sea, is generally regarded as its source, though its origin has been traced to other streams at a still higher elevation. For the first 36 m. of its course the stream intersects the shire of Peebles in a north-easterly direction, and, shortly before the county town is reached, receives Lyne Water on the left and Manor

Water on the right. The valley now widens, and the river, bending towards the south-east, passes Innerleithen, where it receives the Leithen (left) and the Quair (right). It then crosses Selkirkshire and, having received the Ettrick (reinforced by the Yarrow) on the right, flows northward past Abbotsford, forming for about 2 m. the boundary between the counties of Selkirk and Roxburgh. After receiving the Gala on the left, the Tweed crosses the north-western corner of Roxburghshire past Mel- rose and, after being joined by the Leader on the left, winds past Dryburgh Abbey round the south-western corner of Berwickshire. The remainder of its course is in a north-easterly direction through Roxburghshire past Kelso, where it receives the Teviot on the right, and then between the counties of Berwick and Northumberland, past Coldstream, to the town of Berwick, where it enters the North Sea. On the left it receives Eden Water at Edenmouth and Leet Water at Cold-stream, and the Till from Northumberland between Cold-stream and Norham Castle. The last 2 m. of its course before reaching Berwick are in England. The Tweed is 97 m. long and drains an area of 1870 sq. m. Its bed is pebbly and sandy, and notwithstanding discolorations from manu-factures, the stream, owing to its clear and sparkling appear- ance, still merits the epithet of the " silver Tweed." The river, however, has no estuary, and traffic is chiefly confined to Berwick, though for a short distance above the town some

navigation is carried on by barges. The Tweed is one of the best salmon streams in Scotland. From the time of Kenneth the Grim (d. 1005) to that of James VI. (1600) the Tweed uplands were the favourite hunting ground of the Scots monarchs, and, at a later date, the Covenanters found refuge in the recesses of the hills and on the banks of Talla Water, an early right-hand affluent. Close to Stobo Castle is Stobo Kirk, the mother-church of the district, founded by St Kentigern and probably the oldest ecclesiastical building in Tweeddale, a mixture of Saxon, Norman and modern Gothic.

See Sir Thomas Dick Lauder, Scottish Rivers (1874);

Professor John Veitch, The River Tweed (1884); Rev. W. S. Crockett, The Scott Country (1892).

TWEEDDALE, MARQUESSES OF. John Hay, 2nd Earl and ist Marquess of Tweeddale (1626-1697), was the eldest son of John, 8th Lord Hay of Yester (c. 1 599-1654), created earl of Tweeddale in 1646, who was the grandson of William Lord Hay of Yester (d. 1576), one of the partisans of Mary Queen of Scots, and thus a descendant of John Hay of Yester (Haddingtonshire) who was created a lord of the Scottish parliament in 1488 and died about 1500. Before succeeding to the peerage in 1654 the second earl fought for Charles I. during the Civil War, but he soon transferred his allegiance, and was in the Scottish ranks at Marston Moor. Changing sides again, he was with the royalists at Preston; but he was a member of Cromwell's parliament in 1656, and was imprisoned just after the restoration of Charles II. He was soon, however, in the king's favour, and in 1663 was appointed president of the Scottish council, and in 1664 an extraordinary lord of session. In Scotland he sought to mitigate the harshness shown by the English government to the Covenanters, and for this attitude he was dismissed from his offices in 1674; but he regained an official position in 1680 and held it during the reign of James II. A supporter of William of Orange, he was made lord high chancellor of Scotland in 1692, and two years later was created marquess of Tweeddale and earl of Gifford. He favoured the scheme for the expedition to Darien, and as lord high commissioner during William's absence he formally assented to the act establishing the trading company in 1695; for this action he was dismissed from office when the king returned to England in 1696. He died on the nth of August

1697.

His son John, 2nd Marquess of Tweeddale (1645-1713), was prominent in Scottish politics during the stormy period which preceded the union with England. After acting for a time with the national party he became the leader of the squadrone volante, a band of men who at first took up an inde- pendent attitude en the question, but afterwards supported the union. For a very short time he was lord chancellor of Scotland, and he was one of the first of the Scottish represen- tative peers. He died on the 20th of April

17 13. His eldest son, Charles (c. 1670-1715), became 3rd marquess; a younger son, Lord John Hay (d. 1706), commanded the famous regiment of dragoons, afterwards called the Scots Greys, at the battle of Ramillies and elsewhere.

John, 4TH Marquess of Tweeddale (c. 1695-1762), eldest son of the 3rd marquess, was chief secretary of state for Scot- land from 1742 to 1746 and extraordinary lord of session from 1 72 1 until his death. In six parliaments he was a representa- tive peer for Scotland; he was for a time keeper of the king's signet, and in 1761 he was made lord-justice-general. He died on the 9th of December 1762. His brother, Lord Charles Hay (d. 1760), was the soldier who displayed great coolness when suddenly brought face to face with some French troops at Fontenoy, requesting the enemy, so Voltaire's account runs, to fire first.

The family of the 4th marquess became extinct when George, the 5th marquess, died on the 4th of October 1770; and George, a son of the 3rd marquess, succeeded to the title. When he died unmarried on the 16th of November 1787 the marquessate passed to a kinsman, George (1 733-1804), a descendant of the 2nd marquess, who became 7th marquess.

George, 8th Marquess of. Tweeddale (1787-1876), son of the preceding, succeeded in August 1804. He fought in the Peninsular War, being wounded at the battles of Busaco and Vittoria, and then in America; and he attained the rank of a field marshal in 1875. From 1842 to 1848 he was governor and commander-in-chief of Madras, but his later life was mainly spent at Yester, where he showed a very practical interest in agriculture. He died on the 10th of October 1876. His son, Arthur (1824-1878), who became 9th marquess, was an ornithologist of repute and a soldier who served in India and the Crimea. His ornithological works were published privately in 1 88 1 by his nephew, Captain R. E. W. Ramsay, with a memoir by Dr W. H. Russell. His successor was his brother, William Montagu (b. 1826), who, after sitting in the House of Commons for thirteen years, was made a peer of the United Kingdom as Baron Tweeddale in 1881.

TWEEZERS, a small instrument like a pair of tongs, used for

picking up minute objects, extracting thorns or splinters from the flesh, &c. Etymologically a ” tweezer ” is an instrument contained in a ” tweeze ” or a small case containing several instruments, ” tweeze ” being a plural form of ” twee,” an adaptation of French etui, a sheath-case or box to put things in. Why one particular instrument out of the case should be called ” tweezers ” is not certain; Skeat suggests a possible connexion of ideas with the obsolete ” twich,” ” twitch ” (Ger. zwicken, to nip, fasten, Eng. ” tweak “), or reference may be made to the M. Eng. twisel or twissel, a pair of objects (twi-, two).

The derivation of the French etui (O. Fr. estuy) is doubtful. Cog- nate forms are Span, estuche, Port, estojo, Ital. astuccio, formerly stuccio or stucchio, all with the same meaning of a small case for instruments such as scissors, knife, &c. Skeat supports Die” in his connexion with the modern German dialect Stauche, cuff, that part of the sleeve where such small objects were carried. Others connect the word with Lat. studium, a place where one studies, hence a place where objects of study are carried, a somewhat far-fetched sense development.

TWELVE TABLES, the tables of wood on which was engraved or painted the earliest codification of the Roman law. Origi- nally ten in number, two others were afterwards added, con- taining supplemental matter, and the whole code was termed the Lex XII. Tabularum (Law of the Twelve Tables). (See Roman Law and Rome.)

TWENTY-FOUR PARGANAS, THE, a district of British India, in the presidency division of Bengal, with an area of 4844 sq. m. It occupies part of the Gangetic delta, east of the Hugh, surrounding (but not including) the city of Calcutta”. It also includes the greater part of the almost uninhabited Sundarbans (q.v.). The administrative headquarters are at Alipur, a southern suburb of Calcutta. The country consists for the most part of a vast alluvial plain, and is everywhere watered by numerous branches of the Ganges. In 1901 the population was 2,078,359, showing an increase of 10 % in the decade. Rice is the staple crop, followed by jute, pulses and sugar-cane. The district is traversed by three railways, two of which terminate at the ports of Diamond Harbour and Port Canning, but numerous river channels are still the chief means of communication. Apart from the suburbs of

Calcutta, there is hardly a single real ˆtown. But round Calcutta all the manufactures of a great city are to be found, principally jute mills and jute presses, cotton mills and paper mills, and also government factories for rifles and ammunition.

The Twenty-four Parganas form the tract of which the zamindari or landlord rights were granted to the East India Company after the battle of Plassey, while the revenue arising therefrom was conferred upon Clive, upon whose death it reverted to the company.

TWICKENHAM, an urban district in the Brentford parliamentary division of Middlesex, England, 12 m. W.S.W. of St Paul's Cathedral, London, on the river Thames. Pop. (1891), 16,027; (10OI)j 20,991. Its situation is pleasant, and it has grown into an extensive residential district. The body of the church of St Mary was rebuilt in brick after its collapse

in 1 7 13, but the Perpendicular tower remains. Among men of eminence buried here are Alexander Pope and Sir Godfrey Kneller. The Thames in this neighbourhood forms a long deep reach in favour with fishermen, and Eel Pie Island is a resort of boating parties. There are many fine houses in the vicinity, more than one possessing historical associations. Strawberry Hill, the residence of Horace Walpole, was built to his taste in a medley of Gothic styles. Marble Hill was erected by George II. for the countess of Suffolk, and Pope, Swift and Gay took part in its equipment. Orleans House was the residence in 1800 of Louis Philippe, then duke of Orleans, and this family again acquired it in 1852, when it was occupied by the duke of Aumale. Several eminent French refugees resided at this period in the neighbourhood. In 1700 the young duke of Gloucester, son of Queen Anne, died here. York House was given to Lord Clarendon by Charles II., was probably the occasional residence of James II. when duke of York, and in 1864 was occupied by the comte de Paris, nephew of the duke of Aumale. Twickenham House was the residence of Sir John Hawkins, author of the History of Music, and Twicken- ham Park House, no longer standing, that of Lord

Chancellor Bacon. Pope's Villa was replaced by another building after his death, but the tunnel which connected his garden and house beneath a road, and was ornamented by him as a grotto, remains. Other eminent residents were Turner, who occupied Sandy- combe Lodge, and painted many of his famous works here, Henry Fielding the novelist, and Tennyson. Kneller Hall, the house built by Kneller (1711), was converted into a training college for masters of workhouse schools in 1847, and in 1856 became the Royal Military School of Music.

Twickenham at the Domesday survey was included in Isleworth. Anciently it was called Twittenham or Twicanham, and the first form, or a variation of it, is used by both Pope and Walpole. The manor was given in 941 by King Edmund to the monks of Christ Church, Canterbury, from whom it had been previously taken, but it was again alienated, for it was restored to the same monks by Edred in 948. In the reign of Henry VIII. it came into the possession of the Crown, and by Charles I. was assigned to Henrietta Maria as part of her jointure. It was sold during the Protectorate, but after the Restoration the queen mother resumed possession of it. In 1670 it was settled for life on Catherine of Braganza, queen of Charles II. It remains in possession of the Crown, but since the death of Catherine has been let on leases. The old manor house, now demolished, was Catherine's residence; and had been, according to tradition, the place of the retirement of Catherine of Aragon after her divorce from Henry VIII.

TWILIGHT, formerly known as Crepusculum (a Latin word meaning dusky or obscure) , properly the interval during which the atmosphere is illuminated after the setting of the sun. The analogous phenomenon in the morning, i.e. the interval between the first appearance of light and the rising of the sun, is known as the dawn. These phenomena are due to the light of the sun after refraction by the atmosphere being reflected to the observer by the clouds, dust, and other adventitious matter present in the atmosphere. Even in the early infancy of astronomy, the duration of twilight was associated with the position of the sun below the horizon, and measurements were made to de- termine the maximum vertical depression of the sun which admitted the phenomena. This was found by Alhazen, Tycho Brahe and others, to be about 18 , and

although other observers obtained somewhat different values, yet this value is now generally admitted. The duration of twilight is therefore measured by the time in which the sun traverses an arc of 1 8° of vertical depression, and primarily depends on the latitude of the observer and the declination of the sun. It is subject to several minor variations, occasioned by the variable amount of dust, clouds, &c. suspended in the air; and also on the temperature, which alters the altitude of the reflecting particles; thus at the same place and on the same day, the morning twilight or dawn is generally shorter than the evening twilight.

The duration and possibility of twilight may be geometrically exhibited as follows: Let O be the position of the observer (fig. 1) ; Z, the zenith; P, the pole of the heavens; ADB, the plane of the horizon; EDF, the path of the sun. Let the circles ADB and FDE intersect in the points D and Di; then these points correspond to the rising and setting of the sun. Now twilight prevails from sunrise or sunset until the sun is depressed through 18 ; hence if we draw arcs ZC and ZCi equal to 108 , and terminating on the circle FDE at C and Ci, then the arcs DC and D1C1 represent the distance traversed by the sun during the twilight. Also it may be observed that CiEC represents the path of the sun during the night, and DFDj during the day. The arc CD is readily determined by spherical trigonometry. For, join CP by an arc of a great circle ; then in the triangle ZPC we know ZP (the colatitude of O) ; PC (the sun's polar distance) and ZC (= 108° by construction). Hence the angle ZPC, the sun's hour angle, may be found; this gives the time before or after noon when the sun passes C. The times of sunrise and sunset being known, then the arcs DC and D1C1 (and the duration of dawn and twilight) are determined.

So far we have considered the case when the sun does attain a depression of 18 , but it is equally possible for this depression not to be attained. To investigate this, take ZG equal to 108 °. Now if G lies beyond B and E (the maximum depression of the sun), E being also below B, then the sun will rise and set, but never descend so low as to occasion true night, and the entire interval between sunrise and sunset will be twilight.

If E be not below B but above it, the sun will never descend

below the horizon, and will neither rise nor set, and we are presented with the phenomenon known as the midnight sun. Since PE = 90° — sun's declination, and PG = latitude of observer + 18 , then it follows that for there to be no night the latitude of the ob- server together with the declination of the sun must lie between 90 and 72 °.

The maximum declination of the sun is about 23° 30', and hence in latitude 48 30′ there will be one day without a true night; in higher latitudes there will be an increasing number of such days; and in lower latitudes none. In England there is no real night from about the 22nd of May till the 22nd of July.

The phenomenon known as the after-glow, or second twilight, has been referred to a second reflection of the solar rays in the atmosphere.

TWILL (connected with "two"), a woven cloth in which the passage of the weft is arranged, not in regular suc- cession as in plain weaving, but over one thread and under two or more according to the kind of twill. This gives a suc- cession of diagonal lines to the cloth, and though in the normal type of twill this diagonal traverses from selvage to selvage at an angle of 45 , considerable variations may be made. Twills may be stout and serviceable cloths, though, theoreti- cally, it would seem that the strain of wear on the threads that compose the cloth is necessarily irregular. The twill or dia- gonal may run either from left to right or vice versa. Twills are made in most kinds of cloths — silk, woollen, cotton, &c.

TWINING, THOMAS (1735-1804), English classical scholar, was born at Twickenham on the 8th of January 1734-173 5- The son of Daniel Twining, tea merchant of London, he was originally intended for a commercial life, but his distaste for it and his fondness for study decided his father to send him to the university. He entered Sidney Sussex College, Cambridge (fellow, 1760), took orders, and after his marriage in 1764 spent the remainder of his life at Fordham (Essex) and Colchester, where he died on the 6th of August 1804. His reputation as a classical scholar was established by his translation, with notes, of Aristotle's Poetics (1789). Twining was also an accomplished musician, and assisted Charles Burney in his History of Music.

Selections from his correspondence will be found in Recreations and Studies of a Country Clergyman of the Eighteenth Century (1882) and Selections from Papers of the Twining Family (1887)) edited by his grand-nephew (Richard Twining) ; see also Gentleman's Magazine, lxxiv. 490, and J. E. Sandys, History of Classical Scholarship, vol. iii. (1908).

TWISS, HORACE (1787-1849), English writer and politician, was born at Bath, being the son of Francis Twiss (1760-1827), a Shakespearian scholar who married Mrs Siddons's sister, Fanny Kemble, and whose brother Richard (1747-1821) made a name as a writer of travels. Horace Twiss had a pretty wit, and as a young man wrote light articles for the papers; and,

going to the bar, he obtained a considerable practice and became a K.C. in 1827. In 1820 he was elected to parliament, where, with some interruptions, he sat till 1841, holding the office of under-secretary for war and the colonies in 1828-1830. In 1844 he was appointed vice-chancellor of the duchy of Lan- caster, a well-paid post which enabled him to enjoy his popu- larity in London society. For some years he wrote for The Times, in which he first compiled the parliamentary summary, and his daughter married first Francis Bacon (d. 1840) and then J. T. Delane, both of them editors of that paper. He was the author of the Life (1844) of Lord Eldon, and other volumes. He died suddenly in London on the 4th of May 1849.

TWISS, SIR TRAVERS (1809-1897), English jurist, eldest son of the Rev. Robert Twiss, was born in London on the 19th of March 1809. At University College, Oxford, he obtained a first-class in mathematics and a second in classics in 1830, and was elected a fellow of his college, of which he was after- wards successively bursar, dean and tutor. During his connexion with Oxford he was, inter alia, a public examiner in classics and mathematics, Drummond professor of political economy (1842), and regius professor of civil law (1853). After he had forfeited his fellowship by marriage, he was elected to an hono- rary fellowship of

University College. He published while at Oxford an epitome of Niebuhr's History of Rome, an annotated edition of Livy and other works, but his studies mainly lay in the direction of political economy, law, chiefly international law, and international politics. In 1840 he was called to the bar at Lincoln's Inn, and became an advocate at Doctors' Commons. In the ecclesiastical courts he enjoyed a large practice, and filled many of the appointments incidental thereto, such as commissary-general of the city and diocese of Canter- bury (1849), vicar-general to the archbishop (1852) and chancellor of the diocese of London (1858). He was professor of international law at King's College, London (1852-1855). In 1858, when the Probate and Divorce Acts of 1857 came into force, and the ecclesiastical jurisdiction of Doctors' Commons had passed away, Twiss, like many other leading advocates of Doctors' Commons, became a Q.C., and in the same year he was also elected a bencher of his Inn. His successful career continued in the civil courts, and in addition to his large practice he was appointed in 1862 advocate-general to the admiralty, and in 1867 queen's advocate-general. In 1867 he was also knighted. He served during his legal career upon a great number of royal commissions, such as the Maynooth commission in 1854, and others dealing with marriage law, neutrality, naturalization and allegiance. His reputation abroad led to his being invited by the king of the Belgians in 1884 to draw up the constitution of the Congo Free State. In 1871 Twiss became involved in an unpleasant scandal, occasioned by allegations against the ante-nuptial conduct of his wife, whom he had married in 1862; and he threw up all his appointments and lived in retirement in London until his death on the 14th of January 1897, devoting himself to the study of international law and kindred topics. Among his more notable publications of this period were The Law of Nations in Peace and The Law of Nations in War, two works by which his reputation as a jurist will chiefly endure.

TWYSDEN, SIR ROGER (1597-1672), English antiquary and royalist pamphleteer, belonging to an ancient Kentish family. His mother, Anne, was the daughter of Sir Moule Finch, and his father, Sir William Twysden, was a courtier and scholar who shared in some of the voyages against the Spaniards in the reign of Queen Elizabeth and was well

known at the court of King James I. He was one of the first baronets. Roger Twysden was educated at St Paul's School, London, and then at Emmanuel College, Cambridge. He entered Gray's Inn on the 2nd of February 1623. He succeeded to the baronetcy on his father's death in 1629. For some years he remained on his estate at Roydon, East Peckham, largely engaged in building and planting, but also in studying antiquities and the law of the constitution. The king's attempts to govern without a parliament, and the vexatious interference of his

lawyers and clergy with the freedom of all classes of men, offended Sir Roger as they did most other country gentlemen. He showed his determination to stand on his rights by refusing to pay ship money, but, probably because the advisers of the Crown were frightened by the unpopularity of the impost, was not molested. He was chosen member of parliament for Kent in the Short Parliament of 1640, but was not elected to the Long Parliament. In common with most men of his class Sir Roger applauded the early measures of the parliament to restrict the king's prerogative, and then became alarmed when it went on to assail the Church. The attainder of Lord Strafford frightened him as a tyrannical use of power. He be- came in fact a very typical example of the men who formed the strength of the king's party when the sword was at last drawn. He considered himself too old to serve in the field, and therefore he did not join the king at Oxford. But he took the most prominent part in preparing the Kentish petition of March 1642 and in subsequent demonstrations on behalf of Charles. He incurred the wrath of the parliament, was arrested on the 1st of April 1642, but was soon let out on bail, and on his promise to keep quiet. But his respect for legality would not let him rest, and he was soon in trouble again for another demonstration known as " The Instruction to Mr Augustine Skinner." For this he was again arrested and for a time confined in a public-house, called " The Two Tobacco Pipes," near Charing Cross, London. He was released with a distinct intimation that he would be well advised not to go back to Roydon Hall, but to keep out of temptation in London. He took the advice and applied himself to reading. One plan for going abroad was given up, but at last he endeavoured to escape in disguise, was detected, and brought back to London. He was now

subjected to all the vexations inflicted on Royalist partisans of good property, sequestrations of his rents, fines for " malignancy," and confinement in the Tower, where he consoled himself with his books. At last he com- pounded in 1650 and went home, where he lived quietly till the Restoration, when he resumed his position as magistrate. He died on the 27th of June 1672. He published The Commons' Liberty (London, 1648), demonstrating that finings and imprisonings by parliament were illegal; Hisloriae anglicanae scriptores decern (London, 1652), a work encouraged by Cromwell; and Historical Vindication of the Church of England (London, 1657). TYBURN, a small left-bank tributary of the river Thames, England, now having its course entirely within London and below ground. The name, which also occurs as Aye-bourne, is of obscure derivation, though sometimes stated to signify Twy-burn, i.e. (the junction of) two burns or streams. The Tyburn rose at Hampstead and ran south, crossing Regent's Park, striking the head of the modern ornamental water thare. Its course is marked by the windings of Marylebone Lane, the dip in Piccadilly where that thoroughfare borders the Green Park and at times by a line of mist across the park itself. It joined the Thames at Westminster [q.v.). But the name is more famous in its application to the Middlesex gallows, also called Tyburn Tree and Deadly Never Green, and also at an early period, the Elms, through confusion with the place of execution of that name at Smithfield. The Tyburn gallows stood not far from the modern Marble Arch. Connaught Square is said by several authorities to have been the exact site, but it appears that so long as the gallows w*a& a permanent structure it stood at the junction of the present Edgware and Bayswater roads. The site, however, may have varied, for Tyburn was a place of execution as early as the end of the 1 2th century. In 1759, moreover, a movable gallows super- seded the permanent erection. On some occasions its two uprights and cross-beam are said to have actually spanned Edgware Road. Round the gibbet were erected open galleries, the seats in which were let at high prices. Among those executed here were Perkin Warbeck (1449), the Holy Maid of Kent and confederates, (1535), Haughton, last prior to the Charter-house (1535), John Felton, murderer of Villiers, duke of Buck- ingham (1628), Jack Sheppard (1724), Earl Ferrers (1760).

In 1661 the skeletons of Cromwell, Ireton and other regicides were hung upon the gallows. The last execution took place in 1783, the scene being thereafter transferred to Newgate. The Tyburn Ticket was a certificate given to a prosecutor of a felon on conviction, the first assignee of which was exempted by a statute of William III. from all parish and ward duties within the district. The hangman's halter was colloquially known in the 16th century as the Tyburn Tippet.

See A. Marks, Tyburn Tree, its History and Annals (London,

1908).

TYDEUS, in Greek legend, son of Oeneus, king of Calydon, and Periboea. Having slain his uncle (or other relatives) he fled for refuge to Argos, where Adrastus received him hospitably and purified him from the guilt of blood. Tydeus took part in the expedition of the " Seven against Thebes," in which, although small of stature, he greatly distinguished himself. In the desperate battle under the walls of the city, he was severely wounded by Melanippus, but managed to slay his adversary. Athena, who held Tydeus in special favour, hastened to the field of battle, to heal him of his wound and bestow immor- tality upon him. But the sight of Tydeus, cleaving open the skull of his dead enemy and sucking out his brains, so disgusted her that she left him to his fate. Tydeus married De'ipyle, the daughter of Adrastus, by whom he had a son, the famous Diomedes, frequently called Tydides.

Homer, Iliad, xiv. 1 14-132 ; Apollodorus iii. 6, 8 ; Schol. on Pindar, Nemea, x. 12.

TYLDESLEY with SHAKERLEY, an urban district in the Leigh parliamentary division of Lancashire, England, n m. W.N.W. from Manchester by the London & North Western railway. Pop. (1901), 14,843. The town is of modern growth and depends upon its cotton mills and the large collieries in the neighbourhood.

TYLER, JOHN (1 790-1862), tenth president of the United

States, was born at Greenway, Charles City county, Virginia, on the 29th of March 1790. He was the second son of John Tyler (1747-1813), governor of Virginia in 1808-1811 and United States district judge in 1812-1813. The family was of English descent, but the claim of relationship to the famous Wat Tyler, though always stoutly maintained by President Tyler, cannot be substantiated. John Tyler the younger entered the grammar- school of the College of William and Mary, at Williamsburg, in 1802, and graduated in 1807. Two years later he was admitted to the bar. His public life began in 1811, when he was elected a member of the Virginia House of Delegates. Here he served for five years, being chosen also in 18 is a mem- ber of the council of state. In 1813 he raised a company for the defence of Richmond against the British, serving sub- sequently in minor operations elsewhere. From December 18 1 6 to March 1821 he was a member of the national House of Representatives. A Republican in politics, and a firm believer in the doctrines of strict construction and state sover- eignty which Thomas Jefferson had been principally instru- mental in formulating, he opposed consistently the demand for internal improvements and increased tariff duties, and declined to follow Henry Clay in the proposed recognition of the independence of the Spanish colonies in South America and in the Missouri Compromise legislation. For the conduct of Jackson in Florida, in the summary execution of Arbuthnot and Ambrister,' he had only strong condemnation. He declined a re-election to the House in 1821. In 1823-1825 he was again a member of the Virginia House of Delegates, and in 1825- 1827 was governor of the state. In 1827 he was elected to the United States Senate to succeed John Randolph. In 1829- 1830 he also served as a member of the Virginia constitutional convention. His career as senator was marked by a degree of independence which at times made his party position uncer- tain, notwithstanding the fact that his political ideas continued to be those of a thoroughgoing strict constructionist. Believ- ing protective tariff duties to be unconstitutional, he voted against the " tariff of abominations " in 1828, and also against the tariff of 1832, since the latter measure, though reducing

duties, showed no abandonment of the protective principle. The compromise tariff of 1833, made necessary by the

hostile attitude of South Carolina, owed its inception largely to him, but he voted against the ” force bill,” an act for enforcing the collection of duties, being the only senator whose vote was so recorded. His hostility to a high tariff policy, however, did not prevent him from condemning the South Carolina ordinance of nullification; and in the presidential election of 1832 he supported Andrew Jackson, to whose political principles and methods, as to those of his advisers, he was invincibly opposed, as the ” least objectionable ” of the various candidates. The vigorous course of the president towards South Carolina, however, led him, after 1833, to act more and more with the opposition which presently became the Whig party; but he was never at heart a Whig, at least as Whig principles came later to be defined, and his place is with the Democrats of the Calhoun school. He sought to incorporate in a new code for the District of Columbia, in 1832, a prohibition of the slave trade in the district, at the same time opposing the aboli- tion of slavery there without the consent of Maryland and Virginia, which had originally ceded the district to the United States. In the controversy over the removal of the govern- ment deposits from the Bank of the United States he sided with the bank, and voted for Clay’s resolution censuring Jack- son for his course in the matter. In 1833 he was again elected to the Senate, notwithstanding the criticism of his independent attitude and the wide approval of Jackson’s policy in regard to the bank. In the election of 1836 he was supported as a candidate for the vice-presidency by the friends of Hugh L. White of Tennessee, the Democratic candidate opposed to Martin Van Buren, and received 47 votes, none of them from Virginia. When the legislature of Virginia voted instructions to its senators to support Senator Thomas H. Benton’s resolu- tion expunging from the journal of the Senate the resolution of censure, Tyler, though admitting the right of instruction, could not conscientiously obey the mandate, and on the 29th of February 1836 he resigned his seat. He was by this time reckoned a Whig, and his refusal to favour the Van Buren administration lent colour to that view. In 1838 he became once more a member of the Virginia House of Delegates, and in the same year was chosen president of the Virginia Coloni- zation Society, of which he had long been a vice-president. In 1839 he made an unsuccessful contest for the United States senatorship.

In December of that year the Whigs, relying upon his record in Congress as a sufficient declaration of political faith, nominated him for vice-president on the ticket with William Henry Harrison, expecting that the nomination would win support for the party in the South. Harrison and Tyler each received 234 electoral votes and were elected. On the 4th of April 1 841, one month after the inauguration, Harrison died, and Tyler became president. The detailed discussion of the events of his administration, 1841-1845, belongs to the history of the United States (see United States: History). He retained Harrison's cabinet until his veto of the bill for a " fiscal corporation " led to the resignation of all the members except Daniel Webster, who was bringing to a close the negotiations with Lord Ashburton for the settlement of the north-eastern boundary dispute; and he not only opposed the recognition of the spoils system in appointments and removals, but kept at their posts some of the ablest of the ministers abroad. He stood, however, as it were, midway between the two great parties, without the leadership or support of either; Van Buren, whose influence in the practical working of politics was still great, refused to recognize him as a Democrat, and the Whigs repudiated him as a Whig; while with Clay leading the majority in Congress, harmony between that body and the executive was from the first impossible. The annexation of Texas, achieved just before the close of his administration, seemed to commend him for a second term on that issue, and in May 1844 he was renominated by a convention of Democrats, irre- gularly chosen, at Baltimore. The majority of the annexa- tionists; however, would not support him, and he had further

to meet the opposition of Van Buren, who had failed to secure the nomination in the regular Democratic convention, and of James K. Polk, the regular Democratic nominee. Tyler accepted the Baltimore nomination, but on the 20th of August withdrew from the contest. From this time until the eve of the Civil War he held no public office, but his opinions on political questions continued to be sought, and he was much in demand as a speaker on public occasions. In December i860, when South Carolina adopted

its ordinance of secession, Tyler, though sympathizing with the state, took firm ground against disunion and exerted himself in behalf of peace. The legisla- ture of Virginia appointed him a commissioner to confer with President Buchanan and arrange, if possible, for the main- tenance of the status quo in the matter of Fort Sumter, in Charleston harbour; but his efforts were unavailing. He did not abate his activity, however, and the Peace Congress which assembled at Washington on the 4th of February 1861, pur- suant to a resolution of the Virginia legislature, and over which he presided, was largely the result of his labours. The con- stitutional amendment proposed by the conference, however, did not meet with his approbation, and his action in signing and transmitting the resolution to Congress was merely formal. On the 13th of February, while absent in Washington on this mission, he was elected to the Virginia convention at Rich- mond, and took his seat on the 1st of March. In the conven- tion he advocated immediate secession as the only proper course under the circumstances. He continued to serve as a member of the convention until it adjourned in December, in the meantime acting as one of the commissioners to nego- tiate a temporary union between Virginia and the Confederate States of America. He was also a member of the provisional Confederate Congress from May 1861, when the capital of the Confederacy was removed from Montgomery, Alabama, to Richmond. He was elected a member of the House of Re- presentatives of the permanent Congress, but died on the 18th of January 1862, in Richmond, before that body assembled.

President Tyler was twice married, first in 1813 to Miss Letitia Christian (1 790-1842), and second in 1844 to Miss Julia Gardiner (1820-1889). His son, Lyon Gardiner Tyler (b. 1853), graduated at the university of Virginia in 1875, and practised law at Richmond, Virginia, from 1882 to 1888, when he became president of the College of William and Mary. Among his publications, besides Letters and Times of the Tylers, are Parties and Patronage in the United States (1890); Cradle of the Republic (1900); England in America (1906) in the ” American Nation ” series, and Williamsburg, the Old Colonial Capital (1908).

The principal authority for the life of Tyler, aside from speeches, messages and other documents, is Lyon G. Tyler,

Letters and Times of the Tylers (3 vols., Richmond, Va., 1884-1896). (W. Mac D.*)

TYLER, MOSES COIT (1835-1900), American author, was born in Griswold, Connecticut, on the 2nd of August 1835. At an early age he removed with his parents to Detroit, Michi- gan. He entered the university of Michigan in 1853, but in the next year went to Yale College, from which he graduated A.B. in 1857, and received the degree of A.M. in 1863. He studied for the Congregational ministry at the Yale Divinity School (1857-1858) and at the Andover Theological Seminary (1858-1859), and held a pastorate at Owego, New York, in 1850-1860 and at Poughkeepsie in 1860-1862. Owing to ill- health, however, and a change in his theological beliefs, he left the ministry. He became interested in physical training, and for some time (partly in England) wrote and lectured on the subject, besides other journalistic work. He became professor of English language and literature in the university of Michigan in 1867, and held that position until 1881, except in 1873-1874 when he was literary editor of the Christian Union; from 1881 until his death on the 28th of December 1900 at Ithaca, New York, he was professor of American history at Cornell University. In 1881 he was ordained deacon in the Protestant Episcopal Church and in 1883 priest, but he never undertook parochial work. Most important among

his works are his valuable and original History of American Literature during the Colonial Time, 1607-1765 (2 vols., 1878; revised in 1897), and Literary History of the American Revolu- tion, 1763-1783 (2 vols., 1897). Supplementary to these two is his Three Men of Letters (1895), containing biographical and critical chapters on George Berkeley, Timothy Dwight and Joel Barlow. In addition he published The Brawnv-ille Papers (1869), a series of essays on physical culture; a revision of Henry Morley's Manual of English Literature (1879); In Memoriam: Edgar Kelsey Apgar (1886), privately printed; Patrick Henry (1887), an excellent biography, in the " American Statesmen" series; and Glimpses of England; Social, Political, Literary (1898), a selection from his - sketches written while abroad.

See " Moses Coit Tyler," by Professor William P. Trent, in The Forum (Aug. 1901), and an article by Professor George

L. Burr, in the Annual Report of the American Historical Association for 1901 (vol.i.).

TYLER, WAT [or Walter] (d. 1381), English rebel, a man of obscure origin, was a native either of Kent or of Essex. Nothing definite is known of him previous to the outbreak of the peasant revolt in 1381, but Froissart says he had served as a soldier in the French War, and a Kentishman in the re- tinue of Richard II. professed to identify him as a notorious rogue and robber of Kent. The name Tyler, or Teghler, is a trade designation and not a surname. The discontent of the rural labourers and of the poorer class of craftsmen in the towns, caused by the economic distress that followed the Black Death and the enactment of the Statute of Labourers in 1351, was brought to a head by the imposition of a poll tax in 1379 and again in 1381, and at the end of May in the latter year riots broke out at Brentwood in Essex; on the 4th of June similar violence occurred at Dartford; and on the 6th a mob several thousands strong seized the castle of Roches- ter and marched up the Medway to Maidstone. Here they chose Wat Tyler to be their leader, and in the next few days the rising spread over Kent, where much pillage and damage to property occurred. On the 10th Tyler seized Canterbury, sacked the palace of Archbishop Sudbury, the chancellor, and beheaded three citizens as " traitors." Next day he led his followers, strengthened by many Kentish recruits, on the road to London, being joined at Maidstone by John Ball (q.v.), whom the mob had liberated from the archbishop's prison. Reaching Blackheath on the 12th, the insurgents burnt the prisons in Southwark and pillaged the archbishop's palace at Lambeth, while another body of rebels from Essex encamped at Mile End. King Richard II. was at the Tower, but neither the king's councillors nor the municipal authorities had taken any measures to cope with the rising. The draw- bridge of London Bridge having been lowered by treachery, Tyler and his followers crossed the Thames; and being joined by thousands of London apprentices, artisans and criminals, they sacked and burnt John of Gaunt's splendid palace of the Savoy, the official residence of the treasurer, Sir Robert Hales, and the prisons of Newgate and the Fleet. On the 14th Richard II., a boy of fourteen, undertook the perilous enter- prise of riding out to confer with the rebels beyond the city wall. At Mile End

the king met Wat Tyler; a lengthy and tumultuous conference, during which several persons were slain, took place, in which Tyler demanded the immediate abolition of serfdom and all feudal services, and the removal of all restrictions on freedom of labour and trade, as well as a general amnesty for the insurgents. Richard had no choice but to concede these demands, and charters were immediately drawn up to give effect to them. While this was in progress Tyler with a small band of followers returned to the Tower, which they entered, and dragged forth Archbishop Sudbury and Sir Robert Hales from the chapel and murdered them on Tower Hill. During the following night and day London was given over to plunder and slaughter, the victims being chiefly Flemish merchants, lawyers and personal adherents of John of Gaunt, duke of Lancaster. Meantime the people

of property began to organize themselves for the restoration of order. On the 15th of June, Richard, after confession and receiving the Sacrament, rode to Smithfield for a further conference with the rebels. Close to St Bartholomew's Church he met Wat Tyler, who advanced from the ranks of the insur- gents and shook the king's hand, bidding him be of good cheer. Tyler then formulated a number of fresh demands, including the confiscation of ecclesiastical estates and the institution of social equality. Richard replied that the popular desire should be satisfied "saving the regalities of the Crown." Tyler thereupon grew insolent, and in the altercation that ensued the rebel leader was killed by the mayor, Sir William Wal- worth (q.v.), and John ' Standwick, one of the king's squires. The rebels now handled their bows in a menacing fashion, but at the critical moment the young king with great presence of mind and courage spurred his horse into the open, crying, " Sirs, will you shoot your king? I will be your chief and captain, you shall have from me all that you seek." Richard then led the mob to a neighbouring meadow, where he kept them in parley till Walworth, who had returned within the city to summon the loyal citizens to the king's aid, returned with a sufficient following to overawe and disperse the rebels. With the death of Wat Tyler the rising in London and the

home counties quickly subsided, though in East Anglia it flickered a short time longer under the leadership of John Wraw and Geoffrey Litster until suppressed by the energy of Henry Despenser, bishop of Norwich. About no persons were exe- cuted for the rebellion in Kent and Essex, including John Ball, and Jack Straw, Tyler's chief lieutenant. 1 The enfranchise- ment of villeins granted by Richard at the Mile End conference was revoked by parliament in 1382, and no permanent results were obtained for the. peasants by Wat Tyler's revolt.

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TYLER, a city and the county-seat of Smith county, Texas, U.S.A., about 115 m. E. by S. of Dallas. Pop. (1890), 6908; (1900), 8069, of whom 2693 were negroes; (1910 census), 10,400. Tyler is served by the International & Great Northern and the St Louis South-Western railways. It is the seat of the Tyler Commercial College, of the East Texas Conservatory of Music and of two institutions for negroes — Texas College (1895; Colored Methodist Episcopal) and the East Texas Normal and Industrial Academy (Baptist, 1905). The principal public buildings include the city hall, the county court-house, a Car- negie library and the post office and Federal Courts building. Sessions of the United States Circuit and District Courts, and of a state district court, as well as of the county court, are held in Tyler. Tyler is situated in a prosperous agricultural region, and has various manufactures. The St Louis South-Western railway maintains general offices and machine-shops here. Tyler, named in honour of President John Tyler, was settled in 1847, was incorporated as a town in 1870 and was chartered as a city in 1907.

TYLOPODA (Gr. for boss-footed, in reference to the cushion-like pads forming the soles of the feet), the scientific name

of the section of ruminating artiodactyle ungulate mammals (see Artiodactyla) now represented by the Old World camels (see Camel) and the South American Llamas (see Llama)

Characters. — In the skull there is a sagittal crest; the tympanic bulla is filled with cancellous tissue ; the condyle of the lower jaw is rounded; and the premaxillae, or anterior bones of the upper jaw, have the full number of incisor teeth in the young state, the outer- most of these being persistent through life as an isolated tooth. The tusk-like canines are present in both jaws, those of the lower jaw

1 Mr F. W. D. Brie (English Historical Review, 1906) vol. xxi. advances the theory that Tyler and Straw are one and the same person.

being differentiated from the long, horizontal and spatulate incisors; in form they are sub-erect and pointed. The crowns of the molars belong to the “rescentic or sefenodont type, and are tall-crowned or hypsodont; but one or more of the anterior premolars is usually detached from the series, and of simple pointed form. The hinder part of the body is much contracted, and the femur long and vertically placed, so that the knee-joint is lower in position, and the thigh altogether more detached from the abdomen than in most mammals. The limbs are long, but with only two digits (the third and fourth) developed on each, no traces of any of the others being present. The trapezoid and magnum of the carpus, and the cuboid and navi- cular of the tarsus are distinct. The two cannon-bones of each limb are confluent for the greater part of their length, though separated for a considerable distance at the lower end. Their lower articular surfaces, instead of being pulley-like, with deep ridges and grooves, as in other Artiodactyla, are simple, rounded and smooth. The first phalanges are expanded at their lower ends, and the wide, depressed middle phalanges embedded in a broad cutaneous pad, forming the sole of the foot, on which the animal rests in walking instead of on the hoofs. The terminal phalanges are small and nodular, not flattened on their inner or opposed surfaces, and not completely encased in hoofs, but bearing nails on their upper surface only. The neck is long and curved, and its vertebrae are remarkable for the position of

the canal for the transmission of the vertebral artery, which does not perforate the transverse process, but passes obliquely through the anterior part of the pedicle of the arch. There are no horns or antlers. Though these animals ruminate, the stomach differs considerably in the details of its construction from that of the Pecora. The interior of the rumen or paunch has no tags or villi on its surface, and there is no distinct psalterium or manyplies. Both first and second compartments are remarkable for the presence of a number of pouches or cells in their walls, with muscular parti- tions, and a sphincter-like arrangement of their orifices, by which they can be shut off from the rest of the cavity, and into which the fluid portion only of the contents of the stomach is allowed to enter. The placenta is diffuse, not cotyledonary. Finally, the Tylopoda differ not only from other ungulates, but from all other mammals, 'in the fact that the red corpuscles of the blood, instead of being circular in outline, are oval as in the inferior vertebrate classes.

Camels. — Of the two existing generic representatives of the Camelidae (as the family in which they are both included is named), the Old World camels (Camelus) are characterized by their great bodily size, and the presence of one or two fleshy humps, which diminish or increase in size according to the physical condition of the animals themselves. There is a total of 34 teeth, arranged as i. \, c. \, p. I, m. §. Of these the first upper premolar is a simple tooth placed close behind the premaxilla and separated by a long gap from the two other teeth of the same series; while the lower incisors, of which the outermost is the largest, are directed partially forwards. The skull is elongated, with an overhanging occiput, complete bony rims to the orbits, and the premaxillae separated from the arched and rather long nasals. The vertebrae are C. 7. D. 12. L. 7. S. 4 and Ca. 13 to 15. The ears are short and rounded; the toes of the broad feet very imperfectly separated ; the tail is well developed, with a terminal tuft; and the straight hair is not woolly.

Llamas. — Although the name llama properly applies only to one of the domesticated breeds, zoologically it is taken to include all the South American representatives of the Camelidae, which form the genus Lama. In this sense, llamas are characterized as follows. The dentition in the

adult is i. i, c. {, p. §, m. f ; total 32. In the upper jaw there is a compressed, sharp-pointed, tusk-like incisor near the hind edge of the premaxilla, followed in the male at least by a moderate-sized, pointed, curved canine in the anterior part of the maxilla. The isolated canine-like premolar which follows in the camels is not present. The teeth of the cheek-series which are in contact with each other consist of two small premolars (the first almost rudimentary) and three broad molars, constructed generally like those of Camelus. In the lower jaw the three incisors are long, spatulate and horizontal, with the outer one the smallest. Next to the latter is a curved, sub-erect canine, followed after an interval by an isolated minute and often deciduous simple conical premolar; then a contiguous series of one premolar and three molars, which differ from those of recent species of Camelus in having a small accessory column at the anterior outer edge. The skull generally resembles that of Camelus, the relatively larger brain-cavity and orbits and less developed cranial ridges being due to its smaller size. The nasal bones are shorter and broader, and are joined by the premaxillae. Vertebrae: C. 7, D. 12, L. 7, S. 4, Ca. 15 to 20. Ears rather long and pointed. No hump. Feet narrow, the toes being more separated than in the camels, and each with a distinct plantar pad. Tail short. Hairy covering long and woolly. Size smaller and general form lighter than in the camels. Llamas are now confined to the western and southernmost parts of South America, though fossil remains have been found in the caves of Brazil, and in the pampas of the Argentine Republic. (See also Alpaca; Guanaco; Llama and Vicugna.)

Fossil History.— As regards the past history of the group, remains of fossil species of Camelus have been obtained from the superficial

deposits of various parts of Russia, Rumania, and Siberia, and others from the Lower Pliocene of northern India; the molar teeth of these latter presenting the additional column referred to above as distinguishing those of the llamas from those of modern camels. In addition to these Dr M. Schlosser has described remains of a large camel-like

animal from China, with apparently generalized affinities, for which the name of Paracamelus is proposed. Mme Pavlow, of Moscow, has brought to notice a fossil camel-skull of great in- terest, which was collected in the district Alexandrie, of the govern- ment of Kherson, Russia. Unfortunately, the precise age of the formation from which it was obtained is unknown, but it is con- sidered probable that it dates from the later Tertiary. Although it has the deciduous dentition, Mme Pavlow considers herself justified in referring the Kherson skull to the genus Procamelus previously known only from the Lower Pliocene or Upper Miocene strata of North America, and differing from modern camels, among other features, by the retention of a fuller series of premolar teeth. Part of the cannon-bone of a camel from another district in Russia is provisionally assigned to the same species. Possibly this Russian camel (Procamelus khersonensis), as it is called, may form the connecting link between the typical Procamelus of North America and the fossil camel (Camelus sivalensis) of the Siwalik Hills of India. Be this as it may, the identification of a North American type of camel from the Tertiary strata of eastern Europe forms another connecting link between the extinct faunas of the northern half of the Old World and North America, and thus tends to show that the claim of America to be the exclusive birthplace of many Old World types may have to be reconsidered.

Remains of camels (C. thomasi) have also been found in the Pleistocene strata of Oran and Ouen Seguen, in Algeria; and cer- tain remains from the Isle of Samos have been assigned to the same genus, although the reference requires confirmation. The Algerian Pleistocene camel was doubtless the direct ancestor of the living African species, which it serves to connect with the extinct C. sivalensis.

In North America, apart from certain still older and more primi- tive mammals, with teeth of the tubercular type, the earliest known form which can definitely be included in the camel-series is Protylopus, of the Uinta or Upper Eocene. In this creature, which was not larger than a European hare, there was the full number of 44 teeth, which formed a regular series, without any long gaps, and with the canines but little taller than the incisors, while the hinder cheek-teeth, although of the crescentic type, were low-crowned.

In both jaws the anterior front-teeth were of a cutting and compressed type. Unfortunately, the skull is incomplete, and the rest of the skeleton very imperfectly known; but sufficient of the former remains to show that the socket of the eye was open behind, and of the latter to indicate that in the hind-foot, at any rate, the upper bones of the two functional toes had not coalesced into a cannon-bone. The lateral hind-toes (that is to say the second and fifth of the typical series) had, however, become rudimentary; although it is probable that the corresponding digits of the fore- limb were functional, so that this foot was four-toed. In old individuals the bones of the forearm (radius and ulna) became welded together about half-way down, although they remained free above. On the other hand it appears that the smaller bone of the leg (fibula) was welded to the larger one (tibia), and that its upper portion had disappeared. Nothing is known of the neck vertebrae. It is, of course, evident that there must have been an earlier form in which all the feet were four-toed, and the bones of the forearm and lower part of the leg separate.

A stage higher in the series, viz. in the Oligocene, we meet with Pbebrotherium, in which a distinct increase in bodily size is notice- able, as also in the relative length of the two bones which unite in the higher types to form the cannon-bone. Moreover, the crowns of the hinder cheek-teeth are taller, and more distinctly crescentic, both feet are two-toed, the ulna and radius are fused, *nd the fibula is represented only by its lower part. In the verte- brae of the neck the distinctive cameloid characters had already made their appearance. On the other hand, the skull was short and rabbit-like, showing none of the characteristic features of modern camels.

In the Lower Miocene occurs Protomeryx or Gomphotherium, in which there is a considerable increase in the matter of bodily size, the two metacarpal and metatarsal bones (or those which unite in the latter forms to constitute the cannon-bones) being double the length of the corresponding elements in Protylopus. These bones, although separate, have their adjacent surfaces more closely applied than is the case in the latter; while in this and the earlier genera the terminal toe-bones indicate that the foot was of the normal hoofed type. In the skull the socket of the eye is surrounded by bone; while the dentition

begins to approximate to the camel type — notably by the circumstance that the lower canine is either separated by a gap from the outermost incisors, or that its crown assumes a backwardly curved shape. In Protolabis of the Middle Miocene, while no cannon-bone is formed, the first and second pairs of incisor teeth are retained, and the limbs and feet are short and disproportionately small. In the Upper Miocene we come to a distinct type — Procamelus — which is entitled to be regarded as a camel, and approximates in size to a small llama. Here the

metacarpals and metatarsals have partially united to form cannon- bones, the skull has assumed the elongated form characteristic of modern camels, with the loss of the first and second pairs of upper incisors, and the development of gaps in front of and behind each of the next three teeth, that is to say, the third incisor, the canine and the first cheek-tooth. The approximately contemporaneous Pliauchema makes another step by the loss of the second lower cheek-tooth. Both these genera have the toe-bones of the ir- regular nodular form distinctive of modern camels, so that we may safely infer that the feet themselves had assumed the cushion- type.

In one species of Procamelus the metacarpals and metatarsals coalesced into canon-bones late in life; but when we come to the Pleistocene Camelops such union took place at an early stage of existence, and was thoroughly complete. In the living members of the group it occurs before birth. The species of Camelops were probably fully as large as llamas, and some, at any rate, resembled these animals as regards the number of teeth, the incisors being reduced to one upper and three lower pairs, and the cheek- teeth to four or five in the upper and four in the lower jaw ; the total number of teeth thus being 28 or 30 in place of the 44 of Poebrothe- rium. The sole difference between Camelops and Llama seems to consist in certain structural details of the lower cheek-teeth. An allied extinct genus (Eschatius) is also distinguished by certain features in the dentition.

Apart from Procamelus the foregoing genera are exclusively North American. A lower jaw from the Pleistocene deposits of that continent has, however, been referred to the Old World Camelus.

In addition to the above there is an extraordinary North American Miocene giraffe- necked camel (Alticamelus) , a creature of the size of a giraffe, with similarly elongated neck and limbs, and evidently adapted for browsing on trees. The feet and number of teeth were generally similar to those of Procamelus. Unlike the giraffe, the length of the limbs is due to the elongation of their upper segments, and that of the neck to the lengthening of only the hinder vertebrae.

In caverns and superficial deposits of South America occur re- mains of extinct species more or less closely related to modern llamas ; but previous to the Upper Pliocene the group is unknown in South America, which it reached from the north.

All the foregoing genera are included in the sub-family Camelidae. Parallel to this is, however, the North American family Leptomery- chidae (Hypertragulidae), as represented by Leptomeryx, Camelo- meryx and Leptoreodon, which presents remarkable resemblances, especially in the type genus, to the Tragulina (see Chevrotain); camel-like features being, however, apparent in the two genera last mentioned. Generalized features are also displayed by the Oligocene Hypisodus, which in its short skull and large orbits presents a curious approximation to the African dik-dik antelopes of the genus Madoqua (see Antelope). Again, the remarkable horned North American Oligocene genus Protoceras, while dis- playing resemblances to Leptomeryx and Leptoreodon, presents also points of similarity to the Tragulina and Pecora (q.v.).

The North American genus Oreodon typifies a second family included by Professor W. B. Scott in the Tylopoda and generally known as the Oreodontidae. As Oreodon is, however, antedated by Merycoidodon, the latter name is properly entitled to stand, in which case the family should be called Agriochoeridae. It is not easy to point out the characters in which the family approximates to the Camelidae, and only its general characteristics can be indicated. The family ranges in North America from the Upper Eocene to the Lower Miocene, but Oreodon (or Merycoidodon), which is typified by an animal of the size of a sheep, is Oligocene. In the Oreodontinae or typical section of the family, which includes several genera nearly

allied to Oreodon, the skull is snorter and higher than in the camels, with a swollen brain-case, a preorbital gland-pit, the condyle of the lower jaw transversely elongated, the tympanic bulla hollow, and the orbit surrounded by bone. The dentition comprises the typical 44 teeth, of which the molars are short-crowned, with four crescentic cusps on those of the upper jaw (selenodont type). The most characteristic dental feature is, however, the assumption of the form and function of a canine by the first lower premolar; the lower canine being incisor-like. The tail is very long; and the feet have five functional toes, with com- plete but short metacarpals or metatarsals. In the Miocene Agriochoerus, which typifies a second sub-family (Agriochoerinae) , there is no gland-pit in the skull, of which the orbit is open behind ; while the upper incisors are wanting in the adult and the terminal toe-bones are claw-like rather than of the hoofed type. The molars are less completely selenodont than in the type genus. It is note- worthy that a molar from the Tertiary of India has been referred to Agriochoerus, a determination which if correct probably indicates the occurrence of Oreodonts in the unknown Tertiary deposits of Central Asia. It may be added that in the Oreodontidae the vertebral artery pierces the transverse processes of the cervical vertebrae in the normal manner.

The earliest representatives of the Tylopoda according to Professor Scott is the Middle Eocene genus Homacodon, typifying the family Homacodontidae, which is regarded as the common ancestor of both

Camelidae and Oreodontidae, with resemblances to the European Oligocene genus Dichobune (see Artiodactyla). Homacodon was an animal of the size of a rabbit, with five toes (of which only- five were functional to each foot) and 44 teeth, of which the molars are tuberculated (bunodont), with six columns on those of the upper jaw; the premolars being of a cutting type. It should be added that this generalized animal is not unfrequently classed among the ancestral pigs, but its cameline affinities are strongly emphasized by Frofessor Scott.

Literature. — W. B. Scott, ” On the Osteology of Poebrotherium,” Journal of Morphology (1891), vol. v.; “The Osteology of Protoceras ” (1895), ibid., vol, xi. ; J. L. Wortman, ” On the Oste- ology of Agriochoerus,” Bull. Amer. Museum (1895), vol. vii. ; ” The Extinct Camelidae of North America (1898), ibid., vol. x. ; W. D. Matthew, ” The Skull of Hypisodus (1901), ibid;, vol. xvi.

(R. L.*)

TYLOR, EDWARD BURNETT (1832-), English anthropologist, was born at Camberwell, London, on the 2nd of October 1832, the son of Joseph Tylor, a brassfounder. Alfred Tylor, the geologist, was an elder brother. His parents were members of the Society of Friends, at one of whose schools, at Grove House, Tottenham, he was educated. In 1848 he entered his father’s manufactory in London, but at about the age of twenty he was threatened with consumption and forced to abandon business. During 1855-1856 he travelled in the United States of America to recruit his health. Proceeding in 1856 to Cuba, he met Henry Christy the ethnologist, with whom he visited Mexico. Tylor’s association with Christy greatly stimulated his awakening interest in anthropology, and his visit to Mexico, with its rich prehistoric remains, led him to make a systematic study of the science. While on a visit to Cannes he wrote a record of his observations, entitled Anahuac; or, Mexico and the Mexicans, Ancie,nt and Modern, which was published in 1861. In 1865 appeared Researches into the Early History of Mankind, which made Tylor’s reputa- tion. It showed great research, original insight, and much constructive power in the formation of systematic views. The chapters on early myths and their geographical distribution are especially valuable. The work reached a third edition in 1878. This book was followed in 1871 by the more elaborate Primitive Culture: Researches into the Development of Mythology, Philosophy, Religion, Language, Art and Custom, which at once became the standard general treatise on anthropology. Tylor’s treatment of animism (chs.xi.xvii.) was particularly elaborate, and he first determined the limits of that province of anthro pology intending it to include ” the general doctrine of souls, and other spiritual beings.” In 1881 Tylor published a smaller and more popular handbook on Anthropology. His work had already met with

recognition. In 187 1 he was elected F.R.S., and in 1875 received the honorary degree of D.C.L. from the university of Oxford. He was appointed keeper of the Uni- versity Museum at Oxford in 1883, and reader in anthropology in 1884. In 1888 he was appointed first Gifford lecturer at Aberdeen University, and delivered a two years' course on "Natural Religion." In 1896 he became first professor of anthropology at Oxford. At the end of 1907 the Clarendon Press published a volume of Anthropological Essays, to which various representative scholars of a younger generation in the same field had contributed, the essays being dedicated and presented to Tylor as a mark of honour; and this collection includes not only a bibliography of his publications by Miss Freire-Marreco, but also an appreciation of Tylor's life-work by Andrew Lang.

TYMPANON, or Tympanum (Gr. riinravov, from Tvirrtiv, to strike) , a name applied by the Romans to both kettledrum and tambourine, in the case of the latter sometimes qualified by leve. The tympanum leve, generally included among the tympana, described as being like a. sieve, was the tambourine used in the rites of Bacchus and Cybele. Pliny doubtless described half pearls having one side round and the other flat, as tympania, on account of their resemblance to the tympanum or kettledrum, which, in its primitive form, innocent of screws or mechanism for tightening the head, exactly resembled the half pearl. During the middle ages the tympanum was gene- rally a tambourine, the kettledrum being known as nacaire.

In architecture the term tympanum is given to the triangular space enclosed between the horizontal cornice of the entabla- ture and the sloping cornice of the pediment. Though sometimes left plain, in the most celebrated Greek temples it was filled with sculpture of the highest standard ever attained. In Romanesque and Gothic work the term is applied to the space above the lintel or architrave of a door and the discharging arch over it, which was also enriched , either with geometrical patterns or in later work with groups of figures; those in continental work are usually arranged in tiers. The upper portion of a gable when enclosed with a horizontal string-course, is also termed a tympanum.

TYNDALE (or Tindale), WILLIAM (c. 1492-1536), translator

of the New Testament and Pentateuch (see Bible, English), was born on , the Welsh border, probably in Gloucestershire, some time between 1490 and 1495. In Easter term 1510 he went to Oxford, where Foxe says he was entered of Magdalen Hall. He took his M.A. degree in 151 5 and removed to Cam- bridge, where Erasmus had helped to establish a reputation for Greek and theology. Ordained to the priesthood, probably towards the close of 1521, he entered the household of Sir John Walsh, Old Sodbury, Gloucestershire, as chaplain and domestic tutor. Here he lived for two years, using his leisure in preaching in the villages and at Bristol, conduct which brought him into collision with the backward clergy of the district, and led to his being summoned before the chancellor of Worcester (William of Malyern) as a suspected heretic; but he was allowed to depart without receiving censure or giving any undertaking. But- the persecution of the clergy led him to seek an antidote for what he regarded as the corruption of the Church, and he re- solved to translate the New Testament into the vernacular. In this he hoped to get help from Cuthbert Tunstall, bishop of London, and so " with the good will of his master " he left Gloucester in the summer of 1523. Tunstall disappointed him, so he got employment as a preacher at St Dunstan's-in- the-West, and worked at his translation, living as chaplain in the house of Humphrey Monmouth, an alderman, and forming a firm friendship with John Frith; but finding publication impossible in England, he sailed for Hamburg in May 1524. After visiting Luther at Wittenberg, he settled with his amanu- ensis William Roy in Cologne, where he had made some progress in printing a 4to edition of his New Testament, when the work was discovered by John Cochlaeus, dean at Frankfurt, who not only got the senate of Cologne to interdict further printing, but warned Henry VIII. and Wolsey to watch the English ports. Tyndale and Roy escaped with their sheets to Worms, where the 8vo edition was completed in 1526. Copies were smuggled into England but were suppressed by the bishops, and William Warham, archbishop of Canterbury, even bought up copies on the Continent to destroy them. At- tempts were made to seize Tyndale at Worms, but he found refuge at Marburg with Philip, landgrave of Hesse. There he probably met Patrick Hamilton, and was joined by John Frith. About this time he changed his views on the Eucharist and swung

clean over from transubstantiation to the advanced Zwinglian position. His Parable of the Wicked Mammon (1528), Obedience of a Christen Man (1528), in which the two great principles of the English Reformation are set out, viz. the authority of Scripture in the Church and the supremacy of the king in the state, and Practyse of Prelates (1530), a strong in- dictment of the Roman Church and also of Henry VIII. 's divorce proceedings, were all printed at Marburg. In 1529 on his way to Hamburg he was wrecked on the Dutch coast, and lost his newly completed translation of Deuteronomy. Later in the year he went to Antwerp where he conducted his share of the classic controversy with Sir Thomas More. After Henry VIII. 's change of attitude towards Rome, Stephen Vaughan, the English envoy to the Netherlands, suggested Tyndale's return, but the reformer feared ecclesiastical hostility and declined. Henry then demanded his surrender from the emperor as one who was spreading sedition in England, and Tyndale left Antwerp for two years, returning in 1533 and

busying himself with revising his translations. In May 1535 he was betrayed by Henry Phillips, to whom he had shown much kindness, as a professing student of the new faith. The imperial officers imprisoned him at Vilvorde Castle, the state prison, 6 m. from Brussels, where in spite of the great efforts of the English merchants and the appeal of Thomas Cromwell to Archbishop Carandolet, president of the council, and to the governor of the castle, he was tried for heresy and condemned. On the 6th of October 1536 he was strangled at the stake and his body afterwards burnt. Though long an exile from his native land, Tyndale was one of the greatest forces of the English Reformation. His writings show sound scholarship and high literary power, while they helped to shape the thought of the Puritan party in England. His translation of the Bible was so sure and happy that it formed the basis of subsequent renderings, especially that of the authorized version of 161 1. Besides the New Testament, the Pentateuch and Jonah, it is believed that he finished in prison the section of the Old Testament extending from Joshua to Chronicles.

Beside the works already named Tyndale wrote A Prologue on the Epistle to the Romans (1526), An Exposition of the 1st Epistle of John (1531), An Exposition of Matthew v.-vii. (1532), a treatise on the sacraments (1533), and possibly another (no longer extant) on matrimony (1529).

The works of Tyndale were first published along with those of John Frith (q.v.) and Robert Barnes, " three worthy martyrs and principal teachers of the Church of England," by John Day, in 1573 (folio). A new edition of the worKS of Tyndale and Frith, by T. Russell, was published at London (1828-1831). His Doctrinal Treatises and Introductions to Different Portions of the Holy Scripture were published by the Parker Society in 1848. For biography, see Foxe's Acts and Monuments; R. Demaus, William Tyndale (London, 1871); also the Introduction to Mombert's critical reprint of Tyndale's Pentateuch (New York, 1884), where a bibliography is given.

TYNDALL, JOHN (1820-1893), British natural philosopher, was born in Co. Carlow, Ireland, on the 2nd of August 1820, his father being the son of a small landowner in poor circum- stances, but a man of more than ordinary ability. With Darwin and Huxley his name is inseparably connected with the battle which began in the middle of the 19th century for making the new standpoint of modem science part of the accepted philo- sophy in general life. For many years, indeed, he came to repre- sent to ordinary Englishmen the typical or ideal professor of physics. His strong, picturesque mode of seizing and expressing things gave him an immense living influence both in speech and writing, and disseminated a popular knowledge of physical science such as had not previously existed. But besides being a true educator, and perhaps the greatest popular teacher of natural philosophy in his generation, he was an earnest and original observer and explorer of nature.

Tyndall was to a large extent a self-made man; he had no early advantages, but with indomitable earnestness devoted him- self to study, to which he was stimulated by the writings of Carlyle. He passed from a national school in Co. Carlow to a minor post (1839) in the Irish ordnance survey, thence (1842) to the English survey, attending mechanics' institute lectures at Preston in Lancashire. He then became for a time (1844) a railway engineer, and in

1847 a teacher at Queenwood College, Hants. Thence with much spirit, and in face of many difficulties, he betook himself, with his colleague Edward Frankland, to the university of Marburg (1848-1851), where, by intense application, he obtained his doctorate in two years. His inaugural dissertation was an essay on screw-surfaces.

Tyndall's first original work in physical science was in his experiments with regard to magnetism and diamagnetic polarity, on which he was chiefly occupied from 1850 to 1855. While he was still lecturing on natural philosophy at Queenwood College, his magnetic investigations made him known in the higher circles of the scientific world, and through the initiative of Sir E. Sabine, treasurer of the Royal Society, he was elected F.R.S. in June 1852. In 1850 he had made Faraday's acquaintance, and shortly before the Ipswich meeting of the British Associa- tion in 185 1 he began a lasting friendship with T. H. Huxley.

The two young men stood for chairs of physics and natural history respectively, first at Toronto, next at Sydney, but they were in each case unsuccessful. On the nth of February 1853, however, Tyndall gave, by invitation, a Friday evening lecture (on " The Influence of Material Aggregation upon the Manifesta- tions of Force ") at the Royal Institution, and his public reputa- tion was at once established. In the following May he was chosen professor of natural philosophy at the Royal Institution, a post which exactly suited his striking gifts and made him a colleague of Faraday, whom in 1866 he succeeded as scientific adviser to the Trinity House and Board of Trade, and in 1867 as superintendent of the Royal Institution. His reverent attach- ment to Faraday is beautifully manifested in his memorial volume called Faraday as a Discoverer (1868).

The more original contributions which Tyndall made to science are dealt with elsewhere, in the articles concerned with the various subjects (see Heat, &c). But his inquiries into glacier motion were notable alike for his association with Switzer- land and for prolonged controversy with other men of science on the subject. In 1854; after [the meeting of the British Association in Liverpool, a memorable visit occurred to the Penrhyn slate quarries, where the question of slaty cleayage arose in his mind, and ultimately led him, with Huxley, to Switzerland to study

the phenomena of glaciers. Here the mountains seized him, and he became a constant visitor and one of the most intrepid and most resolute of explorers; among other feats of climbing he was the first to ascend the Weiss- horn (1861). The strong, vigorous, healthfulness and enjoyment which permeate the record of his Alpine work are magnificent, and traces of his influence remain in Switzerland to this day. The problem of the flow of glaciers occupied his attention for years, and his views brought him into acute conflict with others, particularly J. D. Forbes and James Thomson. Every one knew that glaciers moved, but the questions were how they moved, for what reason and by what mechanism. Some thought they slid like solids; others that they flowed like liquids; others that they crawled by alternate expansion- and contraction, or by alternate freezing and melting; others, again, that they broke and mended. Thus there arose a chaos of controversy, illumi- nated by definite measurements and observations. Tyndall's own summary of the course of research on the subject was as follows: —

The idea of semi-fluid motion belongs entirely to Rendu ; the proof of the quicker central flow belongs in part to Rendu, but almost wholly to Agassiz and Forbes ; the proof of the retardation of the bed belongs to Forbes alone; while the discovery of the locus of the point of maximum motion belongs, I suppose, to me.

But while Forbes asserted that ice was viscous, Tyndall denied it, and insisted, as the result of his observations, on the flow being due to fracture and regelation. All agreed that ice flowed as if it were a viscous fluid; and of this apparent viscosity James Thomson offered an independent explanation by the application of pure thermodynamical theory, which Tyndall considered inefficient to account for the facts he observed. It is unnecessary here to rake among the ashes of this prolonged dispute, but it may be noted that Helmholtz, who, in his lecture on "Ice and Glaciers," adopted Thomson's theory, afterwards added in an appendix that he had come to the conclusion that Tyndall had "assigned the essential and principal cause of glacier motion in referring it to fracture and regelation "

(1865).

Tyndall's investigations of the transparency and opacity of gases and vapours for radiant heat, which occupied him during many years (1859-1871), are frequently considered his chief scientific work. But his activities were essentially many- sided. He definitely established the absorptive power of clear aqueous vapour — a point of great meteorological significance. He made brilliant experiments elucidating the blue of the sky, and discovered the. precipitation of organic vapours by means of light. He called attention to curious phenomena occurring in the track of a luminous beam. He examined the opacity of the air for sound in connexion with lighthouse and siren work,

and he finally clinched the proof of what had been already sub- stantially demonstrated by several others, viz. that germ-free air did not initiate putrefaction, and that accordingly " spon- taneous generation " as ordinarily understood was a chimera (1875-1876). One practical outcome of these researches is the method now always adopted of sterilizing by a succession of gentle warmings, sufficient to kill the developed micro-organisms, instead of by one fierce heating attempting to attack the more refractory undeveloped germs of the same. This method of inter- mittent sterilization originated with Tyndall, and it was an im- portant contribution to biological science and industrial practice.

For the substantial publication of these researches reference must be made to the Transactions of the Royal Society; but an account of many of them was incorporated in his best-known books, namely, the famous Heat as a Mode 0} Motion (1863; and later editions to 1880), the first popular exposition of the me- chanical theory of heat, which in 1862 had not reached the text- books; The Forms of Water, &c. (1872); Lectures on Light (1873); Floating Matter in the Air (1881); On Sound (1867; revised 1875, 1883, 1803). The original memoirs themselves on radiant heat and on magnetism were collected and issued as two large volumes under the following titles: Diamagnetism and Magne-crystallic Action (1870); Contributions to Molecular Physics in the Domain of Radiant Heat (187 2) .

It was on the whole the personality, however, rather than the discoverer, that was greatest in Tyndall. In the pursuit of pure science for its own sake, undisturbed by sordid considera- tions, he shone as a beacon light to younger men — an exemplar of simple tastes, robust nature and lofty aspirations. His elevation above the common run of men was conspicuous in his treatment of the money which came to him in connexion with his successful lecturing tour in America (1872-1873). It amounted to several thousands of pounds, but he would touch none of it ; he placed it in the hands of trustees for the benefit of American science — an act of lavishness which bespeaks a noble nature. Though not so prominent as Huxley in detailed controversy over theological problems, he played an important part in educating the public mind in the attitude which the development of natural philosophy entailed towards dogma and religious authority. His famous Belfast address (1874), de- livered as- president of the British Association, made a great stir among those who were then busy with the supposed conflict between science and religion; and in his occasional writings — Fragments of Science, as he called them, " for unscientific people " — he touched on current conceptions of prayer, miracles, &c, with characteristic straightforwardness and vigour.

As a public speaker he had an inborn Irish readiness and vehemence of expression; and, though a thorough Liberal, he split from Mr Gladstone on Irish home rule, and took an active part in politics in opposing it.

In 1876 Tyndall married Louisa, daughter of Lord Claud Hamilton. He built in 1877 a cottage on Bel Alp above the Rhone valley, and in 1885 a house on Hindhead, near Haslemere. At the latter place he spent most of his later years; his health was, however, no longer as vigorous as his brain, and he suffered frequently from sleeplessness. On the 4th of December 1893, having been accidentally given an overdose of chloral, he died at Hindhead.

TYNDARIS, an ancient city on the northern coast of Sicily, about 13 m. W.S.W. of Mylae (mod. Milazzo) and 5 m. E. of the modern town of Patti. It was founded by Dionysius the Elder in 395 B.C., who settled there 600 Peloponnesian Messenians on a site cut out of the territory of Abacaenum (1 m. north of the modern Tripi). It was thus almost the last

Greek city founded in Sicily. It was one of the earliest allies of Timoleo'n. In the First Punic War it was dependent on Carthage, but expelled the garrison in 254 B.C. and joined the Romans, under whom it seems to have flourished. Cicero calls it " nobilissima civitas," though it seems to have suffered especially under Verres. It wˆs one of the points occupied by Sextus Pompeius, but was later on taken by Agrippa, who used it as a base of operations. Augustus probably made it a colonia. Pliny mentions that half of it was swallowed up

by the sea, though he does not give the date of this event (Hist, nat. ii. 206). It was probably, however, due to a fault in the limestone rock of which it is composed, and the action of the sea. The site is a remarkably fine one, and it is surprising that it was not occupied sooner. It is an isolated hill (920 ft.) with projecting spurs, rising abruptly on the seaward side, and con- nected by a comparatively narrow isthmus with the lower ground inland. It thus commands a magnificent view, including even the summit of Etna, while opposite to it on the north are the Lipari Islands. Considerable remains of the city walls, built of rectangular blocks of stone, exist on the south side; on the west their foundations are traceable. Remains of several towers may be seen, and tht site of the main gate, which was in a recess on the south (the land) side, is clearly traceable, the walls defending it on each side being well preserved. Outside it are several tombs of the Roman period. The walls follow the upper edge of the plateau, and do not seem to have included the spurs to seaward. Their remains indicate that it was the north and north-east portion of the city that fell. This fact renders it doubtful whether the church of the Madonna di Tindari, at the east extremity, marks the site of the acropolis. Along parts of the north side, where the line of the wall should run, is a line of debris, which may belong to a reconstruction after the catastrophe described by Pliny. Within the walls are considerable remains of a building generally known (though not correctly) as the gymnasium, constructed of masonry, with three narrow halls, each about 90 ft. long, the cen- tral hall being 21 ft. wide, the other two 14 ft. Below it to the north are remains of a building with several mosaic pavements, and to the west is a small theatre, the internal diameter of which is 212 ft., and the length of the stage 80 ft. There are traces of

many other buildings within the city area, including a consider- able number of underground cisterns An important collection of objects found on the site is preserved in the Villa della Scala (i| m. to the west), belonging to Baron Sciacca, the owner of the site itself.

See R. V. Scaffidi, Tyndaris (Palermo, 1895). (T. As.)

TYNE, a river in the north-east of England, flowing east-ward to the North Sea, formed of two main branches, the North Tyne and South Tyne. The North Tyne rises in the Cheviot Hills, at their south-western extremity, near the Scottish border. The valley soon becomes beautifully wooded. At Bellingham it receives the Rede, whose wild valley, Redesdale, was one of the chief localities of border warfare, and contains the site of the battle of Otterburn (1388). The South Tyne rises in the south-eastern extremity of Cumber- land, below Cross Fell in the Pennine Chain, and flows north past Alston as far as the small town of Haltwhistle, where it turns east. The valley receives from the south the picturesque Allendale, in which the lead mines were formerly important. The two branches of the Tyne join at Warden, a little above the town of Hexham, with its great abbey, and the united stream continues past Corbridge, where a Roman road crossed it, in a beautiful sylvan valley. The united course from the junction to the sea is about 30 m. The length from the source of the North Tyne is 80 m., and the drainage area is 1130 sq. m. In its last 15 m. the Tyne, here the boundary between Northumber- land and Durham, is one of the most important commercial waterways in England. Sea-going vessels can navigate up to Blaydon, and collieries and large manufacturing towns line the banks — Newburn, Newcastle-upon-Tyne, Wallsend and North Shields on the Northumberland side; Gateshead, Jarrow and South Shields on the Durham side, with many lesser centres, forming continuous lines of factories and shipbuilding yards. The growth of the great shipbuilding and engineering companies, now amalgamated, of which the Armstrong firm at Elswick is the most famous, necessitated the dredging of the river so as to form a deep waterway. At high-water spring tides there are 40 ft. of water at Shields Harbour at the mouth, and 31 at Newcastle, 8 m. up river. Dangerous rocks outside the mouth have been partially removed and the remainder protected, and the Tyne forms a very safe

harbour of refuge.

TYNEMOUTH, a municipal, county and parliamentary borough of Northumberland, England, including the townships of Chirton, Cullercoats, North Shields, Preston and Tynemouth. Pop. (1891), 46,588; (iqoi), 51,366. North Shields, Tynemouth and Cullercoats are successive stations on a branch of the North- Eastern railway. Tynemouth lies on the north bank of the Tyne, on a picturesque promontory, 85 m. E. of Newcastle. North Shields (q.v.) adjoins it on the W.; Chirton is to the W. again, and Preston to the N. of North Shields, while Cullercoats is on the coast ij m. N.N.W. of Tynemouth. Tynemouth is the prin- cipal watering-place on this part of the coast, and here and at Cullercoats are numerous private residences. On the point of the promontory there is a small battery called the Spanish battery, and near it is a monument to Lord Collingwood. Within the grounds, to which the gateway of the old castle gives entrance, are the ruins of the ancient priory of St Mary and St Oswin — the principal remains being those of the church, which was a magnificent example of Early English work engrafted upon Norman. The priory and castle serve as the headquarters of the Tyne Submarine Engineers. The municipal buildings are in North Shields, which is also an important seaport. The coast is rocky and dangerous, but a fine pier protects the harbour (see North Shields). The municipal borough is under a mayor, 6 aldermen and 18 councillors. Area, 4372 acres.

Tynemouth is supposed to have been a Roman station, from the discovery of Roman remains there, but its early history centres round the priory, supposed to have been founded by Edwin, king of Northumbria, between 617 and 633, and rebuilt by king Oswald in 634. In 651 it became famous as the burial- place of Oswin, king of Deira, afterwards patron saint of the priory. After the conquest Malcolm, king of Scotland, and Edward his son, who had been defeated and killed at Alnwick, were buried there. Earl Waltheof gave Tynemouth to the monks of Jarrow, and it became a cell to the church of Durham, but later, owing to a quarrel with the bishop, Robert de Mowbray granted it to the abbey of St

Albans in Hertfordshire. The priory was probably fortified in Saxon times, and was strengthened by Robert de Mowbray so that it was able to sustain a siege of two months by William Rufus. After the Dissolution the fortifications were repaired by Henry VIII. In 1642 it was garrisoned for the king by the earl of Newcastle, but surrendered to parliament in 1644. It was converted into barracks at the end of the 18th century. Owing to their close proximity to New- castle and to the ascendancy which the burgesses of that town had gained over the river Tyne, Tynemouth and North Shields did not become important until the 19th century; the privileges which they held before that time are contained in charters to the prior and convent, and include freedom from toll, &c, granted by King John in 1 203-1 204. In 1292 there were disputes between the citizens of Newcastle and the prior, who had built a quay at North Shields, but was obliged by act of parliament to destroy ft. Edward IV. in 1463 confirmed the previous charters of the monks, and at the same time gave them and their tenants licence to buy necessaries from ships in the " port and river of Tyne," and to load ships with coal and salt " without hindrance from the men of Newcastle." After the Napoleonic wars the trade of North Shields rapidly increased. The borough was incorporated in 1849, and has returned one member to parliament since 1832. In 1279 the prior claimed a market at Tynemouth, but was not allowed to hold it; and in 1304 a fair, which had been granted to him in the preceding year, was withdrawn on the petition of the burgesses of Newcastle. A market and two fairs on the last Friday in April and the first Friday in November were estab- lished in 1802 by the duke of Northumberland. In the 17th century the chief industries were the salt and coal trades. The former, which has entirely disappeared, was the more important, and in 1635 the salt-makers of North and South Shields received an incorporation charter.

See Victoria County History, Northumberland; W. S. Gibson, The History of the Monastery founded at Tynemouth in the Diocese jf Durham (1846-1847).

TYPEWRITER, a writing machine which produces characters resembling those of ordinary letterpress; the term is also applied to the operator who works such machines.

In 1 7 14 a British patent was granted to Henry Mill, who claimed that he had brought his invention to perfection at great pains and expense, for ” An Artificial Machine or Method for the Impressing or Transcribing Letters, Singly or Progressively one after another as in Writing, whereby all Writing whatever may be Engrossed in Paper or Parchment so Neat and Exact as not to be distinguished from Print “; but beyond the title the patent gives no indication of the nature or construction of the machine. In America a patent for a ” typographer ” was obtained by William A. Burt in 1829, but the records of it were destroyed by a fire at Washington in 1836. The ” typo- graphic machine or pen ” patented by X. Progrin, of Mar- seilles, in 1833, was on the type-bar principle, and at the York meeting of the British Association in 1844 a Mr Littledale showed an apparatus for the use of the blind, by which the impression of a type selected from a series contained in a slide could be embossed on a sheet of paper. In the ” chirographer,” for which American patents were granted to Charles Thurber in 1843 and 1845, a horizontal wheel carried in its periphery a series of rods each bearing a letter, the wheel being rotated till the required type was over the printing point. The Great Exhibition of 1851 contained a machine patented by Pierre Foucault, of Paris, in 1849, in which a series of rods with type at their ends could be pushed down to emboss paper at the print- ing point to which they were arranged radially; and there was in addition the ” typograph ” of William Hughes, which was also intended for embossing, though it was subsequently modified to give an impression through carbon paper. Between 1847 and 1856 Alfred E. Beach in America, and between 1855 and 1 860 Sir Charles Wheatstone in England, constructed several typewriters, and in 1857 Dr S. W. Francis, of New York, made one with a pianoforte keyboard and type bars arranged in a circle. In 1866 John Pratt, an American living in London, patented a machine having 36 types mounted in three rows on a type wheel, the rotation of which brought the required character opposite the printing point, when the paper with a carbon sheet intervening was pressed against it by a hammer worked by the keys. Two years later an American patent was taken out by C. L. Sholes and C. Glidden, and in 1875, after effecting various improvements, they finally placed the manufacture of their machines in the hands of Messrs E. Remington & Sons, gun- makers, of

Ilion, New York. The Remington machines worked on the type-bar principle, but at first each of the 44 bars carried only a single character, so that the writing was in capitals only. But in 1878 type-bars with two types were introduced, so that a machine with 40 keys, two being change-case keys, could print 76 characters, with both capital and small letters.

The great majority of modern typewriters are worked from a keyboard; the few that are not, known as index machines, will be disregarded here, for although they are much less expensive in first cost than the others, they scarcely come into competition as practical instruments, on account of their slowness. Key- board machines fall into two classes, according as the types which make the impressions are (a) carried at the end of levers or type-bars which strike the paper when the keys are depressed, or (b) are arranged round the circumference of a wheel, or segment, which is rotated by the action of the keys until the corresponding type is brought opposite the printing point. The former of these arrangements is the more common. Another point of difference is in the inking device; in some cases, the type is inked by means of an ink-pad before being brought down on the paper to make the impression, but more frequently an inked ribbon is drawn along by the action of the machine between the type-face and the paper. Sometimes this ribbon is inked in two colours, enabling the operator, by bringing the appropriate portion opposite the type-face, to write, say, in black and red at will. A third basis of classification may be found in the arrangement of the keyboard. In some machines there is one key for each character, in others each key does duty

for two or more characters. For example, in the former class there is one key for the capital A and another for the small a, the keys being arranged in two banks corresponding to the upper and lower cases of a printer's type-case; in the latter, one key is capable of striking both the small and the capital letter, and it does one or other according as a subsidiary key is or is not brought into simultaneous use with it. In type-bar machines designed on this plan, each

bar carries two or more letters (cf. fig. i). This form of keyboard is also applied to type- wheel machines.

Though there are numberless differences in detail, all type-writers, apart from the index machines, bear a general resem- blance to each other in their me- chanical arrangements. The really essential operations may be reduced to two; the machine must print a letter when a key is struck, and it must have a device by which the paper may be moved a short distance to the left with each stroke in order that the letters may be printed separately, not one on top of the other. Of the many subsidiary appliances that are fitted — a bell to warn the operator that he is approaching the end of a line, a lock to prevent the machine from working after the end of the line has been passed, attachments for facilitating insertion of fresh paper, corrections, and tabulation, &c. — some are certainly of advan- tage, but others are more useful to the manufacturer in drawing up his advertisements than to the expert operator, whose first care often is to disconnect them from the machine. Similarly with the ” visible writing,” which is some- times put forward as a recommendation of extraordinary importance; doubtless the novice who is learning the keyboard finds a natural satisfaction in being able to see at a glance that

rhe has struck the key he was aiming at, but to the practised operator it is not a matter of (A great moment whetherthe writing

‘^ is always in view or whether it is

only to be seen by moving the carriage, for he should as little need to test the accuracy of his performance by constant inspec- tion as the piano-player needs to look at the notes to discover whether he has struck the right ones. The one important desid- eratum, without which no type-writer can produce work of satisfactory appearance, is ac- curacy of alignment. For the attainment of this the use of type-bars has given wide scope to the ingenuity of inventors, who have been confronted with the problem of making a system of levers at once strong, rigid and light, and of supporting them on bearings which are

steady and adjustable for wear in conditions where space is

much restricted.

In the Oliver machine the type-bar is of the form shown in fig. I, to secure stiffness and a double bearing. In the Bar-Lock, the type- bars are arranged three in one hanger, so that each has a bearing

Fig. i.-

-Type-bar of Oliver Machine.

FlG.2.-

-Type-barsof Bar-Lock Machine.

three times as wide as would be possible in the same space if each

had a hanger to itself (fig. 2) ; in addition the wear of the pivots

can be taken up by the screws seen on the

right of the bearings, and as a further

precaution each type-bar is locked at the

printing point by falling between a pair of

conical pins, which centre it exactly in the

required place. In the Yost and the

Empire the type-bars pass through guides.

The centre guide of the former is shown

at G in fig. 3, the type being just about to

strike the paper. Pressure on one of the

keys works the Jever and pushes up the

Central

connecting-rod C, when the type leaves Guide and Type-bar of the ink-pad P and passes through the y° st Machine, guide, which is slightly bevelled so as to guide it exactly to

the print- ing point. In the Smith Premier the shafts upon which the type-

Fig. 4. — Type-bar Bearings, Smith Premier.

bars swing are mounted tangentially on the ring (fig. 4), so that long supporting bearings are obtained, while the shortness of the type-bars themselves renders it possible to make them very stiff. The rocking-shaft mechan- ism (fig. 5), by which the power is transmitted from the keys to the type-bars, admits of each key having the same leverage and tends to uniformity of touch. This last quality is also aimed at by inter- posing an intermediate parallel bar between the key levers and the type- bar, as in the New Century Caligraph. In the Dens- more the friction of the movements is minimized by the employment of ball bearings for the type-bar pivots. Electrical type- writers, in which the de- t * pression of a key does not . | work a type-bar directly, but merely closes a circuit that energizes an electro- _ magnet, have been sug- FlG 5 _R oc king-shaft Mechanism of gested as a means of Smith Premier.

ˆou&mbinedˆThˆasI L Key with stem 2, Rocking shaft,

and raniditv but have 3- Connecting-rod. 4, lype-bar. not as yet displaced thˆ A and B, Conical bearings, if m. apart: ordinary machines to any extent.

One special form of typewriter, the Elliott Fisher, is designed to write in a book such as a ledger. One leaf is clamped between the platen and an open frame which holds the paper smoothly. The operative parts slide on this frame, and move up and down the page so as to space the lines properly, the keyboard, with the type bars, ribbon, &c, travelling step by step across the page. An adding device may be combined with this machine.

TYPHOID FEVER

5°3

TYPHOID FEVER. Typhoid or enteric 1 (Gr. Ivrtpov, the intestine) is a specific infectious fever characterized mainly by its insidious onset, by a peculiar course of the temperature, by marked abdominal symptoms occurring in connexion with a specific lesion of the bowels, by an

eruption upon the skin, by its uncertain duration, and by a liability to relapses. This fever has received various names, such as gastric fever, abdominal typhus, infantile remittent fever, slow fever, nervous fever, ” pythogenic fever,” &c. The name of ” typhoid ” was given by Louis in 1829, as a derivative from typhus. Until a com- paratively recent period typhoid was not distinguished from typhus. For, although it had been noticed that the course of the disease and its morbid anatomy were different from those of ordinary cases of typhus, it was believed that they merely represented a variety of that malady. The distinction between the two diseases appears to have been first accurately made in 1836 by Messrs Gerhard and Pennock, of Philadelphia, and valu- able work was done by other American doctors, particularly Elisha Bartlett (1842). The difference between typhus and typhoid was still more fully demonstrated by Dr A. P. Stewart, of Glasgow (afterwards of London). Finally, all doubt upon the subject was removed by the careful clinical and patho- logical observations made by Sir William Jenner at the London fever hospital (1849-1851).

The more important phenomena of typhoid fever will be better understood by a brief reference to the principal pathological changes which take place during the disease. These relate for the most part to the intestines, in which the morbid processes are highly characteristic, both as to their nature and their locality. The changes (to be presently specified) are evidently the result of the action of the contagium on the system, and they begin to show themselves from the very commencement of the fever, passing through various stages during its continuance. The portion of the bowels in which they occur most abundantly is the lower part of the small intestine (ileum), where the ” solitary glands” and ” Peyer’s patches ” on the mucous surface of the canal become affected by diseased action of a definite and progressive character, which stands in distinct relation to the symptoms exhibited by the patient in the course of the fever. (1) These glands, which in health are compara- tively indistinct, become in the commencement of the fever enlarged and prominent by infiltration due to inflammatory action in their substance, and consequent cell proliferation. This change usually affects a large extent of the ileum, but is more marked in the lower portion near the

ileo-caecal valve. It is generally held that this is the condition of the parts during the first eight or ten days of the fever. (2) These enlarged glands next undergo a process of sloughing, the inflammatory products being cast off either in frag- ments or en masse. This usually takes place in the second week of the fever. (3) Ulcers are thus formed varying in size according to the gland masses which have sloughed away. They may be few or many in number, and they exhibit certain characteristic appear- ances. They are frequently, but not always, oblong in shape, with their long axis in that of the bowel, and they have somewhat thin and ragged edges. They may extend through the thickness of the intestine to the peritoneal coat and in their progress erode blood-vessels or perforate the bowel. This stage of ulceration exists from the second week onwards during the remaining period of the fever, and even into the stage of convalescence. (4) In most instances these ulcers heal by cicatrization, leaving, however, no contraction of the calibre of the bowel. This stage of healing occupies a considerable time, since the process does not advance at an equal rate in the case of all the ulcers, some of which have been later in forming than others. Even when convalescence has

1 The word ” enteric ” has been substituted for ” typhoid ” by the Royal College of Physicians in the nomenclature of diseases authorized by them, and the change was officially adopted by all departments of the British government. Its advantages are doubt- ful, and it has been generally ignored by those foreign countries which used the word ” typhoid. ‘ ” Enteric ” is preferable in that it cannot be confounded with ” typhus ” and bears some relation to the nature of the affection, the characteristic feature of which is a specific inflammation of the small intestine; but it is not suffi- ciently distinctive. There are, in truth, several enteric fevers, and the appropriation of a term having a general meaning to one of them is inconvenient. Thus it is found necessary to revert to the discarded ” typhoid,” which has no real meaning in itself, but is convenient as a distinctive label, when speaking of the cause of the disease or some of its symptoms. We have the ” typhoid bacillus,” ” typhoid stools,” ” typhoid spots”, ” typhoid ulcers,” &c. The word ” enteric ” cannot well be applied to these things, because of its general meaning. Consequently both words

have to be used, which is awkward and confusing.

been apparently completed, some unhealed ulcers may yet remain and prove, particularly in connexion with errors in diet, a cause of relapse of some of the symptoms, and even of still more serious or fatal consequences. The mesenteric glands external to, but in functional relation with, the intestine, become enlarged during the progress of the fever, but usually subside after recovery.

Besides these changes, which are well recognized, others more or less important are often present. Among these may be mentioned marked atrophy, thinning and softness of the coats of the intestines, even after the ulcers have healed — a condition which may not improbably be the cause of that long-continued impairment of the function of the bowels so often complained of by persons who have passed through an attack of typhoid fever. Other changes common to most fevers are also to be observed, such as softening of the muscular tissues generally, and particularly of the heart, and evidences of complications affecting chest or other organs, which not infre- quently arise. The swelled leg of fever sometimes follows typhoid, as does also periosteal inflammation.

The symptoms characterizing the onset of typhoid fever arje very much less marked than those of most other fevers. The most marked of the early symptoms are headache, lassitude and dis- comfort, together with sleeplessness and feverishness, particularly at night ; this last symptom is that by which the disease is most readily detected in its early stages. The peculiar course of the temperature is also one of the most important diagnostic evidences of this fever. During the first week it has a morning range of moderate febrile rise, but in the evening there is a marked ascent, with a fall again towards morning, each morning and evening, however, showing respectively a higher point than that of the pre- vious day, until about the eighth day, when in an average case the highest point is attained. This varies according to the severity of the attack; but it is no unusual thing to register 104 or 105 F. in the evening and 103 or 104° in the morning. During the second week the daily range of temperature is comparatively small, a slight morning remission being all that is observed. In the third week the same condition continues more or less ; but

frequently a slight tendency to lowering may be discerned, particularly in the morning temperature, and the febrile action gradually dies down as a rule between the twenty-first and the twenty-eighth days, although it is liable to recur in the form of a relapse Although the patient may. during the earlier days of the fever, be able to move about, he feels languid and uneasy; and usually before the first week is over he has to take to bed. He is restless, hot and un- comfortable, particularly as the day advances, and his cheeks show a red flush, especially in the evening or after taking food. The aspect, however, is different from the oppressed, stupid look which is present in typhus. The pulse in an ordinary case, although more rapid than normal, is not accelerated to an extent corresponding to the height of the temperature, and is, at least in the earlier stages of the fever, rarely above 100. In severe and protracted cases, where there is evidence of extensive intestinal ulceration, the pulse becomes rapid and weak, with a dicrotic character indicative of cardiac feebleness. The tongue has at first a thin, whitish fur and is red at the tip, edges and central line. It tends, however, to become dry, brown or glazed looking, and fissured transversely, while sordes may be present about the lips and teeth. There is much thirst and in some cases vomiting. Splenic and hepatic enlargement may be made out. From an early period in the disease abdominal symptoms show themselves and are frequently of highly diagnostic significance. The abdomen is somewhat distended or tumid, and pain accompanying some gurgling sounds may be elicited on light pressure about the lower part of the right side close to the' groin — the region corresponding to that portion of the intestine in which the morbid changes already referred to are progressing. Diarrhoea is a frequent but by no means constant symptom. When present it may be slight in amount, or, on the other hand, ex- tremely profuse, and it corresponds, as a rule, to the severity of the intestinal ulceration. The discharges are highly characteristic, being of light yellow colour resembling pea soup in appearance. Should intestinal haemorrhage occur, as is not infrequently the case during some stage of the fever, they may be dark brown or composed entirely of blood. The urine is scanty and high- coloured. About the beginning, or during the course of the second week of , the fever, an eruption frequently makes its appearance on the

skin. It consists of isolated spots, oval or round in shape, of a pale pink or rose colour, and of about one to one and a half lines in diameter. They are seen chiefly upon the abdomen, chest and back, and they come out in crops, which continue for four or five days and then fade away. At first they are slightly elevated, and disappear on pressure. In some cases they are very few in number, and their presence is made out with difficulty; but in others they are numerous and sometimes show themselves upon the limbs as well as upon the body. They do not appear to have any relation to the severity of the attack, and in a very considerable proportion of cases (particularly in children) they are entirely absent. Besides this eruption there are not infrequently numerous Very faint bluish patches or blotches about half an inch in diameter, chiefly upon the body and thighs. When present the rose-coloured spots continue to come out in crops till nearly the end of the fever, and they may reappear should a relapse

subsequently occur. These various symptoms persist throughout the third week, usually, however, increasing in intensity. The patient becomes prostrate and emaciated; the tongue is dry and brown, the pulse quickened and feeble, and the abdominal symptoms more marked; while nervous disturbance is exhibited in delirium, in tremors and jerkings of the muscles {subsultus tendinum), in drowsiness, and occasionally in ” coma vigil.” In severe cases the exhaustion reaches an extreme degree, although even in such in*- stances the condition is not to be regarded as hopeless In favour- able cases a change for the better may be anticipated between the twenty-first and twenty-eighth days, more usually the latter. • It does not, however, take place as in typhus by a well-marked crisis, but rather by what is termed a ” lysis ” or gradual subsidence of the febrile symptoms, especially noticeable in the daily decline of both morning and evening temperature, the lessening of diarrhoea, and improvement in pulse, tongue, &c. Convalescence proceeds slowly and is apt to be interrupted by relapses. Should such re- lapses repeat themselves, the case may be protracted for two or three months, but this is comparatively rare.

Death in typhoid fever usually takes place from one or other of the following causes, (i) Exhaustion, in the second or third weeks, or later. Sometimes sinking is sudden, partaking of some of the characters of a cpllapse. (2) Haemorrhage from the intestines. The evidence of this is exhibited not only in the evacuations, but in the sudden fall of temperature and rise in pulse-rate, together with great pallor, faintness and rapid sinking. Sometimes haemor-rhage, to a dangerous and. even fatal extent, takes place from the nose. (3) Perforation of an intestinal ulcer. This gives rise, as a rule, to sudden and intense abdominal pain, together with vomiting and signs of collapse, viz. a rapid flickering pulse, cold clammy skin, and the marked fall of temperature. Symptoms of peritonitis quickly supervene and add to the patient's distress. Death usually takes place within 24 hours. Occasionally peritonitis, apart from perforation, is the cause of death. (4) Occasionally, but rarely, hyperpyrexia (excessive fever). (5) Complications, such as pulmonary or cerebral inflammation, bedsores, &c.

Certain sequelae are sometimes observed, the, most important being the swelled leg, periostitis affecting long bones, general ill- health and anaemia, with digestive difficulties, often lasting for a long time, and sometimes issuing in pulmonary tuberculosis. Occasionally, after severe cases, mental weakness is noticed, but it is usually of comparatively short duration.

No disease has been more thoroughly studied in recent years than typhoid fever. The chief points requiring notice are (1) causation and spread, (2) prevalence, (3) treatment, (4) prevention.

Causation.— The cause is the bacillus typhosus, discovered by Eberth in 1880 (see Parasitic Diseases). This organism multiplies in the body of a person suffering from the disease, and is thrown off in the discharges. It enters by being swallowed and is conveyed into the intestine, where sets up the charac- teristic inflammation. It is found in the spleen, the mesenteric glands, the bile and the liver, not infrequently also in the bone marrow, and sometimes in the heart, lungs and kidneys, as well as in the faeces and the urine. It has also, though more rarely, been found in the hlood. The illness is therefore regarded as a general toxaemia with special local lesions. The relation of the

bacillus to the other numerous bacteria infesting the intestinal canal, some of which are undoubtedly capable of assuming a pathogenic character, has not been determined; but its natural history, outside the body, has been investigated with more positive results than that of any other micro-organism, though much still remains obscure. Certain conclusions may be stated on good evidence, but it is to be understood that they are all more or less tentative. (1) In crude sewage the bacillus does not multiply, but dies out in a few days. (2) In partly sterilized sewage {i.e. heated to 65° C.) it does not multiply, but dies out with a rapidity which varies directly with the number of other organisms present — the more organisms the quicker it dies. (3) It is said not to be found in sewer air, though Sir Charles Cameron, from a series of recent experiments, claims to have proved the contrary. (4) In ordinary water containing other organisms it dies in about a fortnight. (5) In sterilized water it lives for about a month. (6) In ordinary soil moistened by rain it has lived for 67 days, in sewage-polluted soil for at least 53 days, in soil completely dried to dust for 25 days,, and in sterilized soil for upwards of 400 days. (7) Exposed to direct sunlight it dies in from four to eight hours. (8) It is killed by a temperature of 58 °C, but not by freezing or drying. (9) It multiplies at

any temperature between io° C. and 46 C, but most rapidly between 35° C and 42 C. These conclusions, which are derived from experiment, are to a considerable extent in agreement with certain observations on the behaviour of the disease on a large scale.

The susceptibility of individuals to the typhoid bacillus varies greatly. Some persons appear to be quite immune. The most susceptible age is adolescence and early adult life; the greatest incidence, both among males and females, is between the ages of 15 and 35. The aged rarely contract it. Men suffer considerably more than women, and they carry the period of marked susceptibility to a later age. Predisposing causes are believed to be debility, depression, the inhalation of sewer air by those unaccustomed to it, and anything tending to ” lower the vitality,” whatever that convenient phrase may mean. According to the latest theories, it probably means in this connexion a chemical change in the blood which diminishes its bactericidal power. The lower animals appear to be free from typhoid in

nature; but it has been imparted to rabbits and other laboratory animals. There is no evidence that it is infectious in the sense in which small-pox and scarlet fever are infectious; and persons in attendance on the sick do not often contract it when sufficient care is taken. The recognition of these facts has led to a general tendency to underrate contagion, direct and indirect, from the sick to the healthy as a factor in the dissemination of typhoid fever; but it must be remembered that the sick, from whose persons the germs of the disease are discharged, are always an immediate source of danger to those about them. Such personal infection may become a very important means of dissemination. There is evidence that this is the case with armies in the field, e.g. the conclusions of the commission appointed to inquire into the origin and spread of enteric fever in the military encampments of the United States in the Cuban campaign • of 1898. Out of 1608 cases most thoroughly investigated, more than half were found to be due to direct and indirect infection in and from the tents (Childs: Sanitary Congress, Manchester, 1902). A similar but perhaps less direct mode of infection was shown to account for a large number of cases under more ordinary conditions of life in the remarkable outbreak at Maidstone in 1897, which was also subjected to very thorough investigation. It was undoubtedly caused in the first instance by contaminated water, but 280 cases occurred after this cause had ceased to operate, and these were attributed to secondary infection, either direct or indirect, from the sick. A good deal of evidence to the same effect by medical officers of health in England has been collected by Dr Goodall, who has also pointed out that the attendants on typhoid patients in hospital are much more frequently attacked than is commonly supposed {Trans. Epidem. Soc. vol. xix.).

Recent discoveries as to the part played in the dissemination of typhoid fever by what are termed ” typhoid carriers ” have thrown light upon the subject of personal infection. The subject was first investigated by German hygienists in 1907, and it was found that a considerable number of persons who have recovered from typhoid fever continue to excrete typhoid bacilli in their faeces and urine (typhoid bacilluria). They found that after six weeks 4 % to 5 % of typhoid patients were still

excreting bacilli; 23% of 65 typhoid patients at Boston City Hospital showed typhoid bacilli in their excretions ten days before their discharge. The liability of a patient to continue this excretion bears a direct relation to the severity of his illness, and it is probable that the bacilli multiply in the gall bladder, from which they are discharged into the intestine with the bile. The condition in a small number of persons may persist indefinitely. In 101 cases investigated, Kayser found three still excreting bacilli two years after the illness, and George Deane has recorded a case in which bacilli continued to be excreted 29 years afterwards.

Many outbreaks have in recent times been traced to typhoid carriers, one of the first being the Strassburg outbreak. The owner of a bakehouse had had typhoid fever ten years

previously, and it was noticed that every fresh employe entering her service developed the disease. She prepared the meals of the men. On her exclusion from the kitchen the cases ceased. In Brentry reformatory, near Bristol, an outbreak numbering 28 cases was traced to a woman employed as cook and dairymaid who had had typhoid fever six years previously. Before entering the reformatory she had been cook to an insti- tution for boarded-out girls, and during her year's residence there 25 cases had occurred. A case is reported by Huggen- berger of Zurich (Lancet, October 1908) in which a woman carrier is said to have infected a series of cases lasting over 31 years, including her husband, son, daughter-in-law, and no less than nine different servants. Numerous cases of contamination of milk supplies by a " carrier " have been investigated, and in outbreaks traced to dairies it is wise to submit the blood of all employes to the agglutination test. A persistently high opsonic index to typhoid bacilli is notable among " carriers." Not only do persons who have had tyhpoid' fever harbour bacilli, but also persons who come in contact with cases of the disease and who have no definite history of illness themselves.

The other means of dissemination are polluted soil, food

and drink, particularly milk and water. The precise mode in which polluted soil acts is not understood. The result of experiments mentioned above shows that the bacillus lives and multiplies in such soil, and epidemiological investigation has repeatedly proved that typhoid persists in localities where the ground is polluted by the leakage of sewage or by the failure to get rid of excrementitious matter. In some instances, no doubt, drinking water thus becomes contaminated and conveys the germs,' but there appears to be some other factor at work, for the disease occurs under the condi- tions mentioned where the drinking water is free from suspicion. Exhalation is not regarded as a channel of communication. The resaarches of Majors Firth and Horrocks prove that dust,, flies and clothing may convey the germs. Another way in which food becomes the medium of conveyance is by the contamination of oysters and other shellfish with sewage containing typhoid bacilli. This has been abundantly proved by investigations in Great Britain, America and France. Uncooked vegetables, such as lettuces and celery, may convey the disease in a similar way. The most familiar and important medium, however, is water. It may operate directly as drinking water or indirectly by contaminating vessels used for holding other liquids, such as milk cans. Typhoid caused by milk or cream has generally been traced to the use of polluted water for washing out the cans, or possibly adulterating their contents. There is obviously no reason why this chain of causation should not hold good of other articles of food and drink. Outbreaks have been traced to ginger-beer and ice-creams. Water sources become contaminated directly by the inflow of drains or the deposit of excretal matter; indirectly, and more frequently, by the leakage of sewage into wells or by heavy rains which wash sewage matter and night-soil from ditches and the surface of the land into springs and watercourses. Water may further be contaminated in the mains by leakage, in domestic cisterns, and in supply pipes by suction. There is some reason to believe that the bacilli may multiply rapidly in water containing suitable nourishment in the absence of large numbers-of their natural foes.

Prevalence. — Typhoid fever is more or less endemic and liable to epidemic outbreaks all over the world. It is more prevalent in temperate than in tropical climates. The

follow- ing comparative death-rates show its relative prevalence in certain countries in 1890: Italy, 658; Austria, 470; U.S.A. 462; Prussia, 204; England, 179. It has undergone marked and progressive diminution in many countries coincidently with improved sanitation,- particularly in regard to drainage and water-supply. Table I. gives annual death-rates in England and Wales after 1869, when typhoid was registered separately from typhus and ” simple ” fever.

London shows less improvement than Great Britain as a whole, but it started with superior sanitary conditions, and though the reduction has not been maintained in the last recorded quinquennium, the mortality is still much below the mean. The disease is more prevalent in Paris, but the diminu- tion effected has been far greater in the time, , the average annual mortality per million having fallen from 1430 in 1882 and 581 in 1883-1888 to 293 in 1889-1894 and 172 in 1895-1900. Other recorded instances of diminution are Berlin, Hamburg, Munich, Copenhagen, the Netherlands, Buenos Aires (from 1060 per million in 1890 to 140 in 1899). In all these and

Table I. — Annual Mortality from Enteric Fever per Million Persons living— England and Wales.

Year.

Mortality.

Year.

Mortality.

1869

390

1889

176

1870

388

1890

179

1871

371

1891

168

1872

377

1892

137

1873

376

1893

229

1874

374

1894

159

1875

37i

1895

175

1876

3°9

1896

166

1877

279

1897

156

1878

306

1898

182

1879

231

1899

199

1880

261

1900

160

1881

212

1901

173

1882

229

1902

126

1883

228

1903

100

1884

236

1904

93

1885

175

1905

89

1886

184

1906

92

1887

185

1907

67

1888

172

The diminution is more clearly shown if quinquennial periods are taken, as in Table II.

Table II.-

— Average Annual Mortality per Million in England and Wales, and in London.

	England and Wales .	London .
1871-75-	354	256
1876-80.	278	234
1881-85.	218	226
1886-00.	180	150
1891-95-	176	136
i 896-1 goo.	174-8	148
1901-05	1 12 -6	

other cases the improvement is attributed either to drainage or water-supply, or both. The case of Munich is so instructive that it deserves special mention. For many years typhoid was excessively prevalent in that city. The

prevalence was con- tinuous, but aggravated by large epidemic waves, extending over several years. These gradually decreased in magnitude, and ceased towards the end of 1880. Since then the prevalence has still further diminished, the average annual mortality per million having fallen from 2024 in 1851-1860, 1478 in 1861-1870 and 1167 in 1871-1880 to 160 in 1881-1890 and 52 in 1891-1900.

It has been forcibly argued by Dr Childs (Trans. Epidem. Soc. vol. xvi.) that drinking water had little, if anything, to do with the prevalence of the disease, and that its gradual reduction was due to purification of the soil by improved drainage systems and the abolition of slaughter-houses. The epidemic waves were found by von Pettenkofer to be associated with the rise and fall of the subsoil water; when the water fell the fever rose, and vice versa. He did not, however, consider that the subsoil water exercised any influence itself; he merely regarded it as an index to certain con- ditions of moisture which exercised a favourable or unfavourable influence on the development of the disease. His theory, which has been much misunderstood, is to some extent corroborated by some facts observed in Great Britain. One is the seasonal preva- lence of typhoid, which in England is an autumnal disease. The minimum occurs in May or June; in August a marked rise begins, which continues throughout the autumn and reaches a maximum in November, after which an abrupt fall sets in. These facts are in keeping with Pettenkofer's theory, for the subsoil water reaches its maximum height at the end of spring and falls throughout the summer and a great part of the autumn. The coincidence is further emphasized by the fact that in dry years, when the subsoil water sinks lower than usual, typhoid is more prevalent, and in wet years the contrary. A glance at the mortality table for England given above will show that the progressive improvement recorded down to 1892 was suddenly interrupted in 1893, when the rate rose abruptly from 137 to 229. That was an extraordinarily dry and hot year, and it was followed by a succession of dry and hot years, culminating in 1899, with two exceptions — 1894 and 1897. In both the typhoid rate fell again, but in all the others it rose. One explanation has been suggested by Mr Matthew Adams of Maid- stone. He points out that organic matter deposited on or in the

ground passes in normal years gradually through several layers of soil, and undergoes a process of destruction or purification before reaching the underground water; but in hot summers the ground becomes baked and cracked, and there is no such percolation; when rain comes everything is swept suddenly away without any purification, and finds its way into the sources of drinking water.

Whether this be so or not, there is no doubt that dangerous material does collect during the summer and is swept into watercourses by the autumnal rains. Perhaps this is sufficient to Account for the seasonal prevalence and the annual variations noted. There is, however, a great deal of typhoid which has no connexion with water-supply. Numerous cases of persistent prevalence have been investigated by the medical officers of the local government board, in which drinking water has been exonerated and the mischief attributed to standing pollution of the soil — for instance, Mold, Middlesbrough, Southend, Swinton and Pendlebury, &c. In such places the chronic prevalence is apt to swell at times to more epi- demic proportions, as at Munich; and possibly the condition of the ground may be the cause. An examination of the relative incidence of typhoid in the counties of England and Wales (Bulstrode) goes to show that its prevalence, broadly regarded, is not capricious. The areas of maximum and minimum incidence remained practically the same throughout the twenty years 1871-1890, though there was everywhere a large diminution. This fact suggests the reflection that standing conditions are more important factors than those accidental occurrences which attract public attention by causing sudden and explosive outbreaks. When these are on a small scale they may be due to milk; on a large scale they are always water- borne and caused by sudden contamination of a public supply. The classical example is Maidstone. That outbreak began towards the end of August 1897, and within six weeks some 1500 persons were attacked. The total number of cases was 1847, with 132 deaths, in a population of about 34,000. With the exception of 280 cases of secondary infection, which lingered on till the following January, they all occurred before the 18th of October, and

the disease subsided almost as rapidly as it arose. A mass of evidence of different kinds left no possibility of doubt that accidental contamina- tion of a water-supply was the cause. Perhaps the most striking point was that Maidstone is supplied with water from three different sources, known as Cossington, Boarley and Farleigh, and out of 1681 cases the respective incidence in these areas was — Cossington 29, Boarley 69, Farleigh 1 583. Another great example of water-borne typhoid is furnished by Philadelphia, where 14,082 cases occurred in 1898-1899.

Treatment. — Improved knowledge of the nature and causation of typhoid fever has not led to the successful introduction of a specific treatment; nor have means been found to cut short the illness, though its fatality has been reduced. It still goes through the classical stages, which broadly coincide with first, second and third weeks. Attempts have been made to deal directly with the toxins produced by the bacilli, on the hypo- thesis that they are formed in the intestinal canal, by the use of internal disinfectants, such as mercury, iodine, carbolic acid, salol, &c, and these agents are sometimes beneficial; but the treatment remains essentially symptomatic, and follows the principles that were recognized before the discovery of the bacillus typhosus. One of the most important improvements is the regular use of sponging or bathing for the reduction of temperature. It has even been developed into a continuous bath, in which the patient is kept in water throughout the illness. Since the recent development of serum-therapy various serums have been tried in the treatment of typhoid fever, and successful reports are given of the anti-endotoxic serum devised by Dr Allen Macfadyen, while Professor Chantemesse, in the statistics of serum treatment at the Bastion Hospital, Paris, states that from July 1901 to July 1907 he so treated 1000 cases, 43 proving fatal, a mortality of 4-3%. During the same period, 5621 cases were treated in fourteen other Paris hospitals, with 960 deaths, a mortality of 17%. Chantemesse's serum was employed by Professor Brunon at Rouen in 100 cases with three deaths, and Dr Josias of Paris in 200 cases with eight deaths in typhoid fever occurring in young children. The serum is taken from a horse which has received over a long period injec- tions of an emulsion of the bacillus typhosus or a soluble toxin. Sir Almroth Wright has suggested the use

of an autogenous vaccine in this as in other parasitic diseases, opsonic control being exercised. –

The fatality of typhoid fever varies greatly. Age exercises a marked influence, the fatality rising steadily after the period 5 to 10 years. The importance of careful and intelligent nursing is undoubtedly great, but there is a tendency, encouraged by some nurses, on the part of the public to overestimate that factor and to think that nothing more is needed. This is a grave mistake. No disease requires more vigilant attention or greater medical experience. The following table shows quinquennial figures for the London Metropolitan Asylums Board hospitals.

Metropolitan Asylums Board Hospitals.

County of London.

Ratio per cent.

Mean annual

Admissions.

Deaths.

of deaths to admissions.

mortality per 1000 living.

18.74-1878

1878

379

20

0-25

1879-1883

2049

381

19

0-23

1884-1888

1937

3H

16

0-17

1889-1893

2517

415

16

0-13

,1894-1898

3328

578

17

0-13

1899-1903

6779

1023

15

0-13

1904-1908

3084

457

005

Prevention. — If house drainage were always perfectly carried out, sewage satisfactorily disposed of, water-supply efficiently protected or treated, patients segregated, and the typhoid material excreted by them and typhoid ” carriers ” effectually annihilated— if; in short, scientific cleanliness were completely attained, the disease would disappear, or be at least excessively rare. In some communities much has been done in the direc- tions indicated; but in many others the lessons of experience are ignored, and even in the best practice lags behind theory. This is mainly due to apathy and reluctance to spend money, but there are certain real difficulties which stand in the way. To discuss them fully would involve a lengthy consideration of drainage, water-supply and other matters, which would be out of place here; but some points must be noted. The most important is undoubtedly water-supply. The substitution of public water-supplies for shallow wells and small streams liable to pollution is one of the greatest factors in the diminution of typhoid and other water-borne diseases; but it may give rise to danger on a far larger scale, for a, whole community may be poisoned at one blow when such a supply becomes contaminated. Unfortunately, it is extremely difficult to prevent contamination with certainty in a populous country. Theoretically, water may be pure at its source, and may be distributed in that condition. Such is water derived from deep wells and springs, or gathered from uncultivated and uninhabited uplands. In the one case it has undergone natural filtration in the ground; in the other, it escapes all risk of pollution. These waters are generally pure, but the condition cannot be relied on. A tramp or a shepherd may pollute the most remote gathering-ground unless it be fenced in; deep Wells may be similarly fouled by workmen, and sewage may find its way into them from the surface or through fissures. In an outbreak of enteritis and typhoid fever at Leavesden Asylum, investigated by Dr A. Shadwell in 1899, the source of mischief was traced to con- tamination of the well, which was 250 ft. deep in the chalk. The contamination did not take place from the surface, but from some underground source, and there were grounds — corroborated by subsequent observation — for believing that it occurred at irregular intervals, and was probably

connected with the level of the deep underground water. At the same time the similar well of a neighbouring poor-law school was found to be dangerously polluted, and it was ascertained that two others in the same locality had been condemned and closed in the past. The deep chalk in that neighbourhood was clearly unsafe, and this was thought to be due to the practice of digging holes called " dumb wells," but in reality cess-pits, as much as 40 ft. deep, in the chalk for the reception of sewage. The same practice is common in all inhabited localities on a chalk forma- tion, as it is an extremely convenient way of disposing of sewage, which percolates away and renders it unnecessary to empty the cess-pit. Several similar cases of deep well pollution have been recorded, notably those of Houghton-le-Spring in 1889 and Worthing in 1893. To secure purity, therefore, and prevent liability to outbreaks of typhoid and other intestinal diseases, all gathering-ground's should be fenced in, and water, even from deep wells, should be regularly examined, both chemically and bacterioscopically, in order that any change in composition may be detected. In the water-supplies of great populations such examination should be made daily. Further, all supplies which

are not above suspicion should be filtered through sand or sterilized by boiling. The latter can be carried out by simple means in the case of individual domestic water, and attempts have been made to apply it by means of mechanical apparatus to supplies on a larger scale. It is not, however, applicable to the water-supply of large towns, because of the liability of such apparatus to get out of order. Sand filtration is at present the best mode . of dealing with these supplies. There is no purer water than that which has been properly treated by subsidence and sand filtration, even when it is taken from an impure source. So far as the prevention of typhoid and other water-borne disease is concerned, it is certainly safer than the unfiltered water which is taken from so-called pure sources. It cannot be a mere coincidence that London, Hamburg, Berlin and other towns using well-filtered but originally impure river water should be generally freer

from water-borne disease than many large towns drawing their supply from purer sources but neglecting to filter it, such as Manchester, Glasgow and the American cities. Table III., prepared by Mr Caink, engineer to the city of Worcester, illustrates this fact, which has also been noted by Professor Saltet of Amsterdam as holding good of the Netherlands.

type and severity of the illness. Bacteriological science has here come to the assistance of the clinical physician with what is called the Widal or serum reaction, which has a great diagnostic value when carefully performed. Professor Chantemesse has also intro- duced a cutaneous reaction similar to von Pirquet's reaction in tuberculosis. But obviously these remedies can only be applied to persons in the position of patients; it is of no use in the case of those who do not proclaim themselves ill, but go about their business when suffering from the disease. Such " ambulatory " cases have long been recognized as an important factor in spreading the disease. Many of the most memorable epidemics have probably been caused by them, and it is difficult to see how they can be guarded against. The " typhoid-carrier," however, when discovered should be inter- dicted from the preparation of food and should undergo a course of treatment with a view to lessening their excretion of typhoid bacilli.

The prevention of typhoid among armies in the field is a problem of special difficulty, not in principle but because of the conditions. The water is generally polluted, and soldiers are too thirsty to wait while it is boiled or filtered, even if the means are at hand. The sanitary arrangements are such as to ensure the saturation of the ground with excreta; flies and dust abound; personal cleanliness is impossible, and men feed and sleep together in the closest proximity. No doubt a great deal might be done by efficient sanitary organization, which

Table III. — Occurrences of Typhoid according to Sources

f Water-Supply.

(

Source of Water.

Town.

Annual Typhoid Case-rate per 100,000.

1892.

1893.

1894.

1895.

1896.

1897.

1898.

1899.

1900.

Deep wells in Red Sandstone

\ Wolverhampton . \ Birkenhead

109

184

109

146

159

117

124

.224

237

157

207

185

165

138

126

211

230

145

Deep wells in Chalk

Southampton .

145

159

109

83

78

64

153

171

109

(Liverpool ■j Manchester

152

275

267

190

168

160

129

149

115

Upland surface water

120

120

90

96

92

90

118

78

78

(Plymouth .

126

63

47

32

31

49

41

49

120

(London

65

84

77

81

71

70

66

98

95

Rivers (filtered) ....

■j Reading

30

35

28

53

30

67

32

48

41

(Worcester .

155

H5

no

36

43

45

31

50

26

Average of 219 towns .

88

142

103

115

102

100

“5

127

116

The amount of typhoid is dependent on other factors besides the water-supply, but the close connexion between the two and the influence of filtration are well attested by the experience of Wor- cester, where the great reduction recorded since 1894 ooincided with new and improved filtration. The weak point about sand filtration is that it is apt to be imperfectly performed when the filters are frozen or newly cleaned, or when the process is too rapid. Filtration through porcelain is an efficient purifier, but it is not applicable to supplies on a large scale, and is liable to break down through clogging of the filters. Other portable filters are regarded as useless or worse. The best emergency treatment for suspected drinking water is boiling. Contamination of water in the mains is due to bad laying, and ought never to occur; that of supply pipes can be prevented by a constant service, and of domestic filters by providing them with covers.

Next to water-supply, and hardly less important, is drainage. The drying and cleansing of the soil by good household drainage and sewerage is essential to the prevention of typhoid. Cess-pits, leaking drains and privies, especially when there is only one to several houses, as in many industrial towns, are powerful allies of this disease.

The drainage of all old houses is defective and dangerous. The ground about them is commonly honeycombed with cess-pits and saturated with sewage. The only way to discover and remedy such defects is to lay them bare with the pickaxe and shovel. Soil-pipes should always be trapped and ventilated. In short, no disease requires for its prevention more careful attention to house sanitation. The paving of yards and other spaces is also desirable in towns, on account of the liability of the unprotected soil to harbour moisture and filth.

Other modes by which the disease is spread — such as shellfish, milk and uncooked vegetables — suggest their own remedy. The dissemination by dust and flies is less easily prevented. All that can be done is to segregate the sick and promptly destroy all danger- ous matters proceeding from them. It should be remembered that the urine may be an even greater source of danger than the faeces. The same observation applies to the prevention of infection from person to person. There is no doubt that sufficient care is often wanting, even in hospitals, in handling patients' soiled linen and clothes, and in dealing promptly and effectually with their excreta. For the effectual segregation and treatment of persons suffering from typhoid prompt recognition is necessary ; and this, unfortun- ately, is a matter of much difficulty on account of variation in the

has hitherto been lacking, and by educating the men. Dr Leigh Canney in 1901 suggested a scheme for dealing system- atically with the water-supply of an army. Extraordinary results were obtained by the Japanese army medical depart- ment in the Russo-Japanese War of 1904-5 in the prevention of typhoid fever, which up to that period was responsible for the largest mortality of any disease affecting armies in the field. Handbooks on the avoidance of cholera, plague and typhoid fever were issued to the troops. Boiled water in quantities was provided for the soldiers, each battalion having its boil- ing outfit. Even foreign attaches and correspondents were requested to observe the regulations on this point. With this there was a systematic advance testing of wells, the wells being labelled " fit for drinking " or " for washing purposes only." It being impossible to suppress the presence of flies on food,- care was taken to cover all latrines and cover and

disinfect excreta, so that infection from flies was reduced to a minimum. Food was transferred from sterilized caldrons into sterilized lacquer boxes and served on sterilized plates. A crematory was attached to base hospitals, where all nightsoil, garbage and waste was burnt daily. Owing to these precautions the inci- dence of infectious disease, notably typhoid fever, was reduced to a figure unparalleled in any previous war, only 3-51% of the total sickness being due to infectious disease. Taking the number of men at the front in April 1905 to have been 599,617, the entire deaths from infectious and contagious diseases amounted to 1-24% of the entire army in the field.

In a table furnished by the Japanese war office at a still later date we note the small percentage of typhoid fever.

Percentage of patients in entire Army Corps at a certain date : —

Wounds received in action 45‘53

Other wounds and injuries 3-71

Typhoid fever l-6l

Dysentery 1-95

All other diseases 47 – 2o

5 o8

TYPHON— TYPHUS FEVER

In the statistics of General Oku’s army, calculated to be at least 75,000 strong, Major-General Mori, chief medical officer, reports the typhoid cases to be 66 only between the dates of October 1904 and April 1905. Of this army 2142 were invalided home or died; 133 only being cases of typhoid fever.

The sickness incidence in the First Army under General Kuroki was as follows during the first six months of the campaign: —

Months.

Sickness : all Diseases.

Typhoid Fever.

March

April

May

July

August ....

3829 3545 3*54 4824

5565 6006

3 1

9 9

4 9

The figures are interesting when we consider that during the South African War of 1899-1902 no fewer than 31,000 men were invalided home to England on account of typhoid fever.

One other point requires mention in connexion with preven- tion, namely, protective inoculation. This is performed with an anti-toxic substance prepared from dead cultures of bacilli, and has been tried on a fairly large scale, particularly on the British army in India and South Africa. Sir W. B. Leishman, writing on the results of anti-typhoid inoculations in the army (Journ. of R.A.M.C., February 1909), gives the total number of men inoculated up to the 1st of June 1908 as 5473, amongst whom 2 1 cases (3 ■ 8 per 1000) with 2 deaths occurred. The number non-inoculated, 6610 men, had an incidence of 187 cases (283 per 1000) with 26 deaths. The case mortality of the inoculated was 9-5%, of the non-inoculated 13-8%. Several regiments however were not exposed to enteric fever. If these be excluded the incidence in the inoculated is 6-6 per 1000 against 39-5 per 1000 in the non-inoculated. Lord Kitchener, speaking at Middlesex Hospital in October 1910,

bore emphatic testimony to the value of inoculation coupled with improved sanitary methods on the health of the army in India, declaring his belief that enteric would before long join cholera in total banishment from the barracks.

TYPHON (Typhaon, Typhoetjs), in Greek mythology, youngest son of Gaea and Tartarus. He is described as a grisly monster with a hundred dragons' heads, who was conquered and cast into Tartarus by Zeus. In other accounts, he is con- fined in the land of the Arimi in Cilicia (Iliad, ii. 783) or under Etna (Aeschylus, P.V. 370) or in other volcanic regions, where he is the cause of eruptions. Typhon is thus the personification of volcanic forces. Amongst his children by Echidna are Cerberus, the Lernaean hydra, and the Chimaera. He is also the father of dangerous winds (typhoons), and by later writers is identified with the Egyptian Seth.

See Eduard Meyer, Set-Typhon (1875), and M. Mayer, Die Giganten und Titanen (1887); Preller-Robert, Griechische Mythologie (1894), pp. 63-66; O. Gruppe, Griechische Mythologie, ii. 845, 1333, according to whom Typhon, the " snake-footed " earth-spirit, is the god of the destructive wind, perhaps originally of the sirocco, but early taken by the Phoenicians to denote the north wind, in which sense it was probably used by the Greeks of the 5th century in nautical language; and also in Philologus, ii. n.f. (1889), where he endeavours to prove the identity of Typhon with the Phoenician Zephon (Baal- Zephon, translated in Gesenius's Thesaurus by " locus Typhohis " or " Typhoni saar "), signifying " darkness," " the north wind," and perhaps " snake "; A. von Mess, " Der Typhonmythus bei Pindar und Aeschylus," in Rhein. Mus. lvi. (1901), 167.

TYPHOON (probably from the Arabic and Hindustani tufan, a tempest, which is perhaps derived from Typhon, q.v.: the Chinese t'ai fung, strong wind, is not used in application to typhoons), the name given to a heavy cyclonic storm in the seas fringing the eastern coast of Asia from Japan to the Philippine Islands. Typhoons generally occur in a series during the months of August, September and October, the season when the belt of equatorial calms in the Pacific Ocean reaches its most northerly extension.

TYPHUS FEVER (from Gr. tD0os, smoke or mist, in allusion to the stupor of the disease) , an acute infectious disease of highly contagious nature, lasting for about fourteen days, and characterized mainly by great prostration of strength,

severe nervous symptoms, and a peculiar eruption on the skin. It has received numerous other names, such as pestilential, putrid, jail, hospital fever, exanthematic typhus, &c. It appears to have been known for many centuries as a destructive malady, frequently appearing in epidemic form, in all countries in Europe, under the conditions to be afterwards referred to. The best accounts of the disease are those given by old English writers, who narrate its ravages in towns and describe many " black assizes," in which it was communicated by prisoners brought into court to the judges, jurymen, court officials, &c, with fatal effect. Typhus fever would seem to have been observed in almost all parts of the world; but it has most frequently prevailed in temperate or cold climates.

The conditions concerned in its production include both the predisposing and the exciting. Of the former the most power- ful are those influences which lower the health of a community, especially overcrowding and poverty. Hence this fever is most frequently found to affect the poor of large cities and towns, or to appear where large numbers of persons are living crowded together in unfavourable hygienic conditions, as has often been seen in prisons, workhouses, &c. Armies in the field are also liable to suffer from this disease; for instance, during the Crimean War it caused an enormous mortality among the French troops. Recently, however, an important change of view of the connexion of typhus fever has arisen. Professor Matthew Hay (Journal of Public Health, September 1907) attributes the spread of typhus fever to fleas. His observations are based on the epidemic in Aberdeen. He sums up his conclusions in the following manner: (1) Every case in hospital examined by Professor Hay and his assistants was flea bitten, and those of the staff who complained of flea bites were attacked. Care was exercised to distinguish between flea bites and petechiae. (2) Where a patient was apparently free from bites it was found he had been in contact with verminous families. (3) The disease did not spread in clean houses with clean inhabi- tants, even when a typhus patient remained in the dwelling during his entire

illness. (4) All nurses or wards-maids who were attacked were in contact with the patients when they were first admitted. No nurse, wards-maid or doctor who had been in close contact with the cases when cleaned contracted the disease.- (5) An ambulance driver who complained of being pestered by fleas contracted typhus fever, but when the ambu- lance staff were adequately protected from fleas no other cases developed.

Typhus is now regarded as certainly due to the action of some specific micro-organism (see Parasitic Diseases), but the bacteriology is still imperfect. In 1891 Jaroslav Hlava, of Prague, found in the blood of 20 out of 33 cases of typhus a well-defined organism which he termed the strepto-bacillus. Lewaschew in 1892 found in the blood and spleen of typhus patients small round highly refractive actively-moving bodies lying between the corpuscles. Sometimes these bodies were flagellate. Dubieff and Bruhl also found a diplococcus in the blood which they named the diplococcus exanthematicus.

The course of typhus fever is characterized by certain well-marked stages. I. The stage of incubation, or the period elapsing between the reception of the fever poison into the system and the manifestation of the special evidence of the disease, is believed to vary from a week to ten days. During this time, beyond feelings of languor, no particular symptoms are exhibited.

2. The invasion of the fever is in general well marked and severe, in the form of a distinct rigor, or of feelings of chilliness lasting for hours, and a sense of illness and prostration, together with headache of a distressing character and sleeplessness. Feverish symptoms soon appear and the temperature of the body rises to a considerable height (103 °- 105° F.), at which it continues with little daily variation until about the period of the crisis. It is, however, of importance to observe certain points connected with the tempera- ture during the progress of this fever. Thus about the seventh day the acme of the fever heat has been reached, and a slight subsidence (1° or less) of the temperature takes place in favourable cases, and no further subsequent rise beyond this lowered level occurs. When it is otherwise, the case often proves a severe one. Again, when the fever has advanced towards

the end of the second week, slight falls of temperature are often observed, prior to the extensive descent which marks the attainment of the crisis. The oulse in

typhus fever is rapid (100-120 or more) and at first full, but later on feeble. Its condition as indicating the strength of the heart's action is watched with anxiety. The tongue, at first coated with a white fur, soon becomes brown and dry, while sordes (dried mucus, &c.) accumulate upon the teeth; the appetite is gone; and intense thirst prevails. The bowels are as a rule constipated, and the urine is diminished in amount and high coloured. The physician may make out distinct enlargement of the spleen.

3. The third stage is characterized by the appearance of the eruption, which generally shows itself about the fourth or fifth day or later, and consists of dark red (mulberry-coloured) spots or blotches varying in size from mere points to three or four lines in diameter, very slightly elevated above the skin, at first disappear- ing on pressure, but tending to become both darker in hue and more permanent. They appear chiefly on the abdomen, sides, back and limbs, and occasionally on the face. Besides this charac- teristic typhus rash, there is usually a general faint mottling all over the surface. The typhus rash is rarely absent and is a very important diagnostic of the disease. In the more severe and fatal forms of the fever the rash has all through a very dark colour, and slight subcutaneous haemorrhages (petechiae) are to be seen in abundance. After the appearance of the eruption the patient's condition seems to be easier, so far as regards the headache and discomfort which marked the outset of the symptoms; but this is also to be ascribed to the tendency to pass into the typhous stupor which supervenes about this time, and becomes more marked throughout the course of the second week. On the examination of the blood a marked leucocytosis is present This is considered to be diagnostic in doubtful cases when the rash is badly marked. The patient now lies on his back, with a dull dusky countenance, an apathetic or stupid

expression, and contracted pupils. All the febrile symptoms already mentioned are fully developed, and delirium, usually of a low muttering kind, but sometimes wild and maniacal (delirium ferox), is present both by night and day. The peculiar condition to which the term ” coma vigil ” is applied, in which the patient, though quite unconscious, lies with eyes widely open, is regarded, especially if persisting for any length of time, as an unfavourable omen. Throughout the second week the symptoms continue unabated ; but there is in addition great weakness, the pulse becoming very feeble, the breathing shallow and rapid, and often accompanied with bronchial sounds.

4. A crisis or favourable change takes place about the end of the second or beginning of the third week (on an average the 14th day), and is marked by a more or less abrupt fall of the temperature and of the pulse, together with slight perspiration, a discharge of loaded urine, the return of moisture to the tongue, and by a change in the patient’s look, which shows signs of returning intelligence. Although the sense of weakness is extreme, convalescence is in general steady and comparatively rapid.

Typhus fever may, however, prove fatal during any stage of its progress and in the early convalescence, either from sudden failure of the heart’s action — a condition which is specially apt to arise — from the supervention of some nervous symptoms, such as meningitis or of deepening coma, or from some other complication, such as bronchitis. Further, a fatal result sometimes takes place before the crisis from sheer exhaustion, particularly in the case of those whose physical or nervous energies have been lowered by hard work, inadequate nourishment and sleep, or intemperance.

Occasionally troublesome sequelae remain for a greater or less length of time. Among these may be mentioned mental weakness or irritability, occasionally some form of paralysis, an inflamed condition of the lymphatic vessels of one leg (the swelled leg of fever), prolonged weakness and ill health, &c. Gradual improve- ment, however, may be confidently anticipated and even ultimately recovery.

The mortality from typhus fever is estimated by Charles Murchison (1830-1879) and others as averaging about 18%

of the cases, but it varies much according to the severity of type ˆparticu- larly in epidemics), the previous health and habits of the individual, and very specially the age — the proportion of deaths being in strik- ing relation to the advance of life. Thus, while in children under fifteen the death-rate is only 5 %, in persons over fifty it is about

46%.

The treatment of typhus fever includes the prophylactic measures of attention to the sanitation of the more densely populated por- Treatmeni tions of towns – Where typhus has broken out in a crowded district the prompt removal of the patients to a fever hospital and the thorough disinfection and cleansing of the infected houses are to be recommended. Where, however, a single case of accidentally caught typhus occurs in a member of a family inhabiting a well-aired house, the chance of it being communicated to others in the dwelling is small; nevertheless every precaution in the way of isolation and disinfection should be taken.

The treatment of a typhus patient is conducted upon the same general principles as in typhoid. Complete isolation should be maintained throughout the illness, and due attention given to the ventilation and cleansing of the sick chamber. Open-air treat- ment when practicable greatly reduces the temperature. The main element in the treatment of this fever is good nursing, and especially

the regular administration of nutriment, of which the best form is milk, although light plain soup may also be given. The food should be administered at stated intervals, not, as a rule, oftener than once in one and a half or two hours, and it will frequently be necessary to rouse the patient from his stupor for this purpose. Sometimes it is impossible to administer food by the mouth, in which case recourse must be had to nutrient enemata. Alcoholic stimulants are not often required, except in the case of elderly and weakly persons who have become greatly exhuasted by the attack and are threatening to collapse. When the pulse shows unsteadiness and undue rapidity, and the first sound of the heart is but indistinctly heard by the stethoscope, the prompt administration of stimulants (of which the best form is pure spirit) will often succeed in averting danger.

Should their use appear to increase the restlessness or delirium they should be discontinued and the diffusible (ammoniacal or ethereal) forms tried instead.

Many other symptoms demand special treatment. The headache may be mitigated by removing the hair and applying cold to the head. The sleeplessness, with or without delirium, may be com- bated by quietness, by a moderately darkened room (although a distinction between day and night should be made as regards the amount of admitted light), and by soothing and gentle dealing on the part of the nurse. Opiate and sedative medicines in any form, although recommended by many high authorities, must be given with great caution, as their use is often attended with danger in this fever, where coma is apt to supervene. When resorted to, probably the safest form is a combination of the bromide of potas- sium or ammonium with a guarded amount of chloral. Alarming effects sometimes follow the administration of opium. Occasionally the deep stupor calls for remedies to rouse the patient, and these may be employed in the form of mustard or cantharides to the surface (calves of legs, nape of neck, over region of heart, &c), of the cold affusion, or of enemata containing turpentine. The height of the temperature may be a serious symptom, and antipyretic remedies appear to have but a slight influence over it as compared to that which they possess in typhoid fever, acute rheumatism, &c. Hugo Wilhelm von Ziemssen (1 829-1902) strongly recommends baths in hyperpyrexia, the temperature of the bath being gradually reduced by the addition of ice. Cold sponging of the hands and feet and exposed parts, or cold to the head, may often considerably lower the temperature. Throughout the progress of a case the condition of the bladder requires special attention, owing to the patient's drowsiness, and the regular use of the catheter becomes, as a rule, necessary with the advance of the symptoms.

TYPOGRAPHY (i.e. writing by types) is the general term for the art of printing movable (cast-metal) types on paper, vellum, &c. It is distinct from writing, and also from wood-engraving or xylography, which is the art of cutting figures, letters, words, &c, on blocks of wood and taking impressions from such blocks by means of ink, or any other fluid coloured substance, on paper or vellum.

I. — History of Typography

Although the art of writing and that of block-printing both differ widely from printing with movable metal types, yet this last process has apparently been such a gradual transition from block-printing, 1 and block-printing in its turn such a natural outcome of the many trials that were probably made to produce pictures, books, &c, in some more expeditious manner than could be done with handwriting, that a cursory glance at these two processes will not seem out of place, especially as a discussion on the origin and progress of typography could hardly be understood without knowing the state of the literary development at the time that printing appeared.

The art of printing, i.e. of impressing (by means of certain forms and- colours) figures, pictures, letters, words, lines, whole pages, &c, on other objects, as also the p/ re * art of engraving, which is inseparably connected Attempts at with printing, existed long before the 15th cen- Prlntl °s- tury. Not to go back to remoter essays, there is reason to suppose that medieval kings and princes (among others William

1 We do not deal here with copperplate engraving (chalcography), nor with the question, raised by some authors, whether this art preceded that of wood-engraving (xylography), or vice versa. The earliest known date of the former is 1446 on the small engravings of " the Passion " in the Berlin Royal Print Room, whereas the earliest known date of wood-engraving is 141 8 (on the Brussels Mary engraving). Both arts were naturally dependent upon MSS. for the forms of their letters, but as to the question of transition from the art of writing to that of typography, xylography alone can be regarded as the intervening and connecting link between those two arts, and there are good reasons for assuming that the inventor of printing with movable types was a xylographer (see below).

ihe Conqueror) had their monograms cut on blocks of wood

or metal in order to impress them on their charters. Such impressions from stamps are found, instead of seals on charters of the 15th century. Manuscripts, even of the 12th century, show initials which, on account of their uniformity, are believed to have been impressed by means of stamps or dies. 1 Before the invention of printing, say about 1436, bookbinders are known to have impressed names or legends or other inscriptions on their bindings in two ways: (1) by means of single, insulated letters engraved reversely downwards into a stamp of brass, whereby the letters appeared en relief on the leather or parchment of the binding; (2) by letters engraved reversely en relief on the brass stamp, whereby the letters sank into the binding. For this reason the term itnpressor, applied afterwards to the " printer," was, in the first instance, applied to the binder, whereas ligator was the proper word for him (see F. Falk, Der St&mpeldruck, in " Festschrift," 1900, p. 73 sqq.; Zedler, Gutenberg-Forschungen, 1901, p. 6). But the idea of " multiplying " representations from one engraved plate or block or stamp, or other form, was unknown to the ancients, whereas it is predominant in what we call the art of block- printing, and especially in that of typography, in which the same types can be used again and again.

Block-printing and printing with movable types seem to have been practised in China and Japan long before they were known in East Asiatic F- uro P e – It ' s sa 'd that ' n tne Y ear ! 75 the text of Printing the Chinese classics was cut upon tablets, and that

impressions were taken of them, some of which are supposed to be still in existence. Printing from wooden blocks can be traced as far back as the 6th century, when the founder of the Suy dynasty is said to have had the remains of the classical books engraved on wood, though it was not until the 10th century that printed books became common. In Japan the earliest example of block-printing dates from the period 764-770, when the empress Shiyau-toku, in pursuance of a vow, had a million small wooden toy pagodas made for distribution among the Buddhist temples and monasteries, each of which was to contain a dharant out of the Buddhist Scriptures, entitled " Vimala nirbhasa Sfltra," printed on a slip of paper about 18 in. in length and 2 in. in width, which was rolled up and deposited in the body of the pagoda under the spire. In a

journal of the period, under the year 987, the expression " printed book " (suri-hoii)is applied to a copy of the Buddhist canon brought back from China by a Buddhist priest. This must have been a Chinese edition; but the use of the term implies that printed books were already known in Japan. It is said that the Chinese printed with movable types (of clay) from the middle of the nth century. The authorities of the British Museum exhibit as the earliest instance of Korean books printed with movable types a work printed in 1337. To the Koreans is attributed the invention of copper types in the beginning of the 15th century; and an inspection of books bearing dates of that period seems to show that they used such types, even if they did not invent them. 2

From such evidence as we have, it would seem that Europe is not indebted to the Chinese or Japanese for the art of block- printing, nor for that of printing with movable types.

In Europe, as late as the second half of the 14th century, every book and every public and private document was written by hand; all figures and pictures, even playing cards and images of saints, were drawn with the pen or painted with a brush. In the 13th century there already existed a kind of book trade. The organization of universities as well as that of large ecclesiastical establishments was at that time incomplete, especially in Italy, France and Ger- many, without a staff of scribes and transcribers (scriptores), illuminators, lenders, sellers and custodians of books (stdtionarii librorum, librarii), and pergamenarii, i.e. persons who prepared and sold the vellum or parchment required for books and docu- ments. The books supplied were for the most part theological, legal and educational, and are calculated to have amounted to above one hundred different works. As no book or document was approved unless it had some ornamented and illuminated

'Passavant, Le Peintre-Graveur, i. 18 (Leipzig, 1860-1864); John Jackson, Wood Engraving (London, 1839) ; Bruno Buchcr, Gesch. der iechn. Kiinste, I. p. 362 seq.

2 See Ern. Satow, " On the Early History of Printing in Japan," in Trans. Asiat. Soc. of Japan, x. 48 seq. ; and Stan. Julien, " Documents sur l'art d'imprimer," &c, in Journ. Asiat., 4 mo ser., vol, ix. p. 505.

initials or capital letters, there was no want of illuminators. The workmen scribes and transcribers were, perhaps without exception, calligraphers, and the illuminators for the most part artists. . Beautifully written and . richly illuminated manuscripts on vellum became objects of luxury which were treasured by princes and people of distinction. Burgundy of the 15th century, with its rich literature, its wealthy towns, its love for art and its school of painting, was in this respect the centre of Europe, and the libraries of its dukes at Brussels, Bruges, Antwerp, Ghent, &c, contained more than three thousand beautifully illuminated MSS.

In speaking of the writing of the manuscripts of the 15th and preceding centuries it is essential to distinguish in each country between at least four different writing. classes of writing, two of which must be again subdivided into two classes.

I. The book hand, that is, the ordinary writing of theological, legal and devotional books, used by the official transcribers of the universities and churches, who had received a more or less learned education, and consequently wrote or transcribed books with a certain pretence of understanding them and of being able to write with greater rapidity than the ordinary calligrapher. Hence they produced two kinds of writing : (a) the current or cursive book hand, of which several illustrations are given in Wilh. Schum, Exempla Codicum Amplon. Erfurtensium; the volumes of the (London) Palaeogr. Society, &c. Quite distinct from this current writing, and much clearer and more distinct, is (6) the upright or set book hand, which was employed not only by writers who worked for universities and churches, but also by persons who may be presumed to have worked in large Cities and commercial towns for schools and the people in general without university connexion. (2) In the church hand (Gothic or black letter) were produced transcripts of the Bible, missals, psalters and other works intended for use in churches and private places of worship and devotion. This writing we may again subdivide into two classes : (a) the ornamental or calligraphic writing; tound exclusively in books intended for use in churches or for the private use of

wealthy and distinguished persons, and (6) the ordinary upright or set church hand, employed for less ornamental and less expensive books. (3) The letter hand may be said to be intermediate between the set literary book hand and the set literary church hand, and to differ but little from either. It was employed in all public documents of the nature of a letter. (4) The court or Charter hand was used for charters, title-deeds, papal bulls, &c. 3

These different kinds of writing served again, in the first instance, as models for cutting the inscriptions and explanatory texts that were intended to illustrate and explain the figures in blockbooks, and afterwards as models for the types used in the printing of books and documents.

Dypold Laber (Lauber), a teacher and transcriber at Hagenau in Germany, is known to have carried on a busy trade in manuscripts about the time of the invention of printing. His prospectuses * in handwriting of the middle of the 15th century announce that whatever books people wish to have, large or small, ” geistlich oder weltlich, hiibsch gemolt,” are all to be found at Dypold Lauber’s the scribe. He had in stock Gesta Romanorum, mit den Viguren gemolt ; poetical works (Parcival, Tristan, Freidank) ; romances of chivalry (Der Witfarn Ritter; Von eime Getruiven Ritter der sin eigen Hertze gab umb einer schonen Frowen willen; Der Ritter unter dent Zuber); biblical and legendary works (A Rimed Bible; A Psalter, Latin and German; Episteln und Evangelien durch das J or; Vita Christy; Das gantze Passional, ■winterteil und summerteil; devotional books (Bellial ; Der Selen Trost ; Der Rosenkrantz ; Die zehn Gebot mit Glosen ; Small Bette-Biicher) ; and books for the people (Gute bewehrle Artznien-Bucher; Gemolte Loss-Bucker, i.e. fortune-telling books; Schachtzabel gemolt), The lower educational books consisted for the most part of the Abecedaria, containing the alphabet, the Lord’s Prayer, the creed, and one or two prayers; the Donatus, a short Latin grammar extracted from the work of Aelius Donatus, a Roman grammarian of the 4th century, and distinctly mentioned in a school ordinance of Bautzen of 1418; the Doctrinale, a Latin grammar in leonine verse, compiled by Alexander Gallus (or De Villa Dei), a minorite of Brittany of the 13th century; the Summula logica of Petrus Hispanus (afterwards Pope John XXL), used in the teaching of logic and dialectics ; and

Dionysius Cato's Disticha de Moribus, and its supplement called Facetus, with the Floretus of St Bernard, used in the teaching of morals. As helps to the clergy in educating the lower classes, and as a means of assisting and promoting private devotion, there were picture books accompanied with an easy explan- atory text, for the most part representations of the mystic relation

3 See further Palaeography.

4 An original copy of one of them is in the British Museum (Addit. MS. 28752).

between the Old and New Testaments (typology). Among these books the Biblia pauperum 1 stands first. It represents pictorially the life and passion of Christ, and there exist MSS; of it as early as the 13th century, in some cases beautifully illuminated. 2 A richly illuminated MS. of it, executed in the Netherlands c. 1400, is in the British Museum (press-mark, King's 5), and also fragments of one of the 14th century (press-mark, 31,303). A remodelling and development of this work is the famous Speculum humanae salvationis, of which we shall speak when dealing with the block- books and early printed books. It was written in rhymed prose before 1324, and represents, in forty-five chapters, the Bible history of the fall and redemption of mankind interwoven with Mariolatry and legend. Of this work alone more than 200 MSS., illuminated or without pictures, are known to exist in various libraries of Europe. The National and Arsenal Libraries in Paris each possess one written some time after 1324; the British Museum has sixteen MSS. of it (eleven of which are illuminated) of the 14th and 15th centuries, written in the Netherlands, Germany, France and England, one (press-mark, 16,578) bearing the distinct date 1379 and another (press-mark, Egerton, 878) that of 1436. A work of a similar nature is the Apocalypsis, of which at least two recensions

with illustrations may be pointed out. One gives the text as we know it, with or without commentary, for which cf. Brit. Mus. 17,333 (French), 18,633 (French, but written in England), Reg. 2 D. xiii. and 22,493 (French) — all four early 14th century. Another is more a short history or biography of St John, but the illustrations follow those of the former work very closely; cf. Brit. Mus. 19,896 (15th century, German). It is this last recension which agrees with the blockbook to be mentioned hereafter. Other devotional works are the Ars Moriendi, the Antichrist and other works which will be mentioned below among the blockbooks.

Block-printing or Xylography. — When all this writ- ing, transcribing, illustrating, &c, had reached their period of greatest development, the art of printing from wooden blocks (block-printing, xylography) on silk, cloth, vellum, paper, &c, made its appearance in Europe. This art was already a great advance on writing, in that it enabled any one with a few simple tools to multiply impressions from any block of wood with text or pictures engraved on it, and so produce a number of single (paper) leaves or sheets with text or pictures printed on them in almost the same time that a scribe produced a single copy of them.

It seems to have been practised, so far as we have evidence, on cloth, vellum and other stuffs as early as the 12th century (Weigel, Anfdnge, i. 10); and on paper as far back as the second half of the 14th century; while it began to be largely employed in the early part of the 15th all over Germany, Flanders and Holland in the production of (1) separate leaves (called briefs, from breve, scriptum), containing either a picture (jirint, prent, shortened from the Fr. emprint, empreinte, and already used by Chaucer, C.T. 6186, six-text, D. 604, printe, prente, preeiite, and in other early English documents; also called in colloquial German Helge, Helglein, or Halge), or a piece of text, or both together; and of (2) whole sheets (two leaves), a number of which, arranged like the MSS. in quires or gatherings, formed what are called ” blockbooks,” sometimes consisting of half picture and half text, or wholly of text, or altogether of picture.

The earliest dated woodcut that we know of is the Mary engraving, discovered at Malines, and now preserved in the

Brussels Royal Library. It bears the date mccccxviii. Some authors Early dated have asserted that an / has been scratched out between Wood- t j. e f ourtn c an(j t h e X ; that, therefore, the date is 1468.

Engravings. g ut t jj ere ; s no g rounc l f or suc h an assertion (cf. H. Hymans, L'Estampe de 1481, Brussels, 1903). A slightly modified reproduction of it, on a reduced scale, which could hardly be placed later than 1460, is preserved in the St Gall Library. The next date is 1423 found on the St Christopher, preserved in the John Rylands Library (Spencer collection) at Manchester. In the third place comes the woodcut of 1437 preserved in the Imperial Library at Vienna, which was discovered in 1779 in the monastery of St Blaise in the Black Forest, and represents the martyrdom of St Sebastian, with fourteen lines of text. The date, however, is said by some to refer to a concession of indulgences. A woodcut, preserved in the same library in Vienna, which represents St Nicolas de Tolentino, has the date

1 This title is applied to at least three works: (1) the well-known blockbook, of which we speak below, (2) a treatise " in qua de vitiis et virtutibus agitur," and (3) a work in rhyme by Alexander Callus.

2 See Laib and Schwarz, Biblia pauperum (Zurich, 1867).

1440, but written in by hand; as the saint was canonized in that year it may refer to that event. Another in the Weigel collection, repre- senting the bearing of the cross, St Dorothea and St Alexis, has the date 1443, also written in by hand, though the woodcut is con- sidered to belong to that period. These are the only known wood- engravings with dates ranging from 1418 to 1443. But there exist a good many woodcuts which, from the style of the engraving, are presumed to be of an earlier date, and to have been printed partly in the 14th and partly in the first half of the 15th century. J. D. Passavant (Le Peintre-Graveur, 1 860-1 864, i. 27 seq.) enumerates twenty-seven of them, all of German origin and preserved in various libraries in Germany; 154 are recorded in the Colleclio Weigeliana (vol. 1., 1866), and W.L. Schreiber {LaGravure sur bois, vols. i. and ii., 1891 and 1892) enumerates over 2000 of theni, some of which may be ascribed to the

Netherlands, exx.g. (1) representing the Virgin Mary, with Flemish inscriptions in the museum in Berlin; (2) representing the Virgin Mary (see above) in the library at Brussels ; (3) representing St Anthony and St Sebastian, in the Weigel collection (now in the Brit. Mus.); (a) a St Hubert and St Eustatius, in the royal library at Brussels; (5) representing the Child Jesus, in the library at Berlin; (6) the Mass of St Gregory, with indulgence, in the Weigel collection (cf. 1, 195), now at Nuremberg.

In these blocks, as in wood-engraving now, the lines to be printed were in relief. The block, after the picture or the text had been engraved upon it, was first thoroughly wetted with a thin, watery, pale brown material, much resembling distemper; then a sheet of damp paper was laid upon it, and the back of the paper was care- fully rubbed with some kind of dabber or burnisher, usually called a frotton, till an impression from the ridges of the carved block had been transferred to the paper. In this fashion a leaf or sheet could only be printed on one side (anopisthographic) ; and in some copies of blockbooks we find the sides of the leaves on which there is no printing pasted together, so as to give the work the appearance of an ordinary book. Any one wanting to set up as a printer of briefs or books needed no apparatus but a set of woodblocks and a rubber. We know only three blockbooks which do not possess this characteristic, as the Legend of St Servatius in the royal library of Brussels, which may be called a xylo-chirograph (see below), in which the pictures occur on both sides of the paper (with some lines of text written underneath), but apparently impressed by hand from blocks without any rubbing, there being no traces of any indentures either on the rectos or the versos; Das ZeitglbcHein in the Bamberg Library (cf. Falkenstein, p. 49) ; Das geistlich und weltlich Rom, in- the John Rylands Library (Spencer collection) and at Gotha (cf. Falkenstein, p. 46) ; but these belong to the end of the 15th century r and therefore to a later period than the ordinary blockbooks;

Formerly it was the general opinion that playing cards had been the first products of xylography ; but the earliest that have been preserved are done by hand, while the printed cards date from the 15th century, therefore from a off 4 * period in which woodcuts were already used for other Printers. purposes. Some of the wood engravings and

blockbooks are sup- posed to have been printed in monasteries. In a necrology of the Franciscan monastery at Nordlingen, which comes down to the beginning of the 15th century, this entry occurs: “VII. Id. AugUsti, obiit Frater h. Luger, laycus, optimus incisor lignorum ” ; and on some of the engravings we find the arms of certain monasteries, which may, however, merely mean that they were printed for, not in, those monasteries. The registers of Ulm mention several wood- engravers (formschneider) — in 1398 a certain Ulrich ; in 1441 Heinrich Peter von Erolzheim, Joerg, and another Heinrich; in 1442 Ulrich and Lienhart; in 1447 Claus (Nicolas), Stoffel (Christopher) and Johann; in 1455 Wilhelm; in 1461 Meister Ulrich, &c. In a register of taxes of Nordlingen we find from 1428 to 1452 a certain Wilhelm Kegeler mentioned as brief trucker; in 1453 his widow is called oft brief ‘truckerin ; and in 1461 his brother Wilhelm is registered for the same craft. At Mainz there was a printer, Henne Cruse, in 1440. At Nuremberg we find in 1449 Hans (Spoerer?), a formschneider, while his son Junghans exercised the same industry from 1472 to 1490. Hans von Pfedersheim printed at Frankfort in 1459 ; Lienhart Wolff, priefdrucker, is mentioned in the registers of Regensburg oi 1463 ; Peter Schott at Strassburg in 1464. A certain George Glocken- don exercised the same trade at Nuremberg till 1474, when he died and was succeeded by a son and afterwards by a grandson. In Flanders a Jan de Printere was established at Antwerp in 1417; and printers and wood engravers (houle bildsnyters) worked there in 1442 {Privileges of the Corporation of St Luke at Antwerp). At Bruges printers and beeldemakers (makers or engravers of images) were enumerated in 1454 among the members of the fraternity of St John the Evangelist. The printers of playing cards seem to have constituted a separate class.

All these entries show that long before the middle of the 15th century there were men who exercised the art of wood-engraving and printing as a trade or craft. It seems also certain that wealthy persons and religious institutions were wont to possess sets of blocks, and, when occasion arose, printed a set of sheets for presentation to a friend, or in the case of monasteries for sale to the passing pilgrim. A printer of briefs or blockbooks had no need to serve an apprenticeship;

any neat-handed man could print for himself. We learn from the inventory of the possessions of Jean de Hinsberg, bishop of Liege (1410-1455), and his sister, a nun in the convent of Bethany, near Mechlin, that they possessed ” unum instrumentum ad imprimendas scripturas et ymagines, ” and ” novem printe lignee ad imprimendas ymagines cum quatuordecim aliis lapideis printis.” These entries would seem to indicate that people purchased engraved blocks of wood or of stone from the wood-cutter rather than books from a printer.

Concurrently with these single woodcuts, with or without written or xylographic text, arose a class of books, in some

of which written texts were added to pictures chirographs, printed from wooden blocks; in others the text was

written first, and woodcuts pasted or printed in spaces reserved for them. These books, combining wood-engraving with handwriting, are now in technical language called xylo-chirographs (wood-handwritten books); they may also be called semi-blockbooks, and form an intervening stage between the manuscript book and the blockbook (xylograph) entirely printed from wooden blocks. They tend to show that xylography, after having been for some time confined to the production and multiplication of insulated pictures, was gradually applied to the printing of whole series of illustrations, to be added to written texts, or to have written texts added to , them. It is not possible to assign definite dates to these xylo-chirographs; they could hardly be placed after, but may, for ought we know, be contemporaries of the blockbooks. We know nine of them; the years 1440 (which occurs in No. 5) and 1463 (found in No. 9) marking, for the present, the period within which they can be placed.

(1) Biblia Pauperum, in the Heidelberg University Library, German work, MS., Latin text added to engravings (cf. Schreiber, Manuel, iv. 90, c. 1460; photogr. pi. xlv.) ; (2)

Anti-christus, one part of which is in the Paris Bibl. St Gen. (see Bernard, Orig. de I'impr. i. 102), another at Vienna, Alb. Bibl.; Bavarian work, MS., German text added to engravings (Schreiber iv. 231, pi. Iv.); (3) Vita et Passio Jesu Christi, 48 leaves, in the Vienna Hofbibliothek, German work, the woodcuts printed on the versos, Latin prayers written on the rectos (Schreiber iv. 321, c. 1450, pi. lxxxx.) ; (4) Septem planetae, seven xylographically printed plates in the Berlin K. K. Library, German work, with German explanatory text written on separate leaves facing the engravings (Schreiber iv. 417, c. 1470, pi. cxi.) ; (5) Pomerium spirituale, by Henricus de Pomerio (or Henri Vanden Bogaert), in the Brussels Royal Library, bearing the date 1440 in two places; its twelve engravings seem to have originally been published as a blockbook, without any text (see below) ; l in this copy they are cut up, pasted on other (contemporary) leaves of paper, and a Latin MS. commentary added to them (see Alvin, Documents iconogn; Schreiber iv. 317, pi. lxiv. ; Conway, Notes on the Exercitium super Pater Noster; Holtrop, Mon. typ. p. 9). Some bibliographers unreasonably contend that the engravings cannot be earlier than c. 1470, and that the year 1440 is the date of the original, now lost, which the transcriber of this copy inadvertently repeated. (6) Exercitium super Pater Noster (ascribed for good reasons to the same Henri Vanden Bogaert) ; imperfect copy (8 leaves) in the Paris National Library (Invent. D. 1581); woodcuts printed on the recto of each leaf, and an explanatory text (in Flemish) written underneath them (Schreiber iv. 245, pi. lxxxvii. ; Conway, I. c); (7) the same Exercitium, with the same eleven engravings that were issued, some time before, as a complete blockbook (see below), a copy of which is preserved in the public library at Mons, in which the engravings are cut up and (after the Flemish verses of the block- book had been cut away) pasted, with their versos, on the versos of other contemporary leaves, with an explanatory (Latin) text written 0.1 the recto of the leaf next to each engraving (Schreiber iv. 247, pi. lxxxviii. ; Conway, /. c. ; (8) a MS. of the Speculum humanae salvationis, with the written date 1461 (Munich Hof.-u. Staatsbibl. cod. lat. 21543), m which the 192 illustrations, usually found in the MSS. of the Speculum, have been impressed from small wooden blocks in the spaces reserved for them in the MS. ; (9) another MS. of a German version of

the Speculum in the same Munich library (Cod. Ger. 1126), with the written date 1463, in which the 192 woodcut illustrations, impressed in No. 8, are again impressed in the spaces reserved. for them.

Of blockbooks of probable German origin the following are known: —

1. The Apocalypsis, or Historia S. Johannis evangelistae ejusque visiones apocalypticae (Germ. Das Buck der haymlichen Offenbarungen

1 Dumortier testifies to having seen a copy of the engravings unaccompanied by MS. (" Notes sur l'imprimerie," in Bull. Acad. Roy. de Belg., 1841, vol. viii.).

Sanct Johans).—Of this work six or seven editions are said to exist, each containing 48 (the 2nd and 3rd edition 50) illustrations, on as many anopisthographic leaves, which seem to _. have been divided into three quires of eight sheets each, s

The first edition alone is without signatures. Cf. S. L. „?V v " a Sotheby, The Blockbooks, i. I. A copy of the 5th edition 0f «" ,> (according to W. L. Schreiber, Manuel, iv. 168), 48 leaves, is in the Cambridge University Library. A copy of the supposed 4th edition in the British Museum (C. 9, c. 1), and one of the 6th edition (IB. 14); also a single leaf (with signature H) of the 5th edition (IB. 16).

2. Ars moriendi. — Although the origin of this work must be as- cribed to the Netherlands, some authors think that there are early German editions, among others that spoken of below as the 2nd Dutch edition. Certainly German is the edition of Hans Sporer of Nuremberg (1473), in the public library at Zwickau, and a fragment of leaf 18, in the British Museum (IB. 20) ; another by Ludwigzu Ulm, in the Paris National Library, and the one described in Collectio Weigel. (ii. 16), where also other, but opisthographic, editions are described (see Sotheby i. 70; Schreiber iv. 253). A copy of one of these in the British Museum (IA. 24). A copy of an edition printed in a press and ascribed to Augsburg, in the British Museum (IB. 23).

3. Ars memorandi qualuor evangelia; 30 leaves, folio,

printed on one side, 15 leaves being letterpress and 15 plates (Sotheby ii. 2; Schreiber iv. 135). Copy in the British Museum (IB. 17).

4. Salve Regina, bears the name of its engraver, Lienhart czu Regenspurck; 16 leaves; 2 leaves (signature a) are wanting in the only copy known of it, which was in the Weigel collection (ii. 103) and is now in the British Museum (IB. 1) ; Schreiber iv. 381.

5. Vita et Passio Christi (German) ; 32 leaves, small 8vo. Two copies in the Paris Library (Sotheby ii. 143; Schreiber iv. 320, who describes other issues in German and Italian).

6. The Ten Commandments for Unlearned People (Die Zehn Bolt filr die ungelernte Leut).— Ten leaves in the library at Heidelberg bound upwith MS. No. 438; see Joh. Geffcken, Bildercatechismus (Leipzig, 1*855), 4to; Sotheby ii. 160; W. L. Schreiber iv. 234.

7. The Passion of our Lord; 16 leaves in the Weigel collection (Sotheby ii. 141 ; Schreiber iv. 320), now in the British Museum (IA. 25).

8. The Antichrist (Der Enndchrist) ; 26 leaves, small folio (Sotheby ii. 38; Weigel ii. m ; Schreiber iv. 217). Copies in the Manchester Rylands Library (Spencer collection) ; Coll. Weig. No. 264, leaf 6 and the upper half of 7 now in the British Museum, where also a fragment of leaf 28 is preserved ; four copies at Munich.

9. The Fifteen Signs of the Last Judgment; 12 engravings, usually bound up with the engravings of The Antichrist (Sotheby ii. 42; Schreiber iv. 217). Copies as of No. 8. An edition was also pub- lished at Nuremberg in 1472 by Jung hannss Priffmaler (copy at Gotha).

19. Symbolum Apostolicum; small 4to, 7 leaves printed on one side only, containing 12 woodcuts. Cf. Sotheby ii. 148; also Schreiber iv. 239, who describes three editions: (1) at Vienna; (2) at Heidelberg; (3) with German inscriptions, at Munich.

1 1 . The Legend of St Meinrad ; 48 leaves. Copies in the libraries at Munich and Einsiedeln (Sotheby ii. 150; Schreiber iv. 385).

12. The Acht Schalkheiten, of which 8 leaves were in the Weigel collection (i. 112; Sotheby ii. 154).

13. The Fable of the Sick Lion; 12 leaves. Copies in the Berlin Museum, and in the Heidelberg Library (No. 438). Cf. Sotheby ii. 159, pi. lxxxvi. ; Schreiber iv. 444.

14. Defensorium Inviolatae Virginitatis b. Mariae Virginis; 16 leaves, folio, with the initials of the printer F(riedrich) W(althern) and the date 1470 on the first leaf (Schreiber iv. 368; Sotheby ii. 63). Copies in the British Museum (IB. 2) ; two at Paris ; three at Munich ; one at Berlin ; another at Stuttgart.

15. The same work, 27 leaves, large folio, 1471, with the imprint " Johannes eysenhiit impressor (at Regensburg) Anno ab incarnacois dnice M° quadringentesimo septuagesimo j° " (cf. Sotheby ii. 72; Schreiber iv. 374). Copies in the British Museum (IC. 4) at Berlin, Gotha, Manchester.

16. The Dance of Death (Dance Macabre; der Doten Dantz); 27 leaves; two editions; one in the library at Heidelberg; another at Munich (cf. Schreiber iv. 432; Sotheby ii. 156).

17. Die Kunst Ciromantia of Dr Johan Hartlieb (Sotheby ii. 84; Schreiber iv. 428). Ten leaves of the edition of Jorg Schapff of Augsburg c. 1478 in the British Museum (IB. 8).

18. Der Beichtspiegel or Confessionals ; 8 engravings (Sotheby ii. 145; Schreiber iv. 252). Copy in the royal library (Mus. Meerman) at the Hague.

19. Exercitium super Pater Noster, only one leaf (the first) pre- served at Kremsmiinster, of a German edition (Schreiber iv. 247). For two xylo-chirographic issues of this Netherlandish work, see above, and below for a xylographic edition.

20. Biblia Pauperum, German text; copy in the British Museum (IB. 3); and a copy of another edition (40 leaves) with the device of Hans Spoerer, and the date 1471 (IC. 5).

21. The Apostles' Creed; 7 leaves, folio. Copy at Wolf enbiittel.

22. The Credo, in German; 12 leaves, 4to. Copy in the Munich Royal Library.

23. Propugnacula, sen Tunis sapientiae (Sotheby ii. 164). One sheet, piano, in the British Museum (IC. 30). It may have originated in the Netherlands.

Blockbooks of Netherlandish origin are: —

1. Apocalypsis S. Johannis. — Copy in the Haarlem Town Library.

A copy of the 3rd (?) edition, of 50 leaves, in the British Museum

(IC. 40), the leaves 36 and 38 having been supplied from

Ot Nether- anot ˆ eT copy . Leaf 21 of another copy in the same

’” a . d ‘ sh library.

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signature: a to v, .a. to .v.). As many as seven editions have been distinguished by Sotheby (i. 43), Holtrop (Mon. typ. p. 3), and ten by Schreiber (iv. 1), who likewise mentions a Latin edition of 50 leaves, besides the two editions with German texts of 1470 and 147 1. The British Museum Catalogue of 15th-century books enumerates copies or fragments of copies of seven editions.

3. Speculum humanae salvationis. — Of this work a blockbook must have existed, of which only 10 sheets (=20 leaves) with woodcuts and texts, besides 12 isolated woodcuts (used in 1483), have come down to us. We speak of it at length below when dealing with the typographic editions known of this work.

4. Ars moriendi; 24 leaves, small folio, 13 containing text, II plates. See above (German) No. 2 ; Sotheby i. 69 ; Holtrop, p. 8 ; Schreiber iv. 253, who enumerates ■ thirteen editions,

some of which are German. l The theory, started a few years ago, that the engravings of this blockbook are imitations of the sketches by the master E. S. (see M. Lehrs, Der Kunstler der Ars moriendi, 1890; L. H. Cust, The Master E. S., 1898) is wholly inadmissible. Copy in the British Museum (IB. 18), and an imperfect one in the Haarlem Town Library.

5. A copy of another edition of 24 leaves in the British Museum (IA. 19).

6. Canticum Canticorum; Histona sett Providentia B. Virginis Mariae ex Cantico Canticorum; 16 leaves in folio, two editions (Sotheby i. 77; Holtrop, p. 6; Schreiber iv. 151). Copies in the Haarlem Town Library (wanting the leaves 3, 4, 7, 11, 13, 15, 16); the British Museum (IB. 46), which possesses also a copy of another edition (IC. 47).

7. Liber Regum, seu Historia Davidis; 20 leaves, folio (Sotheby i. I20 b ; Schreiber iv. 146). Some consider this to be a German work.

8. Exercitium super Pater Noster, by Henricus de Pomerio or Henry Vanden Bogaert; 10 leaves, small folio (Sotheby ii. 137; Holtrop p. 10; Conway, Notes on the Exercitium, 1887; Schreiber iv. 245). For other editions see the two preceding sections.

9. Pomerium Spirituale, by the same author as No. 8; 12 leaves, having 12 woodcuts. This blockbook is now only known from a xylo-chirographic issue with the MS. date 1440 (see above), pre- served in the Brussels Royal Library. See Conway, Notes on the Exercitium.

10. Temptationes Demonis lemptantis hominem de septem peccatis morlalibus; a single large folio leaf printed on one side (Sotheby i. 122"; Schreiber ii. 249). One copy in the British Museum (IC. 29), another in the Wolfenbuttel Library.

11. Vita Chrisli, or The Life and Passion of Christ; 36 cuts, originally printed in a press on six anopisthographic leaves, in 8vo. Copy in the Erlangen Library (Campbell, Annates, 746).

12. Historia Sanctae Crucis; a fragment of one leaf (with signature g), formerly in the Weigel Collection (ii. 92), but now in the museum at Nuremberg; it seems to be only a proof-sheet.

13. Alphabet (grotesque) in figures (Holtrop p. II ; Sotheby i. 122; Schreiber ii. 324-327). — There is one copy in the British Museum and another in the Basel Library, the latter having the date 1464 engraved on the letter A, which is mutilated in the Museum copy. A similar alphabet preserved at Dresden seems to be a copy made in Germany.

14. Donatus (Aelius) de octo partibus orationis. Leaf 6 of an edition c. 1500 of 16 leaves in the British Museum (IA. 48). For other xylographic editions of this work cf. Holtrop, Mon. typ.

Besides the works of Sotheby, Holtrop, Weigel, Schreiber, Lehrs, Cust, &c, quoted above, consult Sir W. M. Conway, The Woodcutters of the Netherlands in the 15th Century (Cambridge, 1884) ; Heinecken, Idee generate (Leipzig, 1771); J. Ph. Berjeau's Facsimiles of the Biblia Pauperum, Canticum Canticorum, Speculum (London, 1859- 1861), and idem, Catal. IllustrS des limes xylogr. (London, 1865); Dodgson, Cat. of Early German and Flemish Woodcuts in the" Brit. Mus.

Early Printing with movable Metal Types. — When the art of writing, and that of printing from wooden blocks (xylo-graphy), and all the subsidiary arts of illuminating, Haariem? decorating and binding manuscripts, books, pictures, &c, were at their greatest height, and had long passed out of the exclusive hands of the monasteries into the hands

Heinecken enumerates six editions, of which one has German inscriptions. See also an article by Guichard, in Bull, du Bibliophile (Paris, 1841).

of students and artisans, the art of printing with movable cast-metal types (typography) was invented. As to when, where and by whom this invention came about, a dispute ha been waged for more than four hundred years. It will be seen below that we must attribute it, as in our former edition, to Lourens Janszoon Coster, of Haarlem, and not to Johan Gutenberg, of Mainz.*

In saying this, we are aware that in the year 1900 (exactly four hundred years after the Cologne Chronicle had publicly started the dispute by saying that Gutenberg had ng aalms improved but not invented the art) Germany enthu-

otQermaoy. siastically celebrated the supposed 500th anniversary of his birthday. The speeches delivered on that occasion, after making faint allusions to the doubts and opposition of former times, all declared that, after the rediscovery of the Helmas- perger document of 1455, which could not be found in 1880 (Hessels, Gutenberg, pp. 99-101), it was impossible for any unbiased person to dispute Gutenberg's claims to the honour of the invention any longer.

In the same year a Gutenberg Museum was erected at Mainz to be a repository for anything connected with Gutenberg and printing; also a Society (Gutenberg-Gesellschaft) founded with the view of publishing any book that related, however remotely, to Gutenberg and his invention, to which the whole civilized world was invited to subscribe, as its object was to honour the genius who had conferred such an inestimable boon on mankind by his invention. As a first result, a " Festschrift " was published con- taining an historical introduction by Professor Hart wig; and articles on the first steps to typography (Schreiber); stamp-printing before Gutenberg and the Psalters of 1457, 1459, &c. (Falk); 15th-century printing in France (Labande) ; German printers in Spain and Portugal (Habler) ; German printers in Italy (Marzi) ; the coloured initials in Fust and Schoeffer's Psalter (Wallau) ; the Turkkalendar for 1455 (Wyss) ; the earliest spread of typography (Velke) ; also an elaborate pedigree of the family Gansfleisch (Schenk zu Schweinsberg), and an equally full account (by Schorbach) of all the documents related to Gutenberg. This " Festschrift " was followed by publications of the "Gutenberg Society": I. (1902) Die alteste Gutenberg type (Zedler); II. (1903) Die Donat- und Kalendar type (Schwenke); III. (1904) Das Maimer Fragment vom Weltgericht (Schrdder, Zedler, Wallau); IV. (1905) Das Maimer Catholicon (Zedler); V., VI., VII. (1908) Das Mainzer Fragment vom Weltgericht (Schroder) ; Die B a type im Schofferschen Missale Mogunt. v on 1403 (Zedler) ; Die Missal- drucke P. Schoffers und seines Sohnes Johann (Tronier) ; Zu den Biich- eranzeigen Peter Schoffers (Velke).

We admit the great value of these learned and painstaking publications, and those who have the time and patience to study the mass of material here brought together in a some- what bewildering fashion, will find their knowledge enriched on various subjects connected with early printing, but no proofs that Gutenberg invented it. It is clear from these books that their authors firmly believed from the outset that

Gutenberg invented printing, and printed nearly every book that appeared or can be placed before his death in 1468. Under this impression they always speak of him as the " great master," the " great genius," &c, and represent him, not as inventing printing by accident, but as conceiving, somewhere about 1436 or earlier, the idea of inventing it, and meditating from that moment over the problems which he had to solve. Consequently, our authors read a good deal between the lines of their documents, which we fail to find there, and in this way the texts of the docu- ments always show somehow that " the great master " is making or has already made his invention. For instance, the Strass- burg lawsuit of 1436-1439 is to them an unimpeachable proof that Gutenberg was secretly working there at printing and trying to solve his problems; when he is paying there, during the same time, a considerable sum in duties for large quantities of wine, we are told that he was then in good cir- cumstances; but when he borrows money in 1442, 1448, 1450 and i452,andis summonsed in 1455 for not repaying the two last loans, and prosecuted in 1457 for not paying the interest due on his first debt, it is all owing to his difficulties in working out the problems of his invention, though the documents themselves never allude to any " invention " and may be interpreted in quite a different way.

We proceed to examine the documents. The earliest mention and description of the new art is perhaps that in the Donatus issued

by Peter Schoeffer at Mainz before 1456, which, according to its colophon, was finished "Arte nova imprimendi seu caracterizandi (from character = letter) . . . absque calami exaratione." rte/i itlons Fust and Sc hoeffer said of the Mainz Psalter of 1457 that ofPrlntlair lt was f° rmeo ' by an " adinventio artificiosa imprimendi ac caracterizandi absque calami ulla exaratione." The colophon of the Catholicon of 1460 says that the book was printed " non calami, stili, aut pennae sutfragio, sed mira patronarum formarumque

concordia, proporcione, ac modulo." In 1462 Albrecht Pfister says that he had " gedrucket " the Four Histories. Fust and Schoeffer say of the Liber Sextus Decretalium, published in 1465, that it was completed "non atramento (" atramento communi ' in the Justinianus of 1468 and 1472), plumali canna neque aerea, sed artificiosa quadam adinventione imprimendi seu caracterizandi," which phrase they slightly varied in Cicero's Officio., issued in the same year: " non atramento, plumali canna neque aerea, sed arte quadam perpulcra." The edition of St Jerome's Epistles of 1470 is said to have been completed by an " ars impressoria," the Decrelum Graliani of 1472 by an " ars quaedam ingeniosa imprimendi," the Dyalogus of 1478 by an " ars magistra." We find further —" ars sancta " or " divina," " nova ars scribendi," " novum exscribendi genus prope divinum," " sculptoria archetyporum ars," " ars mirifica formandi," " ars excusoria," " nova imprimendi ratio," "ars pressurae," " chalcotypa ars," " chalcographia " (1472 and ' ' ' ' " " libraria im-

" prenten.

The early printers called themselves, or were called by others, " librorum prothocaragmatici " (Gramm. Rhythm., 1468), " impres- sores librorum," " exsculptor librorum " (Jenson, 1471), Printers. " c halcographus " (1473; Hain 13036), " magister artis impressoriae," " boeckprinter " ; and during the 16th century we find them still frequently called " chalcotypus " and " chalco- graphus."

The types were at first designated more by negative than positive expressions. In 1468 they were called " caragma," later on " car- acter" or "character," " archetipae notae " (1473; Types. Hain 13036), " sculptoria archetyporum ars," " chal-

cotypa ars," " formae, " artificiosissimae imprimendorum librorum formae." We soon hear also of the process and material by which they were produced. The Grammatica of 1468, published by Schoeffer, says that it was " cast " (sum fusus libellus). In 1471 " aeneae formulae " are spoken of; and Bernardus Cenninus and his son testify that they had printed the Virgil " expressis ante calibe caracteribus et deinde fusis Uteris " (with letters first cut into steel and then cast) . In 1 473 Friedrich Creusner at Nuremberg states that he had " cut " (sculpsit) the work of Diogenes (Hain 6192). Johan Zeiner of

Ulm says in 1474 that he had perfected a book, not with the pen, but with letters of metal (stagneis caracteribus). In 1474 Joh. Ph. de Lignamine speaks of " metallicae formae." In 1476 Husner of Strassburg represents the Nider as being printed with " letters cut of metal (litteris sculptis artificiali certe conatu ex aere)." Nicolas Jenson printed in 1480 with letters " cut and cast " (sculptis ac conflatis).

The word typographies seems to occur for the first time in 1488, in the preface of P. Stephanus Dulcinius Scalae to the Astronomicon w rd °f Manilius, printed in that year at Milan by Antonius

"Tvoo Zarotus; 1 in 1498 Erasmus uses it in a letter (dated mohv" Feb. 13) to Christianus, a Liibeck merchant; 2 and in 1517 F p y ' ' Johan Schoeffer applies the word to himself in the colophon of the Aeneas Sylvius published by him. But of the use of the word typographic no earlier instance is known than 1520, in which year Gerardus Noviomagus (= Geldenhaurius) in his Lucubratiuncula de Batavorum Insula (pref. to Nicol. Buscoducensis, dated 1520) says: " inventa Germanorum . . . bombarda videlicet, typographia, pyxis chartaque nautica " ; and Johan Schott, a printer of Strassburg, in the Geogr. Ptolem. published by him, describes his grandfather, johan Mentelin, as '^primus typographiae inventor." Gerardus, it may be added, borrowed the whole passage from Pet. Montanus (li. I Adag., published an. 1504), who has chalcographia instead of typographia. Meerman indeed 3 speaks of a use of the word typo- graphia (or at least of typographus) earlier than 1520, and refers to the preface of Bernardinus Veronensis in the edition of Tibullus, Catullus and Propertius published at Venice in 1493 by Symon Bevilaqua, " at least," Meerman adds, " as it (the preface) is read in the Annal. typogr. of Maittaire, i. 560, 2nd ed. ' But on page 560 Maittaire quotes the first two lines of Bernardinus's preface (till dicit) and then adds: " Graecis characteribus destitutus, typo- graphus necesse habuit hiatus in commentario hie illic relinquere," which is evidently Maittaire's own remark, not that of Bernardinus. The present writer at least has been unable to find such a passage in the Tibullus.

When we, for the moment, leave out of sight the question as to when, where, and by whom the art was invented, and

1 Maittaire, Annates Typogr. i. 508, note 1.

2 Opp. iii. col. 24.

8 Origg. Typogr. i. 32, note ex.

take our stand on well-authenticated dates in such printed docu- ments as have been preserved, we find that the first printed date, 1454, occurs in two different editions of the same letter of indulgence issued in that year by Pope Nicholas V. in behalf of the kingdom of Cyprus.

*These two editions bear no printer's name, nor the place of printing, but are distinguished respectively as the 31-line and the 30-line Indulgence. The one with 31 lines claims priority, 4 ˆ.. . from a chronological point of view, oyer the. one with Ind ° l f e S ' * 30 lines, because one of the sold copies that has been otl Jlj 4 preserved was issued at Erfurt on the 22nd of October 1454 (in the possession of Herr Ernst Fischer at Weinheim, Centralbl., 1909, p. 30); a second (in the Hanover Archives; Veroffentt. II. tab. i.) at Fritzlar on the 12th of November 1454; a third (in the Mus. Meerman, at the Hague) at Erfurt on the 15th of November 1454, &c, whereas of the 30-line Indulgence the earliest sold copy that has as yet come down to us was issued at Cologne on the 27th of February 1455, though it has the printed date mcccccliiii., which was altered with the pen to mcccccliiiij. In the 31-line Indulgence occur (a) a large church type used for the headings and commencing words of the absolutions, for the first word in the document and for the Christian name of the pope's legate; (6) a smaller text or brief type for the text ; (c) a large initial V and two large initials M, which slightly differ from each other. In the 30-line Indulgence occur (a) a large church type, used as in the 31-line Indulgence; (b) a smaller text or brief type for the text ; (c) a large initial U, and two large initials M differing from each other.*

These two different editions are usually regarded as having been printed at Mainz ; and, in the absence of any evidence to the contrary, we assume that such really was the fact. But we must ju a i„ at the same time conclude that about October 1454 prjntlnz there were at least two rival printers at work there: (1) the printer of the 31-line Indulgence, who may have been Johan Gutenberg, perhaps subsidized by Johan Fust; (2) the printer of the 30-line Indulgence, who was no doubt Peter (Schoeffer). de Gernssheym, as this Indulgence is connected with one of 1489 printed by him. Four written copies of this

1454 Indulgence are known to exist which respectively bear the dates: Frankfurt, 10th April 1454 (in the possession of Herr Lais, Wiesbaden) ; Frank- furt, nth April 1454 (Frankfurt Archives); nth July 1454 (place unknown; Darmstadt archives); Liibeck, 6th October 1454. As their dates precede by a few weeks only the earliest known date (Oct. 22, 1454) on a printed copy, they mark, perhaps, the exact time when printing made its appearance at Mainz, in an already advanced state of perfection.

Basing ourselves on the above Indulgences with their printed date, and four different types, we subjoin two lists of the books which the German bibliographers of the present day regard as having all been printed by Johan Gutenberg at Mainz, in the types or " developments " of them, employed for these Indulgences. They are arranged in two columns (A and B) according to types, but without regard to strict or supposed chronology. For further details cf. Hessels, Gutenberg (1882), p. 150 sqq.; Schwenke, Berlin Festschr. (and in the Veroffentt. of the Mainz Gutenberg-Gesellsch.); Zedler (Gulenberg-Forsch. and in the Veroffcntl.), &c.

A.

Types: I (large church type, also called the 36-line Bible type) and II (smaller brief type), used by an unknown printer, not later than October 1454.

i. 3 1 line Indulgence; three different issues (A, B, C), with the printed year mcccclliiii., and one issue (D) with the printed year mcccclv. All printed on vellum. Of issues A and B no sold copies have yet come to light; but three unsold copies of each are preserved at Brunswick, Wolfen buttel and Hanover (Culemann coll.). Of issue C ten sold copies are known to exist in various libraries with dates ranging from the 22nd of October 1454 to April 1455, besides three unused copies. Of issue D ten sold copies with dates from the 7th of March 1455 to the 30th of April 1455 and four unused copies are known.

B.

Types. Ill (large church type, somewhat smaller than Type I, also called the 42-line Bible type) and IV (a smaller brief type), used by Peter Schoeffer de Gernssheym (1454-1455).

i. 30-line Indulgence; one issue (A) with the printed year mccccliiii., and two issues (B, C) with the printed year mccccl-

Suinto. All printed on vellum, if issue A only one copy has been discovered (now in the Rylands- Spencer Library) , which was sold at Cologne on the27th of February 1455, the printed date mccccliiii having been altered with the pen to mccccliiiij. Of issue B two sold copies, with dates April II and 29, 1455, are in ,the Berlin Library and the British Museum. Of issue C a sold copy with date April 24, 1455 is at Wolfen- buttel.

4 No inferences can be drawn from this priority, as it merely rests on the date of a sold copy that has come to light.

HISTORY]

A (contd.).

Type I continued; for type II. (of which no further trace is found) see below.

ii. Poem on the " Weltge- richt." Fragment of one leaf (paper), discovered at Mainz about 1892, preserved in the Gutenberg Museum at Mainz; presumed to have been printed

c. 1443-1444-

iii. Donatus, 27 lines. Frag- ments of 4 vellum leaves (4, 5,

8, 9) recently discovered in the Heiligenstadt Library, and now

E reserved in the Berlin Royal ibrary.

iv. Donatus, 27 lines. Two rubricated vellum leaves (5 and 10) of an edition of 14 leaves, usually called the Donatus of 1 45 1, preserved in the Paris National Library.

v. Donatus, 27 (?) lines. Two strips of vellum leaves, containing the remains of 3 lines and about 30 mutilated letters, discovered in the Heiligenstadt Library, and now in the Berlin Royal Library.

vi. Astronomical Kalendar, said to be for the year 1448, therefore supposed to have been printed at the end of 1447. Fragments of two large vellum rubricated sheets, printed on one side, discovered in 1901 in the binding of a MS. belonging

to the monastery of Schonau, near Mainz, now preserved in the Wiesbaden Landesbibliothek.

vii. Donatus of 18 leaves, 26 lines, on vellum; of which 2 rubricated sheets (4 leaves, 1, 2,

9, 10) are preserved in the Berlin Royal Library; probably issued between 1447 and 1450 (Cen- tralbl. xxvii. 65 sqq.).

viii. Manung wilder die Dur- ken. An almanac for January 1455, in 4to, 5 paper leaves, 20 and 21 uneven lines. A unique copy, discovered at Augsburg, now in the Munich Hof Library.

ix. A German translation of the bull of Pope Calixtus III., dated XII. Kal. Julii (= Jun. 20) 1456. Fourteen rubricated leaves 4to, in the Kalendar type, except that two of the capital E's belong to the B 36 type (13b and 14 blank), pre- served in the Berlin Royal Library; not to be ascribed to P. Schoeffer {Centralbl. xxvii. 63).

x. Conjunctiones el opposi- tions solis et lunae (now called by German bibliographers Laxier-Kalendar). A calendar for 1457, a broadside parJer sheet, printed on one side, of which the upper half of the only copy known, discovered at Mainz, is in the Paris Library.

xi. Der Cisianus (not Cisla- nus) zu Dutsche. A broadside paper sheet, 36 lines, printed on one jide, with separate head- line. The Tross-copy mentioned in suppl. to Brunet's Manuel (1878, sub voce " Cisianus ") was bought in 1870 for the Cam- bridge University Library.

xii. Donatus, 27 lines, 14 vellum leaves, of which the British Museum possesses the leaves 4, 10 and 1 1 (entire) with fragments of the leaves 2, 6-9 and 13. A fragment of 6} lines

TYPOGRAPHY

5i5

B (contd.).

Type III continued (till about 1457; of Type IV no further trace is found).

ii. Donatus, of 35 lines, folio, printed, according to the colo-

phon, " per Petrum de Gernss- heym, in urbe Moguntina cum suis capitalibus."

iii. Bible of 42 lines (also called Mazarine Bible and re- ferred to below as B 12), printed before the 15th of August 1456, as the binder of the paper copy in the Paris Library states that he finished its rubrication on that day. Two volumes foho, 641 lea vesin2columnsof 42 lines each, though insomecopiesthecolumns of pp. 1 to 9 contain 40 lines only, while the 10th page has 2 col- umns of4ilineseach,thedifference in the number of lines making no difference in the space which they occupy. For other copies see Hessels, Gutenberg, p. 170; Dziatzco, Beitr. zur Gutenberg- frage (Berlin, 1889) ; Schwenke, Festschr., who has drawn up a list of all the copies known to be still in existence. The copy known as the Klemm copy, which was bought by the Saxon Government in 1886, and pre- sented to the " Deutsches Buch- gewerbemuseum " at Leipzig, has the year " 1453 " written in small Arabic numerals of 15th-century form at the bottom of the last leaf of the second volume. But this date is highly suspicious, for Klemm, who must have known its importance and high value, never mentioned it, though he described his copy three times, in 1883 and 1884.

iv. Donatus of 33 lines. Vel- lum fragment at Oxford, without printed initials.

v. Donatus of 33 lines. Vel- lum fragment at Paris, without printed initials; also three rubri- cated leaves (5, 6 and 8) in the Berlin Royal Library (Centralbl, xxvii. 68).

vi. Donatus of 33 lines. Leaf 1 (defective) on vellum, men- tioned in Ludw. Rosenthal's Cat. 105, No. 3, and purchased by the Berlin Royal Library, which has also acquired the leaves I and II (Centralbl. xxvii. 69.). The large Psalter initials are used for the initials of chapters.

vii. Donatus of 33 Hnes._ Leaf 1 (vellum) discovered in the Berlin Royal Library.

viii. Donatus of 33 (?) lines. Small fragment, discovered in the library at Giessen, of a vellum leaf, which Schwenke thinks may be the 10th of an edition which differs from Schoeffer's 35-line edition, and also from the Paris 33-line edition.

ix. Donatus of 26 lines. One defective vellum leaf, discovered in a Munich private library, and now in the Mainz Gutenberg Museum.

x. Donatus of 26 lines. One vellum leaf at Mainz, another at Hanover, a third in the British Museum.

xi. Donatusoi'H (?) lines, be- tween 1470 and 1477 (Schwenke).

A (contd.). in the Bodleian Library, and two small fragments discovered in the library at Heiligenstadt.

xiii. Donaius, 27 lines, which Schwenke calculates to have consisted of 14 vellum leaves, of which the leaves 6 to 9 are now in che Berlin Royal Library. ■

xiv. Donatus, 27 lines. Three strips of a rubricated vellum leaf 5 discovered in the Karls- ruhe Hol-Bibliothek.

xv. Donatus. 27 lines. One rubricated vellum leaf (6), in the Kalendar type, in the Berlin Library (Centralbl. xxvii. 62)

xvi. Donatus, 27. 28 or 30 (?) lines. Fragments of two vellum leaves of an edition of 12 (?) leaven discovered in the binding of a book (printed at Milan in 1476) which formerly belonged to the Episcopal Library at Salzburg, and is now in the Munich Hof-Bibliothek.

xvii. Donatus, 27 (or 30?) lines. Vellum fragments of an edition of 12 (?) leaves in the British Museum (C. 18. e. 1 No. 5). Leaves 1 and 2 are in the Bodleian Library, and leaf 8 in the Mainz Town Library.

xviii. Donatus, 27 lines. Frag- ment of a vellum leaf (3?) dis- covered in the binding of a MS. in the Munich Hof-Bibliothek.

xix. Donatus, 27 lines. Two vellum fragments of the leaves 6+9, the upper part of which is preserved in the Bodleian Library (Auct. 2 Q infra I. 50 No. 6), the lower part in the Bamberg Royal Library (VI. F 1).

xx. Donatus, 28 (?) lines. One defective vellum leaf, showing 25 lines, formerly in the pos- session of Jacq. Rosenthal (In- cun. lyp. ii. No. 2154), afterwards in the Amherst collection (Hand- list No. 5). Another leaf in the Mainz Gutenberg

Museum.

xxi. Bible of 36 lines (referred to everywhere as B 36), 2 vols., folio, 882 leaves, with 2 columns of 36 lines each on a page. Some

bibliographers, assuming that _ –

Pfister printed it, call it the Pfister Bible. A paper copy of it is in the Paris Library, and also a separate copy of the last leaf, which bears the MS. date 1 46 1. Other copies are pre- served in the Rylands-Spencer Library, in the British Museum, at Jena, Leipzig, Antwerp, &c. (Hessels, Gutenberg, p. 160; Bernard, Origine, ii. 31).

The above eight types and the books printed with them (besides a few others printed by Albrecht Pfister at Bamberg) are the only ones that bear, more or less closely, on the question regarding the introduction, or possible invention, of printing at Mainz.

Till recently the church type 1, of the 31 -line Indulgence, had always been regarded as identical with that of B 36 , and the church type 3, of the 30-line Indulgence, with that of B 42 . But.'as the capital P of Indulgence 30 seems not to occur in B 42 , and on examination minute differences show themselves in other respects, identity be- tween the two types cannot be accepted. The use of the brief type 2 of Indulgence 31 seems to have been limited to printing this one document, as its great resemblance to the type employed at Eltville in 1472 for printing a Vocabularius ex quo, and Thomas Aquinas' Summa de articulis fidei, amounts not to identity. Nor has any further trace been found of the brief type 4 of the Indulgence 30 , so that the four types used for the two Indulgences were, perhaps, specially manufactured for them and discarded afterwards or melted down for other types.

B (contd.).

xii. Cantica ad Matutinas; only known from one vellum leaf (the first) in the Pans Library, considered to be the remains of a Psalterium. for the printing of which Humery may have furnished (!) the type (Schwenke Untersuch. p. 72 seq.). Judging from the leaf preserved, the work corresponds in every respect to the 42-line Bible, having double columns 42 lines.

&c.

Type V. — The " first stage " of Type VII., supposed by Otto Hupp (Ein Missale Spec.) and others to have served for printing (1) a Missale speciale, in the possession of Ludw. Rosenthal at Munich; (2) a Missale abbre- viatum discovered in 1900 in the Benedict Church of St Paul in the Lavantthale.

Type VI. — The large type for the Psalter of 1457.

Type VII.— The small type for the same Psalter (" second stage " of Type V). Types VI and VII were also used for the " Canon Missae "of 1458,3 copy of which is preserved in the Bodleian Library.

Type VIII used for (1) Joannis de Balbis Catholicon of 1460. Large folio, 373 leaves, with two columns of 66 lines each on a page; (2) Matth. de Cracovia, Tractatus racionis, 22 leaves with 30 lines to the page, 4to; (3) and (4) Thomas de Aquino, Summa de articulis fidei, two 4to editions, one of 13 leaves with 34 lines to the page; the second of 12 leaves with 36 lines to the page; (5) an Indul- gence of 1461 of 15 lines (see Hessels, Gutenberg, p.171 sqq.).

Hence there is nothing to connect these two broadsides with any locality or any printing-office, except that one of the initial M's of the Indulgence 30 re-occurs as the initial M of the second absolution of a 33-line Indulgence of 1489, which was unquestionably printed by Peter Schoeffer at Mainz, for " Raymundus Peyraudi archi- diaconus Alniensis in ecclesia Xanton," who issued it at the order of Pope Innocent VIII., " pro tuicione orthodoxe fidei contra Tur- chos. " For this reason types 3 and 4 and the books printed with them, including B 42 , must all be ascribed to him, all the more as he printed, with the type of B 42 , the 35-line Donatus, which bears his name in the colophon. As Schoeffer, in the colophon of this Donatus (ii.) which bears his name, says that it was printed " cum suis capitalibus," and as these capitals gradually disappear after 1459 and the type of the 42-line Bible is no longer found after 1456, we must presume that some of the twelve incunabula

mentioned above (in col. B) were printed by Peter Schoeffer alone before he entered (in 1457) into partnership with Johan Fust (see Hessels, Gutenberg, p. 166 seq.).

During the last two decades, however, the two types (3 and 4) and most of the books mentioned above in column B, including B 42 , together with the two types (1 and 2), and several of the books in column A, including B 36 , have been attributed by German biblio- graphers to Gutenberg. This singular proceeding is chiefly owing to the late Dr Dziatzko's treatises (Beitrdge zur Gutenbergfrage, 1889; Gutenberg's fruheste Druckerpraxis, 1890) on Gutenberg's supposed work as a printer. This author, noticing that the two types of B 36 and B 42 , their signs of contraction, marks of punctua- tion, &c, though differing in size, closely resemble each other in form, concluded that they were manufactured in one and the same office, by one and the same printer, that is, Gutenberg. He thought his conclusion confirmed by the two Bibles being printed on the same kind of paper showing the same watermarks, and arranged in quires in the same way, and divided off into parts at the same place. Finally, from a misprint in B 42 being rectified in the Stuttgart copy of B 36 by a cancel (Druckerpraxis, p. 95), he concluded: (a) that B 36 was a reprint of B 42 ; that the latter was printed by Gutenberg during his partnership (1450-1455) with Fust, who supplied the money and the material, while he himself superintended the manufacture of the type, instructed the compositor and printer, and therefore was its printer; and that the type came afterwards into Schoeffer's possession; (b) as B 42 was Gutenberg's first work, and had been begun in 1450, B 36 , a reprint of it, could not be dated before this year; but as its type already existed in 1454 (in the Indulgence 31), Gutenberg, foreseeing his quarrels with Fust, must have been preparing it since 1453, and have printed with it, first, some Donatuses, the Indulgence 31 , &c, and finally B 36 , with the technical and financial assistance of Albrecht Pfister who, shortly before 1458, acquired its type and printing-material (see further, Hessels, " A Bibliogr. Tour, " in The Library, July 1908). Dr Dziatzko, noticing also a " resemblance " between the types and the workmanship of the two Indulgences, attributed both these broadsides likewise to Gutenberg.

His conclusions, and the method of research by which he reached them, the German bibliographers of the present day have adopted and amplified into a bibliographical and typo-

graphical " system," which professes to examine minutely the form and size of every letter, capital or small; the combined letters like do and de cast on one type; the signs of contraction above, or by the side of or through certain letters, the marks ot punctuation, the habits and workmanship of the printer, the arrangement of the quires, the paper and its water-marks, &c.

The " system " divides the Gothic or Church types with which B 3C and B 42 and the other books mentioned above are printed into " chief " and " by-forms " (Haupt- und Nebenformen) . The tips and bottoms of the former are ornamented with minute pro- truding tags, angles and points, while the " by-forms " miss most of these ornaments, their limbs being straight on the left or right, so as to be easily joined to the protruding tags, angles and points of the " chief forms, " whenever the two come together. For instance, if a u or a t follows an e, the " by-form " of u with straight limbs was to be used, while the t was to be without its crossbar protruding on the left.

The bibliographers who deal with the incunabula enumerated above, in accordance with this " system," regard the books in which they find these chief and by-forms used in their proper places as the earliest, and therefore as the products of Gutenberg's " creative genius and skill," while they ascribe the books which bear evidence of the misuse of those forms to other printers, but their types to him. But this is an uncertain guide, as by errors in the distribution of the types after the printing cf the first or second pages this misuse may already occur in the third and further pages of a book. In this way, however, the

" system " arranges the books enumerated above in the following approximately chronological order: —

1443-1444. " First phase " of the Gutenberg type (= the Donatus type). The numbers ii., iii., iv. (with the suspicious date 1451) and v.

1447 (end of) till I457. " Second phase " of the same type (= the Kalendar type). The numbers vi. to xiv.

1450-1453. B 42 presumed to have been finished in or before 1453, taking this year, written in the Klemm copy, as genuine.

H53-. " Third phase " of Gutenberg's type, B 30 (xviii., of which the earliest known date is 1461).

1454. The two Indulgences with their types (1, 3 ; 2, 4).

1457. The two Psalter types.

1461, 1462 till (?). Pfister, who is said to have acquired the type of B 36 from Gutenberg, is known to have issued a book with the date 14 February 1461, and another with the year 1462. Hence, Schwenke says that the 36-line Bible type, which he regards as a "continuation " of the Donatus, and the Kalendar types, had a life of nearly 20 years (Verbffentl. ii. 1). Type v. is thought to be Gutenberg's earliest (before 1443!) by the few who regard the " Missale speciale " and the' " Missale abbreviatum "as his work.

The " Donatus type " is so called from the Paris Donatus, on one of whose leaves the year 1451 is written. Zedler, somewhat unrea- sonably, considers this date to be a forgery of Professor Bodmann, though he is known to have forged other Gutenberg documents. This type is regarded as the same as that of the Astronomical Kalendar, but in an earlier, more imperfect stagfe. As this Kalen- dar calculates the ephemerides of the sun, moon and stars, either for the year 1429 or for 1448 or 1467, it is presumed to have been printed for 1448, that is at the end of 1447, and as its type looks new and almost perfect, the Paris Donatus is placed considerably earlier because its type looks old. The poem on the " Weltgericht " (No. ii.) is said to show all the forms of the Donatus type, but as its workmanship looks primitive, it is dated back to 1443-1444. The Heiligenstadt Donatus (No. iii.) is placed after the "Welt- gericht " (ii.), but before the Paris Donatus (iv.) and the other Heiligenstadt Donatus (v.).

Some German bibliographers do not feel sure that Gutenberg manufactured types v., vi. and vii., though they have no doubt as to the remaining. Others are of opinion that Pfister printed some of the. books in the type of B 36 , Schwenke thinks this Bible could not have been begun before 1457, but all agree that every book in the above lists must have been printed either by Gutenberg himself, or in his office, or with his type, or under his superintendence.

Though the church type 1 cannot be said to be identical with

that of B 36 , and no further trace of the brief type 2 has been found, we see no reason for separating Indulgence 31 from Mainz printing. And assuming that it was printed there, its printer may have been Johan Gutenberg, who was at Mainz in 1454.

A peculiarity of the above-mentioned " system " is that it ascribes two types, so different in size, shape and form, as those of B 36 and B 42 , to one and the same printer, merely because they " resemble " each other. This shows that the " system " takes no account of the fact that the inventor of printing, and all the early printers who came after him, in manufacturing their types necessarily imitated the forms of the written characters of their time. Hence if two printers simultaneously erected their presses in one town, their types, though cut and cast indepen- dently, Were apt to resemble each other, as appears from various examples. The printers of B 36 and B 42 are no exception to this rule; they each' took a MS. as their model, and the types which they produced are simply imitations of the Gothic or Church hand, which, from its first beginnings in the 10th century, if not earlier, can clearly be traced down to, and reached its greatest development in, the 15th century. 1

The written characters of all ages and countries resemble and yet differ from each other in various respects ; and as their resemblances and differences are closely reproduced by the metal printing types of every country, we are able to ascribe MSS. as well as incunabula to definite countries, some manuscripts even to '. " schools, " a few even to definite scribes. But when two types differ in size and form, however slightly, and there is no evidence that they belonged to one and the same printer, some of their characteristics may justify us in ascribing both to the same country or town, but not to the same printer. It is, moreover, not safe to ascribe incunabula to one and the same printer on account of their similarity of the quires and divisions into volumes, their paper or water-marks (which Dziatzko observed in the two Bibles), as these particu- lars are nothing but a continuance of the MSS.

1 The Cambridge University Library possesses two folio volumes (press-mark] Dd. 7. I, 2), the writing of which, ascribed in the catalogue to 1490, resembles the types of B 42 with all its chief and by-forms so much, that at first sight they might be mistaken for copies of this Bible.

Nor is his evidence for saying that B 86 is a reprint of B 42 conclusive. The types of B 36 and B 42 may be ascribed to Germany, but as both are used for the printing of a Bible and editions of Donatus, it is improbable that the printer of B 42 and one set of Donatuses should manufacture, about the same time, another type for another Bible and another set of Donatuses. We have shown above that B 42 must, on bibliographical grounds, be ascribed to Peter Schoeffer at Mainz, and as he used its type for a book which actually bears his name, all the other books in the same type must be ascribed to him. It follows that B 36 and every other book in column A must be assigned to some other printer or printers.

Type v. is a Church type and resembles those of B 36 and B 42 , but it can have nothing to do with Gutenberg or the invention of printing, as it is not earlier than 1480-1490. Types vi. and vii., which are nothing but imitations of the written Psalters of the time, are employed for a work, the colophon of which distinctly mentions Fust and Schoeffer as the printers; hence they cannot be claimed for Gutenberg. Of the Catholicon type we speak below. Therefore the books numbered i. to xxi. in column A of the above list are the only ones about which there can be any doubt or discussion.

Here we encounter another peculiarity of the above-mentioned " system," which treats the three different types detected in these twenty-one works not as different, but as " phases " or " developments " of one and the same type, while the differences between them, and the absence or presence of certain forms of letters, are taken as guides for approximately dating the books, and for subdividing the type, hitherto known as the 36-line Bible or Gutenberg type, into three or more varieties. For instance, Schwenke (Centralbl., 1908, p. 74) explains that " the types b, c, i, s, t enable us to distinguish the earliest from the later elements in the Donatus type; the ' Weltgericht ' shows, at least of i and s, the old forms still unmixed. But in the Paris Donatus, the new forms appear by the side of the old forms, though the latter are already to a great extent superseded. The new (Heiligenstadt) Donatus comes between these

two works; it has chiefly the old b, which begins to a great extent to be absent in the Paris Donatus."

As we cannot regard types which differ in form as " developments " of one type, we must deal with three types in column A, that is (1) the so-called Donatus type; (2) the Kalendar type; (3) the 36-line Bible type, besides the two employed for the Indulgence 31 . Gutenberg's career, and the straightened cir- cumstances in which he appears to have lived, so far as they are known to us, make it difficult to ascribe them all to him.

More than thirty documents have come to light which enable us to trace Johan Gutenberg from 1420 to 1468. Dr Carl Schorbach has published nearly all their texts, with elaborate explanations, in the Festschrift zum 500 jaltr. Geburtstage von J. Gutenberg (suppl. to Centralbl. f. Biblioth., 1900, p. 163 sqq.), and they are further explained by Hessels {Gutenberg, was he the Inventor of Printing? 1886; idem, The so-called Gutenberg Documents, 191 1).

At least six of them are known to be forgeries, among them the " relics " of a printing-press with the date " 1441 " which were accidentally(I) discovered in 1856 in the " Hof zum Jungen " which had always been supposed to have been Gutenberg's first printing- office at Mainz, but which we now know not to have been the case. Assuming that the Gutenberg mentioned in the remaining docu- ments is no other than Henne (= Hans or Johan) Gensneisch — called Gutenberg from his mother (whose maiden name was Elsa Wyrich) having lived in the " Hof zum Gutenberg " at Mainz, where he is supposed to have been born about 1400 — he appears to have lived at Strassburg from 1436 (?) till the 12th of March 1444, in easy and somewhat luxurious circumstances, at least during the first three years, as he was then paying duties for large quantities of wine (about 1924 liter). But this prosperity does not seem to have continued, for on the 17th of November 1442 he borrowed 80 pounds Strassburg denarii (= about 4800 marks) from the Strassburg St Thomas Chapter, a Strassburg citizen, Martin Brechter, being his surety. From the 12th of March 1444 till the 17th of October 1448 there is no trace of him, but on the latter day he again borrowed, this time at Mainz, 150 gold guilders. Both these loans he never redeemed, nor is it known whether he ever paid any interest on his Mainz loan. But the account books of the Thomas Chapter, still

preserved in the Strassburg Public Archives, show that the interest of 4 pounds per annum on his loan of 1442 was regularly paid, by him or his surety, till 1457. The interest due in the latter year was also paid, but difficulties appear to have occurred before the Chapter received it, as there is an item in their account book for 1457-1458 of two shillings for

expenses, incurred by them for arresting Gutenberg and his surety. In and after 1458 no further payments were made; the Chapter had recourse to law, and made various efforts to arrest the defaulters, but in vain; and in 1474, six years after Gutenberg's death, the debt is no longer recorded in the Chapter's accounts. He can be traced at Mainz from 1450 (when he borrowed money from Fust) till the 21st of June 1457, when he is a witness at the conveyance of pro- perty in Bodenheim near Mainz. After this date we hear no more of him until the 17th of January 1465, when the archbishop of Mainz appointed him as his servant and courtier for life on account of the " grateful and willing service which he had rendered to himself and to his Stift, and will and may render in future. " The nature of this " service " is not stated. It has always been supposed that he was then residing at Eltville, the residence of the archbishop, and that he died there about or before the 26th of February 1468, on which day Dr Kunr. Humery received from the archbishop some " printing apparatus which belonged to him, and which he had lent to Gutenberg." But recent researches seem to have shown that Gutenberg remained at Mainz till his death, and was buried there.

Apart from the six forgeries, about which there is no dispute, Bockenheimer, a Mainz magistrate, explains (Gutenberg- Feier, Mainz, 1900) as forgeries also (1) the document of the 14th of March 1434, which represents Gutenberg as having at Strassburg arrested and released the secretary of Mainz for a debt which this city owed him; (2) a document of 1437 recording a breach of promise case between Gutenberg and a Strassburg lady; (3) the records of a Strassburg lawsuit between Gutenberg and some Strassburg citizens in 1439; (4) the Helmasperger notarial instrument of the 6th of November 1455, recording a lawsuit of Joh. Fust against Joh. Gutenberg.

The last two, and a third dated the 26th of February 1468, men- tioned above, are the only documents that can be said to connect Gutenberg with the art of printing. Various external and internal circumstances throw serious doubts on the

genuineness of the 1439 documents; but suppose they were genuine, they only show that Gutenberg had been engaged, with other Strassburg citizens, in " polishing stones " and " manufacturing looking-glasses," and promised to give instruction in " new arts.' A " press," however, is mentioned, and a clause reports that one of Gutenberg's witnesses, Hans Dunne, a goldsmith, had testified that he had earned nearly 100 guilders from Gutenberg, " merely for that which belonged to printing " (alleine das zu dem trucken gehbret). The document contains nothing to connect Gutenberg with the art of printing, except this line, which has clearly been added (as an afterthought) by a different hand from the one that wrote the two first lines of this witness's testimony, a circumstance which makes the whole document more than suspicious. Several theories, however, as to Gutenberg printing at Strassburg in or before 1439 have been built upon this document, and German bibliographers are even now expressing their hope of finding some day evidence of Gutenberg having printed Donatuses and other works in that town.

As to the notarial instrument of 1455, Bockenheimer suggests that as it contains absurdities which are contradictory to all the legal usages of the time, it may be a forgery of the Faust family, perhaps of Joh. Fr. Faust von Aschaffenburg (who pretended to descend from Joh. Fust, whom he called "Faust"), who appears to have possessed, in or about 1600, an " original " of the instrument. From this " original " are derived all the texts published before 1741. In that year, however, J. D. Kohler (Ehren-Rettung Joh. Guttenberg's, Leipzig) printed the text again from an " original " which is now in the Gottingen University Library (republished by Dziatzko, Beitrage, Berlin, 1889), and is perhaps identical with Faust von Aschaffenburg's " original." Though an analysis of the text brings out various incongruities as to the business relations between Fust and Gutenberg, it is difficult to look upon the Gottingen document as a forgery, and we deal with it here as genuine.

It is dated the 6th of November 1455, and records some of the proceedings in the lawsuit between Johan Fust (q.v.) and Gutenberg, which had taken place on that day in the convent of the Bare- footed Friars at Mainz, whereby the former sought to recover from Gutenberg 2026 guilders in repayment of 1600 guilders which he had advanced to him (800 about August 1450, and another 800 about December 1452), with the interest thereon. The document first relates that, on some

previous day (not stated), Fust had testi- fied (1) that by a written agreement between them, Gutenberg was to " finish the work " (line 24) with the 800 guilders to be ad- vanced to him at 6%; Fust being unconcerned whether it cost more or less. (2) Gutenberg had not been content with these 800 guilders, and Fust, wishing to please him, advanced him another 800 guilders at 6%. (3) He had himself borrowed this money, and as Gutenberg had never paid any interest, the principal sum and the interest thereon amounted to 2026 guilders (= between 15,000 and 16,000 marks), which he now demanded from him.

(4) On the same occasion Gutenberg had replied that Fust should have furnished him with 800 guilders, wherewith to make his " tools " (or apparatus; Germ. Geczuge), and he should be content with this money, and might devote it to his own use. ■ (5) Such tools should be a pledge to Fust. (6) The latter should also give him (lines 37 to 40) annually 300 guilders for maintenance and furnish workmen's wages, house-rent, parchment, paper, ink, &c. (7) If they did not agree further, he should return Fust his 800 guilders, and his tools should be free; but it was to be well understood that he should finish " such work " (line 41) with the money which Fust had lent him on his pledge, and he hoped that he had not been bound to Fust to spend such 800 guilders on " the work of the books " (line 41). (8) Fust had told him that he did not desire to take interest from him; nor had these 800 guilders all, and at once, come to him in accordance with the agreement. (9) Of the addi- tional 800 guilders he wished to render Fust an account; hence he allowed Fust no interest, nor usury, and hopes not to be legally indebted to him.

We assume, though it is nowhere stated, that these clauses re-late to the" printing of books," to be executed by Gutenberg with the money which Fust advanced to him. But as he was already in debt at Strassburg since the 17th of November 1442 (and had to pay annually interest on this debt) , and at Mainz since the 17th of October 1448 (also against interest), it is not surprising that when he contracted this fresh loan in 1450, at

the high rate of 6%, he (by not giving any security except, tools which he had still to make) practically admitted that he was penniless, and stipulated that Fust should give him also an annual sum for maintenance, and besides furnish workmen's wages, house-rent, parchment, paper, ink, &c, in fact everything required for setting up a printing-office and keeping it going. Fust seems not to have complied with these demands, otherwise he would have mentioned them'in his account and at the trial. But he ad- vanced another 80c guilders in December 1452, barely two years after his first advance, merely to please Gutenberg, who had not been satisfied with the first 800.

It is argued that Gutenberg must have been able to show Fust some specimens of his work to induce him to lend him so much money, and we have seen above that German bibliographers attribute to him a poem on the " Weltgericht, " which they date c. 1443- 1444, and the Paris Donatus which they date a little later, both printed, it is said, in the " first phase " of the " Gutenberg type," but showing already some traces of wear and tear; and thirdly, an Astronomical Kalendar (a broadside of 4 leaves) which they ascribe to the end of 1447, and regard as a " masterpiece " printed in a new type, said to be a " development " or " second phase " of the Gutenberg type, which must have been used for several years after- wards, till a fresh or " third phase " was cast of it (for B 36) with the alteration of some of the letters. But if Gutenberg had printed these three works in the years ascribed to them, however small they may be, he must be supposed to have had, from 1443 to 1448, types for printing them, and patrices and matrices for making his types, besides a press and various other tools for printing. Yet the notarial instrument of 1455, if it is genuine, reveals him as borrowing money, not so early as 1443, but so late as 1450, for " preparing his tools," and as having, at the time, nothing to offer his creditor as security except the tools which he still had to make(!). But, says one theory, Gutenberg, intending to print a Bible, and finding the type in his possession too large for it, manufactured a smaller one with the aid of Fust's money, while another theory would have it that he wanted to begin with the printing of a Missal, and for this purpose casted two types, one large and the other smaller. Difficulties, however, arose which induced him to use the smaller type for B 42 , which was finished about the beginning of 1453, and Dziatzko places the type of B 36 also in the year 1453, while Schwenke assigns a life of nearly twenty years

(1443-1462) to this type.

If, however, Gutenberg had cast all these types, and printed all these books, and sold them, straight from 1443 to 14.50, and from 1450 straight on to, say, 1455, he could not have done this without Fust : his money-lender, becoming aware of it, especially as Fust, for his first advance of 800 guilders, was to have received, as security, the " tools " which Gutenberg had to make before he could begin to print. Yet in 1455, fully five years after Fust had entered into such close financial relations with Gutenberg, he claimed, in spite of what he must have known of Gutenberg's supposed activity, the whole of the money which he had advanced, with interest and compound interest on it. And Gutenberg, instead of pleading on the first day of the trial that he had from 1450 to 1455 printed two large folio Bibles and a considerable number of other books, merely refers to the initial stages of his work, to " tools " to be prepared by him as a future pledge for Fust; he tells the judges that he had expected Fust to supply him with various necessaries for printing and his own existence, without saying whether Fust

had complied with his demands or not, and finally declares that he had not felt called upon to devote the first 800 guilders to the " work of the books " ; that he was ready to account for the second 800, but did not feel indebted to Fust either for interest or any- thing else, while, on the second day of the trial, he absented himself, and merely sent two of his workmen to hear what was going on (!). This does not look as if he had performed much from 1450 to 1455, but rather the reverse. Anyhow, if the Helmasperger instrument of November 1455 is not a fabrication, it shows that Gutenberg could not have begun to print before 1450; that in this year, 1450 (about August), when he borrowed money from Fust, he had no property such as a printing-office, presses, types, patrices, matrices, &c, which he must have possessed if he had been printing since 1443, to offer his creditor as security; had not a penny to maintain himself ; besides being already in debt at Strassburg since 1442, and at Mainz since 1448.

The remainder of the instrument records the verdict given on the first day of the trial which decided (1) when Gutenberg shall have rendered his account of all receipts and disbursements paid out by him on the " work for the use [or profit] of them both " (1. 49), whatever less 1 money he then

has received and taken in above it, that shall be reckoned in the 800 guilders ; (2) but if the account should show that Gutenberg had paid out more for Fust than 800 guilders which had not come in their common good [or use] (line 60) Gutenberg shall return it to Fust ; (3) and if Fust adduces by oath or by reasonable evidence that he has borrowed the above money on interest, and not lent it of his own money, then Gutenberg shall also pay such interest according to the tenor of the schedule.

The verdict is followed by Fust's sworn declaration regarding the amount of his claim, which he had been ordered to make in Guten- berg's presence, but which he now made in his absence, declaring

(4) that he had taken up 1550 guilders which Gutenberg had re- ceived and which also had gone on " our common work " (line 60) ;

(5) that he had annually given interest and loss, part of which he still owed; six guilders for every 100 guilders which he had thus taken up; (6) of all that Gutenberg had received of this borrowed money, which has not gone on the " work " of them both, which is found in the account, he claimed from him the interest in accordance with the verdict.

Gutenberg appears not to have produced the account which he was expected (clause 1) to render, as Fust's allusion to an account (in clause 6) must refer to his Own account. Hence we know not whether he made any " disbursements. " The " receipts " seem to mean nothing more than the instalments of the first 800 guilders which he acknowledged to have received from Fust, though some authors think that allusion is made to things (printed books or broadsides ?) from which he might have received money by sale or otherwise.

It is to be noticed that Fust speaks here (for the sake of accuracy?) of having taken up 1550 not 1600 guilders, as in his first account. On the whole the wording of the verdict and the sworn declaration is obscure, and open to different interpretations, but it is impossible to ascribe to Gutenberg, on the strength of this document, the manufacture of the types and the printing of all the books in column A above, especially when we have regard to his own inexplicable silence at the trial, when it was incumbent on him for his own sake to show

what he had done with Fust's money, and still more when we have regard to the pecuniary difficulties in which he had been placed at least eight years before he contracted these heavy new loans with Fust. Within the space of two years after the trial he was bankrupt, unable to pay either his loans or the small interest thereon, and might have ended his days in prison if the Strassburg St Thomas Stift had been able to have him arrested.

Certain circumstances point to Albrecht Pfister of Bamberg as the printer of the numbers vii., viii., ix., xviii. and perhaps those that come between them in column A. Even in former years when the church type of the Indulgence 31 (1454) was be- lieved to be identical with that of B 36 , it was the general opinion that, though Pfister could not have printed the Indulgence, he had acquired. its church type from Gutenberg for printing B 3e Now that a closer examination has shown that the type of B 36 need not be dated so early as 1454, the known dates of Pfister (1461, 1462) harmonize with the approximate date (1460) of B 36 . It is admitted that the types of vii., viii. and ix. differ from that

1 The instrument says: "was er dan men gelts dar uber enp- fangen . . . hait. " Senckenberg, Kohler, Van der Linde, &c, printed nun for the correct reading men. This latter word has hitherto been interpreted as meaning more (see Dziatzko, Guten- bergfrage, p. 34, note 1 ; Schorbach, in Festschr. of 1900, p. 259). Zedler (Gutenbergforschungen, p. 65, note) thinks that it is a dialectic by-form of the Mid. H. German mein found in mein-kouf, mein- rdt, mein-swern, mein-tdt, and still preserved in the Mod. H. German Meineid; he translates it therefore as " widerrechtlich " (unlawfully). But men is the same as the Mid. Dutch min (see Verdam's Middel- Nederl, Woordenb, in voce) =New Netherl. minder, and means less, the only meaning which Can give sense to this clause.

of B 36 in the form of certain capitals. But Pfister issued on the 14th of February 1401 at Bamberg, with the B 36 type, an edition of Boner's Edelstein (88 leaves fol., with wood-

engravings), and at least eight other works (Hessels, Gutenberg, p. 161, seq.), one of which bears the date 1462, the seven others none.

Most of the copies of the 36-line Bible now known to us were at one time or another preserved in the libraries of Bavaria, and several fragments have been found in monasteries of that country, even in a register of the year 1460 of the abbey of St Michael at Bamberg. Moreover, a transfer or sale of type from Gutenberg to Pfister is contrary to all analogy in the infancy of printing, when every printer started with a type of his own making.

It is alleged that, in consequence of the lawsuit between Gutenberg and Fust, the former was deprived of all tools, &c, The which he had made, or is supposed to have made,

Catholkoa with the latter's money, and that afterwards a cer-
lype- tain Dr Homery or Humery, a syndic of Mainz,

lent him fresh money to enable him to set up another printing-office.

This allegation is made on the strength of a letter of obligation (dated Feb. 26, 1468) referred to above, and given by Dr Homery to Adolph, the archbishop of Mainz, by which he acknowledges to have received from the said archbishop " several forms, letters, instruments, implements and other things belonging to the work of printing, which Johan Gutenberg had left after his death, and which had belonged and still did belong to him (Dr Homery)." It is to be observed that Homery, though willing to assist or oblige Gutenberg, had been cautious enough to reserve to himself all rights to this printing apparatus, in somewhat the same way as Fust in 1450 demanded, or was promised, to receive Gutenberg's " tools " as pledge for his advances. The Homery apparatus could hardly have been of large dimensions, seeing that it was readily passed on first from him to Gutenberg, then from the latter to the archbishop and returned again to its owner. But it is presumed that with these types, which appear in the above list as type VIII., Gutenberg had printed (1) Joannis de Balbis, Catholicon of 1460, copies of which exist in the Cambridge University Library, three in the British Museum,, two in the Paris Library, in the Spencer collection of the Rylands Library, in the Wolfenbuttel and Mainz libraries, &c. ; (2) Matthaeus

de Cracovia, Tractatus rationis, 22 leaves, of 30 lines, 4to, three copies of which are in the British Museum, one in the Rylands, one in the Cambridge, two in the Paris Library, &c. ; (3 and 4), two editions of Thomas Aquinas, Summa de articulis fidei, in 4to., the first of 13 leaves and 34 lines (two copies of which are in the British Museum, one in the Rylands and one in the Cambridge Library, &c); the second of 12 leaves and 36 lines (copies in the British Museum and the Paris Library) ; and (5) an indulgence of 1461 of 15 lines.

We have seen above that on the 17th of January 1465 Adolph II., archbishop of Mainz, had appointed "Johan Gudenberg, his servant and courtier. " It has always been inferred from this that Gutenberg had quitted Mainz and gone to Eltville (Elf eld) to reside at the arch- bishop's court, and that, his dignity as courtier preventing him from printing himself, he passed the Catholicon types on to Henry Bechtermuncze at Eltville. It seems certain that in 1467 the Catholicon type with some additions (already found in the Indulgence of 1461) was at Eltville near Mainz, in the hands of Henry and Nicholas Bechtermuncze and Wigandus Spyes de Orthenberg, who issued on the 4th of November of that year (vi.) Vocabularius ex quo (a Latin-German vocabulary) in ˆto, 166 leaves, 35 lines, the only known copy of which is in the Paris Library, and (vii.) Vocabularius ex quo, 2nd edition, with colophon dated the 5th of June 1469, 4to, 165 leaves, 35 lines, copies of which exist in the Rylands, the Blen- heim, and the Paris libraries. It is therefore asked how the Bechter- munczes could have been using the Catholicon type in 1467, if we assume that it was this type to which Homery refers in his letter of obligation as being in his possession. Some, therefore, conclude that the Catholicon and the four other works in the same type were printed at Mainz by Henry Bechtermuncze, who may afterwards have transferred his printing office to Eltville. In that case it is difficult to see what type Homery could refer to, unless it were type II, a close imitation of which, if not the actual type, was used by Nicholas Bechtermuncze at Eltville in printing (March 12, 1472) a 3rd edition of the Vocabularius ex quo, 166 leaves, 35 lines, copies of which are preserved in the Paris and Hamburg libraries, and an edition of Thomas Aquinas, Summa de articulis fidei, 12 leaves, 35 lines (Munich Library).

It would seem, however, that Fust and Schoeffer were the printers and publishers of the Catholicon, and the other three

works mentioned above, as the latter advertised them for sale in a list which he printed and circulated in 1469-1470 (see Konr.

Burger, Buchhandleranzeigen He's 15 Jahrhunderts, Leipzig, 1907, No. 3). Schoeffer may of course have purchased the stock of these books from Gutenberg or acquired it after his death from Homery, but as nothing compels us to attribute the printing of these books to Gutenberg, there is still less reason to deny that Fust and Schoeffer printed them, as the much discussed colophon of the Catholicon is found, almost verbatim, in three books published by them in 1465 and 1467. Hence the numbers i. to vi. are the only ones that could be ascribed to Gutenberg.

Even this number, involving the manufacture of four different types (apart from the alterations in the forms of certain letters which involved the making of new patrices and matrices) would be large for a man who, after having lived in luxury -for some years, practically subsisted from 1442 to 1455 on money which he borrowed from various parties and never repaid. But the poem on the " Weltgericht," printed on paper, could scarcely be placed at the head of a list which includes and, but for this poem, begins with vellum printed works. Moreover, as it can hardly be regarded as a specimen of primitive printing, it takes a more natural place by the side of the paper-printed Turkkalendar, Cisianus and Con- junctions, which all show that printing on paper was beginning to supersede that on vellum. It is asserted that its type is the same as that of the 1451 Donatus, but this is doubtful.

That the Astronomical Kalendar calculates the ephemerides for 1448 is no evidence of its having been printed at the end of 1447; as kalendars of this kind seem to have been printed without any regard to time and circumstances. Some years ago the Cisianus was ascribed to Gutenberg and to the year 1444, because some of the saints and movable feasts mentioned in it were thought to relate to that year. But as the same saints and feasts occur in the same way in Cisianus editions printed long after 1500, this notion was abandoned. The Astronomical Kalendar in question lays down rules for blood-letting at certain times of the year, and was evidently intended to be hung up in houses as guides for this purpose. It is admitted that it contains mistakes if we apply its calculations to 1448, and it has not yet been proved that these rules required a special

kalendar for each year in particular. Removing, therefore, Nos. ii. and vi. to somewhat later dates in the list, the Donatus No. iii. and that of 1451 (No. iv.) with another edition (No. v.) of the same school-book remain at the head of the column A, together with the Indulgence 31 , as the only works that could be ascribed to Gutenberg. They bring us down to the time (c. 1451) when he, according to the Helmasperger document, may be supposed to have been in a position to exercise the new art of printing.

It is necessary to point out that eight books — (1) Prognostication or Calendar; (2) Hermann de Saldis, Speculum sacerdotum; (3) Tractatus de celebratione missarum; (4) a work in German treating of the necessity of councils; (5) Dialogus inter Hugonem Cathonem et Oliverium super libertate ecclesiastica; (6) Sifridus de Arena, Determinatio duarum quaestionum; (7) idem, Responsio ad quatuor quaestiones; (8) Klagspiegel, or New geteutscht Rechtbuch — have been ascribed to Gutenberg on the strength (a) of the date 1460, which was said to be found in a Prognostication in the Darmstadt library, and (b) of a so-called rubrication alleged to be in a copy of the Tractatus de celebratione missarum, in which " Johannes dictus a bono monte " and Johannes Numeister are represented as offering this work on the 19th of June 1463 to the Carthusians at Mainz. But the date in the Prognostication has been falsified from 1482 into 1460, and the rubrication in the Tractatus is a forgery (Hessels, Gutenberg, pp. 107-114). The eight books are now considered to have been printed by Erhard Reuwich.

Apart from these disputed points there is no further difficulty as regards the history of Mainz printing. Fust and Schoeffer worked together from 1457 to 1466, starting in August 1457 with an edition of the Psalterium, printed in large missal types, which, as far as we know, is the first printed book which bears, a date, besides the place where it was printed and the name of the printers. It was reprinted with the same types in 1459 (the second printed book with date, place and name of printer), in 1490, and in 1502 (the last work of Schoeffer, who had manufactured its types). In 1459 Fust and Schoeffer also published Gul. Durantus, Rationale divinorum officiorum, with the small type (usually called Durandus type) with which they continued to print long afterwards. In 1460 they published the Constitutiones of Pope Clement V., the text printed in a type (Clement type) about a third larger than the Durandus. This type was,

however, in existence in 1459, as the colophon of the Durandus is printed with it. 1

The Invention Controversy. — Now that we have traced the art of printing from the moment (1454) that it made its 1 See further Bernard, Origine, i. 2i6seq.

appearance in a perfect state at Mainz, and have seen that none of the particulars known to us of the life and career of Johan Gutenberg, who is alleged to have invented it, nor any of the books said to have been printed by him, afford us any basis for ascribing that honour to him, we will examine what has been said during a period of more than four hundred years on the question of the invention. For this purpose we will gather up into a chronological sequence (a) a few of the most important expres- sions used by the earliest printers in their colophons, (b) whatever documentary evidence there may be on the subject, and © some accounts of the earliest authors on the question. The Roman numerals i., ii., &c, are for the sake of convenient reference.

*The earliest * testimony (i.) is the notarial instrument, dated the 6th of November 1455, of the lawsuit between Fust and Guten- _ berg, already mentioned above, which records trans-*

t?”~r , actions between the two men from August 1450 to ‘ est ‘ moa,es – November 1455, Fust speaking of ” the work ” and of ” our common work “; Gutenberg of ” tools ” which he wanted to prepare, of ” workmen’s wages, house-rent, vellum, paper, ink, &c,” of ” such work ” and of ” the work of the books, ” whereas the judges speak of ” the work to the profit of both ” and ” their common use. ” (ii.) In the first 2 book published with a date (the Mainz Psalter, issued the 14th of August 1457 by Fust and Peter Schoeffer) it is p said that it was perfected at Mainz by an ” adinventio

c”/ 1 ” h °° art ‘ nc ‘ osa imprimendi ac caracterizandi absque calami

°°P ons ‘ u n a exaratione, ” repeated and varied later, by the

same printers in their colophons of the years 1459 to at least 1470. (iii.) In 1460 the colophon of the Catholicon published at Mainz without the printer's name, after stating that " the book was printed at Mainz, the genial city of the renowned German nation, which town God's mercy had deigned to prefer and adorn above the other nations of the earth by such an exalted light of genius and spontaneous gift, " adds that the book was printed and completed " non calami, stili, aut pennae suffragio, sed mira patronarum forma- rumque Concordia, proporcione, et modulo. " This work (which is to be ascribed to Peter Schoeffer) is considered to have been printed by Gutenberg, and the mention of God's mercy, &c, is regarded as an allusion to the invention of printing. The phrase is, however, also found, with some variations, in the Liber sextus Decretalium, in the Summa of Thomas Aquinas, and in the Clementinae, published respectively on the 17th of December 1465, the 6th of March and the 8th of October 1467, by Fust and Schoeffer. (iv:) On the 17th of January 1465 Adolph II., archbishop of Mainz, by a public decree, appointed Gutenberg as his servant in reward for " his services, " but he does not say what kind of " services " he had rendered, nor does he speak of him as the inventor of printing, nor as a printer, (v.) In the Grammatica rhythmica, published in 1466 by Fust and Schoeffer, the third line of the colophon runs: " Hinc Nazareni sonet oda per ora Johannis, " which was formerly regarded as an allusion to Johann Fust or Johann Gutenberg, but which more prob- ably refers to Johann Brunnen or Fons, the author of the grammar, (vi.) On the 26th of February 1468 Dr Homery wrote to the arch- bishop of Mainz the letter quoted above, from which it may be inferred that Gutenberg had been a printer, though nothing is said as to his being the inventor of printing, (vii.) In 1468 Schoeffer reprinted Fons's Grammatica, in the colophon of which it is said : " At Moguntina sum fusus in urbe libellus meque (the book)domus genuit unde caragma venit. " (viii.) Schoeffer published on the 24th of May 1468 the 1st edition of Justiniani Imper. Institutionum juris libri VI., cum glossa. To this were added by way of colophon some verses commencing: " Scema tabernaculi, " &c, in which it is said that (the ornament of the church) Jesus " hos dedit eximios sculpendi in arte magistros . . . Quos genuit ambos urbs Moguntina Johannes, librorum insignes prothocaragmaticos, " which is regarded as an allusion to Johann Gutenberg and Johann Fust as first or chief printers, (ix.) In the same year (1468) Johannes Andreae, bishop of

Aleria, says, in the dedication of his edition of St Jerome's Epistles, published in that year (Dec. 13,) at Rome, to Pope Paul II., that " Germany is to be honoured for ever as having been the inventress of the greatest utilities. Cardinal Cusa wished that the sacred art of printing, which then (under Cardinal Cusa, who died on the nth of August 1464) seemed to have arisen in Germany, were brought to Rome. " (x.) In 1470 Guil. Fichet, in an octastichon inserted in the Paris edition of 1470 of the Letters of Gasparinus of Bergamo, exhorts Paris to take up the almost divine art of writing (printing) which Germany is acquainted with (see below No. xiii.). In the same year Erhard Windsberg writes to the same effect in an epigram inserted in the Epistolae Phalaridis published at Paris about 1470. (xi.) In 1471 Ludov. Carbo, in the dedication of the Letters

1 The earliest would be the records of the Strassburg lawsuit of 1439, in which the word " trucken " is used, but we cannot accept them as genuine.

- Earlier is perhaps the Donatus issued by Peter Schoeffer, possibly before 1456, the colophon of which says that it was finished Arte nova imprimendi seu caracterizandi . . . absque calami exaratione (by a new art of printing or making letters . . . without the writing of a pen).

of Pliny to Borso, duke of Modena, speaks of the Germans having invented printing; Nicolaus Gupalatinus (Venice, 1471) of a German being the inventor of printing, and Nicolaus Perottus of the art which had lately come from Germany, (xii.) On the 2 1st of May 1471 Nicolas Jenson published an edition of Quintilian, edited and revised by Ognibene de Lonigo (Omnibonus Leonicenus), who in the preface speaks of its printer as "librariae artis mirabilfs inventor, non ut scribantur calamo libri, sed veluti gemma imprimantur, ac prope sigillo, primus omnium ingeniose demonstravit. " (xiii.) About 1472 the first three printers of Paris published Gasparinus Pergamensis's Orthographiae liber, to which is prefixed (in the copy of the university library of Basel) a letter, dated the 1st of January, from Guillaume Fichet (see above No. x.), prior of the Sorbonne, to Robert Gaguin, in which he says that " it is rumoured that in Germany, ' not far from the city of Mainz,' a certain Johann Guten- berg (Johannes, cui cognomen Bonemontano) first of all invented the art of printing (impressoriam artem), by means of which books are made with

*letters of metal, not with a reed (as the ancients did), nor with the pen (as is done at present). ” (xiv.) On the 14th of July 1474 Joh. Philippus de Lignamine published at Rome Chronica summorum pontificum imper atorumque, in which, between two entries, relating one to the 14th of July 1459 and the other to the 1st of October 1459, an undated paragraph is found saying that Jacobus with the surname of Gutenberg of Strassburg and a certain other one named Fustus, ” imprimendarum litterarum in membranis cum metallicis formis periti, trecentas cartas quisque eorum per diem facere innotescunt apud Moguntiam Germanie civitatem. ” It says the same of Mentelin, and (under 1464) of Conrad Sweynheym, Arnold Pannarts, and Udalricus Gallus. (xv.) On the 23rd of May 1476 Peter Schoeffer issued the 3rd edition of the Institutiones of Justinian, with the same imprint as in the edition of 1468 (see testimony viii.), but with the addition that Mainz is the ” impres- soriae artis inventrix elimatrixque prima. ” (xvi.)Tn the Fasciculus temporum, issued at Cologne in 1478, it is stated under the year 1457 that the printers of books were multiplied on earth, deriving the origin of their art from Mainz. The earlier editions merely stated that the printers of books were multiplied on earth, (xvii.) In 1483 Matthias Palmer of Pisa, in the Chron. Euseb. published at Venice, stated under the year 1457 that students owe a great debt to Germany, where Johannes Gutenberg zum Jungen, knight of Mainz, invented the art of printing in 1440. (xviii.) In the same year, 1483, Jac. Phil. Foresta of Bergamo, in the Supplementum chronicorum, says under the year 1458 that the art of printing books was first discovered in Germany, according to some by Guthimberg of Strassburg, according to others by Faust (see xiv.), according to others by Nicolas Jenson (see xii.). (xix.) On the 6th of March 1492 Peter Schoeffer published the Niedersdchsische Chronik of Conrad Botho, saying in the colophon that it was ” geprent . . . in . . . Mentz, die eyn anefangk is der prentery.” (xx.j At the end of 1494 two Heidelberg professors, Adam FTOm uocu ” Wernher and Joh. Herbst, composed some Latin verses jg*irf^f’” in honour of Johannes Gensfleisch (Gutenberg’s family v * ce ‘ name turned into the Latin Ansicarus), whom they called ” primus librorum impressor ” and ” impressoriae artis inventor primus. ” 3 (xxi.) In 1499 Jacob Wimpheling (born at Schlettstadt 1450, died 1528) published (at Mainz, by P. Friedberg [?]) an Oratio in Memoriam Marsilii ab Inghen(d. 1396), in which he, on leaf 22 a, praises Joannes Ansicarus in*

Latin verse for his invention at Mainz. (xxii.) These verses are preceded by a Latin epitaph on Johann Gensfleisch, " artis impressoriae inventor " and " repertor, " written by Adam Gelthus, a relative of Gutenberg, adding that his remains rest in the Franciscan Church at Mainz, (xxiii.) In the same year (1499) Polydore Vergil (De inventoribus rerum, Venice, lib. ii. cap. 7) says that a certain Peter [Schoeffer ?], a German, invented in 1442 the art of printing at Mainz in Germany, as he had heard from the latter's countrymen ; this statement was repeated in a Venice edition of 1503. In later editions " Peter " was altered to " Joh. Guten- berg. " (xxiv.) In the same year Koelhoff, printer at Cologne, published Cronica van der hilliger Stat van Coellen, in which on fol. 311 b, the following statements occur: (1) The art of printing was found first of all in Germany at Mainz about the year 1440 ; (2) from that time till 1450 the art and what belonged to it were investi- gated; (3) and in 1450, when it was a golden year (jubilee), they began to print, and the first book that they printed was the Bible in Latin, in a large letter, resembling that with which at present missals are printed. (4) Although the art was found at Mainz, as aforesaid, in the manner in which it is generally employed now, yet the first prefiguration was found in Holland from out the Bona- tuses which were printed there before that time, and from and out of them was taken the beginning of the aforesaid art, and it was found much more masterly and exact (subtilis) than that other manner was, and has become more and more artistic. (5) Omnibonus wrote in a preface to Quintilian, and in some other books, too, that a Walloon

3 These verses were not published at the time, but in the 19th century by F. J. Mone, Quettensamml. der bad. Landesgesch. iii. 163, from the contemporary MS. of Adam Wernher, preserved in the archives of Carlsruhe. — We pass over here a few books which merely say that the invention was made at Mainz: a Chronyk derlanden van Overmaas, written by an inhabitant of Beek, near Maastricht, in the 15th century; the Chronycke van Hollandt (Leiden, 1517), &c.

from France, named Nicol. Jenson (see xii.), discovered this

art; but that is untrue, for there are those still alive who testify that books were printed at Venice before Nicol. Jenson came there and began to cut and make letters. (6) But the first inventor of printing was a citizen of Mainz, named Junker Johan Gudenburch. (7) From Mainz the art was introduced first of all into Cologne, then into Strassburg, and afterwards into Venice. (8) The origin and progress of the art were told to the writer verbally by Ulrich Zell of Hanau, still printer at Cologne (anno 1499), through whom the said art came to Cologne, (xxv.) In 1501 Jacob Wimpheling (see xxi.), who stated in his Oratio querulosa contra Invasores Sacerdotum, &c. (published at Delft, c. 1495) that chalcography had been invented at Mainz, says on p. 43 of his Germania (Strassburg, Joh, Priiss, 1 501), that the invention was made at Strassburg by Johann Guten- berg of Strassburg, and that it was perfected at Mainz, (xxvi.) In 1503 Johann Schoeffer (the son of Peter Schoeffer and the grandson of Johann Fust) published an edition of Hermes Tris- megistus, in which he represents himself as one of the most dis- tinguished citizens of Mainz (nobili vrbe maguntina artis impressoriae inventrice illuminatriceque prima), descended from the most fortunate race who invented the art of printing, (xxvii.) In 1504 Ivo Wittig, a canon and the keeper of the seal of the St Victor Cathedral near Mainz (of which Gutenberg had been a lay member), erected in the house " Zum Gutenberg " a memorial stone and an epitaph (missing already in 1700) to Joh. Gutenberg of Mainz, " qui primus omnium litteras aere imprimendas invenit." (xxviii.) In 1505, in the German translation of Livy published by Johann Schoeffer (see xxxii.) the dedication to the emperor Maximilian, probably written by Ivo Wittig (see xxvii.), speaks of Johan Giittenbergk as inventor of printing (1450) and Johan Faust and Peter Schoeffer as improvers and perpetuators of the art. This work was reprinted at least eight times (in 1514, 1523, 1529, 1530, '533> I55I. 1553. 1.557) with the same dedication ; but in 1509 the Breviarium Moguntinum says that it was printed at the expense and labour of Johann Schoeffer, whose grandfather (i.e. Johann Fust) was the first inventor and author of the art of printing (see xxvi.). (xxix.) In 1505 Jacob Wimpheling, in his Epithoma Germanorum (Strassburg, 1505), asserts (on leaf xxxviii. b and xxxix. a) that in 1440 Johann Gutenberg of Strassburg invented there the art of printing. And in 1507, in his Catal. episcoporum Argent. (Strassburg, 1507), he says that the art was invented, though in an imperfect

manner, by a certain Strassburger, who after- wards went to Mainz and joined others working and trying the same art, where it was, under the guidance of Johann Gens- fleisch, perfected in the house " boni montis " (Gutenberg). This he repeated in 1515. (xxx.) About 1506-1511 Johannes Trithemius wrote his Chronikon of Spanheim, published at Frankfort in 1601, in which he says (p. 366), under the year 1450, that the art of printing books was discovered afresh (d. novo) at Mainz by a certain citizen said to be Johan Gutenberg, who, after having spent all his property in accomplishing the new invention, perfected it by the advice and assistance of Johan Fust and others. The first propagator of the new art was, after the inventor, Peter Schoeffer. (xxxi.) In 1515 Johann Schoeffer published Joh. Trithemius's Compendium sive Breviarium hisioriae Francorum, and said in the colophon that the book was published at Mainz (the first inventress of the art of printing), by him, the grandson of the late Johann Fust, the first author of the said art, who finally from his own genius commenced to excogitate and to investigate the art in 1450, and in 1452 perfected it and commenced printing, assisted by many necessary inventions of Peter Schoeffer von Gernsheim, his servant and adopted son. Johann Fust and Peter Schoeffer kept this art secret, binding all their servants and domestics by oath never to reveal it; but in 1462 it was spread by the same domestics into divers countries. The same statements were repeated in the Breviar. eccles. Mindensis of 151 6. (xxxii.) On the 9th of December 1518 the emperor Maximilian accorded to Johann Schoeffer the privilege of printing Livy (1518-1519), saying that " he has learnt and been advised on the faith of worthy testimonies that the ingenious invention of chalcography was effected by the printer's grandfather." Erasmus, in his preface to this book, says that great praise is due to the inventors of the almost divine art of printing, the chief among whom is rumoured or said to be Joan Faust, the grandfather of Joan Scheffer; and Nicolaus Car- bachius, in a final notice of the edition, speaks of " Joan Scheffer Chalcographus," whose grandfather first invented and exercised this art in Mainz, (xxxiii.) In 1519 Joh. Thurmayer Aventinus (1474- '534) wrote that " in 1450 Joannes Faustus, a German, a citizen of Mainz, invented a new kind of writing, called chalcography, and completed it in two years; it was kept secret by him and Peter Schoeffer, his son-in-law, but divulged in Germany ten years after- wards by Faust's servant, Johannes Guttenberger, a Strasburger." (xxxiv.) In a pedigree

of Lourens Janssoen Coster of Haarlem and his descendants, preserved in the Haarlem Town Library, it is asserted that " he brought the first print into the world 1446." It would seem that an attempt was made, at some time or other, to alter the date 1446 of this document into 1440, otherwise its genuineness is beyond doubt; in its present state it was probably first drawn up about 15S9, but its first four divisions including the above statement \>ere evidently copied from some earlier document,

as they are all written by one hand, in Roman or Karoline minuscules, and, of course, this earlier document may be assumed to have existed long before 1 502-1 560, the period usually assigned to this pedigree, and to go back to the time of L. J. Coster him- self. There is some doubt as to whether the year 1446 refers to Coster's bringing the first print into the world, or to the marriage of his daughter. In the latter case the " first print " must be earlier, (xxxv.) In 1520 Johan Schott, a printer at Strassburg and grandson of Johan Mentelin, the first printer of that town, published an edition of Ptolemy, and printed at the end the arms of his grandfather with the following inscription: " insigne Schottorum Familiae ab Friderico Rom. Imp. III. Joan. Mentelio primo Typo- graphiae Inventori ac suis concessum: Anno Christi 1466." Apart from the assertion that Mentelin was the inventor of printing, we may remark that the emperor Frederick III. raised Mentelin to the rank of a nobleman in 1466 and granted him new arms, (xxxvi.) In 1524 Johan Schoeffer speaks again (at the end of S. Prosperi libel- lus) of his maternal grandfather Joan " Faust " and his father Peter Schoeffer, citizens of Mainz, who first of all invented and practised metal printing, (xxxvii.) in 1531 Ivo Schoeffer, the son of Johan Schoeffer, speaks of his great grandfather Johan " Faust " having invented chalcography, and " Faust " continues for many years afterwards to be spoken of as the inventor, sometimes in connexion with Peter, once or twice even with Ivo Schoeffer. (xxxviii.) About 1533 the Neapolitan Mariangelo Accorso, who had resided at the court of Charles V., wrote on the first leaf of a vellum Donatus (in the possession of Aldus Manutius, jun.) that " Joh. Faust of Mainz first discovered the art of printing with metal types which afterwards he made of lead; his son Peter Schoeffer added much afterwards to polish the said art. This Donatus and Confessionalia were printed first of all in 1450. Faust derived the suggestion from a Donatus printed before in Holland from an engraved block." This state- ment is found on

p. 411 of the- Biblioth. Apost. Vaticana of Angelo Roccha (Rome, 1591), who saw the leaf. Some consider its latter part to have been derived from the Cologne Chronicle (xxiv.) and it seems probable that it was a mixture of some of the above testimonies, (xxxix.) In 1536 Johan Schott (see xxxv.) published Historien Handt-Buchlein (Strassburg, 1536), in which on leaf b 1 and b 2 he says that " Hans Mentlin of Strassburg in- vented the art, which, through infidelity, was brought to Mainz." On the strength of this and other statements (xxv., xxix., xxxv.) the bicentenary of the Strassburg invention was celebrated there in 1640. (xl.) In 1541 Joh. Arnold (Bergel or) Bergellanus, who had settled as press-reader at Mainz two years previously, published his Encomium chalcographiae (Mainz, in the St Victor Stift, Fr. Behem, 1541, 4to), in which the lawsuit between Fust and Gutenberg (i.) is alluded to for the first time. Bergel had read Tritheim's books (xxx.), in which the invention is ascribed to Johan Gutenberg with two coadjutors, Johann Faust and Peter Schoeffer, which he (Bergel) had heard confirmed in conversations with Mainz citizens; he had also seen some old tools prepared for the work by the originators which were still in existence. Gutenberg invented it in 1450. (xli.) About 1 561 Jan van Zuren (born at Haarlem in 1517) and Dirk Volkerts Coornhert (born at Amsterdam in 1522) established a printing-office at Haarlem. Of the former it is alleged that he had compiled a work on the invention of print- ing, which is presumed to have been lost during the siege of Haarlem m T 573- This work was not publicly mentioned before 1628, when Peter Scriverius published his Laurecranz voor Laurens Coster, in which he says that he had only found the title, preface and introduction, in which Van Zuren contended that the first foundations of the art were laid at Haarlem, and that it afterwards accompanied a foreigner to Mainz. In this introduction he does not mention the name of the inventor, nor a date, but points in indefinite terms to the house of the inventor as still existing, (xlii.) In the same year (1561) Van Zuren and Coornhert published an edition of the Officia Ciceronis, in which the latter, in a dedication to the magistracy of Haarlem, refers to the rumour that the art of printing books was invented first of all at Haarlem, and was brought to Mainz by an unfaithful servant and much improved there. He adds that very old and dignified persons had often told him, not only the family of the inventor, but also his name and surname, and had explained the first crude way of printing,

and pointed out to him the house of the first printer, (xliii.) In 1566 Luigi Guicciardini, a Florentine noble- man, who had visited the Netherlands and had resided many years at Antwerp, finished a description of the Netherlands (published in 1567), in which, alluding to Haarlem, he speaks of the invention there according to the assertions of the inhabitants, the evidence of some authors, and other remembrances ; the inventor died before the perfection of his art; his servant went to Mainz, where he per- fected the art, and hence the report that it was invented there, (xliv.) About 1568 (it is calculated) Hadrianus Junius wrote his Batavia, published at Leiden in 1588, with two prefaces, dated, the one from Leiden, the 6th of January 1575, the other from Delft ad annum salutis 1575. On p. 253 he says: (a) the opinion that the forms of the letters whereby books are printed were first discovered at Mainz is very inveterate, but old and eminent inhabitants of Haarlem had assured him that they had heard from their ancestors (b) that there lived at Haarlem, more than 128 years before, in a decent house then existing, near the market-place, opposite the

royal- palace, Lourens (son of) Jan, surnamed Coster, who, while walking in the wood near Haarlem, began to shape beechen bark first into figures of letters, by which, reversely impressed one by one on paper, he composed one or two lines to serve as an example for the children of his son-in-law. (c) When this succeeded, he began to contemplate greater things, and first of all invented, assisted by his son-in-law Thomas, (son of) Peter, a more gluey and substantial kind of ink (as the ordinary ink was found to blot), with which he printed whole tablets with pictures, with the letters added, (d) Junius had seen books of this kind printed by Coster (the beginnings of his labours) on the rectos of the leaves only, not on both sides ; the book was written (in Dutch) by an anonymous author, and entitled Speculum noslrae salutis, in which care was taken that the blank versos could be pasted together, so that the blank pages should not present any unsightliness. (e) Afterwards (Coster) changed the beechen characters into leaden, and the latter again into tin ones. Very ancient wine-pots cast of the remains of these types were still to be seen in the house of

Lourens, which was afterwards inhabited by his great-grandson Gerard (son of) Thomas, who had died an old man a few years before, (/) When the new merchandise attracted purchasers everywhere, workmen were added to (Lourens') household, among whom was a certain John (whether, as was sus- pected, Faust, or another of the same name, Junius did not inquire), who was bound to the work of printing by oath. But, when he thought he knew the art of joining the letters and of casting the types, &c, he stole away, when everybody had gone to church, the whole apparatus of the types and the tools prepared by his master, and hastened to Amsterdam, thence to Cologne, until he arrived at Mainz, where he could remain in safety, and, having opened a work- office, issued within the space of one year, about 1442, the Doctrinals of Alexander Callus and the Tracts of Petrus Hispanus, printed with the same types which Lourens had used at Haarlem, (g) Junius recollects that Nicolaas Gaal, his tutor, a man of firm memory and venerable old age, had told him that as a boy he had often heard a certain bookbinder, Cornelis (a man of more than eighty years of age, who had been an under-workman in the same office) narrating the story of the invention (as he had heard it from his master), the polishing and increase of the crude art, &c, and cursing those nights which he had passed, during some months, with the culprit in one bed. (h) The burgomaster Quirinus Talesius admitted to Junius that he had formerly heard nearly the same from the mouth of the same bookbinder.

(xlv.) Natalis Comes, in his Universa historia sui temporis (Venice 1581; the edition of 1572 contains only books I to 10), lib. xxiv. 521, says that Haarlem is memorable on account of the almost divine invention of printing books first contrived by John Cutenberg in the year 1453 ; who, when he had invented the rudiments of it, had a rather cunning servant, observant of his master's art, who, after the death (see xliii., xlvi., xlvii.) of Johan went to Mainz and there perfected the art, and hence the report that it was invented in that city, (xlvi.) Geo. Braunius, in the second volume of his Civitates orbis terrarum (Coin, 1575?), says of Haarlem, that in this town and the whole province of Holland, there was a fixed tradition that the art of typography was first invented there. , But before it was perfected and brought to light, the inventor died (see xliii., xlv.) and his servant went to Mainz, and made it known there, (xlvii.) Mich. Eyzinger on p. 75 of his Niederldndsche Beschreibung (Coin, 1584) says that the art of

printing, as it was then done, with letters and characters on paper or otherwise, was invented by some one at Haarlem, but, on the death of his master (see xliii., xlv., xlvi.), was brought to light in perfection by his servant. (Repeated by Matthias Quadus Pictor Juliacus in Compendium Universi, sive Geographical narrationes, lib. iii. c. 38, Colon. 1600.) (xlviii.) Chronicon Sublacense, per P. D. Cherubinum Mirtium Trevirensem monachum Sublacensem laboratum anno . . . 1629. A MS. in4to, on p. 1 50 of which is read: Non egre ferat, quaeso lector, si inseruero ratione temporis rem non plane ab instituto nostro alienam, nempe laudabile studium monachorum Sublacensium teutonicorum . . . Nempe, quod nobilissima librorum typographia paucis ante annis in inferiori Germania enata est et in lucem producta (with a note by Mirtius: Hollandia A.D. 1453 in civitate Haarlem per Joannem Cutenbergam, quae tamen ars, postea Moguntiae per dicti inventoris famulum in meliorem redacta fuit excudendi formam). It is supposed that xlv. to xlvii. are derived from Test, xliii., but this seems impossible as regards xlviii.

(xlix.) In 1628 Scriverius in his Laurecranz (see xli.) placed the date of the Haarlem invention as far back as 1428, and mentioned as its inventor Lourens Janszoon, sheriff of Haarlem. He asserts that the art of printing appeared, " not in the manner, as it is used now, with letters cast of lead and tin, but a book was cut leaf for leaf on wooden blocks," and the Haarlem inventor was robbed in 1440 by Johan Gutenberg. Scriverius based the date 1428 upon a Hebrew Chronicle compiled by Joseph ben Meir (1496-1575?), and published in 1554 at Sabionetta by Cornelius Adelkind, where, under the year of the Jewish era 5188 (= 14.28), the author mentions a book (without giving the title) printed at Venice and seen by him. Scriverius, being convinced that this could only refer to a book printed at Haarlem, applied the entry to a xylographic Biblia paupemm, of which he gave a description, together with several other blockbooks and early printed books.

(1.) In 1639 Boxhorn pushed the date of the Haarlem invention back to 1420, referring, as his authority, to the same Chronicle of Rabbi Joseph. Since that time the date of the Haarlem invention has been variously placed between 1420 and 1430.

Later testimonies are mere repetitions of earlier statements. 1 We need not discuss the story of Antonio Cambruzzi, who

asserted that Pamfil'o Castaldi invented printing at Feltre, in Italy, in 1456, and that Fausto Comesburgo, who lived in his house in order to learn the Italian language, learnt the art from him, and brought it to Mainz; the story, however, found so much credence that in 1868 a statue was erected at Feltre in honour of Castaldi. Nor need we speak of Kuttenberg in Bohemia, where John Gutenberg is asserted to have been born and to have found the art of printing. Nor is it necessary to speak of Jean Brito, who printed at Bruges c. 1477-1488, and is asserted to have invented printing there. We may also pass over Johann Fust, later on called Faust (testimonies xiv., xviii., xxvi., xxviii., xxxi., xxxii., xxxiii., xxxviii.), as we know from the Mainz lawsuit of 1455 that he had simply assisted Gutenberg with loans of money. We may also pass over Johann Mentelin of Strassburg (testimonies xxxv., xxxix.), only remarking here that he had already printed a Bible in 1460, and that he is mentioned in Strassburg registers as a chrysographer or gold- writer from 1447 to 1450; but of his whereabouts between 1450 and 1460 there is no record. That he had gone, or had been called, after 1450 by Gutenberg to Mainz has been asserted but not proved, though there is no reason why he should not be one of the two Johannes alluded to as the prothocaragmatici of Mainz in the Justinian of 1468 (testimony viii.). That Nicolas Jenson came to be regarded in certain circles and for a time as the inventor of printing is owing to testimony xii. being misunderstood.

There remain, therefore, to be considered the testimonies which bear on the rival claims of Haarlem and Mainz. So far as we know, the controversy between Germany and Holland was pub^- licly started as early as 1499 by the Cologne Chronicle (testimony xxiv.), that between the two towns mentioned not publicly before 1561 (testimony xli.); while the name of the Haarlem inventor was not mentioned publicly in print earlier than 1 588 (testimony xliv.).

The claims of Germany and Mainz, as centred in the person of Johann Gutenberg, have been discussed above while treating of the early printing at Mainz. A few more words about these claims are necessary. Though some of the documents relating to him connect him with the art of printing, they say nothing of him as the inventor of it; nor do any of the books ascribed to him.

The first document that connects him with the art of printing,

the notarial instrument of the 6th of November 1455 (testimony i.), says nothing of an invention or a new mode of printing. And yet the occasion was such as to make it almost imperative on Gutenberg to speak of his invention, if he had made any, for he had spent 1600 guilders of Fust's money for making " tools," apparently without printing anything, 2 and was On the point of being robbed by the latter and having taken away from him all that he is supposed to have made and done to- give effect to his idea or invention. The next testimony (ii.) i.e. the earliest Mainz books with printed dates (1457 to 1467), shows that the art of printing was not treated as a secret at Mainz; it is openly proclaimed; its importance fully realized and appreciated, but it is distinctly advertised as a "by-invention of printing," and still more distinctly as a " new art of printing"; the public were informed that books were now no longer produced by means of the pen, but by a new art of forming characters and printing. Such advertisements are natural and appropriate if we assume that the new art of printing had recently (say about 1450 to 1455) become known at Mainz, but not when we assume that Gutenberg had been printing there devotional and school books and folio Bibles since 1443. But, though the new art is so distinctly described and advertised, in none of these adver- tisements is there one word of a " Mainz invention " or an " in- ventor." In testimony iii. (the Catholicon of 1460) there is an allusion to Mainz being favoured by God, but again not one word about an invention or an inventor. If Gutenberg had printed the Catholicon, it would be incredible that he, who had been wronged and robbed by his two rivals (Fust and Schoeffer), should join in with them in defining and proclaiming the new art, but never with one word assert his claim to the honour and profit of the invention, if he had made any, and should even omit his name, whereas he saw

1 Over a hundred of them have been collected by Ger. Meerman, Origines typogr. ii. 58 seq.

2 In line 42 Gutenberg distinctly declares that " he hoped he was under no obligation to Fust to devote the first 800 guilders to the work of the books "; and, as Fust, by advancing the second 800 guilders in 1452, had practically become Gutenberg's partner, it seems clear that the former claimed in October or November. 1455, when the trial may be said to have commenced, his money and interest because Gutenberg had as yet not printed anything.

his two rivals never neglect to print their names in full on every book which they published. Those who believe that Gutenberg was the inventor of printing suggest that he kept silent, as otherwise his creditors would have seized his copies and his printing-office. But this explanation cannot be accepted, as we have seen that Gutenberg was practically bankrupt at that time, and prosecuted as a defaulter; and the verbose colophon at the end of a gigantic folio book like the Catholicon, published at a time when there were perhaps not more than three printing offices in the world, would be calculated to draw attention to its printer and his residence, not to conceal him. Testimony v. (1466) can no longer be regarded as having any reference to Gutenberg or the invention of printing; vii. (1468) was formerly thought to mean: " I, the book, am cast {i.e. its types are cast) in the Mainz city, and the house whence the type came (= where the type was invented) produced me." But of late years it has been shown that the author of the book, Johann Fons, was Peter Schoeffer's press-corrector. And, as he no doubt resided in Schoeffer's house, the two lines evidently mean: " I am a little book cast in Mainz, and I was born (= written) in the same house whence the type comes 1 (= where I am printed)." Testimony viii. (also of 1468) speaks of two Johannes (Gutenberg and Fust) as the " prothocaragmatici librorum quos genuit urbs Moguntina." But this means, not that the first printers of books were born at Mainz, but that the two Johannes (born) produced at Mainz were the chief printers of books.

When we now place together the clear documentary testimonies (i. to viii.) of the first fourteen years of printing (1454 to 1468) at „ . Mainz, we see that they all come from Mainz itself.

t'Ii al s Everybody connected with the art when speaking of I454-%I68 e ' " does so m tne most public and unreserved manner ; its importance was as fully realized and advertised then as it is now; the German nation is even congratulated on possessing it; there is never any secrecy about it; but from the moment that it begins to be mentioned there (say about 1456)

it is called a new art. In the midst of all this publicity, however, the new art which Mainz and Germany possess is never spoken of as having been invented at Mainz or anywhere else in Germany. The supposed Mainz inventor (Gutenberg) even speaks himself on two occasions (certainly in the lawsuit of 1455, and presumably in the Catholicon of 1460) but never says that he made an invention. The archbishop of Mainz, too, speaks publicly of Gutenberg in 1465 (testimony iv.), and rewards him for services, but does not speak of him as the inventor of printing, nor even as a printer. Nor does Dr Homery, in his letter to the archbishop (testimony vi. of 1468), in which he refers to Gutenberg's printing apparatus, call him the inventor of printing.

In 1468 we enter on a new phase in the history of the invention. Even if we set aside testimony viii. as being merely local, testimony ix. (1468) speaks of the art of printing as having arisen in Germany. This testimony, however, does not come from Germany, norfrom Mainz, but from Italy, and is supposed to have been inspired by the two German printers who had established a printing-office at Subiaco in 1465, and in 1467 at Rome, and who most likely learned their craft at Mainz.

As the two printers are mentioned in the testimony, and as it does not speak of Gutenberg, nor of Mainz, it is far more likely that it was merely derived from the colophons of Fust and Schoeffer, or from something that Cardinal Cusa had heard during his em- bassies in Germany. To the Mainz colophons we must also ascribe (a) the two testimonies of 1470 (x.) and (b) the three of 1471 (xi.), all five of which come from France and Italy. At last, in 1472 (testimony xiii.), the invention of printing is ascribed to Gutenberg of Mainz, but as a rumour, and the testimony comes from France. Guil. Fichet of Paris, who gives it, is supposed to have heard the rumour from the three German printers who commenced printing at Paris in 1470. And as two of them had resided, immediately before they came to Paris, in the university of Basel, and are supposed to have learnt their art there, the rumour is traced to " Bertolff von Hanauwe," who appears in the lawsuit of 1455 as Gutenberg's servant and who was printing at Basel in 1468. But it came more likely from information which Fichet obtained from the St Victor Cathedral, near Mainz (of which Gutenberg had been a lay member), as he speaks of the art having been invented " not far from that town." Testimony xiv. (1474) again comes from Italy, from Rome, and was perhaps

derived from one of the German printers settled there at that time. It merely speaks of Gutenberg, Fust and Mentelin as printers, but says not a word which even touches upon the invention of the art. In testimonv xv. (1476). we have the first definite mention of Mainz as the inventress of the art; it is given as an addition to the Mainz colophon of 1468 (see viii.). In 1478 Mainz is again mentioned in a Cologne testi- mony (xvi.) which gives evidence of research, as it is an amplifica- tion of an earlier one in which Mainz was not mentioned. Germany, Gutenberg and Mainz are again mentioned in the Venetian testi- mony xvii. (1483), which gives (under the year 1457) for the first time 1440 as the date of the invention. In the same year we have

1 Venit (comes), the present not the perfect tense (has come).

two earlier testimonies (xiv. and xii.) worked into one (xviii.), to the effect that printing was invented either by Gutenberg or by Fust or by Jenson. Testimony xix. (1492), which states that printing commenced at Mainz, is practically equivalent to xv. In 1494 and 1499 we have three German testimonies (xx., xxi., xxii.) as to Gutenberg being the inventor of printing ; these, however, come, not from Mainz, but from Heidelberg; xxii. is given by a relative of Gutenberg, Adam Gelthus, and, as the latter resided at Heidelberg, it is clear that he was the real source of the other two Heidelberg testimonies (xx. and xxi.). Two years later, when, Wim- pheling, the author of testimony xxi., had left Heidelberg, he ascribed (xxv.) the invention of printing to Strassburg, though stating that Gutenberg was the inventor. Testimony xxiii. is recorded above to show the confusion that reigned in people's minds about 1500 regarding the invention. We must add to these testimonies those of 1504 (xxvii.) and 1505 (xxviii.), which are owing to Ivo Wittig, a canon and the keeper of the seals of the St Victor Cathedral, near Mainz, of which, according to its liber fraternitatis, Gutenberg had been a lay member.

Thus, the Helmasperger document, the two Indulgences of 1454 and the 42-line Bible tell us, that in the period from August 1450 to 1456 the art of printing had commenced and been perfected at Mainz; but not a word is heard as to how it arose, or what its nature was. In the period from 1456 (if we place Schoeffer's 35- line Donatus in this year) to 1468 various books were printed at Mainz with colophons in which the art of printing is proclaimed as a by-invention of printing;

more especially as a new art; its mechanism is fully described and said to be quite different from the mode of producing books by means of the pen; but, no one says that, it was invented at Mainz, or mentions the name of a Mainz inventor.

In the period from 1468 to 1505, however, we have (1) several vague statements made in Italy and France as to the art of printing being known or practised or invented in Germany, statements which arose from the books and colophons published at Mainz; (2) one item of rumour in 1472 that Gutenberg invented it near that town; (3) two Mainz statements, of 1476 and 1492, and one Cologne statement, of 1478, that it was invented at Mainz; (4) three German statements, of 1492, 1494 and 1499, that Gutenberg had invented it; and (5) two. Mainz statements, of 1504 and 1505, to the same effect. But it is to be particularly noticed that the statements (2, 4, 5), which speak distinctly of Gutenberg being the inventor, can be clearly traced to the St Victor Cathedral, that is, to Gutenberg himself and one of his relatives.

Seeing then how slender the basis is for the assertion that printing was invented hy Gutenberg at Mainz, that even this slender basis was not laid till fourteen years after the art had been fully established and proclaimed Contra- in that city, and that it may be traced to Gutenberg Gutenberg's himself, we cannot be surprised to find it promptly claims, contradicted, not in Holland, but in Germany itself.

This contradiction was made in 1499 (testimony xxiv.) in a Chronicle published at Cologne.' To facilitate the understanding of this testimony it is divided above into eight sections. The first (taken from Hartmann Schedel's Chronicle, 1493), second, sixth, seventh and eighth are no doubt due to the compiler of the Chronicle, and must not be connected with the third, fourth and fifth, which, according to the compiler, are due to UlrichZell, a printer at Cologne, who had probably settled there about 1463, and had most likely learnt his art at Mainz, as he called himself " clericus moguntinus." As Zell's testimony leaves to Gutenberg nothing but the honour of having perfected the art, various attempts have been made to ex- plain away this account. As long as no typographically, printed Donatus had been found that could be fitted into Zell's account it was argued that he meant a Donatus printed from wooden blocks; and this argument is brought forward even at the present time. But a practical printer like Zell must have

been able to express himself to that effect if he had really meant to say so; and, as block-printing was not less practised in Germany than in Holland, we could hardly assume that blockbooks printed in Holland would have inspired the German inventor rather than the same books printed in Germany. That testimony xxxviii. speaks of a Donatus printed from wooden blocks may be ascribed to the notion arising at that time (c. 1533) that block-printing had given rise to typo- graphy. It has also been remarked that unless we take Zell to refer to a Donatus xylographically printed in Holland, the passage in the Chronicle would be contradictory, as it says in its first and sixth section that the art of printing was found first of all at Mainz about 1440, by a Mainz citizen, Junker Johan Gudenburch, and then in its fourth that the art had already been found before that time in another place. But if the fourth section is read in accord- ance with its punctuation in the Chronicle itself, it says clearly that the art was found at Mainz, as aforesaid in the manner in which it is generally employed now, that is, more masterly, more artistic than in the Donatuses printed in Holland. It has further been asserted that Holland in the Chronicle means Flanders; but the Chronicle is usually correct in geographical matters, and is

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therefore not likely to have gone astray in this particular case. It has also been suggested that Zell most likely learnt his art in Fust and Schoeffer's office and invented the passage to injure the reputation of Gutenberg, who had been their enemy. Finally it has been said that Zell did not suggest or write the passage at all; but it is hard to see how this can be maintained in face of the compiler's own statement to that effect.

As, therefore, all these suggestions do not weaken or invalidate Lourens Zell's testimony, we must see how far it harmonizes Coster's with other circumstances and the testimonies xxxiv., Claims. x jj ˆ0 xlix., which claim the honour of the invention for Haarlem in Holland

Testimony xxxiv. (the Pedigree) is sufficiently clear as to the in- vention of printing at Haarlem, the supposed date and the

name of its inventor. Testimonies xli. and xlii., though coming from Haar- lem, do not mention the name of the inventor. But xli. is a mere introduction destined for a complete book that seems to have been lost during the siege of Haarlem in 1573 before it was printed; we are, therefore, not justified in saying that Van Zuren did not know the name; xlii. may have omitted the name, because the publication of Van Zuren's work was in contemplation at the time that it was written. That Guicciardini (testimony xliii.) in 1566 did not mention the name of the reputed Haarlem inventor cannot be considered as an indication that it was not known or had not yet been " invented " when he wrote, as his accounts of the cities of the northern Netherlands are all rather meagre and for the most part derived from correspondence. He and other authors coming after him (testimonies xlv.-xlvii.) state that the Haarlem inventor had died before the art was perfected, and that thereupon his servant had brought it to perfection at Mainz. We do not find any such statement in Junius. The latter's account (xliv.), however, gives various particulars as regards the inventor and his invention. He begins by referring to the difficulty of vindicating the honour of the invention for Haarlem on account of the deep-rooted and general opinion that it took place at Mainz. He then mentions that Lourens (son of Jan) surnamed Coster resided at Haarlem " more than 128 years ago," and gives us to understand that in the year indicated by that phrase he invented the art of printing, junius's book was not published till after his death, in 1588, but its two prefaces are dated 1575 (he died June 16, 1575), hence the number 128 is supposed to go back from the date when he actually wrote his account, which he is calculated to have done about 1568. Thus we get the year 1440 as the supposed date of the Haar- lem invention, though, if we based our calculation upon the date of the preface, the year 1446 or 1447 would have to be assumed. But, as Junius adds that Coster's types were stolen by one of his servants, who fled with them to Mainz, and, establishing there a printing-office, printed within a year's time, in 1442, two books, he must, if this latter date is correct, have meant 1440. By testimonies xlix. and 1. we see that in the 17th century the date of the Haarlem invention was first put back as far as 1428, then to 1420; and since then it has usually been regarded as 1420-1423, especially after it was discovered that the Haarlem wood where Coster is said to have cut his wooden letters was destroyed during a siege in 1426.

The researches regarding the reputed Haarlem inventor have hitherto been made in an inadequately scientific manner, and it appears that, after Scriverius (1628) had pushed back, in spite of Junius, the date of the invention to 1420-1428, he and later Dutch authors on the subject mixed up two Haarlem citizens (a) Lourens Janszoon, who never bore the surname Coster: he is proved to have been sheriff, wine merchant and innkeeper from 1404 to 1439, and to have died in the latter year; (6) Lourens Janszoon Coster, authenticated by official documents as a chandler and innkeeper from 1436 to 1483, leaving Haarlem in the latter year. The name of this person and some genea- logical particulars known of him seemed to agree with Junius's account and the Coster pedigree.

But recent investigations at Haarlem and elsewhere tend to show that there have been two, if not three, persons of this name living at Haarlem about the same time. Though this superabundance of namesakes shows that van der Linde and those who accepted his conclusions were lather hasty in declaring L. J. Coster to be a myth, it is somewhat perplexing to the historian, and it would seem that the Dutch people prefer to make speculations and guesses on this point, rather than search in some systematic way the original documents and registers from which they draw haphazard extracts. The result of the latest inquiries (so far as they may be called in- quiries) is that L. J. Coster, who would agree with Junius's account and the Haarlem Coster pedigree, was a member of a Christmas-gild in 1436, is mentioned in the Haarlem registers as a dealer in candles and oil till 1454, and seems to have died before 1460 (see Fruin, De huidige stand van het Costervraagstuk, 1906; Enschede,

Laurens Jansz. Coster, 1904) ; so that his business as printer was probably continued by one of his relatives, and finally broken up about 1 48 1, when the Speculum cuts are in the hands of Veldener.

Junius's account of the Haarlem invention is based on three books: (1) a Dutch edition of the Speculum kumanae Salvationist (2) the Doctrinale of Alexander Gallus ; and (3) the Tracts of Petrus Hispanus (Pope John XXL). The first work, he said, was printed by Coster as a first specimen of his art, and it would seem from his words that the tradition believed it to be printed with wooden types; the second and third books, he declares, were printed at Mainz with Coster's types, stolen

from him by his workman. Of the Hispanus Tracts no edition answering to Junius's description has as yet come to light. Of the Doctrinale and the Speculum we possess editions which fit into his account, though, of course, it will be impossible to say whether any of the Doctrinale editions were printed at Haarlem or at Mainz. Various editions of the Latin grammar of Aelius Donatus, printed in the same types, link Junius's independent testimony regarding Haarlem and Coster on to that of Ulrich Zell, who declares in the Cologne Chronicle of 1499 that editions of this school book printed in Holland were the models (prefiguration) for the printing at Mainz, which commenced about 1450.

As the evidence for Haarlem's claims has been obscured by various adverse and not always intelligent criticisms, and no less by imperfect and incorrect descriptions of the books on which they rest, we describe here, from autopsy, the types and books that have always been and still may be, on solid grounds, attributed to Coster, and which, for this reason, we continue to call Costeriana.

The Costeriana. Xylographic Printing.

Of the Speculum humanae salvationis, a folio Latin blockbook (that is, an edition printed entirely from wooden blocks) must have been printed several years before 147 1, consisting, like the later type-printed Latin editions, of at least 32 sheets = 64 leaves, all printed on one side of the leaf only, alternately on the versos or rectos (therefore 64 printed pages). The sheets were, no doubt, arranged in the same number of quires (a 3 for the preface; bed 7 , e 8 =29 sheets for the text) as in the later editions,; the first leaf was perhaps blank, the preface occupied the leaves 2 to 6, and 58 leaves remained for the 29 chapters of text, each occupying two opposite pages of two columns each. We may further assume that the upper part of each printed page of the text was occupied by one of the woodcuts, which we know from the later editions, and which are divided each into two compartments or scenes by a pillar, with a line or legend below each compartment explaining, in Latin, the subject of the engraving; and that underneath the woodcut was the text, in two columns, corresponding to the two divisions of the engraving above.

This blockbook has already been alluded to above among the Netherlandish blockbooks, but we give here further details, as various circumstances make it clear that it was the work of the same (Haarlem) printer who issued the other editions of the Speculum, together with the several incunabula described below, and to whom a Haarlem tradition ascribes the invention of printing.

All the Speculum editions which concern us contain, so far as we know, 29 chapters. But previous to the above blockbook anothei one of more than 29 chapters (may be 45, like most of the MSS.) must have existed, as may be inferred from Johan Veldener's 4to edition of a Dutch version of the Speculum,

published in 1483, in which all the 58 blocks of the old folio editions reappear cut up into 116 halves to suit this smaller edition, besides twelve additional woodcuts for three additional chapters (the 25th, 28th and 29th) not found ˆin any of the old folio editions. As these additional woodcuts appear to be also cut-up halves of six larger blocks, they point to the existence, at some earlier period, of a folio edition (xylochirographic or xylographic?) of at least 32 chapters, at present unknown to us.

Of the blockbook as is here assumed we know now only 10 sheets or 20 leaves, which, in combination with 22 sheets or 44 typographically printed leaves, make up an edition, called, on account of this mixture of xylography and typography, the mixed Latin edition. These twenty xylographic leaves are (counting the 6 leaves of the type-printed preface) 7+20, 8 + 19, 10+17, 11 + 16, 12 + 15,- I3 + H (in quire b); 22+33, 23+32. 27+28 (in quire c) ; 52+61 (in quire e).

Copies of this mixed Latin edition still existing: (1) Bodleian Library, Oxford (Douce collection, 205), perfect; (2 and 3) Paris National Library, 2 copies, one perfect, the other wanting the first (blank) leaf; (4) John Rylands Library at Manchester (Spencer collection), wanting the first (blank) leaf; (5) Colonel Geo. Lindsay Holford, London, wanting the first (blank) leaf; (6) British Museum (Grenville collection), wanting the leaves I (blank) and 21 (this being supplied in facsimile) ; (7) Royal Public Library at Hanover, wanting the leaves 19 (xylogr.) and 24 (typ.), but having duplicates of the (xylogr.) leaves 15 and 28 ; (8) Museum Meerman-Westreenen, the Hague, wanting the leaves I to 36, and portions of the text of

leaves 37 and 38; (9) Berlin Royal Library, wanting the leaves I (blank), 58, 59, 62, 63, 64, while in place of the (xylogr.) leaves 52 and 61 it has the same (type-printed) leaves of the second Latin edition; several of the other leaves are bound in a wrong order; (10) Pembroke library at Wilton House, wanting the leaves I to 7 and 64, while the leaves 9 + 18 have been supplied from the second (type-printed) Latin edition; (11)

Copy, represented now by the leaves 15 + 28, which appear as duplicates in the Hanover copy (above, No. 7); (12) Ottley (Invention of Printing, p. 287) mentions another copy as having belonged to Mr Singer, which wanted three or four leaves, but has since been taken to pieces and dispersed. See further Holtrop, Cat. bibl. reg. Hag. 560; idem, Mon. typ. p. 22 and facs. pis. 20, 21; Bernard, Orig. i. 13 sqq.; Sotheby i. pi. xxxii. ; Campbell, Ann. No. 1570 (who wrongly states that the two copies in the Paris National Library belong to the unmixed Latin edition).

Efforts have from time to time been made to account, for the unusual mixture of xylography and typography in this one book, and to assign a date to it and the other editions, with the further view of ascertaining the date of their printer, as for him the honour . of the invention of printing is claimed. Bernard (1853) Beraara. wag uncer tain as to the chronological order to be assigned to the various editions, but, without stating his reasons, concluded that at least six or seven must have been issued, and that the xylographic leaves of the mixed Latin (his edition A), are the re- mains of a first complete, entirely xylographic edition. As there is a close resemblance between the letters of the xylographic and typographic texts, and both texts agree, with a few exceptions, word for word with the corresponding texts of the other Latin edition (which, being wholly typographical, is called the utuey. unmixed Latin), Ottley in 1816 concluded that the xylo- graphic pages were facsimiles from those of the typographically printed unmixed Latin edition, which the publisher caused to be made after having lost, through some accident in his office, not only those sheets already typographically printed, but also his types. In support of this theory he pointed to some defects or breakages in the pillars, dresses, &c, of the woodcuts of the xylo- graphic pages which he did not find in the same woodcuts in the unmixed Latin edition ; so that he thought the latter must be the first edition. Secondly, as the scrolls in the last vignette (Daniel interpreting the handwriting on the wall) are black in the Inglis copy of the unmixed Latin edition, but white in all the copies of the mixed Latin and the other editions, he concluded that the former must have been printed before the woodcutter had cut away the piece of wood which produced the black scroll, which was to him an additional proof that the unmixed Latin edition was the first. These theories were adopted by Sotheby in 1858 and again by Schreiber in two

treatises on xylography (in Centralbl., 1895, p. 20 sqq. ; in the Gutenberg-Festschrift, Centralbl., 1900, p. 46 sqq. ; and in his Manuel de la gravure sur bois, 1902, iv. 114 sqq., vii. pis. 48, 49, viii. pis. 79, 80). The latter author is of opinion that xylography was not employed for the multiplication of books till about 1468-1470, and that about that time printing with movable metal types was almost unknown in the Netherlands. Hence he thinks that the woodcut illustrations in the various editions of the Speculum were printed somewhere in the Netherlands, and the sheets afterwards sent to Germany, most likely to Cologne, for the purpose of having the texts added by typography. These pro- ceedings, he fancies, were successful twice, once with what he calls the first (unmixed) Latin, secondly with the first Dutch edition, but on the third return journey a part of the material of the second (mixed) Latin edition, that is the ten sheets in question, all packed in one parcel, were lost, and the publisher, in a hurry to sell his copies, had these sheets replaced by xylography.

As a careful examination of the mixed Latin and other editions clearly shows their real condition and the order of their issue, we do not discuss Schreiber's improbable theories. As to those of Ottley and Sotheby, some of the lines which they regarded as broken in the copy or copies of the mixed Latin edition which they examined, are intact in other copies of the same edition, so that no reliance can be placed on these defects and breakages, which are clearly due to printing from wooden blocks, a process which admittedly causes more defects in the impressions than printing from types. Of the black and white scrolls we speak below.

It is to be noticed first of all that the legends underneath the woodcuts are in Latin, so that they were no doubt engraved for a Latin edition. But, unless we take the twenty xylographic leaves as remains of a complete xylographic edition issued (at Haarlem) before the invention of printing, there would be no Latin edition to connect the woodcuts with in the first instance, as the primitive types and workmanship of one, if not two, of the Dutch editions described below show that these must have been printed before the 44 type-printed leaves of the mixed Latin edition, and also before the wholly type-printed unmixed Latin edition, the types of which are new and far better cast.

Incidentally, this fact that the types of the mixed Latin edition are later than those of the Dutch editions disposes also of

another theory favoured by some authors, viz. that during the progress of the xylographic edition its printer invented the movable type, and thereupon stopped his xylographic work to complete the book

by means of type, so that in this mixed Latin edition we were to see the transition from xylography to typography.

The priority of the xylographic over the typographic leaves is proved by the Pembroke (No. 10) and Berlin (No. 9) copies. In the former the third sheet of quire b (=the leaves 9 + 18 with the figures 5, 6 and 23, 24), the only type-printed sheet in this quire in the other copies (1 to 7 and 9), is not the same as in the other copies, but belongs to the unmixed or second Latin edition. 1

A somewhat similar but still more important manipulation we observe in the Berlin copy, in which the fourth sheet of quire e (=the leaves 52 and 61), the only xylographic sheet in this quire in the other copies, is replaced by the corresponding type-printed sheet of the unmixed or second Latin edition.

All this makes it clear that the printer of the Speculum, some time after having become a type-printer instead of a block-printer, replaced gradually (or by one operation), forty-four xylographically printed leaves of his first edition by type-printed leaves, for the purpose of issuing the Latin edition, now known as the mixed Latin edition; then, at a later stage, prepared a new Latin edition, wholly printed in movable type (now known as the unmixed Latin edition), and afterwards used sheets of this latest edition, not only to replace more of his old xylographic sheets (as in the Berlin copy), but even (as in the Pembroke copy) some of the forty-four sheets which he had printed (evidently for no more copies than he calculated to have left of the old xylographic stock), in the first instance, for issuing the mixed Latin edition. We shall see below that he proceeded in a somewhat similar way in completing copies of his Dutch editions.

Hence the sequence of the Latin editions was thus: (1) The xylographic edition of 64 (?) or more leaves in 29 (?) or more chapters, of which we have only 20 leaves remaining, which was issued before the invention of printing with movable types, and was probably preceded in its turn by a xylographic or xylo-chirographic edition of at least 32 or more chapters; (2)

another issue of 20 leaves of the preceding edition, in combination with 44 typographic leaves (the mixed Latin edition) printed for the purpose of replacing the corresponding xylographic leaves of the preceding edition, considered unfit for further publication, or discarded for other reasons ; (3) the wholly typographically printed edition known as the unmixed Latin edition.

This clear sequence of the Latin makes it easy to explain that of the other editions of the Speculum.

Typographic Printing.

(Speculum type 1). — First edition of a Dutch translation of the Speculum, with the title Spieghel der menschliker behoudenisse, hitherto called the first, or the unmixed, Dutch edition, or the Dutch edition in one fount of type. First issue entirely printed in type I.

Judging by this and the third, the editions of the Dutch version of the Speculum must have had the same number of sheets, arranged (woodcuts and text) in the same way, as the mixed and unmtxed Latin editions, with the exception of the preface, which required only 2 sheets (= 4 leaves). Hence complete copies consist of the quires a 2 (prefatory matter), bed 7 , e 8 = 31 sheets or 62 leaves.

Holtrop, who gives a facsimile of one of its pages (Mon. pi. 22), regarded this edition as the last of all the Speculum editions, because he thought the type to be identical with that employed for the other editions, only here more used up. Bernard, however, saw that it was a different fount, and there can be no doubt that it is ; it differs in form and size from Speculum type 2 as well as from type 3, though it has all the characteristics and the family likeness of the two. Most of the letters might even be regarded as identical with those of type 3, if they were not slightly smaller. That it looks old and battered seems to be owing to bad ink having been used for the printing; it was, however, badly engraved and badly cast, for not one line in the book runs straight. For this reason alone this edition is to be placed before the next two, which are printed with a better type, especially the third. There are, however, more reasons for doing this. First of all, leaf 46 (with the figures 83: Semey, and 84: Rex amon) of Lord Pembroke's copy belongs to the 3rd edition (in Speculum type 3), so that the present

edition, to which the Pembroke copy belongs, must have existed earlier. It appears from Holtrop's facsimile (Mon. pi. 22) that leaf 46 was duly printed in type 1 like the other leaves of this edition. But the leaf 46, from which he took his facsimile, is an isolated one which found its way into the Meerman Museum at the Hague, but is wanting in the copy of the Communal Library at Lille. Hence this particular leaf is, perhaps, a cancel meant to be replaced (in the Lille copy) by another one of the 3rd edition, as in the Pembroke copy. The corresponding leaf of this sheet (33, with the figures 57 : Cristus fleuit, and 58 : Jeremias) is wanting in the Pembroke copy, so that we can obtain no further information. Another reason for placing this edition before the 3rd is found in the Haarlem copy (No. 5), the leaves 24 + 27, 25 + 26 of which also belong to the (3rd) edition, and were apparently meant to replace in that copy the corresponding leaves of this edition, which

1 The Pembroke copy has this additional peculiarity that these leaves 9 + 18 consist each of two separate slips, one having the engraving, the other the text, the latter being pasted on to the bottom part of the former slip.

may have been lost, or the stock of which had become exhausted. Similar manipulations we have noticed above, type-printed leaves having been used to replace earlier xylographic leaves, and again below in the 3rd edition leaves of another edition are found.

Hence we must distinguish between at least three issues of this edition; the first, with the whole text printed in Speculum type I ; the second, with sheet 46 of the 3rd Dutch edition , the third, with the leaves 24 to 27 of the 3rd Dutch edition. Copies of the first issue: (1) Communal Library at Lille, wanting the leaves 33 and 46 (which latter are probably now in the Meerman Museum at the Hague) , and showing several peculiarities; 1 (2) Haarlem Town Library (No. 4), wanting the leaves 2 and 3, besides the woodcuts (figures 7, 8 and 21, 22) belonging to the leaves 8 and 15. The sheets of this copy

have all been cut up into halves, mounted on other larger sheets, and so bound in one volume, together with a copy of the Liber Alexandri Magni, printed at Utrecht by Ketelaer and De Leempt, and of Pet. Scriverius' Laurecrans, both mounted in the same way. There is no rubrication. Second issue : (3) Lord Pem- broke's copy, which was completed by leaf 46 of the 3rd Dutch edition. Besides wanting the original leaf 46 in type 2, this copy also wants the leaves 32, 33, 54 and 55. It shows, moreover, these peculiarities, that on the recto of leaf 7 and the verso of the corre- sponding leaf 16 (therefore, on the verso of the third sheet of quire b) are illegible sets-off of the texts of two other pages, or, perhaps, they are faulty impressions of the leaves 8 and 15, which, in the Haarlem copies, seem to be reprints. Third issue: (4) Haarlem Town Library (No. 5), wanting the leaves 20 + 31, 21 + 30, 22 + 29, 23 + 28, while its leaves 24 + 27, 25 + 26 belong to the third (formerly called second) Dutch edition (in Speculum type 3). It has, moreover, this peculiarity that the fourth sheet of quire b (= the leaves 8 + 15, with the figures 7, 8 and 21, 22), consists of two separate slips of paper, one containing the impression of the engravings, the other that of the text, the latter slip being pasted on the former, while underneath the figures 7 and 8 are still visible the blind impressions of the two top lines (on the corresponding leaf even 3 lines) of the old discarded letterpress. Seeing that the other copy at Haarlem has the text of these leaves, but not their engravings, it would seem that the letterpress had failed, that is, it had been impressed on the paper without its having been inked.

It is clear from all these manipulations in the copies of this edition, that its printer was inexperienced ; moreover, considering its defec- tive type, &c, it is necessary to give it precedence to all the other types and to place this edition immediately after the xylographic edition.

(Speculum type 2). — Second (?) edition of the Dutch version of the Speculum, at present only known from one sheet (the 26th) = the two leaves 49 (with the figures 89: Xpus crucifixus and 90: Inventores artis) and 60 (with the figures III: Exitus ione and 112: Lapis reprobatus), that is, the third sheet of quire e, found in all the existing copies of the Dutch edition (in the Speculum type 3), called the mixed Dutch edition, on account of its having these two leaves, printed in a different type, bound up with the others.

The type (on which see Holtrop, Mon. pi. 19, and Ottley, Inquiry, i. 249) used for these two leaves is slightly smaller than the Speculum type 3, and differs from it and from Speculum type I in several respects, though there is a great family likeness between all three. We place it before type 3 because the letters ba, be, ha, he, he, ho, pe, pe, ve, &c, are cast in pairs on one body of type, which combinations appear no longer in type 3. Moreover it looks so primitive, uneven and used up that its proper place would almost seem to be before Speculum type 1, although the latter's uneven, wobbling condition suggests its priority. Further, its look and " ductus litterarum " bear such a singular likeness to the Valla type (mentioned below) that it seems reasonable to place it as near to that type as possible. Under ordinary circumstances these two leaves might be regarded

'The fourth sheet of quire b (leaves 8 and 15) consists of two separate slips of paper, one containing the engravings, the other the text, the latter being pasted on the former. The fifth sheet of quire c (= leaves 23 and 28) is in the same condition. But these slips are not, like the former, pasted one on the other, but the pieces of leaf 23 are pasted on a small, apparently old, slip of paper, another newer piece of paper having been pasted on to the outer margin to strengthen the old piece. The slips of leaf 28 are pasted together by a slip of modern paper on the back, from which it would appear that they had been left loose when the volume was issued. Further the 7th or centre sheet of this same quire c (leaves 25 and 26) is bound wrongly in the place of the first sheet of quire d (leaves 33 and 46), which is wanting in this copy, so that leaf 25 follows after leaf 32, taking the place of the missing leaf 33, while leaf 26 follows after leaf 45, taking the place of the missing leaf 46 (now at the Hague). But on leaf 25, which should be blank, is an impression of the text belonging to leaf 62", but not of the figures (115, 116), while on leaf 26, which should also be blank, is now the text belonging to leaf 47, but without its figures (85 and 86). Hence the text of these pages (62* and 47 b) occurs twice in this copy, first on the leaves 25" and 26 b , and secondly in their proper place. These peculiarities seem to show that the letterpress was printed first, and that in this case a mistake was made in the first instance, but discovered when the figures were printed.*

as later impressions for completing the edition in which they occur. Ottley and others regarded them as replacing earlier

leaves which, by some accident in the printing-office, had got lost or spoiled. But why should a printer use an old, quaint-looking type for printing and reprinting, with differences, one sheet for a book which he had printed entirely with a new and better type employed for many other works? We rather assume that the leaves are the remains of a complete (the second Dutch ?) edition in Speculum type 2 and were used on this occasion as substitutes for the two corresponding leaves of the third edition, which had become defective or momentarily unavailable.

Differences in the text of the second column of leaf 60 between Meerman's copy and the Spencer Rylands and (Enschede) Crawford copies (see Meerman, Origg. typ. i. 121, note cl., and facs. on pi. vi. 3rd div. ; also Holtrop Mon. pi. 19, sec. col.) point to another edition printed in this same type. We therefore distinguish between one edition represented by the Meerman-Westreenen copy, and another represented by the two other copies, without being able to say which of the two is the earlier.

No other trace of this type has hitherto been found, but as it looks old and used up, it seems reasonable to suggest that it must have been employed not only for printing one or more editions of the Speculum, but for other books not yet known to us. It bears a singular likeness to the Valla type mentioned below, and some of the capitals seem almost identical.

(Speculum type 3). (1) The (second, or third, but) first type-printed Latin edition of the Speculum, or rather of 22 of its sheets (= 44 leaves), printed on one side only, in a type which is newer, and therefore later than the above types 1 and 2, and, for that reason, here called Speculum type 3- It has hitherto been called the Speculum type, as it was thought that all the editions of the Speculum were printed in one and the same type; type 1 being considered identical with 3, while of type 2, regarded as a stray one, no account was taken. The 22 type-printed sheets of this edition are only found in combination with the 10 sheets (20 leaves) printed entirely (figures and text) from wooden blocks, described above; and the edition so made up is, on account of this mixture of xylography and typography, called the mixed Latin edition. The type-printed leaves are 1 (blank) + 6, 2+5, 3 + 4 (quire a, preface) ; 9 + 18 (of quire b) ; 21 + 34, 24 4- 31 , 25 + 30, 26 + 29 (of quire c) ; the whole quire d (leaves 35 + 48,

36 + 47, 37 + 46, 38 + 45, 39 + 44, 40 + 43, 41 + 4 2); and the leaves 49 + 64, 50 (63, 51 + 62, 53 + 6°. 54 + 59. 55 + 58, 5 6 + 57 of quire e. The copies of this edition, still in existence, with all the particulars related to them, have been enumerated above.

(2) The third (hitherto called the second) Dutch edition ; also called the mixed Dutch edition, or the Dutch edition in two types, two of its leaves (49 and 60) being printed in a different type (see above, Speculum type 2). This edition is arranged in the same way as the first and second, and consists therefore of 62 leaves. Copies: 1. John Rylands Library, Manchester (Spencer collection), perfect; (2) Lord Crawford's library, pettect; (3), Museum Meerman, the Hague, perfect; (4) Geneva Public Library.

(3) The (third, or fourth, but) second type-printed Latin edition, usually called the unmixed Latin edition, it being printed throughout in one type (3). It contains 64 leaves, printed on one side and arranged in the same number of quires as the mixed Latin edition. But under figure 100 (column 100) it has a line (5th) which is wanting in the first (mixed) Latin edition, and the final word of line 4 is correctly printed corporali, not spirituali as in the mixed Latin. Moreover, line 10 in col. 104 has the final word egipti, which is want- ing in the mixed Latin, and line 6 in col. 62 has the correct final word terrestris instead of celestis as in the mixed Latin. (See also Holtrop, BRH. 561; Sotheby, i. 145; Bernard, i. 17; Facs. in Holtrop, Mon. pis. 17, 19; Sotheby, i. pis. xxix. and xxx.). Copies: (1) The Hague, Museum Meerman-Westreenen, wanting the first six leaves of the preface. A separate impression of the engraving (Semey maledicit + Rex amon) of leaf 48 is pasted on the lower part of the same cut, which had been printed with the text in the first instance, but defectively (Holtrop, Mon. p. 20, and rjl. 17); (2) Florence, Royal National Library, formerly in the Pitti Palace, wanting the first (blank) leaf and having also a separate impression of the engraving of leaf 48, but here the text seems to have failed and is pasted on the engraving; (3) Stuttgart, Landesbibliothek, wanting the first (blank) leaf; (4) Munich, Hofbibliothek (pressmark Xyl. 4to No. 37) wanting the first (blank) leaf; (5) Vienna, Hof- bibliothek (pressmark Inc. 2 D 19) wanting the first (blank) leaf; (6) [John B. Inglis, bought by Mr Quaritch, and now in] the Lennox library; (7) Haarlem, Town Library (No. 8), wanting the preface (leaves 1 to 6) ; (8) Brussels,

Royal Library, wanting, besides the first (blank) leaf, the second and third sheet of quire b (leaves 8 + 19, 9 + 18), and the second half of the fourth sheet (leaf 31) of quire c; (9) Hanover, Royal Library, wanting 18 leaves, that is, the first four, and the whole quire d (leaves 34 to 48) ; (10) Munich, University Library (pressmark Xyl. 10), wanting the four leaves I (blank), 54, 55 and 59. In this copy Schreiber (Centralbl. 1895, p. 208) discovered the date 147 1, in old arabic numerals in rubrics, under- neath the blind impression of some line after the last line of the Prohemium. The date is repeated by a hand of the 18th century, in modern arabic numerals, underneath the old date, by way of

explanation; (11) Library of the Royal Gymnasium at Freiberg in Sachsen where the 14 leaves of quire c are said to be preserved, but which in June 1908 could not be found

In the Florence, Munich (University Library), Vienna and (Inglis) Lennox copies, all four belonging to this (unmixed) Latin edition, the three scrolls on the last vignette of the book (over col. 116), representing Daniel before Belshazzar, and the " handwriting on the wall," appear black (see Sotheby, Principia typogr. i. pi. xxx., xxxvii., xxxviii.), but blank in all other copies of this and the other editions. From this fact some authors have concluded that the unmixed Latin edition, here called the last, was, in reality, the first, as the black scrolls show that the pieces of wood which caused these black impressions had not yet been cut away when the copies were printed off. But as its type and other circumstances connected with this unmixed Latin edition make it impossible to regard it as the first, we have to look for another explanation of these black scrolls. First of all, scrolls, especially scrolls proceeding from the mouth of some individual, were already common in the pictures or illustrations of the manuscript- and block-printing periods, just as they are now. They were then, as they are now, intended in all cases to convey to the reader some memorable saying, quotation, inscription or motto. As black scrolls, therefore, could have had no object, we should have to assume that the practised engraver of the Speculum had

prepared this last engraving carelessly and only saw his mistake after some copies had been printed off, which yet he allowed to pass into circulation. In some copies the Bible words Mane thecel phares have been written in the blank scrolls, as was to be expected; other copies vary this by adding the Latin inter- pretations, numerus, appensio, divisio. But in one of the Haarlem copies the scrolls have been coloured yellow with a brush, and it would seem that to some such operation the black scrolls are due; the colour in none of the impressions looks exactly like that of the vignette. It is, however, more than probable that, for some purpose or another, some of these scrolls were intended to be black, and that, while they were printed, something was placed in the block in the hollow of the scrolls to produce a black impression.

Sotheby, in his Principia typogr. p. 178 sqq., calls attention to an imitation of this Speculum vignette by Jacobus de Breda, who began printing at Deventer about 1483. This imitation (having one scroll which proceeds from the mouth of a figure supposed to represent Jacobus himself) he used for the first (?) time in Matthaei Bossi Sermo, c. 1491, the scroll being blank. But when he uses the engraving for the second (?) time, in P. Ovidi Naso. meiamor. Liber Secundus, c. 1493 (copy in the Cambridge University Library), his name, " Jacob' de Breda " appears in the scroll (upside down when reading from right to left). A third time the vignette appears in his edition of Pub. Ov. Nas. Metamorphoseos lib. tertius (copy in the Cambridge Library) with his name in the ordinary way. A fourth time it is on the title-page of Seneca de quattuor virtutibus, c. 1495 (also in the Cambridge Library), with the name " Seneca " in the scroll. Sotheby shows that it occurs a fifth time on the title-page of a Donatus published by J. de Breda, again with his name in the scroll. A sixth time (says Sotheby) the engraving occurs on the title-page of a tract Dominus que Pars, again with his name in the scroll. And finally (says Sotheby) it is on the title-page of Secunda Pars Doctrinalis Alexandra, with the date 151 1 and the name " Joanes Bergis " in the scroll. Seeing then the use made of this imitation till 1511, Sotheby, not unreasonably, suggests that the original scroll in the Speculum was from, the beginning meant to contain the name of the printer (the inventor of printing). See also Dibdin, Bibliographical Decameron, ii. 285-296. One thing seems certain, the scrolls in the Speculum were not intended to be black in all cases, but to contain something or other, and not

always the words Mene, &c, as in that case it would have been as easy for the engraver to cut them on the block as any other words or figures, pillars, &c. The printer probably wished to leave the choice to his purchasers. Incidentally the use made by Jacobus de Breda of his scroll points to his having been aware of the use for which the original scroll, which he imitated, was intended; and as the printer of the Speculum was undoubtedly the first printer of Holland, it is not improbable that Jacobus learnt his craft from him.

The above descriptions and explanations, based on bibliographical and typographical facts, deal exclusively with the editions and issues of editions of the Speculum now known to us. They by themselves make it clear (1) that their printer began as a xylographer and block-printer; (2) that the six editions which he published of this one work cannot be placed later than 1471, as this date is written in a copy of the latest of them; (3) that, for the printing of his five type-printed editions (Dutch and Latin) , he manufactured no less than three different types.

When round these editions and types we now group the various other incunabula which must be ascribed to him, as being printed with the same types or others related to them by a striking family likeness and other circumstances, we obtain the following sequence for this printer's work.

A. — The Xylographic Period.

1. One or two folio editions of the Speculum in Latin, printed (pictures and text) from wooden blocks, and consisting most likely of 32 if not more chapters, but of which only ten sheets (twenty leaves), and six separate woodcuts (cut up into twelve halves, for the Veldener 4to edition of 1483) have come down to us. Of one of these xylographic editions, at least of ten sheets of it, three issues are known to have been made in combination with type-printed leaves (see below).

2. As various circumstances compel us to regard the printer of the Speculum as having been a xylographer before he invented printing with movable types, it is necessary to mention here a small block of wood which is known to have been preserved for nearly 300 years at Haarlem as a remnant of Coster's printing-office. On it is engraved part of an Horarium; its first lines beginning with Servu [m] tuum in pace Quiaviderunt ocuh mei

Salutare, &c. ,of the hymn of Simeon. About 1628 it was in the possession of Adriaen Rooman, printer to the Haarlem Corporation, who had obtained it from one of Coster's descendants, a man of great age. Rooman gave it to Dr Johan Vlasveld, of Haarlem, at whose death, in 1684, it came into the hands of his children; in 1734 it was bought by Jan Maas of Haarlem, who left it at his death to his son-in-law the Rev. Jacobus Mandt, a pastor at Gorinchem; at whose death it was bought by Jacobus Koning, the well known author on the invention of printing, and after his death it was acquired by the Haarlem Town Library where it now is (see A. de Vries, de Uitvinding der Boekdrukkunst, 1862, p. 35).

B. — Printing with movable Metal Types.

Type I . , also called the A becedarium type, with which were printed : (1) The Abecedarium, 4 leaves, l6mo, on vellum, now preserved at Haarlem (Town Library), where M. Joh. Enschede discovered it in 1751, in a MS. Breviarium of the 15th century; (2) An edition of Donatus, 31 lines, 4to, two vellum leaves, printed on one side, dis- covered in 1844, in the ancient binding of a Dutch Book of Hours, printed at Delft in 1484; it is now preserved in the Hague Royal Library.

Type II. (Speculum type 1; see p. 525; hitherto erroneously regarded as identical with Speculum type 3) : (1) First Dutch edition of the Speculum, of 31 paper sheets (62 leaves) printed on one side, folio, hitherto known as the first or unmixed Dutch edition. Two issues: (a), printed entirely in this type, represented by copies at Lille and Haarlem (No. 4); (b), having some of its leaves replaced by leaves of the third Dutch edition, represented by the Pembroke and Haarlem (No. 5) copies. (2) 1 An edition of Donatus, 28 lines, 4to; two vellum leaves in the Haarlem Town Library, found pasted in the original binding of an account book of 1474 of the cathedral of that town, in which an entry testifies that this account-book was bound by Cornelis the bookbinder, whom Junius asserts to have been the servant of Lourens Janszoon Coster (Meerman, Orig. typ. Tab. VI.). (3) Another Donatus of 28 lines, two leaves of which are in the Haarlem Town Library, and were discovered in the original bindings of account-books of the Haarlem Cathedral Church of 1476, also bound by " Cornelis the bookbinder." Fragments of this same edition are also in the Paris National Library, and in various Other public and private collections. (4) Donatus, 28 lines, 4to, one vellum leaf, in the Hague Royal*

Library (BRH. 2 ; Ca. 612; Holtrop, Mon. pi. 13), discovered in the binding of a book belonging formerly to the Sion Convent at Cologne containing several treatises printed by Ulrich Zell, one being dated 1467. (5) Donatus, 30 lines, 4to. Two unrubricated vellum leaves in the Cambridge University Library (Inc. 4. E. 1.1), discovered in the binding of a copy of J. Mile's Reportorium, Louvain, 1475, now also in the same library. The first leaf contains the chapters xiv. 11 to xvi. 4, the second chapter xxvi. 6 to xxix. 10. The text is abridged, having amabamus, batis, bant, &c, where other editions have amabamus, atnabatis, amabant, &c. (6) Donatus, 30 lines, abridged edition, 4to, one unrubricated vellum leaf, cut into halves. Wrongly described by Holtrop (BRH5) and Campbell (614) as part of No. 7 (below). (7) Donatus, 30 lines, 4to; two rubricated vellum leaves, in the Paris National Library (Van Praet, Velins, No. 8; now 1040). (8) Donatus, 30 uneven lines, 4to. Two rubricated vellum leaves, in the Hague Royal Library (BRH 5; Ca. 614). (9) Donatus, 30 line's 4to. Two vellum leaves in the Haarlem Town Library, discovered in 1750 by M. Joh. Ensched6 at Haarlem in the binding of a MS. (Handvesten . . . van Kennemerland, 1330 to 1477). (10) A liturgical book, containing rules for saying Mass, in i6mo (12 lines to a page [Holtrop, Mon. pi. 14] 2 vellum leaves, pp. 3-6), in the Brussels Royal Library. (11) Alex. Galli Doctrinale, on vellum, 32 lines,

1 The present writer is certain that Speculum type 1 differs from Speculum type 3 in size, and somewhat in form too. But he is still uncertain whether the Donatuses (2 to 7) here enumerated are in the same type as the first Dutch Speculum, though he travelled twice to the places where they are preserved to examine them. It would seem that the Donatuses are in a different type, more compact, regular and better cast than that used for this edition of the Speculum. But if there is any difference between the types it is so minute that it is well nigh impossible to detect it.

4to; one leaf and fragment of a second, in the Ghent University Library (Res. 1409). (12) Alex. Galli Doctrinale, on vellum, 32 lines, 4to. Two leaves (forming one sheet) in the Cologne Town Library. 1

Type III. (Speculum type 2): (1) Second Dutch edition of the Speculum, which probably consisted of 31 paper sheets (62 leaves) printed on one side in folio, like the first and third. Only known from one sheet (leaves 49 and 60) which forms part of all the copies of the mixed or third Dutch edition preserved to us. (2) On account of differences in the setting up of the second column of leaf 60, another edition in this type may be supposed to have existed. There is no further trace of this type, 2 which greatly resembles type IV.

Type IV., also called the Valla type: (1) Laur. Vallae Facetiae morales et Franc. Petrarcha de salibus virorum illustrium ac faceciis tractatus, 24 paper leaves, small 4to. No other books printed in this type 2 are known to exist. But four of its capitals (B, H, L, and M) have been used in printing the edition of the Singularia of Ludovicus (Pontanus) de Roma, which otherwise is entirely printed in type VI.

Type V. (Speculum type 3, hitherto wrongly called The Speculum type): (1) The [second or third, but] first type-printed Latin edition of the Speculum, for which only 22 paper sheets (44 leaves) seem to have been printed to replace the same sheets of the earlier xylo- graphic edition A, and to make up, in combination with the ten remaining xylographic leaves, a folio Latin edition of 64 anopistho- graphic leaves, called, on account of this mixture of xylography and typography, the mixed Latin edition. Some copies (the Berlin and Pembroke) of this mixed edition were still further mixed with sheets of the second type-printed Latin edition. (2) Third Dutch edition of the Speculum, hitherto known as the mixed Dutch edition, as having two leaves, (49 and 60) printed in a different type {Specu- lum type 2) ; 31 paper sheets (62 leaves) printed on one side, folio. (3) A Dutch version of the Seven Penitential Psalms, one vellum sheet (= 2 leaves), 4 pages l6mo, 11 lines to the page, printed on one side; copies in the Royal Library of Brussels (where it was dis- covered) and the Hague. (4) An edition of Donatus, of 27 lines, fragments of which are in the British Museum and the Bodleian Library. (5, 6, 7) Three editions of Donatus, of 30 lines, all on vellum (Holtrop, Mon. pi 14b; Meerman, Origg. iv.). (8) A French translation of Donatus, on vellum, 29 or 30 lines to a page ; four leaves, now in the Utrecht University Library, discovered by Dr Samuel Muller, the Archivist of Utrecht, in a Utrecht MS. Cartulary of the first half of the 16th century. (9, 10) Two different editions of Alexandri Galli Doctrinale on vellum, 32 lines to a

page (Holtrop, M on. pi. 15). (11) Catonis Disticha, imperfect copy of four vellum leaves, 8vo, 21 lines to a page (Holtrop, Mon. pi. 16) in the John Rylands Library (Spencer Collection). (12) The [third or fourth, but] second type-printed Latin edition of 32 sheets (64 leaves), printed entirely in this Speculum type (3), and therefore known as the unmixed Latin edition (Holtrop, Mon., pi. 17). For the use of sheets of this edition to complete copies of the earlier edition, see above V.I. The Munich University Library copy has the rubricator's date 1471.

Type VI., also called the Pontanus type: (1) Ludov. (Pontani) de Roma Singularia juris (in type VI.) and Pii Secundi Tractatus de mulieribus pravis et ejusdem Epitaphia (in type VII.), 60 paper leaves, folio, of which the Pontanus occupies the leaves 1 (blank) to 45 recto, and the Pius, the leaves 45 verso to the end. Various differences are found in the copies of the Pontanus known to us, and we may assume two if not three issues. This type VI., there- fore, is linked on to type VII. by the two being used in one and the same book, while it is inseparably connected with type IV. by the capitals B, H, L and M of this latter type being employed in printing the Singularia. Copies in the British Museum, Cambridge University Library, John Rylands Library (Spencer Collection), Hague Royal Library. (2, 3, 4, 5) Four different editions of Donatus, each of 24 lines, fragments of which are preserved in the Hague Royal Library, Haarlem Town Library, Paris National Library, Cologne Town Library, &c.

Type VII., also called the Saliceto, or the Pii Secundi Tractatus type. (1) Pii Secundi Tractatus et Epitaphia, mentioned above under type VI. as being printed with the Pontanus in one volume. (2) Guil. de Saliceto De salute corporis. Fragments of two vellum leaves of this edition, discovered in the binding of a copy of the Formulae Noviciorum, printed at Haarlem by Joh. Andreae, in i486, are now in the British Museum. The fragments are printed on one side only, and their texts correspond to the leaves 3 and 5 of

1 It may be that some of the works enumerated under type v. are really printed in the first Speculum type, but it is almost impossible to come-to some certainty as to the difference between types 1 and 3, unless the books are together.

1 The present writer has recently purchased from Herr Jaques

*Rosenthal, of Munich, two leaves of a Donatus, which were said (in Herr Rosenthal's catalogue) to be printed in the Valla type (IV.). On examination this proves not to be the case. At first sight it seemed to him to be type III (Speculum type 2). But this is not the case either. It has, however, the peculiarities of both these types combined, so that he does not hesitate to call these fragments a unicum, and its type provisionally type III.**

[HISTORY

another edition (see below) in the same type, to which treatises ot I urrecremata, Pius Secundus, &c. have been added. It is not clear why these fragments were printed on one side only; the versos have not been scraped as was asserted by Holtrop and Campbell nor are they printer's waste, as they are rubricated. It is not known whether the treatises added to the other edition formed also part of this one. (3) An edition of Donatus minor, or abbreviatus 26 lines. (4, 5, 6, 7, 8) Five different editions of Donatus of 27 lines (9) An edition of the Doctrinale, of 26 lines. (10) A Doctrinale of 28 lines. (11) Doctrinale of 29 lines. (12) Doctrinale of 32 lines (13) Catonis disticha, 21 lines. (14) [Incerti auctoris, vulgo Pindari Thebani] Ihados Homericae Epitome abbreviatum (metrice) cum praefatione Pii II. in laudem Homeri, in folio, 10 leaves (first blank), 35 lines; first edition having, on fol. 9a, as last line 35: " intecio homeri in preceded poemate est describere," as in the copy in the Cambridge University Library (Inc. 3 E. 1. 1) (15) Guil. de Saliceto De salute corporis; De Turrecremata De salute corporis; Pii II. Tractatus de amore; (Pindari) Iliados Homericae epitome abbreviatum, cum praefatione Pii II.; added are three additional pages, the first contains " Hectoris . . . Epitaphium "• the second " Homonee . . . Epitaph."; the third is blank. In folio, 24 leaves (first blank), divided into two quires of six sheets each- 34. 35 and 36 lines (second edition of the Saliceto, and of the Yliada; but first of the Turrecremata, and the Tract, de amore of Pius II.) This edition is represented by the copy in the Hague Museum Meerman, in which a MS. note records that it was bought between 1 47 1 and 1474 (Campbell Ann. 1493), which still has in the Yliada:

in precedeti poemate est describere." (16) Second edition of the Yliada, having as last line (35) on folio 9a a more correct reading:

intecio homeri in hoc opere est describere troiana." This edition is represented by the British Museum copy (pressm. 8814) and the three additional pages (3rd blank already found in No. 15) " Hectoris . . . Epitaphium " and " Homonee . . . Epitaph " (17) Another edition of No. 15 (that is third edition of the Saliceto, second of the Turrecremata and Tract, de amore of Pius II., third of the Yliada and third of the additional pages), but with the line in the Yliada (on 22a) : " intecio . . . troiana." This edition is represented by the British Museum copy (C. 14. b 10). (18) Another issue of the Saliceto; Turrecremata; Pii Tract, de amore et epitaphia, 26 leaves, with various additions or omissions and differences in the setting up not in the former editions. Copy in the Darmstadt Hof-Biblio-thek (S 4705), which has the rubricator's date 1472 written in two places. (19) Another issue of the Yliada with the Pii Tract, de amore et epitaphia, again with additions, omissions and differences in the setting up, not in the Darmstadt copy or in the earlier editions Represented by 17 loose leaves in the Museum Meerman at the Hague (see Holtrop, Mon. typ., pp. 32, 33).

An eighth type, hitherto regarded as a Costerian, is type VI. in Hessels's List of Costeriana (Haarlem not Mentz, p. 31 seq.), where two editions of Donatus in this type are mentioned, one of 26 lines, four leaves of which are in the Catholic Gymnasium at Cologne (Camp- bell, 629), another of 27 lines, of which leaf 11 is in the Museum Meerman at the Hague, some fragments in the Haarlem Town Library and two leaves (formerly in the Weigel Collection) in the British Museum (IA 47028). Holtrop (Mon. typ. pi. 21) and Meerman (Opp. pi. II.) give a facsimile of the type. Campbell, in his Annates (No. 629, 631), referring to pi. 31 of Holtrop's Mon. for a facsimile of both these editions, says that they are printed with the types of the Pii II. Tractatus (the Saliceto type), but that, by the size and form of the P, this edition is distinguished from the other books in this type. Hessels (/. c. p. 24) repeated this ; but Campbell's assertion proves to be an error, as the two types differ, in spite of a great likeness between them (the C, F, I and V being almost identical). That of the two Donatuses is an early Gothic, and has some of the characteristics of the Costerian types, as 1 the t with perpendicular stroke to its cross-bar, the marks of contraction connected with the letters above which they appear, but only a few pairs of letters cast on one body, and no r with a curl ; so that it seems somewhat

later than those mentioned above.

A ninth type (facsimile in Holtrop's Mon. pi. 32a), hitherto regarded as a Costerian, is No. VII. in Hessels's List (I.e.). It resembles much that of the Saliceto, and has served for a Donatus of 27 lines, fragments of which representing two copies, were found in the binding of a Durandi Rationale, printed at Strassburg, 1493, belonging to the Convent of the Holy Cross, at Uden in North Bra- bant. This type again bears a great likeness to the Saliceto and also to the above type 8, but it differs from both.

Setting aside for the moment the types viii. and ix. as doubtful Costerians, we must also point out that there is no direct evidence that type i. is connected with the other seven, or that it is the first of them. But it is a primitive one; it has all the characteristics of the Speculum and other Costerian types, and could hardly be placed later than the earliest of them ; the Donatus printed with it is printed on one side of the leaf only; it shows, moreover, in other respects that it must be dated before 1470. The Abecedarium printed with the same type, and discovered at Haarlem in a 15th century manu- script belonging to a Haarlem family, looks as the work of an inexperienced, printer. The types II., III. and V. (the Speculum types 1, 2 and 3) are inseparably connected with each other; they

must have been in one and the same office; their workmanship shows that their founder step by step simplified and improved his work, and in what order they are to be placed ; the most perfect of them (V.) was in existence not later than 1471 (see above), and the three, together with the xylographic leaves in the mixed Latin Speculum (from which they cannot be separated) take us back to a period which could not possibly be extended beyond 1470, but which may reasonably be said to have begun as early as, say 1440.

Therefore these three types, and the books printed with them in combination with the xylographic leaves, and various

circumstances pointing to Haarlem as their birthplace, would alone suffice to sup- port and vindicate the Haarlem claims to the honour of the inven- tion of printing. It could, however, serve no useful purpose to separate the types I., IV., VI. and VII. from those of the Speculum, as they have all a great family likeness and three distinctive peculiarities common among them: (1) a perpendicular stroke to the cross-bar of the t ; (2) a small curl attached to the top of the r found in no other Netherlandish type; it goes backward in types I and 3; and in type 2 another curl is added to the first, bending to the right again; (3) a minute perpendicular link connecting the marks of contraction with the letters above which they appear (a peculiarity common also in the Dutch MSS. of the time). A copy of the latest issue of the Saliceto, preserved at Darmstadt, printed in type VII., has the rubrica'tor's date 1472 in two places; another book in the same type (in the Meerman Museum) was bought between 1471-1474, and as this type is used for a tract printed together with the Pontanus treatise printed in type VI., and the Pontanus type is supple- mented with capitals of type IV. (the Valla type), it follows that these three types (IV., VI. and VII.) must have been in use in one and the same office, and that the latest of them (VII.) cannot be placed later than 1472. Again, it must be said that there is no direct evidence that these three types were used by the printer of the Speculum, but as fragments of Donatuses in the Saliceto type have been found in account-books of the Great Church at Haarlem, all presumably bound by the same Cornells the bookbinder (the reputed servant of the Haarlem inventor), who also used fragments of Donatuses in the Speculum types, Haarlem may be regarded as their common birthplace. 1 Hence these seven types may be grouped thus: (a) the Abecedarium type; (b) the three Speculum types; (c) the Valla, Pontanus and Saliceto or Pius types; the (a) group cannot be dated later than 1470; (b) (three types) not later than 1471; (c) (three types) not later than 1472 and perhaps not before 1458.

Here then we have a printer who, before 1472, had manufac- tured and extensively used at least seven (if not eight or nine) different and primitive looking types; three of the seven must have existed long before 147 1, as with them he had printed before that year no less than five folio editions of one book (the Speculum), besides several editions of Donatus and the Doctrinale of Alex. Gallus and other smaller books. This work may be supposed to have extended over a number of years, and

before he printed any of these type-printed books he had already engraved, printed and issued at least one large folio blockbook (the Speculum).

And yet the catalogues of the present day, which profess to arrange the incunabula chronologically, under their respective countries, towns, printers, types and dates — according to some " historical " or " natural history method " suggested in 1870 by an eminent bibliographer, and intended to show the " develop- ment of printing " — assign this primitive Dutch printer, and his primitive types and books, to what is presumed to be their " chronological " place, after the productions of Germany, Italy, Switzerland and France; that is, they are placed in a period when printing presses had been established in nearly every large town of Europe, and the art of printing was already so fully developed and vulgarized, that the books of that period show, on comparison with the Costeriana, that the latter must have preceded them by at least two or three decades.

Apart from this anachronism, the same catalogues assign this printer and his books no longer to Haarlem in North Hol- land, to which they had always been attributed in conformity with the tradition that printing had been invented in that town and the Speculum and other books printed there; but they locate them at Utrecht, the capital of the province of the same name, although the types of the Costeriana show that they are imitations of the handwritings indigenous to the province of Holland, not to those of Utrecht.

1 The Cambridge University Library possesses two sheets of two different editions of Donatus, one (unrubricated) printed in Speculum type I, the other (rubricated) in the Saliceto type, both found pasted by the binder on the wooden boards of a copy of J. Mile's Reportorium, printed at Louvain in 1475, which is also in the same library.

This bibliographical calamity dates from the year 1870, when Dr Anton Van der Linde published his book The Haarlem Coster Legend. After it had become known to him that for years past the " Lourens Janszoon Coster " mentioned by Junius as the inventor of printing had been confused by some authors with another inhabitant of Haarlem, whose name was " Lourens Janszoon, " but who had never borne the surname " Coster, " he, after an inadequate investigation in the Haarlem

archives and elsewhere, professed to prove from documents (1) that the Haarlem tradition was nothing but a " legend, " the kernel of which was " Jacob Bellaert, " who published in 1483 the first Haarlem book with a date; (2) Lourens Janszoon Coster was a " myth "; (3) Cornells the bookbinder, Junius's chief witness for the Haarlem tradition, had been Bellaert's servant, and, telling his story in his second childhood, magnified the first Haarlem printer of 1483 into the first printer of the world; (4) the " Spiegel " and the Donatuses could not have been printed before 1470-1474, &c. As Van der Linde's book was appa- rently based on documents, it was generally thought to have put an end to the Haarlem claims. It seems to have struck nobody at the time that this Haarlem tradition or legend, if it had originated in or after 1483, could not have been so strangely distorted and altered that, within a few decades, " Jacob Bellaert " its hero, according to Van der Linde, was forgotten, while his " servant, " in his second childhood, substituted for him another person of an entirely different name and of a much earlier period; whose descendants all appear in Haarlem's history, and one of whom records him in a genealogy; who is himself mentioned again and again in the Haarlem registers of the time, but who is finally, in 1870, declared to be a " myth." Nor did it strike anybody at the time that if Cornelis the book- binder had been Bellaert's servant or binder, and his story of the inventor related to him, and to no other printer, this book- binder must have used fragments of Bellaert's productions for strengthening his bindings, instead of which he employed fragments of the Costeriana, which are admittedly not printed by Bellaert.

These are two of the many points which might have arrested Van der Linde in his sweeping denunciation of the Haarlem tradition if he had given more attention to the subject. As no reply invalidat- ing the main part of his criticism emanated from Haarlem, Henry Bradshaw, the librarian at Cambridge, who had been studying the Dutch incunabula for some years, accepted Van der Linde's conclu- sions, and published, in 1871, his List of the founts of type used by printers in Holland in the 15th century, in which he explained that he was compelled to place the printer of the Speculum at Utrecht because " it is there that the cuts of the old folio editions first appear cut up into pieces in a book (Epistelen ende Evangelien) printed by Veldener at that place in 1481. Without further information he would have found it necessary to place the

printer of the Speculum last among the Utrecht presses and to affix as his date (before 1481). But as the types of the Yliada (VII.) and of the Ludovicus de Roma (VI.) bear a close resemblance to those of the Speculum, they could not be separated from the latter, and a note in the Hague copy of the Tractatus de salute corporis in the same type VII. makes it clear that it was bought between 1471 and 1474, this was the only date which he could accept, and it compelled him to place the printer of the Speculum at the head of the Dutch printers, just as the Speculum compelled him to place him at Utrecht."

It is clear that Bradshaw's system of classifying the incunabula, so inflexible as regards dates and places of printing, that he would admit any stray statement on these points it it be found in the books themselves, rather than go outside the books for further information, is yet elastic enough to ascribe the Yliada and the Pontanus to the printer of the Speculum, merely on account of a close resemblance between the types of these books. As he knew that the early printers shaped their types according to the handwritings indigenous to the places where they settled, it must have escaped him that in locating the printer of the Speculum at Utrecht, he placed him among printers whose types bore no resemblance to those of the Costeriana. This system, therefore, so rigorous on the one hand and so flexible on the other, can only be applied with safety to books whose country, printer -and date are known, not to such as the Costeriana, which have neither date nor printer's name, nor place of printing, and might, therefore, be ascribed to France, Italy, Germany or any other European country, if it were not that some of them were printed in the Dutch vernacular.

As to the Speculum cuts being in Veldener's hands in 1 48 1 (and 1483), various circumstances show (see Holtrop, Mon. p. no sqq.) that he could not have possessed them, nor acquired them from other

printers at Utrecht, until he used them cut up into, halves and already considerably worn out. It is also known that ten years

at least before he employed them, the cuts had been used intact as illustra- tions in a book which could not be ascribed to him. In such cases bibliography is bound to inquire where they could have been so used before ascribing them to the place where they are used in 1481. The statements of the Cologne Chronicle (1499) and of Junius (1568) when examined together with the types and workmanship of the Costeriana give satisfactory answers on this point. The fact that fragments of a French translation of Donatus, printed in Speculum type 3, and of a treatise of Ludov. Pontanus on Canonical Law in the Pontanus type, were discovered at Utrecht, cannot be set against the finding of many more fragments of Donatuses, &c. at Haarlem. Bradshaw lived to see some result of his system in Campbell's Annates, published in 1874, where all the Costeriana are ascribed to a Prototypographie neerlandaise d, Utrecht, and he regretted it. Unhappily, his untimely death prevented him from testing his system more closely; those who adopted it were unable, or considered it unnecessary, to repeat his explanations and reservations, so that the Costeriana are now, in almost every catalogue, placed at Utrecht, 1 without any sign of doubt or hesitation, though all the particulars connected with them prove that they could not have originated there.

To ascertain the probable date of the Haarlem invention, we have at our disposal: (a) some historic statements and Date of documents, namely (a) two entries of 1446 and 145 1 Haarlem in the Diary of Jean Le Robert (Abbat of Cam- invention. bray); (6) the Helmasperger Instrument of 1455; (c) Ulrich Zell's account of the invention of printing in the Cologne Chronicle of 1499; (d) the Coster pedigree; and (e) Junius's narrative of the Haarlem tradition; (b) a collec- tion of nearly, if not more than, fifty incunabula, known as Costeriana, the printing of which must have involved the manufacture of seven types, four of which (the A becedarium, and three Speculum types) cannot be placed later than 1471, the other three (the Valla, Pontanus and Saliceto types) not later than 1472. With these types were printed five folio editions of the Speculum, twenty-three of Donatus, eight of the Doctrinale, besides several other important books.

A. Historic Statements. — Junius, saying that Coster invented printing in 1440, and that Johan, who stole his types, printed with them at Mainz in 1442, probably knew, or had heard, nothing more definite about a date than that Coster's types

were used at Mainz within a year after the theft. The year 1440 as that of the invention was first mentioned, it seems, in 1483, in testimony xvii.; a second time by the Cologne Chronicle in 1499 (but only as the year in which the art began to be " investigated," whatever that may mean), and again in 1505 and later (testimonies xxix., xxxix.). Junius, therefore, may have derived 1440 not from the Haarlem tradition, nor from the Coster pedigree (which gives 1446, and may imply a still earlier date), but from other sources, and hence fixed the com- mencement of printing at Mainz in 1442 (first mentioned, it seems, in 1499 by Polyd. Vergil, testimony xxiii.). Be this as it may, the Helmasperger instrument of 1455, if it is genuine, shows that Guten- Malnzdate B could not have begun printing before the end of I4S0 ' I 45°» if s ° early, as in that year, about the middle of

August, he borrowed money for " making his tools," and was then, moreover, destitute of everything necessary for print- ing, as parchment, paper, even ink. This year 1450 agrees with the date (1451) written in the Paris Donatus, which, on insufficient grounds is considered to be a forgery. It also agrees with Ulr. Zell's statement in the Cologne Chronicle that printing and all that be- longed to it were " investigated " from 1440 to 1450, and that in the latter year they began to print. And it likewise agrees with the testimonies xxviii., xxx., xxxi., xxxiii., xxxviii. and xl. quoted above, which all come from persons who may be supposed to have known something about the date of early Mainz printing, namely, Johan Schoeffer, the son of Peter Schoeffer, Joh. Trithemius (who was personally acquainted with both Peter and Johan Schoeffer), Joh. Thurmayer Aventinus (who lived from 1474 to 1534), Mariangelo Accorso (who wrote c. 1533), while No. xl. is that of Joh. Bergellanus, the first author, so far as we know, who mentioned the lawsuit of 1455, in his Encomium, printed and published in the very St Victor Stift of which Gutenberg had been for some years a lay- brother till his death, so that this testimony points to Gutenberg's own version of the ".beginning " of Mainz printing.

Therefore the Mainz date 1450, derived from documents and testimonies which cannot be lightly set aside, is much later than the latest date (1446) of the Haarlem claims, and those who accept the Haarlem tradition, as we do, may reasonably conclude that Fust was induced to advance money to Gutenberg about August 1450, not by seeing anything printed

by the latter, but by having some

1 It is pleasant to be able to record some exceptions. Voullieme and Giinther in their Catalogues still mention Haarlem.

of Coster's types and tools, and a type-printed Donatus, shown and explained to him.

We are, however, now asked to disregard this date 1450 and all documents that indicate, and have hitherto always been relied on as fixing, the beginning of printing at Mainz in that year, and to believe that the Astronomical Kalendar, said to be for 1448, was printed at Mainz in 1447. If this year could be accepted for the printing of this Kalendar, its value would of course be greater than any written or printed statement. It is, however, far from certain, and its assumed date, though not interfering with the Haarlem dates, as it falls after 1446 of the Coster pedigree, is incompatible with the Helmasperger instrument, which shows that so late as August 1450 Gutenberg had not printed anything, and had not even made his apparatus for printing. There remains the Poem on the " Welt- gericht," also ascribed to Gutenberg and said to be printed in the same type as the Donatus of 1451, with the exception of certain letters the form of which represents, it is thought, a still earlier stage. Hence the Poem is dated back, apparently for no tangible reason, to 1443-1444, and the Donatus placed between it and the Kalendar, the type of which is said to be a " development " of the Donatus type. This date, which is even more speculative than that assigned to the Kalendar, militates entirely against the Helmasperger instrument ; it can hardly be said to go against the Coster pedigree, while it does not interfere with, but rather favours, Junius' dates. •

Among the historic statements also come the two entries of the Abbot of Cambray, on folio 161" of his Diary, preserved in the Archives at Lille, in which he records having bought in January (I 445 l o.s. =) 1446 and in 1451 , at Bruges and Valenciennes, printed 2 Doctrinalia (on vellum 3 and on paper). Even if printing could be said to have begun at Mainz in 1450 or earlier, no Doctrinalia printed there have ever come to light, unless we accept the Haarlem tradition, tha,t those printed with Coster's types were printed there. Hence these entries can only be applied to the Doctrinalia printed in Holland in the same types as the Speculum (on which Junius

based the tradition of the Haarlem invention) and the Donatuses which fit into Zell's historic statement (in the Cologne Chronicle of 1499), that the Donatuses printed in Holland were the models for the Mainz printing. Therefore there is no certainty as to any Mainz printing having been done before 1450, and, if the Helmasperger instrument has any value, it is certain that it could not have begun there before that year; Ulrich Zell unreservedly places the printing done in Holland before that of Mainz; Jean Le Robert's statements make it certain that printing was exercised before January 1446; the Coster pedigree fixes no later date than 1446 for the invention at Haarlem; Junius' years (1440-1442) are, perhaps, his own guess. Anyhow, if historic statements and documents have any value, the invention must have been accomplished within the six years from 1440 to 1446 (also indicated by Zell).

B. The Costeriana. — It has been pointed out above that we have nearly 50 Costeriana, for which seven types have been employed, four of which cannot be placed later than 1471, the remaining three not later than 1472; and that with these types five folio editions of the Speculum were printed, 23 of Donatus, 8 of the Doctrinale, besides several other important books. With such an abundance of material, for the greatest part of which we have the year 1471-1472 as an undoubted terminus ad quern, we need not inquire too anxiously whether Junius placed the invention in 1440, or whether the Haarlem Coster pedigree fixes it at 1446 or earlier. For, by placing intervals either between the seven types or between the several editions of the Speculum, Donatus, Doctrinale, &c, we can easily reach any terminus a quo which may be found to agree with the historic state- ments explained above. Such intervals, however natural and necessary they may be to arrange the Costeriana in some chrono- logical order, must always be more or less arbitrary, as it is impossible to say whether the editions followed each other within two months or within two or more years, or whether the types became used up within six months or within six, seven or more years. Therefore, only such intervals need be suggested as may show that the Costeriana, or some of them, may reasonably be placed before Mainz dates which are certain (that is c. 1450, derived from the Helmasperger instrument, and 1454, the date of the Indulgences), or speculative (as 1443-1444 for the " Weltgericht," and 1447 for the Astronomical Kalendar).

Thefirst products of the art of printing were intended to be faithful imitations of the manuscripts, and no material deviations from the general plan become observable till about 1473-1477. Nowhere are the features of the MSS. of the 15th century so faith- fully imitated as in the productions of the three earliest printing- offices of Coster, Gutenberg (?) and Schoeffer. They are all without

2 The abbot speaks of Doctrinalia " gette " or " jettez en molle," and the phrase is, as Bernard (Origine, i. 97 seq.) shows by eight examples from 1474 (the year when printing is first officially spoken of in France) to 1593, and down to the present day, applied to typographically printed books only; see also Fred. Godefroy, Dictionaire, in voce mole (which he interprets as caractere d'imprimerie, where he gives six quotations showing the same meaning.

3 The abbot does not mention the word vellum, but states that the Doctrinale which he had bought at Valenciennes was full of mistakes wherefore he had bought one on paper.

signatures, without printed initial directors, 1 without printed catch- words; in short, without any of those characteristics which we see gradually, one after the other, come into almost general use when printing becomes more developed, that is from 1473 (if not earlier) to 1480. Hence a comparison of the Speculum, Donatus and Doclrinale editions, printed in the Speculum and other types, with the Gutenberg and Schoeffer Donatuses and their other books enumerated above, shows that the types, mode of printing and work- manship of all these books stand on nearly the same primitive stage. Yet there is a considerable difference between the productions of the three offices, those of the Haarlem office being more primitive than any of the other two. First of all the types of the Costeriana (which have nothing in common with any of those used in the Netherlands after 1471), show by their / with the perpendicular stroke attached to its cross-bar, the r with a curl, and the signs of contraction connected by a fine link to the tops of the letters over which they stand, that they were

manufactured during the MS. and block-printing periods of Holland. Secondly, none of the Costeriana have any hyphens, which, in the Gutenberg and Schoeffer incunabula appear already from the beginning. Thirdly, the five editions of the Speculum are all printed anopisthographically (that is, on one side), the woodcuts at the top of the pages as well as the explanatory text underneath, which would hardly be the case if they had been printed after 1471, when the printing of woodcuts, together with text in movable types, on both sides of the leaf, was no longer a novelty. None of them have any colophon (except such a word as explicit), which would, for a collection of nearly 50 books, be incompatible with a period after 147 1, but not with the earlier period of the blockbooks and MSS. Moreover, of the 50 no less than 38 are printed on vellum, which is incompatible with a period after 147 1 and even earlier, when printing on paper had become universal, but not with the earlier period of the MSS. Therefore, those who wish to date the Donatuses, ascribed to Gutenberg, before 1450, or before 1447, must not forget that the more primitive editions of the Speculum, Donatus and Doclrinale printed in types I. and II. &c. can also be dated before 1450 or 1 447; and when once so much is admitted, there is no reason to reject Zell's statement that the Donatuses printed in Holland served as models to Mainz printing. In addition to the above considerations, there is the remarkable fact that the chief productions of the three earliest printing-offices are editions of Donatus, all printed on vellum. This fact has become more conspicuous by the discovery in recent years, in various parts of Holland and Germany, of a multitude of fragments of different editions of this schoolbook. Of the Haarlem office we know 23 editions ; 13 are ascribed to Gutenberg; 9 we have in the Schoeffer or B 42 type. The production of so many editions, all about the same time in the infancy of printing and in two different places, so widely apart from each other as Haarlem and Mainz, cannot have been an accident or coincidence, but suggests some connexion, some links 2 between the three or more offices that produced them. One link we find in Ulrich Zell's statement that the Donatuses printed in Holland were the models for Mainz printing, another in the Haarlem tradi- tion, as narrated by Junius, that one of Coster's workmen, taking his master's types and tools, went with them to Mainz and settled there as a printer. These two statements go far to explain not only how the art of printing was transferred from Haarlem to Mainz, but how, at the latter

place, it was thought expedient to continue the printing of Donatuses begun at Haarlem. Bearing this obvious connexion between the three earliest offices in mind, and also that the books of the printer of the Speculum show that he could not have learnt his art at Mainz or any other place, the only question really is: Can the Costeriana, or some of them, by placing an interval between them, be dated so far back that they may be placed before the certain or speculative dates now attributed to books or broad- sides printed at, or ascribed to Mainz. In our former edition, when only 20 Costerian editions of Donatus were known, and no earlier final date than 1474, we suggested an interval of 18 months between each of them, giving about 30 years, from 1474 back to 1445, for the issue of all the Donatuses. We now know 23 editions, and 1472 as final date for the existence of all the types, though, of course, some of the editions may have appeared after this year. Therefore, our interval need not be longer than about 15 months, which makes a stretch of nearly 29 years from 1472 back to 1443. As to an interval between the types, an eminent type-founder, Dr Ch. Enschede of Haarlem, when dealing with Coster's types (in his treatise Laurens Jansz. Coster de uitvinder van de boekdrukkunst,

1 An exception is to be noticed in the Costerian Yliada (see above type VII., no. 14-17) in which on the recto of the second leaf the initial director i is printed.

2 Schwenke has, to some extent, observed this connexion, and suggested that the texts of the Donatuses should be studied, as the differences between them might show whether those of Mainz were printed from the Haarlem editions or vice versa. Such a study may be useful, but could hardly lead to a definite result, as the types of these schoolbooks, like those of other incunabula, were imitations of the respective handwritings of the places where they were printed, and the texts were no doubt taken from the same MSS. in the first instance, though it is possible that the types were cast for other books and used afterwards for the Donatuses.

Haarlem, 1904, p. 28), reminds us of three printers (Eckert van Homberch of Delft, Govaert Bac and Willem Vorsterman, of Ant- werp), who used one type all the time that they were printing (which means 23 years for the first and 19 for the second), and declares that we could not possibly put a shorter interval than 6 years between each type. As there are seven

Costerian types, such an interval would mean a period of 42 years, from 1472 back to 1430, hence only four and a half years (= 315 years) between each type would suffice to reach the year 1440.

These calculations, however, include the Abecedarium (i.),. Valla (v.), Pontanus (vi.) and Saliceto (vii.) types, and, as has been pointed out above there is no absolute proof that these four also belonged to the printer of the Speculum. Types v., vi., and vii. cannot be separated, and two circumstances, mentioned above, make it more than probable that they did belong to him. But the Abecedarium type can be ascribed to the Speculum printer on no other grounds than that it has all the characteristics of the Costerian types; that it is too primitive to be attributed to any later Dutch printer, so far as we know them, and that the Abecedarium printed with it, was discovered at Haarlem in a Dutch MS. which belonged to a Haarlem family.

Hence a computation based on the five Speculum editions (all printed and issued at least before 1471), the 12 editions of Donatus and four editions of the Doctrinale printed in the same types might be more convincing to the opponents of Haarlem's claims. Apart from the final date (147 1) for them there is also evidence that the Speculum type 1 existed a considerable time before 1474, as in that year the bookbinder Cornells used fragments of a Donatus printed in' that type in the binding of an account book of the cathedral church at Haarlem. Their types and workmanship, moreover, compel us to place them before the Valla, Pontanus and Saliceto (or Pius) types. The last two, employed together in one book, cannot have been used for this book before 1458, as it bears the name of Pope Pius II., who was not elected till that year, but it is certain that it cannot have been printed after 1472. The Valla type, however, existed before the Pontanus and Saliceto types, as four capitals of the former were used to supply the want of such capitals in the Pontanus type.

If then, as suggested by Enschede, the type-founder, an interval of six years is placed between the three Speculum types, it would mean 18 years, or a period from 1471 back to 1453. A similar number of years we obtain by intervals of 18 months between each of the 12 editions of Donatus printed in type 1. Even this moderate calculation makes it plain that the printer of the Speculum must have begun printing at least about the

same time that printing began at Mainz. But we have seen above that this printer did not hesitate to make up complete copies of his books by mixing sheets of a later edition, printed in a different type, with those of an earlier edition, and even mixed type-printed with xylographically printed sheets. A printer so carefully and economically husbanding his stock of sheets is not likely to have printed new editions of his books before the old ones were fully sold off, or to have manufactured new types till his old ones were used up. Moreover, Haarlem, a quiet provincial town, could not have been a favourable market for a rapid sale of books, especially not for books in the vernacular, like the Dutch versions of the Speculum. Hence we should not put too short an interval either between his editions or his types.

As (e.g.) Gerard Leeu 3 printed at Gouda, during the six years 1477 to 1482, 17, mostly bulky, volumes, together consisting of 2968 leaves, or nearly 6000 folio pages, all in one type, we need not hesitate to place at least eight or nine years between each of the three Speculum types, that is together 24 or 27 years from 1471" back to 1447 or 1444. It is true, the types manufactured after, say 1477, may have been more enduring than the earlier types, as being, perhaps, cast of better material and by a more perfect process than those of Coster, but the number of pages printed by the latter with the three Speculum types, barely amounts, so far as we know, to a tenth part (600 pages) of Gerard Leeu's work. Our calcula- tions are, of course, liable to modification or alteration ; earlier dates may yet be discovered in the Costeriana or in other documents; more editions of Donatus in the same types may be. found, which would shorten the intervals. But we have shown that, without straining chronology, bibliography or typology, the Costeriana can be dated back so as to harmonize with any historical date, Dutch (1440, 1446) or German (1450), known at the present time,_or so as to precede even the speculative dates (1447 or 1444) assigned to some Gutenberg products.

There is therefore no reason to discredit Zell's statement in the Cologne Chronicle of 1499, that the Donatuses printed id Holland were anterior to, and the models for, the art NeceasUyo f of printing at Mainz, or that of Hadrianus Junius in an Earlier his Batavia, that printing was invented at Haarlem Printer by Lourens Janszoon Coster, and that the Speculum jˆ™ was one of his first productions. The two statements were made independently of each other. But even

without

3 These examples might easily be multiplied. Ulr. Zell, for instance, printed more than 80 books in his first type.

them, the existence of a group of nearly fifty primitively printed books of undoubtedly Dutch origin, the printing of which must have taken a number of years before 1471, would suggest serious doubts as to the priority of Mainz printing. Zell's statement is all the more weighty, as it is not one made at random but meant to be a direct contradiction of the vague rumours and statements about an invention of printing at Mainz by Gutenberg, which had gradually crept into print since 1468 in Italy and France, and had found their way back into Germany about 1476, after Mainz and Germany had given the greatest publicity, during twenty-two years, to the existence of the new art in their midst; while all those who might, and would and could, have told the public that the invention had been made at Mainz, if it had come about there, preserved a profound silence on this particular point, even the supposed inventor himself. And, though Zell accords to Mainz and Gutenberg the honour of having " improved " the art and having made it more artistic, he denies to them the honour of having " invented " or " begun " it, and this latter honour was never claimed by that town before 1476. Junius's account, on the other hand, is the embodiment of a local tradition at Haarlem, the first written traces of which we have in a pedigree (testimony xxxiv) of the family of the reputed Haarlem inventor, which, as regards its central part, may have existed at least as early as 1520, whereas its first part may be dated much earlier. His account is indirectly confirmed by the finding of several fragments at Haarlem, all belonging to the groups of books mentioned above, but still more by the discovery of several fragments of the Donatuses printed in the Speculum type 1 and 3, some of which had been used as binder's waste by Cornelis, the bookbinder, the very man whom Junius alleges to have been the servant of Coster.

As the case stands at present, therefore, we have, after careful

and impartial examination, no choice but to repeat that the invention of printing with movable metal types took place at Haarlem between the years 1440 and 1446 by Lourens Janszoon Coster.

That the Haarlem inventor of printing was, as we have shown, a block-printer before he printed with movable types, helps us to understand what the tradition, as chronicled by Junius, says of him (Testimony xliv. b) : that he, while walking in the wood near Haarlem, cut some! letters in the bark of a tree, and with them, reversely impressed one by one on paper, he composed one or two lines as an example for the children of his son-in-law. Junius does not say it, but clearly implies that, in this way, Coster came to the idea of the movability (the first step in the invention of typo- graphy) of the characters which, hitherto, he had been cutting together on one block. He perceived the advantage and utility of such insulated characters, and so the invention of printing with movable types was made. The questions as to whether he con- tinued to print with movable " wooden " types, or even printed books with them, cannot be answered, because no such books or fragments of them have come down to us. Junius's words (Test. xliv. § d) onthis point are ambiguous, and no Dutch edition of the Speculum printed, figures and text, from wooden blocks or movable wooden types, is known.

By the middle of the 19th century the claims of Coster and Haar- lem had steadily gained ground, owing to the researches of Joh. Enschede (1751), Meerman (1765), Koning (1815), Young Ottley (1816), Bernard (1853), Sotheby (1858) and others. But in 1870 they were wellnigh destroyed by a criticism which afterwards proved to be partly groundless, partly a distortion of facts. At the time, however, it was, without further research, accepted as decisive; the claims were regarded to be a fiction, and a system of classifying the incunabula started with the unfortunate result that Utrecht came to be adopted as the birthplace of the Costeriana and Coster and Haarlem almost obliterated from all our catalogues. Since then many things have come to light, all tending to confirm Haar- jem's claims, and showing how unjustifiably they were attacked in 1870. An examination of the incunabula on which they rest is far from easy or inexpensive, as the books are scattered not only over Europe but now also over America, and therefore not easy of access. We have, however, made it, sufficiently to be able to prove that

the claims are based on good grounds. Our evidence, though still circumstantial, is not based on guesses; we assert nothing except on bibliographical or historical grounds; nor do we accept one statement unless it is corroborated by other statements, or by ,the rules of bibliography and history. Hence we should not accept Zell's evidence or that of Junius, or of any one else, if the books to which they refer did not corroborate them to the fullest

extent, or if the claims of Mainz to the honour of the invention could be said to have any substance of fact. The great efforts made in Germany since 1882 to strengthen the case for Gutenberg, which culminated in the celebrations of 1900 and the publication of valuable and learned books, have enriched our knowledge of early Mainz and German printing, but at the same time conclusively shown that it requires great courage to maintain that Gutenberg was the inventor of printing.

How long Coster or his successors continued the first printing-office at Haarlem we cannot say; it seems to have come to an end in or before 1481, as the cuts of the Speculum had evidently then passed into John Veldener's hands, and the Haarlem tradition says that wine-pots had been cast of the remains of the types. In 1483 Jacob Bellaert was printing at Haarlem, and Jan Andrieszn in 1485 ; their types are imitations of the writing of their time, but already differ from those of the Speculum and the other Costeriana in various respects, and show many features of a later period. The question as to whether they learnt their craft from the first Haarlem printer, or from other masters, has been asked but not yet answered.

Spread of Typography. — Having explained the early printing of Haarlem and Mainz, in so far as it bears upon the controversy as to where and by whom the art of printing was invented, and shown that the testimony of Ulrich Zell (in the Cologne Chronicle of 1499) as to Mainz having learnt the art of printing from Holland through the Donatuses . printed there, and that of Hadrianus Junius, as to the tradition of its Haarlem origin, are confirmed by bibliographical and historical facts, we can follow its spread from Haarlem to Mainz, and from the latter place to other towns and countries.

1460; Strassburg. — First printers: Johann Mentelin, who completed a Latin Bible in that year, according to a rubrication in

a copy at Freiburg in the Breisgau; Adolph Rusch de Inguilen, who is presumed to be the printer of the undated books with a singularly shaped R, 1 c. 1464; Henricus Eggestein, 1471; George Husner, &c.

1 461; Bamberg. — First printers: Albrecht Pfister, who in 146 1 published Boner's Edelstein, though it is still doubtful whether he did not print earlier, while he has always been regarded as the printer of B 36 (see above) ; Joh. Sensenschmidt, c. 1480.

1465; Subiaco. — First and only printers: Conrad Sweynheym and Arnold Pannarts, who completed in that year an edition of Cicero, De Oratore, and Lactantius, and removed to Rome in 1467.

1466; Cologne. — Earliest printers: (1) Ulrich Zell, who published in that year Chrysostom, Super Psalmo quinquagesimo liber primus, though it is presumed that he printed already in 1463; (2) Arnold Ther Hoernen, 1470; (3) Johannes Koelhoff of Lilbeck, 1470, who printed the Cologne Chronicle in 1499; (4) Nicolaus Gotz, 1474; (5) Goiswinus Gops, 1475; (6) Petrus de Olpe, 1476 (not 1470); (7) Conradus Winter of Homburg, 1476; (8) Joh. Guldenschaaf, 1477; (9) Henricus Quentel, 1479, &c. 2

1467; Eltville. — First printers: Nicolas and Henry Bechter-muncze and Wygandus Spyes de Orthenberg, who completed in that year a Vocabularius ex quo.

1467; Rome. — First printers: Conrad Sweynheym and Arnold Pannarts from Subiaco, who published an edition of Cicero's Epistolae ad familiares; Ulrich Hahn or Udalricus Gallus, who issued on the 31st of December 1467 Turrecremata's Meditationes.

1468; Augsburg. — First printer: Gunther Zainer or Zeyner. Same year at Basel (first printer Berthold Rot of Hanau) and at Marienthal (Brothers of the Common Life).

1469; Venice. — Printers : (1) Johannes of Spires; (2) his brother Vindelinus of Spires; (3) Christopher Valdarfer; (4) Nicolas Jenson, &c.

The further spread of typography is indicated by the following dates: 1470 at Nuremberg (Johan Sensenschmidt, Friedr.

Creusner, Anton Koberger, &c), Berona or Beromiinster in Switzerland (Helyas Helye alias De Llouffen), Foligno (Emilianus de Orfinis and Johannes Numeister), Trevi (Johann Reynard), Paris (first printers the three partners Ulrich Gering, Michael Friburger, Martin Krantz); 1471 at Spires, Bologna, Ferrara, Florence, Milan, Naples, Pavia, Treviso, Savigliano (Hans Glim?); 1472 at Esslingen, Cre- mona, Mantua, Padua, Brescia, Parma, Monreale (Mondovi), Fivizzano, Verona, Iesi, St Ursino (?) ; 1473 at Lauingen, Ulm (per- haps as early as 1469), Merseburg, Alost, Utrecht, Lyons, Messina, Buda-Pest, Santorso; 1474 at Louvain, Genoa, Como, Savona, Turin, Vicenza, Modena, Valencia; 1475 at Liibeck, Breslau, Blau- beuren, Burgdorf, Trent, Cracow (?), Reggio (in Calabria), Cagli,

1 M. Philippe, Origine de I'imprimerie a Paris, p. 219, mentions two books printed in this type, which contain manuscript notes, to the effect that they were purchased in 1464 and 1467, so that Inguilen is to be placed before Eggestein.

2 Johann Veldener, who is said to have printed at Cologne, was never established there, but at Louvain (1473-1477), Utrecht (1478-1481), and Culenborg or Kuilenburg; (1483-1484) ; see Holtrop, Mon. typ., pp. 42, 47, 109.

Caselle or Casale, Pieve (Piove) di Sacco, Perugia, Piacenza, Sara- gossa; 1476 at Rostock, Bruges, Brussels, Angers, Toulouse, Pol- liano (Pogliano), Pilsen; 1477 at Reichenstein, Deventer, Gouda, Delft, Westminster, Lucca, Ascoli, Bergamo, Tortosa, Palermo, Seville; 1478 at Oxford, St Maartensdijk, Colle, Schussenried (in Wtirtemberg), Eichstadt, Geneva, Vienne, Trogen (?), Chablis, Cosenza, Prague, Barcelona; 1479 at Erfurt, Wiirzburg, Nijmegen, Zwolle, Poitiers, Toscolano, Pinerolo, Novi, Lerida, Segorbe, Saluzzo;

1480 at London, St Albans (or in 1479), Oudenarde, Hasselt, Reggio (in Modena), Salamanca, Toledo, Nonantola, Friuli (?), Caen;

1481 at Passau, Leipzig, Magdeburg, Treves, Urach, Casale di San Vaso, Saluzzo, Albi, Antwerp, Rougemont; 1482 at Reutlingen, Memmingen, Metz, Pisa, Aquila, Promentoux, Zamora, Odense, Chartres, Wien, Guadalajara, Milnchen, Erfurt; 1483 at Leiden, Kuilenburg (Culenborg), Ghent, Chalons-sur-Marne (?), Gerona, Stockholm, Siena, Soncino, Salins; 1484 at Bois-le-Duc, Eichstatt, Novi, Sangermano, Chambery, Udine, Winterberg, Klosterneuburg, Rennes, Loudeac, Tarragona; 1485 at Heidelberg, Ratisbon, Pescia, Vercelli, Treguier or Lantreguet, Briinn, Salins, Burgos, Mallorca, Hijar, Palma, Xeres; i486 at Miinster, Stuttgart, Chiavasco, Voghera, Casal Maggiore, Abbeville, Schleswig, Toledo ; 1487 at Ingolstadt, Gaeta, Rouen, Murcia, Besancon; 1488 at Stendal, Viterbo, Gradisca, Faro, Constantinople, Lantenac; 1489 at Hagenau, Kuttenberg, San Cucufat (near Barcelona), Portesio, Coria, Pamplona, Tolosa, Lisbon; 1490 at Embrun, Orleans, Gre- noble, Dole; 1491 at Hamburg, Kirchheim, Norzano, Goupillieres, Angoulfime, Dijon, Narbonne; 1492 at Marienburg, Cluni, Zinna, Valladolid, Leiria; 1493 at Liineburg, Freiburg (in Breisgau), Urbino, Cagliari, Lausanne, Nantes, Copenhagen, Rieka; 1494 at Oppenheim, Tours, Macon, Monterey, Braga; 1495 at Freisingen, Freiberg (near Leipzig), Scandiano, Forli, Limoges, Schoonhoven (monastery Den Hem), Pamplona, Wadstena, Cettinje; 1496 at Offenburg, Provins, Barco, Valence, Granada; 1497 at Carmagnola, Avignon: J498 at Tubingen, Perigueux, Schiedam, Gripsholm; 1499 at Danzig, Olmutz, Montserrat, Madrid; 1500 at Pforzheim, Sursee, Perpignan, Valenciennes, Jaen.

Printing seems to have begun in Scotland after September 1507, when King James IV. granted a patent to Walter Chepman and Andrew Myllar (also printed Millar) for the establishment of a printing press at Edinburgh. Their first book {The Maying or disport. of Chaucer) appeared on the 4th of April 1 508. Myllar, however, appeared to have been established there as a book- seller already in 1 503 and to have published there his first book, Joh. de Garlandia Interpr. vocabulorum equivocorum (printed for him abroad) in 1505, his second Expositio Sequentiarum (also printed abroad) in 1506. (See Rob. Dickson and John Ph. Edmond, Annals of Scottish Printing from 1507 to the 17th century, Cambridge, 1890; Harry G. Aldis, List of Books printed in Scotland before 1700, Edinburgh 1904). Printing was intro- duced into Ireland

at Dublin in 1551 by Humfrey Powell, who published in that year a verbal reprint of Whitchurch's edition of the Common Prayerbook of 1549. Printing in Irish types was brought into the kingdom in 1571 by N. Walsh and John Kearney, the first book printed in that type being A Catechism, written by Kearney.

Above we have stated that printing was established at Avignon

in the year 1497. But during the last two decades various trea-

rises have been published endeavouring to show that

©»e«tfo»o/ printing had already been exercised there more than

Date at half a century earlier.

Avignon. j n Ig90 the Abb at Requin discovered at Avignon, in

three notarial registers, five Latin notarial Protocols of the years 1444 and 1446, which, though they mention only the arts of " writing artistically," and painting different colours on stuffs, he and others interpreted as showing that, during those years, certain artisans had exercised the art of printing with movable types at Avignon; so that, if the art was not invented there, one of those artisans must have learnt the secret from Gutenberg, said to have been en- gaged in printing at Strassburg from 1436 to 1439. And hence Avignon, hitherto regarded as the 60th town where printing was introduced, was to take the second place, if not the first, in the his- tory of the invention of printing, between Strassburg and Mainz (Requin, V Imprimerie d. Avignon en 1444, Paris, 1890; id., Origines de I'imprimerie en France, Avignon, 1444, Paris, 1891).

From Requin's first document (dated July 4, 1444) it appears that a silversmith, Procopius Waldfoghel, of Prague, residing at Avignon, had received from a magister Manaudus (also called Menal- dus Vitalis, born at Dax, in the Departement des Landes, bacca- laureus in decretis, and student at Avignon) two alphabets of steel, two iron forms (frames?), one steel screw, 48 forms of tin, and divers other forms belonging to the art of writing {duo_abecedaria calibis et duas formas ferreas, unum instrumentum calibis vocatum vitis, quadraginta octo formas stangni necnon diversas alias formas ad artem scribendi pcrtinentes) , and promised to return these

instruments

{ad usum scribendi pertinencia) the moment Manaudus asked for them. The second document (dated August 27, 1444) makes no mention of tools or instruments, but is Procopius's bond for two sums of money (10 to 27 florins) which he had borrowed from Georgius de la Jardina ; for the first he promised to instruct the said George in the art of writing well and seemly, and to do the necessary and suitable things for one month {pro quibus promisit instruere dictum Georgium in arte scribendi bene et condecenter, et administrate necessaria et opportuna, hinc ad unum mensem), on condition that neither of them should instruct anyone else in the said art of writing, without the consent of the other {fuit tamen de pacto quod nullus non debeat instruere aliquem in dicta arte scribendi, nisi de licentia alterius). The third document (March 10, 1446) is an agreement between Procopius and a Jew of Avignon named Davinus de Codarossia, who had advanced money to him and held property from him as security. The Jew had promised to teach Procopius to paint stuffs in different colours, and the latter had promised the Jew to make for him and to deliver to him " twenty-seven prepared Hebrew letters, well and properly cut in iron according to the science and practice of writing, which, two years ago, the said Procopius had shown and taught the Jew, together with instru- ments of wood, tin and iron {Procopius promisit . . . judeo facere et factas redder e et restituere viginti septem litter as ebreaycas formatas, scisas in ferro bene et debite juxta scientiam et practicam scribendi, sunt duo anni elapsi ipsi judeo per dictum Procopium ostensam et doctam, ut dixit, una cum ingeniis de fuste, de stagno et de ferro). It was also agreed that the Jew should pay for the tin and wood for the instruments of the Hebrew writing {fuit de pacto quod idem judeus soliiet stagnam et fustes artificiorum sive ingeniorum scripture ebrayce). And Procopius further promised to give the Jew, the following week, ten florins to recover certain pledges or utensils which the Jew had in pawn from him, the latter binding himself not to reveal the science or teach the art to any one as long as Pro- copius should remain at Avignon or in the neighbourhood {promisit eidem judeo dare decern florenos per totam hebdomadam proxime fuluram et restituere sibi certa pignora sive ustensilia que ipse judeus habet in pignora a dicto Procopio). The fourth document (April 5, 1446) shows that Procopius had made for the above-named Menaldus Vitalis and Arnaldus de Coselhaco (and Girardus

Ferrosis?) and de- livered to them several instruments or tools of iron, steel, copper, latten, lead, tin and wood for writing artistically; he had instructed them in the said art of writing artistically, and all the tools belonged to them in common. But Menaldus, wishing to sell his share in the said tools to the others and to retire from the association, twelve florins were paid to him in two instalments, but at the request of Procopius he testifies under oath that the said art of writing, taught him artistically by the said Procopius, was real and most proper, and also easy, practicable and useful to any one wishing and choosing to work it {Cum dictus Procopius super arte scribendi artificialiter fecerit venerabilibus viris . . . Menaldo Vitalis et Arnaldo de Cosel- haco . . . nonnulla instrumenta sive artificia causa artificialiter scribendi tarn ferro de callibe, de cupro, de lethono, de plumbo, de stagno, et de fuste . . . dictamque artem scribendi artificialiter eos docuerit, instrumentaque ipsa omnia et singula sint . . . communia inter eosdem sludentes . . . Cumque dictus . . . Vitalis cupial . . , par- tem suam dictorum instrumentorum sive artificiorum . . . venders et a communione eorum recedere . . . vendidit dicto Procopio et Girardo presentibus . . . partem suam . . . precio duodecim flore- norum . . . Ibidem Vitalis . . . medio suo juramento . . . dixit . . . dictam artem scribendi per dictum Procopium artificialiter eidem doctam, esse veram et verissimam, esseque facilem, possibxlem et utilem laborare volenti et diligenti earn). The fifth document (April 26, 1446) shows that Procopius had recovered from Davinus all the pledges which he had pawned with him, except one mantle and 48 letters engraved in iron, that Davinus had not yet carried out his part of the agreement as to teaching Procopius the painting of different colours on stuffs, whereas Procopius had delivered to the Jew all the arts, tools and instruments pertaining to writing artistically in Latin letters, as he had promised to do on the 10th of March last. {Procopius confessus fuit se ab eodem judeo recepisse . . . omnia pignora sua per eum penes dictum judeum impignorata, excepto uno mantello et quadraginta octo litteris gravaiis in ferro. Et . . . dictus judeus confessus fuit . . . recepisse a dicto Procopio . . . omnia artificia, ingenia et instrumenta ad scribendum artifi- cialiter in litera latina, &c.) Again the compact is that Davinus shall not reveal the science to anyone, at least so long as Procopius should reside at Avignon or within 30 m. in the neighbourhood. {nemini mundi dicere, notificare nee quovismodo revelare, per se nee per alium ullomodo, presentem scientiam in teorica nee pratica, et nulli mundi earn

docere neque revelare earn fuisse ostensam per quemvis).

It is difficult to find the art of printing with movable types, or the art of casting types in these documents. The Abbat, however, says they prove the establishment of a printing-office at Avignon in 1444, and he reads ” matrices,” ” caracteres d’impri- merie,” une ” imprimerie,” and ” tout un matiriel d’imprimerie ” in them, although the documents themselves do not mention such things ; they only allude to the ” art of writing,” the ” practice ” or ” exer- cise of writing ” ; the ” art of writing well and seemly ” ; the ” science and practice of writing ” ; the “art of writing artistically.” “

And

there is, apparently, no reason to think that these precise documents, while speaking exclusively of this art, should always mean another art which they do not mention. Procopius, indeed, seemed to have known an art of writing, in which he instructed others (second document) and which he and his associates wished to keep secret, while the ” letters,” tools, &c. of which they speak were no doubt ” movable.”

But Procopius himself appears to have possessed neither letters nor tools nor instruments or forms at the beginning of these pro- ceedings; it was Menaldus Vitalis, a bachelor of law and student at Avignon, who entrusted to him the ” two steel alphabets, two iron forms, one steel screw, and forty-eight tin and other forms,” mentioned in the first document of 1444. Procopius. however, appears to have seen no permanent value in these letters, forms, &c. as he, of his own accord, promised to return them at the first request of Menaldus, who had handed them to Procopius without asking for a receipt. The third document, however, makes it plain that Procopius engraved for Davinus the Jew, not for himself, twenty-seven Hebrew letters (therefore a complete alphabet, in- cluding the five final letters) in iron, in accordance with the art of writing which he had taught Davinus two years ago, together with tools of wood, tin and iron, in return for which the Jew would teach

Procopius the art of painting stuffs. The fourth document shows that Procopius had made tools of iron, steel and other metals for writing artistically, but again not for himself but for two other men one of whom was Menaldus who, two years ago, had entrusted him with two alphabets and some tools; Procopius, however, had this time reserved to himself a share in these tools, and Menaldus sold his share in the tools for twelve florins to the other associates, so that the value of all these tools cannot have amounted to more than about 36 florins of Avignon currency. ■

Therefore, the precise descriptions in the documents of the letters, tocls and instruments required for Procopius's art of writing artistically, and the absence of all allusions to paper, ink and other things necessary for printing with movable types, show that there is no reference to this art, even in its infancy. That art means the multiplication of books or documents by means of an adequate quantity of single types for composing a whole page of text, and capable of being taken asunder and used again for a second, a third and a multitude of other pages, and so produce a number of copies of a book in the same or a shorter time than a scribe with his pen could produce one copy. But two Latin alphabets (of steel) and one Hebrew alphabet (of iron) would not suffice for composing and printing more than two or three words on any one page at a time, so that a person with such a small quantity of letters at his command would, in several respects, be worse off than a scribe. Hence the documents which only refer to the art of writing, mean nothing more serious than an art of taking impressions of certain letters (perhaps initials or capitals) in a more regular and steady fashion than even trained scribes could produce them by hand. For pressing in such (ornamental) initials or capitals here and there in MSS., after the scribes had done their ordinary work of writing, the insulated alphabets of Menaldus and Davinus would be a great help and save a deal of time and labour, but useless for the art of printing with movable types. If the two steel alphabets, and the one Hebrew alphabet of iron, and the 48 letters engraved in iron had been patrices, and the 48 forms of tin had been matrices, the documents, no doubt, would contain some expressions to show this, in spite of the endeavour not to divulge this art of writing. What the nature of this writing was, and why all these forms and instru- ments, even a screw, were required, we cannot say. It has been pointed out that the art of

printing was also described as an art of writing, which is true; but when it is so described we learn at the same time that typography is meant. But we must bear in mind that Davinus the Jew was engaged on the painting of colours on stuffs and that Procopius desired to become acquainted with this industry. No doubt tools were much more required for this work than for writing. However, this writing association seems to have come to an end in 1446, and the parties departed from Avignon, without leaving there or anywhere else any trace of themselves and their interesting operations. See also Zedler, Gutenberg- Forsch., p. 10 sqq.

As for non-European countries and towns, printing was established in Mexico in 1544, at Goa about 1550, at Tranquebar in 1569, Terceira inthe Azores 1583, Lima 1585, Manila and Macao (China) 1590, in Haiti in the beginning of the 17th century, at Puebla in 161 2, Cambridge (Mass.) 1638, Batavia 1668, Tiflis 1701, German-town 173s, Ceylon 1737, Halifax (Nova Scotia) 1766, Madras 1772, Calcutta 1778, Buenos Aires 1789, Bombay 1792, in Egypt (at Alexandria, Cairo, and Gizeh) in 1798, at Sydney 1802, Cape Town 1806, Montevideo 1807, Sarepta 1808, Valparaiso 1810, Astrakhan 181 5, in Sumatra and at Hobart Town and Santiago (in Chile) in 181 8, in Persia (at Teheran) in 1820, and at Chios about 1821. 1

1 On the introduction of printing in various towns, consult Henry Cotton, A Typog. Gazet., 8vo, Oxford, 1831 and (second series, 8vo,

Till the moment (say 1477) that printing was practised in almost all the chief towns of the Netherlands, Germany Italy, Switzer- land, France, Spain, England, not a single printer carried away with him a set of types or a set of punches*

*or moulds from the master who had taught him, but, in _. , setting up his printing office, each man cast a set of types **

for his own use, always imitating as closely as possible the hand- writing indigenous to his locality, or of some particular manuscript which he or his patron desired to publish. When we compare Schoeffer's 30-line Indulgence of 1454 with a manuscript copy of the same Indulgence dated the 10th of

April 1454, now in the hands of a private collector at Wiesbaden, we see that the types used in printing that document were specially cast for the purpose after the model of the handwriting employed for the written copies. We know also that the types of the 36-line and 42-line Bibles and those of the Psalter of 1457 are the closest possible imitations of the ornamental church handwriting cus- tomary at the time of their production. Also, when we compare the 31-line Indulgence of 1454 with the German blockbook called the Enndtchrist, and both in their turn with the German MSS. of that period (especially the manuscript portions in the printed copies of the Indulgences), we see that the cutter of the text type of the Indulgence, as well as the engraver of the blockbook, formed his characters according to some German handwriting (book hand) of the period. This imitation extended, not only to the shape of the individual letters of the alphabet, but likewise to all those combinations of letters (double p, double /, double s, st, ti, tu, re, cu, ct, si, de, to, ci, te, ce, or, ve, po, fa, he, be, &c.) and contractions (for pro, -urn, -em, en, the, tier, -bus, bis, sed, am, tur, qui, quae, quod, secundum, &c.) which were then, and had been for many centuries, in use by scribes. In most, if not all cases, the MSS. which the printers imitated were, as has been re marked above, indigenous to the place where they settled. Thus the first printers of Slibiaco, though they were Germans and had most probably learnt the art of casting types and printing at Mainz, yet cut their types after the model of some Italian MS. which was free from any Gothic influence, but written in a pure Caroline minuscule hand, differing but slightly from the Caroline minuscules which the same printers adopted two years afterwards at Rome. The first Paris printers started in 1470 with a type cast entirely on the model of the Caroline minuscule handwriting then in vogue at Paris. John de Westphalia, who introduced printing into Belgium, used from the beginning a type which he calls Venetian. Therefore a great similarity (without absolute identity) between the types of two printers {e.g. Schoeffer and Ulr. Zell), should be attributed to the similarity of the handwritings which the printers followed, hot to any attempt on their part to imitate each other's types. To this universal system (clearly discernible in the first twenty-five years of printing) of each printer setting up business with a new type cast. by himself, there would be, according to the conjectures of some bibliographers, -only two exceptions; one is Albrecht Pfister (see above) ; the other is the

Bechtermunczes of Eltville (see above). 2

Another important feature in the earliest books is that the printers imitated, not only the handwriting, with all its contractions, com- bined letters, &c, but all the other peculiarities of the,, MSS. they copied. There is in the first place the un yaevenaess evenness of the lines, which often serves as a guide to° nes ‘ the approximate date of an early printed book, especially when we deal with the works of the same printer, since each commenced with uneven lines, and gradually made them less uneven, and finally even. The unevenness was unavoidable in manuscripts as well as in blockbooks; but in the earliest printed books it is regarded as evidence of the inability of the printers to space out their lines. If this theory be correct, this inability was perhaps owing to the types being perforated and connected with each other by a thread, or to some other cause which has not yet been clearly ascertained. In some incunabula we find some pages with uneven lines, and others quite straight in the same book. It is not impossible, however, that the unevenness was simply part and parcel of the system of imitating MSS., and that only gradually about 1473 or 1474, but in some cases later) printers began to see that even lines looked better than uneven. This seems clear when we observe that the imitation of MSS. was carried so far that sometimes things which deviated from the work of the scribe, but had accidentally been printed in, were afterwards erased and altered in conformity with the MS. The Paris Library, for instance, possesses two copies of the Liber Epistolarum of Gasparinus Pergamensis (printed at Paris; in 1470), in both of which the initial G of the first line and the initial M of the fourth line were printed in, and, whilst they have been allowed to

Oxford, 1866); (P. Deschamps) Diet, de geogr. a I’usage du libraire, (8vo, Paris, 1870); R. C. Hawkins, Titles of the First Books from the Earliest Presses Established in Different Cities in Europe, (4to, New York, 1 884) ; Rob. Proctor, Early Printed Books in the British Museum , (1898), &c.

2 In recent years Dr Dziatzko, overlooking the relation between MSS. and typography in its infancy, has attempted’ to show that’ the types of the 36-line Bible were imitations of those of the 42-line Bible.

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remain in one of the copies, in the other they were regarded as a fault and replaced by a rubricated L and M.

In the second place the initials of books or the chapters of books in MSS., and again in blockbooks and the earliest products of printing, were always, or at least in most cases (they are printed Initials. j n tng i n(j u lg ence g { 1454), omitted by the scribe and the printer and afterwards rilled in by the rubricator. As the latter artists were sometimes illiterate and very often filled up the gap by a wrong initial, we find in many MSS. as well as early printed books small letters written either in the margin or in the blank left for the initial, to guide the rubricator. In most cases where these letters (now called initial directors) were written in the margin, they were placed as much as possible on the edges of the pages in order that they might be cut away by the binder as unsightly; but in many incunabula they have remained till the present day. 1 Later on these initial directors were in many books printed in (in lower-case type) with the text. In all cases, whether written or printed, they were meant to be covered by the illuminated initial ; but, as a matter of fact, the latter very seldom covers the initial director so completely as to make it invisible, and in various cases the intended illumination was never carried into effect. With respect to the hyphens, which were used in the 1454 Indulgences and the 36-line and Hyphens. ˆ 2 line Bibles, always outside the printed margin, some of the earliest printers did not employ them at the moment that they started their presses, and in the case of some printers the non use or use of hyphens, and their position outside or inside the printed margin, serve as a guide to the dating of their products. After about 1472 they become more uniform in their shape and more generally used.

The use of signatures was confined in MSS. mostly to mark the quires (with a numeral or a letter of the alphabet), sometimes also the leaves; in many cases they were written close to the signatures, bottom of the leaf, so that they might be cut off by the binder, which has happened in many cases, wholly or in part, as may be seen in many MSS. ; in blockbooks they are usually printed with the picture on each sheet or page ; they are not printed in incunabula close to the bottom line of the

page before 1472 (at least in no earlier book with a date), when they appear in Joh. Nider's Praeceptorium Divinae Legis, published by Johan Koelhoff at Cologne. Caxton did not adopt them till 1480. In the books printed before 1472 they were written by the rubricator or the binder, in the same way as in the MSS.

Catchwords (custodes) were used for the first time about 1469 by

_ . . . Johannes of Spires, at Venice, in the first edition of Catchwords. Tachus

Pagination or rather foliation was first used by Arn. Ther Hoernen,

at Cologne in 1471, in Adrianus's Liber de remediis fortuitorum

. casuum, having each leaf (not page) numbered by

agination. fig Ures pl ace d j n the end of the line on the middle of

each right-hand page.

The practice among early printers of imitating and reproducing MSS. was not abandoned till many years after the first dated docu- S| . ˆment (1454) made its appearance; and, looking at the

Progress at b°°k s printed, say from 1454 to 1477, from our present pjrst standpoint, the printing of that period may be said to

have been almost wholly stagnant, without any improve- ment or modification. If some printers (for instance, Sweynheym and Pannarts at Subiaco and Rome, and Nicolas Jenson at Venice) produced handsomer books than others, this is to be attributed to the beauty of the MSS. imitated and the paper used rather than to any superior skill. Generally speaking, therefore, we shall not be far wrong in saying that the workmanship of Ketelaer and De Leempt's first book, published at Utrecht c. 1473, and that of Caxton's first book issued at Westminster in 1477, exhibit almost the same stage of the art of printing as the 1454 Indulgences. If, therefore, any evidence

were found that Ketelaer and De Leempt and Caxton had really printed their first books in 1454, there would hardly be any- thing in the workmanship of these books to prevent us from placing them in that year. And conversely, if the Indulgences of 1454 had been issued without a date or without any names to indicate their approximate date, their workmanship might induce bibliographers to ascribe them to c. 1470, if not somewhat later. Even after 1477 alterations in the mode of printing books came about slowly and almost imperceptibly. It was no longer a universal system for printers to begin business by casting a type for themselves, but some received their types from one of their colleagues. And, though there were still many varieties of types, one sort began to make its appearance in two or three different places. The combinations of letters were the first to disappear; but the contractions remain in a good many books eyen of the 17th century.

Some theories have been based on, and others have been considered to be upset by, the supposition that the early printers always required as much type as printers of the present day, or at any rate

1 The university library of Basel possesses a collection of the earliest Paris books still bound in their original binding, in which these initial directors are written not only on the outer edges, but on the inner sides of the pages, and so close to the back that they can only be seen by stretching the books wide open.

so much as would enable them to set up, not only a whole quire of 4 or 5 sheets (= 8 or 10 leaves= 16 or 20 pages), but even two quires (= 40 pages). Consequently calculations have been made that, for instance, the printer of the 42-line Bible required a fount of at least 120,000 characters. See Bernard, Orig. de Vimpr. i. 164, who was a printer himself and speaks very strongly on this point. But there are numerous proofs that many early books were printed page by page, even when in small 4to. For instance, in some books it has been observed that portions of the types with which the text of the first, second or third pages of a quire had been printed, were used to "lock up" the types employed for the later pages of the same quire, as is evident from the blank impressions of such portions being found on these later pages. Again, in some small books, two, three or four blank leaves are found at the end, showing a

miscalculation of the printer at the commencement. Moreover, numerous itinerant printers of the 15th century established a press for a short time wherever they went, which proves that the furniture of the earliest printing-offices cannot have been of any great extent.

Early Types and their Fabrication. — We must now take notice of two theories or traditions which have been current for a long time as to some intervening stage between the art of block-printing and the art of printing with movable cast metal types. 2 One theory or tradition would have it that the inventor of printing, after the idea of single, individual, movable types had arisen in his mind, practised his new invention for some time with wooden types, and that he came only gradually to the idea of movable types cast of metal.

Junius gives us to understand that the Dutch Speculum was printed with such wooden types. Of Johann- Gutenberg it was asserted that he printed his first Bible with wooden w , types. The Mainz psalter, printed in 1457 by Joh. Fust Xv ° e s and Peter Schoeffer, was alleged to have been printed '

with wooden types, in which case the 4th edition, published in 1502, and even the 5th edition of 1516, would be printed with wooden types, the same being used for them as for the editions of 1457 and 1459. Theod. Bibliander was the first to speak (in 1548) of such types and to describe them: first they cut their letters, he says, on wood blocks the size of an entire page; but, because the labour and cost of that way was so great, they devised movable, wooden types, perforated and joined one to the other by a thread. 3 Bibliander does not say that he had ever seen such types himself, but Dan. Speckle or Specklin (d. 1589), who ascribed the invention to Mentelin, asserts that he saw some _ of these wooden types at Strassburg. 4 Angelo Roccha asserted in 1 591 that he had seen at Venice types perforated and joined one to the other by a thread, but he does not say whether they were of wood or of metal. 5 In 1710 Paulus Pater asserted that he had seen wooden types made of the trunk of a box-tree, and perforated in the centre to enable them to be joined together by a thread, originating from the office of Fust at Mainz. 6 Bodman, as late as 1781, saw the same types in a worm- eaten condition at Mainz; and Fischer stated in 1802 that these relics were used as a sort of token of honour to be bestowed on worthy apprentices on the occasion of their finishing their term.

Besides those who believed in these wooden types from the fact that the letters (especially in the Speculum) vary among themselves in a manner which would not be the case had they been cast from a matrix in a mould, there were authors and practical printers who attempted to cut themselves, or to have cut for them, some such wooden types as were alleged to have been used by the early printers. Some of them came to the conclusion that such a process would be quite practicable; others found by experiment that it would, in the case of small types, be wholly impossible. Nearly all the experi- ments, however, were made with the idea that the inventor of print- ing, or the earliest printers, started, or had to start, with as large a supply of type as a modern printer. This idea is erroneous, as it is known that, for a good many years after the first appearance of the art, printers printed their books (large or small) not by quires (quaternions or quinternions) but page by page. 7 Therefore, all considerations of the experimenters as to the impracticability of such wooden types, on account of the trouble and length of time required for the cutting of thousands of types, fall to the ground in face of the fact that the earliest printers required only a very small quantity of type, in spite of the peculiar forms (combined letters, letters with contractions, &c.) which were then in vogue. Up to

2 We do not allude to Tritheim's assertion that the Catholicon of 1460 was printed from wooden blocks; for this story, which he declares he had heard from Peter Schoeffer, if it were true, would belong to the history of block-printing. Nor need we speak of Bergcllanus's verses (1541), in which he distinctly alludes to carved blocks.

3 Commentatio de ratione communi omnium linguarum et literarum, p. 80 (Zurich, 1548).

4 Chron. Argent. MS. ed. Jo. Schilterus, p. 442.

5 De Bibliotheca Vaticana, p. 412 (Rome, 1591).

6 De Cermaniae miraculo, p. 10 (Leipzig, 1710).

7 See, for instance, W. Blades, Life of Caxton, i. 39.

the present time no book or document has come to light which can be asserted to have been printed from single, movable, wooden types. But we have seen above that the Haarlem tradition, as told by Junius, distinctly points to such types having been used for, among other things, the first edition of the Dutch Spiegel, and no one examining this edition (of which two copies are preserved at Haar- lem) would deny that there are grounds for this belief; the dancing condition of the lines and letters making it almost impossible to think that they are metal types. For how long and to what extent such types were employed, if at all, we cannot say.

The other theory would have it that between block-printing and printing with movable cast types there was an intermediate stage of printing with " sculpto-fusi " types, that is, types / "it"' °^ wn ich tne snan ks had been cast in a quadrilateral ypes. mou j c] j an(j tne " faces," i.e. the characters or letters engraved by hand afterwards. This theory was suggested by some who could not believe in wooden types and yet wished to account for the marked irregularities in the types of the earliest printed books.

Gerardus Meerman, the chief champion of this theory, based it, not only on the words of Celtes 04 mores, iii. 3), who in 1502 described Mainz as the city " quae prima sculpsit solidos acre characteres," but on the frequent recurrence of the word sculptus in the colophons of the early printers (for Jenson and Husner of Strassburg, see p. 514 above). Sensenschmid in 1475 said that the Codex Justinianus was " cut " (insculptus) , and that he had " cut " (sculpsit) the work of Lombardus, In Psalterium. Meerman also interpreted the account of the invention of printing by Trithemius 1 as meaning that, after the rejection of the first wooden types, the inventors discovered a method of casting the bodies only of all the letters of the Latin alphabet from what they called matrices, on which they cut the face of each letter; and from the same kind of matrices a method was in time discovered of casting the complete letters of sufficient hardness for the pressure they had to bear, which letters they were before — that is, when the bodies only were cast — obliged to cut. 2 In this way Meerman explained that the Speculum was printed in sculpto- fusi types, although in the one page of which he gives a facsimile there are nearly 1700 separate types, of which 250 alone are e's. Schoepflin claimed

the same invention for Strassburg, and believed that all the earliest books printed there were produced by this means. Meerman and Schoepflin agreed that engraved metal types [liter ae in aere sculptae) were in use for many years after the invention of the punch and matrix, mentioning among others so printed the Mainz psalter, the Catholicon of 1460, the Eggestein Bible of 1468, and even the Praeceptorium of Nider, printed at Strassburg in 1476. But the difficulty connected with the process of first casting the shanks and afterwards engraving the faces of the types has become apparent to those who have made experiments; and it seems more probable that the terms sculpere, exsculpere, insculpere, are only a figurative allusion to the first process towards producing the types, namely, the cutting of the punch, which is artistically more important to the fabrication of types than the mechanical casting — all the more as Schoeffer in 1468 makes his Grammatica vetus rhythmica say, " I am cast at Mainz," an expression which could hardly be anything but a figurative allusion to the casting of the types.

*Granting that all the earlier works of typography preserved to us are impressions of cast-metal types, there are still differences of T ■ Ca t °P' n ' on ' especially among practical printers and type- 1**5* d S f° un ders, as to the probable methods employed to cast " an ' them. It is considered unlikely that the inventor of printing passed all at once to the perfect typography of the punch, the matrix and the mould. Bernard 3 thought that the types of the Speculum were cast in sand, as that art was certainly known to the silversmiths and trinket-makers of the 15th century ; and he accounts for the varieties observable in the shapes of various letters on the ground that several models would probably be made of each letter, and that the types, when cast by this imperfect mode, would require some touching up or finishing by hand. He exhibits a specimen of a word cast for him by this process which not only proves the possibility of casting types in this manner, but also shows the same kind of irregularities as those observable in the types of the Speculum.*

But here again it is argued that in types cast by this or any other primitive method there would be an absence of uniformity in what founders term " height to paper." Some types would stand higher than others, and the low ones, unless raised, would miss the ink and not appear in the impression. The comparative rarity of faults of this kind in the Speculum

leads one to suppose that, if a process of sand-casting had been adopted, the difficulty of uneven heights had been surmounted either by locking up the forme face downwards, or by perforating the types, either at the time of casting or afterwards, and holding them in their places by means of a thread or wire.

1 Annales Hirsaugienses, ii. 421 : " Post haec inventis successerunt subtiliora, inveneruntque modum fundendi formas omnium Latini alphabeti Hterarum, quas ipsi matrices nominabant, ex quibus rursum aeneos sive stanneos characteres fundebant, ad omnem pressuram sufficientes, quos prius manibus sculpebant."

*2 Origines typographical app. p. 47 (The Hague, 1765). * Qrigine de limprimerie, 1. 40.*

To this cause Ottley attributed the numerous misprints in the Speculum, to correct which would have involved the unthreading of every line in which an error occurred. And, as a still more striking proof that the lines were put into the forme one by one, in a piece, he shows a printer's blunder at the end of page 42 in the unmixed Dutch edition, where the whole of the last reference-line is put in upside down, thus: —

No traaa bropot alaptnat tnat nttl tmrirntif.*

-JJfltlS] X{ 0|B4IMg)

A " turn " of this magnitude could hardly have occurred if the letters had been set in the forme type by type.

A second suggested mode is that of casting in clay moulds, by a method very similar to that used in the sand process, and resulting in similar peculiarities and variations in the types.

Ottley, who was the chief exponent of this theory, Types Cast suggested that the types were made by pouring melted ' B c,a y lead or other soft metal into moulds of earth or plaster, Moulds. after the ordinary manner used from time immemorial in casting statues of bronze and other articles of metal. But the mould thus formed could hardly avail for a second casting, as it would be scarcely possible to extract the type after casting without breaking the clay, and, even if that could be done, the shrinking of the metal in cooling would be apt to warp the mould beyond the possibility of further use. Ottley therefore

suggests that the constant renewal of the moulds could be effected by using old types cast out of them, after being touched up by the graver, as models — a process which he thinks will account for the varieties observable in the different letters, but which would really cause such a gradual deterioration and attenuation in the type, as the work of casting progressed, that in the end it would leave the face of the letter unrecognizable as that with which it began. It would, therefore, be more reasonable to suppose that one set of models would be used for the preparation of all the moulds necessary for the casting of a sufficient number of types to compose a page, and for the periodical renewal of the moulds all through the work, and that the variations in the types would be due, not to the gradual paring of the faces of the models, but to the different skill and exactness with which the successive moulds would be taken.

It is evident that the sand and clay methods of casting types above described would be slow. The time occupied after the first engraving of the models in forming, drying and clearing the moulds, in casting, extracting, touching up and possibly perforating the types required for one page, would exceed the time required by a practised xylographer for the cutting of a page of text upon a block. But he that has gone through the trouble of casting separate movable types has a clear gain over the wood-block printer in having a fount of movable types, which, even if the metal in which they were cast were only soft lead or pewter, might be used again and again in the production of any other page of text, while the wood block can only produce the one page which it contains. Moreover, only one hand could labour on the xylographic block; but many hands could be employed in the moulding and casting of types, however rude they might be. Bernard states that the artist who produced for him the few sand-cast types shown in his work assured him that a work- man could easily produce a thousand such letters a day. He also states that, though each letter required squaring after casting, there was no need to touch up the faces.

A third suggestion was made as to the method in which the types of the rude school may have been produced. This may _ . be described as a system of what the founders of about y ype ‘ 1800 called polytype, which is a cast or facsimile copy of an engraved block, matter in type, &c.

Lambinet, 4 who is responsible for the suggestion, based upon a new translation of Trithemius's narrative, explains that this process really means an early adoption of stereotype. He thinks that the first printers may have discovered a way of moulding a page of some work — an Abecedarium — in cooling metal, so as to get a matrix- plate impression of the whole page. Upon this matrix they would pour a liquid metal, and by the aid of a roller or cylinder press the fused matter evenly, so as to make it penetrate into all the hollows and corners of the letters. This tablet of tin or lead, being easily lifted and detached from the matrix, would then appear as a surface of metal in which the letters of the alphabet stood out reversed and in relief. These letters could easily be detached and rendered mobile by a knife or other sharp instrument, and the operation could be repeated a hundred times a day. The metal faces so produced would be fixed on wooden shanks, type high, and the fount would then be complete. Lambinet's hypothesis was endorsed by Firmin-Didot, the renowned type-founder and printer of Lambinet's day. But it is impossible to suppose that the Mainz psalter of 1457, which these writers point to as a specimen of. this mode of execution, is the impression, not of type at all, but of a collection of " casts " mounted on wood.

Yet another theory has been proposed by Dr Ch. Enschede, head of the celebrated type foundry of the same name at Haarlem, who says (pp. 15 sqq. of his Technisch onderzoek naar de uitvinding van de Boekdrukkunsi, 1901), that the principle, of a printing surface

4 Orig. de Vimprimeric i. 97 (2 vols. 8vo., Paris, 1810).

composed of separate pieces was known to the block-printer, but he would have found it impossible to use small insulated blocks of wood _ . M for printing, or to manufacture them for that purpose ensc eae w j t j 1 tne necessar y mathematical precision'. Hence the

tory. jj ea Q j se p arate movable characters was not the inven-

tion of printing, but the art of casting them, and this was a work not for the block-printer, but for another industry, for a foundry.

From the types of B 36 and B 42 Enschede concludes that Guten- berg's punches (patrices) were made, like the bookbinders' stamps, of yellow copper (brass. Germ. Messing). With such patrices only leaden matrices could be made, but the latter could be produced in two ways: the lead can be poured over the patrix, or the patrix be pressed into cold lead. The first mode is somewhat complex, but the matrix would have a smooth surface, and need no further adjustment. The second mode is more simple, but requires great force, although lead is a soft metal. Moreover, the surface of the matrix has to be trimmed, as the impression forces the lead down- wards and sidewards, which makes the surface uneven, though by this pressure the lead becomes firmer and more compact, to the advantage of the type-founder. Enschede thinks that Gutenberg's letters must have been sharp, and that he obtained his matrices by the second mode; he had each letter engraved on a brass plate, 2mm. thick, therefore a mere letter without anything underneath it. This letter (patrix) was pressed, by means of a small flat plate, so far into the metal that its back formed one surface with the top part of the lead, and then removed. After the patrix and matrix had been made in this way, the letter was to be cast, and Enschede believes that for this work Gutenberg used what in Germany is called the Abklatsch-method, which, after having been gradually improved, was at last superseded by more perfect machinery. By this method the letter wi= ca=t in two tempos. First the letter itself on a small plate; then the plate placed underneath a casting- form, to fix it to a small shank, which was to be cast into the form and would make, with the plate, the exact height of the letter. The letter on the plate was made not by pouring the metal into the matrix, but by beating the latter into the molten metal. When lead is heated so as to be a soft mass it easily assumes the form of any object which falls on or in it, therefore also of the matrix, which is the image of the engraved type. When the metal is not over- heated it will immediately cool down by contact with the cold matrix, so that the latter will not be injured, although it consists of the same substance as the molten metal. In this way a great many letters can be cast from one fhatrix. Enschede describes various difficulties connected with this method, and tells us that only large letters,

like those of B 36 and B 4Z , could be made by it, as the operation of adding the shank to the letter becomes impossible in the case of smaller letters. Hence Gutenberg, having conceived the idea of printing from seeing (!) the Dutch Donatuses, chose this large size of type for his work; for the smaller types of the 1454 Indulgences a copper matrix was required, which, in its turn, necessi- tated the use of a steel patrix, the introduction of which he ascribes, as others have done before-him (e.g. Bergellanus), to Peter Schoeffer.

As to the Costerian types, their bad and irregular condition shows, he thinks, that they were produced from leaden matrices, and the latter from brass patrices, though wooden patrices are also possible, but not probable. All the tools, however, were imperfect, and the workmen inexperienced, and therefore bound to produce such imperfections as he finds in the Abecedarium and, Donatus types. But the types were cast in one tempo; the A bklatsch-method would have been out of the question for them on account of their small size. In this way Enschede thinks Coster, not having learnt his art from anybody, invented the type cast with the staff, in one tempo, while Gutenberg, having had a Costerian Donatus as his model, cast his large types in two tempos by the Abklatsch system till Peter Schoeffer, by means of his steel patrices, was able to cast smaller types such as those of the 1454 Indulgences, with staff and all.

Enschede warns us that he is merely making suggestions as a type-founder, that he is not a bibliographer, and leaves the inter- pretation of documents to others. We quote his theories as coming from such a qualified type-founder, and because they have made some impression in certain quarters, but they lead us away from the real points connected with the invention of printing. First of all the " casting of metal types " is not, as he thinks, the first stage in the invention ; its beginning, its essence is, and has always been thought to be, the movability of the characters. This movability, and the accidental way in which it was discovered, form together the pith of the Haarlem tradition as told by Junius. He indicates it, without using the word " movable," by saying that Coster, while walking in the Haarlem wood, cut some letters in the bark of a tree, and with them, " reversely impressed one by one on paper," composed one or two lines. Nothing seems more natural than that a block-printer (as the printer of the xylographically printed Speculum must have been) should cut such separate letters,

and thereupon perceive that they could be used over and over again for a variety of words, on different pages, while those which he used to cut in a block only served him for one page and for one purpose. It is equally clear from the Haarlem tradition that the art of casting metal types was the second stage in the invention, a development or outcome of the primary idea of " movable letters," and the realiza- tion of their advantage, for Junius says that Coster " afterwards

changed the beechen characters into leaden, and the latter again into tin ones." This also shows that the discoverer of the insulated movable wooden letters — after realizing, perhaps, that they could not endure much pressure, or missed (as Enschede says) the mathe- matical precision necessary for his purpose — transformed himself from a woodcutter into a letter-founder, and had no recourse (as Enschede would have it) for casting his types to a foundry apart from his own. As this transformation is possible and probable there seems to be no reason for departing from the simple but clear Haarlem tradition as we read it in Junius.

In the infancy of printing every printer, in different countries and different towns, starts with his own types; hence we may conclude that he had learnt the art of engraving and casting them himself, and so combined the art of type-founding with that of printing. This points back to a combination of the two or three arts in the first printing-office. It would be strange if the inventor of the movable letters, whom we have shown to have been a block- printer, and therefore acquainted with the art of engraving letters, and other mechanical contrivances connected with printing, had lacked the ability, which his immediate followers possessed, of imparting to his movable characters, by some means or another, that firmness and precision which he required for the realization of his invention. How long Coster had been a block-printer before he invented, and how long and to what extent he continued to use, the movable wooden letters, we cannot tell.

That Enschede 1 ascribes to Coster the invention of casting metal types with a shank (as they have been manufactured for centuries afterwards), and that of another mode of manufacturing types (the Abklatsch-method) to Gutenberg, suggested to the latter by seeing (!) the Donatuses printed at Haarlem, looks like an amia'me attempt to get over the unpleasant tradition of the theft of Coster's types, but his

theories are irreconcilable with the Haarlem tradition, with Zell's account of the relation between Dutch and Mainz printing and with bibliography in general.

It is not surprising that Enschede's theories called forth others from Zedler (Verbffentl. i. 34), who argues as follows: Enschede says rightly that the type of the Hague Dutch Donatus is more defective than that of any other 15th-century book, more than even that of the Paris Donatus. Such types could not have been cast from a copper matrix. But a printer who had derived his art of casting types from Gutenberg or one of his pupils, would hardly, after the introduction of the steel stamp and the. copper matrix (necessary for manufacturing the small types of the 1454 Indul- gences), have returned to the casting of a small type from a leaden matrix, and used, moreover, a process which remained, in its consequences, behind that of Gutenberg. Zedler then points to a peculiarity of the earliest Dutch incunabula already mentioned above, namely, the sign of contraction connected with some letters by a fine stroke, which he says is not (!) found in the Dutch block-books, or in the Dutch MSS. He thinks, therefore, that this stroke was required by the method of casting this type. The stamp for making the matrix cannot have been a staff, on the lower end of which the reversed letter was cut, but a mere letter without any footing. Consequently, it must have consisted of lead not wood, and have been manufactured in the same way as Gutenberg's type was made, according to Enschede. Every sign of contraction had to be one whole with the letters to which they belonged tp prevent their being shifted during the process of printing. The letters cast from the matrix made in this way had as foot a thin square plate which enclosed the letter but no staff, owing to the mode of making the stamp and the matrix. If the Dutch printer had in- tended to cast a type with a staff by means of a casting tool, however primitive, he would not have required the thin plate. But his letters, with a thin plate as their foot, required to be pasted on a sheet of strong paper, so as to be firmly connected in words and sentences for the purpose of printing. Hence the printer could regulate the spaces between the words, without using, like Gutenberg, spaces of a definite width for this purpose, so that he had no trouble in making the lines end evenly. From such a printing-surface with a firm footing, it was possible, after the ground had become hard, to obtain impressions just as from movable types enclosed in the forme. Zedler was told

by an expert that, technically, there was nothing against such an explanation, but, he says, if it were correct, it would not solve the question, not yet satisfactorily answered, as to what we have to understand by the printed Dutch Donatuses. The " doctrinal jett6 en molle " of Jean le Robert and the libri impressi, mentioned under the year 1450 in the Memorial of the monastery Weidenbach in Cologne would then be books printed from such printing plates with separately cast letters. In this way Zells' account in the Cologne Chronicle would be confirmed (!). We should also understand why the Dutch, though knowing the art of casting types, only printed Donatuses and similar small schoolbooks, for which there was much demand, for in the present day, stereotype-printing is likewise used for books which, when editions follow each other rapidly, have to be printed unaltered. In this case Gutenberg would not be the inventor of the cast letter. But the Dutch could not claim, with Ensched6, the honour of the invention of movable metal types. They invented the casting of letters, but it would be Gutenberg's merit to have invented the movable cast types. At any rate he would be the inventor of the

casting instrument whereby the letter with the staff became inde- pendent, that is movable. The early Dutch printing letter, which could only be used by being firmly footed on a plate, would have missed its real value for printing, its free movability.

Zedler, for want of data, cannot say where and when Gutenberg learnt the technics of early Dutch printing, though the Cologne Chronicle tells us that from this printing his work began. But he thinks that the secret arts which occupied Gutenberg at Strassburg, and which, when the documents are impartially (!) considered, can be regarded as nothing but experiments in the printing of books, are earlier than 1440. He will not decide whether Guten- berg has been in Holland, or whether this historical kernel is the foundation of the Coster legend (!) of Adrianus Junius which is independent of the Cologne Chronicle. Anyhow, Gutenberg still required ten years of hard work and troublesome experiments, before he, basing

himself on the early Dutch printing, whatever this may have been, could become the inventor of the present mode of printing books.

We here see how Enschede's theories give rise to Zedler's structure of theories. When the former says that Gutenberg chose for his first work the large letters of B 36 and B 42 , because the Abklatsch-method (invented [?] by him) was only fit for large letters, he forgets that the printers of these Bibles, wishing to apply their new art to the production of copies of the Bible in a speedier way than the scribes of their time were able to do, had, of necessity, to design their types from the large ornamental church-hand then in vogue for Bibles, Psalters, Missals, &c. For the same reason they prepared different, much smaller, types for the Indulgences of 1454, as the manuscript copies of these Indulgences, handed to them as " copy," were written in the bastard Roman book-hand, used for such documents. When the arts of casting types and of printing with them found their way to Mainz they were new in that city, but they came there already well-developed, and the printers, whoever they were, knew how to prepare themselves for any book or docu- ment which it was thought desirable to print. But of these questions Enschede takes no account. He ascribes the two Bibles to Gutenberg, because Dziatzko has done so, without inquiring whether Gutenberg (not Pfister) had, after all, anything to do with B 36 .

Zedler's theories, partly developments, partly corrections of those of Enschede's, are based on the misapprehension that a peculiarity in the Costerian types, i.e. the connexion of the signs of contractions by a fine stroke with the letters over which they stand, does not occur either in the Dutch blockbooks or in the Dutch MSS. This connexion, however, far from being not found, is a conspicuous feature, in the Dutch blockbooks and MSS., and being faith- fully reproduced in the Costerian types, shows how near these types stand to the block-printing and MS. periods. Zedler does not explain how he would print with the plate-footed types, pasted on strong paper, which he ascribes to Coster. Nor does he say whether he ever examined the Costerian editions of the Speculum, Donatuses, &c, to see whether they showed any traces of such awkward contrivances.

After having done justice, we hope, to these latest theories, which, in spite of their great length, leave many things

unexplained, it is a pleasure to read once more Junius's unvarnished account of the Haarlem tradition, which contains no intricate theories, but a simple explanation of the rise and progress of printing with mov- able (metal) types in that city. The reading of it shows that real facts can be explained in a few words, while theories require long explanations, first for explaining away the real facts, and then for explaining the theories, which after all lead us astray.

The shape and manufacture of the types used as early as c. 1470 do not seem to have differed materially from those of the present types. This is evident (1) from the shape of the old p h types which were discovered in 1878 in the bed of the Earliest river Sadne, near Lyons, opposite the site of one of the Type. 15th-century printing-houses of that city, and- which*

there is reason to believe belonged once to one of those presses, and were used by the early printers of Lyons; (2) from a page in Joh. Nider's Lepra moralis, printed by Conrad Homburch at Cologne in 1476, which shows the accidental impression of a type, pulled up from its place in the course of printing by the ink-ball, and laid at length upon the face of the forme, thus leaving its exact profile indented upon the page; (3) from an entirely similar page (fol. 4 b) in Liber de laudibus ac festis gloriosae Virginis (Cologne, c. 1468). From the small circle appearing in the two last-mentioned types, it is presumed that the letters were pierced laterally by a circular hole, which did not penetrate the whole thickness of the letter, and served, like the nick of modern types, to enable the compositor to tell by touch which way to set the letter in his stick. The fact that in these two cases the letter was pulled up from the forme seems to show that the line could not have been threaded.

Vine. Fineschi, Notizie Storiche sopra la stamperia di Ripoli, p. 49 (Florence, 1781), gives an extract from the cost-book of the Ripoli press, about 1480, which shows that steel, brass, copper, tin. lead and iron wire were all used in the manufacture of types at that period. 1

1 On the above theories and types consult T. B. Reed, Old English Letter Foundries, pp. 3-26.

History of the Earliest Types. — The history and nomenclature of the earliest types are practically a continuation of the history and nomenclature of the characters figured in the

earliest blockbooks, wood-engravings and MSS. For instance, Gothic type was first used, say, about the year 1445 ; but Gothic writing, of which that type was an imitation, was already known and used about the second half of the 12 th century and can be traced still farther back (see above). Again, the pure Roman type, which appeared about 1464, is nothing but an imitation of what in palaeography is called the Caroline minuscule, a hand- writing which was already fully developed towards the end of the 8th century (see Palaeography).

The broad outlines of the history of the earliest types are as follows: —

Gothic type, of the angular or pointed kind, was first used by the Haarlem printer of the Speculum, Donatus, &c. (see specimen No. 1, taken from the British Museum copy of the Gothic Speculum humanae sahationis, mixed Latin edition), presumably c. 1445. An entirely similar but larger type (No. 2, taken from the British Museum copy of Ludovicus [Pontanus] de Roma, Singularia) was used, presumably by the same printer, c. 1465-1470. Gothic type appeared in Germany as a church type in 1454, in the 31-line Indulgence, presumably printed by Johan Gutenberg at Mainz (No. 3, from the Gottingen copy), and in the 30-line Indulgence (No. 4, taken from the British Museum copy), printed by Peter Schoeffer at Mainz. Type No. 3 was also: used about the same time for the 36-line Bible, and type No. 4 for the 42-line Bible. Two much larger Gothic types appeared in the Psalter of 1457, published by Fust and Schoeffer (see Bernard, Origine, pi. vii.). In Italy Gothic type appears in 1468 (No. 5, taken from the British Museum copy of Cicero, De'oratore, published at Rome by Ulr. Hahn, the 15th of December 1468, in small Roman type, with imprint in Gothic), but in a more rounded form; it is practically the ordinary Italian writing influenced by the Gothic. In France Gothic began t to be used in 1473; in England it appears first in Caxton's type about the year 1480. 2 It was employed extensively in a great many of the earliest presses all over Europe, and con- tinued to be used largely at all times, especially for Bibles, law books, royal proclamations, _ &c, and even to this day it is the national character of Germany. It is now usually called lettre de forme, black letter or English in English-speaking countries, lettre flamand in Holland, and fractur in Germany.

Bastard Italian or bastard Roman was introduced in 1454 at

Mainz in the 31-line (No. 6) and 30-line (No. 7) Indulgences. It is also called lettre de somme, some think from the Summa of Thomas Aquinas, printed in the type of the Bible of Bastar ”

Italian or Roman.

1462 by Fust and Schoeffer. Varieties of this kind of type were, like the Gothic, much used by the earliest printers, as, for instance, the printer of the 1460 Catholicon, Mentelin of Strassburg, c. 1460, and Ulrich Zell at Cologne, c. 1466, &c. In England it appeared in the first three books printed (1478, 1479) at Oxford (No. 8, taken from the British Museum copy of Jerome’s Expositio in Simbolum Apostolorum wrongly dated 1468 for 1478).

Roman type, the Caroline minuscule of palaeography, was first used in Germany about 1464, Strassburg, by the printer whose fount of type is known by a peculiarly shaped R, and Roman who on that account is usually called ” the R printer ” (No. 9, taken from the British Museum copy of Durandus, Rationale, of which the Basel library possesses a copy which was bought in 1464). 3 In Italy it appears in 1465 at Subiaco (see Bernard pi. xii. No. 19), at Rome in 1 467 (op. cit. pi. xii. No. 20), but in all its purity at Venice in 1469, used by Johannes of Spires (op. cit. pi. xii. No. 25), and at Paris in 1470 (op. cit. pi. xiii. No. 25). In England it was not used before 1518, when Richard Pynson printed Pace’s Oratio in Pace nuperrima(sce facsimile in Reed’s Type Foundries,p. 92) .

Burgundian type, or gros batarde or secretary, was first used about 1470-1472 by Colard Mansion at Bruges (No. 10, taken from the British Museum copy of La Controversie de Noblesse, Burgundian. c. 1471-1472). With a somewhat similar type (No. 1-1, taken frorn the British Museum copy of the Recuyell) William Caxton is presumed to have printed, likewise at Bruges, a set of five books, of which the Recuyell of .the History, of Troye, a trans- lation of a work by Raoul le Fevre, is the best known and was probably printed c, 1471. 4 To this same class belong the first type (No. 12, from the British Museum copy of the Dictes) used in England by William Caxton for the printing of Dictes and Sayings of the Philosophers (Nov. 18, 1477), and that used by the printer of St Albans (No. 13, taken from the Cambridge University Library copy of Aug. Dactus, Elegancie). It was an imitation of the manuscript hand of the English and Burgundian scribes of

the 15th century, and, after having figured for a long time in several of the early London and provincial presses, was about 1534 entirely superseded by the English black letter. To this class of type

8 See Blades, Life of Caxton, pi. xvii.

3 See Jules Philippe, L'Imprimerie & Paris, p. 219.

4 Cf. Blades, Life of Caxton.

HISTORY]

belong also the later lettre de civilitb (c. 1 570), the script {lettre coulee, lettre de finance, Dutch, geschreven schrift), set court, base secretary, and running secretary types.

TYPOGRAPHY

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3» prima mpFo

No. 1 . — Speculum type c. 1445 (?).

prima mfafi

No. 2. — Pontanus type, ■jc. 1470 (?).

*atur**

aptoz; a? ac aiictc 6 bPeycefjafycritrnfy

Nos. 3 and 6. — Mainz 31-line Indulgence, 1454.

HtZltriaxm.

No. 5. — Cicero, De oratore,

1468.

merits fe&if uafc affectum

No. 8. — Jerome's Expositio

(1468), 1478.

Jlcucrtfk&e. tux cfcncranoij anˆj

ifcceatur 4

ftpfoit cf^acftude cxce/ftfy criitrintb)

Nos. 4 and 7. — Mainz 30-line Indulgence, 1454.

*♦toBCtffc ift**

No. 10. — Controversie de Noblesse, c. 1471-1472.

Remifinmsclc dinibD.Nucd antonomafice

No. 9.— Durandus, c. 1464.

No. 1 1 . — Recuyell of the Hist, of Troye, c. 1 471.

No. 12. — Dictes and Sayings,

1477-

fbftte fo&mo pEcSte: edRt&itfuetniemcR quo 35atim&Ce penu r

No. 13. — Aug. Dactus, Elegancie, 1479.

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of Typography at the University Press, Oxfora, 1693-1794, folio (Oxford, 1900); Olgar Thierry-Poux, Premiers monuments de I'imprimerie en France au I5 mc siecle, fol. (Paris, 1890); British Museum {Facsimiles from early printed books in the), (1897), 32 pis. folio; Type Facsimile Society, folio (Oxford, 1900-). The types after 1500 can best be learned from the catalogues of type-founders, among which those of Messrs Enschede of Haarlem occupy a foremost place. Of others we may mention : Indice dei caratteri nella stampa Vaticana, 4to (Rome, 1628); Epreuves des caracteres qui se trouvent chez Claude Lameste, 4to (Paris, 1742); Epreuves des car. de la fonderie de Claude Mozet, 8vo (Nantesi 1754); Les Car. de I'imprimerie par Fournier le Jeune, 8vo (Paris,

1764); Proef van Letteren, Bloemen, &c, van Ploos van Amstel, 8vo (Amsterdam, 1767); &preuve de car. de Jacques Francois Rosart, 8vo (Brussels, 1771) ; Schriften . . . bey J. II. Prentzler, 4to (Frank- fort-on-Main, 1774); Upreuves des car. de la fond, de J. L. Joannis, 8vo (Paris, 1776); Epreuves des car. de la fond, de J. L. de Boubers, 8vo (Brussels, 1777); Proeve van Letteren welke gegooten warden door J. de Groot, 8vo (the Hague, 1787); Pantographie, by Edmund Fry, 8vo (London, 1799) ; and Manuale typographico, by G. Bodoni, 4to (Parma, 1818).

Printers after 1500. — Though the Cologne Chronicle of 1499 denies to Mainz the honour of the invention of the art of printing, it was right in asserting that, after it had been brought there from Holland, it became more masterly and exact, and more and more artistic. During the first half-century of printing a good many printers distinguished themselves by the beauty, excellence and literary value of their productions. We may mention as such: Johan Fust and Peter Schoeffer at Mainz; Johan Mentelin and Heinrich Eggestein at Strassburg; Ulrich Zell at Cologne; Sweynheym and Pannarts at Subiaco and at Rome; Nicolas Jenson at Venice; Anton Koberger at Nurem- berg; Ketelaer and De Leempt at Utrecht; Johan Veldener at Louvain, Utrecht and Kuilenburg; Gerard Leeu at Gouda; Johan of Westphalia at Louvain; and William Caxton (q.v.) at Westminster.

Very soon the demand for books increased, and with it came a reduction in their prices. This caused a decline in the exe-cution of printing, which begins to be appreciable about 1480 in some localities, and may be said to have become general

towards the end of the 15th century. At all times, however, we find some printers raise their art to a great height by the beauty of their types and the literary excellence of their productions. Among the later printers we may mention the Aldi of Venice (1490 to 1597); G. B. Bodoni of Parma (1768-1813); John Amerbach at Basel (1492-1516); John Froben at Basel (1496-15 2 7); John Baskerville at Birmingham (1750-1775); the house of Weichel, first at Paris (c. 1530-1572), afterwards at Frankfort; Christopher Plantin at Antwerp (1554-1589); the Elzevirs, fiist at Leiden, afterwards at Amsterdam (1580-1680); Antoine Verard at Paris (1485-1513); Josse Bade or Badius at Paris (1495-1535); and the Estiennes at Paris (1502- IS98).

The Italic type 1 is said to be an imitation of the handwriting of Petrarch, and was introduced by Aldus Manutius of Venice for the purpose of printing his projected small editions of the classics. The cutting of it was entrusted to Fran- Italic

cesco da Bologna, an artist who is presumed to be identical with the painter Francesco Francia or Raibolini. The fount is a " lower case " only, the capitals being Roman in form. It contains a large number of tied letters; to imitate handwriting, but is quite free from contractions and ligatures. It was first used in the Virgil of 1500. Aldus produced six different sizes between 1 501 and 1558. It was counterfeited almost immediately in Italy, at Lyons and elsewhere. Originally it was called Venetian or Aldine, but subsequently Italic type, except in Germany and Holland, where it is called " cursive." The Italians also adopted the Latin name " characteres cursivi seu cancellarii." In fc-ngland it was first used by Wynkyn de Worde in Wakefield's Oratio in 1524. The character was at first intended and used for the entire text of classical works. When it became more general, it was employed to distinguish portions of a book not properly belonging to the work, such as introductions, prefaces, indexes, notes, the text itself being in Roman. Later it was used in the text for quotations, and finally served the double part of emphasizing certain words in some works, and in others, chiefly translations of the Bible, of marking words not rightly forming a part of the text.

Greek type {minuscules) first occurs in Cicero, De officiis printed at Mainz in 1465 by Fust and Schoeffer. The fount used is rude and imperfect, many of the letters being ordinary Latin. . In the same year Sweynheym and Pannarts used a good

Greek.

Greek letter for some of the quotations in their edition of Lactantius (see, for instance, leaves 11a, 19a, 36a, 139, 140) ; but the supply was evidently short at first, as some of the larger quotations in the first part of the book were left blank to be filled in by hand. The first book wholly printed in Greek minuscules was the Grammar of Lascaris, by Paravisinus, at Milan in 1476, in types stated to have been cut and cast by Demetrius of Crete. The fount contains breathings, accents and some ligatures. The headings to the

1 These paragraphs on the various types are for the most part taken from T. B. Reed's History of the Old English Letter Foundries, p. 50 seq. (London, 1887).

chapters are wholly in capitals. The Anthologia graeca of Lascaris was printed at Florence in 1494 wholly in Greek capitals (litterae majusculae), and it is stated in the preface that they were designed after the genuine models of antiquity to be found in the inscriptions on medals, marbles, &c. But as late as 1493 Greek type was not common, for in that year the Venice printer Symon Bevilaqua issued Tibullus, Catullus and Propertius with blanks left in the com- mentary for the Greek quotations. In England Greek letters ap- peared for the first time in 1519 in W. de Worde's edition of Rob. Whittington's Grammatica, where a few words are introduced cut in wood. Cast types were used at Cambridge in Galen's De tempera- mentis, translated by Linacre, and printed by Siberch in 152 1, who styles himself the first Greek printer in England ; but the quotations in the Galen are very sparse, and Siberch is not known to have printed any entire book in Greek. The first printer who possessed Greek types in any quantity was Reginald Wolfe, who held a royal patent as printer in Greek, Latin and Hebrew, and printed in 1543 two Homilies of Chrysostom, edited by Sir John Cheke, the first Greek lecturer at Cambridge. In Edinburgh, in 1563, and as late as 1579, the space for Greek words was left blank in printing, to be filled in by hand.

The Oxford University Press, re-established in 1585, was well supplied with Greek types, which were used in the Chrysostom of 1586. About 1607 Sir Henry Savile introduced Greek types (vulgarly called on account of their beauty " the silver letter ") into Eton College, for printing his edition of St Chrysostom (8 vols., 1610-1613, John Norton), and other Greek authors. He afterwards presented this type to the university of Oxford. In 1632 Cambridge applied to Oxford for the loan of a Greek fount to print a Greek Testament, and the same university made an offer in 1700 for the purchase of a fount of the king's Greek at Paris, but withdrew on the French Academy insisting as a condition that every work printed should bear the imprint " characteribus Graecis e typographeo regio Parisi- ensi." It should not be forgotten that the large number of ligatures in the Greek of that day made the production of a fount a serious business. The Oxford Augustin Greek comprised no fewer than 354 matrices, the great primer 456, and Fournier's fount showed even 776 different sorts. The Dutch founders effected a gradual reduction of the Greek typographical ligatures. Early in the 19th century a new fashion of Greek, for which Porson was sponsor and furnished the drawings, was introduced, and has remained the prevailing form to this day. Cf. Rob. Proctor, The Printing of Greek in the XVth Century, folio (Oxford, 1900).

The first Hebrew types are generally supposed to have appeared in 1475 in Petrus Niger's Tractatus contra perfidos Judaeos (leaf 10), „ . printed by Conrad Fyner at Esslingen. De Rossi states

Hebrew. t ˆ at a pj e] jrew work ; n f our folio volumes entitled Arba Turim, of Rabbi Jacob ben Asher, was printed in 1475 at Pieve di Sacco in Austrian Italy, while in the same year, a few months earlier, Salomon Jarchi's Comment, on the Pentateuch appeared at Reggio in Italy, printed in the Rabbinical character. Numerous other Hebrew works followed before 1488, in which year the first entire Hebrew Bible was printed, with points, at Soncino, by a family of German Jews. The first English book in which any quantity of Hebrew type was used was Dr Rhys's Cambro-Brytannicae Cym- raecaeve linguae institutiones, printed by Thomas Orwin in 1592, though already in 1524 Hebrew characters, but cut on small blocks of wood, were used by W. de Worde in Rob. Wakefield's Oratio. The Hebrew fount made use of in Walton's Polyglott in 1657 was probably the first important fount cut and cast in England,

though there were as yet no matrices there for Rabbinical Hebrew. In the beginning of the 18th century Amsterdam was the centre of the best Hebrew printing in Europe.

The first book printed in Arabic types is said to be a Diurnale Graecorum Arabum, printed at Fano in Italy in 1514. 1 Two years . . fc later P. P. Porrus's Polyglott Psalter, comprising the

" ' Arabic version, was printed at Genoa; and two years later a Koran in Arabic is said to have been printed at Venice. In 1505 an Arabic Vocabulary at Granada had the words printed in Gothic letters with the Arabic points placed over them ; and in other presses where there were no Arabic types the language was expressed in Hebrew letters or cut in wood. De Guignes and others mention a fount of Arabic used by Gromors in Paris in 1539-1540 to print Postel's Grammar . In England some Arabic words were introduced in Wakefield's Oratio of 1524, but apparently cut on small blocks of wood. In Minsheu's Ductor in linguas, 1617, the Arabic words are printed in Italic characters. Laud's gift of Oriental MSS. to Oxford in 1635, and the appointment of an Arabic lecturer, were the first real incentives to the cultivation of the language by English scholars. Previous to this it is stated that the Raphelengius Arabic Press at Leiden had been purchased by the English Orientalist, William Bedwell; but, if it was brought to England, it does not appear to have been immediately made use of. The Arabic words in Thomas Greave's Oratio de linguae Arabicae utilitate, printed at Oxford in 1639, were written in by hand.

Syriac type, probably cut in wood, first appeared in Postel's Linguarum XII. Alphabeta, printed in Paris in 1538; but the char- acters are so rude in form and execution as to be scarcely legible.

1 See Panzer vii. 2.

In 1555. however, Postel assisted in cutting the punches for the Syriac Peshito New Testament, printed at Vienna in dto, the first portion of the Scriptures, and apparently the first book, ,. rf printed in that language. In 1 569-1 572 Plantin at y

Antwerp included the Syriac New Testament in his Polyglott, and reissued it in a separate form in 1574. In England Syriac was usually expressed in the earlier works in Hebrew characters. But in 1652, when the prospectus and preliminary

specimen of Walton's Polyglott were issued, we find Syriac type in use.

Of the Armenian character the press of the Vatican possessed a good fount in 1591, when Angelo Roccha showed a specimen in his Bibliotheca Apostolica Vaticana. A psalter is said to have been printed at Rome in 1565, and Rowe Mores Arm,:n " B – mentions doubtfully a liturgy printed at Cracow in 1549. Armenian printing was practised in Paris in 1633; but the Armenian bishops, on applying to France for assistance in printing an Armenian Bible, in 1662, were refused, and went to Rome, where, as early as 1636, the press of the Propaganda had published a specimen of its Armenian matrices. The patriarch, after fifteen months' residence in Rome, removed to Amsterdam, where he established an Armenian press, and printed the Bible in 1666, which was followed in 1668 by a separate edition of the New Testament. In 1669 the press was set up at Marseilles, where it continued for a time, and was ulti- mately removed to Constantinople. In England the first Arme- nian type was that presented by Dr Fell to Oxford in 1667. The alphabet given in the prolegomena of Walton's Polyglott was cut in wood.

Of Ethiopic the earliest type appeared in Potken's Psalter and Song of Solomon, printed at Rome in 1513. The work was reprinted at Cologne, in 1518, in Potken's Polyglott Psalter. In pthiook 1548 the New Testament was printed at Rome by some '

Abyssinian priests. The press of the Propaganda issued a specimen of its fount in 1631, and again in Kircher's Prodromus Coptus in 1636. Erpenius at Leiden had an Ethiopic fount, which in 1626 was acquired by the Elzevirs. Usher attempted to procure the fount for England; but, his attempt failing, punches were cut and matrices prepared by the London founders for the London Polyglott, which showed the Psalms, Canticles and New Testament in the Ethiopic version.

Of Coptic the press of the Propaganda possessed a fount, and a specimen was issued in 1636, in which year also Kircher's Prodromus Coptus appeared from the same press. In England Cooilc David Wilkins's edition of the New Testament was . "

Crinted in 1 7 16 from Coptic types cast with matrices which Dr Fell ad presented to Oxford in 1667. The alphabets shown

in the introduction and prolegomena to the London Polyglott of 1655 and 1657 were cut in wood.

Of Samaritan the press of the Propaganda had a fount in 1636, and the Paris Polyglott, completed in 1645, contained the entire Pentateuch in type, the punches and matrices of which _ „ had been specially prepared under Le Jay's direction. s " mar " an – The fount used for the London Polyglott in 1657 is admitted to have been an English production, and was probably cut under the super- vision of Usher.*

With Slavonic type a psalter was printed at Cracow as early as 1491, and reprinted in Montenegro in 1495. The only Slavonic fount in England was that given by Dr Fell to Oxford, ~. fc and this, Mores states, was replaced in 1695 by a fount avo " ' of the more modern Russian character, purchased probably at Amsterdam. The Oratio Dominica in 1700 gives a specimen of this fount, but renders the Hieronymian version in „ . copper-plate. Modern Slavonic, better known as ss """

Russian, is said to have appeared first in portions of the Old Testa- ment, printed at Prague in 1517-1519. Ten years later there was Russian type in Venice. A Russian press was established at Stock- holm in 1625, and in 1696 there were matrices in Amsterdam, from which came the types used in Ludolph's Grammatica Russica, printed at Oxford in that year, and whence also, it is said, the types were procured which furnished the first St Petersburg press, estab- lished in 171 1 by Peter the Great. Mores notes that in 1778 there was no Russian type in England, but that Cottrell was at that time engaged in preparing a fount. It does not appear that this project was carried out, and the earliest Russian in England was cut by Dr Fry from alphabets in the Vocabularia, collected and published for the empress of Russia in 1 786-1 789. This fount appeared in the Pantographia in 1799.

A fount of the Etruscan character cut by William Caslon about T 733 f° r Swinton of Oxford was apparently the first produced. Fournier in 1766 showed an alphabet engraved in metal „. or wood. In 1771 the Propaganda published a specimen rascan – of their fount, and Bodoni of Parma in 1806 exhibited a third in his Oratio Dominica.

Runic types were first used at Stockholm in a Runic and Swedish Alphabetarium, printed in 161 1. The fount, which

was cast at the expense of the king, was afterwards acquired by . .

the university. About the same time Runic type was used at Upsala and at Copenhagen. Voskens of Amsterdam had matrices about the end of that century, and it was from Holland that Francis Junius is supposed to have procured the matrices which, in 1677, he presented to Oxford. This fount appears in the

Oratio Dominica of 1700, and in Hickes's Thesaurus (1 703-1 705), and it remained the only one in England.

Matrices of Gothic type were presented to Oxford by Francis Junius in 1677, and a fount of them was used for the Oratio Dominica Gothic. ° I 7°° an ˆ m Hickes's Thesaurus. A different fount was used for Chamberlayne's Oratio Dominica, printed at Amsterdam in 1715. Caslon cut a fount which appeared in his first specimen in 1734. This and the Oxford fount were the only two in England in 1 820.

Founts of Icelandic, Swedish and Danish were included in Junius's gift to Oxford in 1677, and were, perhaps, specially prepared in _ Holland. The first-named is shown in the Oratio

○ *" Dominica of 1700 and in Hickes's Thesaurus. Printing*

*van * had been practised in Iceland since 1 531, when a Breviary*

was printed at Hoolum, in types rudely cut, it is alleged, in wood. In 1574, however, metal types were provided and several works produced. After a period of decline, printing was revived in 1773, and in 1810 Sir George M'Kenzie reported that the Hoolum press possessed eight founts of type, of which two were Roman, and the remainder of the common Icelandic character, which, like the Danish and Swedish, bears a close resemblance to the German.

For the Anglo-Saxon language the first type was cut by John

*Day in 1567, under the direction of Archbishop Parker, and appeared in ˆElfric's Paschal Homily in that year and in the Anglo- JElfreii res gestce of Asser Menevensis in 1574. Anglo-n * Saxon type was used by Browne in 1617, in Minsheu's Ductor in linguas; and Haviland, who printed the second edition of that work in 1626, had in 1623 made use of the character in Lisle's edition of /Eifric's Homily.*

The first fount of Irish character was that presented by Queen Elizabeth to O' Kearney in 1 571, and used to print the Catechism . which appeared in that year in Dublin, from the press

of Franckton. But the fount is only partially Irish, many of the letters being ordinary Roman or Italic. It was used in several works during the early years of the 17th century, and as late as 1652 in Godfrey Daniel's Christian Doctrine, printed in Dublin. The Irish seminaries abroad were better supplied with Irish type. A new type was cut by Moxon, and appeared in 1681 in Boyle's New Testament, printed by Robert Everingham.

The earliest specimen of music type occurs in Higden's Poly-chronicon, printed by De Worde at Westminster in 1495. The „ . square notes appear to have been formed of ordinary

quadrats, and the staff-lines of metal rules imperfectly joined. In Caxton's edition of the same work in 1482 the space had been left to be filled up by hand. The plain chant in the Mainz psalter of 1490, printed in two colours, was probably cut in wood. Hans Froschauer of Augsburg printed music from wooden blocks in 1473, and the notes in Burtius's Opusculum Musices, printed at Bologna in 1487, appear to have been produced in the same manner; while at Lyons the missal printed by Matthias Hus in 1485 had the staff only printed, the notes being intended to be filled in by hand. About 1500 a musical press was established at Venice by Ottavio Petrucci, at which were produced a series of mass-books with lozenge-shaped notes, each being cast complete with a staff-line. In 1513 he removed to Fossombrone, and obtained a patent from Leo X. for his invention of types for the sole printing of figurative song (canlus figuralus). Before 1550 several European presses followed Petrucci's example, and music type was used, among other places, at Augsburg in 1506 and 151 1, Parma in 1526, Lyons in 1532 and Nuremberg in 1549. In

1525 Pierre Hautin cut punches of lozenge-shaped music at Paris. Round notes were used at Avignon in 1532. In England, after its first use, music-printing did not become general till 1550, when Grafton printed Marbecke's Book of Common Prayer, " noted " in movable type, the four staff-lines being printed in red and the notes in black. There are only four different sorts of notes used — three square and one lozenge. About 1660 the detached notes hitherto employed began to give place to the " new tyed note," by which the heads of sets of quavers could be joined. But at the close of the 17th century music-printing from type became less common, on account of the introduction of stamping and engraving plates for the purpose. Cf. Rob. Steele, The Earliest English Music Printing, folio (London, 1903) ; Andr. Deakin, Mus. Bibliogr., 8vo. (Birmingham, 1893).

Printing for the blind was first introduced in 1784 by Valentin Hauy, the founder of the asylum for blind children in Paris. He Priatlazfor mac 'e use of a large script character, from which im- the Blind Passions were taken on a prepared paper, the impressions being so deeply sunk as to leave their marks in strong relief and legible to the touch. Hatty's pupils not only read in this way, but executed their own typography, and in 1786 printed an account of their institution and labours as a specimen of their press. The first school for the blind in England was opened in Liverpool in 1 79 1, but printing in raised characters was not successfully accom- plished till 1827, when Gall of the Edinburgh asylum printed the Gospel of St John from angular types. Alston, the treasurer of the Glasgow asylum, introduced the ordinary Roman capitals in relief, and this system was subsequently improved upon by the addition of the lower-case letters by Dr Fry, the type-founder, whose specimen gained the prize of the Edinburgh Society of Arts

in 1837. Several rival systems have competed in England for adoption, of which the most important are those of Lucas. Frere, Moon, Braille, Carton and Alston (see Blindness).

The trouble and cost involved in the use of the initial director early suggested the use of woodcut initials, and Erhard Ratdolt of Venice, about 1475, is generally supposed to have been the first initials printer to introduce the hterae florenies, called also lettres tourneures, or typi tornatissimi, which eventually superseded the hand-painted initials. Caxton introduced one or

two kinds in 1484. Among the earliest to be used are the so called Lombardic initials or capitals. The more elaborate initials, such as those used in the Mainz indulgences and psalter, by Aldus at Venice, by Johann Schoeffer at Mainz in 1518, by Tory and the Estiennes at Paris, by Froben at Basel, and by the other great printers of their day, were known as lettres grises. Besides these, the ordinary " two- line letters " or large plain capitals came into use: and these were generally cast, whilst the ornamental letters were for the most part engraved on wood or metal.

*Type ornaments and flowers began, like the initials, with the illuminators, and were afterwards cut on wood or metal. The first printed ornament or vignette is supposed to be the scutum or arms of Fust and Schoeffer in some copies OTn f^ ents of their 1457 Psalter, and of their edition of the Bible *"»"«< >«"><«■ of 1462. There is no vignette in the Subiaco Lactantius of 1465 (as stated by Mr Reed, Letter Foundries, p. 82). In Holtrop's Monum. typogr. des Pays-Bas may be seen borders used by some of the earliest printers of Holland (1475-1490), which would not look bad even in the present time. Caxton in 1490 used ornamental pieces to form the border for his Fifteen O's. At the same time the Paris printers engraved still more elaborate border pieces. At Venice entire frames were engraved in one piece, while Aldus as early as 1495 used tasteful head-pieces cut in artistic harmony with his lettres grises. Early in the 16th century we observe detached ornaments and flourishes which have evidently been cast from a matrix.*

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(J. H. H.)

II. — Modern Practical Typography The printing surfaces used in the production of books and newspapers, apart from wood- or process-blocks and casts, and apart also from such surfaces as are obtained by means of the Linotype and kindred machines, are made up primarily of an aggregation of separate types, each representing a letter, mark or sign, though the actual surface employed on the printing press is frequently a duplicate copy made by a process of stereotyping or electrotyping.

*Material Characteristics of Type. — A fount consists of a propor- tioned quantity of each ot these letters and signs of any one particular body and face. It therefore contains single letters, both capitals (" upper case ") and small letters (" lower case "), diphthongs, liga- tures, such as ff, fl, accents, points, figures, fractions, commercial signs such as @, £, " peculiars " such as *, f and leaders (. . .), to- gether with quads (pieces of metal which do not print, but are used to compensate for the shortness of occasional lines, as at the end of a paragraph), and spaces which separate words. A fount may thus have ahout 275 characters or sorts, about 100 of them consisting of italic letters, points and figures.*

The numbers of the different sorts vary with different languages, and even with the style of different writers, the works of Charles Dickens, for instance, making unusually heavy demands on the vowels, while the writings of Lord Macaulay run with like persistence on the consonants. Type-founders determine the proportions of the different sorts according to a bill of type, or scheme, either numeri- cally, when the basis of the computation is the number of lower case m's (or of A's, in the case of display type used for headings)

or by weight. In the second method a fount of 125 lb of Roman type includes, on one scheme, 8 oz. of E, M, C; 9 oz. of T; 8 lb of e; 5 lb each of a, b, n, o, t; and so on down to 3 oz. of z. A fount of body-letters, that is those used for the reading matter of books and newspapers, as made up by one British type-founder, contains capitals 9% by weight, small capitals 4%, figures 6%, lower case letters, points and leaders 56%, spaces 15% and quads 10%; rules, accents and fractions not being supplied except in new complete founts or when specially asked for. A rule for estimating the quantity of type required for a page is to divide the number of square inches it con- tains by 4, when the quotient represents approximately the weight of type in lb. But for large founts 25% and for small ones 40% should be allowed in addition, on account of unused type in the cases which cannot be completely set.

For many years it was a favourite idea with inventors, especially those who were not practical printers, that great economy might be gained in composition by the use of word characters, . or " logotypes," instead of single letters. The constant logotypes. recurrence of certain words such as " the," " and," " is," suggested that they, as well as affixes and

suffixes like ad-, ac-, -ing, ment, should be cast in single pieces instead of being set up with their component letters. Such logotypic printing was used in 1785 in the London Daily Universal Register, which three years later became The Times, but it has never found general favour. The chief practical objection is that it involves the use of cases with an in conveniently large number of boxes. The greater the variety of characters the more " travel " of the compositor's hand over the cases is necessary for picking them up, and by so much is the speed of his work retarded.

*Each of the parts of a type has a technical name. In fig. 1, representing the capital letter M, the darkest space a, a, a, a, is called the face; and only that part of the type touches the Partso t a paper in printing. The face is divided into the stem, ~ marked I, which comprises the whole outline of the y type M ; the serifs, or the horizontal lines marked 2, which complete the outline of the letter; the beard, consisting of the bevel or sloping part marked b, b, and the shoulder or flat portion below b. The shank is the entire body of the letter d, the front part (that shown) being known as the belly and the corresponding part behind as the back. The spaces at h and h are the counters, which regulate the distances apart of the stems in a line of type. The hollow groove extending across the shank at e, e is the nick, which enables the workman to recognize the direction of the type and to distinguish different founts of the same body. The absence of this simple expedient would retard the operation of hand-setting up by fully one-half. The earliest type-founders did not know the use of the nick. If a part of the face overhangs the shank, this part is called the kern, but kerned letters are avoided as much as possible. The groove g divides the bottom of the type into two parts called the feet. An impression from that part of a type on which it stands would be as ~. Types must be perfectly rectangular, the minutest deviation rendering them useless. Any roughness at the sides is called burr, and any injury to the faces a batter. Types which have the face cast in the middle of the shank, as a, c, e, m, &c, and thus leave an open space above them corresponding to that below, caused by the beard, are known as short s , , letters. Those whose stem extends to the top of the ~ p ™ esof shank, as b, d, f, &c, are called ascending letters. Those te " er * that have a stem extending over the shoulder, as g, p, &c, are called descending letters. Those that are both ascending and descending, and extend over*

the whole of the shank, as Q and j, are long letters. Small letters and figures cast upon the upper part of the shank, as i», are called superiors; those very low down on the shank are inferiors, as H 3 . Types that are very heavy and massive in appear- ance are called fat-faced ; those that are fine and delicate, lean-faced. A type whose face is not in proportion to the depth of the shank (e.g. a small pica cast on a pica body) is a bastard type.

*Types of are various sizes, from those used for the smallest pocket bibles to those used for large placards, and the sizes are classified according to the dimensions of their ends or bodies. s . . In a given fount the length of the end of the type which *" es <" bears the /ace is the same for all characters, but the Ty P e ' width varies, an i for example being narrower than a w. Each body has a distinctive name, but it used to be a confusing and in- convenient anomaly that types made by different founders, though called by the same name, were not of precisely the same size. The long primer of one maker, for example, was 89 lines to the foot, of another 895, and of a third 92. This inconvenience was remedied in America by the founders agreeing to adopt a uniform point- system ; the pica of 0-16604 m – was taken as a standard, six picas being 0-996 in., and was divided into twelve parts or points of 0-013837 in., other types being cast as multiples of one of these points, and specified according to the number of them they contained. This system, with the same basic unit, has been adopted by British*

Fig.

I. — Finished Type.

typefounders, though not to the exclusion of older sizes, and it has been extended to regulate the thickness or set of types, and also the position of the faces on the bodies as regards alignment. The Didot point-system, used in France, is based on a point of 0-376 mm., the English point being 0-35145 mm. The following are specimens of the principal bodies of ordinary

British and American types, with their corresponding appellations on the point-system, the first five being now mainly for display purposes : —

The Encyclo

The Encyclopaed

The Encyclopaedia The Encyclopaedia Brit The Encyclopaedia Britan The Encyclopaedia Britannica, The Encyclopaedia Britannica, The Encyclopaedia Britannica, nth The Encyclopaedia Britannica, nth The Encyclopaedia Britannica, nth edition The Encyclopaedia Britannica, nth edition The Encyclopaedia Britannica, nth edition

2-line small pica

Great primer English Pica . .

Small pica . Long primer Bourgeois . Brevier . Minion . Nonpareil . Ruby . . Pearl . .

Points.

22

‘4 12

II

10

9

8

7 6

5

5

[The larger type used in the body of this work is ID-point, and the smaller 8-point.]

The height of types is } \ in. Those lower than the standard dimensions are said to be ” low to paper,” and if surrounded

by higher types will not give perfect impressions. Spaces and quads are f-in. high for direct printing, but for stereotyping are cut rather higher (0-83 in.).

According to the purpose lor which they are used, types are divided into two classes — book type, including Roman and Italic; v ri f an(ˆ °k tyPˆ i nc ‘ u ding a multitude of fanciful forms of

va e eso j etterSj cn iefly founded on the shape of the Roman and ace ‘ Italic letters, and intended to be more prominent,

delicate, elegant, &c. It is impossible to enumerate all the varieties of the latter class, as additions are being constantly made and once popular styles always going out of fashion. The leading varieties are the antiques, which are Roman letters with strokes of nearly uniform thickness, as M; sanserifs or grotesques, which have no serifs, as M ; blacks, as ,M ; and scripts, which represent the modern cursive or Italian handwriting, as ˆjf. Black letter is now only a jobbing type in English-speaking countries, although it was the first character used in printing. It is still used in Germany, with certain modifications, as the principal text-letter for books and newspapers. A comparison of the numerous leproductions that have been issued of Caxton’s works with any modern line of black letter will show how greatly the form and style have been altered. The present style of Roman type dates only from about the first quarter of the 1 8th century. Previously the approved shape was as follows : —

Printing has been defined to be the act, art, or practice

The use of this type was revived by Charles Whittingham, nephew of the founder of the Chiswick Press, about 1843, and it has since become a favourite form, under the name of old style. Some of the punches cut by the first notable English type-founder, William Caslon (1 692-1 766), have been preserved, and types are being constantly cast from them. Neariy all founders now produce modernized old style.

In this connexion rererence may be made to the modern revival of artistic book printing in England by William Morris and others influenced by him. This development took definite form in the founts and books of the Kelmscott Press, which is distinguished by the use of three founts designed by Morris.

The Troye and Chaucer founts, both Gothic, are best fitted for ornamented medieval works, while the Golden or Roman fount is without the exaggerated con- traction of form laterally, the exaggerated use of thick and thin strokes, and the vicious stroke-terminations common to modern founts. It is a type of full body, designed in careful relation to the up and down strokes, and resting upon solid serifs, as with Jenson's fount, for instance, but in detail more allied to fine penmanship or black letter. The Vale books, often classed with the Kelmscott, may be counted with them so far as they also are controlled by one designer, from the important matter of type, decoration and illustra- tion, to that of " build " and press work. The first Vale book in which these conditions were achieved is Milton's Minor Poems (1896). In this is employed the Roman type, known as the Vale fount, designed by Charles Ricketts, which differs from the Kelmscott fount in a greater roundness or fullness of body, and in a modification of details by the conditions of type-making. The second fount used in the Vale issues, first employed in The Plays of Shakespeare (1896), is less round in body, more traditional in detail and lighter in effect.

Manufacture of Type. — Type is made of an alloy, known as type-metal, which consists chiefly of lead, with smaller amounts of antimony and tin. The exact proportions vary in different countries and foundries and with the size and quality of the type, but in general more than 60% is lead and the antimony pre- dominates over the tin. Sometimes small quantities of other metals, such as copper and iron, are added. Large letters, such as are used for bills and posters do not come within the province of the type-founder; they are made of wood, chiefly rock maple, sycamore, pine and lime, planed to the right size and engraved by special machinery.

The earliest printers made their own types, and the books printed from them can now be distinguished with almost as much certainty as handwriting can be identified. The modern printer „ .. . has recourse to the type-founder. The first step m ™ at " cesfor

the making of type, according to the old method, is the

Type.

production of a matrix. The letter is cut on the end of a piece

of fine steel, forming the punch (fig. 2), which is afterwards hardened. A separate punch is req-uired for each character in every fount of type, and the making of them requires great care and delicacy in order that the various sorts in a fount may be exactly uniform in width, height and general proportions. During the process of its

/

fmj

&

m

Gt.R

Fig. 2. — Punch. Fig. 3. — Drive. Fig. 4. — Matrix.

manufacture, the punch is frequently tested or measured by delicate gauges to insure its accuracy, and from time to time it is examined by means of a smoke-proof, that is, an impression obtained by holding it in a flame and stamping it on paper. When the letter is perfect, it is driven into a piece of polished copper, called the drive or strike (fig. 3). This passes to the justifier, who makes the width and depth of the feces uniform throughout the fount. They must then be made to line exactly with each other. When completed, the strike be- comes the matrix (fig. 4), wherein the face of the type is made. But matrices are now commonly produced by the aid of an engraving engine which copies a standard drawing of each letter on any desired scale, and they may be obtained from existing founts by electro- typing.

Until well into the 19th century types were cast from the matrices in small hand-moulds, the output from which with a skil- ful worker was about 400 letters an hour. The mould _ consisted of two portions fitting closely to each other cti and containing the matrix with a space to receive the as "' metal for the shank; holding it in his left hand the operator poured in the metal with his right, and after jerking it at arm's length, to bring the metal well up against the matrix, opened the two halves and threw out the type. In 1838 David Bruce, Junr., of New York, a Scotsman, who had migrated to America, invented a machine to perform substantially the same operations; this increased the rate of production to about 100*

a minute for ordinary sizes, and with improvements and modifications remained a standard appliance for 40 years after its introduction. The metal, kept molten by a small furnace, was injected by a pump into the mould, which at every revolution of the axle came up to the spout of the pump, received a charge of metal, receded, opened, and discharged the type. But neither the hand mould nor the Bruce machine produced finished type. To the bottom of each there was attached a wedge-shaped jet (fig. 5), somewhat similar to that on a bullet cast in a hand mould. This had to be picked off by hand; the burr on the shoulder of the types had also to be rubbed off, and a groove had to be cut in the bottom to form the feet. Many efforts were made to devise machines which should perform these operations and produce finished type, one of the most satisfactory being that patented by Henry Barth, of Cincinnati, in 1888, but the principle of the divided mould which opened to discharge_ the type was generally retained. A new principle, however, was adopted by Frederick Wicks (1840-

1910) in his rotary type casting machine, which p JG Type

was developed into a practical apparatus in London w \xfo jet. just at the end of the 19th century, and which is able to produce finished types, ready to be despatched to the printer without any inspection or treatment beyond packing, at a

o

continuous rate of 60,000 an hour. It consists of a horizontal mould wheel, 20 in. in diameter, contained in the casing D (fig. 6), in which are cut 100 radial slots, each having a matrix at its inner end. These slots thus form moulds, and are of varying width according to the letter each has to cast. Each wheel can only pro- duce type of the particular body for which it has been cut, but by changing the matrices the moulds can be made to cast any descrip- tion of face capable of being received upon the body. The wheel is rotated once in every six seconds, so that the slots are successively presented to a jet of molten

type-metal, which is pumped from the

Type-setting by Hand. — The types, received from the foundry in the packages called pages, containing about 8 lb, are placed in shallow trays called cases. These contain compartments jvpe-case. or boxes, each of which is appropriated to some particular sort or character. The cases when in use stand on frames or sloping desks. The case at the top is the upper case, and that below the lower case. The former contains 98 equal-sized boxes, appropriated principally to the capital and small capital letters; the latter has 53 boxes of various sizes, appropriated to the lower case sorts. The difference in the size of the boxes corre- sponds to the difference of quantity of letters in a fount, the lower-case e, for instance, having the largest box. As a man picks out from the boxes seldom less than 1500 letters an hour and distributes or replaces on the average about

Fig. 6. — Wicks Rotary Type-casting Machine.

metal reservoir A by a pump B of special construction,'and forced out at high pressure through a nozzle under the shield C. As soon as any particular slot has passed the jet and been filled with metal, a cam-action comes into play and gradually pushes out the formed type. This operation is completed in half a revolution, the ejected type being taken up by carriers mounted on a continuous chain E, which is moved along exactly in step with the wheel. The carriers, which are of different sizes according to the particular letters they have to hold, are raised by a cam-action as they come opposite the slots to receive the types, but fall again at the point F, depositing the letters at the end of the race G. Each successive type thus dropped pushes its predecessors farther along the race until when the row contains 200 types — the product of two revolutions of the wheel — an attendant lifts the whole series off and places them on the plate H, one row below the other. Since the sequence of the letters is of course the same in each revolution, the result is that each vertical line on the plate consists of the same character, and each sort can be easily removed and packed in any required form for despatch to the printer. As soon as each slot has been emptied of its type, another cam begins to draw in the matrix towards the centre of the wheel, so that it is in as far as it can go by the time the slot is again opposite the jet. To prevent a type from being drawn back with the matrix, the bead-cam K engages with the nicks

which have already been formed on the front oPthe type-bodies by the operation of the machine. To ensure trueness and accuracy in the product, the conditions under which casting is conducted are maintained as uniform as possible. The composition of the type-metal alloy is kept constant; the temperature of the molten metal is carefully regulated by the aid of a pyrometer to about 8oo° F., so as not to volatilize the antimony it contains; the pumps work up to a pressure of 900 lb to the square inch, and by the interposition of a reducing valve deliver the metal at the nozzle at a constant pressure of 200 lb; and the moulding slots are main- tained at an equably cool temperature by an elaborate system of water circulation.

Fig. 7. — Type-case.

5000 an hour, it is necessary that the most economical allo- cation of the boxes should be adopted. The system of allocating the various types is called the lay of the case; one plan is illustrated in fig. 7.

The types when taken from the cases are arranged in lines (composed or set up) in an instrument called a composing stick, made of iron, brass or gun metal. The„ .

*slide in the middle is movable so as to accom- om P os * modate varying lengths of lines. The compositor fixes the ” copy ” or document which he has to repeat in type, in a convenient place before his eye. In his left hand he holds the composing stick, and with the thumb and first finger of the right hand lifts the letters from the boxes, and arranges them in the composing stick, every letter,*

Eoint or sign being picked out separately. In this operation e is much assisted by the use of a setting-rule, a thin brass or steel plate which, being removed as successive lines are completed, keeps the type in place. When so many words and parts of words as will nearly fill the line have been composed, it is made the exact length required by increasing or diminishing the space between the several words. This is called justifying the line and is effected by means of the spaces already mentioned. If the work is not ” solid “• — that is, if the lines are not close together — the strips ot metal called leads or brasses are inserted between each. When the composing stick is filled, the type is lifted upon a galley, a shallow tray of wood or metal, two or three sides of which are flanged, for the

purpose of supporting the type when the galley is slightly inclined. Stickful after stickful of type is placed on the galley until it is full. The matter is then fastened up, a proof taken at the proof press, and the work of the reader or corrector of the press begins (see Proof-reading). The proof, marked with the necessary corrections, is given back to the compositor, in order that he may make the required alterations in the type.

The type, being duly corrected, is made up into pages of the required length (unless the author has desired to see proof in slip). It is then imposed, that is, the pages are arranged in / _„„„»_ such a manner that, when printed and the sheet folded, they will fall in due numerical sequence. The impression from any arrangement of pages will be the reverse of that in which they are laid down. If a four-page newspaper be opened and spread out with the first page uppermost, it will be found that on this side the order of pages is 4, I ; when turned the pages are 2, 3. The type pages must be ranged in the reverse way, as I, 4; 3, 2. Thus the fourth page is placed alongside the first, because both must be printed together on the outside; the third page is to the left, and the second to the right, because in books the odd page — the verso — is always to the right. For a quarto a sheet of paper is folded twice, that is once across its breadth and then once in a perpendicular direction down the middle. It contains four leaves, and if these are printed on both sides eight pages. The two sides of a sheet are called the outer and inner formes respectively. A sheet of octavo is folded three times, making 8 leaves or 16 pages. The size of a book depends not only upon the number of times the sheet has been folded, and described accordingly as 4to, 8vo, I2mo, &c, but upon the size of the sheets. The dimensions of the papers commonly used in book- printing are: imperial, 22X30 in.; super royal, 20JX27J; royal,

20 X 25; medium, 19 X 24; demy, I7§ X22i; double crown, 20 X 30; djuble foolscap, 17 X27; post, 15! X 19J. Hence to say merely that a book is a quarto gives no precise indication of its dimensions, as a quarto of one size of paper may be smaller than an octavo of another ; it is also necessary to know the

size of the sheets of which it is composed.

When a printed book is opened, it will be found that at the foot of certain pages there is usually a letter and at the foot of another Signatures a ‘ e ” er an d a figure, as B, B 2 ; farther on another letter ” and another letter and figure. On going through the book it will be seen that the letters are in regular alphabetical order, and occur at regular intervals of eight, twelve, sixteen, &c, pages. These designate the several sheets of which the book is composed and are called signatures, so that a sheet may be designated B, and the pages of which it consists are thereby sufficiently indicated. (Occasionally, numbers are used instead of letters.) These signatures assist the binder in folding, as they occupy a certain specified place in each sheet ; hence to ascertain if the sheet has been folded properly it is only necessary to examine the position of the signature. The binder also is thus assisted in gathering or collating together the sheets of a volume in proper order. Signature A is omitted, because it would be on the title or first page, and would be both unnecessary and unsightly. By old custom J, V and W are discarded, I and J, U and V being originally used indiscriminately, by printers, while W was written UU or VV. When the alphabet is exhausted, a new one is begun, distinguished by a figure precedent, as 2 B, 2 C, &c.

The pages of types are arranged in proper order on a flat table, covered with stone or metal, called the imposing stone, and are then p ready to be made into a forme, that is, into such a state

orme. t\ a t they can be securely fastened up and moved about. The forme is enclosed in an iron frame or chase, sub-divided by a cross bar. The portions of the type are separated by furniture, which may be of metal or wood or both. It is of the same height as the chase, but lower than the type, and therefore does not print, but forms the margin of the printed pages. As the sides of the two sections of the formes are pieces of furniture of a tapering shape, called side-sticks, and at the top and bottom corresponding pieces, called foot-sticks. Small wedges, called quoins, are inserted and driven forward by a mallet and a shooting-stick, so that they gradually exert increasing pressure upon the type. Other mechanical means for locking up are also occasionally adopted. When sufficiently locked up, the whole is quite as firm and portable, however many thousands of pieces of metal it may consist of, as if it were a single plate, and is ready for use on the printing press,

either directly or in the form of a stereotyped or electrotyped copy.

After use the type undergoes the operation of distributing, which is the converse of composing; it is de-composing the forme and _. . returning the several letters to their proper boxes in

h ti tne case- e f° rme ‘ s nrst wasn ed over with an alkali

buting. or ot fr eT detergent to remove the ink from its surface, and then laid down on the imposing surface, unlocked and damped ; this assists the cohesion of the type, after the chase, furniture, side- sticks, &c, are removed. The compositor then takes in his left hand, supported by a setting rule, a portion of type in lines, and with the right hand takes a word or so between the finger and thumb, letting each letter drop separately into its proper box. The types are held upside down, that is, with the nicks uppermost; hence the letters of each word are read from left to right like ordinary matter when printed, but the words are of course dealt with in the inverse order.

Type-setting by Machine. — The above method of producing a printing surface depends entirely upon hand labour, but it has long been an object of inventors in connexion with print- ing to perfect a mechanical system by which hand-work may be done away with both in setting type and in distributing it after use. The first step in this direction was the construction of composing machines in which the compositor put together types in the required order, not by lifting them one after another from his ” boxes ” and placing them by hand in his ” stick,” but by operating a keyboard which liberated them from maga- zines and assembled them in the order in which the keys had been struck. Such machines were followed as a natural correlative by distributing machines which performed the converse opera- tion. Then the idea occurred of avoiding distribution altogether, by returning the printing surface to the melting-pot and using the metal over again to produce an entirely new printing sur- face as required, instead of sorting the types into their various kinds to be set up again either by hand or by machine. There are two main solutions of this problem. One is to manu- facture ordinary movable types at a cost that is less than that of distribution, when it obviously becomes advantageous to treat the formes, after use, as old

metal and return them directly to the melting pot without distribution. In 1900 The Times xxvii. iS

began to adopt this method, thus securing the advantage of fresh new type for each issue. In its offices for several years type made by the Wicks casting machine was set up by composing machines, and after being used in making the necessary stereotype plates was returned to the foundry to be melted and recast. The other solution depends upon the employment of apparatus which are in effect combinations of type-setting and type-casting machines, and may be divided into two broad classes: (a) those in which, by the operation of a keyboard, letters are translated into metal types which appear as a product for use in the printing-press, not singly, but cast into complete bars or lines of type; and (b) those in which the final product is separate types, delivered made up into lines of the required length. The former class is exemplified by the Linotype, the Typograph, and the Monoline machines, the latter by the Lanston Monotype, the Tachytype and the Goodson. In machines of the Linotype class, which have come into exten- sive use, especially for newspaper printing, it is impossible to make corrections or alterations in the line of type after it has been cast. The smallest change, such as the addition of a comma, involves the resetting and recasting of a whole line, while, if two or three words have to be added or removed, the compositor may have to recast a considerable number of lines, perhaps a whole paragraph. Machines of the second class, like the Monotype, which has been employed for setting up the present edition of the Encyclopaedia Britannica, appeal rather to the book printer, though the Monotype is used by such newspapers as The Times (London) and the Sun (New York). They have the advantage that corrections can be made as with hand-set type; but for newspaper work the fact that the manipulation of the keyboard does not, as with the Linotype, directly produce a printing surface but merely a punched strip of paper, which has then to be passed through a separate casting machine, inevitably introduces some delay. This is a matter that must be taken into account in the hurried conditions under which a daily paper is produced, when the shortest possible interval must elapse between the time when the latest news is received and the actual priiiting is begun. A machine invented by Mr H. Gilbert-Stringer is designed to combine the advantages of the Linotype and Monotype machines by casting at a single operation separate types properly arranged in lines and uni- formly spaced. Up to the point where the matrices are ranged in a line ready for the bar

of type to be cast, the mechanism may be identical with that of the Linotype; from that point each matrix is separately pushed into a mould which is auto- matically varied in size to suit the size of the particular letter it is casting, and also casts the spaces between the words (deter- mined by the use of a modified Schuckers wedge-space), so that when all the individual types and spaces in the line are assembled after casting they exactly fill the line. The machine requires only one operator, and while one line is being cast the matrices which have formed the preceding one are being dis- tributed to the magazine, as in the Linotype, and the following one is being set up. The matrices differ from those of the Linotype in that the face is impressed on their broad flat sur- face, not on the thin edge.

Composing Machines. — An early attempt to make a machine for setting up ordinary foundry type was patented in England by Dr William Church in 1822. In the machine of Young and Delcambre, which was used in London for composing the Family Herald in 1842, and was the forerunner of the Kastenbein machine adopted in The Times office in 1869, the types were arranged in tubes placed either vertically or horizontally, and the lowest or endmost letter was, when wanted, ejected from the tube by a pusher actuated by a finger-key. It then passed down the channels of a guide-plate to a common point, whence it was pushed forward by a reciprocating motion to the line of previously composed matter and divided into lines of the required length. To the same group belong the Fraser machine, the Hattersley and the Empire, also known in America as the Burr. Another group of machines developed from the rotary composer was invented by Alexander Mackie of Warrington in 1871, and used in the office of the Warrington Guardian. In this the types were arranged in vertical tubes round a rotating disk, and the letters were automatically selected by a strip of paper previously punched with holes through which feelers passed and caused the desired type

to be ejected upon a travelling band. This device of using a paper strip perforated in different positions to correspond to different letters was patented by Felt in i860 (U.S. Patent Spec. No. 28,463), and he also utilized it for effecting distribution, the " dead " or used type being dealt with by another machine through which the paper strip was run in the reverse direction. This quality, however, was not so valuable as it might appear at first sight, since any correction, however simple, of necessity made the perforated paper ineffectual as a guide in distribution. The Thorne machine, exhibited in the Paris Exhibition of 1878, was a development of the principle of a rotating disk, but the types, which were contained in a vertical cylinder, were selected by touching keys in the ordinary manner. When liberated they fell upon a rotating table, whence they were deflected by a finger upon a travelling band and delivered into the composing race. The American Simplex machine resembles the Thorne very closely. The Wicks composing machine, again, adopts a different principle from both the above groups. The types are ejected upon a straight race set at an angle of 45°. Thus each has to travel a different distance from the other — a result which the inventors of the Delcambre group of machines were at. pains to avoid; and when several keys are struck together so as to give a combination like " and," the several types delivered to the race follow each other in proper succession to the point of assembly, the letter whose key is nearest to the left side of the key- board preceding those whose keys are more to the right.

The Paige composing, justifying and distributing machine — an American invention — is one of the most remarkable pieces of mechanism ever put together. It contains 18,000 parts, and the patent specifications form an imposing volume. It is operated by keys in the ordinary way, but automatic mechanism advances the ejected letters in words, spaces them and inserts the lines in the " galley "with" leads "if desired; at the same time other mechanism automatically distributes dead matter and refills the tubes which contain the supplies of types. Two machines were made, and are said to have done good work, but the cost of construction and the complicated nature of the mechanism made the apparatus im- practicable commercially, and the two that were made are now on view as mechanical curiosities, the one in the Columbia Institute and the other in Cornell University. The Paige machine dispensed with the guide-plate of the Delcambre group, the letters being ejected on

a plane along which a driver passed at intervals and swept the type into a receiving race on the left of the machine. The Dow composing and justifying machine, a later American invention, adopts this Characteristic of the Paige, but has two drivers meeting at the centre of the plane which receives the letters. The types having been swept to the centre by these, a vertical driver forces them downwards into a vertical receiver. When a line has been set a justifying key is touched, the vertical line passes to a horizontal position, and is driven forwards to a point where apparatus measures it, and having removed temporary brass spaces replaces them with others selected from a series of ten different thicknesses.

Distributing Machines. — There are two main classes of distributing machines. One, which is exemplified by the Delcambre or the

Fig. 8. — Nick System of Distribution (Simplex Machine).

Fraser machine, is operated by a keyboard; the compositor strikes the keys corresponding to the letters of the printed matter he wishes to distribute, and thus opens gates through which the types pass and find their way down a guide-plate to their proper tubes. The other comprises a number of machines which agree in requiring the type to be specially nicked for their use. Each type has its own particular combination of nicks, and the receptacles in which the type is collated are provided at their entrances with wards corre- sponding to these nicks, so that each type can only enter the one receptacle for which its nicks are arranged (fig. 8). In some cases, as in the Empire and the Dow, the distributor is a separate machine; in others, as the Thorne and the Simplex, it is combined with the composing machine in such a way that the two work simultaneously. Linotype. — An enormous amount of ingenuity has been expended on the Linotype, which was developed into a practical machine by

Diagram of Linotype Machine.

Ottmar Mergenthaler, of Baltimore, though two of its elements — the solid bar of type and the wedge space — were invented by others, the former by T. W. Smith, of the Caslon Foundry, and the latter by Jacob W. Schuckers, of Washington. The following will give a general idea of its working: In the magazine A (fig. 9) are a series of matrices, formed with the

characters in intaglio on one edge, which are discharged by gates, operated from the keyboard D into the chutes E, and thence upon the travelling belt F; this delivers them upon a revolving pusher wheel by which they are set up in proper order in the assembler block G. Above the assembler block is a space magazine, and from this the space key J releases a space bar, when desired, which drops into place in the line. As the matrices are forced into the assembler block they move to the left against the resistance of a sliding abutment, thus being held com- pactly in place in the line. As soon as a complete line is set up, the compositor operates a hand lever by which the assembler block and matrices are raised to the level of a horizontal slide, where the line is grasped between two jaws and carried to the left, and lowered into position opposite the mouth of the mould wheel K. Here the justification of the line is effected by means of an upwardly moving pl/unger which drives the wedge-shaped spaces, seen in fig. 10, into the line, and thus expands it to the exact length required. The matrices are then locked firmly in a vice with the characters opposite the mouth of the mould. At this time the pump plunger in the melting pot M (fig. 9) is forced downwards by mechanism actuated by suitable cams on the driving shaft, and a jet of molten type metal is ejected into the mould and against the characters on the matrices, thus casting the bar or " slug." The cast bar is next forced, by a revolution of the wheel K, between a pair of knives, by which it is trimmed, and into a galley, where it is pushed along by a packer arm and placed beside its fellows in a column ready for use. It is next necessary to distribute the matrices to the magazines, in order that the operation of the machine may be carried on con- tinuously. The matrices and spaces are raised from the vice and brought opposite a bar R, which carries on its under side a series of undercut ribs corresponding to the teeth which are shown at the edges of the V-shaped notch in the top of the matrices (fig. 10) and the matrices are pushed on to this bar so as to be suspended by the

ribs. They are next pushed still farther towards the right of the machine into a box having ribs engaging the notches in the side

of the matrices, but with downwardly inclined grooves crossing these ribs, by which the shoulders at the upper end of the space bars

are allowed to descend, and the spaces are thus dropped out of line and fall through a chute into the space-box from which they originally came. The matrices are pushed still farther to the right, where their teeth slide along the distributor bar T, being carried by two screws which engage opposite sides of the ma- trices and keep them sepa- rated so that they hang loosely from the distributor bar. The ribs of the distributor bar are so ar- ranged as to support each matrix by one or more pairs of teeth until it arrives opposite the mouth Fig. 10. — Line of Matrices with Spaces, of its own magazine chan- nel, where they are inter- rupted in such a manner that the matrix is unsupported and drops into the magazine for further use. It will thus be apparent that there is a constant circulation of the matrices through the machine, and the composing of one line, the casting of another and the distribu- tion of a third are all carried on at the same time, which adds greatly to the speed of the operation. The machine may be fitted with double magazine, which with double-letter matrices gives 360 characters or four faces ready for use, or even with three magazines, which provide for 540 characters or six faces, the movement of a hand lever bringing the desired magazine into use.

Lanston Monotype. — In the Lanston apparatus there are two distinct machines, a ribbon-punching machine and a type-cast- ing and composing machine. The first of these is a small device resembling a typewriter, having a number of keys, 257 in all, corre- sponding to all the characters used in a fount of type, with some additions representing certain movements to be performed by the composing machine. These keys, when depressed, admit com- pressed air to a plunger or combination of two plungers working punches, whereby perforations are made in a strip of paper fed step by step through the machine. Most of the keys make two perfora- tions, though some a single one only. These perforations stand in a

transverse line across' the strip, as shown in fig. ir, and their relative position in the line varies with the particular key operated. At the end of each word a spacing key is struck, and suitable perforations are made in the strip, and as the end of a line is neared, a bell rings to warn the operator, who, by

looking at a line scale facing him on the machine, is enabled to see how many units of space remain to be filled, and can then determine whether another word or syllable can be set up. If not, it then be- comes necessary to provide proper space-type to jus- tify or fill out the line, which is done by increasing the width of the normal ° space-types already pro- ^^v v ided for in the proportion which the number of units of space still vacant in the line bears to the number of space-types which the line contains. For example, if there are ten space-types and x"s of an inch of space remains to be filled, each space-type must be increased in thickness just T Jj of an inch completely to fill the line. It is not necessary, however, for the operator to make this calculation, for he has only to consult the scale provided for this purpose, and is referred at once to the proper keys to punch the justifying perforations in the strip. Each time the space key is depressed a pointer rises one step against a cylindrical scale placed vertically in front of the machine, and when the operator has finished setting a line he presses a special key which causes the cylinder to rotate until it automatically stops with the required number at the end of the pointer. This number is in the form J, and to complete the justification of the line the

Fig. 11. — Perforated Strip.

operator has only to depress the appropriate keys in the top two rows of the keyboard, in this case No. 3 of the top row and No. 4 of the second.

The ribbon thus prepared in the punching machine is used to control all the movements of the casting or composing machine. The matrices for making the type faces are formed in a plate about 3 in. square, and any character is brought opposite the casting point by the movement of the matrix-carrier in two directions, or rather by the resultant of two such independent movements. As the perforations for controlling the galley movements and those for justifying the line are necessarily made after the others in the per- forating machine, and these operations must be provided for in the composing machine before the line is set up, the latter machine is so organized that the ribbon is passed through and the types are set in the reverse order to that in which the strip was punched. The perforated ribbon is wound from one wheel off to another, passing over the edge of a tracker board in which there are a number of holes corresponding to those which may occur in the

ribbon, and each of these holes communicates by a tube with a small piston which controls some device for performing one of the various opera- tions of the machine. As the ribbon passes over the tracker board, a jet of compressed air passes to the appropriate operating device whenever a ribbon perforation or any combination of them coincides with the proper holes. The two perforations on each transverse line control two stop pins which limit the movements of the matrix- carrier to bringing the proper matrix to the casting-point, while the justifying perforations set in motion devices which open the space mould to cast space type of the exact size to effect the proper justifi- cation of the line, and the galley perforation starts the feeding device which moves the galley for the next line of type. The matrix- carrier may be readily removed and another carrying a different style or size of type substituted therefor.

In modern printing it is often the case that the printing surface actually used in the press (see Printing) is not the original forme of type, whether consisting of separate type set up by machine or by hand, or of Linotype slugs, but a repro- duction of it made by electrotyping or by stereotyping. Of these two processes the former is the slower and the more costly, but it produces the better results, since electrotyped plates are capable of yielding a larger number of sharp impressions than are stereotypes.

Electrotyping.-ˆln making an electrotype, a moulding composition consisting mainly. of wax with a little blacklead t is poured when molten into a shallow metal tray, and, when it has set, its surface is brushed over with blacklead and polished. An impression of the forme, which is also blackleaded, is next taken in the wax while it is still warm, often by the aid of a hydraulic press, and the mould thus obtained, after being separated from the forme, undergoes a process of building up, which consists of dropping heated wax upon those portions which require to be more deeply sunk in the finished type, that is, upon those places where " whites " are to appear in the print. The face of the finished mould is then carefully covered with blacklead, which is a conductor of electricity, and the whole is immersed in an electrotyping bath, where copper is deposited on the blackleaded portions by means of the current from a Smee's battery or a dynamo machine. When the deposit, or shell, is sufficiently thick, it is disengaged from the wax mould, backed with a metal which resembles type-metal but contains a larger proportion of lead,

and trimmed and planed. For use in rotary presses curved electrotypes may be produced.

Stereotyping. — The great advantage of stereotyping is in connexion with the production of newspapers, where the desideratum is the printing off of a large number of copies in a short time. For this purpose, in the first place, rotary machines must be employed, and stereotyping affords a ready means of obtaining curved printing surfaces to fit their cylinders. It is true that stereotyping is not absolutely necessary for rotary printing, since it has been found possible to print from movable type clamped on the cylinders in curved frames known as "turtles." But to set up duplicate formes of type is impracticable, and, therefore, this device does not permit the utilization of more than one press. Herein lies the second great advantage of stereotyping, for it enables the printer to obtain as many replicas of each forme as he desires, and thus not only to employ a number of machines simultaneously, but also to " dress " each of them with several duplicates of the same forme, as is required in the later developments of high-speed presses.

The first attempt at making stereotypes was by means of moist clay into which, after it had been impressed with the type and baked, molten type metal was poured ; but this method did not yield a curved plate. Later the clay was replaced by papier-mache\ which being flexible can be bent to the required shape. This papier- mach<5, known as flong and composed of several sheets of paper united by a paste capable of withstanding a high temperature without burning, is moistened and laid over the forme of type, into which it is well pressed either by beating with a long-handled brush or, according to the more modern and expeditious method, by being passed through a moulding press. The flong is next dried, for vhiefa

purpose it is either placed with the type in a heated chamber covered with blankets which absorb the moisture, or is removed from the type and heated separately. Sometimes these two methods are used in combination; processes have also been devised for pressing the flong dry upon the type, when [subsequent drying becomes unnecessary. For casting a plate the matrix thus prepared is fastened in a casting mould or box

curved to the circumference of the cylinder of the press, and molten stereo-metal (a softer form of type-metal) is poured upon it. During this process the box stands upright, but while the matrix is being placed in position it lies horizontally, a swivel mounting enabling it to be readily turned. After time has been allowed for solidification, the cast is taken out, stripped from the matrix and adjusted on a " finishing saddle," where a machine cuts oft the superfluous metal from its upper end and forms a bevel by which it can be clamped on the press. It is then placed face downwards in another machine which shaves out and smooths its interior surface, and finally it is set face upwards, while men with chisels remove protruding pieces of metal that might take ink and print.

Up to the end of the 19th century the general method of stereo-typing was as outlined above, though of course there were variations in different establishments. The time required to produce a plate, as distinct from making the matrix, was about I or I J minute, and the process was expensive in labour since it required the employment of half-a-dozen men. This time may seem short enough, but when plates are needed by the score, as may be the case with a paper having a large circulation, the delay entailed by the preparation of the whole number by this method becomes of serious importance. Means were therefore sought to reduce it by the adoption of auto- matic mechanism. In the Autoplate machine, invented in America by Henry A. Wise Wood, and first used by the New York Herald in 1900, the operation of casting is performed automatically from the time the matrix is put in position until the finished plate is ready to be placed on the printing press, and from a single matrix four plates J in. thick, or seven or eight \ in. thick, can be produced every minute, by the aid of three men only. The casting is done against a horizontal cylinder or core, the interior of which is cooled by water. Below it is a frame or " back " carrying the matrix. This back has an up and down movement of about six inches, and when it is in its topmost position there is a semicircular space between it and the core equal in length, breadth and thickness to the plate which has to be cast. Molten metal having been injected into this space by a pump, there is a pause of a few seconds to permit of solidification, and then the back falls, bringing away the matrix with it. Immediately afterwards the cylinder makes a half turn, and pre- sents what was previously its upper half to the matrix for another cast. The first cast is taken with it as it

turns, and is then pushed along from the top of the core against two rotating saws which trim its edges. Next it comes under a shaving arch, where it pauses while its interior surface is smoothed to proper thickness, and finally water is directed against its back, to cool it without wetting its printing face. The Junior Autoplate is a simpler machine which does not perform so many operations. In it the casting core is vertical, not horizontal, but the matrix is still automatically stripped from the plate, the casts are made alternately on the two halves of the cylinder, and as one plate is being removed another is being cast. The machine also automatically cuts off the sprue which is left on the top of the plate as it stands in the casting box. About three plates a minute are produced, but they are not delivered completely finished, and have to undergo several further operations before they are ready to be placed on the press. The Double Junior consists of two Junior Autoplates served from a common melting-pot, and its capacity is six plates a minute, with two matrices; and another machine, the Autoshaver, has been devised which can shave, cool and deliver that number of plates automatically, no labour being required except to take the plate from the casting machine and place it on the Autoshaver.

See Practical Printing, by John Southward and Arthur Powell (5th ed., London, 1900) ; Modern Printing, by John Southward (London, 1898); The American Handbook of Printing, by Edmund G.Gress (New York, 1907) ; History of Composing Machines, by John S. Thompson (Chicago, 1904); Traite de la typographie, by Henri Fournier (4th ed., Paris, 1904); "Type Casting and Composing Machines," by L. A. Legros, Proc. Inst. Mech. Eng. (London, 1908) ; " Modern Stereotypy and the Mechanics of the Newspaper," by Henry A. Wise Wood, Journ. Franklin Inst. (Philadelphia, 1910). (J.So.;H.M.R.)

TYR, the Scandinavian god of battle. He is not a prominent figure in Northern mythology, for even in this special capacity he is overshadowed by Odin, and there are hardly any traces of worship being paid to him. Among other Teutonic peoples, however, he seems at one time to have been a deity of considerable importance. In Anglo-Saxon he was called TI (Ti, Tug, gen. Tiwes, whence " Tuesday ") and equated with the Roman Mars. He is also identified with the German god mentioned more than once by Tacitus, as well as in inscriptions, by the name Mars. His Teutonic name is the same as the word for "

god ”

in several other Indo-European languages (e.g. Lat. diuus, Lith. devas, Skr. devas), and even in Old Norse the plural (tivar) was still used in the same sense. (See Teutonic Peoples § Religion, ad fin.) (H. M. C.)

TYRANT (Gr. rvpawos, master, ruler), a term applied in modern times to a ruler of a cruel and oppressive character. This use is, however, based on a complete misapprehension of the application of the Greek word, which implied nothing more than unconditional sovereignty. Such rulers are not, as is often supposed, confined to a single period, the 7th and 6th centuries B.C. (the so-called ” Age of the Tyrants “) of Greek history, but appear sporadically at all times, and are frequent in the later city-states of the Greek world. The use of the term ” tyrant ” in the bad sense is due largely to the ultra-constitutionalists of the 4th century in Athens, to whom the democracy of Pericles was the ideal of government. Thus the government which Lysander set up in Athens at the close of the Peloponnesian War is called that of the ” Thirty Tyrants ” (see Critias). The same term is applied to those Roman generals (really 18) who usurped authority locally under Gallienus.

TYRAS, a colony of Miletus, probably founded about 600 B.C., situated some 10 m. from the mouth of the Tyras River (Dniester). Of no great importance in early times, in the 2nd century B.C. it fell under the dominion of native kings whose names appear on its coins, and it was destroyed by the Getae about 50 B.C. In a.d. 56 it seems to have been restored by the Romans and henceforth formed part of the province of Lower Moesia. There exists a series of its coins with heads of emperors from Domitian to Alexander Severus. Soon after the time of the latter it was destroyed by the Goths. Its government was in the hands of five archons, a senate, a popular assembly and a registrar. The types of its coins suggest a trade in wheat, wine and fish. The few inscriptions are also mostly concerned with trade. Its remains are scanty, as its site has been covered by the great medieval fortress of Monocastro or Akkerman (q.v.).

See E. H. Minns, Scythians and Greeks (Cambridge, 1909) ; V. V. Latyshev, Inscriptiones Orae Septentrionalis Ponti Euxini, vol. i.

(E. H. M.)

TYRCONNELL, RICHARD TALBOT, Earl [Titular Duke] of (1630-1691), Irish Jacobite, came of an ancient Anglo-Norman family, the Talbots of Malahide. His father, Sir William Talbot (d. 1633), was a Roman Catholic lawyer and politician of note. His brother Peter was Roman Catholic archbishop of Dublin. Richard Talbot served as a royalist during the Great Rebellion. He was present in Drogheda (Tredah) when it was stormed by Cromwell on the 3rd of September 1647, and was one of the few members of the garrison who escaped from the massacre; he fled to Spain. He then lived like many other royalist refugees, partly by casual military service, but also by acting as a subordinate agent in plots to upset the Commonwealth and murder Cromwell. He was arrested in London in November 1655 and was examined by Cromwell. Once more he escaped, but it was said by his enemies that he was bribed by the Protector, with whom one of his brothers was certainly in correspondence. After the Restoration he had a place in the household of the duke of York (James II.). He was actively engaged in an infamous intrigue to ruin the character of Anne Hyde, the duke's wife, but continued in James's employment and saw some service at sea in the naval wars with the Dutch. He accumulated money by acting as agent for Irish Roman Catholics who sought to recover their confiscated property. He was arrested in connexion with the Popish Plot agitation in 1678, but was allowed to go into exile. He returned just before the death of Charles II., and during the reign of James II. he was the chief agent of the king's policy in Ireland. He was appointed commander-in-chief and created earl of Tyrconnell in 1685. The duty assigned him was to create a Roman Catholic army which might be used to coerce England. In February 1687 he was appointed lord deputy, and became the civil as well as the military governor of Ireland. Tyrconnell, who foresaw the revolution in England, entered into intrigues for handing Ireland over to the king of France in order to secure the interest of his

fellow Roman Catholics. For a time he made a pretence of protecting the Protestants, but when the revolution of 1688 occurred in England he threw himself, after some hesitation,

into the struggle against William III., and when James fled to France Tyrconnell was left as his representative. When William raised the siege of Limerick, Tyrconnell went over to France to seek help, and after his return (January 1691) he was little more than a spectator of the military operations. When he did act it was to thwart the French General St Ruth and his own countryman Sarsfield. He became so unpopular that he was compelled to retire to Limerick, where he died of apoplexy on the 14th of August 1691. In 1689 King James created him duke of Tyrconnell, but the title was recognized only by the Jacobites.

TYRCONNELL (Tir-Conaill), an ancient kingdom of Ireland. Conall Gulban, a son of Niall of the Nine Hostages, king of Ireland, acquired the wild territory in the north-west of Ulster (the modern Co. Donegal, &c), and founded the kingdom about the middle of the 5th century. Of the several branches of his family, the O'Connells, O'Cannanans and O'Dohertys may be mentioned. The kings of Tyrconnell maintained their position until 1071.

TYRE (Phoen. and Hebr. is, nx =" rock," Assyr. Surru, Egypt. Dara, Early Lat. Sarra), the most famous city of Phoe nicia. It is now represented by the petty town of Sur (about 5,000 inhabitants), built round the harbour at the north end of a peninsula, which till the time of Alexander's siege was an island, without water or vegetation. The mole which he constructed has been widened by deposits of sand, so that the ancient island is now connected with the mainland by a tongue of land a quarter of a mile broad. The greatest length of the former island, from north to south, is about f m. and its area about 142 acres. The researches of Renan have refuted the once popular idea that a great part of the original island has disappeared by natural convulsions, though he believes that the remains of a submerged wall at the south end indicate that about 1 5 additional acres were once reclaimed and have been again lost. On this narrow site Tyre was built; its 25,000 inhabitants were crowded into many- storeyed houses loftier than those of Rome; and yet place was found not only for the great temple of Melqarth with its courts, but for docks and warehouses, and for the purple factories, which in Roman times made the town an unpleasant place of residence (Strabo xvi. 2, 23). In the Roman period the population occupied a strip of the opposite mainland, including Palaetyrus. Pliny (Nat. Hist. v. 19) gives to the whole city, continental and

insular, a compass of 19 Roman miles; but this account must be received with caution. In Strabo's time the island was still the city, and Palaetyrus on the mainland was distant 30 stadia; modern research, however, indicates an extensive line of suburbs rather than one mainland city that can be identified with Palaetyrus. This name was given by the Greeks to the settlement on the coast under the mistaken impression that it was more ancient than that on the island; the Assyr. Ushu, frequently mentioned in the Amarna letters, makes it probable that Usu or Uzu was the native name. Owing to the paucity of Phoenician remains the topography of the town and its surroundings is still obscure. The present harbour is certainly the Sidonian port, though it is not so large as it once was; the other ancient harbour, the Egyptian port, has disappeared, and is supposed by Renan to have lain on the south side of the island, and to be now absorbed in the isthmus. The most important ruins are those of the cathedral, with its magnificent columns of rose-coloured granite, now prostrate. The present building is assigned by De Vogiie to the second half of the 12th century, but the columns may have belonged to the 4th-century church of Paulinus (Euseb. H.E. x. 4). The water-supply of ancient Tyre came from the powerful springs of Ras-al 'Ain (see Aque- duct) on the mainland, one hour south of the city, where there are still remarkable reservoirs, in connexion with which curious survivals of Adonis worship have been observed by travellers. Tyre was still an important city and an almost impregnable fortress under the Arab Empire. From 1124 to 1291 it was a

stronghold of the crusaders, and Saladin himself besieged it in vain. After the fall of Acre the Christians deserted the place, which was then destroyed by the Moslems. The present town has arisen since the Motawila (Metawila or Mutawileh) occupied the district in 1766.

The most important references to Tyre in the Bible are 1 Kings v., vii., ix. ; Is. xxiii. ; Am. i. 9 seq.; Ezek. xxvi.-xxviii. ; 2 Mace. iv. 18 sqq.; Mark iii. 8, vii. 24 sqq. ; Matt. xi. 21 seq. (and parallels); Acts xii. 20. Cf. also Joshua xix. 29; 2 Sam. xxiv. 7; Ezra iii. 7; Neh. xiii. 16; Ps. xlv. 12, lxxxiii. 7, lxxxvii. 4. For the history of Tyre see Phoenicia. See also Renan, Mission de Phenicie (1864); Pietschmann, Gesch. der Phonizier (1889), 61-72; F. Jeremias, Tyrus bis zur Zeit Nebukadnesars (1891); H. Winckler, Altor. Forsehungen, ii. 65 sqq. ; A. Socin in Baedeker, Pal. u. Syrien.

(W. R. S.;G. A. C.)*

TYREE, an island of the Inner Hebrides, Argyllshire, Scotland. Pop. (1901), 2192. It is situated fully 2 m. S.W. of Coll, the isle of Gunna lying in the channel between the two islands, and has an extreme length from north-east to south- west of nearly 12 m. and a breadth varying from J m. to 45 m. Carnan Mor (460 ft.) is the highest point; there are several lakes. On the south-western point of Balephuill Bay are ruins of St Patrick's temple, besides duns and ancient chapels. Steamers call from Oban regularly at the small harbour of Scarinish. Skerryvore, a lonely rock in the Atlantic, 14 m. south-west, belongs to the parish of Tyree. The massive lighthouse, which Alan Stevenson erected in 1833-1843, was constructed of granite from the quarries of Hynish at the south- eastern extremity of Tyree.

TYRONE, EARLS OF. The earldom of Tyrone was first conferred by Henry VIII. in 1542 on Conn Bacach O'Neill, and was forfeited in 1614 when an act of attainder was passed against his grandson Hugh, 2nd earl (more strictly 3rd earl, for his brother Brien was for some years de jure holder of the title though never recognized as such), the famous rebel who fled from Ireland with the earl of Tyrconnell in 1607 (see O'Neill). Descendants of the 1st earl in Spain continued to style themselves earls of Tyrone till the death early in the 18th century of Owen O'Neill, grandson of Owen Roe O'Neill. In 1673 Richard Power, 6th Baron Le Power and Coroghmore, governor of Waterford, was created viscount of Decies and earl of Tyrone, being succeeded in these titles by his two sons successively, on the death of the younger of whom in 1704 they became extinct. A daughter of this last earl married Sir Marcus Beresford, Bart., of Coleraine, Co. Derry, in 1717; and in 1720 Beresford was created Baron Beresford and Viscount of Tyrone. In 1746 he was further created earl of Tyrone, and after his death in 1763 his widow became in 1767 Baroness La Poer in her own right. The only surviving son of this marriage inherited the titles of both his parents, all of which were in the peerage of Ireland, and in 1786 he was created a peer of Great Britain as Baron Tyrone of Haverfordwest in the county of Pembroke; three years later he was created marquess of Waterford, with which dignity the earldom of Tyrone has remained conjoined.

TYRONE, a. county of Ireland in the province of Ulster,

bounded N. and W. by Donegal, N.E. by Londonderry, E. by Lough Neagh and Armagh and S. by Monaghan and Fermanagh. The area is 806,658 acres or about 1260 sq. m. The surface is for the most part hilly, rising into mountains towards the north and south, but eastward towards Lough Neagh it declines into a level plain. Running along the north-eastern boundary with Londonderry are the ridges of the Sperrin Mountains (Sawel, 2240 ft., and Meenard, 2061 ft.). Farther south there is a range of lower hills, and Mullaghearn, north-east of Omagh, reaches 1778 ft. South of Clogher a range of hills, reaching 1255 ft. in Slieve Beagh, forms the boundary between Tyrone and Monaghan. On each side of the Mourne River near Omagh rise the two picturesque hills Bessy Bell and Mary Gray. The Foyle forms a small portion of the western boundary of the county, and receives the Mourne, which flows northward by Newton Stewart. The principal tributaries of the Mourne are the Strule (constituting its upper waters), the Derg from

Lough Derg, and the Owenkillew, flowing westward from Fir Mountain. The Blackwater rises near Fivemiletown and forms part of the south-eastern boundary of the county with Monaghan and Armagh. With the exception of Lough Neagh, bounding the county on the east, the lakes are small, also few in number. Lough Fea is picturesquely situated in the north-west, and there are several small lakes near Newtown Stewart.

Geology. — The Sperrin Mountains in the north consist of ordinary " Dalradian " mica schists, covered mostly with grass. Lower Carboniferous Sandstone occurs as an outlier between the mountains and Strabane. The relation of the northern schists to the gneissic and " green rock " axis that forms the central moorland of Tyrone is obscure; intrusions of granite have evidently coarsened the structure of this axis. Ancient perlitic rhyolites occur among the " green rocks " on its northern flank. Omagh lies on Lower Carboniferous Sandstone, which, fringed by Old Red Sandstone, stretches west from the town to the county boundary; but the Dalradian schists appear Continuously south of this from Omagh to Lack in Co. Fermanagh. A great mass of Old Red Sandstone, rising in long ranges of hills, occupies most of the south of the county,

resting on Silurian shales at Pomeroy. Lower Carboni- ferous sandstone and limestone occur on the south flank of this upland, and extend over its east end to Cookstown. At Slieve Beagh in the extreme south Upper Carboniferous sandstones and shales are reached, and from Coalisland to Dungannon true Coal Measures appear. This coalfield includes one fine seam 9 ft. thick at Coalisland; less important coals occur in the Millstone Grit series at Dungannon. Though much denuded before Triassic times, the field doubtless continues eastward under the Triassic sandstone that stretches towards Lough Neagh. The pale clays, probably Pliocene, of the southern shore of the lake cover the flat land east of Coalisland. and are several hundred feet thick. North of Stewarts- town, near Tullaghoge, a very small patch of Magnesian limestone contains Permian marine fossils; and, farther north, the county includes part of the basaltic plateaus, protecting Chalk, which extend away into Co. Londonderry. The Glacial epoch has left immense deposits of gravel and long eskers throughout the county. These are especially conspicuous north of Pomeroy. Fire-clay is raised from the collieries at Coalisland ; but coal-mining here awaits exploration on the east.

Industries. — The hilly districts are unsuitable for tillage; but in the lower regions the soil is remarkably fertile, and agriculture is generally practised after improved methods, the county in this respect being in advance of most parts of Ireland. The excellent pasturage of the hilly districts supports a large number of young cattle. The proportion of tillage to pasture is roughly as 1 to 15. Oats, potatoes and turnips are the principal crops. The cultivation of flax, formerly an important industry, has greatly deteriorated. Poultry-keeping is a growing industry. There are manufactures of linens and coarse woollens (including blankets) ; brown earthen- ware, chemicals, whisky, soap and candles are also made. There are a few breweries and distilleries, and several flour and meal mills. But for the lack of enterprise the coal and iron might aid in the development of a considerable manufacturing industry.

Branches of the Great Northern railway from Portadown (Co. Armagh) and Dungannon in the south-east, and from Enniskillen (Co. Fermanagh) and Fintona. unite at Omagh, whence a line proceeds north by Newtown Stewart and Strabane to Londonderry. From Dungannon a branch runs north to Cooks- town, where it joins a branch of the Northern Counties (Midland) railway. From Victoria Bridge on the

Londonderry line the Castlederg light railway serves that town. The south of the county is served by the Clogher Valley light railway. Water communica- tion includes Lough Neagh, and the Blackwater entering it, and navigable to Moy, whence the Ulster canal skirts the boundary of the county with Co. Armagh to Caledon. The Foyle is navigable to Strabane.

Population. — The population (150,567 in 1901) shows a decrease among the most serious of Irish county populations, and emigration is heavy. About 55% of the inhabitants are Roman Catholics, 22% Protestant Episcopalians and 19% Presbyterians; about 90% constitute the rural population The chief towns are Strabane (pop. 5033), Omagh (the county town, 4789), Dungannon (3694), Cookstown (3531) and Newtown Stewart (1062). The county comprises 8 baronies. Two county members and 2 for each of the boroughs of Augher, Clogher, Dungannon and Strabane were returned to the Irish parliament: after the Union the county returned 2 members to parliament, the borough of Dungannon also returning 1; but in 1885 Dungannon was disfranchised and the county arranged in four divisions — east, mid, north and south — each returning one member. Assizes are held at Omagh and quarter-

sessions at Clogher, Cookstown, Dungannon, Omagh and Strabane.

History. — Tyrone became a principality of one of the sons of Niall of the Nine Hostages in the 5th century, and from his name — Eogan — was called Tir Eogan, gradually altered to Tyrone. From Eogan were descended the O'Neals or O'Neills and their numerous septs. The family had their chief seat at Dungannon until the reign of Elizabeth, when it was burned by Hugh O'Neill to prevent it falling into the hands of Lord Mountjoy. The earldom of Tyrone had been conferred by Henry VIII. on Conn O'Neill, but on his death, when the earldom should have descended to his heir Matthew, baron of Dungannon, another son, Shane, was proclaimed chief with the consent of the people. Shane maintained a contest with English authority, but his last-remaining forces were completely defeated near the river Foyle in May 1567, and shortly after-wards he was himself killed. Tyrone was one of the counties formed at Sir John Perrot's shiring of the unreformed parts of Ulster; but his work was interrupted by the rising of Hugh O'Neill in 1596. During the insurrection of 1641 Charlemont

Fort and Dungannon were captured by Sir Phelim O'Neill, and in 1645 the parliamentary forces under General Munro were signally defeated by Owen Roe O'Neill at Benburb. At the Revolution the county was for a long time in the possession of the forces of James II.

Raths are scattered over every district of the county. There is a large cromlech near Newtown Stewart, another at Tarnlaght near Coagh and another a mile above Castlederg. At Kilmeillie near Dungannon are two stone circles. There are some ruins of the ancient castle of the O'Neills, near Benburb; mention may also be made of the ruins of the castles of Newtown Stewart, Dungannon, Strabane and Ballygawley.

TYRONE, a borough of Blair county, Pennsylvania, U.S.A., about 15 m. N.E. of Altoona, on the Little Juniata river, a small tributary of the Juniata river. Pop. (1910) 7176. Tyrone is served by the main line and three short branches of the Pennsylvania railway (which has repair shops here), and is connected with Altoona by an electric line. The borough is situated about 910 ft. above sea-level, in an agricultural and lumbering region, and there are deposits of limestone in the vicinity. It is a distributing point for the Clearfield coal region to the northward. At the village of Birmingham, 3 m. east, is a school for girls (founded 1853; incorporated 1907). Tyrone was laid out as a village in 1851, and was incorporated as a borough in 1857.

TYRRELL, GEORGE (1861-1909), Irish divine, was born in Dublin on the 6th of February 1861, and came of a family noted for its intellectual distinction. He was educated under Dr Benson at Rathmines School and entered Trinity College in 1878. He was greatly influenced by the writings of Cardinal Newman, and early in 1879 entered the Roman Catholic Church. In 1880 he joined the Society of Jesus and passed his novitiate at Manresa and other houses of the order, becoming teacher of philosophy at Stonyhurst. He had a keen sympathy with the difficulties experienced by the ordinary lay mind in trying to reconcile the conservative element in Catholicism with the principle of development and growth, and in The Faith of the Millions, Hard Sayings and Nova et Vetera he attempted to clear them away. His writings have been described as " apolo- getic in intention, meditative in method and mystical in substance," and Tyrrell himself certainly combined in a wonder- ful way the judicial and the enthusiastic types of

character. Besides the influence of Newman, the friendship and work of Robert Dolling made a great impression on him, and as he admitted, saved him from being contented with a merely academic and ecclesiastical type of religion. Tyrrell privately circulated among his friends writings in which he drew a clear line of distinction between religion as a life and theology as the incomplete interpretation of that life. One of these, the Letter to a Professor of Anthropology, was translated without his knowledge into Italian, and extracts from it were published in the Corriere della Sera of Milan in January 1906. For at

least eight years before this he had been more or less in conflict with the authorities of his order, through his sympathy with " modernist " views, but the publication of this letter (afterwards issued by Tyrrell as A Much Abused Letter) brought about his expulsion from the order in February 1906. " The conflict," he wrote, " such as it is, is one of opinion and ten- dencies, not of persons; it is the result of mental and moral necessities created by the antitheses with which the Church is wrestling in this period of transition." Tyrrell found no bishop to give him an ecclesiastical status and a celebret, and he never regained these privileges. In July 1907 the Holy Office published its decree condemning certain modernist propositions, and in September the pope issued his encyclical Pascendi Gregis. Tyrrell's criticism of this document appeared in The Times on the 30th of September and the 1st of October, and led to his virtual excommunication from the Church. In the few years that remained to him he gave himself with patience and dignity to the work of his life. He had already published Lex orandi, insisting that the true interpretation of the creed is determined by its prayer value, and in 1906 he wrote Lex credendi. This was followed by Through Scylla and Charybdis, in which he developed his favourite view of revelation as experience ; Mediaevalism, a vigorous apologia in reply to a Lenten pastoral of Cardinal Mercier, archbishop of Malines, who had attacked him as the chief exponent of Modernism; and Christianity at the Cross Roads, which emphasizes the distinction between his own position and that of the Liberal Protestants, and is of special interest for its treatment of the eschatological problems of the Gospels. On the 6th of July 1909 he was suddenly taken ill, on the 10th he received conditional absolution from a priest of the diocese of Southwark, and on the 12th extreme unction from the prior of

Storrington. His intimate friend, the Abbe Bremond, gave him the last absolution and remained with him until his death on the 15th of July 1909. Such appear to be the facts, but Tyrrell's relations with Rome were such that a good deal of mystery was made as to whether he really received the last rites of his Church in any authorized manner. About his own saintly and sym- pathetic character, and his essential religiousness, there was no doubt.

See the estimates by Baron F. von Hugel and Rev. C. E. Osborne in The Hibbert Journal for January 1910; also the obituary in The Times (July 16, 1909), and the Life, by Miss M. D. Petre.

TYRRELL, SIR JAMES (d. 1502), the supposed murderer of the English king Edward V., and of his brother Richard, duke of York, was a son of William Tyrrell and a grandson of Sir John Tyrrell (d. c. 1437), who was treasurer of the royal household and was on three occasions Speaker of the House of Commons. The family is said to descend from Walter Tirel, the murderer of William Rufus. During the Wars of the Roses James Tyrrell fought for the Yorkists; in 1471 he was knighted; and in 1477 he was member of parliament for Cornwall. With regard to his share in the murder of the prince in 1483 he appears to have been selected by Richard III. and sent to the Tower of London, where he supervised the crime which was carried out by his subordinates. Afterwards he received several appointments from Richard and was sent to Flanders. He was also employed by Henry VII. and was made governor of Guisnes, but he seems to have incurred the king's displeasure through his friendship with Edmund de la Pole, earl of Suffolk. Having been treacherously seized he was conveyed to England and was executed on the "6th of May 1502. Just before his death he made a confession about the murder of the princes.

Members of the same family were Sir Thomas Tyrrell (1594-1672), justice of the common pleas under Charles II., and Anthony Tyrrell (1552-c. 1610), a Roman Catholic priest and spy, who afterwards became a clergyman of the Church of England.

TYRTAEUS, Greek elegiac poet, lived at Sparta about the middle of the 7th century B.C. According to the older tradition he was a native of the Attic deme of Aphidnae, and was invited to Sparta at the suggestion of the Delphic oracle to assist

the Spartans in the second Messenian war. According to a later version, he was a lame schoolmaster, sent by the Athenians as likely to be of the least assistance to the Spartans (Justin iii. 5; Themistius, Orat. xv. 242; Diod. Sic. xv. 67). A fanciful explana- tion of his lameness is that it alludes to the elegiac couplet, one verse of which is shorter than the other. According to Plato (Laws, p. 629 A), the citizenship of Sparta was con- ferred upon Tyrtaeus, although Herodotus (ix. 35) makes no mention of him among the foreigners so honoured. Basing his inference on the ground that Tyrtaeus speaks of himself as a citizen of Sparta (Fr. 2), Strabo (viii. 362) is inclined to reject the story of his Athenian origin. Suiidas speaks of him as " Laconian or Milesian "; possibly he visited Miletus in his youth, where he became familiar with the Ionic elegy. Busolt, who suggests that Tyrtaeus was a native of Aphidnae in Laconia, conjectures that the entire legend may have been concocted in connexion with the expedition sent to the assis- tance of Sparta in her struggle with the revolted Helots at Ithome (464). However this may be, it is generally admitted that Tyrtaeus flourished during the second Messenian war (c. 650 B.C.) — a period of remarkable musical and poetical activity at Sparta, when poets like Terpander and Thaletas were welcomed —that he not only wrote poetry but served in the field, and that he endeavoured to compose the internal dissensions of Sparta (Aristotle, Politics, v. 6) by inspiring the citizens with a patriotic love for their fatherland. About twelve fragments (three of them complete poems) are preserved in Strabo, Lycur- gus, Stobaeus and others. They are mainly elegiac and in the Ionic dialect, written partly in praise of the Spartan con- stitution and' King Theopompus (Evvofiia), partly to stimulate the Spartan soldiers to deeds of heroism in the field ('Tirodrjicai.- — the title is, however, later than Tyrtaeus). The interest of the fragments preserved from the Evvonia is mainly historical, and connected with the first Messenian war. ' The "TiroOrJKai, which are of considerable merit, contain exhortations to bravery and a warning against the disgrace of cowardice. The popularity of these elegies in the Spartan army was such that, according to Athenaeus (xiv. 630 F), it became the custom for the soldiers to sing them round the camp fires at night, the polemarch rewarding the best singer with a piece of flesh. Of the march- ing songs ('E/i(3ari7pia), written in the anapaestic measure and the Doric dialect, only

scanty fragments remain (Lycurgus, In Leocratem,p. 211, § 107; Pausaniasiv. 14, 5. 15, 2; fragments in T. Bergk, Poetae lyrici graeci, ii.).

Verrall (Classical Review, July 1896, May 1897) definitely places the lifetime of Tyrtaeus in the middle of the 5th century B.C., while Schwartz (Hermes, 1899, xxxiv.) disputes the existence of the poet altogether; see also Macan in Classical Review (February 1897); H. Weil, Etudes surl'antiquitegrecque(1900), and C.Giarratani, Tirteo e i suoi carmi (1905). There are English verse transla- tions by R. Polwhele (1792) and imitations by H. J. Pye, poet laureate (1795), and an Italian version by F. Cavallotti, with text, introduction and notes (1898). The fragment beginning 'YfdvankvaL yap KaKbv has been translated by Thomas Campbell, the poet. The edition by C. A. Klotz (1827) contains a dissertation on the war-songs of different countries.

• TYRWHITT, THOMAS (1730-1786), English classical scholar and critic, was born in London on the 27th of March 1730, where he died on the 15th of August 1786. He was educated at Eton and Queen's College, Oxford (fellow of Merton, 1755). In 1756 he was appointed under-secretary at war, in 1762 clerk of the House of Commons. In 1768 he resigned his post, and spent the remainder of his life in learned retirement. In 1784 he was elected a trustee of the British Museum, to which he bequeathed a portion of his valuable library.

His principal classical works are: Fragmenta Plutarchi II. inedita (!773). from a Harleian MS. ; Dissertatio de Babrio (1776), containing some fables of Aesop, hitherto unedited, from a Bodleian MS.; the pseudo-Orphic De lapidibus (1781), which he assigned to the age of Constantius; Conjecturae in Strabonem (1783); Isaeus De Meneclis hereditate (1785); Aristotle's Poetica, his most important work, published after his death under the superintendence of Dr Burgess, bishop of Salisbury, in 1794. Special mention is due of his editions of Chaucer's Canterbury Tales (1775-1778); and of Poems, supposed to liave been written at Bristol by Thomas Rowley

and others in the Fifteenth Century (1777-1778), with an appendix to prove that the poems were all the work of Chatterton. In 1782 he published a Vindication of the Appendix in reply to the arguments of those who maintained the genuineness of the poems. While clerk of the House of Commons he edited Proceedings and Debates of the House of Commons, 1 620-1 621 from the original MS. in the library of Queen's College, Oxford, and Henry Elsynge's (1598- 1654) The Manner of holding Parliaments in England.

TYTLER, WILLIAM (1711-1792), of Woodhouselee, Scottish historian and antiquarian, son of Alexander TvUer of Edinburgh, was born in that city on the 12th of October 171 1. He was educated at the High School and the University, and was in 1744 admitted into the society of Writers to the Signet. In 1759 he published an Inquiry, Historical and Critical, defending the character of Mary, Queen of Scots, and in 1783 the Poetical Remains of James the First, King of Scotland. He died at Woodhouselee on the 12th of September 1792. His life, written by Henry Mackenzie, was published in 1796.

His son Alexander Fraser Tytler, Lord Woodhouselee (1747-1813), Scottish judge, was born at Edinburgh on the 15th of October 1747. He was called to the Edinburgh bar in 1770. His first work, a supplement to Lord Karnes's Dictionary of Decisions, entitled The Decisions of the Court of Session, was published in 1778, and a continuation appeared in 1796. In 1780 he was appointed conjoint professor of universal history in the university of Edinburgh, becoming sole professor in 1786. In 1783 he published Outlines of his course of lectures, extended and republished in 1801 under the title of Elements of General History. In 1790 he was appointed judge-advocate of Scotland, and while holding this office he wrote a Treatise on the Law of Courts-Martial. In 1801 he was raised to the bench, taking his seat (1802) in the court of session as Lord Woodhouselee. He died at Edinburgh on the 5th of January 1813.

Besides the works already mentioned, he wrote Life and Writings of Dr John Gregory (1788); Essay on the Principles of Translation (1790); a dissertation on Final Causes, prefixed to nis edition of Derham's Physico-Theology (1799); a political pamphlet entitled Ireland profiting by Example (1799); an Essay on Laura and Petrarch (1801); and Memoirs of the Life and Writings of Henry Home of Karnes (1807).

Patrick Fraser Tytler (1 791-1849) Scottish historian, son of Lord Woodhouselee, was born at Edinburgh, on the 30th of August 1791. He was called to the bar in 1813; in 1816 he became king's counsel in the exchequer, and practised as an advocate until 1832. He contributed to Allison's Travels in France (181 5); his first independent essays were papers in Blackwood's Magazine. His great work, the History of Scotland (1828-1843) covered the period between 1249 and 1603. While occupied on this work Tytler removed to London, and it was largely owing to his efforts that a scheme for publishing state papers was carried out. Tytler was one of the founders of the Bannatyne Club and of the English Historical Society. He died at Great Malvern on the 14th of December 1849. His life (1859) was written by his friend, John W. Burgon, dean of Chichester.

His other works include: contributions to Thomson's Select Melodies of Scotland (1824); Life of James Crichton of Cluny, commonly called the Admirable Crichton (1819; 2nd ed., 1823); a Memoir of Sir Thomas Craig of Riccarton (1823) ; an Essay on the Revival of Greek Literature in Italy, and a Life of John Wickliff, published anonymously (1826) ; Lives of Scottish Worthies, for Murray's Family Library (1831-1833) ; Historical View of the Progress of Discovery in America (1832); Life of Sir Walter Raleigh (1833); Life of Henry VIII. (1837) ; England under the Reigns of Edward VI. and Mary, from original letters (1839) ; Notes on the Darnley Jewel (1843), and on the Portraits of Mary Queen of Scots (1845).

TYUMEN, a town in West Siberia, in the government of Tobolsk, situated where the chief highway from Russia across the Urals touches the first navigable river (the Tura) of Siberia. Pop. (1900), 29,651. A railway passing through Ekaterinburg (202 m west by rail) and the principal ironworks on the eastern slopes of the middle Urals connects Tyumen with Perm, the

terminus of steamboat traffic on the Kama and Volga. Tyumen has regular steam communication with Omsk and Semipalatinsk Irtysh (steamers penetrating as far as Lake Zaisan in Dzungaria), with Tomsk, and other places in the Altai, and with the Arctic Ocean and the fisheries of the lower Ob. The town is well built, and stands on both banks of the Tura, here spanned by a bridge. The inhabitants have always been renowned for their industrial skill. Woollen cloth, linen, belts,

barges, paper, and especially boots and gloves, are manufactured to a large amount ; and Tyumen carpets have a great reputation in Russia and Siberia.

TZETZES, JOHN, Byzantine poet and grammarian, flourished at Constantinople during the 12th century a.d. Tzetzes has been described as a perfect specimen of the Byzantine pedant. Excessively vain, he resented any attempt at rivalry, and violently attacked his fellow grammarians. Owing to want of books, he was obliged to trust to his memory; hence he is to be used with caution. But he was a learned man, and deserves gratitude for his efforts to keep up the study of ancient Greek literature. Of his numerous works the most important is the Book of Histories, usually called Chiliades (" thousands ") from the arbitrary division by its first editor (N. Gerbel, 1546) into books each containing 1000 lines (it actually consists of 12,674 lines in " political " verse). It is a collection of literary, historical, theological and antiquarian miscellanies, whose chief value consists in the fact that it to some extent makes up for the loss of works which were accessible to Tzetzes. The whole production suffers from an unnecessary display of learning, the total number of authors quoted being more than 400 (H. Spelthahn, Studien zu den Chiliaden des Johannes Tzetzes, diss., Munich, 1904). The author subsequently brought out a revised edition with marginal notes in prose and verse (ed. T. Kiessling, 1826; on the sources see C. Harder, De J. T. historiarum fontibus qiiaestiones selectae, diss., Kiel, 1886). The Chiliades is based upon a collection of Letters (ed. T. Pressel, 1851), which has been called an index to the larger work, itself described as a versified com- mentary on the letters. These letters (107 in number) are addressed partly to fictitious personages, and partly to the great men and women of the writer's time. They contain a considerable amount of biographical details. The Iliaca, an abridgment of and supplement to the Iliad, is divided into three parts — Antehomerica, Homerica, Post- homerica — containing the narrative from the birth of Paris to the return of the Greeks after the fall of Troy, in 1676 hexameters (ed. C. Lehrs and F. Diibner, 1868, in the Didot series, with Hesiod, &c.) The Homeric Allegories, dedicated to the empress Irene, in " political " verse, are two didactic poems in which Homer and the Homeric theology are explained on euphemistic principles (ed. P. Matranga, in his Anecdota graeca, i. 1850). Tzetzes also wrote commentaries on a number of Greek authors, the

most important of which is that on the Cassandra or Alexandra of Lycophron (ed. C. G. Miiller, 181 1), in the production of which his brother Isaac is generally associated with him. Mention may also be made of a dramatic sketch in iambic verse, in which the caprices of fortune and the wretched lot of the learned are described; and of an iambic poem on the death of the emperor Manuel, noticeable for introducing at the beginning of each line the last word of the line preceding it 1 (both in Matranga, An. gr. ii.).

' For the other works of Tzetzes see_ J. A. Fabricius, Bibliotheca graeca (ed. Harles), xi. 228, and C. Krumbacher, Geschichle der byz. Litt. (2nd ed., 1897); monograph by G. Hart, " De Tzetzarum nomine, vitis, scriptis," in Jahn's Jahrbucher fiir classische Philologie. Supplementband xii. (Leipzig, 1881).

1 This versification is called kXiˆokojtos (/cAijuaf, ladder), a term more commonly applied to a verse in which each word contains one letter more than the one which precedes it.

UThe twenty-first letter of the English alphabet. It is a modification made in manuscript writing of the Latin inscriptional V, and is itself found on the inscrip- tions of Rome as early as the latter part of the 2nd century a.d. The symbols U, V, Y are all of the same origin, but what the origin is has been much disputed. In the Phoenician alphabet T is the last symbol, but there can be little doubt that when the Greeks introduced symbols for vowels, which had not been indicated in the alphabet they had borrowed, they took the sixth symbol of the Phoenician alphabet (see F) in its ordinary form Y and placed it at the end of the alphabet with the value of a vowel. This vowel was apparently u (English oo in moon), though Ionic and Attic Greek at a very early period changed it to the sound of the French u. In other dialects the earlier value long persisted, and in modern Tzakonian, the representa- tive of the ancient Laconian, it still survives. In some places, e.g. Boeotia, the sound seems to have changed, in connexion with dental consonants, in the same way as the English sound, in certain cases i (y) being inserted in front of it. This seems to be the only feasible explanation of such spellings as rtoirjca {tuxv),

iro\io{>!ev(K (iroKv^evoi), which appear after the Boeo tians adopted the Ionic alphabet. A similar change must have existed in very early Attic and Ionic to account for the change of / before u into 5 in cb, " thou " for tv; some authorities think it was universal in the earliest Greek. Greek nowhere shows the symbol in the bowl shape that it has in the Semitic alphabet. From the 7th century B.C. both Y and V are found, sometimes both in the same area. Another form somewhat later has the upper strokes curved outwards T, while the angle is much less deep than in the other forms. It is noticeable that the symbol for u in the syllabary which was used to write Greek in Cyprus has this form amongst others. The name of the sixth symbol in the Phoenician alphabet was Www (Vau), but though U has taken its form, in Greek its name was v (i.e. English 00, as in moon, except in Attic and Ionic, where it was like the French u in lune), not upsilon, as is frequently stated. In Sweet's terminology u (00), as pronounced in English " put " or " too, " is a high back wide round, while the sound in the French sou or the Scotch pro- nunciation of " book " is a high back narrow round. The high front corresponding sound is found in the French lune. With this the German " modified u "•(«) is often equated, but it is not really identical, being a mid front narrow round vowel. The pitch of the vowel u is among the lowest of the vowel sounds; the rounding and protrusion of the lips make the breath passage longer than it is for other vowels, and so its production may be compared to that of a sound made upon a flute when all the finger-holes are covered. In modern English u preceded by i (y) arises from three different sounds in middle English: (a) the long French u (ii) brought in with borrowed words from French (duke), (b) eu (Early English eow) as in "new," (f) a more open sound eu (Early English eaw) as in " dew " (Sweet, New English Grammar, § 806). The y-sound was dropped after r, ch and dzh, as in " true, " " choose, " " juice " (ibid., § 857)- In the literary dialect also it generally disappears after /, as in " lurid," " lute." In some provincial and American pronunciations it is dropped everywhere except initially, so that " Tuesday " is pronounced Toosday, " new " noo. (P- Gi.)

UAKARI (Ouakari), the native name of certain tropical American monkeys, distinguished from all other New World monkeys by their short tails. The three known species con- stitute the genus Uacaria (or Cothurus) of zoologists, and are con- fined to the forests of Amazonia and the neighbourhood.

One of them (U . calva) is remarkable for its long, silky, pale chestnut fur and brilliant scarlet face, which is naked (see Primates).

UBANGI, a river of Equatorial Africa, the chief northern affluent of the Congo (q.v.). The Ubangi (otherwise Mubangi or Mobangi) enters the Congo by various mouths between o° 22′ and o° 37′ S. and 17° 40′ and 17 50′ E. The main channel,

fully 1 m. wide, joins the Congo in o° 31′ S. The Ubangi is formed by the junction of the Mbomu and the Welle, both of which rise on the north-eastern rim of the Congo basin.

The water-parting between the Bahr-el-Ghazal affluents (Nile system) and the Mbomu headstreams is not very clearly marked, but high hills running parallel with the Nile between Albert Nyanza and Dufile sharply separate the valley of the Welle and other west- flowing streams from that of the Mountain Nile. The chief of the headstreams of the Welle (known in its upper course as the Kibali) rises on the western slope of a hill about 40 m. west of Wadelai. It is joined by several small streams, the main river flowing in a W.N.W. direction. After a course of over 700 m. (during which it receives one large southern tributary — the Bomokandi — and other considerable affluents) the Welle joins the Mbomu in 4 10′ N. 22° 37′ E. The Mhc.nu, which has two large northern tributaries, the Shinko and the Bale, rises in 4 50′ N. 27 12′ E. For some distance it runs parallel to and about 100 m. north of the lower course of the Welle. About 23 12′ E. it turns sharply south until its junction with the Welle. In its lower course the Mbomu is interrupted by many falls and rapids. A short distance below the junction of the Mbomu and Welle the Kotto, coming from beyond 8° N., on the borders of Darfur, and forming the most northerly extension of the Congo basin, enters the united stream, now known as the Ubangi, on the right bank. The remaining tributaries, mostly on the right bank, are smaller, but the Kemo, which joins the Ubangi near its most northern point (5 8′ N.), is of some importance as offering water communication to within a short distance of the Shari basin. Below the Kemo confluence the Ubangi, which has hitherto continued to flow W.N.W., makes a great bend south and runs into the Congo after a southerly course of 400 m. Shortly after receiving the Kemo the river forces its way through a line of hills whose tops rise 600 to 800 ft. above the banks of the stream. Here are the Zongo or Grenfell rapids,*

which are a barrier to navigation save for small boats at flood season. Above the Zongo rapids the river is navigable up to the confluence of the Welle and Mbomu, and the Welle is navigable at high flood up to the Bomokandi confluence in 26 8', though the stream is much interrupted by rapids.

From the Mbomu-Welle confluence to the junction of the Ubangi with the Congo the river has a course of fully 700 m., while the Ubangi-Welle combined exceeds 1400 m. From its mouth to Zongo rapids, a distance of 350 m., the stream is navigable by steamers drawing 3 ft. of water. In general the Ubangi flows through a fertile and forested region.

The Welle was discovered from the north by G. A. Schweinfurth in 1870; i.e. seven years before the discovery of the course of the Congo by H. M. Stanley. By Schweinfurth the Welle was believed to belong to the Chad system, but W. Junker, who (1882- 1883) followed the river to near its confluence with the Mbomu, made it clear that the Welle belonged to the Congo system. In 1885 the Rev. George Grenfell, of the Baptist Missionary Society (who had discovered the mouth of the river in 1884), ascended the Ubangi as far as the Zongo rapids. He was followed in 1886-1889 by the Belgian A. van Gele, who in the last-named year finally established the identity of the Ubangi with Schweinfurth's Welle. The Mbomu was discovered from the north in 1877 by a Greek, Dr P. Potagos, and its upper course was followed for some distance by Junker. The Ubangi and the Mbomu form the frontier between Belgian Congo and French Congo, the northern banks of both streams belonging to France.

See, besides the works of Schweinfurth, Junker and other travel- lers, A. J. Wauters, Les Bassins de V Ubangi (inferiettr) et de la Sanga, with map (Brussels, 1902); Dr Cureau's map (1 : 1,000,000) of the upper Ubangi in La Geographie (October 1900) ; the Congo and works there cited.

fJBEDA, a town of southern Spain, in the province of Jaen; 2000 ft. above sea-level, in the Loma de Ubeda, a range on the right bank of the Guadalquivir. Pop. (1900), 19,913- The surrounding country produces wheat, wine, olives and fruit. TJbeda has a station 6 m. south on the Madrid-Almeria railway. Portions of the old walls, with towers and gates, still remain, and there are three late Gothic churches, the oldest of

which, San Salvador, dates from 1540 to 1556, and contains some interesting paintings. An important fair is held from the 29th of September to the 5th of October. Oil, soap, esparto and linen fabrics are manufactured. TJbeda was an important town under Moorish rule.

UDAD, Aoudad or Audad, the Moorish name of the Barbary sheep, or arui, Ovis {Ammotragus) lervia, the only wild sheep found in Africa, where it inhabits all the mountain ranges of the north, descending to the eastward far into the heart of the Sudan. The udad is distinguished by the abundant hair on the throat and fore-quarters of the rams, and the length of the tail. In the absence of face-glands and in the structure of the horns the species approximates to the goats. The " lion-coloured " coat approximates to the hue of the limestone rocks on which these sheep dwell.

UDAIPUR, Oodeypore or Mewar, a native state of India, in the Rajputana agency. Area, 12,691 sq. m. Pop. (1901), 1,030,212. Estimated revenue £200,000; tribute £17,000. The greater part of the country is level plain. A section of the Aravalli Mountains extends over the south-western and southern portions, and is rich in minerals, but the mines have been long closed. The general inclination of the country is from south-west to north-east, the Banas and its numerous feeders flowing from the base of the Aravalli range. There are many lakes and tanks in the state, the finest of which is the Debar or Jaisamand, with an area of nearly 21 sq. m.; it is considered to be the largest artificial sheet of water in the world. A portion of the state is traversed by the Malwa line of the Rajputana railway. A branch from Chitor towards Udaipur was taken over by the state in 1898, and was extended nearer to the capital. Like the rest of Rajputana the state suffered severely from famine in 1900. The ancient coinage is of the Sasanian or Persian type, copper issues of this type being still in circulation. Modern coins bear on the reverse the words " Friend of London."

The chief, whose title is maharana, is the head of the Sisodhyia clan of Rajputs, and claims to be the direct representative of Rama, the mythical king of Ajodhya. He is universally recog-

nized as the highest in rank of all the Rajput princes. The dynasty offered a heroic resistance to the Mahomniedans, and boast that they never gave a daughter to a Mogul emperor. They are said to have come from Gujarat and settled at Chitor in the 8th century. After the capture of Chitor by Akbar in 1568 the capital was removed to Udaipur by Maharana Udai Singh. During the 18th century the state suffered greatly from internal dissension and from the inroads of the Mahrattas. It came under British protection in 1 8 1 7. The Maharana Fateh Singh, G. C. S. I. (b. 1848), succeeded by adoption in 1884.

The name of Mewar is derived from the Meos, or Minas, a tribe of mixed Rajput origin, who have likewise given their name to a different tract in northern Rajputana, called Mewat, where they are now all Mahommedans. About 1400 a sub-division of the Mewatis, called Khanzadas, made themselves the dominant power in this tract; and at the end of the 18th century, and again during the Mutiny, they were notorious for their ravages in the Upper Doab, around Agra and Delhi. In 1901 the total number of Mewatis in Rajputana was 168,596, forming 13 % of the population in the state of Alwar. Down to 1906 the Mewar residency was the title of a political agency in Rajputana, comprising the four states of Udaipur, Banswara, Dungarpur and Partabgarh ; area, 16,970 sq. m. ; pop. (1901), 1,336,283. But in that year the three last states were separated from Udaipur, and formed into the Southern Rajputana States agency. The Mewar Bhil Corps, raised as a local battalion in 1840, which was conspicuously, loyal during the Mutiny, was in 1897 attached to the Indian army, with its headquarters at Kherwara.

The city of Udaipur is 2469 ft. above sea-level. Pop. (1901), 45,976. It is situated in a valley amid wooded hills, on the bank' of a large lake (Pichola), with palaces built of granite and marble. The maharana's palace, which crowns the ridge on which the city stands, dates originally from' about 1570, but has had additions made to it till it has become a conglomeration of various architectural styles. On Lake Pichola are two islands, on which are palaces dating respectively from the middle of the :7th and of the 18th centuries. In one of these the European residents were sheltered during the Indian Mutiny. In the neighbourhood are Eklingji (with a magnificent temple of the 15th century), and Nagda, the seat of the ancestors of the chiefs of Udaipur, with a number of temples, two of which are said to date from the nth

century.

There is another Udaipur State in the Central Provinces (till 1905 one of the Chota Nagpur states of Bengal). Area, 1052 sq. m. ; pop. (1901), 45,391. Its capital is Dharmjaygarh.

UOAL, NICHOLAS (1504-1556), English schoolmaster, translator and playwright, author of the earliest extant English comedy, Roister Bolster, came of the family of Uvedale, who in the 14th century became lords of Wykeham, Hants, by marriage ' with the heiress of the Scures. The name was probably pronounced Oovedale, as it appears as Yevedale, Owdall, Woodall, with other variants. He latinized it as Udallus, and thence anglicized it as Udall. He is described as Owdall of the parish of St Cross, Southampton, 12 years old at Christmas 1 516, when admitted a scholar of Winchester College in 1517 {Win. Schol. Reg.). He was therefore not 14 (as Anthony Wood says) but 16J years of age when admitted a scholar of Corpus Christi College, Oxford, in June 1520; he is called Wodall as a lecturer at that college in 1526 to 1528 (T. Fowler, Hist.C.C.C).

With John Leland he produced " dites " (ditties) " and interludes" (B.M. MS. 18A lxiv.) at Anne Boleyn's coronation on the 31st of May 1533. Leland's contributions are all in Latin; those of " Udallus," which form the chief part, are mostly in English, the speeches being each spoken by a " child," at Cornhill beside Leadenhall," " at the Conducte in Cornhill " and " at the little Conducte in Cheepe." His Floures for Laline Spekynge, selected and gathered out of Terence and the same translated into Englysshe, published by Bartlet (in aedibus Bertheleti), were dedicated " to my most sweet flock of pupils, from the monastery of the monks of the order of Augustine," on the 28th of February 1 533-1 534. There were no monks of that order, and whether Austin Friars or Augustinian canons were meant is open to doubt. The book was prefaced with laudatory Latin verses by Leland and by Edmund Jonson. The latter was a Winchester and Oxford contemporary of Udal's, in 1528 lower master {hostiarius) at Eton, a post which he left to become master of the school of St Anthony's Hospital, then the most flourishing school in London. From the dedication we may infer that Udal was usher under Jonson and" the sweet flock "was at St Anthony's school next door to Austin Friars. At Midsummer 1534 he became head master of Eton {informator puerorum or ludi grammalicalis; Eton Audit Book.

25-26 Hen. VIII.). It has been suggested {Die. Nat. Biog.) that the Floures was dedicated to Eton boys in advance; but this is unlikely, as in those days schools never got their masters till the place was vacant, or on the verge of vacancy. At Eton Udal's salary was £10 and £1 for livery, with " petty receipts " of 8s. 4d. for obits, 2s. 8d. for laundress, 2s. for candles for his chamber, and 23s. 4d. " for ink, candles and other things given to the grammar school by Dr Lupton, provost." One' of his school books, Commentaries on the Tusculan questions of Cicero (ed. Berouldus, 1509), with the inscription "sum Nicolai Udalli 1536," is in the King's Library at the British Museum.

There was a yearly play, 3s. being paid for the repair of the dresses of the players at Christmas, and is. 4d. to a servant of the dean of Windsor for bringing his master's clothes for the players. A payment for repair of the players' dresses recurs every year. Udal has been credited (E. K. Chambers, Mediaeval Stage, ii. 144, 192) with producing a play at Braintree while vicar there, recorded in the churchwardens' account's for 1534 as " Placidas alias Sir Eustace." The play is actually called in the accounts (only extant in 17th-century extracts) " Placy Dacy alias St Ewastacy," and is the old play of Placidas, mentioned in the 9th century. Udal did not become vicar of Braintree till the 27th of September 1537 (Newcourt's Repert. ii. 89). At Michaelmas he resigned the mastership of Eton to reside at Braintree, being called "late schole-master wose roome no we enjoyeth and occupieth Mr Tindall " in a letter from the provost to Thomas Cromwell, then privy seal, on the 7th October 1537 {Lett, and Fa. HenSVIII., 1537). He returned to Eton, however, or rather to Hedgeley, the school being removed there on account of the plague, at Midsummer 1537, being paid for the third and fourth terms of the school year

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{Eton Audit Book, 29-30 Hen. VIII.). In October 1538 " Nicholas Uvedale, professor of the liberal arts, informator and schoolmaster of Eton, " was licensed to hold the vicarage of Braintree, " with other benefices." without personal residence. The accounts of Cromwell for 1538 include " Woodall, the scholemaster of Eton, to playing before my lord, £5." Pre-

sumably he brought a troupe of Eton boys with him. In that year he published a second edition of his Floures of Terence for the benefit of Eton boys. The often-questioned account of Thomas Tusser {Five Hundred Pointes of Good Husbandrie) is typical of Eton at the time, as Udal's predecessor Cox is said in Ascham's Scholemaster to have been " the best scholemaster and greatest beater of our time " : —

" From Powles l I went to Aeton sent,

To learn straightwaies the Latin phraise;

Where fifty-three stripes given to me at once I had ;

For fault but small or none at all

It came to pass thus beat I was;'

See, Udall, see, the mercie of thee to mee, poor lad."

Udal's rule of the rod at Eton was brought to an abrupt conclusion by his being brought up before the privy council on the 14th of March 1540/1541 for being " counsail " with two of the boys, Thomas Cheney, a relation of the lord treasurer of the household, and Thomas Hoorde, for stealing some silver images and chapel ornaments. He denied the theft, but confessed to a much more scandalous offence with Cheney, and was sent to the Marshalsea prison. He tried, but failed, to get restored to Eton. Attempts have been made to whitewash him. But his own confession, and an abject letter of repentance with promises of amendment, addressed (probably) to Wriothesley, a Hamp- shire man and a family friend, cannot be got over. It shows that he was a bad schoolmaster as well as an immoral one, since he pleads " myn honest chaunge from vice to vertue, from prodigalitee to frugall lyving, from negligence of teachyng to assiduitee, from play to studie, from lightness to gravitee." In 1 54 2-1 543, after the bursar of Eton had ridden up to London to the provost, Udal was paid " 53s. 4d. in full satisfaction of his salary in arrears and other things due to him while he was teaching the children"; but on the other side of the account appears an item of "60s. received from Dr Coxe for Udal's debts." So no money passed to Udal.

He seems to have maintained himself by translating into English, in 1542, Erasmus's Apophthegms and other works. In 1544 he published a new edition of the Floures of Terence. He

seems to have taken a schoolmastership in Northumberland or Durham, as Leland in one of his Encomia speaks of him, probably at this time, as translated to the Brigantes. He seems to have been made to resign his living at Braintree, a successor being appointed on the 14th of December 1544. He purged himself, however, by composing the Answer to the Articles of the Commoners of Devonshire and Cornwall (Pocock; Troubles of the Prayer Book of 1549, Camd. Soc, new series, 37, 141, 193), when they rose in rebellion in the summer of 1549 against the First Prayer Book of Edward VI. In 1551 he received a patent for printing his translation of Peter Martyr's two works on the Eucharist ' and the Great Bible in English (Pat. 4 Edw. VI. pt. 5, m. 5, Shakespeare Soc. iii. xxx.). He was rewarded by being made a canon of Windsor on the 14th of December 1551. On the 5th of January " after the common reckoning 1552 " {i.e. 1551/2) he edited a translation of Erasmus's Paraphrases of the Gospels, him- self translating the first three, while that on St John was being translated by the princess Mary, till she fell sick and handed her work over to Dr Malet. The work was done at the suggestion and expense of the dowager queen Katharine, in whose charge Mary was. A translation by Udal of Gcminus's Anatomie or Compendiosa totius anatomiae delineatio, a huge volume with gruesome plates, was published in 1553." Udal's preface is dated the 20th of July 1552 " at Windesore. In June and September 1553 {Trevelyan Pap. Camd. Soc. 84, ii. 31, 33) " Mr Nicholas Uvedale " was paid at the rate of £13, 6s. 8d. a year as " scholemaster to Mr Edward Courtney, 1 Tusser was a chorister of St Paul's.

beinge within the Tower of London, by virtue of the King's Majesty's Warrant "—the young earl of Devon, who had been in prison ever since he was twelve years old.

Queen Mary on the 3rd of December 1554 issued a warrant on Udal's behalf reciting that he had " at soundrie seasons con- venient heretofore shewed and myndeth hereafter to shewe his diligence in setting forth Dialogues and Enterludes before us for our royal disporte and recreacion, " and directing "the maister and yeomen of the office of the Re veils " to deliver whatever Udal should think necessary for setting forth such devices, while the exchequer was ordered to provide the money to buy them (Loseley MSS. Kempe 63, and Hist. MSS. Com. Rep. vii. 612). One of these interludes was probably Roister Doister; for it was in January 1553, i.e. 1554, that Thomas

Wilson, master of St Katharine's Hospital by the Tower, produced the third edition of The Rule of Reason, the first textbook on logic written in English, which contains, while the two earlier editions, published in 1551 and 1552 respectively, do not con- tain, a long quotation from Roister Doister. It gives under the heading of " ambiguitie, " as " an example of such doubtful writing whiche, by reason of poinding, maie have double sense and contrarie meaning . . . taken out of an intrelude made by Nicholas Udal," the letter which Ralph Roister procured a scrivener to compose for him, asking Christian Constance, the heroine, to marry him. Roister's emissary read it —

" Sweete mistresse, where as I love you nothing at all,
Regarding your substance and richnesse chiefe of all,"

and so on ; whereas it was meant to read —

" Sweete mistresse, whereas I love you (nothing at all
Regarding your substance and richnesse) chiefe of all, For your personage, beautie, demeanour and wit."

The play was entered at Stationers' Hall, when printed in 1566. Only one copy is known, which was given to Eton by an old Etonian, the Rev. Th. Briggs, in 1818, who privately printed thirty copies of it. As the title-page is gone the only evidence of its authorship is Wilson's quotation. Wilson being an Etonian, it has been argued that his, quotation was a reminiscence of his Eton days, and that the play was written for and first per- formed by Eton boys. But the occurrence of the quotation first in the edition of 1554, and its absence in the previous editions of 1551 and 1552, coupled with the absence of anything in the play to suggest any connexion with a school, while the scene is laid in London and among London citizens and is essentially a London play, furnish a strong argument that Roister Doister first appeared in 1553, and therefore could not have been written at Eton or for Eton boys.

Nor could it have been written at Westminster School or for Westminster boys, as argued by Professor Hales in Eng. Studien (1893) xviii. 408. For though Udal did become head master of Westminster, he only became so nearly two years after Wilson's quotation from Roister Doister appeared. He was at Winchester in the interval, for Stephen Gardiner, bishop of Winchester and chancellor, by will of the 8th of November

1555 (P.C.C. 3 Noodes), gave 40 marks (£26, 13s. 4d.) to " Nicholas Udale, my scholemaister. " In what sense he was Gardiner's schoolmaster it is hard to guess. He was not head master or usher of Winchester College; but he may have been master of the old City Grammar or High School, to which the bishop appointed (A. F. Leach, Hist. Winch. Coll. 32, 48). The schoolhouse had been leased out for 4t years in 1 544 but it is possible Gardiner had revived the school or kept a school at his palace of Wolvesey. At Westminster " Mr Udale was admitted to be scholemaster 16 Dec. anno 1555 " {Chapter Act-Book).

The last act of the secular canons, substituted by Henry VIII. for the monks, was the grant of a lease on the 24th of September 1556. When the monks re-entered, on Mary's restoration, of the abbey (Nov. 21, 1556), the school did not, as commonly alleged, cease, nor had Udal ceased to be master (Shakespeare Soc. iii. xxxiv.) when he died a month later. The parish register of St Margaret's, Westminster, under " Burials in December a.d. 1556 " records " 11 die Katerine Woddall," " 23 die Nicholas

Yevedale," i.e. Udal. Katharine was perhaps a sister or other relation, as Elizabeth Udall was buried there on the 8th of July 1559. The abbey cellarer's accounts ending Michaelmas 1557 contain a payment " to Thomas Notte, usher of the boys, £6, ios., and to the scholars (scolasticis vocatis le grammer childern), £63, 6s. 8d.," showing that the usher carried on the school after Udal's death. Next year (1557-1558) the abbey receiver accounted for £20 paid to John Passey, (the new) schoolmaster, to Richard Spenser, usher, £15, and £133, 6s. 8d. for 40 grammar boys. So it is clear that the school never stopped. Udal therefore was master of Westminster for just over two years. He died at the age of 52.

Roister Doister well deserves its fame as the first English comedy. It is infinitely superior to any of its predecessors in form and substance. It has sometimes been described as a mere adaptation of Plautus's Miles Gloriosus. Though the central idea of the play — that of a braggart soldier (with an impecunious parasite to flatter him) who thinks every woman he sees falls in love with him and is finally shown to be an

arrant coward — is undoubtedly taken from Plautus, yet the plot and incidents, and above all the dialogue, are absolutely original, and infinitely superior to those of Plautus. Even the final incident, in which the hero is routed, is made more humorous by the male slaves being represented by maid-servants with mops and pails.

The play was printed by F. Marshall in 1821 ; in Thomas White's Old English Dramas (3 vols., 1830); by the Shakespeare Society, vol. iii., the introduction to which contains the fullest and most accurate account of his life; in Edward Arber's reprints in 1869; and Dodsley's Old Plays (1894), vol. iii. (A. F. L.)

UDAL (Dan. odel), a kind of right still existing in Orkney and Shetland, and supposed to be a relic of the old allodial mode of landholding existing antecedently to the growth of feudalism in Scotland (see Allodium). The udal tenant holds without charter by uninterrupted possession on payment to the Crown, the kirk, or a grantee from the Crown of a tribute called scat (Dan. skat), or without such payment, the latter right being more strictly the udal right. Udal lands descend to all the children equally. They are convertible into feus at the option of the udallers.

UDINE, a town and' archiepiscopal see of Venetia, Italy, capital of the province of Udine, situated between the Gulf of Venice and the Alps, 84 m. by rail N.E. of Venice, 450 ft. above sea-level. Pop: (1906), 25,217 (town); 40,627 (commune). The town walls were in the main demolished towards the end of the 19th century. The old castle, at one time the residence of the patriarchs of Aquileia, and now used as a prison, was erected by Giovanni Fontana in 1517 in place of the older one destroyed by an earthquake in 151 1. The Roman- esque cathedral contains some interesting examples of native art (by Giovanni Martini da Udine, a pupil of Raphael, and others). The church of S. Maria della Purita has frescoes by Giovanni Battista and Domenico Tiepolo. In the principal square stands the town hall, built in 1448-1457 in the Venetian- Gothic style, and skilfully restored after a fire in 1876; oppo- site is a clock tower resembling that of the Piazza di San Marco at Venice. In the square is a statue of Peace, erected in commemoration of the peace of Campo Formio (1796), which lies 5 m. to the W.S.W. The archiepiscopal palace and Museo Civico, as well as the municipal buildings,

have some valuable paintings. The leading industry of Udine is silk-spinning, but it also possesses manufactures of linen, cotton, hats and paper, tanneries and sugar refineries, and has a considerable trade in flax, hemp, &c. Branch railways lead to Cividale del Friuli and S. Giorgio di Nogaro, and a steam tramway to S. Daniele del Friuli.

The origin of Udine is uncertain; though it lay on the line of, the Via Iulia Augusta, there is no proof of its existence in Roman times. In the middle ages it became a flourishing and populous city; in 1222 or 1238 the patriarch Berthold made it the capital of Friuli, and in 1420 it became Venetian. In 1752 it became an archbishopric. (T. As.)

UEBERWEG, FRIEDRICH (1826-1871), German historian of philosophy, was born on the 22nd of January 1826 at Leichlingen, in Rhenish Prussia, where his father was Lutheran pastor. Educated at Gottingen and Berlin, he qualified himself at Bonn as Privaldozent in philosophy (1852). In 1862 he was called to Konigsberg as extraordinary professor, and in 1867 he was advanced to the ordinary grade. He married in 1863, and died on the 9th of June 1871. His compendious History of Philosophy is remarkable for fullness of information, conciseness, accuracy and impartiality. At first he followed Beneke's empiricism, and strongly opposed the subjectivistic tendency of the Kantian system, maintaining in particular the objectivity of space and time, which involved him in a somewhat violent controversy. His own mode of thought he preferred later to describe as an ideal realism, which refused to reduce reality to thought, but asserted a parallelism between the forms of existence and the forms of knowledge. Beneke and Schleiermacher exercised most influence upon the develop- ment of his thought.

Works. — System der Logik (1857; 5th ed., 1882; Eng. trans, of 3rd ed. by T. M. Lindsay, 1871); Grundriss der Gesch. der Phil. (1863-1866, 8th ed., M. Heinze, 1894-1898; Eng. trans., G. S. Morris, 1872; 4th ed., 1885); an essay (1861) on the authenticity and order of Plato's writings, crowned by the Imperial Academy of Vienna; Schiller als. Hist, und Phil, (published by Brasch from his papers, Leipzig, 1884). See F. A. Lange, Friedrich Ueberweg (Berlin, 1871) ; M. Brasch, Die Welt- und Lebensanschauung Friedrich Ueberwegs (Leipzig, 1889).

UELZEN, a town of Germany, in the Prussian province of Hanover, on the Ilmenau, east of the famous Liineburger Heide, at the junction of the railway connecting Hamburg, Hanover, Bremen and Stendal, 52 m. S.E. of Hamburg. Pop. (1905), 9329. The town has four Evangelical churches, one of which, dedicated to the Holy Ghost, has a valuable altar- piece dating from the 14th century. The principal industries are flax, sugar, tobacco and machinery, and there is a trade in cattle and horses. In the vicinity are some interesting Slavonic remains and the former Benedictine monastery of Ullesheim.

Founded in the 10th century as Lowenwold, Uelzen became in the middle ages an active member of the Hanseatic League.

See Jaenicke, Geschichte der Stadt Uelzen (Hanover, 1889).

UFA, a government of south-eastern Russia, on the western slope of the Ural Mountains. It has the governments of Vyatka and Perm on the N., Orenburg on the E. and S., Samara and Kazan on the W., and comprises an area of 47,094 sq. m. Several craggy and densely wooded ranges, running from S.W. to N.E. parallel to the main chain of the southern Urals, occupy its eastern part. They rise to altitudes of 2500103500 ft.; their highest peaks — Iremel (5230ft.), Urenga (4115 ft.) andTaganai (3935 ft.) — ascend above the limits of arboreal vegetation, but in no case reach those of perpetual snow. Southward Ufa extends over the slopes of the Obshchiy Syrt plateau, the angular space between the latter and the Urals being occupied by elevated plains (1000 to 1500 ft.), deeply grooved by the river valleys, and sometimes described as the " Ufa plateau." Towards the Kama the fertility of the soil increases, and the black- earth regions of Menzelinsk and Birsk are granaries for that part of Russia.

The geological structure of Ufa is very varied. The main range of the Urals consists of gneisses and various crystalline slates resting upon granites and syenites; next comes a broad strip of limestones and sandstones, the fossil fauna of which is intermediate between the Upper Silurian and the Lower Devonian. These form the highest elevations in the government. Farther west the Devonian deposits are followed by Lower and Upper Carboniferous and Artinsk schists, which, together with Permian deposits, cover western Ufa. Quaternary deposits are extensively developed in all the valleys, most of which were occupied by lakes during the Lacustrine period. There is -great

wealth in iron (Devonian) and copper (Permian). The district of Zlatoust is celebrated for its granite, epidote, nephrite and a variety of decorative stones and minerals. Coal is found over a wide area.

Ufa belongs almost entirely to the drainage area of the Byelaya, I a tributary of the Kama, which rises in Orenburg and flows north and

north-west through Ufa, receiving a number of tributaries, among which the Syun, the Tanyp and the Ufa are also navigable. The Byelaya is an important channel for trade; but it sometimes drops to so low an ebb in summer that steamers cannot proceed beyond Birsk. The Kama flows for 120 m. along the western border of the government.

The average temperature at the city of Ufa is 37° F., and the winter is extremely cold (January 5-5° F., July 68° F.); at the Zlatoust observatory the average temperature is only 32-2° (January 2°; July 6i-8°). Even in the hilly tracts of Zlatoust the annual rainfall is not more than 19 in. The rivers are frozen 158 days at Ufa and 202 at Zlatoust.

The estimated population in 1900 was 2,620,600. The government is divided into six districts, the chief towns of which are Ufa, Belebey, Birsk, Menzelinsk, Sterlitamak and Zlatoust. Towns have sprung up around the ironworks at Zatkinsk, Yurezan and Katav-Ivanovsk. The Russian element in the population has rapidly increased (in 1897, 45%; in 1865, 36%), the other ethnographical elements being mainly Bashkirs, Tatars and Meshcheryaks, together with Chuvashesand Cheremisses, Votyaks and Mordvinians. Since the wholesale plundering of the Bashkir lands, which took place under Alexander II., the land has been sold by the nobles, and bought chiefly by the merchant class. Large estates are common, though it is the peasants and the peasants' co-operative societies that cultivate most of the area under crops. Agriculture has greatly developed, owing partly to the Russian immigration and partly to the educational efforts of the local councils; in 1900 there were 4,860,000 acres (16%) under crops and 9,780,000 acres (32ˆ%) under cultivation. The

principal crops are rye, wheat, oats, barley, millet, buckwheat and potatoes.

The government is rich in antiquities belonging to three different periods — the Finnish or Chud period, the period of the Bulgarian empire, and the period of the Nogai Tatar domination. The burial- mounds of the Chudes contain brass implements and decorations, and in one of them near Ufa a coffin sheeted with silver was found. Remains from the Bulgarian epoch have been discovered at Menzel- insk. But it is the ruins of the Mongol period which are of greatest value; the remains of a large town, with a mausoleum and a palace, have been found near Ufa and extend several miles along the Byelaya River. (P. A. K. ; J. T. Be.)

UFA, a town and river-port of Russia, capital of the government of the same name, situated 326 m. by rail N.E. of Samara, on the main line from Moscow to Siberia, at the confluence of the Ufa with the Byelaya. Pop., 49,275. The better part of the town contains two cathedrals and a few churches; the remainder is a scattered aggregation of small wooden houses. There are a museum, a public library and a theological seminary; and the industries include iron and copper works, machinery works and saw-mills.

Ufa was founded in 1574. The wooden kreml, or fort, protected by wooden towers and an outer earthen wall, had to sustain the attacks of the revolted Bashkirs and Russian serfs in 1662 and at later dates; and in 1773 Chika, one of the chiefs of the Pugachev revolt, besieged it for four months.

UGANDA, a British protectorate in Eastern Equatorial Africa, lying between Lakes Victoria and Albert and between the Mountain Nile and Lake Rudolf. The same name was originally applied to the Bantu kingdom of Buganda, which is one of the five provinces of the protectorate, but which is now styled officially by the correct native name of " Buganda." The Swahili followers of the first explorers always pronounced the territorial prefix, Bu, as a simple vowel, U; hence the incorrect rendering " Uganda " of the more primitive Bantu designation. It was first applied to the kingdom of Mutesa, discovered by J. H. Speke in 1862, and in time came to include the large protectorate which grew out of the extension of British influence over Buganda.

Boundaries and Area. — On the north the frontier of the pro- tectorate is an undetermined line running between Lado (which lies a little north of 5 N.) on the Mountain Nile and the watershed of Lake Rudolf. This northern boundary is in any case conter- minous with the southern boundary of the Anglo-Egyptian Sudan. On the east the limit of the Uganda Protectorate in 1 901 was the thalweg of Lake Rudolf and a line drawn

from the south-eastern coast of that lake south along the edge of the Laikipia and Kikuyu escarpments to the frontier of German East Africa. The southern frontier of Uganda was the 1st degree of S. lat.; the western was the 30th meridian of E. long., from the German frontier on the south, across Albert Edward Nyanza and the Semliki River to the line of water-parting between the systems of the Congo and the Nile (in the country of Mboga); thence northwards this western boundary descended to the north coast of Albert Nyanza at Mahagi, and then followed the main stream of the Nile to about 5° N. In 1904, however, it was found that the 30th meridian had been placed some 25 m. west of its true position in the maps used when the frontier was agreed upon, and that if it was maintained as the dividing line it would cut off the Uganda Protectorate from access to Albert Edward Nyanza while giving a corner of the Congo forest to Uganda. A survey commission was subsequently despatched, and in 1910 British, Belgian and German dele- gates met in Brussels to draw up a new frontier line. Germany was interested in the dispute, inasmuch as the southern frontier of the Uganda Protectorate coincided with the northern frontier

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English Miles

20 40 60 80 100

Emery Walker ic.

of German East Africa. Moreover Germany, Great Britain and Belgium (as inheritor of the Congo State) had conflicting claims in the region N.E. of Lake Kivu. On the 14th of May 1910 a protocol was signed defining the new frontier as follows: Fiom the north end of Lake Kivu the Congo-German frontier turns east by north, traversing the volcanic region of

Mfumbiro, and crosses the summit of Mt Karissimbi to the summit of Mt Sabyino, where the British, Belgian and German frontiers meet. From Mt Sabyino the frontier between Belgian Congo and the Uganda Protectorate goes in a direct line north to Mt Nkabwe, and thence along the Ishasha River, to its mouth on the S.E. shores of Albert Edward Nyanza. Thence it crosses that lake in a straight line and afterwards the Ruwenzori to its highest point, Margherita peak, whence ft follows the Lamia River to its junction with the Semliki. From that point the frontier is formed by the Semliki to its mouth and the middle of Albert Nyanza to a point opposite Mahagi, where it meets the Congo- Sudan frontier.

Meantime in 1903 the then Eastern province cf the Uganda Protectorate had been transferred to the adjoining East Africa Protectorate, the new eastern boundary being the west coast of Lake Rudolf, the river Turkwel, the eastern flanks of Mt Elgon, the Sio River, and a line running south from the mouth of the Sio across Victoria Nyanza to i° S. The area of the protectorate, approximately 150,000 sq. m. in 1901, has been reduced by these changes to about 1 10,000 sq. m.

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Physical Features. — The protectorate, with a singularly diversified surface of lofty plateaus, snow-capped mountains, vast swamps, dense forests and regions of desolate aridity (valley of Climate. Lake Rudolf), offers a remarkable variety of climates.

The Rudolf province lies low — an average altitude of not more than 2000 ft. — -is extremely hot, and has a very poor rainfall. In some of its districts no rain falls for two years at a time, elsewhere scarcely as much as 10 in. per annum. The Eastern province is abundantly watered near Victoria Nyanza and around Mt Elgon and the noble Debasien mountain (about 50 in. to 100 in. annually) ; elsewhere, in Karamojo and the northern regions, the rainfall lessens to about 20 in. Busoga and the western part of the Elgon district in this province have a regular West African climate — hot, moist and not over-healthy. These are the conditions of Buganda, a country with an annual rainfall of from 60 to 80 in., a regular West African climate, and severe and frequent thunderstorms. Much the

same may be said about the Western province, except for the cooling influence of the Ruwenzori snow range, which pleasantly affects Toro and northern Ankole. The rainfall on Ruwenzori and the central Semliki valley is quite 100 in. per annum. Along the Ruwenzori' range are glaciers and snowfields nearly 15 m. in continuous length and some 5 m. in breadth. The Northern (formerly called the Nile) pro- vince is perhaps the hottest part of Uganda. Like the districts round Lake Rudolf, the average altitude (near the Nile) is not more than 2000 ft., but the rainfall is more abundant than in the terrible Rudolf region, being an average of 30 in. per annum.

The surface of the protectorate is diversified. Mount Elgon (g.») just outside the Eastern province is one of the leading physical features of the Uganda and East Africa protectorates. Mountains, j t cons ; sts f the vast crater — some 10 m. in diameter Lakes and — Q f An extmc t volcano, the rim of which rises in several Rivers. places to over i|,ooo ft. Terraces and buttresses

extend and ramify in all directions from the central crater, so that the giant volcano and its surrounding heights form a mountain country (notable for its innumerable cascades and dense forests) the size of Montenegro. The mass of Elgon can be seen from the north- east coast of Victoria Nyanza, from near the main Nile stream, from the heights overlooking Lake Rudolf and from the Kikuyu escarp- ment. The Eastern province consists of well-forested, undulating land (Busoga) on the coast of the lake, a vast extent of marsh round the lake-like backwaters of the Victoria Nile (Lakes Ibrahim or Kioga, Kwania, &c.) and a more stony, open, grain-growing country (Bukedi, Lobor, Karamojo). The Turkana country west of Lake Rudolf has been of late years terribly arid. A little vegetation is met with in the stream valleys, but most of the rivers marked on the map have ceased to show running water in their lower courses. A good deal of high land — rising in some peaks to near 10,000 ft. —is found in the eastern part of the Northern province, and these heights attract moisture and nourish permanent streams flowing Nilewards. But much of the lower ground is stony and poor in vegetation, while the lowland near the main Nile is exceedingly marshy.

The Ripon Falls, in the centre of the northern coast of the Victoria Nyanza, at the head of the exquisitely beautiful Napoleon Gulf, mark the exit of the fully born Nile from the

great lake. The Victoria Nile tumbles over 50 m. of cascades and rapids (descend- ing some 700 ft. in that distance) between Ripon Falls and Kakoge. Here it broadens into Lake Ibrahim (Kioga) (in reality a vast back- water of the Nile discovered by Colonel Chaille Long in 1874), and continues navigable (save for sudd obstacles at times) right through Lake Ibrahim and thence northwards for 100 m. to Foweira and Karuma Falls. Between Karuma and Murchison Falls the Victoria Nile is unnavigable. At Fajao the navigation can be resumed into Lake Albert. The main Nile stream when it quits Lake Albert continues navigable as far north as Nimule (3 40′ N.). Between Nimule and Fort Berkeley the river flows through a deep gorge and falls nearly 1000 ft. Navigability really only begins again at Gondokoro on the Sudan frontier, from which point steamers ply to Khartum (see Nile).

The geography of the Western province includes many interesting features, the in many ways peculiar Albert Nyanza (q.v.), the great snowy range of Ruwenzori {q.v .), the dense Semliki, Budonga, Mpanga and Bunyaraguru forests, the salt lakes and salt springs of Unyoro and western Toro, the innumerable and singularly beautiful crater lakes of Toro and Ankole, the volcanic region of Mfumbiro (where active and extinct volcanoes rise in great cones to altitudes of from 11,000 to nearly 15,000 ft.), and the healthy plateaus of Ankole, which are in a lesser degree analogous in climate and position, and the Nandi plateau, on the east of Victoria Nyanza. Ruwenzori is a snowv range, and not a single mountain. Its greatest altitude— the Duke of the Abruzzi's Mt Stanley (Margherita Peak)— is 16,816 ft., and therefore the third highest point on the African con- tinent. The Uganda Protectorate is a land of great lakes, and in- cludes partially or wholly the water areas of Victoria Nyanza (about 27,000 sq. m.), Lake Rudolf (about 3500 sq. m.), Lake Ibrahim- Kioga- Kwania (800 sq. m.), Albert Nyanza (2700 sq. m.), and Lakes Albert Edward and Dweru 1 (1500 sq. m.), besides the small crater

1 In 1909 Albert Edward Nyanza was renamed by British geo-

lakes of Toro and Ankole (singularly beautiful) , the lake-swamps Salisbury and Kirkpatrick in the Eastern province, Lakes Wamala in Buganda, and Kachera in Ankole. The water of Lake Victoria is perfectly fresh. This is the case with all the other lakes except Rudolf, Albert Nyanza and Albert Edward,

in which the water ranges from salt to slightly brackish.

Geology. — Wide tracts remain geologically unexplored. Archean rocks— gneiss, schist and granite — cover large areas through which the Nile cuts its way in alternate narrow gorges and open reaches. In Ankole and Koki rocks consisting of granular quartzite, schis- tose sandstone, red and brown sandstone, and shales with cleaved killas rest on the Archean platform and possibly represent the Lower Witwatersrand beds of the Transvaal. No traces of the Karroo formation have been detected. Volcanic rocks occur in Usoga and elsewhere. The Nile at the Ripon Falls leaps over a basalt dike. The rocks on the verge of the Kisumu province of East Africa are mainly volcanic (basalt, tuff, lava, kenyte). West of the volcanic region, nearer to Lake Victoria and the Eastern province, ironstone, granite, gneiss and schistose formations pre- dominate, with phonolite in places.

Iron ore (haematite) is abundant. In the Eastern province the rocks are mainly quartz, gneiss and granite, with sandstone in Busoga, basalt round Mt Elgon, slate (Busoga) and iron- pefroWy stone (Busoga and Bukedi). In the Rudolf province there anrf are the basalt, lava, tuff and kenyte of the volcanic Mineralogy. Rift valley, overlying a formation of granite, gneiss and quartz. Gold — in some cases alluvial — is found in the moun- tainous country to the north-west of Lake Rudolf. Gneiss, granite and quartz — the decomposed granite giving the red " African " clay — are the leading features in the formations of the Northern province, of Buganda, and of the Western province, with some sandstone in the littoral districts of Buganda and in Ankole, and eruptive rocks and lava in south-western Ankole and on the eastern flanks of Ruwenzori. There are indications of copper in Busoga, of gold in Unyoro. Iron is founa nearly everywhere. Graphite is present in Buganda and Unyoro.

Flora.— The vegetation is luxuriant except in the Rudolf region, which has the sparse flora of Somaliland. In the Western province, Busoga and the Elgon district the flora is very West African in char- acter. The swampy regions of the Nile and of the Eastern province are characterized by an extravagant growth of papyrus and other rushes, of reeds and coarse grass. There are luxuriant tropical forests in the coast region of Buganda, in Busoga, west Elgon, western Unyoro, eastern Toro, the central Semliki valley and north-west

Ankole. The upper regions of Mt Elgon, Mt Debasien and Mt Agoro are clothed with forests of conifers — juniper and yew — and witch-hazels (Trichodadus) . There are also giant yew-trees (Podocarpus) on the flanks of Ruwenzori and theMfumbiro volcanoes between 7000 and 9000 ft., but no junipers. The alpine vegetation pn all these lofty mountains is of a mixed Cape and Abyssinian character — witch-hazels, senecios, lobelias, kniphofias, everlasting flowers, tree heaths and hypericums. The really tropical vegetation of Buganda is nearly identical with that of West Africa, but there is no oil-palm.

Fauna.— The fauna also has many West African affinities in the hot, forested regions. In the Kisumu province of East Africa even, there are several West African mammals such as the broad-horned tragelaph and the forest pig. These are also found in part of the Semliki forests. As a rule, however, the fauna of the L'pper Semliki valley, of parts of Ankole, Buganda and Unyoro, of the Northern, Rudolf and Eastern provinces, is of that " East African," " Ethi- opic " character which is specially the feature of South and East Africa and of the Sudan right across from Abyssinia to the river Senegal. Among notable mammals the chimpanzee is found in Unyoro, Toro and north-west Ankole, and has only recently become extinct in Buganda; the okapi inhabits the Semliki forests on the Congo frontier; the giraffe (the male sometimes developing five horn cores) is common in the Northern, Eastern and Rudolf provinces; there are three types of buffalo — the Cape, the Congo and the Abyssinian ; two species of zebra (one of them Grevy 's) , the African wild ass, the square-lipped (" white ") and pointed-lipped (" black ") rhinoceroses, the elephant, hippopotamus, water tragelaph (" Speke's antelope"), Cape ant-bear, aard-wolf (Proteles), hunting-dog, and nearly every genus and most of the species of African antelopes. The birds are more West African than the mammals, and include the grey parrot, all the genera of the splendidly-coloured turacoes, the unique " whale-headed stork," and the ostrich.

Inhabitants. — The inhabitants in 1909 numbered about 3,500,000 natives, 3000 British Indians and Arabs, and 507 Europeans (British, French, Germans, Italians and Maltese). Of these last 119 were women. The races indigenous to the protectorate are mainly of the Negro species (with slight Cau-casian intermixture), and may be divided into the following categories: (1) Pigmy -prognathous (so-called " Congo "

pigmies of Semliki forest, of Kiagwe in Buganda, and of the western

graphers (with the consent of Edward VII) Lake Edward, and Lake Dweru Lake George, in honour of George V.

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flanks of Mt Elgon and the types of Forest Negroes); (2) Bantu negroes (Banyoro, Bairu, Basese, Basoga, Bakonjo, Baganda, Masaba and Kavirondo); (3) Nile negroes (Aluru, Bari, Madi, Acholi, Gang, Lango, Latuka, Tesi, Sabei (Nandi), Turkana and Karamojo) ; (4) Hamitic (some tribes on islands and the north coast of Lake Rudolf; and the remarkable " Hima " or " Huma " aristocracy in Unyoro, B Uganda, Toro and Ankole). The pigmies are generally known as Bambute or Bakwa in the Semliki forests. They are both reddish yellow and brownish black (according to individual variation) in skin colour, with head hair often tending to russet, and body hair of two kinds — black and bristly on the upper lip, chin, chest, axillae and pubes; and yellowish and fleecy on the cheeks, back and limbs. Their faces are remarkable for the long upper lip and the depressed broad nose with enormous alae. Associated with these pigmies is the " Forest Negro " type (Lendu, Lega, Baamba, Banande) of normal human stature, but short-legged and un- usually prognathous. The Bantu negroes represent the future ruling race of the protectorate, and ■ include the remarkable Baganda people. These last, prior to the arrival of Arabs and Europeans, displayed a nearer approach to civilization than has as yet been attained by an unaided Negro people. Their dynasty of monarchs can be traced back with tolerable cer- tainty to a period coincident with the reign of Henry IV. of England (a.d. 1400). The first Buganda king was probably a Hamite of the Hima stock (from Unyoro). Until recent years the Baganda and most of the other Bantu peoples of the pro- tectorate worshipped ancestral and nature spirits who had become elevated to the rank of gods and goddesses. The Baganda are now mainly Christian. There is also a " totem " system still in vogue. All the Baganda belong to one or other of twenty-nine clans, or " Bika, " which are named after and have as totem familiar beasts, birds, fish or vegetables. The Baganda are not a very moral people, but they have an extreme regard for decency, and are always scrupulously

clothed (formerly in bark-cloth, now in calico). As a general rule, it may be said that all the Bantu tribes in the western half of the protectorate, including the Basoga, are careful to consider decency in their clothing, while the Nilotic negroes are often completely nude in both sexes. More or less, absolute nudity among men is characteristic even of the Bahima (Hamites). But in this aristocratic caste the women are scrupulously clothed.

The Nile negroes and Hima are tall people. The former are seldom handsome, owing to their flat faces and projecting cheek-bones. The Bahima are often markedly handsome, even to European eyes. In the Bahima the proportion of Caucasian blood is about one-fourth; in the Nile negroes and Bantu from one-sixteenth to none at all. The aboriginal stock of the Uganda Protectorate is undoubtedly the pigmy-prognathous, which has gradually been absorbed, overlaid or exterminated by better developed specimens of the Negro sub-species, or by Negro-Caucasian hybrids from the north and north-east.

The languages spoken in the Uganda Protectorate belong to the following stocks : (1) Hamitic (Murle and Rendile of Lake Rudolf) ; (2) Masai (Bari, Elgumi, Turkana, Suk, &c.) ; (2a) Sabei, on the northern slopes of Elgon and on Mt Debasien; (2b) Nilotic (Acholi, Aluru, Gang, &c.) ; (3) Madi (spoken on the Nile between Aluru and Bari, really of West African affinities) ; (4) Bantu (Lu-ganda, Runyoro, Lu-konjo, Kuamba, Lihuku, the Masaba languages of west Elgon and Kavirondo, &c.) ; and lastly, the unclassified, isolated Lendu and Mbuba spoken by some of the pigmy-prognathous peoples.

Towns. — The seat of the British administration is Entebbe (" a throne ") on the south shores of a peninsula projecting into the Victoria Nyanza in 0° 4′ 2″ N. 32 ° 27′ 45″ E. It contains a number of commodious official residences, churches, hospitals, a laboratory, covered market, &c. The port is protected by a breakwater and provided with a pieron which is the customs-house. The native capital of Buganda is Mengo (pop. about 70,000), situated some 20 m. N. by E. of Entebbe. It is a straggling town built on seven steep hills: on one hill is the royal residence; on another (Namirembe = the hill of peace) was the cathedral of St Paul, destroyed by light- ning in September 1910, and other buildings of the Anglican mission. St Paul's was a fine Gothic church of brick, built by the Baganda in 1901-1904. After its destruction steps were at

once taken to rebuild the cathedral. On a third hill are the cathedral and mission buildings of the Roman Catholics. On still another hill, Kampala, the British fort and government and European quarters are situated.

Some 73 m. S. by E. of Kampala, and connected with it by mono- rail, is Kampala Port, on Victoria Nyanza. The capital of the Eastern province is Jinja, on the Victoria Nyanza, immediately above and east of the Ripon Falls. It is a thriving trading Centre and port. Hoima is the administrative headquarters in Unyoro; Butiaba is a trading port of some importance on Lake Albert; Mbarara is the capital of Ankole. Kakindu, Mruli, Fowera and Fajao are government stations and trading posts on the Victoria Nile ; Wadelai (?.!).), Nimule and Gondokoro (qx.) are similar stations on the Mountain Nile. Bululu is a port on Lake Ibrahim.

Agriculture and Trade.— A few plantations are owned and managed by Europeans. Otherwise agriculture is in the hands of the natives. Some Baganda chiefs have started cotton, rubber ; and cocoa plantations, the botanic department assisting in this enterprise. Para and Funtumia rubber trees are also cultivated by the department. (For the work of the botanic, forestry and scientific department, the government plantations, &c., see the Colonial Report [Miscellaneous], No. 64.) A forest area of 150 sq. m. has been leased to a European company. Trade is mainly conducted by native (i.e. Arab, Somali and Negro) traders, by British Indians and by Germans. The value of the trade during 1901-1902 was approxi- mately £400,000 in imports (largely railway material) and £50,000 in exports. The articles exported were ivory, rubber, skins and hides, and livestock (for consumption in East Africa). These, except livestock, continue to be the main items of export. For the six years 1903-1904 to 1908-1909 the imports increased from £147,000 to £419,000, and the exports— produce of the protectorate— from £43,000 to £127,000. The imports included the transit trade (with the Belgian Congo and German East Africa), which grew from £8460 in. 1903-1904 to £82,615 in 1908-1909. The transit trade in the last-named year included bullion valued at £33,000, being raw gold from the Kilo mines, Belgian Congo. Among the new industries are sugar and coffee plantations, while cotton, ground-nuts and rubber figure increasingly among the exports, cotton and cotton- seed being of special importance. Cotton goods, chiefly " Americani," are the chief imports, machinery, hardware and

provisions ranking next. Large quantities of rice are imported from German East Africa. About 50% of the imports are from the United Kingdom and British possessions.

Communications.— \n connexion with the railway from Mombasa to Victoria Nyanza a steamship service is maintained on the lake between Port Florence, Entebbe and other ports, including those in German territory. Government boats also ply on the Victoria Nile and Lake Kioga (Ibrahim) and on Albert Nyanza and the Mountain Nile. A railway (begun in 1910), some 50 m. long, runs from Jinja to Kakindu, i.e'. along the Victoria Nile from it's point of issue from the Nyanza to where it becomes navigable above Lake Kioga. Good roads connect Entebbe and Butiaba (the steamboat terminus on Albert Nyanza) and other districts. There is a direct telegraphic service to Gondokoro and Khartum and to Mombasa. The postal service is well organized.

Administrative Divisions and Government. — The protectorate is divided into five provinces — Rudolf, Eastern (formerly central), kingdom of Buganda, Western, and Northern (formerly Nile) — and these again into a number pf administrative districts. The kingdom of Buganda, which has a thoroughly efficient and recog- nized native government, is subdivided into no fewer than nineteen " counties " or districts, but the other provinces have as a rule only three or four subdivisions.

The protectorate is administered by a governor and commander- in-chief, under the colonial office, residing at Entebbe, on the north- western coast of the Victoria Nyanza. He is assisted by a staff of officials similar to the functionaries of a Crown colony, but there is at present no legislative council. The natives are ordinarily under the direct rule of their own recognized chiefs, but in all the organized districts the governor alone has the power of life or death , of levying taxes, of carrying on war, of controlling waste lands and forests, and of administering justice to non-natives. In the case of Buganda special terms were accorded to the native king and people in the settlement dated the 10th of March 1900. The king was secured a minimum civil list of £1500 a year out of the native revenues; pen- sions were accorded to other members of the Buganda royal family ; the salaries of ministers and governing chiefs Were guaranteed; compensation in money was paid for removing the king's control over waste lands ;

definite estates were allotted to the king, royal family, nobility and native landowners; the native parliament or " Lukiko " was reorganized and its powers were defined ; and many other points in dispute were settled. The king was accorded the title of " His Highness the Kabaka of Buganda," and his special salute was fixed at eleven guns. By this agreement the king and his people pledged themselves to pay hut and gun taxes to the administration of the protectorate. Somewhat similar arrangements on a lesser scale were made with the king of Ankole, the kings of Toro and Unyoro, and with the much less important chieftains Or tribes of other districts. The territories north and north-east of these Bantu kingdoms are inhabited by Nilotic negroes and up to 1909 were left almost unadministered, except in close vicinity to the Nile banks.

The education of the natives is confined to the schools maintained by the missionaries, who are doing an excellent work. Manual,

technical and higher education is provided. In 1909-1910 there were in the Anglican schools over 36,000 scholars, of whom 17,000 were girls. Of the total number of scholars over 26,000 were in the kingdom of Buganda. The Roman Catholic schools had in 1909 over 11,000 scholars. (See the Col. Off. Report on Uganda, No. 686.)

The expenditure for I 902-1903 was fixed at £210,000, of which about £170,000 was furnished by an imperial grant-in-aid and _ .„ the balance from local revenue. Between 1903 and Expenditure j 909 tne revenue increased from £51,000 to £102,000. J?" enue Revenue is chiefly derived from hut and poll taxes,

customs, wharfage dues, game licences and land tax. The hut and poll taxes yield about £62,000 a year. The expenditure increased from £186,000 in 1903 to £256,000 in 1909. Deficiencies are made good by parliamentary grants. The rupee (is. 4d.) is the standard coin, with a subsidiary decimal coinage.

History. — The countries grouped under this protectorate were

invaded at some relatively remote period — say, three to four thousand years ago — by Hamitic races from the north- east (akin to the ancestors of the ancient Egyptians, Gallas, Somalis), who mingled extensively with the Nile negroes first, and then with the aboriginal inhabitants of Buganda, Unyoro and Nandi. These Hamites brought with them a measure of Egyptian civilization, cattle, and the arts of metallurgy, pottery and other adjuncts to neolithic civilization. There was probably no direct intercourse with Egypt by way of the Nile, owing to the lake-like marshes between B6r and Fashoda, but instead an overland traffic with Ethiopia (the Land of Punt) via Mt Elgon and the Rudolf regions. In time even this intercourse with the non-negro world died away, and powerful kingdoms with an aristocracy of Galla descent grew up in Buganda, Unyoro and Ankole.

The kingdom of Buganda especially dominated the lands of Victoria Nyanza in the 19th century. In the 'forties and 'fifties Egyptian officials, Austrian missionaries, and British, Dutch, Italian, and German explorers had carried our knowledge of the Nile beyond Khartum as far south as Gondokoro. In the same period of time the Zanzibar Arab traders were advancing from the south on the Bahima kingdoms of the western Victoria Nyanza and on Buganda. King Suna of Buganda first heard of the outer world of white men in 1850 from a runaway Baluch soldier of Zanzibar. Captains Burton and Speke, on their Tanganyika expedition, heard of Buganda from the Arab traders in 1857. Captain Speke in 1862 reached Buganda, the first of all Europeans to enter that country. In the early 'seventies Sir Samuel Baker (who had discovered Albert Nyanza) extended the rule of the Egyptian Sudan as far south as the Victoria Nile. General Gordon, who succeeded Baker, and who had Dr Emin Bey (afterwards Emin Pasha) as lieutenant, attempted through Colonel Charles Chaille Long, in 1874, not only to annex Unyoro but also Buganda to the Egyptian dominions, and thoroughly established Egyptian control on Albert Nyanza. But owing to the indirect influence of the British government, exercised through Sir John Kirk at Zanzibar, the Egyptian dominions were prevented from coming south of the Victoria Nile.

Suna, the powerful king or emperor of Buganda, who was the first to hear of a world beyond Negroland, had been succeeded in 1857 by his still more celebrated son, Mutesa {Mutesa means the measurer). Mutesa had received Speke and Grant in

a most friendly manner. Subsequent to their departure he had opened up relations with the British agent at Zanzibar. In 1875 he received an epoch-making visit from Sir H. M. Stanley. Stanley, in response to Mutesa's questions about religion, obtained from that king an invitation to Anglican missionaries, which he transmitted to London through the Daily Telegraph. 1 Having made the first survey of Victoria Nyanza and confirmed Speke's guesses as to its shape and area, Stanley passed on (half discovering Ruwenzori on the way) to the Congo.

Meanwhile the Zanzibar Arabs had reached Buganda in ever-increasing numbers as traders; but many of them were earnest 1 The letter was entrusted to Linant de Bellefonds, a Belgian in the Egyptian service, who had been sent to Buganda by Gordon. On his return journey Bellefonds was murdered by the Bari. When his body was recovered Stanley's letter was found concealed in one of his boots and was forwarded to England. •

propagandists of Islam, and strove hard (with some success) to convert to that religion the king and chiefs of Buganda and adjoining countries. In 1877 the Rev. C. T. Wilson, one of a party of missionaries sent in answer to Stanley's appeal by the Church Missionary Society of England, arrived in Uganda, and towards the end of 1878 was joined ˆ r/ y W " by Alexander Mackay. In 1879 another party jst7-1879. arrived by the Nile route; and Wilson, after thirteen months' actual residence, left for England with Dr R. W. Felkin, who had arrived only three months before, taking with him envoys from Mutesa. In the same year the French Roman Catholic mission of the White Fathers of Algeria was inaugurated, and thus from 1879 dates the triangular rivalry of the creeds of Anglican and Roman Christianity and of Islam.

In 1882 Islam gained an ascendancy, and the French with-drew for a time. In the autumn of 1884 Mutesa died. A great change had been wrought in Uganda during the Mtltesa latter years of his reign. Calico, fire-arms and succeed: • swords had replaced the primitive bark-cloth and by Mwanga, spear, while under the teaching of the missionary- engineer Mackay the native artisans had learnt to repair arms and use European tools. Mutesa was a clever man of restless energy, but regardless of human life and suffering, and consumed by vanity. He was succeeded by Mwanga, a cruel, weak and vicious youth. The intrigues of the Arabs led him to suspect the*

designs of the missionaries-. He was alarmed at their influence over numbers of his people and resolved to stamp out Christianity.

In the early 'eighties the aspirations of several European powers turned towards Africa as a field for commercial and colonial expansion. The restless Arabs of Zanzibar had since 1857 steadily advanced Zanzibar influence to Tanganyika, Nyasa, and even through the Masai countries to the north-east coast of Victoria Nyanza and the " back door " of Uganda. In 1882 the Royal Geographical Society despatched Joseph Thomson to discover through Masailand the direct route to Victoria Nyanza. Thomson succeeded (he also discovered Lake Baringo and Mt Elgon), but turned back from the frontier of Busoga in order not to provoke Mutesa to hostilities. Mr H. H. Johnston was despatched on a scientific mission to Kilimanjaro, and concluded treaties on which the British East Africa Company was subsequently based. The vague stir of these movements had perturbed Mutesa, and they were regarded with deep suspicion by his successor, Mwanga.

The annexations of Emin on Albert Nyanza, the visit of Thomson to the closed door of Busoga, the opposition of the Europeans to the slave trade, and, lastly, the identification of the missionaries with political embassies and their letters of introduction from secular authorities, added to Mwanga's fears, and early in 1885, simultaneously with the return of the French Fathers, the long smouldering hostility broke out, and the Christian converts were seized and burnt at the stake. Bishop Hannington, who attempted to enter Buganda j nurierot by the forbidden route from the east, was murdered, Bishop and the Rev. R. P. Ashe and Mackay only redeemed Hannington. their lives by presents. The Buganda Christians tS8S ' showed heroism, and in spite of tortures and death the religion spread rapidly. Mwanga now determined to rid himself of Christians and Mahommedans alike by inducing them to pro- ceed to an island in the lake, where he meant to leave them to starve. The plot was discovered, and Mwanga fled to the south of the lake, and Kiwewa, his eldest brother, was made king. The chiefs of the rival creeds — British (Anglicans), French (Catholics), and Ba-Islamu, as they were called — divided the chiefships. The Mahommedans now formed a plot to oust the Christians, and treacherously massacred a number of their chiefs and then defeated their unprepared adherents. Kiwewa, refusing to submit to

circumcision, was (after Religious reigning three or four months) expelled by the Feuds. Ba-Islamu, who placed another brother, Kalema, on the throne and began a fanatical propaganda, forcing the peasantry to submit to the hated circumcision. The British and French

factions, who had taken refuge in Ankole, could not agree even in their common exile, and nearly came to blows, but on the spur of threatened famine they agreed to combine and to take back Mwanga as their king and strike a blow for supremacy in Buganda. In May 1889 Mwanga, aided by the trader Charles Stokes, approached Buganda by water, and after several bloody battles captured the capital, but shortly afterwards was again defeated, and Kalema and the Ba-Islamu reoccupied Mengo (the native capital). Appeals for help were sent to Frederick John Jackson (subsequently lieutenant-governor of British East Africa), who had arrived on the east of the lake with a caravan of some 500 rifles, sent by the newly-formed East African Chartered Company. He replied saying he would come if all the expenses were guaranteed and the British flag accepted. Pere Lourdel, who was Mwanga's chief adviser at this time, counselled acceptance of these terms, but Jackson at first marched in a different direction northwards. Re- turning three months later, he found that Dr Karl Peters, a German in command of an " Emin Pasha Relief " expedition, had passed through his camp, read his letters, and, acting on the information thus obtained, had marched to Buganda, arriving in February 1890, where with the aid of Lourdel he Pnnch and concluded a treaty which was kept secret from British the British party, who repudiated it. The Baganda Factions. Christians, before the arrival of Peters, had again engaged the Mahommedans and driven them to the frontier of Unyoro, where King Kabarega gave them an asylum and aid. Kalema died later in the same year — 1890 — and was succeeded by Mbogo, a half brother of King Mutesa. The posts of honour had been divided between the rival factions. Peters's treaty had given fresh offence and added to the disputes arising in the division of the offices of state, and the factions were on the point of fighting. Jackson arrived in April with 180 gun-men (a portion of his caravan having mutinied), and presented a new treaty, which was refused by the French. Feeling ran high, and

Jackson withdrew his treaty, and, taking a couple of envoys who should bring back word whether Uganda was to be French or British, he left the country, Mr Ernest Gedge remaining in charge of his expeditfon.

While these events were happening in Uganda the Anglo-German treaty of July 1890 had assigned Uganda to Great Lugard's Britain, and in October 1890 Captain F. D. Lugard, Arrival, then at Kikuyu, halfway between the coast and the 1890. lake, received instructions to go to Uganda. He had

with him Messrs De Winton and W. Grant, some 50 Sudanese soldiers, and about 250 porters, armed with Snider carbines. Marching with unprecedented rapidity, he entered Mengo on the 1 8th of December. Lugard, by introducing the names " Protestant " and " Catholic " — till then unknown — and by insisting that all religion was free, endeavoured to dissociate it from politics, and urged that as Uganda was now under Great Britain there could be no hostile " French " faction. This attitude was welcome to neither faction, and for some days the position of the new arrivals on the little knoll of Kampala was very precarious. Lugard's first object was to obtain a treaty which would give him a right to intervene in the internal affairs of the country. The hostile French faction was much the stronger, since at this time the king (whom the whole of the pagan party followed) was of that faction; but after some critical episodes the treaty was signed on the 26th of December. Lugard then endeavoured to settle some of the burning disputes relative to the division of lands and chief ships, &c, and to gain the confidence of both parties. In this he was to some extent successful, and his position was strengthened by the arrival in January 1891 of Captain (subsequently Colonel) W. H. Williams, R.A., with a small force of Sudanese and a maxim. In April Lugard, hoping to achieve better results away from the capital, led the combined factions against the Mahommedans, then raiding the frontier, whom he defeated. Seeing that the situation in Buganda was impossible unless they had a strong central force, which the company could not provide, Lugard and Williams had formed the idea of enlisting the Sudanese who

had been left by Emin and Stanley at the south end of the Albert Lake. Taking with him Kasagama, the rightful king of Toro, he traversed the north of Ankole, with which country he made a treaty, and passing thence through Unyoro, along the

northern slopes of Ruwenzori, reached Kavali at the south end of Lake Albert, defeating the armies of Unyoro who opposed his progress. He brought away with him 8000 Sudanese men, women, children and slaves, under Selim Bey (an Egyptian officer). Some of these he left at the posts he established along southern Unyoro. After an absence of six months from Buganda, Lugard reached the capital at the end of the year (1891) with 200 or 300 Sudanese soldiers and two or three times that number of followers. Lugard little thought that in bringing these Sudanese, already (some of them) infected with the sleeping-sickness of the Congo forests, he was to introduce a disease which would kill off some 250,000 natives of Uganda in eight years. Meanwhile Williams, amid endless difficulties, with a mere handful of men, had managed to keep the two factions from civil war, though fighting had actually occurred in Buddu and in the Sese Islands.

After Lugard's return a lull occurred till the coast caravan left, when lawlessness again broke out and several murders were committed. On the 22nd of January the killing of a Protestant at the capital (Mengo) pro- l89I r ' duced a crisis. Lugard appealed to the king to do justice, but he himself was treated with scant courtesy, and his envoy was told that the French party would sack Kampala if Lugard interfered on behalf of the murdered man. In spite of strenuous efforts on the part of the British administrator to avert war the French party determined to fight, and finally attacked the British, who had assembled round Kampala. The king and French party were defeated and fled to the Sese Islands. The king and chiefs (except two ringleaders) were offered reinstatement, and they appeared anxious to accept these terms, but the French bishop joined them in the islands, and from that day all hopes of peace vanished. Fighting was recommenced by a " French " attack on " British " canoes, and Williams thereupon attacked the island and routed the hostile faction. After this the " French " slowly concentrated in Buddu in the south, the Protestants migrating thence. Williams then led a successful expedition against the Sese islanders and went on to the south of the lake to obtain one of the young princes — heirs to the throne — who were at the French mission there. But the Fathers were hostile, and though Mwanga was eager to accept Lugard's offers of reinstatement, he was a prisoner in the hands of his party. He succeeded eventually in escaping, and arrived in Mengo on the 30th of March (1892). A new treaty was made, and the British

flag flew over the capital, while the French party were given a proportion of chiefships and assigned the province of Buddu. These con- ditions they themselves said were liberal, nor could they have ventured to assume their old positions throughout Uganda.

The Mahommedans had all this time refrained from attacking the capital as had been expected. They now clamoured for recognition, and Lugard went to meet them, and after a some- what precarious and very difficult interview he succeeded in bringing back their king Mbogo to Kampala, and in assigning them three minor provinces in Uganda. 1

Lugard on his return to Uganda at the end of 1891 had received orders to evacuate the country with his whole force, as the company could no longer maintain their position. rne A reprieve till the end of 1892 followed, funds having Question of been raised through the efforts of Bishop Tucker Evacuation, by the Church Missionary Society and friends. The lives of many Europeans were at stake, for anarchy must follow the withdrawal, and it seemed impossible to repudiate the pledges to Toro, or to abandon the Baganda who had fought for the British. In June 1892, therefore, Lugard determined to leave for England to appeal against the decision for abandonment. Williams remained in Uganda, where the outlook was now fairly promising, and every effort 1 Since reduced to one.

was made to reduce expenses. On arrival in England Lugard found that the British Government had decided not to come to the help of the company, and Uganda was to be left to its fate. A strong movement was set on foot for the " retention of Uganda," and on the 10th of December Lord Rosebery despatched Sir Gerald Portal to report on the Mission. best means of dealing with the country, and a subsidy was given to the company to enable them to retain their troops there till the 31st of March 1893. Captain (afterwards General Sir) J. R. L. Macdonald, who had been in charge of a railway survey to Uganda, was directed to inquire into the claims put forward by France for compensation for the priests. His report was set aside by the government, which, without admitting liability, but to close the controversy with France, agreed to pay £10,000 to the French priests, and the foreign office published a categorical reply by Lugard to the accusations made. Portal and his staff reached Uganda in March, and Williams left soon afterwards with the original troops of the company, leaving Selim Bey and the Sudanese and Portal's large escort in Uganda. The country on Portal's arrival bore every mark of prosperity and revival. By in- creasing the territory of the Roman Catholics, and giving them estates on the road from Buddu to the capital, Portal gave effect to projects which the Protestants had violently opposed. He added also to their chiefships, and on the 1st of April hoisted the British flag,

made a new treaty with Mwanga, and sent Major Roderick Owen to enlist 400 Sudanese from the Toro colonies. He recommended to the imperial government the retention of Uganda {i.e. Buganda), the abandon- ment of Unyoro and Toro, and the construction of a railway half-way only to the lake. He departed after two and a half months' residence, leaving Macdonald in charge. During Macdonald's administration the Sudanese under Selim Bey began to conspire against the British control. The movement was checked and Selim Bey was deported to the coast.

In November 1893 Colonel (Sir Henry) Colvile arrived to take charge, and at once led the whole of the Baganda army Colvile' s against King Kabarega of Unyoro. Major R. Owen Occupation defeated the hostile army, first in the south and of Unyoro. j ater m t jj e nor th, and the Baganda chiefs scattered the main body, while Colvile occupied the capital and built a line of forts from Buganda to Lake Albert, of which he left Major A. B. Thruston in command. This officer fought a number of brilliant actions, and aided by Major (later Colonel) G. G. Cunningham, Captain Seymour Vandeleur, William Grant and others, he overran Unyoro and broke down all resistance. In June 1894 TTganda {i.e. the kingdom of Buganda) was declared a protectorate, and at the end of the year Sir Henry Colvile was invalided. Mr F. J. Jackson now took temporary charge, pending the arrival in June 1895 of Mr E. J. L. Berkeley, the first administrator.

At this time also it was decided to construct a railway to Uganda, but work was not begun till December 1896. Peace seemed assured in Uganda; territorial limits to religious teaching were abolished, English Roman Catholic priests were added to the French Fathers, and the material progress of the country was very marked. European traders settled in the country, good permanent houses were built, roads were made and kept in repair, and many new industries introduced, chief among which were the expression of oil from various oilseeds and the cultivation of coffee. Trees were imported and land set aside for planting forests. The success of these efforts at progress was largely due to Mr G. Wilson, C.B., who had been sent to Uganda from East Africa as an assistant administrator in 1896. In this year also the protectorate was extended over Unyoro and Busoga. 1

In the middle of 1897 this era of peace was rudely interrupted.

Colonel Trevor Ternan was acting commissioner, and Macdonald had returned to East Africa in command of an exploring expedi- tion, for which Ternan had been ordered to supply 300 Sudanese.

'Toro, Ankole, Bukedi and. the other countries now included in the protectorate were added By Sir Harry Johnston in 1899-1901.

In June Wilson discovered a plot to revolt, and in July Mwanga fled to the south of Buddu and raised the standard of rebellion. The rebels were defeated, while Mwanga was made a ■ prisoner by the Germans. Ternan, unaware of the

Rebellion ot

1897.

Sudanese Mutiny.

disaffection of his men, now sent three companies to Macdonald, selecting those who had been continuously fighting in Unyoro, Nandi and Buddu. This caused great discontent, which was increased by the fact that their pay was six months in arrears and their clothing long overdue. The men, too, resented the fact that their pay was but a fifth of that given to Zanzibari porters and to those of their own body enlisted in the adjoining protectorate. They were sore at again being sent on service without their wives, and com- plained of harsh treatment from their officers. Necessaries had been delayed in the attempt to import steamers from the coast before the railway was made.

After Colonel Ternan 's departure on leave the three companies who had joined Macdonald broke out into revolt in the Nandi dis- trict (East Africa) and set off to Uganda, looting the countries they passed through. Macdonald and Jack- son followed with a force of Zanzibaris. Meanwhile Major Thruston — a man justly loved by his soldiers, in whom he had complete confidence — hurried to the garrison at Luba's, near the Ripon Falls, relying on his personal influence to control the men, and risking his life in the heroic attempt. He and two other Europeans were seized and made prisoners. On the 19th of October a battle was fought between the mutineers and Macdonald's force, in which the former were defeated. The

same night the Sudanese leaders, fearful lest their men might submit, murdered Thruston and his companions and sent letters to Uganda to incite their comrades to mutiny. Wilson, however, had already disarmed the troops in Kampala, who remained loyal, as also did Mbogo, the ex-king of the Baganda Mahommedans. A large Protestant army now went to the assistance of Macdonald, and from the 19th of October to the 9th of January the siege of Luba's continued, with constant skirmishes, among the killed being the Rev. G. Pilkington. Early in January Mwanga escaped from the Germans, and, declaring himself a Mahommedan, reached Buddu' with a large force, which Major Macdonald defeated with the aid of the Baganda army. He then disarmed the Sudanese garrisons in Buddu. The garrisons in Unyoro (about 500) and in Toro remained loyal. Meanwhile the Sudanese at Luba's (numbering 600, with 200 Mahommedan Baganda) escaped, proceeded up the east bank of the Nile and crossed the river, making their way to Mruli. It appeared probable that if they reached that point the Sudanese garrisons in Unyoro would revolt as well as the Baganda Mahommedans, and the last hope of the Europeans would ' be lost. Leaving a small column to deal with Mwanga's force in the south, and another with Kabarega, Macdonald pursued the mutineers, overtook them in the swamps of Lake Kioga, and after a couple of successful skirmishes returned to Kampala, leaving Captain (afterwards Colonel) E. G. Harrison in command. That officer, crossing a swamp supposed to be impassable, attacked the rebel stockade at Kabagambi, and carried it with great gallantry. Captain Maloney was killed and Lieut. Osborne wounded, but the crisis was past. A large number of Indian troops arrived early in 1899, and in May Colonel C. G. Martyr inflicted another heavy defeat on the mutineers at Mruli. Mwanga, however, managed to get through and join Kabarega and the rebels in the north. These were dealt with in a series 01 engagements, but it was not till June 1899 that Colonel J. T. Evatt had the good fortune to capture Kings Mwaiiga and Kabarega, who were deported to the coast and subsequently removed to the Seychelles, where Mwanga died in 1903. Colonel Martyr at the close of the year (1899) undertook an expedi- tion up the Nile, and extended the limits of the protectorate in that direction. Major H. H. Austin, who had come up to Uganda in 1897 with Macdonald and had fought through the mutiny operations, revealed the regions north of Mt Elgon. Colonel C. Delm6-Radcliffe finally subdued the last

remnant of the Sudanese mutineers in 1900-igoi. The year 1899 had been a costly one, £329,000 being voted in aid. In the autumn of 1899 Sir Harry Johnston was sent out as special commissioner to Uganda, being also given the rank of commander-in-chief. By extensive reorganizations, and in spite of having to cope with a rising in Nandi, his commission resulted in the reduction of expenditure and increase of local revenue. He gave the kingdom of Buganda a definite constitution, settled the land question in the provinces of Buganda, Busoga, Unyoro, Toro and Ankole, and also the question of native taxation. By the treaty of Mengo, signed in March 1900, the young king of Buganda, Daudi Chwa, a son of Mwanga, born in 1896, was accorded the title of his Highness the Kabaka. During his minority the kingdom of Buganda was governed by regents. In 1900, the Uganda Protectorate was divided into six provinces, but in 1903 the Eastern and part of the Central provinces were transferred to the British East Africa Protectorate.

In 1902 the Uganda railway, begun in 1896. was finished. Its terminus is at Kisumu (Port Florence) on Kavirondo Gulf, Victoria Nyanza. It is some 580 m. long, ascends in places to altitudes of 7000 and 8000 ft. (highest point 8300 ft.), but has only one tunnel. Its cost was about £5,300,000. (See British East Africa.)

Colonel Sir James H. Sadler succeeded Sir Harry Johnston in 1902 and was transferred to East Africa in 1905. His place in Uganda was taken by Sir Henry Hesketh Bell, who was made the first governor of Uganda in 1906. The ravages of sleeping-sickness between 1901 and 1909 destroyed upwards of a quarter of a million people, and the whole of the native population had to be removed from the lake shores and the Sese Islands; but nevertheless the protectorate continued to make steady progress in civilization and in the development of its material resources. Its transit trade, especially with the Belgian Congo, became of great importance. To facilitate commerce with the Congo and with the Anglo-Egyptian Sudan and to open up the Busoga region the British government in 1910 voted money to build a railway from Jinja to Kakindu. The work was carried out under the superintendence of

Captain H. E. S. Cordeaux, who became governor of the protectorate in 1910.

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UGLICH, a town of Russia, in the government of Yaroslavl, on the upper Volga, 63 m. W. by S. of the. city of Yaroslavl. Pop., 9698. Its historical remains are mostly associated with Prince Dmitri, son of Ivan the Terrible, who was believed to have been murdered (1 591) here by Boris Godunov. The wooden house (built in 1481, restored in 1892) which the prince occupied, a church of St Demetrius, erected at the spot where he was killed,

and a kiosk on the site of a convent where his mother was forcibly consecrated a nun, are the principal memorials of this incident. The cathedral was erected in the 13th century, but subsequently restored, and contains the grave of Prince Roman. The industries include paper-mills, Hour-mills, distilleries, copper works, and linen factories; and the samovars (tea-urns) and sausages made here are famous.

The local annals go as far back as the 9th century. Until the 14th century Uglich was a separate principality, which extended over eastern Tver. In 1329 the sons of Prince Roman the Saint renounced their independence in favour of Moscow, and fifty years later the Uglich princes sold their rights to the great prince of Moscow. The Tatars plundered the town in 1237, 1293 and 1408, and the Lithuanians did the same at a later date.

UHDE, FRITZ KARL HERMANN VON (1848-), German painter, was born at Wolkenburg in Saxony. His artistic career, for which he studied first in Dresden, was interrupted for nearly ten years by military service, which included the two years of the Franco-German War, but in 1877 he again turned his attention to art, studying under Munkacsy in Paris and afterwards indepen- dently in Holland. His inclination was from the first directed towards religious subjects. He revived the practice of treating Biblical episodes realistically by transferring them to modern days. Thus in the " Come, Lord Jesus, be our Guest," of the Berlin National Gallery, Christ appears among the peasant family assembled for their meal in a modern German farmhouse " par- lour," and in " The Sermon on the Mount " (Berlin, private collection) addresses a crowd of 19th century harvesters. Similar in conception are " Suffer Little Children to come unto Me " (Leipzig Museum), " The Holy Night " (Dresden Gallery), " The Last Supper," " The Journey to Bethlehem " (Munich Pinakothek) and " The Miraculous Draught of Fishes." Other works of his in public collections are: " Saying Grace," at the Lux- embourg in Paris; " Christ at Emmaus," at the Staedel Institute, Frankfort; "The Farewell of Tobias," at the Liechtenstein Gallery, Vienna; and a portrait oi the actor Wohlmuth, at the Christiania Museum. Von Uhde became professor and honorary member of the academies of Munich, Dresden and Berlin.

UHLAND, JOHANN LUDWIG (1787-1S62), German poet, was born at Tubingen on the 26th of April 1787. He studied juris-

prudence at the university oi his native place, but also devoted much time to medieval literature. Having graduated as a doctor of laws in 18 10, he went for some months to Paris; and from i8i2toi8i4he worked at his profession in Stuttgart, in the bureau of the minister of justice. He had begun his career as a poet in 1807 and 1808 by contributing ballads and lyrics to L. von Seckendorff's Musenalmanach; and in 1812 and 1813 he wrote poems for J. Kerner's Poetischer Almanack and Deutscher Dichler- wald. In 181 s he collected his poems in a volume entitled Gedichle, which almost immediately secured a wide circle of readers. To almost every new edition he added some fresh poems. He wrote two dramatic works— Ernst, Herzog von Schwaben and Ludwig der Baier — the former published in 1818, the latter in 1819. These, however, are unimportant in comparison with his Gedickte. As a lyric poet, Uhland must be classed with the writers of the romantic school, for, like them, he found in the middle ages the subjects which appealed most strongly to his imagina- tion. But his style has a precision, suppleness and grace which sharply distinguish his most characteristic writings from those of the romantic poets. Uhland wrote manly poems in defence of freedom, and in the states assembly of Wiirttemberg he played a distinguished part as one of the most vigorous and consistent of the liberal members. In 1829 he was made extraordinary professor of German literature at the university of Tubingen, but he resigned this appointment in 1833, when it was found to be incompatible with his political views. In 1848 he became a member of the Frankfort parliament.

Uhland was not only a poet and politician; he was also an ardent student of the history of literature. In 1812 he published an interesting essay on Das altfranzosische Epos; and ten years afterwards this was followed by an admirable work on Walther von der Vogelweide. He was also the author of an elaborate

study of Der Mythus von Thor nach nordischen Quellen (1836), and he formed a valuable collection of Alte hock- und nieder- deutsche Volkslieder, which appeared in 1844-1845. He died at Tubingen on the 13th of November 1862.

Uhland's Gesammelte Werke, edited by H. Fischer, were published in 1892 in 6 vols.; also by L. Frankel (2 vols., 1893) and L. Holthof (1901). His Gedichte passed through nearly fifty editions in the poet's lifetime; jubilee edition of the Gedichte und Dramen (1886). A critical edition by E. Schmidt and J. Hartmann appeared in 1898 (2 vols.). Uhland's Schriften zur Geschichte der Dichtung und Sage were published in 8 vols. (1 865-1 873); his Tagebuch von 1810-1820 by J. Hartmann (1893). See F. Notter, L. Uhland, sein Leben und seine Dichtungen (1863); K. Mayer, L. Uhla?id, seine Freunde und Zeitgenossen (2 vols., 1867); L. Uhlands Leben (with Nachlass), by his widow (1874); A. von Keller, Uhland als Dramatiker (1877); H. Dederich, L. Uhland als Dichter und Patriot (1886) ; W. L. Holland, Zu Uhlands Geddchtnis (1886); H. Fischer, L. Uhland (1887); H. Maync, Uhlands Jugenddichtung (1899).

UIGHUR, or Ouighour, the name of a Turkish tribe and dynasty who came from the East and ruled in Kashgaria from the 10th to the 12th centuries. They used a variety of the Syriac alphabet. (See Turks.)

UIST, NORTH AND SOUTH, islands of the outer Hebrides, Inverness-shire, Scotland. North Uist lies S.W. of Harris (Long Island), from which it is separated about 8 m. by the Sound of Harris. The island measures 14 m. in length by 16 m. in greatest width, but the coasts are extremely indented. The highest point is Mt Eaval (1138 ft.). The principal sea-lochs are Loch Maddy and Loch Eport, both on the east. On the east coast the surface is mostly swampy moorland, but on the west there is some fertile soil. The inhabitants are chiefly engaged in crofting, fishing and cattle-rearing. The principal village, Loch Maddy, is the centre of a large trade, and is a favourite resort of anglers, being a regular calling station for the steamers from Oban and Portree. The islands belonging to the parish of North Uist comprise — to the south-west Balleshare and Uleray (pop., 383), Kirkibost, Heisker (98), and the Monach group, with a lighthouse on Shillay; to the south, Grimisay (290) and Ronay; to the north-east, Levera; to the north, Boreray (118) and Vallay.

South Uist has a population (1901) of 3541, an extreme length of 22 m. and an extreme width of 8 m. Towards the north-east it becomes mountainous, the highest points being Buail'a Choill (2034), Ben More (1994) and Hecla (1988). The chief sea-

lochs are Loch Boisdale, largely frequented by anglers, Loch Eynort and Loch Skiport on the east coast. On the east side the surface is mainly alluvial peat, broken by hills, but on the west there is a belt of productive land. Besides crofting, the inhabitants are engaged in the fisheries and cattle-raising. Steamers from Oban call regularly at the village of Loch Boisdale. The islands attached to the parish of SouthUist include, to the south, Eriskay (pop., 3478), where Prince Charles landed on the 2nd of August 1745; to the north-east, Wiay; to the north, Grimisay, Fladda, just off the north-east shore of Benbecula, and Benbecula (pop., 1417), with an area of 40 sq. m., from which there is at low tide a ford to North and South Uist.

UITENHAGE, a town of the Cape province, South Africa, in the valley of the Zwartkops river, 270 ft. above the sea, 21m. by rail N.N.W. of Port Elizabeth. Pop. (1904), 12,193, of whom 6680 were whites. It was founded in 1804 by De Mist, the Batavian commissioner, who took over Cape Colony from the British in 1803. Many natives find employment in the mills along the Zwartkops, where vast quantities of wool from the sheep farms of the eastern part of the province are cleansed and forwarded for shipment at Port Elizabeth. Extensive railway works are established here. There are in addition large flower and fruit nurseries. The town is laid out in rectangular blocks, and contains a handsome town-hall, court-house and public offices.

UJEST (Polish, Viast), a small town on the Klodnitz in Prussia, which gives the title of duke to the head of the family of Hohenlohe-Ohringen, a branch (1823) of that of Hohenlohe-Ingelfingen (see Hohenlohe). Prince Hugo of Hohenlohe-Ohringen was created duke of Ujest in 1861, and in 1897 was succeeded by his son Christian Kraft (b. 1848). The duke is an

hereditary member of the upper houses of Wurttemberg and Prussia.

UJIJI, a town in German East Africa, also known as Kavele, situated on the eastern shores of Lake Tanganyika, in 4° 55′ S,, 29° 40′ E. It is connected with Cape Town by an overland tele- graph line. The population (about 14,000) is composed of Arabs and members of numerous Central African tribes. Ujiji is the meeting-point of merchants from all parts of Tanganyika, and the terminus of the caravan route from Dar-es-Salaam. Arabs from Zanzibar made Ujiji their headquarters during the'

first half of the 19th century, and it became a great slave and ivory mart. In 1858 Richard Burton and J. H. Speke reached Ujiji from Zanzibar, being the first Europeans to see Lake Tanganyika. In 1869 David Livingstone, coming from the south, arrived at Ujiji, and it was here that H. M. Stanley found him on the 28th of October 1871. In 1890 it came within the German sphere of influence. (See Tanganyika and German East Africa.)

UJJAIN, or Ujain, a city of central India, in the state of Gwalior, on the right bank of the river Sipra, with a station on the branch of the Rajputana railway from Ratlam to Bhopal. Pop. (1901) 39,892. Ujjain, known as Avanti in the Buddhist period and as Ozene to the Greeks, is one of the seven sacred cities of the Hindus and the traditional capital of King Vikra-maditya, at whose court the " nine gems " of Sanskirt literature are said to have flourished. It marks the first meridian of longi- tude in Hindu geography. It is heard of first as the residence of Asoka (afterwards emperor), when viceroy of the western pro- vinces. It was sacked by the Mahommedans in 1235. Under Akbar it became the capital of Malwa, and during the last half of the 1 8th century it was the headquarters of Sindhia. It contains few old buildings, though relics of antiquity are often found on the abandoned site of the old city. It is now a centre of the trade in Malwa opium, with a wealthy colony of Bohra merchants. The principal institutions are the Madhava College (called after the present Maharaja), two state hospitals, and a dispensary belonging to the Canadian Presbyterian mission. A great religious festival is held here every twelfth year.

UJVIDˆK (German, Neusatz), a town of Hungary in the county of Bacs-Bodrog, 171 m. S.S.E. of Budapest by rail. Pop. (1900), 28,763. It is situated on the left bank of the Danube near the terminus of the Franz- Josef canal. It is the seat of a Greek Orthodox bishop, and has become the literary and religious centre of the Servians in Hungary, especially since the founda- tion in 1864 of the Matica Srbska, or Servian Literary Society. The town was founded in the middle of the 18th century, and was almost totally destroyed during the revolution of 1848-49. On the opposite bank of the Danube, connected with Ujvidek by a railway bridge, lies Petervarad or Peterwardein.

UKAZ, or Ukase (Russ., from ukazat, a shortened form of

ukazlivat, to show, announce, prescribe), a term applied in Russia to an edict or ordinance, legislative or administrative, having the force of law. A ukaz proceeds either from the emperor or from the senate, which has the power of issuing such ordinances for the purpose of carrying out existing decrees. All such decrees are promulgated by the senate. A difference is drawn between the ukaz signed by the emperor's hand and his verbal ukaz, or order, made upon a report submitted to him. (See Russia: Constitution and Government.)

UKRAINE (" frontier "), the name formerly given to a dis- trict of European Russia, now comprising the governments of Kharkov, Kiev, Podolia and Poltava. The portion east of the Dnieper became Russian in 1686 and the portion west of that river in 1793.

ULAN (formerly spelt Uhlan), originally a Polish cavalry soldier armed with a lance. These troops were light cavalry, and wore the national dress and czapka (or lancer cap). They were introduced into the Prussian service in 1740, but failed to distinguish themselves in the first Silesian War, and it was only after the treaty of Tilsit (1807) that Ulan regiments were again formed in the Prussian army. In the Austrian army a " Uhlan- pulk " of Poles was formed in 1784 and ordinary Ulan regiments of Austrian cavalry in 1791. The Austrian Ulans no longer

carry the lance. In the German army of to-day Ulans are classed as heavy cavalry and wear the distinctive lancer dress inherited from the original Polish light horse. (See Cavalry and Lance.)

ULBACH, LOUIS (1822-1889), French writer, was born at Troyes (Aube) on the 7th of March 1822. He was encouraged to take up a literary career by Victor Hugo. He became dramatic critic of the Temps, and attracted attention by a series of satirical letters addressed to the Figaro over the signature of " Ferragus," and published separately in 1868. He edited the Revue de Paris until its suppression in 1858, and in 1868 he founded a paper, La Cloche, which was suppressed in 1869 for its hostility to the empire. Ulbach was imprisoned for

six months, and when on his release he revived the paper he got into trouble both with the commune and the government, and was again imprisoned in 1871-1872. In 1878 he was made librarian of the arsenal, and died in Paris on the 16th of April 1889.

Among his works are: Voyage autcur de mon clocher (1864), Nos contemporains (1869-1871), Aventures de trois granules dames de la cour de Vienne (3 vols., 1876); Les Buveurs de poisons: la fee verte (1879), La Vie de Victor Hugo (1886), &c.

ULCER, an open sore (derived through the French from Lat. ulcus, Gr. Z\kos). When a portion of animal tissue dies in consequence of an infection or injury, the death of that tissue taking place by gradual breaking down or disintegration, the process is termed ulceration and the result an ulcer. When the ulcer is spreading the place is painful and the surrounding parts are flushed with extra blood, but under appropriate treatment the destructive process ceases and the ulcer gradually heals. The bright surface of the ulcer becomes glazed over, and those changes take place in it which occur in an open wound. The ulcer gradually contracts, and round its edges cicatrization, or scarring, occurs. Ulcers may arise from various causes in different parts of the body, and in association with certain specific diseases, such as syphilis, tubercle, cancer and typhoid fever. (For Gastric Ulcer see the separate article.) (E.O.)*

ULEABORG (Finnish, Oulu), a province in the grand duchy of Finland, including a wide territory to the north of Kuopio and nearly reaching Varangerf jord, taking in the high dreary plateau of Laponia (16,000 sq. m.) and the fertile plains of Osterbotten. It has a total area of 63,970 sq. m., with a population, chiefly agricultural in Osterbotten and nomadic in Laponia, of (1904) 295,187. The bulk of the inhabitants (.99) are Finnish. There are immense forests, and onlv 0-4 of the area is under culture. The capital of the government is Uleaborg, a sea- port on the Gulf of Bothnia, now connected by railway with Helsingfors (498 m.); pop. (1904), 17,737.

ULEMA (Arab, 'ulamd, sing, 'alim, literally " knowers," in the sense of scienies), the learned of Islam, theologians, canon-lawyers, professors, judges, muftis, &c, all who, whether in office or not, are versed theoretically and practically in

Muslim science in general. By " science " in this case is especially meant what is learned from tradition, books or men, and through the intellect. In a narrower sense, Ulema is used, in a Muslim state, of a council of such learned men, holding government appointments. If all conception of intermediary priesthood be eliminated, the Ulema may be said to be equivalent to the secular clergy of Roman Christendom (see Dervish). Opposed to them, again, are the 'arifs (" knowers," " perceivers," sentientes, as opposed to scienies), to whom religious knowledge comes in the vision of the mystic, not by tradition or reason (see Sufiism).

On the training of the ulema see Sunnites. (D. B. Ma.)

ULFELDT, KORFITS (1 606-1 664), Danish statesman, was the son of the chancellor Jacob Ulfeldt. After a careful educa- tion abroad he returned to Denmark in 1629 and quickly won the favour of Christian IV. In 1634 he was made a Knight of the Elephant, in 1636 became councillor of state, in 1637 governor of Copenhagen, and in 1643 lord treasurer. In 1637 he married the king's daughter Leonora Christina, who had been betrothed to him from her ninth year. Ulfeldt was the most striking personality at the Danish court in all superficial

accomplishments, but his character was marked by ambition, avarice and absolute lack of honour or conscience. He was largely responsible for the disasters of the Swedish war of 1643-45, and when the treaty of Bromsebro was signed there was a violent scene between him and the king, though Ulfeldt's resignation was not accepted. In December 1646 he was sent as ambassador extraordinary to the Hague, but the results of his embassy by no means corresponded to its costliness, and when he returned to Denmark in July 1647 he found the king profoundly irritated. Ulfeldt, supported by the Raad and the nobility, who objected to Christian's fiscal policy, resisted his father-in-law, and triumphed completely. As lord high steward he was the virtual ruler of Denmark during the two months which elapsed between the death of Christian IV. and the election of Frederick III. (July 6, 1648); but the new king was by no means disposed to tolerate the outrageous usurpations of Ulfeldt and his wife, and this antagonism was still further complicated by allegations of a plot (ultimately proved to be false, but believed at the time to be true) on the part of Dina Winhavers, a former mistress of Ulfeldt, to poison the royal family. Dina was. convicted of perjury and executed, but

Ulfeldt no longer felt secure at Copenhagen, and on the day after the execution he secretly quitted Denmark (July 14, 1651), with his family. After living for a time in concealment at Amsterdam, he migrated to Barth in Swedish Pomerania, and began the intrigues which have branded his name with infamy. In July 1657 he eagerly responded to the invitation of Charles X. of Sweden, when he invaded Denmark, and entered the service of his country's deadliest foe, for the express purpose of humiliating his sovereign and enriching himself. He persuaded the commandant of Nakskov, the one fortress of Laaland, to surrender to Charles X., and did his best to convince his countrymen that resistance was useless. Finally, as one of the Swedish negotiators at the congress of Taastrup, he was instrumental in humiliating his native land as she had never been humiliated before. Ulfeldt's treason was rewarded by Charles X. of Sweden with the countship of Solvitsburg in Blekinge; but the discontented renegade began intriguing against his new master, and in May 1659 was con- demned to death. The Swedish regents, on the 7th of July, amnestied him, and he returned to Copenhagen to try to make his peace with his lawful sovereign, who promptly im- prisoned him and his wife. In the summer of 1660 they were conveyed to Hammershus in Bornholm, as prisoners of state. Their captivity was severe to brutality; and they were only released (in September 1661) on the most degrading conditions. The fallen magnate henceforth dreamed of nothing but revenge, and in the course of 1662, during his residence at Bruges, he offered the Danish crown to the elector of Brandenburg, proposing to raise a rebellion in Denmark for that purpose. Frederick William betrayed Ulfeldt's treason to Frederick III., and the Danish government at once impeached the traitor; on the 24th of July 1663 he and his children were degraded, his property was confiscated, and he was condemned to be beheaded and quartered. He escaped from the country, but the sentence was actually carried out on his effigy; and a pillory was erected on the ruins of his mansion at Copenhagen. He died at Basel, in February 1664.

See Julius Albert Fridericia, Adelsvaeldens sidste dage (Copen- hagen, 1894); Danmarks riges historie, vol. iv. (Copenhagen, 1897-1905) ; Robert Nisbet Bain, Scandinavia, chs. vii., ix., x. (Cambridge, 1905).

ULFILAS (c. 311-383), the apostle of Christianity to the Gothic race, and, through his translation of the Scriptures into

Gothic, the father of Teutonic literature, was born among the Goths of the trans-Danubian provinces about the year 31 1. 1 The Arian historian Philostorgius (Hist. eccl. ii. 5) says that his grand-parents were Christian captives from Sadagolthina in Cappadocia, who had been carried off to the lands beyond the Danube in the Gothic raid of 264, and became so naturalized that the boy received a Gothic name, Wulfila (Little Wolf). 1 Krafft gives 313 as the date; Waitz, 318.

An authoritative record of the outlines of his life was only-discovered early in the igth century in a writing of Auxentius of Milan, his pupil and companion. At an early age Ulfilas was sent, either as an envoy or as a hostage for his tribe, to Constantinople, probably on the occasion of the treaty arranged in 332. During the preceding century Christianity had been planted sporadically among the Goths beyond the Danube, through the agency in part of Christian captives, many of whom belonged to the order of clergy, and in part of merchants and traders. Ulfilas may therefore have been a convert to Christianity when he reached Constantinople. But it was here probably that he came into contact with the Arian doc- trines which gave the form to his later teaching, and here that he acquired his command over Greek and Latin. For some time before 341 he worked as a lector (reader of the Scriptures), probably among his own countrymen in Constantinople, or among those attached as foederati to the Imperial armies in Asia Minor. From this work he was called to return as mis- sionary bishop to his own country, being ordained by Eusebius of Nicomedia and " the bishops who were with him," probably at Antioch, in 341. This ordination of Ulfilas by the chiefs of the semi-Arian party is at once an indication of their deter- mination to extend their influence by active missionary enter- prise, and evidence that Ulfilas was now a declared adherent of the Arian or semi-Arian party. He was now thirty years of age, and his work as " bishop among the Gcths " covered the remaining forty years of his life. For seven of these years he wrought among the Visigoths beyond the Danube, till the success which attended his labours drew down the persecution of the still pagan chief of the tribe. This " sacrilegus judex " has been identified with Athanaric, a later persecutor, but the identification is not beyond question. To

save his flock from extinction or dispersion, Ulfilas decided to withdraw both himself and his people. With the consent of the emperor Constantius he led them across the Danube, " a great body of the faithful," and settled in Moesia at the foot of the range of Haemus and near the site of the modern Tirnova (349). Here they developed into a peace-loving pastoral people.

The life of Ulfilas during the following thirty-three years is marked by only one recorded incident (Sozomen iv. 24), his visit to Constantinople in January 360, to attend the council convened by the Arian or Homoean party. His work and influence were not confined to his own immediate flock, but radiated by means of his homilies and treatises, and through the disciples he despatched as missionaries, among all the Gothic tribes beyond the Danube. Thus the Church beyond the Danube, which had not been extinguished on Ulfilas's with-drawal, began to grow once more, and once more had to undergo the fires of persecution. Catholic missionaries had not been wanting in the meanwhile, and in the indiscriminate persecution by Athanaric, between 370 and 37s, Catholics and Arians stood and fell side by side. The religious quarrel either accentuated, or was accentuated by, political differences, and the rival chiefs, Athanaric and Frithigern, appeared as champions of Paganism and Christianity respectively. Then followed the negotiations with the emperor Valens, the general adhesion of the Visigoths under Frithigern to Arian Christianity, the crossing of the Danube by himself and a host of his followers, and the troubles which culminated in the battle of Adrianople and the death of Valens (378). The part played by Ulfilas in these troublous times cannot be ascertained with certainty. It may have been he who, as a " presbyter christiani ritus," conducted negotiations with Valens before the battle of Adria- nople; but that he headed a previous embassy asking for leave for the Visigoths to settle on Roman soil, and that he then, for political motives, professed himself a convert to the Arian creed, favoured by the emperor, and drew with him the whole body of his countrymen — these and other similar stories of the orthodox church historians appear to be without founda- tion. The death of Valens, followed by the succession and the early conversion to Catholicism of Theodosius, dealt a fatal blow to the Arian party within the empire. Ulfilas lived long

enough to see what the end must be. Hardships as well as years

must have combined to make him an old man. when in 383 he was sent for to Constantinople by the emperor. A split seems to have taken place among the Arians at Constantinople. Ulfilas was summoned to meet the innovators, and to induce them to surrender the opinion which caused the dispute. His pupil Auxentius describes how, " in the name of God," he set out upon his way, hoping to prevent the teaching of these new heretics from reaching " the churches of Christ by Christ committed to his charge." No sooner had he reached Constantinople than he fell sick, " having pondered much about the council," and before he had put his hand to the task which had brought him he died, probably in January 383. A few days later there died, also in Constantinople, his old enemy and persecutor, Athanaric.

The Arianism of Ulfilas was a fact of pregnant consequence for his people, and indirectly for the empire. It had been his lifelong faith, as we learn from the opening words of his own confession — " Ego Ulfilas semper sic credidi." If, as seems probable from the circumstances of his ordination, he was a semi-Arian and a follower of Eusebius in 341, at a later period of his life he departed from this position, and vigorously opposed the teaching of his former leader. He appears to have joined the Homoean party, which took shape and acquired influence before the council of Constantinople in 360, where he adhered with the rest of the council to the creed of Ariminum, with the addendum that in future the terms iirdaraais and obala should be excluded from Christological definitions. Thus we learn from Auxentius that he condemned Homoousians and Homoiousians alike, adopting for himself the Homoean formula, " filium similem esse patri suo." This Arian form of Christianity was imparted by Ulfilas and his disciples to most of the tribes of the Gothic stock, and persisted among them, in spite of persecution, for two centuries.

The other legacy bequeathed by Ulfilas was of less questionable value. His version of the Scriptures is his greatest monument. By it he became the first to raise a barbarian tongue to the dignity of a literary language; and the skill, knowledge and adaptive ability it displays make it the crowning testimony of his powers as well as of his devotion to his work.

The personal qualities of the man may be inferred from his pupil's description of him as "of most upright conversation,

truly a con- fessor of Christ, a teacher of piety, and a preacher of truth— a man whom I am not competent to praise according to his merit, yet altogether keep silent I dare not."

See Waitz, Das Leben des Ulfilas (1840); W. L. Krafft,Kirchen-geschichte der deutschen Volker (Abth. i., 1854); H. Bohmer in Herzog-Hauck, Realencyklopadie, 3 vol. xxi. ; W. Bessell, Das Leben des Ulfilas (i860); C. A. Scott, Ulfilas, Apostle of the Goths (1885).

(C. A. S.)

ULLATHORNE, WILLIAM BERNARD (1806-1889), English Roman Catholic bishop, was born at Pocklington, Yorkshire, on the 7th of May 1806, of an old Roman Catholic family. At fifteen he went to sea, and made several voyages to the Baltic and Mediterranean. In 1823 he entered the Benedictine monastery of Downside, near Bath, taking the vows in 1825. He was ordained priest in 1831, and in 1833 went to New South Wales, as vicar-general to Bishop William Morris (1794-1872), whose jurisdiction extended over the Australian missions. It was mainly Ullathorne who caused Gregory XVI. to establish the hierarchy in Australia. He returned to England in 1836, and, after another visit to Australia, settled in England in 1841, taking charge of the Roman Catholic mission at Coventry. He was consecrated bishop in 1847 as vicar-apostolic of the western district, in succession to Bishop C. M. Baggs (1806- 1845), but was transferred to the central district in the follow- ing year. On the re-establishment of the hierarchy in England Ullathorne became the first Roman Catholic bishop of Birming- ham. During his thirty-eight years tenure of the see 67 new churches, 32 convents and nearly 200 mission schools were built. In 1888 he retired and received from Leo XIII. the honorary title of archbishop of Cabasa. He died at Oscott College on the 21st of March 1889.

Of his theological and philosophical works the best known are: The Endowments of Man (1882); The Groundwork of the Christian Virtues (1883); Christian Patience (1886). For an account of his life see his Autobiography, edited by A. T. Drane (London, l89r).

ULLMANN, KARL (1796-1865), German Protestant theo-logian, was born at Epfenbach, near Heidelberg, on the 15th of

March 1796. He studied at Heidelberg and Tubingen, and in 1820 delivered exegetical and historical lectures at Heidelberg. In 1829 he went to Halle as professor to teach church history, dogmatics and symbolics, but in 1836 he accepted a chair at Heidelberg. A lifelong exponent of the mediating theology (Vermittelungs-Theologie), in 1828, with the help of Umbreit (1 795-1860), he founded and edited the Theologische Studien und Kritiken in its interests. When Wegscheider and Gesenius were denounced by Hengstenberg as rationalists, he pleaded for freedom in theological teaching (cf. his Theol. Bedenken, 1830). On the other hand, he vigorously attacked David Strauss. His Historisch oder mythisch (1838; 2nd ed. 1866) was a reply to Strauss's Life of Jesus, and his criticism resulted in Strauss making numerous concessions in later works. Ullmann died on the 12th of January 1865.

In Das Wesen des Christenthums (1845; 5th ed., 1865; Eng. trans., i860) Ullmann explains that Christianity is independent of the orthodox formulas, and contends that a distinction should be made between faith and dogmatics. His principal historical works are Gregor von Nazianz (1825; 2nd ed., 1867) and Die Reformatoren vor der Reformation (2 vols., 1841 ; 2nd ed., 1866; Eng. trans., 1854). Another well-known work is Die Siindlosigkeit Jesu (1854 ; Eng. trans., 1858 and 1870). See O. Pfleiderer, Development of Theology (1890); and cf. W. Beyschlag, Karl Ullmann (1867), and Adolf Hausrath in Kleine Schriften religionsgeschichtlichen Inhalts (1883).

ULM, a fortress-city of Germany, in the kingdom of Wurttemberg, situated on the left bank of the Danube, in a fertile plain at the foot of the Swabian Alps, 58 m. by rail S.E. of Stuttgart and 63 m. N.W. of Munich. Pop. (1905), 51,680. Ulm still preserves the dignified and old-fashioned appearance of a free imperial town, and contains many medieval buildings of historic and of artistic interest. Among these are the town hall, of the 1 6th century, in the Transition style from late Gothic to Renais- sance, restored in recent years; the Kornhaus: the Ehingerhaus or Neubronnerhaus, now containing the industrial museum; and the commandery of the Teutonic order, built in 171 2-17 18 on the site of a habitation of the order dating from the 13th century, and now used as barracks. The magnificent early Gothic cathedral is capable of containing

30,000 people. Begun in 1377, and carried on at intervals till the 16th century, the building was long left unfinished; but in 1844 the work of restoration and completion was begun, being completed in 1890. Ulm cathedral has double aisles and a pentagonal apsidal choir, but no transepts. Its length (outside measurement) is 464 ft., its breadth 159 ft.; the nave is 136 ft. high and 47 \ wide; the aisles, which are covered with rich net-vaulting, are 68 ft. in height. The massive and richly decorated square tower in the centre of the west facade, which for centuries terminated in a temporary spire, was completed in 1890, according to the original plans, by the addition of an octagonal storey and a tall open spire (528 ft.), the loftiest ecclesiastical erection in the world, outstripping the twin spires of Cologne cathedral by 21 ft. The towers of the choir, rebuilt in the course of the restoration, are 282 ft. high. The cathedral contains some fine stained glass, the largest organ in Germany (1856), and a number of interesting old paintings and carvings by Jdrg Syrlin the elder, Jbrg Syrlin the younger, Burkhard Engelberger, and other masters of the Swabian school. It belongs to the Protestant Church. Trinity church dates from 1617-1621, and there are also four Roman Catholic churches and a synagogue.

The Danube, joined by the Iller just above the town and by the Blau just below, here becomes navigable, so that Ulm occupies the important commercial position of a terminal river-port. Hence there is water communication with the Neckar, and so to the Rhine and into the interior of France. The market for leather and cloth is important, and Ulm is famous for its vegetables (especially asparagus), barley, beer, pipe-bowls and sweet cakes (Ulmer Zuckerbrot). Bleaching, brewing and brass-founding are carried on, as well as a large miscellany of manufactures.

Ulm has long been a fortress of the first rank. In 1844-1859 the German Confederation carefully fortified it, and in 1876

the new German Empire added a comprehensive outer girdle of detached forts, culminating in the powerful citadel of Wil-helmsburg. The long straight lines of works which stretched to the plateau of the Michelsberg and formed the outworks of the main fortress on the left bank of the Danube were pur- chased in 1900 by the municipal authorities, in order to be levelled

and laid out in streets for the extension of the town in this direction. The fortifications also of Neu-Ulm, on the Bavarian side of the Danube, were ordered to be razed and devoted to municipal purposes. The citadel of Wilhelmsburg remains, and also the defences on the left bank of the Danube, further extended and strengthened. Ulm is the basis of opera- tions for the German army behind the Black Forest, and can easily shelter a force of 100,000 men; its peace garrison is

5600.

Ulm is mentioned as early as 854, and under the Carolingian sovereigns it was the scene of several assemblies. It became a town in 1027, and was soon the principal place in the duchy of Swabia. Although burned down by Henry the Lion, it soon recovered from this disaster and became a free imperial town in 1 1 55. Towards the close of the middle ages it appears several times at the head of leagues of the Swabian towns. Its trade and commerce prospered and in the 15th century it attained the summit of its prosperity, ruling over a district about 300 sq. m. in extent, and having a population of about 60,000. In 1803 it lost its freedom and passed to Bavaria, being ceded to Wurttemberg in 1809. In October 1805 General Mack with 23,000 Austrians capitulated here to Napoleon. Ulm is remarkable in the history of German literature as the spot where the Meistersinger lingered longest, preserving without text and without notes the traditional lore of their craft. In 1830 there were twelve Meistersinger alive in Ulm, but in 1839 the four survivors formally made over their insignia and gild property to a modern singing society and closed the record of the Meistergesang in Germany.

See E. Niibling, Vims Handel und Gewerbe im Mittelalter (Ulm 1892-1900) ; G. Fischer, Geschichte der Stadt Ulm (Stuttgart, 1863) : Pressel, Ulmisches Urkundenbuch (Stuttgart, 1873); and Ulm und sein Munster (Ulm, 1877); Schultes, Chronik von Ulm (Stuttgart, 1 88 1 and 1886) ; Hassler, Ulms Kunstgeschichte im Mittelalter (Stutt- gart, 1872) ; and Das rote Buch der Stadt Ulm, edited by C. Mollvo

(1904).

ULPIAN (Domitius Ulpianus), Roman jurist, was of Tyrian ancestry. The time and place of his birth are unknown, but the period of his literary activity was between a.d. 211 and 222.

He made his first appearance in public life as assessor in the auditorium of Papinian and member of the council of Septimius Severus; under Caracalla he was master of the requests (magi:ler libellorum). Heliogabalus banished him from Rome, but on the accession of Alexander (222) he was reinstated, and finally became the emperor's chief adviser and praefeclus praetorio. His curtailment of the privileges granted to the praetorian guard by Heliogabalus provoked their enmity, and he narrowly escaped their vengeance; ultimately, in 228, he was murdered in the palace, in the course of a riot between the soldiers and the mob.

1. *His works include Ad Sabinum, a commentary on the jus civile, in over 50 books; Ad edictum, a commentary on the Edict, in 83 books; collections of opinions, responses and disputations; books of rules and institutions; treatises on the functions of the different magistrates— one of them, the De officio proconsulis libri x., being a comprehensive exposition of the criminal law ; monographs on various statutes, on testamentary trusts, and a variety of other works. His writings altogether have supplied to Justinian's Digest about a third of its contents, and his commentary on the Edict alone about a fifth. As an author he is characterized by doctrinal exposition of a high order, judiciousness of criticism, and lucidity of arrangement style and language.*

Domitii Ulpiani fragmenta, consisting of 29 titles, were first edited by Tilius (Paris, 1549). Other editions are by Hugo (Berlin 1834), Bockmg (Bonn, 1836), containing fragments of the first book oi the InsMutiones discovered by Endlicher at Vienna in 1835, and in Girard s Textes de droit romain (Paris, 1890).

ULRICH, duke of Wurttemberg (1487-1550), was a son of Henry, count of Montbeliard (d. 1519), younger son of Ulrich V.,

count of Wurttemberg. He succeeded his kinsman Eber- hard II. as duke of Wurttemberg in 1498, being declared of age in 1503. He served the German king, Maximilian I., in the war

over the succession to the duchy of Bavaria-Landshut in 1504, receiving some additions to Wurttemberg as a reward; he accompanied Maximilian on his unfinished journey to Rome in 1508; and he marched with the imperial army into France in 1 513. Meanwhile in Wurttemberg Ulrich had become very unpopular. His extravagance had led to a large accumulation of debt, and his subjects were irritated by his oppressive methods of raising money. In 1514 a rising under the name of " poor Conrad " broke out, and was only suppressed after Ulrich had made important concessions to the estates in return for financial aid. The duke's relations with the Swabian league, moreover, were very bad, and trouble soon came from another quarter also. In 1 51 1 Ulrich had married Sabina, a daughter of Albert III., duke of Bavaria-Munich, and niece of the emperor Maximilian. The marriage was a very unhappy one, and having formed an affection for the wife of a knight named Hans von Hutten, a kinsman of Ulrich von Hutten, the duke killed Hans in 151 5 during an altercation. Hutten's friends now joined the other elements of discontent. Fleeing from her husband, Sabina won the support of the emperor and of her brother William IV., duke of Bavaria, and Ulrich was twice placed under the imperial ban. After the death of Maximilian in January 1519 the Swabian league interfered in the struggle, and Ulrich was driven from Wurttemberg, which was afterwards sold by the league to the emperor Charles V.

Ulrich passed some time in Switzerland, France and Germany, occupied with brigand exploits and in service under Francis I. of France; but he never lost sight of the possibility of recovering Wurttemberg, and about 1523 he announced his conversion to the reformed faith. His opportunity came with the outbreak of the Peasants' War. Posing as the friend of the lower orders and signing himself " Ulrich the peasant," his former oppressions were forgotten and his return was anticipated with joy. Collect- ing men and money, mainly in France and Switzerland, he invaded Wurttemberg in February 1525, but the Swiss in his service were recalled owing to the defeat of Francis I. of France at Pavia; the peasantry were unable to give him any serious support, and in a few weeks he was again a fugitive. During his exile Ulrich had formed a friendship with Philip, landgrave of Hesse; and his restoration, undertaken by Philip, is an event of some importance in the political history of the Reformation. In 1526 Philip had declared he was anxious to restore the exiled duke, and about

the same time Francis I. and Zwingli had intimated their willingness to assist in a general attack upon the Habsburgs. Many difficulties, however, barred the way, and it was 1534 before Philip was prepared to strik ;. In January of that year Francis I. had definitely promised assistance; the Swabian league had just been dissolved; and, after a manifesto had been issued by Ulrich and Philip justifying the proposed undertaking, Wurttemberg was invaded in April 1534. Charles V. and his brother, the German king, Ferdinand I., could send but little assistance to their lieutenants, and on the 13th of May the troops of the Habsburgs were completely defeated at Lauffen. In a few weeks Ulrich was restored, and in June 1 534 a treaty was negotiated at Kaaden by which he was recognized as duke by Ferdinand, but was to hold Wurttemberg under Austrian suzerainty. After some hesitation Ulrich yielded to the solicita- tions of Philip, and signed the treaty in February 1535.

The duke now lost no time in pressing on the teaching of the reformed doctrines of Luther and Zwingli. Many convents and monasteries were, destroyed, and extensive seizures of church property formed a welcome addition to his impoverished exchequer. Taxation, however, was so heavy that he soon lost his temporary popularity. In April 1536 he joined the league of Schmalkalden, though he did not assent to some of the schemes of Philip of Hesse for attacking Charles V. In 1546 his troops fought against the emperor during the war of the league of Schmalkalden, but with disastrous results for Wurttemberg. The duchy was quickly overrun, and the duke compelled to

agree to the treaty of Heilbronn in January r 547. By this treaty Charles, ignoring the desire of Ferdinand to depose Ulrich again, allowed him to retain his duchy, but stipulated that he should pay a large sum of money, surrender certain fortresses, and appear as a suppliant before the emperor at Ulm. Having submitted under compulsion to the Interim issued from Augs- burg in May 1548, Ulrich died on the 6th of November 1550 at Tubingen, where he was buried. He left a son, Christopher (1515-1568), who succeeded him.

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des Mittelalters (Freiburg, 1890), Eng. trans, by A. M. Christie and M. A. Mitchell (London, 1900 seq.) ; C. F. von Stalin, Wirtembergische Geschichte, Bd. iv. (Stuttgart, 1873); and J. Wille, Philipp der Grossmiithige von Hessen und die Restitution Ulrichs von Wirtemberg (Tubingen, 1882).

ULRICI, HERMANN (1806-1884), German philosopher, was born at Pforten, Prussia, on the 23rd of March 1806. He was educated for the law, but gave up his profession on the death of his father, and devoted four years to the study of literature, philosophy and science. In 1834 he was called to a professorship at Halle, where he remained till his death, on the nth of January 1884. His philosophical standpoint may be characterized as a reaction from the pantheistic tendency of Hegel's idealistic rationalism towards a more pronouncedly theistic position. The Hegelian identity of being and thought is also abandoned and the truth of realism acknowledged, an attempt being made to exhibit idealism and realism as respectively incomplete but mutually complementary systems. Ulrici's later works, while expressing the same views, are largely occupied in proving the existence of God and the soul from the basis of scientific conceptions, and in opposition to the materialistic current of thought then popular in Germany.

His first works were in the sphere of literary criticism; of his treatise On Shakespeare's Dramatic Art (1839; editions, 1847, 1868, 1874), the 3rd ed. was translated into English by L. D. Schmitz in 1876. In 1841 he published Uber Princip u. Methode der Hegel- schen Philosophic, a severe criticism of the Hegelian system. This was continued in the Grundprincipˆ der Philosophie (1845-1846), which also gives his speculative position. Complementary to this is his System der Logih (1852). His later works on the relation of philosophy to science and to the thought of his time were more popular in character. These are Glauben u. Wissen (1858), Gott u. die Nalur (1862; 3rd ed., 1875), Gott und der Mensch (2 vols., 1866- 1873; 2nd ed., 1874). From 1847 onward Ulrici edited, jointly with the younger Fichte, the Zeitschrift fur Philosophie u. phil. Kritik. See Frankel's art. in Allgemeine deutsche Biog. (1895) and works there quoted.

ULSTER, EARLS OF. The earldom of Ulster was the first title of honour in Ireland of English creation, and for more than a century was the only one. By many authorities John de Courci (q.v.), the conqueror of Ulster, is held to have been the first

earl of Ulster; " it is, however, certain," says J.H. Round, " that this title was the invention of a late chronicler, and that it first appears in the Book of Howth, where we read of " Sir John Courcey, earl and president of Ulster." The confusion probably arose from the words of a charter, dated the 29th of May 1205, by which King John confirmed to Hugh de Lacy, whom he then created earl of Ulster, a grant of Ulster " as John de Courci held it on the day when Hugh conquered and took him prisoner in the field "; these words referring not to the earldom but to the lands held by de Courci, and possibly also to the authority which he had exercised in the king's name. The earldom therefore dates from this grant to de Lacy in 1205.

Hugh de Lacy, 1st Earl of Ulster (d. 1242 ?), was descended from Walter de Lacy (d. 1085), who fought for William the Conqueror at Hastings. The family came from Lassy in Normandy, and after the Conquest Walter de Lacy obtained extensive grants of land on the Welsh marches. He was the first baron Lacy by tenure, and was probably a brother, certainly a kinsman, of Ilbert de Lacy, from whom were descended Roger de Lacy, justiciar in the reign of King John, and the earls of Lincoln (q.v.) of the de Lacy family. Although Walter had three sons, one of whom founded Llanthony Abbey, none of them left

heirs; but his daughter's son Gilbert took the name of de Lacy and became the fourth baron. Gilbert's son Hugh de Lacy (d. 1 1 86) was one of the barons who accompanied Henry II. to Ireland in 1 171; he obtained a grant of Meath, and governed Ireland as vicegerent for the king. By his wife Rose of Monmouth Hugh was father of Walter de Lacy (d. 1241), who succeeded his father as lord of Meath and took a leading part in the conflict of his family with John de Courci in Ireland, and also of Hugh de Lacy, 1st earl of Ulster. The latter was for a time a coadjutor of de Courci in Leinster and Munster-, but after 1200 the rivalry between the two developed into war, and in 1203 de Lacy drove de Courci out of Down, and in the following year took him prisoner. He was rewarded by the king with grants of land in Ulster and Connaught, which were confirmed by the charter of the 29th of May 1205, when Hugh

was created earl. He returned to Ireland with quasi-viceregal authority, and endeavoured without much success to reduce the O'Neill of Tyrone to submission. In 1207 war broke out between the earl of Ulster and FitzHenry, the justiciar. This brought King John in person to Ireland, where he expelled the earl's brother, Walter de Lacy, from Meath, and compelled the earl himself to fly from Carrickfergus to Scotland. For several years Ulster took part in the wars in France, and he did not return to Ireland till 1221, when he allied himself with O'Neill against the English. In 1226 his lands in Ulster were handed over to his brother Walter, but were restored to him in the following year, after which date he appears to have loyally served the king, being more than once summoned to England to give advice about Irish affairs. He died at Carrickfergus in T242 or 1243. He left no surviving legitimate children, and on his death the earldom of Ulster reverted to the Crown.

In 1254 the lordship of Ireland was granted by Henry III. to Prince Edward (afterwards Edward I.), who about 1255 transferred " the county of Ulster " to Walter de Burgh, lord of Connaught, in exchange for the rich domain of Kilsilan. De Burgh was henceforth, or at all events within a short time afterwards, styled earl of Ulster, to which title he may have advanced some hereditary claim of a loose order through his mother Egidia, daughter of Walter de Lacy, the first earl of Ulster's brother. The earldom remained in the family of De Burgh until the death of William, 3rd earl of this line, in 1333, when it passed to his daughter Elizabeth, who married Lionel Plantagenet, son of Edward III. Lionel, having inherited in right of his wife the great estates of the family of de Clare as well as those of de Burgh, was created duke of Clarence in 1362. Leaving no male heirs, Lionel was succeeded in the earldom of Ulster by his daughter Philippa, who married Edmund Mortimer, earl of March. The third Mortimer, earl of Ulster, died unmarried in 1425, when his titles were inheiited by his sister's son, Richard Plantagenet, duke of York, whose son Edward ascended the throne as Edward IV. in 1461.

Since that date the earldom of Ulster, which then merged in the Crown, has only been held by members of the royal family. It was granted in 1659 to James, duke of York, second son of Charles I., on whose accession as James II. it again merged in the Crown. The next prince to bear the title (1716) was Ernest • Augustus, duke of Brunswick-Liineburg, son of the elector of Hanover, and youngest brother of George I. The title became

extinct at his death without heirs in 1728. It was next conferred on Edward Augustus, brother of George III., in 1760, again becoming extinct at his death seven years later. In 1784 Prince Frederick, second son of George III., was created earl of Ulster, and died leaving no children in 1827. Each of these last four earls of Ulster, all being of separate creations, held the title in conjunction with the dukedoms of York and Albany. On the next occasion of its revival it was united with the dukedom of Edinburgh, Prince Alfred Ernest Albert, second son of Queen Victoria, being created duke of Edinburgh, earl of Kent and earl of Ulster in 1866. Oft the death of the duke of Edinburgh in 1900 the earldom became extinct.

See, for the de Lacy and de Burgh earls of Ulster, The Chronicle of Florence of Worcester, edited by T. Forester (London, 1854);

Annals of Ireland by the Four Masters, edited by J. O'Donovan (7 vols., Dublin, 1851) ; The Annals of Loch Ce, edited by W. M. Hen- nessy, " Rolls Series " (2 vols., London, 1871) ; Calendar of Documents Relating to Ireland, edited by H. S. Sweetman (5 vols., London, 1875- " ~ " ; W. W. Shirley, Royal and Historical Letterr, of the Reign of

Henry III., " Rolls Series " (2 vols., London, 1862-1866); Sir J. T. Gilbert, History of the Viceroys of Ireland (Dublin, 1865). For the later history of the earldom see G. E. C, Complete Peerage, vol. viii. (London, 1898). (R. J. M.)

ULSTER, a province of Ireland occupying the northern part of the island. It includes the counties Donegal, Londonderry, Antrim, Fermanagh, Tyrone, Cavan, Monaghan, Armagh and Down. Ulster (Uladh) was one of the early provincial kingdoms of Ireland, formed, according to the legendary chronicles, at the Milesian conquest of the island ten centuries before Christ, and given to the descendants of Ir, one of the sons of Mileadh. Interprovincial wars frequently altered its boundaries, notably in 332 when the three Collas, sons of Eochaidh Doimhlein, con- quered the land between the river Boyne and Lough Neagh, which became a separate kingdom under the name of Uriel (Oriel or Orgial). Its princes maintained themselves until the close of the 16th century. In n 77 John de Courci, with the countenance of Henry II., set out to the conquest of Ulster. His operations were gradually successful, and he became lord deputy of Ireland in 1186 (see

above). The nominal reign of the last king of Ulster closed in 1200. In 1585 Lord Deputy Sir John Perrot undertook the shiring of Ulster (excluding the counties Antrim and Down, which had already taken shape) ; and his work, though of little immediate effect owing to the rising of Hugh O'Neill, served as a basis for the division of the territory at the plantation of Ulster in the reign of James I.

ULTIMATUM (from Lat. ultimus, last), a word used in diplomacy to signify the final terms submitted by one of the parties in negotiation for settlement of any subject of disagreement. It is accompanied by an intimation as to how refusal will be regarded. English diplomacy has devised the adroit reservation that refusal will be regarded as an " unfriendly act," a phrase which serves as a warning that the consequences of the rupture of negotiations will be considered from the point of view of forcing a settlement. This opens up a variety of possibilities, such as good offices, mediation, the appointment of a commission of inquiry, arbitration, reprisals, pacific blockade and war. 1

As regards the alternative of war, the Hague convention relative to the Opening of Hostilities of the 1 8th of October 1907, provides as follows: —

" Considering that it is important, in order to ensure the maintenances of pacific relations, that hostilities should not commence without previous warning," it is agreed by the Contracting Powers to " recognize that hostilities between them must not commence without a previous and explicit warning in the form of either a declaration of war, giving reasons, or an ultimatum with a conditional declaration of war."

As reasons for a declaration of war are necessarily in the nature of an ultimatum, the ultimatum may now be regarded as an indispensable formality precedent to the outbreak of hostilities.

Another Hague convention of the same date respecting the limitation of the employment of force for the recovery of contract debts provides as follows : —

" Being desirous of preventing between nations armed conflicts originating in a pecuniary dispute respecting contract debts claimed from the government of one country by the government

of another country as due to its subjects or citizens," the Contracting Powers agree " not to have recourse to armed force for the recovery of contract debts claimed from the government of one country by the government of another country as being due to its subjects or citizens."

This undertaking, however, is not applicable when the debtor

1 To these may be added a new unofficial method devised by the Turks in connexion with the Austro-Turkish difficulty over the annexation of Bosnia-Herzegovina, viz. the boycotting of the goods and ships of the natives of the state against which the grievance exists. This is a method open to weaker as against more powerful states, which can have serious coercive and even compli- cated consequences under the influence of democratic institutions.

state refuses or neglects to reply to an offer of arbitration or, " after accepting the offer, renders the settlement of the com- promis impossible, or, after the arbitration, fails to comply with the award."

Under this convention, in the cases to which it relates, the alternative of the ultimatum is ipso facto arbitration, and it is only when the conditions of the convention havp. been set at naught that other measures may be employed.

ULTRAMARINE, a blue pigment, consisting essentially of a double silicate of aluminium and sodium with some sulphides or sulphates, and occurring in nature as a proximate component of lapis lazuli {q.v.). As early at least as the nth century the art of extracting a blue pigment from lapis lazuli was prac- tised, and from the beginning of the 16th century this pigment began to be imported into Europe from " over the sea," as azurrum ultramarinum. As the mineral only yields from 2 to 3% of the pigment, it is not surprising to learn that the pig- ment used to be weighed up with gold. It was valued chiefly on account of its brilliancy of tone and its inertness in opposi- tion to sunlight, oil, and slaked lime (in fresco-painting). In 1 814 Tassaert observed the spontaneous formation of a blue compound, very similar to ultramarine, if

not identical with it, in a soda-furnace at St Gobain, which caused the SociUe pour V Encouragement d'Industrie to offer, in 1824, a prize for the artificial production of the precious colour. Processes were devised by Guimet (1826) and by Christian Gmelin (1828), then professor of chemistry in Tubingen ; but while Guimet kept his process a secret Gmelin published his, and thus became the originator of the "artificial ultramarine" industry.

The details of the commercial processes are trade secrets. The raw materials used in the manufacture are: (1) iron-free kaolin, or some other kind of pure clay, which should contain its silica and alumina as nearly as possible in the proportion of 2S1O2 : AI2O3 demanded by the formula assigned to ideal kaolin (a deficit of silica, however, it appears can be made up for by addition of the calculated weight of finely divided silica); (2) anhydrous sulphate of soda; (3) anhydrous carbonate of soda ; (4) sulphur (in the state of powder) ; and (5) powdered charcoal or relatively ash-free coal, or colophony in lumps. " Ultramarine poor in silica " is obtained by fusing a mixture of soft clay, sodium sulphate, charcoal, soda and sulphur. The product is at first white, but soon turns green ("green ultra- marine ") when it is mixed with sulphur and heated. The sulphur fires, and a fine blue pigment is obtained. " Ultramarine rich in silica " is generally obtained by heating a mixture of pure clay, very fine white sand, sulphur and charcoal in a muffle-furnace. A blue product is obtained at once, but a red tinge often results. The different ultramarines— green, blue, red and violet — are finely ground and washed with water.

Artificial, like natural, ultramarine has a magnificent blue colour, which is not affected by light nor by contact with oil or lime as used in painting. Hydrochloric acid at once bleaches it with liberation of sulphuretted hydrogen and milk of sulphur. It is remarkable that even a small addition of zinc-white (oxide of zinc) to the reddish varieties especially causes a considerable diminution in the intensity of the colour, while dilution with artificial precipitated sulphate of lime (" annalin ") or sulphate of baryta (" blanc fix ") acts pretty much as one would expect. Ultramarine being very cheap, it is largely used for wall painting, the printing of paperhangings and calico, &c., and also as a corrective for the yellowish tinge often present in things meant to be white, such as linen, paper, &c. Large quantities are used in the manufacture of paper, and

especially for producing that kind of pale blue writing paper which is so popular in Great Britain. The composition of the pigment is quite similar to that of lapis lazuli ; but the constitution of both is uncertain.

By treating blue ultramarine with silver nitrate solution, " silver- ultramarine " is obtained as a yellow powder. This compound gives a blue potassium- and lithium-ultramarine when treated with the corresponding chloride, and an ethyl-ultramarine when treated with ethyl iodide. Selenium- and tellurium-ultramarine, in which these elements replace the sulphur, have also been prepared. It has been suggested that ultramarine is a compound of a sodium aluminium silicate and sodium sulphide. Another view is that the colour is due to some comparatively simple substance suspended in a colourless medium.

ULTRAMONTANISM (Lat. ultra, beyond, monies, the mountains), the name given to a certain school of opinion in the Roman Catholic Church. The expression ultramontane was originally no more than a term of locality, characterizing the persons so described as living — or derived from — " beyond the mountains." The " mountains " in this case are the Alps,

so that, from the Italian standpoint, Germans and French for instance were " ultramontane." In this sense the word was applied in the later middle ages to the Germans studying at Italian universities and— to take a particular example — to the French cardinals at the election of Clement V. (1305). North of the Alps, however, the term seems never to have been restricted to the sense implying locality; for from the very beginning we find it used as a party appellation to describe those who looked " beyond the mountains " in order to obtain a lead from Rome, who represented the papal point of view and supported the papal policy. Thus, as early as the nth century, the partisans of Gregory VII. were styled ultramontanes, and from the 15th century onwards the same name was given to the opponents of the Gallican movement in France.

It was not until the 19th century that "ultramontane" and " ultramontanism " came into general use as broad designations covering the characteristics of particular personalities, measures and phenomena within the Roman Catholic Church. At the present time they are applied to a tendency representing a definite form of Catholicism within that Church; and this

tendency, in spite of the individual forms it has assumed in different countries, everywhere displays the same essential features and pursues the same ends. It follows, to be sure, from the very nature of Ultramontanism, and from the im- portant position to which it has attained, that the official organs of the Church and all the people interested in the continuance of the actual state of affairs deny that it exists at all as an independent tendency, and seek to identify it with any proper interpretation of Roman Catholicism. Numerous Catholics, on the other hand, well qualified to form a judgment, themselves protest against this obliteration of the dividing line. It is indisputably legitimate to speak of Ultramontanism as a dis- tinct policy, but it is very difficult to define its essential character. For, true to its nature, it has itself drawn up no complete pro- gramme of its objects, and, in addition to its avowed aims, its subsidiary effects claim attention. There is something chameleon-like in its appearances; its genuine views are kept in the background from tactical considerations, and first one aspect, then another, comes into prominence. It is evident, therefore, that the request for a definition of Ultramontanism cannot be answered with a concise formula, but that the varied character of its manifestations necessitates a more detailed examination of its peculiar objects.

The indications given by the late Franz Xaver Kraus— him- self a Catholic — may well serve for a guide {Spectator, ep. 2). He classes as Ultramontane: (1) Whoever places the idea of the Church above that of religion; (2) whoever confounds the pope with the Church; (3) whoever believes that the kingdom of Heaven is of this world, and maintains, with medieval Catholi- cism, that the power of the keys, conferred on Peter, includes secular jurisdiction over princes and nations; (4) whoever holds that religious conviction can be imposed by material force, or may legitimately be crushed by it; (5) whoever is always ready to sacrifice a clear injunction of his own conscience to the claims of an alien authority.

The first and fundamental characteristic of Ultramontanism is its championship of a logical carrying out of the so-called " papalistic system," the concentration, that is, of all ecclesias-, tical power in the person of the Roman bishop. This tendency among occupants of the Roman see to exalt themselves above other bishops, and to usurp the part of a superior authority as compared with them, may be traced even in antiquity. No later than the end of the 2nd century Bishop Victor made an attempt

to establish this position during the discussions regarding the date of the Easter festival. But he met with a sharp rebuff, and Bishop Stephen fared no better when, in the middle of the 3rd century, he came into collision with Cyprian of Carthage and Firmilian of Caesarea in the dispute concerning heretical baptism. How the Roman bishopric rose in status till it became the papacy, how the individual popes — in spite of these and similar repulses — advanced steadily on their path, how they succeeded in founding

their primacy within the Church, and in re-establishing and maintaining that primacy notwithstanding severe defeats and long periods in which their prestige sank to the vanishing point, is told elsewhere (see Papacy). A characteristic pecu- liarity of the process is that the claims of the Roman see were always in advance of the actual facts and always encountered opposition; though there were many periods — at the height of the middle ages, for instance — when the voices raised in protest were only timid and hesitating. To the curial system, so evolved, and continually fortifying its position in the domains of theology, ecclesiastical law and politics, the episcopal system stands in diametrical opposition. This system admits that the pope represents the unity of the Church, and acknowledges his primacy, but only in the sense that he is primus inter pares; while at the same time it claims on behalf of the bishops that, in virtue of the divine ordinance, they possess an inalienable right to a share in the government of the Church (see Episcopacy). This theory of the independence of the episcopate with regard to the Roman bishop was first propounded by Cyprian, in his treatise De unitate ecdesiae. In the 15th century it received its classical expression in the resolutions of the ecumenical council at Constance; its principles were developed and amplified by Gallicanism, and, finally, in the 18th century, was restored in a modernized form by "Febronius" (Nikolaus von Hontheim, q.v.) and in the Punctation of Ems (see Feb- ronianism). The struggle between these two systems con- tinued well into the 19th century; and, though episcopalism was not infrequently proscribed by the curia, it still survived, and till the year 1870 could boast that no ecumenical council had ventured to condemn it. This was done for the first time, in 1870, at the Vatican Council (q.v.),

whose decrees, recognizing the universal episcopate and the infallibility of the pope, marked the triumph of that ultramontane doctrine by which they had been long anticipated.

In 1865 Dollinger wrote: " The Ultramontane view can be summarized in a single, concise, and luminous proposition; but out of this proposition are evolved a doctrine and a view that embrace not merely religion and the Church, but science and the state, politics, morals and the social order — in a word, the whole intellectual life of men and nations. The proposition runs: The pope is the supreme, the infallible, and consequently the sole authority in all that concerns religion, the Church, and morality , and each of his utterances on these topics demands unconditional submission — internal no less than external." History, since the Vatican Council, has shown this judgment to have been correct. The Roman Catholic Church, in all countries, has become more and more dependent on the Curia: the bishops have lost their autonomous standing, and their position is little more than that of papal delegates, while all important questions are referred to Rome or settled by the nuncios.

A second peculiarity of Ultramontanism is its confusion of religion with politics; it claims for the Roman Catholic Church the functions of a political power, and asserts that it is the duty of the secular state to carry out its instructions and wishes. Ultramontanism regards the state, not as a divinely established order but, like its ancient prototype, as a profane institution and, for that reason, not co-ordinate with, but subordinate to the Church.

Since the conditions of the age no longer allow the pope to depose a temporal sovereign, the practical application of this conception of the relationship between the spiritual and temporal powers has taken other forms, all of which, however, clearly show that the superiority of the Church over the state is assumed. This may be seen in the attitude of Ultramon- tanism towards secular law. It assumes that God has conferred on the individual and on society certain rights and competences as inalienable possessions. This " natural law " ranks above all secular law, and all state legislation is binding only in so far as it is in harmony with that law. As to the provisions of this natural law, and the consequences they entail in in- dividual cases, these can be decided only by the Church, i.e.

the last resort, by the pope. This is to assert the principle of the invalidity of all legislation conflicting with ecclesiastical interests and rules. This was the attitude of Innocent III. when he annulled the English Magna Charta; of Innocent X. when he pronounced the treaty of Westphalia null and void; of Pius IX. when he condemned the Austrian constitution (1868) and the ecclesiastical laws of Prussia so far as they affected the circumstances of the Roman Catholic Church (1875). Thus, too, even at the present time, the opinion is very clearly expressed in Ultramontane quarters that, in the event of the state issuing laws contravening those of nature or of the Church, obedience must be refused. The attitude of Ultramontanism, for instance, towards the right claimed and exercised by the state to make laws concerning marriage is wholly negative; for it recognizes no marriage laws except those of the Church, the Church alone being regarded as competent to decide what impediments are a bar to marriage, and to exercise jurisdiction over such cases. Thus Ultramontanism disclaims any moral subjection to secular authority or law, and will recognize the state only in so far as it conforms its rules to those of the Churchy An instance of this interference with the duties of the individual citizen towards the state may be found in the fact that, till the year 1904, the Catholics of Italy were prohibited by the pope from taking part in any parliamentary election. Since Ultramontanism cannot hope to realise its political ambitions unless it succeeds in controlling the intellectual and religious life of Catholic Christendom, it attempts to extend its sphere of influence in all directions over culture, science, education, literature and the forms taken by devotion. This endeavour is the third great characteristic of Ultramontanism. Wherever its operations can be traced, they are dominated by the conviction that all stirrings of independence must be repressed, and any advance beyond the stage of immaturity and nonage checked at the outset. That science must be left free to determine tne aims of her investigation, to select and apply her own methods, and to publish the results of her researches without restraint, is a postulate which Ultramontanism either cannot understand or treats with indifference, for it regards as strange and incredible the fundamental law governing all scientific research — that there is for it no higher aim "than the discovery of the truth. This ignorance of the very nature of science leads to under-estimation of the elemental force which science possesses; for only thus can we explain the pertinacity with which Ultramontanism, even at the present day, strives to

subject her work to its own censorship and con- trol. Nor are its criticisms limited to theology alone: its care extends to philosophy, history and the natural sciences. Even medicine has not escaped its vigilance, as is proved by the prohibition of certain surgical operations. The development of these efforts may be easily traced from decisions of the Congregation of the Index and the Holy Office in Rome. Ultramontanism, too, labours systematically to bring the whole educational organization under ecclesiastical supervision and guidance; and it manifests the greatest repugnance to allowing the future priest to come into touch with the modern spirit. Hence the attempts to train its growing manhood in clerically regulated boarding-schools and to keep it shut out from the external world in clerical seminaries, even in places where there are universities. Again, it works zealously to bring the elementary schools under the sway of the Church. Since it regards the training and instruction of childhood as inseparable, and holds that the former is essentially the work of the Church, it contests the right of the state to compel parents to send their children to the state schools and only to the state schools. In logical sequence to these tenets it seeks to divorce the school from the state — a proceeding which it terms educational freedom, though the underlying motive is to subordinate the school to the Church. In the domain of religion, Ultramontanism tends to foster popular superstitions and to emphasize outward forms as the essence of religious life^ for it can only maintain its dominion so long as the common people remain at a low spiritual level. If any one desires to appreciate the intellectual plane —

and the power — of this Ultramontane habit of thought, he will find ample material in the performances of the notorious swindler Leo Taxil under Leo XIII., and in the acceptance of his blasphemous effusions by the highest ranks of the clergy.

In the fourth place, Ultramontanism is the embodiment of intolerance towards other creeds. The general presupposition involved is that a man cannot be saved except within the Catholic Church. Since, however, on the one hand — in virtue of a theory advanced by Pius IX. against the emperor William I. of Germany, in a letter which has since become famous —

every Christian, whether he will or no, belongs to that Church by baptism, and is consequently pledged to obey her, and, on the other hand, since the state lies under the obligation to place the " secular arm " at her disposal whenever one of her members wishes to secede, the most far-reaching consequences result. In the past this principle led to the erection of the Inquisition (q.v.) and, even at the present day, there exists in the Curia a special congregation charged with its application (see Curia Romana). On the Roman Catholic side the employment of compulsion against heretics has never been acknowledged as a blunder; and this method of silencing opposition has found champions in the bosom of the Church down to the most recent years. But the development of modern culture has rendered these exploits of an unbridled fanaticism impossible, and no govern- ment would consent to enforce the once obligatory sentences of ecclesiastical courts. As a result of this situation, the Catholic condemnation of heresy — though as stringent as ever in principle — has assumed less dangerous forms for the heretic. Nevertheless, it proved capable, even in the 19th century, of imposing onerous restrictions on the heterodox, and practical exemplifications of this hostile attitude persist to the present day. The embittering influence of Ultramontanism may be further traced in its attitude towards the baptism of non- Catholics, for it seeks to establish the rule that baptism conferred by Protestants is invalid through defect of form or matter, or even of intention, and that, consequently, the rite must be readministered, at least conditionally, to proselytes joining the Roman Church. Finally, ample scope for the dis- play of tolerance— or intolerance — is found in the mixed marriages between Protestants and Catholics, which, as a result of the modern facilities for intercommunication and the conse- quent greater mobility of the population, have shown a large increase during the last few decades — in Germany, for instance. Here, again, Ultramontanism has done much to aggravate the pernicious feud between the two creeds, by exacting a promise before marriage from the Roman Catholic party that all the children shall be brought up as members of the Roman Catholic Church (see Marriage: Canon Law). A like result has been produced when, in response to Ultramontane agitation, inter- dicts have been placed on churchyards in which non-Catholics have found their last resting-place.

Lastly, Ultramontanism is the foe of the nationalization of

Catholicism. This peculiarity is connected, though not identical, with the above-mentioned tendency towards the Romanization of- the Church. Just as in Protestant countries there has often been an amalgamation of evangelical belief with national feeling, to the great gain of both, Catholics demand that Catholicism shall enter into the sphere of their national interests, and that the activities of the Catholic Church should rest on a national basis. These aspirations have been proclaimed with especial emphasis in France, in Germany (Reformkatholizismus) and in the United States (Americanism; see Hecker, I. T.) but are everywhere met with a blank refusal from the Ultramontane side. For Ultramontanism fears that any infusion of a national element into ecclesiastical life would entail the eventual independence of the people in question from papal control, and lead to developments opposed to its papalistic mode of thought. It endeavours, therefore, to undermine all aspirations of this nature and, its own tendency being essentially international, strives to ensure that national sentiment and national interests shall not find over-zealous champions among the clergy .

The relationship of Ultramontanism to Catholicism is a much-disputed problem. The Ultramontane, indeed, main- tains that there is no justification for distinguishing between the two: but the motives underlying this attitude are obvious. For, by representing the prosecution of its party-political objects as a championship of the Catholic Church, Ultramon- tanism seeks to acquire the support of the official organs of that Church, and the good will of all circles interested in her welfare; while at the same time it strives to discredit any attempt at opposition by branding it as an assault on the orthodox faith. But, even within the pale of the Roman Church, this identification provokes emphatic dissent, and is repudiated by all who are shocked by the effects of a one- sided accentuation of political Catholicism en the inner life of the church, and are reluctant to see the priest playing the part of a political agitator. It was on these grounds that Count May, in January 1904, proposed in the chamber of the Bavarian Reichsrath that the clergy should be deprived of the suffrage. In Germany, again, the last few years have witnessed a growing aversion from Ultramontanism on the part of those Catholics who cannot reconcile its tenets with their patriotic sentiments, and are disinclined to submit to a limitation of their share in the intellectual life of the times, particularly in art, science and

literature. It may be admitted that, in many cases, the distinction between Ultramontanism and Catholicism cannot be clearly traced; and it is impossible to draw a sharp line of severance between the two, which could be absolutely valid under all circumstances and in relation to all questions. For there are many almost imperceptible stages of transition from the one to the other; and, for all the principal contentions of Ultra- montanism, analogies may be found in the past history of the Catholic Church. Thus, in the middle ages, we find extremely bold pronouncements with respect to the position of the papacy in the universal Church; while political Catholicism had its beginnings in antiquity and found very definite expression, for instance, in the bull Unam sanctam of Boniface VIII. Again, the attempt to subordinate all intellectual life to ecclesiastical control was a feature of the medieval Church, and the fundamental attitude of that Church towards heresy was fixed during the same period. But since then much has been altered both in the Church and her secular environment. The state has become independent of the Church, legislates on its own sole authority, and has recognized as falling within its own proper sphere the civilizing agencies and social questions formerly reserved for the Church. Again, education, science, art and literature have been secularized: the printing-press carries knowledge into every house, the number of illiterates diminishes from year to year in every civilized country, and the clergy are no longer the exclusive propagators of culture, but merely one factor among a hundred others. Finally, the Roman Catholic Church has long forfeited the privileged position formerly accorded as her due. The days when she was the Christian Church are past: and now the civic rights of a man in a modern state are not curtailed, though he may neglect his duty to the Church or flatly refuse to acknowledge the existence of any such duty. The struggle for religious freedom has suffered no intermission since the beginning of the Reforma- tion; and the result is that to-day its recognition is considered one of the most precious trophies won in the evolution of modern civilization; nor can these changes be reversed, for they stand in the closest connexion and reciprocity one with another, and represent the fruits of centuries of co-operation on the part of the European peoples. But Ultramontanism ignores this latest page of history and treats it as non-existent, aspiring to the erection of a new order of society, similar to that which Rome created — or, at least, endeavoured to create — in the halcyon days of medievalism.

For the justification of this enterprise, it is considered sufficient to point out that the several elements of its programme once enjoyed validity within the Church. But Cyprian of Carthage said long ago, Consuetuio sine veritate vetustas err oris est; and the bare fact of previous existence is no argument for the re-introduction of obsolete

and antiquated institutions and theories. But, under the guise of a restoration on conservative lines, Ultramontanism — notwith- standing the totally different conditions which now obtain — girds itself to work for an ideal of religion and culture in vogue during the middle ages, and at the same time holds itself justified in adopting the extreme point of view with respect to all questions which we have mentioned. Thus Ultramontanism is not to be conceived as a theological movement, but as the programme of a party whose principles are in fundamental opposition to modern culture, modern education, modern tolerance and the modern state — a party which seeks to carry out its campaign against the society of to-day, not by bridging the gulf betwixt creed and creed, but by widening it, by awakening religious fanaticism, and by closing the way to a peaceful co-operation of Catholics and non-Catholics in the highest tasks of culture and human civilization. The hierophants of this Ultramontane system are to be found in the Society of Jesus (See Jesuits). In fact, the terms Jesuitical and ultramontane may, in numerous cases, be regarded as equivalent.

The origin of modern Ultramontanism is preceded and con- ditioned by the collapse of Catholicism in the period of the French Revolution. Pius VI. and Pius VII. were expelled from Rome, deprived of the papal states, and banished to France. In that country the Church almost completely lost her possessions; in Germany they were at least considerably cur- tailed; in both the hierarchical- organization was shattered, while the Catholic laity surveyed the catastrophe in complete passivity. But from this severe fall the Roman Church re- covered with comparative readiness, and the upward movement is contemporaneous with the rise of Ultramontanism. The birth of that system, however, cannot be fixed as a definite event by the day and the hour; nor was it created by any single personality.

Rather it was the product of the first post- revolutionary generation. Neither is it merely fortuitous that the reaction proceeded from France itself. For in no other country had hostility to religion attained such a pitch or assumed such grotesque forms; and consequently in no other country did the yearning for religion manifest itself so unequivocally, when bitter experience had demonstrated the necessity of a return to law and order. And in the other states of Europe there existed, more or less, a similar desire for peace and an equal dread of a fresh out- break of revolutionary violence. In contrast to the struggle for an ideal freedom, which was at first hailed with tempestuous delight only to reveal itself as a dangerous tyranny, men became con- scious of the need for a firmly established authority in the recon- struction of society. After the violent upheaval in the political world during the last few decades, the existent — as such — increased in value, and the high estimation in which the old regime was now held led to a policy of restoration. At the same time, the repression of idealism and sentiment during the period of " illumination " was amply revenged, and the barren age of reason gave place to Romanticism. These tendencies in contem- porary opinion favoured the renovation of the Roman Catholic Church. But the papacy signalized its reinstation by restoring the Society of Jesus (1814) and re-establishing the index. Even before this, the earliest germs can be traced back into the revolutionary period itself — the movement characterized above had begun working in France on the same lines; and, as it showed- great zeal for the increase of the papal authority, it received the support of the Curia. True, the principles of Bonald, Lemaitre, Lamennais and Lacordaire, were not carried through in the French Church without opposition; but, about the year 1850, they had become predominant there. In Germany Ultramontanism had to contend with great difficulties; for here ecclesiastical affairs were not in so desperate a case that the most drastic remedies possessed the most powerful attraction; while, in addition, the clergy were too highly educated to be willing to renounce all scientific work. The result was that a series of violent struggles took place between the old Catholicism and the new Ultramontane species (Hermes, Baader, Dollinger, &c). But even here Ultramontanism gained ground and derived inestimable assistance from the blunders of government after government — witness the conflict of the

Prussian administration with Archbishop Droste-Vischering

(q.v.) of Cologne, 1837. Additional impetus was also lent by the revolution of 1848.

The growth of the Jesuitical influence at Rome — more especially after the return of Pius IX. from exile — implied a more definite protection of Ultramontanism by the papacy. The proclamation of the dogma of the immaculate conception in 1854 was more than the decision of an old and vexed theological problem; it was an act of conformity to a pietistic type especially represented by the Jesuits. The Syllabus of 1864, however, carried with it a recognition of the Ultramontane condemnation of all modern culture (see the articles Pius IX., and Syllabus). Finally, in the Vatican Council, the Jesuits saw another of their favourite theories — that of papal infallibility — elevated to the status of a dogma of the Church (see Vatican Council and Infallibility) .

Ultramontanism, again, though essentially averse from all forms of progress, had displayed great dexterity in utilizing the oppor- tunities presented to it by modern life. Where it appeared advis- able, it has formed itself into a political party, as for instance, the Centre Party in Germany. It has shown extreme activity in the creation of a press devoted to its interests, and has consoli- dated its influence by the formation of an extensive league- system. In the episcopacy it has numerous adherents; it has made progress in the universities, and most of the learned and theological reviews are conducted in its spirit.

Whether the powerful position of this movement within the Roman Catholic Church be an advantage for that Church itself cannot be discussed here. The answer to the problem will mainly depend on the estimate which we form of the Society of Jesus and its whole activity. The outstanding event in the latest history of Ultramontanism is the separation between Church and state in France (1904), by which the republic has endeavoured to break the influence of this party. Similarly, the dissolution of the German Reichstag in December 1906 was a weapon directed against Ultramontanism; and, though the elections of 1907 failed to diminish the numbers of the Centre, they rendered possible the formation of a majority, in face of which that system forfeited the influence it had previously possessed.

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ULUGH BEG, MIRZA MAHOMMED BEN SHAH ROK (1394-1449), Persian astronomer, son of the shah Rok and grand- son of Timur, succeeded his father as prince of Samarkand in 1447, after having for years taken part in the government, and was murdered in 1449 by his eldest son. He erected an observa- tory at Samarkand, from which were issued tables of the sun, moon and planets, with an interesting introduction, which throws much light on the trigonometry and astronomical methods then in use (ProUgomenes des tables astroncmiques d'Ouloug Beg, ed. by Sedillot, Paris, 1847, and translated by the same, 1853). The serious errors which he found in the Arabian star catalogues (which were simply copied from Ptolemy, adding the effect of precession to the longitudes) induced him to redetermine the positions of 992 fixed stars, to which he" added 27 stars from Al Sufi's catalogue, which were too far south to be observed at Samarkand.

This catalogue, the first original one since Ptolemy, was edited

by Th. Hyde at Oxford in 1665 (Tabulae longitudinis et lalitudinis stellarum fixarum ex observatione Ulugbeighi) , by G. Sharpe in 1767, and in 1843 by F. Baily in vol. xiii. of the Memoirs of the Royal Astronomical Society.

See Delambre, Histoire de Vastronomie du moyen Age; Poggendorff, Biographisck-litterarisches.

ULUNDI (Zulu for " high place"), the royal kraal of Cetywayo, situated in the Mahlabatini district of Zululand, about 3 m. north of the White Umfolosi River, and 115 m. N.N. E. of Durban. The valley of the White Umfolosi here forms an extensive basin called the Emhlabatini, and from the time of Chaka to the overthrow of Cetywayo in 1883 was the exclusive place of residence of the Zulu kings. The basin on the south side of the river is regarded as the cradle of the Zulu race; here all their early chiefs are buried, hence the term Emakosini (i.e. at the grave of the chiefs) applied to the district (see Blue Book C. 5143). During Cetywayo 's reign a garrison of 3000 was kept at Ulundi. About a mile from the kraal on the 4th of July 1879 a Zulu army some 20,000 strong was totally defeated by Lord Chelmsford. The British force, consisting of the second division and Wood's column, numbered in all 4200 Europeans and some 1000 natives. On the morning of the battle they formed a square, with the mounted troops (about 300) inside. The Zulus attacked with great gallantry but were received with so deadly a fire that they could not come within thirty yards of the rifles. After twenty minutes they broke and fled, and the cavalry followed them till broken ground rendered further pursuit impossible. The British loss was about 100, that of the Zulus 1500. After the fight the royal kraal was burned. On the 1st of September following, at the site of the ruined kraal, Sir Garnet (afterwards Lord) Wolseley announced the partition of Zululand into thirteen petty chief- tainships. But on the 29th of January 1883 Cetywayo was reinstalled by the British at Ulundi as chief over two-thirds of his old dominions. Attacked at Ulundi in July 1883 by the rival chief Usibepu, Cetywayo and his 5000 followers fled to the Nkandhla bush. The royal kraal was again destroyed and Ulundi ceased to be a rallying point. The magistracy for the district is situated 5 m. north of the site of Ulundi. (See Zululand.)

ULVERSTON, a market town in the North Lonsdale parliamentary division of Lancashire, England, in the Furness district, q| m. N.E. from Barrow-in-Furness and 256 m. N.W.

by N. from London, on the Furness railway. Pop. of urban district (1001), 10,064. The church of St Mary, founded in mi, retains the south door of the original building in the Transition style, but the greater portion of the structure is Perpendicular, of the time of Henry VIII. It contains an altar-tomb with recumbent figure of Walter Sandys of Conishead, dated 1588. After the destruction of Furness Abbey, Ulverston succeeded Dalton as the most important town in Furness, but the rapid rise of Barrow surpassed it in modern times. A monument on Hoad Hill commemorates Sir John Barrow, secretary of the admiralty and a native of the town. Conishead Priory, 2 m. south-east, a mansion on the site of a priory founded in the reign of Henry II., is used as a hydropathic establishment. Formerly Ulverston had a considerable trade in linens, checks and ginghams, but it is now dependent on large iron and steel works, chemical works, breweries, tan-yards, and hardware, paper, and wooden hoop manufactories. Through its connexion with Morecambe Bay by a ship canal of 1 m. in length, owned by the Furness railway, it has a shipping trade in iron and slates.

Ulverston, otherwise Vlureston, Oivestonum, occurs in Domes-day Book, where Vlurestun is named as a manor in possession of Turulf, who was probably the original Saxon owner. Early in the 1 2th century the manor passed to Stephen, count of Boulogne, and was given by him to Furness Abbey. In 1196 the abbot granted the vill of Ulverstone with the inhabitants to Gilbert Fitz-Reinfred, who granted it a charter by which he raised it to the rank of a free borough. The lord'hip became divided, and one-half passed to the Harringtons and finally to Henry Grey, duke of Suffolk, on whose attainder in 1553 it was forfeited to the Crown. The other moiety returned to the abbey about the

end of the 14th century, and at the dissolution was surrendered to the Crown. Early in the 17th century the Crown alienated the manor, which is now in the family of Buccleuch. The yearly court-leet and court-baron are still held in October. In 1280 Roger de Lancaster obtained a charter from Edward I. for a weekly market on Thursday and an annual fair of three days beginning onthe eve of the nativity (Sept. 7).

UMAfl, a town of Russia, in the government of Kiev, 120 m. S. of the city of Kiev. Pop. 28,628, many of whom are Jews, and carry on the export of corn, spirits, &c. It has a park (290

acres), planted in 1793 by Count Potocki, and now containing a gardening school. Uman was founded early in the 17th century as a fort against the Tatar raiders. The Cossacks of the Ukraine, who kept it, revolted against their Polish rulers about 1665, and sustained a fierce siege. In 1674 it was plun- dered and most of its inhabitants murdered by the Ukrainians and Turks. In 171 2 its last occupants were transferred by Peter the Great to the left bank of the Dnieper. But by the end of the 1 8th century, when it again became the property of the Potockis, it was repeopled and became one of the busiest trading towns of Little Russia. In 1768, when the Cossacks revolted anew against the Poles, they took Uman and murdered most of its inhabitants.

UMARKOT, a town in Sind, India, 7 m. from a station on the North-Western railway; pop. (1901), 4924. It is the head-quarters of the Thar and Parkar district. The Mogul emperor Akbar was born here in 1542, when his father, Humayun, was fleeing to Afghanistan.

UMBALLA, or AmBala, a city and district of British India, in the Delhi division of the Punjab. The city is 3 m. E. of the river Ghaggar, 902 ft. above the sea. Pop. (1901), 78,638. It has a station on the North-Western railway (1077 m. N.W. of Calcutta), with a branch line to Kalka at the foot of the hills (39 m.), which was continued up to Simla in 1903. Umballa owes its importance to a large military cantonment which was first established in 1843, and is the headquarters of a cavalry brigade belonging to the Northern army. The cantonment, which lies 4 m. south-east of the native town, is well laid out with broad roads shaded by trees. It contains a church, a club-house, several hotels and English shops.

The District or Umballa has an area of 1851 sq. m. With one small exception it consists of a level alluvial plain, sloping away gradually from the foot of the Himalayas, and lying between the rivers Jumna and Sutlej. These rivers do not materially affect the district, which has a drainage system consisting of the numerous torrents which pour down from the hills. In the south these torrents run in broad sandy beds scarcely below the surface of the country, and vary from 200 yds. to 1 m. in width, until, at a distance of 20 or 30 m. from the hills, they become compara- tively docile streams, with well-defined clay banks. Towards the north the torrents run in deep beds from the point where they debouch from the hills;

they also differ from the streams of the south in being free from sand. The principal of these northern streams is the Ghaggar, into which the minor streams empty themselves, some within and some beyond the limits of the district. Whatever surplus water of this river is not swallowed up by irrigation passes on through Patiala state and Sirsa, and is finally lost in the sands of Rajputana. The Ghaggar is the only perennial stream within the district, but dwindles to a tiny rivulet in the dry season, and disappears altogether beyond the border of the district. In 1901 the population was 815,880, showing a decrease of 5-6% in the decade. The principal crops are wheat, maize, pulse, millets, rice, cotton and some sugar- cane. There are factories for ginning and pressing cotton, and also for grinding wheat. Two opposite corners of the district are watered by the Sirhind and the Eastern Jumna canals. A portion is crossed by the main line of the North-Western railway and by the Delhi-Umballa-Kalka railway, which have their junction at Umballa city. Umballa is one of the territories previously held by numerous Sikh sirdars, which were attacked by Ran jit Singh during one of his marauding expeditions. This caused the movement of British troops in 1809 which resulted

in the treaty with Ranjit Singh, by which he was required to withdraw his army from the left bank of the Sutlej and to relinquish his recent conquests in Sirhind. In June 1849, after the second Sikh War had brought the Punjab under British rule, the chiefs were deprived of all sovereign power and the district took practically its modern form. In March 1869 a grand durbar was held at Umballa on the occasion of the visit of the amir Shere All

UMBELLIFERAE, in botany, an order of polypetalous Dicotyledons belonging to the series Umbelliflorae, which includes also the orders Araliaceae (ivy family) and Cornaceae (dogwood family). It contains 180 genera with about 1400 species, occur- ring in all parts of the world but chiefly in north temperate regions. It is well represented in the British flora by 35 genera. The plants are annual or perennial herbs, rarely shrubby as sometimes in Bupleurum, with generally a very characteristic habit, namely stout erect stems with hollow internodes, alternate pinnately compound exstipulate

sheathing leaves and compound umbels of small, generally white, flowers.

An example of an annual is the common fool's parsley, Aethusa Cynapium; carrot (Daucus Carola) is a biennial; others are perennial,

persisting by means of tubers or rhizomes — such are hogweed (Her- acleum), Angelica, Peucedanum, and others. Some genera have a creeping stem as in Hydrocotyle (pennywort), a small herb with a creeping filiform stem and, in the British species, entire leaves. Bupleurum has simple, entire, often perfoliate leaves (fig. 1). Azorella, a large genus in south temperate regions, has a peculiar caespitose habit, forming dense cushions often several feet in dia- meter and persisting for many years. Eryngium, represented in iff Britain by sea-holly (E. maritimum), Fig. 1. I erfohate leat of a ; s a large genus of rigid often glaucous species of hare s-ear (Bupleu- herbs with spiny-toothed leaves, rum rotundijohum). The two w h; c h in some South American lobes at the base of the leaf species with narrow parallel-veined are united, so that the stalk blade and broadly sheathing base appears to come through the reC all those of a Monocotyledon such leaf. as Agave or Bromelia. In sanicle

(Sanicula), Astrantia and others the leaves are palmately divided; and there is a great variety in the degree of division in the characteristic pinnate leaf, which varies from simply pinnate to a branching of the blade to the fifth or sixth order.

There is also considerable variety in the development of the umbel, which is usually compound but sometimes simple, as generally in Hydrocotyle and Astrantia, rarely reduced to a single flower as in species of Hydrocotyle. In Eryngium the flowers are crowded into dense heads subtended by a whorl of rigid bracts. A terminal flower is sometimes present as in carrot, where it is distinguished by its form and dark colour. The presence or absence of bracts and their form when present afford useful diagnostic characters. When present at the base of the primary rays of the umbel they form the involucre, and the involucel when at the base of a partial umbel. In Astrantia the simple umbel is enveloped by a large, often coloured, involucre.

The small epigynous flowers are usually hermaphrodite and

regular, with parts in fives. The sepals are usually very small, often repre- sented only by teeth on the upper edge of the ovary ; the petals are usually obovate or obcordate in shape, often with the tip indexed; the stamens have long slender filaments bent inwards in the bud but ultimately spreading; the two carpels are in the median plane; the two-celled ovary is sur- mounted by an epigynous glandular disk — the stylopodium — which bears the two styles. Each ovary-cell contains a single pendulous anatropous ovule with a ventral raphe and a single integument. In the development of the flower the stamens appear first, followed by the petals, the sepals and the rudiments of the carpels in succession. The flowers are rendered conspicuous by being massed into more or less dense flat-topped inflorescences. A resemblance to the rayed heads of Compositae is suggested in the frequently larger size of the flowers on the circumference of the umbel which are often sterile and zygo- morphic from the larger size of the outer petals. This arrangement allows a large number of flowers to be visited in a short time. The flowers are generally white, sometimes pink or yellow, very rarely blue; they are generally scented, but the whole plant has an

Fig. 2. — Diagram of flower of Umbelliferae.

odour from the general presence in the tissues of an ethereal oil or resin. The flower is widely open, the petals and stamens radiating from the central disk (fig. 3, d), on which honey is secreted, and is thus acces- sible to quite short-lipped flies. Cross- pollination is rendered necessary by the flowers being generally markedly proter- androus; the stamens throughout the umbel have generally shed their pollen before the stigmas have begun to be functional even in the outer flowers.

The fruit is again very characteristic ; a schizocarp which splits down the septum to form two dry one-seeded mericarps which are at first attached to, or pen- dulous from, an entire or split central axis or carpophore (fig. 3). The form of the mericarp affords valuable characters for distinguishing genera. On the outer surface of each are generally 5 ridges (primary ridges), between which are sometimes 4 secondary ridges; oil-cavities, viltae, are often present in the intervening furrows.

The fruits are variously adapted for _ m| s ^ ^

distribution ; they are sometimes thin and Book"of Botany,

by^pe'raksiaa fiat as in Heracleum, when they are easily of Swan, Soanenschein & Co.)

carried by the wind, or, as in carrot, pro- p IG , ^ Pistil – B

vided with hooks. The seed contains a small Fruit of the' Carawav embryo embedded in oily endosperm, – - –

which is usually cartilaginous in texture.

The order is divided into 9 tribes de- pending on the form of the fruit, whether compressed, angled, grooved, constricted, &c, and the presence or absence of vittae. The 35 British genera include represen- tatives of 7 of the tribes. The following may be mentioned : Hydrocotyle (penny- wort), Eryngium (sea-holly). Sanicula (sanicle), Conium (hemlock, q.v.), Smyr- nium (Alexanders), Bupleurum (hare's-ear), Apium (celery, q.v.), Carum (caraway, q.v.), Conopodium or Buniunt (earth-nut, q.v.), Myrrhis (Cicely), Chaerophyllum (chervil), Foeniculum (fennel, q.v.), Crithmum (samphire), Oenanthe (water dropwort), Aethusa

(From Vines's Student's Text

(Carum Carui) ; en- larged.

d, epigynous disk; /, ovary; n, stigma; p, pedicel. In B the two carpels have separated so as to form two meri- carps (m). Part of the septum constitutes the carpophore (a).

Fig. 4. — Water Dropwort, Oenanthe crocata, with thickened root

fibres, about half nat. size.

1, Flower; 2 and 3, Side and front view of fruit; enlarged.

(fool's parsley, q.v.), Angelica (q.v.), Peucedanum (hog's fennel, parsnip, q.v.), Heracleum (hogweed;, Daucus (carrot). Fetroselinum sativum is common parsley (q.v.).

UMBER, a brown mineral pigment consisting of hydrated iron and manganese oxides. The finely-powdered mineral is known

as raw umber; when calcined the beauty of the colour increases and the pigment is known as burnt umber. It was probably first obtained from Umbria in Italy, but it occurs in many localities, notably in Cyprus (Turkey umber); large quantities of English umber are mined in Devonshire and Cornwall. (See Pigments.)

UMBRA (Lat. for shade or shadow), in astronomy, the completely dark portion of the shadow of a heavenly body, filling the space within which the sun is entirely hidden. The body being supposed spherical, the umbra is a cone circumscribing both the sun and the body that casts the shadow. The term is also given to the interior and darkest part of a sunspot. (See Sun; Eclipse.)

UMBRELLA, a portable folding protector from rain (Fr. parapluie), the name parasol being given to the smaller and more fanciful article carried by ladies as a sunshade, and the en-tout-cas being available for both purposes. Primarily the umbrella (ombrella, Ital. dim. from Lat. umbra, shade) was a sunshade alone — its original home having been in hot, brilliant climates. In Eastern countries from the earliest times the umbrella was one of the insignia of royalty and power. On the sculptured remains of ancient Nineveh and Egypt there are representations of kings and sometimes of lesser potentates going in procession with an umbrella carried over their heads; and throughout Asia the umbrella had, and still has, something of the same significance. The Mahratta princes of India had among their titles " lord of the umbrella." In 1855 the king of Burma in addressing the governor-general of India termed himself " the monarch who reigns over the great umbrella-wearing chiefs cf the Eastern countries." The baldachins erected over ecclesiastical chairs, altars and portals, and the canopies of thrones and pulpits, &c, are in their origin closely ■ related to umbrellas, and have the same symbolic significance. In each of the basilican churches of Rome there still hangs a large umbrella.

Among the Greeks and Romans the umbrella (erKtds,

" And, like umbrellas, with their feathers Shield you in all sorts of weathers."

Although it was the practice to keep an umbrella in the coffee-houses early in the 18th century, its use cannot have been very familiar, for in 1752 Colonel Wolfe, writing from Paris,

mentions the carrying of them there as a defence against both rain and sun, and wonders that they are not introduced into England. The traveller Jonas Hanway, who died in 1786, is credited with having been the first Englishman who habitually carried an umbrella.

The umbrella, as at first used, was based on its Eastern prototype, and was a heavy, ungainly article which did not hold well together. It had a long handle, with ribs of whalebone or cane, very rarely of metal, and stretchers of cane. The jointing of the ribs and stretchers to the stick and to each other was very rough and imperfect. The covering material consisted of oiled silk or cotton, heavy in substance, and liable to stick together in the folds. Gingham soon came to be substituted for the oiled cloth, and in 1848 William Sangster patented the use of alpaca as an umbrella covering material. One of the most notable inventions for combining lightness, strength and elasticity in the ribs of umbrellas was the " Paragon " rib patented by Samuel Fox in 1852. It is formed of a thin strip of steel rolled into a U or trough section, a form which gives great strength for the weight of metal. Umbrella silk is chiefly made at Lyons and Crefeld; much of it is so loaded that it cuts readily at the folds. Textures of pure silk or of silk and alpaca mixed have better wear-resisting properties.

UMBRIA ('OtifipiKri), the name of an ancient and a modern district of Italy.

1. The ancient district was bounded in the period of the Roman supremacy by the Ager Gallicus (in a line with Ravenna) on the N., by Etruria (the Tiber) on the W., by the Sabine territory on the S. and by Picenum on the E. The Via Flaminia passed up through it from Ocriculum to Ariminum; along it lay the important towns of Narnia (Narni) Carsulae, Mevania (Bevagna), Forum Flaminii, Nuceria Camellaria (Nocera) and Forum Sempronii; and on the Adriatic coast Fanum Fortunae (Fano) and Pisaurum (Pesaro). To the east lay Interamna (Terni), Spoletium (Spoleto), Fulginium (Foligno — on a branch of the Via Flaminia which left the main road at Varina and rejoined it at Forum Flaminii) and the important town of Camerinum on the side of the Apennines towards Picenum. On the side towards Etruria lay Ameria (Amelia) and Tuder (Todi), both on the direct road from Rome to Perusia, 1 Iguvium, which occupied a very advantageous position close to the main pass through the Apennines, and Hispellum (Spello).

Not far off was Assisium (Assisi), whilst far to the north in the mountains lay Sarsina. Under the empire it formed the sixth region of Italy. In earlier times it embraced a far larger area. Herodotus (iv. 49) describes it as extending to the Alps, and the irepioBos ascribed to Scylax (a treatise which embodies material of the 4th century B.C. or earlier) makes Umbria conterminous with Samnium. Furthermore, place-names of undoubted Umbrian origin abound in Etruria and are also found in the Po valley. Thus in the early days of Italian history Umbria may be taken as having extended over the greater part of northern and central Italy.

The name Umbria is derived from the Umbri, one of the chief constituent stocks of the Italian nation. The origin and ethnic affinities of the Umbrians are still in some degree a matter of dispute, but their language proves them to have been an Aryan people closely allied with the Oscans and in a remoter degree with the Latins. Archaeological considerations further show with approximate certainty that the Umbri are to be identified with the creators of the Terramara (q.v.), and probably also of the Villanova (q.v.), culture in northern and central Italy, who at the beginning of the Bronze Age displaced the original Ligurian population by an invasion from the north-east. From the time and starting-point of their migrations, as well as from their type of culture, it may be provisionally inferred that the Umbrians were cognate with the Achaeans of prehistoric Greece. Pliny's statement (iii. 13, 19) that they were the most ancient race of Italy may certainly be rejected.

The process by which the Umbrians were deprived of their predominance in upper and central Italy and restricted to their confines of historic times cannot be traced in any detail. A tradition declares that their easternmost territory in the region of Ancona was wrested from them by the Picentes, a branch of the Sabine stock. It may also be conjectured that they were partly displaced in the valley of the Po by the Gaulish tribes which began to pour acioss the Alps from about 500 B.C. But their chief enemies were undoubtedly the Etruscans. These invaders, whose encroachments can be determined by archaeological evidence as proceeding from the western seaboard t6wards the north and east, and as lasting from about 700 to 500 B.C., eventually drove the Umbrians into that upland tract athwart the Apennines to which the name of Umbria belonged in historical times. In the course of this struggle the Etruscans are said to have captured 300 Umbrian

towns. Nevertheless the Umbrian element of population does not seem to have been eradicated in the conquered districts. Strabo records a tradi- tion that the Umbrians recovered their ground in the plain of the Po at the expense of the Etruscans, and states that the colonies subsequently founded in this region by the Romans contained large Umbrian contingents. In Etruria proper the persistence of the Umbrian stock is indicated by the survival of numerous Umbrian place-names, and by the record of Um- brian soldiers taking part in Etruscan enterprises, e.g. the

1 The geographers make this road go round by Vettona (mod. Bettona) between Tuder and Perusia, instead of following the more direct modern line.

attack on Cumae in 524 B.C. Indeed it is not unlikely that the bulk of the population in Etruria continued to be of Umbrian origin, and that the Romanization of this country was facilitated by the partial absorption of the Etruscan conquerors into the Umbrian multitude.

Against the Romans the Umbrians never fought any wars of importance, a fact which may be explained partly by the remote- ness of their position, but chiefly by the common hostility of the two nations to the Etruscans. After the downfall of the Etrus- can power they made a belated attempt to aid their Samnite kinsmen in their decisive struggle against Rome (308 B.C.); but their communications with Samnium were impeded by the foundation of a Roman fortress at Narnia (298 B.C.), and at the great battle of Sentinum (295 B.C.), which was fought in their own territory, the Umbrians are not reported to have lent the Samnites any substantial help. It is perhaps on account of this defection that in 200 B.C. they received from the Romans a portion of the Ager Gallicus reconquered from the Senonian Gauls. They offered no opposition to the construction of the Via Flaminia through the heart of their country, and in the Second Punic War withheld all assistance from Hannibal. In the Social War (90-89 B.C.), they joined the rebels tardily and were among the first to make their peace with Rome. Henceforth the Umbrians no longer played an independent part in Italian history.

The material prosperity of Umbria, in spite of its unfavourable position for commercial intercourse, was relatively great, owing to the fertility of the numerous small valleys which intersect the Apennine system in this region. The chief products of the soil were olives, vines and spelt; the uplands harboured the choicest boars of Italy. In Pliny's time there still existed in Umbria 49 independent communities, and the abundance of inscriptions and the high proportion of recruits furnished to the imperial army attest its continued populousness. Among its most famous natives were the poets Plautus (b. at Sarsina) and Propertius (b. at Assisi).

Of the Umbrians' political and municipal organization little is known. In addition to the city (lota) they seem to have had a larger territorial division in the tribus (trifu, ace.) as we gather from Livy (xxxi. 2, " per Umbriam quam tribum Sapiniam vocant " ; cf. xxxiii. 37) and from the Eugubine Tables (" trifor Tarsinates," vi. B. 54). Ancient authors describe the Umbrians as leading effeminate lives, and as closely resembling their Etruscan enemies in their habits (Theopompus, Fragm. 142; Pseudo-Scymnus, 366-368). It is almost certain that each race influenced and modified the other to a large extent. There is conclusive proof of strong Etruscan influences in Umbria. For instance, they undoubtedly borrowed their alphabet and the art of writing from the Etruscans. Their writing ran from right to left. The alphabet consisted of nineteen letters. It had no separate symbols for O, G, Q; the aspirates and X were wanting; on the other hand, it possessed forms for Z and V, and had likewise the Etruscan / (8). It also had a symbol peculiar to itself for expressing the sound of palatal k when followed by either e or /. The fact that it is only in towns on the side next Etruria, e.g. Tuder and Iguvium, that a coinage is found indicates that they borrowed the art of minting from that quarter. The Umbrians counted their day from noon to noon. But whether they borrowed this likewise from the Etruscans we do not know (Pliny ii. 77). In their measuring of land they employed the vorsus, a measure common to them and the Oscans (Frontinus, De Limit, p. 30), 3 1 of which went to the Roman jugerum.

See Strabo bk. v. ; T. E. Peet, The Stone and Bronze Ages of Italy and Sicily (Oxford, 1909), pp. 492-510; B. V. Head, Historia numorum (Oxford, 1887) ; B. Nissen, Italische Landeskunde; Bilcheler, Umbrica (1883) ; R. S. Conway, Italic Dialects. . (M. O. B. C.)

2. The modern territorial division is situated in the middle of the peninsula, between Tuscany and the Marches on the N. and E., and Rome and the Abruzzi on the S. and W., and comprising the one province of Perugia, with an area of 3748 sq. m.; pop. (1901), 675,352. Umbria and the two provinces of Ancona and Pesaro and Urbino taken together form an area slightly xxvii. 19

more extensive than that of the sixth region of Augustus. The surface is mountainous, but affords good pasture, and there are numerous fertile valleys. Many treasures of art and architec- ture are preserved, and Umbria is in this respect one of the most interesting regions of Italy (see Perugia). Modern Umbria formed down to i860 a part of the States of the Church.

Two main lines of railway run through the territory. That from Florence to Rome skirts the borders of the province on the west, running north and south, while the Rome-Ancona runs across the province from north-east to south-west. The cross communication is given by three branch lines. In the north a narrow gauge line from Arezzo to Fossato passes through Gubbio. Perugia, the capital of the province, stands on the line from Terontola to Foligno, while on the extreme south a line passing through Rieti and Aquila, and ultimately reaching Sulmona, starts from Terni on the Rome- Ancona line. (T. As.)

UMFRAVILLE, the name of an English baronial family, derived from Amfreville in Normandy. Members of this family obtained lands in Northumberland, including Redesdale and Prudhoe, from the Norman kings, and a later member, Gilbert de Umfraville (d. 1245), married Matilda, daughter of Malcolm, earl of Angus, and obtained this Scottish earldom. Gilbert's son, Gilbert, earl of Angus (c. 1 244-1307), took part in the fighting between Henry III. and his barons, and in the Scottish expeditions of Edward I. His son, Robert, earl of Angus (1277-1325), was taken prisoner by the Scots at Bannockburn, but was soon released, though he was deprived of the earldom of Angus and of his Scottish estates. His son and heir, Gilbert de Umfraville (1310-1381), claimed the earldom, which he hoped to gain by helping Edward Baliol to win the Scottish crown, but he failed, and on his death without issue the greater part of his English estates passed to his niece, Eleanor, the wife of Sir Henry Talboys (d. 1370), while others, including Redesdale, Harbottle and Otterbourne, came to his half-brother, Sir Thomas de Umfraville (d. 1386). Sir Thomas's son, another Sir Thomas de Umfraville (1362-1391), left a son, Gilbert de Umfraville (1390-1421), who fought on the Scottish border and in France under his warlike uncle, Sir Robert de Umfraville (d. 1436). Although not related in blood he appears to have inherited the estates in Lincolnshire of the Kyme family, and he was generally known as the earl of Kyme, though the title was never properly conferred upon him. In 141 5 he fought at Agin- court; he was afterwards sent as an ambassador to Charles VI. of France, and arranged an alliance between the English and the Burgundians. He was killed at the battle of Bauge on the 22nd of March 142 1. His heir was his uncle Sir Robert, who died on the 29th of January 1436, when the male line of the Umfraville family became extinct. The

chronicler John Hardyng was for many years in the service of Sir Robert, and in his Chronicle he eulogizes various members of the family.

UMPIRE, the term used, like " referee," for a person appointed by consent to settle disputes arising between opposing parties, and particularly one chosen to see that the rules of a game are obeyed. The word itself stands for the Middle English nompere or noumpere, " a numpere " becoming " an umpire." The earlier form represents the Old French nompere, nonpair, i.e. not equal, odd. The Latin impar, unequal, was similarly used in the sense of " arbitrator."

UMRA KHAN, of Jandol (c. 1 860-1 903), a Pathan chief on the north-western frontier of India, who was chiefly responsible for the Chitral Campaign of 1895. He was the younger son of the khan of Jandol; but he killed his elder brother, seized the throne, and made himself a power on the frontier. In 1894 he held undisputed sway over almost the whole of Bajour, when his restless ambition caused him to interfere in the internal affairs of Chitral. He instigated Amir-ul-Mulk, a half-witted brother of the Chitral chief, to murder his brother Nizam-ul-Mulk, and then threw over the fratricide and supported the claims of his uncle Sher Afzul to the throne. The government of India intervened and ordered Umra Khan to leave Chitral. When he refused, the Chitral Expedition was despatched (see Chitral) ; Umra Khan was driven into exile in Afghanistan, and died there in 1903.

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UNAO— UNEMPLOYMENT

UNAO, a town and district of British India, in the Lucknow division of the United Provinces. The town is 10 m. N.E. of Cawnpore, on the Oudh and Rohilkhand railway. Pop. (1901),

13,109.

The District of Unao has an area of 1792 sq. m. It consists of a fiat alluvial plain, lying north of the Ganges. Rich and fertile tracts, studded with groves, alternate with stretches of waste land and plains of barren usar, the whole being intersected by small streams, used for irrigation. The Ganges is the only navi-

gable river in the district, while the Sai forms its north-eastern boundary. The temperature varies from about 75° to 103° in the hot season and from 46° to 79 in the cold season. The annual rainfall averages about 35 in. Pop. (1901), 976,639, showing an increase of 2-4% in the decade. The principal crops are barley, wheat, pulses, rice and millets, with some cotton, sugar-cane and poppy. The district is crossed by the i main line of the Oudh & Rohilkhand railway.

During the Mutiny of 1857-58 Unao was the scene of several severe engagements between General Havelock's little army and the rebels on his march to relieve Lucknow. Gn the death of Raja Jasa Singh, one of the leading rebels, and the capture of his two sons, the family estates were confiscated, and the villages either restored to their former owners or given to other landholders for their loyalty.

See Unao District Gazetteer (Allahabad, 1903). UNCLE, the brother of a person's father or mother, also the husband of one's aunt (i.e. the sister of a father or mother). The French oncle, which appears in Anglo-French as uncle, comes from a Late Latin unculus, a shortened form of the Latin avun- culus, a maternal uncle, the brother of one's mother. The word is a diminutive of avus, grandfather. The Latin for a paternal uncle is patruus. " Aunt" comes through the Old French aunte, ante, corrupted into the modern tante, from Latin amita, a father's sister, a paternal aunt, the maternal aunt being called matertera. UNCTION (Lat. unctio, anointing, ungere, unguere, to smear with ointment, to anoint; cf. " ointment," O.Fr. oignement, from oigner, mod. oindre, to anoint), the act of pouring, or rubbing oil, ointment or salve over or on to a person or object. The term is particularly used of the ceremonial practice of anointing with oil or unguents (see Anointing). The sacrament of the anointing of the sick in the Roman church is treated under Extreme Unction. The use of the term for religious fervour in speech has degenerated into its common meaning of exag- gerated sentiment.

UNDER-CROFT, in architecture, a synonym for crypt (q.v.), a vaulted chamber under ground.

UNDERWRITER, one who insures ships and their cargoes from loss and damage, so called from his writing his name under the document or policy of insurance. A request to an under- writer to insure is termed the offering of a " risk," and the word risk

in marine insurance is equivalent to the liability of an underwriter under a contract. When the risk is divided up among several underwriters, each signs his name individually, putting opposite thereto the amount for which he accepts liability. Each signature has the effect of making a separate contract, in the terms of the policy, for the amount set opposite the name of the underwriter. (See Insurance: Marine.)

UNEMPLOYMENT, a modern term for the state of being unemployed among the working-classes. The social question involved is intimately bound up with that of relief of the poor, and its earlier history is outlined in the article Charity and Charities. It is more particularly within the 20th century that the problem of unemployment has become specially insistent, not by reason of its greater intensity — for it is open to considerable doubt whether, comparatively speaking, there was not more unemployment in the organized industrial communities of the early middle ages — but because the greater facilities for publicity, the growth of industrial democracy, the more scientific methods applied to the solution of economic questions, the larger humanitarian spirit of the times all demand that remedies differing considerably from those of the past should at least be tried. In most civilized countries attempts

have been made to solve this or that particular phase of the problem by improved methods. There is, however, always a great difficulty in knowing the extent of unemployment even in any one particular country. No census has ever been taken in any country of those of the whole population who were employed and unemployed on any particular day, and even if it were possible to take such a census modern conditions of industry might render its results valueless almost imme- diately after. It would be complicated, too, by having of necessity to include the shiftless and unemployable sections of the population, as well as those on the borderland of employ- ment (those who are worth some sort of wage in times of pres- sure), while at the same time it would be necessary, to make the census of practical value, to obtain returns of the demand for labour, in order to value the true character of the supply. Such statistics are obtainable possibly only in theory, but every country makes an endeavour to obtain statistics of a sort. In England the Board of Trade, for example, has com- piled valuable memoranda on the percentages of unemployment in the more important trade union groups of trades, which may be

taken as a measure of unemployment in the more highly organized industries; while other memoranda throwing light on the subject deal with the amount of time lost by workpeople through want of employment and other causes; with cyclical trade depressions; the extent to which female labour has displaced adult male labour of late years; seasonal industries and industries carried on by casual labour; emigration and immigration, &c, all intimately bound up with the study of the problem. The statistics issued by the Labour Bureaus of many of the states in the United States are of considerable value, in particular, those of Massachusetts, New Jersey, New York, Connecticut and Wisconsin. Germany, France and Belgium also publish statistics, but like the figures of other countries, they far from represent the actual state of unemployment.

The actual causes of unemployment in any one country' will always remain to a certain extent controversial, as will the comparative weight to be assigned to each cause. Putting aside the much disputed theories of economists as to the causes of cyclical depressions of trade, there are certain well-observed facts which present themselves in connexion with the question of unemployment, and to each one of them some contributory portion of blame may be assigned. These facts causes of may be classified as (a) those over which the worker Vnempioy has no control, and (b) those which may be said menU to lie in the worker himself. Some of those under (a), of which it is impossible to give more than the more obvious examples, have, of course, been operating, especially in the United Kingdom, sometimes potently, sometimes slowly and almost unnoticed, over a long range of years. They are seasonal industries and industries carried on by casual labour. There are many industries affected by certain states of the weather or by the changes of the seasons, as the building and allied trades, the furriers' trade, confectionery trades, &c. But more impor- tant are those industries which depend largely in times of pressure on casual and unskilled labour, such as port and riverside work of all kinds, construction works and to a certain extent the iron and steel industries. Then there are a number of skilled trades which have about them continually a fringe of casual labour, for which employment is very intermittent.

To quote from the report of the British Royal Commission on the Poor Laws (1909): —

" The class of under-employed includes not merely the whole of

the men in such occupations as dock and wharf labour and market porters, and a waxing and waning share of the lower grades of the building operations, but also a very extensive fringe of men more or less attached to particular industries, and working at them only by way of brief and casual jobs. " To go in " for one half-day, one day, two, three, four or five days out of the five and a half is common to bootmaking, coopering, galvanizing, tank-making, oil pressing, sugar boiling, piano-making, as it is to dock-labouring, stevedoring, crane-lifting, building. Some trades, like that of the London bakers, regularly employ more men on one or two days of the week than on others. In London a large body of men is always required fof the Friday night baking when the work in preparation for Saturday and Sunday is we are told, exceedingly heavy. The usual hours of

working are fifteen or sixteen instead of the ten of other nights and twice as many men are required. These Friday night men, many hundreds in number, pick up odd jobs the rest of the week. At the factory gates every night during the week, a number of men are always hanging about ready to be taken on in an emergency, or to fill the ptace of any man who, according to a very common custom, has " taken a night off." In busy marketing neighbourhoods, a whole class of butchers' assistants are engaged only for Fridays and Saturdays. Analogous arrangements exist in many other trades. Moreover, in every trade there are men whom the employer takes on only when he has a sudden and temporary press of business. They may be the " glut men " of the customs department or the Christmas hands of the post office. Every tramway undertaking, municipal or commercial, has its reserve of extra drivers, conductors, yard-men, washers, &c, who get a day's work now and then when they are wanted. At Liverpool, and indeed in all large towns, there is a whole class of casual carmen, who are taken on for the job as required."

Then there are the accidental circumstances which incidentally produce unemployment, such as the displacement of labour by the progress of invention and improvement. The example of the distress brought upon the hand-loom weavers by the invention of the power-loom is only one of many, but

the process is continually going on. The change, for example, from horse carriages to motor cars has brought much unemployment in its train. Then there is the unemployment due to decaying or declining trades, brought about through a persistent falling off of the demand, or through some change of process or of fashion; the removal of an industry from one place to another, the displacement of adult labour by that of women and boys, the continuous migration of unskilled labour from the country to the towns, and the depression in general trade caused by the occurrence of something unfore- seen, as war. Then too, there are to be added the numberless frictions of industrial life, all contributing their quota to unemployment, such as the bankruptcy of an employer, changes in management, the arbitrariness of a foreman, &c. There are also what may be termed the political causes of unemployment, which depend on the commercial policy of the nation, in so far as it adopts Free Trade or Protection.

Recognizing the existence of the problem of unemployment, and putting aside the possibility of knowing exactly its extent, Remedies we have to consider the remedies which have been lor Uaem- advanced for its solution. These may be classified pioyment. as temporary and permanent. Temporary expedients, whether in the nature of voluntary relief by individuals or organized societies, or on the larger scale of municipal or state organized relief works, more properly fall under the description of charity (see Charity and Charities). Two particular methods of permanent remedy, however, are especially favoured. The first of these is the establishment of a system of labour exchanges, national in character if pos- sible, by which it is claimed that machinery would at once be set in motion for assisting that mobility which is so effective for the proper utilization of labour and which, even with the modern facilities for travel, labour so lacks at the present time. Labour exchanges would also, it is argued, facilitate the collection of data for the enumeration

Labour Exchanges.

and classification of the unemployed. Labour exchanges have been long established in Germany. " There is a network of labour exchanges of various types. The most important … are the public and municipal exchanges. There are over 200 such, among the 700 odd exchanges, filling now 150,000 places a month, which report regularly to the imperial statistical

officer. Practically there is a public general exchange in every town of over 50,000 inhabitants, and in a very large proportion of the smaller towns. Most of the public labour exchanges date from 1894 to 1896 or received a fresh impulse then" (Report of Commission on Poor Laws, 1909). The causes of the success of the German system of labour exchanges 1 are attributed by the Poor Law Commis- sioners to (a) the high standing given to the movement by the 1 The German system of labour exchanges is exhaustively dealt with in Report to the Board of Trade on Agencies and Methods for Dealing with the Unemployed in certain Foreign Countries, by D. F. Schloss (1904).

advocacy and practical assistance of all public authorities, town councils, state governments, imperial government, &c; (b) the association through combined committees of employers and employees in the management of the exchanges; (c) the unequivocal character of the exchanges as industrial and not relief institutions; (d) the excellent arrangements for the use of telephonic, telegraphic and postal facilities by the ex- changes, and («) the preferential railway fares for men sent to a situation. •

An attempt was made in England to start labour exchanges by the Labour Bureaux (London) Act 1902, which gave metro- politan boroughs power to establish and maintain bureaux, to be paid for out of the general rate. Before this act, however, certain municipalities here and there had made experiments in the way of exchanges, but they were never very successful, for they had no knowledge of what they intended to do; they were not properly staffed; they were hampered by bad rules; they were nearly all started in times of depression, exactly the wrong time to start a labour exchange, the time to start it being when trade is going up. The act of 1902 was a failure because it merely permitted, and did not compel borough councils to establish bureaux, and consequently only a very small part of the metropolis was covered, and there was no interchange of ideas amongst those established. However, a fresh attempt was made to establish exchanges over a greater part of the United Kingdom by the Labour Exchanges Act 1909. The Labour Exchanges Act defines a labour exchange as any office or place used for the purpose of collecting and furnishing information, either by the keeping of registers or otherwise, respecting employers who desire to engage work- people and workpeople who seek engagement or employment. The act gave the Board

of Trade power to establish and maintain labour exchanges in such places as they might think fit, and to collect and furnish information to employers and work- people. An important provision of the act was the authoriza- tion of advances by way of loan towards meeting the expenses of workpeople travelling to places where employment is found for them through a labour exchange. The regulations of the exchanges provide that no person shall suffer any disqualifi- cation or be otherwise prejudiced on account of refusing to accept employment found for him through a labour exchange where the ground of refusal is that a trade dispute which affects his trade exists, or that the wages offered are lower than those current in the trade in the district where the employment is found. The act also empowers the Board of Trade to establish advisory committees in connexion with the exchanges and imposes penalties for making false statements for the purpose of obtaining employment or procuring workpeople. For the carrying out of the act the whole of the United Kingdom was mapped out into divisions, with a divisional inspector at the head of each. In all the more important towns of each division exchanges were established, classified according to the popula- tion of the town. All the exchanges a/e in telephonic com- munication either with each other or with a divisional clearing- house, the divisional clearing-house in turn being in com- munication with a central clearing-house in London. The advantage of the English system of labour exchanges will be found in the fact that it is a national system, with the sup- port of the state behind it. Unless, as has been proposed, it is made compulsory in all large trades, much of its success will depend on the patronage extended to it by employers, which in its turn must be justified by the efficiency of the service rendered. Patronage by government and municipal authori- ties, while making an imposing addition to the returns of situations found, will not necessarily be an effective guarantee that the true objects of the exchanges are being fulfilled.

The German labour registries are of seven principal types: the; private registry office, maintained by ordinary agents for purposes of gain, and occupying itself chiefly with the placing of domestic servants; the travellers' homes and relief stations, which endeavour to find situations for their inmates — their success is not great, as the better elements of the labouring classes avoid them; trade union registries maintained by trade unions to assist their members in

obtaining employment; gild labour registries or associations of employers (mainly small employers) for the promotion of the in- terests of the trade in which they are engaged; agricultural labour registries maintained in different parts of Germany by the chambers of agriculture; employers' labour registries, established as a counter- move against the trade union registries — they are chiefly in indus- tries employing large capital, particularly the metal industries; and public labour registries, established either by voluntary associa- tions or by municipalities. These latter have been very successful and have provided the model for the English registries. In Austria labour registries have also been established on the German model by many district and municipal authorities, those of Vienna and Prague being especially successful. Switzerland has a few registries established by public authorities, notably those at Basel, Bern, Schaffhausen and Zurich. In Belgium there are a considerable number of public registries, some established by associations, some philanthropic, some political, some organized by employers, some by employees, some jointly by employers and employed. Some of these registries are in receipt of subventions granted by municipali- ties, while in a few cases the municipalities themselves have started registries. In France labour registries are of many types. There are the ordinary registry offices, carried on for gain, and requiring a licence from the municipal authorities. They are very numerous and according to returns to the French Labour Department fill over 1,000,000 situations yearly in various occupations. There are also registries maintained by trade gilds, by individual trade unions, by a number of trade unions jointly, by joint associations of employers and employed, by associations of employers, by friendly societies, by philanthropic institutions and by municipalities. These last are being rapidly increased, and will without doubt eventually supersede all the others. In the United States the states of Colorado, Connecticut, Illinois, Kansas, Maryland, Massachusetts, Michigan, Minnesota, Missouri, Nebraska, Ohio, West Virginia and Wisconsin have established free public employment offices, and in many of the other states the private registries are under strict supervision and licensing.

The second permanent remedy is that of insurance against

unemployment. Certain schemes have been tried in Switzer- lasuraace land, notably the voluntary municipal scheme of against Berne, the compulsory municipal scheme of St Gall Uoempioy- anc i a trade union scheme at Basel, 1 while there is in Germany a system of insurance against sickness, accident and incapacity (see Germany). Much attention has been devoted in England to the possibilities of insurance against unemployment, and in 1910 a scheme was being worked out by the government with a view to its discussion by parlia- ment in 191 1. The lines on which such a scheme must work were clearly laid down by Sir H. Llewellyn Smith, the permanent secretary to the Board of Trade, in his presidential address to the Economic Science and Statistics section of the British Association at Sheffield in September 1910.

" The crucial question from a practical point of view," said Sir H. Llewellyn Smith, " is whether it is possible to devise a scheme of insurance which, while nominally covering unemployment due to all causes other than those which can be definitely excluded, shall automatically discriminate as between the classes of unemploy- ment for which insurance is or is not an appropriate remedy. We can advance a step towards answering this crucial question by enu- merating some of the essential characteristics of any unemployment insurance scheme which seem to follow directly or by necessary implication from the conditions of the problem as here laid down.

" 1 . The scheme must be compulsory ; otherwise the bad personal risks against which we must always be on our guard would be certain to predominate.

" 2. The scheme must be contributory, for only by exacting rigorously as a necessary qualification for benefit that a sufficient number of weeks' contribution shall have been paid by each recipient can we possibly hope to put limits on the exceptionally bad risks.

"3. With the same object in view there must be a maximum limit to the amount of benefit which can be drawn, both absolutely and in relation to the amount of contribution paid ; or, in other words, we must in some way or other secure that the number of weeks for which a workman contributes should bear some relation to his claim upon the fund. Armed with this double weapon of a maximum limit to benefit and of a

minimum contribution, the operation of the scheme itself will automatically exclude the loafer.

" 4. The scheme must avoid encouraging unemployment, and for this purpose it is essential that the rate of unemployment benefit payable shall be relatively low. It would be fatal to any

*1 For a detailed description of these schemes see G. Schanz, Zur Frage der Arbeitslosen-Versicherung (Bamberg, 1895); Neue Beitrdge zur Frage der Arbeitslosen-Versicherung (Berlin, 1897), and Dritter Beitrag zur Frage der Arbeitslosen-Versicherung und der Bekdmpfung der Arbeitslosigkeit (Berlin, 1901)**

scheme to offer compensation for unemployment at a rate approxi- mating to that of ordinary wages.

" 5. For the same reason it is essential to enlist the interest of all those engaged in the insured trades, whether as employers or as workmen, in reducing unemployment, by associating them with the scheme both as regards contribution and management.

" 6. As it appears on examination that some trades are more suitable to be dealt with by insurance than others, either because the unemployment in these trades contains a large insurable element, or because it takes the form of total discharge rather than short time, or for other reasons, it follows that, for the scheme to have the best chance of success, it should be based upon the trade group, and should at the outset be partial in operation.

" 7. The group of trades to which the scheme is to be applied must, however, be a large one, and must extend throughout the United Kingdom, as it is essential that industrial mobility as between occupations and districts should not be unduly checked.

" 8. A state subvention and guarantee will be necessary, in addi- tion to contributions from the trades affected, in order to give the necessary stability and security, and also in order to justify the amount of state control that will be necessary.

" 9. The scheme must aim at encouraging the regular employer and workman, and discriminating against casual engagements. Otherwise it will be subject to the criticism of placing an undue

burden on the regular for the benefit of the irregular members of the trade.

" 10. The scheme must not act as a discouragement to voluntary provision for unemployment, and for that purpose some well-devised plan of co-operation is essential between the state organization and the voluntary associations which at present provide un- employed benefit for their members. Our analysis, therefore, leads us step by step to the contemplation of a national contributory scheme of insurance, universal in its operation within the limits of a large group of trades — a group so far as possible self-contained and carefully selected as favourable for the experiment, the funds being derived from compulsory contributions from all those engaged in these trades, with a subsidy and guarantee from the state, and the rules relating to benefit being so devised as to discriminate effectively against unemployment which is mainly due to personal defects, while; giving a substantial allowance to those whose unemployment results from industrial causes beyond the control of the individual. Is such a scheme practicable? This is a question partly actuarial, partly administrative, and partly political. I may say that so far as can be judged from such data as exist (and those data are admittedly imperfect and rest on a somewhat narrow basis) a scheme framed on the lines I have indicated is actuarially possible, at least for such a group of trades as building, engineering and shipbuilding."

In addition to insurance against unemployment by the state, there are various voluntary associations, such as friendly societies and trade unions, which make a feature of grants to their members when out of employment.

In September 1910 the first International Conference on Unemployment was convened in Paris, the subjects of statistics of unemployment, labour registries and state insurance being the chief topics. The outcome of the conference was the formation of a society to study all phases of the problem, and to keep in touch with public and private bodies and the various governments.

Authorities. — Report of Royal Commission on Labour (1894); Report of House of Commons Committee on Distress from Want of Employment (1895); Report of Royal Commission on Poor Laws (1909) \ Report ol the Massachusetts Board to Investigate the Subject of the Unemployed. The following

recent books will be found useful: P. Alden, The Unemployed (1905); W. H. Beveridge, Un- employment: A Problem of Industry (1909); N. B. Dearie, Problems of Unemployment in the London Building Trades (1909) ; J. A. Hobson, The Problem of the Unemployed (1904) ; F. W. Lewis, State Insurance a Social and Industrial Need (1909) ; D. F. Schloss, Insurance Against Unemployment (1909) ; F. I. Taylor, A Bibliography of Unemployment and the Unemployed (1909). (T. A. I.)

UNGAVA, an unorganized territory of the Dominion of Canada, including the north-western side of the peninsula of Labrador (q.v.), bounded by Hudson Bay on the W. as far S. as East Main River; Hudson Strait and Ungava Bay on the N.; and with indefinite boundaries toward Quebec on the S., and the coast strip of Labrador belonging to New- foundland on the E. The area is estimated at 354,961 sq. m. Ungava includes much of the lower portion of Labrador, with a rim of recent marine deposits along its western coast, but the interior has the usual character of low rocky hills of Archean rocks, especially granite and gneiss, with a long band of little disturbed iron-bearing rocks, resembling the Animikie, or Upper Huronian of the Lake Superior region, near its eastern

side. Along Hudson Bay shore there is a strip of similar rocks, and a long row of small islands of the same age, with great sheets of trap or diabase forming the tops of the hills. The iron formation is widely spread. There is evidence that Ungava, like the rest of Labrador, has risen several hundred feet since the Ice Age, marine beaches being found up to 700 ft. on the Hudson Bay side; and it is interesting to find seals like those of the adjoining seacoasts in the Seal Lakes 100 m. inland and 800 ft. above the present sea-level. Owing to its northerly position a large part of Ungava is treeless, and belongs to the barren grounds where caribou roam and feed on the so- called caribou moss, a greyish lichen.

UNGULATA, the name of an order of placental mammals in which the terminal joints of the toes are usually encased in solid hoofs or covered with broad hoof-like nails, while the molar (and not unfrequently some or all of the premolar) teeth

have broad tuberculated crowns adapted for crushing vegetable substances. The teeth (when all are present) are differentiated into the usual four series; and milk-teeth, not completely discarded till the full stature is attained, are in- variably developed. All the existing members of the group are eminently adapted for a terrestrial life, and in the main for a vegetable diet. Though a few may in some circumstances kill living creatures smaller than themselves for food, none are habitually predaceous. In none of the existing, and in but few of the extinct types, are collar-bones, or clavicles, developed; and the scaphoid and lunar bones of the carpus are separate. The typical ungulates are the members of the suborders Artiodactyla and Perissodactyla (g.v.), in both of which the bones of the foot articulate with each other by means of groove-and-tongue joints, whence the name of Dip- larthra (equivalent to Ungulata Vera), which has been pro- posed for these two groups collectively, as distinct from the other representatives of the order. The remaining and less typical subordinal groups — sometimes ranked as orders by themselves — include among living animals the Proboscidea, or elephants, and the Hyracoidea, or hyraxes, and among extinct groups the Amblypoda, Ancylopoda, Barypoda, Condylarthra, Litoptema and Toxodontia. The characteristics of these groups will be found under their respective headings, with the exception of the Barypoda and Condylarthra, for which see Arsinoitherium and Phenacodus.

In the great majority of the Subungulata the bones of the upper and lower rows of the wrist-joint, or carpus, retain the primitive

or more typical relation to each other (see fig., and contrast with Perissodactyla, fig. 1); the os magnum of the second row articulating mainly with the lunar of the first, or with the cuneiform, but not with the scaphoid. On the other hand in the Diplarthra, the group to which the vast majority of modern Ungulates belong, the second or lower row has been shifted altogether towards the inner side of the limb, so that the magnum is brought considerably into rela- tion with the scaphoid, and is entirely removed from the cuneiform, as in most existing mammals.

In the typical Ungulata or Diplarthra, the feet are never plantigrade, and the functional toes do not exceed four — the inner digit being suppressed, at all events in all forms which

have existed since the Early Eocene period. The os magnum of the carpus articulates freely with the scaphoid. The allan- tois is largely developed, and the placenta, so far as known, is nondeciduate, the chorionic villi being either evenly diffused or collected in groups or cotyledons (in Pecora). The testes descend into a scrotum. There is never an os penis. The uterus is

Right Fore Foot of Indian

Elephant.

U, ulna; R, radius; c, cuneiform ;

/, lunar; sc, scaphoid; it, unciform;

m, magnum; td, trapezoid; tm,

trapezium ; I to V, first to fifth digit.

bicornuate. The teats are usually few, and inguinal, but may be numerous and abdominal (as in Suina), although they are never solely pectoral. The cerebral hemispheres in existing Ungulates are well convoluted. (R. L.)*

UNICORN (Lat. unicornis, for Gr. /xovoKepus, having one horn; Fr. licorne; Ital. alicorno), a fabulous beast, usually- having the head and body of a horse, the hind legs of an ante- lope, the tail of a lion (sometimes horse's tail), sometimes the beard of a goat, and as its chief feature a long, sharp, twisted horn, similar to the narwhal's tusk, set in the middle of its forehead. The earliest description is that of Gtesias, who (Indica opera, ed. Baehr, p. 254) states that there were in India white wild asses celebrated for their fleetness of foot, having on the forehead a horn a cubit and a half in length, coloured white, red and black; from the horn were made drinking cups which were a preventive of poisoning. Aristotle mentions (Hist. anim. ii. 1 ; De part. anim. iii. 2) two one- horned animals, the oryx, a kind of antelope, and " the so- called Indian ass." In Roman times Pliny (N.H. viii. 30; xi. 106) mentions the oryx, the Indian ass, and an Indian ox as one-horned; Aelian (De not. anim. iii. 41; iv. 52), quoting Ctesias, adds that India produces also a one-horned horse, and says (xvi. 20) that the Monoceros was sometimes called Carcazonon, which may be a form of the Arabic Carcadan, meaning rhinoceros (see Rev. W. Haughton, " On the Unicorn

of the Ancients," in Annals and Mag. of Natural History for 1862, p. 363). Strabo (lib. xv.) says that in India there were one-horned horses with stag-like heads. The origin of all these statements is probably to be found partly in the rhinoceros, which was well known to the ancients, and partly in the narwhal, specimens of the long tusk of which were probably brought home by travellers. The theory of a one-horned oryx would probably be drawn from the remembrance of a passing glimpse of an antelope in silhouette, or even of one which had broken one horn off short in fighting, and E. Schrader (Sitzungsberichie d. kgl. preuss. Akad. zu Berlin, 1892, pp. 573-581, and pi. 5) traces the idea of a one-horned ox to the sculptures of Persepolis and other places, which Ctesias would probably have seen, in which the ox, represented in silhouette, has apparently only one horn. As India became better known, and it was realized that the unicorn was not found there, its place of abode was changed to Africa.

The medieval conception of the unicorn as possessing great strength and fierceness may have been partly due to the fact that in certain passages of the Old Testament (e.g. Num. xxiii. 22; Deut. xxxiii. 17; Job xxxix. 9-10) the Hebrew word R'em, now translated in the Revised Version " wild ox," was translated in the Septuagint /uowkepcos, in the Vulgate unicornis or rhinoceros, and in the Authorised Version " unicorn," though in Deut. xxxiii. 17 it obviously refers to a two-horned animal. The early commentators applied to this beast the classical attributes of the iMvbutpws (e.g. Isidore xii. 2, 12 tells how the unicorn has been known to worst the elephant in combat). There is also the passage in Aelian xvi. 20 which says that though as a rule savage and quarrelsome, even with females, the unicorn at mating time becomes very gentle to his mate, which is supposed to have given rise to the medieval idea that the unicorn is subdued to gentleness at the sight of a virgin, and will come and lay his head in her lap, which is the only means by which he can be caught on account of his swiftness and ferocity. This story is illustrated in the tapestry figured in Plate II. Fig. 10 of Embroidery, also on Pisanello's medal of Cecilia Gonzaga (see J. de Foville, Pisanetto et les medailleurs italiens, 1909, p. 40), on the reverse of which is a young girl with a unicorn lying by her side, the unicorn here being repre- sented as a beautiful long-haired goat, with the long horn in the middle of his brow. The idea was widely spread in the middle ages, and Lauchert

(Geschichte des Physiologus, 1889) gives instances of its allegorical use, as typical not only of Christ and the Virgin, but also of the softening influence of love upon the fiercest of men, and a symbol of purity. As a decoration of drinking cups it symbolized the ancient belief in the efficacy

of the unicorn's horn against poison, which in England remained even in the time of Charles II., though Sir E. Ray Lankester (Science from an Easy Chair, London, 1910, p. 127) mentions that a cup made of rhinoceros horn was then handed over to the Royal Society for experiment, with the result of entirely disproving the superstition. In the court ceremonial of France as late as 1789 instruments of " unicorn's " horn were still used for testing the royal food for poison. So-called unicorns' horns, or articles made of unicorn's horn, have always been sought after as " curiosities "; some of them, like the cup mentioned above, were of rhinoceros horn; others, like the horn seen at Windsor by Heutzner, a German traveller, in 1598 (see E. Phipson, Animal-lore of Shakespeare's Time, p. 456), were pro- bably narwhals' tusks. Another medieval legend about the unicorn is that when it stooped to drink from a pool its horn, dipping into the water, purified and rendered it sweet. The traditional rivalry of the lion and the unicorn, which is generally considered to date at earliest from the Union of England and Scotland, when the lion and the unicorn appeared as the sup- porters of the royal arms, is referred to, curiously enough, in Spenser's Faery Queene, ii. 5.

In heraldry the unicorn was sometimes used as a device (see Heraldry, where two English families are enumerated who used the unicorn on their arms), but more frequently as a supporter, and subsists to the present day as the left-hand supporter of the royal arms. This position it assumed at the Union, the Scottish royal arms having previously been supported by two unicorns. The origin of these is uncertain. The unicorn first appears (c. 1480), as a single supporter, on two gold coins of James III. of Scotland, hence known as " unicorns " and " half-unicorns " (see Lindsay, Coinage of Scotland, pp. 135-137 and plate xiii. figs. 22-27). ft is represented in a sitting posture, having round its neck a crown, to which is attached a chain and ring, and holding the shield between its front feet. Seton (Law and

Practice of Heraldry in Scotland, Edinburgh, 1863, p. 274, foot-note) suggests that the unicorn as a supporter may have been introduced into Scotland by the marriage of James I. with Jane Beaufort, the Beauforts as dukes of Somerset having used it as such. 1 However this may be, the unicorn became established by the end of the 15th century. J. A. Smith in " Notes on Melrose Abbey" (Proceedings of Society of Antiquaries of Scotland, ii. 257) describes a table dated 1505 on which are sculptured the royal arms supported by two unicorns. The royal arms are also sup- ported by unicorns on the Great Seals of Scotland from the time of Queen Mary onwards (see Anderson, Diplomata Scotiae, plate lxxxviii. xc. xci.) At the Union, when the unicorn became a supporter of the royal arms both of England and Scotland, a royal crown was added on the head of the unicorn, in addition to the crown with chain and ring round its neck (see Great Seal of James I. and VI. in Anderson, pi. xciii.), but this crown was removed after the Hanoverian succession. In England after the Union the unicorn became the left-hand supporter, but in Scotland, as late as 1766, it was still put on the right (Seton, p. 442), and Scotland displayed great reluctance to alter this, or to remove the crown from the head of the unicorn. Seton tells us how in 1853 a petition was made in favour, among other things, of retaining the crown on the unicorn, but without success. The rule, however, that the unicorn is to be the left-hand supporter, uncrowned, is still sometimes ignored, and Seton states (1863) that in the case of seals, such as that of the Board of Manufactures, which bear the Scottish arms alone, the two unicorns are still kept as supporters.

Authorities. — There are many treatises on the unicorn and other fabulous beasts, from the 16th century onwards. Of these, good bibliographies are given by Drexler, s.v. Monokeros, in Roscher's Lexicon, and by Rev. W. Haughton in Annals and Magazine of Natural History for 1862, p. 363, "On the Unicorn of the Ancients."

(C. B. P.)

UNIFORMS. The word " uniform " (Lat. unus, one, and forma, form), meaning adjectively homogeneous, is specifically used as a substantive for the distinctive naval and military dress, which serves, in its various styles, to give homogeneity to the several services, regiments and ranks. Although in ancient history we occasionally meet with uniformed soldiers, such as

the white and crimson Spanish regiments of Hannibal, it was not until the beginning of large standing armies that uniforms were introduced in modern times. Before this, armed bodies were of two sorts, retainers and mercenaries, and while the former often wore their master's livery, the latter were dressed each according to his own taste or means. The absence

1 Willement, Regal Heraldry, p. 70, says that it was also so used by Anne Boleyn and by the earls of Hertford.

of uniforms accounts very largely for the significance attached to the colours and standards, which alone formed rallying points for the soldier and his comrades, and thus acquired the sacred character which they have since possessed. A man who left the colours wandered into the terrifying unknown, for there was nothing to distinguish friend and foe. Even if the generals had ordered the men to wear some improvised badge such as a sprig of leaves, or the shirt outside the coat, such badges as these were easily lost or taken off. The next step in advance was a scarf of uniform colour, such as it is supposed was worn by the " green," " yellow " and other similarly-named brigades of the Swedish army under Gustavus Adolphus. This too was easily removed, as in the example of the squire who at Edgehill put on the orange scarf of the parliamentarians and with no more elaborate disguise succeeded in recapturing the lost royal standard from the hands of Essex's own secretary. By this time, in France at least, the general character of the clothes and accoutrements to be worn on various occasions was strictly regulated by orders. But uniformity of clothing was not to be expected so long as the " enlistment " system prevailed and soldiers came and went, were taken in and dismissed, at the beginning and end of every campaign. The beginnings of uniform are therefore to be found in truly national armies, in the Indelta of Gustavus, and the English armies of the Great Rebellion. In the earlier years of the latter, though the richer colonels uniformed their men (as, for instance, the marquess of Newcastle's " Whitecoats " and the king's own " Bluecoats "), the rustics and the citizens turned out for war in their ordinary rough clothes, donning armour and sword-belt. But in 1645 the parliament raised an army " all its own " for permanent service, and the colonels became officials rather than pro- prietors. The " new model " was clothed in the civilian costume of the date — ample coat, waistcoat, breeches, stockings and shoes (in the case of cavalry, boots) — but with the distinc- tive colour throughout

the army of red and with regimental facings of various colours. The breeches were grey. Soon after- wards the helmet disappeared, and its place was taken by a grey broad-brimmed hat. From the coat was evolved the tunic of to-day, and the hat became the cocked hat of a later genera- tion, which has never altogether disappeared, and has indeed reverted to its original form in the now familiar " slouch-hat."

For service in Ireland the red coat was exchanged for one of russet colour, just as scarlet gave way to khaki for Indian service in the 19th century. The cavalry, however, wore buff leather coats and armour long after the infantry had abandoned them; the Austrians (see Plate I., line 1, No. 2), on account of their Turkish wars, retained them longer than any.

Thus the principle ever since followed — uniform coat and variegated facings — was established. Little or nothing of sentiment led to this. By choice or convenience the majority of the corps out of which the new model was formed had come to be dressed in red, with facings according to the colonel's taste, and it is a curious fact that in Austria sixty years after- wards events took the same course. The colonels there uniforming their men as they saw fit, had by tacit consent, probably to obtain " wholesale " prices, agreed upon a service- able colour (pearl grey), and when in 1707 Prince Eugene procured the issue of uniform regulations, few line regiments had to be reclothed. The preferences of the colonel were exhibited in the colour of the facings (Plate I., line 1, fig. 3). In France, as in England and Austria, the cavalry, as yet rather led by the wealthy classes than officered by the professional, was not uniformed upon an army system until after the in- fantry. But in 1688 six-sevenths of the French cavalry was uniformed in light grey with red facings; and about half the dragoon regiments had red uniforms and blue facings. Louvois, in creating a standing army, had introduced an infantry uni- form as a necessary consequence. The native French regiments had light grey coats, the Swiss red, the German black and the Italian blue, with various facings. The French grey was probably decided upon, like the Austrian grey, as being a good " service " colour, which could be cheaply manufactured (Plate I.,

PUVTO I.

France :

Austrln :

Auutrla :

Huiurnry:

England:

*Knnli»n*l :*

PruHJim :

Fnelnml

Serena IjI.

CUifHWHˆL'f,

*\VGrtlL*Jtitj*'t-«r*

SYujawly

31th fool.

Grenadier.

llomc-Ciiimcl

totli Foot

AtKnreltcEt-. WOO.

1T05-

Heft. 171ft.

HiiKBtirs. l"di.

17«.

itliKoat, lttl.

Ittet., 174.*

1TD0.

Frnrirr;

Franrc:

France:

Auxtrta :

Atutr In :

Emtlarid:

England:

Knil-nxl :

Hcvulutioiuirr

Vollicour.

(.■mini

L'Mnn,

DcutHchitirifftcr

Stll t"uut.

RpJ'ul lEontc

1st Huyal

Inf.-iiHri", Itiia.

S].«t Holft.. 1S09.

l>/il£uuti. ISM.

tlMO.

RCBU, 1005.

mi.

Artillery. ISIJ.

DruKDoia, WIS.

I8I5-I&55.

England :

Officer. 1H43.

Krmlitml :

IWIh Light

Infantry. WU.

Austria; Prance: Ausbrlii-Hiinjsiry;

Janet, Line tnfiieitry. Oj-ulnl Itcgt..

li«M- ISM. 1HM.

Frnnee : EriElnnd : U. S. A.:

Infnntrj- OBlccr. Scots Fuaillcf Ouncrnl OlBwr.

1MB. Guard. GEUecr. 1W5. |S6t.*

UNIFORMS

583

line 1, fig. 1). Both these greys, however, refined themselves in course of time into white.

The hat and the long coat and breeches remained the uniform of line infantry almost everywhere up to the advent of the shako and the coatee about 1 790-1 820. The gradual evolution of these two garments, from the comfortable civilian clothes of 1690 to the stiff, precise military garments of 1790, can be traced in a few words. The brim of the felt hat was first looped up on one side for convenience, then, for appearance' sake, on the other, and so became the three-cornered cocked hat, fringed with feathers, lace or braid, of Marlborough's wars. 1 Then came the fashion of looping up before and behind, which pro- duced the hat called the " Khevenhuller," or the broadside-on cocked hat. Lastly, came the purely decorative, lace-looped " fore-and-aft " pattern, as worn in many states to-day. But before this came into vogue the cocked

hat had practically dis- appeared from the ordinary ranks of all armies. It may be said that so long as the cocked hat survived in its simple, rank-and-file form, uniforms retained much of their looseness. Though the long skirts that rendered great coats unnecessary were looped back, and the ample cuffs of Marlborough's time were becoming narrower until they were at last sewn down to the sleeve, yet the military costume was in all essentials the civil costume of the time — long coat, hat, sleeved waistcoat, breeches and gaiters.

But other influences were at work. The principal was the introduction into armies of Slavonic irregulars, which tended to restrict line infantry and cavalry to parade drill and to pitched battles in parade order. This, and their complete separation from the civil population, stiffened their costume until it became " soldierly." Frederick the Great, indeed, could not have developed the infantry fire power that he needed if his soldiers had had tight sleeves, but in his old age the evil of sacrificing comfort to smartness attained a height which, except in the 1820- 1840 period, was never surpassed. The figure of a Prussian fusilier, Plate I. line 1, No. 7 (in which by mistake a slung sword is shown) shows this process beginning. The stock has made its appearance, soon to stiffen into a cloth collar, under which, as if it were not already tight enough, another stock in due course came to be worn. The flapped cuffs, shown in the British figure No. 5, have become plain round cuffs, above which are embroidery stripes and buttons which at one time laced the flaps of the cuff together and now survive as the " guard-stripe." This may be called the first instance of the dummy adornments, which are so marked in modern full-dress uniforms. Similarly the former cloth turnback on the front of the coat has even in 1756 been cut off, the buttons and embroidered loops that retained it being kept as decorations.

Many of these specially military adornments were borrowed from the national costumes of the irregulars themselves. Their head-gear in particular drove out the cocked hat. The grenadier cap, now a towering bearskin, was its first successful rival, the shako the next. The grenadier cap was, in the first instance, a limp conical cap (identical with the hussar cap), edged with fur and having a tassel at the end. Soon the fur became more prominent in the front, and the tail disappeared. Then the cloth mitre-cap (Plate I., line 1, fig. 6) appeared. This was originally a field-service cap, with ear-flaps and sunshade.

But it stiffened about 1775 into a fur cap of the same shape (with which sometimes the old cloth tail is found), and this in turn evolved, through the fuller but still narrow and forward-pointing bearskin of Peninsular days, into the great fur cap of grenadiers and fusiliers of the present time. The mitre-shaped cloth cap survives in a few Russian and Prussian regiments. As early as 1755, as the Prussian figure shows, a conical leather cap with a large brass plate in front had come into existence. This held its ground for some time, and the grenadier cap of to-day in Russia and Prussia is a metal copy of the mitre field-service cap itself. A curious derivative of the low fur cap with a peak in front and a bag-tail behind worn by some 17th- and 18th-century grenadiers is the head-dress of the Russian horse-grenadiers.

1 In the cavalry an iron-framed skull-cap was often worn under the cocked hat.

The peak has become the helmet, the fur a " sausage " across the cap from ear to ear, and the back part of the helmet is covered by the bag-tail.

The Hungarian hussars introduced the jacket and the busby. The latter was originally a conical cap with fur edge, but the fur became higher until there was nothing left of the cap but the ornamental " busby-bag " of to-day. It would appear also as if the hussars brought the shako to western Europe. This is a conical, bell-topped, or cylindrical head-dress of stiff material, commonly leather. Its prototype, the tall cylindrical cap of the 18th-century hussars, was tilted on one side and wound round with a very narrow bag-tail, the last few inches of which, adorned with a tassel, hung down. But the shako itself succeeded, as nothing else succeeded, in being accepted by line infantry and cavalry, and after passing through numerous forms it remains in every army to-day, either as a low rigid cap (Germany, England and Austria), a stiffened or limp kepi (France and Italy), or the flat-topped peaked cap which is the most common military head-dress of modern Europe.

All these adjuncts came in the first place from the national costume of imported auxiliaries. So also did the lancer cap, which, originally the Polish czapka, was a cylindrical cap, the upper part of which could be pushed up or down after the fashion of a bellows or accordion, with a square top. The original form is seen in Plate I., line 2, fig. 4, and the stiffened

develop- ment" of it in Plate I., line 3, fig. 1. The British lancer cap (Plate II., line 1, No. 2) has still a full middle portion, but in Austria and Germany this has dwindled to a very narrow neck (Plate II., line 3, No. 6; Plate IV., line 1, No. 7). The line infantry and cavalry coat, full-skirted in the first instance, retained its original length until about 1780, but from that time onwards (probably in most cases in the interests of the colonel's pocket) it becomes, little by little, shorter and scantier (Plate I., line 2, Nos. 2, 3, and 5), until at last it is a " coatee," not as long as the present-day tunic (Plate I., line 2, Nos. 6 and 8), or a swallow-tailed coat (Plate I., line 3, figs. 1-3). This, of course, did away with the protection afforded by the full skirt, and necessitated the introduction of the great coat, which even to-day in some cases is worn, without the tunic, over the " vest " that represents the sleeved waist- coat (Plate II., line 2, No. 3), formerly worn under the long skirted coat. The white breeches and gaiters, retained to the last, gradually gave way to trousers and ankle boots in

1800-1820.

Meanwhile another form of head-dress, which was purely military and owed nothing to Poland or Hungary, came into vogue. This was the helmet, which had disappeared from the infantry about 1650-1670, and the cavalry thirty years after-wards. It took two forms, both of which possessed some of the characteristics of ancient Greek and Roman helmets. These were a small helmet with sausage-shaped ornament from front to back, worn chiefly by British light dragoons and artillery (Plate I., line 2, fig. 7), and the towering crested helmet worn by the French, British and Austrians. The French cuirassiers and dragoons (Plate I., line 2, No. 3) had, and still have, long horse- hair tails dependent from the crest. The Austrian infantry helmet, worn with the white coat, similar to, but smaller than, that shown in Plate II., line 2, No. 5, had no ornament, but the British heavy cavalry helmet (Plate I., line 2, No. 8) resembled that of the French. To-day, besides the French, the Austrian dragoons and Italian heavy cavalry have this form of helmet (Plate II., line 3, No. 1, and Plate IV., line 2, No. 8).

It has been said above that the coatee and the shako are the principal novelties in European military costumes of Napoleon's time. To these should be added the replacement of the gaitered breeches by trousers, and the adoption of hussar

and lancer uniforms of ever-growing sumptuousness, in which the comfort that had originally belonged to these national irregular costumes was entirely sacrificed. After Waterloo, indeed, all traces of the old-fashioned coat disappeared, and, except for the doubtful gain of tight-fitting " overalls," the soldier was more showy and worse off in comfort and convenience than ever before or since. One or two examples may be quoted. In George IV. 's time

the coatees of the lifeguards were so tight that the men were unable to perform their sword exercise, and their crested helmet, surmounted by a " sausage " ornament, was so high that the sword could not be raised for a downward blow. The total height of the lancer cap with its plume (Plate I., line 3, No. 1) was about an arm's length, and prints exist showing British lancers in a cap of which the square top is very nearly as broad as the wearer's shoulders. The hussar furred pelisse, originally worn over a jacket (Plate I., line 1 , fig. 4) , and so worn by the Austrians to-day, had become a magnificently embroidered and laced garment, always slung and never worn, and the old plain under- jacket had been loaded with buttons and lace, and differed from the pelisse only in the absence of fur. It was the Restoration era, too, that delighted to decorate uniforms with sewn-down imitations of the skirt pockets, turn-back cuffs, &c, of the old coat. This was, in short, the epoch of pure dandyism, and although some of its wilder extravagances were abolished between 1830 and 1850, enough still remained when the British army took the field in the Crimea to bring about a sudden and violent reaction, in which the slovenliest dress was accounted the best. The dress regulations of 1855 introduced the low " Albert " shako and the tunic, abolished the epaulette — an ornament which had grown in the t8th century out of a shoulder cord that kept the belts in place and was decorated at the outer end with a few loose strands or tassels of embroidery — and made other changes which, without bringing back uniform to its original roominess and comfort, destroyed not only the dandyism of George IV. 's time, but also the chastened finery of the Early Victorian uniforms (Plate I., line 3, No. 7).

The tunic, accompanied by a spiked helmet of burgonet shape,

had been introduced in Prussia and Russia about 1835. Russia was too poor to allow extravagance in dress, and Russians, clothed as they generally were in their great coats, had little incentive to aim at futile splendour. Both countries, however, and France and Austria likewise, passed through a period of tight, if unadorned, uniforms, before Algeria, Italy, and similar experiences brought about the abandonment of the swallow-tailed coatee. The French adopted the tunic in 1853, the Austrians in 1856, and in both countries the shako became smaller and lighter. From about 1880, when the spiked helmet replaced the low shako in England, no radical changes were made

Tunic.

Facings.

Helmet.

Plume.

1st Life Guards

Scarlet

Blue

Steel

White

2nd ,, ,, ...

,,

**J*

Roval Horse Guards (Blues) .

Blue

Red

,,

Red

1st Dragoon Guards (King's) .

Scarlet

Black

Brass

,,

2nd „ ,, ...

White

Black

3rd ,, ,, ...

Yellow

M

Black and red

4th „ ,, ...

Blue

White

5th „ „ ....

,

Dark green

n

Red and white

6th ,, ,, (Carabineers).

Blue

White

White

7th ,, ,, ...

Scarlet

Black

,,

Black and white

1st Royal Dragoons ....

Blue

Steel

Black

2nd Dragoons (Scots Greys) .

,,

(Bearskin cap)

White

6th Inniskilling Dragoons .

..

Primrose

Steel

»

Czapka top.

Blue

Scarlet

Scarlet

Green

9th ,,

,,

Black

Black and white

12th

M

Scarlet

Scarlet

1 6th ,,

Scarlet

Blue

Blue

Black

17th ,, .

Blue

White

White

White

2Ist ,,

»

Light blue

Light blue

11

Busby-bag.

3rd Hussars

Blue

Nil

Garter blue

White

4th „ .

Yellow

Scarlet

7th

„

Scarlet

White

8th

White over red

10th

„

„

White over black

nth „

„■

Crimson

White over crimson

13th „

„

White

White

14th ,,

”

ff

Yellow

15th

,,

)(

Scarlet

Scarlet

18th „

,,

Blue

White over red

19th

”

M

White

White

20th ,,

”

M

Crimson

Yellow

in full dress uniforms, except that the Russian army, abandoning the German pattern uniforms formerly in vogue, adopted a national uniform which is simple, roomy, and exceedingly plain, even in full dress. In 1906-1909, however, this attempt to combine handsomeness and comfort was given up, full dresses being made more decorative, and light green-grey service dresses being introduced. Lastly, since the South African War and the development of infantry fire, the attempt to wear full dress uniform on active service has been practically given up. Great Britain first of all adopted the Indian khaki, and then a drab mixture for " service dress " and returned, after 150 years, to the civilian style of field dress, adopting the " Norfolk jacket " or shooting coat with spinal pleat and roomy pockets. Germany, Italy, the United States and other countries have followed suit, though each has chosen its own shade, and the shades vary from light grey blue in Italy to deep olive drab in the United States. The details of the present-day uniforms in the principal states are given below. It might be stated, as a summary of modern uniforms, that Great Britain has most completely divorced service and full dress, and that in consequence her full dress is handsomer and her service dress plainer than those of any other country. Whether, for European war at any rate, the oblitera- tion of regimental distinctions has not been carried too far, is open to question. The method adopted for the Italian infantry would seem to give enough means of identification, without in- creasing visibility, and as this method was used by the British in the South African War, it will probably be revived in future wars.

Great Britain The full dress uniforms of the British service in 1910 had not undergone any radical change since the army reorganiza- tion of 1881. Many regiments had, however, resumed their original facings instead of the white common to all non-royal English regiments in the last twenty years of the 19th century. But the Scottish regiments maintained their yellow or yellow-buff facings, and the single Irish regiment which is not " royal " (the Connaught Rangers) its green. Rifle regiments had astrakhan busbies, resembling in shape enlarged " glengarry " caps, with plume and lines. Details in all corps have been changed, rendering the uniforms more handsome. In September 1910 it was announced that the cloth helmet would be replaced by a shako.

Cavalry. — Household cavalry and dragoons wear single-breasted tunics with gold buttons, cuffs pointed with Austrian knot collars and shoulder-straps of the facings colour and white piping on the

front and the skirt-flaps. The household cavalry wear steel cuirasses in review order, and in undress tight-fitting jackets and blue red-striped overalls. All wear steel or brass helmets, with drooping horsehair plumes, except the Scots Greys (2nd Dragoons), who have a grenadier bearskin with feather plume. All wear blue pantaloons and jack boots, except the household cavalry, who in full dress wear white leather breeches and high jack boots reaching above the knee. The stripes on the pantaloons are yellow, (white in~ 2nd and 6th DragoonGuards) , white belts 1 and slings. See Plate II., line I, figs. 4 and 9.

Lancers (Plate II., line I, No. 2) wear double-breasted tunics with gold buttons, and the front or " plastron,'-' the peculiar mark of the lancer, varies in colour with the facings of the regiment. Lancers wear lancer caps (the Polish czapka) with drooping plumes. Pantaloons are blue, with yellow stripes (white in 17th), boots as in the dragoons. Round the waist is a girdle of yellow and red, and the cap is secured to the collar of the tunic by yellow lines.

1 The 1st Life Guards have a red line, the 2nd a blue line, in the pouch belt.

GREAT BRITAIN

UNIFORMS.

Plate

Will llnMitrx, Ofllrar.

] > lh T^inccrs, Ollker.

Dlllccr,

?ntl Life Guards OOlcvr.

Field Msntlud,

Mnjor-Ocncnil.

Ilnj'nl Horse

Artillery,

Officer,

Koynl Field 6(li Imitn- Artillery, killinir UrtiKooM, Officer. Officer.

GREAT BRITAIN

Anny Service Kii»K'« Oven Scot nitjirdK. Corr>«, Scottiuli UnilrcM.*

Officer, Murderers.

Rnyal

Ilnl'lll

Grenadier

Ptmil icru,

Kniri rt«r.*

RiuinlK.

Oalcer.

OlBccr.

OlBccr.

Wcl«h RifclMinuie. KSiie'iiOwii Awllaiid

Kcitiment, Olllcer. (ftoynl Lnnciwtcr) SulherlAnd

Oflleer. Service Dreaa. Illtflilandcrs.

AUSTRIA-HUNGARY

Ulli OraKMIl., Olllcer.*

Austrian

tutu loriuitrr.

tturiKnrian Bfnd hifiuitrj.

GetieraU

Bill Hussars.

Itt Ulilaiu,

Arllllcry, CoUaail,

Jllffcr.

UNIFORMS

585

The undress cap is in all the above blue, with bands of various colours, amongst which the most noticeable is the white zigzag on a black background of the Scots Greys.

Hussars (Plate I., line I, figs. 1 and 3) wear a blue jacket, shorter than the ordinary tunic, braided with yellow or gold in front, along the back seams and on the collars and cuffs. They have no shoulder-straps, facings or waist-belt. The 3rd Hussars wear, how- ever, scarlet and the 13th white, collars. The distinctive head-dress is the cylindrical busby with an upright feather plume, lines, and a busby-bag on the right side. The pantaloons are blue, except for the 1 it'h Hussars, who wear crimson. Double stripes on the trousers, yellow (white, 13th). The undress cap is a red peaked cap. Officers' Hessian boots have gold edging and boss.

Infantry. — The uniforms of the four Foot Guard regiments are distinguished by the cuffs, which have slashed flaps and buttons, by the blue shoulder-straps and by the embroidery patches on the collar, cuff-flaps and skirts, which are analogous to the Garde- Litzen of continental armies. The only uniform which could be mistaken for it is the Royal Marine Light Infantry's (Plate IV. line 3. No. 1), which has also slashed flaps, but it has fewer and smaller embroidery patches and plain collars. All the Guard regi- ments wear scarlet tunics with blue collars, shoulder-straps and cuffs, bearskin caps, blue trousers with red piping (officers, red stripe). The regimental distinctions (Plate II., line 2, Nos. 3 and 6) are: Grenadiers — Buttons equally spaced, white plume, red cap-band. Coldstream — Buttons spaced in twos, red plume, white

cap-band. Scots — Buttons in threes, no plume, diced red and white cap-band. Irish — Buttons in fours, green plume, green cap- band. All wear in undress the white jacket, which is the old sleeved waistcoat, and peaked cap.

The uniforms of the line infantry may be classed as Line, Light, Fusilier, Rifle, Lowland and Highland Scottish. The tunic in the first three is red, with pointed cuffs and collars of the facings colour (blue in Royal regiments, white in English and Welsh, yellow in Scottish, green in Irish, except where the older colours have been revived), red shoulder-straps, gold buttons and white piping, blue trousers with red piping. On the shoulder-strap in the case of the rank and file is the regimental title, on the collar the regimental badge. The line infantry have a dark blue helmet (Plate II., line 2, No. 7), with brass spike and ornaments; the light infantry a dark green helmet of the same pattern; 1 the fusiliers (Plate II., line 2, fig. 4) bear or racoon skin cap with hackle plume. In undress all ranks have a blue (green for light infantry) peaked cap, with a black (royal regiments, scarlet, non-royal Irish, green) band. The rifle regiments (Plate II., line 2, No. 8) wear very dark green tunics and trousers without coloured cuffs or collars. In the King's Royal Rifles the scarlet piping and collar form a conspicuous distinction. The head-dress of the rifle regiments is an astrakhan cap with plume (red and black, K.R.R.; dark green and black, K.I.R.; black, Rifle Brigade), in undress a dark green peaked cap.

The Lowland and Highland Scottish regiments wear a scarlet (Scottish Rifles, green) " doublet " with gauntlet cuffs (Plate II., line 2, Nos. 2 and 10.) In undress Highland regiments wear the white jacket. Highland regiments wear tartan kilt and plaid and sporran (varying with the regiments), diced hose-tops and white spats, Lowland regiments (also Scottish Rifles, Highland Light Infantry, and all mounted officers) tartan trews. The head-dress of Highland regiments is a " feather bonnet " — a loose fur cap of peculiar shape with hackle. The Highland Light Infantry wear a small shako with a red and white diced band and ball. Lowland regiments (except the Royal Scots Fusiliers) wear the Kilmarnock bonnet (Plate II., line 2, No. 2). The Scottish Rifles have a shako with black drooping plume. The undress cap of all Scottish infantry is the " glengarry."

The full dress of officers is similar to that of the men, but it is more ornamented (sec below for badges of rank). In all English

and Irish regiments clothed in scarlet a crimson waist-sash is worn by officers. Guards officers on ceremonial occasions wear a gold and crimson sash. On the collar and cuffs there are broad edgings of lace termi- nating in the case of the cuffs in a small Austrian knot. The rifle Jacket is of hussar pattern with black embroidery and a black pouch belt (Plate II., line 2, fig. 8.) The Highland officer has a special pattern of sword; in full dress the basket-hilted claymore (so- called) or a plainer sword decorated with ribbon, on service a plain cross-hilted sword. He has also a richly decorated dirk, a broad white baldric, and a very full sash over the left shoulder. Lowland officers have also the shoulder belt and claymore, &c.

Royal Artillery. — The Royal Horse Artillery (Plate II., line 1, fig. 7) wears an old-fashioned hussar uniform, consisting of busby with red bag and white plume, a blue jacket with 18 rows of gold braid and scarlet collar. Trousers blue with red stripe. The Royal Field and Royal Garrison Artillery (Plate II., line 1, No. 8) wear a blue tunic with red collar and gold lace (Austrian knot on the sleeve), blue trousers with red stripe, helmet with brass plate and ball orna- ment, waist-belt and pouch-belt (white for men, gold for officers). The badge is either a grenade or a device of a field gun on its carriage.

Own

Line Infantry, English and Welsh. Queen's (R. West Surrey) Buffs (East Kent),.. . King's Own (R. Lancaster) Royal Warwickshire King's Liverpool . Norfolk .... Lincolnshire Devonshire . Suffolk .... Prince of Wales's

(West Yorks) East Yorkshire. Bedfordshire Leicestershire . Princess of Wales's Own

(Yorkshire Regt.) Cheshire.

South Wales Borderers Gloucestershire .

Worcestershire .

East Lancashire

East Surrey

West Riding (Duke Wellington's)

Border …. Royal Sussex Hampshire . South Staffordshire Dorsetshire .

Prince of Wales's Volun- teers (S. Lancashire)

Welsh Essex

of

Facings.

Blue

Buff yellow

Blue

Yellow

White

Lincoln green

Yellow

Buff yellow White

Grass green

Buff yellow

Grass green

White

1 To be replaced by a shako.

Sherwood Foresters (Notts

and Derby) . Loyal North Lancashire

Northamptonshire .

Princess Charlotteof Wales's Royal Berkshire

Queen's Own R. West Kent

Duke of Cambridge's Own ' Middlesex ….

Wiltshire (Duke of Edin- burgh's Own)

Manchester

Scarlet White Blue Yellow White Grass green

White

Corresponding Corps and

their facings in 1815.

(S = silver lace. J

Prince of Wales's North Staffordshire . . . .

York and Lancashire . t .

Line Infantry, Irish. Royal Irish Regt. . Connaught Rangers .

Leinster Regt. (R. Cana- dian)

Light Infantry.

Prince Albert's Somerset- shire

Duke of Cornwall's

Oxfordshire and Bucks

Blue

Lemon yellow

Buff yellow White

Blue Green

Blue

Blue White

2nd, blue (S). 3rd, buff (S). 4th, blue. 6th, yellow (S). 8th, blue, gth, yellow (S). 10th, yellow (S). nth, green. 12th, yellow.

14th, buff (S). 15th, yellow (S). 16th, yellow (S). 17th, white (S).

19th, grass green. 22nd, buff yellow. 24th, grass green (S). 28th, yellow (S). 6lst, yellow (S). 29th, yellow (S). 36th, gosling green. 30th, pale yellow (S) 59th, white (S). 31st, buffs (S). 70th, black.

33rd,red (S) ; 76th,

red (S). 34th, yellow (S). 55th, green. 35th, orange (S). 107th, (?). 37th, yellow (S). 67th, yellow (S). 38th, yellow (S). 80th, yellow. 39th, grass green. 54th, green (S).

40th, buff yellow. 82nd, yellow (S). 41st, red (S). 69th, green. 44th, yellow (S). 56th, purple (S).

45th, dark green (S). 47th, white (S). 81st, buff (S). 48th, buff. 58th, black.

49th, green. 66th,gosling grn. (S). 50th, black (S). 97th, blue (S).

57th, yellow. 77th, yellow (S).

62nd, buff (S). 99th, pale yellow. 63rd, dark green (S). 96th, buff (S).

64th, black. 98th, buff. 65th, white; 84th, yellow (S).

1 8th, blue.

88th, yellow (S).

94th, green.

(iootlr and 109th late H.East India Co.'s troops).

13th, yellow (S). 32nd, white; 42nd, pale yellow (S). 43rd, white (S). ,52nd, buff (S).

5 86

UNIFORMS

Corresponding Corps and

Facings.

their facings in 1815. (S = silver lace.)

Light Infantry — continued.

Yorkshire (King's Own) .

Blue

51st, grass green (105th H.E.India Co.'s troops).

Shropshire (the King's) .

"

53rd, red; 85th, yellow (S).

Durham

Dark green

68th, bottle green (S) (106th H.E. India Co.'s troops).

Highland

Buff yellow

71st, buff (S); 74th, white.

Fusiliers.

Northumberland

Gosling green

5th,goslinggreen (S).

Royal (City of London) .

Blue

7th, blue.

Lancashire

White

20th, yellow (S).

Royal Scots

Blue

21st, blue.

Royal Welsh

,,

23rd, blue.

”

27th, buff (108th latell.East India Co.‘s troops).

Royal Inniskilling

j»

87th, green; 89th

black. (101st and 104th

Royal Munster ….

”

late H. East India

Co.‘s troops).

Royal Dublin ….

”

(102nd and 103rd, late H. East India Co.‘s troops).

Rifles.

‘Cameronians (Scottish Rifles)

Dark green

(Formerly 26th and 90th line).

Red

60th Rifles, red.

Dark green

(Formerly 83rd and 86th line).

Rifle Brigade

Black

95th Rifles, black.

Line Infantry, Lowland

Scottish.

Royal Scots Lothian

Blue

1st, blue.

King’s Own Scottish Bor-

»

25th, blue.

Highlanders.

Black Watch (Royal Hrs.)

”

42nd, blue; 73rd, dark green.

Seaforth

Buff yellow

72nd, yellow (S).

Gordon

Yellow

75th, yellow; 92nd yellow (S).

Queen's Own Cameron Hrs. .

Blue

79th, dark green.

Princess Louise's (Argyll and

91st, yellow (S).

Sutherland Hrs.) .

Yellow

93rd, yellow (S).

Royal Engineers (Plate II., line 2, No. 5). — Scarlet tunic with garter, blue cuffs and collar, yellow shoulder-cords and piping, blue trousers with red stripe, helmet with royal arms on plate, and spike. Waist- belt white for men, gold-laced russia leather for officers, who wear also a pouch-belt of russia leather with a wavy gold lion in the centre.

Army Service Corps (Plate II., line 2, No. 1). — Blue tunic with white facings and white piping. Helmet with ball and plate, trousers blue with double white stripe. Officers, gold belts. Royal Army Medical Corps, blue uniform with magenta facings; Army Veterinary Corps, blue with maroon facings; Army Pay Corps, blue with yellow facings ; A rmy Ordnance Corps, blue with red facings. The West India Regiment (negroes) wear a red sleeveless jacket over a white smock, baggy dark blue trousers, and a round cap with white puggaree.

The distinguishing mark of the staff officer in full dress is the

aiguillette and the cocked hat with upright or drooping plume; in undress and service dress the red gorget patches on the collar. The full-dress uniforms of afield marshal and a general officer are shown in Plate II., line 1, Nos. 5 arid 6.

Badges of Rank. — All officers have twisted gold shoulder-cords (except Foot Guards, who wear a blue Cloth shoulder-strap with lace edges) ; on these cords badges of rank are worn as follows : 2nd lieu- tenant, lieutenant and captain, I, 2 and 3 stars; major, crown; lieu- tenant-colonel, crown-and star; colonel, crown and 2 stars; brigadier- general, crossed swords; generals, sword and baton crossed, and (major- general)star; (lieutenant-general), crown; (general), crown and star; field marshal, crossed batons in a laurel wreath with crown above. In service dress (khaki), however, the badges are worn in worsted on a slashed flap of the sleeve, coupled with rings of braid (1 for a 2nd lieutenant or lieutenant, 2 for a captain, &c). Non-commissioned officers wear chevrons (point downwards) on the upper right arm; lance-corporal or acting bombardier, 1 ; corporal, 2 ; sergeant, 3; colour- sergeant, 3 chevrons and crossed colours; staff-sergeant, 4 chevrons. On the lower part of the left arm chevrons(point up) are worn as "good

conduct " badges. A sergeant-major is dressed as an officer, except that he has a crown on the lower part of the right sleeve). There are also badges of proficiency such as crossed rifles for marksmen, a spur for rough-riders, a fleur-de-lys for scouts, &c.

Regimental Badges. — The grenade in various forms is worn by the Royal Artillery, the Grenadier Guards and the Fusilier regiments. The figure of Britannia was awarded to the (9th) Norfolk regiment for gallantry at Almanza, 1707. The White Horse of Hanover was given to some regiments for service against the Jacobites. The Lion of England was awarded by William III. to the King's Own (Royal Lancaster) Regiment for services against the troops of James II. The Queen's (Royal West Surrey) Regiment wear a Paschal Lamb, the badge of Catherine of Braganza, queen of Charles II. The Dragon of Wales figures among the badges of all the Welsh regiments. Several regiments wear a castle and key in memory of services at Gibraltar, others have a tiger for services in India and still more a sphinx for Egyptian campaigns. The most general of all badges— though not the most generally worn — is the "

stripped " rose. Nearly all corps possess several badges, which are combined in various ways.

The special interest of these badges is that they are peculiar to the British army. Although a badge of the branch (infantry, cavalry, &c.) is common, no other army wears distinctive regimental devices.

A few details of general practice may be added. All cavalry wear a pouch-belt over the left shoulder. The crimson infantry sash is worn by officers round the waist and by sergeants across the body and over the right shoulder. All officers and sergeants who do not wear the sash, to whatever branch they belong, have a pouch- belt, the pattern of course varying. Ankle boots (and sometimes leggings with them) are worn by dismounted men. Swords, except in the case of Scottish infantry, are worn suspended by slings from a belt (the belt in infantry, rifles and hussars being worn under the tunic or sash). On foreign service the uniform is varied according to circumstances, the most usual change being from the full dress head-dress to the white helmet.

The full dress of the territorial army varies greatly, sometimes conforming exactly to the uniform of the corresponding regular units, sometimes keeping to its original " Rifle " character in grey or green of various shades. The latter conform to the rules of the dress of " Rifles " (e.g wear pouch-belts instead of sashes), and the former, though in many cases the silver lace and ornaments of the old volun- teer force are retained, to those for the regulars, the distinguishing mark in all cases being the letter " T " on the shoulder or collar. The yeomanry cavalry is variously attired, some old regiments possessing rich old-fashioned hussar uniforms, others of recent formation wearing " service " colours only. Some regiments are dressed as dragoons, but the great majority are hussars. The infantry and artillery of the Honourable Artillery Company of London are dressed somewhat after the fashion of the Grenadier Guards and the Royal Horse Artillery.

Undress Uniforms. — In " walking-out " order most troops wear the tunic, Household Cavalry and Dragoons with waist-belts and sword-slings, lancers with girdle (R.F.A. and Army Service Corps also wear girdles in walking-out order) , infantry and all other branches except hussars with waist-belt. Sergeants of infantry wear the sash and side-arms, the latter

privilege being accorded also to corporals of the guards regiments. White gloves are worn by sergeants. Since the general introduction of khaki service dress, undress uni- forms of red, blue, &c, have mostly disappeared, but the blue serge " jumper " is still retained. Officers of infantry (except in hussars and Rifles) have undress frock coats of various patterns. With these the " Sam Browne " equipment brown leather waist-belt, frog and the sash and slings are worn, but with the jumper and service frock, braces. Field officers have an edging of braid on the peak of the undress caps, staff and general officers an oak-leaf design.

Service Dress. — This, since the conclusion of the Boer War, is universally khaki serge, of shooting-coat pattern, with a spinal pleat and four large pockets; all buttons and badges are in bronze. It has a double collar. A peaked cap, breeches or trousers, and puttees of the same colour are worn with it. The universal pattern great- coat and macintosh are also khaki coloured. The guards and staff officers, however, wear a light grey overcoat.

Mess Dress, for officers, after undergoing various modifications, now almost universally consists of a jacket with roll collar, waistcoat, and overalls and patent leather Wellington boots, the colours following in the main those of the full dress.

It remains to mention a few of the many regimental distinctions, trifling in themselves yet of the greatest importance as fostering regimental pride and as recalling specially gallant services in the old wars. The officers of the 7th Hussars and the Oxfordshire and Buckinghamshire Light Infantry wear linen collars with their undress uniforms. The Royal Welsh Fusiliers have a bow of black velvet (called a " flash," this being an obsolete slang word for " wig ") sewn to the back of the collar — a survival of the old-fashioned method of tying the hair in a club queue. The officers of certain regiments, in memory of severe losses, wear a black line in their gold lace. To com- memorate Culloden the sergeants of the Somersetshire Light Infantry wear their sashes over the left shoulder as officers used to do. Until after the South African War the only fusilier regiment that wore plumed busbies was the Northumberland Fusiliers; now, however, all fusiliers wear a hackle (in the order of regiments shown in the

table: red and white; white; primrose; white; white; grey; green; white and green; blue and green). The (28th) Gloucestershire regi- ment wears two badges on the helmet, to commemorate its having fought facing both ways, ranks back to back, at Alexandria in 1801.

Indian Native Army. — The uniforms of the Indian army vary infinitely in details, owing to the different methods of tying the turban, &c, practised by different castes and tribes, and to the strictly regimental system of clothing and equipping the soldier. But the infantry, except the Gurkha Rifles, have tunics of similar pattern, viz. long skirted, without collars, and (if scarlet) with round cuffs, flaps and broad edgings on the front of the tunic of the facings colour. The trousers are dark blue and wide, and spats are worn with them (Plate III., line 3, No. 4). Gurkhas (Plate III., line 3, No. 5) are dressed as Rifles, except that their head-dress is a round cap. The pattern of cavalry uniform, which is generally followed whatever the colours and regimental distinctions, is shown on Plate III., line 3, No. 3.

In the main the dress of the native cavalry is dark blue. Five of the regiments wear red, the three Madras corps French grey, the Hyderabad and one other green, and only three drab. One regi- ment, the 1st, wears a yellow uniform, being perhaps the only one so clothed in the world.

Native artillery units wear blue with red facings, native engineer units, red with blue facings. The Queen's Own Corps of Guides wears drab with red facings.

The greater part of the infantry wears, in full dress, scarlet, the various facings following no discoverable system, although certain groups of regiments have a regular colour scheme.

A large number of regiments are clothed in drab, and there are Gurkha and other rifles in green; the remarkable Baluchi uniforms (green and drab with baggy red trousers) are unique in the British Empire.

The regiments of the Australian Commonwealth, with certain exceptions, wear khaki or drab with white facings and emu

plume in the cavalry and green facings in the infantry. The same principle is carried out in other services, the intelligence corps having pale blue, the signal corps royal purple, the medical chocolate and the veterinary maroon facings. The artillery, engineers and army service corps are dressed as the corresponding branches of the home army. All the Canadian forces are uniformed very similarly to the British army. The 6th Dragoon Guards and the 13th Hussars are the models for the cavalry, and line, rifle, highland and fusilier uniforms are all represented, the dark rifle uniform predominating. In South Africa, as in Australia, khaki has become almost universal.

France

The Revolutionary simplification cf the varied uniforms of the Ancien Rigime has endured to the present day. Even in the various waves of flamboyant military fashions they have remained simple in the sense that all troops of an arm or branch were dressed practically alike, with none of the regimental differences that England, deferring to tradition, and Germany, systematizing the ordre de bataille to the last detail, preserved and introduced.

The line infantry wears a single-breasted blue tunic with red collar, a small red flap on the cuff, red epaulettes and gold buttons. The number of the regiment appears on a blue collar patch. The cap is a madder-red kepi, with blue band, brass grenade, tricolour cockade and a ball. The trousers are loose, madder-red, and worn either with shoes and gaiters or with high ankle boots. The men usually march in the blue double-breasted greatcoat, under which is worn the plain veste (Plate III., line 2, No. 1). With this is worn a kepi without ornaments and having the number in front. The officers wear a tunic of a different blue, almost black; otherwise, except for rank badges, it is similar to the men's; epaulettes and braid, gold. The officers' full dress kepi has a golden ball and the trousers have a black stripe (Plate III., line 1, No. i).

The chasseur battalions (Plate III., line 2, No. 2) wear the same pattern of tunic as the line, but the collar and cuffs are self-coloured, the epaulettes green, the trousers grey-blue with yellow piping, kepi dark blue with yellow edgings and green ball, buttons, &c, silver. Chasseur officers are dressed as the men (with the usual officer's blue-black tunic), but have a drooping green plume. The Alpine battalions wear a plain dark

blue jumper and soft cap (biret) or tam- o'-shanter. Under the jumper, which is usually half-open, they wear a light blue shawl round the waist. The trousers are wide, dark blue knickerbockers, and puttees are worn with them.

The Zouaves (Plate III., line 1 , No. 8) wear dark blue red-trimmed jackets and waistcoats, with a light blue cummerbund, baggy red trousers with blue piping and dark blue or white spats. The head- dress is a red tasselled cap (chechia). The " false pockets " round which the braid circles on the front of the jacket are red for the 1st, white for the 2nd, yellow for the 3rd and blue for the 4th Zouaves. Zouave officers have the ordinary officer's tunic, with blue-black collar and gold ornaments, but wear it unbuttoned (showing a red cummerbund) and without epaulettes. The cuff is pointed and slit almost to the elbow, the edges of the slit being gold laced according to rank and having a scarlet lining. Only the service kepi is worn. The red trousers have the usual black stripe, and are cut very wide.

The Turcos are dressed similarly to the Zouaves, but with light blue jackets and waistcoats, light blue or white trousers, red cummer-

bund and yellow braid ; the four regiments are distinguished among themselves in the same way as the four Zouave units. Their officers have a light blue tunic with yellow collar, Zouave cuff, red trousers with light blue stripe ; kepi red, with light blue band.

The Foreign Legion is dressed as line infantry, with certain minor distinctions. The colonial (formerly marine) infantry wears a double-breasted tunic with gold buttons, blue grey trousers and dark blue kepi with red piping, plain collar and cuffs. The full dress cap badge is an anchor.

Cavalry. — Cuirassiers (Plate III., line 1, No. 3) wear dark blue tunics with red collars and cuff-flaps, silver ornaments and steel cuirasses, steel helmet with brass ornaments, black horsehair tail, red " shaving-brush " at the front of this tail and another shaving- brush, of colour varying with the squadron, &c, on the left side of the helmet. The trousers are red (officers with dark blue stripes, men with blue piping). The number is borne on a blue collar patch. The officers wear silver, the men red, epaulettes. Undress cap as infantry, silver-

laced for officers.

Dragoons wear blue tunics (the black-braided " dolman, " shown on Plate III., line 1, No. 6, is gradually passing out of the service) with white collars and cuff-flaps, silver buttons, &c, helmet as for cuirassiers, but without the " shaving-brush " at the front of the horsehair tail, trousers red with dark blue stripe. The men wear shoulder-cords instead of epaulettes, and the officers only wear their silver epaulettes on ceremonial duties. The number appears on a blue collar patch. Undress cap as for cuirassiers.

Chasseurs a cheval (Plate III., line 1, No. 7) wear a light blue tunic or dolman (the latter black-braided) with silver buttons, red collars and cuff-flaps. The trousers are red with light blue piping (two broad and one narrow light blue stripes between for officers). The full dress head-dress is a light blue shako, with dark green plume in full dress, coloured ball in other orders. The badge on the shako is a brass bugle. The kepi is red with light blue band and piping (silver braid for officers). Number on the collar.

Hussars are dressed as chasseurs a cheval, but with white braiding on the dolman instead of black, and self-coloured collar. The badge on the shako is an Austrian knot.

The Chasseurs d' Afrique wear the half-open veste, which is light blue with yellow collar and edgings. The cuff is slit in the Zouave style, the visible lining being yellow. A red cummerbund is worn. The shako is almost invariably worn with a white cover and neck curtain. The trousers are red. Officers as the corresponding chasseur officers in France, but with yellow instead of red collars, &c.

The native Algerian cavalry, the Spahis, wear national costume — red jacket with black braiding, red cummerbund, light blue wide trousers, and red morocco boots. Above this they wear a flowing red mantle of thick cloth, and over this mantle the ample white burnous, which covers the head and shoulders. Their French officers wear a red tunic, with self-coloured collar and cuffs, gold buttons and epaulettes, number with crescent in gold on the collar, gold rings on cuff according to rank, trousers as for the hussars, &c, in France.

Artillery. — The rank and file wear blue tunics or dolmans

(more usually, however, the veste). The dolman has black braiding but a red shoulder-cord, and has red collar, with black patch and number, and red pointed cuffs; buttons, &c, gold. The trousers are dark blue, with two broad and one narrow red stripe. The kepi is dark blue, with dark blue band and red ornaments, the full dress cap having a badge, in red, of crossed guns and grenade. Artillery officers wear a black-braided dolman (blue-black) with gold shoulder- cord and Austrian knot. Their kepi has the artillery badge in brass, gold braid, and a red plume. Plate III., line 1, No. 5 shows an artillery officer serving on the general staff. ,

Engineers, dark blue tunic with gold buttons, black red-edged collar patches bearing the number in red , black red-edged flap on cuff s ; red epaulettes, trousers and kepi as for artillery. Engineer officers have the same tunic as infantry, without facings, and the engineer badge (a cuirass and helmet) on the full dress kepi.

Train (Army Service Corps), blue-grey dolman, black-braided, with red collar, black braid on the cuff, and red shoulder-cord; infantry kepi, officers as officers of the chasseurs a cheval but with (silver) Austrian knot on the sleeve, and red plume. Medical officers have dark blue dolman, red trousers with black stripe, and red collars and cuffs. Their distinctive marks are a whole red kepi (with gold braid), a white armlet with the red cross, Aesculapius' staff on the collar, gold-laced shoulder-strap, and a curious pouch-belt which is entirely wrapped in a red cloth cover that buttons over it.

Generals wear in full dress the uniform shown in Plate III., line 1 , No. 4, with some distinctions of rank. In undress they wear a dark blue jacket with black braiding, the black Austrian knot on the sleeve carrying the silver stars of rank ; trousers red with black stripe; kepi red, with a blue band covered by gold, oak leaf lace. General staff officers (see Plate III., line 1, No. 5) wear their regi- mental uniform, with gold or silver aiguillettes, and on the collar, instead of the regimental number, the thunderbolt badge of the staff, the badge or number being removed also from the kepi. Their special distinctions are the armlet and the plume, which vary according to the staff to which the officer belongs.

Badges of Rank. — General officers (on the epaulette or on the Austrian knot), one silver star for general of brigade, two for

general of division. Other officers (rings on the cuff and kepi band, or

strands of braid on the Austrian knot), I for sub-lieutenant, 2 for lieutenant, 3 for captain, 4 for commandant, 5 (3 gold and 2 silver) for lieutenant-colonel, 5 for colonel (Plate III., line 1, figs. 1 and 5). Epaulettes: sub-lieutenant, I with fringe on right shoulder and 1 scale on left; lieutenant, fringed on left and scale on right shoulder; captain, both fringed; commandant, as sub-lieutenant but with thicker fringe; lieutenant-colonel and colonel, both with thick fringes (in the case of the lieutenant-colonel the body is silver). The vertical braids of the kepi also vary according to rank. Field officers as a rule wear in full dress " shaving brush " plumes instead of a ball. Under-Officers. — The badge is a stripe crossing the lower half of the sleeve diagonally ; lance-corporals I , corporals 2 worsted stripes ; sergeants I, sergeant-majors 2 gold or silver stripes. The " adju- tant," who corresponds to the British sergeant-major, has a ring of lace, like an officer's, but narrower.

Germany

The infantry of the Prussian Guard wear single-breasted dark Prussian blue tunics with red piping on front and skirt flaps, or gold buttons (1st and 5th Foot Guards and Guard Fusiliers silver), white belts (3rd or " Fusilier " battalions and the Guard Fusiliers black), red collars and cuffs, spiked helmets with, in full dress, white plumes (Guard Fusiliers black). Guard distinctions through- out Germany take the form of " guard-stripes," collar stripes of embroidery, and similar stripes forming false buttonholes round the buttons on the cuff, whether these are of the " Brandenburg " (plain flap with 3 buttons), " French " (slashed flap with 3 buttons), or " Swedish " (round cuff with buttons along the top edge) pattern.

The 1st to 4th Foot Guards have two guard-stripes on the collar, Swedish cuff with stripes, and white, red, yellow and light blue (the ordinary German indicative sequence) shoulder-straps. The Guard Fusiliers have the same uniform with yellow shoulder-straps and plume and belt as stated above. The 1st to 4th Grenadier Guards have double guard-stripes, red "

Brandenburg ” cuffs with blue flaps and embroidered stripes, shoulder-straps coloured in the same order as the Foot Guards. The 5th Foot Guards and 5th Grenadier Guards (of later formation) wear only a single guard-stripe; these return to white shoulder-straps in the sequence, and both have the blue flap and stripes. Service cap as in the line. For gala wear the 3rd battalion of the 1st Foot Guards, and all battalions of the 1st Grenadier Guards, wear the old mitre cap, once of cloth, but now become rigid and consisting of a metal front plate and a stiff red cap behind it.

The line infantry (other than Bavarians, Saxons, Wiirttembergers, &c.) wear blue tunic with gold buttons, red piping, and red collar. The cuffs, also red, are of the ” Brandenburg ” pattern, plain round with a small red flap. The shoulder straps bear the number, or cipher. The head-dress is a small black leather helmet with brass Prussian eagle badge and spike. The trousers are dark grey with red piping, the equipment of black leather, the boots of Wellington pattern (the trousers being tucked into them). The greatcoat is grey with shoulder-straps as on tunic and a collar patch of the cuff-flap colour. The service cap is a round cap without peak, dark blue with red band and piping, and two cockades, “national” and ” imperial.” Exceptions to these rules are: Prussian grenadiers (Nos. 1 to 12) wear black horsehair plumes and white belts, Mecklen- burg grenadiers No. 89, Queen’s Fusiliers No. 86, Brunswick regi- ment No. 92, 145th Prussian regiment, black plumes.

The Prussian and quasi-Prussian portions of the army follow a clear rule as to the badge of the army corps. The infantry of each corps has shoulder-straps of uniform colour, and when a regiment changes its corps it changes its shoulder-strap. There is a further distinguishing mark on the cuff-flap: —

I.

II.

III.

IV.

V.

VI.

VII.

VIII.

Shoulder-strap Cuff-flap pip- ing .. .

White White

White Nil

Red White

Red

Nil

Yellow White

Yellow Nil

Lt. blue White

Lt. blue Nil

IX.

X.

XI.

XV.

XVI.

XVII.

XVIII.

XX.l

Shoulder-strap Cuff-flap pip- ing .. .

White Yellow

White Lt. blue

Red

Yellow

Red

Lt. blue

Yellow Yellow

Yellow Lt. blue

Lt. blue Yellow

Lt. blue Lt. blue

Except in regiments (such as the guards of the smaller states now numbered in the line of the army, and a few others) where the blue flap and guard-stripes are worn, the greater part of the Prussian regiments wear the historic red flap; but there came a time when the system of indicating regimental variations had to be expanded, and thereafter (from No. 145 inclusive onwards) red and white flaps were given alternately to new regiments, in such a way that there was one " white " regiment in each corps. The I. corps on the Russian frontier, being further reinforced, received one regiment with a yellow (150th) and one with a light blue flap (151st). " Guard " distinctions are worn by the Mecklenburg Grenadiers, No. 89, double guard-stripe on collar, blue cuff-flap with red piping and embroidery; by the 7th Prussian Grenadiers, single guard-stripe and blue flap with embroidery (edged with V. corps colour) ; by the 1st, 2nd, 3rd and 8th Prussian Grenadiers and by the 80th Fusiliers

1 Not yet formed.

(formerly the elector of Hesse's bodyguard), single guard-stripe and embroidery on the ordinary red cuff-flap.

The infantry of Hesse-Darmstadt, Wurttemberg and Baden are similarly uniformed to those of Prussia, the distinctions being easily described. The five " Grand Ducal Hessian " regiments (11 5-1 18 and 168) have not the corps (XVIII.) distinction, and have both shoulder-straps and cuff -flap of the same colour (red, white, light blue, yellow and red), the senior regiment, 115 (bodyguard regiment), having double guard-stripe on the collar and guard patches on the flap. A very marked distinction is in the buttons, which are invariably

silver, and in the helmet badge, which is a lion rampant. The first three regiments wear a black plume.

Of the Wurttemberg infantry (XIII. corps), the 119th and 123rd regiments (guards) wear the double guard-stripe, and the " Swedish " cuff, also plumed helmets. The remainder have red shoulder-straps and red cuff-flaps edged with light blue, like the XV. army corps, and the only conspicuous distinction is the royal arms instead of the eagle on the helmet. The 120th also wears the grenadier plume.

Of the Baden regiments, the 109th and 110th (guards and grenadiers) have white plumes and white shoulder-straps, the 109th having the Swedish cuff with patches, the double guard stripe, and silver buttons. The remainder have yellow, red, light blue and green shoulder-straps; there is no edging to the flap. The only distin- guishing mark for these is the Baden device (a griffin and a shield) on the helmet.

The Saxon infantry, though assimilated to the Prussian in most respects, is distinguished by various well-marked peculiarities. All shoulder-straps are self-coloured and edged with red. All Saxon regiments have either the " Swedish " or more usually the so- called " German " plain round cuff (red), with two buttons on back seam. The guard and grenadier regiments, 100th and 101st, have black plumes, double guard-stripes and " Swedish " cuffs. The helmet has an eight-pointed brass star. The 108th is a rifle regiment, and wears a green tunic with black red-edged collar and cuffs, dark grey trousers and a shako with black plume looped to one side in the Austrian fashion. The service cap of this corps is green with black piping and band. A peculiarity of the Saxons is that the bottom edges of the tunics are edged with red, as well as the front, and the skirt flaps are very short.

The Bavarian infantry has retained its historic light blue uniform, though in most details the Prussian model has been accepted. Tunic and trousers are light blue with red piping, red cuffs, collars and shoulder-straps. The Bavarian bodyguard regiment has red collar with double guard-stripe, red Swedish cuff with stripes, red shoulder- straps and silver buttons, but no plume. The line has gold buttons and appointments and " Brandenburg " cuffs, flaps edged according to the usual sequence (I. corps white, II. none, III. yellow). The service cap is light blue with red band and piping. Belts black.

Jdgers and Schiitzen. — The Jager uniform is bright green, with red collars, piping and Swedish cuffs (Prussian Guard, double guard- stripe and cuff-stripes), gold buttons, trousers as for line, and a small shako with drooping black plume. The Mecklenburg battalion No. 14, however, has light green collars, cuffs and shoulder-straps edged with red, and double guard-stripe and cuff-stripes. The Guard Schiitzen battalion (originally a French-speaking corps from Neuch&tel) has black collars and cuffs, edged with red shoulder- straps, double guard-stripe and green red-edged " French " {i.e. slashed) cuff-flaps with stripes; and the Jager battalions of the XII. and XVIII. corps have exactly the same uniform as the Saxon Schiitzen regiment already mentioned, silver buttons being substituted for gold. The Bavarian Jager battalions have light blue uniforms with green facings, Swedish cuff, and shako. In all these the field cap is of the colour of the uniform, the band of the colour of the collar, the piping as on the tunic.

Cavalry. — The heavy cavalry consists of the Prussian Gardes du Corps and Guard Cuirassiers, the eight line cuirassier regiments, and the Saxon and Bavarian " heavy cavalry." In most of these cuirasses of black or bright iron or of brass (with or without breast decora- tions), and even cuirass-shaped remnants of the old buff coat, in richly decorated leather, are worn on ceremonial occasions. The head-dress is a helmet of burgonet shape. The ordinary full dress of Prussian cuirassiers is a white long-skirted tunic (called a Koller) with white shoulder-straps and collars, edged along the collar and down the front (which is hooked, not buttoned) with broad braid (white, with lines of the regimental colour). The Swedish cuffs, edged with similar braid, are of the regimental colour, of which colour there is also a patch on the collar and piping round the shoulder-straps and back seams. In full dress white trousers, otherwise dark grey trousers with red piping, are worn. The undress tunic is dark blue of the ordinary buttoned pattern, but with braided cuffs, white shoulder-strap and collar-patch and braid as in full dress. The field cap is of the tunic colour with band of the regimental colour. The belts are white. High jack-boots are worn. The guard regiments have double guard-stripe and cuff-stripes.

The Saxon heavy cavalry wears light blue braided cuirassier tunics, with brass scales instead of shoulder-straps, white piping, brass helmets with the Saxon star device, Swedish cuffs cut gauntlet- wise, white or light blue trousers, light blue cap,

and white belts. In the 1st Guard regiment the collar and cuffs are white, the braid light blue and white, the helmet ornament a silver lion, the cap-

FRANCE.

UNIFORMS

Artillery (l.hnit,

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PtATE I [I,

Cbevul Suti-lieuL

3rd Zouava.

FRANCE.

RUSSIA

Line Infantry. Marching

artier.

Cria&si.'iLrs

Mt

Den

Lithuanian

Kutmn

Grodno

ITth Infantry

h Pi«J,

Dragoons.

Coasack.

Guunls.*

*C«it*f*clc.*

iitwjuirs.

of tin- Line.

Lieutenant,

Offlccr,

Om«t-r-

Officer,

JAPAN.

INDIA.

UNITED STATES.

iLruntry.

Guileful

ISth Cuvalry.

LudliiiiiiA

ttid Gurkbu.

Infantry.

Lieut. Cwlaliel.

OipUtin. Ininntry.

Service

Ollk-er.

SiUu.

{jcrvice

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drcin.

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df«A

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L'Ddroii.

UNIFORMS

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band white; in the 2nd Carabineers collar and cuffs black, braid black and white, helmet ornament a brass spike, cap-band black. The Bavarian heavy cavalry is dressed in dragoon fashion — light blue tunic, red facings, light blue collar edging, light blue trousers with red stripe, helmet with white plume. 1st regiment has silver buttons, the 2nd gold.

Helmet.

Facings.

Blue Tunic Facings.

Buttons.

G. du Corps

Brass with

silver eagle (or

spike)

Red

Red

Silver

G. Cuirassiers

Blue

Blue

1

Steel with brass spike

Black

Black

ti

2 „

Dark red

Dark red,

3 .1

Light blue

Light blue

4 >•

Red

Red

5 ”

Pink

Pink

Gold

6 „

Brass with silver spike

Dark blue

Poppy-red

M

7 ..

Steel with brass spike

Yellow

Yellow

M

8

..

Green

Green

‘•

The line dragoon regiments, other than those of Oldenburg, Mecklenburg, Baden, Wurttemberg, and Grand Ducal Hesse (Saxony and Bavaria have no dragoons) wear light blue tunics with collars, shoulder-straps (with number), piping and cuffs of the regimental colour. The cuffs are Swedish. The trousers are blue- black without s;iipe. The helmet is black leather, very similar to the infantry heimet, with black horsehair plume. The regimental distinctions follow a regular scheme thus: —

Regiment.

1

2

3

4

5

6

7

8

Facing . . .

Collar edging

Buttons and

ornament;.

Sca.let Lt. olue

Gold

Black Lt. blue

Gold

Pink Lt. blue

Silver

Yellow Lt.blue

Silver

Scarlet Lt. blue

Silver

Black Lt. blue

Silver

Pink Lt. blue

Gold

Yellow Lt. blue

Gold

Regiment.

9

10

11

12

13

14

15

16

Facing . . . Collar edging Buttons and ornaments.

White Lt. blue

Goid

White Lt. blue

Silver

Crimson Lt. blue

Gold

Crimson Lt. blue

Silver

Scarlet White

Gold

Black White

Gold

Pink White

Silver

Yellow White

Silver

The 17 th and 18th (Mecklenburg) have respectively scarlet facings and gold buttons, and black facings with silver buttons. They have the double guard-stripe and cuff stripes. The 19th (Oldenburg) have the ordinary uniform with black facings and silver buttons, but white shoulder-straps.

The Baden regiments (20, 21 and 22) have light blue uniforms with scarlet, yellow and black facings, light blue, light blue and red edgings, and silver buttons. They have white plumes instead of black, and the Baden device on the helmet. The

Hessian regi- ments (23 and 24) have dark green tunics; the 23rd have double guard-stripe, cuff stripes and scarlet facings; the 24th the ordinary tunic with white facings, and both silver buttons. The Wurttem- bergers (25 and 26) have white and yellow facings respectively, collar edging light blue, buttons gold and silver respectively; the 25th regiment has double guard-stripe and cuff stripes, and white plume. Belts are white throughout, except in the Hessian units, which have black.

The Prussian Guard Dragoons have light blue uniforms and red facings, double guard-stripes, and cuff stripes. Buttons gold in the 1st, silver in the 2nd. White plumes.

The uniforms of the eight Bavarian regiments of Chevaukgers resemble those of dragoons. They wear the black dragoon helmet and white plumes, dark green tunics, trousers and undress cap, and white belts. They also have the dragoon cuffs. But they have the double-breasted lancer tunic with front and piping of the regimental colour ; crimson 1st and 2nd; pink 3rd and 6th ; scarlet 4th and 5th; white 7th and 8th; the first of each pair having gold, the second silver ornaments.

The Lancers (Ulanen) wear the usual lancer uniform of czapka, double-breasted tunic with plastron, and girdle. The trousers are dark grey, the plume white. The girdle is of the uniform colour edged with the facings colour. The cuff is the so-called " Polish," a round, slightly pointed cuff with a button (and where appropriate a guard-stripe) in the middle of the pointed portion. The collar is edged with the uniform colour. Regimental distinctions in the line are as shown in table at the top of next column.

Guard Ulans : dark blue tunic with double guard-stripe and cuff stripes, and dark grey trousers; 1st, red facings, and piping, white turnback (piped red), white czapka; 2nd, scarlet facings and czapka; 3rd, yellow facings and czapka.

17th, 1 8th and 21st (Saxon), light blue tunics and trousers, crimson facings, double guard-stripes and cuff stripes, brass scales, white piping. Czapkas white, crimson, light blue. Undress caps white. 19th and 20th (Wurttemberg). dark blue uniforms, dark

grey trousers, facings and czapkas scarlet in 19th, yellow in 20th. 19th double guard-stripe and cuff stripe. Ornaments

silver. 1st and 2nd Bavarian Ulans, dark green tunics and trousers, crimson facings and czapkas, white belts instead of girdles; 1st gold, 2nd silver ornaments.

1

2

3

4

5

6

7

8

Facings and piping . .

Czapka and ground of scale . . .

Ornaments .

Scarlet

White Gold

Scarlet

Scarlet Gold

Scarlet

Yellow Gold

Scarlet

Lt. blue Gold

Scarlet

White Silver

Scarlet

Scarlet Silver

Scarlet

Yellow Silver

Scarlet

Lt. blue Silver

Q

10

11

12

13

14

is

16

Facings and piping . .

Czapka and ground of scale . . .

Ornaments .

White

White Gold

Crimson

Crimson Gold

Yellow

Yellow Gold

*Lt.blue**

Lt. blue Gold

White

White

Silver

Crimson

Crimson Silver

Yellow

Yellow

Silver

*Lt.blue**

Lt. blue Silver

- *These two regiments have white piping.*

The Hussars are very richly dressed, many having the slung pelisse. The front cuffs, back seams and collar are braided. The busby is low and slightly conical, the busby-bag hanging over towards the back on the left side. On the front of the busby are various decorations. Round the waist is a white girdle intertwined with the colours of the state to which the regiment belongs. A plain shoulder cord is worn. The trousers are dark grey with lace stripe. The Hessian boots have embroidered top and boss. The five senior regiments preserve the unusual colours indicative of their irregular origin. The remainder are clothed in dark and light blue, or green. All wear a white (gold or silver officers) pouch-belt, white plumes. The undress cap is of the colour of the tunic, with various bands.

Guard

14 15

9 12

13 16

6

10 11

Uniform.

Scarlet

Black

Dull vermilion

Brown

Dark red

Dark blue

Light blue

Dark green

Busby-bag.

Scarlet

Red White

Vermilion Yellow

Dark red

Red

Light blue

Red

Yellow

Light blue

White

Red

Yellow

Red Pink Red

Lace and Braid.

Gold

Silver

Gold Silver

Gold Silver

Gold Silver

Gold Silver

Pelisse.

Dark blue

Black Dark blue

Dark blue Dark blue

Light blue Light blue

The 17th Brunswick Hussars, preserving the memory of the Black Brunswickers of the Napoleonic wars, have black uniforms (no pelisse), with gold lace and red busby-bag. The 18th and 19th (Saxon) Hussars have light blue tunics and trousers (no pelisse), with gold and silver lace and red and crimson busby-bags respec- tively. No information is available as to the 20th Hussars, formed in November 1910.

The Jagers zu Pferd (mounted rifles) have a green-grey tunic and trousers of cuirassier cut, with green collars, Swedish cuffs, shoulder-straps, and piping, green-grey cap, brown belts and a black helmet of cuirassier pattern. The buttons are silver. The broad cuirassier braid on collar, front and cuffs is green, with white lines in the 1st, red in the 2nd, yellow 3rd, light blue 4th (the normal sequence), black 5th. The edgings of the shoulder-straps are similarly white, red, &c. The "staff orderlies " wear the same uniform, with certain deviations, in particular yellow and green braid, gold buttons, and white undress cap.

The machine gun detachments wear a grey uniform with red Swedish cuffs (guard-stripes and cuff stripes in the Guard corps), collar, shoulder-strap and piping. The head-dress is the Jager shako, and the whole uniform is of Jager type, so much

so that the 2nd Guard detachment has the black collar and " French " cuff of the Gardeschiitzen.

The field artillery has the dark blue tunic with red piping, black collar and Swedish cuffs, gold appointments, and dark grey trousers without stripe. The helmet has a ball ornament. The cap is blue with black band. The Guard regiments have double guard-stripes and cuff stripes and a white plume — shoulder-straps, white for 1st, red for 2nd, yellow for 3rd, light blue for 4th regiment. In the field artillery at large the shoulder-straps are of the corps colour.

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The Bavarian, two WUrttemberg, one Baden and two Hessian regi- ments have white or black (Bavarians red) plumes, otherwise as for a " red " Prussian corps. The Mecklenburg artillery has silver buttons. The Saxon field artillery uniform is altogether different, consisting of green tunics with red collars and Swedish cuffs, gold appointments, red edgings, and black plume (horse artillery have a brass scale). Prussian and Bavarian field artillery have white belts, others black. The foot artillery, which has white shoulder-straps, is distinguished from the field by the black Brandenburg cuff with plain blue flap (Guard Swedish cuff, guard-stripes, &c.) and by a red trouser piping. The Saxon foot artillery is distinguished from the field by the ball ornament instead of plume, and the " German " cuff. Belts black (Guard and Bavarians white). Bavarian foot artillery as Prussian, but with a spiked helmet and black cuff-flap, red-edged.

The pioneers have the same uniform as artillery, but with silver buttons and appointments. The shoulder-straps are red, the helmet is spiked (Guards, black plume). The cuffs are black, red- edged, Swedish. Saxon pioneers as field artillery, but with " Ger- man " cuff. The " communication troops " wear similar uniforms with special badges, some having the Jager shako. The Train (army service corps) has dark blue dragoon uniforms with light blue facings and black plumes; Saxons, however, have light blue with black facings. Medical officers and hospital corps wear blue uniforms with blue collars and cuffs and red edgings; stretcher bearers, &c, blue with magenta facings and silver buttons, &c.

Rank Badges (a). — Non-commissioned officers: lance-corporal

a button on each side of the collar. Corporals and sergeants gold

or silver lace on the collar and cuffs, small patches of the national

colours on the collar patches of the greatcoat. Sergeants are

distinguished from corporals by a button to the collar. There are

numerous minor distinctions on the sword knots, lance pennons,

hussar girdles, &c. Sergeant-majors have a narrow ring of lace on

the cuff in addition to the broad under-officer's ring; and on the

greatcoat patch two small national patches. Aspirant officers

wear the uniform of their non-commissioned rank with some of

the officer's distinctions, (b) Officers: The distinctive mark of

the commissioned officer is the shoulder-piece (epaulette or cord).

The epaulette is almost always silver and is worn as a " scale,"

i.e. without fringe, by captains and subalterns, with a fine fringe

by field officers and with a thick fringe by general officers. The

ranks within each class are distinguished by small stars on the

circle of the epaulette, lieutenant, major, and major-general, no star;

first lieutenant, lieutenant-colonel and lieutenant-general, one star;

captain, colonel and general, two stars. A colonel-general has

three stars and a field-marshal crossed batons. The number or

cipher is also worn by all regimental officers. The body of the

epaulette is usually of the same colour as the shoulder-strap of the

rank and file. The shoulder cord for captains and subalterns is

made up of straight strips of silver lace, that for field officers is of

twisted silver cords, that of general officers is composed of two gold

cords and one of silver and colours intertwined. In all these, lines of

the national colours are interwoven with the silver. Badges,

numbers, &c, as on the epaulette. A silver waist-sash (staff officers

and adjutants shoulder-sash) is worn by all combatant officers

(except hussars, who have girdles). An interesting survival of

earlier uniforms is found in the full dress of general officers. The

tunic buttons below the waist, and while on the left shoulder there

is only a narrow silver cord, on the right the thick cord of gold,

silver and coloured silks is extended to form an aiguillette. The

aiguillette is also worn on the right shoulder by staff officers and

some others. A universal custom, which is also a survival, is

for all ranks to wear sword-knots, even with the bayonet.

The new service dress is a loose-fitting " field-grey " uniform,

except in Jagers, machine-gun detachments and Jagers zu Pferd, who wear grey-green field dress.

Austria-Hungary The infantry uniforms, since the abandonment of the his- toric white after 1866, have been of a very quiet shade of dark blue, and the facings colours are more varied than those of any other army. The "German," that is Austrian, _ infantry wears in full dress a dark blue single-breasted tunic, light blue trousers, and a black leather shako with double eagle and a metal ball ornament. The equipment is black. On the shoulders are straps terminating in rolls or " wings," all of the regimental colour, as are the collar and the (" German ") cuffs. In marching or service dress the tunic is replaced by a hooked jacket or blouse with plain cuffs, no shoulder-straps, and only collar patches of the regimental colour. The trousers are turned up over or tucked into a high ankle boot. The field cap is of cloth, cylindrical, with flaps buttoning in front. Hungarian infantry wears the same tunic but has a silver or white embroidered device in front of the cuff. The trousers are tight pantaloons, with a yellow piping and " Aus- trian " — really Hungarian — knots. Officers of infantry have no shoulder cords or straps. The full dress shako and the collar are ornamented with braid or lace according to rank. A yellow waist- sash is worn. Hungarian officers are dressed as Austrian except for the tunic cuff ornament. In other respects both the tunic and the blouse are similar to the men's. Jagers wear a broad-brimmed felt hat with cock's feather plume on the left. The tunic, trousers and cap are green-grey; the buttons gold; cuffs, collar, shoulder

ornament and piping in full dress, and collar patch and piping in undress, green. Officers wear the waist-sash and double green stripes on the trousers. All officers in undress wear plain dark grey trousers and dark grey cylindrical cloth cap, both in the line and the Jagers.

Austrian.

Hung

arian.

Facings.

White or silver but-

Gold or brass but-

White but- tons, &c.

Gold but- tons, &c.

tons, &c.

tons, &c.

Black . . .

58th

14th

38th

26th

Dark brown

17th

55th

78th

68th

Maroon .

7th

93rd

83rd

I2th

Dark red .

18th

1st

53rd

52nd

Amaranthˆed

95th

90th

■ —

86th

Bordeaux red

88th

89th

—

—

Cherry red .

77th

73rd

23rd

43rd

Madder red

74th

15th

34th

44th

Crimson .

81st

84th

82nd

96th

Scarlet

80th

45th

9th

37th

Vermilion

20th

35th

67th

71st

Pink . . .

36th

57th

66th

65th

Rose .

97th

13th

6th

5th

White . .

92nd

94th

—

—

Sea green .

87th

2 1st

25th

70th

Apple green

54th

9th

79th

85th

Bright green

10th

91st

50th

46th

Grass green .

28th

8th

62 nd

61st

Seaweed green

—

102nd

—

- —

Grey green .

47th

56th

60th

48th

Pike grey

49th

30th

69th

76th

Ash grey .

24th

nth

33rd

51st

Orange

42 nd

59th

63rd

64th

Imperial

yellow .

22nd

27th

31st

2nd

Sulphur .

41st

99th

101st

1 6th

Sky blue .

8th

4th

19th

32 nd

Pale blue .

75th

40th

29th

72nd

Pearl . . .

98th

100th

—

■

Dragoons wear light blue jackets with collar and cuffs of regimental colour and narrow white or gold shoulder cord, red trousers, black crested helmets (gilded crests for officers), and slung pelisse exactly similar to the jacket except that the collar and cuffs are of black fur. The jacket is not merely an ornament, but is frequently worn, serving as a tunic. The field cap of the rank and file is red, shaped as for infantry, but without peak. Belts brown. The facings are — dark red 1st and 3rd, black 2nd and 6th, grass green 4th and 9th, imperial yellow 5th and 12th, sulphur yellow 7th and 10th, scarlet 8th and I Ith, madder red 13th and 14th, white 15th. Silver buttons I, 2, 4, 5, 6, 7- 11. 13; gold 3, 8,9, 10, 14, 15-

Hussars wear dark or light blue jackets and pelisses, the former braided, the latter braided and edged with black fur. The trousers are red with gold " Austrian " knots and piping (all hussars are Hungarian) and the boots have the usual hussar braid. The head- dress is a shako with black " shaving-brush " plume. Regimental distinctions are as follows : —

Shako.

White

Dark blue

Madder red

Ash grey

Silver. Gold

9th 13th

nth

3rd

1st

8th

15th

,°3

f3J

Shako.

White

Light blue

Madder red

Ash grey

Silver. Gold.

12th 7th 4th

1 6th

2nd

10th

14th

6th

Lancers (Uhlans, who do not carry lances) wear the lancer cap (czapka) with black plume looped back, and old ornaments, light blue double-breasted lancer tunics (slung on the shoulder as pelisses) with madder red cuffs and piping — but no " plastron "—black for collar and gold shoulder cord. The jacket is plain, light blue, with breast and skirt pockets and flaps edged red, red collar and cuffs, no shoulder cord. The trousers are red. . Regimental distinc- tions — top of the czapka, imperial yellow 1st and 6th, dark green 2nd and 7th, madder 3rd and 8th, white 4th, light blue 5th, cherry I ith, dark blue 12th and 13th. Gold buttons 1st, 2nd, 3rd, 4th, 5th and 12th; silver 6th, 7th, 8th, nth and 13th. ••

All cavalry officers wear gold or silver pouch-belts ; in undress dark grey trousers and cap are worn. Men's undress cap as for dragoons. All cavalry men carry the carbine slung and have brown belts.

Artillery wear maroon tunics, light blue trousers, red collars,

cuffs, shoulder-straps and wings, light blue cap, shako with black plume looped back. Fortress artillery have a red stripe in the trousers, technical artillery are dressed as field, but with dark grey trousers and cap and without plume. Buttons gold. On the jacket the whole collar is red. Officers wear pouch-belts as cavalry, and in undress the usual grey trousers and cap.

Engineers have an infantry uniform, but in the Jager colours, grey and green. Train (A.S.C.) as artillery, but with light blue facings and red trousers with cap. Their shako has no plume.

GERMANY.

UNIFORMS.

Plate IV

Bavaria :

Infantry

till. CorpiX

Pniwliv :

Infantry

f V. Corp).*

Prussia :

rnuula :

Prussia :

Fruasm ;

Prussia:

Prussia :

Js UrsiKoons,

Captain, Field

*Ma|*ir.*

Oflker. irtlZkten

Utli UWaiu.

4Ui Grenadier

ArtllK-ry.

1th Cuirassiers.

Hussars,

Guards.

Saxony:

J&ffcr.

GERMANY.

ITALY.

Prussia;

General Staff,

Bemnirtierl :

Field Artillery

Cn vail ejrlitfi

Miilor- Infantry LlneCnvalry, Infantry,

General.

Sen' ice

Marching

Ofllcrar.

(ttthawt.K

*General, (Meer, OITJcer Und«*s Service*

dress.

order.

Uintrran Utli Genoa (Aorta OrtKocte).

NAVIES.

(Piitoin Brigade). Reft.}.

Brwlnnd: Marine Usht Infantry.

Fnince : &aEii»r.

Gercnnny ; Marine,

Germany; Germany; Enisland:

Sailor, Vicc-Adniiral. I'lce-Admlral.

Ennlaml: U.S. A,:

Sailor.

Sailor.

UNIFORMS

59 1

The staff wears a dark green tunic, short-waisted, double-breasted and piped all round with red. The collar and cuffs are red (cuffs black for general staff), buttons and lace usually gold. The trousers are dark grey, piped red (in some cases with stripes of yellow and red). The general staff wears the waist-sash; the adjutant-general's branch, aides-de-camp, &c, the same sash over the shoulder (as indeed all adjutants wear it in Germany and Austria). The cocked hat is small and has a green feather plume. General officers ordinarily wear dark grey trousers with double red stripe, pearl- grey tunics, cocked hats and waist-sash; their collars and cuffs are red. Inspector-generals of artillery and engineers wear the colours of their arm (brown and Jager grey). In court dress, however, Austrian generals wear the old white tunic and red, gold-laced trousers; Hungarian generals an elaborate red hussar dress, with a white pelisse.

Rank is shown by stars and lace on the collar. Lance-corporal, corporal and sergeant have I, 2 and 3 worsted stars; second lieu- tenant, first lieutenant and captain 1, 2, and 3 gold or silver stars; major, lieutenant-colonel and colonel 1, 2 and 3

stars on a gold- laced collar; major-general, lieutenant field-marshal and general (or Feldzeugmeister) I, 2 or 3 stars on laced collar.

Russia

The figures in Plate III. represent the uniforms of 1905. Since that time the attempt to combine bright colours with the looseness and comfort of service dress has been abandoned, and the troops have received a more handsome full dress and a grey-green field dress. Little information as to the details of the new uniforms has been published. The ordinary infantry uniform was a double- breasted hooked tunic of dark green cloth, dark green trousers and cap (in full dress a round fur cap). With a few exceptions, details of facings, &c, followed well-marked rules. The number of the regiment appeared on the cap, that of the division on the shoulder- strap. The two regiments of the 1st brigade in each division wore red shoukLr-straps, the two of the 2nd brigade blue. The 1st regiment had a red cap band and red collar patches, the 2nd blue, the 3rd white and the 4th green. It is not known how far this has been modified of late years. Regiments with royal colonels-in-chief wear ciphers on the shoulder-strap, and some have double guard- stripes on the collar. In winter a heavy grey-brown greatcoat is worn, usually with a loose sheepskin lining and a fur-lined hood. The grenadiers are distinguished by yellow shoulder-straps (with a narrow edging of red, blue, white and yellow, according to the division). The Guards wear closely fitting tunics, with guard-stripes on the collars and cuff-flaps. In the 1st Guard division the shoulder- straps and piping are red and white, in the 2nd red and red; in the 3rd yellow and yellow respectively. The cuff-flaps are red in 1st, and 2nd, yellow in 3rd division. The colour of the collars and cuffs varies according to the order of regiment within the division. The Pavlovsky regiment wears, instead of the fur cap, the old mitre- cap in brass and stiff red cloth.

Rifles wear the universal pattern uniform with plain cap-band and collar and crimson shoulder-straps. The Finland rifles have light blue instead of crimson, and the Guard rifles have double guard-stripes and stripes on the cuff-flap (or Swedish cuff).

Line dragoons wear a dark green silver or gold buttoned tunic, double-breasted, grey-blue trousers and knee boots. The cap,

which was peaked, and had a dark green band, was, in 1905, red for the 1st, blue for the 2nd, and white for the 3rd regiment of each division, the same colours appearing on the collar patches, piping and shoulder-straps. The regimental number (or colonel-in-chief's cipher) appears on the shoulder-strap. The fur cap is in shape a truncated cone, the body of the cap being of the colour of the facings and the sides of fur. A few regiments had special distinctions.

The cuirassiers (guards) wear in full dress white cuirassier uniforms with brass helmets and eagles, and in field order dark green tunics and white caps. The trousers are grey-blue with red stripe. The Horse Grenadiers wear dark green lancer tunic with red facings, double guard-stripe and cuff-stripe, red girdles and dark grey trousers with red stripes. They wear epaulettes and the curious grenadier cap mentioned above. The Guard Dragoons are dressed as the Horse Grenadiers, but with the dragoon busby and red shoulder-straps. The Guard Lancers wear a lancer uniform resembling the German, blue with scarlet facings, lancer caps and grey-blue trousers. The top of the czapka is scarlet and yellow for the respective regiments. The Emperor's Hussars wear scarlet tunics and blue trousers, and the Grodno Hussars dark green tunics and crimson trousers (see Plate III., line 2, No. 7), with busby, red busby-bag and white plume; girdles scarlet and blue and green and white, and braid yellow and white respectively.

The artillery tunic, trousers and cap are dark green, the piping and shoulder-strap red. The Guard Artillery has black collar and cuffs, red-edged. The engineers are distinguished from artillery by their having silver buttons and appointments instead of gold.

The greater part o f the Cossacks wear a long, loose caftan. This, in the Don, Ural and Astrakhan contingents is dark blue, in the rest, except as mentioned below, dark green. Cossacks w>ar no spurs, but use a whip. As for the facings, the Don regiments have plain, and the other blue regiments crimson and yellow shoulder-straps respectively, and the green regiments have red, yellow or light blue. The head-dress is a conical lambskin cap, with cloth top, or a blue or green cap with band of the regimental colour. The Caucasus

regiments, however, wear a more distinctly national uniform, con- sisting of a dark brown, collarless caftan, cut away below

the throat to show a waistcoat, scarlet for Kuban and blue for Terek regiments (Plate III., line 2, No. 6). The shoulder-straps are of the colour of this waistcoat. The Caucasus regiments always wear the full head- dress and never the field cap. The Guard Cossacks have short tunics (scarlet, light blue and' dark red) with guard-stripes on collar and cuffs, and caps of the same colours. These wear spurs besides carrying whips. The Cossacks of the tsar's escort wear a scarlet caftan edged with gold braid, white waistcoat and dark blue trousers. The Cossack artillery wears green uniforms of Cossack cut, with red facings.

Badges of rank are as follows: Non-commissioned officers, one, two or three stripes of braid across the shoulder-strap; sergeant- major, a stripe of gold lace across the shoulder-strap. In and above the rank of corporal, gold lace is worn on the collar and cuffs as in Germany. Officers wear broadcloth (red, blue, &c.) shoulder-straps nearly covered by strips of silver or gold lace ; on these appear the number or cipher and stars of rank — subalterns one, two and three, second captains four and senior captains none. In these ranks the cloth of the shoulder-strap shows in one narrow strip through the lace. In the field ranks, the cloth, covered by three bars of lace, shows two strips and the same sequence is followed: lieutenant-colonel, three stars; colonel, none. In general officers' uniforms the lace entirely covers the cloth, and the stars number two for a major-general, three for lieutenant-general and none for a full general.

Italy

The universal colour in full dress and undress coats is a dark, flat blue, faintly tinged with purple. Generals, cavalry and infantry (except Bersaglieri) wear blue-grey trousers and silver ornaments ; staff officers, artillery and engineers dark blue trousers and gold ornaments.

The coat, whether tunic or frock, has a stand and fall collar, on the corners of which invariably figures a five-pointed silver or white star. The cuffs are slightly pointed, except for cavalry. The full- dress head-dress is a low cloth shako, the undress throughout a kepi. Generals wear only the kepi. The tunic, double-breasted for officers and single-breasted for rank and file, is cut very short, and has little piping. Officers have plain blue shoulder-straps with stars showing rank. A white collar is

worn under the coat collar by all ranks. Officers have a blue frock, with. black braid and plain cuffs.

Infantry have silver buttons and (rank and file) red-edged shoulder-straps and shoulder wings, blue-grey trousers with red piping (officers, double stripe). The shako is blue with red piping (officers, silver braid), silver device and cockade; the kepi (in the rank and file pointed back and front and pressed down at the sides) is similar in colour, &c, to the men's shako. The belts are black. The Grenadier brigade alone has red collars and cuffs, all others are self-coloured (red edge to cuff). The greatcoat is light blue- grey, single-breasted and unadorned except for shoulder wings. White or holland gaiters are worn with the blue uniform. The brigades are distinguished by gorget patches of the brigade colours, upon which the star is worn. Officers wear a shoulder sash of light blue, and in full dress silver epaulettes.

Cavalry. — Line cavalry have light coloured collars, cuffs and shoulder-strap edges, silver buttons, and blue-grey trousers with double back stripe (officers, of the facings colour). Regimental distinctions are given in the table. The full head-dress is a singularly handsome helmet, partly black, partly bright steel, with a tall swan- neck crest (see Plate IV., line 2, fig. 8) and on the front a broad white cross. The undress cap is a kepi with piping as in table. On the men's shoulder-straps is a silver grenade. The lancers {Lanzieri) have coat and trousers as line cavalry with regimental distinctions given below. On the men's shoulder-straps are crossed lances. The head-dress is a fur cap, adorned with crossed lances and chain in silver. It has also a cockade and a small upright plume. The crossed lances appear also on the kepi. The light horse (Cavallegieri) have a similar coat and trousers, except that the collar has a flame-shaped patch. Shoulder-strap, full head- dress and kepi as for lancers, with a bugle instead of lanCes. All cavalry have brown bandoliers over the left shoulder.

Artillery, gold buttons, dark blue trousers, with yellow piping (officers, double yellow stripe). Officers' tunics have black yellow- edged collars and cuffs, men's a black yellow-edged collar patch, and yellow edgings on the collars, shoulder-straps and cuff. The badge of the field artillery on shako, k£pi and men's shoulder-straps is gold crossed guns; that of the horse and mountain, a gold grenade; fortress artillery are dressed practically as field. The shako has gold badge and short

upright plume (horse artillery long black plume, looped back on the right side) ; the kepi piping is yellow. Gold epaulettes and light blue sash are worn by officers, and in the horse artillery a pouch-belt as well. Engineers have the artillery uniform, but with red piping, &c. instead of yellow, and badge of crossed axes. The departmental corps wear, as a rule, black facings with light blue piping, differing amongst themselves in details.

The famous Bersaglieri (light infantry) have the infantry tunic, and frock with gold buttons, &c. (officers in full dress, epaulettes), dark blue trousers with crimson stripe. Officers have crimson cuffs, all ranks a blue red-edged collar, with crimson flame patch. The distinctive feature is the dark, wide-brimmed, slouch hat with a

large drooping cock's feather plume. The Alpine infantry (Alpini) have a black felt hat with silver device and eagle feather, tunic, fousers and kepi with green instead of red piping throughout. Officers wear black collar with green flame patch and green cuffs.

Collar.

Cuff.

Piping.

Line.

1 Xice

2 Piedmont

3 Savoy ....

4 Genoa ....

Crimson

Red

*{ Black, red *

*I edged *

Yellow

Crimson Red Black Yellow

Crimson Red

Yellow

Lancers.

5 Novara ….

6 Aosta

7 Milan

8 MontebcUo .

9 Florence …. io Victor Emmanuel II.

White Red Crimson Green Orange Yellow

Black

- As collar

Collar.

Flame patch.

Cuff.

Piping.

Light Horse.

1 1 Foggia

Red

Black

Red

Red

12 Saluzzo

Yellow

Black

Yellow

13 Monferrato

Black

Crimson

”

Crimson

14 Alessandria

Orange

”

Orange

15 Lodi

Red

Black

”

Red

16 Lucca .

White

”

White

17 Cascrta

Black

Red

Red

Red

18 Piacenza .

Green

Black-

Black

Green

19 Guides

Lt. blue

White

Lt. blue

White

20 Rome .

Black

M

Black

,,

21 Padua .

Crimson

Black

j)

Crimson

22 Catania

Orange

»)

,,

Orange

23 Humbert I .

White

Lt. blue

White

White

24 Yicenza

..

Red

»

Red

General officers have a single-breasted tunic with black velvet collar and cuffs laced with silver, red piping, silver shoulder-straps, and silver buttons. Frock, trousers, &c, as shown on Plate IV., line 2, No. 6. Staff officers wear light blue collar and cuffs, dark blue trousers with gold stripe and shako somewhat as for artillery officers. They wear the usual light blue shoulder sash, but over the left, instead of, as in the army at large, over the right shoulder.

The new service dress is blue-grey, regimental distinctions as on the officer's frock and kepi in all arms. Infantry equipment is shown on Plate IV., line 2, No. 9. The cavalry head-dress is a round grey helmet.

Rank Badges. — Non-commissioned officers : Red or silver chevrons above the cuff, and small distinctions on the shako. Officers: On the shoulder-strap, I, 2 and 3 silver stars for subalterns and captains, the same with narrow silver edging round the strap for field officers, 1, 2 or 3 gold stars on a

silver shoulder-strap for general officers; on the shako, silver or gold rings round the upper part, on the kepi rings round the lower part of the cap, I, 2 or 3 for company officers, 1 broader ring and I, 2 or 3 for field officers. On the general's kepi there is a red, silver-embroidered band with 1, 2 or 3 rings above.

United States

The uniforms, though recent changes have largely deprived them of their character, still in some respects follow the French fashion upon which they were originally modelled. The helmet, worn until 1899, indeed showed no trace of French influence — it was simply a mere showy parade head-dress. The French kepi, worn during and after the Civil War, has been abolished and replaced by a cap which, like the full-dress cap now worn, bears some resemblance to the Japanese cap. But the long-skirted blue tunic, the general's " chapeau," the sergeant's and corporal's long pointed chevrons still survive to recall the old uniforms, and one or two of the innovations, the rank badges on the sleeve, are also French.

Infantry Officers. — Full dress : universal pattern tunic (dark blue, double-breasted w-ith thick gold shoulder cord) with light blue, gold-laced collar, light blue trousers with white stripe, badges of rank and branch on sleeve. Universal pattern full-dress peaked cap (stiff blue cloth, gold-edged band, and eagle badge, with light blue band). Undress: universal pattern frock (dark blue, single-breasted, braided black and hooked; across the shoulder, flat loops edged with gold lace and bearing rank badges) ; shoulder loop light blue; plain collar with U.S. and branch badge in gold; trousers as in full dress. Sword belt under 1 the frock, slings brown leather. Cap, of the same shape as full-dress cap but with

ilain black braid band. A white undress of similar pattern is worn in

lot climates. Service dress (olive drab or light' khaki). Coat,

i

single-breasted, four pockets, stand and fall collar, bronze buttons and ornaments. Brown waistbelt and braces, somewhat similar to British " Sam Browne," but with sword slings. Peaked cap, plain olive drab or khaki, with bronze eagle

badge. Slouch hat, grey, with gold and black twisted cord.

Evening dress and mess dress: blue, with shoulder cords and rank-marks as in full dress, blue trousers. Greatcoat, universal pattern, khaki with horn buttons; rank-marks in black braid on the sleeve, branch badge in bronze.

Cavalry officers as infantry, but with yellow collar, cap-band and trousers stripes as full dress and branch badge.

Artillery officers as infantry, but with red collar, cap-band and trousers stripes, and branch badge.

Engineer officers as infantry, but branch badge, red ground with white edges on full-dress collar and cap. Full-dress trousers, dark blue with red, white-edged stripe; undress, light blue with red stripe. In full dress engineer officers have the special distinction of wearing red skirt-flaps with white line and gold edge. Signal Corps, as infantry, but with branch badge and salmon collar, cap- band, &c. Signal officers, alone in the army, wear a pouch-belt: this is of black leather — crimson leather for the chief of the corps — ■ with gold appointments. Ordnance Corps, as infantry, but dark blue red-edged trousers stripes, &c, and branch badge. Medical, as infantry, but with magenta stripes, &c, and branch badge.

Generals and Staff Officers. — Major-generals (and with a third star lieutenant-generals), dark blue double-breasted tunic with buttons in threes, and cuffs and collar of black velvet ornamented with oak-leaf gold embroidery, above the cuffs two silver stars; gold epaulettes and aiguillette, wide yellow waist-sash ; dark blue trousers with two gold stripes: slings, and waist-belt if worn, crimson leather with gold stripes. " Chapeau " Or cocked hat (French pattern) black felt with black feather edging and gold ornament; full-dress cap, universal pattern, with black velvet band, embroidered on band and peak as on full-dress cuffs. Undress: blue frock, double-breasted, with buttons in threes, " stand and fall" collar with U.S. in gold; rank marks on shoulder loops; plain dark blue trousers, universal pattern undress caps with oak- leaves on the peak only. White undress uniform is similar. Briga- dier-generals, as major-generals with the following distinctions: one star on the sleeve or shoulder-loop, narrow yellow sash, buttons in pairs, plain black strap instead of crimson waist-belt (with, how-ever, crimson and gold slings). Service dress and overcoats (all

general officers) universal pattern: on the slouch hat a gold cord instead of black and gold. Evening and mess dress, universal pattern, with cuffs, collar and epaulettes as in full dress. Certain general officers who are chiefs of departments wear some of the distinctions of their branch; thus the adjutant-general, the quarter- master-general, &c, wear the branch badge below the stars, the chief of engineers the scarlet engineer skirt flap, the chief of artillery a crimson waist-sash instead of yellow. In undress these officers have a ground of their branch colour instead of dark blue on the shoulder loops. Staff officers are in the main uniformed in the same way as those of infantry, but wear dark blue trousers (in full dress a gold stripe), black and gold belts and slings, branch badge on sleeve, and full-dress collars, full-dress cap-bands and undress shoulder loops of the branch colour.

Branch and Line Badges. — General staff, a silver star, decorated with eagle device; inspector-general's department, sword and " fasces "crossed in wreath, gold; adjutant-general's department .gold shield with U.S. arms; quartermaster-general's department, sword and key crossed, surmounted by eagle, over a wheel, gold ; ordnance, grenade; commissary or subsistence, silver crescent; infantry, gold crossed rifles; cavalry, gold crossed swords; artillery, gold crossed guns; engineers, silver castle; signal corps, crossed flags and torch; medical, winged Aesculapius staff. Aides-de-camp wear a shield like the adjutant-general's but in red, white and blue enamel and surmounted by an eagle; adjutants, quartermasters, commissaries, &c, of the combatant arms wear a shield, sword and key, crescent, &c, under the guns, swords, &c, of the regiment or corps.

Branch and Arm Colours. — Infantry, light blue; cavalry, yellow; artillery, red ; engineers, red with white edge ; signal corps, salmon with white edge; quartermaster's department, yellow ochre; ord- nance, blue with crimson edge ; other staffs and departments, light blue; medical, magenta; general staff, dark blue.

Badges of Rank. — Officers: general, lieutenant-general, major- general, brigadier-general, stars 4, 3, 2, and 1 respectively, in all orders of dress. Other officers, in undress, silver on a shoulder loop of coloured cloth according to branch; colonel, spread eagle; lieutenant-colonel, pair of oak-leaf sprigs; major as lieutenant- colonel but in gold; captain,

two pairs of bars; 1st lieutenant, one pair of bars ; 2nd lieutenant, no badge : in full dress, evening dress and greatcoat, colonel fivefold, lieutenant-colonel fourfold, major three- fold, captain twofold, 1st lieutenant single Austrian knot of narrow gold braid, 2nd lieutenant no Austrian knot. . Field officers have black leather waist-belt and slings completely covered with gold braid, and also oak-leaf embroidery on the peak of the full-dress cap. Captains and lieutenants have similar belts, but with four gold braids only; in the infantry, cavalry, artillery and engineers the intervening spaces (" lights ") are coloured light blue, yellow, &c, while in other cases the black leather is allowed to appear.

Enlisted men are dressed similarly to officers, with the following differences : tunic with dark blue cuffs, collar and shoulder-straps. The collar is edged top and bottom, the shoulder-straps all round and the cuffs along the top edge wth yellow for cavalry, light blue for infantry, &c. The badge of the branch in brass is on the collar. Lines are worn (aiguillette fashion) as an additional decoration ; these are of the branch colours. The trousers are light blue, with, in full dress, stripes of branch colours. The white undress, service dress and greatcoat are similar to those for officers, with certain distinctions in detail. The full-dress cap is of the officers' pattern, but the band is dark blue, edged with the branch or arm colour above and below, and the badge is brass in a white metal wreath. The slouch hat has a cord of the branch colours. Rank marks of non-commissioned officers are long, graceful chevrons (inherited from France) pointing upwards, I, 2 and 3 for iance-corporals, corporals and sergeants, 3 with diamond star, &c, for " first ser- geants " and corresponding ranks, 3 with the lower ends connected by bars or arcs of the chevron material for sergeant-majors and staff-sergeants. In full dress these chevrons are of the colour of the branch facings, in service dress of khaki embroidery.

Naval Uniforms. — The full-dress coat of British naval officers is a dark blue double-breasted swallow-tailed coat with gold buttons, lace and epaulettes, a white gold-edged slashed-flap on the sleeve with rings of lace showing rank. Dark blue trousers with gold stripes, and black silk cocked hat. The

undress coats are frock coat, which may be worn with epaulettes, and double-breasted jumper, both having plain cuffs with rings of gold lace. The undress cap is a peaked cap with gold badge. Certain petty officers wear blue jumpers, the rest and the sailors wear sailors dress (Plate IV., line 3, No. 7). White is worn in the tropics, with white pith helmets in the case of officers and broad-brimmed straw hats in that of the sailors. Royal Marine Artillery and Royal Marine Light Infantry are dressed as artillery and infantry of the army, with certain distinctions; they may always be recognized by the badge of a globe within a laurel wreath. (Plate IV., line 3, No. 1.)

Officers' Rank Marks. — (a) On the epaulette: Batons in laurel wreath and crown, admiral of the fleet; crown, sword and baton crossed, and 1, 2, 3 stars, rear-admiral, vice-admiral, admiral; anchor and crown, with o, 1, 2, stars, commander, junior captain, senior captain ; anchor and star, senior lieutenant ; anchor, junior lieutenant ; anchor on fringeless epaulette, sub-lieutenant, (b) On the sleeve (in all orders of dress except white, and greatcoat) : flag officers, broad gold ring with 1, 2, 3, 4 narrow rings (the uppermost with a curl) for rear-admiral, vice-admiral, &c. ; other officers, 1, 2, 2 with narrower ring between, 3 and 4 for sub-lieutenant, junior lieutenant, senior lieutenant, commander and captain, (c) Shoulder straps in greatcoat and white undress, blue strap with bars and curl as on sleeve in other orders, except flag officers, who have gold-laced shoulder-strap with rank marks as on epaulette. Non-combatant branches have not the " curl," and between the gold bars or rings there are " lights " or stripes of various colours according to branch. The Royal Naval Reserve officers have similar rank mark, but, instead of bars of plain lace, a thin twist of gold embroidery, and an oval badge surrounding the anchor on the epaulettes.

The uniforms of other navies are very similar to those of the British. The old-fashioned jacket worn over the sailor blouse, and the conspicuous white lapels of the full-dress coat, are the principal peculiarities of the German navy. The Spanish naval officer has red lapels. A very marked peculiarity of the Austrian navy is that the officers, dressed in all other respects similarly to the naval officers of other countries, have the military tunic. The marines, where they exist, conform to the infantry of the respective land forces in most respects; the German marines, however, wear the Jager shako, and navy-blue uniforms with white collars and cuffs. (Plate IV., line 3,

No. 3.)

See Colonel C. Walton, British Army; and British regimental histories; Ottenfeld and Teuber, Oesterreichs Armee; Richard Knotel, Uniformen-Kunde; R. Nevill, British Military Prints; Licnhardt and Humbert, Les Uniformes de I' Armee Francaise; British Dress Regulations, 1822, 1834, 1846, 1855-64, 1874, 1883, 1891 and 1904; Lavisse, Sac au Dos, and Moritz Ruhl's handbooks of the German, Austrian, Russian, Italian and French army uniforms of the present day. The particulars given of the United States army uniforms have been obtained, by the kind permission of the United States Embassy, from official plates. (C. F. A.)

UNION (known locally as Union Hill and officially as Town of Union), a town of Hudson county, New Jersey, U.S.A., on the Hudson river, adjoining West Hoboken and Weehawken, and opposite New York City. Pop. (1900), 15,187, of whom 5179 were foreign-born; (1910 U.S. census) 21,023. I n tne foreign element Germans predominate. The town is served by the railways passing through Weehawken and Hoboken. The principal manufactures are silk goods, shirts and malt liquors. In 1905 the factory products were valued at $3,512,451. Originally a part of the township of North Bergen, Union was incorporated as a separated township in 1861, and as a town, under the name Town of Union, in 1864.

Town of Union must not be confused with Union township (pop. in I 9 I °. 34 T 9). Union county, incorporated in 1808; Union township (1910, 2756), Bergen county, incorporated in 1852; Union township (1910, 982), Ocean county, incorporated in 1846; and Union town- ship (1910, 930), Hunterdon county, incorporated in 1853. Union township, Camden county, became Gloucester City in 1868, and Union township, Hudson county, became West New York in 1898.

UNION, a town and the county-seat of Union county, South Carolina, U.S.A., about 66 m. N.W. of Columbia. Pop. (1900) 5400, of whom 1701 were negroes; (U.S. census 1910) 5623. Union is served by the Southern and the Union & Glenn Springs railways; the latter connects at Pride, 16 m. distant, with the Seaboard Air Line. The city is situated in the Piedmont region near the foot of the Blue Ridge Mountains. It is the seat of Clifford Seminary for Young Women (opened, 1881; chartered, 1883), and has a Carnegie library. Union is in a

rich cotton-growing, farming and fruit-growing region, and deposits of gold, magnetic iron ore, marble and granite are found. The town has several large cotton mills and a large knitting mill. Union was settled about 1755 and was incorporated as a town in 1872.

UNION LEAGUE OF AMERICA, THE, sometimes called the Loyal League, an organization for political purposes of Northern whites, later of Southern blacks, which originated in Ohio in 1862 when the Confederate military successes and political disaffection in the Northern states made the outlook for the North seem doubtful. Within one year it had spread over eighteen Northern states and among the Unionists of the South. The order raised troops, paid their expenses, sent supplies to the field and distributed political literature. At the close of the war it worked for radical reconstruction of the Southern states, punishment of the Southern leaders, confiscation of property and negro suffrage. The Southern Unionists hoped to make it the nucleus of a new political party, but this was frustrated by the admission of the blacks for political purposes, after which the Southern whites generally deserted the League. After the Freedmen's Bureau agents and other Northern whites obtained command of the League in the South it became simply a machine to control the votes of the blacks. The League ceased to be important in the North, though headquarters were in New York City. Each Southern state had its grand council and each county one or more councils. A constitution and an elaborate ritual were adopted, making it an oath-bound secret order, whose members were sworn to support one another on all occasions, to vote in elec- tions only for negroes or Northern men, and to overthrow the Southern " white oligarchy." No ex-Confederate and few Southern Unionists were permitted to join. At each meeting the members were taught from a catechism prepared by Radical members of Congress that they must beware of their white neighbours as their worst enemies, that the Democratic party, to which the Southern whites belonged, had opposed emancipation and was still opposed to any rights for the negro. In order to prevent moral control of the negroes by former masters, the League, by an " exodus order," required all negroes who were still living with their former masters to find other homes. The negroes were taught the equality of men and the right of the negro to his master's property. The votes of blacks, during reconstruction, were controlled by the few white Radical

leaders. No negro could safely break away and vote independently. Negroes who voted with the mass of the Southern whites were persecuted, beaten or (as in a few cases) killed. The League died out about 1870, but not before it had succeeded, with the Freedmen's Bureau and other forces, in permanently arraying the blacks and whites into opposing political parties. (w. L. F.)

UNIONTOWN, a borough and the county-seat of Fayette county, Pennsylvania, U.S.A., about 40 m. S. by E. of Pittsburg. Pop. (1900) 7344 (449 foreign-born); (1910) 13,344. Uniontown is served by the Pennsylvania and the Baltimore & Ohio railways. Coal, iron and natural gas are found in the neighbouring region. The manufactures include glass products, iron, steel, enamel, radiators, coke, flour and bricks.

The original village was surveyed and laid out in 1776 on land owned by Henry Beeson, and the borough was incorporated in 1796. From 1827 to 1832 Uniontown was the seat of Madison College, formed from Union Academy (founded 1808); in 1832 the college was merged with Allegheny College, of Meadville, Pa. In 1866 the buildings were turned over to the Soldiers' Orphans' School (now at Jumonville, a suburb), which occupied them until 1875. In the south-eastern part of the county is the district known as Great Meadows; here George Washington built Fort Necessity in 1754, and General Edward Braddock died and was buried here after his defeat by the French and Indians in 1755.

UNITARIANISM, a system of Christian thought and religious observance, based, as opposed to orthodox Trinitarianism, on the unipersonality of the Godhead, i.e. that the Godhead exists in the person of the Father alone. Unitarians carry their history up to the Apostolic age, claim for their doctrine a prevalence during the ante-Nicene period, and by help of Arian communities and individual thinkers trace a continuity of their views to the present time. However this may be, it is certain that the Reforrhaticn of the 16th century was in every European country attended by an outbreak more or less serious of anti-Trinitarian opinion. Suppressed as a rule in individual

cases, this type of, doctrine ultimately became the badge of separate religious communities, in Poland (extinct), in Hungary (still flourishing), and at a much later date in England. Along with the fundamental doctrine, certain characteristics have always marked its professors; namely, a large degree of toleration, a minimizing of essentials, a repugnance to formulated creed, an historical study of Scripture. Martin Cellarius (1499-1564) a friend of Luther, is usually regarded as the first literary pioneer (1527) of the movement; the ahti-Trinitarian position of Ludwig Haetzer (q.v.) was not disclosed till after his execution (1529) for anabaptism. Both by his writings (from 1531) and by his fate (1353) Servetus (q.v.) stimulated thought in this direction. The Dialogues (1563) of Bernardino Ochino, while defending the Trinity, stated objections and difficulties with a force which captivated many. In his 27th Dialogue Ochino points to Hungary as a possible home of religious liberty. It was in Poland and Hungary that religious communities, definitely anti-Trinitarian, were first formed and tolerated.

Poland. — Scattered expressions of anti-Trinitarian opinion appear here early. At the age of 80, Catherine, wife cf Melchior Vogel or Weygel, was burned at Cracow (1539) for apostasy; whether her views embraced more than deism is not clear. The first synod of the Reformed Church was held in 1555; at the second (1556), Gregory Pauli and Peter Gonesius avowed anti-Trinitarian and anabaptist views. The arrival of Bland- rata (q.v.) in 1558 furnished the party with a leader. In 1565 the diet of Piotrkow excluded anti-Trinitarians from the existing synod; henceforward they held their own synods as the Minor Church. Known by various other names (of which Arian was the most common) , at no time in its history did this body adopt for itself any designation save Christian. Originally Arian (though excluding any worship of Christ) and anabaptist, the Minor Church was (by 1 588) brought round to his own views by Fausto Sozzini, who had settled in Poland in 1579 (see Socinus). In 1602 James Sienynski established at Rakow a college and a printing-press, from which the Racovian Catechism was issued in 1605. In 1610 a Catholic reaction began, led by Jesuits. The establishment at Rakow was suppressed in 1638, two lads having pelted a crucifix outside the town. Twenty years later the Polish Diet gave anti-Trinitarians the option of conformity or exile. The Minor Church included many Polish magnates, but their adoption of

the views of Sozzini, which precluded Christians from magisterial office, rendered them politically powerless. The execution of the decree, hastened by a year, took place in 1660. Some conformed; a large number made their way to Holland (where the Remonstrants admitted them to membership on the basis of the Apostles' Creed); others to the German frontier; a contingent settled in Tran-

sylvania, not joining the Unitarian Church, but maintaining a distinct organization at Kolozsvar till 1793. At Amsterdam was published (1665-1669) the Bibliotheca jratrum polonorum, embracing the works of Hans Krell, their leading theologian, of Jonas Schlichting, their chief commentator, of Sozzini and of Johann Ludwig Wolzogen; the title-page of this collection, bearing the words quos Unitarios vacant, introduced this term to Western Europe.

Transylvania and Hungary. — No distinct trace of anti-Trinitarian opinion precedes the appearance of Blandrata at the Transylvanian court in 1563. His influence was exerted on Francis David (1 510-1579), who was successively Catholic, Lutheran, Calvinist and anti-Trinitarian. In 1564 David was elected by the Calvinists as " bishop of the Hungarian churches in Transylvania," and appointed court preacher to John Sigismund, prince of Transylvania. His discussion of the Trinity began (1565) with doubts of the personality of the Holy Ghost. His antagonist in public disputations was the Calvinist leader, Peter Juhasz (Melius); his supporter was Blandrata. John Sigismund, adopting his Court-preacher's views, issued (1568) an edict of religious liberty at the Torda Diet, which allowed David (retaining his existing title) to transfer his episcopate from the Calvinists to the anti-Trinitarians, Kolozsvar being evacuated by all but his followers'. In 1 5 7 1 , John Sigismund was succeeded by Stephen Bathory, a Catholic, and trouble began. Under the influence of John Sommer, rector of the Kolozsvar gymnasium, David (about 1572) abandoned the worship of Christ. The attempted accommodation by Sozzini only pre- cipitated matters; tried as an innovator, David died in prison at Deva (1579). The cultus of Christ became an established usage of the Church; it is recognized in the 1837 edition of the official hymnal, but removed in the edition of 1865. On the other hand, in 1621 a new sect arose, the Sabbatarii, with strong Judaic tendencies; though excluded from toleration they main- tained an existence till 1848. The term unilarius (said to have been introduced by Melius, in

discussions of 1560-1571) makes its first documentary appearance in a decree of the Lecsfalva Diet (1600); it was not officially adopted by the Church till 1638. Of the line of twenty-three bishops the most distinguished were George Enyedi (1592-1597), whose Explicationes obtained European vogue, and Michael Lombard Szentabrahami (1737- 1758), who rallied the forces of his Church, broken by persecution and deprivation of property, and gave them their existing constitution. His Sumtna universae theologiae secundum Unitarios (1787), Socinian with Arminian modifications, was accepted by Joseph II. as the official manifesto of doctrine, and so remains, though no subscription to it has ever been required. The official title is the Hungarian Unitarian Church, with a membership of over 60,000, most of them in Transylvania, especially among the Szekler population, a few in Hungary; their bishop has a seat in the Hungarian parliament. At Kolozsvar, the seat of the consistory, is the principal college; others are at Torda and at Szekely-Keresztur. Till 181 8 the continued existence of this body was unknown to English Unitarians; relations have since become intimate; since i860 a succession of students have finished their theological education at Manchester College, Oxford; others at the Unitarian Home Missionary College.

England. — Between 1548. (John Assheton) and 161 2 we have a thin line of anti-Trinitarians, either executed or saved by recantation. Those burned were George van Parris (1551), Flemish surgeon; Patrick Pakingham (1555), fellmonger; Matthew Hamont (1579), ploughwright; John Lewes (1583); Peter Cole (1587), tanner; Francis Kett (1589), physician and author; Bartholomew Legate (1612), cloth-dealer, last of the Smithfield victims; and the twice-burned fanatic Edward Wightman (1612). In all these cases the virus seems to have come from Holland; the last two executions followed the rash dedication to James I. of the Latin version of the Racovian Catechism (1609). The vogue of Socinian views, which for a time affected men like Falkland and Chillingworth, led to the abortive fourth canon of 1640 against Socinian books. The

Ordinance of 1648 made denial of the Trinity capital, but it was a dead letter, Cromweir intervening in the cases of Paul

Best (1590-1657) and John Biddle (1616-1662). In 1650 John Knowles was an Arian lay-preacher at Chester. In 165 2-1654 and 1658-1662 Biddle held a Socinian conventicle in London; in addition to his own writings he reprinted (1651) and trans- lated (1652) the Racovian Catechism, and the Life of Socinus (1653). His disciple Thomas Firmin (1632-1697), mercer and philanthropist, and friend of Tillotson, was weaned to Sabellian views by Stephen Nye (1648-1710), a clergyman. Firmin pro- moted a remarkable series of controversial tracts (1690-1699). The term " Unitarian " first emerges in 1682, and appears in the title of the Brief History (1687). It was construed in a broad sense to cover all who, with whatever differences, held the unipersonalityof the Divine Being. Firmin had later a project of Unitarian societies " within the Church "; the first preacher to describe himself as Unitarian was Thomas Emlyn(i663-i74i) who gathered a London congregation in 1705. This was con- trary to the Toleration Act of 1689, which excluded all who should preach or write against the Trinity. It is noteworthy that in England the Socinian controversy, initiated by Biddle, preceded the Arian controversy initiated by Samuel Clarke's Scripture Doctrine of the Trinity (1712). Arian or semi-Arian views had much vogue during the 18th century, both in the Church and in dissent. The free atmosphere of dissenting academies (colleges) favoured new ideas. The effect of the Salters' Hall conference (1719), called for by the alleged heresy of James Peirce (1673-1726) of Exeter, was to leave dissenting congregations to determine their own orthodoxy; the General Baptists had already (1700) condoned defections from the common doctrine. In 1689 Presbyterians and Independents had coalesced, agreeing to drop both names and to support a common fund. The union in the London fund was ruptured in 1693; in course of time differences in the administration of the two funds led to the attaching of the Presbyterian name to theological liberals, though many of the older Unitarian chapels were Independent foundations, and at least half of the Pres- byterian chapels (of 1690-1710) are now in the hands of Congre- gationalists. Leaders in the advocacy of a purely humanitarian christology came largely from the Independents, e.g. Nathaniel Lardner (1684-1768), Caleb Fleming (1698-1779), Joseph Priestley (1733-1804), Thomas Belsham (1750-1829).

The formation of a distinct Unitarian denomination dates from the secession (1773) of Theophilus Lindsey (1 723-1808) from

the Anglican Church, on the failure of the Feathers petition to par- liament (1772) for relief from subscription. Lindsey's secession had been preceded in Ireland by that of William Robertson, D.D. (1705-1783), who has been called "the father of Unitarian nonconformity." It was followed by other clerical secessions, mostly of men who left the ministry, and Lindsey's hope of a Unitarian movement from the Anglican Church was disappointed. By degrees his type of theology superseded Arianism in a considerable number of dissenting congregations. The Toleration Act was amended (1779) by substituting belief in Scripture for belief in the Anglican (doctrinal) articles; in 1813 the penal acts against deniers of the Trinity were repealed. In 1825 the British and Foreign Unitarian Association was formed as an amalgamation of three older societies, for literature (1791), mission work (1806) and civil rights (1818). Attacks were made on properties held by Unitarians, but created prior to 1813. The Wolverhampton Chapel case began in 1817, the more important Hewley Fund case in 1830; both were decided against the Unitarians in 1842. Appeal to parliament resulted in the Dissenters' Chapels Act (1844), which secures that, so far as trusts do not specify doctrines, twenty-five years tenure \egitimates existing usage.

The drier Priestley-Belsham type of Unitarianism, bound up with a determinist philosophy, was gradually modified by the influence of Channing (see below), whose works were reprinted in numerous editions and owed a wide circulation to the efforts of Robert Spears (1825-1899). Another American influence, potent in reducing the rigid though limited' supernaturalism

of Belsham and has successors, was that of Theodore Parker (1810-1860). At home the teaching cf James Martineau (1805-1900), resisted at first, was at length powerfully felt, seconded as it was by the influence of John James Tayler (1797-1869) and John Hamilton Thom (1808-1894). The body has produced some remarkable scholars, e.g. John Kenrick (1788-1877), James Yates (1789-1871), Samuel Sharpe (1799- i88i) s but few very popular preachers, though George Harris (1794 — 1859) is an exception. Its year-book specifies 406 congregations in England and Wales. For the education of it ministry it supports Manchester College at Oxford (which deduces its ancestry from the academy of Richard Frankland r begun 1670), the Unitarian Home Missionary College (founded in Manchester in 1854 by John Relly Beard, D.D., and William Gaskell), and the Presbyterian*

College, Carmarthen.

English Unitarian periodical literature begins with Priestley's Theological Repository (1 769-1 788), and includes the Monthly Repository (1806-1838), The Christian Reformer (1834-1863), the Prospective Review '(1845-1854), the National Review (1855ˆ1864), the Theological Review (1864-1879), and now the Hibbert Journal, one of the enterprises of the Hibbert Trust, founded by Robert Hibbert (1770-1849) and originally designated the Antiˆ Trinitarian Fund. This came into operation in 1853, awards scholarships and fellowships, supported (1878-1894) an annual lectureship, ; and has maintained (from 1 894) a chair of ecclesiastical history at Manchester College. The general activities of the body are conducted partly by its association (Essex Street, Strand), partly by its (triennial) National Conference, established 1882. It has two weekly papers, the Inquirer and the Christian Life.

Scotland. — Much has been made of the execution (1697): at Edinburgh of the student Thomas Aikenhead, convicted of blaspheming the Trinity. The works of John Taylor, D.D. (1694-1761) on original sin and atonement had much influence in the east of Scotland, as we learn from Robert Burns; and such men as William Dalrymple, D.D. (1723ˆ-1814) and William M'Gill, D.D. (1732-1807), along with other "moderates," were under suspicion of similar heresies. Overt Unitarianism has never had much vogue in Scotland. The only congregation of old foundation is at Edinburgh, founded in 1776 by a seces ˆ sion from one of the "fellowship societies" formed by James Fraser, of Brea (1639-1699). The mission enterprises of Richard Wright (1764-1836) and George Harris (1794-1859) produced results of no great permanence. There are now seven congregations. The Scottish Unitarian Association was founded in 1813, mainly by Thomas Southwood Smith, M.D., the sani- tary reformer. The McQuaker Trust was founded (1889) for propagandist purposes.

Ireland. — Controversy respecting the Trinity was excited in Ireland by the prosecution at Dublin (1703) of Thomas EmlyH (see above), resulting in fine and imprisonment, for re-> jecting the deity of Christ. In 1705 the Belfast Society was founded for theological discussion by Presbyterian ministers in the north, with the result of creating a body of opinion adverse

to subscription to the Westminster standards. Toleration of dissent, withheld in Ireland till 17 19, was then granted without the requirement of any doctrinal subscription. Next year a movement against subscription was begun in the General Synod of Ulster, culminating (1725) in the placing of the advocates of non-subscription, headed by John Abernethy, D.D., of Antrimˆ into a presbytery by themselves. This Antrim presbytery was excluded (1726) from jurisdiction, though not from communion. During the next hundred years its members exercised great influence on their brethren of the synod; but the counter- influence of the mission of the Scottish Seceders (from 1742) produced a reaction. The Antrim Presbytery gradually became Arian; the same type of theology affected more or less the Southern Association, known since 1806 as the Synod of Munster. From 1783 ten of the fourteen presbyteries in the General Synod had made subscription optional; the synod's code of 1824 left " soundness in the faith " to be ascertained by sub- scription or by examination. Against this compromise Henry Cooke, D.D. (1788-1868), directed all his powers, and was ulti- mately (1829) successful in defeating his Arian opponent, Henry Montgomery, LL.D. (1788-1865). Montgomery led a secession

which formed (1830) the Remonstrant Synod, comprising three presbyteries. In 1910 the Antrim Presbytery, Remonstrant Synod and Synod of Munster were united as the General Synod of the non-subscribing Presbyterian Church of Ireland. They have 38 congregations and some mission stations. Till 1889 they maintained two theological chairs in Belfast, where John Scott Porter (1801-1880) was a pioneer in biblical criticism; they now send their students to England for their theological education, though in certain respects their views and practices are more conservative than those of their English brethren.

Irish Unitarian periodical literature began in 1832 with the Bible Christian, followed by the Irish Unitarian Magazine, the Christian Unitarian, the Disciple and now the Non-subscribing Presbyterian.

See generally R. Wallace's Antitrinitarian Biog. (1850) ; G. Bonet- Maury's Early Sources of Eng. Unit. Christianity, trans.

E. P. Hall (1884) ; A. Gordon's Heads of Eng. Unit. Hist. (1895). (A. Go.)*

United States. — Unitarianism in the United States followed essentially the same development as in England, and passed through the stages of Arminianism, Arianism, anti-tritheism, to rationalism and a modernism based on a large-minded acceptance of the results of the comparative study of all religions. In the early 18th century Arminianism presented itself in New England, and sporadically elsewhere; this tendency was largely accelerated by the reaction from the excesses of the " Great Awakening " under Jonathan Edwards and George Whitefield. Before the War of Independence Arianism showed itself in individual instances, and French influences were widespread in the direction of deism, though they were not organized into any definite utterance by religious bodies.

As early as the middle of the 18th century Harvard College represented the most advanced thought of the time, and a score or more of clergymen in New England were preaching what was essentially Unitarianism. The most prominent of these men was Jonathan Mayhew (1 720-1 766), pastor of the West Church in Boston from 1747 to 1766. He preached the strict unity of God, the subordinate nature of Christ, and salvation by character. Charles Chauncy (1705-1787), pastor of the First Church from 1727 until his death, the chief opponent of Edwards in the great revival, was both a Unitarian and a Universalist. Ebenezer Gay (1696-1787) of Hingham, Samuel West (1730-1807) of New Bedford, Thomas Barnard (1748-1814) of Newbury, John Prince (1751-1836) and William Bentley (1758-1819) of Salem, Aaron Bancroft (1755-1836) of Worcester, and several others, were Unitarians.

The first official acceptance of the Unitarian faith on the part of a congregation was by King's Chapel in Boston, which settled James Freeman (1759-1853) in 1782, and revised the Prayer Book into a mild Unitarian liturgy, in 1785. The Rev. William Hazlitt (father of the essayist and critic), visiting the United States in 1783-1785, published the fact that there were Unitarians in Phila- delphia, Boston, Charleston, Pittsburg, Hallowell, on Cape Cod and elsewhere. Unitarian congregations were organized at Portland and Saco in 1792 by Thomas Oxnard; in 1800 the First Church in Plymouth accepted the more liberal faith. Joseph Priestley came to the

United States in 1794, and organized a Unitarian Church at Northumberland, Pennsylvania, the same year, and one at Philadelphia in 1796. His writings had a considerable influence.

Thus from 1725 to 1825 a more tolerant and rational belief was developing in New England, and to some extent elsewhere. The first distinctive manifestation of the change was the inaugura- tion of Henry Ware (1764-1845) as professor of divinity at Har- vard College, in 1805. In the same year appeared Unitarian books by John Sherman (1772-1828) and Hosea Ballou (1771- 1852), and another in 1810 by Noah Worcester (1758-1837). At the opening of the 19th century, with one exception, all the churches of Boston were occupied by Unitarian preachers, and various periodicals and organizations expressed their opinions. Churches were established in New York, Baltimore, Washing- ton, Charleston and elsewhere during this period.

William Ellery Channing was settled over the Federal Street Congregational Church, Boston, 1803; and in a few years he

*became the leader of the Unitarian movement. At first mystical rather than rationalistic *in his theology, he took part with the " Catholic Christians," as they called themselves, who aimed at bringing Christianity into harmony with the pro- gressive spirit of the time. His essays on The System of Exclu- sion and Denunciation in Religion (18 15), and Objections to Unitarian Christianity Considered (1819), made him a defender of Unitarianism. His sermon on " Unitarian Christianity," preached at Baltimore in 1819, at the ordination of Jared Sparks, and that at New York in 1821, on " Unitarian Christianity most favourable to Piety," made him its interpreter. The result was a growing division in the Congregational churches, which was emphasized in 1825 by the formation of the American Unitarian Association at Boston. It was organized " to diffuse the know- ledge and promote the interests of pure Christianity"; and it published tracts and books, supported poor churches, sent out missionaries into every part of the country, and established new churches in nearly all the states. Essentially non-sectarian, with little missionary zeal, the Unitarian movement has grown slowly; and its influence has been chiefly exercised through general culture and the better literature of the country. Many of its clergymen have been trained in other*

denominations; but the Harvard Divinity School was distinctly Unitarian from its formation, in 1816, to 1870, when it became an unsectarian department of the university. The Meadville (Pa.) Theological School was founded in 1844; and the Unitarian Theological School at Berkeley, California, in 1904.

Unitarian thought in the United States has passed through three periods. The first, from 1800 to 1835, was formative, mainly influenced by English philosophy, semi-supernatural, imperfectly rationalistic, devoted to philanthropy and practical Christianity. Dr Channing was its distinguished exponent. The second, from 1835 to 1885, profoundly influenced by German idealism, was increasingly rationalistic, though its theology was largely flavoured by mysticism. In 1865 the National Unitarian Conference was organized, and adopted a distinctly Christian platform, affirming that its members were " disciples of the Lord Jesus Christ." The more rationalistic minority thereupon formed the Free Religious Association, " to encourage the scientific study of theology and to increase fellowship in the spirit." The Western Unitarian Association accepted the same position, and based its " fellowship on no dogmatic tests," but affirmed a desire " to establish truth, righteousness and love in the world." This period of controversy, and of vigorous theological development, practically came to an end soon after 1885; and its cessation was assured by the action of the national conference at Saratoga in 1894, when it was affirmed by a nearly unanimous vote: " These churches accept the religion of Jesus, holding, in accordance with his teaching, that practical religion is summed up in love to God and love to man. The conference recognizes the fact that its constituency is Congregational in tradition and polity. Therefore it declares that nothing in this constitution is to be construed as an authoritative test; and we cordially invite to our working fellowship any who, while differing from us in belief, are in general sympathy with our spirit and our practical aims." The leaders of this period were Emerson, with his idealism, and Theodore Parker, with his acceptance of Christianity as absolute religion.

The third period, beginning about 1885, has been one of rationalism, recognition of universal religion, large acceptance of the scientific method and ideas and an ethical attempt to realize the higher affirmations of Christianity. It has been

marked by harmony and unity to a degree perhaps found in no other religious body by steady growth in the number of churches and by a widening fellowship with all other progressive phases of modern religion. This last phase has been shown in the organization of " The International Council of Unitarian and other Liberal Religious Thinkers and Workers," at Boston on the 25th of May 1900, " to open communication with those in all lands who are striving to unite pure religion and perfect liberty, and to increase fellowship and co-operation among them." This council has held biennial sessions in London, Amsterdam,*

Geneva and Boston. During the period since 1885 the influence of Emerson has become predominant, modified by the more scientific preaching of Minot J. Savage, who has found his guides in Darwin and Spencer.

Beyond its own borders the body has obtained recognition through the public work of such men as Henry Whitney Bellows and Edward Everett Hale, the remarkable influence of James Freeman Clarke and the popular power of Robert Collyer. The number of Unitarian churches in the United States in 1909 was 461, with 541 ministers. The church membership, really nominal, may be estimated at 100,000. The periodicals are The Christian Register, weekly, Boston; Unity, weekly, Chicago; The Unitarian, monthly, New York ; Old and New, monthly, Des Moines ; Pacific Unitarian, San Francisco.

See Joseph Henry Allen, Our Liberal Movement in Theology (Boston, 1882), and Sequel to our Liberal Movement (Boston, 1897); John White Chadwick, Old and New Unitarian Belief (Boston, 1894), and specially William Ellery Channing (1903); Unitarianism: its Origin and History, a course of Sixteen Lectures (Boston, 1895); George Willis Cooke, Unitarianism in America: a History of its Origin and Development (Boston, 1902); and Unitarian Year Book (Boston). (G. W. C.)*

UNITED BRETHREN IN CHRIST, 1 an American religious sect which originated in the last part of the 18th century under the leadership of Philip William Otterbein (1726-1813), pastor of

the Second Reformed Church in Baltimore, and Martin Boehm (1725-1812), a Pennsylvanian Mennonite of Swiss descent. Otterbein and Boehm licensed some of their followers to preach and did a great work, especially through class-meetings of a Wesleyan type; 2 in 1789 they held a formal conference at Baltimore, and in 1800, at a conference near Frederick City, Maryland, the Church was organized under its present name, and Otterbein and Boehm were chosen its first bishops or superintendents. The ecclesiastical polity of the Church is Wesleyan and its theology is Arminian: there is no hard-and-fast rule about baptism. Bishops are elected for four years. The first delegated general conference met at Mount Pleasant, Pennsylvania, in 181 5, and adopted a confession of faith, rules of order and a book of discipline, which were revised in 1885-1889, when women were first admitted to ordination, and when the Conservatives, protesting against the new constitution, withdrew and formed the body now commonly known as the United Brethren in Christ " of the Old Constitution."

The Liberal branch had 3732 organizations in 1906 with a total membership of 274,649. This body carries on missions in West Africa (since 1855), Japan, China, the Philippines and Porto Rico. It has a publishing house (1834) and Ronebrake Theological Seminary (1871) at Dayton, Ohio; and suppoits Otterbein University (1847) at Westerville, O. ; Westfield Colleg • (1865) at Westfield, Illinois; Leander Clark College (1857) at Toledo, Iowa; York College (1890) at York, Nebraska; Philomath College (1867) at Philomath, Oregon; Lebanon Valley College (1867) at Annville, Pa.; Campbell College (1864) at Holton, Kansas, and Central University (1907) at Indianapolis, Indiana.

The " Old Constitution " body had 572 organizations in 1906 with a total membership of 21,401. It has a publishing house at Hunting- ton, Indiana.

See D. Berger, History of the Church of the United Brethren (1897), and his sketch (1894) in vol xii. of the " American Church History Series "; E. L. Shuey, Handbook of the United Brethren in Christ (1893) ; W. J. Shuey, Year-Book of the United Brethren in Christ (from 1867); and A. W. Drury, Life of Philip William Otterbein (1884).

UNITED FREE CHURCH OF SCOTLAND, a religious organiza-

tion, representing the union made in 1900 between the Free Church of Scotland (except a dissentient section who separated off and retained the name of Free Church) and the United Presbyterian Church. (See Free Church of Scotland and United Presbyterian Church.)

The first moderator was Dr Rainy (q.v.). The Free Church brought into the union 1077 congregations, the United Presbyterians 599; the revenue of the former amounted to £706,546, of the latter to £361,743. The missionaries of both churches

1 The sect is not to be confused with the Moravian Brethren (q.v.), whose official name, Unitas Fratrum, is commonly rendered in English " United Brethren. "

2 Otterbein was an intimate friend of Francis Asbury and was greatly influenced by him.

joined the union, and the United Church was then equipped with missions in various parts of India, in Manchuria, in Africa (Lovedale, Livingstonia, &c), in Melanesia and in the West Indies. The formula which was adopted allowed for develop- ment of doctrine, the candidate stating that he believes " in the doctrine of this Church, set forth in the Confession of Faith," the Church being thus set above the confession. The Church has three divinity halls, at Glasgow, Edinburgh and Aberdeen, served by seventeen professors and five lecturers.

The minority of the Free Church who had refused to join the union lost no time in testing the legality of the act of the majority in entering it. Their summons, dated the 14th of December 1900, claimed that in uniting with the United Presby- terian Church, which did not hold the principles of the Free Church, the majority had forfeited the right to the property of the Free Church, which must be judged to belong to the minority who remained faithful to the principles of the Free Church and were that Church. In the Scottish courts the case was decided in favour of the union by Lord Low on the 9th of August 1901, and by the second division of the Court of Session on the 4th of July 1902, it being held in both trials that the old Free Church had a right within limits to change its views and to do by its Assembly what had been done. The proceedings before the House of Lords on appeal were protracted by the death of one of the judges, which involved

the necessity of a second hearing, and it was not till the 1st of August 1904 that the verdict was pronounced. By a majority of five to two the House of Lords reversed the decision of the Court of Session, allowed the appeal, and found the minority entitled to the funds and property of the Free Church. It was held that the majority of an independent church, adopting new standards of doctrine or ceasing to hold essential or fundamental doctrines of the church, forfeit the right to the property, which remains with the minority holding the church's original doctrine: also that the establishment principle was a fundamental doc- trine of the Free Church, and that by entering a union on terms leaving that doctrine an open question, the majority had violated the conditions on which the property of the Free Church was held. On the plea that by the Declaratory Act of 1892 the Free Church had abandoned its doctrinal position, argument was he? ˆd, but the House of Lords did not decide.

Few legal decisions have occasioned so great consternation or such serious practical difficulties. At first sight it deprived the Free Church section of the United Church of all its material goods — churches, manses, colleges and missions, even of the provision for the old age of the clergy. It appeared to divert large amounts of church property from the uses for which it had been provided, and to hand it over to a body with which the United Church was deeply out of sympathy and which could have little prospect of making effective use of it. A conference held in September between representatives of the United Free and of the (now distinct) Free Church, in order to come to some working arrangement in view of the decision, found that no basis for such an agreement could be arrived at. Nothing remained but to invoke the intervention of parliament to put an end to an impossible situation. A convocation of ministers and elders of the United Free Church, held on the 15th of December, decided that the union should go on, and resolved to " take every lawful means of appealing to the nation and to parliament to rescue the funds and buildings of the Church for the sacred purposes for which they had been provided." The Free Church could not refuse to consent to this, and in December a commission was appointed, consisting of Lord Elgin, Lord Kinnear and Sir Ralph Anstruther, to inquire into matters connected with the two churches, while the question of interim possession was referred to Sir John Cheyne, as commissioner, for inquiry and action. The com- mission sat

in public, and after hearing evidence on both sides, issued their report in April 1905. They reported that the state of feeling on one side and on the other had made their work difficult. They had concluded however that the Free Church

was unable in man)' respects to carry out the purposes of the trusts, which, under the verdict of the House of Lords, was a condition of their holding the property, and that there was a case for parliamentary interference. They recommended that an executive commission should be set up by act of parliament, in which the whole property of the Free Church, as at the date of the union, should be vested, and which should allocate it to the United Free Church, where the Free Church was unable to carry out the trust purposes. The commission was to entertain suggestions which might be made to them for friendly arrangements.

The Churches (Scotland) Act, which gave effect to these recommendations, was passed on the nth of August 1905. It contained (see Scotland, Church of) a clause (No. 5) providing for the relaxation of subscription in the Established Church,' parliament thus interesting itself in the affairs of all Presbyterian churches. The commissioners were those on whose report the act was formed, with the addition of two others. In October 1006 the commission intimated that the Assembly Hall, with the New College Buildings and the High Church, were to be the property of the United Free Church, the Free Church receiving the offices in Edinburgh, and a tene- ment to be converted into a college, while the library was to be vested in the United Free Church, but open to members of both churches. After having occupied class-rooms in the university for two sessions, and held an assembly (1905) in another hall, the United Free Church in 1906 again occupied in its own right the historic buildings of the Free Church. All the foreign missions and all the continental stations were adjudged to the United Free Church. The allocation of churches and manses was a slow business, but in 1908 over 100 churches had been assigned to the Free Church. Some of the dispossessed United Free Church congregations, most of them in the High- lands, found shelter for a time in the parish churches; but it was early decided that in spite of the objection against the erection of more church buildings in districts where many were now standing empty, 60 new churches and manses should at once

be built at a cost of about £150,000. (A. M.)*

the union of the two crowns, and the adoption of the name of Great Britain for the common country (Teulet, M&m. Caille a M. de la Mothe, Dec. 20) . But in England the innovation at first met with great opposition. Various objections, sentimental and practical, were urged against it in parliament; and the judges, when appealed to by the king, declared that the adoption of the title would invalidate all legal processes. At length, on the 20th of October 1604, the king, weary of the dis- cussion, cut the knot by assuming the title by royal proclamation, and in due course the inscription " J. D. G. Mag. Brit. F. et H. Rex " appeared on his coins. In November 1604 we find the king instructing the lords commissioners of the Gunpowder Plot to try and discover if the prisoner was the author of a most " cruel pasquil " against him for assuming the name of Britain.

For further details see Calendar of State Papers, Domestic Series ; and J. Spedding, Letters and Life of Lord Bacon, vol iii. (London,

1 861-1874).

England and Wales, Scotland and Ireland are politically united under a parliament {q.v.), consisting of the king, the House of Lords 2 and the House of Commons, 3 the prerogatives of the Crown being exercised through responsible ministers. The executive government is carried on under the supervision of the ministers of state (see Ministry), the more important of whom are united in the cabinet (q.v.). The first minister of the Crown or prime minister (q.v.) is appointed by the king, and having made choice of his colleagues, recommends them for appointment. (See the separate articles on the various offices. For the judiciary system, see Court; Appeal; &c.)

The table at the foot of this column shows the imperial revenue and expenditure, with the amount of revenue per head of population of the United Kingdom for various years. The financial year now ends on the 31st of March of the year following that quoted. The figures before 1907 did not include the revenue assigned to local purposes. The deficit in 1909 was due to delay in passing the Finance Act.

Year ending March 31st.

1901.

1906.

1910.

*Funded debt . Terminable annuities Unfunded debt . Other capital liabilities**

579,472,082

66,550,579 36,140,079

1-317,719

589,146,878

49,183,748

9,975,800

3.979,940

551,182,153 60,154,800 78,133,000 14,464,396

634,047,429

43,459,548 65,713-000 45,770,210

614,868,547 35,876,861 62,500,000 49,218,217

Total gross liabilities of the state

683,480,459

652,286,366

703,934,349

788,990,187

762,463,625

Assets- Suez Canal shares

Other assets

Exchequer balances at banks of England and Ireland

3,532,040!

1,740,397 6,370,897

22,627,000}

939,354 8,975,201

25,806,000! 712,760 5.596,918

3 1, 080,000 %

2,586,799

10,451,487

35,295,000 4,118,352 2,831,248

- *These are in respect of sums borrowed under certain acts.*

% Estimated market Value on the 31st of March each year.

UNITED KINGDOM OF GREAT BRITAIN AND IRELAND, 1

the official title, since the 1st of January 1801, of the political unity composed of England and Wales, Scotland and Ireland. " Great Britain " was employed as a formal designation from the time of the union of the kingdoms of England and Scotland in 1707. Although the name (which apparently had its origin in Britannia Major, the name given to the island to distinguish it from Britannia Minor or Brittany) had, in earlier times, been often used both by English and by foreign writers, especially for rhetorical arid poetical purposes, it was not till after the accession of James I. that it became a recognized part of the royal style. Its adoption was due to the king himself, who was anxious to give expression to the fact that he was sovereign of the undivided island, and not only of England or Scotland. As early as 1559 the Scottish congregation had formally proposed 'See also Britain; British Empire; England; Ireland; Scotland; Wales; &c.

f Nominal value.

Year.

Total Revenue.

Total Expenditure.

Proportion

of Revenue

per head.

£

£

£ s. d.

1 861

70,283,674

72,792,059

2 8 10

1871

69,945,220

69,548,539

2 4 5

1881

81,872,354

80,938,990

271

1891

89,489,112

87,732,855

262

1901

130,384,684

183,592,264

3 2 10

1902

142,997,999

195.522,213

3 '2 II

1903

151,551.698

184,483,708

3 n 6

1904

141,545,597

146,961,136 ■

362

1905

143,370,404

141,956,497

364

1906

143,977,575

140,511,955

3 5 11

1907

156,537,690

151,812,094

3 6 5

1908

151-578,295

152,292,395

3 5

1909

131,696,456

157,944,611

2 l8 5 i

2 See Peerage. 3 See Representation and Parliament.

In separate articles throughout this Encyclopaedia the main subjects of interest in connexion with British institutions are fully dealt with ; and it is only necessary here to give such details as are needed to supplement those given under the subject- heading. See Agriculture; Navy (also Ship and Ship-Building) ; Education; English Finance; English History; Civil Ser- vice; National Debt; Police; Poor Law; &c. A separate section, however, is devoted to the army, the constitution of which in 19 10 is described; the history is given under Army.

National Debt (g.v.). — The table on the preceding page shows the position of the national debt at quinquennial intervals during 1891-1910.

Area and Population. — The United Kingdom has an area of 120,651 sq. m., and at the census of 1891 had a population of 37,732,922 and in 1901 of 41,458,721. If the islands in British seas are included, the area is increased to 120,953 sc l-m -> an d the population to 41,609,091. The main divisions are as follows: —

Area sq. m.

Population.

1891.

1901.

England and Wales . Islands in the British seas

58,324 29,796

32,531 302

29,002,525

4,025,647

4,704,750

147,842

32,527,843

4,472,103

4,458,775

150,370

Vital Statistics. — The following table institutes a comparison between the birth-rates per thousand of the population in the United Kingdom and certain other countries, at intervals (so far as possible) of five years, adding the figures for other years in specific years when there was a marked fluctuation: —

The number of marriages (a) and the proportion of persons married per thousand of the population (&) are thus shown: —

Year.

England and Wales.

Scotland.

Ireland.

United Kingdom.

1896 1901 1906 1909

{a) (b)

242,764 15 7 259,400 159

269,734 I5‘6

260,259 146

to (b)

30,270 142 31,387 140 33,123 140 30,092 12 3

(«) (b)

23,055 102 22,564 10-2

22,557 103 22,769 10 4

to (b)

296,089 150

313,351 151 325,414 14-9 313,120 139

Emigration. — The following table shows the number of passengers, distinguishing English and Welsh, Scottish and Irish, who left the United Kingdom for extra-European countries in 1895, 1900 and 1905, and the total for 1909, and in certain other years in which the numbers show marked fluctuations: —

Year.

English and Welsh.

Scottish.

Irish.

Total.

1895

112,538

18,294

54,349

185,181

1898

90,679

15,570

34.395

140,644

1900

102,448

20,472

45-905

168,825

1904

175,733

37,445

58,285

271,435

1905

170,408

41,510

5o,i59

262,077

1906

219,765

53-162

52,210

325,137

In 1909 the total number to British dominions was 163,594 and the total number to other extra-European countries was

125,167.

Occupations. — The following table shows the occupations of the people (excluding children under ten years of age) as

1886.

1896.

1901.

1905, 1906.

*Russia in Europe * Hungary Austria . Germany Japan …. Holland . . . . Denmark … Switzerland . United Kingdom*

47-8 (1882, 50-4)

42-9

37-5 (1882, 38-9)

37-0

25-6

350

32-2

29-8

32-5

46-5

45-6

38-1

37-0

27-3 (1889, 30-2)

34-6

32-4

27-8

31-5 (1890,29-2)

48-8 42-3 38-3 37-0 26-7

33‘7

31-0 (1892, 29-6)

28-2 30-4

49-7

4°-5

38-0

36-3 30-0

32-7 30-5 28-1 29-0

47 37 36 35 32 32 29 29 28

33-7 33-0 30-6

27-4

360

30-4 28-5

268

England Scotland Ireland

339 33-7 24-5

32-8 (1890, 30-2) 32-9 (1890, 30-4)

23-2 (189O, 22-3)

31-4,

31-2 (1894,29-9)

23-1 (1892,22-5)

29-6 30-4 23-7

28 29

27-1 27-9 23-6

Norway . Sweden . Belgium France .

30-6 29-1 31-8 24-9

31-2 29-8 29.9

23-9

30-9 28-3 30-0

22-6

30-2 27-2 29-0 22-5

29 27 29 22

26-5

25-7 25-7

20-6

The number of births in the United Kingdom in 1909 was 1,146,118, giving a rate per thousand of 25-5.

- *Not including Finland.*

distinguished in five great orders, according to the census of. 1 901: —

The death-rate is similarly treated: —

Denmark

1881.

1886.

1891.

1896.

1901.

A

1905

I906.

18-3

18-1

20-0

15-7

15-8

— .

13-5

Norway

17-0

16-2

17-5

151

14-9

—

13-7

Sweden

17-7

16-6

16-8

15.6

16-1

— .

14-4

Holland . . .

21-5

21-8

20-7

17-2

17-2

—

14-8

United Kingdom.

18-7

19-2

200

i6-9

17-1

—

15-6

England .

18-9

19-5

20-2

17-1

16-9

—

15-4

Scotland .

19-3

18-9

20-7

166

17-9

—

16-0

Ireland

17-5

17-8

18-4

16-7

17-8

—

17-0

Belgium

21 2

21-3

21-2

17-5

17-2

—

16-4

Switzerland

22-4

20-7

20-6

17-8

18-0

179 —

Germany

•25-5

26-2

23-4

20-8

20-7

19-

i —

h ranee ….

22-0

22-5

22-9

20-O

20-1

—

199

Japan ....

18-7

24-4

21-0

21-4

20-4

22-0 —

Hungary

34-4

31-7

33-1

28-9

25-4

—

24-8

Austria

30-5

29-5

28-1

26-3

24-0

2.V

3 —

Russia in Europe.*

33-2

31-2

34-6

3 2-8

32-1

—

•”-

‘ Not including Finland.

The deaths in the United Kingdom in 1909 numbered 667,765, the rate per thousand being 14-8.

England and Wales.

Scotland.

Ireland.

Professional Domestic Commercial Agricultural Industrial .

804,427 1,994,197 1,858,454 1-152,495 7,534,994

101,061 201,230 245,715 237,3” 1,197,495

131,035 219,418 97,889 876,062

639-4I3

Agriculture. — The following table illustrates broadly the

difference in the position of agriculture in Great Britain and in Ireland: —

Percentage to total area of area —

Great Britain.

Ireland.

I890.

1909.

1890.

1909.

Cultivated

Under green crops …. Under grasses and other crops . In permanent pasture

57-7 14-1

5-8 8-5

28-2

56-6

12-4

5-4

7‘9

30-2

73-i

7-3 5-8 5-9

53-4

70-3 6-1 5-0

11-2

Minerals and Mining. — The mineral production of the United Kingdom reached a total value in 1890 of £100,802,657 and in 1009 of £119,394,486, with a maximum during that period of £160,605,154 in 1900 and a minimum of £73,024,066 in 1893. These figures include pig-iron produced from foreign ores. About 73 % represents the value of the coal output. The figures for the more important minerals are as follows: —

Description of Minerals.

1900.

N 1909-

Value, 1909.

Coal

Iron ore

Clay and shale. Sandstone ....

Slate

Limestone (not chalk) . Igneous rocks .

Tin ore (dressed)

Salt

Tons.

225,181,300

14,025,208

14,049,694

5,019,874

585,859

11,905,477

4,634,301

2,282,221

6,800

1,861,347

Tons.

263,774,312

H,979,979

14,067,810

4,600,084

402,184

11,811,122

6,283,297

2,967,057

8,289

1,822,744

£

106,274,900

3,689,777

1,718,056

1,339,106

1,007,013

1,226,967

1,235,046

815,937

617,376

548,896

Gold ore, manganese ore and uranium ore are produced in small quantities, and the list of minerals worked in the United Kingdom also includes chalk, lead, alum, phosphate of lime, chert and flint, gravel and sand, zinc ore, gypsum, arsenic, copper, barytes, wolfram and strontium sulphate.

Metals were obtained from the ores as follows: —

„f

1900.

1909.

Metal.

Quantity.

Quantity.

Value (average market price).

Iron Tin . Lead . Zinc . Copper Gold . Silver

4,666,942 tons 4,268 „

24,364 „

9,066 ,,

765 „

14,004 oz.

190,850 ,,

4,802,163 tons

5,199 „

22,463 „

3,8l8 „

435 „ 1,210 oz.

142,146 ,,

i

15,559,253

695,546

298,945

87,146

27,162

4,400

14,030

The total number of persons employed in and about all the mines of the United Kingdom in 1901 was 839,178, and in 1909

1,126,372.

The workers were thus distributed between the three kingdoms and the principality in 1905 : —

Coal Mines, &c.

Metalliferous Mines (a).

Quarries (ft).

England . Wales . . Scotland Ireland

606,206

137,124 114,294

749

19,561

7,333

974

733

60,725

17,277

12,187

4,464

The total figures given above include (a) 550 and (ft) 166 workers in the Isle of Man; and the figures quoted for production include that of the isle.

The production of coal in Great Britain, though marked by fluctuation, has, on the whole, largely increased, and in 1901 the output was 42 % greater than that of 1 88 1. The maximum quantity extracted in any one year

Coal.

England. Cumberland Derby Durham Gloucester . Lancashire Leicester Monmouth Northumberland – Nottingham Somerset Stafford Warwick York . . .

Wales. Carmarthen Denbigh Glamorgan

1900.

Tons.

2,022,327

15,243,031

34,800,719 1,578,386

24,842,208 2,106,343 9,818,829

“,514,521 8,626,177 1,046,792

14,222,743 2.957,490

28,247,249

1,333,880

2,447,092

27,686,758

1909.

Tons.

2,309,370 16,869,347 41,240,612

1,486,526

23,705,387

2,661,606

13.204,357

H.013. 135

11,106,702

1,140,818 13,517,101

4,447,978 35,896,623

1,950,429

2,556,612

34,461,631

between 1890 and 1910 was 267,830,962 tons in 1907, and the minimum 164,325,795 in 1893. The maximum estimated value, however, was £121,652,596 for the 225,181,300 tons raised in 1900; the value in 1907 being £120,527,378.

In the chief coal-producing counties of England and Wales the quantity raised in 1900 and in 1909 will be found in the table at the foot of preceding column.

Thus it appears that of the coal raised in England the county of Durham contributes about 22%, Yorkshire 17%, Lancashire 16%, Stafford and Derbyshire each about 9%, and Northumber- land 7 % ; while of the coal raised in Wales 85 % is contributed by the county of Glamorgan; and that the coal production of England and Wales together constitutes, in quantity and value, 85 % of the whole production of the United Kingdom.

The export of coal greatly increased on the whole during the period 1890-1909. The following table shows this; the figures for 1893 are given as the lowest during the period. The tonnage of coke and patent fuel is included in the totals: —

Year.

Tons.

Year.

Tons.

1890 1893 1895

30,442,839

29,031,955 33,101,452

1900

1905 1909

46,098,228 49,359,272 65,694,267

Iron.

The chief receiving countries are, in order, Germany, France, Italy, Sweden, Spain, Russian Empire, Denmark, Egypt, Holland, Argentina, Norway and Brazil.

The annual output of iron ore in the United Kingdom has on the whole decreased since 1882. In that year it reached a maximum of 18,031,957 tons; it then fell off to 13,098,341 tons in 1887, rose in the two years follow- ing to nearly 15,000,000, fell to little over 11,000,000 in 1892- 1893, rose fairly steadily to 14,461,330 in 1899, stood in 1900 at 14,028,208 tons of a value of £4,224,400, and then showed a further fall and rise, until in 1905 the tonnage was 14,590,703, and the value £3,482,184.

The iron ore raised in the various countries, and in the most productive counties, is here shown : —

1900.

1909.

England

Cumberland 1

Lancashire l

Leicester

Lincoln

Northampton

Stafford 2

York

Scotland 2

Ireland

Tons.

13,072,118

1,103,430

630,361

750,708

1,924,898

1,622,539

1,084,797

5,550,677

7,418

849,031

99,641

Tons.

14,176,658 1,246,228

312,367

514,896

2,037,363

2,875,659

902,565

6,234,589

38,043

697,276

68,002

The number of furnaces in blast (fractions showing the proportion of the year furnaces were in blast) was: in England 298ˆ, Wales 19/2 ; Scotland 85 o , total 403,. The total number ofexisting furnaces in 1900 was: in England 456, Wales 42, Scotland 106; total 604 ; so that 33 % of the number stood unused. In 1905 furnaces in blast numbered: England 244-/,, Wales 13ˆ, Scotland 871%; total 345/2 ; and those existing: in England 412, Wales 31, Scotland 101 ; total 544; and the percentage unused was thus 36.

In 1888 the imports of iron ore amounted to 3,562,071 tons, in 1898 to 5,468,396 tons, in 1899 to 7,054,578 tons, in 1900 to 6,297,953 tons, in 1901 to 5,548,888 tons and in 1909 to 6,361,571 tons, of which the bulk was imported from Spain. The amount of pig-iron ob- tained found its minimum, during the period 1890-1910, of 6,976,990 tons in 1893, and its maximum of 10,183,860 in 1966, and in 1905 the quantity produced from foreign ores (4,847,899 tons) for the first time exceeded that produced from British ores (4,760,187).

The quantity of lead ore produced within the United Kingdom has decreased. It is now less than one-half of the output of about 1877, and the value has decreased more than proportionately. In the period 1890-1908 the maxi- mum annual production of metallic lead from British ore was 33,590 tons in 1890, valued at £449,826 ; the production fluctuated somewhat, but generally fell, to the minimum of 17,704 tons in 1902 (value £198,875). The most productive

counties are Flint, Durham and Derby; the ore obtained in the Isle of Man is increased in value by the silver it contains.

1 These counties supply the richest ore in the United Kingdom.

2 In these cases the greater proportion of ore is from mines also producing coal.

Lead.

UNITED KINGDOM OF GREAT BRITAIN AND IRELAND 60 1

The annual output of tin ore, which in 1878 amounted to 15,045 tons, valued at £530,737, fell to 12,898 tons in 1881,

though the value in that year rose to £697,444.

During the years 1882-1892 the average output was over 14,000 tons, and its average value about £770,000, but in 1893 a decline began in the output (not however accompanied closely by a decline in the value), slightly relieved about 1905.

Year.

Tin Ore.

Value.

1893 1900

1905 1909

Tons.

13.689 6,800 7,201 5.193

£

637.053 523.604 574.183 617.376

Tin ore is obtained almost exclusively in Cornwall.

Like others of the less important mining industries, copper

mining in the United Kingdom has declined. In 1881 the

*output of ore amounted to 52,556 tons, in 1801 to Copper. % t „ * t • 4. *

9158 tons, in 1893 to 5576 tons, in 1905 to 7153 tons,

valued at £32,696 and yielding 716 tons of metal by smelting. The total tonnage of ore included 5757 tons from England (chiefly from Cornwall) and n 46 from Ireland (Wicklow, &c). Copper precipitate is taken from water pumped up from old copper mines on Parys Mountain in Anglesey.

Zinc ore is obtained chiefly from mines in Cumberland, Wales and the Isle of Man. In 1881 the output reached 35,527 tons, valued at £110,043; m 1891 the output was only 22,216 tons, but its value was £113,445. In 1897 the quantity was 19,278 tons, and the value £69,134; but in 1898 the price had risen so that the output of 23,552 tons was worth £117,784. In 1900 the output of 24,675 tons was worth £97,606; and in 1905 that of 23,909 tons was worth £139,806.

During the period 1890-1905 gold mines were worked continuously in Merionethshire. Notices of the discovery of gold elsewhere (as in the Forest of Dean, Argyllshire and Ireland) have appeared from time to time. The principal fluctuations in production were as follows : —

Zinc.

Year.

Ore.

Gold.

Value.

Tons.

Oz.

£

1890

575

206

675

l8qi

I4,H7

4,008

13,700

1893

4,489

2,309

8,691

1895

13,266

6,600

18,520

1898

703

395

1,229

1900

20,802

14,004

52,147

1902

29,953

4,181

14,570

1904

23,203

19.655

73,925

1905

15.981

5,797

21,222

1908

—

915

3,3″

It should be noted also that from imported cupreous iron pyrites, copper, gold and silver are extracted at some fifteen metal extraction works in Great Britain. From 386,858 tons of burnt ore in 1900 there were obtained 13,925 tons of copper, 1777 oz. of gold and 309,486 oz. of silver; and in 1905 the figures were: ore, 402,863 tons; copper, 14,502 tons: gold, 1850 oz.; silver, 322,291 oz.

Textile Industries. — The most important of the textile industries of Great Britain is cotton manufacture. The quantities of raw cotton imported, exported and retained for consumption for various years during the period 1 890-1910 were as follows: —

Cotton.

Year.

Imported.

Exported.

Retained.

lb

lb

lb

1890

1.793.495.200

214,641,840

1,578,853,360

‘893

1,416,780,064

224,621,488

1,192,158,576

1895

1,757,042,672

203,284,592

i,553,758,o8o

1898

2,128,548,352

203,072,464

!, 925,475,888

1900

1,760,206,672

215,747,168

1,544,459,504

1905

2,203,595,520

283,177,888

1,920,417,632

1907

2,386,901,104

330,352,064

2,056,549,040

1909

2,188,761,456

268,633,456

1,920,128,000

During the same period the minimum and maximum amount of raw cotton (in lb) imported into the United Kingdom from the principal countries whence it is exported was as follows : United

States of America (1893), 1,055,855,360; (1898), 1,805,353,424; Egypt (1890), 181,266,176; (1907), 423,052,448; British possessions in the East Indies (1898), 27,349,728; (1890), 238,746,704; (1909), 75,621,168; Brazil (1899), 5,464,592; (1906), 54,362,000; Peru (1891), 6,175,344; (1909), 24,413,648. In 1905 there were imported 7,941,920 lb from Chile (only 195,328 in 1909); 6,033,104 lb from Canada (this also fluctuates greatly; 1,801,072 in 1909) ; 1,241,408 lb from British West Africa (4,985,232 in 1909); 1,126,720 lb from the British West Indies and Guiana (3,022,208 in 1908).

According to the census returns of 1901 there were 546,065 per- sons employed in cotton factories, 199,920 male and 346,145 female. Of the total number of workpeople, 529,131 were employed in England and Wales, 14,805 in Scotland and 212 in Ireland. In 1907 the total had risen to 576,820 (217,742 males and 359,078 females).

The extent of the woollen and worsted manufactures of the

United Kingdom is indicated by the following table showing the imports and exports of wool and the quantity retained for use in various years (1890-1905): —

Wool.

Year.

Imports.

Exports of imported Wool.

Retained.

1890

1895 1898 1900 1905 1907 1909

lb

633,028,131

775.379,o63

699,555,048 558,950,528 620,350,885 764,286,625 808,710,087

lb

340,712,303 404,935,226 283,317,748 196,207,261 277,864,215 313,519,282 390,695,182

lb

292,315,828 370,443,837 416,237,300 362,743,267 342,486,670

450,767,343 418,014,905

During the same period the minimum and maximum amount of wool (in lb) imported into the United Kingdom was as follows: Australia (1904), 220,483,961; (1895), 417,163,078; New Zealand (1890), 95.632,598; (1909), 176,457.150; British possessions in South Africa (1900), 32,219,369; (1909), 115,896,598; South America (1890), 11,173,692; (1908), 78,938,157; British possessions in the East Indies (1901), 24,069,571; (1909), 56,238,633; France (1890),

10,873,788; (1902), 27,770,790; Turkish Empire (1908), 5,705,671;

(1897), 25,727,462.

In the woollen and worsted industries 239,954 persons were employed according to the census of 1901, of whom 99,425 were males and 140,529 females. Of the total number 209,700 were employed in England and Wales, 24,906 in Scotland and 5348 in Ireland.

The numbers of persons employed in the other principal textile industries in 1901 was as follows: —

England

and Wales.

Scotland.

I reland .

United Kingdom.

Total.

Males.

Females.

Flax . . Hemp, jute,

&c. . Silk . . Hosiery

4,493

2,750

34,847 48,374

23.570

39,200

2,424

H.957

71,464

639 209 611

29,226

11,618 11,058 15.067

70,301

30,971 26,422

45,875

99,527

42,589

37,48o

60,942

Commerce. — British commerce received an enormous development after the first quarter of the 19th century. In 1826 the aggregate value of the imports into and exports from the United Kingdom amounted to no more than £88,758,678; while the total rose to £110,559,538 in 1836 and to £205,625,831 in 1846. In 1856 the aggregate of imports and

exports had risen to £311,764,507, in 1866 to £534,195,956 and in 1876 to £631,931,305. Thus the commercial transactions of the United Kingdom with foreign states and British colonies increased more than sevenfold in the course of fifty years.

An important fact in connexion with the foreign commerce of the United Kingdom is that there has been a steady increase in imports, but there has been no corresponding steady increase in exports of British produce and manufactures. Many industries, which formerly were mainly in British hands, have been developed on the continent of Europe, in America, and to some extent in the East. The movement began in 1872. Up to that time the exports of British home produce had kept on increasing with the imports, although at a lesser rate, and far inferior in aggregate value; but a change took place in the latter year. While the imports continued their upward course, gradually rising from £354,693,624 in 1872 to £375,1 54,7°3 in 1876, the exports of British produce fell from £256,257,347 in 1872 to £200,639,204 in 1876. The decline in exports, regular and steady throughout the period, and with a tendency to become more pro- nounced every year, affected all the principal articles of British

Country.

I. — British Possession's —

India and Ceylon

Straits Settlements, Malaysia and Hong Kong .

Africa

Canada and Newfoundland .

West Indies, Bermudas.Hon- duras and Guiana .

Australia

New Zealand

Other

II. Foreign Countries —

France

Germany

Belgium

Holland

Denmark, Faeroe, Iceland, Greenland

Norway

Sweden

Austria-Hungary

Rumania

Greece

Italy

Spain

Portugal

Russian Empire ….

Turkey

Japan

China

Netherlands— India .

Egypt

U.S.A

Mexico andCentral American States

Brazil

Argentina

Chile

Other countries in Asia .

Africa

South America .... Other countries .

1890.

1895-

1900.

I9°5-

1909.

Total for British possessions

Total for foreign countries

Grand total

Imports Exports Imports Exports Imports Exports Imports Exports Imports Exports Imports Exports Imports Exports Imports Exports

Imports Exports Imports Exports

Imports Exports Imports Exports Imports Exports Imports Exports

Imports Exports

37,856,598

38,254.769

6,412,865

5,766,059

11,290,022

10,744,904

12,444,489

8,272,743

2-992,472

4,262,669

20,992,185

21,750,705

8,347,430

3,705,428

1,720,583

3,826,012

44,828,148 24,710,803 26,073,331 30,516,281 17,383,776 13,594,966 25,900,924 16,445,992

7,753,389 2,928,006

1,728,337 1,694,318

4,447,159 1,350,497 1,962,798 1,235,126

3,093,9i8

8,523,209 12,508,533 5,702,804

2,942,194 2,612,638 23,750,868 8,846,054 8,368,851 1

7,340,868 l

1,024,993

4,i87,373 4,830,850ˆ

6,763,221 2 1,223,037 1,675,054 8,368,851

3,459,991 97,283,349 46,340,012 1,863,284 3,050,051 4,350,675

7,795,073 4,129,802

8,530,427 3,473,348 3,365,824

376,969 516,846

2,345,843 3,262,462 2,080,466

5,674,325 3,206,713 6,605,220

100,279,852 94,522,469

Imports Exports

324,530,783 233,729,649

Imports Exports

420,691,997 328,252,118

31,076,761

27,519,909 5,404,887 4,077,436

12,522,366

13,325,089 13,400,570

6,594,903 2,831,343 3,230,189

24,954,779 15,867,979 8,383,058 3,443,688 1,952,431 3,095,184

47,470,583 20,324,998 26,992,559 32,736,651 17,545,169

n,934,653

28,419,944 11,272,258 9,799,328 3,135,122

3,831,727 2,532,050 8,784,256 4,036,729 1,221,783 2,149,552 2,118,505

944,034

1,241,406

860,193

3,132,720

6,211,337

11,314,518

4,052,806

2,491,926

1,865,973

24,736,919

10,686,333

5,630,240

5,566,187

1,143,382

4,772,829

3,343,865 2

5,363,536 2

874,313 1,988,479 9,524,507

3,4H,556

86,548,860 44,067,703 1,443,345 3,035,097 3,614,155 7,643,739 9,084,497 5,480,848

3,436,142 3,454,332

344,895 720,350 1,683,319 3,052,023 2,437,294 4,489,592 3,447,034 3,901,551

100,405,592 76,138,896

321,038,151 209,693,511

416,689,658 285,832,407

£

32,861,217

32,885,147

8,092,057

6,162,526

9,703,086

16,725,092

22,240,325

9,659,138

2,483,648

2,954,477

23,800,820

23,545,565

11,615,881

5,899,292

2,287,537

4,252,072

53,618,656

25,877-453 31,181,667 38,542,790 23,502,603 14,846,307 31,381,023 14,931,090

13,187,757 4,724,121 5,756,018 3,910,982

10,635,060 6,495,223

1,375,245

3,157,716

1,396,639

616,287

2,227,212

1,104,196

3,417,790

9,444,498

15,882,346

6,333,857

3,241,367

2,529,305

21,983,952

16,360,475

5,657,627

5,372,956

1,540,526

9,933,925 2,359,821

5,634,313

287454

2,881,601

12,585,578

6,159,468

138,789,261

37,343,955 1,144,590

3,H9,652

5,946,547 6,156,600 13,080,466 7,438,238 4,828,371 3,535,736

373,344 684,440 2,503,823 4,686,727

2,355,8oi

4,088,731 3,190,888 6,370,943

113,074,557 102,083,109

413,434,242 252,290,645

523,075,163 354,373,754

40,540,341

45,796,432

7,222,215

7,162,908

H,755,353

21,338,292

26,204,205

14,267,967

2,717,318

3,324,665

26,968,977

19,476,463

13,391,222

6,994,806

3,731,132

4,351,367

53,072,900 23,232,663 35,799,758 42,742,300 27,751,288 14,818,923 35,481,059 14,516,887 15,606,991 4,609,671 5,954,870

3.712,532 9,827,993 6,016,332 1,488,604 2,603,223

1,689,513 1,305,658 1,328,234 1,251,642

3,324,595 9,787,306

13,858,631 4,841,774 2,929,634 2,826,257

33,366,234

14,884,050 5,491,443 6,979,147 1,860,313 9,796,900 2,340,346 3

13,298,828 3 2,129,479 3,558,562

14,976,188

8,059,668

U5,573,05i

47,282,088

2,138,574 3,022,074 8,109,208

6,9l”6,6l7

25,034,325 13,383,835 6,068,031 4,782,382

611,096 699,556 2,901,281 6,063,114 3,897,595 5,129,351 6,289,947 8,352,264

40,995,633

46,617,909

8,948,582

7,455,726

13,130.724

20,181,408

27,674,340

18,750,970

2,969,772

3,777,244

32,655,709

27,207,430

17,730,556

8,081,422

2,800,939

4,246,362

50,690,785

31,515,320

40,115,450

47,168,852

29,217,560

19,284,791

37,371,702

16,303,884

19,427,483

5,705,415

6,574,3!9

3,835,436

9,245,303

7,114,071

1,208,499

4,333,269

3,395,474

1,749,996

1,613,174

1,513,744

3,634,073

13,274,764

13,362,959

5,352,017

2,912,994

2,777,201

36,897,746

18,325,844

5,085,435

7,789,432

4,232,716

8,618,821

3,725,502

8,558,275

2,436,518

3,768,264

19,872,288

8,142,325 118,269,777

59,254,166 2,595,356 3,179,577

11,271,890 8,809,226

32,528,446

19,202,496 6,607,415 5,054,144

1,043,280 1,214,041

4,538,5i8

7,783,508 5,657,201 6,137,748 4,260,790 7,440,065

134,530,683 ‘ 122,712,920

437,i5i,i9i

284,883,607

565,019,917 407,596,527

146,908,244 136,318,471

477,796,713 333,206,695

624,704,957 469,525,166

1 Including Cyprus in this year.

! Including Korea.

1 Excluding Wei-hai-wei.

Cotton yarn and manufactures Iron and steel and manufactures Woollen yarn and manufactures

Coal

Machinery

Chemicals

Textiles (not cotton or wool) . Metal manufactures (not iron)

Clothing

Leather and leather goods Ships

home produce just enumerated. The value of the cotton manu-

factures exported sank from £80,164,155 in 1872 to £67,641,268 in 1876; woollen fabrics from £38,493, 411 to £23,020,719; iron and steel from £35,996,167 to £20,737,410; coals from £10,442,321 to £8,904,463; machinery from £8,201,112 to £7,210,426; and linen manufactures from £10,956,761 to £7,070,149. The decline during the four years, it will be seen, was greatest in all textile manufactures, and least in coal and machinery.

The table 1 on p. 602 shows the sub- sequent movement in value of imports from other countries to the United Kingdom, and of exports to other countries from the United Kingdom, at quinquennial intervals; bullion and specie being excluded.

As regards fluctuations not revealed by the above figures, it may be mentioned that the highest total figures for any one year during the period covered are those for 1907, viz. imports £645,807,942; exports £517,977,167. As to minima within the period, the lowest totals for British possessions were: imports £91,851,534 in 1893, and exports, the figure quoted for 1895; for foreign countries, imports £312,836,644 in 1893, and exports £195,133,239 in 1894; grand totals, imports £404,688,178 in 1893, and exports £273,785,867 in 1894. It may be added that the maximal import figures for France within the period are those of 1906 (£53,871,661), for Germany those of 1909, and for the United States those of 1901 (£141,015,465). For exports to the United States the figures for 1909 were highest, to France those of 1907 (£33,507,544) and to Germany those of 1907 (£56,729,988).

The following table presents the value of the chief groups and articles of importation into the United Kingdom : —

The value of the chief articles and groups of export of home produce are similarly shown:—

1895-

63,746,463 19,428,3832

29.094-568 14,600,326 15.150,522 11,463,304 11,986,718 5.048,588

5.6i5,594

3,833,980

1900.

69,750,279

3i,623,353 2

24259,766 36,409,614 19 619 784

13 154,344 12191,069

6473,197 6,499,086

3,875.683 8,587,710

1905.

92,010,985 31,826.438 29,916,807 24,859 129 23,260.326 14,536,857 13,204,899

8,920,533 6,021,242 5,660,494 5,431,298

1909.

93,444,799

38,192,142

30,917,807

37,129,978

28,057,643

16,783,019

12,441,525

8,708,945

9,824,125

4,242,356

5,927,H4

The proportion of imports and exports per head of population of the United Kingdom was :—

Year.

Total Imports.

Exports of British Produce.

£ s. d.

£ 8. d.

1890

11 46

707

1895

10 12 6

5 15 4

1900

12 14 3

7 i 6

1905

13 1 5

7 12 7

1906

13 18 5

8 12

1907

14 12 6

9 13 3

1908

13 6 3

894

1909

13 17 7

8 8 1

Grain and flour

Meat

Other principal articles of food and drink —

Butter

Sugar

Tea . . “.

Wine

Coffee

Fish (preserved)

Cocoa and chocolate ….

Principal fruits —

Apples

Oranges

Bananas

Tobacco

Raw materials —

Cotton

Wool

Oils, &c

Wood and timber

Textile materials excluding cotton and wool

Caoutchouc

Hides and skins

Metallic ores excluding iron .

Iron ore, &c

Manufactured articles —

Yarns and textile fabrics .

Metal, excluding iron and steel .

Leather

Chemicals .....

Iron and steel (not machinery)

Paper -.

Machinery

1895-

53,077,981 33,334,171

14,235,230 17,684,413 10,242,999

5,448,088

3,778,305 2,289,260 1,610,483

960,273 1,925,415

3,353,916

30,522,016 28,494,249

18,497,573 16,372,181

11,378,608 3,760,178 7,360,070

4,575,929 3,027,196

11,196,315

11,035,870

8,714,360

2,845,730

1900.

62,992,082 46,782,579

17,450,435 19,256,439 10,686,910

5,192,909 2,544,726 2,895,330 2,398,248

1,224,657

2,120,790

548,956

4,799,417

41,117,308 24,073,917 23,564,644 27,875,913

ll,553,H4

6,986,133 8,465,660 5,575,272 5,750,947

21,844,683 11,823,132 8,628,279 7,314,696 4,412,440 3,475,887

1905-

1909.

Certain omissions are necessary in this table owing to alterations in classification of the returns.

1 Adapted from the Statistical Abstract for the United Kingdom, where it is specified that the Value of new ships and boats, with their machinery, was not included in exports before 1 899.

The tables on p. 604 show the value of unregistered imports of

gold and silver bullion and specie from British possessions and from foreign countries into the United Kingdom, specifying the most important countries individually.

Shipping. — The table at foot of p. 604 shows the tonnage of vessels entered from and cleared to British possessions and

foreign countries at the principal ports of the United Kingdom.

For the purpose of showing the rela- tive importance of British and Irish ports falling below the list, the follow- ing figures may be quoted for 1909 only: Methil, entered 824,375 tons, cleared 1,105,048 tons ; Harwich, entered 792,980, cleared 776,595; Grangemouth, entered 988,007, cleared 1,064,217; Burntisland, entered 609, 722, cleared 8 1 5 ,507 ; B ristol, entered858 ,933, cleared 61 5,266 ; Goole, entered 815,177, cleared 817,226; Hartlepool, entered 934,836, cleared 730,141; Newhaven, entered 385,3 13, cleared 376,083; Folke- stone, entered 364,524, cleared 359,697; Belfast, entered490,5 1 3, cleared 165,670; Borrowstounness (Bo'ness), entered 301,549, cleared 292,194; Dublin, en- tered 219,081, cleared 80,868; Cork, entered 146,724, cleared 7413; Mary- port and Workington, entered 118,388, cleared 67,494. The figures for Ply- mouth have included vessels which call " off " the port to embark passen- gers, &c,, by tender only since 19O7 ; for 1909 they were: entered, 1,455,605; cleared, 1,29,2,244.

The table at the commencement of page 605 shows the total tonnage of vessels entered from and cleared to British possessions and foreign countries at ports in the United Kingdom, and also the nationality of vessels under British and the principal foreign flags.

Out of the following totals steam vessels had an aggregate tonnage of 30,604,578 entered and 31,080,481 cleared in 1890, and 64,327,508 entered and 64,968,655 cleared in 1909. The total tonnage of vessels entered and follows: (1890), 47,738,612 entered,

70,057,290 49,431,748

21,586,622

19,471,811

9,302,713

4,072,199

2,578,327 2,493,876 2,227,141

2,065,193 1,949,496 1,770,256 3,721,920

52,370,878 26,648,737 23,600,927 23,274,020

14,511,978

9,643,153 8,084,793 7,610,990

5,525,575

39,688,418

21,840,696

11,037,983

9,624,638

8,589,405 5,256,065

4,537,871

83,107,421 47,623,428

22,424,962 21,691,894 11,617,031

3,746,489 2,075,516

2,509,573 903,464

2,007,911 2,522,491 1,752,190 4,986,663

60,295,049 35,041,766 31,039,883 23,591,579

12,127,707

14,138,204

11,617,756

8,327,193

5,076,131

29,651,658

24,346,328

11,617,130

10,596,593

7,971,594

5.647,437

4,438,336

cleared coastwise was as

2 Owing to an alteration in classification these figures are not strictly comparable with those for 1905.

604 UNITED KINGDOM OF GREAT BRITAIN AND IRELAND

Gold.

1890.

1895-

1900.

1905.

1909.

From British possessions South Africa . India .

Australia .... Foreign countries Total ....

£

5,368,424 1,876,677

443.079

1,398,627

18,199,625

23,568,049

£

17,618,466

8,353,913

1,929,590

5,324,498

18,390,863

36,009,329

£

11,350,591 378,626

3,637,978

6,182,718

14,840,282

26,190,873

£

38,567,895

21,286,374

6,850,360

3,440,037

4,949,335

43,517,230

£

40,464,212 32,912,428

2,170,957

2,613,002

14,227,617

54,691,829

Silver.

1890.

1895-

1900. ,

1905.

1909.

From British possessions . Foreign countries United States of America Total

£

350,094

10,035,565

4,057,709

10,385,659

£

282,269

10,384,063

8,082,925

10,666,332

£

264,676

13-057.624

11,459,612

13,322,300

£

412,756

12,579,258

9,784,828

12,992,014

£

667,619

11,147,270

9,971,396

11,814,889

42,317,876, cleared; (1895), 54,304,703 entered, 47,263,791 cleared; (1900), 55,828,569 entered, 54,425,666 cleared; (1905), 60,066,919 entered, 58,670,971 cleared; (1909), 60,566,043 entered, 60,060,979 cleared.

The number and gross tonnage of the registered sailing and steam vessels belonging to the United Kingdom were as follows at the end of each of the years named : —

Year.

Sailing Vessels.

Steam Vessels.

Number.

Gross Tonnage.

Number.

Gross Tonnage.

1890

1895 1900

1905 1909

14,181 12,617

10,773 10,059

9,392

3.055.136 3,040,194 2,247,228 1,796,826 1,407,469

7,410

8,386

9,209

10,552

“,797

8,095,370

9,952,2H

11,816.ˆ4

H.883,594

16,994 732

These figures show not only that steamers have been rapidly taking the place of sailing vessels, but also that large steamers are preferred to small, their average tonnage having increased from 1092 tons in 1895 to 1440 in 1909.

Railways. — The first ordinary roads deserving the name of highways were made about 1660, and canal -building began in

London .

Liverpool and Bir- kenhead Cardiff . .

Tyne Ports 1 & 2

Southampton

Hull . . .

Glasgow .

Newport

Dover

Middlesbrough

Blyth 2 .

Sunderland

Swansea 3

Leith .

Grimsby .

Manchester

•s

Entered Cleared Entered Cleared Entered Cleared Entered Cleared Entered Cleared Entered Cleared Entered Cleared Entered Cleared Entered Cleared Entered Cleared Entered Cleared Entered Cleared Entered Cleared Entered Cleared Entered Cleared Entered Cleared Entered Cleared Entered Cleared Entered Cleared

1890.

Tons.

7,708,705 5,772,062 5,782,351 5,159,450 3,173,699

5,64i,5n

3,401,216 5,010,098

888,352

813,133 1,997,138 1,655,996 1,121,700 1,697,662

920,560 1,316,430

789,846

767,724 833,562 623,967

725,859 956,266

565,644 858,215 706,491 626,573

663,513 689,165

1895-

Tons.

8,435,676 6,110,325

5,598,341 4,883,199 3,739,856 6,500,510 3,292,624 4,822,648

l,4 2 o,53i

1,328,393 2,150,654 1,612,385 1,184,537

i.9H,739

871,886

1,374,237 742,940 734,334 953,985 875,059

730,396 1,002,552 580,481 931,588 887,842

750,257 763,892

829,837 317.625 288,001

1900.

Tons.

9,580,854 7,479,008 6,001,563 5,778,114 5,132,523 7,636,717 3,897,142 4,894.157 1,613,913 1,395.486 2,666,598

2,274,137

1 ,454,860

2,229,574

1,092,068

1,511,383

973,074

964,476

1,096,130

882,156

974,285

1,525,727

800,027

1,163,310

1,018,148

1,427,903

1,055,291

982,309

931.238

960,236

787-497

595.757

1 Newcastle, North Shields, South Shields.

2 Blyth was included with North Shields till 1897. 1 Swansea included Port Talbot till 1904.

the middle of the following century; but though roads and canals aided materially in raising the commercial and industrial activity of the nation, their fostering agency was very slight compared with that of railways, of which England is the birth- place. The first line of railway for regular passenger service, that from Stockton to Darling- ton, 14 m. in length, was opened on the 27th of September 1825. The first really important rail- way was the line from Man- chester to Liverpool, opened on the 15th of September 1830, when William Huskisson, M.P., was accidentally killed. It took three

years to get the bill for the London-Birmingham railway, which was passed at last in the session of 1833, obtaining the royal assent on the 8th of May. The first sod of the great line was cut at Chalk Farm, London, on the 1st of June 1834. Enormous engineering difficulties had to be overcome, originating not so much from the nature of the ground as from intense public prejudice against the new mode of locomo- tion. It took over four years to construct the railway from London to Birmingham, at a cost exceeding £4,000,000. Even friends of the railway presaged that such outlay could not by any possibility be remunerative; but the contrary became evident from the moment the line was opened on the 17th of September 1838. All the great railway systems of England sprang into existence within less than ten years after the opening of the London-Birmingham line. Out of this railway grew one of the largest companies, the London & North- Western; while the most extensive system as regards mileage, the Great Western, originated in a line from Paddington, London, to Bristol, for which an act of parliament was obtained in 1835, and which was opened in

1 84 1. In 1836 a bill passed the legislature erecting the " Great North of England " Railway Com- pany, from which was developed the North-Eastern system. A few years later other acts were passed, sanctioningthe " Midland Counties" and the " North Midland " lines, from which the present Midland system grew.

The total length of railways conveying passengers in the United Kingdom at the end of the year 1825 was 40 m., constructed at a cost of £120,000. Five years later, at the end of 1830, there were not more than 95 m., built at a cost of £840,925, but at the end of 1835 there were293 m. , costing£5,648, 53 1 . Thus, in the first five years of rail- way construction, from 1825 to 1830, the mileage doubled; while in the second five years, from 1830 to 1835, it trebled. It quintupled in the next five-yearly period, till the end of 1840, when the total length of miles of railway in the kingdom had come to be 1435, built at a cost of £41,391,634, as represented by the paid-up capital of the various companies. The next five years saw nearly another doubling of length of lines, for at the end of 1845 there were 2441 m. of railway created by a paid-up capital of £88,481,376.

1905.

Tons.

10,814,115

7,9I3,H5

7,806,844 6,932,687 4,337,720

7.476,879 4,058,618 5,158,899 2,087,277 1,888,030 2,546,064 2,102,160 1,635,609 2,836,462 1,250,192

i,773,i6i

2,928,741

2,944,774 1,227,017 1,092,958 1,094,168 1,623,003

081,606 1,344,999

635,458

1,335,134 1,124,281 1,085,734 1,094,531 1,074,495 1,133,003 970,620

1909.

Tons.

11,605,698 8,622,316 7,747,994 6,593,094 5,771,476 8,888,756 5,700,405 6,899,023 4,279,052 4,108,063 3.517,953 3,164,156 1,917,144 3,160,916 1,548,258 2,105,509 1,636,530

1,631,751

1,728,385 1,586,148

1,292,353 1,836,503

i,357,2oi

1,676,777 1,020,480

1,719,654 1,344,898 1,314.361 1,289,476 1,334.566

1,275.937 1,067,835

1890.

1895.

1900.

1905,

1909.

Total (Entered

(Cleared

Tons.

36,835,712 37,448,157

Tons.

40,001,691 40,537,483

Tons.

49.913.223 50,182,439

Tons.

55,623,974 56,416,760

Tons.

66,309,519 66,958,163

British German .

Norwegian

Swedish

Danish

Dutch

French

Spanish

Belgian

U.S.A.

.

(Entered

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‘ (Cleared I Entered I Cleared (Entered

‘ I Cleared (Entered

‘ I Cleared (Entered

‘) Cleared

26,777.955 27,195,157 2,161,536 2,230,419 2,477.936 2,522,865

783,045 792,767 901,819 952,183 952,695 948,196

834,039 852,935 631,629

644,431 449,470

423,639 146,721

145.212

29,175,282 29,516,644

1.940,358 1,948,284 2,604,049 2,660,795

990,728 1,003,634

961,730

990,006 1,150,098 1,156,936

929,250

909,493 645,210 682,184 551,513 537,969 323,700

332,825

32,135,745 32,147,060 2,966,426 3,060,782 3,839,602 3,821,969 1,788,844 1,808,354 1.735,288 1,759,509 1,600,317 1,613,450 1,417,128 1,405,247 1,309,915 1,399.332 804,472

797,134 282,152 277,400

35,200,869

35,762,218

4,298,769

4,346,284

3,392,216

3,387,152

2,114,028

2,117,717

2,106,717

2,123,830

1,949,161

1,957,107

1,574,395

1,587,762

1,462,488

1,471,300

936,918

920,597

664,360

675,096

39,661,660 40.102,311 6,766,591 6,754,026 4,315,870 4,308,221 2,456,144 2,478,534 2,889,986 2,886,731 2,272,075 2,294,584 1 ,640,466 1,663,197 1,477,199 1,499,319 1,355,135 1,357,668

274,241 280,464

Not far from a fresh trebling took place in the course of the next quinquennial period, and at the end of 1850 there were 6621 m. of railways, constructed at the cost of £240,270,745.

The construction of railways (especially in England) was undertaken originally by a vast number of small companies, each under separate acts of parliament. But it was soon discovered that there could be neither harmonious nor profitable working of a great many systems, and this led to a series of amalgamations (see under England; Ireland; Scotland).

The number of passengers carried per mile in 1832 was 4860, but before ten more years were past the number of passengers had not only increased in proportion with the opening of new lines, but more than doubled per mile, and, instead of being under 5000, had in 1842 come to be near 12,000. In 1861 the number of passengers carried per mile of railway was 15,988; in 1876 it was 31,928; and in 1900 it was over 52,000.

The two following tables illustrate the further development of railways in the United Kingdom :—

In 1909 the percentage of working expenses to total receipts was 63 in England and Wales, 57 in Scotland and 62 in Ireland.

Tramways. — An act passed in 1870 to facilitate the construction of tramways throughout the coun- try marks the beginning of their modern development. It led to the laying down of " street rail- ways " in many large towns. According to a return laid before the House of Commons in the ses- sion of 1878, the total length of tramways authorized by parlia- ment up to the 30th of June 1877 was 363 m., and the total length opened for traffic 213 m., compris- ing 125 m. of double lines and 88 m. of single lines. On the 30th of June 1900 there were in the United Kingdom 70 tramway undertakings with 585 m. of line belonging to local authorities, while 107 with 592 ni. of

line belonged to other than local authorities. The capital expenditure on the former amounted to £10,203,604, on the latter to £11,532,384.

The development of tramway enterprise in the United Kingdom, as shown by the mileage open, the paid-up capital, gross receipts, working expenses and number of passengers carried, has been as follows : —

Years ending June 30.

Miles open.

Paid-up Capital.

Gross Receipts.

Working Expenses.

Passengers

carried during

year.

1890

1895 1900

1905 1909

948

982

1 177

2117

2526

£

13,502,026 14,111,521 20,582,692 51,501,410 70,345,155

£

3,214,743 3,733,690 5,445,629 9,917,026 12,641,437

£

2,402,800 2,878,490

4,075,352 6,565,049 8,045,658

526,369,328

661,760,461

1.065,374,347

2,068,913,226

2,659,981,136

Year.

Mileage.

Paid-up

Number of

Traffic Receipts.

Percentage of

Working Expenses

to Receipts.

Capital.

*Passengers. **

Total.

Per Mile.

£

£

£

i860

io,433

348,130,127

163,435,678

27,766,622

2,661

47

1865

13.298

455,478,143

251,862,715

35,890,116

2,701

48

1870

15.537

529,908,673

336,545,397

43,417,070

2,794

48

1875

16,658

630,223,494

506,975,234

58,982,753

3,541

54

1880

17,933

728,316,848

603,885,025

62,961,767

3.5H

51

1885

19,169

815,858,055

697,213,031

66,644,967

3,477

53

1890

20,073

897,472,026

817,744,046

76,548,347

3,8i3

54

1895

21,174

1,001,110,221

929,770,909

81,396,047

3,844

56

1900

21,855

1,176,001,890

1,142,276,686

98,854,552

4,523

62

1905

22,847

1,272,601,000

1,199,022,102

105,131,709

4,601

62

1909

23,280

1,314,406,000

1,265,081,000

110,682,266

4,754

62

- *Excluding season-ticket holders, whose number in 1880 was 502,174; in 1900, 1,749,804; and in England and Wales alone, in 1880, 449,823; in 1900, 1,610,754.*

In the next table further details are given for 1909: —

1909.

England and Wales.

Scotland.

Ireland.

Mileage of \ Do^le or more lines . . b (Single lines

("Passenger traffic Traffic ! Total goods traffic . . . R -i P ts l-gEST ....

L General merchandise . Working expenditure

10,746

5,299

£

43,919,702

50,647,426

24,837,682 24,885,494 65,169,619 37,979,313

1,580

2,264

£

5,080,603

6,836,920

3,286,074 3,299.588 7,200,173 5,489,579

670

2,721

£

2,204,756

1,992,859

» 281,634

1,392,600 2,667,796 1,667,572

Authorities. — The following publica- tions relating to the United Kingdom are issued annually in London (unless otherwise stated): Finance Accounts; Financial Estimates;

Return showing Re- venue and Expenditure {England, Scotland and Ireland); National Debt Accounts; National Debt during 60 Years; Local Taxation Returns; Army Estimates; Army Accounts; Army List (quarterly); Navy Estimates ; Navy List (quarterly) ; Royal Commission on Agriculture, Reports (1896) ; Mineral Statistics; Reports of Inspectors of Mines; Reports on Factories and Work- shops; Reports of Inspectors of Fisheries; Return of Fish conveyed inland by rail; Statement of the Trade of the United Kingdom; Statement of the Shipping and Navigation of the United Kingdom ; Report of the Postmaster-General. Vital statistics : Reports of the registrars-general respectively for England, for Scotland (Edinburgh), for Ireland (Dublin); Census Reports (decennial, 1901, &c), ditto; Education: Reports of the Board of Education for England and Wales ; Report of the Commissioners of National Education in Ireland; Report of the Committee of Council on Education in Scot- land; Electoral Statistics (London, 1905) ; Statistical Tables relating to Emigration and Immigration ; Judicial Statistics of England and Wales, of Scotland, of Ireland; Local Government Reports, ditto; Statistical Abstract for the United Kingdom, in which the most important statistics are summarized for each of the fifteen years preceding the year of issue. Among books may be mentioned the following: Sir W. R. Anson, The Law and Custom of the Constitution (2 vols., 2nd ed., Oxford, 1892-1896); W. J. Ashley (edited by), British Industries (London, 1902); E. G. Boutmy, Le Developpement de la constitution et de la societe politique en Angleterre (2nd ed., Paris, 1897). Of this there is an English translation (from 1st ed.)

by I. M. Eaden (London, 1891); £tudes de droit constitutional, France, Angleterre, £tats-Unis (Paris, 1885; Eng. trans, by E. M. Dicey, London, 1891); Brassey, The Naval Annual (Portsmouth, 1886 onwards) ; Cassell's Gazetteer of Great Britain and Ireland (London, '899); W. L. Clowes and other writers, History of the Royal Navy (London, 1896-1901) ; W. Cunningham, Growth of English Industry and Commerce (4th ed., London, 1904) ; A. V. Dicey, Introduction to the Study of the Law of the Constitution (5th ed., London, 1897) ; R. Donald (edited by) Municipal Year-book (London, annual) ; S. Eardley-Wilmot, Our Fleet To-day and its Development during the Last Half Century (London, 1900) ; Hon. J. W. Fortescue, History of the British Army (London, 1906); R. Giffen, Essays

in Finance (London, 1880 and 1886); R. von Gneist, Das englische Parlament in tausendjdhringen Wandelungen (Berlin, 1885; translated into Eng- lish by A. H. Keane, History of the English Parliament, London, 1889) ; Englische Verfassungsgeschichte (Berlin, 1882 ; Eng. trans, by P. A. Ashworth, London, 1891); E. Hull, The Coalfields of Great Britain (London, 1905); J. E. T. Rogers, Industrial and Commercial History of England (London, 1892); J. Holt Schooling, The British Trade Book (London, 1908) ; Sir J. R. Seeley, The Growth of British Policy (2 vols., London, 1895) ; H. Taylor, The Origin and Growth of the English Constitution (2 vols., London, 1889-1899); A. Todd, Parlia- mentary Government in England (new ed., revised by S. Walpole, 2 vols., London, 1892).

British Military Forces.

The forces of the British Crown may be classed as (a) the regular, or general service, army, together with the Indian army; and (J>) the home territorial force; while there are also certain forces controlled by the governments of the various self- governing dominions. The home government raises, pays and controls the regular army, its reserves, the territorial force, and some few details such as the militia of the smaller possessions, Indian native battalions employed on imperial service out of India, &c. But the cost of that portion of the regular army which is in India is borne by the Indian government, which is not the case with the regulars serving in other colonies or in the dominions. Consequently the Indian government t unlike the colonial governments, can within limits dispose of the British paid regulars within its sphere.

Regular Army. — The duties of the regular army are to garrison India and overseas colonies, to garrison Great Britain and Ire- land, and to find expeditionary forces of greater or less strength for war in Europe or elsewhere. The principles upon which the reorganization of 1905-1908 was based are: {a) that in peace the army at home must be maintained at such an effective standard that all necessary drafts for the army abroad shall be forthcoming, without undue depletion of the army at home; (b) the home army on mobilization for service shouM be brought up to war strength by the recall of reservists in sufficient, but not too great, numbers; (c) the wastage of a campaign shall be made good by drafts partly from the remaining army reserve, but above all from the militia, now

converted into the special reserve; and (d) the volunteers and yeomanry, reorganized into the territorial force, shall be responsible, with little regular help, for the defence of the home country, thus freeing the regular army at home for general service. The first of these conditions entirely, the second largely, and even indirectly the third and fourth depend upon the recruiting, establishments and terms of service of the regular army. These last are a compromise between the opposite needs of short service, pro- ducing large reserves, and long service, which minimizes the sea- transport of drafts; they are also influenced by the state of the labour market at any given moment, as recruiting is voluntary. To enable the authorities to deal with these conditions, the secretary of state for war may without special legislation vary the terms of enlistment, not only in general but also for the various arms and branches.

After the South African War, several different terms were tried for the line infantry and cavalry, but these experiments proved that the terms formerly prevailing, viz. 7 years with the colours and 5 in the reserve, were the most convenient. In the Horse and Field Artillery the term is 6 and 6, in the Household Cavalry and the Garrison Artillery 8 and 4, and in the Foot Guards 3 and 9. Engineers and other specialists are recruited on various terms. A certain number, again varying from year to year, almost from month to month, are allowed to engage for the full 12 years with the colours (long service). Thus in 1907-1908, 1551 men were serving

on a 12-year colour engagement, 24,856 on a term of 7 years colours and 5 reserve, 3589 on a 6 and 6 'term, 3449 on 3 and 9 engagement, 4529 for other terms, out of a total of 37,974 recruits or soldiers signing fresh engagements.

The following figures show the inflow of recruits : —

Percentage

Year.

Recruits

Recruits

Percentage

of Recruits

offering.

approved.

approved.

to Strength

of Army.

Oct. 1903-Oct. 1904

89,824

42,041

46-8

14-6

Oct. 1904-Oct. 1905

81,045

35.551

43-9

1305

Oct. 1905-Oct. 1906

83.155

36,380

43-5

14

Oct. 1906-Oct. 1907

72,855

34.710

47-6

14-25

Oct. 1907-Oct. 1908

77.526

37,222

47-9

14-05

Oct. 1908-Oct. 1909

75.6.30

33.766

447

13-6

The army consists of about 250,000 officers and men of the regular forces on full pay, distributed (October 1909) as follows:—

Strength.

Establishment.

Staff and departments, &c. On regimental strength :—

Total . . ...

3.293

128,412 77,866 47,127

3.392

130,714 76,009 44,981

253.004

253,405

By units, it is composed of 3 regiments of Household Cavalry, 7 regiments of Dragoon Guards, 3 of Dragoons, 6 of Lancers and 12 of Hussars (total cavalry, 31 regiments); 4 regiments of Foot Guards of 9 battalions, 51 English and Welsh, 10 Scottish and 8 Irish line infantry and rifle regiments (total infantry, 149 battalions) ; the Royal Regiment of Artillery, divided into Royal Horse and Field Artillery, and Royal Garrison Artillery — the R.H.A. con- sisting of 28 batteries, the R.F.A. of 150 batteries, the R.G.A. of 100 companies (told off to garrisons, siege train and heavy field batteries) and 8 batteries mountain guns; the Corps of Royal Engineers, organized into mounted field troops, field companies, fortress, telegraph, railway, searchlight, balloon, wireless companies and bridging train; the Army Service Corps, divided into transport, supply, mechanical-transport and other companies and sections; the Royal Army Medical Corps of 35 companies; the Army Ordnance Corps ; the Army Veterinary Corps ; Army Post Office Corps (formed on mobilization only) and Army Pay Corps.

In addition, there are the following colonial troops under the home government: — West India Regiment, 2 battalions; Royal Malta Artillery, 2 garrison companies ; West African Frontier Force, 2 batteries, 1 garrison company, 1 battalion M.I., 6 battalions infantry; and King's African Rifles (East Africa), 5 battalions, besides the Indian troops in imperial services.

The army reserve, formed of men who have served with the colours, consists of four classes. Sections A, B and C consist of men who are fulfilling the reserve portion of their original twelve years' liability. Section A, which receives extra allowances, is liable to be called up in a minor emergency ; section B is the general reserve ; section C, also part of the general reserve, consists of men who have been sent to the reserve prematurely; section D (which is often sus- pended) consists of men who at the expiry of their twelve years' engagement undertake a further four years' reserve liability.

Strength and Ages of the Army Reserve (Oct. 1,

1909).

Section.

A.

B&C.

D.

Total.

Infantry .... Cavalry ....

R.H. &F.A

R.G.A

R.E

Others

4,051 604

415 427

70,998 8,894

13.849 7.748 4,200 9.356

9,608 1,229

I.57I

642 406 558

84.657 10,123 16,024 8,189 5.021

io,34i

5.497

“5.045

14,014

134.556

30-35

Over 35

98,146

21,730

666

201

10,758

3.055

98,347

32,488

3.721

120,542

14.014

134,556

The special reserve, converted from the militia, consists of Infantry, field and garrison artillery, the Irish Horse (late Yeomanry), engineers, and a few A.S.C. and R.A.M.C. Its object is to make good on mobilization deficiencies (so far as they may exist after the

calling in of the army reserve) in the expeditionary or regular forces, and to repair the losses of a campaign. It also acts as a feeder co the regular army. Its establishment and strength on the 1st of October 1909 were 90,664 and 69,954 respectively, without counting in the latter figure 6172 militia and militia reserve men not then absorbed into the new organization.

The war organization of the home establishment, with its general and special reserves, aimed at the mobilization and despatch overseas of 6 army divisions, each of 12 battalions in 3 brigades; 9 field batteries in 3 brigades, a brigade of 3 field howitzer batteries, and a heavy battery, each with the appropriate ammunition columns; 2 field companies and 1 telegraph company R.E.; 2 companies mounted infantry; and ambulances, columns and parks. In addition to these 6 divisions, there are " army troops " at the disposal of the commander-in-chief, consisting of two mixed " mounted

brigades " (cavalry, mounted infantry, and horse artillery) serving as the " protective cavalry," and of various technical troops, such as balloon companies and bridging train. The " strategical " cavalry is a division of 4 brigades (12 regiments or 36 squadrons), with 2 brigades (4 batteries) of horse artillery, 4 " field troops " and wireless company R.E., and ambulances and supply columns. The peace organization of the regular forces at home conforms to the prospective war organization. In addition to the field army itself, various lines of communication troops are sent abroad on mobilization. These number some 20,000 men, the field army about 135,000, with 492 field guns, 7561 other vehicles and 60,769 horses and mules.

But the first condition of employing all the home regulars abroad is perfect security at home. Thus the pivot of the Haldane system is the organization of the Territorial Force as a completely self-contained army. The higher organization — which the volunteers (g.v.) and yeomanry (q.v.) never possessed — -varies only slightly from that in vogue in the regular army. The second line army consists of 14 mixed mounted brigades as protective cavalry and 14 army divisions of much the same combatant strength as the regular divisions, the only important variation being that the artillery consists of 4-gun instead of 6-gun batteries. In addition to the divisions and mounted brigades there are " army troops," of which the most important component is the cyclist battalions, recruited in the different coast counties and specially organized as a first line of opposition to an invader. Affiliated to the territorial force are officers' training corps, cadets, " veteran reserves," and some of the other organizations mentioned below, the Haldane scheme having as its express object the utilization of every sort of contribution to national defence, whether combatant or non-combatant, on a voluntary basis.

The conditions of enlistment and reserve in the territorial force are a four years' engagement (former yeomen and volun- teers being however allowed to extend for one year at a time if they desire to do so), within each year a consecutive training in camp of 14-18 days and a number of " drills " (attendances at company and battalion parades) that varies with the branch and the year of service. The minimum is practically always exceeded, and trebled or quadrupled in the case of the more enthusiastic men, and the chief difficulty with which the officers responsible for training have to contend is the fact that

no man can be compelled to attend on any particular occasion. Attend- ance at the camp training, in so far as the claims of men's civil employment do not infringe upon it, is compulsory, and takes place at one time for all- — generally the first half of August.

The army troops, divisions and mounted brigades consist of 56 regiments of yeomanry; 14 batteries and 14 ammunition columns R.H.A., 151 batteries and 55 ammunition columns R.F.A., 3 mountain batteries and ammunition column, and 14 heavy batteries and ammunition columns R.G A. ; 28 field companies, 29 telegraph companies, railway battalion, &c, R.E.; 204 battalions infantry (including 10 of cyclists, the Honourable Artillery Company, and certain corps of the Officers' Training Corps training as territorials) ; 60 units A.S.C. ; 56 field ambulances, 23 general hospitals and 2 sanitary companies R.A.M.C. Told off to the defended seaports are 16 groups of garrison artillery companies and 58 fortress and electric light companies R.E.

Establishment and Strength (April 1, 19 10)

Arm or Branch.

Establishment.

Strength.

Officers.

Men.

Officers.

Men.

1.345

24,766

I.I93

24,219

R.H. & EA

1,211

32,945

1,015

29,658

R.G.A

450

11.455

406

9.356

R.E

571

14,660

525

12,896

5,679

195.297

5,064

173,670

A.S.C

322

8,562

277

7,577

R.A.M.C

1.438

13,664

1,151

1 1 ,849

A.V.C

198

14

95

—

Total

11,214

301,363

*9,726 **

269,225

The Territorial Force is enlisted to serve at home, but individuals and whole corps may volunteer for service abroad in war if called upon. A register is kept of those who accept this liability before- hand, and about 6000 officers 1 and men had joined it in April

1910.

The force is trained, commanded and inspected exclusively by the military authorities, the regular army finding the higher comman- ders and staffs. But in accordance both with the growing tendency to separate command and administration and with the desire to enlist local sympathies and utilize local resources, " associations," partly of civilian, partly of military members, were formed in every county and charged by statute with all matters relating to the enlistment, service and discharge of the county's quota in the force, finance (other than pay, &c. in camp), buildings, ownership of regimental property, &c. To these duties of county associations are added that of supervising and administering cadet corps of all sorts (other than officers' training corps), and that of providing the

extra horses required on mobilization, not only by the territorial force, but by the expeditionary force as well.

There are several groups of more or less military character which are for various reasons outside war office control. These are: (a) boys' brigades — the Church Lads' Brigade, the London Dioce- san Brigade, the Jewish Lads' Brigade, &c; (b) the Legion of Frontiersmen, an organization intended to enroll for " irregular " service men with colonial or frontier experience ; (c) rifle clubs, which exist solely for rifle practice, and have no military liabilities ; (d) boy scouts, an organization founded in 1908 by Lieut.-General Sir R. S. S. Baden-Powell.

Command and Administration. — The secretary of state for war is the head of the army council, which comprises the heads of departments and is the chief executive authority. These departments (see Staff) are: the general staff; the adjutant-general's department; the quartermaster-general's department; the department of the master-general of the ordnance; the civil member's department; and the finance member's department: In addition to these departments, whose heads form the army council itself, there is the very important department of the inspector-general of the forces, whose duties are to ensure by inspection the maintenance of military efficiency and an adequate standard of instruction, &c. This department is thus in the main a complement of the general staff branch. In 1910 the commander-in-chief in the Mediterranean was appointed in- spector-general of the overseas forces other than those in India, and the inspector-general in London supervises therefore only the forces in the home establishment. There are, therefore, three single authorities of high rank for the great divisions of the army— the two inspectors-general and the commander-in-chief in India.

The United Kingdom is subdivided into 7 command's and 12 districts, the commands under a lieutenant-general or general as commander-in-chief and the districts under brigadier-generals. The commands are the eastern, southern, western, northern; Scottish, Irish and the Aldershot. London is organized as a separate district under a major-general. In the colonial establishment the principal commands are the Mediterranean (including Egypt) and the South African. Except in South Africa, there are no imperial troops quartered in the self-governing colonies.

Since 1904-1905 command and administration have been separated and general officers commanding in chief relieyed of administrative details by the appointment to their staffs of major- generals in charge of administration (see Staff and Officers).

Finance. — The army estimates for 1910-1911 show a total sum 01 £27,760,000 required for the home and colonial establishments, made up as follows (after deducting appropriations in aid) : —

1 Does not include unattached_ list of officers, 853, or 736 R.A.M.C. officers not available until mobilization.

Regular Army, Pay and Allowances £8,733,000

Special Reserve 833,000

Territorial Force 2,660,000

Medical Services 452,000

Educational Establishments 147,000

Quartering, Transport, Remounts 1,589,000

Supplies, Clothing 4,397,000

Stores and Ordnance Establishment 533,ooo

Armament and Engineer Stores 1,482,000

Works, Buildings and Land, &c 2,598,000

War Office and Miscellaneous 503,000

Pensions, &c. 3,833,000

£27,760,000 The pay of the soldiers has increased since the South African War. Without allowances of any kind, it was in 1910 as follows: Warrant officer, 5s. to 6s. per day; quartermaster-sergeants, colour- sergeants, &c, 3s. 4d. to 4s. 6d. ; sergeants, 2s. 4d. to 3s. 4d. ; cor- porals, Is. 8d. to 2s. 8d. ; lance-corporals, Is. 3d. to is. 9d.; privates is. id. to is.

9d.; boys, 8d. In addition, all receive a messing allowance of 3d. per day, 2d. for upkeep of kit, and most receive " service " or " proficiency " pay at 3d.6d a day; and engineers, A.S.C. and R.A.M.C. specialist pay at various rates. Officers' pay, without allowances, is for second lieutenants 5s. 3d. to 7s. 8d. ; lieu tenants, 6s. 5d. to 8s. iod. ; captains, 1 is. 7d. to 15s. ; majors, 13s. 7d. to 18s. 6d.; and lieutenant-colonels, 18s. to 24s. gd.

Indian Army. — The forces in India consist of the British army on the Indian establishment and the Indian native army with its dependent local militias, feudatories, contingents, &c. In addition there is a force of European and Eurasian volunteers, drawn largely from railway employes. The Indian army consists of 138 battalions of infantry, 10 regiments of cavalry, 16 mountain batteries, 1 garrison artillery .company, 32 sapper and miner companies (2 railways companies included). The proportion between British and Indian troops observed since the Mutiny is roughly one British to two native, the Indian army being about 162,000 men. In addition the native army includes supply and transport corps, the medical service, and the veterinary service, officered in the higher ranks by officers of the A.S.C, R.A.M.C. and A.V.C. respectively.

The Indian army is recruited from Mahommedans and Hindus of various tribes and sects, and with some exceptions (chiefly in the Madras infantry) companies, sometimes regiments, are composed exclusively of men of one class. The official F.S. Pocket Book 1908 gives the following particulars: Mahommedans (Pathans of the frontier tribes, Hazaras Baluchis, Moplahs, Punjabi Mahommedans, &c.), 35° infantry companies, 76 squadrons- (35 % of the army). Hindus (Sikhs, Gurkhas, Rajputs, Jats, Dogras, Mahrattas, Tamils, Brahmans, Bhils, Garhwalis, &c), 727 companies, 79 squadrons

(63-3 %)•

Enlistment is entirely voluntary, and the army enjoys the highest prestige. Service is for three years, but in practice the native soldier makes the army his career and he is allowed to extend up to 32 years. The native cavalry is almost entirely Silahdar, in which the trooper mounts and clothes himself, and practically serves without pay. In the infantry, too, the old system of paying men and requiring them to equip, clothe and feed themselves, is in vogue to some extent. There is a reserve

of the native army, numbering some 35,000 men. But it is rather a draft to replace wastage than a means of bringing the army up to a war footing in the European way. Indeed, a cardinal principle of the Indian forces, British and native alike, is that the units are maintained in peace at full war effective, often a little above their field strength. Part of the army, nearest the north-west frontier, has even its transport practi- cally in readiness to move at once. The command is in the hands of British officers assisted by native officers, promoted from the ranks. The number of native officers in a unit is equal to that of the British officers.

Besides the regular native army there are: (a) various frontier and other levies, such as the Khyber Rifles and the Waziristan Militia; (b) selected contingents from the armies of the native princes, inspected by British officers, numbering about 20,000 and styled " imperial service troops "; (e) the volunteers, about 32,000 strong ; and (d) the military police.

The general organization of the forces is into two armies, the northern and the southern, with headquarters at Rawal Pindi and Poona respectively.

Administration. — Under the governor-general in council the commander-in-chief (himself a member of the council) is the execu- tive authority. Under him in the army department, now divided into higher committees and the headquarter staff, the latter com- prising (since the abolition of the military staff department under Lord Kitchener's reorganization) the divisions of the chief of the general staff, the adjutant-general and the quartermaster-general. India has her own staff college at Quetta, and can manufacture

rifles, ammunition and field artillery equipment except the actual guns.

The cost of the Indian army, and of the British forces on the Indian establishment, borne by the Indian government in 1909 was £20,558,000.

Regulars only.

Northern Army.

Southern Army.

Total.

British .'....

40,608

34,H3

74-751

Indian Army, white . „ ,, native .

Total . .

i,534

85,189

1,512 76,772

3,046 161,961

86,723

78,284

165,007

Total

127,331

112,427

239-758

Forces of the Dominions and Colonies. — Lord Kitchener and Sir John French in 1909-19 10 paid visits of inspection to Australia and Canada in connexion with the reorganization by the local governments of their military forces, and a beginning was made of a common organization of the forces of the empire in the colonial military conference of 1909. Without infringe- ment of local autonomy and local conditions, a common system of drill, equipment, training and staff administration was agreed on as essential, and to that end the general staff in London was to evolve into an " imperial general staff." The object to be attained as laid down was

twofold; (a) complete organization of the territorial forces of each dominion or colony; (b) evolu- tion of contingents of colonial general-service troops with which the dominion governments might assist the army of Great Britain in wars outside the immediate borders of each dominion. (See British Empire; Australia; Canada.)

UNITED METHODIST CHURCH, or United Methodists, and English Nonconformist community formed in 1907 by the union of the Methodist New Connexion (1797), the Bible Chris- tians (1815), and the United Methodist Free Churches (1857). The act of parliament which enabled this amalgamation received the royal assent on the 26th of July 1907, and authorized the union " to deal with real and personal property belonging to the said three churches or denominations, to provide for the vesting of the said property in trust for the United Church so formed and for the assimilation of the trusts thereof, and for other purposes." The union was completed on the 16th of September 1907 in Wesley's Chapel, City Road, London. The Church gives power of speech and vote in its meetings to every member of 18 years of age and upwards. Its principal courts are constituted of an equal number of ministers and laymen. The Church had theological colleges at Manchester and Sheffield, beys' schools at Shebbear, in Devonshire, and at Harrogate, and a girls' school at Bideford. It issues a weekly and two monthly journals. In 1908 its statistics showed 2343 chapels with accommodation for 714,793 persons, 848 ministers and 5621 local preachers, 165,463 church members and 332,756 Sunday scholars; there were 55 foreign missionaries, and about 30,000 church members and probationers in the foreign field.

UNITED METHODIST FREE CHURCHES, an English Non- conformist community merged since 1907 in the United Methodist Church (?.».). The organization was itself formed in 1857 by the amalgamation of the " Wesleyan Association " (which had in 1836 largely absorbed the Protestant Methodists of 1828) and the "Wesleyan Reformers" (dating from 1849, when a number of Wesleyan Methodist ministers were expelled on a charge of insubordination).

UNITED PRESBYTERIAN CHURCH (of Scotland). This Presbyterian organization, merged since 1900 in the United Free Church of Scotland (see above), was formed in 1847 by

the union of the United Secession and Relief Churches.

*The general causes which led to the first great secession from the Church of Scotland, as by law established in 1688, are indicated • in the article Scotland, Church of. Uatted Its immediate occasion rose out of an act of assembly Secession of 1732, which abolished the last remnant of < *««*• popular election by enacting that, in cases where patrons*

might neglect or decline to exercise their right of presentation the minister was to be chosen, not by the congregation, but only by the elders and Protestant heritors. The act itself had been passed by the assembly, although the presbyteries to which it had been previously submitted as an overture had disapproved of it by a large majority; and in accordance with a previous act (1730), which had taken away even the right of complaint, the protests of the dissentient majority were refused. In the following October Ebenezer Erskine (q.v.), minister of Stirling, preached a synod sermon, in the course of which he took occasion to refer to the act in question as in his opinion unscriptural and unconstitutional. 1 Some of his expressions were objected to by members of synod, and it was resolved that he should be censured for them. This judgment, on appeal, was affirmed by the assembly in May 1733, whereupon Erskine protested to the effect that he held himself still at liberty to teach the same truths and to testify against the same or similar evils on every proper occasion. This protest, in which he was joined by William Wilson (1690-1741), Alexander Moncrieff (1695- 1761) and James Fisher (1697— 1775), ministers at Perth, Aber- nethy and Kinclaven respectively, was regarded by the assembly as contumacious, and the commission of assembly was ordered to procure its retractation or to proceed to higher censures. In November accordingly the protesting ministers were severed from their charges, their churches declared vacant, and all ministers of the Church prohibited from employing them in any ministerial function. They replied by protesting that they still adhered to the principles of the Church, though now obliged to " make a secession from the prevailing party in ecclesiastical courts."

In December 1733 they constituted themselves into a presbytery, but for some time their meetings were devoted almost entirely to prayer and religious conferences. In 1734 they published their first " testimony," with a statement of the grounds of their secession, which made prominent reference to the doctrinal laxity of previous general assemblies. In 1736 they proceeded to exercise " judicial powers " as a church court, published a " judicial testimony," and began to organize churches in various parts of the country. Having been joined by four other ministers, including the well-known Ralph Erskine, they appointed Wilson professor of divinity. For these acts proceedings were again instituted against them in the assembly, with the result that, having disowned the authority of that body in an " act of declinature," there were in 1740 all deposed and ordered to be ejected from their churches. Meanwhile the members of the " Associate Presbytery " and its adherents steadily increased, until in 1745 there were forty-five congre- gations under its jurisdiction, and it was reconstituted into an " Associate Synod." A violent controversy arose the same year respecting the religious clause of the oath taken by burgesses in Edinburgh, Glasgow and Perth (" I profess and allow with my heart the true religion presently professed within this realm and authorized by the laws thereof"), and resulted in April 1747 in a " breach," when two bodies weje formed, each claiming to be the " Associate Synod "; those who condemned the swear- ing of the burgess oath as sinful came to be popularly known as "Antiburghers," while the other party, who contended that abstinence from it should not be made a term of communion, were designated " Burghers." The Antiburghers not only re- fused to hold further friendly conference with the others, but ultimately went so far as to pass sentences of deposition and the greater excommunication on the Erskines and other ministers who held the opposing view. The Associate (Antiburgher) Synod held its first meeting in Edinburgh in the house of Adam Gib (q.v.) on the 10th of April 1747. It grew with con- siderable rapidity, and in 1788 had ninety-four settled charges in Great Britain and nineteen in Ireland, besides a presbytery in America. For purposes of organization it was formed in that year into four provincial synods, and took the name of " The General Associate Synod." The " new light " controversies as to the province of the civil rnagistrate

'The passing of the act was certainly unconstitutional; it was

rescinded in 1734, " because not made according to former acts."

XXVII. 20

in matters of religion led to the publication of a revised testimony in the " voluntary " sense in 1804, and in consequence Thomas M'Crie(i772-i835), with three other brethren, withdrew to form the Constitutional Associate Presbytery. The Associate (Burgher) Synod held its first meeting at Stirling on the 16th of June 1747. The number of congregations under its charge rapidly increased, and within thirty years there were presbyteries in connexion with it in Ireland and North America, as well as throughout Scotland. In 1782 the American presby- teries took the designation of the Associate Reformed Church in America. About the year 1795 the "voluntary" controversy respecting the power of the civil magistrate in matters of religion arose within this synod also, and a large majority was found to have adopted " new light " views. This led in 1799 to the seces- sion of the "Associate Presbytery," which in 1805 took the designation of the Associate Synod or Original Burgher Synod. 2 In 1820 the General Associate or Antiburgher Synod (to the number of 129 congregations 3) united with the 154 congregations of the Associate or Burgher Synod. The body thus constituted, " The United Secession Church," had increased by 1847 to 400 congregations.

The Presbytery of Relief was constituted in 1761 by three ministers of the Church of Scotland, one of whom was Thomas Gillespie (q.v.), who had been deposed by the assembly in 1752 for refusing to take part in the church. intrusion of unacceptable ministers. The number of congregations under its charge increased with considerable rapidity, and a Relief Synod was formed in 1773, which in 1847 had under its jurisdiction 136 congregations. The Relief Church issued no distinctive " testimonies," and a certain breadth of view was shown in the formal declaration of their terms of communion, first made in 1773, which allowed occasional communion with those of the Episcopal and Independent persuasion who are " visible saints." A Relief theological hall was instituted in 1824.

In 1847 a union was formed between all the congregations of the United Secession Church and 118 out of 136 of the Relief Churches, in what now became the United United Presbyterian

Church. It was the first Presbyterian Presbyterian body to relax the stringency of subscription, the Church ' Synod passing a declaratory act on the subject in 1879. On such points as that of the six days' creation it was made clear that freedom was allowed; but when Mr David Macrae of Gourock claimed that it should also be allowed on the question of eternal punishment, he was at once declared to be no longer a minister of the church. He left behind him many who sympathized with his position, and in the remaining part of the 19th century the United Presbyterian Church came fully to share the forward movement of thought of the other Scottish churches. Doctrinally there was little difference between the United Presbyterian Church and the Free Church of Scotland, and between 1863 and 1873 negotiations were carried on for a union, which however were fruitless. But in 1896 the United Presbyterian Church again made advances, which were promptly met, and on the 31st of October 1900 the United Free Church of Scotland came into existence.

UNITED PROVINCES OF AGRA AND OUDH (formerly known as the North- Western Provinces and Oudh), a province of British India, lying between 23° 52′ and 31 18′ N., and between 77 3′ and 84 39′ E. The province, including native states, has a total area of 112,243 sq. m. It is bounded N. by Tibet; N.E. by Nepal; E. by Bengal; S. by Chota Nagpur, Rewa, the Bundelkhand states, and the Central Provinces; and on the W. by Gwalior, Rajputana and the Punjab.

2 The majority of this synod joined the Church of Scotland in 1839. The small minority which. still retained the name joined the Original Seceders in 1842, the resultant body assuming the designa- tion of United Original Seceders. A small majority (twenty- seven ministers in all) of the Synod of United Original Seceders joined the Free Church in 1852.

3 A dissentient remnant (eight congregations) of the General Associate Synod united with the Constitutional Associate Presbytery in 1827, the resultant body being called the Associate Synod of Original Seceders.

6io

UNITED PROVINCES OF AGRA AND OUDH

Physical Aspects. — The province occupies, roughly speaking,

the upper basin of the Ganges and the Jumna, corresponding to the Hindostan proper of the Mahommedan chroniclers. A large semi-circular tract, comprising the valleys of the Gogra and the Gumti, has long been separated from the remainder of the great plain as the kingdom of Oudh; and though since 877 it has been under the administrative charge of a lieutenant-governor, it retains certain features of its former status as a chief-commissionership. The province includes the whole upper portion of the wide Gangetic basin, from the Himalayas and the Punjab plain to the Vindhyan plateau, and the low- lying ricefields of Behar. Taken as a whole, the lieutenant-governorship consists of the richest wheat-bearing country in India, irrigated both naturally by the rivers which take their rise in the northern mountains, and artificially by the magnificent system of canals which owe their origin to British enterprise. It is studded with villages, interspersed at greater distances with commercial towns. Except during the hot season, when the crops are off the fields, the general aspect in normal years is that of a verdant and well-tilled but very monotonous plain, only merging into hilly or mountainous country at the extreme edges of the basin on the south and north. The course of the great rivers marks the prevailing slope of the land, which falls away from the Himalayas, the Rajputana uplands, and the Vindhyan plateau south-eastwards towards the Bay of Bengal. The chief natural features of the province are thus determined by the main streams, whose alluvial deposits first formed the central portion of the United Provinces; while the currents afterwards cut deep channels through the detritus they brought down from the ring of hills or uplands.

The extreme or north-western Himalayan region comprises the native state of Garhwal, with the British districts of Dehra Dun, Naini Tal, Almora and Garhwal. The economic value of this mountainous tract is almost confined to the export of forest produce. South of the Himalayas, from which it is separated by valleys or duns, is the Siwalik range, which slopes down to the fruitful plain of the Doab (two rivers), a large irregular horn-shaped tongue of land enclosed between the Ganges and Jumna. The great boundary rivers flow through low-lying valleys fertilized by their overflow or percolation, while a high bank leads up to the central upland, which, though naturally dry and unproductive except where irrigated by wells, has been transformed by various canal systems. This

favoured region may be regarded as the granary of upper India. North of the Ganges, and enclosed between that river and the Himalayas and Oudh, lies the triangular plain of Rohilkhand. This tract presents the same general features as the Gangetic valley, varied by the damp and pestilential submontane region of the tarai on the north-east, at the foot of the Kumaon hills. South of the Jumna is the poor and backward region of Bundelkhand, comprising the districts of Jalaun, Jhansi, Hamirpur and Banda. The soil is generally rocky and unfertile, and the population impoverished, scanty and ignorant. The southernmost portion of Bundelkhand is much cut up by spurs of sandstone and granite hills, running down from the Vindhyan system; but the northern half near the Jumna has a somewhat richer soil, and comes nearer in character to the plain of Doab. Below the junction of the Ganges and the Jumna at Allahabad the country begins to assume the appearance of the Bengal plains, and once more expands northwards to the foot of the Nepal Himalayas. This tract consists of three portions, separated by the Ganges and the Gogra. The division south of the Ganges comprises portions of Allahabad, Benares and Ghazipur, together with the whole of Mirzapur, and in general features somewhat resembles Bundelkhand, but the lowlands along the river bank are more fertile. The triangular tract between the Ganges and the Gogra and the boundary of Oudh is the most fertile corner of the Gangetic plain, and contains the densest population. The trans-Gogra region presents a wilder, submontane appearance.

Oudh forms the central portion of the great Gangetic plain, sloping downwards from the Nepal Himalayas in the north-east to the Ganges on the south-west. For 60 m. along the northern border of Gonda and Bahraich districts the boundary extends close up to the lower slopes of the Himalayas, embracing the damp and unhealthy sub- montane region known as the tarai. To the westward of this the northern boundary recedes a little from the mountain tract, and the tarai in this portion of the range has been for the most part ceded to Nepal. With the exception of a belt of government forest along the northern frontier, the rest of the province consists of a fertile and densely peopled plain. The greatest elevation (600 ft.) is attained in the jungle-clad plateau of Khairagarh in Kheri district, while the extreme south-east frontier is only 230 It. above sea-level. Four great rivers traverse or skirt the plain of Oudh in converging courses —the Ganges, the Gumti, the

Gogra and the Rapti. Numerous

smaller channels seam the whole face of the country carrying off the surplus drainage in the rains, but drying up in the hot season. All the larger rivers, except the Gumti, as well as most of the smaller streams, have beds hardly sunk below the general level ; and in time of floods they burst through their banks and carve out new channels. Numerous shallow ponds or jhils mark the former beds of the shifting rivers. These jhils have great value, not only as preservatives against inundation, but also as reservoirs for irrigation. The soil of Oudh consists of a rich alluvial deposit, the detritus of the Hima- layan system washed down into the Ganges valley. Usually a light loam, it passes here and there into pure clay, or degenerates occa- sionally into barren sand. The uncultivable land consists chiefly of extensive usar plains, found in the southern and western districts, and covered by the deleterious saline efflorescence known as reh. Oudh possesses no valuable minerals. Salt was extensively manu- factured during native rule, but the British government has pro- hibited this industry for fiscal reasons. Nodular limestone (kankar) occurs in considerable deposits, and is used as road metal.

The villages lie thickly scattered, consisting of low thatched cottages, and surrounded by patches of garden land, or groves of banyan, pipal and pakar trees. The dense foliage of the mango marks the site of almost every little homestead, no less an area than 1000 sq. m. being covered by these valuable fruit-trees. Tamarinds overhang the huts of the poorer classes, while the seat of a wealthy family may be recognized by cliapps of bamboo. Plantains, guavas, jack-fruit, limes and oranges add further beauty to the village plots. The flora of the government reserved forests is rich and varied. The sal tree yields the most important timber; the finest logs are cut in the Khairagarh jungles and floated down the Gogra to Bahramghat, where they are sawn. The hard wood of the shisham is also valuable ; and several other timber-trees afford materials for furniture or roofing shingle. Among the scattered jungles in various parts of the province, the mahua tree is prized alike for its edible flowers, its fruits and its timber. The jhils supply the villages with wild rice, the roots and seeds of the lotus, and the singhara water-nut. The fauna comprises most of the animals and birds common to the Gangetic plain ; but the wild elephant is now practically unknown, except when a stray specimen loses its way at the foot of the hills. Tigers are

now only found in any numbers in the wilds of Khairagarh. Leopards still haunt the cane-brakes and thickets along the banks of the rivers ; and nilgai and antelopes abound. Game birds consist of teal and wild duck, snipe, jungle fowl and peacock.

Rivers. — The Ganges and its affluents, the Jumna, the Ramganga and the Gogra, rise in the Himalayas, and meet within the province. In addition there are the following secondary streams: the Kali- nadi and the Hindan flow through the Doab ; the Chambal intersects the trans-Jumna tract; in Bundelkhand the principal streams are the Betwa and the Ken; the Ramgana, rising in Garhwal, pursues a tortuous course through Rohilkhand; the Gumti flows past Luck- now and Jaunpur to join the Ganges; the trans-Gogra region is divided into two nearly equal parts by the Rapti. These rivers are constantly modifying the adjacent lands. A small obstruction may divert the stream from one side to the other. The deep stream corrodes and cuts down the high ground; but meanwhile alluvial flats are gradually piled up in the shallows. The tributary streams get choked at the mouth and assist the process of deposition. The deposit is greatest when the floods of the rainy season are sub- siding.

Climate. — The climate as a whole is hot and dry. The Himalayan districts of course are cool, and have a much greater rainfall than the plains. They are succeeded by a broad submontane belt, the tarai, which is rendered moist by the mountain torrents, and is covered by forest from end to end. This region bears the reputation of being the most unhealthy in all India, and in many parts only the acclimatized aborigines can withstand its deadly malaria. The plain country is generally warm and dry, the heat becoming more oppressive as the general level of the country sinks towards Allahabad and Benares, or among the hills of Bundelkhand. There are three seasons. The cold changes gradually to the hot ; the hot season gives way abruptly to the rains ; and the rains again change gradually into the cold season. In point of humidity and temperature the province lies half-way between Bengal and the Punjab. The rainfall varies from 30 to 44 in. in the plains, increasing gradually towards the Himalaya. The temperature in the hot season ranges from 86° to 115° F., and even higher, in the shade.

Minerals. — Owing to the loamy nature of the soil, few

minerals of any kind are found. Iron and coal exist in the southern hills. A little coal was extracted from Mirzapur in 1896, but the enterprise was dropped. Iron, copper, sapphires, &c, are said to be obtain- able in the Himalaya. It has been suggested that the oily water known as telya pani indicates the presence of petroleum.

Agriculture. — Out of a total area of 104,075 sq. m. in the British districts of the province, over 54,000 sq. m. are under cultivation. The course of tillage comprises two principal harvests: the kharif, or autumn crops, sown in June and reaped in October or November; and the rabi, or spring crops, sown in October or November, and reaped in March or April. The great agricultural staple is wheat, but millets and rice are also largely cultivated. Speaking broadly, rice and oilseeds predominate in the eastern and sub- Himalayan

districts, millets and cotton in Bundelkhand and wheat in the greater part of the Gangetic plain. The pulses mung, urd and moth are grown generally in the autumn alone, or in combination with millets; and gram, alone or in combination with wheat and barley, is an important spring crop. Sugar-cane, indigo, poppy and tobacco are locally important; and a little tea is grown in the submontane districts of Almora Garhwal and Dehra Dun.

Land Tenure. — Owing to historical reasons, the system of land tenure is not uniform. In the Benares division, which was the first portion to come under British administration, the land revenue was permanently fixed in 1795, on the same principles that had been previously adopted in Bengal; and there a special class of tenants, as well as the landlords, enjoy a privileged status. Throughout the rest of the province of Agra, almost all of which was acquired between 1 801 and 1803, temporary settlements are in force, usually for a term of thirty years, the revenue being assessed at one-half of the ” assets “or estimated rental value. The settlement is made with the landholders or zamindars, who are frequently a group of persons holding distinct shares in the land, and may be themselves petty cultivators. No proprietary rights superior to those of the actual landowners are recognized. The only

privileged class of tenants are those possessing " occupancy " rights, as defined by statute. These rights, which are heritable but not transferable, protect the tenant against eviction, except for default in payment of rent, while the rent may not be enhanced except by mutual agreement or by order of a revenue court. " Occupancy " rights are acquired by continuous cultivation for ten years, but the cultiva- tion need not be of the same holding. All other tenants are merely tenants-at-will. In Oudh, after the convulsion of the Mutiny, all rights in land were confiscated at a stroke, and the new system adop- ted was in the nature of a treaty between the state and the talukdars, or great landlords. These talukdars had not all the same origin. Many were Rajput chiefs, ruling over their tribesmen by ancient hereditary right ; while others were officials or court favourites, who had acquired power and property during the long period of native misrule. On all the same status was now conferred — a status that has no analogy in the rest of India. By sanad (or patent) and by legislation the talukdars were declared to possess permanent, heritable and transferable rights, with the special privilege of alienation, either in lifetime or by will, notwithstanding the limits imposed by Hindu or Mahommedan law. In addition m)st of them follow the rule of primogeniture, while a power of entail has recently been granted. The estates of talukdars extend over more than half the total area of Oudh. No " occupancy " rights based on con- tinuous cultivation are recognized in Oudh, but similar rights, here known as " sub-proprietary," were granted to all those who had possessed them within thirty years before annexation. On the other hand, there are no tenants-at-right in Oudh. Any person admitted to the cultivation of land is entitled to hold it for seven years at the same rent, which may not be advanced by more than 6i% at the end of the term.

Manufactures. — The principal manufactures are those of sugar, indigo and coarse cotton cloth. Ornamental metal-work is made at Benares. Among the factories on the English model are the Elgin and Muir cotton mills at Cawnpore, the Cawnpore tanneries and leather factories, the Shahjahanpur rum distillery, and breweries at Mussoorie and Naini Tal. There are also woollen and jute mills, iron and brass foundries, lac factories and oil-mills. The manu- facture of synthetic indigo by German chemists has greatly affected the growth and manufacture of indigo, the indigo factories decreasing in 1904-1905 from 402 to 252.

Trade. — The export trade is chiefly confined to agricultural produce. The principal staples include wheat, oilseeds, raw cotton, indigo, sugar, molasses, timber and forest produce, dry-stuffs, ghee, opium and tobacco. The imports consist mainly of English piece- goods, metal-work, manufactured wares, salt and European goods. The chief centres of trade are Cawnpore, Allahabad, Mirzapur, Benares, Meerut and Moradabad.

Irrigation. — The Doab is intersected by canals drawn from the great rivers. The major productive works are the upper and lower Ganges, the eastern Jumna, and the Agra canals. The greatest work in the province, and one of the greatest irrigation works in the world, is the upper Ganges canal, which is taken from the river where it leaves the hills, some 2 m. above Hardwar. In the first 20 m. of its course this gigantic canal crosses four great torrents, which bring down immense volumes of water in the rainy season. The first two are carried in massive aqueducts over the canal, the third is passed through the canal by a level-crossing, regulated by drop-gates, and the canal is taken over the fourth by an aqueduct. The total length of .the main canal is 213 m., navigable through- out, and designed to irrigate 1,500,000 acres. The lower Ganges canal is taken from the river at Narora, 149 m. below Hardwar. After crossing in 55 m. four great drainage lines, it cuts into the Cawnpore, and 7 m. lower down into the Etawah, branches of the upper Ganges canal. These branches are now below the point of intersection, part of the lower Ganges canal system. The irrigating capacity of this canal is 1,250,000 acres.

Railways. — The province is well supplied with railways. The main line of the East Indian runs throughout south of the Ganges, which is bridged at Benares and Cawnpore. North of the river

the Oudh & Rohilkhand system connects with Bengal and with the Punjab. From Allahabad, Cawnpore and Agra trade finds an outlet to the sea at Bombay as well as at Calcutta.

Administration. — The administration is conducted by a lieu-tenant-governor, with five secretaries and five under-secretaries. There is no executive council; but the board of revenue, consist- ing of two members, exercises important executive duties, and is also the highest court of appeal in revenue and rent cases. For legislative purposes the lieutenant-

governor has a council, first constituted in 1886, and enlarged in 1909. It now con- sists of 48 members, of whom 28 are nominated, and the re- mainder are elected by local bodies, landholders, Mahommedans, &c. In Agra the chartered high court sitting at Allahabad, and in Oudh the court of the judicial commissioner, sitting at Lucknow, have final jurisdiction in both civil and criminal cases, subject to appeal to the privy council. The former is composed of a chief justice and six puisne judges appointed by the Crown; the latter of a judicial commissioner and two additional judicial commissioners. For ordinary purposes of administration the provinces are divided into nine divisions, each under a commissioner, and into 48 districts, each under a collector or deputy commissioner. Two native states are attached to the United Provinces — Rampur and Garhwal.

Population. — Out of a total population in 1901 of 47,691,782 no fewer than 40,691,818, or over 85% were Hindus, and 6,731,034 or 14% Mahommedans. The total number of persons belonging to all the other religions— Sikhs, Jains, Buddhists, Parsees, Christians, Jews, Aryas and Brahmos — was only 268,930, or less than o-6%. While nearly fifty lan- guages in all are spoken in the provinces, out of every 10,000 people 4527 speak Western Hindi, 3125 Eastern Hindi, 2109 Bihari and 211 Central Pahari.

History. — If the present limits be slightly extended in either direction so as to include Delhi and Patna, the United Provinces would contain the area on which almost the whole drama of Indian history has been played. Here lay the scene, known as Madhya Desa or " middle country," of the second period of Aryan colonization, when the two great epics, the Maha- bhdrata and Ramayana, were probably composed, and when the religion of Brahmanism took form. Here Buddha was born, preached and died. Here arose .the successive dynasties of •Asoka, of the Guptas, and of Harshavardhana, which for a thousand years exercised imperial sway over the greater part of India. Here is Ajodhya, the home of Rama, the most popular of Hindu demigods; and also Benares and Muttra, the most sacred of Hindu shrines. Here too were the Mahommedan capitals — Delhi, Agra, Allahabad, Jaunpur and Lucknow. Here finally, at the crisis of the Mutiny, British dominion was permanently established in India.

The political vicissitudes through which this tract of country

passed in earlier times are described under India: History. It will be sufficient here to trace the steps by which it passed under British rule. In 1765, after the battle of Buxar, when the nawab of Oudh had been decisively defeated and Shah Alam, the Mogul emperor, was a suppliant in the British camp, Lord Clive was content to claim no acquisition of territory. The whole of Oudh was restored to the Nawab, and Shah Alam received as an imperial apanage the province of Allahabad and Kora in the lower Doab, with a British garrison in the fort of Allahabad. Warren Hastings augmented the territory of Oudh by lending the nawab a British army to conquer Rohilkhand, and by making over to him Allahabad and Kora on the ground that Shah Alam had placed himself in the power of the Mahrattas. At the same time he received from Oudh the sovereignty over the province of Benares. Subsequently no great change took place until the arrival of Lord Wellesley, who acquired a very large accession of territory in two instalments. In 1 801 he obtained from the nawab of Oudh the cession of Rohilkhand, the lower Doab, and the Gorakhpur division, thus enclosing Oudh on all sides except the north. In 1804, as the result of Lord Lake's victories in the Mahratta War, the rest of the Doab and part of Bundelkhand, together with

Agra and the guardianship of the old and blind emperor, Shah Alam, at Delhi, were obtained from Sindia. In 1815 the Kumaon division was acquired after the Gurkha War, and a further portion of Bundelkhand from the peshwa in 1817. These new acquisitions, known as the ceded and conquered provinces, continued to be administered by the governor-general as part of Bengal. In 1833 an act of parliament was passed to constitute a new presidency, with its capital at Agra. But this scheme was never fully carried out, and in 1835 another statute authorized the appointment of a lieutenant-governor for the North-Western Provinces, as they were then styled. They included the Delhi territory, transferred after the Mutiny to the Punjab; and also (after 1853) the Saugor and Nerbudda territories, which in 1861 became part of the Central Provinces. Meanwhile Oudh remained under its nawab, who was permitted to assume the title of king in 1819. All protests against gross misgovernment during many years

having proved useless, Oudh was annexed in 1856 and constituted a separate chief commissionership. Then followed the Mutiny, when all signs of British rule were for a time swept away throughout the greater part of the two provinces. The lieutenant- governor died when shut up in the fort at Agra, and Oudh was only reconquered after several campaigns lasting for eighteen months.

In 1877 the offices of lieutenant-governor of the North-Western Provinces and chief commissioner of Oudh were combined in the same person; and in 1902, when the new name of United Provinces was introduced, the title of chief com- missioner was dropped, though Oudh still retains some marks of its former independence.

See Gazetteer of the United Provinces (2 vols., Calcutta, 1908) ; and Theodore Morison, The Industrial Organization of an Indian Province (1906).

UNITED STATES, THE, the short title usually given to the great federal republic which had its origin in the revolt of the British colonies in North America, when, in the Declaration of Independence, they described themselves as " The Thirteen United States of America." Officially the name is " The United States of America," but " The United States " (used as a singular and not a plural) has become accepted as the name of the country; and pre-eminent usage has now made its citizens " Americans," • in distinction from the other inhabitants of North and South America.

The area of the United States, as here considered, exclusive of Alaska and outlying possessions, occupies a belt nearly twenty degrees of middle latitude in width, and crosses North America from the Atlantic to the Pacific.

Boundaries aad Area.

The southern boundary is naturally defined on the east by the Gulf of Mexico; its western extension crosses obliquely over the western highlands, along an irregular line determined by aggressive Americans of Anglo-Saxon stock against Americans of Spanish stock. The northern boundary, after an arbitrary beginning, finds a natural extension along the Great Lakes, and thence continues along the 49th parallel of north latitude to the Pacific (see Bulletin 171, U.S. Geological Survey). The

area thus included is 3,026,789 sq. m. 1

I. — Physical Geography

Coast. — The Atlantic coast of the United States is, with minor exceptions, low; the Pacific coast is, with as few exceptions,

1 The following are the states of the Union (recognized abbrevia- tions being given in brackets): Alabama (Ala.), Arizona (Ariz.), Arkansas (Ark.), California (Cal.), Colorado (Col.), Connecticut (Conn.), Delaware (Del.), Florida (Fla.), Georgia (Ga.), Idaho, Illinois (111.), Indiana (Ind.), Iowa (la.), Kansas (Kan.), Kentucky (Ky.), Louisiana (La.), Maine (Me.), Maryland (Md.), Massachusetts (Mass.), Michigan (Mich.), Minnesota (Minn.), Mississippi (Miss.), Missouri (Mo.), Montana (Mont.), Nebraska (Neb.), Nevada (Nev.), New Hampshire (N.H.), New Jersey (N.J.), New Mexico (N. Mex.), New York (N.Y.), North Carolina (N.C.), North Dakota (N. Dak.), Ohio(0.), Oklahoma (Okla.), Oregon (Oreg.), Pennsylvania (Pa.), Rhode Island (R.I.), South Carolina (S.C.), South Dakota (S. Dak.), Tennessee (Tenn.), Texas (Tex.), Utah, Vermont (Vt.), Virginia (Va.), West Virginia (W. Va.), Washington (Wash.), Wisconsin (Wis.), Wyoming (Wyo.) ; together with the District of Columbia (D.C.).

hilly or mountainous. The Atlantic coast owes its oblique N.E.S.W. trend to crustal deformations which in very early geological time gave a beginning to what later came to be the Appalachian mountain system; but this system had its climax of deformation so long ago (probably in Permian time) that it has since then been very generally reduced to moderate or low relief, and owes its present altitude either to renewed elevations along the earlier lines or to the survival of the most resistant rocks as residual mountains. The oblique trend of the coast would be even more pronounced but for a comparatively modern crustal movement, causing a depression in the north east, with a resulting encroachment of the sea upon the land, and an elevation in the south-west, with a resulting advance of the land upon the sea. The Pacific coast has been defined chiefly by relatively recent crustal deformations, and hence still preserves a greater relief than that of the Atlantic. The minor features of each coast will be mentioned in connexion with the land districts of which the coast-line is only the border.

General Topography and Drainage. — The low Atlantic coast and the hilly or mountainous Pacific coast foreshadow the leading features in the distribution of mountains within the United States. The Appalachian system, originally forest - covered, on the eastern side of the continent, is relatively low and narrow; it is bordered on the south-east and south by an important coastal plain. The Cordilleran system on the western side of the continent is lofty, broad and complicated, with heavy forests near the north-west coast, but elsewhere with trees only on the higher ranges below the Alpine region, and with treeless or desert intermont valleys, plateaus and basins, very arid in the south-west. Between the two mountain systems extends a great central area of plains, stretching from the Gulf of Mexico northward, far beyond the national boundary, to the Arctic Ocean. The rivers that drain the Atlantic slope of the Appalachians are comparatively short; those that drain the Pacific slope include only two, the Columbia and the Colorado, which rise far inland, near the easternmost members of the Cordilleran system, and flow through plateaus and intermont basins to the ocean . The central plains are divided by a hardly perceptible height of land into a Canadian and a United States portion; from the latter the great Mississippi system discharges southward to the Gulf of Mexico. The upper Mississippi and some of the Ohio basin is the prairie region, with trees originally only along the watercourses; the uplands towards the Appalachians were included in the great eastern forested area ; the western part of the plains has so dry a climate that its herbage is scanty, and in the south it is barren. The lacustrine system of the St Lawrence flows eastward from a relatively narrow drainage area.

Relation of General Topography to Settlement. — The aboriginal occupants of the greater part of North America were compara- tively few in number, and except in Mexico were not advanced beyond the savage state, The geological processes that placed a much narrower ocean between North America and western Europe than between North America and eastern Asia secured to the New World the good fortune of being colonized by the leading peoples of the occidental Old World, instead of by the less developed races of the Orient. The transoceanic invasion progressed slowly through the 17th and 18th centuries, delayed by the head winds of a rough ocean which was crossed only in slow sailing vessels, and by the rough " backwoods " of the Appalachians, which retarded the

penetration of wagon roads and canals into the interior. The invasion was wonderfully accelerated through the 19th century, when the vast area of the treeless prairies beyond the Appalachians was offered to the settler, and when steam transportation on sea and land replaced sailing vessels and wagons. The frontier was then swiftly carried across the eastern half of the central plains, but found a second delay in its advance occasioned by the dry climate of the western plains. It was chiefly the mineral wealth of the Cordilleran region, first developed on the far Pacific slope, and later in many parts of the inner mountain ranges, that urged pioneers across the

dry plains into the apparently inhospitable mountain region; there the adventurous new-comers rapidly worked out one mining district after another, exhausting and abandoning the smaller " camps " to early decay and rushing in feverish excite- ment to new-found river fields, but establishing important centres of varied industries in the more important mining dis- tricts. It was not until the settlers learned to adapt themselves to the methods of wide-range cattle raising and of farming by irrigation that the greater value of the far western interior was recognized as a permanent home for an agricultural population.

The purchase of " Louisiana " — a great area west of the Missis- sippi river — from the French in 1803 has sometimes been said to be the cause of the westward expansion of the United States, but the Louisiana purchase has been better interpreted as the occasion for the expansion rather than its cause; for, as Lewis Evans of Philadelphia long ago recognized (1749), whoever gained pos- session of the Ohio Valley — the chief eastern part of the central plains — would inevitably become the masters of the continent.

Physiographic Subdivisions. — The area of the United States may be roughly divided into the Appalachian belt, the Cordilleras and the central plains, as already indicated. These large divi- sions need physiographic subdivision, which will

now be made, following the guide of " structure, process and stage "; that is, each subdivision or province will be defined as part of the earth's crust in which some similarity of geological structure prevails, and upon which some process or processes of surface sculpture have worked long enough to reach a certain stage in the cycle of physiographic development.

The Appalachians. — The physiographic description of the Appala- chian mountain system offers an especially good opportunity for the application of the genetic method based on " structure, process and stage." This mountain system consists essentially of two belts: one on the south-east, chiefly of ancient and greatly deformed crystalline rocks, the other on the north-west, a heavy series of folded Palaeozoic strata; and with these it will be convenient to associate a third belt, farther north-west, consisting of the same Palaeozoic strata lying essentially horizontal and constituting the Appalachian plateau. The crystalline belt represents, at least in part, the ancient highlands from whose ruins the sandstones, shales and limestones of the strati- fied series were formed, partly as jnarine, partly as fluviatile deposits. The deformation of the Appalachians was accomplished in two chief periods of compressive deformation, one in early Palaeozoic, the other about the close of Palaeozoic time, and both undoubtedly of long duration ; the second one extended its effects farther north- west than the first. These were followed by a period of minor tilting and faulting in early Mesozoic, by a moderate upwarping in Tertiary, and by a moderate uplift in post-Tertiary time. The later small movements are of importance because they are related to the existing topography with which we are here concerned. Each of the disturbances altered the attitude of the mass with respect to the general base-level of the ocean surface; each movement there- fore introduced a new cycle of erosion, which was interrupted by a later movement and the beginning of a later cycle.

Thus interpreted, the Appalachian forms of to-day may be ascribed to three cycles of erosion : a nearly complete Mesozoic cycle, in which most of the previously folded and faulted mountain masses were reduced in Cretaceous time to a peneplain or lowland of small relief, surmounted, however, in the north-east and in the south-west by monadnocks of the most resistant rocks, standing singly or in groups; an incomplete Tertiary cycle, initiated by the moderate Tertiary upwarping of the Mesozoic peneplain, and of sufficient length

to develop mature valleys in the more resistant rocks of the crystalline belt or in the horizontal strata of the plateau, and to develop late mature or old valleys in the weaker rocks of the stratified belt, where the harder strata were left standing up in ridges; and a brief post-Tertiary cycle, initiated by an uplift of moderate amount and in progress long enough only to erode narrow and relatively imma- ture valleys. Glacial action complicated the work of the latest cycle in the northern part of the system. In view of all this it is possible to refer nearly every element of Appalachian form to its appropriate cycle and stage of development. The more resistant rocks, even though dissected by Tertiary erosion, retain in their summit uplands an indication of the widespread peneplain of Cretaceous time, now standing at the altitude given to it by the Tertiary upwarping and post-Tertiary uplift; and the most resistant rocks surmount the Cretaceous peneplain as unconsumed monadnocks of the Mesozoic cycle. On the other hand, the weaker rocks are more or less com- pletely reduced to lowlands by Tertiary erosion, and are now trenched by the narrow and shallow valleys of the short post-Tertiary cycle. Evidently, therefore, the Appalachians as we now see them are not the still surviving remnants of the mountains of late Palaeozoic deformation; they owe their present height chiefly to the Tertiary upwarping and uplifting, and their form to the normal processes of

sculpture which, having become nearly quiescent at the close of the Mesozoic cycle, became active again in Tertiary and later times.

The belts of structure and the cycles of erosion thus briefly . described are recognizable with more or less continuity from the Gulf of St Lawrence 1500 m. south-westward to Alabama, where the deformed mountain structures pass out of sight under nearly hori- zontal strata of the Gulf coastal plain. But the dimensions of the several belts and the strength of the relief developed by their later erosion varies greatly along the system. In a north-eastern section, practically all of New England is occupied by the older crystalline belt; the corresponding northern part of the stratified belt in the St Lawrence and Champlain-Hudson valleys on the inland side of New England is comparatively free from the ridge-making rocks which abound farther south; and here the plateau member is wanting, being replaced, as it were, by the Adirondacks, an outlier of the Laurentian highlands of Canada

which immediately succeeds the deformed stratified belt west of Lake Champlain. In a middle section of the system, from the Hudson river in southern New York to the James river in southern Virginia, the crystalline belt is narrowed, as if by the depression of its south-eastern part beneath the Atlantic Ocean or beneath the strata of the Atlantic coastal plain which now represents the ocean; but the stratified belt is here broadly developed in a remarkable series of ridges and valleys determined by the action of erosion on the many alternations of strong and weak folded strata ; and the plateau assumes full strength southward from the monoclinal Mohawk valley which separates it from the Adirondacks. The linear ridges of this middle section are often called the Alleghany Mountains. In a south-western section the crystalline belt again assumes importance in breadth and height, and the plateau member maintains the strength that it had in the middle section, but the intermediate stratified belt again has fewer ridges, because of the infrequence here of ridge-making strata as compared to their frequency in the middle section.

The middle section of the Appalachians, rather arbitrarily limited by the Hudson and the James rivers, may be described first because it contains the best representation of the three longitu- dinal belts of which the mountain system as a whole is ^ ™”” e composed. The mountain-making compression of the Appala- heavy series of Palaeozoic strata has here produced a ™«’*» marvellous series of rock folds with gently undulating axes, trending north-east and south-west through a belt 70 or 80 m. wide ; no less wonderful is the form that has been produced by the processes of sculpture. The peculiar configuration of the- ridges may be appre- hended as follows : The pattern of the folded itrata on the low-lying Cretaceous peneplain must have resembled the pattern of the curved grain of wood on a planed board. When the peneplain was uplifted the weaker strata were worn down almost to a lowland of a second generation, while the resistant sandstones, of which there am three chief members, retained a great part of their new-gained altitude in the form of long, narrow, even-crested ridges, well deserving of the name of Endless Mountains given them by the Indians, but here and there bending sharply in peculiar zigzags which give this Alleghany section of the mountains an unusual individuality. The post- Tertiary uplift, giving the present altitude of 1000 or 1500 ft. in Pennsylvania, and of 2500 or 3500 ft. in Virginia, has not signifi- cantly*

altered the forms thus produced ; it has only incited the rivers to intrench themselves 100 or more feet beneath the lowlands of Tertiary erosion. The watercourses to-day are, as a rule, longi- tudinal, following the strike of the weaker strata in paths that they appear to have gained by spontaneous adjustment during the long Mesozoic cycle ; but now and again they cross from one longitudinal valley to another by a transverse course, and there they have cut down sharp notches or " water-gaps " in the hard strata that else- where stand up in the long even-crested ridges.

The transition from the strongly folded structure of the Alleghany ridges and valleys to the nearly horizontal structure of the Appala- chian plateau is promptly made; and with the change of structure comes an appropriate change of form. The horizontal strata of the plateau present equal ease or difficulty of erosion in any direc- tion ; the streams and the submature valleys of the plateau therefore ramify in every direction, thus presenting a pattern that has been called insequent, because it follows no apparent control. Further mention of the plateau is made in a later section.

The crystalline belt of the middle Appalachians, 60 or 80 m. wide, is to-day of moderate height because the Tertiary upwarping was there of moderate amount. The height is greatest along the inner or north-western border of the belt, and here a sub-mountainous topography has been produced by normal dissection, chiefly in the Tertiary cycle; the valleys being narrow because the rocks are resistant. The relief is strong enough to make occupation difficult – , the slopes are forested ; the uplands are cleared and well occupied by farms and villages, but many of the valleys are wooded glens. With continued decrease of altitude south-eastward, the crystalline belt dips under the coastal plain, near a line marked by the Delaware river from Trenton to Philadelphia in Pennsylvania, and thence south-south-westward through Maryland and Virginia past the cities of Baltimore, Washington and Richmond.

The Pennsylvania portion of the crystalline belt is narrow, as has been said, because of encroachment upon it by the inward overlap of the coastal plain ; it is low because of small Tertiary uplift ; but.

still more, it is discontinuous, because of the inclusion of certain belts of weak non-crystalline rock; here the rolling uplands are worn down to lowland belts, the longest of which reaches from the southern corner of New York, across New Jersey, Pennsylvania and Maryland, into central Virginia.

The middle section of the Appalachians is further distinguished from the north-eastern and south-western sections by the arrange- Dralaage. ment of its drainage : its chief rivers rise in the plateau belt and flow across the ridges and valleys of the stratified belt and through the uplands of the crystalline belt to the sea. The rivers which most perfectly exemplify this habit are the Delaware, Susquehanna and Potomac; the Hudson, the north-eastern bound- ary of the middle section, is peculiar in having headwaters in the Adirondacks as well as in the Catskills (northern part of the plateau) ; the James, forming the south-western boundary of the section, rises in the inner valleys of the stratified belt, instead of in the plateau. The generally transverse course of these rivers has given rise to the suggestion that they are of antecedent origin ; but there are many objections to this over-simple, Gordian explanation. The south-east course of the middle-section rivers is the result of many changes from the initial drainage; the Mesozoic and Tertiary up- warpings were probably very influential in determining the present general courses.

For the most part the rivers follow open valleys along belts of weak strata; but they frequently pass through sharp-cut notches in the narrow ridges of the stratified belt — the Delaware water-gap is one of the deepest of these notches; and in the harder rocks of the crystalline belt they have eroded steep-walled gorges, of which the finest is that of the Hudson, because of the greater height and breadth of the crystalline highlands there than at points where the other rivers cross it. The rivers are shallow and more or less broken by rapids in the notches; rapids occur also near the outer border of the crystalline belt, as if the rivers there had been lately incited to downward erosion by an uplift of the region, and had not yet had time to regrade their courses. This is well shown in the falls of the Potomac a few miles above Washington; in the rapids of the lower Susquehanna; and in the falls of the

Schuylkill, a branch which joins the Delaware at Philadelphia, where the water-power has long been used in extensive factories. Hence rivers in the Appalachians are not navigable; it is only farther down-stream, where the rivers have been converted into estuaries and bays — such as Chesapeake and Delaware bays — by a slight depression of the coastal plain belt, that they serve the purposes of navigation. But the Hudson is strikingly exceptional in this respect; it possesses a deep and navigable tide-water channel all through its gorge in the highlands, a feature which has usually been explained as the result of depression of the land, but may also be explained by glacial erosion without change of land-level ; a feature which, in connexion with the Mohawk Valley, has been absolutely determinative of the metropolitan rank reached by New York City at the Hudson mouth.

The community of characteristics that is suggested by the associa- tion of six north-eastern states under the name " New England " The North- ' s ' n ' ar S e measure warranted by the inclusion of eastern Ad- a " tnese states within the broadened crystalline belt palacblans. °^ tne north-eastern Appalachians, which is here 150 m. wide. The uplands which prevail through the centre of this area at altitudes of about 1000 ft. rise to 1500 or 2000 ft. in the north-west, before descent is made to the lowlands of the stratified belt (St Lawrence-Champlain-Hudson valleys, described later on as part of the Great Appalachian valley), and at the same time the rising uplands are diversified with monadnocks of increasing number and height and by mature valleys cut to greater and greater depths; thus the interior of New England is moderately mountainous. When the central uplands are followed south-east or south to the coast, their altitude and their relief over the valleys gradually decrease; and thus the surface gradually

C asses under the sea. The lower coastal parts, from their accessi- ility and their smaller relief, are more densely populated; the higher and more rugged interior is still largely forested and thinly settled ; there are large tracts of unbroken forest in northern Maine, hardly 150 m. from the coast. In spite of these contrasts, no physio- graphic line can be drawn between the higher and more rugged interior and the lower coastal border; one merges into the other. New England is a unit, though a diversified unit.

The Appalachian trends (N.E.S.W.) that are so prominent in

the stratified belt of the middle Appalachians, and are fairly well marked in the crystalline belt of New Jersey and Pennsylvania, are prevailingly absent in New England. They may be seen on the western border, in the Hoosac range along the boundary of Massa chusetts and New York; in the linear series of the Green Mountain summits (Mt Mansfield. 4364 ft., Killington Peak, 4241 ft.) and their (west) piedmont ridges farther north in Vermont; and in the ridges of northern Maine: these are all in sympathy with Appalachian structure; so also are certain open valley3, as the Berkshire (lime- stone) Valley in western Massachusetts and the corresponding Rutland (limestone and marble) Valley in western Vermont; and more particularly the long Connecticut Valley from northern New Hampshire across Massachusetts to the sea at the southern border of Connecticut, the populous southern third of which is broadly eroded along a belt of red Triassic sandstones with trap ridges.

But in general the dissection of the New England upland is as irregu- lar as is the distribution of the surmounting monadnocks. The type of this class of forms is Mt Monadnock in south-western New Hampshire, a fine example of an isolated residual mass rising from an upland some 1500 ft. in altitude and reaching a summit height of 3186 ft. A still larger example is seen in Mt Katahdin (5200 ft.) in north-central Maine, the greatest of several similar isolated moun- tains that are scattered over the interior uplands without apparent system. The White Mountains of northern New Hampshire may be treated as a complex group of monadnocks, all of subdued forms, except for a few cliffs at the head of cirque-like valleys, with Mt Washington, the highest of the dome-like or low pyramidal summits, reaching 6293 ft., and thirteen other summits over 5000 ft. The absence of range-like continuity is here emphasized by the occur- rence of several low passes or " notches " leading directly through the group; the best-known being Crawford's Notch (1900 ft.).

In consequence of the general south-eastward slope of the high- lands and uplands of New England, the divide between the Atlantic rivers and those which flow northward and westward _ . into the lowland of the stratified belt in Canada and "&•*

New York is generally close to the boundary of these two physio- graphic districts. The chief rivers all flow south or south-east: they are the Connecticut, Merrimack, Kennebec,

Penobscot and St John, the last being shared with the province of New Brunswick. The drainage of New England is unlike that of the middle and south-western Appalachians in the occurrence of numerous lakes and falls. These irregular features are wanting south of the limits of Pleistocene glaciation; there the rivers have had time, in the latest cycle of erosion into which they have entered, to establish themselves in a continuous flow, and as a rule to wear down their courses to a smoothly graded slope. In New England also a well-established drainage undoubtedly prevailed in preglacial times; but partly in consequence of the irregular scouring of the rock floor, and even more because of the very irregular deposition of unstratified and stratified drift in the valleys, the drainage is now in great dis- order. Many lakes of moderate size and irregular outline have been formed where drift deposits formed barriers across former river courses; the lake outlets are more or less displaced from former river paths. Smaller lakes were formed by the deposition of washed drift around the longest-lasting ice remnants; when the ice finally melted away, the hollows that it left came to be occupied by ponds and lakes. In Maine lakes of both classes are numerous; the largest is Moosehead Lake, about 35 m. long and of a very irregular shore line.

The features of a coast can be appreciated only when it is perceived that they result from the descent of the land surface beneath the sea and from the work of the sea, upon the shore line _

thus determined ; and it is for this reason that through- Coast,

out this article the coastal features are described in connexion with the districts of which they are the border. The maturely dissected and recently glaciated uplands of New England are now somewhat depressed with respect to sea-level, so that the sea enters the valleys, forming bays and estuaries, while the interfluve uplands and hills stand forth in headlands and islands. Narragansett Bay, with the associated headlands and islands on the south coast, is one of the best examples. Where drift deposits border the sea, the shore line has been cut back or built forward in beaches of submature expres- sion, often enclosing extensive tidal marshes; but the great part of the shore line is rocky, and there the change from initial pattern due to submergence is as yet small. Hence the coast as a whole is irregular, with numerous embayments, peninsulas and

islands; and in Maine this irregularity reaches a disadvantageous climax. As in the north-east, so in the south-west, the crystalline belt widens and gains in height; but while New England is an indivisible unit, the southern crystalline belt must be subdivided _. South- into a higher mountain belt on the north-west, 60 m. wes tern Ao- wide where broadest, and a lower piedmont belt on the pslachians. south-east, 100 m. wide, from southern Virginia to South Carolina. This subdivision is already necessary in Maryland, where the mountain belt is represented by the Blue Ridge, which is rather a narrow upland belt than a ridge proper where the Potomac cuts across it; while the piedmont belt, relieved by occasional monadnocks. stretches from the eastern base of the Blue Ridge to the coastal plain, into which it merges. Farther south, the mountain belt widens and attains its greatest development, a true highland district, in North Carolina, where it includes several strong mountain groups. HereMt Mitchell rises to 671 1 ft., the highest of the Appalachians, and about thirty other summits exceed 6000 ft., while the valleys are usually at altitudes of about 2000 ft. Although the relief is strong, the mountain forms are rounded rather than rugged ; few of the summits deserve or receive the name of peaks; some are called domes, from their broadly rounded tops, others are known as balds, because the widespread forest cover is replaced over their heads by a grassy cap.

The height and massiveness of the mountains decrease to the south-west, where the piedmont belt sweeps westward around them in western Georgia and eastern Alabama, Some of the residual mountains hereabouts are reduced to a mere skeleton or framework by the retrogressive penetration of widening valleys between wasting spurs; the very type of vanishing forms. Certain districts within

the mountains, apparently consisting of less resistant crystalline rocks, have been reduced to basin-like peneplains in the same time that served only to grade the slopes and subdue the summits of the neighbouring mountains of more resistant rocks; the best example of this kind is the Asheville peneplain

in North Carolina, measuring about 40 by 20 m. across; but in consequence of later elevation, its general surface, now standing at an altitude of 2500 ft., is maturely dissected by the French Broad river and its many branches in valleys 300 ft. deep; the basin floor is no longer a plain, but a hilly district in the midst of the mountains; Asheville on its southern border is a noted health resort.

The rivers of the mountain belt, normally dividing and subdividing in apparently insequent fashion between the hills and spurs, generally follow open valleys; there are few waterfalls, the streams being as a rule fairly well graded, though their current is rapid and their channels are set with coarse waste. The valley floors always join at accordant levels, as is the habit among normally subdued moun- tains; they thus contrast with glaciated mountains such as the Alps and the Canadian Rockies, where the laterals habitually open as " hanging valleys " in the side slope of the main valleys. It is a peculiar feature of the drainage in North Carolina that the head- waters lie to the east of the highest mountains, and that the chief rivers flow north-westward through the mountains to the broad valley lowland of the stratified belt and then through the plateau, as the members of the Mississippi system. It is probable that these rivers follow in a general way courses of much more ancient origin than those of the Atlantic rivers in the middle Appalachians.

The piedmont belt may be described as a maturely dissected peneplain over much of its extent; it is indeed one of the best examples of that class of forms. Its uplands are of fairly accordant altitude, which gradually decreases from 500 to 1000 ft. near the mountain belt to half that height along the coastal plain border. The uplands are here and there surmounted by residual monad- nocks in the form of low domes and knobs; these increase in height and number towards the mountain belt, and decrease towards the coastal plain: Stone Mountain, near Atlanta, Georgia, a dome of granite surmounting the schists of the uplands, is a striking example of this class of forms. The chief rivers flow south-eastward in rather irregular courses through valleys from 200 to 500 ft. deep; the small branches ramify indefinitely in typical insequent arrange- ment ; the streams are nearly everywhere well graded ; rapids are rare and lakes are unknown.

The boundary between the mountains and the piedmont belt is

called the Blue Ridge all along its length; and although the name is fairly appropriate in northern Virginia, it is not deserved in the Carolinas, where the " ridge " is only an escarpment descending abruptly 1000 or 1500 ft» from the valleys of the mountain belt to the rolling uplands of the piedmont belt ; and as such it is a form of unusual occurrence. It is not defined by rock structure, but appears to result from the retrogressive erosion of the shorter Atlantic rivers, whereby the highlands, drained by much longer rivers, are undercut. The piedmont belt merges south-eastward into the coastal plain, the altitudes of the piedmont uplands and of the coastal plain hills being about the same along their line of junction. Many of the rivers, elsewhere well graded, have rapids as they pass from the harder rocks of the piedmont to the semi-consolidated strata of the coastal plain.

There is one feature of the Appalachians that has greater continuity than any other; this is the Great Valley. It is determined The Great structurally by a belt of topographically weak limestones Valley arK ˆ sna ‘ es (or slates) next inland from the crystalline

uplands; hence, whatever the direction of the rivers which drain the belt, it has been worn down by Tertiary erosion to a continuous lowland from the Gulf of St Lawrence to central Alabama. Through all this distance of 1500 m. the lowland is nowhere interrupted by a transverse ridge, although longitudinal ridges of moderate height occasionally diversify its surface. In the middle section, as already stated, the Great Valley is somewhat open on the east, by reason of the small height and broad interrup- tions of the narrow crystalline belt; on the west it is limited by the complex series of Alleghany ridges and valleys; in the north-east section the valley is strongly enclosed on the east by the New England uplands, and on the west by the Adirondacks and Catskills (see below); in the south-west section the valley broadens from the North Carolina highlands on the south-east almost to the Cumberland plateau on the north-west, for here also the ridge-making formations weaken, although they do not entirely disappear.

A striking contrast between New England and the rest of the Appalachians is found in the descent of the New England uplands The Atlantic to an ‘ mTne diate frontage on the sea; while to the south Coastal °ˆ New York harbour the remainder of the Appala- Plaia chians are set back from the sea by the

interposition

of a coastal plain, one of the most characteristic examples of this class of forms anywhere to be found. As in all such cases, the plain consists of marine (with some estuarine and fluviatile) stratified deposits, more or less in- durated, which were laid down when the land stood lower and the sea had its shore line farther inland than to-day. An uplift, increasing to the south, revealed part of the shallow sea bottom in the widening coastal plain, from its narrow

beginning at New York harbour to its greatest breadth of no or 120 m. in Georgia: there it turns westward and is continued in the Gulf coastal plain, described farther on. The coastal plain, however, is the result, not of a single recent uplift, but of movements dating back to Tertiary time and continued with many oscillations to the present ; nor is its surface smooth and unbroken, for erosion began upon the inner part of the plain long before the outer border was revealed. Indeed, the original interior border of the plain has been well stripped from its inland overlap ; the higher-standing inner part of the plain is now maturely dissected, with a relief of 200 to 500 ft., by rivers extended seaward from the older land and by their innumerable branches, which are often of insequent arrangement; while the seaward border, latest uplifted, is pre-vailingly low and smooth, with a hardly perceptible seaward slope of but a few feet in a mile ; and the shallow sea deepens very gradually for many miles off shore.

South Carolina and Georgia furnish the broadest and most typical section of this important physiographic province: here the more sandy and hilly interior parts are largely occupied by pine forests, which furnish much hard or yellow pine lumber, tar and turpentine. Farther seaward, where the relief is less and the soils are richer, the surface is cleared and cotton is an important crop.

A section of the coastal plain, from North Carolina to southern New Jersey, resembles the plain farther south in general form and quality of soils, but besides being narrower, it is further character- ized by several embayments or arms of the sea, caused by a slight depression of the land after mature valleys had been eroded in the plain. The coastal lowland between the sea arms is so flat that, although distinctly above sea-level, vegetation hinders drainage and extensive swamps or ”

pocossins " occur. Dismal Swamp, on the border of North Carolina and Virginia, is the largest example.

The small triangular section of the coastal plain in New Jersey north of Delaware Bay deserves separate treatment because of the development there of a peculiar topographic feature, which throws light on the occurrence of the islands off the New England coast, described in the next paragraph. The feature referred to results from the occurrence here of a weak basal formation of clay overlaid by more resistant sandy strata; the clay belt has been stripped for a score or more of miles from its original inland overlap, and worn down in a longitudinal inner lowland, while the sandy belt retains a significant altitude of 200 or 300 ft. overlooking the inner lowland in a well-defined slope dissected by many inland-flowing streams, and descending from its broad crest very gently seaward, thus giving rise to what has been called a " belted coastal plain," in which the relief is arranged longitudinally and the upland member, with its very unsymmetrical slopes, has sometimes been called a " cuesta." This is a form of relief frequently occurring elsewhere, as in the Niagara cuesta of the Great Lake district of the northern United States arid in the Cotswold and Chiltern hills of England, typical examples of the cuesta class. The Delaware river, unlike its southern analogues, which pursue a relatively direct course to the sea, turns south-westward along the inner lowland for some 50 m. ,

There is good reason for believing that at least along the southern border of New England a narrow coastal plain was for a time added to the continental border; and that, as in the New Jersey section: the plain was here stripped from a significant breadth of inland overlap and worn down so as to form an inner lowland enclosed by a longitudinal upland or cuesta; and that when this stage was reached a submergence, of the kind which has produced the many embay- ments of the New England coast, drowned the outer part of th2 plain and the inner lowland, leaving only the higher parts of the cuesta as islands. Thus Long Island (fronting Connecticut, but belonging to New York state), Block Island (part of the small state of Rhode Island), Martha's Vineyard and Nantucket (parts of Massachusetts) may be best explained. Heavy terminal moraines and outwashed fluviatile plains have been laid on the cuesta remnants, increasing their height as much as 100 ft. and burying their seaward slope with gravel and sand. t Moreover, the sea has worked on the shore line thus

originated, reducing the size of the more exposed islands farther east, and even consuming some islands which are now represented by the Nantucket shoals.

The same Palaeozoic formations that are folded in the belt of the Alleghany ridges lie nearly horizontal in the plateau district next north-west. The exposed strata are in large part _,. resistant sandstones. While they have suffered active . e . .. dissection by streams during the later cycles of erosion, p£fL_J the hilltops have retained so considerable an altitude that the district is known as a plateau; it might be better described as a dissected plateau, inasmuch as its uplands are not continuous but are nearly everywhere interrupted by ramifying insequent valleys. The unity and continuity of the district, ex- pressed in the name Appalachian plateau, is seldom recognized in local usage. Its north-eastern part in eastern New York is known as the Catskill Mountains ; here it reaches truly mountainous heights in great dome-like masses of full-bodied' form, with two summits rising a little over 4000 ft. The border of this part of the plateau descends eastward by a single strong escarpment to the Hudson valley, from which the mountains present a fine appearance, and northward by two escarpments (the second being called the " Helder- berg Mountains ") to the Mohawk Valley, north of which rise the

Adirondacks; but to the south west the dissected highland continues into Pennsylvania and Virginia, where it is commonly known as the Alleghany plateau. A curious feature appears in northern Penn- sylvania : here the lateral pressure of the Palaeozoic mountain-making forces extended its effects through a belt about fifty miles wider than the folded belt of the Hudson Valley, thus compressing into great rock waves a part of the heavy stratified series which in New York lies horizontal and forms the Catskills; hence one sees, in passing south-west from the horizontal to the folded strata, a beautiful illustration of the manner .in which land sculpture is controlled by land structure. Altitudes of 1200 ft. prevail in Pennsylvania and increase in Virginia; then the altitude falls to about 1000 ft. in Kentucky and Tennessee, where the name

Cumberland plateau is used for the highest portion, and to still less in northern Alabama, where the plateau, like the mountain belt, disappears under the Gulf coastal plain. Through all this distance of 1000 m. the border of the plateau on the south-east is an abrupt escarpment, eroded where the folded structure of the mountain belt reveals a series of weaker strata; but in the north-west the plateau suffers only a gradual decrease of height and of relief, until the prairie plains are reached in central Ohio and southern Indiana and Illinois, about 150 m. inland from the escarpment. Two qualifications must, however, be added. In certain parts of the plateau there are narrow anticlinal uplifts, an outlying effect of mountain-making compression ; here a ridge rises jf the exposed strata are resistant, as in Chestnut ridge of western Pennsylvania ; but here a valley is excavated if the exposed strata are weak, as in Sequatchie Valley, a long narrow trough which cuts off a strip of the plateau from its greater body in Tennessee. Again, in Kentucky and Tennessee, there is a double alternation of sandstone and limestone in the plateau-making strata; and as the skyline of the plateau bevels across these forma- tions, there are west-facing escarpments, made ragged by mature dissection, as one passes from the topographically strong sandstone to the topographically weak limestone.

In the north-east (New York and Pennsylvania) the higher parts of the plateau are drained by the Delaware and Susquehanna rivers directly to the Atlantic; farther west and south-west, the plateau is drained to the Ohio river and its branches. The submature or mature dissection of the plateau by its branching insequent streams results in giving it an excess of sloping surface, usually too steep for farming, and hence left for tree growth.

The Superior Oldland. — An outlying upland of the Laurentian highlands of Canada projects into the United States west and south of Lake Superior. Although composed chiefly of crystal-line rocks, which are commonly associated with a rugged land-scape, and although possessing a greatly deformed structure, which must at some ancient period have been associated with strong relief, the upland as a whole is gently rolling, and the inter-stream surfaces are prevailing plateau-like in their even-ness, with altitudes of 1400 to 1600 ft. in their higher areas. In this province, therefore, we find a part of one of those ancient mountain regions, initiated by crustal deformation, but reduced by long continued erosion to a peneplain of modern

relief, with occasional surmounting monadnocks of moderate height not completely consumed during the peneplanation of the rest of the surface. The erosion of the region must have been far advanced, perhaps practically completed, in very ancient times, for the even surface of the peneplain is overlapped by fossili- ferous marine strata of early geological date (Cambrian); and this shows that a depression of the region beneath an ancient sea took place after a long existence as dry land. The extent of the submergence and the area over which the Palaeozoic strata were deposited are unknown; for in consequence of renewed elevation without deformation, erosion in later periods has stripped off an undetermined amount of the covering strata. The valleys by which the uplands are here and there trenched to moderate depth appear to be, in part at least, the work of streams that have been superposed upon the peneplain through the now removed cover of stratified rocks. Glaciation has strongly scoured away the deeply- weathered soils that presumably existed here in preglacial time, revealing firm and rugged ledges in the low hills and swells of the ground, and spreading an irregular drift cover over the lower parts, whereby the drainage is often much disordered; here being detained in lakes and swamps (" muskegs ") and there rushing down rocky rapids. The region is therefore generally unattractive to the farmer, but it is inviting to the lumberman and the miner.

The Adirondack Mountains. — This rugged district of northern New York may be treated as an outlier in the United States of the Laurentian highlands of Canada, from which it is separated

by the St Lawrence Valley. It is of greater altitude (Mt Marcy 5344 ft.) and of much greater relief than the Superior Oldland; its heights decrease gradually to the north, west and south, where it is unconformably overlapped by Palaeozoic strata like those of Minnesota and Wisconsin; it is of more broken structure and form on the east, where the disturbances of the Appalachian system have developed ridges and valleys of linear trends, which are wanting or but faintly seen elsewhere. (See Adirondacks.)

Region of the Great Lakes. — The Palaeozoic strata, already mentioned as lapping on the southern slope of the Superior Oldland and around the western side of the Adirondacks. are but parts of a great area of similar strata, hundreds of feet in thick- ness, which decline gently southward from the great

oldland of the Laurentian highlands of eastern Canada. The strata are the deposits of an ancient sea, which in the earlier stage of geological investigation was thought to be part of the primeval ocean, while the Laurentian highlands were taken to be the first land that rose from the primeval waters. Inasmuch, however, as the floor on which the overlapping strata rest is, like the rest of the Laurentian and Superior Oldland, a worn-down mountain region, and as the lowest member of the sedimentary series usually contains pebbles of the oldland rocks, the better inter- pretation of the relation between the two is that the visible oldland area of to-day is but a small part of the primeval con- tinent, the remainder of which is still buried under the Palaeozoic cover; and that the visible oldland, far from being the first part of the continent to rise from the primeval ocean, was the last part of the primeval continent to sink under the advancing Palaeozoic seas. When the oldland and its overlap of stratified deposits were elevated again, the overlapping strata must have had the appearance of a coastal plain; but that was long ago; the strata have since then been much eroded, and to-day possess neither the area nor the smooth form of their initial extent. Hence this district may be placed in the class of ancient coastal plains. As is always the case in the broad denudation of the gently inclined strata of such plains, the weaker layers are worn down in sub-parallel belts of lower land between the oldland and the belts of more resistant strata, which rise in uplands.

Few better illustrations of this class of forms are to be found than that presented in the district of the Great Lakes. The chief upland belt or cuesta is formed by the firm Niagara limestone, which takes its name from the gorge and falls cut through the upland by the Niagara river. As in all such forms, the Niagara cuesta has a relatively strong slope or infacing escarpment on the side towards the oldland, and a long gentle slope on the other side. Its relief is seldom more than 200 or 300 ft., and is commonly of small measure, but its continuity and its contrast with the associated lowlands worn on the underlying and overlying weak strata suffice to make it a feature of importance. The cuesta would be straight from east and west if the slant of the strata were uniformly to the south; but the strata are somewhat warped, and hence the course of the cuesta is strongly convex to the north in the middle, gently convex to the south at either end. The cuesta begins where its determining limestone begins, in west-central New York; there

it separates the lowlands that contain the basins of lakes Ontario and Erie; thence it curves to the north-west through the province of Ontario to the belt of islands that divides Georgian Bay from Lake Huron; then west- ward through the land-arm between lakes Superior and Michigan, and south-westward into the narrow points that divide Green Bay from Lake Michigan, and at last westward to fade away again with the thinning out of the limestone; it is hardly traceable across the Mississippi river. The arrangement of the Great Lakes is thus seen to be closely sympathetic with the course of the lowlands worn on the two belts of weaker strata on either side of the Niagara cuesta; Ontario, Georgian Bay and Green Bay occupy depressions in the lowland on the inner side of the cuesta; Erie, Huron and Michigan lie in depressions in the lowland on the outer side. When the two low. lands are traced eastward they become confluent after the Niagara limestone has faded away in central New York, and the single lowland is continued under the name of Mohawk Valley, an east-west longitudinal depression that has been eroded on a belt of relatively weak strata between the resistant crystalline rocks of the Adiron- dacks on the north and the northern escarpment of the Appalachian plateau (Catskills-Helderbergs) on the south ; forming a pathway of great historic and economic importance between the Atlantic seaports and the interior.

In Wisconsin the inner lowland presents an interesting feature

in a knob of resistant quartzites, known as Baraboo Ridge, rising

‘ from the buried oldland floor through the partly denuded cover

of lower Palaeozoic strata. This knob or ridge may be appropri- ately regarded as an ancient physiographic fossil, inasmuch as, being a monadnock of very remote origin, it has long been preserved from the destructive attack of the weather by burial under sea-floor deposits, and recently laid bare, like ordinary organic fossils of much smaller size, by the removal

of part of its cover by normal erosion.

The occurrence of the lake basins in the lowland belts on either side of the Niagara cuesta is an abnormal feature, not to be explained by ordinary erosion, which can produce only valleys. The basins have been variously ascribed to glacial erosion, to obstruction of normal outlet valleys by barriers of glacial drift, and to crustal warping in connexion with or independent oJ the presence of the glacial sheet. No satisfactory solution of this problem has been reached; but the association of the Great Lakes and other large lakes farther north in Canada with the great North American area of strong and repeated glaciation is highly suggestive.

Lake Superior is unlike the other lakes; the greater part of its basin occupies a depression in the oldland area, independent of the overlap of Palaeozoic strata. The western half of the basin occupies a trough of synclinal structure; but the making of this syncline is so ancient that it cannot be directly connected with the occurrence of the lake to-day. A more reasonable explanation ascribes the lake basin to a geologically modern depression within the Superior oldland area; but there is at present no direct evidence in favour of this hypothesis. The Great Lakes are peculiar in receiving the drainage of but a small peripheral land area, enclosed by an ill-defined water-parting from the rivers that run to Hudson Bay or the Gulf of St Lawrence on the north and to the Gulf of Mexico on the south.

Large canals and locks on both sides of the Sault (pronounced Soo) Ste Marie in the outlet of Lake Superior are actively used except during three or four winder months. The three lakes of the middle group stand at practically the same level: Michigan and Huron are connected by the Strait of Mackinac (pronounced Mackinaw) ; Huron and Erie by the St Clair and Detroit rivers, with the small Lake St Clair between them. The navigable depth of these two short rivers is believed to be the result of a slow elevation of the land in the north-east, still in progress, whereby the waters have risen on their former shores near Detroit. Niagara river, connecting lakes Erie and Ontario, with a fall of 326 ft. (160 ft. at the cataract) in 30 m., is manifestly a watercourse of very modern origin ; for a large river would now have a thoroughly matured valley had it long followed its present course; the same is true of the St Lawrence, which in its several rapids and in its subdivision into

many channels at the Thousand Islands, presents every sign of youth. Canals on the Canadian side of these unnavigable stretches admit vessels of a considerable size to lakes Ontario and Erie.

The Prairie States. — The originally treeless prairies of the upper Mississippi basin began in Indiana and extended westward and north-westward until they merged with the drier region described beyond as the Great Plains. An eastward extension of the same region, originally tree-covered, extended to central Ohio. Thus the prairies may be described as lying in a general way between the Ohio and Missouri rivers on the south and the Great Lakes on the north. Under the older-fashioned methods of treating physical geography, the prairies were empirically described as " level prairies," " rolling prairies," and so on. The great advance in the interpretation of land forms now makes it possible to introduce as thoroughly explanatory a description of these fertile plains as of forms earlier familiar, such as sand dunes, deltas and sea cliffs. The prairies are, in brief, a contribution of the glacial period; they consist for the most part of glacial drift, deposited unconformably on an underlying rock surface of moderate or small relief. The rocks here concerned are the extension of the same stratified Palaeozoic formations already described as occurring in the Appalachian region and around the Great Lakes. They are usually fine-textured limestones and shales, lying horizontal; the moderate or small relief that they were given by mature preglacial erosion is now buried under the drift, but is known by numerous borings for oil, gas and water.

The greatest area of the prairies, from Indiana to North Dakota, consists of till plains, that is, sheets of unstratified drift, 30, 50 or even 100 ft. thick, which cover the underlying rock surface for thou- sands of square miles (except where postglacial stream erosion has

locally laid it bare), and present an extraordinarily even surface. The till is presumably made in part of preglacial soils, but it is more largely composed of rock waste mechanically comminuted by the creeping ice sheets ; although the crystalline rocks from Canada and some of the more resistant stratified rocks south of the Great Lakes occur as boulders and stones, a great part of the till has been crushed and ground to a clayey texture. The till plains, although sweeping in broad swells of slowly changing altitude, are often level to the eye,

and the view across them stretches to the horizon, unless interrupted by groves of trees along the watercourses, or by belts of low morainic hills. Here and there faint depressions occur, occupied by marshy " sloughs," or floored with a rich black soil of post- glacial origin. It is thus by sub-glacial aggradation that the prairies have been levelled up to a smooth surface, in contrast to the higher and non-glaciated hilly country next south.

The great ice sheets formed terminal moraines around their border at various halting stages; but the morainic belts are of small relief in comparison to the great area of the Jce ; they rise gently from the till plains to a height of 50, 100 or more feet; they may be one, two or three miles wide ; and their hilly surface, dotted over with boulders, contains many small lakes in basins or hollows, instead of streams in valleys. The morainic belts are arranged in groups of concentric loops, convex southward, because the ice sheets advanced in lobes along the lowlands of the Great Lakes ; neighbouring morainic loops join each other in re-entrants (north-pointing cusps), where two adjacent glacial lobes came together and formed their moraines in largest volume. The discovery of this significant looped arrange- ment of the morainic belts is the greatest advance in interpretation of glacial phenomena since the first suggestion of a glacial period; it is also the strongest proof that the ice here concerned was a continuous sheet of creeping land ice, and not a discontinuous series of floating icebergs, as had been supposed. The moraines are of too small relief to be shown on any maps but those of the largest scale; yet small as they are, they are the chief relief of the prairie states, and, in association with the nearly imperceptible slopes of the till plains, they determine the course of many streams and rivers, which as a whole are consequent upon the surface form of the glacial deposits.

The complexity of the glacial period and its subdivision into several glacial epochs, separated by interglacial epochs of consider- able length (certainly longer than the postglacial epoch) has a structural consequence in the superposition of successive till sheets, alternating with non-glacial deposits, and also a physiographic consequence in the very different amount of normal post- glacial erosion suffered by the different parts of the glacial deposits. The southernmost drift sheets, as in southern Iowa and northern Missouri, have lost their initially plain surface and are now maturely dissected, into gracefully

rolling forms ; here the valleys of even the small streams are well opened and graded, and marshes and lakes are wanting: hence these sheets are of early Pleistocene origin. Nearer the Great Lakes the till sheets are trenched only by the narrow valleys of the large streams ; marshy sloughs still occupy the faint depressions in the till plains, and the associated moraines have abundant small lakes in their undrained hollows : hence these drift sheets are of late Pleistocene origin.

When the ice sheets fronted on land sloping southward to the Ohio, Mississippi and Missouri rivers, the drift-laden streams flowed freely away from the ice border; and as the streams, escaping from their subglacial channels, spread in broader channels, they ordinarily could not carry forward all their load; hence they acted not as destructive but as constructive agents, and aggraded their courses. Thus local sheets or " aprons " of gravel and sand are spread more or less abundantly along the outer side of the morainic belts; and long trains of gravel and sands clog the valleys that lead southward from the glaciated to the non-glaciated area. Later when the ice retreated farther and the unloaded streams returned to their earlier degrading habit, they more or less completely scoured out the valley deposits, the remains of which are now seen in terraces on either side of the present flood plains.

When the ice of the last glacial epoch had retreated so far that its front lay on a northward slope, belonging to the drainage area of the Great Lakes, bodies of water accumulated in front of the ice margin, forming glacio-marginal lakes. The lakes were small at first, and each had its own outlet at the lowest depression in the height of land to the south; but as the ice melted back, neighbouring lakes became confluent at the level of the lowest outlet of the group; the outflowing streams grew in the same proportion and eroded a broad channel across the height of land and far down stream, while the lake waters built sand reefs or carved shore cliffs along their margin, and laid down sheets of clay on their floors. All of these features are easily recognized in the prairie region. The present site of Chicago was determined by an Indian portage or " carry " across the low divide between Lake Michigan and the headwaters of the Illinois river; and this divide lies on the floor of the former outlet channel of the glacial Lake Michigan. Corresponding outlets are known for the glacial lakes Erie, Huron and Superior, and for a very large sheet of water, named Lake Agassiz, which once overspread a broad till plain

in northern Minnesota and North Dakota. The outlet of this glacial lake, called river Warren, eroded a large channel in which the Minnesota river of to-day is an evident " misfit."

Certain extraordinary features were produced when the retreat of the ice sheet had progressed so far as to open an eastward outlet for the marginal lakes along the depression between the northward slope of the Appalachian plateau in west-central New York and the southward slope of the melting ice sheet; for when this eastward outlet came to be lower than the south-westward outlet across the height of land to the Ohio or Mississippi river, the discharge of the marginal lakes was changed from the Mississippi system to the Hudson system. Many well-defined channels, cutting across the north-sloping spurs of the plateau in the neighbourhood of Syracuse, N.Y., mark the temporary paths of the ice-bordered outlet river. Successive channels are found at lower and lower levels on the plateau slope, thus indicating the successive courses taken by the lake outlet as the ice melted farther and farther back. On some of these channels deep gorges were eroded heading in temporary catar- acts which exceeded Niagara in height but not in breadth; the pools excavated by the plunging waters at the head of the gorges are now occupied by little lakes. The most significant stage in this series of changes occurred when the glacio-marginal lake waters were lowered so that the long cuesta of Niagara limestone was laid bare in western New York; the previously confluent waters were then divided into two lakes; the higher one, Erie, supplying the outflowing Niagara river, which poured its waters down the escarpment of the cuesta to the lower lake, Ontario, whose outlet for a time ran down the Mohawk Valley to the Hudson : thus Niagara falls began. (See Niagara.)

Many additional features associated with the glacial period might be described, but space can be given to four only. In certain dis- tricts the subglacial till was not spread out in a smooth plain, but accumulated in elliptical mounds, ioo or 200 ft. high, half a mile or a mile long, with axes parallel to the direction of the ice motion as indicated by striae on the

underlying rock floor; these hills are known by the Irish name, drumlins, used for similar hills in north-western Ireland. The most remarkable groups of drumlins occur in western New York, where their number is estimated at over 6000, and in southern Wisconsin, where it is placed at 5000. They completely dominate the topography of their districts.

A curious deposit of an impalpably fine and unstratified silt, known by the German name loess, lies on the older drift sheets near the larger river courses of the upper Mississippi basin. It attains a thickness of 20 ft. or more near the rivers and gradually fades away at a distance of ten or more miles on either side. It is of inexhaustible fertility, being in this as well as in other respects closely like the loess in China and other parts of Asia, as well as in Germany. It contains land shells, and hence cannot be attributed to marine or lacustrine submergence. The best explanation suggested for loess is that, during certain phases of the glacial period, it was carried as dust by the winds from the flood plains of aggrading rivers, and slowly deposited on the neighbouring grass-covered plains.

South-western Wisconsin and parts of the adjacent states of Illinois, Iowa and Minnesota are known as the "driftless area," because, although bordered by drift sheets and moraines, it is free from glacial deposits. It must therefore have been a sort of oasis, when the ice sheets from the north advanced past it on the east and west and joined around its southern border. The reason for this exemption from glaciation is the converse of that for the southward convexity of the morainic loops; for while they mark the paths of greatest glacial advance along lowland troughs (lake basins), the driftless area is a district protected from ice invasion by reason of the obstruction which the highlands of northern Wisconsin and Michigan (part of the Superior oldland) offered to glacial advance.

The course of the upper Mississippi river is largely consequent upon glacial deposits. Its sources are in the morainic lakes in northern Minnesota; Lake Itasca being only one of many glacial lakes which supply the headwater branches of the great river. The drift deposits thereabouts are so heavy that the present divides between the drainage basins of Hudson Bay, Lake Superior and the Gulf of Mexico evidently stand in no very definite relation to the preglacial divides. The course of the Mississippi through Minnesota is largely guided by the form of the drift cover. Several rapids and the Falls of St Anthony (determining the site of Minneapolis) are signs of immaturity, resulting from superposition through the drift on the under rock. Farther south, as far as the entrance of the Ohio, the Mississippi follows a rock-walled valley 300 to 400 ft. deep, with a flood-plain 2 to 4 m. wide; this valley seems to represent the path of an enlarged early-glacial Mississippi, when much precipitation that is to-day discharged to Hudson Bay and the Gulf of St Lawrence was delivered to the Gulf of Mexico, for the curves of the present river are of distinctly smaller radius than the curves of the valley. Lake Pepin (30 m. below St Paul), a picturesque expansion of the river across its flood-plain, is due to the aggradation of the valley floor where the Chippewa river, coming from the north-east, brought an overload of fluvio-glacial drift. Hence even the " father of waters," like so many other rivers in the Northern states, owes many of its features more or less directly to glacial action.

The fertility of the prairies is a natural consequence of their origin. During the mechanical comminution of the till no

vegetation was present to remove the minerals essential to plant

growth, as is the case in the soils of normally weathered and dis- sected peneplains, such as the Appalachian piedmont, where the soils, though not exhausted by the primeval forest cover, are by no means • so rich as the till sheets of the prairies. Moreover, whatever the rocky understructure, the till soil has been averaged by a thorough mechanical mixture of rock grindings; hence the prairies are continuously fertile for scores of miles together.

The true prairies, when first explored, were covered with a rich growth of natural grass and annual flowering plants. To-day they are covered with farms. The cause of the treelessness has been much discussed. It does not seem to lie in peculiarities of temperature or of precipitation; for trees thrive where they are properly planted on the prairies; every town and farm to-day has its avenues and groves of trees; but it should be noted that west of the Mississippi river increasing aridity becomes an important factor, and is the chief cause of the treelessness of the Great Plains (see below). The treelessness of the prairies cannot be due to insufficient time for tree invasion since glacial evacuation; for forests cover the rocky uplands of Canada, which were occupied by ice for ages after the prairies were laid bare. A more probable cause is found in the fineness of the prairie soil, which is inimical to the growth of young trees in competition with the grasses and annual plants. Prairie fires, both of natural and artificial origin, are also a contributive cause; for young trees are exterminated by fires, but annual plants soon reappear.

The Gulf Coastal Plain. — The westward extension of the Atlantic coastal plain around the Gulf of Mexico carries with it a repetition of certain features already described, and the addition of several new ones. As in the Atlantic coastal plain, it is only the lower, seaward part of this region that deserves the name of plain, for there alone is the surface unbroken by hills or valleys; the inner part, initially a plain by reason of its essentially horizon- tal (gently seaward-sloping) structure, has been converted by mature dissection into an elaborate complex of hills and valleys, usually of increasing altitude and relief as one passes inland.

The special features of the Gulf Plain are the peninsular exten-

sion of the plain in Florida, the belted arrangement of relief and soils in Alabama and in Texas, and the Mississippi embayment or inland extension of the plain half-way up the course of the Mississippi river, with the Mississippi flood plain there included.

A broad, low crustal arch extends southward at the junction of the Atlantic and Gulf coastal plains; the emerged half of the arch constitutes the visible lowland peninsula of Florida; the submerged half extends westward under the shallow Plorlua. overlapping waters of the Gulf of Mexico. The northern part of the peninsula is composed largely of a weak limestone; here much of the lowland drainage is underground, forming many sink-holes (swallow- holes). Many small lakes in the lowland appear to owe their basins to the solution of the limestones. Valuable phosphate deposits occur in certain districts. The southern part of the state includes the " Everglades " (?.».), a large area of low, flat, marshy land, overgrown with tall reedy grass, a veritable wilderness; thus giving Florida an unenvied first rank among the states in marsh area. The eastern coast is fringed by long-stretching sand reefs, enclosing lagoons so narrow and continuous that they are popularly called " rivers." At the southern end of the peninsula is a series of coral islands, known as " keys "; they appear to be due to the forward growth of corals and other lime-secreting organisms towards the strong current of the Gulf Stream, by which their food is supplied: the part of the peninsula composed of coral reefs is less than has been formerly supposed. The western coast has fewer and shorter off-shore reefs; much of it is of minutely irregular outline, which seems to be determined less by the work of the sea than by the forward growth of mangrove swamps in the shallow salt water.

A typical example of a belted coastal plain is found in Alabama and the adjacent part of Mississippi. The plain is here about 150 m. wide. The basal formation is chiefly a weak limestone, which has been stripped from its original Alabama. innermost extension and worn down to a flat inner lowland of rich black soil, thus gaining the name of the "black belt." The lowland is enclosed by an upland or cuesta, known as Chunnenugga Ridge, sustained by partly consolidated sandy strata ; the upland, however, is not continuous, and hence should be described as a " maturely dissected cuesta." It has a relatively rapid descent toward the inner lowland, and a very gradual descent to the coast prairies, which become very low,

flat and marshy before dipping under the Gulf waters, where they are generally fringed by off-shore reefs. _ The coastal plain extends 500 m. inland on the axis of the Missis- sippi embayment. Its inner border affords admirable examples of topographical discordance where it sweeps north-westward square

*across the trend of the piedmont belt, the ridges and valleys, and the plateau of the Appalachians, which are all terminated by dipping gently beneath the unconformable cover of the coastal T,. e . . plain strata. In the same way the western side of the em- p * pp . bayment, trending south and south-west, passes along the eym lower south-eastern side of the dissected Ozark plateau of southern Missouri and northern Arkansas, which in many ways resembles the Appalachian plateau, and along the eastern end of the Massern ranges of the Ouachita mountain system in central Arkansas, which in geological history and topographical form present many analogies with the ridges and valleys of the Appalachians; and as the coastal plain turns westward to Texas it borders the Arbuckle hills in Oklahoma, a small analogue of the crystalline Appalachian belt. In the embayment of the coastal plain some low cuesta-like belts of hills with associated strips of lowlands suggest the features of a beltedcoastal plain; the hilly beltordissected cuesta determined by the Grand Gulf formation in western Mississippi is the most distinct. Important salt deposits occur in the coastal plain strata near the coast. The most striking feature of the embayment is the broad valley which the Mississippi has eroded across it.*

The lower Mississippi is the trurk in which three large rivers join; the chief figures (approximate only) regarding them are as follows : —

Drainage Area (square miles).

Percentage of Total Discharge.

Upper Mississippi

Ohio

170,000 210,000 530,000

18 31

14

The small proportion of total water volume supplied from the great Missouri basin is due to the light precipitation in that region. The _. . lower Mississippi receives no large tributary from the

M , e l ” V [er j east, but two important ones come from the west; the River SPP Arkansas drainage area being a little less than that

‘ of the Ohio, and the basin of the Red River of Louisiana

being about half as large. The great river thus constituted drains an area of about 1,250,000 sq. m., or about one-third of the United States; and discharges 75,000 cub. yds. of water per second, or 785,190,000,000 cubic yds. per annum, which corresponds roughly to one quarter of the total precipitation on its drainage basin. Its load of land waste (see I. C. Russell, Rivers of North America) is as follows : —

In suspension , . 6,718,694,400 cub. ft. or 241 ft. deep over 1 sq. m. Swept along bottom 750,000,000 ,, ,, 26 ,, ,, 1 ,,

In solution. . . 1,350,000,000 ,, ,, 45 ,, ,, 1 ,,

Average annual removal of waste from entire basin, j-^ in. or l ft.

in 4000 years.

The head of the coastal plain embayment is near the junction of the Ohio and the Mississippi. Thence southward for 560 m. the great river flows through the semi-consolidated strata of the plain, in which it has eroded a valley, 40 or 50 m. wide, and 29,700 sq. m. in area, enclosed by bluffs one or two hundred feet high in the northern part, generally decreasing to the southward, but with local increase of height associated with a decrease in flood plain breadth on the eastern side where the Grand Gulf cuesta is traversed. This valley in the

coastal plain, with the much narrower rock-walled valley of the upper river in the prairie states, is the true valley of the Mississippi river; but in popular phrase the "Mississippi Valley " is taken to include a large central part of the Mississippi drainage basin. The valley floor is covered with a flood plain of fine silt, having a southward slope of only half a foot to a mile. The length of the river itself, from the Ohio mouth to the Gulf, is, owing to its windings, about 1060 m. ; its mean fall is about 3 in. in a mile. On account of the rapid deposition of sediment near the main channel at times of overflow, the flood plain, as is normally the case on mature valley floors, has a lateral slope of as much as 5, 10, or even 12 ft. in the first mile from the river; but this soon decreases to a less amount. Hence at a short distance from the river the flood plain is often swampy, unless its surface is there aggraded by the tributary streams: for this reason Louisiana, Arkansas and Mississippi rank next after Florida in swamp area.

The great river receives an abundant load of silt from its tributaries, and takes up and lays down silt from its own bed and banks with every change of velocity. The swiftest current tends, by reason of centrifugal force, to follow the outer side of every significant curve in the channel; hence the concave bank, against which the rapid current sweeps, is worn away; thus any chance irregularity is exaggerated, and in time a series of large serpentines or meanders is developed, the most symmetrical examples at present being those near Greenville, Miss, the growth of the meanders tends to give the river continually increasing length; but this tendency is counter- acted by the sudden occurrence of cut-offs from time to time, so that a fairly constant length is maintained.

The floods of the Mississippi usually occur in spring or summer: Owing to the great size of the drainage basin, it seldom happens that the three upper tributaries are in flood at the same time; the coin- cident occurrence of floods in only two tributaries is of serious import in the lower river, which rises 30, 40, or occasionally 50 ft. The

abundant records by the Mississippi River Commission and the United States Weather Bureau (by which accurate and extremely useful predictions of floods in the lower river course are made, on the basis of the observed rise in the tributaries) demonstrate a num- ber of interesting features, of which the chief are as follows : the fall of the river is significantly

steepened and its velocity is accelerated down stream from the point of highest rise ; conversely, the fall and the velocity are both diminished up stream from the same point. The load of silt borne down stream by the river finally, after many halts on the way, reaches the waters of the Gulf, where the decrease of velocity, aided by the salinity of the sea water, causes the formation of a remarkable delta, leaving less aggraded areas as shallow lakes (Lake Pontchartrain on the east, and Grand Lake on the west of the river). The ordinary triangular form of deltas, due to the smoothing of the delta front by sea action, is here wanting, because of the weakness of sea action in comparison with the strength of the current in each of the four distributaries Or "passes " into which the river divides near its mouth. (See Mississippi River.)

After constriction from the Mississippi embayment to 250 m. in western Louisiana, the coastal plain continues south-westward with this breadth until it narrows to about 130 m. in _. Texas southern Texas near the crossing of the Colorado river, Coas< _. (of Texas) ; but it again widens to 300 m. at the p/./ n national boundary as a joint effect of embayment up the valley of the Rio Grande and of the seaward advance of this river's rounded delta front : these several changes take place in a distance of about 500 m., and hence include a region of over 100,000 sq. m. — less than half of the large state of Texas. A belted arrangement of reliefs and soils, resulting from differential erosion on strata of unlike composition and resistance, characterizes almost the entire area of the coastal plain. Most of the plain is treeless prairie, but the sandier belts are forested ; two of them are known as " cross timbers," because their trend is transverse to the general course of the main consequent rivers. An inland extension from the coastal plain in north-central Texas leads to a large cuesta known as Grand Prairie (not structurally included in the coastal plain), upheld at altitudes of 1200 or 1300 ft. by a resistant Cretaceous limestone, which dips gently seaward; its scalloped inland-facing escarpment overlooks a denuded central prairie region of irregular structure and form; its gentle coastward slope (16 ft. to a mile) is dissected by many branching consequent streams; in its southern-part, as it approaches the Colorado river the cuesta is dissected into a belt of discontinuous hills. The western cross timbers follow a sandy belt along the inner base of the ragged escarpment of Grand Prairie; the eastern cross timbers follow another sandy belt in

the lowland between the eastern slope of Grand Prairie and the pale western escarpment of the next eastward and lower Black Prairie cuesta. This cuesta is supported at an altitude of 700 ft. or less by a chalk formation, which gives an infacing slope some 200 ft. in height, while its gently undulating or " rolling " seaward slope (2 or 3 ft. in a mile), covered with marly strata and rich black soil, determines an important cotton district. Then comes the East Texas timber belt, broad in the north-east, narrowing to a point before reaching the Rio Grande, a low and thoroughly dissected cuesta of sandy Eocene strata; and this is followed by the Coast Prairie, a very young plain, with a seaward slope of less than 2 ft. in a mile, its smooth surface interrupted only by the still more nearly level flood plains of the shallow, conse- quent river valleys. Near the Colorado river the dissected cuesta of the Grand Prairie passes southward, by a change to a more nearly horizontal structure, into the dissected Edwards plateau (to be referred to again as part of the Great Plains), which terminates in a maturely dissected fault scarp, 300 or 400 ft. in height, the northern boundary of the Rio Grande embayment. From the Colorado to the Rio Grande, the Black Prairie, the timber belt and the Coast Prairie merge in a vast plain, little differentiated, overgrown with " chaparral " (shrub-like trees, often thorny), widening eastward in the Rio Grande delta, and extending southward into Mexico.

Although the Coast Prairie is a sea bottom of very modern uplift, it appears already to have suffered a slight movement of depression, for its small rivers all enter embayments; the larger rivers, however, seem to have counteracted the encroachment of the sea on the land by a sufficiently actiye delta building, with a resulting forward growth of the land into the sea. The Mississippi has already been mentioned as rapidly building forward its digitate delta; the Rio Grande, next in size, has built its delta about 50 m. forward from the general coast-iine, but this river being much smaller than the Mississippi, its delta front is rounded by seashore agencies. In front of the Brazos and the Colorado, the largest of the Texan rivers, the coast-line is very gently bowed forward, as if by delta growth, and the sea touches the mainland in a nearly straight shore line. Nearly all the rest of the coast is fringed by off-shore reefs, built up by waves from the very shallow sea bottom ; in virtue of weak tides, the reefs continue in long unbroken stretches between the few inlets.

The Great Plains. — A broad stretch of country underlaid by nearly horizontal strata extends westward from the 97th meridian to the base of the Rocky Mountains, a distance of from 300 to 500 m., and northward from the Mexican, boundary far into Canada. This is the province of the Great Plains. Although the altitude of plains increases gradually from, 600 or 1200 ft. on the east to 4000, 5000 or 6000 ft. near the mountains, the local relief is generally small; the

sub-arid climate excludes tree growth and opens far-reaching views. The plains are by no means a simple unit ; they are of diverse structure and of various stages of erosional development; they are occasionally interrupted by buttes and escarpments; they are frequently broken by valleys: yet on the whole a broadly extended surface of moderate relief so often prevails that the name, Great Plains, for the region as a whole is well deserved. The western boundary of the plains is usually well defined by the abrupt ascent of the mountains. The eastern boundary of the plains is more climatic than topographic. The line of 20 in. of annual rainfall trends a little east of northward near the 97th meridian, and if a boundary must be drawn where nature presents only a gradual transition, this rainfall line may be taken to divide the drier plains from the moister prairies. The plains may be described in northern, intermediate, central and southern sections, in relation to certain peculiar features.

The northern section of the Great Plains, north of latitude 44°, including eastern Montana, north-eastern Wyoming and most of the Dakotas, is a moderately dissected peneplain, one of the best examples of its class. The strata here are Cretaceous or early Tertiary, lying nearly horizontal. The surface is shown to be a plain of degradation by a gradual ascent here and there to the crest of a ragged escarpment, the cuesta-remnant of a resistant stratum ; and by the presence of lava-capped mesas and dike-ridges, surmounting the general level by 500 ft. or more and manifestly demonstrating the widespread erosion of the surrounding plains. All these reliefs are more plentiful towards the mountains in central Montana. The peneplain is

no longer in the cycle of erosion that witnessed its production ; it appears to have suffered a regional elevation, for the rivers — the upper Missouri and its branches — no longer flow on the surface of the plain, but in well graded, maturely opened valleys, several hundred feet below the general level. A significant exception to the rule of mature valleys occurs, however, in the case of the Missouri, the largest river, which is broken by several falls on hard sandstones about 50 m. east of the mountains. This peculiar feature is explained as the result of displacement of the river from a better graded preglacial valley by the Pleistocene ice-sheet, which here overspread the plains from the moderately elevated Canadian high- lands far on the north-east, instead of from the much higher moun- tains near by on the west. The present altitude of the plains near the mountain base is 4000 ft.

The northern plains are interrupted by several small mountain areas. The Black Hills, chiefly in western South Dakota, are the largest group: they rise like a large island from the sea, occupying an oval area of about 100 m. north-south by 50 m. east-west, reaching an altitude in Harney Peak of 7216 ft., and an effective relief over the plains of 2000 or 3000 ft. This mountain mass is of flat-arched, dome-like structure, now well dissected by radiating consequent streams, so that the weaker uppermost strata have been eroded down to the level of the plains where their upturned edges are evenly truncated, and the next following harder strata have been sufficiently eroded to disclose the core of underlying crystalline rocks in about half of the domed area.

In the intermediate section of the plains, between latitudes 44° and 42°, including southern South Dakota and northern Nebraska, the erosion of certain large districts is peculiarly elaborate, giving rise to a minutely dissected form, known as " bad lands," with a relief of a few hundred feet. This is due to several causes: first, the dry climate, which prevents the growth of a grassy turf ; next, the fine texture of the Tertiary strata in the bad land districts; and con- sequently the success with which every little rill, at times of rain, carves its own little valley. Travel across the bad lands is very fatiguing because of the many small ascents and descents; and it is from this that their name, " mauvaises terres pour traverser," was given by the early French voyageurs.

The central section of the Great Plains, between latitudes 42 °

and 36 , occupying eastern Colorado and western Kansas, is, briefly stated, for the most part a dissected fluviatile plain; that is, this section was once smoothly covered with a gently sloping plain of gravel and sand that had been spread far forward on a broad denuded area as a piedmont deposit by the rivers which issued from the mountains; and since then it has been more or less dissected by the erosion of valleys. The central section of the plains thus presents 3. marked contrast to the northern section; for while the northern section owes its smoothness to the removal of local gravels and sands from a formerly uneven surface by the action of degrading rivers and their inflowing tributaries, the southern section owes its smoothness to the deposition of imported gravels and sands upon a previously uneven surface by the action of aggrading rivers and their outgoing distributaries. The two sections are also unlike in that residual eminences still here and there surmount the peneplain of the northern section, while the fluviatile plain of the central section completely buried the pre-existent relief. Exception to this statement must be made in the south-west, close to the mountains in southern Colorado, where some lava-capped mesas (Mesa de Maya, Raton Mesa) stand several thousand feet above the general plain level, and thus testify to the widespread erosion of this region before it was aggraded.

The southern section of the Great Plains, between latitudes 35i ° and 29!°, lies in eastern Texas and eastern New Mexico; like the

central section it is for the most part a dissected fluviatile plain, but the lower lands which surround it on all sides place it in so strong relief that it stands up as a table-land, known from the time of Mexican occupation as the Llano Estacado.' It measures roughly 150 m. east-west and 400 m. north-south, but it is of very irregular outline, narrowing to the south. Its altitude is 5500 ft. at the highest western point, nearest the mountains whence its gravels were sup- plied ; and thence it slopes south-eastward at a decreasing rate, first about 12 ft., then about 7 ft. in a mile, to its eastern and southern borders, where it is 2000 ft. in altitude : like the High Plains farther north, it is extraordinarily smooth; it is very dry, except for occa- sional shallow and temporary water sheets after rains. The Llano is separated from the plains on the north by the mature consequent valley of the Canadian river, and from the mountains on the west by the broad and probably mature

valley of the Pecos river. On the east it is strongly undercut by the retrogressive erosion of the head- waters of the Red, Brazos and Colorado rivers of Texas, and presents a ragged escarpment, 500 to 800 ft. high, overlooking the central denuded area of that state ; and there, between the Brazos and Colo- rado rivers, occurs a series of isolated outliers capped by a limestone which underlies both the Llano on the west and the Grand Prairies cuesta on the east. The southern and narrow part of the table-land, called the Edwards Plateau, is more dissected than the rest, and falls off to the south in a frayed-out fault scarp, as already mentioned, overlooking the coastal plain of the Rio Grande embayment. The central denuded area, east of the Llano, resembles the east-central section of the plains in exposing older rocks; between these two similar areas, in the space limited by the Canadian and Red rivers, rise the subdued forms of the Wichita Mountains in Oklahoma, the westernmost member of the Ouachita system.

The Cordilleran Region. — From the western border of the Great Plains to the Pacific coast, there is a vast elevated area, occupied by mountains, plateaus and intermont plains. The intermont plains are at all altitudes from sea-level to 4000 ft. ; the plateaus from 5000 to 10,000 ft. ; and the mountains from 8000 to 14,000 ft. The higher mountains are barren from the cold of altitude; the timber line in Colorado stands at 11,000 to 12,000 ft.

The chief provinces of the Cordilleran region are: The Rocky Mountain system and its basins, from northern New Mexico north- ward, including all the mountains from the front ranges bordering on the plains to the Uinta and Wasatch ranges in Utah ; the Pacific ranges including the Sierra Nevada of California, the Cascade range of Oregon and Washington, and the Coast range along the Pacific nearly to the southern end of California ; and a great inter- mediate area, including in the north the Columbian lava plains and in the south the large province of the Basin ranges, which extends into Mexico and widens from the centre southward, so as to meet the Great Plains in eastern New Mexico, and to extend to the Pacific coast in southern California. There is also a province of plateaus between the central part of the Basin ranges and the southern part of the Rocky Mountains. An important geological characteristic of most of the Cordilleran region is that the Carboniferous strata, which in western Europe and the eastern United States contain many coal seams, are represented in the

western United States by a marine limestone; and that the important unconformity which in Europe and the eastern United States separates the Palaeozoic and Mesozoic eras does not occur in the western United States, where the formations over a great area follow in conformable sequence from early Palaeozoic through the Mesozoic.

The Rocky Mountains begin in northern Mexico, where the axial crystalline rocks rise to 12,000 ft. between the horizontal structures of the plains on the east and the plateaus on the west. The Rocky The upturned stratified formations wrap around the juoaatalns. flanks of the range, with ridges and valleys formed on their eroded edges and drained southward by the Pecos river to the Rio Grande and the Gulf of Mexico. The mountains rapidly grow wider and higher northward, by taking on new complications of structure and by including large basins between the axes of uplift, until in northern Colorado and Utah a complex of ranges has a breadth of 300 m., and in Colorado alone there are 40 summits over 14,000 ft. in altitude, though none rises to 14,500. Then turning more to the north-west through Wyoming, the ranges decrease in breadth and height; in Montana their breadth is not more than 1 50 m., and only seven summitsexceed 11,000 ft. (one reaching 12,834).

As far north as the gorge of the Missouri river in Montana, the Front range, facing the Great Plains, is a rather simple uplift, usually formed by upturning the flanking strata, less often by a fracture. Along the eastern side of the Front Range in Colorado most of the upturned stratified formations have been so well worn down that, except for a few low piedmont ridges, their even surface may now be included with that of the plains, and the crystalline core of the range is exposed almost to the mountain base. Here the streams that drain the higher areas descend to the plains through narrow canyons in the mountain border, impassable for ordinary roads and difficult of entrance even by railways; a well-known example is the gorge of Clear Creek east of the Georgetown mining district. The crystalline highlands thereabouts, at altitudes of 8000 to 10,000 ft., are of so moderate a relief as to suggest that the mass had stood much lower in a former cycle of erosion and had then been worn down to rounded hills; and that since uplift to the

present altitude the revived streams of the current cycle of erosion have not entrenched themselves deep enough to develop strong relief. This idea is confirmed 80 m. farther south, where Pike's Peak (14,108 ft.), a conspicuous landmark far out on the plains, has every appearance of being a huge monadnock, surmounting a rough peneplain of 10,000 ft. in general elevation. The idea is still better confirmed farther north in Wyoming, where the Laramie Range, flanked with upturned strata on the east and west, is for the most part a broad upland at altitudes of 7000 or 8000 ft., with no strong surmounting summits and as yet no deep carved valleys. Here the first of the Pacific railways chose its pass. When the sum- mit is reached, the traveller is tempted to ask, " Where are the mountains?" so small is the relief of the upland surface. This low range turns westward in a curve through the Rattlesnake Mountains towards the high Wind River Mountains (Gannett Peak, 13,775ft.), an anticlinal range within the body of the mountain system, with flanking strata rising well on the slopes. Flanking strata are even better exhibited in the Bighorn Mountains, the front range of northern Wyoming, crescentic in outline and convex to the north- east, like the Laramie Range, but much higher; here heavy sheets of limestone arch far up towards the range crest, and are deeply notched where consequent streams have cut down their gorges.

Farther north in Montana, beyond the gorge of the Missouri river, the structure of the Front Range is altogether different ; it is here the carved residual of a great mass of moderately bent Palaeozoic strata, overthrust eastward upon the Mesozoic strata of the plains ; instead of exposing the oldest rocks along the axis and the youngest rocks low down on the flanks, the younger rocks of the northern range follow its axis, and the oldest rocks outcrop along its eastern flanks, where they override the much younger strata of the plains; the harder strata, instead of lapping on the mountain flanks in great slab-like masses, as in the Bighorns, form out-facing scarps, which retreat into the mountain interior where they are cut down by outflowing streams.

The structure of the inner ranges is so variable as to elude simple description; but mention should be made of the Uinta

range of broad anticlinal structure in north-east Utah, with east-west trend, as if corresponding to the east-west Rattlesnake Mountains, already named. The Wasatch Range, trending north-south in central Utah, is peculiar in possessing large east-west folds, which, are seen in cross-section in the dissected western face of the range, because the whole mass is there squarely cut off by a great north-south fault with down-throw to the Basin Range province, the fault face being elaborately carved.

Volcanic action has been restricted in the Rocky Mountains proper. West Spanish Peak (13,620 ft.), in the Front Range of southern Colorado, may be mentioned as a fine example of a deeply dissected volcano, originally of greater height, with many unusually strong radiating dike-ridges near its denuded flanks. In north-western Wyoming there are extensive and heavy lava sheets, uplifted and dissected, and crowned with a few dissected volcanoes. It is in association with this field of extinct volcanic activity that a remark- able group of geysers and hot springs has been developed, from which the Yellowstone river, a branch of the Missouri, flows north-eastward, and the Snake river, a branch of the Columbia, flows south-westward. The geyser district is held as a national domain, the Yellowstone Park.

Travellers whose idea of picturesqueness is based upon the abnor- mally sharpened peaks of the ice-sculptured Alps are disappointed with the scenery of the central and southern ranges of the Rocky Mountains. It is true that many of these ranges are characterized by the rounded tops and the rather evenly slanting, waste-covered slopes which normally result from the long-continued action of the ordinary agencies of erosion; that they bear little snow in summer and are practically wanting in glaciers ; that forests are often scanty on the middle and lower slopes, the more so because of devastation by fires; and that the general impression of great altitude is much weakened because the mountains are seen from a base which itself is 5000 or 6000 ft. above sea-level. Nevertheless the mountains are of especial interest to the physiographer who wishes to make a comparative study of land forms as affected by normal and by glacial sculpture, in order to give due attention to " process " as well as to " structure and stage " in the analysis and description of mountain topography. A journey along the range from south to north reveals most strikingly a gradual increase -in the share of

sculpture due to Pleistocene glaciers. In New Mexico, if glaciers were formed at all in the high valleys, they were so small as not greatly to modify the more normal forms. In central Colorado and Wyoming, where the mountains are higher and the Pleistocene glaciers were larger, the valley heads were hollowed out in well-formed cirques, often holding small lakes; and the mountain valleys were enlarged into U-shaped troughs as far down as the ice reached, with hanging lateral valleys on the way. Different stages of cirque development, with accompanying transformation of mountain shape, are finely illustrated in several ranges around the headwaters of the Arkansas river in central Colorado, where the highest summit of the Rockv Mountains is found (Mt Massive, 14,424 ft., in the Sawatch range); and perhaps even better in the Bighorn range of Wyoming. In this central region, however, it is only by way of exception that the cirques were so far enlarged by retrogressive glacial erosion

as to sharpen the preglacial dome-like summits into acute peaks; and in no case did glacial action here extend down to the plains at the eastern base of the mountains; but the widened, trough-like glaciated valleys frequently descend to the level of the elevated intermont basins, where moraines were deployed forward on the basin floor. The finest examples of this kind are the moraines about Jackson Lake on the basin floor east of the Teton Range (Grand Teton, 13,747 ft.), a superb north-south range which lies close to the meridional boundary line between Wyoming and Idaho. Farther north in Montana, in spite of a decrease of height, there are to-day a few small glaciers with snowfields of good size ; and here the effects of sculpture by the much larger Pleistocene glaciers are seen in forms of almost alpine strength.

The intermont basins which so strongly characterize the Rocky Mountain system are areas which have been less uplifted than the enclosing ranges, and have therefore usually become the depositories of waste from the surrounding mountains.

Some of the most important basins may be mentioned. San Luis " Valley " is an oval basin about 60 m. long near the southern end of the mountain system in New Mexico and Colorado; its level, treeless floor, at an altitude of 7000 ft., is as yet hardly trenched by the Rio Grande, which escapes through an impassable canyon south- ward on its way to the Gulf of Mexico. The much smaller basin of the upper Arkansas river in

Colorado is well known because the Royal Gorge, a very narrow cleft by which the river escapes through the Front Range to the plains, is followed by a railroad at river- level. South Park, directly west of Pike's Peak, is one of the highest basins (nearly 10,000 ft.), and gains its name from the scattered, park-like growth of large pine trees ; it is drained chiefly by the South Platte river (Missouri-Mississippi system), through a deep gorge in the dissected mass of the plateau-like Front Range. The Laramie Plains and the Green river basin, essentially a single structural basin between the east-west ranges of Rattlesnake Mountains on the north and the Uinta Range on the south, measuring roughly 260 m. east-west by 100 m. north-south, is the largest intermont basin; it is well known from being traversed through its greatest length by the Union Pacific railway. Its eastern part is drained north-eastward through a gorge that separates the Laramie and Rattlesnake (Front) ranges by the North Platte river to the Missouri-Mississippi ; its western part, where the basin floor is much dissected, often assuming a bad-land expression, is drained south- ward by the Green river, through a deep canyon in the Uinta Range to the Colorado river and then to the Pacific. The Bighorn basin has a moderately dissected floor, drained north-eastward by Bighorn river through a deep canyon in the range of the same name to the Missouri. Several smaller basins occur in Montana, all somewhat dissected and drained through narrow gorges and canyons by members of the Missouri system.

The Plateau province, next west of the southern Rocky Mountains, is characterized for the most part by large-textured forms, developed on a great thickness of nearly horizontal Palaeozoic, The Plateau Mesozoic and Tertiary formations, and by a dry climate. p rov i nce The province was uplifted and divided into great blocks by faults or monoclinal flexures and thus exposed to long-lasting denudation in a mid-Tertiary cycle of erosion ; and then broadly elevated again, with renewed movement on some of the fault lines; thus was introduced in late Tertiary time the current cycle of erosion in which the deep canyons of the region have been trenched. The results of the first cycle of erosion are seen in the widespread exposure of the resistant Carboniferous limestone as a broad platform in the south-western area of greater uplift through central Arizona, where the higher formations were worn away ; and in the development of a series of huge, south-facing,

retreating escarpments of irregular outline on the edges of the higher formations farther north. Each escarpment stands forth where a resistant formation overlies a weaker one; each escarpment is separated from the next higher one by a broad step of weaker strata. A wonderful series of these forms occurs in southern Utah, where in passing northward from the Carboniferous platform one ascends in succession the Vermilion Cliffs (Triassic sandstones), the White Cliffs (Jurassic sandstones, of remarkably cross-bedded structure, interpreted the dunes of an ancient desert), and finally the Pink Cliffs (Eocene strata of fluviatile and lacustrine origin) of the high, forested plateaus. Associated with these irregular escarpments are occasional rectilinear ridges, the work of extensive erosion on monoclinal structures, of whict Echo Cliffs, east of the Painted Desert (so called from its many-coloured sandstones and clays), is a good example.

With the renewal of uplift by which the earlier cycle of erosion was interrupted and the present cycle introduced, inequalities of surface due to renewed faulting were again introduced; these still appear as cliffs, of more nearly rectilinear front than the retreating escarpments formed in the previous cycle. These cliffs are peculiar in gradually passing from one formation to another, and in having a height dependent on the displacement of the fault rather than on the structures in the fault face ; they are already somewhat battered and dissected by erosion. The most important line of cliffs of this class is associated with the western and southern boundary of the plateau province, where it was uplifted from the lower ground. The few rivers of the region must have reached the quiescence of old age in the earlier cycle, but were revived by uplift to a vigorous youth in

the current cycle ; and it is to this newly introduced cycle of physio- graphic evolution that the deep canyons of the Plateau province are due. Thus the Virgin river, a northern branch of the Colorado, has cut a vertical slit, iooo ft. deep, hardly wider at the top than at the bottom, in the heavy Triassic sandstones of southern Utah; but the most famous example is the Grand Canyon (q.v.) of Arizona, eroded by the Colorado river across

the uplifted platform of Carboniferous limestone.

During the current cycle of erosion, several of the faults, whose scarps had been worn away in the previous cycle, have been brought to light again as topographic features by the removal of the weak strata along one side of the fault line, leaving the harder strata on the other side in relief; such scarps are known as " fault-line scarps," in distinction from the original " fault scarps." They are peculiar in having their altitude dependent on the depth of revived erosion, instead of the amount of faulting, and they are sometimes " topo- graphically reversed," in that the revived scarp overlooks a lowland worn on a weak formation in the upheaved fault-block. Another consequence of revived erosion is seen in the occurrence of great landslides, where the removal of weak (Permian) clays has sapped the face of the Vermilion Cliffs (Triassic sandstone), so that huge slices of the cliff face have slid down and forward a mile or two, all shattered into a confused tumult of forms for a score or more of miles along the cliff base.

Volcanic features occur in abundance in the Plateau province. Some of the high plateaus in the north are capped with remnants of heavy lava flows of early eruption. A group of large volcanoes occurs on the limestone platform south of the Grand Canyon, culmin- ating in Mt San Francisco (12,794 ft.), a moderately dissected cone, and associated with many more recent smaller cones and fresh- looking lava flows. Mt Taylor in western New Mexico is of similar age, but here dissection seems to have advanced farther, probably because of the weaker nature of the underlying rocks, with the result of removing the smaller cones and exposing many lava conduits or pipes in the form of volcanic necks or buttes. The Henry Moun- tains in south-western Utah are peculiar in owing their relief to the doming or blistering up of the plateau strata by the underground intrusion of large bodies or " cisterns " (laccolites) of lava, now more or less exposed by erosion.

The lava plains of the Columbia basin are among the most extensive volcanic outpourings in the world. They cover 200,000 sq. m. or more in south-eastern Washington, eastern Oregon and south- western Idaho, and are known to be 4000 ft. deep in some river gorges. The lava completely buries the pre-existent land forms over most of its extent. The earlier supposition that these vast lava flows came chiefly from fissure eruptions has been made doubtful by the later discovery of flat-

sloping volcanic cones from which much lava seems to have been poured out in a very liquid state. Some of the flows are still so young as to preserve their scoriaceous surface; here the "-shore-line" of the lava contours evenly around the spurs and enters, bay-like, into the valleys of the enclosing mountains, occasionally isolating an outlying mass. Other parts of the lava flood are much older and have been more or less deformed and eroded. Thus the uplifted, dislocated and dissected lava sheets of the Yellowstone National Park in the Rocky Moun- tains on the east (about the headwaters of the Snake river) are associated with the older lavas.of the Columbian plains.

The Columbia river has entrenched itself in a canyon-like valley around the northern and western side of the lava plains ; Snake river has cut a deeper canyon farther south-east where the plains are higher and has disclosed the many lava sheets which build up the plains, occasionally revealing a buried mountain in which the superposed river has cut an even narrower canyon. One of the most remarkable features of this province is seen in the temporary course taken by the Columbia river across the plains, while its canyon was obstructed by Pleistocene glaciers that came from the Cascade Mountains on the north-west. The river followed the temporary course long enough to erode a deep gorge, known as " Grande Coulee," along part of its length.

The lava plains are treeless and for the most part too dry for agriculture ; but they support many cattle and horses. Along parts of their eastern border, where the rainfall is a little increased by the approach of the westerly winds to the Rocky Mountains, there is a belt of very deep, impalpably fine soil, supposed to be a dust deposit brought from the drier parts of the plains farther west; excellent crops of wheat are here raised.

The large province of the Basin ranges, an arid region throughout, even though it reaches the sea in southern California, involves some novel problems in its description. It is characterized by numerous disconnected mountain ranges trending north and south, from 30 to 100 m. in length, the higher ranges reaching altitudes of 8000 or 10,000 ft., separated by broad, intermont desert plains or basins at altitudes varying from sea-level (or a little less) in the south-west, to 4000 or 5000 ft. farther inland. Many of the intermont plains — these chiefly in the north — appear to be

heavily aggraded with mountain waste ; while others — these chiefly in the south — are rock-floored and thinly veneered with alluvium. The origin of these forms is still in discussion; but the following interpretation is well supported. The ranges are primarily the result of faulting and uplifting of large blocks of the earth's

The Basla

Range

Province.

crust. The structure of the region previous to faulting was depen- dent on long antecedent processes of accumulation and deformation and the surface of the region then was dependent on the amount of erosion suffered in the prefaulting cycle. When the region was broken into fault blocks and the blocks were uplifted and tilted, the back slope of each block was a part of the previously eroded surface and the face of the block was a surface of fracture ; the present form of the higher blocks is more or less affected by erosion since faulting, while many of the lower blocks have been buried under the waste of the higher ones. In the north, where dislocations have invaded the field of the horizontal Columbian lavas, as in south-eastern Oregon and north-eastern California, the blocks are monoclinal in structure as well as in attitude; here the amount of dissection is relatively moderate, for some of the fault faces are described as ravined but not yet deeply dissected ; hence these dislocations appear to be of recent date. In western Utah and through most of Nevada many of the blocks exhibit deformed structures, involving folds and faults of relatively ancient (Jurassic) date ; so ancient that the moun- tains then formed by the folding were worn down to the lowland stage of old age before the block-faulting occurred. When this old-mountain lowland was broken into blocks and the blocks were tilted, their attitude, but not their structure, was monoclinal ; and in this new attitude they have been so maturely re-dissected in the new cycle of erosion upon which they have now entered as to have gained elaborately carved forms in which the initial form of the uplifted blocks can hardly be perceived ; yet at least some of them still retain along one side the highly significant feature of a relatively simple base-line, transecting hard and soft structures alike, and thus indicating the faulted margin of a tilted block. Here the less uplifted

blocks are now heavily aggraded with waste from the dissected ranges : the waste takes the form of huge alluvial fans, formed chiefly by occasional boulder-bearing floods from the mountains; each fan heads in a ravine at the mountain base, and becomes laterally confluent with adjacent fans as it stretches several miles forward with decreasing slope and increasing fineness of material.

In the southern part of the Basin Range province the ranges are well dissected and some of the intermont depressions have rock floors with gentle, centripetal slopes; hence it is suggested that the time since the last dislocation in this part of the province is relatively remote; that erosion in the current cycle has here advanced much farther than in the central or northern parts of the province; and that, either by outwash to the sea or by exportation of wind-borne dust, the depressions — perhaps aggraded for a time in the earlier stages of the cycle — have now been so deeply worn down as to degrade the lower and weaker parts of the tilted blocks to an evenly sloping surface, leaving the higher and harder parts still in relief as residual ranges. If this be true, the southern district will furnish a good illustration of an advanced stage of the cycle of arid erosion, in which the exportation of waste from enclosed depressions by the wind has played an important part. In such case the washing of the centripetal slopes of the depressions by occasional " sheet- floods " (widespreading sheets of turbid running water, supplied by heavy short-lived rains) has been efficient in keeping the rock floor at even grade toward a central basin, where the finest waste is collected while waiting to be removed by the winds.

Only a small part of the Basin Range province is drained to the sea. A few intermont areas in the north-west part of the province have outlet westward by Klamath river through the Cascade range and by Pitt river (upper part of the Sacramento) through the Sierra Nevada: a few basins in the south-east have outlet by the Rio Grande to the Gulf of Mexico ; a much larger but still narrow medial area is drained south-westward by the Colorado to the head of the Gulf of California, where this large and very turbid river has formed an extensive delta, north of which the former head of the gulf is now cut off from the sea and laid bare by evaporation as a plain below sea-level. It is here that an irrigation project, involving the diversion of some of the river water to the low plain, led to disaster in 1904, when the flooded river washed away the canal gates at the

intake and overflowed the plain, drowning the newly established farms, compelling a railway to shift its track, and forming a lake (Salton Sea) which would require years of evaporation to remove (see Colorado River). Many streams descend from the ravines only to wither away on the desert basin floors before uniting in a trunk river along the axis of a depression ; others succeed in uniting in the winter season, when evaporation is much reduced, and then their trunk flows for a few score miles, only to disappear by " sinking " (evaporating) farther on. A few of the large streams may, when in flood, spread out in a temporary shallow sheet cm a dead level of clay, or playa, in a basin centre, but the sheet of water vanishes in the warm season and the stream shrinks far up its course, the absolutely barren clay floor of the playa, impassable when wet, becomes firm enough for crossing when dry. One of the south- western basins, with its floor below sea-level, has a plain of salt in its centre. A few of the basins are occupied by lakes without outlet, of which Great Salt Lake (q.v.), in north-west Utah, is the largest. Several smaller lakes occur in the basins of western Nevada, next east of the Sierra Nevada. During Pleistocene times all these lacustrine basins were occupied by lakes of much greater depth and laiger size; the outlines of the eastern (Lake Bonneville) and the western (Lake Lahontan) water bodies are well recorded by shore lines

and deltas on the enclosing slopes, hundreds of feet above the present lake surfaces ; the abandoned shore lines, as studied by G. K. Gilbert and I. C. Russell, have yielded evidence of past climatic changes second in importance only to those of the Pleistocene glaciated areas. The duration of the Pleistocene lakes was, however, brief as compared with the time since the dislocation of the faulted blocks, as is shown by the small dimensions of the lacustrine beaches compared to the great volume of the ravine-heading fans on which the beaches often lie.

Strong mountain ranges follow the trend of the Pacific coast, 150 or 200 m. inland. The Cascade Range enters from Canada, trending southward across the international boundary

through The Pacific Washington and Oregon to latitude 41 °; the Sierra Ranges. Nevada extends thence south-eastward through Cali-

fornia to latitude 35 °. The lower coast ranges, nearer the ocean, continue a little farther southward than the Sierra Nevada, before giving way to that part of the Basin Range province which reaches the Pacific in southernmost California.

The Cascade Range is in essence a maturely dissected highland, composed in part of upwarped Columbian lavas, in part of older rocks, and crowned with several dissected volcanoes, of which the chief are (beginning in the north) Mts Baker (10,827 ft.), Rainier (14,363 ft.), Adams (12,470 ft.) and Hood (11,225 ft-); the first three in Washington, the last in northern Oregon. These bear snowfields and glaciers; while the dissected highlands, with ridges of very irregular arrangement, are everywhere sculptured in a fashion that strongly suggests the work of numerous local Pleistocene glaciers as an important supplement to preglacial erosion. Lake Chelan, long and narrow, deep set between spurless ridges with hanging lateral valleys, and evidently of glacial origin, ornaments one of the eastern valleys. The range is squarely transected by the Columbia river, which bears every appearance of antecedent origin: the cascades in the river gorge are caused by a sub-recent landslide of great size from the mountain walls. Klamath river, draining several lakes in the north-west part of the Basin Range province and traversing the Cascade Range to the Pacific, is apparently also an antecedent river.

The Cascade Mountains present a marked example of the effect of relief and aspect on rainfall ; they rise across the path of the pre- vailing westerly winds not far inland from a great ocean ; hence they receive an abundant rainfall (80 in. or more, annually) on the west- ward or windward slope, and there they are heavily forested ; but the rainfall is light on the eastward slope and the piedmont district is dry ; hence the forests thin out on that side of the range and treeless lava plains follow next eastward.

The Sierra Nevada may be described, in a very general way, as a great mountain block, largely composed of granite and deformed metamorphosed rocks, reduced to moderate relief in an earlier (Cretaceous and Tertiary?) cycle of erosion, sub-

recently elevated with a slant to the west, and in this position sub-maturely dissected. The region was by no means a peneplain before its slanting uplift; its surface then was hilly and in the south mountainous ; in its central and still more in its northern part it was overspread with lavas which flowed westward along the broad open valleys from many vents in the eastern part : near the northern end of the range, eruptions have continued in the present cycle, forming many cones and young lava flows. The tilting of the mountain mass was presumably not a simple or a single movement; it was probably slow, for Pitt river (headwaters of the Sacramento) traverses the northern part of the range in antecedent fashion ; the tilting involved the subdivision of the great block into smaller ones, in the northern half of the range at least ; Lake Tahoe (altitude 6225 ft.) near the range crest is explained as occupying a depression between two block fragments ; and farther north similar depressions now appear as aggraded highland " meadows." The tilting of the great block resulted in presenting a strong slope to the east, facing the deserts of the Basin Range province and in large measure determining their aridity ; and a long moderate slope to the west. The altitudes along the upraised edge of the block, or range crest, are approximately 5000 ft. in the north and 11,000 ft. in the south. The mountains in the southern part of the block, which had been reduced to subdued forms in the former cycle of erosion, were thus given a conspicuous height, forming the " High Sierra," and greatly sharpened by revived erosion, normal and glacial. In this way Mt Whitney (14,502 ft.) came to be the highest summit in the United States (excluding Alaska). The dis- placement of the mountain block may still be in progress, for severe earthquakes have happened in the depression next east of the range ; that of Owen's Valley in 1870 was strong enough to have been very destructive had there been anything in the desert valley to destroy. In the new altitude of the mountain mass, its steep eastern face has been deeply carved with short canyons; and on the western slope an excellent beginning of dissection has been made in the erosion of many narrow valleys, whose greatest depth lies between their headwaters which still flow on the highland surface, and their mouths at the low western base of the range. The highlands and uplands between the chief valleys are but moderately dissected ; many small side streams still flow on the highland, and descend by steeply incised gorges to the valleys of the larger rivers. Some of the chief valleys are not

cut in the floors of the old valleys of the former cycle, because the rivers were displaced from their former courses by

lava flows, which now stand up as table mountains. Glacial erosion has been potent in excavating great cirques and small rock-basins, especially among the higher southern surmounting summits, many of which have been thus somewhat reduced in height while gaining an Alpine sharpness of form; some of the short and steep canyons in the eastern slope have been converted into typical glacial troughs, and huge moraines have been laid on the desert floor below them. Some of the western valleys have also in part of their length been converted into U-shaped troughs; the famous Yosemite Valley, eroded in massive granite, with side cliffs 1000 or 2000 ft. in height, and the smaller Hetch-Hetchy Valley not far away, are regarded by some observers as owing their peculiar forms to glacial modifications of normal preglacial valleys.

The western slope of the Sierra Nevada bears fine forests similar to those of the Cascade Range and of the Coast Range, but of more open growth, and with the redwood exchanged for groves of " big trees " (Sequoia gigantea) of which the tallest examples reach 325 ft. The higher summits in the south are above the tree line and expose great areas of bare rock: mountaineering is here a delightful summer recreation, with camps in the highland forests and ascents to the lofty peaks. Gold occurs in quartz veins traversing various forma- tions (some as young as Jurassic), and also in gravels, which were for the most part deposited previous to the uplift of the Sierra " block." Some of the gravels then occurred as piedmont deposits along the western border of the old mountains ; these gravels are now more or less dissected by new-cut valleys. Other auriferous gravels are buried under the upland lava flows, and are now reached by tunnels driven in beneath the rim of the table mountains. The reputed discovery of traces of early man in the lava-covered gravels has not been authenticated.

The northernmost part of the coast ranges, in Washington, is often given independent rank as the Olympic Range (Mt Olympus, 8150 ft.) ; it is a picturesque mountain group, bearing snowfields and glaciers, and suggestive of the dome-like uplift of a previously worn-down mass ; but it is now so maturely dissected as to make the suggested origin uncertain. Farther south, through Oregon and northern California, many members of the coast ranges resemble the Cascades and the

Sierra in offering well-attested examples of the uplift of masses of disordered structure, that had been reduced to a tame surface by the erosion of an earlier cycle, and that are now again more or less dissected.

Several of the ranges ascend abruptly from the sea ; their base is cut back in high cliffs ; the Sierra Santa Lucia, south of San Francisco, is a range of this kind; its seaward slope is almost uninhabitable. Elsewhere moderate re-entrants between the ranges have a continuous beach, concave seaward; such re-entrants afford imperfect harbour- age for vessels; Monterey Bay is the most pronounced example of this kind. On still other parts of the coast a recent small elevatory movement has exposed part of the former sea bottom in a narrow coastal plain, of which some typical harbourless examples are found in Oregon. Most of the recent movements appear to have been upward, for the coast presents few embayments such as would result from the depression and partial submergence of a dissected mountain range; but three important exceptions must be made to this rule.

In the north, the Strait of Juan de Fuca and the intricately branch- ing waterways of Puget Sound between the Cascade and the Olympic ranges occupy trough-like depressions which were filled by extensive glaciers in Pleistocene times ; and thus mark the beginning of the great stretch of fiorded coast which extends northward to Alaska. The waterways here afford excellent harbours. The second impor- tant embayment is the estuary of theColumbia river; buttheoccur- rence of shoals at the mouth decreases the use that might otherwise be made of the river by ocean-going vessels. More important is San Francisco Bay, situated about midway on the Pacific coast of the United States, the result of a moderate depression whereby a trans- verse valley, formerly followed by Sacramento river through the outermost of the Coast ranges, has been converted into a narrow strait — the " Golden Gate " — and a wider interment longitudinal valley has been flooded, forming the expansion of the inner bay.

The Coast Range is heavily forested in the north, where rainfall is abundant in all seasons; but its lower ranges and valleys have a scanty tree growth in the south, Where the rainfall is very fight : here grow redwoods (Sequoia sempervirens) and live oaks (Quercus agri- folia). The chief metalliferous deposits of the range are of mercury at New

Almaden, not far south of San Francisco. The open valleys between the spaced ranges offer many tempting sites for settlement, but in the south irrigation is needed for cultivation.

The belt ol relative depression between the inner Pacific ranges and the Coast range is divided by the fine volcano Mt Shasta (14,380 ft.) in northern California into unlike portions. To the north, the floor of the depression is for the most part above baselevel, and hence is dissected by open valleys, partly longitudinal, partly transverse, among hills of moderate relief. This district was originally for the most part forested, but is now coming to be cleared and farmed.

South of Mt Shasta, the " Valley of California " is an admirable example of an aggraded intermont depression, about 400 m. long and from 30 to 70 m. wide. The floor of this depression being below baselevel, it has necessarily come to be the seat of the mountain waste brought down by the many streams from the newly uplifted

Sierra Nevada on the east and the coast ranges on the west; each stream forms an alluvial fan of very gentle slope ; the fans all become- laterally confluent, and incline very gently forward to meet in a nearly level axial belt, where the trunk rivers — the Sacramento from the north and the San Joaquin from the south-east — wander in braided courses; their tendency to aggradation having been increased in the last half century by the gravels from gold washing ; their waters entering San Francisco Bay. Kings river, rising in the high southern Siena near Mt Whitney, has built its fan rather actively, and obstructed the discharge from the part of the valley next farther south, which has thus come to be overflowed by the shallow waters of Tulare Lake, of flat, reedy, uncertain borders. A little north of the centre of the valley rise the Marysville Buttes, the remains of a maturely dissected volcano (2128 ft.). Elsewhere the floor of the valley is a featureless, treeless plain. (W. M. D.)

II. — Geology All the great systems of rock formations are

represented in the United States, though close correlation with the systems of Europe is not always possible. The general geological column for the country is shown in the following table: —

Eras of Time. Groups of Systems.

Cainozoic

Mesozoic

Palaeozoic

Proterozoic

Periods of Time. Systems of Rocks.

Present. Pleistocene. Pliocene. Miocene. Oligocene. _Eocene.

Transition (Arapahoe and Denver formations). Upper Cretaceous.

Widespread unconformity. • Comanchean (Lower Cretaceous). Jurassic. Triassic. Permian.

Coal Measures, or Pennsylvanian. Widespread unconformity. Subcarboniferous, or Mississippian. J Devonian. Silurian.

Widespread unconformity. Ordovician. .Cambrian.

Great unconformity. Keweenawan.

Widespread unconformity. Upper Huronian.

Widespread unconformity. Middle Huronian.

Widespread unconformity. .Lower Huronian.

Great unconformity.

"Great Granitoid Series (intru- sive in the main, Laurentian). Great Schist Series (Mona, Kitchi, Keewatin, Quinnissec ; Lower Huronian of some authors).

Archeozoic (Archean) Group. — -The oldest group of rocks, called the Archean, was formerly looked upon, at least in a tentative way, as the original crust of the earth or its

downward extension, much altered by the processes of metamorphism. This view of its origin is now known not to be applicable to the Archean as a whole, since this system contains some metamorphosed sedimentary rocks. In other words, if there was such a thing as an original crust, which may be looked upon as an open question, the Archean, as now defined, does not appear to represent it. The meta-sedimentary rocks of the Archean include metamorphosed limestone, and schists which carry carbonaceous matter in the form of graphite. The marble and graphite, as well as some other indirect evidence of life less susceptible of brief statement, have been thought by many geologists sufficient to warrant the inference that life existed before the close of the era when the Archean rocks were formed. Hence the era of their formation is called the Archeozoic era.

Most of tie Archean rocks fall into one or the other of two great series, a schistose series and a granitoid series, the latter being in large part intrusive in the former. The rocks of the granitoid series appear as great masses in the schist series, and in some places form great protruding bosses. They were formerly regarded as older than the schists and were designated on this account " primitive," " funda- mental," &c. They have also been called Laurentian, a name which is still sometimes applied to them.

Nearly all known sorts of schist are represented in the schistose oart of the system. Most of them are the metamorphic products of

igneous rocks, among which extrusive rocks, many of them pyro- clastic, predominate. Metamorphosed sedimentary rocks are widely distributed in the schistose series, but they are distinctly subordinate to the meta-igneous rocks, and they are so highly metamorphic that stratigraphic methods are not usually applicable to them. In some areas, indeed, it is difficult to say whether the schists are meta- sedimentary or meta-igneous. The likeness of the Archean of one part of the country to that of another is one of its striking features.

The Archean appears at the surface in many parts of the

United States, and in still larger areas north of the national boundary'. It appears in the cores of some of the western mountains, in some of the deep canyons of the west, as in the Grand Canyon of the Colorado in northern Arizona, and over considerable areas in northern Wisconsin and Minnesota, in New England and the piedmont plateau east of the Appalachian Mountains, and in a few other situations. Wherever it comes to the surface it comes up from beneath younger rocks which are, as a rule, less metamorphic. By means of deep borings it is known at many points where it does not appear at the surface, and is believed to be universal beneath younger systems.

Locally the Archean contains iron ore, as in the Vermilion district of northern Minnesota, and at some points in Ontario. The ore is mostly in the form of haematite.

Proterozoic (Algonkian) Systems. — The Proterozoic group of rocks (called also Algonkian) includes all formations younger than the Archean and older than the Palaeozoic rocks. The term Archean was formerly proposed to include these rocks, as well as those now called Archean, but the subdivision here recognized has come to be widely approved.

The Proterozoic formations have a wide distribution. They appear at the surface adjacent to most of the outcrops of the Archean, and in some other places. In many localities the two groups have not been separated. In some places this is because the regions where they occur have not been carefully studied since the subdivision into Archeozoic and Proterozoic was made, and in others because of the inherent difficulty of separation, as where the Proterozoic rocks are highly metamorphosed. On the whole, the Proterozoic rocks are predominantly sedimentary and subordinately igneous. Locally both the sedimentary and igneous parts of the group have been highly metamorphosed ; but as a rule the alteration of the sedimentary portions has not gone so far that stratigraphic methods are in- applicable to them, though in some places detailed study is necessary to make out their structure.

The Proterozoic formations are unconformable on the Archean in most places where their relations are known. The unconformity between these groups is therefore widespread, probably more so than any later unconformity. Not only is it extensive in area, but the stratigraphic break is very great, as

shown by (1) the excess of metamorphism of the lower group as compared with the upper, and (2) the amount of erosion suffered by the older group before the depo- sition of the younger. The first of these differences between the two systems is significant of the dynamic changes suffered by the Archean before the beginning of that part of the Proterozoic era represented by known formations. The extent of the unconformity is usually significant of the geographic changes of the interval unrecorded by known Proterozoic rocks.

The Proterozoic formations have been studied in detail in few great areas. One of these is about Lake Superior, where the forma- tions have attracted attention on account of the abundant iron ore which they contain. Four major subdivisions or systems of the group have been recognized in this region, as shown in the preceding table. These systems are separated one from another by uncon- formities in most places, and the lower systems, as a rule, have suffered a greater degree of metamorphism than the upper ones, though this is not to be looked upon as a hard and fast rule. The commoner sorts of rock in the several Huronian systems are quartzite and slate (ranging from shale to schist) ; but limestone is not wanting, and igneous rocks, both intrusive and extrusive, some metamorphic and some not, abound. Iron ore occurs in the sedimentary part of the Huronian, especially in Minnesota, Michigan, Wisconsin and parts of Canada. The ore is chiefly haematite, and has been de- veloped from antecedent ferruginous sedimentary deposits, through concentration and purification by ground water.

The lower part of the Keweenawan system consists of a great succession of lava flows, of prodigious thickness. This portion of the system is overlain by thick beds of sedimentary rock, mostly conglomerate and sandstone, derived from the igneous rocks beneath. A few geologists regard the sedimentary rocks here classed as Keweenawan as Palaeozoic ; but they have yielded no fossils, and are unconformable beneath the Upper Cambrian, which is the oldest sedimentary formation of the region which bears fossils. The aggregate thickness of the Proterozoic systems in the Lake Superior region is several miles, as usually computed, but there are obvious difficulties in determining the thickness of such great systems, especially when they are much metamorphosed. The copper of the Lake Superior region is in the Keweenawan system, chiefly in its sedimentary and amygdaloidal parts.

The Proterozoic formations in other parts of the continent cannot be correlated in detail with those of the Lake Superior region. The number of systems is not everywhere the same, nor are they every- where alike, and their definite correlation with one another is not

possible now, and may never be. The Proterozoic formations have yielded a few fossils in several places, especially Montana and northern Arizona; but they are so imperfect, their numbers, whether of individuals or of species, are so small, and the localities where they occur so few, that they are of little service in correlation throughout the United States. The carbon-bearing shales, slates and schists, and the limestone, are indications that life was relatively abundant, even though but few fossils are preserved. Among the known fossils are vermes, Crustacea and probably brachiopods and pteropods

The character of the sediments of the Proterozoic is such as to show that mature weathering affected the older rocks before their material was worked over into the Proterozoic formations. This mature weathering, resulting in the relatively complete separation of the quartz from the kaolin, and both from the calcium car- bonate and other basic materials, implies conditions of rock decay comparable to those of the present time.

In all but a few places where their relations are known, the Protero- zoic rocks are unconformable beneath the Palaeozoic Where conformity exists the separation is made on the basis of fossils, it having been agreed that the oldest rocks carrying the Olenellus fauna are to be regarded as the base of the Cambrian system.

The Palaeozoic and later formations are usually less altered,

12,000 ft. in eastern New York, and almost as much in the southern Appalachian Mountains (Georgia and Alabama) ; but its average thickness is much less. In Wisconsin, where the Upper Cambrian only is present, the thickness is about 1000 ft. The greater thickness in the east appears to be due in part to

the fact that an extensive area of land, Appalachia. lay east of the site of the Appalachian Mountains throughout the Palaeozoic era, and quantities of sediment from it were accumulated where these mountains were to arise later. The greatness of the thickness, as it has been measured, is also due in part to the oblique position in which the beds of sediment were originally deposited.

The Cambrian formations have not been notably metamorphosed, except in a few regions where dynamic metamorphism has been effective. The system is without any notable amount of igneous rock. As in other parts of the world, the system here contains abundant fossils, among which trilobites, brachiopods and worms are the most abundant. The range of forms, however, is great.

Ordovician System. — The succeeding Ordovician (Lower Silurian) system of rocks is closely connected with the Cambrian, geographi- cally, stratigraphically and faunally. Its distribution is much the same as that of the Upper Cambrian, with which it is conform- able in many places. The Ordovician system contains much more

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more accessible, and better known than the Proterozoic and Archeozoic, and will be taken up by systems.

Cambrian System. — The lower part of the Cambrian system, characterized by the Olenellus fauna, is restricted to the borders of the continent, where it rests on the older rocks unconformably in most places. The middle part of the system, characterized by the Paradoxides fauna, is somewhat more

widespread, resting on the lower part conformably, but overlapping it, especially in the south and west. The upper part of the system, carrying the Dicello- cephalus fauna, is very much more extensive ; it is indeed one of the most widespread series of rocks on the continent. The lower, middle and upper parts of the system all contain marine fossils. This being the case, the distribution of the several divisions indicates that progressive submergence of the United States was in progress during the period, and that most of the country was covered by the sea before its close.

The system is composed chiefly of clastic rocks, and their composi- tion and structure show that the water in which they were deposited was shallow. In the interior, the upper part of the system, the Potsdam sandstone, is generally arenaceous. It is well exposed in New York, Wisconsin, Missouri and elsewhere, about the out- crops of older rocks. The system is also exposed in many of the western mountains or about their borders, especially about those the cores of which are of Archean or Proterozoic rock.

The thickness of the system has been estimated at 10,009 to

Ordovician

limestone, and therefore much less clastic rock, than the Cambrian, pointing to clearer seas in which life abounded. The succession of beds in New York has become a sort of standard with which the system in other parts of the United States has been compared. The succession of formations in that state is as follows : — •

(Richmond beds (in Ohio and Indiana). Lorraine beds. Utica shales. Middle Ordovician (or f Trenton limestone. Mohawkian) -| Black River limestone.

L Lowville limestone. Chazy limestone. Beekmantown limestone. (= Calciferous).

The classification in the right-hand column of this table is not applicable in detail to regions remote from New York.

There is in some places an unconformity between the Richmond beds (or their equivalent) and underlying formations, and this unconformity, together with certain palaeontological considerations, has raised the question

whether the uppermost part of the system, as outlined above, should not be classed as Silurian (Upper Silurian). Over the interior the strata are nearly horizontal, but in the mountain regions of the east and west, as well as in the mountains of Arkansas

Lower Ordovician (or Canadian)

and Oklahoma, they are tilted and folded, and locally much meta- morphosed. The outcrops of the system appear for the most part in close association with the outcrops of the Cambrian system, but the system appears in a few places where the Cambrian does not, as in southern Ohio and central Tennessee. The thickness of the system varies from point to point, being greatest in the Appalachian Mountains, and much less in the interior.

The oil and gas of Ohio and eastern Indiana come from the middle portion of the Ordovician system. So also do the lead and zinc of south-western Wisconsin and the adjacent parts of Iowa and Illinois. The lead of south-eastern Missouri comes from about the same horizon.

The fossils of the Ordovician system show that life made great progress during the period, in numbers both of individuals and of species. The life, like that of the later Cambrian, was singularly cosmopolitan, being in contrast with the provincial character of the life of the earlier Cambrian and of the early (Upper) Silurian which followed. Beside the expansion of types which abounded in the Cambrian, vertebrate remains (fishes) are found in the Ordovician. So, also, are the first relics of insects. The departure of the Ordovician life from that of the Cambrian was perhaps most pro- nounced in the great development of the molluscs and crinoids (including cystoids), but corals were also abundant for the first time, and graptolites came into prominence.

Silurian System. — The Silurian system is much less widely distributed than the Ordovician. This and other corroborative facts imply a widespread emergence of land at the close of the

Ordo- vician period. As a result of this emergence the stratigraphic break between the Ordovician and the Silurian is one of the greatest in the whole Palaeozoic group.

The classification of the system in New York is as follows : —

Silurian

Cayugan (Neo- or Upper Silurian)

Niagaran (Meso- or Middle Silurian)

Oswegan (Palaeo-or Lower Silurian)

{Manlius limestone. Rondout waterlime. Cobleskill limestone. Salina beds. ("Guelph dolomite. J Lockport limestone. 1 Rochester shale. 1 Clinton beds. C Medina sandstone, -j Oneida conglomerate. [Shawangunk grit.

The lower part of this system is chiefly clastic, and is known only in the eastern part of the continent. The middle portion contains much limestone, generally known as the Niagara limestone, and is much more widespread than the lower, being found very generally over the eastern interior, as far west as the Mississippi and in places somewhat beyond. The Niagara limestone contains the oldest known coral reefs of the continent. They occur in eastern Wisconsin and at other points farther east and south. It is over this limestone that the Niagara falls in the world-famous cataract. One member of the middle division of the system (Clinton beds) contains much iron ore, especially in the Appalachian Mountain region. The ore is extensively worked at some points, as at Birmingham, Alabama. The upper part of the system is more restricted than the middle, and includes the salt-bearing series of New York, Ohio and Pennsylvania, with its peculiar fauna. It is difficult to see how salt could have originated in this region except under conditions very different climatically from those of the present time.

In the interior the thickness of the system is less than iooo ft. in many places, but in and near the Appalachian Mountains its thick- ness is much greater — more than five times as great if the maximum thicknesses of all formations be made the basis of calculation. In the Great Plains and farther west the Silurian has little known representation. Either this part of the continent was largely land at this time, or the Silurian

formations here have been worn away or remain undifferentiated. Rocks of Silurian age, however, are known at some points in Arizona, Nevada and southern California.

Corals, echinoderms, brachiopods and all groups of molluscs abounded. Graptolites had declined notably as compared with the Ordovician, and the trilobites passed their climax before the end of the period. Certain other remarkable Crustacea, however, had made their appearance, especially in connexion with the Salina series of the east.

There are numerous outliers of the Silurian north of the United States, even up to the Arctic regions. These outliers have a common fauna, which is closely related to that of the interior of the United States. They give some clue to the amount of erosion which the system has suffered, and also afford a clue to the route by which the animals whose fossils are found in the United States entered this country. _ Thus, the Niagara fauna of the interior of the United States has striking resemblances to the mid-Silurian faunas of Sweden and Great Britain. It seems probable, therefore, that marine animals found migratory conditions between these regions, probably by way of northern islands. The fauna of the Appalachian region is far less like that of Europe, and indicates but slight connexion with the fauna of the interior. Both the earlier and the later parts of the Silurian period seem to have been times when physical con- ditions were such as to favour the development of provincial faunas,

while during the more widespread submergence of the middle Silurian the fauna was more cosmopolitan.

Devonian System. — The Devonian system appears in some parts of New England, throughout most of the Appalachian region, over much of the eastern interior from New York to the Missouri River, in Oklahoma, and perhaps in Texas. It is absent from the Great Plains, so far as now known, and is not generally present in the Rocky Mountains, though somewhat widespread between them and the western coast. As a whole, the system is more- widespread than the Silurian, though not so widespread as the Ordovician. As in the case of the Ordovician and the Silurian, the New York section has become a standard with which the system in other parts of the country is commonly compared. This section is as follows : —

“Chautauquan-Chemung (including Cat- skill).

Devonian .

Upper Devonian

Middle Devonian

Lower Devonian

Senecan

Erian .

Ulsterian .

Oriskanian

f Portage beds. -s Genesee shale. (_Tuliy limestone.

S Hamilton shale. (Marcellus shale. (“Onondaga (Corniferous J limestone) 1 Schoharie grit. [Esopus grit. Oriskany beds. C Kingston beds. HelderbergianJ Becraft limestone. | New Scotland beds. [Coeymans limestone.

The formations most widely recognized are the Helderberg lime- stone, the Onondaga limestone and the Hamilton shale.

The Catskill sandstone, found chiefly in the Catskill Mountain region of New York, is one of the distinctive formations of the system. It has some similarity to the Old Red Sandstone of Great Britain. In part, at least, it is equivalent in time of origin to the Chemung formation; but the latter is of marine origin, while the Catskill formation appears to be of terrestrial origin.

No other system of the United States brings out more clearly the value of palaeontology to palaeogeography. The faunas of the early Devonian seem to have entered what is now the interior of the United States from the mid-Atlantic coast. The Onondaga fauna which succeeded appears to have resulted from the commingling of the resident lower Devonian fauna with new emigrants from Europe by way of the Arctic regions. The Hamilton fauna which followed represents the admixture of the resident Onondaga fauna with new types which are thought to have come from South America, showing that faunal connexions for marine life had been made be- tween the

interior of the United States and the lands south of the Caribbean Sea, a connexion of which, before this time, there was no evidence. The late Devonian fauna of the interior represents the commingling of the Hamilton fauna of the eastern interior with new emigrants from the north-west, a union which was not effected until toward the close of the period.

Like the earlier Palaeozoic systems, the Devonian attains its greatest known thickness in the Appalachian Mountains, where sediments from the lands of pre-Cambrian rock to the east accumu- lated in quantity. _ Here clastic rocks predominate, while limestone is more abundant in the interior. If the maximum thicknesses of all Devonian formations be added together, the total for the system is as much as 15,000 ft. ; but such a thickness is not found in any one place.

The Devonian system yields much oil and gas in western Pennsylvania, south-western New York, West Virginia and Ontario; and some of the Devonian beds in Tennessee yield phosphates of commercial value. The Hamilton formation yields much flagstone.

Among the more important features of the marine life of the period were (1) the great development of the molluscs, especially of cephalopods ; (2) the abundance of large brachiopods ; (3) the aberrant tendencies of the trilobites ; (4) the profusion of corals ; and (5) the abundance, size and peculiar forms of the fishes. The life of the land waters was also noteworthy, especially for the great deployment of what may be called the crustacean-ostracodermo-vertebrate group. The Crustacea were represented by eurypterids, the ostracoderms by numerous strange, vertebrate-like forms (Cepkalaspis, Cyathaspis, Trematopsis, Bothriolepis, &c), and the vertebrates by a great variety of fishes. The land life of the period is represented more fully among the fossils than that of any preceding period. Gymnosperms were the highest types of plants.

The Devonian system is not set off from the Mississippian by any marked break. On the other hand, the one system merges into the other, so that the plane of separation is often indistinct.

Mississippian System. — The Mississippian system was

formerly regarded as a part of the Carboniferous, and was described under the name of Lower Carboniferous, or Subcarboniferous, without the rank of a system. This older classification, which has little support except that which is traditional, is still adhered to by many geolo- gists; but the fact seems to be that the system is' set off from the Pennsylvanian (Upper Carboniferous) more sharply than the Cambrian is from the Ordovician, the Silurian from the Devonian, or the Devonian from the Mississippian.

The system is well developed in the Mississippi Basin, whence its name. Its formations are much more widespread than those of any other system since the Ordovician. They appear at the surface in great areas in the interior, in the south-west and about many of the western mountains. In many places in the west they rest on what appear to be Ordovician beds, but without unconformity. The explanation of the apparent conformity of the strata from the Cambrian to the Pennsylvanian in some parts of the west, with no fossils defining with certainty any horizon between the Ordovician and the Mississippian, is one of the open problems in the geology of the United States.

The subdivision of the system for various regions in the eastern part of the United States is as follows : —

Mississippi River States.

Ohio.

Pennsylvania.

Maryland.

4. Kaskaskia or Chester

3. St Louis

2. Osage or Augusta (in- cluding the Bur- lington, Keokuk and Warsaw)

1. Kinderhook or Chou-

7. Maxville 6. Logan 5. Black Hand 4. Cuyahoga 3. Sunbury 2. Berea grit 1. Bedford

2. Mauch Chunk 1. Pocono

3. Mauch Chunk 2. Greenbrier

1. Pocono

teau

In the interior the Kinderhook series has a distribution similar to that of the Devonian; the Osage series is more widespread, pointing to progressive submergence; and the St Louis is still more extensive. This epoch, indeed, is the epoch of maximum submer-

fence during the period, and the maximum since the Ordovician. lefore its close the sea of the Great Basin which had persisted since the Devonian was connected with the shallow sea which covered much of the interior of the United States. The fourth series, the Kaskaskia or Chester, is more restricted, and points to the coming emergence of a large part of the United States. In the Mississippi Basin the larger part of the system is of limestone, though there is some clastic material in both its basal and its upper parts. In Ohio the system contains much clastic rock, and in Pennsylvania little else. The Mauch Chunk series (shale and sandstone) is now believed to be largely of terrestrial origin.

The system ranges in thickness from nearly 5000 ft. maximum in Pennsylvania to 1500 ft. in the vicinity of the Mississippi river. In West Virginia some 2000 ft. of limestone are assigned to this system. The zinc and lead of the Joplin district of Missouri are in the limestone of this system, and the corresponding limestone in some parts of Colorado, as at Leadville, is one of the horizons of rich ore.

The end of the period was marked by the widespread emergence of the continent, and parts of it were never again submerged, so far as is known. Certainly there is no younger marine formation of comparable extent in the continent. When deposition was renewed in the interior of the continent, the formations laid down were largely non-marine, and, over great

areas, they rest upon the Mississippian unconformably.

From the conditions outlined it is readily inferred that the faunas of the system were cosmopolitan. All types of life to which shallow, clear sea-water was congenial appear to have abounded in the interior. It was perhaps at this time that the crinoids, as a class, reached their climax, and most forms of lime-carbonate-secreting life seem to have thriven. Where the seas were less clear, as in Ohio, the conditions are reflected in the character of the fossils. Marine fishes had made great progress before the close of the period. Amphibia appeared before its close, and plant life was abundant and varied, though the types were not greatly in advance of those of the Devonian. The time of such widespread submergence was hardly the time for the great development of land vegetation.

Pennsylvanian System. — The Pennsylvanian or Upper Carboni- ferous system overlies the Mississippian unconformably over a large part of the United States. In the eastern half of the country the system consists of shales and sandstones chiefly, but there is some limestone, and coal enough to be of great importance economically, though it makes but a small part of the system quantitatively. The larger part of the system in this part of the country is not of marine origin ; yet the sea had access to parts of the interior more than once, as shown by the marine fossils in some of the beds. The dominantly terrestrial formations of the eastern half of the country are in con- trast with the marine formations of the west. The line separating the two phases of the system is a little east of the 100th meridian. West of the Mississippi the Coal Measures are subdivided into two series, the Des Moines below and the Missouri above. In the eastern part of the country (Pennsylvania, Ohio, &c.) the system is divided into four principal parts: —

" 4. Monongahela formation (or series) — Upper Productive Coal Measures. 3 Conemaugh formation (or series) — Lower Pennsylvanian . . < Barren Coal Measures.

. Allegheny formation (or series) — Lower

Productive Coal Measures. . Pottsville formation (or series).

The Pottsville formation is chiefly clastic, and corresponds roughly to the Millstone Grit of England. The Allegheny and

Mononga- hela series contain most of the coal, though it is not wanting in the other subdivisions of the system. Productive coal beds are found in five principal fields. These are (1) the Anthracite field in eastern Pennsylvania, nearly 500 sq. m. in extent; (2) the Appalachian field, having an area of about 71,000 sq. m. (75 % being pro- ductive), and extending from Pennsylvania to Alabama; (3) the northern interior field, covering an area of about 11,000 sq. rn. in southern Michigan; (4) the eastern interior field in Indiana, Illinois and Kentucky, with an area of about 58,000 sq. m. (55 % being productive) ; and (5) the western interior and south- western field, some 94,000 sq. m. in extent, reaching from Iowa on the north to Texas on the south. There is also a coalfield in Nova Scotia and New Brunswick, about 18,000 sq. m. in extent. Some of the well-known beds of coal are known to be continuous for several thousands of square miles.

Unlike the older systems of the Palaeozoic, the Pennsylvanian system has not its maximum thickness in the Appalachian Mountains, but in Arkansas, in a region which was probably adjacent to high lands at that time. These lands perhaps lay in the present position of the Ouachita Mountains.

The close of the Pennsylvanian period was marked by the beginning of profound changes, changes in geography and climate, and therefore changes in the amount and habitat of life, and in the sites of erosion and sedimentation. One of the great changes of this time was the beginning of the development of the Appalachian Mountain system. The site of these mountains had been, for the most part, an area of deposition throughout the Palaeozoic era, and the body of sediments which had gathered here at the western base of Appalachia, by the close of the Pennsylvanian period, was very great. At this time these sediments, together with some of Appa- lachia itself, began to be folded up into the Appalachian Mountains. These mountains have since been worn down, so that, in spite of their subsequent periods of growth, their height is not great.

The chief interest of the palaeontology of this system is in the plants, which were very like those of the Coal Measures of other parts of the earth and showed a high development of forms that are now degenerate. Among land animals the amphibia had great develop- ment at this time. So also had insects and some other forms, of land life.

Permian Period. — The Permian system appears in smaller areas in the United States than any other Palaeozoic system. The " Upper Barren Coal Measures " of some parts of the east (Ohio, Pennsylvania, &c.) are now classed as Permian on the basis of their fossil plants. They represent but a part of the Permian period, and are commonly described under the name of the Dunkard series.

The system has much more considerable development west of the Mississippi than east of it, especially in Texas, Kansas, Nebraska and beyond. Some of the Permian beds of this region are marine, while others are of terrestrial origin. In this part of the country the Permian beds are largely red sandstone, often saliferous and gypsi- ferous. They are distinguished with difficulty from the succeeding Triassic, for the beds have very few fossils. The system has its maximum known thickness in Texas, where it is said to be 7000 ft. in maximum thickness. West of the Rocky Mountains the Permian has not been very generally separated from overlying and underlying formations, though it has been differentiated in a few places, as in south-western Colorado and in some parts of Arizona. Perhaps the most remarkable feature of the palaeontology of the system is its paucity of fossils, especially in those parts of the system, such as the Red Beds, which are of terrestrial origin.

In the United States no direct evidence has been found of the low temperature which brought about glaciation in many other parts of the earth during this period. Salt and gypsum deposits, and other features of the Permian beds, together with the fewness of fossils, indicate that the climate of the Permian was notably arid in many regions.

Triassic System. — This system has but limited representation in the eastern part of the United States, being known only east of the Appalachian Mountains in an area which was land throughout most of the Palaeozoic era, but which was deformed when the eastern mountains were developed at the close of the Palaeozoic. In the troughs formed in its surface during this time of deformation, sedi- ments of great thickness accumulated during the Triassic period. These sediments are now mostly in the form of red sandstone and shale, with conglomerate, black shale and coal in some places. These rocks do not represent the whole of the period. They are often known as the Newark series, and seem to be chiefly, if not wholly, of terrestrial origin. The sedimentary rocks are affected by many

dikes and sheets of igneous rock, some of the latter being extrusive and some intrusive. The strata are now tilted and much faulted, though but little folded. In the western plains and in the western mountains the Triassic is not clearly separated from the Permian in most places. So far as the system is differentiated, it is a part of the Red Beds of that region. The tendency of recent years has been to refer more and more of these beds to the Permian. The

Triassic system is well developed on the Pacific coast, where its strata are of marine origin, and they extend inland to the Great Basin region.

The climate of the period, at least in its earlier part, seems to have been arid like that of the Permian, as indicated both by the paucity of fossils and by the character of the sediments. The salt and gypsum constitute a positive argument for aridity. The character of some of the conglomerate of the Newark series of the east, and the wide- spread redness of the beds, so far as it is original, also point to aridity.

As in other parts of the earth, the Triassic was the age of gymno- sperms, which were represented by diverse types. Reptiles were the dominant form of animals, and land reptiles (dinosaurs) gained over their aquatic allies.

Jurassic System. — This system is not known with certainty in the eastern half of the United States, though there are some beds on the mid-Atlantic coast, along the inland border of the coastal plain, which have been thought by some, on the basis of their reptilian fossils, to be Jurassic. The lower and middle parts of the system are but doubtfully represented in the western interior. If present, they form a part of the Red Beds of that region. On the Pacific coast marine Jurassic beds reach in from the Pacific to about the same distance as the Triassic system. The Upper Jurassic formations are much more widely distributed. During the later part of the period the sea found entrance at some point north of the United States to a great area in the western part of the continent, developing a bay

which extended far down into the United States from Canada. In this great bay formations of marine origin were laid down. At the same time marine sedimentation was continued on the Pacific coast, but the faunas of the west coast and the interior bay are notably unlike, the latter being more like that of the coast north of the United States. This is the reason for the belief that the bay which extended into the United States had its connexion with the sea north of the United States.

The Jurassic faunas of the United States were akin to those of other continents. The great development of reptiles and cephalo- pods was among the notable features. At the close of the period there were considerable deformations in the west. The first notable folding of the Sierras that has been definitely determined dates from this time, and many other mountains of the west were begun or rejuvenated. The close of the period, too, saw the exclusion of the sea from the Pacific coast east of the Sierras, and the disappearance, so far as the United States is concerned, of the great north-western bay of the late Jurassic. Before the close of the period, the aridity which had obtained during the Permian, and at least a part of the Triassic, seems to have disappeared.

Comanchean System. — This system was formerly classed as the lower part of the Cretaceous, but there are strong reasons for regard- ing it as a separate system. Its distribution is very different from that of the Upper Cretaceous, and there is a great and widespread unconformity between them. The faunas, too, are very unlike. The Comanchean formations are found (l) on the inland border of the coastal plain of the Atlantic (Potomac series) and Gulf coasts (Tuscaloosa series at the east and Comanchean at the west) ; (2) along the western margin of the Great Plains and in the adjacent moun- tains; and (3) along the Pacific coast west of the Sierras. In the first two of these positions, the formations show by their fossils that they are of terrestrial origin in some places, and partly of terrestrial and partly of marine origin in others. In the coastal plain the Comanchean beds are generally not cemented, but consist of gravel, sand and clay, occupying the nearly horizontal position in which they were originally deposited. Much plastic clay and sand are derived from them. In Texas, whence the name " Comanchean " comes, and where different parts of the system are of diverse origins, there is some limestone. This sort of rock increases in importance southward and has great development in Mexico. In the western interior there is difference of opinion

as to whether certain beds rich in reptilian remains (the Morrison, Atlantosaurus, Como, &c.) should be regarded as Jurassic or Comanchean. On the western coast the term Shastan is sometimes applied to Lower Cretaceous. In the United States, marine Shastan beds are restricted to the area west of the Sierras, but they here have great thickness.

Widespread' changes at the end of the period exposed the areas where deposition has been in progress during the period to erosion, and the (Upper) Cretaceous formations rest upon the Comanchean unconformably in most parts of the country. The Comanchean system contains the oldest known remains of netted-veined leaved plants, which mark a great advance in the vegetable world. Reptiles were numerous and of great size. They were the largest type of life, both on land and in the sea.

Cretaceous System. — This system is much more extensively deve- loped in the United States than any other Mesozoic system. It is found (1) on the Atlantic coastal plain, where it laps up on the Comanchean, or over it to older formations beyond its inland margin ;

(2) on the coastal plain of the Gulf region in similar relations;

(3) over the western plains; (4) in the western mountains; and (5) along the Pacific coast. Unlike the Comanchean, the larger part of the Cretaceous system is of marine origin. The distribution of the beds of marine origin shows that the sea crept up on the eastern and southern borders of the continent during the period, covered the

western plains, and formed a great mediterranean sea between the eastern and western lands of the continent, connecting the Gulf of Mexico on the south and the Arctic Ocean on the north. This widespread submergence, followed by the deposition of marine sediments on the eroded surface of Comanchean and older rocks, is the physical reason for the separation of the system from the Comanchean. This reason is reinforced by palaeontological considerations.

Both on the Atlantic and over the western plains the system is divided into four principal subdivisions : —

Atlantic Coast. 4. Manasquan formation. 3. Rancocas formation. 2. Monmouth formation. I. Matawan formation.

Western Plains. 4. Laramie. 3. Montana: Fox Hills; Fort

Pierre. 2. Colorado: Niobrara; Benton. 1. Dakota.

The most distinctive feature of the Cretaceous of the Atlantic coastal plain is its large content of greensand marl (glauconite). The formations are mostly incoherent, and have nearly their original position. In the eastern Gulf states there is more calcareous material, represented by limestone or chalk. In the Texan region and farther north the limestone becomes still more important. In the western plains, the first and last principal subdivisions of the system (Dakota and Laramie) are almost wholly non-marine. The Dakota formation is largely sandstone, which gives rise to " hog- backs " where it has been tilted, indurated and exposed to erosion along the eastern base of the Rocky Mountains. The Colorado series contains much limestone, some of which is in the form of chalk. This is par excellence the chalk formation of the United States. That the chalk was deposited in shallow, clear seas is indicated both by the character of the fossils other than foraminifera and by the relation of the chalk to the clastic portions of the series. The Montana series, most of which is marine, was deposited in water deeper than that of the Colorado epoch, though the series is less widespread than the preceding. The Laramie is the great coal- bearing series of the west, and corresponds in its general physical make-up and in its mode of origin to the Coal Measures of the east. The coal-bearing lands of the Laramie have been estimated at not less than 100,000 sq. m. On the Pacific coast the Cretaceous formations are sometimes grouped together under the name of Chico. The distribution of the Chico formations is similar to that of the Comanchean system in this region.

The Cretaceous system is thick. If maximum thicknesses of its several parts in different localities, as usually measured, are added together, the total would approach or reach 25,000 ft. ; but the strata of any one region have scarcely more than half this thickness, and the average is much less.

The close of the period was marked by very profound changes which may be classed under three general headings: (1) the emer- gence of great areas which had been submerged until the closing stages of the period ; (2) the beginning of the development of most of the great mountains of the west ; (3) the inauguration of a protracted period of igneous activity,

stimulated, no doubt, by the crustal and deeper-seated movements of the time. These great changes in the relation of land and water, and in topography, led to corre- spondingly great changes in life, and the combination marks the transition from the Mesozoic to the Cainozoic era.

Tertiary Systems. — The formations of the several Tertiary peripds have many points of similarity, but in some respects they are sharply differentiated one from another. They consist, in most parts of the country, of unconsolidated sediments, consisting of gravel, sand, clay, &c, together with large quantities of tuff, volcanic agglomerate, &c. Some of the sedimentary formations are of marine, some of brackish water, and some of terrestrial origin. In the western part of the country there are, in addition, very extensive flows of lava covering in the aggregate some 200,000 sq. m. Terres- trial sedimentation was, indeed, a great feature of the Tertiary. This was the result of several conditions, among them the recent development, through warping and faulting and volcanic extrusion, of high lands with more or less considerable slopes. From these high lands sediments were borne down to lodge on the low lands adjacent. The sites of deposition varied as the .period progressed, for the warping and faulting of the surface, the igneous extrusions, and the deposition of sediments obliterated old basins and brought new ones into existence. The marine Tertiary formations are confined to the borders of the continent, appearing along the Atlan- tic, Gulf and Pacific coasts. The brackish water formations occur in some parts of the same general areas, while the terrestrial forma- tions are found in and about the western mountains. As in other parts of the world, the chiefest palaeontological interest of the Tertiary attaches to the mammalian fossils.

The Eocene beds are unconformable, generally, upon the Creta- ceous, and unconformable beneath the Miocene. On the Atlantic coast they are nearly horizontal, but dip gently seaward. Eocene On this coast they are nowhere more than a few System. hundred feet thick. In the Gulf region the system is more fully represented, and attains a greater thickness — 1700 ft. at least. In the Gulf region the Eocene system contains not a little

fiddle Eocene. Lower Eocene.

non-marine material. Thus the lower Eocene has some lignite in the eastern Gulf region, while in Texas lignite and saliferous and gypsiferous sediments are found, though most of the system is marine and of shallow water origin. The Eocene of the western Gulf region is continued north as far as Arkansas. The classifica- tion of the Eocene (and Oligocene) formations in the Gulf region, especially east of the Mississippi, is as follows: —

4. Jacksonian . Upper Eocene

3. Claibornian Mil" "

2. Chickasawan /

I. Midwayan)

The Jacksonian is sometimes regarded as Oligocene. This classification is based almost wholly on the fossils, for there seems to be little physical reason for the differentiation of the Oligocene anywhere on the continent.

On the Pacific coast the marine Eocene lies west of the Sierras, and between it and the Cretaceous there is a general, and often a great, unconformity. The system has been reported to have a thickness of more than 7000 ft. in some places, and locally (e.g. the Pescadero formation) it is highly metamorphic. The Eocene of southern California carries gypsum enough to be of commercial value. It is also the source of much oil. The system is wanting in northern California and southern Oregon, but appears again farther north, and has great development in Oregon, where its thickness has been estimated at more than 10,000 ft. As in other comparable cases, this figure does not make allowance for the oblique attitude in which the sediments were deposited, and should not be construed to mean the vertical thickness of the system.

In Washington the Eocene is represented by the Puget series of brackish water beds, with an estimated thickness exceeding that of the marine formations of Oregon. Workable coal beds are distributed through 3000 ft. of this series. The amount of the coal is very great, though the coal is soft.

Terrestrial Eocene formations — eolian, fluvial, pluvial and lacus- trine — are widespread in the western part of the United States, both in and about the mountains. By means of the fossils, several more or less distinct stages of deposition have been recognized. Named in chronological order, these are : —

1. The Fort Union stage, when the deposition was widespread about the eastern base of the northern part of the Rocky Mountains, and at some points in Colorado (Telluride formation) and New Mexico (Puerco beds), where volcanic ejecta entered largely into the formation. The Fort Union stage is closely associated with the Laramie, and their separation has not been fully effected.

2. The Wasatch stage, when deposition was in progress over much of Utah and western Colorado, parts of Wyoming, and elsewhere.

3. The Bridger stage, when deposition was in progress in the - Wind River basin, north of the mountain of that name, and in the

basin of Green river.

4. The Uinta stage, when the region south of the mountains of that name, in Utah and Colorado, was the site of great deposition.

More or less isolated deposits of some or all of these stages are found at numerous points in the western mountain region. The present height of the deposits, in some places as much as 10,000 ft-, gives some suggestion of the changes in topography which have taken place since the early Tertiary. The thickness of the system in the west is great, the formations of each of the several stages mentioned above running into thousands of feet, as thicknesses are commonly measured.

The Miocene system, generally speaking, has a distribution similar to that of the Eocene. The principal formation of the „. Atlantic coastal plain is the Chesapeake formation,

oceae largely of sand. In Florida the system contains ‘ calcium phosphate of commercial value. The Miocene of the Atlantic and Gulf regions nowhere attains great thickness. The oil of Texas and Louisiana is from the Miocene (or possibly Oligocene) dolomite. On the Pacific coast the system has

greater development. It contains much volcanic material, and great bodies of siliceous shale, locally estimated at 4000 ft. thick and said to be made up largely of the secretions of organisms. Such thicknesses of such material go far to modify the former opinion that the Tertiary periods were short. The Miocene of California is oil- producing. The terrestrial Miocene formations of the western part of the country are similar in kind, and, in a general way, in distribution, to the Eocene of the same region. The amount of volcanic material, consisting of both pyrOclastic material and lava flows, is great.

At the close of the Miocene, deformative movements were very widespread in the Rocky Mountains and between the principal development of the Coast ranges of California and Oregon, and mountain-making movements, new or renewed, were somewhat general in the west. At the close of the period the topography of the western part of the country must have been comparable to that of the present time. This, however, is not to be interpreted to mean that it has remained unmodified, or but slightly modified since that time. Subsequent erosion has changed the details of topography on an extensive scale, and subsequent deformative movements have renewed large topographic features where erosion had destroyed those developed by the close of the Miocene. But

in spite of these great changes since the Miocene, the great outlines of the topography of the present were probably marked out by the close of that period. Volcanic activity and faulting on a large scale attended the deformation of the closing stages of the Miocene.

The Pliocene system stands in much the same stratigraphic relation to the Miocene as the Miocene does to the Eocene. The marine Pliocene has but trifling development on the Atlantic pliocene coast north of Florida, and somewhat more extensive System. development in the Gulf region. The marine Pliocene of the continent has its greatest development in California (the Merced series, peninsula of San Francisco), where it is assigned a maximum thickness of nearly 6000 ft., and possibly as much as 13,000 ft. This wide range is open to doubt as to the correlation of some of the beds involved. Thicknesses of several thousand feet are recorded at other points in California and elsewhere along the coast farther north. Marine Pliocene beds are reported to have an altitude of as much as 5000 ft. in Alaska. The position of these beds is significant of the amount

of change which has taken place in the west since the Pliocene period. The non-marine formations of the Pliocene are its most characteristic feature. They are widely distributed in the western mountains and on the Great Plains. In origin and character, and to some extent in distribution, they are comparable with the Eocene and Miocene formations of the same region, and still more closely comparable with deposits now making. In addition to these non-marine formations of the west, there is the widespread Lafayette formation, which covers much of the Atlantic and Gulf coastal plain, reaching far to the north from the western Gulf region, and having uncertain limits, so far as now worked out, in various directions. The Lafayette for- mation has been the occasion of much difference of opinion, but is by many held to be a non-marine formation, made up of gravels, sands and clays, accumulated on land, chiefly through the agency of rain and rivers. Its deposition seems to have followed a time of deformation which resulted in an increase of altitude in the Appa- lachian Mountains, and in an accentuation of the contrast between the highlands and the adjacent plains. Under these conditions sediments from the high lands were washed out and distributed widely over the plains, giving rise to a thin but widespread forma- tion of ill-assorted sediment, without marine fossils, and, for the most part, without fossils of any kind, and resting unconformably on Cretaceous, Eocene and Miocene formations. To the seaward the non-marine phase of the formation doubtless grades into a marine phase along the shore of that time, but the position of this shore has not been defined. The marine- part of the Lafayette is probably covered by sediments of later age.

In earlier literature the Lafayette formation was described under the name of Orange Sand, and was at one time thought to be the southern equivalent of the glacial drift. This, however, is now known not to be the case, as remnants of the formation, isolated by erosion, lie under the old glacial drift in Illinois, and perhaps else- where. It seems probable that the Lafayette formation of the Gulf coastal plain is continuous northward and westward with gravel deposits on the Great Plains, washed out from the Rocky Mountains to the west. The careful study of these fluvial formations is likely to throw much light on the history of the deformative movements and changes in topography in the United States during the late stages of geological history.

Deformative movements of the minor sort seem to have been in progress somewhat generally during the Tertiary periods, especially in the western part of the country, but those at the close of the Pliocene seem to have exceeded greatly those of the earlier stages. They resulted in increased height of land, especially in the west, and therefore in increased erosion. This epoch of relative uplift and active erosion is sometimes called the Sierran or Ozarkian epoch. The details of the topography of the western mountains are largely of post-Pliocene development. The summits of some of the high mountains, such as the Cascades, appear to be remnants of a peneplain developed in post-Miocene time. If so, the mountains themselves must be looked upon as essentially post-Pliocene. De- formative movements resulting in close folding were not common at this time, but such movements affected some of the coast ranges of California. This epoch of great deformation and warping marks the transition from the Tertiary to the Quaternary.

Quaternary Formations. — The best-known formations of the Quaternary period are those deposited by the continental glaciers which were the distinguishing feature of the period ataclaL and by the waters derived from them. The glacial drift covers something like half of the continent, though much less than half of the United States. Besides the drift of the ice-sheets, there is much drift in the western mountains, deposited by local glaciers. Such glaciers existed in all the high mountains of the west, even down to New Mexico and Arizona.

The number of glacial epochs now recognized is five, rrot Counting minor episodes. Four defined zones of interglacial deposits are detected, all of which are thought to represent great recessions of the ice, or perhaps its entire disappearance. The climate of some of the interglacial epochs was at least as warm as that of the present time in the same regions. The glacial epochs which have been

differentiated are the following, numbered in chronological order: (5) Wisconsin, (4) Iowan, (3) Illinoian, (2) Kansan, (1)

Sub- Aftonian, or Jerseyan. Of these, the Kansan ice-sheet was the most extensive, and the later ones constitute a diminishing series.

Essentially all phases of glacial and aqueo-glacial drift are repre- sented. The principal terminal moraines are associated with the ice of the Wisconsin epoch. Terminal moraines at the border of the Illinoian drift are generally feeble, though widely recognizable, and such moraines at the margin of the Iowan and Kansan drift sheets are generally wanting. The edge of the oldest drift sheet is buried by younger sheets of drift in most places.

Loess is widespread in the Mississippi River basin, especially along the larger streams which flowed from the ice. Most of the loess is now generally believed to have been deposited by the wind. The larger part of it seems to date from the closing stages of the Iowan epoch, but loess appears to have come into existence after other glacial epochs as well. Most of the fossils of the loess are shells of terrestrial gastropods, but bones of land mammals are also found in not a few places. Some of the loess is thought to have been derived by the wind from the surface of the drift soon after the retreat of the ice, before vegetation got a foothold upon the new-made deposit ; but a large part of the loess, especially that associated with the main valleys, appears to have been blown up on to the bluffs of the valleys from the flood plains below. As might be expected under these conditions, it ranges from fine sand to silt which ap- proaches clay in texture. Its coarser phases are closely associated with dunes in many places, and locally the loess makes a considerable part of the dune material.

Much interest attaches to estimates of time based on data afforded by the consequences of glaciation. These estimates are far apart, and must be regarded as very uncertain, so far as actual numbers are concerned. The most definite are connected with estimates of the time since the last glacial epoch, and are calculated from the amount and rate of recession of certain falls, notably those of the Niagara and Mississippi (St Anthony Falls) rivers. The estimate of the time between the first and last glacial epochs is based on changes which the earlier drift has undergone as compared with those which the younger drift has undergone. Some of the estimates make the lapse of time since the first glacial epoch more than a million years, while others make it no more than one-third as long. The time since the last

glacial epoch is but a fraction of the time since the first — probably no more than a fifteenth or a twentieth.

Outside the region affected by glaciation, deposits by wind, rain, rivers, &c, have been building up the land, and sedimentation has been in progress in lakes and about coasts. The non- glacial deposits are much like the Tertiary in kind and distribution, except that marine beds have little representation on the land. On the coastal plain there is the Columbia series of gravels, sands and loams, made up of several members. Its distribution is similar to that of the Lafayette, though the Co- lumbia series is, for the most part, confined to lower levels. Some of its several members are definitely correlated in time with some of the glacial epochs. The series is widespread over the lower part of the coastal plain. In the west the Quaternary deposits are not, in all cases, sharply separated from the late Tertiary, but the deposits of glacial drift, referable to two or more glacial epochs, are readily differentiated from the Tertiary; so, also, are certain lacustrine deposits, such as those of the extinct lakes Bonneville and Lahontan. On the Pacific coast marine Quaternary formations occur up to elevations of a few scores of feet, at least, above the sea.

Igneous rocks, whether lava flows or pyroclastic ejections, are less important in the Quaternary than in the Tertiary, though volcanic activity is known to have continued into the Quaternary. The Quaternary beds of lakes Bonneville and Lahontan have been faulted in a small way since they were deposited, and the old shore lines of these lakes have been deformed to the extent of hundreds of feet. So also have the shorelines of the Great Lakes, which came into existence at the close of the glacial period.

Much has been written and more said concerning the existence of man in the United States before the last glacial epoch. The present state of evidence, however, seems to afford no warrant for the conclusion that man existed in the United States before the end of the glacial period. Whatever theoretical reasons there may be for assuming his earlier existence, they must be held as warranting no more than a presumptive conclusion, which up to the present time lacks confirmation by certain evidence.

The following sections from selected parts of the country give

some idea of the succession of beds in various type regions. The thicknesses, especially where the formations are metamorphosed, are uncertain.

West Central Massachusetts Triassic.

Chicopee shale 200 ft. (?)

Granby tuff 580 ,,

Blackrock diabase (cones and dikes).

Longmeadow sandstone iooo ,,

Sugarloaf arkose 4660 „

Mount Toby conglomerate. Unconformity.

Nan- glacial.

Devonian.

Bernardston series 1950 ft.

Unconformity. Silurian.

Leyden argillite 300 ft.

Conway schist “|

Amherst schist ” [-5000 „ (?)

Brinfield fibrolite-schist J

Goshen schist 2000 „ (?)

Unconformity. Ordovician.

Hawley schist 2000 ft. (?)

Savoy schist 5000 ,, (?)

Chester amphibolite 3000 „ (?)

Rowe schist 4000 ,, (?)

Hoosic schist 1500 ,, (?)

Unconformity. Cambrian.

Becket gneiss 2000 ft.(?)

Unconformity. Proterozoic.

Washington gneiss 2000 ft.(?)

(Base not exposed.)

The above section is fairly representative for considerable parts of New England.

West Virginia, &c. Pennsylvanian.

(Top of system removed by erosion.)

Braxton formation 700 ft.

Upshur sandstone 300- 500 „

Pugh formation 300- 450 „

Pickens sandstone 400— 500 „

Unconformity. Mississippian.

Canaan formation 1000-1300 ft.

Greenbrier limestone 350- 400 „

Pocono sandstone 70- 90 „

Devonian.

Hampshire formation 1500-1800 ft.

Jennings formation 3000-3800 „

Romney shale 1000-1300 „

Unconformity.

Monterey sandstone 50- 200 ft.

Silurian.

Lewiston limestone . . . • . . . . 550-1050 ft.

Rockwood formation 100- 800 ,,

Cacapon sandstone 100- 630 ,,

Tuscarora quartzite 30- 300 ,,

Juniata formation 205-1250 ,,

Ordovician.

Martinsburg shale 800-1800 ft.

Middle and Upper Cambrian.

Shenandoah limestone 2400 ft.

(Base not exposed.) This section is fairly representative for the Appalachian Mountain

tract, though the Cambrian is often more fully represented.

Ohio Permian.

Dunkard formation

Pennsylvanian.

Monongahela formation 200— 250

Conemaugh formation 400- 500

Alleghany formation 165- 300

Pottsville conglomerate 250

Unconformity. Mississippian.

Maxville limestone c. 25

Waverley series —

Logan group 100- 150

Black Hand conglomerate 50- 500

Cuyahoga shale 150- 300

Sunbury shale 5-30

Berea grit 5- 175

Bedford shale 50- 150

Devonian.

Ohio shale 300-2600

Olentangy shale ˆo- 35

Delaware limestone 30- 40

Columbus limestone no

Silurian.

Monroe formation 50- 600

Niagara group 150- 350

Clinton limestone ‘ 10- 50

Medina shales (?) . so- I so

(Belfast bed.)

c 25

ft.

ft.

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Ordovician.

Saluda beds

. . . 20 ± ft.

Richmond formation .

. . . 300 ± „

Lorraine formation

*. . . 300 = *= „*

Eden (Utica) shale

• • • 250 „

Trenton limestone ....

... 130 „

Iowa

Glacial drift. Unconformity. Upper Cretaceous.

Benton formation o- 150 ft.

Dakota formation 50- 100 ,,

Unconformity. Pennsylvanian.

Missouri formation 1500 it.

Des Moines formation 250- 400,,

Unconformity. Mississippian.

St Louis limestone 100 ft.

Osage (Augusta) formation 200- 300 ,,

Kinderhook formation 150- 200 „

Devonian.

Lime Creek formation 80 ft.

State Quarry beds 20- 40 ,,

Sweetland Creek shales 20- 40 ,,

Unconformity.

Cedar Valley limestone 250- 300 ft.

Wapsipinicon formation (Independence,

Fayette, Davenport) 100- 150 ,,

Silurian.

Anamosa limestone 50- 75 ft.

Le Claire limestone 50 ,,

Delaware stage 200 ,,

Unconformity. Ordovician.

Maquoketa shales 175 ft.

Possible Unconformity.

Galena- Trenton limestone 290 ft.

St Peters sandstone 100 ,,

Oneota formation (includes Shakopee, New

Richmond and Oneota proper) . . . 300 ,,

Cambrian.

St Croix sandstone (= Potsdam) . . . . 1 000 ft.
Unconformity. Proterozoic.

Sioux quartzite (?)

This section is fairly representative for much of the central Mississippi Basin.

Oklahoma

Pennsylvanian.

(Summit removed by erosion.) Seminole conglomerate

Holdenville shale

Wewaka formation .... Wetumka shale.

50 ft.

260 ,,

700 „

120 ,,

Calvin sandstone H5~ 240

Senora formation 140- 485 ,,

Stuart shale 90- 280 ,,

Thurman sandstone 80- 260 ,,

Boggy shale 2000-2600 ,,

Savannah sandstone 750-1100 ,,

McAlester shale 1 150-1500,,

Hartshorne sandstone 150- 200 ,,

Atoka formation (Chickahoc chert lentil) . 3200 ,, Wapanucka limestone 100- 150 ,,

Mississippian .

Caney shale 1500 ft.

Devonian.

Woodford chert 600 ft.

Silurian.

Hunton limestone 160 ft.

Sylvan shale (upper part) 50- 100 ,,

Ordovician-

Sylvan shale (lower part) 250 ft.

Viola limestone ‘ 750 ,,

Simpson series 1600 „

Arbuckle limestone 4000-6000 „

Cambrian.

Regan sandstone …… 50- 100 ft.

Unconformity.

Pre- Cambrian.

Tishomingo granite (?)

Composite section. The upper part is taken from vicinty of Coalgate, the lower part from the vicinity of Atoka.

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West Central Colorado

Eocene or later.

West Elk breccia 3000 ft.

Unconformity. Cretaceous.

Ruby formation 2500 ft.

Unconformity.

Ohio formation (local only) 200 ft.

Unconformity.

Laramie formation 2000 ft.

Montana formation 2800 „

Niobrara formation 100- 200 ,,

Benton formation 150- 300 ,,

Dakota formation 40- 300 „

Jurassic.

Gunnison formation 350- 500 ft.

Unconformity. Pennsylvanian.

Maroon conglomerate 4500 ft.

Possible unconformity.

Weber limestone 100- 550 ft.

Unconformity. Mississippian.

Leadville limestone 400- 525 ft.

Apparent unconformity. Ordovician.

Yule limestone 350- 450 ft.

Upper Cambrian.

Sawatch quartzite 50- 350 ft.

Unconformity. Archean.

The Bighorn Mountains of Wyoming Cretaceous.

De Smet formation (shale and sandstone) . 4000 ft.

Kingsbury conglomerate 0-1500 „

Piney formation (shale and sandstone) . . 2500 ,,

Parkman sandstone ‘ 350 „

Pierre shale 1500-3500 „

Colorado formation 1 050-1 700 ,,

Comanchean.

Cloverly formation (upper part may be

Cretaceous) . . _ 30- 300 ft.

Morrison formation (may be Jurassic) . 100- 300 ,, Jurassic.

Sundance formation 250- 350 ft.

Unconformity. Triassic and Permian.

Chugwater formation 750-1200 ft.

Pennsylvanian.

Tensleep sandstone 30- 150 ft.

Amsden sandstone T 5o- 350 ,,

Mississippian.

Madison limestone 1000 ft.

Unconformity. Ordovician.

Bighorn limestone 300 ft.

Unconformity. Cambrian {Upper).

Deadwood formation 900 ft.

Unconformity. Pre- Cambrian. Granites. This section is fairly representative for the Rocky Mountains.

Southern California Quaternary.

Alluvium, &c.

Terrace deposits and dune sand. Pliocene (?)

Paso Robles formation 1000+ft.

Unconformity. Miocene (?)

Pismo formation (in south part of area) . 3000 == ft. Santa Margarita (in north part of area) . 1550=*= ,, Unconformity. Miocene.*

Monterey shale. ..... 5000-7000 ft.

Vaquero sandstone o- 500 „

Unconformity. Cretaceous.

Atascadero formation ..... 3000-4000 ft.

Unconformity. Comanchean.

Toro formation (Knoxville) ..... 3000 == ft.*

Unconformity.

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Jura-Trias.

San Luis formation (Franciscan) . . . 1000== ft.*

Unconformity.

Granite — age undetermined. This section is representative of

the southern Pacific coast.

Section in Central Washington Pliocene (?).

Howson andesite 250 ft.

Miocene.

Keechelus andesite series 4000 ft.

Unconformity. Guye formation (sedimentary beds with

some lava flows) 35°° ± ft.

Eocene.

Roslyn formation (sandstone and shale ;

coal) c. 3000 ft.

Teanaway basalt 4000 ,,

Kachess rhyolite 0-2000 ,,

Swauk formation (clastic rocks with some

tuff, &c.) 200-5000 „

Unconformity.

Pre-Tertiary.

Igneous and metamorphic rocks.

This section is representative of the north-west part of the country.

Bibliography. — A detailed bibliography for North American geology from 1732 to 1891, inclusive, is given in U.S. Geological Survey Bulletin 127 (1896); for 1892-1900 in Bulletin 188 (1902); for 1901-1905 in Bull. 301 (1906) ; for 1906-1907 in Bull. 372 (1909) ; for 1908 in Bull. 409 (1909), &c. A few of the more important and available publications are enumerated below.

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New York) ; J. D. Dana, Manual of Geology (New York, 1862); W. B. Scott, Introduction to Geology (New York, 1897); and Joseph Le Conte, Elements of Geology (New York, 1878).

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III. — Climate The chief features of the climate of the United States may be best apprehended by relating them to the causes by which they are controlled. Two leading features, from which many others follow, are the intermediate value of the mean annual temperatures and the prevalence of westerly winds, with which drift the areas of high and low pressure — cyclonic and anticyclonic areas — controlling the short-lived, non-periodic weather changes. The first of these features is determined by the intermediate position of the United States between the equator and the north pole; the second by the equatorial-polar temperature contrast and the eastward rotation of the planet. Next, dependent on the inclination of

the earth's axis, is the division of the planetary year into the terrestrial seasons, with winter and summer changes of temperature, wind-strength and precipitation; these seasonal changes are not of the restrained measure that is characteristic of the oceanic southern temperate zone, but of the exaggerated measure appropriate to the continental interruptions of the northern land-and-water zone, to which the term " temperate " is so generally inapplicable. The effects of the continent are already visible in the mean annual temperatures, in which the poleward temperature gradient is about twice as strong as it is on the neighbouring oceans ; this being a natural effect of the immobility of the land surface, in contrast to the circulatory movement of the ocean currents, which thus lessen the temperature differences due to latitude: on the continent such differences are developed in full force. Closely associated with the effect of conti- nental immobility are the effects dependent on the low specific heat

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and the opacity of the lands, in contrast with the high specific heat and partial transparence of the ocean waters. In virtue of these physical characteristics, the air over the land becomes much warmer in summer and much colder in winter than the air over the oceans in corresponding latitudes ; hence the seasonal changes of temperature in the central United States are strong; the high temperatures appro- priate to the torrid zone advance northward to middle latitudes in summer, and the low temperatures appropriate to the Arctic regions descend almost to middle latitudes in winter. As a result, the isotherms of July are strongly convex poleward as they cross the United States, the isotherm of 70 sweeping up to the northern boundary in the north-west, and the heat equator leaping to the over- heated deserts of the south-west, where the July mean is over 90 °. Conversely, the isotherms of January are convex southward, with a monthly mean below 32 ° in the northern third of the interior, and of zero on the mid-northern boundary. The seasonal bending of the isotherms is, however, unsymmetrical for several reasons. The continent being interrupted on its eastern side by the Gulf of Mexico and Hudson Bay, with the Great Lakes between these two large water bodies, the northward bending of the July isotherms is most pronounced in the western part of the United States.

Indeed the contrast between the moderate temperatures of the Pacific coast and the overheated areas of the next interior deserts is so great that the isotherms trend almost parallel to the coast, and are even " overturned " somewhat in southern California, where the most rapid increase of temperatures in July is found not by moving southward over the ocean toward the equator, but north-eastward over the land to the deserts of Nevada and Arizona. So strong is the displacement of the area of highest interior temperatures west- ward from the middle of the continent that the Gulf of California almost rivals the Red Sea as an ocean-arm under a desert-hot atmo- sphere. In the same midsummer month all the eastern half of the United States is included between the isotherms of 66° and 82°; the contrast between Lake Superior and the coast of the Gulf of Mexico, 1200 m. to the south, is not so great as between the coast of southern California and the desert 150 m. inland to the north-east. In January the northern water areas of the continent are frozen and snow-covered; Hudson Bay becomes unduly cold, and the greatest southward bending of the isotherms is somewhat east of the conti- nental axis, with an extension of its effects out upon the Atlantic; but the southward bending isotherms are somewhat looped back about the unfrozen waters of the lower Great Lakes. In the mid-winter month, it is the eastern half of the country that has strong temperature contrasts ; the temperature gradients are twice as strong between New Orleans and Minneapolis as on the Pacific coast, and the contrast between Jacksonville, Fla., and Eastport, Me., is about the same as between San Diego, Cal., and the Aleutian Islands.

The strong changes of temperature with the seasons are indicated also by the distribution of summer maxima and winter minima; summer temperatures above 112° are known in the south-western deserts, and temperatures of ioo° are sometimes carried far north- ward on the Great Plains by the " hot winds " nearly to the Canadian boundary; while in winter, temperatures of -40° occur along the mid-northern boundary and freezing winds sometimes sweep down to the border of the Gulf of Mexico. The temperature anomalies are also instructive: they rival those of Asia in value, though not in area, being from 15° to 20° above the mean of their latitude in the northern interior in summer, and as much below in winter. The same is almost true of the mean annual range (mean of July to mean of January), the states of the northern prairies

and plains having a mean annual range of 70° and an extreme range of 135°. In this connexion the effect of the prevailing winds is very marked. The equalizing effects of a conservative ocean are brought upon the Pacific coast, where the climate is truly temperate, the mean annual range being only 10° or 12°, thus resembling western Europe; while the exaggerating effects of the continental interior are carried eastward to the Atlantic coast, where the mean annual range is 40° or 50°.

The prevailing winds respond to the stronger poleward tempera- ture gradients of winter by rising to a higher velocity and a more frequent and severer cyclonic storminess; and to the weaker gradients of summer by relaxing to a lower velocity with fewer and weaker cyclonic storms ; but furthermore the northern zone occupied by the prevailing westerlies expands as the winds strengthen in winter, and shrinks as they weaken in summer; thus the stormy westerlies, which impinge upon the north-western coast and give it plentiful rainfall all through the year, in winter reach southern California and sweep across part of the Gulf of Mexico and Florida; it is for this reason that southern California has a rainy winter season, and that the states bordering on the Gulf of Mexico are visited in winter by occasional intensified cold winds, inappropriate to their latitude. In summer the stormy westerly winds withdraw from these lower latitudes, which are then to be more associated with the trade winds. In California the effect of the strong equator- ward turn of the summer winds is to produce a dry season; but in the states along the Gulf of Mexico and especially in Florida the withdrawal of the stormy westerlies in favour of the steadier trade winds (here turned somewhat toward the continental interior, as explained below) results in an increase of precipitation. The general

winds also are much affected by the changes of pressure due to the strong continental changes of temperature. The warmed air of summer produces an area of low pressure in the west-central United States, which interrupts the belt of high pressure that planetary conditions alone would form around the earth about latitude 30 ; hence there is a tendency of the summer winds to

blow inward from the northern Pacific over the Cordilleras toward the continental centre, and from the trades of the torrid Atlantic up the Mississippi Valley; conversely in winter time, the cold air over the lands pro- duces a large area of high pressure from which the winds tend to flow outward; thus repelling the westerly winds of the northern Pacific and greatly intensifying the outflow southward to the Gulf of Mexico and eastward to the Atlantic. As a result of these seasonal alternations of temperature and pressure there is something of a monsoon tendency developed in the winds of the Mississippi Valley, southerly inflowing winds prevailing in summer and northerly outflowing winds in winter; but the general tendency to inflow and outflow is greatly modified by the relief of the lands, to which we next turn.

The climatic effects of relief are seen directly in the ascent of the higher mountain ranges to altitudes where low temperatures prevail, thus preserving snow patches through the summer on the high summits (over 12,000 ft.) in the south, and maintaining snow- fields and moderate-sized glaciers on the ranges in the north. With this goes a general increase of precipitation with altitude, so that a good rainfall map would have its darker shades very generally along the mountain ranges. Thus the heaviest measured rainfall east of the Mississippi is on the southern Appalachians; while in the west, where observations are as yet few at high level stations, the occurrence of forests and pastures on the higher slopes of mountains which rise from desert plains clearly testifies to the saime rule. The mountains also introduce controls over the local winds; diurnal warming in summer suffices to cause local ascending breezes which frequently become cloudy by the expansion of ascent, even to the point of forming local thunder showers which drift away as they grow and soon dissolve after leaving the parent mountain. Conversely, nocturnal cooling produces well-defined descending breezes which issue from the valley mouths, sometimes attaining an unpleasant strength toward midnight.

The mountains are of larger importance in obstructing and de- flecting the course of the general winds. The Pacific ranges, stand- ing transverse to the course of the prevailing westerlies near the Pacific Ocean, are of the greatest importance in this respect; it is largely by reason of the barrier that they form that the tempering effects of the Pacific winds are felt for so short a distance inland in winter, and that the heat centre is

displaced in summer so far towards the western coast. The rainfall from the stromy westerly winds is largely deposited on the western slopes of the mountains near the Pacific coast, and arid or desert interior plains are thus found close to the great ocean. The descending winds on the eastern slopes of the ranges are frequently warm and dry, to the point of resembling the Fohn winds of the Alps; such winds are known in the Cordilleran region as Chinook winds. The ranges of the Rocky Mountains in their turn receive some rainfall from the passing winds, but it is only after the westerlies are reinforced by a moist indraft from the Gulf of Mexico arid the Atlantic — the result of summer or of cyclonic inflow — that rainfall increases to a sufficient measure on the lower lands to support agriculture without irrigation. The region east of the Mississippi is singularly favoured in this way; for it receives a good amount of rainfall, well dis- tributed through the year, and indeed is in this respect one of the largest regions in the temperate zones that are so well watered. The Great Plains are under correspondingly unfavourable conditions, for their scanty rainfall is of very variable amount. Along the transition belt between plains and prairies the climate is peculiarly trying as to rainfall ; one series of five or ten years may have sufficient rainfall to enable the farmers to gather good crops; but the next series following may be so dry that the crops fail year after year.

The cyclonic inflows and anticyclonic outflows, so characteristic of the belt of westerly winds the world over, are very irregular in the Cordilleran region ; but farther eastward they are typically developed by reason of the great extent of open country. Although of reduced strength in the summer, they still suffice to dominate weather changes ; it is during the approach of a low pressure centre that hot southerly winds prevail; they sometimes reach so high a tempera- ture as to wither and blight the grain crops; and it is almost exclusively in connexion with the cloudy areas near and south-east of these cyclonic centres that violent thunderstorms, with their occasional destructive whirling tornadoes, are formed. With the passing of the low pressure centre, the winds 9hift to west or north- west, the temperature falls, and all nature is relieved. In winter- time, the cyclonic and anticyclonic areas are of increased frequency and intensity; and it is partly for this reason that many meteoro- logists have been disposed to regard them as chiefly driven by the irregular flow of the westerly

winds, rather than as due to convectional instability, which should have a maximum effect in summer. One of the best indications of actual winter weather, as apart from the arrival of winter by the calendar, is the develop- ment of cyclonic disturbances of such strength that the change from their warm, sirocco-like southerly inflow hi front of their

centre, to the " cold wave " of their rear produces non-periodic temperature changes strong enough to overcome the weakened diurnal temperature changes of the cold season, a relation which practically never occurs in summer time. A curious feature of the cyclonic storms is that, whether they cross the interior of the country near the northern or southern boundary or along an intermediate path, they converge towards New England as they pass on toward the Atlantic; and hence that the north-eastern part of the United States is subjected to especially numerous and strong weather changes. (W. M. D.)

IV.— Fauna and Flora Fauna. — Differences of temperature have produced in North America seven transcontinental life-zones or areas characterized by relative uniformity of both fauna and flora ; they are the Arctic, Hudsonian and Canadian, which are divisions of the Boreal Region; the Transition, Upper Austral and Lower Austral, which are divisions of the Austral Region, and the Tropical. The Arctic, Hudsonian and Canadian enter the United States from the north and the Tropical from the south ; but the greater part of the United States is occupied by the Transition, Upper Austral and Lower Austral, and each of these is divided into eastern and western subzones by differences in the amount of moisture. The Arctic or Arctic- Alpine zone covers in the United States only the tops of a few mountains which extend above the limit of trees, such as Mt Katahdin in Maine, Mt Washington and neighbouring peaks in the White Mountains of New Hampshire, and the loftier peaks of the Rocky, Cascade and Sierra Nevada Mountains. The larger animals are rare on these mountain-tops and the areas are too small for a distinct fauna. The Hudsonian zone covers the upper slopes of the higher mountains of New England, New York and North Carolina and larger areas on the elevated slopes of the Rocky and Cascade Mountains; and on the western mountains it is the home of the mountain goat, mountain sheep, Alpine flying-squirrel, nutcracker, evening grosbeak and Townsend's solitaire. The Canadian zone crosses from Canada into northern and north- western Maine, northern and central New

Hampshire, northern Michigan, and north-eastern Minnesota and North Dakota, covers the Green Mountains, most of the Adirondacks and Catskills, the higher slopes of the mountains in Pennsylvania, West Virginia, Virginia, western North Carolina and eastern Tennessee, the lower slopes of the northern Rocky and Cascade Mountains, the upper slopes of the southern Rocky and Sierra Nevada Mountains, and a strip along the Pacific coast as far south as Cape Mendocino, interrupted, however, by the Columbia Valley. Among its charac- teristic mammals and birds are the lynx, marten, porcupine, northern red squirrel, Belding's and Kennicott's ground squirrels, varying and snowshoe rabbits, northern jumping mouse, white-throated sparrow, Blackburnian warbler, Audubon warbler, olive-backed thrush, three-toed woodpecker, spruce grouse, and Canada jay; within this zone in the North-eastern states are a few moose and caribou, but farther north these animals are more characteristic of the Hudsonian zone. The Transition zone, in which the extreme southern limit of several boreal species overlaps _ the extreme northern limit of numerous austral species, is divided into an eastern humid or Alleghanian area, a western arid area, and a Pacific coast humid area. The Alleghanian area com- prises most of the lowlands of New England. New York and Pennsylvania, the north-east corner of Ohio, most of the lower peninsula of Michigan, nearly all of Wisconsin, more than half of Minnesota, eastern North Dakota, north-eastern South Dakota, and the greater part of the Appalachian Mountains from Penn- sylvania to Georgia. It has few distinctive species, but within its borders the southern mole and cotton-tail rabbit of the South meet the northern star-nosed and Brewer's moles and the varying hare of the North, and the southern bobwhite, Balti- more oriole, bluebird, catbird, chewink, thrasher and wood thrush are neighbours of the bobolink, solitaryˆ vireo and the hermit and Wilson s thrushes. The Arid Transition life-zone comprises the western part of the Dakotas, north-eastern Montana, and irregular areas in Washington, Oregon, Idaho, Wyoming, California, Nevada, Utah, Colorado, Arizona, New Mexico and western Texas, covering for the most part the eastern base of the Cascade and Sierra Nevada Mountains and the higher parts of the Great Basin and the plateaus. Its most characteristic animals and birds are the white-tailed jack-rabbit, pallid vole, sage hen, sharp-tailed grouse and green-tailed townee; the large Columbia ground-squirrel (Spermophilus columbianus) is common in that part of the

zone which is west of the Rocky Mountains, but east of the Rockies it is replaced by another species (Cynomys) which closely resembles a small prairie dog. The Pacific Coast Transition life-zone comprises the region between the Cascade and Coast ranges in Washington and Oregon, parts of northern California, and most of the California coast region from Cape Mendocino to Santa Barbara. It is the home of the Columbia black-tail deer, western raccoon, Oregon spotted skunk, Douglas red squirrel, Townsend's chipmunk, tailless sewellel (Haplodon rufus), peculiar species of pocket gophers and voles, Pacific coast forms of the great-horned, spotted, screech and pigmy owls, sooty grouse, Oregon ruffed grouse, SteUer's jay, chestnut- backed chickadee and Pacific winter wren. The Upper Austral

zone is divided into an eastern humid (or Carolinian) area and a western arid (or Upper Sonoran) area. The Carolinian area ex- tends from southern Michigan to northern Georgia and from the Atlantic coast to western Kansas, comprising Delaware, all of Maryland except the mountainous western portion, all of Ohio except the north-east corner, nearly the whole of Indiana, Illinois, Iowa and Missouri, eastern Nebraska and Kansas, south-eastern South Dakota, western central Oklahoma, northern Arkansas, middle and eastern Kentucky, middle Tennessee and the Tennessee valley in eastern Tennessee, middle Virginia and North Carolina, western West Virginia, north-eastern Alabama, northern Georgia, western South Carolina, the Connecticut Valley in Connecticut, the lower Hudson Valley and the Erie basin in New York, and narrow belts along the southern and western borders ot the lower peninsula of Michigan. It is the northernmost home of the opossum, grey fox, fox squirrel, cardinal bird, Carolina wren, tufted tit, gnat catcher, summer tanager and yellow-breasted chat. The Upper Sonoran life-zone comprises south-eastern Montana, central, eastern and north-eastern Wyoming, a portion of south-western South Dakota, western Nebraska and Kansas, the western extremity of Oklahoma, north-western Texas, eastern Colorado, south-eastern New Mexico, the Snake plains in Idaho, the Columbia

plains in Washington, the Malheur and Harney plains in Oregon, the Great Salt Lake and Sevier deserts in Utah, and narrow belts in California, Nevada and Arizona. Among its characteristic mammals and birds are the sage cotton-tail, black-tailed jack-rabbit, Idaho rabbit, Oregon, Utah and Townsend's ground squirrels, sage chipmunk, five- toed kangaroo rats, pocket mice, grasshopper mice, burrowing owl, Brewer's sparrow, Nevada sage sparrow, lazuli finch, sage thrasher, Nuttall's poor-will, Bullock's oriole and rough-winged swallow. The Lower Austral zone occupies the greater part of the Southern states, and is divided near the 98th meridian into an eastern humid or Austroriparian area and a western arid or Lower Sonoran area. The Austroriparian zone comprises nearly all the Gulf States as far west as the mouth of the Rio Grande, the greater part of Georgia, eastern South Carolina, North Carolina and Virginia, and extends up the lowlands of the Mississippi Valley acnjss western Tennessee and Kentucky into southern Illinois and'Indiana and across eastern and southern Arkansas and eastern Oklahoma into south-eastern Missouri and Kansas. It is the home of the southern fox-squirrel, cotton rat, ricefield rat, wood rat, free-tailed bat, mocking bird, painted bunting, prothonotary warbler, red-cockaded woodpecker, chuckwill's-widow, and the swallow-tailed and Mississippi kites. A southern portion of this zone, comprising a narrow strip along the Gulf Coast from Texas to Florida and up the Atlantic coast to South Carolina, is semi-tropical, and is the northernmost habitation of several small mammals, the alligator (Alligator mississippiensis), the ground dove, white-tailed kite, Florida screech owl and Chap- man s night-hawk. The Lower Sonoran zone comprises the most arid parts of the United States: south-western Texas, south-western Arizona and a portion of northern Arizona, southern Nevada and a large part of southern California. Some of its characteristic mammals and birds are the long-eared desert fox, four-toed kangaroo rats, Sonoran pocket mice, big-eared and tiny white-haired bats, road runner, cactus wren, canyon wren, desert thrashers, hooded oriole, black-throated desert sparrow, Texas night-hawk and Gambel's quail. It is the northernmost home of the armadillo, ocelot, jaguar, red and grey cats, and the spiny pocket mouse, and in southern Texas especially it is visited by several species of tropical birds. There is some resemblance to the Tropical life-zone at the south-eastern extremity of Texas, but this zone in the United States is properly restricted to southern Florida and the lower valley of

the Colorado along the border of California and Arizona, and the knowledge of the latter is very imperfect. The area in Florida is too small for characteristic tropical mammals, but it has the true crocodile {Crocodilus americanus) and is the home of a few tropical birds. Most of the larger American mammals are not restricted to any one faunal zone. The bison, although now nearly extinct, formerly roamed over nearly the entire region between the Appalachian and the Rocky Mountains. The black bear and beaver were also widely distributed. The Virginia deer still ranges from Maine to the Gulf states and from the Atlantic coast to the Rocky Mountains. The grizzly bear, cougar, coyote, prairie dog and antelope are still found in several of the Western states, and the grey wolf is common in the West and in northern Minnesota, Wisconsin and Michigan.

Flora. — The Alpine flora, which is found in the United States only on the tops of those mountains which rise above the limit of trees, consists principally of a variety of plants which bloom as soon as the snow melts and for a short season make a brilliant display of colours. The flora of the Hudsonian and the Canadian zone consists largely of white and black spruce, tamarack, canoe-birch, balsam-poplar, balsam-fir, aspen and grey pine. In the Alleghanian Transition zone the chestnut, walnut, oaks and hickories of the South are inter- spersed among the beech, birch, hemlock and sugar maple of the North. In the Western Arid Transition zone the flora consists largely of the true sage brush (Artemisia tridentata), but some tracts are covered with forests of yellow or bull pine (Pinus ponderosa). The Pacific coast Transition zone is noted for its forests of giant

conifers, principally Douglas fir, Sitka spruce, Pacific cedar and Western hemlock Here, too, mosses and ferns grow in profusion, and the sadal (Caultheria shallon) , thimble berry (Rubus nootkamus) , salmon berry (Rubus spectabilis) and devil's club (Fatsia horrida) are characteristic shrubs. In the Carolinian zone the tulip tree, sycamore, sweet gum, rose magnolia, short-leaf pine and sassafras find their northernmost limit Sage brush is common to both the western arid Transition zone and the Upper Sonoran zone, but in suitable soils ot the latter several greasewoods (Artiplex conferti- folia, A. canescens, A. nuttalli, Tetradymia canescens, Sarcobatus vermiculatus and Grayia spinosa) are characteristic species, and on the mountain slopes are some nut pines (piiion) and

junipers. Trie Austroriparian zone has the long-leaf and loblolly pines, magnolia and live oak on the uplands, and the bald cypress, tupelo and cane in the swamps; and in the semi-tropical Gulf strip are the cabbage palmetto and Cuban pine ; here, too, Sea Island cotton and tropical fruits are successfully cultivated. The Lower Sonoran zone is noted for its cactuses, of which there is a great variety, and some of them grow to the height of trees; the mesquite is also very large, and the creosote bush, acacias, yuccas and agaves are common. The Tropical belt of southern Florida has the royal palm, coco-nut palm, banana, Jamaica dogwood, manchineel and mangrove; the Tropical belt in the lower valley of the Colorado has giant cactuses, desert acacias, palo-verdes and the Washington or fan-leaf palm. Almost all of the United States east of the 98th meridian is naturally a forest region, and forests cover the greater part of the Rocky Mountains, the Cascades, the Sierra Nevadas and the Coast Range, but throughout the belt of plains, basins and deserts west of the Rocky Mountains and on the Great Plains east of the Rocky Mountains there are few trees except along the watercourses, and the prevailing type of vegetation ranges from bunch grass to sage brush and cactuses according to the degree of aridity and the temperature. In the eastern forest region the number of species decreases somewhat from south to north, but the entire region differs from the densely forested region of the Pacific Coast Transi- tion zone in that it is essentially a region of deciduous or hardwood forests, while the latter is essentially one of coniferous trees; it differs from the forested region of the Rocky Mountains in that the latter is not only essentially a region of coniferous trees, but one where the forests do not by any means occupy the whole area, neither do they approach in density or economic importance those of the eastern division of the country. Again, the forests of most of the eastern region embrace a variety of species, which, as a rule, are very much intermingled, and do not, unless quite exceptionally, occupy areas chiefly devoted to one species; while, on the other hand, the forests of the west — including both Rocky Mountain and Pacific coast divisions — exhibit a small number of species, considering the vast area embraced in the region; and these species, in a number of instances, are extraordinarily limited in their range, although there are cases in which one or two species have almost exclusive possession of extensive areas.

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the United States, Bulletin No. 10 of the United States Department of Agriculture, Division of Biological Survey (Washington, 1898) ; I. C. Russell, North America (New York, 1904); W. T. Hornaday, American Natural History (New York, 1904); W. Stone and W. E. Cram, American Animals (New York, 1902) ; E. Coues, Key to North American Birds (Boston, 1896); Florence M. Bailey, Handbook of Birds of the Western United States (Boston, 1902) ; E. D. Cope, " The Crocodilians, Lizards and Snakes of North America," in the Report of the United States National Museum for the year 1898 (Washing- ton, 1900) ; L. Stejneger, " The Poisonous Snakes of North America," ibid., 1893 (Washington, 1895). (N. D. M.) :

V. — Population and Social Conditions Geographical Growth of the Nation. — The achievement of independence found the people of the United States owning the entire country between the Gulf and the Great Lakes, excepting only Florida, as far to the west as the Mississippi; but the actual settlements were, with a few minor exceptions, confined to a strip of territory along the Atlantic shore. The depth of settlement, from the coast inland, varied greatly, ranging from what would be involved in the mere occupation of the shore for fishing purposes to a body of agricultural occupation extending back to the base of the great Atlantic chain, and averaged some 250 m. 1 Westward, beyond the general line of continuous settlement,

1 In the Statistical Ati-as volume of the census of 1900 the reader will find for each decennial census since 1 790 a map showing the dis- tribution of population, w'th indication of the density of settlement, and an elaborate explanatory text. In Orin Grant Libby's Geo- graphical Distribution of the Vote of the Thirteen States on the Federal Constitution, 1787-1788 (University of Wisconsin, Madison, 1894), along with a valuable map interesting facts are given regarding the social and economic characteristics of different sections.

were four extensions of population through as many gaps in

the Appalachian barrier, constituting the four main paths along which migration westward first took place: the Mohawk Valley in New York, the upper Potomac, the Appalachian Valley, and around the southern base of the Appalachian system. Four outlying groups beyond the mountains, with perhaps a twentieth part of the total population of the nation, — one about Pittsburg, one in West Virginia, another in northern Kentucky, and the last in Tennessee: all determined in situa- tion by river highways — bore witness to the qualities of strength and courage of the American pioneer. Finally, there were in 1790 about a score of small trading or military posts, mainly of French origin, scattered over the then almost unbroken wilderness of the upper Mississippi Valley and region of the Great Lakes.

Twelve decennial censuses taken since that time (1800-1910) have revealed the extraordinary spread of population over the present area of the country (see Census : United States). The large percentage of the population, particularly

no years moved more than 500 m westward, almost exactly along the 39th parallel of latitude: 9-5 degrees of longitude, with an extreme variation of less than 19 minutes of latitude. Growth of the Nation in Population. — If the 19th century was remarkable with respect to national and urban growth the world over, it was particularly so in the growth of the United States. Malthus expressed the opinion that only in such a land of unlimited means of living could population freely increase. The total population increased from 1800 to 1900 about fourteen fold (i33i-6%). 1 The rate of growth indicated in 1900 was still double the average rate of western Europe. 2 In the whole world Argentina alone (1869-1895) showed equal (and greater) growth. At the opening of the century not only all the great European powers of to-day but also even Spain and Turkey exceeded the United States in numbers; at its close only Russia. At the census of 1910, while the continental United States population (excluding Alaska) was 91,972,266, the total, including Alaska, Hawaii and Porto Rico, but excluding the Philippine Islands, Guam, Samoa and the Canal Zone, was 93,402,151.

Continental United States, exclusive of Alaska.

Population enumerated.

Number of

foreign immigrants entering in

Areas (excluding water), in square miles.

Total population.

Total area.

Settled area.

Total area covered by census.

Density of population.

Population

Population

1

Area

Area with

Estimated

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Of entire census area-

Years.

within area

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Number.

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Total.

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13,850

417,170

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5,247,355

61,128

5,308,483

35-1

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819,466

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305,708

33,800

434,670

17-4

12-6

0-2

12-2

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6,779,308

460,573

7,239,881

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1,698,107

878,641 §

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1820

8,293,869

1,344,584

9,638,453

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1,752,347

54,240||

508,717

4,200

688,670

18-9

19-9

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1830

10,240,232

2,625,788

*12,860,69***

33-5

143,439

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4,700

877,170

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11,781,231

5,288,222

17,063,353*

32-7

599,125

1,752,347

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807,292

2,150

1,183,870

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1850

14,569,584

8,622,292

23,191,876

35-9

1,713,251

2,939,021

1,186,674^!

979,249

38,375

1,519,170

2.3-7

34-9

5-3

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i860

17,326,157

14,117,164

31,443,321

35-6

2,598,214

2,970,038

*31,017***

1,194,754

107,375

1,951,520

26-3

4 I- 5

57

16-1

I870

19,687,504

18,870,867

38,558,371

22-6

2,314,824

2,970,038

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1,272,239

131,910

2,126,290

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1880

23,925,639

26,263,570

50,155,783

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2,812,191

2,970,038

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1,569,565

260,025

2,727,454

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28,188,321

34,791,445

-62,947,714

24-9

5,246,613

2,970,038

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1,947,280

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2,974,159

32-2

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33,533-630

42,749,757

*75,994,575**

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3,844,420

2,970,138

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91,972,266

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2,974,159

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- *Excludes persons of the military and naval service stationed abroad (5318 in 1830; 6100 in 1840; 91,219 in 1900). t Estimates of total up to 1820.*

t Total, 27,604,509, exclusive of at least some hundreds of thousands of Canadians and Mexicans. § Louisiana purchase from France.

|J_ Florida purchase from Spain; population counted first, 1830.

If Annexation of Texas (385,926 sq. m.) ; peace cession from Mexico (520,068 sq. m.) ; extinction of British claims to Oregon (280,680 sq. m.).

Gadsden purchase from Mexico.

of the great urban centres, that is established to-day in the river lowlands, reflects the role that water highways have played in the peopling of the country. The dwindlings and growths of Nevada down to the present day, and to not a slight degree the general history of the settlement of the states of the Rocky Mountain region, are a commentary on the fate of mining industries. The initial settlement of the Pacific coast following the discovery of gold in California in 1848, and of the eastern base of the Rocky Mountains after the discovery of gold in 1859, illustrates the same factor. The Mormons settled Utah to insure social isolation, for the security of their theological system. A large part of the Great Plains to the east of the Rockies was taken up as farms in the decade 1880-1890; abandoned afterwards, because of its aridity, to stock grazing; and reconverted from ranches into farms when a system of dry farming had proved its tillage practicable. The negro more or less consciously moves, individually, closer into the areas whose climate and crops most nearly meet his desires and capabilities as a farmer; and his race as 1 whole uncon-

sciously is adjusting its habitat to the boundar es of the Austroriparian life zone. The country's centre of population in

In 1790 there were about 600,000 white families in the United States. Speaking broadly, there were few very rich and few very poor. Food was abundant. Both social traditions and the religious beliefs of the people encouraged fecundity. The country enjoyed domestic tranquillity. All this time, too, the land was but partially settled. Mechanical labour was scarce, and even upon the farm it was difficult to command hired service, almost the only farm labourers down to 1850, in the north, being young men who went out to work for a few years to get a little money to marry upon. A change was probably inevitable and came, apparently, between 1840 and 1850.

The accessions in that decade from Ireland and Germany were enormous, the total immigration rising to 1,713,251 against 599,125 during the decade preceding, and against only 143,439 from 1820 to 1830. These people came in condition to breed with unprecedented rapidity, under the stimulus of an abundance,

Unless otherwise explicitly stated, by "United States" is to be understood continental United States exclusive of Alaska.

2 According to Lavasseur and Bodio, 14-5% from i860 to 1880; 21-2% from 1880 to 1900; from 1886-1900, n-0%.

in regard to food, shelter and clothing, such as the most fortunate of them had never known. Yet in spite of these accessions, the population of the country realized a slightly smaller pro- portion of gain than when the foreign arrivals were almost insignificant.

For a time the retardation of the normal rate of increase among the native population was concealed from view by the extraordinary immigration. In the decade 1850-1860 it was seen that almost a seventh of the population of the country consisted of persons born abroad. From 1840 to i860 there came more than four million immigrants, of whom probably

three and a half million, with probably as many children born in America, were living at the latter date.

The ten years from i860 to 1870 witnessed the operation of the first great factor which reduced the rate of national increase, namely the Civil War. The superintendent of the Ninth Census, 1870, presented a computation of the effects of this cause — first, through direct losses, by wounds or disease, either in actual service of the army or navy, or in a brief term following discharge; secondly, through the retardation of the rate of increase in the coloured element, due to the privations, exposures and excesses attendant upon emancipation; thirdly, through the check given to immigration by the existence of war, the fear of conscription, and the apprehension abroad of results prejudicial to the national welfare. The aggregate effect of all these causes was estimated as a loss, to the population of 1870 of 1,765,000. Finally, the temporary reduction of the birth-rate, consequent upon the withdrawal of perhaps one-fourth of the national militia (males of 18 to 44 years) during two-fifths of the decade, may be estimated at perhaps 750,000.

The Tenth Census put it beyond doubt that economic and social forces had been at work, reducing the rate of multiplica- tion. Yet no war had intervened; the industries of the land had flourished; the advance in accumulated wealth had been beyond all precedent; and immigration had increased.

It is an interesting question what has been the contribution of the foreign elements of the country's population in the growth of the aggregate. This question is closely connected with a still more important one: namely, what effect, if any, has foreign immigration had upon the birth-rate of the native stock. In 1850 the foreign- born whites (2,244,602 in number) were about two-thirds of the coloured element and one-eighth of the native-white element; in 1870 the foreign-born whites (5,567,229) and the native whites of foreign parentage (5,324,786) each exceeded the coloured. In 1900 the two foreign elements constituted one-third of the total popu- lation. The absolute numbers of the four elements were: native whites of native parents, 40,949,362; natives of foreign parents, 15,646,017; foreign-born whites, 10,213,817; coloured, 8,833,994.

Separating from the total population of the country in 1900 the non-Caucasians (9>i85,379)> all white persons having

both parents foreign (20,803,800), and one-half (2,541,365) of the number of per- sons having only one parent foreign, the remaining 43,555,250 " native " inhabitants comprised the descendants of the Americans of 1790, plus those of the few inhabitants of annexed territories, plus those in the third and higher generations of the foreigners who entered the country after 1790 (or for practical purposes, after 1800). The second element may be disregarded. For the exact determination of the last element the census affords no precise data, but affords material for various approximations, based either upon the elimination of the probable progeny of immigrants since 1790; on the known increase of the whites of the South, where the foreign element has always been relatively insignificant ; on the percentage of natives having native grandfathers in Massachusetts in 1905 ; or upon the assumed continuance through the 19th century of the rate of native growth (one-third decennially) known to have prevailed down at least to 1820. The last is the roughest approximation and would indicate a native mass of 50,000,000 in 1900, or a foreign con- tribution of approximately half. The results of computations by the first two methods yield estimates of the contribution of foreign stock to the " native " element of 1900 varying among themselves by only 1-8%. The average by the three methods gives 8,539,626 as such contribution, making 31,884,791 the total number of whites of foreign origin in 1900; and this leaves 35,015,624 as the progeny of the original stock of 1790. 1 Adding to the true native whites of 1900 (35.015.624_) the native negroes (8,813,658), the increase of the native stock, white and black, since 1 790 would thus be about 1091 , and of the whites of 1790 (3,172,006) alone about 1104. It is evident that had the fecundity of the American stock of 1790 been

1 W. S. Rossiter, A Century of Population Growth (Bureau of the Lensus, Washington, 1909), pp. 85 seq.

equal only to that of Belgium (the most fertile population of western Europe in the 19th century) then the additions of foreign elements to the American people would have been by 1900 in heavy pre- ponderance over the original, mainly British, elements. A study of the family names appearing on the census rolls of two prosperous and typical American counties, one distinctively urban and the other rural, in 1790 and 1900, has confirmed the popular impression that the British element is growing little, and that the fastest

reproducers to-day are the foreign elements that have become large in the immi- gration current in very recent decades. In applying to the total population of 1790 the rate of growth shown since 1790 by the white people of the South, this rate, for the purpose of the above compu- tations, is taken in its entirety only up to 1870, and thereafter — in view of the notorious lesser birth-rate since that year in the North and West — only one half of the rate is used. If, however, applica- tion be made of the rate in its entirety from 1790 to 1900, the result would be a theoretical pure native stock in 1900 equal to the then actually existing native and foreign stock combined.

In 1900 more than half of every 100 whites in New England and the Middle states (from New York to Maryland) were of foreign parentage (i.e. had one or both parents foreign), and in both sections the proportion is increasing with great rapidity. The Southern states, on the other hand, have shown a diminishing relative foreign element since 1870, and had in 1900 only 79 of foreign parentage in 1000 whites. Relatively to their share of the country's aggregate population the North Atlantic states, and those upon the Great Lakes — the manufacturing and urbanized states of the Union — hold much the heaviest share of immigrant population.

The shares of different nationalities in the aggregate mass of foreigners have varied greatly. The family names on the registers of the first census show that more than 90 % of the white papula- tion was then of British stock, and more than 80 'was Englishf The Germans were already near 6 . The entry of the Irish began on a great scale after 1840, and in 1850 they formed nearly half of all the foreign-born. In that year 85-6 of this total was made up by natives of Great Britain and Germany. The latter took first place in 1880. In 1900 these two countries represented of the total only 52-7%; add the Dutch, the Danes, Swedes, Norwegians and Swiss to the latter and the share was 65-1%. A great majority of all of these elements except the British are settled in the states added to the original Union — the Scandinavians being the most typically agricultural element; while almost all the other nationalities are in excess, most of them heavily so, in the original states of 1790, where they land, and where they are absorbed into the lower grades of the industrial organization. Since 1880 Italians, Russians, Poles, Austrians, Bohemians and Hungarians have enormously increased in the immigrant

population. Germans, Irish, British, Canadians, Scandinavians, Slavs and Italians were the leading elements in 1900.

In 1790 the negroes were 19-3% of the country's inhabitants; in 1900 only ir6%. While the growth of the country's aggregate population from 1790 to 1900 was 1833-9%, that of the whites was 2005-9 %> an d of the negroes only 1066-7 %•

Certain generalizations respecting the " South " and the " North," the " East " and the " West " are essential to an understanding of parts of the history of the past, and of social conditions in the present. For the basis of such comparisons the country is divided by the census into five groups of states: (1) the North Atlantic divisions-down to New Jersey and Pennsylvania; (2) the South Atlantic division-ˆfrom Dela- ware to Florida (including West Virginia) ; (3) the North Central division — including the states within a triangle tipped by Ohio, Kansas and North Dakota; (4) the South Central division —covering a triangle tipped by Kentucky, Alabama and Texas; and (5) the Western division — including the Rocky Mountains and Pacific states. The first and third lead to-day in manu- facturing interests; the third in agricultural; the fifth in mining.

Groups I and 3 (with the western boundary somewhat indefinite) are colloquially known as the " North " and 2 and 4 as the " South." The two sections started out with population growths in the decade 1790-1800 very nearly equal (36-5 and 33-7) ; but in every suc- ceeding decade before the Civil War the growth of the North was greater, and that of the South less, than its increment in the initial decade. In the two twenty-year periods after i860 the increases of the North were 61-9 and 48-7; of the South, 48-4 and 4 8- 5 %• In 1790 the two sections were of almost equal population; in 1890, 1900 and 1910 the population of the North was practically double that of the South. In the decade 1890-1900 the increase of the South exceeded slightly that of the North for the same period owing to the rapid development in recent years of the Southern states west of the Mississippi, which only the Western group has exceeded since 1 870.2 In ge neral the increase of the two sections

2 The number of inhabitants of the North at each census for every 1000 in the South was as follows from 1790 to 1900:

1004; 1025; 1092; 1181; 1253; 1455; 1562; 1769; 2057; 1930; 2005; 1932.

since 1880 has been nearly equal. But while this growth was relatively uniform over the South, in the North there was a low (often a decreasing) rate of rural and a high rate of urban growth. Throughout the 19th century the rates of growth of the North Central division and that of the eastern half of the South Central division steadily decreased. It is notable that that of the South Atlantic group has grown faster since i860 than ever before, despite the Civil War and the conditions of an old settled region: a fact possibly due to the effects of the emancipation of the slaves.

Comparing now the population of the regions east and west of the Mississippi, we find that the population of the first had grown from 3,929,214 in 1790 to 55,023,513 in 1900; and that of the second from 97,401 in 1810 to 20,971,062 in 1900. From i860 to 1890 the one increased its numbers decennially by one half, and the other by under one fifth; but from 1890 to 1910 the difference in growth was slight, owing to a tremendous falling off in the rate of growth of much of the Western and the western states of the North Central divisions. Only an eighth of the country's total population lived in 1900 west of the 96th meridian, which divides the country into two nearly equal parts. Although, as already stated, the population of the original area of 1790 was passed in 1880 by that of the added area, the natives of the former were still in excess in 1900.

Urban and Rural Population. — The five cities of the country that had 8000 or more inhabitants in 1790 had multiplied to 548 in 1900. Only one of the original six (Charleston) was in the true South, which was distinctly rural. The three leading colonial cities, Philadelphia, Nˆv York and Boston, grew six-fold in the 1 8th century, and fifty- fofll in the next. The proportion of the population living in cities seems to have been practically constant throughout the 18th century and up to 1820. The great growth of urban centres has been a result of

industrial expansion since that time. This growth has been irregular, but was at a maximum about the middle of the century. On an average throughout the no years, the population in cities of 8000 considerably more than doubled every twenty years. 1 The rate of rural growth, on the other hand, fell very slowly down to i860, 2 and since then (disregarding the figures of the inaccurate census of 1870) has been steady at about half the former rate. In Rhode Island, in 1900, eight out of every ten persons lived in cities of 8000 or more inhabitants; in Massachusetts, seven in ten. In New York, New Jersey and Connecticut the city element also exceeded half of the population. At the other extreme, Mississippi had only 3% of urban citizens. If the limit be drawn at a population of 2500 (a truer division) the urban element of Rhode Island becomes 95-0%; of Massachusetts, 91-5; of Mississippi, 7-7. All the Southern states are still relatively rural, as well to-day as a hundred years ago. Ten states of the Union had a density in 1910 exceeding 100 persons to the square mile: Illinois (100-7), Delaware (103), Ohio (117), Maryland (130-3), Pennsylvania (171-3), New York (191-2), Connecticut (231-3), New Jersey (337-3), Massachusetts (418-8) and Rhode Island (508-5).

There are abundant statistical indications that the line (be the . -ˆMuence that draws it economic or social) between urban centres of enly 2500 inhabitants and rural districts is much sharper to-day than was that between the country and cities of 8000 inhabitants (the largest had five times that number) in 1790. The lower limit is therefore a truer division line to-day. Classifying, then, as urban centres all of above 2500 inhabitants, three-tenths of the total population lived in the latter centres in 1880 and four-tenths (30.583,411) in 1900; their population doubled in these twenty years. If one regards the larger units, they held naturally a little more of the total population of the country — just a third (33-1%; ten times their proportion of the country's total in 1790) ; and they grew a little faster. The same years, however, made apparent a rapid fall, general and marked, yet possibly only temporary, in the rate at which such urban centres, as well as larger ones, had been gaining upon the rural districts ; this reaction being most pronounced in the- South and least_ so in the North Atlantic states, whose manu- facturing industries are concentrated in dense centres of population.

Interstate migration is an interesting element in American

national life. A fifth of the total population of 1900 were living in other states than those of birth ; and this does not take account of tem- porary nor of multiple migration. Every state numbers among its residents natives of nearly every other state. This movement is complicated by that of foreign immigration. In 1900 the percen- tage of resident natives varied from 92-7% in South Carolina to 15% in Oklahoma; almost all of the Southern states having high percentages.

Sexes.— The percentages of males and females, of all ages, in the aggregate population of 1900, were 51-0 and 49-0 respectively. The corresponding figures for the main elements of the population were as follows: for native whites, 50-7 and 49-3; foreign whites, 54-0 and 46-0; negroes, 49-6 and 50-4. The absolute excess of males in the aggregate population has been progressively greater at every successive census since 1820, save that of 1870 — which followed the Civil War, and closed a decade of lessened immigration. The relative excess of males in each unit of population has not constantly progressed, but has been continuous. In densely settled regions

1 Average 62-2% decennially. 2 Average 31-9% decennially.

females generally predominate; and males in thinly settled regions. In every 1000 urban inhabitants there were, in 1900, 23 (in 1890 only 19) more females than in 1000 rural inhabitants. In the rural districts, so far as there is any excess of females, it is almost solely in the Southern cotton belt, where negro women are largely employed as farm hands.

Vital Statistics, 1900. — The median age of the aggregate popula- tion of 1900 — that is, the age that divides the population into halves — was 22-85 years. In 1800 it was 15-97 years. A falling birth-rate, a falling death-rate, and the increase in the number of adult immigrants, are presumably the chief causes of this difference. The median age of the foreign-born in 1900 was 38-42 years. The median age of the population of cities of 25,000 or more inhabitants was 3‘55 years greater than that of the inhabitants of smaller urban centres and rural districts, owing probably in the main to the movement of middle-aged native and foreign adults to urban centres, and the higher birth-rate of the rural, districts. The median age of the aggregate population is highest in New England and the Pacific states, lowest in the South, and in the North Central about equal to the country’s average. The

average age of the country's population in 1900 was 26-2 years. The United States had a larger proportion (59-1%) within the "productive" age limits of 15 and 60 years than most European countries; this being due to the immigration of foreign adults (corresponding figure 80-3%), the productive group among the native whites (55-8%) being smaller than in every country of Europe. The same is true, however, of the population over 60 years of age.

The death-rate of the United States, though incapable of exact determination, was probably between 16 and 17 per 1000 in 1900; and therefore less than in most foreign countries. Dea

during the eleven years 1890-1900 in 83 cities of above 25,000 population, is given by Dr J. S. Billings : —

Average Annual Death-

rate per 100,000 Popula- tion for the Cities of the

Consumption.

Pneumonia.

Typhoid Fever.

Diphtheria and Croup.

Sections Indicated.

New England .

244

220

30

77

Middle states . .

259

268

32

101

Lake states

156

159

48

79

Southern states

277

I89

50

54

West North Central

183

142

38

61

*Among the statistics of conjugal condition the most striking facts are that among the foreign-born the married are more than twice as numerous as the single, owing to the predominance of adults among the immigrants; and the native whites of foreign parents marry late and in much smaller proportion «_/_._ than do the native whites of native parentage — the _ *^"*

explanation of which is probably to be found in the reaction of the first American generation caused on one hand by the high American standard of living, and on the other by the relative economic independence of women. In 1900 1-0% of the males and 10-9% of the females from 15 to 19 years of age were married; from 20 to 24 years, 21-6% and 46-5% respectively. Of females above 15 years of age 31-2% were single, 56-9

*married, 1 1 -2 widowed, 0-5 divorced; many of the last class undoubtedly reporting them- selves as of the others. The corresponding figures for males were : 40-2, 54-5, 4-6 and 0*3 %• In 1850 there were 5-6 persons (excluding the slave population) in an average American family; fifty years later there were only 4-7— a decline, which was constant, of 16-1 . In 1790, 5 persons was also the normal family — i.e. the greatest proportion (14) of the total were of this size; but in c anj//tes 1900 the model family was that of 3 persons by a more decisive proportion (18%). The minimum state average of 1790, which was 5-4 in Georgia, was greater than the maximum of 1900. Within the area of 1790 there were twice as many families in 1900 as in 1790 consisting of 2 persons, and barely half as many con- sisting of 7 and upward ; New England having shown the greatest and the South the least decrease. In 1790 about a third and in 1900 more than one half of all families had less than 5 members.*

The data gathered by the Federal census have never made possible a satisfactory and trustworthy calculation of the birth-rate, and state and local agencies possess no such data g/ rt ˆ. ra

6 3 8

UNITED STATES

[EDUCATION

J—

Sections of the Country. 1

Area of 1790 . New England . Middle states . Old South Added area

Whites under 16 Years per 1000 of Total Population.

1790. 1820. 1850. 1880. 1900,

490 470

494 502

483 443 485 508 526

414

358 405 464

463

373 309 358

43i

406

344 291 326 402 368

ratios of 1900 and 2000, and reinforce the suggestions of various other facts that the social, as well as the economic, conditions in colonial times were practically constant.

The decline in the proportion of children since i860 has been decidedly less in the South (Southern Atlantic and South Central states as defined below) than in the North and West, but in the most recent decades the last section has apparently fast followed New England in having a progressively lesser proportion of children. In the North there was little difference in 1900 in the ratios shown by city and country districts, but in the South the ratio in the latter was almost twice that reported for the former.

The decades 1840-1850, 1880-1890 and 1860-1870 have shown much the greatest decreases in the percentage of children ; and some have attributed this to the alleged heavier immigration of foreigners (largely adults)- in the case of the two former decades, and the effects of the Civil War in the third. So also the three decades immediately succeeding the above showed minimum decreases; and this has been attributed to a supposed greater birth-rate among the immigrants.

These uncertainties raise a greater one of much significance, viz. what has been the cause of the reduction in the national birth-rate indicated by the census figures? The question has been very differently judged. In the opinion of General Francis A. Walker, superintendent of the censuses of 1870 and 1880, the remarkable fact that such reduction coincided with a cause that was regarded as certain to quicken the increase of population, viz. the intro- duction of a vast body of fresh peasant blood from Europe, afforded proof that in this matter

of population morals arc far more potent than physical causes. The change, wrote General Walker, which produced this falling off from the traditional rate of increase of about 3 % per annum, was that from the simplicity of the early times to comparative luxury; involving a rise in the standard of living, the multiplication of artificial necessities, the extension of a paid domestic service, the introduction of women into factory labour. 2 In his opinion the decline in the birth-rate coincidently with the increase of immigration, and chiefly in those regions where immigra- tion was greatest, was no mere coincidence; nor was such immigrant invasion due to a weakening native increase, or economic defence ; but the decline of the natives was the effect of the increase of the foreigners, which was " a shock to the principle of population among the native element." Immigration therefore, according to this theory, had- " amounted not to a reinforcement of our population, but to a replacement of native by foreign stock. That if the foreigners had not come, the native element would long have filled the places the foreigners usurped, I entertain " — says General Walker — " not a doubt."

It is evident that the characteristics of the " factory age " to which reference is made above would have acted upon native British as upon any other stock; and that it has universally so acted there is abundant statistical evidence, in Europe and even in a land of such youth and ample opportunities as Australia. The assumption explicitly made by General Walker that among the immigrants no influence was yet excited in restriction of population, is also not only gratuitous, but inherently weak ; the European peasant who landed (where the great majority have stayed) in the eastern industrial states was thrown suddenly under the influence of the forces just referred to; forces possibly of stronger influence upon him than upon native classes, which are in general economically and socially more stable. On the whole, the better opinion is probably that of a later authority on the vital statistics of the country, Dr John Shaw Billings, 3 that though the characteristics of modern life doubtless influence the birth-rate somewhat, by raising the average age of marriage, lessening unions, and increasing divorce and prostitution, their great influence is through the transmutation into necessities of the luxuries of simpler times; not automatically, but in the direction of an increased resort to means for the pre- vention of child-bearing.

Education. — In the article Education (United Stales), and in

the articles on the -several states, details are given generally of the conditions of American education. Here the statistics of literacy need only be considered.

In 1900 illiterates (that is, persons unable to write, the

1 Table from Rossiter, op. cit., p. 103.

2 See his Discussions in Economics and Statistics, ii. 422, " Immigration and Degradation."

3 See the Forum (June, 1893), xv – 4 D 7-

majority of these being also unable to read) constituted nearly one-ninth (10-7%) of the population of at least ten years of age ; but the greatest part of this illiteracy is due to the negroes and the foreign immigrants. Since 1880 the proportion of illiteracy has steadily declined for all classes, save the foreign-born between 1880 and 1890, owing to the beginning in these years, on a large scale, of immigration from southern Europe. Illiteracy is less among young persons of all classes than in the older age-groups, in which the foreign-born largely fall. This is due to the extension of primary education during the last half of the 19th century. The older negroes (who were slaves) naturally, when compared with the younger, afford the most striking illus- tration of this truth. On the other hand, a notable exception is afforded by the native whites of native parents, particularly in the South, where child illiteracy (and child labour) is highest; the declining proportion of illiterates shown by the age-groups of this class up to 24 years is apparently due to a will to learn late in life.

The classification of the illiterate population (above 10 years of age) by races shows that the Indians (56-2), negroes (44-5), Chinese (29-0%), Japanese (18-3%), foreign white (13-0%), native white of native parentage (5-7%), and native whites of foreign parents (i-6%), are progressively more literate. The advantage of the last as compared with native whites of native parentage is apparently owing to the lesser concentration of these in cities. The percentages of illiterate children for different classes in 1900 were as follows: negroes, 30-1; foreign whites, 5-6; native whites of foreign parentage, 0-9; native whites of native parentage, 4-4. There is a greater difference in the North than in the South between the child illiteracy of the Caucasian and non-Caucasian elements; also a

ranking of the different sections of the country according to the child illiteracy of one and the other race shows that the negroes of the South stand relatively as high as do its whites. All differ- ences are lessened if the comparison be limited to children, and still further lessened if also limited to cities. Thus, the illiteracy of non-Caucasians was 44-5%, of their children 30-1%, and of such in cities of 25,000 inhabitants, 7-7%.

In the total population of 10 years of age and- over the female sex is more illiterate than the male, but within the age-group 10 to 24 years the reverse is true. In 1890 females preponderated among illiterates only in the age-group 10 to 19 years. The excess of female illiteracy in the total population also decreased within the same period, from 20-3 to io-8 illiterates in a thousand. The tendency is therefore clearly toward an ultimate higher literacy for females ; a natural result where the two sexes enjoy equal facilities of schooling, and the females greater leisure. Among the whites attending school there was still in 1900 a slight excess of males; among the negro pupils females were very decidedly in excess. In all races there has been since 1890, throughout the country, a large increase in the proportion of girls among the pupils of each age-group; and this is particularly true of the group of 15 years and upward — that is of the grammar school and high school age, in which girls were in 1900 decidedly preponderant. A similar tendency is marked in college education.

Religious Bodies. — According to the national census of religious bodies taken in 1906 there were then in the country 186 denominations represented by 212,230 organizations, 92-2% of which represented 164 bodies which in history and general character are identified more or less closely with the Protestant Reformation or its subsequent development. The Roman Catholic Church contributed 5 "9% of the organizations. Among other denominations the Jewish congregations and the Latter Day Saints were the largest. The immigrant movement brings with it many new sects, as, for example, the Eastern Orthodox churches (Russian, Servian, Syrian and Greek), which had practically no existence in 1890, the year of the last preceding census of religious bodies. But the growth of independent churches is most remarkable, having been sixfold since 1890.

The statistics of communicants or members are defective, and because of the different organization in this respect of different bodies, notably of the Protestants and Roman Catholics, comparisons are more or less misleading. Disregarding, however, such incom- parability, but excluding 15 % of all Roman Catholics (for children under 9 years of age), the total number of church members was 32,936,445, of whom 6l-6% were Protestants, 36-7% Roman Catholics and 1-7% members of other churches. The correspond- ing figures in 1890 were 68-0, 30-3 and 1-7%. For the reasons just given these figures do not accurately indicate the religious affiliations of the population of the United States. In this parti- cular they very largely understate the number of Hebrews, whose

communicants (0-3%) are heads of families only, and largely of the Protestants; whereas they represent practically the total Roman Catholic population above 9 years of age. In comparing the figures of 1890 with those of 1906 these cautions are not of force, since both census counts were taken by the same methods. The membership of the Protestant bodies increased in the interval 44-8%, while that of the Roman Catholic Church increased 93-5 %. The immi- gration from Catholic countries could easily account for (though this does not prove that in fact it is the only cause of) this great increase of the Roman Catholic body.

Among the Protestants, the Methodists with 17-5 % of the total membership, the Baptists with 17-2, the Lutherans with 6-4, the Presbyterians with 5-6 and the Disciples and Christians with 3-5 — each of these bodies comprising more than a million members — together include one-half of the total church membership of the country, and four-fifths (81-3%) of all Protestant members.

The Baptists and Methodists are much stronger in the South, relatively to other bodies, than elsewhere ; the former constituting in the South Atlantic states 43-9% of all church members, and in the South Central states 39-5 . Adding in the Methodists these proportions become 76-3 and 65-3. The

Lutherans are relatively strongest in the North Central division of the country (13-2) ; the Presbyterians in the North Atlantic and Western divisions (6-0); and the Disciples in the South Central division (6-1). The Roman Catholics are strongest in the Western division and the North Atlantic division, with 49-2 in the former and 56-6% in the latter of all church members ; their share in the North Central division is 36-9%. Thus the numerical superiority of the Baptists and Methodists in the two Southern divisions is complementary to that of the Roman Catholics in the other three divisions of the country. New York, Rhode Island, Massachusetts and New Hampshire in the eastern part of the country, Louisiana in the south, and New Mexico, Arizona, California and Montana in the western part are distinctively Roman Catholic states, with not less than 63 % of these in the total church body. Racial elements are for the most part the explanation. So also the immigration of French Canadians and of Irish explains the fact that in every state of one-time Puritan New England the Roman Catholics were a majority over Protestants and all other churches. This was true in 1890 of 12 states, while in one other the Roman Catholics held a plurality; in 1906 the corresponding figures were 16 and 20. The Protestant bodies are more widely and evenly distributed throughout the country than are the Roman Catholics.

The total value of church property (almost in its entirety exempt from taxation) reported in 1906 was $1,257,575,867, of which 5935,942,578 was reported for Protestant bodies, $292,638,786 for Roman Catholic bodies, and $28,994,502 for all other bodies.

Occupations. — 29,073,233 persons 10 years or more of age — nearly two-fifths (38-3%) of the country's total population — were engaged in gainful occupations in 1900. Occupations were reported first for free males in 1850, and since i860 women workers have been separately reported. Five main occupation groups are covered by the census: (1) agriculture, (2) professional service, (3) domestic and personal service, (4) trade and transportation, (5) manufacture and mechanical pursuits. The percentage of all wage-earners engaged in these groups in 1900 was 35-7, 4-3, 19-2, 16-4, and 24-4 respectively. Outside of these are the groups of mining and fishing.

Although manufactures have increased tremendously " of

recent years — their products representing in 1905 a gross total of $14,802,147,087 as compared with $6,309,000,000 for those of farms (according to the U.S. Department of Agriculture) — agriculture is still the predominant industry of the United States, employing nearly half of the workers, and probably giving subsistence to considerably more than half of the people of the country.

Turning to the factor of sex, it may be stated that the toWLpumber of the gainfully employed in 1900 above givenj included 8»5J% of all the men and boys, and 18-8% of all the women and gira in the country. The corresponding figures in 1880 were 78-7 and > 4-7%. The proportion of women workers is greatest in the North Atlantic group of states (22-1 %) where they are engaged in manufacturing, and in the South (23-8) where negro women are engaged in agri- cultural operations. The percentage of such wage-earners is there- fore increasing much more rapidly in the former region. But in all other parts of the country the increase is faster than in the South ; since aside from agriculture, which has long been in a relatively stable condition, there is not by any means so strong a movement of women into professional services in city districts. The increase is universal. There is not a state that does not show it. The greatest increase for any section between 1880 and 1900 was that of the North Central division from 8-8 to 14-3 %. Here too both factors — farm-life, as in North Dakota, and manufacturing, as in Illinois — showed their plain influence.

Of all agricultural labourers 9-4% were females in 1900 (77 in 1880); but in the South the proportion was much greater — 16-5 in the South Atlantic and 14-9 in the South Central division. In professional service 34-2 % (in 1880, 29-4) were females, the two northern sections showing the highest proportions. In the occupa- tions of musicians and teachers of music, and of school-teachers and professors (which together account for seven-eighths of profes- sional women) women preponderate. The same sex constituted only 37-5 % (34-6 % in 1880) of the wage-earners of the third group ; the South also showing here, as is natural in view of its coloured class, much the highest and the Western division of states much the lowest percentage. Women are in excess in the occupations of boarding and lodging house keepers, housekeepers, launderers, nurses and midwives, and servants and waiters. These account for almost all women in this group; servants and waitresses

make up two-thirds of the total. Finally, in the fourth and fifth groups the percentage of women was io-6 (3-4 in 1880) and 18-5 (16-7 in 1880). In manufactures the South Atlantic states show a higher percentage than the North Central, owing to the element of child- labour already indicated. In the third group women greatly pre- ponderate in the occupation of stenographers and type- writers ; and in those of book-keepers and accountants, clerks and copyists, packers and shippers, saleswomen (which is the largest class), and telegraph and telephone operators they have a large representation (13 to 34 %). A great variation exists in the proportion of the sexes employed in different manufacturing industries. Of dress-makers, milliners, seamstresses (which together make up near half of the total in this occupation group) more than 96 % are women. Of the makers of paper boxes, of shirts, collars and cuffs, of hosiery and knitting mill operatives, of glove-makers, silk mill operatives and book-binders they are more than half ; so also of other textile workers, excluding wool and cotton mill operatives (these last the second largest group of women workers in manufactures), in which occupa- tions males are in a slight excess. The distribution of women wage- earners in 1900 among the great occupation groups was as follows: in agriculture, 18-4 %; professional service, 8-1 %; domestic and personal service, 39-4 %; trade and transportation, 9-4 %; manufac- turing and mechanical pursuits, 24-7 %.

The proportion which children 10 to 15 years of age engaged in gainful occupations bore to the whole number of such children was in 1880 24-4 % for males, and 9-0% for females. Twenty years later the corresponding figures were 26-1 and 10-2 %. In the North Atlantic and North Central states, notwithstanding their manufactur- ing industries, the proportions were much lower (17-1 and 17-0 in 1900), and they increased very little in the period mentioned. In the Western group the increase was even less, and the total (10-9 % in 1900) also. But in the South Atlantic and the South Central states — where agriculture, mining and manufacturing have in recent decades become important — although the increase was very slight, the proportions were far above those of the other sections, both in 1880 and in 1900. In the former year the ratios were 40-2 and 41-5, in the latter 41-6 and 42-7 %. In Alabama (70-8 % in 1880), North and South Carolina, and Arkansas the ratio exceeded 50 % in 1900.

National Wealth. — Mulhall has estimated the aggregate

wealth of the United States in 1790 at $620,000,000, assigning of this value $479,000,000 to lands and $141,000,000 to buildings and improve- ments. It is probable that this estimate is generous according to the values of that time. But even supposing $1,000,000,000 to be a juster estimate according to present-day values, it is probable that the increase of this since 1790 has been more than a hundredfold and since 1850 (since when such data have been gathered by the census) about fifteenfold. The value of farm property increased from $3,967,343,580 in 1850 to $20,439,901,164 in 1900. The gross value of manufactures rose in the same interval from $1,019,106,616 to $13,010,036,514; of farm products, from $2,212,540,927 in 1880 to $6,309,000,000 in 1900. The census estimate of the true value of " property " constituting the national wealth was limited in an enumeration of 1 850 to taxable realty and privately held personalty ; in 1900 it covered also exempt realty, government land, and corporation and public personalty. The estimate of the national wealth of 1850 was $7,135,780,228:ˆ 1904 (made by the census office), $107,104,192,410. It may be added that the net ordinary revenue of the government was in 1850 $43,592,889, and in 1909 $662,324,445; that the value of imports rose from $7-48 per capita in 1850 to $14-47 in 1909; and of exports from $6-23 to $18-50. The public debt on the 1st of November 1909, less certificates and notes offset by cash in the Treasury, was $1,295,147,432.04.

(F. S. P.) VI. — Industries and Commerce

Manufactures. — In the colonial period there were beginnings in some lines of manufacturing, but the policy of the British gov- ernment was generally hostile and the increase was insignificant. In the first decades after the establishment of independence the resources and energies of the nation were absorbed in the task of occupying the vacant spaces of a continent, and sub- duing it to agriculture; and so long as land was so abundant

that the spreading population easily sustained itself upon the

fruits of the soil, and satisfied the tastes of a simple society with the products of neighbourhood handicrafts, there was no incentive to any real development of a factory economy. This has been, for the most part, a development since the Civil War.

No attempt was made in the census enumerations of 1790 and 1800 to obtain statistics of manufactures. In 1810 Congress provided for such a report, but the results were so imperfect that there was never published any summary for the country, nor for any state. Nor were the data secured in 1820 and 1840 of much value. Since 1850, however, provision has been made on an ample scale for their collection, although the constant modifications of the schedules under which the statistics were arranged makes very difficult comparisons of the latest with the earlier censuses.

From 1850 to 1900 fairly full industrial statistics were gathered as a part of each decennial census. In 1905 was taken the first of a new series of special decennial censuses of manufactures, in which only true factories — that is, establishments producing standardized products intended for the general market — were included, and mere " neighbourhood " (local) establishments of the hand trades were excluded. Without corrections, therefore, the figures of earlier censuses are not comparable with those of the census of 1905. Thus of 512,254 establishments included in the reports of 1900, six-tenths, employing 1 1 -2 % of the total number of wage-earners and producing 12-3% of the total value of all manufactures, must be omitted as "neighbourhood" establishments in order to make the following comparison of the results of the two enumerations of 1900 and 1905. The magnitude in 1905 of each of the leading items, and its increase since 1900, then appear as follows: number of factories, 216,262, increase 4-2%; capital invested, $12,686,265,673, increase 41-3%; salaries, $574,761,231, increase 50-9%; total wages, $2,009,735,799, increase 29-9%; miscellaneous expenses, $1,455,019,473, increase 60-7%; cost of materials, $8,503,949,756, increase 29-3%; value of products, including custom work and repairing (in such factories), $14,802,147,087, being an increase of 29-7%. Of the last item $3,269,757,067 represented the value of the products of rural factories (that is, those in cities of under 8000 inhabitants). The increase of the different items during the five years was greater in every case in the rural than in the urban factories. There was a very slight decline in

the number of child labourers both in city and country, their total number in 1905 being 159,899 and in 1900 161,276. The total wages paid to children under 16 years, however, which was in 1905 $27,988,207, increased both in the city and, especially, in the country, and was 13-9% greater in 1905 than five years earlier. In the same period there was an increase of 16-0% in the number and of 27-5 % in the wages of women workers of 16 years (and upwards) of age.

Deducting from the total value of manufactured products in 1905 the cost of partially manufactured materials, including mill supplies; a net or true value of $9,821,205,387 remains. Partially manufactured articles imported for use in manufactures are not included. Deducting from this the cost of raw materials and adding the cost of mill supplies, the result — $6,743,399,718 — is the value added to materials by manufacturing processes.

The extent to which manufactures are controlled by large factories is shown by the fact that although in 1905 only 11 2 % of the total number reported products valued at $100,000 or over, these estab lishments controlled 81-5% of the capital, employed 71-6% of the wage earners, and produced 79-3 % of the value of the products, of all establishments reported. 52-3 % of the total number, employ- ing 66-3% of all wage-earners, and producing 69-7% of the total product-value, were in urban centres.

Only six establishments in a thousand employed as many as 500 workers, and only two in a thousand employed as many as 1000 workers. Cotton mills are most numerous in the last class of estab- lishments. The manufacture of lumber and timber gave employ- ment to the largest total number of workers; and this industry, together with those of foundry and machine shops (including locomotives, stoves and furnaces), cotton goods (including small wares), railway car and repair shops, and iron and steel, were (in order) the five greatest employers of labour.

Measured by the gross Value of products, wholesale slaughtering and meat packing was the most important industry in 1905. The products were valued at $801,757,137. In each of four other industries the products exceeded in value five hundred millions of dollars, namely, those of foundry and machine shops, flour and grist mills, iron and steel, and lumber

and timber. In one other, cotton goods, the value was little less. These six industries contributed 27-2% of the value of all manufactured products. Both in 1905 and in 1900 the group of industries classed as of food and kindred products ranked first in the cost of materials used and the value of products; the group of iron and steel ranking first in capital and in wages paid ; and textiles in the number of wage-earners employed.

The close relation of manufactures to agriculture is reflected in

the fact that, of the raw materials used, 79-4% came from the farm. The remainder came from mines and quarries, 15-0%; forests, 5-2%; the sea, 0-4%.

Four states — New York, Pennsylvania, Illinois and Massachusetts — each manufactured in 1900 products valued at over$i,ooo,ooo,ooo; New York exceeding and Pennsylvania attaining almost twice that sum. The manufacture of some products is highly localized. Thus, of silk goods, worsteds, the products of blast furnaces, of rolling mills and steel works, glass, boots and shoes, hosiery and knit goods, slaughtering and meat products, agricultural implements, woollens, leather goods, cotton goods and paper and wood pulp, four leading states produced in each case from 88-5 , in the case of silk goods, to 58-6 in the case of pulp.

M. G. Mulhall (Industry and Weatlh of Nations, 1896) assigned fourth place to the United States in 1880 and first place in 1894 in the value of manufactured products, as compared with other countries. Paul Leroy-Beaulieu (Les Etats-Vnis au x& me Stick, Paris, 1904) would assign primacy to the United States as far back as 1885. Since the English board of trade estimated the exports of British manufactured goods at from 17 to 20% of the industrial output of the United Kingdom in 1902, this would indicate a manufactured product hardly two-thirds as great as that of the true factory estab- lishments of the United States in 1900. But exact data for com- parison do not exist for other countries than the United States. In the production of pig iron, the share of the United States seems to have been in 1850 about one-eighth and that of Great Britain one- half of the world's product; while in 1903 the respective shares were 38-8 and 19-3%; and Germany's also slightly exceeded the British output. In the manufacture of textiles the United States holds the second place, after Great Britain; decidedly second in cottons, a close competitor with Great

Britain and France in woollens, and with France in silks. In the manufacture of food products the United States holds a lead that is the natural result of immense advantages in the production of raw materials. No other country produces half so much of leather. In the dependent industry of boots and shoes her position is commanding. These facts give an idea of the rank of the country among the manufacturing countries of the world. The basis of this position is generally considered to be, partly, immense natural resources available as materials, and, partly, an immense home market.

For Agriculture, see the article Agriculture; for Fisheries, see Fisheries ; and for Forestry, see Forests and Forestry.

Minerals. — In 1619 the erection of " works " for smelting the ores of iron was begun at Falling Creek, near Jamestown, Va., and iron appears to have been made in 1620; but the enterprise was stopped by a general massacre of the settlers in that region. In 1643 the business of smelting and manufacturing iron was begun at Lynn, Mass., where it was successfully carried on, at least up to 1671, furnishing most of the iron used in the colony. From the middle of the 17th century the smelting of this metal began to be of impor- tance in Massachusetts Bay and vicinity, and by the close of the century there had been a large number of ironworks established in that colony, which, for a century after its settlement, was the chief seat of the iron manufacture in America, bog ores, taken from the bottom of the ponds, being chiefly used. Early in the 18th century the industry began to extend over New England and into New Jersey, the German bloomery forge being employed for reducing the ore directly to bar iron, and by the middle of that century it had taken a pretty firm hold in the Atlantic colonies. About 1789 there were fourteen furnaces and thirty-four forges in operation in Pennsylvania. Before the separation of the colonies from the mother country, the mahufacture of iron had been extended through all of them, with the possible exception of Georgia. As early as 171 8 iron (both pig and bar) began to be sent to Great Britain, the only country to which the export was permitted, the annual amount between 1730 and 1775 varying ordinarily between 2000 and 3000 tons, but in one year (1771) rising to between 7000 and 8000 tons.

The first metal other than iron mined by whites within the territory of the United States was lead, the discovery of which

on the American continent was recorded in 1621. The first English settlers on the Atlantic bartered lead of domestic origin with the Indians in the 17th century, and so did the French in the upper Mississippi Valley. The ore of the metal occurring in the Mississippi basin — galena— is scattered widely and in large quantities, and being easily smelted by the roughest possible methods was much used at an early date. In the second half of the 18th century, during the period of French and Spanish domination in the valley, lead was a common medium of exchange, but no real mining development took place. Copper was the next metal to be mined, so far as is known. The first company began work about 1709, at Simsbury, Conn. The ore obtained there and in New Jersey seems to have been mostly shipped to England. A few years later attempts were made to work mines of lead and cobalt in Connecticut and Massachusetts.

The first mining excitement of the United States dates back to the discovery of gold by the whites in the Southern states, along the eastern border of the Appalachian range, in Virginia, and in North and South Carolina. The existence of gold in that region had been long known to the aboriginal inhabitants, but no attention was paid to this by the whites, until about the beginning of the 19th century, when nuggets were found, one of which weighed 28 lb.

Industries about 1850.

From 1824 the search for gold continued, and by 1829 the business had become important, and was attended with no little excitement. In 1833 and 1834 the amount annually obtained had risen to fully a million of dollars. A rapid development of the lead mines of the West, both in Missouri and on the Upper Mississippi in the region where Iowa, Wisconsin and Illinois adjoin one another, took place during the first quarter of the 19th century, and as early as 1826 or 1827 the amount of this metal obtained had risen to nearly 10,000 tons a year. By this time the making of iron had also become important, the production for 1828 being estimated at

130,000 tons.

In 1820 the first cargo of anthracite coal was shipped to Philadelphia. From 1830 the increase in the production was very rapid, and in 1841 the annual shipments from the Pennsylvania anthracite region had nearly reached 1,000,000 tons, the output of iron at that time being estimated at about 300,000 tons. The develop- ment of the coal and iron interests, and the increasing importance of the gold product of the Appalachian auriferous belt, and also of the lead product of the Mississippi Valley, led to a more general and decided interest in geology and mining; and about 1830 geo- logical surveys of several of the Atlantic states were begun, and more systematic explorations for the ores of the metals, as well as for coal, were carried on over all parts of the country then open to settlement. An important step was taken in 1844, when a cession of the region on the south shore of Lake Superior was obtained from the Chippewa Indians. Here explorations for copper immediately began, and for the first time in the United States the business of mining for the metals began to be developed on an extensive scale, with suitable appliances, and with financial success. An event of still greater importance took place almost immediately after the value of the copper region in question had been fully ascertained. This was the demonstration of the fact that gold existed in large quantities along the western slope of the Sierra Nevada of California. In five years from the discovery of gold at Coloma on the American river, the yield from the auriferous belt of the Sierra Nevada had risen to an amount estimated at between sixty-five and seventy millions of dollars a year, or five times as much as the total production of this metal throughout the world at the beginning of the century.

The following details show the development of the mineral resources of the country at the middle of the 19th century. In 1850 the shipments of anthracite amounted to nearly 3,500,000 M n ag tons; those of Cumberland or semi-bituminous coal were about 200,000 tons. The yearly production of pig iron had risen to between 500,000 and 600,000 tons. The annual yield of gold in the Appalachian belt had fallen off to about $500,000 in value, that of California had risen to $36,000,000, and was rapidly approaching the epoch of its culmination (1 851-1853). No silver was obtained in the country, except what was separated from the native gold, that mined in California containing usually from 8 to 10

% of the less valuable metal. The ore of mercury had been discovered in California before the epoch of the gold excitement, and was being extensively worked, the yield in the year 1850-1851 being nearly 2,000,000 ft. At this time the copper mines of Lake Superior were being successfully developed, and nearly 600 tons of metallic copper were produced in 1850. At many points in the Appalachian belt attempts had been made to work mines of copper and lead, but with no considerable success. About the middle of the century extensive works were erected at Newark, New Jersey, for the manufacture of the oxide of zinc for paint; about 1100 tons were produced in 1852. The extent and value of the deposits of zinc ore in the Saucon Valley, Pennsylvania, had also just become known in 1850. The lead production of the Missouri mines had for some years been nearly stationary, or had declined slightly from its former importance; while that of the upper Mississippi region, which in the years just previous to 1850 had risen to from 20,000 to 25,000 tons a year, was declining, having in 1850 sunk to less than 18,000 tons.

*At the end of the century, in only fifty years, the United States had secured an easy first place among the mineral-producing countries , of the world. It held primacy, with a large margin, Pn #r t * n tne y' e 'd °f coa l, i ron , l ea d and copper, the minerals Mlalaf most important in manufactures; in gold its output Industries. was seconc ' on 'y to that of South Africa (though practi- cally equalled by that of Australia) ; and in silver to that of Mexico. Although the data are in general incomplete upon which might be based a comparison of the relative standing of different countries in the production of minerals of lesser impor- tance than those just mentioned, it was estimated by M. G. Mufhall (Industries and Wealth of Nations, edition of 1896, pp. 34-35) that Great Britain then produced approximately one-third, the United States one-third, and all other countries collectively one-third of the minerals of the world in weight.*

The leading products, as reported by the Geological Survey for 1907, were as follows: coal, $614,798,898 (85,604,312 tons of anthra- cite coal, 394,759,112 of bituminous); petroleum, $120,106,749; natural gas, #54,222,399; iron ore, $131,996,147 (pig iron, 8529,958,000); copper, refined, $173,799,300; gold, coinage value, $90,435,700; building-stone, $71,105,805; silver, commercial value, $37i299,7oo ; leaa, refiijetj, ^39.707,596; and zinc, refined, $26,401,910.

The North Atlantic and the North Central census groups of states (that is, the territory east of the Mississippi and north of the Ohio rivers, and north of Maryland) produced two-thirds of the total output. Pennsylvania, Ohio, Illinois, West Virginia, California, Colorado, Montana, Michigan, New York and Missouri were the ten states of greatest absolute production in 1907. The rank relative to area or population is of course different. Those which, according to the bureau of the census, produced $1000 or over per sq. m. in 1902 were Pennsylvania, Ohio and West Virginia; $500 to $1000, Illinois, Michigan, Indiana, Vermont and Massachusetts. Seventeen states produced from $100 to $500 per sq. m.

The total mineral output for the decade 1 899-1908 according to the United States Geological Survey was as follows : —

Year.

Total Value of Products.

Value of

Non-metallic

Products.

Value of Metallic Products.

1908 1907 1906

1905 1904 1903 1902 1901 1900 1899

$ 1,595,670,186 2,071,607,964 1,902,517,565 1,623,928,720 1,361,067,554 1,491,928,980 1,323,105.717 1,141,971 309 1,107,020,352 1,014,355,705

$

1,045,497,070

1,167,705,720

1,016,206,709

921,075,619

859,383,604

793,962,609

617,251,154

567,318,592 512,195,262 446,090,251

$

549,923,n6

903,802,244 886,110,856 702,453,101 501,099,950 624,318,008 642,258,584 518,266,259 550,425,286 525,472,981

*The vastly greater part of mineral products are used in manufac- tures within the United States, and only an insignificant part (for example, 2*47 % in 1902) is exported in the crude form.*

Coal exists in the United States in large quantity in each of its important varieties: anthracite, or hard coal; bituminous, or soft coal; and lignite; and in various intermediate and q ,

special grades. Geologically the anthracite and bitumi- nous coals mainly belong to the same formation, the Carboniferous, and this is especially true of the better qualities ; though it is stated by the United States Geological Survey that the geologic age of the coal beds ranges from Carboniferous in the Appalachian and Mississippi Valley provinces to Miocene (Tertiary) on the Pacific coast, and that the quality of the coal varies only to a very uncertain degree with the geologic age. The following estimates rest upon the same authority: (1) total area underlaid by coal measures, 496,776 sq. m., of which 250,531 are credited to anthracite and bituminous, 97,636 to sub-bituminous and 148,609 to lignite; (2) total original coal supply of the country, 3,076,204,000,000 short tons, including 21,000,000,000 tons of anthracite in Pennsyl- vania, and small amounts elsewhere (semi-anthracite and semi-bituminous), 650,157,000,000 tons of sub-bituminous and 743,590,000,000 tons of lignite; (3) easily accessible coal still avail- able, 1,992,979,000,000 tons; (4) available coal accessible with difficulty, 1,153,225,000,000 tons.

The total production of coal from 1 814 (the year in which

anthracite was first mined in Pennsylvania) to 1908 amounted to 7,280,940,265 tons, which represented an exhaustion — adding 50 % for waste in mining and preparation — of 1 1 ,870,049,900, or four-tenths of I % of the supposed original supply.

In 1820 the total production was only 3450 tons In 1850 it was already more than 7,000,000. And since then, while the population increased 230% from 1850 to 1900, the production of coal increased 4,084 %. At the same time that the per capita consumption thus rose in 1907 to 5-6 tons, the waste was estimated by the National Conservation Commission at 3-0 tons per capita. This waste, however, is decreasing, the coal abandoned in the mine having averaged, in the beginning of mining, two or three times the amount taken out ; and the chief part of the remain- ing waste is in imperfect combustion in furnaces and fire-boxes. Thus, notwithstanding the fact that the supposed supply still avail- able at the close of 1908 was 7369 times the production of that year, and 4913 times the exhaustion such production represented, so extraordinary has been the increased consumption of the country that, in the opinion of the Geological Survey (1907), " if the rate of increase that has held for the last fifty years is maintained, the supply of easily available coal will be exhausted before the middle of the next century " (a.d. 2050).

In 1870 both Great Britain and Germany exceeded the United States in the production of coal. Germany was passed in 1 871 (definitively in 1877) ; Great Britain in 1899. Since 1901 the United States has produced more than one-third of the world's output.

Coal was produced in 1908 in 30 states out of the 46 of the Union; and occurs also in enormous quantities in Alaska ; 690,438 men were employed in this year in the coal mines. Pennsylvania (117,179,527 tons of bituminous and 83,268,754 of anthracite), Illinois (47,659,690), West Virginia (41,897,843), Ohio (26,270,639), Indiana (12,314,890) and Alabama (11,604,593) were the states of greatest production. The production of each was greater still in 1907.

The total output amounted to 415,842,692 short tons, valued al- ii

$53 2 . 3H. H7ini9o8;and to 480,363,424 tons, valued at $614,798,898 in 1909. Pennsylvania produced three-fourths of the total output of the country in i860, and since 1900 slightly less than one-half. Up to 1870 there was more anthracite mined in Pennsylvania than bituminous in the whole country, but since that year the production of the latter has become vastly the greater, the totals in 1907, in which year each stood at its maximum, being 83,268,754 and 33 2 .573,944 tons respectively.

Inasmuch as the present production is not considered locally — ■ and with more or less justice — as at all indicative of the wealth in coal of the respective states, it may be said that according to esti- mates of the Geological Survey the following states are credited with the deposits indicated of true bituminous coal, including local admixtures of anthracite, the figures being millions of short tons : Colorado, 296,272; Illinois, 240.000; West Virginia, 231,000; Utah, 196,408; Pennsylvania, 112,574; Kentucky, 104,028; Ohio, 86,028; Alabama, 68,903; Indiana, 44,169; Missouri, 40,000; New Mexico, 30,805 , Tennessee, 25,665; Virginia. 21,600; Michigan, 12,000; Maryland, 8,044; Texas, 8,000; Kansas, 7,022; and Montana, 5,000; with lesser deposits in other states. At the same time there are estimated deposits of sub-bituminous coal, isolated or mixed with bituminous, amounting to 75,498 millions of tons in Colorado (which is probably the richest coal area of the country) ; and in other states as follows: Wyoming, 423,952 millions of tons; New Mexico, I3?,975; Washington, 20,000; Montana, 18,560; California and Oregon, 1 ,000 each ; and lesser amounts elsewhere. Finally, of true lignite beds, or of lignite mix>;d with sub-bituminous qualities, the states of North Dakota, Montana, Texas and South Dakota are credited with deposits of 500,000; 279,500; 23,000; and 10,000 millions of tons respectively. But it is to be re- membered that the amount and the fuel value of both the lignite and, to a lesser degree, the sub-bituminjus coals, is uncertain to a high degree.

Petroleum, according to the report of the National

Conservation Commission in 1908, was then the sixth largest contributor to the Petroleum nat ‘ on s mineral wealth, furnishing about one-sixteenth of the total. Oil was produced in 1908 in sixteen states. This productive area is divided by the United States Geological Survey into six ” fields ” (in addition to some scattering states) with reference to the quality of oil that they produce, such quality determining their uses. The Appalachian field (Penn- sylvania, New York, Ohio, West Virginia and Tennessee) produces oil rich in paraffin, practically free from sulphur and asphalt, and yielding the largest percentage of gasoline and illuminating oils. This is the highest grade crude oil produced in the world. The California field produces oil characterized by much asphalt and little or no paraffin, and low in volatile constituents. The Lima (Ohio)- Indiana, the Illinois, the Mid-Continent (Kansas, Oklahoma and northern Texas) and the Gulf (Texas and Louisiana) fields produce oils containing more or less of sulphur and asphalt between the extremes of the two other fields just mentioned. The geological conditions of the different fields, and the details of the composition of the oils yielded, are exceedingly varied, and their study has been little more than begun

In 1859 when the total output of the country is supposed to have been only 2000 barrels of oil, production was confined to Pennsyl- vania and New York. Ohio, West Virginia and California appeared as producers in 1876, Kentucky and Tennessee in 1883, Colorado in 1887, Indiana in 1889, along with Illinois, Kansas, Texas and Missouri, Oklahoma in 1 891, Wyoming in 1894, and, lastly, Louisiana in 1902. From 1859 to 1876 the Appalachian field yielded 100% of the total output of the country; in 1908 its share had fallen to J 3‘9 %• In the same period of 50 years the yearly output rose from 2000 to 179,572,479 barrels (134,717,580 in 1905) and to a grand total of 1,986,180,942 barrels, 1 worth $1,784,583,943, or more than half the value of all the gold, and more than the commercial value oi all the silver produced in the country since 1792. The production in 1908 exceeded in value the output of both metals. Deducing from the figures of production since 1859 an equation of increase, one finds that in each nine years as much oil has been produced as in all preceding years together, and in recent years the factor of increase has been higher. So rapid has been the extension of the yielding areas, so diverse the fate of many fields, so shifting their relative rank in output, that the outlook from year to year as regards all

these elements is too uncertain to admit of definite statements respecting the relative importance of the five fields already men- tioned The total output of these, it may be stated, from 1901 to 1908 — uniting the yield of the Illinois to the Lima-Indiana field (since their statistics were long so united, until their industrial differences became apparent), and adding a sixth division for the production of scattered areas of production — was as follows : Appalachian, 235,999,859; Lima-Indiana-Illinois, 219,609,347; Mid- Continent, 136,148,892; Gulf, 159,520,306; California, 27,931,687; and others, 3,367,666; the leading producers in 1907-1908 being the Mid-Continent and the California areas.

The world's output of oil was trebled between 1885 and 1895, and quadrupled between 1885 and 1900. In this increase the United States had the largest share. So recently as 1902 the output of the

1 Barrels of 42 gallons.

United States was little greater than that of Russia (the two yielding 91-4% of the world's product), but this advantage has since then been greatly increased, so that the one has produced 63-1 and the other 21 8% of the total output of the world. In 1908 the Geological Survey issued a preliminary map of the then known areas productive of oil and natural gas in the United States, estimating the extent of the former at 8850 and of the latter at 9365 sq. m. The supply of oil in this area was estimated at from 15,000,000,000 to 20,000,000,000 barrels; and the National Conservation Com mission of 1908 expressed the opinion that in view of the rapid increase of production and the enormous loss through misuse the supply cannot be expected .to last beyond the middle of this century.

Natural gas, as a source of light and for metallurgical purposes, became important in the mid-eigbties. In recent years its use for industrial purposes has lessened, and for domestic ptfr- ». , .„ poses increased. The existence of outflows or springs ura as ' of gas in the region west of the Alleghanies had long been known, and much gas was used for illuminating purposes in Fredonia, New York, as early as 1821. Such gas is a more or less general con- comitant of oil all through the petroleum-bearing areas of the country. The total output of the country rose from a value of $215,000 in 1882 to one of $54,640,374 in 1908, with several fluctua- tions up and down

in that interval. Pennsylvania, with a product valued at $155,620,395 from 1899 to 1908, West Virginia with 5f 8 4.955.496, Ohio with $48,172,450 and Indiana with $46,141,553 were the greatest producers of the Union.

The National Conservation Commission in 1908 estimated the area of the known gas fields of the country at 9000 sq. m. ; the portion of their yield in 1907 that was utilized at 400,000,000,000 cub. ft.; and the waste at an equal amount — more than 1,000,000,000 of cub. ft. daily, or enough to supply all the cities in the United States of above 100,000 population.

Of other non-metallic mineral substances, apart from coal, petro- leum and natural gas, little need be said in detail. Stone is of the greatest actual importance, the value of the quarry output, includ- ing some prepared or manufactured product, such as dressed and crushed stone, averaging $65,152,312 annually in 1904-1908. Limestone is by far the largest element, and with granite makes up two-thirds of the total value. Vermont, Pennsylvania and New York are the leading producers. In this, as in other cases, actual product may indicate little regarding potential resources, and still less regarding the distribution of these throughout the Union. Glass and other sands and gravel ($13,270,032), lime ($11,091,186), phosphate rock ($10,653,558), salt ($7,553,632), natural mineral waters ($7,287,269), sulphur ($6,668,215, almost wholly from Louisi- ana), slate ($6,316,817), gypsum ($4,138,560), clay ($2,599,986), asphalt ($1,888,881), talc and soapstone ($1,401,222), borax ($975.ooo, all from California), and pyrite ($857,113) were the next most important products in 1908. It may be noted that the output in almost every item of mineral production was considerably greater in 1907 than in 1908, and the isolated figures of the latter year are of little interest apart from showing in a general way the relative commercial importance of the products named. In the yield of gypsum, phosphate rock and salt the United States leads the world. In sulphur it is a close second to Sicily. Phosphate rock is heavily exported, and in the opinion of the National Conservation Com- mission of 1908 the supply cannot long satisfy the increasing demand for export, which constitutes a waste of a precious natural resource. Other minerals whose production may be found stated in detail in the annual volume on Mineral Resources of the United States Geological Survey are : _

natural pigments, felspar, white mica, graphite, fluorspar, arsenic, quartz, barytes, bromine. Some dozens of varieties of precious stones occur widely. Of building-stone, clay, cement, lime, sand and salt, the country's supply was esti- mated by the National Conservation Commission of 1908 to be " ample.'

In 1907 iron ore was mined for blast-furnace use in twenty-nine states only, but the ore occurs in almost every state of the Union. As nearly as can be estimated from imperfect statistics, the total ore production of the country rose steadily from iron.

2,873,400 long tons in i860 to 51,720,619 tons in 1907. The United States became practically independent of foreign ore imports during thedecade i870to 1879. The iron-producing area of the country may be divided, with regard to natural geographic, historic and trade considerations, into four districts: (1) the Lake Superior district, embracing the states of Minnesota, Michigan and Wisconsin; (2) the southern district, embracing the triangle tipped by Texas, Maryland and Georgia; (3) the northern district, embracing the triangle tipped by Ohio, New Jersey and Massachusetts, plus the states of Iowa and Missouri; (4) the western district, which includes the states of the Rocky Mountain region and Pacific coast. Of these districts the Lake Superior region' — which embraces the Marquette range (opened in 1854), the Menominee (1872), the Gogebic (1884), the Vermilion (1884) and the Mesabi (1892) — first attracted exploration about 1844, when the copper deposits of the same region were opened, and produced from 1854 to 1908 a total of 410,239,551 long tons, of which 341,036,883 were mined in the period 1889-1908. From the Mesabi range alone, opened in 1892, no less than 168,143,661 long tons were taken up to 1908. The

share of the whole district for some years past has been practically four-fifths of the total output of the country; and together with the yield of the southern district, more than 90%. Minnesota alone produces more than half of the same total, having multiplied her product since 1889 by more than 33 times. Michigan held first place in output until 1901. Alabama

is the third great pro- ducer of the Union, and with the other two made up in 1907 more than four-fifths of the country's total. In 1907 the product of Minnesota (28,969,658 long tons) was greater than that of Germany (with Luxemburg), and nearly twice the production of Great Britain.

Of the two classes of iron minerals used as ores of that metal, namely, oxides and carbonates, the latter furnish to-day an insig- nificant proportion of the country's product, although such ores were the basis of a considerable part of the early iron industry, and even so late as 1889 represented one-thirteenth of the total. Of the oxides, various forms of the brown ores in locations near to the Atlantic coast were the chief basis of the early iron industries. Magnetites were also early employed, at first in Catalan forges, in which by means of a direct process the metal was secured from the ores and forged into blooms without being cast; later they were smelted in blast furnaces. But in the recent and great development of the iron industry the red haematite ores have been overwhelmingly predominant. From 1889 to 1907 the average yearly percentages of the red haematite, brown ores, magnetite and carbonate in the total ore production were respectively 82-4, io-i, 7-1 and 0-4. In the census of 1870 the share of the three varieties appeared almost equal; in 1899 that of the red ores had risen to near two-thirds of the total. The red and brown ores are widely distributed, every state in the Union in 1907, save Ohio and North Carolina, producing one or both. Magnetite production was confined to mountain regions in the east and west, and only in Ohio were carbonates mined.

An investigation was made in 1908 for the National Conservation Commission of the ore reserves of the country. This report was made by Dr. C. W. Hayes of the Geological Survey. With the reservations that only in the case of certain red haematite bedded deposits can any estimate be made of relative accuracy, say within 10%; that the concentration deposits of brown ore can be estimated only with an accuracy represented by a factor varying between 0-7 and 3 ; and that the great Lake Superior and the less known Adirondack deposits can be estimated within 15 to 20%, the total supply of the country was estimated at 79,594,220,000 long tons — 73,210,415,000 of which were credited to haematite ores and 5,054,675,000 to magnetite. Almost 95 % is believed to lie about Lake Superior.

The output of pig iron and steel in 1907 was 25,781,361 and 23,362,594 long tons respectively. It is believed that the first steel made in the United States was made in Connecticut in 1728. Crucible steel was first successfully produced in 1832, Bessemer and open-hearth in 1864. Pennsylvania, Ohio, Illinois, Alabama and New York are the leading states in production.

The washing of the high or Tertiary gravels by the hydraulic process and the working of mines in the solid rock did not, on the whole, compensate for the diminished yield of the ordinary placer and river diggings, so that the product of gold in California continued to fall off, and by i860 had decreased to about half what it had been ten years before. Discoveries in other Cordilleran territories, notably in Montana and Idaho, made up, however, in part for the deficiency of Cali- fornia, so that in i860 the total amount of gold produced in the United States was estimated at not less than $45,000,000. In the latter part of the decade 1 850-1 859 the territories adjacent to Cali- fornia on the east, north and south were overrun by thousands of miners from the Sierra Nevada goldfields, and within a few years an extraordinary number of discoveries were made, some of which proved to be of great importance. The most powerful impulse to mining operations, and the immediate cause of a somewhat lengthy period of wild excitement and speculation, was the discovery and successful opening of the Comstock lode in 1859, in the western part of what is now Nevada, but was then part of Utah. About this lode grew up Virginia City. From 1859 to 1902 the total yield of this lode was $204,653,040 in silver and $148,145,385 in gold; the average annual yield from 1862 to 1868 was above eleven millions; the maximum yield $36,301,537 in 1877; and the total product to July 1880 was variously estimated at from $304,752,171-54 to $306,181,251-25. The lode was an ore channel of great dimensions included within volcanic rocks of Tertiary age, themselves broken through pre-existing strata of Triassic age, and exhibited some of the features of a fissure vein, combined in part with those of a contact deposit and in part with those of a segregated vein. The gangue was quartz, very irregularly distributed in bodies often of great sizes, for the most part nearly or quite barren of ore. The metalli- ferous portion of the lode was similarly distributed in great masses, known as " bonanzas." The next most famous lode is that of Leadville, Colorado, which from 1879 to 1889 yielded

$147,834,186, chiefly in silver and lead. In later years the Cripple Creek district of Colorado became specially prominent.

The total output of gold and silver in the United States according to the tables published by the Director of the Mint has been as follows : —

Gold and Silver.

Years.

Gold.

Silver.

Quantity in Fine Ounces.

Value.

Quantity in Fine Ounces.

Commercial Value.

1792-1847 1848-1872 1873-1908

1,187,170 58,279,778 88,833,231

○

24,537,000 1,204,750,000 1,836,344,000

309,500

118,568,200

1,664,271,300

$

404,500

157,749,900

1,379,892,200

148,300,179

$3,065,631,000

1,783,149,000

$1,538,046,600

Colorado ($22,871,000), Alaska ($19,858,800), California ($19,329,700), Nevada ($11,689,400), South Dakota ($7,742,200), Utah ($3,946,700), Montana ($3,160,000) and Arizona ($2,500,000) were the leading producers in 1908, in which year the totals for the two metals were $94,560,000 for gold and $28,050,600 for silver.

The grade of precious ores handled has generally and greatly decreased in recent years — according to the census data of 1880 and 1902, disregarding all base metallic contents — from an average commerical value of $29-07 to one of $8-29; nevertheless the product of gold and silver has greatly increased. This is due to improve- ments in mining methods and reduction processes, which have made profitable low-grade ores that were not commercially available in

1880.

Copper was produced in 1908 in twenty-four states of the Union. Their output was almost seventeenfold the quantity reported by the census of i860. The quantity produced from 1845 — Copper. the year in which the Lake Superior district became a producer, and in which the total product was only 224,000 lb — up to 1908 was 13,106,205,634 lb. The increases from 1845 to 1850, in each decennial period thereafter, and from 1901 to 1908, were as follows, in percentages: 50-0, 27-0, 6-1, 7-2, 14-8, 9-1 and 5-8. The total product passed 10,000,000 lb in 1857, 20,000,000 lb in 1867, 30,000,000 lb in 1873, 40,000,000 lb in 1875, 50,000,000 lb in 1879 and 100,000,000 lb in 1883. Comparing the product of the United States with that of the world, the figures for the two respectively were 23,350 and 151,936 long tons in 1879, when the United States was second to both Spain (and Portugal) and Chile as a producer; 51,570 and 199,406 long tons in 1883, when the Unites States first took leading rank; 172,300 and 334,565 long tons in 1895, when the yield of the United States first exceeded that of all other parts of the world combined ; and 942,570,000 and 1,667,098,000 lb in 1908.

The three leading producing states or Territories of the Union

are, and since the early 'eighties have been, Arizona, Montana and Michigan. With Utah and California their yield in 1908 was 93% of the total. During the decade ending with that year the average yearly output of the three first-named was 197,706,968 lb, 267,172,951 lb and 192,187,488 lb respectively.

The production of lead was for many years limited, as already mentioned, to two districts near the Mississippi : one the so-called Upper Mines of Wisconsin, Iowa and Illinois; the other Lead

the Lower Mines of south-eastern Missouri. The national government, after reserving the mineral lands (1807) and attempting to lease them, concluded in 1847 to sell them, owing to the difficulty of preventing illegal entry and collecting royalties. The yield of the Upper Mines culminated about 1845, and long ago became insignificant. The greatest lead district is in south-western Missouri and south-eastern Kansas, known as the Joplin-Galena district after the names of the two cities that are its centre. The United States is the greatest lead producer and consumer in the world, its percentage of the total output and con- sumption averaging 30-4% and 32-5% respectively in the years 1904-1908. Since 1825 the total product of lead refined from domestic ores and domestic base bullion was, up to the close of 1908, 7,091,548 short tons. An annual yield of 100,000 tons was first passed in 1 881; of 200,000, in 1891 ; of 300,000, in 1898. The total refined domestic product in 1907 was 337,340, and the total domestic lead smelted was 365,166 tons. Of the smelter domestic product 235,559 tons were of desilverized lead and 129,607 of soft lead. Considerable quantities of foreign ores and base bullion are also refined in the United States. The average percentage of metallic recovery from lead ores was about 68 %, in 1880, and again in 1902, according to the national censuses of these years: According to the bureau of the census the value in 1902 of the lead yielded by copper, by non-argentiferous lead and zinc, and by gold and silver ores respectively was $19,053, $5,850,721 and $12,311,239. This reflects the revolutionary change in the history of lead mining since the first discovery of argentiferous lead ores in the Rocky Mountain states in 1864, which became available only after the building of railways. Until the completion of the Union Pacific in 1869 there was no smelting of such ores except for their silver contents. The deposits in the Joplin-Galena district

were discovered in 1848, but attracted little attention for three decades. Of the soft lead smelted in 1907 no less than 94-8 % came from Missouri. Idaho, Utah and Colorado produce together almost as great a proportion of the desilverized lead, half of which has come in recent years from Idaho.

Spelter production began in the United States in 1858 in an experimental way, and regular production in i860. The census of

the latter year reported an output of product valued at $72,600. According to the census data for 1889 and 1902 there was an in- ~ loc crease in value of product of 184-1 % in the interval, and

of 109-5% i° the quantity of ore produced. The value of products in 1902 were reported as $340,686 from gold and silver ores, and $8,665,675 from non-argentiferous lead and zinc ores. The total product of zinc from domestic ore for the entire country was 7343 short tons in 1873, passed 100,000 tons in 1898, and 200,000 in 1907, when it amounted to 223,745 tons. From 1904 to 1908 the share of the United States in the world's output averaged 28-2 %, and in the world's consumption (disregarding stocks) 27-5 . Of the product of 1907 above stated no less than 63-4 came from Missouri alone; Colorado, Wisconsin, Kansas and New Jersey yielding together 30-8 % more.

Most of the quicksilver produced in the United States comes from California (86% of the total in 1908), but a considerable quantity „ comes from Texas, and small amounts are produced

mercury. – in ˆjtah, Arizona and Oregon. Veins of cinnabar are known elsewhere in the Rocky Mountain and Sierra Nevada regions but not in workable quantities. The mercurial ores of the Pacific Coast ranges occur in very irregular deposits in the form of strings and bunches, disseminated through a highly metamorphosed siliceous rock. The first locality where the

metal was successfully mined was at New Almaden, about 100 m. south of San Francisco. These mines have been productive since 1824. Another old mine, discovered in 1853, is the New Idria located another 100 m. farther south. These two are still among the foremost producers.

From 1850 to 1908 California produced a total of 2,052,000 flasks of metal, of 76-5 ft (since June 1, 1904, 75-0 lb net) each. The year of greatest yield was 1877, with 79,395 flasks. The production had steadily fallen 'to 16,984 flasks in 1908, but in the opinion of the United States Geological Survey this reduction is mainly attribut- able, in recent years at least, to market conditions, and does not truly indicate the exhaustion of the mines, although the ores now available are of low grades, those of New Almaden having shown a decrease in yield from 36-7 % in 1850-185 1 to 0-74 % in 1895-1896, so that only the greatest metallurgical skill and business economy can sustain the mines against a weak market.

Bauxite was produced on a commercial scale in four states in 1908: Alabama, Arkansas, Georgia and Tennessee; Arkansas pro- ducing — as for years past — more than six-tenths of the total product of the country. This rose from an insignificant amount in 1889 to 97,776 long tons (valued at $480,330) in 1907. The consumption of the United States is, however, much larger than its product, and is rapidly growing. The production of aluminium rose from 83 lb in 1883 to 7,500,000 ft in 1903, and a consumption (the Geological Survey not reporting the production) of 17,211,000 ft in 1907. Antimony, bismuth, selenium, tellurium, chromic iron ore, tin, nickel, cobalt, vanadium, titanium, molybdenum, uranium and tantalum are produced in the United States in small amounts, but such " production " in several cases has amounted to only slight discoveries, and in general they are of little importance in the market. Of tungsten the United States was in 1907 the greatest producer in the world (1640 tons in a total of 6062). Tin ores have been widely discovered, but though much has been hoped for from them, particularly from the deposits in the Black Hills region of South Dakota, there has been no more than a relatively insignificant commercial production.

Commerce, Foreign and Domestic. — The English colonies that became the United States carried on during the colonial period a commerce with the mother country, and also, both so far as the legislative trammels of the British colonial system

permitted it and illicitly, a fairly active commerce with the West Indies. This latter became of increasing moment in the successive periods of European colonial wars of the 1 8th century. With the achievement of independence by the United States the same interest became of still greater importance to the new nation, so as to constitute a lead- ing element in its early diplomacy. Although relatively unsuccess- ful in securing access to the British islands, the importance of the United States as a supplier of the other West Indies continually grew, and when the communication of the French and Spanish islands with their metropolises was practically cut off by the British during the Napoleonic wars, the dependence of these colonies upon the American carrying trade became absolute. It was the profits of this neutral trade, notwithstanding the losses to which it was exposed by the high-handed measures of the British and the French governments, that caused these insults to be more or less patiently endured by the trading interests. When President Jefferson, and after him President Madison, attempted to secure redress for these injuries by the imposition of an embargo on American vessels, the West Indian trade was temporarily ruined, the war of 1812-15 with Great Britain contributing to the same end. The East Indian trade had been opened from New England ports late in the 1 8th century. The whaling and cod and mackerel fisheries were of earlier colonial origin. As general carriers American ships gained no importance until the Napoleonic wars; and this interest was greater in the West Indies than in Europe. Such were the main branches of national commerce up to the time of the second war with England. After the war of 1812 new outlets were found in all directions, and the

commerce of the country grew apace, until in the years immediately preceding the Civil War the United States was a close second to Great Britain among the trading countries of the world. The Civil War caused enormous losses to the merchant marine, and the world- wide substitution about this time of iron steamers for wooden steamers and sailing vessels contributed to prevent a recovery; because, although ship-building was one of the earliest arts developed in the colonies, and one that was prosecuted with the highest success so long as wooden ships were the dominant type, the United States has never achieved marked success with the iron steamer, and the law has precluded the registry as American of vessels built abroad. The American ” clipper ‘ ships that were constructed at

Baltimore and elsewhere during the last three decades before the Civil War were doubtless the swiftest sailers that have ever been built.

The total trade of the country by land and sea, the movement inward and outward, is shown in the following table for various years since 1861 : —

Year.

Imports by Land and Sea.

Exports by Land and Sea.

Total Commerce.

1861 1870 1880 1890 1900 1905 1909

$ 335,650,153 462,377,587 667,954,746 789,310,409 849,941,184

1,117,513,071 1,475,612,580

$

249,344,9 T 3

529,519,302

835,638,658

857,828,684

1,394,483,082

1,518,561,666

1,728,203,271

$

584,995,o66

991,896,889

1,503,593,404 1,647,139,093 2,244,424,266 2,636,074,737 3,203,815,851

The excess of exports over imports in the decade 1 899-1908 totalled $5,728,214,844; and in the same period there was an excess of ex- ports of gold and silver, above imports, of $444,908,963. Of the total exports of 1909 $1,700,743,638 represented domestic merchandise. The remainder, or element of foreign exports, has been of similarly small relative magnitude since about 1880, but was of course much larger while the carrying trade was of importance. From 1820 up to 1880 agricultural products made up with remarkable steadiness almost exactly four-fifths of all exports of domestic merchandise. Since then the increase of manufactures, and to a slight degree that of minerals, has lessened much the share of agricultural products, which in 1906 was 56-43%, that of manufactures being 35-11% and of minerals 3-09 %. The following table indicates in a general way the increased value, in round millions of dollars, of the leading agricultural exports since i860: —

Year.

Raw Cotton.

Bread

Stuffs.

Leaf Tobacco.

Meats and Dairy Products.

Cattle,

and other

Animals.

i860

1900 1905 1909

192-0 242-9 381-4 461-9

24-0 262-7 107-7 139-5

16-0 29-4 29-8 36-8

16-9

184-5

200-0

I52-0

i-8

43-6 46-7

20-8

Classifying imports and domestic exports as of six groups: (1) crude foodstuffs and good animals; (2) foodstuffs partly or wholly prepared; (3) raw materials for use in manufacturing; (4) manufac- tured articles destined to serve as materials in further processes of manufacture; (5) finished manufactures; (6) miscellaneous pro- ducts — the table on p. 645 shows the distribution of imports and exports among these six classes since 1820. 1

It will be seen from the table that the share of the first two classes in both imports and exports has been relatively constant. On the other hand the great increase of imports of class III., and the great decrease of class V. ; and of exports the great increase of those of class IV., and decrease of those of classes III. and V., all reflect the great development of manufactures in modern times. The table also shows the great rapidity of this change in recent years.

Europe takes, of course, a large share of the exports of finished manufactures — a little more than a third of the total in the quin- quennial period 1903-1908; but North America takes but very slightly less. On the other hand, above 70 % of manufactures destined to serve, as material in further processes of manufacture went, in the same years, to Europe, and from eight- to nine-tenths of the first three classes of exports. After Europe the largest shares of exports are taken by North America, Asia and Oceania, South America and Africa in order. The share of the five continental divisions in 1909 was as follows, respectively: $1,169,672,326; $344,767,613; $113,129,907; $83,509,047 and $17,124,298. The respective shares of the same divisions in the imports of the country were as follows: $763,704,486; $277,863,210; $223,254,724; $193,202,131 and $17,558,029. It will be seen that the commercial

1 The official statistics are kept current since 1820. For the years 1789-1818 consult Adam Seybert's Statistical Annals (Philadelphia, 1818), which are based upon official documents, a large part of which are no longer in existence.

All Imports.

Percentages

Export

s of Domestic Merchandise.

Years.

by Classes.

Percentages by Classes.

I.

II.

III.

IV.

V.

VI.

I.

II.

III.

IV.

V.

VI.

182O

1115

19-85

3-64

7-48

56-86

1-02

4-79

I9-5I

60-46

9-42

5-66

0-16

1830

n-77

15-39

672

8-22

56-97

0-93

4-65

16-32

62-34

7-04

9-34

0-31

1840

15-54

15-46

11-71

11-56

45-09

0-64

4-09

14-27

67-61

4-34

9-47

0-22

1850

10-38

12-37

6-75

15-08

54-93

0-49

5-59

14-84

62-26

4.49

12-72

0-10

i860

IO-II

15-26

10-48

6-67

56-52

I-OO

3-85

12-21

68-31

3-99

n-33

0-31

1870

12-38

22-08

12-18

12-51

39-69

i-i6

11-12

13-53

56-64

3-66

14-96

0-09

1880

15-01

17-69

19-74

16-59

29-43

1-54

32-30

23-47

28-98

3-52

11-26

o-47

1890

16-28

16-89

21-62

14-81

29-23

1-17

15-62

26-59

36-03

5-50

15-68

0-58

1900

11-52

15-65

32-50

15-79

23-90

0-64

16-59

23-21

23-75

11-15

24-22

1-08

1908

12-19

12-31

30-43

16-43

27-77

0-87

10-30

18-10

30-34

14-23

26-68

o-35

1909

11-67

10-99

35-89

17-48

23-24

o-73

6-75

16-76

33-62

14-89

27-52

0-46

interests in South America are relatively small. The shares of the ten nations having the largest part in the trade of the country were as follows in 1909: —

Great Britain . .

Germany

Canada, Newfoundland and Labrador

France

Cuba

Brazil

Holland

Mexico

Japan

Belgium

Imports from

$ 247,474,104 161,951,673

88,321,706 132,069,748 107,334.716 117,062,725

30,905,712

52,578,454 68,116,665 36,236,568

Exports to

521

247

191

126

48

19

89

53

23

44

281,999 ,310,084 ,438,400

36i,959

,217,689 ,765,836 ,121,124 .512,947 ,471,837 477,380

The leading imports in 1909 were as follows, indicating in each case, when not evidently unnecessary, the value of

finished manu- factures and of unmanufactured materials: Silk (manufactured, $32,963,162; unmanufactured, $75,512,401); hides and skins, other than fur skins ($103,758,277); sugar and molasses ($91,535,466); fibres, vegetables and textile grasses (manufactured, $33,511,696; unmanufactured, $54,860,698) ; coffee ($86,524,006) ; chemicals ($86,401,432); cotton (manufactured, $68,380,780; raw and waste, $15,421,854); rubber (manufactured, $1,462,541, unmanufactured, 883,682,013); wool (manufactured, $22,058,712; unmanufactured, $55,530,366) ; and wood (manufactured, $43,620,591 ; unmanufac- tured, $13,584,172). Precious stones ($43,620,591); fruits and nuts; copper, iron and steel; tobacco (leaf $25,897,650; manufac- tured, $4,138,521); tin; spirits, wines and liquors; oils, paper, works of art, tea and leather ($16,270,406), being the remaining items in excess of $15,000,000 each. The leading exports of domestic merchandise in excess of the same value were the following: cotton ($496,334,448); iron and steel, excluding ores ($157,680,331); meat and dairy products ($151,964,037); petroleum, vegetable and animal oils ($126,350,916); wheat and wheat flour ($100,529,381); copper, excluding ores ($92,584,640) ; wood ($72,312,880) ; leather (S47, 146,415) ; tobacco ($41,554,058) ; coal ($38,441,518) ; agricultural implements ($27,327,428) ; corn and corn meal ($27,062,128) ; animals ($21,007,122); chemicals ($20,330,335); oil-cake ($20,245,818); fruits and nuts ($18,707,670); vehicles ($16,774,036); naval stores ($16,103,076); and paper ($15,280,541).

New York, New Orleans, Boston, Galveston, Philadelphia, Baltimore, San Francisco and Puget Sound are, in order, the leading customs districts of the country in the value of their imports and exports. Almost one-half of the country's foreign trade is done through the single port of New York. In 1909 more than eight- tenths of all imports of the country entered by, and more than seven- tenths of all exports went out through, the eight customs districts just named. Savannah and Charleston are other great ports and southern outlets, particularly for cotton.

Of the imports and exports of 1 86 1 two-thirds (in value) were carried in American vessels. By 1864 the proportion had fallen to 27-5 , and except for a temporary slight recovery after the close of the war there has been a steady progress downward

since that time, until in 1908 only 9-8 of the commerce of the country was carried on under its own flag. More than half the shipping entering and leaving the ports of the United States in 1908 was British ; Germany, the Scandinavian countries, France, Holland and Italy ranking next in order; the United States, although ranking after Great Britain, contributed less than a seventh of the total. The total tonnage entered was 38,539,195 net tons (of 100 cub. ft. each), as compared with 18,010,649 tons in 1880.

Of the total of tonnage entered in 1909, 30,443,695 tons repre- sented seaport entries, the remainder entering across the land frontiers.

The merchant marine of the United States in 1900 totalled 5,164,839 net tons, which was less than that of i860 (5,353,808), in which year American shipping attained an amount which only in recent years

has been again reached. In the decline that followed the Civil War an apparent minimum was reached of 4,068,034 tons in 1880; but this does not adequately indicate the depression of the shipping interest, inasmuch as the aggregate was kept up by the tonnage of vessels engaged in the coasting trade and commerce of the inland waters, from which foreign shipping is by law excluded. The decline of tonnage engaged in ocean traffic was from 2,546,237 net tons in i860 to 1,352,810 in 1880; and this decline continued in later years. On the other hand the aggregate tonnage of the country has again begun to rise, and in 1908 the total was 7,365,445 net tons, a third of this being on the Great Lakes, and somewhat under one-half on the Gulf and Atlantic coasts. Of the same total 6,371,865 tons represented the coasting trade, only 930,413 tons being engaged in the foreign trade of the country. New England still supplies a quarter of the shipping annually built along the entire seaboard of the country ; but more is yearly built upon the Great Lakes than upon the seaboard.

Internal Commerce: Railways and Canals. — Large as has become the foreign commerce of the country, it is small beside the aggregate interior commerce between the states of the Union. The basis of this is necessarily facilities for transportation. At the end of 1908 the railway lines 1 of the country totalled 232,046 m. — more than those of all Europe. The traffic on these, measured in units moved one mile, was

28,797,781,231 passenger-miles, and 214,340,129,523 freight miles. Various systems, with joint or separate outlets from the Pacific coast to the Mississippi Valley, provide for the handling of transcontinental freight. Rivers and canals are relatively much less important to-day than in the middle decades of the 19th century, before the growth of the railway traffic made small by comparison the movement on the interior watercourses. According to a special report of the department of commerce and labour of 1906, 290 streams are used to a " substantial degree " for navigation, affording together an aggregate of 2600 m. of 10 ft. navigation, or 5800 m. of 6 ft. navigation at ordinary water. Of the last almost half belongs to the Mississippi river. More than $250,000,000 has been spent by the national government for the improvement of waterways, yet no general system exists, and a large part of this enormous sum has been wasted on unimportant or impossible projects, especially in recent decades, since the river navigation has been a declining interest. 1360 m. of state-owned canals and 632 m. /of private canals of " some importance " were also reported as in operation in 1909. More than an equal length of canal ways (2444 m., costing $80,000,000) was reported as having been abandoned after con- struction. Of recent years there has been a great revival of interest in the improvement of inland waterways upon systematic plans, which promises better than an earlier period of " internal improve- ments " in the first half of the 19th century, the results of -which were more or less disastrous for the state and local governments that undertook them, and only less so for the national government. The Erie Canal in New York, the Chesapeake & Delaware Canal, and the Sault Ste Marie Canal are the most important in the country.

Coal, iron ore, building materials, lumber, livestock, cotton, fruits, vegetables, tobacco and grain are the great items in the domestic commerce of the country, upon its railways, inland waterways, and in the coasting trade. The magnitude of these items is so great as to defy exact determination ; data for the formation of some idea of them can be found in the account of the mineral, forest and agricultural resourcesof the country. It was estimated by the Bureau of the Census that in 1906 the tonnage of freight moved by American vessels within American waters, excluding harbour traffic, was 177,519,758 short tons (as compared with 1,514,906,985 long tons handled by the railways of the country). Of this total 42-6% was moved on

the Great Lakes, and 36-8% on the Atlantic and Gulf coasts and waterways.

The Great Lakes are connected by canals with the Atlantic, the St Lawrence river and the Mississippi ; the connexion with the first being through the Erie Canal, a 7-ft. waterway, and that with the St Lawrence through Canadian canals that afford a 14-ft. navigation. The connexion with the Mississippi is through the drainage-canal

1 See further Railway.

of Chicago, and thence into branches of the Mississippi affording as yet even less water than the Atlantic outlet. The commerce on the lakes is largely in grain, coal, iron and lumber. The tonnage of vessels cleared between American ports on the lakes in 1908 was 103,271,885 net tons; the freight they carried came to 80,974,605 long tons. Vessels aggregating 46,751,717 net tons, carrying 57,895,149 tons of freight, valued at $470,141,318, passed through the Sault Ste Marie Canal and 47,621 ,078 tons of freight were moved through the Detroit river in the same year. In these figures no account is taken of the trade of the Canadian ports on the lakes. Compared with this volume of traffic the movement through the Suez Canal is small.

It has been estimated by O. P. Austin, chief of the national bureau of statistics, using data of 1903, that the internal commerce of the United States exceeds in magnitude the total international commerce of the world. (F. S. P.)

VII. — Constitution and Government I. — Introductory.

§ 1. A description of the government of the United States falls naturally into three parts: —

First, an account of the states and their governments.

Second, an account of the Federal system, including the relation of the states as communities to the Federation as

representing the whole nation.

Third, an account of the structure and organization of the Federal government considered as the general government of the nation.

As the states are older than the Federal government, and as the latter was, indeed, in many respects modelled upon the scheme of government which already existed in the thirteen original states, it may be convenient to begin with the states and then to proceed to the national government, whose structure is more intricate and will require a fuller explanation.

Before entering, however, on a description of the state governments, one feature must be noticed which is common both to the states and to the Federation, and gives to the governmental system of both a peculiar character, different from that of the government of Great Britain. This feature is the existence of a supreme instrument of government, a document, enacted by the people, which controls, and cannot be altered by, any or all of the ordinary organs of government. In Great Britain parliament is the supreme power, and can change any of the laws of the country at any moment. In the American Union, and in every state of the Union, there exists a docu- mentary or rigid constitution, creating and defining the powers of^ every authority in the government. It is the expression of the ultimate sovereignty of the people, and its existence gives to the working both of the Federal government and of the several state governments, a certain fixify and uniformity which the European, and especially the British, reader must constantly bear in mind, because under such a constitution every legislative body enjoys far scantier powers than in the United Kingdom and most European countries.

II. — The State Governments. § 2. The state is the oldest political institution in America, and is still the basis and the indestructible unit of the American Origin otihe system. It is the outgrowth from, or rather the American continuation of, the colony, as the latter existed State. before the Declaration of Independence in 1776.

In every one of the North American colonies there was in operation at that date a system of self-government, in seven colonies under a charter from the Crown. In each there was a governor, with minor executive officers, a legislature, and a

judiciary; and although the Crown retained the power of altering the charter, and the British parliament could (in strict legal view) legislate over the head of the colonial legislature so as to abrogate statutes passed by the latter, still in practice each colony was allowed to manage its own affairs and to enact the laws it desired. Thus the people were well accustomed to work their institutions, and when they gained their independence continued to maintain those institutions with comparatively little change. In two colonies, Rhode Island and Connecticut, the colonial charter was substantially maintained as the

constitution of the state for many years, in the former case till 1842, in the latter till 1818.

§ 3. Each state was under the Confederation of 178 1 sovereign (except as regarded foreign relations), and for most purposes practically independent. In adopting the Federal Rights and Constitution of • 1787-1789, each parted with some Powers of a of the attributes of sovereignty, while retaining Siaie – others. Those which were retained have been to some extent diminished by the 14th and 15th amendments to the Consti- tution, and if the right to secede from the Union ever existed (a point much controverted) , it was finally negatived by the Civil War of 1861-65. Otherwise, however, these attributes survive. The powers of a state are inherent, not delegated, and each retains all such rights and functions of an independent government as it has not, by entering the Union, affirmatively divested itself of in favour of the Federal government. Each has its own documentary constitution; its legislature of two elective houses; its executive, consisting of a governor and other officials; its judiciary, whose decisions are final, except in cases involving Federal law; its system of local government and local taxation; its revenue, system of taxation, and debts; its body of private civil and criminal law and procedure; its rules of citizenship, which may admit persons to be voters in state and national elections under conditions differing from those prevailing in other states.

The rights and functions of a state practically cover the field in which lie most of the relations of private citizens to one another and to the authorities with which they come into contact in daily life. An American may through a long life never be reminded of the Federal government, except when he votes at Federal elections (once in every two years) , lodges a

complaint against the post office, or is required to pay duties of customs or excise. His direct taxes are paid to officials acting under state laws. The state (or a local authority created by the state) registers his birth, appoints his guardian, provides schools for him and pays for them, allots him a share in the property of a parent dying intestate, licences him when he enters a trade (if the trade needs a licence), marries him, divorces him, enter- tains civil actions against him, tries and executes him for murder. The police that guard his house, the local boards which care for the poor, control highways, provide water, all derive their powers from the state. Nevertheless the state is (as will be explained later) a slightly declining factor in the public life of the nation, because public interest tends more and more to centre in the Federal or national government.

§ 4. The constitution of each state is framed and enacted by the state itself, without any Federal interference, save that the Federal Constitution requires that the Con- _, , _ stitution under which a new state seeks admission to st n u tions" the Union must be "republican"; and under this re- quirement, Congress has seemed to assume a right of making the adoption, or omission, of any particular provision in a state constitution a condition of the admission of that particular state. Even in these cases, however, the constitution derives its force not from the national government, but from the people of the state. The invariable method of forming a constitution is for the citizens to elect by special popular vote a body called a convention to draft the document, which, when drafted and circulated, is usually, though not quite invariably, submitted to popular vote. This is done either when a state is to be formed out of a Territory (as to which see post, § 10), or when an existing state desires to give itself a new constitution. 1

A state constitution usually consists of the following parts : —

A description of the state boundaries (now frequently omitted) ;

A bill of rights, defining the so-called " primordial rights " of the citizens to security of life, liberty and property;

A declaration and enactment of the frame of state government, i.e. the names, functions and powers of the houses of the legislature,

1 Details as to state constitutions will be found in J. Bryce, American Commonwealth, chs. xxxvii.-xxxix. , which is referred to here and subsequently as containing a fuller treatment of all the topics dealt with in this article. .Further details may be found also in the articles on the separate states.

the chief executive officials; and the courts of justice, with provisions regulating the electoral franchise ;

Provisions creating, or directing the creation of, a system of local government for cities and rural areas;

Miscellaneous provisions relating to law and administration, including the militia, revenue and taxation, state prisons and hospitals, agriculture, banking and other corporations, railways, labour questions ;

Provisions for the amendment of the constitution;

A schedule prescribing the method of submitting the draft constitution to the vote of the people, with temporary provisions regulating the mode of transition from the old constitutional arrang3ments to the new ones.

The method of amending the constitution varies in detail from state to state, but that most usual is for the legislature to propose amendments, often by a prescribed majority, and for these amend- ments to be voted on by the people. Such amendments have latterly come to include many matters notstrictly constitutional, and so to constitute a specias of direct legislation by the people similar in principle to what is called in Switzerland the Referendum. Some states have recently allowed a prescribed number of voters to propose, by what is called the Initiative, amendments which are submitted to the vote of all the citizens without the inter- vention of the legislature.

Two remarkable changes have passed over the state constitutions. In the earlier days of the republic they were comparatively short and simple instruments, confined to the

definition of civic rights and the establishment of a frame of government. They have now become very long and elaborate documents, seven, eight or ten times as long as the Federal Constitution, and containing a vast number of provisions on all sorts of subjects, many of them partak- ing of the nature of ordinary statutes passed by a legislature rather than safeguards suitable to a fundamental instrument. And secondly, whereas in earlier days the constitutions were seldom changed, they are now frequently recast or amended. Only Maine and Massachusetts and a few of the newer states live under original constitutions, and only Massachusetts is under a constitution older than the 19th century. Some have recast their constitutions seven or eight times. Some provide for the revision of the constitution at stated intervals. Notwithstanding the facility and frequency of amendments, the variations between one constitution and another are less conspicuous than might have been expected. There is, however, a distinction of type and character between those of the western and southern and those of the eastern states, the former being generally more prolix, more prone to go into details, more apt to contain new experiments in legislation.

Comparing the old constitutions with the new ones, it may be said that the note of those enacted in the first thirty or forty years of the republic was their jealousy of executive power and their careful safeguarding of the rights of the citizen; that of the second period, from 1820 to the Civil War (1861-65), the democratization of the suffrage and of institutions generally; that of the third period (since the war to the present day), a disposition to limit the powers and check the action of the legislature, and to commit power to the hands of the whole people voting at the polls.

§ 5. In every state the legislature consists of two houses. This remarkable feature, originally due to the practice that had prevailed in some colonies, and to the example of Legislatures Great Britain, soon became universal, and the belief " in its necessity has passed into a fundamental dogma, the idea being that a single chamber would be either hasty, or tyrannical or unscrupulous — perhaps all three — so that there must always be a second chamber to keep the first in order. The smaller house is called the Senate, the larger one is (usually) called the House of Representatives, sometimes, however, the Assembly — sometimes the House of Delegates. Both are chosen by popular vote, almost universally by the same voters, and

usually in single-membered districts, and at the same time. The senatorial districts are, of course, larger than the house districts. A senator is usually chosen for a longer term (often four years) than a representative, and, in most cases, whereas the house is elected all at once, the senate is renewed only partially at each election. In some states by law, and in all by custom also, a member must reside in the district which he represents.

Universal manhood suffrage, subject to certain disqualifications {e.g. certain crimes or receipt of poor relief), is the rule in the great majority of states. Certain terms of residence within the United States, in the state, and in the voting district are generally prescribed, the periods varying from state to state. Nine states allow voting rights to aliens who have declared their intention to become citizens, and in some they can as

taxpayers vote on financial matters submitted to a special vote. Kansas grants them a full municipal suffrage. Fourteen pre- scribe some sort of educational qualification. Five states — Wyoming, Colorado, Utah, Idaho and Washington — give the suffrage for all elections to women. 1 In 1905 women could vote at school elections in twenty-four states. Of late years seven Southern states, beginning with Mississippi (constitution of 1890) and including Virginia, North Carolina, South Carolina, Georgia, Alabama and Louisiana, have so altered their constitu- tions as to exclude from voting the great bulk of their respective negro populations, by means of educational tests, property qualifications, a combination of both, or by other means, while various ingenious devices have been employed to admit a large part, at least, of the illiterate whites. In 1910 Oklahoma adopted provisions of the same kind. The suffrage for legislature elections generally determines that for all other elections within the state, and as a rule it carries with it eligi- bility to office. And by the Federal Constitution it is also the suffrage for Federal elections, viz. elections of representatives in Congress and of presidential electors. v

Elections are now practically everywhere conducted under that system of secret voting, which is called in America " the Australian ballot," and which is very similar to that used in the United Kingdom since 1872. There used to be a good deal of fraud practised at elections, including " personating " and "

repeating," as well as a good deal of bribery in a few states and in some of the larger cities. Legislation has reduced these evils in recent years; and efforts have been made to prevent the excessive expenditure of money at elections, and the making of contributions to party " campaign funds " by wealthy corporations who desire to secure some benefit for themselves. Another evil which has not yet been dealt with is the large number of posts for which the voter is expected, at an election to select the best men. This, of course, does not apply to elections to a legislature; but in city elections, and to some extent in state elections and county elections also, it creates great diffi- culties, for how is the average citizen to know (especially in a large city) who are the fittest men out of a long list of candidates for perhaps ten or twenty offices, all of which have to be filled by election at the same time? The perception of these difficulties has evoked a movement for what is called " a short ballot."

The number of members of the legislative chambers varies from state to state. Delaware with 17 senators and 35 representatives, has the smallest; Minnesota, with 63 senators, has ' the largest Senate; and New Hampshire (a small state) has, with its 390 representatives, the largest House. The New York houses number 51 and 150 respectively; those of Pennsylvania, 50 and 204; of Illinois, 51 and 153; of Ohio, 34 and 118; of Massachusetts, 40 and 240. In all states, members of the legislature receive a salary, which is the same for both houses, some states fixing an annual sum, but most preferring a per diem rate, while the maximum is generally determined by a limitation on the length of the session.

It has become the wish of the people in most places to have sessions both short and few. Whereas formerly legislatures met annually, regular sessions are now biennial except in New York, New Jersey, Massachusetts, Rhode Island, Georgia and South Carolina — all original states. In Alabama the legislature meets regularly once only in four years, though it may be convoked in the interval.

The Senates act as courts for the trial of state officers impeached by the house (in imitation of the British House of Lords and the Federal Senate), and have in some states „ the function of confirming or refusing appointments Functions made by the governor. Otherwise the powers and of the State procedure of the two houses are everywhere sub- Le ˆ s '

*stantially identical, though it is worth noting that "**• whereas every house chooses its own Speaker, the president of*

1 Woman suffrage amendments to state constitutions have been rejected by the people in at least twelve states and in two territories. State organizations of women to oppose the extension of the suffrage to women exist in Illinois, Massachusetts, New York and Oregon: possibly in other states also.

the Senate is, in most states, a lieutenant-governor, whom the people have directly elected. Bills may originate in either house, but in about half of the states money bills must originate in the House of Representatives — a survival of British custom which has here, where both houses equally represent the people, no functional value. Both houses do most of their work by committees, much after the fashion (to be presently described) of the Federal Congress, and it is in these committees that the form of bills is usually settled and their fate decided. Sometimes, when a committee is taking evidence on an important question, reporters are present, and the proceedings receive comment in the newspapers; but in general the proceedings of committees and even debates in the houses are imperfectly reported and excite no great public interest. In all the states except one, viz. North Carolina, bills passed by the two houses must be submitted to the state governor for his approval. Should he return it to the legislature disapproved, it is lost unless repassed " over his veto " by a majority usually of two-thirds, but sometimes larger, in each house. A good governor is apt to use his veto freely — indeed, a frequent exercise of the power is deemed in many states to be a sort of test of the governor's judgment and courage.

Subjects of state legislation may be classified under three heads : —

1. Ordinary private law, including property, contracts, torts, family relations, offences, civil and criminal procedure.

2. Administrative law, including the regulation of urban and

rural local government, state and local taxation and finance, education, public works, the liquor traffic, vaccination, adultera- tion, charities, asylums, prisons, the inspection of mines and factories, general laws relating to corporations, railways, labour questions.

3. Matters of a local or special nature, such as bills for chartering and incorporating gas, water, canal, tramway, railway or telephone companies, or for conferring franchises in the nature of monopolies or special privileges upon such companies, or for altering their constitutions, as also for incorporating cities or minor communities and regulating their affairs. Although there usually exist general laws under which corporations or companies (including railway and electric car companies) can be formed, laws which in some states and for some purposes confer a greater freedom of incorporation than the general law allows in the United Kingdom, there is never- theless a noticeable tendency to come to the legislature for special purposes of this kind.

As respects class 1, there is not much change in the law from year to year. The legal profession does not like to see the ordinary and established rules disturbed. Sometimes the laws belonging to this class are codified, or rather consolidated, and then usually by a special committee of competent lawyers whose work is passed en bloc by the legislature.

As respects class 2, a good many measures are passed, particularly in matters affecting labour, and for the protection of any sections of the population which may be deemed to need protection.

It is, however, in class 3 that the legislatures show most activity, much of it pernicious, because prompted by persons seeking to serve private interests which are often opposed to the interests of the whole community. The great " public service " corporations have, in particular, frequently succeeded in obtaining franchises of large pecuniary value without making any adequate payment therefor. A peculiarly notable form of this special or private bill legislation is that of dealing by special statutes with the governmental forms and details of management of municipalities; and the control exercised by the state legislatures over city governments is not only a most important branch of legislative business, but at the same time a means of power to scheming politicians and of

enrich- ment to greedy ones. This has led in some states to the grant of power to cities to frame their own charters. Speaking generally, it is chiefly in the sphere of special or private legislation that state legislatures have shown their weak side, and incurred, in many states, the distrust of the people.

The members of these bodies belong for the most part, though by no means entirely, and least so in the agricultural states, to the class of professional politicians. They are seldom persons of shining ability or high standing in their communities. Except as a stepping-stone to a seat in Congress or a high executive post, the place is not one which excites the ambition of aspiring men. The least respected legislatures are those of the richest and most populous states, such as New York and Pennsylvania, because in such states the opportunities offered to persons devoid of scruple are the largest.

The general decline in the quality of these bodies, and especially their proneness to pass ill-considered or pernicious bills at the instance of private promotors, has led to the restriction in recent years of their powers by the insertion in the state constitutions of many provisions forbidding the enactment of certain classes of measures, and regulating the procedure to be adopted in the passing,

either of statutes generally or of particular kinds of statutes. Even these provisions, however, are frequently evaded.

§ 6. At the head of every state government stands an official called the governor, who is the descendant and representa- tive of the governor of colonial times. 1 Under the earlier constitutions of most of the original thirteen Executive. states he was chosen by the legislature, but he is now everywhere directly elected by the people, and by the same suffrage as the legislature. His term of office is four years in twenty-three states (including Pennsylvania and Illinois), three years in one state, two years in twenty, and one year in two (Massachusetts and Rhode Island). In a few states there are prohibitions on re-election.

It is the duty of the governor to see that the laws of the state are faithfully administered by all officials, and the judgments of the courts carried out. He has, in most states, the right of reprieving or pardoning offenders, but some recent constitutions place restrictions on this power. He is also

commander of the militia or other armed forces of the state, which he can direct to repel invasion, or suppress insurrection or riot. He appoints some of the state officials, his nominations usually requiring the concurrence of the state senate; but his patronage is in most states not very large — in many it is indeed insignificant — – because the offices of greatest importance are filled by direct popular election. He has also the almost mechanical function of representing the state for various formal purposes, such as demanding from other states the extradition of offenders, the issuing of writs for the election of members of the legislature and of members of the Federal House of Representatives, and the receiving of reports from various state officials or boards.

Not less important than his directly executive work is the influence which the governor exerts upon state legislation through his possession (in all the states but one) of a veto power. His right of recommending measures to the legislature (which does not formally include that of framing and presenting bills, but practically permits him to have a bill prepared and use all his influence on its behalf) is of greater value according to the extent to which he leads the public opinion of his state. The legis- lature need not regard his counsels, but if he is a strong man whom the people trust, it may fear him and comply with his demands. When a commercial crisis occurs much may depend on his initiative. Moreover, his veto is a thing to be reckoned with. It is seldom overridden by the prescribed majority, especially if the bill against which it is directed be one of a jobbing nature. And as the people look to him to kill bad measures, he is frequently able, if he be a man both strong and upright, to convey intimations to the legislature, or to those who are influential in it, that he will not approve of certain pending measures, or will approve of them only if passed in a form satis- factory to him. The use of this potential authority, which the possession of the veto power gives, has now become one of a governor's most important duties.

In New England, and in the greater states generally, the governorship is still a post of dignity, and affords an opportunity for a display of character and talents. During the War of Secession, when each governor was responsible for organizing troops from his state, much turned upon his energy, popularity and loyalty. And in recent years the danger of riots during strikes has, in some states, made it important to have a

man of decision and fearlessness in the office which issues orders to the state militia. There has been of late years a revival in the case of some able governors of the old respect for, and deference to, the office.

In thirty-five states there is a lieutenant-governor, elected by popular vote. He is usually president of the state senate, is sometimes aˆnember of some administrative boards, and steps into the governor's place should it become vacant.

Executive councils advising the governor, but not chosen by him, existed under the first constitutions of all the original thirteen states. In New York the council of appointment advised the governor only in regard to appointing officers; and

in Georgia there was no executive council after 1789. True executive councils have now disappeared except in Massachusetts, Maine and New Hampshire.

§ 7. The names and duties of the other officers vary from state to state. In every state thereareasecretaryof state, who iscustodian Admlnlstra- °ˆ tne documents and archives, and a treasurer. Nearly Uve Offices' everywhere there are also a comptroller or auditor, who la a Slate, keeps the accounts and is the principal financial officer, an attorney-general or legal adviser, an adjutant- general, who has immediate charge of the militia, and a superintendent of public instruction, with some little authority over the public schools. Most of the states have also a board of charities, a board of health, a board of railway commissioners, and either boards or single commissioners for banking, insurance, agriculture, public lands and prisons. Other administrative de- partments found in different states are those having control of public works — principally canals — insane hospitals, factory inspection, labour statistics and immigration. New York state, with nearly fifty different administrative bureaus, has a larger number than any other state. In many states the most important of these officials are elected by the people at a general election, but some officials are either chosen by the legislature or appointed by the

governor, the latter method applying mainly to offices of recent creation. The terms of office vary for the different offices, very few exceeding four years. The state officials, being thus largely independent of the governor, and responsible only to the people, are in no sense a cabinet (save in North Carolina) . Each administers his own department, subject to the detailed regulation imposed by statutes, and as these statutes determine such matters as might come into controversy, a general agreement in policy among the administrative officials is not essential.

In many states officials may be removed, not only by impeachment, but also sometimes by vote of the legislature, sometimes by the governor on the address of both houses, or by the governor either alone or with the concurrence of the senate; but such removals must be made for specific misconduct.

The extent of direct state administration of public institutions and works is very limited, and most of the state bureaus have only a supervision over private enterprises, or over local administrative officers. On this account the subordinate civil service of the state is not large compared with that of either the Federal government or of the large municipalities, and only in a few states does it possess any importance. However, these bureaus are seldom well manned, because salaries and tenure of office are seldom such as to induce able men to offer themselves, while the places are often given as rewards for political service. New York, Massachusetts and a few other states have systems of civil service examinations, similar to those in the Federal administration, which serve to keep certain branches out of politics.

*§ 8. The judiciary is in every state an independent department of the government, directly created by the state con- TheSt t st ‘ tut * on > an d not controlled in the exercise of its Judiciary, functions either by the legislature or by the executive. In every state it includes three sets of cqurts: a supreme court or court of appeal; superior courts of record; and local courts, but the particular names and relations of these several tribunals vary greatly from state to state. Most of the original thirteen colonies once possessed also separate courts of chancery; and these were maintained for many years after the separation from Great Britain, and were imitated in several of the earlier among the new states, but special chancery courts now exist only in a few of the states, chiefly in the East and*

South. In other states the common law judges have also equity jurisdiction; and in four states — New York, North Carolina, California and Idaho— there has been a complete fusion of law and equity.

In colonial days the superior judges were appointed by the governors, except in Rhode Island and Connecticut, where the legislatures elected them. These precedents were followed in all the revolutionary constitutions, except in Georgia, where election by the people was established. During the democratizing period from 1820 to i860 the system of popular election was extended, especially in the new states, and at present this system prevails in thirty-six states, including practically all of the new states and five of the original states — New York, Penn- sylvania, Maryland, North Carolina and Georgia. Three of the original thirteen have their judges elected by the legislatures, and in five others, together with Maine and Mississippi among the newer states, they are appointed by the governor, subject to the approval of the executive council, the Senate, or (in

Connecticut) the General Assembly. Local judges are generally chosen by the voters of the district in which they hold court.

Originally the superior judges were in most states appointed for life and held office during good behaviour, but only three states now retain this system. Eight to ten years is the average term of service; it is longer in New York (14), Maryland (15), and Pennsylvania (21), where alone superior judges are not re-eligible. Salaries, too, are small in most states, often not more than one- tenth of what a prominent lawyer can make by private practice. These three factors — popular election, limited terms and small salaries — have all tended to lower the character of the judiciary; and in not a few states the state judges are men of moderate abilities and limited learning, inferior (and some- times conspicuously inferior) to the best of the men who practise before them. Nevertheless, in most states the bench is respect- able in point of character, while in some it is occasionally adorned by men of the highest eminence. The changes intro- duced since 1870 have been, on the whole, for the better, though there is still room for further improvement. Corruption seems to be very rare, but instances of subservience to powerful political groups sometimes shake public confidence. Things would doubt- less have become worse but for the watchfulness which the bar generally shows in

endeavouring to secure the selection of honest and fairly competent men. The administration of civil justice is decidedly better than that of criminal justice. The latter is in many states neither prompt nor certain, offenders frequently escaping through the excessive regard for techni- calities even more than through the indulgence of juries and the occasional weakness of judges.

- It must be remembered that the courts of each state form a judicial system, complete in itself, and independent of the Federal courts, and, of course, of other states. There is no appeal from the highest state court, except in those cases where a question of Federal law is involved, for then such cases may be removed, in manner to be explained hereafter, to the Federal' courts. And, sub- ject only to this limitation, the jurisdiction of the state courts covers the entire field of civil and criminal law. The existing legal system of all the states, except Louisiana, whose law is based on the Roman, have been built upon the foundation of the principles contained in the common and statute law of England as that law stood in 1776, when the thirteen colonies declared their independence. In the development of the law since that time the courts of one state are not bound either by law or by usage to follow the decisions either of the Federal courts or of the courts of any other state, any more than they would follow English courts, although such decisions are used and discussed as evidence of the common law, and great deference is always shown to the opinions expressed by the Federal courts. In many states the legislatures have taken action in the develop- ment of law by adopting statutory codes of procedure, and in some instances have even enacted codes embodying the substance of the common law fused with the statutes. These latter codes have not, however, received the general approval of the legal profession.

It is, of course, to the state courts that the duty belongs of construing the constitution as well as the statutes of the state, and if they find any state law to be inconsistent with the state constitution it is their duty to declare it invalid. It is also the duty of the state court to declare any state law invalid if it is contrary to the Federal constitution or to a Federal statute or treaty. As in the case of the similar power of the Federal judges, this is founded on no special commission, but arises out of the ordinary judicial function of expounding the law and discriminating between the fundamental law and laws of inferior authority (see post, § 25).

*§ 9. Wide as is the range of the rights and powers of a state, and elaborate as is the structure of its government, the state holds a practically less important position in the chag u American system than it once did, and has not so thePoUtical strong a hold as it had in the first quarter of the importance 19th century upon the loyalty and affection of its oitheSt * te – citizens. The political interest and the patriotism of the people generally are now given rather to the nation as a whole than to a state, whereas in the two generations following the Revolutionary War the opposite would have been the case. This notable difference is due not to any con- stitutional changes, for there has been none except those contained in the 13th, 14th and 15th amendments to the Constitution, but to the three following causes: —*

The first is the growth of the party system with its complicated machinery, which has linked the citizens of different states

more closely together, and has led to the eclipsing of political issues confined to a state by issues which are matters of controversy throughout the nation.

The second cause is the Civil War of 1861-65, which prac- tically negatived the far-reaching claims of state sovereignty and the right of secession made by statesmen of the type of Calhoun, and showed that the nation was really much stronger than any group of states.

The third is the enormous development of swift and cheap communications by land and water, and the growth of com- merce and of productive industry, which have brought every part of the country into much closer relations with every other part, and have increased the sense of economic solidarity.

§ 10. During the entire history of the United States there has been a considerable area within the jurisdiction of the Federal government not included in that of any one Territories. or more °f the states; and the systems of government for the various parts of this area require some descrip- tion. The Territories (strictly so called) were at one time impor- tant,

though now less so, because there lemain only two, the unorganized Territory or District of Alaska, and the Hawaiian Islands in the Pacific Ocean. Till 1910 there were the two organized Territories of Arizona and New Mexico, but in that year Congress passed an act for their admission as states. Previously to that year there had been ever since 1787 a large area of the continent which, while belonging to the United States, was deemed too thinly peopled to be fit to be divided up into states. Parts of this area were, however, set off and organized as Territories, receiving a qualified form of self-government while under the ultimate control of Congress for the purposes of legislation. When these parts had been sufficiently filled up by settlers, they were allowed to organize themselves as states, each giving itself a constitution. The Territorial government consisted of a legislature of two houses elected by the people, with a governor appointed by the president of the United States, with the consent of the Senate, and judges similarly appointed. The Territories were not represented in Congress, but each could send a delegate to the House of Representatives, who could speak there but not vote.

Since the Spanish War of 1898 there have been added to the United States various transmarine dominions, none of which has been formed into a state, or is likely to be so formed for a good while to come; and there is also one small piece of original area of the United States, viz. the District of Columbia, which is outside any state, because it contains the national capital. The transmarine dominions are Alaska, the Hawaiian Islands, Porto Rico, the Philippine Islands, and the Canal Zone on the Isthmus of Panama.

III. — Local Government.

§ 11. Every state in the Union has its own system of local administrative areas and local authorities, working under its Rural Local own laws, these systems agreeing in many points Govern- with one another, and differing in many others. “”” Three main types of rural local government may be

distinguished, prevailing in different regions. The first is characterized by its unit, the town or township, and exists in the six New England states. The second is characterized by a much larger unit, the county, and prevails in the southern states. The third may be called the mixed system, combining some features of the first with some of the second, and is found

under a considerable variety of forms in the middle and north-western states. The different types spring from the original differences in the character of the colonists who settled on the Atlantic coast, and in the conditions under which the various colonial communities developed. (See American Commonwealth, chs. xlvii. and xlix.)

The town, or township, of New England is generally a rural com- munity occupying a comparatively small area, and with a population averaging about 3000, but ranging from 200 in newly-settled dis- tricts or thinly-peopled hilly districts up to 17,000 in the vicinity of large cities and in manufacturing neighbourhoods. Each town is governed by the town meeting, an assembly of all the qualified

voters within the limits, which meets at least once a year in the spring, and also at other times when specially summoned. This assembly elects the town officials at the annua! meetings, but it is much more than an electoral body. It is also a deliberative assembly and the legislative authority for local matters. It Inacts by-laws and ordinances, receives the reports of the local officials, passes their accounts, manages the town property, votes appropria- tions for each item of expenditure, and authorizes the necessary taxation. Every resident citizen has the right to bring forward and to speak in favour of any proposal. The meeting is presided over by a chairman called the moderator. In rural communities the attendance is usually good, the debates are sensible and practical, and a satisfactory administration is generally secured. But when the town meeting has grown to exceed seven or eight hundred persons, and especially when the farming class of native American stock has been replaced by factory operatives of other nationalities, the institution works tar less perfectly.

The town officials consist of the " selectmen " (usually three, five or seven, sometimes nine), the town clerk, treasurer, assessors, tax collector, school committee men, and the holders of divers minor offices according to local needs. These are elected annually, except that in some cases the " selectmen " and school committee have a term of several years, one member of each board being elected annually. The " selectmen," who receive no regular salary, but may charge for expenses actually incurred, form a sort of directory or executive committee, which manages the ordinary administrative and financial business under such instructions

as may have been given by the town meeting.

In the Middle and Western states the township is a more artificial organism than the rural town of New England. In one group of states — Pennsylvania, New Jersey, New York, Ohio, Indiana, Iowa — while the township has more or less power, and there are town officials, there is no town meeting. In another group — Michigan, Illinois, Wisconsin, Minnesota, the two Dakotas — the town meeting reappears, though in a less primitive and less perfect form. In the states west of the Alleghanies each township covers an artificial area 6 m. square, and a separate quasi-municipal organization is usually provided for the villages which have grown up in many townships.

The county is to be found in every state of the Union, but its importance varies inversely with the position held in the system of local government by that smaller and older organism, the town. In New England the county was originally an aggregation of towns for judicial purposes, and in that part of the Union it is still in the main a judicial district. There is no general representative council or board, but judicial officers, a sheriff and a clerk, are elected in each county, and also a county treasurer and county commissioners. The latter have the management of county buildings, such as court- houses and prisons, have power to lay out new main highways, to grant licences, and to apportion among the towns and cities the taxation necessary to meet county expenses. Besides these officials there are generally to be found in New England a county school superintendent and an overseer of roads. In the Southern states the county is the local administrative unit, and in addition to its original judicial and financial functions it has now also control over public schools, the care of the poor and the construction and management of roads. County government is generally vested in a board of county commissioners, elected (in almost every state) by the people, and in various officials also directly elected. In some Southern states some counties have been subdivided into school districts, each of which elects a school committee, and from this nucleus there may possibly develop something resembling the New England town. In those Middle and Western states where the town meeting is not found, the functions and officials of the county tend to resemble those existing in the Southern states, while even in those parts of the west where the town meeting is found the county remains more important than in New

England. Thus in many of these states poor relief is a county and not a town charge. In most states' county administration belongs to a small board of three commissioners elected for the county at large, but in New York, Michigan, Illinois and Wisconsin there is a larger board of super- visors elected by townships and cities within each county. Although local affairs do not now enlist, even in New England, so large a measure of interest and public spirit as the town system used to evoke in Massachusetts, Rhode Island and Connecticut in the 'thirties, still, broadly speaking, the rural local government of America may be deemed satisfactory. The administration is fairly cheap and fairly efficient, most so, on the whole, in the Northern and Western states, while jobbery and corruption are uncommon. The value of local self-government as a training for the duties of citizenship has been very great, and in many parts of the country, especially where the funds dealt with are small, elections are not fought and offices not distributed upon party lines. § 1 2. The tendency, now so marked in nearly all civilized countries, to the development of urban communities has been nowhere more marked than in the United States. The increase in ~. the range and importance of municipal functions has government been not less striking than the growth of urban popu- lation. This can best be illustrated by the figures of municipal

expenditure. In 1810 the annual budget of New York city — with a population of 100,000 — was $100,000; to-day an average city of 100,000 population has an annual expenditure of from $1,000,000 to $2,000,000, and the total expenditure of the city of New York in 1909 exceeded $150,000,000. Municipal government is therefore a matter of high concern to America, and plays a large part in any study of American political institutions.

The historical origin of American municipal government is to be found in certain boroughs which had been chartered in the colonial period, after the fashion of English boroughs. These American corporations had the usual English system of borough government, consisting of a mayor, aldermen and

councilmen, who carried out the simple administrative and judicial functions needed tor the then small communities. The basis for the government of each American city is still a charter, but since the Revolution these charters have been granted by the state legislatures, and are subject to constant change by statute. The charters of cities have shown the same process of increasing length and detailed regulation as the state constitutions; and in details there are many differences between different cities. In some states cities are now permitted to enact their own charters. (See American Commonwealth, chs. 1.— Hi.)

As a rule, one finds (1) a mayor, elected directly by the voters within the city, who is the head of the administration; (2) adminis- trative officers or boards, some directly elected by the city voters, others nominated by the mayor or chosen by the council ; (3) a council or assembly, consisting sometimes of two, but more fre- quently of one chamber, elected directly by the city voters; and (4) judges, usually elected by the city voters, but sometimes appointed by the state.

The mayor is by far the most important official in the city govern- ment. He is elected usually for two years, but sometimes for one, three or four (in New York his term is now four years). He has almost everywhere a veto on all ordinances passed by the council, modelled on the veto of the Federal president and of a state governor. In many cities he appoints some or all of the heads of the adminis- trative departments, usually with the approval of the council, but in some important cities the mayor has an absolute power of appointment. As the chief executive officer, he preserves the public peace. In practice he is often allowed to exert a certain discretion as to the enforcement of the laws, especially those providing for Sunday closing, and this discretion has sometimes become a source of mischief. He usually receives a considerable salary, varying with the size of the city.

The practical work of municipal administration is carried on by a number of departments, some under single heads, and some under boards or commissions. The number and classification of these departments vary widely in the different cities. The board of education, which controls the public schools, is usually largely independent of the council, and in some important cities has an independent power of taxation. In Boston, St Louis, Baltimore, and some few other cities, the

police board (or commissioner) is appointed by the governor because police matters had been mismanaged by the municipal authorities and occasionally allowed to become a means of extortion and a door to corruption.

The city councils pass local ordinances, vote appropriations, levy taxes and generally exert some control over appointments to administrative positions. The recent tendency has been, how- ever, to decrease the powers of the council and to increase those of the mayor. In some cities the mayor has received an absolute power of appointment; the departments, especially the boards of health, have large ordinance-making powers; statutes passed by the state legislature determine (excepting the states where cities can make their own charters) the principal lines of municipal policy, and the real control over appropriations and taxes is occasion- ally found vested in a board of estimate, consisting of the mayor, comptroller (the chief financial officer), and a few other adminis- trative officials. In New York City, where the council had lost public confidence, and in some other places, the only important power still possessed by the council is that of granting franchises to street railways, gas companies and the like. In the smaller cities, however, the councils have retained a wider measure of authority. In 1902 the city of Galveston, in Texas, adopted a new form of municipal government by vesting all powers in a commission of five persons, elected by the citizens on a " general ticket," one of whom is mayor and head of the commission, while each of the others has charge of a department of municipal administration. A similar plan, differing in some details, was subsequently introduced in the city of Des Moines, in Iowa; and the success which has attended this new departure in both cities has led to its adoption in many others, especially, but not exclusively, in the Western states. In 1910 more than seventy cities were so administered. Under it administration would appear to have become both more pure and more efficient. The functions of city government may be dis- tributed into three groups: (a) Those which are delegated by the state out of its general coercive and administrative powers, includ- ing the police power and the granting of licences; (b) those which, though done under general laws, are properly matters of local charge and subject to local regulation, such as education and the relief of the poor; and © those which involve no questions of

policy, but are of a purely business nature, such as the paving

and cleansing of streets, the construction and maintenance of drains, the provision of water, &c.

It is here proper to advert to a remarkable extension of direct popular government which has in recent years been applied both to states and to cities. Several state initiative, constitutions now contain provisions enabling a Referendum prescribed number (or proportion) of the voters in aodR ecali. a state or city to submit a proposition to all the registered voters of the state (or city) for their approval. If carried, it takes effect as a law. This is the Initiative. These constitutions also allow a prescribed number of voters to demand that a law passed by the state legislature, or an ordinance passed by the municipal authority, be submitted to all the voters for their approval. If rejected by them, it falls to the ground. This is the Referendum. Some cities also provide in their charters that an official, including the mayor or a member of the council, may be displaced from office if, at a special election held on the demand of a prescribed number of the city voters, he does not receive the largest number of votes cast. This is the Recall. All these three institutions are in operation in some Western states and are spreading to some of the Eastern' cities. Their working is observed with lively interest, for they carry the principle of direct popular sovereignty to lengths unprecedented except in Switzerland. But it is not merely to the faith of the Western Americans in the people that their introduction is due. Quite as much must be ascribed to the want of faith in the legislatures of states and cities, which are deemed tco liable to be influenced by selfish corporations.

IV.— TAe Federal System.

§ 13. When, in 1776, the thirteen colonies threw off their allegiance to the British Crown and took the title of states, they proceeded to unite themselves in a league by the Articles of Confederation of 1781. This scheme of union proved defective, for its central authority, an assembly called Congress, was hopelessly weak. It had neither an executive nor a judiciary, nor had it proper means of coercing a recalcitrant state. Its weakness became so apparent, especially after the pressure of the war with Great Britain had been removed, that the opinion of the wisest men called for a closer and more effective union. Thus the present Constitution was drafted by a convention in 1787, was ratified by nine states (the prescribed number) in

1788, and was set to work under George Washington as first president in 1789.

*§ 14. The Constitution is a document of the first importance in the history of the world, because it has not only determined the course of events in the American Republic, but xhe Federal has also influenced, or become a model for, other CoastUw constitutions, such as those of Switzerland (1848 ‘ /0, *• and 1874), Canada (1867), Australia (1900), besides Mexico and the numerous republics of South and Central America. It was in substance a compromise effected between those who wished for a centralized government and those who desired to leave very wide powers to the component states; and many subsequent difficulties arose from the omission to settle certain points, and from the somewhat vague language in which other points were referred to. Of these omissions and points left vague, some were inevitable, because an agree- ment could not have been reached, some were due to the im- possibility of foreseeing what difficulties the future would bring with it. But they were, considering the conditions under which the instrument was framed, comparatively few, and the Constitution, when one regards it as a piece of drafting, deserves the admiration which it has received from nearly all American and most foreign critics. It is, on the whole, admirably clear, definite and concise, probably superior in point of technique to all the documents since framed on its model.*

As respects substance, the Constitution, being enacted by and expressing the will of the people, who are the ultimate source of political power, is the supreme law of the land over the whole Union, entitled to prevail over all laws passed by Congress, the legislature which it creates, as well as over all

state constitutions and all state laws. It can be altered only by the people, in manner to be hereafter mentioned. It is a comparatively short document, and consists of seven articles, subdivided into sections. Art. I. deals with the Federal legis- lature, its structure and powers, and imposes certain

restrictions upon the states. Art. II. provides for the election of an execu- tive head, the president,' and assigns certain powers and duties to him. Art. III. treats of the judicial power, defining its range and the mode of its exercise. Arts. IV., V. and VI. contain certain miscellaneous provisions, including those which regulate the mode of amendment. Two alternative methods of proposing amendments and also two of passing them are recognized. They may be proposed either by a two-thirds vote in each house of Congress, or by a convention called by Congress on the application of the legislatures of two-thirds of the states. They may be passed either by the legislatures of three-fourths of the states, or by conventions in three-fourths of the states. Congress has in every instance preferred the method of itself proposing amendments and the method of submitting them to the state legislatures for ratification.

The provisions of the Constitution, which is later in date than the creation of the original states, and presupposes the existence and activity of those communities, include two sets of matters, which must be considered separately — (a) the Federal system, i.e. the relations of the national government to the states; and (b) the structure of the national government itself.

§ 15. In the determination and allotment of the rights

*Distribution anc * P owers 0I tne national government on one side*

ot Powers and of the states on the other, a determination

between the which is the foundation of every federal system,

Nation and ˆ American Constitution proceeds upon these the State. ...

principles: —

1. No powers are expressly allotted to the states, because the states are contemplated as continuing to enjoy those pre-existing powers which they have by their own right, and not as devolved upon them by the nation.

2. The powers allotted to the national government are those, and those only, which are required for the purposes of the

collective life of the nation, i.e. (a) powers which relate to its action in the international sphere; and (b) powers which can be exercised within the Union more efficiently and more to the benefit of the people by one central government than by a number of separate governments.

3. All powers which are not expressly allotted to the national government are left to the states, unless specially forbidden to be exercised by the latter, i.e. powers not specifically referred to remain with the states, and if the national government wishes to claim any particular power, it must show affirmatively that that power has been granted to it by the Constitution. [This principle has been followed in the Constitution of Australia, but not in that of Canada.]

The powers given to the national government may be described as those which subserve purposes of common national utility. 1 They are the following (see Const, art. I. § 8) -xsˆ

To impose and collect taxes, which must be uniform throughout the United States;

To borrow money on the credit of the United States;

To regulate foreign and inter-state commerce;

To establish a uniform rule of naturalization and a uniform bank- ruptcy law;

To coin money and fix the standard of weights and measures ;

To establish post offices and post roads ;

To secure exclusive rights for limited time by granting patents and copyrights ;

To constitute tribunals inferior to the Supreme Court;

To declare war, and regulate captures on land and water;

To raise and maintain an army and a navy ;

To provide for calling out the militia, for organizing and arming them, and for governing such part of them as may be in the actual service of the United States ;

To exercise exclusive jurisdiction in the area selected for the

seat of the national government and over spots acquired for military or naval purposes;

To make all laws necessary for carrying out the above powers

(including laws punishing such offences as fall within Federal juris- diction as being transgressions of Federal law) ;

To pass laws protecting citizens of the United States against unjust or discriminating legislation by any state (amendments xiii.andxiv.).

§ 16. The national government is, however, interdicted from using these powers in certain directions by the following prohibitions (art. I. § 9, and first ten amendments) : It may not suspend the writ of habeas corpus (except in time of war or

Powers withheld

1 As to the scheme and working of the Federal government in its relation to the states, see American Commonwealth, chs. xxvii.-xxx.

*public danger) or pass a bill of attainder or an ex post JL._ * 1. facto law ; give any state a commercial preference over jy_tf na7 another; grant any title of nobility; establish or Q 0ve rnment. prohibit any religion, or impose any religious test as a condition of holding office; abridge the freedom of speaking or writing, or of public meeting, or of bearing arms; try any person for certain offences except on the presentment of a grand jury, or otherwise than by a jury of his state and district; decide any common law action where the value in dispute exceeds $20 except by a jury.*

Although prima facie all powers not given to the national government remain with the states, the latter are debarred from some powers. No state may (art I. § 10, and amendments xiii., xiv. and xv.) make any treaty or alliance; coin money or make anything, save gold and silver coin, a legal tender; pass any bill of attainder or ex post facto law, or law impairing the obligation of contracts; have any but a republican form of government; grant any title of nobility; maintain slavery; abridge the privileges of any citizen of the United States, or deny to him the right of voting on account of race, colour or previous condition of servitude ; deprive any person of life, liberty or property without due process of law; deny to any

person the equal protection of the laws.

There are also certain powers which, though not absolutely with- drawn from the states, can be exercised only with the consent of the national legislature, viz. those of laying duties on exports or im- ports, keeping troops or war-ships in time of peace, entering into agreements with another state or foreign power, engaging in war unless invaded. And it may be added that there are certain-powers which, since they do not lie within the province of the national government, and have been refused to the states, are said to be " reserved to the people." This expression means that it is only the people who can confer them and direct them to be exercised. Should the people wish to confer them, they would have to do so by way of amending the Constitution ; and herein lies a remarkable difference between the American system on the one hand and those of some European countries on the other, which, although they have created rigid constitutions, do not expressly debar the legislature from using any and every power of government.

§ 17. The aim of those who framed the Constitution was to avoid friction between the state governments and the Federal government by rendering their respective p e i at j ons ot spheres of action as separate and distinct as possible, the National They saw that the less contact the less danger of Government collision. Their wish was to keep the two mechan- ˆff e isms as independent of each other as was com- patible with the still higher need of subordinating, for national purposes, the state to the central government.

Nevertheless there are, as was unavoidable, certain points of contact between the two, the chief of which are the following) —

The Constitution requires each state government to direct the choice of, and accredit to the seat of the national govern- ment, two senators and so many representatives as the state is (in respect of its population) entitled to send; to provide for the election, meeting and voting of presidential electors in each state, and to transmit their votes to the national capital; to organize and arm the militia forces of the state, which, when duly summoned by the national government for active service, are placed under the command of the president.

Besides these direct services imposed upon the states, each

state is of course practically limited in its legislative and executive action by the power of the Federal judiciary (in the exercise of its function of interpreting the Constitution) to declare invalid laws passed or acts done inconsistent with the Federal Constitution, or with statutes passed by the Federal legislature within the scope of its authority under the Constitution.

So, too, when a subject, such as bankruptcy, is one on which a state may legislate in the absence of legislation by Congress, the state law is valid only so long as Congress does not legislate.

Finally, another point of contact exists in the right of a state to call upon the national government to protect it against invasion .or domestic violence. This right has been several

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times exerted. The national government is also bound to guarantee to every state a republican form of government. (See American Commonwealth, ch. xxviii.)

§ 18. It is a fundamental principle of the American system that the national government possesses a direct and immediate Direct authority over all its citizens, quite irrespective of

Authority of their allegiance and duty to their own state. This the National authority corresponds to and is coextensive with over The" tne sphere of the Federal government. So far as the citizens of functions of that government extend, it acts upon the states, the citizens not through the states, but as of its own right and by its own officers. Beyond that sphere its autho- rity stops, and state authority, unless inhibited by the Federal Constitution, begins. But Federal authority is always entitled to prevail, as against a state legislature or officer, in all matters specifically allotted to it; and in these its power of direct action has two great advantages. It makes the citizen recognize his allegiance to the power which represents the unity of the nation; and it avoids the necessity of calling upon the state to enforce obedience to Federal authority, for a state might possibly be weak or dilatory, or even itself inclined to*

disobedience. Thus the indirect taxes of customs and excise which the Federal government imposes are levied by Federal custom-house collectors and excisemen, and the judgments of Federal courts are carried out by United States marshals distributed over the country. Nothing has done more to give cohesion to the American Federal system than the direct action of the Federal executive and judiciary.

V. — The Federal Government. § 19. The Federal or national government was created de novo by the Constitution of 1787-1789. It was really a new creation rather than a continuation of the feeble organiza- tion of the pre-existing Confederation. But the principles on which it was constructed were old principles, and most of its features were drawn from the state governments as they then existed. These states themselves had been developed out of the previous colonial governments, and both they and the national government have owed something to the example of the British Constitution, which had suggested the division of the legislature into two branches and the independent position of the judiciary. It was, however, mainly from the state constitutions, and not from the arrangements prevailing in Great Britain or in any other country, that the men of the convention of 1787 drew their ideas and precedents.

Following what was then deemed a fundamental maxim of political science, they divided the government into three departments, the legislative, the executive and the judicial, and sought to keep each of these as far as possible detached from and independent of the other two.

In 1787 all the states but three had bicameral legislatures- it was therefore natural that the new national government should follow this example, not to add that the Legislature division into two branches seems calculated to reduce the chances of reckless haste, and to increase the chances of finding wisdom in a multitude of counsellors. There was, however, another reason. Much controversy had raged over the conflicting principles of the equal representation of states and of representation on the basis of numbers, the larger states advocating the latter, the smaller states the former principle; and those who made themselves champions of the rights of the states professed to dread the tyrannical power which an assembly representing population might exert. The adoption of a bicameral system made it possible to give due recognition to

both principles. One house, the Senate, contains the representatives of the states, 'every state sending two; the other, the House of Representatives, contains members elected on a basis of population. The two taken together are called Congress, and form the national legislature of the United States.

§ 20. The House of Representatives is composed of members elected by popular vote in each of the various states, the re-

presentation of each state being in proportion to its population. Each state is at liberty under the Constitution to adopt either the "general ticket" system, i.e. the plan of House of electing all its members by one vote over the Reoresemta- whole state, or to elect them in one-membered , tlres – districts (the " district system "). The system of single-member districts now prevails almost everywhere. (Pennsylvania, however, has two representatives elected at large from the entire state, and there have been other similar instances.) The number of members in the house was originally 65, but it has steadily increased until, in December 1910, there were 398. Besides the full members, each of the Territories is allowed to send a delegate, who has, however, no vote. The electoral franchise on which the house is elected is for each state the same as that by which, under the provisions of the state constitution, the members of the more numerous branch of the state legislature are chosen. Originally franchises varied much in different states, but for many years prior to 1890 what was practically manhood suffrage prevailed in nearly all of • the states. In that year and since, not a few of the southern states have introduced restrictions which tend to exclude the bulk of the coloured population (see ante, §5). It has already been observed that paupers and convicted criminals are excluded in many states, illiterates in some states. Every member must reside in the state which sends him, and custom, rarely broken, requires that he should reside even in the district which he represents. This habit restricts the field of choice and has operated unfavourably on the political life of the nation.

The House of Representatives is chosen for two years, the terms of all the members expiring together. The election of a new house takes place in November 1 of the even years (i.e. 1910, 1912, &c). Members enter on their term of service in the March following, but the first regular session does not begin until the following December, or more than a year after the

elec- tion. In fact, the old house holds its second regular session of three months after the new house has been elected. The rules are very complicated, and considerably limit the power of debate. A remedy against obstruction has been found in a system of closure called the " previous question." Speeches are limited to one hour, and may be confined in committee of the whole house to five minutes. There is comparatively little good debating in the European sense of the term, and this is due partly to the great size of the hall, partly to the system of legislation by committees.

The organization of the house is entirely different from that of the British House of Commons or of most assemblies on the European continent. The ministers of the pre- The sideht do not sit, and since there are thus no officials Committee to undertake the leadership of the majority and System. conduct business, legislative work is shaped and directed by a number of committees in each house. Every bill when introduced is referred to some committee, and each bill comes up for consideration by the whole house on the report of the committee which has dealt with it. There were in 1910 62 regular or standing committees in the House of Represen- tatives, each consisting of from 3 to 20 members. The most important committees are the following: ways and means, rules, elections, appropriations (with several committees for different branches of public expenditure), rivers and harbours, banking and currency, and foreign affairs. _ Each committee has complete control of all bills referred to it, and nineteen- twentieths of the bills introduced meet their death by the failure of the Committee to take action on them. The bills taken up for action are debated and freely amended by the committees, and sometimes public hearings are held. The committees on the expenditure of the various government departments conduct minute investigations into the adminis- tration of each. A bill, as finally agreed on by a committee, is reported to the house, and when taken up for action the fate of most bills is decided by an hour's discussion, opened by the member of the committee making the report. The 1 In Tune in Oreeon; in September in Maine and Vermont.

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more important measures, including taxation and appropriation bills, receive genuine discussion by the house at large, through special orders submitted by the committee on rules. Of the enormous number of bills brought in very few pass.

The unifying force of this complicated system of committee legislation is the Speaker of the House of Representatives. Like the Speaker of the British House of Commons, Speaker ˆ e ‘ s primarily the presiding official, but the char- acter of his office has become different from that of the impartial moderator of the British house. The American Speaker, who of course has a vote like other members, always belongs to the party which commands a majority, and is, indeed, virtually the leader of the majority party in the House of Repre- sentatives. He resembles in some respects a European prime minister, and is second only to the president in political impor- tance. His power is derived from three main sources. He appoints the members of nearly all committees, he chooses the chairman of each, and he directs the reference of bills to the various committees. Of the committee on rules, which practi- cally determines the order in which important measures come before the house, he was formerly chairman, and he had the power of appointing the committee; but on the 19th of March 1910, the house passed a resolution which increased the mem- bership of this committee from 5 to 10, excluded the Speaker, and transferred the appointments to the house. As presiding officer the Speaker exercises a right of discrimination between members rising to speak in debate, and can thus advance or retard the progress of a measure. He is elected by the House of Representatives at its first session for the whole Congress, and his election is regularly carried by a strict party vote.

§ 2r. The Senate in ioro consisted of 92 members, two persons deputed from each state, be it great or small (New York Th s t w ˆ 9,ioo,ooo population and Nevada with 81,875 ‘ having the same representation), who must be inhabitants of that state, and at least thirty years of age. They are elected by the legislature of their state for six years, and are re-eligible. It used to be supposed by many Europeans, following Tocqueville, that this method of election was the cause of the (former) superiority of the senators to members of the House. This was an error, the true reason being that able men preferred a seat in the Senate owing to its larger powers and longer term. One-third retire every two years, so that the old members are always twice as numerous as the new members,

and the body has been continuous ever since its first creation. Senators are re-elected more frequently than mem- bers of the House, so there is always a considerable proportion of men of long service and mature experience.

There has long been a demand for an amendment to the Constitution which should vest the election of senators in the peoples of the several states, and more than one-half of the state legislatures have at one time or another passed resolutions in favour of the change. Within the last few years the object desired has been practically attained in a few states by pro- visions they have introduced for taking a popular vote as to the person whom the legislature ought to elect, the latter being expected to defer to the popular will.

The vice-president of the United States is ex officio presiding officer of the Senate, and this is his only active function in the government. He has, however, no vote in the Senate, except a casting vote when the numbers are equally divided, and his authority on questions of order is very limited.

The methods of procedure in the Senate are somewhat different from those in the House of Representatives. There is a similar committee system, but the Senate committees and their chairmen are chosen, not by the presiding officer, but by the Senate itself voting by ballot. Practically they are selected by caucuses of the majority and minority parties. The Senate rules have no provision for the closure of debate, nor any limitation on the length either of a debate or of a speech. For the consideration of some classes of business the Senate goes into executive or secret session, although what is done at this session usually leaks out, and finds its way to the public through the press.

The functions of the Senate fall into three classes — legislative, executive and judicial. In legislative matters its powers are identical with those of the House of Representatives, with the single restriction that bills for raising revenue must originate in the popular assembly. In practice, too, the Senate is at least as influential in legislation as the House. Disagreements, which are frequent, are usually settled in conference, and in these the Senate is apt to get the better of its antagonist. Serious deadlocks are of comparatively rare occurrence.

The executive functions of the Senate are: (1) To approve or disapprove the president's nominations of Federal officers,

including judges, ministers of state and ambassadors; (2) to approve, by a majority of two-thirds of those present, of treaties submitted by the president. Through the latter power the Senate secures a general control over foreign policy. Its approval is necessary to any important action, and in general the president finds it advisable to keep the leaders of the senatorial majority, and in particular the Senate committee on foreign relations, informed of pending negotiations. Foreign governments often complain of this power of the Senate, because it prevents them from being able to rely upon the carrying out of arrangments they have made with the executive; but as the president is not responsible to Congress and is irremovable (except by impeachment) during his term of office, there would be objections to giving him an unqualified treaty-making authority. Through the power of confirming or rejecting the president's nominations to office, the senators of the presi- dent's party are able to influence a large amount of patronage. This sort of " dual control " works with less friction and delay than might have been expected, but better appointments would probably be secured if responsibility were more fully and more clearly fixed on the president alone, though there would no doubt be a risk that the president might make a serious error.

The judicial function of the Senate is to sit as a high court for the trial of persons impeached by the House of Representatives, a vote of two-thirds of those present being needed for conviction. There have been eight cases of impeachment. The most important was that of President Johnson, whose conviction failed by one vote — 35 to 19. Five of the other seven cases also ended in acquittal, one for want of jurisdiction, 1 and one by the resignation of the official before the impeachment was preferred in the Senate. Two Federal judges were many years ago thus deprived of office, impeachment being the only process by which a Federal judge can be removed.

§ 22. The procedure of each house in framing and passing bills has already been noted. When a bill has passed one chamber it is sent to the other, and there referred coaares- to the appropriate committee. In course of time this slonalLegts- committee may report the bill as received from the lotion aad other house, but frequently an amended or an fi,aDce- entirely new measure is presented, which is discussed and enacted on by the second house. When bills passed by the two chambers

are not identical, and each persists in its own view, the regular procedure is to appoint a committee of conference, consisting of an equal number of members from the Senate and from the House. These meet in secret, and generally agree upon a compromise measure, which is forthwith adopted by both chambers. If no compromise can be arranged, the conflict continues until one side yields, or until it ends by the adjournment of Congress. After passing both houses, the bill goes to the president, and if approved by him, or not returned by him within ten days, becomes law: if vetoed, it returns to the house in which it originated; and if re-passed by a two-thirds vote, is sent to the other house; and if again passed there by a two-thirds vote, it becomes law without the president's consent.

The scope of Congressional legislation has been indicated in the list given of the powers of the national government

1 This case was that of the impeachment of a senator, and the failure to convict arose from the fact that some of the senators at the time held the now generally accepted opinion that a member of Congress is not subject to impeachment.

(see ante, § 15). The most important measures are those dealing with the revenues and appropriations; and the procedure on these matters is slightly different from that on other bills. The secretary of the treasury sends annually to Congress a report containing a statement of the national income and expenditure and of the condition of the public debt, together with remarks on the system of taxation and suggestions for its improvement. He also sends what is called his annual letter, enclosing the estimates, framed by the various departments, of the sums needed for the public service of the United States during the coming year. With this the action of the executive ceases, and the matter passes into the hands of Congress.

Revenue bills for imposing or continuing the various customs duties and internal taxes are prepared by the House committee

on ways and means, whose chairman is always a leading man in the majority party. The report presented by the secretary of the treasury has been referred to this committee, but the latter does not necessarily in any way regard that report. Neither does it proceed on estimates of the sums needed to main- tain the public service, for, in the first place, it does not know what appropriations will be proposed by the spending committees; and in the second place, a primary object of the customs duties has been for many years past, not the raising of revenue, but the protection of American industries by subjecting foreign imports to a very high tariff. Regular appropriation bills down to 1883 were all passed by the House committee on appro- priations, but in that year a new committee — on rivers and harbours — received a large field of expenditure; and in 1886 certain other supply bills were referred to sundry standing committees. These various appropriation committees start from, but are not restricted by and do not in fact adopt, the estimates of the secretary of the treasury. Large changes are made both by way of increasing and reducing his estimates.

The financial bills are discussed, as fully as the pressure of work permits, in committee of the whole House. Fresh items of appropriations are often added, and changes are made in revenue bills in the interest of particular purposes or localities. If the Senate is controlled by the same party as the House, it is likely to secure the acceptance of many of its amendments. The majorities in the two houses then labour together to satisfy what they believe to be the wishes of their party. Im- portant legislation is almost impossible when one of the houses is controlled by one party and the other house by the other.

When finally adopted by the House, the bills go to the Senate and are forthwith referred to the committee on finance or to that on appropriations. The Senate committees amend freely both classes of bills, and further changes may be made by the Senate itself. When the bills go back to the House that body usually rejects the amendments: the Senate declines to recede, and a conference committee is appointed by which a compromise is arranged, usually hastily and in secret, often including entirely new items, and this compromise is accepted with little or no discussion, generally at the end of the session.

Thus it comes that comparatively slight use is made of the experience of the permanent financial officials in the framing of revenue-raising and appropriation bills. There is little

relation between the amounts proposed to be spent in any one year and the amounts proposed to be raised, and there is a strong tendency to deplete the public treasury through special grants secured by individual members. These defects have' long been felt, but Congress is not disposed either to admit officials to attend its sittings or to modify the methods to which it has grown accustomed. A tariff commission was, however, created by statute in 1909, the reports of which may have some influence on the framing of tariffs in future.

§ 23. The executive power of the nation is vested in a president of the United States of America, who holds office The during the term of four years. He, together with

President, the vice-president, is nominally chosen by a system of double election through an electoral college, but in practice this system operates merely as a roundabout way of getting the judgment of the people, voting by states.

The

Electoral

College.

The Constitution directs each state to choose a number of " presi- dential electors equal to the number of its representatives in Con- gress " (both senators and members of the House of Representatives). Members of Congress and holders of Federal offices are ineligible as electors. These electors (in 1908, 483) meet in each state on the second Monday in January, and give their votes in writing for the presi- dent and vice-president. The votes are transmitted to Washington, and there opened by the president of the Senate, in the presence of both houses of Congress, and counted. A majority of the whole number of electors is necessary to elect. If no person have such majority, the president is chosen by the House of Representatives voting by states, and the vice-president is chosen by the Senate. This plan of creating an electoral college to select the president was expected to secure the choice by the best citizens of each state, in a tranquil and deliberate way, of the man whom they in their un- fettered discretion should deem fittest to be the chief magistrate of the Union. In fact, however, the electors exercise no discretion, and are chosen under a pledge to vote for a particular

candidate. Each party during the summer preceding a presidential election holds a huge party meeting, called a national convention, which nominates candidates for president and vice-president. (See post, § 33.) Candidates for the office of elector are also nominated by party conventions, and the persons who are in each state chosen to be electors — they are chosen by a strict party vote — are expected to vote, and do in point of fact vote, for the presidential candidates named by their respective parties at the national conventions. The Constitution leaves the method of choosing electors to each state, but by universal custom they are now everywhere elected by popular vote, and all the electors for each state are voted for on a " general ticket." In the early days the electors were chosen in many states by the legislatures, but by 1832 South Carolina was the only state retaining this method, and in 1868 she also dropped it. Some states also, for a time, chose electors by districts, but by 1832 all had adopted the " general ticket " system. Michigan, however, in the election of 1892 reverted to the " district " system, thereby dividing its electoral vote. Thus the election is virtually an election by states, and the struggle concentrates itself in the large states, where the great parties are often nearly equally divided, e.g. the party which carries New York by even a small majority gains all the 39 electoral votes of that state. The polling for electors takes place early in November on the same day over the whole union, and when the result is known the contest is over, because the subsequent meeting and voting of the electors is a mere matter of form. Never- theless, the system here described, being an election by states, is not the same thing as a general popular vote over the union, for it some- times happens that a person is chosen president who has received a minority of the popular vote cast.

The Constitution requires the president to be a native-born citizen of the United States, not under thirty-five years of age, and for fourteen years resident in the United States. There is no legal limitation to his re-eligibility any number of times; but tradi- tion, dating from the refusal of George Washington to be nominated for a third term, has virtually established the rule that no person shall be president for more than two continuous terms. If the president dies, the vice-president steps into his place; and if the latter also dies in office, the succession passes to the secretary of state. 1 The president receives a salary of $75,000 a year, besides $25,000 a year for travelling expenses, and has an official residence called the Executive

Mansion, or more familiarly the White House.

Functions of the President. — These may be . grouped into three classes: those which (1) relate to foreign affairs; (2) concern legislation; (3) relate to domestic administration.

The president appoints ambassadors and ministers to foreign countries, and receives those sent by foreign countries to the United States. He has, through his secretary of state, immediate direction of all negotiations with such countries, and an unfettered initiative in all foreign affairs. He does not, however, enjoy a free hand in finally determining the foreign policy of the government. Treaties require the approval of two-thirds of the Senate, and the foreign affairs committee of that body is usually kept informed of the negotiations which are being conducted by the executive. The power to declare war formally belongs to Congress; but the execu- tive may, without an act of Congress, virtually engage in hostilities and thus bring about a state of war, as happened in 1845-46, when war broke out with Mexico.

As respects legislation, the position of the president is in marked contrast to that of the British crown. While nearly all important measures are brought into parliament by the ministers of the sovereign, and nominally under his instructions, the American president cannot introduce bills either directly or through his

1 The order of succession, after the secretary of state, is as follows : the secretary of the treasury, the secretary of war, the attorney- general, the postmaster-general, the secretary of tha navy, the secretary of the interior — this order to apply only to such officers as " shall have been appointed by the advice and consent of the Senate . . . and such as are eligible to the office of president . « . and not under impeachment. ..."

ministers. All that the Constitution permits him to do in this direction is to inform Congress of the state of the nation and to recommend the measures which he deems to be necessary. This latter function is discharged by written messages addressed by

the president to Congress, the message sent at the beginning of each session being usually the most important; but the suggestions made in these messages do not necessarily or directly induce legislation, although it is open to him to submit a bill or have one drafted by a minister presented to Congress through a member.

More constantly effective is the president's part in the last stage of legislation. His so-called " veto-power " permits him to return to Congress, within ten days after its passage, any bill of which he may disapprove, and, unless this bill re-passes both houses by a two-thirds vote, it does not become law. Most presidents have made use of the veto power sparingly. Jackson, however, as well as Tyler, Johnson and especially Cleveland, employed it pretty boldly. Most of Johnson's vetoes were promptly overruled by the large majority opposed to him in both houses, but the vetoes of all the other presidents have generally prevented the enactment of the bills of which they disapproved.

The domestic executive authority of the president in time of peace is small, because by far the larger part of law and administration belongs to the state and local governments, while the Federal administration is regulated by statutes which leave little discretion to the executive. The power of making appointments to the administrative service would invest him with a vast influence but for the constitutional requirement of securing the consent of the Senate to the more important appointments made. The president is given a free hand in choosing his cabinet ministers; but for most other appointments, whether or not they are by law in his sole gift, the senators belonging to the president's party have practically controlled the selections for offices lying within their respective states, and a nomination made by the president against the will of the senator concerned will generally be disapproved by the Senate. The members of the president's party in the House also demand a share in the bestowal of offices as a price for their co-operation in those matters wherein the executive may find it necessary to have legislative aid. Nevertheless, the distribution of offices under the so-called " spoils system " remains the most important ordinary function of the president, and the influence he exerts over Congress and legislation is due mainly to his patronage.

In time of war or of public disturbance, however, the domestic

authority of the president expands rapidly. . This was markedly the case during the Civil War. As commander-in-chief of the army and navy, and as " charged with the faithful execution of all laws," he is likely to assume, and would indeed be expected to assume, all the powers which the emergency requires. In ordinary times the president may be almost compared to the managing clerk in a large business establishment, whose chief function is to select his sub-ordinates, the policy of the concern being in the hands of the board of directors. But when foreign affairs reach a critical stage, or when disorders within the Union require Federal intervention, immense responsibility is then thrown on one who is both commander-in- chief of the army and the head of the civil executive. In no Euro- pean country is there any personage to whom the president can be said to correspond. He may have to exert more authority, even if he enjoys less dignity, than a European king. He has powers which are in ordinary times narrower than those of a European prime minister; but these powers are more secure, for instead of depending on the pleasure of a parliamentary majority, they run on to the end of his term. Although he is always elected as a party candidate, he generally receives, if he shows tact and dignity, abundant respect and deference from all citizens, and is able to exert influence beyond the strict limits of his legal power.

The only way of removing the president from office is by impeachment, an institution borrowed from Great Britain, where it had not become obsolete at the time when the United States constitution was adopted. The House of Representatives may impeach the president. The Senate tries him, and a two-thirds majority is required for conviction. Andrew Johnson is the only president who has been impeached.

§ 24. There is in the government of the United States no such thing as a cabinet, in the British or French or Italian The CaHnet sense ˚f the word. But the term is regularly used and Admin- to describe a council of the president, composed litraUvc f t ne heads of the chief administrative depart- ments: the secretary of state, the secretary of the treasury, secretary of war, attorney-general, secretary of the navy, postmaster-general, secretary of the interior, secretary of agriculture, and secretary of commerce and labor. Like the British cabinet, this council is not formally recognized by the law, but it is nevertheless accepted as a permanent feature in the

government. It is really a group of persons, each individually dependent on, and answerable to, the pre- sident, but with no joint policy, no collective responsibility.

The final decision on all questions rest with the president, who is solely and personally responsible. Moreover, the members of the cabinet are excluded from Congress, and are entirely independent of that body, so that an American cabinet has little to do in the way of devising parliamentary tactics, or of preparing bills, or of discussing problems of foreign policy. It is not a government, as Europeans understand the term, but a group of heads of departments, whom their chief, though he usually consults them separately, often finds it useful to bring together for a talk about current politics and the course proper for the administration to take in them, or in order to settle some administrative question which lies on the borderland between the provinces of two ministers.

The principal administrative departments are those already named, whose heads form the president's cabinet. The most important are the state and treasury departments. The former has the conduct of foreign affairs and Admlnlsira- interests, and directs the diplomatic service, but is e ˆ e P art ' obliged to keep in touch with the Senate, because meats – treaties require the consent of the latter. It also has charge of the great seal of the United States, keeps the archives, publishes the statutes of Congress and controls the consular service.

The two main functions of the treasury department are the administration of the government revenues and expenditures, and of the banking and currency laws. The secretary has, however, a smaller range of action than a finance minister in European countries, for, as he is excluded from Congress, he has nothing directly to do with the imposition of taxes, and very little with the appropriations for government expenditure.

The department of the interior is less important than in France or Italy, since the principal functions which there belong to it lie, in the United States, within the field of state powers. Inthe United States the principal matters in this department are the management of the public lands, the conduct of Indian affairs, the issue of patents, the administration of pension laws, of the national census and of the geological survey, and the collection of educational information.

The department of war controls the formerly very small, but now largely increased, army of the United States; and its corps of engineers execute the river and harbour improvements ordered by Congress. The navy department has charge of the dockyards and vessels of war; and the post office department directs the postal system, including the railway mail service. The department of agriculture includes the weather bureau, the bureau of animal industry and other bureaus which conduct investigations and experiments. The attorney-general is the legal adviser of the president, public prosecutor and standing counsel for the United States, and also has general oversight of the Federal judicial ad- ministration, especially of the prosecuting officers called district attorneys and of the executive court officers called marshals.

The department of commerce and labor controls the bureaus which deal with the mercantile marine, the lighthouse and life-saving service, commercial statistics, immigration, and the coast and geodetic survey, and the census is also under its charge.

Two commissions not connected with any of the above depart- ments deserve some notice. The inter-state commerce commission, established by statute in 1887, is a semi-judicial, semi-administrative board of five members, with limited powers of control over inter- state 'railway transportation. The chief duty is to prevent dis- criminations in freight rates and secret rebates from the published list of charges. Its powers have been much extended by subsequent acts, especially that of 1910. The civil service commission, established in 1883, conducts competitive examinations for appoint- ments to subordinate positions under all of the administrative departments. Some 235,000 posts have now been placed under civil service rules and withdrawn from the category of spoils.

§ 25. The Federal judicial system is made by the Constitution independent both of the legislature and of the executive. It consists of the Supreme Court, the circuit court of appeals, the circuit courts and the district courts. judiciary.

The Supreme Court is created by the Constitution, and consisted in 1910 of nine judges, who are nominated by the president and confirmed by the Senate. They hold office during good behaviour, i.e. are removable only by impeach- ment, thus having a tenure even more secure than that of English

judges. The court sits at Washington from October to July in every year. The sessions of the court are held in the Capitol. A rule requiring the presence of six judges to pronounce a decision prevents the division of the court into two or more benches; and while this secures a thorough considera- tion of every case, it also retards the despatch of business. Every case is discussed twice by the whole body, once to ascer- tain the view of the majority, which is then directed to be set

forth in a written opinion; then again when the written opinion, prepared by one of the judges, is submitted for criticism and adoption by the court as its judgment.

The other Federal courts have been created by Congress under a power in the Constitution to establish " inferior courts." The circuit courts consist of twenty-nine circuit judges, acting in nine judicial circuits, while to each circuit there is also allotted one of the justices of the Supreme Court. The judges of each circuit, acting with or without the justice of the Supreme Court for the circuit, constitute a circuit court of appeals, established to relieve the Supreme Court. Some cases may, however, be appealed to the Supreme Court from the circuit court of appeals, and others directly from the lower courts. The district courts are now eighty in number, each having usually a single justice, rarely two. There is also a special tribunal called the court of claims, which deals with the claims of private persons against the Federal government. It is not strictly a part of the general judicial system, but is a creation of Congress designed to relieve that body of a part of its own labours. A customs court of five judges was created by an act of 1909 for the hearing of cases relating to the tariff.

The jurisdiction of the Federal courts extends only to those cases in which the Constitution makes Federal law applicable. All other cases are left to the state courts, from which there is no appeal to the Federal courts, unless where some specific point arises which is affected by the Federal Constitution or a Federal law. The classes of cases dealt with by the Federal courts are as follows: —

1. Cases in law and equity arising under the Constitution, the laws of the United States and treaties made under their authority;

2. Cases affecting ambassadors, other public ministers and consuls ;

3. Cases of admiralty and maritime jurisdiction;

4. Controversies to which the United States shall be a party;

5. Controversies between two or more states, between a state and citizens of another state, between citizens of different states, between citizens of the same state claiming lands under grants of different states, and between a state or the citizens thereof and foreign states, citizens or subjects (Const, art. iii. § 2). Part of this jurisdiction has, however, been with- drawn by the eleventh amendment to the Constitution, which declares that " the judicial power of the United States shall not be construed to extend to any suit in law or equity com- menced or prosecuted against one of the United States by citizens of another state, or by citizens or subjects of any foreign state."

The jurisdiction of the Supreme Court is original in cases affecting ambassadors, and wherever a state is a party; in other cases it is appellate. In some matters the jurisdiction of the Federal courts is exclusive; in others it is concurrent with that of the state courts.

As it frequently happens that cases come before state courts in which questions of Federal law arise, a provision has been made whereby due respect for the latter is secured by giving the party to a suit who relies upon Federal law, and whose contention is overruled by a state court, the right of having the suit removed to a Federal court. The Judiciary Act of 1789 (as amended by subsequent legislation) provides for the appeal to the Supreme Court of the United States of " a final judgment or decree in any suit rendered in the highest court of a state in which a decision in the suit could be had where is drawn in question the validity of a treaty or statute for an authority exercised under the United States, and the decision is against their validity; or where is drawn in question the validity of a statute of, or an authority exercised under, any state, on the ground of their being repugnant to the Constitution, treaties or laws of the United States, and the decision is in favour of their

validity; or where any title, right, privilege or immunity is claimed under the Constitution, or any treaty or statute of, or commission held or authority exercised under the United States, and the decision is against the title, right, privilege

or immunity specially set up or claimed by either party under the Constitution, treaty, statute, commission or authority." If the decision of the state court is in favor of the right claimed under Federal law or against the validity or applicability of the state law set up, there is no ground for appeal, because the applicability or authority of Federal law in the particular case could receive no further protection from a Federal court than has in fact been given by the state court.

The power exercised by the Supreme Court in declaring statutes of Congress or of state legislatures (or acts of the executive) to be invalid because inconsistent with the Federal Constitution, has been deemed by many Europeans a peculiar and striking feature of the American system. There is, however, nothing novel or mysterious about it. As the Federal Constitution, which emanates directly from the people, is the supreme law of the land everywhere, any statute passed by any lower authority (whether the Federal Congress or a state legislature) which contravenes the Constitution must necessarily be invalid in point of law, just as in the United Kingdom a railway bye-law which contravened an act of parliament would be invalid. Now, the functions of judicial tribunals — of all courts alike, whether Federal or state, whether superior or inferior — is to interpret the law, and if any tribunal finds a congressional statute or state statute inconsistent with the Constitution, the tribunal is obliged to hold such statute invalid. A tribunal does this not because it has any right or power of its own in the matter, but because the people have, in enacting the Constitution as a supreme law, declared that all other laws inconsistent with it are ipso jure void. When a tribunal has ascertained that an inferior law is thus inconsistent, that inferior law is therewith, so far as inconsistent, to be deemed void. The tribunal does not enter any conflict with the legis- lature or executive. All it does is to declare that a conflict exists between two laws of different degrees of authority, whence it necessarily follows that the weaker law is extinct. This duty of interpretation belongs to all tribunals, but as constitutional cases are, if originating in a lower court, usually carried by appeal to the Supreme Court, men have grown accustomed to talk of the Supreme Court as in

a special sense the guardian of the Constitution.

The Federal courts never deliver an opinion on any constitutional question unless or until that question is brought before them in the form of a lawsuit. A judgment of the Supreme Court is only a judgment on the particular case before it, and does not prevent a similar question being raised again in another lawsuit, though of course this seldom happens, because it may be assumed that the court will adhere to its former opinion. There have, however, been instances in which the court has virtually changed its view on a constitutional question, and it is understood to be entitled so to do.

§ 26. As the Federal Constitution is a short document, which deals very concisely with most of the subjects it touches, a vast number of questions have arisen upon its R esu itsot interpretation in the course of the 122 years which Constltu- have elapsed since its enactment. The decisions tioaal later- al the Supreme Court upon these questions form a P retat,oa – large body of law, a knowledge of which is now indispens- able to a mastery of the Constitution itself. By them the Constitution has been so expanded in the points which it expressly treats of, and so filled up in the matters which it covers only by way of implication, that it is now a much more complete instrument than it was when it came from the hands of its framers. Thus the courts have held that, while the national government can exercise only such powers as have been affirmatively granted, it is not restricted in its choice of the methods for exercising such powers as have been granted. From this doctrine there has been derived a con- spicuous activity of- the national government in such fields as taxation, borrowing of money, regulating commerce and carry- ing on war. Executive and legislative acts not authorized by the letter of the Constitution have also been allowed to remain unchallenged, and thus precedents have been in fact established.

with the tacit recognition of the courts and the people, through which the sphere of the national government has been en-

larged. The purchase of Louisiana from France by President Jefferson is an instance. It may indeed be said that the Constitution as it now stands is the result of a long process of develop- ment; and that process is still going on. In iooi the Supreme Court delivered several judgments in cases arising out of the annexation of Porto Rico, which handled, though they did not fully settle, divers points of novelty and of importance, and still more recently questions of great intricacy affecting the respective legislative rights of the Federal and the state governments have come before it.

§ 27. It is not, however, only by way of interpretation that the Constitution has been developed. A great many matters
Development which it passed over have become the subject of
of the Con- legislation by Congress; and there has also sprung
stitution by U p a i ar g e mass f usages regulating matters not touched either by the Constitution or by any express enactment. These usages have in many cases lasted so long and become so generally accepted, that they may be regarded as parts of the actual or (so to speak) " working " Constitution, although of course they could be at any moment changed. Among the matters that are now thus settled by usage the following may be mentioned: —

The president practically is limited to two continuous terms of office. The presidential electors are expected to vote for the candidate of the party which has chosen them, exercising no free will of their own. The Senate always confirms the nominations to a cabinet office made by the President.

It may be added that in respect of one matter assigned by the Constitution to the states a momentous change has taken place since the enactment of the Constitution. This matter is the electoral franchise in Federal elections. In 1789 property qualifications were general, but now in all the northern and western states these have been long since abolished, and the electoral suffrage is practically manhood suffrage. In Wyoming, Colorado, Utah, Idaho and Washington universal adult suffrage prevails. Down till 1890 manhood suffrage had prevailed in all the Southern states also (as to some Southern states now see ante, § 5). As the electoral suffrage for state legislature elections is also that for Federal elections (including the election of presidential electors) , the working of the Federal Constitution has thus been affected without any change in the Constitution itself.

§ 28. Besides these changes which have been brought about by judicial interpretation and by usage, the Constitution has Amend- a ˆ s0 Deen altered in the regular and formal way meats to the which its own provisions permit (see ante, § 14). ConstHu- This has happened four times. Ten amendments

the Constitution itself, in order to meet certain objections which had been taken to it. These may be described as a sort of bill of rights. Another, the eleventh, was enacted in 1794-1798 to negative the construction which the Supreme Court had put upon its own powers in holding that it could entertain a suit by a private person against a state. Another, the twelfth (1 803-1 804), corrected a fault in the method of choosing the president; and three more (1865-1870) confirmed and secured some of the results of the victory of the North in the War of Secession (1861-65). In 1909 Congress proposed an amendment for enabling the national legislature to impose an income tax. But few amendments pass beyond the first stage of a formal proposal. This is due not merely to the respect of the Americans for their fundamental law, but also to the difficulties which surround the process of change. It is hard to secure the requisite majorities in Congress, and still harder a majority in three-fourths of the states. The obstacles placed in the way of amendment, which are greater than in the case of almost any other Constitution, may be reckoned among the causes which led to the War of Secession.

§ 29. As compared with the cabinet system of Great Britain, of the British self-governing colonies, and of such European countries as France, Italy, Holland and Belgium, the

characteristic features of the scheme of the American national government are the following:—

a. The legislature and the executive are independent and disjoined. The executive does not depend upon the aenerat legislature, but holds its powers by a direct commis- character of sion from the people. No member of the execu- the P r "me of tive sits in the legislature, nor can the legislature Q 0vemmeat eject any one from office save by impeachment.

b. Both the legislature and the executive sit for fixed terms.

c. No method is provided for getting rid of deadlocks, either between the legislature and the executive or between the two

branches of the legislature. Should action be needed which cannot be legally taken without the concurrence of these different authorities, and should they be unable to concur, the legal situation must remain in statu quo until by a new election the people have changed one or more of the conflicting authorities, and so brought them into harmony.

d. The judiciary holds a place of high importance, because it is the proper interpreter of the will of the people expressed in the supreme law, the Federal Constitution, which the people have enacted.

It will be noted that the structure of the Federal Government is less democratic than that of the state governments. The only posts in the former conferred by popular election are those of the president and the members of the legislature, and while the two houses are a check on each other, the president is a check upon both.

The defects which have been remarked in this system are, broadly speaking, the following: There is a danger that prompt action, needed in the interests of the nation, may fail to be taken owing to a deadlock between legislature and executive, or between the two branches of the legislature. There may be a difficulty in fixing responsibility upon any person, or small group of persons,' because cases may arise in which- the executive, being unable to act without the concurrence of the legislature, can hardly be blamed for failing to act, while yet it is unable to relieve itself by resigning; while on the other hand the legislature — which consists of two bodies, each of them numerous, and in neither of which are there recognized leaders — contains no person on whom responsibility can be fixed. On the other hand, the characteristic merits of the system may be summed up as consisting in the safeguards it provides against the undue predominance of any one power or person in the government, and therewith against any risk there may be that the president should become a despot, and in the full opportunities it secures for the due consideration of all important measures. It is a system amply provided with checks and balances; it recognizes and enforces the principle of popular sovereignty, while subjecting that principle to many checks in practice; and it is well calculated to maintain unchanged the relation of its component parts each to the other. There has been, in point of fact, no permanent shifting of weight or strength from any one organ of government to any

other. At some particular epoch the president has seemed to be gaining upon Congress, at other epochs Congress has seemed to be gaining upon the president. Much depends on the personal qualities of the president and his power of inspiring the people with trust in his courage and his uprightness. When he possesses that power he may overawe Congress, and make them follow, even reluctantly, in the path he points out. Now and then the Senate has been more influential than the House, now and then it has fallen back, at least so far as the confidence of the people in it is concerned. The part played by the judiciary has at some moments been of special importance, while at others it has been little noticed. But, taking the history of the republic as a whole, that equilibrium between the several organs of the govern- ment which the Constitution was intended to secure has been substantially maintained.

VI. — The Party System. § 30. The actual working of the government of the Union and of the governments of the several states cannot be properly

of the Government.

understood without some knowledge of the party system as it exists in the United States. That system is, as has been well observed by H. J. Ford, 1 a sort of link between the executive and the legislative departments of government, and thus the policy and action of the party for the time being in power forms a sort of second and unofficial government of the country, directing the legal government created by the Constitution. In no country have political parties been so carefully and thoroughly organized. In no country does the spirit of party so completely pervade every department of political life; , „ . not that party spirit is any more bitter than

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the Party li 1S ln Europe, for in some respects it is usually less System upon bitter and less passionate than in France, the United the Working Kingdom or Austria, but that it penetrates farther into the body of the people, and exerts a more con-

stant influence upon their minds. Party organiza- tions have in the United States a wide range of action, for they exist to accomplish five purposes. Three of these are pursued in other countries also. These three are: first, to influence governmental policy; secondly, to form opinion; and thirdly, to win elections. But the two others are almost (if now not quite) peculiar to the United States, viz. to select candidates for office and to procure places of emolu- ment for party workers. The selecting by a party of its candidates, instead of allowing candidates to start on their own account, is a universal practice in the United States, and rests upon the notion that the supreme authority and incessant activity of the people must extend not only to the choice of officials by vote, but even to the selection of those for whom votes shall be cast. So the practice of securing places for persons who have served the party, in however humble a capacity, has sprung from the maxim that in the strife of politics " the spoils belong to the victors," and has furnished a motive of incomparable and ever-present activity ever since the administration (1829-1837) of President Andrew Jackson. It is chiefly through these two practices that the party organiza- tions have grown so powerful, and have been developed into an extremely complicated system of machinery, firm yet flexible, delicate yet quickly set up, and capable of working efficiently in the newest and roughest communities.

§ 31. The contests over the adoption of the Federal Consti- tution by the several states in 1787-1700 brought to the surface Origin and two opposite tendencies, which may be called the History of centrifugal and centripetal forces, a tendency to the Parties. mam tain both the freedom of the individual and the independence, in legislation, in administration and in jurisdiction, of the several states, and an opposite tendency to subordinate the states to the nation, and to vest large powers in the central Federal authority. These tendencies soon arranged themselves in concrete bodies, and thus two great parties were formed. One, which took the name of Republican, became the champion of states' rights, and claimed to be also the champion of freedom. It was led by Thomas Jefferson. The other, the Federalist party, led by Alexander Hamilton, stood for an energetic exercise of the powers of the central government, and for a liberal interpretation of the powers granted that government by the Federal Constitution. The Jeffersonian party has had an unbroken continuity of life, though it has been known since

about 1830 as the Democratic party. The .Federalist party slowly decayed, and ultimately vanished between 1820 and 1830, but out of its ruins a new party arose, practically its heir, which continued powerful, under the name of Whigs, till 1854, when it broke up over questions con- nected with the extension of slavery. Very soon thereafter a party, nominally new, but largely formed out of the Whigs, and maintaining many of its traditions, sprang up, and took the name of Republicans. Since 1856 these two great parties, Democrats and Republicans, have confronted one another, including between them the vast majority of the people. After the Civil War, when the questions attending Reconstruction had become less acute, economic discontents gave rise to other 1 Rise and Growth of American Politics.

smaller parties, such as Greenbackers, Labor party and Popu- lists, and the sense of the harm done by the licensed sale of alcohol evoked a party which became known as the Prohibitionists. Still later the growth of Collectivist views, especially among the immigrants from Continental Europe, led to the formation of a Socialist Labor party and a Socialist party, some of those who had belonged to the Populists associating themselves with these new groups.

The Democratic party began to form for itself a regular organization in the presidency (1820-1837) of Andrew Jackson, and the process seems to have been first seriously under- taken in New York state. The Whigs did the same; and when the Republicans organized themselves, shortly after the fall of the Whigs, they created a party machinery on lines resembling those which their predecessors had struck out. The estab- lishment of the system in its general form may be dated from before the Civil War, but it has since been perfected in its details.

§ 32. The machinery of an American party consists of two distinct but intimately connected sets of bodies, the one permanent, the other temporary, or rather inter- outline of mittent. The function of the former is to manage the System the general business of the party from month to of Party month and year to year. That of the latter is to Oiy««x»a- nominate candidates for the next ensuing elec- tions and to make declarations of party opinion intended to indicate the broad lines of party policy.

The permanent organization consists of a system of committees, one for each of the more important election areas. There is a committee for every city, every county, and every congressional district, and in some states ˆyL e < " n " even for every township and every state legisla- ture district. There is, of course, a committee for every state, and at the head of the whole stands a national committee for the whole Union, whose special function it is to make arrangements for the conduct of party work at a presidential election. Thus the country from ocean to ocean is covered by a network of committees, each having a sphere of action corresponding to some election area, whether a Federal area or a state area. Each committee is independent and respon- sible so far as regards the local work to be done in connexion with the election in its own area, but is subordinate to the party committees above it as respects work to be done in its own locality for the general purposes of the party. The ordinary duties of these committees are to raise and spend money for electioneering and otherwise in the interests of the party, to organize meetings, to " look after the press," to attend to the admission of immigrants or new-comers as voters, and generally to attract and enrol recruits in the party forces. At election times they also direct and superintend the work of bringing up voters to the polls and of watching the taking and counting of the votes; but in this work they are often aided or superseded by specially appointed temporary bodies called " campaign committees." These party committees are permanent, and though the membership is renewed every year, the same men usually continue to serve. The chairman in particular is generally reappointed, and is often, in a populous area, a person of great and perhaps autocratic power, who has large funds at his disposal and a regular army of " workers " under his orders.

The other and parallel branch of the party organization consists of the bodies whose function it is to nominate party candidates for elective posts, whether legislative or p ar t y Nom- executive. (It must be remembered that many Inating executive state, county and city officers are chosen Conven- by direct popular vote.) These bodies are meetings tlons ‘ of the members of the party resident in each election area. In the smallest areas, such as the township or city ward, the meeting is composed of all the recognized members of the party who are entitled to vote, and it is then called a primary. In the larger election areas, such as a county or city, the number of voters

who would be entitled to be present

renders it impossible to admit all, so the nominating meetings in these areas are composed of delegates elected in the various primaries included in the area, and the meeting is called a nominating convention. This is the rule, but in some parts of the South and West nominations for members of the state legislature and county officials, and even for members of Congress, are made by primary assemblies meeting over the entire area, which all the party voters are entitled to attend. Where candidates are to be nominated for a state election, the number of delegates from primaries 'would be too large, so the state nominating convention is composed of delegates chosen at representative conventions held in smaller areas.

Every registered voter belonging to the party in the local election area for which party candidates are to be nominated is presumably entitled to vote in the primary. In rural districts little difficulty arises, because it is known what citizens belong to each party; but in cities, and especially in large cities, where men do not know their neighbours by sight, it becomes necessary to have regular lists of the party voters entitled to attend a primary; and these lists are either prepared and kept by the local party committee, or are settled by the votes of the persons previously on the party rolls. The composition of these lists is of course a serious matter, because the primary is the foundation of the whole party edifice. Accordingly, those who control the local organizations usually take pains to keep on the lists all the voters whom they can trust, and are apt to keep off those whom they think likely to show a dangerous independence. By their constant activity in this direction, and by their influence over the pliable members of the party, they are generally able to have a primary subservient to their will, which is ready to nominate those whom they may suggest as suitable candidates, and to choose as delegates to the conventions persons on whom they can rely. In this way a few leaders may sometimes be able to obtain control of the nominating machinery of a city, or even of a state, for the local committees usually obey instructions received from the com-

mittees above them. (See, as to the details of party machinery, American Commonwealth, chs. lix.-lxiv., M. Ostrogorski on Democracy in England and America, and Professor Jesse Macy on Party Organization and Machinery, 1904.)

The great importance of these nominating bodies lies not only in the fact that there are an enormous number of state, county and city offices (including judicial offices) filled by direct popular election, but also in the fact that in the United States a candidate has scarcely any chance of being elected unless he is regularly nominated by his party, that is to say, by the recognised primary or convention. To control the primary or the convention (as the case may be) of the party which is strongest in any given area is therefore, in ninety- nine cases out of a hundred, to control the election itself, so far as the party is concerned, and in many places one party has a permanent majority.

As the desire to dominate primaries was found to lead to many abuses, both in the way of manipulating the lists of party voters and in the unfair management of the primary meetings themselves, a movement was started for reforming the system, which, beginning soon after 1890, gathered so much support that now in the large majority of the states laws have been enacted for regulating the proceedings at primary nomination meetings. These laws vary greatly in their details from state to state, but they all aim at enabling the voters to exercise a free and unfettered voice in the selection of their candidates, and they have created a regular system of elections of candidates preliminary to the election of office-holders from among the candidates. In most states the voter is required, when he obtains his ballot at the primary election, to declare to which party he belongs, but sometimes the primary is " open " and he may vote for any one of the persons who are put forward as desiring to be selected as candidates. The laws usually contain pro- visions punishing fraud or bribery practised at a primary, similar to those which apply to the subsequent elections to office. Although political parties were originally mere private

organizations, little objection seems to have been felt to giving them statutory recognition and placing the proceedings at them under full official control.

§ 33. One nominating body is of such conspicuous magni- tude as to need special notice. For the selection of party candidates

for the offices of president and vice- The National president of the United States there is held once Nominating every four years, in the summer preceding the Convention. election (which takes place in November) of the president, a huge party assembly of delegates from conventions held in the several states, each state having twice as many dele- gates as it has electoral votes to cast (i.e. twice as many as its Federal senators and Federal representatives). Two delegates are chosen for each congressional district by a district convention, and four delegates for the state at large by a state convention. Each state delegation usually keeps together during the national convention, and holds private meetings from time to time to decide on its course.

When the national convention has been duly organized by the appointment of committees and of a chairman, its first business is to discuss and adopt a series of resolutions (prepared by the committee on resolutions, but subject to amendment by the convention as a whole), which, taken together, embody the views, programme and policy of the party, and constitute what is called its " platform " for the ensuing election. This declaration of principles and plans is sometimes of importance, not only as an appeal to the people in respect of the past services and merits of the party, but as pledging them to the measures they are to introduce and push forward if they win the election. It then proceeds to receive the nomination of various aspirants to the position of party candidate for the presidency. The roll of states is called alphabetically, and each state, as reached in the roll, is entitled to present a candidate. Thereafter a vote is taken between the several aspirants. The .roll of states is again called, and the chairman of each state delegation announces the vote of the state. In Democratic conventions a state delegation, when instructed by the state convention to cast its whole vote solid for the particular aspirant favoured by the majority of the delegation, must do so (this is called the unit rule); in the conventions of the other parties individual delegates may vote as they please. If one aspirant has obtained on the first roll-call an absolute majority of the whole number of delegates voting — or, in Democratic conventions, a majority of two-thirds of those voting — he is held to have been duly chosen, and the choice is then made unanimous. If, however, no one obtains the requisite majority, the roll is again called until some one competitor secures the requisite

number of votes. Sometimes one or two votings are sufficient, but some- times the process has to be repeated many times — it may even continue for several days — before a result is reached. Where this happens there is much room for the display of tactical skill by the party managers in persuading delegates who favour one of the less prominent aspirants to transfer their votes to the person who seems most likely to unite the party.

When one aspirant has been duly selected as the party candidate for the presidency, the convention proceeds to choose in the same way a person to be candidate for the vice-presidency. This is a much simpler matter, because the post is much less sought after, and it is usually despatched with ease and promptitude. The two nominees are then deemed to be the candidates of the whole party, entitled to the support, at the ensuing election, of the party organizations and of all sound party men throughout the Union, and the convention thereupon dissolves.

§ 34. It is hardly too much to say that in the United States the parties work the government. The question follows, Who work the parties? The action of the parties influences depends upon and is the resultant of three factors, which guide which are indeed more or less present in all the Parties. constitutional representative governments. These are (a) individual leaders, who are powerful either by their talents or by the influence they enjoy over the citizens; (6) rich men,

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who can supply the party with the very large sums of money needed for maintaining the party machinery in efficiency and for fighting the elections; and © the opinion of the mass of the citizens, who, though generally disposed to adhere to the traditions and follow the leaders of the party to which they belong, do, especially in the more educated classes and in the most advanced parts of the country, exert a certain measure of independence, and may refuse to vote for the party candidates if they either distrust those candidates personally or disapprove of the policy which the party seems to be following.

It need hardly be said that the relative importance of these three factors varies from time to time. Fortunately that of the second has grown weaker in recent years.

§35- The national parties have been so pervasive in their influence, and the working of their machinery has formed so General lm P orta nt a part of the political history of the Results of United States, that it is necessary here to call ttePowei-o/attention to the high significance of this element in the Party tne sys t e m of the Republic. The party system has ys em. ma(j e ne arly all elections, including those for state offices and city offices, the functions of which have, as a rule, nothing whatever to do with national party issues, matters of party strife fought upon party lines. It has disposed voters in state and city elections to support party candidates, of whom they might otherwise have disapproved, for the sake of maintaining in full strength for national purposes the local party organization, and it has thereby become a fruitful source of municipal misgovernment. It has thrown great power into the hands of party managers, because where the strife between the two great parties is keen and the result of a contest doubt-ful, discipline and obedience are deemed needful for success. It has tended to efface state lines, and to diminish the interest in state issues, and has thus helped to make the nation over-shadow the states. (J. Br.)

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VIII. — Finance

The taxing powers within the United States are as follows : —

a. The national government, whose revenue powers are only limited by: (a) the provision of the constitution which prohibits all duties on exports, and (b) the provision that all direct taxes must be levied in proportion to population — a provision which deprives direct taxes of nearly all their efficiency for revenue purposes.

b. The several states, whose revenue powers are only limited by : (a) restrictions in their respective constitutions, and (b) the general principle that those powers must not be exercised in such a way as to contravene laws of the United States, or to destroy sources of the national revenue, although a state may prohibit within its borders thesale of liquors, from taxes upon

which the United States Treasury derives a considerable part of its receipts.

c. Within each state powers of taxation, to a determinate or to an indeterminate extent, as the case may be, are by the constitution and laws of the state conferred, almost always for strictly defined

purposes, (i) upon counties, (2) upon cities, boroughs and incorporate villages, and (3) in nearly all the states, though in widely varying degrees, upon the primary geographical divisions of counties, such as the "town" of New England and the "township" of the Middle and Western states.

The revenues of the several states, and of minor governmental areas within them, are mainly derived from a general property tax, laid directly upon realty and personalty. More than 82 % of the tax revenues of state and local governments were thus derived in 1902. The average real rate of assessment was $0-72 in 1880 and $0-74 in 1902. The details of this system, which has no other refuge in the civilized world save partially in Switzerland, are remarkable for a most extraordinary diversity in the manner of collection, which practically becomes, however, self-assessment, and an equally extra-ordinary and general evidence of the crudity and inadequacy of the system, which has been the target of state tax reports throughout the Union for half a century. Nevertheless/only recently have other sources of revenue been largely developed, and the general property tax to a degree abandoned. Thus an inheritance tax was first adopted by Pennsylvania in 1826, yet sixty years later only two states were taxing collateral inheritances. In 1907 there were 34 such, and 19 of these were taxing direct inheritances as well. This is a modern democratic tax, and there are similar tendencies in other taxes. Business taxes are fast increasing, and many special property taxes, these two classes yielding in 1902 7-24% of state and local revenues. The taxation of corporations is recent and rapidly increasing. The same is true of habitation taxes. A be- ginning has been made with income taxes. Finally, the strain upon

municipal finances incident to a realization of civic improvements has called attention to intangible wealth: street railways are no longer taxed as scrap iron but as working systems, with due attention to their franchises ; and there is a beginning of the doctrine that the increase in value of unimproved realty constitutes income that should be taxed. The same conditions have made of impor- tance general theories, such as the single tax theory of Henry George, for taxing landed values. All these tendencies, although strongest in municipal finances, are general.

Restrictions upon the taxing power, and unwise classifications of property for taxation purposes, embodied without good under- standing in state constitutions, have been a primary obstacle to the development of sound systems of taxation in the several states. A lack of interstate comity, and double taxation of certain classes of property, have also offered difficulties. The progress toward better conditions has, however, been in late years rapid.

A similar restriction placed by the Constitution (art. 1, § 2) upon the power of the Federal government to lay " direct taxes " has been interpreted by the Supreme Court, by a bare majority, in such a way as to make very difficult, if not impossible, the imposition of an income tax (although, it may be added, such taxes had been unanimously held constitutional by the court in earlier decisions, which rested in turn upon interpretations of the constitutional provision just referred to given by the court when it counted among its members justices who had been members of the convention that framed the constitution).

The entire Federal system is the result, partly of constitutional provisions, partly of experience. The Federal authority naturally resorted first to customs duties upon foreign commerce, because in this field it had exclusive authority. It adopted next excise duties on articles produced or consumed within the country, notably liquors and tobacco. These two species of indirect taxes have from the beginning been the main sources of national revenue. At three periods, namely 1800-1802, 1814-1817 and 1863-1871, direct taxes have contributed considerable amounts to the revenue. These taxes included in the last period — that of the Civil War—income and legacy taxes, taxes on commercial transactions, and taxes on persons and property. At times also the proceeds of the sales

of public lands have formed an important element of the receipts of government, although it has been the accepted policy to sell such lands to actual settlers at rates so low as to be inconsistent with the object or attainment (relatively) of revenue. Indeed, under the homestead law, large portions of the public domain have been given away to settlers (see Homestead and Exemption Laws), while even larger amounts have been alienated in aid of schools, public improvements, &c, so that the portion sold has not been a third of the total amount alienated. It is possible, however, that the growing consciousness of the necessity of conserving the national resources may lead to a much greater income in the future from the small amounts still remaining in the hands of the national govern- ment. In 1908 there still remained unappropriated and unsur- veyed, according to the General Land Office, 754,895,296 acres. Of these, 387,000,000 acres were still open to entry, but most of this vast extent consisted, in the opinion of the National Conservation Commission of 1908, of lands either arid or otherwise unsuited for settlement. There were also, in July 1908, about 235,000,000 acres of national forests, parks and other reservations for public use.

Customs duties have been found to be in general the most cheaply collected, the least conspicuous, and least annoying of all taxes. They have, however, never been a stable source of revenue, even during periods when the tariff was constant; and compared with thfi steady returns shown by the selected articles of the British tariff

list this instability has been most extraordinary. Very often their income has been far above the amount needed for all disbursements of the government. In times of war they have of course fallen to a minimum. Thus, in the period 1791 to 181 1 their ratio to total government expenditure ranged from 41-6 to 189-6%; during the years 1812-1817, from 17-2 in 1814, when war finances reached their weakest point, to 131-470 in 1817, showing how rapid was their response under the return of peace; in the period 1817-1859 from 29-9% in the crisis year of 1837 to 158-9%; in the period 1860-1869 from 6-5% in 1865, when the government's bonds fell in price to $50-93 per hundred and the war policy of loans was most desperate, to 84-1%; in the years 1870-1893 from 51-4 to 85%; and, finally, in the years 1893-1909, from 36-9 % (in 1898) to 52-7 %.

Of the total imports of 1909 47-4%, of a value of $699,799,771, entered duty free. More than half of these were crude materials for manufactures. The total imports per capita and the duty col- lected upon them per capita have been as follows since 1885, taking every fifth year: 1885 — $10-32 and $3-17; 1890 — $12-35 and $3-62; 1895 — $10-61 and $2-17; 1900 — $io-88 and $3-01; 1905 — $13-08 and $3-11 ; 1908 — $13-57 and $3-24.

The attempts of the Federalist party to create a system of internal taxation was a leading cause of its downfall. During the years in which it was in power little more than a tenth of the national revenue was derived from excises, yet they became a national political issue, and the Whisky Rebellion shows how little they were fitted to the nation at that time. The excise system disappeared with the in- coming of the Democratic party in 1 801. As a temporary necessity such taxes were again resorted to during the war of 1812, and again during the Civil War. In the latter period the excise proved of great richness, and quickly responsive in its returns; whereas the customs were inelastic so long as the war continued. After the war a system of internal revenue was therefore continued.

Of recent years the growing stringency of both national and local finances by enormously increased disbursements has made important the question of the relation of national with state and local taxation. The customs revenue, in its form of high protection, has always had against it a strong free trade sentiment, generally un- organized, and this seems to be growing. The internal revenue is affected by the remarkable spread of the prohibition movement. A considerable and growing public sentiment in favour of the use of the taxing power for the regulation of wealth taken from society demands the introduction into the Federal system of income and inheritance taxes. The last — inasmuch as an income tax that is constitutional can perhaps not be framed — is the only promising source that can give the addition to the Federal revenues that must be needed in case the customs or the excise revenues are reduced.

From i860 to 1870 the population increased 22-6%, and the net ordinary expenditures of government, not including payments on the national debt, rose 173%; from 1870 to 1900 the correspond- ing figures (using the official estimated population) were 129% and 408 %. The aggregate net

ordinary receipts into the United States treasury, from 1791 to the 30th of June 1885, were as follows, in millions of dollars : from customs, 5642 ; from internal revenue, 3449 ; from direct taxes, 28; from public lands, 241; from miscellaneous sources, 578; total, 9938. The corresponding figures for the years from 1886 to the 30th of June 1909 were as follows, respectively:

5403; 4618; 0-142; 121; 969.

The expenditures of the government increased steadily per capita up to the opening of the Civil War. The ease with which money was acquired in the war period, the acquiescence of the people, and the influences of extravagance and corruption engendered by the war, opened, at the return of peace, a period of extravagant expendi- ture that has continued with progressive increase down to the present. A phenomenal growth of both customs and excise revenue has made such expenditures easy. From 1791 to 1886 the aggregate net ordinary expenditures of the government- — these expenditures being exclusive of payments on account of principal and interest of the public debt — were as follows, in millions of dollars: for the army, 4563; navy, 1106; military pensions, 900; miscellaneous, 2168; total 8737. The corresponding figures for the period 1887 (June 30) to 1908 (June 30) were: 2003; 1219; 2884; 2790; total 8896.

The average yearly ordinary receipts of the decade 1 900-1 909, dis- tributed by source, was as follows: from customs, $280,728,741-30; from excise, $257,477,356-45; from miscellaneous sources, $48,736,721-89; total ordinary revenue, $586,942,919-64 or $7-11 per capita; revenue from sale of Panama bonds, $8,730,959-48; from premiums exclusive of Panama bonds, $397,894-20. Tha average yearly disbursements during the decade, distributed accord- ing to object, were as Tollows : for civil list and miscellaneous objects, $143,697,123-09; army, $130,416,902-62; navy, $96,722,000-90; military pensions, $144,856,529-16; Indians, $12,966,563-00; on account of debt, $25,632,072-60; total, $586,942,920.

In 1909 the ordinary receipts were $637,773,165, or $7-17 per capita; and the ordinary disbursements $670,507,889, or $7-54 per capita. The revenues of all the states, counties, cities and other local governments, plus those of the national

government, aggregated in 1879 only $584,980,614.

Since 1870 the national census office has determined several times the aggregate indebtedness of the national, state and other local

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governments. The results are stated below, for 1870 and 1902, in round millions of dollars. Sinking funds are deducted.

1870.

1902.

Government.

Total.

Per capita.

Total.

Pet" capita.

$

$

$

$

United States .

2,33!-2

60-46

925-0

u-77

States and territories .

352-9

9-15

234-9

2-99

Counties . . . .

I87-6

4-87

196-6

2-50

Other local govern-

ments, excluding

rural school districts

328-2

8-51

i,387-3

17-65

School districts out-

side of urban centres

of 8000 or more in

habitants

○

—

46-2

0-59

○ *Included in 1870 in the preceding category.*

The national government set out in 1790 with a revolutionary debt of about 75 millions of dollars. This debt continued, slightly increased but without any very important change, until 1806, when a reduction began, continuing until 1812, when the debt was about 45 millions. The then ensuing war with England carried the debt up to 127 millions in 1816. This was reduced to 96 millions in 1819, to 84 millions in 1825 and to 24 millions in 1832, and in the three years following was extinguished. The crisis of 1837, and the financial difficulties ensuing, created indebtedness, fluctuating in amount, which at the beginning of the war with Mexico was about 16 millions. At the conclusion of peace the debt had risen to 63 millions, near which point it remained until about 1852, from which time successive reductions brought it down to 28 millions in 1857. The financial crisis of that year caused an increase, which continued until the imminence of the Civil War, when it rose from 65 millions in i860 to 91 millions in 1861, to 514 in

1862, to 1120 in 1863, to 1816 in 1864, to 2681 in June, and its maximum (2846 millions) in August 1865. These figures are of gross indebtedness. The amount of the debt per capita of population, less cash in the treasury, was $15-63 in 1800; it fell to $0-21 in 1840; rose again, and in 1865 reached a maximum of §76-98 ; since when it had fallen by the 30th of June 1908 to $10-76. The amount of the debt outstanding, minus gold and silver certificates and Treasury notes offset by cash in the Treasury, was $1,295,147,432-04 on the 1st of November 1909. Of this amount $913,317,490 was bearing interest.

IX. — Arjty

The regular army has always been small, and in time of war reliance has been upon volunteer forces (see Army). This was truer of the Civil War than of the War of Independence or the war with Mexico. In the last the numbers of militia and volunteers was but little more than twice, and in the second little more than equal to the number of regulars engaged ; while in the Civil War the propor- tion was as one to twenty. Again, the number of regular troops engaged in the War of Independence (namely, 130,711 men enlisted) was greater, absolutely, than that engaged in the Civil War (126,587). Finally, it is interesting to note that in 1799, when war seemed prob- able with France, the army was organized with a force of 52,766 men, and during the second war with Great Britain the number was made 57,351 in 1813 and 62,674 in 1814; while the organized strength under the law of 1861, which was in force throughout the Civil War, was only 39,273 men. Small as the regular force has always been, its organization has been altered some two score of times in all.

The law for its organization in force in 1910 provides that the total enlisted strength shall not at any one time exceed 100,000. The full active force of the present organization is as follows : 1 5 regiments of cavalry, with 765 officers and 13,155 enlisted men; 6 regiments of field artillery, with 236 officers and 5220 enlisted men; 30 regi- ments of infantry, with 1530 officers and 26,731 enlisted men; 3 battalions of engineers, with 2002 enlisted men, commanded by officers detailed from the corps of engineers; a special regiment of infantry for Porto Rico, with 31 officers and 576 enlisted men; a provisional force of 50 companies of native scouts in the Philippines, with 178 officers and 5731 enlisted men; staff

men, service school detachments, the military academy at West Point, Indian scouts, &c, totalling 1 1,777 enlisted men. The total number of commis- sioned officers, staff and line, on the active list, is 4209 (including 219 first lieutenants of the medical reserve corps on active duty). The total enlisted strength, staff and line, is 78,782, exclusive of the hospital corps and the provisional force. (See also Navy and Navies.)

(F. S. P.)

X. — History

A. — Beginnings of Self-government, 1578-16QO.

1. The American nation owes its origin to colonizing activi- ties in which the British, Dutch, Swedes, French and Spaniards bore a share, and which were continued during a period of more

than two centuries at the beginning of the modern era. The settlements of the Dutch and Swedes (New Netherland and New Sweden) were soon merged in those of the British, and of the territory colonized by Frenchmen and Spaniards the United States, as it was in 1783, included only certain outlying regions (Florida and certain posts on the Great Lakes and in the Missis- sippi Valley). All the European nations which were interested in colonization shared in the enterprise, and the population of the region was therefore cosmopolitan ' from the outset. But the British, especially after 1660, secured a controlling influence, to such an extent that the history of the period can properly be regarded as the record of an experiment in British colonization. Permanent settlements on the Atlantic seaboard were first made in the early years of the 17th century, and they continued steadily to increase until after 1680. Relatively speaking, that was the period of settlement, but population continued slowly to advance westward. In the 18th century occurred a large immigration of Germans and Scottish-Irish, who settled in Pennsylvania and New York and thence overflowed into the western parts of Virginia and the Carolinas. The only colony which was founded in the 18th century was Georgia (1732), by means of which British outposts on the Florida frontier were strengthened.

2. British colonization originated chiefly in private initiative, though it acted in half-conscious obedience to certain general

principles of action. From this fact originated the aenerai trend toward self-government, which was funda- Aspects of mental and controlling in the history of the British Coionixa- on the American continent. But to an extent the tloB ‘ tendencies which favoured self-government were counteracted by the influence of the British Crown and parliament. The influence of the Crown was continuous, except during the period of the Civil War and Commonwealth (1642-1660), while that of parliament was not felt until the middle of the 17th century, and its colonial legislation subsequent to that time was chiefly confined to matters of trade. The activities of Crown and parlia- ment were directed toward the securing of Imperial interests and of that degree of subordination and conformity which, in states that have developed from Roman and feudal origins, attaches to the condition of colonies or dependencies. The term ” imperial control ” therefore suggests the second tendency in colonial affairs, to the discussion of which the historian must address himself.

3. Among the colonists the trend toward local independence and self-government was in harmony with the spirit of the English. Neither was it lacking among the other nationalities represented in the colonies. But in the case of the British it was greatly strengthened by the fact that the colonies were founded by private initiative, the government legalizing the efforts of the ” adventurers ” and planters, but leaving them in many cases almost wholly to themselves. Hence many small colonies and settlements were founded along the coast. A variety of motives — economic, religious and political — con- tributed to the founding of these colonies, and people corre- spondingly different in type came to inhabit them. As they differed from one another, so their descendants came to differ from the Europeans, out of the midst of whom they had come. The remoteness of the colonies from Europe and the difficul- ties under which communication with them was maintained confirmed and perpetuated the tendency toward independence both of England and its government. Somewhat similar con- ditions controlled intercolonial relations, kept the colonists apart from one another and checked efforts at co-operation. Thus it was that the causes which confirmed the colonists in the spirit of independence toward the mother country at the same time made them jealous of any external authority.

4. The term ” chartered colonies ” is the one which best describes the forms under which the British-American settle-

ments were founded and under which they all con- tinued for periods varying from a single generation to that of the entire duration of their colonial existence. They were the direct and characteristic results of private initiative in colonization. The discoverers and would-be

Chartered Colonies.

colonizers, acting individually or in groups, collected the ships, men and resources necessary for their enterprises, and pro- cured from the Crown a charter. By this document the king conveyed to them a claim to the soil which would be valid in English law, gave them the right to transfer Englishmen thither as colonists, to trade with them and with the natives, and to govern the colony, subject to the conditions of allegiance and of British sovereignty in general. The rights and liberties of the colonists as British subjects, without attempt to define what they were, were guaranteed by the charters, and the grantee was prohibited from passing laws or issuing orders which were repugnant to those of England. In only a part of the charters — those chiefly which were issued subsequent to 1660 — was express reference made to the calling of assemblies in the colonies. So general were the provisions of the charters that they only remotely determined the forms which government should assume under them and what the rights of the colonists should be. A considerable variety of institutions and social types existed under them. But their very indefiniteness made them valuable as objects of appeal to those who in time of contro- versy were upholding local rights and liberties.

5. Of the chartered colonies there were two varieties — proprietary provinces and corporate colonies. Though alike

in the fact that the patentees who founded them Provinces? were mesne tenants of the Crown, they were quite

unlike in their internal organization and to a considerable extent also in the character of the people who inhabited them. The proprietary province was a development from the principle of the fief, though with many variations. The early charters of

discovery, those for example which were granted to John and Sebastian Cabot and to Sir Humphrey Gilbert, contemplated the founding of feudal principalities in the New World. The grant to Sir Walter Raleigh, which resulted in the abortive colonial experiment at Roanoke, was of the same character. At the period of transition from the rule of the Tudors to that of the Stuarts, trading companies and companies whose purpose was colonization were increasing in number and importance. The first half of the 1 7th century was distinguished by the founding of many such, in France and the Netherlands as well as in England. The joint companies which were chartered London and by James I. in 1606, one to have its residence Plymouth at London and the other at Plymouth, were of this Companies, character. They were granted the right to colonize, the one in northern and the other in southern "Virginia"; the intervening territory, three degrees in breadth, being left common to the two. The rights of the companies were confined to those of settlement and trade. The Plymouth patentees achieved no permanent result; but those of London founded Jamestown (1607) and other settlements along the James river, which later became the province of Virginia (q.v.).

6. But before this result had been reached the London patentees had secured in succession two new charters, one in 1609 and another in 161 2. By means of these grants they had practically separated from the Plymouth Company, had secured a concession of territory 400 m. broad and extending through the continent, and had been able to perfect the organization of their company. By the grant of 1606 the right to govern the colonies had been reserved to councils of royal appointees, one resident in England and one in each distinct colony which should be founded. But by their later charters the London patentees were fully incorporated, and in connection therewith received not only the power to grant land but rights of government as well. This made the Virginia Company of London in the full sense of the word the proprietor of the province which it was founding. It now appointed resident governors, councillors and other officials for the colony, and instructed and controlled them in all ways, subject of course to the general supervision of the king in council. Under the charter of 1606, in order to facilitate colonization on a strange continent, joint management of land and trade was temporarily instituted. But under the fully organized company, as managed by Sir Thomas Smith, and especially by Sir Edwin

Sandys and the Ferrars, this system was

abandoned, and private property in land and the control of trade through private " magazines " were established. – A number of distinct plantations and settlements were founded which later developed into counties and parishes. From these localities, in 1619, under authority from the company, representatives were elected who met with the governor and council at Jamestown and formed the first colonial assembly held on American soil. Its acts were duly submitted to the company in London for its approval or disapproval. Other assemblies were called, the tobacco industry was established and the principles upon which traffic in that staple was to be conducted with Europe were announced. Thus Virginia assumed the form of a proprietary province, with an English trading company as its proprietor.

7. Meantime west of England men had been making fishing voyages and voyages of discovery to northern " Virginia ", which now was coming to be known as New England. In New 1620 a new charter was procured, the reorganized England company being known, in brief, as the New England ounc ' Council. Like the London patentees, this body was now fully incorporated and received a grant of the vast territory between 40° and 48° N. lat. and extending through to the South Sea (Pacific). Full rights of government, as well as of trade and settlement, were also bestowed. The moving spirit in this revived enterprise was Sir Ferdinando Gorges (q.v.), an Anglican and royalist from the west of England. For a time John Mason (q.v.) was his most active coadjutor. Such backing as the company received came from nobles and courtiers, and it had the sympathy of the court. But lack of resources and of active interest on the part of most of the patentees, together with the development of a Puritan interest in New England, led to the failure of this enterprise. No colony was established directly by the council itself, but that part of its vast territory which lay adjacent to the coast was parcelled out among the patentees and by them a few weak and struggling settlements were founded. They were all proprietary in char- acter, and those along the northern coast were more or less connected with Anglican and royalist interests. But, as events proved, Plymouth Colony (founded in 1620), which was Puritan and Separatist to the core, became a patentee of the New England Council; and the colony of Massachusetts Bay (founded in 1628-1630), which was to become the citadel of Puritanism in

America, procured the original title to its soil from the same source. At the outset both Massachusetts and Plymouth must be classed as proprietary settlements, though far different from such in spirit and destiny. Massachusetts soon (in 1629) secured a royal charter for its territory between the Merrimac and Charles rivers, and thus took a long step towards independence of the council. At the same time the Plymouth settlers were throwing aside the system of joint management of land which, as in the case of Virginia, had been imposed upon them by adventurers who had lent money for the enterprise; were paying their debts to these same adven- turers and securing control of the trade of the colony; were establishing a system of self-government similar to that of Massachusetts. Thus a strong Puritan interest grew up in the midst of the domain which had been granted to the New England Council, and in connexion therewith the type of colony to which we have given the name corporate came into existence.

8. In order to understand the nature of the corporate colony, it is necessary to explain the internal organization of that type of company which, like the Virginia Company corporate of London, was founded for purposes of trade and colonies; colonization. It was composed of stockholders, who tbe Virginia became members as the result of the purchase of ComDaa y' shares or of migration to the colony as planters, or of both acts combined. In the Virginia Company they were known as the " generality, " in the Massachusetts and other companies as the " freemen. " In them, when met as a democratically organized body under the name of " quarter court " or " general court," was vested the governing power of the company. It

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elected the officers, chief among whom were a treasurer or governor, and a council or board of assistants. These, as well as the subordinate officers, held for annual terms only. Four

times a year, at the law terms, the general courts met for the transaction of business, elections being held at the spring meeting. Membership in such companies might be indefinitely increased through the issue and sale of shares. They were, in other words, open companies, whereas the New England Council was a closed body, its membership being limited to forty. The Massachusetts Company was an open corporation of the type just described.

9. In 1629 the prospects of Protestantism at large, and of Puritanism in England, were so dark that the founders of the Massachusetts Company, who were decidedly Massachu- p ur ˆ an m spirit and inclined to nonconformity in Company; practice, resolved to remove with their charter and Removal ot the governing body of their company into New Charter to England. Preparatory to this, John Winthrop was se"tts? C "' e l ecte d governor and a settlement was made of their business relations in England. After the removal had been made, the assistants and general court met in New England and business was carried on there exclusively by planters. An order was soon passed that none should vote or hold office who were not members of some one of the churches within the colony. As all these churches were Independent or Congregationalist in form and doctrine, this order gave a wholly new definition to the term " freemen. " It made of this colony something approximating to a biblical commonwealth, and subordinated trade, land-holding and settle- ment to the interests of the Puritan faith. The board of assistants now assumed political and judicial functions. As local settlements about Massachusetts Bay were founded, the general court, which before had been a primary assembly — ■ simply the freemen of the company — came to consist partly of representatives elected by the freemen of the towns. In this way a second chamber — that of the deputies — was added to the assistants to form the general court of the colony. Taxes were levied by this body, and laws and orders proceeded from it which related to all functions of government. It elected or appointed the governor and other chief officials, and determined the times of its own meeting. The governor had no veto and the general court was the controlling organ in the system.

10. Of primary importance in the affairs of the colony was everything which concerned religious belief and church govern- ment. The churches and their relation to the civil power pre- sented the great questions upon which hinged its policy. This

was true not only in its internal affairs, but in its relations with other colonies and with the mother country. An ecclesiastical system was developed in which Independent and Presby- terian elements were combined. By a rigid system of tests this was upheld against Antinomians, Baptists, Quakers and dissenters of all sorts. The securing of revenue from land and trade was considered subordinate to the maintenance of the purity of the faith. It was this which gave a point and vigour to the spirit of self-government in the New England colonies which is not perceptible elsewhere.

As a consequence of the Puritan migration from England and of the expulsion of dissenters from Massachusetts, Plymouth, Connecticut (q.v.), the New Haven Colony, and the New Haven towns about Narragansett Bay which became the Colony; colony of Rhode Island (q.v.), were settled. These Rhode a jj were corporate colonies, organized upon funda-

mentally the same plan as Massachusetts but differing from it in minor particulars. Their settlers at the outset had no charters, but by means of plantation or town covenants assumed powers of government, which ultimately were vested in general courts similar to that of Massa- chusetts. Rhode Island was formed by a union of towns, but elsewhere the colony was coeval with or antedated the town. Connecticut and Rhode Island, the former in 1662 and the latter in 1663, secured royal charters by which they were incorporated within New England itself and the governments

which they had established there were legalized. New Haven was absorbed by Connecticut in 1664 under the charter of 1662 (see Connecticut), and Plymouth remained without a charter from the king until, toward the close of the 17th century, it became a part of the enlarged province of Massachusetts.

11. The most prominent feature of the New England land system was the " town grant, " which in every case became the territorial basis of a group settlement. Throughout New England, and in the outlying districts which were colonized by New Englanders, settlement was effected by groups. The process began in Plymouth and was extended through the entire section. The Puritan migration from Europe was of the same general character. Groups of people, animated by a common religious or political ideal, broke away from their

original or temporary abiding-places and pushed farther into the wilder- ness, where tracts of land were granted to them by the general court. The corporate colonies did not seek profit from their land, but granted it freely to actual settlers, and in such amounts as suited their needs. No distinct land office was established by any New England colony. Land was not sold by the colony; nor, as a general rule, was it leased or granted to individuals. Rent formed no appreciable part of the colony revenue..

12. Over the founding of towns the general courts, as a rule, exercised a watchful supervision. Not only did the courts fix and maintain their bounds, but they issued regulations for the granting of lands, for common fields, fences, herds, the punishment of trespass, the admission of inhabitants and free-holders, the requirement that records of land titles should be kept, and the like. But subject to these general regulations, the allotment and management of its land was left to each town. The colonies had no land system apart from the town. It was partly in order to manage their lands that the towns were made centres of local government and town meetings or boards of town proprietors were established. By means of town action, taken in town meetings and by local officials, the land of each settlement was laid off as house lots, common and common fields, meadow and pasture. Detailed regulations were made for the management of common fields and for their ultimate division and allotment among their proprietors. The same was true of fences and herds. The result was an organization similar to the English manor, but with the lord of the manor left out; for in the case of the New England town administrative authority resided in the body of the freeholders. To this peculiarity in the form of New England settlement is due the prominence of the town, as compared with the county, in its system of local government. The town was the unit for purposes of taxation and militia service as well as of elections. It was also an impor- tant ecclesiastical centre, the parish usually corresponding with it in extent.

13. As a result of the process thus sketched, southern New England was settled by a population of English origin, with similar instincts and a form of political organization which was common to them all. Gorges, meantime, had secured (1639) a royal charter for his province of Maine, but Mason had died before he obtained such a guaranty for his settlements on the Piscataqua river. The small communities along that

entire coast remained weak and divided. In i63S the New England Council surrendered its charter. The helplessness of the Gorges family was insured by its adherence to the royalist cause in the English Civil War. Massachusetts availed itself of a forced inter- pretation of the language of its charter respecting its northern boundary to extend its control over all the settlements as far north-east as the Kennebec river. This was accomplished soon after 1650, and for the time Anglican and royalist interests throughout New England seemed hopelessly wrecked. New England had thus developed into a clearly defined section under Puritan domination. This fact was also clearly indicated by the organization, in 1643, of the New England Confederacy, or the United Colonies of New England (see Nejv England), which comprised the orthodox Puritan colonies, whose leading magistrates, as annually elected commissioners, for twenty years exercised an advisory control over New England.

14. The colonies of the middle and southern sections of the territory, which later became the United States, were wholly Middle and proprietary in form. This was true of New Nether- Southern land (founded by the Dutch West India Company Colonies. – m ˆ21) and of New Sweden (settled under the authority of the Swedish Royal Company in 1638), as well as of the English colonies which were established on that coast. In the case of Virginia and of the Dutch and Swedish settlements, trading companies were the proprietors. But the later English colonies, beginning with Maryland in 1632, and continuing with the Carolinas (1663), New York (1664), New Jersey (1665), Pennsylvania and the Lower Counties, afterwards Delaware (1681), were founded by individual proprietors or proprietary boards. Georgia (1732), the only English colony settled after 1681 on the continent, existed for twenty years under a proprietary board of trustees. By the efforts of adventurers of this class, put forth chiefly during the period of the Restoration, the entire coast-line from Florida to Acadia was permanently occupied by the English. But, unlike New England, the population of the other sections was of a mixed character, as were their economic and religious systems, and to

an extent also their political institutions.

15. As has already been stated, in their internal structure and in the course of their history the proprietary provinces differed very materially from the corporate colonies. Those of later English origin also differed in some important respects from Virginia under the company and from New Netherland and New Sweden. The system of joint management of land and trade, which was so characteristic of early Virginia, was out-grown before the other proprietary provinces were founded. Neither did it prevail in the Dutch and Swedish provinces, but there the law and institutions of government of those nations existed, and no provision whatever was made for assemblies.

16. In the proprietary province the proprietor, or board of proprietors, was the grantee of powers, while in the corporate colony it was the body of the freemen organized as an assembly or general court. The proprietor might or might not be a resident of the province. He might exercise his powers in person, or, as was usually the case, delegate them to one or more appointees. In any case, the form of government of the pro- prietary province was essentially monarchical in character. The powers that were bestowed were fundamentally the same as those which were enjoyed during the middle ages by the counts palatine of Chester and Durham. In some charters express reference was made to Durham as a model. The normally deve- loped provinces which resulted were miniature kingdoms, and their proprietors petty kings. As Coke said, their powers were king-like though not sovereign. This character arose from the fact that the grantee of power was the executive of the province. This branch of government was thereby brought into the fore- front. At the beginning and for a long time thereafter it con- tinued to bear the leading part in affairs. It was not so in the corporate colony, for there the freemen and the general court stood at the centre of the system, and their ultimate control, which no one dreamed of disputing, was maintained through a system of annual elections. In most of the corporate colonies the executive (i. e. the body of magistrates) was strong, but that was due to the political and social influence which its officials had gained, and not to their tenure of office. But the nature of the proprietary province demands further explanation.

17. In every case, apart from the ordinary rights of trade and the guarantees of the liberties of the colonists, the powers

Government wmcn were bestowed on the proprietors were of the territorial and governmental. The territory of Proprietary (-jj e provinces was granted under the conditions Province. wn i cn by English law controlled private estates of land. An entire province, or any part of it, could be leased, sold or otherwise disposed of like a private estate. It was an estate of inheritance, descending to heirs. The attitude of proprietors toward it was that of landlords, investors or speculators in land. They advertised for settlers, and, in doing so, an ever present motive with them was the desire I

to secure more private income from land. In 1664 the duke of York sold New Jersey to Berkeley and Carteret, and the sale was effected by deeds of lease and release. In 1708 William Penn mortgaged Pennsylvania, and under his will devising the province legal complications arose which necessitated a suit in chancery. Thus proprietors and proprietary boards changed with every generation or oftener. All this, of course, was different in the corporate colony.

18. In all the later proprietary charters, except that of New York, the operation of the statute Quia emptor es was suspended, so far as relations between the proprietor and his immediate grantees were concerned. By virtue of this provision each proprietor, or board, became the centre from which originated an indefinite number of grants. These were held directly of the proprietor and through him of the Crown. In practice the same was true also of New York. The proprietors were thus left free to make grants on such conditions as they chose — limited by the nature of their patents — to erect or permit the erection ol manors, to devise the machinery necessary for surveying, issuing and recording gr.ants, and collecting rents. Preparatory to the exercise of this power, the proprietors issued so-called " concessions " or " conditions of plantation, " stating the terms on which they would grant lands to colonists. These were often accompanied by descriptions of the country, which were intended to be advertisements for settlers. Under a system of head rights, analogous to that which existed in Virginia, land was thus bestowed on settlers upon easy terms. Proportional amounts of land were granted upon the importation of servants, and in this way a traffic in servants and their head rights to land was encouraged among planters and masters of merchant vessels. In all the provinces, except New Netherland, a quit rent was imposed on all grants. In the Dutch province rents were sometimes imposed, but they

varied in character and differed from the English quit rent. In Maryland fines' were levied on alienations. In Maryland and Pennsylvania the demand for land became so great that it was sold. In most of the provinces manorial grants were made, but in none except New Netherland did the manor become an institution of government. In all the provinces territorial affairs were administered directly by the provincial authorities, and not by towns as in New England. In Maryland a land office was fully organized, towns developed only to a very limited extent, and when they did originate they were in no sense village communities. Lots in them were granted by provincial authorities and they were subject to a quit rent. They were simply more densely populated parts of the counties, and, unless incorporated as boroughs, had no distinct institutional life. In almost all cases land, in the provinces, was granted to individuals, and individual ownership, with direct relations between the owners or tenants and the proprietary authorities, was the rule. This was in marked contrast to the conditions which have been described as existing in the corporate colonies. In the corporate colony the elements of the fief had been eliminated, but in the provinces they still survived to a considerable degree.

19. Had governmental powers not accompanied the terri- torial grants which have been described, these grants would have been estates of land, unusually large, no doubt, but nothing more. In cases where the governmental rights of proprietors were suspended or resigned into the hands of the Crown, they remained thereafter only private landlords. But the fact that rights of government were bestowed with the land made the territory a province and the proprietor its political head. The bestowment of rights of land carried with it not only the obligation to pay quit rent, but to take to the proprietor the oath of fidelity.

20. In the discussion of the corporate colony it was necessary to dwell first and chiefly on the legislature. But in the case of the proprietary province the executive, for the reason already mentioned, demands first attention. The provincial charters made the proprietors the executives of their provinces and for the most part left it to them to determine how and under what forms the governmental powers which they had received should

be exercised. The powers which were definitely bestowed were executive and judicial in character — the ordinance power, the authority to appoint all officers, to establish courts, to punish and pardon, to organize a military force and defend the provinces, to bestow titles of honour, to found churches and present to livings. The executive thus became the centre from and around which development in the province chiefly occurred. It gave to the proprietor an importance, especially at the outset, which was comparable with that enjoyed by the general courts in the corporate colonies. It made him in a derived and inferior sense the source, within the province, of office and honour, the foun- tain of justice, the commander of the militia, the recipient of the provincial revenue, the constituent part of the legislature. But in most cases the proprietors did not attempt to exercise these powers in person. Even if resident in their provinces they needed the assistance of officials. By means of commissioners they appointed a group of leading officials for their provinces, as a' governor, councillors, a secretary, surveyor-general, receiver-general or treasurer, and somewhat later an attorney- general. These all held office at the pleasure of the proprietor, and were subject to guidance by his instructions.

Altogether the chief place among these officials was held by the governor. He was par excellence the agent for the pro- Tke prietor for all purposes of administration. He

Provincial regularly corresponded with the proprietor and Governor. rece j vec i the latter's directions. In making appoint- ments the proprietor was usually guided by his recommendations. In some cases he was a relative of the proprietor, and family influence in Maryland after the Restoration came to dominate the government of the province. In all his important acts the governor was required to take the advice of his council, and that body was expected to co-operate closely with him in all matters; but the governor was not bound to follow their advice. The relations between the two was the same as that between the king and his privy council in England. As settle- ments multiplied and counties and other local subdivisions were formed, other and inferior offices were created, the right of appointment to which rested with the

governor, though it was exercised in the name of the proprietor. By means of an executive, thus organized, land was granted and the revenue from it collected, counties and other local divisions were established, relations were developed with the Indians, early preparations were made for defence, courts were opened and the administration of justice begun.

21. But in the later proprietary charters generally, with the exception of that issued to the duke of York, provision was made for assemblies. It was made, however, in very general terms, and it was left to the option of the proprietors to determine when, where and how they would call them. These legislatures did not originate in the natural or pre-existent rights of English- men, nor did the existence of a parliament in England make them necessary, though it greatly increased the difficulties of governing the colonies without them. Though they were not original in the sense which attached to the executive, they were immediately proven to be indispensable and their activity in the provinces gradually opened the way for the growth of modern democratic institutions.

22. When met in regular form, the provincial legislature consisted of the governor, the council or upper house, and the The assembly or deputies. The latter, who were elected Provincial by the localities, constituted the only representative Legislature. p art f t jj e legislature. In tenure and functions the governor and council were largely independent both of the deputies and of the electors. They were a part of the execu- tive and were naturally swayed by a regard for the interests of the proprietor and by administrative traditions. Though a component of the legislature, the council was the legal advisor of the governor. In many cases the importance of the councils was increased by the fact that, with the governor, in early times they formed the highest judicial tribunal in the province. As the governor had the sole power of calling, pro- roguing and dissolving the general assembly, the council might

advise him in such a way as to destroy the body itself or thwart its plans. The joint work of the council and assembly was subject to the veto of the proprietor, or of both the proprietor and his governor. The legislature of the province, therefore, differed materially from the general court, though in practice this was somewhat offset by the fact that in the New England colonies the magistrates were usually re-elected for a long series of terms.

23. In the province, as in the kingdom, the legislature was in a sense an expansion of the executive, developed out of it, and was to an extent controlled by it. Out of this relation arose the possibility ol conflict between the two parts of the legislature — that which represented the people and that which represented the proprietor. In the history of the provinces this formed the central line of cleavage. From the first the assemblies largely controlled taxation. Using this as a lever, they endeavoured to limit and define the powers of the executive and to extend the sphere of legislation more widely. Fees, from which officials derived most of their support, were a favourite object of their regulation. Occasionally offices which had originally been appointive were made elective. Protests of various kinds were made against official cliques. British statutes which favoured liberty and the powers of parlia- ment were often referred to as guides and ideals of the opposi- tion. Now and again the lower house came to a deadlock with council or governor. Threatened or actual revolt was sometimes necessary to bring the executive to terms. By such tactics as these the popular elements in the constitutions of the provinces asserted themselves. The sphere of ordinance was gradually limited and that of statute extended, while incidentally the system of government became more complex.

In a number of provinces — the Carolinas, New Jersey and Pennsylvania — the proprietors at various times initiated elaborate constitutions, in which not only a land system, but forms and functions of government tions. were prescribed on a large scale. These were variously known as fundamental constitutions, concessions and agreements, frames of government, and in every case were submitted to the general assembly for its acceptance or rejec- tion. Long struggles often ensued over the question of accep- tance, which usually ended in the modification or rejection of the schemes as too cumbersome for use or because they reserved excessive powers to the provincial executive.

24. Though the main features in the form and development of the proprietary provinces have thus been indicated, it should be noted that their history was by no Course ot means uniform. In New Netherland and New York Develop- occurred a struggle for the establishment of a meaU legislature, which continued at intervals for forty years and was not permanently successful until after New York had become a .royal province. The proprietors of New Jersey never secured a royal charter, and

therefore were not able to establish satisfactorily their claim to rights of govern- ment. As grants of land had been made to the settlers in certain localities within that province before its purchase by Berkeley and Carteret, opposition was made to the collection of quit rents, as well as to the enforcement of rights of government, and disturbances, resulting from these causes, became chronic. The province was also divided into East and West Jersey, the boards of proprietors being greatly increased in both, and West Jersey attaining an organization which was almost democratic in character. Within the vast reaches of the Carolina grant developed two provinces. One of these — North Carolina — was almost entirely neglected by the proprietors, and the weakened executive repeatedly succumbed to popular violence. In South Carolina many violent controversies occurred, espe- cially over the efforts of the proprietors to compel the acceptance of the Fundamental Constitutions, which originated with Locke and Shaftesbury. But in the end this failed, and a simple form of government, such as was adapted to the needs of the province, was developed. In Pennsylvania the liberal policy of the proprietor led at the beginning to unusual concessions

in favour of the colonists. One of the most characteristic of these was the grant of an elective Council, which was intended to be aristocratic and the chief institution in the province. But owing to conflicts between it and the governors, affairs came to a deadlock. The total neglect of provision for defence by the Quaker province led to the suspension of Penn's powers of government for about two years after the English Revolu- tion and the outbreak of the war with France. This did away with the elective Council for the time, and an appointive Council was soon substituted. Finally, in 1701, the Council was de- prived of its powers of legislation and thereafter the legislature of Pennsylvania consisted of only one house — the Assembly.

B. — Development of Imperial Control, 1606-1760.

25. Turning now to the exercise of imperial control over the colonies, it is to be noted that it proceeded chiefly from the

English Crown. It was exercised through the secre- tary of state, the privy council and a succession of boards subordinate to it which were known as commissioners of plantations or the board of trade; by the treasury and admiralty boards and their subordinate bureaus; by the attorney-general and the solicitor-general and by the bishop of London. The more continuous and intimate supervision proceeded from the privy council and the commissioners sub- ordinate to it, and from the treasury board. The latter caused the auditing of such revenue as came from the colonies, super- vised expenditures for them and had an oversight over appoint- ments in the colonial service. The privy council received letters and petitions on almost every kind of colonial business, caused hearings and inquiries to be held, and issued letters, instructions and orders in council on an equally great variety of matters. It also acted as the regular court of appeal for the plantations. As time advanced, more of the adminis- trative business passed directly into the office of one of the secretaries of state and the privy council became less active. The admiralty was concerned with the equipment of the navy for service in the colonies, and the high court of admiralty with the trial of prize cases and of cases arising from violations of the acts of trade. The assistance of the law officers of the Crown was sought in the drafting of charters, in the prosecution of suits for their recall, and in all cases which required the interpretation of the law as affecting the colonies and the defence of the interests of the British government in relation thereto. The bishop of London had supervision over the appointment and conduct of clergymen of the English Church in the colonies and over parish schools there. Not all of these boards and officials were active from the first, but they were created or brought into service in colonial affairs as the importance of the dominions increased.

26. The parliament by mentioning the dominions in its statutes could extend their provisions to the colonies. The

early acts of supremacy and uniformity contained aty control. suc ˆ re ˆ erence i but it was dropped after the Restora- tion and no serious attempt was ever made to enforce uniformity in the colonies. Parliament did not begin to legislate seriously for the colonies until after the Restora- tion. Then the acts of trade and navigation were passed, to which additions were made in

the reign of William III. and from time to time during the 18th century. This body of legislation, including about fifty statutes, comprised the most important acts relating to the colonies which were passed by parliament. A few statutes relating to military affairs were passed about the middle of the 18th century. Certain other laws relating to currency and coinage, to naturalization, to the punishment of governors, to the post office, to the collection of debts, and to a few other miscellaneous subjects complete the colonial legislation of parliament prior to 1760. About one hundred statutes in all were passed. The colonists themselves imitated in a general way the organization and procedure of the English courts. The main features of the common law came spontaneously into force in the colonies. The legislatures of several of the colonies adopted large, parts

of the statute law of England. The colonists were always accustomed to avail themselves, as far as possible, of the great English statutes which guaranteed liberty. After about 1690 the obligation was very generally enforced upon the colonies of sending the acts of their assemblies to England for acceptance or rejection by the k'ing in council. Thus a general agreement between colonial and English law was attained.

27. But this, though far-reaching, was only one of the objects which were sought through the exercise of imperial control. Its object was to maintain the rights of Great Britain over the colonies and her interests in them in all respects. The diplomacy of Great Britain concerned itself to an increasing extent, as the 18th century advanced, with the acquisition or losses of colonial territory, with the fixing of boundaries and with the securing of commercial interests. The interests of trade, more than any other subject, determined the colonial policy of England. The Church and her interests also demanded attention. In all these matters the English executive — the Crown — continuously, and for the most part exclusively, managed colonial affairs. During the Commonwealth in the 17th century parliament was the source of all activity, whether legislative or executive, but at other times, as we have seen, its legislation was confined chiefly to the subject of trade. The English courts also played a minor part except when, in conjunction with the executive, they were concerned in the revocation of colonial charters.

28. A natural condition which affected colonial administra-

tion as a whole and to a large extent determined its limits and character was the remoteness of the colonies isolation from England. With this the conditions of sparse of the and scattered settlements in a new continent in Colonles – the midst of savages were closely connected. At best three months were required for sending a despatch from London to America and procuring a return. This explains the large degree of self-government which the colonies possessed and the indifference with which their affairs were usually viewed, even by British officials. Only a relatively small part of colonial business came before English officials or received their serious attention. Only at long intervals and in summary fashion was it brought to the attention of parliament. It is believed that the affairs of the continental colonies were never seriously debated in parliament until after the beginning of the controversy which led to the American War of Independence. Social and political intercourse with the colonists and govern- mental control over them were therefore very imperfectly developed, as compared with that which existed within the realm. That is the real meaning of the distinction between the realm and the dominions. Over the counties and other local jurisdictions of the realm the control of Crown and central courts and parliament was continuously felt. In law and theory the same was true of the dominions; in fact, the control over them was almost wholly executive, and during most of the period it was to a degree unintelligent and weak. In theory the British Empire was a consolidated structure; in fact it was something more resembling a federation.

29. The central fact in colonial history during the 17th century was the development of the chartered colonies. At their founding, as we have seen, the Crown dele- oeveloomeot gated rights of settlement and subordinate rights of the

of government to proprietors, who used them in Chartered a variety of ways. The effect of this was to Co,OI W' introduce a number of mesne lords between the king and his colonial subjects, a phenomenon which centuries before had vanished from England itself. The patentees governed the colonists, and the Crown only interfered at intervals to adjust matters. And when the Crown did this, its dealings were far more with the patentees and their officials than with the body of the colonists. The king had no officials of his own in . the colonies, and a practical system of immunity existed. Under the first two Stuarts some rather desultory efforts were made to check the

development of such a system in the early stages. After a controversy over a contract for

the sole importation of tobacco, which became involved with the political struggles of the time in England, the charter of the Virginia Company of London was revoked (1624). A royal commission was appointed to readjust the affairs of Virginia and to inaugurate its government as a royal province, and the king declared that he desired the government of all his dominions to be monarchical in form. Several commissions were later appointed to manage the tobacco trade. In 1634 a board of commissioners of plantations was created and it received very large powers over the colonies. Of this body Archbishop Laud was the moving spirit. The year following the New England Council resigned its charter, a writ of quo warranto was issued against the Massachusetts charter, and a plan was nearly perfected for sending out Sir Ferdinando Gorges as royal governor, or rather governor-general, to New England. But means were lacking, the suit against the Massachusetts patent failed to accomplish its purpose, and troubles at home soon absorbed the attention of the government.

30. During the Great Rebellion in England New England was left practically to itself. Strife broke out in Maryland, over which the home government was scarcely able to exercise even a moderating 4nfluence. The Dutch from New Netherland and Europe were able to monopolize a large part of the carrying trade in tobacco and European goods. Virginia, with Barbadoes and a few other island colonies, assumed an attitude of distrust or hostility toward the new government in England. In 1651 and 1652 parliament sent out a commission, with an armed force, which reduced the island colonies to submission and adjusted affairs in Virginia by suspending government under Sir William Berkeley, the royalist governor, and leaving control in the hands of the Assembly. By a stretch of power the commissioners also took control of affairs in Maryland, but there they intensified rather than allayed the strife. Baltimore, however, managed to save his interests from total wreck, and at the Restoration was able fully to re-establish his

authority.

31. During this period of unstable government in England the seeds were planted of a colonial policy which was hence- Commerciai f° rt h to dominate imperial relations. It was then influences; that England entered upon the period of commercial Administra rivalries and wars. The Cromwellian government JiatS«toD eS ” determined to wrest the control of the carrying Acts and trade from the Dutch, and the Navigation Act of other 1 65 1 and the first Dutch War were the result. f^Jf 1 !!?’ General Robert Sedgwick was sent against New*

Netherland, but ended in attacking Acadia. At this time also the national hatred of Spain, which had so charac- terized the age of Elizabeth, reasserted itself and the Spanish seas were invaded, Hispaniola was attacked, and Jamaica was conquered. In connexion with these events plans were formed for a more systematic colonial administration, which Cromwell did not live to execute, but which were taken up by Clarendon, the duke of York, the earl of Shaftesbury and a large group of officials, lawyers and merchants who sur- rounded them. They took definite shape after the Restoration in the creation of a council for trade and a council for foreign plantations, in the passage of the acts of trade, in the conquest of New Netherland and the organization within it of three English provinces, in the settlement of the Carolinas, in a resolute attempt to remedy grievances and adjust disputes in New England. These events and their consequences give greater importance to the next three or four decades than to any later period until the colonial revolt.

32. The council for foreign plantations was continued, some- times under a patent and sometimes as a committee of the privy council, until, in 1696, it was commissioned as the board of trade. As a board of inquiry and report, subordinate to the privy council, the most important business relating to the colonies was transacted before it. The acts of trade, in which the principles of the system were laid down, were passed in 1660, 1663, 1673 and 1696. They expanded and systematized the principles of mercantilism as they had long been accepted,

and as in some particulars they had already been applied to the Virginia tobacco trade. The import and export trade of the colonies was required to be carried on in English and colonial

built ships, manned and commanded by Englishmen. The policy of the staple was applied to the trade of the colonies by the enumeration of their chief products which could not be raised in England and the requirement that such of these as were exported should be brought to England and pay duties there, and that thence the supplies not needed for the English market should be sent to foreign countries. The same policy was applied to all colonial imports by the requirement that they should pass through English ports. In order to prevent intercolonial traffic in enumerated commodities, which might lead to smuggling, the act of 1673 provided for the levy of an export duty on them in the colonies in cases where a bond was not given to land them in the realm. In the 18th century severe restrictive measures were passed to prevent the growth of manufactures, especially of wool, hats and iron, in the colonies; but these acts proved mostly a dead letter, be- cause the colonies had not reached the stage where such industries could be developed on any scale. Certain compensations, favourable to the colonies, also appear in the system, e.g. the measures to suppress the raising of tobacco in England and Ireland, in order that the colonists might have the monopoly of that market; the payment of bounties on the importation of naval stores and on the production of indigo by the colonists; the allowance, on the re-exportation of colonial products, of drawbacks of part or all of the duties paid on importation; the admission of colonial imports at lower rates of duty than were charged on the same products from foreign countries. In order to ensure the enforcement of these acts elaborate provisions became necessary for the issue of bonds, and this, with the collection of a duty in the colonies, led to the appointment of colonial customs officers who were immediately responsible to the commissioners of the customs and the treasury board in England. With them the governors were ordered to co- operate. Courts of vice-admiralty, with authority to try cases without a jury, were established in the colonies; and just before the close of the seventeenth century they were given jurisdiction over violations of the acts of trade, a power which they did not have in England. Naval officers were very generally provided for by colonial law, who were to co-operate with the customs officers in the entry and clearance of vessels; but in some cases their aim was rather to keep control over trade in colonial hands. It thus appears that the resolve to enforce the policy set forth in the acts of trade resulted in a noteworthy extension of imperial control over the colonies. How far it was successful in the

immediate objects sought it is impossible to say. In some of the colonies and at some times the acts were practically nullified. Illegal trading was always carried on, especially in time of war. In such times it was closely allied with privateering and piracy. But in the large it is probable that the acts were effective, and their existence always furnished a standard to which officials were required by their instructions and oaths to conform. By the Act of Union of 1707 Scotland was admitted to the advantages of the English trade system. In 1733, in order to check the development of the French colonies and prevent the importa- tion of their products into English possessions, the Molasses Act was passed. This provided for high specific duties on rum, molasses and sugar, when imported from foreign colonies into those of Great Britain. So high were these rates that they could not be collected, and therefore no serious attempt was made to enforce the act.

33. Returning again to the 17th century, in order to trace in other connexions the notable advance which was then made in colonial administration, we are to note that the conquest of New Netherland by the British in 1664 was an event of great importance. Taken in connexion with the settlement of the Carolinas, it completed the hold which the English had upon the North American coast and gave them for the first time an extent of territory which could be profitably developed.

Molasses Act.

6)c

UNITED STATES

[HISTORY 1606-1760

The occupation of New Netherland was effected by a royal commission, which was also empowered to hear complaints and report a plan for the settlement of disputes in New England. Precedents for such a commission existed in the past, and a little more than ten years later a similar body, accompanied by a military force, was sent to Virginia to adjust matters at the close of Bacon's rebellion. But the commission of 1664 was the most noteworthy example of its kind. Yet, though it succeeded at New Amsterdam and in the southern colonies of New England, it failed at Boston. Massachusetts would not admit its right to hear appeals. It did not succeed in wresting

from Massachusetts the territory of New Hampshire and Maine, which the heirs of Gorges and Mason claimed.

34. In 1676 Edward Randolph was sent as a special agent to Massachusetts, to require it to send agents to England. He returned to England the sworn enemy of that colony and continued to be its tireless prosecutor. A series of negotiations ensued which lasted for almost a decade, and ended in the revocation of the Massachusetts charter by a degree in chancery, 1684. New Hampshire had already been organized as a royal province. Government under the charters of Rhode Island and Connecticut was soon after suspended. All New England was then organized as a dominion or vice-royalty under Sir Edmund Andros. Assemblies were everywhere abolished and government was left wholly in the hands of the executive. New York — also without an assembly — and New Jersey were Dominion of soon after incorporated with the Dominion of New New England, its boundary being extended to the England. Delaware river (see New England). After Bacon's rebellion in 1676 the lines of executive control were strengthened in Virginia, but the Assembly con- tinued active. These rapid changes involved the downfall of the former system of chartered colonies and the sub- stitution of royal provinces in their place. The effect of this was to introduce into the colonies a large number of officials of royal appointment — the governors, members of the council, judges, secretaries, surveyors-general, receivers-general and attorneys-general. The entire executive and judiciary in a royal province was appointed directly or indirectly by the king. Its members held under commissions subject to the king's pleasure and were controlled by his instructions. The exclusiveness of the chartered jurisdictions no longer obtained, but the Crown through its officials was brought into direct relations with the body of the colonists. Government could now be carried on under relations analogous to those between Crown and people in England.

35. By the abolition of assemblies and the union of colonies on a large scale James II. did violence to the strongest feelings and traditions of the colonists. The New Englanders not only viewed the levy of taxes by prerogative with the utmost aversion, but they feared a general unsettlement of land titles, the destruction of much that was valuable in their system of town government, and the introduction of Anglican worship among them. They shared also in the fear, which was wide-

*spread among the colonists, that the Crown intended by an alliance with the French and Indians to force Roman Catholicism upon them. Therefore the fall of the Stuart government in England was the signal for an uprising at Boston (April 1689) followed by a less successful one at New York. The Dominion of New England at once collapsed and the old colony governments were generally restored. A revolt against the Catholic proprietor in Maryland resulted in the suspension of his powers of government and the organization of Maryland as a royal province. William III. granted a new charter to Massachusetts (1691) in which full provision was made for an assembly, but also for a governor and secretary of royal appointment. Rhode Island and Connecticut were allowed Colonial to remain under their corporate charters. New Reorganlza. York and New Hampshire were organized as royal **"• provinces with assemblies. Proprietary government struggled back into existence in New Jersey. In Pennsylvania the governmental powers of the proprietor were suspended for*

two years (1692-1694), because of his neglect of provision for defence; then they were restored and Pennsylvania continued under proprietary government until the War of Independence.

36. The transition from the system of chartered colonies to that of royal provinces was thus begun and well advanced towards completion. But it was a gradual process, and the later stages of it were not reached until the second decade of the 18th century. South Carolina became provisionally a royal province in 1 719, and a parallel change was completed in North Carolina a decade later. Georgia received a royal government in 1752. But in 1715 Maryland was permitted to resume its proprietary form. After the Revolution of 1689 the change to royal govern- ments did not involve in any case the abolition of colonial assemblies. Henceforward the Crown had a fully equipped executive in every royal province, and for the maintenance of its rights could depend upon its efforts and the influence which it was able to exert upon the assemblies. The governors exercised the royal rights of calling, proroguing and dissolving the assemblies; they assisted in initiating legislation and exercised the right of veto. All bills passed by the assemblies were required to be submitted to the king in council, for acceptance or disallowance. The upper houses of the legislature were the councils of the provinces. These were small bodies and consisted, in every case except Massachusetts, of royal ap- pointees. Their support was in most cases given to the

gover- nors, and by that means they were greatly assisted in resisting the encroachments of the lower houses of assembly, which were elected by the freeholders. But, as a rule, the Crown made no provision for the salaries of its governors and other officials, and left them largely dependent for support on appropriations by the assemblies. In very many cases the withholding of salaries was successfully resorted to by the assemblies as a means of thwarting the executive or forcing it into submission. Under this system of balanced forces, analogous in general to that which was reached after the Revolution in England, the colonies entered upon the long period of the French wars.

C. — The Struggle with the French, 1690-1760.

37. Early French discoveries and colonization in North America were confined chiefly to the valley and gulf of the St Lawrence. These led, in the early 17th century, to the establishment of the province of Canada. By 1610 the French had possessed themselves of the valley of the lower St Lawrence, and the relations with the Indian tribes were being determined. During the next fifty years Canada grew slowly into an auto- cratically governed province, in which a mild form of feudalism existed and in which the Catholic Church was so strong as to contest supremacy at times with the civil power. The fur trade became from the first a most important industry in the province. The Jesuits and other priestly orders undertook missionary work on a large scale among the natives. The fur trader and the missionary soon extended French influence through the region of the Great Lakes and involved the province in inti- mate relations with the Indian tribes, and that throughout a large area of country. Between the Iroquois and the French wars were almost continuous, but with the other Indian tribes the French were in general on friendly terms. The Iroquois, on the other hand, maintained friendly relations with the Dutch and afterwards with the English. This deeply affected relations between the English and the French, as well as the entire development of the province of New York.

38. Exploration was a most important incident of both the fur trade and the missionary enterprises of the French. Between 1670 and 1690 their work culminated in the great exploring activity of Marquette, Joliet and La Salle. The Ohio and Missis- sippi rivers were discovered and their courses were mainly or wholly traced. Explorers also penetrated far into the

regions beyond the Mississippi. Posts were established at various points along the Great Lakes. During the first

two decades of the 18th century the French also eˆlajisAwi

established themselves on the Gulf of Mexico,

Mobile being founded in 1702 and New Orleans in 1718.

Quebec and the Gulf ports were then connected by a series of forts which, though few and weak, sufficed for communication and for the establishment of a claim to the Mississippi Valley. They were Niagara and Detroit, commanding the approaches to lakes Erie and Huron; Fort Miami, on the Maumee river; Fort St Joseph, at the southern end of Lake Michigan; Vincennes and French Fort, on the Wabash; Fort Chartres, on the Mississippi opposite St Louis; Michillimackinac and Ste Marie, which guarded the upper lakes. French zeal and enterprise had thus seized upon the heart of the continent, and was prepared to oppose any westward movement which the English might in the future attempt. It seemed possible that English settlements might be confined to the coast, for they expanded slowly and no genius for exploration or sympathy with Indian life was shown. The tendency of British commer- cial policy was likewise to confine them there, for in no other way did it seem possible to restrict the trade of the colonists to British markets. The Indian alliances of the English were also far less extensive than those of the French. The provinces of South Carolina and Georgia had conflicts with the Spanish on the Florida frontier, and in these the Indian tribes of the south were also involved. But these rivalries were slight and local in character, when compared with the struggle for supre- macy which was preparing between the French and English.

39. The conflict with the French was precipitated by events in Europe. It was the English Revolution of 1689 that opened the great conflict between France and England. The question of Protestantism versus Catholicism was involved, but at bottom the struggle was one for the balance of power among European states. Rival claims between the two powers in America, Africa

and Asia existed at the beginning of the conflict, or originated and were intensified as it progressed. Questions of commercial and naval supremacy world-wide in extent were involved, and the colonial possessions of the two states were necessarily drawn into the struggle. In America it involved four intercolonial wars, which were closed respectively by the treaties of Ryswick(i697), Utrecht(i7i3), Aix-la-Chapelle (1748), and Paris (1763). Between the second and third wars intervened thirty years of peace, the early period of Hanoverian and Whig ascendancy in England, the so-called Walpole era. On the American continent during the first two wars the struggle was confined to the northern frontier, and consisted of devastat- ing raids by the French and Indians, which in turn provoked retaliatory efforts on the part of the English. These took the form in part of attacks on Acadia and of unsuccessful efforts to conquer Canada by means of joint expeditions by sea and land. The favourite land route was that from New York by way of Lake Champlain to Montreal, while the expeditions by sea were forced to make the long and perilous voyage round Nova Scotia and through the Gulf and River St Lawrence to Quebec. In 1690, and again in 171 1, an enterprise of this kind was actually undertaken. Acadia, " with its ancient limits, " and the claim of France to Newfoundland and the Hudson Bay territory were, however, ceded to England by the treaty of Utrecht.

40. As the great world-conflict progressed the relative importance of the colonial and maritime issues which were in-_, volved increased. The first two wars had their between origin primarily in European questions. The third British and war had its beginning in the Spanish West Indies, ˆ ren ˆ° an d clearly revealed the existence of the Bourbon

Family Compact, which bound France and Spain together in active alliance. On the American continent its most striking event was the capture, in 1745, of Louisburg, a stronghold which the French had recently fortified on Cape Breton for the purpose of defending its interests in the Gulf of St Lawrence. This victory was secured largely by the efforts of the New England colonists. In the following year another plan for the conquest of Canada was thwarted by the necessities of war in Europe. At the close of the war Louisburg, too, was restored to the French. After this fashion did the world-struggle react upon the special interests of the English in North America, and perplex and irritate the

colonists. In the fourth intercolonial war (1754-63) the struggle between the two nationalities in North America was decided. Events which immediately preceded this war — the occupation of the Ohio Valley and the building of Fort Duquesne — clearly revealed an intention on the part of the French to exclude the English from the Mississippi Valley and confine them to the Atlantic slope. A persistent effort was also made to recover Acadia. The western, as well as the northern, frontier was not threatened, and the war which followed affected all the colonies. Great Britain sent over a succession of commanders-in-chief. Great improvement was made upon the crude efforts at joint colonial action which had characterized the earlier wars. To as great a degree did the Albany Congress of 1754 (see Albany, New York) surpass in importance the meetings of governors and military officers which had occasionally been held in previous times, though its plan of colonial union failed to meet the approval both of the colonists and of the government of Great Britain. The campaigns of this war were all upon a compara- tively large scale. Campaigns were carried on not merely along the line of Lake Champlain and in Acadia, but against Fort Duquesne (see Pittsburg, Penn.), Oswego, and Fort Frontenac, Louisburg, and Quebec {g.v.) itself. The weak Spanish power was overthrown in Florida and expeditions were sent against the southern Indians. In all quarters, and especially after Pitt became secretary of state, the British assumed the offensive. The navy of Great Britain, as well as its army, was called into action on a much larger scale in America than ever before. The result was the conquest by the British of Canada, and with it of all North America east of the Mississippi river; the French claim to territory west of this river was ceded to Spain in 1762. 41. The wars with the French brought the problem of colonial defence among the English into greater prominence than ever before, and added it to the other questions which had been of practical moment from the first. Against the Indians the colonists in the 17th century had provided for their own defence. Chiefly with this object in view, each colony had developed a militia system, modelled in general after that of England. But such a force was not fitted for long campaigns or large operations. It was comparatively undisciplined; both officers and men were inexperienced and destitute of proper habits of command, as well as those of subordination; the commissariat was poor or totally lacking, and the men were able to remain away from their homes for only brief periods. The colonists possessed no

navy, and for coast defence only a few rude forts. So poor were means of communication and so isolated were the colonies from one another, that co-operation in joint expeditions was very difficult. Equally difficult was it to secure proportional contributions of money from the colonies. Early in the French wars the British government prescribed quotas both of men and money to be raised by the colonies, but little attention was paid to these except by the colonies which were in immediate peril. Because of the limited amount of available money and the modest resources of the colonists heavy taxation was impossible, and the financing of the wars was a matter of great difficulty. The assemblies resorted to the issue of bills of credit, to which they gave the legal tender quality, and for the redemption of which in nearly all cases they made inadequate provision. The paper depreciated and in some colonies became worthless. Great confusion resulted, involving loss to all, and among the sufferers were British merchants. Strained relations were produced between the assemblies and the colonial executive, because the latter, acting under royal instructions, persisted in vetoing bills for additional issues of currency. For this reason, in addition to others, the assemblies withheld the salaries of governors and other officials, and in this way sought to coerce the executives into submission. In some colonies the Assembly secured the right of electing the treasurer, and in most of them appropriations were made specific. Thus by skilfully utilizing their control over the purse, and that during a long period of war, the colonial assemblies were able materially to limit the authority of the executives and to establish not a few privileges for

themselves and their constituents. It was in such ways as these that the constitutions of the provinces became developed and liberalized during the French wars. Many a precedent was then established which was utilized in the later struggle with the mother country. The home government on its part also became convinced that requisitions were altogether inadequate as a method of procuring revenue for general purposes.

42. The quality of the rank and file of the Canadian militia

was not essentially different from that of the British colonies. But the Canadian government was autocratic. The power of the French was also concentrated in a single large province, and not distributed among thirteen or more colonies. These conditions greatly promoted military efficiency. When taken in connexion with their Indian alliances, they enabled the French to take the offensive in the earlier wars much oftener than did the English, and with much greater effect. The government at Quebec was not subject to the limitations of quotas and requisi- tions. There were no assemblies to thwart its will. The English frontier was also more accessible and more exposed than was the lower part of the valley of the St Lawrence. Quebec was in every sense a citadel to which additional security was given during a large part of every year by the intense cold of the Canadian winter. But so superior were the training and enterprise of the French coureur de bois that, with his Indian allies, he was far better able than the English farmer or artisan to penetrate the wilderness, whether in winter or in summer, and massacre the exposed dwellers on the frontier. It was this class which gave the French the superiority in the long succession of raids by which the English frontier was laid waste.

43. Though the French by their skill and boldness achieved a remarkable success, their defects and weaknesses were equally evident. The flow of population from France to America was never great, and even it was diminished by the exclusion of Huguenots. The natural growth of population within New France was not rapid. The result was that the French colonists did not become sufficiently numerous to maintain the interests to which their vast claims and possessions gave rise. The disparity between their numbers and those of the British colonists became greater with every generation. At the opening of the last intercolonial war the proportion of English to French colonists was approximately 15 to 1. New York alone had about the same population as that of all the French colonies on the North American continent combined. The resources of the British exceeded those of the French colonists to a corresponding degree. Had the decision of the questions at issue depended upon population and wealth alone, the issue could not long have remained doubtful. But the tendencies arising from these fundamental conditions were to such an extent offset by other circumstances, already alluded to, that the result of the struggle was for a long time uncertain. Had it

been confined to the forces of the colonies alone, it would perhaps never have been decided. The English could have defended the territory which they occupied; so could the French. Moreover, with the French and English thus facing one another, it would have been impossible for the latter to have declared their independence. The French would never have desired to do this. Therefore, the two peoples must apparently have remained in the condition of colonists for an indefinite period. But the motherlands were to be the decisive factors in the problem, which thus depended to an extent on complications which existed in Europe or even on remoter seas and continents. When the climax of the struggle was reached the result might have been different if France at the time had not been so deeply involved in the pob'tics of central Europe.

44. Of the first' importance in reaching a decision were the fleets and armies of Great Britain and France, or those parts of them which were available for use on the continent of North America. During the larger part of the period under review the French neglected their fleet, while the English steadily advanced toward naval and commercial supremacy. But the first conspicuous service on the northern coasts was that which was rendered by Commodore Peter Warren and his squadron

at the capture of Louisburg in 1745. In the next year a large French fleet was despatched to North America, but it accomplished nothing. In the last intercolonial war the operations before Louisburg in 1758 and at Quebec (q.v.) in 1759 decisively proved the superiority of the British navy. The colonies also, in the later stages of the struggle, contributed loyally toward the result. France failed to make her natural military superiority effective in North America, and therefore her power on that continent had to yield before the combined attacks of Great Britain and her colonies by land and sea.

D. — The Colonial Revolt, 1763-1776.

45. The Treaty of Paris (1763), by which the period of colonial wars — but not the struggle between England and France — was concluded, added vast stretches of territory to the British dominions of Great Britain in North America. The Acquisitions Floridas, Canada and Louisiana as far west as the of Territory. Mississippi river now came into the possession of the English. Of the islands which were occupied, the two most important — Guadaloupe and Martinique — were restored to

the French. The retention of Canada in preference to these involved an important change in the nature and objects of British coloniza- tion. Hitherto tropical colonies had been preferred to those in northern climes. The occasion of this had been the view that, as England was not over-populated, colonies were not needed as " homes for a surplus population." Instead, they were estimated in proportion to their commercial value. The ideal was a self-sufficing commercial empire. The sup- porters of this view now argued that the islands which had been conquered from the French were more valuable than Canada and should be retained in preference to the northern continental territories, which had yet produced nothing for export except furs. But the government did not hesitate. . Following the lead of Pitt, it was now bent upon continental expansion. Canada and the West were retained and the most important French islands were given back. The development of modern industry — the so-called industrial revolution — had already begun in Great Britain. Its effect was vastly to increase the popu- lation of the British Isles and to necessitate an overflow into the unoccupied regions of the globe. Colonies therefore began to be regarded from this point of view, and the retention of Canada opened the way for the change. Henceforth, as time progressed, colonies were to be valued as homes for a surplus population quite as much as sources of raw materials and food supplies. The retention of Canada and the West also coincided exactly with the desires of the continental colonies. The chief gains of the war went therefore to them and not to the island colonies. They now possessed a continental domain which was adequate to their need for expansion, and their long-cherished desire to be rid of the French was gratified. Though, as expansion progressed, conflicts with the Indian tribes of the interior, and that on a large scale, were to be expected, the conquest of the French removed the sense of dependence on Grea| Britain for military aid which the northern colonies in particular had previously felt.

46. In consequence of the policy thus adopted, largely increased burdens were devolved on the imperial government, while the conquest and the events which led to Cnaaj[ea

it strengthened imperialist sentiment and ambi- Colonial tions. The course of action which was at first Policy of favoured by leading officials, both in England < jj£jfj Un . and the colonies, was a more systematic adminis- strengthen- tration of

Indian affairs, the employment oiingof sufficient regular troops under the commander-in- I ^' pe t rla l l chief to defend the newly acquired territory, the maintenance of posts with English settlers in the interior on a scale sufficient to prevent the French or Spanish from securing the trade of the region. Improved methods of administration were urged through the press by Thomas Pownall, Henry McCulloh, Francis Bernard and Dr John Campbell. French methods were praised and

the shortcomings of the surviving chartered colonies were again emphasized. This all required additional revenue, as well as administrative vigour, and that at a time when Great Britain was specially burdened with debt and when several of the colonies had recently incurred heavy expenditures. The large acquisitions of territory also necessitated some changes in the acts of trade. The necessity for their more vigorous enforcement was revealed by the existence of a large contraband trade between the colonists and the enemy during the later years of the war and also of a considerable illegal trade with Europe. These conditions, together with the conviction that, as the continental colonies had reaped the chief advantages of the war, some favour should be extended to the islands, led to the passage of the Sugar Act by the Grenville ministry in 1 764. It also caused a resort to writs of assistance in two of the colonies, and finally the legalization of them in all the colonies by act of parliament (1767). The aid of the navy was directly invoked in the en- forcement of the trade laws, and the activity of the customs officials and of the admiralty courts in the colonies was increased. Garrisons of regular troops — numbering several thousand — with a commander-in-chief were now present in the colonies in time of peace, and their aid might possibly be invoked by the civil power to suppress disorder. The Sugar Act itself was a trade and revenue act combined, and the fact was expressed in the preamble of the measure. It was intended directly to affect the traffic between the northern colonies and the foreign West Indies in lumber and food-stuffs, molasses and rum. The duty on foreign molasses, for which provision had been made in the Molasses Act of 1733, was halved; but now it was proposed really to

collect this duty. A cry was immediately raised in New England that, if the duty was collected, the manu- facture of rum — of which molasses was the staple material — would be lessened or wholly prevented and a most important industry sacrificed. The fisheries would incidentally suffer. The supply of coin, with which colonial balances were paid in England, they also said, would be lessened. Another act of parliament, passed about this time, prohibited the bestowment of the legal tender quality on colonial bills of credit. Though parliament regarded this act as a necessary remedy for the excesses of which many of the colonies had been guilty in the issue of paper money, it was generally regarded in America as a blow at a necessary system of credit. In spite, however, of the opposition and criticism which it provoked in the northern colonies, it is probable that the Sugar Act could have been per- manently enforced. The Act of Trade of 1673 and the Molasses Act — though the latter was not fully executed — were two early instances of the exercise by parliament of the right to tax the colonies. Had the Sugar Act been enforced, a clear and decisive precedent in favour of this right would have been established. In view of the general situation, that was pro- bably as far as the British government should have gone at that ime. But it immediately committed itself to another and still more significant measure, and the two acts combined caused an outburst of protest and resistance from the colonists.

47. Repeatedly in earlier years the imposition of a stamp duty upon the colonies had been suggested. Archibald Cum- mings, William Keith, ex-governor of Pennsylvania, and Governor George Clinton cf New York had prominently urged this policy. With the outbreak of the fourth intercolonial war comprehensive plans of parliamentary taxation were repeatedly proposed. The cost of the regular troops which must be stationed in America was estimated at about £300,000 annually. The Sugar Act was expected to yield about £45,000 a year. It was thought that the colonies should raise about £100,000 more as their reasonable share of the cost. George Grenville resolved to secure this by means of a stamp duty. This would fall upon the island colonies, equally with those of the continent, though it would be expended chiefly for the en- larged military force on the mainland. Though its simplicity and ease of collection recommended it, the Stamp Act was a purely fiscal measure, and its character was not concealed by any features which allied it to the earlier acts for the

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trade. It involved an extension of the British system of stamp duties to the colonies, and was intended to draw revenue directly from many lines of their activity. It was passed by parliament in 1765, almost without debate and with scarcely a thought that it would be resisted. It provided for the appointment of officials to distribute the stamped papers in the colonies and further extended the power of the admiralty courts by giving them jurisdiction over violations of this act. The legal theory upon which the act was based was that of the unqualified sovereignty of parliament as the represen- tative body for the whole empire, and that its authority, if it chose to use it, was as effective for purposes of taxation as for the regulation of trade or other objects of legislation. But never before, during the century and a half of colonial history, had the taxing power been so amp unqualifiedly exercised or in such trenchant force as by this statute. It followed close on the heels of the Sugar Act, which itself had aroused much hostile criticism. The two measures also came at a time when the consciousness of strength among the colonists had been increased by the defeat and expulsion of the French. Moreover, at the time when the policy was initiated, George III. had undertaken to crush the Whig party and to revive the latent prerogatives of his office. This re- sulted in the formation of a series of coalition ministries. Vacil- lation and uncertainty were thus introduced into the colonial policy of the government. The royal policy also brought into the public service in England and kept there an unusually large group of inferior men who persistently blundered in the treat- ment of colonial questions. It was only with the accession of the North ministry, in 1770, that permanence and a certain consistency were secured. But, in the view of the colonists, the prestige of the government had by that time been seriously lowered, and the stubborn self-will of the king became the only available substitute for broad and intelligent statesmanship.

48. Determined opposition to the Stamp Act was shown in all the colonies, by or before the time (Nov. 1) when it was to go into effect. The forms assumed by this opposition were such as characterized the entire controversy with Great Britain until the opening of hostilities in 1775. It consisted in the passage of resolutions of protest by the lower houses of some of the colonial legislatures; in the calling of a congress at New York, which was attended by delegates from nine of the colonies; in

the activity of mobs organized under the name of the " Sons of Liberty" in all the large seaports and in some smaller inland towns; and, finally, in a somewhat widely extended movement against the importation of British, or even foreign, goods and in favour of frugality and the encouragement of home manufactures. The newspaper press also sprang into much greater activity than ever before, and many notable pamphlets were published in defence of the colonial cause. The most important resolutions at the outset were those adopted by the Virginia House of Bur- gesses and by the House of Representatives of Massachusetts. Through the first-named body the dramatic eloquence of Patrick Henry (q.v.) forced five resolutions. Two others, which threat- ened resistance and the coercion of any who should venture to uphold the home government, failed to pass, but the whole seven were published broadcast through the colonies. The calling of a general congress was proposed bv the House of Representatives of Massachusetts. Prominent among its members was James Otis, who had already distinguished himself by radical opposition to measures of the government, especially in the case against writs of assistance which was argued before the superior court in 1761. Samuel Adams {q.v.), already a prominent man, was now elected a member of the house from Boston. He almost immediately became its leader, drafting its most important resolutions and papers, and to a large extent directing its policy. With the aid of others he was able greatly to increase the activity of the town-meeting in Boston, and in the course of a few years to develop it on occasion into a great popular convention, which could be utilized to overawe the government. Throughout New England the town and its institutions served well the purposes of opposition and

facilitated its extension over large areas. The county system of the provinces along the middle and southern coast was not so well adapted to these purposes, and their population was more dispersed. The intense Puritan spirit, with its century and a half of pronounced independence, both in polity and temper,

was also lacking outside New England; though on the frontiers of the provinces from Pennsyl- vania southward was a Scottish-Irish population which exhibited many of the New England characteristics. But the tenant farmers of New York, the German pietist sects of Penn- sylvania, the Quakers wherever they had settled, and in general the adherents of the 'English Church were inclined toward indifference or, as the controversy progressed, toward positive loyalism. Hence the mixture of nationalities in the Middle Colonies greatly increased the difficulty of rousing that section to concerted action. In Pennsylvania the issues were obscured by a struggle on the part of the western counties to secure equal representation with those of the east. This helped to make loyalists of the Quakers. Special grievances also produced among the frontier settlements of North and South Carolina quite as much dislike of the officials and social leaders of the tide-water region as they could possibly feel toward Crown and parliament. Throughout the struggle New England and Virginia exhibited a unity and decision in action which were not equalled elsewhere.

40. But to return to the Stamp Act. Before the meeting of the Congress at New York outbreaks of mob violence in

Boston had forced the stamp distributor there to OoaosHion res is n > an< i had wrecked the house of Thomas

Hutchinson, the chief justice. Owing largely to the indecision of the elective council, the government had proved powerless to check the disorder. The resolutions passed by the Congress, as well as its petitions to the home government, gave authoritative form to the claims of the colonial opposition in general, though the body which issued them, like all the congresses which followed until 1776, was extra-legal and, judged by the letter of the law, was revolutionary. In these utterances, as later, the colonists sought to draw their arguments from British precedents and their own history. As they owed allegiance in common with subjects within the realm, so the rights of the two were the same. The two British rights which, it was claimed, were violated by the Stamp Act were the right to trial by jury and the right to be taxed only by an assembly in which they were represented. The former grievance was simply an incident of the latter, and was occasioned by the exten- sion of the jurisdiction of the admiralty courts. The tax was a direct grievance. Therefore, for purposes of legislation like this these

bodies denied that parliament was representative of the whole empire (so-called virtual representation), and asserted that it represented only the realm. For purposes of taxation, their assemblies, they affirmed, were the only repre- sentative bodies they had known. Therefore, ignoring the earlier and tentative measures by which parliament had actually taxed the colonies, and falling back upon the sweeping declarations of their assemblies, they denied the right of parliament to tax them. They declared that the recent policy of parliament was wholly an innovation and insisted upon a return to the Constitution as it was before 1763. The doctrine of natural right and compact was also resorted to with increasing emphasis in New England utterances. For purposes of government they had all along acknowledged — and now did so expressly — that parliament bound them; and the inference would have been fair that they were represented in it. But they did not draw this inference, nor did they seek by any scheme of reform to secure representation in the imperial legislature. James Otis was the only colonial leader who ever contemplated the possi- bility of such a solution. Adams early declared it to be undesir- able. The British never proposed it, and therefore it played practically no part in the discussion.

50. The decisive blows, however, were struck by the mobs in the colonies and by the government itself in England. As the time for the execution of the Stamp Act approached, more

or less violent demonstrations occurred in New York and in many other localities. The stamp distributors were forced to resign. Everywhere in the original continental colonies the use of stamped papers was prevented, except to a slight extent in Georgia. Business requiring the use of stamps was in part suspended, but far more generally it was carried on without their use. Without the aid of the militia, which in no case was invoked, the colonial executives proved indisposed or powerless to enforce the act and it was effectively nullified. In England the petitions of the colonists produced little effect. There the decisive events were the accession of the Rockingham ministry to power and the clamours of the merchants which were caused by the decline in American trade. What might have happened if Gren- ville had remained in office, and if the duke of Cumberland had not been suddenly removed by death, it would be impossible to tell. But the serious lack of adjustment between British politics and colonial government is illustrated by the fact that, more than three months before the

Stamp Act was to go into effect, the ministry whose measure it was resigned, and a cabinet which was indifferent, if not hostile, to it was installed in office. Pre- parations were soon made for its repeal. The slight extent to which relations with the colonies had been defined is indicated by the fact that the debates over the repeal contain the first serious discussion in parliament of the constitution of the British Empire. While the colonies were practically united in their views a great variety of opinions was expressed in parliament. On the question of right Lord Mansfield affirmed the absolute supremacy of parliament in realm and dominions, while Camden and Pitt drew the same sharp line of distinction between taxation and legislation upon which the colonists insisted, and denied the right of parliament to tax the colonies. The debates at this time gave rise to the fancied distinction between internal and external taxes, of which much was made for a few months and then it was dropped. But motives of expediency, arising both from con- ditions in the colonies and in England, proved decisive, and in the spring of 1766 the Stamp Act was repealed, while its repeal was accompanied with the passage of a statute (The R a y 0/

51. These soon came in the form of a colonial Mutiny Act and of the so-called Townshend Acts (1767). The former was intended largely to meet the needs of the troops stationed in the West and in the new colonies, but it also affected / ^" s e " the older colonies where garrisons of regular soldiers existed. The act provided for a parliamentary requisition for barrack supplies, and partly because it included certain articles which were not required for the soldiers in Europe, the New York legislature at first refused to make the necessary appro- priation. Partly through the influence of the governor, it later came to think better of it and in a non-committal way appro- priated the supplies required. But meantime in England the Pitt-Grafton ministry had come into office, in which the brilliant but reckless Charles Townshend was chancellor of the exchequer. Pitt himself was disabled by illness, and the ministry, lacking his control, steadily disintegrated. Townshend availed himself of this situation to spring upon his colleagues and upon parlia- ment a new measure for colonial taxation, and with it a bill legalizing writs of assistance and establishing a board of commissioners of the customs in America, and a third bill suspending the functions of the assembly of New York until it should comply with the terms of

the Mutiny Act. These Bills all became law. Before the last-mentioned one reached the colonies, the New York Assembly had complied, and therefore the necessity for executing this act of parliament was avoided. The establish- ment of a customs board at Boston, of itself, did not provoke much criticism. But the Act of Trade and Revenue, which pro- vided for the collection in the colonies of 'duties on glass, lead, painters' colours, paper and tea, and that out of the revenue

raised therefrom salaries should be paid to the governors and judges in America, opened anew the controversy over taxation.

52. John Dickinson, in his Letters of a Farmer (1767-1768), denied in toto the authority of parliament to tax the colonies, and his argument was widely accepted. Massachusetts peti- tioned the home government, and in a circular letter conveyed its views to the other colonies and asked an expression of theirs in return. This provoked Hillsborough, the incumbent of the new colonial secretaryship, to order the Massachusetts house to rescind its action and the other colonies to treat the letter with contempt. The Massachusetts assembly refused to rescind and was dissolved by the governor. The activity of the customs officials at Boston in seizing John Hancock's sloop, " Liberty," occasioned rioting, which in turn was followed by the transfer of two regiments to Boston. Several vessels of war were also stationed in its harbour (autumn of 1768). Deprived of their assembly, the towns of Massachusetts chose deputies, who met in convention, but without important result. Favourable re- plies to its circular letter were, however, received from a majority of the colonies. Resolutions against the new act were passed by many colonial assemblies, and in several cases petitions were sent to England. But, either because these addresses were not sent through the regular constitutional channels, or because they expressed views inconsistent with the Declaratory Act, they were laid on the table or rejected outright. The king and ministers expressed the view that the Americans were opposed to all restrictions, and that in Massachusetts treason or misprision of treason had already been committed. In this they had the support of large

majorities in parliament. The statute of 35 Henry VIII., for the punishment in England of such offences when committed outside the realm, was now revived, and the royal officials in Massachusetts were instructed to collect evidence against suspected popular leaders with a view to their deportation across sea for trial. Though sufficient evidence was not found, nothing could have been better calculated to increase the exaspera- tion of the colonists than a threat of this kind. It drew from the Virginia burgesses strong addresses and resolutions of pro- test. Fear lest the English Church would induce the govern- ment to establish a colonial episcopate caused much discussion at this time, especially in New England, and led to plans for joint action on the part of Dissenters, in self-defence. Though the government never sanctioned the plan, the fears which were aroused by its discussion contributed appreciably to the general agitation. In the course of 1769 the policy of commercial non- intercourse was again revived, and resolutions in favour of its enforcement were passed by many local bodies. But it was found difficult to enforce these, and, as the colonies were prosperous, trade, open and illicit, with Europe continued to be large. The British merchants did not clamour for relief, as they had done at the time of the Stamp Act, but gave loyal support to the policy of the government. The king was also steadily gaining an ascendancy, which in 1770 was permanently established by the accession of Lord North to the premiership. Thus, on both sides of the ocean, parties were bracing themselves for a struggle, the one for and the other against the principle of the Declara- tory Act. The question of revenue was now largely obscured by that of right and power.

53. It cannot be said that the Townshend Revenue Act was nullified, for to a certain limited extent it was executed. But in 1770, on the specious plea that the duties were uncommercial because they were levied on British manufactures, all except the duty on tea — 3d. per lb — were repealed, and a drawback of one-fourth and later of three-fifths of this duty was granted on the re-exportation of tea to the colonies. But the preamble of the act was retained, and with it the principle of taxation. For this reason opposition continued and non-importation agreements, especially against tea, were maintained. But after the collision which occurred between the troops and the people in Boston, in March 1770, the soldiers were removed from that town and affairs became more quiet. For more than a year it

seemed as if the controversy was wearing itself out and that the old relations would be restored.

Tea Tax.

But the conduct of certain naval officers and small ves.els of war which had been trying to suppress illegal trade in Narragansett Bay led, in June 1772, to the destruction of the schooner " Gas- pee." The inquiry which necessarily followed this, together with legislation for the protection of the royal dockyards, ships and supplies, again revealed the possibility that colonists might be removed to England for trial. About the same time provision was made for the payment by the home government of the salaries of the governors and of the judges of the superior court of Massa- chusetts while those officials continued to hold at the pleasure of the Crown. These events occasioned a movement in Massa- chusetts and Virginia which led at once to the organization of committees of correspondence, and these ultimately extended far and wide throughout the colonies. At the same time in England the East India Company appealed ta parliament for relief from the losses caused by the transfer of tho American trade so largely to the Dutch, and in response the Tea Act was passed authorizing the company to import its teas into the colonies and providing that the English duties should be wholly drawn back on exportation, and that no compensation need be made to the government for consequent loss of revenue. This, it was expected, would enable the company to out-compete the Dutch. But popular uprisings prevented the reception or sale of the tea at any of the ports and culminated in the destruction (Dec. 16, 1773) of 340 chests at Boston. As the king and the North ministry were now fully intrenched in power, coercion was at once resorted to and affairs were thus brought to a crisis.

54. Those among the colonists who were intelligent enough to watch the course of events had long felt that they were being enveloped in a network of relations over which they

*had no control. This was a result of the develop- jˆ *" ment of the empire, with its world-wide interests and its policies the motives for which had their origin in conditions which by the colonists were dimly perceived, if perceived at all. They were particularists whose views and resources were alike narrow, but whose perception of their interests was clear. The Quebec Act, which was passed by parliament near the close of the*

session of 1774, furnished a case in point. Owing to the failure of the imperial government to secure the revenue which it had hoped to collect under the Stamp Act and the later statutes, it had been forced to abandon its plans for the vigorous administra- tion of Indian affairs and of the West. In view of these facts, it was thought wisest and cheapest to commit the immediate charge of the West to the province of Quebec, and therefore to extend its bounds southward to the Ohio. The Roman Catholic religion was recognized as legal within Quebec, and no provision was made for an assembly. Its extension also indicated a pur- pose to prevent the westward movement of population across the mountains, which was already beginning from the Middle and Southern colonies. It is true that this act involved the possi- bility of danger to the colonies, but exaggerated inferences were drawn respecting it and the motives which probably impelled its passage. So it had been with the distinctively imperialist measures from the first and so it was to continue.

55. But the acts of the session of 1774 which were of most immediate importance were those which directly affected Massachusetts, where lay the centre of disturbance. One of these closed the port of Boston, another substituted an appointed for an elected council in Massachusetts and took the selection of jurors out of the hands of the people, and a third made possible the removal from Massachusetts of the trials of persons indicted for capital offences committed in support of the government into neighbouring colonies or to Great Britain, where a fair hearing was considered possible. General Thomas Gage, who had been commander-in-chief in America, was now appointed governor of Massachusetts, with authority to uphold the new acts with military force. As soon as knowledge of the fate impending over Boston reached the other colonies, con- ventions, local and provincial, were held, and the plan of a general congress, as proposed by Massachusetts and Virginia, was adopted. Delegates were chosen from all the colonies except Georgia, though that province fell into line when the

second Congress met. The members were instructed to the

general effect that they should consult together and adopt such measures as were best calculated to secure the just rights of the colonists and redress their grievances. Voting by colonies, but occasionally listening to utterances which implied that Americans were now thrown into a single mass, this body sent addresses to the king, to the people of the colonies, of Quebec First and of Great Britain, and prepared a declaration

Continental of rights. It is a significant fact that an address Congress. was not sent t0 gjfjjgj. f the houses of parliament. In its statement of rights the Congress (known as the First Continental Congress) limited itself to those which it believed had been infringed since 1763. These acts they described as innovations, and claimed themselves to be the true conservatives who only desired peace on the basis of the former Constitution. Even Joseph Galloway's elaborate plan of union (see Galloway) between Great Britain and the colonies was debated at great length and was laid on the table by a majority of only one, though later all reference to it was expunged from the record. But, on the other hand, the warlike " Suffolk Resolves " (see Milton, Mass.) were ap- proved, as was the opposition which Massachusetts was making to the recent acts of parliament; and the view was expressed that, if an attempt were made to execute them by force, all America should support Massachusetts. Though the work of this Congress was deliberative, it performed one positive act which contained the germ out of which new governments were to develop. That was the issue of the Association, or non- importation and non-exportation agreement, accompanied with resolutions for the encouragement of agriculture and home manufactures and for the organization of committees to carry these measures into effect. Coercion, according to the principle of the boycott, was to be applied by the colonies and other local bodies to all who declined to accept and obey the terms of the Association. This policy had been followed at intervals since the time of the Stamp Act. It had been ■ revived and urged by very many local and pro- tion, or Non- vincial bodies during the past few months. The Importation Congress had been called with a view to its enforce- and Non- me nt throughout the continent. Its issue of the AmemenU Association gave this policy wide extension, and at the same time strengthened the system of com- mittees, whose energies were henceforth to be chiefly devoted to its enforcement. The Association became the touchstone by which loyalty to the colonies, or loyalty to the

king, was determined. Those whose loyalty to the king forbade their submission to the new regulations now felt the coercive power of committees, even to the extent of virtual trial, imprisonment or banishment. Local bodies, acting under general regula- tions of Congress, and all revolutionary in character, accom- plished these results and thus laid the foundation of the new governments. From this action the First Continental Congress derived its chief significance.

56. The line of policy thus indicated was not such as would conciliate the home government, though it is doubtful if at that time anything short of an acknowledgment of the principle of the Declaratory Act would have been effective. All measures of congresses and committees, everything which did not emanate from the assemblies and come through legal channels, savoured of sedition and was little likely to secure a hearing. The Asso- ciation, with its threats and coercive spirit, and. depending as it did upon extra-legal bodies for enforcement, was a direct blow at the commercial system of the empire and could scarcely help provoking retaliation. When the Congress adjourned, some of its members predicted war. In New England the im- pression that war was inevitable was widespread. In Massa- chusetts a provincial congress was at once organized, which assumed the reins of government and began to prepare for defence. A committee of safety was chosen to carry on the work during recesses of the Congress. Thomas Gage, the governor, began fortifying Boston, while he looked about for opportunities to seize military stores which the colonists were accumulating.

The raising of voluntary militia companies was soon begun in Virginia. In South Carolina, as earlier in Boston and New York, a quantity of tea was now actually destroyed, and a general committee assumed practical control of the province. From New York City and Philadelphia as centres the process of revolutionizing the two most conservative provinces was carried on. When parliament met, at the close of 1774, the king and ministers declared that a most daring spirit of resistance existed in Massachusetts, which was countenanced by the other colonies, where unlawful combinations against the trade of Great Britain were already widely extended. In these opinions the government had the support of the majority in the two houses, and in a joint address the rebellion in Massachusetts was declared to be a fact. As a conciliatory measure Chatham proposed that parliament agree by

resolution not to levy any tax upon the colonies, but that the Continental Congress be required to make a free grant of a perpetual revenue which should be fully at the disposition of parliament, the Congress fixing the quota which should be paid by each province. But the imperialist and mercantilist ideas of Chatham were expressed in the further provisions that the system of trade and navigation should not be changed and that the army might be lawfully kept in any part of the dominions where it was deemed necessary, though it should never be used to violate the just rights of the people. Edmund Burke, in his great speech on conciliation, advocated a return to the system of requisitions and did not consider a representation of the colonists in parliament as a possibility. But these motions were rejected, and a resolution introduced by Lord North was passed. This contained no recognition of extra-legal bodies, but provided that when the assembly of any colony should engage to support civil govern- ment within the colony and contribute according to its ability to the common defence, the king and parliament would then forbear to levy any more taxes on that province except what were necessary for the regulation of trade. The colonies, with the exception of New York, North Carolina and Georgia, were excluded from the fisheries, as a counterstroke to the Association. North's resolution proved utterly futile, and the two parties drifted steadily toward war, though, as Burke never tired of asserting, the British government in its military estimates made no adequate provision for meeting the crisis.

57. On the 19th of April 1775 hostilities began in Massa- chusetts. They had been narrowly escaped two months before, when, on a Sunday, Gage had sent an expedition by water to Salem in search of powder. Now, on a Hostilities- week-day, a force was sent overland to Concord, Lexington 20 m. from Boston, to seize or destroy the military anrf stores which the colonists had brought together ˆ Bunˆ rHill that village. The minute-men were warned to oppose the approaching force, and at Lexington (q.v.), a village situated on the road to Concord, occurred a skirmish in which the first blood of the American War of Independence was shed. The troops marched on to Concord (q.v.) and destroyed such of the stores as had not been removed or concealed. On their return march they were pursued by a galling fire from behind fences and buildings, and had it not been for the arrival of a relieving force the command would have been destroyed before it reached the protection of

the British vessels of war at Boston. The " Lexington alarm " brought in throngs of militia- men from all parts of New England. Officers were appointed by the provincial congress of Massachusetts and by similar bodies in the other colonies, and immediately the so-called siege of Boston began. Cannon, as well as every other form of military equipment, were now in great demand. In order to secure a supply of the former and at the same time strike a telling blow at British authority in the north, Ticonderoga (q.v.) was sur- prised and taken on the 10th of May. Men from Connecticut, Massachusetts, and the New Hampshire Grants (later Vermont) co-operated in this enterprise. It was soon followed by a dash into Canada, by steps which involved New York in the affair, and by the organization of a military force under General Philip Schuyler for permanent service on the northern frontier.

Meantime reinforcements reached Boston, led by Howe, Clinton and Burgoyne, and it was resolved to extend the British lines by occupying the heights of Dorchester on the south and those of Charlestown on the north. The Americans, hearing of this, seized Breed's Hill, overlooking Charlestown, where they hastily threw up a redoubt on the night of the 16th of June. The British might easily have entrapped them, but instead on the next day the American position was assaulted on the left and carried, though with much difficulty and after a loss to the assailants of more than 1000 men. Such was the battle of Bunker Hill (q.v.), one of the most dramatic encounters in the war which was then beginning. In connexion with all these events the Americans, as in their earlier conventions and manifestoes, claimed to be acting on the defensive. But it was not difficult to perceive that, especially in New England, this claim only imperfectly concealed an intensely aggressive spirit. (For military events of the war, see American War of Independence.)

58. The news of the outbreak of hostilities aroused strong feeling throughout the colonies. The Second Continental Congress met under its influence. Its members, however, had been chosen and instructed before the clash of arms, and for

that reason the course which had been worked out for them differed only slightly, if at all, from that which had been followed by their predecessors. To a certain extent the new body adhered to the former course of action. But a state of war now existed in New England and on the Canadian border. Troops were expected soon to arrive at New York. Reports of these events were thrust upon the attention of Congress at once, and the provinces involved asked for advice as to what course they should pursue. The northern frontier especially demanded attention. As a result of these events in the colonies generally the Association was being changed from a system of co-operation against British trade into a union for purposes of defence. This new situation the Congress was forced to meet. This it did largely by resolutions of advice to the colonies, but also by positive orders. Of the former class were the resolutions about the procuring of military supplies, the assumption of powers of government by the various colonies, and concerning defence at New York City, on the northern frontier and, later, in the Highlands of the Hudson. Of a more decisive character was the appointment of officers for the army, George Washington being made commander-in-chief, the prescribing of their pay, the issue of continental bills of credit, the issue of articles of war, the regulation of trade and of Indian affairs, and the establishment of postal communication. As the colonies were passing through a strong reaction against executive authority, Second the Congress did its business with the help of Continental temporary committees and did not seek to establish Congress. a permanent executive. The same was true for a time of the congresses and conventions in the different colonies. As the movement progressed through 1775 and the early months of 1776, executive authority in the royal and pro- prietary provinces collapsed. The assemblies were either dissolved or ceased to meet. The governors, their authority gone, retired on board British vessels of war, returned to England or, perchance, found themselves prisoners in the hands of the revolutionists. This gradual fall of the old governments, imperial and colonial, was the revolution on its negative side. The rise of the system of congresses, conventions and com- mittees, deriving their authority from the people, was the revolution on its positive side, and foreshadowed the new federal system which was rising on the ruins of the half - federated empire. The process in the different colonies was as varied as were their social and political conditions.

59. In Connecticut and Rhode Island the corporate system of government, which they had inherited from the 17th century, necessitated no change. The general assemblies always had been the centres of power, and the leading officials were elective for short terms and were subject to the control of the electorate. So far as the internal organization of the colonies was concerned that was all which the revolution demanded. In the two

proprietary provinces — Pennsylvania and Maryland — the execu- tives were not so directly interested and pledged to support the imperial government as were those of the royal provinces. But Governor Robert Eden of Maryland was so tactful that, though the last Assembly met in 1774, he was able, with the courts, to keep up some form of government there in the name of the Crown and proprietor until the early summer of 1776. In Pennsylvania the proprietors, though in sympathy with the British government, never sought actively to influence events in their province. So strong was the conservative spirit there that the proprietary Assembly even met — though without a quorum — as late as September 1776, at the time when the convention was completing the first constitution of the state. In the royal provinces the prorogation of the legislatures for indefinite or prolonged periods caused them early to disappear — that of Massachusetts in October 1774. The burgesses of Virginia last met for business in May 1774. They were pro- rogued to several later dates, but the governor was Qollapseot never again able to meet them. The long and im- the Royal portant session of January-March 1775 was the last Govera- ever held by the New York Assembly. In April 1775 meatSM Governor John Martin of North Carolina met the Assembly for the last time, and even then the Provincial Convention was in session at the same time and place and the membership of the two bodies was the same. In May 1775 disappeared the Assembly of Georgia; in June those of New Hampshire and South Carolina met for the last time. Governor William Franklin was able to meet the Assembly of New Jersey as late as November, but months before that date the Provincial Convention had practi- cally assumed the control of affairs. The royal courts and executives continued some form of activity a few months longer and then totally vanished.

60. After Bunker Hill the command at Boston had been transferred from Gage to Sir William Howe: In July Wash-

ington took command of the colonists and gradually established some degree of order and discipline among them. Though the American levies were raw and ever fluctuating in numbers, the British never seriously attempted to break through their lines. Indeed, it was not the plan of the British to make New England the chief seat of war. As early as the 2nd of August 1775 Lord Dartmouth wrote to General Gage on " the obvious advantages that would attend the taking Possession of New York and the hazard of the Army's continuing at Boston." On the 5th of September he wrote to Howe that every day's intelligence exhibited this fact in a clearer light. Rhode Island was considered as a convenient naval station, and steps were soon taken to secure possession of it and its surrounding waters. This indicates what was necessarily the fact, that the British would so plan the war as to secure the maximum of advantage from their fleet. This would give them an easy command of the entire coast, and enable them to secure a foothold at strategic centres. Hence it was that, though the arrival of a fresh supply of cannon enabled Washington to fortify Dorchester Heights, this simply enabled him to hasten a process for which Howe had long been preparing. The evacuation occurred Evacuation on the 17th of March 1776, and the British force of Boston;

withdrew temporarily to Halifax. Meantime the "i"""""^""" i_ 11 ,. c a u 1 ■»«■ ., • Expeditions

bold expeditions of Arnold and Montgomery against against

Canada — suggesting the joint efforts of the French Canada.

wars — had met with only a partial success. Montreal

had been occupied, but the assault upon Quebec had failed.

A small American force awaited the return of spring in

Canada, in order that they might renew the struggle for that

colony. – > . – •. –

61. The view, as it was now repeatedly expressed by king and parliament, was that the colonists were in open rebellion. North's offer of conciliation was peremptorily rejected by Congress. The acts of parliament were being openly resisted, and Congress in its manifestoes had ignored the two houses. There-

fore the British government stood committed to coercion. That was the meaning of the legislation of the winter of 1776 — the prohibition of trade with the rebellious colonies, the increase

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of the estimates for the army and navy, the employment of German auxiliaries for service in America. Preparations were made to send a large military and naval force against the colonies the following season, and that it should operate in part against the insurgents in New York and the southern colonies and in part through Canada. New England was no longer to be the direct object of attack. The Howes, as commanders of the royal army and navy, were appointed commissioners to grant assurance of peace and pardon and the repeal of the obnoxious acts, provided submission was made and some way could be found by parliament in which an imperial revenue for purposes of defence could be secured from the colonies. Military operations, meanwhile, should be directed against points of least resistance, and in that way, if possible, the union of the colonies should be broken. The trend of British policy indicated that an invasion from Canada might be attempted and the effort be made to hold Charleston, Philadelphia, and especially New York as strategic points on the coast.

62. The course of events in the colonies by which this situation was met was the erection of a system of feeble defences about New York and the removal thither of the army of about 9000 men in the spring of 1776; the fitting out of privateers to prey on British commerce and of a few small armed vessels by the colonies and the general government to watch the coast and procure supplies; the disarming of loyalists; the opening of American ports to the trade of all peoples who were not subject to the British Crown; and the tentative opening of relations with France. As the result of a combination of ill luck, bad manage- ment and American energy the British suffered a repulse at Charleston, South Carolina, in June, which was analogous to the affair of the year before at Bunker Hill, and which necessi- tated a postponement of their plans in the

South. The Congress and the various revolutionary bodies in the colonies were forced to carry on war upon a constantly increasing scale. They had to assume powers of government and gradually to perfect their or- ganization for the purpose. Committees in Congress became more permanent. Conditions approximating to those which existed the year befoie in New England extended through the colonies generally. On the 15th of May 1776, as the result of various earlier applications on the subject, and especially of one from certain Whigs in New York, the Congress recommended to the assemblies and conventions of the colonies where no government sufficient to the exigencies of their affairs had been established, " to adopt such government as shall, in the opinion of the representatives of the people, best conduce to the happiness of their constituents in particular arid of America in general." The preamble to this resolution set forth as facts the statements that the colonies had been excluded from the protection of the Crown, that no answer had been given to their petitions for redress, and that the whole force of the kingdom was to be used for their destruction, and therefore that it was no longer reason- able or honest for the colonists to take the oaths or affirmations necessary for the support of government under the Crown. Organiza- Though the preamble was warmly debated, it was tloaof state adopted. And this act marked a turning-point, for beats' '^ e P r °g ress °f events from that time to the declara- DeclMratioa tion of independence was rapid and decisive. The of lade- colonies — now becoming states — one after another, peadeace. j n reS p 0nse to letters from Philadelphia, empowered their delegates to concur in declaring independence. On the 7th of June R. H. Lee of Virginia introduced in Congress a resolution " that these United Colonies are and of right ought to be free and independent states," that it was expedient forth- with to take effectual measures for securing foreign allies, and that a plan of confederation should be formed. John Dickinson and others, speaking for the Middle Colonies, argued that the order of procedure should be reversed. But John Adams and the more aggressive party insisted that the proposed declara- tion would simply state the facts and would open the way for foreign alliances; that it was useless to wait for unanimity. The debate showed that the delegates from the Middle Colonies and South Carolina could not act, and so the decision was postponed

for three weeks. In the interval steps were taken to draft a plan

of treaties and articles of confederation. A board of war and ordnance, the earliest germ of an executive department, was also created by Congress. At the end of the three weeks the dele- gates from all the colonies except Georgia, South Carolina and New York had received instructions favourable to independence. The two former left their delegates free, and under the influence of the British attack on Charleston they voted for independence. News had just come that Howe had landed with a large force at Sandy Hook — as events proved, it was an admirably equipped army of 30,000 men, supported by a fleet. Under the impression of , these stirring events Dickinson and his leading supporters ceased their opposition, and the Declaration, substantially in the form given to it by Thomas Jefferson, was agreed to (July 4, 1776), only three adverse votes being cast. The delegates from New York took no part, but a few days later the act was approved by the convention of that state. The signing of the document by the members took place at a later time. Thus triumphed the tendencies toward self-government which had been predominant in the continental colonies from the first, and which the system of imperial control had only superficially modified and restrained. But the most significant part of the document for the future was the preamble, in which the democratic aspirations of the new nation were set forth, the spirit to which Thomas Paine had just made so powerful an appeal in his Common Sense. Governments, it was said, derive their just powers from the consent of the governed, and when any system becomes destructive of these ends it is the right of the people to abolish it and to institute a new govern- ment, establishing it upon such principles and under such forms as seem most likely to effect their safety and happiness. (See Independence, Declaration of.)

E. — The Struggle to Maintain Independence, 1776-1783. 63. Viewed from one standpoint, the declaration of indepen- dence was apparently an act of the utmost recklessness. The people were by no means a unit in its support, and in several of the states widespread indifference to it, or active sympathy with the British, prevailed. In New York, South Carolina and Georgia a condition of civil war came sooner or later to exist. The United States, as yet, had no international status, and it would seem that that must be secured, if at all, by a series of victories which would ensure independence. But how could these be won against the greatest naval power on the globe,

supported by veteran armies of continental and British troops? The colonies had no money; the few vessels which, as a collective body, they did send out, were more like privateers than anything else. Their army was an undisciplined throng of militiamen, serving on short enlistments, without organized commissariat, and for the most part under inexperienced officers. Its numbers, too, were far inferior to those of the British. Taxation by the Continental Congress for the support of the war Finance; was not among the possibilities of the case. The Weakaesses colonies were struggling against taxation by one ˆ tBe e e imperial body, and it was not likely that they would American submit to similar impositions at the hands of another. General The Congress, moreover, as has truly been said, was OovernmeaU little more than a general committee or interstate council of safety, and had to proceed largely by way of advice. A strong tendency also toward the provision for immediate needs by the issue of bills of credit had been inherited from the period of the French wars, and resort was again had to that device. The battle of Bunker Hill had been immediately followed by an order of Congress for the issue of $2,000,000 in that form of currency. Issues followed in rapidly increasing amounts, until by the close of 1779 $241,000,000 had been authorized. The states put out nearly as much ($209,000,000), Virginia and the two Carolinas issuing the largest amounts. All that Congress could do to secure the redemption of its issues was to recommend to the states to provide the means therefor; but this they failed to do, or even to provide for the redemption of their own issues. The continental paper money depreciated until it became

worthless, as to a large extent did that of the states also. The states decreed it to be legal tender, and dire threats were uttered against those who refused to receive the bills; but all to no purpose. The Congress also tried to induce the states to tax themselves for the general cause and was forced to rely on requisitions for the purpose. The colonies had insisted that the system of requisitions was good enough for the mother country, but when applied by Congress it proved as complete a failure as when resorted to by the Crown. The revolution was

therefore never financed. It early became necessary to resort to loans and that chiefly from foreign sources. It was therefore an absolute necessity that the colonies should secure international recognition and status. Then loans were obtained from the governments of France and Spain and from private bankers in Holland to the amount of about

$7,830,000.

64. The collapse of royal government left the colonies in a chaotic state. The old institutions had disappeared and new ones could not be immediately developed to take their place. But the institutions of local government, the town and county systems, were left intact, and upon these as a basis the new fabrics were erected. It was therefore easier to construct the governments of the states than to define and develop the general government. At first little else was intended than that the Congress should be the mouthpiece of the patriot party. It proceeded mainly by way of recommendation, and looked to the states, rather than to itself, as the ultimate sources of authority. Upon them it depended for the execution of its measures. The common will, as well as enactment, was lacking which would have given the force of positive law to the measures of Congress. As the war proceeded the states grew jealous of the central body and tried to prevent appeals to it from the state courts in prize cases. Under the pressure of war, moreover, the enthu- siasm, which had been strong at the outset, declined, and it became increasingly difficult to secure co-operation or sacrifice toward any general enterprise. At the same time, war devolved upon Congress an enormous burden of work. It was forced to devise general policies and provide for their execution, and also to attend to an infinite number of administrative details. This was due not only to the exigencies of the time, but to the fact that no general executive was developed, As was characteristic not only of this revolution, but of all others, the committee system underwent an enormous development. " The whole congress," wrote John Adams, " is taken up, almost, in different committees, from seven to ten in the morning. From ten to four or sometimes five we are in congress, and from six to ten in com- mittees again." " Out of a number of members," writes another, " that varied from ten dozen to five score, there were appointed committees for a hundred varying purposes." Upon its president and secretary the Congress was forced to depend not a little for the diligence and ability which was requisite to keep the machine going. But

as the war progressed most of the able members were drawn off into the army, into diplomatic service or into official service in the states. Sectional and state jealousies also developed and became intense. By many the New Englanders were regarded with aversion, and members from that section looked with dislike upon the aristocrats from the South. As the Congress voted by states the smaller commonwealths were often moved by jealousy of their larger rivals to thwart important measures. But, above all, the con- duct of the war and foreign relations occasioned infinite jealousies and cabals, while many of the most important measures seemed to meet with downright indifference. Washington's corre- spondence abounds in evidence of these facts, while it is well known that he was the object against whom one of the cabals of the time was directed. Benjamin Franklin was the object of somewhat similar jealousies. But, as time passed, rudimentary executive departments, beginning with the board of war and the postmaster-general, were developed, and some advance was made toward a working and permanent system. In 1781 the offices of foreign secretary, superintendent of finance, secretary of war and secretary of marine were created.

65. For a time, and indeed during most of the struggle, the course of the land war seemed to justify these criticisms and gloomy fears. Until its very close the campaign of 1776, from the American standpoint, was a dismal failure. The battle of Long Island was lost by the Americans and, as at Bunker Hill, it would have been quite possible for the British to have captured the entire force which opposed them on Long Island. Howe compelled Washington to evacuate New York City. On the 1 6th of November the practical abandonment of the

state of New York by the main army was necess i tat; ed w ,ˆ sWt ˆ oa by the capture of Fort Washington. Earlier in the year the Americans had been compelled to retire from Canada, while the Tories in northern New York were contributing valuable aid to the British.

66. But there was another side to the picture, and already certain faint outlines of it might be discerned. The British commander was proceeding slowly, even according to established European methods. At almost every step he was failing to seize the advantages that were within his reach, while Wash- ington was learning to play a losing game with consummate patience and tact. Although he was constantly

trying to rouse Congress and the states to more vigorous action, he showed no disposition to break with the civil power. Already, too, the physical obstacles arising from the wooded and broken character of the country, and from the extremely poor means of com- munication, were becoming apparent to the British; while the Americans always had the alternative, if too hard pressed, of withdrawing beyond the mountains. After Washington had crossed the Delaware, Howe, instead of seizing Philadelphia and driving Congress and the American army to some remote places of refuge, as he might have done, prepared for winter quarters. Washington seized the opportunity to return across the Delaware and surprise the British outposts at Trenton (Dec. 26, 1776) and Princeton (Jan. 3, 1777), and thus secured a safe post of observation for the winter at Morristown. Confidence was to an extent restored, the larger part of New Jersey was regained, and many loyalists were compelled to take the oath of allegiance. Howe's plan for the next campaign involved the strengthening of his army by large reinforcements from home and by all the men who could be spared from Canada. With this force he proposed to capture Philadelphia and thereby to bring the War of Independence to an end in Pennsylvania, New Jersey and New York. New England and the states farther south could then be dealt with in detail. But Howe was over- ruled by Lord George Germain, the colonial secretary, whose plan included an invasion from Canada, in which Tories and Indians should share, while Howe should advance up the Hudson and meet the northern forces at Albany. If this ambitious scheme should succeed, the British would occupy the valley of the Hudson and New England would be cut off from the rest of the colonies. General Burgoyne was appointed to command the northern expedition. But the failure of the plan was almost ensured from the outset by neglect on the part of British officials to instruct General Howe as to his part in its execution, while Burgoyne was forced to surrender near Sara- toga on the 17th of October. Meanwhile, Howe, who had long waited for instructions respecting the northern expedition, was finally informed that he might undertake the Pennsylvania campaign, but with the hope that at its close he would still be able to march up the Hudson. Thereupon, embarking his army, Howe sailed for Chesapeake Bay, at the head of which he landed and advanced towards Philadelphia. Washington's army opposed his march at the Brandywine (Chad's Ford), but was defeated (Sept. n, 1777) and forced to retire beyond Phila- delphia. The

British then entered the city (Sept. 26) and the Congress withdrew to Lancaster, and later to York, in the interior of Pennsylvania. The British fleet had in the meantime arrived in Delaware Bay, and, after a prolonged and brave defence, had captured Forts Mercer and MifBin. When the winter began the Delaware, as well as lower New York and Rhode Island, was in the possession of the British. With the fragments of an army Washington retired to Valley Forge (q.v.).

67. But the influence of Burgoyne's surrender in Europe was to prove a turning-point in the war. Since 1763 a strong sentiment at the French court had been favourable to a resump- tion of war with Great Britain. An opportunity was now pre- sented by the colonial revolt. In November 1775 the Congress created a committee of secret correspondence, which, in April 1777, was developed into a committee of foreign affairs, and this continued until 1781, when the office of foreign secretary was established. To Congress, and to the members who were serving on its secret committee, the possible attitude of France was known from an early date. The necessity of securing supplies and loans from Europe was also imperative, though the United States had nothing to pledge in repayment except the future products of her soil. In February 1776 Silas Deane (g.v.) was sent to Paris, ostensibly as a business agent, and with the connivance of the French government supplies were sent to America and American vessels were received into French ports. Soon American privateers were bringing their prizes into French harbours, and British commerce began to suffer from these attacks. On the French side Beaumarchais and others actively co-operated in this. In the autumn of 1776 Congress appointed three commissioners to France, and resolved that Spain, Prussia, Austria and other European states should be approached with a view to securing recognition and aid. In December 1776 Franklin, who, with Deane and Arthur Lee, had been appointed commissioner to France, arrived at Paris, bringing with him proposals for treaties of commerce and alliance. But, though the attitude of the French court toward the Americans was friendly, and though it continued to send secret aid, and to

exert a favourable influence upon Spain, yet it could not be French- induced to abandon its outward appearance of American neutrality until after the news of Burgoyne's Alliance, surrender arrived. Then the real purpose of the French government was revealed. On the 6th of February 1778 the treaties were signed, and in the following summer war between France and England began. The influence of France under the Family Compact was also persistently used to bring Spain into the alliance. The latter was naturally hostile to England, but her aversion to colonial revolts and her desire to substitute mediation for war kept her from declaring against England until April 1779. In October 1779 Henry Laurens {q.v.) was elected minister to the Netherlands, and sailed for Europe, taking with him a plan of a commercial treaty. But Laurens and his papers were captured by the British at sea, and partly by that event the Netherlands were forced into war with England. With the other states of northern Europe they undertook to defend the interests of neutrals against the arrogant enforcement by Great Britain of the rights of search at sea. Thus the conflict expanded into a commercial and naval war, Great Britain being confronted by the larger part of Europe.

68. The conclusion of the treaty of alliance by France was immediately followed by the equipment of a fleet under the comte d'Estaing, which sailed from Toulon in April 1778, having on board M Conrad Alexandre Gerard de Rayneval, who had been accredited as minister to the United States, and Silas Deane, who was returning to report to Congress. Sir Henry Clinton had now succeeded Howe in command of the British army. The certainty that a French fleet would soon appear in American waters made it necessary for the British to evacuate Philadelphia and return to a point on the coast where the army could be in easy communication with the fleet. This fact shows how the French alliance had changed the nature of the war. It now became to a large extent a contest between the two navies, the principal evolutions of which occurred in West Indian and European seas. (See American War or Independence.) In the north the British now relatively neglected the land war, and refrained from sending such forces to the eastern coast as had supported Howe in 1776. The Americans, on the other hand, had a naval force upon which they relied, in the hope that the blockade of their coasts might be raised and trade routes opened more freely. On the

evacuation of Philadelphia in June

Washington's army pursued the British as they retired toward New York, and the indecisive battle of Monmouth was fought on the 28th of June. It did not prevent Clinton from reaching New York, and that city continued to be the centre of British power and operations in the north until the close of the war. The Congress returned to Philadelphia, where Gerard was received, and where he was soon exercising an influence favourable to the policies of Washington and opposed to the clique of which General Horatio Gates was the leader. Washington's army came gradually to occupy a line of forts, of which West Point in the Highlands of the Hudson was the citadel. From there as a centre it was possible to communicate with Newport on the east and with the Delaware region on the south, and at the same time to prevent the British from gaining access to the interior of the country. Though the fleet of D'Estaing carried a heavier equipment of cannon than did that of Admiral Howe, the French commander did not choose to risk an attack on New York, but passed eastward to Newport. Howe followed him, while Washington and his generals planned active co- operation with the new allies by land. But a sudden storm so dispersed and injured the fleets that the French admiral retired to Boston for repairs and later sailed for the West Indies.

69. While the war and foreign relations were thus developing, the states were organizing their governments and Congress was beginning to consider articles of confederation between the states. In this way an effort was made s tHutions. to gather up and make permanent the positive results of the revolution. As under the chartered and royal governments of the colonial period the source of political authority had been the Crown, now by a necessary reaction this was sought in the people. This principle had been stated in the Declaration of Independence, and had been implied throughout the earlier controversy and in much of the history of the colonies as well. The colonies had insisted on a more precise definition of the powers of government ; they had opposed parliament because its powers were undefined and therefore dangerous. Following these ideas, the states now described their institutions of government and defined their powers by means of written constitutions. These were formulated by the provincial congresses — which had now become the legislatures — or, as they came to insist upon a more specific expression of the

popular will, by conventions chosen for the purpose by the electors. Connecticut and Rhode Island retained their colonial charters. In the earlier days of hasty and temporary devices, the constitutions, like statutes, had been promulgated by the legislatures which formed them and had been put into force by their authority alone. But as time passed and more permanent arrangements became necessary an express popular approval of the instruments was insisted upon and was obtained before they were put into force. The establishment of state governments in this way began before the issue of the Declaration of Independence. It was actively continued during 1776 and the early months of the following year, by which time all of the states had secured at least a temporary constitution. South Carolina and New Hampshire revised theirs before the close of the war. Massa- chusetts did not secure a constitution which suited her until 1780, but then her procedure corresponded in all particulars with what was to be later American practice in such matters. Of the constitutions of the revolutionary period the two most striking features were the bills of rights and the provisions which were made concerning the executives and their relations to the legis- latures. The men of that generation were jealous of govern- ment. They insisted upon individual rights, not as acquired and guaranteed by the state, but as original, natural and inhering in time prior to all governments. Governments were instituted for the common benefit, protection and security. Officials were trustees and were accountable to the people. There should be no hereditary title to office or power. There should be no titles of nobility, and in Virginia the system of entails was swept away. Monopolies were declared to be inconsistent with the spirit of a free state. The doctrine that it was unlawful 'to resist

arbitrary power was declared to be absurd. Freedom of the press and of conscience was asserted, and no obstacles to fair and speedy jury trials were to be tolerated. Elections should be free and frequent, and a preference was expressed for short terms of office. The legislature was universally regarded as the most important department of government. Although the

principle of the separation of powers was recognized, in eight states provision was made that the executives should be elected by the legis- latures, eleven withheld from them the veto, and the states generally provided for a council to advise them. So manifold and important, however, were the restrictions on suffrage that the states were as yet far from being democracies. On the other hand, many wild and impractical ideas were cherished, and there were anarchic tendencies, which were revealed soon after the war and still later, under the influence of the French Revolution.

70. The first draft of the Articles of Confederation between the states was prepared by John Dickinson in the early summer TheArtklesoi 1776 and was reported. The report was debated of Con- for some weeks after the issue of the Declaration of federation. Independence. Owing to the pressure of war it was then laid aside until the autumn of 1777. By that time the feeling in favour of state sovereignty had so increased that the impossibility of securing assent to the articles in any form had begun to be feared. But the document was completed and submitted to the states in November 1777, when all were encouraged by the news of Burgoyne's surrender. The system for which provision was made in this document was a " con- federacy," or " firm league of friendship " between the states, for their common defence, security and general welfare. The Congress was to be continued, and was to consist of delegates annually appointed by the legislature of each state and paid by their states. No attempt was made to create an executive for the confederacy, though authority was given to Congress to appoint a council of state which should manage general affairs, especially during recesses of Congress. To Congress various general powers were entrusted, as deciding on peace and war and superintending the conduct of the same, building a navy, controlling diplomatic relations, coining money and emitting bills of credit, establishing post offices, regulating Indian trade, adjusting boundary disputes between the states. The financial powers entrusted to Congress included those of borrowing money and determining necessary expenditures, but not the power to tax. For supplies the general government had to depend on requisitions from the states. The same system also had to suffice for the raising and equipment of troops. Congress could not make its laws or orders effective in any matter of importance. This was simply a continuation of the policy under which the revolution was being conducted. The

Americans had thought that the military and financial concerns of the British Empire could be managed under a system of requisitions, and now they were bent upon trying it in their own imperial relations. The control of trade was also practically left with the states, the Americans in this matter failing to live up to the requirements of the British system. The predomi- nance of the states was further ensured by the provision that no votes, except those for daily adjournment, could be carried with- out the assent of a majority of all the states, and no important measure without the consent of nine states. But a common citizenship was declared to exist, and Congress received authority to establish a court of appeal which might pass finally on all disputes between states. Taken as a whole, the Articles of Con- federation would bear favourable comparison with other schemes of their kind, and they fairly represented the stage of develop- ment to which the American states had then attained. The defects which existed in them were reflections of the immaturity, political and social, which had always been apparent in the Americans as colonists and which was to characterize them as a nation for generations to come.

71. We have seen that, on the whole, the attitude of Great Britain, after the peace of 1763, was not favourable to the colonization of the Mississippi Valley. To the colonists the

Quebec Act gained in offensiveness by seeming to imply that it was intended to exclude them from the West. But all such plans were swept away by the outbreak of the War of Independence. Already, before the beginning of hostilities, emigrants had begun to flock across the mountains. Plans were on foot for the establishment of a number of commonwealths, or proprietary provinces, as the case might be. Vandalia was planned in western Virginia, Watauga in western North Carolina. Daniel Boone and his associates pushed farther west into the Kentucky region, and there it was proposed to establish the commonwealth of Tran- sylvania. Other similar projects were started, all repeating in one form or another the political methods which were used when the seaboard colonies were first settled. The backwoodsmen who managed these enterprises were extreme individualists, believed in the propriety of resistance to governments, and were in full sympathy with the War of Independence. They desired to escape to the free land and life of the West and be rid of the quit- rents and other badges of dependence which still lingered

in the East. The states which had claims in the West opposed the founding of independent settlements there and, if possible, induced the settlers to be content with the status of counties within some one of the eastern states. After the beginning of the War of Independence, the British from Detroit incited Indian raids for the purpose of destroying or driving out the settlers, especially in Kentucky. These provoked the expeditions of George Rogers Clark (q.v.), in 1778 and 1770. With a force of Virginians he seized Kaskaskia and later, after a long march, captured Vincennes and compelled General Henry Hamilton, who had come with a relief force from Detroit, to surrender. This secured to the Americans a permanent hold upon the North- West. But Spain, after she entered upon the war, was determined, if possible, to wrest the valley of the Mississippi from the British and to keep all, or the larger part of it, for herself. To that end, operating from New Orleans, her troops took possession of Natchez, and other posts on the lower Mississippi, and occupied Mobile and Pensacola. These events prevented the possibility of the expulsion of the Americans from the West, but devolved upon their representatives at Paris the necessity of engaging in a diplomatic contest against Spain for the purpose of securing the Mississippi as the western boundary of the United States. But meanwhile the occupation of the West by Americans had a notable influence upon the ratification of the Articles of Confederation.

72. Within the Confederacy a fundamental line of cleavage was that between the large and small states. It was jealousy on the part of the latter, their fear lest they might titles of be absorbed by their larger neighbours, which had confedera- necessitated the adoption of the plan that in the 'Ion Rait- Congress the delegates should vote by states. When

the articles were referred to the states for ratification, the difficulty reappeared. Massachusetts, Connecticut and New York, with Virginia and the three states to the south of it, had large claims to territory between the Appalachians and the Mississippi. New Hampshire, Rhode Island, New Jersey, Delaware and Maryland, which were without hope of westward extension, hesitated to enter the Confederacy, if the large states were to be still further increased by additions to their areas of vast stretches of western country. They insisted that before ratification the states which had claims to western lands should surrender these for the common benefit of the United

States. Maryland insisted upon this until, in the end, the cause of state equality and of nationality triumphed. Congress declared that the ceded lands should be formed into states, which should become members of the union with the same rights as other states. When, in 1781, this course of action had become possible, Maryland ratified the articles and they came into effect. The possibility of the expansion of the United States through the development of territories was thus ensured.

73. So far as the North American continent was concerned, the character of the last stage of the struggle with Great Britain

was determined by the fact that the British resolved to transfer the main seat of war to the Southern states, in the hope that Georgia and South Carolina might be detached from the Union. At the close of 1778 Savannah was captured. In

September 1779 D'Estaing returned and assaulted the South. Savannah, but, failing to capture it, sailed for France.

In 1780 Clinton sailed from New York, besieged Charleston with a force much superior to that of Lincoln, and captured it (May 12). State government in South Carolina ceased. But the chance of detaching those states from the Union and of bringing the war in that region to an end was finally lost by the British. This was chiefly due to an order which recalled the paroles of many of those who had surrendered at Charleston and required that they should perform military service under the British. The attempt to enforce this order, with the barbarities of Colonel Banastre Tarleton and certain Tory bands, provoked a bloody partisan conflict in the upper districts, especially of South Carolina, which contributed more than any other cause to turn the scale against the British in the remote South. By the winter of 1781 they were forced back to Charleston and Savannah. (See American War or Independence.)

74. During the summer of 1780 Washington was prevented from accomplishing anything in the North by the demoralized condition of the finances and by the decline of public spirit. It

was very difficult to secure recruits or supplies. The pay of the troops had fallen so into arrears that some of them had already begun mutiny. A second French squadron and military force, under De Ternay and Rochambeau, landed at Newport, but they were at once shut up there by the British. Clinton and Cornwallis were now planning that the latter, having put down resistance in the remote South, should march through North Carolina and Virginia to Baltimore and Philadelphia and that a junction of the two British forces should be effected which, it was believed, would complete the ruin of the American cause. This, too, was the period of Arnold's treason and the death of Andre. But the turn of the tide in favour of the Americans began with the partisan warfare in South Carolina, which delayed the northward march of Cornwallis, who retired to

Wilmington and thence marched north with a small force into Virginia, and in July retired to Yorktown, in the peninsula of Virginia. Washington and Rochambeau had meantime been planning a joint move against the British at New York, or possibly in Virginia, and a letter was sent to De Grasse, the French admiral in the West Indies, suggesting his co-operation. De Grasse replied that he would sail for the Chesapeake. This confirmed Washington and Rochambeau in the opinion that they should march at once for Virginia and, after junction with the force of Lafayette, co-operate with De Grasse against Cornwallis. By well-timed movements the forces were brought together before Yorktown (q.v.), and Cornwallis was forced to surrender on the 19th of October 1781.

75. As the effect of this event was to drive Lord North from power in England, it proved to be the last important operation

of the war in America. The king was compelled Peac ^° to give way. Rockingham was called into office

at the head of a cabinet which considered the recognition of American independence to be indispensable. The negotiations fell into the hands of Shelburne, the friend of Franklin and disciple of Adam Smith. Richard Oswald was the leading British agent, while Franklin, Jay, John Adams and Henry Laurens were the American negotiators. From the first the acknowledgment of independence, the settlement of the boundaries and the freedom of fishing were insisted on as necessary terms by the Americans. Free commercial intercourse and the cession of Canada to the United States,

partly in payment of war claims and partly to create a fund for the compensation of loyalists, were also put forward as advisable conditions of peace. The first three points were early conceded by the British. They also agreed to restrict Canada to its ancient limits. But discus- sions later arose over the right to dry fish on the British coasts, over the payment of debts due to British subjects prior to the war,

Yorktown,

and over the compensation of the loyalists. Adams vigorously insisted upon the right to dry and cure fish on British coasts, and finally this concession was secured. Franklin was opposed to the demands of the loyalists, and they had to be content with a futile recommendation by Congress to the states that their claims should be adjusted. It was also agreed that creditors on either side should meet with no lawful impediment to the collection of their debts. Both France and Spain considered the claims of the Americans to be excessive, and were not inclined to yield to them. But the Americans negotiated directly with the British and the articles were signed without consultation with the French government. This course was offensive to Vergennes, but it was insisted upon as necessary, especially by Jay and Adams, while the diplomatic skill of Franklin prevented a breach with France. Peace was formally ratified on the 3rd of September

1783.

76. The American army was now disbanded. Since the close of active military operations both officers and men had been striving to secure their pay, which was hopelessly in arrears. Congress had voted half pay to the officers for life, and many had agreed to accept a commutation of this in the form of full pay for a certain number of years. Certificates for these amounts were issued. But in this, as in other cases, it was found impos sible to procure the money for the purpose from the states. Parts of the army repeatedly mutinied, and it was only the influence of Washington which prevented a general outbreak against Congress and the civil government. When the disband- ment was finally effected the officers found their certificates depreciated in value and the states indisposed to honour them. They consequently received only a small part of their due, and the privates scarcely anything. This deplorable result was due in part to poverty, but quite as much to bad

faith. The country was left in a most demoralized condition, the result of the long war and the general collapse of public and private credit which had accompanied it. It should not be forgotten that the conflict had taken to a considerable extent the form of a civil war. In many of the states Loyalists and Whigs had been arrayed against one another, and had been more or less fully incorporated with the two contending armies. In general the Loyalists showed less capacity for combined action than did their opponents, and in the end they were everywhere defeated. The real tragedy of the conflict will be found, not in the defeat of the British, but in the ruin of the Loyalists. It was accompanied by wholesale confisca- tions of property in many quarters, and by the permanent exile of tens of thousands of the leading citizens of the republic. These were the emigres of the War of American Independence, and their removal deeply affected property relations and the tone and structure of society in general. Many of those who had been social and political leaders were thus removed, or, if they remained, their influence was destroyed (see Loyalists). New men and new families rose in their places, but of a different and in some ways of an inferior type. By this process sym- pathizers with the War of Independence gained and kept the ascendancy. British and monarchical influences were weakened, and in the end the permanence of republican institutions was ensured. But, as had been foreseen, society in this period of transition exhibited so many repulsive features as almost to cause the stoutest hearts to despair.

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colonial period. Connecticut has printed The Colonial Records of Connecticut (15 vols., Hartford, 1850-1890), and the Records of the Colony of New Haven, 1638-1665 (2 vols., Hartford, 1857-1858). The Records of the Colony of Rhode Island fill 10 vols. (Providence, 1856-1865). New York has published the Laws and Ordinances of New Netherland (1 vol.), the Colonial Laws of New York from 1664 to the Revolution (5 vols., Albany, 1894), The Journal of the Legislative Council, 1691-1775 (2 vols., 1861), the Journal of the Votes and Proceedings of the General Assembly, 1691-176$ (2 vols., 1764-1766), the Documents relating to the Colonial History of New York (15 vols., 1853-1883), Minutes of the Albany Commissioners for Detecting Conspiracies (3 vols., 1909-1910) and the Documentary History of the State of New York (4 vols., 1849-1851). New Jersey has published the Grants and Concessions (1 vol.), edited by Learning and Spier, and 28 vols, of The Archives of the Stale of New Jersey (Newark, 1880 sqq.). Pennsylvania has published 16 vols, of Colonial Records, 1 683-1 7 go (Philadelphia, 1 852) and four series of Pennsylvania Archives (1852-1856, 1874-1893, 1894-1895, &c), the latter con- taining miscellaneous records relating to the colonies and the War of Independence. Under the title of Statutes at Large (11 vols.) its laws to the close of the War of Independence have been published. The Archives of Maryland (27 vols., Baltimore) contain the proceed- ings of the council, the assembly and the provincial court, with the laws, for a part of the colonial period. The Records of the Virginia Company of London (2 vols., Washington, 1906) have been printed; also Henning's Statutes at Large (13 vols., 1819-1823), and the Journal of the House of Burgesses for the later provincial period. Under the titles of Colonial Records (1886-) and State Records, North Carolina has published the sources of her early history very fully, except the land papers and laws. Thomas Cooper's Statutes of South Carolina (4 vols., to 1782) contain

practically all of its sources which that state has published. Georgia has published 12 vols, of Colonial Records, containing minutes of the trustees and of the governor and council. The Calendar of State Papers, Colonial Series, 1574-1660 (London, i860), and for 1661-1700 (13 vols., London, 1880-1910), the Acts of the Privy Council Colonial, 1 613-1720 (2 vols., London, 1908-1910), and the Calendars of Treasury Papers (for the 18th century) cover relations between the British government and the colonies. Additional matter may also be found in many of the reports of the British Historical MSS. Commission. Hazard's Historical Collections (2 vols., Philadelphia, 1792-1794) is still valuable. B. Perley Poore's Federal and State Constitutions (2 vols., Washington, 1877) contains the texts of the colonial charters and state constitutions ; and a similar collection was edited by F. N. Thorpe (7 vols., ibid., 1909). The records of many New England towns have been printed, as also those of New York City, Phil- adelphia and Albany. The Original Narratives of Early American History (1906-1910), edited by J. F. Jameson, contain reprints of much source material.

Cobbett's Parliamentary History, Almon's Remembrancer (17 vols., London, 1 775-1 784), and the writings of the British statesmen of the period, contain much material which is indispensable to the history of the War of Independence on its British side. Of official matters relating to the period of the War of Independence, special reference should be made to the Public Journals of the Continental Congress (13 vols.), and the Secret Journals (4 vols.). A new and improved edition (1908 sqq.) has been edited by W. C. Ford and G. Hunt. Indispensable to the student is Peter Force's American Archives (9 vols., Washington, 1 837-1 853), covering the years 1774 to 1776 inclusive. Francis Wharton's Revolutionary Diplomatic Correspondence of the United States (6 vols., Washington, 1889), and the earlier and less complete edition of the same by Jared Sparks (12 vols,, Boston, 1829-1830), are also of great value. Alden Bradford's Massachusetts State Papers is valuable for that province. The journals of committees of safety, provincial congresses, con- ventions and early state legislatures are also for the most part in print. The colonial and revolutionary newspapers contain material of great variety. Semi-official also are the writings of the states- men of the War of Independence — John and Samuel Adams, Jefferson, Dickinson, Franklin, Washington, Jay, all of which exist in

very satisfactory editions. Henri Doniol's Histoire de la participation de la France a V elablissement des Etats-Unis d'Amerique (5 vols., Paris, 1886-1900) is a diplomatic history of the War of Independence and the peace, dealing chiefly with France. The states all have historical societies, and there are many private and local societies in addition. Of these the most prominent are the societies of Massachusetts, New York, Pennsylvania, Maryland and Virginia. In addition, mention should be made of the Prince Society of Boston, the American Antiquarian Society of Worcester, Mass., the Essex Institute of Salem, Mass., the Narragansett Club of Providence, R.I., and the Colonial Society of Massachusetts. The American Historical Association (Washington, D.C.) publishes valuable monographs; the second volume of the Report of the Association for 1905 is a detailed Bibliography of American Historical Societies (Washington, 1907).

Standard Histories: Of these the histories of the states first demand attention. Jeremy Belknap's History of New Hampshire (3 vols., 1784-1792; enlarged, 3 vols., Boston, 1813); Thomas Hutchinson's History of the Province of Massachusetts Bay (3 vols., Boston, 1767, and vol. iii., London, 1828); Samuel Greene Arnold's

History of the State of Rhode Island and Providence Plantations, 1636-1790 (2 vols., New York, 1 859-1 860); Benjamin Trumbull's Complete History of Connecticut, Civil and Ecclesiastical, to 1764 (New Haven, 1818; revised, 2 vols., New London, 1898); John Romeyn Brodhead's History of the State of New York (2 vols., New York, 1853-1871); William Smith's History of the Late Province of New York, from its Discovery to 1762 (2 vols., New York, 1829- 1830); Samuel Smith's History of the Colony of Nova C&saria, or New Jersey, to 1721 (Burlington, N.J., 1765; 2nd ed., Trenton, 1877); Robert Proud's History of Pennsylvania from 1681 till after the year 1742 (2 vols., Philadelphia, 1797-1798) ; John Leeds Bozman's History of Maryland, 1633-1660 (2 vols., Baltimore, 1837) ; John V. L. McMahon's A Historical View of the Government of Mary- land from its Colonization to the Present Day (Baltimore, 1833J; William Stith's History of the First Discovery and Settlement of Virginia (Williamsburg, 1747); John Daly Burk's History of Vir- ginia (3 vols., Petersburg, 1804-1805); Francois Xavier Martin's History of North Carolina (2 vols., New Orleans, 1829) ; William James Rivers's Sketch of the History of South Carolina to the Close of

the Proprietary Government by the Revolution of 171Q (Charleston, 1856); Edward McCrady's South Carolina (4 vols., New York, 1897-1902) — covering the period from 1670 to 1783 — and Charles Colcock Jones's (jun.) History of Georgia (2 vols., Boston, 1883) are especially noteworthy. William Bradford's History of Plimouth Plantation (latest edition, Boston, 1898), and John Winthrop's History of New England, 1630-164Q (2 vols., Boston, 1825-1826), are essentially original sources, as are the Writings of Captain John Smith (Arber's ed.) for early Virginia. So are Alexander Brown's Genesis of the United States (2 vols., Boston, 1890), and the First Republic in America (Boston, 1898). Philip Alexander Bruce's Economic History of Virginia in the Seventeenth Century (2 vols., New York, 1896) and W. B. Weeden's Economic and Social History of New England (2 vols., Boston, 1890) are of great value. Edmund B. O'Callaghan's History of New Netherland (2 vols., New York, 1846-1848), John Gorham Palfrey's History of New England (5 vols., Boston, 1858-1890) and I. B. Richman's Rhode Island, its Making and its Meaning (New York, 1902), are valuable for colonial New York, New England and Rhode Island respectively. George Bancroft's History of the United States (6 vols., 1884-1885) still has a great reputation, though it is altogether inadequate for the colonial period. Richard Hildreth's History of the United States (6 vols., New York, 1849-1852) is dry but accurate. John Andrew Doyle's English in A merica (5 vols., New York, 1882-1907) is valuable for the 17th century. Herbert L. Osgood's American Colonies in the Seventeenth Century (3 vols., New York, 1904-1907) discusses the institutional history of the period. John Fiske has popularized the history of the times in a number of excellent works, some of them of 'decided originality. Francis Parkman's France and England in North America (12 vols., latest ed., Boston, 1898) is a classic on the history of Canada and its relations with the British colonies. William Kingsford's History of Canada (10 vols., Toronto, 1887-1898), and Francois Xavier Garneau's Histoire du Canada (4 vols., Quebec, 1 845-1 852), may be cited as holding places of special authority. Justin Winsor's Christopher Columbus (Boston, 1891), Cartier to Frontenac (ibid., 1894), and later volumes, are especially valuable for the history of exploration, discovery and cartography. The American Nation (22 vols., New York, 1903-1907), a co-operative history, edited by A. B. Hart, outlines the political history of the country as a whole. Edward

Channing's History of the United States (8 vols., New York, 1905 sqq.), and Elroy McKendree Avery's History of the United States and Its People (15 vols., Cleveland, Ohio, 1905 sqq.) devote much space to the colonies and War of Independence. Sir George Otto Trevelyan's American Revolution (3 vols., London, 1899- 1904) is a brilliant literary performance. Of special value is Lecky's study of the same subject in his History of England in the Eighteenth Century (8 vols., London, 1878-1890). George Louis Beer's Origins of the British Colonial System (New York, 1908) and his British Colonial Policy, 17 $4-176$ (New York, 1907), Justin Harvey Smith's Our Struggle for the Fourteenth Colony (2 vols., New York, 1907) and S. G. Fisher's Struggle for American Independence (2 vols., Philadelphia, 1908) are valuable monographs. For biography see the " American Statesmen Series " (16 vols., Boston) and Samuel V. Wells's Life and Public Services of Samuel Adams (3 vols., Boston, 1865); James Kendall Hosmer's Life of Thomas Hutchinson (Boston, 1896) ; William Garrott Brown's Life of Oliver Ellsworth (New York, 1905) ; B.J. Lossing's Life and Times of Philip Schuyler (2 vols., New York, 1860-1873) and Bayard Tucker- man's Philip Schuyler, Major-General in the American Revolution (New York, 1903) ; George Washington Greene's Life of Nathanael Greene (3 vols., Boston, 1867-1871) and William Johnson's Sketches of the Life and Correspondence of Nathanael Greene (Charleston, 1822); William Thompson Reed's Life and Correspondence of George Reed (Philadelphia, 1870); Charles Janeway Stille's Life and Times of John Dickinson (Philadelphia, 1891); William Wirt Henry's Patrick Henry (3 vols., New York, 1891); John Marshall's Life of George Washington (5 vols., Philadelphia, 1804- 1807) ; C. Tower's The Marquis de La Fayette in the American Revolution (2 vols., ibid., 1895) ; F. Kapp's Life of Frederick William von Steuben (New York, 1859), and Tiis Life of John Ka!b (New York, 1884). Moses Coit Tyler's Literary History of the American Revolution (2 vols., New York,

1897) is of unique interest. Lorenzo Sabine's Biographical Sketches of Loyalists of the American Revolution (2 vols.,

Boston, 1864), and Claude Halstead Van Tyne's The Loyalists in the American Revolution (New York, 1902) ; Herbert Friedenwald's The Declara- tion of Independence (New York, 1904), and John Hampden Hazelton's the Declaration of Independence— Its History (New York, 1906), are valuable special studies. Many important monographs have appeared in the "Johns Hopkins University Studies," "the Columbia University Studies," the "Harvard Historical Studies," and among the publications o f the universities of Wisconsin and Pennsylvania. The Carnegie Institution has issued the first volume of a report, edited by C. M. Andrews and F. G. Davenport, on materials in British archives for the period before 1783. The biblio- graphy of American history receives adequate treatment in Justin Winsor's Narrative and Critical History of America (8 vols., Boston, 1886-1889) and in J. N. Larned's Literature of American History (Boston, 1902). (H. L. O.)

F. — The Struggle for National Government, i?S$-i , j8q.

77. The long struggle to secure the ratification of the Articles of Confederation had given time for careful consideration of the new scheme of government. Maryland's persistent criticism had prepared men to find defects in them. Conventions of New England states, pamphlets, and private correspondence had found flaws in the new plan; but a public trial of it was a necessary preliminary to getting rid of it. The efforts of the individual states to maintain the war, the disposition of each state to magnify its own share in the result, the popular jealousy of a superior power, transferred now from parlia- ment to the central government, were enough to ensure the articles some lease of life. A real national government had to be extorted through the " grinding necessities of a reluctant people."

*78. Congress and its committees had already begun to declare that it was impossible to carry on a government efficiently under the articles. Its expostulations were to be continued for several years before they were heard. In the meantime it did not neglect the great subject which concerned the essence of nation- ality — the western territory. Virginia had made a first offer to cede her claims, but it was not accepted. A committee of Congress now made a report (1782) maintaining the validity of the rights which New York had transferred to Congress; and t rHt h 1 * n t ˆ ie next y ear Virginia made an*

acceptable offer. Cessions. Her deed was accepted (March 1, 1784); the other

claimant states followed; and Congress, which was not authorized by the articles to hold or govern territory, became the sovereign of a tract of some 430,000 sq. m., covering all the country between the Atlantic tier of states and the Mississippi river, from the British possessions nearly to the Gulf of Mexico.

79. In this territory Congress had now on its hands the same question of colonial government in which the British

parliament had so signally failed. The manner in

- *_ a , which Congress dealt with it has made the United Government. ° .*

States the country that it is. The leading feature of its plan was the erection, as rapidly as possible, of states, similar in powers to the original states. The power of Congress over the Territories was to be theoretically absolute, but it was to be exerted in encouraging the development of thorough self-government, and in granting it as fast as the settlers should TbeOrdt- become capable of exercising it. Copied in succeed- nttnce of ing acts for the organization of Territories, and still ,78T – controlling the spirit of such acts, the Ordinance of

1787 (July 13, 1787) is the foundation of almost everything which makes the modern American system peculiar.

80. The preliminary plan of Congress was reported by a committee of which Thomas Jefferson (q.v.) was chairman, and was adopted by Congress on the 23rd of April 1784. It provided for the erection of seventeen states, north and south of the Ohio, with some odd names, such as Sylvania, Assenisipia, Mesopotamia, Polypotamia and Pelisipia. These states were for ever to be a part of the United States, and to have republican governments. The provision, "After the year 1800 there shall be neither slavery nor involuntary servitude in any of the said states, other than in the punishment of crimes whereof the party shall have been duly con- victed," represented Jefferson's feeling on this subject, but was lost for want of seven states in its favour. – _ /

81. The final plan of 1787 was reported by a committee of

which Nathan Dane, of Massachusetts, was chairman. The prohibition

of slavery was made perpetual, and a fugitive slave clause was added. The ordinance covered only the territory north of the Ohio, and provided for not less than three nor more than five states. Ohio, Indiana, Illinois, Michigan and Wisconsin have been the resultant states. At first Congress was to appoint the governor, secretary, judges and militia generals, and the governor and judges were, until the organization of a legislature, to make laws subject to the veto of Congress. When the population reached 5000 free male adult inhabitants the Territory was to have an assembly of its own, to consist of the governor, a legislative council of five, selected by Congress from ten nominations by the lower house, and a lower House of Representatives of one dele- gate for every 500 free male inhabitants. 1 This assembly was to choose a delegate to sit, but not to vote, in Congress, and was to make laws not repugnant to " the principles and articles " estab- lished and declared in the ordinance. These were as follows : the new states or Territories were to maintain freedom of worship, the benefits of the writ ot habeas corpus, trial by jury, proportionate representation, bail, moderate fines and punishments, and the preservation of liberty, property and private contracts ; they were to encourage education and keep faith with the Indians; they were to remain for ever a part of the United States; and they were not to interfere with the disposal of the soil by the United States, or to tax the lands of the United States, or to tax any citizen of the United States for the use of the navigable waters leading into the Mississippi or St Lawrence rivers. These articles were to be un- alterable unless by mutual consent of a state and the United States. The transformation of the Territory, with its limited govern- ment, into a state, with all the powers of an original state, was promised by Congress as soon as the population should reach 60,000 free inhabitants, or, under certain conditions, before that time.

82. The Constitution, which was adopted almost immediately afterwards, provided merely (art. iv, § 3) that " Congress shall have power to dispose of, and make all needful rules and regulations respecting, the territory or other property belonging to the United States," and that " new states may be admitted by the Congress into this Union." Opinions have varied as to the force of the Ordinance of 1787. The Southern school of

writers have been inclined to consider it ultra vires and void ; and they adduce the fact that the new Congress under the Constitution thought it necessary to re-enact the ordinance (Aug. 7, 1789). The opposite school have inclined to hold the ordinance as still in force. Even as to the Territorial provision of the Constitution, opinions have varied.

83. In the interval of the settlement of the territorial question the affairs of the " league of friendship," known as the United States, had been going from bad to worse, culminat-
Difficulties ing in 1786. The public debt amounted in 1783 oftheCon-

to about $42,000,000, of which $8,000,000 was

federation.

owed abroad — in Holland, France and Spain. Congress had no power to levy taxes for the payment of interest or principal; it could only make requisitions on the states. In the four years ending in 1786 requisitions had been made for $10,000,000 and the receipts from them had amounted to but one-fourth of what had been called for. Even the interest on the debt was falling into arrears, and the first instalment of the principal fell due in 1787. To pay this, and subsequent annual instalments of $1,000,000, was quite impossible. Robert Morris, the financier of the War of Independence, resigned in 1783 rather than " be the minister of injustice," hoping thus to force upon the states the necessity of granting taxing powers to Congress. Washing- ton, on retiring from the command-in-chief, wrote a circular letter to the governors of all the states, urging the necessity of granting to Congress some power to provide a national revenue. Congress (April 18,1783) appealed to the states for power to levy specific duties on certain enumerated articles, and 5% on others. It was believed that with these duties and the requisitions, which were now to be met by internal taxation, $2,500,000 per annum could be raised. Some of the states ratified the proposal; others ratified it with modifications; others rejected it, or changed their votes; and it never received the necessary ratification of all the states. The obedience to the requisitions grew more lax. In 1786 a committee of Congress reported that any further reliance on requisitions would be " dishonourable to the understandings of those who entertain such confidence."

1 When the total number should reach 25, the legislature itself was to have the power of regulating the number and proportion. Property qualifications were prescribed for electors, representatives and members ot the council.

Of Congress.,,

84. In the states the case was even worse. Some of them had been seduced into issuing paper currency in such profusion

that they were almost bankrupt. Great Britain, states. m tne treaty of peace, had recognized the indepen- dence of the individual states, naming them in order; and her government followed the same system in all its inter- course with its late colonies. Its restrictive system was main- tained, and the states, vying with each other for commerce, could adopt no system of counteracting measures. Every possible burden was thus shifted to American commerce; and Congress could do nothing, for, though it asked for the power to regulate commerce for fifteen years, the states refused it. The decisions of the various state courts began to conflict, and there was no power to reconcile them or to prevent the conse- quences of the divergence. Several states, towards the end of this period, began to prepare or adopt systems of protection of domestic productions or manufactures, aimed at preventing com- petition by neighbouring states. The Tennessee settlers were in insurrection against the authority of North Carolina; and the Kentucky settlers were disposed to cut loose from Virginia. Poverty, with the rigid execution of process for debt, drove the farmers of western Massachusetts into an insurrection (Shays's Insurrection) which the state had much difficulty in suppressing; and Congress was so incompetent to aid Massachusetts that it was driven to the expedient of imagining an Indian war in that direction, in order to transfer troops thither. Congress itself was in danger of disappearance from the scene. "The necessity for the votes of nine of the thirteen states for the passage of important measures made the absence of a state's delegation quite as effective as a negative vote. Congress even had to make repeated appeals to obtain a

quorum for the ratification of the treaty of peace with Great Britain. In 1784 Congress actually broke up in disgust, and the French minister reported to his government — " There is now in America no general government — neither Congress, nor president, nor head of any one administrative department." Everywhere there were symptoms of a dissolution of the Union.

85. Congress was evidently incompetent to frame a new plan of national government; its members were too dependent on Proposals their states, and would be recalled if they took part for a in framing anything stronger than the articles. conventions' idea of a convent j on f t h e states, independent

of Congress, was in the minds and mouths of many; Thomas Paine had suggested it as long ago as his Common Sense pamphlet: " Let a continental conference be held … to frame a continental charter . . . fixing the number and manner of choos- ing members of Congress, members of assembly . . . drawing the line of business and jurisdiction between them." To a people as fond of law and the forms of law as the Americans there was a difficulty in the way. The articles had provided that no change should be made in them but by the assent of every state legisla- ture. If the work of such a convention was to be subject to this rule, its success would be no greater than that of Congress; if its plan was to be put into force on the ratification of less than the whole number of states, the step would be more or less revolutionary. In the end the latter course was taken, though not until every other expedient had failed; but the act of taking it showed the underlying consciousness that union, indepen- dence and nationality were now inextricably complicated, and that the thirteen had become one in some senses.

86. The country drifted into a convention by a roundabout way. The navigation of Chesapeake Bay and the Potomac needed regulation; and the states of Maryland and Virginia, having plenary power in the matter, appointed delegates to arrange such rules. The delegates met (1785) at Alexandria, Va. (q. v.), and at Washington's house, Mount Vernon. Maryland, in adopting their report, proposed that Pennsylvania and Dela-

ware be asked to nominate commissioners, and of 1786. Virginia went further and proposed a meeting of

commissioners from all the states to frame com- mercial regulations for the whole. The convention met (1786) at Annapolis (?.>.), Maryland, but only five states were*

represented, and their delegates adjourned, after recommending another convention at Philadelphia in May 1787.

87. Congress had failed in its last resort — a proposal that the states should grant it the impost power alone; New York's veto had put an end to this last hope. Confessing its helplessness, Congress approved the call for a second fj^sT. convention; twelve of the states (all but Rhode

Island) chose delegates; and the convention met at Philadelphia (May 25, 1787), with an abler body of men than had been seen in Congress since the first two Continental Congresses. . Among others, Virginia sent Washington, James Madison, Edmund Randolph, George Mason and George Wythe; Pennsylvania: Franklin, Robert and Gouverneur Morris and James Wilson; Massachusetts: Rufus King, Elbridge Gerry and Caleb Strong; Connecticut: William S. Johnson, Roger Sherman and Oliver Ellsworth; New York : Alexander Hamilton; New Jersey: William Paterson; and South Carolina the two Pinckneys and John Rutledge. With hardly an exception the fifty-five delegates were clear-headed, moderate men, with positive views of their own and firm purpose, but with a willingness to compromise.

88. Washington was chosen to preside, and the convention began the formation of a new Constitution, instead of proposing changes in the old one. Two parties were formed

*at once. The Virginia delegates offered a plan pl ^ m * (see Randolph, Edmund), proposing a Congress, of two houses, having power to legislate on national subjects, and to compel the states to fulfil their obligations. This is often spoken of as a " national " plan, but very improperly. It was a " large-state " plan, proposed by those states which had • or hoped for a large population. It meant to base represen- tation in both houses on population, so that the large states could control both of them, and it left the appointment of the president or other executive and the Federal judges to Congress — so that the whole administration of the new government would fall under large-state control. On behalf of the " small states " Paterson of New*

Jersey brought ˆrseyPUn. in another plan. 1 It continued the old Confederation, with its single house and equal state vote, but added the power to regulate commerce and raise a revenue, and to compel the states to obey requisitions. The large states had a general majority of six to five, but the constant dropping off of one or more votes, on minor features, from their side to that of the small states prevented the hasty adoption of any radical measures. Nevertheless, the final collision could not be evaded; the basis of the two plans was in the question of one or two houses, of equal or proportionate state votes, of large-state supremacy or of state equality. In July the large states began to show a disposition to force their plan through, and the small states began to threaten a concerted withdrawal from the convention.

89. The Connecticut delegates, from their first appearance in the convention, had favoured a compromise. They had been trained under the New England system, in which

the assemblies were made up of two houses, one premise." representing the people of the whole state, according to population, and the other giving an equal representation to the towns. They proposed that the new Congress should be made up of two houses, one representing the states in proportion to their population, the other giving an equal vote to each state. At a deadlock the convention referred the proposition to a committee, and it reported in favour of the Connecticut compromise. Connecticut had been voting in the large-state list, and the votes of her delegates could not be spared from their slender majority;' now another of the large states, North Carolina, came over to Connecticut's proposal, and it was adopted. Thus the first great struggle of the convention resulted in a compromise, which took shape in an important feature of the Constitution, the Senate.

90. The small states were still anxious, in every new question, to throw as much power as possible into the hands of their

1 A third plan was introduced by Charles Pinckney ; for a discussion of this plan see the separate article on Pinckney.

special representative, the Senate; and that body thus obtained its power to act as an executive council as a restraint The Work on t fie president in appointments and treaties. of the This was the only survival of the first alignment

Convention. f p ar ti e s; but new divisions arose on almost every proposal introduced. The election of the president was given at various times to Congress and to electors chosen by the state legislatures; and the final mode of choice, by electors chosen by the states, was settled only two weeks before the end of the convention, the office of vice-president coming in with it. The opponents and supporters of the slave trade compromised by agreeing not to prohibit it for twenty years. Another compromise included three-fifths of the slaves in enumerating population for representation. This provision gave the slaveholders abnormal power as the number of slaves increased.

91. Any explanation of the system introduced by the Constitution must start with the historical fact that, while the national govern- ment was practically suspended, from 1776 until 1789, the only power to which political privileges had been given by the people was the states, and that the state legislatures were, when the convention met, politically omnipotent, with the exception of the few limitations imposed on them by the early state constitu- tions. The general rule, then, is that the Federal governnient has only the powers granted to it by the Federal Constitution, while the state has all governmental powers not forbidden to it by the state or the Federal Constitution. But the phrase defining the Federal government's powers is no longer " expressly granted, " as in the Articles of Confederation, but merely " granted, " so that powers necessary to the execution of granted powers belong to the Federal government, even though not directly named in the Con- stitution. This question of the interpretation or " construction " of the Constitution is at the bottom of real national politics in the United States: the minimizing parties have sought to hold the Federal government to a strict construction of granted powers, while their opponents have sought to widen those powers by a broad construction of them. The strict-construction parties, when they have come into power, have regularly adopted the practice of their opponents, so that construction has pretty steadily broadened.

92. Popular sovereignty, then, is the basis of the American system. But it does not, as does the British system, choose its The Con- legislative body and leave unlimited powers to it.

tu tin ˆ ma ‘ c es its ” Constitution ” the permanent medium s ” “• f it s orders or prohibitions to all .branches of the Federal government and to many branches of the state govern- ments: they must do what the Constitution directs and leave undone what it forbids. The people, therefore, are continually laying their commands on their governments; and they have instituted a system 01 Federal courts to ensure obedience to their commands. A British court must obey the act of parliament; the American court is bound and sworn to obey the Constitution first, and the act of Congress or of the state legislature only so far as it is warranted by the Constitution. But the American court does not deal directly with the act in question; it deals with individuals who have a suit before it. One of these individuals relies on an act of Congress or of a state legislature; the act thus comes before the court for examination ; and it supports the act or disregards it as ” unconstitutional, ” or in violation of the Con- stitution. If the court is one of high rank or reputation, or one to which a decision may be appealed, as the United States Supreme Court, other courts follow the precedent, and the law falls to the ground. The court does not come into direct conflict with the legis- lative body; and, where a decision would be apt to produce such a conflict, the practice has been for the court to regard the matter as a ” political question ” and refuse to consider it.

93. The preamble states that ” we, the people of the United States, ” establish and ordain the Constitution. Events have shown that it was the people of the whole United States that established the Constitution, but the people of 1787 seem to have inclined tc the belief that it was the people of each state for itself. This belief was never changed in the South; and in 1861 the people of that section believed that the ordinances of secession were merely a repeal of the enacting clause by the power which had passed it, the people of the state. An account of the form of government established bv the Constitution appears elsewhere (see United States: VII. — Constitution and Government, pp. 646 sqq.).

94. The Constitution’s leading difference from the Confederation is that it gives the national government power

over individuals. The

Federal courts are the principal agent in securing this

s .-.“‘Sr essential power; without them, the Constitution might

victuals ‘ eas i’y have been as dismal a failure as the Confederation.

It has also been a most important agent in securing to the national government its supremacy over the states. From this point of view the most important provision of the Constitution is the grant of jurisdiction to Federal courts in cases involving the construc- tion of the Constitution or of laws or treaties made under it. The

25th section of the Judiciary Act of 1 789 permitted any Supreme Court justice to grant a writ of error to a state court in a case in which the constitutionality of a Federal law or treaty had been denied, or in which a state law objected to as in violation of the Federal Constitu- tion had been maintained. In such cases, the defeated party had the right to carry the ” Federal question ” to the Federal courts. It was not until 1816 that the Federal courts undertook to exercise this power; it raised a storm of opposition, but it was maintained, and has made the Constitution what it professed to be — ” the supreme law of the land. ”’ Treason was restricted _ to the act of levying war against the United States, ason.

or of adhering to their enemies, giving them aid and comfort. The states, however, have always asserted their power to punish for treason against them individually. It has never been fully maintained in practice; but the theory had its effect in the secession period.

95. The system of the United States is almost the only national system, in active and successful operation, as to which the exact location of the sovereignty is still a mooted question. _

The contention of the Calhoun school — that the separate „ e , . states were sovereign before and after the adoption of overe s ° y ‘ the Constitution, that the Union was purely voluntary, and that the whole people, or the people of all the other states, had no right to main- tain or enforce the Union against any state — has been ended by the Civil War. But that did not decide the location of the sovereignty. The prevalent opinion is still that

first formulated by Madison: that the states were sovereign before 1789; that they then gave up a part of their sovereignty to the Federal government ; that the Union and the Constitution were the work of the states, not of the whole people; and that reserved powers are reserved to the people of the states, not to the whole people. The use of the bald phrase " reserved to the people, " not to the people of the several states, in the 10th amendment, seems to argue an underlying consciousness, even in 1789, that the whole people of the United States was already a political power quite distinct from the states, or the people of the states; and the tendency of later opinion is in this direction. The restriction to state lines seems to be a self-imposed limi- tation by the national people, which it might remove, as in 1789, if an emergency should make it necessary.

96. By whatever sovereignty the Constitution was framed and imposed, it was meant only as a scheme in outline, to be filled up afterwards, and from time to time, by legislation. _ The Details of idea is most plainly carried out in the Federal judiciary : . „

the Constitution only directs that there shall be a ˆ stem – Supreme Court, and marks out the general jurisdiction of all the courts, leaving Congress, under the restriction of the president's veto power, to build up the system of courts which shall best carry out the design of the Constitution. But the same idea is visible in every department, and it has carried the Constitution safely through a century which has radically altered every other civilized government. It has combined elasticity with the limitations necessary to make democratic government successful over a vast territory, having infinitely diverse interests, and needing, more than almost anything else, positive opportunities for sober second thought by the people. A sudden revolution of popular thought or feeling is enough to change the House of Representatives from top to bottom ; it must continue for several years before it, can make a radical change in the Senate, and for years longer before it can carry this change through the judiciary, which holds for life ; and all these changes must take place before the full effects upon the laws or Constitution are accomplished. But minor changes are reached in the meantime easily and naturally in the course of legislation. The members of the Convention of 1787 showed their wisdom most plainly in not trying to do too much ; if they had done more they would have done far less.

97. The convention adjourned on the 17th of September 1787, having adopted the Constitution. Its last step was a resolution that the Constitution be sent to the Congress of the Confederation, with the recommendation that it be^"^ /s ^"" submitted to conventions elected by the people*

of each state for ratification or rejection; that, if nine states should ratify it, Congress should appoint days for the popular election of electors, and that then the new Congress and president should, " without delay, proceed to execute this Constitution." Congress resolved that the report of the convention be sent to the several legislatures, to be submitted to conventions; and this was all the approval the Consti- tution ever received from Congress. Both Congress and the convention were careful not to open the dangerous question, How was a government which was not to be changed but by the legislatures of all the states to be entirely supplanted by a different system through the approval of conventions in three-fourths of them? They left such questions to be opened, if at all, in the less public forum of the legislatures.

98. Before the end of the year Delaware, Pennsylvania and

Ratifies Hon.

New Jersey had ratified; and Georgia, Connecticut and Massa- chusetts followed during the first two months of 1788. Thus far Federalists tne on 'y strong opposition had been in Massa- andAntl- chusetts, a " large state." In it the struggle began Federalists, between the friends and the opponents of the Constitution, with its introduction of a strong Federal power; and it raged in the conventions, legislatures, newspapers and pamphlets. In a classic series of papers, the Federalist, Alexander Hamilton, with the assistance of James Madison and John Jay, explained the new Constitution and defended it. As it was written before the Constitution went into force, it speaks much for the ability of its writers that it has passed into a standard textbook of American constitutional law.

99. The seventh and eighth states — Maryland and South

Carolina — ratified in April and May 1788; and, while the con- ventions of Virginia and New York were still wrang- ling over the great question, the ninth state, New Hampshire, ratified, and the institution passed out

of theory into fact. The Anti-Federalists of the Virginia and New York conventions offered conditional ratifications of all sorts; but the Federalists stubbornly refused to consider them, and at last, by very slender majorities, these two states ratified. North Carolina refused to ratify the Constitution, and in Rhode Island it was referred to the several towns instead of to a con- vention and was rejected by an overwhelming majority, the Federalists, who advocated the calling of a convention, refrain- ing from voting (§112). Congress named the first Wednesday of January 1789 as the day for the choice of electors, the first Wednesday in February for the choice of president and

vice-president, and the first Wednesday in March tion gUra ‘ f° r t ‘ le inauguration of the new government, at

New York City. The last date fell on the 4th of March, which has been the limit of each president’s term since that time.

100. When the votes of the electors were counted before Congress, it was found that Washington had been unanimously Fall of the elected president, and that John Adams, standing Confedera- next on the list, was vice-president. Long before tlon. t be inauguration the Congress of the Confederation had expired of mere inanition; its attendance simply ran down until (Oct. 21, 1788) its record ceased, and the United States got on without any national government for nearly six months. The struggle for nationality had been successful, and the old order faded out of existence.

101. The first census (1790) followed so closely upon the inauguration of the Constitution that the country may fairly be said to have had a population of nearly four millions in 1789. slavery la Something over half a million of these were slaves, of the United African birth or blood. Slavery of this sort had taken States. root ; n a i mos t a n the colonies, its original establish- ment being everywhere by custom. When the custom had been sufficiently established statutes came in to regulate a relation already existing. But it is not true, as the Dred Scott decision held long afterwards (§215), that the belief that

slaves were chattels simply, things, not persons, held good at the time of the adoption of the Constitution. Times had changed somewhat. The peculiar language of the Constitution itself, describing a slave as a " person held to service or labour," under the laws of any state, puts the general feeling exactly: slaves were persons from whom the laws of some of the states withheld personal rights for the time. In accordance with this feeling most of the Northern states were on the high road towards abolition of

slavery. Vermont had never allowed it. In Massa- tbeN'Vtb" cnusetts it was swept out by a summary court

decision that it was irreconcilable with the new state constitution. Other states soon began systems of gradual abolition, which finally extinguished slavery north of Maryland, but so gradually that there were still 18 apprentices for life in New Jersey in i860, the last remnants of the former slave system. In the new states north of the Ohio slavery was prohibited by the ordinance of 1787 (§81), and the prohibition was maintained in spite of many attempts to get rid of it and introduce slavery.

102. The sentiment of thinking men in the South was exactly the same, or in some cases more bitter from their personal entanglement with the system. Jefferson's language

as to slavery is irreconcilable with the chattel notion; tˆlsouUi no abolitionist agitator ever used warmer language than he as to the evils of slavery; and the expression, " our brethren," used by him of the slaves, is conclusive. Washing- ton, George Mason and other Southern men were almost as warm against slavery as Jefferson, and there were societies for the abolition of slavery in the South. In the Constitutional conven- tion of 1787 the strongest opposition to an extension of the period of non-interference with the slave trade from 1800 to 1808 came from Virginia, whereas every one of the New England states, in which the trade was an important source of profit, voted for this extension. No thinking man could face with equanimity the future problem of holding a separate race of millions in slavery. Like most slave laws, the laws of the Southern states were harsh: rights were almost absolutely with- held from the slave, and punishments of the severest kind were legal; but the execution of the system was milder than its legal possibilities might lead one to imagine. The country was as yet so

completely agricultural that Southern slavery kept all the patriarchal features possible to such a system.

103. Indeed, the whole country was almost exclusively agricultural, and, in spite of every effort to encourage manufactures by state bounties, they formed the meagrest jXgriciiure element in the national production. Connecticut, Commerce which now teems with manufactures, was just begin- and Manu- ning the production of tinware and clocks; Rhode tactures – Island and Massachusetts were just beginning to work in cotton from models of jennies and Arkwright machinery surreptitiously obtained from England; and other states, beyond local manufactures of paper, glass and iron, were almost entirely agricultural, or were engaged in industries directly dependent on agriculture. Commerce was dependent on agri- culture for export and manufactured imports were enough to drown out every other form.

104. There were but five cities in the United States having a population of more than 10,000— New York (33,000), Philadelphia (28,500), Boston (18,000), Charleston (16,000)

and Baltimore (13,00c). The Dopulation of the , , ag f!nA

\ ■ 1 1 r 1 sinc& 1790.

city of New York is now greater than that of the original thirteen states in 1790; the state of New York has now about twice as many inhabitants as the thirteen had in 1790; and the new states of Ohio and Illinois, which had hardly any white inhabitants in 1789, have each a larger population than the whole thirteen then had. Imports have swollen from $23,000,000 to $1,475,612,580 (1909); exports from $20,000,000 to $1,728,203,271 (1909), since 1790. The revenues of the new government in 1790 were $4,000,000; the expenditures, exclud- ing interest on the public debt, but $i,ooo,coo; now both the revenues and the expenditures are about $1,000,000,000. It is not easy for the modern American to realize the poverty and weakness of his country at the inauguration of the new system of government, however he may realize the simplicity of the daily life of its people.

105. Outside the cities communication was slow. One stage a week was enough for the connexion between the great cities; and communication elsewhere depended on private

conveyance. The Western settlements were just beginning to make the question more serious. Enterprising land companies were the moving force which had impelled the passage of the Ordinance of 1787; and the first column of their settlers was pouring into Ohio and forming connexion with their predecessors in Kentucky and Tennessee. Marietta and Cincinnati had been founded. But the intending settlers were obliged to make the journey down the Ohio river from Pittsburg in bullet-proof flat-boats, for protection against the Indians, and the return trip depended on the use of oars. For more than twenty years these flat-boats were the chief means of river commerce in the West ; and in the longer trips, as to New Orleans, the boats were generally broken up at the end and sold for lumber

the crew making the trip home on foot or on horseback. John Fitch and others were already experimenting on what was soon to be the steamboat; but the statesman of 1789, looking at the task of keeping under one government a country of such distances, with such difficulties of communication, may be pardoned for having felt anxiety as to the future. To almost all thinking men of the time the Constitution was an experiment, and the unity of the new nation a subject for very serious doubt.

106. The comparative isolation of the people everywhere, the lack of books, the poverty of the schools and newspapers, were

all influences which worked strongly against any pronounced literary development. Poems, essays and paintings were feeble imitations of European models; history was annalistic, if anything; and the drama hardly existed. In two points the Americans were strong, and had done good work. Such men as Jonathan Edwards had excelled in various departments of theology, and American preaching had reached a high degree of quality and influence; and, in the line of politics, the

American state papers rank among the very best of their kind. Having a very clear perception of their political purposes, and having been restricted in study and reading to the great masters of pure and vigorous English, and particularly to the English translators of the Bible, the American leaders came to their work with an English style which could hardly have been improved. The writings of Franklin, Washington, the Adamses, Hamilton, Jefferson, Madison, Jay and others show the secret of their strength in every page. Much the same reasons, with the influences of democracy, brought oratory, as represented by Patrick Henry, Fisher Ames, John Randolph and others, to a point not very far below the mark afterwards reached by Daniel Webster. The effect of these facts on the subsequent develop- ment of the country is not often estimated at its full value. All through an immigration of every language and dialect under heaven the English language has been protected in its supremacy by the necessity of going back to the " fathers of the republic " for the first, and often the complete, statement of principles in every great political struggle, social problem or lawsuit.

107. The cession of the " North- West Territory " by Virginia and New York had been followed up by similar cessions by

Massachusetts (1785), Connecticut (1786) and South Carolina (1787). North Carolina did not cede

Limits ot Settlement

Tennessee until early in 1790, nor Georgia her western claims until 1802. Settlement in all these regions was still very sparse. The centres of Western settlement, in Tennessee and Kentucky, had become more firmly established, and a new one, in Ohio, had just been begun. The whole western limits of settle- ment of the old thirteen states had moved much nearer their present boundaries; and the acquisition of the Western title, with the liberal policy of organization and government which had been begun, was to have its first clear effects during the first decade of the new government. Almost the only obstacle to its earlier success had been the doubts as to the attitude which the Spanish authorities, at New Orleans and Madrid, would take towards the

new settlements. They had already asserted a claim •top; fdve'r' ˆ nat the Mississippi, was an exclusively Spanish stream

from its mouth up to the Yazoo, and that no American boat should be allowed to sail on this part of it. To the Western settler the Alleghanies and bad roads were enough to cut him off from any other way to a market than down the Mississippi; and it was not easy to restrain him from a forcible defiance of the Spanish claim. The Northern states were willing to allow the Spanish claim for a period of years in return for a commercial treaty; the Southern states and the Western settlers protested angrily; and once more the spectre of dissolution appeared, not to be laid again until the new government had made a treaty with Spain in 1795 (see Pinckney, Thomas), securing common navigation of the Mississippi.

108. Contemporary authorities agree that a marked change Soaal had come over the people since 1775, and few of Conditions, them seem to think the change one for the better.

Many attribute it to the looseness of manners and morals introduced by the French and British soldiers; others to

the general effects of war; a few, Tories all, to the demoralizing effects of rebellion. The successful establishment of nationality would be enough to explain most of it ; and if we remember that the new nation had secured its title to a vast western territory, of unknown but rich capacities, which it was now moving to reduce to possession by emigration, it would seem far more strange if the social conditions had not been somewhat disturbed.

G. — The Development of Democracy, 1789-1801. 109. All the tendencies of political institutions in the United States had certainly been towards democracy; but it cannot be said that the leading men were hearty or unanimous Democracy in their agreement with this tendency. Not a few in the United of them were pronounced republicans even before states ‘ 1775, but the mass of them had no great objections to a mon- archical form of government until the war-spirit had converted them. The Declaration of Independence had been directed rather against the king|than against o king. Even after popular sovereignty had pronounced against a king, class spirit was for some time a fair substitute for aristocracy. As often happens, democracy at least thought of a Caesar when it apprehended class control. Certain discontented officers of the Continental Army proposed to Washington that he become king, but he promptly and indignantly put the offer by. The suggestion of a return to

monarchy in some form, as a possible road out of the confusion of the Confederation, occurs in the correspondence of some of the leading men; and while the Convention of 1787 was holding its secret sessions a rumour went out that it had decided to offer a crown to an English prince.

no. The state constitutions were democratic, except for property or other restrictions on the right of suffrage, or provisions carefully designed to keep the control of at least one house of the state legislature " in the hands of property." The Federal Constitution was so drawn that it would have lent itself kindly either to class control or to democracy. The electoral system of choosing the'president and vice-president was altogether anti-democratic, though democracy has conquered it: not an elector, since 1706, has disobeyed the purely moral claim of his party to control his choice. Since the Senate was to be chosen by the state legislatures, " property," if it could retain its influence in those bodies, could control at least one house of Congress. The question whether the Constitution was to have a democratic or an anti-democratic interpretation was to be settled in the next twelve years.

in. The states were a strong factor in the final settlement, from the fact that the Constitution had left to them the control of the elective franchise : they were to make its conditions what each of them saw fit. Religious tests for the right of '°™ence of suffrage had been quite common in the colonies ; property '''' n « ra " tests were almost universal. The former disappeared on ' shortly after the War of Independence; the latter survived in some of the states far into the constitutional period. But the desire to attract immigration was always a strong impelling force .to induce states, especially frontier states, to make the acquisition of full citizenship and political rights as easy and rapid as possible. This force was not so strong at first as it was after the great stream of immigration began about 1848, but it was enough to tend constantly to the development of democracy. Inlatertimes.when state lawsallow the immigrant to vote even before the period assigned by Federal laws allows him to become a naturalized citizen, there have been demands for the modification of the ultra state democracy ; but no such danger was apprehended in the first decade.

112. The Anti-Federalists had been a political party, but a party with but one principle. The absolute failure of that principle deprived the party of all cohesion; and the 0rs , aa i

., Federalists controlled the first two Congresses almost tionotthe entirely. Their pronounced ability was shown in New their organizing measures, which still govern the ° ov « rn ” American system very largely. The departments of state, of the treasury, of war, of justice, and of the post-office were rapidly and successfully organized; acts were passed for the regulation of seamen, commerce, tonnage duties, lighthouses, intercourse with the Indians, Territories, and the militia; a national capital was selected; a national bank was chartered; the national debt was funded, and the state debts were assumed as

part of it. The first four years of the new system showed that the states had now to deal with a very different power from the impotent Congress of the Confederation. The new power was even able to exert pressure upon the two states which had not ratified the Constit ution, though the pressure was made as gentle as possible. As a first step, the higher duties imposed on imports from foreign countries were expressly directed to apply to imports from North Carolina and Rhode Island. North Carolina having called a second convention, her case was left to the course of nature ; and the second convention ratified the Constitution (November 21, 1789). The Rhode Island legislature asked that their state might not be considered altogether foreigners, made their duties agree with those of the new government, and reserved the pro- ceeds for ” continental ” purposes. Still no further steps were taken. A bill was therefore introduced, directing the president to suspend commercial intercourse with Rhode Island, and to de- mand from her her share of the continental debt. This was passed by the Senate, and waited but two steps further to become law. Newspaper proposals to divide the little state between her two nearest neighbours were stopped by her ratification of the Consti- tution (May 29,1790). The “old thirteen” were thus united under Completion the Constitution; and yet, so strong is the American of the prejudice for the autonomy of the states that these

Union. j as £ tw0 were allowed to enter in the full conviction that they did so in the exercise of sovereign freedom of choice.

Their entrance, however, was no more involuntary than that of others. If there had been real freedom of choice, nine states would never have ratified: the votes of Pennsylvania, Massachusetts, New Hampshire, Virginia and New York were only secured by the pressure of powerful minorities in these states, backed by the almost unanimous votes of the others.

1 13. Protection was begun in the first Tariff Act, whose object, said its preamble, was the protection of domestic manufactures.

The duties, however, ranged only from 7§ to 10%, Protection, averaging about 8|%. The system, too, had

rather a political than an economic basis. Until 1789 the states had controlled the imposition of duties. The separate state feeling was a factor so strong that secession was a possibility which every statesman had to take into account. Hamilton's object, in introducing the system, seems to have been to create a class of manufacturers, running through all the states, but dependent for prosperity on the new Federal government and its tariff. This would be a force which would make strongly against any attempt at secession, or against the tendency to revert to control by state legislatures, even though it based the national idea on a conscious tendency towards the development of classes. The same feeling seems to have been at the bottom of his establishment of a national bank, his assumption of state debts, and most of the general scheme which his influence forced upon the Federalist party. (See Hamilton, Alexander; and Federalist Party.)

114. In forming his cabinet Washington had paid attention to the opposing elements which had united for the temporary

purpose of ratifying the Constitution. The national Cabinet, element was represented by Hamilton, secretary of

the treasury, and Henry Knox, secretary of war; the particularist element (using the term to indicate support of the states, not of a state) by Jefferson, secretary of state, and Edmund Randolph, attorney-general. At the end of 1792 matters were in train for the general recognition of the existence of two parties, whose struggles were to decide the course of the Constitution's development. The occasion came in the opening of the following year, when the new nation was

first brought into contact with the French Revolution.

115. The controlling tendency of Jefferson and his school was to the maintenance of individual rights at the highest possible TheJeffef point, as the Hamilton school was always ready to son school assert the national power to restrict individual rights oi Politics. f or tne g enera i good. Other points of difference are rather symptomatic than essential. The Jefferson school supported the states, in the belief that they were the best bulwarks for individual rights. When the French Revolution began its

usual course in America by agitation for the " rights of man," it met a sympathetic audience in the Jefferson party and a cold and unsympathetic hearing from the Hamilton school of Federal- ists. The latter were far more interested in securing the full recognition of the power and rights of the nation than in securing the individual against imaginary dangers, as they thought them. For ten years the surface marks of distinction between the two parties were to be connected with the course of events in Europe; but the essence of distinction was not in the surface marks.

116. The new government was not yet four years old; it was not familiar, nor of assured permanency. The only national governments of which Americans had had previous experience were the British government and the ion e school Confederation: in the former they had had no share,

and the latter had had no power. The only places in which they had had long-continued, full, and familiar experience of self-government were their state governments: these were the only governmental forms which were then distinctly associated in their minds with the general notion of republican government. The governing principle of the Hamilton school, that the con-struction or interpretation of the terms of the Constitution was to be such as to broaden the powers of the Federal government, necessarily involved a corresponding trenching on the powers of the states. It was natural, then, that the Jefferson school should look on every feature of the Hamilton programme as " anti-republican," meaning, probably, at first no more than opposed to the state system, though the term soon came to imply something of monarchical and, more particularly, of English ten- dencies. The disposition of the Jefferson school to claim for them- selves a certain peculiar title to the position of

" republicans " developed into the appearance of the first Republican, or the Democratic-Republican, party, about 1793.

117. Many of the Federalists were shrewd and active business men, who naturally took prompt advantage of the opportunities which the new system offered. The Republicans therefore believed and asserted that the whole Differences. Hamilton programme was dictated by selfish or class interest; and they added this to the accusation of monarchical tendencies. These charges, with the fundamental differences of mental constitution, exasperated by the passion which differences as to the French Revolution seemed to carry with them every- where, made the political history of this decade a very unpleasant record. The provision for establishing the national capital on the Potomac (1790) was declared to have been carried by a corrupt bargain; and accusations of corruption were renewed at every opportunity. In 1793 a French agent, TheNat , 0Bat Edmond Charles Edouard Genet (1765-1834), ap- capital. peared to claim the assistance of the United States Genet's

*for the French republic, and went to the length of Mlssljn – commissioning privateers and endeavouring to secure recruits, especially for a force which he expected to raise for the conquest of Louisiana from Spain. Washington decided to issue a proclamation of neutrality, the first act of the kind in American history. It was the first indication, also, of the policy which has made the course of every president, with the exception of Polk, a determined leaning to peace, even when the other branches of the government have been intent on war. Genet, however, continued his activities, and made out- The Whisky rageous demands upon the government, so that finally insurrec Washington demanded and secured (1794) his recall. 1 *""*• The proclamation of 1793 brought about the first distinctly party feeling; and it was intensified by Washington's charge that popular opposition in western Pennsylvania (1794) to the new excise law (see Whisky Insurrection) had been Aamlss i 00 fomented by the extreme French party. Their name, of Vermont, Democrat, was applied by the Federalists to the whole Kentucky Republican party as a term of contempt, but it was aad Tea ~ not accepted by the party for some twenty years; then the compound title " Democratic-Republican " became, as it*

1 Genet, fearing the fate of his fellow Girondists in France, re-

mained in the United States and became a naturalized American citizen.

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UNITED STATES

*[HISTORY 1789-180**

still is, the official title of the party. There was no party opposi- tion, however, to the re-election of Washington in 1792, or to the admission of Vermont (1791), Kentucky (1792) and Tennessee (1796) as new states.

118. The British government had accredited no minister to the United States, and it refused to make any commercial treaty or to give up the forts in the western territory of the United States, through which its agents still exercised a com- manding influence over the Indians. In the course of its war with France, the neutral American vessels, without the protection of a national navy, fared badly. A treaty negotiated in 1794 by

*Chief -Justice John Jay (q.v.) settled these difficulties Treaty. * or t ˆ le following twelve years. But, as it engaged the*

United States against any intervention in the war on behalf of France, was silent on the subject of the right of search, and agreed to irksome limitations on the commercial privileges of the United States, the Republicans, who were opposed to the negotiation of any treaty at this time with Great Britain, made it very unpopular, and the bitter personal attacks on Washington grew out of it. In spite of occasional Republican successes, the Federalists retained a general control of national

affairs; they elected John Adams president in 1796, 1T96 “° though Jefferson was chosen vice-president with him;

and the national policy of the Federalists kept the country out of entangling alliances with any of the European belligerents. To the Republicans, and to the French republic, this last point of policy was only a practical intervention against France and against the rights of man.

119. At the end of Washington’s administration the French Directory broke off relations with the United States, demand- ing the abrogation of Jay’s treaty and a more pronounced

sympathy with France. Adams sent three envoys, C. C. Pinckney (q.v.), John Marshall and Elbridge Gerry (q.v.), to endeavour to re-establish the former relations; they were The met by demands for " money, a great deal of "X.Y.Z." money," as a prerequisite to peace. They refused; Mission, their letters home were published, 1 and the Fede- ralists at last had the opportunity of riding the whirlwind of an intense popular desire for war with France. Intercourse with France was suspended by Congress (1798); the treaties with France were declared at an end; American frigates were authorized to capture French vessels guilty of depredations on American commerce, and the president was authorized to issue letters of marque and reprisal; and an American army was formed, Washington being called from his retirement at Mount Vernon to command it. The war never went beyond

a few sea-fights, in which the little American navy »«"fi!ua,ˆ itself credit, and Napoleon, seizing power the

next year, renewed the peace which should never have been broken. But the quasi-war had internal consequences to the young republic which surpassed in interest all its foreign difficulties: it brought on the crisis which settled the development of the United States towards democracy.

120. The reaction in Great Britain against the indefinite " rights of man " had led parliament to pass an alien law, a sedition law suspending the writ of habeas corpus, and an act giving wide and loosely defined powers to magistrates for the

dispersion of meetings to petition for redress of Federalists, grievances. The Federalists were in control of a

Congress of limited powers; but they were strongly tempted by sympathies and antipathies of every sort to form their programme on the model furnished from England. The measures which they actually passed were based only on that construction of the Constitution which is at the bottom of all American politics; they only tended to force the Constitution into an anti-democratic direction. But it was the fixed belief of their opponents that they meant to go farther, and to secure control by iome wholesale measure of political persecution.

121. Three alien laws were passed in June and July 1798.

1 In these letters as published the letters X, Y and Z were substituted for the names of the French agents with whom the American envoys dealt ; and the letters are known as the X Y Z correspondence.

The first (repealed in April 1802) raised the number of years necessary for naturalization from five to fourteen. The third (still substantially in force) permitted the arrest or The Alien removal of subjects of any foreign power with and Sedition which the United States should be at war. The Laws – second, which is usually known as the Alien Law, was limited to a term of two years; it permitted the president to arrest or order out of the country any alien whom he should consider dangerous to the country. As many of the Republican editors and local leaders were aliens, this law really put a large part of the Republican organization in the power of the president elected by their opponents. The Sedition Law (to be in force until March 1801 and not renewed) made it a crime, punishable by fine and imprisonment, to publish or print any false, scandalous and malicious writings against the government of the United States, either house of Congress, or the president, or to stir up sedition or opposition to any lawful act of Congress or of the president, or to aid the designs of any foreign power against the United States. In its first form the bill was even more sweeping than this and alarmed the opposition thoroughly.

122. Most of the ability of the country was in the Federalist ranks; the Republicans had but two first-rate men— Jefferson and Madison. In the sudden issue thus forced The between individual rights and national power, Republican Jefferson and Madison could find but one bulwark Opp 08 ”’ “- for the individual — the power of the states; and their use of it gave their party a pronounced list to state sovereignty from which it did not recover for years. They objected to the Alien Law on the grounds that aliens were under the jurisdiction of the state, not of the Federal government; that the jurisdiction over them had not been transferred to the Federal government by the Constitution, and that the assumption of it by Congress was a violation of the Constitution’s reservation of powers to the states; and, further, because the Constitution reserved to every ” person,” not to every citizen, the right to a jury trial. They objected to the Sedition Law on the grounds that the Constitution had specified exactly the four crimes for whose punishment Congress was to provide; that criminal libel was

not one of them; and that amendment I. forbade Congress to pass any law restricting freedom of speech or of the press. The Federalists asserted a common-law power in Federal judges to punish for libel, and pointed to a provision in the Sedition Law permitting the truth to be given in evidence, as an improvement on the common law, instead of a restriction on liberty.

123. The Republican objections might have been made in court, on the first trial. But the Republican leaders had strong doubts of the impartiality of the Federal judges, who were Federalists. They resolved to entrench the party in the state legislatures. The Virginia legislature in 1798 passed Virginia and a series of resolutions prepared by Madison, Kentucky and the Kentucky legislature in the same year Resolutions. passed a series prepared by Jefferson (see Kentucky: History). Neglected or rejected by the other states, they were passed again by their legislatures in 1799, and were for a long time a documentary basis of the Democratic party. The leading idea expressed in both was that the Constitution was a " compact " between the states, and that the powers (the states) which had made the compact had reserved the power to restrain the creature of the compact, the Federal government, whenever it undertook to assume powers not granted to it. Madison's idea seems to have been that the restraint was to be imposed by a second convention of the states. Jefferson's idea is more doubtful; if it meant that the restraint should be imposed by any state which should feel aggrieved, his scheme was merely Calhoun's idea of nullification; but there are some indications that he agreed with Madison.

124. The first Congress of Adams's term of office ended in 1799. Its successor, elected in the heat of the French war excitement, kept the Federalist policy up to its first pitch. Out

of Congress the execution of the objectionable laws the Laws.

had taken the shape of political persecution. Men

were arrested, tried and punished for writings which the people had

been accustomed to consider within legitimate political methods. The Republican leaders made every trial as public as possible, and gained votes constantly, so that the Federalists began to be shy of the very powers which they had sought. Every new election was a storm-signal for the Federalist party; and the danger was increased by schism in their own ranks.

125. Hamilton was now a private citizen of New York; but he had the confidence of his party more largely than its nominal

head, the president, and he maintained close and confidential relations with the cabinet which Adams had taken unchanged from Washington. The Hamilton faction saw no way of preserving and consolidating the newly acquired powers of the Federal government but by keeping up and increasing the war feeling against France; Adams had the instinctive leaning of an American president towards peace. Amid cries of wrath and despair from his party he accepted the first overtures of the new Napoleonic govern- ment, sent envoys to negotiate a peace, and ordered them to depart for France when they delayed too long. Then, discover- ing fiat treachery in his cabinet, he dismissed it and blurted out a public expression of his feeling that Hamilton and his adherents were " a British faction." Hamilton retorted with a circular letter to his party friends, denouncing the president; the Republi- cans intercepted it and gave it a wider circulation than its author had intended; and the Hamilton faction tried so to arrange the electoral vote that C. C. Pinckney should be chosen 1800 °"° P res ident in 1800 and Adams should be shelved into the vice-presidency. The result depended on the electoral vote of New York; and Aaron Burr, who had introduced the drill and machinery of a modern American political party there, had made the state Republican and secured a majority for the Republican candidates. These (Jefferson and Burr) received the same number of electoral votes (73), 1 and the House of Representatives (controlled by the Federalists) was thus called upon to decide which should be president. There was an effort by the Federalists to disappoint the Repub- licans by making Burr president; but Jefferson obtained that office, Burr becoming vice-president for four years. This disputed election, however, led to the adoption in 1804 of the 1 2th amendment to the Constitution, which prescribed that each elector should vote separately for president and vice-president, and thus

prevent another tie vote of this kind; this amend- ment, moreover, made very improbable the choice in the future of a president and a vice-president from opposing parties.

126. The "Revolution of 1800" decided the future develop- ment of the United States. The new dominant party entered

upon its career weighted with the theory of state ' oTwoo "" sovereignty; and a civil war was necessary before

this dogma, put to use again in the service of slavery, could be banished from the American system. But the demo- cratic development never was checked. From that time the interpretation of the Federal Constitution has generally favoured individual rights at the expense of governmental power. As the Republicans obtained control of the states they altered the state constitutions so as to cut out all the arrangements that favoured property or class interests, and reduced political power to the dead level of manhood suffrage. In most of the states outside of New England this process was completed before 181 5; but New England tenacity was proof against the advancing revolu- tion until about 1820. For twenty years after its downfall of 1800 the Federalist party maintained its hopeless struggle, and then it faded away into nothing, leaving as its permanent memorial the excellent organization of the Federal government, which its successful rival hardly changed. Its two successors — the Whig and the second Republican party — have also been broad-constructionist parties, but they have admitted democracy as well; the Whig party adopted popular methods at least, and the Republican went further in the direction of individual rights, securing the emancipation of enslaved labour.

1 Adams received 65, Pinckney 64 and John Jay 1.

127. The disputed election of 1800 was decided in the new capital city of Washington, to which the government had just been removed, after having been for ten years at Philadel-

phia. Its streets and parks existed only on paper, capital. The Capitol had been begun; the Executive Mansion was unfinished, and its audience room was used by Mrs Adams as a drying room for clothes; and the congressmen could hardly find lodgings. The inconveniences were only an exaggeration of the condition of other American cities. Their sanitary condi-

tions were bad, and yellow fever and cholera from time to time reduced several of them almost to depopulation. More than once, during this decade, the fever visited Philadelphia and New York. drove out most of the people, and left grass growing in the streets. The communication between the cities was still wretched. The traveller was subject to every danger or annoyance that bad roads, bad carriages, bad horses, bad inns and bad police pro- tection could combine to inflict upon him. But the war with natural obstacles had fairly begun, though it had little prospect of success until steam was brought into use as the ally of man.

128. About this time the term "the West" appears. It meant then the western part of New York, the new territory north of the Ohio, and Kentucky and Tennessee. In settling land boundaries New York had transferred

(1786) to Massachusetts, whose claims crossed her territory, the right to (but not jurisdiction over) a large tract of land in central New York, and to another large tract in the Erie basin. The sale of this land had carried population considerably west of the Hudson. After other expeditions against the Ohio Indians had been defeated, one under General Anthony Wayne had compelled them in 1794-95 to give up all the territory now in the state of Ohio. Settlement received a new impetus. Between 1790 and 1800 the population of Ohio had risen from almost nothing to 45,000, that of Tennessee from 36,000 to 106,000, and that of Kentucky from 74,000 to 221,000 — the last-named state now exceeding six of the " old thirteen " in population. The difficulties of the western emigrant, however, were still enormous. He obtained land of his own, fertile land and plenty of it, but little else. The produce of the soil had to be consumed at home, or near it; ready money was scarce and distant products scarcer; and comforts, except the very rudest substitutes of home manufacture, were unobtainable. The new life bore most hardly upon women; and, if the record of woman's share in the work of American colonization could be fully made up, the price paid for the final success would seem enormous.

129. The number of post offices rose during these ten years from 75 to 903, the miles of post routes from 1900 to 21,000, and the revenue from $38,000 to $231,000. These ,nffk figures seem small in comparison with the 61,158

post offices, 430,738 m. of post routes (besides 943,087 m. of rural delivery routes), and a postal revenue of $191,478,663. in 1908, but the comparison with the figures of 1790 shows a development in which the new Constitution, with its increased security, must have been a factor.

130. The power of Congress to regulate patents was already bearing fruit. Until 1789 this power was in the hands of the states, and the privileges of the inventor were restricted to the territory of the patenting state.

Now he had a vast and growing territory within which all the profits of the invention were his own. Twenty patents were issued in 1793, and 23,471 one hundred years afterwards; but one of the inventions of 1793 was Eli Whitney's cotton gin,

131. When the Constitution was adopted it was not known that the cultivation of cotton could be made profitable in the Southern states. The " roller gin " could clean

only 6 lb a day by slave labour. In 1784 eight bags of cotton, landed in Liverpool from an American ship, were seized on the ground that so much cotton could not be the produce of the United States. Eli Whitney {q.v.) invented the saw-gin, by which the cotton was dragged through parallel wires with openings too narrow to allow the seeds to pass; and one slave could now clean 1000 lb a day. The exports of cotton leaped from 189,000 lb in

1791 to 21,000,000 lb in 1801, and doubled in three years more. The influence of this one invention, combined with the wonderful series of British inventions which had paved the way for it, can hardly be estimated in its commercial aspects. Its political influences were even wider, but more unhappy. The introduction of the commercial element into the slave system of the South robbed it at once of the patriarchal features which had made it tolerable; while it developed in slave-holders a new disposition to defend a system of slave labour as a " positive good." The abolition societies of the South began to dwindle as soon as the results of Whitney's invention began to

be manifest.

132. The development of a class whose profits were merely the extorted natural wages of the black labourer was certain;

*and its political power was as certain, though it D*moa-ac"' never showed itself dearly until after 1830. And ' this class was to have a peculiarly' distorting effect on the political history of the United States. Aristocratic in every sense but one, it was ultra-Democratic (in a purely party sense) in its devotion to state sovereignty, for the legal basis of the slave system was in the laws of the several states. In time, the aristocratic element got control of the party which had originally looked to state rights as a bulwark of individual rights; and the party was finally committed to the employment of its original doctrine for an entirely different purpose — the suppression of the black labourer's wages.*

H. — Democracy and Nationality, i8oi-i82g

133. When Jefferson took office in 1801 he succeeded to a task larger than he imagined. His party, ignoring the natural Democracy forces which tied the states together even against and their wills, insisted that the legal basis of the bond Nationality. was m t ne power of any state to withdraw at will. This was no nationality ; and foreign nations naturally refused to take the American national coin at any higher valuation than that at which it was current in its own country. The urgent necessity was for a reconciliation between democracy and nationality; and this was the work of this period. An under- lying sense of all this has led Democratic leaders to call the war of 1812-15 the "Second War of Independence"; the result was as much independence of past ideas as of Great Britain.

134. The first force in the new direction was the acquisition of Louisiana in 1803. Napoleon had acquired it from Spain,

and, fearing an attack upon it by Great Britain, offered it to the United States for $15,000,000. The Constitution gave the Federal government no power to buy and hold territory, and the party was based on a strict construc- tion of the constitution. Possession of power forced the strict- construction party to broaden its ideas, and Louisiana was bought, though Jefferson quieted his conscience by talking for a time of a

futile proposal to amend the Constitution so as to grant the necessary power. (See Louisiana Purchase; and Jefferson, Thomas.) The acquisition of the western Mississippi basin more than doubled the area of the United States, and gave them control of all the great river-systems of central North America. The difficulties of using these rivers were removed almost immediately by Robert Fulton's utilization of steam in navigation (1807). Within four years steamboats were at work on western waters; and thereafter the increase of steam navigation and that of population stimulated one another. The " centre of popu- lation " has been carefully ascertained by the census

The Steamboat.

Centre of Population,

authorities for each decade, and it represents the ' westward movement of population very closely. During this period it advanced from about the middle of the state of Maryland to its extreme western limit; that is, the centre of population was in 1830 nearly at the place which had been the western limit of population in 1770.

135. Jefferson also laid the basis for a further acquisition in the future by sending an expedition under Meriwether Lewis (17.1'.) and William Clark to explore the territory north of the then Spanish territory of California and west of the

Rocky Mountains — the " Oregon country " as it was afterwards called. The explorations of this party (1804-1806), with Captain Robert Gray's discovery of the q^^ " Columbia river (1792), made the best part of the claims of the United States to the country forty years later.

136. Jefferson was re-elected in 1804, 1 serving until March, 1809; his party now controlled almost all the states outside of New England, and could elect almost any one whom it

chose to the presidency. Imitating Washington in t i804. refusing a third term of office, Jefferson established more firmly the precedent, not since violated, restricting a president to two terms, though the Constitution contains no such restriction. The great success of his presidency had been the acquisition of Louisiana, which was a violation of his party

principles; but all his minor successes were, like this, recognitions of the national sovereignty which he disliked so much. After a short and brilliant naval war the Barbary pirates were reduced to submission (1805). The long-continued control of New Orleans by Spain, and the persistent intrigues of the Spanish authorities, looking towards a separation of the whole western country from the United States, had been ended by the acquisi- tion of Louisiana, and the full details concerning them will probably remain for ever hidden in the secret history of the early West. They had left behind a dangerous ignorance of Federal power and control, of which Aaron Burr {q.v.) took advantage (1806-07). Organizing an expedition in Kentucky and Tennessee, probably for the conquest of the Spanish colony of Mexico, he was arrested on the lower Mississippi and brought back to Virginia. He was acquitted; but the incident opened up a vaster view of the national authority than demo- cracy had yet been able to take. It had been said, forty years before, that Great Britain had long arms, but that three thousand miles was too far to extend them; it was something to know now that the arms of the Federal government were long enough to reach from Washington city to the Mississippi.

137. All the success of Jefferson was confined to his first four years; all his heavy failures were in his second term, in which he and his party as persistently refused to Difficulties recognize or assert the inherent power of the nation with Great in international affairs. The Jay treaty expired in Britam – 1806 by limitation, and American commerce was thereafter left to the course of events, Jefferson refusing to accept the only treaty which the British government was willing to make. All the difficulties which followed may be summed up in a few words: the British government was then the representative of the ancient system of restriction of commerce, and had a powerful navy to enforce its ideas; the American government was endeavouring to force into international recognition the present system of neutral rights and unrestricted commerce, but its suspicious democracy refused to give it a navy sufficient to command respect. The American government apparently expected to gain its objects without the exhibition of anything but moral force.

138. Great Britain was now at war, from time to time, with almost every other nation of Europe. In time of peace European nations followed generally the old restrictive

principle

of allowing another nation, like the United States, A ta ˆ B \ eTtx no commercial access to their colonies; but, when they were at war with Great Britain, whose navy controlled the ocean, they were very willing to allow the neutral American merchantmen to carry away their surplus colonial produce. Great Britain had insisted for fifty years that the neutral nation, in such cases, was really intervening in the war as an ally of her enemy; but she had so far modified her claim as to admit that " transhipment," or breaking bulk, in the United States was enough to qualify the commerce for recognition. The neutral nation thus gained a double freight, and grew rich in the traffic; the belligerent nations no longer had commerce afloat for British vessels to capture; and the "frauds of the neutral flags " became a standing subject of complaint among British merchants and naval officers. About 1805 British prize courts

1 Jefferson received 162 electoral votes and his opponent, C. C. Pinckney, only 14.

Expatrla tion.

began to disregard transhipment and to condemn American vessels which made the voyage from a European colony to the mother country by way of the United States. This was really a restriction of American commerce to purely American productions, or to commerce with Great Britain direct, with the payment of duties in British ports.

139. The question of expatriation, too, furnished a good many burning grievances. Great Britain maintained the

old German rule of perpetual allegiance, though she

had modified it by allowing the right of emigration.

The United States, founded by immigration, was anxious to establish what Great Britain was not disposed to grant, the

right of the subject to divest himself of allegiance by naturalization under a foreign jurisdiction. Four facts thus tended to break off friendly relations: (1) Great Britain's claim to allegiance over American naturalized subjects; (2)

her claim to the belligerent right of search of meat. SS ' neutral vessels; (3) her claim of right to impress for

her vessels of war her subjects who were seamen wherever found; and (4) the difficulty of distinguishing native-born American from British subjects, even if the right to impress naturalized American subjects were granted. British naval officers even undertook to consider all who spoke the English language as British subjects, unless they could produce proof that they were native-born Americans. The American sailor who lost his papers was thus open to impress- ment. A particularly flagrant case of seizure of Americans occurred in 1807. On the 27th of June the British ship " Leo- pard " fired upon the American frigate " Chesapeake," which, after having lost 3 men killed and 18 wounded, hauled down its flag; the British commander then seized four of the " Chesa- peake's " crew. This action aroused intense anger throughout the country, and but for the impotence of the government would undoubtedly have led to immediate war. The American government in 1810 published the cases of such impressments since 1803 as numbering over 4000, about one-third of the cases resulting in the discharge of the impressed man; but no one could say how many cases had never been brought to the attention of a government which never did anything more than remonstrate about them.

140. In May 1806 the British government, by orders in council, declared a blockade of the whole continent of Europe

from Brest to the Elbe, about 800 m. In November, after the battle of Jena, Napoleon answered by the " Berlin decree," in which he assumed to blockade the British Isles, thus beginning his " continental system." A year later the British government answered by further orders in council, forbidding American trade with any Berlin and country from which the British flag was excluded, Milan allowing direct trade from the United States to Decrees. Sweden only, in American products, and permitting American trade with other parts of Europe only on condition of touching in England and paying duties. Napoleon retorted with the " Milan decree," declaring good prize any

vessel which should submit to search by a British ship; but this was evidently a vain fulmination.

141. The Democratic party of the United States was almost exclusively agricultural and had little knowledge of or

sympathy with commercial interests; it was pledged to the reduction of national expenses and the debt, and did not wish to take up the responsibility for a navy; and, as the section of country most affected by the orders in council, New England, was Federalist, and made up of the active and irreconcilable opposition, a tinge of political feeling could not but colour the decisions of the dominant party. Various ridiculous proposals were considered as substitutes for a neces- sarily naval war; and perhaps the most ridiculous was adopted. Since the use of non-intercourse agreements as revolutionary weapons against Great Britain, an overweening confidence in such measures had sprung up, and one of them was now resorted to — the embargo of the 22nd of December 1807, forbidding foreign commerce altogether. It was expected to starve Great Britain

Orders in Council.

The Navy.

into a change of policy; and its effects may be seen by comparing the $20,000,000 exports of 1790, $49,000,000 of 1807 and $9,000,000 of 1808. It does not seem to have struck those who passed the measure that the agricultural Embargo. districts also might find the change unpleasant; but that was the result, and their complaints reinforced those of New England, and closed Jefferson's second term in a cloud of recog- nized misfortune. The pressure had been slightly relieved by the substitution of the Non-Intercourse Law of the 1st of March 1809 for the embargo; it prohibited commercial intercourse with Great Britain and France and their dependencies, leaving pi on .j nter . other foreign commerce open, prohibited the impor- course Law. tation from any quarter of British and French goods, Election and forbade the entrance of British or French vessels, ofI808 – public or private, into any port of the United States. Madison, Jefferson's secretary of state, who succeeded Jefferson in 1809, having defeated the Federalist candidate C. C. Pinckney in the election of 1808, assumed in the presidency a burden which was not enviable. New England was in a ferment, and

was suspected of designs to resist the restrictive system by force; and the administration did not face the future with confidence.

142. The Non-Intercourse Law was to be in force only " until the end of the next session of Congress " and was to be abandoned as to either belligerent which should abandon its attacks on neutral commerce, and maintained against the other. In 1810 the American government was led to believe that France had abandoned its system. Napoleon continued to enforce it in fact; but his official fiction served its purpose of limiting the non- intercourse for the future to Great Britain, and thus straining relations between that country and the United States still further. The elections of 1811-1812 resulted everywhere in the defeat of " submission men " and in the choice of new members who were determined to resort to war against Great Britain. Henry Clay, John C. Calhoun, William H. Crawford and other new men seized the lead in the two houses of Congress, and forced Madison, it is said, to agree to a declara- tion of war as a condition of his renomination in 1812 when he defeated De Witt Clinton by an electoral vote of 128 to 89. (See Madison.) Madison sent to Congress a confidential E/ec

" war message " on the 1st of June and on the 18th ofi8i2. war was declared. The New England Federalists War with always called it " Mr Madison's war," but the Ba sland. president was about the most unwilling participant in it.

143. The national democracy meant to attack Great Britain in Canada, partly to gratify its western constituency, who had been harassed by Indian attacks, asserted to , have been instigated from Canada. Premonitions ' of success were drawn from the battle of Tippecanoe, in which William Henry Harrison had defeated in 181 1 the north-western league of Indians formed by Tecumseh (q.v.). Between the solidly settled Atlantic states and the Canadian frontier was a wide stretch of unsettled or thinly settled country, which was itself a formidable obstacle to war. Ohio had been admitted as a state in 1802, and Louisiana was tbe War% admitted in 181 2; but their admission had been

due to the desire to grant them self-government rather than to their full development in population and resources, Cincinnati was a little settlement of 2500 inhabitants; the fringe of settled

country ran not very far north of it ; and all beyond was a wilder- ness of which little was known to the authorities. The case was much the same with western New York; the army which was to cross the Niagara river must journey almost all the way from Albany through a very thinly peopled country. It would have been far less costly, as events proved, to have entered at once upon a naval war; but the crusade against Canada had been proclaimed all through Kentucky and the West, and their people were determined to wipe out their old scores before the conclusion of the war. (For the military and naval events of the war see American War of i8r2.)

144. The war opened with disaster — General William Hull's surrender of Detroit; and disaster attended it for two years. Political appointments to positions in the regular army were

Tippecanoe.

numerous, and such officers were worse than useless. The war department showed no great knowledge, and poverty put

its little knowledge out of service. Futile attempts by Laid at invasion were followed by defeat or abortion, until

the political officers were weeded out at the end of the

year 1813, and Jacob Brown, Winfield Scott, E. W. Ripley and

others who had fought their way up were put in command. Then

for the first time the men were drilled and brought into effective

condition; and two successful battles in 1814 — Chippewa and

_., Lundy's Lane — threw some glory on the end of

Chippewa , , . • ,■

and Lundy's the war. bo weak were the preparations even for

Lane. defence that a British expedition in 1814 met no

Washington effective resistance when it landed and burned Washington. For some of the disasters the responsi- bility rested as much, or more, upon the war department as upon the officers and soldiers in the field.

145. The American navy was but a puny adversary for the British navy, which had captured or shut up in port all the other

navies of Europe. But the small number of Ameri- theNavy. can vesse l s > with the superabundance of trained

officers, gave them one great advantage: the train- ing and discipline of the men, and the equipment of the vessels, had been brought to the very highest point. Captains who could command a vessel but for a short time, yielding her then to another officer who was to take his sea service in rotation, were all ambitious to make their mark during their term. " The art of handling and fighting the old broadside sailing frigate " had been carried in the little American navy to a point which unvarying success and a tendency to fleet-combats had now made far less common among British captains. Altogether the American vessels gave a remarkably good account of themselves.

146. The home dislike to the war had increased steadily with the evidence of incompetent management by the administration. Feeling The Federalists, who had always desired a navy, in New pointed to the naval successes as the best proof of Engand. f \y w j t jj vvhich the war had been undertaken and managed. New England Federalists complained that the Federal government utterly neglected the defence of their coast, and that Southern influence was far too strong in national affairs. They showed at every opportunity a disposition to adopt the furthest stretch of state sovereignty, as stated in the Kentucky Resolutions; and every such development urged the national democracy unconsciously further on the road to nationality. When the New England states sent delegates to meet at Hartford, „ ,, . Conn, (a .v.), and consider their grievances and

Hartford .. , ,. , , ,

Conventionale best remedies — a step perfectly proper on the Democratic theory of a " voluntary Union " — treason was suspected, and a readiness to suppress it by force was plainly shown. The recommendations of the convention came to nothing; but the attitude of the dominant party towards it is one of the symptoms of the manner in which the trials of actual war were steadily reconciling democracy and nationality. The object which Hamilton had sought by high tariffs and the development of national classes had been attained by more natural and healthy means.

147. In April 1814 the first abdication of Napoleon took place, and Great Britain was able to give more attention to her Ameri- can antagonist. The main attack was to be made on Louisiana, the weakest and most distant portion of

the Union. A fleet and army were sent thither, but the British assault was completely repulsed (Jan. 8, 1815) by the Americans under Andrew Jackson. Peace had been made at Ghent fifteen days before the battle was fought, but the news of the battle and the peace reaehed Washington almost together, the former going far to make the latter tolerable.

148. The United States really secured a fairly good treaty. Itis true that it said not a word about the questions of impressment, search and neutral rights, the grounds of the war; Great Britain did not abandon her position on any of them. But everybody knew that circumstances had changed. The new naval power whose frigates alone in the past twenty years had shown their ability to fight English frigates on equal terms was not likely

Peace.

to be troubled in future with the question of impressment; and in fact, while not renouncing the right, the British government no longer attempted to enforce it. The navy, it must be con- fessed, was the force which had at last given the United States a recognized and cordial acceptance in the family of nations; it had solved the problem of the reconciliation of democracy and nationality.

149. The remainder of this period is one of the barrenest in American history. The opposition of the Federalist party to the war completed the measure of its unpopularity, and Extinction

it had only a perfunctory existence for a few years otthe longer. Scandal, intrigue and personal criticism Federalist became the most marked characteristics of Ameri- y ‘ can politics until the dominant party broke at the end of the period, and real party conflict was renewed. But the seeds of the final disruption are visible from the peace of 1814. The old-fashioned Republicans looked with intense suspicion on the new form of Republicanism generated by the war, a type which instinctively bent its energies toward the further development of national power. Clay was the natural leader of the new Democracy; but John Quincy Adams and others of Federalist antecedents or leanings took to the new doctrines kindly; and even Calhoun, Crawford and others of the Southern interest were at first strongly inclined to support them. One of the first effects was the revival of protection and of a national bank.

1 50. The charter of the national bank had expired in 181 1, and the dominant party had refused to recharter it. The attempt to carry on the war by loans resulted in almost a bank-Bank of the ruptcy and in a complete inability to act efficiently. United

As soon as peace gave time for consideration, a second a es ‘ bank was chartered (April 10, 1816) for twenty years, with a capital of $35,000,000, one-fifth of which was to be sub-scribed for by the national government. It was to have the custody of the government revenues, but the secretary of the treasury could divert the revenues to other custodians, giving his reasons for such action to Congress.

151. Protection was advocated again on national grounds, but not quite on those which had moved Hamilton. The additional receipts were now to be expended for fortifications D ˆ i ri , and other national defences, and for national roads

and canals, the latter to be considered solely as military measures, with an incidental benefit to the people. Business distress among the people gave additional force to the proposal. The war and blockade had been an active form of protection, under which American manufactures had sprung up in great abundance. As soon as peace was made English manufacturers drove their American rivals out of business or reduced them to desperate straits. Their cries for relief had a double effect. They gave the spur to the nationalizing advocates of protection, and, as most of the manufacturers

were in New England or New York, they developed in the citadel of Federalism a class which looked for help to a Republican Congress, and was therefore bound to oppose the Federalist party. This was the main force which brought New England into the Republican fold before 1825. An increase in the number of tares". """" spindles from 80,000 in 1811 to 500,000 in 1815, and in cotton consumption from 500 bales in 1800 to 00,000 in 1815, the rise of manufacturing towns, and the rapid development of the mechanical tendencies of a people who had been hitherto almost exclusively agricultural, were influences which were to be reckoned with in the politics of a democratic country.

152. The tariff of 1816 imposed a duty of about 25%onimports of cotton and woollen goods, and specific duties on iron imports, except pig-iron, on which there was an ad valorem Tariff ot duty of 20%. In 1818 this duty also was made ,816 ' specific (50 cents a cwt.). The ad valorem duties carried most of the manufacturers through the financial crisis of 1818-1819, but the iron duties were less satisfactory. In English manu- facture the substitution of coke for charcoal in iron production led to continual decrease in price. As the price went down the specific duties were continually increasing the absolute amount of protection. Thus spared the necessity for improvements

in production, the American manufacturers felt English com- petition more keenly as the years went by, and called for more protection.

153. James Monroe (q.v.) succeeded Madison as president in 1817, and, re-elected with hardly any opposition in 1820, he ••Era of served until 182s. 1 So complete was the supremacy Good of the Republican party that this is often called Feeling." « ˆ era f g 00c j feeling." It came to an end when a successor to Monroe was to be elected; the two sections of the dominant party then had their first opportunity for open struggle. During

Monroe's two terms of office the nationalizing party developed the policy on which it proposed to manage national affairs. This was largely the product of the continually swelling western movement of population. The influence of the steamboat was felt more and more every year, and the want of a similar improvement in land transport was correspondingly evident. The attention drawn to western New York by the war had filled that part of the state with a new population. The southern Indians had been completely overthrown by Andrew Jackson during the War of 1812, and forced to cede their lands. Admission The admission of the new states of Indiana (1816), of New Mississippi (1817), Illinois (1818), Alabama (1819), states. Maine (1820) and Missouri (1821) — all but Maine the product and evidence of western growth — were the immediate results of the development consequent upon the war. All the territory east of the Mississippi, except the northern part of the North-West Territory, was now formed into self-governing states; the state system had crossed the Mississippi; all that was needed for further development was the locomotive engine. The four millions of 1790 had grown into thirteen millions in 1830; and there was a steady increase of one-third in each decade.

154. The urgent demand of western settlers for some road to a market led to a variety of schemes to facilitate intercourse

between the East and the West — the most successful being that completed in New York in 1825, the Erie Canal. The Hudson river forms the great natural breach in the barrier range which runs parallel to the Atlantic coast. When the traveller has passed up the Hudson through that range he sees before him a vast champaign country extending westward to the Great Lakes, and perfectly adapted by nature for a canal. Such a canal, to turn western traffic into the lake rivers and through the lakes, the canal, and the Hudson to New York City, was begun by the state through the influence of De Witt Clinton, was derisively called " Clinton's big ditch " until its completion, and laid the foundations for the great commercial prosperity of New York state and city. Long before it was finished the evident certainty of its success had seduced other states into far less successful enterprises of the kind and had established as a nationalizing policy the combination of high tariffs and expenditures for internal improvements which was long known as the " American system." 2 The tariffs of duties on The imports were to be carried as high as revenue results

"American would justify; within this limit the duties were System." to be defined for purposes of protection; and the superabundant revenues were to be expended on enterprises which would tend to aid the people in their efforts to subdue the con- tinent. Protection was now to be for national benefit, not for the benefit of classes. Western farmers were to have manufac- turing towns at their doors, as markets for the surplus which

1 In 1816 Monroe received 183 electoral votes and his opponent, Rufus King,34; m 1820 Monroe received 231 and his opponent, John Quincy Adams, 1.

2 For a generation the making of " internal improvements " by the Federal government was an issue of great political importance. In 1806 Congress made an appropriation for the National or Cumberland Road, eventually constructed from Fort Cumberland, Md., to Vandalia, III. The policy of making such improve- ments was opposed on the ground that the Constitution gave to the Federal government^ no power to make them, that it was not an "enumerated power," and that such improvements were not a " necessary and proper " means of carrying out any of the enu- merated powers. Others argued that the Federal government might constitutionally make such improvements, but could not exercise jurisdiction over them when —.ade.

had hitherto been rotting on their farms; competition among manufacturers was to keep down prices; migration to all the new advantages of the West was to be made easy at national expense; and Henry Clay's eloquence was to commend the whole policy to the people. The old Democracy, particularly in the South, insisted that the whole scheme really had its basis in benefits to classes, that its communistic features were not such as the Constitution meant to cover by its grant of power to Congress to levy taxation for the general welfare, and that any such legislation would be unconstitutional. The dissatisfaction in the South rose higher when the tariffs were increased Tariffs of in 1824 and 1828. The proportion of customs lS24and revenue to dutiable imports rose to 37% in 1825 and to 44% in 1829; and the ratio to aggregate imports to 33% in 1825 and 37% in 1829. As yet, Southern dissatisfaction showed itself only in resolutions of state legislatures.

155. In the sudden development of the new nation cir-

cumstances had conspired to give social forces an abnormally materialistic cast, and this had strongly influenced the expression of the national life. Its literature and its art had amounted to little, for the American people were still engaged in the fiercest of warfare against natural difficulties, which absorbed all their energies.

1 56. In international relations the action of the government was strong, quiet and self-respecting. Its first weighty action took place in 1823. It had become pretty evident that the Holy Alliance, in addition to its interventions in Europe to suppress popular risings, meant to aid Spain in bringing her revolted South American colonies to obedience. Great Britain had been drifting steadily away from the alliance, and George Canning, the new secretary, determined to call in the weight of the transatlantic power as a check upon it. A hint to the American minister was followed by a few pregnant passages in Monroe's annual message in December. D OCtr!ne ,

" We could not view," he said, " any interposition for the purpose of oppressing them [the South American states], or controlling in any other manner their destiny by any European power, in any other light than as the manifestation of an unfriendly disposition towards the United States." If both the United States and Great Britain were to take this ground the fate of a fleet sent by the Alliance across the Atlantic was not in much doubt, and the project was at once given up.

157. It was supposed at the time that Spain might transfer her colonial claims to some stronger power; and Monroe therefore said that " the American continents, by the free and independent condition which they have assumed and maintained, are hence- forth not to be considered as subjects for future colonization by any European powers." This declaration and that quoted above constitute together the " Monroe doctrine " as originally proclaimed. The doctrine has remained the rule of foreign intercourse for all American parties. Added to the already established refusal of the United States to become entangled in any European wars or alliances, it has separated Europe and America to their common, advantage. (See Monroe Doctrine.)

158. By a treaty with Russia (1825) that power gave up all claims on the Pacific coast south of the present limits of Alaska. The northern boundary of the United States had The

been defined by the treaty of 1783; and, after the North-west acquisition of Louisiana, a convention with Great Bo< ""ao'. Britain (1818) settled the boundary on the line of 49 N. lat. as far west as the Rocky Mountains. West of these mountains the so-called Oregon country, on whose limits the two powers could not agree, was to be held in common possession for ten years. This common possession was prolonged by another convention (r827) indefinitely, with the privilege to either power to terminate it, on giving twelve months' notice. This arrangement lasted until 1846 (see Oregon: History).

159. Monroe's term of office came to an end in March 1825. He had originally been an extreme Democrat, who could hardly speak of Washington with patience; he had slowly modified his views, and his tendencies were now eagerly claimed by

the few remaining Federalists as identical with their own. The nationalizing faction of the dominant party had scored almost

all the successes of the administration, and the ofi824 divergence between it and the opposing faction

was steadily becoming more apparent. All the can- didates for the presidency in 1824 — Andrew Jackson, a private citizen of Tennessee; William H. Crawford, Monroe's secretary of the treasury; John Quincy Adams, his secretary of state; and Henry Clay, the speaker of the House of Representatives — claimed to be Republicans alike; but the personal nature of the struggle was shown by the tendency of their supporters to call themselves " Adams men " or " Jackson men," rather than by any real party title. Calhoun was supported by all groups for the vice- presidency, and was elected without difficulty. The choice of a president was more doubtful.

160. None of the four candidates had anything like a party organization behind him. Adams and Clay represented the

nationalizing element, as Crawford and Jackson Divergence. ˆd not > DUt there the likeness among them stopped.

The strongest forces behind Adams were the new manufacturing and commercial interests of the East; behind Clay were the desires of the West for internal improvements at Federal expense as a set-off to the benefits which the seaboard states had already received from the government; and the two elements were soon to be united into the National Republican or Whig party (q.v.). Crawford was the representative of the old Democratic party, with all its Southern influences and leanings. Jackson was the personification of the new democracy — not very cultured, perhaps, but honest, and hating every shade of class control instinctively. As he became better known the whole force of the new drift of things turned in his direc- tion. Crawford was taken out of the race, just after the electors had cast their votes, by physical failure, and Adams, later, by the revival of ancient quarrels with the Federalists of New England; and the future was to be with Clay or with Jackson. But in 1824 the electors gave no one a majority; and the House of Representatives, voting by states, gave the presidency to Adams.

161. Adams's election in 1825 was due to the fact that Clay's friends in the House — unable to vote for him, as he was the The Adams lowest in the electoral vote, and only three names Administra- were open to choice in the House — very naturally gave Hon 1825- their votes to Adams. As Adams appointed Clay

to the leading position in his cabinet, the defeated party at once raised the cry of " bargain and intrigue," one of the most effective in a democracy, and it was kept up through- out Adams's four years of office. Jackson had received the largest number of electoral votes, though not a majority, 1 and the hazy notion that he had been injured because of his devotion to the people increased his popularity. Though demagogues made use of it for selfish purposes, this feeling was an honest one, and Adams had nothing to oppose to it. He tried vigorously to uphold the " American system," and succeeded in passing the tariff of 1828; he tried to maintain the influence of the United States on both the American continents; but he remained as unpopular as his rival grew popular. In 1828 Adams was easily displaced by Jackson, the electoral vote being 178 to 83. Calhoun was re-elected vice-president.

162. Jackson's inauguration in 1829 closes this period, as it ends the time during which a disruption of the Union by the

Election ot peaceable withdrawal of any state was even possible. 1828. De- The party which had made state sovereignty its mocracyand bulwark in 1798 was now in control of the govern- NationaJUy. ment a gˆ m j but Jackson's proclamation in his first term, in which he warned South Carolina that " disunion by armed force is treason," and that blood must flow if the laws were resisted, speaks a very different tone from the speculations of

1 Jackson received 99, Adams 84, Crawford 41, and Clay 37; in the House of Representatives Adams received the votes of 13 states, Jackson of 7, and Crawford of 4. For vice-president Calhoun received 182 electoral votes, and his principal competitors, Nathan Sanford, of New York, and Nathaniel Macon, of North Carolina, received 30 and 24 respectively.

Slavery.

Jefferson on possible future divisions of the United States. And even the sudden attempt of South Carolina to exercise independent action (§§ 172-173) shows that some interest dependent upon state sovereignty had taken alarm at the drift of events, and was anxious to lodge a claim to the right before it should slip from its fingers for ever. Nullification was only the first skirmish between the two hostile forces of slavery and democracy.

163. When the vast territory of Louisiana was acquired in 1803 the new owner found slavery already established there by custom recognized by French and Spanish law. Congress tacitly ratified existing law by taking no action; slavery continued legal, and spread further through the territory; and the state of Louisiana entered as a slave state in 181 2. The next state to be carved out of the territory was Missouri, admitted in 1821. ATerritory, on applying for admis- sion as a state, brings a constitution for inspection by Congress; and when it was found that the new state of Missouri proposed to recognize and continue slavery, a vigorous opposition spread through the North and West, and carried most of the senators and representatives from those sections with it. In the House of Representatives these two sections had a greatly superior number of members; but, as the number of Northern and Southern states had been kept about equal, the compact Southern vote, with one or two Northern allies, generally retained control of the Senate. Admitted by the Senate and

rejected by the House, Missouri's application hung suspended for two years until it was successful by the admission of Maine, a balancing Northern state, 2 and by the following arrangement, known as the Missouri „. ...

„ ■ , o if ■ 4. The Missouri

Compromise of 1820: Missouri was to enter as a compromise. slave state ; slavery was for ever prohibited through- out the rest of the Louisiana Purchase north of lat. 36° 30', the main southern boundary of Missouri; and, though nothing was said of the territory south of the compromise line, it was understood that any state formed out of it was to be a slave state, if it so wished (see Missouri Compromise and Missouri, § History). Arkansas entered under this provision in 1836.

1 64. The question of slavery was thus set at rest for the present, though a few agitators were roused to more zealous opposition to the essence of slavery itself. In the next decade

these agitators succeeded only in the conversion d Divergence. a few recruits, but these recruits were the ones who took up the work at the opening of the next period and never gave it up until slavery was ended. It is plain now, however, that North and South had already drifted so far apart as to form two sections, and it became evident during the next forty years that the wants and desires of these two sections were so divergent that it was impossible for one government to make satisfactory laws for both. The chief cause was not removed in 1820, though one of its effects was got out of the way for the time.

*165. The vast flood of human beings which had been pouring westward for years had now pretty well occupied the territory east of the Mississippi, while, on the west side of that stream, it still showed a disposition to hold to the Area. * * river valleys. The settled area had increased from 240,000 sq. m. in 1790 to 633,000 sq. m. in 1830, with an average of 20-3 persons to the square mile. There was still a great deal of Indian territory in the Southern states of Georgia, Alabama, Mississippi, and Florida, for the Southern Indians were among the finest of their race ; they had become semi- civilized, and were formidable antagonists to the encroaching white race. The states interested had begun preparations for their forcible removal, in public defiance (see Georgia: History) of the attempts of the Federal government to protect the Indians*

(1827); but the removal was not completed until 1835. In the North, Wisconsin and Michigan, with the northern halves of Illinois and Indiana, were still very thinly settled, but everything indicated early increase of population. The first lake steamboat, the " Walk-in-the- Water," had appeared at Detroit in 1818, and the opening of the Erie Canal in 1825 added to the number

- *A prompt admission of Missouri would have balanced the slave and free states, but Alabama's admission as a slave state balanced them in 1819,*

of such vessels. Lake Erie had seven in 1826; and in 1830, while the only important lake town, Detroit, was

steamboat, hardly yet more than a frontier fort, a daily line of steamers was running to it from Buffalo, carrying

the increasing stream of emigrants to the western territory.

166. The land system of the United States had much to do with the early development of the West. From the first settle- ment, the universally recognized rule had been that of absolute individual property in land, with its corollary of unrestricted competitive or " rack "

rents ; and this rule was accepted fully in the national land system, whose basis was reported by Jefferson, as chairman of a com- mittee of the Confederation Congress (1785). The public lands were to be divided into "hundreds" each ten miles square and containing one hundred mile-square plots. The hundred was called a " township," and was afterwards reduced to six miles square, of thirty-six mile-square plots of 640 acres each. From time to time principal meridians and east and west base lines have been run, and townships , have been determined by their relations to these lines. The sections (plots) have been sub- divided, but the transfer describes each parcel from the survey map, as in the case of " the south-west quarter

of section 20, township 30, north, range 1 east of the third principal meridian." The price fixed in 1790 as a minimum was $2 per acre; it has tended to decrease, and no effort has ever been made to gain a revenue from it. When the nation acquired its western territory it secured its title to the soil, and always made it a fundamental condition of the admission of a new state that it should not tax United States lands. To compensate the new states for the freedom of unsold public lands from taxation, one township jn each thirty-six was reserved to them for educational purposes; and the excellent public school systems of the Western states have been founded on this provision. The cost of obtaining a quarter section (160 acres) , under the still later homestead system of granting lands to actual settlers, has come to be only about S26; the interest on this, at 6%, represents an annual rent of one cent per acre— making this, says F. A. Walker, as nearly as possible the " no-rent land " of the economists.

167. The bulk of the early westward migration was of home production; the great immigration from Europe did not begin until about 1847. The West as well as the East thus had its institutions fixed before being called upon to absorb an enormous foreign element.

I. — Industrial Development and Sectional Divergence,

1829-1850.

168. The eight years 1829-1837 have been called " the reign of Andrew Jackson "; his popularity, his long struggle for the Sew presidency, and his feeling of his official ownership Political of the subordinate offices gave to his administration Methods. at \ eai i an appearance of Caesarism. But it was a strictly constitutional Caesarism; the restraints of written law were never violated, though the methods adopted within the law were new to national politics. Since about 1800 state politics in New York and Pennsylvania had been noted for the systematic use of the offices and for the merciless manner in which the office- holder was compelled to work for the party which kept him in place. The presence of New York and Pennsylvania politicians in Jackson's cabinet taught him to use the same system. Re- movals, except for cause, had been relatively rare before; but under Jackson men were removed almost exclusively for the purpose of installing some more serviceable party tool; and a clean sweep was made in the civil

service. Other parties adopted the system, and it remained the rule at a change of administration until comparatively recent years.

169. The system brought with it a semi-military reorganiza- tion of parties. Hitherto nominations for the more important The New offices had been made mainly by legislative caucuses ; orgaaiza- candidates for • president and vice-president were tioa of nominated by caucuses of congressmen, and candi- Parties. dates for the higher state offices by caucuses of ihe state legislatures. Late in the preceding period " con- ventions " of delegates from the members of the party in the state

were held in New York and Pennsylvania; and in 1831-1832 this became the rule for presidential nominations. It rapidly developed into systematic state, county, and city " conventions "; and the result was the appearance of that complete political machinery, the American political party, with its local organiza- tions, and its delegates to county, state and national conventions. The Democratic machinery was the first to appear, in Jackson's second term (1833-1837). Its workers were paid in offices, or hopes of office, so that it was said to be built on the " cohesive power of public plunder "; but its success was immediate and brilliant. The opposing party, the Whig party (q.v.), had no chance of victory in 1836; and its complete overthrow drove its leaders into the organization of a similar machinery of their own, which scored its first success in 1840. Since that time these strange bodies, unknown to the law, have governed the country by turns; and their enormous growth has steadily made the organization of a third piece of such machinery more difficult or hopeless.

170. The Bank of the United States had hardly been heard of in politics until the new Democratic organization came into hostile contact with it. A semi-official demand Bank of the upon it for a political appointment was met by a United refusal; and the party managers called Jackson's states – attention to an institution which he could not but dislike the more he considered it. His first message spoke of it in unfriendly terms, and every succeeding message brought a more open attack. The old party of Adams and Clay had by this time taken the name of Whigs, probably from the

notion that they were struggling against " the reign p ar \ y , of Andrew Jackson," and they adopted the cause of the bank with

eagerness. The bank charter did not expire until 1836, but in 1832 Clay brought up a bill for a new charter. It was passed and vetoed; and the Whigs made the veto an im- portant issue of the presidential election of that year. They were beaten; Jackson was re-elected, receiving 219 electoral votes, and Clay, his Whig opponent, only 49, and the bank party could never again get a majority in the House of Representatives for the charter. The insistence of the president on the point that the charter was a " monopoly " bore weight with the people. But the president could not obtain a majority in the Senate. He determined to take a step which would give him an initiative, and which his opponents could not induce both houses to unite in overriding or punishing. Taking advantage of the provision that the secretary of the treasury might order the Removal public funds to be deposited elsewhere than in the of the bank or its branches, he directed the secretary to, ° e P° s " s – deposit all the public funds elsewhere. Thus deprived of its great source of dividends, the bank fell into difficulties, became a state bank after 1836, and then went into bankruptcy. (See Banks and Banking: United States; and Jackson, Andrew.)

171. All the political conflicts of Jackson's terms of office

were close and bitter. Loose in his ideas before 1829, Jackson

showed a steady tendency to adopt the strictest construction

of the powers of the Federal government, except in such official

perquisites as the offices. He grew into strong opposition to

all traces of the " American system," and vetoed opposition

bills for internal improvements unsparingly; and to the

his feeling of dislike to all forms of protection is as "American
• 11,1 1 i ■ System."

evident, though he took more care not to make it

too public. There are many reasons for believing that his drift was the work of a strong school of leaders — Martin Van Buren, Thomas H. Benton, Edward Livingston, Roger B. Taney, Levi Woodbury, Lewis Cass, W. L. Marcy and others — who developed the policy of the party, and controlled it until the

great changes of parties about 1850 took their power from them. At all events, some persistent influence made the Democratic party of 1830-1850 the most consistent and successful party which had thus far appeared in the United States.

172. Calhoun (q.v.) and Jackson were of the same stock — ■ Scottish-Irish — much alike in appearance and charac- teristics, the former representing the trained and edu- Jackson ˆ cated logic of the "race, the latter its instincts and passions. Jackson was led to break off his friendly relations with

Calhoun in 1830, and he had been led to do so more easily because of the appearance of the doctrine of nullification (?.».), which was generally attributed, correctly enough, to the authorship of Calhoun. Asserting, as the Republican party of 1798 had done, the sovereign powers of each state, Calhoun held that, as a means of avoiding secession and violent struggle upon every occasion of the passage of an act of Congress which should seem uncon- stitutional to any state, the state might properly suspend or Nulllfica- " nulli fy " tne operation of the law within its juris- tion. diction, in order to protect its citizens against

oppression. The passage of the Tariff Act of 1832, which organized and systematized the protective system, forced the Calhoun party into action. .A state convention in South Carolina (g.v.) on the 24th of November 1832 declared the Tariff Act null, and made ready to enforce the declaration.

173. But the time was past when the power of a single state could withdraw it from the Union. The president issued a proclamation, warning the people of South Carolina against any attempt to carry out the ordinance of nullification; he ordered a naval force to take possession of Charleston harbour to collect the duties under the act; he called upon Congress for additional executive powers, and Congress passed what nullifiers called the " bloody bill," putting the land and naval forces at the disposal of the president for the collection of

duties against " unlawful combinations "; and he is said to have announced, privately and profanely, his intention of making Calhoun the first victim of any open conflict. Affairs looked so threatening that an un- official meeting of " leading nullifiers " agreed to suspend the operation of the ordinance until Congress should adjourn; whence it derived the right to suspend has never been stated.

174. The president had already asked Congress to reduce the duties; and many Democratic members of Congress, who had Tariff of >' e lded to tne popular clamour for protection, were 1833. ver 3′ glad to use " the crisis " as an excuse fcr now

voting against it. A compromise Tariff Act, scaling down all duties over 20% by one-tenth of the excess every two years until 1842, when the remaining excess over 20% should be dropped, was introduced by Clay and became law. Calhoun and his followers claimed this as all that the nullification ordinance had aimed at; and the ordinance was formally repealed. But nullification had received its death-blow; even those Southern leaders who maintained the right of secession refused to recognize the right of a state to remain in the Union while nullifying its laws; and, when protection was reintroduced by the tariff of 1842, nullification was hardly thought of.

175. All the internal conditions of the United States were completely altered by the introduction of railways. For twenty

years past the Americans had been pushing in every Locomotive, direction which offered a hope of the means of recon- ciling vast territory with enormous population. Stephenson's invention of the locomotive came just in time, and Jackson's two terms of office marked the outburst of modern American life. The miles of railway were 23 in 1830, 1098 in 1835, some 2800 in 1840, and thereafter they about doubled every five years until i860.

176. A railway map of 1840 shows a fragmentary system, designed mainly to fill the gaps left by the means of communica-

*tion in use in 1830. One or two short lines run back otisJo** mto ˆhe countr y fr° m Savannah and Charleston;*

another runs north along the coast from Wilmington to

*Baltimore; several lines connect New York with Washington and other points; and short lines elsewhere mark the openings which needed to be filled at once — a number in New England and the Middle states, three in Ohio and Michigan, and three in Louisiana. Year after year new inventions came in to increase Anthracite. arK * a ‘^ tm s development. The anthracite coal*

of the Middle states had been known since 1790, but no means had been devised to put the refractory agent to work. It was now successfully applied to railways (1836), /ron and to the manufacture of iron (1837). Hitherto

wood had been the best fuel for iron-making; now the states which relied on wood were driven out of competition,

and production was restricted to the states in which nature had placed coal alongside of iron. Steam navigation across the Atlantic was established in 1838. The telegraph OceanNavl- came next, S. F. B. Morse’s line being erected in gation. The 1844. The spread of the railway system brought refc s™»P A – with it, as a natural development, the rise of the American system of express companies, whose first phases of individual enterprise appeared in 1839. No similar period in American history is so extraordinary for material development as the decade 1 830-1 840. At its beginning the country was an over-grown type of colonial life; at its end American life had been shifted to entirely new lines, which it has since followed. Modern American history had burst in with the explosiveness of an Arctic summer.

177. The steamboat had aided Western development, but the railway aided it far more. Cities and states grew as if the oxygen of their surroundings had been suddenly increased. The steamboat influenced the railway, settlement and the railway gave the steamboat new powers.

Vacant places in the states east of the Mississippi were filling up; the long lines of emigrant waggons gave way to the new and better methods of transport; and new grades of land were made accessible. Chicago was but a frontier fort in 1832; within a half-dozen years it was a flourishing town, with eight steamers connecting it with Buffalo, and dawning ideas of its future development of railway connexions. The maps change from decade to decade, as mapmakers hasten to insert new

cities which have sprung up. Two new states, Admission Arkansas and Michigan, were admitted (1836 and of Arkansas 1837). The population of Ohio grew from 900,000 and to 1,500,000, that of Michigan from 32,000 to ”’

212,000, and that of the country from 13,000,000 to 17,000,000, between 1830 and 1840.

178. With the change of material surroundings and possi- bilities came a steady amelioration of social conditions and a development of social ideals. Such features of the

past as imprisonment for debt and the cruel indiffer- c ˆ«/oas. ence of old methods of dealing with crime began to disappear; the time was past when a state could use an aban- doned copper mine as its state prison, as Connecticut had formerly done (see Simsbury, Connecticut). The domestic use of gas and anthracite coal, the introduction of expensive aqueducts for pure water, and the changing life of the people forced changes in the interior and exterior of American dwellings. Wood was still the common building material; imitations of Greek architecture still retained their vogue; but the interiors were models of comfort in comparison with the houses even of 1810. In the ” new ” regions this was not yet the case, and here social restraints were still so few that society seemed to be reduced almost to its primitive elements. Western steamers reeked with gambling, swindling, duelling and every variety of vice. Public law was almost suspended in some regions; and organized associations of counterfeiters and horse-thieves terrorized whole sections of country. But this state of affairs was altogether temporary, as well as limited in its area; the older and more densely settled states had been well prepared for the change and had never lost command of the social forces, and the process of settling down went on, even in the newer states, with far more rapidity than could reasonably have been expected. Those who took part in the movements of population in 1830- 1840 had been trained under the rigid forms of the previous American life; and these soon re-asserted themselves. The rebound was over before 1847, and the Western states were then as well prepared to receive and digest the great immigration which followed as the older states would have been in 1830.

179. A distinct American literature dates from this period. Most of the publications in the United States were still cheap

reprints of foreign works; but native productions ... . no longer followed foreign models with servility. Between 1830 and 1840 Whittier, Longfellow, Holmes, Poe, Hawthorne, Emerson, Bancroft and Prescott joined the advance- guard of American writers — Bryant, Dana, Halleck, Drake,

News- papers

Irving and Cooper; and even those writers who had already made their place in literature showed the influence of new condi- tions by their growing tendency to look less to foreign models and methods. (See American Literature.) Popular education was improved. The new states had from the first endeavoured to secure the best possible system of common schools. The attempt came naturally from the political instincts of the class from which the migration came; but the system which resulted was to be of incalculable service during the years to come. Their absolute democracy and their universal use of the English Common language have made the common schools most School successful machines for converting the raw material System. Q t immigration into American citizens. This supreme benefit is the basis of the system and the reason for its existence and development, but its incidental advan- tage of educating the people has been beyond calculation. It was an odd symptom of the general change that American newspapers took a new form during these ten years. The old " blanket-sheet " newspaper, cumbrous to handle and slow in all its ways, met its first rival in the type of newspaper which appeared first in New York City, in the Sun, the Herald and the Tribune (1833, 1835 and 1841). Swift and energetic in gathering news, and fearless, sometimes reckless, in stating it, they brought into American life, with very much that is evil, a great preponderance of good. 180. The chaos into which a part of American society had been thrown had a marked effect on the financial institutions Land Sales °^ ^ e countr y> which went to pieces before it for a ' time. It had not been meant to make the public lands of the United States a source of revenue so much as a source of development. The sales had touched their high-water mark during the speculative year 1819, when receipts

from them had amounted to $3,274,000; in other years they seldom went above $2,000,000. When the railway set the stream of migration moving faster than ever, and cities began to grow like mush- rooms, it was natural that speculation in land should feel the s latlon e ff ects – Sales rose to $3,200,000 in 1831, to $4,000,000 'in 1833, to $5,000,000 in 1834, to $15,000,000 in 1835, and to $25,000,000 in 1836. In 1835 the president an- nounced to Congress that the public debt was extinguished, and that some way of dealing with the surplus should be found. Calhoun's proposal, that after the year 1836 any surplus in excess of $5,000,000 should be divided among the states as a loan, was adopted, as regards the surplus (almost $37,000,000) of that year; and some $28,000,000 — still carried on the books of the treasury as unavailable funds — were actually distributed before the crisis of 1837 put an end to the surplus and to the policy. The states had already taken a hand in the general speculation by beginning works of public improvement. Foreign, particularly English, capital was abundant; and states which had been accustomed to think a dozen times over a tax of a hundred thousand dollars now began to negotiate loans of millions of dollars and to appropriate the proceeds to the digging of canals and the construction of railways. Their enterprises were badly conceived and badly managed, and only added to the confusion when the crash came. If the Federal government and the states felt that they were rich, the imaginations of individuals ran riot. Every one wanted to buy; prices rose, and every one was growing richer on paper. The assessed value of real estate in New York City in 1832 was $104,000,000; in 1836 it had grown to $253,000,000. In Mobile the assessed value rose from $1,000,000 to $27,000,000. Fictitious values were the rule.

181. When Jackson in 1833 ordered the government revenues to be deposited elsewhere than in the Bank of the United States, there was no government agent to receive them. The secretary of the treasury selected banks at various points in which the revenue should be deposited by the collecting officers; but these banks were organized under charters from their states, as were all banks except that of the United States. The theory of the dominant party denied the constitutional power of Congress to charter a bank, and th& states had not yet learned how to

deal with such institutions. Their grants of bank charters had

been based on ignorance, intrigue, favouritism or corruption, and the banks were utterly unregulated. The Democratic feeling was that the privilege of forming banking Corpora- corporations should be open to all citizens, and it tions. soon became so. Moreover, it was not until after the crash that New York began the system of compelling such deposits as would really secure circulation, which was long afterward further developed into the present national bank system. In most of the states banks could be freely organized with or without tangible capital, and their notes could be sent to the West for the purchase of government lands, which needed to be held but a month or two to gain a handsome profit. (See Banks and Banking: United States.) " Wild-cat banks " sprang up all over the country; and the " pet banks," as those chosen for the deposit of government revenues were called, went into speculation as eagerly as the banks which hardly pretended to have capital.

182. The Democratic theory denied the power of Congress to make anything but gold or silver coin legal tender. There have been " paper-money heresies " in the party;

but there was none such among the new school of circular' " Democratic leaders which came in in 1829; they were " hard-money men." In July 1836 Jackson's secretary of the treasury ordered land agents to take nothing in payment for lands except gold or silver. In the following spring the full effects of the order became evident; they fell on the adminis- tration of Van Buren, .Jackson's successor. 1 Van Buren had been Jackson's secretary of state, the representative man of the new Democratic school, and, in the opinion of the opposition, the evil genius of the Jackson administration; and it seemed to the Whigs poetic justice that he should bear the weight of his predecessor's errors. The " specie circular " turned the tide of paper back to the East, and when it was presented for payment most of the banks suspended specie payment with hardly a struggle. There was no longer a thought of buying; every one wanted to sell; and prices ran down with a rapidity even more startling than that with which they had risen. Failures, to an extent and on a scale unprecedented in the United States, made up the " panic of 1837." Many of the fg"^ ot states had left their bonds in the hands of their agents, and, on the failure of the latter, found that the bonds had been hypothecated or disposed of, so that the states got no return from them except a debt which was to them enormous. Saddled suddenly with such*

a burden, and unable even to pay interest, some of the states tioa " repudiated " their obligations; and repudiation was made successful by the fact that a state could not be sued by its creditors except by its own consent. Even the Federal government felt the strain, for its revenues were locked up in suspended banks. A little more than a year after Congress had authorized the distribution of its surplus revenues among the states Van Buren was forced to call it into special session to provide some relief for the government itself.

183. Van Buren held manfully to the strictest construction of the powers of the Federal government. He insisted that the panic would best right itself without government sub-interference, and, after a four years' struggle, he treasury succeeded in making the " sub-treasury scheme " Scheme. law (1840). It cut off all connexion of the government with banks, putting collecting and disbursing officers under bonds to hold money safely and to transfer it under orders from the treasury, and restricting payments to or by the United States to gold and silver coin. Its passage had been preceded by another commercial crisis (1839), more limited in its field, but more discouraging to the people. It is true that Jackson, in dealing with the finances, had " simply smashed things," leaving his successor to repair damages; but it is far from certain that this was not the best way available at the time. The wisest scheme of financial reform would have had small chance

1 In the election of 1836 Van Buren received 170 electoral votes, W. H. Harrison (Whig) 73, Hugh L. White 26, Daniel Webster 14 and W. P. Mangum 11.

of success with the land-jobbers in Congress, and Van Buren's firmness found the way out of the chaos.

184. Van Buren's firmness was unpopular, and the Whig party now adopted methods which were popular if somewhat

demagogical. It nominated William H. Harrison in 1840; it

contrasted his homely frontier virtues with Van Buren's " ostentatious indifference to the misfortunes of the people " and with the supposed luxury of his life in the White House; and, after the first of the modern " campaigns " of mass meetings and processions, Harrison was elected, receiving 234 electoral votes and Van Buren only 60. He died on the 4th of April 1841, only a month after his inaugu- ration, and the vice-president, John Tyler, became president. Tyler was of the extreme Calhoun school, which had shown some disposition to grant to Van Buren a support which it had refused to Jackson; and the Whigs had nominated Tyler to retain his faction with them. Now he was the nominal leader of the party, while his politics were opposite to theirs, and the real leader of the party, Clay, was ready to force a quarrel upon him. The quarrel took place; the Whig majority in Congress was not large enough to pass any measures over Tyler's veto; and the first two years of his administration were passed in barren conflict with his party. The " sub-treasury " law 1842. ° was re P ea l e d (1841); the tariff of 1842 introduced a modified protection; and there the Whigs were forced to stop. Their dissensions made Democratic success comparatively easy, and Tyler had the support of a Democratic House behind him during the last two years of his term.

185. The success of the Democratic machinery, and the reflex of its temporary check in 1840, with the influences brought to bear on it by the returning Calhoun faction, were such as to take the control of the party out of the hands of the leaders who had formed it. They had had high regard for political principle, even though they were willing to use doubtful methods for its propagation; these methods had now brought out new men, who looked mainly to success, and to close connexion with the controlling political element of the South as the easiest means of attaining success. When the Democratic convention of 1844 met it was expected to renominate Van Buren. A majority of the delegates had been sent there for that purpose, but many of them would have been glad to be prevented from doing so. They allowed a resolution to be passed making a two-thirds vote necessary for nomination; Van Buren was unable to command so many votes; and, when his name was withdrawn, James K. Polk was nominated. The Whigs nominated Clay.

186. The beginning of the abolitionist movement in the United States, the establishment of the Liberator (1831),

*and of the American Anti-Slavery Society (1833), Movement. anc * t * le subsequent divisions in it, are dealt with 'elsewhere (see Garrison, William Lloyd). Up to that time " abolition " had meant gradual abolition; it was a wish rather than a purpose. Garrison called for immediate abolition. The basis of the American system was in the reserved rights of the states, and slavery rested on their will, which was not likely to be changed. But the cry was kept up. The mission of the Abolitionists was to force the people to think of the question; and, in spite of riots, assaults and persecution of every kind, they fulfilled it manfully. In truth, slavery was more and more out of harmony with the new economic conditions which were taking complete control of the North and West, but had hardly been felt in the South. Thus the two sections, North and South, were more and more disposed to take opposite views of everything in which slavery was involved, and it had a faculty of involving itself in almost everything. The status of slavery in the Territories had been settled in 1820; that of slavery in the states had been settled by the Constitution; but even in minor questions the intrusive element had to be reckoned with. The Abolitionists sent their documents through the mails, and the South wished the Federal government to interfere and stop the practice. The Abolitionists persisted in petitioning Congress for the passage of various measures which Congress regarded as utterly unconstitutional; and the disposition of Congress to deny*

Texas.

Oregon.

or regulate the right of petition in such matters (see Adams, John Quincy) excited the indignation of Northern men who had no sympathy with abolition. But the first occasion on which the views of the two sections came into flat contrast was on the question of the annexation of Texas.

187. The United States had had a vague claim to Texas until 1 8 19, when the claim was surrendered to Spain in part compensa- tion for Florida. On the revolt of Mexico Texas became a part of that republic. It was colonized by Americans, mainly southerners and slave-holders, seceded from Mexico in 1835, and defeated the Mexican armies and established its independence in the following year. Southern politicians desired its annexation to the United States for many reasons.

Its people were kindred to them; its soil would widen the area of slavery; and its territory, it was hoped, could be divided into several states, to reinforce the Southern column in the Senate. People in the North were either indifferent or hostile to the proposal; Van Buren had declared against it, and his action was a reason for his defeat in the Democratic convention. On the other hand, there were indications that the joint occupation of the Oregon country could not last much longer. American immigration into it had begun, while the Hudson's Bay Company, the British tenant of the soil, was the natural enemy of immigration. To carry the sentiment of both sections, the two points were coupled; and the Democratic convention declared for the reannexation of Texas and the reoccupation of Oregon.

188. One of the cardinal methods of the political Abolitionists was to nominate candidates of their own against a doubtful friend, even though this secured the election of an

open enemy. Clay's efforts to guard his condemna- Party! tion of the Texas annexation project were just enough to push the Liberty party (q.v.), the political Abolitionists, into voting for candidates of their own in New York; on a close vote their loss was enough to throw the electoral votes of that state to Polk, and its votes decided the result. Election Polk was elected (November 1844); 1 and Texas of 1844. was annexed to the United States in the following Admission spring. At the next meeting of Congress (1845) ° Texas – Texas was admitted as a state.

189. West of Texas the northern prolongation of Mexico ran right athwart the westward movement of American population; and, though the movement had not yet reached the barrier, the Polk administration desired further acquisitions from Mexico. The western boundary of Texas was undefined; a strip of territory claimed by Teias was settled exclusively by Mexicans; but the Polk administration directed General Zachary Taylor, the American commander in Texas, to cross the Nueces river and seize the disputed territory. Collisions with Mexican troops followed; they were beaten in the battles of Palo Alto and Resaca de la Palma, and were chased across the Rio Grande. Taylor followed and took the city of Monterey.

190. On the news of the first bloodshed Congress declared war against Mexico, over the opposition of the Whigs. A land and

naval force took possession of California, and a

land expedition occupied New Mexico, so that the Mexico. authority of Mexico over all the soil north of her present boundaries was abruptly terminated (1846). At the opening of 1847 Taylor fought the last battle in northern Mexico (Buena Vista), defeating the Mexicans, and General Winfield Scott, with a new army, landed at Vera Cruz for a march upon the city of Mexico. Scott's march was marked by one successful battle after another, usually against heavy odds; and in September he took the capital city and held it until peace was made (1848) by the treaty of Guadalupe Hidalgo. Among the terms of peace was the cession of the present Cali- fornia, Utah, Arizona and New Mexico, the consideration being a payment of $15,000,000 by the United States and the assump- tion of some $3,000,000 of debts due by Mexico to American citizens. With a subsequent rectification of frontier (1853) by the Gadsden Treaty (see Gadsden, James), this cession 1 Polk received 170 electoral votes and Clay 105.

Pence.

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UNITED STATES

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WUmot Proviso.

added some 500,000 sq. m. tu che area of the United States; Texas itself made up a large additional area. The settlement of the north-east and north-west boundaries (see Maine and Oregon) by the Webster-Ashburton and Buchanan-Pakenham treaties (1842, 1846) with the Texas and Mexican cessions, gave the United States the complete territorial form retained until the annexation of Alaska in 1867.

191. In the new territory slavery had been forbidden under Mexican law; and its annexation brought up the question of Slavery la its status under American law. He who remembers the New the historical fact that slavery had never been more Territory, than a custom, ultimately recognized and protected by state law, will not have much difficulty in deciding about the propriety of forcing such a custom by law upon any part of a territory. But, if slavery was to be excluded from the new

territory, the states which should ultimately be formed out of it would enter as free states, and the influence of the South in the Senate would be decreased. For the first time the South appears as a distinct imperium in imperio in the territorial difficulties which began in 1848.

192. The first appearance of these difficulties brought out in the Democratic party a solution which was so closely in line "Squatter w i tn the prejudices of the party, and apparently so Sove- likely to meet all the wishes of the South, that it reignty." bade fair to carry the party through the crisis without the loss of its Southern vote. This was " squatter sovereignty," the notion that it would be best for Congress to leave the people of each Territory to settle the question of the existence of slavery for themselves. The broader and democratic ground for the party would have been that which it at first seemed

likely to take — the " Wilmot Proviso," a condition proposed to be added to the act authorizing acquisi- tions of territory, providing that slavery should be forbidden in all territory to be acquired under the act (see Wilmot, David). In the end apparent expediency carried the dominant party off to " squatter sovereignty," and the Demo- cratic adherents of the Wilmot Proviso, with the Liberty party and the anti-slavery Whigs, united in 1848 under the name of the Free Soil party (q.v.) . The Whigs had no solution to offer; their entire programme, from this time to their downfall as a party, consisted in a persistent effort to evade or ignore all difficulties connected with slavery.

193. Taylor, after the battle of Buena Vista, resigned and came home, considering himself ill-used by the administration.

He refused to commit himself to any party; and the Whigs were forced to accept him as their candidate in 1848. The Democrats nominated Lewis Cass; and the Free Soil party, or " Free-Soilers," nominated Van Buren. By the vote of the last-named party the Democratic candidate lost New York and the election, and Taylor was elected presi- dent, receiving 163 electoral votes, while Cass received 127. Taking office in March 1849, he had on his shoulders the whole burden of the territorial difficulties, aggravated by the discovery of gold in California and the sudden rise of population there. Congress was so split into factions that it could for a long time agree upon nothing; thieves and outlaws were too strong for the semi-

military government of California; and the Calif omians, with the approval of the president, proceeded to form a constitution and apply for admission as a state. They had so framed their constitution as to forbid slavery; and this was really the applica- tion of the Wilmot Proviso to the richest part of the new territory, and the South felt that it had been robbed of the cream of what it alone had fought cheerfully to obtain.

194. The admission of California was not secured until September 1850, soon after Taylor's sudden death (July 9), and then only by the addition of a bonus to Texas, the division of the rest of the Mexican cession into the Territories of Utah and New Mexico without prohibition of slavery, and the passage of a fugitive slave law. The slave trade, but not slavery, was forbidden in the District of Columbia. The whole was generally known as the Compro- mise Measures of 1850 {q.v.). Two of its features need notice.

Free Soli Party.

Election or 1848.

Admission of + California-

As has been said, slavery was not mentioned in the act; and the status of slavery in the Territories, was thus left uncertain. Congress can veto any legislation of a territorial legislature, but, in fact, the two houses of Congress /ˆj™ m S " were hardly ever able to unite on anything after 1850, and both these Territories did establish slavery before i860, without a Congressional veto. The advantage here was with the South. The other point, the Fugitive Slave Law (q.v.), was a special demand of the South. The Constitu- tion contained clauses directing that fugitive ˆ"" v ˆ aw , criminals and slaves should be delivered up, on requisition, by the state to which they had fled. In the case of criminals the delivery was directed to be made by the executive of the state to which they had fled; in the case of slaves no delivering authority was specified, and an act of Congress in 1793 had imposed the duty on Federal judges or on local state magistrates. Some of the states had passed " Personal Liberty Laws," forbidding or Personal limiting the action of their magistrates in such cases, Liberty and the act of 1850 transferred the decision of such taws- cases to United States commissioners, with the assistance of United States marshals. It imposed penalties on rescues, and

denied a jury trial.

195. The question of slavery had taken up so much time in Congress that its other legislation was comparatively limited. The rates of postage were reduced to five and ten cents for distances less and greater than 300 m. (184s); and the naval school at Annapolis was established in the same year. The military academy at West Point had been established as such in 1802. When the Democratic party had obtained cemplete control of the government, it re-established (by act of 6th August, 1846), the " sub-treasury," or independent treasury, which is still the basis of the treasury system.

In the same year, after an exhaustive report by t g 46 ° Robert J. Walker, Polk's secretary of the treasury, the tariff of 1846 was passed; it reduced duties, and moderated the application of the protective principle. Apart from a slight reduction of duties in 1857, this remained in force till 1861.

196. Five states were admitted during the last ten years of this period: Florida (1845), Texas u (i84s), Iowa (1846), Wisconsin (1848) and California (1850). The early entrance Ad mlssion of Iowa, Wisconsin and Florida had been due largely of Florida, to Indian wars — the Black Hawk War (see Black Iowa and Hawk) in Iowa and Wisconsin (1832), and the Semi-Wisconsin. nole War in Florida (1835-37), after each of which the defeated Indians were compelled to cede lands as the price of peace. The extinction of Indian titles in northern Michi- gan brought about the discovery of the great copper fields of that region, whose existence had been suspected long before it could be proved. Elsewhere settlement followed the lines already marked out, except in the new posses- sions on the Pacific coast, whose full possibilities were not yet known. Railways in the Eastern states were beginning to show something of a connected system; in the South Railways they had hardly changed since 1840; in the West and they had only been prolonged on their original lines. Telegraphs. The telegraph was brought into use in 1844; but it is not until the census of i860 that its effects are seen in the fully connected network of railways which then covers the whole North and West.

197. The sudden development of wealth in the country gave an impetus to the spirit of invention. Charles Goodyear's method of vulcanizing rubber (1839) had come into

use. Cyrus Hall M'Cormick had made an invention whose results have been hardly less than that of the locomotive in their importance to the United States. He had patented a reaping machine in 1834, and this, further improved and supplemented by other inventions, had brought into play the whole system of agricultural machinery, whose existence was scarcely known elsewhere until the London " World's Fair " of 1 8 5 1 brought it into notice. A successful sewing-machine came in 1846; the power-loom and the surgical use of anaesthetics in the same year; and the rotary press for printing in 1847.

J02

UNITED STATES

[HISTORY 1 850-1861

The South.

198. All the conditions of life were changing so rapidly that it was natural that the minds of men should change with them or become unsettled. This was the era of new sects, of communities, of fantastic proposals of every kind, of transcendentalism in literature, religion, and politics. Not the most

fantastic or benevolent, but certainly the most Aiormons successful, of these was the sect of Mormons or

Latter-day Saints. They settled in Utah in 1847, calling their capital Salt Lake City, and spreading thence through the neighbouring Territories. They became a menace to the American system; their numbers were so great that it was against American instincts to deprive them of self-government; while their polygamy and total submission to their hierarchy made it impossible to erect them into a state having complete control of marriage and divorce. The difficulty was lessened by their renunciation of polygamy in 1890 (see Mormons).

199. The material development of the United States since 1830 had been extraordinary, but every year made it more

evident that the South was not sharing in it. It is plain now that the fault was in the labour system of the South: her only labourers were slaves, and a slave who was fit for anything better than field labour was prima facie a dangerous man. The

divergence had as yet gone only far enough to awaken intelligent men in the South to its existence, and to stir them to efforts as hopeless as they were earnest, to find some artificial stimulus for Southern industries. In the next ten years the process was to show its effects on the national field.

J. — Tendencies to Disunion, 1850-1861.

200. »The Abolitionists had never ceased to din the iniquity of slavery into the ears of the American people. Calhoun, Slavery Webster and Clay, with nearly all the other political and the leaders of 1850, had united in deploring the wicked- Sectloos. ness f these fanatics, who were persistently stirring up a question which was steadily widening the distance between the sections. They mistook the symptom for the disease. Slavery itself had put the South out of harmony with its surroundings. Even in 1850, though they hardly yet knew it, the two sections had drifted so far apart that they were practically two different countries.

201. The South remained much as in 1790; while other parts

*of the country had developed, it had stood still. p**^' r s /f ve The remnants of colonial feeling, of class influence,*

which advancing democracy had wiped out else- where, retained all their force here, aggravated by the effects of an essentially aristocratic system of employment. The ruling class had to maintain a military control over the labouring class, and a class influence over the poorer whites. It had even secured in the Constitution provision for its political power in the representation given to three-fifths of the slaves. The twenty additional members of the House of Representatives were not simply a gain to the South; they were still more a gain to the " black districts," where whites were few, and the slave-holder controlled the district. Slave-owners and slave-holders together, there were but 350,000 of them; but they had common interests, the intelligence to see them, and the courage to con- tend for them. The first step of a rising man was to buy slaves; and this was enough to enrol him in the dominant class. From it were drawn the representatives and senators in Congress, the governors, and all the holders of offices over which the " slave power," as it came to be called, had control. Not only was the South inert;' its ruling class, its ablest and best men, united in defence of tendencies hostile to those of the

rest of the country.

202. Immigration into the United States was not an im- portant factor in its development until about 1847. The

immigrants, so late as 1820, numbered but 8000 per immigra- annum . their number did not touch 100,000 until

1842, and then it fell for a year or two almost to half that number. In 1847 it rose again to 235,000, in 1849 to 300,000, and in 1850 to 428,000; all told, more than two and a quarter million persons from abroad settled in the United States between 1847 and 1854. Leaving out the dregs of the immigra-

tion, which settled down in the seaboard cities, its best part was a powerful nationalizing force. It had not come to any particular state, but to the United States; it had none of the traditional prejudices in favour of a state, but a strong feeling for the whole country; and the new feelings which it brought in must have had their weight not only on the gross mass of the people, but on the views of former leaders. And all the influences of this enormous immigration were confined to the North and West. The immigration avoided slave soil as if by instinct. So late as 1880 the census reported that the Southern states, except Florida, Louisiana and Texas, are " practically without any foreign element "; but it was only in 1850-1860 that this differentiating circumstance began to show itself plainly. And, as the sections began to differ further in aims and policy, the North began to gain heavily in ability to ensure its success.

203. Texas was the last slave state ever admitted; and, as it refused to be divided, the South had no further increase of numbers in the Senate. Until 1850 the admission

of a free state had been so promptly balanced by)n congress. the admission of a slave state that the senators of the two sections had remained about equal in number; in i860 the free states had 36 senators and the slave states only 30. As the representation in the House had changed from 35 free state and 30 slave state members in 1790 to 147 free state and 90 slave state in i860, and as the number of presidential electors is the sum of the numbers of senators and representa- tives, political power had passed away from the South in 1850. If at

any time the free states should unite they could control the House of Representatives and the Senate, elect the president and vice-president, dictate the appointment of judges and other Federal officers, and make the laws what they pleased. If pressed to it, they could even control the interpretation of the laws by the Supreme Court. No Federal judge could be removed except by impeachment, but an act of Congress could at any time increase the number of judges to any extent, and the appointment of the additional judges could reverse the opinion of the court.

204. In circumstances so critical a cautious quiescence and avoidance of public attention was the only safe course for the " slave power," but that course had become im- possible. The numbers interested had become too J^"^ large to be subject to complete discipline; all could

not be held in cautious reserve; and, when an advanced proposal came from any quarter of the slave-holding lines, the whole army was shortly forced up to the advanced position. Every movement of the mass was necessarily aggressive; and aggression meant final collision. If collision came it must be on some question of the rights of the states; and on such a question the whole South would move as one man.

205. The Protestant churches of the United States had reflected in their organization the spirit of the political in- stitutions under which they lived. Acting as purely voluntary associations, they had been organized oMsioa'! into governments by delegates, much like the

" conventions " which had been evolved in the political parties. The omnipresent slavery question intruded into these bodies, and split them. The Methodist Episcopal Church was thus divided into a Northern and a Southern branch in 1844, and the equally powerful Baptist Church met the same fate in the following year. Two of the four great Protestant bodies were thus no longer national; it was only by the most careful management that the integrity of the Presbyterian Church was maintained until 1861, when it also yielded; and only the Episcopal and Roman Catholic Churches retained their national character.

206. The political parties showed the same tendency. Each began to shrivel up in one section or the other. The notion of "

squatter sovereignty," attractive at

first to the Western democracy, and not repudiated changes. by the South, enabled the Democratic party to pass the Crisis of 1850 without losing much of its Northern vote, while Southern Whigs began to drift in, making the party continually

more pro-slavery. This could not continue long without

beginning to decrease its Northern vote, but this effect did not

become plainly visible until after 1852. The efforts of the

Whig party to ignore the great question alienated its anti-slavery

members in the North, while they did not satisfy its Southern

members. The Whig losses were not at first heavy, but, as the

electoral vote of each state is determined by the barest plurality

of the popular vote, they were enough to defeat the party almost

everywhere in the presidential election of 1852. The Whigs

nominated General Winfield Scott and the Democrats Election

of 1852. Franklin Pierce; and Pierce carried all but four of the thirty-one states, and was elected, receiving 254 out of the 296 electoral votes. This revelation of hopeless weakness was the downfall of the Whig party; it maintained its organization for four years longer, but the life had gone out of it. The future was with the Free Soil party, though it had polled but few votes in 1852.

207. During the administration of Taylor (and Vice-Pre- sident Millard Fillmore, who succeeded him) Clay, Webster,

Calhoun, Polk and Taylor were removed by Leadership, death, and there was a steady drift of other political

leaders out of public life. New men were push- ing in everywhere, and in both sections they showed the prevailing tendency to disunion. The best of them were unprecedentedly radical. Charles Sumner, William H. Seward, and Salmon P. Chase came into the Senate, bringing the first accession of recognized force and ability to the anti- slavery feeling in that body. The new Southern men, such as Jefferson Davis, and the Democratic recruits from the Southern Whig party, such as Alexander H. Stephens, were ready to take the ground on which Calhoun had always insisted — that Con- gress was bound not merely to the negative duty of not attacking slavery in the Territories, but to the positive duty of protecting it. This, if it should become the general Southern position, was certain to destroy the notion of "squatter sovereignty," and thus to split the Democratic party, which was almost the last national ligament that now held the two fragments of the Union together.

208. The social disintegration was as rapid. Northern men travelling in the South were naturally looked upon with

increasing suspicion, and were made to feel that they Dˆerreace were on a so ˆ alien in sympathies. Some of the worst phases of democracy were called into play in the South; and, in some sections, law openly yielded supremacy to popular passion in the cases of suspected Abolitionists. Southern conventions, on all sorts of subjects, became common; and in these meetings, permeated by a dawning sense of Southern nationality, hardly any proposition looking to Southern independence of the North was met with disfavour. 20Q. Calhoun, in his last and greatest speech, called attention to the manner in which one tie after another was snapping. But he ignored the real peril of the situation — its oSon" dangerous facts: that the South was steadily grow- ing weaker in comparison with the North, and more unable to secure a wider area for the slave system; that it was therefore being steadily forced into demanding active Congressional protection for slavery in the Territories; that the North would never submit to this; and that the South must submit or bring about a collision by attempting to secede.

210. Anti-slavery feeling in the North was stimulated by the manner in which the Fugitive Slave Law was enforced

immediately after 1850. The chase after fugitive Slave Law s l aves was prosecuted in many cases with circum- stances of revolting brutality, and features of the slave system which had been tacitly looked upon as fictitious were brought home to the heart of the free states. (See Fugitive Slave Laws.) The added feeling showed its force when the Kansas- Nebraska Act was passed by Congress (1854). It organized the two new Territories of Kansas- K ansas anc [Nebraska. Both of them were for ever Act. free soil by the terms of the Missouri Compromise

(q.v.). But the success of the notion of squatter sovereignty in holding the Democratic party together while

destroying the Whig party had intoxicated Stephen A. Douglas (q.v.), and other Northern Democrats; and they now applied the doctrine to these Territories. They did not desire " to vote slavery up or down," but left the decision to the people of the two Territories and the essential feature of the Missouri Compromise was specifically repealed.

*2ii. This was the grossest political blunder in American history. The status of slavery had been settled, by the Con- stitution or by the compromises of 1820 and 1850, on every square foot of American soil; right or wrong, the settlement was made. The Kansas-Nebraska Act took a great mass of territory out of the settlement and flung it into the arena as a prize for which the sections were to struggle. The first result of the act was to throw parties into chaos. An American or " Know- Nothing" (q.v.) party, a secret oath-bound organiza- The tion, pledged to oppose the influence or power of "American foreign-born citizens, had been formed to take the place p *rty" of the defunct Whig party. It had been quite successful in state elections for a time, and was now beginning to have larger aspirations. It, like the Whig party, intended to ignore slavery, but, after a few years of life, the questions com- plicated with slavery entered its organization and divided it also. Even in 1854 many of its leaders in the North were forced to take position against the Kansas-Nebraska Act, while hosts of others joined in the opposition without any party organiza- tion. No American party ever rose sc swiftly as this latter; with no other party name than the awkward The title of " Anti-Nebraska men," it carried the Republican Congressional elections of 1854 at the North, forced Part y- many of the former Know-Nothing leaders into union with it, and*

controlled the House of Representatives of the Congress which met in 1855. The Democratic party, which had been practically the only party since 1852, had now to face the latest and strongest of its broad-constructionist . opponents, one which with the nationalizing features of the Federalist and Whig parties combined democratic feelings and methods, and, above all, had a democratic purpose at bottom. It acknowledged, at first, no purpose aimed at slavery, only an intention to ex- clude slavery from the Territories; but, under such principles, it was the only party which was potentially an anti-slavery party, the only party to which the enslaved labourer of the South could look with the faintest hope of aid in reaching the status of a man. The new party had grasped the function which belonged of right to its great opponent, and it seized with it its opponent's original title. The name Democrat had quite taken the place of that first used — Republican — but the latter had never passed out of popular remembrance and liking at the North. The new party took quick and skilful advantage of this by assuming the old name (see Republican Party), and early in 1856 the two great parties of the present — Democratic and Republican — were drawn up against one another.

212. The foreign relations of the United States during Pierce's term of office were overshadowed by the domestic difficulties, but were of importance. In the Koszta case (1853) national protection had been afforded Koszta on foreign soil to a person who had only taken the preliminary steps to naturalization (see Marcy, W. L.). Japan had been opened to American intercourse and commerce (1854). But the question of slavery was more and more thrusting itself even into foreign relations. A great Southern republic, to be founded at first by the slave states, but to take in gradually the whole territory around the Gulf of Mexico and include the West Indies, was soon to be a pretty general ambition among slave-holders, and its first phases appeared during Pierce's administration. Efforts were begun to obtain Cuba from Spain; and the three leading American ministers abroad, meeting at Ostend, ostend united in declaring the possession of Cuba to be Manifesto; essential to the well-being of the United States Filibuster- (1854). (See Buchanan, James.) " Filibustering " '"■?■ expeditions against Cuba or the smaller South American states, intended so to revolutionize them as to lay a basis for an

Japan.

application to be annexed to the United States, became common, and taxed the energies of the Federal government. But these yielded in importance to the affairs in Kansas.

213. Nebraska was then supposed to be a desert, and attention was directed almost exclusively to Kansas. No sooner Kansas ˆad ‘ ts organization left the matter of slavery to be

decided by its ” people ” than the anti-slavery people of the North and West felt it to be their duty to see that the ” people ” of the Territory should be anti-slavery in sympathy. Emigrant associations were formed, and these shipped men and families to Kansas, arming them for their protection in the new country. Southern newspapers called for similar measures in the South, but the call was less effective. Southern men without slaves, settling a new state, were un- comfortably apt to prohibit slavery, as in California. Only slave- holders were trusty pro-slavery men; and such were not likely to take slaves to Kansas and risk their ownership on the result of the struggle. But for the people of Missouri, Kansas would have been free soil at once. Lying across the direct road to Kansas, the Missouri settlers blockaded the way of free-state settlers, crossed into Kansas, and voted profusely at the first Territorial election. The story of the contest between the free- state and pro-slavery settlers is told elsewhere (see Kansas: § History) ; here it need only be said that the struggle passed into a real civil war, the two powers mustering considerable armies, fighting battles, capturing towns and paroling prisoners. The struggle was really over in 1857, and the South was beaten. There were, however, many obstacles yet to be overcome before the new state of Kansas was recognized by Congress, after the withdrawal of the senators of the seceding states (1861).

214. In the heat of the Kansas struggle came the presidential election of 1856. The Democrats nominated James Buchanan,

declaring, as usual, for the strictest limitations of ofisst tne P owers OI tri e Federal government on a number

of points specified, and reaffirming the principle of the Kansas-Nebraska Act — the settlement of slavery by the people of a Territory. The remnant of the Whig party, including the Know-Nothings of the North and those Southern men who wished no further discussion of slavery, nominated the president who had gone out of office in 1853, Millard Fill- more. The Republican party nominated John C. Fremont; the bulk of its manifesto was taken up with protests against attempts to introduce slavery into the Territories; but it showed its broad-construction tendencies by declaring for appropriations of Federal moneys for internal improvements. The Democrats were successful in electing Buchanan; 1 but the position of the party was quite different from the triumph with which it had come out of the election of 1852. It was no longer master of twenty-seven of the thirty-one states; all New England and New York, all the North-West but Indiana and Illinois, all the free states but five, had gone against it; its candidate no longer had a majority of the popular vote. For the first time in the history of the country a distinctly anti- slavery candidate had obtained an electoral vote, and had even come near obtaining the presidency. Fillmore had carried but one state, Maryland; Buchanan had carried the rest of the South, with a few states in the North, and Fremont the rest of the North and none of the South. If things had gone so far that the two sections were to be constituted into opposing political parties, it was evident that the end was near.

215. Oddly enough the constitutionality of the Compromise of 1820 had never happened to come before the Supreme Court TheDred for consideration. In 1856-1857 it came up for Scott the first time. One Dred Scott, a Missouri slave Decision. wno had been taken in 1834 to Illinois, a free state, and in 1836 to Minnesota, within the territory covered by the Compromise, and had some years after being taken back to Missouri in 1838 sued for his freedom, was sold (1852) to a citizen of New York. Scott then transferred his suit from

'Buchanan received 174 electoral votes, Fremont 114 and Fillmore 8. The popular vote was: for Buchanan, 1,838,169; for FrSmi ut, 1.341,264; for Fillmore, 874,534.

the state to the Federal courts, under the power given them to try suits between citizens of different states, and the case came by appeal to the Suprsme Court. Its decision, announced on the 6th of March 1857, put Scott out of court on the ground that a

slave, or the descendant of slaves, could not be a citizen of the United States or have any standing in Federal courts. The opinion of Chief Justice Taney went on to attack the validity of the Missouri Compromise, for the reasons that one of the Constitutional functions of Congress was the protection of property; that slaves had been recognized as property by the Constitution, and that Congress was bound to protect, not to prohibit, slavery in the Territories. 2 The mass of the Northern people held that slaves were looked upon by the Constitution, not as property, but as " persons held to service or labour " by state laws; that the Constitutional function of Congress was the protection of liberty as well as of property; and that Congress was thus bound to prohibit, not to protect, slavery in the Territories. A large part of the North flouted the decision of the Supreme Court, and the storm of angry dissent which it aroused did the disunionists good service at the South. From this time the leading newspapers in the South maintained that the radical Southern view first advanced by Calhoun, and but slowly accepted by other Southern leaders, as to the duty of Congress to protect slavery in the Territories, had been confirmed by the Supreme Court; that the Northern Republicans had rejected it; even the " squatter sovereignty " of North- ern Democrats could no longer be submitted to by the South.

*216. The population of the United States in i860 was over 31,000,000, an increase of more than 8,ooo,coo in ten years. As the decennial increases of population became Admission larger, so did the divergence of the sections in popu- of Minnesota lation, and still more in wealth and resources. Two and 0re zon. more free states came in during this period — Minnesota (1858) and Oregon (1859) — and Kansas was clamouring loudly for the same privilege. The free and slave states, which had been almost equal in population in 1790, stood now as 19 to 12. And of the 12,000,000 in slave states, the 4,000,000 slaves and the 250,000 free blacks were not so much a factor of strength as a possible source of weakness and danger. No serious slave rising had ever taken place in the South; but John Brown's John attack (1859) on Harper's Ferry as the first move Brown's in a project to rouse the slaves (see Brown, John), * aW- and the alarm which it carried through the South, were tokens of a danger which added a new horror to the chances of civil war. It was not wonderful that men, in the hope of finding some compromise by which to avoid such a*

catastrophe, should be willing to give up everything but principle, nor that offers of compromise should urge Southern leaders further into the fatal belief that " the North would not fight."

217. Northern Democrats, under the lead of Douglas, had been forced already almost to the point of revolt by the determination of Southern senators to prevent the admission of Division Kansas as a free state, if not to secure her admission 0/ the

as a slave state. When the Democratic convention Democratk of i860 met at Charleston the last strand of the last national political organization parted; the Democratic party itself was split at last by the slavery question. The Southern dele- gates demanded a declaration in favour of the duty of Congress to protect slavery in the Territories. It was all that the Douglas Democrats could then do to maintain themselves in a few Northern states; such a declaration meant political suicide every- where, and they voted it down. The convention divided into two bodies. The Southern body adjourned to Richmond, and the Northern and Border state convention to Baltimore. Here the Northern delegates, by seating some delegates friendly to Douglas,

2 In his decision Taney, referring to the period before the adoption of the Constitution, wrote: " They (negroes) had for more than a century before been regarded as beings of an inferior order, and altogether unfit to associate with the white race, either in social or political relations; and so far inferior that they had no rights which the white man was bound to respect." This was intended to be merely a historical statement, but it is often incorrectly quoted as if it referred to the status of the negro in 1857. ,

provoked a further secession of border state delegates, who, in company with the Richmond body, nominated John C. Breckin- ridge (q.v.) and Joseph Lane for president and vice-president. The remainder of the original convention nominated Douglas

and H. V. Johnson.

*218. The remnant of the old Whig and Know-Nothing parties, now calling itself the Constitutional Union party, met CoastHu- a *- Baltimore and nominated John Bell (q.v.) tioaal Union and Edward Everett. The Republican convention Party; met at Chicago. Its " platform " of 1856 had*

Repubican ˆ een somewhat broad-constructionist in its nature and leanings, but a strong Democratic element in the party had prevented it from going too far in this direction. The election of 1856 had shown that, with the votes of Pennsylvania and Illinois, the party would have then been successful, and the Democratic element was now ready to take almost anything which would secure the votes of these states. This state of affairs will go to explain the nomina- tion of Abraham Lincoln, of Illinois, for president, with Hannibal Hamlin, a former Democrat, for vice-president, and the declaration of the platform in favour of a protective tariff. The mass of the platform was still devoted to the necessity of excluding slavery from the Territories. To sum The Parties U P : tne ˆ e ˆ P art y wished to have no discussion of and slavery slavery; the Douglas Democrats rested on " squatter intheTerri- sovereignty" and the Compromise of 1850, but would tories. accept the decision of the Supreme Court; the Republicans demanded that Congress should legislate for the prohibition of slavery in the Territories; and the Southern Democrats demanded that Congress should legislate, for the protection of slavery in the Territories.

210. No candidate received a majority of the popular vote, Lincoln standing first and Douglas second. But Lincoln and Hamlin had a clear majority of the electoral of i860. vote, and so were elected, Breckinridge and Lane coming next. 1 It is worthy of mention that, up to the last hours of Lincoln's first term of office, Congress would always have contained a majority opposed to him but for the absence of the members from the seceding states. The interests of the South and even of slavery were thus safe enough under an anti-slavery president. But the drift of events was too plain. Nullification had come and gone, and the nation feared it no longer. Even secession by a single state was now almost out of the question; the letters of Southern governors in i860, in consultation on the state of affairs, agree that no state would secede without assurances of support by others. If this crisis were allowed to slip by without

action, even a sectional secession would soon be impossible.

220. In October i860 Governor W. H. Gist, of South Carolina, sent a- letter to the governor of each of the other cotton states Secession. exce Pt Texas, asking co-operation in case South Carolina should resolve upon secession, and the replies were favourable. The democratic revolution which, since 1829, had compelled the legislature to give the choice of presi- dential electors to the people of the states had not affected South Carolina; her electors were still chosen by the legislature. That body, after having chosen the state's electors on the 6th of Novem- ber, remained in session until the telegraph had brought assurances that Lincoln had secured a sufficient number of electors to ensure his election; it then (on the 10th) summoned a state convention and adjourned. The state convention, which is a legislative body chosen for a special purpose, met first at Columbia and then at Charleston, and on the 20th of December unanimously passed an " ordinance of secession," repealing the acts by which the state had ratified the Constitution and its amendments, and dissolving " the union now subsisting between South Carolina and other states, under the name of the ' United States of America.' " The convention took all steps necessary to prepare for war, and adjourned. Similar ordinances were passed by conventions in

' 'Lincoln received 180 electoral votes, Breckinridge 72, Bell 39 and Douglas 12. Their popular votes were 1,866,352, 847,514, 587,830 and 1,375.157 respectively.

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Mississippi (Jan. 9, 1861), Florida (Jan. 10), Alabama (Jan. 11), Georgia (Jan. 19), Louisiana (Jan. 26) and Texas (Feb. 1).

221. The opposition in the South did not deny the right to secede, but the expediency of its exercise. Their effort was to elect delegates to the state conventions The Argw who would vote not to secede. They were beaten, meat tor says A. H. Stephens, by the cry, originally uttered Secessi »n. by T. R. R. Cobb before his state legislature (Nov. 12, i860), " we can make better terms out of the Union than in it." That is, the states were to withdraw individually, suspend the functions of the Federal government within their juris- diction for the time, consider maturely any proposals for guarantees for their rights

in the Union, and return as soon as satisfactory guarantees should be given. A second point to be noted is the difference between the notions Action at of a state convention prevalent in the North tne state and in the South. The Northern state convention ˚ efl ‘ was generally considered as a preliminary body,

whose action was not complete or valid until ratified by a popular vote. The Southern state convention was looked upon as the incarnation of the sovereignty of the state, and its action was not supposed to need a popular ratification. When the conventions of the seceding states had adopted the ordinances of secession, they proceeded to other business. They appointed delegates, who met at Montgomery, the capital of Alabama, formed a provisional constitution (Feb. 8) for the ” Confederate States,” chose a provisional president and vice-president (Jefferson Davis and federate A. H. Stephens), and established an army, treasury, states.” and other executive departments. The president and vice-president were inaugurated on the 18th of February. The permanent constitution, adopted on the nth of March, was copied from that of the United States, with variations meant to maintain state sovereignty, to give the cabinet seats in Congress, and to prevent the grant of bounties or any protective features in the tariff or the maintenance of internal improvements at general expense; and it expressly provided that in all the territory belonging to the Confederacy but lying without the limits of the several states ” the institution of negro slavery, as it now exists in the Confederate States, shall be recognized and protected by Congress and by the Territorial government ” (see Confederate States oe America).

222. Under what claim of Constitutional right all this was done passes comprehension. That a state convention should have the final power of decision on the consthu- question which it was summoned to consider is tional quite as radical doctrine as has yet been heard R te hts – of; that a state convention, summoned to consider the one question of secession, should go on, with no appeal to any further popular authority or mandate, to send delegates to meet those of other states and form a new national govern- ment, which could only exist by warring on the United States, is a novel feature in American Constitutional law. It was revolution or nothing. Only in Texas, where the call of the state convention was so irregular that a popular vote could hardly be escaped, was any

popular vote allowed. Elsewhere the functions of the voter ceased when he voted for delegates to the state convention; he could only look on helplessly while that body went on to constitute him a citizen of a new nation.

223. The Border states were in two tiers— North Carolina, Tennessee and Arkansas next to the seceding states, and Dela ware, Maryland, Virginia, Kentucky and Missouri TheBordet next to the free states. None of these was willing Slates ,

to secede. There was, however, one force which might draw them into secession. A state which did not wish to secede, but believed in state sovereignty and the abstract right of secession, would be inclined to take up arms to resist any attempt by the Federal government to coerce a seceding state. In this way, in the following spring, the original seven seceding states were reinforced by four of the Border states.

224. In the North and West surprisingly little attention was given to the systematic course of procedure along the

Gulf. The people of those sections were very busy; they had heard much of this talk before, and looked upon it as a kind

of stage-thunder, the inevitable accompaniment of the North. recent presidential elections. Republican politicians,

with the exception of a few, were inclined to refrain from public declarations of intention. Some of them such as Seward, showed a disposition to let the " erring sisters " depart in peace, expecting to make the loss good by accessions from Canada. A few, like Senator Zachariah Chandler, believed that there would be " blood-letting," but most of them were still doubtful as to the future. In the North the leaders and the people generally shrank from the prospect of war, and many were prepared to make radical concessions to avert hostilities. Among the various proposals to this end that offered in the Senate by John J. Crittenden, of Kentucky, and known as the Crittenden Compromise, was perhaps received with most favour. This took the form of six proposed amend- ments to the

Constitution, of which two were virtually a re- phrasing of the essential feature of the Missouri Compromise and of the principle of popular or squatter sovereignty, and others provided that the national government should pay to the owner of any fugitive slave, whose return was prevented by opposition in the North, the full value of such slave, and prohibited the abolition of slavery in the District of Columbia" so long as it exists in the adjoining states of Virginia and Maryland or either." This proposed compromise was rejected by the Senate by a close vote on the 2nd of March 1861. A Peace Congress, called by Virginia, met in Washington from the 4th to the 27th of February 1861, 21 states being represented, and proposed a consti- tutional amendment embodying changes very similar to those of the Crittenden Compromise, but its proposal was not acted upon by Congress. Democratic politicians were hide-bound by their repetition of the phrase " voluntary Union " ; they had not yet hit upon the theory which carried the War Democrats through the final struggle, that the sovereign state of New York could make war upon the sovereign state of South Carolina for the unfriendly act of secession, and that the war was waged by the non-seceding against the seceding states. President Buchanan publicly condemned the doctrine of secession, though he added a confession of his inability to see how secession was to be pre- vented if a state should be so wilful as to attempt it. Congress Admission ˆd nothing, except to admit Kansas as a free state of Kansas; and adopt the protective Morrill tariff; even after Morrill its members from the seceding states had withdrawn, Ism"" those who remained made no preparations for

conflict, and, at their adjournment in March 1861, left the Federal government naked and helpless.

225. The only sign of life in the body politic, the half-awakened word of warning from the Democracy of the North and West, Th "w was ' ts c h°i ce °f governors of states. A remark- Ooveraors." aD ˆ e S rou P °f men, soon to be known as the " war

governors " — Israel Washburn of Maine, Erastus Fairbanks of Vermont, Ichabod Goodwin of New Hampshire, John Albion Andrew of Massachusetts, William Sprague of Rhode Island, William Alfred Buckingham of Connecticut, Edwin Dennison Morgan of New York, Charles Smith Olden of New Jersey, Andrew Gregg Curtin of Pennsylvania, William Dennison of

Ohio, Oliver Perry Morton of Indiana, Richard Yates of Illinois, Austin Blair of Michigan, Alexander Williams Randall of Wisconsin, Samuel Jordan Kirkwood of Iowa, and Alexander Ramsey of Minnesota — held the executive powers of the Northern states in 1861-1862. Some of these governors, such as Andrew and Buckingham, as they saw the struggle come nearer, went so far as to order the purchase of warlike material for their states on their private responsibility, and their action saved days of time.

226. The little army of the United States had been almost Seizure of P ut out of consideration; wherever its detachments United could be found in the South they were sur- states rounded and forced to surrender and were trans-

Property.

of the states even before it, the forts, arsenals, mints, custom-

ferred to the North. After secession, and in some

houses, ship-yards and public property of the United States had been seized by authority of the state, and these were held until transferred to the new Confederate States organization. In the first two months of 1861 the authority of the United States was paralysed in seven states, and in at least seven more its future authority seemed of very doubtful duration.

227. Only a few forts, of all the magnificent structures with which the nation had dotted the Southern coast, remained to it — the forts near Key West, Fortress Monroe at the Position ot mouth of Chesapeake Bay, Fort Pickens at Pensa- the Remain- cola and Fort Sumter in Charleston harbour. Both ln x Forts. the last-named were beleaguered by hostile batteries, but the administration of President Buchanan, intent on maintaining the peace until the new administration should come in, instructed their commanding officers to refrain from any acts tending to open conflict. The Federal officers, therefore, were obliged to look idly on while every preparation was made for their destruction, and even while a vessel bearing supplies for Fort Sumter was driven back by the batteries between it and the sea.

228. The divergence between the two sections of the country had thus passed into disunion, and was soon to pass into open

hostility. The legal recognition of the custom

of slavery, acting upon and reacted upon by every ˆ2™' step in their economic development and every difference in their natural characteristics, surroundings and institutions, had carried North and South further and faster apart, until the elements of a distinct nationality had appeared in the latter. Slavery had had somewhat the same effect on the South that democracy had had on the colonies. In the latter case the aristocracy of the mother-country had made a very feeble struggle to maintain the. unity of its empire. It remained to be seen, in the American case, whether democracy would do better.

K. — The Civil War, 1 861-186 5.

229. Secession had taken away many of the men who had for years managed the Federal government, and who under- stood its workings. Lincoln's party was in power embarrass- for the first time; his officers were new to the mentsofthe routine of Federal administration; and the circum- Government. stances with which they were called upon to deal were such as to daunt any spirit. The government had become so nearly bankrupt in the closing days of Buchanan's administration that it had only escaped by paying double interest, and that by the special favour of the New York banks, which obtained in return the appointment of John A. Dix as secretary of the treasury. The army had been almost broken up by captures of men and material and by resignations of competent and trusted officers. The navy had come to such a pass that, in February 1 86 1, a House committee reported that only two vessels, one of twenty, the other of two guns, were available for the defence of the entire Atlantic coast. And, to complicate all difficulties, a horde of clamorous office-seekers crowded Washington.

230. Before many weeks of Lincoln's administration had passed, the starting of an expedition to provision Fort Sumter brought on an attack by the batteries around the Pori fort, and after a bombardment of 36 hours the Sumter. fort surrendered (April 14, 1861). It is not necessary R'singin to rehearse the familiar story of the outburst of ineNortn – feeling which followed this event and the proclamation of President Lincoln calling for volunteers. The 75,000 volunteers called for were supplied three or four times over, and those who were refused felt the refusal as a personal deprivation.

231. There had been some belief in the South that the North-West would take no part in the impending conflict, and that its people could be persuaded to keep up friendly relations with the new nationality until ™ e s s ” orU ” the final treaty of peace should establish all the fragments of the late Union upon an. international basis. In the spring months of 1861 Douglas, who had long beea

denounced as the tool of the Southern slave-holders, was spending the closing days of life in expressing the determination of the North- West that it would never submit to have ” a line of custom-houses ” between it and the ocean. The Viatteries which Confederate authority was erecting on the banks of the Mississippi were fuel to the flame. Far-off California, which had been considered neutral by all parties, pronounced as unequivocally for the national authority.

232. The shock of arms put an end to opposition in the South as well. The peculiar isolation of life in the South

precluded the more ignorant voter from any com- the° State”” parisons of the power of his state with any other;

to him it was almost inconceivable that his state should own or have a superior. The better educated men, of wider experience, had been trained to think state sovereignty the foundation of civil liberty, and, when their state spoke, they felt bound to ” follow their state.” The president of the Confederate States issued his call for men, and it also was more than met.

233. Lincoln’s call for troops met with an angry reception wherever the doctrine of state sovereignty had a foothold.

The governors of the Border states generally States. returned it with a refusal to furnish any troops.

Two states, North Carolina and Arkansas, seceded and joined the Confederate States. In two others, Virginia and Tennessee, the state politicians formed ” military leagues ” with the Confederacy, allowing Confederate troops to take possession of

the states, and then submitted the question of secession to " popular vote." The secession of these states was thus accomplished, and Richmond became the Confederate capital. The same process was attempted in Missouri, but failed, and the state remained loyal. The politician class in Maryland and Kentucky took the extraordinary course of attempting to maintain neutrality; but the growing power of the Federal government soon enabled the people of the two states to resume control of their governments and give consis- tent support to the Union. Kentucky, however, had troops in the Confederate armies; and one of her citizens, the late vice-president, John C. Breckinridge, left his place in the Senate and became an officer in the Confederate service. Delaware cast her lot from the first with the Union.

234. The first blood of the war was shed in the streets of Baltimore, when a mob attempted to stop Massachusetts troops

on their way to Washington (April 19). For a time

there was difficulty in getting troops through Mary- land because of the active hostility of a part of its people, but this was overcome, and the national capital was made secure. The Confederate lines had been pushed up to Manassas Junction, about 30 m. from Washington. When Congress, called into special session by the president for the 4th of July, came together, the outline of the Confederate States had been fixed. Their line of defence held the left bank of the Potomac from Fortress Monroe nearly to Washington; thence, at a distance of some 30 m. from the river, to Harper's Ferry; thence through the mountains of western Virginia and the southern part of Kentucky, crossing the Mississippi a little below Cairo; thence through southern Missouri to the eastern border of Kansas; and thence south-west through the Indian Territory and along the northern boundary of Texas to the Rio Grande. The length of the line, including also the Atlantic and Gulf coasts, has been estimated at 11,000 m. The territory within it comprised about 800,000 sq. m., with a population of over 9,000,000 and great natural resources. Its cotton was almost essential to the manufactories of the world; in exchange for it every munition of war could be procured; and it was hardly possible to

blockade a coast over 3000 m. in length, on which Blockade. tne blockading force had but one port of refuge, and

that about the middle of the line. Nevertheless President Lincoln issued his first call for troops on the 15th of April, President Davis then issued a proclamation (on the 17th) offering letters of marque and reprisal against the com- merce of the United States to private vessels, and on the 19th

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Lincoln answered with a proclamation announcing the blockade of the Southern coast. The news brought out proclamations of neutrality from Great Britain and France, and, according to subsequent decisions of the Supreme Court,' made the struggle a civil war, though the minority held that this did not occur legally until the act of Congress of the 13th of July 1861, authorizing the president, in case of insurrection, to shut up ports and suspend commercial intercourse with the revolted district.

235. The president found himself compelled to assume powers never granted to the executive authority, trusting to the subsequent action of Congress to validate his suspension action. He had to raise and support armies and of "Habeas navies; he even had to authorize seizures of neces- Corpus." sary property, of railroad and telegraph lines, arrests of suspected persons, and the suspension of the writ of habeas corpus in certain districts. Congress supported him, and proceeded in 1863 to give the president power to suspend the writ anywhere in the United States; this power he promptly ex- ercised. The Supreme Court, after the war, in the Milligan case (4 Wallace, 133) decided that no branch of the government had power to suspend the writ in districts where the courts were open — that the privilege of the writ might be suspended as to persons properly involved in the war, but that the writ was still to issue, the court deciding whether the person came within the classes to whom the suspension applied. This decision, however, did not come until " arbitrary arrests," as they were called, had been a feature of the entire war. A similar suspension took place in the Confederate States.

236. When Congress met (July 4, 1861) the 'absence of Southern members had made it heavily Republican. It decided to consider no business but that connected

with the war, authorized a loan and the raising Con ˆ ress ' of 500,000 volunteers, and made confiscation of property a

penalty of rebellion. While it was in session the first serious battle of the war — Bull Run, or Manassas — took place (July 21), and resulted in the defeat of the Federal army. (For this and the other battles BullRua – of the war see American Civil War, and the supplementary articles dealing with particular battles and campaigns.) The over-zealous action of a naval officer in taking the Confederate envoys James M. Mason and John Slidell out of the fhe British steamer Trent" sailing between two neutral "Trent" ports almost brought about a collision between Case ' , the United States and Great Britain in November. But the American precedents were all against the United States, and the envoys were given up.

237. The broad-construction tendencies of the Republican party showed themselves more plainly as the war grew more serious; there was an increasing disposition to cut p aper every knot by legislation, with less regard to the Currency; constitutionality of the legislation. A paper cur- Slavery. rency, commonly known as "greenbacks" (?.».), was adopted and made legal tender (Feb. 25, 1862). The first symptoms of a disposition to attack slavery appeared: slavery was prohibited (April 16) in the District of Columbia and the Territories (June 19); the army was forbidden to surrender escaped slaves to their owners; and slaves of insurgents were ordered to be confiscated. In addition to a homestead act (see Homestead and Exemption Laws) giving public lands to actual settlers at reduced rates, Congress began a further development of the system of granting public lands to railways. Another impor- tant act (1862) granted public lands for the establishment of agricultural and mechanical colleges (see Morrill, J. S.).

238. The railway system of the United States was but twenty years old in 1850, but it had begun to assume some consistency. The day of short and disconnected

lines had passed, and the connexions which were iaisso. to develop into railway systems had appeared. Consolidation of smaller companies had begun; the all-rail route across the state of New York was made up of more than a dozen original companies at its consolidation in 1853. The Erie railway, chartered in 1832, was completed from

Piermont to Dunkirk, New York, in 1851; and another line— the Pennsylvania— was completed from Harrisburg to Pittston, Pennsylvania, in 1854. These were at least the germs of great trunk lines. The cost of American railways has been only from one-half to one-fourth of the cost of European railways; but an investment in a Far Western railway in 1850-1860 was an extra-hazardous risk. Not only did social conditions make any form of business hazardous; the new railway often had to enter a territory bare of population, and there create its own towns, farms and traffic. Whether it could do so was so doubtful as to make additional inducements to capital neces- sary. The means attempted by Congress in 1850, in the case of the Illinois Central railroad, was to grant public lands to the corporation, reserving to the United States the alternate sections. At first grants were made to the states for the benefit of the corporations; the act of 1862 made the grant directly to the corporation.

239. The vital military and political necessity of an imme- diate railway connexion with the Pacific coast was hardly open to doubt in 1862; but the necessity hardly ™' Pac ' /fc justified the terms which were offered and taken. Railways. ˆ Union Pacific railroad was incorporated; the United States government was to issue to it bonds, on the completion of each 40 m., to the amount of $i6,coo per mile, to be a first mortgage; through Utah and Nevada the aid was to be doubled, and for some 300 m. of mountain building to be trebled; and, in addition to this, alternate sections of land were granted. The land-grant system, thus begun, was carried on extensively, the largest single grants being those of 47,000,000 acres to the Northern Pacific (1864) and of 42,000,000 to the Atlantic & Pacific line (1866).

240. Specie payments had been suspended almost every- where towards the end of 1861; but the price of gold was but

102-5 at the beginning of 1862. About May its j£Jˆ* /n price in paper currency began to rise. It touched

170 during the next year, and 285 in 1864; but the real price probably never went much above 250. Other articles felt the

influence in currency prices. Mr D. A. Wells, in 1866, estimated that prices and rents had risen 90% since 1861, while wages had not risen more than 60%.

241. The duties on imports were driven higher than the original Morrill tariff had ever contemplated. The average rates, which had been 18% on dutiable articles and 12% Tariff and on the aggregate in 1860-1861, rose, before the internal end of the war, to nearly 50 % on dutiable Revenue art i c les and 3 s % on the aggregate. Domestic Taxation. manu f actures s p ra ng into new life under such hot- house encouragement; every one who had spare wealth con- verted it into manufacturing capital. The probability of such a result had' been the means of getting votes for an increased tariff; free traders had voted for it as well as pro- tectionists. For the tariff was only a means of getting capital into positions in which taxation could be applied to it, and the " internal revenue " taxation was merciless beyond precedent. The annual increase of wealth from capital was then about $550,000,000; the internal revenue taxation on it rose in 1866 to $310,000,000, or nearly 60%.

242. The stress of all this upon the poor must have been great, but it was relieved in part by the bond system on which the war was conducted. While the armies and navies were shooting off large blocks of the crops of 1880 or 1890, work and wages were abundant for all who were competent for them. It is true, then, that the poor paid most of the cost of the war; it is also true that the poor had shared in that anticipation of the future which had been forced on the country, and that, when the^ drafts on the future came to be redeemed, it was done mainly by taxation on luxuries. The destruction of a Northern railway meant more work for Northern iron mills and their workmen. The destruction of a Southern road was an unmitigated injury; it had to be made good at once, by paper issues; the South could make no drafts on the future, by bond issues, for the

Issues la the South.

blockade had put cotton out of the game, and Southern bonds were hardly saleable. Every expense had to be met by paper issues; each issue forced prices higher; every rise in Paper prices called for an increased issue of paper, with increased effects for evil. A Rebel War-Clerk's Diary gives the following as the prices in the Richmond market for May 1864: " Boots,

$200; coats, $350; pantaloons, $100; shoes, $125; flour, $275 per barrel; meal, $60 to $80 per bushel; bacon, $9 per pound; no beef in market; chickens, $30 per pair; shad, $20; potatoes, $25 per bushel; turnip greens, $4 per peck; white beans, $4 per quart or $120 per bushel; butter, $15 per pound; lard, same; wood, $50 per cord." How the rise in wages, always far slower than other prices, could meet such prices as these one must be left to imagine. Most of the burden was sustained by the women of the South.

243. The complete lack of manufactures told heavily against the South from the beginning. As men were drawn from agriculture in the North and West, the in- Maautac . creased demand for labour was shaded off into t ures . an increased demand for agricultural machinery; every increased percentage of power in reaping-machines liber- ated so many men for service at the front. The reaping- machines of the South — the slaves — were incapable of any such improvement, and, besides, required the presence of a portion of the possible fighting-men at home to watch them. There is an evident significance in the exemption from military duty in the Confederate States of " one agriculturist on such farm, where there is no white male adult not liable to duty, employ- ing 15 able-bodied slaves between ten and fifty years of age." But, to the honour of the enslaved race, no insurrection took place.

244. The pressing need for men in the army made the Con- federate Congress utterly unable to withstand the growth of executive power. Its bills were prepared by the Contederate cabinet, and the action of Congress was quite per- congress functory. The suspension of the writ of habeas aad Pres,m corpus, and the vast powers granted to President enU Davis, or assumed by him under the plea of military necessity, with the absence of a watchful and well-informed public opinion, made the Confederate government by degrees almost a despotism. It was not until the closing months of the war that the expiring Confederate Congress mustered up courage enough to oppose the president's will. (See Confederate States of America.) The organized and even radical opposition to the war in the North, the meddlesomeness of Congress and its " committees on the conduct of the war," were no doubt I unpleasant to Lincoln but they carried the country through the crisis without the effects visible in the South.

245. Another act of Federal legislation — the National Bank

Act (Feb. 25, 1863; supplemented by the act of June 3, 1864) — should be mentioned here, as it was closely con- nected with the sale of bonds. The banks were to National be organized, and, on depositing United States Banking bonds at Washington, were to be permitted to s >' steln – issue notes up to 90% of the value of the bonds deposited. As the redemption of the notes was thus assured, they circulated without question all over the United States. By a subsequent act (1865) the remaining state bank circulation was taxed out of existence. (See Banks and Banking: United States.)

246. At the beginning of 1862 the lines of demarcation between the two powers had become plainly marked. The western part of Virginia had separated itself from Admission the parent state, and was admitted as a state (1863) ° West under the name of West Virginia. It was certain vlr S laia ' that Delaware, Maryland, Kentucky and Missouri had been saved to the Union, and that the battle was to be fought out in the territory to the south of them.*

247. At the beginning of the war the people and leaders of the North had not desired to interfere with slavery, but circumstances had been too strong for them. Lincoln had declared that he meant to save the Union as he best could— by preserving slavery, by destroying it, or by destroying part

and preserving part of it. Just after the battle of Antietam (17 Sept. 1862) he issued his proclamation calling on the revolted The Emaacl- states to return to their allegiance before the next patioaPro- year, otherwise their slaves would be declared clamatioa. f ree men]\j s tate returned, and the threatened declaration was issued on the 1st of January 1863. As president, Lincoln could issue no such declaration; as com- mander-in-chief of the armies and navies of the United States he could issue directions only as to the territory within his lines; but the Emancipation Proclamation applied only to territory outside of his lines. It has therefore been debated whether the proclamation was in reality of any force. It may fairly be taken as an announcement of the policy which was to

guide the army, and as a declaration of freedom taking effect as the lines advanced. At all events, this was its exact effect. Its international importance was far greater. The locking up of the world's source of cotton supply had been a general calamity, and the Confederate government and people had steadily expected that the English and French governments, or at least one of them, would intervene in the war for the purpose of raising the blockade and releasing the Southern cotton. The conversion of the struggle into a crusade against slavery made intervention impossible for governments whose peoples had now a controlling influence on their policy and intelligence enough to understand the issue.

248. Confederate agents in England were numerous and active. Taking advantage of every loophole in the British

Foreign Enlistment Act, they built and sent to sea Privateers the " Alabama " and " Florida," which for a time*

almost drove Federal commerce from the ocean. Whenever they were closely pursued by United States vessels they took refuge in neutral ports until a safe opportunity occurred to put to sea again. Another, the " Georgia," was added in 1863. All three were destroyed in 1864. (See Alabama Arbitration.) Confederate attempts to have iron- clads equipped in England and France were unsuccessful.

249. The turning-point of the war was evidently in the early days of July 1863, when the victories of Vicksburg and The Current Gettysburg came together. The national govern- or Success ment had at the beginning cut the Confederate changes. States down to a much smaller area than might well have been expected; its armies had pushed the besieg- ing lines far into the hostile territory, and had held the ground which they had gained; and the war itself had developed a class of generals who cared less for the conquest of territory than for attacking and destroying the opposing armies. The great drafts on the future which the credit of the Federal govern- ment enabled the North to make gave it also a startling appear- ance of prosperity; so far from feeling the war, it was driving production of every kind to a higher pitch than ever before.

250. The war had not merely developed improved weapons and munitions of war; it had also spurred the people on to a more careful attention to the welfare of the soldiers, the fighting men

drawn from their own number. The sanitary commission, the Christian commission, and other voluntary associations for the physical and moral care of soldiers, received and disbursed very large sums. The national government was paying an average amount of $2,000,000 per day for the pro- secution of the war, and, in spite of the severest taxation, the debt grew to $500,000,000 in June 1862, to twice that amount a year later, to $1,700,000,000 in June 1864, and reached its maximum on the 31st of August 1865 — $2,845,907,626. But this lavish expenditure was directed with energy and judgment. The blockading fleets were kept in perfect order and with every condition of success. The railway and telegraph were brought into systematic use for the first time in modern warfare. Late in 1863 Edwin M. Stanton, the secretary of war, moved two corps of 23,000 men from Washington to Chattanooga, 1200 m., in seven days. A year later he moved another corps, 15,000 strong, from Tennessee to Washington in eleven days, and within a month had collected vessels and transferred it to North Carolina.

251. On the other hand, the Federal armies now held almost all the great southern through lines of railroad, except the Georgia lines and those which supplied Lee from the South.

The want of the Southern people was merely growing ifo™" P ' in degree, not in kind. The conscription, sweeping from the first, had become omnivorous; towards the end of the war every man between seventeen and fifty-five was legally liable to service, and in practice the only limit was physical incapacity. In 1863 the Federal government also was driven to conscription. The first attempts to carry it out resulted in forcible resistance in several places, the worst being the " draft riots " in New York (July), when the city was in the • hands of the mob for several days. All the resistance was put down; but exemptions and substitute purchases were so freely permitted that the draft in the North had little effect except as a stimulus to the states in filling their quotas of volunteers by voting bounties.

252. In 1864 Lincoln was re-elected with Andrew Johnson as vice-president. The Democratic Convention had declared that, after four years of failure to restore the Union „„_,. by war, during which the Constitution had been vio- tts64. lated in all its parts under the plea of military necessity,

a cessation of hostilities ought to be obtained, and had nominated General George B. McClellan and G. H. Pendleton. Farra- gut's victory in Mobile Bay (Aug. 5), by which he sealed up the last port, except Wilmington, of the blockade-runners, and the evidently staggering condition of the Confederate resistance in the East and the West, were the sharpest comment- aries on the Democratic platform; and its candi- /jv era(/ a dates carried only three of the twenty-five states which took part in the election. 1 The thirty-sixth state — Nevada — had been admitted in 1864.

253. The actual fighting of the war may be said to have ended with the surrender of General Robert E. Lee to General U.S. Grant at Appomattox, Va., on the 9th of April 1865.

All the terms of surrender named by Grant were "^" generous: no private property was to be surrendered; both officers and men were to be dismissed on parole, not to be disturbed by the United States government so long as they pre- served their parole and did not violate the laws; and he instructed the officers appointed to receive the paroles " to letall the men who claim to own a horse or mule take the animals home with them to work their little farms." It should be stated, also, to Grant's honour that, when the politicians afterwards undertook to repu- diate some of the terms of surrender, he personally intervened and used the power of his own name to force an exact fulfilment. General Joseph E. Johnston, with the only other considerable army in the field, surrendered on much the same terms at Durham Station, N.C. (April 26), after an unsuccessful effort at a broader settlement. All organized resistance had now ceased; Union cavalry were ranging the j"hˆst a South, picking up government property or arresting leaders; but it was not until May that the last detached parties of Confederates gave up the contest.

254. Just after Lee's surrender President Lincoln died by assassination (April 15), the crime of a half -crazed enthusiast. Even this event did not impel the American people

to any vindictive use of their success for the punish- Lincoln. ment of individuals. In the heat of the war, in 1862, Congress had so changed the criminal law that the punish- ment of treason and rebellion should no- longer be death alone, but death or fine and imprisonment. Even this modified punish- ment was not inflicted. There was no hanging; some of the

leaders were imprisoned for a time, but never brought to trial.

255. The armies of the Confederacy are supposed to have been at their strongest (700,000) at the beginning The

of 1863; and it is doubtful whether they contained Opposing 200,000 men in March 1865. The dissatisfaction Arwles – of the southern people at the manner in which Davis

1 Lincoln received 212 electoral votes and McClellan only 21; but Lincoln's popular vote was only about 407,000 in excess of McClellan's, out of about 4,000,000.

had managed the war seems to have been profound; and it was only converted into hero-worship by the ill-advised action of the Federal government in arresting and imprisoning him. Desertion had become so common in 1864, and the attempts of the Confederate government to force the people into the ranks had become so arbitrary, that the bottom of the Confederacy, the democratic elements which had given it all the success it had ever obtained, had dropped out of it before Sherman moved northward from Savannah; in some parts the people had really taken up arms against the conscripting officers. On the contrary, the numbers of the Federal armies increased steadily until March 1865, when they were a few hundreds over a million. As soon as organized resistance ceased, the dis-banding of the men began; they were sent home at the rate of about 300,000 a month, about 50,000 being retained in service as a standing army. The cost of the Civil War has been variously . . estimated: by Mulhall (Dictionary of Statistics, War. 4th ed., 1899, p. 541) at £555,000,000 and (p. 586)

at £740,000,000; by Nicolay and Hay {Abraham Lincoln, vol. x., p. 339) at $3,250,000,000 to the North and $1,500,000,000 to the South; by Edward Atkinson (the Forum, October 1888, p. 133), including the first three years of Reconstruction at $5,000,000,000 to the North and $3,000,000,000 to the South. The last alone of these estimates is an approximation to the truth. The ordinary receipts of the government for the four fiscal years 1862 to 1865 totalled

$729,458,336, as compared with $196,963,373 for the four preceding years, 1858-1861; the difference representing the effort of the treasury to meet the burden of war. In the same period more than $2,600,000,000 was secured in loans upon the credit of the nation; and this total was raised by later borrowings on account of the war to more than $2,800,000,000. The immediate and direct cost of the struggle to the North was therefore about $3,330,000,000. To this sum must be added, in order to obtain the final and total cost: (1) the military pensions paid on account of the war since 1861 — about $3,600,000,000 up to 1909, inclusive; (2) the interest on the war debt, approxi- mately $3,024,000,000 in the same period; (3) the expenditures made during the war by state and local governments, which have never been totalled, but may be put at $1,000,000,000; and (4) the abnormal expenditures for army and navy during some years following the war, which may be put, conserva- tively, at $500,000,000. The result is a total of some $11,450,500,000 for the North alone. But the cost to the South also was enormous; $4,000,000,000 cannot be an exaggeration. It follows that, up to 1909, the cost of the war to the nation had approximated the tremendous total of $15,500,000,000.

256. In return for such an expenditure, and the death of probably 300,000 men on each side, the abiding gain was incal- culable. The rich section, which had been kept back

Results 0/

the War. m tne general development by a single institution, and had been a clog on the advance of the whole country, had been dragged up to a level with the rest of the country. Free labour was soon to show itself far superior to slave labour in the South; and the South was to reap the largest material gain from the destruction of the Civil War. The per- sistent policy of paying the debt immediately resulted in the higher taxation falling on the richer North and West. As a result of the struggle the moral stigma of slavery was removed. The power of the nation, never before asserted openly, had made a place for itself; and yet the continuing power of the states saved the national power from a development into centralized tyranny. And the new power of the nation, by guaranteeing the. restriction of government to a single nation in central North America, gave security against any introduction of international relations, international armament, international

wars, and continual war taxation into the territory occupied by the United States. Finally, democracy in America had certainly shown its ability to maintain the unity of its empire.

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L. — History, 1865-igio.

257. The capitulation of Lee (April 9, 1865), followed by the assassination of Lincoln (April 15) and the surrender of the last important Confederate army, under J. E. Johnston, marked the end of the era of war and the beginning of that of Recon- struction, a problem which involved a revolution in the social and political structure of the South, in the relation of state and nation in the American Federal Union, and in the economic life of the whole country.

258. Economically the condition of the South was desperate. The means of transport were destroyed; railways and bridges were ruined; Southern securities were valueless; the Confederate currency system was completely disorganized. Great numbers of the emancipated negroes wandered idly from place to place, trusting the Union armies for sustenance, while their former masters toiled in the fields to restore their plantations.

259. The social organization of the South had been based on negro slavery. Speaking generally, the large planters had constituted the dominant class, especially social and in the cotton states; and in the areas of heaviest Economic negro population these planters had belonged for Condition ot the most part to the old Whig party. Outside theSouta – of the larger plantation areas, especially in the hill regions and the pine barrens, there was a population of small planters and poor whites who belonged in general to the Democratic party. In the mountain regions, where slavery had hardly existed, there were Union areas, and from the poor whites of this section had come Andrew Johnson, senator and war governor of Tennessee, who was chosen vice-president on the Union ticket with Lincoln in 1864 as a recognition of the Union men

of the South. Accidental as was Johnson's elevation to the presidency, there was an element of fitness in it, for the war destroyed the former ruling class in the Southern States and initiated a democratic revolution which continued after the interregnum of negro government. Of this rise of the Southern masses Johnson was representative.

260. The importance of personality in history was clearly illustrated when the wise and sympathetic Lincoln, who had the confidence of the masses of the victorious Distrust of North, was replaced by Johnson, opinionated and President intemperate, whose antecedents as a Tennessean and Johnson. Democrat, and whose state rights' principles and indifference to Northern ideals of the future of the negro made him distrusted by large numbers of the Union Republican party.

261. The composition of this party was certain to endanger its stability when peace came. It had carried on the war by a coalescence of Republicans, War Democrats, Whigs, union Constitutional Unionists and Native Americans, Republican who had rallied to the cause of national unity. Part y-

At the outset it had asserted that its purpose was not to interfere with the established institutions in slave states, but to defend the Constitution, and to preserve the Union with all the dignity, equality and rights of the several states unimpaired. But the war had destroyed slavery, as well as preserved the Union, and the civil status of the negro and the position of the revolted states now became burning questions, reviving old antagonisms and party factions. To the extremists of the Radical wing it seemed in accordance with

the principles of human liberty that the negro should not only be released from slavery but should also receive full civil rights, including the right to vote on an equality with the whites. This group was also ready to revolutionize Southern society by destroying the old ascendancy of the great planter class. Of this idealistic school of radical Republicans, Charles Sumner, of Massachusetts, was the spokesman in the Senate,

and Thaddeus Stevens, of Pennsylvania, in the House.

262. For many years before the war parties had differed on such important questions as the tariff, internal improvements and foreign policy; and the South had used its alliance with the Northern Democracy to resist the economic demands of the industrial interests of the North. A return of Southern congressmen, increased in .numbers by the inapplicability to the new conditions of the constitutional provision by which they had representation for only a fraction of the slaves, might mean a revival of the old political situation, with the South and the Northern Democracy once more in the saddle.

263. Any attempt to restore the South to full rights, there- fore, without further provision for securing for the freedmen Northern the reality of their freedom, and without some Attitude means of establishing the political control of the towards the victorious party, would create party dissension.

ou ' Even Lincoln had aroused the bitter opposition of the radical leaders by his generous plan of Reconstruction. Johnson could have secured party support only by important concessions to the powerful leaders in Congress; and these concessions he was temperamentally unable to make. The masses of the North, especially in the first rejoicings over the peace, were not ungenerous in their attitude; and the South, as a whole, accepted the results of defeat in so far as to acquiesce in the permanence of the Union and the emancipa- tion of the slaves, the original issues of the war.

264. In the settlement of the details of Reconstruction, however, there were abundant opportunities for the hatred engendered by the war to flame up once more. As it became clear that the Northern majority was determined to exclude the leaders of the South from political rights in the re- construction of the Union, and especially as the radicals disclosed their purpose to ensure Republican ascendancy by subjecting the section to the rule of the loyalist whites and, later, to that of the emancipated negroes, good will disappeared, and the South entered upon a fight for its social system. The natural leaders of the people, men of intelligence and property, had been the leaders of the section in the war. Whatever their views had been at first as to secession, the great majority of the Southern people had followed the fortunes of their states. To disfranchise their leaders was to throw the control into the

hands of a less able and small minority of whites; to enfranchise the blacks while disfranchising the white leaders was to under- take the task of subordinating the former political people of a section to a different race, just released from slavery, ignorant, untrained, without property and fitted only to follow the leader- ship of outside elements. The history of this attempt and its failure constitutes much of that of the Reconstruction.

265. These underlying forces were in reality more influential than the constitutional theories which engaged so much of the discussion in Congress, theories which, while they afford evidence of the characteristic desire to proceed constitutionally were really urged in support of, or opposition to, the interests just named.

266. The most extreme northern Democrats, and their southern sympathizers, starting from the premise that con- tu .» stitutionally the Southern states had never been out

Theories . . TT ~ .

Regarding °f the Union, contended that the termination of the status hostilities restored them to their former rights in the ofthe Federal Union unimpaired and without further State's.™ action – Tnis theory derived support from President Lincoln's view that not states, but assemblages of individuals, had waged war against the government. The theory of the extreme Republican Radicals was formulated by Sumner and Stevens. The former contended that, while*

the states could not secede, they had by waging war reduced themselves to mere Territories of the United States, entitled only to the rights of Territories under the Constitution. Stevens went further and, appealing to the facts of secession, declared the Southern states conquered provinces, subject to be disposed of under international law at the will of the conqueror. In the end Congress adopted a middle ground, holding that while the states could not leave the Union, they were, in fact, out of normal relations, and that the constitutional right of the Federal government to guarantee republican governments to the various states gave to Congress the power to impose conditions precedent to their rehabilitation.

267. It is necessary to recall the initiation of Reconstruction

measures by President Lincoln rightly to understand the position which was taken by President Johnson. President Impatient of theoretical discussion, Lincoln laid Lincoln's down practical conditions of restoration in his pro- Policy. clamation of the 8th of December 1863. In this he offered amnesty to those who would take an oath of loyalty for the future and accept the acts of Congress and the proclamation of the president with reference to slaves. From the amnesty he excepted the higher military, civil and diplomatic officers of the Confederacy as well as those who had relinquished judicial stations, seats in Congress, or commissions in the army or navy to aid the rebellion, and those who had treated persons in the Federal service otherwise than lawfully as prisoners of war. The proclamation provided, further, that when in any of the seceding states (except Virginia, where the president had already recognized the loyal government under Governor Francis H. Pierpont) a number of persons not less than one-tenth of the voters in i860 should have taken the above described oath, and, being qualified voters under the laws of the state in i860, should have established a state government, republican in form, it should be recognized. Lincoln's comprehension of Southern difficulties was shown in his declaration in this proclamation that the president would not object to such provisions by the states regarding the freedmen as should, while declaring their freedom and providing for their education, recognize their condition as a labouring, landless and homeless class.

268. Although Lincoln expressly pointed out that the admission of the restored states to representation AttH . . in Congress rested exclusively with the respective congress; houses, and announced his readiness to consider the First other plans for Reconstruction, heated opposition Hecoostruc- by the radicals in Congress was called out by

this proclamation. They feared that it did not sufficiently guarantee the abolition of slavery, which up to this time rested on the war powers of the president, and they asserted that it was the right of Congress, rather than that of the president, to determine the conditions and the process of Reconstruction. In a bill which passed the House by a vote of 73 to 59 and was concurred in by the Senate, Congress provided that Reconstruction was to be begun only when a majority of the white male citizens of any one of the Confederate States should take oath to support the Constitution of the United States. The

president should then invite them to call a constitutional convention. The electors of this convention would be required to take an oath of allegiance which excluded a much larger class than those deprived of the benefit of the amnesty proclamation, for it eliminated all who had voluntarily borne arms against the United States, or encouraged hostility to it, or voluntarily yielded support to any of the Confederate governments. In addition to entrusting the formation of a constitution to the small minority of thorough-going loyalists, the bill required that the state constitution should exclude a large proportion of the civil and military officers of a Confederate government from the right of voting, and that it should provide that slavery be for ever abolished and that state and Confederate debts of the war period should never be paid. In July 1864 Lincoln gave a " pocket veto " to the bill and issued a pro- clamation explaining his reasons for refusing to sign, where- upon Benjamin F. Wade and Henry W. Davis (q.v.), leaders of

the radicals, violently attacked the president. The triumph of Lincoln in the election of 1864 did not clearly signify the will of the people upon the conditions of Reconstruction, or upon the organ of government to formulate them, for the declaration of the Democratic convention that the war was a failure overshadowed the issue, and the Union party which supported Lincoln was composed of men of all parties.

269. On January 31st 1865 the House concurred in the vote of the Senate in favour of the Thirteenth Amendment to the

Constitution abolishing slavery throughout the Amendment. Union. Four years earlier Congress had submitted

to the states another Thirteenth Amendment by the terms of which no amendment should ever authorize Congress to interfere with slavery within the states. But owing to the war this amendment had remained unratified, and now Congress proposed s to place beyond constitutional doubt, or the power of states to change it, the emancipation of slaves. By the 18th of December 1865 the amendment had been ratified and was proclaimed in force.

270. In the meantime, Louisiana, in accordance with Lincoln's proclamation, had adopted a constitution and abolished slavery within the state. Owing to the obstructive tactics of Sumner, aided by Democrats in the Senate, Congress adjourned on the 4th of March 1865 without having recognized this new state government as legitimate. " If we are wise and dis- creet," said Lincoln, " we shall reanimate the states and get their governments in successful operation with order prevailing and the Union re-established before Congress comes together in December."

271. Such was the situation when Johnson took up the presidency upon Lincoln's death. After an interval of uncertainty, in which he threatened vengeance against various Southern leaders and gave the radicals some hope that he

would favour negro suffrage, President Johnson accepted the main features of Lincoln's policy. Congress not being in session, he was able to work out an executive Reconstruction on the lines of Lincoln's policy during the summer and autumn of 1865. On the 29th of May he issued a proclamation of amnesty, requiring of those who desired to accept its provisions an oath to support the Constitution and Union, and the laws and proclamations respecting the emancipation of slaves. Certain specified classes of persons were excepted, including certain additions to those excluded by Lincoln, especially " all persons who have volun- tarily participated in said rebellion and the estimated value of whose taxable property is over twenty thousand dollars." This provision was characteristic of Johnson, who disliked the Southern planting aristocracy, and aimed at placing the preponderant power in the hands of ihe Democratic small farmers, who had been his supporters. To those of the excepted classes who would ask pardon from the president, he promised a liberal clemency. As part of his system he issued Policy of another proclamation in which he appointed a President governor for North Carolina and laid down a Johnson. pi an f or Reconstruction. By this proclamation it was made the duty of the governor to call a convention chosen by the loyal people of the state, for the purpose of altering the state constitution and establishing a state government. The right to vote for delegates to this convention was limited to those who had taken the oath of amnesty and who had been qualified to vote prior to the secession of the state. To the state itself was to be left the determination of the future qualifications of electors and office-holders.

272. Already Virginia, Tennessee, Louisiana and Arkansas had governments which had been recognized by Lincoln. Be- tween the 13th of June and the 13th of July 1865 Johnson applied the same process which he had outlined for North Caro- lina to the remaining states of the Confederacy. Before Congress met in December all the Confederate states, except Texas (which delayed until the spring of 1866), had formed constitutions and elected governments in accordance with the presidential plan. All of their legislatures, except that of Mississippi, ratified the Thirteenth Amendment abolishing slavery.

273. Gradually, however, the South turned to its former leaders to shape its policy, and the radical . Republicans of the North were alarmed at the rapidity of the process of

restoration on these principles. The disorganized and idle condition of the former slaves constituted a serious element in the Southern situa- tion, as Lincoln had foreseen. The negroes expected a grant of land from confiscated Southern estates, and it was difficult to preserve order and to secure a proper labour supply.

274. Under these conditions the efforts of the South to provide security for their communities by bodies of white militia were looked upon with apprehension by the North, and there was sufficient conflict between the two races to give colour to charges that the South was not accepting in good faith the emancipation of the slaves. Especially irritating to Northern sentiment were the so-called " black codes " or " peonage laws," passed by the newly elected Southern legislatures, southern They rested on the belief that it was necessary "Black that the former slaves should be treated as a separate Co " es – and dependent class, and varied in severity in the dif- ferent states. Some of these imposed special disabilities upon the negro in the matter of carrying weapons and serving as witnesses. Vagrancy laws and provisions regarding labour contracts which had precedents in colonial and English legis- lation, but were specifically framed to restrain the negroes only, were common. Mississippi denied them the right to own land, or even to rent it outside of incorporated towns; South Carolina restricted them to husbandry and to farm or domestic service, unless specially licensed. Although several of the Southern states, perceiving that their course was likely to arouse the North to drastic measures, repealed or mitigated the most objectionable laws, the North had received the im- pression that an attempt had been made to restore slavery in disguised form.

275. The problem of succouring and protecting the negroes had forced itself upon the attention of the North from the beginning of the war, and on the 3rd 'of March 1865 The Congress had created the Freedmen's Bureau (q.v.), Preedmen's with the power to assign abandoned lands, in the Bureau – states where the war had existed, to the use of the freed- men; to supervise charitable and educational activities among them ; to exercise jurisdiction over controversies in which a freedman was a party; and to regulate their labour contracts. The local agents of the bureau were usually Northern men; some of them gave the worst interpretation to Southern conditions and aroused vain hopes in the negroes that the lands of the former masters

would be divided among them; and later many of them became active in the political organization of the negro.

276. Although the national government itself had thus recognized that special treatment of the freedmen was necessary, Congress, on assembling in December 1865, was disposed to regard the course of the South in this respect with deep suspi- cion. Moreover, as the Thirteenth Amendment was now rati- fied, it was seen that the South, if restored according to the presidential policy, would return to Congress with added representatives for the freed negroes. Only three-fifths of the negro slaves had been counted in apportioning representa- tives in Congress; though now free they were not allowed to vote.

277. Under the leadership of the Radicals Congress refused, therefore, to receive the representatives of the states which had met the conditions of the president's proclamations. A joint committee of fifteen took the whole subject of Recon- struction under advisement, and a bill was passed continuing the Freedmen's Bureau indefinitely. When this was vetoed by President Johnson (Feb. 19, 1866) Congress retaliated by a con- current resolution (March 2) against admitting any reconstructed state until Congress declared it entitled to recognition, thus assert- ing for the legislative. body the direction of Reconstruction.

278. While the measure was under consideration the pre- sident in an intemperate public address stigmatized the leaders of the radicals by name as labouring to destroy the principles

of the government and even intimated that the assassination of

the president was aimed at. It was hardly possible to close

the breach after this, and the schism between the

tween the president and the leaders of the Union Republican

President party was completed when Congress passed (April

ana Coo- g t 1866) the Civil Rights Bill over Johnson's veto.

t s ,VJ, h l The act declared the freedmen to be citizens of the Civil Rights T T . , ... , .

BUI United States with the same civil rights as white

persons and entitled to the protection of the Federal

government. It provided punishment for those who, relying

upon state authority, should discriminate against the negroes.

279. To place this measure beyond the danger of overthrow by courts, or by a change of party majority, on the 13th of The June 1866 Congress provided for submitting to the Fourteenth states a Fourteenth Amendment to the Constitution. Amend- This gave constitutional guarantee of citizenship

and equal civil rights to freedmen, and, in effect, provided that when in any state the right to vote should be denied to any of the male inhabitants twenty-one years of age and citizens of the United States, except for participation in rebellion or other crime, the basis of representation in the state should be reduced in the proportion which the number of such citizens bore to the whole number of male citizens twenty-one years of age in the state. This section of the amend- ment, therefore, left the states the option between granting the suffrage to the negro or suffering a proportionate reduction in the number of representatives in Congress. It was a fair com- promise which might have saved the South from a long period of misrule and the North from the ultimate breakdown of its policy of revolutionizing Southern political control by enfranchise- ment of the blacks and disfranchisement of the natural leaders of the whites. But the South especially resented that section of the amendment which disqualified for Federal or state office those who, having previously taken an oath to support the Con- stitution of the United States, afterwards engaged in rebellion, which involved the repudiation of their leaders. The amend- ment further safeguarded the validity of the United States debt and declared null the war debt of the seceding states and the Confederacy and forbade the payment of claims for emancipation.

280. In order to ensure the passage of this amendment the Radical leaders proposed bills which declared that, after its

adoption, any of the seceding states which ratified it should be readmitted to representation. But it also provided that the higher classes of officials of the Confederacy should be ineligible to office in the Federal government. These bills were allowed to await the issue of the next election.

281. For further protection of the rights of the negro, Congress succeeded in passing, over President Johnson's veto, an act continuing the Freedmen's Bureau for two years. Ten- nessee having ratified the Fourteenth Amendment was (July 24, 1866) restored to representation and Congress adjourned, leaving the issue between the president and the legislative body to the people in the Congressional elections.

282. The campaign brought with it some realignment of party. President Johnson having broken with the leaders of the Union

Republican party was more and more forced to rely align m en'ts. u P on Democratic support, although his executive

appointments were still made from the ranks of the Republicans. The so-called National Union Convention, which met in Philadelphia in midsummer in an effort to abate sectionalism, and to endorse the president's policy, included a large number of War Democrats who had joined the Union party after the secession of the South, many moderate Southerners, a fragment of the Republican party, and a few Whigs, especially from the Border states. They claimed that the southern States had a right to be represented in Congress. Other meetings friendly to the Radicals were called, and under the designation of Union-Republican party they declared for the Congressional policy. While the campaign for elections to Congress was in progress the president made a journey to Chicago, speaking at various cities en route and still further

alienating the Republicans by coarse abuse of his opponents. As a result of the autumn elections two-thirds of the members of the House of Representatives were opposed to him. Almost contemporaneously every seceding state except Tennessee rejected the Fourteenth Amendment, and thereby paved the way for the entire triumph of the Northern extremists, who favoured negro suffrage on idealistic grounds or as a means for forcing the South to agree to the Republican policy.

283. In the ensuing winter and spring Congress completed the

conquest of the president, awed the Supreme Court, and provided a drastic body of legislation to impose negro suffrage on the South. By the Tenure of Office Act (March 2, 1867) Congress forbade the president to remove civil officers without the consent of the Senate, and at the same time by another act required him to issue military orders only fticeAct. through the general of the army (Grant), whom

the president was forbidden to remove from command or to assign to duty at another place than Washington, unless at the request of the officer or by the prior assent of the Senate. These extraordinary invasions of the presidential authority were deemed necessary to prevent Johnson from securing control of the military arm of the government, and to protect Edwin Stanton, the secretary of war, and General Grant. Fearing lest the president might take advantage of the interim during which Congress would not be in session, the Fortieth Congress was required to meet on the 4th of March immediately following "the expiration of the thirty-ninth.

284. The Reconstruction Act of the 2nd of March 1867 provided for the military government of the Southern states while the drastic policy of Congress was being carried jt econstruc , out. It was passed over the veto of the president tion Act of and declared that no legal governments or adequate March 2, protection for life or property existed in the t867 ' seceding states, except Tennessee. These states it divided into five military districts, each to be placed under the command of a general of the army, whose duty it was to preserve law and order, using at discretion either local civil tribunals or military commissions. But the existing civil governments were declared provisional only and subject to the paramount authority of the United States to abolish, modify, control, or supersede them. The act further provided that a constitutional convention might be elected by the adult male citizens of the state, of whatever race, colour or previous condition, resident in the state for a year, except such as might be disfranchised for rebellion or felony. No persons excluded from holding office under the Fourteenth Amendment were eligible for election to the convention or entitled to vote for its members.

285. When the convention, thus chosen under negro suffrage, and with the exclusion of Confederate leaders, should have framed a state constitution conforming to the Federal Constitution and allowing the franchise to those entitled to vote for the

members of the convention, the constitution was to be submitted for the approval of Congress. If this were obtained and if the state adopted the Fourteenth Amendment, and this amendment became a part of the Federal Constitution, then the state should be entitled to representation in Congress; but the senators and representatives sent to Congress were required to take the " iron- clad oath," which excluded those who had fought in the Con- federate service, or held office under any government hostile to the United States, or given support to any such authority.

286. By the pressure of military control Congress thus aimed at forcing the adoption of the Fourteenth Amendment, as well as the acceptance of negro suffrage in the state con- Supple- stitutions of the South. A supplementary act of the mentary 23rd of March 1867 and an act of interpretation Acts ' passed on the 19th of July completed this policy of " thorough." In the registration of voters the district commanders were required to administer an oath which excluded those disfran- chised for rebellion and those who after holding state or Federal office had given aid and comfort to the enemies of the United States.

287. Against this use of military power to govern states in

time of peace the Supreme Court interposed no effective obstacle. Like the executive it was subordinated to Congress. Supreme It is true that in the case ex parte Milligan, Court decided in December 1866, the court held military

Decisions, commissions unlawful where the ordinary civil tribunals were open. In the case of Cummings v. Missouri (Jan. 14, 1867) it decided also that a state test oath excluding Confederate sympathizers from professions was a violation of the prohibition of ex post facto laws; and the court {ex parte Garland) applied the same rule to the Federal test oath so far as the right of attorneys to practise in Federal courts was concerned.

288. But threats were made by the radicals in Congress to take away the appellate jurisdiction of the court, and even to

abolish the tribunal by constitutional amendment. The judges had been closely divided in these cases and, when the real test came, the court refused to set itself in opposition to Congress. When Mississippi attempted to secure an injunction to prevent the president from carrying out the Reconstruction acts, and when Georgia asked the court to enjoin the military officers from enforcing these acts in that state, the Supreme Court refused (April and May 1867), pleading want of juris- diction. Chief Justice Salmon P. Chase argued that if the president refused to obey the court could not enforce its decree, while if he complied with the order of the court, and if the House of Representatives impeached him for refusing to enforce the law, the Supreme Court would be forced to the vain attempt to enjoin the Senate from sitting as a court of impeachment.

289. In one instance it seemed inevitable that the court would clash with Congress; the McCardle case involved an

editor's arrest by military authority for criticizing that Case authority and the Reconstruction policy. But Con-

gress, apprehending that the majority of the court would declare the Reconstruction acts unconstitutional, promptly repealed that portion of the act which gave the court jurisdiction in the case, and thus enabled the judges to dismiss the appeal. Afterwards, when the Reconstruction policy had been accom- plished, the court, in the case of Texas v. White (1869), held that the Constitution looked to " an indestructible Union com- posed of indestructible states "; and that although the secession acts were null, and the Federal obligations of the seceding states remained unimpaired, yet their rights were White.' suspended during the war. It also held that in re-establishing the broken relations of the state with the Union, Congress, under the authority to guarantee to every state a republican form of government, was obliged to regard the freedmen as part of the people of the state, and was entitled to decide what government was the established one. This decision, though it did not involve the direct question of the constitutionality of theReconstructionacts, harmonized with the general doctrines of the Congressional majority.*

290. The powerful leaders of the Republicans in Congress had been awaiting their opportunity to rid themselves of Impeach-President Johnson by impeachment. After various meat of failures to convince a majority of the House that President

articles should be preferred against him, an oppor-

BSOD- tunity seemed to present itself when Johnson, in the summer recess of 1867, suspended Secretary Stanton and made General Grant the acting secretary of war. The Senate, on reassembling, refused to consent to the suspension, and General Grant yielded his office to Stanton, thus spoil- ing the president's plan to force Stanton to appeal to the courts to obtain his office and so test the constitutionality of the Tenure of Office Act. This proved to be a turning-point in Grant's political career, for by his break with Johnson he gained new support among the masses of the Republican party. To Johnson's foes it seemed that the president had delivered himself into their hands when he next defied Congress by taking the decisive step of removing Stanton in defiance of the Tenure of Office Act, and the House announced to the Senate (Feb. 45, 1868) its decision to bring articles of impeachment against

the president. But careful reading of the law showed that it could not be relied on as conclusive ground for impeachment, for it provided that cabinet officers should hold office during the term of the president by whom they were appointed and for one month thereafter, subject to removal with the consent of the Senate. As Stanton had been appointed by President Lincoln and had merely continued under Johnson, a doubtful question was raised. The leaders, therefore, incor- porated additional charges in the articles of impeachment which they pushed through the House of Representatives. By these the president was accused of attempting to bring the legislative branch into disgrace by his public utterances and of stigmatizing it as a Congress of only part of the states. This raised the question whether it was necessary to show a legal, technical crime or misdemeanour as the necessary ground of impeachment. Had the theory of the leaders that this was not the case been successful, the executive would have been reduced to an obvious dependence upon Congress. In the spring of 1868, however, the trial by the xcquittaiby Senate resulted in a verdict of acquittal. (See the Senate. Johnson, Andrew.)

291. Meanwhile the military Reconstruction of the South and the organization of the negro vote progressed effec- tively. The party management of the negroes was conducted by " carpet-baggers," as the Northern ' Dag ££s~> men who came South to try their fortunes under ancf'Scala- these new conditions

were nicknamed, and by the wags"; the white loyalists of the South, to whom was given ˆ n,on

the name " scalawags." In the work of marshal- ling the freedmen's vote for the Republican party secret societies like the Loyal League, or Union League (?.».), played an important part. As the newly enfranchised mass of politically untrained negroes passed under Northern influence politically, the Southern whites drew more and more together in most of the former Confederate States, and although they were unable under the existing conditions to take control, they awaited their opportunity. A " Solid South " was forming in which old party divisions gave way to the one dominant antagonism to Republican ascendancy by negro suffrage; and a race antagonism developed which revealed the fact that underneath the slavery question was the negro question.

292. Politically the important fact was that the Republicans had rejected the possibility of reviving the old party lines in the South, and had gambled upon the expectation of wielding the united coloured vote with such leadership and support as might be gained from former Northerners and loyal whites. In the end negro rule failed, as was inevitable when legal dis- abilities and military force were removed; but the masses of the Southern whites emerged with a power which they had not possessed under the old rule of the planting aristocracy. For the time being, however, negro votes gave control to the Repub- licans. In South Carolina, Florida, Alabama, Mississippi and Louisiana the negroes were in a majority; in Virginia, North Carolina, Arkansas and Texas they were in the minority; while in Georgia the two races were nearly evenly balanced.

293. The white leaders of the South were divided as to the best means of meeting the problem. Some advocated that those entitled to vote should register, and then poiicyof refrain from the polls, in order to defeat the con- the South; stitutions made under negro suffrage, for the law theKu- required them to be ratified by a majority of the Klux K,an ' qualified voters. Others would have the white race bear no part in the process. Societies such as the " Ku-Klux Klan " and the " Knights of the White Camelia " were organized to intimidate or restrain the freedmen. But for the present the Republicans carried all before them in the South. Some of the new state constitutions imposed severe disfranchise- ment upon the former dominant class, and before the end of July 1868 all of the former

Confederate States, except Virginia, Mississippi and Texas, had ratified the.Fourteenth Amendment, which was proclaimed in effect. By the beginning of 1870 these three states had also ratified the amendment, as had

Georgia a second time, because of her doubtful status at the time of her first ratification.

294. By the summer of 1868 Arkansas, South Carolina,

North Carolina, Georgia, Alabama, Louisiana and Florida,

„. having satisfied the requirements of the Recon-

Southera struction acts, were entitled to representation in

states Re- Congress. But Georgia did not choose her senators

f f°T, d f° until after the adjournment of Congress, and, inas-

the Union. , , ‘ , . , _ , ,

much as the state excluded the negro members of

the legislature in September, Congress on reassembling returned the state to military rule until its submission. Alabama was restored in spite of the fact that her white voters had remained away from the polls in sufficient numbers to prevent a majority of all the voters registered from having ratified the constitu- tion of the state, as the Reconstruction acts had required. The nominating conventions and the campaign of 1868 gave in- teresting evidence of the trend of political and economic events. Party lines, which had broken down in the North when all united in saving the Union, were once more reasserting themselves. President Johnson, who had been elected by the Union Republican party, had found his most effective support among the Democrats. The Republicans turned to General Grant, a Democrat before the outbreak of the war. His popularity with the Republicans was due not only to his military distinction, but also to his calm judgment in the

trying period of the struggle between the president and Congress. He was seriously considered by the Democrats until he broke with Johnson in the Stanton episode.

295. The Republican nominating convention met on the 20th of May 1868, a few days after the failure of the

impeachment proceedings, and it chose Grant as Republican tne candidate for the presidency. The platform Convention; supported the Congressional Reconstruction measures. Grant Upon the vital question whether universal negro

Nominated su ff ra g e should be placed beyond the power of Presidency, states to repeal it by a new constitutional amendment, the platform declared: " The guarantee by Congress of equal suffrage to all loyal men at the South was demanded by every consideration of public safety, of gratitude and of justice, and must be maintained; while the question of suffrage in all the loyal states properly belongs to the people of those states." Nowhere in the North was the negro an important element in the population, but the North had shown an unwillingness to apply to itself the doctrines of negro rights which had been imposed upon the South. Between 1865 and 1868 Connecticut, Wisconsin, Minnesota, Kansas, Ohio and Michigan had refused to give the negro the right to vote within their own bounds, and this plank was evidence of the unwillingness of the party to make a direct issue of universal negro suffrage. Although the platform failed to indicate the future proposals of the Republican leaders on the negro question, on the topics of finance and currency it clearly showed that the party was controlled by economic interests which were to exercise increasing influence upon it. It pronounced in favour of payment of the public debt, not only according to the letter but the spirit of the laws under which it was contracted. The significance of this lay in its challenge to the Democratic agitation on the currency question.

296. It was this question which gave the tone to the proceedings of the Democracy at their convention in July 1868. The situation can best be presented by a brief review of the financial history just preceding the convention. Together with the discussion over political Reconstruction in the South, Congress and the administration had been obliged to deal with the reconstruction of debt, taxation and currency in the nation at the close of four years of expensive war. At its maximum

point the debt had risen to $2,758,000,000, of a complicated variety of forms, and of the total less than one-half was funded. The problems of funding, readjustment of taxation, and re- sumption of specie payments proved to be so complicated with the industrial growth of the nation that they led to issues destined to exert a long continued influence.

297. The various war tariffs, passed primarily for the sake of increased revenue, had been shaped for protection under the influence of the manufacturing interests, and they pi aaa(X ; had been framed also with reference to the need of the Tariff; compensating the heavy internal taxes which were Internal imposed upon the manufacturers. When the war Revenue ‘ ended public sentiment demanded relief from these heavy burdens, and especially from the irksome internal taxes. The rapidly growing grain-raising districts of the Middle West exhibited a lively discontent with the protective tariff, but this did not prevent the passage in 1867 of the Wool and Woollens Act, which discriminated in favour of the woollen manu- facturers and raised the ad valorem duty on wool. In spite of several large reductions of internal revenue, the national debt was being extinguished with a rapidity that only a prosperous and growing nation could have endured.

298. The currency question, however, furnished the economic issue which was most debated in the period of Reconstruc- tion. One set of interests aimed at rapidly reducing _.

*the volume of the currency by retiring the legal Currency tender notes, or ” greenbacks,” issued during the Question; war, on the ground that they had been provided only “°™ e f” as a war measure, that the country needed a ‘ **

contraction of this currency, and that specie payments woula be hastened by the withdrawal of the greenbacks. The secre- tary of the treasury, Hugh McCulloch, pressed this policy to the foreground, and desired authority to issue bonds to retire these notes. Another set of interests demanded the retention of the greenbacks, supporting their views by arguments varying according to the degree of radicalism of the speakers. The more moderate, like Senator John Sherman, of Ohio, who reflected the views of parts of the West, argued that the recuperation of the nation and the rapid increase of business would absorb the existing currency, while gold would cease to go abroad. Thus, by the increasing credit of the government, specie payment

would be automatically resumed, and the holders of currency certificates would convert them into coin obligations at a lower interest rate. Others wished to use the greenbacks to pay the principal of such of the bonds as did not explicitly specify coin as the medium of payment; the most extreme, so far from contracting the currency by retiring the greenbacks, wished to increase this form of money, while diminishing the circulation of the notes of the national banks. The discussion tended to produce a sectional issue with the West against the East, and a social issue with bondholders and the creditor class in general arrayed against the less well-to-do. Congress agreed with Secretary McCulloch, and in the Funding Act of 1866 not only provided for converting short-time securities into long-term bonds, but also for retiring ten million dollars of greenbacks in six months and thereafter not more than four millions monthly. But the agricultural depression of 1866 produced a reaction. Loud demands were made that bonds should be paid in greenbacks instead of coin, that United States securities should be taxed, and the national bank notes suppressed. In 1868, on the eve of the presidential campaign, Congress, alarmed by the extent of these popular demands, suspended the process of contraction by decisive majorities in both houses, after forty million dollars in greenbacks had been retired by the secretary of the treasury.

299. Ohio was the storm centre of the agitation. The " Ohio idea " that greenbacks should become the accepted currency of the country was championed by George ..nuin H. Pendleton, of that state, and his friends now /,f ea .» brought him forward for the Democratic nomina- tion for president on this issue. In the national convention of that party they succeeded in incorporating into the platform their demands that there should be one currency for the government and the people, the bondholder and the pro- ducer, and that where the obligations of the government did not expressly provide for payment in coin, they should be paid in lawful money (i.e. greenbacks) of the United States.

300. But another wing of the Democratic party desired to

make prominent the issue against the Reconstruction measures of the Republicans. This wing added to the platform and declaration that these acts were unconstitutional and void, and the demand that the Southern states should be restored to their former rights and given control over their own elective franchise.

301. Although the followers of Pendleton had shaped the financial plank of the platform, they could not nominate their

leader. The opposition was at first divided between Democratic l ˆ e various candidates. New York, which feared Convention; the effect upon the conservative financial interests Seymour f t ne East if Pendleton were nominated, attempted for"the led t0 Drea k the deadlock by proposing an Ohio man, Presidency. Chief Justice Chase. But eager as Chase was for

the presidency he had flatly refused to abandon the views which he held in favour of negro suffrage. Ohio was, therefore, able to retaliate by stampeding the convention in favour of Horatio Seymour, of New York, chairman of the convention. As the war governor of his state he had been a consistent critic of the extremes to which the Federal admin- istration had carried its interpretation of the war power. For vice-president the convention nominated Francis P. Blair, jun., of Missouri, who had denounced the unconstitutionality of the Reconstruction acts in unmeasured terms.

302. But the popularity of Grant in the North, together with the Republican strength in the states of the South which

had been reconstructed under negro suffrage, gave Elected an easv victory to the Republicans in the election

of 1868. Seymour carried only Delaware, New Jersey, New York and Oregon, of the North; and Maryland, Kentucky, Georgia and Louisiana of the South. Tennessee, and five of the former Confederate States, upon which negro suffrage had been imposed under military Reconstruction (North Carolina, South Carolina, Florida, Alabama and Arkansas) voted for Grant. Virginia, Mississippi and Texas had not yet been restored.

303. This decisive victory and the knowledge that it had been won by the advantage of the negro vote in the restored states

led the Republican leaders to ignore their recent Amendment-platform declaration in regard to negro suffrage. Shortly after Congress assembled propositions were made to place the freedman's right to vote beyond the power of the states to change. To do this by constitutional enact- ment it was necessary to make the provision universal, and Congress, therefore, submitted for ratification the Fifteenth Amendment declaring that " the right of citizens of the United States to vote shall not be denied or abridged by the United States or by any state on account of race, color or previous condition of servitude." Congress was given power to enforce the amendment by appropriate legislation. By the 30th of March 1870 the amendment had been ratified; but it is doubtful whether this could have been accomplished by legislatures chosen on the issue. As it was, the states of Virginia, Mississippi, Texas and Georgia were required to ratify it as a condition of their readmittance to representation in Congress, and the three former states, having been permitted to vote separately on the obnoxious provisions of their constitutions in regard to the disfranchisement of former Confederates, rejected those clauses, adopted the Fifteenth Amendment and were restored in 1870. Georgia, after a new experience of military rule, admitted '" likewise ratified the amendment, and her repre- sentatives were likewise admitted to Congress.

304. As soon as the Fifteenth Amendment was proclaimed in effect, and the military governments of the South were New Con- superseded, the dominant party proceeded to enact gressional measures of enforcement. These seemed especially Measures. ne cessary in view of the fact that, partly by intimidation of the coloured vote, Louisiana (1868) and Tennessee (1869) broke away from the Republican column; while in the election of 1870 Tennessee, North Carolina, Georgia, Virginia and Alabama went Democratic. The enforcement legislation of 1870 provided penalties for violating the Fourteenth and Fifteenth amendments and re-enacted the Civil Rights Act of

1866. Jurisdiction was given to the Federal courts to maintain the equality of the races before the law. The underlying doctrine of the acts was that the amendments guaranteed the freedmen against invasion of their rights by the acts of individuals as well as by explicit legislation of the states. In the next two years (187 1 and 1872) acts were passed provid- ing for effective Federal supervision of Congressional elections, and the " Ku-Klux Acts" (1871 and 1872) still further in-

creased the power of the Federal courts to enforce the amendments and authorized the president to suspend the writ of habeas corpus and use military force to suppress the public disorders occasioned by the attempts to intimidate negro voters. But these stern measures were accompanied by some efforts to restore harmony, such as the repeal of the " iron-clad oath " for ex-Confederates, in 1871, and the passage of the General Amnesty Act of 1872. The North was becoming restive under the long continued use of the Federal military arm within state borders in time of peace, and especially with the results of negro rule under " carpet-bag" leadership.

305. In any case the cost of rehabilitating the public works and providing education and the political and judicial institutions which should equally apply to the _ hitherto non-political class of the blacks, would g ance0 f Re- have been a heavy one. But the legislatures, construction especially of Louisiana, South Carolina, Tennessee, Oovern- Arkansas and Alabama, plunged into an extrava- gance made possible by the fact that the legislatures con- tained but few representatives who paid considerable taxes, and that they were controlled by Northern men who were some- times corrupt, and often indifferent to the burdens laid upon the propertied classes of the South. In 1872 it was estimated that the public debts of the eleven reconstructed states amounted to nearly $132,000,000, two-thirds of which was composed of guarantees to corporations, chiefly railway companies. Legis- lative expenses were grotesquely extravagant, the coloured members in some states engaging in a saturnalia of corrupt expenditure. Gradually this alienated from the so-called Radical party the support of Southern whites, because they resented the concessions of the carpet-bag leaders to the negro vote, because they suffered from the burden of taxation, and above all because race friction increased, drawing the whites together, in spite of former antagonisms between localities and classes.

306. By 1872 a coalition had been formed under the name of Conservatives. But the control of electoral machinery in the strongly centralized state executives chosen by negro votes, and coercion by the Federal authority, still upheld Republican rule in various Southern states. Virginia and North Carolina were practically bankrupt, the capitals of Louisiana, Arkansas and Alabama, where rival state officers claimed possession, were occupied by Federal troops, and many of the governments were so corrupt that only the contemporaneous revela-

tions of rottenness in New York City and in certain branches of the Federal government afford a parallel.

307. It was a .time of lax public morals after war, which was ill suited to the difficult experiment of transferring political power to a race recently enslaved. Only the strong arm of the Federal authority sufficed to prevent the whites of the South from overthrowing a condition of things which it was impossible under American political ideas permanently to maintain.

308. An important economic reorganization was in progress in the South. White districts were recovering from the war and were becoming the productive cotton areas by Economic the use of fertilizers and by the more intelligent Changes to white labour. Cities were rising, and the mines and tbe Souta – manufactures of the southern Appalachians were developing. In the black belt, or region of denser negro settlement, the old centres of cotton production and the citadels of the Southern political aristocracy, the blacks became tenant farmers, or workers on shares, but the white farmer in other areas raised his cotton at less cost than the planter who lived in the rich soils of the former cotton areas. The effective and just direction of negro labour was a difficult problem and was aggravated. by

Maximilian.

Alaska.

the political agitation which intensified race friction. It became evident that there was a negro problem as well as a slavery question, and that the North was unable to solve it.

309. In the meantime important foreign relations had been dealt with by Secretary William H. Seward, under Johnson, foreign and by Secretary Hamilton Fish, under Grant. Not Relations, only were many treaties of commerce and extradition, including one with China, negotiated by Seward, but he also brought about a solution of more important diplomatic

problems. The relations of the United States with France and England had been strained in the course of the war, by the evident friendliness of the governments of France and England for the Scuth. Not only had Napoleon III. been inclined to recognize the Confederacy, but he had also taken advantage of the war to throw into Mexico a French army in support of the emperor Maximilian. The temptation to use force while American military prestige was high appealed even

to General Grant; but Seward by firm and cautious ' diplomatic pressure induced France to withdraw her troops in 1867; the power of Maximilian collapsed, and the United States was not compelled to appeal to arms in support of the Monroe Doctrine. Russia's friendly attitude through- out the war was signalized by her offer to sell Alaska to the United States in 1867. Seward promptly accepted it and the treaty was ratified by the Senate and the purchase money ($7,200,000) was voted by the reluctant House, which saw little in the acquisition to commend it. Later years revealed it as one of the nation's treasure houses, particularly of gold and coal.

3 10. With England affairs were even more threatening than with France. Confederate cruisers (notably the " Alabama "),

The built in England and permitted by the negligence of

"Alabama" the British government to go to sea, had nearly Claims. swe p(; jhe American merchant marine from the ocean. Unsettled questions of boundary and the fisheries aggravated the ill feeling, and England's refusal in 1865 to arbitrate made a serious situation. Prolonged negotiations followed a change of attitude of England with regard to arbitration, and in 1870 President Grant recommended to Congress that the United States should pay the claims for damages of the Confederate cruisers, and thus assume them against England. However, in 187 1, the treaty of Washington was negotiated under Secretary Fish, by the terms of which England expressed regret for the escape of the cruisers and for their depredations, and provided for arbitration of the fisheries, the north-western boundary, and the " Alabama " claims. Senator Sumner had given fiery expression to demands for indirect damage done by the destruction of our merchant marine and our commerce, and for the expenses of prolonging the war. For a time this so aroused the passions of the two nations as to endanger a

solution. But Sumner, who quarrelled with the president, was deposed from the chairmanship of the committee on foreign relations, and Secretary Fish so arranged matters that the Geneva arbitration tribunal ruled these indirect claims out. Thus limited, the case of the United States was victorious, the tribunal awarding damages against Great Britain to the amount of $15,500,000. Two months later the German emperor gave to the United States the dis- S . a ” n J ˆ an puted north-west boundary, including the San Juan island in Puget Sound. The fisheries controversy was not settled until 1877.

311. In the West Indies also important questions were presented. Seward had negotiated a treaty of purchase of the Danish Danish West Indies, but the Senate refused to ratify it, nor West Indies; did Grant's attempt to acquire Santo Domingo meet Sant0 with a different fate at the hands of that body (1870).

om ngo. jˆ Cuba another insurrection was in progress. Secretary Fish ” pigeon-holed ” a proclamation of President Grant recognizing the Cubans as belligerents, and secured a policy of neutrality which endured even the shock of the ” Virginius affair ” in 1873, when fifty of the men of the filibustering steamer flying the American flag were shot by the Spanish

authorities (see Santiago, Cuba). It was shown that the vessel had no right to the flag. Negotiations about an isthmian canal resulted only in a treaty with The “Vir- Nicaragua in 1868 giving to the United States a glnius” right of way across the isthmus and in provisions for Affair. a government survey of the Panama route. Foreign relations in this period were chiefly significant in that they were con- ducted in a spirit of restraint and that peace was preserved.

312. It was in the field of domestic concerns, in economic and social development, that the most significant tendencies appeared. The old issues were already diminishing in importance before the other aspect of Reconstruction which came from the revived expansion of the nation toward the West and the new forms taken by the development of American industrial society,

313. The Republican party, following the traditions of the Whigs, was especially responsive to the demands of the creditor class, who demanded legislation to conserve their

interests. Its victory in 1868 was signalized by the passage in the spring of the following year of an act pledging the faith of the United States to pay in coin or its equivalent all the obligations of the United States, except in cases where the law authorizing the issue had expressly provided otherwise. In 1870 and 1871 refunding acts were passed, providing for the issue of bonds to the total amount of $1,800,000,000, one billion of which was to run for thirty years at 4%. This abandonment of the doctrine of early convertibility was made in order to render the bonds acceptable to capitalists, but in fact they soon went to a premium of over 25%. Long before their maturity the govern- ment had a surplus, but although it could then

borrow at 25% these bonds could not be retired. ju'a""" 3 *While the legislature was thus scrupulous of the credit of the nation and responsive to the views of capital, the Supreme Court was engaged in deciding the question of whether the legal tender notes (greenbacks) were constitutional. Suc- cessive decisions in 1868 determined that they were not legal tender for state taxes, that they were exempt from taxation, and that they were not legal tender in the settlement of con- tracts providing for payment in specie. In the case of Hepburn v. Griswold (1870) Chief Justice Chase, under whom, as secretary of the treasury, the notes were first issued, gave the opinion of the court denying that they were legal tender in settlement of contracts made before the first Legal Tender Act, and intimating that they were not legal tender for later contracts. • The judges had divided, four to three. Within a year the court was changed by the appointment of one new judge to fill a vacancy, and the addition of another in accordance with a law enlarging the court. In 1 87 1 the former decision was reversed and the con- stitutionality of the Legal Tender Acts sustained on loose- construction reasoning. In 1884 the court went to the extent of affirming the right of Congress to pass legal tender acts in time of peace, in accordance with the usage of sovereign governments, as an incident to the right of coinage, and it declared that the power to borrow money includes the power to issue obligations in any appropriate form. In 187 1 and 1872 Secretary George S. Bout well illustrated the power of the administration to change the volume of the currency, by issuing in all over six million dollars of legal tender notes; and, following the practice of his predecessors, he sold gold from the treasury to check specula-*

tions in that part of the currency. The most noteworthy instance of this was in 1869, when two Wall Street speculators, Jay Gould and James Fisk, jun., attempting to corner the gold market and relying upon a supposed influence in the councils of President Grant, ran up the premium on gold until Secretary Boutwell ordered the sale of gold by the government. The result was the financial crash of " Black Friday."

314. Speculation and the rapid growth of great fortunes were characteristic of the period. The war itself had furnished means for acquiring sudden riches; the reorganization of taxation, currency and banking increased the opportunities as well as the uncertainties; and the opening of new fields of speculative enterprise in the oil fields of Pennsylvania and Ohio and the gold and silver mines of the mountains of the Far West tended in the

same direction. An enormous development of manufactures resulted from the diminished commerce and increased demand

for manufactured goods, the protection afforded by tures. the tariff, the stimulus due to rising prices, and the

consumption of the rapidly growing West. It was officially reported in 1869 that " within five years more cotton spindles had been put in motion, more iron furnaces erected, more iron smelted, more bars rolled, more steel made, more coal and copper mined, more lumber sawn and hewn, more houses and shops constructed, more manufactories of different kinds started, and more petroleum collected, refined and exported, than during any equal period in the history of the country."

315. Between the Civil War and 1872 the extension of the nation's activity to the industrial conquest of the great West, as well as the economic reorganization of the East, had a profound effect upon the development of the United States. Between 1862 and 1872 grants were made to the Union Pacific and Central

Pacific companies, and to other connecting corpora- Railways. tions, for railways from the Missouri to the Pacific,

amounting to nearly 33,000,000 acres, and in the same period large loans of funds were made by the general government for this enterprise. Construction advanced rapidly after 1866, and by 1869 an all-rail connexion had been established on the line of the Union Pacific and Central Pacific railways between the East and San Francisco. Various grants were made in these years to other roads, both trans- continental and Middle Western. Between 1850 and 1871 Congress granted about 155,000,000 acres for railway construc- tion, but not all these grants were perfected. It is estimated that some $500,000,000 were invested in the construction of Western railways between 1868 and the panic of 1873, and about 30.000 m. of railway had been added.

316. The effects of this extraordinary extension of railway transportation were immediately apparent. In the Far West Effects of the railway lines rapidly made possible the ex- Railway tinction of the bison herds which had occupied Extension, ˆe great plains. Divided into the northern and southern herds by the Union Pacific railway in 1869, the southern herds were slaughtered in the period between 1871 and 1879, and the northern herds between 1880 and 1883. This opened the way for the great extension of the cattle country, following the retreat of the Indians. Upon the plains Indians the effect was revolutionary. Their domain had been penetrated by the railways, at the same time that their means of subsistence had been withdrawn. During the Civil War most of these Western tribes had engaged in hostflities against the Federal government. In 1866 and 1867 General George Crook was reducing the Indians of the South-West to submission, while other generals trained in the Civil War were fighting the Indians in the northern plains and Kansas, Nebraska and Okla- homa. By the Peace Commission Act of the 20th of July 1867 commissioners, including General William T. Sherman, were sent to negotiate treaties. As a result the tribes of the Indian Territory were so concentrated as to permit the transfer of other Western tribes to the same region, while the Sioux of the northern plains were given a reservation embracing the western portions of the Dakota,. Discontent with these treaties resulted, however, in hostilities following 1867. Between the close of the war and 1880 some $22,000,000 were expended in Indian wars, although the act of 1871 inaugurated the

change of policy whereby the Indians were no longer dealt with by treaty, but were regarded as wards of the nation, to be concen- trated on reservations and fed at the expense of the nation under the supervision of Indian agents.

317. Part of these Indian difficulties were due to the opening up of new mining areas in the Rocky Mountains, some of them within the Indians' choicest hunting grounds. At the beginning of the Civil War a preliminary mining boom struck Colorado; the rich Comstock lode was opened in Nevada; Arizona was the scene of mining rushes; the Idaho mines were entered; and the Montana ores were discovered; so that in the period of the Civil War itself the Territories

Mining.

of Nevada, Idaho and Montana had been organized and the mountains provisionally occupied from the northern to the southern limit. The discovery of gold in the Black Hills in 1874 continued the same movement. In i860 the nation produced $156,000 worth of silver, in 1861 over $2,000,000 and in 1873 nearly $36,000,000. In the last-mentioned year the production of gold amounted also to $36,000,000, although in i860 it had been $46,000,000. Capital in mines and quarries of the United States was over $65,000,000 in i860, over $245,000,000 in 1870, and nearly $1,500,000,000 in 1880.

318. This revolution in the life of the great plains and the Rocky Mountains, opening the way to agriculture and to cattle raising, and preparing for the exploitation of the precious metals of that great area, was contemporaneous with the important development of the farming regions of the Middle West; Even dur- ing the Civil War the agricultural development of the northern half of the Mississippi Valley had continued. This was aided by the deriand for food products to supply the armies and was made possible by the extension of railways, the taking up of the prairie lands through the operation of the Homestead Law of 1862, the marketing of the railway land grants, and the increased use of agricultural machinery in those years. Between i860 and 1870 the population of the North Central group of states (engaged chiefly in grain raising) increased over 42 %, and in the next decade by 34 %, a total addition to the popula-

tion in those two decades of 8,000,000. Between ott i, e 1870

and 1880 about 200,000 sq. m. were added to the Middle West. farm lands of the United States, an area almost equal in extent to that of France. In the same decade the North Central states increased their improved farms from near 78,500,000 acres to over 136,800,000 acres. The product of Indian corn about doubled between i860 and 1880, and that of wheat and oats more than doubled. The addition came chiefly from the Middle West. In i860 the North Central states raised 95,000,000 bushels of wheat; in 1870 nearly 195,000,000; in 1880 329,000,000. In 1870 the same states produced 439,000,000 bushels of corn; in 1880 they produced over 1,285,000,000.

319. The pressing need of increased transportation facilities had led, as we have seen, to lavish land grants and to subsidies by nation, states and municipalities to the railways. The rail- ways themselves, tempted by these opportunities, had extended their lines in some cases beyond the immediate needs of the regions entered in advance of settlement. Extravagances in construc- tion and operation, aggravated by " construction rings " of railway officials, who secured the contracts for _ ,. themselves and their friends, and by rolling stock Abuses. companies who received extravagant prices by favouritism, as well as the watering of stock in the creation of systems by absorption andc onsolidation of railway corpora- tions, brought about a condition where the roads were no longer able to meet the demands of their stockholders for returns on the investment without imposing rates that the Western farmer deemed extortionate. In the competitive development of these roads and in the struggle of business corporations and localities with each other, the roads also discriminated between persons and places. This condition chiefly accounted for the political unrest which manifested itself in the West in the so-called " Granger " movements of the 'seventies.

320. The farmers felt the pressure of the unsettled currency, taxes were very heavy, the protective tariff seemed to them to bear unduly upon the producers of crops which exceeded the home consumption and had to seek the foreign markets. The price of Indian corn, wheat and cotton in the early 'seventies tended to fall as production rose, so that the gold value of the total crop was not greatly increased during the decade after the war, in spite of the extraordinary extension of agricultural settlement and the increase of production. Dissatisfaction with his share in the prosperity of the country, and especially with

the charges of middlemen and transportation companies, discontent with the backwardness of rural social conditions, and a desire for larger political influence, all aided in fostering the growth of

The Tweed Ring.

organizations designed to promote the farmers' interests. The most influential of these organizations was the Patrons of Husbandry, which was foundedin 1867 and spread chiefly after 1872 by local clubs or " granges," especially in the West and South.

321. The height of the movement was reached in the autumn of 1874. It threatened the disruption of the old political parties The in m °st of the Middle Western states. By holding '• Granger" the balance of power the Grangers secured legislation Movement j n man y f these states, fixed maximum railway rates, and provided for regulation through commissions to prevent discriminations. In the reaction after the panic of 1873 (when nearly a fifth of the railway mileage of the United States had passed into the hands of receivers) many of the " Granger laws" were repealed, the regulation was rendered nominal and the railways more than regained their political power in the states; yet the agitation had established the important principle, sanctioned by decisions of the Supreme Court, that the railways were common carriers subject fully to public regulation so far as it was not confiscatory. The move- ment for regulation of interstate commerce by congressional legislation was begun at this time under the leadership of congressmen from the Granger states. Later efforts were more wisely considered and more effective; but the rural democracy showed its opposition to the increasing political influence of capital, to special privileges and to the attempts of corporations to avoid public control periodically thereafter (see Farmers' Movement). The attempt to eliminate the middlemen by co-operative stores and grain elevators was another feature of the time which gained a brief strength but soon declined.

322. The presidential election of 1872 took place in the midst of this Western upheaval. At the same time in the South the

reform Republicans and Democrats were uniting under the name of " Conservatives " against the carpet-bag rule, and control was passing into their hands. A reform movement was active against the evident corruption in national and municipal administrations, for Grant's trust in his appointees was grossly violated. The Tweed Ring was systematically looting New York City, and prior to Tweed's indictment in 1871 (See New York (City) ; Tammany Hall; Tilden, S.J.) it was acquiring large power in state legisla- tion. Jay Gould, the railway operator, was one of the signers of Tweed's million dollar bail bond. Civil service reformers, men of moderate views with respect to Reconstruction, such as Carl Schurz, many War Democrats who had adhered to the Union party, and tariff reformers began to break away.

323. The Liberal-Republican movement started in Missouri, and a national convention was called to meet at Cincinnati on Liberal the ist of May 1872. Their platform announced Republican irreconcilable differences on the tariff and left it to Movement, ˆg Congressional districts, attacked the corruption of civil service by the administration, supported the results of the war as embodied in the last three amendments and demanded amnesty and local civil government for the South. It opposed further land grants to railways, but denounced repudiation and demanded specie payments in terms which excluded from its support the advocates of inflation of the currency. This effort to combine the opponents of Grant's administration was wrecked by the nomination of Horace Gree- ley, a strong protectionist, who did not command the confidence of the masses of the disaffected. Although endorsed by the

Democrats, Greeley was defeated by Grant, who ran Re-elected. on tne recor(i ˚f the Republican party, which now

dropped the word Union from its name. Greeley died before the electoral count; the Democrats won only the states of Maryland, Kentucky, Missouri, Tennessee, Georgia and Texas, the votes of Louisiana and Arkansas being thrown out.

324. The enormous cost of the war, the excessive railway build- ing, over-trading, and inflated credit and fluctuating

currency, the sinking of capital in opening new farming lands and in readjust- ing manufactures to new conditions brought their results in the panic of 1873, precipitated by the failure (Sept. 18) of Jay Cooke, the financier of the Northern Pacific railway. For over

five years the nation underwent a drastic purgation; railway building almost ceased, and so late as 1877 over 18% of the railway mileage of the nation was in the hands of receivers. The iron industry was prostrated, and t “° 3 ˆ ° mercantile failures for four years amounted to $775,000,000. At the close of the period there was a replace- ment of partnerships and individual businesses by corporations, but in the interval political unrest was in the foreground.

325. The charges that congressmen had been bribed by stock in the Credit Mobilier (q.v.), a construction company controlled by Union Pacific stockholders, led to a Tne credit congressional investigation which damaged the repu- Mobilier; tations of prominent Republicans, including Vice- the Salary president Schuyler Colfax; but the same Congress ra ‘ which investigated this scandal voted itself retroactive increases of salary, and this ” back-pay grab ” created popular indigna- tion. Evidences of fraud and corruption in revenue collection under the ” moiety system,” and the general demoralization of the civil service continued. The demand for relief from the stringency of the crisis of 1873 expressed itself in the so-called Inflation Bill (passed April 1874), providing a maximum of four hundred million dollars for greenback issues. This was vetoed by Grant, but he later signed a bill accepting as a maximum the existing greenback circulation of $382,000,000. This com- promise was satisfactory neither to contractionists nor green- backers. The latter especially resented the provisions regarding the national banks and their circulation.

326. The ” tidal wave ” in the Congressional elections of 1874 was the result of these conditions. It marked a political revolution. The House of Representatives, which Republicans exhibited a two-thirds Republican majority in 1872, lose Control showed an opposition majority of about seventy, of Congress. and the Senate was soon to be close. Such Republican strong- holds as Pennsylvania, Ohio and Massachusetts went over to the Democrats in the state elections, while in the grain-raising states of the Middle West the Grangers were holding the balance of power, and in the

South the Republican radicals remained in force in few states and only by the use of Federal troops. President Grant in his message of December 1874 acknowledged that public opinion was opposed to this use of force, but declared that without it negro suffrage would be worse than a mockery. Thus by the year 1874 the era of triumphant Republicanism and Reconstruction was closing. The leaders perceiving power about to pass from them rapidly enacted a series of party measures before the meeting of the newly elected Congress. Under the leadership of Senator John Sherman an act was passed (Jan. 14, 1875) providing for resumption of specie payments on the ist of January 1879, gradually contracting greenbacks to three hundred million dollars and compensating this by expanding the circulation of the national banks. Sherman's personal preference was to make the greenbacks exchangeable for 4% bonds and thus to make the general public instead of the banking houses the purchasers of these securities, but he was unable to convince his colleagues. In the field of the tariff a similar policy was followed. The act of 1870 had somewhat reduced duties on tea, coffee, sugar and iron; but under Western pressure in 1872 the Republican Congress had consented to a 10% reduction on most classes of goods in order to save the general system of protection. On the eve of their relinquishment of full power the Republicans (March 3, r875) repealed the Tariff Act of 1872, increased the duties on molasses and sugar and increased the revenue tax on tobacco and spirits. Thus the tariff was restored to the war basis, before the incoming Democratic House could block the advance. Similarly on the ist of March Congress passed a Civil Rights Act, milder than the measure for which Sumner had fought so long, A ˆ u g guaranteeing equal rights to the negroes in hotels,

public conveyances, and places of amusement and forbidding the exclusion of them from juries. But an effort to pass a new force bill levelled against the intimidation of negro voters failed. By these measures the Republicans placed the

The Tariff.

important features of their policy where they could be overturned only by a Democratic capture of presidency and Senate.

327. In the midst of these changes the Supreme Court handed down decisions undoing important portions of the Reconstruction Supreme system by restraining the tendency of the nation to Court encroach on the sphere of the state; and restricting Decisions t jj e SCO p e f the recent constitutional amendments. On the 14th of April 1873, in the Slaughter House cases, the courts held that the amendments were primarily restrictions upon the states for the protection of the freedom of the coloured man, rather than extensions of the power of the Federal government under the definition of United States citizenship, and that general fundamental civil rights remained under state protection. In the case of the United States v. Reese, decided on the 27th of March 1876, the court declared parts of the act of 1870 (which provided for the use of Federal force to protect the negro in his right to vote) unconstitutional, on the ground that they did not specify that the denial of suffrage must be on the sole ground of race or colour. A reasonable prerequisite, such as a poll tax, for voting was permissible. The South later took advantage of this decision to restrain negro suffrage indi- rectly. In United States v. Cruikshank (1876) the court held that the amendments to the Constitution left it still the duty of the state, rather than of the United States, to protect its citizens, even when whites had mobbed the negroes. The right of the nation in the case was held to be limited to taking care that the state governments and laws offered equal protection to whites and blacks. The affirmation of the power of the states over common carriers in the Granger cases (1877) has been mentioned. In 1883 the court declared the conspiracy clause of the Ku-Klux Act unconstitutional and restricted the application of the law to acts of a state through its officers and not to private citizens. In the same year it declared the Civil Rights Act of 1875 invalid.

328. In 1875 President Grant refused the appela of the " carpet-bagger " Governor Adelbert Ames of Mississippi to be supported by troops, whereupon Ames resigned his office into the hands of the Conservatives. The Mississippi plan of general intimidation'of negroes to keep them from the polls was followed in Louisiana, South Carolina and Florida which alone remained Republican. Thus steadily the radical Reconstruction policy and Republican control of the South were being reversed. It was made clear that negro suffrage could be

enforced upon the South only by military rule which could no longer com- mand Northern sympathy or the sanction of the Federal court. Northern interest increasingly turned to other issues, and especially to discontent over administrative corruption.

320. The spoils system had triumphed over the advocates of civil service reform to such an extent that Grant abandoned the competitive system in 1875 on the ground that Ring Congress did not support him in the policy. Enor-

mous frauds in the collection of the internal revenue by the Whisky Ring with the connivance of Federal officials were revealed in 1875, and about the same time, Secre- tary of War William W. Belknap resigned to avoid impeach- ment for corruption in the conduct of Indian affairs. The enforced resignation in 1876 of Secretary of the Treasury Ben- jamin H. Bristow (q.v.) after he had successfully exposed the Whisky Ring, and of Postmaster-General Marshall Jewell, who had resisted the spoils system in his department , tended to dis- credit the administration. Blaine, the leader of the Republicans in the House of Representatives, fell under suspicion on account of his earlier relations with the Little Rock & Fort Smith and Northern Pacific railways (see Blaine, J. G.), which left it doubtful, in spite of his aggressive defence, whether he had not used his influence as speaker in previous Congresses to secure pecuniary advantages from land grant railways. This clouded Blaine's prospects for a presidential nomination, and the House of Representatives voted a resolution against the third term which Grant seemed not unwilling to accept.

330. Thus the campaign of 1876 approached, with the Republicans divided into (1) steadfast supporters of the Grant administration, (2) a discontented reform wing (which favoured

ex-Secretary Bristow), and (3) an intermediate group which followed Blaine. This statesman made a bold stroke to shift the fighting which the Democrats planned to make Party against the scandals of the administration, to the old Platforms time war issues. By proposing to exclude Jefferson otl ˆ 76 – Davis from amnesty, he goaded southern congressmen into indiscreet utterances which fanned anew the fires of sectional animosity. The Republican platform, while deprecating sectionalism, placed the war record of the party in the foreground and

denounced the Democracy, because it counted upon the united South as its chief hope of success. A com- promise candidate was selected in the person of Governor Rutherford B. Hayes, of Ohio, who had vigorously opposed the greenback movement in his state, and whose life and character, though little known to the general public, made him acceptable to the reform leaders of the party. The Democrats, demanding reform, economy, a revenue tariff and the repeal of the resumption clause of the act of 1875, chose the reform governor of New York, Samuel J. Tilden, as their candidate. The Independent National, or Greenback, party, which was to develop rapidly in the next two years, nominated Peter Cooper, a New York philanthropist, and demanded the repeal of the Resumption Act, and the enactment of a law providing a paper currency issued directly by the government, and convertible on demand into United States obligations bearing a rate of interest not exceed- ing one cent a day for each one hundred dollars and exchangeable for United States notes at par. It also proposed the suppres- sion of bank paper, and was in general antagonistic to the bond-holding and banking interests.

33 r. The election proved to be a very close contest. Tilden, according to the count of both parties, had a plurality of over a quarter of a million votes, and at first the leading #»™«-77/» Republican journals conceded his election. He had den Contest; carried New York, Indiana, New Jersey and Con- the Electoral necticut and, by the Democratic count, the solid ~ r °™ m/s ” South. But the Republican headquarters claimed the election of Hayes by one electoral vote, based on the belief that the states of South Carolina, Florida and Loui- siana, 1 had gone Republican. Since these states were in the midst of the transition from negro to white government, and elections were notorious for fraudulent practices, a serious question was raised, first as to the proper authority to count the electoral vote, and second, how far it was Dermissible to go behind the returns of the state authorities to ascertain the validity of the canvass of the votes in the state. The political capacity and moderation of the nation were severely tested; but in the end a characteristic American solution was found by the creation of an Electoral Commission (q.v.) in which five associate justices of the Supreme Court were joined with an equal number of representatives from each of the two houses of Congress. The result was that this com- mission refused to ” go behind the returns,” and Hayes was declared elected by one vote. To

prevent the threatened danger of a filibuster by Democrats Elected of the' House of Representatives against the com- pletion of the count until after legal date for the inaugu- ration of the president, Hayes's friends agreed with leading Democrats that he would withdraw the Federal troops from Louisiana. Thus a new era began under a moderate and ref ormin g Republican president, a close Republican Senate and a Demo- cratic House of Representatives. The Southern question was not settled, but other issues of an economic and social nature increasingly forced themselves to the front. They were con- cealed in a measure by the fact that the following of each of the leading political parties was divided on financial policies, which resulted in attempts to compromise and evade the issue by the party managers. During the dozen years that fol- lowed Hayes's inauguration neither party held complete posses- sion of both the executive and the two houses of Congress. His own moderate character, the conditions of his election and

1 There was a conflict with regard to the electoral vote of Oregon also. (See Oregon: History.)

the check imposed during the first two years by a Democratic House of Representatives (and during the second two years by an opposition in both houses) made the period of Hayes's administration a transition from the era of Reconstruction to the era of dominant economic and reform agitation.

332. When he withdrew the troops which sustained the Republican governments in Louisiana and South Carolina, those states returned to the rule of the white Democrats. In the Congress elected in 1878 the former slave states chose 101 Democrats to the House of Representatives and only four Republicans. Leading Republicans like Blaine protested vigor- ously against the policy, declaring that the men who saved the Union should govern it; and on the other hand the Demo- crats in Congress added " riders " to appropriation bills designed to

starve the administration into complete cessation of the use of troops and Federal deputy marshals at Southern elec- tions. Extra sessions had to be summoned in 1877 and 1870 to provide supplies for the government, due to this policy. Hayes assisted his party by vetoing these coercive attempts of the Democrats and it was not until later that Federal attempts to supervise Southern elections entirely ceased.

333. As his early policy toward the South had dissatisfied many of the leaders of his party, his opposition to the spoils

system alienated others. In 1877 a Civil Service Reform Reform Association was formed in New York, and

under the leadership of reformers like George William Curtis, Carl Schurz, John Jay and Dorman B. Eaton, it extended to other states. In June 1877 President Hayes issued an exe- cutive order against the participation of Federal officers in political management, and he furnished evidence of his sincerity by removing Alonzo B. Cornell, the naval officer of New York, who was also chairman of both state and national Republican committees, and Chester A. Arthur, collector of the port of New York. As both men were friends of Senator Roscoe Conk- ling of that state, the leader of the Grant men, this was a bold challenge. The " Stalwarts " answered it by soon afterward securing the nomination of Cornell as governor of New York and Arthur as vice-president of the United States.

334. The monetary question rose to primary importance at this time. Hayes himself had campaigned in Ohio successfully

against the Greenback movement, and he chose ofi&7? as ms secretary of the treasury, John Sherman,

former senator from that state, whose long service as chairman of the finance committee had made him familiar with conditions and influential with moderate men of all factions. The per capita circulation of the nation had fallen from $20-57 m 1865 to $15-58 in 1877 and was still de- clining. The remarkable increase in the production of silver, as the new mining regions were opened, was accompanied by a fall in its ratio to gold from 15 to 1 in i860 to 17 to 1 in 1877. Congress had, in 1873, passed an act dropping the standard silver dollar from the list of coins; but the significance of this omission of a coin not widely circulated, although it came at a time when

European nations were adopting the gold standard, passed almost unnoticed at the moment; but the demonetization of silver was afterward stigmatized as a conspiracy, " the crime of 1873." As the date (January 1, 1879) for the redemption of the green- backs in specie approached, demands were renewed for the replacement of national bank notes by greenbacks, for the postponement, or abandonment of resumption, for the free coinage of silver, and for the use of silver as well as gold in the payment of bonds redeemable in " coin." Sectional grouping of the debtor against the creditor regions, rather than party alignment, showed itself in the votes, for each party had its " soft money " as well as its " hard money " followers. Many who could not support the Greenback party in its theory that currency derived value from purchasing power based on the government's credit and authority rather than on convertibility, would, nevertheless, make larger use of paper money; while men who did not assent to the free coinage reasoning opposed the single gold standard as too narrow

and too much under the influence of the speculative and banking interests, and would adopt some system of bi-metallism.

335. A Monetary Commission, appointed in 1876, reported in 1877, but without agreement or real influence upon the country. The president took strong ground against

free coinage (though he would resume coinage of Ams(m Ac ˆ silver in limited quantities) and against the pay- ment of bonds in silver; but the House of Representatives passed the measure, known as the Bland Bill, for the free coinage of silver, by a vote of 163 to 34. In the Senate this was amended, and as it finally passed both houses it was known as the, Bland-Allison Act after the two leaders, the Democratic repre- sentative from Missouri and the Republican senator from Iowa. This compromise was carried over the veto of President Hayes and became a law on the 28th of February 1878. In the vote of the 15th of February, all but one of the senators from New England, New York and New Jersey opposed it, while the states west of the Alleghanies furnished only four opposing votes. The law restored the legal tender character of the silver dollar and authorized the secretary of the treasury to buy silver bullion at the market price, to an amount of not less than $2,000,000 nor more than $4,000,000 per month, and to coin the bullion into silver dollars. Silver certificates of denominations not less

than ten dollars were to be issued upon deposit of silver dollars. As neither the silver nor the certificates circulated freely the denominations of the certificates were reduced in 1886, when they filled the deficiency in the contracting bank-note circulation.

336. Hardly had the Bland-Allison compromise been effected on the silver issue when an act was passed (May 31, 1878) for- bidding the further retirement of greenbacks, which remained at $346,681,000. Substantially the same sectional alignment was followed in the vote on this bill as in the silver votes. Not satisfied with this legislation, nearly a million voters cast their ballots for Greenback party candidates at the Congressional elections in the autumn of 1878. The preparations of Secretary Sherman had been so carefully made, and the turning tide of trade brought coin so freely to the United States, that before the date of resumption of specie payments a gold reserve had been accumulated to the amount of $133,000,000 in excess of matured liabilities and the greenbacks rose to par before the date of redemption.

*337. In the campaign of 1880, Hayes and Tilden both declined to stand for renomination. Thus the issue of the " fraud of 1876," which the Democratic platform called the party paramount issue, was subordinated. Nor was it Platforms possible for the Republicans to force the tariff 0//5 *°- question into a commanding position, for although the Democratic platform declared for a tariff for revenue only, a considerable wing of that party led by Samuel J. Randall, of Pennsylvania, favoured protection. General Winfield S. Hancock, a distinguished soldier in the Civil War, whose nomination for the presidency by the Democrats was designed to allay Northern distrust, refused to make the tariff a national issue. The recent adjustment of the monetary question and the return of prosperity relegated the discussion of the currency also to a subordinate place, so that the Greenback party was able to poll only a little over 300,000 votes instead of the million which it commanded two years before. It favoured unlimited coinage of silver as well as the replacement of bank-notes by greenbacks.*

338. The Republicans, after a heated convention in which the followers of Grant (who had recently returned from a several years' trip round the world), Blaine and Sherman, oarfkld fought each other to a deadlock, selected General Elected

James A. Garfield (g.v.) of Ohio, who was political P resi ˆ eat – manager for Sherman in the convention. This was a blow to the Grant, or " Stalwart " wing, which was partly placated by the nomination of Arthur for the vice-presidency. Garfield's popular plurality was only a little over seven thousand out of a total vote of over nine millions; but his electoral vote was 214 to Hancock's 155. The area of the former slave

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states marked the boundaries between the Republican and the Democratic states, except that Hancock also carried New Jersey, Nevada and California. The Republicans won the elections for the House of Representatives which would meet in 1881, and the Senate was at first nearly evenly divided, two independents holding the balance. In the ensuing four years party lines were badly broken, factions made bitter war upon each other, and the independent reformers or " Mugwumps " (q.v.) grew in numbers. The selection of Blaine as secretary of state committed Garfield to the anti-Grant wing, and the breach was widened by his appointment of the collector of the port of New York against the protests of Roscoe Conkling and Thomas C. Piatt, the " Stalwart " senators from New York. They resigned, then sought re-election in order to vindicate the right of senatorial recommendation; but were defeated.

33g. In the midst of this excitement the president was assassinated by a disappointed office-seeker of unsound mind. Vice-President Arthur, who succeeded Garfield in Hon of ' September 1881, by his tact and moderation Garfield; won the admiration of former opponents; but Arthur ˆ e b ac j cr0 p s j n jggj an d t ne dissatisfaction

/Vesitfen. yfith boss ru l e among independent voters caused a Democratic victory in the Congressional campaign of 1882. Garfield's assassination had given new impetus to the movement against the spoils system, a National Civil Service Reform League had been organized in 1881, President Arthur*

presented the question in his message of December of that year, and in 1882 George H. Pendleton, a Democratic senator from Ohio, urged the subject upon the attention of Congress. Stimulated by the elections of 1882 Congress passed an act (January 16, 1883) authorizing the president to appoint a commission to classify certain of the Federal employees, and providing for appointment and promotion within this classified list by competitive exami- nation, the employees being distributed among the states and territories according to population, with preference for soldiers and sailors of the Civil War. Congressional recommendations for these offices were not to be received, and political assess- ments for campaign purposes were forbidden. This was an effective beginning in the purification of the civil service; but the evil of assessment of employees was succeeded by the evil of soliciting campaign contributions from corporations interested in legislation. The extension of the competitive Anti-Poly nst proceeded gradually through succeeding ad- gamyAct; ministrations. The Edmunds Anti-Polygamy Act CA/iiese (1882) was levelled at the Mormons (q.v.), and the Chinese Exclusion Act was passed at the demand of labour, after a long agitation in 1882, the way having been prepared by the Treaty of Peking in 1880. Bills to this effect had been vetoed by Hayes and Arthur as violative of international agreement, but the desire of the politicians to win the California vote, and the compromise by which the exclusion was limited to ten years finally carried the measure, and the Supreme Court (1889) held it constitutional. Later acts modified and extended the exclusion.

340. From 1879 to 1890 the treasury showed a surplus of revenue over expenditure. This furnishes the explanation of much of the legislation of that period. It led to extravagant appropriations, such as the Arrears of Pensions Act of 1879, and the River and Harbor Act of 1882 providing for the expenditure of more than $18,000,000, which was passed over the veto of Arthur. Appropriation bills were merely constructed in various committees of Congress under a system of bargaining between interests and sections with primary reference to the political fortunes of the congressmen.

341. The surplus also strengthened the demand for a reduction of the tariff. A tariff commission, composed of men friendly to protection, appointed in 1882, proposed an average reduc- tion of 20 to 25%. Nevertheless in the act as passed in 1883 duties were increased in general on those protected articles

which continued to be imported in large volume, especially on certain woollen goods and about two-thirds of

the imported cotton goods, and on iron ore and some steel products, while they were lowered on finer grades of wool and cheaper grades of woollen and cotton fabrics, &c. It was unsatisfactory to large portions of both parties and did not materially lower the revenue; but the act of 1883 made extensive reductions in internal taxes. As the Senate had just fallen into the hands of the Republicans, and the House would not become Democratic until the new Congress met, this protective law gave the former the advantage of position. Moreover the Democrats were themselves divided, nineteen Representatives (one-third from Pennsylvania) voting with the Republicans on the act of 1883. In the next Congress (1884), when the leaders made an, attempt to rally the Democrats to show their position by passing a bill for a horizontal reduction of 20% in general, forty-one Democrats voted against the bill and prevented its passage through the House.

342. Thus the campaign of 1884 found both parties still lacking unity of policy although it seemed possible that the tariff might become the touchstone of the contest. The Republicans challenged the independents by nominating Blaine, whose record was objectionable to many reformers, and who had been chiefly identified with the Reconstruction politics. The Democrats, taking advantage of the situation, nominated Grover Cleveland (q.v.) of New York. He had won approval by his reform administration as mayor of Buffalo and as governor of New York during the past two years, when he had shown an independence of party " bosses " and had con- vinced the public of his sincerity and strength of character. He represented conceptions and interests which had grown up since the war, and which appealed to a new generation of voters. The platform emphasized the idea that " new issues Party are born of time and progress," and made the leading Platforms question that of reform and change in administra- oflS84. tion, lest the continued rule of one party should corrupt the government. On the question of tariff the Democrats took a conservative attitude, emphasizing their desire to promote healthy growth; rather than to injure any domestic industries, and recognizing that capital had been invested and manufactures developed in reliance upon the protective system. Subject to these limitations, they demanded correction of the abuses of the tariff and adjustment of it to the

needs of the government economically administered. The Greenbackers nominated General Benjamin F. Butler of Massachusetts, recently chosen governor of that state on the Democratic ticket, but he polled only 175,000 votes, while John P. St John, the candidate of those who would prohibit the liquor traffic, secured 150,000 votes, an unprecedented gain. The Prohibitionist platform included a demand that all money, coin and paper, should be made, issued and regulated by the government and be a legal tender for all debts, public and private.

343. The campaign abounded in bitter personalities, and the popular vote was close, Cleveland's plurality being only twenty-three thousand. The great state of New Cleveland York, with electoral votes enough to have turned the Elected scale, was carried by the Democrats by only a few President. more than one thousand votes out of a total of over a million. Cleveland's electoral majority was 37. The election was nevertheless recognized as making an epoch. For the first time since victory came to Lincoln and the Republicans on the eve of the Civil War, nearly a quarter of a century earlier, the country had entrusted power to the Democrats, although over two-thirds of their electoral vote came from the former slave states. New York, Connecticut, New Jersey and Indiana constituted their Northern territory. Perhaps the most significant thing about the result was the evidence that in the North political and sectional habits and prejudices were giving way among a sufficient number of independent voters, responsive to strong personal leadership on reform issues, to turn the political scale. The transition from war issues which began in 1872, and became marked in 1876, was completed by the election of Cleveland in 1884.

Civil Service.

During the first half of his term President Cleveland had the opposition of a strongly Republican Senate. In the second half the Senate remained Republican by a majority of two, and the House continued Democratic. His civil service policy naturally

met severe criticism not only from his party foes, but also from the spoilsmen among his Demo- cratic followers, who desired a clean sweep of Republican office-holders, and from those of his independent supporters who looked to him to establish the service on a strictly non-partisan basis. The outcome of the first two years of his administration was that, of the entire body of Federal office-holders, two-thirds were changed and the obnoxious Tenure of Office Act was repealed, thus leaving the president the right of removal with- out presenting his reasons. Nevertheless there was a gain, for Cleveland somewhat checked the political activity of office- holders, the criticism by the Republicans placed them on record against the former spoils system, and before leaving the presi- dency (but after the election of 1888 showed that power was to pass to the Republicans), he transferred the railway mail service to the classified list requiring competitive examination.

344. The transition of executive power for the time to the Democratic party, however "much it impressed the imaginations of the public as the end of an era, was not so significant as the national growth and expansion in the decade between 1880 and 1890 whereby forces were set loose which determined the characteristics of the succeeding period. Between these years the nation grew from about fifty millions to over sixty-two millions. The Middle West, or North Central group of states, gained nearly five millions and the Western division over a million and a quarter. West of the Allegharies altogether more than eight million souls had been added, while the old Eastern states gained but four millions. In 1890 the North Central division alone had achieved a population nearly five millions greater than that of the North Atlantic, while the trans-Alleghany region surpassed the whole East by about ten millions, and the numbers of its representatives in House and Senate placed the political destiny of the nation in its hands.

345. One of the most important reasons for the wholesale taking up of Western resources in these and the following years

was the burst of railway building subsequent to the oVthe'west interruption of the panic of 1873. The eager

pioneers pushed into western Kansas and Nebraska as they had into the northern Ohio Valley a half-century before. Nebraska grew from a population of one hundred and twenty-three thousand in 1870 to nearly half a million in 1880 and to over

a million in 1890. From about a third of a million in 1870, Kansas rose to almost a million in 1880, and to nearly a million and a half in 1890. The railway had " boomed " the Golden West and a cycle of abundant rains seemed to justify the belief that the " Great American Desert " was a myth. Thus settlers borrowed money to secure farms beyond the region of safe annual rainfall under the agricultural methods of traditional pioneering. Swift disappointment overtook them after 1886, when droughts and grasshoppers ruined the crops and turned back the tide of Middle Western colonists until the western parts of these states were almost depopulated, Kansas alone losing one-seventh of its population; nor did prosperity return for a decade.

346. As the column of settlement along the Ohio Valley had extended its flanks into the old North- West between the Ohio and the Great Lakes, and into the old South- West of the lower Mississippi after the War of 181 2, so the later pioneers by railway trains began to take possession of the remoter and vaster North- West and South-West. The " granger roads, ' ' centring in Chicago, thrust their fines Out to develop wheat farms in interior Iowa, Minnesota and the Dakotas, where the virgin soil of the prairie farms brought returns that transferred the wheat belt to this new land of promise, and by competition forced the older wheat areas to develop varied agriculture. The introduction of the recently invented steel roller system of making flour into the Minneapolis mills not only built up a great flour industry there but created a demand for the hard wheat suited to the

North-western prairies. The pine forests of Michigan, Wisconsin and Minnesota were exploited in the same era.

347. A more impressive movement was in progress as additional transcontinental railways were extended from the frontier to the Pacific. In 1870 for a thousand miles west of Duluth, at the head of Lake Superior, along the line of the projected Northern Pacific railway there were no cities or little towns. Relying upon its land grant and upon the undeveloped resources of the vast tributary region, the railway, after halting for a few years subsequent to the panic of 1873 at Bismarck on the Missouri rushed its construction to Seattle and was opened in 1883. The Great Northern, a product of the vision and sound judgment of James J. Hill, started from St Paul without a land grant and reached Puget Sound in 1893,

constructing lateral feeders as it built. Thus a new industrial zone had been brought into existence. Colorado had become a state in 1876; in 1889 North Dakota, South Dakota, Washington and Montana were admitted as states and the next year Idaho and Wyoming were added. The Western political forces, especially the friends of silver, were thus given the balance of power in the Senate and additional weight in the electoral college.

348. As a new North- West was opened by the completion of the Canadian Pacific (1883), the Northern Pacific (1883) and the Great Northern (1893), so the new South-West

was entered by the completion of the Southern \ye S f° Pacific from New Orleans across Texas, New Mexico, Arizona and southern California to San Francisco by 1883. In 1883 also the lines which became the Atchison, Topeka & Santa Fe, extending from the lower Missouri valley, with St Louis and Kansas City as important terminals, through south-eastern Colorado, northern Arizona and New Mexico, reached the same goal. The Denver & Rio Grande in the same period opened new mining areas between Denver and Ogden. Not only additional mines were reached by these lines, but a great cattle country, recently the habitat of the bison and the Indian, was opened. All the large cities command- ing the approaches to this country developed packing industries, but Chicago especially profited. Although her main supply was still the Middle Western farms, this domestic supply was supplemented by vast quantities of range cattle. South-eastern Texas was the original home of these cattle ranches, but the driving of herds to supply the miners of the Rocky Mountains revealed the fact that the whole bison country was capable of supporting range cattle, and the practice grew of driving the stock to the feeding ground of the north and returning. The height of the movement along the cattle trail, which in its largest extent ran through the public lands of the great plains from Texas to the Dakotas and Montana, was reached in 1884. In that period cattlemen fought over the possession of the range, controlled vast tracts by seizing the approaches to the water supplies under perversion of the land laws, fenced in the public domain, either defiantly or by leases from land grant roads, and called out proclamations of presidents from Hayes to Cleveland. The steady advance of the farmer, and protective measures against the spread of the cattle diseases known as Texas fever, gradually prevented the continuance of the trail, and

ultimately broke down the system of great ranches. The grade of cattle was improved and great packing interests organized the industry on the basis of concentrated large scale production. About 1870 shipment of livestock from Chicago had become significant, and within a decade the refrigerator car revolutionized the packing industry by making possible the shipment of dressed beef not only to the markets of the Eastern United States but even to Europe. The value of slaughtering and packing indus- tries in the United States increased from less than thirty million dollars in 1870, to over three hundred millions in 1880, and to five hundred and sixty- four millions in 1890.

349. Another important revolution in American economic life was effected by the opening of new iron-mines, the growth of the steel and coal industry and the rise of an extraordinary internal commerce along the whole length of the Great Lakes. By 1890 the output of pig-iron in the United States surpassed

The South.

that of Great Britain, having doubled since 1880. The full meaning of the revolution is seen in the fact that by 1907 the

United States produced more pig-iron and steel Commerce. than Great Britain, Germany and France combined.

As a result of the growth of the wheat, lumber and iron-ore production of the North- West, the traffic along the thousand miles of the Great Lakes grew (chiefly after 1890) by leaps, and changed from wooden sailing vessels to steel ships driven by steam. The traffic through the Sault Ste Marie Canal came greatly to exceed that through the Suez Canal.

350. The South shared in these industrial transformations. Not only did white labour produce an increasing proportion of

the cotton crop, which was now extended into the cut-over pine lands, but cheap white labour came from the uplands to cotton mills situated at the water-powers. This, with the abundant

supply of raw material, enabled the South to develop cotton manufacture between 1880 and 1890 on a scale that threatened New England's dominance. The southern Appalachians began to yield their treasures of coal and iron; northern Alabama became one of the great centres of the iron industry and the South produced nearly 400,000 tons of pig iron in 1880 and two and a half millions twenty years later. By 1890 the production of coal, iron-ore and pig- iron in this section was as great as that of the United States in 1870. The value of the products of manufacture in the South rose from $338,000,000 in 1880 to $1,184,000,000 in 1900. The exploitation of the long leaf pine forests also attracted Northern capital. Fruit and truck gardening grew rapidly, and the South began to exhibit traits of industrial development familiar in the North and West. Protective tariffs and the interests of capital found recruits in the old-time planting states; but the negro problem continued to hold the South as a whole to the Democratic party.

351. The opportunities opened to capital by these forces of growth in the West and South, as well as the general influence industrial °^ an a S e °f machine production, led to transforma- aad tions in the East which brought new difficulties for Financial political solution. The East began to exhibit char- Changes. ac teristics of other long-settled countries where increasing density of population and highly developed industry are accompanied by labour troubles, and where problems of democratic society and government take the form of forcible action or political revolt, in the absence of ample outlets into adjacent areas of cheap lands and new opportunities. To capital the opening resources of the West, and the general national prosperity after 1879, offered such inducements that large scale production by corporations and vast designs became the order of the day. The forces which had exhibited themselves in increased manufacture and railway development between the Civil War and the panic of 1873 now found expression in a general concentration of industries into fewer plants with vastly greater capital and output, in the combination of partnerships into corporations, and of corporations into agree- ments, pools and trusts to avoid competition and to secure the needed capital and economies for dealing with the new problems of industrial magnitude. Western farming competition led to the actual abandonment of much inferior land in New England and to agricultural

disadvantages in the Middle states. As agriculture became less attractive and as industrial demands grew, the urban population of the East increased at the expense of the rural. The numbers of cities of the United States with more than 8000 people nearly doubled between 1880 and 1890; by 1900 the urban population constituted a third of the total, and this phenomenon was especially marked in the North Atlantic division, where by 1900 over half the population was in cities of more than eight thousand inhabitants.

352. In similar fashion concentration of industry in large establishments was in progress. In 1880 nearly two thousand mills were engaged in the woollen industry; in 1890 not many more than thirteen hundred. Even more marked was the change in iron and steel, where large-scale production and concentration of mills began to revolutionize this fundamental

industry, and other lines of production showed the same tendency. The anthracite mines of Pennsylvania, the great resource for the nation, fell into the possession of seven coal-carrying railways which became closely allied in interest. In most of the important industries the tendency of large organizations to subject or drive out the small undertakings became significant. Already the railways to avoid " cut-throat competition " had begun to consolidate their systems by absorption of component lines, to form rate agreements and to " pool " their earnings in given districts. Western agitation had led to reports and bills by committees headed by Western congressmen, such as the report of William Windom, of Minnesota, in 1874, where the construc- tion of Federal lines to regulate rates by competition, was suggested; the report of George W. McCrary of Iowa, whose bill for regulation was passed by the House in 1874 under the stimulus of the Granger movement, but failed in the Senate; that of John H. Reagan, of Texas (1878), whose bill forbidding pooling and compelling publicity of rates by the machinery of the Federal courts, was discussed for several years, but failed to become law;" and that of Shelby M. Cullom, of Illinois, in 1886.

3 S3- The decision of the Supreme Court in the Wabash case, made in that year, reversed the doctrine followed in the case of Munn v. Illinois, and held that the regulative power j Be inter. of the state (even in the absence of Federal legis- state Com- lation) was limited to traffic wholly within the me ' e Act. state and not passing from one state to another. The Cullom*

bill as enacted into the Interstate Commerce Law of the 4th of February 1887, was framed to prevent unjust discriminations by the railroads between persons, places and commodities, the tendency of which was, as the report declared, to foster monopoly. The law forbade discriminations and pooling, made a higher charge for a short haul than for a long haul over the same road illegal (unless permitted after investigation by the commission), required publicity of rates, and provided for a commission to investigate and fine offenders. But the decisions of the commis- sion were reviewable by the Federal courts and the offender could be coerced, if he refused to obey the commission, only by judicial proceedings. The commission was empowered to pro- vide uniform accounting and to exact annual reports from the roads. The principle settled by the law was an important one, and marked the growing reliance of the former individualistic nation upon Federal regulation to check the progress of economic consolidation and monopoly. But the difficulties by no means disappeared; the Federal judiciary refusing to accept the findings of the commission on questions of fact, retried the cases; and the Supreme Court overruled the commission on fundamental questions, and narrowed the scope of the act by interpretation.

354. Labour exhibited the tendency to combination shown by capital. The Knights of Labor, founded in 1869, on the basis of " the individual masses " instead of the trades ' unions, and professing the principle that Comblna- " the injury of one is the concern of all," grew tions; in- from a membership of about one hundred thousand dustriai in 1885 to seven hundred and thirty thousand in ˆn nTe °t 1886. The number of strikes in 1886 was over twice as many as in any previous year. In one of the strikes on the Gould railway system six thousand miles of railway were held up. In New York, Henry George, author of books proposing the single tax on land as a remedy for social ills, ran for mayor of the city and received 68,000 out of 219,000 votes. At the same time socialistic doctrines spread, even among Western farmers. But sympathetic strikes, anarchistic outbreaks, and drastic plans for social change did not appeal to the people as a whole. The Knights of Labor began to split, and the unions, organized as the American Federation of Labor, began to take their place with a less radical member- ship. President Cleveland broke with precedents in 1886 by sending in the first message on labour, in which he advocated, without success, a labour commission

to settle controversies. A national bureau of labour to collect statistics had been estab- lished in 1884; state legislation increasingly provided for arbitra- tion of labour disputes, and regulation of factories and child

labour. Early in 1885 a law had been enacted forbidding the importation of labour under contract, and in 1888 the Chinese

Exclusion Act was continued. Immigration was ttoa.^*' exceptionally large in the decade from 1880 to 1890,

amounting to about five and a quarter millions as compared with two million eight hundred thousand for the previous decade. But a large number of these new-comers settled on the newly ooened lands of the Middle West. By 1800 the persons of German parentage in the Middle West numbered over four millions — more than half the total of persons of German parentage in the nation. Minnesota held 373,000 persons of Scandinavian parentage, and of the whole of this element the Middle West had all but about 300,000. The Irish constituted the largest element among the English- speaking immigrants. The population of foreign parentage amounted to one-third of the whole population of the United States in 1890. In the midst of this national develop- ment and turmoil President Cleveland struggled to unite his party on a definite issue. The silver question continued to divide each party, the continued fall of silver leading to re- newed agitation for free coinage. In 1886 a bill for this purpose was defeated by a majority of 37 in the House, 98 Democrats favouring it, and 70 opposing, as against 26 Republicans for

*it and 93 against. The surplus led to extravagant vwoe™ * appropriation bills, such as special pension bills,*

which Cleveland vetoed by the wholesale, thereby incurring criticism by veterans of the Civil War, and river and harbour improvement measures, particularly the act of 1886, to which the president gave reluctant assent and the bill of 1887 to which he gave a " pocket veto " by refusing his signature. But the retention of the surplus in the treasury would create a

monetary stringency, its deposit in banks aroused opposition, and its use to buy bonds was unpopular with the Democrats. Cleveland boldly met the issue and gave purpose to his party

by his annual message of December 1887, which he Message, entirely devoted to an exposition of the situation

arising from the surplus, and to a demand for a revision of the tariff in order to reduce revenue. He did not profess free trade doctrines: " It is a condition which confronts us, not a theory," he declared. The election of 1886 had reduced the Democratic majority in the House, but the president was able Mm to m ˆ uce his party to pass the Mills Bill (1888) BW- through that body as a concrete presentation of

policy. The bill put many important raw materials (including wool and unmanufactured lumber) on the free list, substituted ad valorem for specific duties to a large extent, and generally reduced the protective duties. It was believed that the measure would remit over fifty and a-half million dollars of duties, nearly twenty millions of which would result from additions to the free list. The Republican Senate also found party unity on the tariff issue and its committee on finance, under the leadership of Senator Nelson W. Aldrich of Rhode Island, drafted a counter proposal. They would reduce revenue by repealing the taxes on tobacco, and the taxes on spirits used in the arts and for mechanical purposes, and by revising the tariff so as to check imports of articles produced at home.

355. On the tariff issue the two parties contested the election of 1888, the Republicans denouncing the Mills Bill and the Benjamin Democrats supporting it. Blaine having withdrawn Harrison from the contest, and John Sherman having secured pwTmL t k ut ˆttle more than half the votes necessary to

nominate, the Republicans picked from a multitude of candidates General Benjamin Harrison of Indiana, grandson of President William Henry Harrison, to run against Mr Cleveland. The popular vote was exceedingly close, but Harrison had an electoral majority of 65, having carried all of the states except the solid South, Connecticut and New Jersey. The increasing use of money to influence the election, and particularly the association of great business interests with such political " bosses " as Matthew S. Quay of Pennsylvania and Thomas C. Piatt of New York, were features of the

campaign. The Congressional elections ensured to the Republicans the undis-

puted control of all branches of the government when the Fifty-first Congress should convene, and it was generally agreed that the party had a mandate to sustain the protective tariff.

356. Lacking a large majority in either house the Republicans were not only exposed to the danger of free silver defections in the Senate, but to " filibustering " by the Democratic Speaker minority in the House as a means of blocking the Thomas victorious party's programme. These obstructive B.Reed. tactics were made possible chiefly by the use of privileged motions and roll calls to delay business, and the refusal to respond on the roll call for a vote, thus preventing a quorum. Speaker Thomas B. Reed of Maine, a virile and keen-witted leader, greatly strengthened the power of the speaker, as well as expe- diting the business of the House, by ruling that the Constitu- tion required a present, not a voting, quorum; and in spite of disorderly protests he " counted a quorum " of those actually present. By securing rules sanctioning this action and empower- ing the speaker to refuse to entertain dilatory motions, that officer became the effective agent for carrying on the business of the party majority. As his power through the committee on rules, which he appointed, grew, he came, in the course of time, also to dominate the action of the House, refusing to recognize members except for motions which he approved, and through his lieu- tenants on important committees selecting such measures for consideration as seemed most desirable. This efficiency of action was secured at a loss to the house as a representative and debating body, responsive to minority proposals.

357. But the discipline of party caucus and House rules enabled the Republican leaders to put through with rapidity a number of important laws. One of these was the Tne measure known as the Sherman Anti-Trust Act of Sherman the 2nd of July r890, which declared combinations Anti-Trust affecting commerce between the several states, or with Act ' foreign nations, illegal and punishable by fine or imprisonment or both. This act, the full power of which was not exhibited until later, was a response to the growing unrest of the nation as other corporations emulated the success of the Standard Oil Trust (formed in 1882) . The members of a trust combined in an organiza- tion managed by boards of trustees whose

certificates the former owners accepted instead of their shares of stock in the component companies. Competition was thus eliminated within the com- bination and the greatly increased capital and economies enabled it not only to deal with the increasing magnitude of business operation, but also to master the smaller concerns which opposed it. State legislation had proved unable to check the process, partly because the trust was an interstate affair. By putting into operation its power under the Constitution to regulate interstate commerce, Congress responded to the popular demand for Federal restraint of these great combinations which threatened the old American ideals of individualism and freedom of com-

ipetition. The trusts, although embarrassed, soon showed their ability to find other devices to maintain their unified control. Nor was the act used, in this period, to prevent the railways from agreements and combinations which in large measure neutralized the anti-pooling clause of the Interstate Commerce Act of 1887.

358. Another important law was the so-called Sherman Silver Purchase Act of the 14th of July 1890. By 1889 the ratio of silver to gold had fallen to 1 to 22. In the Sherman twelve years of the Bland-Allison Act of 1878 Silver Pur- over 378,000,000 silver dollars had been coined from chase Act. bullion purchased at the market price. This bullion value was falling: it was $-89 in 1877 and $-72 in 1889. The production of gold in the United States in 1878 was about two and one-half million fine ounces, and of silver about thirty-five millions; in 1890 the gold production was 1,588,000 and the silver 54,500,000. The Silver Purchase Act authorized the secre- tary of the treasury to purchase each month 4,500,000 oz. of silver at its market price and to pay for it in treasury notes redeemable at his discretion, in silver or gold. This law, passed to placate the demands of the free silver men by increasing the use of silver, was insufficient to prevent the Senate from pass- ing a free coinage bill by a combination of Democrats and- the

silver Republicans, chiefly from the newer states of the Far West; but this free coinage bill was lost in the House by a small majority. The explanation of this sudden re-opening of the question was that of party apprehension. In some of the Republican states of the Middle West, long relied upon as safe, the Farmers' Alliance had been spreading, and fomenting a demand for unlimited coinage of silver. A silver convention held at St Louis in the fall of 1889 had been attended by many delegates from this region as well as from the new silver-mining states whose increased power in the Senate was soon to be effective. It was feared, therefore, that a veto of a free coinage measure might array the West and South-West against the East and break up the party.

359. The customs duties upon which the fighting of the campaign of 1888 had turned was promptly taken up, and in Tl, e the McKinley Tariff Act of the 1st of October 1890 McKialey the Republicans embodied their conceptions of Tariff. protection to American industry. Some of the main features of this law were: the addition of agricultural products to the protected articles; the extension of the free list, particularly the inclusion therein of raw sugar, which had been bringing in a revenue of $50,000,000 annually; the granting of compensating bounties to sugar planters to an amount of about $10,000,000 a year; and the raising of duties to the prohibitory point on many articles of general consumption which could be produced at home. Mr Blaine, then secretary of state, had just been active in promoting closer relations with South America wherein he hoped for an extension of American trade and he severely criticized the bill as it passed the House, because the free list opened wide the doors of American trade, particularly to sugar producing countries, without first exacting compensating advantages for our products in those markets. To meet this criticism a provision was finally added authorizing the president to impose discriminating duties where it was necessary to obtain the advantages of reciprocity.

360. This tariff, which passed on the eve of the Congressional elections of 1890, was immediately followed by such increases in prices and the cost of living that it was potent in bringing about the political revolution, or " land slide," which swept the Republicans from power in the House of Representatives. The Republicans returned but 88 members as compared with nearly twice that number in the Congress which passed the McKinley Bill. The South sent but four Republicans; New England a'

majority of Democrats; and such strongholds of Republicanism as the Middle Western states of Illinois, Michigan, Wisconsin, Iowa and Kansas, hitherto responsive to the traditions of the Civil War. sent Democratic or independent delegations. Looked at broadly, the movement was a rural uprising, strongest in the South and Middle West, the old Granger areas, against forces which seemed to them to threaten their ideals of American democracy. But the movement was recruited by the silver-mining states and discontented labour interests.

361. Farm products had not proportionally shared the general increase in prosperity. This convinced large portions of the Western agricultural West that the currency system had too Discontent, narrow a basis in gold, which was appreciating in value. Much of the Middle Western agricultural develop- ment had been made on borrowed Eastern capital, and it seemed to the farmer that the principal of his mortgage was in effect increasing with the rise in the price of gold, at the same time that his crops brought a smaller net profit. He did not give due attention to the effect of greatly increased production, as the new wheat lands were opened on such a grand scale; but he was keenly sensitive to increased freight rates and discriminations, to the influence of Eastern capitalists, banks, bondholders, trusts and railways upon Federal and state legis-latures and judiciary, and to the large amount of railway lands, unproductively held by the companies, while the land hunger of the nation was exhibited in the rush to newly opened Indian lands, such as Oklahoma (1889) and parts of the Sioux reserva- tion (1890). After the evidence of the power of this tide of Western discontent in the elections of 1890, those portions of it

which were ripest for revolt combined in 1892 as the People's party or Populists, soon to prove an important political factor.

362. The Republicans meanwhile had been actively reducing the surplus. In 1892 the excess of revenue over expenditures was ten million dollars; by 1893 only two millions.

This was effected not only by the Tariff Act but by such measures as the Dependent Pension Act of 1890 (resulting in a list of pensioners of the Civil War which cost the nation $68,000,000 by 1893, over half of these pensioners having been added during Harrison's administration); the rapid construction of the new navy, raising the United States from

twelfth to fifth in the list of naval powers; the repayment of the direct war tax to the states (1891) to the amount of fifty-one millions; and other appropriations such as those provided by river and harbour bills. The Democrats stigmatized this Congress as a " billion dollar Congress" from its expenditures, to which Speaker Reed replied that the United States was a billion dollar nation. In fact the Democrats when they regained power were not able greatly to diminish the cost of government.

363. The Democratic House in the Fifty-second Congress

repressed obstructive Republican tactics by methods like those

adopted by Speaker Reed, and contented itself with passing a

series of bills through that body proposing reductions of the

tariff in special schedules, including free wool and a reduction

of the duty on woollens, free raw material for the cotton planters

of the South, free binding twine for the farmers of the North

and a reduced duty on tin plate for the fruit raisers. The new

industries of the southern Appalachians prevented action on

coal and iron. Of course these bills failed in the Republican

Senate. A bloody strike on the eve of the election of 1892 in

the great steel works at Homestead, Pennsylvania, „

u a a j t. 4.1. Homestead

where armed guards engaged by the company strike.

fired upon the mob which sought higher. wages, was

not without its adverse effect upon public sentiment in regard

to the Republican tariff for the protection of labour.

364. During the campaign of 1892 the Democrats rejected a conservative tariff plank, denounced the McKinley tariff in

violent language, and denied the constitutional power to impose tariff duties except for the purpose of revenue only. But Cleve- land, who was renominated in spite of vigorous opposition from leading politicians of his own state, toned down the platform utterances on the tariff in his letter of acceptance. In their declarations upon the currency the Democrats furnished a common standing ground for the different factions by attacking the Silver Purchase Act of 1890 as a cowardly makeshift.

365. The People's party, in its national convention at Omaha (July 1892), drew a gloomy picture of government corrupted in all of its branches, business prostrated, farms covered

with mortgages, labour oppressed, lands concen- P g rt ^° p " s trating in the hands of capitalists. Demanding the restoration of government to the " plain people," they proposed an expansion of its powers, to afford an adequate volume of currency and to check the tendency to " breed tramps and millionaires." Among their positive proposals were: the free and unlimited coinage of silver at the legal ratio of sixteen to one; the expansion of a national currency issued directly to the people; the establishment of postal savings banks; government ownership of the railways, telegraph and telephone; restoration to the government of the lands held by railways and other cor- porations in excess of their needs; and a graduated income tax. In supplementary resolutions the Australian ballot system, which had spread rapidly in the past few years, was commended, as also were the initiative and referendum in law- making. Combining with the Democratic party in various states beyond the Mississippi, and with Republicans in some of the Southern states, they won large masses of voters in the West, and exerted an influence upon public opinion in that section beyond what was indicated in the returns, although General James B. Weaver of Iowa, their candidate for the presidency, received over 1,000,000 popular votes and 22 votes in the electoral college. The Republicans renominated President Harrison, though he lacked an enthusiastic personal following. They

supported the McKinley Tariff Act in spite of the wave of opposition shown in the elections of 1890. But, fearing party divisions, they, like the Democrats, made an ambiguous declara- tion on the currency. The result of the election of 1892 was to Cleveland return the Democrats under Cleveland to power re-elected by a plurality of over 380,000 and an electoral President, plurality of 132. Congress in both branches was to be Democratic in 1893, and the way was open for the first time in a generation for that party to carry out a policy un- checked by any legislative or executive branch of government.

366. But before Cleveland was fairly started in his second administration the disastrous panic of 1893 swept the nation,

nor did prosperity return during the four years HBO ‘ that flowed. The Panic is not, directly at least,*

to be traced to the silver purchases, but was the result of various causes, including the agricultural depression, farm mortgages, reckless railway financiering and unsound banking in the United States, as well as to Argentine and European financial troubles. The panic began in the spring with the failure of the Reading railway (which had undertaken the acquisition of coal land and an extension of activity beyond its resources) and the collapse of the National Cordage Company, one of the numerous examples of reckless trust financiering into which large banks had also been drawn. Clearing-house certificates were resorted to by the New York banks in June, followed in August by partial suspension of specie payments. Currency remained at a premium for a month; deposits in national banks shrank enormously; national bank loans contracted more than 14-7%; failures were common; 22,000 m. of railways were under receiverships, and construction almost ceased. The interruption to business is indicated by the decline of iron production by one-fourth.

367. The panic of 1893 was in many ways a turning-point in American history. It focused attention upon monetary questions, prostrated the silver-mining states, embittered the already discontented farming regions of the West, produced an industrial chaos out of which the stronger economic interests emerged with increased power by the absorption of embarrassed companies, and was accompanied by renewed labour troubles. Most noteworthy of these was the Pullman Car

Company strike near Chicago in 1894, which led to sympathetic strikes by the American Railway Union, extending over twenty-seven states and Territories from Cincinnati to San Francisco. Mobs

of the worst classes of Chicago burned and looted cars. Strike"/ The refusal of Governor John P. Altgeld of Illinois

to call out the militia, and the interference with the United States mails, led President Cleveland to order Federal troops to the scene, on the constitutional ground that they were necessary to prevent interference with interstate commerce and the postal service and to enforce the processes of the Federal' courts. The latter issued a sweeping injunction requiring that the members of the American Railway Union or other persons desist from interference with the business of the railways concerned. The president of the striking organization, Eugene V. Debs, was imprisoned for contempt of court and conspiracy.

368. The most immediate political effect of the panic was upon the silver issue. Soon after the outbreak of the financial crisis, the gold reserve, which protected the greenbacks and the treasury notes issued under the Silver Purchase Act, shrank ominously, while foreigners returned their American securities instead of sending gold. To sell bonds in order to replenish the gold reserve, and to repeal the Silver Purchase Act without substituting free coinage, would aggravate western discontent and turn away the promise of recruits to the Democratic party from the Populists of the prairie and silver-mining states; to carry out the Democratic platform by a tariff for revenue only while mills were shutting down would be hazardous in Repeal of the East. The fruits of victory were turning to Silver Purashes; but Cleveland summoned a special session chase Act. £ Congress for August, while the panic was acute, and asked his party to repeal the Silver Purchase Act without accompanying the repeal with provisions for silver.

Not until the last of October 1893 was repeal carried, by a vote in which the friends of repeal in the House were about equally divided between Democrats and Republicans, and nearly two-thirds of its opponents Democrats.

369. By this time the surplus had disappeared and the gold reserve was drawn upon for ordinary expenses. Early in 1894 the administration, failing to secure legislation from Congress

to authorize the sale of gold bonds on favourable terms to protect the reserve, sold under the Resumption Act of 1875 $50,000,000 5% bonds, redeemable in ten years. Part of this very gold, however, was withdrawn from the reserve by the presentation of legal tender notes for redemption, and the " endless chain " continued this operation to the verge of extinguishing the reserve, so that another loan of $50,000,000 in 1894 was followed in 1895 by a dramatic meeting between Cleveland and some of his cabinet with the important Wall Street banker, J. Pierpont Morgan, who agreed on behalf of his syndicate to sell the government $65,166,000 of gold for $62,315,000 of bonds, equivalent to 4% bonds for thirty years at a price of 104. In return the syndicate agreed to use its influence to protect the withdrawals of gold from the treasury. These securities were over-subscribed when offered to the public at 1 12 j. President Cleveland had protected the treasury and sustained the parity of gold and silver, but at the cost of disrupting his party, which steadfastly refused to authorize gold bonds. Again, in the beginning of 1896, the treasury was forced to sell bonds, but this time it dealt directly with the public and easily placed $100,000,000 in bonds at about in, affording a rate of interest about equal to 3-4%.

370. Before the political harvest of the monetary issue was reaped, the Democrats had also found party ties too weak to bear the strain of an effective redemption of the

party pledges on the tariff. The Wilson Bill pre- B £ so " pared as the administrative measure was reported late in 1893, while the panic was still exerting a baneful influence. Its leading features were the substitution of ad valorem for specific duties in general, the extension of the free list to include such materials of manufacture as iron ore, wool, coal, sugar and lumber, and the reduction of many pro- hibitory rates. The loss in revenue was partly provided for by an income tax, significant of the new forces affecting American society, and an increase in the duty on distilled liquors. Although the bill passed the House by an overwhelming majority, it met the opposition in the Senate of the representatives, Democratic as well as Republican, of those states whose interests were adversely affected, especially the iron ore and coal pro- ducing states of the Southern Appalachians, the sugar producers of Louisiana, the wool growers and manufacturers of Ohio, and the regions of accumulated property in the East, where an income tax was especially obnoxious. Led by Senators Arthur

P. Gorman, of Maryland; Calvin S. Brice, of Ohio; and David B. Hill, of New York, the bill was transformed by an alliance between Democratic and Republican senators, on the plea that it would otherwise result in a deficit of $100,000,000. Coal, iron ore and sugar were withdrawn from the free raw materials and specific duties replaced ad valorem in many cases, while many other individual schedules were amended in the direction of protection. The House, given the alternative of allowing the McKinley Act to remain or to accept the Senate's bill, yielded, and the Wilson-Gorman Tariff Act became a law without the president's signature, on the 27th of August 1894. He called upon his followers still to fight for free raw materials, and wrote bitterly of " the trusts and combinations, the communism of pelf, whose machina- tions have prevented us from reaching the success we deserved." Even the income tax was soon (1895) held by the Supreme Court to be unconstitutional.

371. Toward the close of his administration Cleveland's brusque message on the Venezuelan boundary question (see later) aroused such excitement and so rallied the general public (though not the more conservative) that the war spirit, shown soon afterwards against Spain, might have been a potent factor

in the election of 1896 had not England exhibited exceptional moderation and self-restraint in her attitude. The silver question, therefore, became the important issue. The Republicans nominated McKinley and declared for the gold standard in opposition to free coinage, losing thereby an influential following in the silver-mining and prairie states, but gaining the support of multitudes of business men among the Democrats in the East and Middle West, who saw in the free-silver programme a violation of good faith and a menace to returning prosperity. The Democratic convention marked a revolution in the party. Free Silver The old school leaders were deposed by decisive Issue; majorities, and a radical platform was constructed William J. w hich made " the free and unlimited coinage of tya "' both silver and gold at the present legal ratio of sixteen to one, without waiting for the aid or

consent of any other nation," the paramount issue. Objecting also to the decision against the income tax, and to " government by injunction as a new and highly dangerous form of oppression," they incurred the charge of hostility to the Federal judiciary. William J. Bryan made a brilliant speech in behalf of free coinage, and so voiced the passion and thought of the captivated convention that he was nominated by it for the presidency over the Democrats. veteran free-silver leader, Richard P. Bland of Missouri. The Cleveland men, or " gold Democrats," broke with their party after it became committed to free silver, and holding a convention of their own, nominated General John McA. Palmer of Illinois for the presidency on a platform which extolled Cleveland, attacked free coinage, and favoured the gold standard. Its main influence was to permit many Cleveland men to vote against Bryan without renouncing the name of Democrats. On the other hand the Populist con- vention also nominated Bryan on a platform more radical than that of the Democrats, since it included government owner- ship of the railways, the initiative and referendum, and a currency issued without the intervention of banks.

372. The contest was marked by great excitement as Bryan travelled across the country addressing great audiences. The endangered business interests found an efficient manager in Marcus A. Hanna of Ohio, McKinley's adviser, and expended large sums in a campaign of education. In the event, the older states of the Middle West, holding the balance between the manufacturing and capitalistic East and the populistic prairie and mining states of the West, gave their decision against free silver. But class appeals and class voting were a marked feature of the campaign, the regions of agricultural depression and farm mortgages favouring Bryan, and those of urban life favouring McKinley. Labour was not convinced that its interests lay in expanding the currency, and Mr Hanna had conducted McKinley's campaign successfully on the plea that he was the advance agent of prosperity under the gold standard and a restoration of confidence. McKinley carried all the Northern William states east of the Missouri, and North Dakota, McKinley Oregon and California of the Farther West, as e J° ted well as Maryland, Delaware, West Virginia and President. Kentucky along the borders of the South. His*

plurality over Bryan in the popular vote was more than 600,000, and his electoral majority 95. All the departments of

government were transferred by the election to the Republicans.

373. Having secured power, the administration called a special session of Congress, and enacted the Dingley protective

tariff (July 24, 1897), under which the deficit in the Tariff!" treasury was turned into a surplus. The act

raised duties to their highest point, and as the protective schedules included some important articles produced by trusts which had' a practical monopoly, such as sugar and petroleum, this was seized upon by the Democrats to stig- matize the tariff as the " mother of trusts." Many articles which had been placed on the free list in the Tariff Act of 1894, including lumber, wool and the raw material for cotton baling, were made dutiable. The high rates were defended, in part, by the provision authorizing the president to negotiate reci- procity treaties under which they might be lowered. Several

such treaties were signed, but the Senate refused to ratify them.

374. The Republicans also wrote their triumph into the Gold Standard Act of the 4th of March 1900, which ensured the maintenance of this standard by reserving aoU $150,000,000 of gold coin and bullion to redeem Standard the United States notes and the treasury notes of Act ' 1890, and by authorizing the sale of bonds when necessary to maintain the reserve. National banks were authorized in the smaller towns (three thousand or less) with a capital of $25,000, half of that formerly required, and increased circulation was further provided for by permitting the national banks to issue United States bonds up to their par value.

375. The economic policy of the Republicans was facilitated by the prosperity which set in about 1898. The downfall of silver-mining turned the prospectors to seek new gold fields, and they found them, especially in Alaska, about this time; and contemporaneously the chemists discovered cheaper and more efficient methods of extracting the gold from low-grade ores. Within five years after the crisis of 1893 the gold produc- tion of the United States nearly doubled. The United States coined $437,500,000 in gold in the five-year period Economic 1897-1902, while the average for five-year periods and since

1873 had been only $224,000,000. Thus gold Industrial instead of silver began to inundate the market, chan S es – and to diminish the demand for expansion of the currency. Agriculture, prostrated in the years immediately preceding and following the panic of 1893, turned to the scientific study of its problems, developed dry farming, rotation and variety of crops, introduced forage crops like alfalfa, fed its Indian corn to cattle and hogs, and thus converted it into a profitable and condensed form for shipment. Range cattle were brought to the corn belt and fattened, while packing industries moved closer to these western centres of supply. Dairy-farming replaced the unprofitable attempts of older sections of the Middle West and the East to compete with the wheat-fields of the Farther West. Truck and fruit farming increased in the South, and the canning industry added utility to the fruits and vegetables of the West. Following the trend of combination the farmers formed growers' associations and studied the demand of the market to guide their sales. The mortgaged farms were gradually freed from debt. The wheat crop in- creased from less than 400,000,000 bushels valued at $213,000,000 in 1893 to 675,000,000 bushels valued at $392,000,000 in 1898. Prosperity and contentment replaced agitation in the populistic West for the time, and the Repub- lican party gained the advantage of these changed conditions. Land values and the price of farm products rose. The farmers soon found it profitable to sell all or part of their land and re-invest in the cheaper virgin soils of the farther North- West and South-West, and thus began a new movement of colonization into the new West, while the landowners who remained gained an increasingly higher status, though farm labour failed to share proportionally in this advance.

376. In the South also there was greater contentment as the new industries of iron, textiles and forestry grew, and as the cotton crops increased. Unrest was diminished by the new state constitutions, which after 1890 disqualified negro voters by educational and tax requirements so contrived as not to disfranchise the poor whites.

377. In the decade which followed the crisis of 1893 a new industrial structure was made out of the chaos of the panic. "High financiering" was undertaken on a scale "nigh hitherto unknown. Combinations absorbed their Financier- weaker rivals; Standard Oil especially gained large mg '" interests in New York banks and in the iron mines and trans- portation

lines about the Great Lakes, while it extended its power over new fields of oil in the South-West. In general, a small group of powerful financial interests acquired hold- ings in other lines of business, and by absorptions and " com- munity of interest " exerted great influence upon the whole business world. The group of financiers, headed by J. Pierpont

The South.

Morgan, came to dominate various Southern transportation lines and the anthracite coal roads and mines, and extended their influence to the Northern Pacific railway, while a new genius in railway financiering, Edward H. Harriman, began an avowed plan of controlling the entire railway system of the nation. Backed by an important banking syndicate he rescued the Union Pacific from bankruptcy, and with its profits as a working basis he started in to acquire connecting and com- peting lines. Labour also shared in the general prosperity after 1898. Relative real wages increased, even allowing for the higher cost of living, and the length of the working day in general decreased except in special industries.

378. By 1900 the continental United States had a popula- tion of 76,000,000; an aggregate real and personal wealth of $88,500,000,000; a per capita public debt of $14-52, and per capita money circulation of $26-94 against $2i – 4i in 1896. In 1901 bank clearings amounted to nearly $115,000,000,000

against $45,000,000,000 in 1894. Imports of mer- Prosoeritv cnan dise had fallen in this period, while exports rose

from about $847,000,000 in 1893 to $1,394,000,000 in 1900. Of these exports food stuffs and food animals, crude and partly manufactured, aggregated nearly 40% of the total. The production of pig-iron, which was about 7,000,000 long tons in 1893, was nearly twice that in 1900. This economic prosperity and these far-reaching processes of social change by which the remaining natural resources of the nation were rapidly appropriated, went on contempo- raneously with the extension of the activity of the nation over- seas. The first

rough conquest of the wilderness accomplished, the long period of internal colonization drawing to a close, the United States turned to consider its position as a world power.

379. To understand this position it is necessary to return to an earlier period and briefly survey the foreign relations since the close of the Reconstruction era. The most significant and persistent influence came from the growing interest of the United States in the Pacific, as its population and economic power extended to that ocean. The problem of an overflow of Chinese migration to the Pacific coast, and the jeopardizing of the American standard of labour by this flood, had been settled by various treaties and laws since 1880. The question of the relation of the United States to an interoceanic canal was not so easily settled. In 1878 Colombia granted a con- cession to a French company, promoted by Ferdinand de Lesseps, the engineer of the Suez Canal, to dig a tide-level canal through the Isthmus of Panama. President Hayes voiced the antagonism of the United States to this project

of European capital in his message of 1880 in which he declared that such a canal should be under the control of this nation, and that it would be " virtually a part of the coast-line of the United States." Although an American company was organized to construct a canal under a concession from Nicaragua in 1884, no real progress was made, and the French company, defeated by engineering and sanitary difficulties, failed at the close of 1888.

380. Meantime, for a few months, Blaine, as secretary of state under President Garfield, began a vigorous foreign policy with especial reference to the Pacific. He attempted to get the consent of England to abrogate the Clayton-Bulwer Treaty of 1850, which contemplated the construction of an isthmian canal by private enterprise under joint control and neutraliza- tion of the United States and Great Britain, together with such other powers as should join them. In South America he actively pressed the influence of the United States to settle the war between Chile and Peru. Again, in the years from p aa . 1889 to 1892, Blaine held the portfolio of state, and American attempted to increase the influence of his country Congress. ; n Spanish America by the Pan-American Congress of 1890, which proposed a great international railway system and bank, commercial reciprocity and arbitration, without im- mediate results. (See Pan-American Conferences.) Indeed, the bad

feeling aroused by his earlier policy toward Chile found expression in 1891 in a mob at Valparaiso, when some

Isthmian Canal.

Chile.

of the men from the United States ship ” Baltimore ” on

shore leave were killed and wounded. An apology

averted the war which President Harrison threatened.

Blaine also asserted, against Canada particularly, the right of

the United States to the seals of the Bering Sea; but

in 1893 arbitrators decided against the claim. ermg ea ‘

381. As the navy grew and American policy increasingly turned to the Pacific, the need of coaling stations and positions advantageous to its sea power was appreciated.

By a tripartite treaty in 1889 the Samoan islands islands were placed under the joint control of the United States, England and Germany, and, a decade later, they were divided among these powers, Tutuila and the harbour of Pago-Pago falling to the United States. The Hawaiian islands, which had been brought under the influence of civilization by American missionaries, were connected by commercial ties with the United States. Upon the attempt ■ of the ruler to overturn the constitution, the American party, aided by the moral support of the United States, which landed marines, revolted, set up a republic, and asked j^^J s an annexation to the Union. A treaty, negotiated under President Harrison to this end, was withdrawn by President Cleveland, after investigation, on the ground that the part of the United States in the revolution was improper. He attempted without success to restore the original ■ state of affairs, and on the 7th of July 1898 the islands were annexed.

382. President Cleveland’s conservatism in this and other matters of foreign policy had not prepared the people for the sudden exhibition of firmness in foreign policy

with which he startled the nation in his message g otma – arv

of December 1895 upon the question of the boundary of Venezuela. That nation and England had a long-standing dispute over the line which separated British Guiana from Venezuela. Great Britain declined to arbitrate, at the suggestion of the United States, and gave an interpre- tation to the Monroe Doctrine which the administration declined to accept. President Cleveland thereupon brusquely announced to Congress his belief that Great Britain's attitude was in effect an attempt to control Venezuela, and proposed that a commis- sion on the part of the United States should report upon the disputed boundary, and support Venezuela in the possession of what should be ascertained to be her rightful territory. Secretary-of-State Richard Olney declared: " To-day the United States is practically sovereign on this continent, and its fiat is law upon the subjects to which it confines its inter- position." Great Britain tactfully accepted arbitration, how- ever, and in the end (1899) was awarded most of the territory regarding which she had been unwilling to arbitrate.

The growing activity of the United States in foreign relations next manifested itself against Spain. Cuba in its commanding position with reference to the Gulf of Mexico and the approaches to the proposed isthmian canal, as well as in its commercial relations, and its menace as a breeding spot for yellow fever, had long been regarded by the United States as an important factor in her foreign policy. Successive administrations from the time of Jefferson had declared that it must not fall to another European nation, if Spain relinquished it, and that it was against the policy of the United States to join other nations in guaranteeing it to Spain. Between 1868 and 1878 a harsh war had been in progress between the island Caba . and the mother country, and American intervention Spanish- was imminent. But Spain promised reforms and American peace followed; again in 1895 revolt broke out, ar " accompanied by severe repressive measures, involving grave commercial injury to the United States. (See Spanish-American War.)

383. By the Treaty of Paris, signed on the 10th of December 1898, Spain lost the remaining fragments of her ancient American Empire. She relinquished Cuba, which the United _ States continued temporarily to occupy without j^^ s y °g 98 holding the sovereignty pending the orderly estab- lishment of an independent government for the island. Porto

Rico, Guam and the Philippines were ceded outright to the United States, which agreed to pay $20,000,000 to Spain, and to satisfy the claims of its citizens against that power. By the treaty Congress was to determine the civil rights and political status of the native inhabitants of the ceded territory.

384. As a result of the Spanish-American War, the United States found itself in a position of increased importance and

*prestige among the nations of the world. Especially tbe"war. * n tne P ac ifi c > it was immediately involved in the*

diplomatic situation created by the efforts of European states to divide China into spheres of influence or of actual possession. The interests of the United States in the trade with China, as well as her new position in the Philippines, inclined her to oppose this policy, and Secretary- of-State John Hay showed himself one of the great American diplomats in his treatment of this difficult problem. In order to preserve Chinese entity and the " open door " for trade, he drew replies from the nations concerned, the result of which was to compel them to avow and moderate their intentions. When the Boxer insurrection broke out in China in 1900, and the legations were besieged at Peking, it was largely through the United States that a less rigorous treatment was secured for that disordered nation.

385. The acquisition of Porto Rico and the acceptance of responsibilities in Cuba gave new importance to the isthmian canal and increased the relative weight of the United States in regard to its control. The popular excitement with which the voyage of the " Oregon " was followed, as it took its way 14,000 m. around South America to participate in the destruction of the Spanish fleet in the battle of Santiago, brought home to the American people the need of such communication between the Atlantic and Pacific coasts.

386. But the immediate political issues were concerned with problems of the relation of the newly won lands to the United States government. Bryan had persuaded his party to join in

ratifying the treaty of Paris, expecting to determine the status of the islands later. But attention soon turned to the insurrection which broke out (Feb. 4, 1899) in the Philippines (q.v.) under Aguinaldo, after it became probable that the administration intended to retain these islands, not under a weak protectorate, but as a possession to be ruled and " assimi-

lated." It was not until the spring of 1902 that pines. P ° tn ' s insurrection was completely put down, and in

the interval the question of the destiny of the islands and the harshness of the measures of repression aroused political debate. The Democrats and many Republicans charged the administration with a policy of imperialism.

387. The same issue was involved, in its constitutional and economic aspects, in the treatment of Porto Rico and Cuba. While the insurrection continued in the Philippines the government there was legally a military one, although exercised in part through civil officers and commissions. But in the case of Porto Rico the question was whether the " Constitution follows the flag," that is, whether it extended of its own force without an act of Congress to acquired territory, and covered the inhabitants with all the rights of citizens of the United States, as an integral part of the American people. Not only was it. a iv.r< inn Q uest i on whether the native inhabitants of these aod°Cuba. new acquisitions could be wisely entrusted with

this degree of political liberty, but the problem of the tariff was involved. The beet sugar producers of the United States feared the effect of the competition of Porto Rican sugar unless a protective tariff excluded this commodity. But if Porto Rico were an integral part of the United States the Dingley tariff could not be applied against its products, since this act imposed duties only on articles from " foreign countries." To meet this difficulty the Foraker Act of 1900 imposed a special tariff for two years upon Porto Rico, the pro- ceeds to go to that island's own treasury. The act further asserted the principle that the inhabitants of the new possessions were not incorporated into the United States or entitled to all the privileges of citizens of the United States under the

Constitution, by declaring that statutory acts of the United States locally inapplicable should not be in force in Porto Rico.

The Supreme Court sustained this act in 1901, holding that Porto Rico was not so strictly a part of the United States that separate customs tariffs could not be imposed upon the territory. The close division of the court and the variety of opinions by which the decision was sustained left it somewhat uncertain whether and how far the Constitution extended of its own force to these annexations. The Foraker Act also provided a government for the island (see Porto Rico). In Cuba the United States remained in authority until the 20th of May 1902, and details of the work of the government there, and the subsequent arrangements whereby the United States secured the substan- tial advantages of a protectorate without destroying the independence of Cuba, will be found in the article on Cuba.

388. Meantime, in the election of 1900, the Democrats renominated Bryan on a platform which opposed the Repub- lican administration's acts in relation to the newly acquired territory and declared that " imperialism " . ™£ e was the paramount issue. The platform reaffirmed its silver doctrine of the previous campaign and denounced the tariff as a breeder of trusts. The Republicans renominated McKinley and endorsed his administration. While the Demo- crats declared for publicity in the affairs of interstate corpora- tions and favoured enlargement of the interstate commerce law to prevent discriminations in railway rates, the Republicans were less hostile in their attitude toward the combinations, admitting the necessity of honest co-operation of capital to meet new business conditions. The Populists divided, the " anti-fusionists " supporting a separate ticket, with free silver, government ownership of railways, and anti-imperialism prominent in their demands; the other wing supported Bryan. Marcus A. Hanna, the Republican campaign pe.,,/,ˆ,,,, manager, who was increasingly influential with, the andAssas- great business interests of the country, appealed to ainationof labour to support the administration and thereby McKinIe y- retain " a full dinner pail." McKinley received an electoral majority of 137 and a popular plurality of 849,790. Before his second term was fairly begun he was shot by an anarchist while attending the Pan-American Exposition at Buffalo, and died on the 14th of September 1901. His wisdom in choosing able cabinet officers, his sympathetic tact in dealing with men and with sections, as well as the victories of the Spanish-American War, had brought him popularity even among his

political opponents. But McKinley, like Cleveland, lacked the imagination to perceive and the desire to voice the aspirations and demands that had been gathering force for many years for legislation and executive action that should deal with the problem of effective regulation of the economic forces that were transforming American society. This gave his opportunity to Theodore Roosevelt (q.v.), who as vice-president now succeeded to office.

It was in foreign relations, which Secretary Hay continued to conduct, that continuity with McKinley's administration was most evident. But even here a bolder spirit, a readiness to break new paths and to take short cuts was shown by the new, president. Venezuela had long delayed the payment of claims of citizens of various nations. In 1901, the president, having been informed by Germany of its intention to collect the claims of its citizens by force, but with- out acquisition of territory, announced that the United States would not guarantee any state against punishment if it mis- conducted itself, provided that the punishment did not take the form of acquisition of territory. As a result, a blockade of Venezuela was undertaken by the joint action of Germany, England and Italy at the close of 1902. The diplomatic inter- vention of the United States early the. next year resulted in Venezuela's agreement to pay the claims in part and to set aside a. portion of her customs receipts to this end. But since the blockading powers demanded preferential treatment, the United States secured a reference of the question to the Hague court, which decided that this demand was justified. San

Domingo offered a similar problem, having a debt incurred by revolutionary governments, beyond its power to pay, and

being threatened with forcible intervention by Domingo. European states. President Roosevelt, in 1904,

declared that in case of wrongdoing or impotency requiring intervention in the western hemisphere the United States might

be forced " to the exercise of an international police power." In 1905 San Domingo and the United States signed a protocol under which the latter was empowered to take possession of the custom-house, conduct the finances and settle the domestic and foreign debts of San Domingo. In spite of the refusal of the Senate to assent to this protocol, President Roosevelt put the arrangement unofficially into effect, until, in 1907, the Senate consented to a treaty author- izing it with some modifications.

389. In the Far East the Boxer insurrection in China had been

followed by the combined military expedition of the powers

n-ii_ . .■. to the relief of Peking (in which the United States

Policy wine . ° . . . .

Far Bast; shared), and the exaction of a huge indemnity, of

the Ports- which the United States relinquished nearly half of mouth ; ts 5ˆ,ˆ as m excess of the actual losses. The United States protested against Russian demands upon China, and actively participated in the negotiations which resulted in Russia's agreement to evacuate Man churia. The delays of that power and her policy toward China having led Japan to declare war, Secretary Hay's diplomacy was influential in limiting the zone of hostilities; and the good offices of President Roosevelt brought about the conference between the two powers at Portsmouth, New Hampshire, which terminated hostilities in 1905. In this, and in his efforts to promote peace by extending the power of the various inter- national peace congresses and by making the Hague tribunal an effective instrument for settling disputes, Roosevelt won the approval of Europe as well as of America. The dispute over the boundary between Alaska and Canada was narrowed by diplomatic discussion, and the remaining questions, involv- ing the control of important ports at the head of the great inlets which offered access to the goldfields, were settled by arbitration in 1903 favourably to the American contentions.

390. The Isthmian Canal also received a settlement in this administration by a process which was thoroughly character- istic of the resolution of President Roosevelt. The Clayton-Bulwer treaty was superseded by the Hay-Pauncefote treaty of 1901, by which Great Britain withdrew her objections to a

canal constructed by the United States, and under the sole guarantee of neutralization by the latter power. The treaty also omitted a clause previously insisted on, forbidding the fortification of the canal. Having thus cleared the way, the United States next debated the advantages of the Nicaragua and the Panama routes. Influenced by the cost of acquiring the rights ahd property of the French company, an American

commission reported in 1901 in favour of the Nicara- Canai. guan route; but upon receiving information that a

smaller sum would be accepted, the Spooner Law was enacted (June 28, 1902) authorizing the president to purchase the rights and property of the Panama Company for $40,000,000, to acquire upo» reasonable terms the title and jurisdiction to a canal strip at least 6 m. wide from Colombia, and through the Isthmian Canal Commission to construct the canal. But if the president was unable to secure a valid title from the French company and the con- trol from Colombia within " a reasonable time and upon reason- able terms " the Nicaraguan route was to be made the line of the canal. With this means of pressure the president acquired the French rights; but Colombia declined to ratify the treaty negotiated for the purpose of giving the United States the specified control, on the terms offered. In this emergency an insurrection broke out in Panama on the 3rd of November 1903. The naval force of the United States, acting under the'theory that it was obliged to keep open the transit across the isthmus by its treaty obligations, excluded armed forces from the canal strip, and the Republic of Panama, having declared its

independence of Colombia, was promptly recognized on the 6th of November. Twelve days later a treaty was negotiated with this republic, by which the United States paid Panama $10,000,000, together with an annuity of $250,000 to begin ten years later, and guaranteed the independence of the republic, receiving in exchange the substantial sovereignty and owner- ship of a ten-mile strip for the canal. This treaty was ratified by the Senate on the 23rd of February 1904, and excavation was begun in 1907. (See Panama Canal.)

391. In the Philippines early in 1901 municipal and pro- vincial governments were provided for, and the president had been for a brief time granted full power to govern

the archipelago. He appointed Judge Taft civil p n nip P j nes . governor, and limited the power of the military governor to regions where insurrection continued. On the 1st of July 1902 Congressional authority was substituted for that of the president, but Taft remained governor. The provisions of the Constitution guaranteeing life, liberty and property were in general extended specifically to the dependency, and a legislative assembly was promised, the lower house elective, and the upper house to consist of the Philippine Commission. By negotiations with Rome Governor Taft secured for the Philippines the " friars' lands " which had been a source of friction. On the 1 6th of October 1907 the first Philippine assembly was convened in the presence of Taft, then secretary of war.

392. The tariff question complicated American relations with both the Philippines and Cuba. Beet sugar and tobacco interests feared the competition of these products, and opposed freedom of trade between the United States and the new territories. The Philippine tariff of 1902 made a reduction of only 25% from the Dingley tariff in the case of the products of those islands, instead of the 75% urged by Taft; but the duties were to go to the Philippines. In the case of Cuba a more heated controversy arose over the tariff — Roosevelt strongly urged a substantial reduction in justice to Cuba at several regular and special sessions of Congress; but not until the close of 1903 was a treaty in operation which, under the principle of reciprocity, ad- mitted some products of the United States to Cuba at reduced rates, and allowed Cuban products a reduction of 20% from the Dingley tariff, stipulating at the same time that so long as this arrangement continued no sugar should be admitted at reduced rates from any other country. This sacrifice of the means of reciprocity with sugar countries for the advantage of the beet sugar raisers of the West was quickly followed by the acquisition of preponderant interest in the beet sugar refineries by the Sugar Trust, which was thus able to control the domestic market; but for the time being it was evident that the forces friendly to the protective tariff had increased their following in important agricultural regions.

393. The dominant historical tendencies of the beginning of the 20th century in the United States, however, were characterized by huge combinations of capital and labour, the rapid passing of natural resources into private possession, and the exploitation of these resources on the principle of

individualism by aggregations of capital which prevented effective competition by ordinary individuals. Pioneer conceptions of individual industrial achievement free from governmental restraint were adopted by huge monopolies, and the result was a demand for social control of these dangerous forces.

394. After the Sherman Anti-Trust Act of 1890 the combinations found in the favourable laws of states like New Jersey opportunity to incorporate under the device of the " holding company," which was supposed to be within the law. A " promotion mania " set in in i9or. The steel industry, after a threatened war between the Standard Oil and Carnegie groups, was united by Pierpont Morgan into the United States Steel Corporation with stocks and bonds aggregating $1,400,000,000. This was only one of the many combinations embrac- combina- ing public utilities of all kinds. Where open consolida- "

Union Pacific to acquire the Southern Pacific with the Central Pacific, and by 1906 he was dictator of one-third of the total mileage of the United States. Meanwhile the Great Northern and the Northern Pacific had been brought into friendly working arrangements under James J. Hill, and tried to secure the Burlington railway. A fierce contest followed between the Hill, Morgan and Harriman forces, resulting in a compromise by which the Northern Securities Company, a holding company for the joint interests of the contestants, was created. It was admitted by the counsel for this company that the machinery provided The in this organization would permit the consolidation

Northern of all the railways of the country in the hands of f? ' es three or four individuals. By using notes of one railway company, based on its treasury securities, it was possible to acquire a controlling interest in others; and by watering the capital stock to recover the cost of the undertaking, while the public paid the added rates to supply dividends on the watered stock.

395. Following a similar tendency the great Wall Street banking houses were dominated by the large financial groups in the interest of speculative undertakings, the directors of banks loaning to themselves, as directors of industrial combinations, the funds which flowed into New York from all the banks of the interior. By a similar process the great insurance and trust companies of New York became feeders to the same operations. Thus a community of control over the fundamental economic interests of the nation was lodged in a few hands. Rebates and discriminations by the railways gave advantage to the powerful shippers, and worked in the same direction.

396. Such was the situation in domestic affairs which confronted Roosevelt when he became president. In his first message he foreshadowed his determination to grapple with these problems. In 1903 he instructed the attorney- general to bring suit to dissolve the Northern Securities Com- pany as a combination in restraint of trade, and in 1904 the Supreme Court held the merger illegal. But the effect was to increase the tendency to change from incomplete combination of financial interests to consolidated corporations owning the property, and to lead the government, on the other hand, to The Eikins see ' i t0 re g u l ate these vast business interests by Law; the legislation. The Eikins Law, passed in 1903, in- Bureau of creased the power of the interstate commerce

commission to prosecute offenders, especially those who violated the anti-rebating clauses. In the same year the creation of the Federal Bureau of Corporations provided for increased publicity in the affairs of these organizations.

397. Labour was combining in its turn. Not only did local unions in most of the trades increase in number and power, but Combina- workers in separate industries over large areas were tioas ot combined for collective bargaining and the national Labour. organization, the American Federation of Labor, had a membership by 1905 of approximately 2,000,000. Labour legislation by the states increased under these influences, and political leaders became increasingly aware of the power of the labour vote, while employers began to form counter organizations to check the growth of the movement. In 1902 Pennsylvania members of the United Mine Workers of America, led by John Mitchell, struck. Inasmuch as their employers were the owners of the anthracite coal monopoly

under the control of an allied group of coal-carrying railways, the contest was one of far-reaching importance, and soon brought about a coal famine felt throughout the nation. So threatening was the situation that President Roosevelt called a conference of the contestants, and succeeded in inducing them to submit their difficulties to an arbitration commission which, by its report, in the spring of 1903, awarded to the miners shorter hours and an increase of wages.

398. Steadily the United States enlarged its economic functions. In 1903 Congress created a Department of Commerce and Labor and made the secretary a member of the cabinet. The reports of this department gave publicity to investigations of the perplexing industrial conditions. The Department of Agriculture

Corpora tions,

enlarged its staff and its activity, investigating diseases of plants and animals, ascertaining means of checking insect pests, advising upon the suitability of soils to crops, seeking new Economic and better seeds, and circulating general information. Measures of The contemporaneous development of agricultural (he Federal education in the various Western and Southern states aoyetDmept ' whose agricultural colleges had been subsidized by land grants and appropriations by the Federal government, and the experi- mental farms conducted by railways, all worked to the same end. Congress passed acts to limit the substitution of oleomargarine for butter (1902) and provided for the limitation of the spread of live-stock diseases (1903). The nation began also to awake to the need of protecting its remaining forests, which were rapidly falling into the hands of corporations by perversion of homestead and other land laws. President Cleveland had with- drawn large forest tracts, and in 1898 Gifford Pinchot was made head of a division of forestry in the Department of Agriculture. In 1901 the work was organized under a separate bureau, and four years later the National Forests were placed under his management.

399. The increasing demand for lands for agriculture led also, under Roosevelt, to the real beginning of national irriga- tion actively in the vast arid area of the Far West. The

The Reclamation Service was created by the act Reclamation

of the 17th of June 1902, which set aside the pro- «”’• ceeds of the sale of public lands in thirteen states and three Territories as a fund for irrigation works. The government itself reserved timber and coal tracts, water powers and other requisites for construction, and sold the irrigated lands to actual settlers in small farms, while retaining title to the reservoirs and the works. The income from the reclamation fund between 1901 and 1910 aggregated over $60,000,000. By the use of suitable crops and dry farming agricultural occupation was extended into formerly desert lands.*

When corruption was discovered in the Land Office and Post Office, Roosevelt, instead of yielding to the effort to conceal the scandal, compelled effective investigation.. Two United States senators were convicted of land frauds. The application to all kinds of lands, whether coal lands, timber tracts, water rights or other natural resources, of the general principle of homesteads governing the acquisition of agricultural lands, had invited fraudulent entries. The Homestead Act of 1862, the Timber Culture Act of 1873, the Desert Land Act of 1877, the Stone and Timber Act of 1878 had all been used by corporations to secure great tracts of valuable land through employing men to homestead them, and the laws themselves were loosely enforced. In successive messages, and by reports of public land commissions, the administration urged the importance of readjusting the land laws for the protection of the public.

400. In the election of 1904 the popularity of President Roosevelt, after his strenuous activity in challenging some of the strongest tendencies in American life, was put to

the test. His political management exhibited the 0/1004 fact that he was trained in the school of the New York politician as well as in the reformer’s camp, and he was easily nominated by the Republicans on a platform which en- dorsed his administration, and made no promise of tariff changes. The Democrats turned to the conservative wing, omitted any reference to silver or the income tax, and nominated Judge Alton B. Parker, of New York. The radicals, who favoured William R. Hearst, the well-known newspaper proprietor, who was influential with the masses of large cities, were largely represented in the convention, but unable to poll a third of its vote. Parker accepted the nomination after telegraphing that he regarded the gold standard as irrevocably established. The*

issue of imperialism had been largely eliminated by the current of events and the an ti- trust issue was professed by both parties. In the outcome Roosevelt won by the unpre- cedented popular plurality of over 2,500,000, and an electoral majority of 196.

401. The state elections of the same period showed that a

wave of reform and of revolt against former political forces was rising. In five states which Roosevelt carried by his popularity the machine Republican candidates for governor were defeated by reforming Democratic candidates, and in cities like Chicago and Philadelphia the issues of reform and radicalism won unexpected though temporary success. Roose- velt had " stolen the thunder " of the parties of social unrest, including the old populistic areas of the Middle West and the labour element of the cities at the same time that he retained control of the Republican party machinery.

402. In his second administration President Roosevelt pressed his policies so hard and with such increasing radicalism the that he lost control of the regular organization President's in Congress before the end of his term. In the Radicalism. jj ouse Speaker Joseph G. Cannon, of Illinois, exhibited the full power of his office in concentrating party policies in the hands of the few regular leaders, while in the Senate a directing group of New England men who had served for a long time, chiefly senators Nelson W. Aldrich and Eugene Hale, showed a similar mastery. Against this control a significant revolt, illustrative of revived discontent in the Middle West, was made by the Republican senator Robert M. La Follette, of Wisconsin, who had won his fight in that state against the faction friendly to the railways, and had secured primary elec- tions, railway rate regulation on the basis of expert valuation of the physical property of the railways, and a system of taxa- tion which rested more heavily upon public utilities. In pressing similar policies upon Congress he became isolated from the party leaders, but forced them to go on record by roll calls.

403. In New York a legislative investigation of the in- surance companies disclosed such connexions with the high New York financiering of Wall Street as to create widespread insurance distrust and to lead to reform legislation. The investiga- attorney who conducted the investigation, Charles ”””” Evans Hughes (b. 1862), had shown such ability that he was chosen governor of New York in 1906. 1 His adminis- tration was marked by independence of the party machine and a progressive policy. Foreign relations were conducted during the second administration of Roosevelt by Secretary Elihu Root from 1905. He fostered friendly relations with the other American nations, allaying their concern lest ambitious designs of their larger neighbour might endanger their inde- pendence. In Cuba a signal illustration of the good faith of the United States was exhibited when an insurrection in the summer of 1906 left the republic substantially without a government.

Mr Taft, then secretary of war, was sent, under ”””’ the treaty provisions for intervention, to organize*

a provisional government. During his few days’ service as governor-general he set in motion the machinery for restoring order. But President Roosevelt had plainly stated that if the insurrectionary habit became confirmed in Cuba she could not expect to retain continued independence.

*404. Attention was again fixed upon the Pacific coast, not only by the earthquake and conflagration which in 1906 Japanese destroyed the business parts and much of the resi- immigra- dence section of San Francisco, but also by municipal **”*• regulations there against the presence of Japanese in the public schools. The incident seemed to threaten grave con- sequences, which were averted by the popularity of Roosevelt both in California and in Japan. In the Immigration Act of the 20th of February 1907 the problem of exclusion of Japanese labour, which underlay the difficulty, was partly solved by preventing the entrance to the continental United States by way of neighbouring countries of persons holding passports issued by a foreign government for going to ether countries or dependencies of the United States. Since Japan discouraged its citizens from migrating directly to the United States this satisfied California.*

405. As a demonstration of the naval power of the United States in Pacific waters, the President sent the American fleet

on

1 In 1910 Hughes was appointed a justice of the United States Supreme Court.

a cruise around the world, in the course of which they were received in a friendly spirit by Japan. The navy was increased to keep pace with the growth of that of other nations, both in numbers and size of vessels, in this period, but not to the extent demanded by the administration. Already a more efficient organization of both army and navy had been effected. While the nation prepared for war, it also engaged prominently in the successive international peace congresses between 1899 and 1907, aiming consistently to increase the use of arbitration.

406. The tendencies of the government to deal with social improvement were exemplified by the laws of 1906 providing for pure food and meat inspection. The Railway Railway Rate Regulation Act of 1906 strengthened previous RateRegu- interstate acts by including pipe lines (except tattonAa – for gas and water) under the jurisdiction of the Interstate Commerce Commission, and extending the meaning of " common carrier " to include express and sleeping-car companies. Published rate schedules were required, not to be changed without thirty days' notice, and more stringent provisions were made to prevent rebating. The act provided for review by the Federal courts, and did not permit the commission to investigate an increase of rates until the rates went into operation, nor did it provide fo a valuation of the railways as a basis of rate-making which the commission had desired. Later acts partly met the demands of railway employes by increasing the liability of common carriers and by providing for shorter hours.*

407. Although Roosevelt had made concessions to the railways in the formation of the act of 1906, his utterances showed a tendency alarming to the large business interests and the holders of corporation securities generally. The unsettled business conditions were reflected in the stock market, and began to produce a reaction against the activity of government in this direction. The panic of 1907 started with the downfall of an attempted combination of a chain of banks, copper interests and other enterprises of F. Augustus Heinze and Charles W. Morse, two daring operators in Wall Street, and was followed by the collapse of the Knickerbocker Trust Company

(October 21, 1907). Already, in 1903, liquidation had begun in some of the stocks so actively issued in the preceding years. The leading New York banks failed to check specu- lation, however, and were even contributors to the movement up to the time of the panic. The country was generally pros- perous, though much of the banking funds was tied up in New York City at this juncture. Clearing-house certificates were resorted to; by the 1st of November partial suspension was general throughout the nation; and banking facilities were more completely interrupted than at any time since the Civil War. The government greatly increased its deposits, financial and offered Panama 2% bonds to the amount of Panic of $50,000,000, and 3% certificates for $100,000,000, 19 °7. with the object of providing the national banks a basis for additional note issues. But these were taken only to a small amount, as they proved useful for their moral effect chiefly. An enormous addition to the money supply was made in the course of the panic, both by governmental activity, gold imports and national bank-notes. The crisis was brought to a close before the end of 1907 by the vigour of the government and the activity of the large financial interests under the lead of J. P, Morgan, who finally entered the field to stop the decline, at the same time that his associates in the Steel Trust acquired possession of their last remaining rival of importance, the Tennessee Coal & Iron Company.

*408. The reaction after the panic, and the loss of influence resulting from his announcement that he would not permit his renomination for the campaign of 1908, left Roosevelt unable to exercise the compelling power which he had displayed in previous years. Congress under the control of the con- servatives refused him legislation which he asked, Conaerva- but before he left the presidency he raised a *» on ” new issue to national importance in his calling of a con- gress of state governors and experts to consider the need*

of the conservation of natural resources (see Irrigation: United States; and the article Roosevelt). This congress met in May 1908 and endorsed the proposal for vigorous attention by state

and nation to the question.

409. In the campaign of 1908 he succeeded, against the opposition of both the extreme conservative and the radical wings, in procuring the nomination of Secretary Taft by the Republicans on a platform endorsing the Roosevelt policies, promising a revision of the tariff at a special session, on the basis of such protection as would equal the difference between the cost of production at home and abroad, together with a reasonable profit to American industries, and providing for maximum and minimum rates to be used in furthering American commerce and preventing discriminations by other nations. A postal bank was promised, a more effective regulation of the railways, and a modification of the Sherman Anti-Trust Act. Labour failed to secure a thoroughgoing pledge to prevent the use of the writ of injunction in labour disputes, but the convention promised legislation to limit its use. The Democrats again selected William J. Bryan as their candidate; demanded the enforcement of criminal law against " trust magnates " and such additional legislation as would prevent private monopoly; opposed the use of injunctions in cases where they would issue if no industrial dispute was involved ; impugned the Republicans' good faith in tariff revision, promising for themselves a sub- stantial reduction of duties; favoured an income tax and a guarantee fund by national banks to pay depositors of insol- vent banks, or a postal savings bank, if the guaranteed bank could not be secured; demanded election of United States senators by direct vote of the people, legislation to prevent contributions by corporations to campaign funds, and a more efficient regulation of railways. The party also declared against centralization, favouring the use of both Federal and state control of interstate commerce and private monopoly.

410. The Republicans won a sweeping victory, Taft's popu- lar plurality reaching about 1,270,000 and his electoral William majority 159. But it had been won by some H. Taft, ambiguity of utterance with respect to tariff President. anc j railway regulation. The result was made manifest early in the new administration, when party contentions over the direction of revision of the tariff, the thoroughness of the regulation of railways and corporations, and the question of where the postal bank fund should be placed, resulted in a movement of " insurgency " among the Republicans of the Middle West. The insurgents termed themselves " Progressive Republicans," and

did not hesitate to join forces with the Democrats in order to shape legislation to their wishes. Progressives and Democrats united in over- turning the control of Speaker J. G. Cannon in the House of Representatives by modifying the rules, and a group of senators, chiefly from the Middle Western states, destroyed the control of the regular leaders in the Upper House. President Taft's influence over the revolting wing was further weakened by the charges made against his secretary of the interior, Richard A. Ballinger, on behalf of Gifford Pinchot, the chief forester, who accused the administration of obstructing Mr Roosevelt's " conservation " policy.

411. Mr Pinchot was indeed removed from office, but the " conservation " issue was raised to primary importance by the

return of Mr Roosevelt from his African trip. Roosevelt's His influence was revealed even while he was National- en J°yi n S the hospitality of European countries on Ism." his return. There was a widely extended desire to

know his judgment of the administration's policy; but he maintained silence until the close of the summer of 1 9 10, when in a series of public utterances in the West he ranged himself, on the whole, with the progressive wing and announced a " new nationalism " which should enlarge the power of the Federal government and drive the " special interests " out of politics. The " insurgents " achieved remarkable victories in the Middle West, California, New Hampshire and New York in the fall conventions and primary

elections, retiring various leaders of the regular wing of the Republicans. Senators Aldrich and Hale, former regular leaders in the Senate, had already announced their purpose to resign. President Taft's utterances indicated his intention to discontinue the use of patronage against the leaders of the progressive wing and to secure additional tariff revision by separate schedules. The result of the autumn elections was a pronounced victory for the Democratic party.

412. At the close of the first decade of the 20th century the United States was actively engaged in settling its social economic questions, with a tendency toward radicalism in its dealings with the great industrial forces of the nation. The " sweat shops " and slums of the great cities were filled with new material for American society to assimilate. To the sister- hood

of states had been added Oklahoma (1907), and in 1910 Congress empowered New Mexico and Arizona to form constitutions preparatory to statehood, thus extinguishing the last Territories, except the insular dependencies and Alaska. Already the food supply showed signs of not keeping pace with the growth of population, while the supply of gold flowed in with undiminished volume. High prices became a factor in the political situation. Between 1890 and 1900, in the continental United States, farms were added in area equal to that of France and Italy combined. Even the addition ' of improved farm land in that decade surpassed the whole area of France or of the German Empire in Europe. But intensive cultivation and agricultural returns hardly kept pace with the growth in population or the extension of farms.

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The Library of Congress publishes, under the editorship of k. P. C. Griffin, lists and references to books and articles on special

subjects.

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Documentary Sources. — The Congressional documents and state public documents afford valuable material. The Congressional debates have become too bulky for the general reader, but in the president's messages, as collected in J. D. Richardson (ed.), Messages and Papers of the_ Presidents (to 1899), the main questions are pre- sented, and detailed information is in the reports of the heads of departments and bureaus. W. MacDonald, Select Statutes of United States, 1861-1898 (New York, 1903), contains important laws, with brief historical introductions. {F. J. T.)

UNITED STATES NAVAL ACADEMY, an institution for the education of officers of the United States Navy, at Annapolis, Maryland, occupying about 200 acres on the banks of the Severn. Its principal buildings are the marine engineering building, the academic building (containing the library), the

chapel, the gymnasium, the physics and chemistry building, the audi- torium, the armoury, the power-house, the administration building, Bancroft Hall (the midshipmen's quarters), officers' mess and club, and Sampson Row, Upshur Row and Rodgers Row, the officers' quarters. 1 By an Act of Congress passed in 1903 two midshipmen (as the students have been called since 1902; " naval cadets " was the term formerly used) were allowed for each senator, representative, and delegate in Congress, two for the District of Columbia, and five each year at large; but after 1913 only one midshipman is to be appointed for each senator, representative and delegate in Congress. Candi- dates are nominated by their senator, representative, or dele- gate in Congress, and those from the District of Columbia and those appointed at large are chosen by the President; but to be admitted they must be between sixteen and twenty years of age and must pass an entrance examination. Each midshipman is paid $600 a year, beginning with the date of his admission; and he must bind himself to serve in the United States Navy for eight years (including the years spent in the academy) unless he is discharged sooner. The couise of in- struction is for four years — " final graduation " comes only after six years, the additional years being spent at sea — and is in eleven departments: discipline, seamanship, ordnance an 1 gunnery, navigation, marine engineering and naval con- struction, mathematics and mechanics, physics and chemistry, electrical engineering, English, modern languages, naval hygiene and physiology. Vessels for practice work of mid- shipmen in the first, second, and third year classes are attached to the academy during the academic year, and from early in June to September of each year the midshipmen are engaged in practice cruises. The academy is governed by the Bureau of Navigation of the United States Navy Department, and is under the immediate supervision of a superintendent appointed by the secretary of the navy, with whom are associated the Commandant of Midshipmen, a disciplinary officer, and the Academic Board, which is composed of the superintendent and the head of each of the eleven departments. The institution was founded as the Naval School in 1845 by the secretary of the navy, George Bancroft, and was opened in October of that year. Originally a course of study for five years was pre- scribed, but only the first and last were spent at the school, the other three being passed at sea. The present name was adopted when the school was reorganized in 1850, being placed under the supervision of

the chief of the Bureau of Ordnance and Hydrography, and under the immediate charge of the super- intendent, and the course of study was extended to seven years; the first two and the last two to be spent at the school, the intervening three years to be passed at sea. The four years of study were made consecutive in 1851, and the practice cruises were substituted for the three consecutive years at sea. At the outbreak of the Civil War the three upper classes were detached and were ordered to sea, and the academy was removed to Fort Adams, Newport, Rhode Island (May 1861), but it was brought back to Annapolis in the summer of 1865. The supervision of the academy was transferred from the Bureau of Ordnance and Hydrography to the Bureau of Navigation when that bureau was established in 1862; and, although it was placed under the direct care of the Navy Department in 1867, it has been (except in 1 869-1 889) under the Bureau of Navi- gation for administrative routine and financial management. The Spanish-American War greatly emphasized its importance, and the academy was almost wholly rebuilt and much enlarged in 1 899-1 906.

1 The old quarters of the superintendent, a colonial house, once the official residence of the governors of Maryland, was destroyed in 1900. In 1909 old Fort Severn, a small circular structure with thick walls, built in 1809, was torn down.

See J. R. Soley, Historical Sketch of the United States Naval Academy (Washington, 1876); Park Benjamin, The United States Naval Academy (New York, 1900) ; Randall Blackshaw, " The New Naval Academy," in the Century Magazine for October 1905.

UNITS, DIMENSIONS OF. Measurable entities of different kinds cannot be compared directly. Each one must be specified in terms of a unit of its own kind; a single number attached to this unit forms its measure. Thus if the unit of length be taken to be L centimetres, a line whose length is I centimetres will be represented in relation to this unit by the number //L ; while if the unit is increased times, that is [LJjT] -2 times: this expression thus represents the dimensions (1 in length and — 2 in time) of the derived entity acceleration in terms of its fundamental elements length and time. In the science of dynamics all entities are derived from the three fundamental ones, length, time and mass; for example, the dimensions of force (P) are those of mass and acceleration jointly, so that in algebraic form (P) = [M][L][T]~ 2 . This restriction of the fundamental units to three must therefore be applicable to all departments of physical science that are reducible to pure dynamics.

The mode of transformation of a derived entity, as regards its numerical value, from one set of fundamental units of reference to another set, is exhibited in the simple illustrations above given. The procedure is as follows. When the numerical values of the new units, expressed in terms of the former ones, are substituted for the symbols, in the expression for the dimensions of the entity under consideration, the number which results is the numerical value of the new unit of that entity in terms of the former unit: thus all numerical values of entities of this kind must be divided by this number, [in order to transfer them from the former to the latter system of fundamental units.

As above stated, physical science aims at reducing the phenomena of which it treats to the common denomination of the positions and movements of masses. Before the time of Gauss it was customary to use a statical measure of force, alongside the kinetic measure depending on the acceleration of motion that the force can produce in a given mass. Such a statical measure

could be conveniently applied by the extension of a spring, which, however, has to be corrected for temperature, or by weighing against standard weights, which has to be corrected for locality. On the other hand, the kinetic measure is independent of local conditions, if only we have absolute scales of length and time at our disposal. It has been found to be indispensable, for simplicity and precision in physical science, to express the measure of force in only one way; and statical forces are therefore now generally referred in theoretical discussions to the kinetic unit of measurement. In mechanical

engineering the static unit has largely survived; but the increasing importance of electrical applications is introducing uniformity there also. In the science of electricity two different systems of units, the electrostatic and the electrodynamic, still to a large extent persist. The electrostatic system arose because in the development of the subject statics came before kinetics; but in the complete synthesis it is usually found convenient to express the various quantities in terms of the electrokinetic system alone.

The system of measurement now adopted as fundamental in physics takes the centimetre as unit of length, the gramme as unit of mass, and the second as unit of time. The choice of these units was in the first instance arbitrary and dictated by convenience; for some purposes subsidiary systems based on multiples of these units by certain powers of ten are found convenient. There are certain absolute entities in nature, such as the constant of gravitation, the velocity of light in free space, and the constants occurring in the expression giving the constitution of the radiation in an enclosure that corre- sponds to each temperature, which are 'the same for all kinds of matter; these might be utilized, if known with sufficient accuracy, to establish a system of units of an absolute or cosmical kind. The wave-length of a given spectral line might' be utilized in the same manner, but that depends on recovering the kind of matter which produces the line.

In physical science the uniformities in the course of pheno- mena are elucidated by the discovery of permanent or intrinsic relations between the measurable properties of material

systems. Each such relation is expressible as an equation connecting the numerical values of entities belonging to the system. Such an equation, representing as it does a relation between actual things, must remain true when the measurements are referred to a new set of fundamental units. Thus, for example, the kinematical equation v 2 = nfH, if n is purely numerical, contra- dicts the necessary relations involved in the definitions of the entities velocity, acceleration, and length which occur in it. For on changing to a new set of units as above the equation should still hold; it, however, then becomes t> 2 /[V] 2 = n / 2 /[F] 2 • lj[L]. Hence on division there remains' a dimensional relation [V] 2 = [F] 2 [L], which is in disagreement with the dimensions above determined of the derived units that are involved in it. The inference follows, either that an equation such as that from which we started is a formal impossibility, or else that the factor n which it contains is not a mere number, but represents n times the unit of some derived quantity which ought to be specified in order to render the equation a complete statement of a physical relation. On the latter hypothesis the dimensions [N] of this quantity are determined by the dimensional equation [V] 2 = [N][F]'[L] where, in terms of the fundamental units of length and time, [V] = [L][T]" 1 , [F] = [L][TP; whence by substitution it appears that [N] = [L] l [Tf. Thus, instead of being merely numerical, n must represent in the above formula the measure of some physical entity, which may be classified by the statement that it has the conjoint dimensions of time directly and of velocity inversely.

It often happens that a simple comparison of the dimensions of the quantities which determine a physical system will lead to important knowledge as to the necessary relations that subsist between them. Thus in the case of a simple pendulum the period of oscillation t can depend only on the angular amplitude a of the swing, the mass m of the bob considered as a point, and the length I of the suspending fibre considered as without mass, and on the value of g the acceleration due to gravity, which is the active force; that is, T=f(a, m, I, g). The dimensions must be the same on both sides of this formula, for, when they are expressed in terms of the three independent dynamical quantities mass, length, and time, there must be complete identity between its two sides. Now, the dimensions of g are [L][T] -2 ; and when the unit of length is altered the numerical value of the period is unaltered, hence its expression

must be restricted to the form /(a, m, l/g). Moreover, as the period does not depend on the unit of mass, the form is further

reduced to /(a, l/g) ; and as it is of the dimensions + I in time, it must be a multiple of (//g) } , and therefore of the form $(a) VWn). Thus the period of oscillation has been determined by these considerations except as regards the manner in which it depends on the amplitude a of the swing. When a process of this kind leads to a definite result, it will be one which makes the un- known quantity jointly proportional to various powers of the other quantities involved; it will therefore shorten the process if we assume such an expression for it in advance, and find whether it is possible to determine the exponents definitely and uniquely so as to obtain the correct dimensions. In the present example, assuming in this way the relation T=A.afm q l r g s , where A is a pure numeric, we are led to the dimensional equa- tion [T] = [a]p[M]5[L] r [LT 2] s , showing that the law assumed would not persist when the fundamental units of length, mass, and time are altered, unless 9 = 0, 5= §, r=§; as an angle has no dimensions, being determined by its numerical ratio to the invariable angle forming four right angles, p remains unde- termined. This leads to the same result, r = {a)l +i g~ i , as before.

As illustrating the power and also the limitations of this method of dimensions, we may apply it (after Lord Rayleigh, Roy. Soc. Proc, March 1900) to the laws of viscosity in gases. The dimensions of viscosity (u) are (force/area) f (velocity / length), giving [ML -1 T 1] in terms of the fundamental units. Now, on the dynamical theory of gases viscosity must be a function of the mass m of a molecule, the number n of molecules per unit volume, their velocity of mean square v, and their effective radius a; it can depend on nothing else. The equation of dimensions cannot supply more than three relations connecting these four possibilities of variation, and so cannot here lead to a definite result without further knowledge of the physical circumstances. And we remark conversely, in passing, that wherever in a problem of physical dynamics we know that the quantity sought can depend on only three other quantities whose dynamical dimensions are known, it must vary as a simple power of each. The additional knowledge required, in order to enable us to proceed in a case like the present, must be of the form of such an equation of simple variation. In the present case it is involved in the new fact that in an actual gas the mean free path is very great compared

with the effective molecular radius. On this account the mean free path is inversely as the number of molecules per unit volume; and therefore the coefficient of vis cosity, being proportional to these two quantities jointly, is inde- pendent of either, so long as the other quantities defining the system remain unchanged. If the molecules are taken to be spheres which exert mutual action only during collision, we therefore assume

*11 oc m x v*a', which requires that the equation of dimensions [ML-'T- 1] = [MHLT-'ML]' must be satisfied. This gives x = l, y = l, z = 2. As the tem perature is proportional to mv 1 , it follows that the viscosity is proportional to the square root of the mass of the molecule and the square root of the absolute temperature, and inversely proportional to the square of the effective molecular radius, being, as already seen, uninfluenced by change of density.*

If the atoms are taken to be Boscovichian points exerting mutual attractions, the effective diameter a is not definite ; but we can still proceed in cases where the law of mutual attraction is expressed by a simple formula of variation — that is, provided it is of type km t r', where r is the distance between the two molecules. Then, noting that, as this is a force, the dimensions of k must be (M _1 L" +1 T^], we can assume

fx oc m x v«k w ,

provided [ML-'T- 1] = [M] I [LT- I]"[M- I L ! + I T- 2]«',

which demands and is satisfied by

x—w = l, y-)-2w = l, y--(s + i)w=— I, 2 5-f"^ s — ^

so that «»=-r=i.y=j=t.=j=T.*

Thus, on this supposition,

s~9 _ 2 s--$

where 6 represents absolute temperature. (See Diffusion.)

When the quantity sought depends on more than three others, the method may often be equally useful, though it cannot give a complete result. Cf. Sir G. G. Stokes, Math, and Phys. Papers, v. (1881) p. 106, and Lord Rayleigh, Phil. Mag.

(1905), (1) p. 494, for examples dealing with the determination of viscosity from observations of the retarded swings of a vane, and with the formula- tion of the most general type of characteristic equation for gases respectively. As another example we may consider what is involved in Bashforth's experimental conclusion that the air-resistances to shot of the same shane are proportional to the squa— s of their

linear dimensions. A priori, the resistance is a force which is deter- mined by the density of the air p, the linear dimensions / of the shot, the viscosity of the air /t, the velocity of the shot v, and the velocity of sound in air c, there being no other physical quantity sensibly involved. Five elements are thus concerned, and we can combine them in two ways so as to obtain quantities of no dimensions; for example, we may choose pvl// j. and v/c. The resistance to the shot must therefoie be of the form ix x p y \fit>(j>vlln)J{vlc) this form being of sufficient generality, as it involves an undetermined function for each element beyond three. On equating dimensions we find x = 2, y=—i, z=o. Now, Bashforth's result shows that

In electrical science two essentially distinct systems of measurement were arrived at according as the development began with the phenomena of electrostatics or those of electro-kinetics. An electric charge appears as an entity having different dimensions in terms of the fundamental dynamical units in the two cases: the ratio of these dimensions proves to be the dimensions of a velocity. It was found, first by W. Weber, by measuring the same charge by its static and its kinetic effects, that the ratio of the two units is a velocity sensibly identical with the velocity of light, so far as regards experiments conducted in space devoid of dense matter. The emergence of a definite absolute velocity such as this, out of a comparison of two different ways of approaching the same quantity, entitles us to assert that the two ways can be con-solidated into a single dynamical theory only by some develop-ment in which this velocity comes to play an actual part. Thus the hypothesis of the mere existence of some complete dynamical theory was enough to show, in the stage which

electrical science had reached under Gauss and Weber, that there is a definite physical velocity involved in and underlying electric phenomena, which it would have been hardly possible to imagine as other than a velocity of propagation of electrical effects of some kind. The time was thus ripe for the reconstruction of electric theory by Faraday and Maxwell.

The power of the method of dimensions in thus revealing general relations has its source in the hypothesis that, however complicated in appearance, the phenomena are really restricted within the narrow range of dependence on the three fundamental entities. The proposition is also therein involved, that if a changing physical system be compared with another system in which the scale is altered in different ratios as regards corre- sponding lengths, masses, and times, then if all quantities affecting the second system are altered from the corresponding quantities affecting the first in the ratios determined by their physical dimensions, the stage of progress of the second system will always correspond to that of the first; under this form the application of the principle, to determine the correlations of the dynamics of similar systems, originated with Newton (Principia, lib. ii. prop. 32). For example, in comparing the behaviour of an animal with that of another animal of the same build but on a smaller scale, we may take the mass per unit volume and the muscular force per unit sectional area to be the same for both; thus [L], [M], . . . being now ratios of corre- sponding quantities, we have [ML _3] = i and [ML _1 T _2] = i, giving [L] = [T]; thus the larger animal effects movements of his limbs more slowly in simple proportion to his linear dimen- sions, while the velocity of movement is the same for both at corresponding stages.

But this is only on the hypothesis that the extraneous force of gravity does not intervene, for that force does not vary in the same manner as the muscular forces. The result has thus application only to a case like that of fishes in which gravity is equilibrated by the buoyancy of the water. The effect of the inertia of the water, considered as a perfect fluid, is included in this comparison; but the forces arising

from viscosity do not correspond in the two systems, so that neither system may be so small that viscosity is an important agent in its motion. The limbs of a land animal have mainly to support his weight, which varies as the cube of his linear dimensions, while the sectional areas of bis muscles and bones

vary only as the square thereof. Thus the diameters of his limbs should increase in a greater ratio than that of his body — theoretically in the latter ratio raised to the power f, if other things were the same. An application of this principle, which has become indispensable in modern naval architecture, permits the prediction of the behaviour of a large ship from that of a small-scale model. The principle is also of very wide utility in unravelling the fundamental relations in definite physical problems of such complexity that complete treatment is beyond the present powers of mathematical analysis; it has been applied, for example, to the motions of systems involving viscous fluids, in elucidation of wind and waves, by Helmholtz (Akad. Berlin, 1873 and 1889), and in the electrodynamics of material atomic systems in motion by Lorentz and by Larmor.

As already stated, the essentials of the doctrine of dimensions in its most fundamental aspect, that relating to the comparison of the properties of correlated systems, originated with Newton. The explicit formulation of the idea of the dimensions, or the ex- ponents of dimension, of physical quantities was first made by Fourier, Theorie de la chaleur, 1822, ch. ii. sec. 9; the homogeneity in dimensions of all the terms of an equation is insisted on by him, much as explained above; and the use of this principle as a test of accuracy and precision is illustrated. (J. L.)*

UNITS, PHYSICAL. In order that our acquaintance with any part of nature may become exact we must have not merely a qualitative but a quantitative knowledge of facts. Hence the moment that any branch of science begins to develop to any extent, attempts are made to measure and evaluate the quantities and effects found to exist. To do this we have to select for each measurable magnitude a unit or standard of reference (Latin, unitas, unity), by comparison with which amounts of other like quantities may be numerically defined. There is nothing to prevent us from selecting these fundamental quantities, in terms of which other like quantities are to be expressed, in a perfectly arbitrary and independent manner, and as a matter of fact this is what is generally done in the early stages of every science. We may, for instance, choose a certain length, a certain volume, a certain mass, a certain force or power as our units of length, volume, mass, force or power, which have no simple or direct relation to each other. Similarly we may select for more special measurements any arbitrary electric current, electromotive force, or resistance,

and call them our units. The progress of knowledge, however, is greatly assisted if all the measurable quantities are brought into relation with each other by so selecting the units that they are related in the most simple manner, each to the other and to one common set of measurable magnitudes called the fundamental quantities.

The progress of this co-ordination of units has been greatly aided by the discovery that forms of physical energy can be converted into one another, and that the conversion is by definite rule and amount (see Energy). Thus the mechanical energy associated with moving masses can be converted into heat, hence heat can be measured in mechanical energy units. The amount of heat required to raise one gramme of water through 1° C. in the neighbourhood of io° C. is equal to forty-two million ergs, the erg' being the kinetic energy or energy of motion associated with a mass of 2 grammes when moving uniformly, without rotation, with a velocity of 1 cm. per second. This number is commonly called the " mechanical equivalent of heat," but would be more exactly described as the " mechan- ical equivalent of the specific heat of water at 10° C." Again, the fact that the maintenance of an electric current requires energy, and that when produced its energy can be wholly utilized in heating a mass of water, enables us to make a similar statement about the energy required to maintain a current of one ampere through a resistance of one ohm for one second, and to define it by its equivalent in the energy of a moving mass. Physical units have therefore been selected with the object of

establishing simple relations between each of them and the fundamental mechanical units. Measurements based on such relations are called absolute measurements. The science of dynamics, as far as that part of it is concerned which deals with the motion and energy of material substances, starts from certain primary definitions concerning the measurably quantities involved. In constructing a system of physical units, the first thing to consider is the manner in which we shall connect the various items. What, for instance, shall be the unit of force, and how shall it be determined by simple reference to the units of mass, length and time ?

The modern absolute system of physical measurement is founded upon dynamical notions, and originated with C. F. Gauss. We are for the most part concerned in studying motions in nature; and even when we find bodies at rest in equilibrium it is because the causes of motion are balanced rather than absent. Moreover, the postulate which lies at the base of all present-day study of physics is that in the ultimate issue we must seek for a mechanical explanation of the facts of nature if we are to reach any explanation intelligible to the human mind. Accordingly the root of all science is the knowledge of the laws of motion, and the enunciation of these laws by Newton laid the foundation of a more exact knowledge of nature than had been possible before. Our fundamental scientific notions are those of length, time, and mass. No metaphysical discussion has been able to resolve these ideas into anything simpler or to derive them from each other. Hence in selecting units for physical measurements we have first to choose units for the above three quantities.

Fundamental Units. — Two systems of fundamental units are in common use: the British system, having the yard and pound as the standard units of length and mass, frequently termed the " foot-pound-second " (F.P.S.) system; and the "centimetre-gramme-second" system (C.G.S.), having the centimetre and gramme as standard units of length and mass, termed the " metric " system. The fundamental unit of time is the same in both systems, namely, the " mean solar second," 86,400 of which make 1 solar day (see Time). Since these systems and the corresponding standards, together with their factors of conversion, are treated in detail in the article Weights and Measures, we need only deal here with such units as receive special scientific use, i.e. other than in ordinary commercial practice. The choice of a unit in which to express any quantity is determined by the magnitude and proportional error of the measurement. In astronomy, where immense distances have to be very frequently expressed, a common unit is the mean radius of the earth's orbit, the " astronomical unit " of length, i.e. 92,900,000 miles. But while this unit serves well for the region of our solar system, its use involves unwieldy numerical coefficients when stellar distances are to be expressed. Astronomers have therefore adopted a unit of length termed the " light year," which is the distance traversed by light in a year; this unit is 63,000 times the mean radius of the earth's orbit. The relative merits of these units as terms in which

astronomical distances may be expressed is exhibited by the values of the distance of the star a Centauri from our earth, namely, 25,000,000,000,000 miles = 275,000 astronomical units = 4-35 light years.

As another example of a physical unit chosen as a matter of convenience, we may refer to the magnitudes of the wave-lengths of light. These quantities are extremely small, and admit of correct determination to about one part in ten-thousand, and range, in the visible spectrum, from about 6 to 4 ten-millionths of a metre. Since their values are determined to four significant figures, it is desirable to choose a unit which represents the value as an integer number; the unit is therefore a ten-thousand- millionth of a metre, termed a " tenth metre," since it is io~ 10 metres. Sometimes the thousand-millionth of a metre, the " micromillimetre," denoted by ju;u, serves as a unit for wave lengths. Another relatively minute unit is the " micron," denoted by n, and equal to one-millionth of a metre; it is espe- cially used by bacteriologists.

Units in Mechanics. —The quantities to be measured in mechanics (q.v.) are velocity and acceleration, dependent on the units of length and time only, momentum, force, energy or work and power, dependent on the three fundamental units. The unit of velocity in the British system is 1 foot, 1 yard, or 1 mile per second; or the time to which the distance is referred may be expressed in hours, days, &c, the choice depending upon the actual magnitude of the velocity or on custom. Thus the muzzle velocity of a rifle or cannon shot is expressed in feet per second, whereas the speed of a train is usually expressed in miles per hour. Similarly, the unit on the metric system is 1 metre, or any decimal multiple thereof, per second, per hour, &c. Since acceleration is the rate of increase of velocity per unit time, it is obvious that the unit of acceleration depends solely upon the units chosen to express unit velocity ; thus if the unit of velocity be one foot per second, the unit of acceleration is one foot per second per second, if one metre per second the unit is one metre per second per second, and similarly for other units of velocity. Momentum is defined as the product of mass into velocity; unit momentum is therefore the momentum of unit mass into unit velocity; in the British system the unit of mass may be the pound, ton, &c, and the unit of velocity any of those mentioned above; and in the metric system, the gramme, kilogramme, &c, may be the unit of mass, while the metre per second, or any other metric unit of

velocity, is the remaining term of the product.

Force, being measured by the change of momentum in unit time, is expressed in terms of the same units in which unit momentum is defined. The common British unit is the ‘ poundal," the force which in one second retards or accelerates the velocity of a mass of one pound by one foot per second. The metric (and scientific) unit, named the " dyne," is derived from the centimetre, gramme, and second. The poundal and dyne are related as follows: — 1 poundal = 13,825-5 dynes.

A common unit of force, especially among engineers, is the " weight of one pound," by which is meant the force equivalent to the gravitational attraction of the earth on a mass of one pound. This unit obviously depends on gravity; and since this varies with the latitude and height of the place of observation (see Earth, Figure oe), the " force of one pound " of the engineer is not constant. Roughly, it equals 32-17 poundals or 980 dynes. The most frequent uses of this engineer's unit are to be found in the expressions for pressure, especially in the boilers and cylinders of steam engines, and in structures, such as bridges, foundations of buildings, &c. The expression takes the form: pounds per square foot or inch, meaning a force equivalent to so many pounds' weight distributed over a square foot or inch, as the case may be. Other units of pressure (and therefore special units of force) are the " atmosphere " (abbrevi- ated " atmo "), the force exerted on unit area by the column of air vertically above it; the " millimetre or centimetre of mercury," the usual scientific units, the force exerted on unit area by a column of mercury one millimetre or centimetre high; and the " foot of water," the column being one foot of water. All these units admit of ready conversion: — 1 atmo = 760 mm. mercury = 32 feet of water = 1,013,600 dynes.

Energy of work is measured by force acting over a distance. The scientific unit is the " erg," which is the energy expended when a force of one dyne acts over one centimetre. This unit is too small for measuring the quantity of energy associated, for instance, with engines; for such purposes a unit ten-million times as great, termed the " joule," is used. The British absolute unit is the " poundal-foot." As we noticed in the case of units of force, common-life experience has led to the introduction of units dependent on gravitation, and therefore not invariable: the common British practical unit of this class is the " foot- pound "; in the metric system its congener is the "

kilogramme- metre."

Power is the rate at which force does work; it is therefore expressed by " units of energy per second." The metric unit in use is the " watt," being the rate equal to one joule pe' second. Larger units in practical use are: " kilowatt,' equal to 1000 watts; the corresponding energy unit being the

kilowatt-second, and 3600 kilowatt-seconds or 1 kilowatt-hour called a " Board of Trade unit " or a " kelvin." This last is a unit of energy, not power. In British engineering practice the common unit of power is the " horse-power " (HP), which equals 550 foot-pounds performed per second, or 33,000 foot-pounds per minute; its equivalent in the metric system is about 746 watts, the ratio varying, however, with gravity.

Units of Heat. — In studying the phenomena of heat, two measurable quantities immediately present themselves: — (1) temperature or thermal potential, and (2) quantity of heat. Three arbitrary scales are in use for measuring temperature (see Thermometry), and each of these scales affords units suitable for the expression of temperature. On the Centigrade scale the unit, termed a " Centigrade degree,"' is one-hundredth of the interval between the temperature of water boiling under normal barometric pressure- (760 mm. of mercury) and that of melting ice; the " Fahrenheit degree " is one-hundred- and-eightieth, and the " Reaumur degree " is one-eightieth of the same difference. In addition to these scales there is the " thermo-dynamic scale," which, being based on dynamical reasoning, admits of correlation with the fundamental units. This subject is discussed in the articles Thermodynamics and Thermometry.

Empirical units of " quantity of heat " readily suggest them-selves as the amount of heat necessary to heat a unit mass of any substance through unit temperature. In the metric system the unit, termed a " calorie," is the quantity of heat required to raise a gramme of water through one degree Centigrade. This quantity, however, is not constant, since the specific heat of water varies with temperature (see Calorimetry). In denning the calorie, therefore, the particular temperatures must be

specified; consequently there are several calories particularized by special designations: — (1) conventional or common gramme- calorie, the heat required to raise 1 gramme of water between 150° C and 1 7 C. through i° C; (2) " mean or average gramme calorie," one-hundredth of the total heat required to raise the temperature of 1 gramme of water from o° C. to ioo° C; (3) " zero gramme calorie," the heat required to raise 1 gramme of water from o° C. to 1° C. These units are thus related: — 1 common calorie = 1-987 mean calories = o-902 zero calories. A unit in common use in thermo-chemistry is the major calorie, which refers to one kilogramme of water and i° C. In the British system the common unit, termed the " British Thermal Unit " (B.Th.U.), is the amount of heat required to raise one pound of water through one degree Fahrenheit.

A correlation of these units of quantity of heat with the fundamental units of mass, length and time attended the recognition of the fact that heat was a form of energy; and their quantitative relationships followed from the experimental determinations of the so-called " mechanical equivalent of heat," i.e. the amount of mechanical energy, expressed in ergs, joules, or foot-pounds, equivalent to a certain quantity of heat (cf. Calorimetry). These results show that a gram-calorie is equivalent to about 4-2 joules, and a British thermal unit to 780 foot-pounds.

Electrical Units. — The next most important units are the electri- cal units. We are principally concerned in electrical work with three quantities called respectively, electric current, electro- motive force, and resistance. These are related to one another by Ohm's law, which states that the electric current in a circuit is directly as the electromotive force and inversely as the re- sistance, when the current is unvarying and the temperature of (he circuit constant. Hence if we choose units for two of these quantities, the above law defines the unit for the third. Much liscussion has taken place over this question. The choice is decided by the nature of the quantities themselves. Since resistance is a permanent quality of a substance, it is possible to select a certain piece of wire or tube full of mercury, and declare that its resistance shall be the unit of resistance, and if the substance is permanent we shall possess an unalterable standard or unit of resistance. For these reasons the practical

tlon units.

unit of resistance, now called the international ohm, has been selected as one of the above three electrical units.

It has now been decided that the second unit shall be the unit of electric current. As an electric current is not a thing, but a process, the unit current can only be reproduced when desired. There are two available methods for creating a standard or unit electric current. If an unvarying current is passed through a neutral solution of silver nitrate it decomposes or electrolyses it and deposits silver upon the negative pole or cathode of the electrolytic cell. According to Faraday's law and all subsequent experience, the same current deposits in the same time the same mass of silver. Hence we may define the unit current by the mass of silver it can liberate per second. Again, an electric current in one circuit exerts mechanical force upon a magnetic pole or a current in another circuit suitably placed, and we may measure the force and define by it a unit electric current. Both these methods have been used. Thirdly, the unit of electromotive force may be defined as equal to the difference of potential between the ends of the unit of resistance when the unit of current flews in it.

Apart, however, from the relation of these electrical units to each other, it has been found to be of great importance to establish a simple relation between the latter and the absolute mechanical units. Thus an electric current which is Absolute passed through a conductor dissipates its energy as electrical heat, and hence creates a certain quantity of heat ualts – per unit of time. Having chosen our units of energy and related unit of quantity of heat, we must so choose the unit of current that when passed through the unit of resistance it shall dissipate 1 unit of energy in 1 unit of time.

A further consideration has weight in selecting the size of the units, namely, that they must be of convenient magnitude for the ordinary measurements. The founders of the British modern system of practical electrical units were a Associa- committee appointed by the British Association in 1861, at the suggestion of Lord Kelvin, which made its first report in 1862 at Cambridge (see B. A. Report). The five subsequent reports containing the results of the committee's work, together with a large amount of most valuable matter on the subject of electric units, were collected in a volume edited by Prof. Fleeming

Jenkin in 1873, entitled Reports of the Committee on Electrical Standards. This committee has con- tinued to sit and report annually to the British Association since that date. In their second report in 1863 (see B.A. Report, Newcastle-on-Tyne) the committee recommended the adoption of the absolute system of electric and magnetic units on the basis originally proposed by Gauss and Weber, namely, that these units should be derived from the fundamental dy- namical units, but assuming the units of length, mass and time to be the metre, gramme and second instead of the millimetre, milligramme and second as proposed by Weber. Considerable differences of opinion existed as to the choice of the funda- mental units, but ultimately a suggestion of Lord Kelvin's was adopted to select the centimetre, gramme, and second, and to construct a system of electrical units (called the C.G.S. system) derived from the above fundamental units. On this system the unit of force is the dyne and the unit of work the erg. The dyne is the uniform force which when acting on a mass of 1 gramme for 1 second gives it a velocity of 1 centimetre per second. The erg is the work done by 1 dyne when acting through a distance of 1 centimetre in its own direction. The electric and magnetic units were then derived, as previously suggested by Weber, in the following manner: If we consider two very small spheres placed with centres 1 centimetre apart in air and charged with equal quantities of electricity, then if the force between these bodies is 1 dyne each sphere is said to be charged with 1 unit of electric quantity on the electro- static system. Again, if we consider two isolated magnetic poles of equal strength and consider them placed 1 centimetre apart in air, then if the force between them is 1 dyne these poles are said to have a strength of 1 unit on the electromag- netic system. Unfortunately the committee did not take into

account the fact that in the first case the force between the electric charges depends upon and varies inversely as the di- electric constant of the medium in which the experiment is made, and in the second case it depends upon the magnetic permeability of the medium in which the magnetic poles exist. To put it in other words, they assume that the dielectric constant of the circumambient medium was unity in the first case, and that the permeability was also unity in the second

case.

The result of this choice was that, two systems of measurement were created, one depending upon the unit of electric quantity so chosen, called the electrostatic system, and the other depend- ing upon the unit magnetic pole defined as above, called the electromagnetic system of C.G.S. units. Moreover, it was found that in neither of these systems were the units of very con- venient magnitude. Hence, finally, the committee adopted a third system of units called the practical system, in which con- venient decimal multiples or fractions of the electromagnetic units were selected and named for use. This system, moreover, is not only consistent with itself, but may be considered to be derived from a system of dynamical units in which the unit of length is the earth quadrant or 10 million metres, the unit of mass is io" u of a gramme and the unit of time is 1 second. The units on this system have received names derived from those of eminent discoverers. Moreover, there is a certain relation between the size of the units for the same quantity on the electrostatic (E.S.) system and that on the electromagnetic (E.M.) system, which depends upon the velocity of light in the medium in which the measurements are supposed to be made. Thus on the E.S. system the unit of electric quantity is a point charge which at a distance of 1 cm. acts on another equal charge with a force of 1 dyne. The E.S. unit of electric current is a current such that 1 E.S. unit of quantity flows per second across each section of the circuit. On the E.M. system we start with the definition that the unit magnetic pole is one which acts on another equal pole at a distance of 1 cm. with a force of 1 dyne. The unit of current on the E.M. system is a current such that if flowing in circular circuit of 1 cm. radius each unit of length of it will act on a unit magnetic pole at the centre with a force of 1 dyne. This E.M. unit of current is much larger than the E.S. unit defined as above. It is v times greater, where » = 3Xio 10 is the velocity of light in air expressed in cms. per second. The reason for this can only be understood by considering the dimensions of the quantities with which we are concerned. If L, M, T denote length, mass, time, and we adopt certain sized units of each, then we may measure any derived quantity, such as velocity, acceleration, or force in terms of the derived dynamical units as already explained. Suppose, however, we alter the size of our selected units of L, M or T, we have to consider how this alters the correspond- ing units cf velocity,

acceleration, force, &c. To do this we have to consider their dimensions. If the unit of velocity is the unit of length passed over per unit of time, then it is obvious that it varies directly as the unit of length, and inversely as the unit of time. Hence we may say that the dimensions of velocity are L/T or LT _1 ; similarly the dimensions of acceleration are L/T 2 or LT 2 , and the dimen sions of a force are MLT -2 .

For a fuller explanation see above (Units, Dimensions of), or Everett's Illustrations of the C.G.S. System of Units.

Accordingly on the electrostatic system the unit of electric quantity is such that / = <7 2 /K<2 2 , where q is the quantity of _. . _ the two equal charges, d their distance, /the mechanical static and force or stress between them, and K the dielectric electro- constant of the dielectric in which they are im- magoetic m ersed. Hence since / is of the dimensions MLT -2 , q 2 must be of the dimensions of KML 3 ! 1-2 , and q of the dimensions M s LˆTˆKJ. The dimensions of K, the dielectric constant, are unknown. Hence, in accordance with the sug- gestion of Sir A. Rucker (Phil. Mag., February 1889), we must treat it as a fundamental quantity. The dimensions of an electric current on the electrostatic system are therefore those of an electric quantity divided by a time, since by current we

mean the quantity of electricity conveyed per second. Accord- ingly current on the E.S. system has the dimensions M'lJTˆK.*

We may obtain the dimensions of an electric current on the magnetic system by observing that if two circuits traversed by the same or equal currents are placed at a distance from each other, the mechanical force or stress between two elements of the circuit, in accordance with Ampere's law (see Electro- kinetics), varies as the square of the current C, the product of the elements of length ds, ds' of the circuits, inversely as the square of their distance d, and directly as the permeability /x of the medium in which they are immersed. Hence C 2 ds ds'n/ d must be of the dimensions of a force or of the dimensions MLT -2 . Now, ds and ds' are lengths, and d is a length, hence the dimensions of electric current on the E.M. system must be M-LˆT -1 /* – '— Accordingly the dimensions of current on the E.S. system are M*LˆT~ Kˆ, and on the E.M. system they are M*LˆT l /t~S where n and K, the permeability and di electric constant of the medium, are of unknown dimensions, and therefore treated as fundamental quantities.*

The ratio of the dimensions of an electric current on the two systems (E.S. and E.M.) is therefore LT K 2 /i 2 . This ratio must be a mere numeric of no dimensions, and therefore the dimensions of V Kju must be those of the reciprocal of a velocity. We do not know what the dimensions of n and K are separately, but we do know, therefore, that their product has the dimensions of the reciprocal of the square of a velocity.

*Again, we may arrive at two dimensional expressions for electro- motive force or difference of potential. Electrostatic difference of potential between two places is measured by the mechanical work required to move a small conductor charged with a unit electric charge from one place to the other against the electric force. Hence if V stands for the difference of potential between the two places, and Q for the charge on the small conductor, the product QV must be of the dimensions of the work or energy, or of the forceXlength, or of ML 2 T~\ But Q on the electrostatic system of measurement is of the dimensions M*LˆT -1 K* ; the potential difference Vmust be, therefore, of the dimensions M'LˆT – KT*. Again, since by Ohm's law and Joule's law electromotive force multiplied by a current is equal to the power expended on a circuit, the dimen- sions of electromotive force, or, what is the same thing, of potential difference, in the electromagnetic system of measurement must be those of power divided by a current. Since mechanical power means rate of doing work, the dimensions of power must be ML 2 T -3 . We have already seen that on the electromagnetic system the dimensions of a current are M-L*T – V~* ; therefore the dimensions of electromotive force or potential on the electromagnetic system must be M=L 3 T -2 jA Here again we find that the ratio of the dimensions on the electrostatic system to the dimensions on the electromagnetic system is L TK J ju *.*

In the same manner we may recover from fundamental facts and relations the dimensions of every electric and magnetic quantity on the two systems, starting in one case from electrostatic phenomena and in the other case from electromagnetic or magnetic. The electrostatic dimensional expression will always involve K, and the electromagnetic dimensional expression will always involve M, and in every case the dimensions in terms of K are to those in terms of /i for the same quantity in the ratio of a power of LT K'/A This therefore confirms the view that whatever may be the true dimensions in terms of fundamental units of yx and K, their

product is the inverse square of a velocity.

Table I. gives the dimensions of all the principal electric and magnetic quantities on the electrostatic and electromagnetic systems.

*It will be seen that in every case the ratio of the dimensions on the two systems is a power of LT 1 K*mS or of a velocity multiplied by the square root of the product K and 11 ; in other words, it is the product of a velocity multiplied by the geometric mean of K and 11. This quantity l/VK]u must therefore be of the dimensions of a velocity, and the questions arise, What is the absolute value_ of this velocity? and, How is it to be determined? The answer js, that the value of the velocity in concrete numbers may be obtained by measuring the magnitude of any electric quantity in two ways, one making use only of electrostatic phenomena, and the other only of electromagnetic. To take one instance : — It is easy to show that the electrostatic capacity of a sphere suspended in air or in vacuo at a great distance from other conductors is given by a number equal to its radius in centimetres. Suppose such a sphere to be charged and discharged rapidly with electricity from any source, such as a battery. It would take electricity from the source at a certain rate, and would in fact act like a resistance in permitting the passage through it or by it of a certain quantity of electricity per unit of time. If K is the capacity and n is the number of dis charges per second, then nK is a quantity of the dimensions of an electric conductivity, or of the reciprocal of a resistance. If a conductor, of which the electrostatic capacity can be calculated, and which has associated with it a commutator that charges and*

Table I. — Dimensions of Electric Quantities

Dimensions

Dimensions

Quantity.

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on the Electro-

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E.S.

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L~i M T~ l M J*

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T K”V

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= i ohm

= 1 volt = i ampere = I coulomb

I joule I watt I henry I weber 1 I gauss 1

discharges it n times per second, is arranged in one branch of a Wheatstone's Bridge, it can be treated and measured as if it were a resistance, and its equivalent resistance calculated in terms of the resistance of all the other branches of the bridge (see Phil. Map.,

1885,20,258).

Accordingly, we have two methods of measuring the capacity of a conductor. One, the electrostatic method, depends only on the measurement of a length, which in the case of a sphere in free space is its radius; the other, the electromagnetic method, deter- mines the capacity in terms of the quotient of a time by a resistance. The ratio of the electrostatic to the electromagnetic value of the same capacity is therefore of the dimensions of a velocity multiplied by a resistance in electromagnetic value, or of the dimensions of a velocity squared. This particular experimental measurement has been carried out carefully by many observers, and the result has been always to show that the velocity v which expresses the ratio is very nearly equal to 30 thousand million centimetres per second ; 11 = nearly 3X10 10 . The value of this important constant can be determined by experiments made to measure electric quantity, potential, resistance or capacity, both in electrostatic and in electro- magnetic measure. For details of the various methods employed, the reader must be referred to standard treatises on Electricity and Magnetism, where full particulars will be found (see Maxwell, Treatise on Electricity and Magnetism, vol. ii. ch. xix. 2nd ed.; also Mascart and Joubert, Treatise on Electricity and Magnetism, vol. ii. ch. viii., Eng. trans, by Atkinson).

Table II. gives a list of some of these determinations of v, with references to the original papers.

It will be seen that all the most recent values, especially those

in which a comparison of capacity has been made, approximate to 3X10 10 centimetres per second, a value which is closely in accord with the latest and best determinations of the velocity of light.

We have in the next place to consider the question of Practical practical electric units and the determination and units. construction of concrete standards. The committee

of the British Association charged with the duty of arranging

a system of absolute and magnetic units settled also on a system of practical units of convenient magni- tude, and gave names to them as follows: — io 9 absolute electromagnetic units of resist- ance io 8 ,, ,, units of electro-

motive force ,, unit of current

,, unit of quantity

,, units of capacity = I farad

„ units of capacity = I microfarad

Since the date when the preceding terms were adopted, other multiples of absolute C.G.S. units have received practical names, thus: —

IO 7 ergs or absolute C.G.S. units of energy = IO 7 ergs per second or C.G.S. units of power = •io 9 absolute units of inductance io 8 absolute units of magnetic flux 1 absolute unit of magnetomotive force

An Electrical Congress was held in Chicago, U.S.A., in August 1893, to consider the subject of international practical electrical units, and the result of a conference between scientific representatives of Great Britain, the United States, France, Germany, Italy, Mexico, Austria, Switzerland, Sweden and British North America, after deliberation for six days, was a unanimous agreement to recommend the following resolutions as the definition of practical international units. These resolutions and definitions were confirmed at other conferences, and at the last one held in London in October 1908 were finally adopted. It was agreed to take : — ,

" As a unit of resistance, the International Ohm, which is

based upon the ohm equal to io 9 units of resistance of the C.G.S. system of electromagnetic units, and is represented by the resistance offered to an unvarying electric current by a column of mercury at the temperature of melting ice 14-4521 grammes in mass, of a constant cross-sectional area and of the length of 106-3 cm –

" As a unit of current, the International Ampere, which is one-tenth of the unit of current of the C.G.S. system of electromagnetic units, and which is represented sufficiently well for practical use by the unvarying current which, when passed through a solution of nitrate of silver in water, deposits silver at the rate of 0-00111800 of a gramme per second.

"Asa unit of electromotive force, the International Volt, which is the electromotive force that, steadily applied to a conductor whose resistance is one international ohm, will produce a current of one international ampere. It is represented sufficiently well for practical purposes by ilrjsi of the E.M.F. of a normal or saturated cadmium Weston cell at 20° C, prepared in the manner described in a certain specification.

"As a unit of _ quantity, the International Coulomb, which is the quantity of electricity transferred by a current of one international ampere in one second.

" As the unit of capacity, the International Farad, which is the capacity of a condenser charged to a potential of one international volt by one international coulomb of electricity.

" As a unit of work, the Joule, which is equal to io 7 units of work in the C.G.S. System, and which is represented sufficiently well for practical use by the energy expended in one second by an international ampere in an international ohm.

" As a unit of power, the Watt, which is equal to io 7 uniti of power in the C.G.S. System, and which is represented sufficiently well for practical use by the work done at the rate of one joule per second.

" As the unit of inductance, the Henry, which is the induction in a circuit when an electromotive force induced in this circuit is one international volt, while the inducing current varies at the rate of one ampere per second."

1 Neither the weber nor the gauss has received very general adoption, although recommended by the Committee of the British Association on Electrical Units. Many different suggestions have been made as to the meaning to be applied to the word " gauss." The practical electrical engineer, up to the present, prefers to use one ampere-turn as his unit of magnetomotive force, and one line of force as the unit of magnetic flux, equal respectively to 10/4 times and I times the C.G.S. absolute units. Very frequently the " kiloline," equal to 1000 lines of force, is now used as a unit of magnetic flux.*

Table II.— Observed Values of V in Centimetres per Second

Electric

v in

Date.

Name.

Reference.

Quantity Measured.

Centimetres per Second.

1856

W. Weber and R. Kohlrausch

Electrodynamische M assbestimmungen and Pogg. Ann. xcix., August 10,

1856

Quantity

3-107X1010

1867

> Lord Kelvin Sand W. F. King

Report of British

Potential

2 -8 1 Xio™

1868

Assoc, 1869, p. 434;

and Reports on Elec-

trical Standards,

F. Jenkin, p. 186

1868

J. Clerk Maxwell .

Phil. Trans. Roy. Soc, 1868, p. 643

”

*284 Xio 1 *)*

1872

Lord Kelvin and Dugald M’Kich-

Phil. Trans. Roy. Soc. 1873, p. 409

”

2-89 Xio”>

1878

an W. E. Ayrton and J. Perry

Journ. Soc. Tel. Eng. vol. viii. p. 126

Capacity

2-94 Xioi°

1880

Lord Kelvin and Shida

Phil. Mag., 1880, vol. x. p. 431

Potential

2-955X1010

1881

A. G. Stoletow

Soc. Franc, de Phys.,

1881

Capacity

2-99 Xio 10

1882

F. Exner

Wien. Ber., 1882

Potential

292 Xioio

1883

Sir J. J. Thomson

Phil. Trans. Roy. Soc, 1883, p. 707

Capacity

2-963Xio ia

1884

I. Klemencic .

Journ. Soc. Tel. Eng., 1887, p. 162

”

3019X10 10

1888

F. Himstedt .

Electrician, March 23 , 1888, vol. xx. p. 530

”

3 007 Xio 10

1888

Lord Kelvin, Ayr- ton and Perry

British Association, Ba th; and Elec- trician, Sept. 28,

1888

Potential

2-92 Xioio

1 888

H. Fison

Electrician, vol. xxi. p. 215; and Proc. Phys. Soc. Lond., June 9, 1888

Capacity

2-o6sXioio

1889 1889

i88g

Lord Kelvin .

Proc Roy. Inst., 1889

Potential

3 -004X1010

H. A. Rowland

PhiLMag., 1889

Quantity

2-981 XrolO

E. B. Rosa .

Phil. Mag., 1889

Capacity

S-oooXioiO

1890

Sir J. J. Thomson and G. F. C. Searle

Phil. Trans., 1890

*'**

2-995XioiO

1897

M. E. Maltby.

Wicd. Ann. 1897

Alternating currents

3-015X1010

In connexion with the numerical values in the above definitions much work has been done. The electrochemical equivalent of silver or the weight in grammes deposited per second by i C.G.S. electromagnetic unit of current has been the subject of much research. The following determinations of it have been given by various observers: —

Name.

Value.

Reference.

E. E. N. Mascart .

0-011156

Journ. de physique, 1884,

(2), 3. 283.

F. and W. Kohlrausch .

0-011183

Wied. Ann., 1886, 27, 1.

Lord Rayleigh and Mrs

0-011179

Phil. Trans. Roy. Soc,

Sedgwick

1884, 2, 411.

J. S. H. Pellat and

0-011192

Journ. de Phys., 1890, (2),

A. Potier

9, 38i-

Karl Kahle

0-011183

Wied. Ann., 1899, 67, 1.

G. W. Patterson and

0-011192

Physical Review, 1898, 7,

K. E. Guthe

251.

J. S. H. Pellat and S. A.

0-011195

Comptes rendus, 1903,

Leduc

136, 1649.

Although some observers have urged that the 0-01119 is nearer to the true value than 0-01118, the preponderance of the evidence seems in favour of this latter number and hence the value per ampere- second is taken as 0-0011800 gramme. The exact value of the electromotive force of a Clark cell has also been the subject of much research. Two forms of cell are in use, the simple tubular form and the H-form introduced by Lord Rayleigh. The Berlin Reichsanstalt has issued a specification for a particular H-form of Clark cell, and its E.M.F. at 15° C. is taken as 1-4328 international volts. The E.M.F. of the cell set up in accordance with the British Board of Trade specification is taken as 1-434 international volts at 1 5 C. The detailed specifications are given in Fleming's Hand-book for the Electrical Laboratory and Testing Room (1901), vol. i. chap. 1 ; in the same book will be found copious references to the scientific literature of the Clark cell. One objection to the Clark cell as a concrete standard of electromotive force is its variation with temperature and with slight impurities in the mercurous sulphate used in its construction. The Clark cell is a voltaic cell made with mercury, mercurous sulphate, zinc sulphate, and zinc

as elements, and its E.M.F. decreases 0-08 % per degree Centi-grade with rise of temperature. In 1891 Mr Weston proposed to employ cadmium and cadmium sulphate in place of zinc and zinc sulphate and found that the temperature coefficient for the cadmium cell might be made as low as 0-004 % per degree Centigrade. Its E.M.F. is, however, 1-0184 international volts at 20 C. For details of construction and the literature of the subject see Fleming's Handbook for the Electrical Laboratory, vol. i. chap. 1.

In the British Board of Trade laboratory the ampere and the volt are not recovered by immediate reference to the electrochemical equivalent of silver or the Clark cell, but by

means of instruments called a standard ampere balance and a standard 100-volt electro- static voltmeter. In the standard ampere balance the current is determined by weighing the attraction between two coils tra- versed by the current, and the ampere is defined to be the current which causes a certain attraction between the coils of this standard form of ampere balance. The form of ampere balance in use at the British Board of Trade electrical standards office is described in Fleming's Handbook for the Electrical Laboratory, vol. i., and that constructed for the British National Physical Laboratory in the report of the Committee on Electrical Standards {Brit. Assoc. Rep., 1905). This latter instrument will recover the ampere within one-thousandth part. For a further description of it and for full discussion of the present position of knowledge respecting the values of the international practical units the reader is referred to a paper by Dr F. A. Wolff read before the International Electrical Congress at St Louis Exhibition, U.S.A., in 1904, and the subse- quent discussion (see Journ. Inst. Elec. Eng. Lond., 1904-5, 34, 190, and 35, 3). . . .

The construction of the international ohm or practical unit of resistance involves a knowledge of the specific resistance of mercury. Numerous determinations of this constant have been made. The results are expressed either in terms of the length in cm. of the column of pure mercury of 1 sq. mm. in section which at 0° C. has a resistance of 10 C.G.S. electromagnetic units, or else in terms of the weight of mercury in grammes for a column of constant cross- sectional area and length of 100-3 cm – The latter method was adopted at the British Association Meeting at Edinburgh in 1892, but there is some uncertainty as to the value of the density of mercury at 0° C. which was then adopted. Hence it was proposed by Professor J. Viriamu Jones that the redetermination of the ohm should be made when required by means of the Lorentz method (see J. V. Jones, " The Absolute Measurement of Electrical Resist- ance," Proc. Roy. Inst. vol. 14, part iii. p. 601). For the length of the mercury column defining the ohm as above, Lord Rayleigh in 1882 found the value 106-27 cm., and R. T. Glazebrook in the same year the value 106-28 cm. by a different method, while another determination by Lord Rayleigh and Mrs Sedgwick in 1883 gave 106-22 cm. Viriamu Jones in 1891 gave the value 106-30 cm., and one by W. E. Ayrton in 1897 by the same method obtained the value 106-27 to 106-28 cm. Hence the*

specific resistance of mercury cannot be said to be known to 1 part in 10,000, and the absolute value of the ohm in centimetres per second is uncertain to at least that amount. (See also J. Viriamu Jones, " On a Determination of the International Ohm in Absolute Measure," Brit: Assoc. Report, 1894.)

The above-described practical system based on the C.G.S. double system of theoretical units labours under several very great disadvantages. The practical system is derived ˆtional from and connected with an abnormally large unit of system oi length (the earth quadrant) and an absurdly small electrical unit of mass. Also in consequence of the manner in unlts ' which the unit electric quantity and magnetic pole strength are defined, a coefficient, 47r, makes its appearance in many practical equations. For example, on the present system the magnetic force H in the interior of a long spiral wire of N turns per centi- metre of length when a current of A amperes circulates in the wireis47r AN/10. Again, the electric displacement or induction D through a unit of area is connected with the electric force E and the dielectric constant K by the equation D = KE/4x. In numerous electric and magnetic equations the constant 4?r makes its appearance where it is apparently meaningless. A system of units in which this constant is put into its right place by appro- priate definitions is called a rational system of electric units. Several physicists have proposed such systems. Amongst others that of Professor G. Giorgi especially deserves mention. Qj 0rx p s We have seen that in expressing the dimensions of system oi electric and magnetic qualities we cannot do so simply electrical by reference to the units of length, mass and time, unHs ' but must introduce a fourth fundamental quantity. This we may take to be the dielectric constant of the ether of its magnetic permeability, and thus we obtain two systems of

measurement. Professor Giorgi proposes that the four fundamental quantities shall be the units of length, mass, time and electrical resistance, and takes as the concrete units or standards the metre, kilogramme, second and ohm. Now this proposal not only has the advantage that the theoretical units are identical with the actual practical concrete units, but it is

also a rational system. Moreover, the present practical units are unaltered; the ampere, volt, coulomb, weber, joule and watt remain the actual as well as theoretical units of current, electro- motive force, quantity, magnetic flux, work and power. But the unit of magnetic force becomes the ampere-turn per metre, and the unit of electric force the volt per metre; thus the magnetic units are measured in terms of electric units. The numerical value of the permeability of ether or air becomes 47rXio~ 7 and the dielectric constant of the ether or air becomes r/4irXoXio 9 ; their product is therefore i/QXio 8) 2 , which is the reciprocal of the square of the velocity of light in metres per second.

For a discussion of the Giorgi proposals, see a paper by Professor M. Ascoli, read before the International Electrical Congress at St Louis, 1904 {Journ. Inst. Elect. Eng. Lond., 1904, 34, 176).

It can hardly be said that the present system of electrical units is entirely satisfactory in all respects. Great difficulty would of course be experienced in again altering the accepted practical concrete units, but if at any future time a reformation should be possible, it would be desirable to bear in mind the recommendations made by Oliver Heaviside with regard to their rationalization. The British Association Committee defined the strength of a magnetic pole by reference to the mechanical stress between it and another equal pole: hence the British Association unit magnetic pole is a pole which at a distance of one centimetre attracts or repels another equal pole with a force of one dyne. This, we have seen, is an imperfect definition, because it omits all reference to the permeability of the medium in which the experiment takes place; but it is also unsatisfactory as a starting-point for a system of units for another reason. The important quantity in connexion with polar magnets is not a mechanical stress between the free poles of different magnets, but the magnetic flux emanating from, or associating with, them. From a technical point of view this latter quality is far more important than the mechanical stress between the magnetic poles, because we mostly employ magnets to create induced electromotive force, and the quantity we are then mostly concerned with is the magnetic flux proceeding from the poles. Hence the most natural definition of a unit magnet pole is that pole from which proceeds a total magnetic flux of one unit. The definition of one unit of magnetic flux must then be that flux which, when

inserted into or withdrawn from a conducting circuit of one turn having unit area and unit conductivity, creates in it a flow or circulation of one unit of electric quantity. The definition of a unit magnetic pole ought, therefore, to have been approached from the definition of a unit of electric quantity.

On the C.G.S. or British Association system, if a magnetic filament has a pole strength m — that is to say, if it has a magnetization I, and a section s, such that Is equals m — then it can be shown that the total flux emanating from the pole is ˆvm. The factor 4ir, in consequence of this definition, makes its appearance in many practically important expressions. For instance, in the well-known magnetic equation connecting the vector values of magnetization I. magnetic force H and magnetic flux density B, where we have {he equation

B = H + 4irI, the appearance of the quantity 4ir disguises the real physical meaning of the equation.

The true remedy for this difficulty has been suggested by Heaviside

to be the substitution of rational for irrational formulae and definitions.

He proposes to restate the definition of a unit magnetic

*rf'" P°' e m sucn a manner as to remove this constant 4x S t! " al from the most frequently employed equations. His start – Tvstem ing-point is a new definition according to which a unit ' magnetic pole is said to have a strength of m units if it attracts or repels another equal pole placed at a distance of d centimetres with a force of m*i%TrcP dynes. It follows from this definition that a rational unit magnetic pole is weaker or smaller than the irrational or British Association unit pole in the ratio of*

l/V4»r to 1, or -28205 to 1. The magnetic force due to a rational pole of strength m at a distance of d centimetres being mlˆ-xd? units, if we suppose a magnetic filament having a pole of strength m in rational units to have a smaller sphere of radius r described round its pole, the magnetic force on the surface of this sphere is m/4?rr 2 units, and this is therefore also the numerical value of the flux density. Hence the total magnetic flux through the surface of the sphere is

ˆvr 2 Xm/ˆirr 2 units = m units; and therefore the number which denotes the total magnetic flux coming out of the pole of strength m in rational units is also m.

The Heaviside system thus gives us an obvious and natural definition of a unit magnetic pole, namely, that it is a pole through which proceeds the unit of magnetic flux. It follows, therefore, that if the intensity of magnetization of the magnetic filament is I and the section is s, the total flux traversing the centre of the magnet is Is units ; and that if the filament is an endless or poleless iron filament magnetized uniformly by a resultant external magnetic force H, the flux density will be expressed in rational units by the equation B = I+H. The physical meaning of this equation is that the flux per square centimetre in the iron is simply obtained by adding together the flux per square centimetre, if the iron is supposed to be removed, and the magnetization of the iron at that place. On the rational system, since the unit pole strength has been decreased in the ratio of I to i/V4x, or of 3-5441 to I, when compared with the magnitude of the present irrational unit pole, and since the unit of magnetic flux is the total flux proceeding from a magnetic pole, it follows that Heaviside's unit of magnetic flux is larger than the C.G.S. unit of magnetic flux in the ratio of 3-5441 to 1.

It will be seen, therefore, that the Heaviside rational units are all incommeasurable with the practical units. This is a great barrier to their adoption in practice, because it is impossible to discard all the existing resistance coils, ammeters, voltmeters, &c, and equally impossible to recalibrate or readjust them to read in Heaviside units. A suggestion has been made, in modification of the Heaviside system, which would provide a system of rational practical units not impossible of adoption. It has been pointed out by J. A. Fleming that if in place of the ampere, ohm, watt, joule, farad and coulomb, we employ the dekampere, dekohm, the dekawatt, the dekajoule, the dekafarad and the dekacoulomb, we have a system ot practical units such that measurements made in these units are equal to measurements made in Heaviside rational units when multiplied by some power of 471-. Moreover, he has shown that this power of 4?r, in the case of most units, varies inversely as the power under which ix appears in the complete dimensional expression for the quantity in electromagnetic measurement. Thus a current measured in Heaviside rational units is numerically equal to (411-) = times the same current

measured in dekamperes, and in the electromagnetic dimensional expression for current, namely, LJM = T 1 h~5, m appears as yri. If, then, we consider the per meability of the ether to be numerically \ir instead of unity, the measurement of a current in dekamperes will be a number which is the same as that given by reckoning in Heaviside rational units. In this way a system of Rational Practical Units (R.P. Units) might be constructed as follows : —

The R.P. Unit of Magnetic Force = 4tt X the C.G.S. Unit. ,, ,,
Magnetic Polarity = i/4ir X ■. ,,

,, „ Magnetic Flux = 1 ,,

,, ., Magnetomotive Force = 1 ,,

,, ,, Electric Current = 1 ,,

,, „ Electric Quantity = 1 ,,

„ ,, Electromotive Force = io" 1 ,,

„ ,, Resistance = io 8 ,,

,, ,, Inductance = io 3 ,',

,, ,, Power = io 8 ,,

Work = io 8

,, Capacity = io -8 ,,

All except the unit of magnetic force and magnetic polarity are commensurable with the corresponding C.G.S. units, and in multiples which form a convenient practical system.

Even the rational systems already mentioned do not entirely fulfil the ideal of a system of physical units. There are certain constants of nature which are fundamental, invariable, and, as far as we know, of the same magnitude in all parts of the universe. One of these is the mass of the atom, say of hydrogen. Another is the length of a wave of light of particular refrangibility emitted by some atom, say one of the two yellow lines in the spectrum of sodium or one of the hydrogen lines. Also a time is fixed by the velocity of light in space which is according to the best measurement very close to 3X10 10 cms. per sec. Another natural unit is the so-called constant of gravitation, or the force in dynes due to'the attraction of two spherical masses each of 1 gramme with centres at a distance of 1 cm. Very approximately this is equal to 648X10 ~ w dynes. Another natural electrical

unit of great importance is the electric charge represented by i electron (see Electricity). This according to the latest determination is nearly 3-4 Xio 10 electrostatic units of quantity on the C.G.S. system. Hence, 2930 million electrons are equal to 1 E.S. unit of quantity on the C.G.S. system, and the quantity called 1 coulomb is equal to 879 Xio 16 electrons. In round numbers 9Xio ls electrons make 1 coulomb. The electron is nature's unit of electricity and is the charge carried by 1 hydrogen ion in electrolysis (see Conduction, Electric, § Liquids). Ac cordingly a truly natural system of physical units

would be one which was based upon the electron, or a multiple of it, as a unit of electric quantity, the velocity of light or fraction of it as a unit of velocity, and the mass of an atom of hydrogen or multiple of it as a unit of mass. An approximation to such a natural system of electric units will be found discussed in chap. 17 of a book on The Electron Theory, by E.E. Fournier d'Albe (London, 1906), to which the reader is referred.

See J. Clerk Maxwell, Treatise on Electricity and Magnetism, vol. ii. chap. x. (3rd ed., Oxford, 1892); E. E. N. Mascart and J. Joubert, Treatise on Electricity and Magnetism, translation by E. Atkinson, vol. i. chap. xi. (London, 1883) ; J. D. Everett, Illustra- tions of the C.G.S. System of Units (London, 1891) ; Magnus Maclean, Physical Units (London, 1896) ; Fleeming Jenkin, Reports on Electrical Standards (London, 1873); Reports of the British Associa- tion Committee on Electrical Units from 1862 to present date; J. A. Fleming, A Handbook for the Electrical Laboratory and Testing- Room (2 vols., London, 1901); Lord Rayleigh, Collected Scientific Papers, vol. ii. (1881-87); A. Grey, Absolute Measurements in Electricity and Magnetism, vol. ii. part ii. chap. ix. p. 150 (London, 1893); Oliver Heaviside, Electromagnetic Theory, 1. 116 (London, 1893); Sir A. VV. Rucker, "On the Suppressed Dimensions of Physical Quantities," Proc. Phys. Soc. Lond. (1888), 10, 37; W. Williams, " On the Relation of the Dimensions of Physical Quantities to Directions in Space," Proc. Phys. Soc. Lond. (1892), 11, 257; R. A. Fessenden, " On the Nature of the Electric and Magnetic Quantities," Physical Review (January 1900).

(J. A. F.)

UNIVERSALIST CHURCH, a religious body organized in the United States, and represented chiefly by parishes and churches in that country and in Canada. While the distribution of the denomination extends to every state in the Union, the greater number of organizations and members are found in New England and New York.

A distinction should be noted between Universalism and the Universalist denomination. Universalism is found very early in the history of the Christian Church — apparently from the beginning. It was certainly held and taught by several of the greatest of the Apostolic and Church fathers: as Clement of

Alexandria, Gregory of Nyssa, Origen and probably by Chrysostom and Jerome. It was taught in a majority of the Christian Schools of the second and third centuries; at Alexandria, at Antioch, at Edessa and at Nisibis. 1 But the Universalist denomination is of modern origin and confined mostly to the American continent. It dates from the arrival in Good Luck, N.J., of the Rev. John Murray (1714-181S), 2 of London, in September 1770; although there were some preachers of the doctrine in the country before Mr Murray came. He preached in various places in New Jersey, New York, Pennsylvania and Massachusetts, and societies sprang up as the result of his ministry in all these states. His first regular settlement was in Gloucester, Mass., in 1774, whence in 1793 he removed to Boston, which from that time forth became the headquarters

1 See Dr Edward Beccher's History of Opinions on the Scriptural Doctrine of Retribution (New York, 1878), and Hosea Ballou 2nd's Ancient History of Universalism (Boston, 1829).

- A Wesleyan, then a follower of Whitefield, Murray became a Universalist after reading the tract on Union (1759) written by James Relly (1720-1778), minister of a Universalist congregation in London. Murray was a chaplain in a Rhode Island brigade during the War of American Independence, and a friend ofGeneral Nathanael Greene. His Universalism was Calvinistic in its tone, arguing from a universal election to a universal redemption — Ballou first openly broke with Calvinism. Murray's parish in Gloucester through him brought successful suit for the recovery of property appropriated for the use of the original (Congregational) parish, and thus gained the first legal recognition granted in New England to a Universalist society. See the Autobiography (Boston, 1816) edited by his wife, Judith Sargent Murray (1751-1820).

of the denomination. A contemporary of Murray in his later years was Hosea Ballou (q.v.), also of Boston, who soon became the recognized leader of the movement, and for half a century was its most honoured and influential name. During his ministry the sect developed from twenty or thirty churches to five hundred, with a distribution over the Eastern and Middle states. In the period of Mr Ballou's domination little attention was paid to organization. It was the period of the propagation of the doctrine and of the controversies to which

that gave rise. But about i860 began an agitation for a more coherent organiza- tion, and a polity better suited to unity and progress than the spontaneous Congregationalism that had developed during the earlier period. The result of that agitation was the adoption, at the Centennial Convention in 1870, of a somewhat elaborate plan of organization, and a manual of administration under which the denomination has since been conducted.

The plan of organization of the Universalist body follows, with necessary modifications, the scheme of the civil organiza- tion of the national government. While the local parish is the unit, the states are organized as independent federations, and combined into a national congress or convention. The parishes within the territory of a state are organized into a state convention; representatives, duly elected by the several state conventions, constitute the General Convention, which is the supreme legislative authority of the denomination. The state conventions meet annually; the General Convention once in two years. In the interval of sessions a Board of Trustees, consisting of eleven members, of whom the secretary, the chief administrative officer of the Convention, is one, administer the affairs of the denomination, except those concerns " reserved to the states and the people."

Doctrine. — The historic symbol of the denomination remains the Winchester Profession, adopted at the meeting of the General Convention — then a spontaneous yearly gathering of Universalists, without ecclesiastical authority — in Winchester, N.H., in Sept. 1803. It consists of three brief articles, as follows: —

Article I. — We believe that the Holy Scriptures' of the Old and New Testaments contain a revelation of the character of God and of the duty, interest and final destination of mankind.

Article II. — We believe that there is one God, whose nature is Love, revealed in one Lord Jesus Christ, by one Holy Spirit of Grace, who will finally restore the whole family of mankind to holiness and happiness.

Article III. — We believe that holiness and true happiness are inseparably connected, and that believers ought to be careful to maintain order and practise good works; for these things are good and profitable unto men. 3

At the session of the General Convention in Boston in October 1900, a still briefer " Statement of Essential Principles " was adopted and made the condition of fellowship, in the following terms: —

I. The Universal Fatherhood of God; 2. the Spiritual authority and leadership of His Son, Jesus Christ; 3. the trustworthiness of the Bible as containing a revelation from God ; 4. the certainty of just retribution for sin ; 5. the final harmony of all souls with God.

Universalism, shortly described, is the belief that what ought to be will be. In a sane and beneficent universe the primacy belongs to Truth, Right, Love. These are the supreme powers. The logic of this conception of the natural and moral order is imperious. It compels the conclusion that, although we see not yet all things put under the sway of the Prince of Peace, we see the Divine plan set forth in Him, and cannot doubt the consummation which He embodies and predicts. Universalists are those members of the Christian family in whom this thought has become predominant. The idea that there is a Divine order, and that it contemplates the final triumph of Good over Evil, in human society as a whole and in the history of each individual, has taken possession of them. Hence they are Universalists.

3 Certain Universalists objected to the last clause of Article II. as implying a universal fall in Adam's sin; and others objected to the material and utilitarian construction which might be put on the last clause of Article III.

The Universalist Church embraces but a fraction of those who hold the Universalist belief. The literature of religion, the testimony of common knowledge, the drift of theological thinking, equally with the results of expert investigation, confirm this conclusion. But the denomination holds aloft the banner, conducts the campaign of education and organization, and represents in the religious world the principle, that the best possible outcome is to be expected to the human experiment.

Work. — Some idea of the work carried on by the denomina-

tion may be derived from the extent and variety of its organized forces. There were in 1907 about 1000 parishes on its roll; and these, with large numbers of families not included in parishes, were organized into 41 state and provincial conven- tions; into a National Young People's Christian Union, of over 600 local societies, with a membership of 10,000; into one National Women's Missionary Association and several state societies; and into one General Convention, with its Board of Trustees, Secretary, Superintendent, and Committees on Mis- sions, Education, Investments, Ways and Means and Fellowship.

a. The Home Missionary work devolves in the first instance on the several State Conventions, which have a Board and local secre- taries and superintendents charged with this particular business in their several territories. In the next place, the Home Missionary work in new fields and where the local organization is weak, is in charge of the Board of Trustees of the General Convention. They employ a Southern Missionary and a General Superintendent, and appoint and aid in maintaining superintendents and missionaries in the newer states and Territories — as the North- Western Super- intendent, the California Superintendent, &c.

b. Foreign Missions. In 1907 the Universalist denomination had for about fifteen years maintained a mission in Japan, where five American and five native missionaries were regularly employed, with teachers and helpers of varying numbers. The parent church of this mission is established in Tokyo, and plantings have been made at eight or nine other points throughout the empire. A Girls' Home is maintained in Tokyo, and a considerable work in teaching and training is conducted under the auspices of the Mission in uni- versities and other schools elsewhere. A mission under the auspices of the Universalist General Convention is also maintained at Columbia, Province of Camaguey, Cuba.

c. The educational interests and activities of the denomination are expressed in four colleges, established by the Universalists — Tufts College (1852), at Medford, Massachusetts; Lombard College (1855; opened in 1852 as Illinois Liberal Institute), at Galesburg, Illinois; St Lawrence University (1856), at Canton, New York; and Buchtel College (1872), at Akron, Ohio; three theological schools, connected with the first three colleges just named and founded respectively in 1869,1881 and 1858; and

three academies, Dean Academy, Franklin, Massachusetts, Goddard Seminary, Barre, Vermont, and Westbrook Seminary, Portland, Maine; and a publishing house in Boston with a branch in Chicago is one of the denomination's chief agencies for the spread of the knowledge of what it holds to be the truth.

d. The Chapin Home in New York, the Church of the Messiah Home in Philadelphia, the Washburne Home in Minneapolis and the Bethany Home in Boston are examples of the benevolent and charitable work in which the Universalist body is interested and enlisted.

As stated above, the Universalist denomination embraces about 1000 churches, with congregations numbering about 200,000 persons; a membership of communicants reported in 1906 as 55,831 ; a membership in Sunday schools of 52,538; and church property valued at $10,598,100-39.

Bibliography. — The Universalist Quarterly Review (Boston, 1843- 91); T. Whittemore, Modern History of Universalism (Boston, 1830); Richard Eddy, Universalism in America (2 vols., 1884); J. G. Adams, Fifty Notable Years (Boston, 1882); Abel C. Thomas, A Century of Univt salism (Philadelphia, 1870); J. W. Hanson, Universalism in the First Five Hundred Years of the Christian Church (Boston and Chicago, 1902) ; T. B. Thayer, Origin and History of the Doctrine of Endless Punishment (Boston, 1885), tracing the doctrine directly to heathen sources; T. B. Thayer, The Th "^gy of Universalism (Boston, 1862); I. M. Atwood (ed.), The . tst Word of Universalism, Essays by Thirteen Representative Clergymen (Boston, 1880) ; Manuals of Faith and Duty, a set of eleven volumes by different writers, treating of the chief doctrines, institutions and problems of religion in the modern era ; Orello Cone, The Gospel and its Earliest Interpretations (New York, 1898); and biographies of John Murray, Hosea Ballou, Edwin H. Chapin, Thomas J. Sawyer, Alonzo Ames Miner, James Henry Tuttle, &c. (I. M. A.)

UNIVERSAL LANGUAGES. The inconveniences resulting from the diversity of languages have been felt since the dawn of civilization. Even the most gifted linguist cannot master

more than a comparatively small number of languages, and has to rely more or less on interpreters in his intercourse with speakers of foreign languages.

Advancing civilization brought with it a partial remedy at different periods and in different parts of the world by the spread of such languages as Assyrian, Greek, Latin, Arabic, English over a wide area as the accompaniment of political supremacy, or as a vehicle of culture. Even when Latin split up into the Romance languages, and ceased to be a living language itself, it still survived as the common learned language of Europe both in speech and writing (see Latin Language and Classics) , till the rapid development of modern science and modern thought and the rapidly increasing complexity of modern life outstripped the limited range of a language never suited for international use.

Meanwhile the growth of the spirit of nationality has largely increased the number of literary languages. Russian men of science are no longer content to record their discoveries in French or German. The English student of science or philosophy has to leave unread many important works written in the more remote European languages, or make their acquaintance through an often inaccurate translation — perhaps in a language of which he is only imperfectly master.

The question of the adoption of a common language becomes, therefore, more and more pressing.

The most obvious solution of the problem would be the adoption of some one existing language as a means of international communication. But which? To revive the international use of Latin is out of the question. If it is to be a dead language, post-classical Greek would afford a more flexible — and perhaps an easier — means of expression. If we dismiss dead languages as impracticable, the choice of a living language raises new difficulties. To exalt English, or French, or Spanish to the rank of a world-language would give its native speakers such an advantage over the other nationalities that it has been seriously proposed to disarm international jealously by selecting such a language as Norwegian, which is spoken by a small community and is at the same time comparatively simple in structure.

But even if agreement were possible, we are still met -by the difficulty that to the average human being it is practically impossible to acquire anything like an easy, thorough command of any foreign language. No natural language is really easy. In fact, we may go further and say that all

languages are equally difficult (see H. Sweet, Practical Study of Languages, p. 66); although some are made more difficult than they need be by the way in which they are written — by the crabbedness of their alphabet, or by their unphonetic spelling — by the want of handbooks or their unpractical character, by the artificiality of their literature, and other purely external causes. Norwegian is easy to a Swede because it is practically a mere dialect of his own language: he knows two-thirds of it already. But that does not prove that Norwegian is easy in itself — that it would be easy, for instance, to an Oriental. The dialects of Chinese are mutually unintelligible, but it takes a Chinaman only about six months to learn another dialect, which would occupy even a gifted European at least three years to learn to speak; and yet Chinese is, from a European point of view, far simpler in structure than Norwegian, or even English.

Natural languages are difficult because they are imperfect expressions of thought : because language is only partly rational. The greatest difficulty of a language is the vocabulary; and the foundation of the vocabulary of all languages is practically arbitrary: there is no connexion between sound and mean- ing except in a few isolated words. And even that part of a language which can be brought more or less under general rules is full of irregularities and exceptions, ambiguities and redundancies of expression, and superfluous or irrational distinctions such as those of grammatical gender, so that when we have learnt one sentence we can never be sure that it will serve as a pattern for another.

These considerations suggest a further step towards the

attainment of a common language: to rationalize and make regular some existing language. Even if we agreed to adopt an existing language unaltered in itself, we should certainly get rid of its external difficulties: neither English nor French could become world-languages till they had got rid of their unphonetic spelling. But from this it would be a natural step to eliminate such grammatical difficulties as those of shall and will in English. If this were once agreed on, why not go a step further and get rid of all grammatical irregularities, making,

for instance, better men into gooder mans, saw, seen into seed, and so on? The vocabulary would offer little obstacle to a parallel simplification. The self-evident method would be to select certain words as the foundation: to use them as root-words from which all the other words could be formed by derivation and composition. The inconvenient length of many of the words so formed would then suggest reducing the root-words to a monosyllabic form, with such modifications as would be required to prevent confusions of form or meaning, or to make their pronunciation easier.

It is on these principles that the well-known Volapuk (q.v.) is constructed (1880) — the first artificial language that achieved a certain measure of success. But its roots are so disguised by arbitrary alterations that the English basis is not generally easy to recognize.

Volapuk is mainly an adapted (borrowed) or a-posteriori language, as opposed to an original or a-priori one, although it belongs partly to the latter class as well. Its vocabulary is adapted, but its grammar is, to a great extent, original.

On the ruins of Volapuk there rose Esperanto {q.v.), which by 1907 had become the most widely known and used of its numerous competitors. In it? grammar Esperanto is partly original, partly borrowed. Its vocabulary is not based exclusively on that of any one language, but is selected from the chief European languages — including Latin and Greek— the words being generally unaltered except in spelling. The extensive use made of word-composition and of derivative prefixes and suffixes enables the author to reduce the number of his root-words to between two and three thousand. This does not include international literary, scientific and technical words such as professor, telegraph, which are not translated into Esperanto compounds or derivatives, but are simply incorporated into the language with the minimum of change.

The most formidable rival of Esperanto is unquestionably Idiom Neutral (1902). It is the collective work of the Akademi internasional de lingu universal, its real author being the director of the Akademi, M. Rosenberger, of St Petersburg. This academy was originally instituted by the two international Volapuk congresses in 1887 and 1889: it now numbers among its members not only many former adherents of the defunct Volapuk, but also many ex-Esperantists. The most marked

feature of Idiom Neutral is that its vocabulary is definitely and consistently based on the principle of the maximum of inter- nationality for the roots. A systematic examination of the vocabularies of the seven chief European languages — English, French, German, Spanish, Italian, Russian, Latin — showed that the number of international roots and words was much greater than had been supposed. There are many, such as apetit and tri, " three," which occur in all seven; and it is only occasionally that it has been found necessary to adopt a word or root which occurs in less than four of them. The result is that instead of the unpleasant mixture of Romance elements with words taken arbitrarily from English and German which makes a great part of the vocabulary of Esperanto unintelligible to learners who know only one language, Idiom Neutral offers a vocabulary which is practically Romance-Latin. Thus the Idiom Neutral omit, " bird," and diurn, " day, " are almost self-interpreting even apart from any context, while the' Esperanto bird and tag are unintelligible except to those who know English and German; and as the former is pronounced in Esperanto approximately as English beard, it is only intelli- gible to English speakers when written, not when spoken. In its grammar Idiom Neutral is almost entirely a-posteriori on a

Romance basis, generally following French, sometimes in a somewhat slavish and unintelligent fashion, as in the use of eske as an interrogative particle, and of leplu as the mark of the superlative, although there is no definite article in Idiom Neutral. On the whole, there can be no doubt that Idiom Neutral is the simplest language that has yet been devised, and the most easily understood by any educated European; those who take several days to learn to read Esperanto find that they can read Idiom Neutral in as many minutes. Com- pare the following extract from a letter written by a Norwegian doctor to a colleague in Russia with the specimens given under the headings Volapuk and Esperanto: — ■

Idiom Neutral es usabl no sole pro skribasion, ma et pro perlasion; sikause in kongres sekuant internasional de medisinisti mi av intension usar ist idiom pro mie raport di maladitet " lupus," e mi esper esar komprended per omni medisinisti present.

But the construction of such languages is by no means so easy as would at first sight appear. All a-posteriori systems are

liable to various defects, the inevitable result of the con- flict between their old and new elements, and the difficulties and embarrassments of an arbitrary selection. Thus Idiom Neutral, which ought to be the most perfect of these attempts, admits homonyms (kar = " carriage " and "dear," adj.), alter- native forms such as sientik and sientifik, and ambiguities such as filosofi, which is both an abstract noun and the plura,l of filosof, " philosopher." Esperanto is better constructed in this respect; but it often only avoids confusion by arbitrary alteration of its words.

Another difficulty is that of national associations. No one likes to have his own language travestied. Thus Esperanto, which looks like bad Italian, is on that account less popular among the speakers of Romance languages (except in France) than elsewhere. It is a significant fact that none of the inventors of these languages base them on their native speech.

And then, these languages are not international after all. A really international language ought to be as acceptable to speakers of Arabic, Chinese or Japanese as to a European. Even from a European point of view they are not wholly international.

And they are not independent languages: they are only parasites — sickly parasites — on other languages. Their vocabuˆ laries are liable to incessant change and addition; and the meanings of their words are liable to be misunderstood in different ways by speakers of different languages. It is no answer to say that they are only auxiliary languages, which are not in- tended to supplant the national languages; for every artificial language must, at first at least, content itself with this role.

It is evident that the a-priori is the only basis which is really international, neutral and independent. And it is a significant fact that the earlier attempts were all a-priori. But all these attempts— beginning with Dalgarno's Ars signorum (1661) and Wilkins' well-known Real Character (1668) — have been failures. They were failures because the ground was not sufficiently prepared. A great part of Wilkins' folio is taken up with attempts to lay the necessary foundations. He saw — what none of his successors has yet seen— the necessity of a knowledge of the formation of sounds and the principles of their representation; and his sketch of phonetics is still valu-

able. His classification of the ideas expressed by language is an attempt to do what was afterwards done by Linnaeus and his successors and by Roget in the Thesaurus of English Words and Phrases.

Wilkins was only a dilettante, because the greater part of science was then only in the dilettante stage. We have a right now to demand that our universal language shall be the work, not of dilettantes, but of experts: that is, of trained philologists.

Now that the ground has been prepared — now that the principles of linguistic science are the common property of the educated world, and the chief languages of the earth have been made accessible, and whole families of languages have been included in comparative grammars and dictionaries — we

have a right to ask that no one shall henceforth come before the public as the inventor of a new language till he has made him- self acquainted with those branches of the science of language wjiich form the natural foundation for such a work.

The first step in constructing an artificial language is to settle what sounds it is to contain. The answer, of course, is : the easiest. To the man in the street the only easy sounds are those of his own language. The question, which sounds are easiest in themselves, can only be settled by means of general practical phonetics, which often leads to conclusions directly contradicting popular prejudices. Then comes the question, how these sounds are to be written. It would be an easy matter to re-write Esperanto in the alphabet, say, of the International Phonetic Association, instead of its present antiquated and unpractical orthography; but the mere fact that the author of Esperanto did not take the trouble to make himself acquainted with the principles of phonetics and sound-representation before attacking so stupendous a problem makes us sceptical of his competence for the rest of his task.

The grammar of the new language must not be a mere imitation of that of Latin or an ordinary modern European language : it must be based on first principles. The inventor, after care-

fully considering the grammatical structure of languages of different types, must not only pick out what is best in each, but must consider whether he cannot do still better.

As regards the vocabulary, we are told that the inventor of Esperanto in his first attempts to construct a new language began with forming his roots by arbitrary combinations of letters, but failed to arrive at any satisfactory result in this way. It is, in fact, impossible to construct words arbitrarily: the attempt to do so inevitably results in distorted reminiscences of words already familiar to the experimenter. There are only two ways in which it is possible to construct an a-priori vocabulary: the schematic and the symbolic. The systems of Dalgarno and Wilkins belong to the former class. Wilkins's vocabulary is founded on a classification of all ideas under 40 categories, each expressed by the combination of a consonant and a vowel in a certain arbitrary (partly alphabetic) order. Thus de signifies " element," from which is formed the first subdivision deb, " fire," from which, again, is formed the further subdivision deba, " flame." The objections to this method are that there is no direct connexion between the words and their meanings, and that it involves not only knowing by heart the endless categories, and subdivisions of these, on which it is founded, but also their order and number— a task beyond any human memory. Even if it were not, no one would care to learn a classification which the advance of know- ledge might render obsolete in a few years — together with the language itself.

The symbolic method, on the other hand, aims at establishing a direct association between the word and the idea it expresses, as is already the case, to some extent, in existing languages. Thus we have imitative words such as cuckoo, interjectional words, such as hush, and specially symbolic or gesture-words, such as thou, me, mother.

The difficulty in carrying out the symbolic principle is that the associations are few and often vague. But the material is sufficient, if handled in a practical spirit. However far removed from theoretical perfection the result might be, it would have at least two advantages: — (1) There would be none of that waste of material which is common to all natural languages and those artificial ones which are founded on them. (2) This would result in a brevity far exceeding that of the opposite type of language.

A well constructed a-priori language would, indeed, have many uses far transcending those of a rough-and-ready language of the Esperanto type. It would be more than a mere auxiliary language. It would be useful not only as a means of international communication, but as a means of expression superior in most respects to the native language: as an aid, not a hindrance, to accurate thought and scientific exactitude. It would repel by its unfamiliarity. It would have to be learnt;

and it would not be learnt without effort, for its use would imply accurate thought and emancipation from the associations of the native language. But the difficulties would be impartially distributed: the new language would not necessarily be more difficult for the speakers of one language than for those of another.

The obstacles to the construction and adoption of an a-priori language are many; and meanwhile the need is pressing. So it is possible that the problem may be partially solved in the near future by the provisional adoption of an adapted language. Although such a language would not be very acceptable to non-European nations, it would still be easier to them than any European language. But whatever language may be adopted, it must be imposed by a competent tribunal, which, as in all analogous cases, will refuse to consider any scheme which has not been worked out by experts — that is, by scientific linguists. (H. Sw.)

UNIVERSITIES. 1 The medieval Latin term universitas (from which the English word " university " is derived) was originally employed to denote any community or corporation regarded under its collective aspect. When used in its modern sense, as denoting a body devoted to learning and education, it required the addition of other words in order to complete the definition — the most frequent form of expression being " universitas magistrorum et scholarium " (or " discipulorum "). In the course of time, probably towards the latter part of the 14th century, the term began to be used by itself, with the exclusive meaning of a community of teachers and scholars whose corporate existence had been recognized and sanctioned by civil or ecclesiastical authority or by both. But the more ancient and customary designation of such communities in medieval times (regarded as places of instruction) was " studium " (and subsequently " studium generale "), a term implying a centre of instruction for all. 2 The expressions "

universitas studii ” and ” universitatis collegium ” are also occasionally to be met with in official documents.

It is necessary, however, to bear in mind, on the one hand, that a university often had a vigorous virtual existence long before it obtained that legal recognition which entitled it, technically, to take rank as a ” studium generale,” and, on the other hand, that hostels, halls and colleges, together with com- plete courses in all the recognized branches of learning, were by no means necessarily involved in the earliest conception of a university. The university, in its earliest stage of development, appears to have been simply a scholastic gild — a spontaneous combination, that is to say, of teachers or scholars, or of both combined, and formed probably on the analogy of the trades gilds, and the gilds of aliens in foreign cities, which, in the course of the 13th and 14th centuries, are to be found springing up in most of the great European centres. The design of these organizations, in the first instance, was little more than that of securing mutual protection — for the craftsman, in the pursuit of his special calling; for the alien, as lacking the rights and privileges inherited by the citizen. And so the university, composed as it was to a great extent of students from foreign countries, was a combination formed for the protection of its members from the extortion of the townsmen and the other annoyances incident in medieval times to residence in a foreign state. It was a first stage of development in connexion with these primary organizations, when the chancellor of the cathedral, or some other authority, began, as we shall shortly see, to accord to other masters permission to open other schools than the cathedral school in the neighbourhood of his church; a further stage was reached when a licence to teach — granted only after a formal examination — empowered a master to carry on his vocation at any similar centre that either already existed or might afterwards be formed throughout Europe — “facultas

1 It is the design of the present article to exhibit the universities in their general historical development; more detailed information respecting the present condition of each will be found in the separate articles under topographical headings.

2 Denifle, Vie Universitdten des Mittelalters, i. 1-29.

ubique docendi." It was a still further development when it began to be recognized that, without a licence from either pope, emperor or king, no " studium generale " could be formed possessing this right of conferring degrees, which originally meant nothing more than licences to teach.

In the north of Europe such licences were granted by the Chancellor Scholasticus, or some other officer of a cathedral Meaning church; in the south it is probable that the gilds of of masters (when these came to be formed) were at first

••studium f re e to grant their own licences, without any ecclesi- geaerale.' as tj ca [or ther supervision. But in all cases such per- missions were of a purely local character. Gradually, however, towards the end of the 12th century, a few great schools claimed from the excellence of their teaching to be of more than merely local importance. Practically a doctor of Paris or Bologna would be allowed to teach anywhere; while those great schools began to be known as studio, generalia, i.e. places resorted to by scholars from all parts. Eventually the term came to have a more definite and technical signification. The emperor Frederick II. set the example of attempting to confer by an authoritative bull upon his new school at Naples the prestige which the earlier studia had acquired by reputation and general consent. In 1229 Gregory IX. did the same for Toulouse, and in 1233 added to its original privileges a bull by which any one who had been admitted to the doctorate or mastership in that university should have the right to teach anywhere without further examination. Other studia generalia were subsequently founded by papal or imperial bulls; and in 1292 even the oldest universities, Paris and Bologna, found it desirable to obtain similar bulls from Nicolas IV. From this time the notion began to prevail among the jurists that the essence of the studium generale was the privilege of conferring the jus ubicunque docendi, and that no new studium could acquire that position without a papal or imperial bull. By this time, however, there were a few studia generalia (e.g. Oxford) whose position was too well estab- lished to be seriously questioned, although they had never obtained such a bull; these were held to be studia generalia ex consuetadine. A few Spanish universities founded by royal charter were held to be studia generalia respectu regni. The word Origin of universitas was originally applied only to the scholastic the

term gild (or gilds) within the studium, and was at first not "unlver- used absolutely; the phrase was always universitas slt y-" magistrorum, or scholarium or magislrorum el scholarium.

By the close of the medieval period, however, the distinction between the terms studium generale and universitas was more or less lost sight of, and in Germany especially the term universitas began to be used alone. 1

In order, however, clearly to understand the conditions under which the earliest universities came into existence, it is necessary to take account, not only of their organization, but also History ˆ their studies, and to recognize the main influences learning which, from the 6th to the 12th century, served to before the modify both the theory and the practice of education. In the former century, the schools of the Roman empire, which had down to that time kept alive the traditions of pagan education, had been almost entirely swept away by the barbaric invasions. The latter century marks the period when the institutions which supplied their place — the episcopal schools attached to the cathedrals and the monastic schools — attained to their highest degree of influence and reputation. Between these and the schools of the empire there existed an essential difference, in that the theory of education by which they were pervaded was in complete contrast to the simply secular theory of the schools of paganism. The cathedral school taught only what was supposed to be necessary for the education of the priest; the monastic school taught only what was supposed to be in harmony with the aims of the monk. But between the pagan system and the Christian system by which it had been superseded there yet existed something that was common to both: the latter, even in the narrow and meagre instruction which it imparted, could not altogether dispense 1 Denifle i. 34-39.

univer- sity era.

with the ancient text-books, simply because there were no others in existence. Certain treatises of Aristotle, of Porphyry, of Martianus Capella and of Boetius continued consequently to be used and studied; and in the slender outlines of pagan learning thus still kept in view, and in the exposition which they necessitated, we recognize the main cause which prevented the thought and literature of classic antiquity from falling altogether into oblivion.

Under the rule of the Merovingian dynasty even these scanty traditions of learning declined throughout the Frankish dominions; but in England the designs of Gregory Rev iy a j j n the Great, as carried out by Theodoras, Bede and time of Alcuin, resulted in a great revival of education and charie- letters. The influence of this revival extended in the magne – 8th and 9th centuries to Frankland, where Charlemagne, advised and aided by Alcuin, effected a memorable reformation, which included both the monastic and the cathedral schools; while the school attached to the imperial court, known as the Palace School, also became a famous centre of learned intercourse and instruction.

But the activity thus generated, and the interest in learning which it served for a time to diffuse, well-nigh died out amid the anarchy which characterizes the 10th century in Latin Christendom, and it is at least questionable whether any real connexion can be shown to have existed between this earlier revival and that remarkable movement in which the university of Paris had its origin. On the whole, however, a clearly traced, although imperfectly continuous, succession of distinguished teachers has inclined the majority of those who have studied this obscure period to conclude that a certain tradition of learn- ing, handed down from the famous school over which Alcuin presided at the great abbey of St Martin at Tours, continued to survive, and became the nucleus of the teaching in which the university took its rise. But, in order causes of adequately to explain the remarkable development formation and novel character which that teaching assumed in of first the course of the 12th and 13th centuries, it is neces- sities sary to take account of the operation of certain more general causes to which the origin of the great majority of the earlier universities may in common unhesitatingly be referred. These causes are — (1) the introduction of new subjects of study, as embodied in a new or revived literature; (2) the adoption of new methods of teaching which were rendered necessary by the new studies; (3) the growing tendency to organization which accompanied the development and consolidation of the European nationalities.

That the earlier universities took their rise to a great extent in endeavours to obtain and provide instruction of a kind be- yond the range of the monastic and cathedral schools gi st f appears to be very generally admitted, but with respect unlver- to the origin of the first European university — that of ”’& of

Salerno in Italy, which became known as a school of medicine as early as the 9th century — the circumstances are pronounced by a recent investigator to be " veiled in im- penetrable obscurity." 2 One writer 3 derives its origin from an independent tradition of classical learning which continued to exist in Italy down to the 10th century. Another writer 4 maintains that it had its beginning in the teaching at the famous Benedictine monastery of Monte Cassino, where the study of medicine was undoubtedly pursued. But the most authori- tative researches point to the conclusion that the medical system of Salerno was originally an outcome of the Graeco- Roman tradition of the old Roman world, and the Arabic medicine was not introduced till the highest fame of the Civitas Hippocratica was passing away. It may have been influenced by the late survival of the Greek language in southern Italy, though this cannot be proved. In the first half of the 9th century the emperor at Constantinople sent to the Caliph

2 Rashdall, Universities of Europe in the Middle Ages, i. 76.

3 De Renzi, Storia Documentata delta Scuola Medica di Salerno (ed. 1857), p. 145. _

- *Puccinotti, Storia della Medicina, 1. 317-26.*

Bologna.

Mamoun at Bagdad a considerable collection of Greek manu- scripts, which seems to have given the earliest impulse to the study of the Hellenic pagan literature by the Saracens. The original texts were translated into Arabic by Syrian Christians, and these versions were, in turn, rendered into Latin for the use of teachers in the West. Of the existence of such versions we have evidence, according to Jourdain, 1 long prior to the time when Constantine the African (d. 1087) began to deliver his lectures on the science at Salerno, although these early versions have since altogether disappeared. Under his teaching the fame of Salerno as a medical school became diffused all over Europe; it was distinguished also by its catholic spirit, and, at a time when Jews were the object of religious

persecution throughout Europe, members of this nationality were to be found both as teachers and learners at Salerno. Ordericus Vitalis, who wrote in the first half of the 12th century, speaks of it as then long famous. In 1231 it was constituted by the emperor Frederick II. the only school of medicine in the king- dom of Naples.

The great revival of legal studies which took place at Bologna about the year 1000 had also been preceded by a corresponding

activity elsewhere — at Pavia by a famous school of

Lombard law, and at Ravenna by a yet more important school of Roman law. And in Bologna itself we have evidence that the Digest was known and studied before the time of Irnerius (1100-30), a certain Pepo being named as lecturing on the text about the year 1076. The traditional story about the " discovery " of the Pandects at Amalfi in 1135 was disproved even before the time of Savigny. Schulte has shown that the publication of the Decretum of Gratian must be placed earlier than the traditional date, i.e. not later than 1142. This instruction again was of a kind which the monastic and cathedral schools could not supply, and it also contributed to meet a new and pressing demand. The neighbouring states of Lombardy were at this time increasing rapidly in population and in wealth ; and the greater complexity of their political relations, their growing manufactures and commerce, demanded a more definite application of the principles embodied in the codes that had been handed down by Theodosius and Justinian. But the distinctly secular character of this new study, and its close connexion with the claims and prerogatives of the Western emperor, aroused at first the susceptibilities of the Roman see, and for a time Bologna and its civilians were regarded by the church with distrust and even with alarm. These sentiments were not, however, of long duration. In the year 1151 the

appearance of the Decretum of Gratian, largely com- 7 ecr ˆ piled from spurious documents, invested the studies Gratian of the canonist with fresh importance; and numer- andthe ous decrees of past and almost forgotten pontiffs canon now c i a ; mec i t t a k e their stand side by side with

the enactments contained in the Corpus Juris Citilis. They constituted, in fact, the main basis of those new pretensions

asserted with so much success by the popedom in the course of the 12th and 13th centuries. It was necessary, accordingly, that the Decretum should be known and studied beyond the walls of the monastery or the episcopal palace, and that its pages should receive authoritative exposition at some common centre of instruction. Such a centre was to be found in Bologna. The needs of the secular student and of the ecclesiastical student were thus brought for a time into accord, and from the days of Irnerius down to the close of the 13th century we have satis- factory evidence that Bologna was generally recognized as the chief school both of the civil and the canon law. 2 It has, indeed, been asserted that university degrees were instituted there as early as the pontificate of Eugenius III. (1145-53), but the statement rests on no good authority, and is in every way im- probable. There is, however, another tradition which is in better harmony with the known facts. When Barbarossa marched his forces into Italy on his memorable expedition of 1155, and reasserted those imperial claims which had so long

1 Sur V&ge et Vorigine des traductions latines, &c, p. 235.

2 Denifle, Die Universitdten, &c, i. 48.

lain dormant, the professors of the civil law and their scholars, but more especially the foreign students, gathered Foreign round the Western representative of the Roman students Caesars, and besought his intervention in their favour at in their relations with the citizens of Bologna. A large Bologna proportion of the students were probably from Germany; and it did not escape Frederick's penetration that the civilian might prove an invaluable ally in the assertion of his imperial preten- sions. He received the suppliants graciously, and, finding that their grievances were real, especially against the landlords in whose houses they were domiciled, he granted the foreign students substantial protection, by conferring on them certain special immunities and privileges (November 1158). 3 These privileges were embodied in the celebrated Authentica, Habita, in the Corpus Juris Civilis of the empire (bk. iv. tit. 13), and were eventually extended so as to include all the other universities of Italy. In them we may discern the precedent for that state pro- tection of the university which, however essential at one time for the security and freedom of the teacher and the taught, has been far from proving an unmixed benefit — the influence which the civil power has thus been

able to exert being too often wielded for the suppression of that very liberty of thought and inquiry from which the earlier universities derived in no small measure their importance and their fame.

But, though there was a flourishing school of study, it is to be observed that Boiogna did not possess a university so early as 1 1 58. Its first university was not constituted until _. „ , the close of the 1 2th century. The " universities " at versHies" Bologna were, as Denifle has shown, really student gilds, at formed under influences quite distinct from the pro- Bolo S" a – tecting clauses of the Authentica, and suggested, as already noted, by the precedent of those foreign gilds which, in the course of the 1 2th century, began to rise throughout western Europe. These were originally only two in number, the Ultramontani and the Citramontani, and arose out of the absolute necessity, under which residents in a foreign city found themselves, of obtaining by combination that protection and those rights which they could not claim as citizens. These societies were modelled, Denifle considers, not on the trade gilds which rose in Bologna in the 13th century, but on the Teutonic gilds which arose nearly a century earlier in north-western Europe, being essentially " spon- taneous confederations of aliens on a foreign soil." Originally, they did not include the native student element and were composed exclusively of students in law.

The power resulting from this principle of combination, when superadded to the privileges conferred by Barbarossa, gave to the students of Bologna a superiority of which Their

they were not slow to avail themselves. Under the demo-leadership of their rector, they extorted from the cratJc citizens concessions which raised them from the condition of an oppressed to that of a specially privileged class. The same principle, when put in force against the professors, reduced the latter to a position of humble deference to the very body whom they were called upon to instruct, and imparted to the entire university that essentially democratic character by which it was afterwards distinguished. It is not surprising that such advantages should have led to an imitation and extension of the principle by which they were obtained. Denifle considers that the " universities " at Bologna were at one time certainly more than four in number, and we know that the Italian students alone were subdivided into two — the other Tuscans

and the Lombards. In the centres formed by similar secession from the parent body a like subdivision took com- place. At Vercelli there were four universitates, com- posed respectively of Italians, English, Provencals and Germans; at Padua there were similar divisions into Italians >

s See Savigny, Gesch. d. rom. Rechts, iii. 152, 491-92. See also Giesebrecht, Gesch. d. Kaiserzeit (ed. 1880), v. 51-52. The, story is preserved in a recently discovered metrical composition descriptive of the history of Frederick I. ; see Sitzungsberichte d. Bairisch. Akad. d.'Wissenschaft, Phil.Hist. Klasse (1879), ii. 285. Its authen ticity is called in question by Denifle, but it would seem to be quite in harmony with the known facts.

char- acter.

inanities in Italy,

The rector.

French (i.e. Francigenae, comprising both English and Normans), Provencals (including Spaniards and Catalans). When, accordingly, we learn from Odofred that in the time of the eminent jurist Azo, who lectured at Bologna about 1200, the number of the students there amounted to some ten thousand, of whom the majority were foreigners, it seems reasonable to conclude that the number of these confederations of students {societatcs scholarium) at Bologna was yet greater. It is certain that they were not formed simultaneously, but, similarly to the free gilds, one after the other — the last in order being that of the Tuscans, which was composed of students from Tuscany, the Campagna and Rome. Nor are we, again, to look upon them as in any way the outcome of those democratic principles which found favour in Bologna, but rather as originating in the tra- ditional home associations of the foreign students, fostered, how- ever, by the peculiar conditions of their university life. As the Tuscan division (the one least in sympathy, in most respects, with Teutonic institutions) was the last formed, so, Denifle conjectures, the German " university " may have introduced the conception which was successively adopted by the other nationalities.

In marked resemblance to the gilds, these confederations were presided over by a common head, the " rector schola- rium," an obvious imitation of the "rector societatum" or " artium " of the gild, but to be carefully distin- guished from the " rector scholarum " or director of the studies, with whose function the former officer had, at this time, nothing in common. Like the gilds, again, the different nations were represented by their " consiliarii," a deliberative assembly with whom the rector habitually took counsel.

While recognizing the essentially democratic character of the constitution of these communities, it is to be remembered Mature that the students, unlike the majority at Paris and later age of the universities, were mostly at this time of mature years. students. ˆ s t jj e c ; v ;[j aw anc j t jj e canon i aw we re at first the only branches of study, the class whom they attracted were often men already filling office in some department of the church or state — archdeacons, the heads of schools, canons of cathe- drals, and like functionaries forming a considerable element in the aggregate. It has been observed, indeed, that the permission accorded them by Frederick I. of choosing, in all cases of dis- pute, their own tribunal, thus constituting them, to a great extent, sui juris, seems to presuppose a certain maturity of judgment among those on whom this discretionary power was bestowed.

Innocent IV., in according his sanction to the new statutes of the university in 1253, refers to them as drawn up by the Forma- " rectores et universitas scholarium Bononiensium." tloo of About the year 1 200 were formed the two faculties

theuai- f medicine and philosophy (or " the arts" 1), the former being somewhat the earlier. It was developed, as that of the civil law had been developed, by a succession of Faculties a

[e teachers, among whom Thaddeus Alderottus was especially eminent. The faculty of arts, down to the 14th century, scarcely attained to equal eminence. The teaching of theology remained for a long time exclusively in the hands of the Dominicans; and it was not until the year 1360 that Innocent VI. recognized Bologna as a " studium generale " in this branch — in other words, as a place of theological education for all students, with the power of conferring degrees of universal validity. In the year 1371 the cardinal legate, Anglicus, compiled, as chief director of ecclesiastical affairs in the city, an account Account ° tne university, which he presented to Urban V. of the The information it supplies is, however, defective,

unlver- owing to the fact that only the professors who were in yufttT s receipt °f salaries from the municipality are

mentioned. Of these there were twelve of civil law and six of canon law; three of medicine, three of practical medicine and one of surgery; two of logic, and one each of astrology, rhetoric

1 The arts course of study was that represented by the ancient triyium {i.e. grammar, logic and rhetoric) and the quadrivium {i.e. arithmetic, geometry, music and astronomy) as handed down from the schools of the Roman empire. See J. B. Mullinger's History of the University of Cambridge, i. 24-27.

vers/. tates,

insti- tuted.

and notarial practice. The professors of theology, who, as membere of the religious orders, received no state remuneration, are unmentioned. The significance of the term " college," as first employed at Bologna, differed, like that of " university," from that which it subsequently acquired. The collegia of the doctors no more connoted the idea of a place of residence than did the universitates of the students. There were the College of Doctors of Civil Law, the College of Doctors of Canon Law, the College of Doctors in Medicine and Arts and Tne (from 1352) the College of Doctors in Theology, unlver- Though the professors were largely dependent upon sitiesat the students, they had separate organizations of their ogaa.

own; the college alone was concerned in the conferment of degrees. Each faculty was therefore at Bologna entirely independent of every other (except for the union of medicine and arts): the only connecting link between them was the necessity of obtaining their degrees (after 1219) from the same chancellor, the archdeacon of Bologna. The decline in the reputation of the studium from about 1250 was largely due to the successful efforts of the doctors to exclude all but Bolognese citizens from membership of the doctoral colleges (which alone possessed the valuable " right of promotion "), and from the more valuable salaried chairs. They even attempted and partially succeeded in restricting these privileges to members of their own families.

Colleges as places of residence for students existed, however, at Bologna at a very early date, but it is not until the The 14th century that we find them possessing any earliest organization;

and the humble domus, as it was termed, colleges. was at first designed solely for necessitous students, not being natives of Bologna. A separate house, with a certain fund for the maintenance of a specified number of scholars, was all that was originally contemplated. Such was the character of that founded by Zoen, bishop of Avignon, in February 1256 (O.S.), the same month and year, it is to be noted, in which the Sorbonne was founded in Paris. It was designed for the maintenance of eight scholars from the province of Avignon, under the supervision of three canons of the church, maintaining themselves in the university. Each scholar was to receive 24 Bolognese lire annually for five years. The college of Brescia was founded in 1326 by William of Brescia, archdeacon of Bologna, for poor foreign students without distinction as to nationality. The Spanish college, founded in 1364, for twenty-four Spanish scholars and two chaplains, is noted by Denifle as the one college founded in medieval times which still exists on the Continent.

Of the general fact that the early universities rose in response to new wants the commencement of the university of Paris supplies us with a further illustration. The study origin of of logic, which, prior to the 12th century, was founded univer- exclusively on one or two meagre compends, received sky of about the year 1100, on two occasions, a powerful ars ~ stimulus — in the first instance, from the memorable controversy between Lanfranc and Berengar; in the second, from the no less famous controversy between Anselm and Roscellinus. A belief sprang up that an intelligent apprehension of spiritual truth depended on a correct use of prescribed methods of argumentation. Dialectic was looked upon as " the , .

science of sciences"; and when, somewhere in the login. first decade of the 1 2th century, William of Champeaux opened in Paris a school for the more advanced study of dialectic as an art, his teaching was attended with marked success. Among his pupils was Abelard, in whose hands the study made a yet more notable advance; so that, by the middle of the century, we find John of Salisbury, on returning from the French capital to England, relating with astonishment, not unmingled with contempt, how all learned Paris had gone well- nigh mad in its pursuit and practice of the new dialectic.

Abelard taught in the first instance at the cathedral school at

Notre Dame, and subsequently at the schools on Teaching the Montagne Ste Genevieve, of which he was the of founder, and where he imparted to logic its new Abelard. development. But in 1147 the secular canons of Ste Genevieve

gave place to canons regular from St Victor; and henceforth the school on the former foundation was merely a fheof ° f scno °l f° r tne teaching of theology, and was attended only by the members of the house. 1 The schools out of which the university arose were those attached to the cathedral on the lie de la Cite, and presided over by the chancellor — a dignitary who must be carefully distinguished from the later chancellor of the university. For a long time the teachers lived in separate houses on the island, and it was only by degrees that they combined themselves into a society, and that special buildings were constructed for their class-work. But the flame which Abelard's teaching had kindled was not destined to Lom- expire. Among his pupils was Peter Lombard, who

bard's was bishop of Paris in 1150, and widely known to "Sen- posterity as the compiler of the famous volume of the tences." Sentences. The design of this work was to place before the student, in as strictly logical a form as practicable, the views (sententiae) of the fathers and all the great doctors of the church upon the chief and most difficult points in the Christian belief. Conceived with the purpose of allaying and preventing, it really stimulated, controversy. The logicians seized upon it as a great storehouse of indisputable major premises, on which they argued with renewed energy and with endless ingenuity of dialectical refinement; and upon this new compendium of theological doctrine, which became the text-book of the middle ages, the schoolmen, in their successive treatises Super sententias, expended a considerable share of that subtlety and labour which still excite the astonishment of the student of metaphysical literature.

It is in these prominent features in the history of these early universities — the development of new methods of instruction Rise ot concurrently with the appearance of new material other for their application — that we find the most probable

eaHy . t 'f D} ' solution of the question as to how the university, as distinguished from the older cathedral or monastic schools, was first formed. In a similar manner, it seems prob- able, the majority of the earlier universities of Italy — Reggio, Modena, Vicenza, Padua and Vercelli — arose, for they had their origin independently alike of the civil and the papal authority. Instances, it is true, occur, which cannot be referred to this spontaneous mode of growth. The university of Naples, for example, was founded solely by the fiat of the emperor Frederick II. in the year 1224; and, if we may rely upon the documents cited by Denifle, Innocent IV. about the year 1245 founded in connexion with the curia a " studium generale," 2 which was attached to the papal court, and followed it when removed from Rome, very much as the Palace School of Charles the Great accompanied that monarch on his progresses.

As the university of Paris became the model, not only for the universities of France north of the Loire, but also for the great majority of those of central Europe as well as wganlza- ˆ or Oxford and Cambridge, some account of its early tioa of organization will here be indispensable. Such an uaiver- account is rendered still further necessary by the fact B parU t ˆ lat ˆe recent and almost exhaustive researches of

Denifle, the Dominican father, have led him to con- clusions which on some important points run altogether counter to those sanctioned by the high authority of Savigny

The original university, as already stated, took its rise entirely out of the movement carried on by teachers on the island, who taught by virtue of the licence conferred by the chancellor of the cathedral. In the second decade of the 13th century, it is true, we find masters withdrawing themselves from his authority by repairing to the left bank of the Seine and placing them- selves under the jurisdiction of the abbot of the monastery of Ste Genevieve; and in 1255 this dignitary is to be found

1 The view of Thurot {De V organisation de V enseignement dans I'universite de Paris, pp. 4-7) that the university arose out of a combination of these several schools is rejected by Denifle (see Die Universitdten, &c, i. 653-94).

2 Where the words studium generale are placed within marks

of quotation they occur in the original charter of foundation of the university referred to.

appointing a chancellor whose duty it should be to confer licentia docendi on those candidates who were desirous of opening schools in that district. But it was around the bestowal of this licence by the chancellor of Notre Dame, on the lie de la Cite, that the university of Paris grew up. It is in this licence that the whole significance of the master of arts degree is contained; for what is technically known as admission r_ ce „« _ to that degree was really nothing more nor less than receiving the chancellor's permission to " incept," and by " inception " was implied the master's formal entrance upon, and commencement of, the functions of a duly licensed teacher, and his recognition as such by his brothers in the profession. The previous stage of his academic career, that of bachelordom, had been one of apprenticeship for the The mastership; and his emancipation from this state bachelor was symbolized by placing the magisterial cap (biretta) of arts. upon his head, a ceremony which, in imitation of the old Roman ceremony of manumission, was performed by his former instructor, " under whom " he was said to incept. He then gave a formal inaugural lecture, and, after this proof of magisterial capacity, was welcomed into the society of his professional brethren with set speeches, and took his seat in his master's chair.

This community of teachers of recognized fitness did not in itself suffice to constitute a university, but some time between the years 1 1 50 and 1 1 70, the period when the Sentences The uni- of Peter Lombard were given to the world, the university versity of Paris came formally into being. Its first formed. written statutes were not, however, compiled until about the year 1208, and it was not until long after that date that it possessed a "rector." Its earliest recognition as a legal cor- poration belongs to about the year 1211, when a brief of Inno- cent III. empowered it to elect a proctor to be its representative at the papal court. By this permission it obtained the right to sue or to be sued in a court of justice as a corporate body.

This papal recognition was, however, very far from im- plying the episcopal recognition, and the earlier history of the new community exhibits it as in continual conflict alike with the chancellor, the bishop and the cathedral cu i t i' es „/ chapter of Paris, by all of whom it was regarded as a first centre of

insubordination and doctrinal licence. Had it not been, indeed, for the papal aid, the university would probably not have survived the contest; but with that powerful assistance it came to be regarded as the great Transalpine centre of orthodox theological teaching. Successive pontiffs, down to the great schism of 1378, made it one of the foremost points of their policy to cultivate friendly and con- fidential relations with the authorities of the university of Paris, and systematically to discourage the formation of theological faculties at other centres. In 1231 Gregory IX., in the bull Parens Scientiarum, gave full recognition to the right of the several faculties to regulate and modify the constitution of the entire university — a formal sanction which, in Denifle's opinion, rendered the bull in question the Magna Charta of the university. In comparing the relative antiquity of the universities 0$ Paris and Bologna, it is difficult to give an unqualified decision. The university of masters at the former was probably slightly anterior to the university of students at the latter; but there is good reason for believing that Paris, in reducing its traditional customs to statutory form, largely availed itself of the precedents afforded by the already existing code of the Transalpine centre. The fully developed university was divided into four faculties — three " superior," viz. those of theology, canon law and medicine, and one " inferior," that of arts, which was divided into four " nations." These nations, which included both professors and scholars, were — (1) the French nation, composed, in addition to the native element, of Spaniards, Italians and Greeks; (2) the Picard nation, repre- t i OBS .» senting the students from the north-east and from the Netherlands; (3) the Norman nation; (4) the English nation, comprising, besides students from the provinces under English rule, those from England, Ireland, Scotland and

develop- ment.

Germany. The head of each faculty was the dean; the head of each nation was the proctor. The rector, who in the first instance was head of the faculty of arts, by whom he was elected, was eventually head of the whole university. In congregations of the university matters were decided by a majority of faculties; the vote of the faculty of arts was

determined by a majority of nations. The chancellor of Notre Dame, whose functions were now limited to the conferment of the licence, stood as such outside the university or gild altogether, though as a doctor of theology he was always a member of that faculty. Only " regents," that is, masters actually engaged in teaching, had any right to be present or to vote in congregations. Neither the entire university nor the separate faculties had thus, it will be seen, originally a common head, and it was not until the middle of the 14th century that the rector became the head of the collective university, by the incorporation under him, first, of the students of the canon law and of medicine (which took place about the end of the 13th century), and, secondly, of the theologians, which took place about half a century later.

*In the course of the 16th and 17th centuries this democratic constitution of the middle ages was largely superseded by the growth of a small oligarchy of officials. The tribunal of the university — the rector, deans and proctors — came to occupy a somewhat similar position to the old " Hebdomadal Board " of heads of colleges at Oxford and the Caput at Cambridge. Moreover, the teaching functions of the university, or rather of the faculty of arts, owing chiefly to the absence of any endowment for the regents or teaching graduates, practically passed to the colleges. Almost as much as the English universities, Paris came to be virtually reduced to a federation of colleges, though the colleges were at Paris less independent of university authority, while the smaller colleges sent their members to receive instruction in the larger ones (colleges de plein exercise), which received large numbers of non-foundation members. This state of things lasted till the French Revolution swept away the whole university system of the middle ages. It may be remarked that the famous Sorbonne was really the most celebrated college of Paris — founded by Robert de bonne. 1 * Sorbonne circa 1 257 — but as this college and the college of Navarre were the only college foundations which provided for students in theology, the close connexion of the former with the faculty and the use of its hall for the disputations of that body led to the word Sorbonne becoming a popular term for the theological faculty of Paris.*

Apart from the broad differences in their organization, the very conception of learning, it will be observed, was different Paris and at Bologna from what it was at Paris. In the former Bologna it was entirely professional — designed, that is to say,

coo- to prepare the student for a definite and practical

trasted. caree r in after life; in the latter it was sought to provide a general mental training, and to attract the learner to studies which were speculative rather than practical. In the sequel, the less mercenary spirit in which Paris cultivated knowledge added immensely to her influence and reputation, which about the middle of the 14th century may be said to have reached their apogee. It had forty colleges, governed either by secular or religious communities, and numbered among its students representatives of every country in Europe (Jourdain, Excursions historiques, c. xiv.). The university became known as the great school where theology was studied in its most scientific spirit; and the decisions of its great doctors upon those abstruse questions which absorbed so much of the highest intellectual activity of the middle ages were regarded as almost final. The popes themselves, although averse from theological controversies, deemed it expedient to cultivate friendly relations with a centre of such im- portance for the purpose of securing their influence in a yet wider field. Down therefore to the time of the great schism (1378), they at once conciliated the university of Paris and consulted what they deemed to be the interests of the Roman see, by discouraging the creation of faculties of theology elsewhere. The apparent exceptions to this policy are easily

Papal policy.

explained: the four faculties of theology which they sanctioned in Italy — Pisa (1343), Florence (1349), Bologna (1362) and Padua (1363) — were designed to benefit the Italian monasteries, by saving the monks the expense and dangers of a long journey beyond the Alps; while that at Toulouse (1229) took its rise under circumstances entirely exceptional, being designed as a bulwark against the heresy of the Albigenses. The popes, on the other hand, favoured the creation of new faculties of law, and especially of the canon law, as the latter represented the source from which Rome derived her most warmly contested powers and prerogatives. The effects of this twofold policy were sufficiently intelligible: the withholding of each charter which it was sought to obtain for a new school of theology only served to augment the numbers that flocked to Paris; the bestowal of each new charter for a faculty of law served in like manner to divert a certain proportionate number from Bologna. These facts enable us to understand how it is

that, in the 13th and 14th centuries, we find, even in France, a larger number of universities created after the model of Bologna than after that of Paris.

*In their earliest stage, however, the importance of these new institutions was but imperfectly discerned alike by the civil and the ecclesiastical power, and the first four univer- sities of Italy, after Bologna, rose into existence, like Bologna itself, without a charter from either pope or emperor. Of these the first were those of Reggio nelP Emilia and Modena, both of which are to be found mentioned as schools of civil law before the close of the 12th century. The latter, throughout the 13th century, appears to have been resorted to Reggio by teachers of sufficient eminence to form a flourish- and ing school, composed of students not only from the Modena. city itself, but also from a considerable distance. Both of them would seem to have been formed independently of Bologna, but the university of Vicenza was probably the outcome of a migration of the students from the "**'*

former city, which took place in the year 1204. During the next fifty years Vicenza attained to considerable prosperity, and appears to have been recognized by Innocent III.; its students were divided into four nations, each with its own rector; and in 1264 it included in its professoriate teachers, not only of the civil law, but also of medicine, grammar and dialectic. The university of Padua was unquestion- ably the direct result of the migration in 1222 of a considerable number of students from Bologna. Some writers, indeed, have inferred that the " studium " in the latter city was transferred in its entirety, but the continued residence of a certain proportion in Bologna is proved by the fact that two years later we find them appealing to Honorius III. in a dispute with the civic authorities. In the year 122S the students of Padua were compelled by circumstances to transfer their residence to Vercelli, and the latter city guaranteed them, besides other privileges, the right to rent no less than five hun- dred lodging-houses at a fixed rental for a period of eight years. At first Padua was a school only of the. civil and canon law; and during the oppressive tyranny of Ezzelin (1237-60) the uni- versity maintained its existence with some difficulty. But in the latter part of the century it incorporated the faculties of grammar, rhetoric and medicine, and became known as one of the most flourishing schools of Italy, and a great centre of the Dominicans, at that time among the most active promoters of

learning.

The university of Naples was founded by the emperor Frederick II. in the year 1225, as a school of theology, juris- prudence, the arts and medicine — his design being that his subjects in the kingdom of Naples should p

find in the capital adequate instruction in every branch of learn- ing, and " not be compelled in the pursuit of knowledge to have recourse to foreign nations or to beg in other lands." In the year 1231, however, he decreed that the faculty of medicine should cease to exist, and that the study should be pursued nowhere in the kingdom but at Salerno. The university never attained to much eminence, and after the death of Frederick came for a time altogether to an end, but was restored

Vercelll.

Piacenza.

Pavla.

in 1258 by King Manfred. In 1266 its faculty of medicine was reconstituted, and from 1272-74 Thomas Aquinas was one of its teachers of theology. The commencement of the uni- versity of Vercelli belongs to about the year 1228; it pro- bably included, like Naples, all the faculties, but would seem to have been regarded with little favour by the Roman See, and by the year 1372 had ceased to exist, although mention of colleges of law and medicine is to be found after that date. The two universities of Piacenza and Pavia stand in close connexion with each other. The former is noted by Denifie as the earliest in Italy which, was founded by virtue of a papal charter (6th February 1248), although the scheme remained for a long time inoperative. At length, in the year 1398, the university was reconstituted by Giovanni Galeazzo Visconti, duke of Milan, who in the same year caused the university of Pavia to be transferred thither. Piacenza now became the scene of a sudden but short-lived academic prosperity. We are told of no less than twenty- seven professors of the civil law — among them the celebrated Baldus; of twenty-two professors of

medicine; of professors of philosophy, astrology, grammar and rhetoric; and of lec- turers on Seneca and Dante. The faculty of theology would appear, however, never to have been duly constituted, and but one lecturer in this faculty is mentioned. With the death of Galeazzo in 1402, this precarious activity came suddenly to an end; and in 1404 the university had ceased to exist. Its history is, indeed, unintelligible, unless taken in conjunction with that of Pavia. Even before Irnerius taught at Bologna, Pavia had been widely known as a seat of legal studies, and more especially of the Lombard law, although the evidence is wanting which would serve to establish a direct connexion between this early school and the university which was founded there in 1361, by virtue of the charter granted by the emperor Charles IV. The new " studium " included faculties of jurisprudence, philosophy, medicine and the arts, and its students were formally taken under the imperial pro- tection, and endowed with privileges identical with those which had been granted to Paris, Bologna, Oxford, Orleans and Montpellier; but its existence in Pavia was suddenly suspended by the removal, above noted, of its students to Piacenza. It shared again in the decline which overtook the university of Piacenza after the death of Giovanni Galeazzo, and during the period from 1404 to 141 2 it altogether ceased to exist. But in October 141 2 the lectures were recommenced, and the university entered upon the most brilliant period of its existence. Its professors throughout the 15th century were men of distinguished ability, attracted by munificent salaries such as but few other universities could offer, while in the number of students who resorted thither from other countries, and more especially for the study of the civil law, Pavia had no rival in Italy but Padua. Arezzo appears to have been known as a centre of the same study so early as 1215, and its earliest statutes are assigned to the year 1255. By that time it had become a school of arts and medicine also; but for a considerable period after it was almost entirely de- serted, and is almost unmentioned until the year 1338, when it acquired new importance by the accession of several eminent jurists from Bologna. In May 1355 it received its charter as a studium generate from Charles IV. After the year 1373 the school gradually dwindled, although it did not become alto- gether extinct until about the year 1470. The university of Rome (which is to be carefully distinguished from the school attached to the Curia) owed its foundation (1303) to Boniface VIII., and was especially designed by that pontiff

for the benefit of the poor foreign students sojourning in the capital. It originally included all the faculties; but in 13 18 John XXII. decreed that it should possess the power of conferring degrees only in the canon and civil law. The university maintained its existence throughout the period of the residence of the popes of Avignon, and under the patron- age of Leo X- could boast in 1514 of no less than eighty pro- fessors. This imposing array would seem, however, to be but a

Arezzo.

Rome.

Trevlso.

fallacious test of the prosperity of the academic community, for it is stated that many of the professors, owing to the im- perfect manner in which they were protected in their privileges, were in the receipt of such insufficient fees that they were compelled to combine other employments with that of lecturing in order to support themselves. An appeal addressed to Leo X. in the year 1513 represents the number of students as so small as to be sometimes exceeded by that of the lecturers (" ut quandoque plures sint qui legant quam qui audiant "). Scarcely any of the universities in Italy in the 14th century attracted a larger concourse than that of Perugia, _ where the study chiefly cultivated was that of the '

civil law. The university received its charter as a studium generate from Clement V. in the year 1308, but had already in 1306 been formally recognized by the civic authorities, by whom it was commended to the special care and protection of the podesta. In common with the rest of the Italian uni- versities, it suffered severely from the great plague of 1348-49; but in 1355 it received new privileges from the emperor, and in 1362 its first college, dedicated to Gregory the Great, was founded by the bishop of Perugia. The university of Treviso, which received its charter from Frederick the Fair in 1318, was of little celebrity and but short duration. The circumstances of the rise of the university of „. Florence are unknown, but the earliest evidence of academic instruction belongs to the year 1320. The dis- persion of the university of Bologna, in the March and April of the following year, afforded a favourable opportunity for the creation of a studium generate, but the necessary measures were taken somewhat tardily, and in the

meantime the greater number of the Bolognese students had betaken themselves to Siena, where for the space of three years twenty-two pro- fessors gathered round them a body of enthusiastic students. Eventually the majority returned to Bologna, and when in 1338 that city was placed under an interdict by Benedict XII. another exodus of students repaired to Pisa, which in 1343 received from Clement VI. its charter as a studium generate. Closed in 1406, Pisa, aided by the powerful intervention of Lorenzo de' Medici, reopened in 1473, to undergo, however, a long series of vicissitudes which at last found a termination in 1850, when its fortunes were placed on a more stable basis, and it gradually acquired the reputation of ranking among the foremost universities of a reunited Italy. The charter of foundation for Florence, on the other hand, was not granted until May 31, 1349, when Clement VI. decreed that there should be instituted a studium generate in theology, jurisprudence, medicine and every other recognized faculty of learning, the teachers to be professors who had obtained the degree of doctor or master either at Bologna or Paris, or " some other studium generate of celebrity." On the 2nd of January 1364 the university also obtained the grant of imperial privileges from Charles IV. On 14th February 1388 it adopted a body of statutes which are still extant, and afford an interesting study in connexion with the university history of the period. The university now entered upon that brilliant period in its history which was destined to so summary an extinction. " It is almost touching," says Denifie, " to note how untiringly Florence exerted her- self at this period to attract as teachers to her schools the great masters of the sciences and learning." In the year 1472, however, it was decided that Florence was not a con- venient seat for a university, and its students joined the throngs which repaired to the reopened halls of Pisa. A special in- terest attaches to the rise of the university of Siena, as that of one which had made good its position prior to becoming recognized either by emperor or pope. Its be- ginning dates from about the year 1241, but its charter was first granted by the emperor Charles IV., at the petition of the citizens, in the year 1357. It was founded as a studium generate in jurisprudence, the arts and medicine. The im- perial charter was confirmed by Gregory XII. in 1408, and the various bulls relating to the university which he subsequently issued afford a good illustration of the conditions of academic

Oxford.

life in these times. Residence on the part of the students appears to have been sometimes dispensed with. The bishop of Siena was nominated chancellor of the university, just as, says the bull, he had been appointed to that office by the im- perial authority. The graduates were to be admitted to the same privileges as those of Bologna or Paris; and a faculty of theology was added to the curriculum of studies. The uni-

Ferrara. *versity of Ferrara owes its foundation to the house of Este — Alberto, marquess of Este, having obtained from Boniface IX. in 1391 a charter couched in terms precisely similar to those of the charter for Pisa. In the first half of the 15th century the university was adorned by the presence of several distinguished humanists, but its fortunes were singularly chequered, and it would appear for a certain period to have been altogether extinct. It was, however, restored, and be- came in the latter part of the century one of the most celebrated of the universities of Italy. In the year 1474 its circle of studies comprised all the existing faculties, and it numbered no less than fifty-one professors or lecturers. In later times Ferrara has been noted chiefly as a school of medicine.*

Of the universities modelled on that of Paris, Oxford would appear to have been the earliest, and the manner of its develop- ment was probably similar. Certain schools, opened within the precincts of the dissolved nunnery of St Frideswyde and of Oseney abbey, are supposed to have been the nucleus round which the university grew up. In the year 1133 one Robert Pullen, a theologian of considerable eminence (but whether an Englishman or a Breton is uncertain), arrived from Paris and delivered lectures on the Bible. It has been main- tained, on the authority of Gervase of Canterbury, that Vacarius, a native of Lombardy, who, in the latter half of the 12th century, incurred the displeasure of King Stephen by lecturing in England on the civil law, delivered lectures at Oxford. H. S. Denifle, however (Die Entstehung der UniversiliUen, p. 241), maintains that the naming of Oxford is a gratuitous assumption on the part of Gervase, and that we have, at best, only pre- sumptive evidence of a studium generate there in the 12th century. Of this, Mr Rashdall

inclines to find the beginning in a migration of English students from Paris about 1167 or 1 168. In the first-mentioned year we are told by John of Salis- bury that " France, the mildest and most civil of nations," has " expelled her foreign scholars " (Materials for the History of Thomas Becket, ed. Robertson, vi. pp. 235-36). At about the same time we hear of an edict of Henry II., during the quarrel with Becket, recalling all clerks holding benefices in England (as they loved their benefices), and forbidding all clerks in England to cross the Channel (ibid. i. pp. 53-54). The arch- bishop himself remarks that " The king wills that all scholars shall be compelled to return to their country or be deprived of their benefices " (ibid. vii. p. 146). Paris was at this time the great place of higher education for English students. No English school was a recognized stadium generate. Immedi- ately after 1168 allusions to Oxford as a studium and a studium generate begin to multiply. The natural inference is that the breaking off of relations between England and Paris in 1167 or 1 1 68 led to the growth of a studium generate in Oxford, formed no doubt in the first instance of seceders from Paris. In the 13th century mention first occurs of university " chests," especially the Frideswyde chest, which were benefactions de- signed as funds for the assistance of poor students. Halls, or places of licensed residence for students, also began to be established. In the year 1257, when the bishop of Lincoln, as diocesan, had trenched too closely on the liberties of the community, the deputies from Oxford, when preferring their appeal to the king at St Albans, could venture to speak of the university as " schola secunda ecclesiae," or second only to Paris. Its numbers about this time were probably some three thousand; but it was essentially a fluctuating body, and when- ever plague or tumult led to a temporary dispersion a serious diminution in its numerical strength generally ensued for some time after. Against such vicissitudes the foundation of col- leges proved the most effectual remedy. Of these the three

Cam- bridge.

earliest were University College, founded in 1 249 by William of Durham; Balliol College, founded about 1263 by John Balliol, the father of the king of Scotland of the same name; and Merton College, founded in 1264. The last-named is especially notable as associated with a new conception of university education, namely, that of collegiate discipline for the secular clergy, instead of for any one of the religious

orders, for whose sole benefit all similar foundations had hitherto been designed. The statutes given to the society by Walter de Merton are not less noteworthy, as characterized not only by breadth of con- ception, but also by a careful and discriminating attention to detail, which led to their adoption as the model for later col- leges, not only at Oxford but at Cambridge. Of the service rendered by these foundations to the university at large we have significant proof in the fact that, although representing only a small numerical minority in the academic community at large, their members soon obtained a considerable preponder- ance in the administration of affairs.

The university of Cambridge, although it rose into existence somewhat later than Oxford, may reasonably be held to have had its origin in the same century. There was prob- ably a certain amount of educational work carried on by the canons of the church of St Giles, which gradually developed into the instruction belonging to a regular studium. In the year n 12 the canons crossed the river and took up their residence in the new priory in Barnwell, and their work of instruction acquired additional importance. In 1209 a body of students migrated thither from Oxford. Then, as early as the year 1224, the Franciscans established them- selves in the town, and, somewhat less than half a century later, were followed by the Dominicans. At both the English universities, as at Paris, the Mendicants and other religious orders were admitted to degrees, a privilege which, until the year 1337, was extended to them at no other university. Their interest in and influence at these three centres was conse- quently proportionably great. In the years 1231 and 1233 certain royal and papal letters afford satisfactory proof that by that time the university of Cambridge was already an organized body with a chancellor at its head — a dignitary appointed by the bishop of Ely for the express purpose of granting degrees and governing the studium. In 1229 and 1231 the numbers were largely augmented by migrations from Paris and from Oxford. Cambridge, however, in its turn suffered from emigra- tion; while in the year 1261, and again in 1381, the records of the university were wantonly burnt by the townsmen. Throughout the 13th century, indeed, the university was still only a very slightly and imperfectly organized community. Its endowments were of the most slender kind; it had no systematic code for the government of its members; the supervision of the students was very imperfectly provided for. Although both' Oxford and Cambridge were

modelled on Paris, their higher faculties never developed the same distinct organization; and while the two proctors at Cambridge originally represented " north " and " south," the " nations " are scarcely to be dis- cerned. An important step in the direction of discipline was, however, made in the year 1276, when an ordinance was passed requiring that every one who claimed to be recognized as a scholar should have a fixed master within fifteen days after his entry into the university. The traditional constitution of the English universities was in its origin an imitation of the Parisian chancellor, modified by the absence of the cathedral chancellor. As Oxford was not in the 12th century a bishop's see, the bishop (in 1 2 14, if not earlier) appointed a chancellor for the express purpose of granting degrees and governing the studium. But he was from the first elected by the masters, and early obtained recognition as the head of the university as well as the representa- tive of the bishop. The procuratores (originally also rectores) remained representatives of the faculty of arts and (there being at Oxford no deans) of the whole university. But the feature which most served to give permanence and cohesion to the entire community was, as at Oxford, the institution of colleges. The earliest of these was Peterhouse, first founded as a separate

institution by Hugh Balsham, bishop of Ely, in the year 1284, its earliest extant code being that given in 1344 by Simon de Montacute, which was little more than a transcript of that drawn up by Walter de Merton for his scholars at Oxford. In 1323 was founded Michaelhouse, and two years later, in 1326, Edward II. instituted his foundation of " king's scholars," afterwards forming the community of King's Hall. Both these societies in the 16th century were merged in Trinity College. To these succeeded Pembroke Hall (1347) and Gonville Hall (1348). All these colleges, although by no means conceived in a spirit of hostility to either the monastic or the mendicant orders, were expressly designed for the benefit of the secular clergy. The foundation of Trinity Hall (Aula) 1 in 1350 by Bishop Bateman, on the other hand, as a school of civil and canon law, was prob- ably designed to further ultramontane interests. That of Corpus Christi (1352), the outcome of the liberality of a gild of Cambridge townsmen, was

conceived with the combined object of providing a house of education for the clergy, and at the same time secur- ing the regular performance of masses for the benefit of the souls of departed members of the gild. But both Trinity Hall and Corpus Christi College, as well as Clare Hall, founded in 1359, were to a great extent indebted for their origin to the ravages caused among the clergy by the great plague of 1349. In the latter half of the same century, the coming change of feeling is shown by the fact that the chancellor was under the necessity of issuing a decree (1374) in order to protect the house of the Carmelites from molestation on the part of the students.

*Returning to France, or rather to the territory included within the boundaries of modern France, we find Montpellier a recognized school of medical science as early as pettier. *^e 12th century. William VIII., lord of Montpellier, in the year 1181 proclaimed it a school of free resort, where any teacher of medical science, from whatever country, might give instruction. Before the end of the century it pos- sessed also a faculty of jurisprudence, a branch of learning for which it afterwards became famed. The university of medicine and that of law continued, however, to be totally distinct bodies with different constitutions. Petrarch was sent by his father to Montpellier to study the civil law. On 26th October 1289 Montpellier was raised by Nicholas IV. to the rank of a " studium generale," a mark of favour which, in a region where papal influence was so potent, resulted in a considerable accession of prosperity. The university also now included a faculty of arts; and there is satisfactory evidence of the existence of a faculty of theology before the close of the 14th century, although not formally recognized by the pope before the year 1421. In the course of the same century several colleges for poor students were also founded. The university of Toulouse is to be noted as the first founded in any country by virtue of a papal charter. It took its rise in the efforts of Rome for the suppression of the Albigensian heresy, and its foundation formed one of the articles of the conditions of peace imposed by Louis IX. on Count Raymond of Toulouse. In the year 1233 it first acquired its full privileges as a " studium generale " by virtue of a charter given by Gregory IX. This pontiff watched over the university with especial solicitude, and through his exertions it soon became noted as a centre of that Dominican teaching which involved the .extermination of the Catharists. As a school of arts, jurisprudence and*

medicine, although faculties of each existed, it never attained to any reputation. The university of Orleans had a virtual existence as a studium generale as early as the first half of the 13th century, but in the year 1305 Clement V. endowed it with new privileges, and gave its teachers permission to form themselves into a corporation. The schools of the city had an existence long prior — as early, it is said, as the 6th century — and subsequently supplied the nucleus for the foundation of a university at Blois; but of this university no records are extant. 2

1 Aula denoting the building which the " college " of scholars was to inhabit; the society continued to retain this designation in order to distinguish it from Trinity College, founded in 1546.

•See Ch. Desmaze, V UniversM de Paris (1200-1875).

Toulouse.

Avignon.

Orleans, in its organization, was modelled mainly on Paris, but its studies were complementary rather than in rivalry to the older university. The absorbing character of the study of the civil law, and the mercenary spirit in which it was pursued, had led the authorities at Paris to refuse to recognize it as a faculty. The study found a home at Orleans, where it was cultivated with an energy which attracted numerous students. In January 1235 we find the bishop of Orleans soliciting the advice of Gregory IX. as to the expediency of countenanc- ing a study which was prohibited in Paris. Gregory decided that the lectures might be continued; but he ordered that no beneficed ecclesiastic should be allowed to devote himself to so eminently secular a branch of learning. Orleans subsequently incorporated a faculty of arts, but its reputation from this period was always that of a school of legal studies, and in the 14th century its reputation in this respect was surpassed by no other university in Europe. Prior to the 13th century it had been famed for its classical learning; and Angers, which received its charter at the same time, also once enjoyed a- like reputation, which, in a similar manner, it exchanged "'

for that of a school for civilians and canonists. The roll of the university forwarded in 1378 to Clement VII. contains the

names of 8 professors utriusque juris, 2 of civil and 2 of canon law, 72 licentiates, 284 bachelors of both the legal faculties, and 190 scholars. The university of Avignon was first recognized as a " studium generale " by Boniface VIII. in the year 1303, with power to grant degrees in jurisprudence, arts and medicine. Its numbers declined somewhat during the residence of the popes, owing to the counter-attractions of the " studium " attached to the Curia; but after the return of the papal court to Rome it became one of the most frequented universities in France, and possessed at one time no less than seven colleges. The university of Cahors enjoyed the advantage of being regarded with especial favour by John XXII. In June 1332 he conferred upon it privileges identical with those already granted to the university of Toulouse. In the following October, again following the precedent estab- lished at Toulouse, he appointed the scholasticus of the cathedral chancellor of the university. In November of the same year a bull, couched in terms almost identical with those of the Magna Charta of Paris, assimilated the constitution of Cahors to that of the oldest university. The two schools in France which, down to the close of the 14th century, most closely resembled Paris were Orleans and Cahors. The civil immunities and privileges of the latter university were not, however, acquired until the year 1367, when Edward III. of England, in his capacity as duke of Aquitaine, not only exempted the scholars from the payment of all taxes and imposts, but bestowed upon them the peculiar privilege known as privilegium fori. Cahors also received a licence for faculties of theology and medicine, but, like Orleans, it was chiefly known as a school of jurisprudence. It was as a " studium generale " in the same three faculties that Grenoble, in the year 1339, _ received its charter from Benedict XII. The university never attained to much importance, and its annals are for the most part involved in obscurity. At the commencement of the 16th century it had ceased altogether to exist, was reorganized by Francis of Bourbon in 1542, and in 1565 was united to the university of Valence. The university of Perpignan, founded, according to Denifle, in 1379 by Clement VII. nan . (although tradition had previously ascribed its origin Q to Pedro IV. of Aragon), and that of Orange, founded in 1365 by. Charles IV., were universities only by name and constitution, their names rarely appearing in contemporary chronicles, while their very existence becomes at times a matter for reasonable doubt.

To some of the earlier Spanish universities — such as Palencia, founded about the year 1214 by Alphonso VIII.; Huesca, founded in 1354 by Pedro IV.; and Lerida, founded palencia, in 1300 by James II. — the same description 3s applic- Huesca, able; and their insignificance is probably indicated by Lerida. the fact that they entirely failed to attract foreign students.

Valla- dolid.

Valladolid, which received its charter from Pope Clement VI. in 1346, attained, however, to great celebrity; and the foreign teachers and students frequenting the university became so numerous that in 1373 King Enriquez II. caused an enactment to be passed for securing to them the same privileges as those already accorded to the native element. But the total number of the students in 1403 was only 116, and grammar and logic, along with jurisprudence (which was the principal study), constituted the sole curriculum. In 1418, however, at the council of Constance, Martin V. not only decreed that Valladolid should take rank as a studium generate, but also as a " universitas theologiae," and that the new faculty should possess the same privileges as those of the same faculty in Paris. From this time accordingly the advance of the uni- versity in numbers was steady and continuous throughout the 15th century, and, along with Salamanca, it served as the model . for Alcala in 1499. The university which rose on the banks of the Henaresandbecamefamousunderthedirec- tion of the eminent Ximenes, was removed in 1623 to Madrid; and for the next century and a half the foremost place among the universities of Spain must be assigned to Salamanca, to which Seville, in the south, stood in the relation of a kind of subsidiary school, having been founded in 1254 by Alphonso the Wise, Seville simply for the study of Latin and of the Semitic aadSala- languages, especially Arabic. Salamanca had been maaca. f oun d e d in 1243 by Ferdinand III. of Castile as a studium generale in the three faculties of jurisprudence, the arts and medicine. The king also extended his special pro- tection to the students, granting them numerous privileges and immunities. Under his son Alphonso (above named) the university acquired a further development, and eventually

included all the faculties save that of theology. But the main stress of its activity, as was the case with all the earlier Spanish universities until the beginning of the 15th century, was laid on the civil and the canon law. The provision for the payment of its professors was, however, at first so inadequate and precarious that in 1298 they by common consent suspended their lectures, in consequence of their scanty remuneration. A permanent remedy for this difficulty was thereupon provided, by the appropriation of a certain portion of the ecclesiastical revenues of the diocese for the purpose of augmenting the professors' salaries, and the efforts of Martin V. established a school of theology which was afterwards regarded almost as an oracle by Catholic' Europe. About the year 1600 the students are shown by the matriculation books to have numbered over 5000. According to Cervantes they were noted for their lawlessness. The earliest of the numerous colleges founded at Salamanca was that of St Bartholomew, long noted for its ancient library and valuable collection of manuscripts, which now form part of the royal library in Madrid.

The one university possessed by Portugal had its seat in medieval times alternately in Lisbon and in Coimbra, until, in the year 1537, it was permanently attached to the latter city. Its formal foundation took place in 1309, when it received from King Diniz a charter, the provisions of which were mainly taken from those of the charter given to Salamanca. In 1772 the university was entirely reconstituted.

Of the universities included in the present Austrian empire, Prague, which existed as a " studium " in the 13th century, was the earliest. It was at first frequented mainly by students from Styria and Austria, countries at that time ruled by the emperor Charles IV., who was also" king of Bohemia, and at whose request Pope Clement VI., on the 26th of January 1347, promulgated a bull authorizing the foundation of a " studium generale " in all the faculties. In the following year Charles himself issued a charter for the foundation. This document, which, if original in character, would have been of much interest, has but few distinctive features of its own, its provisions being throughout adapted from those contained in the charters given by Frederick II. for the university of Naples and by Conrad for Salerno — almost the only important feature of difference being that Charles bestows on the students of Prague all the civil

Coimbra.

Prague.

Cracow,

privileges and immunities which were enjoyed by the teachers of Paris and Bologna. Charles had himself been a student in Paris, and the organization of his new foundation was modelled on that university, a like division into four " nations " (although with different names) constituting one of the most marked features of imitation. The numerous students — and none of the medieval universities attracted in their earlier history a larger concourse — were drawn frtfm a gradually widening area, which at length included, not only all parts of Germany, but also Eng- land, France, Lombardy, Hungary and Poland. Contemporary writers, with the exaggeration characteristic of medieval cred- ulity, even speak of thirty thousand students as present in the university at one time — a statement for which Denifle pro- poses to substitute two thousand as a more probable estimate. It is certain, however, that Prague, prior to the foundation of Leipzig, was one of the most frequented centres of learning in Europe, and Paris suffered a considerable diminution in her numbers owing to the counter-attractions of the great studium of Slavonia.

The university of Cracow in Poland was founded in May 1364, by virtue of a charter given by King Casimir the Great, who bestowed on it the same privileges as those possessed by the universities of Bologna and Padua. In the following September Urban V., in consideration of the remote- ness of the city from other centres of education, constituted it a " studium generale " in all the faculties save that of theology. It is, however, doubtful whether these designs were carried into actual realization, for it is certain that, for a long time after the death of Casimir, there was no university whatever. Its real commencement must accordingly be considered to belong to the year 1400, when it was reconstituted, and the papal sanction was given for the incorporation of a faculty of theology. From this time its growth and prosperity were continuous; and with the year 1416 it had so far acquired a European reputation as to venture upon forwarding an expression of its views in connexion with the deliberations of the council of Constance. Towards the close of the 15th century the university is said to have been in high repute as a school of both astronomical and

humanistic studies.

The Avignonese popes appear to have regarded the establishment of new faculties of theology with especial jealousy; and when, in 1364, Duke Rudolph IV. founded the university of Vienna, with the design of constituting it a " studium generale " in all the faculties, Urban V. refused his asssent to the foundation of a theological school. Owing to the sudden death of Duke Rudolph, the university languished for the next twenty years, but after the accession of Duke Albert III., who may be regarded as its real founder, it acquired additional privileges, and its prosperity became marked and continuous. Like Prague, Vienna was for a long time distinguished by the comparatively little attention bestowed by its teachers on the study of the civil law.

No country in the 14th century was looked upon with greater disfavour at Rome than Hungary. It was stigmatized as the land of heresy and schism. When, accordingly, in 1367 King Louis applied to Urban V. for his sanction of the scheme of founding a university at Funfkirchen, Urban would not consent to the foundation of a faculty of theology, jurchen. although theological learning was in special need of encouragement in those regions; the pontiff even made it a condition of his sanction for a studium generale that King Louis should first undertake to provide for the payment of the professors. We hear but little concerning the university after its foundation, and it is doubtful whether it survived for any length of time the close of the century. " The extreme east of civilized continental Europe in medieval times," observes Denifle, " can be compared, so far as university education is concerned, only with the extreme west and the extreme south. In Hungary, as in Portugal and in Naples, there was constant fluctuation, but the west and the south, although troubled by yet greater commotions than Hungary, bore better fruit. Among all the countries possessed of universities in medieval

Vienna,

Cologne.

times, Hungary occupies the lowest place — a state of affairs of which, however, the proximity of the Turk must be looked upon as a main cause."

*The university of Heidelberg (the oldest of those of the German realm) received its charter (October 23, 1385) from Urban VI. as a " studium generale " in all the re- b * e ' cognized faculties save that of the civil law — the form and substance of the document being almost identical with those of the charter granted to Vienna. It was granted at the request of the elector palatine, Rupert I., who conferred on the teachers and students, at the same time, the same civil privileges as those which belonged to the university of Paris. In this case the functionary invested with the power of bestowing degrees was non-resident, the licences being con- ferred by the provost of the cathedral at Worms. But the real founder, as he was also the organizer and teacher, of the university was Marsilius of Inghen, to whose ability and energy Heidelberg was indebted for no little of its early reputation and success. The omission of the civil law from the studies licensed in the original charter would seem to show that the pontiff's compliance with the elector's request was merely formal, and Heidelberg, like Cologne, included the civil law among its faculties almost from its first creation. No medieval university achieved a more rapid and permanent success. Regarded with favour alike by the civil and ecclesiastical potentates, its early annals were singularly free from crises like those which characterize the history of many of the medieval universities. The number of those admitted to degrees from the commencement of the first session (19th October 1386 to 16th December 1387) amounted to 579. 1*

Owing to the labours of the Dominicans, Cologne had gained a reputation as a seat of learning long before the founding of its university; and it was through the advocacy of some leading members of the Mendicant orders that, at the desire of the city council, its charter as a " studium generale " (21st May 1388) was obtained from Urban VI. It was organized on the model of the university of Paris, as a school of theology and canon law, and " any other recognized faculty " — the civil law being incorporated as a faculty soon after the promulgation of the charter. In common with the other early universities of Germany — Prague, Vienna and Heidelberg — Cologne owed nothing to imperial patronage, while it would appear to have been, from the first, the object of special favour with Rome.

This circumstance ˆserves to account for its distinctly ultramontane sympathies in medieval times and even far into the 16th century. In a report trans- mitted to Gregory XIII. in 1577, the university expressly derives both its first origin and its privileges from the Holy See, and professes to owe no allegiance save to the Roman pontiff. Erfurt, no less noted as a centre of Franciscan than was Cologne of Dominican influence, received its charter (16th September 1379) from the anti-pope Clement VII. as a " studium generale " in all the faculties. Ten years later (4th May 1389) it was founded afresh by Urban VI., without any recognition of the act of his pretendec" predecessor. In the 15th century the number of its students was larger than that at any other German university — a fact attributable partly to the reputation it had acquired as a school of juris- prudence, and partly to the ardour with which the nominalist and realist controversies of the time were debated in its midst; its readiness in according a hearing to novel theories causing it to be known as novorum omnium porlus.

The collegiate system is to be noted as a feature common to all these early German universities; and, in nearly ail, the professors were partly remunerated by the appropriation of certain prebends, appertaining to some neighbouring church, to their maintenance.

During the first half of the 15th century the relations of the Roman pontiffs to the universities continued much the st me, although the independent attitude assumed by the deputies

1 The statistics of Hautz {Gesch. d. Univ. Heidelberg, i. 177-178) are corrected by Denifle {Die Entstehung der Universitdten, p. 385).

Erfurt.

of those bodies at the great councils of Constance and Basel, and especially by those from Paris, could not fail to give rise to apprehensions. The papal bulls for each new founda- tion begin to indicate a certain jealousy with respect to ofthe the appropriation of prebends by the founders. Where popes to such appropriations are recognized, and more particu- ibe “”” larly in France, a formal sanction of the transfer gener- ally finds a place in the bull authorizing the foundation; but sometimes the founder or founders are themselves enjoined to provide the endowments requisite for the establishment and

support of the university. In this manner the con- trol of L the pontiff over each newly created seat of learn- ing assumed a more real character, from the fact that his assent was accompanied by conditions which rendered it no longer a mere formality. The imperial intervention, on the other hand, was rarely invoked in Germany — Greifs- wald, Freiburg and Tubingen being the only instances in which the emperor's confirmation of the foundation was solicited. 2 The inadequacy of the traditional studies to meet the growing wants of civilization, and the consequent lack of sympathy on the part of each civic population in which a new studium was founded, now become frequently apparent. Of such conditions the fortunes of the studium at Wtirzburg in Bavaria — founded in 1402 by a bishop, with a charter bung' bestowed by Boniface IX. — illustrate the dangers. The students belonged chiefly to the faculties of law and theology, and the frequency of their conflicts with the citizens made it necessary before ten years had elapsed to close the university, which was not reopened until 1582. Under the patronage of the prince Bishop Julius Echter von Mespelbrunn, however, it soon became largely frequented by Catholic students. At the present time, under the patronage of the house of Wittelsbach, it is widely famed as a school of medicine.

In Turin the university founded in 141 2 by the counts of Savoy had to be refounded in 143 1. The efforts of Parma in the 14th century to raise itself by papal aid to the dignity of a university proved altogether abortive, and it was not until 1422 that, under the protection of the dukes of Milan, its object was attained. In Sicily, Catania, the earliest of its high schools, was created a university by Alphonso of Aragon in 1445. Five years later Barcelona Bane- received from Pope Nicholas V. the same privileges as Toulouse had obtained from Gregory IX. Among the Spanish universities, however, none has had a more chequered history, although now taking rank with foremost.

In Hungary, Mathias Corvinus obtained from Paul II. in 1465 permission to found a general studium where he thought best within his realms — a latitude of choice conceded probably in consequence of the dangers which menaced the kingdom alike from Bohemia and from the Turks; while the fact that the university at Ofen (Hungarian Buda) was not actually founded until some ten years later, may have been owing to the resolute stand made by the youthful monarch against the claims to

nominate bishops put forward not only by Pope Paul but by his successor Sixtus IV. (1471-84). After a series of eventful experiences, the university of Budapest remains, at the present time, almost exclusively Magyar. It has a school of law at Pressburg, which is all that remains of the university there founded by Mathias Corvinus in 1465.

In northern Germany and in the Netherlands, on the other hand, the growing wealth and prosperity of the different states especially favoured the formation of new centres of Founds-learning. In the flourishing duchy of Brabant the tion of university of Louvain (1426) was to a great extent i-ouvafa. controlled by the municipality; and their patronage, although ultimately attended with detrimental results, long enabled Louvain to outbid all the other universities of Europe in the munificence with which she rewarded her professors. In the course of the next century the " Belgian Athens," as she is styled by Lipsius, ranked second only to Paris in numbers and reputation. In its numerous separate foundations and general 2 Meiners, Gesch. d. hohen Schulen, i. 370.

Catania,

Budapest.

organization — it possessed no less than twenty-eight colleges — it closely resembled the English universities; while its active press afforded facilities to the author and the controversialist of which both Cambridge and Oxford were at that time almost destitute. It embraced all the faculties, and no degrees in Europe stood so high as guarantees of general acquirements. Erasmus records it as a common saying, that " no one could graduate at Louvain without knowledge, manners and age." Sir William Hamilton speaks of the examination at Louvain for a degree in arts as " the best example upon record of the true mode of such examination, and, until recent times, in fact, the only example in the history of universities worthy of con-sideration at all." He has translated from Vernulaeus the order and method of this examination. 1 In 1788 the faculties of jurisprudence, medicine and philosophy were removed to Brussels, and in 1797 the French suspended the university

altogether.

In Germany the conditions under which the new centres were created reflect and illustrate the history of the country in a remarkable manner. Those connected with the rise of the university of Leipzig are especially noteworthy, it having been the result of the migration of almost the entire German element from the university of Prague. This element comprised (1) Bavarians, (2) Saxons, (3) Poles (this last- named division being drawn from a wide area, which included Meissen, Lusatia, Silesia and Prussia), and, being represented by three votes in the assemblies of the university, while the Bohemians possessed but one, had acquired a preponderance in the direction of affairs which the latter could no longer submit to. Religious differences, again, evoked mainly by the preaching of John Huss, further intensified the existing disagreements; and eventually, in the year 1409, King Wenceslaus, at the prayer of his Bohemian subjects, issued a decree which exactly reversed the previous "distribution of votes, — three votes being assigned to the Bohemian nation and only one to all the rest. The Germans took deep umbrage, and seceded to Leipzig, where, a bull having been obtained from Alexander V. (September 9, 1409), a new " studium generale " was founded by the landgrave of Thuringia and the margraves of Meissen. The members were divided into four nations — composed of natives of Meissen, Saxony,Bavaria and Poland. Two colleges were founded, a greater and a smaller, but designed, not for poor students, but for masters of arts — twelve being admitted on the former and eight on the latter foundation. At Rostock, in the north, the dukes John and Albert of Mecklenburg conceived the design of founding a university from which the faculty of theology should be excluded. os M ' Pope Martin V., to whom they applied for his sanction, was scarcely in a position to refuse it, absorbed as he was with the pacification of Italy, the consolidation of his own temporal power, and the restoration of his almost ruinous capital. The university was accordingly founded as proposed in 1419; but in 143 1 Eugenius IV. instituted a faculty of theology, and two colleges were founded with the same design and on the same scale as at Leipzig. Six years later the whole academic com- munity having incurred the papal ban was fain to migrate to Greifswald, returning, however, to Rostock in 1443, but with one important exception, that of a master of arts named Henry Rubenow, who remained to become burgomaster of the former

city, and succeeded in persuading Duke Wratislaw of Pommern to make it the seat of a university. Calixtus III. granted a bull in 1456, but it was stipulated that the rector should be a bishop, and the professorial chairs were also made parti- ally dependent for endowment on canonries. Greifswald thus became exposed to the full brunt of the struggle which had ensued when the endeavour to nationalize the German church was terminated by the Concordat of Vienna (1448). Of its original statutes only those of the arts faculty are extant.

The universities of Freiburg in Baden and Tubingen in

Wiirttemberg, on the other hand, reflect the sympathies of

Frem n t ‘ ie Catholic party under the Austrian rule. They

alike owed their foundation to the countess Matilda,

by whose persuasion her husband, the archduke of Austria,

1 Dissertations and Discussions, Append, iii.

Oreifs- wald.

known as Albrecht VI., was induced to found Freiburg in 1455, and Count Eberhard (her son by a former marriage) to found Tubingen in 1477. The first session at Freiburg opened auspici- ously in 1460 under the supervision of its rector, Matthew Hummel of Villingen, an accomplished and learned man, and its numbers were soon largely augmented by migrations of students from Vienna and from Heidelberg, while its resources, which originally were chiefly an annual grant from the city council, were increased by the bestowal of canonries and prebends in the neighbouring parishes. Erasmus had made Freiburg his residence from 1529 to 1535, during which time he may have originated a tradition of liberal learning, but in 1620, under the rule of the archduke Maximilian, the control of the Humanistic studies and of the entire faculty of philosophy was handed over to the Jesuits, who also gained possession of two of the chairs of theology. Although Strassburg since 1872 has been able to offer considerable counter-attractions, Freiburg has held her own, and numbers over 1600 students. The university of Tubingen was founded in 1477 with four faculties — those of theology, law, medicine and the arts — and numbered scholars such as John Reuchlin and Melanchthon itibinven among its teachers; while in the last

century it was famous both for its school of medicine and that of theology (see Tubingen). Its general condition in the year 1541-1542, and the sources whence its revenues were derived, have been illustrated by Hoffmann in a short paper which shows the fluctuating nature of the resources of a university in the 16th century — liable to be affected as they were both by the seasons and the markets. 2

The earliest 15th-century university in France was that of Aix in Provence. It had originally been nothing more than a school of theology and law, but in 1409 it was re- organized under the direction of the local count. as a Provence. studium generale on the model of Paris. The sphere of its activity is indicated by the fact that the students were divided into Burgundians, Provencals and Catalans. The next foundation, that of Poitiers, had a wider signi- ficance as illustrating the struggle that was going on between the French crown and the Roman see. It was insti- tuted by Charles VII. in 143 1, almost immediately after his accession, with the special design of Creating a centre of learning less favourable to English interests than Paris had at that time shown herself to be. Eugenius IV. could not refuse his sanction to the scheme, but he endeavoured partially to defeat Charles's design by conferring on the new " studium generale " simply the same privileges as those possessed by Toulouse, and thus placing it at a disadvantage in comparison with Paris. Charles rejoined by an extraordinary exercise of his own pre- rogative, conferring on Poitiers all the privileges collectively possessed by Paris, Toulouse, Montpellier, Angers and Orleans, and at the same time placing the university under special royal protection. The foundation of the university of Caen, in the diocese of Bayeux, was attended by conditions almost exactly the reverse of those which belonged to the foundation of that at Poitiers. It was founded under English auspices during the short period of the supremacy of the English arms in Normandy in the 15th century. Its charter (May 1437) was given by Eugenius IV., and the bishop of Bayeux was appointed its chancellor. The university of Paris had by this time completely forfeited the favour of Eugenius by its attitude at the council of Basel, and Eugenius inserted in the charter for Caen a clause of an entirely novel character, requiring all those admitted to degrees to take an oath of fidelity to the see of Rome, and to bind themselves to attempt nothing prejudicial to her interests. To this proviso the famous Pragmatic Sanction

of Bourges was Charles's rejoinder in the following year. On the 18th of May 1442 we find King Henry VI. writing to Eugenius, and dwelling with satisfaction on the rapid progress of the new university, to which, he says, students had flocked from all quarters, and were still daily

2 Okonomischer Zustand der Universitat Tubingen gegen die Mitte des i6ten Jahrhunderls (1845).

Poitiers.

arriving. 1 Ten years later, when the English had been expelled, its charter was given afresh by Charles in terms which left the original charter unrecognized; both teachers and learners were subject to the civil authorities of the city, and all privileges made previously conferred in cases of legal disputes were abolished. From this time the university of Caen was distinguished by its loyal spirit and firm resistance to ultramontane pretensions; and, although swept away at the French Revolution, it was afterwards restored, owing to the sense of the services it had Bordeaux, thus onc e rendered to the national cause. 2 No especi- valence, ally notable circumstances characterize the foundation Nantes. f t he university of Bordeaux (1441) or that of Valence (1452), but that of Nantes, which received its charter from Pius II. in 1463, is distinguished by the fact that it did not receive the ratification of the king of France, and the conditions under which its earlier traditions were formed thus closely resemble those of Poitiers. It seems also to have been regarded with particular favour by Pius II., a pontiff who was at once a ripe scholar and a writer upon education. He gave to Nantes a notable body of privileges, which not only represent an embodiment of all the various privileges granted to universities prior to that date, but afterwards became, with their copious and somewhat tautological phraseology, the accepted model for the great majority of university charters, whether issued by the pope or by the emperor, or by the civil authority. The bishop of Nantes was appointed head of the university, and was charged with the special protection of its privileges Bourses against all interference from whatever quarter. 3 The bull for the foundation of the university of Bourges was giyen

in 1465 by Paul II. at the request of Louis XL and his brother. It confers on the community the same privileges as those enjoyed by the other universities of France. The royal sanction was given at the petition of the citizens; but, from reasons which do not appear, they deemed it necessary further to petition that their charter might also be registered and enrolled by the parlement of Paris.

Founded about the same time, and probably in a spirit of direct rivalry to Freiburg, the university of Basel was opened in 1460 under the auspices of its own citizens. The cathedral school in that ancient city, together with others attached to the monasteries, afforded a sufficient nucleus for a studium, and Pius II., who, as Aeneas Sylvius, had been a resident in the city, was easily prevailed upon to grant the charter (November 12, 1459). During the first seventy years of its existence the university prospered, and its chairs were held by eminent professors, among them historical scholars, such as Sebastian Brant and Jacob Wimpheling. But with the Reformation, Basel became the arena of contests which menaced the very existence of the university itself, the professors being, for the most part, opposed to the new movement with which the burghers warmly sympathized. Eventually, the statutes were revised, and in the latter half of the 16th century the university may be said to have attained its apogee. Before he had signed the bull for the foundation of the university of Basel, Pope Pius, at the request of Duke William of Bavaria, had issued another bull for the foundation of a university at Ingol- stadt (7th April 1459). But it was not until 1472 that the work of teaching was actually commenced there. Some long-existing prebends, founded by former dukes of Bavaria, were appropriated to the endowment, and the chairs in the different faculties were distributed as follows: theology 2, jurisprudence 3, medicine 1, arts 6 — arts in conjunction with theology thus obtaining the pre-ponderance. As at Caen, twenty-two years before, an oath of fidelity to the Roman pontiff was imposed on every student admitted to a degree. 4 That this proviso was not subsequently

1 Bekynton's Correspondence, 1. 123.

2 De la Rue, Essais hist, sur la ville de Caen, ii. 137-140.

3 Meiners i. 368.

4 Paulsen, in speaking of this proviso as one " die weder vorher

noch nachher sonst vorkommt,' would consequently seem to be not quite accurate. See Die Griindung der deutschen Universitaten, p. 277.

Basel.

Ingol- siadt.

Treves.

abolished, as at Caen, is a feature in the history of the university of Ingolstadt which was attended by important results. No- where did the Reformation meet with more stubborn resistance, and it was at Ingolstadt that the Counter-Reformation was commenced. In 1556 the Jesuits made their first settlement in the university.

The next two universities took their rise in the archiepiscopal seats of Treves and Mainz. That at Treves received its charter as early as 1450; but the first academical session did not commence until 1473. Here the ecclesiastical influences appear to have been unfavourable to the project. The arch-bishop demanded 2000 florins as the price of his sanction. The cathedral chapter threw difficulties in the way of the appropria- tion of certain livings and canonries to the university endow- ment; and so obstinate was their resistance that in 1655 they succeeded in altogether rescinding the gift on payment of a very- inadequate sum. It was not until 1722 that the assembly of deputies, by a formal grant, relieved the university from the difficulties in which it had become involved. The university of Mainz, on the other hand, was almost entirely indebted to the archbishop Diether for its foundation. It was at his petition that Sixtus IV. granted the charter, 23rd November 1476; and Diether, being himself an enthusiastic humanist, thereupon circulated a letter, couched in elegant Latinity, addressed to students throughout his diocese, inviting them to repair to the new centre, and dilating on the advan- tages of academic studies and of learning. The rise of these two universities, however, neither of which attained to much dis- tinction, represents little more than the incorporation of certain already existing institutions into a homogeneous whole, the power of conferring degrees being superadded.

Nearly contemporaneous with these foundations were those of

Upsala (1477) and Copenhagen (1479), which, 'although lying without the political boundaries of Germany, Upsala reflected her influence. The charter for Copenhagen and was given by Sixtus IV. as early as 1475. The Copen- students attracted to this new centre were mainly hagen. from within the radius of the university of Cologne, and its statutes were little more than a transcript of those of the latter foundation.

The electorates of Wittenberg and Brandenburg were now the only two considerable German territories which did not possess a " studium generale," and the university founded at Wittenberg by Maximilian I. (6th July 1502) is Yergˆ.""" notable as the first established in Germany by virtue of an imperial as distinguished from a papal decree. Its charter is, however, drawn up with the traditional phraseology of the pontifical bulls, and is evidently not conceived in any spirit of antagonism to Rome. Wittenberg is constituted a " studium generale " in all the four faculties — the right to confer degrees in theology and canon law having been sanctioned by the papal legate some months before, on the 2nd of February 1502. The endowment of the university with church revenues duly received the papal sanction — a bull of Alexander VI. authorizing the appropriation of twelve canonries attached to the castle church, as well as of eleven prebends in outlying districts — ut sic per omnem modum unum corpus ex studio et collegia praedictis fiat et constituatur. No university in Germany attracted to itself a larger share of the attention of Europe at its commencement. And it was its distinguishing merit that it was the first academic centre north of the Alps where the antiquated methods and bar- barous Latinity of the scholastic era were overthrown. p n ak- The last university founded in Germany prior to the fort-on- Reformation was that of Frankfort-on-the-Oder. The the-oder. design, first conceived by the elector John of Brandenburg, was carried into execution by his son Joachim, at whose request Pope Julius II. issued a bull for the foundation, 15th March 1506. An imperial charter, identical in its contents with the papal bull, followed on the 26th of October. The university received an endowment of canonries and livings similar to that of Wittenberg, and some houses in the city were assigned for its use by the elector.

The first university in Scotland was that of St Andrews, founded in 141 1 by Henry Wardlaw, bishop of that see, and modelled chiefly on the constitution of the university

St Andrews.

of Paris.

Glasgow.

Aberdeen.

It acquired all its three colleges — St Salvator's, St Leonard's and St Mary's — before the Reformation — the first having been founded in 1456 by Bishop James Kennedy; the second in 1512 by the youthful Arch- bishop Alexander Stuart (natural son of James IV.), and John Hepburn, the prior of the monastery of St Andrews; and the third, also in 1512, by the Beatons, who in the year 1537 procured a bull from Pope Paul III. dedicating the college to the Blessed Virgin Mary of the Assumption, and adding further endowments. The most ancient of the universities of Scotland, with its three colleges, was thus reared in an atmosphere of medieval theology, and undoubtedly designed as a bulwark against heresy and schism. But " by a strange irony of fate," it has been observed, " two of these colleges became, almost from the first, the foremost agents in working the overthrow of that church which they were founded to defend." St Leonard's more especially, like St John's or Queens' at Cam- bridge, became a noted centre of intellectual life and Reformation principles. That he " had drunk at St Leonard's well " became a current expression for implying that a theologian had imbibed the doctrines of Protestantism. The university of Glasgow was founded as a " studium generate " in 1453, and possessed two colleges. Prior to the Reformation it acquired but little celebrity; its discipline was lax, and the number of the students but small, while the instruction was not only inefficient but irregularly given; no funds were pro- vided for the maintenance of regular lectures in the higher faculties; and there was no adequate executive power for the maintenance of discipline. The university of Aberdeen, which was founded in 1494, at first possessed only one college, namely, King's, which was coextensive with the university and conferred degrees. Marischal College, founded in 1593 by George Keith, fifth Earl Marischal, was constituted by its founder independent of the university in Old Aberdeen,

being itself also a college and a university, with the power of conferring degrees. Bishop Elphinstone, the founder both of the university and of King's College (1505), had been educated at Glasgow, and had subsequently both studied and taught at Paris and at Orleans. To the wider experience which he had thus gained we may probably attribute the fact that the constitution of the university of Aberdeen was free from the glaring defects which then characterized that of the university of Glasgow. 1 But in all the medieval universities of Germany, England and Scotland, modelled as they were on a common type, the absence of adequate discipline was, in a greater or less degree, a common defect. In connexion with this feature we may note the comparatively small percentage of matriculated students proceeding to the degree of B.A. and M.A. when compared with later times. Of this disparity the table on next Degrees column, exhibiting the relative numbers in the uni- taken at versity of Leipzig for every ten years from the year Lepxg. I42 ˆ t0 jjj 2j probably affords a fair average illustra- tion — the remarkable fluctuations probably depending quite as much upon the comparative healthiness of the period (in respect of freedom from epidemic) and the abundance of the harvests as upon any other cause.

The German universities in these times seem to have admitted for the most part their inferiority in learning to older and more favoured centres; and their consciousness of the fact is shown by the efforts which they made to attract in- structors from Italy, and by the frequent resort of the more ambitious students to schools like Paris, Bologna, Padua and Pavia. That they took their rise in any spirit of systematic opposition to the Roman see (as Meiners and others have contended), or that their organiza- tion was something external to and independent of the church, is an assertion somewhat qualified by the foregoing evidence. Generally speaking, they were eminently conservative bodies, 1 Fasti Aherdnnenses, Pref. p. xvi.

General aspects of German medieval univer- sities.

Matricu-

i ~ — -— — — ~ '

Percentage of

Years.

lations.

Years.

B.A.

M.A.

B.A's.

M.A's.

1 42 7-1 430

737

1 429-1 432

151

28

20-4

3-8

1 437-1440

715

1439-1442

199

50

27-8

6-9

1447-1450

808

1449-1452

274

(50)

33-9

1457-1460

1,447

1459-1462

559

81

38-6

5-6

1 467-1470

1. 137

1 469-1 472

410

61

36-0

5-4

1477-1480

1,163

1479-1482

458

49

39-4

4-2

1487-1490

1,858

1489-1492

7H

62

38-4

3-4

1497-1500

1,288

1499-1502

497

59

38-5

4-6

1 507-1 5 10

1,948

1 509-1 5 12

5io

65

26-1

3-4

151 7-1520

1,445

1519-1522

247

35

17-0

2-4

1527-1530

419

1 529-1 532

77

33

18-4

7-9

1537-1540

686

1 539-1 542

122

27

17-8

3-9

1 547-1 550

1,318

1 549-1 552

200

72

15-2

5-5

14,969

4418

672

29-5

4-5

and the new learning of the humanists and the new methods of instruction that now began to demand attention were alike for a long period unable to gain admission within academic circles. Reformers such as Hegius, John Wessel and Rudolphus Agricola carried on their work at places like Deventer remote from univer- sity influences. That there was a considerable amount of mental activity going on in the universities themselves is not to be denied; but it was mostly of that unprofitable kind which, while giving rise to endless controversy, turned upon questions in connexion with which the implied postulates and the terminology employed rendered all scientific investigation hopeless. At almost every university — Leipzig, Greifswald and Prague (after 1409) being the principal exceptions — the so-called Realists and Nominalists represented two great parties occupied with an internecine struggle. At Paris, owing to the overwhelming strength of the theologians, the Nominalists were indeed under a kind of ban; but at Heidelberg they had altogether expelled their antagonists. It was much the same at Vienna and at Erfurt — the latter, from the ready reception which it gave to new speculation, being styled by its enemies " novorum omnium portus." At Basel, under the leadership of the eminent Johannes a Lapide, the Realists with difficulty maintained their ground. Freiburg, Tubingen and Ingolstadt, in the hope of diminishing controversy, arrived at a kind of compromise, each party having its own professor, and representing a distinct " nation." At Mainz the authorities adopted a manual of logic which was essentially an embodiment of Nominalistic principles. In Italy, almost without exception, it was decided that these controversies were endless and that their effects were pernicious. It was resolved, accordingly, to expel logic, and allow its place to be filled by rhetoric. It was by virtue of this decision, which was of a tacit rather than a formal character, that the expounders of the new learning in the 15th century — men like Emmanuel Chrysoloras, Guarino,

Leonardo Bruni, Bessarion, Argyropulos and Valla — carried into effect that important revolution in academic studies which constitutes a new era in university learning, and largely helped to pave the way for the Reformation. 2 This discourage ment of the controversial spirit, continued as it was in relation to theological questions after the Reformation, obtained for the Italian universities a fortunate immunity from dissensions like those which, as we shall shortly see, distracted the centres of learning in Germany. The professorial body also Hj ■ B rem attained to an almost unrivalled reputation. It was putation exceptionally select, only- those who were in receipt ot Italian of salaries being permitted, as a rule, to lecture; it £™ es " was also famed for its ability, the institution of con- current chairs proving an excellent stimulus. These chairs were of two kinds — " ordinary " and " extraordinary " — the former being the more liberally endowed and fewer in number. For each subject of importance there were thus always two and sometimes three rival chairs, and a powerful and continuous emulation was thus maintained among the teachers. " From

2 For an excellent account of this movement, see Georg Voigt, Die Wiederbelebung des classischen Alterthums (2nd ed., 2 vols., 1880).

Abandon- ment of logical studies In Italy.

Valencia,

Seville.

Granada.

the integrity of their patrons, and the lofty standard by which they were judged," says Sir W. Hamilton, " the call to a Paduan or Pisan chair was deemed the highest of all literary honours. The status of professor was in Italy elevated to a dignity which in other countries it has never reached; and not a few of the most illustrious teachers in the Italian seminaries were of the proudest nobility of the land. While the universities of other countries had fallen from Christian and cosmopolite to sectarian and local schools, it is the peculiar glory of the Italian that, under the enlightened liberality of their patrons,

they still continued to assert their European universality. Creed and country were in them no bar — the latter not even a reason of preference. Foreigners of every nation are to be found among their professors; and the most learned man in Scotland, Thomas Dempster, sought in a Pisan chair that theatre for his abilities which he could not find at home." 1

To such catholicity of sentiment the Spanish universities during the same period offer a complete contrast, their history being so strongly modified by political and religious movements that some reference to these becomes indispensable. Valencia, founded in 1 501 as a school not only of the- ology and of civil and canon law, but also of the arts and of medi- cine, and sanctioned at the petition of its council by Alexander VI. (see Denifle, i. 645-46), and Seville, sanctioned by Julius II. in 1505, appear both to have been regarded without mistrust at Rome. But although the latter pontiff had approved the foundation of the university of Santiago as early as 1504, the bull for its creation was not granted by Clement VII. until 1526. While, again, the design of establishing a university at Granada had been approved by' Charles V. in the same year, it was not until 1531 that Clement gave his consent, and even then the work of preparation was deferred for another six years. Little indeed is to be learnt respecting the new society until the foundation of the liberally endowed College de Sacro Monte by the archbishop of the province in 1605. These delays are partly to be accounted for by the well-known political jealousies that existed between the monarch and the pontiff; but it is also to be noted that at precisely the same period a movement of no slight importance, whereby it was sought to gain the recognition by the church of the writings and teaching of Erasmus, had been going on in the universities of Spain, and had ultimately died out. It died out at the uncreating voice of the Dominican Melchior Cano, who revived the ancient scholasticism and the teaching of Aquinas. Then followed the Jesuits, whom Cano himself had once denounced as " precursors of Antichrist," and under their direction the scholastic philo- sophy, together with a certain attention to Greek and Hebrew, became the dominant study. And when the council of Trent had done its work, and doctrinal controversy seemed to have been finally laid to rest, Gregory XIII. in 1574 authorized the foundation of the university of Oviedo; but this was not opened until 1608, and then only with a faculty of law. After this time the universities in Spain shared in the

general decline of the country; and even after the expulsion of the Jesuits in 1769 no marked improvement is discernible in their schools. On the contrary, the departure of a body of very able instructors, who, whatever objections might be taken to their doctrinal teaching, were mostly good scholars and men in close touch with the outer world, distinctly favoured that tendency to lifeless routine and unreasoning tradition which characterizes the Spanish universities until the second half of the 19th century.

The comparative unimportance of the universities founded during the same period in Italy is partially explained by the Italian number of those which previously existed. In the papal states Macerata and Camerino were founded at a wide interval; the former, according to tradition, Macerata. Dy a DU n f Nicholas IV. as early as the 13th century, Camerino. the i atter not unti i the year iy27 Dy a t> u u of Benedict XIII. Macerata, however, ceased to exist as a university in the last century, retaining only a faculty of law, but contributing 1 Hamilton, Discussions, 2nd ed. p. 373.

Oviedo.

univer- sities.

*to the maintenance of the medical faculty at Camerino, which was constituted one of the newly created " free universities " (along with Urbino, Ferrara and Perugia) in 1890, but continued to exist only with the aid of contributions levied on the local parishes. Urbino, originally »**"> • opened as a studium under papal patronage in 1671, was also constituted a free university, its chief study being that of law. At Modena there had long existed a faculty of the same study which enjoyed a high repute, but it was °< > ena \ not until 1683 that it received its charter from Duke Francis II. of Este as the university of his capital. Like Camerino, Modena had to rely chiefly on funds collected in the commune, but was able nevertheless to acquire some reputation as a school of law and medicine, declining, when the Jesuits were installed by the Austrian authorities, to revive again in the general recovery which took place among the seats of learning after the unification of Italy. In Sicily, Palermo (1779) originated skll in an earlier institution composed mainly of subjects of Ferdinand IV., who had followed him on his ex- ern "><«*

pulsion from the throne of the Two Sicilies at Naples towards the end of the 18th century. It was closed in 1805, but re-opened in 1850 to become a school of considerable importance in all the faculties with over 1000 students. The two universities of Sardinia — Sassari (1634)and Cagliari (1596) — s H were founded under the Spanish rule, and both died out when that rule was exchanged for that of Austria. Under " s ar ' the auspices of the house of Savoy they were re-established, but neither can be said to have since achieved any marked success.

For the most part, however, the Reformation represents the great boundary line in the history of the medieval universities, and long after Luther and Calvin had passed away was still the main influence in the history of those new foundations which arose in Protestant countries. Even in Catholic countries its secondary effects were scarcely less perceptible, as they found expression in connexion with the Counter Reformation. In Germany the Thirty Years' War was attended by con sequences which were felt long after the 17th century. In France the Revolution of 1789 resulted in the actual uprooting of the university system.

*The influence of the Humanists, and the special character which it assumed as it made its way in Germany in connexion with the labours of scholars like Erasmus, John Reuchlin and Melanchthon, augured well for the future. It was free from the frivolities, the pedantry, the immoralities and the scepticism which characterized so large a proportion of the corresponding culture in Italy. It gave promise of resulting at once in a critical and enlightened study of the masterpieces of classical antiquity, and in a reverent and yet rational interpretation of the Scriptures and the Fathers. The fierce bigotry and the ceaseless controversies evoked by the pro- nkious mulgation of Lutheran or Calvinistic doctrine dispelled, influences however, this hopeful prospect, and converted what ofs «*ar- might otherwise have become the tranquil abodes aflsm * of the Muses into gloomy fortresses of sectarianism. Of the manner in which it affected the highest culture, the observa- tion of Henke in his Life of Calixtus (i. 8), that for a century after the Reformation the history of Lutheran theology becomes almost identified with that of the German universities, may serve as an illustration.*

The first Protestant university was that of Marburg, founded by Philip the Magnanimous, landgrave of Hesse, 30th May

1527. Expressly designed as a bulwark of Lutheranism, it was mainly built up out of the confiscation of the ar urg ‘ property of the religious orders in the Hessian capital. The house of the Dominicans, who had fled on the first rumour of spoliation, was converted into lecture-rooms for the faculty of jurisprudence. The church and convent of the order known as the ” Kugelherrn ” was appropriated to the theological faculty. The friary of the Barefooted Friars was shared be- tween the faculties of medicine and philosophy. The university, which was the object of the landgrave’s peculiar care, rapidly rose to celebrity; it was resorted to by students from remote

countries, even from Greece, and its professors were of distin- guished ability. How much, however, of this popularity depended on its theological associations is to be seen in the fact that after the year 1605, when, by the decree of Count Maurice, its formulary of faith was changed from Lutheran to Calvinistic, its numbers greatly declined. This dictation of the temporal power now becomes one of the most notable features in academic history in Protestant Germany. The universities, having repudiated the papal authority, while that of the episcopal order was at an end, now began to pay especial court to the temporal ruler, and sought in every way to con- ciliate his goodwill, representing with peculiar distinctness the theory — cujus regio, ejus religio. This tendency was further strengthened by the fact that their colleges, bursaries and other similar foundations were no longer derived from or supported by ecclesiastical institutions, but were mainly dependent on the civil power.

The Lutheran university of Konigsberg was founded 17 th August 1544 by Albert III., margrave of Brandenburg, and the first duke of Prussia, and his wife Dorothea, a teˆf” Danish princess. In this instance, the religious character of the foundation not having been determined at the commencement, the papal and the imperial sanction were both applied for, although not accorded. King Sigismund of Poland, however, which kingdom exercised at that time a protectorate over the Prussian duchy, ultimately gave the necessary charter (29th September 1561), at the same time ordaining that all students who graduated as masters in the faculty of philosophy should

rank as nobles of the Polish kingdom. When Prussia was raised to the rank of a kingdom (1701) the university was made a royal foundation, and the " collegium Fridericianum," which was then erected, received corresponding privileges. In 1862 the university buildings were rebuilt, and the number of the students soon after rose to nearly a thousand.

The Lutheran university of Jena had its origin in a gymnasium founded by John Frederick the Magnanimous, elector of Saxony, during his imprisonment, for the express purpose of promoting Evangelical doctrines and repairing the loss of Wittenberg, where the Philippists had gained the ascendancy. Its charter, which the emperor Charles V. had refused to grant, and which was obtained with some difficulty from his brother, Ferdinand I., enabled the authorities to open the university on the 2nd of February 1558. Dis- tinguished for its vehement assertion of Lutheran doctrine, its hostility to the teaching of Wittenberg was hardly less pro- nounced than that with which both centres regard Roman Catholicism. For a long time it was chiefly noted as a school of medicine, and in the 17th and 18th centuries was in bad repute for the lawlessness of its students, among whom duelling prevailed to a scandalous extent. The beauty of its situation and the eminence of its professoriate have, however, generally attracted a considerable proportion of students from other countries. Its numbers in 1906 were 1281.

The Lutheran university of Helmstedt, founded by Duke Julius (of the house of Brunswick- Wolf enbiittel), and designated after him in its official records as " Academia Julia," Itedt' received its charter, 8th May 1575, from the emperor Maximilian II. No university in the 16th century commenced under more favourable auspices. It was muni- ficently endowed by the founder and by his son; and its " Convictorium," or college for poor students, expended in the course of thirty years no less than 100,000 thalers, an extra- ordinary expenditure for an institution of such a character in those days. Beautifully and conveniently situated in what had now become the well-peopled region between the Weser and the lower Elbe, and distinguished by its comparatively temperate maintenance of the Lutheran tenets, it attracted a considerable concourse of students, especially from the upper classes, not a few being of princely rank. Throughout its history, until suppressed in 1809, Helmstedt enjoyed the special and powerful patronage of the dukes of Saxony.

Giesseo.

The " Gymnasium Aegidianum " of Nuremberg, founded in 1526, and removed in 1575 to Altdorf, represents the origin of the university of Altdorf. A charter was granted AMorf . in 1578 by the emperor Rudolph II., and the university was formally opened in 1580. It was at first, however, em- powered only to grant degrees in arts; but in 1623 the emperor Ferdinand II. added the permission to create doctors of law and medicine, and also to confer crowns on poets; and in 1697 its faculties were completed by the permission given by the emperor Leopold I. to create doctors of theology. Like Louvain, Altdorf was nominally ruled by the municipality, but in the latter university this power of control remained practically inoperative, and the consequent freedom enjoyed by the community from evils like those which brought about the decline of Louvain is thus described by Hamilton: " The decline of that great and wealthy seminary (Louvain) was mainly determined by its vicious patronage, both as vested in the university and in the town. Altdorf, on the other hand, was about the poorest university in Germany, and long one of the most eminent. Its whole endowment never rose above £800 a year; and, till the period of its declension, the professors of Altdorf make at least as distinguished a figure in the history of philosophy as those of all the eight universities of the British empire together. On looking closely into its constitution the anomaly is at once solved. The patrician senate of Nuremberg were too intelligent and patriotic to attempt the exercise of such a function. The nomination of professors, though formally ratified by the senate, was virtually made by a board of four curators; and what is worthy of remark, as long as curatorial patronage was a singularity in Germany, Altdorf maintained its relative pre-eminence, losing it only when a similar mean was adopted in the more favoured universities of the empire." 1

The conversion of Marburg into a school of Calvinistic

doctrine gave occasion to the foundation of the universities

of Giessen and of Rinteln. Of these the former,

founded by the margrave of Hesse-Darmstadt, Louis V.,

as a kind of refuge for the Lutheran professors from Marburg,

received its charter from the emperor Rudolph II. (19th May 1607). When, however, the margraves of Darmstadt acquired possession of Marburg in 1625, the university was transferred thither; in 1650 it was moved back again to Giessen. The number of matriculated students, which at the beginning of last century was about 250, had risen before its close to over 800. In common with the other universities of Germany, but with a facility which obtained for it a specially unenviable reputation, Giessen was for a long time wont to confer the degree of doctor in absentia in the different faculties without requiring adequate credentials. This practice drew forth an emphatic protest from the eminent historian Mommsen, and was abandoned long before his death. The university Rlnte i,,, of Rinteln was founded 17th July 162 1 by the emperor Ferdinand II. Almost immediately after its foundation it became the prey of contending parties in the Thirty Years' War,

and its early development was thus materially hindered. It never, however, attained to much distinction, and in 1819 it was suppressed. The university of Strassburg was founded in 162 1 on the basis of an already existing academy, strass- to which the celebrated John Sturm stood, during the ˆ "”'• ? • latter part of his life, in the relation of " rector perpetuus " and of which we are told that in 1578 it included more than a thousand scholars, among whom were 200 of the nobility, 24

counts and barons and three princes. It also attracted students from all parts of Europe, and especially from Portugal, Poland, Denmark, France and England. The method of Sturm's teaching became the basis of that of the Jesuits, and through

them of the public school instruction in England. In 1621 Ferdinand II. conferred on this academy full privileges as a university; in the language of the charter, " in omnibus facultatibus, doctores, licentiatos, magistros, et baccalaureos, atque insuper poetas laureates creandi et promovendi." 2 In 1681

1 Discussions, &c., 2nd ed., pp. 388-89.

2 Promulg. Acad. Privil., &c. (Strassburg, 1628).

Peters- burg.

Kiev. Odessa.

Strassburg became French, and remained so until 1872, when it was refounded by the Emperor William I., and before the close of the century numbered over 1100 students.

At the beginning of last century Russia possessed but three Moscow universities — that of Moscow (175s), founded by ' the Empress Elizabeth; of Wilna (1578), which was Polish and chiefly in the hands of the Jesuits; and of orpa . Dorpat [Yuriev] in Livonia, which was virtually German. Under the enlightened policy of Alexander I. was founded the university of Charkow (1804) for New Russia, _. . that of Kazan (1804) for the countries about the

Volga, but designed also for the populations of Fin- Kasan. land and Siberia, and that of St Petersburg (1819). St Each of the foregoing six universities had a definite

district assigned to it, from whence it was entitled to recruit students, and, as a further incentive to the pur- suit of academic studies, a ukaz promulgated in 1809 proclaimed that in all appointments to official posts throughout the empire the holders of a university degree would receive the first consideration in the competition for vacancies. In 1826 the uni-

versity at Abo in Finland was removed to Helsingfors, tors. "' an d st iU preserves the charter whereby, in its original home, it had been constituted a university by Queen Christina and her chancellor Oxenstiern in the year 1640. In 1832 the foundation of the St Wladimir University of Kiev absorbed both that at Wilna and the lyceum of Kre- menetz. Odessa, founded in 1865, was designed to represent the university of New Russia. Although at St Petersburg considerable attention was regularly given to the teaching of languages, especially those of Armenia, Georgia, and Tatary, the general status of the Russian uni- versities continued throughout the greater part of last century exceptionally low; and in 1884 they were all reconstituted by the promulgation of a "universal code"; with this the statutes of the universities at Dorpat (1632) and Warsaw (1886) are essentially in agreement. The former, originally founded at the suggestion of the governor-general, with the design of bringing " martial Livonia into the path of virtue and mor- ality," was at first almost exclusively taught by German pro- fessors, of whom, however, very few had retained their chairs at the conclusion of last century. The study of the Slavonic languages, on the other hand, received a considerable stimulus; and when, by a decree in May 1887, the use of the Russian language was made obligatory in all places of instruction throughout the Baltic provinces, Russian began to displace German as the language of the lecture-room, the only faculties in which the use of German continued to be permissible being _. . those of theology and medicine. The university of Tomsk in western Siberia, founded in 1888, recruited its numbers chiefly from students in the same faculties. It was, however, without endowment, and depended chiefly on a grant from the state aided by private liberality.*

During the ensuing twenty years the general influence of Dorpat rapidly spread far beyond the Baltic provinces, while the number of students, which in 1879 was 1106, rose oi Dorpat. to near ly 2000. 1 In 1889, however, the appointment of the university officials was taken from the Senatus Academicus and entrusted to the state minister, a change which went far to deprive the university of its claim to be considered German. A like contest between contending nationalities met with a final solution at Prague, where a Czech university having been established on an independent basis, the German university began its separate career in the winter session of 1882-83. The German foundation retains

certain revenues accruing from special endowments, but the state subvention is divided between the two.

The repudiation on the part of the Protestant universities of both papal and episcopal authority evoked a counter-demonstration among those centres which still adhered to Catholicism, while their theological intolerance gave rise to a great reaction, under the influence of which the medieval Catholic univer- 1 See Die deutsche Universitat Dorpat im Lichte der Geschichte, 1882.

Prague.

Breslau.

sities were reinvigorated and reorganized (although strictly on the traditional lines), while new and important centres were created. It was on the tide of this reaction, aided by their own skilful teaching and practical sagacity, that the Jesuits were borne to that commanding position which made them for a time the arbiters of education in Europe. The earliest university whose charter represented this reaction was that of _ . Bamberg, founded by the prince-bishop Melchior Otto, after whom it was named " Academia Ottoniana." It was opened 1st September 1648, and received both from the emperor Frederick III. and Pope Innocent X. all the civil and ecclesiastical privileges of a medieval foundation. At first, however, it comprised only the faculties of arts and of theology; to these was added in 1729 that of jurisprudence, and in 1764 that of medicine. In this latter faculty Dr Ignatius Dollinger (the father of the historian) was for a long time a distinguished professor. The university library is of especial interest, as including that of an earlier Jesuit foundation and also valuable collections by private donors. Its collection of manuscripts in like manner includes those contained in some thirty suppressed monasteries, convents, and religious institutions at the time of the " secularization." The university of Innsbruck was founded in 1672 by the emperor Leopold I., from whom it received its name of " Academia Leopoldina." In the following century, under the patronage of the empress Maria Theresa, it made considerable progress, and received from her its ancient library and bookshelves in 1745. In 1782 the brock. university underwent a somewhat singular change, being reduced by the emperor Joseph II. from the status of a uni- versity to that of a lyceum, although retaining in the theological faculty the right

of conferring degrees. In 1791 it was restored to its privileges by the emperor Leopold II., and since that time the faculties of philosophy, law and medicine have been repre- sented in nearly equal proportions. The foundation of the university of Breslau was contemplated as early as the year 1505, when Ladislaus, king of Hungary, gave his sanction to the project; but Pope Julius II., in the assumed interests of Cracow, withheld his assent.

Nearly two centuries later, in 1702, under singularly altered conditions, the Jesuits prevailed upon the emperor Leopold I. to found a university without soliciting the papal The sanction. When Frederick the Great conquered Jesuits in Silesia in 1741, he took both the university and the the uni- Jesuits in Breslau under his protection, and when in rerslt y- 1774 the order was suppressed by Clement XIV. he estab- lished 'them as priests in the Royal Scholastic Institute, at the same time giving new statutes to the university. In 181 1 the university was considerably augmented by the incorporation of that at Frankfort-on-the-Oder, and was ultim- ately reconstituted on lines similar to those of the newly founded university of Berlin. In no country was the influence of the Jesuits on the universities more marked than in France. The civil wars in that country during the thirty years which preceded the close of the 16th century told with disastrous effects upon the condition of the university of Paris, and with

the commencement of the 17th century its collegiate _ .... it 1 1 1 ..- 11 1 Condition

life seemed at an end, and its forty colleges stood ofthe

absolutely deserted. To this state of affairs the Univer- obstinate conservatism of the academic authorities s J ty . of not a little contributed. The statutes by which the ars " university was still governed were those which had been given by the cardinal D'Estouteville, the papal legate, in 1452, and remained entirely unmodified by the influences of the Renais- sance. In 1579 the edict of Blois promulgated a scheme of organization for all the universities of the realm (at that time twenty-one in number)— a measure which, though productive of unity of teaching, did nothing towards the advancement of the studies themselves. The theological instruction became largely absorbed by the episcopal colleges, and acquired, in the schools of the different orders, a narrower and more dogmatic

character. The eminent lawyers of France, unable to find chairs in Paris, distributed themselves among the chief towns

of the provinces. Tbe Jesuits did not fail to profit by this immobility and excessive conservatism on the part of the university, and during the second half of the 16th century and the whole of the 17th they had contrived to gain almost a complete monopoly of both the higher and the lower education of provincial France. Their schools rose at Toulouse and Bordeaux, at Auch, Agen, Rhodez, Perigueux, Limoges, Le Puy, Aubenas, Colleges Beziers, Tournon, in the colleges of Flanders and Lor- ofthe raine, Douai and Pont-a-Mousson — places beyond Jesuits la the jurisdiction of the parlement of Paris or even France. o £ ˆ crown Q f France. Their banishment from Paris itself had been by the decree of the parlement alone, and had never been confirmed by the crown. " Lyons," says Pattison, " loudly demanded a Jesuit college, and even the Huguenot Lesdiguieres, almost king in Dauphin6, was preparing to erect one at Grenoble. Amiens, Rheims, Rouen, Dijon, and Bourges were only waiting a favourable opportunity to introduce the Jesuits within their walls." 1 The university was rescued from the fate which seemed to threaten it only by the excellent statutes given by Richer in 1 598, and by the discerning protection extended to it by Henry IV., while its higher culture was in some measure provided for by the establishment by Richelieu in 1635 of the Academie francaise.

The " college of Edinburgh " was founded by charter of James VI., dated 14th April 1582. This document contains no reference to a studium generate, nor is there ground burgh. f° r supposing that the foundation of a university was at that time contemplated. In marked contrast to the three older centres in Scotland, the college rose comparatively untrammelled by the traditions of medievalism, and its creation was not effected without some jealousy and opposition on the part of its predecessors. Its first course of instruction was commenced in the Kirk of Field, under the direction of Robert Rollock, who had been educated at St Andrews under Andrew Melville, the eminent Covenanter. " He began to teach," says Craufurd, " in the lower hall of the great lodging, there being a great concourse of students allured with the great worth of the man;

but diverse of them being not ripe enough in the Latin tongue, were in November next put under the charge of Mr Duncan Name, . . . who, upon Mr Rollock's recommendation, was chosen second master of the college." 2 In 1585 both Rollock and Nairne subscribed the National Covenant, and a like subscription was from that time required from all who were admitted to degrees in the college.

Disastrous as were the effects of the Thirty Years' War upon the external condition of the German universities, resulting Results ' D no ' a ˆ ew i nstances m t ne total dispersion of the ot the students and the burning of the buildings and libraries, Thirty they were less detrimental and less permanent than those which were discernible in the tone and temper of these communities. Aformalpedantryand unintelligent method of study, combined with a passionate dogmatism in matters of religious belief and a rude contempt for the amenities of social intercourse, became the leading characteristics, and lasted throughout the 17th century. But in the year 1693 the foundation of the university of Halle opened up a career to two very eminent men, whose influence, widely different as was its character, may be compared for its effects with that of Luther and Melanchthon, and served to modify the whole current of German philosophy and German theology. Halle has indeed been described as " the first real modern uni- versity." It was really indebted for its origin to a spirit of rivalry between the conservatism of Saxony and the progressive tendencies of the house of Brandenburg, but the occasion of its rise was the removal of the ducal court from Halle to Magde- burg. The archbishopric of the latter city having passed into the possession of Brandenburg in 1680 was changed into a duke-dom, and the city itself was selected as the ducal residence. This change left unoccupied some commodious buildings in Halle, which it was decided to utilize for purposes of education.

1 Life of Casaubon, p. 181.

2 Craufurd, Hist, of the Univ. of Edinburgh, pp. 19-28.

years' War.

Halle.

A " Ritterschule " for the sons of the nobility was opened, and

*in the course of a few years it was decided to found a university. Saxony endeavoured to thwart the scheme, urging the proximity of Leipzig; but her opposition was overruled by the emperor Leopold I., who granted (19th October 1693) the requisite charter, and in the following year the work of the university commenced. Frankfort-on-the-Oder had by this time become a centre of the Reformed party, and the primary object in founding a university in Halle was to create a centre for the Lutheran party; but its character, under the influence of its two most notable teachers, Christian Thomasius and A. H. Francke, soon expanded i n tiuence beyond the limits of this conception to assume a highly of Thomˆ original form. Thomasius and Francke had both aslus “> < * been driven from Leipzig owing to the disfavour Fraacke - with which their liberal and progressive tendencies were there regarded by the academic authorities, and on many points the two teachers were in agreement. They both regarded with contempt alike the scholastic philosophy and the scholastic theology; they both desired to see the rule of the civil power superseding that of the ecclesiastical power in the seats of learn- ing; they were both opposed to the ascendancy of classical studies as expounded by the humanists — Francke regarding the Greek and Roman pagan writers with the old traditional dislike, as immoral, while Thomasius looked upon them with con- tempt, as antiquated and representing only a standpoint which had been long left behind; both again agreed as to the desira- bility of including the elements of modern culture in the educa- tion of the young. But here their agreement ceased. It was the aim of Thomasius, as far as possible, to secularize education, and to introduce among his countrymen French habits and French modes of thought; his own attire was gay and fashionable, and he was in the habit of taking his seat in the professorial chair adorned with gold chain and rings, and with his dagger by his side. Francke, who became the leader of the Pietists, re- garded all this with even greater aversion than he did the lifeless orthodoxy traditional in the universities, and was shocked at the worldly tone and disregard for sacred things which characterized his brother professor. Both, however, com- manded a considerable following among the students. Thom- asius was professor in the faculty of jurisprudence, Francke in that of theology. And it was a common prediction in those days with respect to a student who proposed to pursue his aca- demic career at Halle, that he would infallibly become either an atheist or a Pietist. But the services rendered by Thomasius*

to learning were genuine and lasting. He was the first to set the example, soon after followed by all the universities of Germany, of lecturing in the vernacular instead of in the customary Latin; and the discourse in which he first departed from the traditional method was devoted to the consideration of how far the German nation might with advantage imitate the French in matters of social life and intercourse. His more general views, as a disciple of the Cartesian philosophy and founder of the modern Rationalismus, exposed him to incessant attacks; but by the establishment of a monthly journal (at that time an original idea) he obtained a channel for expounding his views and refuting his antagonists which gave him a great advantage. On the influence of Francke, as the founder of that Pietistic school with which the reputation of Halle afterwards became especially identified, it is unnecessary here to dilate. 3 Christian Wolf, who followed Thomasius as an assertor of the new culture, was driven from Halle by the accusations of the Pietists, who declared that his teaching was fraught with atheistical prin- ciples. In 1740, however, he was recalled by Frederick II., and reinstated in high office with every mark of consideration and respect. Throughout the whole of the 18th century Halle was the leader of academic thought and advanced theology in Pro- testant Germany, although sharing that leadership, after the middle of the century, with Gottingen. The university of .., Gottingen (named after its founder "Georgia Augusta ") ^^ was endowed with the amplest privileges as a university by George II. of England, elector of Hanover, 7th December 8 See Paulsen, Gesch. des gelehrten Unlerrichts, &c, pp. 348-58.

1736. The imperial sanction of the scheme had been given three years before (13th January 1733), and the university v/ as formally opened 17th September 1737. The king himself assumed the office of " rector magnificentissimus," and the liberality of the royal endowments (doubling those of Halle), and the not less liberal character of the spirit that pervaded its organization, soon raised it to a foremost place among the schools of Germany. Halle had just expelled Wolf; and Gottingen, modelled on the same lines as Halle, but rejecting its Pietism and disclaiming its intolerance, appealed with remark- able success to the most enlightened feeling of the

time. It included all the faculties, and two of its first professors — Mos- heim, the eminent theologian, from Helmstedt, and G. L. Boh- mer, the no less distinguished jurist from Halle — together with Gesner, the man of letters, at once established its reputation. Much of its early success was also due to the supervision of its chief curator (there were two) — Baron Miinchhausen, himself a man of considerable attainments, who by his sagacious super- intendence did much to promote the general efficiency of the whole professoriate. Not least among its attractions was also its splendid library, located in an ancient monastery, and now containing over 200,000 volumes and 5000 MSS. In addition to its general influence as a distinguished seat of learning, Gottingen may claim to have been mainly instrumental in diffusing a more adequate conception of the importance of the study of history. Before the latter half of the 18th century the mode of treatment adopted by university lecturers was singu- larly wanting in breadth of view. Profane history was held of but little account, excepting so far as it served to illustrate ecclesiastical and sacred history; while this, again, was invariably treated in the narrow spirit of the polemic, intent mainly on the defence of his own confession, according as he represented the Lutheran or the Reformed Church. The labours of the pro- fessors at Gottingen, especially Putter, Gatterer, Schlozer and Spittler, combined with those of Mascov at Leipzig, did much towards promoting both a more catholic treatment and a wider scope. Not less beneficial was the example set at Gottingen of securing the appointment of its professors by a less prejudiced and partial body than a university board is only too likely to become. " ' The Great Miinchhausen,' says an illustrious professor of that seminary, ' allowed our university the right of presenta- tion, of designation, or of recommendation, as little as the right of free election; for he was taught by experience that, although the faculties of universities may know the individuals best qualified to supply their vacant chairs, they are seldom or never disposed to propose for appointment the worthiest within their knowledge.'" 1 The system of patronage adopted at Gottingen was, in fact, identical with that which had already been insti- tuted in the universities of the Netherlands by Douza. The

university of Erlangen, a Lutheran centre, was founded

by Frederick, margrave of Baireuth. Its charter was granted by the emperor Charles VII., 21st February 1743, and the

university was formally constituted, 4th November. From its special guardian, Alexander, the last margrave of Ansbach, it was styled " Academia Alexandrina." In 1791, Ansbach and Baireuth having passed into the possession of Prussia, Erlangen also became subject to the Prussian government, and, as the 19th century advanced, her theological faculty became distinguished by the fervour and ability with which it championed the tenets of Lutheranism.

On comparison with the great English universities, the universities of Germany must be pronounced inferior both in point

of discipline and of moral control over the students. English The superiority of the former in these respects is and aen- partly to be attributed to the more systematic care man uni- w hich they took, from a very early date, for the super- compared. y i s i° n °f eac h student, by requiring that within a

certain specified time after his entry into the university

he should be registered as a pupil of some master of arts,

who was responsible for his conduct, and represented him

generally in his relations to the academic authorities. Mar-

1 Hamilton, Discussions, p. 381.

burg in its earliest statutes (those of 1529) endeavoured to establish a similar rule, but without success. 2 The development of the collegiate system at Oxford and Cambridge materially assisted the carrying out of this discipline. Although again, as in the German universities, feuds were not unfrequent, especi- ally those between " north " and " south " (the natives of the northern and southern counties), the fact that in elections to fellowships and scholarships only a certain proportion were allowed to be taken from either of these divisions acted as a considerable check upon the possibility of any one college representing either element exclusively. In the German uni- versities, on the other hand, the ancient division into nations, which died out with the 15th century, was revived under another form by the institution of national colleges, which largely served to foster the spirit of rivalry and contention. The demoraliza- tion induced by the Thirty Years'

War and the increase of duelling intensified these tendencies, which, together with the tyranny of the older over the younger students, known as " Pennalismus," were evils against which the authorities con- tended, but ineffectually, by various ordinances. The institution of " Burschentum," having for its design the encouragement of good fellowship and social feeling irrespective of nationality, served only as a partial check upon these excesses, which again received fresh stimulus by the rival institution of " Landsmann- schaften," or societies of the same nationality. The latter proved singularly provocative of duelling, while the arrogant and even tyrannical demeanour of their members towards the unassociated students gave rise to a general combination of the latter for the purposes of self-defence and organized re- sistance.

The political storms which marked the close of the 18th and the beginning of the 19th century gave the death-blow to not a few of the ancient universities of Germany. Extinc Mainz and Cologne ceased to exist in 1798; Bamberg, tion of Dillingen and Duisburg in 1804; Rinteln and Helm- German s'tedt in 1809; Salzburg in 1810; Erfurt in 1816. iles rfu/ J Altdorf was united to Erlangen in 1807, Frankfort- on- Ingi79&- the-Oder to Breslau in 1809, and Wittenberg to Halle l8,s ' in 181 5. The university of Ingolstadt was first moved in 1802 to Landshut, and from thence in 1826 to Munich, where it was united to the academy of sciences which was founded in the Bavarian capital in 1759. Munster in Prussia was for the first time constituted a university in four faculties by Maximilian Frederick (elector and archbishop) in 1771. Its charter was confirmed by Clement XIV. in 1773, and again by the Emperor Joseph II. The university was abolished in the year 1818; but two faculties, those of theology and philosophy, continued to exist, and in 1843 it received the full privileges of a Prussian university together with the designa- tion of a royal foundation. Of those of the above centres which altogether ceased to exist, but few were much missed or regretted — that at Mainz, which had numbered some six hundred students, being the one notable exception. The others had for the most part fallen into a perfunctory and lifeless mode of teaching, and, with wasted or diminished revenues and declining numbers, had long ceased worthily to represent the functions of a uni- versity, while the more studious in each centre were harassed by the frequency with which it was made an arena for political demonstrations. Whatever loss may have attended

their sup- pression was more than compensated by the activity and influence of the three great German universities which rose in the last century.

Munich, after having been completely reorganized, soon became a distinguished centre of study in all the faculties; and

2 " Volumus neminem in hanc nostram Academiam admitti, aut per rectorem in album recipi, qui non habeat privatum atque domesticum praeceptorem, qui ejus discipulum agnoscat, ad cujus judicium quisque pro sua ingenii capacitate atque Marte lecturas et publicas et privatas audiat, a cujus latere aut raro aut nunquam discedat." Koch expressly compares this provision with the discipline of Oxford and Cambridge, which, down to the commencement of the present century, was very much of the same character (Koch, Gesch. des ocademischen Padagogiums in Marburg, p. 11).

Munich.

Miinster.

Bonn.

its numbers, allowing for two great wars, have been continuously on the increase, the eminence of its professoriate, among whom have been Dbllinger, Liebig, Schelling, Zeuss and Giesebrecht, having attracted students from all parts of Europe.

The university of Berlin, known as the Royal Friedrich Wil- helm University, was founded in 1809, immediately after the _ .. peace of Tilsit, when Prussia had been reduced to the

level of a third-rate Power. Under the guiding in- fluence of Wilhelm von Humboldt, however, supported by the strong purpose of Frederick William III., the principles adopted in connexion with the new seat of learning not only raised it to a foremost place among the universities of Europe, but also largely conduced to the regeneration of Germany. It had not only incorporated at the time of its foundation the famous " Academy of Sciences " of the city, but expressly repudiated all

attachment to any particular creed or school of thought, and professed subservience only to the interests of science and learning. " Each of the eminent teachers with whom the university began its life — F. A. Wolfe, Fichte, Savigny, Reil — represented only himself, the path of inquiry or the completed theory which he had himself propounded. Its subsequent growth was astonishing, and before the 19th century closed the number of its matriculated students exceeded that of every other university except Vienna."

The university of Bonn, founded in 1818 and also by Friedrich Wilhelm III., thus became known as the Rhenish Friedrich

Wilhelm University — it being the design of the founder

to introduce into the Rhine provinces the classic literature and the newly developed scientific knowledge of Germany proper. With this aim he summoned to his aid the best available talent, among the earlier instructors being Niebuhr, A. W. von Schlegel, with C. F. Nasse in the faculty of medicine and G. Hermes in that of theology. In the last-named faculty it further became noted for the manner in which it combined the opposed schools of theological doctrine — that of the Evangelical (or Lutheran) Church and that of the Roman Catholic Church here standing side by side, and both adorned by eminent names. After the war with Austria in 1859 the German universities underwent a considerable change owing to the enforced military service required by the law of 1867; and the events of 1870 were certainly not disconnected with the martial spirit which had been evoked in the student world, while in the universities themselves there had risen up a new and more lively interest in political affairs.

In 1878 a comparison of the numbers of the students in the different faculties in the Prussian universities with those for

the year 1867 showed a remarkable diminution in the

tionso't faculty of theology, amounting in Lutheran centres to

numbers more than one-half, and in Catholic centres to nearly

in the three-fourths. In jurisprudence there was an increase

*faculty of j near iy two-fifths, in medicine a decline of a third, theology**

and in philosophy an increase of one-fourth.

The universities of the United Provinces, like those of Protestant Germany, were founded by the state as schools for the u . m maintenance of the principles of the Reformation and shies of the education of the clergy, and afforded in the 16th United and 17th centuries a grateful refuge to not a few of p f °" those Huguenot crPort-Royalistscholars whompersecu-

tion compelled to flee beyond the boundaries of France, as well as to the Puritan divines who were driven from England. The earliest, that of Leiden (in what was then the county of Holland), founded in 1575, commemorated the gallant and successful resistance of the citizens to the Spanish forces under Requesens. Throughout the 17th century Leiden was distinguished by its learning, the ability of its professors, and the shelter it afforded to the more liberal thought associated at that period with Arminianism. Much of its early success was owing to the wise provisions and the influence of the celebrated Janus Douza: — " Douza's principles," says Hamilton, " were those which ought to regulate the practice of all aca- demical patrons; and they were those of his successors. He knew that at the rate learning was seen prized by the state in

Leiden.

the academy, would it be valued by the nation at large

He knew that professors wrought more even by example and influence than by teaching, that it was theirs to pitch high or low the standard of learning in a country, and that, as it proved easy or arduous to come up with them, they awoke either a restless endeavour after an even loftier attainment, or lulled into a self-satisfied conceit." Douza was, for Leiden and the Dutch, what Miinchhausen afterwards was for Gottingen and the German universities. " But with this difference: Leiden was the model on which the younger universities of the republic were constructed; Gottingen the model on which the older universities of the empire were reformed. Both Miinchhausen and Douza proposed a high ideal for the schools founded under their auspices; and both, as first curators, laboured with paramount influence in realizing this ideal for the same long period of thirty-two years. Under their patronage Leiden and Gottingen took the highest place among the universities of Europe; and both have only lost their relative supremacy by the

application in other seminaries of the same measures which had at first determined their superiority." The appointment of the professors at Leiden was vested in three (afterwards five) curators, one of whom was selected from the body of the nobles, while the other two were appointed by the states of the pro- vince — the office being held for nine years, and eventually for life. With these was associated the mayor of Leiden for the time being. The university of Francker was „ . founded in 1585 on a somewhat less liberal basis than Leiden, the professors being required to declare their assent to the rule of faith embodied in the Heidelberg Catechism and the confession of the " Belgian Church." Its four faculties were those of theology, jurisprudence, medicine, and "the three languages and the liberal arts." 1 For a period of twelve years (c. 1610-22) the reputation of the university was enhanced by the able teaching of William Ames (" Amesius '"), a Puritan divine and moralist who had been driven by Archbishop Bancroft from Cambridge and from England. His fame and ability are said to have attracted to Franeker students from Hungary, Poland and Russia.

With similar organization were founded the universities of Harderwijk (1600), Groningen (1614) and Utrecht (1634), the last-named being much frequented in the 18th Harder- century by both English and Scottish students who w#- repaired thither to obtain instruction of a kind that Qronin- Oxford and Cambridge at that time failed altogether ge " m to impart — more than a fourth of the students of Utrecht. Utrecht about the year 1736 being of those nationalities. In the 19th century, however, political considerations began seri- ously to diminish such intercourse between different centres, and during the first Napoleon's tenure of the imperial dignity the universities in both the "kingdom of Holland" and the Austrian Netherlands (as they were then termed) were in great peril. But on the settlement of Europe in 1814-15 the restoration of the house of Orange and consequent formation of the " kingdom of the Netherlands " brought both realms under a single rule. The universities of Franeker and Harder- wijk were suppressed, and those of Ghent and Liege created, while a uniform constitution was given both to the cheat Dutch and Belgian universities. It was also provided that there should be attached to each a board of '*

curators, consisting of five persons, " distinguished by their love of literature and science and by their rank in society," to

be nominated by the king, and at least three of them to be chosen from the province in which the university was situated, the other two from adjacent provinces. After the lapse of another fifteen years, however, the kingdom of the Netherlands having been reduced to its present limits and the kingdom of Belgium (identical for the most part with the Austrian Netherlands) newly created, an endeavour was made in dealing with the whole question of secondary education to give a fuller recog- nition to both traditional creeds and ethnic affinities. At Louvain, the chief Catholic centre, the faculties of law, medicine 1 Statuta et Leges (Franeker, 1647), p. 3.

Brussels.

Norway.

Lund.

Upsala.

and philosophy had already, in 1788, been removed to Brussels • — an almost unique example of a university which owed its origin neither to a temporal nor an ecclesi- astical authority — and in 1834 Brussels was constituted a free and independent university with a new fourth faculty of natural science, and supported mainly by contributions from the Liberal party. Having, however, no charter, it continued incapable by law of possessing property. While Louvain and Brussels thus represented to a great extent the two chief political parties in the realm, the universities of Ghent on the Scheldt and Liege on the Meuse recruited their students mainly from the two chief races — the Flemish and the Walloon. In Holland, on the other hand, where no such marked racial differences exist, the universities of Groningen, Leiden and Utrecht have been assimilated (1876) in constitution, each being administered by a consistory of five rectors with a senate composed of the professors in the respective faculties. The foundation of the university of Amsterdam (1877) more than repaired dam er ~ ˆ e ‘ oss °ˆ Franeker and Harderwijk, and the progress of this new centre during the first ten years of its exist- ence was remarkably rapid. The higher education of

women has made some progress in the Netherlands.

In Sweden the foundation of the university of Upsala, sanctioned in 1477 by Sixtus IV. as a studium generale on the . model of Bologna, was followed at a long interval by

shies of that of Lund (1666), which was created during the Sweden minority of Charles XL with statutes and privileges and almost identical with those of Upsala and with an

endowment largely derived from the alienated revenues of the chapter of the cathedral. The students were recruited from Denmark, Germany and Sweden; and Puffendorf, the civilian, was one of its first professors. During Charles's reign its resources were in turn confiscated, and the university itself was closed in 1676 in consequence of the war with Denmark. When again opened it remained for a long time in a very depressed condition, from which it failed to rally until the 19th century, when it took a new departure, and the erection of its handsome new buildings (1882) invested it with additional attractions. The royal university of Upsala, roused to new life in the 17th century by the introduction of the Cartesian philosophy, has been throughout (notwithstanding its singularly chequered history), the chief home of the higher Swedish education. In the 18th century lectures began to be delivered in Swedish; while the medieval division of the students into " nations " continued, as at Lund, until the second quarter of the 19th. The various changes and events during the interesting period 1872 to 1897 have been recorded at length in the national tongue by Reinhold Geijer in a handsome quarto which appeared in 1897. Gothenburg, on the other hand, with its society of science and literature, dating from 1841, has represented rather a popular institution, existing independently of the state, maintained chiefly by private contributions, and governed by a board called the Curatorium. For a long time it was not empowered to hold examinations. Stockholm (1878) still remains a gymnasium, but its curriculum is to a certain extent supplemented by its connexion with Upsala, from which it is little more than forty miles distant by rail. The university of Christiania in Norway, founded in 181 1, and the Swedish universities are strongly Lutheran in character; and all alike are closely associated with the ecclesiastical institutions of the Scandinavian kingdoms. The same observation applies to Copenhagen — where, however, the labours of Rask and Madvig have done much to

sustain the reputation of the university for learning. The royal university of Kiel was founded in 1665 by Duke Christian Albrecht of Holstein (who himself assumed the office of rector) with faculties of theology, law, medicine and philosophy. It maintained its ground, although not without difficulty, amid the feuds that frequently arose between its dukes and the kings of Denmark, and under the rule of Catherine II. of Russia and after the incorporation of Schleswig-Holstein with the kingdom of Denmark made a

Chris- Uanla.

Kiel

marked advance. In the latter half of last century it acquired new buildings and rose into high reputation as a school of chemistry, physiology and anatomy, while its library in 1904 exceeded 250,000 volumes.

The number of universities founded in the last century is in striking contrast to the paucity which characterizes the two preceding centuries, an increase largely resulting, however, from the needs of English colonies and dependencies. In the Mediterranean, Genoa (1812), Messina (1838) and Genoa. Marseilles (1854) were foundations which supplied a Messina. genuine want and have gradually attained to a fair Mar- measure of success. The first had previously existed seiiies. as a school of law and medicine, but when, along with the rest of the Ligurian republic, it became incorporated in the empire under Napoleon L, the emperor, in order to conciliate the population, raised it to the rank of a university in 18 12. The university subsequently fell into the hands of the Jesuits, who maintained their tenure of the principal chairs until the unification of the Italian kingdom under Victor Emmanuel, when Messina, which had been founded during the rule of the Bourbons over the Two Sicilies, became similarly included under Italian rule. Of Marseilles mention has above been made.

In France the fortunes of academic learning were even less happy than in Germany. The university of Dole in Franche Comt6 had for two hundred years been a flourishing D g le ˆ

centre of higher education for the aristocracy, and was consequently regarded with envy by Besancon. In 1691,

however, when the country had been finally ceded to France, and Savoy had been subjugated by the arms of Catina, Louis XIV. was induced, on the payment of a considerable sum, to transfer the university to Besancon. Here it forthwith acquired enhanced importance under the direction of the Jesuits. But in 1722, on the creation of a university at Dijoti, the oiion, faculty of law was removed to that city, where it continued to exist until the Revolution.

The university of Paris indeed was distracted, throughout the 17 th century, by theological dissensions — in the first instance owing to the struggle that ensued after the u n { ve r- Jesuits had effected a footing at the College de Cler- sityot mont, and subsequently by the strife occasioned by Paris the teaching of the Jansenists. Its studies, discipline f”””” tBe and numbers alike suffered. Towards the close of the century a certain revival took place, and a suc- cession of illustrious names — Pourchot, Rollin, Grenaa, Coffin, Demontempuys, Crevier, Lebeau — appear on the roll of its teachers. But this improvement was soon interrupted by the controversies excited by the promulgation of the bull Uni- genitus in 17 13, condemning the tenets of Quesnel, when Rollin himself, although a man of singularly pacific disposition, deemed it his duty to head the opposition to Clement XL and the French episcopate. At last, in 1762, the parlement of Paris issued a decree (August 6) placing the colleges of the Jesuits at the disposal of the university, and this was immediately followed by another for the expulsion of the order from Paris, the university being installed in possession of their vacated premises. Concurrently with this measure, the curriculum of prescribed studies assumed a more hopeful character, and both history and natural science began to be cultivated with a certain success. These innovations, however, were soon lost sight of in the more sweeping changes which followed upon the Revolution. On the 15th of September 1793 the universities and colleges throughout France, together with the faculties of theology, medicine, jurisprudence and arts, were abolished by a decree of the convention, and the whole system of national education may be said to have remained in abeyance, until, in 1808, Napoleon I. promulgated the scheme which in its essential features is almost identical with that which at present obtains — the whole system of education, both secondary and primary, being made subject to the control and direction of the state. In pursuance of this conception, the ” university of

France," as it was henceforth styled, became little more

17th century.

UNIVERSITIES

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than an abstract term 1 signifying collectively the various centres of professional education in their new relations to the state. All France was divided into seventeen districts, designated " academies," each administered by its own rector and council, but subject to the supreme authority of the minister of public instruction, and representing certain faculties which varied at different centres in conformity with the new scheme of distribution for the entire country.

While, accordingly, three new " academies " — those of Lille, Lyons and Rennes — date their commencement from 1808, Lille many of the pre-existing centres were completely sup-

*Lyons pressed. In some cases, however, the effacement «"< * of an ancient institution was avoided by investing*

Rennes. j t ^^ new importance, as at Grenoble; in others, the vacated premises were appropriated to new uses connected with the department, as at Avignon, Cahors and Perpignan. Each rector of an " academy " was also constituted president of a local conseil d'enseignement, in conjunction with which he nominated the professors of lycees and the communal schoolmasters, 2 these appointments being subsequently ratified by a promotion committee sitting in Paris. In 1895, however, 1 sth – t ^ ie g° vernnlent was prevailed upon to sanction the Hon of institution of certain " free faculties," as they were " free termed, to be placed under the direction of the bishop, faculties." an(j depending for support upon voluntary contribu- tions, and each including a faculty of theology. The faculty at Marseilles, on the other hand, which originated in an earlier " faculty of sciences " founded in 1854, was now called upon to share the governmental grant with Aix, and the two centres became known as the Academie d'Aix-Marseille — Alx .j. M "' the faculties in the latter being restricted to mathe- ' ' matics and natural science (including a medical

school), while faculties of law and philosophy were fixed at Aix, which possesses also the university library properly so

termed. In the capital itself, the university of Paris and the Ecole Pratique des Hautes Etudes carried on the work of higher instruction independently of each other — the former with faculties of Protestant theology, law, medicine, science, letters and chemistry distributed over the Quartier Latin; the latter with schools of mathematics, natural science, history, philology, and history of religions centred at the Sorbonne.

*The College de France, founded in the 16th century by Francis I., was from the first regarded with hostility both by the university and by the Sorbonne. It became, Sfoce * however, so highly esteemed as a school of gratuitous instruction in Latin, Greek and Hebrew, that it not only held its ground, but at the Revolution ultimately sur- vived alike the universities and their hostility. As reconstituted in 1 83 1 it became chiefly known as an institution for the in- struction of adults, and its staff of professors, some fifty in number (including their deputies), has comprised from time to time the names of not a few of the most distinguished scholars and men of science in the country. The university of Strassburg, which in the latter part of the 18th century had been distinguished by an intellectual activity which became associated with the names of Goethe, Herder and others, was also swept away by the Revolution. It was re- vived in 1804 as a Protestant " academy," but four years later incorporated in the newly created " academy " of Nancy, with a faculty of Protestant theology which lasted only until*

1818.

In Switzerland the universities shared in the conflicts handed down from the days when the Helvetic republic had been first created, and each with somewhat similar ex- periences. In 1832, Basel having joined the Sarner Blind or League of the Catholic Cantons, the Con- federates divided the canton into two, and agreed to raise the

S trass burg.

Switzer- land.

1 It retains a certain professional meaning, in that a student studying for the " university " is understood to be one who is himself aiming at the profession of a teacher in a lycee.

s The preset of the department has since taken the place of the

rector with regard to nominations.

xxvn. 25

ZUrlch.

Bern.

Lausanne.

Geneva.

flourishing Hochschule which already existed at Zurich to the rank of a university — a measure which may be said to mark a turning-point in the history of the higher education of the republic. In 1839, however, the teaching of D. F. Strauss, who had been installed in the chair of theology at Zurich soon after his expulsion from Tubingen, gave rise to a popular demonstration which not only brought about the overthrow of the governing body, but placed the existence of the university itself in jeopardy. But the storm was success- fully weathered, and in 1859 the statutes were revised and a considerable addition made to the professoriate. The gym- nasium of Bern, originally established under the teaching of Ulrich Zwingli, developed in 1834 into a university with all the faculties, those of medicine and philo- sophy rising with the advance of the century into high repute. As early as 1586 Lausanne had been a noted school for the education of Protestant ministers, but it was not until 1806 that chairs of philosophy and law were estab- lished, to which those of natural science and literature were added in 1836, and, somewhat later, that of medicine. It was not, however, until 1891 that Lausanne was formally consti- tuted a university. At Geneva the famous academy of the 1 6th and 17th centuries, long distinguished as a centre of Calvinistic teaching, became merged in 1876 in a university, where the instruction (given mainly in the French language) was carried on by a staff of forty-one professors. With this was also incorporated an earlier school of science, in which De Saussure and De Candolle had once been teachers. Fribourg, founded in 1889 as a university of the canton so named, began with only two faculties — those of Fr,bour Z' law and philosophy, to which one of theology was added in the following year. A certain spirit of innovation character- ized most of the Swiss universities at this time, especially in connexion with female education. At Zurich, in 1872 (and

some- what later at Geneva and Bern), women were admitted to the lectures, and in 1892 were permitted themselves to lecture, a lady, Frau Dr Emilie Kempin, succeeding to the chair of Roman law. At Fribourg the proposition was first brought forward that all professors should be appointed only for a specified period, a limitation which along with other questions affecting the professorial body gave rise to much divergence of opinion.

In Spain the act of 1857 introduced a radical change similar to that in France, the whole system of education being placed under the responsible control of the minister for that depart- ment, while the entire kingdom was at the same time divided into ten university districts — Madrid, Barcelona, Granada, Oviedo, Salamanca, Santiago, Seville, Valencia, Valladolid and Saragossa — the rector of the universities in each district repre- senting the chief authority. The degrees to be conferred at each were those of bachelor, licentiate and doctor. Each university received a rector of its own, selected s P a,a a/ ”’ by the government from among the professors, and a ° ” g ‘ precise plan of instruction was prescribed in which every hour had its appointed lecturer and subject. Philosophy, natural science, law and medicine were to be studied at all these uni- versities, and at the majority a school of chemistry was sub- sequently instituted, except at Oviedo, which was limited to a faculty of law and a school for notaries. But at Salamanca, Valladolid, Seville and Saragossa no school of chemistry was instituted, and at the first three that of medicine ultimately died out. No provision was made for instruction in theology, this being relegated to the seminaries in the episcopal cities. The university of Manila in the Philippines was opened in 1601 as a school for the nobility, and ten years later the famous college of St Thomas was founded by the Dominican order; but it was not until 1857 that the university, properly speaking, was founded by royal Spanish decree. In Portugal, coimbra Coimbra, which narrowly escaped suppression in the 16th century and was removed from 1380 to 1537 to Lisbon, has long been a flourishing school. Its instruction is given gratis; but, as all members of the higher courts of judicature and administration in the realm are required to have graduated

Italy.

at the university, it is at the same time one of the most aristocratic schools in Europe. Of its five faculties, theology, jurisprudence, medicine, mathematics and philosophy, that of law is by far the most flourishing, the number of students in this faculty nearly equalling the aggregate of all the rest. In 1772 the university received new statutes and was to a great extent reorganized. There is a valuable library, largely composed of collections formerly belonging to suppressed convents. As a school of theology Coimbra has always been distinctly anti-ultramontane.

In Italy, as in Spain, education for the church has been relegated almost entirely to the numerous "seminaries," where it is of an almost entirely elementary character. In 1875 a laudable effort was made by R. Bonghi, the minister of education, to introduce reforms and to assimilate the universities in their organization and methods to the German type. His plans were, however, to a great extent reversed by his successor, Coppino.

In Austria the universities, being modelled on the same system as those of the German Empire, present no especially Austria-noteworthy features, except that the sphere of the Hungary, functions of a rector corresponds precisely with that of Vknna. t ne rector in those German universities which have no curator, and the faculties are represented by the ordinary professors as a body along with two representatives of the " Privatdozents." Vienna has long been chiefly distinguished for its school of medicine, which enjoyed in the last century a reputation almost unrivalled in Europe. The other faculties were, however, suffered to languish, and throughout the first half of the last century the whole university was in an extremely depressed state. From this condition it was in a great measure restored by the exertions of Count Thun. The university of Olmiitz, founded in 1581, was formerly in possession of what is now the imperial library, and contained also a valuable collection of Slavonic works, which were carried off by the Swedes and ultimately dispersed. It was suppressed in 1853, and is now represented only by a theological faculty. The

university of Graz, the capital of Styria, was founded in 1586, and has long been one of the most flourishing centres, with nearly 2000 students, chiefly in law and philo- Salzburg. sophy. The university of Salzburg, founded in 1623, Lemberg. w-as suppressed in 1810; that of Lemberg, founded in 1784 by the Emperor Joseph II., was removed in 1805 to Cracow and united to that university. In 181 6 it was opened on an independent basis. In the bombardment of the town in 1848 the university buildings were burnt down, and the site was changed to what was formerly a Jesuit convent. The fine library and natural history museum were at the same time almost entirely destroyed. The most recent foundation is that of Czernowitz (1875), with faculties of theology (Greek Church), law and political economy, and philosophy. The universities of the Hungarian kingdom are three in number: — Budapest, originally founded at Tyrnau in 1635 under the auspices of the Jesuits, now possessing four faculties — theology, jurisprudence, medicine and philo- sophy (number of professors in 1903, 180; students, 3223); Kolozsvar (Klausenburg), the chief Magyar centre, founded in Kiausen- J ˆ 2 anc ˆ a ˆ so comprising four faculties, but where burg. mathematics and natural science supply the place of

theology; Zagrab (Agram), the Slovack university, in Croatia, originally founded by Maria Theresa in 1776 from some suppressed schools of the Jesuits, and reopened in 1874 with three faculties, viz. jurisprudence, theology and philosophy. The chief centre of Protestant education is the college at Debreczen, founded in breezes. l 53 l > which in past times was not infrequently sub- sidized from England. It has faculties of law and theology, courses of instruction in philosophy, and a school for teachers, and possesses a fine library.

In Japan there are two imperial universities — Tokyo (1868) and Kioto (1897)— the former representing the union of two pre-existing foundations, on which occasion it was placed under

Olmiitz.

Oraz.

Czer- nowitz.

Budapest.

Agram.

Athens.

the control of the minister of instruction with yearly grants from the treasury The ordinary course of studies j aBan was limited to three years, that of medicine being extended to four. Kioto was formed out of four previously existing colleges of law, medicine, science and engineering.

The " National University " of Athens (founded May 22, 1837) was modelled on the university systems of northern Germany, on a plan originally devised by Professor Brandis. It originally included only four faculties, viz. theology, jurisprudence, medicine and philosophy, to which one of applied mathematics was subsequently added.

In European Turkey the university of Jassy (i860) in Rumania was founded by its ruler, Prince Cuza, and together with the newly founded university of Bucharest received its Turkey completed organization in 1864. Both were constituted and state institutions and were represented in the senate, Bulgaria. although not receiving any fixed revenues from the govern- ment. Its students are instructed and examined gratuit- ously. In the university of Sophia (1888) in Bulgaria, faculties were established, in the course of the ensuing four years, of history, philology, physics, mathematics and jurisprudence, the main object in view being the training of competent teachers of schools and of lawyers, and affording them the means of gaining an intelligent insight into the real wants of the native population. The university of Constantinople was founded in 1900 at the jubilee festival in honour of the sultan's succession to the throne. It included five faculties and was placed under the control of a director and sub-director, the former being invested with authority over teachers and scholars alike.

The history of the two English universities during the 16th and following centuries has presented, for the most part, features which contrast strongly with those of the continental The ' seats of learning. Both suffered severely from con- English fiscation of their lands and revenues during the period u "' vep " of the Reformation, but otherwise have generally s!nce tne enjoyed a remarkable immunity from the worst con- medieval sequences of civil and political strife and actual period. warfare. Both long remained centres chiefly of theological

teach- ing, but their intimate connexion at once with the state and with the Church of England, as " by law established," and the modi- fications introduced into their constitutions, prevented their becoming arenas of fierce polemical contentions like those which distracted the Protestant universities of Germany.

The influence of the Renaissance, and the teaching of Erasmus, who resided for some time at both universities, exercised a notable effect alike at Oxford and at Cambridge, influence The names of Colet, Grocyn and Linacre illustrate this of the influence at the former centre; those of Bishop Fisher, Renals- Sir John Cheke and Sir Thomas Smith at the latter. sance ' The labours of Erasmus at Cambridge, as the author of a new Latin version of the New Testament, with the design of placing in the hands of students a text free from the errors of the Vulgate, were productive of important effects, and the university became a centre of Reformation doctrine _. some years before the writings of Luther became known neforma- in England. The foundation of Christ's College (1505) tion at and St John's College (1511), through the influence of P"" Fisher with the countess of Richmond, also materi- ally aided the general progress of learning at Cambridge. The Royal Injunctions of 1535, embodying the views and designs of Thomas Cromwell, mark the downfall of the old scholastic methods of study at both universities; and the foundation of Trinity College, Cambridge, in 1547 (partly by an amalgamation of two older societies), represents the earliest conception of such an institution in England in complete inde- pendence of Roman Catholic traditions. Trinity (1554) and St John's (1555) at Oxford, on the other hand, founded during the reactionary reign of Mary, serve rather as examples of a transitional period.

In the reign of Elizabeth Cambridge became the centre of another great movement — that of the earlier Puritanism, St John's and Queens' being the strongholds of the party led

Puritan Ism at Cam- bridge.

by Cartwright, Walter Travers and others. Whitaker, the

eminent master of St John's, although he sympathized to some extent with these views, strove to keep their expres- sion within limits compatible with conformity to the Church of England. But the movement continued to gather strength; and Emmanuel College, founded in 1584, owed much of its early prosperity to the fact that it was a known school of Puritan doctrine. Most of the Puritans objected to the discipline enforced by the university and ordinary college statutes — especially the wearing of the cap and the surplice and the conferring of degrees in divinity. The Anglican Eliza- P art y> headed by such men as Whitgift and Bancroft,

bethan resorted in defence to a repressive policy, of which statutes subscription to the Acts of Supremacy and Uniformity, otiS70. an(j t 2j e Elizabethan statutes of 1570 (investing the " caput " with larger powers, and thereby creating a more oligarchical form of government), were the most notable results. Oxford, although the Puritans were there headed by Leicester, the chancellor, devised at the same time a similar scheme, the rigid discipline of which was further developed in the Laudian or Caroline statutes of 1636. It was under these Laudian respective codes — the Elizabethan statutes of 1570 and statutes the Laudian statutes of 1636 — that the two universities ofi636. W ere governed until the introduction of the new codes of 1858. The fidelity with which both universities adhered to the royal cause in the Civil War caused them to be regarded with suspicion by the Puritan party, and under the Commonwealth both Oxford and Cambridge were for a brief period in great danger owing to the distrust, which culminated among the members of the " Nominated Parliament " (July- December 1653), of university education generally, as tending to foster contentiousness with respect to religious belief. It was even proposed by William Dell — himself the master of Caius College — to abolish the two universities altogether, as hopelessly pledged to antiquated and obsolete methods, and to establish in their place schools for the higher instruction throughout the country. They were saved, however, by the firmness of Crom- well, at that time chancellor of Oxford, and, although Aristotle and the scholastic philosophy no longer held their ground, a marked improvement was observable both in discipline and morality among the students, and the prescribed studies were assiduously pursued. At Oxford, under the influence and teaching of Dr Wilkins, Seth Ward and John Wallis, a flourishing school of mathematics

was formed at a time when the study had died out at Cambridge.

After the Restoration Cambridge became the centre of a remarkable movement (a reflex of the influence of the Cartesian philosophy), which attracted for a time considerable attention. Its leaders, known as the Cambridge Platonists, among whom Henry More, Cudworth and Whichcote were especially conspicuous, were men of high character and great learning, although too much under the influence of an ill-restrained enthusiasm and purely speculative doctrines. The spread of the Baconian philosophy, and the example of a succession of eminent scientific thinkers, among whom were Isaac Barrow, master of Trinity (1673-77), the two Lucasian pro- fessors, Isaac Newton (prof. 1669-1702) and his successor William Whiston (prof. 1 702-1 1), and Roger Cotes (Plumian prof. 1707-16), began to render the exact sciences more and more an object of study, and the institution of the tripos examinations in the course of the first half of the 18th century established the reputation of Cambridge as a school of mathematical science. At Oxford, where the study had in turn declined, and where the statutable requirements with respect to lectures and exercises were suffered to fall into neglect, the degeneracy of the whole community as a school of academic culture is attested by evidence too emphatic to be gainsaid. The moral tone at both universities was at this time singularlylow ; andthe rise of Methodism as associated with the names of the two Wesleys and Whitefield at Oxford and that of Berridge at Cambridge, operated with greater effect upon the nation at large than

The Cam- bridge Platonlst move- ment.

The New- tonian philo- sophy.

Method- ism.

on either of the two centres where it had its origin. With the advance of the next century, however, a perceptible change took place. The labours of Charles Simeon at Cam- bridge, in connexion with the Evangelical party, and ˆm. the far more celebrated movement known as Trac- _

*T rflCiAn**

tarianism, at Oxford, exercised considerable influence anism. in developing a more thoughtful spirit at either university. At both centres, also, the range of studies was extended: written examinations took the place of the often merely formal viva voce ceremonies; at Cambridge the study of the classics was raised in 1824 to the dignity of a new tripos. The number of the students at both universities in- creased, the matriculations at each rising to over four hundred. Further schemes of improvement were put forward and discussed. And in 1850 it was decided by the government to appoint com- missioners to inquire what additional reforms might advantage- ously be introduced. Their recommendations were not all carried into effect, but the main results were as ot°858. follows: " The professoriate was considerably increased, reorganized and re-endowed, by means of contributions from colleges. The colleges were emancipated from their medieval statutes, were invested with new constitutions, and acquired new legislative powers. The fellowships were almost universally thrown open to merit, and the effect of this was not merely to provide ample rewards for the highest academical attainments, but to place the governing power within colleges in the hands of able men, likely to promote further improvements. The number and value of scholarships were largely augmented, and many, though not all, of the restrictions upon them were abolished. The great mass of vexatious and obsolete oaths was swept away; and, though candidates for the M.A. degree and persons elected to fellowships were still required to make the old subscriptions and declarations, it was enacted that no religious test should be imposed at matriculation or on taking a bachelor's degree." '

In 1869 a statute was enacted at Cambridge admitting students as members of the university without making . it imperative that they should be entered at any s / n„/ hall or college, but simply be resident either with non-col- their parents or in duly licensed lodgings. legiate

The entire abolition of tests followed next. After s ' u

*In 1877 the reports of two new commissions were followed by further changes, the chief features of which were the diversion of a certain proportion of the revenues of the colleges to the uses of the university, especially */ «™ S with a view to the encouragement of studies in natural science; the enforcement of general and uniform regulations with respect to the salaries,*

selection and duties of professors, lecturers and examiners; the abolition (with a few exceptions) of all clerical restrictions on headships or fellowships; and the limitation of fellowships to a uniform amount.

That these successive and fundamental changes were on the whole in unison with the national wishes and requirements may fairly be inferred from the remarkable increase in numbers at both universities, especially at Cambridge, where the number of undergraduates, which in 1862 was 1526, rose in 1887 to 2979. In the academic year 1862-63 the number of matricula- tions was 448, and in 1906-7 1083. The following universities and colleges, twenty-two in number, have since, in the MtuiaUi order of their enumeration, sought and received the unlver- privilege of affiliation: University College, Notting- s,iles ““d ham; university of Sheffield; university of Adelaide; eo ” e ˆ es ‘ St David's College, Lampeter; university of Calcutta; university college of Wales, Aberystwyth; university of New Zealand; university of the Cape of Good Hope; university of Allahabad; Punjab University; university of Bombay; university of Toronto; St Edmund's College, Ware; university of Madras; university of Sydney; M'Gill University, Montreal; university of Tasmania; university of New Brunswick; Hartley University 1 Brodrick, University of Oxford, pp. 136, 137.

College, Southampton; University College of South Wales and Monmouthshire, Cardiff; university of King's College, Windsor, Nova Scotia; university of Queen's College, Kingston, Ontario.

The changes introduced by the legislation of 1877 have been gradually carried out as the occurrence of vacancies in the colleges has made possible the appropriation of portions of their revenue for the foundation of professorships and other university purposes, though in some cases the intentions of the com- missioners have been frustrated by the effects of agricultural depression upon college revenues. The general effect of the revolution has been a marked diminution in the clerical character of the college teaching bodies, the conversion of the college „ rtfi teaching staff from a temporary employment for

changes bachelors awaiting livings or other preferment into a at Oxford permanent profession, and the growth of a resident and cam- an(j working university professoriate. At the same time a change of almost equal significance has taken place in the teaching system of the university through the gradual growth of " inter-collegiate lectures." At Oxford nearly all honour lectures given by college tutors and lecturers have been thrown open to all members of the university: the college tutor is now recognized by the university as a teacher in the faculty to which he belongs, and the institution of boards of faculties has done something to bring the organization of the university into harmony with that of universities outside the British Isles. 1 At Cambridge the system of inter-collegiate lectures has also developed itself, but to a considerably smaller extent. At both the old English universities the great widening of the courses of study open to senior students (honour men), which began about the middle of the 19th century, has been continued, while there has been some widening and modernizing of the studies by which a pass or " poll " degree can be obtained. At Oxford there are now the following " Final Honour Schools ": Litterae Humaniores (Classics, Ancient History and Philosophy), Mathematics, Natural Science, Jurisprudence, Modern History, Theology, Oriental Languages, English Literature; and at Cambridge there are the following " Triposes " : Mathematics, Classics, Moral Sciences, Natural Sciences, Theology, Law, History, Oriental Languages, Medieval and Modern Languages, Mechanical Sciences (Engineering). Degrees in letters and science have also been instituted at both Oxford and Cambridge. The doctorate is given for original work. At Oxford the B.Litt. and B.Sc. can be taken by dissertation or original research, without passing the examination for B.A. At Cambridge the B.A. can be obtained in a similar manner by advanced students.

The strenuous efforts of both universities fully to meet the constantly increasing requirements of scientific education have necessitated appeals for public aid which have met with much generous response. Among the latest instances is that of the late Sir W. G. Pearce, who appointed to Trinity College, Cam-

1 The proposed reforms initiated by Lord Curzon as chancellor of Oxford University, though largely administrative, may be mentioned here. In 1909 he issued his " Principles and Methods of University Reform." Committees of Council were formed to prepare definite schemes in the various directions

indicated, and in 1910 a volume on the subject was issued to the members of Congregation. It was proposed, inter alia, to make Greek an optional subject in Responsions, thus foreshadowing changes in Moderations and final schools. Responsions itself was to be replaced by an entrance examination, though it has long practically served as such. The creation of " a diploma specially suitable for candidates con- templating a commercial career " was recommended. Additional provision to assist poor students, including the resignation of their emoluments by non-necessitous students in favour of exhibition funds for necessitous students in the colleges, and changes in the system of college fellowships, with especial reference to the encourage- ment of research in combination with tutorial work, were also indicated. Among purely administrative reforms, besides certain changes in the rules governing eligibility to the Hebdomadal Council and Congregation, it was proposed to reconstitute the method of election to and membership of the boards of faculties, at the same time creating a general board of the faculties, to control the individual boards, and to " relieve the Hebdomadal Council of the greater part of the business connected with curricula and examinations." A finance board was proposed to review the accounts of the university, all university institutions and colleges, and to act in an advisory and supervisory capacity. — [Ed.]

Durham.

bridge, a certain trust fund over which he had a general power of appointment, and also bequeathed to the society the residue of a considerable estate.

So long ago as the year 1640 an endeavour had been made to bring about the foundation of a northern university for the benefit of the counties remote from Oxford and Cambridge. Manchester and York both petitioned to be made the seat of the new centre. Cromwell, however, rejected both petitions, and decided in favour of Durham. Here he founded the university of Durham (1657), endowing it with the sequestered revenues of the dean and chapter of the cathedra], and entitling the society " The Mentor or Provost, Fellows and Scholars of the College of Durham, of the founda- tion of Oliver, &c." This scheme was cancelled at the Restora- tion, and not revived until the present century; but on the 4th July 1832 a bill for the foundation of a university at Durham received the royal

assent, the dean and chapter being thereby empowered to appropriate an estate at South Shields for the establishment and maintenance of a university for the advance- ment of learning. The foundation was to be directly connected with the cathedral church, the bishop of the diocese being appointed visitor, and the dean and chapter governors; while the direct control was vested in a warden, a senate and a convocation. A college, modelled on the plan of those at the older universities, and designated University College, Durham, was founded in 1837, Bishop Hatfield's Hall in 1846, and Bishop Cosin's Hall (which no longer exists) in i8sr. The university includes all the faculties, and in 1865 there was added to the faculty of arts a school of physical science, including pure and applied mathematics, chemistry, geology, mining, engineering, &c. In 1871 the corporation of the university, in conjunction with some of the leading landed proprietors in the adjacent counties, gave further extension to this design by the foundation of a college of physical science at Newcastle-upon-Tyne (subse- quently designated Armstrong College), designed to teach scientific principles in their application to engineering, mining, manufactures and agriculture. Students who had passed the required examinations were made admissible as associates in physical science of the university. There is also at Newcastle the College of Medicine which stands in similar relations to Durham, of which university Codrington College, Barbados, and Fourah Bay College, Sierra Leone, are likewise affiliated colleges.

The university of London had its origin in a movement initiated in the year 1825 by Thomas Campbell, the poet, in conjunction with Henry (afterwards Lord) Brougham, uatver- Mr (afterwards Sir) Isaac Lyon Goldsmid, Joseph sityot Hume and some influential Dissenters, most of them London. connected with the congregation of Dr Cox of Hackney. The scheme was originally suggested by the fact that Dissenters were practically excluded from the older universities; but the conception, as it took shape, was distinctly non-theological. The first council, appointed December 1825, comprised names representative of nearly all the religious denominations, includ- ing (besides those above mentioned) Zachary Macaulay, George Grote, James Mill, William Tooke, Lord Dudley and Ward, Dr Olinthus Gregory, Lord Lansdowne, Lord John Russell and the duke of Norfolk. On nth February 1826 the deed of settlement was drawn up; and in the course of the year seven acres,

constituting the site of University College, were pur- chased, the foundation stone of the new buildings being laid by the duke of Sussex 30th April 1827. The course of instruc- tion was designed to include " languages, mathematics, physics, the mental and the moral sciences, together with the laws of England, history and political economy, and the various branches of knowledge which are the objects of medical educa- tion." In October 1828 the college was opened as the university of London. But in the meantime a certain section of the supporters of the movement, while satisfied as to the essential soundness of the primary design as a development of national education, entertained considerable scruples as to the propriety of altogether dissociating such an institution from the national church. This feeling found expression in the foundation and

incorporation of King's College (14th August 1829), opened 8th October 1831, and designed to combine with the original plan instruction in " the doctrines and duties of Christianity, as the same are inculcated by the United Church of England and Ireland." This new phase of the movement was so far successful that in 1836 it was deemed expedient to dissociate the university of London from University College as a " teach- ing body," and to limit its action simply to the institution of examinations and the conferring of degrees — the college itself receiving a new charter, and being thenceforth designated as University College, London, while the rival institution was also incorporated with the university, and was thenceforth known as King's College, London. In the charter now given to the university it was stated that the king " deems it to be the duty of his royal office to hold forth to all classes and denominations of his faithful subjects, without any distinction whatsoever, an encouragement for pursuing a regular and liberal course of education." The charters of the university of London and of University College, London, were signed on the same day, 28th November 1836. In 1869 both the colleges gave their adhesion to the movement for the higher education of women which had been initiated elsewhere, and in 1880 women were for the first time admitted to degrees.

By the University of London Act 1898, and the statutes of the commissioners named therein (issued in 1900), the university

of London was reconstituted. The senate is composed of the chancellor and fifty-four members, of whom four are appointed by the king in council, sixteen by the convocation {i.e. doctors and proctors) of the university, sixteen by the various faculties, and the remainder by various public bodies or institutions. The senate is the supreme governing body, and has three standing committees, of which one is the academic council for " internal students," another the council for " external students " and the third a board to promote the extension of university teaching. Provision is made for the appointment of professors and other teachers by the university itself, and also for the recognition as teachers of professors and others teaching in such institutions in or near London as may be recognized as schools of the uni- versity. The following bodies are constituted schools of the university: University College and King's College, London; the Royal Holloway College, Egham, Bedford College, London, and Westfield College, Hampstead (colleges for women) ; the Imperial College of Science and Technology; the medical schools of the principal London hospitals; the London School of Econo- mics and Political Science; the South-Eastern Agricultural College, Wye; the Central Technical College of the City and Guilds of London Institute, and the East London College; and several theological colleges. The " appointed " and " recognized " teachers in each group of subjects form the various faculties of the university. Of these there are eight — theology, arts, law, music, medicine, science, engineering, economics and political science (including commerce and industry). Each faculty elects its dean. Courses of study are to be provided by the university for its " internal " students, i.'e. those who pursue their studies in one of the schools of the university. Its degrees remain open to " external " students as heretofore, but separate examinations are in future to be held for " internal " and for " external " students respectively, and the senate is to " provide that the degrees conferred upon both classes of students shall represent, as far as possible, the same standard of knowledge and attainments." The whole scheme may be described as a compromise between the views of various schools of reformers — as an attempt to create a teaching university without destroying the existing purely examining university or erecting two distinct universities of London, and at the same time, without any immediate endowments, to create a uni- versity which might hereafter expand by utilizing existing institutions. One of the most important of these, King's Col- lege, it may be

observed, has, without losing its connexion with the Church of England, abandoned its theological test for members of its teaching body.

The Owens College, Manchester — so called after a wealthy

citizen of that name, to whom it owed its foundation — was founded on the 12th of March 1851, for the purpose The of affording to students who were unable, on the uaiver- ground of expense, to resort to Oxford or Cambridge, sity of an education of an equally high class with that given M ^"' t at those centres. The institution was, from the first , un- sectarian in character; and, for more than a quarter of a cen- tury, students desirous of obtaining a university degree availed themselves of the examinations conducted by the university of London. In July 1877, however, a memorial was presented to the privy council petitioning for the grant of a charter whereby the college should be raised to the rank of a university with power to grant degrees. This petition having received a favourable hearing, it was at first decided that the new university should be styled the university of Manchester, and the New University College at Liverpool and the Yorkshire College at Leeds were invited to become affiliated institutiona But before the charter was issued, exception having been taken to the localization implied in the above title, it was resolved that the new institution should be styled the " Victoria University of Manchester," and under this name the university on the 20th of April 1880 received its charter. Since then, however, not only Liverpool (1881) and Leeds (1904), but the Mason University College at Birmingham (1900) and the University College at Sheffield (1905) have aspired to and attained like indepen- dence. The academic authorities at Manchester have accordingly since preferred, in other than legal documents, to revert to the original designation of the " university of Manchester."

In Scotland the next change to be noted in connexion with the university of St Andrews is the appropriation in 1579 of the two colleges of St Salvator and St Leonard to the changes faculty of philosophy, and that of St Mary to theology, in uaiver- In 1747 an act of parliament was obtained for the suiesot union of the two former colleges into one, while in 1880 ScotUu " 1 – the university college at Dundee was instituted as a general school both of arts and science in similar connexion. Glas- gow, in the year 1577, received a new

charter, and its history from that date down to the Restoration was one of almost continuous progress. The re-establishment of episcopacy, however, involved the alienation of a considerable portion of its revenues, and the consequent suspension of several of its chairs. With the Revolution of 1689 it took a new departure, and several additional chairs were created. In 1864 the old university buildings were sold, and a government grant having been obtained, together with private subscriptions, new build- ings were erected from the joint fund. By the act of 1858 important measures were passed in connexion with all the four universities. In Aberdeen, King's College and Marischal College, with their independent powers of conferring degrees, were amalgamated. In Glasgow the distribution of the " nations " was modified in order more nearly to equalize their respective numbers. The right of returning two members of parliament was bestowed on the four universities collectively — one representing Aberdeen in conjunction with Glasgow, the other Edinburgh in conjunction with St Andrews. Other important changes were enacted, which, however, became merged in turn in those resulting from the commission of 1889, whereby, after investigations extending over nearly ten years, a complete transformation was effected of both the organization and the curriculum of each university.

The government was transferred from the senatus to the courts, which were enlarged so as to include representatives from the senatus, the general councils of graduates, and the municipality within which the university is situated. In addi- tion to these representatives, the principal, the lord rector, his assessor, the chancellor's assessor, and the lord provosts of the cities of Aberdeen, Edinburgh and Glasgow, and the provost of St Andrews have seats in the courts of their respective univer- sities. The provost of Dundee occupies a seat in the university court of St Andrews. The lord rector is the president of the court. To the court is entrusted the management of the property and finances, and, in most cases, such patronage

univer- sities.

as does not belong to the crown; but in the case of Edinburgh, the patronage of some of the older chairs is in the hands of a

body of curators. Disciplinary powers are retained by the senatus, and the general council remains, as under the act of 1858, a purely advisory body. Another advisory body — the students' representative council — was added by the commission. The curriculum of all the faculties (except divinity) was reorganized: the most important alterations consisted in the abolition of the once sacred six as compulsory subjects in arts ˆLatin, Greek, Mathematics, Natural Philosophy, Logic and Moral Philosophy). 1 The curriculum was greatly widened, an elaborate scheme of " options " introduced, and a new system of honours degrees was established. The length of residence required was reduced from four years to three, and the courts were empowered to institute summer sessions, and to admit women to lectures and degrees in all faculties.

There has been since the act of 1858 a great development of student life, illustrated by the institution of student's unions in all four universities, by the publication of undergraduate maga- zines, and by the growth, in Edinburgh, of combined residences and settlements.

All the four universities of Scotland were aided from meatary t ' me to tlme ' n tne ˆ ast cen tury by grants from govern- grants to ment, and in 1905 received a material addition to their Scottish resources by the magnificent donation of £2,000,000 from Mr Carnegie.

Trinity College, Dublin, was founded in 1591, under the auspices of Sir John Perrot, the Irish viceroy. A royal charter nominated a provost and a minimum number of Trinity three fellows and three scholars as a body corporate, College, empowered to establish among themselves " whatever Dublin. j aws f either f the universities of (Cambridge or Oxford they may judge to be apt and suitable; and especially that no other persons should teach or profess the liberal arts in Ireland without the queen's special licence." The first five provosts of Trinity College were all Cambridge men, and under the influence of Archbishop Loftus, the first provost, and his successors, the foundation received a strongly Puritan bias. The original statutes were mainly the work of Temple, the fourth provost, modified by Bedell, the eminent bishop of Kilmore, and the policy of Laud and Wentworth was to make the college more distinctly Anglican as regards its tone and belief. At the Restoration its condition was found to be that of a well-ordered home of learning and piety, with its estates well

secured and its privileges unimpaired. Under Bishop Jeremy Taylor, who succeeded to the vice-chancellorship, its progress in learn- ing was considerable, and the statutes underwent a further modification. Prior tJ the year 1873 the provostship, fellow- ships and foundation scholarships could be held only by members of the Church of Ireland; but all such restrictions were abolished by Act 36 Vict. c. 21, whereby the requirement of subscription to any article or formulary of faith was finally abrogated.

The first departure from the above exclusive system dates from the creation of the Queen's University, incorporated by Queen's royal charter on the 3rd of September 1850. By this Untver- charter the general legislation of the university, to- sity. gether with its government and administration, was

vested in the university senate. In 1864 the charter of 1850 was superseded by a supplementary charter, and the university reconstituted " in order to render more complete and satisfactory the courses of education to be followed by students in the colleges "; and finally, in 1880, by virtue of the act of parliament known as the University Education (Ireland) Act 1879, the Queen's University gave place to the „ . Royal University of Ireland, which was practically a

Unirer- reconstitution of the former foundation, the dissolu- sityof tion of the Queen's University being decreed so soon Ireland. as ˆ e newly constituted body should be in a posi- tion to confer degrees; at the same time all graduates of

1 At Edinburgh there was a seventh, viz. rhetoric and English literature.

the Queen's University were recognized as graduates of the new university with corresponding degrees, and all matriculated students of the former as entitled to the same status in the latter. The university confers degrees in arts (B.A., M.A., D.Litt.), science, engineering, music, medicine, surgery, obstetrics and law. The preliminary pass examina- tions in arts were to be held at annually selected centres, — those chosen in 1885 being Dublin, Belfast, Carlow, Cork, Galway, Limerick and Londonderry — all honour examinations, and all examinations in other faculties, in Dublin. The Queen's Colleges at Belfast, Cork and Galway were founded CoIIeges in December 1845, under an act of

parliament "to at Belfast, enable Her Majesty to endow new colleges for the Cork, and advancement of learning in Ireland," and were sub- ° alwa y- sequently incorporated as colleges of the university. Their professors were at the same time constituted professors in the university, and conducted the examinations. But in the reconstruction of 1880 the chief share in the conduct of the examinations and advising the senate with respect to them was vested in a board of fellows, elected by the senate in equal numbers from the non-denominational colleges and the purely Roman Catholic institutions. The colleges retained, however, their independence, being in no way subject to the control of the university senate except in the regulations with respect to the requirements for degrees and other academic distinc- tions. In 1907 a scheme was projected by Mr Bryce (then chief secretary for Ireland) for reconstructing the university, whereby Trinity College was to become merged in a untver- new "University of Dublin," in which the Queen's sity of Colleges and a new college for Roman Catholics were Dublin. also to be included. The control of the entire community was to be vested in a board, partly nominated by the crown and partly by the colleges and the general body of students. The scheme, however, was strongly opposed by the Dublin Uni- versity Defence Committee on the ground that the ideals which had hitherto dominated the aims and teaching of Trinity College were incompatible with a system in which regard for the principle of authority and the repudiation of scientific theoriza- tion (as it finds expression in the Index) are leading features. On the other hand, the Irish bishops, while admitting the need for more efficient scientific instruction of the Catholic youth throughout their respective dioceses, declined to give support to measures whereby such students would be attracted into an atmosphere inimical to their religious faith. It was conse- quently next proposed by the government to establish two new universities — one in Dublin (side by side with Trinity College) and one in Belfast — in which, although no religious tests were to be enforced, it should be tacitly agreed that the former was to be the resort for Catholics, the latter for Presbyterians, Trinity College remaining, as before, the recognized Episcopalian centre. To this considerable exception was taken — the non- conformists, more especially, maintaining that such an arrange- ment could not fail to be prejudicial to the higher interests of the people by imparting to education a denominational bias which it was most desirable

to avoid — and eventually Mr Birrell's measure was brought forward and ultimately adopted, whereby Trinity College has been left intact, but two new uni- versities were created, one in Dublin and one in Belfast, the former involving the erection of another college (towards the expense of which the government was pledged to contribute) and the incorporation of the Queen's Colleges at Cork and Galway; while the college in Belfast was to form the nucleus of the second university. In order further to ensure their representative character, the new university of Dublin had a nominated senate of 36 members, of whom all but seven were to be Roman Catholics; that of Belfast had a similar body, of whom all but one were to be Protestants. In all these new centres there were to be no religious tests either for professors or students. On the other hand, the obligation formerly imposed of a preliminary course of study at one or other of the colleges before admission to degrees had been abolished at the founda- tion of the Royal University, the examinations being now open,

Wales.

like those of the university of London, to all matriculated students on payment of certain fees.

The university of Wales, which received the royal charter in 1893, incorporated three earlier foundations — the university colleges of Aberystwyth, Bangor and Cardiff. St David's College at Lampeter was founded in 1822 for the purpose of educating clergymen in the principles of the established Church of England and Wales, mainly for the supply of the Welsh dioceses, but, although affiliated to both Oxford and Cambridge, -retained its independence and also the right of conferring the degrees of bachelor of arts and of divinity. Bangor in North Wales, on the other hand, which received its charter in 1885, is designed to " provide instruction in all the branches of a liberal education except theology."

In India the three older universities all date from 1857 — that of Calcutta having been incorporated January 24, Bombay July ... 18, Madras September 5, in that year. At these three

*” *’ universities the instruction is mainly in English. ” A*

university in India is a body for examining candidates for degrees, and for conferring degrees. It has the power of prescribing text- books, standards of instruction, and rules of procedure, but is not an institution for teaching. Its governance and management are vested in a body of fellows, some of whom are ex officio, being the chief European functionaries of the state. The remainder are appointed by the Government, being generally chosen as repre- sentative men in respect of eminent lea/ning, scientific attainment, official position, social status or personal worth. Being a mixed body of Europeans and natives, they thus comprise all that is best and wisest in that division of the empire to which the university belongs, and fairly represent most of the phases of thought and philosophic tendencies observable in the country. The fellows in their corporate capacity form the senate. The affairs of the university are conducted by the syndicate, consisting of a limited. number of members elected from among the fellows. The faculties comprise arts and philosophy, law, medicine and civil engineering. A degree in natural and physical science has more recently been added ” (Sir R. Temple, India, in 1880, p. 145). The Punjab University was incorporated in 1883 — the Punjab University College, prior to that date, having conferred titles only and not degrees. The main object of this university is the encouragement of the study of the Oriental languages and literature, and the rendering accessible to native students the results of European scientific teaching through the medium of their own vernacular. The Oriental faculty is here the oldest, and the degree of B.O.L. (bachelor of Oriental literature) is given as the result of its examinations. At the Oriental College the instruction is given wholly in the native languages, and the success of the institution was sufficiently demonstrated before the close of. the 19th century by the fact that twelve centres of instruction at Lahore and elsewhere had been affiliated. The university of Allahabad was founded in 1887 as an examining university for the united provinces of Agra and Oudh. In 1887 the senate at Cambridge (mainly on the representations of Mr C. P. Ilbert, formerly vice-chancellor of the university of Calcutta) adopted resolutions whereby some forty-nine collegiate institutions already affiliated to the latter body were affiliated to the university of Cambridge, their students becoming entitled to the remission of one year in the requirements with respect to residence at Cam- bridge.

*In Australia the university of Sydney was incorporated by an act of the colonial legislature which received the royal assent 9th Ail. December 1 85 1, and on 27th February 1 858 a royal charter "l r " ' was granted conferring on graduates of the university the as * same rank, style and precedenceasareenjoyed by graduates*

of universities within the United Kingdom. Sydney is also one of the institutions associated with the university of London from which certificates of having received a due course of instruction may be received with a view to admission to degrees. The design of the university is to supply the means of a liberal education to all orders and denominations, without any distinction whatever. An act for the purpose of facilitating the erection of colleges in connexion with different religious bodies was, however, passed by the legislature during the session of 1884, and since that time colleges representing the Episcopalian, Presbyterian and Roman Catholic Churches have been founded. In the same year women were first admitted to degrees, and subsequently became an appreci- able element, numbering before the close of the 19th century one-fifth of the entire number of students. The university of Melbourne, in the state of Victoria, was incorporated and endowed by royal act on the 22nd of January 1853. This act was amended on the 7th of June 1881. Here also no religious tests are imposed on admission to any degree or election to any office. The council is empowered, after due examination, to confer degrees in all the faculties (excepting divinity) which can be conferred in any university within the British dominions. It is also authorized to affiliate colleges; and Trinity College (Church of England), Ormond College

(Presbyterian) and Queen's College (Methodist) were all established in the 19th century. The university of Adelaide in South Australia (founded mainly by the exertions and munificence of Sir Walter Watson Hughes) was incorporated by an act of the colonial legislature in 1874, in which year it was further endowed by Sir Thomas Elder. In 1 88 1 degrees conferred by the university were constituted cf equal validity with those of any university of the United Kingdom. The university of Tasmania at Hobart was founded in 1890 by act of parliament as a state university with an annual grant, and was subsequently affiliated both to Oxford and Cambridge.

The universfty of New Zealand, founded in 1870, and

reconstituted in 1874 and 1875, was empowered by royal charter to grant the several degrees of bachelor and master of arts, and bachelor and doctor in law, medicine and music. Women have since been made admissible to degrees. To this university, University College at Auckland, Canterbury College at Christchurch, and the university of Otago at Dunedin have successively been admitted into connexion as affiliated institutions, while the university of New Zealand itself has become affiliated to that of Cambridge. Otago was founded in 1869 by an order of the provincial council, with the power of conferring degrees in arts, medicine and law, and received as an endowment 100,000 acres of pastoral land. It was opened in 1871 with a staff of three professors, all in the faculty of arts. In 1872 the provincial council further subsidized it by a grant of a second 100,000 acres of land, and the university was thereby enabled to establish a lectureship in law, and to lay the foundations of a medical school. In 1874 an agreement was made between the university of New Zealand and that of Otago, whereby the functions of the former were restricted to the examination of candidates for matriculation, for scholarships and for degrees; while the latter bound itself to become affiliated to the university of New Zealand and to hold in abeyance its power of granting degrees. As the result of this arrangement, the university of Otago became possessed of 10,000 acres of land which had been set apart for university purposes in the former province of Southland. In 1877 a school of mines was established in connexion with the' university.

Prior to the union of the two provinces of Lower and Upper Canada, the M'Gill College and University in the former province had been instituted in Montreal by royal charter in 1821, Canada. on the foundation of the Honourable James M'Gill, who died in that city on the 19th of December 1813. It was designed to be Protestant but undenominational. With this a group of colleges in the same province — the Stanstead Wesleyan, Vancouver, Victoria, and King's — have since become associated as affiliated institutions, as also have the four Protestant colleges in Montreal itself, such affiliation, however, extending no further than the examinations in the faculty of arts. Into similar relation the University Laval in Quebec, founded as a Catholic university in 1852, was admitted in 1878. Notwithstanding the difficulties presented by divergencies of race, Montreal has prospered during the chancellorship of Lord Strathcona, and numbers over 1 100

students. The university of Toronto in Upper Canada, or Ontario, was originally established by royal charter in 1827, under the title of King's College, with certain religious restrictions, but in 1834 these restrictions were abolished. In 1849 the designation of the university was changed into that of the university of Toronto, and the faculty of divinity was abolished. In 1853 the university was constituted with two corporations, "the university of Toronto" and " University College," the latter being restricted to the teaching of subjects in the faculty of arts. In 1873 further amendments were made in the constitution of the university. The chancellor was made elective for a period of three years by convocation, which was at the same time reorganized so as to include all graduates in law, medicine and surgery, all masters of arts, and bachelors of arts of three years' standing, all doctors of science, and bachelors of science of three years' standing. The powers of the senate were also extended to all branches of literature, science and the arts, to granting certificates of proficiency to women, and to affiliating colleges. T he whole work of instruction was now assigned to University College, which is maintained out of the endowment of the provincial university, and governed by a council composed of the residents and the professors. Its several chairs include classical literature, logic and rhetoric, mathematics and natural philosophy, chemistry and experimental philosophy, history and English literature, mineralogy and geology, metaphysics and ethics, meteorology and natural history, and lectureships on Oriental literature, German and French. Trinity College, in the same university, is the Church of England college, founded in 1852 in consequence of the above- mentioned suppression of the theological faculty. Other univer- sities and colleges with power to confer degrees are the Dalhousie College at Halifax, which obtained the rights of a university in 1841 and was subsequently organized as such in 1863, with the governor of Nova Scotia as supreme authority; the Victoria University at Cobourg (1836), supported by the Methodist Church of Canada; Queen's University, Kingston (1841).

In South America the beginning of the " national university ■" of Buenos Aires may be assigned (in the absence of any charter) to about the year 1890. Before the close of the century it had become a flourishing school of law, medicine and the exact sciences.

with professors in all the faculties and considerably over 2000 students. Monte Video in Uruguay had its origin in a faculty . of medicine established in 1876, with courses of study ex-

°" j. tending over six years. It is here imperative when the

me ' diploma is taken by those who are not natives that it should be attested by the consul of their own country. Faculties of law and mathematics were subsequently created, and also a faculty of preparatory studies corresponding with the gymnasium or Realschule of Germany. The new " national university of La Plata " has recently (1905-1908) been opened in the city of that name, under the auspices of the university of Philadelphia. It claims to be the exponent of the most advanced theories in relation to subjects and methods of instruction and to university extension. In the north of the continent the academy at Caracas is little more than a branch of the royal Spanish academy for education in the Spanish language, and is subsidized by the Venezuelan government.

The university of the Cape of Good Hope (see Cape Colony) grants degrees, but is not a teaching institution. An inter-state ... commission, appointed in 1907, recommended the estab-

Atrica. lishment of a Federal University for South Africa with constituent colleges. While the colleges would possess freedom in management and teaching, it was recommended that the university should test all candidates seeking admission to the colleges and for the final examinations for degrees, &c. At the opening of the first Union parliament in November 1910 the ministry announced that a scheme for a national South African University would be submitted. It was also announced that the Beit bequest of £200,000 for a university at Johannesburg {q.v r) would be diverted towards the creation of a teaching university at Groote Schuur, and that Sir Julius Wernher would make a donation towards it of £300,000.

In 1903 a highly influential conference was held at Burlington House to promote closer relations between British and colonial universities, the sittings being presided over by Mr Bryce, Lord Strathcona and Sir Gilbert Parker. The conference held that Great Britain should help the colonial universities to co-operate one with another, and increase their own efficiency by

combination and specialization. (J. B. M.)

Universities in the United States.

In the United States the word " university " has been applied to institutions of the most diverse character, and it is only since 1880 or thereabouts that an effort has been seriously made to distinguish between collegiate and university instruc- tion; nor has that effort yet completely succeeded. Harvard, William and Mary, and Yale, the three pioneers of colonial times, were organized in the days of colonial poverty, on the plans of the English colleges which constitute the universities of Oxford and Cambridge. Graduates of Harvard and Yale carried these British traditions to other places, and similar colleges grew up in New York, New Jersey, Pennsylvania, New Hampshire and Rhode Island, and later in many other Origins. states. The underlying principle in these institutions was discipline — mental, moral and religious. Dor- mitories and commons were provided, and attendance upon religious worship in the chapel was enforced. Harvard and Yale were the children of the Congregational churches, Columbia was fostered by the Episcopalians, Princeton by the Presby- terians, Rutgers by the Dutch Reformed and Brown by the Baptists. Around or near these nuclei, during the course of the 19th century, one or more professional schools were fre- quently attached, and so the word " university " was naturally applied to a group of schools associated more or less closely with a central school or " college." Harvard, for example, most comprehensive of all, has seventeen distinct departments, and Yale has almost as many. Columbia and Pennsylvania have a similar scope. In the latter part of the 19th century Yale, Columbia, Princeton and Brown, in recognition of their enlargement, formally changed their titles from colleges to universities. The ecclesiastical, or religious, note was a strong characteristic of these foundations. Protestant evangelical doc- trines were taught with authority, especially among the under- graduates, who were spoken of as constituting " the college proper." In the oldest and largest colleges this denominational influence has ceased to have the importance it once possessed.

Noteworthy innovations came when Thomas Jefferson, the philosophical statesman, returned to the United States from France, emancipated from some of the narrow views by which his countrymen were bound. He led the Virginians to establish, on a new plan, the university of Virginia as a

child of the state; and the freshness of his advice, the importation of distinguished foreign teachers, and the freedom of the student from an enforced curriculum awakened admiration and emulation on the one hand, and animadversion on the other. But this university unquestionably led to broad conceptions of academic work, which appeared foreign and even questionable, if not irreligious, to the colonial universities already mentioned, although many of the features which were then regarded as doubtful peculiarities are now familiar everywhere. Following Virginia's example, many of the new states in the West estab- lished state universities, most of which included a central college of the colonial type and afterwards one or more pro- fessional schools. Freedom from ecclesiastical control is found in all the foundations that make up this second group — the state universities. Michigan, Wisconsin, Minnesota and Cali- fornia present distinguished examples of such organizations. In earlier days, Maryland, North and South Carolina, Georgia and other states of the South had anticipated in a limited way the state support of higher education which was made so conspicuous in Virginia. In their plans of education, intellectual and moral, they adhered closely to the college methods which the Northern institutions had introduced from English ante- cedents. Since 1865 another class of universities has arisen, quite distinct from the colonial establishments and from the wards of the state. These are independent foundations due to individual generosity. The gifts of Cornell, Johns Hopkins, Rockefeller (University of Chicago), Tulane, De Pauw, Clark and Leland Stanford have brought into being universities wh-ch have no dependence upon state control, 1 and when a denominational character is assured this fact is not made prominent.

Thus, looking at their origin, we see three impulses given to American high schools, from churches, states and individuals. It is true that all receive from the state some degree of authority as incorporations, but this authority is so easily obtained that in a single city there may be, and in some places there are, several incorporations authorized to bestow degrees and to bear the name of universities. A foreigner cannot understand nor can an American justify this anomaly. The most that can be said for it is that there is complete freedom of organization, and that the best, and only the best, are likely to survive. Another influence, proceeding from the national government, must also be borne in mind. During the Civil War,

Congress, led by Senator Morrill of Vermont, bestowed upon every state a certain portion of the public domain in the Far West- — " land- scrip," as it was called — the proceeds of its sale to be devoted to the establishment and maintenance of one or more colleges in each state, where instruction should be given in agriculture and the mechanic arts, not excluding liberal studies, and including military tactics. In some states this bounty was directed to existing universities. New departments were organized in old institutions. Elsewhere new institutions were created. While all these schools were regarded as practical and technical at the first, most of them as they developed became liberal and scientific; and when Congress made later large appropriations for " experiment stations " in the sciences relating to agriculture, an impulse of the most valuable character was given to many departments of scientific research.

This sketch would not be complete without the mention of two foundations, each unique. The Catholic University in Washington has been created by the pope, and in its government the hierarchy •of the Roman Catholic Church is made dominant. Already the Roman Catholics had established, especially under the charge of the Jesuit fathers and of the Sulpicians, excellent colleges for liberal education, as well as schools of theology; but the newer metropolitan university was distinctly organized on a broader plan, in closer accordance with the universities of continental Europe, and with a pronounced recognition of the importance of science. The university of the State of New York is a supervisory (not a teaching)

1 Cornell, however, received New York's share of the Congressional land grant of 1862, and the state is represented on its board of trustees. See Cornell University.

and

Organlia tloo.

body exercising a general control over all the schools of higher instruction in the state, and especially guarding the conditions upon which degrees are conferred.

The interior organization of these institutions may now be considered. Some of them have but one department, the philosophical, which includes the liberal arts and sciences; others have two, three or many correlated departments. Clark University, for example, has but one faculty, the philosophical; Harvard, as already stated, has many departments, including philosophy, law, medicine and theology. So has Yale. Princeton has four. Johns Hopkins has two, the philosophical the medical. In most American universities a sharp distinction is made between undergraduates and graduates, between those who are candidates for the baccalaureate degree (A.B., S.B., and Ph.B.) and those who are engaged in higher professional study, like law, medicine and theology, or in the manifold branches of modern science, like philology, historical and political science (including economics), philosophy (including logic, ethics and psychology), mathematics, physics, chemistry, biology, geology, &c. In certain places, as at Johns Hopkins, since 1876, emphasis is given to the idea that college instruction is disciplinary, requiring definite, but not uniform methods, and a certain deference to the authority of a master; while university instruction is much freer, and the scholar is encouraged to inquire rather than to accept; to test and observe rather than to hear and recite; to walk with a friendly guide rather than to obey a commander. This distinction is not universally recognized. Indeed, it has been made but recently in American institutions, so that older men are often heard asking, " What is the difference between a college and a university? " But generally it is admitted that college training is one thing, and work in a uni- versity is another; that thorough instruction in language, history, mathematics, natural and physical sciences, and in morals, should precede the discipline of professional schools and the pursuit of the higher and more advanced studies in letters and science. In a complete university provision should be made, according to ancient and widespread usages, for the study of law, medicine and theology; but unfortunately the develop- ment of such schools in the United States has been fettered by narrow conditions. The schools of theology, with rare excep- tions, are under denominational control; and so established is this usage, that in the state universities, and in most of the private foundations (Chicago being an exception), theological departments are not encouraged, because of the dread of religious rivalries and dogmatism. Until recently there have been no Profes- endowments for medical schools to any

adequate sioaal extent, and consequently the fees paid by students schools. jj ave b een distributed among the teachers, who have usually been the real managers of the institution, although acting under the name of some university. It is nearly the same in law. There are many indications that changes are at hand in these particulars. Theological schools make their denominational characteristics less pronounced, and the old colleges no longer speak of the schools of law and medicine as " outside " departments. The rapid growth of the physical and natural sciences during the 19th century, and the extension of scientific methods of inquiry and verification to subjects which were formerly taught by the traditional methods of authority, have led to the development of laboratories and libraries. Everywhere special buildings, well equipped with the latest and best apparatus, are springing up, where the students of chemistry, physics, biology (in its numerous sub- departments — bacteriology among them) and electricity have every facility for study and research. The introduction of laboratories for psychology is specially noteworthy. Patho- logical laboratories have become essential in schools of medicine. Libraries are — as they always have been and always will be — storehouses where the books and manuscripts of the past are preserved; but in American universities they have taken on another characteristic. Subdivided into special depart- ments, or supplemented by fresh additions, they are the working-

rooms of " seminaries," where capable teachers, surrounded by scholars properly qualified, are engaged in teaching, study- ing and writing. Seminaries and laboratories distinguish the modern philosophical departments from those of old, where the lecture-room was the seat of instruction. Numerous memoirs and monographs proceed from this active life. Books, periodicals and dissertations are contributions to the advance- ment of knowledge. Two agencies have effected these changes, most of which are the product of the last quarter of the 19th century. In the first place, gifts for higher education have been munificent, sometimes, especially in the East, from private citizens — often, especially in the West, from the treasuries of separate states. Quite as important has been the growth of liberal ideas. Very many of the foremost professors in American universities are the scholars of European teachers, especially Germans. Candidates for professorships are resuming the usages which prevailed early in the 19th century, of studying in France and Great Britain. On their return it is*

essential that they should keep themselves familiar with the latest literature in their departments, whatsoever may be the language in which it appears. Hence the American universities are no longer provincial. They must be judged, for better or for worse, by the standard of universities established in Europe. The bestowal of academic degrees ought to be strictly governed by some recognized authority, and according to ancient usages it is one of the highest functions of a university. In the United States there is but little restraint proceeding from law, tradition or public opinion. Every " college " is at liberty to exercise this privilege. Hence the variety of academic titles that have been introduced; hence, also, occasional and scandalous frauds in the issue of diplomas. The best institutions exercise due dili- gence; the public may be protected by requiring that every one who claims the privileges of his degree, or who appends fo his name the usual abbreviations indicative of professional or academic authority, should make it clear where, when and how he received his title.

The institutions in the United States which claim to be universities, in the world-wide use of that designation, recognize these principles and, so far as their means allow, adhere to these methods: I. There is a disciplinary stage in education which is the requisite introduction to the higher and freer work of the university. This is the sphere of the colleges. 2. The success of the higher work depends upon the intellectual and moral qualities of the professors. No amount of material prosperity is of value unless the dominant authorities are able to discover, secure and retain as teachers men of rare gifts, resolute will, superior training and an indomitable love of learning. 3. The professors in a university should be free from all pecuniary anxiety, so that their lives may be consecrated to their several callings. Pensions should be given them incases of disability, and, in case of premature death, to their families. In methods of instruction they should have as large an amount of freedom as may be consistent with due regard for the co-operation of their colleagues and the plans of the foundation. 4. The steady improvement of the libraries and laboratories is essential if the institution is to keep in the front line. The newest books and the best apparatus are indispensable, for instruments and books quickly deteriorate and must be superseded. 5. For all these outlays large endowments are required. To a considerable extent reliance must be placed on wealthy and public-spirited citizens. In order to enlist such

support, the members of a faculty should manifest their interest in public affairs, and by books, lectures and addresses should inform the public and interest them in the progress of knowledge. 6. Publication is one of the duties of a professor. He owes it not only to his reputation but also to his science, to his colleagues, to the public, to put together and set forth, for the information and criti- cism of the world, the results of his inquiries, discoveries, reflections and investigations. Qualified students should also be encouraged, under his guidance, to print and publish their dissertations.

Closely associated with the development of the university idea since 1875 is the improvement of the American college. Complaints are often made that the number of col- College leges is too large, and it is undoubtedly true that improve- some institutions, inferior to city high schools, have men ' s – usurped the names, the forms and some of the functions that should be restricted to establishments with larger endow- ments and better facilities for the promotion of scholarship; but while this is admitted, the great benefits which have resulted

from the recognition, far and wide over the vast domain of the United States, of the value of higher education must not be forgotten. The support of churches of every name and the gifts of states, cities and private citizens, have been every- where enlisted in behalf of learning. In every college worthy of the name, mathematics, ancient and modern languages, and the elements at least of modern science, are taught. More or less choice is permitted in the courses requisite to a bachelor's degree. Moral and religious influences are brought to bear on the formation of character. All this is favourable to the enlightenment of the people, and excuses, if it does not justify, the multiplication which is so often deprecated. The establish- ment of colleges for women, fully equal to the colleges for men, and in many places the admission of women to colleges and universities not originally intended for women, is one of the most noteworthy of the advances in higher education. Opinions are still divided in respect of the widsom of co-education, especially in the undergraduate period, but there is no longer any question as to the wisdom of giving to women the very best opportunities for intellectual culture; while the success that

women have shown in the pursuit of many branches of science has led in many universities to their admission to the established laboratories and lecture-rooms. Separate colleges for women are now maintained in close connexion with Harvard, Columbia, Tulane and other institutions, and this mode, of procedure seems likely to be introduced elsewhere. At the same time, independent foundations like Vassar, Smith, Wellesley, Bryn Mawr and Goucher are supported with so much vigour, and with such able faculties, that it is not easy to say which organization is the best, and indeed there is no occasion to raise the question. In the Western universities generally, as in Michigan, Wisconsin, California, Chicago, &c, women are admitted to all courses on the same terms as men. (D. C. G.)

Authorities. — On the earlier history and organization of the medieval universities, the student should consult F. C. von Savigny, Gesch. d. romischen Rechts im Mittelalter (7 vols., 1826-51); for the university of Paris, Du Boulay, Historia Universitatis Parisiensis (6 vols., Paris, 1665); Crevier, Hist, de Vuniversite de Paris (7 vols., Paris, 1761); and C. Jourdain, Hist, de Vuniversite de Paris au X VII' et an X VIII' Steele (Paris, 1862), and also articles on special points in the same writer's Excursions historiques (1888).

The work of Du Boulay (Bulaeus)is one of great research and labour, but wanting in critical judgment, while that of Crevier is little more than a readable outline drawn from the former. The views of Du Boulay have been challenged on many important points by P. H. Denifle in the first volume of his Die Universitaten des Mittelalter s bis 1400 (1885), and more particularly on those relat- ing to the organization of the early universities. The results of Denifle's researches have been largely incorporated in Mr Rashdall's Universities of Europe in the Middle Ages (2 vols., Oxford, 1895), especially in connexion with the origines of Paris, Oxford and Cambridge; and the earlier works of Meiners, Gesch. d. Entstehung und Entwickelung der hohen Schulen (4 vols., 1802-5); and T. A. Huber, Die englischen Universitaten (Cassel, 1839-40), translation by F. W. Newman (3 vols., 1845), are thus to a great extent super- seded. Much useful criticism on the comparative merits of the German and the English universities prior to the 19th century is to be found in the Discussions (1853) of Sir W. Hamilton. For the German universities exclusively, Zarncke's Die deutschen Univer- sitaten im Mittelalter (Leipzig, 1857); Heinrich von Sybel, Die deutschen

Universitaten (2nd ed., 1874); and Georg Kaufmann's Gesch. der deutschen Universitaten (2 vols.), are indispensable. Of the latter, vol. i. (1888) treats of the origines; vol. ii. (1896) carries the subject to the end of the middle ages, dealing generally with the history of academic institutions rather than the details of sepa- rate universities. Georg Voigt's Die Wiederbelebung des classischen Alterthums (2 vols., 1880-81) throws much light on the history of both Italian and German scholarship at the time of the Renaissance, and supplies a useful bibliography. The work of Professor Friedrich Paulsen, Gesch. d. gelehrten Unterrichts auf den deutschen Schulen und Universitaten (2nd ed., 2 vols., 1906; English translation by M. E. Sadler, London, 1906), is a masterly survey of the whole modern period down to the close of last century. Tholuck, Das academische Leben des 17 Jahrhunderts (2 vols., Halle, 1853-54); Dolch, Gesch. des deutschen Studententhums (1858); J. Conrad, The German Universities for the Last Fifty Years, translated by Hutchin- son, preface by Bryce (Glasgow, 1885); T. Ziegler, Der deutsche Student am Endedes 10 Jahrhunderts (Stuttgart, 1895), all deal with special periods. Adolf Harnack, Geschichte der koniglich-preussischen Academie der Wissenschaften zu Berlin (4 vols., 1900), is also of high value, the first two volumes for the medieval, the latter two for

the modern period. To these may be added, as useful for reference, the Geschichte der Erziehung vom Anfang an bis auf unsere Zeit (Stuttgart, 1896-1901), by Dr K. A. and Georg Schmidt, containing critical bibliographies at the beginning of each chapter; while the Bibliographic der deutschen Universitaten by Wilhelm Erman and Ewald Horn (3 vols., Leipzig, 1904-6) is most complete for the literature of the entire subject down to the close of last century. For a comparative estimate of the history of the different faculties, Die Universitat Giessen von 1607 bis 1907 (2 vols., Giessen, 1907) is highly suggestive. The- Monumenta Germaniae Paedagogica (20 vols., 1 886-1900), though relating mainly to schools, often supplies valuable illustrative matter.

The statutes of the French universities, so far as ascertainable, have been edited by Fournier, Statutes et privileges des universites francaises (1890); the Chartularium of the university of Paris, as edited by Denifle and Chatelain (4 vols., Paris, 1889-97), coming down to 1452. Works dealing with later history are Greard, Nos adieux d la vieille Sorbonne

(Paris, 1893) ; H. Schon, Die franzbsischen Hochschulen seit der Revolution (Munich, 1896) ; L. Liard, L' Enseigne- ment superieur en France, 1789-1894 (2 vols., Paris, 1894) ; Joseph Prost, La Philosophic a V academie protestante de Saumur, 1606-1685 (Paris, 1907).

For Italy, the origines of Bologna are dealt with by Chiapelli, Lo Studio Bolognese (Pistoia, 1888); Fitting, Die Anfange der Rechtsschule zu Bologna (Bologna and Leipzig, 1888); Ricci, / primordi d. Studio di Bologna (2nd ed., Bologna, 1888). All the extant statutes are edited by Carlo Malagola, Statuti d. univ. e del collegi d. studio bolognese (Bologna, 1888) ; and a new edition has appeared of the learned C. J. Sarti's De Claris Archigymnasii Bonon- iensis Professoribus (Bologna, 1888, &c). In connexion with Padua we have Die Statuten der Juristen- Universitat Padua vom Jahre 1331, ed. H. Denifle, a reprint from the Archiv. For Spain, the work of De La Fuente (Madrid, 1855) gives a concise summary of the main facts in the growth of the universities and also of the other institu- tions for public instruction throughout the country; the Libro Memoria, by Solier and Vilches (1895) gives the necessary information down to a later period, in connexion with the central institution in Madrid. The history of the faculty of theology at the Portuguese university of Coimbra has been recorded on a more elaborate scale by Dr Manuel Eduardo da Motta Veiga (Coimbra, 1872). The Universidades y Colegios of Dr Joaquin v. Gonzalez (Buenos Aires, 1907) contains an interesting account of the new university movement in Argentina. For Oxford there are the laborious collections by Anthony Wood, History and Antiquities of the University and of the Colleges and Halls of Oxford, edited with continuation by Rev. j . Gutch (5 vols., 1786-96), and Athenae and Fasti Oxonienses, edited by Dr P. Bliss (4 vols., 1813-20); A History of the University of Oxford from the Earliest Times to 1530, by H. C. Maxwell Lyte (1886) ; and Statutes of the University of Oxford compiled in 1636 under Authority of Archbishop Laud, ed. Griffiths (Oxford, 1888). The publications of the late Joseph Foster, Alumni Oxonienses, 1500-1886 (8 vols.), supply the facts that are contained in the registers relating to the academic careers of graduates; his Oxford Men and their Colleges, 1880-92 (2 vols., 1893) contains, vol. i., college life and antiquities, with illustrations; vol. ii., completion of Alumni and Matriculation Register, 1880-92. The publications of the Oxford Historical Society include some valuable

histories of separate colleges, that of Pembroke (by Macleane), Corpus Christi (by Fowler), Merton (by Brodrick) ; also Anthony Wood's Life and Times, ed. Rev. Andrew Clark (4 vols.) ; Hearne's Collections, ed. Doble and Rannie (4 vols.); and Early Oxford Press (to 1640), by Falconer Madan. The series of College Histories, originally pub- lished by F. E. Robinson (now by Hutchinson & Co.), is often service- able both to the historian and the biographer. For Cambridge, the researches of C. H. Cooper, greatly surpassing those of Wood in thoroughness and impartiality, are comprised in three series: (1) Annals of Cambridge (5 vols., 1842-1908); (2) Athenae Canta- brigienses, 1500-1609 (2 vols., 1858-61); (3) Memorials of Cambridge (3 vols. ; new ed. 1884). The A rchitectural History of the University of Cambridge and of the Colleges, by the late Robert Willis, edited and continued by J. Willis Clark (4 vols., 1886), is a work of admirable thoroughness and completeness. The Grace Books, in 3 vols., down to 1526, have been carefully edited and published by the University Press. J. B. Mullinger, History of the University of Cambridge from the Earliest Times to Accession of Charles I. (2 vols., 1873-85), vol. 3 at press, and Cambridge Described and Illustrated, by T. D. Atkinson and J. W. Clark (1897), deal chiefly with the course of education and learning, and with the antiquities respectively. To these may be added Thomas Baker's History of the College of St John the Evangelist, edited by Professor Mayor (2 vols., 1869); also, by same editor, Admissions to St John's (3 vols., 1630-1765); and Records of same society (2 series), edited by R. F. Scott — all three works being valuable aids both to the biography and history of contemporary times. Equally so is Dr Venn's excellent Biographical History of Caius College (3 vols., 1897-1901). Mr J. A. Venn's Statistical Chart, exhibiting conjointly the Matriculation Statistics at both universities from 1544 to 1906, has been reproduced, along with an explanatory article, in the Oxford and Cambridge Review for Lent term, 1908, and a similar chart for the colleges (in Cambridge) has been

published by the same editor. For both universities see the Documents issued by the Oxford and Cambridge Commissions of 1858.

Mr M. E. Sadler's Special Report to the Education Office on the Admission of Women to the Universities is the most authoritative source of information on the subject. Of the existing endowments, faculties and professoriate of universities throughout the world, the serial entitled Minerva, edited by Dr K. Trtibner (Trubner, Strassburg), has supplied trustworthy particulars since its first publication in 1891, together with concise information and references to original sources respecting the origin and history of the universities themselves. (J. B. M.)

Academic Hoods I. Great Britain and Ireland

Aberdeen. — D.D., scarlet cloth, lined purple; B.D., black, 1 lined purple; LL.D., scarlet cloth, lined pale blue; LL.B., black, bordered pale blue; M.D., scarlet cloth, lined crimson; M.B., black, lined crimson; D.Litt., scarlet cloth, lined white; D.Phil., scarlet cloth, lined white; D.Sc., scarlet cloth, lined green; B.Sc., black, lined green; M.A., black, lined white.

Cambridge. — D.D., scarlet cloth, lined pink and violet shot, with loops of black cord; B.D., black, unlined; LL.M., black, lined white; LL.D., scarlet cloth, lined pink; LL.B., black silk or stuff, edged white fur; M.D. scarlet cloth, lined dark cherry colour; M.B., black, lined dark cherry colour; Mus.D., cream damask, lined cherry colour; Mus.B., dark cherry colour, lined white fur; Litt.D., scarlet cloth, lined scarlet; D.Sc., scarlet cloth, lined pink and light blue shot; M.A., black, lined white; B.A., black stuff or silk, edged white fur. Proctors as their Congregation habit wear the ruff and black and white hood; on other occasions they wear the hood " squared."

Dublin. — (The hoods are the same for the Royal University, except M.B., Mus.D. and divinity degrees, which it does not grant.) D.D., scarlet cloth, lined black; B.D., black, unlined; LL.D., scarlet cloth, lined pink; LL.B., black, bordered white; M.D., scarlet cloth, lined scarlet; M.B., black, lined white fur (Royal University, black, bordered scarlet); Mus.D., crimson cloth, lined white (Royal University, white damask, faced and lined rose satin); Mus.B., blue, lined white fur (rabbit-skin); Litt.D., scarlet cloth, lined white; D.Sc, scarlet cloth, lined blue; M.A., black, lined blue; B. A., black, edged white fur; Proctor, black silk, lined " ermine."

Durham. — D.D., scarlet " cassimere," lined " palatinate

purple "; B.D., black, unlined; D.C.L., scarlet cassimere, lined white; B.C.L., palatinate purple, edged white fur; M.D., scarlet cassimere, lined scarlet, bordered palatinate purple; M.B., scarlet silk, lined palatinate purple, edged white fur; Mus.D., white brocade, lined palatinate purple; Mus.B., palatinate purple, edged white fur; Litt.D., scarlet cassimere, lined old-gold satin; Litt.B., old-gold satin, edged white fur; D.Sc., palatinate purple cassimere, lined scarlet; B.Sc., palatinate purple, edged white fur; M.A., black, lined palatinate purple; B.A., black stuff or silk, edged white fur.

Edinburgh. — D.D., black cloth, lined purple; B.D., black silk, lined purple, edged white fur; LL.D., black cloth, lined blue; LL.B., black silk, lined blue, edged white fur; B.L., black, bordered blue, edged white fur; M.D., black cloth, with cape attached, lined and faced crimson silk; M.B., black, lined crimson, edged white fur; Mus.D., scarlet cloth, lined white corded silk; Mus.B., scarlet silk, lined white, edged white fur; Litt.D., black cloth, lined royal blue shot with maize; D.Phil., black cloth, lined white, shot with "Vesuvius"; D.Sc., black cloth, lined green; B.Sc., black silk, lined green, edged white fur; M.A., black silk, lined white.

Glasgow. — D.D., scarlet cloth, lined white; B.D., black, lined light cherry colour, bordered scarlet cloth; LL.D., scarlet cloth, lined Venetian red; LL.B., black, lined Venetian red, bordered scarlet cloth; B.L., black, bordered Venetian red; M.D., scarlet cloth, lined scarlet; M.B., black, lined scarlet, bordered scarlet cloth: D.Sc., scarlet cloth, lined gold colour; B.Sc., black, lined gold colour, bordered scarlet cloth; M.A., black silk, lined " bell- heather " colour (purplish red); B.A., black silk or stuff, bordered bell-heather red.

London. — (Bachelors, if members of Convocation, have their hoods lined white silk, bordered with the colour of their faculty.) D.D., scarlet cloth, lined " sarum red"; B.D., black, bordered sarum red; LL.D., scarlet cloth, lined blue; LL.B., black, bordered blue; M.D., scarlet cloth, lined violet; M.B., and B.S., black, bordered violet; Mus.D., scarlet cloth, lined white, if a member of Convocation, if not, same as Mus.B., blue, lined white, watered silk; Litt.D., scarlet cloth, lined russet; D.Sc., scarlet cloth, lined gold colour; B.Sc., black, bordered gold colour; M.A., black, lined russet; B.A., black, bordered russet.

Oxford.— D.D., scarlet cloth, lined black; B.D., black, unlined; D.C.L., scarlet cloth, lined rose; B.C.L., light blue, edged white fur; M.D., scarlet cloth, lined rose; M.B., dark blue, edged white fur; Mus.D., white damask, lined crimson; Mus.B., light blue, edged white fur; Litt.D., scarlet cloth, lined slate colour; Litt.B., light blue, edged white fur; M.A., black, lined red; B.A., black silk or s tuff, edged white fur; Proctors wear a " miniver " hood.

1 Where not otherwise stated, the hood is of silk.

St Andrews. — D.D., violet silk or cloth, lined white satin; B.D.. violet silk or cloth, lined white satin, edged white fur; LL.D., scarlet silk or cloth, lined white satin; LL.B., scarlet silk or cloth, lined white satin, edged white fur; M.D., crimson silk or cloth, lined white satin; M.B., crimson silk or cloth, lined white satin, edged white fur; Mus.D., cerulean blue silk or cloth, lined white satin; Mus.B., cerulean blue, lined white satin, edged white fur; D.Sc., "amaranth" silk or cloth, lined white satin; B.Sc, amaranth silk or cloth, lined white satin, edged white fur; M.A., black, lined red.

Victoria University. — LL.D., gold velvet or satin, lined light gold; LL.B., black, bordered violet; M.D., gold velvet or satin, lined light gold; M.B., black, bordered red; Litt.D., gold velvet or satin, lined light gold; D.Sc, gold velvet or satin, lined light gold; B.Sc, black, bordered pale red; M.A., black, lined pale blue; B.A., black, bordered pale blue.

University of Wales and Lampeter. — B.D. (Lampeter), black, lined violet, bordered white; B.A., black, bordered blue and green shot.

2. Australia

Sydney. — B.A., black stuff, edged white fur; M.A., black, lined blue; LL.B., black, bordered blue; LL.D., scarlet cloth, lined blue; B.Sc, black stuff, bordered amber; D.Sc, scarlet cloth, lined amber; B.E. (Engineering), black stuff, bordered light maroon; M.E., black, lined light maroon; M.B., black, bordered purple; M.C., black, lined French grey; M.D., scarlet cloth, lined purple.

Adelaide. — B.A., black, lined grey; .M.A., black, lined dark grey; LL.B., black, lined blue; LL.D., dark blue, lined light blue;

B.Sc, black, lined yellow; D.Sc, dark yellow, lined light yellow; M.B., black, lined rose; M.C. (Surgery), black, lined dark rose; M.D., dark rose, lined light rose; Mus.B., black, lined green; Mus.D., dark green, lined light green.

Melbourne. — B.A., black, lined dark blue; M.A., black, lined violet; Litt.D., black, lined dark blue; LL.B., black, lined white fur; LL.M., black cloth, edged red silk, lined white; LL.D., black, lined white; B.Sc, black, lined moss-green, edged white fur; M.Sc, black, lined moss-green; D.Sc, scarlet cloth, lined moss- green; B.E. (Engineering), black, lined light blue; M.E., black, lined yellow; M.B., black, lined white; M.C. (Surgery), black, lined dark amber; M.D., black, lined crimson; Mus.B., black, lined lavender, edged white fur; Mus.D., black, lined lavender.

New Zealand. — B.A., black, lined pink, edged white fur; M,A., black, lined pink; LL.B., black, lined blue, edged white fur; LL.D., black, lined light blue; B.Sc, black, lined dark blue, edged white fur; D.Sc, black, lined dark blue; M.B., black, lined mauve, edged white fur; M.D., black, lined mauve; Mus.B., black, lined white, edged white fur; Mus.D., black, lined white.

3. Canada

These follow the British model, with the exception of Laval, Quebec, which grants the same degrees as the University of France, the distinctive mark of which is the scarf.

Dalhousie (N.S.). — B.A., black stuff, lined white fur; M.A., black stuff, lined crimson; B.L. (Letters), black stuff, lined white, bordered light blue; M.L., black stuff, lined light blue; LL.B., black, lined white, bordered gold; LL.D., black, lined purple; B.Sc, black stuff, lined white silk, bordered crimson; M.Sc, black stuff, lined crimson; B.E. (Engineering), black stuff, lined white silk, bordered purple; M.C, scarlet cloth, bordered white; M.D., scarlet silk, bordered white; Mus.B., black stuff, lined white, bordered lavender.

Fredericton (N.B.).-B.A., black stuff, edged white fur; M.A., black, lined blue; B.C.L., black, lined blue silk, edged white fur; D.C.L., scarlet cloth, lined pink.

McGill (Montreal). — B.A., black stuff, edged white fur; M.A.,

black, lined blue; Litt.D. (Literature), scarlet cloth, lined pale blue; B.C.L., black, lined French grey, edged white fur; D.C.L., scarlet cloth, lined French grey; B.Sc, black, lined yellow, edged white fur; M.Sc, black, lined yellow; D.Sc, scarlet cloth, lined yellow; M.B., black, lined dark blue; M.D., scarlet cloth, lined dark blue; D.V.S. (Doctor of Veterinary Science), scarlet cloth, lined fawn.

Toronto. — D.D. (Trinity College), scarlet cloth, lined black; B.D. (Trinity College), black, unlined; B.A., black stuff, edged white fur; M.A., black, lined crimson; LL.B., blue, lined white fur; LL.D., scarlet cloth, lined pink; M.B., blue, lined white fur; M.D., scarlet cloth, lined pink.

Windsor (N.S.).—B.A., black stuff, edged white fur; M.A., black, lined crimson; B.C.L., blue, edged white fur; D.C.L., scarlet cloth, lined pink.

4. India

These foilow the British model, but also give Oriental degrees, the distinctive mark of which is a sash. They also grant the degree of Licentiate in certain subjects, which has a hood.

Allahabad. — B.A., black, bordered amber; M.A., black, lined amber; LL.B., black, lined blue; LL.D., pale blue.

Bombay. — B.A., black stuff, bordered garter blue; M.A., garter blue, lined same; LL.B., black, bordered scarlet cloth; B.Sc,

black stuff, bordered garter blue; L.C.E. (Engineering), black stuff, bordered brown; M.E., brown, lined garter blue; L.M. and S. (Medicine and Surgery), black stuff, bordered crimson; M.D., crimson, lined garter blue; L.Ag. (Agriculture), black stuff, bordered green.

Calcutta. — B.A., black, bordered dark blue; M.A., black, lined blue; LL.B., black, bordered green; LL.D., scarlet, lined white satin; B.Sc., black, bordered light blue; B.E., black, bordered orange; M.E., black, lined green; M.B., black, bordered scarlet; M.D., black, lined scarlet.

Madras.— B. A., black, bordered crimson; M.A., black, lined crimson; LL.B., black, lined purple; M.L., purple silk; LL.D., scarlet silk; B.E., black, lined orange; M.B., black, lined light blue; L.M. and S., black, lined light blue; M.C., black, lined light blue; M.D., scarlet cloth, lined light biue; L.San.Sc. (Sanitary Science), black, bordered terra-cotta; L.T. (Teaching), black, lined gold.

Punjab. — B.A., purple, lined yellow; M.A., purple, lined claret; Litt.D., purple, lined scarlet; LL.B., white, lined blue; LL.D., scarlet silk; M.B., purple, lined purple cloth; M.D., purple, lined purple.

5. South Africa

Cape of Good Hope. — B.A., black, bordered orange-brown; M.A., black, lined orange-brown, bordered black; Litt.D., orange- brown, lined white, bordered black; LL.B., black, bordered red; LL.D., red, lined white, bordered black; B.Sc., black, bordered green; M.Sc., green, bordered black; D.Sc., green, lined white, bordered black; M.B., black, bordered blue; M.D., blue, lined white, bordered black; Mus.B., black, bordered purple; Mus.M., purple, bordered black; Mus.D., purple, lined white, bordered black.

6. United States

The American universities have adopted a uniform system, according to which the length and shape of the hood indicate the degree (bachelor, master, doctor), the silk lining displays the official colours of the university or college granting the degree (e.g. crimson for Harvard, blue for Yale, orange and black for Princeton, light blue and white for Columbia, royal purple and white for Cornell and red and blue for Pennsylvania), while the velvet trimming indicates the faculty or department. Thus the trimming for arts and letters is white, for theology scarlet, laws purple, philosophy blue, science gold-yellow, fine art6 brown, medicine green, music pink, pharmacy olive, dentistry lilac, forestry russet, veterinary science grey and library science lemon. It is also usual in America for a graduate of a German university to wear a hood lined with the colours of the university charged with a trichevron of the German colours, black, white and red.

UNIVERSITY COURTS, in the English universities of Oxford

and Cambridge, courts of inferior jurisdiction, administering principles of justice originally founded on the canon and civil law, but now defined and limited by the common law (see particularly Ginnett v. Whittingham, 1886, 16 Q.B.D. 769).

At Oxford the judge of the chancellor's court is the vice-chancellor, who is his deputy or assessor; the court has had since 1244 civil jurisdiction, to the exclusion of the king's courts, in all matters and suits wherein a scholar or privileged person of the university is one of the parties, except in actions relating to freehold. It had also, from 1290 downwards, jurisdiction of all injuries and trespasses against the peace, mayhem and felony excepted, but since the Summary Jurisdiction Acts this is possibly no longer exercisable, but the chancellor, vice- chancellor and the vice-chancellor's deputy are justices of the peace for Oxford, Oxfordshire and Berkshire, where scholars are concerned, and exercise this jurisdiction under the Summary Jurisdiction Acts. By the Oxford University Act 1854 the vice-chancellor's court now administers the common and statute law of the realm.

The criminal jurisdiction of Cambridge University in cases where any person not a member of the university is a party has ceased, and its jurisdiction over light women, which was founded on a charter and statute of Elizabeth, was taken away in 1894 by a private act of that year (c. 60), and an act of 6 Geo. IV. c. 97, dealing with them and applicable till then only to Oxford University, was extended to Cambridge University. Previous to 1891, women of light character, who had been con- victed of consorting with or soliciting members of the university in statu pupillari, were detained in a house of correction called the spinning house, but in that year a conviction was held bad (ex parte Hopkins, 1891, 61 L.J.Q.B. 240; see also, however, Kemp v. NevUl, 1861, 10 C.B.N.S. 523).

UNNA, a town of Germany, in the Prussian province of Westphalia, 15 m. by rail E. of Dortmund, on the line to Hamm. Pop. (1905) 16,324. It has two Roman Catholic and two Protestant churches, a synagogue and several schools. Its chief industries are iron foundries, machine shops, salt works and breweries — other articles of manufacture being bricks and cement. In the middle ages Unna formed part of the electorate of Cologne. It received municipal rights in 1256 and was a member of the Hanseatic League.

UNTERWALDEN, one of the cantons of central Switzerland, extends to the south of the lake of Lucerne, 14 sq. m. of which are included within the canton (13 being in Nidwalden). It is composed of two valleys, through which run two streams, both called Aa, and both flowing into the lake of Lucerne. The more westerly of these glens is called Obwalden, and the more easterly Nidwalden. These names really come from the 13th century expression for the inhabitants, homines intramontani (men dwelling in the mountains), whether of vallis superioris (of the upper valley) or vallis inferioris (of the lower valley). But in the 14th century the relative position of the two valleys is defined as " upper " and " lower " with reference to the great Kerns forest (stretching between Stans and Kerns), and hence is derived the historically inaccurate name of " Forest cantons," now so well known. The total area of the canton is 295-4 sq. m. (Obwalden has 183-2 and Nidwalden 11 2-i, though it must be borne in mind that the upper portion of what should be the territory of Nidwalden is, as regards the Blacken Alp, in Uri, while the Engelberg region is in Obwalden). Of this area 238-2 sq. m. (154-1 in Obwalden and 84-1 in Nidwalden) are classed as " productive," forests covering 73-8 sq. m. (47 in Obwalden and 26-8 in Nidwalden), while of the rest glaciers occupy 5-2 sq. m. (3-9 in Obwalden and 1-3 in Nidwalden), the highest point in the canton being the Titlis (10,627 ft.) situated in the Obwalden half. The small lakes of Sarnen and of Lungern are wholly situated in Obwalden. Obwalden, as including the Engelberg region, is far more mountainous than Nidwalden, which is rather hilly than mountainous. The inhabitants in both cases are mainly devoted to pastoral and, in a lesser degree, to agricultural pursuits. In Obwalden there are 290 " alps," or mountain pastures, capable of supporting 13,399 cows, and of an estimated capital value of 5,474,400 fr.: the figures for Nidwalden are respec- tively 166, 5207 and 3,899,900. In 1900 the total popula- tion of the canton was 28,330 (15,260 in Obwalden and 13,070 in Nidwalden), of whom all but the most insignificant proportion were German-speaking and Romanists. Till 1814 the canton was in the diocese of Constance, but since then it is practically administered by the bishop of Coire, though legally included in no diocese. The capital of Obwalden is Sarnen {q.v.), and of Nidwalden Stans (q.v.). The other most con- siderable villages are all in Obwalden — Kerns (2392 inhab.), Engelberg (1973 inhab.) and Lungern (1828 inhab.). The canton is traversed by the Briinig railway line

from Hergiswil (in Nidwalden) to the top of the pass (20 m.), but most of the electric line from Stansstad to Engelberg (14 m.) is in Nidwalden. The mountain lines up Pilatus (Obwalden), the Stanserhorn, and to the Biirgenstock (both in Nidwalden) are also in the canton. Each half forms a single administrative district, and has its own independent local institutions, while in Obwalden there are 7 communes and in Nidwalden 11. In each the supreme legislative authority is the " Lands getneinde" or primitive democratic assembly (meeting in both cases on the last Sunday in April), composed of all male citizens of 20 (Obwalden) or 18 (Nidwalden) years of age. In both cases the Landsgemeinde elects the executive for three years (Nidwalden) or four years (Obwalden), while it is composed of 11 (Nidwalden) or 7 (Obwalden) members, out of whom the Landsgemeinde elects annually the chief officials. In each half there is also a sort of " standing committee " (the Landrath, Nidwalden, or Kantonsrath, Obwalden), which drafts measures to be submitted to the Landsgemeinde, supervises the cantonal administration, and is empowered to spend sums below a certain amount. In

each case the Landrat is composed of the members of the executive, plus a certain number of members elected in each " commune, " in the proportion of 1 member to every 250 inhabitants, or fraction over 125 (so Nidwalden, which allows them to hold office for six years), or 1 member to every 200 inhabitants (Obwalden, which allows them to hold office for four years). These Lands gemeinden are of immemorial antiquity, while the other constitutional details are settled by the con- stitution of 1877 in Nidwalden, and by that of 1902 in Obwalden. In each half the single member of the Federal Stdnderat is elected by the Landsgemeinde, while the single member enjoyed by each in the Federal Nationalrat is chosen by a popular vote, but not by the Landsgemeinde. The people of the canton have always been very pious and religious. In the church of Sachseln (near Sarnen) still lie the bones of the holy hermit, Nicholas von der Flue, fondly known as " Bruder Klaus " (141 7-1487), while at Sarnen there are several convents, though the most famous of all the monasteries in the canton, the great Benedictine house of Engelberg (founded about 1 1 20) is situated at the head of the Nidwalden valley, though

politically in Obwalden. At the lower end of the Nidwalden valley is Stans, the home of the Winkelried family (

It is very remarkable that in both valleys the old " common lands " are still in the hands of the old gilds, and " communes " consist of natives, not merely residents, though in Obwalden these contribute to the expenses of the new "political communes " of residents, while in Nidwalden the latter have to raise special taxes. In Engelberg (which still retains some independence) the poor are greatly favoured in the division of the common lands and their proceeds, and unmarried persons (or widowers and widows) receive only half of the share of those who are married.

Historically, both Obwalden (save a small bit in the Aargau) and Nidwalden were included in the Zurichgau. In both there were many great landowners (specially the abbey of Murbach and the Habsburgs) and few free men; while the fact that the Habsburgs were counts of the Aargau and the Zurichgau further delayed the development of political freedom. Both took part in the risings of 1245-47, and in 1247 Sarnen was threatened by the pope with excommunication for opposing its hereditary lord, the count of Habsburg. The alleged cruelties committed by the Habsburgs do not, however, appear in history till Justinger's Chronicle, 1420 (see Tell). On the 16th of April 1 291, Rudolph the future emperor bought from Murbach all its estates in Unterwalden, and thus ruled this district as the chief landowner, as count and as emperor. On the 1st of August 1 291 Nidwalden (Obwalden is not named in the text of the document, though it is named on the seal appended to it) formed the " Everlasting League " with Uri and Schwyz (this being the first known case in which its common seal is used). In 1304 the two valleys were joined together under the same local deputy of the count, and in 1309 Henry VII. confirmed to them all the liberties granted by his predecessor — though none is known to have been granted. However, this placed Unterwalden on an equal political footing with Uri and Schwyz; and as such it took part (1315) in Morgarten fight (also driving back an invasion over the Briinig Pass) and in the renewal of the Everlasting League at Brunnen (131s), as well as at Sempach (1386) and in driving back the Gugler or English freebooters (1375). For physical reasons, it was difficult for Unterwalden to enlarge its territories. Yet in 1368 it acquired Alpnach, and in 1378 Hergiswil. So too Obwalden snared with Uri in the conquest of the Val Leventina (1403)

and in the purchase of Bellinzona (1419), as well as in the loss of both (1422). It was Nidwalden that, with Schwyz and Uri, finally won (1500) and ruled (till 1798) Bellinzona, the Riviera, and the Val Blernio; while both shared in conquests of the Aargau (1415), the Thurgau (1460), and Locarno, &c. (151 2), and in the temporary occupation of the Val d' Ossola (1410-14, 1416-22, 1425-26, 1512-15). In the Burgundian war Unterwalden, like the other Forest cantons, long hung back through jealousy of Bern, but came to the rescue

in time of need. In 1481 it was at Stans that the Confederates nearly broke up the League for various reasons, and it was only by the intervention then of the holy hermit Nicholas von der Flue (of Sachseln in Obwalden) that peace was restored, and the great Federal agreement known as the compact of Stans concluded. Like the other Forest cantons, Unterwalden clung to the old faith at the time of the Reformation, being a member of the " Christliche Vereinigung " (1529) and of the Golden League (1586).

In 1798 Unterwalden resisted the Helvetic republic, but, having formed part of the short-lived Tellgau, became a district of the huge canton of the Waldstatten. Obwalden submitted at an early date, but Nidwalden, refusing to accept the oath of fidelity to the constitution mainly on religious grounds, rose in desperate revolt (September 1798), and was only put down by the arrival of 16,000 armed men and by the storming of Stans. In 1803 its independence as a canton was restored, but in 181 5 Nidwalden refused to accept the new constitution, and Federal troops had to be employed to put down its resistance, the punishment inflicted being the transfer (181 6) to Obwalden of the jurisdiction over the abbey lands of Engelberg (since 1462 " protected " by the four Forest cantons), which in 1798 had fallen to the lot of Obwalden and had passed in 1803 to Nidwalden. Since that time the history of Unterwalden has been like that of the other Forest cantons. It was a member of the " League of Sarnen " (1832), to oppose the reforming wishes of other cantons, and of the " Sonderbund " (1845); it was defeated in the war of 1847; and it voted against the acceptance of the Federal constitution both in 1848 and in 1874.

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Kanton Unter- walden (St Gall, 1836) and Die Geschichte des Volkes von Unter- walden (2 vols., Lucerne, 1827-28); M. A. Cappeller, Pilati montis historia (Basel, 1767); E. Etlin, Die Alpwirtschaft in Obwalden (Soleure, 1903); H. Christ, Ob dem Kernwald (Basel, 1869); R. Durrer, Die Kunst- und Architekturdenkmdler d. Unterwaldens (in course of publication since 1899); J. Gander, Die Alpwirtschaft im Kant. Nidwalden (Soleure, 1896); Geschichtsfreund, from 1843 (in vols. 49, 51-53, 55 and 57 the charters of Engelberg 1 122-1428 have been printed) ; Conrad Gesner, Descriptio montis fracti {Pilatus) (Zurich, 1555); A. Liitolf, Sagen, Brduche, Legenden aus den Fiinf Orten (Lucerne, 1862); Obwaldner GesChichtsbldtter (Zurich, from 1901); W. Oechsli, Die Anfdnge d. schweiz. Eidge- nossenschaft (Zurich, 1891); H. Ryffel, Die schweiz. Landsgemein- den (Zurich, 1903); J. Sowerby, The Forest Cantons of Switzerland (London, 1892). (W. A. B. C.)

UNTON (or Umpton), SIR HENRY (c. 1557-1596), English diplomatist, was the second son of Sir Edward Unton, or Umpton (d. 1583), of Wadley, near Faringdon, Berkshire, his mother, Anne (d. 1588), being a daughter of Edward Seymour, duke of Somerset, the protector. Educated at Oriel College, Oxford, Unton became a member of parliament in 1584 and served with the English forces in the Netherlands in 1585 and 1586, being present at the skirmish of Zutphen. In 1586 he was knighted. In 1 591, through the good offices of the earl of Essex, Unton was sent as ambassador to Henry IV. of France; he became very friendly with this king and accompanied him on a campaign in Normandy before he was recalled to England in June 1592. Again securing a seat in parliament he lost for a short time the favour of Queen Elizabeth; however, in 1593 he went again as ambassador to France. He died in the French camp at La Fere on the 23rd of March 1596, a collection of Latin verses being published in his memory at Oxford later in the year. This was edited by his chaplain, Robert Wright (1 560-1643), afterwards bishop of Lichfield and Coventry.

There is an interesting picture in the National Portrait Gallery re- presenting Unton and various scenes in his life. Many of his official letters are in the British Museum and in the Public Record Office, London. A collection of these was edited by Joseph Stevenson (1847), and some are printed in W. Murdiu's Burghley Papers (1759).

UNYAMWEZI, a region of German East Africa, lying S. of Victoria Nyanza and E. of Lake Tanganyika. It is mentioned as early as the 16th century by the Portuguese and by Antonio Pigafetta, under the name Munemugi or " Land of the Moon," which is the exact equivalent of the name — Wu-nya-mwezi — by

which the land is known to its own people. It is part of the plateau between the two great rift-valleys of East Africa, is rich in woods and grass, and has many villages surrounded by well cultivated farms and gardens. The western portions, however, are somewhat swampy and unhealthy. The people of Unyamwezi, called Wanyamwezi, are Bantu-negroes of medium size and negroid features, but with long noses and curly rather than woolly hair, suggestive of mixed blood. Dwelling on the main road from Bagamoyo to Tanganyika, the route by which J. H. Speke, Richard Burton, J. A. Grant, H. M. Stanley and others travelled, and having from early times had commercial relations with the Arabs, the Wanyamwezi are more civilized than the neighbouring races. They practise tattooing, file or extract the upper incisor teeth, and load their legs and arms with brass wire rings. The men look after the flocks and poultry, while the women do the field-work. They often keep bees; in some cases the hives are inside the huts, and the bees form an efficient protection against intruders. Inheritance is to the direct issue, not as is often the case among Negro races to the nephew. In some parts, one of twins is always killed. On Stanley's first visit in 1871, the Zanzibar Arabs were predominant in the country, but later the natives rose and, under Mirambo, who from a common porter rose to be a conquering chief — earning for himself the title of the " Black Bonaparte " — a Negro kingdom was formed. Since 1890 the country has been under German control and the power of the native chiefs greatly curtailed. As a people the Wanyamwezi are extremely vigorous and have shown great capacity for ex- pansion, being energetic and enterprising.

See H. Brode, Tippoo Tib: the Story of his Career in Central Africa (1907); Sir H. H. Johnston, The Uganda Protectorate (1902) ; Sir Charles Eliot, The East Africa Protectorate (1905).

UNYORO, called by its people Bunyoro, a country of east central Africa lying N. W. of the kingdom of Buganda (Uganda) and bounded E. and N. by the Victoria' Nile. On the west, Unyoro includes nearly all the eastern shores of Albert Nyanza and a strip of territory — incorporated in Belgian Congo in 1910 — west of that lake. In 1896 a British protectorate was established over Unyoro, which now forms the S.W. part of the northern province of the Uganda Protectorate. The limits of Unyoro have varied according to the strength of its rulers; during the 19th century the states of Bunyoro and Buganda appear to have been rivals for the overlordship of the region between the Bahr-el-Jebel and the great lakes. The Banyoro (as its people call themselves) had a certain degree of civilization and were skilled in iron-work, pottery and wood-work. The ruling class is of Hima stock, the Bahima possessing large herds of cattle. The first Europeans to enter the country were J. H. Speke and J. A. Grant, who spent part of 1862 there, the king, Kamurasi, putting many obstacles in the way of the travellers continuing their journey down the Nile. Its next white visitors were Sir Samuel and Lady Baker, who in 1864 discovered the Albert Nyanza. At this time ivory and slave traders, nominally Egyptian subjects, penetrated as far south as Unyoro, and a few years later (1870-74) Baker, as governor- general of the Equatorial Provinces, extended Egyptian influ- ence over the country and placed a garrison at Foweira on the Victoria Nile. He formally annexed Unyoro to the Egyptian dominions at Masindi on the 14th of May 1872. General Gordon, who succeeded Baker, established posts at Masindi and Mruli. With King Kabarega, a son of Kamurasi, the Egyptians had many encounters. Egyptian authority ceased altogether with the withdrawal of Emin Pasha in 1888, but not long after- wards British influence began to be felt in the country. Kabarega in 1891 found himself in conflict with Captain F. D. Lugard, who entered Unyoro from the south. From this point the history of Unyoro is traced in the article Uganda. It need only be stated here that in 1899 Kabarega was captured by the British and deported to the Seychelles, and that one of his sons (Yosia, a minor) was subsequently recognized as chief in his place, though with very restricted powers, the province being virtually ad- ministered directly by the British government.

Unyoro has played rather an important r61e in the past (unwritten) history of Equatorial Africa as being the region

from which the ancient Gala (Hamitic) aristocracy, coming from Nileland, penetrated the forests of Bantu Africa, bringing with them the Neolithic civilization, the use of metals, and the keeping of cattle. Unyoro, though not a large country, is in many ways remarkable. It is thought to contain gold in the north and north-east. In the west and south-west are the vast primeval forests of Budonga and Bugoma, containing large chimpanzees and a peculiar sub-species of straight-tusked elephants (only found in Unyoro).

See the works of Speke, Grant and Baker; also Colonel Gordon in Central Africa (4th ed., 1885); J. F. Cunningham's Uganda and its Peoples (1905) ; and Winston Churchill's My African Journey (1908). (H. H. J.)

UPAS, a Javanese word meaning poison, and specially applied to the poison derived from the gum of the anchar tree (Antiaris toxicaria), a member of the fig-family (Moraceae), and a native of the Sunda Islands, which was commonly used to envenom the darts of the natives. The name of the upas tree has become famous from the mendacious account (professedly by one Foersch, who was a surgeon at Samarang in 1773) published in the London Magazine, December 1783, and popularized by Erasmus Darwin in " Loves of the Plants " {Botanic Garden, pt. ii.). The tree was said to destroy all animal life within a radius of 15 m. or more. The poison was fetched by condemned malefactors, of whom scarcely two out of twenty returned. All this is pure fable, and in good part not even traditional fable, but mere invention. The milky juice of the tree contains an active principle named antiarin, which has been recommended as a cardiac stimulant. It is without any pro- perties, however, that entitle it to clinical employment. The tree is described as one of the largest in the forests of Java, the straight cylindrical stem rising without a branch to the height of 60 to 80 ft. It has a whitish bark and on being wounded yields plentifully the milky juice from which the poison is prepared.

For a full account of the tree, see Bennett and Brown, Plantae Javanicae rariores, p. 52 (1838).

UPHOLSTERER, in modern usage, a tradesman who supplies coverings, cushions, padding and stuffing for chairs, sofas or beds, or who repairs the same, and more generally one who also provides carpets, curtains and household furniture. The

word first appears as " upholder, " then as " upholdster " or " up- holster, " and finally with repetition of -er, as in " poulterer," " upholsterer. " The first meaning seems to have been a broker or dealer in small wares. Probably the name was given to a broker who sold such goods by auction, holding them up to public view as is the manner of auction-rooms.

UPPER SIND FRONTIER, a district of British India, in the Sind province of Bombay, with administrative headquarters at Jacobabad. Area, 2621 sq. m. In the north-east the country is hilly; the remainder consists of a narrow strip of level plain, one half being covered with jungle and subject to inundation, from which it is protected by artificial embankments. The land is watered by canals from the Indus, of which the chief are the Begari and Desert canals. The district contains several thriving timber plantations. The climate is remarkable for its dryness and for its extraordinary variations of temperature. The annual rainfall at Jacobabad averages less than 5 in. In 1901 the population was 232,045, showing an increase of no less than 33% in the decade, chiefly due to immigration from Baluchistan. The principal crops are millets, oil-seeds, pulses, wheat and rice. The internal trade is principally in grain, the greater part of which is sent to the sea-board; the transit trade from Central Asia into Sind crosses the district, bringing wool and woollen goods, fruits, carpets and horses. The district is crossed by the Quetta branch of the North-Western railway. The wild Baluchi inhabitants were pacified by General John Jacob between 1847 and his death in 1858.

UPPINGHAM, a market town of Rutland, England, 98 m. N.N.E. of London, on a branch of the London & North-Western railway. Pop. (1901) 2588. The church of St Peter

and St Paul has Decorated portions in the nave, tower and spire. The pulpit is of the 17th century. Jeremy Taylor was rector here at the outbreak of the Civil War. The principal institu- tion of Uppingham is the school. It is coeval with the grammar school of Oakham (1584), and had the same founder, Robert Johnson, archdeacon of Leicester. It rose in the last half of the 19th century to a place of distinction among English public schools, owing to the exertions of its headmaster

(1853-77), the Rev. Edward Thring. A new group of school-buildings, with chapel, was erected in 1863 from the designs of G. E. Street. New (Tercentenary) class-rooms were opened in 1890, and a memorial chapel, containing a statue of Edward Thring, by T. Brock, R.A., was erected in 1891. The Victoria Building, containing museum, laboratory and lecture theatre, was opened in 1897. The quadrangle is by T. G. Jackson, R.A., and over the gateway is a statue of the founder, by G. J. Frampton, R.A. The school contains about 450 boys. There are general ex- hibitions to the universities, and also several, in which scholars of this school and Oakham school have preference, at St John's, Clare, Emmanuel and Sidney Sussex colleges, Cambridge. The town of Uppingham has some agricultural trade.

UPSALA, or Uppsala, a city of Sweden, the seat of a. university and of the archbishop of Sweden, chief town of the district (Ian) of Upsala, 41 m. N. of Stockholm by the Northern rail- way. Pop. (1900) 22,855. It has water-communication with Stockholm by the river Fyris and the northward arm of Lake Malar, into which it flows. The older part of the city lies on its sloping west bank, the cathedral and castle occupying dominating heights, with the university buildings below. West and south is a girdle of gardens. The new town occupies the flat east bank, and the whole is set in a fertile plain.

The university, the chief and oldest in Sweden, was founded in 1477 by Archbishop Jakob Ulfsson. The university build- ing, completed in 1887, lies west of the cathedral. It has a fine vestibule with galleries, lit from a cupola, a senate-hall, rooms for the governing body, and lecture rooms. The whole is very richly adorned. The library building was erected in 1819-41. It is on the site of the Academia Carolina, founded by Charles IX., and is known in consequence as Carolina Redi- viva. Since 1707 the library has had the right of receiving a copy of every work printed in Sweden, and its MS. collection is also large and valuable. Among the MSS. is the famous Codex Argenteus (6th century), a translation of the Gospels in the Gothic of Bishop Ulfilas (4th century). Other univer- sity institutions are the chemical laboratory, the chemical, physical and pathological institutes, the anatomy house, and the collection of Northern antiquities. The last is situ- ated in the old botanic garden, where Rudbeck and Linnaeus worked, and Linnaeus had his residence. The new botanic garden, W. of the castle

hill, was given by Gustavus III. in 1787. The astronomical observatory was founded in 1730, though there was a professorial chair in the preceding century. The Victoria Museum contains Egyptian antiquities. The Royal Society of Sciences, founded in 17 10 by Archbishop Erik Ben- zelius, occupies a house of its own and has a valuable library. Among other learned societies in the university are the Royal Association for Literary Science, and the Society for Swedish Literature. The annual expenditure of the university amounts to about £56,000, a large proportion of which is covered by a grant from parliament. The revenue of the university itself, however, amounts to about £25,000, a considerable part of which is still drawn from the property with which Gustavus Adolphus endowed it in 1624 from his private estates, amount- ing to 360 farms. . There are about sixty professors, and a large number of assistants, lecturers and docents. The number of students is from 1500 to 2000, but it fluctuates considerably; the average in 1886-90 was 1825. Every student must belong to a "nation" (landskap), of which there are thirteen, each comprising mainly students from a particular part of the country. Each nation has generally its own club- house and fund. There are also societies for special branches of study, athletics and music, especially singing, for which the students

have a deservedly high reputation. A cap of white velvet with a black border is worn by the students.

The cathedral stands nobly above the town; its tall western towers with their modern copper-sheathed spires are visible for many miles. It is of simple form, consisting of a nave with aisles and flanking chapels, short transepts, and choir with ambulatory and chapels and an apsidal eastern end. It is French in style (the first architect was a Frenchman, Etienne de Bonneuil) modified by the use of brick as building material. Ornamentation is thus slight except at the southern portal. The church was building from 1287 to 1435. It suffered from several fires, and a thorough restoration was completed in 1893. The easternmost chapel is the fine mausoleum of Gustavus Vasa. The castle was founded in 1548 by Gustavus I. but was not finished till a century later, when it was often used as a royal residence. It was destroyed by fire in 1702, and is still in part ruined, but part is used as the offices of the govern- ment of the Ian and the residence of the governor. Apart from the cathedral and a few insignificant buildings, there are no

other medieval remains. Among institutions may be mentioned the Ultuna Agricultural Institute, immediately south of the city. The industries are unimportant.

The name of Upsala originally belonged to a place still called Old Upsala nearly 2 m. N. of the present city. This Upsala, mentioned as early as the 9th century, was famous throughout Scandinavia for its splendid heathen temple, which, gleaming with gold, made it the centre of the country, then divided into a great number of small kingdoms. Three huge grave mounds or barrows remain here. In the same place the first cathedral of the bishops of Upsala was also erected (c. 1100). On the destruction of this building by fire, the inconvenient situation caused the removal in 1273 of the archiepiscopal see to the present city, then called Ostra Aros, 1 but within a short time it came to be generally called Upsala. During the middle ages the cathedral and the see of the archbishop made Upsala a kind of ecclesiastical capital. Here the kings were crowned, after their election had taken place at the Mora Stones, 10 m. S.E. of Upsala. In 1567 Eric XIV. murdered in the castle five of the most eminent men of the kingdom, three of them belonging to the family of Sture. In 1593 was held the great synod which marks the final victory of Protestantism in Sweden; in the same year the university was restored by Charles IX. In the castle, Christina, daughter of Gustavus Adolphus, resigned her crown to Charles X. in 1654. In 1702 nearly the whole city, with the castle and the cathedral, was burnt down. Among the teachers of the university who have carried its name beyond the boundaries of their own Country the following (besides Linnaeus) deserve to be mentioned: Olof Rudbeck the elder, the author of the Atlantica (1630-1702); Torbern Bergman (1735-1784), the celebrated chemist; and Erik Gustaf Geijer (1783-1847), the historian.

UR, one of the most important of the early Babylonian cities, represented to-day by the ruin mounds called Mughair (Moghair), or, more properly, Muqayyar (Mukayyar), " the pitched," or " pitch-built." It lay 140 m. S.E. of Babylon (30 95′ N., 46 5′ E.), about 6 m. S. of the present bed of the Euphrates, half-way between that and the low, pebbly sandstone hills which form the border of the Syrian desert, and almost opposite the mouth of the Shatt-el-Hai, on the Sa'ade canal. It was the site of a famous temple, E-Nannar, " house of Nannar," and the chief seat in Babylonia of the worship of the moon-god, Nannar, later known as Sin (q.v). Under the title*

Ur of the Chaldees, it is mentioned in the Bible as the original home of Abraham. It is worthy of notice that Haran, in upper Mesopotamia, which also was a home of Abraham, was likewise a famous site of worship of the god Sin, and that the name of that god also appears in Mount Sinai, which was historically connected with the origin of the Hebrew nation and religion. While not equal, apparently, in antiquity, and

1 The name first occurs in Snorro Sturluson in connection with event9 of the year 1018; it signifies " the mouth of the eastern river."

certainly not in religious importance, to the cities of Nippur, Eridu and Erech, Ur, from a very early period, played a most important part politically and commercially. Lying at the junction of the Euphrates and Tigris, at the head of the Persian Gulf, it enjoyed very extensive water-communications with rich and important regions. Lying close to the Syrian desert, at a natural point of communication with Arabia, it was the centre of caravan communication with interior, southern and western Arabia. In the Sumerian period, antedating the time of Sargon, about or before 3000 B.C., we find Ur exercising hegemony in Babylonia under a king whose name is read Lugal-Kigub-Nidudu. Comparatively early, however, it be- came a centre of Semitic influence and power, and immediately after the time of the Sargonids it comes to the front, under King Ur-Gur, or Ur-Engur, the great builder of ziggurats (stage- towers) in the ancient Babylonian cities, as mistress of both northern and southern Babylonia, and even seems to have exacted tribute from countries as far remote as southern Syria. With relatively brief intervals, during which Erech and Isin come to the fore, Ur held the hegemony in Babylonia until or shortly before the Elamite invasion, when Larsa became the seat of authority. After the period of the Elamite dominion and the establishment of the empire of Babylon, under Kham- murabi, about or shortly after 2000 B.C., Ur lost its political independence and, to a considerable extent, its political im- portance. The gradual filling up of the Persian Gulf had probably also begun to interfere with its trade supremacy. It continued, however, to be a place of religious and literary importance until the close of the Babylonian period. The ruins of the ancient site were partly

excavated by Loftus and Taylor in 1854. They are egg-shaped, with the sharper end towards the north-west, somewhat elevated above the sur- rounding country, which is liable to be inundated by the Euphrates, and encircled by a wall 2946 yards in circumference, with a length of 1056 and a greatest breadth of 825 yds. The principal ruin is the temple of E — Nannar, in the north-western part of the mounds. This was surrounded by a low outer wall, within which rose a platform, about 20 ft. in height, on which stood a two-storeyed ziggurat, or stage-tower, a right-angled parallelogram in shape, the long sides towards the north-east and south-west. The lower stage measured 198 ft. in length by 133 ft. in breadth, and is still standing to the height of 27 ft. The second storey was 14 ft. in height and measured 119 by 75 ft. The ascent to the first storey was by a stairway 8 ft. broad, on the north-east side. Access to the summit of the second storey was had on the same side, either by an inclined plane or a broad stairway — it is not clear which — extending, apparently, the whole length of that stage. Ruins on the summit show that there was a chamber on top, apparently of a very ornamental character, like that at Eridu. The bricks of the lower stage are laid in bitumen, and bear the inscription of Ur-Gur. The bricks of the upper stage are laid in mortar, and clay cylinders found in the four corners of this stage bore an inscription of Nabonidus, the last king of Babylon (639 B.C.), closing with a prayer for his son Belshar-uzur (Bel-sarra-Uzur), the Belshazzar of the book of Daniel. Between these two ex- tremes were found evidences of restoration by Ishme-Dagan of Isin and Gimil-Sin of Ur, somewhere towards the middle of the 3rd millennium B.C., and of Kuri-galzu, a Cossaean (Kassite) king of Babylon, of the 14th century B.C. Nebuchadrezzar also claims to have rebuilt this temple. Taylor further ex- cavated an interesting Babylonian building, not far from the temple, and part of an ancient Babylonian necropolis. All about the city he iound abundant remains of burials of later periods. Apparently, in the later times, owing to its sanctity, Ur became a favourite place of sepulture, so that after it had ceased to be inhabited it still continued to be used as a necropolis. The great quantity of pitch used in the construction of these ruins, which has given them the name by which they are to-day known among the Arabs, is evidence of a peculiarly close relation with some pitch-producing neighbourhood, presumably Hit, which lay at the head of the Sa'ade canal on which Ur was

located. Large piles of slab and scoria, in the neighbourhood of Ur, show, apparently, that the pitch was also used for manufacturing purposes, and that Ur was a manufacturing as well as a commercial city. Since Taylor's time Mughair has been visited by numerous travellers, almost all of whom have found ancient Babylonian remains, inscribed stones and the like, lying upon the surface. The site is rich in remains, and is relatively easy to explore.

See J. E. Taylor, Journal of the Royal Asiatic Society (1855), vol. xv.; W. K. Loftus, Chaldaea and Susiana (1857); John P. Peters, Nippur (1897); H. V. Hilprecht, Excavations in Assyria and Babylonia (1904). (J. P. Pe.)

URAL-ALTAIC, the general term for a group of languages (also called Turanian, Finno-Tatar, &c.) constituting a primary linguistic family of the eastern hemisphere. Its subgroups are Turkish, Finno-Ugrian, Mongol and Manchu. Philologists have differentiated various forms of the languages into numerous subdivisions; and considerable obscurity rests on the relationship which such languages as Japanese or ancient Accadian and Etruscan bear to the subgroups already named, which are dealt with in other articles.

In its morphology Ural-Altaic belongs to the agglutinating order of speech, differing from other languages of this order chiefly in the exclusive use of suffixes attached to the unmodified root, and partly blended with it by the principle of progressive vowel harmony, in virtue of which the vowels of all the suffixes are assimilated to that of the root. Thus the typical formula is R+r+r+R, &c, where R is the root, always placed first, and r, R, r . . . the successive postfixed relational elements, whose vowels conform by certain subtle laws of euphony to that of the root, which never changes. These suffixes differ also from the case and verbal endings of true inflecting languages (Aryan, Semitic) in their slighter fusion with the root, with which they are rather mechanically united (agglutinated) than chemically fused into a term in which root and relational element are no longer separable. Hence it is that the roots, which in Aryan are generally obscured, blurred, often even changed past the possibility of identification, inUral- Altaic are always in evidence, unaffected by the addition of any number of formative particles, and controlling the whole formation of the word. For instance, the infinitive element mak of the Osmanli yaz-mak = to write becomes mek

in sev-mek = to love (vowel harmony), and shifts its place in sev-il-mek = to be loved (imperfect fusion with the root), while the root itself remains unchanged as to form and position in sev-ish-il-mek = to be impelled to love, or in any other possible combination with suffixed elements. The facility with which particles are in this way tacked on produces an exuber- ance, especially of verbal forms, which in Osmanli, Finnish, Magyar, Tungus and Mordvinian raay be said to run riot. This is particularly the case when the numerous modal forms become further complicated by incorporating the direct pronominal object, as in the Magyar varjak = they await him, and the Mordvinian palasa = I embrace him. Thus arise endless verbal combinations, reckoned in Turki at nearly 30,000, and past counting in the Ugrian group.

Another marked peculiarity of the Ural-Altaic, at least as compared with the inflecting orders of speech, is weak subjec- tivity, the subject or agent being slightly, the object of the action strongly accentuated, so that " it was done by him " becomes " it was done with him, through him, or in his place " (apud eum). From this feature, which seems to be characteristic of all the branches, there follow some important consequences, such as a great preponderance of locative forms in the declension, ■ — the nominative, and often even the possessive, being expressed by no special suffix. Hence also the object normally precedes the subject, while the idea of possession (to have) is almost everywhere replaced by that of being (to be), so that, even in the highly developed Osmanli, " I have no money " becomes " money-to-me not-is " {Akchehim yokdtir). In fact the verb is not clearly differentiated from the noun, so that the conjugation is mainly participial, being effected by agglutinating pronominal, modal, temporal, negative, passive, causative, reciprocal,

reflexive and other suffixes to nominal roots or gerunds: I write = writing-to-me-is. Owing to this confusion of noun and verb, the same suffixes are readily attached indifferently to both, as in the Osmanli jdn= soul, jdn-ler = souls, and ydzdr=he will write, ydzdr-ler = they will write. So also, by assimilation, the Yakut kOtordor kbtdllor= the birds fly (from root kot= flying), where hotol stands for kotor, and dor for

lor, the Osmanli ler, or suffix of plurality.

But, notwithstanding this wealth of nominal or verbal forms, there is a great dearth of general relational elements, such as the relative pronoun, grammatical gender, degrees of comparison, conjunctions and even postpositions. Byrne's remark, made in reference to Tungus, that " there is a great scarcity of elements of relation, very few conjunctions, and no true postpositions, except those which are given in the declension of the noun," 1 is mainly true of the whole family, in which nouns constantly do duty for formative suffixes. Thus nearly all the Ostiak postpositions are nouns which take the possessive suffix and govern other nouns in the genitive, precisely as in the Hindi: ddmi-ki-t&r&f (men) gdyd = ma.n-oi - direction (in) I went = I went towards the man, where the so-called postposition tthr&f, being a feminine noun = direction, requires the preceding posses- sive particle to be also feminine (ki for ke) .

As there are thus only two classes of words — the roots, which always remain roots, and the suffixes, which always remain suffixes — it follows that there can be no true com- position or word-building, but only derivation. Even the numerous Magyar nominal and adjectival compounds are not true compounds, but merely two words in juxtaposition, unconnected by vowel harmony and liable to be separated in construc- tion by intervening particles. Thus in aran-sinii = gold-colour = golden, the first part aran receives the particle of comparison, the second remaining unchanged, as if we were to say " gold-er-colour " for "more golden"; and ata-fi = relative becomes ala-m-fi-a = my relative, with intrusion of the pronominal m = my.

But, while these salient features are common, or nearly common, to all, it is not to be supposed that the various groups otherwise present any very close uniformity of structure or vocabulary. Excluding the doubtful members, the relationship between the several branches is far less intimate than between the various divisions of the Semitic and even of the Aryan family, so that, great as is, for instance, the gap between English and Sanskrit, that between Lapp and Manchu is still greater.

After the labours of Castren, Csink, Gabelentz, Schmidt, Bohtlingk, Zenker, Almqvist, Radlov, Munkacsi-Berat and

especially Winkler, their genetic affinity can no longer be seriously doubted. But the order of their genetic descent from a presumed common organic Ural-Altaic language is a question presenting even greater difficulties than the analogous Aryan problem. The reason is, not only because these groups are spread over a far wider range, but because the dispersion from a common centre took place at a time when the organic speech was still in a very low state of development. Hence the various groups, starting with little more than a common first germ, sufficient, however, to give a uniform direction to their subsequent evolution, have largely diverged from each other during their independent development since the remotest prehis- toric times. Hence also, while the Aryan as now known to us represents a descending line of evolution from the synthetic to the analytic state, the Ural-Altaic represents on the contrary an upward growth, ranging from the crudest syntactical arrangements in Manchu to a highly agglutinating but not true inflecting state in Finnish. 2 No doubt Manchu also, like its congeners, had formerly possessive affixes and personal elements, lost probably through Chinese influences ; but it can never have possessed the surprisingly rich and even superabundant relational forms so characteristic of

1 Gen. Prin. of Struct, of Lang. i. 391 (London, 1885).

a " Meine Ansichten werden sich im Fortgange ergeben, so nament- lich dass ich nicht entfernt die finnischen Sprachen fur flexivische halten kann " (H. Winkler, Uralaltaische Volker, 1884, i. p. 54). Yet even true inflexion can scarcely be denied at least to some of the so-called Yenisei Ostiak dialects, such as Kotta and others still surviving about the middle Yenisei and on its affluents, the Agul and Kan (Castren, Yen., Ostjak und Kort. Sprachlehre, 1858, Preface, pp. v-viii). These, however, may be regarded as aberrant members of the family, and on the whole it is true that the Ural-Altaic system nowhere quite reaches the stage of true inflexion.

Magyar, Finn, Osmanli and other western branches. As regards the mutual relations of all the groups, little more can now be said than that they fall naturally into two main divisions — Mongolo- Turkic and Finno-Ugro-Samoyedo-Tungusic — according to the ■ several methods of employing the auxiliary elements. Certainly Turkic lies much closer to Mongolic than it does to Samoyedic and Tungusic, while Finno-Ugric seems to occupy an intermediate position between Turkic and

Samoyedic, agreeing chiefly in its roots with the former, in its suffixes with the latter. Finno-Ugric must have separated much earlier, Mongolic much later, from the common connexion, and the latter, which has still more than half its roots and numerous forms in common with Turkic, appears on the whole to be the most typical member of the family. Hence many Turkic forms and words can be explained only by reference to Mongolic, which has at the same time numerous relations to Finno- Ugric and Samoyedic that have been lost in Turkic and Tungusic. It may therefore be concluded that the Finno-Ugric migrations to the north and west and the Tungusic to the east had been completed while the Turkic and Mongolic tribes were still dwelling side by side on the Altai steppes, the probable cradle of the Ural-Altaic peoples.

How profoundly the several groups differ one from the other even in their structure is evident from the fact that such assumed universal features as unchangeable roots and vowel harmony are subject to numerous exceptions, often spread over wide areas. Not only is assimilation of final consonants very common, as in the Osmanli_ bulun-mak for the Uighur bulul-mak, but the root vowel itself is frequently subject to umlaut through the influence of suffixed vowels, as in the Aryan family. Thus in the Surgut dialect of Ostiak the long vowels of nominal stems become modified before the possessive suffix, a and e to i and to u (Castren). It is still more remarkable to find that the eastern (Yenisei) Ostiak has even developed verbal forms analogous to the Teutonic strong conjugation, the presents tabaq', abbatag'an and datpaq' becoming in the past tobaq', abbatog'an and datpiyaq' respectively; so also taig,_ torg and targ, present, past and imperative, are highly suggestive of Teutonic inflexion, but more probably are due to Tibetan influences. In the same dialects many nouns form their plurals either by modifying the root vowel, in combination with a suffixed element, or by modification alone, the suffix having disappeared, as in the English foot — feet, goose — geese. So also vowel harmony, highly developed in Finnish, Magyar and Osmanli, and of which two distinct forms occur in Yakutic, scarcely exists at all in Chere- missian, Votyak and the Revel dialect of Esthonian, while in Mordvinian and Syryenian; not the whole word, but the final vowels alone are harmonized. The unassimilated Uighuric kilur-im answers to the Osmanli kilur-um, while in Manchu the concordance is neglected, especially when two consonants intervene between the root and

the suffixed vowels. But too much weight should not be attached to the phenomenon of vowel harmony, which is of com- paratively recent origin, as shown in the oldest Magyar texts of the 12th century, which abound in such discordances as haldl-nek, tiszta-seg, for the modern haldl-nak, tiszta-sag. It clearly did not exist in the organic Ural-Altaic speech, but was independently developed by the different branches on different lines after the dispersion, its origin being due to the natural tendency to merge root and suffix in one harmonious whole.

This progressive vocalic harmony has been compared to a sort of progressive umlaut, in which the suffixed vowels are brought by assimilation into harmony with those of the root. All vowels are broadly divided into two categories, the guttural or hard and the

Ealatal or weak, the principle requiring that, if the root vowel be ard, the suffixed must also be hard, and vice versa. But in some of the groups there is an intermediate class of " neutral " vowels, which do not require to be harmonized, being indifferent to either category. In accordance with these general principles the vowels in some of the leading members of the Altaic family are thus classified by L. Adam : 3 —

Gutturals.

Palatals.

Neutrals.

Finnish Magyar Mordvinian Syryenian . Osmanli Mongolian . Buriat Manchu

u, 0, a u, 0, a u, 0, a 6, a u, 0, a, e u, 0, a u, 0, a 6, 0, a

ii, 0, a ii, 6 a, i a, i, e ii, 6, e, i u, 0, a ii, 6, a e

e, i

e, 1

i

e, i u, i

A close analogy to this law is presented by the Irish rule of "

broad to broad " and " slender to slender," according to which under certain conditions a broad (a, 0, u) must be followed in the next syllable by a broad, and a slender (e, i) by a slender. Obvious parallelisms are also such forms in Latin as annus, perennis, ars, iners, lego, diligo, where, however, the root vowel is modified by the affix, not the affix by the root. But such instances suffice to show

3 De I'harmonie des voyelles dans les langues Ouralo-Altaiques (Paris, 1874).

that the harmonic principle is not peculiar to the Ural-Altaic, but only more systematically developed in that than in most other linguistic families.

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URAL MOUNTAINS, a system of mountains which extends from the Arctic Ocean southwards nearly to the Caspian Sea, and is regarded as separating Europe from Asia. Russians describe them either as Kamen (stone) merely, or by the appropriate name of Poyas (girdle), while the name of Urals (Uraly) — derived either from the Ostyak urr (chain of mountains) or from the Turkish aral-tau or ural-tau — has with them become a generic name for extensive mountain chains. Although the real structure of the Urals, both orographical and geological, is imperfectly ascertained, enough is known to warrant the statement that they have been affected by a series of separate

upheavals, some having a north-western strike and some a north-eastern, and that they reach their maximum altitudes along a zone stretching nearly north and south. The composite nature of the Urals is best seen at the northern and southern extremities of the system, where the upheavals assume the character of distinct chains of mountains.

The Pae-khoy or coast ridge (Samoyedic " stony ridge ") is quite independent of the Urals proper, from which it is separated by a marshy tundra, some 30 m. wide. It has a distinct north-north- westerly and north-westerly trend along the shores of the Kara Sea ; and, although it is cut through by the Ugrian Strait (Yugorskiy- shar), there is no doubt that it is continued in Vaygach Island and Novaya-Zemlya. Its dome-shaped summits, which rise 1000 ft. above the tundra (Vozaipae, 1312 ft.), are completely destitute of trees, and its stony crags are separated by broad marshy tundras.

The Obdorsk or Northern Urals, which begin within a few miles of the head of Kara Bay (Konstantinov Kamen, in 68° 30′ N., 1465 ft.), and extend south-west as far as the 64th parallel, form a distinct range, stony and craggy, sloping steeply towards the south- east and gently towards the marshes of European Russia. Its highest elevations (e.g. Khard-yues, 3715 ft., and Pae-yer, 4650 ft.) are on the 66th and 67th parallels. Sometimes the main chain has on the west two or three secondary chains, formed by the upheaval of sedimentary rocks, and it is towards the southern extremity of one of these that the highest peaks of the Urals occur (Sablya, 5135 ft., in 64 47′ N., and Toll-poz-iz or Murai'chakhl, 5535 ft. in 63 55') Dense forests, chiefly fir, pine and larch, clothe the slopes of the mountains and the narrow valleys; but, as the less hospitable latitudes are approached, every species except the larch gradually disappears and the upper limit of vegetation (2400 ft. in the south) rapidly descends till it reaches the very base of the mountains towards the Arctic Circle, and forest vegetation disappears alto- gether about 65 N. (67° in the plains of Russia and Siberia).

Although usually reckoned to the Northern Urals, the section between 64 and 61 " N. has again a wholly distinct character. Here the main chain (or, more correctly, the main water-parting) of the Urals is a succession of plateaus stretching in a north-westerly direction, and dimpled with broad, flat, marshy valleys, rising here and there into isolated dome-shaped,

flattened summits, mostly under 3000 ft. (Yang-tump, 62 43′ N., 4170 ft.). The whole region, except the mountain summits, is densely clothed with coniferous forests, birch appearing only occasionally in the south, and even the Scotch pine only in a few valleys. This part of the range is also uninhabited.

The Middle Urals, between 61 ° and 55 30′ N. and about 80 m. in breadth, are the best known, as they contain the richest iron, copper and gold mines (Bogoslovsk, Goroblagodatsk and Ekaterin- burg Urals). The Denezhkin Kamen in the north (5353 ft.) and

the Tara-tash in the south (2800 ft.) may be considered as marking the limits of this section. Here the orographical structure is still more complicated. In the north (61st to 60th parallel) there is a succession of chains with a distinct north-eastern trend ; and it still remains an open question whether, for two degrees farther south, the whole of the Bogoslovsk Urals (4795 ft. in the Konzha- kovski-Kameii, and from 3000 to 4000 ft. in several other summits) do not consist of chains having the same direction. South of Kach- kanar (2885 ft.), i.e. from the 58th to the 56th parallel, the Urals assume the appearance of broad swellings 1000 to 2000 ft. in height, deeply trenched by ravines. These low and ravine-broken plateaus, the higher parts of which can be reached from Russia on a very gentle gradient, have been utilized for centuries as the chief highway to Siberia. The water-parting between the Russian and Siberian rivers is here not more than 1245 ft. above sea-level on the great Russo-Siberian highway (W. of Ekaterinburg). The eastern slope is steeper, but even there Ekaterinburg is only 435 ft. below the water-parting. The valleys have a decidedly south-eastern direction, and such is also the course of the railway from Perm to Tyumen, as soon as it reaches the Siberian slope. The Middle Urals are densely forested. The valleys and lower slopes are covered with a thick sheet of rich humus and have become the site of large and wealthy villages. The mines also support a considerable population.

The Southern Urals (55° 30′ to 51° N.), instead of being made up of three chains of mountains radiating from Mount Yurma, as was formerly supposed, consist of three parallel chains running north- east and south-west, and therefore constitute a quite independent part of the Ural system. The Urals proper are a low sinuous chain extending due south-west and hardly

exceeding 2200 to 2800 ft. in altitude. They slope gently towards the north-west and abruptly towards the south-east, where several short, low spurs (Ilmefi, Irenly) rise in the basins of the Miyas and the Ui. In the west a chain, separated from the main range, or Ural-tau, by a longi- tudinal valley, accompanies it throughout its entire length. This, although pierced by the rivers which rise in the longitudinal valley just mentioned (Ai, Upper Byelaya), nevertheless rises to a much greater height than the main range. Its wild stony crest reaches an extreme altitude of 5230 ft. Farther west, another series of chains reach nearly the same altitudes. The gorges by which the rivers pierce the Devonian limestones on their way towards the lower terraces are most picturesque in the west, where the Urals assume an alpine character. The forests are no lohger continuous; the gentle slopes of the hilly tracts are dotted with woods, mostly of deciduous trees, while the hollows contain rich pasture grounds. The whole region, formerly the exclusive abode of the Bashkirs, is being colonized by Russians.

Farther south, between the 53rd and 51st parallels, the main range continues in the same direction, and, except when deeply trenched by the rivers, assumes the appearance of a plateau which hardly reaches 1500 ft. It is continued farther south-west (towards the Volga) under the name of Obshchiy Syrt.

As a rule, the Urals are not considered to continue south of the great bend of the Ural river, where quite independent ranges of hills, or flat swellings, appear (e.g. Dzhaman-tau, Mugodzhar Hills). It appears, however, that the Mugodzhar Hills may safely be regarded as an actual prolongation of the upheavals which constitute the Urals. These consist of diorites and crystalline slates, and reach their maximum in Ai'ryuk (1885 ft.). A range of heights connects the Mugodzhar Hills with the Ust-Urt plateau (see Transcaspian Region).

Geology. — The Ural Mountains are no more than the western edge of a broad belt of folding of which the greater part is buried beneath the Tertiary deposits of western Siberia. Throughout the greater portion of the chain a broad strip of granites, diorites, peri- dotites, gneisses and other crystalline rocks rises directly from the Siberian plain, and is covered towards the west by Silurian, Devonian, Carboniferous, Permian and Triassic strata, which are thrown into numerous folds parallel to the length of the chain and usually rise to much greater heights than the crystalline zone. In the north,

however, folded sedimentary rocks lie to the east as well as to the west of the crystalline axis, and between 60° 40′ and 46° 50′ N. Fedorov distinguishes three zones: (i.) the eastern hill region, where one finds Mesozoic rocks (Chalk, Jurassic) in the north, and Devonian limestones, porphyrites and quartz-porphyries farther south; in this zone most gold placers are found; (ii.) the central mountain zone consists of various amphibolitic metamorphic slates, and also of syenite and gabbro; granites, gneisses, and occasionally serpentines and porphyrites are found subordinately ; and (iii.) the western hilly zone consists chiefly of Carboniferous and Permo-Carboniferous deposits; Middle and Upper Devonian limestones and, occasionally, crystalline slates are found in a few meridional ridges. The crystalline rocks are usually believed to be of Archean age. The Carboniferous deposits — coal-bearing in the Middle and Southern Urals — although appearing at the surface only as a narrow strip in the west Urals, occupy an extensive area, but are concealed by the largely developed Permian deposits, and that series of sediments which must be considered as intermediate between the Carboniferous and the Permian. These latter, described as ” Permo- Carbon ” by Russian and German geologists, are largely developed

in the west Urals. The Permian deposits cover a wide zone all along the western slope of the Urals from north to south, and are most important on account of their copper ores, salt beds and salt springs. They are also covered with variegated marls which are almost destitute of fossil organisms, so that their age is not yet quite settled.

Climatic, Geo-Botanical and Geo- Zoological Importance. — The importance of the Urals as a climatic and geo-botanical boundary can no longer be regarded as very great. Most European species of plants freely cross the Urals into Siberia, and several Siberian species travel across them into northern Russia. But, being a zone of hilly tracts extending from north to south, the Ural Moun- tains necessarily exercise a powerful influence in pushing a colder northern climate, as well as a northern flora and fauna, farther south along their axis. The harshness of the climate at the meteoro- logical stations of Bogoslovsk, Zlatoust and Ekaterinburg is not owing merely to

their elevation a few hundred feet above sea-level. Even if reduced to sea-level, the average temperatures of the Ural meteorological stations are such as to produce a local deflexion of the isotherms towards the south. The same is true with regard to the limits of distribution of vegetable and animal species. The reindeer, for instance, is met with as far south as the 52nd parallel. The Southern Urals introduce into the Cis-Caspian steppes the flora and fauna of middle Russia.

In the distribution of the races of mankind the Urals have played an important part. To the present day the Northern Urals are inhabited by Finnish races (Samoyedes, Syryenians, Voguls and Permians) who have been driven from their former homes by Slav colonization, while the steppes on the slopes of the Southern Urals have continued to be inhabited by the Turkish Bashkirs. The Middle Urals were in the 9th century the abode of the Ugrians, and their land, Bjarmeland or Biarmia (now Perm), was well known to the Byzantine historians for its mineral wealth, — there being at that time a lively intercourse between the Ugrians and the Greeks. Compelled to abandon these regions, they moved (in the 9th century) south along the Ural slopes towards the land of the Khazars, and through the prairies of south-eastern and southern Russia (the Af/3e5ia of Constantine Porphyrogenitus) towards the Danube and to their present seat — Hungary — leaving but very few memorials behind them in the Northern and Middle Urals. 1 At present the Urals, especially the Middle and the Southern, are being more and more colonized by Great Russian immigrants, while the Finnish tribes are rapidly melting away.

Metallurgy and Mining. — The 1 mineral wealth of the Urals was known to the Greeks in the 9th century, and afterwards to the Novgorodians, who penetrated there in the nth century for trade with the Ugrians. When the colonies of Novgorod (Vyatka, Perm) fell under the rule of Moscow, the Russian tsars soon grasped the importance of the Ural mines, and Ivan III. sent out German engineers to explore that region. In 1558 the whole of the present government of Perm was granted by the rulers of Moscow to the brothers Stroganov, who began to establish salt-works and mines for iron and copper. Peter the Great gave a new impulse to the mining industry by founding several iron-works, and from 1745, when gold was first discovered, the Russian colonization of the Urals took a new departure. The colonization was of a double character, being partly free — chiefly by Nonconformists in search of religious

freedom — and partly compulsory, — the government sending peasant settlers who became serfs at the iron and copper works. Until 1861 all work at the mines was done by serfs belonging either to private persons (the Stroganovs, Demidovs and others) or to the crown. Not only are the Urals very rich in minerals, but the vast areas covered with forests afford an almost inexhaustible supply of cheap fuel for smelting purposes. Thus for a long time the Urals were the chief mining region in Russia. But when coal began to be used for smelting purposes, south Russia generally, and Ekaterino- slav in particular, became the chief iron-producing region. Attention has, however, again been directed to the great mineral wealth locked up in the mountain region, and the last two years of the 19th century witnessed a " boom " in the purchase of iron and gold mines by foreign companies. The chief pig-iron and iron-works are at Nizhniy- Tagilsk, and the principal steel-works at Bogoslovsk. The manu- facture of agricultural machinery has increased in the southern Urals, especially at Krasno-ufimsk, and the manufacture of tea-urns has grown in importance at Perm.

Gold is met with in the Urals both in veins and in placers; the output increased from about 30,000 oz. in 1883 to three times that amount at the end of the century. The Urals have also rich placers of platinum, often mixed with gold, iridium, osmium and other rare metals, and supply annually some 13,000 lb, i.e. 95% of all the platinum obtained in the world. Silver, mercury, nickel, zinc and cobalt ores are found. Rich mines of copper are found at Turinsk, Gumishev and other places, yielding as much as 5% of pure copper; nickel is obtained at Revdinsk, and the extraction

1 Comp. Moravia and the Madiars, by K. J. Groth ; Zabyelin's History of Russian Life, and the polemics on the subject in Izvestia of the Russ. Geogr. Soc., xix. (1883).

of iron chromates has developed. Coal exists in many places on the western slope of the Urals, mainly on the Yaiva river, in the basin of the Kama, and on the Usva (basin of the Chusovaya), and about 500,000 tons are raised annually. Several beds of coal have been found on the eastern ■ slope ; excellent anthracite exists at Irbit and good coal at Kamyshlov. Sapphires, emeralds beryls, chrysoberyls, tourmalines, aquamarines, topaz, amethysts, rock- crystals, garnets and many kinds of jade, malachite and marble are cut

and polished at several stone-cutting works, especially at Ekaterinburg; and diamond-mining may prove successful. Good asbestos is extracted, and pyrites is worked for the manufacture of sulphuric acid Many varieties of mineral waters occur in the Urals, the best being those at Serginsk, Klyuchevsk and Elovsk.

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(P. A. PL; J. T. Be.)

URALSK, a province of Asiatic Russia, lying N. of the Caspian Sea, with an area of 140,711 sq. m. It is bounded by the govern- ment of Astrakhan on the W., Samara and Orenburg on the N., Turgai and the Sea of Aral on the E., and the Caspian Sea and Transcaspian region on the S. It is geographically situated mostly within the boundaries of Asia, i.e. E. of the Ural river, and both its physical features and its inhabitants are, to a very large extent, Asiatic. Administratively, it belongs to the " Kirghiz provinces," or governor-generalship of the Steppes. Apart from a narrow strip of land in the north, where the slopes of the Obshchiy-Syrt plateau, covered with fertile- black earth and stretches of forest, descend towards the Ural river, and the gentle slopes of the Mugojar Hills in the north-east, Uralsk consists of arid steppes and deserts, which, incline with an im- perceptible gradient towards the Caspian. Most of the province is below sea-level, the zero altitude line running from Kamyshin on the Volga to the south of the town of Uralsk.

Uralsk is drained by the river Ural or Yaik, which rises in Orenburg and flows south, west and south, entering the Caspian after a course of 900 m. Its chief tributaries, the Sakmara, the Qr and the Ilek, are in the north ; along its lower course the Great and Little Uzen and many small streams on the left bank become lost in lakes before reaching the Ural. The Emba, which flows through the north of the Ust-Urt plateau,

reaches the Caspian by a series of shallow lagoons, which were navigable in the 18th century.

The climate is influenced by the Central Asian steppes. A cold and dry winter is succeeded by a hot and still drier summer, during which the grass, and sometimes all the crops, are destroyed by the burning heat. Uralsk, although lying wholly to the south of 52 N., has the same average yearly temperature as Moscow and south Finland (39°-5) ; its January is colder than that of north Finland (3), while July averages 73 °.

The estimated population in 1906 was 730,300. It consists of three different elements — Ural Cossacks, who constitute about one-fifth; some 15,000 Russian peasants, and Kirghiz. The Kirghiz are almost entirely dependent on pastoral pursuits. The Cossacks, descendants of those independent communities of free settlers and Raskolniks who are so often mentioned in Russian history under the name of Yaik Cossacks, owing to their unwilling- ness to submit to the rule of the tsars, are fine representatives of the Great Russian race, though not without some admixture of Tatar and Kalmuck blood. Their chief occupations are live-stock breed- ing and fishing.

History. — In the first half of the 16th century Uralsk was occupied by the Nogai horde, a remnant of the Mongol Golden Horde, which retired there after the fall of Astrakhan and Kazan; the khans resided at Saraichik on the river Ural. At the same time the lower parts of the Ural were occupied by Russian runaway serfs and free Cossacks who did not recognize the authority of Moscow. They took Saraichik in 1560 and formed an independent community, like that of the Zaporogian Cossacks. When the Moscow princes attempted to bring them under their rule and prosecuted them for nonconformity, the Cossacks revolted, first under Stenka Razin (1667-71) and afterwards under Pugachev (1 773-75)- After tne latter rising, the name of Ural was officially given to the Yaik river and the Yaik Cossacks. The disbanding of their artillery, the planting

of Russian garrisons within the domains of the voisko, and the interference of Russian officials in their interior organization

during the 19th century occasioned a series of smaller outbreaks, the latest of which, in 1874, resulted in the deportation of 2500 Cossacks, with their families, to Turkestan.

URALSK, a town of Asiatic Russia, the capital of the pro- vince of the same name, on the Ural river, 165 m. W.S.W. of Orenburg, and 270 m. by rail E. of Saratov. Pop. (1885) 26,055; (1901) 38,919. It is rapidly developing owing to its trade with the nomad Kirghiz in cattle, sheep and animal pro- ducts, all of which are exported to Russia; it is also a centre for trade in grain. It has two cathedrals, founded, one in the 18th century, the other in 1837; a small museum, a school farm, a people's palace, free libraries, and branches of the Russian Geographical and the Fisheries Societies.

URANIUM [symbol U, atomic weight 238-5 (0=i6)], a metallic chemical element. In 1789 Klaproth isolated from pitchblende a yellow oxide which he viewed as the oxide of a new metal, which he named uranium, after the newly discovered planet of Herschel. By reducing the oxide with charcoal at a high temperature, he obtained a product which he took to be metallic uranium. Berzelius about 1823 found that the yellow oxide, when treated with excess of sulphuric acid, gave a sulphate not unlike the ferric salt. He concluded that the uranium salt was Ur 2 3 3S0 3 , where Ur 2 3 , according to his analysis, represents 864 parts of yellow oxide (0=i6). Like Fe 2 3 , the yellow oxide lost 48 parts of oxygen per Ur2C>3 (= 864 parts) as water, while Ur 2 = 8i6 parts of metal remained. These results were adopted until Peligot in 1840 discovered that Berzelius's (and Klaproth's) metal contains oxygen, and that his (Ur 2)0 3 really is (U 6 06)-0 3 = 3U20 3 , where U=i2o is one equivalent weight of real uranium. Peligot's results, though called in question by Berzelius, have been amply confirmed by all subsequent investigators; only now, on theoretical grounds, first set forth by Mendeleeff, we double Peligot's atomic weight, so that U now signifies 240 parts of uranium, while U0 3 stands as the formula of the yellow oxide, and U0 2 as that of Berzelius's metal.

The only practically available raw material for the extraction of uranium is pitchblende (q.v.). Pure pitchblende is U3O8, which, in relatively good specimens, forms some 80% or more of the whole. It is remarkable as always containing helium

(q.v.) and radioactive elements (see Radioactivity). To extract the metal, the pitch- blende is first roasted in order to remove the arsenic and sulphur. In one process the purified ore is disintegrated with hot nitric acid to produce nitrates, which are then converted into sulphates by evaporation with sulphuric acid. The sulphates are treated with water, which dissolves the uranium and other soluble salts, while silica, lead sulphate, &c, remain; these are removed by filtration. From the solution the arsenic, copper, &c, are precipitated by sulphuretted hydrogen as sulphides, which are filtered off. The filtrate contains the uranium as uranous and the iron as ferrous salt. These are oxidized and precipitated conjointly by excess of ammonia. The precipitate, after having been collected and washed, is digested with a warm concentrated solution of ammonium carbonate, which dissolves the uranium as a yellow solution of ammonium uranate, while the hydrated oxide of iron, the alumina, &c, remain. These are filtered off hot, and the filtrate is allowed to cool, when crystals of the uranate separate out. The mother liquor includes generally more or less of nickel, cobalt, zinc and other heavy metals, which, as Wohler showed, can be removed as insoluble sulphides by the addition of ammonium sulphide; uranium, under the circum-stances, is not precipitated by this reagent. The filtrate, on being boiled down, yields a second crop of uranate. This uranate when ignited in a platinum crucible leaves a green oxide of the composition UsOs, i.e. artificial pitchblende, which serves as a starting-point for the preparation of uranium compounds. The green oxide, as a rule, requires to be further purified. One method for this purpose is to convert it into a solution of the nitrate U0 2 (NO») 2 , and from it to precipitate the metal as oxalate by oxalic acid (Peligot). The latter (U0 2 - C 2 04) yields a purer oxide, UO2, or, in the presence of air, U3O8, on ignition.

Metallic uranium, as shown by Pdligot, can be obtained by the reduction of a . mixture of dry chloride of potassium and dry uranous chloride, UCL,, with sodium at a red heat. A better process is that of H. Moissan (Compt. rend., 1896, 122, p. 1088), in which the oxide is heated with sugar charcoal in the electric furnace. Uranium is a white malleable metal, which is pretty hard, though softer than steel. Its specific

gravity has the high value 18-7; its specific heat is 0-02765, which, according to Dulong and Petit's law, corresponds to U=24o. It melts at bright redness. The compact metal when

exposed to the air tarnishes only very slowly. The powdery metal when heated in air to 150 or 170 C. catches fire and burns brilliantly into U 3 8 ; it decomposes water slowly at ordinary temperatures, but rapidly when boiling. It burns in oxygen at 170°, in chlorine at 180 , in bromine at 210 , in iodine at 260 , in sulphur at 500°, and combines with nitrogen at about 1000°. Dilute sulphuric acid attacks it but slowly; hydrochloric acid, especially if strong, dissolves it readily, with the formation, more immediately, of a hyacinth- coloured solution of U 2 Clfl, which, however, readily absorbs oxygen from the air, with the formation of a green solution of UCI4, which in its turn gradually passes into one of yellow uranyl salt, U0 2 -C1 2 .

Uranium is chemically related to chromium, molybdenum and tungsten. If forms two series of salts, one, the uranous compounds, are derived from the oxide U0 2 , the other, the uranyl compounds, contain the divalent group U0 2 .

Uranous Compounds. — Uranium dioxide, U0 2 (Berzelius's metal), is a brown to copper-coloured powder, obtained by heating U3O8 or uranyl oxalate in hydrogen. It fires when heated in air, and dissolves in acids to form uranous salts. It may be obtained as jet black octahedra (isomorphous with thoria) by fusion with borax. Uranous hydrate is obtained as reddish-brown flakes by precipitat- ing a uranous solution with alkali. The solution in sulphuric acid deposits green crystals of the sulphate, U(S04) 2 8H 2 0, on evapora tion. Uranous chloride, UCU, was first prepared by Pefigot by heating an intimate mixture of the green oxide and charcoal to redness in a current of dry chlorine; it is obtained as sublimate of black-green metallic-looking octahedra. The chloride is very hygroscopic. By heating in hydrogen it yields the trichloride, UCI3, and by direct combination with chlorine the pentachloride, UC1 6 . With hydroflouric acid it yields uranous fluoride, UF4, which forms double salts of the type MF-UF4. Uranous bromide, UBr4, and uranous iodide, UI4, also exist.

Uranyl or Uremic Compounds. — Uranic oxide, U0 3 or U0 2 -0, is obtained by heating uranyl nitrate to 250 as a yellow solid, insoluble in water, but soluble in acids with the formation of uranyl salts. Various hydrates have been described, but they cannot be formed by precipitating a uranyl salt with an alkali, this reagent giving rise to salts termed

uranates. These salts generally resemble the bichromates; they are yellow in colour, insoluble in water, soluble in acids, and decomposed by heat. Sodium uranate, Na 2 U 2 Oj, is used as a pigment for painting on glass and porcelain under the name of uranium yellow. It is manufactured by heating pitchblende with lime, treating the resulting calcium uranate with dilute sulphuric acid, and adding sodium carbonate in excess. Dilute sulphuric acid precipitates uranium yellow, Na 2 U 2 07-6H 2 0, from the solution so obtained. Ammonium uranate heated to redness yields pure U 3 0s, which serves as a raw material for uranium compounds. Uranyl nitrate, U022-6H 2 0, is the most important uranium salt. It is obtained as fine lemon yellow deliquescent prisms by evaporating a solution of any of the oxides in nitric acid. By electrolysis it yields uranium dioxide as a pyrophoric powder, and peruranic hydroxide, U0 4 -2H 2 0, when treated with hydrogen peroxide. The latter gives rise to salts, the peruranates, e.g. (Na 2 02) 2 U04-8H 2 0. Uranyl nitrate is used in photography, and also in analytical chemistry as a precipitant for phosphoric acid (as uranyl ammonium phosphate, U02-NH4-P04). Uranyl chloride, U0 2 C1 2 , is a yellow crystalline mass formed when chlorine is passed over uranium dioxide at a red heat. It is also obtained by dissolving the oxide in hydrochloric acid and evaporating. It forms double salts with metallic chlorides and with the hydrochlorides of organic bases. Uranyl sulphide, U0 2 S, is a black precipitate obtained by adding ammonium sulphide to a uranyl solution. Exposed to air this mixture is oxidized to the pigment uranium red, Ue(NH4) 2 S09, which is a fine blcod-coloured amorphous powder.

Analysis. — A borax bead dissolves uranium oxides in the reducing flame with a green, in the oxidizing flame with a yellow, colour. Solutions of uranyl salts (nitrate, &c.) behave to reagents as follows : sulphuretted hydrogen produces green uranous salt with precipita- tion of sulphur; sulphide of ammonium in neutral solutions gives a black precipitate of U0 2 S, which settles slowly and, while being washed in the filter, breaks up partially into hydrated U0 2 and sulphur ; ammonia gives a yellow precipitate of uranate of ammonia, characteristically soluble in hot carbonate of ammonia solution; prussiate of potash gives a brown precipitate which in appearance is not unlike the precipitate produced by the same reagent in cupric salts.

URANUS, in astronomy, the seventh major planet in the order

of distance from the sun, and denoted by the symbol $ or -$■ It was discovered by the elder Herschel on the*

13th of March 1781. He saw it as a round nebulous disk, slowly moving among the stars, and at first supposed it to be a comet, and announced it as such to the Royal Society. But a few weeks' observation showed it to be moving in a nearly circular orbit at a distance from the sun about nineteen times that of the earth. Its planetary character was thus established, and Herschel named it the Georgium Sidus in honour of his royal patron. This name was long recognized in England, and " the Georgian " was officially used in the Nautical Almanac up to 1850. But it was never received with favour on the continent of Europe, nor was that of the discoverer, which was proposed by Lalande. The name Uranus was proposed by Bode, and adopted everywhere outside of England.

As seen in a telescope of the highest power, Uranus presents to the eye the appearance of a disk about four seconds in diameter of a faint sea-green tint. No trace of a marking can be seen on the surface, and, so far as measures have yet been made on it, no deviation of the disk from a circular form has been established. Nothing is therefore known as to its axial rotation. Although the planet is commonly considered a telescopic one, it is really of the sixth magnitude, and therefore faintly visible to the naked eye if one knows precisely where to look for it. Long before its discovery it had been observed as a fixed star by J. Flamsteed. P. C. Lemonnier also made eight observations of it during the opposition of 1768-69, which would have revealed its planetary character had he reduced and compared them. For other particulars relating to Uranus, its spectrum, &c, see Planet.

Satellites of Uranus. — In January 1787 Herschel detected two satellites of Uranus of which the inner one, now known as Titania, had a period of 9 days, the outer, Oberon, of 135 days. He also on other occasions saw what he supposed to be two additional satellites, but careful investigation of his observations has shown that the supposed objects could not have been of this character. But in 1851-52 William Lassell at Malta, in conjunction with his assistant A. Marth, observed

two satellites yet nearer the planet than those of Herschel. These are now known as Ariel and Umbriel. Their periodic times are about 2\ and 4 days respectively. Lassell's telescopes, which were reflectors, were superior to others of his time in light-power, and these inner satellites were not seen by other astronomers for more than twenty years after their discovery. Indeed, doubts of their reality sometimes found expression until, in 1873, they were observed with the Washington 26-inch telescope, and observations upon them showed their identity with the objects discovered by Lassell. The greater difficulty in seeing the inner than the outer satellites arises from their proximity to the planet. There is no very great difference in the actual brightness of the four objects. It is found that Umbriel, though less easy to see than Titania, actually exceeds it in light. But none of them has been seen except in a few of the most powerful telescopes. The most remarkable feature of these bodies is that, instead of the planes of their orbits being near that of the ecliptic, they are actually inclined to it nearly 90 . The result is that, as the planet performs its orbital revolution, there are two opposite points near which the orbits are seen edgewise, and the satellites seem to us to swing north and south on each side of the planet. This was the case in 1882, and will be the case again in 1924. At the points midway between these two, through which the planet passed in 1861 and 1903, and will pass again in 1945, the orbits are seen almost perpendicularly, so that the apparent orbit, like the real one, is nearly circular.

Orbits of the Satellites of Uranus. — So far as has yet been determined, the four satellites all revolve in the same plane, the position of which, referred to the Earth's equator and equinox, is —

R.A. of ascending node, l66°-05 + o°-oi420 <. Inclination of orbit, 75°-28-o°-ooi3(.

None of the orbits seems to have a measurable eccentricity. The positions of the satellites in the orbits at any time may be found from the following elements, where u is the angular

distance from the node upon a plane parallel to that of the Earth's equator, and the motion is that in a Julian year.

Satellite.

u at Epoch.

Annual Motion.

Daily Motion.

Mean Dist.

Ariel Umbriel Titania Oberon

22°-6l

l 3 6°-49 229°-93 i54°-90

579 rev. +242 "-64 352 „ +i95°'3i

167 „ +294°20

108 „ +i86°-27

i42°-8 3 6 86°-869

4i°'35i 26°-739

i 3 '-78

19-20

31ˆ48

42-10

The epoch force is 1872, January o, Washington mean noon. The mean distance is the angle subtended by the radius of the orbit as seen at the mean distance of Uranus from the Sun (log a= 1-28310).

Bibliography. — Details as to Uranus are found in Chambers's Descriptive Astronomy, and all the current treatises on popular astronomy. For researches on the spectrum of the planet see Sir William Huggins in Proceedings of the Royal Society, vol. xix., (1871); H. C. Vogel, Astrophysical Journal, vol. i. ; and P. Lowell, Bulletin of the Lowell Observatory, No. 13. Tables of the motions of this planet were published by Alexis Bouvard in 1813, S. Newcomb in 1873 (Smithsonian Contributions to Knowledge, No. 262), Leverrier in 1877 (Annates de I'observatoire de Paris, M6moires, tome xiv.), and Newcomb

again in Astronomical Papers of the American Ephemeris, vol. vii. Tables of the four satellites are found in New- comb, Uranian and Neptunian Systems (Appendix I. to Washington Observations for 1873). Observations are found in the Bulletins of the Lick Observatory and elsewhere. (S. N.)

URANUS (Heaven), in Greek mythology, the husband of Gaea (Earth), and father of Cronus (Saturn) and other deities. As such he represents the generative power of the sky, which fructifies the earth with the warmth of the sun and the moisture of rain. For the legend of his treatment by Cronus and its meaning, see Saturn. Uranus and other Greek gods anterior to Zeus were probably deities worshipped by earlier barbarous inhabitants of the land.

The Roman Caelus (or Caelum) is simply a translation of the Greek Ovpavos, not the name of a distinct national divinity. There is no evidence of the existence of a cult of Caelus, the occurrence of the name in dedicatory inscriptions being due to Oriental influences, the worship of the sky being closely con- nected with that of Mithras. Caelus is sometimes associated with Terra, represented in plastic art as an old, bearded man holding a robe stretched out over his head in the form of an arch.

See Wissowa, Religion der Romer (1902), p. 304, and his article in Pauly-Wissowa's Realencyclopddie, iii. pt. 1 (1897) ; also Steuding in Roscher's Lexikon der Mythologie and De Vit's Onomasticon (suppt. to Forcellini's Lexicon).

URA-TYUBE, or Ora-tepe, a town of Russian Turkestan, in the province of Samarkand, lying 37 m. S.W. of Khojent, on the road from Ferghana to Jizak across the Zarafshan range. Pop. (1900) 22,088, chiefly Uzbegs. It is surrounded by a wall and has a citadel. The inhabitants carry on trade in horses and camel-wool cloth, and manufacture cottons, boots and shoes, oil, and camel's-hair shawls. Ura-tyube is sup- posed to have been founded by Cyrus under the name of Cyro- pol, and was taken in 329 B.C. by Alexander the Great of Macedon. Later it was the capital of an independent state, though often held by either Bokhara or Kokand. The Russians took it in 1866.

URBAN (Urbanus), the name of eight popes.

St Urban, first pope of that name, was bishop of Rome from 222 to 230. He had been preceded by Calixtus, and was followed by Pontianus.

Urban II. (Odo or Otho or Eudes de Lagary), pope from the 1 2th of March 1088 to the 29th of July 1099, was born of knightly rank at Lagary (or Lagery or Lagny), near Reims. He studied for the church, became archdeacon of Auxerre, and later joined the congregation of Cluny. Displaying great ability as reformer and theologian, he was chosen subprior of the celebrated monastery. He was created cardinal-bishop of Ostia in 1078 by Gregory VII., to whom he displayed such loyalty, especially as papal legate in Germany (1084), that

he was imprisoned for a time by Henry IV. He was designated by Gregory as one of four men most worthy to succeed him, and, after a vacancy of more than five months following the decease of Victor III., he was elected pope on the 12th of March 1088 by forty cardinals, bishops, and abbots assembled at Ter- racina, together with representatives of the Romans and of Countess Matilda. He frankly took up the policy of

Gregory VII., but, while pursuing it with equal determination, showed greater flexibility and diplomatic skill. Throughout the major part of his pontificate he had to reckon with the presence of the powerful antipope Clement III. (Guibert of Ravenna) in Rome; but a series of well-attended synods at Rome, Amalfi, Benevento and Troia, supported him in renewed declarations against simony, lay investiture, and clerical marriages, and in a policy of continued opposition to Henry IV. He maintained an alliance with the Norman Duke Roger, Robert Guiscard's son and successor, and united the German with the Italian op- position to the emperor by promoting the marriage of the Countess Matilda with young Welf of Bavaria. He aided Prince Conrad in his rebellion against his father and crowned him king of the Romans at Milan in 1093, and likewise en- couraged the Empress Praxedis in her charges against her husband. By excommunicating Philip I. of France for matri- monial infidelity in 1095, Urban opened a struggle which was not terminated until after his death. Invited to Tuscany by the Countess Matilda, he convoked a council at Piacenza in March 1095, attended by so vast a number of prelates and laymen that its sessions were held in the open air, and addressed by ambassadors of Alexis, the Byzantine emperor, who sought aid against the Mussulmans. Urban crossed the Alps in the summer, and remained over a year in France and Burgundy, being everywhere reverently received. He held a largely attended council at Clermont in November 1095, where the preaching of the First Crusade marked the most prominent feature of Urban's pontificate. Thenceforth until his death he was actively engaged in exhorting to war against the infidels. Crusaders on their way through Italy drove the antipope Clement III. finally from Rome in 1097, and established Urban firmly in the papal see. With a view to facilitating the crusade, a council was held at Bari in October 1098, at which religious differences were debated and the exiled Anselm of Canterbury combated the Eastern view of the Procession of the Holy Ghost. Urban died suddenly at Rome on the 29th of July 1099, fourteen days after the capture of Jerusalem, but before the tidings of that event had reached Italy. His successor was Paschal II.

It is well established that Urban preached the sermon at Clermont which gave the impetus to the crusades. The sermon was written out by Bishop Baudry, who heard it, and is to be found in full in J. M. Watterich, Pontif. Roman. Vitae. Letters

of Urban are published in J. P. Migne, Patrol. LaL, vol. 151.

See J. Langen, Geschichte der romischen Kir die von Gregor VII. bis Innocenz III. (Bonn, 1893) ; F. Gregorovius, Rome in the Middle Ages, vol. 4, trans, by Mrs G. W. Hamilton (London, 1900-2); K. J. von Hefele, Conciliengeschichte, vol. 5 {2nd ed., 1873-90); Jaffe-Wattenbach, Regesta pontif. Roman, vol. I (1885-88); H. H. Milman, History of Latin Christianity, vol. 3 (London, 1899); M. F. Stcn, Zur Biographie des Papstes Urbans II. (Berlin, 1883); A. de Brimont, Un Rape au moyen age — Urbain II. (Paris, 1862); W. Norden, Das Papsttum und Byzanz (Berlin, 1903); Gigalski, " Die Stellung des Papstes Urbans II. zu den Sacramentshandlungen der Simonisten, Schismatiker und Haretiker," in the Tiibinger theol. Quartalschrift (1897).

Urban III. (Uberto Crivelli), pope from the 25th of November 1185 to the 20th of October 1187, was a Milanese, and had been made cardinal-priest of St Lorenzo in Damaso and archbishop of Milan by Lucius- III., whom he succeeded. His family had suffered greatly at the hands of Frederick I., and he now took up vigorously his predecessor's quarrels with the emperor, including the standing dispute about the territories of the Countess Matilda. His opposition to the pretensions of the Roman senate to govern the Papal States, moreover, compelled him to remain in exile through his pontificate. He suspended the patriarch of Aquileia for crowning the emperor's

son, Henry, king of Italy (January 1186), in violation of his own rights as archbishop of Milan; and only the entreaties of the citizens of Verona, where he was stopping, prevented him from excommunicating Frederick. In n 87 he exhorted the Christian kings to renewed endeavours in the Holy Land, and the fall of Jerusalem on the 2nd of October is said to have caused his death. He died at Ferrara and was succeeded by Gregory VIII. His letters are in J. P. Migne, Patrol. Lat., vol.

202.

See J. Langen, Geschichte der romischen Kirche von Gregor VII. bis Innocenz III. (Bonn, 1893); Jaffe-Wattenbach, Regesta pontif. Roman. (1885-88) ; F. Gregorovius, Rome in the Middle Ages, vol. 4, trans, by Mrs G. W. Hamilton (London, 1896); P. Scheffer- Boichorst, Friedrichs I. letzter Streit mit der Curie (Berlin, 1866); W. Meyer, " Zum Streite Kaiser

Friedrichs I. mit Papst Urban III.," in Forschungen zur deutschen Geschichte, vol. 19 (1879).

Urban IV. (Jacques Pantaleon), pope from the 29th of August 1 261 to the 2nd of October 1264, was the son of a shoemaker of Troyes. Having received a monastic education, he became archdeacon of Liege and papal legate of Innocent IV. to Poland and Prussia; he "was consecrated bishop of Verdun in 1253, and two years later was translated to the patriarchate of Jerusalem. While on a trip to Italy to explain at court a quarrel with the Hospitallers he was elected to succeed Alexander IV., after a three months' vacancy in the Holy See. He never visited Rome, but lived most of his pontificate at Orvieto. He favoured his own countrymen, and under him began that preponderance of the French in the curia which later led to the papal residence at Avignon, and indirectly to the Great Schism. He endeavoured without success to stir up Louis IX. of France to undertake a new crusade. In 1264 he instituted the festival of Corpus Christi. His chief domestic problems arose out of the competing claims for the crown of the Two Sicilies. He favoured Charles of Anjou, and declared in June 1263 that the papal grant of the kingdom to Edmund, son of Henry III. of England, had expired because of the latter's inability to oust the usurper Manfred. Urban died before the arrival of Charles of Anjou, and was succeeded by Clement IV.

The registers of Urban IV. have been published by L. Dorez and J. Guiraud in the Bibliotheque des ecoles francaises d'Athenes et de Rome (Paris, 1892).

See F. Gregorovius, Rome in the Middle Ages, vol. 5, trans, by Mrs G. W. Hamilton (London, 1900-2) ; H. H. Milman, Latin Christianity, vol. 6 (London, 1899) ; K. Hampe, " Urban IV. und Manfred " in Abhandlungen zur mittleren u. neueren Geschichte (Heidel- berg, 1905); Sievert, " Das Vorleben Papst Urbans IV." in Die rom- ische Quartalschrift (1898) ; A. Potthast, Regesta pontif. Roman. (berlin, 1S75).

Urban V. (Guillaume Grimoard or Grimaud de Beauvoir), pope from the 28th of October 1362 to the 19th of DecemDei 1370, was born in 1309 near Lozere in Languedoc, and entered the Benedictine priory of Chiriac. After receiving orders he became successively professor of canon law at Avignon and Montpellier, vicar-general of the dioceses of Clermont and Uzes, abbot of St Germain d'Auxerre, abbot of St Victor at

Marseilles, administrator of the bishopric of Avignon, and papal legate to Naples. He was returning from his mission to Italy when news reached him at Corneto that he had been chosen to succeed Innocent VI. He announced his acceptance from Marseilles, and was consecrated at Avignon on the 6th of November 1362. Urban witnessed the completion of the work of tranquillizing Italy under the able Cardinal Albornoz, and in 1364, in the interests of peace, made heavy concessions to Bernabo Visconti. Moved by Peter of Lusignan, king of Cyprus, and by the cele- brated Carmelite Peter Thomas, who had come to Avignon in February 1363, the pope proclaimed another crusade, which found some echo in France and resulted in the temporary occu- pation of Alexandria (1365). Urban, yielding to the entreaties of the Emperor Charles IV. and of Petrarch, left Avignon on the 30th of April 1367, despite the opposition of the French cardinals, and made his entry into Rome on the 16th of October. The following year he was visited by Charles IV., and crowned the Empress Elizabeth (1st of November); and in 1369 he received the Greek emperor, John Palaeologus, who renounced the

schism but for whom the pope was unable to secure assistance. Urban sanctioned the order of Jesuates and founded the medical school at Montpellier. On account of the poor repair of Rome, the restlessness of the Romans and the discontent of the French cardinals in Italy, he at length announced his in- tention of returning to France, avowedly to settle trouble between France and England. He took ship at Corneto on the 5th of September 1370, and, arriving at Avignon on the 24th of the same month, died on the 19th of December. Urban was serious and humble, opposed to all nepotism, simony, and secular pomp. He was himself of blameless morality and reformed many abuses in the curia. He was honoured as a saint immediately after his death, and beatified by Pius IX. in 1870. Urban's successor was Gregory XI.

See H. J. Tomaseth, " Die Register u. Secretare Urbans V. u. Gregors XI." in Mitteilungen des Instituts fur osterreichtsche Ge- schichtsforschung (1898); Baluzius, Vitae Pap. Avenion., vol. I (Paris, 1693); L. Pastor, History of the Popes, vol. 1, trans, by F. I. Antrobus (London, 1899); F. Gregorovius, Rome

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Urban VI. (Bartolommeo Prignano), pope from the 8th of April 1378 to the 15th of October 1389, was born at Naples in 1318. He was made bishop of Acerenza in 1364, and in 1377 was translated to the archiepiscopal see of Bari and placed in charge of the papal chancery. On the death of Gregory XL, who had finally returned to Rome from Avignon, he was elected pope in a conclave held under circumstances of great excitement, owing to popular apprehension of an intention of the French cardinals to elect a French pope and again abandon Rome. The populace broke into the hall after the election had been made and dispersed the cardinals, but the latter returned and confirmed their action on the following day. Urban VI. turned his attention at once to the reformation of the higher clergy, and, in spite of the warnings of Catherine of Siena, so angered the cardinals by his harsh and ill-tempered measures that they assembled at Anagni in July 1378, and revoked his election, in which they declared they had acted under fear of violence. On the 20th of September they elected at Fondi the Cardinal Robert of Geneva, who called himself Clement VII. and took up his residence at Avignon. Urban, on the other hand, remained at Rome, where he appointed twenty-six new cardinals and excommunicated Clement and his adherents. Thus began the Great Schism which divided the Western Church for about fifty years. Urban deposed Joanna of Naples (21st of April 1380) for adhering to France and Savoy in support of the antipope, and gave her kingdom to Charles of Durazzo. Charles was crowned at Rome on the 1st of June 1 38 1, but three years later quarrelled with the pope and shut him up in Nocera. Urban succeeded in escaping to Genoa, where he put several of his cardinals to death for suspected disloyalty. On the death of Charles he set out with an army apparently to seize Naples for his nephew if not for himself. To raise funds he proclaimed, by bull of the nth of April 1389, a jubilee for every thirty-three years, but before the celebration

could be held he died of injuries caused by a fall from his mule. Urban was frugal and never practised simony, but harshness, lack of tact, and fondness for unworthy nephews disgraced his pontificate. He was succeeded by Boniface IX.

The chief sources for the life of Urban VI. are in Baluzius, Vitae Pap. Avenion. (Paris, 1693) ; Theoderici de Nyem De schismate Libri tres, ed. by G. Erler (Leipzig, 1890) ; Sauerlande, " Acten- stiicke zur Gesch. des Papstes Urban VI.," in Hist. Jahrbuch der Gorres-Gesellschaft, xiv. (1893); "Acta Urbani VI. et Bonifatii IX.," ed. C. Krofta, in Monumenta vaticana res gestas Bohemicas illustrantia (Prague, 1905); Der Liber Cancellariae Apostolicae vom Jahre 1380, ed. by G. Erler (Leipzig, 1888) ; // Trattato di S. Vincenzo Ferrer intorno al grande schisma d'Occidente, ed. by A. Sorbelli (Bologna, 1906).

See L. Pastor, History of the Popes, vol. 1, trans, by F. I. Antrobus (London, 1899); M. Souchon, Die Papstwahlen in der Zeit des grossen Schismas, vol. 1 (Brunswick, 1898); N. Valois, La France et le grand schisme d'Occident (Paris, 1896-1902); M. Creighton, History of the Papacy, vol. 1 (London, 1899) ; F. Gregorovius, Rome in the Middle Ages, vol. 6, trans, by Mrs G. W. Hamilton (London, 1900-2) ; R. Jahr, " Die Wahl Urbans VI." in Hallische Beitrage zur Geschichtsforschung (1892) ; T. Lindner, " Papst Urban VI.," in Zeitschrift fur Kirchengeschichte, iii. (1879) ; W. St C. Baddeley, Charles III. of Naples and Urban VI. (1894) ; J. B. Christophe, Histoire de la papaute pendant le XIV in " siecle, vol. 3 (Paris, 1853). (C. H. Ha.)

Urban VII. (Giovanni Battista Castagna), successor of Sixtus V., was born on the 4th of August 1521. He became governor of Bologna, archbishop of Rossano, and was long nuncio to Spain. Gregory XIII. made him a cardinal, 1583; and in 1590 he was elected pope by the Spanish faction, but died twelve days later, on the 27th of September 1590, and was succeeded by Gregory XIV.

See Ciaconius, Vitae et res gestae summorum Pontiff. Rom. (Rome, 1601-2) ; Cicarella, continuator of Platina, De vitis Pontiff. Rom. (both contemporary ; the latter prolix and tedious) ; Arrigho, Vita Urbani VII. (Bologna, 1614) ; and Ranke, Popes (Eng. trans., Austin), ii. 227.

Urban VIII. (Maffeo Barberini), pope from 1623 to 1644, was born in 1568, of a wealthy Florentine family. He early entered the prelacy, became prefect of Spoleto, twice nuncio to France, cardinal (1606), and finally, on the 6th of August 1623, succeeded Gregory XV. as pope. Urban was vain, self-willed and extremely conscious of his position; he accepted the papacy chiefly as a temporal principality, and made it his first care to provide for its defence and to render it formidable. He built Castelfranco on the northern frontier; fortified the port of Civita Vecchia; and strengthened the Castel Sant' Angelo, equipping it with cannon made from the bronze of the Pantheon, an act of vandalism which the Romans punished by the epigram, " Quod non fecerunt barbari, fecerunt Barberini." He also established an arsenal and a factory of arms. But all this provision was to no purpose. The only territory gained during Urban's pontificate, the duchy of Urbino, the last addition to the papal states, was acquired by reversion (1631); and in his one war, with the duke of Parma, for the district of Castro, he met defeat and humiliation (1644). The Thirty Years' War Urban professed to regard as waged for political, not for religious, ends. He therefore took counsel merely with his interest as a temporal prince, threw in his lot with France, supported the duke of Nevers in the Mantuan Succession, and, under stress of fear of Habsburg supremacy, suffered himself to be drawn into closer relations with the Protestants than beseemed his office, and incurred the reproach of rejoicing in the victories of heretics. Later, in keeping with his position, he opposed all concessions to the Protestants; but still showed himself so vacillating that the papacy ceased to be regarded as a serious political factor, and was entirely ignored in the final settlement of Westphalia, 1648.

Urban was the last pope to practise nepotism on a grand scale. He failed to found a princely house; but he enriched his family to an extent that astonished even the Romans. Urban bore a hand in the condemnation of Galileo. He acknowledged the genius of the astronomer, and had not approved of the action of the Inquisition in 1616; but subsequently, believing himself to have been caricatured in the Dialogo, he permitted the Inquisition to have its way and to compel an abjuration (1633). Urban also denounced the doctrines of Jansen, 1644 (see Jansenism). He promulgated the famous bull In Coena Domini in its final form, 1627; published the latest revision of the Breviary, 1631; founded the College of the Propaganda for

the education of missionaries, 1627; and accorded the title of " eminence " to the cardinals, 1630. Urban did mucn to embellish the city. Conspicuous among his works are the Barberini Palace, the College of the Propaganda, the Fountain of the Triton, and the baldachin of St Peter's. His hymns and poems, which have frequently been published, are evidence of his literary taste and ability. Urban died on the 29th of July 1644, and was succeeded by Innocent X.

For contemporary accounts of Urban see: Tommasucci, in Platina, De vitis Pontiff. Rom ; Oldoin, continuator of Ciaconius, Vitae et res gestae sumtnorum Pontiff. Rom. ; and Simonin, Gesta Urbani (Antwerp, 1637). A rich collection of materials was made by Andrea Niccoletti, Delia vita di Papa Urbano VIII. e storia del suo pontificato, never published, but extensively used by Ranke and others. See also Ranke, Popes (Eng. trans., Austin), ii. 552 seq., iii. 1 seq., 21 seq. ; v. Reumont, Gesch. der Stadt Rom, iii. 2, 611 seq., 702 seq.; Santa Pieralisa, Urbano VIII. e Galileo Galilei (Rome, 1875) ; Gregorovius, Urban VIII. im Widerspruch zu Spanien u. dem Kaiser (Stuttgart, 1879) ; and Weech, Urban VIII. (London, 1905). (T. F. C.)

URBANA, a city and the county-seat of Champaign county, Ohio, U.S.A., about 47 m. W. by N. of Columbus. Pop. (1890) 6510; (1900) 6808, including 796 negroes and 405 foreign-born; (1910) 7739. Urbana is served by the Erie, the Pittsburg, Cincinnati, Chicago & St Louis, and the Cleveland, Cincinnati, Chicago & St Louis railways, and by the Ohio Electric inter-urban line. It has a public library (1890) and a county children's home (1892), and is the seat of Urbana University (co-educa- tional), founded in 1850 under the auspices of the New Church. The city is situated in a fertile farming region. Its manu- factures include furniture, telephones, woollen goods, paper, foundry and machine-shop products, &c. Urbana was laid out in 1805 by Colonel William Ward, of Greenbriar, Va., who owned the land included in the original survey and gave many lots to the county on condition that the proceeds from their sale should be used for public improvements; it was incor-porated as a village in 1816 and was chartered as a city in 1867. Colonel Ward 'was the grandfather of the sculptor J. Q.

A. Ward, who was born here and here first pursued, unaided, his study of art. Urbana was also the home for several years (after 1802), and is the burial place, of Simon Kenton, the famous pioneer and Indian fighter.

URBINO (anc. Uniinum Mataurense), a city and archiepiscopal see of the Marches, Italy, in the province of Pesaro and Urbino, 19 m. direct S.W. of Pesaro and 50 m. by rail N. by W. of Fabriano, a junction on the line from Ancona to Rome. Pop. (1901) 6809 (town), 18,244 (commune). It is picturesquely situated on an abrupt hill 1480 ft. above sea-level; its streets are narrow and crooked, and the town has a medieval aspect. It is dominated by the ducal palace erected by Luciano da Laurana, a Dalmatian architect, in 1460-82, for Federigo Montefeltro, and regarded by the contemporaries of the founder as the ideal of a princely residence. The sculptured doorways, chimneys and friezes of the interior are especially fine. Some are by Domenico Rosselli of Florence, others by Ambrogio d' Antonio da Milano. The rich and beautifully executed intarsia work may be due to Baccio Pontelli. The massive irregularity of the exterior is due to the unevenness of the site. The decoration of the exterior was never completed; but the arcaded courtyard is the finest of the Renaissance, except perhaps that of the Cancelleria at Rome (Burckhardt). The palace is now partly used for government purposes, and also contains the municipal archives, a collection of ancient inscriptions, formed by the epigraphist Raffaele Fabretti (many of them from Rome), a gallery of sculpture of various periods and a picture gallery. This last contains a small but interesting collection of pictures, including works by Paolo Uccello, Giovanni Santi, Justus of Ghent, Timoteo della Vite, and other isth-century artists, also a " Resurrection " by Titian (a late work). The picture of the " Last Supper " by Justus is specially valuable from its containing fine portraits of the Montefeltro family and members of the ducal court. The cathedral, a building of no special interest, stands in the great piazza close to the ducal palace. It was erected in 1801 after the collapse x>f the former structure. In the sacristy there is a very beautiful miniature-like painting of the " Scourging of Christ," by Piero della Francesca, and other pictures by later artists. In the crypt there is a fine pieta in marble by Giovanni da Bologna. Opposite the palace is the church of S. Domenico, a Gothic building with a good early Renaissance portal and a relief in the lunette by Luca della Robbia (1449). The interior

was spoilt in the 17th century. S. Francesco has a fine 14th-century loggia and campanile, and a handsome portal of a

chapel in the interior by Constantino Trappola (15th century). S. Bernardino, outside the town, is a plain early Renaissance structure. On the walls of the chapel of the gild or confraternity of San Giovanni Battista are some valuable early frescoes, painted by Lorenzo and Giacomo Salimbene da San Severino in 1416. In the church of S. Spirito are two paintings by Luca Signorelli, the " Crucifixion " and the " Day of Pentecost," originally intended for a processional banner. The modest house where Raphael was born and spent his boyhood is preserved. It is now the property of a society of artists. Its rooms form a museum of engravings and other records of Raphael's works, together with a picture of the Madonna by his father, Giovanni Santi, formerly thought to be by Raphael himself. A monument was erected to him in the piazza in 1897. The theatre, decorated by Girolamo Genga, is one of the earliest in Italy; in it was performed the first Italian comedy, the Calandria of Cardinal Bibbiena, the friend of Leo X. and Raphael. The magnificent library formed by the Montefeltro and Della Rovere dukes was removed to Rome, and incorporated in the Vatican library (but with a separate numbering) in 1657. There is a free university founded in 1564 which has two faculties (with i63.students in 1902-03), and also a technical school. The town has manufactures of silk, majolica and bricks.

The ancient town of Urvinum Mataurense (taking its name from the river Mataurus or Metaurus) is mentioned a few times in classical literature, and many inscriptions relating to it exist. The course of its walls can still be traced. It was an important place in the Gothic wars, and is frequently mentioned by Procopius. At the end of the 12th or beginning of the 13th century it came into the possession of the family of Monte- feltro. Of this by far the most important member was Federigo da Montefeltro, lord of Urbino from 1444 to 1482, one of the most successful condottieri chiefs of his time, and not only a man of great military and political ability, but also an enthusiastic patron of art and literature, on which he lavished immense sums of money. Federigo much strengthened his position, first by his own marriage with Battista, one of the powerful Sforza family, and secondly by marrying his daughter to Giovanni della Rovere, the favourite nephew of Pope Sixtus IV., who in return conferred upon Federigo the title of duke.

Federigo's only son Guidubaldo, who succeeded his father, married in 1489 the gifted Elizabeth Gonzaga, of the ruling family in Mantua. In 1497 he was expelled from Urbino by Caesar Borgia, son of Alexander VI., but regained his dukedom in 1503, after Caesar's death. Guidubaldo was the last duke of the Montefeltro line; at his death in 1508 he bequeathed his coronet to Francesco Maria della Rovere, nephew of Julius II., and for about a century Urbino was ruled by its second dynasty of the Delia Rovere family. In 1626 the last descendant of Francesco, called Francesco Maria II., when old and childless abdicated in favour of Pope Urban VIII., after which time Urbino, with its subject towns of Pesaro, Fano, Fossombrone, Gubbio, Castel Durante, Cagli and about 300 small villages, became part of the papal states until the suppression of the temporal power in 1870.

During the reigns of Federigo and Guidubaldo, Urbino was one of the foremost centres of activity in art and literature in Italy. The palace erected by Federigo has already been mentioned. It was at his court that Piero della Francesca wrote his celebrated work on the science of perspective, Francesco di Giorgio Martini his Trattato a" architettura (published by Saluzzo, Turin, 1841), and Giovanni Santi his poetical account of the chief artists of his time. The refined magnificence of Guidubaldo's court is eloquently described by Baldassare Castiglione (q.v.) in his Cortegiano. When Henry VII. of England conferred the order of the Garter on Guidubaldo, Castiglione was sent to England with a letter of thanks and with the -small picture, now in the Louvre, of " St George and the Dragon," painted by Raphael in 1504, as a present to the English king. This painting was among Charles I.'s collection which was sold by order of the Commonwealth in 1649.

Throughout the whole of the 16th century the state of Urbino

was one of the chief centres for the production of majolica, especially the towns of Gubbio and Castel Durante. Most of the finest pieces of Urbino ware were made specially for the dukes, who covered their sideboards with the rich storied piatti di pompa. Among the distinguished names which have been associated with Urbino are those of the Ferrarese painter and

friend of Raphael, Timoteo della Vite, who spent most of his life there, and Bramante, the greatest architect of his age. The Milanese sculptor, Ambrogio, who worked so much for Federigo, married a lady of Urbino, and was the progenitor of the Baroccio family, among whom were many able mathematicians and painters. Federigo Baroccio, Ambrogio's grandson, was a very popular painter, some of whose works still exist in the cathedral and elsewhere in Urbino. This city was also the birthplace of F'ope Clement XL, of several cardinals of the Alban family, and of Bernardino Baldi, Fabretti, and other able scholars. An interesting view of Urbino, in the first half of the 16th century, occurs among the pen drawings in the MSS. Arte del vasajo, by the potter Piccolpasso, now in the Victoria and Albert Museum.

See also E. Calzini, Urbino e i suoi monumenti (1897); G. Lipparini, Urbino (Bergamo, 1903).

URBS SALVIA (mod. Urbisaglia), an ancient town of Picenum, Italy, about 8 m. S. of the modern Macerata, and 10 m. S. of Ricina. It was the meeting-point of several ancient roads; the road leading south from Ancona through Ricina and Falerio to Asculum was crossed here at right angles by that from Fanum to Tolentinum, Septempeda (S. Severino) and Nuceria Camellaria, while another led north-east from Urbs Salvia to Pausulae and the coast at Potentia (near mod. Porto Recanati). It seems to have been also called Pollentia. The date of its foundation is unknown, but it became a colony in the time of Trajan, and its importance seems to begin from this period. It was utterly destroyed by Alaric, and both Procopius (B.G. ii. 16, 17) and Dante (Paradiso, xvi. 73) speak of its desolation. The arx is occupied by the modern village; below it consider- able remains of the city walls and of the buildings within them, alike of brickwork of the imperial period, are preserved — an amphitheatre 328X249 ft., with an arena 100X112 ft., a theatre, baths, tombs, &c. A subterranean aqueduct and a number of inscriptions have been found on the site. Close by is a little chapel with paintings of the early 16th century. The Romanesque abbey church of the Fiastra, about 3 m. to the north, is noticeable. The territory of Urbs Salvia probably extended as far as the old Romanesque church of S. Maria di Rambona, 8 m. to the north-west.

URDU, the name of that variety of Hindostani which borrows a great part of its vocabulary from Persia and Arabic, as con-

trasted with " Hindi," the variety which eschews such words, but borrows from Sanskrit instead. It is spoken by Mussulmans and those Hindus who have come under Mussulman influences, and has a considerable literature. See Hindostani and Hindostani Literature.

UREA, or Carbamide, CO(NH 2) 2 , the amide of carbonic acid, discovered in 1773 by H. M. v. Rouelle, is found in the urine of mammalia, birds and some reptiles; human urine contains approximately 2-3 %, a grown man producing about 30 grammes daily. It is also a constituent of the blood, of milk, and other animal fluids. Its synthesis in 1828 by F. Wohler (Pogg. Ann., 1828, 12, p. 253) is of theoretical importance, since it was the first organic compound obtained from inorganic materials. Wohler oxidized potassium ferro- cyanide to potassium cyanate by fusing it with lead or manganese dioxide, converted this cyanate into ammonium cyanate by adding ammonium sulphate, and this on evapora- tion gives urea, thus: —

K 4 Fe(NC)rˆKCNO-ˆNH4CNO-＞CO(NH 2) 2 –

It may also be prepared by the action of ammonia on carbonyl chloride, diethyl carbonate, chlorcarbonic ester or urethane; by heating ammonium carbamate in a sealed tube to 130-140 C; by oxidizing potassium cyanide in acid solution with

potassium permanganate (E. Baudrimant, Jahresb., 1880, P-393)i by the action of 50 % sulphuric acid on cyanamide: CN-NH 2 +H 2 = CO(NH 2) 2 ; by the action of mercuric oxide on oxamide (A. Williamson): (CONH 2) 2 +HgO = CO(NH 2) 2 + Hg+C0 2 ; by decomposing potassium cyanide with a dilute solution of sodium hypochlorite, followed by adding ammonium sulphate (A. Reychler, Bull. Soc. Chim., 1893 [3], 9, p. 427); and by oxidation of uric acid. It may be obtained from urine by evaporating to dryness on the water bath, taking up the residue in absolute alcohol and evaporating the alcoholic solution to dryness again. The residue is then dissolved in water, decolorized by animal charcoal and saturated at 50° C. with oxalic acid. The urea oxalate is recrystallized and decolorized and finally decomposed by calcium carbonate (J. J. Berzelius, Pogg. Ann., 1830, 18, p. 84). As an alternative method, A. N. E. Millon {Ann. chim. phys [2], 8, p. 235) concentrates the urine and precipitates the urea by nitric acid. The pre- cipitate is dissolved in boiling

water, decolorized by potassium permanganate and decomposed by barium carbonate. The solution is then evaporated to dryness and extracted by alcohol. Urea crystallizes in long needles or prisms which melt at 132 C. and sublime when heated in vacuo. It is readily soluble in water and in alcohol, but is insoluble in chloroform and ether. When heated above its melting-point, it yields ammonia, cyanuric acid, biuret and ammelide. On warming with sodium, it yields cyanamide. Dry chlorine gas passed into melted urea decomposes it with formation of cyanuric acid and ammonium chloride, nitrogen and ammonia being simultaneously liberated. Alkaline hypobromites or hypochlorites or nitrous acid decompose urea into carbon dioxide and nitrogen. It is also decomposed by warm aqueous solutions of caustic alkalis, with evolution of ammonia and carbon dioxide. When heated with alcohol in sealed tubes, it yields carbamic esters; with alcohol and carbon bisulphide at ioo° C, carbon dioxide is liberated and ammonium sulphocyanide is formed. Acid potassium permanganate oxidizes it to carbon dioxide and nitrogen. It acts as a monacid base.

Urea may be recognized by its crystalline oxalate and nitrate, which are produced on adding oxalic and nitric acids to concen- trated solutions of the base; by the white precipitate formed on adding mercuric nitrate to the neutral aqueous solutions of urea; and by the so-called " biuret " reaction. In this reaction urea is heated in a dry tube until it gives off ammonia freely; the residue is dissolved in water, made alkaline with caustic soda, and a drop of copper sulphate solution is added, when a fine violet-red coloration is produced. Several methods are employed for the quantitative estimation of urea. R. Bunsen {Ann., 1848, 65, p. 875) heated urea with an ammoniacal solution of barium chloride to 220° C, and converted the barium carbonate formed into barium sulphate, which is then weighed (see also E. Pfluger and K. Bohland, Zeit. f. anal. Chem., 1886, 25, p. 599; K. A. H. Morner, ibid., 1891, 30, p. 389). Among the volumetric methods used, the one most commonly employed is that of W. Knop (ibid., 1870, 9, p. 226), in which the urea is decomposed by an alkaline hypobromite and the evolved nitrogen is measured (see A. H. Allen, Commercial Organic Analysis). J. v. Liebig {Ann., 1853, 85, p. 289) precipitates dilute solutions of urea with a dilute standard solution of mercuric nitrate, using alkaline carbonate as indicator. In this process

phosphates must be absent, and the nitric acid liberated during the reaction should be neutralized as soon as possible. Chlorides also prevent the formation of the precipitate until enough of the mercury solution has been added to convert them into mercuric chloride (see also E. Pfluger, Zeit. f. anal. Chem., 1880, 19, p. 378). E. Riegler (ibid., 1894, 33, p. 49) decomposes urea solutions by means of mercury dissolved in nitric acid, and measures the evolved gas.

Urea chlorides are formed by the action of carbonyl chloride on ammonium chloride (at 400° C), or on salts of primary amines. They are readily hydrolysed by water, and combine with bases to form alkyl ureas, and with alcohols to form carbamic esters. Substituted urea chlorides are formed by the direct action of chlorine (F. D. Chattaway and D. F. S. Wunsch, Jour. Chem. Soc, T 909. 95. P- I2 9)- Urea chloride, NH 2 -C0-C1 (L. Gattermann, Ann., 1888, 244, p. 30), melts at 50° C. and boils at 61-62° C. In the presence of anhydrous aluminium chloride it reacts with aro- matic hydrocarbons to form the amides of aromatic acids. Nitro- urea, H 2 N-CO-NH-N0 2 , prepared by adding urea nitrate to well- cooled concentrated sulphuric acid (J. Thiele and A. Lachmanh, Ann., 1895, 288, p. 281), is a crystalline powder, soluble in water, and which decomposes on heating. It is a .strong acid_ and is stable towards oxidizing agents. Diazomethane converts it into the

methyl derivatives of isocyanic acid, and nitramide, NH2NO2. Amidourea, or semicarbazide, NH2-CO-NH-NH 2 , is best prepared from hydrazine sulphate and potassium cyanate (J. Thiele and O. Stange, Ber., 1894, 27, p. 31). It may also be obtained by reducing nitrourea in acid solution with zinc dust. It crystallizes in prisms, which melt at 96 C, and are easily soluble in water. It reduces Fehling's solution in the cold. It reacts with carbonyl compounds, giving semi-carbazones, and in consequence is frequently used for characterizing such substances. Hydroxy-urea, NH 2 -CO'NH-OH, is produced from hydroxylamine and cyanic acid (W. F. Dresler and R. Stein, Ann., 1869, 150, p. 242), or from ammonium hypo- chlorite and potassium cyanate (A. Hantzsch, Ann., 1898, 299, p. 99). It crystallizes in needles, which melt at 128-130°

C, and is decomposed on long heating. It is readily soluble in water and reduces warm silver solutions. Hyponitrous acid is formed by passing nitrous fumes into its methyl alcohol solution.

Alkyl ureas are formed by the action of primary or second- ary amines on isocyanic acid or its esters: CONH+NH 2 R = R-NHCONH 2 ; CONR + NHR 2 = NR 2 -CO-NHR; by the action of carbonyl chloride on amines: COCl 2 +2NHR2 = CO(NR2)2+2HCl; and in the hydrolysis of many ureides. The tetra-alkyl derivatives are liquids, the remainder being solids. Hydrolysis by alkalis decomposes them into carbon dioxide, amines and ammonia. The symmetrically substituted ureas are generally tasteless, while the asymmetrical derivatives are sweet. For example, oa-dimethyl urea is sweet, a/3-dimethyl urea is tasteless; ˆ-phenetol carbamide ordulcin, NHi-CO-NH-CeHˆOˆHs, is sweet, while the di-p-phenetol carbamide, CCKNH-CeHˆOQHsˆ, is tasteless.

The derivatives of urea containing acid radicles are known as ureides. Those derived from monobasic acids, obtained by the action of acid chlorides or anhydrides on urea, decompose on heating and do not form salts. Those containing more than one acyl group are formed by the action of carbonyl chloride on acid amides : COCI2+2CH3CONH2 = CO(NHCOCH 3)2+2HCl.

Acetyl urea, NH2-CO-NH-COCH3, formed by the action of acetic anhydride on urea, crystallizes in needles which melt at 212 ° C. and, on heating, strongly decomposes into acetamide and cyanuric acid. Methyl acetyl urea, CH 3 NH-CO-NHCOCH 3 , is formed by the action of potash on a mixture of bromine (1 mol.) and acetamide (2 mols.) (A. W. v. Hofmann, Ber., 1881, 14, p. 2725), or of methylamine on acetylurethane (G. Young, Jour. Chem. Soc : 1898, 73, p. 364). When heated with water it is decomposed into carbon dioxide, ammonia, methylamine and acetic acid. Bromural or o-brom- isovaleryl urea, NH 2 -CO-NH-CO-CHBr-CH(CH 3)2, has been intro- duced as an hypnotic ; its action is mild, and interfered with by the presence of pain, cough or delirium.

The ureides of oxy-acids and dibasic acids form closed chain compounds (see Allantoin; Alloxan; Hydantoin; Purin). Parabanic acid (oxalyl urea), CO[NH-CO] 2 , is formed by oxidizing uric acid; or by condensing oxalic acid and urea in

the presence of phosphorus oxychloride. It crystallizes in needles and is readily hydrolysed by alkalis. It behaves as a monobasic acid and forms unstable salts. When heated with urea, it forms oxalyl diureide, H 2 N-CO-CO-NH-CO-NH-CO-NH 2 . Dimethylparabanic acid (choles- terophane), CO[NCH 3 -CG]2, is formed by oxidizing caffeine or by methylating parabanic acid. It crystallizes in plates, which melt at 145-5° C, and is soiuble in cold water. Hydrochloric acid at 200° C. decomposes into oxalic acid, carbon dioxide and methylamine, whilst an alcoholic solution of a caustic alkali gives dimethyl urea and oxalic acid. Barbituric acid (malonyl urea), CH2[CONH]C02H 2 0, formed by condensing malonic acid with urea (E. Grimaux, Bull. Soc. Chem., 1879, 31, 146), crystallizes in prisms, which decompose on heating. It yields a nitroso derivative, is nitrated by nitric acid to dilituric acid and brominated by bromine. It is a dibasic acid. Veronal (q.v.) is diethyl malonyl urea. For isobarbituric acid see T. B. Johnson and E. V. McCollum, Jour. Biol. Chem., 1906, 1, p. 437. Tartronyl urea (dialuric acid), CO[NH-CO]CH-OH, formed by the reduction of alloxan (J. v. Liebig and F. Wohler, Ann., 1838, 26, p. 276), or of alloxantin (A. Baeyer, Ann., 1863, 127, p. 12), crystallizes in needles or prisms and possesses a very acid reaction. It becomes red on exposure, and in the moist condition absorbs oxygen from the air, giving alloxantin. Allo- phanic acid, NH2-CO-NH-C0 2 H, is not known in the free state, as when liberated from its salts, it is decomposed into urea and carboji dioxide. Its esters are formed by passing the vapours of cyanic acid into alcohols (W. Traube, Ber., 1889, 22, p. 1572): CONH-ˆNHs-COsR-ANHjCO-NH-COjR;*

by the action of chlorcarbonic esters on urea (H. Schiff, Ann., 1896, 291, p. 367); and by the action of urethanes on urea chloride (L. Gatterm^nn, Ber., 1888, 21, p. 293 R). They are readily decomposed by alkalis, yielding cyanuric acid and ammonia. Biuret (allophana- mide), NH 2 -CO-NH-CO-NH 2 , is formed by heating urea; by the action of ammonia on allophanic ester; and by heating urea to 140° C. and passing chlorine into the melt at 140-150° C. (J. Thiele, Ann., 1898, 303, p. 95 Anm.). It crystallizes in needles which melt at 190° C. (with decomposition), and is readily soluble in hot water. When heated strongly it is decomposed into ammonia and cyanuric acid. Baryta water hydrolyses it to carbon dioxide, ammonia and

urea. With silver nitrate and caustic soda it yields a silver salt, Ag2C 2 H 3 N 3 02. With nitric acid in the presence of sulphuric acid it yields a nitro derivative.

Thiourea, or sulphocarbamide, CS(NH2)2, is formed by prolonged fusion of ammonium thiocyanate (E. Reynolds, Ann., 1869, 150, p. 224), by passing sulphuretted hydrogen into an ethereal solution of cyanamide (E. Baumann, Ber., 1873, 6, P-I 37S) > or by heating isopersulpho-cyanic acid (F.D. Chattaway, Jour. Chem. Soc, 1897, 71, p. 612). It crystallizes in thick prisms which melt at 180 C. and is readily soluble in water. When heated for some time with water to 140 C. in a sealed tube, it is transformed into ammonium thiocyanate, a similar result being obtained by heating the base alone for some hours to 160-170° C. On heating alone for some hours to 170-180 C. it is converted into guanidine thiocyanate. It is hydrolysed by alkalis, giving carbon dioxide, ammonia and sulphuretted hydrogen. It is readily desulphurized by silver oxide, mercuric oxide or lead oxide. Potassium permanganate oxidizes it to urea (R. Maly, Monats., 1890, n, p. 278). It acts as a weak base and forms salts with one equivalent of an acid.

The alkyl derivatives of thiourea are obtained by the action of ammonia and of primary and secondary amines on the mustard oils (A. W. Hofmann, Ber., 1867, I, p. 27):

CSNR + NH 3 = NH2-CS-NHR;CSNR + NH2R = R-NH-CS-NHR, or by heating the amide salts of the alkyl dithiocarbaminic acids, viz., NR-CS-S(NH 3 R). The monoalkyl derivatives are desul- phurized by lead hydroxide in the presence of sodium carbonate, the a/3 dialkyl and trialkyl derivatives being unaffected (A. E. Dixon, Jour. Chem. Soc, 1893, 63, p. 325). The dialkyl thioureas when digested with mercuric oxide and amines give guanidines. CS(NHR) 2 + NH2R + HgO-ˆHgS + RN:C(NHR)2.

Thiourea and many of its unsymmetrical derivatives have marked physiological action; thiourea causes a slowing of the pulse and respiration, cardiac failure, and death in convulsions; phenyl-, ethyl- and acetyl-thiourea are actively toxic. The most important derivative pharmacologically is allyl-thiourea, also known as thiosinamine or rhodallin, NH 2 -CS-NH-CH2-CH:CH2.

Thiosemicarbazide, NH 2 -CS-NH-NH2, prepared from

hydrazine sulphate, potassium carbonate and thiocyanate (N. Freund, Ber., 1895, 28, p. 946; 1896, 29, p. 2501), crystallizes in long needles, which melt at 181-183° C The addition of sodium nitrite to an aqueous solution of its hydrochloride converts it into amido-triaz-

/ N= =N sulphol S< I . The hydrochloride with potassium cyanate

\C(NH 2) : N gives hydrazothio-carbonamide, NH 2 -CO-NH-NH-CS-NH 2 .

Medicine. — Urea has been given in medicine in doses of 10 to 60 grs. either in mixture or hypodermically. It has been used with success as an antiperiodic and antipyretic in ague, and also as a diuretic in gout and kidney affections. Thiosinamine is given internally in doses of 5 to I gr. in capsule. Larger doses usually upset the digestion. It has been used for the cure of lupus and of keloid, in which case it is administered hypodermically. In keloid 20 minims of a 10% solution is injected directly into the part. It causes a local reaction with absorption of the scar tissue. For this reason it is used to remove corneal opacities, deafness due to thickening of the membrane, stricture of the oesophagus and hypertrophy of the pylorus, it has also been successful in the treatment of adhesive parametritis. Fibrolysin is a modified form of thiosinamine made by mixing it with sodium salicylate Fibrolysin is freely soluble and may be given in hypodermic or intra-muscular injection. Like thiosinamine it has a specific action on scar tissue and has been used in urethral strictures. Both these preparations should only be used in cases where it is possible to exclude any tuberculous foci, or by their action in breaking down protective fibrous tissues they may cause a quiescent lesion to become active. In large doses toxic symptoms are produced, death following on coma.

URETHANE, NH2CO2C2H5, the ethyl ester of carbamic acid, is synthesized from ammonia and chlorcarbonic ester or diethyl carbonate; by prolonged boiling of urea with alcohol (A. W. Hofmann, Ber., 1871, 4, p. 268); by the action of alcoholic hydrochloric acid on cyanogen; by the action of alcohol on urea chloride (L. Gattermann, Ann., 1888, 244, p. 40); and by warming alcoholic hydrochloric acid with an alcoholic solution of potassium cyanate (0. Folin, Amer. Chem. Jour., 1897, 19, p. 341). It crystallizes in large plates, readily

soluble in water and melting at 49-50° C. When heated with ammonia to 180° C, it gives urea. Cold alcoholic potash decomposes it into potassium cyanate and alcohol.

Nitroso-urethane, NO-NH-C02C 2 H 6 , formed by reducing ammonium nitro-urethane with zinc dust and glacial acetic acid (J. Thiele,

Ann., 1895, 288, p. 304), crystallizes in needles which melt at 51-52 C. (with decomposition). It is decomposed by alkalis and by acids:

C 3 H 6 N 2 3 = C02+C 2 H 5 OH + N 2 (alkalis),

2C 3 H 6 N203 = 2C0 2 +C 2 H 5 OH+2N 2 + H 2 0+C 2 H 4 (acids).

On oxidation it yields nitro-urethane. With a methyl alcoholic solution of potash it yields a yellow precipitate, which is probably the potassium salt of nitrosocarbamic acid, NK-NO-C0 2 K. Nitro- urethane, N0 2 -NH-C0 2 C 2 H 5 , formed by dissolving urethane in concentrated sulphuric acid and adding ethyl nitrate to the well- cooled mixture (J. Thiele, ibid.), crystallizes in plates which melt at 64 ° C. and is soluble in water. It has a strongly acid reaction, its salts, however, being neutral. Its silver salt with methyl iodide gives a methyl ether, which is readily split by ammonia into methyl nitramine and methyl urethane (cf. A. P. Franchimont, Rec. trav. chim., 1894, 13, p. 309). On reduction with zinc dust and acetic acid it yields hydrazine carboxylic ester. Phenyl urethena, C 6 H5NH-C0 2 C 2 H 6 , is formed by the action of cyanformic ester on aniline at ioo° C. ; by the action of absolute alcohol on benzoyl azoimide (T. Curtius, Jour. prak. Chem.[2], 52, p. 214); and by the action of bromine and sodium ethylate on benzamide (E. Jeffreys, Amer. Chem. Jour., 1899, 22, p. 41). It crystallizes in long needles which melt at 51-52 C. and boil at 227-228 C. (with partial de- composition). It is easily soluble in alcohol and when heated in a sealed tube yields aniline and urea. With phosphorus penta- sulphide it yields phenyl mustard oil.

Physiologically urethane has a rapid hypnotic action,

producing a calm sleep and having no depressant effect on the circulation. It is much used as an anaesthetic for animals. Di- urethane, NH(C0 2 C 2 H 5) 2 , and hedonal, NH 2 C0 2 CH(CH 3)-(C 3 H,), are also nar- cotics, the latter being, in addition, a powerful diuretic. Phenyl urethane or euphorin has a physiological action more like that of acetanilide and phenacetin than of urethane. It depresses the temperature and is an analgesic. It is of little value as an hypnotic.

URFfi, HONORH D\ Marquis de Valbromey, Comte de Chateauneuf (1568-162 5), French novelist and miscellaneous writer, was born at Marseilles on the nth of February 1568, and was educated at the College de Tsarnon. A partisan of the League, he was taken prisoner in 1595, and, though soon set at liberty, he was again captured and imprisoned. During his imprisonment he read Ronsard, Petrarch and above all the Diana enamorada of George de Montemayor and Tasso's Aminta. Here, too, he wrote the Epitres morales (1598). Honore's brother Anne, comte D'Urfe, had married in 1571 the beautiful Diane de Chateaumorand, but the marriage was annulled in 1598 by Clement VIII. Anne D'Urfe was ordained to the priesthood in 1603, and died in 1621 dean of Montbrison. Diane had a great fortune, and to avoid the alienation of the money from the D'Urfe family, Honore married her in 1600. This marriage also proved unhappy; D'Urfe spent most of his time separated from his wife at the court of Savoy, where he held the charge of chamberlain. The separation of goods arranged later on may have been simply due to money em- barrassments. It was in Savoy that he conceived the plan of his novel Astree, the scene of which is laid on the banks of the Lignon in his native province of Forez. It is a leisurely romance in which the loves of Celadon and Astree are told at immense length with many digressions. The recently discovered cir- cumstances of the marriages of the brothers have disposed of the idea that the romance is autobiographical in its main idea, but some of the episodes are said to be but slightly veiled accounts of the adventures of Henry IV. The shepherds and shepherdesses of the story are of the conventional type usual to the pastoral, and they discourse of love with a casuistry and elaborate delicacy that are by no means rustic. The two first parts of Astree appeared in 1610, the third in i6ig, and in 1627 the fourth part was edited and a fifth added by D'Urfe's secre- tary Balthazar Baro. Astree set the fashion temporarily in the drama as in romance, and no

tragedy was complete without wire-drawn discussions on love in the manner of Celadon and Astree. D'Urfe also wrote two poems, La Sireine (161 1) and Sylvanire (1625). He died from injuries received by a fall from his horse at Villafranca on the 1st of June 1625 during a cam- paign against the Spaniards. The best edition of Astree is that of 1647. In 1908 a bust of D'Urfe was erected at Virien (Ain), where the greater part of Astrie was written.

URG A (the Russian form of the Mongol Orgo = palace of a high official) , a city of Mongolia, and the administrative centre of the

northern and eastern Kalka tribes, in 48 20′ N., 107 30′ E., on a tributary of the Tola river. It is the holy city of the Mongols and the residence of the " Living Buddha," metro- politan of the Kalka tribes, who ranks third in degree of veneration among the dignitaries of the Lamaist Church. This " resplendently divine lama " resides in a sacred quarter on the western side of the town, and acts as the spiritual colleague of the Chinese amban, who controls all temporal matters, and who is specially charged with the control of the frontier town of Kiakhta and the trade conducted there with the Russians.

Hurae, as the Mongols call Urga (Chinese name, K'ulun), stands on the high road from Peking to Kiakhta (Kiachta), about 700 m. N.W. of Peking and 165 m. S. of Kiakhta. There are three distinct quarters: the Kuren or monastery, the residence of the " Living Buddha "; the Mongol city proper (in which live some 13,000 monks); and the Chinese town, two or three miles from the Mongol quarter. Besides the monks the inhabitants number about 25,000. The Chinese town is the great trading quarter. The houses in this part are more substantially built than in the Mongol town, and the streets have a well-to-do appearance. The law which prohibits Chinamen from bringing their wives and families into the place tends to check increase. There is considerable trade between the Russians, Mongols and Chinese, chiefly in cattle, camels, horses, sheep, piece-goods and milk. Until the second half of the 19th century bricks of tea formed the only circulating medium for the retail trade at Urga, but Chinese brass cash then began to pass current in the markets. The trade of Urga is valued at over £1,000,000 a year.

The temples in the Mongol quarter are numerous and imposing,

and in one is a gilt image of Maitreya Bodhisattva, 3$ ft. in height and weighing 125 tons. When in 1904, on the occasion of the British expedition to Tibet, the Dalai Lama withdrew from Lhassa he went to Urga, where he remained until 1908. During his residence there the Dalai Lama would have no communica- tion with the Urga Lama — described as a drunken profligate (see The Chinese Empire, ed. M. Broomhall, London, 1907, p. 357). The Chinese contemplate building a railway from Peking to Urga. The first section, to Kalgan, was completed in 1909 (see China, § Communications) .

URI, one of the cantons of central Switzerland, and one of the earliest members of the confederation. The name is prob- ably connected with the same obscure root as Reuss and Ursern, and is popularly derived from Urochs or Auerochs (wild bull), a bull's head having been borne for ages as the arms of the region. The total area of the canton is 415-3 sq. m., of which 184-3 are reckoned as " productive " (forests covering 43-9 sq.m.), while of the rest 44-3 are occupied byglaciers and75sq. m. by the cantonal share of the Lake of Lucerne. The highest sum- mit in the canton is the Dammastock (11,920 ft.). The canton is composed of the upper valley of the Reuss, a mountain torrent that has cut for itself a deep bed, save in case of the basin of Ursern, near its upper end, and the plain of Altdorf, just before it forms the Lake of Lucerne. Hence, save in these two cases, the canton is made up of a wild Alpine valley, very picturesque in point of scenery, but not offering much chance of cultivation. Through nearly the whole of this savage glen runs the main line of the St Gotthard railway (opened in 1882), the part (285 m.) in the canton being that between Sisikon, on the Lake of Lucerne, and Goschenen, at the northern mouth of the great tunnel (91 m.) through the Alps, and at the lower end of the wild Schollenen gorge that cuts it off from the basin of Ursern. The most remarkable engineering feats are near Wassen. There is also an electric tramway from Altdorf to its port, Fliielen. On the other hand, several magnificent carriage roads are within the borders of the canton, leading to or over the mountain passes that give access either to Glarus (the Klausen Pass, 6404 ft.), or to Ticino (St Gotthard Pass, 6936 ft.), or to the Grisons (Oberalp Pass, 6719 ft.), or to the Valais (Furka Pass, 7992 ft.). Owing to the physical conformation of the canton, it was difficult for it to extend its rule save towards the south (see below), but since very early days it has held the splendid pastures of the

Urnerboden, on the other slope of the Klausen Pass, as well

as the Blacken Alp, at the head of the Engelberg valley, though the northernmost slope of the St Gotthard Pass still belongs to Ticino. In 1900 the population of the canton was only 19,700, of whom 18,685 were German-speaking, 947 Italian- speaking (this number varied much during the construction of the St Gotthard railway, mainly by Italian navvies), and 24 French-speaking, while 18,924 were Romanists, 773 Pro- testants, and 1 a Jew. The capital is Altdorf (q.v.) , indis- solubly connected with the legend of William Tell (q.v.). The only other important villages are Erstfeld (2416 inhab.), a great railway centre, where the mountain engines are put on, and Silenen (1892 inhab.). The population is all but exclusively pastoral, natural causes limiting much effort in the way of agriculture, save near Altdorf. In the canton there are 102 " alps " or mountain pastures, capable of supporting 10,354 cows, and of an estimated capital value of 5,771,000 fr. Till 1 814 Uri formed part of the diocese of Constance (save Ursern, which has always been in that of Coire), while since that date it is administered by the bishop of Coire, though legally in no diocese. The inhabitants are very industrious and saving, though not rich in worldly goods, as their land is so barren. They are extremely conservative, and passionately attached to their religion. Wooden sandals are still commonly worn in the Alpine glens. Of recent years the canton has been much visited by travellers, who have brought much money into it. It forms a single administrative district, which comprises twenty communes. The legislature of the canton is the time-honoured primitive democratic assembly, called the Lands gemeinde, com- posed of all male citizens of 20 years of age, and meeting once annually near Altdorf on the first Sunday in May. It has retained many curious antique ceremonies and customs. It elects the single member of the Federal Stdnderat, as well as the cantonal executive of seven members (holding office for four years), two of whom are the highest officials, the Landam-mann and his deputy. There is also a sort of standing com-mittee, called the Landrat, which is charged with the adminis-tration and minor legislative matters. It is composed of members elected for four years by a popular vote in the pro-portion of one to every 400 (or fraction over 200) inhabitants,

though each commune, even if not attaining this standard of population, is entitled to a member. The single member of the Federal Nationalrat is elected by a popular vote. The constitutional details, apart from the Landsgemeinde, are settled by the cantonal constitution of 1888 (since revised slightly).

Uri is first mentioned in 732 as the place of banishment of Eto, the abbot of Reichenau, by the duke of Alamannia. In 853 it was given by Louis the German to the nunnery (Frauenmunster) at Zurich which he had just founded, and of which his daughter, Hildegard, was the first abbess. Hence the "abbey folk" in Uri enjoyed, as such, the privilege of exemption from all jurisdictions save that of the king's Vogt or " steward of the manor " at Zurich, this Vogtei being cut off from the country of the Zurichgau. The rule of the abbess was mild, so that the other inhabitants of Uri either became her. tenants or obtained similar privileges. Little by little the gathering together of all the inhabitants for the purpose of regulating the customary cultivation of the land created a corporate feeling and led to a sort of local government. On the extinction of the Zaringen dynasty (12 18), the Vogtei reverted to the king, who gave it to the Habsburgs. But in 1 23 1 King Henry bought Uri from them, and thus it became again immediately dependent on the king, the purchase being perhaps due to the rising importance of the route over the St Gotthard Pass (first distinctly mentioned in 1236). As early as 1243 Uri had a common seal, and in the confirmation of its privileges (1274) granted by Rudolf of Habsburg mention is made of its " head-man " (Amman) and of the " commune " (universitas). Uri therefore was quite ready to take part, with Schwyz and Unterwalden, in founding the " Everlasting League " (germ of the later Swiss confederation) on the 1st of August 1 291, defending its liberty in the fight of Morgarten

(1315) and renewing the League of the Three at Brunnen (1315). Later it took part in the victory of Sempach (1386). In 1403, with the help of Obwalden, it won the Val Leventina from the duke of Milan, but it was lost in 1422, though in 1440 Uri alone reconquered it and kept it (winning the bloody fight of Giornico in 1478) till 1798. In 1419, with Obwalden, Uri bought Bellin- zona, but lost it at the battle of Arbedo (1422), though, with Schwyz and Nidwalden, it won it back in 1500, keeping it also till 1798. In 151 2 Uri shared in the conquest of Lugano, &c, by the Confederates, her natural

position forcing her to extend her rule towards the south, though many attempts on and temporary occupations of the Val d'Ossola (1410-1515) ultimately failed. In 1410 a perpetual alliance was made with the valley of Ursern or Val Orsera, the latter being allowed its own head-man and assembly, and courts under those of Uri, with which it was not fully incorporated till 1888. Ursern originally belonged to the great Benedictine monastery of Disentis, at the head of the Vorder Rhine valley, and was most probably colonized in the 13 th century by a German- speaking folk from the Upper Valais. At the Reformation Uri clung to the old faith, becoming a member of the " Christ- liche Vereinigung " (1529) and of the Golden League (1586). In 1798, on the formation of the Helvetic republic, Uri be- came part of the huge canton of the Waldstatten and lost all its Italian possessions. In September 1799 Suworoff and the Russian army, having crossed the St Gotthard to Altdorf, were forced by the French to pass by the Kinzigkulm Pass into Schwyz, instead of sailing down the lake to Lucerne. In 1803 Uri became an independent canton again, with Ursern, but without the Val Leventina. It tried hard to bring back the old state of things in 1814-15, and opposed all attempts at reform, joining the League of Sarnen in 1832 to maintain the pact of 181 5, opposing the proposed revision of the pact, and being one of the members of the Sonderbund in 1845. Despite defeat in the civil war of 1847, Uri voted against the Federal constitution of 1848, and by a crushing majority against that of 1874.

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(Altdorf, 1902) ; " Urkunden aus Uri, 1196-1500," published by A. Denier in vols. 41-44 (1 886-89) of the Geschichtsfreund (as above) ; M. Wanner, Geschichte d. Baues d. Gotthardbahn (Lucerne, 1885). See also Tell. (W. A. B. C.)

URIC ACID, C5H4N4O3, in organic chemistry, an acid which is one of the penultimate products of the tissue waste in the human body. While the bulk of the nitrogen of the albuminoids passes off through the bladder as urea, a small portion of it stops at the uric acid stage. Human urine contains only a fraction of a per cent, of the acid, chiefly as sodium salt; abundance of uric acid is met with in the ex- crement of serpents and birds, with whom it is the principal nitrogenous product of tissue waste. For its preparation guano is boiled repeatedly with a solution of borax in 120 parts of water. The filtered solution is acidified with hydro- chloric acid, when impure uric acid separates out as a brown precipitate, which is washed with cold water; it is then dissolved in hot dilute caustic potash- or soda, the solution filtered, and the filtrate saturated with carbon dioxide. An almost insoluble urate is precipitated, which is filtered, washed and decomposed by hot dilute hydrochloric acid. Uric acid separates as a white precipitate, which is filtered off, washed and dried, to be repurified by a repetition of the alkali process or otherwise. Pure uric acid forms a snow-white

tnicro-crystalline powder, devoid of smell or taste, soluble in 1800 parts of boiling and in 14,000 parts of cold water, but in- soluble in alcohol and in ether. For its detection in urine, the urine is mixed with excess of hydrochloric acid, and allowed to stand, when the uric acid separates out, generally coloured reddish by impurities. The precipitate is dissolved in a few drops of nitric acid and the solution cautiously evaporated to dryness. The residue when exposed to ammonia gas assumes the intense purple colour of murexide.

The acid, which was discovered by C. Scheele in 1776 in urinary calculi, was afterwards investigated by Liebig and Wohler. The determination of its constitution, and its relation , to other vegetable and animal products, followed from the researches of A. von Baeyer and E. Fischer (see Purin).

URICONIUM (more correctly Viroconium), a large Romano-British country town, chef-lieu of the Cornovii, now Wroxeter on the Severn, 5. m. E. of Shrewsbury. At first perhaps (a.d. 45-55) a Roman legionary fortress, held by Legio XIV. Gemina against the Welsh hill-tribes, its garrison was soon removed and it became a flourishing town with stately town hall, baths and other appurtenances of a thoroughly civilized and Romanized city. It was larger and probably richer than — for example — Silchester. The lines of its walls can still be traced, enclosing an area of 170 acres, and parts of the town hall and baths have been uncovered. Its originally Celtic name seems to survive in the names of Wroxeter and the neighbouring hill, Wrekin.

See Victoria History of Shropshire, i. 215-56. (F. J. H.)

URIM AND THUMMIM, in the Bible. These descriptive terms are applied to one of the methods of divination employed by the ancient Hebrews, which, it is now generally agreed, consisted in a species of sacred lot. Together with " dreams " and the prophetic oracle it formed the recognized channel by which divine communications were given (cf. 1 Sam. xxviii. 6). That some method of casting lots is denoted by the terms is evident from 1 Sam. xiv. 41 f. The Hebrew text in this passage, as emended by the LXX and in this form generally accepted, runs as follows: " And Saul said: ' O Jehovah, God of Israel, why dost Thou not answer Thy servant to-day? If this fault be in me or in Jonathan my son, give Urim, and if it be in Thy people Israel, give Thummim.' And the lot fell upon Saul and Jonathan, and the people escaped. And Saul said: ' Cast (the lot) between me and Jonathan my son, and on whomsoever Jehovah shall cause the lot to fall let him die.' So they cast (the lot) between him and Jonathan his son, and Jonathan was taken."

From this illuminating passage it is clear (a) that by means of the Urim and Thummim the guilt or innocence of the suspected parties was determined; (b) that this was effected by a series of categorical questions implying the simple alterna- tive of " yes " or " no," or something positive or negative. A further inference © from a comparison of 1 Sam. xiv. 41 f. with ver. 36 (Greek text) is that this method of casting the sacred lot was closely connected with divination by the ephod (q.v.), and was the prerogative of the priests. This last point appears explicitly in the " Blessing of Moses " (Deut. xxxiii.), where the

opening words of the Benediction on Levi run thus (text as emended by Ball, following LXX; P.S.B.A. 1896, 118 f.):— " Give to Levi Thy Thummim, And Thy Urim to the man of Thy favour."

Similar modes of divination were practised, it would seem, among the pre-Islamic Arabs. The following custom is cited by Professor G. F. Moore, 1 on the testimony of Moslem writers, as having been in vogue: "Two arrow shafts (without heads or feathers), on one of which was written ' Command,' on the other 'Prohibition,' or words of similar purport, were placed in a receptacle, and according as one or the other of them was drawn out it was known whether the proposed enterprise was in accordance with the will of the god and destined to succeed or not " (cf. Prov xvi. 33; Acts i. 26).

Regarding the form and material of the Urim and Thummim 1 Encycl. Biblica, iv. (col. 5236), where further details are given.

no details are given in the Old Testament. They seem to have fallen into desuetude at a comparatively early period. No mention is made of their use in the historical books after the time of David and Solomon, though it is probable that such use is implied in passages where the ephod is mentioned (e.g. Hosea iii. 4). In the post-exilic Priestly Code (i.e. the bulk of the Levitical legislation of the Pentateuch), however, the Urim and Thummim figure as part of the equipment of the high priest (cf. Ex. xxviii. 30; Lev. viii. 8; Num. xxvii. 21). Here it is stated that they are kept in a square pouch which is worn upon the high priest's breast (" the breastplate of judg- ment "), and attached to the ephod. Thus the association of the Urim and Thummim with the ephod, which appears in the oldest narratives, is retained in the Priestly Code (P). It is doubtful, however, whether P had any clear notion as to what exactly the Urim and Thummim were. The priestly writer gives no directions as to how they were to be made. They were retained in his ideal legislation, apparently, because their use was already invested with the mystery of a long-vanished past, and they were regarded as having formed one of the most venerable adjuncts of the priesthood. That this method of divination was not in actual use after the Exile is shown by Neh. vii. 65 (Ezra ii. 63; 1 Esdras v. 40) where an important point affecting the priestly families is reserved " till there stood up a priest with Urim and Thummim." Later references (Ecclus. xiv. 10; in

Josephus and the Talmud) prove that no real tra- dition survived on the subject. The identification of them with the jewels of the breastplate and on the shoulders of the high priest (which apparently has the authority of Josephus) is unwarranted; other ancient guesses are equally baseless. Nor has any satisfactory explanation of the names Urim and Thummim been proposed. As vocalized in the Massoretic Hebrew text the names = " Lights and perfection." But the Greek translators read the former 'orim and connected it with torah, "decision"; it would thus = " doctrine " ; so Symmachus, cf. 1 Esd. v. 40, where " a high priest wearing Urim and Thummim " (R.V.) is given as " a high priest clothed in doctrine and truth " in A.V. Nor can the attempt of the American scholar Muss-Arnolt to explain them as cognate with the Babylonian Tablets of Destiny be pronounced success- ful. Perhaps the conjecture least open to objection is that which regards the terms Urim and Thummim as the names of two lots 2 (perhaps actually written on them) of opposite import. In this case the former of the two names might be derived from the root 'arar, "to curse"; the other from a root meaning " to be without fault." The one would thus signify " that a proposed action was satisfactory to God, the other that it provoked His wrath " (Professor G. F. Moore). But all such explanations are highly precarious.

Bibliography. — For the older views, see Spencer, Ve leg. Hebr. ril. Diss. VII. ; and a useful summary by Plumptre in Smith's Bib. Vict. For modern discussions, see the articles " Urim and Thummim " in the Bible dictionaries; the relevant sections in the treatises on archaeology; and W. Muss-Arnolt, The Urim and Thummim (reprinted from the American Journal of Semitic Lan- guages, July 1900). (G. H. Bo.)

URINARY SYSTEM. The urinary system in the fully developed human being consists of (1) the kidneys, (2) the ureters, (3) the urinary bladder, and (4) the urethra.

As the greater part of the male urethra is a generative as well as a urinary canal, its description will be found in the article on the Reproductive System.

The kidneys are two bean-shaped granular masses, firm in con- sistence and reddish brown in colour, about 4ˆ in. long, and placed obliquely behind the other abdominal viscera — one on each side of the last thoracic and three upper lumbar

vertebrae. Kidneys. Each is imperfectly covered on its ventral surface by peritoneum and is moulded to some extent by the viscera which press on it. Around them there is usually a considerable amount of fat and areolar tissue, by which, as well as by the peritoneum and by the presence of the surrounding viscera, the kidneys are retained in their place. In rare cases the kidney may slip from its usual place in the loins to a lower position (movable kidney), and may even be movable

2 The lots may have been small pebbles, or small tablets of wood or bone.

in the abdominal cavity (floating kidney) — a condition often productive of serious consequences. The kidney in the foetus is lobulated, but the intervals between the lobes become smoothed out in later years of childhood. Each gland is invested

s

FlG. I. — Vertical Section through the Kidney. A, branch of renal artery; U, ureter. I, cortical substance with cortical pyramids, and labyrinth substance of tortuous tubes; 2 and 3, medullary pyramids of straight tubules; 4, fatty masses around blood vessels (5) ; 6, papilla ; 7, pelvis.

Labyrinth Medullary lay

Glomerulus

.Collecting tube

T.OOP of

” Henle-

Efferent vessel

.Afferent vessel

Glomerulus Capsule From A. F. Dixon, Cunningham’s Text-Book of Anatomy.

Fig. 2. — Diagrammatic Representation of the Structures forming a Kidney Lobe. In the middle part of the figure the course of one of the kidney tubules is indicated, and in the lateral parts the disposition of the larger arteries. A, cortex; B, intermediate zone; C, papillary portion. The diagram at the right-hand side of the lower part of the figure illustrates the connexions of the structures composing a Mal- pighian corpuscle.

by a firm, closely adherent, fibrous capsule, under which is an imperfect lamina of unstriped muscle. The inner and ventral margin of each kidney is concave, and into this hilum or concavity

the renal artery from the aorta passes. Here also the renal vein escapes and joins the vena cava inferior. The ureter or meta-nephric duct, always behind and below the blood vessels, emerges here and passes downward to the bladder. When the kidney is longitudinally divided from hilum to outer edge, the cut surface is seen to consist of two parts — an outer layer, the cortex, and an inner part, the medulla (fig. 1). The latter consists of a series of eight to sixteen pyramids, whose bases and sides are invested with cortical matter, and whose apices or papillae project into the hilum, where they are severally surrounded by membranous tubes (calices), which by their union make up the ureter. The part of the ureter situated in the hilum is dilated, and is named the pelvis of the kidney.

In minute structure the kidney is the most complex gland in the body. Each of the papillae consists of a large number of straight tubes — collecting tubules — which open by pores on its surface. When these are traced into the pyramid, they are seen to divide several times, their fine end-branches projecting in little tufts into the cortical matter at the base of each pyramid. Here the branches coming from the tube change in structure and become convoluted in the cortex — the convoluted tubules. Next, each suddenly dips back again as a long straight loop — the loop of Henle — into the pyramid, reaching nearly to the papillary region; then turning sharply on itself, passes back straight to the cortex, where it again becomes convoluted, ultimately ending by dilating into a flask-like bulb called a Malpighian corpuscle. The renal artery, after breaking

FlG. 3. — Vertical Section through Pelvis, showing urinary

*bladder and rectum in situ. 1, peritoneum; 2, pubic symphysis; 3, muscular coat of bladder; 5, mucous membrane folded and wrinkled; 6, opening of ureter; 8, prostate; 10, vena dprsalis penis; 12, corpus spongiosum; 14, testis in its sac; 15, bulbo-cavernosus muscle; 16, bulb; 17, sphincters of the anus; 22, anal opening; 30, coccyx; *, vesicula seminalis.*

up into branches between the pyramids, ends in minute end-arteries in the cortex. Each of these pierces into one of the flasks just described, and there becomes branched, the branches being col- lected into a little ball or glomerulus which nearly fills the flask. From this an efferent vessel escapes, which, joining with its neigh- bouring vessels of the same kind, makes a close network around the convoluted tubes, ultimately ending in the renal vein. It is sup- posed that the different constituents of the urine are eliminated in different 'parts of these tubes — some, especially the watery parts, in the flask, and some, especially the more solid constituents, in the convoluted tubular apparatus. A peculiar form of glandular epithelium lines the two convoluted areas of the tubes and the limb of the loop nearer the straight or collecting tubes.

The ureter or duct of the kidney begins at the hilum and descends on the back wall of the abdominal cavity to open into the bladder. It is usually about 12 in. in length and as thick as a goose Bi a dd quill. At its termination it passes obliquely through the – er

coats of the bladder, so that when the bladder is distended urethra the lumen of its end is closed. The urinary bladder is a membranous bag lying in the pelvic cavity directly behind and above the dorsal surface of the pubes. In the foetus and infant, how- ever, the bladder lies in the abdomen, not in the pelvis. During life it is seldom distended so as to hold more than about 10 oz., but when the abdomen is opened it can be dilated to more than double that size. When distended it rises and is applied closely against the back of the ventral abdominal wall. The bladder has a strong muscular investment of unstriped muscle in several layers, which

are innervated by branches from the sacral nerves. It has a

peculiar epithelial lining of several strata, the superficial cells of which are cubical when the sac is collapsed, but become flattened and scale- like when it is distended. At the lower part of the bladder there is a triangular space known as the trigone, the angles of which are formed by the openings of the two ureters and the urethra. In this space the mucous membrane is smooth and firmly bound to the subjacent muscle; elsewhere it is thrown into numerous folds when the bladder is empty. A muscular band called the torus uretericus

*Bladder *pex*

Infero-lateral area

Ureter

litenor surface of prostate

Seminal vesicle From A. F. Dixon, Cunningham's Text-Book of Anatomy.

Fig. 4. — -The Bladder, Prostate and Seminal Vesicles, viewed from below. Taken from a subject in which the viscera were hardened in situ. The bladder contained but a small amount of fluid.

or Mercier's bar joins the orifices of the ureters. The female urethra is only ij in. in length and is comparable only with that part of the male urethra which extends from the bladder to the openings of the seminal ducts (fig. 3).

Embryology. The excretory organs of the embryo are developed as a series' of small tubes in the intermediate cell mass (see fig. 5), the ventral part of which projects to form the Wolffian ridge. Three sets of these tubes appear in succession and occupy the whole length of the body from the cervical to the lumbar region. The most anterior — pronephros or head kidney — is represented in man by only two or three small tubules on each side which appear as ingrowths from the neighbouring coelom (fig. 6, Pro.N.). From the study of comparative anatomy it is probable that these are mere vestiges. Although the pronephros is rudimentary, the duct which in lower

Neural tube

Notochord

Somite

Wolffian duct and mesoneph:

Intermediate cell mass

Mesonephros and Wolffian duct Body cavity

From A. F. Dixon, Cunningham's Text-Book of Anatomy.

Fig. 5. — Transverse Section through the Body of a Fowl Embryo.

types carries away its excretion is well developed. This is the Wolffian duct, which appears in man before the pronephric tubes are formed, and runs longitudinally back in each intermediate cell mass to open into the cloaca (fig. 6, W.D.). In certain parts of its course it is at an early date in very close relation with the skin on the dorsal side of the intermediate cell mass, and many embryologists hold that it is originally ectodermal in origin, and has sunk into the mesoderm secondarily. Others think that it is primarily meso- dermal but has gained secondary connexions with the ectoderm. From a morphological point of view, as will be explained in the comparative anatomy section, the former view seems the more likely.

When the pronephric tubules disappear, which they, do at an early stage of the embryo's development, the Wolffian duct persists and acts as the drain for another and much more important series of tubules, which are formed in the intermediate cell mass behind the region of the pronephros, and make up the mesonephros or middle kidney (fig. 6, M.N.). There is some doubt as to whether these tubes are strictly homologous and in series with those of the pronephros ; but they are certainly of later development.

By about the sixth week of intra-uterine life these tubules reach their maximum development and form the Wolffian body, which projects into the coelom as the now very definite Wolffian ridge and acts as the functional excretory organ of the embryo (see fig. 7). When the permanent kidney is formed this organ degener- ates and its ultimate fate is discussed in the article on the Repro- ductive System.

The metanephros or hind kidney begins as a diverticulum from the dorsal side of the Wolffian duct close to its opening into the

Ep.O.

M.N.

r MtJ«

Fig. 6. — Diagram of the Formation of the Genito-Urinary Apparatus. The first figure is the generalized type, the second the male and the third the female specialized arrangements. Suppressed parts are dotted.

Pro.N

Pronephros.

N.

Nephrostome.

M.N.

Mesonephros.

M.C.

Malpighian corpuscle.

Mt.N

Metanephros.

T.

Testis.

B.

Bladder.

E.

Epididymis.

Clo.

Cloaca.

O.G.

Organ of Giraldes.

R.

Rectum.

V.D.

Vas deferens.

M.D.

Mullerian duct.

U.M.

Uterus masculinus.

W.D.

Wolffian duct.

0.

Ovary.

Ur.

Ureter.

Ep.O.

Epoophoron.

S.H.

Sessile hydatid.

Par.O

Paroophoron.

P.H.

Pedunculated hydatid.

F. T.

Fallopian tube.

S.G.

Sexual gland.

U.

Uterus.

cloaca (see fig. 6, Mt.N.) ; this occurs about the fourth week of intrauterine life, and the diverticulum grows forward (cephalad), dorsal to the hind end of the Wolffian body. In doing this it forms a duct — the metanephric duct or ureter — the cephalic end of which enlarges and divides to form the calices of the kidney. From the calices numerous smaller ducts grow into the mesoderm of the hind (caudal) end of the intermediate cell mass and become the collecting

Neural tube

Aorta-

Mesentery'— ——— — Blood-vessel———-

—Spinal ganglion

Spinal nerve

-Vein

■*WolfEan-dueU*

■*— Intestine*

From A. F. Dixon, Cunningham's Text-Book of Anatomy.

Fig. 7. — Transverse Section through the Body of a Rat Embryo. The position where the germinal epithelium arises is indicated at a.

tubes of the kidney. While this is going on another set of tubules, probably in series with the mesonephric tubules,

develop inde- pendently in the intermediate cell mass and so form all the rest of the tubular system of the kidney. Toward these tubules, at one point, branches from the aorta push their way and invaginate each tube, thus forming the Malpighian corpuscles.

By the eighth week the kidney is definitely formed and takes over the excretory work of the mesonephros, which now atrophies; its surface is distinctly lobulated, a condition which persists until after birth.

At first, as has been stated, the ureters open into the Wolffian ducts, but later on each gains a separate opening into the cloaca, and eventually these shift in a ventral direction until they reach their permanent connexion with the allantoic bladder.

The bladder is developed from that part of the cloaca from which the allantois has gr6wn out, and also from that part of the allantois which is nearest the cloaca. At first it is a tubular structure, but after the second month becomes more pyriform, the stalk of the pear corresponding to the fibrous urachus which reaches the umbilicus. Most of that part of the tubular allantois which lies between the per- manent openings of the ureters and the Wolffian ducts becomes the urinary sinus and does not dilate in the same way that the permanent bladder does. This, in the female, forms the whole of the urethra, and in the male the upper part of the prostatic urethra. Behind (caudad) the urinary sinus is the urogenital sinus, which is treated of in the article on the Reproductive System.

The Miillerian ducts (fig. 6, M.D.) are formed after the Wolffian ducts are fully developed. A ridge appears in the intermediate cell mass ventral to the Wolffian duct, and into the anterior (cephalic) end of this a tubular process of the coelom forces its way back- ward (caudad). Before reaching the cloaca the two Miillerian ducts coalesce and open between the orifices of the two Wolffian ducts. These ducts, as is shown in the article, on the Repro- ductive System, form the oviducts, uterus and at least part of the vagina.

For further details and literature see Quain's Anatomy, vol. i. (Longmans, Green & Co., London, 1908) ; J. M'Murrich, The Develop- ment of the Human Body (Rebman, London, 1906), and A. Keith, Human Embryology and Morphology (Arnold, London).

Comparative Anatomy.

In the Acrania (Amphioxus) the nephridial tubules are segment- ally arranged and are only found in the pharyngeal region; each opens into the coelom by several ciliated funnels called nephrostomes, and also into the atrium, which is practically the exterior of the animal, by an opening called the nephridiopore. There is reason to believe that we have here a pronephros of a very primitive type and arranged on the same plan, in many respects, as the simple nephridia of such lowly forms as the earthworm. There is nothing to indicate that a mesonephros is present, nor are there any Malpighian corpuscles or longitudinal ducts.

Among the Cyclostomata (lampreys and hags) the pronephros persists throughout life in Bdellostoma and probably in the hag (Myxine), but a Wolffian (archinephric) duct has been evolved so that the tubules no longer open on the surface by nephridiopores. It has been surmised that in a transitional type the tubules opened into a groove on each side of the surface of the animal and that the edges of this, coming together, formed a duct. At any rate the superficial openings of the primitive nephridia make it probable that the Wolffian duct was originally of ectodermal origin. A mesonephros has now appeared behind (caudad) the pronephros, though it is not certain whether its tubules (mesonephridia) are in series with those of the pronephros or whether they are structures on a more dorsal plane; but they certainly open into the Wolffian duct, which also drains the pronephros, and so this duct is func- tionally simply a ureter and has nothing to do with the sexual glands. No Miillerian duct has yet been evolved.

In the Teleostomi (bony and ganoid fish) the pronephros is usually aborted in the adult and the mesonephros is the functional kidney. As the genital glands have special coelomic relations the Wolffian duct is still merely a ureter, and in the Teleostei at least there is no true Miillerian duct.

In the Elasmobranchii (sharks and rays) the pronephros is

more completely and more early aborted than in the last subclass, and the mesonephros is divided into an anterior or genital part, which receives the vasa efferentia in the male from the testis and thus is the first appearance phylogenetically of an epididymis and a posterior or renal part. The Wolffian duct therefore acts both as a vas deferens for the sperm and a ureter for the urine, though in the female it is merely a ureter. In the hindmost part of the mesone- phros there are separate ducts which are called ureters and open into the lower part of the Wolffian duct in the same way that the metanephric ducts of the Amniota do ; it is, however, very doubtful whether they are really homologous with these ducts. The Miillerian duct (see Reproductive System) is present in elasmobranchs and according to modern views arises as a backgrowth from the coelom as in the Amniota.

The Dipnoi or mudfish are remarkable for having a cloacal caecum which probably functions as an urinary bladder. It is situated on the dorsal wall of the cloaca and is not homologous with the allantoic bladder of higher forms. A good deal of the kidney (mesonephros) as it appears to the naked eye is composed of lymphoid tissue.

In the Amphibia the snake-like forms (Gymnophiona) show a very primitive arrangement of the kidney tubules, each having its nephrostome, Malpighian capsule and short convoluted part leading to the Wolffian duct which acts both as ureter and vas deferens.

In the adult Anura (frogs and toads) the nephrostomes lose their

connexion with the nephridia and communicate with the renal veins. In the amphibians a true allantoic bladder first appears as a diverticulum from the ventral wall of the cloaca; in different forms it may be single, bilobed or even double.

In Reptilia the hind kidney or metanephros is developed and takes over all the excretory work; it is usually lobulated, its nephridia are never provided with nephrostomes and its duct (the ureter) opens into the Wolffian duct or vas deferens before reaching the cloaca. The allantoic bladder is present in the Lacertilia (lizards) and Chelonia (turtles), but is absent in others. Birds resemble reptiles very closely in their urinary system except that there is never any bladder and that the

ureters and vasa deferentia open independently into the cloaca.

In the Mammalia the bean shape of the kidney is fairly character- istic. In foetal life the organ is always lobulated, and this sometimes persists throughout adult life as in the ox, bear, seal and whale. More often the lobulation disappears on the surface and is only imperfectly represented, on making a section, by the pyramids; even these in some cases fuse so closely that their apices appear as a single papilla. This is the case in many monkeys, Carnivores and rodents.

In the Monotremata (Ornithorhynchus and Echidna) there is an allantoic bladder, but the ureters open into the cloaca as they do in birds. In all other mammals they have reached the bladder and open into it by valvular orifices.

On comparing the embryology (ontogeny) of the urinary system with its comparative anatomy (phylogeny) the harmony of the two from a broad point of view is very striking.

For further details see Parker and Haswell, Text-Book of Zoology (Macmillan, London, 1897); Wiedersheim's Comparative Anat. of Vertebrates, translated by W. N. Parker (London, 1907) ; Gegenbaur, Vergleich. Anat. der Wirbelliere (Leipzig, 1901).

URMIA (the name as written by the Persians is Urumleh and Urmieh; the inhabitants of the place say Urmi), a town in the province of Azerbaijan in Persia, situated at an elevation of 4400 ft., in an extremely fertile and highly cultivated plain, 78 m. S.W. of Tabriz (120 by road), n to 12 m. from the western shore of the lake of the same name, in 37 34′ N. and 45° 4′ E. It is surrounded by a wall and deep dry ditch that can be flooded, and is encircled by orchards and gardens which extend all round for miles and even penetrate the heart of the town. The streets are broader than is usual in Persian cities, and most of them have a stream of water running down the middle. There are a busy bazaar and some old mosques. The population is about 35,000, and there are post and telegraph offices. The only building of importance is the ark, or citadel, a walled building in the centre of the town containing an arsenal and barracks for a small garrison. Urmia has for many years been the headquarters of various missions to the Nestorians of the neighbourhood: an American mission (since 1835)

representing the " Board of the Foreign Missions of the Presbyterian church of the United States of America"; the French Lazarists (since 1840); British, "The Anglican Mission" founded by Archbishop Benson (1884), and a Russian mission (Orthodox, since 1902). Urmia is the capital of a fertile district 50 m. long and about 20 m. broad, having the same name and con- taining more than 300 flourishing villages. It exports great quantities of dried fruit and excellent tutun, tobacco for chibuks, or Turkish pipes.

URMIA, LAKE OF (also spelt Urumiah), a lake in north-western Persia, between 37° 10′ and 38° 20′ N. and between 45° 10′ and 46 E., which takes its name (Pers. Deryacheh i Urmia, Turk. Urmi gbl) from the town of Urmia, situated near its western shore, but is also known as the Deryacheh i Shahi and Shahi gol. The limits of the lake vary much, the length, N.-S., from 80 to 90 m., the width, E.-W., from 30 to 45, being greater in the season of high water — in spring when the snows melt — and considerably less in the season of low water. A rise of the level by only a few inches extends the shore of the lake for miles inland, and it may be estimated that the surface covered by the lake during high water is half as much again as that during low water. The Shahi peninsula, which juts out into the lake from the eastern bank, is an island during the season of high water and also sometimes after heavy autumnal rains, separated from the mainland by several miles of shallow water. The mean depth of the lake is 15 to 16 ft., and its greatest depth probably does not exceed 50 ft. The lake has in recent years exhibited extraordinary changes of level, and it is not certain

whether some occasional extraordinary rises of level were due to a movement of the earth's crust or merely to an increase of rainfall as compared with evaporation. Gunther calculated that the lake covered 1795 sq. m., but he did not state whether during high or low water. De Morgan gives 4000 and 6000 sq. kilometres (1544 and 2317 sq. m.) for low and high water respectively. In the southern half of the lake is a cluster of about fifty rocky islands composed of Miocene strata with marine shells, echinoderms and corals, much resembling the beds of the Vienna basin. The largest of these islands, Koyun

daghi, i.e. " Sheep-mountain," is 3 to 4 m. long and has a spring of sweet water near which a few people settle occasionally for looking after herds of goats and sheep taken there for grazing. All the islands are uninhabited and some are mere bare rocks of little extent. Although fed by many rivers and streams of sweet water the lake is «ery saline and its water is about three- fifths as salt as the water of the Dead Sea — far too salt to permit the existence of fish life. The specific gravity of the water is 1-155 during low water and 1-113 during high water. The principal salts contained in solution are sodium chloride, bromide and iodide and sulphates of magnesia, soda and iron. The only organisms living in the lake are a species of artemia, a crustacean known from other brine lakes in Europe and North America, the larva of a species of dipterous insect, probably allied to ephydra, and green vegetable masses composed of bacterial zoogloeae covered with a species of diatom. The rivers which flow into the lake drain an area of nearly 20,000 sq. m.; chub and roach are found in all of them, silurus in some. The lake is navigated by a few round-bottomed boats with round bows and flat sterns, each of about 20 tons burden and carrying an enormous square sail.

Strabo (xi. c. 13, 2) mentions the lake with the name Spauta, a clerical error for Kapauta, from Pers. Kapaut, New Pers. Kebud, meaning " blue." Old Armenian writers have Kapoit-dzov, " the blue sea." In the Zendavesta and Bundahish it is called " Chae- chasta," and Firdousi in his Shahnamah (nth century) has " Chichast."

See J. de Morgan, Mission scientifique en Perse (1894); R. T. Gunther, " Lake Urmi and its Neighbourhood," Geogr. Journ. (November 1899). (A. H.-S.)

URN (Lat. urna, either from root of urere, to burn, being made of burnt clay, or connected with urceus, Gr. f5px& > J ar) > a vessel or vase, particularly one with an oviform body and a foot. The Roman term urna was used primarily of a jar for carrying or drawing water, but was also specifically applied to the vessel in which the voting-tablets (tabellae) and lots (sortes) were cast, whence its figurative use for the urn of fate from which are drawn the varying lots of man's destiny. The ashes of the cremated dead were deposited in cinerary urns, a custom perpetuated by the marble or other urns placed upon funeral monuments. The Roman urna was also a liquid measure containing half an amphora, or about 35 gallons.

Modern usage has given the name to large silver or copper vessels containing tea or coffee with a tap for drawing off the liquids and heated either by a spirit lamp or, as in the older forms, by the insertion of a hot iron in a special receptacle placed in the body of the vessel.

UROTROPIN (hexamethylenetetramine), known also in the United States under the name Uritone, a medicinal preparation due to the action of ammonia on formaldehyde. It consists of colourless granular crystals freely soluble in water and having an alkaline reaction. Urotropin is among the most powerful of urinary antiseptics. It was formerly thought that its action was due to the setting free of formaldehyde in the urine, but it is now known by the researches of P. Cammidge that this is not so. It is used to render the urine acid in cases where it is alkaline, loaded with phosphates or purulent, and is thus useful in cases of cystitis. It is slightly diuretic. Experimentally it has been shown to have a solvent action on uric acid, but its action in this direction in the body requires confirmation. Urotropin is very valuable in sterilizing the urine of patients who have suffered from typhoid fever and thus preventing the spread of the disease by what are known as " typhoid carriers." Analogous

preparations are cystamine, helmitol and hetralin. Chinotropin is urotropin quinate, and borovertin is urotropin triborate.

*URQUHART, DAVID , British diplomatist and publicist, born at Braelangwell, Cromarty. He came of a good Scottish family and was educated in France, Switzerland and Spain, and then at St John's College, Oxford. In 1827 he went under Lord Cochrane (Dundonald) to fight for the Greeks in the War of Independence; he was prese*nt at the action of the 28th of September when Captain Hastings destroyed the Turkish squadron in the Bay of Salona, and as lieutenant of the frigate " Hellas " he was severely wounded in the attack on Scio. In November 1828 he left the Greek service. In 1830 he privately examined the new Greek frontier as determined by the protocol of March 22, 1829, and the value of his reports to the government led to his being named British commissioner to accompany Prince Leopold of Coburg to Greece, but the appointment fell to the ground with that prince's refusal of the Greek throne. His knowledge of the local conditions, however,*

led to his being appointed in November 1 83 1 attache to Sir Stratford Canning (Lord Stratford de Red cliffe, q.v.), ambassador extraordinary to the sultan, for the purpose of finally deliminating the frontiers of Turkey and Greece. On his return to England he published in 1833 Turkey and its Resources, a violent denunciation of Russia. In 1833 he was sent on a secret mission to Turkey to inquire into pos- sible openings for British trade, and at Constantinople he gained the complete confidence of the Turkish government. The situation, however, was a delicate one, and Urquhart's out- spoken advocacy of British intervention on behalf of the sultan against Mehemet AH, the policy of Stratford Canning, made him a danger to international peace; he was conse- quently recalled by Palmerston. At this time appeared his pamphlet England, France, Russia and Turkey, the violent anti-Russian character of which brought him into conflict with Richard Cobden. In 1835 he was appointed secretary of embassy at Constantinople, but an unfortunate attempt to counteract Russian aggressive designs in Circassia, which threatened to lead to an international crisis, again led to his recall in 1837. In 1835, before leaving for the East, he founded a periodical called the Portfolio, and in the first issue printed a series of Russian state papers, which made a profound im- pression. From 1847 to 1852 he sat in parliament as member for Stafford, and carried on a vigorous crusade against Lord Palmerston's foreign policy. The action of England in the Crimean War provoked indignant protests from Urquhart, who contended that Turkey was in a position to fight her own battles without the assistance of other Powers. To attack the government, he organized " foreign affairs committees " which became known as " Urquhartite," throughout the country, and in 1855 founded the Free Press (in 1866 renamed the Diplomatic Review), which numbered among its contributors the socialist Karl Marx. In i860 he published his book on The Lebanon. From 1864 until his death Urquhart's health compelled him to live on the continent, where he devoted his energies to promoting the study of international law. He died on the 16th of May 1877. His wife (Harriet Chichester Fortescue), by whom he had two sons and two daughters, and who died in 1889, wrote numerous articles in the Diplomatic Review over the signature of " Caritas."

To Urquhart is due the introduction into Great Britain of hot-air Turkish baths. He advocated their use in his book called

Pillars of Hercules (1850), which attracted the attention of the Irish physician Dr Richard Baxter (1802-1870), and the latter introduced them in his system of hydropathy at Blarney, Co. Cork. The Turkish baths in Jermyn Street, London, were built under Urquhart's direction.

URQUHART, or Urchard, SIR THOMAS (1611-1660), Scottish author and translator of Rabelais, was the son of Sir Thomas Urquhart of Cromarty, the representative of a very aiicient family, and of Christian, daughter of the fourth Lord Elphinstone. Sir Thomas was hard pressed by his creditors,, and after part of the family estate had been alienated received

a " letter of protection " from his creditors from Charles I. in 1637. In the same year, his son Thomas and a younger one were accused of forcibly detaining their father in an upper room, but the matter was settled without further proceedings. Thomas was educated at King's College, Aberdeen, spending his spare time in the pursuit of physical science. On leaving the univer- sity he travelled over Europe, succeeded to his embarrassed inheritance, and got together a remarkable library, which, however, fell into the hands of his creditors. All his later life was disturbed by pecuniary and political difficulties. He was an enthusiastic Royalist; and, so far as religious matters went, his principles may be judged from his favourite signature, " C. P.," for Christianus Presbyteromastix. He took part in the " Trot of Turriff " in 1639, and was rewarded by being knighted on 7th April 1641 by the king's own hand at Whitehall. He took occasion by this visit to London to see through the press his first work, a collection of Epigrams of no great merit. Four years later, in 1645, he produced a tract called Trissotetras, a treatise on logarithms, adjusted to a kind of memoria technica, like that of the scholastic logic. In 1649 he was proclaimed a rebel and traitor at the Cross of Edinburgh for taking part in the abortive rising at Inverness on behalf of Charles II. in that year; but no active proceedings were taken against him. He took part in the march to Worcester, and was there wounded and taken prisoner. His MSS. were destroyed after the battle, with the exception of a few pages of the preface to his Universal Language. Urquhart was imprisoned in the Tower and at Windsor, but was released

by Cromwell's orders in 1651. He published in rapid succession during 1652 and 1653 three tracts with quaint titles and quainter contents. Havroxpovoxovov is an amazing genealogy of the house of Urquhart up to Adam, with the names extemporized for the earlier ages in a kind of gibberish. 'Ekctkv- fiaXavpov is supposed to be a treatise on the virtues of a jewel found in the streets of Worcester. The jewel is the recovered sheets of his manuscript. The defence of his system for a universal language was supplemented by a eulogy of the Scottish character, as shown in the Admirable Crichton and others. Finally, in Logopandecteision he again handled the subject of a universal language. The Translation of Rabelais (Books I. and II.), which Urquhart produced in 1653, is of the highest value as literature, and, by general testimony, one of the great masterpieces of translation. Though by no means a close rendering, it reproduces the spirit of the original with remarkable felicity. The translation was reprinted in 1664; and in 1 693 that of the Third Book was added. Next to nothing is known of Urquhart after 1553; it is said that he sought refuge, like other cavaliers, on the continent, and died (1660) of a fit of laughing, brought on by joy at hearing of the Restoration.

His original Works, with such scanty particulars of his life as are known, and with reproductions of two original and curious frontis- pieces, which represent him as a handsome and dandified wearer of full cavalier costume, were published by the Maitland Club (1834). See also Sir Thomas Urquhart of Cromartie, by John Willcock (1899), and the articles in the New Review (July 1897) and Diet. Nat. Biog. The Rabelais has been frequently reprinted; Peter Motteux's translation of the whole appeared in 1708, and Ozell's in 1737, each incorporating Urquhart's portions. Theodore Martin in 1838, and Henry Morley in 1883, published editions of Urquhart's text.

URSA MAJOR (" The Great Bear "), in astronomy, a constellation of the northern hemisphere, supposed to be referred to in the Old Testament (Job ix. 9, xxxviii. 22), mentioned by Homer, "ApKTOs 6', rjv koI a/mijap ewiiCKrioiv KaXeovrai (//. 18.487), Eudoxus (4th century B.C.) and Aratus (3rd century B.C.). The Greeks identified this constellation with the nymph Callisto (q.v.), placed in the heavens by Zeus in the form of a bear together with her son Areas as "bear-warder," or Arcturus (q.v.); they named it Arctos, the she-bear, Helice,

from its turning round the pole-star. The Romans knew the constellation as Arctos or Ursa; the Arabians termed the quadrilateral, formed by the four stars a, (3, 7, 5, Na'sh, a bier, whence it is sometimes known as Feretrum majus. The Arabic name should probably be identified with the Hebrew name 'Ash and ' Ayish in the book of Job (see G. Schiaparelli, Astronomy in the Old Testament,

1905). Ptolemy catalogued 8 stars, Tycho 7 and Hevelius 12. Of these, the seven brightest (a of the 1st magnitude, ft, 7, e, f, ij of the 2nd magnitude, and 5 of the 3rd magnitude) constitute one of the most characteristic figures in the northern sky; they have received various names — Septentriones, the wagon, plough, dipper and Charles's wain (a corruption of " churl's wain," or peasant's cart). With the Hindus these seven stars represented the seven Rishis. a and /3 are called the " pointers," since they are collinear with, or point to, the pole-star. £ Ursae majoris is a beautiful binary star, its components having magni- tudes 4 and 5; this star was one of the first to be recognized as a binary — i.e. having two components revolving about their common centre of gravity — and the first to have its orbit calculated, f Ursae majoris is perhaps the best known double star in the northern hemisphere, the larger component is itself a spectroscopic double. The nebula M. 97 Ursae majoris is of the planetary type; the earl of Rosse observed two spiral condensations turning in opposite directions, — hence its name, — the " Owl nebula."

URSA MINOR ("The Little Bear"), in astronomy, a constellation of the northern hemisphere, mentioned by Thales (7th century B.C.) and by Eudoxus and Aratus. By the Greeks it was sometimes named Cynosura (Gr. kvvos, dog's; ovpa, tail), alleging this to be one of the dogs of Callisto, who became Ursa major. The Phoenicians named it Phoenice, or the Phoenician constellation, possibly in allusion to the fact that the brightest star is a Ursae minoris or the pole-star, which being situated very close to the north pole is of incalcul- able service to navigators. Ptolemy catalogued 8 stars, Tycho Brahe 7 and Hevelius 12. a Ursae minoris, more generally known as the pole-star or Polaris, a star of the 2nd magnitude, describes a circle of 2° 25′ daily about the north pole; it has a 9th-magnitude companion, and is also a spectroscopic binary.

URSINS, MARIE ANNE DE LA TREMOILLE> Princess des (1642-1722), lady of the Spanish court, was the daughter of

the duke of Noirmontier and his wife Renee Julie Aubri. She was. born in 1642, and was married young to Adrien Blaise de Talleyrand, Prince de Chalais. Her husband, having been concerned in the duel of four against four, in which the duke of Beauvilliers was killed in 1663, was compelled to fly the country. He died soon afterwards in Spain, and his widow established herself in Rome. In 1675 she married Flavio Orsini, duke of Bracciano. The marriage was far from har- monious, but her husband left her his fortune. It brought her a series of lawsuits and troubles with Livio Odescalchi, who claimed that he had been adopted by the duke. At last the widow sold the title and estates to Odescalchi. She then assumed the title of Princess des Ursins, a corruption of Orsini, and was tacitly allowed to use it, though it had no legal exist- ence. The Princess des Ursins had indulged in a great deal of unofficial diplomacy at Rome, more particularly with Nea- politans and Spaniards of rank, whom it was desirable to secure as French partisans in view of the approaching death of Charles II. of Spain, and the plans of Louis XIV. for placing his family on the Spanish throne. Her services were rewarded in 1699 by a pension which her spendthrift habits made necessary to her. When Philip, duke of Anjou, grandson of the French king, was declared heir by the will of Charles II., the princess took an active part in arranging his marriage with a daughter of the duke of Savoy. Her ambition was to secure the post of Camarera Mayor, or chief of the household to the young queen, a mere child of twelve. By quiet diplomacy, and the help of Madame de Maintenon, she succeeded, and in 1701 she accom- panied the young queen to Spain. Till 17 14 she was the most powerful person in the country. Her functions about the king and queen were almost those of a nurse. Her letters show that she had to put them to bed at night, and get them up in the morning. She gives a most amusing description of her em- barrassments when she had to enter the royal bedroom, laden with articles of clothing and furniture. But if the Camarera Mayor did the work of a domestic servant, it was for a serious political purpose. She was expected to look after French

interests in the palace, and to manage the Spanish nobles, many of whom were of the Austrian party, and who were

generally opposed to foreign ways, or to interferences with the absurdly elaborate etiquette of the Spanish court. Madame des Ursins was resolved not to be a mere agent of Versailles. During the first period of her tenure of office she was in frequent conflict with the French ambassadors, who claimed the right of sitting in the council and of directing the government. Madame des Ursins wisely held that the young king should rely as much as possible on his Spanish subjects. In 1704 her enemies at the French court secured her recall. But she still had the support of Madame de Maintenon, and her own tact enabled her to placate Louis XIV. In 1705 she returned to Spain, with a free hand, and with what was practically the power to name her own ministry. During the worst times of the war of the Spanish Succession she was the real head of the Bourbon party, and was well aided by the spirited young queen of Philip V. She did not hesitate to quarrel even with such powerful personages as the Cardinal Archbishop of Toledo, Portocarrero, when they proved hostile, but she was so far from offending the pride of the nation, that when in 1709 Louis the XIV., severely pressed by the allies, threatened, or pretended, to desert the cause of his grandson, she dismissed all Frenchmen from the court and threw the king on the support of the Castilians. Her influence on the sovereigns was so strong that it would probably have lasted all through her life, but for the death of the queen. Madame des Ursins confesses in her voluminous correspondence that she made herself a burden to the king in her anxiety to exclude him from all other influence. She certainly rendered him ridiculous by watching him as if he were a child. Philip was too weak to break the yoke himself, and could only insist that he should be supplied with a wife. Madame des Ursins was persuaded by Alberoni to arrange a marriage with Eliza- beth Farnese of Parma, hoping to govern the new queen as she had done the old. Elizabeth had, however, stipulated that she should be allowed to dismiss the Camarera Mayor. Madame des Ursins, who had gone to meet the new queen at Quadraque near the frontier, was driven from her presence with insult, and sent out of Spain without being allowed to change her court dress, in such bitter weather that the coachman lost his hand by frostbite. After a short stay in France, she went to Italy, and finally established herself in Rome, where she had the satis- faction of meeting Alberoni after his fall, and where she died on the 5th of December 1722. Madame des Ursins has the credit of having begun to check the overgrown power of the

church and the Inquisition in Spain, and of having attempted to bring the finances to order.

A readable life of Madame des Ursins was published in Paris in 1858 by N. F. Combes, and there is an English life by C. Hill, The Princess des Ursins in Spain (London, 1899). See her Lettres inkdites, edited by A. Geoffrey (Paris, 1859), and her correspondence with Madame de Maintenon (Paris, 1826).

URSINUS, ZACHARIAS (1534-1583), German theologian, and one of the authors of the Heidelberg Catechism (q.v.), was born at Breslau on the 18th of July 1534, and became a disciple of Melanchthon at Wittenberg. He afterwards studied divinity at Geneva under Calvin, and Hebrew at Paris under Jean Mercier. In 1561 he was appointed professor in the Collegium Sapientiae at Heidelberg, where in 1563 at the instance of the elector-palatine, Frederick III., he drew up the Catechism in co-operation with Kaspar Olevian. The death of the elector in 1576 led to the removal of Ursinus, who from 1578 till his death in 1583 occupied a professorial chair at Neustadt-ar- der-Haardt.

His Works were published in 1587-89, and a more complete edition by his son and two of his pupils, Pareus and Reuterus, in 1612.

URSULA, ST, and her companions, virgins and martyrs, are commemorated by the Roman Catholic church on the 21st of October. The Breviary gives no legend; but in current works, such as Butler's Lives of the Saints, it is to the effect that " these holy martyrs seem … to have met a glorious death in defence of their virginity from the army of the Huns. . . .

They came originally from Britain, and Ursula was the con-ductor and encourager of the holy troop. " The scene of the martyrdom is placed near the lower Rhine.

The date has been assigned by different writers to 238, c. 283 and c. 451. The story, however, is unknown both to Jerome and to Gregory of Tours — and this though the latter gives a somewhat detailed description of the Cologne church dedicated to that Theban legion with which the tradition of the-martyred virgins was very early associated. The story of their fate is not entered under 21st October in the martyrology of Bede (ob. c. 735), of Ado (c. 858), of Usuard (ante 877), Notker Bal-

bulus (896) or Hrabanus Maurus (845); but a 9th-century life of St Cunibert (06. 663) associates a prominent incident in the life of this saint with the basilica of the sacred virgins at Cologne (Surius vi. 275, ed. 1575)- Not only does Arch- bishop Wichfrid attest a grant to the church of the sacred virgins outside the walls of Cologne (in 927), but he was a large donor in his own person. Still earlier a Cologne martyrology, written, as Binterim (who edited it in 1824) argues, between 889 and 891, has the following entry under 21st October: " xi. virg. Ursule Sencie Gregorie Pinose Marthe Saule Britule Satnine Rabacie Saturie Paladie." Much shorter entries are found in two of the old martyrologies printed in Migne (cxxxviii. 1207, 1275). A more definite allusion to the legend may be found (c. 850) in Wandelbert of Priim's metrical martyrology (21st October) :

" Tunc numerosa simul Rheni per littora fulgent Christo virgines erecta tropaea maniplis Agrippinae urbi, quarum furor impius olim Millia mactavit ductricibus inclyta Sanctis."

The full legend first makes its appearance in a festival discourse (sermo) for the 21st of October, written, as internal evidence seems to show, between 731 and 839. This sermo does not mention St Ursula, but makes Pinnosa or Vinnosa the leader of these spiritual " amazons," who, to avoid Maximian's persecution, left their island home of Britain, following their bridegroom Christ towards that East whence their faith had come a hundred years before. The concurrent traditions of Britain, Batavia, i.e. the Netherlands (where many chapels still preserved their memory), and Cologne are called in evidence to prove the same origin. The legend was already very old and the festival " nobis omni tempore celeberrima "; but, as all written documents had disappeared since the burning of the early church erected over the sacred bones, the preacher could only appeal to the continuous and careful memory of the society to which he belonged (nostrates). Even in his time there were sceptics who pointed dubiously to the full-grown bones of " widows " and of men among the so-called virgin relics. The author of the sermo pointedly rejects the two theories that connected the holy virgins with the Theban band and brought them as pilgrims from the East to the West; but he adds that even in his days there still existed an inscription in the church, showing how it had been restored from its foundations by a certain " Clematius, vir consularis, ex partibus Orientis."

Two or three centuries, later the Passio XI. MM. SS. Virginum, based apparently on the revelations made to Helentrude, a nun of Heerse near Paderborn, gives a wonderful increase of detail. The narrative in its present form may date somewhere between 900 and 1 100, while Helentrude apparently flourished before 1050. According to her account, the son of a powerful pagan king demands in marriage Ursula, the beautiful daughter of Deonotus, a king " in partibus Britanniae." Ursula is warned by a dream to demand a respite of three years, during which time her companions are to be 11,000 virgins collected from both kingdoms. After vigorous exercise in all kinds of manly sports, to the admiration of the populace, they are carried off by a sudden breeze in eleven triremes to Thiel on the Waal in Gelderland. Thence they sail up the Rhine by way of Cologne to Basel, at which place they make fast their vessels and proceed on foot to Rome. Returning, they re-enter their ships at Basel, but are slaughtered by the Huns when they reach Cologne. Their relics are then collected and buried " sicut hodie illic est cernere," in a spot where " to this day "

no meaner sepulture is permitted. Then follows the usual allusion to Clematius; the date is expressly fixed at 238, and the whole revelation is seemingly ascribed to St Cordula, one of the 11,000 who, after escaping death on the first day by hiding in one of the vessels, on the morrow gave her- self up to death of her own accord. Towards the beginning of the 1 2th century Sigebert of Gembloux (ob. 11 12) gives a brief risumi of -the same story. He is the first to introduce the name of Attila, and dates the occurrence 453.

Passing over the visions and exhumations of the first half of the 1 2th century, we come to the singular revelations of St Elizabeth of Schonau. These revelations, delivered in Latin, German or a mixed jargon of both languages, were turned into simple Latin by Elizabeth's brother Egbert, from whose words it would seem that in n 56 an old Roman burial- ground had lately been laid open near Cologne. The cemetery was naturally associated with the legend of St Ursula; and, this identification once accepted, it is not unlikely that when more careful investigations revealed male skeletons and tomb- stones

bearing the names of men, other and more definite epitaphs were invented to reconcile the old traditions with the facts of such a damaging discovery. Hence perhaps the bare- faced imposture: " Cyriacus, papa Romanus, qui cum gaudio suscepit sanctas virgines et cum eis Coloniam reversus mar- tyrium suscepit." One or two circumstantial forgeries of this kind would form the basis of a scheme for explaining not a few other problems of the case, such as the plain inscription " Jacobus," whom St Elizabeth promptly transformed into a supposititious British archbishop of Antioch, brother to the equally imaginary British Pope Cyriacus. For these epitaphs, with others of a humbler kind, were brought before St Elizabeth to be identified in her ecstatic converse with St Verena, her cousin St Ursula, and others. Elizabeth herself at times distrusted her own revela- tions: there was no Cyriac in the list of the popes; Antherus, who was said to be his successor (235-36), died more than two centuries before Attila, to whom common report assigned the massacre; and it was hardly credible that James of Antioch could cut 11,000 epitaphs in less than three days. Every doubt, however, was met by the invention of a new and still more improbable detail. According to St Verena, the virgins suffered when Maximus and " Africanus " were principes at Rome (? 387-88).

In 1 183 the mantle of St Elizabeth fell upon Hermann Joseph, a Praemonstratensian canon at Steinfeld. He had to solve a more difficult problem than St Elizabeth's; for the skeletons of little children, ranging in age from two months to seven years, had now been found buried with the sacred virgins. But even such a difficulty Hermann explains away: the little children were brothers, sisters or more distant relatives of the 11,000. Hermann's revelations are mainly taken up with an attempt to show the mutual relationship of nearly all the characters he introduces. The names are a most extraordinary mixture. Among British bishops we have Michael, William, James and Columbanus. Sovereign princes — an Oliver, a Clovis and a Pepin — start out in every page, till the writer finds it necessary to apologize for the number of his kings and his own blunders. But, for all this, Hermann exposes his own doubts when he tells that often, as he was preparing to write, he heard a voice bidding him lay down the pen, " for whatever you write will be an unmixed lie." Hermann makes St Ursula a native of Brittany, and so approximates to the version of the story given by Geoffrey of Monmouth (Historia Britonum), according to

whom Maximian, after fleeing from Rome and acquiring Britain by marriage, proceeds to conquer Brittany and settle it with men from the island opposite. For these settlers he has to find British wives, and to this end collects 11,000 noble and 60,000 plebeian virgins, who are wrecked on their passage across. Certain of the vessels being driven upon " bar- barous islands," their passengers are slain by Guanius and Melga, " kings of the Huns and Picts," whom Gratian had called in to his aid against Maximian. In this version St Ursula is a daughter of Dionotus, king of Cornwall. Hermann alludes

more than once to the Historia Britonum, and even to King Arthur.

The legend of St Ursula is perhaps the most curious instance of the development of an ecclesiastical myth. Even in the earliest form known to us this legend is probably the complex growth of centuries, and any claim to the discovery of the first germ can hardly approve itself to the historic sense. These remarks apply especially to that venerable rationalization which evolves the whole legend from a misreading of Undecimilla, the name of Ursula's companion, into undecim millia, i.e. 11,000. A more modern theory makes St Ursula the Christianized representative of the old Teutonic goddess Freya, who, in Thuringia, under the name of Horsel or Ursel, and in Sweden Old Urschel, welcomed the souls of dead maidens. Not a few singular coincidences seem to point in the same direction, especially the two virgins, " Martha and Saula," whom Usuard states to have suffered " cum aliis pluribus " on the 20th of October, whence they were probably transferred to the 21st. It is curious to note that Jerome and many of the earliest martyrologies extant have on the 21st of October the entry, " Dasius Zoticus, Gaius cum duodecim mililibus." Even in copies of Jerome this is transformed into millibus; and it is perhaps not impossible that to this misreading we may indirectly owe the " thousands " in the Ursula legend. The two entries seem to be mutually exclusive in all the early martyrologies mentioned in this article, and in those printed in Migne, cxxxvii. The earlier " Dasius " entry seems to disappear steadily, though slowly, as the Ursula legend works its way into current martyrologies.

See H. Crombach, Vita et Martyrium S. Ursulae (Cologne, 1647), and the Bollandist Acta Sanctorum, 21st October, where the story fills 230 folio pages. The rationalization of the

story is to be found in Oscar Schade ; Die Sage von der heiligen Ursula (Hanover, 1854), of which there is a short resume in S. Baring-Gould's Lives of the Saints. See also S. Baring-Gould, Popular Myths of the Middle Ages; A. G. Stein, Die Heilige Ursula (Cologne, 1879). The credibility of some of the details was doubted as early as the 13th century by Jacobus de Voragine in the Legenda aurea. For further works, especially medieval, see A. Potthast, Bibliotheca hist. med. aevi (Berlin, 1896), p. 1616. (T. A. A.; A. J. G.)

URSULINES, a religious order founded at Brescia by Angela Merici (1470-1 540) in November 1 535, primarily for the education of girls and the care of the sick and needy. It was approved in 1544 by Paul III., and in 1572 Gregory XIII., at the instance of Charles Borromeo, declared it a religious order under the rule of St Augustine. In the following century it was powerfully encouraged and supported by St Francis of Sales. In most cases, especially in France, the sisters adopted enclosure and took solemn vows; they were called the " religious " Ursulines as distinct from the "congregated" Ursulines, , who preferred to follow the original plan. There were Ursulines in Canada in 1639, who taught the catechism to Indian children, and subsequently helped to preserve a religious spirit among the French population and to humanize the Indians and half-breeds. Towards the beginning of the 18th century, the period of its greatest prosperity, the order embraced some 20 congregations, with 350 convents and from 15,000 to 20,000 nuns. The members wear a black dress bound by a leathern girdle, a black sleeveless cloak, and a close-fitting head-dress with a white veil and a longer black veil. Their patron is the St Ursula mentioned above. The founder was beatified by Clement VIII. in 1768 and canonized as St Agnes of Brescia by Pius VII. in 1807. The Irish Ursulines were established at Cork in 1771 by Miss Nano Nagle. The Ursulines do not increase now as rapidly as they did, congregations taking simple vows like the Sisters of Mercy being apparently more adapted to modern needs.

URSWICK, CHRISTOPHER (1448-1522), English diplomatist, was born at Furness in Lancashire and was probably educated at Cambridge. He became chaplain to Margaret, countess of Richmond and Derby, and was employed by her to forward the schemes for securing the English throne for her son, Henry of Richmond, afterwards Henry VII. He crossed from Harfleui to Wales with Henry in August 1485, and was present at the

battle of Bosworth; then followed for him a series of ecclesiastical preferments, the most important of which was to the deanery of York. He was sent on several weighty embassies, including one to Ferdinand and Isabella of Spain to arrange the marriage between Prince Arthur and Catherine of Aragon, and another to France in 1492, when he signed the treaty of Etaples. In 1495 he became dean of Windsor, and he died on the 24th of March 1522. Urswick was very friendly with Erasmus and with Sir Thomas More. He did some building at Windsor, and one of the chapels in St George's chapel there is still called the Urswick chapel. Urswick's kinsman, Sir Thomas Urswick, was a Yorkist partisan, who was recorder of London and chief baron of the exchequer.

See Urswick, Records of the Family of Urw'ick or Urswick (1893).

URTICACEAE (nettle family), in botany, an order of Dicotyledons belonging to the series Urticiflorae, which includes also Ulmaceae (elm family), Moraceae (mulberry, fig, &c.) and Cannabinaceae (hemp and hop). It contains 41 genera, with about 500 species, mainly tropical, though several species such as the common stinging nettle {Urtica dioica) are widely distributed and occur in large numbers in temperate climates. Two genera are represented in the British Isles, Urtica (see Nettle) and Parietaria (pellitory, q.v.).

The plants are generally herbs or somewhat shrubby, rarely, as in some tropical genera, forming a bush or tree. The simple, often serrated, leaves have sometimes an alternate sometimes an opposite arrangement and are usually stipulate — exstipulate in Parietaria. The position of the stipules varies in different genera; thus in Urtica they are lateral and distinct from the leaf-stalk, in other cases they are attached on the base of the leaf-stalk or stand in the leaf-axil when they are more or less united. Stinging hairs often occur on the stem and leaves (fig. 1). The bast-fibres of the

Fig. 2. — Male Flowerof the Nettle (Urtica). The four sepals are arranged sym- metrically, an outer median and an inner lateral pair. A stamen is opposite each sepal, and in the centre

of the flower is the rudiment of a pistil.

From Strasburger's Lehrbuck der Botanih, by permission of Gustav Fischer.

Fig. I. — Stinging Hair of Urtica dioica, with a portion of the epi- dermis, and, to the right, a small bristle

From Vines's Students' Text- Book 0/ Botany, by permission of Swan Sonnenschein & Co.

Fig. 3. — A staminal ((f), B carpellary (?) flower of the Nettle, p, peri- anth; o, stamen; n', rudimentary ovary of the if flower; ap, outer, ip, inner, whorl of the perianth; n, stigma of the ? flower (enlarged).

stem are generally long and firmly attached end to end, and hence cf great value for textile use. Thus in ramie {q.v. , Boehmeria nivea) a single fibre may reach nearly 9 in. in length, and in stinging nettle as much as 3 in. The small inconspicuous regular flowers (figs. 3 and 4) are arranged in definite (cymose) inflorescences often crowded

into head-like clusters. They are unisexual and monoecious or dioecious. The four or five green perianth leaves (or sepals) are free or more or less united; the male flowers (fig. 2) contain as many stamens, opposite the sepals, which bend inwards in the bud

Fig. 4. — Urtica urens (after Curtis, Flora Londinensis).

1 , male flower ; 2 , female flower in fruiting stage — the dry com- pressed fruit 3 escaping from the persistent perianth; 4, fruit cut open, revealing the seed within the large straight embryo e. I, 2, 3, enlarged.

stage, but when mature spring backwards and outwards, the anther at the same time exploding and scattering the pollen. The flowers are thus adapted for wind-pollination. The female flower contains one carpel bearing one style with a brush-like stigma and containing a single erect ovule. The fruit is dry and one-seeded; it is often enclosed within the persistent perianth. The straight embryo is surrounded by a rich oily endosperm.

URUGUAY (officially the Oriental Republic nf the Uruguay, and long locally called the Banda Oriental, meaning the land

on the eastern side of the river Uruguay, from which the country takes its name), the smallest independent state in South America. It runs conterminous with the southern border of Brazil, and lies between 30° and 35 S. and between 53° 25′ and 57 42′ W. (for map, see Argentina). It has a seaboard on the Atlantic Ocean of 120 m., a shore-line to the south on the Rio de la Plata of 235 m., and one of 270 m. along the Uruguay on the west. The boundaries separating it from Rio Grande do Sul, a province of Brazil, are Lake Mirim, the rivers Chuy, Jaguarao and Quarahy, and a cuchilla or low range of hills called Santa Ana. The extent of the northern frontier is 450 m. The southern half of the country is mostly undulating grass land, well watered by streams and springs. The northern section is more broken and rugged; barren ridges and low rocky mountain-ranges, interspersed with fertile valleys, being its characteristic features. There is no forest, timber of any size being found only in the valleys near running water. Uruguay is intersected nearly from west to north-east by the river Negro and its affluent the Yi. The Uruguay is navigable all the year by steamers from the island

of Martin Garcia at the mouth to Salto (200 m.). Above this place the navigation is interrupted by rapids. The ordinary volume of water in the Uruguay averages 11 millions of cub. ft. per minute. Excluding the Uruguay, the Negro, of which the principal port is Mercedes, is the principal navigable river. Others are navigable only for short distances by steamers of light draught. Besides the rivers mentioned, the chief streams are the Santa Lucia, which falls into the Plata a little west of Montevideo; the Queguay, in Paysandu; and the Cebollati, rising in the sierras in Minas and flowing into Lake Mirim. These rivers as well as the Uruguay are fed by innumerable smaller streams or arroyos, such as the Arapey in Salto, the Dayman in Paysandu, the Jaguary (an affluent of the Negro) .in Tacuarembo, the Arroyo Grande between the departments of Soriano and San Jose, and the San Jose (an affluent of the Santa Lucia). None of the sierras or mountains in Uruguay exceeds (or perhaps even attains) a height of 2000 ft.; but, contrasting in their tawny colour with the grassy undulating plains, they loom high and are often picturesque. They are ramifications of the highlands of Brazil. The main chains are

the Cuchilla de Haedo on the north and west and the Cuchilla Grande on the south and east.

Geology. — Little is known of the geology of Uruguay. There is a foundation of schists and crystalline rocks upon which rests a series of sandstones. The latter is, no doubt, identical with the similar sandstone series which is found in the neighbouring Brazilian province of Rio Grande do Sul, and which has there yielded plants which prove it to belong to the Permian or the upper part of the Carboniferous. The plains are covered by a formation similar to that of the Argentine pampas and by the alluvial deposits of the present rivers.

Climate. — Uruguay enjoys the reputation of possessing one of the most healthy climates in the world The geographical position ensures uniformity of temperature throughout the year, the summer heat being tempered by the Atlantic breezes, and severe cold in the winter season being unknown. Endemic diseases are unknown and epidemics are rare. In the interior, away from the sea and the snores of the great rivers, the temperature frequently rises in summer to 86° F. and in winter falls to 35°-6. In the districts bordering on the coast the thermometer seldom falls below 37°; and only for a few moments and at long intervals has it been known to rise as high as 105°. The annual rainfall is about 43 in.

Flora. — The pastoral wealth of Uruguay, as of the neighbouring Argentine Republic, is due to the fertilizing constitutents of " pampa mud," geologically associated with gigantic antediluvian animals, whose fossil remains are abundant. The country is rich in hard woods, suitable for cabinet work and certain building purposes. The principal trees are the alder, aloe, palm, poplar, acacia, willow and eucalyptus. The monies, by which are understood plantations as well as native thickets, produce among other woods the algarrobo, a poor imitation of oak; the guayabo, a substitute for boxwood; the quebracho, of which the red kind is compared to sandalwood ; and the urunday, black and white, not unlike rosewood. Indigenous palms grow in the valleys of the Sierra Jos6 Ignacio, also to some extent in the departments of Minas, Maldonado and Paysandu. The myrtle, rosemary, mimosa and the scarlet-flowered ceibo are common. The valleys within the hill ranges are fragrant with aromatic shrubs. In the plains below, the swards are gay with the scarlet and white verbena and other brilliant wild flowers. The country abounds in

medicinal plants. The sarsaparilla even colours the water of the Rio Negro and gives it its name — the " black river."

Fauna.' — Among wild animals the tiger or ounce — called in the Guarani language the ja-gud or " big dog " — and the puma are found on the frontier of Brazil and on the wooded islets and banks of the larger rivers. The tapir, fox, deer, wild cat, wild dog, carpincho or water hog and a few small rodents nearly complete the list of quadrupeds. A little armadillo, the mulita, is the living repre- sentative of the antediluvian giants Mylodon, Megatherium, &c. The ostrich — Rhea americana — roams everywhere in the plains; and there are a few specimens of the vulture tribe, a native crow (lean, tall and ruffed), partridges and quails. Parakeets are plentiful in the monies, and the lagoons swarm with waterfowl. The most esteemed is the pato real, a large duck. Of the birds of bright plumage the humming-bird and the cardinal — the scarlet, the yellow and the white — are the most attractive. The fish of the lagoons and streams are coarse, and some of them primitive in type; but two or three kinds, found generally in the large rivers, are much prized. The varieties of fish on the sea coast are many and excellent. More than 2000 species of insects have been classified. The scorpion is rare, but large and venomous spiders are common. The principal reptiles are a lizard, a tortoise, the vivora de la cruz (a dangerous viper, so called from marks like a cross on its head) and the rattle- snake in Maldonado and the stony lands of Minas.

Area and Population. — The area of the republic is estimated at 72,210 sq. m., and has a population of 1,042,668 according to the census of 1908 (in 1900 it was 915,647). The country is divided into 19 departments, the area and the population of which, according to the census of 1908, are given in the subjoined table: —

Departments.

Artigas

Canelones ....

Cerro Largo ....

Colonia

Durazno ....

Flores

Florida

Maldonado ....

Minas

Montevideo .... Paysandu ....

Rio Negro ....

Rivera

Rocha

Salto

San Jose 1

Soriano

Tacuarembo .... Treinta-y-Tres

Total

Area, Sq. Miles.

4.392 1,833 5,753 2,192

5,525 1,744 4,763 1,584 4,844 256

5,H5

3,269 3,790 4,280 4,863 2,687

3,56o

8,074 3,686

72,210

Population,

1908.

26,298

87,931 44,806

54,679 42,313 16,158

45,393 28,804

51,170 309,231 38,528 19,909 35,653

34,iio

46,304 46,267

39,431 46,927 28,756

1,042,668

The average density of population on the above figures is 12-9 per sq. m., ranging (exclusive of Montevideo) from 47-9 in Canelones to 5-8 in Tacuarembo and 6 in Artigas. The great majority of the foreign population are Italians or Spaniards, with lesser numbers, in descending scale, of Brazilian, Argentine and French birth. British, Swiss and Germans are comparatively few. In 1907, 26,105 Italian immigrants arrived, 21,927 Spanish, 2355 British, 2315 French and 1823 German.

The natives of Uruguay, though living in conditions similar to those of the Argentine population, are in general more reserved, showing more of the Indian type and less of the Spaniard. In the north there is a strong Brazilian element and the people are intensely conservative. The average annual birth-rate is about 35 per 1000, and the death-rate about 15-5. About 26% of the births are illegitimate. The principal towns are Montevideo, Salto, Paysandu and San Jose.

Agriculture. — The condition of agriculture is fairly satisfactory. In 1885 Uruguay imported most of her breadstuffs; now not only is wheat grown in sufficient quantities to meet the local demand, but a surplus (about 20,000 metric tons in 1908-9) is annually available for export. Land for farming purposes is expensive, and wages are high, leaving small profit, unless it happens that a man, with his family to assist him, works his own land. The farmers are chiefly Italians, Canary Islanders and Frenchmen. The principal crops in addition to wheat are oats, barley, maize, linseed and bird seed. Since 1890 the cultivation of the grape

and the manufacture of wine have considerably extended, especially in the department of Salto, Montevideo, Canelones and Colonia. Red wine, a smaller quantity of white, grape alcohol and wine alcohol are produced. The olive-planting industry is becoming important ; the trees thrive well, and the area devoted tx> their cultivation is annually increasing. Tobacco is also cultivated.

Cattle-breeding and sheep-farming, however, are the principal industries. The lands are admirably adapted for cattle-breeding purposes, although not capable of fattening animals. The cattle are destined chiefly for the saladero establishments for the prepara- tion of tasajo, or jerked beef, for the Brazilian and Cuban markets, and for the Liebig factory, where large quantities of extract of meat are prepared for the European trade. Cattle-breeding is carried on in all parts of the republic, but chiefly in the departments of Salto, Paysandu and Rio Negro. In the southern districts, where the farmers are Europeans, the breed of cattle is being steadily improved by the introduction of Durham and Hereford bulls. Dairy-farming is making some progress, especially in the Swiss colony near San J096.

Sheep-farming flourishes chiefly in Durazno and Soriano. Uruguayan wool is favourably regarded in foreign markets, on account of the clean state in which it is shipped, this being largely due to the natural conditions of the land and climate. The business of shipping live sheep and frozen mutton has not been attempted

on a large scale, owing principally to the lack of facilities for loading at the port of Montevideo or elsewhere.

AfMMtfg.— Minerals are known to exist in the northern section of the republic, and gold-mining is carried on to a small extent. Expert opinions have been advanced stating that gold-mining in Uruguay is capable of development into an important industry. The other minerals found are silver, lead, copper, magnesium and lignite coal.

Commerce. — The economic development of Uruguay was re-

tarded by the corruption of successive governments, by revolutionary outbreaks, by the seizure of farm stock, without adequate compensation, for the support of military forces, by the consequences of reckless borrowing and over-trading in 1889 and 1890, and also by the transference of commercial undertakings from Montevideo to Buenos Aires between 1890 and 1897, on the opening of the har- bour and docks at that port. The annual value of the imports (4-7 dollars taken at £1) was £5,101,740 in 1900 and £7,365,703 in 1908; that of exports was £6,257,600 in 1900 and £7,932,026 in

1908.

The principal imports consist of machinery, textiles and clothing, food substances and beverages, and live stock. The chief exports are animal products and agricultural products. Of the imports about 27% in value are from Great Britain, 14% from Germany, and smaller proportions from France, Argentina, Italy, Spain, the United States and Belgium. Of the exports, France, Argentina, Belgium and Germany take the bulk. Trade is controlled by foreigners, the British being prominent in banking, finance, railway work and the higher branches of commerce; Spaniards, Italians and French in the wholesale and retail trade. Uruguayans find an insignificant place in commerce. The foreign trade passes mainly through Montevideo, where the port has been greatly improved.

In addition to the natural lines of communication provided by the rivers bordering on or belonging to the republic, there are about 2240 m. of national road, besides more than 3000 m. of departmental roads. The railways had a length of 1380 m. open for traffic, and the system is steadily extending. There are over 170 m. of tramway in operation.

Government. — The legislative power of the state rests with the general assembly, consisting of two chambers, one of senators (19 in number) and one of representatives (75). The deputies of the lower house are elected for three years directly by the people, one deputy for every 3000 male adults who can read and write. One senator is named for each department by an electoral college, whose members are elected directly by the people. The senators are elected for six years, and one-third of their number retire every two years. The executive power is exercised by the president of the republic, who is elected by the general assembly for a four years' term. He is assisted by a

council of ministers representing the departments of the interior, foreign affairs, finance, war and marine, industry, labour and instruction and public works. Each department or province of the republic has a governor appointed by the executive, and an administrative council, whose members are chosen by popular vote. The judicial power is vested in a high court and many subordinate courts. The general assembly elects the five judges who compose the high court. There are civil, commercial and criminal courts in Montevideo, a departmental court in each departmental capital, and a justice of the peace in each of 205 judicial districts into which the republic is divided, with sub-district courts under deputy judges in addition. The administration of justice in Uruguay has long been of bad repute. It was reformed on the above lines in 1907.

Education is much neglected, and the public-school system is inefficient. The attendance of children at the schools is small, and the instruction they receive is inferior. Primary instruction is nominally obligatory; nevertheless at the beginning of the 20th century nearly half the population over six years of age was illiterate. Montevideo possesses a university and a number of preparatory schools, a state- supported technical school and a military college. The state religion is Roman Catholic, and there is an archbishop of Montevideo with two suffragan bishops. A number of semin- aries are maintained throughout the republic. Other religions are tolerated.

Army. — There is a standing army with a peace strength of about 7000 officers and men. Service is nominally voluntary, though it appears that a certain amount of compulsion is exercised. In addition to this there is compulsory service in the National Guard (a) in the first class, consisting of men between seventeen and thirty years of age, liable for service with the standing army, and number- ing some 15,000; (b) in the second class, for departmental service only, except in so far as it may be drawn upon to make up losses in the more active units in time of war, consisting of men from thirty to forty-five years of age, and © in the third class, for local garrison

duty, consisting of men between forty-five and sixty years old. The army and guard are well equipped with modern arms.

Finance. — Of the national revenue nearly half is derived from customs duties, taxes being levied also on real estate, licences,

tobacco, stamped paper and in other ways. Nearly half the ex- penditure goes to meet debt charges, while government, internal development and defence absorb most of the remainder. The receipts for the years specified were as follows, Uruguayan dollars being converted into sterling at the par value, 4-7 = £1 : —

Years.

Revenue.

Expenditure.

1894-1895 1899-1900 1904-1905 1909-1910 1

£3,403,324

3,236,300 3,438,300 4,971,660

£3,438,510

4,704,500

1 Estimate. In 1891, when the debt of the republic amounted to $87,789,973, or about £18,678,710, the government suspended payment of interest, and an arrangement was made with the bondholders. A new consolidated debt of £20,500,000 was issued at 3!% interest, and, as security for payment of interest, 45 % of the customs re- ceipts at Montevideo was assigned. At the same time the interest guaranteed to the railway companies was reduced from 7 to 35 %. In 1896 a 5 % loan of £1,667,000 was issued, and the debt was subse- quently increased, until on January I, 1909, it was £27,692,795, and in the same year the annual debt charge amounted to £2,185,347.

The Bank of the Republic was established in 1896 with a nominal capital of $12,000,600, and in 1899 it received the right to issue further shares amounting to $5,000,000. Its note issue (for which it has an exclusive right) may not exceed the value of half the sub- scribed capital. Besides a number of local banks, branches of German, Spanish, French and several British banks are established in Montevideo.

There is no Uruguayan gold coin in circulation, but the theoretical monetary unit is the gold peso nacional, weighing

*1-697 grammes, ■917 fine. The silver peso weighs 25 grammes, -900 fine. A half, fifth and tenth of *a peso are coined in silver, in addition to bronze coins.*

The metric system of weights and measures has been officially adopted, but the old Spanish system is still in general use.

History. — In 151 2 Juan Diaz de Solis entered the Paranaguazu or " sealike " estuary of the Plata and landed about 70 miles east of the present city of Montevideo. Uruguay at that time was inhabited by Indians, of whom the dominant tribe was called Charrua, a people described as physically strong and well-formed, and endowed with a natural nobility of character. Their habits were simple, and they were disfigured neither by the worst crimes nor by the primitive superstitition of savages. They are said to have revealed no vestige of religion. The Charruas are generally classified as a yellow-skinned race, of the same family as the Pampa Indians; but they are also represented as tanned almost black by the sun and air, without any admixture of red or yellow in their complexions. Almost beardless, and with thin eyebrows, they had on their heads thick, black, lustrous hair, which neither fell off nor turned grey until extreme old age. They lived principally upon fish, venison and honey. In the Guarani language " Charrua " means turbu- lent, and by their enemies the Charruas were accounted as such, and even ferocious, although admitted to be generous to their captives. They were a curiously taciturn and reticent race. Their weapons were the bow and arrow and stones.

Solis, on his second visit, 1515-1516, was slain by the Charruas in Colonia. Eleven years later Ramon, the lieutenant of Sebastian Cabot, was defeated by the same tribe. In 1603 they destroyed in a pitched battle a veteran force of Spaniards under Saavedra. During the next fifty years three unsuccessful attempts were made by the Spaniards to subdue this courageous people. The real conquest of Uruguay was begun under Philip III. by the Jesuit missions. It was gradually con- summated by the military and commercial settlements of the Portuguese, and subsequently by the Spaniards, who estab- lished themselves formally in Montevideo under Governor Zavala of Buenos Aires in 1726, and demolished the rival Portu- guese settlement in Colonia in 1777. From 1750 Montevideo enjoyed a provincial government independent of that of Buenos Aires. The American rebellion, the French

Revolution and the British invasions of Montevideo and Buenos Aires (1806-7) , under GeneralsAuchmuty(i 756-182 2)andJohnWhitelocke(i 757-1833),

all contributed to the extinction of the Spanish power on the Rio de la Plata. During the War of Independence, Montevideo was taken in 1814 by the Buenos-Airean general Alvear (see further Montevideo). A long struggle for dominion in Uruguay between Brazil and the revolutionary government of Buenos Aires was concluded in 1828, through the mediation of Great Britain, Uruguay being declared a free and independent state. The republic was formally constituted in 1830. Subsequently Juan Manuel Rosas, dictator of Buenos Aires, interfered in the intestine quarrels of Uruguay; and Montevideo was be- sieged by his forces, allied with the native partisans of General Oribe, for nine years (1843-52).

After the declaration of independence the history of Uruguay becomes a record of intrigues, financial ruin, and political folly and crime. The two great political factors for generations have been the Colorados and the Blancos. So far as political principles are concerned, there is small difference between them. Men are Colorados or Blancos largely by tradition and not from political conviction. The Colorados have held the govern- ment for many years, and the attempts of the Blancos to oust them have caused a series of revolutions. The military element, moreover, has frequently conspired to elect a president amenable to its demands. In 1875 General Latorre headed a conspiracy against President Ellauri and at first placed Dr Varela in power as dictator, but in 1876 proclaimed himself. In the follow- ing year Latorre caused himself to be elected president, but political unrest caused him to resign in March 1880. The president of the senate, Dr Vidal, nominally administered the government for two years, when General Santos, who had held the real power, became president. His administration was so vicious and tyrannical that the opposition organized a revolution. Their forces, however, were surprised by the government troops at Quebracho, on the Rio Negro, and defeated. Ultimately the Colorados themselves exiled Santos. He had plundered the national revenues and scorned constitu- tional government. The Colorados now made

General Tajes president, the practical direction of the administration being in the hands of Julio Herrera y Obes. In March 1890 General Tajes handed over the presidency to Herrera y Obes, a clever but unscrupulous man, who filled every official post with his own friends and ensured the return of his supporters to the chamber. In 1 89 1 he was obliged to suspend the service of the public debt and make arrangements by which the bondholders accepted a reduced rate of interest. The country was at this period conducted practically as if it were the private estate of the president, and no accounts of revenue or expenditure were vouchsafed to the public. In 1894 the Colorados nominated Senor Idiarte Borda for the presidency. He seemed at first inclined to govern honestly, but corruption soon became as marked as under the preceding regime. The Blancos, using the fraudulent elections in 1896 as a pretext, now broke out in armed revolt under the leadership of Aparicio Saraiva. The president made no attempt to conciliate them, and in March 1897 a body of government troops suffered a reverse. On the 25th of August 1897 Borda, after attending a Te Deum at the cathedral in Montevideo, was shot dead by a man named Arredondo, who was sentenced in 1899 to two years' imprison- ment. The defence was that the murder was a political offence, and therefore not punishable as an ordinary case of assassination for personal motives.

The president of the senate, Juan Cuestas, in accordance with the constitution, assumed the duties of president of the republic. He arranged that hostilities should cease on the conditions that representation of the Blancos was allowed in Congress for certain districts where their votes were known to predominate; that a certain number of the jefes politicos should be nominated from the Blancos; that free pardon be extended to all who had taken part in the revolt; that a sufficient sum in money be advanced to allow the settlement of the expenses contracted by the insurgents; and that the electoral law be reformed on a basis allowing the people to take part freely in elections. Cuestas. on attempting to reform corrupt practices, was soon

threatened with another revolution, and on the 10th of February 1898 he assumed dictatorial powers, dissolved the Chambers and suspended all constitutional guarantees. In the following year he resigned and was re-elected to the presidency on the 1st of March 1899. His second term was marked by premonitions of further disorder. In July 1902 a plot for his

assassination was frustrated, and in 1903, on the election of Jose Battle to the presidency, civil war broke out. On September 3, 1904, the revolutionary general Saraiva died of wounds received in battle; and later in the year peace was declared. Claudio Williman became president in 1907. The Colorados favoured Battle as his successor, and before the elections to the chamber in November 1910 the Blancos were again in arms.

See F. Bauza, La Domination Espanola en el Uruguay (Montevideo, 1880); F. A. Berro, A. de Vedia and M. de Pena, Album de la Republica Oriental del Uruguay (Montevideo, 1882) ; R. L. Lomba, La Republica Oriental del Uruguay (Montevideo, 1884); The Uruguay Republic, Territory and Conditions, reprinted by order of the Consul- General of Uruguay (London, 1888); V. Arreguine, Historia del Uruguay (Montevideo, 1892); M. G. and E. T. Mulhall, Handbook of the River Plata (London, 1892); H. Roustan and C. M. de Pena, Uruguay en la Exposition . . . de Chicago (Montevideo, 1893); O. Aranjo, Compendio de la Geografia National (Montevideo, 1894) ; Uruguay, its Geography, History, &c. (Liverpool, 1897); P. F. Martin, Through Five Republics (London, 1905); Anuario Estadistico and Anuario Demografico (official, Montevideo) ; British and American Consular Reports ; Publications, Bureau of American Republics.

URUGUAYANA, a city and river port of the state of Rio Grande do Sul, Brazil, on the left bank of the Uruguay river, 348 ft. above sea-level (at the R. R. station) and about 360 m. in a direct line W. of Porto Alegre. Pop. (1900) 13,638. A railway connects with Quarahim (47 m.) on the Uruguayan frontier, and thence by a Uruguayan line with Montevideo by way of Paysandu. The same line extends N. 62 m. to the naval station of Itaquy. A cross-country line was under construction in 1909 to Cacequy, which is in direct communication with Porto Alegre and the city of Rio Grande. The upper Uruguay is navigable from the Quarahim to the town of Sao Tome, and small river steamers ply regularly between Ceibo, on the Argentine side, and the latter. Opposite Uruguayana is the Argentine town of Restauracion, or Paso los Libres. The river is 2 m. wide at this point, and 154 ft. above sea-level. Uruguayana is prettily situated on a low hill rising gently from the riverside and its low houses are surrounded by orange groves. There are large military barracks near the

shore, a theatre and a custom-house. The surrounding country is chiefly pastoral, but there is a small area under vineyards, and in addition to grapes some other fruits are produced. Uruguayana was captured by a Paraguayan force under General Estigarribia on the 5th of August 1865, and was recaptured without a fight by the allied forces under General Bariolom6 Mitre on the 18th of September. The Paraguayan occupation left the town partially in ruins, and it remained in a decadent condition until near the end of the century, when reviving industries in the state and a renewal of railway construction promoted its commercial activity and growth.

USAS (from the root vas, to shine, and cognate to Latin Aurora and Greek 'Hd>s,) in Hindu mythology, the goddess of dawn. She is celebrated in some twenty hymns of the Rig Veda, and is the most graceful creation of Vedic poetry. She is borne on a shining car drawn by ruddy cows or bulls. She is the daughter of the sky and the sun is her lover. She is described as " rising resplendent as from a bath, showing her charms she comes with light . . . ever shortening the ages of men she shines forth . . . she reveals the paths of men and bestows new life . . . she opens the doors of darkness as the cows their stalls." Scarcely the name of the goddess survives to-day, so completely was she associated with the Vedism long dead and gone.

See A. A. Macdonell, Vedic Mythology (Strassburg, 1897).

USEDOM, an island of Germany, in the Prussian province of Pomerania, lying off the Baltic coast, and separated by the Swine from the island of Wollin, which together with it divides the Stettiner Haff from the open sea. It is 31 m. in length.

13 broad and 160 sq. m. in area. The surface is generally flat (only a few sand-hills rising to any height) and is diversified by moor, fen, lakes and forest. Agriculture, cattle-rearing, fishing and other maritime pursuits are the chief occupations of the inhabitants. Swinemiinde and Usedom (pop. 1700) are the chief towns, and Heringsdorf, Ahlbeck and Zinnowitz are frequented watering-places. Pop. (1900) 33,000.

See Gadebusch, Chronik der Insel Usedom (Anklam, 1863), and C. Muller, Die Seebdder der Inseln Usedom und Wollin (6th ed., Berlin, 1896).

USELIS (mod. Usellus), an ancient town of Sardinia, situated in the hills to the S.E. of Oristano, 900 ft. above sea-level. A bronze tablet of a.d. 158 (a tabula palronatus, setting forth that M. Aristius Balbinus had accepted the position of patron of the town for himself and his heirs) speaks of the place as Colonia Julia Augusta Uselis. From this it would seem that it had become a colony under Augustus, were it not that Pliny (H.N. iii. 85) asserts that Turris Libisonis was the only colony in Sardinia at his time. It may be that civic rights were obtained from Augustus (Th. Mommsen in Corp. Inscr. Lat. x. p. 816). The site of the ancient town is marked by the church of S. Reparata, and various antiquities have been found there. The episcopal see was transferred to Ales in the 12th ' century, though the old name is still officially used.

USES, in law, equitable or beneficial interests in land. In early law a man could not dispose of his estate by will nor could religious houses acquire it. As a method of evading the common law arose the practice of making feoffments to the use of, or upon trust for, persons other than those to whom the seisin or legal possession was delivered, to which the equitable juris- diction of the chancellor gave effect. To remedy the abuses which it was said were occasioned by this evasion of the law was passed the famous Statute of Uses (1536), which, however, failed to accomplish its purpose. Out of this failure of the Statute of Uses arose the modern law of Trusts, under which heading will be found a full history of uses. See also Con- veyancing.

USHAK, a town of Asia Minor, altitude 3160 ft. in the Kutaiah sanjak of the Brusa vilayet, situated in a fertile district, on a tributary of the Menderes, and connected with Smyrna and Konia by rail. Pop. 9000 Moslems and 2000 Christians. It is noted for its heavy pile carpets, khali, known as " Turkey carpets." The Oriental character of the carpets has been almost destroyed by the adoption of aniline dyes and the introduction of Western patterns. The town has a trade in valonia, cereals and opium.

USHANT (Fr. Ouessant), the most westerly of the islands off the coast of France, about 14 m. from the coast of Finistere, of

which department it forms a canton and commune. Pop. (1906) 2761. Ushant is about 3850 acres in extent and almost entirely granitic, with steep and rugged coasts accessible only at a few points, and rendered more dangerous by the frequency of fogs. The island affords pasturage to a breed of small black sheep, and about half its area is occupied by cereals or potatoes. The male inhabitants are principally pilots and fishermen, the women working in the fields. Ushant was ravaged by the English in 1388. The lordship was made a marquisate in 1597 in favour of Rene de Rieux de Sourdeac, governor of Brest. In 1778 a naval action without decisive result was fought off Ushant between the English under Keppel and the French under the Count d'Orvilliers.

USHER (or Ussher), JAMES (1581-1656), Anglican divine and archbishop, was born in the parish of St Nicholas, Dublin, on the 4th of January 1581. He was descended from the house of Nevill, one of whose scions, accompanying John Plantagenet to Ireland in the capacity of usher in 1185, adopted his official title as a surname. James Usher was sent to a school in Dublin opened by two political agents of James VI. of Scotland, who adopted this manner of averting the suspicions of Elizabeth's government from their real object, which was to secure a party for James in Ireland in the event of the queen's death. In 1594 Usher matriculated at the newly founded university of Dublin,

whose charter had just been obtained by his uncle, Henry Usher, archbishop of Armagh. He proved a diligent student, devoting much attention to controversial theology, graduated as M.A. in 1600 and became a fellow of Trinity College. On the death of his father in 1598 he resigned the family estate to his younger brother, reserving only a small rent-charge upon it for his own maintenance, and prepared to take orders. When he was but nineteen he accepted a challenge put forth by Henry Fitzsimons, a learned Jesuit, then a prisoner in Dublin, inviting discussion of Bellarmine's arguments in defence of Roman Catholicism, and acquitted himself with much distinction. In 1600 he was appointed proctor of his college and catechetical lecturer in the university, though still a layman, and was ordained deacon and priest on the same day, in 1601, while still under the canonical age, by his uncle the primate. In 1607 he became regius pro- fessor of divinity and also chancellor of St Patrick's cathedral, Dublin. He was a frequent visitor to England, and made the acquaintance of contemporary scholars like Camden, Selden, Sir Thomas Bodley and Sir Robert

Cotton. In 1613 he published his first printed work, though not his first literary composition — Gravissimae Quaestionis de Christianarum Ecclesi- arum, in Occidentis praesertim partibus, ab Apostolicis tempori- bus ad nostram usque aetatem, continua successione et statu, Historica Explicatio, wherein he took up the history of the Western Church from the point where Jewel had left off in his Apology for the Church of England, and carried it on from the 6th till past the middle of the 13th century, but never completed it. In 161 5 he took part in an attempt of the Irish clergy to impose a Calvinistic confession, embodying the Lambeth Articles of 1595, upon the Irish Church, and was delated to King James in consequence. But on his next visit to England in 16 19 he brought with him an attestation to his orthodoxy and high professional standing, signed by the lord deputy and the members of the privy council, which, together with his own demeanour in a private conference with the king, so influenced the latter that he nominated Usher to the vacant see of Meath, of which he was consecrated bishop in 1621. In 1622 he published a controversial Discourse of the Religion anciently Professed by the Irish and British, designed to show that they were in agreement with the Church of England and opposed to the Church of Rome on the points in debate between those churches. In 1623 he was made a privy councillor for Ireland, and in the same year was summoned to England by the king that he might more readily carry on a work he had already begun upon the antiquity of the British churches. While he was detained on this business the archbishop of Armagh died in January 1625, and the king at once nominated Usher to the vacant primacy; but severe illness and other causes impeded his return to Ireland until August 1626.

For many years Usher was actively employed both in the government of his diocese and in the publication of several learned works, amongst which may be specified Emmanuel (a treatise upon the Incarnation), published in 1638, and Britannicarum Ecclesiarum Antiquitates, in 1639. In 1629 he discountenanced Bishop William Bedell's proposal to revive the Irish language in the service. In 1634 he took part in the convocation which drafted the code of canons that formed the basis of Irish ecclesiastical law till the disestablishment of the Irish Church in 1869, and defeated the attempt of John ˆramhall, then bishop of Deny and later his own successor in Armagh, to conform the Irish Church exactly to the doctrinal

standards of the English. He put the matter on the ground of preserving the independence of the Irish Church, but the real motive at work was to maintain the Calvinistic element introduced in 161 5. In 1640 he paid another visit to England on one of his usual scholarly errands, meaning to return when it was accom- plished. But the rebellion of 1641 broke out while he was still at Oxford, and he never saw his native country again. He published a collection of tracts at Oxford in that year, including a defence of episcopacy and the doctrine of non-resistance. All Usher's property in Ireland was lost to him through the rebellion, except his books and some plate and furniture, but he was

assigned the temporalities of the vacant see of Carlisle for his support. In 1643 he was offered a seat in the Assembly of Divines at Westminster, but declined it publicly in terms which drew upon him the anger of the House of Commons, and an order for the confiscation of his library was averted only by the interposition of Selden. He quitted Oxford in 1645 and went into Wales, where he remained till 1646, when he returned to London, and was in 1647 elected preacher to the Society of Lincoln's Inn, an office which he continued to hold until near his death. During his residence in Wales a hyper-Calvinistic work entitled A Body of Divinity; or the Sum and Substance of (he Christian Religion, was published under his name by John Downham; and, although he repudiated the authorship in a letter to the editor, stating that the manuscript from which it was printed was merely a commonplace-book into which he had transcribed the opinions of Cartwright and other English divines, often disapproving of them and finding them dissonant from his own judgment, yet it has been persistently cited ever since as Usher's genuine work, and as lending his authority to positions which he had long abandoned, if he ever maintained them. In 1648 he had a conference with Charles I. in the Isle of Wight, assisting him in the abortive negotiations with parliament on the question of episcopacy. About this time Richelieu offered him a pension. In 1650-54 he published the work which was long accounted his most important production, the Annates Veteris et Novi Testamenti, in which he propounded a now disproved scheme of Biblical chronology, whose dates were inserted by some

unknown authority in the margin of reference editions of the Authorized Version. In 1655 Usher published his last work, De Graeca LXX Interpretum Versione Syntagma. He died on the 20th of March 1656, in Lady Peterborough's house at Reigate, and was buried in Westminster Abbey. He was long remembered, not only for his great learning but for his modesty and kindly disposition. His daughter sold his library to the state, and in 1661 it was placed in the library of Trinity College, Dublin, of which it still forms a part.

Usher's works are very numerous, and were first collected by C. R. Ellington and J. H. Todd, Dublin (1847-64, in 17 vols.). See Life by Carr (1895); W. B. Wright, The Ussher Memoirs

(1889).

USHER (O. Fr. ussier, uissier, mod. huissier, from Lat. ostiarius, a door-keeper, ostium, doorway, entrance, os, mouth), properly an official or servant who guards the entrance to a building, admits those who have the right of admission and keeps out strangers; such functions as the introduction of those who are admitted, the conducting them to their seats or to the presence of the persons receiving them and the keeping of order and silence are also performed by them. The " ushers " of a law-court are familiar officials of this kind. The name is also applied to various members of the British royal household, in which there are several " gentlemen-ushers." The four principal British orders of knighthood style one of their chief officers " usher "; thus there is a gentleman-usher of the Black Rod, who is also one of the high officials of the House of Lords (see further, Black Rod, and Knighthood and Chivalry, § Orders of Knighthood). A common usage of the word, now obsolescent, is for an undermaster at a school.

USK, THOMAS (d. 1388), the author of The Testament of Love, was born in London. His name was first added to the history of English literature in 1897 by Mr Henry Bradley's discovery that The Testament of Love, an important prose work hitherto attributed to Chaucer, bore in the initial letters of its chapters a statement of authorship — " Margarete of virtw, have merci on thin Usk." By the light of this perception, various autobiographical statements became luminous, and there remained no possible doubt that the author was Thomas Usk, who was clerk of the closet to John of Northampton when he was mayor of London from 1381 to 1383. In July 1384 Usk

was seized and put in prison, but was released on promise of bringing charges against the mayor. Usk had no wish to be what he called " a stinking martyr," and he freely produced evidence which sent John of Northampton to gaol.

For this he was not forgiven by the duke of Gloucester's party, although he continued to hold confidential posts in London until the close of 1386, when he was appointed sub-sheriff of Middlesex. But he fell with the king, in the triumph of the duke of Gloucester, and on the 3rd of February 1388 Usk, among others, was tried for treason and condemned. He was sentenced " to be drawn, hung and beheaded, and that his head should be set up over Newgate." John of Malvern, in his continuation of Ralph Higden's Polychronicon, 1 gives a horrid description of his execution, which occurred on the 4th of March 1388, in circumstances of rude barbarity; it took thirty blows of a sword to sever Usk's head from his shoulders. Professor Skeat has shown that the date of his book must be about 1387, for in it he reviews the incidents of his career, including the odd facts that, after his first imprisonment in 1384, he challenged any one who " contraried " his " saws " — that is to say, denied his allegations — to fight, but that no one took up his wager of battle. From 1381 to 1383, while Chaucer was comptroller of customs, Usk was collector, and they were doubtless acquainted. In The Testament of Love, the god is made to praise " mine own true servant, the noble philosophical poet in English," who had composed " a treatise of my servant Troilus." Usk had at one time been a Lollard, but in prison he submitted to the Church and thought he was forgiven. His solitary work is remarkable, and the most elaborate production in original English prose which the end of the 14th century has bequeathed to us. It is, however, excessively tedious, and of its obscurity and dullness a very amusing proof is given by the fact that successive editors — and even Dr Henry Bradley and Professor Skeat— did not discover till too late that the leaves of the original MS. had been shuffled and the body of the treatise misarranged. No MS. of The Testament of Love has been preserved; it was first printed by W. Thynne in his edition of Chaucer, 1532. In 1897 Professor Skeat, with cancelled sheets to cover the unlucky mistake above referred to, issued a revised and annotated text in his Chaucerian and other Pieces.

(E.G.)

USK, a river of Wales and England, rising on the borders of Carmarthenshire and Brecknockshire, and flowing to the Bristol Channel with a course of 70 m., and a drainage area of 540 sq. m. The source lies at an elevation of 1700 ft. on the north flank of Carmarthen Van, a summit of the Brecon Beacons; and the course is at first northerly, but soon turns east through a beautiful valley closely beset with lofty hills. The river passes the finely situated town of Brecon, and then turns south-east past Crickhowell and south past Abergavenny. Between these towns it forms a short stretch of the Welsh boundary before entering England (Monmouthshire). The valley now broadens, and the course of the river becomes sinuous as it flows by the ancient towns of Usk and Caerleon. The scenery throughout is most beautiful. Not far from the mouth lies Newport, with its extensive docks, to which the estuary gives access. Except in this part, the Usk is not used for navigation, but the Monmouthshire and Brecon and Abergavenny canals, in part following the valley, carry a small trade up to Brecon. The Usk is noted for its salmon and trout fishing.

USK, a small market town, is beautifully situated on the right bank of the Usk river, 10 m. N.N.E. of Newport. Pop. of urban district (1901), 1476. It unites with Newport and Monmouth to form the Monmouth parliamentary district of boroughs, returning one member. It is of high antiquity, occupying the site of a Roman-British village or fort; and there are picturesque ruins of an ancient castle erected in de- fence of the Welsh marches, and as such, a scene of frequent strife from Norman times until the days of the warlike Owen Glendower, about 1400. The church of St Mary originally belonged to a Benedictine nunnery of the 12th century.

USKOKS, or Uscocs. During the early years of the 16th century, the Turkish conquest of Bosnia and Herzegovina 1 Ed. J. R. Lumby, Rolls Series (1886), vol. ix. p. 147.

drove large numbers of the Christian inhabitants from their homes. A body of these Uskoks, as they were called, from a Serbo-Croatian word meaning ” refugee,” established itself in the Dalmatian fortress of Clissa, near Spalato, and thence

waged continual war upon the Turks. Clissa, however, became un- tenable, and the Uskoks withdrew to Zengg, on the Croatian coast, where, in accordance with the Austrian system of plant- ing colonies of defenders along the Military Frontier, they were welcomed by the Emperor Ferdinand I., and promised an annual subsidy in return for their services. Their new strong- hold, screened by mountains and forests, was unassailable by cavalry or artillery, but admirably suited to the light-armed Uskoks, whose excellence lay in guerilla warfare. The Turks, on their side, organized a body of equally effective troops called Martelossi, for defence and reprisals. Thus, checked on land, and with their subsidy rarely paid, the Uskoks turned to piracy. Large galleys could not anchor in the bay of Zengg, which is shallow and exposed to sudden gales, so the Uskoks fitted out a fleet of swift boats, light enough to navigate the smallest creeks and inlets of the Illyrian shore, and easily sunk and recovered, if a temporary landing became necessary. With these they preyed upon the commerce of the Adriatic. Their ranks were soon swelled by outlaws from all nations, and by their own once peaceful neighbours, from Novi, Ottocac and other Croatian towns. After 1540, however, Venice, as mistress of the seas, guaranteed the safety of Turkish merchant vessels, and provided them with an escort of galleys. The Uskoks re- taliated by ravaging the Venetian islands of Veglia, Arbe and Pago, and by using the Venetian territories in Dalmatia as an avenue of attack upon the Turks. Meanwhile the corsairs of Greece and Africa were free to raid the unprotected southern shores of Italy; and Venice was besieged with complaints from the Porte, the Vatican, the Viceroy of Naples and his sovereign, the king of Spain. An appeal to Austria met with little success, for the offences of the Uskoks were outweighed by their services against the Turks; while, if Minucci may be trusted, a share of their spoils, in silk, velvet and jewels, went to the ladies of the Archducal Court of Graz, where the matter was negotiated. From 1577 onwards, Venice endeavoured to crush the pirates without offending Austria, enlisting Albanians in place of their Dalmatian crews, who feared reprisals at home. For a time the Uskoks only ventured forth by night, in winter and stormy weather. In 1592 a Turkish army invaded Croatia, hoping to capture Zengg, but it was routed and dispersed in the following year. Austria being thus involved in war with Turkey, the Venetian Admiral Giovanni Bembo blockaded Trieste and Fiume, whither the pirates forwarded their booty for sale. They also erected two

forts to command the passages from Zengg to the open sea. In 1602 a raid by the Uskoks upon Istria resulted in an agreement between Venice and Austria, and the despatch to Zengg of the energetic commissioner Rabatta with a strong bodyguard. All these measures, however, availed little. Rabatta was murdered, the fugitive Uskoks returned to Zengg and piracy was resumed, with varying fortunes, until 161 5, when a grosser outrage than usual led to open war be- tween Venice and Austria. By the treaty of peace concluded at Madrid, in 1617, it was arranged that the Uskoks should be disbanded, and their ships destroyed. The pirates and their families were, accordingly, transported to the interior of Croatia, where they gave their name to the Uskoken Gebirge, a group of mountains on the borders of Carniola. Their presence has also been traced near Monte Maggiore, in Istria, where such signifi- cant family names as Novlian (from Novi) , Ottocian (from Ottocac) and Clissan (from Clissa), were noted by Franceschi in 1879.

See Minuccio Minucci, Historia degli Uscochi (Venice, 1603) ; enlarged by P. Sarpi, and translated into French as a supplement to Amelot de la Houssaye's Histoire du gouvernement de Venise (Amsterdam, 1705). Minucci was one of the Venetian envoys at Graz. See also the conciser narratives in C. de Franceschi's V Istria, chap. 37 (Parenzo, 1879); and T. G. Jackson's Dalmatia, the Quarnero and Istria, chap. 27 (Oxford, 1887).

USKUB, Uscup, or Skopia (anc. Scupi, Turk. Ushkiib, Slav. Skoplye), the capital of the vilayet of Kossovo, European

Turkey; on the left bank of the river Vardar, and at the junction of the railways from Nish and Mitrovitza to Salonica. Pop. (1905) about 32,000, consisting chiefly of Slavs (Serbs and Bulgars), Turks, Albanians and a few gipsies. Uskiib occupies a picturesque and strategically important position at the foot of a valley which severs two mountain ranges, the Shar Planina and Kara Dagh. Main roads radiate N.W. to Prizren, W. to Gostivar, an important centre of distribution, E.N.E. to Kuma- novo, and thence into Bulgaria, and S. to Koprulii and Monastir. The city is the headquarters of an army corps, and the see of an Orthodox Greek archbishop, of the archbishop of the Roman Catholic Albanians and of a Bulgarian bishop. Its principal buildings are the citadel, the palace of the vali or provincial governor, the Greek and Bulgarian schools, numerous churches and mosques and a

Roman aqueduct. The industries include dyeing, weaving, tanning and the manufacture of metal-work, wine and flour, but Uskiib is chiefly important as the com- mercial centre of the whole vilayet of Kossovo (q.v.). The Imperial Ottoman Bank and the Banque de Salonique have branches in the city, and French is to a remarkable extent the language of commerce. Uskiib retains in a modified form the name of Scupi, one of the chief cities of northern Macedonia. A few unimportant ruins mark the ancient site, about i| m. N.W. Scupi was destroyed by an earthquake in a.d. 518, but was rebuilt by Justinian under the name of Justiniana Prima. Up to the 14th century it was at times the capital of the Servian tsars.

USTARANA, a Pathan tribe who inhabit the outer hills opposite the extreme south portion of Dera Ismail Khan district in the North-West Frontier Province of India. Originally the Ustar- anas were entirely a pastoral and trading tribe; but a quarrel with their neighbours, the Musa Khel, put a stop to their annual westward immigration, and they were forced to take to agri- culture, and have since acquired a good deal of the plain country below the hills. Their territory includes only the eastern slopes of the Suliman mountains, the crest of the range being held by the Musa Khel, Isots and Zmarais (see Suliman Hills). The Ustaranas are venturesome traders, carrying goods from Kandahar as far as Bengal. They are a fine manly race, quiet and well-behaved, and many of them enlist in the Indian army and police.

USTICAˆan island off the N. coast of Sicily, 41ˆ m.N.N.W. of Palermo. Pop. (1861) 2231; (1901) 1916. It is the Oste- odes of the Greeks, but in Roman times was known as Ustica. The island is entirely volcanic and subject to earthquakes, and is fertile. There is a considerable penal colony. There are some Roman tombs excavated in the rock.

USTYUG VELIKIY, a town of Russia, in the government of Vologda, 216 m. N.E. from the city of Vologda, on the navigable Sukhona river, near its confluence with the Yug. Pop. (1885) 81 19; (1897) 11,309. It manufactures hosiery, woollens and linens, has sawmills, and carries on an active trade in corn, hemp, flax, bristles and butter, which it exports. It has two important yearly fairs. Its artisans are famous for their jewelry, for engraving upon silver and the fabrication of boxes with secret locks.

USURY. An ancient legal conception, it has been said, corresponds not to one but to several modern conceptions; and the proposition is equally true when economic is substituted for legal. Until quite recent times the term " usury " (Lat. usura, use, enjoyment, interest, from usus, use) covered a number of essentially different social phenomena. " Thou shalt not lend upon usury to thy brother; usury of money, usury of victuals, usury of anything that is lent upon usury. Unto a stranger thou mayest lend upon usury; but unto thy brother thou shalt not lend upon usury, that the Lord thy God may bless thee " (Deut. xxiii. 19, 20). In this sentence we find interest of all kinds blended together, and the natural economic tendencies directly counteracted by the moral and religious law. At the present day, " usury," if used in the old sense of the term, would embrace a multitude of modes of receiving interest upon capital to which not the slightest moral taint is attached.

USURY

The man who does not in some shape or other lend his capital upon " usury " is, in the modern world, generally considered as lacking in his duty to himself or his family. The change in the moral attitude towards usury is perhaps best expressed by saying that in ancient times so much of the lending at interest was associated with cruelty and hardship that all lending was branded as immoral (or all interest was usury in the moral sense), whilst at present so little lending takes place, comparatively, except on commercial principles, that all lending is regarded as free from an immoral taint. This change in the attitude of common-sense morality in respect to " anything that is lent upon usury" is one of the most peculiar and instructive features in the economic progress of society.

" It is worthy of remark," says Grote (History of Greece, iii. 144), " that the first borrowers must have been for the most part men driven to this necessity by the pressure of want, and contracting debt as a desperate resource without any fair prospect of ability to pay; debt and famine run together in the mind of the poet Hesiod. The borrower is in this unhappy state rather a distressed man soliciting aid than a solvent man capable of making and fulfilling a contract; and if he cannot find a friend to make a free gift to him in the former character he would not under the latter character obtain a loan from a stranger except by the promise of exorbitant interest and by the fullest eventual power over his person which he is in a position to grant." This remark, though suggested by the state of society in ancient Greece, is largely applicable throughout the world until the close of the early middle ages. Borrowers were not induced to borrow as a rule with the view of employing the capital so obtained at a greater profit, but they were compelled of necessity to borrow as a last resort. The conditions of ancient usury find a graphic illustration in the account of the building of the second temple at Jerusalem (Neh. v. 1-12). The reasons for borrowing are famine and tribute. Some said, " We have mortgaged our lands, vineyards and houses, that we might buy corn, because of the dearth." Others said, " We have borrowed money for the king's tribute, and that upon our lands and vineyards . . . and, lo, we bring into bondage our sons and

our daughters to be servants, . . . neither is it in our power to redeem them, for other men have our lands and vineyards." In ancient Greece we find similar examples of the evil effects of usury, and a law of bank- ruptcy resting on slavery. In Athens about the time of Solon's legislation (594 B.C.) the bulk of the population, who had originally been small proprietors or metayers, became gradually indebted to the rich to such an extent that they were practically slaves. Those who still kept their property nominally were in the position of Irish cottiers: they owed more than they could pay, and stone pillars erected on their land showed the amount of the debts and the names of the lenders. Usury had given all the power of the state to a small plutocracy. The remedy which Solon adopted was of a kind that we are accustomed to consider as purely modern. In the first place, it is true that according to ancient practice he proclaimed a general seisachtheia, or shaking off of burdens: he cancelled all the debts made on the security of the land or the person of the debtor. This measure alone would, however, have been of little service had he not at the same time enacted that hence- forth no loans could be made on the bodily security of the debtor, and the creditor was confined to a share of the property. The consequence of this simple but effective reform was that Athens was never again disturbed by the agitation of insolvent debtors. Solon left the rate of interest to be determined by free contract, and sometimes the rate was exceedingly high, but none of the evils so generally prevalent in antiquity were experienced.

When we turn to Rome, we find exactly the same difficulties arising, but they were never successfully met. As in Athens in early times, the mass of the people were yeomen, living on their own small estates, and in time they became hopelessly in debt. Accordingly, the legislation of the XII. Tables, about 500 B.C., was intended to strike at the evil by providing a maxi- mum rate of interest. Unfortunately, however, no alteration

was made in the law 01 aeDt, anft tne attempt to regulate the rate of interest utterly failed. In the course of two or three centuries the small free farmers were utterly destroyed. By the pressure of war and taxes they were all driven into debt, and debt ended practically, if not technically, in slavery. It would be difficult to overestimate the importance of the influence of usury on the social and economic history of the Roman republic. In the provinces the evils of the system reached a much greater height. In 84 B.C. the war tax imposed by Sulla

on the province of Asia was at first advanced by Roman capitalists, and rose within fourteen years to six times its original amount. It is interesting to observe that the old law of debt was not really abolished until the dictatorship of Julius Caesar, who practically adopted the legislation of Solon more than five centuries before ; but it was too late then to save the middle class. About this time the rate of interest on first-class security in the city of Rome was only about 4%, whilst in the provinces from 25 to 50% were rates often exacted. Justinian made the accumulation of arrears (anatocismus) illegal, and fixed the rate at 6%, except for mercantile loans, in which the rate re- ceived was 8%. On the whole, it was truly said of usury during the republic and early years of the empire: " Sed vetus urbi faenebre malum et seditionum discordiarumque creberrima causa." Even when it came to be authorized by Roman law under certain restrictions, it was still looked upon as a pernicious crime. " Cicero mentions that Cato, being asked what he thought of usury, made no other answer to the question than by asking the person who spoke to him what he thought of murder." It was only natural, considering the evils produced by usury in ancient Greece and Rome, that philosophers should have tried to give an a priori explanation of these abuses. The opinion of Aristotle on the barrenness of money became proverbial, and was quoted with approval throughout the middle ages. This condemnation by the moralists was enforced by the Fathers of the church . on the conversion of the empire to Christianity. They held usury up to detestation, and practically made no distinction between interest on equitable moderate terms and what we now term usurious exactions. 1 The consequence of the condemnation of usury by the church was to throw all the dealing in money in the early middle ages into the hands of the Jews. A full account of the mode in which this traffic was conducted in England is given by Madox in chapter vii. of his History of the Exchequer (London, 17 11). The Jews were considered as deriving all their privileges from the hand of the king, and every privilege was dearly bought. There can be no doubt that they were subjected to most arbitrary exactions. At the same time, however, their dealings were nominally under the supervision of the Jews' exchequer, and a number of regula- tions were enforced, partly with the view of protecting borrowers and partly that the king might know how much his Jews could afford to pay. It was probably mainly on account of this money-lending that the Jews were so heartily detested and

liable to such gross ill-treatment by the people. A curious illustration of this popular animosity is found in the insertion of a clause in the charters granted by Henry III. to Newcastle and Derby, forbidding any Jew to reside in either place. Ultimately in 1290 the Jews were expelled in a body from the kingdom under circumstances of great barbarity, and were not allowed to return until the time of Cromwell. Before the expulsion of the Jews, however, in spite of canonical opposition, Christians had begun to take interest openly; and one of the most interest- ing examples of the adaptation of the dogmas of the Church of Rome to the social and economic environment is found in the growth of the recognized exceptions to usury. In this respect the canonical writers derived much assistance from the later Roman law. Without entering into technicalities, it may be said generally that an attempt was made to distinguish between usury, in the modern sense of unjust exaction, and interest on capital. Unfortunately, however, the modifications

'For a popular account of the reasons given in support of the canonical objections to usury, and of the modifications and excep- tions admitted in some quarters, see W. Cunningham's Usury.

which were really admitted were not openly and avowedly made by a direct change in the statutes, but for the most part they were effected (as so many early reforms) under the cover of ingenious legal fictions. One of the most curious and instructive results of this treatment has been well brought out by Walter Ross in the introduction to his Lectures on the Law of Scotland (1793). He shows, in a very remarkable manner and at consider- able length, that " to the devices fallen upon to defeat those laws (i.e. against usury) the greatest part of the deeds now in use both in -England and Scotland owe their original forms " (i. 4). One of the consequences of this indirect method of reforming the law was that in some cases the evil was much exaggerated. " The judges," says Ross, " could not award interest for the money; that would have been contrary to law, a moral evil, and an oppression of the debtor; but, upon the idea of damages and the failure of the debtor in performance, they unmercifully decreed for double the sum

borrowed." He may well remark that imagination itself is incapable of conceiving a higher degree of inconsistency in the affairs of men (compare Blackstone, iii. 434, 435).

In the limits assigned to this article it is impossible to enter further into the history of the question (see also Moneylending), but an attempt may be made to summarize the principal results so far as they bear upon the old controversy, which has again been revived in some quarters, as to the proper relation of law to usury and interest. (1) The opinion of Bentham that the attempt directly to suppress usury (in the modern sense) will only increase the evil is abundantly verified. Mere prohibition under penalties will practically lead to an additional charge as security against risk. The evils must be partly met by the general principles applicable to all contracts (the fitness of the contracting parties, &c.) and partly by provisions for bank- ruptcy. Peculiar forms of the evil, such as mortgaging to excessive amounts in countries largely occupied by peasant proprietors, may be met by particular measures, as, for example, by forbidding the accumulation of arrears. (2) The attempt to control interest in the commercial sense is both useless and harmful. It is certain to be met by fictitious devices which at the best will cause needless inconvenience to the contracting parties; restraints will be placed on the natural flow of capital, and industry will suffer. (3) In the progress of society borrowing for commercial purposes has gradually become of overwhelming importance compared with borrowing for purposes of necessity, as in earlier times. By far the greater part of the interest now paid in the civilized world is, in the language of the English economists, only a fair reward for risk of loss and for manage- ment of capital, and a necessary stimulus to saving.

See Capital and Interest (Eng. trans., 1890), by E. Boehm von Bawerk; Nature of Capital and Income, by Irving Fisher (1906).

(J. S. N.)

UTAH, 1 one of the Central Western states of the United States of America. It lies between latitudes 37 and 42 N. and between longitudes 32 and 37° W. from Washington {i.e. about 109 1′ 34″ and 114° 1′ 34″ respectively W. of Greenwich). The state is bounded wholly by meridians and parallels, and is bordered on the N. by Idaho and Wyoming, on the E. by Wyom- ing and

Colorado, on the S. by Arizona, and on the W. by Nevada. Utah has an area of 84,990 sq. m., of which 2806 sq. m. are water surface, including Great Salt, Utah and other lakes. The state has a maximum length of 343 m. N. and S., and a maximum width of about 280 m. E. and W.

Physical Features. — The eastern portion of Utah consists of high plateaus, and constitutes a part of the Colorado Plateau province. The remaining western portion of the state is lower, belongs in the Great Basin province, and is characterized by north-south mountain ranges separated by desert basins. The high plateaus consist of great blocks of the earth's crust which are separated from each other by fault-lines, and which have been uplifted to different heights. Erosion has developed deep and sometimes broad valleys along the fault-lines and elsewhere, so that many of the blocks and portions of blocks are isolated from their neighbours. As a rule

1 The name is that of a Shoshonean Indian tribe, more commonly called Ute.

the blocks have not been greatly tilted or deformed, but consist of nearly horizontal layers of sandstone, shales and limestone. In some cases these sedimentary rocks lie deeply buried under lavas poured out by volcanoes long extinct. The plateau summits rise to elevations of 9000, 10,000 and 11,000 ft., are generally forested, but are too difficult of access to be much inhabited. The people live along the streams in the valleys between the plateaus. In the southern part of the state the high plateaus are terminated by a series of giant terraces which descend to the general level of the Grand Canyon Platform in northern Arizona. The terraces represent the out-cropping edges of hard sandstone layers included in the series of plateau sediments, and are named according to the colour of the rock exposed in the south-facing escarpments, the Pink Cliffs (highest), White Cliffs and Vermilion Cliffs. A still Jower terrace, terminating in the Shinarump Cliffs, is less conspicuous ; but the higher ones afford magnificent scenery. The northernmost member of the high plateaus is a broad east-west trending arch known as the Uinta Mountains. Local glaciation has carved the higher levels of this range into a maze of amphitheatres contain- ing lakes, separated from each other by aretes and alpine peaks. Among the peaks are King's Peaks (13,498 ft. and 13,496 ft.), the highest points in the state; Mt. Emmons (13,428 ft.); Gilbert Peak (13,422 ft.); Mt.

Lovenia (13,250 ft.); and Tokewanna Peak (13,200 ft.). In the south-eastern part of the state are lower desert plateaus, and several mountain groups which do not properly belong to the plateau system. Most interesting among these are the Henry Mountains, formed by the intrusion of molten igneous rock between the layers of sediments, causing the overlying layers to arch up into dome mountains. Stream erosion has dissected these domes far enough to reveal the core of the igneous rock and to give a rugged topography. The highest peaks exceed 1 1 ,000 ft. By far the greater part of the high plateau district is drained by the Colorado river and its branches, the most important of which are the Green, Grand and San Juan, portions of whose courses lie in canyons of remarkable grandeur. The western members of the high plateaus drain into the Great Basin for the most part, and in this drainage system the Sevier river is perhaps most prominent. Inasmuch as the streams entering the basin have no outlet to the ocean, their waters disappear by evaporation, either directly from alluvial slopes over which they pass, or from saline lakes occupying depressions between the mountain ranges.

The lower basin portion of Utah is separated from the high plateaus by a series of great fault scarps, by which one descends abruptly to a level of but 5000 or 6000 ft. One of the fault scarps is known as the Hurricane Ledge, and continues as a prominent landmark from a point south of the Grand Canyon in Arizona to the central part of Utah, where it is replaced by other scarps farther east. The floor of the Basin Region is formed of alluvium washed from the high plateaus and mountain ranges, a part of which has accumulated in alluvial fans, and part in the greatly expanded lakes which existed here in the glacial period. This alluvium gives gently sloping or level desert plains, from which isolated mountain ranges rise like islands from the sea. The barren " mud flats," frequently found on the desert floor, result from the drying up of temporary shallow lakes, or playas. Lake Bonneville is the name given to the most important of the much greater lakes of the glacial period, whose old shore-lines are plainly visible on many mountain slopes. Great Salt Lake (q.v.) is a shrunken remnant of Lake Bonneville. The mountain ranges of the Basin Region are most frequently formed by faulted and tilted blocks of the earth's crust, which have been carved by stream erosion into rugged shapes. Oquirrh, Tintic, Beaver, House and Mineral Mountains are typical examples of these north-south " basin

ranges," which rise abruptly from the desert plains and are themselves partial deserts. The Wasatch Mountain range constitutes the eastern margin of the Great Basin in central and northern Utah, and resembles the true basin ranges in that it is formed by a great block of the earth's crust uptilted along a north-south fault-line. Its steep fault scarp faces west, and rises from 4000 to 6000 ft. above the basin floor; the eastern slope is more gentle, but both slopes are much scored by deep canyons, some of which have been modified in form by ancient glaciers. Among the highest summits are Timpanogos Peak (11,957 ft.), Mt. Nebo (11,887 ft.), Twin Peak (11,563 ft.), and Lone Peak (11,295 ft-)- At the western base of the Wasatch are Salt Lake City, Ogden, Provo and other smaller towns, situated where streams issue from the mountains, soon to disappear on the desert plains. In such places agriculture is made possible by irrigation, and the Mormon villages, both here and farther south along the base of the Hurricane Ledge, depend largely on this industry. Important mining operations are carried on in the Wasatch Mountains and in a number of the basin ranges. Mercur, Tintic, Bingham and Park City are well-known mining centres.

Fauna. — In the open country the mule deer, the pronghorn antelope and the coyote are found, and the bison formerly ranged over the north-eastern part of the state ; the side-striped ground- squirrel, Townsend's spermophile, the desert pack-rat and the desert pack-rabbit inhabit the flat country. In the mountainous districts and high plateaus are the grizzly, formerly more common, the black bear, the four-striped chipmunk and the yellow-haired

porcupine. Various species of small native mice and voles are abundant.

In the marshes of the Salt Lake breed grebes, gulls and terns, and formerly the white pelican. Many ducks breed here, and many others pass through in migration : of the former, the most numerous are mallard and teal; of the latter, pintail, shoveler, scaup, ring-neck ducks, and mergansers. Wood and glossy ibises are commonly seen, and the white ibis breeds in numbers; the sand-hill crane is less common than formerly. A

few varieties of shore birds breed here, as the Western willet, the Bartramian sandpiper, and the long- billed curlew. Gambel's partridge is resident in the southern part of the state, and the sage-hen and sharp-tail grouse on the plains. The dusky grouse and grey ruffed grouse are confined to the mountains and plateaus. The California vulture is very rare; various species of hawks and golden and bald eagles are common. The burrowing. owl is found on the plains, and various species of small birds are characteristic of the different physical divisions of the state. A few lizards are found in the arid districts. The trout of the Utah mountain streams is considered a distinct species.

Flora. — Western Utah and vast areas along the Colorado river in the east and south-east are practically treeless. The lower plateaus and many of the basin ranges, as well as the basins them- selves, are deserts. The higher plateaus, the Uinta and Wasatch mountains, bear forests of fir, spruce and pine, and the lower slopes are dotted with pifion, juniper, and scrub cedar. On the slopes of mountain valleys grow cedars, dwarf maples and occasional oaks. Willows and cottonwoods grow along streams. The west slope of the Wasatch has been largely denuded of its forests to supply the demands of the towns at its base. Among other plants common to the state are the elder, wild hop, dwarf sunflower, and several species of greasewood and cacti. The sagebrush, artemisia, is characteristic of the desert areas. Bunch grass is abundant on the hillsides the year round, and affords valuable pasturage.

Climate. — On account of its great diversity in topography, the state of Utah is characterized by a wide range in climatic conditions. Extremely cold weather may occur on the lofty plateaus and moun- tain ranges, while the intervening valleys and basins have a milder climate. The mean temperature of the state ranges from 58° in the extreme south to 42° in the north. Winter temperatures as low as 36 below zero are known for the higher altitudes; in the south, summer temperatures of no° and higher have been recorded. At Salt Lake City the mean winter temperature is 31 °, the mean summer temperature 73 . Corresponding figures for St George, in the south-western part of the state, are 38 and 8o°. In general Utah may be said to have a true continental climate, although the presence of Great Salt Lake has a modifying effect on the climate of that portion of the Basin Region in which it lies. Killing frosts occur early in September and as late as the last of May, and in the higher

valleys they may occur at any time. The mean annual precipitation is only II in., the greater part of which occurs in the form of snow in the winter months, summer being the dry season. At Salt Lake City the annual precipitation is 15.8 in., of which 2 in. fall in summer. For St George the figures are: annual precipita- tion, 6.6 in.; summer, 1.3 in. Both Salt Lake City and St George are near the boundary between the Basin Region and the high

fjlateaus. Well out in the basin deserts the precipitation is still ess; and the same holds true for the low desert plateaus in the south-eastern part of the state, where Hite has an annual precipita- tion of only 2.3 in., of which 0.4 in. falls in the summer. On the other hand, the precipitation on the high plateaus probably exceeds 30 in. in places. In the inhabited parts of the state, irrigation is generally necessary for agriculture.

Soil. — -The alluvium of the desert basins furnishes much good soil, which produces abundant crops where irrigated. Alkali soils are also common in the basins, but when water is available they can often be washed out and made productive. Very rich floodplain soils occur along the larger streams. Vast areas of unreclaimable desert exist in the west and south-east. In the protected valleys between the high plateaus alluvial soils are cultivated ; but the plateau summits are relatively inaccessible, and, being subject to summer frosts, are not cultivated. Comparatively poor, sandy soil is found on the lower desert plateaus in the south-east, where population is scanty.

Forests. — The forest resources of Utah are of little value: the total wooded area was about 10,000 sq. m. in 1900, or about 12J % of the land area of the state. The only timber of commercial importance is found in the Uinta Range in the north-eastern corner of the state, and is chiefly yellow pine. The timber of the Wasatch Range is small and scattering. In 1910 there were in the state fourteen national forests varying in size from 1,250,610 acres (the Uinta reserve), 947,490 acres (the Ashley reserve), and 786,080 acres (the Manti reserve), down to the smallest Pocatello (10,720) on the Idaho border. The total area of these reserves was 7,436,327 acres.

Irrigation. — Under the Federal Reclamation Fund, established in 1902, $830,000 was allotted to Utah in 1902-9, and

$200,000 more in 1910, for the development of the Strawberry Valley project. This project, which was about one-third completed in the beginning of 1910, provides for the irrigation in Strawberry Valley (Utah and Wasatch counties, S. of Provo), of 60,000 acres, by a 6800-acre

reservoir of 110,000 acre-feet capacity, on Strawberry river; by a tunnel, 19,000 ft. long, connecting the reservoir with Diamond Fork, a tributary of Spanish Fork river; by a storage dam, 50 ft. high, of 60,000 cub. yds. contents, diverting water from Spanish Fork river into two canals, one on each side of the river, for the irrigation of land in the valley of Utah lake; by a hydro-electric power plant about 3 m. below the diversion dam ; and by the enlarge- ment of existing canal systems. The diversion dam, the power canal, and the first unit of the power plant were completed in 1909. Irrigation of the arid western regions of the United States began in the Great Basin of Utah when the Mormon pioneers in 1847 diverted the waters of City Creek upon the parched soil of SaltXake Valley. In 1900 nearly 90 % of the land reclaimed by irrigation in the whole state lay within the Great Basin. Between 1889 and 1899 the number of irrigators in the state (exclusive of Indian reservations) increased from 9724 to 17,924, or 84.3%, and the number of acres irrigated from 263,473 to 629,293, or 138.8%. In 1900, of the total improved acreage (1,029,226 acres) 61.2% (629,293 acres) was irrigated; and in 1899, of the 686,374 acres in crops, 537,588 acres, or 78.3%.

Agriculture. — The number of farms in Utah (not including those of less than 3 acres and of small productivity) in 1880 was 9452 ; in 1890, 10,517 ; and in 1900, 19,007 : their average size in 1880 was 69.4 acres; in 1890, 125.9 acres; and in 1900, 216.6 acres. The total number of all farms in the state in 1900 was 19,387; and the number of white farmers, 19,144. The greatest number of farms were between 100 acres and 500 acres — 1916 in 1880, and 5565 in 1900. Other holdings were as follows: between 20 acres and 50 acres, 3688 in 1880, and 5261 in 1900; between 50 acres and 100 acres, 2056 in 1880 and 3741 in 1900; less than 10 acres, 434 in 1880 and 1622 in 1900; 1000 acres and more, 9 in 1880 and 248 in 1900. The proportion of farms operated by owners decreased from 95.4 % (9019 farms) in 1880 to 91.2% (17,674 farms) in 1900; those operated by cash tenants increased from 0.6 % (60 farms) in 1880 to 2.6 % (506 farms) in 1900, and those operated by share tenants from 4%

(373 farms) in 1880 to 6.2% (1207 farms) in 1900. The total area of farms increased from 655,524 acres in 1880 to 4,116,951 acres in 1900, but the proportion of improved land decreased from 6 3-5%.(4 lD > I0 5 acres) in 1880 to 25.1 % (1,032,117 acres) in 1900, indicating the great increase in land used for grazing.

The value of farm property, including land with improvements, implements and machinery, and live-stock was $19,333,569 in 1 88c and $75,175,141 in 1900; the average value per farm was $2045 in 1880 and $3878 in 1900; and the average value, per acre of farm land was $29.49 in 1880 and $18.26 in 1900. The value of all farm products was $3,337,410 in 1879 and $16,502,051 in 1899, and the amount expended for fertilizers increased only from $11 ,394 to $14,300.

In 1899 hay and grain furnished the principal income from 35.4% of all farms in the state, and live-stock from 28.1 % of all farms. In 1899, 255,699 acres, or 37.3 % of the acreage of all crops, was sown to cereals, which were valued at $2,386,789, or 29 % of the value of all crops. The production of cereals (which grow chiefly in the northern counties of the state) was 130,842 bu. in 1849, 770,287 bu. in 1869, 2,395,744 bu. in 1889, and 5,381,125 bu. in 1899. The principal cereal was wheat, the value of which was $1,575,064 (3,413,470 bu.) in 1899, and $5,481,000 (6,090,000 bu.) in 1909. 1 The value and product of oats in 1899 was$553,847 (1,436,225 bu.), and in 1909, $1,319,000 (2,536,000 bu.); of Indian corn, in 1899, $121,872 (250,020 bu.), and in 1909, $355,000 (408,000 bu.); of barley, in 1899, $121,826 (252,140 bu.), and in 1909, $343,000 (520,000 bu.); of rye in 1899, $13,761 (28,630 bu.), and in 1909, $46,000 (66,000 bu.).. The value of the hay and forage crop in 1899 was $3,862,820, or 46.9% of the value of all crops, and its acreage was 388,043ˆ acres, or 56.5% of the acreage of all crops; in 1909, the acreage in hay was 375,000 acres, and its value was $9,792,000. Alfalfa (or lucerne) formed the principal part of the hay crop in 1899, and was produced chiefly in the counties of Utah (95,316 tons), Salt Lake (91,266 tons), Cache (64,543 tons) and Boxelder (50,019 tons), all in the northern part of the state.

The vegetable crop in 1899 occupied 24,042 acres, or 3.5% of the acreage of all crops, and its value was $1,250,713, or 15.2% of the value of all crops. The product of potatoes

increased very rapidly from 519,497 bu. in 1889 to 1,483,570 bu. valued at $487,816 in 1899, and to 2,700,000 bu. valued at $1,161,000 in 1909. The pro- duction of other vegetables in 1899 was as follows: water-melons, 620,440; musk-melons, 516,500; tomatoes, 254,052 bu.; cabbages, 997,690 heads, and sweet corn, 16,192 bu. For the important sugar- beet crop, see below under Manufactures. On Gunnison and Hat islands in Great Salt Lake are valuable guano deposits which are used as fertilizers for vegetable gardens.

The value of live-stock onfarms and ranges in 1890 was $9,914, 766; on farms in 1900, $21,474,241. The number of neat cattle in 1900 was 343>°90, valued at $7,152,844; on January 1, 1910, 2 415,000,

1 1909 statistics are from the Year Book of the U.S. Department of Agriculture.

2 These 1910 figures for live-stock are taken from the Year Book (1909) of the United States Department of Agriculture.

valued at $8,976,000, of which 88,000 were milch cows valued at $2,992,000. The number and value of other live-stock were as follows: sheep, in 1900, 3,818,423 ($10,256,488), and on January 1, 1910, 3,177,000 ($13,026,000); horses, in 1900, 115,884 ($3,396,313), and in 1910, 130,000 ($11,050,000); mules, in 1900, 2116 ($58,850), and in 1910, 3000 ($240,000); swine, in 1900, 65,732 ($293,115), and in 1910, 61,000 ($549,000).

The total value of dairy products in 1899 was $1,522,932. The principal products were: milk, in 1890, 8,614,694 gals., and in 1899, 25,124,642 gals, (received from sales, $645,550); butter, in 1890, I,759,354lbandinl899, 2,812, 122 lb (receivedfrom sales, $214,910); cheese, in 1890, 163,539 lb, and in 1899, 169,215 lb (received from sales, $122,933). The value of all poultry raised in 1899 was $262,503; the product of eggs was 3,387,340 doz., and their value,

$424,628.

The product of wool in 1890 (exclusive of wool shorn after the 1st of June) was 9,685,513 lb, in 1900, 17.050,977 lb. and in 1910, 14,850,000 lb. The value of the honey and wax produced in 1899 was $94,364. Honey was a large crop with the early settlers, who put a hive and honey-bees on the state-seal of Deseret and of Utah. Mining. — The mineral resources of Utah are varied and valuable, but their development was retarded for many years by the policy of the Mormon Church, which practically forbade its members to do any mining; more recently the development has been slow_ be- cause of inadequate transportation facilities, and the inaccessibility of some of the deposits. In 1902 the state ranked fourteenth among the states in the value of its mineral products, $12,378,350, and took thirteenth rank in 1907, with a product of $38,099,756, but dropped to the fifteenth rank in 1908, when the total value of its product was $26,422,1 2 1. 1 The value of products manufactuied from minerals in 1902 was $9,123,228, or 43-1 % of all the manu- factures in the state. The relative importance of mining and man- ufacturing may be shown thus: in 1902 the mines and quarries of the state employed 5712 wage-earners and paid to them $5,089,122, and in 1900 manufacturing industries employed 6615 wage-earners, who received $3,388,370 in wages.

Systematic prospecting for the precious metals did not begin in Utah until 1862, when Colonel Patrick E. Connor (1820-1891) of the Third California Infantry established Camp Douglas near Salt Lake City. He permitted many members of his regiment who had been prospectors in California to prospect the territory, with the result that mines were located at Stockton, Bingham Canyon, Little Cottonwood and elsewhere; but attempts to smelt lead-silver ore near Stockton about 1866 were not successful, and the mining of precious metals did not become an established in- dustry in the Territory until about 1870. Ores of good quality are now known to be quite generally distributed throughout the state. In 1902 the state ranked third in the value of its gold and silver production, $8,500,904; in 1908 it ranked sixth in gold, $3,946,700 (a decrease of $1,174,900 since 1907), and fourth in silver. $4,520,600 (a decrease of $3,007,900 since 1907). In 1908 the richest producers of gold were Salt Lake (60,872-63 oz.), Juab (58,679-17 oz.) and Tooele (41,969-96 oz.) counties, which produced about nine-tenths of the total for the state ; in Salt Lake and Juab counties the principal source

was copper ore, but in Tooele county almost all the gold was from siliceous ores. For the whole state, of a total of 179,054-60 oz. in 1908, 111,086-12 were from copper ore, 47,439-15 from siliceous ores, and 19,986-36 from lead ores. In the same year the largest producing gold mines were the Cen- tennial Eureka in Juab county, the Mercur in Tooele county, and the Utah Consolidated and the Utah Copper in Salt Lake county. The principal silver regions in 1908 were the Tintic, in Juab and Utah counties, and the Park City, in Summit and Wasatch counties. Of the total production, 8,451,338 oz. (valued at $4,479,209) in 1908, 2,748,289 oz. (of which more than two-thirds was from copper ores) were from Juab county; 2,463,735 oz. (all but 9586 oz., which were from lead zinc ore, being from lead ores) were from Summit and Wasatch counties; 1,561,983 oz. (all from lead ore, except 1158 oz. from copper ore) were from Utah county; 1,125,209 oz. (704,358 from copper ore, 329,276 from lead ore, 47,130 from copper- lead ore and 44,445 from siliceous ore) were from Salt Lake county ; and 378,373 oz. (of which 341,375 oz. were from lead ore) were from Tooele county. The principal source of the silver was the lead ores mined, from which in 1908 about two-thirds of the total of the silver was secured.

Far larger in value than either gold or silver, and larger than both together, was the output of copper in Utah in 1907 ($12,851,377) and in 1908 ($11,463,383). Up to 1905 the output of silver in the state was greater than that of copper. In the production of copper in 1908 Utah ranked fourth among the states. Most of the metal was produced in the Bingham, or West Mountain district, Salt Lake county, where there were four mines in 1908 with an output of more than 1,000,000 lb; the Tintic district in Juab county; the Frisco district in Beaver county; and the Lucin district

1 The 1907 and 1908 statistics are from the Mineral Resources of the United States, published by the United States Geological Survey.

in Boxelder county. In 1908 more than two-thirds of the total output was from the low-grade porphyry ores mined at New- house, Beaver county, and at Bingham, Salt Lake county. There are copper smelters at Garfield, Copperton and Binghamton. An anti-smoke injunction in 1908 closed the furnaces in. the immediate vicinity of Salt Lake City. The

production of copper in 1883 was 341,885 lb; in 1890, 1,006,636 ft; in 1895, 2,184,708 lb; in 1900, 18,354,726 lb; in 1904, 46,417,234 lb; in 1907, 64,256,884 lb; and in 1908, 81,843,812 lb. 2

Third in value (less than copper or silver) in 1908, but usually equalling silver in value, was the state's output of lead. The maxi- mum production, 125,342,836 ft, was in 1906; in 1908 the output was 88,777,498 ft (valued at $3,728,655)ˆ The decrease in output and value is largely due to the lower price of lead in the market and the higher smelting rate. In 1908 the following mines produced more than 5,000,000 ft each of lead: Silver King at Park City, the Colorado in the Tintic district, the Daly West and the Daly Judge in the Park City district, and the Old Jordan and the Tele- graph at Bingham, and there were fifteen other mines that pro- duced between 1,000,000 and 3,000,000 ft of lead.

Zinc has been produced in commercial quantities in Summit, Tooele and Beaver counties. In 1906 the output was 6,474,615 ft, valued at $394,952; in 1908 it was 1,460,554 ft, valued at $68,646, and almost the entire output was from Summit county.

The apparently inexhaustible supplies of iron ore in southern Utah, and especially in Iron county, had teen little worked up to 1910 on account of their inaccessibility. The beds of magnetite and hematite, in the southern portion of the Wasatch Mountains, are the largest in the western United States; in 1902 the four pro- ductive mines in Milford, Juab and Utah counties produced 16,240 tons of ore, valued at $27,417. There are valuable manganese deposits in the sandstone of the eastern plateau.

Coal was first discovered in Utah in 185 1 along Coal Creek near Cedar City (in what is now Iron county) in the south-western part of Utah, and there was some mining of coal at Wales, Sanpete county, as early as 1855, but there was no general mining until about twenty years later, and the industry was not well established until 1888. Thereafter its development was rapid, and the discovery of outcroppings throughout the central and southern parts of the state gave evidence of the existence of great bodies of the mineral. The only important region of coal mining in the state up to 1910 was in Carson county, where more than nine-tenths of the total output of the

state was mined in 1907 and in 1908. The production in 1870 was 5800 tons; in 1880, 14,748 tons (probably an under-estimate); in 1890, 318,159 tons; in 1900, 1,147,027 tons; in 1903, 1,681,409 tons; in 1907, 1,947,607 tons (the maximum); and in 1908, 1,846,792 tons. The total production from 1870 to 1908 was 20,683,974 tons, or allowing for coal lost, about 31,000,000 tons, which is estimated to represent 0-016% of the original supply. In 1909 the United States Geological _ Survey reported workable beds of coal aggregating 13,130 sq. m. in area, and 2000 sq. m. more in which it seemed probable that coal might be found. The shales of Utah, Sanpete, Juab and San Juan counties may furnish a valuable supply of petroleum if transportation facilities are improved; and there are rich supplies of asphalt — 19,033 tons (valued at $100,324) was the output for 1908.

Salt is obtained by solar evaporation chiefly of the waters of Great Salt Lake and other brine found in that vicinity; at Nephi City, Juab county; near Gunnison, Sanpete county; in Sevier and Millard counties, and at Withee Junction in Weber county. The value of this product in 1907 was $199,779 (345,557 bbls.), and in 1908, $169,833 (242,678 bbls.).

Of other non-metallic products, among' the most important were limestone — valued in 1902 at $186,663, and in 1908 at $253,088 — and sandstone — valued in 1902 at $105,011 and in 1908 at $25,097. Some marble is quarried at Beaver in Beaver county, and Utah onyx has been used for interior decoration, notably in the city and county building of Salt Lake City. The clay products of the state in the same year were valued at $658,517. There are con- siderable deposits of sulphur, of varying degrees of richness, near Black Rock in Beaver county. Many semi-precious and precious stones are found in Utah, including garnet (long sold to tourists by the Navaho Indians), amethyst, jasper, topaz, tourmaline, opal, variscite (or " Utahlite "), malachite, diopside and Smithsonite. In 1908 the reported value of precious stones from Utah was

$20,350.

Manufactures. — The manufacturing industry was long com-paratively unimportant, being largely for local markets. It is still largely dependent on local raw material. _ But, with the growth of the mineral industry and of the cultivation of sugar

beets, there was a remarkable growth in manufacturing between 1900 and 1905: the amount of capital increased from $13,219,039 to $26,004,011, or 96-7%; the average number of wage-earners from 5413 to 8052, or 48-8; and the value of factory products from $17,981,648 to $38,926,464, or 116-5%. I" tne period under

2 These statistics for 1904, 1907 and 1908 are from Mineral Re- sources of the United States for iqo8.

discussion, urban establishments (i.e. those in the two munici- palities — Salt Lake City and Ogden — having a population in 1900 of at least 8000), increased in number from 205 to 256 or 24-9%, and rural establishments decreased in number from 370 to 350 (5'4%)l the . capitalization of urban establishments increased from $4,212,972 to $7,700,750 (82-8%), and that of the rural from $9,006,067 to $18,303,361 (103-2%); the average number of wage- earners in urban establishments increased from 2832 to 3859 (36-3%), and those in rural establishments from 2581 to 4193 (62-5%); the value of the products of urban establishments increased from $5,521,140 to $10,541,040 (90-9%) and that of rural establishments from $12,460,508 to $28,385,424 (127-8%).. This unusual predominance of rural over urban manufacturing is further shown by the fact that in 1900, 64-3 % of the establishments report- ing, and 69-3 % of the value of their products were from factories classified as rural, and in 1905 the proportion of rural factories was 58-8%, and the value of their products 72-9% of the total. This predominance was largely • due to the smelting and refining industry, the smelters being chiefly in the rural districts.

The flour and grist mill industry was the most important in the state, with products valued at $1,659,223 in 1900, and $2,425,791 in 1905. The values of the products of other industries in 1900 and 1905, in the order of their importance, were as follows: Car and general shop construction and repairs by steam railway companies, in 1900, $1,306,591, and in 1905, $1,886,651 ; printing and publish- ing, in 1900, $770,848, and in 1905, $1,466,549; confectionery, in 1900, $403,379, and in 1905, $1,004,601; canning and preserving

fruit and vegetables in 1900, $300,349, and in 1905, $801,958. The value of the products of industries of lesser importance in 1905 were : slaughtering and meat packing (wholesale), $653,314; malt liquors, $636,688; and foundry and machine shop products, $587,484.

The beet sugar industry is one of growing importance in Utah ; there were in 1900 3 refineries, having a daily total capacity of 1 100 tons of beets; in 1905, 4, with a daily total capacity of 2850 tons; and in 1909, l 5, which treated 455,064 tons of beets and produced 48,884 tons of sugar. In 1853 a sugar factory bought in England was erected at Provo, but no sugar was manufactured there, and none was successfully refined until 1889. Sugar beets were first grown by irrigation in Utah ; under that system it becomes possible to estimate closely the tonnage of the product. Slicing stations established at distances of from 12 to 25 m. from a factory receive the beets, extract the juice and force it through pipes to the factory.

Transportation. — The first trade route to be established by white men within the present boundaries of Utah was the old Spanish trail from Santa Fe to Los Angeles. The trail entered what is now Utah, just east of the Dolores river, crossed the Grand river near the Sierra La Salle and the Green river at the present crossing of the Denver & Rio Grande railway, proceeded thence to the Sevier river and southward along its valley to the headwaters of the Virgin river, which it followed southward, and then westward, so that its line left the present state near its south-west corner. The presence of this and other trails to California was of great importance during the gold excitement of 1849, when many miners outfitted at Salt Lake City and the Mormons grew rich in this business. The first considerable railway enterprise in the territory was the Union Pacific, which was completed to Ogden in 1869. This system (which includes the Oregon Short line) has since been supplemented by the Denver & Rio Grande, the Southern Pacific, the San Pedro, Los Angeles & Salt Lake, and various connecting lines. The railway mileage in 1870 was 257 m. ; in 1890, 1265 m.;and in 1909, i962-87m.

Population. — The population in 1850 was 11,380; in i860, 40,273; in 1870, 86,786; in 1880, 143,963; in 1890, 207,905; in 1900, 276,749; and in 1910, 373,351. Of the population in 1900, 219,661 were native whites, 53,777, or 19-4%, were foreign- born, 2623 were Indians (of whom 1472

were not taxed), 672 were negroes, 572 were Chinese and 417 were Japanese. The reservation Indians in 1909 were chiefly members of the Uinta, Uncompahgre and White River Ute tribes on the Uinta Valley reservation (179,194 acres unallotted) in the north-eastern part of the state. 2 Of the 1900 native-born population 3870 were born in Illinois, 3032 in New York, 2525 in Ohio and 2519 in Pennsylvania. Of the foreign-born by far the largest number, 18,879, were natives of England, 9132 were Danes, 7025 were Swedes; and natives of Scotland, Germany, Wales and Nor- way were next in numbers. The large English immigration is to be ascribed to the successful proselytizing efforts of the Mormons in England. The same influence may be traced in the other immigration figures. There was, however, a relative

1 Year Book of the United States Department of Agriculture.

2 The Report of the commissioner of Indian Affairs for 1909 gives the following figures for the Indian population: under the Panguitch School, Kanab Kaibab, 81, Shivwitz Paiute, 118; under the Uinta and Puray Agency, Uinta Ute, 443, Uncompahgre Ute, 469, White River Ute, 296; not under agency, Paiute 370.

decrease in the number of foreign-born in the state from 1890 to 1900. Of the total 1900 population 169,473 were of foreign parentage (i.e. either one or both parents were foreign- born), and 42,735 were of English, 18,963 of Danish and 12,047 of Swedish parentage, both on the father's and on the mother's side. The Latter-Day Saints (Mormons) are far more numerous than any other sect, this church having a membership in 1906 of 151,525 (of these 493 were of the Reorganized Church of Jesus Christ of Latter-Day Saints) out of a total of 172,814 in all denominations; there were 479 members of this denomination to every 1000 of the population in the state, and the next largest sect, the Roman Catholics, had only 26 per 1000 of population and no Protestant body more than 6 per 1000. In the same year there were 8356 Roman Catholics, 1902 members of the Northern Presbyterian Church, 1537 members of the Northern Methodist Episcopal Church, 11 74 Congregationalists, and 987 Baptists (of the Northern Conference). The state in 1900 had 3-4 inhabitants to the sq. m. While this approached the average — 3-5 for all the states west of the Rocky Mountains taken together, with the exception of Colorado, which had 5-2 — it was noticeably

higher than that of its immediate neighbours, Idaho (1-9), Arizona (i-i) and Nevada (0-4). At the census of 1880 the density of the population was i-8 and in 1890 it was 2-6. From 1890 to 1900 the urban population (i.e. the population of places having 4000 inhabitants or more) increased from 69,456 to 81,480, or 17-3%, the urban population in 1900 being 29-4% of the total; the semi-urban population (i.e. population of incorporated places, or the approximate equivalent, having less than 4000 inhabitants) increased from 36,867 to 83,740, 71-1% of the total increase in population; while the rural population (i.e. population outside of incorporated places) increased from 104,456 to 111,529, 10-7% of the total increase. The principal cities of the state are: the capital, Salt Lake City, pop. (1910) 92,777; Ogden, 25,580; Provo, 8925; and Logan, 7522.

Administration. — The state is governed under the first constitution adopted on the 5th of November 1895, and amended in November 1900, November 1906, and November 1908. An amendment may be submitted to the people at the next general election by a two-thirds vote of the members elected to each house of the legislature, and only a majority of the electors voting thereon is required for approval. By a two-thirds majority the legislature may recommend that a constitutional convention be called; and if a majority of the electors at the next general election approve, the legislature shall provide for the convention, but the approval of a majority of the electors voting is necessary for ratification of the work of the convention. Article III., which guarantees religious freedom, forbids sectarian control of public schools, prohibits polygamy and defines the relation of the state to the public lands of the United States, is irrevocable except by consent of the United States. Every citizen of the United States, male or female, twenty-one years old or over, who has lived one year within the state, four months within the county and sixty days within the precinct has the right of suffrage, except that idiots, insane, and those convicted of treason or crime against the elective franchise are disfranchised; but in elections levying a special tax, creating indebtedness or increasing the rate of state taxation, only those who have paid a property tax during the preceding year may vote. A form of the Australian ballot with party columns is provided at public expense. As in so many of the newer Western states, the constitution specifies minutely many details which in the older instruments are left

to be fixed by statute. For example, the employment of women or of children under fourteen in mines and the leasing of convict labour by contract are for- bidden, and eight hours must constitute a day's work in state, county or municipal undertakings.

Executive. — The executive department consists of the governor, secretary of state, auditor, treasurer, attorney-general and superintendent of public instruction, all elected by the people at the time of the presidential election, and

holding office for four years from the first day of January following. All these officers must be qualified electors and must have resided within the state for five years preceding their election. The auditor and treasurer may not succeed them-selves, and governor and secretary of state must be at least thirty years old. The governor may call the legislature in extra-ordinary session or may summon the Senate alone. With the consent of the Senate he appoints all officers whose election or appointment is not otherwise provided for, including the bank examiner, state chemist, dairy and food commissioners, the boards of labour and health, the directors of the state institutions, &c, and fills all vacancies in elective offices until new officers are chosen and qualified. The governor, justices of the supreme court and the attorney-general constitute a board of pardons. The governor and other state officers form other boards, But the legislature is given power to establish special boards of directors. The veto of the governor, which extends to separate items in appropriation bills, can be over- come only by a two-thirds vote of each house of the legislature; but if the bill is not returned to the legislature, within five days it becomes a law without the governor's approval. The governor may not be elected to the United States Senate during his gubernatorial term.

Legislative. — The legislative power is vested in (1) the legis-lature, consisting of the Senate and House of Representatives, and (2) in the people of Utah. The legislature meets biennially on the second Monday in January of the odd-numbered years. No person is eligible to either house who is not a citizen of the United States, twenty-five years of age, a resident of the state

for three years and of the district from which he is chosen for one year. Senators are elected for four years, but one-half the membership of the Senate retires every two years. The representatives are elected for two years. No person who holds any office of profit or trust under the state or the United States is eligible to the legislature, and no member, during the term for which he was chosen, shall be appointed or elected to any office created, or the emoluments of which have been increased during his term. Each house is the judge of the election and qualification of its own members. The member- ship of each house is fixed by law every five years, but the number of senators must never exceed thirty, and the number of representatives must never be less than twice nor more than three times the number of senators. In 1909 the Senate had eighteen and the House forty-five members. The legislature is forbidden to pass any special act where a general law can be made applicable, and is specifically forbidden to pass special acts on a number of subjects, including divorce, the rate of interest, and the incorporation of cities, towns or villages, or the amendment of their charters, &c. Neither the state nor any political subdivision may lend its credit or subscribe to the stock of any private corporation. The powers of the houses are the same, except that the Senate confirms or rejects the governor's nominations and sits as an impeachment court, while the Representatives initiate impeachments. By an amendment of 1900, the legislature was instructed to provide that a fixed fraction of the voters might cause any law to be submitted to the people, or that they might require any legis- lative act (except one passed by a two-thirds vote of each house) to be so submitted before going into effect, but up to 1910 no law had been passed putting the amendment into force.

Judiciary. — The judicial power is vested in the Senate sitting as a court of impeachment, in the Supreme Court, the district courts, in justices of the peace, and in " such inferior courts as may be established by law." The Supreme Court is composed of three justices (but the number may be increased to five whenever the legislature shall deem it expedient) each of whom must be thirty years old, learned in the law, and a resident of the state for five years preceding his election. They are elected by the people for a term of six years, but the term of one expires every two years, and that justice who shall have the shortest time to serve acts as chief justice. The court has

original jurisdiction to issue writs of mandamus, certiorari,

prohibition, quo warranto and habeas corpus. Otherwise its jurisdiction is exclusively appellate, and every final decision of a district court is subject to review. The court holds three terms yearly in the capital. The state is divided into seven districts, in which from one to four judges are elected for terms of four years. They must be twenty-five years old, residents of the state for three years, and of the district in which they are chosen. They have original jurisdiction of civil, criminal and probate matters, not specifically assigned to other tribunals, and appellate jurisdiction from the inferior courts. At least three terms yearly must be held in each county. In cities of the second class (5000-30,000 inhabitants) municipal courts may be established. In cities of the first class (30,000 or more) a city court was established in i9or. Special juvenile courts may be established in cities of the first and second class. Each precinct elects a justice of the peace, who has civil jurisdiction when the debt or damage claimed does not exceed three hundred dollars, and has primary criminal jurisdiction.

Local Government. — The county is the unit of local government. The chief fiscal and police authority is the Board of County Com- missioners of three members, two elected every two years, one for two years and one for four. They create and alter subdivisions, levy taxes, care for the poor, construct, maintain and make regula- tions for roads and bridges, erect and care for public buildings, grant franchises, issue licences, supervise county officers, make and enforce proper police regulations (but the authority does not extend to incorporated towns or cities), and perform such other duties as may be authorized by law. Other county officers are the clerk (who is ex officio clerk of the district court and of the com- missioners), sheriff, treasurer, auditor, recorder, surveyor, assessor, attorney and superintendent of district schools, but where the assessed valuation of any county is less than $20,000,000 the clerk is ex officio auditor, and the commissioners may consolidate offices. The precincts are iaid off by the commissioners and each elects a justice of the peace and a constable. Cities are divided into classes (see above) according to population, and are governed by a mayor and a council. In cities of the first class fifteen, and of the second ten, councilmen are elected by wards, while in cities of the third class (all having less than 5000 inhabitants) five councilmen are elected on a general ticket.

Miscellaneous Laws. — Men and women may hold and dispose of property on the same terms, except that a husband cannot devise more than two-thirds of real estate away from his wife without her consent, and that a woman attains her majority at eighteen or when she marries. The property of an intestate leaving a widow or widower, but no issue, goes to the survivor if not over $5000 in value ; if over that amount, one-half the excess goes to the survivor and one-half to the father and mother of the deceased or to either of them. If neither father nor mother survives, their share goes to the brothers and sisters of the deceased or to their descendants. If there are no descendants, the whole goes to the surviving husband or wife. If a husband or wife and one child survive, they share the estate equally; if more than one child, the surviving husband or wife takes one-third and the children divide the remainder. If the intestate leaves issue but no husband or wife, the issue takes the whole. Failing all these, the estate goes to the next of kin. An illegitimate child is an heir of its mother and of the person who acknowledges himself to be its father. Estates exceeding $10,000 pay an inheritance tax of 5 % on the excess. A homestead not exceeding $1500 for the head of the family and $500 additional for the husband or wife and $250 additional for each other member of the family is not subject to execution except for the purchase price, or mechanic's and labourer's liens, lawful mortgage or taxes. The district courts have exclusive jurisdiction in divorce, which may be granted because of impotency at time of marriage, adultery, wilful desertion for more than one year, wilful neglect to provide the necessities of life, habitual drunkenness, conviction for felony, intolerable cruelty, and per- manent insanity which has existed for at least five years. An interlocutory decree is entered which becomes absolute at the end of six months, unless appeal is entered. The guilty party forfeits all rights acquired through marriage. Children over ten years of age may select the parent to whom they will attach themselves. A marriage may be annulled on ground of idiocy,, insanity, bigamy, loathsome disease at time of marriage, epilepsy, miscegenation (white and negro or white and Mongolian), or when a male is less than sixteen or a female less than fourteen years of age. A marriage licence is required. No female and no male under fourteen may work in a mine. Eight hours is the limit of a day's work in mines and smelters. A person sentenced to death may choose one of two methods of execution — hanging or shooting.

Education.— Before 1890 some districts in the state under a local option law had established free schools, but the general free school system was founded in 1890 by a law which consolidated all the districts in each city into one large school district and classified Salt Lake City as a city of the first class, and Ogden, Logan and

Provo as cities of the second class for school purposes; in 1908-9 six county school districts of the first class were formed. In 1892- 1893 text-books and supplies were first furnished free to pupils in the grades; and in the same year supervisory work was intro- duced. At the head of the public school system is a state superintendent of public instruction, elected for four years, and a board of education, composed of the state superintendent, the presi- dent of the state university, the president of the Agricultural College, and two appointees of the governor serving for four years. There is a county superintendent whose term is two years. And in each district there is a board of three trustees, one retiring each year. Two or more contiguous districts may unite to form a high school district. School attendance is compulsory for twenty weeks each year in rural districts and for thirty weeks each year in cities of the first and second class for all children between eight and sixteen years. In 1900 the percentage of illiterates at least ten years old was 3-1. In 1909 there were 685 public schools in the state ; the total number of pupils of school age (six to eighteen years) was 102,050, the number enrolled in the public schools was 84,804, and the average daily attendance was 66,774; the total number of teachers was 2255 (1645 women), and the average monthly salary of men teachers was $88-13 and of women $57-44; and the total expenditure for public education was $2,762,581 for the year, being more than twice as much as was expended by the state ten years before. The laws of the state provide for a commission, in cities and counties, for the retirement of public school teachers on a pension. The university of Utah at Salt Lake City was opened in 1850 as the state university of the " state of Deseret." The State Agricultural College and Experiment Station (1888) is at Logan. At Cedar City, in Iron county, is a branch normal school, connected with the state university. There is a state school for the deaf and the blind

(1884) at Ogden. The Art Institute at Salt Lake City has an annual art exhibit, a state art collec- tion, and a course of public lectures on art. There is a state com- mission which promotes the establishment of free libraries and gymnasiums. The Mormons control Brigham Young University (1876) at Provo, Brigham Young College (1878) at Logan, the Latter-day Saints University (1887) at Salt Lake City, and academies at Ogden, Ephraim, Castle Dale, Beaver and Vernal. Other denomina- tional schools are : St Mary's Academy (1875; Roman Catholic) in Salt Lake City; All Hallows College (1886; Roman Catholic) in Salt Lake City; Westminster- College (1897; Presbyterian) in Salt Lake City, and Presbyterian academies at Logan, Springville and Mt. Pleasant; Rowland Hall Academy (1880; Protestant Episcopal) for girls at Salt Lake City; and Gordon Academy (1870; Congre- gational) at Salt Lake City.

Charitable and Penal Institutions.— The state supports a Mental Hospital (1884, with provision for feeble-minded and non-insane epileptics since 1907) at Provo, a state Industrial School (1889) at Ogden and a state prison (1850) at Salt Lake City. Under a law of 1905, amended in 1907 and 1909, provision is made for separate juvenile courts in all districts in which there are cities of the first (Salt Lake City) or the second class (Ogden, Logan and Provo) with jurisdiction over children • under eighteen years of age; and similar jurisdiction is given to district courts elsewhere. In connexion with the juvenile court detention homes have been established, and in certain conditions justices of the peace are empowered to act as judges of the juvenile court in their respective precincts. There are many denominational charities, especially Mormon, the entire state being divided into ecclesiastical units or " stakes " for charity organization.

Finance. — The principal source of public revenue is the property tax. An amendment of 1908 provides for the taxation of mines and mining property. The state assumed the Territorial debt of $700,000, and has added to it a bonded indebtedness of $200,000; the bonds, formerly 5 %, have been refunded at 3! and 3 %. There were only private banks until 1872, when Brigham Young organized a national bank. The first savings bank was organized in 1873, and state banks now outnumber national banks. The banking business for many years was largely in the hands of high Mormon officials, and the loyalty of church members built up a remarkable financial

confidence, so that no Utah banks failed even in the panic of 1893.

History. — Existing documents seem to indicate that Francisco Vasquez de Coronado, the Spanish explorer, sent out an expedition of twelve men under Captain Garcia Lopez de Cardenas in 1540, which succeeded in reaching the Colorado river at a point now within the state of Utah. But more extended exploration was conducted by two Franciscan friars, Francisco Atanasio Dominguez and Silvestre Velez de Escalante, who, on the 29th of July 1776, left Santa F6 with seven others to discover a direct route to Monterey on the coast of Alta California. This party came in sight of Utah lake on the 23rd of August. Almost half a century later, in the winter of 1824-25, James Bridger, a trapper, discovered the Great Salt Lake while seeking the source of the Bear river. Many

trappers in their skin boats followed his lead, notably William H. Ashley, of the Rocky Mountain Fur Company, who, in 1825, at the head of about 120 men and a train of horses, left St Louis and established the fort named for him at Lake Utah. In 1843 General John C. Fremont with Kit Carson and three others explored the Great Salt Lake in a rubber boat. With Brigham Young and his little band of Mormon followers (between 140 and 150 members), who entered the Great Salt Lake Valley in July 1847, begins the story of settlement and civilization (see Mormons). Before the end of 1848 about 5000 Mormons had settled in the Salt Lake Valley. The treaty of Guadalupe Hidalgo (Feb. 2, 1848) ceded to the United States the vast western territory which included Utah. Early in 1849 the Mormon community was organized as the state of Deseret l with Brigham Young as governor. Deseret then comprised not only the present state of Utah but all Arizona and Nevada, together with parts of New Mexico, Colorado, Wyoming and California. Application was made to Congress to admit it as a state or Territory, and on the 9th of September 1850 the Territory of Utah, then comprising the present state and portions of Nevada, Colorado and Wyoming, was established under an Act, which provided that it should be admitted as a state, with or without slavery, as the constitution adopted at the time of admission prescribed. (See Compromise of 1850.) The Republican party and (less violently) the Democratic in their national platforms and in Congress attacked and opposed the Mormon institution of polygamy. Statehood, therefore, was not granted until the 4th of January 1896, owing to the*

apparent hostility of the Mormon authorities to non-Mormon settlers and to repeated clashes between the Mormon Church and the United States government regarding extent of control, polygamous practices, &c. And even after the admission of the state these questions arose in the matter of seating prominent Mormons who were elected to Congress. For a detailed account of these difficulties and of the growth of the " Gentile " or non-Mormon element see the article Mormons.

Through irrigation experiments agriculture became the industrial foundation of the desert community. The waters of City Creek were at first diverted and a canal was built; and the results were encouraging, though in the summer of 1848 crops were destroyed by a swarm of black crickets; but in turn this pest was devoured by sea-gulls, and the phrase " gulls and crickets " has become one of peculiar historic significance in Utah. After 1849 the gold-fever horde bound for California furnished a source of revenue to the Mormons, as their settlement afforded an admirable post for supplies.

The division of land among the Mormons was singularly equitable. Each city block consisted of 10 acres divided into eight i|-acre lots, which were assigned to professional and business men. Then a tier of 5-acre lots was apportioned to mechanics, and 10- and 20-acre parcels of land were given to farmers, according to the size of their families. As Great Salt Lake City grew all landholders benefited, either by the location of their property or because of its size, the smaller lots being closer to the business centre and the larger tracts being in the outlying districts.

In 1847 Brigham Young had succeeded Joseph Smith as president of the Mormons, and he held that position of veritable dictator until his death (1877); John Taylor succeeded him, and Wilford Woodruff in 1890 was chosen head of the organiza- tion; then Lorenzo Snow was president in 1898-1901, and Joseph Fielding Smith was elected in 1901.

From time to time the Indians have risen against the Mormons. Between 1857 and 1862 outbreaks were frequent, and on the 29th of January 1863 occurred the battle of Bear river, where some 300 Shoshones and Bannocks and about 200 of Colonel P. E. Connor's command participated in a bloody engagement. In April 1865 an Indian war broke out under the leadership of Blackhawk, which lasted intermittently until the end of 1867.

But in June 1865 treaties were concluded with the majority

1 According to the Book of Mormon, "Deseret" means "land of the working bee."

of Utah tribes, whereby they agreed to remove to Uinta Valley, where a reservation had been made for them. One other important reservation, the Uncompahgre, has also been opened for the Indians of the state.

The state has chosen Republican governors and, except in 1896, when it gave its electoral vote to W. J. Bryan, the Democratic candidate for the presidency, has voted for the Republican nominees in presidential elections.

Governors State of Deserel

Brigham Young 1 849-1 850

Territorial

Brigham Young 1 850-1 857

Alfred Cumming 1857-1861

John W. Dawson 1861

Frank Fuller (Acting Governor) . . . 1861-1862

Stephen S. Harding 1862-1863

James Duane Doty 1863-1865

Charles Durkee. 1 865-1869

Edwin Higgins (Acting Governor) . . . 1869-1870

S. A. Mann (Acting Governor) 1870

J. Wilson Schaffer 1870

Vernon H. Vaughan (Acting Governor) . . 1870-1871

George L. Woods 1871-1874

S. B. Axtell 1874-1875

George B. Emery 1875-1880

Eli H. Murray 1880-1886

Caleb W. West 1886-1889

Arthur L. Thomas 1889-1893

Caleb W. West 1893-1896

State Governors

Heber M. Wells (Republican) .... 1896-1905 John C. Cutler (Republican) .... 1905-1909 William Spry (Republican) 1909-

Bibi.iography. — On the physiography of Utah see Henry Gannett, Gazetteer of Utah (Washington, 1900), being Bulletin 166 of the U.S. Geological Survey; J. W. Powell, Geology of the Uinta Mountains (ibid., 1876), Exploration of the Colorado River of the Wes{ (ibid., 1875), and The Lands of Utah (ibid., 1879); W. M. Davis, " An Excursion to the Plateau Province of Utah and Arizona " and " The Mountain Ranges of the Great Basin," in vol. 42 (1903) of Bulletin of the Harvard Museum of Comparative Zoology; S. F. Emmons, " Uinta Mountains," in vol. 18 (1907) of the Bulletin of the Geological Society of America ; C. E. Dutton, The High Plateaus of Utah (Washington, 1880); and G. K. Gilbert, Lake Bonneville (ibid., 1890), Monograph I. of the U.S. Geological Survey. On mineral wealth see Nichols, Mineral Resources of Utah (Pitts- burg, 1873). For administration see James T. Hammond and Grant H. Smith (edd.), Compiled Laws of the State (Salt Lake City, 1908). The important titles for the history of the state are those given in the article Mormons, especially H. H. Bancroft, History of Utah (San Francisco, 1889), and O. F. Whitney, History of Utah (4 vols., Salt Lake City, 1892-98).

UTAMARO (1754-1806), one of the best known of the Japanese designers of colour-prints, was born at Kawayoye. His father was a well-known painter of the Kano School, Tori-yama Sekiyen (Toyofusa), a pupil of Kano Chikanobu; and Utamaro traced his descent from the old feudal clans of the Minamoto, whose war with the Taira family belongs to the

romantic period of Japanese history. Utamaro's personal name was Yusuke; and he first worked under the signature Toriyama Toyo-aki; but after a quarrel with his father substituted the name Kitagawa for the former appellation. His distinct style was the outcome of that of his father, tempered with the characteristics of the Kano school. As a painter, his landscapes and drawings of insects are most highly considered by Japanese critics; but his fame will always rest among Europeans on his designs for colour-prints, the subjects of which are almost entirely women — professional beauties and the like. These were done for the most part while he lived, in a sort of bondage, in the house of a publisher, Tsutaya Shigesaburo. His talents were wasted by an unbroken career of dissipation, culminating in a term of imprisonment for a pictorial libel on the shogun Iyenari, in 1804. From this he never recovered, and died on the third day of the fifth month, 1806. The colour-prints of Utamaro are distinguished by an extreme grace of line and of colour. His composition is superb; and even in his lifetime

he achieved such popularity among his contemporaries as to gain the title Ukiyo-ye Chuko-no-so, "great master of the Popular School." His work has a considerable reputation with the Dutch who visited Nagasaki, and was imported into Europe before the end of the 18th century. His book illustra- tions are also of great beauty. Three portraits of him are known: two colour-prints by himself, and one painting by Chobunsai Yeishi (in the collection of Mr Arthur Morrison). His prints were frequently copied by his contemporaries, especially by the first Toyokuni and by Shunsen; and many of those bearing his name are really the work of Koikawa Harumachi, who had been a fellow-student, and afterwards married his widow. That artist is known by the name of Utamaro II. Most of these imitations were made between 1808 and 1820. Utamaro II., who afterwards changed his name to Kitagawa Tetsugoro, died between 1830 and 1843.

See E. de Goncourt, Outamaro (1891); E. F. Strange, Japanese Illustration (1897) ; and Japanese Colour-Prints (Victoria and Albert Museum Handbook, 1904). (E. F. S.)

UTE, or Utah, a tribe of North American Indians of Sho- shonean stock. They originally ranged over central and western Colorado and north-eastern Utah. They were divided into five sub-tribes, all acknowledging the authority of one

chief. They were a wild warlike people, constantly fighting the Plain Indians and raiding as far south as New Mexico. Their relations with the whites have been generally friendly. The outbreak of the White River Band in 1879 is almost the only exception. They are now on reservations in Utah and Colorado, and number over 2000.

UTICA, a city of ancient Africa on the sinus Uticensis, 15 J m. N.W. of Carthage and Tunis, on the route from Carthage to Hippo Diarrhytus (Bizerta) and Hippo Regius (Bona). The modern marabout of Sidi Bu Shater, at the foot of Jebel Menzel el Gul, occupies the site of the ruins of Utica, which in ancient times stood at the mouth of the Bagradas (Mejerda). The mouth of the river is now 12 m. to the north, owing to alluvial deposits, and the level of the ancient town is covered with low- lying meadows, pools of water and marshes. The name Utica is of uncertain origin; the coins give the form :nx (Atag, Atig); it is therefore with justification that Movers, Tissot and other scholars have suggested a form Np'njj (Aliqa) meaning " the ancient " or " the magnificent," or Statio nautarum (Movers, Die Phonizier, ii. 2nd part, p. 512; Olshausen in Kheinisches Museum, 1853, p. 329; Tissot, Geogr. comp. de Vane. prov. d'Afrique, ii. p. 58). The Greeks transliterated the Punic name as 'Itvktj, OvtLkti, OirUa and the Romans by Utica. According to tradition, Utica was one of the oldest Phoenician settlements on the African coast, founded three centuries before Carthage. It soon acquired importance as a commercial centre, and was only partially eclipsed by Carthage itself, of which it was always jealous, though it had to submit to its authority. It is men- tioned in the commercial treaty of 348 B.C. between Rome and Carthage (Polyb. iii. 24). Agathocles easily captured it in his expedition to Africa in 310. It remained faithful to Caesar during the First Punic War (Polyb. i. 82), but soon withdrew its support in view of the revolt of the Mercenaries. In the Third Punic War it declared for the Romans (Livy, Epit. xlix.; Polyb. xxxvi. 1; Appian viii. 75). After the destruction of Carthage it received the rank of a civitas libera with an accession of territory (Appian viii. 135; C.I.L. i. 200; Caesar, De bell, civ. ii. 36; A. Audollent, Carthage romaine, p. 30). Having become the city of an administration of the new Roman province up to the time of the rebuilding of Carthage, it played an im- portant part in the wars at the end of the Republic. After the battle of Thapsus in 46 Cato shut himself up in Utica for the final struggle

against Caesar, and there committed suicide. Augustus gave the town the rank of municipium with full civic rights (Dio Cass. xlix. 16; Pliny, Hist. nat. v. 4, 24); its inhabitants were enrolled in the Quirinal tribe {municipium Julium Uticense). Under Hadrian it became a colonia romana, with the title Colonia Julia Aelia Hadriana Augusta Utica (Aul. Gell. Noct. Attic, xiii. 4; C.I.L. viii. n8r and 1183).

Septimius Severus conferred upon it the Ius Italicum {Digest.

50. 15; 8. 11).

We find evidence of the African Church at Utica as early as at Carthage; it was the seat of a bishop and had its martyrs from the 3rd century onwards. But its harbour was beginning to silt; the Sladiasmus Maris Magni (cxxvi.) states that already it was no longer a harbour but merely an anchorage. It was captured by Genseric and the Vandals in 439, reconquered by the Byzantines in 534, and finally, in 698, it fell into the hands of the Arabs and was depopulated. The last inhabitants were driven away by fever after the 8th century.

The ruins of the left bank of the Mejerda are often visited by travellers, but very little is left above the level of the ground. In 1869 A. Daux, the French engineer, explored them and made some important investigations. He was able to distinguish the fortifications, the acropolis, the quays of the commercial harbour and also of the military harbour or Cothon. Conjectural attempts have been made to identify the remains of large buildings with a temple of Apollo, the municipal Curia, the Arsenal and the Palace. The only certain identification, however, is that of the ruins of the amphitheatre, which was capable of holding 20,000 spectators, of the theatre, the baths, the reservoirs and the aqueduct which brought drinking water to the city. Subsequently there was found a Punic cemetery dating from the 5th century B.C. (Delattre, Comptes-rendus de I' Acad, des Inscrip. et Belles Lettres, 1906, p. 60). A number of coins have been found with Punic legends with the name Utica and heads of the Dioscuri Castor and Pollux. For the Roman period the coins have Latin legends and heads of Livia and Tiberius; they have also the names of the pro-consuls of

the African province and of the local Duumvirs.

Authorities. — Herisson, Relation d'une mission archeologique en Tunisie (1881); Sainte-Marie, Mission a Carthage (1884) ; Revue archeologique (1881 and 1882); A. Daux in Le Tour du Monde (1872) (views of the ruins); a mosaic of Utica is in the British Museum: Graeco-Roman Sculpture, ii. p. 86; A. Daux, Recherches sur I'origine et V emplacement des emporia pheniciens dans le Zeugis el le Byzacium (1869); Ch. Tissot, Geographic comparee de la pro- vince romaine d'Afrique (1888), ii. pp. 57 et seq. ; Lud. Miiller, Numis- matique de I'ancienne Afrique, ii. p. 159. (E. B.)*

UTICA, a city and the county-seat of Oneida county, New York, U.S.A., on the Mohawk river, about 45 m. E. of Syracuse and about 85 m. W. of Albany. Pop. (1890) 44,007; (1900) 56,383, of whom 13,470 were foreign-born, including 3696 Germans, 2458 Irish, 1661 Italians and 1165 Welsh; (1910, census) 74,419. Utica is served by the New York Central & Hudson River and several lines leased by it, including the Rome, Watertown & Ogdensburg; the Delaware, Lackawanna & Western; the New York, Ontario & Western; and the West Shore railways; by the Erie Canal, and by interurban electric railways. The city is situated on ground rising gradually from the river. There are many fine business and public buildings, especially on Genesee Street, the principal thorough- fare, and Utica is known for the number of its institutions, public and private. Those of an educational character include, in addition to the public schools and the Utica Free Academy, the New School (for girls) and the Utica Catholic Academy. Among the libraries are included the Public Library (1893) with 54,000 volumes in 1909, the library of the Oneida Historical Society (which occupies the Munson- Williams Memorial Building) , the Utica Law Library and the Deutscher Leserverein. The city is the seat of a State Hospital for the Insane (1843). Among its many charitable institutions are a Masonic Home and School (1893), a Home for the Homeless (1867), St Elizabeth's Home (1886), St Luke.'s Home (1869), a Home, for Aged Men and Couples (1879), Utica Orphan Asylum (1830), St Joseph's Infant Home (1893) and St John's Female Orphan Asylum (1834), both under the Sisters of Charity; the House of the Good Shepherd (1872; Protestant Episcopal); and the General (1873: City of Utica), Homeopathic (1895), St Luke's (1869; supported by the Protestant Episcopal Churches), St Elizabeth's (1866;- Sisters of the Third Order of St Francis) and Faxton

(1873) hospitals. Among the public buildings are a Federal building,

the city hall, the County Court House, a Y.M.C.A. building, a Masonic Temple, an Odd-Fellows' Temple and a State Armoury and Arsenal. The city has a number of fine parks. In Forest Hill Cemetery are the graves of Horatio Seymour and Roscoe Conkling. On West Canada creek, about 15 m. N. of Utica, are Trenton Falls, which descend 312 ft. in 2 m., through a sandstone chasm, in a series of cataracts, some of them having an 80 ft. fall. From the geological formation here the name Trenton is applied to the upper series of the Ordovician (or Lower Silurian) system, and, particularly, to the lowest stage of this series.

Utica has varied and extensive manufactures. In 1905 the capital invested in manufacturing industries was $21,184,033, and the total value of the factory products was $22,880,317, an increase of 38-8% since 1900. Of this product, hosiery and knit goods, with a total value of $5,261,166, comprised 23% of all, and, cotton goods ($4,287,658), 18-7%. The hosiery and knit goods constituted 3-9% of the total value of that product of the entire country. Other important products were: men's clothing ($2,943,214); foundry and machine- shop products ($1,607,258); steam fittings and heating ap- paratus ($1,010,755); rnalt liquors ($933,278); and lumber products ($869,000). Among the other manufactures are food preparations, wooden ware, wagons and carriages, stoves and furnaces, boots and shoes, tobacco and cigars, flour, candy, gloves, bricks, tile and pottery, furniture, paper boxes and firearms. Utica is a shipping point for the products of a fertile agricultural region, from which are exported dairy products (especially cheese), nursery products, flowers (especially roses), small fruits and vegetables, honey and hops.

The territory on which Utica was built was part of the 22,000-acre tract granted in 1734 by George II. to William Cosby (c. 1695-1736), colonial governor of New York in 1732-36, and to his associates, and it was known as Cosby's Manor. During the Seven Years' War a palisaded fort was erected on the south bank of the Mohawk at the ford where Utica later sprung up. It was named Fort Schuyler, in honour of Colonel Peter Schuyler, an uncle of General Philip Schuyler. A fort subsequently built at Rome also was at first called Fort Schuyler (and afterwards Fort Stanwix), and the fort at Utica was then distinguished

from it by the prefix " old " and it was as " Old Fort Schuyler " that Utica was first known. The most used trade route to the western country crossed the Mohawk here. In default of payment of arrears of rent Cosby's Manor was sold at sheriff's sale in 1792 and was bid in by General Philip Schuyler, General John Bradstreet, John Morin Scott and others for £1387, or about 15 cents an acre. Soon after the close of the War of Inde- pendence a settlement was begun, most of the newcomers being Palatine Germans from the lower Mohawk. In 1786 the pro- prietors had the manor surveyed. An inn was erected in 1788, and new settlers, largely New Englanders, began to arrive. Among these, in 1789, was Peter Smith (1768-1837), later a partner of John Jacob Astor, and father of Gerrit Smith, who was born here in 1797. In 1792 a bridge was built across the Mohawk. In 1797 Oneida county was established, and the village was incorporated under the name of Utica. The first newspaper, the Gazette, began publication in the same year, and the first church, Trinity (Protestant Episcopal), was built. The Erie Canal, completed in 1825, added to Utica's prosperity. Utica was chartered as a city in 1832.

See Pomroy Jones, Annals and Recollections of Oneida County (Rome, N.Y., 1851); M. M. Bagg, Pioneers of Utica (Utica, 1877); Outline History of Utica and Vicinity (Utica, 1900) ; and the publica- tions of the Oneida Historical Society (Utica, 1881 sqq.).

UTILITARIANISM (Lat. ulilis, useful), the form of ethical doctrine which teaches that conduct is morally good according as it promotes the greatest happiness of the greatest number of people. The term " utilitarian " was put into currency by J. S. Mill, who noticed it in a novel of Gait; but it was first suggested by Bentham. The development of the doctrine has been the most characteristic and important contribution of British thinkers to philosophical speculation. While British philosophizing up to a recent date has been notably lacking in

width of metaphysical outlook, it has taken a very high place in its handling of the more practical problems of conduct. This is due in part, no doubt, to national character; but in the main, probably, to religious and political freedom, and the habit of

discussing philosophical questions with regard to their bearing upon matters of religious and political controversy. The British moralists who wrote with political prepossessions are interesting, not merely as contributors to speculation, but as exponents of spiritual tendencies which were expressed practically in the political agitations of their times.

The history of utilitarianism (if we may use the term for the earlier history of a philosophic tendency which appeared long before the invention of the term) falls into three divisions, which may be termed theological, political and evolutional respec- tively. Hobbes, when he laid it down that the state of nature is a state of war, and that civil organization is the source of all moral laws, was under the influence of two great aversions, political anarchy and religious domination. It is in a clerical work written to refute Hobbes, Bishop Cumberland's De Legibus Naturae (pub. in 1672), that we find the beginnings of utili- tarianism. Hobbes's conception of the state of nature ante- cedent to civil organization as a state of war and moral anarchy was obviously very offensive to churchmen. Their interest was to show that the gospel precept of universal benevolence, which owes nothing to civil enactment, was both agreeable to nature and conducive to happiness. Cumberland, therefore, lays it down that " The greatest possible benevolence of every rational agent towards all the rest constitutes the happiest state of each and all. Accordingly common good will be the supreme law "; and this supreme and all-inclusive law is essentially a law of nature. This important principle was developed by Cumberland with much originality and vigour. But his handling of it is clumsy and confused; and he does not make it sufficiently clear why the law of nature should be obeyed. He does, however, lay much stress upon the naturally social character of man; and this points forward to that treatment of morality as a function of the social organism which characterizes modern ethical theory. The further development of theological utilitarianism was conditioned by opposition to the Moral Sense doctrine of Shaftesbury and Hutcheson. Both these writers, more particularly the latter, had postulated in controverting Hobbes the existence of a moral sense to explain the fact that we approve benevolent actions, done either by ourselves or by others, which bring no advantage to ourselves. There was a general feeling that the advocates of the moral sense claimed too much for human nature and that they assumed a degree of unselfishness and a natural inclination

towards virtue which by no means corresponded with the hard facts. The fire of human enthusiasm burnt low in the 18th century, and theologians shared the general conviction that self-interest was the ruling principle of men's conduct. Moral sense seemed to them a subjective affair, dangerous to the interests of religion. For, if the ultimate ground of obligation lay in a refined sensi- tiveness to differences between right and wrong, what should be said to a man who might affirm that, just as he had no ear for music, he was insensitive to ethical differences commonly recognized? Moreover, if mere sense were sufficient to direct our conduct, what need had we for religion? Such considera- tions prevailed where we might least expect to find them, in the mind of the idealist Berkeley. And it was another clergy- man, John Gay, who in a dissertation prefixed to Law's trans- lation of Archbishop King's Origin of Evil (pub. in 1731) made the ablest and most concise statement of this form of doctrine. What he says comes to this: that virtue is benevolence, and that benevolence is incumbent upon each individual, because it leads to his individual happiness. Happiness arises from the rewards of virtue. The mundane rewards of virtue are very great, but need to be reinforced by the favour or disfavour of God. Further advances along the same line of thought were made by Abraham Tucker in his Light of Nature Pursued (pub. 1768-74). Gay and Tucker supplied nearly all the important ideas of Paley's Principles of Moral and Political Philosophy

(pub. in 1785), in which theological utilitarianism is summarized and comes to a close. Paley, though an excellent expositor and full of common sense, had the usual defect of common-sense people in philosophy — that of tame acquiescence in the pre- judices of his age. His two most famous definitions are that of virtue as " the doing good to mankind, in obedience to the will of God and for the sake of everlasting happiness," and that of obligation as being " urged by a violent motive resulting from the command of another": both of which bring home to us acutely the limitations of 18th-century philosophizing in general and of theological utilitarianism in particular. Before we proceed to the next period of utilitarian theory we ought to go back to notice Hume's Inquiry concerning the Principles of Morals (pub. in 1751), which though utilitarian is very far from being theological. Hume, taking for granted that bene- volence is the supreme virtue, points out that the essence of benevolence is to

increase the happiness of others. Thus he establishes the principle of utility. " Personal merit," he says, " consists entirely in the usefulness or agreeableness of qualities to the person himself possessed of them, or to others, who have any intercourse with him." This is plain enough; what re- mains doubtful is the reason why we approve of these qualities in another man which are useful or agreeable to others. Hume raises the question explicitly, but answers that here is an ultimate principle beyond which we cannot hope to penetrate. For this reason Hume is sometimes classed as a moral-sense philosopher rather than as a utilitarian. From his point of view, however, the distinction was not important. His purpose was to defend what may be called a humanist position in moral philosophy; that is, to show that morality was not an affair of mysterious innate principles, or abstract relations, or super-natural sanctions, but depended on the familiar conditions of personal and social welfare.

The rise of political utilitarianism illustrates most strik- ingly the way in which the value and dignity of philosophical principles depends on the purpose to which they are applied. Abstractly considered, Bentham's interpretation of human nature was not more exalted than Paley's. Like Paley, he regards men as moved entirely by pleasure and pain, and omits from the list of pleasures most of those which to well- natured men make life really worth living: and he treats all pleasures as homogeneous in character so that they can be measured into equal and equally desirable lots. But his purpose was the exalted one of effecting reforms in the laws and constitution of his country. He took up the greatest happiness principle not as an attractive philosopheme, but as a criterion to distinguish good laws from bad. Sir John Bowring tells us that when Bentham was casting about for such a criterion " he met with Hume's Essays and found in them what he sought. This was the principle of utility, or, as he subsequently expressed it with more precision, the doctrine that the only test of goodness of moral precepts or legislative enactments is their tendency to promote the greatest possible happiness of the greatest possible number." These opinions are developed in his Principles of Morals and Legislation (pub. in 1789) and in the Deontology (published posthumously in 1834). Philosophically Bentham makes but little advance upon the theological utilitarians. His table of springs of actions shows the same mean-spirited omissions that we notice in his pre- decessors; he measures the

quantity of pleasures by the coarsest and most mechanical tests; and he sets up general pleasure as the criterion of moral goodness. It makes no considerable difference that he looked for the moral sanction not to God but to the state: men, in his scheme, are to be induced to obey the rules of the common good by legally ordained penalties and rewards. He never faced the question how a man is to be induced to act morally in cases where these governmental sanctions could be evaded or did not exist in the particular state in which a man chanced to find himself. These principles of Bentham were the inspiration of that most important school of practical English thinkers, the Philosophic Radicals of the early 19th century; these were the principles on which they

relied in those attacks upon legal and political abuses. From Bentham the- leadership in utilitarianism passed to James Mill, who made no characteristic addition to its doctrine, and from him to John Stuart Mill. John Mill wrote no elaborate treatise on the subject. But he did something better than this. His essay Utilitarianism (pub. in 1863) sums up in brief and perfect form the essential principles of his doctrine, and is a little masterpiece worthy to be set beside Kant's Metaphysic of Morals as an authoritative statement of one of the two main forms of modern ethical speculation. Though in its abstract statement John Mill's doctrine may not differ very greatly from that of his predecessors, actually there is a vast change. To say that pleasure is the moral end is a merely formal state- ment: it makes all the difference what experiences you regard as pleasant and which pleasures you regard as the most important. Mill belonged to a generation in which the most remarkable feature was the growth of sympathy. He puts far greater stress than his predecessors upon the sympathetic pleasures, and thus quite avoids that appearance of mean prudential selfishness that is such a depressing feature in Paley and Bentham. Moreover, it is in sympathy that he finds the obligation and sanction of morality. " Morality," he says, " consists in conscientious shrinking from the violation of moral rules; and the basis of this conscientious sentiment is the social feelings of mankind; the desire to be in unity with our fellow-creatures, which is already a powerful principle in human nature, and happily one of those which tend to become

stronger from the influences of advancing civilization." Such passages in Mill have their full significance only when we take them in connexion with that rising tide of humanitarian sentiment which made itself felt in all the literature and in all the practical activity of his time. The other notable feature of John Mill's doctrine is his distinction of value between pleasures: some pleasures, those of the mind, are higher and more valuable than others, those of the body. It is commonly said that in making this distinction Mill has practically given up utilitarianism, because he has applied to pleasure (alleged to be the supreme criterion) a further criterion which is not pleasure. But the validity of this criticism may fairly be questioned. Pleasure is nothing objective and objectively measurable: it is simply feeling pleased. The merest pleasure-lover may consistently say that he prefers a single glass of good champagne to several bottles of cooking-sherry; the slight but delicate experience of the single glass of good wine may fairly be regarded as preferable to the more massive but coarser experience of the large quantity of bad wine. So also Mill is justified in preferring a scene of Shakespeare or an hour's conversation with a friend to a great mass of lower pleasure. The last writer who, though not a political utilitarian, may be regarded as belonging to the school of Mill is Henry Sidgwick, whose elaborate Methods of Ethics (1874) may be regarded as closing this line of thought. His theory is a sort of reconciliation of utilitarianism with intuitionism, a position which he reached by studying Mill in combination with Kant and Butler. .His reconciliation amounts to this, that the rule of conduct is to aim at universal happiness, but that we recognize the reasonableness of this rule by an intuition which cannot be further explained.

Even before the appearance of Sidgwick's book utilitarianism had entered upon its third or evolutional phase, in which principles borrowed from biological science make their entrance into moral philosophy. The main doctrine of evolutional or biological ethics is stated with admirable clearness in the third chapter of Darwin's Descent of Man (pub. in 1871). The novelty of his treatment, as he says, consists in the fact that, unlike any previous moralist, he approached the subject " exclusively from the side of natural history." Theological and political utilitarianism alike had been individualistic. But Darwin shows how the moral sense or conscience may be regarded as derived from the social

instincts, which are common to men and animals. To understand the genesis of human morality we must study the ways of sociable animals

such as horses and monkeys, which give each other assistance in trouble, feel mutual affection and sympathy, and experience pleasure in doing actions that benefit the society to which they belong. Both in animals and in human societies individuals of this character, being conducive to social welfare, are encouraged by natural selection: they and their society tend to flourish, while unsociable individuals tend to disappear and to destroy the society to which they belong. Thus, in man, do sentiments of love and mutual sympathy become instinctive and, when transmitted by inheritance, innate. When man has advanced so far as to be sensitive to the opinions of his fellow-men, their approbation and disapprobation rein- force the influence of natural selection. When he has reached the stage of reflection there arises what we know as conscience. He will approve or disapprove of himself according as his conduct has fulfilled the conditions of social welfare. " Thus the imperious word ought seems merely to imply the conscious- ness of a persistent instinct, either innate or partly acquired, serving as a guide, though liable to be disobeyed."

The most famous of the systematic exponents of evolutional utilitarianism is, of course, Herbert Spencer, in whose Data of Ethics (1879) the facts of morality are viewed in relation with his vast conception of the total process of cosmic evolution. He shows how morality can be viewed physically, as evolving from an indefinite incoherent homogeneity to a definite, coherent heterogeneity; biologically, as evolving from a less to a more complete performance of vital functions, so that the perfectly moral man is one whose life is physiologically perfect and there- fore perfectly pleasant; psychologically, as evolving from a state in which sensations are more potent than ideas (so that the future is sacrificed to the present) to a state in which ideas are more potent than sensations (so that a greater but distant pleasure is preferred to a less but present pleasure); sociologic- ally, as evolving from approval of war and warlike sentiments to approval of the sentiments appropriate to international peace and to an industrial organization of society. The sentiment of obligation Spencer regards as essentially transitory; when a man reaches a condition of perfect adjustment, he will always do what is right without any sense of being obliged to it. The best feature of the Data of

Ethics is its anti-ascetic vindication of pleasure as man's natural guide to what is physiologically healthy and morally good. For the rest, Spencer's doctrine is valuable more as stimulating to thought by its originality and width of view than as offering direct solutions of ethical problems. Following up the same line of thought, Leslie Stephen with less brilliance but more attention to scientific method has worked out in his Science of Ethics (1882) the conception of morality as a function of the social organism: ■while Professor S. Alexander in his Moral Order and Progress (pub. in 1889) has applied the prin- ciples of natural competition and natural selection to explain the struggle of ideals against each other within society: moral evil, says Professor Alexander, is in great part a defeated variety of moral ideal. There is no doubt that much remains still to be done in illustrating human morality by the facts and principles of biology and natural history. A. Sutherland's Origin and Growth of the Moral Instinct (pub. in 1898) is a capable piece of work in this direction. Professor L. T. Hobhouse's Morals in Evolution and Professor Westermarck's Origin and Development of the Moral Ideas (both published in 1906) deal with the matter from the side of anthropology.

See E. Albee's History of English Utilitarianism (1902), a complete and painstaking survey. Leslie Stephen's English Utilitarians (pub. in 1900) deals elaborately with Bentham and the Mills, but more as social and political reformers than as theoretic moralists. See also Ethics. (H. St.)

UTMAN KHEL, a Pathan tribe who occupy the hills to the north of Peshawar in the North- West Frontier Province of India. Their country lies between the Mohmands and the Ranizais of Swat, to the west and south-west of the junction of the Swat and Panjkora rivers. They claim to be descendants of Baba Utman, who accompanied Mahmud of Ghazni in his expedition into India in 997. The Utman Khel are a tall,

stout and fair race, but in their dress and general customs have assimilated themselves to the neighbouring peoples of Bajour. They have none of the vices of the Yusafzais. Their country- is very hilly and difficult, but well cultivated in terraces. They

number some 40,000, and their fighting strength, is about 8000 men. British expeditions were necessary against them in 1852, 1878 and 1898.

UTOPIA, an ideal commonwealth, or an imaginary country whose inhabitants are supposed to exist under the most perfect conditions possible. Hence the terms Utopia and Utopian are also used to denote any visionary scheme of reform or social theory, especially those which fail to recognize defects inherent in human nature. The word first occurs in Sir Thomas More's Utopia, which was originally published in Latin under the title De Optimo Reipublicae Statu, deque Nova Insula Utopia (Louvain, 1516). It was compounded by More (g.v.) from the Greek oil, not, and tottos, a place, meaning therefore a place which has no real existence, an imaginary country.

The idea of a Utopia is, even in literature, far older than More's romance; it appears in the Timaeus of Plato and is fully developed in his Republic. The idealized description of Sparta in Plutarch's life of Lycurgus belongs to the same class of literary Utopias, though it professes to be historical. A similar idea also occurs in legends of world-wide currency, the best known of these being the Greek, and the medieval Norse, Celtic and Arab legends which describe an earthly Paradise in the Western or Atlantic Ocean (see Atlantis). Few of these survived after the exploration of the Atlantic by Columbus, Vasco da Gama and others in the 15th century; but in literature More's Utopia set a new fashion. An ideal state of society is described in the writings of Hobbes, Sir Robert Filmer and J. J. Rousseau. In Bacon's New Atlantis (1624-29) science is the key to universal happiness; Tommaso Campanella's Civitas Solis (1623) portrays a communistic society, and is largely inspired by the Republic of Plato; James Harrington's Oceana (1656), which had a profound influence upon political thought in America, is a practical treatise rather than a romance, and is founded on the ideas that property, especially in land, is the basis of political power, and that the executive should only be controlled for a short period by the same man or men. Bernard de Mandeville's Fable of the Bees is unique in that it describes the downfall of an ideal commonwealth. Other Utopias are the " Voyage en Salente " in Fenelon's Tttemaque (1699); Etienne Cabet's Voyage en Icarie (1840); Bulwer Lytton's The Coming Race (1871); Samuel Butler's Erewhon (1872) and Erewhon Revisited (1901); Edward Bellamy's Looking Backward (1888); William Morris's News from Nowhere (1890); H. G.

Weill's Anticipations (1901), A Modern Utopia (1905) and New Worlds for Old (1908). Many Utopias, such as the Fable of the Bees and Erewhon, are designed to satirize existing social conditions as well as to depict a more perfect civilization. There are separate articles on all the authors mentioned above. A large number of the more recent Utopias have been inspired by socialistic or communistic ideals; among these may be mentioned Freiland, ein soziales Zukunftsbild (1890) and Reise nach Freiland (1893), by the Austrian political economist Theodor Hertzka (b. Budapest, 1845), which portray an imaginary communistic colony in Central Africa.

UTRECHT, a town of northern Natal, 30 m. by rail E. by N. of Newcastle. Pop. (1904) 1315. It is the chief place in a district of the same name, originally settled in 1848 by emigrant Boers from Natal. They formed an independent community and in 1854 obtained, in exchange for a hundred head of cattle, formal cession of the territory from Panda, the Zulu king. In 1858 the district was united with the republic of Lydenburg, and in i860, with Lydenburg, became part of the South African Republic. In 1903 it was, with the neighbouring district of Vryheid, annexed to Natal. The town of Utrecht is built in a hollow among the foothills of the Drakensberg. In the neighbourhood are extensive coal-fields.

UTRECHT, the smallest province of Holland, bounded S. by Gelderland and South Holland, W. by South Holland, N. by North Holland and the Zuider Zee and E. by Gelderland. It has an area of 534 sq. m. and a pop. (1905) of 276,543. It belongs chiefly to the basin of the Rhine; the Lower Rhine, which skirts its southern border, after sending off the Crooked Rhine at Wijk, becomes the Lek, and the Crooked Rhine in its turn, after sending off the Vecht at Utrecht to the Zuider Zee, becomes the Old Rhine. The north-eastern portion of the province is drained by the Eem, which falls into the Zuider Zee. The watershed between the Rhine and the Eem is formed by

a plateau of sand and gravel hills which extend from the south-east corner on the Rhine to Zeist near Utrecht, and also northwards to Huizen on the Zuider Zee. On its western side the plateau declines into the clay lands (and in the north-west low fen) which characterize the western half of the province. The region of sand and gravel is covered with bare heaths and patches of woods, and the occupations of the scanty population

are chiefly those of buckwheat cultivation and peat-digging, as in Drente. Amersfoort is here the only town of any size, but along the western edge of this tract there is a row of thriv- ing villages, namely, Amerongen, Leersum, Doom, Driebergen and Zeist. Bunschoten on the Zuider Zee is a fishing village; Venendaal, on the south-eastern border, originally a fen-colony, is now a market for the bee-keeping industry in the east. On account of the picturesqueness of this part of the province, many country houses and villa residences are found scattered about it. The western half of the province is flat and often below sea-level. Cattle-rearing and the making of cheese (of the Gouda description) and butter are here the chief occu-pations. Agriculture is practised along the Crooked Rhine, wheat, barley, beans and peas being the chief products, and there is considerable fruit-farming in the south-west. The development of towns, however, has here been restricted by the rise of Utrecht, the chief town of the province, as a com-mercial centre. A number of small old towns are found along the Rhine, the Lek and the Holland Ysel, such as Rhenen (or Reenen), Wyk-by-Duurstede, Yselstein, Montfoort. Rhenen was once the seat of an independent lordship, though after- wards joined to the bishopric of Utrecht. The ancient church has a fine tower (1492-1531). Wyk-by-Duurstede, originally a Roman settlement, was of some commercial importance as early as the 7th and 8th centuries, but decayed owing to Norman raids in the 10th century. The ruined castle of the bishops of Utrecht still remains. The lordship of Yselstein can be traced back to the younger brother of Gysbrecht IV. of Amstel, who bought lands and built a castle here before 1279. In the beginning of the next century it had grown to the size of a small town and was granted civic rights and surrounded with walls, and in the course of the following centuries was frequently attacked and even devastated. About 1377 Ystelstein de- scended to the house of Egmont, and in 1551 to the house of Orange, and by paying an annual contribution to the United Provinces remained an independent barony till 1795. The remains of the castle are picturesque. Montfoort owes its origin to a castle built by the bishop of Rhenen in 11 70, which was frequently besieged in the 14th and 15th centuries. In 1833 it was bought by the government, and now serves as a reformatory, for women. Vreeland on the Vecht has a similar origin in the castle built by Bishop Hendrik of Vianen in 1253-59 as a protection to the province against the lords of Amstel. The castle was demolished in 1529 when the province

came under Burgundian rule. The province is traversed by the main railway lines, which all converge at Utrecht, and is also amply provided with navigable waterways.

The province represents the bulk of the territories once comprised in the ancient prince-bishopric of the same name, het Sticht (the see) of Dutch historians. The see was founded in 722 by St Willibrord, and the diocese thus formed, saving for a short time when it was an archbishopric, was subordinate to the see of Cologne. It covered all the northern Netherlands between the Scheldt and the Ems. The bishops, in fact, as the result of grants of immunities by a succession of German kings, and notably by the Saxon and Franconian emperors, gradually became the temporal rulers of a dominion as great as the neighbouring counties and duchies. Bishop Balderic (918-76) successfully defended the see against the Northmen, and received from the emperor Otto I. the right to coin money and all the land between the Leek and the Zuider Zee. The bishopric was weak, however, as compared with the neighbouring states, Holland, Gelderland and Brabant, from the mere fact of its ecclesiastical character. The bishop had no hereditary or dynastic interest in his land, and, as a temporal ruler, his

powers were limited by the necessity of having to secure the goodwill of the higher clergy, of the nobles and of the cities, and also because of his relations to the German king and the pope as an ecclesiastical prince of the empire. The middle ages were marked by constant wars between the bishops of Utrecht and the counts of Holland and Gelderland. The growth of the power of Holland, however, under a succession of strong and capable rulers led to the bishopric becoming, during the 14th century, almost a dependency of the county. The death of every bishop was always the signal for violent disputes among the neighbouring feudal states, each of them intriguing to secure the election of its own candidate; but, as stated above, Brabant and Gelderland had at last to recognize the fact of the supremacy of Holland over the see. In the 15th century this supremacy passed to the dukes of Burgundy, and finally, in 1527, Bishop Henry of Bavaria sold his temporal rights to the emperor Charles V. In 1559 the see of Utrecht was by Pope Paul IV. raised to the dignity of an archbishopric. At the time

of the revolt against Spain Utrecht took the Protestant side, and was one of the seven provinces which signed the Union of Utrecht in 1579. Each of these provinces retained in a large measure its sovereign rights and its own laws, privi- leges and customs. During the republican period the estates of Utrecht consisted of three " members." The chapter of the see was secularized, and out of the members of the five colleges a certain number, known as " the Elected " (Geeligerden) , were chosen by the other two " members " of the estates. They held office for life, and were reckoned as the " first member " of the estates. The knights formed the " second member," the re-presentatives being chosen by co-option. The city of Utrecht, with the four smaller towns of Amersfoort, Rheenen, Wijk-by-Duurstede and Montfoort, made up the " third member."

(G. E.)

The later history of the see of Utrecht is of considerable ecclesiastical interest. The last archbishop of Utrecht, Frederick van Schenk van Toutenburg, died in 1580, a few months before the suppression of Roman Catholic public worship by William of Orange. Two successors were nominated by Spain, both of whom were unable from political causes to take possession of the see. In 1583 the chapter elected Sasbold Vosmeer, Catholic priest at the Hague, vicar-general; the election was confirmed in 1590 by the papal nuncio at Brussels, and in 1602 Vosmeer was consecrated at Rome archbishop of Philippi in partibus. After Vosmeer's death (161 2) Philip Rovenius van Ardensul was elected by the chapter and confirmed by the pope. In 1 63 1 he formed the surviving members of the chapters of Utrecht and Haarlem into a collegiate body which became known as the chapter of Utrecht. Rovenius was succeeded as vicar-general in 1651 by Jacob de la Torre, consecrated as archbishop of Ephesus. Under his vicariate trouble with Rome began, the pope insisting on his right as universal bishop to appoint the vicar-general's coadjutor and successor. It was not, however, until the vicariate of Peter Codde, consecrated vicar-general with the title of bishop of Sebaste in partibus in 1669, that the quarrel came to a head. Codde was the nominee of the Dutch secular clergy, and these had for years past been at violent odds with the Jesuits, the champions of the ultramontane principle. The publication of an anonymous pamphlet in 1697, entitled " A Short Memoir on the State and Progress of Jansenism in Holland " (Kort gendenkschrift van den staat en voortgang van

het Jansenisme in Holland), gave the latter their opportunity. Codde was accused of being its author, and though he successfully refuted this charge, he was ultimately deposed for Jansenism (r702), his opponent, Theodor de Kock, being appointed in his place. The result was a schism which was only temporarily checked by the expulsion of de Kock from the country by the states- general. Codde himself died in 1710. The Church of Utrecht was now without a bishop, and it was believed at Rome that the movement of revolt would soon perish for want of priests, especially as, with the constant influx of regulars, the number of Codde's adherents had steadily decreased. As a result of

the publication of the bull Unigenitus by Pope Clement VII. in 1 7 13, however, many French Jansenist priests took refuge in Holland, and so kept the church alive. In 1723 the chapter of Utrecht, in order to preserve the canonical succession of the Dutch clergy, elected Cornelius Steenoven archbishop. He was consecrated (15th October 1724) by Dominique Varlet, bishop of Babylon in partibus, who, having been deposed by the pope for Jansenism, had settled in Amsterdam in 1720. The pope replied to this by excommunicating all those who had taken part in the election and consecration. Undeterred by this, the chapter, on the death of Steenoven, elected as arch- bishop Cornelis Jan Burchman, who was consecrated by the bishop of Babylon on the 30th of September 1725. From this time onward the Jansenist Church of Holland has continued as an independent body, accepting the authority of the general councils, up to and including that of Trent, but. basing itself on the Gallican theory of Episcopacy (q.v.) and rejecting the Vatican council, the infallibility of the pope and the papal dogma of the Immaculate Conception. Under Archbishop Peter Jan Meindaerts (d. 1767) two suffragan sees were created, that of Haarlem in 1742, that of Deventer in 1757. The Church had shrunk considerably since the 18th century, but in the first decade of the 20th showed signs of revival as a point d'appui for Catholics restive under the yoke of the ultramontanism dominant in the Roman Church. With the Church of Utrecht the Old Catholic movement in Germany at first established close relations, the first German Old Catholic bishop, Dr Reinkens, being consecrated by H. Heykamp, bishop of Deventer, in 1873. The Jansenist Church is, however, intensely conservative, and viewed with extreme disapproval the departures made by the German Old Catholics from

Catholic tradition, notably in the matter of clerical celibacy. It refused, moreover, to recognize the validity of Anglican orders, and consequently to follow the example of the other Old Catholics in establishing intercommunion with the Church of England. This attitude towards the English Church was accentuated by the consecration, on the 28th of April 1908, of Mr Arnold Harris Mathew 1 as bishop of the Old Catholics in England by Dr Gerard Gul, Jansenist archbishop of Utrecht. The singular offshoot of the Church of Utrecht thus created established its headquarters in a former Congregational chapel (dedicated significantly to the Englishman St Willibrord, the first bishop of Utrecht) in River Street, London, N., the minister of which had joined the movement with his congregation. In 1910 Bishop Mathew claimed that his community numbered between 500 and 600, with ten priests, and that he had had many inquiries from both Roman Catholic priests, discontented with the Vatican policy, and Anglican clergy, uneasy about the validity of their orders (see an " interview " in the Daily Graphic, September 4, 1910). Meanwhile, in Holland itself the Roman Catholic hierarchy had been restored by Pope Pius IX. in 1851, with Utrecht as the archiepiscopal see. (W. A. P.)

Authorities. — K. Burmen, Utrechlsche Jaarboeken, &c, annals and documents (3 vols., 1750); A. Buchelius, De Episcopis Ultra- jectensibus, containing the chronicles of J. de Beka and G. Heda (Utrecht, 1643); J. van d. Water, Groot Placaetboek der Stadt Utrecht (3 vols., Utrecht, 1729); J. J. de Geer, Bijdragen tot de Geschied. en Oudheiden der Provincie Utrecht (Utrecht, 1861) ; T. van Riemsdijk, Geschied. van de Kerspelkerk van St Jacob te Utrecht (Leiden, 1882); S. Muller, Openbare verzamelingen der Gemeente Utrecht (Utrecht, 1881); V. T. Blondeel, Beschrijving der Stad Utrecht, de opvolging der Bischoppen (Utrecht, 1757); S. Muller, Rechtsbronnen der Stad Utrecht (2 vols., Utrecht, 1883); R, Fruin, Geschied. der Staats-Instellingen in Nederland (the_ Hague, 1901). For the Old Catholic Church see the article "Jansenistenkirche," by Dr J. A. Gerth van Wijk, in Herzog-Hauck, Realencyklopadie (3rd ed., Leipzig, 1900), pp. 599-606, where further references are given.

UTRECHT, a city of Holland, capital of the province of Utrecht, on the Crooked Rhine, which here divides into the

1 Bishop Mathew (b. 1855) about the year 1892 claimed and

for a while assumed the title of earl of Llandaff (sic), as grandson of Arnold Nesbit Mathew (d. 1820), who was said to have been the eldest son of the first earl of Llandaff, though neither he nor his eldest son ever claimed the title (see G. E. C(okayne)), Complete Peerage; corrigenda to vol. v. in vol. viii. p. 450). :

Old Rhine and the Vecht. Pop. (1905) 114,321. It is an important junction station 22 m. by rail S.S.E. of Amsterdam. Tramways connect it with Vreeswyk on the Lek (where are the large locks of the Merwede canal), Amsterdam, and by way of De Bilt with Zeist, and thence with Arnhem. It is a picturesque and interesting old town with more regular streets and shady squares and fewer canals than most Dutch towns. It is an important fortress, forming the principal point d'appui of the line of defensive inundations called the " New Holland Water Line," in addition to its position as a railway centre. The defences consist of an inner line of works which preserve the place against surprise, and of an outlying chain of detached forts of fairly modern construction, forming roughly two-thirds of a circle of three miles radius. Of these the works facing the east would in war time cover the assembly of troops destined to operate outside the Water Line, while those of the north and south fronts would be surrounded by inundations and serve chiefly to control the sluices. The line of the ancient ramparts, demolished in 1830, is now only marked by the Singel, or outer canal, which surrounds the oldest part of the city, with pleasant gardens and promenades laid out on the inside. Two canals, the Oude and the Nieuwe Gracht, intersect the town from end to end. On the Oude Gracht the roadway and quay are on different levels, the roadway lying over vaults, which open on the quay wall and are used as cellars and poor dwelling-houses. On the east of the town is the Maliebaan or Mall, consisting of an ancient triple avenue of lime trees, now largely replanted. Utrecht is the seat of a university, and of a Roman Catholic archbishopric. It is also the seat of the archbishop of the Dutch Old Catholics. The Domkerk, dedicated to St Martin, the former cathedral church of the bishops of Utrecht, is a large Gothic building, erected in 12 54-1 267 on the site of the original church founded by St Willibrord about 720 and completed by Bishop Adelbold about

1015. An open space forming the heart of the square in which the church stands separates the solitary western tower (14th century) from the choir and transept, the nave having been blown down by a violent hurricane in 1674 and never rebuilt. The interior (30 ft. wide and 115 ft. high) has been clumsily fitted up with pews and galleries for Protestant worship, so that the effect of its slender columns is spoilt. It contains the monuments of Admiral van Gent (d. 1672) and of Bishops Guy of Hainaut (d. 1317) and George of Egmont (d. 1559), while in the crypt are preserved the hearts of the German emperors Conrad II. (1039) and Henry V. (1125). The Roman Catholic cathedral of St Catherine dates from 1524 and has been restored in modern times. Other churches of very early foundation in Utrecht are the Pieterskerk and the Janskerk. Attached Lo the Domkerk by fine old Gothic cloisters is the university, which was founded in 1634 and enlarged in 1894. The students number some 750, and there are five faculties of theology, law, medicine, mathematics and science, and letters. The aula (restored in 1879) was originally the chapter-house of the cathedral. Connected with the university are a valuable library, occupying the palace built for Louis Bonaparte, king of Holland, in 1807 and containing upwards of 200,000 volumes ind MSS.; a museum of natural history; an ophthalmic institute; physical and chemical laboratories; a veterinary school; a botanic garden; and an observatory. The archi-episcopal museum (1872) contains examples of all branches of sacred art in the Netherlands. In the Museum Kunstliefde is a small picture-gallery, chiefly remarkable for some pictures by Jan Scorel (1495-1562); the museum of antiquities contains a miscellaneous collection. Other buildings of interest are the museum of industrial art; the so-called " Pope's house," built in 1517 by Adrian Floriszoon Boeyens, afterwards Pope Adrian VI., and a native of Utrecht; the royal mint of Holland; the Fleshers' Hall (1637); the home for the aged, occupying a 14th-century mansion; the town hall (1830); and the large hospital prison and barracks. The most important industrial establish- ments are cigar manufactories, manufactories of chemicals and earthenware, and brass foundries, and there is also an active trade in the agricultural produce of the surrounding country.*

The country round about Utrecht is pretty and plentifully studded with country houses, especially on the road to Arnhem. Close by, on the north-east, is the village of De Bilt,

the seat of the Dutch Meteorological Institute. In this parish was formerly situated the famous Benedictine convent of Oostbroek, founded in the beginning of the 12th century. The abbey was demolished in 1850. The manor of Zuilen on the Vecht, four miles north-west of Utrecht, was partly held in fief from this abbey and partly from the bishops of Utrecht. The lords of Zuilen grew very powerful and built a castle here at the end of the 13th century. In 1302 this possession passed by marriage to the influential family of van Borsele, lords of Veere and governors of Zeeland. But on the extinction of that house towards the end of the 15th century the castle passed through various hands until it came by marriage in 1665 to the family of Baron van Tuyll van Serooskerke. The castle was carefully restored in 1752, and is still in excellent preservation. Five miles east of Utrecht is the village of Zeist, the seat of a Moravian settlement established here in 1746. There are also a fine castle (1667) and grounds, a sanatorium for children and numerous modern villa residences. At Ryzenburg, close by, is a Roman Catholic seminary, founded in connexion with the establishment of the Roman Catholic hierarchy in 1853 and practically serving as an archiepiscopal palace.

Utrecht (i.e. Oude Treckt or Old Ford, rendered in Latin documents Vetus Trajectum) is a city of great antiquity and much his- toric interest, especially as illustrating the growth of civic liberties during the middle ages. The place existed in Roman times and is mentioned in the itinerary of Antoninus. Though the name Trecht or Trajectum is almost universally found in old documents and on coins, the town was known by another name among the Frisians and Franks. Bede, writing in the 8th century, speaks of Wiltaburg, id est oppidum WUtorum, lingua autem Gallica Trajectum vocatur. That any such people as the Wilten existed there is little evidence, but Wiltaburg (or variants of it) occurs in chronicles as late as the 1 2th century, and it is still preserved in the name Wildenburg, given to a Roman camp near the city.

The earliest authentic record of the town is that of the building of a chapel — afterwards destroyed by the heathen Frisians — by Dagobert I., king of the Franks, in 636; but the importance of the place began when St Willibrord (q.v.), the apostle of the Frisians, established his see there. This fact determined the development of the city. The bishop's seat had to be fortified against the incur- sions of the heathen Frisians and Northmen,

and the security thus afforded attracted population till, after the destruction of its rival Dorestad by the Normans in the 9th century, Utrecht became the chief commercial centre of the northern Netherlands. Bishop Balderic (a.d. 918-976) was the real founder of the prosperity of the town. On his accession to the see Utrecht had just been sacked by the Northmen. He succeeded in driving the raiders away, rebuilt the walls, and during the fifty-eight years of his episcopate the town grew and prospered. Its gradual acquisition of civic rights followed the same line of development as in the German episcopal cities. At first the bishop, holding immediately of the Empire, was supreme. In feudal subordination to him a royal count, who was also Vogt (advocatus) of the cathedral church of St Martin, had his seat at Utrecht as the chief town of the Gouw (Gau, pagus) of Ifterlake. In the nth century a burgrave (chatelain, castellanus) , who was an episcopal officer, is found exercising jurisdiction in the city as well as the Vogt. Bishop Godebald (1122-1127) granted to the inhabitants of Utrecht and of Muiden, the neighbouring port on the Zuider Zee, their first privileges, which were confirmed on the 22nd of June 1 122 by the emperor Henry V., who died at Utrecht in 1 125. The extant imperial charter does not specify what were the municipal rights that were conceded, but it is certain that at this time they were very limited. The magistrates, the Schout or high bailiff and his assessors, the Schepenen {scabini, echevins), were nominated by the burgrave from the order of knights. In 1 196 we read for the first time of councillors (consules, consiliarii, adjurati) as assessors of the magis-trates, but these, who a little later were known as the Raad or council, were also nominated. The position was simplified when, in 1220, Albert van Cuyck, the last of the hereditary burgraves, sold his rights to the bishop. These ecclesiastical princes were churchmen in little but name, and their desire to be absolute rulers found itself confronted by the determination of the burghers to secure greater independence. As the 13th century advanced, the council, repre- senting the wealthy and powerful gild of merchants, began to take a larger share in the government, and to restrict more and more the direct exercise of the episcopal authority. Of the rise of the craft gilds in Utrecht there is no record. They appear suddenly as fully developed organized corporations, able to impose their will upon bishop and aristocracy. All through the 13th century a continual struggle went on, but at last the gilds were victorious and were able

to secure in the Gildebrief of 1304, confirmed by the bishop in 1305, a new constitution for the city. According to this, as emended by a later Gildebrief of 1347, tne ex ‘ stm S board of seven Schepenen were to retain office for life, but the new ones, elected yearly, were in future to be chosen by the Raad either in or outside the gilds. The Raad itself was to be chosen by the aldermen of the gilds. Two aldermen, later styled burgomasters, were to preside, the one over the Schepenen, the other over the Raad, sharing this presidency with two episcopal officials. The Schout was still to be nominated by the bishop from among the knights, but his powers were now comparatively insignificant. The two chief aldermen of the gilds, with the two episcopal official presidents above mentioned, together were to form the supreme government of the city. The victory of the democratic principle was entirely new in the Netherlands, though it had been anticipated in Florence, and was perhaps inspired by Italian example. In all other cities of the Netherlands the craft gilds remained in humble subjection to a council co-opted from a limited number of wealthy patrician families. In Utrecht, however, power was henceforth concentrated in the gilds, which became not only trade but political associations, which together constituted the sovereign community. In this government, though the Schepenen retained a dignified precedence, all power was practically concen- trated in the popularly elected Raad, even the estates of the see (Sticht) had ” nothing to say in the city.”

The new liberties, as might be expected, did not tend to improve the relations between the town of Utrecht and its ecclesiastical sovereign; and the feud reached its climax (1481-84) in the ” groote vorlag,” or great quarrel, between the citizens and Bishop David, the Bastard of Burgundy, who had been foisted upon the unwilling chapter by the combined pressure of Duke Philip of Burgundy, his half-brother, and the pope. With the aid of John, burgrave of Montfoort, who had been called in, after the manner of the Italian podestas, and endowed with supreme power for the defence of the town, the Utrechters defeated all the efforts of their bishop, aided by the Hollanders and an aristocratic faction. They only succumbed when the weight of the archduke Maximilian was thrown into the scale against them (1484). Even then Bishop David was

once more expelled in 1491. The last prince-bishop of Utrecht was Henry of Bavaria, who was elected, in May 1524, in succession to Philip of Burgundy. He took the part of the nobles against the burghers, but Duke Charles of Gelderland, jealous of the growing power of the house of Habsburg, intervened, put an end to the strife, and, in 1527, himself occupied the city. In July of the next year Bishop Henry was back again, having gained possession of the city by surprise; and in the following October he sold, his temporal rights to the emperor Charles V. Utrecht, thus brought into immediate relations with the Spanish Habsburgs, proved no more tolerant of their rule than of that of its bishops, and took a leading part in the revolt of the Netherlands. The union of the seven northern provinces, proclaimed at Utrecht in 1579, laid the foundation of Dutch independence (see Netherlands). The city proved indeed a refractory member of the new league; and, after the death of William the Silent, the Utrechters, jealous of the influence of their old enemies the Hollanders, refused to recognize the authority of the council of state, and elected a stadtholder of their own. Inside the city the old aristocratic and democratic factions still carried on their traditional struggle, complicated now by religious difficulties. The Roman Catholics, though still in the majority in the bishopric, had little influence on the politics of the city, where the aristocrats inclined to the moderate (libertine) opinions advocated by the preacher Hubrecht Duifhuis, while the democrats were organized in the new church order introduced by the uncompromising Calvinist Petrus Dathenus (d. 1581). The adhesion of Utrecht to the party of revolt was the work of the aristocratic party, and the critical state of affairs made it for a while dominant in the town. The gilds and burgher militia were deprived of all voice in the government, and the town council became an hereditary body. After the advent of the earl of Leicester as governor-general of the Netherlands in 1585, a change took place. The ultra-Calvinistic Adolph, count of Nuenar, who was elected stadtholder,overthrew the aristocratic government and placed the people in power. The Utrechters, under the leader- ship of Gerard Prouninek, otherwise Deventer, vehemently took the side of Leicester in his quarrel with the estates of Holland, and the English governor-general made the town his headquarters during residence in the Netherlands, and took it under English protection. Though heartily disliked in Holland, Leicester made himself so popular in Utrecht that the burgher guard even presented him with a

petition that he would assume the sovereignty. The withdrawal of Leicester from the Netherlands was followed by the defeat of Deventer and the return of the aristocratic party to power. The issue was decided (October 5, 1558) when the democrats were defeated in battle. Deventer was imprisoned and banished, and the former Schout, Nicolas van Zuylen van Sevender, was restored to office. An attempt of the democratic party to regain power was temporarily successful (January 10, 1610) ; but the estates appealed to the States General and Maurice of Nassau, who had been appointed stadtholder on the death of Nuenar, put down the movement with a strong hand, and the Utrechters found themselves compelled to yield. From this time, until the French Revolution, the ancient

democratic institutions of the city remained nothing but a name ; the rights of the community were exercised by a municipal aristo- cracy, who held all power in their own hands. The gilds, once supreme, henceforth ceased to have any political importance. At Utrecht the treaty which closed the War of the Spanish Succession was signed on the nth of April 1713. (G. E.)

Authorities. — Pieter Bondam, Charterboek der Hertogen van Gelderland, fife, orig. documents with notes (1783); Codex diplo- matics Neerlandicus, tome i. (Utrecht, 1848) — the documents of the first part concern the trade of Utrecht; De Geer van Oudegain, Het oude Trecht (1875); W. Junghans, "Utrecht im Mittelalter " (in Forschungen zur deutsch. Gesch. ix. 513-526); Laurent P. C. van Bergh, Handboek der Middel Nederlandsche Geographie (Leiden, 1852); Karl Hegel, Stadte der Germanischen Vblker im Mittelalter (Leipzig, 1891), vol. ii. pp. 291-300. Other works are cited in the bibliography to the article on the see and province of Utrecht, above.

UTRECHT, TREATY OF, the general name given to the im- portant series of treaties which in 17 13 and 17 14 concluded the great European war of the Spanish Succession (q.v.), and by which inter alia England obtained possession of Newfoundland, Nova Scotia and Gibraltar.

Worsted, mainly through the genius of Marlborough, in his efforts to secure the whole of the great Spanish monarchy for his grandson, Philip, duke of Anjou, Louis XIV. made overtures for peace in 1706 and again in 1709. These were rejected, and failure also attended the negotiations between France and the

United Provinces which took place at Gertruydenberg in 17 10, negotiations only entered upon by the Dutch after they had by a treaty with England (October 1709) secured a guarantee that they would obtain the coveted barrier of fortresses against France. But matters changed greatly during 1710 and 1711. In England in August and September 17 10, the Tories, the party of peace, succeeded the Whigs, the party of war and the inheritors of the tradition of William III., in the conduct of affairs. In the Empire in April 1711, the archduke Charles, Philip's rival for the throne of Spain, succeeded his brother Joseph I. as ruler of Austria and became prospective emperor, and England and the United Provinces, having waged a long and costly war to prevent the union of the crowns of France and Spain, were equally averse from seeing Spain and Austria under the same ruler. Moreover, the allies realized at last that it was impossible to dislodge Philip from Spain, and all the peoples were groaning- under the expenses and the sufferings of the war. France and England came to terms, and the preliminaries of peace were signed in London in October 1711, their basis being a tacit acquiescence in the partition of the Spanish monarchy.

The congress opened at Utrecht on the 29th of January 1712, the English representatives 'being John Robinson, bishop of Bristol, and Thomas Wentworth, earl of Strafford. Reluctantly the United Provinces accepted the preliminaries and sent representatives, but the emperor refused to do so until he was assured that these preliminaries were not binding. This assurance was given, and in February the imperial representatives made their appearance. As Philip was not yet recognized, as king, Spain did not at first send plenipotentiaries, but the duke of Savoy sent one, and Portugal was also represented.

One of the first questions discussed was the nature of the guarantees to be given by France and Spain that these crowns would be kept separate, and matters did not make much progress until after the 10th of July 1712, when Philip signed a renunciation. Then, England and France having concluded a truce, the pace was quickened and the main treaties were signed on the nth of April 1713.

By the treaty between England and France Louis XIV. recognized the Protestant succession in England and undertook to give no further aid to the Stuarts. France ceded to England

Newfoundland, Nova Scotia or Acadia, the island of St Kitts or St Christopher, and the Hudson's Bay Territory (" sinum et fretum de Hudson, una cum omnibus terris, maribus, maritimis, fluviis, locisque, in dicto sinu et freto sitis "), and promised to demolish the fortifications of Dunkirk and to fill up its harbour. A commercial treaty signed between the two countries on the same day provided that each should allow the other the most favoured nation treatment, while each gave up the claim to

the indiscriminate seizure of shipping which had been practised during the war.

The treaty between France and the United Provinces was mainly concerned with securing the barrier of fortresses. These arrangements were somewhat complicated and to a large extent provisional, as Austria and Bavaria, two countries which were deeply interested in the fate of the Netherlands, had not yet assented to the terms of peace. By a commercial treaty con- cluded on the same day, France gave to the Dutch commercial privileges similar to those enjoyed by England. Other treaties concluded at the same time were between France and Savoy, France and Prussia, and France and Portugal. By the first the duke of Savoy regained Savoy and Nice, taken from him during the war, and France undertook to obtain for him the island of Sicily and the title of king. By the second Prussia secured some small additions of territory, including part of Gelderland and Neuchatel; in return France definitely and finally obtained the principality of Orange. It is interesting to note that as a constituent of the Empire Prussia was still fighting against France. The treaty between France and Portugal mainly concerned the Portuguese settlements in Brazil, her claim to these being recognized by France.

Other treaties were signed at Utrecht between Spain and the allies, Philip now concluding these as the recognized and lawful king of Spain. On the 13th of July 1713 a treaty was signed between England and Spain, which embodied certain com- mercial arrangements previously made between the two countries. Spain ceded to England Gibraltar and Minorca and promised to give up Sicily to Savoy. She gave also to England

the monopoly for thirty years of the lucrative slave trade with Spanish America, hitherto enjoyed by France: this was the famous Asiento treaty. Finally, there was an article concerning the inhabitants of Catalonia, who had fought bravely for Charles of Austria, and who had a large claim upon the protection of England. However, the protection granted to them was a mere sham, and the Catalans were soon the victims of the revenge of Philip of Spain. The peace between Spain and the United Provinces was signed on the 26th of June 17 14, but the conclusion of the one between Spain and Portugal was delayed until the following February. The former was concerned mainly with commercial matters, Spain giving the United Provinces the treatment of a most favoured nation, except as regards Spanish America. The latter dealt with the frontier between the two countries and with the colony of St Sacrament in Uruguay, which was transferred to Spain.

The treaty of Utrecht also provided some compensation for the emperor Charles VI. as soon as he surrendered his claim to Spain. It was arranged that he should receive Naples and Milan, and also the Spanish Netherlands, henceforward known as the Austrian Netherlands.

But the general pacification was still incomplete, as France and the Empire continued the war, albeit somewhat languidly. It was not long, however, before Charles VI. realized how inadequate were his forces, unsupported by those of England and of Holland, to meet the armies of France, and towards the close of 1 7 13 he was for the first time seriously inclined to consider conditions of peace. Accordingly, his representative, Prince Eugene, met the French marshal Villars at Rastatt in November 1 713, and here, after negotiations had been broken off and again resumed, peace was made on the 7th of March 17 14, Charles VI. concluding the treaty without waiting for the assent of the different states of the Empire. This consent, however, was necessary, and a little later the representatives of some of the princes of the Empire met those of France at Baden, where, on the 7th of September 1714, the treaty of Baden, the last of the treaties included in the general peace of Utrecht, was signed. This dealt entirely with the question of the frontier between France and the Empire, which was restored as it was before the outbreak of the war except that France gained Landau.

One important matter dealt with at Utrecht remains to be

mentioned. A second barrier treaty between England and the United Provinces was signed on the 30th of January 17 13,

*and a third treaty signed at Antwerp on the 15th of November 1 7 1 S clinched the matter. Seven fortresses were to be garrisoned by a total of 3*5,000 men, three-fifths of the cost being borne by the imperial government and the remainder by the United Provinces.*

The treaty of Utrecht is second to none in importance in English history. Its provisions were a most potent factor in assisting the expansion of England's colonial empire and also in the building up of the country's commercial greatness. In the domestic politics of the 18th century, too, the peace has a great and recurring importance. Its terms were bitterly assailed by the Whigs, and after the accession of George I. four of its Tory authors, Bolingbroke, Oxford, Ormonde and Strafford, were impeached for concluding it, the charges brought against them being that they had corresponded with the queen's enemies and had betrayed the honour and interest of their own country, while the abandonment of the Catalans was not forgotten.

The text of the treaty of Utrecht is published as the Actes, mimoires et autres pihces authentiques concernant la paix d' Utrecht (Utrecht, 1714-1715); and by C. W. von Koch and F. Scholl in the Histoire abregee des traites (1817-1818). As far as it concerns the party politics of England, there is much about the peace in Dean Swift's works. See also C. Giraud, La Paix a" Utrecht (Paris, 1847); I. S. Leadam, Political History of England 1702-1760 (1909) ; A. W. Ward in the Cambridge Modern History, vol. v. (1908), and the State Trials for the proceedings against the impeached English ministers. But perhaps the most valuable work on the whole peace is O. Weber's Der Friede von Utrecht. Verhandlungen zwischen England, Frank- reich, dem Kaiser und den Generalstaaten 1710-1713 (Gotha, 1891).

(A. W. H.)*

UTRERA, a town of southern Spain, in the province of Seville; on the Arroyo de la Antigua, a right-hand tributary of the river Guadalquivir, and at the junction of the Seville- Cadiz and Cordova-Utrera railways. Pop. (1900) 15,138. Utrera contains few noteworthy buildings, although it is an ancient

town, still partly surrounded by medieval fortifications. The principal church, Santa Maria, is Gothic in style, dates from the 15th century, and contains some interesting tombs; but it was to a great extent restored in the 1 7th century. Agriculture and especially stock-farming are foremost among the local industries, which also include manufactures of leather, soap, oil and spirits. Large numbers of horses, sheep and fighting bulls are bred in the moorlands and marshes which extend eastward towards the Gaudalquivir, and a fair is held yearly in September for the sale of live stock and farm produce. Utrera was occupied by the Moors in the 8th century, anct, though retaken by St Ferdinand (1230-52), was not finally incorporated in the kingdom of Castile until 1340. In the middle ages it was notorious as a favourite refuge of brigands and outlaws.

UTTARPARA, a town of British India, in the Hugh district of Bengal, on the river Hugh. Pop. (1901) 7036. It is famous for the public library founded and endowed by Jai Krishna Mukharji, which is specially rich in books on local topography. There is an aided college, and a girls' school supported by a native association.

UTTOXETER, a market town in the Burton parliamentary division of Staffordshire, England, 15 m. N.E. by E. of Stafford by a branch of the Great Northern railway. Pop. of urban district (1901) 5133. It is also served by the North Staffordshire railway. The town lies pleasantly on high ground near the river Dove, a western tributary of the Trent, here the boundary with Derbyshire. There are large works for the manufacture of agricultural implements, and brewing and brick-making are carried on. Several agricultural fairs are held annually. The church of St Mary has a fine decorated tower and spire; the rest of the fabric dates from 1828. Alleyn's grammar-school was founded in 1558. In the market-place here Dr Johnson stood hatless in the rain doing voluntary penance for disobedience to his father. A bas-relief com- memorates the incident. The name of the town is locally Uxeter, or an approximate pronunciation. At Denstone, 5 m. N. of Uttoxeter, is St Chad's College, a large middle-class school for boys, founded in connexion with St Nicholas' College, Lancing.

Uttoxeter (Wolocheshede, Ullokeshather, Utcester, Uttoxater) was probably not a Roman site, although the termination of the name suggests one, and a few remains have teen discovered. It formed part of the estates of Algar, earl of Mercia; at the time of the Domesday Survey it was held by the king; later it passed to the Ferrers family and was included in the honour of Tutbury. In the early 1 2th century Earl Robert de Ferrers constituted Uttoxeter a free borough, and granted to the inhabitants freedom from all tolls, tonnage, poundage and other exactions. These privileges were confirmed and amplified by a charter, dated August 15, 1251, from William de Ferrers, earl of Derby. Uttoxeter, with the rest of the honour of Tutbury, escheated to the Crown in 1 266 owing to the complicity of Robert Ferrers in the barons' rebellion; it was regranted to Edmund Crouchback, ancestor of the dukes of Lancaster, under whom it became part of the duchy of Lancaster, from which it was not severed until 1625. The Wednesday market, which is still held, was granted by Henry III. to William Ferrers, earl of Derby, together with a fair to be held on the feast of the Nativity of the Blessed Virgin (September 8), which was kept up in the 18th century. In 1308 Thomas, earl of Lancaster, obtained the grant of a fair on the vigil, day and morrow of St Mary Magdalene. In Leland's time " the men of the town used grazing " in the " wonderful pastures upon Dove," and in the 17th and 18th centuries the market was the greatest in that part of England for cattle and provisions; in the 18th century it furnished cheeses to many London cheesemongers. In 1648, on the defeat of the invading Scottish army under the marquis of Hamilton by Cromwell, its leader was captured here by Lambert.

UXBRIDGE, a market town in the Uxbridge parliamentary division of Middlesex, England, 18 m. W. by N. of St Paul's Cathedral, London, on the river Colne, and on branches of the Great Western and Metropolitan railways. Pop. of urban district (1001), 8585. There are breweries, foundries and engineering works, and a considerable traffic is carried on by means of the Grand Junction Canal. The town, which is connected by electric tramway with Hammersmith, London, has extended considerably in modern times as a residential centre. The church of St Margaret is Perpendicular, and retains a fine font in that style, and several ancient monuments.

Uxbridge is an ancient borough, stated to have been one of those originated by Alfred the Great, but it is not mentioned in

Domesday. Here negotiations were begun, on the 30th of January 1645, between the commissioners of Charles I. and the parliament, but were broken off on the 22nd of February. A part of the " Treaty House," in which they were carried on, remains. In 1647 the parliamentary forces had for some time their headquarters in the town. It remained a garrison town until 1689. It obtained the grant of a market from Henry II.

UXMAL, a deserted city of the Mayas in the state of Yucatan, Mexico, 20 m. W. of Tikul, a station on the railway between Merida and Valladolid. The ruins stand on a wooded plain, and cover an area of a little more than half a mile square, although fragments are found over a much larger space. Uxmal is the largest and most important of the deserted cities of Yucatan, and shows some of the finest specimens of Maya archi- tecture. The climate is much drier than that of Chiapas, and the structures are in a better state of preservation than those of Palenque, but the rank vegetation and the decay of the wooden lintels over the doorways have broken down many of the walls. Uxmal was inhabited for some time after the Spanish conquest, but perhaps only by a remnant of a popu- lation once much larger. The neighbourhood is now very unhealthy, and it may be presumed that the process of depopula- tion, caused by increasingly unhealthy conditions and diminish- ing sources of food supply, was gradual. There are no streams near the ruins, and the water-supply was derived from cisterns and from a few pools now filled with soil and vegetation. A rather soft limestone was used in the buildings, but the locality of the quarries has not been discovered. The walls are com- monly about 3 ft. thick, in some cases much thicker, and the stones were set in a whitish mortar. Stone implements were

used. The outer surfaces of the walls are usually divided by a horizontal moulding into two unequal zones, the lower one plain with a band of sculptured ornaments at the base, and the upper elaborately sculptured. The interior walls were gener- ally plastered and rarely ornamented. There are no windows, but large doorways. The jambs were of dressed stone, usually plain, and the longer lintels were of zapote wood; some of them, where protected from the weather, are still to be seen, sometimes covered with inscriptions. The buildings are rectangular in shape, long and narrow, divided usually into two ranges of rooms. They are generally arranged in groups of four, enclosing a quadrangular court, and sometimes singly on massive eminences. The interiors are cut up into numerous

small rooms by transverse partitions, while numerous beam-holes and dumb-sheaves indicate other divisions. The rooms are covered by acutely pointed vaults, the stones forming the sides of the vault being bevelled to the angle, and the apex being covered by capstones covering spaces of one to two feet. The spaces between the vaults are filled with solid masonry, and above all is the roof covering, also of masonry, which is some- times surmounted with an ornamental roof-comb. The build- ings stand upon raised terraces, or upon truncated pyramids, approached by broad stairways, usually of cut stone.

There are five principal buildings or groups — the Temple of the Magician, Nunnery Quadrangle, House of the Turtles, House of the Pigeons and Governor's Palace. There are other structures and groups, smaller and more dilapidated. One of them, standing immediately S. of the Nunnery, consists of two parallel walls only; it is usually described as the ball-court, or gymnasium, a structure common to most Maya cities. The Temple of the Magician crowns an unusually steep pyramid 240 X 180 ft. at the base and 80 ft. high. It has three rooms, and a smaller temple is built against the upper western side of the pyramid. A broad steep stairway ascends to the summit platform on the E., and a narrower stairway to the lower temple on the W. The west front is filled with remarkable figures and designs, including the lattice work common in Uxmal. The Nunnery Quadrangle consists of four large rectangular independent buildings, enclosing a quadrangular court, the whole occupying a terrace over 300 ft. square at the base and upwards of 15 ft. above the level of the plain. The buildings resemble each other in the arrangement of their rooms, and their elaborately ornamented facades face inwards upon the court. The division of the buildings into numerous small rooms is understood to signify that they were used as communal habitations, possibly of priestly orders. The Governor's Palace, standing upon a triple terrace S. of the Nunnery, is, according to W. H. Holmes, " the most important single structure of its class in Yucatan, and for that matter in America." It is 320 ft. long, 40 ft. wide and 25 or 26 ft. high, divided into a long central and two end sections, separated by recesses and two trans- verse archways about 25 ft. long, 10 ft. wide and 20 ft. high. These archways were subsequently blocked, and may have been intended originally as portals to a quadrangle which was never built. Trie upper zone of the

exterior walls is about 10 ft. wide, exclusive of the mouldings and ornamental frieze, and its total length of 720 ft. is crowded with sculptures, in which there are three principal motives — the mask, the fret and the lattice. The projecting snouts in the line of masks forming the upper part of this zone are a peculiar feature of Uxmal ornamentation. The House of the Turtles is a comparatively small structure near the N.W. corner of the Governor's Palace. It has the same features found in the other structures except for a line of sculptured turtles on the mouldings of the frieze. Immediately S.W. of the Governor's Palace is a huge truncated pyramid, 200X300 ft. at the base and 60 to 70 ft. high. Beyond this is another large quadrangular group known as the House of the Pigeons. It resembles the Nunnery Quadrangle, except that the northern building carries a peculiar roof-comb of colossal size, running its entire length and rising to a height of about 16 ft. The base of this comb is 4 ft. high, capped by a moulding and perforated by over 50 openings. Above this the comb is divided into nine sections rising by large steps to the apex, each pierced by 30 or more openings, like an immense dovecote. Projecting stones suggest that they were built to carry statues or figures like the roof-combs of Palenque.

UZ, JOHANN PETER (1720-1796), German poet, was born at Ansbach on the 3rd of October 1720. He studied law, 1739-43, at the university of Halle, where he associated with the poets Johann Ludwig Gleim (q.v.) and Johann Nikolaus Gotz (

UZ— UZZIAH

Ansbach to Prussia (2nd of December 1791), entered the Prussian judicial service, and died, shortly after his appointment as Landrichter, at Ansbach on the 12th of May 1796. Uz wrote a number of graceful lyrics in Gleim's style, and some patriotic odes; he is the typical representative of the rococo period in German poetry. In 1749 the first collection of his Lyrische Gedichte was anonymously published. He also wrote, in alexandrines, Der Sieg des Liebesgottes (1753), a close imitation of Alexander Pope's Rape of the Lock, and a didactic poem, Versuchiiber die Kunst slels frohlich zu sein (1760).

A complete edition of Uz's works — Sdmtliche Poetische Werke — was published at Leipzig, 1768; a new edition (Vienna, 1804), which has been often reprinted. A critical edition was published by A. Sauer in 1890. See Henriette Feuerbach, Uz und Cronegk (1866), Briefe von Uz an einen Freund aus den Jahren 1753-82 (published bv A. Henneberger (1866) and E. Petzet, Johann Peter Uz (Ansbach,

1896).

UZ. The " land of Uz " (py p«) is best known as the scene of the story of Job. Its precise location is a matter of uncertainty, opinion being divided between a position N. of Palestine (" Aram Naharaim ") and one to the S.E., in the neighbourhood of Edom. In favour of the former are the refer- ences in Gen. x. 23, xxii. 21, the inclusion of Job among " the children of the East," the possibility that Bildad the Shuhite (cf. Gen. xxv. 2, 6) belonged to the Stihu, a people living on the right bank of the Euphrates, and the description of Elihu as a Buzite (xxxii. 2). Whether the name Uz is found or not in the cuneiform inscriptions is disputed. In favour of the S.E. position we have the description of Elihu as of the family of Ram 1 which (1 Chron. ii.) was a distinctly southern people, the fact that Eliphaz was a Temanite {i.e. he came from Edom, cf. Gen. xxxvi. 4) and the references in Gen. xxxvi. 28 and Lam. iv. 21. The mention of Uz in Jer. xxv. 20 is probably a gloss. While Edom and Uz are not to be identified, the traditional association of " wisdom " with Edom may incline us to place the Uz of Job in its neighbourhood rather than in that of the

Euphrates. The tradition which places Job's home in Hauran has no value. It is worth noting that the Septuagint forms from Uz the adjective Aroinj, which points to a pro- nunciation ˆ[«5 = Arabic Aud, the name of a god whose worship was widely spread and might therefore be readily borne by tribes or attached to districts in several regions.

UZ&S, a town of southern France, capital of an arrondissement in the department of Gard, finely situated on an eminence above the Alzon, 16 m. N. by E. of Nimes by road. Pop. (1906) 4008. Uzes, the seat of an episcopal see from the 5th century to 1790, has a cathedral almost destroyed by the Protestants during the religious wars and rebuilt in the 17th and 18th centuries, but still flanked by a round tower of five storeys lighted by arched openings and dating from the 12th century. The Duche, a chateau of powerful lords, at first viscounts, and in 1565 dukes, of Uzes, preserves a donjon originally of the 1 2th century; the main building, flanked by a Gothic chapel, is Renaissance in style. The most ancient structure in the town is a crypt beneath a private house, attributed to the early centuries of the Christian era. The sub-prefecture and the tribunal of first instance occupy the old bishop's palace (17th century). There is a statue of Admiral Brueys (1753-1798), a native of the town. Uzes has a communal college for boys, and carries on the manufacture of silk, bricks and fireproof earthenware, and liquorice, and trade in the truffles for which the district is noted.

UZHITSE (also written Uzice and Ushitsa), the capital of

the Uzhitse department of Servia. As implied by its name,

which may be translated " the narrow places," Uzhitse is built

in a narrow and lonely glen amongst the south-western moun-

1 Perhaps a mistake or an abbreviation for Aram.

tains, 1385 ft. above the sea. The surrounding heights, though rugged and barren, produce some of the finest Servian tobacco. Weaving is taught in the girls' school, and fairs are held for the sale of farm produce; but the absence of a railway and the badness of the roads retard commerce. Uzhitse possesses a court of first instance and a prefecture. Despite the prevailing poverty, it has also a real-school with good buildings, founded

in 1865, and attended by about 300 pupils in 1900. The houses in Uzhitse are quite unlike those of more prosperous Servian towns, being tall, narrow structures of timber, frequently blackened by the damp. Pop. (1900) about 7000.

Early in the 13th century Uzhitse was the seat of St Sava, the first archbishop, ' and the patron saint of Servia. The archbishopric was soon removed to Ipek, in Old Servia; but after the Turkish garrison had been expelled in 1862 the city became once more the head of a diocese. At Arilye, 13 m. E.S.E., there is a 13th-century church, dedicated to St Aril, who, according to tradition, was martyred in the 9th century by unconverted Serbs. On the Bosnian frontier, 15 m. W. by N., are the mineral springs of Bayina Bashta (i.e. " the Garden Bath "), with Racha monastery close by; and in the neighbourhood is Dobrinye, the home of the Obrenovich family, with a church built by Milosh Obrenovich, called " the Liberator of Servia "(1818-1839).

UZZIAH (Heb. for " Yah[weh] is [my] strength"), more correctly Azariah (Hebrew for " Yah[weh] helps "), son of Amaziah, grandson of Joash I., and king of Judah (2 Kings xiv. 22, xv. 1-7). Of his long reign of fifty-t;wo years little is recorded. He recovered Elath at the head of the Aelanitic Gulf, evidently in the course of a successful campaign against Edom (a possible reference in Isa. xvi. 1) ; we read further in 2 Chron. xxvi. of great wars against Philistines, Arabians and Meunim, of building operations in Jerusalem (probably after the attack by Joash), and of political and social reforms. The prosperity which Judah enjoyed during this period (middle of 8th century) is illustrated by the writings of Amos and by the earliest prophecies of Isaiah (e.g. ii. 6 sqq.). In his old age Uzziah was a leper (2 Kings xv. 5), and the later history (2 Chron. xxvi. 16 sqq.) regarded this as a punishment for a ritual fault of which the king was guilty; whilst Josephus (Ant. ix. 10. 4) records the tradition that on the occasion of his transgression the land was shaken by the terrible earthquake to which Amos i. 1 and Zech. xiv. 5 refer. During Uzziah's seclusion his son Jotham acted as regent. The growing power of Judah, however, aroused the jealousy of Israel, which, after the death of Jero- boam (2), had fallen on evil days (see Men ahem). Jotham 's victory over Ammon (2 Chron. xxvii. 5) could only increase the hostility, and preparations were made by Israel for an alliance with Damascus which culminated in an attack upon Judah in the time of Jotham's son, Ahaz (q.v.).

The identification (Schrader, McCurdy, &c.) of Azariah with Azriyau of Ja'udi, the head of a North Syrian confederation at Hamath (Hamah) overcome by Tiglath-Pileser IV. (738 B.C.), conflicts with the chronological evidence, with what is known of Uzziah's life and policy, and with the historical situations represented in the Biblical narratives (see Winckler, Alttest. Forschungen [1893], i. 1-23; S. A. Cook, Ency. Bib. col. 5244; Whitehouse, Diet. Bib. iv. p. 844 seq.; id. Isaiah, p. 9 seq.; Skinner, Kings, p. 359). On the other hand, the interrelation of events in Palestine and Syria during this period combine with the sudden prominence of Judah (under Uzziah) and the subsequent anti-Judaean and anti- Assyrian coalition (against Ahaz) to suggest that Uzziah had been supported by Assyria (cf. Winckler, Keilinschr. u. d. Alte Test., 3rd. ed., p. 262). In fact, since the Biblical evidence is admittedly incomplete, and to a certain extent insecure, the question of the identification of Azariah of Judah and Azriyau of Ja'udi may be reopened. See H. M. Haydn, Journ. of Bibl. Lit., xxviii. (1909), pp. 182-199, and artt. Jews, §§13 (beginning), 15; Palestine, Old Test. Hist. (S. A. C.)

8 3 o

V-ˆ-VACARESCU

VThis letter was originally, like Y, only one of the earlier forms of the letter U. According to Florio (1611) V is "sometimes a vowel, and sometimes a consonant." In modern times attempts have been made to assign to it the consonantal value of U, but in English another symbol W is used for this, while V has received the value of the voiced form of F, which itself had originally a sound resembling the English W (see under F). V is therefore a voiced labio-dental spirant, the breath escaping through a very narrow slit between the lower lip and the upper teeth. In German, however, V is used with the same value as F, while W takes the value that V has in English. Apart from some southern dialect forms which have found their way into the literary language, as vat (for fat or wine-fat which still survives in the English Bible) and vixen the feminine of fox, all the words in English which begin with V are of foreign, and most of Latin origin. In the middle of words between vowels / was originally regularly voiced: life, lives; wife, wives, &c. The Latin V, however, was not a labio-dental spirant like the English v, but a bi-labial semivowel like the English w, as is clear from the testimony of Quintilian and of

later gram- marians. This quality has remained to it in southern Italy, in Spain and Gascony. In Northern French and in Italian it has become the labio-dental v, and from French English has adopted this value for it. Early borrowings like wine (Latin vinum), wall (Latin vallum), retain the w sound and are therefore spelt with w. In the English dialects of Kent, Essex and Norfolk there is a common change of v to w, but Ellis says (English Pronunciation, V, pp. 132, 229) that though he has made diligent search he has never been able to hear the v for w which is so characteristic of Sam and Tony Weller in the Pickwick Papers. It is, however, illustrated in Pegge's Anecdotes of the English Language (1803) and confirmed by the editor of the 3rd edition (1844), pp. 65-66. The history of V as the Latin numeral for 5 is uncertain. An old theory is that it represents the hand, while X = io is the two hands with the finger tips touching. This was adopted by Mommsen (Hermes, xxii. 598). The Etruscan used the same tf-symbol inverted. V with a horizontal line above it was used for 5000. (P. Gi.)

VAAL, a river of South Africa, chief affluent of the Orange (q.v.). It rises at an elevation of over 5000 ft. above the sea on the slopes of the Klipstapel, in the Drakensberg mountains, Ermelo district of the Transvaal, and about 170 m. in a direct line west of Delagoa Bay. It flows in a general S.W. direction, with a markedly winding course, across the plateau of inner South Africa, joining the Orange in 29° 3′ S., 23° 36′ E. The river valley is about 500 m. long, the length of the river being some 750 m.

The first considerable tributary is the Klip (80 m. long), which rises in the Draken's Berg (the hill which gives its name to the range) and flows N.W., its junction with the Vaal being in 27 S., 29° 6′ E., 12 m. S.W. of Standerton. From this point to the eastern frontier of the Cape the Vaal forms the boundary between the Orange Free State and the Transvaal. The river is usually shallow and is fordable at many places, known as drifts. But after the heavy summer rains the stream attains a depth of 30 or more feet. At such times the banks, which are lined with willows and in places very steep, are inundated. As a rule little water is added to the Vaal by its tributaries. Of these, the Wilge (190 m.), which also rises on the inner slopes of the Drakensberg, flows first S.W., then N.W. across the eastern part of Orange Free State and joins the Vaal 60 m. below the Klip confluence. Lower down the river receives from the south the Rhenoster, Valsch, Vet and other streams which

drain the northern part of the Orange Free State. On the north the basin of the Vaal is contracted by the Witwaters- rand and Magaliesberg range, and its tributaries are few and, save in the case of the Harts river, short. The Klip, not to be con- founded with the southern Klip already described, rises on the south side of the Witwatersrand about 15 m. W. of Johannesburg, is joined by several small streams, and after a S.E. course of 70 m. reaches the Vaal 2 m. E. of Vereeniging. The Klip is of importance in the supply of water to many of the Black Reef gold mines. The

Mooi rises in the Witwatersrand west of the Klip and, after running almost due S, 75 m., unites with the main stream about 90 m. below Vereeniging. It gets its name Mooi (Beautiful) on account of the picturesqueness of its banks. Some of its sources are at Wonder- fontein, where they issue from stalactite caves. The Harts river (200 m.) rises on the S.W. slopes of the Witwatersrand and flowing S. by W. unites with the Vaal about 65 m. above the confluence of that stream with the Orange. The volume of water in the Harts is often very slight, but that part of the country, the eastern division of Griqualand West, in which the Vaal receives its last tributaries and itself joins the Orange, is the best watered of any of the inland districts of the Cape. The Vaal here flows in a wide rocky channel, with banks 30 ft. high, through an alluvial plain rendered famous in 1867-70 by the discovery of diamonds in the bed of the river and along its banks. The diamonds are washed out by the water and found amid debris of all kinds, frequently embedded in immense boulders. The last affluent of the Vaal, the Riet river, rises in the Beyers Bergen S.E. of Reddersburg and flows N.W. 200 m. through Orange Free State, being joined, a mile or two within the Cape frontier, by the Modder river (175 m.), which rises in the same district as the Riet but takes a more northerly course. The united Riet-Modder joins the Vaal 18 m. above the Orange confluence.

The name Vaal is a partial translation by the Dutch settlers of the Hottentot name of the river — Kai Gariep, properly Garib (yellow water), in reference to the clayey colour of the stream. The Transvaal is so named because the first white immigrants reached the country from the south by crossing the Vaal.

VAALPENS (dusty-bellies), a little-known nomadic people of South Africa, who survive in small groups in the Zoutpansberg

and Waterberg districts of the Transvaal, especially along the Magalakwane river. They are akin to the Bushmen (q.v.). In 1905 their total number was estimated by the Transvaal military authorities at " a few hundreds." The Vaalpens were so called by the Boers from the dusty look of their bodies, due, it is said, to their habit of crawling along the ground when stalking game. But their true colour is black. In height the men average about 4 ft., i.e. somewhat less than the shortest Bushmen. Socially the Vaalpens occupy nearly as low a position as even the Fuegians or the extinct Tasmanians. They were nearly exterminated by the Aman'debele, a tribe of Zulu stock which entered the Transvaal about the beginning of the 19th century. The Vaalpens, who live entirely by hunting and trapping game, dwell in holes, caves or rock- shelters. They wear capes of skins, and procure the few implements they need in exchange for skins, ivory or ostrich feathers. They form family groups of thirty or forty under a chief or patriarch, whose functions are purely domestic, as must be the case where there are no arts or industries, nothing but a knowledge of hunting and of fire with which to cook their meals. Their speech appears to be so full of clicks as to be incapable of expression by any clear phonetic system. Hence it is impossible to say whether the Vaalpens possess any folklore or other oral literature analogous to that of the Bushmen.

VACARESCU, the name, according to tradition, of one of the oldest noble families in Walachia. Its mythical founder is said to have been a certain Kukenus, of Spanish origin, settled in Transylvania as lord over Fogaras. Others connect the family with Ugrin, count of Fogaras. The first member of historical importance was Ianache (b. 1654), the grand treasurer of Walachia, who was killed with his master, Prince Brancovan, in Constantinople, 1714. His grandson through his son Stephan, also called Ianache (or " Enakitza the Ban," 1730-1796), starts a line of Rumanian scholars and poets; he was the author of the first known Rumanian grammar in the vernacular, printed in 1787. While in exile in Nicopolis he wrote the contemporary history of the Turkish empire in two volumes (1 740-1 799). He was also the first to attempt Rumanian versification. Greater as a poet is his son Alecu (Alexander), who died as a prisoner in Constantinople in 1798. In 1796 a collection of his poems appeared in Rumania. His brother Nikolaes (d. 1830) also wrote some poems, but they remained in MS. until i860, when they were published. By

far the greatest member of the Vacarescu family in the male line was lancu (1786-1863), the son of Alexander. He received an excellent education not only in Greek but also in German and French, and was well versed in the literature of the West. An ardent patriot, he sided with the national movement in 1821, and assisted in establishing the Rumanian theatre, trans- lating many books and plays from German and French into Rumanian, notably the Britannicus of Corneille, a literary event of no small importance at the time. He inaugurated modern Rumanian poetry. In 1830 appeared his first volume of verse. He died in 1863. A niece of Alexander is the gifted writer Elena Vacarescu (Helene Vacaresco), who inherited the poetical talent of her family and has enriched Rumanian literature with her Bard of the Dimbovitza, and other poems and novels in Rumanian and in French. (M. G.)

VACARIUS (n 20-1 200?), Italian civilian and canonist, the first known teacher of Roman law in England, was doubtless of the school of Bologna, though of a later generation than the hearers of Irnerius. He was brought to Canterbury, possibly by Becket, together with a supply of books upon the civil law, to act as counsel (causidicus) to Archbishop Theobald in his struggle, which ended successfully in 1146, to obtain the transfer of the legateship from the bishop of Winchester to himself. We next hear of Vacarius as lecturing at Oxford, in 1 149, to " crowds of rich and poor," and as preparing, for the use of the latter, a compendium, in nine books, of the Digest and Code of Justinian, " sufficient," it was said, " if thoroughly mastered, to solve all legal questions commonly debated in the schools." It became a leading text-book in the nascent univer- sity, and its popular description as the Liber pauperum gave rise to the nickname pauperistae applied to Oxford students of law. Nearly complete MSS. of this work are still in existence, notably in the cathedral libraries at Worcester and Prague and in the town library at Bruges. Fragments of it are also pre- served in the Bodleian and in several college libraries at Oxford.

The new learning was not destined to make its way without opposition. King Stephen silenced Vacarius, and ordered the destruction of the books of civil and canon law which had been

imported by Theobald. The edict to this effect seems, however, not to have been in force after the death of its royal author in 1 1 54 (" eo magis virtus legis invaluit quo earn amplius nitebatur impietas infirmare," Joh. Sarisburiensis). There is ample evi- dence that the civil law was soon once more a favourite study at Oxford, where we learn that, in 1100, two students from Friesland were wont to divide between them the hours of the night for the purpose of making a copy of the Liber pauperum. Whether or no Vacarius ever resumed his Oxford lectures after their interruption by Stephen we are not informed. In any case he was soon called off to practical work, as legal adviser and ecclesiastical judge in the northern province, by his old friend and colleague at Canterbury, Roger de Pont l'Eveque, after the promotion of the latter, in the year of Stephen's death, to the archbishopric of York. Thenceforth the name of " magister Vacarius " is of very frequent occurrence, in papal letters and the chronicles of the period, as acting in these capacities. He was rewarded with a prebend in the collegiate church of secular canons at Southwell, half of which he was allowed in 1191 to cede to his " nephew " Reginald. He is last heard of in 1198, as commissioned, together with the prior of Thurgarton, by Pope Innocent III. to carry into execution, in the north of England, a letter with reference to the crusade. It is doubtless to the second half of the life of Vacarius that the composition must be attributed of two works the MS. of which, formerly the property of the Cistercian Abbey of Biddleston, is now in the Cambridge University library. One of these, Summa de assumpto homine, is of a theological character, dealing with the humanity of Christ; the other, Summa de matrimonio, is a legal argument, to the effect that the essential fact in marriage is neither, as Gratian maintains, the copula, nor, as Peter Lombard, consent by verba de praesenti, but mutual traditio.

Authorities. — Most of the original authorities are textually set out and annotated by Prof. T. E. Holland in vol. ii. of the Oxford

Historical Society's Collectanea (1890). Wenck, in his Magister Vacarius (1820), prints the prologue, and a table of contents, of the Liber pauperum, from a MS. how lost. He returns to the subject in Stieber's Opuscula academica (1834). F. Maitland in the Law Quarterly Review, xiii. pp. 133, 270 (1897), gives a full account of the Cambridge MSS., printing in extenso the Summa de matrimonio See also Muhlenbruch, Obs.

juris Rom. i. 36; Hanel, in the Leips. Lit. Zeitung (1828), No. 42, " Intelligenzblatt," p. 334; Savigny, Geschichte, rv. 423; Stolzel, Lehre von der operis novi denunt. (1865), pp. 592-620, and in the Zeitschrift fur Rechtsgeschichte, vi. p. 234 ; Catalogue general des MSS. des bibliotheques publiques de France: Departements, t. x. Lieberman, in the English Historical Review, xi. (1906), pp. 305, 514, identified Vacarius with one " Vac." of Mantua, the author of Contraria legum Longobardorum, but withdrew • this antecedently improbable suggestion (ib. vol. xiii.) after T. Patella had shown, in the Atti delta R. Academia di Torino, xxxii., that " Vac. Mantuanus," the author of the Contraria, must have been " Vacella," who, in 1189, was a judge at Mantua. (T. E. H.)

VACCINATION (from Lat. vacca, a cow), the term originally devised for a method of protective inoculation against small-pox, consisting in the intentional transference to the human being of the eruptive disease of cattle called cow-pox (vaccinia). The discovery of vaccination is due to Dr Edward Jenner (?.».), at the time a country medical practitioner of Berkeley, in the vale of Gloucester, whose investigations were first published in 1798 in the form of a pamphlet entitled An Inquiry into the Causes and Effects of the Variolae Vaccinae, dfc. Many years previously, while he was an apprentice to a medical man at Sodbury, near Bristol, his attention was directed to a belief, widely prevalent in Gloucestershire during the latter half of the 1 8th century, that those persons who in the course of their employment on dairy farms happened to contract cow-pox were thereby protected from a subsequent attack of small-pox. In particular, his interest was aroused by a casual remark made by a young countrywoman who happened to come to the surgery one day for advice, and who; on hearing mention made of small-pox, immediately volunteered the statement that she could not take the disease, as she had had cow-pox. On coming up to London in 1770, to finish his medical education, Jenner became a pupil of John Hunter, with whom he fre- quently discussed the question of the possibility of obtaining protection against small-pox. On his return to his native village of Berkeley in 1773, to practise as a medical man, he took every opportunity of talking over and investigating the matter, but it was not until May 1796 that he actually began to make experiments. His first case of vaccination was that of a boy eight years of age, named James Phipps, whom he inoculated in the arm with cow-pox matter

taken from a sore on the hand of Sarah Nelmes, a dairymaid, who had become infected with the disease by milking cows suffering from cow- pox. It was apparently not until 1798 that he made his first attempt to carry on a strain of lymph from arm to arm. In the spring of that year he inoculated a child with matter taken directly from the nipple of a cow, and from the resulting vesicle on the arm of the child first Operated upon, he in- oculated, or, as it may now be more correctly termed, "vac- cinated," another. From this child several others were vaccinated. From one of these a fourth remove was success- fully carried out, and finally a fifth. Four of these children were subsequently inoculated with small-pox — the " variolous test " — without result. The success of many such experi- ments, in his own hands and in those of his contemporaries, led Jenner to express his belief — a mistaken one, as events have proved — that 1 the protective influence of vaccination would be found to last throughout the lifetime of the person operated on. Obviously he did not realize the fact that the data at his disposal were insufficient for the formation of an accurate judgment on this point, since time alone could prove the exact duration of the protection originally obtained. Sub- sequent experience has demonstrated that, as has been well said by a writer in the Edinburgh Review, " even after efficient vaccination a slow progress away from safety and towards danger is inevitable, and re-vaccination at least once after childhood is necessary if protection is to be maintained. "

In applying to cow-pox the term " variolae vaccinae," Jenner gave expression to his belief that this disease was in _ __ reality nothing more nor less than small-pox of the

ship of cow – But soon it was discovered that if there were small- such a malady as " small-pox of the cow," there pox and was a i SO] as jj r Ley first satisfactorily demonstrated, cow-pox. a sma u_p 0X f tn e horse, which, under the name of " grease," was resorted to from time to time as a source of vaccine lymph. Jenner had, indeed, put forward the suggestion that " grease " was a necessary antecedent to cow- pox; but even taking this term to have been used by him in the sense of horse-pox, he was, in all probability, mistaken in his assumption. At the same time, however, there can be little

doubt that these two diseases are very closely allied, if indeed they be not identical. As evidence of a definite relationship between human small-pox and cow-pox, it may be mentioned that whereas, prior to the introduction of vac- cination, epidemics of these disorders frequently arose con- currently, the so-called " natural " cow-pox has now in great measure disappeared. There is, moreover, no appreciable difference in the minute anatomical appearances characteristic of the eruption following on inoculation of one or other of these two affections in the human subject. But of far greater im- portance in this connexion are the results obtained by numerous observers who, in various parts of the world, and almost from the time of Jenner onwards, have set themselves the task of attempting, by experimentar methods, to solve the problem of the true relationship of variola to vaccinia. As the outcome of this work it may now be definitely stated that small-pox lymph, more especially, as the present writer has shown, if obtained from the primary vesicle of a case of the inoculated form of the disease, by passage through the system of the calf can be so altered in character as to become deprived of its power of causing a generalized eruption, while inducing at the site of inoculation a vesicle indistinguishable from a typical vaccine vesicle; and, more important still, that when trans- ferred again to man, it has by such treatment completely lost its former infectious character. Such being the case, it may fairly be asserted that cow-pox, or rather that artificially inoculated form of the disease which we term vaccinia, is nothing more nor less than variola modified by transmission through the bovine animal. An outbreak of small-pox, indeed, may be turned to account for raising, by appropriate experimental methods, a fresh stock of vaccine lymph.*

There is much evidence to prove that the results following on vaccination are due to a specific contagium, and, moreover,

that the particular micro-organism concerned is capable logy. ‘ °^ ex ‘ st ™8′ during one period of its life-cycle, in a

resting or spore form, in which condition it is more resistant to the germicidal effects of glycerine than is the case with non-sporing microbes. Advantage is taken of this fact, in the method devised by the present writer, and now employed officially in England, as also on the Continent and in America, for ensuring the bacteriological purity of vaccine lymph. Up to the present, unfortunately, no satisfactory method has been

discovered by which the micro-organism of vaccinia can be unfailingly cultivated on artificial media while still retaining its specific properties.

The publication in 1896 of the final report of the English Royal

Commission on Vaccination, in which the various phases of the

vaccination question are discussed on the basis of evidence

ito c – Stained from witnesses of all shades of opinion during

*,” . *”” a period extending over no less than six years, consider- 1889-96′ ably sim P lines the task of dealing with this subject. The*

• J ‘ R °y al Commission, originally numbering fifteen members, 1 with Lord Herscheti as president, was appointed in May 1889, the

1 The original Commissioners were — Lord Herschell, C. Bradlaugh, Dr Bristowe, Dr Collins, Sir C. Dalrymple, J. S. Dugdale, Q.C., Prof. M. Foster, Sir E. H. Galsworthy, Sir Guyer Hunter, J.Hutchin- son, Sir James Paget, J. A. Picton, Sir William Savory, S. Whitbread, F. Meadows White, Q.C. Mr Bradlaugh, Dr Bristowe and Sir William Savory died during the progress of the inquiry. Only one of the vacancies thus caused was filled up, Mr J. A. Bright having been appointed on the death of Mr Bradlaugh.

terms of reference being as follows : ” To inquire and report as to — (r) The effect of vaccination in reducing the prevalence of, and mortality from, small-pox. (2) What means, other than vaccination, can be used for diminishing the prevalence of small-pox; and how far such means could be relied on in place of vaccination. (3) The objections made to vaccination on the ground of injurious effects alleged to result therefrom; and the nature and extent of any injurious effects which do, in fact, so result. (4) Whether any, and, if so, what means should be adopted for preventing or lessening the ill effects, if any, resulting from vaccination; and whether, and, if so, by what means, vaccination with animal vaccine should be further facilitated as a part of public vaccination. (5) Whether any alterations should be made in the arrangements and proceedings for securing the performance of vaccination, and, in particular, in the provisions of the Vaccination Acts with

respect to prosecutions for non-compliance with the law."

The evidence given before the Royal Commission was published at intervals in a series of Blue-books, but, as stated, it was not until August 1896 that the final report made its appearance. As regards the effect of vaccination in reducing the prevalence of, and mortality from, small-pox, the following conclusions were arrived at, Dr Collins and Mr Picton alone dissenting: " (1) That it diminishes the liability to be attacked by the disease. (2) That it modifies the character of the disease and renders it (a) less fatal, and (6) of a milder or less severe type. (3) That the protection it affords against attacks of the disease is greatest during the years immediately succeeding the operation of vaccination. It is im- possible to fix with precision the length of this period of highest protection. Though not in all cases the same, if a period is to be fixed, it might, we think, fairly be said to cover in general a period of nine or ten years. (4) That after the lapse of the period of higjiest protective potency, the efficacy of vaccination to protect against attack rapidly diminishes, but that it is still considerable in the next quinquennium, and possibly never altogether ceases. (5) Thatits power to modify the character of the disease is also greatest in the period in which its power to protect from attack is greatest, but that its power thus to modify the disease does not diminish as rapidly as its protective influence against attacks, and its efficacy, during the later periods of life, to modify the disease is still very considerable. (6) That re-vaccination restores the pro- tection which lapse of time has diminished, but the evidence shows that this protection again diminishes, and that, to ensure the highest degree of protection which vaccination can give, the opera- tion should be at intervals repeated. (7) That the beneficial effects of vaccination are most experienced by those in whose case it has been most thorough. We think it may fairly be concluded that where the vaccine matter is inserted in three or four places, it is more effectual than when introduced into one or two places only, and that if the vaccination marks are of an area of half a square inch, they indicate a better state of protection than if their area be at all considerably below this."

For the evidence, statistical or otherwise, on which these conclusions arc based, the Reports of the Royal Commission should be consulted. But reference may here be made to two facts of which proof is overwhelming. (1) Small-pox, in pre-vaccination days a disease of infancy and childhood — like

measles at the present day — has in the United Kingdom become a disease mainly of adults. The shifting of age-incidence can only be accounted for by the custom of vaccination in infancy. To this day, when small-pox attacks young unvaccinated children, it is found to be as virulent as, or even more virulent than, small-pox in the unvaccinated at higher ages. On the other hand, small-pox is practically unknown among well-vaccinated children. When, quite exceptionally, such children have been attacked, the disease has been so trivial in character as to be liable to escape recognition altogether. (2) Medical men, nurses and other persons exposed to the disease habitually protect themselves by efficient re-vaccination, and when this precaution has been taken, never contract small-pox.

The clinical activity and bacteriological purity of the lymph employed for vaccination; the skilful performance of the operation itself; the making an adequate number Efficient of insertions of lymph over a sufficient area; the vaccina' observance of precautions needful for ensuring strict tio °-asepsis, both at the time of vaccination and subsequently until the vaccination wounds are soundly healed — all these are matters to be regarded as essential to " efficient vaccina- tion." Certain principles in respect of them are generally recognized, and in the case of public vaccinators, whose work comes under government inspection, a series of instructions on these several points are prescribed by the Local Government Board. First in regard to lymph. That which is now almost universally employed in Great Britain is glycerinated cali lymph, the use of which has entirely superseded, in public vaccinations, the arm-to-arm method which for many years previously had been employed as the best means then attainable

of ensuring the activity and comparative purity of the lymph. Glycerinated lymph, under proper conditions, usually retains its potency for many weeks or months; but nevertheless, in certain circumstances at present imperfectly understood, is liable to become gradually weakened, and even eventually to become altogether inert. Possibly the condition of the calves from which the lymph is obtained, especially as regards their general health and the suppleness or the reverse of their skins,

or exposure of the lymph to the action of light or to a high temperature, are of special importance. Consequently, in order to ensure the best results from its use, it is not only necessary that great care should be exercised in its manufacture, but it is also advis- able that the lymph should be employed for vaccination as soon as possible after bacteriological examination has demonstrated its freedom from suppurative and other extraneous micro- organisms. As regards the carrying out of the operation itself, it is somewhat unfortunate that there exists no official definition of what constitutes a " successful vaccination," and in conse- quence it is open to any practitioner to give a certificate of successful vaccination in cases where but one minute vesicle may have been produced. It is to be feared that such certificates are too frequently given, and it cannot be too strongly urged that vaccination of this sort involves incomplete protection. The standard laid down by the Local Government Board — the production, namely, of a total area of vesiculation of not less than half a square inch, divided among four separate vesicles or groups of vesicles, not less than half an inch from one another — has for the most part proved easily attainable in practice, and it is much to be desired that in private as in public work the attainment of this standard should be aimed at in every instance. The protection afforded by a primary vaccination tends gradually to diminish, and eventually to disappear more or less completely, with the lapse of time. In consequence, it is desirable that the operation should be repeated at the age of from seven to ten years, and thereafter, if it be possible, at intervals during later life. The final report of the Royal Commission thus summarizes the evidence as to the value of such additional procedure: —

" Where re-vaccinated persons were attacked by, or died from, small-pox, the re-vaccination had for the most part been performed a considerable number of years before the attack. There were very few cases where a short period only had elapsed between the re- vaccination and the attack of small-pox. This seems to show that it is of importance, in the case of any persons specially exposed to the risk of contagion, that they should be re-vaccinated, and that in the case even of those who have been twice re-vaccinated with success, if a long interval since the last operation has elapsed, the operation should be repeated for a third, and even a fourth time."

It not unfrequently happens that in the case of a re-vaccination the process runs a somewhat different course from that

witnessed in a typical primary vaccination. In a successful re-vaccination, the site of the operation may be distinctly reddened and some- what irritable by the second day, while papules will probably make their appearance about the third to the fifth day. The papules may or may not develop further into vesicles and pustules. Occasionally a re-vaccination appears to fail alto- gether; but, as pointed out by the Royal Commission, it is advisable, as in the case of a primary vaccination, to make further attempts with lymph of known potency before con- cluding that the individual is really insusceptible.

In a certain small proportion of cases the operation of vaccination has been followed, after a longer or shorter inter- Aiieged val, by various complications, of which by far the Injurious most important are those of an inflammatory nature, effects. S uch as erysipelas, which are not peculiar to vaccina- tion, but which constitute the danger of any local lesion of the skin, however caused. During the many decades in which vaccination from arm to arm was practised, in many millions of children, a few authenticated cases were recorded in which there was reason to believe that syphilis could have been invaccinated. Such an occurrence could at no time have happened if proper care had been taken by the vaccinator; and now that the use of calf lymph has become practically xxvn. 27

universal, the possibility of such occurrence in the future may be disregarded, since the calf is not capable of contracting this disease. Tubercle in its various forms and leprosy have also been included in the list of possible complications of vaccination, though without any sufficient proof. The employ- ment of calf lymph, treated with glycerine after the manner first advocated by S. Monckton Copeman, will obviate any such danger, for even if tubercle bacilli or the streptococcus of erysipelas were by chance present in the lymph material when collected, it has been found experimentally that they are quite unable to survive prolonged exposure to the action of a 50% solution of glycerine in water. Leprosy is not communicable to the calf. In view of the frequency of various skin eruptions in infancy, it is to be expected that in a proportion of cases they will appear during the weeks following vaccination. Eczema and impetigo in particular have, post hoc, been attributed to vaccination, but no direct connexion has been proved to exist between the operation and the occurrence of these disorders. In section 434 of the final report of the Royal Commission on Vaccination the extent to which other inoculable diseases are

liable to complicate vaccination is thus summed up: —

" A careful examination of the facts which have been brought under our notice has enabled us to arrive at the conclusion that although some of the dangers said to attend vaccination are un- doubtedly real, and not inconsiderable in gross amount, yet when considered in relation to the extent of vaccination work done, they are insignificant. There is reason, further, to believe that they are diminishing under the better precautions of the present day, and with the additions of the future precautions which experience suggests, will do so still more in the future:" _ (S. M. C.)

Legislation making vaccination compulsory was first intro- duced in Bavaria (1807), Denmark (1810), Sweden (1814), Wtirt- temburg, Hesse and other German states (18 18), com- Prussia (1835), the United Kingdom' (1853), German puisory empire (1874), Rumania (1874), Hungary (1876), vaccina- Servia (1881), Austria (1886). But in many cases there had been earlier provisions indirectly making it necessary. In the same way, though there is no federal compulsory law in Switzerland, most of the cantons enforce it; and though there is no statutory compulsion in France, Italy, Spain, Portugal, Belgium, Norway, Russia or Turkey, there are government facilities and indirect pressure, apart from the early popularity of vaccination which made it the usual practice. In the United States there is no federal law, but many of the separate states make their own compulsion either directly or indirectly, Massa- chusetts starting in 1809.

The benefit of vaccination proved itself in the eyes of the world by its apparent success in stamping out small-pox; but there continued to be people, even of the highest competence, who regarded this as a fallacious argument — post hoc, ergo propter hoc. The cause of " anti- vaccination " has had many followers in England, and their persistence has had important effect in English legislation. Under the provisions of the Vaccination Act 1898, and of the Vaccination Order (1898) of the Local Government Board, with some minor changes in succeeding acts, numerous changes in connexion with vaccina- tion administration and with the performance of the English operation were introduced, in addition to the super- legisia- session of arm-to-arm vaccination, by the use of tloa ' glycerinated calf lymph. Thus, whereas by the Vaccination Acts of 1867 and 1871 the parent or person having the cus-

tody of any child was required to procure its vaccination within three months of birth, this period by the act of 1898 was extended to six months. Again, parents were relieved of any penalty under the compulsory clauses of the Vaccination Acts who afforded proof that they had, within four months of the birth of a child, satisfied a stipendiary magistrate, or two justices in petty sessions, that they conscientiously believed that vaccination would be prejudicial to the health of the child. Moreover, proceedings were not to be taken more than twice against a defaulting parent, namely, once under section 29 of the act of 1867, and once under section 31 of the same act, provided that the child had reached the age of four years. Finally, the

public vaccinator was now required to visit the homes of children for the purpose of offering vaccination with glycerinated calf lymph, " or such other lymph as may be issued by the Local Government Board." The operative procedure in public vac- cinations was formerly based on the necessity of carrying on a weekly series of transferences of vaccine lymph from arm to arm; and for the purposes of such arm-to-arm vaccination the provision of stations, to which children were brought first for the performance of the operation, and again, after a week's interval, for inspection of the results, was an essential. The occasional hardships to the mothers, and a somewhat remote possibility of danger to the children, involved in being taken long journeys to a vaccination station in bad weather, or arising from the collecting together in one room of a number of children and adults, one or more of whom might happen to be suffering at the time from some infectious disorder, are a few of the reasons which appeared to render a change in this regulation desirable; as a matter of fact, it would appear that nothing but good has arisen from the substitution of domiciliary for stational vaccination. There have naturally been some curious dis- cussions before the magistrates as to what is " conscientious " or not, but the working of the so-called " conscience clause " by no means justified the somewhat gloomy forebodings expressed, both in Parliament and elsewhere, at the time of its incorpora- tion in the act of 1898. On the contrary, its operation appeared to tend to the more

harmonious working of the Vaccination Acts, by affording a legal method of relief to such parents and guardians as were prepared to affirm that they had a conscien- tious belief that the performance of the operation might, in any particular instance, be prejudicial to the health of the child.

Authorities. — Acland, " Vaccinia," Allbutt and Rolleston, System of Medicine (1906) ; Baron, Life of Jenner ; Henry Colburn (London, 1838) ; Copeman, Vaccination: Its Natural History and Pathology (Milroy Lectures) (Macmillan, London, 1899); " Modern Methods of Vaccination and their Scientific Basis," Trans. Royal Med. and Chir. Society (1901-2); M'Vail, "Criticism of the Dis- sentient Commissioners' Report," Trans. Epidemiological Society (1897); Reports of the Royal Commission on Vaccination (1889- 1896); "The History and Effects of Vaccination," Edinburgh Review, No. 388 (1899) ; Vaccination Law of German Empire (Berlin, 1904).

VACHEROT, ETIENNE (1809-1897), French philosophical writer, was born of peasant parentage at Torcenay, near Langres, on the 29th of July 1809. He was educated at the Ecole Nor- male, and returned thither as director of studies in 1838, after some years spent in provincial schoolmasterships. In 1839 he succeeded his master Cousin as professor of philosophy at the Sorbonne. His Histoire critique de Vicole a" Alexandrie (3 vols. 1846-51), his first and best-known work, drew on him attacks from the Clerical party which led to his suspension in 1851. Shortly afterwards he refused to swear allegiance to the new imperial government, and was dismissed the service. His work Dimocratie (1859) led to a political prosecution and imprisonment. In 1868 he was elected to the French Academy. On the fall of the Empire he took an active part in politics, was maire of a district of Paris during the siege, and in 187 1 was in the National Assembly, voting as a Moderate Liberal. In 1873 he drew nearer the Conservatives, after which he was never again successful as a parliamentary candidate, though he maintained his principles vigorously in the press. He died on the 28th of July 1897 Vacherot was a man of high character and adhered strictly to his principles, which were generally opposed to those of the party in power. His chief philosophical importance con- sists in the fact that he was a leader in the attempt to revivify French philosophy by the new thought of Germany, to which he had been introduced by Cousin, but of which he never had more than a second-hand knowledge. Metaphysics he held to be based on psychology. He

maintains the unity and freedom of the soul, and the absolute obligation of the moral law. In religion, which was his main interest, he was much influenced by Hegel, and appears somewhat in the ambiguous position of a sceptic anxious to believe. He sees insoluble contradictions in every mode of conceiving God as real, yet he advocates religious

belief, though the object of that belief have but an abstract or imaginary existence.

His other works are: La Metaphysique et la science (1858), Essais de philosophic critique (1864), La Religion (1869), La Science et la conscience (1870), Le Nouveau Spiritualisme (1884), La Dimocratie liberate (1892).

See Olle Laprune, ~&tienne Vacherot (Paris, 1898).

VACQUERIE, AUGUSTE (1819-1895), French journalist and man of letters, was born at Villequier (Seine Inferieure) on the 19th of November 1819. He was from his earliest days an admirer of Victor Hugo, with whom he was connected by the marriage of his brother Charles with Leopoldine Hugo. His earlier romantic productions include a volume of poems, L'Enfer de I 'esprit (1840); a translation of the Antigone (1844) in collaboration with Paul Meurice; and Tragaldabas (1848), a melodrama. He was one of the principal contributors to the t/oenement and followed Hugo into his exile in Jersey. In 1869 he returned to Paris, and with Paul Meurice and others founded the anti-imperial Rappel. His articles in this paper were more than once the occasion of legal proceedings. After 1870 he became editor. Other of his works are Souvent homme varie (1859), a comedy in verse; Jean Baudry (1863), the most suc- cessful of his plays; Aujourd'hui et demain (1875); Futura (1900), poems on philosophical and humanitarian subjects. Vacquerie died in Paris on the 19th of February 1895. He published a collected edition of his plays in 1879.

VACUUM-CLEANER, an appliance for removing dust from carpets, curtains, &c, by suction, and consisting essentially of some form of air-pump drawing air through a nozzle which is passed over the material that has to be cleaned. The dust is carried away with the air-stream and is separated by filtra- tion through screens of muslin or other suitable fabric, sometimes with the aid of a series of baffle-plates which cause

the heavier particles to fall to the bottom of the collecting receptacle by gravity. In the last decade of the 19th century compressed air came into use, especially in America, for cleaning railway carriages, but it was found difficult to arrange for the collection of the dust that was blown out by the jets of air, and in con- sequence recourse was had to working by suction. From this beginning several types of vacuum cleaner have developed.

In the first instance the plants were portable, consisting of a pump driven by a petrol engine or electric motor, and were periodically taken round to houses, offices &c, when cleaning was required. The second stage was represented by the permanent installation of central plants in large buildings, with a system of pipes running to all floors, like gas or water pipes, and provided at convenient points with valves to which could be attached flexible hose termin- ating in the actual cleaning tools. The vacuum thus rendered available is in some cases utilized for washing the floors in combina- tion with another system of piping connected to a tank containing soap and water, which having been sprayed over the floor by com- pressed air is removed with the dirt it contains and discharged into the sewers; or in a simpler arrangement the soap and water is contained in a portable tank from which it is distributed, to be sucked up by means of the vacuum as before. In their third stage vacuum cleaners have become ordinary household implements, in substitu- tion for, or in addition to the broom and duster, and small machines are now made in a variety of forms, driven by hand, by foot, or by an electric motor attached to the lighting circuit. In addition to their domestic uses, other applications have been found for them, as for instance in removing dust from printers' type-cases.

VACUUM TUBE. The phenomena associated with the pas- sage of electricity through gases at low pressures have attracted the attention of physicists ever since the invention of the fric- tional electrical machine first placed at their disposal a means of producing a more or less continuous flow of electricity through vessels from which the air had been partially exhausted. In recent years the importance of the subject in connexion with the theory of electricity has been fully realized; indeed, the modern theory of electricity is based upon ideas which have been obtained from the study of the electric discharge through gases. Most of the important principles deduced from these investigations are given in the article

Conduction, Electric {Through Gases); here we shall confine ourselves to the consider- ation of the more striking features of the luminous phenomena observed when electricity passes through a luminous gas.

VACUUM TUBE

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Methods of producing the Discharge. — To send the current through the gas it is necessary to produce between electrodes in the gas a large difference of potential. Unless the electrodes are of the very special type known as Wehnelt electrodes, this difference of potential is never less than 200 or 300 volts and may rise to almost any value, as it depends on the pressure of the gas and the size of the tube. In very many cases by far the most convenient method of producing this difference of potential is by means of an induction coil; there are some cases, however, when the induction coil is not suitable, the dis- charge from a coil being intermittent, so that at some times there is a large current going through the tube, while at others there is none at all, and certain kinds of measurement cannot be made under these conditions. Not only is the current inter- mittent, but it is apt with the coil to be sometimes in one direction and sometimes in the opposite; there is a tendency to send a discharge through the tube not only when the current through the primary is started but also when it is stopped. These discharges are in opposite directions, and though that produced by stopping the current is more intense than that due to starting it, the latter may be quite appreciable. The reversal of the current may be remedied by inserting in series with the discharge tube a piece of apparatus known as a " rectifier " which allows a current to pass through it in one direction but not in the opposite. A common type of rectifier is another tube containing gas at a low pressure and having one of its electrodes very large and the other very small; a current passes much more easily through such a tube from the small to the large electrode than in the opposite direction. Sometimes an air-break inserted in the circuit with a point for one electrode and a disk for the other is sufficient to prevent the reversal of the current without the aid of any other rectifier.

There are cases, however, when the inevitable intermittence of the discharge produced by an induction coil is a fatal objection. When this is so, the potential difference may be

produced by a battery of a large number of voltaic cells, of which the most convenient type, where more than a few milliamperes of current are required, are small storage cells. As each of these cells only produces a potential difference of two volts, a very large number of cells are required when potential differences of thousands of volts have to be produced, and the expense of this method becomes prohibitive. When continuous currents at these high potential differences are rquired, electrostatic induction machines are most generally used. By means of Wimshurst machines, with many plates, or the more recent Wehrsen machines, considerable currents can be produced and maintained at a very constant value.

The exhaustion of the tubes can, by the aid of modern mercury pumps, such as the Topler pump or the very convenient automatic Gaede pump, be carried to such a point that the pressure of the residual gas is less than a millionth of the atmospheric pressure. For very high exhaustions, however, the best and quickest method is that introduced by Sir James Dewar. In this method a tube containing small pieces of dense charcoal (that made from the shells of coco-nuts does very well) is fused on to the tube to be exhausted. The preliminary exhaustion is done by means of a water-pump which reduces the pressure to that due to a few millimetres of mercury and the charcoal strongly heated at this low pressure to drive off any gases it may have absorbed. The tube is then disconnected from the water-pump and the charcoal tube surrounded by liquid air; the cold charcoal greedily absorbs most gases and removes them from the tube. In this way much higher exhaustions can be obtained than is possible by means of mercury pumps; it has the advantage, too, of getting rid of the mercury vapour which is always present when the exhaustion is produced by mercury pumps. Charcoal does not absorb much helium even when cooled to the temperature of liquid air, so that the method fails in the case of this gas; the absorption of hydrogen, too, is slower than that of other gases. Both helium and hydrogen are vigorously absorbed when the charcoal is cooled to the temperature of liquid hydrogen.

When first the discharge is sent through an exhausted tube, a considerable amount of gas (chiefly hydrogen and carbon monoxide) is liberated from the electrodes and the walls of the tube, so that

to obtain permanent high vacua the exhaustion must be

continued until the discharge has been going through the tube for a consider- able time. One of the greatest difficulties experienced in getting these high vacua is that even when all the joints are carefully made there may be very small holes in the tube through which the air is continually leaking from outside, and when the hole is very small it is sometimes very difficult to locate the leak. The writer has found that a method due to Goldstein is of the greatest service for this purpose. In this method one of the electrodes in the tube and one of the terminals of the induction coil are put to earth, and the pressure of the gas in the tube is reduced so that a discharge would pass through the tube with a small potential difference. The point of an insulated wire attached to the other terminal of the induction coil is then passed over the outside of the tube. When it comes to the hole, a very bright white spark may be seen passing through the glass, and in this way the leak located. The appearance of the discharge when the exhaustion is going on is a very good indication as to whether there is any leakage in the tube or not. If the colour of the discharge remains persistently red in spite of continued pumping, there is pretty surely a leak in the tube, as the red colour is probably due to the continued influx of air into the tube. Platinum is the only metal which can be fused through the glass with any certainty that the contact between the glass and the metal will be close enough to prevent air leaking into the tube. Platinum, however, when used as a cathode at low pressures " sputters," and the walls of the tube get covered with a thin deposit of the metal: to avoid this, the platinum is often fastened to a piece of aluminium, which does not sputter nearly so much. Tantalum is also said to possess this property, and it has the advantage of being much less fusible than aluminium. This sputtering depends to some extent on the kind of gases present in the tube, as in monatomic gases, such as mercury vapour, even aluminium sputters badly.

Electrodeless Tubes. — As some gases, such as chlorine and bromine, attack all metals, it is impossible to use metallic electrodes when the discharge through these gases has to be investigated. In these cases " electrodeless " tubes are sometimes used. These are of two kinds. The more usual one is when tin-foil is placed at the ends of the tube on the outside, and the terminals of the induction coil connected with these pieces of foil; the glass under the, foil virtually acts as an electrode. A more interesting form of the electrodeless discharge is what is

known as the " ring " discharge. The tube in this case is placed inside a wire solenoid which forms a part of a circuit connecting the outside coatings of two Leyden jars, the inside coatings of these jars being connected with the terminals of an induction coil or electrkal machine; the jars are charged up by the machine, and are discharged when sparks pass between its terminals. As the discharge of the jars is oscillatory (see Electric Waves), electric currents surge through the solenoid surrounding the discharge tube, and these currents reverse their direction hundreds ot thousands of times per second. We may compare the solenoid with the primary coil of an induction coil, and the exhausted bulb with the secondary; the rapidly alternating currents in the primary induce currents in the secondary which show themselves as a luminous ring inside the tube. Very bright discharges may be obtained in this way, and the method is especially suitable for spectro- scopic purposes (see Phil. Mag. [5], 32, pp. 321, 445).

Appearance of the Discharge in Vacuum Tubes. — Fig. 15 b of the article Conduction, Electric {Through Gases) represents the appearance of the discharge when the pressure in the tube is comparable with that due to a millimetre of mercury and for a particular intensity of current. With variations in the pressure or the current some of these features may disappear or be modified. Beginning at the negative electrode k, we meet with the following phenomena: A velvety glow runs, often in irregular patches, over the surface of the cathode; this glow is often called the first negative layer. The spectrum of this layer is a bright line spectrum, and Stark has shown that it shows the Doppler effect due to the rapid motion of the luminous 1 particles towards the cathode. Next to this there is a com- paratively dark region known as the " Crookes' dark space," or the second negative layer. The luminous boundary of this dark space is approximately such as would be got by tracing the locus of the extremities of normals of constant length drawn from the negative electrode ; thus if the electrode is a disk, the luminous boundary of the dark sphere is nearly plain

over a part of its surface as in fig. i, while if the electrode is a ring of wire (fig. 2) the luminous boundary resembles that

Fig. 2.

Fig. 1.

shown in fig. 17 of the article Conduction, Electric (Through Gases). The length of the dark space depends on the pressure of the gas and on the intensity of the current passing through it. The width of the dark space increases as the pressure diminishes, and may, according to the experiments of Aston (Pro. Roy. Soc. 79, p. 81), be represented with considerable accuracy by the expression a+b/p or a-|-c\, where a, b, c are con- stants, p the pressure and X the mean free path of a corpuscle through the gas. The thickness of the dark space is larger than this free path; for hydrogen, for example, the value of c is about 4.

When the current is so large that the whole of the cathode is covered with glow the width of the dark space depends upon the current decreasing as the current increases. In helium and hydrogen Aston (Pro. Roy. Soc. 80 A., p. 45) has detected the existence of another thin dark space quite close to the cathode whose thickness is independent of the pressure. The farther boundary of the Crookes dark space is luminous and is known as the negative glow or the third negative layer. Until the current gets so large that the glow next the cathode covers the whole of its sur- face the potential difference between the cathode and the negative glow is independent of the pressure of the gas and the current passing through it; it depends only on the kind of gas and the metal of which the cathode is made. This difference of potential is known as the cathode fall of potential; the values of it in volts for some gases and electrodes as determined by Mey (Verh. deuts. Phys. Ges., 1903, v. p. 72) are given in the table.

Cathode Fall

Gas

Electrode

Pt

Hg

Ag

Cu

Fe

Zn

Al

Mg

Na

Na-K

K

o 2

369

172

H 2

300

295

280

230

213

190

168

185

169

N 2

232

226

207

178

125

170

He

226

80

78-5

69

Arg

167

100

—

The cathode fall of potential measures the smallest difference of potential which can produce a spark through the gas. Thus, for example, it is not possible to produce a spark through nitrogen with platinum electrodes with a potential difference of less than 232 volts, except when the electrodes are placed so close together that with a smaller potential difference the electric force between the terminals amounts to more than a million volts per centimetre; for this to be the case the distance between the electrodes must be comparable with the wave-length of sodium light.

When the current is small the glow next the cathode does not cover the whole of the surface, and when this occurs an increase in the current causes the glow to cover a greater area, but does not increase the current density nor the cathode fall. When the current is so much increased that the glow covers the whole of the cathode an increase in current must result in an increase of the current density over the cathode, and this is accomplished by a rapid increase in the cathode fall of potential. The cathode fall in this case has been investigated by Stark (Phys. Zeit. in, p. 274), who finds that its value K can be

represented by the equation

K = K„ + k(C-xpf)'/pj\ where K„ is the normal cathode fall, / the area of the cathode, C the current through the tube, p the pressure of the gas and k and x constants.

The increase in the potential fall is much more marked in small tubes than in large ones, as with small tubes the formation of the negative glow is restricted; this gives rise to a greater concentra- tion of the current at the cathode and an increase in the cathode

fall. The intensity of the electric field in the dark space has been measured by many observers. Aston used very large plain cathodes and measured the electric force by observing the deflection of a small pencil of cathode rays sent across the dark space at different dis- tances from the cathode. He found that the magnitude of the force at a point in the dark space was proportional to the distance of the point from the junction of the negative glow and the dark space. This law of force shows that positive electricity must be in excess in the dark space, and that the density of the electrifica- tion must be constant throughout that space. The force inside the negative glow if not absolutely zero is so small that no one has as yet succeeded in measuring it; thus the surface of this glow must be very approximately an equi-putential surface. In the dark space there is a stream of positively electrified particles moving towards the cathode and of negatively electrified corpuscles moving away from it, these streams being mutually dependent ; the impact of the positive particles against the cathode gives rise to the emission Of corpuscles from the cathode; these, after acquiring kinetic energy in the dark space, ionize the gas and produce the positive ions which are attracted by the cathode and give rise to a fresh supply of corpuscles. The corpuscles which carry the negative electricity are very different from the carriers of the positive; the former have a mass of only iVitb of the atom of hydrogen, while the mass of the latter is never less than that of this atom.

The stream of positive particles towards the cathode is, often called the Canalstrahlen, and may be investigated by allowing the stream to flow through a hole in the cathode and then measuring, by the methods described in Conduction, Electric (Through Gases), the velocity and the value of e/m when e is the charge on a carrier and m its mass. It has been found that

this stream is some- what complex and consists of —

a. A stream of neutral particles.

j8. A stream of positively electrified particles moving with a con- stant velocity of 2X10 8 cm. /sec, and having e/m = lo i . This is a secondary stream produced by the passage of a through the gas, and it is very small when the pressure of the gas is low.

7. Streams of positively electrified atoms and perhaps molecules of the gases in the tube. The velocity of these depends upon the cathode fall of potential.

The streams of negative corpuscles and positive particles produce different kinds Of phosphorescence when they strike against a solid obstacle. The difference is especially marked when they strike against lithium chloride. The corpuscles make it phosphoresce with a steely blue light giving a continuous spectrum; the positive particles, on the other hand, make it shine with a bright red light giving in the spectroscope the red lithium line. This affords a convenient method of investigating the rays; for example, the dis- tribution of the positive stream over the cathode is readiiy studied by covering the cathode with fused lithium chloride and observing the distribution of the red. glow. Goldstein has observed that the film of metal which is deposited on the sides of the tube through the sputtering of the cathode is quickly dissipated when the positive stream impinges on it. This suggests that the sputtering of the cathode is caused by the impact against it of the positive stream. This view is supported by the fact that the" sputtering is not very copious until the increase in the current produces a large increase in the cathode fall of potential. The magnitude of the potential fall and the length of the dark space are determined by the condition that the positive particles when they strike against the cathode must give to it sufficient energy to liberate the number of cathode particles which produce, when they ionize the gas, sufficient positive particles to carry this amount of energy. Thus the cathode fall may be regarded as existing to make the cathode emit negative corpuscles. If the cathode can be made to emit corpuscles by other means, the cathode fall of potential is not required and may dis- appear. Now Wehnelt (Ann. Phys., 1904, 14, p. 425), found that when lime or barium oxide is heated to redness large quantities of negative corpuscles are emitted; hence if a cathode is covered

with one of these substances and made red hot it can emit corpuscles without the assistance of an electric field, and we find that in this case the cathode fall of potential disappears, and current can be sent through the gas with very much smaller differences of potential than with cold cathodes. With these hot cathodes a luminous current can under favourable circumstances be sent through a gas with a potential difference as small as 18 volts.

The dimensions of the parts of the discharge we have been considering — the dark space and the negative glow — depend essentially upon the pressure of the gas and the shape of the cathode, and do not increase when the distance between the anode and cathode is increased. The dimensions of the other part of the discharge which reaches to the anode and is called the positive column depends upon the length of the tube, and in long tubes constitutes by far the greater part of the discharge. This positive column is separated from the negative glow by a dark interval generally known as the Faraday dark space ; the dimensions of this dark interval are very variable — it is sometimes altogether absent.

The positive column assumes a considerable variety of forms as the current through the gas and the pressure are varied : sometimes it is a column of uniform luminosity, at others it breaks up into

a series of bright and dark patches known as striations. Some examples of these are given in fig. 17 of Conduction, Electric (Through Gases). The distance between the striations varies with the pressure of the gas and the diameter of the tube, the bright parts being more widely separated when the pressure is low and the dia- meter of the tube large, than when the pressure is high and the tube small. The striations are especially brilliant and steady when a Wehnelt cathode covered with hot lime is used and the discharge produced by a number of storage cells; by this means large currents can be sent through the tube, resulting in very brilliant striations. When the current is increased the positive column shortens, retreat- ing backwards towards the anode, and may, by using very low currents, be reduced to a glow over the surface of the

anode. The electric force in the positive column has been measured by many observers. It is small compared with the forces which exist in the dark space; when the luminosity in the positive column is uniform, the force there is uniform; when the positive column is striated there are periodic variations in the electric force, the force being greater in the bright parts of the striation than in the dark.

Anode Drop of Potential. — Skinner (Wied. Ann. 68, p. 752; Phil. Mag. [6], 8, p. 387) has shown that there is a sudden change in potential between the anode itself and a point in the gas close to the anode. This change amounts to about 20 volts in air; it is thus much smaller than the cathode fall of potential, and it is also much more abrupt. There does not seem to be any region at the anode comparable in dimensions with the Crookes' dark space in which the drop of potential occurs.

The highly differentiated structure we have described is not the only way in which the current can pass through the tube. If a large Leyden jar is suddenly discharged through the tube the discharge passes as a uniform, continuous column stretching without interruption from anode to cathode; Gold- stein has shown (Verh. deulsch. phys. Ges. 9, p. 321) that the spectrum of this discharge shows very interesting char- acteristics. (J. J. T.)

VACZ (Ger. Waitzen), a town of Hungary, in the county of Pest-Pilis-Solt-Kis-Kun, 20 m. N. of Budapest by rail. Pop. (iqoo) 16,563. It is situated on the left bank of the Danube, at the point where this river takes its southern course, and at the foot of the Nagyszal (Ger. Waitzenberg), on the outskirts of the Carpathians. It is the seat of a Roman Catholic bishopric, founded in the nth century, and contains a beautiful cathedral, built in 1 761-1777, after the model of St Peter's at Rome. Amongst other buildings are the episcopal palace, with a museum of Roman and medieval antiquities, several convents, and the principal deaf and dumb institute in the country. There are large vineyards in the neighbouring hilly district, and the ex- portation of grapes is extensively carried on. Vacz was the scene of two victories gained by the Austrians against the Turks, one in 1507 and the other in 1684.

VADE-MECUM, a Latin phrase meaning literally " come with me " (vade, imperative of vaderc, to go or come; cum, with;

me, abl. of ego, I), and used in French, Spanish and English for something that a person is in the habit of constantly taking about with him, especially a book of the nature of a handy guide or work of reference.

VAGRANCY (formed from "vagrant," wandering, unsettled; this word appears in Anglo- Fr. as waheranl and O.Fr. as wancrant, and is probably of Teut. origin, cf. M.L.G. welkern, to walk about; it is allied to Eng. " walk," and is not to be directly referred to Lat. vagari), the state of wandering without any settled home; in a wider sense the term is applied in England and the United States to a great number of offences against the good order of society. An English statute of 1547 contains the first mention of the word " vagrant," using it synonymously with " vaga- bond " or " loiterer." Ancient statutes quoted by Blackstone define vagrants to be " such as wake on the night and sleep on the day and haunt customable taverns and alehouses and routs about; and no man wot from whence they come ne whither they go." The word vagrant now usually includes idle and disorderly persons, rogues, vagabonds, tramps, unlicensed pedlars, beggars, &c.

The social problem of vagrancy is one that in 1010 had not yet been satisfactorily dealt with, so far as the United Kingdom :s concerned. Indeed, the legislation of the early 19th century

remained still in force in England and Wales. In early times, legislation affecting the deserving poor and vagrants was blended. It was only very gradually that the former were allowed to run a freer course, but provisions as to vagrancy and mendicity, including stringent laws in relation to constructive " sturdy beggars," " rogues " and " vagabonds," formed, until well on in the 19th century, a prominent feature of Poor Law legislation. In 1 7 13 an act was passed for reducing the laws relating to rogues, vagabonds, sturdy beggars and vagrants into one act, and for more effectually punishing them and sending them to their homes, the manner of conveying them including whipping in every county through which they passed. This act was in turn repealed in 1740; the substituted consolidation act (13 Geo. II. c. 24), embracing a variety of provisions, made a dis- tinction between idle and disorderly persons, rogues and vaga- bonds and incorrigible rogues. Four years later was passed another statute which continued the rough classification already mentioned. The laws relating to idle and disorderly persons, rogues and vagabonds,

incorrigible rogues and other vagrants in England were again consolidated and amended in 1822, but the act was superseded two years later by the Vagrancy Act (5 Geo. IV. c. 83), which in 1910 was the operative statute.

The offences dealt with under the act of 1824 may be classified as follows: (1) offences committed by persons of a disreputable mode of life, such as begging, trading as a pedlar without a licence, telling fortunes, or sleeping in outhouses, unoccupied buildings, &c, without visible means of subsistence; (2) offences against the poor law, such as leaving a wife and family chargeable to the poor rate, returning to and becoming chargeable to a parish after being removed therefrom by an order of the justices, refusing or neglecting to perform the task of work in a workhouse, or damaging clothes or other property belonging to the guardians; (3) offences committed by professional criminals, such as being found in pos- session of house-breaking implements or a gun or other offensive weapon with a felonious intent, or being found on any enclosed premises for an unlawful purpose, or frequenting public places for the purpose of felony.

Offences specially characteristic of vagrancy are begging, sleeping out, and certain offences in casual wards, such as refusal to perform a task of work and destroying clothes. Persons committing these last-mentioned offences are classed as " idle and disorderly persons " and are liable on summary conviction to imprisonment with hard labour for fourteen days or on conviction by a petty sessional court to a fine of £5 or a month's imprisonment with or without hard labour. A second conviction makes a person a " rogue and vaga- bond " liable on summary conviction to imprisonment for fourteen days or on conviction by a petty sessional court to a fine of £25 or imprisonment for three months with or without hard labour. Any person sleeping out without visible means of subsistence is a rogue and vagabond, or on second conviction an incorrigible rogue, while an ordinary beggar is an idle and disorderly person. Under the poor law as reformed in 1834 the primary duty of boards of guardians was to relieve destitute persons within their district, but legislation and administration gradually widened that duty, so that eventually they came to administer relief to vagrants also, or casual paupers, as they are officially termed.

Within the limits prescribed by the local government board the

treatment in English casual wards varies in a striking degree. Before admission to a casual ward a vagrant requires casual an order, obtained either from a relieving officer or his Wards. assistant. In cases of sudden or urgent necessity, however, the master of the workhouse has power to admit without an order. Generally speaking, vagrants are not admitted to the casual wards before 4 p.m. in winter or 6 p.m. in summer. On admission, they are supposed to be searched, but this is not usually done with much thoroughness; broken food found on them is sometimes allowed to be eaten in the ward; money, pipe, tobacco, &c, are restored to them on discharge. As soon as practicable after admission vagrants are required to be cleansed in a bath with water of suitable tempera- ture. Their clothes are taken away and disinfected and a night- shirt provided. Sleeping accommodation is provided either on the cellular system or in associated wards, the proportion of work-houses providing the former being 2 to I. Vagrants are, as a general rule, supposed to be detained two nights and are required to perform a task of work. This consists of stone-breaking, wood-sawing, wood-chopping, pumping, digging or oakum picking, and should represent nine hours' work.

The supervising authority has endeavoured, in prescribing the work to which vagrants are put, to make it as deterrent as possible, but in practice the work presents little difficulty to the' habitual vagrant, and very few workhouses enforce the two nights' detention rule. The fare provided for vagrants is a welcome relief, too, from their usual scanty fare, and in many of the modern workhouses the wards are almost luxurious in their style and equipment.

The consequence of this generous treatment of those who are " work-shy " is that instead of being repelled or reformed by their _ . treatment, the class is continually on the increase. This

If e form i ncre ase has received the serious attention oi social re- mOV V formers, and in 1904 the president of the local government

weau board appointed a departmental committee to inquire into

the subject of vagrancy. The committee presented its report in 1906, which with the evidence of witnesses is a most valuable exposition of the subject. Among the various recommendations of the com- mittee the most important were the transference of casual wards to the control of police authorities; the issue of way-tickets, as used on the continent of Europe and a very few English counties, by the police to bona fide work-seekers, and more especially the de- tention of habitual vagrants in labour colonies. This last recom- mendation was also that of the Royal Commission on the Poor Laws which reported in 1909, to which those interested are also referred for valuable information.

The system of way-tickets has been found useful in Germany and Switzerland in assisting the genuine work-seeker on his way and in discriminating between him and the idle vagrant. In Germany those leaving their districts must carry certain papers of identification in addition to a Wander schein or way-ticket. For the relief of the destitute wayfarer there is the Herberge or lodging-house, maintained by a voluntary society, and the Verpflegungs-station, or relief station, maintained by the local authorities, In each, those in search of work can obtain lodging and food either for a small payment or by the performance of three hours' work, such as wood-chopping or stone-breaking. In Switzerland way -tickets are issued by a society named the Inter-Cantonal Union to those who can prove that they have worked for an employer within the three preceding months, and that at least five days have elapsed since that employment ceased. The Vagrancy Committee recom- mended that the English way-ticket in book form should give the man's personal description, his usual trade, his reason for wanting to travel and his proposed destination, and should contain his signature and, possibly, his finger-prints for the purpose of testing identity. The name of each casual ward visited should be stamped on the ticket. The duration of the ticket should be limited to a certain period, possibly a month. With such a ticket, a man should be entitled at the casual ward to a night's lodging, supper and breakfast, and after performing two hours' work to help to pay for his food and lodging he should be free to leave whenever he liked. The name of the next ward on the direct line of his route, which he could reach that night, should be entered on the ticket, and on his arrival at that place he should be treated in the same manner. The ticket would thus form a record of his journey and show whether he was

genuinely in search of work.

The remedy which has been considered as most likely to be effective for the cure of habitual vagrancy in England is that of

labour colonies, which have been tried on the continent Labour o ˆ £ urope ˆh a substantial measure of success.

These European labour colonies are described in detail in the appendices to the Report and Evidence of the Vagrancy-Committee and in the books mentioned at the end of this article, but a resutni of the more important colonies may here be given.

Holland. — There are two classes of colonies, both originally established by the Maatschaapij van Weldadigheid (Society of Beneficence), a society founded by General van den Bosch (1780- 1844) in 1818. The Free Colonies were designed for the reception of indigent persons, for the purpose of teaching them agriculture, and so enabling them eventually to earn their own living independently. There are three of these free colonies, viz. Frederiksoord, Willem- soord and Wilhelminasoord, forming practically one colony, with a population of about 1500. The expenses of the colonies are met by voluntary subscriptions, but it has been found that the persons who enter the free colonies remain there and few fresh cases are received. The number of inmates has been steadily decreasing. The society also maintained Beggar Colonies for the compulsory detention of persons committing the offence of begging. They were more penal than reformatory institutions, and the inmates were taught certain occupations by which they might support themselves on leaving. They did not prove self-supporting and were eventually taken over by the state. The chief institution is that at Veenhuizen, which occupies some 3000 acres of land, and where some 4000 men of the vagrant class are detained for periods varying from not less than six months to not more than three years. There is a similar institution for women at Leiden.

Belgium. — In Belgium the institutions for the repression of vagrancy are maintained by the state under a law of November 27th, 1891. They are of three kinds: — (1) Depots de mendicite (beggars' depots) ; (2) maisons de refuge (houses of refuge) ; and (3) ecoles de bienfaisance (reformatory schools). The beggars' depots are " exclusively devoted to the

confinement of persons whom the judicial authority shall place at the disposal of the government" for that purpose, and these are classified as (a) able-bodied persons who, instead of working for their living, depend upon charity as

professional beggars ; (b) persons, who, owing to idleness, drunken- ness or immorality, live in a state of vagrancy; and © souteneurs. There are two of these depots : one for men at Merxplas, and another for women at Bruges. Persons are committed to the depots on summary conviction for a period of not less than two years or more than seven years. The population of Merxplas is over 5000; the colonists are employed in land reclamation, farming and various industries. Small daily wages, varying from id. to 3d., are paid, but these may be withheld for disciplinary purposes. One half of the wages is retained by the management and paid out to the colonist on leaving, the other half being given monthly in the shape of tokens to spend at the canteen in articles of food, tobacco, <&c.

The houses of refuge are for men who from age or infirmity are unable to work, or who have been driven to begging or vagrancy by the want of work or misfortune. The chief house of refuge is at Hoogstraeten, where the helpless and sick are received; that at Wortel being reserved for the able-bodied. The colonists earn wages ranging from id. to 7d. a day, one-third of this being given to them to spend, and they may take their discharge when they have saved 12s. from their earnings or can show that they have work to go to. The maximum period of detention .is one year.

Germany. — In Germany there are between thirty and forty labour colonies, under the management of a charitable association, the Labour Colony Central Board. There is however, no compulsory detention. The institutions which deal with vagrants and persons who neglect to maintain themselves are termed " workhouses " (Arbeitshduser), but they correspond to the compulsory colonies of Belgium and Holland. Under the penal code of 1900, any one (a) who wanders about as a vagabond: (b) who begs, or causes or allows his children to beg; (c) who through gambling, drunken-ness or idleness is forced to apply for relief for himself, or those for whose maintenance he is responsible ; {d) who while in receipt of public relief refuses to do work given him by the authorities ; (e) who after losing his lodging fails to procure

another within a certain time, is liable to detention in a workhouse for a period not exceeding two years. The workhouses are under strict military discipline, the inmates being termed prisoners. They are taught domestic, agricultural and industrial occupations.

Switzerland. — Labour colonies are of two kinds, voluntary and compulsory. The voluntary colonies, of which there are three in Switzerland, are managed by philanthropic societies. Entry and discharge are voluntary, but those seeking admission must agree to stay a stated time, usually one or two months. Compulsory colonies are established in every canton, under the management of the cantonal council. Beggars can be arrested, and, if habitual offenders, can be sent to a labour colony for a period varying from six months to two years. If the man is found to have refused work, he can be sent to a labour colony as a " work-shy " for from three months to two years. Owing in great measure to the success of these labour colonies, vagrancy has considerably diminished in Switzerland, and the colonies everywhere are small; that at Witzwyl, the largest, having less than 200 inmates. Punishment is generally inflicted by reduction of food; the inmates receive no wages, but by industry may earn a remission of their period of detention

Authorities. — For a history of vagrancy see C.J. Ribton-Turner, History of Vagrants and Vagrancy (1887) ; see also Reports, Evidence and Appendices of Departmental Committee on Vagrancy, iqo6 — a most valuable publication — as well as The Vagrancy Problem (1910), by W. H. Dawson, who was a witness before the committee, and whose work quoted is full of first-hand information. Two Board of Trade Reports on " Agencies and Methods for dealing with the Unemployed," 1893 and 1904, will be found useful, as also Rev. W. Carlile and V. W. Carlile's The Continental Outcast (1906).

(T. A. I.)

VAISON, a town of south-eastern France, in the department of Vaucluse, 26 m. N.N.E. of Avignon by road. Pop. (1906) 2148. The Ouveze, a tributary of the Rhone, divides Vaison into two quarters — the Roman and early medieval town on the right bank, and the town of the later middle ages on the left bank,- — the two communicating by an ancient Roman bridge consisting of a single arch. On the right bank is the church (once the cathedral) of Ste Marie, the choir of which is thought

to date in parts from the 9th century, while the nave belongs to the 1 2th century. A Romanesque cloister containing a collection of old sculpture flanks the church on the north. Remains of a Roman amphitheatre and the chapel of St Quenin (dedicated to a bishop of the 6th century), with a curious apse of the end of the nth century, are also to be seen in the old town. On the left bank are the parish church (15th and 16th centuries), remains of the medieval fortifications, and the keep of a castle of the counts of Toulouse. The industries of the town include the manufacture of wooden shoes, bellow's and agricultural imple- ments. Vaison, under the name of Vasio, was one of the principal towns of the Vocontii, and was a place of great importance under

the Romans, as is shown by an abundance of objects unearthed by excavation, amongst which may be mentioned a fine statue of an athlete (the Diadumenos) in the British Museum. The bishopric established in the 3rd century was suppressed in 1791. Its holders, towards the end of the 12th century, were despoiled of the temporal power in the town by the counts of Toulouse. Subsequently Vaison came, together with the rest of Comtat- Venaissin, under the power of the popes.

VALAIS (Ger. Wallis, Ital. Vallese), one of the cantons of southern Switzerland. Its name has been explained as meaning the " Walsch " (i.e. non-Teutonic) land. But it is pretty certainly derived from vallis or vallensis pagus, for the region is simply the old Vallis Poenina, or upper valley of the Rhone from its source in the Rhone glacier to the gorge of St Maurice, together with the left bank of the Rhone from that gorge to the Lake of Geneva. The spelling " Vallais " prevailed till the end of the 18th century, and was officially superseded early in the 19th century by " Valais," a form that is very rarely found previously.

The total area of the canton is 2016-6 sq. m. (exceeded only by that of the Grisons and of Bern), of which, however, only 1 107 is reckoned as " productive " (forests covering 297-4 sq. m. and vineyards 10-7 sq. m.), while of the rest no fewer than 375 sq. m. (the most considerable stretch in Switzerland) is occupied by glaciers, and 4if sq. m. by the cantonal share of

the Lake of Geneva. It is therefore naturally one of the poorest cantons in the confederation. It would be still poorer were it not for its excellent wines, and for the fact that in summer-time it is visited by many thousands of travellers, for whom inns have been built in nearly every glen and on many high pastures (Zermatt, Saas, Riffel Alp, Evolena, Arolla, Zinal, Champery, in the Val de Bagnes, in the Lotschen valley, the Bel Alp, the Rieder Alp, the Eggishorn, Binn, and near the Rhone glacier). It consists of a deep and long trench, which becomes a mere gorge between Niederwald and Brieg, the general direction being south-west, till at Martigny the valley makes a sharp bend to the north-west. The loftiest point in the canton is the culminating summit or Dufourspitze (15,217 ft.) of Monte Rosa, which rises on a short spur projecting from the watershed, but the highest mountain which is wholly situated in the canton is the Dom (14,942 ft.), the culminating point of the Mischabel range.

A railway line runs through the canton from Le Bouveret, on the Lake of Geneva, to (73 m.) Brieg, at the N. mouth of the mag- nificent Simplon tunnel (12ˆ m., opened in 1906), the line from St Maurice (about 14 m. from Bouveret) onwards forming the through line from Lausanne towards Milan. There are also mountain railways from Visp up to Zermatt (thence a branch up to the Gornergrat), and from Vernayaz (near Martigny) past Sal van towards Chamonix, while the new tunnel, begun in 1906, beneath the Lotschen Pass or Lotschberg, connects Kandersteg, in the Bernese Oberland, with Brieg, and thus opens up a new direct route from London and Paris to Italy. As the canton is shut in almost throughout its entire length by high mountain ranges it is as a rule only accessible by foot paths or mule paths across this lofty Alpine barrier. But there are excellent carriage roads over the Great St Bernard Pass (81 11 ft.), as well as over the Simplon Pass (6592 ft.), both leading to Italy. At the very head of the Rhone valley two other finely engineered carriage roads give access to Uri over the Furka Pass (7992 ft.) and to the canton of Bern over the Grimsel Pass (7100 ft.). Being thus shut in it was almost impossible for the canton to extend its boundaries, save in 1536, when it won the left bank of the Rhone below the gorge of St Maurice. But at early though unknown dates it acquired and still holds the upper bit of the southern slope of the Simplon Pass, as well as the Alpine pastu-es on the northern slope of the Gemmi. The mineral waters of

Leukerbad, and, to a lesser degree, those of Saxon, attract some summer visitors, the vast majority of whom, however, prefer the glorious scenery of the various high Alpine glens.

The canton forms the diocese of Sion (founded in the 4th century), and has St Th6odule (or Theodore) as its patron saint. Till 1513 the diocese was in the ecclesiastical province of Moiitiers in the Tarentaise (Savoy), but since then has been immediately dependent on the pope. Within its limits are the three famous religious houses (all now held by Austin Canons) of St Maurice (6th century), of the Great St Bernard, and of the Simplon. Since 1840 the abbot of St Maurice has borne the title of bishop of Bethlehem " in partibus infidelium." Ecclesiastical affairs are managed

without any control or interference on the part of the state, though the cantonal legislature presents to the pope as bishop one of four candidates presented by the chapter of Sion.

In 1900 the population was 114,438, of whom 74,562 were French-speaking, 34,339 German-speaking, and 5469 Italian-speaking, while 112,584 were Romanists, 1610 Protestants, and 25 Jews. The linguistic frontier has varied in the course of ages. Nowadays from Sierre (10 m. above Sion) upwards a dialect of German is generally spoken (though it is said that the opening of the Simplon through route has given a considerable impetus to the extension of French among the railway officials), while below Sierre a French dialect (really a Savoyard patois) is the prevailing tongue. To a considerable degree the history of the Valais is a struggle between the German element (pre- dominant politically till 1798) and the French element. Good wines are produced in the district, especially Muscat and Vin du Glacier. Otherwise the inhabitants of the main valley (at least from Brieg onwards) are engaged in agriculture, though suffering much from the inundations of the Rhone, against which great embankments have been constructed, while many swampy tracts have been drained, and so the plague of malarial fever abated to a certain extent.

In the higher valleys the inhabitants are employed in pastoral occupations. The number of " alps " or mountain pastures is 547 (3 10 – in the Lower Valais and 228 in the Upper Valais, the line of division being drawn a little above Sierre), capable of sup- porting 50,735 cows (33,192 and 17,54.3 respectively)

and of an estimated capital value of 10,873,900 fr. (7,969,500 and 2,904,400 respectively), so that, as might be expected for other reasons, the lower portion of the valley where the climate is less rigorous is richer and more prosperous than the upper portion where other conditions prevail. The capital is Sion (q.v.). Next in point of population came (in 1900) Naters (3953), on account of the numbers of Italian workmen engaged in- piercing the Simplon tunnel. The neighbouring town of Brieg had then 2182 inhabitants, and the wide commune of Monthey 3392.

The canton is divided into 13 administrative districts, which comprise 166 communes. The cantonal constitution was little advanced till 1907 when it was entirely remodelled. The legislature (Grand Conseil or Gross Rath) is composed of members elected in the proportion of one for every 1000 (or fraction over 500) citizens, and holds office for four years; The executive (Conseil d'Htat or Staatsrath) is composed of five members, named by the Grand Conseil , and holds office for four years. The ' 'obligatory referendum " prevails, while 4000 citizens (6000 in the case of a revision of the cantonal constitution) have the right of " initiative " as to legislative projects. The two members of the Federal Stdnde- rath are named by the Grand Conseil, but the six members of the Federal Nationalraih are elected by a popular vote. The 1907 cantonal constitution has a curious provision (art. 84) that while members of the cantonal legislature are ordinarily elected by all the voters of a Bezirk or district, yet if one or several communes (numbering over 500 inhabitants) demand it, this commune or these communes form a kreis, or cerde and elect a member or members.

The Vallis Poenina was won by the Romans after a great fight at Octodurus (Martigny) in 57 B.C., and was so thoroughly Romanized that the Celtic aboriginal inhabitants and the Teutonic Burgundian invaders (5th century) became Romance-speaking peoples. According to a tradition which can be traced back to the middle of the 8th century, the " Theban legion " was martyred at St Maurice about 285 or 302. Valais formed part of the kingdom of Transjurane Burgundy (888), which fell to the empire in 1032, and later of the duchy of Bur- gundia Minor, which was held from the emperors by the house of Zahringen (extinct 1218). In 999 Rudolph III. of Burgundy gave all temporal rights and privileges to the bishop of Sion, who was later styled " praefect and count of the Valais," and

is still a prince of the Holy Roman Empire; the pretended donation of Charlemagne is not genuine. The bishops had much to do in keeping back the Zahringen, and later the counts of Savoy. The latter, however, succeeded in winning most of the land west of Sion, while in the upper part of the valley there were many feudal lords (such as the lords of Raron, those of La Tour-Chatillon, and the counts of Visp). About the middle of the 13th century we find independent communities or " tithings " (dizains or Zehnten) growing up, these, though seven in number, taking their name most probably from a very

ancient division of the bishop's manors for administrative and judicial purposes. In the same century the upper part of the valley was colonized by Germans from Hasli (Bern), who thoroughly Teutonized it, though many Romance local names still remain. In 1354 the liberties of several of the seven "tithings " (Sion, Sierre, Leuk, Raron, Visp, Brieg and Conches) were confirmed by the Emperor Charles IV. A little later the influence of Savoy became predominant, and the count secured to his family the bishopric of Sion, of which he was already the suzerain. His progress was resisted by the tithings, which in 1375-76 crushed the power of the house of La Tour- Chatillon, and in 1388 utterly defeated the forces of the bishop, the count and the nobles at Visp, this being a victory of the Teutonic over the Romance element in the land. From 1384 the Morge stream (a little below Sion) was recognized as the boundary between Savoyard or Lower Valais and episcopal or Upper Valais. In 1416-17 the Zehnten of the upper bit of the valley made an alliance with Lucerne, Uri and Unterwalden, with a view partly to the conquest of the Val d'Ossola, which was finally lost in 1422, and partly to the successful crushing of the power of the lords of Raron (1420). By the election of Walther von Supersax of Conches as bishop in 1457 the Teutonic element finally won the supremacy. On the outbreak of the Burgundian War the bishop of Sion and the tithings made a treaty with Bern. In November of the same year (1475) they seized all Lower or Savoyard Valais up to Martigny, and in 1476 (March), after the victory of Grandson, won St Maurice, Evian, Thonon and Monthey. The last three districts were given up in 1477, but won again in 1536, though finally by the treaty of Thonon in 1569 Monthey, Val d'llliez and Bouveret

alone were per- manently annexed to the Valais, these conquests being maintained with the help of the"ir old allies, Uri, Schwyz and Unterwalden. These conquered districts (or Lower Valais) were always ruled as subject lands by the bishop and tithings of Upper Valais. The Valais took part in the Milanese war of 1512-16, and henceforth was reckoned as an "ally" of the Swiss Confederation. In 1533 a close alliance was made with the Romanist cantons; but by 1551 the Protestants had won so much ground that toleration was proclaimed by the local assembly. In 1586 Upper Valais became a member of the Golden League, and finally in 1603-04 the four tithings of Conches, Brieg, Visp and Raron carried the day in favour of the old faith against those of Leuk, Sierre and Sion. In 1790-91 Lower Valais rose in revolt; but it was not finally freed till 1798, when the whole of Valais became one of the cantons of the Helvetic Republic. Such prolonged and fierce resistance was, however, offered to French rule by the inhabitants that in 1802 Bonaparte declared Valais an independent state under the name of the " Rhodanic Republic," yet in 1810, for strategic reasons, he incorporated it with France as the " department of the Simplon,"and it was not freed till the Austrians came in 1813. In 181 5 a local assembly was created, in which each of the seven tithings of Upper and each of the six of Lower Valais (though the latter had nearly double the population of the former) elected four members, the bishop being given four votes. This constitution was approved by the Federal Swiss Diet, which thereupon (181 5) received the Valais as a full member of the Swiss Confederation. In 1832 the Valais joined the League of Sarnen to maintain the Federal Pact of 181 5. In 1839-40 it was convulsed by a struggle between the Conserva- tive and Radical parties, the split into two half cantons being only prevented by the arrival of Federal troops. The constitu- tion was revised in 1839, the local assembly was to be elected according to population (1 member for every 1000 inhabitants), and the bishop was given a seat instead of his four votes, while the clergy elected one deputy. In 1844 civil war raged, many Liberals being slain at the bridge of Trient (May 1844), and the Valais becoming a member of the Sonderbund. By the 1844 constitution the clergy elected a second deputy. The intro- duction of the Jesuits embittered matters, and the Valais was the last canton to submit in the Sonderbund War (1847); it contented itself, however, with voting steadily against the

acceptance of the Federal constitutions of 1848 and 1874. By the constitution of 1848 all ecclesiastical exemptions from taxation were swept away, and the bishop lost his seat in the assembly. New constitutions were framed in 1852, in 1875 and in 1907.

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VALDEMAR I., king of Denmark (1131-1182), the son of the chivalrous and popular Canute Lavard and the Russian princess Ingeborg, was born a week after his father's murder, and was carefully brought up in the religious and relatively enlightened household of Asser Rig, whose sons Absalon and Esbjorn Snare, or " the Swift," were his playmates. On the death of King Eric Lam in 1 147 Valdemar came forward as one of the three pre- tenders to the Danish crown, Jutland

falling to his portion (compact of Roskilde, 9th of August 11 57). Narrowly escaping assassination, at a banquet a few days later, at the hands of his rival, King Sweyn III., he succeeded only with the utmost diffi- culty in escaping to Jutland, but on the 23rd of October utterly routed Sweyn at the great battle of Grathe Heath, near Viborg, Sweyn perishing in his flight from the field. Valdemar had no longer a competitor. He was the sole male survivor of the ancient royal line; his valour and ability were universally recog- nized, and in Absalon, elected bishop of Roskilde in n 58, he possessed a minister of equal genius and patriotism. The first efforts of the new monarch were directed against the Wendish pirates who infested the Baltic and made not merely the political but even the commercial development of the Danish state im- possible. What the Northmen were to the Western powers in the 8th and 9th the Wends were to the Scandinavian lands in the nth and 12th centuries. But the Wendish pirates were more mischievous because less amenable to civilization than the Vikings. They lived simply for plunder, and had neither the ambition nor the ability to found colonies like Normandy or Northumbria. We may form some idea of the extent and the severity of their incursions from the fact that at the beginning of the reign of Valdemar the whole of the Danish eastern coast lay wasted and depopulated. Indeed, according to Saxo, one- third of the realm was a wilderness. The stronghold of the Wends was the isle of Rugen. Here lay Arkona their chief sanctuary and Garz their political capital. Both places were captured in 1169 by a great expedition under the command of Valdemar and Absalon; the hideous colossal idol of Riigievit was chopped into firewood for the Danish caldrons, and the Wends were christened at the point of the sword and placed beneath the jurisdiction of the see of Roskilde. This triumph was only obtained, however, after a fierce struggle of tea years, in which the Danes were much hampered by the uncertain and selfish co-operation of their German allies, chief among whom was Henry the Lion, duke of Saxony and Bavaria, who appropriated the lion's share of the spoil. For at the beginning of his reign Valdemar leaned largely upon the Germans and even went the

length, against the advice of Absalon, of acknowledging the

over- lordship of the Emperor Frederick Barbarossa at the reichstag of Dole, 1 162. Very different was Valdemar's second conference with Barbarossa, on the banks of the Eider, in 1182, when the two monarchs met as equals in the presence of their respective armies, and a double marriage was arranged between two of Valdemar's daughters and two of the emperor's sons. The only serious domestic trouble during Valdemar's reign was the rebellion of the Scanian provinces, which objected to the establishment of a strong monarchy inimical to local pretensions and disturbances, and especially to the heavy taxes and tithes necessary to support the new reign of law and order. The rising was ultimately suppressed by Absalon at the battle of Dysiaa, 1181. In the following year died King Valdemar. His services to his country are aptly epitomized in the epitaph on his ancient monument at Ringsted church which describes him as " Sclavorum domi- nator, patriae liberator et pacis conservator." His fame has been somewhat obscured by that of his great minister Absalon, whom their common chronicler Saxo constantly magnifies at the expense of his master. Valdemar's worst faults were a certain aloof- ness and taciturnity. He is the only one of Saxo's heroes in whose mouth the chronicler never puts a speech. But his long reign is unstained by a single ignoble deed, and he devoted himself heart and soul to the promotion of the material and spiritual welfare of Denmark.

See Danmarks Rige.s Historie, vol. i. pp. 570-670 (Copenhagen, 1897-1905); Saxo, Gesta Danorum, books 10-16 (Strassburg, 1886).

(R. N. B.)

VALDEMAR II., king of Denmark (1170-1241), was the second son of Valdemar I. and brother of Canute VI., whom he succeeded on the 12th of November 1202. Already during his brother's lifetime, as duke of Schleswig, Valdemar had success- fully defended Denmark against German aggression. In 1201 he assumed the offensive, conquered Holstein, together with Ham- burg, and compelled Count Henry of Schwerin to acknowledge the over-lordship of the Danish crown. Immediately after his coronation, he hastened to his newly won territories, accom- panied by the principal civil and ecclesiastical dignitaries of Denmark, and was solemnly acknowledged lord of Northalbingia (the district lying between the Eider and the Elbe) at Liibeck, Otto IV., then in difficulties,

voluntarily relinquishing all German territory north of the Elbe to Valdemar, who in return recognized Otto as German emperor. Thus the three bishoprics of Liibeck, Ratzeburg and Schwerin, which hitherto had been fief of the Reich, now passed under Danish suzerainty. Liibeck was a peculiarly valuable possession. The city had been founded in 1 1 58 with the express object of controlling the Baltic trade. Only through Liibeck, moreover, could supplies and reinforce- ments be poured into the German military colonies in Livonia. By closing Liibeck Valdemar had German trade and the German over-seas settlements entirely at his mercy. This state of things was clearly recognized by German statesmen, and in 1208, when the Emperor Otto felt more secure upon his unstable throne, he became overtly hostile to Denmark and would have attempted the recovery of the lost German territory but for the interposition of Pope Innocent III., who threatened to excommunicate any German prince who should attack Valdemar, the equally pious and astute Danish king having undertaken, at the bidding of the holy see, to lead a crusade against the heathen Esthonians. Valdemar's position was still further strengthened when Frederick II., the successful rival of Otto IV., was, in 121 5, crowned at Aix-la-Chapelle. Valdemar at once cultivated the friendship of the new emperor; and Frederick, by an imperial brief, issued in December 12 14 and subsequently confirmed by Innocent III. and Honorius III., formally renounced all the German lands north of the Elbe and Elde, as well as the Wendish lands on the Baltic, in favour of Valdemar.

An attempt by Otto in 1215 to recover Northalbingia was easily frustrated by Valdemar, who henceforth devoted himself to the extension of the Danish empire over the eastern Baltic shores. Here, however, he had already been forestalled. At the end of the 12th century the whole of the Baltic littoral from

semi-Christian Pomerania to orthodox Pleskow was fiercely and obstinately pagan. The connecting link between the western and the eastern Baltic was the isle of Gotland, where German merchants from Liibeck had established a depot (the later Visby). The fur-trade with the Esthonians and Livonians proved so lucrative that a German colony was planted in Livonia itself at what was afterwards Riga, and in 1201 for its better security the colony was converted into a bishopric. A still firmer footing was gained by the Germans on Livonian soil when Abbot Theo- derick of Riga founded the order of the

Sword (a foundation confirmed by the pope in 1204), whose duty it was to convert the heathen Esths and Livs and appropriate as much of their land in the process as possible. Two years later Valdemar, urged by Archbishop Anders Suneson, also appeared off the Esthonian coast and occupied the isle of Oesel. In 12 10 Valde- mar led a second expedition eastwards, this time directed against heathen Prussia and Samland, the chief result of which was the subjection of Mestwin, duke of Pomerania, the leading chieftain in those parts.

Now was to be seen the determining influence of sea-power even in those days. Despite its superior weapons and mode of warfare, the German east Baltic colony was constantly in danger of being overborne by the endless assaults of the dogged aborigines, whose hatred of the religion of the Cross as preached by the knights is very intelligible; and in 12 18 Bishop Albert of Riga was driven to appeal for assistance to King Valdemar. Valdemar cheerfully undertook a new crusade " for the honour of the Blessed Virgin and the remission of my own sins." In 1 218 he set sail for Esthonia with one of the largest fleets ever seen in northern waters, including a Wendish contingent led by Prince Vitslav. Landing at Lyndantse (the modern Reval) in north Esthonia, Valdemar at once received the submission of the inhabitants, but three days later was treacherously attacked in his camp and only saved from utter destruction by his own personal valour and the descent from heaven, at the critical moment, of a red banner with a white cross on it, the Dannebrog (Danes' Cloth), of which we now hear for the first time, and which henceforth was to precede the Danish armies to victory till its capture by the Ditmarshers, three hundred years later. This victory was followed by the foundation of Reval and the occupation of Harrien and Wirland, the northern districts of Esthonia, by the Danes.

Valdemar was now, after the king of England, the most powerful potentate in the north of Europe. The south-western Baltic was a Danish Mediterranean, and Danish territory extended from the Elbe to lake Peipus. But this scattered and hetero- geneous empire required a large standing army and a strong central government to hold it together. It is doubtful whether even the genius of Valdemar would have proved equal to such a stupendous task. He never had the opportunity of attempting it. In May 1223 he was seized at midnight in his tent on the isle of Lyo, whither he had come to hunt, by his

vassal and guest Count Henry of Schwerin, and conveyed with his son and many other valuable hostages to the inaccessible castle of Dannenberg- on-Elbe. In this dungeon he languished for two and a half years, and, despite all the efforts of Pope Honorius III. on his behalf, was ultimately forced to pay a heavy ransom, and surrender Northalbingia and all his Wendish conquests except Riigen. On his release Valdemar attempted to retrieve his position by force of arms, but was utterly defeated at the battle of Bornhoved (22nd of July 1227), which deserves a place among the decisive battles of history, for it destroyed at once and for ever the Danish dominion of the Baltic and established the independence of Liibeck, to the immense detriment in the future of all the Scandinavian states. On the other hand Valdemar, by prudent diplomacy, contrived to retain the greater portion of Danish Esthonia (compact of Stensby, 1238). With rare resignation Valdemar devoted the remainder of his life to the great work of domestic reform. His noblest achievement in this respect is the codification of the Danish laws known as the Jydske Lov (Jutland Code), which he lived to see completed a few days before his death at Vordingborg on the 28th of March 1241. Valdemar

was twice married, his first consort being Dragomir (Dagmar) of Bohemia, his second Berengaria of Portugal. All his four sons, Valdemar, Eric, Abel and Christopher became kings of Denmark.

See Danmarks Riges Historic vol. i. pp. 736-849 (Copenhagen, 1897-1905). (R. N. B.)

VALDEMAR IV., king of Denmark (c. 1320-1375), was the youngest son of Christopher II. of Denmark. Valdemar was brought up at the court of the German emperor, Louis of Bavaria, during those miserable years when the realm of Denmark was partitioned among Holstein counts and German Ritter, while Scania, " the bread-basket " of the monarchy, sought deliverance from anarchy under the protection of Magnus of Sweden. Even the Hanse Towns, the hereditary enemies of Denmark, regarded the situation with disquietude. " One would gladly have seen a single king in Denmark if only for peace sake," says the contemporary Liibeck chronicle, "for peace was not to be had either at sea or on land." The assassination at Randers of the detested Holstein tyrant Count Gerhard III. (1340), who for nine years had held Jutland and Funen and dominated the rest of Denmark, first opened Valdemar's way to the throne, and on midsummer day 1340 he was elected king at a Landsting held at Viborg, after consenting to espouse Helveg, the sister of his most important confederate, Valdemar, duke of Schleswig.

Neither the time nor the place of Valdemar's birth is known, but he could not have been more than twenty when he became the nominal king of Denmark, though, as a matter of fact, his territory was limited to the northernmost county of Jutland. His precocious maturity is strikingly evident from the first. An energy which never slackened, a doggedness which no adversity could crush, a fiery ambition coupled with the coolest calculation, and a diplomatic unscrupulousness which looked always to the end and never to the means, these were the salient qualities of the reconstructor of the dismembered Danish state. First Valdemar aimed at the recovery of Zealand, which was actually partitioned among a score of Holstein mortgagees who ruled their portions despotically from their strong castles, and sucked the people dry. The oppressed clergy and peasantry regarded Valdemar as their natural deliverer; but so poor and friendless was he that the work of redemption proved painfully slow. In November 1343 he obtained the tow T n and castle of Copenhagen from King Magnus Smek of Sweden, by reconfirming in still more stringent terms the previous surrender of the rich Scanian provinces, and by the end of the following year he had recovered the whole of North Zealand. In 1347 theremainder of Zealand was redeemed, and the southern isles, Laaland, Falster and Mon, also fell into the

king's strenuous hands. By this time, too, the whole of Jutland (except the province of Ribe) had fallen to him, county by county, as their respective holders were paid off. In 1349, at the Landsting of Ringsted, Valdemar proudly rendered an account of his stewardship to the Estates of Zealand, and the bishop of Roskilde congratulated him on having so miraculously delivered his people from foreign thraldom. In August 1346, he prudently rid himself of the distant and useless province of Esthonia by selling it very advantageously to the Livonian Order.

Valdemar now gave full play to his endless energy. In north German politics he interfered vigorously to protect his brother-in-law the Margrave Louis of Brandenburg against the lords of Mecklenburg and the dukes of Pomerania, with such success that the emperor, Charles IV., at the conference of Bautzen, was reconciled to the Brandenburger and allowed Valdemar an annual charge of 16,000 silver marks on the city of Liibeck (1349). Some years later Valdemar seriously thought of re-viving the ancient claims of Denmark upon England, and entered into negotiations with the French king, John, who in his distress looked to this descendant of the ancient Vikings for help. A matrimonial alliance between the two crowns was even discussed, and Valdemar offered, for the huge sum of 600,000 gulden, to transport 12,000 men to England. But the chronic state of rebellion in western Denmark, which, fomented by the discontented Jutish magnates, lasted with short intervals from

1350 to 1360, compelled Valdemar to renounce these far-reaching and fantastic designs. On the other hand, he proved more than a match for his domestic rebels, especially after his great victory at Bfobjaerg in Funen (1357). Finally, the com-pact of Kalundborg restored peace to the kingdom.

Valdemar now turned his eyes from the west to the east, where lay the " kingdom of Scania." Valdemar had indeed pledged it solemnly and irrevocably to King Magnus of Sweden, who had held it for twenty years; but profiting by the diffi- culties of Magnus with his Norwegian subjects, after skilfully securing his own position by negotiations with Albert of Meck- lenburg and the Hanseatic League, Valdemar suddenly and irresistibly invaded Scania, and by the end of 1361 all the old Danish lands, except North Holland, were recovered.

By the recovery of Scania Valdemar had become the lord of the

great herring-fishery market held every autumn from St Bartholomew's day (24th of August) to St Denis's day (9th of October) on the hammer-shaped peninsula projecting from the S.W. corner of Scania containing the towns of Skanor and Falsterbo. This flourishing industry, which fully occupied 40,000 boats and 300,000 fishers assembled from all parts of Europe to catch and salt the favourite Lenten fare of the whole continent, was the property of the Danish crown, and the innumerable tolls and taxes imposed by the king on the frequenters of the market was one of his most certain and lucrative sources of revenue. Foreign chapmen eagerly competed for special privileges of Skanor and Falsterbo, and the Hanseatic merchants in particular aimed at obtaining a monopoly there. But Valdemar was by no means disposed to submit to their dictation, and political conjunctures now brought about actual hostilities between Valdemar and the Hansa, or at least that portion of it known as the Wendish Towns, 1 whose commercial interests lay principally in the Baltic.

From time immemorial the isle of Gotland had been the staple of the Baltic trade, and its capital, Visby, whose burgesses were more than half German, the commercial intermediary between east and west, was the wealthiest city in northern Europe. In July 1361 Valdemar set sail from Denmark at the head of a great fleet, defeated a peasant army before Visby, and a few days later the burgesses of Visby made a breach in their walls through which the Danish monarch passed in triumph. The conquest of Gotland at once led to a war between Valdemar and Sweden allied with the Hanseatic towns; but in the spring of 1362 Valdemar repulsed from the fortress of Helsingborg a large Hanseatic fleet provided with " shooting engines " (cannon) and commanded by Johan Wittenburg, the burgomaster of Liibeck. In Sweden proper he was equally successful, and the general pacification which ensued in April 1365, very greatly in his favour, was cemented by the marriage of his daughter Margaret with Hakon VI. of Norway, the son of King Magnus.

Valdemar was now at the height of his power. Every political rival had been quelled. With the papal see, since his visit to Avignon in 1364, he had been on the best of terms. His ecclesiastic patronage was immense, and throughout the land he had planted strong castles surely held by the royal bailiffs. But in the winter of 1367-68 a hostile league against him of all

his neighbours threatened to destroy the fruits of a long and strenuous lifetime. The impulse came from the Hansa. At a Hansetag held at Cologne on the nth of November 1367, three groups of the towns, seventy in number, concerted to attack Denmark, and in January 1368 Valdemar's numerous domestic enemies, especially the Jutlanders and the Holstein counts, acceded to the league, with the object of partitioning the realm among them. And now an astounding and still inexplicable thing happened. At Easter-tide 1368, on the very eve of this general attack, Valdemar departed for three years to Germany, leaving his realm in the capable hands of the earl-marshal Henning Podbus'k. Valdemar's skilful diplomacy, reinforced by golden arguments, did indeed induce the dukes of Brunswick, Brandenburg and Pomerania to attack the confederates in the rear; but fortune was persistently unfriendly to the Danish king, 1 Rostock, Greifswald, Wismar and Stralsund.

and peace was finally concluded with the towns by Podbusk and the Danish Council of State at the congress of Stralsund, 1370. The conditions of peace were naturally humiliating for Valdemar, 1 though, ultimately, he contrived to render illusory many of the inordinate privileges he was obliged to concede. He was also able, shortly before his death on the 24th of October 1375, to recover the greater part of Holstein from the rebels.

We know astonishingly little of him personally. A few caustically witty sayings of his, and St Bridget's famous comparison of him to a fowler who could entice the shyest birds with his fluting, are almost all his personalia. It would be a mistake to regard him as a patriot. He was too unscrupulous and self-centred to play for anything but his own hand. Yet no other Danish king did so much for his country. His statesmanship, as judged from his acts, was all but flawless, and he was certainly one of the greatest of the medieval diplomatists. His character peeps forth most clearly perhaps in the saying which has become his epithet, Atterdag (" There will be a tomorrow "), which is an indication of that invincible doggedness to which he owed most of his successes.

See Danmarks Riges Historie, vol. ii. pp. 275-356 (Copenhagen, 1897-1905). (R. N. B.)

VALDEPENAS, a town of Spain, in the province of Ciudad Real; near the right bank of the river Jabalon, a tributary of the Guadiana, and on the Madrid-Cordova and Valdepenas-La Calzada railways. Pop. (1900) 21,015. Valdepenas is the largest town in the Campo de Calatrava, an extensive plain north of the Sierra Morena. Its commerce developed rapidly in the last quarter of the 10th century, largely as a result of improvements in its communications by road and rail; the population in the same period increased by more than one-third. Valdepenas contains large distilleries, tanneries, flour mills, cooperages, and other factories; but its trade is chiefly in the red wines for which the district is famous throughout Spain. There are hot mineral springs near the town.

VALDES, JUAN DE (c. 1500-1541), Spanish religious writer, younger of twin sons of Fernando de Valdes, hereditary regidor of Cuenca in Castile, was born about 1500 at Cuenca. He has been confused with his twin-brother Alphonso (in the suite of Charles V. at his coronation in Aix-la-Chapelle, 1520; Latin secre- tary of state from 1524, died in 1532 at Vienna). Juan, who prob- ably studied at the university of Alcala, first appears as the anonymous author of a politico-religious Didlogo de Met curio y Caron, written and published about 1528. A passage in this work may have suggested Don Quixote's advice to Sancho Panza on appointment to his governorship. The Didlogo attacked the corruptions of the Roman Church; hence Valdes, in fear of the Spanish Inquisition, left Spain for Naples in 1530. In 1 53 1 he removed to Rome, where his criticisms of papal policy were condoned, since in his Didlogo he had upheld the validity of Henry VIII. 's marriage with Catherine of Aragon. On the 1 2th of January 1533 he writes from Bologna, in attend- ance upon Pope Clement VII. From the autumn of 1533 he made Naples his permanent residence, his name being Italian- ized as Valdesso and Val d'Esso. Confusion with his brother may account for the statement (without evidence) of his appoint- ment by Charles V. as secretary to the viceroy at Naples, Don Pedro de Toledo; there is no proof of his holding any official position, though Curione (in 1544) writes of him as " cavalliere di Cesare." His house on the Chiaja was the centre of a literary and religious circle; his conversations and writings (circulated in manuscript) stimulated the desire for a spiritual

reformation of the church. His first production at Naples was a philological treatise, Didlogo de la Lengua (1533). His works entitle him to a foremost place among Spanish prose writers. His friends urged him to seek distinction as a humanist, but his bent was towards problems of Biblical interpretation in their bearing on the devout life. Vermigli (Peter Martyr) and Marcantonio Flaminio were leading spirits in his coterie, which included Vittoria Colonna and her sister-in-law, Giulia Gonzaga. On Ochino, for

1 They even gave the Hansa a vote in the future election of the Danish kings.

whose sermons he furnished themes, his influence was great. Carnesecchi, who had known Valdes at Rome as " a modest and well-bred courtier," found him at Naples (1540) " wholly intent upon the study of Holy Scripture," translating portions into Spanish from Hebrew and Greek, with comments and introductions. To him Carnesecchi ascribes his own adoption of the Evangelical doctrine of justification by faith, and at the same time his rejection of the policy of the Lutheran schism. Valdes died at Naples in May 1541.

His death scattered his band of associates. Abandoning the hope of a regenerated Catholicism, Ochino and Vermigli left Italy. Some of Valdes's writings were by degrees pub- lishedf in Italian translations. Showing much originality and penetration, they combine a delicate vein of semi-mystical spirituality with the personal charm attributed to their author in all contemporary notices. Llorente traces in Valdes the influence of Tauler; any such influence must have been at second hand. The Aviso on the interpretation of Scripture, based on Tauler, was probably the work of Alphonso. Valdes was in relations with Fra Benedetto of Mantua, the anonymous author of Del Benefizio di Gesu Cristo Crocefisso, revised by Flaminio (reprinted by Dr Babington, Cambridge, 1855). The suggestion that Valdes was unsound on the Trinity was first made in 1567 by the Transylvanian bishop, Francis David (see article Socinus); it has been adopted by Sand (1684), Wallace (1850) and other anti-Trinitarian writers, and is countenanced by Bayle. To this view some colour is given by isolated expres- sions in his writings, and by the subsequent course of Ochino (whose heterodox repute rests, however, on the insight with which he presented objections). Valdes never treats of the Trinity (even when commenting on Matt, xxviii. 19), reserving

it (in his Latte Spirituale) as a topic for advanced Christians; yet he explicitly affirms the consubstantiality of the Son, whom he unites in doxologies with the Father and the Holy Spirit (Opusc. p. 145). Practical theology interested him more than speculative; his aim being the promotion of a healthy and personal piety.

The following is a list of his writings: —

(1) Didlogo de Mercurio y Caron (no date or place; 1528?). An Italian translation by Nicolo Franco, Venice (no date); reprinted, Venice, 1545. Bound with the original (and with the translation) will usually be found a Didlogo by Alphonso de Valdes on the sack of Rome in 1527; this is also ascribed to Juan in the reprint, Dos Didlogos (1850).

(2) Didlogo de la Lengua (written, 1533; first printed, Madrid, 1737; reprinted, i860, 1873).

(3) Qual Maniera si devrebbe tenere a informare . . . gli figliuoli de Christiani delle Cose delta Religione (no date or place; before 1545, as it was used by the Italian translator of Calvin's catechism, 1545). No Spanish original is known. Reproduced as Latte Spirituale, Basel, 1549; Paris, 1550; in Latin, by Pierpaolo Vergerio, 1554; J 557! in Spanish, by Ed. Boehmer, 1882 ; in English, by J. T. Betts, 1 882 ; also in German (twice) and in Polish.

(4) Trataditos, Bonn, 1881, from a manuscript in the Palatine Library, Vienna; in Italian, J Cinque Tratatelli Evattgelici, Rome, 1545; reprinted, 1869; in English, by J. T. Betts, in XVII Opuscules, 1882.

(5) Alfabeto Christiana (written about 1537), in Italian, Venice, 1545; in English, by B. B. Wiffen, 1861; no Spanish original is known.

(6) Ciento i Diez Concideraciones; all copies of the original edition suppressed by the Spanish Inquisition; thirty-nine of the Con- cideraciones, published with the Trataditos, from a Vienna manu- script; in Italian, by Celio Secondo Curione, Le Cento et Died Divine Consideratione, Basel, 1550; in French, by Claude de Kerquifinen, Lyons, 1563; Paris, 1565; in English, by Nicholas Ferrar (at the instance of George Herbert), Oxford, 1638; Cambridge, 1646; another version by

J. T. Betts, 1865; in Spanish, by Luis Usoz i Rio, 1855.

(7) Seven Doctrinal Letters (original published with the Trataditos from Vienna manuscript), in English, by J. T. Betts, with the Opuscules.

(8) Comentario Breve . . . sobre la Epistola de San Pablo a los Romanos, Venice, 1556 (with text; edited by Juan Perez de Pineda); reprinted, 1856; in English, by J. T. Betts, 1883.

(9) Comentario Breve . . . sobre la Primera Epistola de san Pablo a los Corintios, Venice, 1557 (edited, reprinted and translated as No. 8). '.".■'

(10) El Evangelio de San Mateo (text arid commentary), 1881, from Vienna manuscript; in English, by J. T. Betts, 1883.

(i i) El Saiterio (the Psalms from Hebrew into Spanish), published with the Trutaditos from Vienna manuscript.

(12) At Vienna is an unpublished commentary in Spanish on Psalms i.-xli.

(13) Sand mentions a commentary on St John's Gospel, not known to exist.

Notices of Valdes in Sand (Biblioth. Antitrinitar, 1684), Bayle and Wallace (Antitrin. Biog., 1850) are inadequate. Revival of interest in him is due to McCrie (Hist. Ref. in Italy, 1827 ; Hist. Ref. in Spain, 1829). Fuller knowledge of his career was opened up by Benjamin B. Wiffen, whose Life of Valdes is prefixed to Betts's translation of the Considerations, 1865. Discoveries have since been made in the Aulic Library, Vienna, by Dr Edward Boehmer; cf. his Span. Reformers of Two Centuries (1874), his Lives of J. and A. de Valdes (1882), and his article in . Realencyklopadie fiir prot. Theol. und Kirche (1885). See also M. Young, Aonio Paleario (i860); K. Ben-rath, Bernardino Ochino (1875;) Menendez Pelayo, Los Heterodoxos Espaiioles (1880); G. Bonet-Maury, Early Sources of Eng. Unit. Christ, (trans. E. P. Hall, 1 884). (A. Go.)*

VALDIVIA, a southern province of Chile, bounded N. by Cautin, E. by Argentina, S. by Llanquihue and W. by the Pacific. Area, 8649 sq. m. Pop. (1895) 60,687; (1902, estimated) 76,000. The province is roughly mountainous in the E., is heavily forested and is traversed by numerous rivers. There is a chain of lakes across its eastern side near the Andes, the largest of which are Villarica, Rinihue and Ranco. The rivers are the Token on the northern boundary, the Valdivia, or Calle-Calle, with its large tributaries in the central part of the province, and the Bueno on the southern frontier. The Valdivia (about 100 m. long) has its sources in the Andes and flows W. to the Pacific. Its largest tributary on the N. is the Rio Cruces. The Valdivia is the outlet for Lake Rinihue and is navigable for a long distance. Valdivia is one of the most recently settled provinces and has a large immigrant element, chiefly German. Its most important industry is that of clear- ing away the heavy forests and marketing the timber. Stock- raising is an important industry, and wheat is grown on the cleared lands. Lumber, cattle, leather, flour and beer are ex- ported. The capital is Valdivia, a flourishing city on the Valdivia river, 12 m. above its port, Corral, near the mouth of the river. Pop. (1895) 8062; (1902, estimated) 9704. It is a roughly built pioneer town, in which wood is the principal building material. The mean annual temperature is 59-9° and its annual rainfall is 1 1 5 in. A government railway runs to Osorno on the S., and in 1909 was being connected with the central line running S. through Bio-Bio and Cautin. The port of Corral, at the mouth of the Valdivia river, in lat. 39 49′ S., long. 73 19′ W., is situated on the S. side of a broad, lagoon-like sheet of water, forming one of the best natural harbours on the coast. It is a pott of call for several lines of steamers, including those of the Pacific Mail running between Liverpool and Valparaiso.

VALDOSTA, a city and the county-seat of Lowndes county, Georgia, U.S.A., about 155 m. S.W. of Savannah. Pop. (1890) 2845; (1900) 5613 (2958 negroes); (1910) 7656. Valdosta is served by the Atlantic Coast Line, the Georgia Southern & Florida, and the Georgia & Florida railways. The city has a public library; the principal public buildings are the County Court House and the Federal building. Valdosta is in a rich farming and forest country; among its manufactures are cotton products, lumber, &c. The city owns and operates the water works. Valdosta was first settled in 1859, was incor- porated as a town in i860, and was chartered as a city in 1901.*

VALENCE, a town of south-eastern France, capital of the department of Dr6me, situated on the left bank of the Rhone, 65 m. S. of Lyons on the railway to Marseilles. Pop. (1906), town, 22,950; commune, 28,112. The river is here crossed by a fine suspension bridge. The cathedral of St Apollinaris, which has an interesting apse, was rebuilt in the nth century in the Romanesque style of Auvergne and consecrated in 1095 by Urban II. It was greatly injured in the wars of religion, but restored in the first decade of the 17th century. The porch and the stone tower above it were rebuilt in 1861. The church contains the monument of Pius VI., who died at Valence in 1799. A curious house (Maison des Teles) of the 16th century has a sculptured front with heads of Homer, Hippocrates, Aristotle,

Pythagoras, &c. The Maison Dupre-Latour with a beautifuDy carved doorway and the sepulchral monument known as the Pendentif date from the same century. The library and the museum containing Roman antiquities, sculptures and a picture gallery, are housed in the old ecclesiastical seminary. The most notable of the monuments erected by Valence to its natives are those to Emile Augier the dramatist by the duchess of Uzes (1897) and to General Championnet (1 762-1800).

Valence is the seat of a bishop, a prefect and a court of assizes, and has a tribunal of first instance, a board of trade arbitration, a chamber of commerce, a branch of the Bank of France, training colleges for both sexes, and a communal college. Among the industries are flour-milling, cooperage and the manufacture of furniture, liquorice, whitewash, and tapioca and similar foods. Trade, in which the port on the Rhone shares, is in fruit, cattle and live-stock, wine, early vegetables and farm produce, &c.

Valentia was the capital of the Segalauni, and the seat of a celebrated school prior to the Roman conquest, a colony under Augustus, and an important town of Viennensis Prima under Valentinian. Its bishopric dates probably from the 4th century. It was ravaged by the Alani and other barbarians, and fell successively under the power of the Burgundians, the Franks, the sovereigns of Aries, the emperors of Germany, the dukes of Valentinois, the counts of Toulouse, and its own bishops. The bishops were often in conflict with the citizens and the dukes of Valentinois, and to strengthen their hands against the latter the pope in 1275 united their bishopric with that of Die. The

citizens put themselves under the protection of the dauphin, and in 1456 had their rights and privileges con- firmed by Louis XL and put on an equal footing with those of the rest of Dauphine, the bishops consenting to recognize the suzerainty of the dauphin. In the 16th century Protestantism spread freely under Bishop Jean de Montluc, and Valence became the capital of the Protestants of the province in 1563. The town was fortified by Francis I. It had become the seat of a celebrated university in the middle of the 15th century; but the revocation of the edict of Nantes struck a fatal blow at its industry, commerce and population.

VALENCIA, or Valentia, an island off the south-western coast of Ireland, county Kerry, forming the southern horn of Dingle Bay. It is about 7 m. long and 3 broad at its widest part. The strait between the island and the mainland forms a fine natural harbour, land-locked with narrow entrances, and a depth of about 40 ft. at low tide, and thus capable of accommo- dating large vessels. At its north end is the Valencia Harbour station on a branch of the Great Southern & Western railway, with a ferry across the strait to Knightstown, the town on the island. The harbour is sometimes visited by warships, and is extensively used by fishing vessels, for which it is the head- quarters of a district. At Knightstown are the buildings of the Anglo-American Telegraph Company, for it was from Valencia, after several unsuccessful attempts from 1857 onward, that the steamer " Great Eastern " first succeeded in laying the cable to Newfoundland in 1866. There are four cables across the Atlantic and one to Emden in Germany. On the island are Protestant and Roman Catholic churches, constabulary barracks and a coastguard station. The meteorological reports received by the central office in London from Valencia are of high importance as giving the first indication from any station in the United Kingdom of weather influences from the Atlantic. Valencia formerly exported slate of fine quality. Its cliff scenery is magnificent, and its luxuriant semi-tropical vegetation remarkable. Its name is of Spanish origin; the Irish originally called it Dairbhre, or Darrery, the oak forest.

VALENCIA, the name of a maritime province of eastern Spain, and of the kingdom in which this province was formerly included. The province is bounded on the N. by Teruel and Castellon de la Plana, E. by the Mediterranean, S. by Alicante and W. by Albacete and Cuenca. Pop. (1900) 806,556; area,

4150 sq. m. Along the coast the surface is for the most part low and level, the fertile vegas, or cultivated plains, of Valencia,

Jativa and Gandia in many places rising very little above sea-level. To the west of these is a series of tablelands with a mean elevation of about 1000 ft., which in turn rise into the mountains that form the eastern boundary of the tableland of New Castile, and attain within the province a maximum elevation of nearly 4000 ft. The coast is skirted by considerable stretches of sand-dune, and by a series of these the lagoon called the Albufera (q.v.) de Valencia is separated from the Mediter- ranean. The principal rivers are the Guadalaviar or Turia and the Jucar (q.v.). The Guadalaviar enters the province in the extreme north-west, flows south-east, and falls into the sea below the city of Valencia; it receives numerous tributaries of little importance, and it dispenses fertility by numerous aque- ducts, mostly of Moorish origin, throughout the lower part of its course. Both the Jucar and its right-hand tributary the Albaida supply water for an extensive system of irrigation canals.

In the lowlands, especially towards the coast, very little rain falls; but heavy rain and melting snow among the highlands in which the principal rivers rise occasionally cause sudden and disastrous floods. The vegas have an exceptionally fine, almost sub-tropical climate. In their low-lying portions rice is the favourite crop; elsewhere wheat, maize and all kinds of fruit are abundantly grown; the mulberry is cultivated for silk; and wine and oil are produced. Esparto grass is grown in the less fertile areas. The tablelands produce, according to their elevation and exposure, figs, almonds, olives or vines. The pastures of the higher grounds sustain numerous sheep and goats; but cattle and horses are relatively few. The hillsides are somewhat bare of timber. The mineral resources of the province are little developed. The fishing industry on the coast is considerable, and there are manufactures of silk, carpets and tapestry, woollen, hemp and linen fabrics, glass, pottery and leather; there are also iron foundries, distilleries, cooperages and oil refineries. These industries are important, although the silk manufactures declined after three decades of

prosperity (from 1850 to 1880). The coast railway from Barcelona traverses the province, passing through the city of Valencia on the way south to Alicante and Murcia. From Jativa another important line diverges westward to Albacete, and there are branch lines from Valencia to Liria and to Utiel, from Silla to Cullera, from Carcagente to Gandia, and thence to Denia and Alcoy in the province of Alicante. Valencia, the capital and principal seaport, and the towns of Alcira, Requena, Sueca, Jativa, Carcagente, Cullera, Utiel, Onteniente and Gandia, are described in separate articles. Other towns of more than 7000 inhabitants are Algemesi, Catarroja, Liria, Sagunto, Tabernas de Valldigna and Torrente.

When the ancient kingdom of Valencia was incorporated into Aragon in 1238, it included the provinces of Castellon de la Plana (q.v.) and Alicante (q.v.). It was bounded inland on the N. by Catalonia, W. by Aragon and New Castile, and S. by Murcia. This region has an area of 8830 sq. m.; its present population is about 1,600,000. For its history see Valencia (city). The inhabitants are of very mixed race, owing to the successive occupation of the country by Iberians, Greeks, Carthaginians, Romans, Visigoths and Moors. Their dialect resembles Catalan but is softer, and contains a larger percentage of Arabic words. On the physique of the people, as on their customs and the architecture of their houses, Moorish rule left a durable imprint. The elaborate irrigation-works and the system of intensive agriculture which have rendered the huertas or gardens of Valencia celebrated were initiated by the Moors; the fame of the Elche date-groves, the Alicante vineyards and the Valencia orange plantations, was also originally due to them. With the decline of the caliphate of Cordova early in the nth century, Valencia became an independent kingdom, which passed successively into the power of the Almoravides and Almohades. When James I. of Aragon captured the city of Valencia in 1238, he found so large a number of Mozarabic Christians who had adopted the Arabic language and many of the customs of their rulers, that it was found necessary to translate the Bible into Arabic for their use. In 1609, 200,000 Moriscoes, or Moors who outwardly professed Christianity, were banished from the country. In 1833 Valencia was divided into the three provinces already named.

VALENCIA, the capital of the Spanish province of Valencia, on the right bank of the river Guadalaviar or Turia, 3 m. from the

Mediterranean Sea, and 304 m. by rail E.S.E. of Madrid.

Pop. (1877) 143,856; (1900) 213,550. Valencia is connected by numerous railways with all parts of Spain, and has one of the most secure and capacious harbours on the east coast. It is the seat of an archbishop, a court of appeal, a university, a captain-general and an army corps. All round it stretches the beautiful and closely cultivated Huerta de Valencia, an alluvial plain planted with groves of oranges, lemons and mulberries. The climate is mild and very dry; rain hardly ever falls except when the east wind blows from the sea. The white houses of the city, often Moorish in many details of their architecture, and the multitude of domes and towers overlaid with blue, white and gold tiles, give to Valencia an oriental appearance which is remarkable even in south-eastern Spain. Until 1 87 1 it was enclosed by a wall founded by the Romans and rebuilt in 1356 by Pedro IV.; two picturesque gateways with machicolated towers still remain, but few other remnants are left of the old fortifications, the site of which is now occupied by fine boulevards. The river, reduced, except in time of flood, to a scanty stream by the demands made upon it for irrigation, is crossed by several bridges, of which the longest has thirteen arches. The streets are for the most part narrow, crooked and somewhat gloomy, but in the more modern quarters there are some broad and handsome thoroughfares. Towards the close of the 19th century Valencia was lighted by gas and electricity; electric tramways were laid down and a good water-supply and drainage system secured.

The cathedral (La Seo), begun in 1262, was in 1459 lengthened in its original Gothic style, but in such a way as to spoil its proportions, and in the 18th century it was further injured by pseudo-Classic additions. It possesses some fine examples of the sculpture and metal- work of the 15th century, as well as of the Valencian school of painting. The campanile (el Miguelete), an isolated octagonal Gothic tower, 152 ft. in height, commands an extensive view of the town and surrounding country. Near the cathedral is the episcopal palace; its large and valuable library, rich in medals and other antiquities, suffered greatly during the French occupation in 181 2. Besides the cathedral, Valencia has numerous parish churches and other ecclesiastical buildings, none of them of great architectural beauty or interest; the church of St Nicholas (of Moorish origin) has, however, good specimens of paintings by Vicente Juanes as well as frescoes by Dionis

Vidal; and Ribalta can be studied in the chapel of the Colegio de Corpus or del Patriarcha.

Valencia University was formed about 1 500 by the fusion of an episcopal school of theology with a municipal school of arts, medicine and law, both dating from the middle of the 14th century. New colleges were soon added, and up to 1600 the university attained much prosperity and a high reputation. It then began to decline, but was reorganized after 1848, and resumed its place as one of the leading universities. The average number of students is 1750; law, philosophy, natural science and medicine are the subjects taught. The large but uninteresting university buildings date from the 16th century. The library, containing about 60,000 volumes, was robbed of its chief treasures by the French in 181 2. There. is a rich provincial museum, with paintings by Velazquez, Ribera, Diirer, Juanes, Bosco, Goya and many modern artists. Among other public buildings may be mentioned the court-house, a Doric edifice, dating from the time of Ferdinand the Catholic, and having curious frescoes (1592) in its main hall ; the custom- house (1758), now a cigar manufactory, employing some 3500 women; and the silk exchange, a large and elegant Gothic hall (1482). The citadel, on the north-east of the town, was built by Charles V. as a protection against Khair-ed-Din Barbarossa, the sea-rover; in the south-west cf the town is the former College of Saint Augustine, now used as a model prison, adjoining which is a large hospital. Beyond the old line of the walls there are a botanic garden, a large bull-ring, and various shady promenades, including the beautiful " Glorieta," and, on the north side of the river, the alameda, leading to the port (El Grao). The principal manufacture is silk, and the town is also celebrated for its coloured tiles

or " azulejos," and its oranges. Linen, woollen and esparto fabrics, hats, fans, leather, paper, cigars, glass and pottery- are also manufactured, and there are foundries and printing- works. Corn, rice, silk, saffron, oranges, raisins, almonds, figs and other fruits are extensively exported, and iron, hardware, timber, manure, grain and colonial produce are imported.

The port and the village of Villanueva del Grao are 3 m. E. by

N. of Valencia, and are connected with it by two railways and two tram- ways. The harbour works, begun in 1792 at local expense, have been steadily improved, and now provide many facilities for loading or discharging on the moles and wharves. During the five years, 1901-5, about 2600 ships of 1,500,000 tons entered at the port every year. About 2000 of these were Spanish, including a large number of small coasters. The majority of the foreign ocean-going ships were British. The fishing fleet of El Grao comprises about 600 boats with 2800 hands. About 1 m. N. is the town of Pueblo Nuevo del Mar or El Cabanal, to which large numbers of the Valencians migrate in summer for sea-bathing.

The earliest historical mention of Valencia (Valentia) is by Livy (Epit. lv.), according to whom Junius Brutus settled the soldiers of Viriathus here in 138 B.C., and invested the town with the jus Latinum. It sided with Sertorius (c. 77 B.C.), and was accordingly taken and partially destroyed by Pompey in 75 B.C.; but it must have recovered speedily, as it is mentioned by Pliny (iii. 4) as a colony in the region of the Edetani, and by Mela as an important place. It was taken by the Visigoths in a.d. 413, and by the Moors in 714. After the downfall of the caliphate of Cordova, an independent Moorish kingdom of Valencia was established in 1021, and extended along the coast from Almeria- to the Ebro estuary. The Almoravides occupied the city in 1094, but it was retaken within a few months by the Christians under the Cid (

VALENCIA, a city of Venezuela and capital of the state of Carabobo, in m. by rail W.S.W. of Caracas, and 24 m. direct (33i m. by rail) S. by E. of Puerto Cabello. Pop. (1894) 38,654. There is railway connexion with Caracas by the Great Venezuela line (German) and with Puerto Cabello by the Puerto Cabello and Valencia line (English), which crosses the N. range of the Maritime Andes. There is also a steamboat service on Lake Valencia. The city is situated on the N.W. border of a lacustrine plain occupied in great part by Lake Tacarigua, or Valencia, 1 and nearly 2 m. from its western margin. It is beautifully situated in a large fertile valley between parallel ranges of the Maritime Andes, about 1625 ft. above sea-level, and in the midst of rich plantations and luxuriant tropical vegetation. The climate is mild and pleasant, the temperature ranging from 66° to 87 F.

1 Lake Valencia occupies one of the so-called Aragua valleys,

enclosed between the parallel ranges of the Maritime Andes. It is 1348 ft. above the sea, is about 30 m. long, has an area of 216 sq. m., and a catchment basin of 1782 sq. m., and lies partly in the state of Aragua. It includes a number of small islands, some inhabited, and receives the waters of a score of small streams from the sur- rounding mountains.

with an annual mean of 76 , and the rainfall being about the same as that of Caracas, or 23 to 30 in. Near Valencia on the Puerto Cabello railway are the Las Trincheras thermal springs. Among Valencia's public edifices and institutions are some good churches, the government palace, a university, a national college for women, a normal school for men and a public library.

Valencia was founded in 1555 and is older than Caracas. It was occupied for a time in 1561 by Aguirre and his band of out- laws. At the beginning of the War of Independence it was made the capital of Venezuela, and the patriot congress was in session there in 181 2 when Caracas was destroyed by an earthquake. It changed masters several times during the war, its most famous events being two successful defences in 1814 against Spanish besieging forces. The town suffered much in the war and from subsequent revolutions, but the remarkable productiveness of the surrounding districts and its advantageous commercial position ensured a prompt recovery from all reverses.

VALENCIA DE ALCANTARA, a town of western Spain, in the province of Caceres; on the Madrid-Caceres-Lisbon railway, near the right bank of the Sever, a small stream which here divides Spain from Portugal. Pop. (1900) 9417. Valencia de Alcantara is the most important custom-house for direct traffic between the Peninsular kingdoms except Badajoz, and has a flourishing trade in farm produce of all kinds, and in phosphates from the neighbouring mines. The town is occupied by a garrison, and retains its old-fashioned loopholed walls and dismantled citadel. A Roman aqueduct still brings water to the main street, and there are other Roman remains in the district; the courtyards and windows of many houses are Moorish in style. The interesting church of Roqueamador dates from the 14th century, the church of Encarnacion, the town hall and a fine convent, from the 16th. From the 16th century to the 18th Valencia was a celebrated border fortress; it was captured by the Portuguese in 1664 and 1698.

VALENCIENNES, a town of northern France in the department of Nord on the Scheldt, at its confluence with the Rh6nelle, 30 m. S.E. of Lille by rail. Pop. (1906), town, 25,977; commune, 31,759. The Scheldt here divides into two branches, one of which flows through the town, while the other, canalized and forming a port, skirts it on the west. Of the fortifications, dis- mantled in 1892, and replaced by boulevards, the Tour de la Dodenne (13th and 15th centuries) and the citadel (17th century) are the chief remains. Valenciennes is the centre of a rich coal- field, to which Anzin (q.v.), an industrial town a little over a mile to the north-west, has given its name. To this fact is due the existence of the important foundries, forges, rolling-mills, wire-works and machine shops which line the bank of the Scheldt. There is also an extensive beetroot cultivation, with attendant sugar-works and distilleries, and glass, starch, chemicals and soap are produced. Hosiery, trimmings and handkerchiefs are manufactured and cotton weaving and printing are carried on, though little of the famous lace is now made. Other industries are brewing and malting. There are a sub-prefecture, courts of first instance and of commerce, a chamber of commerce, a board of trade arbitration, and a branch of the Bank of France, a lycSe, a school of music and a school of fine art (founded in 1782). The town hall is a fine building of the early 17th century, but its facade was rebuilt in 1867 and 1868. The museum contains galleries of painting and sculpture, with works by Antoine, Louis and Francois Watteau, Carpeaux, all of whom were natives of the town, and by Rubens and other Flemish artists. Opposite the museum there is a monument commemor- ating the defence of the town in 1793. The principal church is that of Notre-Dame du Cordon, a fine modern building in the Gothic style surmounted by a tower 272 ft. in height. The church of St Gery preserves a few pillars dating from the 13th century. Near it stands the statue of Antoine Watteau, and there is also a statue of Jean Froissart, born at Valenciennes.

Valenciennes is said to owe its name and foundation to one of the three Roman emperors named Valentinian. In the middle ages it was the seat of a countship which in the nth century was united to that of Hainaut. In the 16th century Valenciennes

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became the stronghold of Protestantism in Hainaut, but was conquered by the Spaniards, who committed all sorts of excesses. In 1656 the Spaniards under Conde made a successful defence against the French under Turenne; but in 1677 Louis XIV. took the town after an eight days' siege, and Vauban constructed the citadel. Valenciennes, which then became the capital of Hainaut, has since always belonged to France. In 1793, after forty-three days' bombardment, the garrison, reduced to 3000 men, sur- rendered to the allied forces numbering some 140,000 or 150,000 men, with 400 cannon. In 181 5 it defended itself successfully.

VALENCY. The doctrine of valency, in chemistry, may be defined as the doctrine of the combining power of the atoms or elementary radicles of which compound molecules consist. The conception that each elementary atom has a de- finite atom-fixing power, enunciated by Frankland in 1852, is the foundation of the system of rational or structural formulae which now plays so great a part in chemical science. Frank-land dealt more particularly with the valency of the metallic elements, in which he was specially interested at the time; but in conjunction with his co-worker Kolbe, he subsequently applied it to compounds of carbon. At that time (1852-56), the application of Avogadro's theorem to the determination of atomic weights was not yet recognized; it was only when Cannizzaro 1 made this clear that it became possible to develop the doctrine of valency upon a consistent basis. Kekule, whose services in this field rank with those of Frankland, was the first to develop the consequences of the conception that carbon is a quadrivalent element and to apply it in a logical manner to the explanation of the structure of carbon compounds generally; his paper published in 1858, " On the Constitution and Metamorphoses of Chemical Compounds and on the Chemical Nature of Carbon," is admittedly the foundation of the modern theory of the structure of these compounds.

An admirable though brief summary of the historical develop-ment of the doctrine of valency is to be found in the lecture delivered in 1898 by Professor Japp in memory of Kekule {Journ. Chem. Soc. 73, p. 97). Several discoveries have since been made which have an important bearing on the doctrine.

Frankland held that each element has a certain maximum valency but may manifest one or more subordinate valencies, the affinities in abeyance in cases in which only the lower valency is manifest satisfying each other mutually. By a logical extension of this view, elements have been divided into those of odd and those of even valency; apart from a few excep- tional compounds, elements are to be reckoned as belonging either to the one or to the other of these two classes.

Kekule always maintained that valency could not vary and in discussing this question Professor Japp goes so far as to say: " Of all the doctrines which we owe to Kekule, that of fixed valency is probably the one that has met with least acceptance even among chemists of his own school. At the present day it is, so far as I am aware, without supporters." But he adds, " Yet Kekule held it to the last." And such a fact cannot be overlooked: that Kekule went too far in asserting that valency could not vary is probably true; the essential feature in his objection — that in many cases valency was overestimated by the Frankland school — cannot be so easily disposed of.

He saw clearly that structure is the determining factor to be taken into account in all such discussions; he also considered that it was necessary always to make use of univalent or monad elements in determining valency; moreover, that the only compounds on which valid arguments could be based were those which could be volatilized without undergoing decom- position — a condition that must be fulfilled if the molecular weight of a compound is to be placed beyond question. He therefore objected to the use of compounds such as ammonium' chloride and phosphorus pentachloride as criteria of valency, as they undergo decomposition when volatilized. This objec- tion has been somewhat robbed of its force by Brereton Baker's observation that decomposition can be prevented if the utmost

1 Stanislao Cannizzaro, A Course of Chemical Philosophy (1858). Alembic Club Reprints, No. 18. [1910.]

care be taken to exclude moisture. In objecting to the use of such compounds, however, Kekule took the further important step of dividing compounds into two classes — that of atomic compounds, such as ammonia and hydrogen chloride, in which the components are held together by atomic affinities; and that of molecular compounds, such as ammonium chloride, containing atomic compounds held together by molecular

affinities: but Kekule never gave any very clear explana- tion of the difference. Notwithstanding Brereton Baker's observations, the question remains with us to-day, the only difference being that we have substituted the more precise term "residual affinity" for Kekule's term " molecular affinity."

Hydrogen is the one element which at present can be affirmed to be of unvarying valency: as no compound of determinable molecular weight is known in which a single atom of this element can be supposed to be present in the molecule in association with more than a single atom of another element, the hydrogen atom may be regarded as a consistent univalent or monad radicle. As the element of unit valency, hydrogen is, therefore, the one fit atomic measure to be used in ascertaining valency; unfortunately, it cannot always be applied, as so few elements form volatile hydrides. Hydrocarbon radicles such as methyl, CH 3 , however, are so entirely comparable with the hydrogen radicle that they form equally efficient standards; as many elements form volatile methides, some assistance may be obtained by the use of such radicles. But in all other cases the difficulty becomes very great; indeed, it is doubtful if a trustworthy standard can then be found — we are still forced, in fact, to recognize the wisdom of Kekule's contentions. The greatest difficulty of all that we have to meet is due to the fact that valency is a dependent variable in the case of many if not of most elements, the degree in which it is manifest depending on the reciprocal affinities of the associating elements, as well as on environmental conditions.

Among univalent elements, carbon is the only one that appears to have a determinate maximum valency; this is manifest in methane, CH 4 , the simplest hydride the element forms, the first parent of the mighty host of compounds numbering thousands upon thousands which are the subject-matter of organic chem- istry. Carbon, it is well known, is distinguished from ail other elements by forming a great variety of compounds with hydro- gen — the hydrocarbons; from these, in turn, other series of compounds are formed by the displacement of hydrogen atoms in the hydrocarbons by various radicles. The chemistry of the carbon compounds is, in fact, the chemistry of substitution compounds; no other element can be said to give rise to sub- stitution compounds. It is because of this fact — because of the simple relationship obtaining between the various series of hydrocarbons and between these and their substitution com- pounds — that we

are able to deduce structural formulae for carbon compounds with a degree of certainty not attainable in the case of any other element; and we are consequently able to infer the valency of carbon with a degree of definiteness that cannot be approached in any other case. Several of the simpler derivatives of carbon exhibit peculiarities which may be referred to as of particular interest, as showing how difficult it is to arrive at any understanding of the manner in which valency is exercised. Apparently the compound represented by the symbol CHi cannot exist, all attempts to isolate it having failed, the hydro- carbon ethylene, formed by the union of two such groups, being obtained in its place. This would be in no way surprising were it not that the corresponding oxygenated compound, carbon monoxide-, CO, has no tendency whatever to undergo polymer- ization under ordinary conditions and is, in fact, speaking generally, a remarkably inert substance, although in certain cases it forms compounds without difficulty — yet always in a very quiet manner. A single atom of oxygen apparently has the power, if not of satisfying, at least of stilling the needs of the carbon atom. One other case which makes the behaviour of carbon monoxide still more exceptional may be referred to, that of the analogous sulphur compound carbon monsulphide, CS, recently discovered by Sir James Dewar and Mr H. O.

Jones. This compound is so unstable, so active, that it polymerizes with explosive violence at temperatures slightly above that at which liquid air boils. Such illustrations afford clear proof that, as before mentioned, valency is a reciprocal function — that it is impossible to regard the units of affinity of the atoms of different elements as of equivalent value and capable of satisfying each other mutually.

There is no reason to suppose that an uneven number of affinities can be active in the carbon atom; in devising structural formulae, it is therefore always considered necessary to account for the disposition of the four units of affinity, the four valencies, of the carbon atom. In 1900 some excitement was aroused by the discovery by Gomberg of a remarkable hydrocarbon formed by the withdrawal of the chlorine atom from chlorotriphenyl- methane, C(C 6 H 5) 3

C1: at first it was contended that this was a compound of triad carbon, triphenylmethyl; it is now generally admitted, however, that such cannot well be the case and that one of the phenyl groups becomes altered in structure and converted into a dyad radicle (see Triphenylmethane).

The homologues of methane — the hydrocarbons of the paraffin or C„H 2n +2 series, in which the carbon atoms are associated by single affinities, their remaining affinities being engaged by hydrogen atoms — behave chemically as saturated compounds and are apparently incapable of entering into combination with other molecules. But it is important to guard against the assumption that they are actually saturated in any absolute sense. Even gases such as helium and argon, destitute as they appear to be of all chemical activity, must be credited with the possession of some measure of affinity — as they can be liquefied; moreover, as Sir James Dewar has shown, when helium is lique- fied in contact with charcoal a not inconsiderable amount of heat is liberated beyond that given out in the mere liquefaction of the gas. The argument may be extended to hydrogen and the paraffins and it may even be supposed that the amount of residual affinity increases gradually as the series is ascended — this would account for the fact that their activity, the readiness with which they are attacked, increases slightly as the series is ascended. In any case, it cannot well be supposed that carbon and hydrogen mutually satisfy each other even in the paraffins.

The manner in which the valencies of the carbon atom are disposed of in the case of unsaturated hydrocarbons — that is to say, those containing a lower proportion of hydrogen than is indicated by the formula C„H 2n +2 — has given rise to much discussion, the subject being one which affords an opportunity for great difference of opinion. In ethylene, C2H4, each carbon atom is attached to only two hydrogen atoms, as two affinities of each atom are therefore free to enter reciprocally into combination. These atoms certainly do not combine twice over in the way in which the two atoms of carbon in ethane, H 3 C-CH 3 , enter into combination — if they did, ethylene should be a saturated com- pound, whereas actually it behaves as an eminently unsaturated substance. It was contended by Julius Thomsen, on the basis of determinations of the heat of combustion of the hydrocarbons, that the two carbon atoms in ethylene are less firmly united in ethylene than are those in ethane; moreover, that in acetylene, C 5 H 2 , in which there

are three affinities at the disposal of each of the two carbon atoms, the union is even less firm than in ethy- lene. The argument on which these conclusions are founded has been called in question and the data are clearly insufficient to justify their acceptance; moreover, the stability of acetylene at high temperatures, also the readiness with which ethylene is often formed and with which ethenoid compounds revert to the paraffin type may be cited as arguments against them.

In dealing with such a problem, it is necessary to take into account the evidence we have that valency is a directed function. The tetrahedron is now accepted as the most suitable model of the carbon atom to be visualized whenever carbon is thought of; moreover, it is held that the directions in which valency acts are appropriately pictured if they are regarded as proceed- ing from the centre of mass to the four solid angles of the tetra- hedron. In such a case, two affinities proceeding from each of two carbon atoms do not meet and overlap but cross, each

pair at a considerable angle through which they must be deflected to bring them into contact. Von Baeyer has sug- gested that this angle, 5(io 9° 2 8')> is the measure of the strain imposed upon the affinities and that the existence of this strain affords an explanation of the readiness with which ethylene lapses into a derivative of ethane when suitable opportunity is given to combine with some other substance. Another way of looking at the matter is to suppose that the affinities do not, as it were, overlap but merely cross each other and that the angle of approach referred to is a direct measure of the degree of unsatur- atedness: such a view is more in accordance with Thomsen's contention. In any case, the ethenoid condition of unsatur- atedness at the junction of two carbon atoms is a centre at which altogether peculiar properties, chemical and physical, are developed — the most noteworthy being the enhanced refractive power. The ethenoid symbol C = C is therefore of peculiar significance. It is a remarkable fact that the pro- perties of ring systems generally are in accordance with the above hypothesis — the degree of unsaturatedness diminishing as " the angle of approach " is "diminished, the more nearly the affinities can be pictured as overlapping.

The most stable arrangement of the carbon affinities would appear to be that in benzene and compounds of the benzene

type — whatever that may be. The determination of the " structure " of this hydrocarbon has given rise to a large amount of paper warfare. Two tendencies may be said to have been brought together in the course of this discussion: on the one hand, the desire to arrive at a determination of the actual structure; on the other, the desire to devise formulae which shall be faithful expressions of functional behaviour and broadly indicative of the structural relationship of the constituent elements. The latter is perhaps the tendency which is now in the ascendant: we are beginning to realise, particularly in the case of carbon compounds, that formulae are primarily expressive of behaviour — being based on the observa- tion of behaviour. Thus in the case of all paraffinoid com- pounds, the symbol C-C has a distinctive meaning, as indicating saturation; in the case of ethenoid compounds, the symbol C = C has an equally distinctive meaning, indicating a particular degree of unsaturatedness.

From this point of view, therefore, the benzene symbol originally proposed by Kekule is misleading, inasmuch as it indicates that the hydrocarbon contains three ethenoid junctions; it should therefore be an eminently unsaturated compound, which is not the case. On this account the centric formula is to be preferred as an expression of the properties of the compound.

The non-metallic elements other than carbon all form volatile hydrides and methides from which their fundamental valencies can be deduced without difficulty. Chlorine, oxygen, nitrogen and silicon may be regarded as typical of the four classes into which the non-metals fall. But the number of hydrogen and methyl radicles which the atom carries cannot be taken as the measure of absolute valency in the case of elements of the chlorine, oxygen and nitrogen classes. The hydrides of the elements of these classes must all be regarded as more or less unsaturated compounds, the fact that gases such as hydrogen chloride and ammonia are intensely soluble in water being clearly a proof that their molecules are greatly attracted by and have great attraction for water molecules; it is remarkable, however, that although hydrogen chloride and ammonia are easily soluble in water and also combine readily with one another, they are gases which are by no means easily condensed — in other words, the molecules in each gas have little tendency to associate among themselves. It may also be pointed out that, to account for the properties of liquid water,

it is necessary to suppose that the simple molecules represented by the symbol H 2 have a very considerable mutual affinity and that water consists largely of complex molecules. 1 Taking into account

1 On this account it is desirable to confine the term water to the liquid and to distinguish the simple molecule represented by the symbol H2O by a separate name — that proposed is Hydrone. Liquid water is probably a mixture of several polyhydrones together with more or less hvdrone

the estimate we are able to form, on the one hand, of the functions of hydrogen, on the other of those of elements such as chlorine, oxygen and nitrogen, it seems probable that in the hydrides of these elements the extra attractive power is exercised entirely by the element which enters into combination with the hydrogen — in other words, that chlorine in hydrogen chloride, oxygen in hydrone and nitrogen in ammonia are each possessed of considerable residual affinity. The great question at issue has been and still is — What is the nature of this residual affinity and how is it exercised? This is the question raised by Kekule and left by him as a legacy to be decided upon. When hydrogen chloride and ammonia enter into combination to form am- monium chloride, for example, do they combine in some special manner, molecularly, so that each molecule retains its individ- uality as a radicle in the new compound; or is a redistribution effected, so that the several atoms become arranged around the one which exercises the dominant influence much as they are in the parent compound ammonia? In the former case, two orders of affinity would come into operation; in the latter, only one. The general opinion has always been in favour of the latter view.

The discovery that compounds of sulphur containing four different monad radicles together with a single sulphur atom, such as the chloride, S(CH 3)(C2H5)(CH2-C0 2 H)C1, are optic- ally active may be said to have set the question at rest, as optical activity is only to be expected in the case of a compound of asymmetric structure having the four radicles separately associated with and arranged around the sulphur atom. If it be granted that sulphur can thus function as a

tetrad, it may equally be admitted that nitrogen can function as a pentad element in the ammonium compounds.

The discussion has entered on another stage, however, now that Barlow and Pope have been successful in subjecting the problem to geometric treatment by correlating crystalline form with chemical constitution. The fundamental conception upon which the relationship is based is that each atom present in a compound occupies a distinct portion of space by virtue of an influence which it exerts uniformly in every direction. A crystalline structure is regarded as a close-packed, homogeneous assemblage of the spheres of influence of the component atoms. According to this view, valency acquires volume significance. For example, the hydrogen atom being represented by a sphere of unit volume, that of the tetrad carbon atom is represented by one of four times this unit volume; the monad elements — chlorine, bromine and iodine — are supposed, in like manner, to occupy approximately unit spheres of influence. Whilst they are prepared to admit that the spheres of atomic influence of the univalent elements, for example, are not quite the same — moreover, that the volume ratios of the spheres of influence of various elements may alter slightly under changes of condition — Barlow and Pope contend that the relative magnitudes are only slightly affected in passing from compound to compound. In their view, however, the absolute magnitudes of the spheres of influence often change considerably.

For example, taking the spheres of atomic influence of carbon is of volume 4 and those of hydrogen, chlorine and bromine as of volume 1, they find that benzene, C 6 H 6 , hexachloro-benzene, CeCU, and hexabromobenzene, CeBr6, present an almost identical spatial arrangement of the spheres of atomic influence. This could not be the case if the atoms of carbon, hydrogen, chlorine and bromine appropriated respectively the volumes n-o, 5-5, 22-8 and 27-8 — the so-called atomic volumes deduced by Kopp. Barlow and Pope therefore consider that, both in benzene of molecular volume 77-4 and in a derivative such as tetrabromobenzene of molecular volume 130-2, the sphere of influence of the carbon atom is about four times as large as that of either hydrogen or bromine; on displacing the hydrogen atoms by bromine atoms, however, the volumes of the carbon atoms in the benzene molecule and of the remaining hydrogen atoms expand proportionally in the ratio of 77-4 : 1302. This remarkable conclusion is a most

helpful addition to the doctrine of valency. The relative fundamental valency volume,

according to Barlow and Pope, is a constant — when compounds of a " higher type " are produced, greater number of atoms become arranged about the centralizing atom but the relative valency volumes do not change. They have shown that if an atom of valency 1 be inserted into the space already occupied by an atom of valency m, a gap is produced which must be filled up by another atom of valency 1 if the close packing is to be re- stored without remarshalling, thus accounting for the progression of valency by two units. Ammonium chloride, for example, is to be regarded as formed by the insertion into the ammonia assemblage of a chlorine atom of volume 1 and of an atom of hydrogen of volume 1, the nitrogen atom retaining its funda- mental valency 3. This geometric conception affords a justifica- tion of Kekule's conception of fixed valency; at the same tin.e it gives expression to the view he advocated that a distinction was to be drawn between atomic and molecular compounds; but it also supports the contention of Kekule's opponents that in the two classes of compound the atoms must be regarded equally as arranged about a centralizing atom. The two points of view are therefore brought into harmony. But the problem is by no means solved — other modes of arrangement than those pictured must also be possible. To take the case of a solution of ammonia, for example: it is generally admitted that only a very small proportion is present as the hydroxide NH 4 OH; far the greater part must be held in solution in some other form, either as H 3 N = OH 2 or in the form of more complex molecules of the polymethylene type. These may be regarded as Kekule's molecular compounds and as the fore runners of the " more organized " compounds in which the atoms are centralized in the crystal structure. It has not been found necessary hitherto to attribute spheres of atomic influence of different relative volumes to the same element under different conditions — that is to say, elements such as sulphur and nitrogen always exhibit the fundamental valencies 2 and 3- respectively; moreover, in the case of per- and proto-metallic salts all known facts accord with the assumption of one and only one funda- mental valency of the metal. One other conclusion of interest which Barlow and Pope are inclined to draw may be referred to, namely, that although silicon apparently functions as a tetrad element, its relative valency

volume is probably only 2; they even question whether any element other than carbon has a valency volume four times that of hydrogen. It may well be that the peculiar stability of carbon compounds is to be sought in this peculiarity.

The Barlow-Pope hypothesis, however, affords a purely static representation of the facts: we are still unable to apply dynamic considerations to the explanation of valency. From the time of Faraday onwards, chemists have been willing to regard chemical affinity as electrical in its origin; on this account, the atomic-charge hypothesis advocated by Helmholtz has been most favourably received: but this hypothesis does not in any way enable us to understand the many qualitative peculiarities which are apparent when the reciprocal affinities of various elements are taken into account; moreover, it affords no explanation of the apparent variations in valency which are so frequently manifest; and it affords no satisfactory explanation of the fact that many compounds of like radicles, such as the elementary gases hydrogen, nitrogen and chlorine, for example, are among the most stable compounds known — more stable than many compounds consisting of elements of opposite polarity. Attempts have been made of late to apply the electronic hypothesis — these attempts, however, have involved little more than a paraphrase of current static views and they are in no way helpful in the directions in which help is most needed. It is no way surprising, however, that we should know so little of the origin of a property that may be said to be the fundamental property of matter — if we could ex- plain it, we could explain most things; what we have reason to be surprised at is that it should have been possible to develop so consistent a doctrine as that now at our disposal.

It is scarcely necessary to point out that the sketch above given is but a bare outline of the subject, one in which attention

is drawn to certain points of importance in the hope that it may- be clear that the problems cannot be discussed usefully in the formal manner which is too frequently adopted. Our knowledge of valency cannot be expressed in a few symbols or in a few formal statements. (H. E. A.)

VALENS, East Roman emperor from 364 to 378, owed his elevation in the thirty-sixth year of his age to his brother Valentinian, who chose him to be his associate in the empire, of which a formal division into East and West was now once for all definitively arranged (see Valentinian I.). Valens had been attached to Julian's bodyguard, but he did not inherit the military ability of his father, Gratian of Pannonia, who had risen from the ranks to a high position. A revolt headed by Procopius in the second year of his reign, and backed up by the public opinion of Constantinople and the sympathy of the Gothic princes and chiefs on the Danube, seemed so alarming to him that he thought of negotiation; but in the following year the revolt collapsed before the firmness of his ministers and generals. In the year 366 Valens at one stroke reduced the taxes of the empire by one-fourth, a very popular measure, though one of questionable policy in the face of the threatening attitude of the Goths on the lower Danube. Before venturing on a campaign against them, Valens received baptism from Eudoxus, the bishop of Constantinople and the leader of the Arian party. After some small successes over the Goths, won by his generals (367-9), Valens concluded a peace with them, which lasted six years, on a general understanding that the Danube was to be the boundary between Goths and Romans. On his return to Constantinople in 369-70 Valens began to persecute his orthodox and Catholic subjects, but he lacked the energy to carry out his edicts rigorously.

In the years 371 to 377 Valens was in Asia Minor, most of the time at the Syrian Antioch. Though anxious to avoid an Eastern war, because of danger nearer home from the restlessness of the Goths, he was compelled to take the field against Shapur II. who had invaded and occupied Armenia. It seems that Valens 1 crossed the Euphrates in 373, and in Mesopotamia his troops drove back the king of Persia to the farther bank of the Tigris. But the Roman success was by no means decisive, and no definite understanding as to boundaries was come to with Persia. Valens returned to Antioch, where in the winter of 373-4 he instituted a persecution of magicians and other people whom he foolishly believed to imperil his life. Between 374 and 377 we read of grievous complaints of injustice and extortion perpetrated under legal forms, the result probably of the recent panic, and pointing to an increasing weakness and timidity at headquarters. Although preparations were made for following up the war with Persia

and securing the frontier, a truce was patched up, rather to the disadvantage of the empire, Armenia and the adjacent country being half conquered and annexed by Shapur. The armies of Rome, in fact, were wanted in another quarter. The Huns, of whom we now hear for the first time, were beginning in 376 to press the Goths from the north, and the latter asked leave of the emperor to cross the Danube into Roman territory. This they were allowed to do, on the condition that they came unarmed, and their children were transported to Asia as hostages. The conditions, however, were not observed by the imperial generals, who for their own profit forced the new settlers to buy food at famine prices. Accordingly, the enraged Goths, under their chief Fritigern, streamed across the Balkans into Thrace and the country round Adrianople, plundering, burning and slaughter- ing as they went. They were driven back for a time, but re- turned in the spring of 378 in greater force, with a contingent of Huns and Alans; and again, after some repulses, they penetrated to the neighbourhood of Adrianople. Valens, who had now returned to Constantinople, left the capital in May 378 with a strong and well-officered army. Without awaiting the arrival of his nephew Gratian, emperor of the West, who had just won a great victory over one of the barbarous tribes

'Amm. Marc. xxix. 1 ; the narrative is brief and not very clear.

of Germany in Alsace, Valens attacked the enemy at once, although his troops had to go into action heated and fatigued by a long march on a sultry August day. The battle, which was fought on confined ground in a valley, was decided by a cavalry charge of the Alans and Sarmatians, which threw the Roman infantry into confusion and hemmed it in so closely that the men could scarcely draw their swords. The slaughter, which continued till the complete destruction of the Roman army, was one of the greatest recorded in antiquity. Valens either perished on the field, or, as some said, in a cottage fired by the enemy. From the battle of Adrianople the Goths per- manently established themselves south of the Danube.

See Ammianus Marcellinus, bks. 26-31 ; E. Gibbon, The Decline and Fall of the Roman Empire (ed. Bury, London, 1896), chs. 25-26; W. Judeich in Deutsche Zeitschrift fiir Geschichtswissenschaft (1891), pp. 1-2 1.

VALENTIA, SIR FRANCIS ANNESLEY, Viscount (1585-

1660), Anglo-Irish statesman, son of Robert Annesley of Newport Pagnel in Buckinghamshire, was born in 1585, and settled in Ireland at an early age, acquiring property in various parts of the island. His friendship with the lord deputy, Sir Arthur Chichester, procured for him government employment and the favour of King James I., who conferred on him a grant of the land and fort of Mountnorris, county Armagh, in 1612. He was returned to the Irish parliament by the county Armagh in 1 614, and four years later was appointed secretary for Ireland, being created a baronet in 1620. In the following year he received, by an unusual patent, a reversionary grant of the viscountcy of Valencia after the death without male issue of a kinsman (Sir Henry Power, created viscount of Valentia in 1621), the then living viscount. In 1625 Sir Francis Annesley was elected member for the county of Carmarthen in the English parliament; and in the same, year he was made vice-treasurer and receiver-general of Ireland. In 1628 he was created Baron Mountnorris in the peerage of Ireland. He strongly opposed the policy of Lord Falkland, who became lord deputy in 1622, and procured his recall in 1629. When Sir Thomas Wentworth, afterwards the famous earl of Strafford, went to Ireland in 1633, he took action against Mountnorris, whom he accused of corrup- tion and malversation of public money. The two men became violent opponents, and at a dinner at the lord chancellor's house in April 1635 Mountnorris used insulting and threatening lan- guage in reference to the lord deputy. Wentworth brought him before a court-martial on a charge of insubordination as an officer in the army, and by this tribunal Mountnorris was condemned to death. The sentence was not carried out, but he was imprisoned and deprived of all his offices on the report of a committee appointed by the privy council to inquire into the charges of corruption. The vindictiveness of the proceedings against Mountnorris, which afterwards constituted one of the counts in the impeachment of Strafford, has been strongly condemned by some historians and extenuated by others; that the trial by court-martial and the sentence were at all events not illegal, has been shown by S. R. Gardiner. Mountnorris was not long detained in prison, and in 1640 his relations with Strafford were examined by a committee of the Long Parliament, which pronounced the sentence passed on him unjust and illegal. In 1642 he succeeded, under the above-mentioned reversion, to the title of viscount of Valentia. During the Commonwealth he again held the post of secretary

in Ireland to the lord deputy, Henry Cromwell, with whom he was on friendly terms. Valentia died in 1660. His wife was Dorothy, daughter of Sir John Phillipps of Picton, Pembrokeshire, by whom he was the father of Arthur Annesley, earl of Anglesey (q.v. for later history).

See S. R. Gardiner, History of England, vol. viii. (London, 1883-84) ; Strafford's Letters and Dispatches, edited by W. Knowler (2 vols., Dublin, 1740); G. E. C, Complete Peerage, vol. v. (London,

1893)-

VALENTINE, or Valentinus, the name of a considerable number of saints. The most celebrated are the two martyrs whose festivals fall on the 14th of February — the one, a Roman

priest, the other, bishop of Terni (Interamna). The Passion of the former is part of the legend of SS. Marius and Martha and their companions; that of the latter has no better historical foundation: so that no argument can be drawn from either account to establish the differentiation of the two saints. It would appear from the two accounts that both belonged to the same period, i.e. to the reign of the emperor Claudius (Gothicus); that both died on the same day; and that both were buried on the Via Flaminia, but at different distances from Rome. The Martyr ologium Hieronymianum mentions only one Valentinus: " Interamnae miliario LXIIII. via Flaminia natale Valentini." It is probable that the basilica situated at the second milestone on the Via Flaminia was also dedicated to him. It is impossible to fix the date of his death. The St Valentinus who is spoken of as the apostle of Rhaetia, and venerated in Passau as its first bishop, flourished in the 5th century. Although the name of St Valentine is very popular in England, apparently no church has been dedicated to him. For the peculiar observances that used to be commonly connected with St Valentine's Eve and Day, to which allusion is frequently made by English writers, such works as John Brand's Popular Antiquities (edited by W. C. Hazlitt, vol. ii. pp. 606-n, London, 1905), W. Hone's Every-Day Book, and

Chambers's Book of Days may be consulted. Their appropriateness to the spring season is, in a general way perhaps, obvious enough, but the association of the lovers' festival with St Valentine seems to be purely accidental. 1

See Acta Sanctorum, February, ii. 753, 756, and January, i. 1094; G. B. de Rossi, Bullettino di archeologia cristiana (1871), p. 101 and (1878) p. 59. (H. De.)

VALENTINE AND ORSON, a romance which has been attached to the Carolingian cycle. It is the story of twin brothers, abandoned in the woods in infancy. Valentine is brought up as a knight at the court of Pippin, while Orson grows up in a bear's den to be a wild man of the woods, until he is overcome and tamed by Valentine, whose servant and comrade he becomes. The two eventually rescue their mother Bellisant, sister of Pippin and wife of the emperor of Greece, by whom she had been unjustly repudiated, from the power of a giant. There are versions of the tale, which appears to rest on a lost French original, in French, English, German, Icelandic, Dutch and Italian. In the older versions Orson is described as the " nameless " one. The kernel of the story lies in Orson's upbringing and wildness, and is evidently a folk-tale the connexion of which with the Carolingian cycle is purely artificial. The story of the wife unjustly accused with which it is bound up is sufficiently common, and was told of the wives both of Pippin and Charlemagne.

The French prose romance was printed at Lyons in 1489 and often subsequently. The Historye of the two Valyannte Brethren: Valentyne and Orson ... by Henry Watson, printed by William Copland about 1550, is the earliest known of a long series of English versions. A ballad on the subject was printed in Bishop Percy's Reliques of English Poetry, and the tale adapted for the nursery was illustrated by Walter Crane in the Three Bears' Picture Book (1876). For a detailed bibliography of the English, French, German, Dutch and Italian forms of the tale, see W. Seelman, " Valentin und Namelos " (Norden and Leipzig, 1884), in vol. iv. of Niederdeutsche Denkmaler, edited by the Verein fur niederdeutsche Sprachforschung.

VALENTINIAN I., Roman emperor of the West from A.D. 364 to 375, was born at Cibalis, in Pannonia. He had been an officer of the guard under Julian and Jovian, and had risen

high in the imperial service. Of robust frame and distinguished appearance, he possessed great courage and military capacity. He was chosen emperor in his forty-third year by the officers of the army at Nicaea in Bithynia in 364, and shortly afterwards named his brother Valens (q.v.) colleague with him in the empire. The two brothers, after passing through the chief cities of the neighbouring district, arranged the partition

1 Until nearly the close of the 19th century the custom of sending " valentines " — i.e. anonymous love-tokens, written or otherwise — on St Valentine's day was fairly general. They gradually lost their original significance, and the custom, where it survives, has become completely vulgarized.

of the empire at Naissus (Nissa) in Upper Moesia. As emperor of the West, Valentinian took Italy, Illyricum, Spain, the Gauls, Britain and Africa, leaving to Valens the eastern half of the Balkan Peninsula, Greece, Egypt, Syria and Asia Minor as far as Persia. During the short reign of Valentinian there were wars in Africa, in Germany and in Britain, and Rome came into collision with barbarian peoples of whom we now hear for the first time — Burgundians, Saxons, Alamanni. The emperor's chief work was guarding the frontiers and establishing mili- tary positions. Milan was at first his headquarters for settling the affairs of northern Italy; next year (365) he was at Paris, and then at Reims, to direct the operations of his generals against the Alamanni. This people, defeated at Scarpona (Charpeigne) and Catelauni (Chalons-sur-Marne) by Jovinus, were driven back to the German bank of the Rhine, and checked for a while by a chain of military posts and fortresses. At the close of 367, however, they suddenly crossed the Rhine, attacked Moguntiacum (Mainz) and plundered the city. Valentinian attacked them at Solicinium (Sulz in the Neckar valley or Schwetzingen) with a large army, and defeated them with great slaughter, but his own losses were so considerable that he abandoned the idea of following up his success. Later, in 374, he made peace with their king, Macrianus, who from that time remained a true friend of the Romans. The next three years he spent at Trier, which he chiefly made his headquarters, organizing the defence of the Rhine frontier, and personally superintending the construction of numerous forts. During his reign the coasts of Gaul were harassed by the Saxon pirates, with whom the Picts and Scots of northern Britain joined hands, and ravaged the island from the wall of Antoninus to the shores of Kent. In 368

Theodosius was sent to drive back the invaders; in this he was completely successful, and established a new British province, called Valentia, in honour of the emperor. In Africa the Moorish prince, Firmus, raised the standard of revolt, being joined by the provincials, who had been rendered desperate by the cruelty and extortions of Count Romanus, the military governor. The services of Theodosius were again requisitioned. He landed in Africa with a small band of vet- erans, and Firmus, to avoid being taken prisoner, committed suicide. In 374 the Quadi, a German tribe in what is now Moravia and Hungary, resenting the erection of Roman forts to the north of the Danube in what they considered to be their own territory, and further exasperated by the treacherous murder of their king, Gabinius, crossed the river and laid waste the province of Pannonia. The emperor in April of the following year entered Illyricum with a powerful army, but during an audience to an embassy from the Quadi at Brigetio on the Danube (near Pressburg) died in a fit of apoplexy. His general administration seems to have been thoroughly honest and able, in some respects beneficent. If he was hard and exacting in the matter of taxes, he spent them in the defence and im- provement of his dominions, not in idle show or luxury. Though himself a plain and almost illiterate soldier, he was a founder of schools, and he also provided medical attendance for the poor of Rome, by appointing a physician for each of the fourteen districts of the city. He was an orthodox Catholic, but he permitted absolute religious freedom to all his subjects. Against all abuses, both civil and ecclesiastical, he steadily set his face, even against the increasing wealth and worldliness of the clergy. The great blot on his memory is his cruelty, which at times was frightful, and showed itself in its full fierceness in the punish- ment of persons accused of witchcraft, soothsaying or magical practices.

See Ammianus Marcellinus xxv.-xxx. ; Gibbon, Decline and Fall, chap. 25; T. Hodgkin, Italy and her Invaders, bk. i. chap. 3; H. Schiller, Geschichte der romischen fCaiserzeit (Gotha, 1883-87), bk. iii. chap. iv. 27-30; H. Richter, Das westromische Reich (Berlin, 1865), pp. 240-68.

After his death, his son, Valentinian II., an infant of four years of age, with his half-brother Gratian (q.v.) a lad of about seventeen, became the emperors of the West. They made Milan their home; and the empire was nominally divided

between them, Gratian taking the trans-Alpine provinces, whilst Italy, Illyricum in part, and Africa were to be under jhe rule of Valentinian, or rather of his mother, Justina. justina was an Arian, and the imperial court at Milan pitted Itself against the Catholics, under the famous Ambrose, bishop of that city. But so great was his popularity that the court was decidedly worsted in the contest, and the emperor's authority materially shaken. In 387 Magnus Maximus (q.v.), who had commanded a Roman army in Britain, and had in 383 (the year of Gratian's death) made himself master of the northern provinces, crossed the Alps into the valley of the Po and threatened Milan. The emperor and his mother fled to Theodosius, the emperor of the East and husband of Galla, Valentinian's sister. Valentinian was restored in 388 by Theodosius, through whose influence he was converted to Orthodox Catholicism. Four years later he was murdered at Vienne in Gaul, probably at the instigation of his Frankish general Arbogast, with whom he had quarrelled.

See Gibbon, Decline and Fall, chap. 27; Schiller, Geschichte der romischen Kaiserzeit, bk. iii. vol. iv. pp. 32, 33 ;L. Ra.n]te,Weltgeschich,te, bk. iv. vol. i. chap. 6 ; and especially H. Richter, Das westromische Reich unter den Kaisern Gratian, Valentinian II. und Maximus (Berlin, 1865), pp. 577-650, where full references to authorities are given.

VALENTINIAN III., emperor of the West from 425 to 455, the son of Constantius and Placidia, daughter of the great Theodosius. He was only six years of age when he received the title of Augustus, and during his minority the conduct of affairs was in the hands of his mother, who purposely neglected his education. His reign is marked by the dismemberment of the Western Empire; the conquest of the province of Africa by the Vandals in 439; the final abandonment of Britain in 446; the loss of great portions of Spain and Gaul, in which the barbarians had established themselves; and the ravaging of Sicily and of the western coasts of the Mediterranean by the fleets of Genseric. As a set-off against these calamities there was the great victory of Aetius over Attila in 451 near Chalons, and his successful campaigns against the Visigoths in southern Gaul (426, 429, 436), and against various invaders on the Rhine

and Danube (428-31). The burden of taxation became more and more intolerable as the power of Rome decreased, and the loyalty of her remaining provinces was seriously impaired in consequence. Ravenna was Valentinian's usual residence; but he fled to Rome on the approach of Attila, who, after ravaging the north of Italy, died in the following year (453). In 454 Aetius, between whose son and a daughter of the emperor a marriage had been arranged, was treacherously murdered by Valentinian. Next year, however, the emperor himself was assassinated by two of the barbarian followers of Aetius. He not merely lacked the ability to govern the empire in a time of crisis, but aggravated its dangers by his self-indulgence and vindictiveness.

Our chief original sources for the reign of Valentinian III. are Jordanes, Prosper's Chronicles, written in the 6th century, and the poet Apollinaris Sidonius. See also Gibbon Decline and Fall, chaps. 33-35; J. B. Bury, Later Roman Empire, bk. ii. chaps. 6-8; E. A. Freeman, " Tyrants of Britain, Gaul and Spain " (Eng. Hist. Review, January 1886), and " Aetius and Boniface " {ibid., July

1887).

VALENTINOIS, the name of a countship in France, the chief town of which was Valence (Dr6me). From the 12th to the 15th century Valentinois belonged to a family of Poitiers, which must not be confused with that of the counts of Poitiers. To the detriment of his kinsmen, the lords of St Vallier, Count Louis II. (d. 1419) bequeathed his counties of Valentinois and Diois to_the Dauphin Charles, afterwards King Charles VII.; and in 1498 Louis 'XII. erected the countship of Valentinois into a duchy, and gave it to Caesar Borgia, son of Pope Alexander VI. A few years later Borgia was deprived of the duchy, which, in 1548, was given by Henry II. to his mistress, Diane de Poitiers, a descendant of the counts of Valentinois. Having again reverted to the Crown, the duchy was given by Louis XIII. to Honore Grimaldi, prince of Monaco, whose descendants retained it until the French Revolution. The new duchy of Valentinois, however, did not consist of the lands attached to

the former one, but was made up of several scattered lordships in Dauphine. The title of duke of Valentinois is still borne by the prince of Monaco.

See J. Chevalier, Memoires pour servir d I'histoire des comtes de Valentinois et de Diois (Paris, 1897-1906).

VALENTINUS, pope for thirty or forty days in 827, in succession to Eugenius II. (824-27). He was a Roman by birth, and, according to the Liber Pontificalis, was first made a deacon by Paschal I. (817-24). Nothing further is known of his history. His successor was Gregory IV. (827-44).

VALENTINUS and THE VALENTINIANS. I. Valentinus, the most prominent leader of the Gnostic movement, was born, according to Epiphanius (Haer. 31, 2), near the coast in Lower Egypt, and was brought up and educated in Alexandria. He then went to Rome, as we learn from Irenaeus, Adv. haer. iii. 4, 3; Valentinus came to Rome during the episcopate of Hyginus, flourished under Pius and stayed till the time of Anicetus. The duration of the episcopates of the Roman bishops at this period is not absolutely established, but we can hardly go altogether wrong if, with Harnack (Chronologie der altchristlichen Literatur, i. 291), we fix the period 135-60 for Valentinus's residence in Rome. This is confirmed by the fact that Justin Martyr in his Apology, i. 26, begun about 150, mentions that in his earlier work against heresy, the Syntagma, he attacked, among others, Valentinus; so that his heresy must have begun to appear at least as early as 140. According to Irenaeus iii. 3, 4, Polycarp, during his sojourn in Rome under the episcopate of Anicetus, converted a few adherents of the Valentinian sect. Tertullian (Adv. Valentin, cap. 4) declares that Valentinus came to Rome as an adherent of the orthodox Church, and was a candidate for the bishopric of Rome, but he abandoned the Church because a confessor was preferred to him for this office. The credibility of this statement may be questioned. There is nothing impossible in it, but it has rather the appearance of a piece of the usual church gossip. Great uncertainty attaches to the residence of Valentinus in Cyprus, recorded by Epiphanius (loc. cit.), who places it after his stay in Rome, adding that it was here that he definitely accomplished his secession from the Church. Scholars are divided as to whether this stay in Cyprus was before or after that in Rome. But on the whole it seems to be clear from the various notices that Valentinus did not, e.g. like Marcion, break with the Church from the very beginning, but endeavoured as long as possible to maintain his standing within it.

II. The authorities which we have to consider deal for the most

part with Valentinianism in its fully developed form, and not with the original teaching of the master. Justin's Syntagma (v.s.), which treats of Valentinus, is unfortunately lost. Irenaeus in his section i. II, 1-3, has preserved what is obviously an older docu- ment, possibly from Justin, dealing with Valentinus's own teaching and that of two of his disciples. The sketch which he gives is the best guide for the original form of Valentinianism. For Valentinus himself we have also to consider the fragments of his writings pre- served by Clemens Alexandrinus. The best edition of and com- mentary on them is Hilgenfeld's Ketzer geschichte des Urchristentums (pp. 293-307). Irenaeus in his treatise Adv. haer. gives a detailed account of the two chief schools following Valentinus, the school of Ptolemaeus (i. i-io), and Marcus and the Marcosians (i. 13-21). For his account of the Ptolemaeans, Irenaeus seems to have used various writings and expositions of the school, especially prominent being a collection of Scripture proofs which may have once had a separate literary existence (i. 1, 3; 3, 1-5 (6); 8, 2-4). To this work is appended in a somewhat disconnected fashion a commentary on the prologue to the fourth Gospel (i. 8, 5). Irenaeus himself twice prefaces his remarks by saying he is indebted to other authorities for his exposition (i. 2, 3-4; 7, 2-5). Section 6, 2-4, interrupts and disturbs the continuity, and section 5, 1-3, is a dupli- cate of 5, 4. We see how the account of Irenaeus is built up from small fragments. In his account ol Marcus and the Marcosians the chapters on the sacraments (i. 13 and 20) seem originally to have formed part of the same whole. Very valuable too are the Excerpta ex Theodoto which are to be found in the works of Clemens Alexandrinus, and may be looked upon as a collection made by the author with a view to the eighth book of his Stromateis, which was never finished. Of these excerpts paragraphs 4, 5, 8-15, 17b- 20, 27, should be distinguished as Clemens's own observations; the remaining parts are extracted from Gnostic writings (cf. Zahn, Geschichte des Kanons, ii. pp. 269 seq.). Yet the Excerpta, as their

contents show, are not homogeneous, and cannot have been bor- rowed from one writing. The question as to whether Clemens' method of quotations, which mentions sometimes Theodotus, some- times the Valentinians as his sources for

these excerpts, is of any use as a guide to an estimate between these sources, must be left undecided. The most important sections are paragraphs 29-68, in which an attempt is made at a continuous exposition of the system (though here again from various sources), and section 69-86, which deals with the Gnostic doctrine of the sacraments and that of the liberation of the Heimarmene. The lost Syntagma of Hippolytus, which, as we know, is preserved in the works of Philastrius and the pseudo-Tertullian, seems to furnish us with valuable information as to the earlier doctrines of the sect, and in his second treatise against heretics, the so-called PhUosophumena (6, 29 seq.). Hip- polytus gives a homogeneous and continuous exposition of a later Valentinian system, possibly connected with the school of Ptole- maeus. Important, too, are Hippolytus' references to an Italic and an Anatolian branch of the Valentinian sect (6, 35). Ter- tullian gives at the beginning of his treatise against the Valentinians a few separate notices of the life and disciples of Valentinus, but his further argument is closely dependent upon Irenaeus' exposition of the Ptolemaean system, which he embellishes in his usual fashion with bitterly sarcastic comments. Epiphanius deals with Valen- tinus and his school in sections 31-36 of his work. In cap. 31, 1-8, he gives an account of the Valentinians, which seems to be based on his own observation. Thus in 31, 5-6, we find yet another verbal extract from a Valentinian doctrinal work. For the rest he copies the text of Irenaeus word for word, which has the advantage of preserving for us Irenaeus' Greek phraseology, which we other- wise should only know in a' Latin translation. In his section on Ptolemaeus, cap. 33, Epiphanius has preserved for us a valuable letter of Ptolemaeus to Flora, which is a document of the highest importance for the understanding of Gnosticism.

III. Valentinus is the only one of the Gnostics who had a whole series of disciples who are known by name — indeed, in the accounts of the Church Fathers his own system and views are almost entirely obscured by the accounts of those of his disciples. His fundamental ideas can be with difficulty recon- structed from Irenaeus i. 11, from the fragments contained in Clemens, and to a certain extent from the Syntagma of Hippo- lytus, with the aid of later systems connected with his. Two early disciples of Valentinus are enumerated in Irenaeus ii. 2-3, one of whom is named Secundus; according to Irenaeus we have to trace back to him the division of the Valentinian

Sophia into the double form of an aeon abiding in heaven, and her daughter, Sophia Achamoth. The second disciple is not named by Irenaeus; it is conjectured that he may have been Colorbases, the teacher of Marcus (i. 14, 1). The most important disciples of Valentinus, then, are the two dealt with at length by Irenaeus, Ptolemaeus and Marcus, who both seem to have had a numerous following. Besides these we should also mention Herakleon, of whose commentary on the gospel of St John extensive fragments are preserved by Origen. Ptolemaeus and Herakleon are counted by Hippolytus (6, 35) among the Italic branch of Valentinianism. There was also the Anatolian branch, as representative of which Hippolytus mentions Axionicus, who is also referred to by Tertullian as having actually been taught in Antioch. The Excerpta ex Theodoto in Clemens are also, according to the superscription, fragments from the Anatolian Gnosticism. It is, however, an error when Hippolytus speaks of Bardesanes as representative of this branch, for he had an entirely distinct position.

IV. In the important section of Irenaeus (i. 11) devoted to Valentinus, his teaching is definitely connected with the so-called " falsely reputed Gnostics." It will be useful, in trying to ascertain the teaching and view of life of Valentinus, to keep closely before us that of the " Gnostics " in the narrower sense of the word, as preserved in the expositions of Irenaeus (i. 29, 30) and Epiphanius (passim). The Gnostics were par excellence worshippers of the supreme Mother-goddess, the Mr)Tr]p, in whom we have no difficulty in recognizing the characteristics of the goddess of heaven of anterior Asia. This " Meter " is, in the system of these Gnostics, also at one time the stern, austere goddess, the Mother, who dwells in heaven, at other times the licentious goddess of love, the great courtesan (Prunikon), who, e.g. in the Simonian system, takes the form of the prostitute Helena, in whose worship all kinds of obscene rites were celebrated. She dwells ia the eighth or highest

heaven, whence her name Ogdoas. Next to her stands the supreme and shadowy form of the unknown and nameless Father; below her in the seven lower heavens reign the seven planetary, world-creating angelic powers, headed by Jaldabaoth, who was later to be identified with the God of the Old Testament. The Gnostics are children of the supreme Mother; from her the heavenly seed, the divine spark, descended in some way to this lower world, and thus the children of heaven still exist in this gross material world,

subject to the Heimarmene and in the power of hostile spirits and powers; and all their sacraments and mysteries, their formulae and symbols, must be part of her worship, in order to find the way upwards, back to the highest heaven, " where the Mother dwells." This idea that the Gnostics know themselves to be in a hostile and evil world reacted in the same direction upon the conception of the Mother of heaven. She became likewise a fallen goddess, who has sunk down into the material world and seeks to free herself from it, receiving her liberation at the hands of a heavenly Redeemer, exactly like the Gnostics. Various myths have contributed towards this; one of these is the widespread naive pagan myth of a goddess who disappears, carried off by the powers of evil, to be set free and taken back to her home by a divine liberator, a brother or betrothed. The moon-goddess with her disappearance may have been the prototype of this mythical figure (there are, indeed, certain analogies to be remarked between the Simonian Helena and Selene). With this myth are connected certain Jewish Theologumena; the goddess who sinks down into the material may readily be identified with Ruach (Rucha), the Spirit of God, who broods over Chaos, or even with the later Sophia (Chokma Achamoth), who was generally conceived of as a world-creating agent. Thirdly, the chief influence at work here seems to have been the oriental myth of the Primal Man sunk in the material world, which appears in its simple form in individual Gnostic systems, e.g. in Poimandres (in the Corpus hermeticum) and in Manichaeism. In the Gnostic systems of Irenaeus i. 29, 30, the Anthropos (i.e. the Primal Man) no longer appears as the world-creative power sinking down into the material world, but as a celestial aeon of the upper world (or even as the supreme god), who stands in a clearly denned relationship to the fallen goddess; it is possible that the role of the Anthropos is here transferred to Sophia Achamoth. The fallen Sophia next becomes, in Like manner, a world creative power. And now the highest of the world-creating angels, Jaldabaoth, appears as her son, and with this whole conception are then linked up the ideas of liberation and redemption. Next to the Sophia stands a male redeeming divinity. In all the Gnostic systems known to us Christ already appears as the Saviour, and so in this respect a Christianizing of Gnosticism has been carried out; but originally this Saviour-divinity had nothing in common with the figure of the Christian Redeemer. This is clear from Irenaeus's account of the Gnostics (i. 30). For here the redemp- tion is actually and essentially

effected through the uniting in marriage of the fallen goddess with her higher celestial brother, and they are expressly described as the bride and bridegroom. That is to say, we have here the purely mythical idea of the deliverance of a goddess by a god, and of the celestial marriage of a divine pair. This myth can only with difficulty be connected with the historic redemption through Jesus of Nazareth, by further relating that Christ, having been united to the Sophia, descends into the earthly Jesus.

V. This primitive " Gnosticism " was very closely followed by Valentinus, who may have come to know these doctrines in Egypt. This can be seen from the fact that in Valentinianism the Mother-goddess always stands absolutely at the centre of the system. Irenaeus (i. 6, 1) is very instructive on this point, characterizing the Gnostics as the pneumatici who have a perfect knowledge of God, and have been initiated into the mysteries of Achamoth. A mighty system is certainly erected here out of the modest elements of Gnosticism.

(1) More especially, the superstructure of the celestial system, the celestial world of aeons, which exists above the fallen goddess, ia

here developed in the most complicated way. Valentinus has a system of thirty aeons, but we can with but little trouble recognize the simple system underlying this great superstructure. The quite shadowy plurality of ten and twelve aeons (the Dekas and the Dodekas) of the Valentinian system we may at once set aside as mere fantastical accretions. We have left only a group of eight celestial beings, the so-called Ogdoas, and of these eight figures four again are peculiar to the" Valentinian system, and are probably artificial interpolations. For instance, when for the third pair of aeons we find the Logos and Zoe, figures which occur only here, and perceive, moreover, that the place of this pair of aeons is not firmly established, but that in this Valentinian tradition they occur some- times before and sometimes after the fourth pair of aeons, the Anthropos and the Ekklesia, we cannot be far wrong in suspecting that here already we find Valentinus to have been influenced by the prologue of the fourth Gospel (we

also find the probably Johan- nine names Monogenes and Parakletos in the series of aeons).

(2) The first pair of aeons, Bythos and Sige, is likewise an original innovation of the Valentinian school, and clearly betrays a monistic tendency. According to Irenaeus's account of the " Gnostics" (i. 29), their theory was that Sophia casts herself into the primal sub- stratum of matter to be found outside the celestial world of aeons. In the Valentinian system, primal matter (Bythos), the original Chaos, is brought into connexion with the celestial world of aeons. And thus it is effected that matter is here not found originally and irretrievably separated from the higher celestial world, but that the latter originally exists for itself alone; the fall or disturbance is accomplished within the celestial world, and the material world first comes into existence through the fall. When we subtract from the Ogdoas the two pairs of aeons whose later introduction into the Valentinian system has been demonstrated, we are left actually with a double pair of aeons, the Father and Truth, the Anthropos and the Ekklesia. These strongly recall the Gnostic systems set forth in Irenaeus i. 29 and 30 (cf. i. 29, 3). And thus the Anthropos (man), a leading figure of primitive Gnosticism, now half-forgotten, moves back into the centre of the system and the direct vicinity of the fallen goddess. It is also clear why the Ekklesia appears together with the Anthropos. With the celestial Primal Man — of whom the myth originally relates that he has sunk into matter and then raised him- self up from it again — is associated the community of the faithful and the redeemed, who are to share the same fate with him. Simi- larly among the Gnostics of Irenaeus i. 29, 3, perfect Gnosis (and thus the whole body of Gnostics) is connected with the Anthropos.

(3) The fallen goddess, mentioned above, occurs in the Valentinian system, as in the Gnostic systems described by Irenaeus, and in the older systems it is again the celestial aeon himself who falls, and whose fate outside the Pleroma is related (cf. the exposition in Irenaeus i. II, Excerpta ex Theodoto,,§ 31 seq., and Hippolytus, Syn- tagma, in the pseudo-Tertullian). Iri the later Valentinian systems, probably from Secundus onwards (see above), the figure appears in double guise. The higher Sophia still remains within the upper world after creating a disturbance, and after her expiation and repentance; but her premature offspring, Sophia Achamoth, is re- moved from the PlerOma, and becomes the heroine of the

rest of the drama (we have dealt in the preceding section with the other conception of the fall of Sophia).

(4) In the true Valentinian system the so-called Christos is the son of the fallen Aeon, who is thus conceived as an individual. Sophia, who in a frenzy of love had sought to draw near to the un- attainable Bythos, brings forth, through her longing for that higher being, an aeon who is higher and purer than herself, and at once rises into the celestial worlds. Among the Gnostics of Irenaeus we find a kindred conception, but with a slight difference. Here Christos and Sophia appear as brother and sister, Christos represent- ing the higher and Sophia the lower element. In the enigmatic figure of Christos we again find hidden the original conception of the Primal Man, who sinks down into matter but rises again. (In the later Valentinian systems this origin of the Christos is entirely obscured, and Christ, together with the Holy Spirit, becomes a later offspring of the celestial world of aeons ; this may be looked upon as an ap- proximation to the Christian dogma).

(5) A figure entirely peculiar to Valentinian Gnosticism is that of Horos (the Limiter). The name is perhaps an echo of the Egyptian Horus. The peculiar task of Horos is to separate the fallen aeons from the upper world of aeons. At the same time he becomes (first, perhaps, in the later Valentinian systems) a kind of world-creative power, who in this capacity helps to construct an ordered world out of Sophia and her passions. He is also called, curiously enough, Stauros (cross), and we frequently meet with references to the figure of Stauros. But we must not be in too great a hurry to conjecture that this is a Christian figure. Speculations about the Stauros are older than Christianity, and a Platonic conception may have been at work here. Plato had already stated that the world-soul revealed itself in the form of the letter Chi (X) ; by which he meant that figure described in the heavens by the intersecting orbits of the sun and the planetary ecliptic. Since through this double orbit all the movements of the heavenly powers are determined, so all " becom- ing " and all life depend on it, and thus we can understand the state- ment that the world-soul appears intheformofanX,ora cross. The

cross can also stand for the wondrous aeon on whom depends the ordering and life of the world, and thus Horos-Stauros appears here as the first redeemer of Sophia from her passions, and as the orderer of the creation of the world which now

begins. This explanation of Horos, moreover, is not a mere conjecture, but one branch of the Valentinian school, the Marcosians, have expressly so explained this figure (Irenaeus i. 17, 1). Naturally, then, the figure of HorOs- Stauros was often in later days assimilated to that of the Christian Redeemer.

(6) Peculiarly Valentinian is the above-mentioned derivation of the material world from the passions of Sophia. Whether this already formed part of the original system of Valentinus is, indeed, questionable, but at any rate it plays a prominent part in the Valentinian school, and consequently appears with the most diverse variations in the account given by Irenaeus. By it is effected the comparative monism of the Valentinian system. The dualism of the conception of two separate worlds of light and darkness is over- come by the derivation of the material world from the passions of Sophia. Older myths may here have served as a model ; for instance, we may recall the myth of the derivation of the world from the body and limbs of the Primal Man (Bousset, Hauptprobleme der Gnosis, p. 211).

(7) This derivation of the material world from the passions of the fallen Sophia is next affected by an older theory, which probably occupied an important place in the true Valentinian system. Ac- cording to this theory the son of Sophia, whom she forms on the model of the Christos who has disappeared in the Pleroma, becomes the Demiourgos, and this Demiourgos with his angels now appears as the real world-creative power. These two conceptions had now to be combined at all costs. And it is interesting to observe here what efforts were made to give the Demiourgos a better position. Ac- cording to the older conception, he was an imperfect, ignorant, half- evil and malicious offspring of his mother, who has already been deprived of any particle of light (Irenaeus i. 29, 30). In the Valen- tinian systems he appears as the fruit of Sophia's repentance and conversion. Even his name has been changed from that of the older Gnosticism. He is no longer called Jaldabaoth, but has been assigned the better name, drawn from the philosophy of Plato, of Demiourgos. We must not forget here that the Demiourgos of the Gnostic is known to have corresponded to the God of the Old Testa- ment, who was the God of the Christian Church, and that we can thus lay our finger here on a compromise with the faith of the great Christian community.

(8) With the doctrine of the creation of the world is connected the subject of the creation of man. We fortunately know, from a frag- ment preserved by Clemens, that Valentinus here preserved the old Gnostic myth practically unaltered in his system. According to it, the world-creating angels — not one, but many — create man, but the seed of the spirit comes into their creature without their knowledge, by the agency of a higher celestial aeon, and they are then terrified by the faculty of speech by which their creature rises above them, and try to destroy him. In the Valentinian system known to us this myth has practically lost its original freshness and colour, and can only be arrived at from allusions. On the other hand, the speculations of the Valentinians delight in accounts of the artificial and complicated putting together of the first man out of the various elements. And a specifically Valentinian idea is here added in that of the threefold nature of man, who is represented as at once spiritual, psychical and material. In accordance with this there also arise three classes of men, the pneumatici, the psychici and the hylici (BXrj, matter). It is significant that Valentinus himself is credited with having written a treatise upon the three natures (Schwartz, Aporien, i. 292). Here we have another instance of the theological compromise of the Valen- tinians. All the other Gnostic systems recognize only a dual division, the children of light and the children of darkness. That the Valen- tinians should have placed the psychici between the pneumatici and hylici signifies a certain recognition of the Christian Church and its adherents. They are not numbered simply among the outcasts, but considered as an intermediate class, to whom is left the choice between the higher celestial nature and the lower and earthly.

(9) At the centre of the whole Valentinian system naturally stands the idea of redemption, and so we find here developed particularly clearly the myth of the heavenly marriage already known from Irenaeus i. 30 to be Gnostic. Redemption is essentially accomplished through the union of the heavenly Soter with the fallen goddess. There is great uncertainty in the Valentinian system as to who this celestial Soter is. In the Gnostic systems of Irenaeus i. 30 he is the Christos, the celestial brother who turns back to the fallen sister. In the Valentinian system the redeemer is likewise sometimes brought into relation with the Christos, sometimes, in a significant way, with the Anthropos, and sometimes again with Horos-Stauros.

In the fully developed Ptolemaean system he appears as the common off- spring of the whole Pleroma, upon whom all the aeons confer their best and most wonderful qualities (we may compare here the Marduk myth, in which it is related that all the gods transfer their qualities and powers to the young god Marduk, who is recognized as their leader). And this celestial redeemer-aeon now enters into a marriage with the fallen goddess; they are the " bride and bridegroom." It is boldly stated in the exposition in Hippolytus's Philasopfrumena that

they produce between them 70 celestial sons (angels). (In the other accounts these angels no longer appear as the sons of the celestial pair, but as the heavenly attendants accompanied by whom the Soter approaches Sophia.) It is obvious from the number 70 that we have here a marriage between a celestial and divine pair. This marriage relation between the Soter and Sophia is expounded in quite a material way even in Irenaeus iii. 3, 4, where the Old Testament phrase irdv 6.pptv biavolyov nijTpav is translated, " the Pan (the all, a name for the Soter), the masculinity which opens the mother's womb." This myth of the redeemer, as we shall see more fully below, and as may be mentioned here, is of great significance for the practical piety of the Valentinian Gnostics. It is the chief idea of their pious practices mystically to repeat the experience of this celestial union of the Soter with Sophia. In this respect, conse- quently, the myth underwent yet wider development. Just as the Soter is the bridegroom of Sophia, so the heavenly angels, who some- times appear as the sons of the Soter and Sophia, sometimes as the escort of the Soter, are the males betrothed to the souls of the Gnostics, which are looked upon as feminine. Thus every Gnostic had his angel standing in the presence of God, and the object of a pious life was to bring about and experience this inner union with the celestial abstract personage. This leads us straight to the sacra- mental ideas of this branch of Gnosticism (see below). And it also explains the expression used of the Gnostics in Irenaeus i. 6, 4, that they always meditate upon the secret of the heavenly union (the Syzygia).

(10) With this celestial Soter of the Valentinians and the redemp- tion of Sophia through him is connected, in a way which is now not quite intelligible to us, the figure of Jesus of

Nazareth and the histori- cal redemption connected with his name. The Soter, the bridegroom of Sophia, and the earthly Jesus answer to each other as in some way identical. Here again we recognize the entirely artificial compro- mise between Gnosticism and Christianity. It is characteristic of this that in one passage in the account of Irenaeus it is directly stated that the redeemer came specially on account of the psychici, for the pneumatici (the Gnostics) already belong by nature to the celestial world, and no longer require any historical redemption, while the hylici have fallen beforehand into damnation, so that with the psychici only is there any question as to whether they will turn to re- demption or damnation, and for them the historical redeemer is of efficacy (Irenaeus i. 6, 1). This assertion is in thorough agreement with the fundamental tendency of Gnostic piety; for the Gnostics individual redemption has actually been accomplished in the union between the Soter and Sophia, and is effected for the individual Gnostics in repeating the experience of this union. So that in effect they no longer require the historical redemption through Jesus.

(11) Among the manifold confusion of opinions as to the nature and characteristics of the Redeemer Jesus of Nazareth, certain ex- planations stand out as characteristically Valentinian, especially those in which it is laid down that even the redeemer has a threefold nature; from his mother, Sophia, he derived his nature as a pneumaticos, in the world of the Demiourgos he was united with the Christos, and finally a wonderful bodily nature was formed for him from celestial elements, which was yet not of earthly material. As such he was miraculously born of the Virgin, as through a canal (5ia ffaATjros) . The compromises with the Catholic Church are here obvious. According to this theory Jesus, having an element of the psychical nature, can appear in virtue of this as the son of the Demiourgos, i.e. of the Old Testament God, and as the Redeemer of the psychici; and when we read of this miraculous bodily nature, which is not composed of earthly material, there is an obvious compromise between the fundamental heresy of Gnosticism, Docetism and the dogma of the Christian Church as to the true bodily nature of the Redeemer. Into this already com- plicated Christology is now introduced by an obscure combination, in the systems known to us, the idea that upon this Jesus, so con- stituted, yet another celestial nature, the Christos or the Soter, has

descended at his baptism. This is the older and peculiar Gnostic conception of Irenaeus i. 30, which appears to have been introduced into Valentinianism at a late stage of its development. The express statement i.i Hippolytus 6, 35, that this doctrine was shared only by the Italic branch of the Valentinians, but disclaimed by the Anatolian branch, also bears on the point.

(12) The close of the drama and the final accomplishment of the redemption is also depicted by the Valentinian writings in accordance with the old Gnosticism. A general ascent takes place, the Soter returns with the liberated Sophia into the Pleroma, and likewise the Gnostics with the angels with whom they are connected. But it is characteristic of the Valentinian system that the Demiourgos and the psychici who are connected with him also ascend to the eighth or highest heaven of Achamoth, while the remaining material world sinks into flames.

VI. The first survey of these confused speculations, these myths gathered together and preserved from the ancient world, this marshalling together of the most varied traditions, and above all, these artificial attempts at compromise dictated by practical prudence, makes us inclined to doubt whether it was possible for any true piety to coexist with all this. Yet such

piety existed, indeed we have here a set of regular mystics. It is not, indeed, a purely spiritual and mystical piety, but a mysticism much distorted and over-grown with sacramental additions and a mysterious cult. But all this is not without an inner value and an attractive atmosphere. Our information, it is true, is scant; most of it is to be found in the fragments of the letters and homilies of the master of the school preserved for us by Clemens. The central point of the piety of Valentinus seems to have been the mystical contemplation of God; in a letter preserved in Clemens ii. 20, 114, he sets forth that the soul of man is like an inn, which is inhabited by many evil spirits. " But when the Father, who alone is good, looks down and around him, then the soul is hallowed and lies in full light, and so he who has such a heart as this is to be called happy, for he shall behold God." But this contemplation of God, as Valentinus, closely and deliberately following the doctrines of the Church, and with him the compiler of the Gospel of John declares, is accomplished through the revelation of the Son. This mystic and visionary also discusses the Psalm which is

preserved in the PhilosOphumena of Hippolytus (6, 37). With celestial enthusiasm Valentinus here surveys and depicts the heavenly world of aeons, and its connexion with the lower world. 1 Exalted joy of battle and a valiant courage breathe forth in the sermon in which Valentinus addresses the faith- ful (Clemens iv. 13, 91): "Ye are from the beginning im- mortal and children of eternal life, and desire to divide death amongst you like a prey, in order to destroy it and utterly to annihilate it, that thus death may die in you and through you, for if ye dissolve the world, and are not yourselves dissolved, then are ye lords over creation and over all that passes away." From Tertullian, de came Christi cap. 17, 20, we learn that Valentinus composed psalms. We may conjecture that these psalms were similar in their kind to the beautiful odes of Solomon which have lately been discovered, though without suggesting that these particular psalms were specifically Gnostic or Valentinian.

VII. But with this mysticism, of which we possess only a few of the beautiful flowers, is connected the mystery and cult of the sacrament. The lofty spirituality of the Gnostic de- generates over and over again into a distinctly material and sensual attitude, in which all kinds of efforts are made actually to assimilate to oneself the divine through external means. Our authorities for the sacramental practices of the Valentinians are preserved especially in the accounts of the Marcosians given in Irenaeus i. 13 and 20, and in the last section of the Excerpta ex Theodoto. We must point out once again how the mother aeon stands absolutely at the centre of this cult. There are moreover various figures in the fully developed system of the Valentinians who are in the Gnostic's mind when he calls upon the Mother goddess; sometimes it is the fallen Achamoth, sometimes the higher Sophia abiding in the celestial world, sometimes Aletheia, the consort of the supreme heavenly father, but it is always the same person, the Mother goddess, on whom the fervent faith of the Gnostics is fixed. Thus a baptismal confession of faith of the Gnostics (Irenaeus i. 21,' 3) runs, " In the name of the unknown Father of all, by Aletheia, the mother of all, by the name which descended upon Jesus." And in almost all the sacramental prayers of the Gnostics handed down to us by Irenaeus, the mother is the object of the invocation. If the interpretation generally given of the Aramaean baptismal formula by Irenaeus in the same passage is correct, it began with the words: " In the name of

Achamoth." Hence we can understand how, 1 according to Irenaeus i. 5, 3, Sophia Achamoth had among the Valentinians the title of kyrios (lord), and, a question closely connected with this, why they did not call Jesus kyrios, but Soter, as Irenaeus expressly assures us (i. 1, 3). Kyrios is the title given to the hero who is the subject of a cult among a given body of people, and the heroine of the cult of the Valentinians, Sophia Achamoth, therefore receives this title.

1 Cf. Goethe's Faust, I.:— . /

" Wie Himmelskrafte auf und niedersteigen Und sich die goldnen Eimer reichen."

The chief sacrament of the Valentinians seems to have been that of the bridal chamber.

We have stated above the relation of this sacrament with the Valentinian speculations. Just as the apostle Paul represented his Christianity as a living, dying and rising again with Christ, so the first concern of the pious Valentinian was the experience of the divine marriage feast of Sophia. As Sophia was united with the Soter, her bridegroom, so the faithful would experience a union with their angel in heaven (i.e. their " double," Doppelgdnger). The ritual of this sacra- ment is briefly indicated by Irenaeus i. 21, 3: " A few of them prepare a bridal chamber and in it go through a form of consecration, employ- ing certain fixed formulae, which are repeated over the person to be initiated, and stating that a spiritual marriage is to be performed after the pattern of the higher Syzygia." Through a fortunate chance, a liturgical formula which was used at this sacrament appears to be preserved, though in a garbled form and in an entirely different connexion, the au#ior seeming to have been uncertain as to its original meaning. It runs: " I will confer my favour upon thee, for the father of all sees thine angel ever before his face … we must now become as one ; receive now this grace from me and through me ; decjc thyself as a bride who awaits her bridegroom, that thou mayest become as I am, and I as thou art. Let the seed of light descend into thy bridal chamber; receive the bridegroom and give place to him, and open thine

arms to embrace him. Behold, grace has de- scended upon thee."

Besides this the Gnostics already practised baptism, using the same form in all essentials as that of the Christian Church. The name given to baptism, at least among certain bodies, was apolytrosis (liberation) ; the baptismal formulae have been mentioned above. Great import- ance attaches in the Gnostic sacramental speculations to invocation (of the name). The Gnostics are baptized in the mysterious name which also descended upon Jesus at his baptism. The angels of the Gnostics have also had to be baptized in this name, in order to bring about redemption for themselves and the souls belonging to them (excerpta ex Theodoto, 22). In this connexion we also find the formula \irrpuicn.v hyyeXw-qv (f or the angelic redemption, Irenaeus i. 21, 3). In the baptismal formulae the sacred name of the Re- deemer is mentioned over and over again. In one of the formulae occur the words: " I would enjoy thy name, Saviour of Truth." The concluding formula of the baptismal ceremony is: " Peace over all upon whom the Name rests " (Irenaeus i. 21, 3). This name pro- nounced at baptism over the faithful has above all the significance that the name will protect the soul in its ascent through the heavens, conduct it safely through all hostile powers to the lower heavens, and procure it access to Horos, who frightens back the lower souls by his magic word (exc. ex Theodoto, 22). And for this life also baptism, in consequence of the pronouncing of the protecting name over the baptized person, accomplishes his liberation from the lower daemonic

Cowers. Before baptism the Heirmarmene is supreme, but after aptism the soul is free from her {exc. ex Theod. 77). With baptism was also connected the anointing with oil, and hence we can also understand the death sacrament occurring among the Valentinians consisting in an anointing with a mixture of oil and water (Irenaeus i. 21, 4). This death sacrament has naturally the express object of assuring the soul the way to the highest heaven " so that the soul may be intangible and invisible to the higher mights and powers " (Irenaeus, loc. cit.). In this connexion we also find a few formulae which are entrusted to the faithful, so that their souls may pronounce them on their journey upwards. One of these formulae runs : " I am a son of the Father, the Father who was before the whole world — I came to see everything, that which is strange and that which is my own ; and deep down there is nothing strange,

but only that which belongs to Achamoth. For she is the feminine aeon, and she has made all things. I draw my sex from that which was before the world, and take back to it the property from which I came " (Irenaeus i. 21, 5). Another formula is appended, in which thereis a distinction in the invocation between the higher and lower Sophia. Another prayer of the same style is to be found in Irenaeus i. 13, and it is expressly stated that after prayer is pronounced the Mother throws the Homeric helm.t (cf. the Tarnkappe) over the faithful soul, and so makes him invisible to the mights and powers which surround and attack him.

On the other hand, we see how here and there a reaction took place against the absurdity of this sacramental superstition. Thus Iren- aeus (i. 21, 4) tells- us of certain Gnostics who would admit no external holy practices as efficacious: " The completed apolytrosis is the actual knowledge of the inexpressible majesty (of God), for through ignorance arose all faultiness and suffering, and through knowledge will be removed all the conditions which arose from ignorance ; and therefore knowledge (gnosis) is the perfecting of the inner man." A pure piety, rising above mere sacramentalism, breathes in the words of the Gnostics preserved in excerpta ex Theodoto, 78, 2 : " But not baptism alone sets us free, but knowledge (gnosis) : who we were, what we have become, where we were, whither we have sunk, whither we hasten, whence we are redeemed, what is birth and what rebirth."

VIII. It has already been seen clearly that Valentinian Gnosticism affected the nearest approach of all the Gnostic sects to the

Catholic Church. Valentinus's own life indicates that he for 3 long time sought to remain within the official Church, and had at first no idea of founding a community of his own. Many com- promises in his theories point the same way. The Johannine tendencies of his doctrine of the aeons (Logos, Zoe, Aletheia, Parakletos) ; the attempt to modify the sharp dualism of Gnosti- cism in a monistic direction; the derivation of the world from the fallen Sophia; the favourable judgment of the Demiourgos, and his origin in the repentance and conversion of Sophia, which are peculiar to the Valentinian system; the triple division of mankind into pneumatici, psychici and hylici, which is obviously contrived for the benefit of the psychici; the inclusion of an element of the psychici in the composition of

the Redeemer; the theory that Jesus possessed a miraculous body formed in the upper world; the emphasis on the fact that the redemption of Jesus was primarily for the psychici; the doctrine that by the final redemption the Demiourgos and the psychici find a place in the Ogdoas; the adoption of Christian baptism — all this, and perhaps more, indicates a definite and deliberate approach towards the doctrine of the Church.

These Gnostics, as in the case of most of the other Gnostic sects, possessed their own peculiar holy writings and books, but they also made a great use in their own circle of the canon of the Christian Church, especially the canon of the New Testament and — though with a few reservations — of the Old Testament. Irenaeus in his account of the Ptolemaean sects has used a source which contained a detailed scriptural exposition of the Valentinian doctrines based on the New Testament. We can even — and this is of great interest and significance for the history of the canon — establish the contents of the Gnostic canon. It included the three first gospels and the apostle Paul. The proofs are constantly drawn firstly from the utterances of the Saviour, and then from the Epistles of Paul. The Gospel of John does not seem to have yet found a place in this canon, for the very good reason that it was not yet widely known and circulated. Later Valentinian Gnosticism delighted in making use of the Johannine Gospel as a crowning testimony. Thus to the older and ancient scriptural evidences which we mentioned above, Irenaeus (i. 8, 5) directly appends a com- mentary on the Gospel of John, which is ascribed to Ptolemaeus himself., And in the excerpta ex Theodoto, 6 seq., we also find a commentary on the prologue to this Gospel. And we know that the later Valentinian Herakleon wrote a detailed exposition of the whole Gospel. But the Old Testament too was a sacred book of these Gnostics, and its statements were used as evidence and proofs. This was done with some diffidence and caution. The attitude, at least of the later Valentinians, is best indicated by the letter of Ptolemaeus to Flora, which is preserved in Epiphanius 33, 3-7. Ptolemaeus here openly attacks the doctrine that the Old Testament is the work of the devil, or that it cannot at least be ascribed unconditionally, to the Supreme God. The Old Testament he considers to contain a system of laws given by God himself, a system of laws given by Moses according to his own ideas, and precepts interpolated by the elders of the people. The laws of God himself fall then into three classes: the true law, which is not interwoven with evil;

the law permeated with unrighteousness, which the Redeemer has dissolved; and the typical and symbolical law, which the Redeemer has translated from the material into the spiritual. Thus there is a gradual approach to the Christian Church's con- ception of the Old Testament. (It should indeed be remarked that Ptolemaeus in the above-mentioned letter has purposely expounded the exoteric doctrine in special approximation with the Catholic Church, while for the actual difficult questions as to the nature of the Demiourgos and his relation with the unity of the Divine nature he consoles Flora with a further and more intimate instruction.)

And yet this reconciliation of Gnosticism was a fruitless and henceforward a purposeless undertaking. Oriental dualism and wildly intemperate Oriental mythology had grown into so radical and essential a part of Gnosticism that they could not be sepa- rated from it to make way for a purer and more spiritual view of

religion. And at a time when the prevailing tendency of Christi- anity was a struggle out of the darkness of Oriental mythology and eschatology into clearness, and an effort towards union with the lucid simplicity of the Hellenic spirit, these Gnostics, for all their efforts, and even the most noble of them, had come too late. They are not the men of a forward movement, but they are, and remain, in spite of all clearer insight, the rear- guard in the history of piety, who have gone under and disappeared in a struggle with the impossible. None the less we cannot omit the observation that the Christian Church in later centuries to a certain extent travelled again over Gnostic ground in its sacra- mental theories and fully developed Christological speculations.

See Bibliography to article Gnosticism. Also A. Harnack, Dog- mengcschichte, vol. i. (4th ed,, 1909) ; W. Bousset, Hauptprobleme der unosii (1907). See also Pauly-Wissowa, Realencyklopddie des klassiscken Altertums, s.v. Gnosticismus , Gnostiker. More particu- larly devoted to Valentinianism are: G. Heinrici, Die Valentinian- ische Gnosis und die heiligen Schriften (1871) ; E. Schwartz, " Aporien im 4 Evangelium " in Nachrichten der Gott. Gesellsch. der Wissensch. (1908), ii.

127-41; A. Harnack, Brief des Ptolemaeus an die Flora, SUzungsber. der Bed. Akademie (1909). (VV. Bo.)

VALENZUELA, FERNANDO DE (1630-1692), Spanish royal favourite and minister, was born at Naples on the 19th of January 1630. His father, Don Francisco de Valenzuela, a gentleman of Ronda, had been compelled to flee from Spain in consequence of a brawl, and had enlisted as a soldier in Naples, where he married Dona Leonora de Encisa. Francisco de Valenzuela having died young, his son was placed by his mother as a page in the household of the duke of Infantado. He lost his place owing to a reduction of the duke's establishment, and for several years he lived obscurely; but by good fortune he succeeded in persuading Maria de Uceda, one of the ladies in-waiting of Mariana, second wife of Philip IV., to marry him. By her help Valenzuela obtained a footing in the palace. He was appointed introducer of ambassadors on the 12th of October 1 67 1, and it became notorious that whoever had a petition to present or a place to ask for must apply to him. He became popularly known as the duende, the fairy or brownie of the palace, and was believed to be the lover of the queen. In 1675 a court intrigue, conducted by his rivals and supported by the younger Don John of Austria, was so far successful that he was driven from court; but the queen gave him the title of mar- quis of Villa Sierra, and appointed him ambassador to Venice. Valenzuela succeeded in getting the embassy exchanged for the governorship of Granada. His stay at this post was short, for he was able to organize a counter-intrigue which soon brought him back to court. The queen-regent now openly appointed him prime minister, gave him official quarters in the palace, and conferred a grandeeship on him, to the profound indignation of the other grandees. In January 1678 a palace revolution broke out against the queen-regent, who was driven from Madrid, and Valenzuela fled for refuge to the monastery of the Escorial. He was, however, taken out by force, and his house was pillaged. His property was confiscated — his jewels, furniture and ready money were estimated to amount to £120,000 — he was degraded from the grandeeship and exiled to the Philippines. At a later period he was released from close confinement and allowed to settle in Mexico, where a pension was given him. He died in Mexico, from the kick of a horse he was breaking in, on the 7th of February 1692. Part of his property, and the title of Villa Sierra, but not the grandeeship, were restored to his wife and children. The career

of Valenzuela probably helped to suggest the subject of Ruy Bias to Victor Hugo.

See Documentos Infditos para la Historia de Espana, vol. lxvii. (Madrid, 1842, &c), which contain an artful and well-written defence of himself addressed to King Charles II. of Spain from Mexico.

VALERA Y ALCALA GALIANO, JUAN (1824-1905), Spanish novelist, son of a retired commodore, Jose Valera, who married Dofia Dolores Alcala Galiano, marquesa de la Paniega, widow of a Swiss general named Freuller, was born on the 18th of October 1824 at Cabra (Cordova). Valera' was educated at Malaga and at the university of Granada, where he took a- degree in law. Entering diplomacy in 1847, he became unpaid attache to the

Spanish embassy at Naples under the famous Duke de Rivas, the leader of the romantic movement in Spain. Valera witnessed the events of the Revolution, was promoted second secretary to the embassy at Lisbon in 1850, and in 1851 was transferred as first secretary to Rio de Janeiro, where he remained for two years. After a short period passed at Dresden, he was appointed to the permanent staff of the Foreign Office at Madrid, and in 1857 was attached to the special embassy to St Petersburg under the Duke de Osuna. In 1858 he resigned his post, was elected deputy for Archidona, in the province of Malaga, took his seat with the advanced Liberal Opposition, and joined with Albareda and Fabie in founding El Contempordneo, a very influential journal. An expert in the art of covering an opponent with polite ridicule, his writings in the press attracted general attention. He was elected a member of the Spanish Academy in 1861, and remained in Opposition till 1865, when O'Donnell appointed him minister at Frankfort; on the flight of Isabella II. in 1868 he was elected deputy for Montilla in the province of Cordova, became under-secretary of state for foreign affairs, and was one of the deputation who offered the crown to Amadeus of Savoy in the Pitti Palace at Florence. Though he always called himself a Moderate Liberal, Valera invariably voted for what are considered Radical measures in Spain, and a speech delivered by him in February 1863 against the temporal power of the pope created a profound sensation. However, though a member of the revolutionary party, he steadily opposed organic constitutional changes, and therefore he retired from public life during the

period of republican government. After the Bourbon restoration he acted as minister at Lisbon (1881-1883), at Washington (1885), at Brussels (1886) and as ambassador at Vienna (1893-1895), retiring from the diplomatic service on the 5th of March 1896. During the last ten years of his life he took no active part in politics. He died on the 18th of April 1905.

Valera's first publication, Canciones-, Romances y Poemas, was published in 1856. His verses are melodious, finished and various in subject; but they are rather the imitative exercises of a scholarly man of the world than the inspirations of an original poet. That they failed to attract notice is not altogether to be regretted, for, as Valera himself confessed later in his half- ironical, half-ingenuous preface to the second edition (1885), " In spite of my idleness, I should have shown a most deplorable fecundity had I been received with favour and applause." However, if he published little more in the shape of verse, he wrote incessantly in prose. More than two-thirds of his work is still uncollected, buried in reviews and newspapers; but we may take it that he rescued what he thought most valuable. His criticism may be read in the Estudios criticos sobre literatura (1864), in the Disertaciones y juicios literarios (1878) and in the Nuevos estudios criticos (1888); yet, with all his penetration and taste, Valera laboured under one disadvantage not frequent in critics. He suffered from an excessive amiability. He said a hundred incisive, wise, witty, subtle and suggestive things concerning the mysticism of St Theresa, the art of novel- writing, Faust, the Inquisition, Don Quixote, Shakespeare, the psychology of love in literature; but, to do himself justice, it was an almost indispensable condition that he should deal with the past. In the presence of a living author Valera was dis- armed. Unless the writer were an incurable pessimist, Valera would find something in his work to praise, exhausting the vocabulary of compliment and graceful tribute; but, except in the Cartas americanas (1889), where the laudation was mani- festly so exaggerated that no harm could come of it, this trick of eulogy became perplexing and misleading. Valera, in effect, refused to criticize contemporary literature; as a rival author it seemed to him an indelicacy to censure his competitors, and he was either laudatory or silent. It is regrettable, for criticism was and is greatly needed in Spain.

Valera, then, excelled neither as a poet nor as an impartial

critic; he had the vocation of the novelist, though he was slow in discovering it, since he was in his fiftieth year before be published the novel which was to make him famous. Pepita

Jiminez (1874) is a recital of the fall of Luis de Vargas, a semin- arist who conceived himself to be a mystic and a potential saint, and whose aspirations dissolve at the first contact with reality. It is easy to point out blemishes: the story is not well constructed, and it has pauses during which the; writer's fantasy plays at pleasure over a hundred subjects not very germane to the matter; but its characters are as real as any in fiction, the love story is told with the most refined subtlety and malicious truth, while page upon page is written in such Spanish as would do credit to the best writers of the 16th and 17th centuries. Unquestionably Pepiia Jimenez is a very remarkable achieve- ment — so remarkable, that contemporaries were reluctant to admit the superiority of its successors. It is certain that Valera's second novel, Las ilusiones del Doctor Faustina (1875), was received with marked disfavour, and that it has the faults of over-refinement and of cruelty; yet in keen analysis and in humour it surpasses Pepita Jimenez. The Comendador Mendoza (1877) is more pathetic and of a profounder significance; and if Dona Luz (1879) repeats the situation and the general idea already used in Pepita Jimenez, it strikes a deeper and more tragic note, which came as a surprise to those familiar only with the lighter side of Valera's , genius. Besides these elaborate psychological studies, Valera issued a volume of Cuentos (1887), some of these short tales and dialogues being marvels of art and of insight. Thenceforward he was silent for eight years, but after his retirement from politics he published several good books — El hechicero (1895), Juanita la larga (1896), Genio y figura (1897), De varios colores (1898) and Morsamor (1899). These are not all of equal excellence, but they are characteristic of their author, and abound in understanding, humorous com- ment and sympathetic creation.

At the close of the 19th century Valera was recognized as the most eminent man of letters in Spain. He had not Pereda's force nor his energetic realism; he had not the copious invention nor the reforming purpose of Perez Galdos; yet he

was as realistic as the former and as innovating as the latter. And, for all his cosmopolitan spirit, he fortunately remained in- tensely and incorrigibly Spanish. His aristocratic scepticism, his strange elusiveness, his incomparable charm are his own: his humour, his flashing irony, his urbanity are eminently the gifts of his land and race. He is by no means an impersonal artist; in almost every story there is at least one character who talks and thinks and subtilizes and refines as Valera himself wrote in his most brilliant essays. This may be a fault in art; but, if so, it is a fault which many great artists have committed, from Cervantes to Thackeray. It is dangerous to attempt a forecast of Valera's final place in literary history, yet it seems safe to say that, though his poems and essays will be forgotten, Pepita Jimenez and Dona Luz will survive changes of fashion and of taste, and that their author's name will be inseparably connected with the renaissance of the modern Spanish novel. (J . F.-K.)

VALERIA, VIA, an ancient highroad of Italy, the continuation north-eastwards of the Via Tiburtina (q.v.). It probably owed its origin to M. Valerius Messalla, censor in 1 54 B.C. It ran first up the Anio valley past Varia (q.v.), and then, abandoning it at the 36th mile, where the Via Sublacensis diverged, ascended to Carseoli (q.v.), and then again to the lofty pass of Monte Bove (4003 ft.), whence it descended again to the valley occupied by the Lago di Fucino (q.v.). It is doubtful whether it ran farther than the eastern point of the territory of the Marsi at Cerfennia, to the N.E. of the Lacus Fucinus, before the time of Claudius. Stiabo states that in his day it went as far as Corfinium, and this important place must have been in some way accessible from Rome, but probably, beyond Cerfennia, only by a track. The difficult route from Cerfennia to the valley of the Aternus — a drop of nearly 1000 ft., involving too the crossing of the main ridge of the Apennines (3 675 ft.) by the MonsImeus(mod. Forca Caruso) — was, however, probably not made into a highroad until Claudius's reign: one of his milestones (Corp. Inscr. Lat. ix. 5973) states that he in a.d. 48-49 made the Via Claudia Valeria from Cerfennia to the mouth of the Aternus (mod. Pescara). He also con- structed a road, the Via Claudia Nova, connecting the Via

Salaria, which it left at Foruli (mod. Civitatomassa, near Amiter- num) with the Via Valeria near the modern Popoli. This road was continued south (we do not know by whom or

when) to Aesernia. From Popoli the road followed the valley of the Aternus to its mouth, and there joined the coast-road at Pescara. The modern railway from Rome to Castellammare Adriatico follows closely the line of the Via Valeria.

See E. Albertini in Melanges de I'Hcole francaise de Rome (1907), 463 sqq. (T. As.)

VALERIAN, a genus of herbaceous perennial plants of the natural order Valerianaceae. Two species — Valeriana officinalis and V. dioica — areindigenousin Britain, whilea third, V.pyrenaica, is naturalized in some parts. The valerians have opposite leaves and small flowers, usually of a white or reddish tint, and arranged in terminal cymes. The limb of the calyx is remarkable for being at first inrolled and afterwards expanding in the form of a feathery pappus which aids in the dissemination of the fruit. The genus comprises about 150 species, which are widely dis- tributed in the temperate parts of the world. In medicine the root of V. officinalis is intended when valerian is men- tioned. The plant grows throughout Europe from Spain to the Crimea, and from Iceland through northern Europe and Asia to the coasts of Manchuria. Several varieties of the plant are known, those grow- ing in hilly situa- tions being con- sidered the most valuable for medi- cinal purposes.

Valeri an is cultivated in Eng- land (in several villages near Chesterfield in r Derbyshire), but to a much greater extent in Prussian Saxony (in the neighbourhood of Colleda, north of Weimar), in Hol- land and in the United States (Vermont, New Hampshire and New York). The dried root or rhizome consists of a short central erect portion, about the thickness of the little finger, surrounded by numerous rootlets about Jj, of an inch in diameter, the whole being of a dull brown colour. When first taken from the ground it has no distinctive smell; but on drying it acquires a powerful odour of valerianic acid. This odour, now regarded as intolerable, was in the 16th century considered to be fragrant, the root being placed among clothes as a perfume (Turner, Herbal, 1568, part iii. p. 76), just as V. celtica and some Himalayan species of the genus are still used in the East. By the poorer classes in the north of England it was esteemed of such medi- cinal value that " no broth, pottage or physical meat " was con- sidered of any value without it (Gerard, Herball, 1633, p, 1078).

The red valerian of gardens is Centranthus ruber, also belonging to the Valerianaceae; but Greek valerian is Polemonium coeru- leum, belonging to the natural order Polemoniaceae. Cats are

Habit after Curtis, Flora Londinensis.

Fig. I. — Valerian (Valeriana officinalis), one- third natural size. 1, flower; 2, flower after removal of corolla ; 3, fruit crowned by the feathery pappus. 1, 2, 3 enlarged.

nearly as fond of the smell of this plant as of the true valerian, and will frequently roll on the plant and injure it.

The chief constituent of valerian is a volatile oil, which is present in the dried root to the extent of 1-2 %, plants growing on dry or stony soil being said to yield the largest quantity. The oil is of complex composition, containing valerianic (valeric), formic and acetic acids combined with a terpene, dcHi 6 ; the alcohol known as borneol ; and pinene. The valerianic acid present in the oil is not the normal acid, but isovalerianic acid. It occurs in many plants and in cod-liver oil. It is strongly acid, burning to the palate, and with the odour of the plant. The oil is soluble in thirty parts of water and readily in alcohol and ether. The British Pharmacopeia contains the tinctura Valerianae ammoniata, containing valerian, oil of nutmeg, oil of lemon and ammonia. It is an extremely nauseous and offensive preparation. The valerianate of zinc is also official in Great Britain, but, like valerianic acid itself, it is pharmacologically inert and therapeutically useless.

Valerian acts medicinally entirely in virtue of its volatile oil, which exerts the actions typical of its class. The special use of this drug, like that of others which contain an offensive volatile oil — such as asafoetida — is in hysteria or, as it is more properly styled, neuromimesis. It is generally believed that the drug acts in virtue of its unpleasant odour and taste, which cause the patient to display so much volition as shall enable him or her to control the symptoms and thereby obtain the discontinuance of the drug. Good results are sometimes obtained, however, when the drug is given in capsules or in

some other form which puts this mode of action out of the question. Binz of Bonn has shown that the volatile oils act as sedatives of the motor cells in the anterior horns of grey matter in the spinal cord, and it is probable that this action may account for the good results often obtained by the use of valerian in neuromimesis; though there is little doubt that the modus operandi above described may also come into play. The valerianates of iron, quinine, guaiacol and sodium share with that of zinc the disability of exerting no action attributable to their acid radicle, but have frequently been employed. Valerianic diethylamide, or valyl, has also been employed as a substitute for the preparations in ordinary use.

VALERIANUS, PUBLIUS LICINIUS, Roman emperor from

a.d. 253 to 260. He was of noble family, and in 238 was princeps scnatus. In 251, when Decius revived the censorship with legis- lative and executive powers so extensive that it practically embraced the civil authority of the emperor, Valerian was chosen censor by the senate. After the death of Decius Valerian retained the confidence of his successor, Trebonianus Gallus, who sent him to fetch troops to quell the rebellion of Aemilianus, governor of Moesia and Pannonia. The soldiers in Raetia, however, pro- claimed Valerian emperor; and marching slowly towards Rome he found both his rivals dead, slain by their own soldiers. Valerian was about sixty-three years of age, and had scarcely the vigour to deal with the enemies that threatened every frontier of the empire. Taking his son Gallienus as colleague, he left the wars in Europe to his direction, under which matters went from bad to worse and the whole West fell into disorder. Valerian chose for his own part the war in the East, where Antioch had fallen into the hands of a Persian vassal and Armenia was occupied by Shapur (Sapor) I., while in 258 the Goths ravaged Asia Minor. Valerian recovered Antioch, fought in Mesopotamia with mixed success and finally was taken captive. It is said that he was subjected to the greatest insults by his captors, and that after his death his skin was stuffed with straw and preserved as a trophy in the chief Persian temple. Owing to imperfect and contradictory authorities, the chronology and details of this reign are very uncertain.

See Trebellius Pollio, Life of Valerian (frags.) ; Aurelius Victor, Caesares, 32; Eutropius ix. 6; Ammianus Marcellinus xxiii. 5; Zosimus i. 27; Gibbon, Decline and Fall, chap. 10; H.

Schiller, Geschichte der romischen Kaiserzeit, i. pt. 2.

VALERIC ACID, or Valerianic Acid, C4H9CO2H, an organic acid belonging to the fatty acid series, which exists in four isomeric forms, one of which contains an asymmetric carbon atom and consequently occurs in two optically active modifications and one optically inactive modification. Ordinary valeric acid (baldrianic acid) is a mixture of isovaleric acid or isopropylaceticacid, (CH 3) 2 CH-CH 2 C02H, and optically active methy lethylacetic acid, (CH 3) (C 2 H 5)CH-C0 2 H, which occur free or as esters in the vegetable and animal kingdoms, chiefly in the roots of Angelica archangelica and Valeriana officinalis. It may be extracted by boiling with water or soda. A similar product is

obtained by oxidizing fermentation amyl alcohol with chromic acid. Isovaleric acid is an oily liquid having the odour of stale cheese and boiling at 174 ; the salts are usually greasy to the touch. Potassium permanganate oxidizes it to /3-oxyisovaleric acid (CH 3)2-C(OH)-CH 2 C02H, whilst nitric acid gives, among other products, dinitropropane, (CH 3) 2 C(N0 2) 2 . The acid has been synthesized, as has also the inactive form of methylethyl acetic acid; this modification is split into its optical antipodes by crystallization of its brucine salt. Normal valeric acid or propylacetic acid, CH3-CH 2 -CH 2 -CH2-C0 2 H, is a liquid boiling at 186°. The remaining isomer, pivalic or trimethylacetic acid, (CH 3) 3 C-C0 2 H, melts at 35° and boils at 163°. Both these acids are synthetic products.

VALERIUS, PUBLIUS, surnamed Publicola (or Poplicola), " friend of the people," the colleague of Brutus in the consulship in the first year of the Roman republic (509 B.C.). According to Livy and Plutarch, his family, whose ancestor Volusus had settled in Rome at the time of King Tatius, was of Sabine origin. He took a prominent part in the expulsion of the Tarquins, and though not originally chosen as the colleague of Brutus he soon took the place of Tarquinius Collatiiius. On the death of Brutus, which left him sole consul, the people began to fear that he was aiming at kingly power. To calm their apprehensions he discontinued the building of his house on the top of the Velian Hill, and also gave orders that the fasces should be lowered whenever he appeared before the people. He further introduced two laws to protect the liberties of the citizens, one enacting that whosoever should attempt to make himself a king might be slain by any man at any time, while

another provided an appeal to the people on behalf of any citizen condemned by a magistrate {lex Valeria de provocations, see Rome, History, II. " The Republic "). He died in 503, and was buried at the public expense, the matrons mourning him for ten months.

Livy ii. 6-8; Dion. Halic. iv. 67, v. 12-40; Life by Plutarch.

VALERIUS FLACCUS, GAIUS, Roman poet, flourished under Vespasian and Titus. He has been identified on in- sufficient grounds with a poet friend of Martial (i. 61. 76), a native of Padua, and in needy circumstances; but as he was a member of the College of Fifteen, who had charge of the Sibylline books (i. 5), he must have been well off. The sub- scription of the Vatican MS., which adds the name Setinus Balbus, points to his having been a native of (Setia in Latium. The only ancient writer who mentions him is Quintilian (Instil. Or at. x. 1. 90), who laments his recent death as a great loss, although it does not follow that he died young; as Quintilian's work was finished about a.d. 90, this gives a limit for the death of Flaccus. His work, the A rgonautica, dedicated to Vespasian on his setting out for Britain, was written during the siege, or shortly after the capture, of Jerusalem by Titus (70). As the eruption of Vesuvius (79) is alluded to, it must have occupied him a long time. The Argonautica is an epic in eight books on the Quest of the Golden Fleece. The poem is in a very corrupt state, and ends abruptly with the request of Medea to accompany Jason on his homeward voyage. It is a disputed question whether part has been lost or whether it was ever finished. It is a free imitation and in parts a translation of the work of Apollonius of Rhodes (q.v.), already familiar to the Romans in the popular version of Varro Atacinus. The object of the work has been described as the glorification of Vespasian's achievements in securing Roman rule in Britain and opening up the ocean to navigation (as the Euxine was opened up by the Argo). Various estimates have been formed of the genius of Flaccus, and some critics have ranked him above his original, to whom he certainly is superior in liveliness of description and delineation of character. His diction is pure, his style correct, his versification smooth though monotonous. On the other hand, he is wholly without originality, and his poetry, though free from glaring defects, is artificial and elaborately dull. His model in language was Virgil, to whom he is far inferior in taste and lucidity. His tiresome display of learning, rhetorical exaggeration and ornamentations make him difficult to read, which no doubt accounts for his unpopularity in ancient tiˆes.

The Argonautica was unknown till the first four and a half books frere discovered by Poggio at St Gall in 1417. The editio princeps was published at Bologna (1474). Recent editions by G. Thilo (1863), with critical notes; C. Schenkl (1871), with bibliography; £. Bahrens (1875), with critical introduction; P. Langen (1896), with Latin notes, and short introductions on the style and language; Caesar Giarratano (1904) ; see also J. Peters, De. V. F. Vita et Car- mine (1890); VV. C. Summers, Study of the Argonautica (1894).

VALERIUS MAXIMUS, Latin writer, author of a collection of historical anecdotes, flourished in the reign of Tiberius. Nothing is known of his personal history except that his family was poor and undistinguished, and that he owed everything to Sextus Pompeius (consul A.D. 14), proconsul of Asia, whom he accompanied to the East in 27. This Pompeius was a kind of minor Maecenas, and the centre of a literary circle to which Ovid belonged; he was also the intimate of the most literary prince of the imperial family, Germanicus. The style of Valerius's writings seems to indicate that he was a professional rhetorician. In his preface he intimates that his work is intended as a commonplace book of historical anecdotes for use in the schools of rhetoric, where the pupils were trained in the art of embellishing speeches by references to history. According to the MSS., its title is. Nine Books of Memorable Deeds and Sayings. The stories are loosely and irregularly arranged, each book being divided into sections, and each section bearing as its title the topic, most commonly some virtue or vice, or some merit or demerit, which the stories in the section are intended to illustrate. Most of the tales are from Roman history, but each section has an appendix consisting of extracts from the annals of other peoples, principally the Greeks. The exposition exhibits strongly the two currents of feeling which are intermingled by almost every Roman writer of the empire — the feeling that the Romans of the writer's own day are degenerate creatures when confronted with their own republican predecessors, and the feeling that, however degenerate, the latter-day Romans still tower above the other peoples of the world, and in particular are morally superior to the Greeks.

The author's chief sources are Cicero, Livy, Sallust and Pompeius Trogus, especially the first two. Valerius's treatment of his material is careless and unintelligent in the extreme; but in spite of his confusions, contradictions and anachronisms,

the excerpts are apt illustrations, from the rhetorician's point of view, of the circum- stance or quality they were intended to illustrate. And even on the historical side» we owe something to Valerius. He often used sources now lost, and where he touches on his own time he affords us some glimpses of the much debated and very imperfectly recorded reign of Tiberius. His attitude towards the imperial household has often been misunderstood, and he has been represented as a mean flatterer of the same type' with Martial. But, if the references to the imperial administration be carefully scanned, they will be seen to be extravagant neither in kind nor in number. Few will now grudge Tiberius, when his whole action as a ruler is taken into account, such a title as salutaris princeps, which seemed to a former genera- tion a specimen of shameless adulation. The few allusions to Caesar's murderers and to Augustus hardly pass beyond the con- ventional style of the writer's day. The only passage which can fairly be called fulsome is the violently rhetorical tirade against Sejanus. But it is as a chapter in the history of the Latin language that the work of Valerius chiefly deserves study. Without it our view of the transition from classical to silver Latin would be much more imperfect than it is. In Valerius are presented to us, in a rude and palpable form, all the rhetorical tendencies of the age, unsobered by the sanity of Quintilian and unrefined by the taste and subtlety of Tacitus. Direct and simple statement is eschewed and novelty pursued at any price. The barrier between the diction of poetry and that of prose is broken down; the uses of words are strained ; monstrous metaphors are invented ; there are startling contrasts, dark innuendoes and highly coloured epithets; the most unnatural variations are played upon the artificial scale of grammatical and rhetorical figures of speech. It is an instructive lesson in the history of Latin to compare minutely a passage of Valerius with its counterpart in Cicero or Livy. In the MSS. of Valerius a tenth book is given, which consists of the so-called Liber de Praenominibus, the work of some grammarian of a much later date. The collection of Valerius was much used for school purposes, and its popularity in the middle ages is attested by the large number of MSS. in which it has been preserved. Like other schoolbooks it was epitomated. One complete epitome, probably of the 4th or 5th century, bearing the name of Julius Paris, has come down to us; also a portion of another by Januarius Nepotianus. Editions by C. Halm (1865), C. Kempf (1 888) , contain the epitomes of Paris and Nepotianus.

VALET (Fr. valet; 0. Fr. vaslet), a term now restricted in meaning to that of a gentleman's personal servant. The origin of the word is debated. Du Cange (Glossarium, s. Valeti) explains it as the diminutive of vassallus, a vassal, the sons of vassalli being termed vasseleti (and so vasleti, valeti), on the analogy of domicelli (damoiseaux) for the sons of domini. This view is also taken by W. W. Skeat (Etym. Diet. s. " Varlet "); but Hatzfeld and Darmesteter (Did. gen. de la langue francaise), dispute this derivation as phonetically impossible, preferring that from vassulittus from a hypothetical vassulus, diminutive of vassus, from which vassallus also is ultimately derived (see Vassal). Just as vassus was in Merovingian times the Gallo- Roman word for " servitor," which the Franks borrowed to designate the domestic soldiers of their kings, so " valet " retained this, its sole surviving sense, throughout the middle ages. Yet the phrase " gentleman's gentleman," commonly used of the modern valet, is more historical than may at first sight appear. For valet, like esquire (icuyer), long signified the apprentice stage of knighthood, at first with a certain difference, the esquire being mounted, the valet unmounted, but afterwards with scarce a shade of distinction. Later, " valet " became the usual term for gentlemen who were not knights. In England it was not till the early years of the 14th century that valletus in this sense was superseded by armiger, and that " valet " (valete, vadlete, verlet, varlet 1) began to be applied to the class of free men below the rank of esquire. In France the word valet, though in Saintonge and Poitou it survived till the close of the 14th century, had else-where — like damciseau — much earlier been replaced generally by ecuyer as the designation of an unknighted gentleman.

At the outset, " valet " had meant no more than " youth " or " boy." Thus Wace in the Roman de Rou (III. v. 2903). speaking of William the Conqueror, says: Guillaume fu vadlet petiz ("William was a little boy"). The various develop- ments of the word are closely parallel with those of some of its synonyms. Youth suggested both strength and service, the qualifications for nobility in a primitive society, where service in arms was the title to rank. Puer (boy) was early used, as a synonym for vassus, of the soldiers of the Frankish body- guard (pucri ad minislerium) ; the Greek TtKVov (" child ") is etymologically related to O.H. Ger. degan, M.H. and Mod. Ger. degen, "warrior," A.S. thegn, "thane"; "child" itself was applied in the

13th and 14th centuries to young men of gentle birth awaiting knighthood, as a title of dignity, and was perhaps a translation of valet (see Child) , with which may be compared the Spanish infanzon and German junker. So, too, cniht (a "lad" or "servant"), becomes first a warrior and then develops into a title of dignity as " knight," while in Germany the parallel word knecht remains as " servant." But valet has also shared with other synonyms a downward de- velopment. Just as " knave " (cnafa) meant originally a boy (cf. Ger. knabe) or servant, and has come to mean a rogue, so valet in its English (15th century) form of "varlet". had decayed, before it became obsolete, from its meaning of " servant " to signify a " scoundrel " or " low fellow."

See Du Cange, Glossarium (ed. Niort, 1887); A. Luchaire, Manuel des institutions francaises (Paris, 1892); P. Giulhiermoz, Essai sur V origine de la noblesse en France au moyen age (Paris, 1902); Note on the word " Valet " by Maurice Church, App. xix. to Sir R. Hennell's Hist, of the Yeomen of the Guard (Westminster, 1904).

(W. A. P.)

VALHALLA (Old Norse Valhbll, i.e. " hall of the slain "), the name given by the heathen Scandinavians to the abode in which the god Odin received the souls of those who had fallen in battle. There they are represented as spending their time in constant fighting and feasting in his service. See Teutonic Peoples, ad fin.

VALKYRIES (Old Norse valkyriur, "choosers of the slain "), figures of Northern mythology, generally represented as divine (less frequently human) maidens who ride through the air on Odin's service. Clad in full armour they are sent forth

1 The form valectus led to the spelling valect in transcribing from Latin documents.

to determine the course of battles and to select brave warriors for Valhalla (q.v.). Beings with the same name (waelcyrgean) were known also in England, where we find them associated with witches. The name is used in Anglo-Saxon glossaries to

translate various Latin terms for " War-goddess " or " Fury " (Bellona, Erinys, &c). See Teutonic Peoples, ad fin. (H. M. C.)

VALLA, LORENZO, or Laurentius (c. 1406-1457), Italian humanist, was born at Rome, of parents from the neighbourhood of Piacenza, about 1406, his father, Luca delle Vallea, being an advocate. He was educated at Rome, attending the classes of eminent professors, among them Leonardi Bruni and Giovanni Aurispa (c. 1369-1459), from whom he learned Latin and Greek. In 143 1 he became a priest, and after trying vainly to secure a position as apostolic secretary in Rome he went to Piacenza, whence he proceeded to Pavia, where he obtained a professorship of eloquence. Valla wandered from one university to another, accepting short engagements and lecturing in many cities. During this period he made the acquaintance of Alphonso V. of Aragon, whose service he entered about 1435. Alphonso made Valla his private secretary, defended him against the attacks of his numerous enemies, and at a later date encouraged him to open a school in Naples.

By this time Valla had won a high reputation by his dialogue De Voluptate, and by his treatise De Elegantiis Latinae Linguae. In the former work he contrasted the principles of the Stoics with the tenets of Epicurus, openly proclaiming his sympathy with those who claimed the right of free indulgence for man's natural appetites. It was a remarkable utterance. Here for the first time the paganism of the Renaissance found deliberate expression in a work of scholarly and philosophical value. De Elegantiis was no less original, although in a different sphere of thought. This work subjected the forms of Latin grammar and the rules of Latin style and rhetoric to a critical examina- tion, and placed the practice of composition upon a foundation of analysis and inductive reasoning. The same originality and critical acumen were displayed in his treatise on the Donation of Constantine (Defalso credita et ementita Constantini donatione declamatio) , written in 1439 during the pontificate of Eugenius IV., in which the nature of the forged document known as the Constitutum Constantini was for the first time exposed (see Donation of Constantine). From Naples Valla continued his war against the Church. He showed that the supposed letter of Christ to Abgarus was a forgery, and by throwing doubt upon the authenticity of other spurious docu- ments, and by questioning the utility of monastic life, he aroused the anger of the faithful. He was

compelled to appear before an inquisitory tribunal composed of his enemies, and he only escaped by the special intervention of Alphonso. He was not, however, silenced; he ridiculed the Latin of the Vulgate and accused St Augustine of heresy. In 1444 he visited Rome, but in this city also his enemies were numerous and powerful, and he only saved his life by flying in disguise to Barcelona, whence he returned to Naples. But a better fortune attended him after the death of Eugenius IV. in Feb- ruary 1447. Again he journeyed to Rome, where he was welcomed by the new pope, Nicholas V., who made him an apostolic secretary, and this entrance of Valla into the Roman Curia has been justly called " the triumph of humanism over orthodoxy and tradition." Valla also enjoyed the favour of Pope Calixtus III. He died in Rome on the 1st of August 1457.

All the older biographical notices of Valla are loaded with long accounts of his many literary and theological disputes, the most famous of which was the one with Poggio {q.v.), which took place after his settlement in Rome. It is almost impossible to form a just estimate of Valla's private life and character owing to the clouds of dust which were stirred up by this and other controversies, in which the most virulent and obscene language was employed. He appears, however, as a vain, jealous and quarrelsome man, but he combined the qualities of an elegant humanist, an acute critic and a venomous writer, who bad committed himself to a violent polemic against the temporal power of Rome. In him posterity honours not so

much the scholar and the stylist as the man who initiated a bold method of criticism, which he applied alike to language, to historical documents and to ethical opinions. Luther had a very high opinion of Valla and of his writings, and Cardinal Bellarmine calls him praecursor Lutheri, while Sir Richard Jebb says that his De Elegantiis " marked the highest level that had yet been reached in the critical study of Latin."

Collected, but not quite complete, editions of Valla's works were published at Basel in 1540 and at Venice in 1592 fol., and De Elegantiis was reprinted nearly sixty times between 1471 and 1536. For detailed accounts of Valla's life and work see G. Voigt, Die Wiederbelebung des classischen Alterthums (1880-81); J; A. Symonds, Renaissance in Italy (1897-99); G. Mancini, Vita di Lorenzo Valla (Florence, 1891); M. von Wolff, Lorenzo Valla (Leipzig, 1893); J. Burckhardt, Kultur der Renaissance (i860); J. Vahlen, Laurentius Valla (Berlin,

1870) ; L. Pastor, Geschichte der Papste, Band ii. English trans, by F. I. Antrobus (1892); the article in Herzog-Hauck's Realencyklopddie, Band xx. (Leipzig, 1908) ; and J. E. Sandys, Hist, of Class. Schol. ii. (1908), pp. 66-70.

VALLADOLID, an inland province of Spain, one of the eight into which Old Castile was divided in 1833; bounded on the N. by Leon and Palencia, E. by Burgos, S. by Segovia, Avila and Salamanca, and W. by Zamora. Pop. (1900) 278,561; area, 2922 sq. m. The province belongs entirely to the basin of the Duero (Douro), which traverses it from E. to W., and within its limits receives the Pisuerga (with the Esgueva) on the right, and the Duraton, the Cega, the united Adaja and Eresma, the Zapardiel and the Trabancos on the left. The country watered by these rivers is for the most part flat and exceedingly fertile, the only part that can be called in any sense hilly being in the north-west, where the low Montes de Torozos occur. For the excellence and abundance of its grain crops Valladolid shares with the Tierra de Campos in Palencia the title of granary of the Peninsula.

Besides wheat, maize, barley and oats, the province produces hemp, flax, various fruits, red and white wine, oil and madder. The Montes de Torozos are thinly covered with oaks and other timber, and there are forests in the S.E. The pastures are extensive and large numbers of asses, mules and sheep, as well as some horses and cattle, are reared. Honey, wax and silk are also produced. The woollen fabrics of Valladolid were once highly esteemed, but this industry has now greatly declined, although in the larger towns there are still linen and cloth factories, besides iron foundries, tanneries, saw-mills and flour-mills. But agri- culture is by far the foremost industry of the province. Trade is facilitated by the Canal de Castilla, which connects Valladolid, on the Pisuerga, with Alar del Rey, in Palencia, also on that river. See Palencia (province). Valladolid is traversed by the national highways from Madrid to Santander, Leon and Corunna, and by the Calatayud and Salamanca roads. It is also traversed from N. to S. by the northern railway from Madrid to France via Irun, which has branches from Valladolid to Medina del Rioseco, and from Medina del Campo to Salamanca and Zamora. Apart from the capital Valladolid, Nava del Rey (6148), Medina del Campo (5971) and Medina del Rioseco (5007) are the only towns with more than 5000 inhabitants. For an account of the people and history of the province, see Castile.

VALLADOLID, a town of Mexico, in the state of Yucatan, 90 m. S.E. of Merida, with which it is connected by rail. Pop. about 5000. It is situated in a healthy and fertile part of Yucatan, and is a resort for invalids. It has a number of old churches, a Jesuits' college, town hall, hospital and aqueduct, and the better class of residences are of the usual type, low, large-roomed structures in the midst of gardens. It was founded in 1544, soon after the conquest, and was planned to be a great ecclesiastical centre, but these plans were not realized and its churches and other fine buildings have fallen into decay. Its manufactures include cotton goods and tobacco. The in- habitants, chiefly descendants of the ancient Mayas, have frequently revolted against their rulers. In 1910 they were in a state of insurrection, assisted by the wild tribesmen of the neighbouring territory of Quintana Roo, on which occasion Valladolid was captured by them and many of its officials and prominent white residents were massacred.

VALLADOLID, the capital of the Spanish province of Val- ladolid, situated 2228 ft. above sea-level, at the confluence of the river Pisuerga with the Esgueva. Pop. (1900) 68,789. Valladolid is an archbishopric, and the seat of an army corps,

a court of appeal and a university. It is connected by numerous railways with every province of Spain. Its site is a small valley, enclosed by steep and rugged but not very high hills, which merge into the vast upland plain of Castile. The city was formerly surrounded by walls and entered by four principal gates, but it has been to a great extent modernized, and possesses many fine streets and squares. There are broad avenues and public gardens beside the rivers. Among the chief opfta spaces are the arcaded Plaza Mayor, the Campo Grande, a wooded park and the Paseo de la Avenida, a wide boulevard in which is the statue of the poet Jose Zorilla (181 7-1803). The granite cathedral was begun in 1585 by Juan de Herrera in the Re- naissance style. Herrera's original model is preserved in the muniment-room, but only the nave and one tower (out of four) were completed after his design, and the tower fell in 1841. The building was continued by Churriguera (d. 1725). The interior contains some pictures by Luca Giordana (1623-1705) and the celebrated silver monstrance

wrought by Juan de Arphe (b. 1523), which is 65 ft. high; it is in the form of a temple, decorated with figures of Adam and Eve in the garden of Eden. The tower and nave of the church of Santa Maria la Antigua date from about 1200. The church of San Pablo is later (1286); its chief feature of interest is a beautiful Flam- boyant portal, and formerly it had exquisite cloisters. Adjoin- ing is San Gregorio (15th century) with a fine Plateresque facade. San Benito, dating from the end of the 14th century, is a Gothic building with a lofty roof finely groined. The Plateresque college of Santa Cruz, built by Enrique de Egas in 1479-92, contains an interesting collection of pictures and sculptures, including three pictures by Rubens, which have been somewhat damaged, and some remarkable wooden statues by Alonso Berruguete (d. 1581) and others. The college of San Gregorio, dating from the same period, was wrecked by the French in 1808, but has a magnificent late Gothic facade. This building has been converted into municipal offices. The uni- versity is attended by about 1200 students, and has faculties of law, medicine, natural science, philosophy and literature. Originally founded at Palencia early in the 13th century, it was transferred to Valladolid before 1250 and attained its greatest prosperity from the 16th century to the 18th. The library contains many rare MSS. The university buildings date from the 17th century and are extravagantly ornate. Among other public buildings of Valladolid may be mentioned the royal palace, built in the beginning of the 17th century, the court-house, the town hall, several convents used as barracks, the provincial institute, training schools for teachers and primary schools, royal academy for cavalry cadets, provincial lunatic asylum, hospitals, seminary (raised in 1897 by Pope Leo XIII. to the rank of a pontifical university), archaeological museum, picture gallery and public library. The house in which Cervantes lived (1 603-1 606) is owned by the state. The principal industries are the manufacture of linen, silk and woollen fabrics, pottery, gold and silver work, flour, wine, beer, chocolate, leather, iron- ware and paper. There is also a large agricultural trade.

Valladolid is sometimes identified with the ancient Pintia of Ptolemy, described as a town of the Vaccaei on the road from Asturica to Caesaraugusta. Its Roman origin is uncertain. The present name is undoubtedly Moorish, but its meaning is obscure. Valladolid was recovered from the Moors in the 10th century, but is first named in a public document by Sancho II.

of Leon in 1072. The cortes of Castile frequently met here in the following centuries, and in the beginning of the 15th century John II. made it his principal residence. After the removal of the capital to Madrid by Philip II. in 1560 it began rapidly to decay. In December 1808 it was taken and sacked by the French, who destroyed many fine buildings and works of art. Columbus died (1506) and Philip II. was born (1527) at Valladolid.

VALLANDIGHAM, CLEMENT LAIRD (1820-71), American politician, was born in New Lisbon, Ohio, on the 29th of July 1820. He was educated in the common schools and afterwards studied law and was admitted to the bar in 1842. Elected to

the Ohio House of Representatives in 1845, he became one of the extremest of the state rights Democrats of his section, emphasiz- ing his principles in the legislature in the local and national party conventions, and in the columns of a newspaper, the Western Empire, which he edited at Dayton, Ohio, in 1847-49. From 1858 to 1863 he was in the lower house of Congress, where he was noted for his strong opposition to the principles and policies of the growing Republican party, his belief that the South had been grievously wronged by the North, his leader- ship of the Peace Democrats or Copperheads, who were opposed to the prosecution of the war, and his bitter attacks upon the Lincoln administration, which, he said, was destroying the Constitution and would end by destroying civil liberty in the North. Attempts were made to expel him, but without success. In 1863 he made violent speeches in Ohio against the administration, and for these he was arrested by the military authorities, tried by military commission, and sentenced to imprisonment. President Lincoln commuted this sentence to banishment, and Vallandigham was sent into the Confederate lines, whence he made his way to Canada. While in exile he was elected supreme commander of the Knights of the Golden Circle in Ohio and received the Democratic nomination for governor of Ohio, but was defeated. In 1864 he returned to Ohio, took active part in the campaign of that year, wrote part of the National Democratic platform at Chicago, and assisted to nominate McClellan for the presidency. After the war he denounced the Reconstruction policy of the Republicans as unconstitutional and tyrannical, but in 1870, seeing the use- lessness of further opposition, he advised his party to accept the situation and adopt new issues. He thus initiated what was known as the " New Departure "

Democratic movement. Vallandigham was a good lawyer and a popular politician. He was fanatically devoted to the Constitution as he understood that document, and in his course during the war he was not, as his enemies asserted, trying to aid the Confederates, but merely desirous of restoring " the Union as it was." He died in Lebanon, Ohio, on the 17th of June 1871.

See J. L. Vallandigham, Life of Clement L. Vallandigham (Balti- more, 1872); and J. F. Rhodes, History of the United States from the Compromise of 1850 (New York, 1893-1906).

VALLE, PIETRO DELLA (1586-1652), Italian traveller in the East, came of a noble Roman family, and was born on the nth of April 1586, in the family palace built by Cardinal Andrea. His early life was divided between the pursuits of literature and arms. He saw active service against the Moors of Barbary, but also became a member of the Roman academy of the Umoristi, and acquired some reputation as a versifier and rhetorician. The idea of travelling in the East was sug- gested by a disappointment in love, as an alternative to suicide, and was ripened to a fixed purpose by a visit to the learned Mario Schipano, professor of medicine in Naples, to whom the record of Pietro's travels was addressed in the form of very elaborate letters, based on a full diary. Before leaving Naples he took a vow of pilgrimage to the Holy Land, and, sailing from Venice on the 8th of June 1614, reached Constantinople, where he re- mained for more than a year, and acquired a good knowledge of Turkish and a little Arabic. On the 25th of September i6i5he sailed for Alexandria with a suite of nine persons, for he travelled always as a nobleman of distinction, and with every advantage due to his rank. From Alexandria he went on to Cairo, and, after an excursion to Mount Sinai, left Cairo for the Holy Land on the 8th of March 1616, in time to assist at the Easter cele- brations at Jerusalem. Having visited the holy sites, he journeyed by Damascus to Aleppo, and thence to Bagdad, where he married a Syrian Christian named Maani, a native of Mardin, who died in 1.621. He now desired to visit Persia; but, as that country was then at war with Turkey, he had to leave Bagdad by stealth on the 4th of January 1617. Accom- panied by his wife he proceeded by Hamadan to Isfahan, and joined Shah Abbas in a campaign in northern Persia, in the summer of 1618. Here he was well received at court and treated as the shah's guest. On his return to Isfahan he began

to think of returning by India rather than adventure himself again in Turkey; but the state of his health, and the war between Persia and the Portuguese at Ormuz, created difficulties. In October 1621 he started from Isfahan, and, visiting Persepolis and Shiraz, made his way to the coast; but it was not till January 1623 that he found passage for Surat on the English ship " Whale." In India he remained till November 1624, his headquarters being Surat and Goa. He was at Muscat in January 1625, and at Basra in March. In May he started by the desert route for Aleppo, and took ship at Alexandretta on a French vessel. Touching at Cyprus he reached Rome on the 28th of March 1626, and was received with much honour, not only by literary circles, but by Pope Urban VIII., who appointed him a gentleman of his bedchamber. The rest of his life was uneventful; he married as second wife a Georgian orphan of noble family, Mariuccia (Tinatin de Ziba), whom his first wife had adopted as a child, and who had accompanied him in all his journeys. By her he had fourteen sons. He died at Rome on the 21st of April 1652.

In Pietro della Valle's lifetime there were printed — (1) a Funeral Oration on his Wife Maani, whose remains he brought with him to Rome and buried there (1627); (2) an Account of Shah Abbas, printed at Venice in 1628, but not published; (3) the first part of the letter describing his Travels (Turkey, 1650). The Travels in Persia (2 parts) were published by his sons in 1658, and the third part (India) in 1663. An English translation appeared in 1665 (fol.). Of the Italian text the editon of Brighton, 1843 (2 vols. 8vo), is more esteemed than the other reprints. It contains a sketch of the author's life by Gio. P. Bellori (1622). Della Valle's story is often prolix, with a tendency to the rhetorical; but he is clear and exact, well informed and very instructive, so that his work still possesses high value.

VALLEJO, a city of Solano county, California, U.S.A., on the San Pablo Bay, at the mouth of the Napa river, about 24 m. N.E. of San Francisco. Pop. (1890) 6343; (1900) 7965 (2033 foreign-born); (1910) 11,340. It is served by a branch of the Southern Pacific railway, by steamboats to San Francisco, and by an interurban electric line. The city is situated at the mouth

of the great interior valley of the state, and has a good harbour, the channel of which, since the removal of a shoal by the Federal government in 1902-1906, has a maximum depth at low tide of 24 ft. Directly opposite the city, half a mile distant and connected by ferry, is Mare Island, the headquarters of the Pacific Naval Squadron of the United States, with a large United States Navy Yard, a naval arsenal, two stone dry docks (one 750 ft. long) and a lighthouse. The Navy Yard was established in 1854, and its first commandant was D. G. Farra- gut. In the city are a Carnegie library, St Vincent's Academy and a Good Templars' Home (1869) for orphans. Vallejo is the outlet of the beautiful Napa Valley, one of the finest fruit-grow- ing regions of the state, and, besides fruit, ships large quantities of wheat. Among its manufactures are flour, leather, dairy products and lumber. The municipality owns and operates its waterworks, the water-supply being obtained from the mountains 25 m. distant. The city takes its name from General Mariano Guadalupe Vallejo, a prominent Mexican leader in the years immediately preceding the annexation of California to the United States. It was a dull and out-of-the-way settle- ment in 1851, when, through General Vallejo's efforts, it became the state capital. The state legislature met here in 1851, 1852 and 1853. In 1871 Vallejo ranked third in population among the cities of the state, and its position and the excellence of its harbour made it a rival of Oakland in the struggle (1869-72) for the terminus of the Central Pacific railway; but Vallejo was unsuccessful, and after 1872 began to decline in relative importance.

VALLES, JULES (1832-1883), French journalist and author, was born at Puys, France, on the 10th of June 1832. Coming to Paris, he joined the staff of the Figaro, and became a constant contributor to the other leading journals. In 1866 he repub- lished much of his newspaper work in Refractaires, the volume forming a romance of the seamy side of Paris life. He was in Paris during the siege of 1870, and after the capitulation was a member of the Commune and founded Le Cri du Peuple. He

took a conspicuous part in the fighting in the Paris streets, but finally made his escape to London, whence he contributed anony- mously to the French press. In 1878 he began in the Steele the serial publication of his principal work, Jacques Vingtras, a long autobiographical romance. He died in Paris on the 14th of February 1885.

VALLETTA, or Valetta, the capital of Malta (since 1570). Pop. (1901) 24,685; or 40,406, including suburbs. The nucleus of the city is built on a ridge of rock (Mount Sceberras) which runs like a tongue into the middle of a bay, which it thus divides into two harbours, the Grand Harbour to the east and the Marsa- muschetto to the west, which are subdivided again by three other peninsulas into creeks. On two of these peninsulas on the east side of the Grand Harbour, and at their base, are built the aggre- gate of towns called the Three Cities — Vittoriosa, Conspicua and Senglea (see Malta). On the main promontory, with Valletta, stands the suburb Floriana; Fort St Elmo, with a lighthouse, stands on the extremity of the promontory; the suburb Sliema lies on the point which encloses the Marsamuschetto harbour; Fort Ricasoli on the opposite point enclosing the east, Grand, or Great Harbour. The streets of Valletta, paved with stone, run along and across the ridge, and end on each side towards the water in steep flights of steps. Many of the houses, which are of stone throughout, with flat roofs, are large and luxuriously built; wooden-covered balconies project from the windows and give a peculiar aspect to the streets. There are several fine public buildings, as the governor's palace, the new opera-house, the public library and museum of Maltese antiquities, and the auberges or lodges of the Knights of Malta (especially the Auberge de Castile) which are now used for military offices, club-rooms, and other purposes. Roman Catholic churches in Valletta are very numerous; the cathedral of S. Giovanni, dating from 1576, is famous for its rich inlaid marbles, its Brussels tapestries, its roof painted by Matteo Preti (1661-1699), the picture by Michael Angelo da Caravaggio of the beheading of John the Baptist, numerous memorials of the knights and other relics.

The governor's palace was formerly that of the grand master of the Maltese Order, and it also contains relics of the knights, tapestries, armour, &c. Extensive bagnios under the rock, formerly occupied by the slaves of the knights, are now used for stores. The knights strengthened Valletta and its harbour by bastions, curtain-walls, lines and forts, towards the sea, towards the land and on every available point, taking advantage in every particular of the natural rock and of the marvellous advantages of situation, rendering it then almost impregnable. The work of fortifying the place has been carried on by the British government, which possesses here a naval hospital, military prison and other necessary institutions. Since

the British occupation Valletta has been a naval and military station of the first importance. The dock and victualling yards occupy together an area of some 100 acres spread over the shores on both sides of those arms of the great harbour known as " Dock- yard " and " French " creeks, the dockyard being partly on the former, but principally on the latter creek. In 1880 the graving dock accommodation consisted of one double dock at the extremity of Dockyard creek, known as Nos. 1 and 2 Docks, with a total length of about 525 ft. and with 25 ft. over the sill at average water-level, the tidal range at Malta being but slight; and opening into French creek a dry dock of more modern construction, known as No. 3, or the Somerset Dock, 427 ft. long on floor, and with 34 ft. over the sill.. Subsequently to this period the fine range of buildings known as the iron ship repairing shop was erected close to the Somerset Dock, and added greatly to the repairing resources of the yard. Dock No. 4, or the Hamilton Dock, was completed in 1891, having a length on floor of 520 ft., a width of entrance of 94 ft. and with 35 ft. 5 in. depth over the sill at average water-level. Associated with this dock was the construction of adjacent deep-water wharf walls, together with the great 160-ton crane. Among later additions were gun- mounting stores, boiler shop, boat sheds, canteen, coal stores. &c, together with a double dock 750 ft. long over all, and a single dock 550 ft. long. The large transit trade and the local

trade of the island centre upon Valletta. The influx of winter visitors adds to the wealth of the city.

VALLEYFIELD, town and port of entry, Beauharnois county, Quebec, Canada, 25 m. S.W. of Montreal, at the foot of Lake St Francis — an expansion of the river St Lawrence — and at the head of the Beauharnois canal. Pop. (1891) 5515; (1901) 11,055. It is a station on the Canada Atlantic and New York Central railways, and a port of call for all steamers plying between Montreal and Lake Ontario ports. It is the see of a Roman Catholic bishop, and contains a college and a convent. It has extensive cotton, flour, canning and paper mills.

VALLEY FORGE, a small village in Chester county, Penn-sylvania, U.S.A., on the S. bank of the Schuylkill river, about 20 m. N.W. of Philadelphia. It is served by the Philadelphia & Reading railway. The village lies in part of the tract occu- pied

in the winter of 1777-1778 by the American army (under General Washington), whose sufferings from cold, starvation and sickness made the place historic. On the 19th of December (after the battles of Brandywine and Germantown and the occupation of Philadelphia by the British) the army, numbering about 10,000, went into camp here, the site having been selected by Washington partly because the hilly ground was favourable for defence, and partly because the army was thus placed between the British forces and York, Pennsylvania (about 65 m. W. of Valley Forge), where Congress was in session. The camp was almost unapproachable from the west by reason of the pre- cipitous hillsides and Valley Creek, a small stream flowing northward at their base into the Schuylkill river which afforded a barrier on the north ; on the east a series of intrench- ments and rifle-pits were built. In this vicinity the army remained encamped until the middle of June. As a result of the mismanagement and general incapacity of the Commissary Department, the army received little food or clothing during the winter months; in the latter part of December nearly 2900 men were unfit for duty on account of sickness or the lack of clothing, and by the istof February this number had increased by nearly 1000, a state of affairs which Washington said was due to " an eternal round of the most stupid mismanagement [by which] the public treasure is expended to no kind of purpose, while the men have been left to perish by inches with cold and nakedness." There were many desertions and occasional symptoms of mutiny, but for the most part the soldiers bore their suffering with heroic fortitude. On the 27 th of February Baron Steuben (q.v.) reached the camp, where he drilled and reorganized the army. In 1893 the state of Pennsylvania created a commission of ten members, which (with $365,000 appropriated up to 1911) bought about 475 acres (in Chester and Montgomery counties) of the original camp ground, now known as the Valley Forge Park, preserved Washington's headquarters (built in about the year 1758) and other historic buildings, and reproduced several bake-ovens and huts of the kind used by the army. The state has also erected (1908) a fine equestrian statue by Henry K. Bush-Brown to General Anthony Wayne, and a number of granite markers which indicate the situation of the camps of the different brigades. The state of Maine erected in 1907 a granite memorial to the soldiers from Maine who camped here, and in 1910 Massa- chusetts appropriated $5000 for a memorial to her troops. Valley Forge took its name from an

iron forge (also called " Mountjoy forge ") built on the east side of Valley Creek, near its mouth, in about 1750, and destroyed by the British in 1777.

VALLOMBROSA, a summer resort of Tuscany, Italy, in the province of Florence, reached by a cable railway 5 m. long from the station of S. Ellero (which is 16 m. S.E. of Florence) and 328 ft. above sea-level, on the N.W. slope of the Prato Magno chain. The former monastery, suppressed in 1816, is occupied by the Royal School of Forestry. A number of hotels have been built. Similar summer resorts are situated among the woods above the Casentino or upper valley of the Arno to the east, such as Camaldoli, Badia di Prataglia, &c. Camaldoli was the original headquarters of the Camaldulensian order, now partly occupied by an hotel. Five hours' journey to the

S. of the last on foot and i\ m. to the E. of Bibbiena by road is the monastery of La Verna, 3660 ft. above sea-level, founded by St Francis in 1215.

VALLOMBROSIANS, an order of monks under the Benedictine rule, founded by St John Gualbert in 1038. He was son of a Florentine nobleman, and became first a Benedictine and then a Camaldulian. Finally, about 1030, he withdrew to Vallombrosa, a shady dale on the side of a mountain in the Apennines, 10 m. from Florence, and for some years led a completely solitary ; life. Disciples, however, gathered around him, and he formed them into an order in which the cenobitical and the eremitical lives should be combined. The monks lived in a monastery, not in separate huts like the Camaldulians, and the Benedictine rule was the basis of the life; but the contem- plative side was strongly emphasized, and every element of Benedictine life was eliminated that could be supposed to in- terrupt the attention of the mind to God — even manual labour. The Vallombrosians spread in Italy and France, but they never had more than sixty houses. They now have three, with some sixty monks in all. The habit was originally grey, but it became black; and the life also has been assimilated to that of the Benedictines. There were some convents of Vallombrosian nuns.

See Helyot, Histoire des Ordres religieux (17 1 8), v. cc. 28, 29; Max Heimbucher, Orden u. Kongregationen (1907), I. § 44.

(E.C.B.)

VALLS, a town of north-eastern Spain, in the province of Tarragona; n m. N. of Tarragona, on the Picamoixons-Roda railway. Pop. (1900) 12,625. Vails is an old town, and its walls and towers still remain. Wool and cotton spinning and weaving, dyeing, distilling, paper-making and tanning are carried on here with considerable activity.

VALOIS, COUNTS AND DUKES OF. The French countship of Valois (pagus Vadensis) takes its name from Vez (Latin Vadum), its early capital, a town in the department of the Oise. From the 10th to the 12th century it was owned by the counts of Vermandois and of Vexin; but on the death of Eleanor, sister and heiress of Count Raoul V. (d. 1167), it was united to the crown by King Philip Augustus. Soon detached from the royal domain, Valois was the property of Blanche of Castile, widow of Louis VIII., from 1240 to 1252, and of Jean Tristan, a younger son of Louis IX., from 1268 to 1270. In 1285 Philip III. gave the county to his son Charles (d. 1325), whose son and successor, Philip, count of Valois, became king of France as Philip VI. in 1328. Sixteen years later Valois was granted to Philip's son, Philip, duke of Orleans; then passing with the duchy of Orleans in 1392 to Louis (d. 1407), a son of Charles V., it was erected into a duchy in 1406, and remained the property of the dukes of Orleans until Duke Louis became king of France as Louis XII. in 1498, when it was again united with the royal domain.

After this event the duchy of Valois was granted to several ladies of the royal house. Held by Jeanne, countess of Taillebourg (d. 1520), from 1516 to 1517, and by Marie, countess of Vendome, from 1530 until her death in 1546, it was given to Catherine de Medici, the widow of Henry II., in 1562, and in 1582 to her daughter, Margaret of Valois, the wife of Henry of Navarre. In 1630 Louis XIII. granted Valois to his brother Gaston, duke of Orleans, and the duchy formed part of the lands and titles of the dukes of Orleans from this time until the Revolution.

The house of Valois, a branch of the great Capetian family, is thus descended from Charles, a son of Philip III., and has been divided into several lines, three of which have reigned in France. These are: (1) the direct line, beginning with Philip VI., which reigned from 1328 to 1498; (2) the Orleans branch,

descended from Louis, duke of Orleans, a son of Charles V., from 1498 to 1515; (3) the Angouleme branch, descendants of John, another son of the same duke, from 151 5 to 1589. Excluding the royal house, the most illustrious of the Valois branches are: the dukes of Alencon, descendants of Charles, a younger son of Charles I., count of Valois; the dukes of AnjoUj

descendants of Louis, the second son of King John II.; and the dukes of Burgundy, descendants of Philip, the fourth son of the same king.

VALOIS, HENRI DE [Valesius] (1603-1676), French scholar, was born at Paris on the 10th of September 1603. He was a pupil of the Jesuits at the college of Clermont, then studied law at Bourges. He was called to the bar in 1623, but before long devoted himself entirely to literature. He had an extra-ordinary memory and a thorough knowledge of the classics, and to him we owe editions of several of the Greek historians, with excellent Latin translations, the only fault found with which is that they are too elegant: Polybii, Diodori Siculi, Nicolai Damasceni, Dionysii Halicarnassii, Appiani et Joannis Antiocheni excerpla (1634; Henri de Valois used for this edition a manuscript coming from Cyprus, which had been acquired by Peiresc); Ammiani Marcellini rerum gestarum libri 18 (1636); Euscbii ecclesiastica historia, et vita imperatoris Constantini, graccc et latine (1659); Socratis, Sozomeni, Theodoreti et Evagrii Historia ecclesiastica (1668-1673). When almost sixty years of age, and nearly blind, he married Marguerite Chesneau (1664), and had by her four sons and three daughters He died in Paris on the 7th of May 1676.

His brothei, Admen de VALOIS (1607-1692), was also a well-known scholar. He made the acquaintance of Father Petau, Father Sirmond and the brothers Dupuy, who turned his attention towards medieval studies. He was appointed historiographer in 1660. He undertook the task of writing a critical history of France, but did not get further than the deposition of Childeric III. (752). He devoted, however, to this period three folio volumes (Gesta Francorum sen rerum francicarum tomi tres, 1646-1658), which form a critical commentary of much value, and in many points new, on the

chroniclers of the Merovingian age. His study on the palaces constructed by the Merovingian kings (De basilicis quas primi Francorum reges condiderunt, 1658-1660) is noteworthy in this connexion. In 1675 appeared his Notitia Galliarum ordine hlterarum digesta, a work of the highest merit, which laid the foundations of the scientific study of historical geography in France; but, like all the scholars of his age, he had no solid knowledge of philology. His last work was a life of his elder brother {De Vita Henrici Valesii, 1677).

Adrien's son, Charles de Valois (1671-1747), was a distinguished numismatist, and formed a fine collection of medals, chiefly Roman. He entered at an early age the Academie des Inscrip- tions et Belles Lettres, where he became first a pupil (1705), then an associate (1714) and finally a pensionnaire (1722). He published little; we know, however, an Histoire des Amphictyons by him. His best work, the Valesiana (1694), was inspired by filial affection; in it he collected a number of historical and critical observations, anecdotes and Latin poems of his father. His Eloge, by Freret, is iii the Memoires de V Academie des Inscriptions, vol. xxi. p. 234

(1/47)-

VALPARAISO, a province of Chile on the Pacific coast, bounded N. by Aconcagua, E. and S. by Santiago and W. by the ocean. Area, 1953 sq. m. Pop. (1895) 220,756; (1902, estimated) 249,885. Its surface is chiefly mountainous, and in great part barren. The river and mountain valleys, however, are fertile, and where irrigation is possible yield large crops, especially cereals. The valley of the Aconcagua, which flows across the N. end of the province, is celebrated for its fertility, especially in the vicinity of Quillota, sometimes called the " garden of Chile." The capital is Valparaiso, and the principal town outside the capital is Quillota.

VALPARAISO, a city and seaport of Chile, capital of the province of Valparaiso, on a broad open bay of the Pacific in lat. 33 o' 2" S., long. 71 41′ 15″ W., about 70 m. N.W. of Santiago. Pop. (1902) 142,282; (1907, estimated) 180,600. The almost semicircular Bay of Valparaiso is slightly over 3 m. across from Punta Angeles to Punta Gruesa, and the city stands on the south side, on the slopes of a spur of barren hills projecting into the Pacific and forming a rocky peninsula terminating in Punta Angeles. This point affords good shelter

from southerly and westerly storms, but the bay is open to those from the north. The city occupies a narrow strip of beach extending around the head of the bay, and extends up the steep slopes and valleys of the enclosing hills, which have an altitude of 1000 to 1400 ft. The extreme outer points of the bay are strongly fortified. Valparaiso is pre-eminently a com-

mercial city. The foreign trade is largely in the hands of foreign merchants. Among industrial establishments are the govern- ment railway shops, large foundry and machine shops, coach- building works, a large sugar refinery, breweries, distilleries, bottling works and numerous small factories. The trade of the port, which is the largest and most important on the Pacific coast of South America, makes it a terminal and port of call for several regular lines of steamers, which afford frequent com- munication with Europe and the United States. The trans- continental railway line between Valparaiso and Buenos Aires (the Andean tunnel was opened in April 19 10) adds to the traffic of the port, through the transhipment of passengers and freight to escape the long and dangerous voyage by way of the Straits of Magellan. Two cable lines give telegraphic communication with Europe and the United States — a West Coast line running N. to Panamaˆ and a land line across the Andes to -Buenos Aires in connexion with the cable to Europe from that port. There is but one railway out of Valparaiso — the government line to Santiago, with a branch running to Los Andes and the international tunnel through the Andes. There are a wireless telegraph station in regular communication with the islands of Juan Fernandez, state telegraph lines communicating with all parts of the republic, and an efficient telephone service. Valparaiso has an attractive suburb, Vifia-del-Mar, immedi- ately E. of Punta Gruesa, only 15 minutes by rail from the city.

Valparaiso was founded in 1536 by Juan de Saavedra, who named it after his birthplace near Cuenca, Spain. It was an ill-chosen name, however, for there is nothing in it descriptive of the barren hills, dirty streets and foul-smelling shores of Valparaiso (Paradise Valley). The port and town were of but little note during the colonial period, for free commercial inter-course with the colony was forbidden. In 1819, near the end of the war with Spain, its population barely reached 5000. In 1578 it was captured by Sir Francis Drake, and in 1596 by Sir

John Hawkins. In 1600 it was sacked by the Dutch under Van Noort. On the 31st of March 1866, it was bombarded by a Spanish fleet under the command of Admiral Nunez, when a large part of the town was laid in ruins, and on the 28th of August 1891, after the victory of the congressional troops over Balmaceda's forces in the vicinity, it was partially sacked by the Chileans themselves. Valparaiso has suffered much from earthquakes — in 1730, 1822, 1839, 1873 and 1908. The last- mentioned caused the destruction of a large part of the city, including public edifices, private residences, the water mains, public lighting service and transportation facilities. A large part of the population was deprived of shelter and had to take refuge on the plateau above. Aid was promptly given by the national government, and assistance was sent from foreign countries; and the national government made a grant for the rebuilding of the city.

VALPARAISO, a city and the county-seat of Porter county, Indiana, U.S.A., about 40 m. S.E. of Chicago. Pop. (1890) 5090; (1900) 6280, including 660 foreign-born; (1910) 6987. It is served by the Grand Trunk, the New York, Chicago & St Louis, and the Pennsylvania railways. The city has a public library (1905), and is the seat of an Institute of Telegraphy (founded in 1874; chartered in 1900) and of Valparaiso University (1873; formerly known as the Valparaiso Normal Training School). This university was founded to furnish a practical education at a low cost, and in 1910 had 187 instructors and a total enrolment of 5367 students. Valparaiso was settled about 1835, incorporated in 1856 as a village and chartered as a city in 1865.

VALPY, RICHARD (1754-1836), English schoolmaster, was born in Jersey on the 7th of December 1754. He was sent to schools in Normady and Southampton, and completed his education at Pembroke College, Oxford. In 1777 he took orders, and in 1781 became head master of Reading grammar school, a post which he held for fifty years. He was the author of Greek and Latin grammars which enjoyed a large circulation. He died in London on the 28th of March 1836.

His second son, Abraham John Valpy (1787-1854),

printer and publisher, is remembered in connexion with two great undertakings in the department of classical literature. These were reissues of (i) Stephanus's Greek Thesaurus, for which E. H. Barker was chiefly responsible; (2) the Delphin Classics in 143 volumes with variorum notes, under the editorial superintendence of George Dyer. He also founded the Classical Journal in 18 10.

VALS (Vals-les-Bains), a village of south-western France, in the department of Ardeche, 3 m. N.N.W. of Aubenas, with which it communicates by tramway. Pop. (1906) town, 2694; com- mune, 4352. Vals is situated on the Volane amongst volcanic mountains. It is celebrated for its numerous cold mineral springs impregnated in most cases with bicarbonate of soda. They are used chiefly for drinking but also as baths, and are efficacious in maladies of the digestion, liver and kidneys, and for gravel and gout. Seven or eight million bottles annually are exported. Wood-turning and silk-milling are carried on.

VALTELLINA (Ger. Veltlin; the name comes from the former capital, Teglio, near Tresenda), properly the name of the upper valley of Adda, in north Italy. Historically and officially, it also comprises the Italian Liro or San Giacomo valley, which extends from the Spliigen Pass past Chiavenna (where the Liro is absorbed by the Mera, flowing from the Swiss Val Bregaglia) to the Lake of Como, the Mera entering this lake slightly to the north of the Adda. These two valleys (but not Colico, which is in the province of Como) form together the province of Sondrio. Pop. 145,265 (exclusive of Colico) or 122,466 (omitting Chiavenna). Politically the whole- valley belongs to the kingdom of Italy, except the side valley of Poschiavo (Puschlav), which belongs to the Swiss canton of the Grisons (Graubiinden). The chief town is Sondrio (7172), other important places being Tirano (5870), Chiavenna (4592) and Morbegno (3603). Near Bormio (Ger. Worms) there are some frequented mineral springs (sulphur and lime), known in Pliny's time, and efficacious in diseases of the skin. There are several other baths in the side valleys, such as Santa Caterina (chalybeate), Masino and Le Prese (sulphur).

The highest points in the ranges enclosing the valley are the Piz Zupo (13,131 ft.) in the Bernina group and the Konigsspitze (12,655 ft.) in the Ortler district; the Monte della Disgrazia

(12,067 ft.) is the highest peak comprised entirely within the water-basin of the valley. Four well-marked Alpine passes are traversed by good carriage-roads — the Stelvio Pass or Stilfserjoch (9055 ft., the highest carriage-road in Europe) from Bormio to Meran in the Adige valley, the Bernina Pass (7645 ft.) from Tirano to Samadcn in the Upper Engadine, and the Aprica Pass(3875 ft.) from Tirano to the Val Camonica and the Lake of Iseo, while from near the top of the Stelvio a fourth road leads over the Umbrail Pass (8242 ft., the highest in Switzerland) to the Swiss valley of Miinster, which is reached at the village of Santa Maria. The main valley is traversed from end to end by a magnificent carriage-road constructed by the Austrian Government in 1 820-1 825. A railway runs from Colico, on the Lake of Como, past Sondrio to Tirano, a distance of 42 m., while there is another from Colico to Chiavenna (16J m.).

The population is wholly Italian-speaking and Roman Catholic, the valley being in the diocese of Como. The shrine of the Madonna of Tirano (founded i52o)annually attracts a large numbcrof pilgrims. The valley, particularly in its lower portion, is extremely fertile; and of late years vigorous measures have been taken to prevent the damage caused by the frequent inundations of the Adda. Chestnuts, vines, mulberry trees and fig trees abound; and there are many picturesquely situated churches, castles and villages. The chief articles exported are wine and honey. The wine is largely consumed in north Italy and Switzerland, the best varieties being Grumello, Sassella and Montagna. Large quantities of honey are annually sent abroad.

History. — The political history of Valtellina is made up of the histories of three districts — (1) the " free community " of Poschiavo (first mentioned as such in 1 200-1 201); (2) the county of Bormio (first mentioned as a county in 1347); and (3) Valtel- lina proper, extending from the defile of the Serra di Morignone on the east to the Lake of Como on the west. After the defeat of the Lombards (774) these three districts were given (775) by Charlemagne to the abbey of St Denis near Paris, which never seems to have exercised its rights. In 824 Lothair I., confirming an earlier donation (803) made by Charlemagne, gave the churches of Poschiavo and Bormio to the bishop of Como.

Bormio was in 1205 won by the men of Como, who in 1006

had received one-half of Valtellina from the emperor, and by 1 1 14 they were masters of the entire valley. They retained Bormio till 1300, when it freed itself; but in 1336 it belonged to the bishop of Chur. In 1335 the Visconti, lords (later dukes) of Milan, became lords of Como, and therefore of Valtellina. In 1350 they seized on Bormio and Poschiavo, the latter being won back by the bishop of Chur in 1394, and again lost to the Visconti in 1470. As early as 1360 the men of Rhaetia made incursions into Valtellina under the pretext that it had formed part of ancient Rhaetia. This idea was confirmed in 1404, when, in return for kind treatment received during his exile, Mastino Visconti (son of Barnabo) gave to the bishop of Chur his share of the Milanese, including Poschiavo, Bormio and Valtellina. Relying on this donation, the men of the Three Leagues of Rhaetia (best known by the name of one, Graubiinden) invaded the valley in 1486-1487, Poschiavo becoming in i486 per- manently a member (not a subject land) of the Gotteshausbund. This donation served too as the excuse for seizing, in 1512, on Chiavenna, Bormio and Valtellina, which were harshly ruled as " subject bailiwicks." Under the governor at Sondrio there were four " podestas " for the three divisions of Valtellina (Morbegno and Traona, Sondrio and Tirano), besides one at Teglio and one at Bormio. Mastino Visconti's donation was solemnly confirmed in 1516 by the emperor Maximilian I. In 1530 the bishop of Chur was forced to sell to the Three Leagues for a small sum his title to these two districts. At the time of the Reformation Poschiavo became Protestant. The other two districts clung to the old faith and came under the influence of Carlo Borromeo, who, when founding in 1579 his " Collegium Helveticum " at Milan for Swiss students for the priesthood, reserved for Valtellina six out of the forty-two places. Val- tellina was extremely important to the Habsburgs as affording the direct, route between their possessions of the Milanese and Tirol. Hence a great struggle, into which religious questions and bribery largely entered, took place between Austria and Spain on one side and France and Venice on the other. In 1603 Fuentes, the Spanish governor of the Milanese, built a fortress (of which traces still remain) close to the Lake of Como, and at the entrance to the valley, in order to overawe it. The religious conflicts in Graubiinden led to reprisals in the " sub- ject land" of Valtellina. In 1620 (19th July-4th August) the Spanish and Romanist faction (headed by the Planta family) massacred a great number of Protestants in the valley, 350 to 600

according to different accounts (Veltliner Mord). For the next twenty years the valley was the scene of great strife, being held by the Spaniards (1621-23, 1629-31, 1637-39), by the French (1624-27, 1635-37), and by the pope (1623, 1627). At length George Jenatsch, a former pastor, who had been the active and unscrupulous leader of the Protestant party, became a Romanist (1635) in order to free the land from the French by aid of fce Spaniards (1637), who finally (1639) gave it back to its old masters on condition that the Protestants were excluded from the valley. In this way the local struggles of Valtellina came to be mixed up with the Thirty Years' War. In 1797 Bormio and Valtellina were annexed to the Cisalpine republic, in 1805 to the kingdom of Italy (of which Napoleon was king), and in 18 15 (despite the remonstrances of the Raetian leagues) to the kingdom of Lombardo-Venetia, held by the emperor of Austria. In 1859 they became, like the rest of Lombardy, part of the kingdom of united Italy. Poschiavo followed the fortunes of the " Gotteshausbund." It became (after 1798) part of the canton Raetia of the Helvetic republic, and in 1803 of the canton of the Graubiinden or Grisons, which was then first received a full member of the Swiss Confederation.

See G. Leonhardi, Das Veltlin (1859) and Das Poschiavinothal (i860); Romegialli, Storia della Valtellina (1834-39, 5 vols.); C. von Moor, Geschichte von Curratien (1870-74) ; P. C. von Planta, Die curratischen Herrschaften in der Feudalzeit (1881); W. Coxe, Travels in Switzerland, &c. (4th ed., 1801; Letters 74-78); G. B. Crollalanza, Storia del Contado di Chiavenna (Milan, 1870); D..W. Freshfield, Italian Alps (London, 1875); Edmondo Brusoni, Guida della Valtellina (Sondrio, 1906) ; A. Giussani, II Forte di Fuentes

(Como, 1905) ; P. A. Lavizari, Storia delta Valtellina (2 vols., Capolago (Tessin), 1838) : A. Lorria and E. A. Martel.Le Massif de la Bernind (Zurich, 1894); E. Rott, Henri IV., les Suisses, et la Haute Italie— la Lutte pour les Alpes, 1508-1610 (Paris, 1882); E. Rott, Histoire de la representation diplomatique de la France aupres des cantons Suisses (Bern; vols. iii. (1906) and iv. relate to the French in the Valtellina from 1620 sqq.) ; E. Haffter, Georg Jenatsch (Davos, 1894) ;

F. Pieth, Die Feldzilge des Herzogs Rohan im Veltlin und in Grau- biinden (Bern, 1905) ; F. Fossati, Codice Diplomatico delta Rezia (originally published in the Periodico of the Societd Storica a Comense at Como; separate reprint, Como, 1901); L. von Ranke, History of the Popes, bk. vii.; and H. Reinhardt, " Das Veltliner Mord," in Gescliichtsfreund (vol. xl., 1885).

VALUATION AND VALUERS. A valuation of property may be required in view of a proposed sale or purchase, or in order to ascertain the amount for which it will constitute a sufficient security if mortgaged, or which should be paid by way of compensation where it is compulsorily taken or wrongfully damaged. It may also be necessary with a view to the assessment of property for rating, or for fiscal or other purposes. Where it is desired to ascertain the amount which may properly be invested in the purchase of land or buildings, the valuer will consider their character and situation, and the greater or less degree of risk incidental to their nature, in order to determine the rate of interest which they ought to yield. The valuation will proceed upon the basis that the property should return to the purchaser the capital which he invests together with interest at the rate so settled, or afford him security for such interest while he keeps the property and the return of the capital when he desires to realize it. Accordingly, the net rent which it may be expected to yield must be ascertained by deducting the known and estimated outgoings and any other allowances which have to be taken into consideration from the gross amount which a knowledge of the local circumstances indicates as the probable return. Where the property is leasehold held for a term of fixed duration, the number of years' purchase will depend upon the length of the unexpired portion of the term, and can be ascertained without special calculation by reference to a table in common use. If the duration of the term or other interest in the property is uncertain, as, for example, in the case of a lease for lives, the number of years' purchase which may fairly be taken will be found in some other of the tables (e.g. Inwood's or Willich's), which have been prepared to meet the different classes of cases with which valuers have to deal. If the property is freehold the number of years' purchase can be found by dividing one hundred by the rate of the interest required.

A valuation or appraisement, under English law, need not be stamped where it is made (1) for, and for the information of, one party only, and is not obligatory as between parties; (2) in

pur- suance of the order of a court of admiralty or on appeal therefrom; (3) of property of a deceased person for the information of an executor, or other person required to deliver an affidavit of the estate of such deceased person; or (4) of any property for the purpose of ascertaining the legacy or succession or account duty payable in respect thereof. Any other valuation or appraisement, whether of property or any interest therein or of the annual value thereof, or of any dilapidations or of any repairs wanted or of the materials and labour used, or to be used, in any building or of any artificer's work, must be stamped. An appraiser who makes an appraisement or valuation chargeable with stamp duty must, within fourteen days after making it, write it out in words and figures showing the full amount thereof upon duly stamped material. If he omits to do so, or in any other manner discloses the amount, he becomes liable to a fine of £50. Any person who receives from an appraiser, or pays for the making of, any such appraisement or valuation not so written out and stamped, becomes liable to a fine of £20.

Where a contract has been made for the sale of property at a valuation, a valuation made in accordance with its terms will be conclusive as between the parties, in the absence of fraud, collusion or mistake. Where there has been an agreement to sell goods on the terms that the price-is to be fixed by the valuation of a third party and such third party cannot or does not make such valuation, the agreement is avoided; but if the goods or any part thereof have been delivered to and appropriated by the buyer he must pay a reasonable price therefor. Where the third party is prevented from making the valuation by the fault of the seller or buyer, the party not in fault may maintain an action for damages against the party in fault. Where the fixing of a value by valuers is not of the essence of an agreement, but is wholly subsidiary to it, the courts will, if justice require it, ascertain the value in order to carry the agreement

into effect. Where an agreement had been entered into for the sale of a house at a fixed price and of the fixtures and furniture therein at a valuation by a person named by both parties, and he undertook the valuation but was refused permission by the vendor to enter the premises for that purpose, the vendor was ordered to allow the entry so that the valuation might proceed.

A person who exercises the calling of an appraiser or who, for or in expectation of any fee or reward makes any valuation or appraise- ment chargeable with stamp duty, must (unless he is licensed as an auctioneer or house agent) have an appraiser's licence, upon which a duty of £2 is charged and which continues in force from the day of its date until the following 5th of July. By default in this respect a liability to a penalty of £50 is incurred. Moreover, an unlicensed appraiser cannot recover remuneration. A valuer is liable to the person who has employed him for the consequences of negligence or want of due care and skill on his part. If his services are thereby rendered worthless he will not be able to recover anything by way of remuneration. A valuation of a house taken by a railway company made by a surveyor who did not enter the house was held not to be a proper valuation. Although a valuer cannot be expected to possess a minute and accurate knowledge of the law, he ought to be acquainted with the general principles applicable to the valuations which he undertakes so far as is necessary in order to enable him to make them properly. The valuer, however, will be liable for the consequences of his negligence only towards the person who employed him, and not to any one else who may happen in fact to have been prejudiced thereby. (H. Ha.)

VALUE (O. Fr. value, from valoir, to be worth, Lat. valere), in general usage a term signifying worth. It has, however, a special meaning in economics, which is the subject of this article.

In some departments of economic theory it is still convenient to use as the basis of the exposition the opinions of J. S. Mill, because he embodied in his treatise on Political Economy in a remarkable manner nearly everything of importance from the theoretical standpoint in the work of his predecessors, and to a considerable extent subsequent advances in economic science have been made by way of criticism or development of his version. This observation is especially true of the theory of value. In this subject Mill had digested the mass of previous learning with such effect that he commences his treatment with the remark: " Happily there is nothing in the laws of value which remains for the present or any future writer to clear up; the theory of the subject is complete. The only difficulty to be overcome is that of so stating it as to solve by anticipation the chief perplexities which occur in applying it." Curiously enough this part of economic theory was the first to receive at

the hands of Jevons and others serious modification, the nature and need for which can, however, only be properly understood after a prehminary examination of the old orthodox position.

As regards the question of definition, Mill starts with the distinction somewhat loosely drawn by Adam Smith between value in use and value in exchange. When we say that a thing possesses a certain value in use, we say in more words than are necessary that it is useful: that is to say, value in use is an awkward phrase for utility. The conception of utility (see Wealth) is the most fundamental in economics. It is held by Mill to mean the capacity to satisfy a desire or serve a purpose, and thus " useful," the corresponding adjective, is as fitly applied to ices as to steam-engines. It has always seemed rather paradoxical to apply the term utility (with its adjective useful) to things which the common sense of mankind (or of any representative section) considers to be deleterious or trivial. Accordingly V. Pareto has proposed the term ophelimite (Gr. d)0e\i/ws) for this wider interpretation of "utility." But utility in this sense is obviously much wider than value, and Mill proceeds to say that by value in political economy we should always understand exchange value. This language seems familiar and definite, but on analysis it is clear that exchange implies two terms at least. If we say that a thing can be exchanged, we imply that it can be exchanged for something else, and when we speak of the exchange value of a thing we must directly or indirectly refer to the value of some other thing or things. In practice in modern societies this other thing is standard money: an Englishman who talks of the exchange value of anything means the number of pounds sterling (or parts thereof) which it will fetch in the market or be appraised at by a fair arbitrator. On this view then the value of a thing is its

price; but a very little experience in the theory or history of economics will show that it is often desirable, and sometimes necessary, to contrast value with price. " At the same time and place," says Adam Smith, " money is the exact measure of the real exchangeable value of all commodities. It is so, how- ever, at the same time and place only." If, however, the ex- change

value of a thing is not its price, what is it? According to Mill, " The value of a thing is its general power of purchasing, the command which its possession gives over purchasable commodities in general." But what, we may well ask with Mill, is meant by command over commodities in general? Are we to understand the complete national inventory of wealth, or the total of things consumed in a given time by a nation? Obviously such conceptions are extremely vague and possibly unworkable. If, however, we make a selection on any representative principle, this selection will be more or less arbitrary.

The elaborate work of C. M. Walsh on the Measurement of General Exchange Value (1901) gives a critical analysis of the views of the chief writers on the subject and indicates the advances made since Mill. Mill is to some extent aware of the difficulties, although he never subjected them to a rigorous analysis; and he points to the obvious fact that a ctfat, for example, may exchange for less bread this year than last, but for more glass or iron, and so on through the whole range of commodities it may obtain more of some and less of others. But in this case are we to say that the value of the coat has risen or fallen? On what principles are we to strike an average? The attempt to answer these questions in a satisfactory manner is at present engaging the attention of economists more than any other problem in the pure theory. Mill, however, instead of attempting to solve the problem, frankly assumed that it is impossible to say except in one simple case. If, owing to some improvement in manufacture, the coat exchanges for less of all other things, we should certainly say that its value had fallen. This line of argument leads to the position: "The idea of general exchange value originates in the fact that there really are causes which tend to alter the value of a thing in exchange for things generally, that is, for all things that are not themselves acted upon by causes of similar tendency." There can be no doubt as to the truth of the latter part of this statement, especi- ally if we substitute for one commodity groups of commodities. But it is doubtful if the idea of general exchange value arises from a consideration of the causes of value; and later writers have constantly emphasized the distinction between any change and the causes of the change. Following out the idea in the last sentence quoted, Mill goes on to say that any change in the value of one thing compared with things in general may be due either to causes affecting the one thing or the large group of all other

things, and that in order to investigate the former it is convenient to assume that all commodities but the one in question remain invariable in their relative values. On this assumption any one of them may be taken as representing all the rest, and thus the money value of the thing will represent its general purchasing power. That is to say, if for the sake of simplicity we assume that the prices of all other things remain constant, but that one thing falls or rises in price, the fall or rise in price in this thing will indicate the extent of the change in its value compared with things in general. There can be no doubt that, in discussing any practical problem as to the changes in the relative value of any particular thing, it is desirable to take the changes in price as the basis, and much confusion and cumbrousness of expression would have been avoided in the theory of the subject if, to adapt a phrase of Cournot's, money had by Mill and others been used to oil the wheels of thought, just as in practice it is used to oil the wheels of trade.

By this method of abstraction the treatment of the theory of value becomes essentially an examination of the causes which Requi- determine the values of particular commodities rela- skesfor tively to a standard which is assumed- to be fixed. value. Cournot compares this hypothetical point of the standard of value to the "mean sun" of astronomers. In order that anything may possess value in this sense, that it

may exchange for any portion of standard money or its repre- sentatives, it is evident on the first analysis that two conditions must be satisfied. First, the thing must have some utility; and secondly, there must be some difficulty in its attainment. As regards utility, Mill apparently regards it simply as a kind of entrance examination which every commodity must pass to enter the list of valuables, whilst the place in the list is determined by variations in the degree of the difficulty of attainment. Later writers, however, have given much more prominence to utility, and have drawn a careful distinction between final or py flaioP marginal and total utility. Following Jevons, most marginal economists have adopted this distinction, and the and total writers of the Austrian school in particular have made it ut!,lt y- of vital importance, and by attempting to introduce it when the conception is inappropriate have often caused much unnecessary complexity. The distinction is certainly useful in throwing light on the advantages of, and motives for, exchanging com- modities.

Suppose that on a desert island A possesses all the food, so many measures — (say) pecks — of corn, and B all the drinking water, so many measures — (say) pints. Then A, taking into account present and future needs, might ascribe to the posses- sion of each portion of his stock so much utility. The utility. of the first few pecks of corn might be regarded as practically infinite; but, if his stock were abundant, and a speedy rescue probable, the utility ascribed to successive portions would be less and less. In the same way B might make an estimate of the utility of successive measures of the drinking water. Now, if we regard only total utilities from the point of view of each, both are infinite. If an exchange were made of the total stocks of both men, the position of neither would be improved. But, if A sets aside (say) half his stock, then it may well happen that he could advantageously exchange the rest against part of B's drinking water. In precisely the same way B might set aside so much of his stock for his own consumption, and then the utility of the remaining portion would be much less than the utility he would gain if he obtained in exchange A's surplus. Thus, if the two men exchange their remainders, both will gain in utility; in the case supposed they will make an enormous gain. For simplicity we have supposed each stock to be divided into two portions, but nothing has been said of the principles of the division. It is, however, clear that A can advantageously go on exchanging a measure of corn for a measure of water so long as by doing so he makes a gain of utility. Conversely B can advantageously offer water so long as he gains greater utility from the corn received in exchange. The utility of the last portion of corn retained by A (or of water by B) is the final or marginal utility of the stock retained, and similarly the utility of the last measure obtained in exchange may be called the final utility of the stock purchased. A will have done his best if these utilities are just equal. For at this point, if he were to offer (at the same rate of exchange) more corn, it is clear that he would lose more utility than he would gain. Mutatis mutandis, the same reasoning applies to B; and thus the rate of exchange will be so adjusted as to bring about this equality of marginal utilities on both sides. It follows that, if A gains on the last portion received just as much utility as he loses on the portion parted with, on all the other portions received he will have gained more than he lost. The total of these gains over successive portions has been called by Professor Marshall consumer's rent or surplus.

However useful this theory of marginal utility may be in throwing light on the fundamental nature of value, and on the advantages of exchange, it is obviously too abstract Dim- to be applied to the explanation of the relative values cutty ot of the endless series of commodities and services attain- which constitute a nation's stock of valuables at any men ' time. For this purpose we must resort to the law of supply and demand, which requires a very careful statement owing to the ambiguities of popular language. Mill has succeeded in getting rid of most of these ambiguities, but he has hardly given due emphasis to the fundamental character of the law. He argues, after the brief consideration allotted to the element of utility, that the other preliminary condition necessary for value —

difficulty of attainment — is not always the same kind of difficulty, and he arrives at three distinct laws of value, according to three forms or degrees of this difficulty. (1) In the first place, the difficulty may consist in an absolute limitation of the supply, Thne a &d in this case the corresponding law is said to be the laws of law of supply and demand. Even on Mill's view the value, class of commodities which comes under this heading

is both large and important, for it includes not only the favourite examples of old pictures, china, &c, but also land, and especially building sites in large cities. Again, it is pointed out that, although comparatively few commodities may be absolutely limited, almost all commodities may be so locally and tempor- arily, which is really only another way of saying that the law of supply and demand governs all market values; for it is obvious that the supply actually forthcoming or obtainable in a specified time in any market is limited — a point which may be well illustrated by the extreme case of a " corner." Again, under certain circumstances the supply may be artificially limited, as in the case of monopolies, the classical example being the destruc- tion by the Dutch of some of their spice, in order that the limited quantity might sell for a total higher price. Besides all these important instances of the operation of the law of supply and demand, Mill is compelled also to bring under the same law the wages of labour, the values of the staples of international trade, and some other

peculiar cases of value. In fact, step by step he is almost forced to the conclusion, now generally accepted, that the law of supply and demand is the fundamental law of value, of which the other laws are only particular cases. At the outset, however, he appears to consider the two others as of co-ordinate importance. (2) When the difficulty of attainment consists not in the absolute limitation but simply in the fact that the article requires labour and capital to produce it, the normal or natural value is said to be determined by the cost of pro- duction. (3) In the last case taken by Mill it is supposed that an article can be increased in quantity, but only at an increasing cost, and in this case the corresponding law of value is the cost of production of that portion which is obtained under the most unfavourable circumstances. These three laws of value may now be examined critically and their mutual relations discussed, for the last two, if not properly of co-ordinate importance with the first, are at any rate wide generalizations.

In order to understand the law of supply and demand, it is best to take separately the general law of demand and the Supply general law of supply, and then effect a combination. and Demand must be defined as the quantity of any article

demand, demanded at some particular price, it being assumed of course that the bidder of the price can meet his engage-ments, or, as is sometimes said, that the demand is an effectual demand. It is quite clear that by demand we cannot simply mean desire to possess, because in a sense every one desires everything, and the less the means of payment so much greater in general is the desire. Again, it is obviously necessary to insert the qualifying clause " at some particular price," because, as a rule, with a change in price a different quantity will be demanded. It is, indeed, this variation of quantity demanded, according to variation in price, which gives rise to the statement of the general law of demand, namely: As the price of any article falls, other things remaining demand. t ˆ le same > t ' le quantity demanded increases, and, conversely, as the price rises the quantity demanded decreases. A very good example of this law is found in the effects of the remission of taxes. The repeal of a tax leads to a fall in price, and the fall in price is accompanied by increased consumption. Conversely, it has often been found that to increase the amount of a tax does not increase the revenue from it, because the demand for the article falls off. The general law of demand is best

expressed as by Cournot by saying that the quantity demanded is a function of the price. If we suppose that corresponding to the smallest change in price there is a change in the quantity demanded the law of demand may be illustrated by curves. Marshall has introduced the idea of demand schedules, the quantities demanded being written

in one column and the corresponding prices in another. The precise connexion between the price and the quantity demanded differs in different cases, and, strictly speaking, is probably never the same for any two commodities. Every commodity has its own curve or schedule. At the same time, however, commodities may be placed in large classes according to the general character of the variation. The variation of quantity demanded according to price will ultimately rest on the principle of marginal utility explained above. A person with a limited amount of money to spend will hit the economic mark in the centre if the final utilities of his several purchases are equal. This is a rather technical way of saying that a prudent man will" not spend a penny more on any particular thing if the penny spent upon some new object would give him a little greater satisfaction. Reverting to the variations of demand according to price, a contrast will at once be observed between necessaries and luxuries. However much the price rises, so long as people have the means they must consume a certain amount of necessaries, but, however much the price falls, the limit of consumption of bread, for example, must soon be reached. On the other hand, a great fall in price of many luxuries may cause an enormous increase in the demand, whilst a great rise may almost destroy the demand. The rate of charge — the quantity demanded according to the changes in price — is referred to as elasticity of demand. If for a small change in price there is a considerable increase in the quantity demanded, the demand is said to be very elastic. Other characteristics of demand are indicated by the terms direct, derived, compounded, &c , the demand for any one thing being obviously affected by the possible use of substitutes on the one side and on the other by the emergence of other uses. Recent writers, notably Marshall, have given much attention to the development of the law of demand in its various aspects, which has been too much neglected in the Ricardian analysis followed by Mill. A great deal of light might be thrown on many interesting problems in the progress of a nation and of its various component classes, if the laws of demand, or the

statistics of consumption according to price, were obtainable.

Turning to the element of supply, this term in- a similar way may be defined as the quantity offered for sale at some particular price, and the general law of supply may be stated thus: As the price rises, other things remaining the supply. same, the quantity offered tends to increase, and, con- versely, as the price falls the quantity offered tends to diminish. Expressed in this manner, supply appears to be exactly analogous to demand, and the analdgy seems to hold good even when we push the analysis up to the utility to the seller as compared with the utility to the buyer. For, as the price rises, the seller will obtain greater utility, and will thus retain less for his own use or will be induced to produce more. On closer inspection, however, the law of supply is found to be not so simple as the law of demand. It would only be so if the seller had simply to compare the relative advantages of exchanging his com- modity and of retaining it for his own use, without any further reference to the conditions of, or the motives for, production. In most commodities, however, the determining influence is not the comparative utility of consumption by the owner on the one hand or of the consumption of something else obtained by exchange on the other, but it is rather a comparison of the trouble of producing with the advantage of selling the article when produced. Of course, if we are considering finished products in any market the case is more simple; but even here the question of the relative advantages of present sale and reservation for a future market or distant place must be deter- mined, and then the element of cost of production will again be brought back. The law of supply may be developed on lines corresponding to the law of demand, and we may construct supply schedules on curves indicating the relations between the range of prices and the quantities offered at those prices.

Before considering the relation of cost of production to supply, it will be convenient to combine the laws of supply and demand, taking the former in its simplest aspect, and

to state the general law of supply and demand as governing value. Excluding the simple case of the barter of two com-

modities of which the rate of exchange will be determined as explained above in reference to marginal utility, and meaning by demand the quantity demanded in a market at a certain price, and by supply the quantity there and then offered at a certain price, the general law may be stated thus: In any _ . market the price of any article will be so adjusted between that the quantity demanded will exactly equal the demon quantity offered at that price. The force by which the “” adjustment is made is, in general, competition. Thus,*

if the price were above the point indicated by the law,

supply.

there would be a lessened demand, and the competition of sellers would tend to lower the price. Conversely, if the price were lower the competition caused by the increased demand would tend to raise it. The law as thus stated corresponds to what Mill calls the equation between demand and supply. He was induced to adopt this phrase in place of the more popular expression, the ratio of demand to supply, on the ground of its greater accuracy. And, if the term ratio is to be taken strictly, no doubt Mill’s criticism is perfectly just. At the same time the equation must be stated very carefully to avoid falling into the truism suggested by Cairnes, namely, that in any market the quantity bought at any price is equal to the quantity sold at that price. The point is that in accordance with the general principles of supply and demand the quantities offered and demanded vary with the price. And, however inaccurate the literal use of the term ratio may be, it has the advantage of suggesting a change of price according to changes in demand and supply. The equilibrium between demand and supply was illustrated by Cournot by the intersection of the demand and supply curves, and for purposes of theory this mathematical method offers great advantages.

It may be useful at this point to consider the principles by which monopoly values are regulated. The simplest case is Mono- when one individual possesses the whole stock, and poly the cost of production is so small that it may be

values. neglected. Take the case, for example, of some natural well having a unique character for the mineral waters it supplies. The monopolist will, in the first place, have to discover the law of demand for his article. If he fixes a very

high price, he may only occasionally sell a pint to a king or a millionaire; whilst, if he fixes a very low price, he may sell to every peasant and yet get a very poor return. He will, in fact, have to work out a problem in mathematics, and must so adjust his price that the quantity sold multiplied by the price per unit will be a maximum. The same kind of difficulty is found in the case in which the expenses of production, although considerable, are practically fixed or only increase slightly in proportion to the quantity furnished. The minimum price will be given by the expenses of production, whilst the actual price will tend to be such as to yield the maximum profit. Take, for example, the case of a steamer which has a practical monopoly and is not controlled by government. The owner will not send out the steamer at all unless the passengers and cargo pay the expenses; but, if there is a great demand, he will raise the price so as to secure a maximum profit. In general, however, any increase in the quantity of the article produced (or the service rendered) will be accompanied by an increase in the necessary outlays, and this increase may be greater or less per unit. In these cases the calculation of the maximum profit is a matter of great difficulty. ■ Take, for example, the case of a railway which has a monopoly in a certain tract of country. The manager may aim at keeping down expenses and charging high rates, being contented with a moderate traffic; or he may lower his charges and incur additional expense to increase the gross income. It is worthy of remark that in many cases the monopolist has a choice of two methods which give practically equally good results, one starting with low and the other with high prices. But it is clear that the mass of the general public or the great body of consumers have an interest in low prices being adopted, whilst, on the

other hand, the tendency is usually for the monopolist to charge higher prices than are really profitable in a maximum degree. The simplicity of the method of high prices is always attractive and often deceptive. Accordingly, even on these very general grounds, the interference of government with monopolies may sometimes be defended as being in the interests of the public and not against the interests of the monopolists. The case of the parliamentary third-class tickets furnishes an instructive example. At first the railways made their parliamentary trains as slow and inconvenient as possible, whereas now there is hardly a train which does not

carry passengers at parlia- mentary rates without compulsion. As a rule, however, in modern commercial countrres legal "monopolies are Competl- an exception. Any one, for example, can prosecute Hon any trade or manufacture if he can provide the re- value " quisite skill, labour and capital; and even as regards land — at any rate in the greater part of England and Scotland — there is from the point of view of cultivation no real monopoly. But although legal monopolies (apart from patents and the like) are not general, and in most countries the law is adverse to the creation of monopolies, 1 as a matter of fact in modern times there has been an increasing tendency to the amalgama- tion of businesses of all kinds into large combinations (trusts, kartells, &c), which have the power of monopolies. In the same way in the relation of labour and capital the method of collective bargaining partakes of the character of monopoly. There may be buyers' as well as sellers' monopoly, and capitalistic combinations operate by this method in dealing with the production of raw material or other requisites and also with labour.

The theory of monopolies being a case of the determination of maxima is essentially mathematical, and many of the problems, especially as regards the incidence of taxes and the benefits of the public acquisition of " natural " monopolies, can only be fully explained mathematically as by Marshall. In recent years great attention has been given to the realistic study of monopolies (J. W. Jenks, H. W. Macrosty, &c; see Trusts). When competition arises, and is effective, exceptional profit ceases, and thus a new principle for determining values comes into play. If the producer of any article is obtaining more than the usual rate of profit, he at once provokes com- petition, and thus even the dread of this possible competition may keep down prices. This is often expressed by saying that the potential supply affects prices almost as much as the actual supply. It thus becomes obvious that, as regards freely pro- duced commodities the production of which may be extended indefinitely at the same or at a decreasing cost, the value tends to conform to the minimum cost of production, and that any other value is consequently unstable. It will be observed, however, that cost of production only determines values by operating through the actual or potential supply, and thus that the law of demand and supply is fundamental. Once a thing is made, the actual cost of production has no influence on its value, except as indicating the conditions of future possible

supply.

At this point it becomes necessary to analyse and explain the nature of cost of production. In the last resort it will be found that nothing can be produced without Cost of labour, and in a modern society capital must be prorfuo- added. Thus the component elements of production ” < ", • are labour and capital acting by natural forces upon raw material. But, since both the forces and the produce of nature require labour and capital for their exploitation, the elements that must be considered primary and fundamental in the case of commodities that can be indefinitely increased are labour and capital. Capital, again, is itself a product of labour, and it is also wealth set aside by the owner for future use instead

1 The general theory of monopolies was admirably treated by the French mathematician and economist Cournot, Recherches sur les principes mathematiques de la Morie des richesses (1838), and as far as possible without mathematics in the Revue sommaire des doctrines icoriomiques (1877).

of for present consumption. Accordingly, in order that a thing may be continuously produced, labour must obtain a sufficient reward for toil, and capital a sufficient reward for ” abstinence ” or ” waiting,” or for preservation and accumula- tion of wealth. Thus the ultimate elements in the real cost of production are the toil and trouble and irksomeness of labour and of saving. But this toil and trouble will not be submitted to unless in any particular case the fair reward of industrial competition is forthcoming. However much pleasure a good workman may take in his work or a prudent man in his savings, in the industrial world as at present constituted both labour and capital will be attracted towards the point of highest reward (compare Wages) ; and, accordingly, it is a necessary condition of the production of any article that the price obtained will yield the average rate of wages and profit obtainable for that species of work. Now these rates of wages and profit Expenses can be expressed in terms of money, and may be desig- ofpro- nated, following Marshall, the expenses of production ductioa. as distinguished from the real cost. The real cost of production would on analysis consist of a confused

unwork- able mass of " efforts and abstinences," or " disutilities," and the relation of these mental strains to their material rewards is the problem of wages and profits. But for the purpose of relative values it is not necessary to push the analysis so far; and thus, if we regard the capitalist as the producer, we may look on the elements of production as consisting of wages and profits. And this is quite in accordance with customary thought and language: every one who asks for the details of the cost of a thing expects to have a statement of the wages and profits directly involved, and of the material, which again directly involves wages and profits. So far, then, as freely produced commodities are concerned, the general law is that they tend to sell at such a price as will yield on the average the ordinary rate of wages and profits which by industrial com- petition the occupation can command. It is at this point Wages that the difficulty emerges as to the precise nature and of the connexion between the prices of commodities

values. an(j i-jjg mone y wa ges and profits of producers. Are we to consider that the former are determined by the latter, or the latter by the former ? If, for example, commodity A sells for twice as much as commodity B, are we to say that this is because wages are higher in the former case, or are the wages higher because the price is higher? The answer to this question is given in the theory of Wages (q.v.). It is sufficient to state here that, in discussing relative values, we may assume that industrial competition has established certain relative rates of wages and profits in various employments, and that any prices of articles which yielded more than these rates, whilst in other cases no corresponding rise took place, would be un- stable. Thus, in discussing the normal values of freely pro- duced commodities, we have to consider the quantity of labour and the rates of wages and the quantity of capital and the rate of profits, the normal rates of these wages and profits being given.

The use of the term " normal " requires some explanation. The word norma properly refers to the square used by masons

and carpenters, &c, and thus a thing may be said to value. be in its normal position when no change will be made:

that is to say, the normal position is the stable position, or it is the position to which the workman will try to adjust his work. And, similarly, by the use of normal as applied to wages and profits, we mean the stable rate or the rate towards which they

are attracted. It is thus quite possible that the normal rate may differ from the average rate or the rate obtained over a term of years. For it may easily happen that as regards wages, for example, a high rate for a short period may lead to such an increase in that kind of production that for a much longer period the rate will fall below the normal. The normal rate seems to refer to the actual conditions of industry, the rate which can be obtained for a given amount of exertion, taking the average of employments at the time, rather than to the particular rate obtained for some class of work over a period of years.

With these explanations the proposition holds good that the normal values of freely produced commodities tend to be equal to their cost, or rather expenses, of production, and any price which yields a greater or less return to labour and capital is unstable.

Marshall (Principles of Economics, bk. v. 5th ed., 1907) has treated very fully the subject of normal values and the relations of normal and market values from the side of theory; but the nature and importance of the distinction is perhaps best realized if we compare the normal relative values of important com- modities over a period of centuries, as was done by Adam Smith and in the monumental work by Thorold Rogers on the History of Agriculture and Prices. At this stage in the analysis the difficulty must be met that even in a position of stable equilibrium, i.e. when the normal demand is just satisfied by the normal supply, the different portions of the aggregate supply may be produced at different costs according to differences in the natural environment or in the availability of different factors of production. In dealing with this difficulty the modern conception of marginal cost is of importance. If a commodity is produced at a uniform cost per unit whatever the amount, then the normal value depends simply on this uniform or normal cost; any temporary divergence in market prices will lead to a contraction or increase in the supply until the exceptional gains or losses are got rid of. It may happen, however, that portions of the supply can be obtained at different costs, and in this case the normal value is determined by the cost at the margin. It is this marginal cost which just gives the rates of remuneration to labour and capital which suffice to keep up the continuous supply of the requisite factors of production. If a commodity is produced according to the law of diminishing return, or, what is the same thing, if the supply

can only be increased after a certain point at an increasing cost per unit, then the marginal portion just pays its expenses and the previous portions yield a differential remuneration which constitutes economic rent. If the conditions of difference in cost are natural and permanent we have the case of pure economic rent (see below), but if the factors of production in response to the stimulus of extra remuneration can be increased or improved the extra rates of remuneration tend to disappear with the increase in supply of the more advantageous factors, and instead of pure economic rent we have various species of quasi-ients. " Even the rent of land is seen not as a thing by itself but as the leading species of a large genus; though indeed it has peculiari- ties of its own which are of vital importance from the point of view of theory as well as of practice " (Marshall). Marshall has given special attention to the development of this application of the principle of continuity, of which Cournot was the first writer to realize the significance.

If a commodity is produced according to the law of increasing return (or diminishing cost per unit as the quantity is increased) the solution of the problem of normal value presents peculiar difficulties which cannot be treated in a preliminary survey. Two results, however, of practical importance may be noted. In the first, under increasing return the first established business can be expanded more easily than it is possible to start a new concern, and if new competing concerns are started there are obvious advantages in amalgamation, so that we arrive at the modern generalization that the natural tendency of increasing return production is to monopoly. This again gives the chief economic justification for " trusts "; it being said that through the adoption of various external and internal economies they more than neutralize the higher prices of monopoly.

The other result of importance is that under competition the less advantageous methods of production tend to be extruded and the law of increasing return gives way to that of constant return. For further consideration of these difficulties the reader may refer to the analysis by Marshall {Principles of Economics, bk. v. ch. xi.). The economic analysis of cost of production (or if we take the money measures of the various elements involved, expenses of production) involves a reference to the other great departments of economics, namely,

production and distribution; and it is necessary to take account of the interconnexion and mutual dependence of these depart- ments and that of exchange, in which the idea of value is pre- dominant. In the last resort production will not be carried on unless labour and capital receive a sufficient reward and the sufficient reward is the normal value of the factors of production. But when we are comparing the relative values of commodities and are seeking to explain, for example, how it is that for long periods of time these relative values are stable, or conform to some regular law, we have to break up the elements of value into the constituents of the expenses of the various factors of production. This leads up to the analysis of cost (or expenses) of production as dependent on the amounts and qualities of the labour and capital required.

If all commodities were produced directly by the expenditure of labour, and in such a way that capital need not be considered, ... ,,, as in the simple natural state of society taken by

*Elements . . * . , . ,*

ofex- Kicardo, then the only element to consider in value

peases of would be the quantity of labour. And in a society produc- Q { a more developed character, in which wages are

paid, if we consider that the rate of wages is uniform, and that profits may be disregarded in comparison with wages, the quantity of labour is the most important consideration, and a fall in the relative value of any article can only take place through some economy of labour. But, as we approach more nearly to the actual constitution of modern industrial societies, we find serious differences in the rates of wages in different employments, the use of fixed capital becomes of greater importance, and in some cqpes the lapse of time neces- sary for the completion of the commodity is considerable. Thus interest and profits, as well as the differential rates of wages, have to be taken into account just as much as the quantity of labour, and it is generally convenient to consider also the established differences in various returns to capital under different conditions (risk, irregularity, &c). Indirectly, of course, since

all capital in the ordinary sense is the result of labour, the quantity of labour is always of primary importance; but, in considering the proximate causes of relative values, it is best to consider capital and labour as independent factors. It follows, then, that, in order to compare the relative values of two commodities, A and B, freely produced in a modern industrial society, we must take into account, first of all, the relative wages and relative profits, and the relative amounts of labour and capital employed. If the producers of A are skilled workmen, and if the return to the capital is uncertain, whilst in the case of B the labour is unskilled and profit steady, then the value of A will be higher than that of B, supposing each produced by the same amount of capital and the same quantity of labour. Obviously, too, any change in the relative wages and profits will affect the relative values. If the com- modities considered are not capable of division into similar parts (such as yards of cloth or silk), but must be considered in their entirety (e.g. ships and houses), then we must take into account also the different quantities of labour and capital re- quired for their completion, as well as the relative rates of wages and profits. As regards changes of value in this case, it will be observed that, if the proportions are different in which labour and capital are employed in the production of two commodities, then any change in the general rates of wages and profits will affect relative values. By making various suppositions as to changes in the different elements of the expenses of production, a great many cases may be obtained, as is done, for example, by Mill (Pol. Econ. bk. iii. ch. iv.).

All the cases enumerated and others may, however, be deduced from a general formula. Let Ei represent the total expenses of

production of commodity A. Let Q 1 be the quantity formula °^ nxe< i capital employed, and let r x be the rate of wear for ex- and tear per annum, so that the loss is Qi/) – !. Let Pi peases of be the rate of profits per cent, per annum which must {too UC ' ^ e obtained on the whole capital . Let Q 2 be the number

of labourers, and w 2 the rate of wages per annum. Let /1 represent the time taken for production reckoned in years

lattve values.

(li may be less than unity, thus /1/Q2 would be weeks). Then the total expenses of production are

Ei= j Qi (ˆ + -) + Qrw (1 + ˆ) I tv (\ioo rl \ 100/ 1*

This simply means that the commodity must return in the normal case profits on the fixed capital with repair of waste, and also the wages expended (the amount depending on the number of labourers and the rate of wages), with profit on the circulating capital over all the time necessary to complete production. In some cases, it may be observed, it would be necessary to take / differently for the fixed capital and the labour or circulating capital. Then, in a similar way E2, the expenses of production of B, may be expressed:

E 2 = j Q, (ˆ- + -) + Q4-K-4 (1+ ˆ-) \ k- (3 \ IO o r-J \ 100/)

Thus the relative values of A and B will be found by comparing the aggregate of these several elements expressed on the right-hand sides of the equations. It will now be evident ch on what a number of variable elements relative values /„ re . must depend, even when we consider that the com- modities can be indefinitely increased by the proper expenditure of capital and employment of labour. With the progress of invention and the development of industrial competition, constant changes are taking place in the various elements, and in the somewhat complicated formula given certain practical elements have been eliminated. Even if we suppose, for the sake of simplicity, that Pi and P 3 are equal, as also w 2 and wt and k and t 2 — that is, if we suppose a uniform rate of wages and profits, and the same amount of time required • — still any change in these general rates will affect relative values, owing to the different proportions in which fixed and circulating capital may be employed in the two cases. Thus, for example, we arrive at Mill's statement: " All commodities in the produc- tion of which machinery bears a" large part, especially if the machinery is very durable, are lowered in their relative value when profits fall." And it will be found on trial that by making various suppositions as to the identity of certain of the elements, or as to their disappearance, many other causes of changes in relative values may be deduced. Two important practical conclusions of a general character may be drawn from this analysis. (1) Relative values are liable to constant disturbances, and accordingly, since relative prices tend to be adjusted to relative values, relative prices must be constantly changing. (2) It is extremely difficult to measure changes in the value of the monetary standard, or movements in the

general level of prices, or variations in the purchasing power of money incomes.

These difficulties are further increased by the importance of the group of commodities which can only be increased (the arts of production remaining the same) at an increasing cost, and which are placed by Mill under a third law of Va/ ” e aaa value. The most important examples of this law are agricultural and mining produce. In order to make the principles on which this law depends clear and intelligible, it is necessary to proceed at first by the abstract method. Assume then that there is an isolated country and that its agricultural produce consists of corn. Then at any given stage of the growth of wealth and population the amount of corn may be increased (the art of agriculture remaining stationary) either by taking into cultiva- tion inferior lands or else by cultivating with greater care and expense the lands already in cultivation. But in either case what is known as the law of diminishing return would come into play, and the additional supply could only be obtained at an additional cost. It may be assumed that at any stage of develop- ment the cultivation would be carried to such a point as to give just the ordinary return to capital on the last ” dose ” of capital expended. Further it cannot be carried, for no farmer will work at a continuous loss; and competition will ensure that it is carried so far, for, if this last application of capital yields ordinary profit, the former ” doses ” must yield more, that is to say, rent as well as profit. It thus becomes manifest that, under the con- ditions supposed, the extent to which ” the margin of cultivation ”

will extend depends upon the price of the produce, and in the normal case the price must, be equal to the expenses of production of that part which is produced under the most un- favourable circumstances. This then is the third law of value, from which the economic theory of rent is an immediate deduction. For, if the last dose obtains just a sufficient return, the former doses must yield more, and the sum of these extra profits is rent. It thus appears, also, that rent depends upon price and not price upon rent.

The pure theory of rent is arrived at by making certain

hypotheses and abstractions, and accordingly it must not be . applied to particular practical cases without further

cations consideration. The theory certainly indicates the ofpure effect of very important causes, but requires in theory practice a certain amount of qualification. (1) The essence of the theory is that the return to each dose of capital applied can be separated, and that the application of capital will cease when the last dose yields only ordinary profits; and no doubt it is roughly true to say that a farmer will discover on trial at what point he should cease applying capital, and that this will depend upon the price of the produce. At the same time, however, it is quite possible that a farmer who owns the land which he tills may find it advantageous to carry cultivation to a further pitch than if he only rented his land. For he will apply his own labour and capital at a less return on his own land. There can be little doubt that very many important improve- ments made by landowners have yielded less than the ordinary rate of profit, just as peasant proprietors obtain a poor return by way of wages for their own labour. A landowner cultivating his own land has the whole margin of economic rent to fall back upon, but a farmer has to pay his rent as a first charge. Thus it is possible, provided always that the land is cultivated in both cases with the same skill, that food would be cheaper if all the land were cultivated by the owner and not by tenants farming for a profit, and thus the fact that many American farmers pay no rent may account partially for the lower prices at which they sell their corn. (2) Again, the pure theory takes no account of the size of the portions into which the land is divided, nor of the kinds of crops which are grown. But, when most of the land of a country is rented, both of these factors have to be considered, and it may be more convenient to the landowner to let the land with certain restrictions, which again indirectly operate on the price. (3) It has been well observed by Passy 1 that the principal effect of various land laws is to increase or diminish the amount of the gross produce, which in Ricardian phrase- ology would mean to extend or contract the margin of cultiva- tion. It thus appears that it is not always true to say that the payment of rent makes no real difference to the general public, and that it is simply a necessary method of equalizing farmers' profits. At the same time, however, with the necessary qualifica- tions, there is no doubt that price determines rents, and not rent price, especially when prices are affected by

foreign competition. In Great Britain a striking example has been afforded both of the abandonment of inferior lands (the contraction of the margin) and of a heavy fall in rent under the influence of falling prices.

The hypothetical history implied in Ricardo's theory as to the effects of the progress of society upon the value of agri- Progress cultural produce also requires some criticism, such as and that given by the historian of agriculture and prices,

rent. Thorold Rogers. The theory assumes that in the first

place population increases, and thus there is a greater demand for food, and that therefore the margin of cultiva- tion extends and the price rises, and rent rises also. But, as Rogers observes, history shows that agricultural improve- ments of all kinds have first of all increased the amount of food, and thus allowed of an increase in – population. It is worth noticing that in our own times an increasing population in rural districts (e.g. the Highlands of Scotland and the west of Ireland) may indirectly tend to lower or destroy rents through minute subdivision. Ricardo's theory, however, accounts very 1 Systhmes de culture en France.

well for the rise in the ground-rents of towns and cities, and it is there far more than in the rural districts that the unearned increment is to be found.

The value of mining produce is determined generally in the same way as that of agricultural produce; but similar qualifica- tions must be introduced. The theory is that both value of extensively and intensively the produce of mines is mining subject to the law of diminishing return, that the P r °duce. margin recedes as the price falls and extends as it rises, and that thus the price is determined by the most costly portion which it just pays to bring to market. The principal point to observe is that mines are gradually quite exhausted. In general the produce of mines is, like that of land, consumed in a comparatively short time, and thus the value is subject to fluctuations according to the conditions of the annual demand and supply.

The peculiar durability of the precious metals, however, makes them in this respect differ widely from most mining produce. It is of course undeniable that (supposing ^^ coinage free) the

value of standard coins will be equal m ete/s. to the value of the same amount of bullion, and, con- versely, that the bullion will be equal in value to the same amount of coins. The older economists argued that the precious metals had their value determined by their cost of production under the most unfavourable circumstances, and then argued that in consequence the value of money (or coins) tended to be governed by the cost of production of bullion. If, however, it is remembered that the annual production does not probably amount to 2 % of the quantity in the hands of man, that cost of production can only operate through actual or potential supply, and that in the case of money the increase must be real to affect prices, it will be readily seen that the value of bullion is determined by the general level of prices (or the value of money), and not that the value of money depends upon the value of the bullion. At the same time, however, it is true that, if prices become very high,- — in other words, if the value of money, and thus of bullion, becomes very low,- — then a check is placed upon production from the mines, and, conversely, with falling prices or a rise in the value of the precious metals mining for them is extended and encouraged. But the difference in the annual supply due to this influence will be small under present or similar conditions. On the whole, this case of the precious metals furnishes perhaps the best example of the way in which the cost of production can only act through the law of supply and demand.

There is one other part of the general theory of value which requires some notice. Some articles can only be produced in conjunction with others (e.g. hides and beef, wool and , mutton), and some modification of the theory is governing needed to suit this case. The law deduced is that — value of The sum of the values must be equal to the joint ex- {JlJˆ penses of production, and the relative values inter se are determined by demand and supply. Thus the Australian sheep-farmers will extend their sheep-farms so long as for wool and mutton together they obtain a fair profit, but the amount contributed by each portion will be determined by the relative demand. It is interesting to observe that in the progress of society the value of the meat has risen as compared with that of the hides and the wool. The same principle determines the kind of produce which will be raised from land, though the application is rather more difficult owing to rotation of crops, &c.

*Much discussion has taken place recently on the question whether a distinct theory of international values is required. In the limits assigned to this article it is only possible Theory to indicate the principal points in dispute. The of inter- "orthodox" theory, as held by Ricardo, Mill and national Cairnes, has been attacked by Cournot, Sidgwick and va ues * others, and has been re-stated with admirable clearness and much original power by C. F. Bastable. 2 The best way to answer the question seems to be to make clear the assumptions 5 Theory of International Trade.*

products.

on which the values of commodities produced within any " nation ' : are determined, and then to consider whether any change must be made when we bring in other nations. We are at once met with the difficulty, What is a " nation " ? The orthodox answer appears to be that within any nation (for which the term " economic area " might perhaps be advantage- ously substituted) there is effective industrial and commercial competition. This appears to imply no more than is contained in the principle noticed above, that relative values tend to be equal to the normal expenses of production {commercial com- petition), and that the expenses tend to be proportioned to the real cost {industrial competition). The question then arises, Com- Do these conditions not exist in international trade?

*paratlve The answer appears to be, first, that commercial com- cos ** petition certainly holds good; for as soon as a trade*

is established the commodities will sell at the same prices in both countries (allowance being made for cost of carriage). It would plainly be absurd to say that the value of Manchester goods is determined by their expenses of production if they are consumed in England, but by something else if they are sent to India. If then there is any difference between domestic and international values, it must arise owing to the absence of effective industrial competition; that is to say, in the same country (or economic area) the real cost determines the expenses of production on account of the supposed perfect mobility of labour and capital, but between different economic

*areas these agents of production do not pass with sufficient readiness to secure a similar correspondence. It thus follows that a country may import articles which it could produce at less real cost, provided that it pays for these imports with exports which cost even less. A very striking example of this doctrine of compara- tive cost, as it is termed, was furnished by Victoria after the great gold discoveries. All kinds of produce were imported and paid for with gold, because there was less real cost involved in ob- taining the gold to pay for imports than in making the articles. According to this theory every country will devote its labour and capital to its most productive uses; and, if by some new imports a domestic industry is checked or abolished, it is argued that the labour and capital will be devoted to increasing the exports so as to pay for the new imports. It must clearly be assumed as axiomatic that in the absence of loans, tributes, &c, imports can in the long run only be paid for by exports, and also that those articles will be exported which can be produced at the least comparative real cost. This theory then may be held to explain in a satisfactory manner the origin and development of international trade; but the question of values is still un- Recip- determined. Consistently with exports paying for "**t imports many different rates of exchange are possible,*

demand. an(j tne p ar ticular rate actually adopted is said to depend entirely on reciprocal demand. And in an extreme case, in which new countries trade solely in articles of which each has a monopoly, this answer would seem to be correct; but, when we consider that under present conditions trading countries have many articles in common, and that a slight margin of profit suffices to expand or diminish an export trade, this answer seems too vague and unreal. In general Foreign it is clear that the rate will be determined independ- ent- ently of the foreign trade, or at least that the foreign changes. t ra(j e j s on jy one factor to be considered. If the rate of profit falls, a trade which before was impossible becomes possible. The opinion may be hazarded that the best way of explaining the general theory of international values would be to start with the foreign exchanges; but such an investigation is too technical and difficult for this place (see Exchange).

See J. S. Nicholson's Principles of Political Economy, vol. ii. book iii. ch. 25-28, for the development of this line of criticism cT the Ricardian theory; and C. F. Bastable's Theory of

International Trade (Appendix) for reply to this and other criticisms. (J. S. N.)

VALVE (Lat. valva, a leaf of a double or folding door, allied to volvere, to roll, as of a door on its hinges), a term applied to many mechanical appliances, devices or natural features,

which control, by opening and shutting, the flow of air, liquids, vapour, gas, &c, through a passage, tube, pipe or other vessel. VALVES, or Pistons (Fr. pistons, cylindres; Ger. Ventile; Ital. pistoni), in music, mechanical contrivances applied to wind instruments in order to establish a connexion between the main tubing and certain supplementary lengths required for the purpose of lowering the pitch. Various devices have been tried from the days of ancient Greece and Rome to produce this effect, the earliest being the additional tubes (xXayiui 680L) inserted into the lateral holes of the aulos and tibia in order to prolong the bore and deepen the pitch of each individual hole; these tubes were stopped by the fingers in the same manner as the holes. This device enabled the performer to change the mode or key in which he was playing, just as did the crooks many centuries later. But the resourcefulness of the ancients did not stop there. The tibiae found at Pompeii (see Aulos) had sliding bands of silver, one covering each lateral hole in the pipe; in the band were holes (sometimes one large and one small, probably for semitone and tone) corresponding with those on the pipe. By turning the band the holes could be closed, as by keys when not required. By fixing the 6Sd in the holes of the bands, the bore was lengthened instantly at will, and just as easily shortened again by withdrawing them; this method was more effective than the use of the crooks, and foreshadowed the valves of eighteen centuries later. The crooks, or coils of tubing inserted between the mouthpiece and the main tube in the trumpet and horn, and between the slide and the bell joint in the trombone, formed a step in this direction.

Although the same principle underlies all these methods, i.e. the lengthening of the main column of air by the addition of other lengths of tubing, the valve itself constitutes a radical difference, for, the adjustment of crooks demanding time and the use of both hands, they could only be effective for the purposes of changing the key and of rendering a multiplicity of instru- ments unnecessary. The action of the valve being as instan- taneous as that of the key, the instrument to which it

was applied was at once placed on a different basis; it became a chromatic instrument capable of the most delicate modulations from key to key. The slide had already accomplished this desirable result, but as its application was limited to instru- ments of which the greater part of the bore was cylindrical, i.e. the trumpet and trombone, its influence on concerted musical composition could not be far-reaching. In fact it is doubtful whether the chromatic possibilities of the slide were fully realized until the end of the 18th century, when key mechanism having made some advance, it was being applied successfully to the transverse flute and to the clarinet and oboe families. In 1760 Kolbel, a Bohemian horn-player engaged in the St Petersburg Imperial Orchestra, turned his attention to this method of extending the compass of brass instruments. His experiments, followed up by Anton Weidinger of Vienna at the beginning of the 19th century, produced a trumpet with five keys and a complete chromatic compass. Halliday followed with the keyed bugle in 18 10. Halary applied the principle of the keyed bugle to the bass horn in 181 7, and produced the ophicleide — an ideal chromatic bass as far as technical possi- bilities were concerned. The horn had become a chromatic instrument through Hampel's discovery of bouche sounds, but the defects in intonation and timbre still remained.

Such were the conditions prevailing among the wind instru- ments of the orchestra when the successful application of the valve to brass wind instruments by Heinrich Stolzel of Silesia caused an instantaneous revolution among makers of wind instruments. Further efforts to perfect the key system as applied to the brass wind were abandoned in favour of valves. The short space of two decades witnessed the rise of the Fliigel-horns, the tubas, the saxhorns and the cornet-a-pistons; the trombone, French horn and trumpet having led the van,

Sound is produced on brass wind instruments by overblowing the members of the harmonic series (see Horn). – The harmonic series itself is invariable, whether obtained from a string or a column

of air; the structural features of the instrument determine

which members of the series it is able to produce.

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Harmonic Series in C

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Although the valves of brass wind instruments vary in form and detail according to the makers, the general principles governing their action are the same for all types. The piston placed on some branch of the main tube must be so constructed that on being de- pressed it closes the natural windways through the main bore and opens others into the additional piston length. The piston seated on a spring instantly regains its normal position when the finger is removed. After the actual shape and construction of the valve and its box had been successfully evolved, it was the boring and disposition of the windways which engaged the attention of makers, whose object was to avoid complexity and sharp angles and turns in the tubing. The pitch of all tubes is determined by the length of the column of air set in vibration therein. Any variation in the length of this column of air produces a proportional variation in the pitch of the instrument. When the piston is depressed, there- fore, a partition wall is removed and the column of air within the additional length of tubing representing a definite interval is added to the main column, so that the length of the sound wave is pro- portionally increased whether the column is vibrating as a whole (when it gives the fundamental or first note of the series) or whether it has been induced to divide into equal portions in which sound waves of equal length are simultaneously generated. The numbers under the notes of the harmonic series represent the aliquot parts into which the column of air must divide in order to produce the harmonics.

The length of tubing attached to each valve is there- fore calculated on the basis of the length of the main column, to give for the first piston a tone, for the second a semitone, for the third a tone and a half, and for the fourth two tones. ,

In order to illustrate the working of the pistons, we will take as an example the bombardon or bass tuba in Eb. Depressing the second piston lowers the pitch of the instrument to D, giving it the harmonic series proper to that key; the third harmonic, which on the open tube would be Bb, now becomes A; the fifth harmonic, which was G, is now F#, and so on. The first piston on being de- pressed similarly transforms the Eb bombardon into an instrument in Db, a tone lower; the third piston lowering the pitch 1 \ tones changes the key to C. So far the intonation of the notes produced by means of the pistons is as accurate as that of the harmonics. The varia- tions in the length of the column of air correspond to the positions of the slide on the trombone, the first position being that of the instru- ment with all valves in their normal position. The use of the three pistons in turn gives the second, third and fourth positions. In order to obtain a complete chromatic compass there must be seven positions or different lengths of tubing available, as on the trombone, each having its proper harmonic series. On valve instruments the three other positions are obtained by means of combinations of pistons; the fifth position consists of a combination of pistons 2 and 3 (i and 1 J tones), which would transpose our bombardon into the key of B; the sixth position consists of a combined use of pistons 1 and 3, pro- ducing a drop in pitch of 2 J tones from Eb to Bb. In the seventh posi- tion all three pistons come into play simultaneously, lowering the pitch three tones. The intonation of the notes obtained in positions 5, 6, 7 is not so faultless as that of notes from the other positions, for the following reason : — On the bombardon in Eb piston I lowers the pitch one tone to Db; in the sixth position, when pistons I and 3 are used simultaneously, the third piston is no longer attached to a bombardon in Eb, on which it would produce the effect of C, but to one in Db, on which it lowers the pitch to Bb; it is clear, therefore, that the supplementary tubing will not be quite long enough to give the correct intonation, and that the Bb obtained as the 2nd harmonic in the sixth position will be a little too sharp, a defect which the performer corrects as best he can with his lip. The exact differences in length can be found from the table of ratios given by Victor Mahillon in La Trompette,

son histoire, sa theorie, sa construction (Brussels and London, 1907), p. 38. ■

This inherent defect of the valve system was understood and explained a few years after the invention of valves by Gottfried Weber, 1 and the record of the successive endeavours of brass instru- ment makers to overcome this defect without unduly complicating the mechanism or adding greatly to the weight of the instruments constitutes the histtfry of valve instruments.

The accredited inventor and patentee of valves applied to musical instruments was Heinrich Stolzel 2 of Pless in Silesia in 1815. The credit, however, is really due to Blumel, 3 also a Silesian, who sold his rights to Stolzel.

1 Caecilia (Mainz, 1835), xvii. 89-91.

2 See Captain G. B. Bierey in Allg. musik. Ztg. (Leipzig, 1815), p. 309, and idem for patent 1817, p. 814.

» Ibid. 1818, p. 531.

The first valves made by Stolzel worked in large square brass boxes and consisted of square blocks of solid brass through which the windways were bored in the same horizontal plane. A trumpet having two valves of this make is preserved in the museum of the Brussels Conservatoire (No. 1310 in catalogue). In 1825 Stolzel had improved upon this primitive valve, making it tubular and calling it Schub- Ventil : its action was lighter and more rapid than that of the original valve. Charles Sax of Brussels took up the manufacture of these valves and applied them to the cornet with two pistons. The scale of instruments with only two pistons had several gaps, and could not be strictly termed chromatic. In order to complete the scale, C. A. Muller of Mainz constructed a trumpet in the early 'thirties which not only had three valves, but also tuning- slides for all three additional lengths of tubing 4 and key crooks, for which corresponding piston lengths could be inserted. This was, therefore, the first attempt at compensation, for which the honour is due to Germany.

The early improvements and modifications of Stolzel's invention may be briefly 6 summed up as follows: —

In 1824 John Shaw, of Glossop, invented a system of valves known as transverse spring slides, both ascending and

descending, i.e. respectively having pistons which cut off certain lengths of tubing, thereby raising the pitch, or pistons adding certain lengths, and lowering the pitch thereby. These transverse slides were afterwards improved by Schott in 1830, and became known as the Wiener Ventil, which had an enormous success on the continent of Europe, and were applied to all kinds of brass instruments. In 1827 Blumel invented the rotary valve or cylinder action known as Dreh or cylinder Ventil, a system still in use in Germany and Austria, and preferred to piston systems by many.

In 1833 J. G. Moritz (who was associated with Wieprecht, inventor of the batyphone and bass tuba) made the large pistons of generous diameter known as Berliner Pumpen. In 1835 John, Shaw patented a variation of the rotary valve, known as patent lever. In 1839 Perinet of Paris invented the most modern form of valve, called by his name, similar to the Schub-Ventil and Berliner Pumpen, but of a diameter between the two. In 1851 and 1852 Dr J. P. Oates made his equilateral valves adopted by Antoine Courtois for his cornets; the same clever acoustician invented a piston with four straight windways, afterwards patented by A. Sax of Paris.

Various attempts to improve the windways and get rid of angularities were made by Gustave Besson in 1851, 1854 and 1855, when a system was devised having the same bore throughout the windways. This decided improvement forms the basis of the present system of the same firm. Until now efforts had mainly been directed towards the improvement of the technical construction of valves and windways. The first attempt since Miiller's (which appears to have passed unnoticed in France and England) to remedy by compensation the inherent defect of the valve system when pistons are used in combination was made in 1850, when Adolphe Sax devised a system of six pistons, one for each position, in which it was impossible to use any two pistons in combination : this system was ascending instead of descending. Gustave Besson's registre in 1856-57 followed, providing a large horizontal piston, which, by con- necting other duplicate lengths of tubing of the proper theoretical length, gave eight independent positions. In 1858 G. Besson and Girardin produced the trans positeur, in which two extra pistons when depressed automatically lengthened the slides of the three usual pistons to the required length for combination. In 1859 came the first suggestion for automatic compensation made by Charles Mandel in his book

on the Instrumentation of Military Bands, p. 39. It does not appear that he put his suggestion into practice or patented it. In this ingenious system the valves were so constructed that when two or three pistons were used simultaneously the length of tubing thrown open was automatically adjusted to the correct theoretical length required. The same ingenious principle, elaborated and admirably carried out in practice, was patented by D. J. Blaikley in 1878. The working of his device differs from the action of ordinary valves only when the pistons are used in com- bination. The exact theoretical length is then obtained by bringing into use extra compensating lengths of tubing corresponding to the difference between the piston length for a semitone, a tone and one and a half tones on the open tube and on the tube already lengthened by means of one of the other pistons. The value of this invention, enhanced by the advantage of leaving the fingering unaltered, is more especially appreciated on the large brass instru ments, in which correction of faulty intonation by means of the lips is more difficult to accomplish satisfactorily than on the smaller instruments. A similar device was patented in France in 1881 by Sudre.

Victor Mahillon, who had been for some years at work on similar lines, did not patent his invention till 1886, when his piston

4 Gottfried Weber, op. cit. p. 98.

5 Fuller accounts may be derived from Captain C. R. Day, Descriptive Catalogue of Musical Instruments (London, 1891), pp. 182 seq. ; Victor Mahillon, Catalogue descriptif, vol. i. 2nd ed. pp. 282 seq. ; and from the pages of the Allg. musik. Ztg. (Leipzig) and Caecilia (Mainz).

regulateur was introduced: this first device was not automatic, and was shortly afterwards improved and patented as the automatic regu- lating pistons.

A later valuable development in the history of valve systems is the enharmonic, invented by Messrs Besson & Co., in which they have perfected and simplified the principle of independent positions tried in the regislre of the fifties. In the enharmonic

valve system each position has its independent length of tubing theoretically accurate, which comes into play as the valves are depressed, and there is besides a tuning slide for the open notes.

Finally, there is an improvement in a different direction to be chronicled, unconnected with compensation, in Rudall Carte & Co.'s system (Klussmann's patent) of conical bore throughout, the open tube and the valve slides, which by means of ingeniously combined joints and slides preserve the tone without loss of air. This system has been applied to all valve instruments, and has been found to produce a remarkable improvement in the timbre. (K. S.)

VALYEVO (sometimes written Valjevo or Valievo), a town of western Servia, prettily situated on the river Kolubara, in a well- wooded valley, 627 ft. above the sea. Valyevo gives its name to the department of which it is the capital. It is a garrison town, with streets lighted by electricity, a high-school or gymnasium, a prefecture and a court of first instance. In the neighbouring Medvenik mountains lead-mining and smelting are carried on by an English company; lead and antimony being also worked at Podgora and other places in the same department. Besides being the centre of the plum- growing and distilling industries, Valyevo has a considerable trade in cattle, for which the pastures watered by the Kolubara are celebrated. Pep (1900) about 6800.

VAMBiRY, ARMIN (1832-), Hungarian Orientalist and traveller, was born of humble parentage at Duna-Szerdahely, a village on the island of Shiitt, in the Danube, on the 19th of March 1832. He was educated at the village school until the age of twelve, and owing to congenital lameness had to walk with crutches. At an early age he showed remarkable aptitude for acquiring languages, but straitened circumstances compelled him to earn his own living. After being for a short time ap- prentice to a ladies' tailor, he became tutor to an innkeeper's son. He next entered the untergymnasium of St Georgen, and pro- ceeded thence to Pressburg. Meanwhile he supported himself by teaching on a very small scale, but his progress was such that at sixteen he had a good knowledge of Hungarian, Latin, French and German, and was rapidly acquiring English and the Scandinavian languages, and also Russian, Servian and other Slavonic tongues. At the age of twenty he had obtained sufficient knowledge of Turkish to lead him to go to Constan- tinople, where he set up as teacher of European languages, and shortly afterwards became a tutor in the house of Pasha Hussein Daim. Under the influence of his friend and instructor, the Mollah Ahmed Effendi, he became, nominally at least, a full Osmanli, and entering the Turkish service, was afterwards secretary to Fuad Pasha. After spending six years in Con- stantinople, where he published a Turkish-German Dictionary and various linguistic works, and where he acquired some twenty Oriental languages and dialects, he visited Teheran; and then, disguised as a dervish, joined a band of pilgrims from Mecca, and spent several months with them in rough and squalid travel through the deserts of Asia. He succeeded in maintaining his disguise, and on arriving at Khiva went safely through two audiences of the khan. Passing Bokhara, they reached Samarkand, where the emir, whose suspicions were aroused, kept him in audience for a full half-hour; but he stood the test so well that the emir was not only pleased with " Resid Effendi " (Vambery's assumed name), but gave him handsome presents. He then reluctantly turned back by way of Herat, where he took leave of the dervishes, and returned with a caravan to Teheran, and subsequently, in March 1864, through Trebizond and Erzerum to Constantinople. By the advice of Prokesch-Osten and Eotvos, he paid a visit in the following June to London; there his daring adventures and linguistic triumphs made him the lion of "the day. In the same year he published his Travels in

Central Asia. In connexion with this work it must be remembered that Vambery could write down but a few furtive notes while with the dervishes, and dared

not take a single sketch; but the weird scenes, with their misery and suffering, were so strongly impressed on his memory that his book is convincing by its simplicity, directness and evidence of heroic endurance. Vambery also called the atten- tion of politicians to the movements of Russia in Central Asia, and aroused much general interest in that question. From London he went to Paris, and he notes in his Autobiography that the Parisians were much more interested in his strange manner of travelling than in the travels themselves. He had an inter- view with Napoleon III., who failed to impress him " as the great man which the world in general considers him." Returning to Hungary, he was appointed professor of Oriental languages in the university of Budapest: there he settled down, contributing largely to periodicals, and publishing a number of books, chiefly in German and Hungarian. His travels have been translated into many languages, and his Autobiography was written in English. Amongst the best known of his works, besides those alluded to, are Wanderings and Adventures in Persia (1867); Sketches of Central Asia (1868); History 0/ Bokhara (1873); Manners in Oriental Countries (1876); Primitive Civilization of the Turko-Tatar People (1879); Origin of the Magyars (1882); The Turkish People (1885); and Western Culture in Eastern Lands (1906).

VAMPIRE, a term, apparently of Servian origin {wampir), originally applied in eastern Europe to blood sucking ghosts, but in modern usage transferred to one or more species of blood- sucking bats inhabiting South America.

In the first-mentioned meaning a vampire is usually supposed to be the soul of a dead man which quits the buried body by night to suck the blood of living persons. Hence, when the vampire's grave is opened, his corpse is found to be fresh and rosy from the blood which he has thus absorbed. To put a stop to his ravages, a stake is driven through the corpse, or the head cut off, or the heart torn out and the body burned, or boiling water and vinegar are poured on the grave. The persons who turn vampires are generally wizards, witches, suicides and those who have come to a violent end or have been cursed by their parents or by the church. But any one may become a vampire if an animal (especially a cat) leaps over his corpse or

a bird flies over it. Sometimes the vampire is thought to be the soul of a living man which leaves his body in sleep, to go in the form of a straw or fluff of down and suck the blood of other sleepers. The belief in vampires chiefly prevails in Slavonic lands, as in Russia (especially White Russia and the Ukraine), Poland and Servia, and among the Czechs of Bohemia and the other Slavonic races of Austria. It became specially prevalent in Hungary between the years 1730 and 173s, whence all Europe was filled with reports of the exploits of vampires. Several treatises were written on the subject, among which may be mentioned Ranft's De masticatione mortuorum in tumulis (1734) and Calmet's Dissertation on the Vampires of Hungary, translated into English in 1750. It is probable that this superstition gained much ground from the reports of those who had examined the bodies of persons buried alive though believed to be dead, and was based on the twisted position of the corpse, the marks of blood on the shroud and on the face and hands — results of the frenzied struggle in the coffin before life became extinct. The belief in vampirism has also taken root among the Albanians and modern Greeks, but here it may be due to Slavonic influence.

Two species of blood-sucking bats (the only species known) — Desmodus rufus and Diphylla ecaudata — representing two genera (see Chiroptera) , inhabit the tropical and part of the subtropical regions of the New World, and are restricted to South and Central America. They appear to be confined chiefly to the forest-clad parts, and their attacks on men and other warm- blooded animals were noticed by some of the earliest writers. Thus Peter Martyr (Anghiera), who wrote soon after the con ■ quest of South America, says that in the Isthmus of Darien there were bats which sucked the blood of men and cattle when asleep to such a degree as to even kill them. Condamine, a writer of the 18th century, remarks that at Borja (Ecuador)

and in other places they had entirely destroyed the cattle introduced by the missionaries. Sir Robert Schomburgk relates that at Wicki, on the river Berbice, no fowls could be kept on account of the ravages of these creatures, which attacked their combs, causing them to appear white from loss of blood The

present writer, when in South and Central America, had many accounts given him as to the attacks of the vampires, and it was agreed upon by most of his informants that these bats when attacking horses showed a decided preference for those of a grey colour. It is interesting to speculate how far the vampire bats may have been instrumental — when they were, perhaps, more abundant — in causing the destruction of the horse, which had disappeared from America previous to the discovery of that continent.

Although these bats were known thus early to Europeans, the species to which they belonged were not determined for a long time, several of the large frugivorous species having been wrongly set down as blood-suckers, and named accordingly. Thus the name Vampyrus was suggested to Geoffroy and adopted by Spix, who also considered that the long-tongued bats of the group Glossophaga were addicted to blood, and accordingly described Glossophaga soricina as a very cruel blood-sucker (sanguisuga crudelissima) , believing that the long brush-tipped tongue was used to increase the flow of blood. Vampyrus spec- trum, a large bat inhabiting Brazil, of sufficiently forbidding aspect, which was long considered by naturalists to be thoroughly sanguivorous in its habits, and named accordingly by Geoffroy, has been shown by the observations of travellers to be mainly frugivorous, and is considered by the inhabitants of the countries in which it is found to be perfectly harmless. Charles Waterton believed Artibeus planirostris, a common bat in British Guiana, usually found in the roofs of houses, and now known to be fru- givorous, to be the veritable vampire; but neither he nor any of the naturalists that preceded him had succeeded in detecting any bat in the act of drawing blood. It fell to the lot of Charles Darwin to determine one of the blood-sucking species at least, and the following is his account of the circumstances under which the discovery of the sanguivorous habits of Desmodus rufus was made: " The vampire bat is often the cause of much trouble by biting the horses on their withers. The injury is generally not so much owing to the loss of blood as to the in- flammation which the pressure of the saddle afterwards produces. The whole circumstance has lately been doubted in England; I was therefore fortunate in being present when one was actually caught on a horse's back. We were bivouacking late one evening near Coquimbo, in Chile, when my servant, noticing that one of the horses was very restive, went to see

what was the matter, and, fancying he could detect something, suddenly put his hand on the beast's withers, and secured the vampire" (Naturalist's Voyage Round the World, p. 22).

Desmodus rufus, the common blood-sucking bat, is widely spread over the tropical and subtropical parts of Central and South America from Oaxaca to southern Brazil and Chile. It is a comparatively small bat, a little larger than the noctule, the head and body about 3 in. in length, the forearm 2-J, with a remark- ably long and strong thumb; it is destitute of a tail, and has a very

Eeculiar physiognomy (fig. I). The ody is covered with rather snort fur of a reddish-brown colour but vary- ing in shade, the extremities of the Fig. I.— Head of Blood- na '; rs sometimes ashy. The teeth are sucking Vampire (Desmo- peculiar and characteristic, admirably dus rufus). adapted for the purposes for which

they are employed. The upper front teeth (incisors), of which there are only two, are enormously enlarged (see fig. 2), and in shape obliquely triangular like small guillotines. The canines, though smaller than the incisors, are large and sharp; but the cheek-teeth, so well developed in other bats, are very small and reduced in number to two above and three below, on each side, with laterally compressed crowns rising but slightly above the level of the gum, their longitudinally disposed cutting edges (in the upper jaw) being continuous with the base of the canine and with each other. The lower front teeth (incisors) are small, bifid, in pairs, and separated from the canines,

Fig. 2. — Teeth of D. rufus.

with a space in front. The lower cheek-teeth are narrow, like

those in the upper jaw, but the anterior tooth is slightly larger than

the others, and separated

by a small space from the

canines. Behind the lower

incisors the jaw is deeply

hollowed out to receive the

extremities of the large

upper incisors.

With this peculiar denti- tion there is associated as remarkable a departure ‘ from the general type in the form of the digestive apparatus. The exceed- ingly narrow oesophagus opens at right angles into a narrow, intestine-like stomach, which almost immediately terminates on the right, without a distinct pylorus, in the duodenum, but on the left forms a greatly elongated caecum, bent and folded upon itself, which appears at first sight like part of the intestines. This, the cardiac extremity of the stomach, is, for a short distance to the left of the entrance of the oesophagus, still very narrow, but soon increases in size, till near its termination it attains a diameter quite three times that of the short pyloric portion. The length of this cardiac diverticulum of the stomach appears to vary from 2 to 6 in., the size in each specimen probably depending on the amount of food obtained by the animal before it was captured.

The only other known species of blood-sucking bat, Diphylla ecaudata, inhabits Brazil, and appears to be much less abundant than Desmodus rufus, from which it is distinguished by its slightly smaller size, by the absence of a groove in the front of the lower lip, the non-development of the interfemoral membrane in the centre, and the presence of a short calcaneum (absent in D. rufus), but more particularly by the presence of an additional rudimentary cheek-tooth (?molar) above and below, and the peculiar form of the lower incisors, which are much expanded in the direction of the jaws and pectinated, forming a semicircular row touching each other, the outer incisors being wider than the inner ones, with six notches, the inner incisors with three each.

Travellers describe the wounds inflicted by the large sharp-edged incisors as being similar to those caused by a razor when shaving: a portion of the skin is shaved off and, a large number of severed capillary vessels being thus exposed, a constant flow of blood is maintained. From this source the blood is drawn through the exceedingly narrow gullet — too narrow for anything solid to pass — into the intestine-like stomach, whence it is, probably, gradually drawn off during the slow progress of digestion, while the animal, sated with food, is

hanging in a state of torpidity from the roof of its cave or from the inner sides of a hollow tree. (G. E. D.)

VAMPYRELLA (L. Cienkowski), a genus of azoosporous Proteomyxa {q.v .) , parasitic on freshwater algae.

VAN. (1) The chief town of a vilayet of the same name in Asiatic Turkey; altitude, 5400 ft. Pop. 28,000, of whom 14,000 are Armenians, and the remainder Moslems, mostly of a mixed Kurdish race. It is situated about a mile from the eastern shore of Lake Van, and built along the south side of the citadel rock, an isolated rocky ridge 1300 yds. long, rising 360 ft. out of a plain which extends up to the sharply defined rocky mass of the Varak range, 8 m. distant. On the gently sloping ground cast of the citadel are the Gardens, covering an area of 5 m. by 3, and containing several suburbs and detached houses, along central avenues fringed with trees, and having channels of running water by the sides for irrigation.

The town itself is a poor place with flat-roofed mud houses, narrow winding streets, and surrounded by a ruinous mud wall; but it still contains the business quarter, the government offices and the principal bazaars. In the Gardens are vineyards and orchards of apple, pear, quince, plum and apricot; the houses of the wealthier inhabitants are imposing, built of a wood-frame- work on a stone foundation and filled in with sun-dried bricks. Many of them are brightly ornamented in the Persian style. Water comes from karez or underground channels and streams from Varak, fed from the Sikhe Lake, an ancient reservoir which pre- serves the snow waters on the summit of the mountain. For the southern quarter there is the Shemiram Canal, also of very ancient construction, which derives its supply from a large spring 19 m. distant, near Meshingird. There are British, Russian and French consuls who reside in the Gardens. There are a large American Mission with schools, orphanage and a resident doctor, a French (Dominican) Mission with schools, and also a branch of the arch- bishop of Canterbury's Mission to the Nestorian Christians who live in the mountains to the south. The climate is generally healthy, extremely cold in winter, with 2 to 3 ft. of snow from December to March, while the summer heat is not excessive. The Persian

trade of Van has declined ; European goods, with which the bazaars are fairly well supplied, come from Trebizond through Erzerum. There is a fair local trade in wheat and agricultural produce, also sheep and cattle, wool, hides and furs for export. A thick woollen cloth called shayak, coarse cotton chintzes and a kind of soap prepared from the efflorescences of the lake, with dried and salted fish, are also produced.

The cuneiform inscriptions of Van are very numerous, the town having been the capital of the Vannic kingdom of the Assyrian period. At the end of the Gardens is the rocky mass of Toprak Kale, on which was a fire temple and altar; near it is the Meker Kapusi (" Door of Mithridates "), a large inscribed slab of rock with the names of several deities. On the citadel rock are several inscriptions, the principal being a trilingual one of Xerxes on the southern face. Many other inscribed stones and tablets have been found built into modern buildings, while the excavation of a mound brought to light relics of a stone age. ,,

Van occupies the site of Dhuspas, of which the native name was Biainas (Assyrian, Urardhu), the Byana of Ptolemy and the Ivan of Cedrenus, whence the modern Van. Dhuspas, the Thospia of Ptolemy, gave its name to the district of Thospitis, the modern Thosp. The Biainian dynasty, of which Sarduris I. (c. 833 B.c.)was the first king, died out with Sarduris II., who in 645 B.C. entered into an alliance with Assur-bani-pal. Inscrip- tions of nearly all the kings exist, and the various excavations at Toprak Kale show an advanced state of civilization and great technical skill (see illustrations in Maspero's Histoire ancienne, vol. iii., Les Empires). In the 6th century B.C. Van passed into the hands of the Persians, and shortly before it fell to Alexander the Great it was rebuilt, according to Armenian historians, by a native prince called Van. In 149 B.C. Valarsaces or Vaghar- shag, the first Armenian king of the Arsacidae, rebuilt the town, and a colony of Jews was settled in it by Tigranes (94-56 B.C.). In the middle of the 4th century a.d. it was taken by Sapor (Shapur) II., and became the capital of an autonomous province of the Sassanian Empire, until it fell into the hands of the Arabs (c. 640) , under whom it regained its autonomy. About 908 the governor of Van or Vaspuragan was crowned king by the caliph Moktadir, and in 1021 his descendant Senekherim was persuaded by Basil II. to exchange his kingdom for the

viceroyalty of the Sebasteian theme. After having formed part of the possessions of the Seljuks, Mongols, Tatars and Persians, Van passed in 1514, after the defeat of Shah Ismail by Selim I. at the battle of Kal- deran, to the Osmanlis, who only occupied the town in 1543. In 1636 it was taken by the Persians, but soon recovered. In 1845 the town was held for a time by the Kurd chief Khan Mahmud, who eventually surrendered and was exiled.

(2) The vilayet of Van lies along the Persian frontier between the vilayets of Erzerum and Mosul. The northern sanjak comprises open plateau country N. and E. of the lake (with a large Armenian agricultural population and Kurdish semi-nomad tribes occupied chiefly in cattle and sheep raising), also of several fertile districts along the south shore of the lake. The southern sanjak is entirely mountainous, little developed and having the tribes only partly under government control. This comprises most of the upper basin of the Great Zab, with the country of the Nestorian Christians and many districts inhabited by Kurdish tribes, some of them large nomad tribes who descend for the winter to the plains of the Tigris.

The mineral wealth of the vilayet has never been fully explored, but is believed to be great. There are petroleum springs at Kordzot, deposits of lignite at Sivan and Nurduz, several hot springs at Zilan Deresi and Julamerk. Excellent tobacco is grown in Shems- dinan for export to Persia.

(3) Lake Van, called Arsissa Palus and also Thospitis from its Armenian names, is roughly rectangular 55 m. long and 40 broad, with a long north-eastern arm which increases the greatest length to 80 m. It stands about 5260 ft. above sea-level. It is without an outlet, and its greatest depth is along the southern shore. It has constant steady fluctuations, rising and falling some 8 ft. in a periodic movement of five years. In the middle of the 19th century a sudden rise submerged several places on

the banks, including Arjish Kale, and the waters did not again subside. The north-eastern arm is much shallower than the rest. The water is bitter and undrinkable, being largely im-pregnated with carbonate and sulphate of soda with some borax. The salts are evaporated in pans, and called perek, being sold for washing purposes. There is, however, good water along the coast from springs and streams.

The lake has been navigated from the earliest times, and about 80 sailing boats, carrying about 20 tons burden, now ply on it, chiefly with wheat and firewood. Severe storms make navigation dangerous in winter. The southern shore is fringed by a steep range of mountains, with several thriving villages along the coast. The hills have now been almost denuded of trees. At the south- eastern corner is the island of Akhtamar with its ancient church, erected (c. 928) by Gagig, first king of the Ardzrunian dynasty. The Catholicos of Akhtamar is one of the highest offices in the Armenian Church, and dates from 11 13. The small islands of Lim and Gdutz have also monasteries and churches. Large numbers of darekh, a kind of herring, exist in the lake, and are caught in nets from boats or when they enter the shallow lagoons in the spring and summer. Either fresh or salted they form an important article of diet of the poorer people.

See Sayce, " Cuneiform Inscriptions of Lake Van," in Journal of Royal Asiatic Society, vols, xiv., xx. and xxvi.; Lynch, Armenia, vol. ii. (1901); Belck and Lehmann, papers in Verhand. d. Berliner Ges. fur Anthropologie (1892-99); Zeit. fur Ethnologic (1892, 1899); Mitt. d. Geog. Ges. (Hamburg, 1898, 1899). (C. W. W.; F. R. M.)

VAN, an homonymous word, whose different meanings have no etymological connexion. In the most common sense " van " is merely an abbreviation of the Oriental word " caravan " (q.v.), and is applied to any large covered cart or vehicle used for the conveyance of goods, especially furniture, or, on railways, to a closed carriage for passengers' luggage, or for the accommodation of the guard. In the sense of the front portion of an army or fleet, or the advanced portion of any body, actually or meta- phorically, " van " represents the French avant (Lat. ab ante), in front, as in avant-garde, van-guard, the earliest form in which the word came into English. Lastly, the word is used as a variant of " fan " (Lat. vannus), for a contrivance for winnowing grain, for a bird's wing, and in mining to an appliance for separating ore by washing.

VANADINITE, a mineral consisting of lead chloro-vanadate, $(PbCl)Pb_4(VO_4)_3$, crystallizing in the hexagonal system and isomorphous with pyromorphite and mimetite (q.v.). The crystals are usually six-sided prisms terminated by the basal planes, but are sometimes modified by numerous pyramidal planes which exhibit parallel hemihedrism. Rounded crystals

and groups also occur. The colour is usually light brown or yellow, but crystals from Arizona are bright red. Owing to isomorphous replacement of the vanadium by phosphorus and arsenic, the specific gravity varies from 6-6 to 7-2; a variety containing much arsenic is called endlichite. The hardness is 3. The mineral is one of secondary formation in veins of lead ore. It was first found in Mexico, and in 1801 was asserted to contain a new element, which was called " erythronium " ; this was later proved to be identical with the subsequently discovered element vanadium. Other well- known localities are Wanlockhead in Dumfriesshire, Kappel (Eisen-Kappel), near Klagenfurt in Carinthia, Arizona and New Mexico. (L. J. S.)

VANADIUM [symbol, V; atomic weight, 51-2 (0=i6)], a metallic chemical element. It was first mentioned in 1801 by M. del Rio (Gilb. Ann., 1801, 71, p. 7), but subsequently thought by him to be an impure chromium. Later, it was examined by N. G. Sefstrom, who found it in the slags of the Taberg iron ores (Pogg. Ann., 1830, 21, p. 48), by J. J. Berzelius (ibid., 1831, 22, p. 1), and finally by Sir H. Roscoe (Trans. Roy. Soc, 1868- 1870), who showed that the supposed vanadium obtained by previous investigators was chiefly the nitride or an oxide of the element. In his researches, Roscoe showed that the atomic weight of the metal as determined by Berzelius and the formulae given to the oxides were incorrect, and pointed out that the element falls into its natural place in group V of the periodic classification along with phosphorus and arsenic, and not in the chromium group where it had originally been placed.

In small quantities, vanadium is found widely distributed.

the chief sources being vanadite, mottramite, descloizite, roscoelite, dechenite and pucherite, whilst it is also found as a constituent of various clays, iron-ores and pitchblendes. Vanadium salts may be obtained from mottramite by digesting the mineral with concentrated hydrochloric acid, the liquid being run off and the residue well washed; the acid liquid and the washings are then evaporated with ammonium chloride, when ammonium metavanadate separates. This is recrystal-lized and roasted to vanadium pentoxide, which is then sus-

pended in water into which ammonia is passed, when ammonium metavanadate is again formed and may be purified by re- crystallization. The pure metal may be obtained by reducing vanadium dichloride in hydrogen, the operation being exceed- ingly difficult (for details, see Roscoe's original papers). In a somewhat impure condition it may be obtained by the reduction of vanadium pentoxide with a mixture of the rare earth metals which are obtained by reduction of the waste oxides formed in the manufacture of thoria (Weiss and Aichel, Ann., 1904, 337 > P- 380); from the oxide by Goldschmidt's thermite method (Koppel and Kaufmann, Zeit. anorg. Chem., 1905, 45, p. 352); by electrolysis in a bath of fused fluorspar containing a steel cathode and an anode composed of carbon and vanadium pentoxide (M. Gin, L'Electricien, 1903, 25, p. 5); and by the electrolysis of vanadium trioxide when heated in an evacuated glass tube (W. v. Bolton, Zeit. f. Elektrochem., 1905, n, p. 45). H. Moissan (Comptes rendus, 1896, 122, p. 1297) obtained a vanadium containing from 10 to 16% of carbon by fusing vanadic anhydride with carbon in the electric furnace. For other methods of obtaining vanadium and its compounds, see Cowper Cowles, Engin. and Mining Journ. 67, p. 744; Her- renschmidt, Comptes rendus, 1904, 139, p. 635; M. Gin, Elektrochem. Zeit., 1906, 13, p. 119; W. Prandtl and B. Bleyer, Zeit. anorg. Chem., 1909, 64, p. 217.

Vanadium is a light-coloured metal of specific gravity 5-5. It is not volatilized even when heated to redness in a current of hydrogen, and it burns readily to the pentoxide when heated in oxygen. It dissolves slowly in hydrofluoric acid and in nitric acid, the solution turning blue; it is insoluble in hydro- chloric acid. When fused with caustic soda, hydrogen is liberated and a vanadate is formed. It precipitates platinum, gold and silver from solutions of their salts, and also reduces mercuric, cupric and ferric salts. It absorbs nitrogen when heated in a current of that gas, forming a nitride. Vanadium may be detected by converting it into the pentoxide, which on passing sulphuretted hydrogen through its acid solution becomes reduced to the dioxide, the solution at the same time becoming lavender blue in colour; or if zinc be used as a reducing agent, the solution becomes at first green and ulti- mately blue.

Five oxides of vanadium are known (cf. Nitrogen), the mono-, di- and trioxides being basic in character, the tetra- and pentoxides being acidic and also feebly basic. The monoxide, V2O, is formed when the metal is oxidized slowly in air. In a

hydrated form it is obtained by the reduction of vanadyl monochloride, VOC1, with sodium amalgam, being precipitated from the liquid by the addition of ammonia (Locke and Edwards, Zeit. anorg. Chem., 1899, 19, p. 378). The dioxide, V2O2, is formed in the reduction of vanadyl trichloride by hydrogen (Roscoe). It is a grey powder which is insoluble in water, but dissolves in acids to give a lavender-blue solution which possesses strong reducing properties. The addition of ammonia to this solution precipitates a brown hydrated oxide. The dioxide when heated in oxygen burns, forming the pentoxide. The trioxide, V2O3, is formed when the pentoxide is reduced at a red heat in a current of hydrogen, or by the action of oxalic acid on ammonium metavanadate. It forms a black amor- phous powder or a dark green crystalline mass, and is insoluble in water and in most acids. The tetroxide, V2O4, results when the pentoxide is heated with dry oxalic acid and the resulting mixture of the tri- and pentoxide is warmed in the absence of air, or when the pentoxide is reduced by sulphur dioxide. It is an amorphous or crystalline mass of indigo-blue or steel-grey colour, which is insoluble in water and is also infusible. It oxidizes slowly in moist air, and dissolves easily in acids with the formation of blue solutions. The pentoxide, V2O5, is obtained when ammonium metavanadate is strongly heated, on calcining the sulphide, or by the decomposition of vanadyl trichloride with water. According to Ditte (Comptes rendus, 101, p. 698) it exists in three forms:

a red amorphous soluble form which results when ammonium metavanadate is heated in a closed vessel and the residue oxidized with nitric acid and again heated; a yellow amorphous insoluble form which is obtained when the vanadate is heated in a current of air at 440 C. ; and a red crystalline form which is almost in- soluble in water. It is soluble in hot concentrated sulphuric acid and in concentrated hydrochloric acid. It is an energetic oxidizing agent and is consequently readily reduced when heated with various metals (zinc, magnesium, &c.), with carbon and with oxalic acid. On fusion with the caustic alkalis and alkaline carbonates it yields vanadates. It forms numerous compounds with potassium fluoride. Many complex derivatives are known, such, for example, as phos- phor-vanadates, arsenio-vanadates, tungsto-vanadates, molybdo- vanadates, &c. For the use of this oxide in the electrolytic oxida- tion and reduction of organic

compounds, see German Patents 172654 (1903) and 183022 (1905).

Many salts of oxy-acids of vanadium are known, but of the more common oxy-acids, metavanadic acid, HVO3, and pyrovanadic acid, H4V2O7, alone appear to have been isolated. Metavanadic acid is obtained in the form of yellow scales by boiling copper vanadate with an aqueous solution of sulphur dioxide. It is only very slightly soluble in water. Pyrovanadic acid is deposited as a dark brown unstable powder when an acid vanadate is decom- posed by nitric acid. Of the salts of these acids, those of the ortho- and pyro-acids are the least stable, the orthovanadates being obtained on fusion of vanadium pentoxide with an alkaline carbonate. The metavanadates are usually yellowish or colour- less solids. Ammonium metavanadate is obtained when the hydrated vanadium pentoxide is dissolved in excess of ammonia and the solution concentrated. It has been used in dyeing with aniline black. Tetra- and hexavanadates have also been de- scribed (see Ditte, Comptes rendus, 104, pp. 902, 1061 ; 102, p. 918; Manasse, Ann. 240, p. 23). The hypovanadates are insoluble in water, except those of the alkali metals, which are obtained by the addition of caustic alkalis to concentrated solutions of the chloride or sulphate of the tetroxide. They are brown in colour and easily oxidize. Pure hypovanadic acid has been obtained by G. Gain (Comptes rendus, 1906, 143, p. 823) by calcining ammonium metavanadate and saturating a solution of the resulting oxides with sulphur dioxide; the resulting blue solution (from which a sulphate of composition 2V 2 O4-3SO2-10H 2 O can be isolated) is then boiled with water, when sulphur dioxide is liberated and a pale red crystalline powder of hypovanadic acid, H4V2O5, is precipitated.

Vanadium dichloride, VCI2, is a green crystalline solid obtained when the tetrachloride is reduced with hydrogen at a dull red heat. It is very deliquescent and readily soluble in water. The trichloride, VCI3, is a deliquescent solid formed when the tetra- chloride is heated in a retort as long as chlorine is given off (Roscoe), or by heating vanadium trisulphide in a current of chlorine and fractionally distilling the resulting product at 150° C. in a current of carbon dioxide (Halberstadt, Ber., 1882, 15, p. 1619). The tetrachloride, VCI4, is formed by the direct union of vanadium and chlorine or by the action of sulphur chloride on vanadium pentoxide (Matignon, Comptes rendus, 1904, 138, p. 631). It is a fuming

liquid, which is soluble in benzene and in acetic acid; it dissolves in water to form a deep blue solution. Several oxy-chlorides have also been described. Vanadium carbide, VC, was prepared by H, Moissan (Comptes rendus, 1896, 122, p. 1297) by heating vanadium pentoxide and carbon for a few minutes in the electric furnace. It is a volatile compound which burns when heated in oxygen and which is unacted upon by sulphuric and hydrochloric acids.

For vanadium steels, see Iron and Steel Manufacture.

VAN BEEˆS, JAN (1821-1888), Belgian poet, usually called " the elder " to distinguish him from his son, Jan van Beers, the well-known painter, was born at Antwerp on the 22nd of February 1821. He was essentially a Netherlander, though politically a Belgian, expressing his thoughts in the same language as any North Netherland writer. In fact, the poems of Jan van Beers are perhaps more popular in Holland than in Belgium, and of many of them there exist more editions printed in Holland than in his political fatherland. Van Beers started life as a teacher of Dutch language and literature, first at Malines, then at Lierre, and in i860 was appointed a professor of both at the Athenaeum (high school) in Antwerp, where he had also been a sub-librarian in the communal library. Van Beers as a teacher was early in the field, with Hendrik Conscience, Willems and others, when the Flemish movement began. He composed a Dutch grammar (1852), which, in enlarged editions, still holds the field, and a volume of selections from Dutch authors, both books being so much appreciated that the Belgian government made them text-books in the public schools. Van Beers's historical poems, the principal

of which is, perhaps, Jakob Van Maerlant (Amsterdam, i860), helped the Flemish revival in Belgium as powerfully as his school-books. He is best known, however, as the writer of ballads and songs. Jongelingsdroomen (" A Young Man's Dreams ") first appeared at Antwerp and Amsterdam in 1853. These poems were followed by Levensbeelden (" Life Figures or Pictures," Amsterdam, 1858) and by Gevoel en Leven (" Feeling — Living," Amsterdam, 1861). His Rijzende Bladen ("

Rising Leaves “) first made its appearance at Ghent and Rotterdam in 1883. In the following year an edition de luxe of his poetry was published, adorned with pen-and-ink sketches by Jan van Beers the younger, and a popular edition of his collected poems was published at Ghent and Rotterdam in 1873 and 1884. Among the best known are De Blinde (“Blind”), De Zieke Jongeling (“Young and Doomed”), Bij ‘t Kerkportaal (” At the Church Porch “). Van Beers’s poetry, full of glow and pathos, simple yet forcible, is somewhat akin to that of Longfellow. Van Beers died at Antwerp on the 14th of November 1888.

VANBRUGH, SIR JOHN (1664-1726), British dramatist and architect, was born in the parish of St Nicolas Aeons in the City of London, and christened on the 24th of January 1664. His grandfather, Gillis van Brugg, of Ghent, migrated to England in the reign of James I., was naturalized, resided as a merchant and was buried in the parish of St Stephen’s Walbrook. The dramatist’s father, Giles (1631-1689), a wealthy sugar baker, who married into the Carleton family, was driven from London by the plague and settled at Chester. The mother (Elizabeth Carleton, of the Dorchester family) survived to see her son famous; she died at Claygate, near Esher, in 171 1, and was buried at Thames Ditton. After a few years at the King’s School, Chester, John at nineteen was sent to France to study the arts; after two years’ absence he returned to take up a com- mission in the regiment soon to be known as the 13th Foot. In the early autumn of 1690 Vanbrugh was arrested at Calais on a charge of espionage. The informant against him was a lady. He was imprisoned at Vincennes, but on the 1st of Feb. 1692, by a lettre de cachet, he was removed to the Bastille. On the 1 2th of November he found surety to the extent of one thousand pistoles, but was confined to the fortifications of Paris until his exchange was effected on the cartel. His enforced leisure was responsible for the first draft of the Provok’d Wife. Voltaire said in his Letlres sur les Anglais that he could not imagine what had gained such a comic writer the distinction of detention in such a grim fortress. As a matter of fact, a considerable number of English officers were arrested about this time on a similar charge, as may be seen from the Bastille archives. 1 For a time after his return he resumed his commis- sion and was known as Captain Vanbrugh.

The production of Cibber’s Love’s Last Shift at the Theatre

Royal in January 1696 kindled afresh his attachment to the comic muse. He thought it would be interesting to develop the situation upon which Cibber had rung down the curtain, and the result was The Relapse, " got, conceived and born in six weeks' space." It was given on Boxing Day 1696, with Cibber as Foppington, one of the three parts borrowed from the preced- ing comedy. The Sir Novelty Fashion of Cibber was developed in this play into Lord Foppington, who has been pronounced " the best fop ever brought upon the stage." The play has been revived in various forms: Sheridan adapted it in A Trip to Scarborough, and it inspired two modern versions in 1870 and 1890, The Man of Quality and Miss Tomboy. Aesop — produced at Drury Lane immediately after The Relapse — was an adapta- tion of Boursault's dramatic sermon on the same subject. It ran for a week only, but the success of The Relapse was so triumphant that Montague, afterwards Lord Halifax, asked at once for the Provok'd Wife for the theatre in Lincoln's Inn Fields, and it was produced at that theatre in May 1697. All that could be said in answer to those who condemned it on account of its Unblushing libertinism was that Sir John Brute is sufficiently

1 Ravaisson ; and Funck-Brentano, Liste des prisonniers de la Bastille.

brutal to drive any woman into rebellion, and that since the glorious days of the Restoration a wife's rebellion and a wife's adultery were synonymous terms. The play was a complete triumph, and Brute was one of Garrick's great parts. Vanbrugh was fiercely attacked by Jeremy Collier for immorality in 1698, and wrote nothing more for the stage until 1700, when an adaptation of the Pilgrim of Beaumont and Fletcher was pro- duced at Drury Lane. In this play, in the part of Alinda, Anne Oldfield scored her first success. Two years later appeared The False Friend, a version of Le Sage's Traitre puni. Other adaptations from the French were A Country House, from Dancourt's Maison de campagne; Confederacy (1705), from the same author's Bourgeoises a la mode; Squire Trelooby (1704), a version of Moliere's Monsieur de Pourceaugnac ; and The Mis- take (1705), from Moliere's Depit amoureux.

Collier's attack and the resulting movement must have been responsible in part for " Van " turning his attention to architecture. The demand for splendid country seats in the new Palladian style was steadily increasing, and his reputation as a

modern wit was an introduction in itself. In 1702 he was entered as comptroller of the Royal Works (now the Board of Works, where several of his designs may still be seen). In 1703 he wrote to ask his friend Jacob Tonson to procure him a " Palladio," and in the same year he was a commissioner at Greenwich, where the secretary William Vanbrugh was a kinsman of his own, whom Evelyn had appointed at his request. In the meantime, Vanbrugh had been appointed architect to the earl of Carlisle, and the result, completed in 17 14, was the Corinthian mansion of Castle Howard. The work is an extension of the Palladian plan introduced by Inigo Jones, with the addition of immense corridors in segmental colonnades leading from the main entrance to the wing blocks. From a scenic artist's point of view, it is a magnificent (and certainly his best) piece of work. The earl, then deputy earl-marshal, testified his satis- faction by procuring for Vanbrugh a high place in the College of Arms. In March 1704 he was actually promoted Clarenceux, though he not only knew nothing of heraldry but had openly ridiculed that grave science in Aesop. The indignant college protested in vain, and the architect stuck to his place. His next work was to prepare designs for Kneller Hall near Hounslow. But the success of Castle Howard now caused him to entertain the rash project of building a theatre in the Haymarket, from his own design, for the acting of his own plays. The joyous courage with which, having persuaded thirty people in the fashionable world to aid him in finding the money, and Congreve to aid him in finding the plays, he began to build in perfect un- consciousness of the danger before him, is the only passage in his life which may be called pathetic, save of course his struggle with the " wicked woman of Marlborough." The magnitude of Vanbrugh's architectural ideas grew as the work went on, and with the ideas the structure grew till a theatre meant for the delicate bijouterie work of polite comedy seemed growing to the proportions of the Roman Colosseum. Whether Congreve en- deavoured to put a check upon his friend's architectural and authorial fervour does not appear. But it must be remembered that not only Vanbrugh's plays but his own were to be acted there, and that, although Congreve was a man of great sagacity, no man, not even he who pretended to set his gentility above his genius, is sagacious when confronted by the surpassing excellence of his own poems and plays. When at length the time came to test the acoustics of the pile, it was found to be sadly defective. What changes were made to rectify the errors of structure docs not

appear. The theatre was opened to the public with an Italian opera, which was followed by three of Moliere's comedies, and these by the Confederacy, Vanbrugh's masterpiece on the whole, though perhaps its finest scenes are not equal to the finest scenes in The Relapse.

Vanbrugh at last withdrew from the disastrous speculation; Congreve had already withdrawn. But a man to whom Fortune had been so kind as she had been to Vanbrugh could hardly be depressed by any of her passing frowns. Queen Anne at once sent him abroad on an important state errand, and afterwards

he was commissioned to build Blenheim. Upon the merits and demerits of this famous " hollowed quarry " there has been much conflict of opinion. As to the sarcasms by Swift, Walpole, Evans, and the rest, they are as nothing when set against Sir Joshua Reynolds's defence of Vanbrugh and his style. Blenheim Palace is probably the largest domestic building in England, and consists of three blocks, the centre containing the private living rooms, one wing the stables, and the other the kitchens and storehouses. It is planned on a colossal scale. Vanbrugh considered a building and the parts of a building as simply so much material for effect, without regard to their reasonable use and the necessary limitations of design. Thus he would support his main block by subordinate groups without considering for a moment the inconvenience that might be caused by the kitchen being removed by four hundred yards from the dining-room. Personal comfort was sacrificed to perspective. Windows were to adorn the elevation, not to light the interior; and, as Vol- taire said, if the rooms had only been as wide as the walls were thick, the chateau would have been convenient enough. After Blenheim and Castle Howard, his next largest palace was prob-; ably Fleurs, near Kelso. His plans were only suitable to the largest kind of palace. Blenheim, however, was a source of great sorrow to the kindly dramatist. Though parliament had voted for the building of it, no provision had been made for the supplies. The queen while she lived paid them, and then Van- brugh was left to the meanness of the duke of Marlborough, and afterwards to the insolence of the " wicked woman," who did her best to embitter his life. Besides Castle Howard and Blenheim, he built many

other country mansions, such as Grimsthorpe and Duncombe Hall in Yorkshire, Eastbury in Dorsetshire, Seaton-Delaval in Northumberland, King's Weston near Bristol, Oulton Hall in Cheshire, old. Claremont House at Esher, old Eaton Hall, Iver Grove, Bucks. He also restored Kimbolton Castle for the earl of Manchester. In 1716 he became architect to Greenwich Hospital.

In January 1719 Vanbrugh married Henrietta Maria, daughter of Colonel Yarborough of Heslington, and four years afterwards, at the accession of George I., he was knighted. He afterwards wrote again for the stage, and the unfinished fragment of the Journey to London (completed by Cibber as The Provok'd Husband in 1728) shows that his powers remained to the last as fine as ever. His married life was mostly spent at Blackheath, very probably in " Bastile House " on Maze Hill, repaired in 1904 and now known as Vanbrugh Castle. His wife died there at a great age in 1776, but " Van " himself died on the 26th of March 1726 in his modest town house, built in 1703 out of the ruins of Whitehall and satirized by Swift as the " goose pie." The site is occupied to-day by the War Office. The famous epitaph, " Lie heavy on him, earth," is attributed to Abel Evans. The best portrait of the dramatist is the kit- cat by Kneller.

Vanbrugh's works were edited in 2 vols., 1893, by W. C. Ward (portraits). Select Plays were issued in the Mermaid Series (ed. A. E. H. Swaen) in 1896. See G. H. Lovegrove's Life, Works and Influence of Sir John Vanbrugh (1902), Max Dametz' sVanbrughs Leben und Werke (1898), and Swift's Works (Bohn), xii. 80 sq. ; (T. Se.)

VAN BUREN, MARTIN (1782-1862), eighth president of the United States, was born at Kinderhook, New York, on the 5th of December 1782, of Dutch descent. His father was a farmer and tavern-keeper. His education was limited to that which could be obtained in the common schools and at Kinderhook Academy, and there is testimony to the effect that as late as 1829, when he became secretary of state, he wrote crudely and incorrectly. In 1796 he began the study of law, completing his preparation in 1802 at New York, where he studied under William Peter Van Ness (1778-1826), an eminent lawyer and later Aaron Burr's second in the duel with Alexander Hamilton. Van Buren made the acquaintance of Burr, but did not fall under his influence. In 1803 he was admitted to the

bar and continued in active and successful practice for twenty-five years. His practice made him financially independent, and paved the way for his entrance into politics. New York politics after 1800, the year of the election of Jefferson and the down-

fall of the Federalists, were peculiarly bitter and personal. The Republicans were divided into three factions, followers respectively of George Clinton (and later of his nephew, De Witt Clinton), Robert R. Livingston and Aaron Burr; and such Federalist control as there was from time to time after 1799 depended upon coalition with one or other of these groups. Van Buren, who early allied himself with the Clintonians, was surrogate of Columbia county from 1808 until 1813, when he was removed. In 1812 he entered the state Senate, and he also became a member of the court for the correction of errors, the highest court in New York until 1847.

His career in the Senate covered two terms (1812-1820). In 1815 he became attorney-general, an office which he held, still as a member of the Senate, until 1819, when he was displaced to make room for a Federalist. He had already, in 1808, removed from Kinderhook to Hudson, and in 1816 he took up his residence in Albany, where he continued to reside until he entered Jackson's cabinet in 1829. As a member of the state Senate he supported the War of 181 2 and drew up a classification act for the enrol- ment of volunteers. He was chosen to draft the resolution of thanks voted by the legislature to General Andrew Jackson after the battle of New Orleans. He broke with De Witt Clinton in 1813, but nevertheless favoured, in 1817, Clinton's plan for the Erie Canal. His attitude towards slavery at the moment was shown by his vote, in January 1820, for a resolu- tion opposing the admission of Missouri as a slave state. In the same year he was chosen a presidential elector. It is at this point that Van Buren's connexion began with so-called "machine politics," a connexion which has made his name odious to some historians of the period. He was a leading member of the " Albany regency," a group of politicians who for more than a generation controlled the politics of New York and powerfully influenced those of the nation, and which did more than any other agency to make the " spoils system " a recognized procedure in national, state and local affairs. Van Buren did not originate the system, for it was already well developed when he entered public life; but the nickname of " Little Magician " which presently attached to him testifies to the skill

with which he exploited it, and to the popular im- pression which his political methods produced.

In February 1821 he was elected to the United States Senate. Before taking his seat he served also as a member of the state constitutional convention, where he opposed the grant of universal suffrage. His course in the Senate was not altogether consistent, though in this respect he is not to be judged more harshly than some of his associates. He at first favoured internal improvements, and in 1824 proposed a constitutional amendment to authorize such undertakings, but the next year took ground against them. He voted for the tariff of 1824, then gradually abandoned the protectionist position. In the presidential election of 1824 he appeared as a strong sup- porter of William H. Crawford, and received the electoral vote of Georgia for vice-president; but he shrewdly kept out of the acrimonious controversy which followed the choice of John Quincy Adams. He early recognized the availability of Andrew Jackson, however, as a presidential candidate, and after the election sought to bring the Crawford and Jackson followers together, at the same time strengthening Iris control as a party leader in the Senate. Always notably courteous in his treatment of opponents, he showed no bitterness either towards J. Q. Adams or Henry Clay, and voted for Clay's con- firmation as secretary of state notwithstanding the "corrupt bargain " charge; at the same time he opposed internal im- provements and declined to support the proposal for a Panama Congress. As chairman of the judiciary committee, he brought forward a number of measures for the improvement of judicial procedure, and in May 1826 joined with Benton in presenting a report on executive patronage. In the debate on the " tariff of abominations " in 1828 he took no part, but voted for the measure in obedience to instructions from the New York legis- lature— an action which was cited against him as late as the presidential campaign of 1844. Van Buren was not an orator,

but his more important speeches show careful preparation and his opinions carried weight; and the oft-repeated charge that he refrained from declaring himself on crucial questions is hardly borne out by an examination of his senatorial career. In February 1827 he was re-elected to the Senate by a large

majority. He was now one of the recognized managers of the Jackson campaign, and a tour of Virginia, the Carolinas and Georgia in the spring of 1827 won support for Jackson from Crawford.

In 1828 Van Buren was elected governor of New York for the term beginning on the 1st of January 1829, and resigned his seat in the Senate. But on the 5th of March he was appointed by President Jackson secretary of state, an office which probably had been assured to him before the election, and he resigned the governorship. As secretary of state he took care to keep on good terms with the " kitchen cabinet," the group of politicians who acted as Jackson's advisers, and won the lasting regard of Jackson by his courtesies to Mrs John H. Eaton, wife of the secretary of war, with whom the wives of the cabinet officers had refused to associate. He did not oppose Jackson in the matter of removals from office, but was not himself an active " spoilsman," and protested strongly against the appoint- ment of Samuel Swartwout (1 783-1856), who was later a de- faulter to a large amount as collector of the port of New York. He skilfully avoided entanglement in the Jackson-Calhoun imbroglio. No diplomatic questions of the first magnitude arose during his service as secretary of state, but the settlement of long-standing claims against France was prepared for, and trade with the British West India colonies was opened. In the controversy with the Bank of the United States he sided with Jackson. After the breach between Jackson and Calhoun, Van Buren was clearly the most prominent candidate for the vice-presidency. Jackson in December 1829 had already made known his own wish that Van Buren should receive the nomina- tion. In April 1831 Van Buren resigned, though he did not leave office until June. In August he was appointed minister to England, and arrived in London in September. He was cordially received, but in February learned that his nomination had been rejected by the Senate on the 25th, of January. The rejection, ostensibly attributed in large part to Van Buren's instructions to Louis McLane, the American minister to England, regarding the opening of the West India trade, in which refer- ence had been made to the results of the election of 1828, was in fact the work of Calhoun, the vice-president; and when the vote was taken enough of the majority refrained from voting to produce a tie and give Calhoun his longed-for " vengeance," No greater impetus than this could have been given to Van Buren's

candidacy for the vice-presidency. After a brief tour on the Continent he reached New York on the 5th of July. In May the Democratic convention, the first held by that party, had nominated him for vice-president on the Jackson ticket, notwithstanding the strong opposition to him which existed in many states. No platform was adopted, the widespread popularity of Jackson being relied upon to win success at the polls. His declarations during the campaign were vague regarding the tariff and unfavourable to the United States Bank anc 1 ro nullification, but he had already somewhat placated the South, hy denying the right of Congress to abolish slavery in the District of Columbia without the consent of the slave states. In the election he received 189 electoral votes, while Jackson received 219 for President. Jackson now determined to make Van Buren president in 1836, and bent all his energies to that end. In May 1835 Van Buren was unanimously nominated by the Democratic convention at Baltimore. He expressed himself plainly during the canvass on the questions of slavery and the bank, at the same time voting, perhaps with a touch of bravado, for a bill offered in 1836 to subject abolition literature in the mails to the laws of the several states. Calhoun, bitterly hostile to the last, objected to the usual vote of thanks to the retiring vice-president, but withdrew his objection. In the election Van Buren received 170 electoral votes against 73 for William Henry Harrison, his principal opponent; but

the popular vote showed a plurality of less than 25,000 in- a total vote of about 1,500,060. The election was in fact a victory for Jackson rather than for Van Buren.

The details of Van Buren's administration belong to the history of the United States (see United States). He announced his intention "to follow in the footsteps of his illustrious pre-decessor," took over all but one of Jackson's cabinet, and met with statesmanlike firmness the commercial crisis of 1837, already prepared for before he took office. No exhibition of ability or courage, however, nor yet the most skilful manipulation of the political machinery of the party, could prevent continued hostility to him and to the methods for which he was widely believed to stand. The state elections of 1837 and 1838 were disastrous for the Democrats, and the partial recovery in 1839 was offset by a second commercial crisis in that year. Nevertheless, Van Buren was unanimously renominated by the Democrats in 1840. Charged with being "a

Northern man with Southern principles," he was frequently interrogated during the campaign, and his nomination obviously failed to arouse enthusiasm or even inspire confidence. The revolt against Democratic rule was undoubtedly serious, but a study of the popular vote shows that the election of Harrison, the Whig candidate, was less of a revolution than many affected to think. On the expiration of his term Van Buren retired to his estate at Kinderhook, but he did not with- draw from politics or cease to be a figure of national importance. It was even proposed to make him a member of the Federal Supreme Court in order to get him out of political life. He con- fidently expected to be nominated for president in 1844, and his famous letter of the 27th of April, in which he frankly opposed the immediate annexation of Texas, though doubtless contribut- ing greatly to his defeat, was not made public until he felt practi- cally sure of the nomination. In the Democratic convention, though he had a majority of the votes, he did not have the two- thirds which the rule of the convention required, and after eight ballots his name was withdrawn. In 1848 he was again nomi- nated, first by the " Barnburner " faction of the Democrats, then by the Free Soilers, with whom the " Barnburners " coalesced, but no electoral vote was won by the party. In the election of i860 he voted for the fusion ticket in New York which was opposed to Abraham Lincoln, but he could not approve of President Buchanan's course in dealing with secession, and later supported Lincoln. He died in Kinderhook on the 24th of July 1862. His memoirs, to 1834, remain unpublished, but an Inquiry into the Origin and Course of Political Parties in the United States Was compiled from it by his sons and published in 1867. Van Buren married in 1807 Hannah Hoes (1782-1819), by whom he had four sons.

Van Buren's son Abraham (1807-1873) graduated at West Point in 1827, served under General Winfield Scott against the Seminole Indians in 1836, and was made captain of the First Dragoons. In 1837 he resigned from the army to become his father's private secretary, but in 1846, at the outbreak of the war with Mexico, he was reappointed with the rank of major and paymaster. In August 1847 he was breveted lieutenant-colonel for gallant arid meritorious conduct at Contreras and Churubusco. In 1854 he retired to private life. Another son, John (1810-1866), graduated at Yale in 1828, was admitted to the bar at Albany in 1830 and was attorney-general of New

York in 1845-1846. He was popularly known as " Prince John " because of his manners and appearance.

The best biography of Van Buren is by Edward M. Shepard, in the " American Statesmen Series " (revised ed., Boston, 1899), The Life by George Bancroft (New York, 1889) is highly eulogistic. Von Hoist's United States, MacDonald's Jacksonian Democracy, Garrison's Westward Extension and T. C. Smith's Parties and Slavery (the last three in the " American Nation Series ") give much attention to Van Buren's public career. The Van Buren manu- scripts are in the Library of Congress. (W. MacD.)*

VANCE, ZEBULON BAIRD (1830-1894), American political leader, was born in Buncombe county, North Carolina, on the 13th of May 1830. He was educated at Washington College, at Salem, Tennessee, and the university of North Carolina (1851-52). Entering politics as a Whig, he was elected solicitor

of Buncombe county (1852) and a member of the state House of Commons (1854), and served in the national House of Repreˆ sentatives from December 1858 until the 3rd of March 1861. As captain of a company in the 14th and as colonel of the 26th North Carolina regiments, he took part in the Virginia campaigns of 1861-62. From 1862 until the close of the war he was governor of the state, and from the 20th of May to the 5th of July 1S65, when he was released on parole, was held as a prisoner by the United States authorities in Washington. Having been elected to the United States Senate in 1870 and been refused admission because his disabilities — due to his participation in the war — had not been removed, he took the lead in the fight against " carpet-bag " misrule and was chosen governor in the political revolution of 1876, serving in 1877-79. He was again elected to the Senate in 1878 and was re-elected in 1884 and 1890, serving from March 1879 until his death. Senator Vance was a typical Southern Whig. He disliked ■ slavery and he hated secession. In common with other Whigs, he was forced to remain in the Democratic party after the war by the fear of negro domination. He died at Asheville, North Carolina, on the 1 4th of April 1 894.

See the Life by Clement Dowd (Charlotte, N.C., 1897).

VANCOUVER, GEORGE (c. 1758-1798), English navigator, was born in 1758. He entered the navy at the age of thirteen, and accompanied James Cook in his second (1772-74) and third (1776-80) voyages of discovery. After serving for several years in the West Indies, both under Rodney (his commander in the action of the 12th of April 1782) and under Alan Gardner (1786-89), Vancouver, on Gardner's recommendation, was appointed to command an expedition to the north-west coast of America, to take over from the Spaniards the territory they had seized (and, subsequently relinquished) in that region, to explore the coast from 30° N. round to Cook's River (or Inlet), to search for an eastward passage to the great lakes, and to ascertain the true character of Juan de Fuca Strait. Vancouver, accompanied by Lieutenant Broughton, left Fal- mouth on the 1st of April r79i and proceeded by way of the Cape of Good Hope to Australia, where he carefully surveyed part of the south-west coast, especially King George's Sound, whose value as a harbour he pointed out. He next made for Dusky Bay, New Zealand (which he was the first properly to explore), and thence sailing north-east, discovered Oparo Islet (27° 36′ S.; 144° 12′ W.), and on the 30th of December reached Tahiti, where he was again joined by Broughton, who mean- while had discovered Chatham Island. After staying about three weeks at Tahiti and several weeks at the Hawaiian Islands, Vancouver on the 18th of April 1792 sighted the west coast of North America (California, then known as New Albion) in 39 27′ N. He examined the coast up to 52° 18′ N. with minute care, surveying all inlets, discovering the Gulf of Georgia, and circumnavigating Vancouver Island (named after him). After another visit (February-March 1793) to the Hawaiian Islands, in whose races and affairs he took great interest, Vancouver resumed his exploration of the American coast in April, sur- veying north to 56° N., and south (past the Spanish Cali- fornian settlements) to 35° N. During a fresh stay at the Hawaiian Islands (January-March 1794) Vancouver accepted their submission to Great Britain, but his annexation seems never to have been officially ratified. Quitting the group again in March 1794, Vancouver sailed, by Chernigov Island and Kodiak Island, to Cook's Inlet, which was now proved to be no river. After a fresh survey of much of the coast north of San Francisco, Vancouver set out homewards via Cape Horn and St

Helena in October 1794. On the way he made a careful examination of Cape St Lucas, the southern point of Lower California, the Galapagos Islands and some other points. He reached the mouth of the Shannon on the 13th of September 1795 (the Thames on the 20th of October), and immediately set about the preparation of his narrative; but he died at Peters- ham in Surrey on the 10th of May 1798, before he had com- pleted his task. His brother John, assisted by Captain Puget, published the complete record in 1 798.

See A Voyage of Discovery to the North Pacific Ocean and round the World . . . in 1790-5 . . . under Captain George Vancouver, 3 vols. (1798), with an atlas of maps and plates.

VANCOUVER, a city and the county-seat of Clarke county, Washington, U.S.A., on the Columbia river about 100 m. from its mouth, about 5 m. E. of its confluence with the Willamette, and 8 m. N. of Portland, Oregon. Pop. (1890) 3545; (1900) 3126 (547 foreign-born); (1910) 9300. It is served by the Northern Pacific, the Great Northern, the Oregon & Washington, and the Spokane, Portland & Seattle railways, and by steamship lines, being accessible to sea-going vessels; a ferry connects with the Portland Electric railway. The city is the seat of St James College (Roman Catholic; 1856) and of the state school for defective youth (1886). Vancouver Barracks, east of the city, is an important U.S. military post (established in 1849) and the headquarters of the Military Department of the Columbia (including Washington, Oregon, Idaho, except the part in Yellowstone Park, and Alaska) ; the military reservation includes some 640 acres. The post commands an excellent view of the Columbia, and of the mountain peaks, Mt Hood, Three Sisters, Jefferson and St Helens. The city has a public library and a public park, and there is a U.S. Land Office here. Vancouver lies in a region of extensive forests and of fruit- growing and farming lands; among its manufactures are lumber products, barrels, condensed milk, flour, beer and canned fruit. It was a post of the Hudson's Bay Company in 1828-1846, and was protected by a large stockade, to which settlers fled for protection when attacked by the Indians. It was made the county-seat in 1854, was incorporated as a village in 1858 and was chartered as a city in 1889.

VANCOUVER, a city and port in the province of British Columbia, Canada, on the southern side of Burrard Inlet. Pop.

(1906) about 45,000. It is the western terminus of the Canadian Pacific railway. The harbour of Vancouver is one of the finest natural harbours in the world. The city is the largest in British Columbia, and is the chief Canadian shipping port for Japan, China, Australia and the islands at which the C.P.R. mail steamers call. There are regular lines of steamers running between Vancouver and Alaska and the points of connexion with the Yukon territory, as well as lines to Puget Sound and San Francisco in the United States. The port also has regular and frequent communication by steamer with Victoria, and is the headquarters of an extensive coasting trade. In 1886, soon after its establishment, a fire swept the whole town out of existence, but the inferior wooden buildings at first erected have been largely replaced by stone and brick structures, giving a handsome appearance to the principal streets. Vancouver has well-paved streets and is well supplied with water, electric lighting, electric cars and all the improvements of a modern city. Stanley Park, a large reserve of 900 acres, is one of the principal pleasure resorts. There is also fine sea-bathing at English Bay on the outskirts of the city. The " McGill University College of British Columbia " at Vancouver is one of the colleges of McGill University (Montreal). There are a sugar refinery and cooperage works, as well as large sawmills, shingle factories and many other industrial concerns. A large wholesale trade is carried on with all the settlements of the province. Vancouver is the centre of the important timber industry of B ritish Columbia.

VANCOUVER ISLAND, the largest of an archipelago of innumerable islands which fringes the Pacific coast of Canada, being at the Same time the largest island on the west coast of North America. It forms part of British Columbia. It extends from 48° 20′ to 5i°N. and from 123 to i28°3o' W., and is thus 285 m. long and from 40 to 80 m. wide, with an area of about 20,000 sq. m., being nearly the size of Nova Scotia, which occupies a corresponding position on the Atlantic coast. It is bounded on the south by the Strait of Juan de Fuca, and is separated from the mainland of the province by the Strait of Georgia and Queen Charlotte Sound. A partially submerged range of mountains, which has been termed the Vancouver Range, runs parallel to the coast of British Columbia; a portion of this range

forms Vancouver Island, and it again rises above the level of the sea farther north, forming the Queen Charlotte Islands. The coast line is generally precipitous. The west coast is much broken by bays and inlets — the transverse valleys of the sunken j range — which penetrate far inland. Among these may be men I tioned the Alberni Canal, which is 20 m. long with a fine harbour at its head, the width of the inlet varying from a half to one mile; Nootka Sound, 6 m. wide, and sending three arms inland which are from 40 to 160 fathoms deep, as well as Clayoquot, Esperanza, Kyuquot and Quatsino Sounds, which also penetrate deeply into the island. The general height of the mountain-range on Vancouver Island is from 2000 to 3000 ft.; some peaks are 6000 ft.; and Victoria Peak is 7484 ft. high. The island is composed largely of crystalline and metamorphie rocks, but contains some cretaceous areas which hold extensive beds of coal, especially on the east coast. These are mined at Nanaimo, Ladysmith and other points. The island is covered everywhere with an exceedingly dense forest, which makes its interior very difficult to traverse, so that there are still portions of the island which have not been thoroughly explored. These forests yield immense supplies of magnificent timber, which together with the coal-field and fisheries constitute the chief resources of the island. There are some level tracts on the south-east coast, as well as in the narrow, well-watered valleys of the interior, which afford excellent agricultural land on which cereals of all kinds, as well as all the fruits of the temperate zone, flourish, and which are also suitable for raising sheep and Cattle. The climate of Vancouver Island, especially in the south, is wonder- fully mild for the latitude— as mild as that of Great Britain, with dryer summers. The mean temperature of December at Victoria in the south of the island is about 41 Fahr.; while that of July is about 60°. In the north and west the rainfall is greater than on the south and east coasts. (F. D. A.)

VANDALS (Lat. Vandili or Vandilii), a term used by early writers only as a collective designation for a group of Teutonic tribes including, according to Pliny, the Burgundians and the Goths. As a tribal name Vandali occurs first in connexion with the Marcomannic War. The people to whom the name is there applied seem to be identical with those formerly known as Lugti. Another tribe called Silingae by Ptolemy likewise appears among the Vandals at a later time. Both these tribes

appear to have inhabited the upper part of the basin of the Oder, and the name of the Silingae is preserved in Silesia. The Vandals figure in the earliest legends both of the Goths and the Lombards, both of whom they are said to have encountered unsuccessfully. They first came into contact with the Romans during the Marcomannic War. In the time of Aurelian they invaded Pannonia, and during the reign of Probus we find them fighting in Dacia. In the time of Constantine I., according to Jordanes, they suffered a great defeat at the hands of Geberich, ' king of the Goths, their own king Visimar being killed, and the survivors were allowed by the Romans to settle in Pannonia. Here they seem to have remained in subjection to the Romans for about sixty years. In the year 406 they moved westward, according to some writers at the instigation of Stilicho, who is himself said to have been of Vandal origin, and crossing the Rhine at Mainz proceeded towards Gaul. A portion of the nation is, however, said to have remained behind, and Procopius tells a story that these remnants sent an embassy to Gaiseric, asking that their kinsfolk in Ai rica should renounce their claims to the lands which their forefathers had held in the old homes of the race. (F.G.M.B.)

In Gaul the Vandals fought a great battle with the Franks, in which they were defeated with the loss of 2000 men, and their king Godegisel was slain. In 409 his son Gunderic led them across the Pyrenees. They appear to have settled in Spain in two detachments. One, the Asdingian Vandals, occupied Galicia, the other, the Silingian, Andalusia. Twenty years of bloody and purposeless warfare with the armies of the empire and with their fellow-barbarians, the Goths and the Suevi, followed. The Silingian Vandals were well-nigh exterminated, but their Asdingian brethren (with whom were now associated

the remains of a Turanian people, the Alani, who had been utterly defeated by the Goths) marched across Spain and took possession of Andalusia.

In 428 or 429 the whole nation set sail for Africa, upon an invitation received by their king from Bonifacius, count of Africa, who had fallen into disgrace with the court of Ravenna. Gunderic -was now dead, and supreme power was in the hands of his bastard brother, Who is generally known in history as Genseric, though the more correct form of his name is Gaiseric. This man, short of stature and with limping gait, but with a great natural capacity for war and dominion, reckless of

human life and unrestrained by conscience or pity, was for fifty years the hero of the Vandal race and the terror of Constantinople and Rome. Probably in the month of May 428 he assembled all his people on the shore of Andalusia, and numbering the males among them from the greybeard down to the newborn infant found them to amount to 80,000 souls. The passage was effected in the ships of Bonifacius, who, however, soon returning to his old loyalty, besought his new allies to depart from Africa. They, of course, refused, and Bonifacius turned against them, too late, however, to repair the mischief which he had caused. Notwithstanding his opposition, the progress of the Vandals was rapid, and by May 430 only three cities of Roman Africa — Carthage, Hippo and Cirta — remained untaken. The long siege of Hippo (May 430 to July 43 1) , memorable for the last illness and death of St Augustine, which occurred during its progress, ended unsuccessfully for the Vandals. At length (30th January 435) peace was made between the emperor Valentinian III. and Gaiseric. The emperor was to retain Carthage and the small but rich proconsular province in which it was situated, while Hippo and the other six provinces of Africa were abandoned to the Vandal. Gaiseric observed this treaty no longer than suited his purpose. On the 19th of October 439, without any declaration of war, he suddenly attacked Carthage and took it. The Vandal occupation of this great city, the third among the cities of the Roman empire, lasted for ninety -four years. Gaiseric seems to have counted the years of his sovereignty from the date of its capture. Though most of the remaining years of Gaiseric's life were passed in war, plunder rather than territorial conquest seems to have been the object of his expeditions. He made, in fact, of Carthage a pirate's stronghold, whence he issued forth, like the Barbary pirates of a later day, to attack, as he himself said, "the dwellings of the men with whom God is angry," leaving the question who those men might be to the decision of the elements. Almost alone among the Teutonic invaders of the empire he set himself to form a powerful fleet, and was probably for thirty years the leading maritime power in the Mediterranean. Gaiseric's celebrated expedition against Rome (455), undertaken in response to the call of Eudoxia, widow of Valentinian, was only the greatest of his marauding exploits. He took the city without difficulty, and for fourteen days, in a calm and business-like manner, emptied it of all its movable wealth. The sacred vessels of the Jewish temple, brought to Rome by Titus,

are said to have been among the spoils carried to Carthage by the conqueror. Eudoxia and her two daughters were also carried into captivity. One of the princesses, Eudocia, was married to Hunneric, eldest son of Gaiseric; her mother and sister, after long and tedious negotia- tions, were sent to Constantinople.

There does not seem to be in the story of the capture of Rome by the Vandals any justification for the charge of wilful and object- less destruction of public buildings which is implied in the word " vandalism." It is probable that this charge grew out of the fierce persecution which was carried on by Gaiseric and his son against the Catholic Christians, and which is the darkest stain on their characters. This persecution is described with great vividness, and no doubt with some exaggeration, by the nearly contemporary Victor Vitensis. Churches were burned; bishops and priests were forced by cruel and revolting tortures to reveal the hiding-places of the sacred vessels; the rich provincials who were employed about the court, and who still adhered to the Catholic faith, were racked and beaten, and put to death. The

bishops were almost universally banished, and the congregations were forbidden to elect their successors, so that the greater part of the churches of Africa remained " widowed " for a whole generation. In 476, at the very close of Gaiseric's life, by a treaty concluded with the Eastern emperor, the bishops were permitted to return. There was then a short lull in the perse- cution; but on the death of Gaiseric (477) and the accession of Hunneric it broke out again with greater violence than ever, the ferocity of Hunneric being more thoroughly stupid and brutal than the calculating cruelty of his father.

On the death of Hunneric (484) he was succeeded by his cousin Gunthamund, Gaiseric having established seniority among his own descendants as the law of succession to his throne. Guntha- mund (484-96) and his brother Thrasamund (406-523), though Arians, abated some of the rigour of the persecution, and main- tained the external credit of the monarchy. Internally, however, it was rapidly declining, the once chaste and hardy Vandals being demoralized by the fervid

climate of Africa and the sinful delights of their new capital, and falling ever lower into sloth, effeminacy and vice. On the death of Thrasamund, Hilderic (523-31), the son of Hunneric and Eudocia, at length succeeded to the throne. He adhered to the creed of his mother rather than to that of his father; and, in spite of a solemn oath sworn to his predecessor that he would not restore the Catholic churches to their owners, he at once proceeded to do so and to recall the bishops. Hilderic, elderly, Catholic and timid, was very un- popular with his subjects, and after a reign of eight years he was thrust into prison by his warlike cousin Gelimer (53 1-34) .

The wrongs of Hilderic, a Catholic, and with the blood of Theodosius in his veins, afforded to Justinian a long-coveted pretext for overthrowing the Vandal dominion, the latent weakness of which was probably known to the statesmen of Con- stantinople. A great expedition under the command of Belis- arius (in whose train was the historian Procopius) sailed from the Bosporus in June 533, and after touching at Catana in Sicily finally reached Africa in the beginning of September. Gelimer, who was strangely ignorant of the plans of Justinian, had sent his brother Tzazo with some of his best troops to quell a rebellion in Sardinia (that island as well as the Balearic Isles forming part of the Vandal dominions), and the landing of Belisarius was entirely unopposed. He marched rapidly towards Carthage and on the 13th of September was confronted by Gelimer at Ad Decimum, 10 m. from Carthage. The battle did not reflect any great credit either on Byzantine or Vandal generalship. It was in fact a series of blunders on both sides, but Belisarius made the fewest and victory remained with him. On the 14th of September 533 the imperial general entered Carthage and ate the feast prepared in Gelimer's palace for its lord. Belisarius, however, was too late to save the life of Hilderic, who had been slain by his rival's orders as soon as the news came of the landing of the imperial army. Still Gelimer with many of the Vandal warriors was at liberty. On the return of Tzazo from Sardinia a force was collected considerably larger than the imperial army, and Gelimer met Belisarius in battle at a place about 20 m. from Carthage, called Tricamarum (December 533). This battle was far more stubbornly con- tested than that of Ad Decimum, but it ended in the utter rout of the Vandals and the flight of Gelimer. He took refuge in a mountain fortress called Pappua on the Numidian frontier, and there, after enduring great

hardships in the squalid dwellings of the Moors, surrendered to his pursuers in March 534. The well-known stories of his laughter when he was introduced to Belisarius, and his chant, " Vanitas vanitatum," when he walked before the triumphal car of his conqueror through the streets of Constantinople, probably point to an intellect dis- ordered by his reverses and hardships. The Vandals who were carried captive to Constantinople were enlisted in five squadrons of cavalry and sent to serve against the Parthians under the title " Justiniani Vandali." Four hundred escaped to Africa and took part in a mutiny of the imperial troops, which was with difficulty quelled by Belisarius (536). After this the Vandals disappear from history. The overthrow of their kingdom

undoubtedly rendered easier the spread of Saracen conquest along the northern shore of Africa in the following century. In this as in many other fields Justinian sowed that Mahomet might reap. (T. H.)

See Pliny, Natural History, iv. 99; Tacitus, Germania, cc. 2, 43; Ptolemy, ii. c. 11, §§ 18 ff.; Julius Capitolinus, De Bello Marco- mannico, 17; Vopiscus, Probus, 18; Dexippus, Excerpta, pp. 19 ff. (Bonn); and Jordanes, 4, 16, 22; Procopius, De Bello Vandalico, a first-rate authority for contemporary events, must be used with caution for the history of the two or three generations before his time. The chroniclers Idatius, Prosper and Victor Tunnunensis supply some facts, and for the persecution of the Catholics Victor Vitensis and the Vita Augustini of Posidius may be consulted. See also E Gibbon, Decline and Fall, chaps, xxxiii. and xli. ; Papencordt, Geschichte der vandalischen Herrschaft in Afrika (Berlin. 1837) ; T. Hodgkin, Italy and her Invaders (1880-99) ; L. Schmidt, Geschichte der Wandalen (Leipzig, 1901) ; and F. Martroye, L' Occident ct V epoque byzantine (1904).

VANDAMME, DOMINIQUE RENE\ Count (1 770-1830), French soldier, was born at Cassel, near Dunkirk, on the 5th of November 1770. He enlisted in the army in 1786, served in Martinique in 1788 and on returning to France entered into the Revolutionary movement, raising a company of light infantry at his native place. His extraordinary bravery and vigour in the campaign of 1793 ensured his rapid promotion, and after Hondschoote he was made a general of brigade. He served in this rank in the campaigns of 1794 in the Low Countries, 1795 on the Rhine and 1796 in Germany, and at

the outbreak of the war in 1799 he was promoted general of division. In that year and in 1800 he served under Brune, Moreau and Macdonald in Holland, Germany and Switzerland. He was renowned for his tenacity and fearlessness as a fighting general as well as for his frank, rough manners and plundering and dissolute life, but once he came under Napoleon's influence he was (unlike most of the Rhine Army officers) his absolutely devoted servant. In 1805, for his splendid leadership at Austerlitz, he was given the Grand Eagle of the Legion of Honour, and in 1806-7 ˆ e commanded a small corps of the Grande Armie which reduced the Silesian fortresses. In 1808 he was made count of Unebourg. In 1809 he served in the Eckmuhl campaign with distinction, but in 181 2, while commanding the Westphalian contingent he quarrelled with King Jerome Bonaparte and returned to France. He returned to the army in 1813. But his corps, sent against the line of retreat of the Allies at the time of the battle of Dresden, was entangled in the mountains, surrounded and after a fierce resistance compelled to surrender at Kulm (see Napoleonic Campaigns). In his captivity he appears to have been treated with especial harshness, and when the end of the war released him he was forbidden to enter Paris, and sent to Cassel by Louis XVIII. He was thus free of all obligations towards the Bourbons, and when Napoleon returned, joined him without hesitation. The emperor made him a peer of France and placed him at the head of the III. corps in the Army of the North (see Waterloo Campaign). After Waterloo, under Grouchy's command, he brought back his corps in good order to Paris and thence to the Loire. The Restoration first imprisoned and then exiled him, and unlike most of his comrades he was never re-employed as a general. He died at Cassel on the 15th of July

1830.

See Du Casse, Le General Vandamme el sa correspondance.

VANDERBILT, CORNELIUS (1794-1877), American capitalist, was born near Stapleton, Staten Island, New York, on the 27th of May 1794. He was a descendant of Jan Aersten Van der Bilt, who emigrated from Holland about 1650 and settled near Brooklyn. The family removed to Staten Island in 1715. At the age of 16 he bought a sailboat, in which he carried farm produce and passengers between Staten Island and New York. He was soon doing a profitable carrying business, and in 1813 carried supplies to fortifications in New York Harbour and the

adjacent waters. Recognizing the superiority of steam over sailing vessels, he sold his sloops and schooners, and in 1817-1829 was a captain on a steam ferry between New York and New Brunswick. During the next I twenty years he developed an extensive carrying trade along

the coast in a fleet which became so large as to win for him the popular designation of " Commodore;" In 1849 he got from the Nicaraguan government a charter for a route from Greytown on the Atlantic by the San Juan river and Lake Nicaragua to San Juan del Sur, on the Pacific; and in 1851-1853 by means of this route he conducted a semi-monthly steamship line be- tween New York and San Francisco. In 1855-1861 he operated a freight and passenger line between New York and Havre, and by carrying the United States mails free drove out of business his only rival, the Collins line — the Cunard boats being at that time in use for the Crimean War. In 1857-1862 he sold his steamships and turned his attention more and more to the development of railways. In 1857 he became a director, and in 1863 president, of the New York & Harlem railway com- pany, operating a line between New York and Chatham Four Corners, in Columbia county, and he greatly improved this service. He then acquired a controlling interest in the Hudson River railway, of which he became president in 1865; and after a sharp struggle in 1868 he became president of the New York Central (between Albany and Buffalo), which in 1869 he com- bined with the Hudson River road, under the name of the New York Central & Hudson River railroad, of which he became president. His acquisition of the Lake Shore & Michigan Southern railway in 1873 established a through line (controlled by him) between New York and Chicago. At the time of his death (in New York City on the 4th of January 1877) he owned a majority interest in the New York Central & Hudson River, the Lake Shore & Michigan Southern, the Harlem, and the Canada Southern railways, and had holdings in many others, and his fortune was variously estimated at from $90,000,000 to $100,000,000, about $80,000,000 of which he left to his son, William Henry. He made considerable benefactions to Vanderˆ bilt University, and gave $50,000 during his life to the Church of the Strangers in New York.

His eldest son, William Henry Vanderbilt (1821-1885), was born in New Brunswick, New Jersey, on the 8th of May 182 1. He was a clerk in a New York banking house from 1839 to 1842, when his father bought him a farm of 75 acres near New Dorp, Staten Island, New York. In i860 he was ap- pointed receiver of the Staten Island railway, of which he was elected president in 1862, and which he brought into connexion with New York by means of a line of ferry-boats. He became vice-president of the Hudson River railway in 1865, vice- president of the New York Central & Hudson River railway in 1869, and president in June 1877, succeeding his father as president of the Lake Shore & Michigan Southern, the Canada Southern, and the Michigan Central railways. He died in New York on the 8th of December 1885. His fortune at the time of his death was estimated at $200,000,000. In 1880 he paid all the expenses ($100,000) incident to the removal of the obelisk (" Cleopatra's Needle ") from Egypt to Central Park, New York; in the same year he gave $100,000 to found the Theo- logical School of Vanderbilt University, which his father had endowed. In 1884 he gave $500,000 to found a school of medicine in connexion with the College of Physicians and Surgeons in New York. By his will he left $200,000 to Vander-bilt University, $100,000 to the Domestic and Foreign Missionary Society of the Protestant Episcopal Church, $100,000 to St Luke's Hospital in New York, $100,000 to the Young Men's Christian Association of New York, $100,000 to the Metro- politan Museum of Art in New York, $50,000 to the American Museum of Natural History, $100,000 to the Protestant Epis- copal Mission Society of New York, and $250,000 in all to various other religious and charitable organizations and institutions.

William Henry's eldest son, Cornelius (1843-1899), became assistant treasurer of the Harlem railway in 1865, and treasurer in 1867; in 1877, a ft er the death of his grandfather, was elected first vice-president of the New York Central, and in 1878 be- came treasurer of the Michigan Central and vice-president and treasurer of the Canada Southern. In 1883, under a reorganiza- tion of the New York Central and Michigan Central railways, he became chairman of the boards of directors of those two systems

and their responsible head. His benefactions included $250,000 (1897) for an addition to St Bartholomew's Hospital in New York; to Yale, $1,500,000, part of which was used in

building Vanderbilt Hall (a dormitory); and $100,000 to the fund for the building of the Episcopal Cathedral of St John the Divine in New York. To the Metropolitan Museum of Art in New York he presented Rosa Bonheur's" Horse Fair."

See W. A. Croffut, The Vanderbilts and the Story of their Fortune (Chicago, 111., 1886);- D.W. Gross/'The Railroad Men of America," in Magazine of Western History, vol. viii: (Cleveland, Ohio, 1888); and Burton J. Hendrick, " The Vanderbilt Fortune," in McClure's Magazine, vol. xxxii. (New York, 1908-1909).

VANDERLYN, JOHN (1776-1852), American artist, was born at Kingston, New York, on the 15th of October 1776. He was employed by a print-seller in New York, and was first instructed in art by Archibald Robinson (1765-1835), a Scotsman who was afterwards one of the directors of the American Academy. He copied some of Gilbert Stuart's portraits, including one of Aaron Burr, who placed him under Gilbert Stuart as a pupil. In 1796 Vanderlyn went to Paris, and in 1805 to Rome, where he painted his picture of " Marius amid the Ruins of Carthage," which was shown in Paris, and obtained a gold medal there. This success caused him to remain in Paris for seven years, during which time he prospered greatly. In 1812 he showed a nude "Ariadne" (engraved by Durand, and now in the Pennsylvania Academy), which increased his fame. When Aaron Burr fled to Paris, Vanderlyn was for a time his only support. Vanderlyn returned to America in 1815, but did not meet with success; he worked very slowly, and neither his portraits nor various panorama which he exhibited brought him any considerable financial return. In 1842, through friendly influences, he was commissioned by Congress to paint " The Landing of Columbus " for one of the panels in the rotunda of the Capitol at Washington. Going to Paris, he employed to assist him a French artist, who, it is said, did most of the work. He died in absolute want at Kingston, New York, on the 23rd of September 1852. Vanderlyn was the first American to study in France instead of in England, and to acquire accurate draughtsmanship. He was more academic than his fellows; but, though faithfully and capably executed, his work was rather devoid of charm. He painted portraits of Presidents Washington (a copy of Stuart's portrait, for the National House of Representatives), Monroe, Madison, Jackson and Taylor, and of the statesmen Robert R. Livingston (New York

Historical Society), John C. Calhoun and George Clinton.

VAN PER STAPPEN, CHARLES (1843-1910), Belgian sculptor, was born in Brussels, September 1843. His first contribution to the Brussels Salon was " The Faun's Toilet " of 1869, and thereafter he began to produce work of a high and novel order in every class of sculpture, and soon, along with Paul de Vigne, became recognized as the leader of the section of the new Belgian school of sculpture which, while aiming at truth to life, allowed itself nevertheless to be inspired by the classic perfection of the art of Greece and the spirit of the Italian Renaissance. Van der Stappen has shown his greatest power in decorative sculpture) such as we see in the decoration on the Palais des Postes, Brussels (1872), as well as the pediment " Orchestration " for the Conservatoire de Musique, and the noble bronze group, " The Teaching of Art," on the facade of the Palace of Fine Arts, Brussels. Among his other decora- tive work are the statues for the Alhambra Theatre and the caryatides for the house of the architect M. de Curte (1874). His best-known monuments are those to " Alexandre Gendebien " (1874) and " Baron Coppens," at Sheel (1875). His statues include " William the Silent," set up in the Square du Petit Sablon, " The Man with the Sword," and " The Sphinx "— the last two in the Brussels Museum. The bronze group " Ompdrailles " was acquired by the Belgian government (1892). In 1893 the sculptor began his collaboration with Constantin Meunier for the elaborate decoration of the botanical gardens of Brussels, and the result of the connexion may be

seen in " The Builders of Cities," a group which might almost have come from his companion, so strongly is it imbued with the sentiment and illustrative of the types of the " socialistic art "of Meunier.

See Charles van der Stappen, by Camille Lemonnier; Les Artistes beiges contemporains, by E. L. de Taye; The Renaissance of Sculpture in Belgium, by 0. G. Destree (London, 1895).

VAN DER WEYDEN, ROGER (c. 1400-1464), Flemish painter, also known as Roger de la Pasture, Rogier de Bruxelles, &c,

was born at Tournay, where in 1427 he entered the studio of Robert Campin. He established himself in Brussels about 1435. He was in Italy in 1440-1450, but his visit shows no result on his style, which owes nothing to Italian models; and he returned to Brussels, where he died on the 18th of June 1464. His vigorous, subtle and expressive painting and popular religious conceptions had considerable influence on the art of Flanders and Germany. Memlinc was his greatest pupil; and his place in the early Flemish school is second only to that of the Van Eycks. He was not a pupil of Jan van Eyck, as was at one time supposed. His principal paintings were: a " Descent from the Cross " (1440), now in Madrid, and another (1443) in the church of St Pierre at Louvain; a triptych (1438-1440), now in the Berlin Museum; " Madonna with Saints " (1450), at the Stadel Institute, Frankfort; a " Last Judgment " (1451), in the hospital of Beaune, France; the portraits of Philip the Good (Antwerp Museum) and Charles the Bold (Brussels Museum), painted about 1456-1458; the " Altar- piece of St John " and the triptych from Middelburg (Berlin Museum); an "Entombment of Christ " (National Gallery); a "Woman Crying" (Brussels Museum); " Descent from the Cross" (Louvre); "Adoration of the Magi" (Old Pinakothek at Munich); " Descent from the Cross " (the Hague); " Seven Sacraments" (Antwerp Museum); " Descent from the Cross" (Brussels Museum). Some of these latter, and others, are only doubtfully attributed to the master. The " Cruci- fixion " in the Brussels Museum, assigned either to him or to Memlinc, and containing portraits of the Sforzas, probably represents Roger van der Weyden in some of the principal figures at least, though Memlinc may have completed the picture.

There was a younger Roger van der Weyden (c. 1450-15 29), to whom a brilliant " Mary Magdalen " in the National Gallery is attributed.

There are Lives of the elder Van der Weyden by A. Wauters (1856) and Alex. Pinchart (1876).

VANDEVELDE, ADRIAN (1639-1672), Dutch animal and landscape painter, a brother of William Vandevelde (q.v.), the marine painter, was born at Amsterdam in 1639. He was trained in the studio of Jan Wynants, the landscape painter, where he made the acquaintance of Philip Wouwerman, who is believed to have aided him in his studies of animals, and to have exercised a powerful and beneficial influence upon his

art. Having made exceptionally rapid progress, he was soon employed by his master to introduce figures into his landscape compositions, and he rendered a similar service to Hobbema, Ruysdael, Verboom and other contemporary artists. His favourite subjects are scenes of open pasture land, with sheep, cattle and goats, which he executed with admirable dexterity, with much precision of touch and truth of draughtsmanship, and with clear silvery colouring. He painted a few small but excellent winter scenes with skaters, and several religious subjects, such as the " Descent from the Cross," for the Roman Catholic church in Amsterdam. In addition to his paintings, of which nearly two hundred have been catalogued, he executed about twenty etchings, several of which appear from their dates to have been done in his fourteenth year. They are simple but pleasing in tonality, and are distinguished by great directness of method and by delicacy and certainty of touch. Adrian Vandevelde died at Amsterdam in January 1672.

VANDEVELDE, WILLIAM (1633-1707), the younger, Dutch painter, a son of William Vandevelde, the elder, also a painter of sea-pieces, was born at Amsterdam in 1633. He was in-

structed by his father, and afterwards by Simon de Vlieger, a marine painter of repute at the time, and had achieved great celebrity by his art before he came to London. In 1674 he was engaged by Charles II., at a salary of £100, to aid his father in " taking and making draughts of sea-fights," his part of the work being to reproduce in colour the drawings of the elder Vandevelde. He was also patronized by the Duke of York and by various members of the nobility. He died in London on the 6th of April 1707. Most of Vandevelde's finest works represent views off the coast of Holland, with Dutch shipping. His best productions are delicate, spirited and finished in handling, and correct in the drawing of the vessels and their rigging. The numerous figures are tellingly introduced, and the artist is successful in his renderings of sea, whether in calm or storm.

Vandevelde was a most prolific artist : in addition to his paintings, of which Smith catalogues about three hundred and thirty, he executed an immense number of drawings, sketches and studies, which are prized by collectors.

VAN DORN, EARL (1820-1863), American soldier, was born near Vicksburg in 1820, and entered the army of the United States from West Point in 1842. For several years previous to

the Mexican War he was employed in garrison duty, but in that war he saw a good deal of active service, distinguishing himself at Cerro Gordo and Churubusco, returning to the United States a brevet-major. He also fought in the Seminole War and in 1858 against the Comanches. When his state seceded in 1861 he resigned his commission in the U.S. army, and in the September of that year became major-general C.S.A. He commanded the Confederates in the hard-fought battle of Pea Ridge, but was superseded for failing to win it. Later in 1862 he won promotion and a second independent command in the West, and led the Confederates at the battle of Corinth (the 3rd and 4th of October 1862) at which he came very near to success. In spite of the verdict of a court of inquiry, he was again superseded. As a subordinate of Lieut.-General Pemberton he did splendid service to the Confederate cause in defeating Grant's first advance on Vicksburg at Holly Springs (1862). He was shot in a private quarrel on the 8th of May 1863.

VAN DYCK, SIR ANTHONY (1599-1641), Flemish painter, was born in Antwerp on the 22nd of March 1599. Though the name of Van Dyck is frequently met with in the list of Antwerp painters, Anthony's pedigree cannot be traced beyond his grandparents, who were silk mercers of some standing. He was the seventh of twelve children of Frans Van Dyck, an Antwerp tradesman in good circumstances. His mother, Maria Cupers, who died when he was scarcely eight years of age, seems to have attained a certain degree of excellence in art needlework. Of the boy's early education nothing is known. He was little over ten when he was apprenticed to Hendrick Van Balen, the painter of many delicate little pictures as well as an occasional collaborator of Rubens and Breughel, and the master of Snyders. From a document in the state paper office at Brussels, relating to a lawsuit between a picture dealer and an Antwerp churchman, which arose out of the sale, in 1660, of a series of Apostles' heads ascribed to Van Dyck, it appears that, as far back as 161 5, Van Dyck had worked independently, with pupils of his own, and that his pictures were greatly valued by artists and amateurs. Professor Woermann has identified several of the Apostles' heads here spoken of with some paintings in the gallery at Dresden. Another is in the possession of Earl Spencer at Althorp.

Before he was nineteen (February 1618) Van Dyck became a full member of the Antwerp gild of painters; and some idea of

his ability at the time may be gained from the excellent portraits of an old lady and gentleman, formerly ascribed to Rubens, in the Dresden gallery. Dated 1618, they were originally entered as works of Van Dyck, and, as Professor Woermann observes, are undoubtedly the same as those spoken of by Mols in his MS. annotations on Walpole's Anecdotes, now in the library at Brussels. But the same admiration cannot be accorded to the earliest religious composition known to have been painted by

him — " Christ falling under the Cross," in St Paul's at Antwerp, This picture, of some ten life-size figures, still preserved in the place for which it was originally destined, distinctly proves that from the outset of his career Van Dyck's power of conception was vastly inferior to his refined taste as a portrait painter. At first sight it seems also that with him, as with most other Flemish painters of the period, every conception, whether sacred or profane, needed to be cast in the mould of Rubens. It would be too much, however, to assert that Van Dyck at this time stood under the guidance of that master; their association, indeed, does not seem to have begun until 1610, and Bellori (1672), who got his information from Sir Kenelm Digby, Van Dyck's bosom friend, tells us that he was first employed in making drawings (probably also chiaroscuros) for the use of the great master's engravers, and that among works of the kind one of the first was the " Battle of the Amazons " (1619).

In 1620, we know, Van Dyck was working with Rubens, for on 20th March, in making arrangements with the Antwerp Jesuits for the decoration of their church, the master is allowed to avail himself of his pupil's assistance, and obtains for him the promise of a picture. This proof of Van Dyck's personal reputation is fully confirmed (17th July) by a correspondent of the earl of Arundel, who speaks of Van Dyck as a young man of one-and-twenty whose works are scarcely less esteemed than those of his master, and adds that, his relations being people of considerable wealth, he could hardly be expected to leave his home. Van Dyck was, however, thus persuaded, for on 28th November Sir Toby Mathew mentions the artist's departure to Sir Dudley Carleton, adding that he is in receipt of an annual

pension of £100 from the king. There is evidence of Van Dyck's presence in London till the end of February 1621. He is first mentioned in the order-books of the Exchequer on the 17th of that month as receiving a reward of £100 " for special service by him performed for His Majesty," and on the 28th, " Antonio van Dyck, gent., His Majesties servant, is allowed to travaile 8 months, he havinge obtayneid his Ma" es leave in that behalf, as was signified by the E. of Arundell." What Van Dyck did in London is not known. Among his numerous paintings still preserved in English houses one only is admitted as belonging to the period of this first visit, a full-length portrait of James 1. in the royal collection. That he was at the time a portrait painter of the rarest merit may easily be seen from the portrait of " Van der Geest " in the National Gallery (London), and from his own likenesses of himself when still quite young and beardless, in the National Gallery, in the Pinakothek at Munich and in the Wallace Collection. In this last admirable specimen the young painter has represented himself in the character of Paris. Early paintings by Van Dyck are certainly not scarce in British galleries; at Dulwich there is his admirable Samson and Delilah, ascribed to the school of Rubens.

Though the leave of absence was probably obtained by Van Dyck for the purpose of studying the masters in Italy, the eight months had almost elapsed before he started from Antwerp, whither he had gone from London. He left Antwerp on the 3rd of October 1621, and arrived at Genoa on the 21st of November of the same year. Though Van Dyck unquestionably first became acquainted with the masterpieces of the great Venetian colourists in Rubens's atelier, there can be little doubt that most of the pictures which were formerly ascribed to his earliest period really date from the years of his Italian journey. In fact, studies for some of them can be found in the Chatsworth sketch-book. Among these early works are the " Martyrdom of St Peter " (Brussels), the " Crowning with Thorns " (Berlin), the " Betrayal of Christ " (Madrid and Lord Methuen), " St Martin dividing his Cloak" (Windsor Castle), — a magnificent production, generally ascribed to Rubens, but easily identified through Van Dyck's admirable sketch at Dorchester House.

It is unnecessary to dwell on a number of tales connected with Van Dyck's early life, all of which have on closer examination proved to be apocryphal; but one story has been too

frequently told to be altogether ignored. At the very outset cf his Italian journey the inflammable youth was captivated

by the beauty of a country girl, and for the love of her painted the altar-piece still to be seen in the church at Saventhem, near Brussels, in which he himself is supposed to be represented on a grey horse, given by Rubens to his pupil. It is now known, however, that the picture was commissioned by a gentleman living at Saventhem (to the charms of whose daughter Van Dyck in reality seems not to have been altogether insensible), and a closer study makes it almost certain that it was executed after, not before, his Italian journey. On a reduced scale, and with the omission of two or three figures, the " St Martin " at Saven- them is a reproduction of the picture at Windsor Castle.

With the exception of a short visit to Antwerp at the time of his father's death in 1622, Van Dyck spent the next five years in Italy. No master from beyond the Alps ever took up a higher position than Van Dyck among the most celebrated representatives of Italian art. Study, as a matter of course ; had been one of his principal objects. No doubt can be enter- tained as to the great influence exerted by the works of Titian, Paul Veronese and the other great masters of the Venetian school in the development of his genius; still the individuality of the painter remains a striking feature of what may be termed his Italian works, especially portraits. Their peculiar char- acter seems to originate even more in the stateliness of the personages he was fortunate enough to have as sitters than in any desire to follow individual predilection or prevailing fashion. As in later years Van Dyck gives us a striking picture of the higher classes in England, so at this stage he makes us acquainted with Italian beauty and style; and at no other period is his talent more advantageously shown than in some of the glorious portraits he painted at Rome, at Florence, and, above all, at Genoa. At Rome, whither he journeyed after a prolonged stay in Venice, he resided with Cardinal Guido Bentivoglio, who had been papal nuncio in Flanders from 1607 to ,1617. For this patron were painted several works of very great importance, the most renowned being the prelate's own portrait, now in the Pitti Palace at Florence. Another work was a " Crucifixion," representing Christ dying on the cross with uplifted eyes. Most probably the picture spoken of by Bellori ought to be identified with the admirable canvas now in the gallery at Naples, cata- logued as " Scuola di Van Dyck," unsurpassed by any of those at Antwerp, Paris, Vienna, Rome

or elsewhere. Besides these he painted religious subjects and portraits, several of which are reckoned among his finest examples, such as the portrait of Duquesnoy, better known as Fiammingo, the famous sculptor, formerly belonging to the king of the Belgians, and those of Sir Robert Shirley and his wife, in Persian attire, now at Petwprth.

Bellori tells us of Van Dyck's prepossessing appearance, of his elegance and distinction, altogether so different from the habits of his compatriots in Rome, who formed a jovial " gang," as they termed their association. Van Dyck seems to have kept out of their way, and incurred in consequence such annoy- ance as made his stay in Rome much shorter than it would otherwise have been. In the company of Lady Arundel he travelled to Turin, but he was eager to reach Genoa, where Rubens had worked with great success some twenty years before, and where his Antwerp friends, Luke and Corneiis de Wael, for many years resident in Italy, now were. Van Dyck re- mained their guest for several months, and their portraits, now in the Pinacoteca Capitolina at Rome (engraved by W. Hollar from the monochrome at Cassel), may be supposed to have been one of his first Genoese productions. Though several of the palaces of the " proud " city no longer retain their treasures, and, among the specimens of Van Dyck's genius still left, too many have been greatly injured by cleaning and retouching, Genoa can still boast of a good number of his most attractive pro- ductions, portraits of the beautiful ladies and haughty cavaliers of the noble houses of Doria, Brignole Sale, Pallavicini, Balbi, Cattaneo, 1 Spinola, Lommelini and Grimaldi. It would

'Of the Cattaneo portraits, originally eight in number, seven were privately sold out of Italy in 1906, and in the following year one, a half-length " Portrait of a Man," was acquired for the National Gallery, London, for £13,500. The official acquisition

scarcely be possible to speak too highly of such works as the portrait of the lady in white satin and the Durazzo children at the Durazzo Palace, the Balbi children at Panshanger, the Marchesa Balbi at Dorchester House, the equally beautiful

portraits of the Lommelini and of the knight in black armour, buff jacket and boots in the Scottish National Gallery at Edinburgh, or the Marchesa Brignole Sale (formerly at Warwick Castle, and afterwards in America). Van Dyck's " Genoese manner " is a current expression, and indeed his Genoese por- traits are remarkable for their richness of tonality and what might be called royal splendour, perhaps never before attained in works of the kind. This we may suppose to have had its origin, not only in his recent study of Titian, but also in decora- tive necessities — the size of the palatial galleries and the rich hues of the Genoese velvets, on which these portraits were to find their place, obliging the painter to find a most uncommon strength of contrast. It must also be acknowledged that the beauty and distinction of Van Dyck's models are greatly en- hanced by a splendour of costume entirely different from the dullness then prevalent almost everywhere else. In Italy, more- over, he found the reality of those gorgeous backgrounds — flowing draperies, beautiful gardens, ornamental pillars, marble terraces and balustrades — which elsewhere must be regarded as fictions merely. Here, finally, he was for the first time called upon to paint some of his grandest equestrian portraits, and the often-recurring grey steed with flowing mane (an admirable study of which belongs to Lord Brownlow) was first employed for the portrait of Antonio Giulio Brignole (still at Genoa) and for another picture which we may suppose to represent the same personage at Stafford House. As with Rubens, Titian seems to have been paramount in Van Dyck's regard. Copies in great number we know he possessed of the master's best works, and several little sketches in the British Museum and in the Chatsworth sketch-book bear proof of his devout study of the great Venetian. Some of Van Dyck's earlier paintings, religious and mythological — the " Tribute Money " (Brignole Palace), " Holy Family " (Turin), " Virgin and Saints " (Louvre), " Virgin " (Grosvenor House), " Martyr- dom of St Lawrence " (S. Maria dell' Orto, Venice), " Bacchanal " (Lord Belper) — engraved at Genoa as early as 1628 — " St Sebastian " (Edinburgh) — are certainly Titianesque in the extreme. Still the master's individuality is not obliterated, and the gallery at Parma has a " Virgin with the Infant Asleep," which may be termed a marvel of realistic simplicity.

In 1624 Van Dyck sailed from Genoa to Palermo and there painted several persons of rank, including the viceroy,

Emmanuel Philibert of Savoy. While in Sicily he became acquainted with the painter Sofonisba Anguisciola (or Angussola), who was then ninety-six years of age and blind; and he was wont to say that he had received more valuable information from a blind woman than from many a seeing man. No important works of Van Dyck are now to be found in Sicily, except the " Virgin and Child " at S. Caterina in Palermo, and a " Virgin and Child with Saints " in the same city. Bellori tells us that a plague broke out and compelled him to leave abruptly, taking with him an unfinished picture of St Rosalia, which was destined for a confraternity of that name, and was completed in Genoa. The composition was repeated in Antwerp for the Bachelors' Brotherhood, a picture now in Vienna. Van Dyck most probably remained in Genoa till 1626, and here in all likeli- hood he painted the De Jodes, father and son, the celebrated engravers, who are represented together in a masterly portrait in the Capitol at Rome, the companion picture to the brothers De Wael; and Nicholas Laniere, musician-in-chief to Charles I., a painting spoken of in Van der Dort's catalogue as " done beyond the seas." Laniere was in Italy precisely at this time, and it was through his portrait (now at Windsor Castle), Wal- pole assures us, that Van Dyck attracted the notice of Charles I.

Traversing the Mont Cenis pass, Van Dyck stopped at Aix

of this picture, in view of the Italian law of 1902, created consider- able discussion in Italy and England. The companion female portrait was soon after also purchased.

with Peiresc, the famous scholar and friend of Rubens, and probably proceeded straight to Antwerp. His beautiful portrait of Langlois, the Paris print-seller, from which it was conjectured that he spent some time at Paris, was unquestionably painted in Genoa. It is very likely that, before settling again at Antwerp, Van Dyck at this time paid a second visit to England, to paint a portrait of Queen Henrietta Maria, but left again when he found Mytens firmly established as court favourite. He probably returned to Antwerp in 1627, though there is no recorded proof of his presence before the 3rd of March 1628. One of his sisters had died in a convent the year before, and he now made a will in favour of Susan and Isabella, two other sisters, also nuns. That Van Dyck was in Antwerp on the 1 8th of May is proved by a letter from Lord Carlisle to Buckingham (Sainsbury, ciii.).

Great as may have been the strength of Italian reminiscence, from the moment Van Dyck again trod Flemish soil the influence of Rubens became predominant, and we can scarcely doubt that a competition speedily arose between master and pupil. At this period churches and convents were numerous and richly endowed; and the number of pictures, stained glass windows and elaborate carvings in Belgian churches before the French conquest was enormous. Hardly fifty years had elapsed since these buildings had been stripped of their artistic treasures, and the devout were now eager once more to adorn them with productions of the greatest painters. Hence Van Dyck's share could be very copious without in any degree interfering with the vast undertakings assigned to Rubens. The latter was also absent for many months in 1629 and 1630, so that Van Dyck was for a time the first master in the Netherlands. Among the earliest works after his return to Antwerp we find the " Crucifixion," given to the Dominican nuns, in accordance with the wish expressed by the painter's dying father, and now in the , Antwerp museum. The figures are life-size, and at the foot of the cross, besides a weeping angel, are St Catherine of Siena and St Dominic. Neither in type nor in general effect does it suggest the master's immediately preceding works. As a new feature we observe a kind of elegance, not entirely free from mannerism, which is often conspicuous with Van Dyck even when the technical excellence commands our warmest admiration. Inspiration, as Waagen observes, was far more limited with Van Dyck than with Rubens. His truly delicate nature led him to restrain his conceptions within the bounds of an academic evenness, generally more pleasing to the uninitiated than the strength ' of expression which sometimes imparts a sort of violence to the works of Rubens. To Van Dyck's second — more justly speaking third — manner belong some of his best religious works. The " Crucifixion " in the cathedral at Mechlin is termed by Sir Joshua Reynolds one of the finest pictures in the world. Other Crucifixions are in St Michael's at Ghent (sketches in Lord Brownlow's collection and the Brussels museum) and in the church at Termonde. Still finer are the two works painted for the Antwerp Jesuits and now at Vienna — " The Mystic Marriage of the Blessed Herman Joseph " and " St Rosalia Crowned by the Infant Saviour." To this period likewise belong the celebrated " Elevation of the Cross " at Courtrai and the " St Augustine in Ecstasy," in the church of the Jesuits at Antwerp; the general effect of this last, it must be

acknowledged with •Reynolds, is inferior to that of the beautiful engraving by De Jode, and also to the earl of Northbrook's magnificent sketch. At Dulwich we find the first idea of the composition, with many interesting differences. It may be a matter of individual preference to pronounce Van Dyck's Flemish portraits superior to those of an earlier period; but nobody can fail to admit that, technically speaking, they indicate a further step towards perfection. The darkness of the Genoese portraits has van- ished; broad daylight now freely illuminates the model, and such works as the portraits of Francisco de Moncada (Louvre) and of the Count de Bergh (Prado) are perhaps as close to material excellence as any painting could be. The full-length likenesses of Philip Le Roy (1630) and his wife

(1631) (Wallace Collection) and of Mary Louisa of Tassis (Prince Liechtenstein, Vienna) are not only the finest examples of the master's talent, but deserve to rank among the most beautiful portraits ever painted. The " Snyders " at Castle Howard is regarded by Waagen as not inferior to the most celebrated Raphaels, Titians or Holbeins; and of almost equal excellence are the " Wife of Colin de Nole " in the Munich gallery, the " Lady and her Daughter " at the Louvre, and the " Lady in Black'" at Cassel.

Rapidly rising to honour and wealth, Van Dyck shared with Rubens the official title of court painter, and his numerous portraits of the infanta in her monastic garb (Paris, Vienna, Turin, Parma, &c.) bear testimony to the great favour in which he stood with her. When Marie de Medicis, after her flight from France, took up her residence in Brussels (1631), she honoured Van Dyck, as well as Rubens, with repeated visits, and several times called upon him to paint her likeness, as well as those Of Gaston of Orleans and his wife Margaret of Lorraine, and several of the personages of their court. From Gerbier's letters we learn that Van Dyck at this time was contemplating another journey to England, and was very anxious to be commissioned by the infanta and the queen of France to take over their portraits as presents for the king and royal family. He soon travelled to the Hague to paint the prince and princess of Orange and their son. Quite at the beginning of 1632

Constantine Huygens, who was then living at the Hague, inscribes in his diary, " Pingor a Van Dyckio." When, towards the end of March, Van Dyck sailed for England, he took all these portraits with him, as we learn from an account of the 8th of August 1 63 2 (Carpenter's Pictorial Notices) . Dutch authors speak of a visit paid by Van Dyck to Frans Hals at Haarlem, and of a portrait of the latter through which the Antwerp master was at once recognized by his Dutch colleague. An engraving of a portrait of Hals after Van Dyck seems to confirm the story.

In undertaking this new journey to London, Van Dyck was assured of success, for Gerbier's letters show that the king had personally desired his presence. As early as March 1629 Endymion Porter, one of the gentlemen of the king's bedchamber, had been commissioned to order a picture from Van Dyck, " Rinaldo and Armida." The canvas, now belonging to the duke of Newcastle, may be looked upon as one of the master's finest creations. Exceptional favours were bestowed upon Van Dyck almost from the day of his arrival in London. Besides the title of painter in ordinary, and the grant of an annual pension of £200, he received the honour of knighthood after a residence of less than three months at court (5th July 1632). He rapidly achieved popularity among the higher classes, and, as Walpole says, his works are so frequent in England that to most Englishmen it is difficult to avoid thinking of him as their countryman.

His refined nature is strikingly illustrated in his admirable interpretation of English beauty and style. And, if Van Dyck be compared to Mytens and Cornelius Janssen, the most distinguished painters employed by the English court immediately before him, few artists, whether in England or elsewhere, have more richly endowed their models with distinction of feature and elegance in bearing. To him may be applied what Opie says of Titian, " that he combines resemblance with dignity, costume with taste, and art with simplicity." We are particularly struck with the thorough and immediate identification of his talent with local tastes and exigencies. Charles I. and Henrietta Maria, although pictured by several other painters, are known to posterity almost exclusively through Van Dyck, not from a greater closeness of resemblance to the original, but from a particular power of expression and bearing which, once seen, it is impossible to forget. The artist was lodged at the expense of the crown, with a summer residence at

Eltham Palace, and was frequently honoured with the visits of the king at his studio at Blackfriars. Portraits now followed each other with a rapidity scarcely credible to those unacquainted with the artist's method. In fact, his mode of living and his love of pleasure sufficiently explain his great

need of money. During the first year of his presence in England he painted the king and queen a dozen times. The first of these noble portraits is the admirable full-length of Charles I., with the queen and their two eldest children, at Windsor Castle. The style he adopted in England is generally termed his third manner; we might better say his fourth, as he already had a very particular style before he set out on his Italian journey. De Piles gives us some account of Van Dyck's methods at this period of his career. He began with a small sketch on grey paper with black and white chalks, or a monochrome in oils. This study was passed on to assistants in order to be copied on the required scale. When the clothes were sufficiently advanced by the pupils from those sent by the model, as well as the background and accessories, the master was enabled in a few sittings of an hour each to complete the work. Van Dyck excelled in painting the hands; he is said to have kept special models for this part of his work. It need hardly be said that a system of this kind, although employed by Rubens for his larger creations, was exceedingly ill adapted to portrait painting. In Van Dyck's later productions we too often detect marks of haste, as if the brush were becoming a mere implement of trade.

Nearly the whole of 1634 and 1635 were spent by Van Dyck in the Netherlands, whence his brother, an Antwerp priest, had been called over by the queen to act as her chaplain. The archduchess died on 1st December 1633, and Van Dyck naturally wished to get his official title renewed by her successor, Ferdinand of Austria, brother of Philip IV. That Van Dyck's residence in Antwerp was only to be temporary is shown by the power given to his sister Susan for the administration of his affairs in Belgium (14th April 1634). On the arrival of the new governor Van Dyck was immediately called upon to paint his likeness, a picture now in the Madrid gallery, where the same personage is also represented by Rubens and Velazquez. Several other portraits of Ferdinand, either in his cardinal's robes or in military dress, by Van Dyck, occur elsewhere. One on horse- back was exhibited at the Grosvenor Gallery, London, in 1887, as the duke of Alva (lent

by Mr S. Kynaston Mainwaring). Van Dyck was greatly in demand at this time, and his prices were correspondingly high, as the Antwerp municipality found when they asked for a portrait of the late infanta to decorate one of the triumphal arches for the reception of the new governor. The most important of Van Dyck's works, at any rate as a portrait painter, belong to this period. The picture represent- ing in life-size the members of the Brussels corporation, which was destroyed by fire during. the siege of 1695, is spoken of with intense admiration by several writers. Bullart, for instance, is very enthusiastic about its fine colour and life- like qualities. Among the religious paintings of undisputed excellence belonging to the same period are the " Adoration of the Shepherds " in the church at Termonde, and the " Deposi- tion," where the body of Christ rests upon the lap of the Virgin, in the Antwerp museum. Among the portraits are the admir- able full-length of Scaglia, the king's frequent agent in the Netherlands (at Dorchester House; a replica in the museum at Antwerp), the equestrian portrait of Albert of Arenberg (Arenberg Palace at Brussels), and a portrait of the same nobleman on foot, in the black velvet Spanish dress with golden chamberlain's key (long said to be Rubens) at Althorp, the full- length of Helena Fourment, Rubens's second wife (at St Peters- burg), the beautiful duchess of Havre, Mary Clara de proy, signed and dated 1634 (Mr Ayscough Fawkes), and other members of the same family (at Munich), Thomas of Savoy (at Berlin), an admirable half-length of a lady in black (in the Vienna gallery), and above all the grandiose picture in which John of Nassau is represented at full-length, with his wife and children (at Panshanger). Several portraits of Brussels and Ant- werp magistrates must also be mentioned, the most important being John Van Merstraeten, a Brussels lawyer (at Cassel).

After being chosen honorary president of the Antwerp gild of St Luke, Van Dyck returned to London before the end of 1635. In spite of the vast number of his later portraits, some of them deserve to be ranked among the most celebrated of his

productions. The group of three English royal children in the gallery at Turin (1635), the portraits of Charles I. in the

Louvre and in the National Gallery, London, the picture of the Pembroke family at Wilton House, Sir George and Sir Francis Villiers, and the earls of Bristol and Bedford, at Althorp, as well as those of Francis Russell, fourth earl of Bedford, and Anne Carr, his consort, at Woburn Abbey (1636), all belong to the years im- mediately following the master's return from the Netherlands.

He now married Lady Mary Ruthven, daughter of Sir Patrick Ruthven and granddaughter of the earl of Gowrie. There are several portraits of her by her husband, the most important being in the Munich gallery, in which she is represented in white satin, playing on the violoncello. She is also said to figure as the Virgin in a picture belonging to Lord Lyttelton. There is a capital engraving of her by Bolswert. In another picture, said to be Mary Ruthven, an exceedingly handsome lady is repre- sented as " Herminia Putting on Clarinda's Armour." There can be no doubt as to the model having been Margaret Lemon, a celebrated beauty, whose portrait was engraved by W. Hollar and J. Morin and painted by Van Dyck at Hampton Court. " She was," says Mr Ernest Law, in his excellent catalogue of this gallery, " the most beautiful and celebrated, though far from being the only mistress of Van Dyck. The great artist, in fact, loved beauty in every form, and found the seduction of female charms altogether irresistible. She lived with him at his house at Blackfriars." The precise date of Van Dyck's marriage has not been ascertained. It was probably towards the end of 1639. The union is said to have been promoted by the artist's friends in order to save him from the consequence of his pernicious way of living. Margaret Lemon resented the event most cruelly, and tried to maim Van Dyck's right hand.

Van Dyck found few occasions in England to paint anything but portraits. There exists at Belvoir Castle a sketch by him representing a procession of the knights of the Garter, a really grandiose composition, engraved by Cooper. We know from Bellori that Van Dyck had suggested, through his friend Sir Kenelm Digby, for the banqueting-room at Whitehall, a series of decorations illustrating the history of the order of the Garter, and that the king had been much pleased with the idea. The plan, however, failed through the excessively high price asked by the painter, and perhaps also because the king had thought of having the work done in tapestry. Van Dyck's pension was five years in arrear, and, instead of £560, he

received finally, besides his pension, only £200.

When the news of Rubens's death reached London (June 1640) Van Dyck contemplated a return to his native country, and a letter from Ferdinand of Austria to Philip IV. speaks of his intended journey to Antwerp on St Luke's Day (18th October). Rubens had left unfinished a series of paintings commanded by the king of Spain, and from correspondence published by Professor Justi we learn that Van Dyck had been thought of to give them the finishing touch. But he absolutely refused to finish them. It was then agreed that he should paint an independent canvas destined to complete the series. Van Dyck was delighted with this order, and Ferdinand tells his brother that he returned to London in great haste "to make prepara- tions for his change of residence; possibly," adds the letter, " he may still change his mind, for he is stark mad." Whether Van Dyck found it possible to work during his short stay in the Netherlands is a matter of doubt. Most authors suppose that Van Dyck's principal object in travelling to the continent was to be entrusted with the decoration of one of the galleries of the Louvre. There may be some truth in this, for Mariette speaks of a letter he saw, written by Claude Vignon, the French painter, in January 1641, asking Langlois for an introduction to Van Dyck, who was then in Paris. Unfortunately the great painter was thwarted in his aspirations. His health was beginning to fail. After his return to London he was frequently obliged to interrupt his work; and a letter written (13th August) from Richmond by Lady Anne Roxburgh to Baron W; van Brederode at the Hague states that the portraits of the Princess Mary had been greatly delayed through Van Dyck's illness, and that the

prince's (William II. of Orange) would be ready in eight days. " As Van Dyck intends leaving England in the course of ten or twelve days at latest," she adds, " he will take the paintings himself to the princess of Orange." These portraits, now in the museum at Amsterdam, are the last Van Dyck painted in England. Of works dated 1639 the portrait of Lady Pembroke, in the gallery of Darmstadt, is a fine example; and to the same year belongs a full-length portrait of Arthur Goodwin at Chatsworth. The twin portrait of Thomas Carew and Thomas Killigrew, in the royal collection, dated 163&, is certainly most delicate, but very weak in tone and slight in handling. Van Dyck sailed in September, and probably spent some time with his Antwerp friends. Early in November he reached Paris, and

succeeded in obtaining some important work, when, on 1 6th November, he was compelled to resign his commissions on account of the state of his health. Scarcely three weeks later (gth December 1641) he died at his residence at Blackfriars. Van Dyck was buried in old St Paul's, where a Latin inscription was placed on his tomb by Charles I.

An elegy in Cowley's Miscellanies speaks, not only of the painter's talent, but of his amiable disposition. We may perhaps point to the coincidence that a Mrs Cowley is in Van Dyck's will (of 1st December) named guardian of his child, Justiniana Anna, born only eight days before her father's death. The painter had in the Netherlands an illegitimate daughter, Maria Theresia, who was entrusted to his sister, and to whom he bequeathed £4000. The name of her mother is not known. Not long after her husband's death Lady Van Dyck became the second wife of Sir Richard Pryse of Gogerddan in Cardigan- shire. She was dead in 1645. Justiniana Van Dyck, who was married when scarcely twelve years old to Sir John Stepney of Prendergast, was also something of an artist: she painted a " Crucifixion," with four angels receiving Christ's blood in chalices. A similar subject had been painted by Van Dyck, as Bellori tells us, for the duke of Northumberland. After the Restoration a pension of £200 for life was granted to Justiniana Van Dyck, who died before 1690.

Properly speaking, Van Dyck cannot be said to have formed a school. He was followed to London by some of his earlier collaborators, and there soon met a considerable number of others. Jaa van Reyn, David Beek, Adrian Hanneman, Mathew Merian, John Bockhorst (Lang Jan), Remy van Leemput and Peter Thys were foremost among foreigners, Henry Stone and William Dobson among Englishmen. To their assistance the master owed much; but they are also responsible for the vast number of constantly recurring copies which go by his name. It often requires a very discriminating eye to distinguish some of these copies from the original paintings. Nevertheless, after Van Dyck's death many of his coadjutors produced works of undeniable merit. No school more strikingly reflects the influence of Van Dyck than the British school. Stone and Dobson were, properly speaking, the most fortunate of his continuators; and there is little doubt that such masters as Reynolds, Gainsborough, Lawrence and Raeburn owe a large measure of their superiority to their study of his works.

Though Van Dyck's reputation greatly suffered through the numerous copies he allowed his pupils to take from his works, the case is otherwise with engraving: Vorsterman, Pontius, Peter de Jode, P. Balliu and S. Bolswert were seldom more fortunate than when under his guidance. De Jode's " St Augustine," Bolswert's " Ecce Homo "and " Crucifixion," Vorsterman's "Deposition," and especially Pontius's " Herman Joseph " rank among the masterpieces of the art of engraving. Van Dyck was himself an incomparable etcher, and with the needle arrived at a degree of excellence scarcely inferior to that exhibited in his paintings. Such prints as the portraits of Vorsterman, John de Wael, Snyders, Josse de Momper, Adam van Noort, and above all his own effigy, bear witness to his prodigious knowledge of design. Print collectors pay extravagant prices For a first proof taken from the plates engraved by Van Dyck himself. Van Dyck also employed some of the best engravers of his time for the production of a gallery of illustrious heads, men and women, of different countries. Whether all were taken from life is ques- tionable. Gustavus Adolphus and Wallenstein he can hardly nave met. Du Breucq, the architect, he never knew. But all the sketches and drawings were done by himself, and are often met with in public and private galleries. The engravings are sometimes very beautiful and in their first states very rare. Published successively by Martin van der Enden, Giles Hendrickx and John Meyssens, the collection originally consisted of sixteen warriors and statesmen, twelve scholars and fifty- two artists. Hendrickx raised the number to ninety-nine, and used as a frontispiece the

portrait of Van Dyck, with the following inscription: Icones principum, virorum doctorum, &c. &c, numero centum ab Antonio Van Dyck pictore ad vivum expressae eiusq. sumtibus aeri incisae, 1645. Seventeen editions were published, the last in 1759, with 124 plates. Many of the plates are the property of the French Government, and belong to the Chalcographie Nationale in Paris.

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VANE, SIR HENRY (1589-1654), English secretary of state, eldest son of Henry Vane or Fane, of Hadlow, Kent, a member of an ancient family of that county, by his second wife, Margaret, daughter of Roger Twysden of East Peckham, Kent, was born on the 1 8th of February 1589. He matriculated from Brase- nose College, Oxford, on the 15th of June 1604, was admitted to Gray’s Inn in 1606, and was knighted by James I. on the 3rd of March 161 1. He purchased several offices at court, was made comptroller of the king’s household about 1629, and in spite of a sharp quarrel with Buckingham managed to keep the king’s favour, in 1639 becoming treasurer. He was returned to parliament in 1614 for Lostwithiel, from 1621 to 1626 for Carlisle, in 1628 for Retford, and in the Short and Long Parliament, assembled in 1640, he sat for Wilton. He was despatched on several missions in 1629 and 1630 to Holland, and in 1631 to Gustavus Adolphus to secure the restitution of the Palatinate, but without success. In 1630 Vane had become a privy councillor and one of the chief advisers of the king. He was made a commissioner of the Admiralty in 1632 and for the

colonies in 1636. He was one of the eight privy councillors appointed to manage affairs in Scotland on the outbreak of the troubles there, and. on the 3rd of February 1640, through the influence of the queen and of the marquis of Hamilton and in opposition to the wishes of Strafford, he was made secretary of state in the room of Sir John Coke. In the Short Parliament, which assembled in April, it fell to Vane, in his official capacity, to demand supplies. He proposed a bargain by which the king should give up ship-money and receive in return twelve subsidies. Parliament, however, proved intractable and was dissolved on the 5th of May, to prevent a vote against the continuance of the war with the Scots. In the impeachment of Strafford, Vane played a very important part and caused the earl's destruction. He asserted that Strafford had advised the king at a meeting of the privy council, " You have an army in Ireland; you may employ it to reduce this kingdom." He refused to admit or deny the meaning attributed by the prosecution that " this kingdom " signified England; he was unsupported by the recollection of any other privy councillor, and his statement could not be corroborated by his own notes, which had been destroyed by order of the king, but a copy obtained through his son, the younger Vane, was produced by Pym and owned by Vane to be genuine. He was on bad terms with Strafford, who had opposed his appointment to office and who had given him special provocation by assuming the barony of Raby, a title ardently desired by Vane himself. He was not unnaturally accused of collusion and treachery, and there is no doubt that he desired Strafford's removal not only on private but on public grounds, believing that his sacrifice

would satisfy the demands of the parliament. Nevertheless, there has appeared no evidence to support the charge that he deliberately compassed his destruction. Suspicions of his fidelity, however, soon increased, and after having accompanied the king to Scotland in August 1641, he was dismissed from all his appointments on the 4th of November on Charles's return. Vane immediately joined the parliament; on Pym's motion, on the 13th of December, he was placed on the committee for Irish affairs, was made lord lieutenant of Durham on the 10th of February 1642, became a member of the committee of both kingdoms on the 7th of February 1644, an< l in this capacity attended the Scots army in 1645, while the parliament in the treaty of Uxbridge demanded for him from Charles a barony and the repayment of his losses. He

adhered to the parliament after the king's death, and in the first parliament of the Pro- tectorate he was returned for Kent, but the House had refused to appoint him a member of the council of state in February 1650. He died in 1654. He had married Frances, daughter and co-heir of Thomas Darcy of Tolleshurst Darcy in Essex, by whom he had a large family of children, of whom the eldest son, Sir Henry Vane, the younger, is separately noticed.

Clarendon invariably speaks of Vane in terms of contempt and reproach. He describes him as merely fit for court duties, " of very ordinary parts by nature and . . . very illiterate. But being of a stirring and boisterous disposition, very industrious and very bold, he still wrought himself into some employment." He declares that motives of revenge upon Strafford influenced not only his conduct in the impeachment but his unsuccessful management of the king's business in the Short Parliament, when he " acted that part maliciˆ ously and to bring all into confusion." The latter accusation, considering the difficulties of the political situation and Vane's total want of ability in dealing with them, is probably unfounded. On the general charge of betraying the king's cause, Vane's mysteri- ous conduct in the impeachment, his great intimacy with Hamilton, and the favour with which he was immediately received by the Opposition on his dismissal from office, raise suspicions not altogether allayed by the absence of proof to substantiate them, while the alacrity with which he transferred himself to the parliament points to a character, if not of systematic treachery, yet of unprincipled and unscrupulous time-serving. Materials, however, to elucidate the details and motives of his ill-omened career have hitherto been wanting.

VANE, SIR HENRY (1613-1662), English statesman and author, known as " the younger " to distinguish him from his father, Sir Henry Vane (q.v.), was baptized on the 26th of May 1613, at Debden, Essex. After an education at Westminster, where he was noted for his high and reckless spirits, and at Magdalen Hall, Oxford, where he neither matriculated nor took his degree, he was attached to the embassy at Vienna and at Leiden and Geneva. He had already acquired strong Puritan views which, in spite of the personal efforts of Laud, who made the attempt at the king's request, he refused to give up. In

1635, in order to obtain the free exercise of his religion, he emigrated to Massachusetts, where he was elected governor in

1636. After one year in office, during which he showed some administrative ability, he was defeated by Winthrop, the former governor, chiefly on account of the protection he had given to Mrs Hutchinson in the religious controversies which she raised. He, however, never lost his interest in the colonies, and used his influence hereafter on several occasions in their support.

Vane returned to England in August 1637. He was made joint-treasurer of the navy with Sir W. Russell in January 1639, was elected for Hull in the Short and Long Parliaments, and was knighted on the 23rd of June 1640. Accidentally finding among his father's papers some notes of Strafford's speech iii the council of May 5, 1640, he allowed Pym to take a copy, and was thus instrumental in bringing about Strafford's downfall. He carried up the impeachment of Laud from the Commons, was a strong supporter, when on the committee of religion, of the "Root and Branch" bill, and in June 1641 put forward a scheme of church government by which commissioners, half lay and half cleric, were to assume ecclesiastical jurisdiction in each diocese. During the absence of Pym and Hampden from the House at the time of Charles's attempted arrest of the five members, Vane led the parliamentary party, and was finally dismissed from his office in December 1641, being

reinstated by the parliament in August 1642. The same month he was placed upon the committee of defence. In 1643 he was the leading man among the commissioners sent to treat for a league with the Scots. Vane, who was bitterly opposed to the tyranny of the Presbyterian system, was successful in two important points. The aim of the Scots was chiefly the propagation of their discipline in England and Wales, and for this they wanted only a " covenant." The English desired a political " league." Vane succeeded in getting the bond termed the Solemn League and Covenant, and further in substituting the whole expression " according io the word of God and the example of the best Reformed churches " for the latter part alone. He succeeded to the leadership of the party on Pym's death. He promoted, and became a chief member of, the committee of both kingdoms established in February 1644, and

was sent to York in the summer of the year to urge Fairfax and Manchester to march against Prince Rupert, and secretly to propose the king's deposition. In 1645 he was one of the negotiators of the treaty of Uxbridge. He was, with Cromwell, a prime mover in the Self-Denying Ordinance and the New Model, and his adherence to the army party and to religious tolerance now caused a definite breach with the Scots. Vane had at the Westminster Assembly, writes Baillie indignantly, " prolixly, earnestly and passionately reasoned for a full liberty of conscience to all religions," a policy directly opposed to Presbyterianism, and his leadership terminated when the latter party obtained the supremacy in parliament in 1646. During the subsequent struggle he was one of the six com- missioners appointed to treat with the army by the parliament, and endeavoured to effect a compromise, but failed, being distrusted by both the Levellers and the Presbyterians. His views of government may be studied in The People's Case Stakd, written shortly before his death. " The power which is directive, and states and ascertains the morality of the rule of obedience, is in the hand of God; but the original, from whence all just power arises, which is magistratical and co- ercitive, is from the will or free gift of the people, who may either keep the power in themselves or give up their subjection and will in the hand of another." King and people were bound by " the fundamental constitution or compact," which if the king violated, the people might return to their original right and freedom.

In spite, however, of these free opinions, Vane still desired the maintenance of the monarchy and the constitution. He voted for a declaration to this effect on the 28th of April 1648, and had consistently opposed the various votes of " non-addresses." Several communications had already been fruit-lessly attempted with Vane from the king's side, through the agency of Lord Lovelace in January 1644, and through that of John Ashburnham in March 1646. Vane now supported the re-newal of negotiations, and was appointed on the 1st of September 1648 one of the commissioners for the treaty of Newport. He here showed a desire to come to terms on the foundation of toleration and a "moderate episcopacy," of which Cromwell greatly disapproved, and opposed the shaking off of the con- ferences. He absented himself from parliament on the occasion of " Pride's Purge," and remained in retirement until after the king's death, a measure in which he

took no part, though he continued to act as a member of the government. On the 14th of February 1649 he was placed on the council of state, though he refused to take the oath which expressed approba- tion of the king's execution. Vane now showed himself an able administrator. He served on innumerable committees of importance, and was assiduous in his attendance. He furnished the supplies for Cromwell's expedition to Scotland, and was one of the commissioners sent there subsequently to settle the government and negotiate a union between the two countries. He showed great energy in colonial and foreign affairs, was a leading member of the committee dealing with the latter, and in 1651 went on a secret mission to negotiate with Cardinal de Retz, who was much struck with his ability, while his knowledge of foreign policy, in which he inclined in favour of Holland,

earned the praise also of Milton. To Vane, as chief com- missioner of the navy, belongs largely the credit of the victories obtained against Van Tramp.

In domestic politics Vane continued to urge his views of toleration and his opposition to a state church. On the 9th of January 1650 he brought forward as chairman the report of a committee on the regulation of elections. He wished to reform the franchise on the property basis, to disfranchise some of the existing boroughs, and to give increased representation to the large towns; the sitting members, however, were to retain their seats. In this he was opposed to Cromwell, who desired an entirely new parliament and the supremacy of the army repre- sentation. On the 20th of April Cromwell forcibly dissolved the Long Parliament while in the act of passing Vane's bill. On the latter's protesting, " This is not honest; yea, it is against morality and common honesty," Cromwell fell a-railing at him, crying out with a loud voice, " O Sir Henry Vane, Sir Henry Vane; the Lord deliver me from Sir Henry Vane!" (Ludlow, Mem. i. 353). Hitherto they had lived on intimate terms of friendship, but this incident created a permanent breach. In his seclusion at Raby he now wrote the Retired Man's Meditations (1655). In' 1656 he proposed in A Healing Question (reprinted in the " Somers Tracts," vol. vi. ed. Scott) a new form of government, insisting as before upon a Puritan parliament supreme over the army. The seditious movements of the Anabaptists were also attributed to his influence, and on the 29th of July 1656 he was summoned before the council. Refusing to give security not to disturb the public peace, he was

on the 9th of September sent prisoner to Carisbrooke Castle, and there remained until the 31st of December. He ad- dressed a letter to Cromwell in which he repudiated the extra-parliamentary authority he had assumed. In the parliament of Richard Cromwell he was elected for Whitchurch, when he urged that the protector's power should be strictly limited, and the negative voice of the new House of Lords disallowed.

Subsequently he allied himself with the officers in setting aside the protectorate and in restoring the Long Parliament, and on Richard Cromwell's abdication he regained his former supremacy in the national counsels. He was a member of the committee of safety and of the council of state appointed in May, was commissioner for the navy and for the appointment of army officers, managed foreign affairs and superintended finance. He adhered to Lambert, remained a member of the government after the latter had turned out the Long Parliament, and endeavoured to maintain it by reconciling the disputing generals and by negotiating with the navy, which first deserted the cause. In consequence, at the restoration of the Long Parliament he was expelled the House and ordered to retire to Raby.

At the Restoration Vane was imprisoned in the Tower by the king's order. After several conferences between the houses of parliament, it was agreed that he should be excepted from the indemnity bill, but that a petition should be sent to Charles asking that his life might be spared. The petition was granted. On the meeting, however, of the new parliament of 1661, a vote was passed demanding his trial on the capital charge, and Vane was taken back to the Tower in April 1662 from the Scilly Isles, where he had been imprisoned. On the 2nd of June he appeared before the king's bench to answer the charge of high treason, when he made a bold and skilful defence, asserting the sovereign power of parliament in justification of his conduct. He was, however, found guilty, and executed on Tower Hill oh the 14th of June 1662. He had married, in 1640, Frances, daughter of Sir Christopher Wray of Barlings, by whom he had a large family of sons and daughters. Of these Christopher, the fifth son, succeeded to his father's estates and was created Baron Barnard by William III.

Vane's great talents as an administrator and statesman have been universally acknowledged. He possessed, says Clarendon, " extra- ordinary parts, a pleasant wit, a great understanding,

a temper not to be moved," and in debate " a quick conception and a very sharp and weighty expression." His patriotism and assiduity

in the public service, and complete freedom from corruption, were equally admirable and conspicuous. His religious writings, apart from his constant devotion to toleration and dislike of a state church, are exceedingly obscure both in style and matter, while his en- thusiasm and fanaticism in speculative doctrine combine curiously, but not perhaps incongruously, with exceptional sagacity and shrewdness in practical affairs. " He had an unusual aspect," says Clarendon, " which . . . made men think there was something in him of the extraordinary; and his Whole life made good that imagination." Besides the works already mentioned and several printed speeches, Vane wrote: A Brief Answer to a certain Declara- tion of John Winthrop (reprinted in the Hutchinson Papers, publ. by the Prince Society, 1865) ; A Needful Corrective or Balance in Popu- lar Government ... in answer to Harrington's Oceana; Of Love of God and Union with God; two treatises, viz. (1) An Epistle General to the Mystical Body of Christ on Earth, (2) The Face of the Times: A Pilgrimage into the Land of Promise . . . (1664). The Trial of Sir Henry Vane, Knight (1662), contains, besides his last speech and details relating to the trial, The People's Case Stated (reprinted in Forster's Life of Vane), The Valley of Jehoshaphat, and Meditations concerning Man's Life. A Letter from a True and Lawful Member of Parliament to one of the Lords of His Highness's Council (1656), attributed to Vane, was written by Clarendon; and The Light Shining out of Darkness was probably by Henry Stubbe; while The Speech against Richard Cromwell is the composition of some contemporary pamphleteer.

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(1881), ii. 93-137; also Wood's Ath. Oxon. (Bliss), iii. 578, and Biographia Britannica. See especially S. R. Gardiner's Hist, of England, his Great Civil War and his Common- wealth, and Clarendon's Hist, of the Rebellion, and the contem- porary memoirs and diaries; Hist. MSS. Comm. MSS. of duke of Buccleuch, ii. pt. ii. 756; Masson's Life of Milton, iv. 442 and passim; the sonnet addressed by Milton to Vane; and W. W. Ire- land, Life of Sir Henry Vane the Younger (1907). (P. C. Y.)

VANE (formerly spelt " fane," i.e. pennon, flag; cf. Ger. Fahne, Du. vaan, Fr. girouette, Ital. banderuola, Ger. Wetter- jahne), the weathercock on a steeple. Vanes seem in early times to have been of various forms, as dragons, &c; but in the Tudor period the favourite design was a beast or bird sitting on a slender pedestal and carrying an upright rod, on which a thin plate of metal is hung like a flag, ornamented in various ways.

VAN HORNE, SIR WILLIAM CORNELIUS (1843-), Canadian financier, was born in Will county, Illinois, U.S.A., on the 3rd of February 1843, of Dutch descent. He was educated in the common schools of the state, and in 1857 began work as office boy in a railway station. His ability and force brought him to the front, and he rose till in 1881 he was appointed general manager of the Canadian Pacific railway. For the successful completion of this great road his strong will and mental grasp were largely responsible, and he it was who not only controlled but steadily extended its operations during the lean years which followed. In 1884 he became vice-president of the line, in 1888 president, and in 1899 chairman of the board of directors. From 1885 onward he was more and more associated with every branch of Canadian mercantile and financial life, and as a publicist gave shrewd expression to his views on political and economic questions. After the Spanish-American War (1898) he became one of the chief promoters of railway and industrial enterprise in Cuba. In May 1894 he was knighted by Queen Victoria in acknowledgment of bis dis- tinguished public services. He was also known as a patron of art and literature and an amateur painter of no little merit.

VANILLA, a flavouring agent largely used in the manu- facture of chocolate, in confectionery and in perfumery. It consists of the fermented and dried pods of several species of orchids belonging to the genus Vanilla. 1 The great bulk of the commercial article is the produce of V. planifolia, a native of

south-eastern Mexico, but now largely cultivated in several tropical countries, especially in Bourbon, the Seychelles, Tahiti and Java. The plant has a long fleshy stem and attaches itself by its aerial rootlets to trees; the roots also penetrate the soil and derive a considerable portion of their nourishment from 1 Span, vainilla, dim. of vaina, a pod.

it. The leaves are alternate, oval-lanceolate and fleshy; the light greenish flowers form axillary spikes. The fruit is a pod

Vanilla Plant {Vanilla planifolia). A, shoot with .flower, leaf and aerial rootlets; B, pod or fruit.

from 6 to 10 in. long, and when mature about half an inch in diameter. The wild plant yields a smaller and less aromatic fruit, distinguished in Mexico as Baynilla cimarona, the cultivated vanilla being known as B. corriente.

Vanilla was used by the Aztecs of Mexico as an ingredient in the manufacture of chocolate before the discovery of America by the Spaniards, who adopted its use. The earliest botanical notice is given in 1605 by Clusius {Exoticorum Libri Decern), who had received Fruits from Hugh Morgan, apothecary to Queen Elizabeth; but'he seems to have known nothing of its native country or uses. The Mexican vanilla had been introduced to cultivation before the publication of the second edition of Philip Miller's Gardeners' Dic- tionary (1739). It was reintroduced by the marquis of Blandford, arid in 1807 a flowering specimen was figured and described by' R. A: Salisbury [Paradisus, London, t. 82). Mexican vanilla is regarded as the best. It is principally consumed in the United States. : In Bourbon about 3000 acres are under cultivation; the crop is sent to Bordeaux, the chief centre of the trade in France. Its odour is said to differ from the Mexican variety in having a suggestion of tonqua bean. The Seychelles produce large quantities of exceedingly fine quality, the produce of these islands goes chiefly to the London market. The Java vanilla, grown chiefly in Krawang and the Preanger Regencies, is shippea to Holland. The Tahiti produce is inferior in quality.

Mr Hermann Mayer Senior, in the Chemist and Druggist, June 30, 1900, gives the following figures, which approximately represent the world's output of vanilla during the seasons 1 905-1906: Bourbon, 70 tons; Seychelles, 45 tons ; Mauritius, 5 tons; Comores, Mayotte, Madagascar, &c, 120 tons;

Guadeloupe, Java, Ceylon 'and Fiji, 10 tons; Mexica, 70 tons; Tahiti, 100 tons — total, about 420 tons.

The best varieties of vanilla pods are of a very dark chocolate brown or nearly black colour, and are covered with a crystalline efflorescence technically known as givre, the presence of which is taken as a criterion of quality. The peculiar fragrance of vanilla is due to vanillin, CjHjOa, which forms this efflorescence. Chemi- cally speaking, it is the aldehyde of methyl-protocatechuic acid. It is not naturally present in the fleshy exterior of the pod, but is secreted by hair-like papillae lining its three internal angles, and ultimately becomes diffused through the viscid oily liquid surround- ing the seeds. The amountof vanillin varies according to the kind : Mexican vanilla yields l,-6o.', Bourbon or Reunion 1-9 to 2-48, and Java 2175%. Besides vanillin, the pods contain vanillic acid (which is odourless), about 11% of fixed oil, 2-3% of soft resin, sugar, gum and oxalate of lime.

Vanillin forms crystalline needles, fusible at 81 ° C, and soluble in alcohol, ether and oils, hardly soluble in cold, but more so in boiling water. Like other aldehydes, it forms a compound with the alkaline bisulphites, and can by this means be extracted from bodies con- taining it. Vanillin has been found in Siam benzoin and in raw sugar, and has been prepared artificially from coniferin, a glucoside found in the sapwood of fir-trees, from asafoetida, and from a con- stituent of oil of cloves named eugenol, It is from the last-named that vanillin is now prepared on a commercial scale, chiefly in Germany. Vanillin does not appear to have any physiological action on human beings when taken in small doses, as much as jo to 15 grains having been administered without noxious results. On small animals, however, such as frogs, it appears to act as a convulsive, It has been suggested as a stimulant of an expitpˆ motor character in atonic dyspepsia. It is a constituent of Gilnz- burg's reagent (phloro-vanillin-glucin) for the detection of free hydrochloric acid in the gastric contents. The poisonous effects

that have on several occasions followed from eating ices flavoured with vanilla are not to be attributed to the vanilla,

but probably to the presence of tyrotoxicon {Pharm, Journ. [3], xvii. p. 150), a poison found in milk which has undergone certain putrefactive changes, and producing choleraic effects, or perhaps to the presence of micro- scopic fungi in the vanilla, the plantations being liable to the attack of Bacterium putredinis. Workmen handling the beans in the Bordeaux factories are subject to itching of the hands and face; but this is caused by an Acarus which occupies the end of the pod. In some cases, however, symptoms of dizziness, weariness and malaise, with muscular pains, have been felt, due possibly to the absorption of the oily juice by the hands of the workmen.

See also R. A. Rolfe, " Vanillas of Commerce," in Kew Bulletin (1895), p. 169, and " Revision of the Genus Vanilla," in Journal of The Linnean Society (Botany), xxxii. 439 (1896) ; also S. J. Galbraith, on " Cultivation in the Seychelles," U.S. Dept. of Agriculture, Division of Botany, Bulletin si (1898).

VANINI, LUCILIO, or, as he styled himself in his works, Giulio Cesare (1 585-1619), Italian free-thinker, was born at Taurisano, near Naples, in 1585. He studied philosophy and theology at Rome, and after his return to Naples applied him-self to the physical studies which had come into vogue with the Renaissance. Like Giordano Bruno, though morally and intellectually inferior to him, he was among those who led the attack on the old scholasticism and helped to lay the foundation of modern philosophy. Vanini resembles Bruno, not only in his wandering life and in his tragic death, but also in his anti-Christian bias. From Naples he went to Padua, where he came under the influence of the Alexandrist Pom- ponazzi {q.v.), whom he styles his divine master. At Padua he studied law, and was ordained priest. Subsequently he led a roving life in France, Switzerland and the Low Countries, supporting himself by giving lessons and disseminating anti- religious views. He was obliged to flee from Lyons to England in 1614, but was imprisoned in London for some reason for forty- nine days. Returning to Italy he made an attempt to teach in Genoa, but was driven once more to France, where he made a valiant effort to clear himself of suspicion by publishing a book against atheists, Amphitheatrum Aeternae Providentiae Divino-Magicum (161 5). Though the definitions of God are somewhat pantheistic, the book is sufficiently orthodox, but the arguments are largely ironical, and cannot be taken as expounding his real views. Vanini expressly tells us so in his second (and only other published) work, Be Admirandis

Naturae Rcginae Deaeque Mortalium Arcanis (Paris, 1616), which, originally certified by two doctors of the Sorbonne, was afterwards re-examined and condemned to the flames. Vanini then left Paris, where he had been staying as chaplain to the marechal de Bassompierre, and began to teach in Toulouse. In November t6i8 he was arrested, and after a prolonged trial was condemned, as an atheist, to have his tongue cut out, and to be strangled at the stake, his body to be afterwards burned to ashes. The sentence was executed on the 9th of February 1619.

See Ccusin, Fragments de philosophie carttsienne (Brussels, 1838-40), i. 1-99; French trans. M. X. Rousselot (Paris, 1842); John Owen, Skeptics of the Italian Renaissance (London, 1893), 345-419; J. Toulan, Etude sur L. Vanini (Strassburg, 1869); Cesare Cantu, Gli Erelici d'ltalia (Turin, 1867), iii. 72 ft. ; Fuhr- mann, Leben und Schicksale (Leipzig, 1800); Vaisse, L. Vanini (Paris, 1871); Palumbo, Vanini, e i suoi tempi (Naples, 1878); Passamonti in Rivista iialiana di jilosofia (1893), vol. iii.

ˆANLOO, CHARLES ANDREW (1 705-1 765), subject painter, a younger brother of John Baptist Vanloo (q.v.), was born at ˆTice on the 15th of February 1705. He received some in- duction from his brother, and like him studied in Rome under Luti. Leaving Italy in 1723, he worked in Paris, where he gained the first prize for historical painting. After again visit- ing Italy in 1727, he was employed by the king of Sardinia, for whom he painted a- series of subjects illustrative of Tasso. In 1734 he settled in Paris, and in 1735 became a member of the French Academy; and he was decorated with the order of St Michael and appointed principal painter to the king. By his simplicity of style and correctness of design, the result of his study of the great Italian masters, he did much to purify the modern French school; but the contemporary praise that was lavished upon his productions now appears undue and

excessive. His " Marriage of the Virgin " is preserved in the Louvre. He died at Paris on the 15th of July 1765.

VANLOO, JOHN BAPTIST (1684-1745), French subject and portrait painter, was born at Aix in Provence on the 14th of January 1684. He was instructed in art by his father. Having at an early age executed several pictures for the decoration of the church and public buildings at Aix, he was employed on similar work at Toulon, which he was obliged to leave during the siege of 1707. He was patronized by the prince of Carignan, who sent him to Rome, where he studied under Benedetto Luti. Here he was much employed on church pictures, and in par- ticular executed a greatly praised " Scourging of Christ " for St Maria in Monticelli. At Turin he painted the duke of Savoy and several members of his court. Then, removing to Paris, where he was elected a member of the French Academy, he exe- cuted various altar-pieces and restored the works of Primaticcio at Fontainebleau. In 1737 he went to England, where he attracted attention by his portrait of Colley Cibber and of Owen McSwiny, the theatrical manager; the latter, like many other of Vanloo's works, was engraved in mezzotint by the younger Faber. He also painted Sir Robert Walpole, whose portrait by Vanloo in his robes as chancellor of the exchequer is in the National Portrait Gallery (London) , and the prince and princess of Wales. He did not, however, practise long in England, for. his health failing he retired to Paris in 1742, and afterwards to Aix, where he died on the 19th of December 1745. His like- nesses were striking and faithful, but seldom flattering, and his heads are forcible in colouring. The draperies and accessories in his pictures were usually painted by Van Achen, Eccardt and Root.

VANNES, a town of western France, capital of the depart- ment of Morbihan, 84 m. N.W. of Nantes on the railway to Brest. Pop. (1906), town, 16,728; commune, 23,561. It is situated 10 m. from the open sea, at the confluence of two streams forming the Vannes river, which debouches into the land-locked Gulf of Morbihan about a mile below the town. The narrow, steep and crooked streets of the old town, which lie on a hill facing the south, are surrounded by fortifications of the 14th, 15th and 17th centuries, pierced by four gates and flanked by nine towers and five bastions, connected by battlements. In the Constable's Tower Olivier de Clisson was

confined in 1387. The modern suburbs, with the port, the public buildings, barracks, convents, squares and promenades, notably the Garenne and the park of the Prefecture, surround the old town. The archaeological museum, the contents of which are mainly the fruit of excavations at Carnac and elsewhere in the vicinity, includes one of the richest collections of prehistoric remains in Europe. There are also a museum of natural history and a library. The cathedral of St Peter overlooks the old town; burnt by the Normans in the 10th century, it was rebuilt in the 13th, 15th and 18th centuries. It has remains of a cloister and contains the relics and tomb of the Spanish Dominican preacher St Vincent Ferrier, who died at Vannes in 1419. The curious round Chapelle du Pardon to the left of the nave was built in 1537 in the Italian style. Some interesting old houses, including that of the presidents of the parlement of Brittany, the rich private collections of M. de Limur, and the church of St Paterne (18th century) are also worthy of mention. There is a monument to Le Sage, born near Vannes. Vannes is the seat of a prefect, a bishop and a court of assizes, and has tribunals of first instance and of commerce and a branch of the Bank of France. A communal college is among the educational institu- tions. Among the industries are building, tanning and cotton- weaving. The port of Vannes, to the south of the town, is formed by the Vannes river and is accessible only to small vessels. Vessels of 800 tons can make the harbour of Conleau about 25 m. from the town.

Vannes (Dariorigum), the capital of the Veneti (whence Gwened, the Breton name of the town) , was at the head of the Armorican league against Julius Caesar, who in 56 B.C. over- came their fleet and opened up their country by six roads. St Paternus, the first bishop, was consecrated in 465. In the 5th century Vannes was ruled for a time by independent counts,

but soon came under the $K>ke of the Franks. Nomenoe, the lieutenant of Louis I., the Pious, in Brittany, assumed the title of king in 843, and one of his brothers was the founder of a line of counts who distinguished themselves against the Normans in the 9th and 10th centuries. Valines became part of the duchy of Brittany at the end of the 10th century. The estates of Brittany met there for the first time in 1203 to urge

Philip Augustus to avenge the death of Arthur of Brittany. In' the course of the War of Succession the town was besieged four times in 1342. Duke John IV. built here the castle of L'Hermine and made it his habitual residence. In 1487 the town was for a year in the hands of Charles VIII. of France. In 1532 Brittany was definitively united to France. The estates met at Vannes several times in the 17th and 18th centuries. During the Revolution this town was the scene of the execution in 1795 of some of the prisoners after the royalist disaster at Quiberon.

VAN RENSSELAER, STEPHEN (1764-1839), American political leader and soldier, " last of the patroons," was born at New York City on the 1st of November 1764. He was fifth in descent from Killian Van Rensselaer (c. 1580-1645), the original patroon of Rensselaerwyck, New York, who acquired his large estates between 1630 and 1637. Stephen was graduated at Harvard in 1782. In 1789-90 he was a member of the New York Assembly, and from 1791 to 1795 served as a member of the state Senate. He was lieutenant-governor of New York (1795-1801) for the two terms in which John Jay was governor. In 1801 he presided over the state constitutional convention, and from 1808 to 18 10 was again in the Assembly. He was an ardent promoter of the Erie Canal, and as a commissioner to examine the proposed route, &c, he reported favourably to the Assembly in 1811. In the second war with Great Britain he commanded the First Division of the detached militia of the state of New York, with the rank of major-general, and on the 13th of October 181 2 was defeated at the battle of Queenston Heights. As he was a Federalist he was severely criticised and censured for this defeat and resigned from the army. At the close of the war the Erie Canal project was renewed, and from 1816 till his death he was a member of the board of canal commissioners, and for nearly fifteen years was its president. In 1818 he was again elected to the Assembly; in 1819 he became a regent of the State University of which he was for a time chancellor; and in 1821 he was a delegate to the New York constitutional convention. From 1822 to 1829 he was a member of the National House of Representatives, 1 and there voted for John Quincy Adams for the presidency, and served as chairman of the committee on agriculture. In 1820-23 he sent out at his own expense Professors Amos Eaton (1 776-1842) and Edward Hitchcock to make extensive surveys, results of which were published as An Agricultural and Geological Survey of the District adjoining

the Erie Canal (Albany, 1824). In 1824 he founded a school in Troy which was incorporated two years later as the Rensselaer Polytechnic Institute. He died at Albany, New York, on the 26th of January 1839.

See D. D. Barnard, A Discourse on the Life, Services and Character of Stephen Van Rensselaer (Albany, 1839).

VANSITTART, HENRY (1732-1770 or 1771), Anglo-Indian governor, was born in Londcn on the 3rd of June 1732, His father, Arthur van Sittart (1691-1760), and his grandfather, Peter van Sittart (1651-1705), were both wealthy merchants and directors of the Russia company. Peter, a merchant adventurer, who had migrated from Danzig to London about 1670, was also a director of the East India company. The family name is taken from the town of Sittard in Limburg. Educated at Reading school and at Winchester college, Henry Vansittart joined the society of the Franciscans, or the " Hell-fire club," at Medmenham, his elder brothers, Arthur and Robert, being also members of this fraternity. In 1745 he entered the

1 He succeeded his cousin, Solomon Van Rensselaer (I744"" I 85 2) > who was in the regular army in 1792-1800, who had fought under General Anthony Wayne at Maumee Rapids in 1794 and under Stephen Van Rensselaer at Queenston Heights in 1812, and who was in the House of Representatives in 1819-1822.

service of the East India company and sailed for Fort St David; here he showed himself very industrious, made the acquaintance of Robert Clive and rose rapidly from one position to another. As a member of the council of Madras he helped to defend the city against the French in 1759, and in July 1760 he went to Bengal as president of the council and governor of Fort William. Courageously facing the difficulties of his new position, which included a serious lack of funds, he deposed the subadar of Bengal, Mir Jafar, whom he replaced by his son-in-law, Mir Kasim, a circumstance which increased the influence of England in the province. He was, however, less successful in another direction. Practically all the company's servants were traders in their private capacity, and as they claimed various privileges and exemptions this system was detrimental to the interests of the native princes and gave rise to an enormous amount of corruption. Vansittart sought to

check this, and in 1762 he made a treaty with Mir Kasim, but the majority of his council were against ■ him and in the following year this was repudiated. Reprisals on the part of the subadar were followed by war, and, annoyed at the failure of his pacific schemes, the governor resigned and returned to England in 1764. His conduct was attacked before the board of directors in London, but events seemed to prove that he was in the right, and in

1769 he became a director of the company, having in the previous year obtained a seat in parliament. He was now sent on an important mission to India; he left England in September 1769, but the ship in which he sailed was lost at sea late in

1770 or early in 1771. One of his five sons was Nicholas Vansittart, Baron Bexley (q.v.). To defend his conduct in Bengal Vansittart published some papers as A Narrative of the Transactions in Ben-gal from 1760 to 1764 (London, 1766).

Vansittart's brother, Robert Vansittart (1728-1789), who Was educated at Winchester and at Trinity College, Oxford, was regius professor of civil law at Oxford from 1757 until his death on the 31st of January 1789. Another brother, George Vansittart (1745-1825), of Bisham Abbey, Berkshire, was the father of General George Henry Vansittart (1768ˆ 1824) and of Vice-Admiral Henry Vansittart (1777-1843).

VAN'T HOFF, JACOBUS HENDRICUS (1852-), Dutch chemist and physicist, was born in Rotterdam on the 30th of August 1852. He studied from 1869 to 187 1 at the polytechnic at Delft, in 1871 at the university of Leiden, in 1872 with F. A. Kekule at Bonn, in 1873 with C. A. Wurtz at Paris, and in 1874, when he tcok his doctor's degree, with E. Mulder at Utrecht. In 1876 he became lecturer on physics at the veterinary school at Utrecht, and two years later he was chosen professor of chemistry, mineralogy and geology in Amsterdam University. In 1894 he declined an invitation to the chair of physics at Berlin University, but in 1896 he went to Berlin as professor to the Prussian Academy of Sciences, with a salary and a laboratory, but freedom to do whatever he liked; and at the same time he accepted an honorary professorship in the university so that he might lecture if he were so minded. On taking up these appointments he announced that, the applica- tion of mathematics to chemistry remaining his chief aim, he proposed to devote himself to the

study of the formation of oceanic salt deposits, with special reference to the Stassfurt deposits. He may be regarded as the founder of the doctrine of stereoisomerism (q.v.), for he was the first, in 1874, to intro- duce a definite mechanical theory of valency, and to connect the optical activity exhibited by many carbon compounds with their chemical constitution. In respect of this doctrine of the " asymmetric carbon atom," van't Hoff's name is generally linked with that of J. A. le Bel (born on the 21st of January 1847, at Pechelbronn, Lower Alsace), who, only two months later, independently enunciated the theory of asymmetric combinations with carbon; though it must be noted that J. Wislicenus, to whom van't Hoff, in fact, acknowledged his indebtedness, had already suggested that in order to explain the constitution of certain organic bodies, the tridimensional arrangement of atoms in space must be taken into account. For this work van't Hoff and Le Bel received the Davy medaj

jointly from the Royal Society in 1893. From 1874 to 1884 van't Hoff's attention was mainly given to the law of mass-action, and he established the theorem known by his name, which connects quantitative displacement of equilibrium with change of temperature. From 1885 to 1895 he was engaged on the theory of solutions, and developing the analogy between dilute solutions and gases he showed that the osmotic pressure of a solution has the same value as the pressure that solute would exert if it were contained as a gas in the same volume as is occupied by the solution. From 1885 he published the Zeitschrift filr physikalische Chemie, in collaboration with Professor W. Ostwald of Leipzig.

VAN WERT, a city and the county-seat of Van Wert county, Ohio, U.S.A., about 28 m. W. by N. of Lima. Pop. (1890) 5512; (1900) 6422 (221 foreign-born); (1910) 7157. Van Wert is served by the Pennsylvania and the Cincinnati Northern railways, and by an interurban electric line. Among the principal buildings are the city hall, the court house, the Brumback Library of Van Wert county (containing 14,650 volumes in 1908), the Home Office Building of the Home Guards of America (a fraternal society incorporated in 1899 and having about 16,000 members in 1910), and the Home

Office Building of the Central Manufactures' Insurance Co. Van Wert is situated in a rich agricultural region. It has railway and machine shops and various manufactures. The municipality owns and operates the waterworks. Van Wert was settled about 1840, was incorporated as a town in 1848 and was chartered as a city in 1903. The county and the city were named in honour of Isaac Van Wert (1760-1828), one of the captors of Major John Andre.

VAPEREAU, LOUIS GUST AVE (1819-1906), French man of letters and lexicographer, was born at Orleans on the 4th of April 1819. Educated at the Ecole Normale he became a teacher of philosophy, and was entrusted by Victor Cousin with the preparation of his studies on the Pensees of Pascal. Under the empire his republican principles cost him his position, and Vapereau studied for the bar. He practised, however, little or not at all, and after 1870 he was appointed prefect of Cantal (1870) and of Tarn et Garonne (1871-73). From 1877 to 1888 he was inspector-general of public instruction. He was the author of some excellent editions of the classics, and of works on political and social questions, but he is famous for his valuable Diclionnaire universel des contemporains (1858; 6th ed., 1893), brought up to date in 1895 by a supplementary volume. He also drew up a Diclionnaire universel des litte-rateurs (1876). At the time of his death at Norsang-sur-Orge in 1906, he had been for twenty-six years a regular contributor to L 'Illustration, some of his notes written for this journal being collected in 1896 as L' Homme et la Die.

VAPHIO, an ancient site in Laconia, Greece, on the right bank of the Eurotas, some 5 m. S. of Sparta. It is famous for its " bee-hive " tomb, excavated in 1889 by Dr Tsountas. This consists of a walled approach, or dpo/xos, about 97 ft. long, leading to a vaulted chamber some 33 ft. in diameter, in the floor of which the actual grave was cut. The objects found here and transferred to the National Museum in Athens include a large number of gems and amethyst beads, together with articles in gold, silver, bronze, iron, lead, amber and crystal. But by far the finest of them are two golden cups decorated with scenes in relief, picturing the capture of bulls. These form perhaps the most perfect works of " Mycenaean " or " Minoan " art which have survived. It seems likely that the Vaphio cups do not represent a local art but were imported from Crete, which at that early period was far ahead of main- land Greece in artistic development. The tomb, which probably belonged to

Amyclae rather than to Pharis, as is commonly stated, is now almost entirely destroyed.

See C. Tsountas, 'Vfyweph 'Apxaio\oyi K ri (1889), 136-172; J. G. Frazer, Patisanias's Description of Greece, iii. 135 f. (with full biblio- graphy) ; W. Ridgeway, The Early Age of Greece, i. 26-28; R. C. Bosanquet, Journal of Hellenic Studies (1904), xxiv. 317 ff . ; A. Rieel, Jahreshefte d. bsterr. arch. Institutes (1906), ix. I ff.

(M. N. T.)

VAPORIZATION. 1. In common language a vapour is a gaseous or elastic fluid, which emanates or evaporates from the surface of a solid or liquid at temperatures below its boiling-point. A volatile liquid or solid is one which evaporates rapidly at ordinary temperatures. It is a matter of common experience that evaporation is accelerated by currents of air, or by the use of an exhaust pump, or by any process which removes the vapour rapidly from the liquid. On the other hand, it is retarded, and finally ceases, if the vapour is allowed to accumulate in a closed space. When this equilibrium state is reached, the space is said to be saturated with the vapour; the density of the vapour is then the maximum which can exist in the presence of the liquid at the temperature of the experiment, and its pressure is called the saturation-pressure. The term vapour-pressure, when used without qualification, is also generally employed to denote the saturation or maxi- mum pressure. Dalton showed that the saturation-pressure of a vapour depends only on the temperature, and is unaffected by the presence of any neutral gas or vapour. This relation has been more accurately verified by many subsequent observers, and the exceptions to it have been minutely studied and eluci- dated. The saturation-pressure invariably increases rapidly with rise of temperature, according to a regular law which has been the subject of many elaborate investigations. When the vapour-pressure of a liquid becomes equal to the external pressure, bubbles of vapour are freely formed in the interior of the liquid by the familiar process of boiling or ebullition. The temperature at which this occurs under the normal atmo- spheric pressure of 760 mm. of mercury (reduced to o° C. and sea-level in latitude 45) is termed the boiling-point (B.P.) of the liquid, and is usually determined by taking the temperature of the saturated vapour under normal pressure, to avoid error from superheating (see below, 3) of the liquid. If the external

pressure remains constant, the temperature will also remain constant, provided that the liquid is pure and that its composition remains unaltered, until the whole is vaporized. If, on the other hand, the liquid is contained in a closed space, it may be made to boil at much lower temperatures by dimin- ishing the pressure; or the temperature of the liquid may be raised considerably above the normal boiling-point, as in the boiler of a steam-engine, if the pressure is raised by preventing the free escape of the vapour. In all cases, if the temperature is given, there is a corresponding equilibrium or saturation- pressure of the vapour, and vice versa, in accordance with Dalton's law. It was shown, however, by Cagniard de la Tour {Ann. Chim. Phys., 1822, 1823) that the temperature and pressure of the liquid could not be raised indefinitely in this manner. By heating liquids in strong glass bulbs with manometers attached, he found that at a certain tempera- ture the meniscus or curved surface separating the liquid from the vapour disappeared, and the bulb became filled with an apparently uniform substance. The temperature at which this mixing of liquid and vapour occurs is definite for each liquid, and is called the critical temperature. La Tour found the critical temperature in the case of water to be 362° C, a result which has been remarkably confirmed by later researches (Cailletet, Ann. Chim. Phys. 25, p. 519, 1892). In many books of recent years it has been the custom, following a suggestion of Andrews, to restrict the term " gas " to temper- atures above the critical temperature, and the term " vapour " to temperatures below. But this is often inconvenient in practice, as there is no sudden change in the gaseous phase at ordinary pressures on passing the critical temperature. It is more convenient to employ the terms " vapour " only when discussing the properties of the gaseous phase in relation to the liquid or solid, and to follow the common usage in describ- ing substances like CO_2, or even SO_2 and NH_3, as gases at ordinary temperatures and pressures.

2. Continuity of State. — The form of the isothermal curve, representing the compression of a vapour at constant tempera- ture, consists, as shown in fig. 1, A, of three discontinuous branches. The relation between pressure and volume for an

unsaturated vapour is represented by the branch DE, which is similar to the isothermal of a gas obeying Boyle's law. When the saturation-pressure is reached at D the vapour begins to condense, and the volume diminishes without further increase of pressure, giving the isopiestic branch DCB. At B, when the vapour is completely liquefied, further compression produces a rapid rise of pressure, as shown by the branch BA, representing

Axis of Volume. A

O 12 3 + 56

Volume in c. c. per gm.

Fig. i. A, James Thomson Isothermal; B, Isothermals of CO2 (Andrews).

the behaviour of the liquid. It is possible, however, to trace the branch DN for the supersaturated vapour continuously beyond D without liquefaction in the absence of nuclei. It is similarly possible to trace the liquid branch ABM beyond B to lower pressures in the absence of dissolved gases. As the temperature is raised, the length of the branch BD, representing the increase of volume in passing from the liquid to the gas, diminishes, as shown in fig. 1, B, which represents the isothermals of CO?, 1 according to Andrews {Phil. Trans. 1869). Above the critical temperature, the discontinuities at B and D disappear from the isothermal curve, and it is impossible to obtain separa- tion of the two states, liquid and gas, however great the pressure applied. The critical pressure is the vapour-pressure of the liquid at the critical temperature. It is possible to obtain a perfectly continuous passage from the gaseous to the liquid state by keeping the vapour at a pressure greater than the critical pressure while it is cooled from a temperature above the critical point, at which it would expand indefinitely (if the pressure were reduced) without separation into two phases, to a temperature below the critical point, at which expansion would produce separation into liquid and vapour as soon as the pressure was reduced to the saturation value. It was maintained by Andrews, on the basis of these and similar observations, that the gaseous and liquid states were merely widely separated forms of the same condition of matter, since one could be converted into the other without any breach of continuity or sudden evolution of heat or change of volume; just as an amorphous solid in the process of fusion becomes

gradually more and more plastic as the temperature is raised, and passes into the state of a viscous liquid with continually diminishing viscosity. The same idea was further developed by James Thomson (Proc. R.S., 1871), who suggested that the discontinuity of the isothermal at temperatures below the critical point was only apparent. He supposed that the extensions of the liquid and vapour curves BM, DN, in fig. 1, A, representing the states of superheated liquid and supersaturated vapour, might theoretically be joined by a continuous Curve MN, representing a homogeneous trans-formation, which, however, could not be realized in practice, as the state of the substance corresponding to this part of the curve would be unstable. Maxwell (Nature, 1875) showed that the straight line BCD representing the saturation-pressure must cut off loops BMC, CND, of equal area from this imaginary 1 The slight increase of pressure observed during condensation was attributed by Andrews to the presence of a trace of air in the CO2.

isothermal; otherwise it would be theoretically possible to obtain a balance of work without any difference of temperature by taking the substance through the isothermal cycleB CDNCMB. The theoretical isothermal of James Thomson is qualitatively represented by an equation of the type devised by Van der Waals, in which the mutual attraction of the molecules of a gas is regarded as equivalent to an internal pressure of the form a/u 2 , which he supposes identical with the capillary pressure of the liquid. It has been found, however, that this simple expres- sion is not sufficiently exact. It is probable that it is not merely a question of varying attraction between similar molecules. A vapour should rather be regarded as containing a certain propor- tion of compound or coaggregated molecules, which partially dissociate when the pressure is diminished or the temperature raised. A liquid similarly contains dissolved molecules of vapour, and the state of equilibrium is more nearly analogous to that between conjugate saturated solutions (e.g. water and phenol).

3. Effect of Capillary Pressure on Ebullition. — It was remarked at a very early date that water and other liquids could be raised under atmospheric pressure several degrees above their normal boiling-points in a clean glass vessel without ebullition occurring, and that, when a bubble was formed, it would expand explosively, producing the phenomenon of " bumping "; but that, if metallic filings or

other bodies capable of supplying small bubbles of air were introduced, ebullition would proceed quietly at the normal temperature. L. Dufour succeeded in raising small drops of water, suspended in an oil mixture of suitable density, to a temperature of nearly 180 ° C. under atmospheric pressure. Similar observations lead to the conclusion that the phenomenon of ebullition, or boiling with the formation of bubbles, depends essentially on the presence of air or dissolved gas to provide nuclei for the starting-points of the bubbles. This is a natural consequence of the capillary pres- sure due to surface tension. The vapour-pressure p inside a small spherical bubble of radius r must exceed the pressure P in the liquid just outside the bubble by 2T/V, where T is the surface tension of the liquid. The capillary pressure 2T/r may be. very large if r is small. It is often stated on the strength of this relation that a bubble of radius r in a liquid will not expand indefinitely and rise to the surface as in ebullition, until the vapour-pressure p inside the bubble exceeds the external pressure P by 2T/r. But this neglects the effect of the air or gas contained in the bubble, which plays an essential part in the phenomenon. A bubble of vapour containing no air or gas could not exist at all in stable equilibrium in a liquid. If its radius r were such as to make 2T/ r greater than p — P, it would collapse entirely. A bubble containing gas, on the contrary, is in stable equilibrium when its radius r is such that the pressure of the gas and vapour inside it balance the external pressure P together with the capillary pressure 2T/r. Any diminution of r produces an increase in the pressure of the gas which is more than sufficient to balance the increase of the capillary pressure 2T/c. Supposing that the external pressure and temperature remain constant, the partial pressure of the gas inside the bubble varies inversely as the volume of the bubble, and may be represented by air 3 . The size of the bubble is determined by the equation p-ˆ-ajr 3 =P-{-2T/r. The equilibrium is always stable if p is less than P. If p is greater than P, the equilibrium becomes unstable (and the bubble expands indefinitely), when the gas-pressure a/r 3 is one-third of the capillary pressure 2T/ r. This follows immediately by differentiating the above equation with respect to r, assuming the difference p — P to remain constant. Substituting 2T/37" for a/r 3 we obtain the condition of stability,

/ > -P < 4T/ 3 r (1)

In other words, the temperature of a liquid containing bubbles

ot radius r will rise until the excess pressure given by (1) is reached, and ebullition will begin as soon as the excess pressure amounts to two-thirds of the capillary pressure, and will not be delayed until the full capillary pressure is reached, as might appear at first sight. Bubbles I millimetre in diameter in water at P = 760 mm. become unstable when the temperature reaches ioO'05° C. approxi- mately. To obtain a superheat of io° C, where the excess pressure is 316 mm., the bubbles must not exceed about 5 jjth mm. diameter. The condensation of a vapour is also retarded by the effect of capillary pressure, but the relation in this case is somewhat different.

4. Effect of Capillary Pressure on Vapour-Pressure. — It was observed by Sir W. Thomson (Lord Kelvin) (Phil. Mag. iv. 42,

f). 448, 1871) that if a capillary tube of radius r is immersed in a iquid of surface tension T, and the liquid rises to a height h above the plane surface (the whole being enclosed in a vessel of uniform temperature containing only the vapour of the liquid) the pressure of the vapour at the curved surface of the meniscus in the capillary tube will be less than that at the plane surface by the amount, gh/v, where g is the acceleration of gravity, and i/v is the density of the vapour. But the vapour must be in equilibrium with the liquid at both surfaces. Otherwise perpetual motion would ensue

in an enclosure at uniform temperature. Consequently the equili- brium value of the vapour-pressure must vary with the curvature of the surface, or with the capillary pressure due to the curvature.

If P, p are the hydrostatic pressures in the liquid and vapour close to the meniscus, the difference P—p = 2T/r. This is negative if r is negative, i.e. if the liquid rises in the tube, but is positive if the meniscus is convex and the liquid is depressed in the tube. If Po, Pa are the pressures in the liquid and vapour at the plane surface, Po — po, and if i/V is the density of the liquid, the differences of pressure in the liquid and vapour respectively corresponding to a difference of level h, are P — Po=—gh/V, p — p ——gh/v. Com- bining these with the

relation P—p = 2T/r and eliminating gh, we obtain, for the change of vapour-pressure p—po, due to change of pressure P — po, or to curvature i/r,

£-/>o=(P-Po)V7» = 2TV/K!!-V). ■ ■ (2)

This increase of vapour-pressure with curvature affords a natural explanation of the fact that it is possible to cool a vapour consider- ably below the saturation temperature without condensation. The vapour-pressure in a fog containing small drops of radius r must exceed the normal vapour-pressure over a plane surface at the same temperature by the amount 2TV/r(n — V), which may be consider- able if r is small. The same expression measures the supersatura- tion required to induce condensation in the presence of dust or other nuclei of radius r, and explains why it is that condensation always takes place on dust particles if any are present. This phenomenon forms the basis of J. Aitken's method of counting dust particles, or Wilson's method of counting electrical ions, which are also capable of acting as nuclei for starting condensation.

5. Extension to Higher Pressures. — The approximate formula above given for the effect of hydrostatic pressure on the vaoour- pressure assumes the densities of the liquid and vapour constant, and is true for small differences of pressure only. If we take Po and pi to represent corresponding values of the pressure in the liquid and vapour at the same level (and not necessarily at the plane surface where Po = po), and if the difference of level from P, p is small, substituting dp and dp for the small differences of pressure, we have accurately the relation vdp=VdP, where V and v are the specific volumes of the liquid and vapour under the pressures P and p respectively. In order to apply the formula to large differ- ences of pressure, it is only necessary to integrate it at constant temperature between the required limits of P and p. We thus obtain the general equation

"P

fa'-ft

WP.

(3)

In applying the general equation (3) to an actual case, the com- pressibility of the liquid is the most uncertain factor. Assuming the compressibility constant, we may write V = V (l— oP). For the vapour we may employ equation (17) Thermodynamics, viz. v = KB/p — c + b, as a very close approximation over a wide range. The small quantities c and b are functions of the temperature only. Making these substitutions and integrating the equation we obtain R0 log.O'N = (c-6)(ˆ-/ > o) + Vo(P-Po)-|aV„(P-P 2 o). (4)

C. T. R. Wilson (Phil. Trans. 1898) has observed that in the absence of nuclei a very fine mist is formed in a vapour on sudden expansion when its density is about eight times the saturation value. Putting plpo = S in equation (4), and taking for water vapour R = 4-6i Xio 6 , and 8 = 300° Abs. we find P — Po equal to 3000 atmo- spheres approximately as the pressure required to produce this degree of supersaturation, allowing for compressibility of V. The term (c — b) may be neglected in this case, as p is small, but it would amount to about 17 % of PV at 200° C. The result obtained from the approximate formula (2) would be 9200 atmospheres, which is more than treble, and indicates the inapplicability of the simple formula in an extreme case. Taking P = 3000 atmospheres, and assuming that the formula 2T/r applies for the capillary pressure, we find the equivalent radius of a nucleus corresponding to the fine misty condensation to be s- oXWcm. This is a quantity of molecular dimensions, and lends support to the view that a vapour contains a certain proportion of coaggregated molecules, represented by the term c in the equation, which are capable of acting as nuclei for condensation. The analogous phenomenon of cloudy crystalliza tion, which takes place in a supercooled liquid in the labile state, suggests that a liquid may similarly contain molecular crystals of solid, which would account, in the case of water, for its anomalous expansion and for the variation of its specific heat near the freezing- point.

For small values of the vapour-pressure p, the term (c — b) (p —po) in equation (4) may generally be neglected, as in the case of water at ordinary temperatures. For moderate values of P, not exceeding say 100 atmospheres, V may be taken as nearly constant, and the equation reduces to~the simpler form PV/R0 = log e (£/£o), which is often sufficiently exact.

6. Application to a Solid. — If we imagine a vertical column of

solid in a porous vessel at uniform temperature surrounded by vapour, it would appear probable by similar reasoning that it would be in equilibrium under its own hydrostatic pressure with the pressure of the vapour at different levels. This would give the same formula as (2) for the variation of vapour-pressure, with V, the specific volume of the solid, in place of V. But since the surface

tension analogy does not exactly apply in the case of a solid, it is perhaps better to deduce the formula from a consideration of the effect of pressure on the fieezing-point. The freezing-point do is the point at which the solid and liquid have the same vapour- pressure po. Otherwise they could not remain together in equilibrium. When the freezing-point is changed by pressure, the vapour-pressures p', p", of the solid and liquid must be the same at the new freezing- point. The rise of the freezing-point 8 — do, for an increase of pressure P — Po, is given by the thermodynamic equation (Thermo- dynamics, equation (5))

L(0-0„)/0o=(P-Po)(V"-V), ... (5) where L is the latent heat of fusion, and V, V" are the specific volumes of the solid and liquid respectively. The difference (p'—p") of the vapour-pressures of the solid and liquid under normal pressure Po at a temperature 6 near the normal freezing-point 0o> is deduced from the same equation (see section 24 below)

p'-p'-Ue-eˆivdo, ... (6) where v is the specific volume of the vapour. Substituting for 8 in terms of P from (5), we have for the difference of the vapour- pressures at do under pressure P,

P>-p» = (P-Po)(V'-V')lv. . . . (7)_ The increase of vapour-pressure of the liquid when the pressure is increased to P is given by (2), viz. p" — po=(P — Po)V"/»- The in- crease of vapour-pressure of the solid must be less than that of the liquid by the amount given by (7), in order that their vapour-pressure may be the same at the new freezing-point 0. We thus obtain by subtraction

£'-/,„= (p-p){v>-(v»-V)/»} = (P-Po)V7».

Which is precisely the same as relation (2) for the liquid, with V substituted for V". Hence the effect of pressure on the vapour- pressure follows the same law for both liquid and solid (J. H. Poynting, Phil. Mag. xii. p. 40, 1881).

7. Vapour-Pressure of Solutions. — The rise of boiling-point pro- duced by a substance in solution was demonstrated by M. Fara- day in 1820, but the effect had been known to exist for a long time previously. C. H. L. Babo, 1847, gave the law known by his name, that the " relative lowering" (p — po)(po of the vapour-pressure of a solution, or the ratio of the diminution of vapour-pressure (p—po) to the vapour-pressure po of the pure solvent at the same tempera- ture, was constant, or independent of the temperature, for any solution of constant strength. A. Wullner (Pogg. Ann. 1858, 103, p. 529) found the lowering of the vapour-pressure to be nearly pro- portional to the strength of 'the solution for the same salt. W. Ost- wald, employing Wiillner's results, found the lowering of vapour-pressure produced by different salts in solution in water to be approximately the same for solutions containing the same number of gramme-molecules of salt per c.c. F. M. Raoult (Comptes Rendus, 1886-87) employed other solvents besides water, arid showed that the relative lowering for different solvents and different dissolved sub- stances was the same in many cases for solutions in which the ratio of the number of gramme-molecules n of the dissolved substance to the number of molecules N of the solvent was the same, or that it varied generally in proportion to the ratio w/N. The relative lowering of the vapour-pressure can be easily measured by Dalton's method of the barometer tube for solvents such as ether, which have a sufficient vapour-pressure at ordinary temperatures. But in many cases it is more readily determined by observing the rise of the boiling-point or the depression of the freezing-point of the solution. For the rise in the boiling-point, we have by Clapeyron's equation, dp/d$ = L/8v, nearly, neglecting the volume of the liquid as com- pared with that of the vapour v. If dp is the difference of vapour- pressure of solvent and solution, and d8 the rise in the boiling-point, we have the approximate relation,

n/N = dp!p = mLde/Re, Raoult's law, . . (8) where m is the molecular weight of the vapour, and R the gas- constant which is nearly 2 calories per degree for a gramme-molecule of gas. For the depression of the freezing-point a relation of the same form applies, but dd is negative, and L is the latent heat of fusion. At the freezing-point, the solution must have the same vapour-pressure as the solid solvent, with which it is in equilibrium. The relation follows immediately from Kirchhoff 's expression (below, section 14) for the difference of vapour-*

pressure of the liquid and solid below the freezing-point.

The most important apparent exceptions to Raoult's law in dilute solutions are the cases, (1) in which the molecules of the dissolved substance in solution are associated to form compound molecules, or dissociated to form other combinations with the solvent, in such a way that the actual number of molecules n in the solution differs from that calculated from the molecular weight corresponding to the accepted formula of the dissolved substance; (2) the case in which the molecules of the vapour of the solvent are associated in pairs or otherwise so that the molecular weight m of the vapour is not that corresponding to its accepted formula. These cases are really included in the equation if we substitute the proper values of n or m. In the case of electrolytes, S. Arrhenius (Zeit. phys. Chem. i. p. 631) showed how to calculate the effective number of molecules ra" = (i +ekfko)n, from the molecular conductivity

k of the solution and its value ko at infinite dilution, for an electrolyte giving rise to e + i ions. The values thus found agreed in the main with Raoult's law for dilute solutions (see Solutions). For strong solutions the discrepancies from Raoult's law often become very large, even if dissociation is allowed for. Thus for calcium chloride the depression of the freezing-point, when re = 7, N = ioo, is nearly 60° C. At this point re" = 10 nearly, and the depression should be only 10-4° C. These and similar discrepancies have been very generally attributed to a loose and variable association of the mole- cules of the dissolved substance with molecules of the solvent, which, according to H. C. Jones (Amer. Chem. Jour. 1905, 33, p. 584), may vary all the way from a few molecules of water up to at least 30 molecules in the case of CaCb., or from 12 to 140 for glycerin. It has been shown, however, by Callendar (Proc. R.S.A. 1908) that, if the accurate formulae for the vapour-pressure given below are employed, the lesults for strong solutions are consistent with a very slight, but important, modification of Raoult's law. It is assumed that each molecule of solute combines with a molecules of solvent according to the ordinary law of chemical combination, and that the number a, representing the degree of hydration,

remains con- stant within wide limits of temperature and concentration. In this case the ratio of the vapour-pressure of the solution p" to that of the solvent p' should be equal to the ratio of the number of free molecules of solvent N -an to the whole number of molecules N -an +n in the solution. The explanation of this relation is that each of the n compound molecules counts as a single molecule, and that, if all the molecules were solvent molecules, the vapour-pressure would be p', that of the pure solvent. This assumption coincides exactly with Raoult's law for the relative lowering of vapour-pressure, if a = i, and agrees with it in the limit in all cases for very dilute solutions, but it makes a very considerable difference in strong solutions if a is greater or less than I. It appears that the relatively enormous deviations of CaCb. from Raoult's law are accounted for on the hypothesis that 0=9, but there is a slight un- certainty about the degree of ionization of the strongest solutions at-50 C. Cane-sugar appears to require 5 molecules of water of hydration both at 0° C. and at 100° C, whereas KC1 and NaCl take more water at 100 C. than at 0° C. The cases considered by Callendar (foe. cit.) are necessarily limited, because the requisite data for strong solutions are comparatively scarce. The vapour- pressure equations are seldom known with sufficient accuracy, and the ionization data are incomplete. But the agreement is very good so far as the data extend, and the theory is really simpler than Raoult's law, because many different degrees of hydrationare known, and the assumption = 1 (all monohydrates), which is tacitly in- volved in Raoult's law, is in reality inconsistent with other chemical relations of the substances concerned.

8. Vapour-Pressure and Osmotic Pressure. — W. F. P. Pfeffer (Osmotische. Untersuchungen, Leipzig, 1877) was the first to obtain satisfactory measurements of osmotic pressures of cane-sugar solutions up to nearly I atmosphere by means of semi-permeable membranes of copper ferrocyanide. His observations showed that the osmotic pressure was nearly proportional to the concentration and to the absolute temperature over a limited range. Van't Hoff showed that the osmotic pressure P due to a number of dissolved molecules n in a volume V was the same as would be exerted by the same number of gas-molecules at the same temperature in the same volume, or that PV = R0». Arrhenius, by reasoning similar to that of section 5, applied to an osmotic cell supporting a column of solution by osmotic pressure, deduced the relation between the Osmotic

pressure P at the bottom of the column and the vapour-pressure p" of the solution at the top, viz. mPV/R9 — \og,(p' ;p"), which corresponds with the effect of hydrostatic pressure, and is equivalent to the assumption that the vapour-pressure of the solution at the bottom of the column under pressure P must be equal to that of the pure solvent. Poynting {Phil. Mag. 1896, 42, p. 298) has accordingly defined the osmotic pressure of a solution as being the hydrostatic pressure required to make its vapour- pressure equal to that of the pure solvent at the same temperature, and has shown that this definition agrees approximately with Raoult's law and van't Hoff's gas-pressure theory. It is probable that osmotic pressure is not really of the same nature as gas-pressure, but depends on equilibrium of vapour-pressure. The vapour- molecules of the solvent are free to pass through the semi-permeable membrane, and will continue to condense in the solution until the hydrostatic pressure is so raised as to produce equality of vapour-pressure. Lord Berkeley and E. J. G. Hartley (Phil. Trans. A. 1906, p. 481) succeeded in measuring osmotic pressures of cane-sugar, dextrose, &c, up to 135 atmospheres. The highest pressures recorded for cane-sugar are nearly three times as great as those given by van'-t Hoff's formula for the gas-pressure, but agree very well with the vapour-pressure theory, as modified by Callendar, provided that we substitute for V in Arrhenius's formula the actual specific volume of the solvent in the solution, and if we also assume that each molecule of sugar in solution combines with 5 molecules of water, as required by the observations on the depression of the freezing-point and the rise of the boiling-point. Lord Berkeley and Hartley have also verified the theory by direct measurements of the vapour-pressures of the same solutions.

9. Total Heat and Latent Heat. — To effect the conversion of a solid or liquid into a vapour without change of temperature, it is necessary to supply a certain quantity of heat. The quantity required per unit mass of the substance is termed the latent heat of vaporization. The total heat of the saturated vapour at any temperature is usually defined as the quantity of heat required to raise unit mass of the liquid from any convenient zero up to the temperature considered, and then to evaporate it at that temperature under the constant pressure of saturation. The total heat of steam, for instance, is generally reckoned from the state of water at the freezing-point, 0° C. If h denote the heat required to raise the temperature of the liquid from

the selected zero to the temperature t° C, and if H denote the total heat and L the latent heat of the vapour, also at t° C, we have evidently the simple relation

$$H = L + ft. \quad ..... \quad (9)$$

The pressure under which the liquid is heated makes very little difference to the quantity h, but, in order to make the statement definite, it is desirable to add that the liquid should be heated under a constant pressure equal to the final saturation-pressure of the vapour. The usual definition of total heat applies only to a satu- rated vapour. For greater simplicity and generality it is desirable to define the total heat of a substance as the function (E + pv), where E is the intrinsic energy and v the volume of unit mass (see Thermodynamics). This agrees with the usual definition in the special case of a saturated vapour, if the liquid is heated under the final pressure p, as is generally the case in heat engines and in experimental measurements of H.

The method commonly adopted in measuring the latent heat of a vapour is to condense the vapour at saturation-pressure in a calori- meter. The quantity of heat so measured is the total heat of the vapour reckoned from the final temperature of the calorimeter, and the heat of the liquid h must be subtracted from the total heat measured to find the latent heat of the vapour at the given tempera- ture. It is necessary to take special precautions to ensure that the vapour is dry or free from drops of liquid. Another method, which is suitable for volatile liquids or low temperatures, is to allow the liquid to evaporate in a calorimeter, and to measure the quantity of heat required for the evaporation of the liquid at the temperature of the calorimeter and at saturation-pressure. The first method may be called the method of condensation. It was applied in the most perfect manner by Regnault to determine the latent heats of steam and several other vapours at high pressures. The second method may be called the method of evaporation. It is more difficult of application than the first, but has given some good results in the hands of Griffiths 1 and Dieterici, although the experiments of Regnault by this method were not very successful.

It was believed for many years, in consequence of some rough experiments made by J. Watt, that the total heat of steam was constant. This was known as Watt's law, and was sometines

extended to other vapours. An alternative supposition, due to J. Southern, was that the latent heat was constant. The very careful experiments of Regnault, published in 1847, showed that the truth lay somewhere between the two. The formula which he gave for the total heat H of steam at any temperature t" C, which has since been universally accepted and has formed the basis of all tables of the properties of steam, was as follows: —

H =606-5+0-305/. . . . (I0)

He obtained similar formulae for other vapours, but the experiments were not so complete or satisfactory as in the case of steam, which may conveniently be taken as a typical vapour in comparing theory and experiment.

10. Total Heat of Ideal Vapour. — It was proved theoretically by W. J. M. Rankine (Proc. R.S.E. vol. xx. p. 173) that the increase of the total heat of a saturated vapour between any two temperatures should be equal to the specific heat S of the vapour at constant pres- sure multiplied by the difference of temperature, provided that the saturated vapour behaved as an ideal gas, and that its specific heat was independent of the pressure and temperature. Expressed in symbols, the relation may be written

H'-W = S(e'e"). . . . (11) This relation gives a linear formula for the variation of the total heat, a result which agrees in form with that found by Regnault for steam, and implies that the coefficient of t in his formula should be equal to the specific heat S of steam. Rankine's equation follows directly from the first law of thermodynamics, and may be proved as follows: The heat absorbed in any transformation is the change of intrinsic energy plus the external work done. To find the total heat H of a vapour, we have H=K{-p(v-b), where the intrinsic energy E is measured from the selected zero 3o of total heat. The external work done is p(v-b), where p is the constant pressure, v the volume of the vapour at 6, and b the volume of the liquid at 0o- If the saturated vapour behaves as a perfect gas, the change of in- trinsic energy E depends only on the temperature limits, and is equal to j> (0-0

1 "Latent Heat of Steam," Phil. Trans. A. 1895; of "Benzene," Phil. Mag. 1896.

6′ and 0\ we see that Rankine's result follows immediately, pro- vided that p(v — b) is equal to (S — s)B or R$/m, which is approxi- mately true for gases and vapours when v is very large compared with b. We may observe that the equation (11) is accurately true for an ideal vapour, for which pv = (S-s)$, provided that the total heat is defined as equal to the change of the function (E+pv) between the given limits. Adopting this definition, without restriction to the case of an ideal vapour or to saturation-pressure, the rate of variation of the total heat with temperature (dH/dd) at constant, pressure is equal to S under all conditions, whether S is constant, or varies both with p and 0. (See Thermodynamics, § 7.)

11. Specific Heat of Vapours. — The question of the measurement of the specific heat of a vapour possesses special interest on account of this simple theoretical relation between the specific heat and the variation of the latent and total heats. The first accurate calcula- tions of the specific heats of air and gases were made by Rankine in a continuation of the paper already quoted. Employing Joule's value of the mechanical equivalent of heat, then recently published, in connexion with the value of the ratio of the specific heats of air S/y = i-40 deduced from the velocity of sound, Rankine found for air S = 240, which was much smaller than the best previous deter minations {e.g. Delaroche and Berard, S = -267), but agreed very dosely with the value S = -238, found by Regnault at a later date. Adopting for steam the same value of the ratio of the specific heats, viz. 1-40, Rankine found S = -385, a value which he used, in default of a better, in calculating some of the properties of steam, although he observed that it was much larger than the coefficient •305 in Regnault's formula for the variation of the total heat. The specific heat of steam was determined shortly afterwards by Regnault (Comptes Renins, 36, p. 676) by condensing superheated steam at two different temperatures (about 125° and 225 C.) successively in the same calorimeter at atmospheric pressure, and taking the difference of the total heats observed. The result found in this manner, viz. S = 475, greatly increased the apparent discrepancy between Regnault's and Rankine's formulae for the total heat. The discrepancy was also noticed by G. R. Kirchhoff, who redis covered Rankine's formula {Fogg. Ann. 103, p. 185, 1858). He

suggested that the high value for S found by Regnault might be due to the presence of damp in his superheated steam, or, on the other hand, that the assumption that steam at low temperatures followed the law pv = R0 might be erroneous. These suggestions have been frequently repeated, but it is probable that neither is correct. G. A. Zeuner, at a later date (La Chaleur, p. 441), employing the empirical formula pv = Bd+Cp- 2i for saturated steam, found the value S = -568, which further increased the discrepancy. G. A. Hirn and A. A. Cazin (Ann. Chim. Phys. iv. 10, p. 349, 1867) investigated the form of the adiabatic for steam passing through the state p = y6o mm., 5 = 373° Abs., by observing the pressure of superheated steam at any temperature which just failed to produce a cloud on sudden expansion to atmospheric pressure. Assuming an equation of the form log (PI760) =a log (8/373), their results givea = S/R = 4-305, or S =0-474, which agrees very perfectly with Regnault's value. It must be observed, however, that the agreement is rather more perfect than the comparative roughness of the method would appear to warrant. More recently, Macfarlane Gray (Proc. Inst. Mech. Eng. 1889), who has devoted minute attention to the reduction of Regnault's observations, assuming S/s= 1-400 as the theoretical ratio of specific heats of all vapours on his " aether-pressure theory," has calculated the properties of steam on the assumption 8 = 0-384. He endeavours to support this value by reference to sixteen of Regnault's observations on the total heat of steam at atmospheric pressure with only 19° to 28° of superheat. These observations give values for S ranging from 0-30 to 0-46, with a mean value 0-3778. But it must be remarked that the superheat of the steam in these experiments is only 1 or 2 % of the total heat measured. A similar objection applies, though with less force, to Regnault's main experiments between I25°and 225 C., giving the value S =0-475, in which the superheat (on which the value of S depends) is only one-sixteenth of the total heat measured. Gray explains the higher value found by Regnault over the higher range as due to the presence of particles of moisture in the steam, which he thinks " would not be evaporated up to 124 C, but would be more likely to be evaporated in the higher range of temperature." J. Perry (Steam Engine, p. 580), assuming a characteristic equation similar to Zeuner's (which makes v a linear function of the temperature at constant pressure, and S independent of the pressure), calculates S as a function of the temperature to satisfy Regnault's formula (10) for the total

heat. This method is logically consistent, and gives values ranging from 0-305 at o° to 0-341 at ioo°C. and 0-464 at 210° C, but the difference from Regnault's S = 0-475 cannot easily be explained.

12. Throttling Calorimeter Method. — The ideal method of deter- mining by direct experiment the relation between the total heat and the specific heat of a vapour is that of Joule and Thomson, which is more commonly known in connexion with steam as the method of the throttling calorimeter. It was first employed in the case of steam by Peabody as a means of estimating the wetness of saturated steam, which is an important factor in testing the performance of an engine. If steam or vapour is " wire-drawn " or expanded through a porous plug or throttling aperture without external loss or gain

120 1+0

Temperature Centigrade

Fig. 2. — Throttling Calorimeter Method.

of heat, the total heat (E+pv) remains constant (Thermodynamics, §11), provided that the experiment is arranged so that the kinetic energy of flow is the same on either side of the throttleˆ Thus, starting with satu- rated steam at a temperature 0′ and pressure p' , as repre- sented by the point A on the p6 diagram (fig. 2), if the point B represent the state p"8″ after passing the throttle, the total heat at A is the same as that at B, and exceeds that at any other point D (at the same pressure p" as at B, but at a lower temperature 0) by the amount SX(0"-#), which would be required to raise the temperature from D to B at constant pressure. We have therefore the simple relation between the total heats at A and D —

H A -H D = S(0»-tf). (12) If the steam at A con- tains a fraction z of sus- pended moisture, the total heat H A is less than the value for dry saturated steam at A by the amount zL. If the steam at A were dry and saturated, we should have, assuming Regnault's formula (10), H A -H D = -305 (0'-0), whence, if S = -475, we have zL = -305 (0'-0)— 475 (0"0). It is evident that this is a very delicate method of determining the wet ness z, but, since with dry saturated steam at low pressures this formula always gives negative values of the

wetness, it is clear that Regnault's numerical coefficients must be wrong.

From a different point of view, equation (12) may be applied to determine the specific heat of steam in terms of the rate of variation of the total heat. If we assume Regnault's formula (10) for the total heat, we have evidently the simple relation S = o-3O5(0'-0)/(0"-0), supposing the initial steam to be dry, or at least of the same quality as that employed by Regnault. This method was applied by J. A. Ewing (B.A. Rep. 1897) to steam near 100° C. He found the specific heat smaller than 0-475, but no numerical results were given. A very complete investigation on the same lines was carried out by J. H. Grindley (Phil. Trans. 1900) at Owens College under the direction of Osborne Reynolds. Assuming dHjdO = 0-305 for saturated steam, he found that S was nearly independent of the pressure at constant temperature, but that it varied with the temper- ature from 0-387 at 100° C. to 0-665 at 160 C. Writing Q for the Joule-Thomson " cooling effect," de/dp, or the slope BC/AC of the line of constant total heat, he found that Q was nearly independent of the pressure at constant temperature, a result which agrees with that of Joule and Thomson for air and C0 2 ; but that it varied with the temperature as (i/0) 3 – 8 instead of (i/0) 2 . These results for the variation of Q are independent of any assumption with regard to the variation of H. Employing the values of S calculated from dti/dS = 0305, he found that the product SQ was independent of both pressure and temperature for the range of his experiments. Assuming this result to hold generally, we should have S = 0-306 at o° C, which agrees with Rankine s view; but increasing very rapidly at higher temperatures to S = 1-043 at 200° C., and 1-315 at 220° C. The characteristic equation, if SQ = constant, would be of the form (n+SQ) = R9/p, which does not agree with the well-known behaviour of other gases and vapours. Whatever may be the objections to Regnault's method of measuring the specific heat of a vapour, it seems impossible to reconcile so wide a range of variation of S with his value S =0-475 between 125° and 225" C. It is also extremely unlikely that a vapour which is so stable a chemical compound as steam should show so wide a range of variation of specific heat. The experimental results of Grindley with regard to the mode of variation of Q have been independently confirmed by Callendar (Proc. R.S. 1900), who quotes the results of eimilar experiments made at

McGill College in 1897, but gives an entirely different interpretation, based on a direct measurement of the specific heat at 100° C. by an electrical method.

The method of deducing the specific heat from Regnault's formula for the variation of the total heat is evidently liable in a greater degree to the objections which have been urged against his method of determining the specific heat, since it makes the value of the specific heat depend on small differences of total heat observed under conditions of greater difficulty at various pressures. The more logical method of procedure is to determine the specific heat independently of the total heat, and then to deduce the variations of total heat by equation (12). The simplest method of measuring the specific heat appears to be that of supplying heat electrically to a steady current of vapour in a vacuum-jacket calorimeter, and observing the rise of temperature produced. Employing this method, Callendar finds 8 = 0-497 for steam at one atmosphere

between io3°C.and II3°C. This is about 4 % larger than Regnault's value, but is not really inconsistent with it, if we suppose that the specific heat at any given pressure diminishes slightly with rise of temperature, as indicated in formula (16) below.

13. Corrected Equation of Total Heat. — Admitting the value S =0-497 f° r the specific heat at 108° C, it is clear that the form of Regnault's equation (10) must be wrong, although the numerical value of the coefficient 0-305 may approximately represent the average rate of variation over the range (100 to 190 C.) of the experiments on which it chiefly depends. Regnault's experiments at lower temperatures were extremely discordant, and have been shown by the work of E. H. Griffiths (Proc. R.S. 1894) and C. H. Dieterici (Wied. Ann. 37, p. 504, 1889) to give values of the total hear 10 to 6 calories too large between o and 40 C. At low pressures and temperatures it is probable that saturated steam behaves very nearly as an ideal gas, and that the variation of the total heat is closely represented by Rankine's equation with the ideal value of S. In order to correct this equation for the deviations of the vapour

from the ideal state at higher temperatures and pressures, the simplest method is to assume a modified equation of the Joule-Thomson type (Thermodynamics, equation (17)), which has been shown to represent satisfactorily the behaviour of other gases and vapours at moderate pressures. Employing this type of equation, all the thermodyriamical properties 01 the substance may conveniently be expressed in terms of the diminution of volume c due to the formation of compound or coaggregated molecules,

(t/-i)=R0/£-c„(0o/0)» = V-c. . . (13)

The index n in the above formula, representing the rate of variation of c with temperature, is approximately the same as that expressing the rate of variation of the cooling effect Q, which is nearly pro- portional to c, and is given by the formula

SQ = (n + i)c-b. ._ . . – . (14) The corresponding formula for the total heat is

H-H o = So(0-0o)-(»+i) (cp-CoPd+bip-pe), . (15) and for the variation of the specific heat with pressure

S = So+w(»+ i)pc/6, . . . (16)

where S is the value of S when p=-o, and is assumed to be inde- pendent of 0, as in the case of an ideal gas.

Calendar's experiments on the cooling effect for steam by the throttling calorimeter method gave 71 = 3-33 and c=26-3 c.c. at 100° C. Grindley's experiments gave nearly the same average value of Q over his experimental range, but a rather larger value for n, namely, 3-8. For purposes of calculation, Callendar (Proc. R.S. 1900) adopted the mean value 71 = 3-5, and also assumed the specific heat at constant volume ,.s = 3-5 R (which gives So =4-5 R) on the basis of an hypothesis, doubtfully attributed to Maxwell, that the number of degrees of freedom of a molecule with m atoms is 2m+i. The assumption n=i/R simplifies the adiabatic equa- tion, but the value 71 = 3-5 gives S = o-497 at zero pressure, which was the value found by Callendar experimentally at 108 C. and 1 atmosphere pressure. Later and more accurate experiments have confirmed the experimental value, and have shown that the limiting value of the specific heat should consequently be somewhat smaller than that given by

Maxwell's hypothesis. The introduction of this correction into the calculations would slightly improve the agreement with Regnault's values of the specific heat and total heat between ioo and 200 C, where they are most trustworthy, but would not materially affect the general nature of the results.

Values calculated from these formulae are given in the table below. The values of H at 0° and 40 agree fairly with those found by Dieterici (596-7) and Griffiths (613-2) respectively, but differ considerably from Regnault's values 606-5 and 618-7. The rate of increase of the total heat, instead of being constant for saturated steam as in Regnault's formula, is given by the equation

dEJdB = S,(l-Qdpfd$) . . . (17)

and diminishes from 0-478 at 0° C. to about 0-40 at ioo and 0-20 at 200 C, decreasing more rapidly at higher temperatures. The mean value, 0-313 of dHjdS, between 100° and 200° agrees fairly well with Regnault's coefficient 0-305, but it is clear that consider- able errors in calculating the wetness of steam or the amount of cylinder condensation would result from assuming this important coefficient to be constant. The rate of change of the latent heat is easily deduced from that of the total heat by subtracting the specific heat of the liquid. Since the specific heat of the liquid increases rapidly at high temperatures, while dH/dO diminishes, it is clear that the latent heat must diminish more and more rapidly as the critical point, is approached. Regnault's formula for the total heat is here again seen to be inadmissible, as it would make the latent heat of steam vanish at about 870° C. instead of at 365° C. It should be observed, however, that the assumptions made in deducing the above formulae apply only for moderate pressures, and that the formulae cannot be employed up to the critical point owing to the uncertainty of the variation of the specific heats and the cooling effect Q at high pressures beyond the experimental range. Many attempts have been made to construct formulae representing the deviations of vapours from the ideal state up to

the critical point. One of the most complete is that proposed by R. J. E. Clausius, which may be written

R6ip-v = 'R0{v-b)(A-Ee n)/p(v+a) 2 e n ; . (18) but such fomulae are much too complicated to be of any practical use,

and are too empirical in their nature to permit of the direct physical interpretation of the constants they contain.

14. Empirical Formulae for the Saturation-Pressure. — The values of the saturation-pressure have been very accurately determined for the majority of stable substances, and a large number of empirical formulae have been proposed to represent the relation between pressure and temperature. These formulae are important on account of the labour and ingenuity expended in devising the most suitable types, and also as a convenient means of recording the experimental data. In the following list, which contains a few typical examples, the different formulae are arranged to give the logarithm of the saturation-pressure p in terms of the absolute temperature 0. As originally proposed, many of these formulae were cast in exponential form, but the adoption of the logarithmic method of expression throughout the list serves to show more clearly the relationship between the various types.

log£ = A+B0 .... (Dalton, 1800). . . (19)

log£ = Clog (A+B0) . . . (Young, 1820).

log£ = A0/(B+C0) . . . (Roche, 1830).

logˆ = A-r-B6»-|-Cc9 . . . (Biot, 1844; Regnault).

logp = A+B/0+C/0 2 . . (Rankine, 1849).

log£ = A-r-B/0-)-Clog0 . . (Kirchhoff,i858;Rankine,i866).

logˆA+B/0 6 . . . . (Unwin, 1887).

log £ = A+B log 0+ C log (0+c). (Bertrand, 1887).

log£ = A-r-B/(0-i-C) . . . (Antoine, 1888).

The formula of Dalton would make the pressure increase in geo- metrical progression for equal increments of temperature. In other words, the increase of pressure per degree (dp/dO) divided by p should be constant and equal to B ; but observation shows that this ratio decreases, e.g. from 0-0722 at 0° C. to 0-0357 a t 100° C. in the case of steam. Observing that this rate of diminution is approxi- mately as the square of the reciprocal of the absolute temperature, we see that the almost equally simple formula log £ = A+B/0 represents a

much closer approximation to experiment. As a matter of fact, the two terms A-(-B/0 are the most important in the theoretical expression for the vapour-pressure given below. They are not sufficient alone, but give good results when modified, as in the simple and accurate formulae of Rankine, Kirchhoff, L. C. Antoine and Unwin. If we assume formulae of the simple type A-f-B/0 for two different substances which have the same vapour-pressure p at the absolute temperatures 0′ and 0″ respectively, we may write

l O g£=A'+B70'=A"+B70', • • (20) from which we deduce that the ratio 0'/0″ of the temperatures at which the vapour-pressures are the same is a linear function of the temperature 0′ of one of the substances. This approximate relation has been employed by Ramsay and Young (Phil. Mag. 1887) to deduce the vapour-pressures of any substance from those of a standard substance by means of two observations. More recently the same method has been applied by A. Findlay (Proc. R.S. 1902), under Ramsay's direction, for comparing solubilities which are in many respects analogous to vapour-pressures. The formulae of Young and Roche are purely empirical, but give very fair results over a wide range. That of Biot is far more complicated and troublesome, but admits greater accuracy of adaptation, as it contains five constants (or six, if is measured from an aibitrary zero). It is important as having been adopted by Regnault (and also by many subsequent calculators) for the expression of his observations on the vapour-pressures of steam and various other substances. The formulae of Rankine and Unwin, though probably less accurate over the whole range, are much simpler and more convenient in practice than that of Biot, and give results which suffice in, accuracy for the majority of purposes.

15. Theoretical Equation for the Saturation-Pressure. — The em- pirical formulae above quoted must be compared and tested in the light of the theoretical relation between the latent heat and the rate of increase of the vapour-pressure (dp/dd), which is given by the second law of thermodynamics, viz.

6(dp/d8)=L/(v-w), . '.. . (21)

in which v and w are the volumes of unit mass of the vapour and liquid respectively at the saturation-point (Thermodynamics, § 4). This relation cannot be directly integrated, so as to obtain the equation for the saturation-

pressure, unless L and v—w are known as functions of 0. Since it is much easier to measure p than either L or v, the relation has generally been employed for deducing either Lorn from observations of p. For instance, it is usual to calculate the specific volumes of saturated steam by assuming Regnault's formulae for p and L. The values so found are necessarily erroneous if formula (10) for the total heat is wrong. The reason for adopting this method is that the specific volume of a saturated vapour cannot be directly measured with sufficient accuracy on account of the readiness with which it condenses on the surface of the containing vessel. The specific volumes of superheated vapours may, howeve/,

be measured with a satisfactory degree of approximation. The deviations from the ideal volume may also be deduced by the method of Joule and Thomson. It is found by these methods that the behaviour of superheated vapours closely resembles that of non- condensible gases, and it is a fair inference that similar behaviour would be observed up to the saturation-point if surface condensation could be avoided. By assuming suitable forms of the character- istic equation to represent the variations of the specific volume within certain limits of pressure and temperature, we may therefore with propriety deduce equations to represent the saturation-pres- sure, which will certainly be thermodynamically consistent, and will probably give correct numerical results within the assigned limits.

The simplest assumptions to make are that the vapour behaves as a perfect gas (or that p{v — iv) = R0), and that L is constant. This leads immediately to the simple formula

log.(/#) = (i/9o-i/fl)L/R, . . . (22) which is of the same type as log £ = A+B/0, and shows that the coefficient B should be equal to L/R. A formula of this type has been widely employed by van't Hoff and others to calculate heats of reaction and solution from observations of solubility and vice versa. It is obvious, however, that the assumption L = constant is not sufficiently accurate in many cases. The rate of variation of the latent heat at low pressures is equal to S— s, where 5 is the specific heat of the liquid. Under these conditions both S and s

may be regarded as approximately constant, so that L is a linear function of the temperature. Substituting L = Lo-|-(S— s)(d— Co), and integrating between limits, we obtain the result

log.£ = A + B/9+ClogA . . . (23) where

C = (S-j)/R, B = -[Lo + (j-S)fl„]/R, and

A = log,£ – B /0o – C log,ffo. A formula of this type was first obtained by Kirchhoff {Pogg. Ann. 103, p. 185, 1858) to represent the vapour-pressure of a solution, and was verified by Regnault's experiments on solutions of H2SO4 in water, in which case a constant, the heat of dilution, is addeˆTto the latent heat. The formula evidently applies to the vapour-pressure of the pure solvent as a special case, but Kirchhoff himself does not appear to have made this particular application of the formula. In the paper which immediately follows, he gives the oft-quoted expression for the difference of slope {dp/d0),— {dp/d0)i of the vapour-pressure curves of a solid and liquid at the triple point, which is immediately deducible from (21), viz.

e{dpldB),-0{dpld$)i = (L.-Lj)/(»-») =L//(»-w), (24) in which L, and Lj are the latent heats of vaporization of the solid and liquid respectively, the difference of which is equal to the latent heat of fusion L/. He proceeds to calculate from this expression the difference of vapour-pressures of ice and water in the immediate neighbourhood of the melting-point, but does not observe that the vapour-pressures themselves may be more accurately calculated for a considerable interval of temperature by means of formula (23), by substituting the appropriate values of the latent heats and specific heats. Taking for ice and water the following numerical data, L. = 6747, Li = 595-2, L/ = 79-5, R = o-ii03 cal./deg., £0 = 4-61 mm., i-S = -5l9 cal./deg., and assuming the specific heat of ice to be equal to that of steam at constant pressure (which is sufficiently approximate, since the term involving the difference of the specific heats is very small), we obtain the following numerical formulae, by substitution in (23),

Ice . . logio£ = o-664o+9-73

Water . logio£=o-664o+8-585

where t = — 273, and M =0-4343, the modulus of common

logarithms. These formulae are practically accurate for a range of 20° or 30° C. on either side of the melting-point, as the pressure is so small that the vapour may be treated as an ideal gas. They give the following numerical values: —

Temperature, C. -20° -10° 0° +10 +20°

V.P. of ice, mms. 0-79 1-97 4-61 1020 21-27

V.P. of water, mms. 0-96 2-17 4-61 9-27 17-58

The error of the formula for water is less than I mm. (or a tenth of a

degree C), at a temperature so high as 6o° C.

Formula (23) for the vapour-pressure was subsequently deduced by Rankine {Phil. Mag. 1866) by combining his equation (11) for the total heat of gasification with (21), and assuming an ideal vapour. A formula of the same type was given by Athenase Dupr6 {Th&orie de chaleur, p. 96, Paris, 1869), on the assumption that the latent heat was a linear function of the temperature, taking the instance of Regnault's formula (10) for steam. It is generally called Dupr^'s formula in continental text-books, but he did not give the values of the coefficients in terms of the difference of specific heats of the liquid and vapour. It was employed as a purely empirical formula by Bertrand and Barus, who calculated the values of the coefficients for several substances, so as to obtain the best general agreement with the results of observation over a wide range, at high as well as low pressures. Applied in this manner, the formula is not appro- priate or satisfactory. The values of the coefficients given by

Bertrand, for instance, in the formula for steam, correspond to the values S = 576 and L = 573 at 0° C, which are impossible, and the values of p given by his formula {e.g. 763 mm. at ioo° C.) do not agree sufficiently with experiment to be of much practical value. The true application of the formula is to low pressures, at which it is very accurate. The close agreement found under these con ditions is a very strong confirmation of the correctness of the assumption that a vapour at low pressures does really behave as an ideal gas of constant specific heat. The formula was independently rediscovered by H. R. Hertz {Wied. Ann. 17, p. 177, 1882) in

a slightly different form, and appropriately applied to the calculation of the vapour-pressures of mercury at ordinary temperatures, where they are much too small to be accurately measured.

16. Corrected Equation of Saturation-Pressure. — The approximate equation of Rankine (23) begins to be 1 or 2 % in error at the boiling-point under atmospheric pressure, owing to the coaggrega- tion of the molecules of the vapour and the variation of the specific heat of the liquid. The errors from both causes increase more rapidly at higher temperatures. It is easy, however, to correct the formula for these deviations, and to make it thermodynamically consistent with the characteristic equation (13) by substituting the appropriate values of {v-w) and L = H— h from equations (13) and (15) in formula (21) before integrating. Omitting w and neglecting the small variation of the specific heat of the liquid, the result is simply the addition of the term {c — b)[V to formula (23)

Iog-A + B/ff + Clogfl + (e-&)/V. _• . (25) The values of the coefficients B and C remain practically as before. The value of c is determined by the throttling experiments, so that all the coefficients in the formula with the exception of A are determined independently of any observations of the saturation- pressure itself. The value of A for steam is determined by the consideration that £ = 760 mm. by definition at Ioo° C. or 373 Abs. The most uncertain data are the variation of the specific heat of the liquid and the value of the small quantity b in the formula (13). The term b, however, is only 4% of c at ioo° C, and the error involved in taking b equal to the volume of the liquid is probably small. The effect of variation of the specific heat is more important, but is nearly eliminated by the form of the equation. If we write h = Sot + dh, where so is a selected constant value of the specific heat of the liquid, and dh represents the difference of the actual value of h at t from the ideal value Sol, and if we similarly write 4> = So\og e {0/0o) + d for the entropy of the liquid at t, where d represents the corresponding difference in the entropy (which is easily calculated from a table of values of h), it is shown by Callendar {Proc. R.S. 1900, loc. cit.) that the effect of the variation of the specific heat of the liquid is represented in the equation for the vapour-pressure by adding to the right-hand side of (23) the term — {d— —dh/0) to be less than one-tenth of d4> at 200 C. The whole correction is therefore probably of the same*

order as the uncertainty of the variation of the specific heat itself at these temperatures. It may be observed that the cor- rection would vanish if we could write dh=w0dp/d6=ivh/(v—w). This assumption is made by Gray {Proc. Inst. C.E. 1902). It is equivalent, as Callendar {loc. cit.) points out, to supposing that the variation of the specific heat is due to the formation and solution of a mass w/{v-^iv) of vapour molecules per unit mass of the liquid. But this neglects the latent heat of solution, unless we may suppose it included by writing the internal latent heat Lj in place of L in Callendar's formula. In any case the correction may probably be neglected for practical purposes below 200° C.

It is interesting to remark that the simple result found in equa- tion (25) (according to which the effect of the deviation of the vapour from the ideal state is represented by the addition of the term {c — b)IV to the expression for log p) is independent of the assumption that c varies inversely as the n th power of 6, and is true generally provided that c—b is a function of the temperature only and is independent of the pressure. But in order to deduce the values of c by the Joule-Thomson method, it is necessary to assume an empirical formula, and the type e = c o (0o/0)" is chosen as being the simplest. The justification of this assumption lies in the fact that the values of c found in this manner/ when substi- tuted in equation (25) for the saturation- pressure, give correct results for p within the probable limits of error of Regnault's experiments.

17. Numerical Application to Steam. — As an instance of the application of the method above described, the results in the table below are calculated for steam, starting from the following funda- mental data: £ = 760 mm. at / = ioo° C. or 373-0° Abs. pV/d = 0-11030 calories per degree for ideal steam. 80=0-478

calories per degree at zero pressure, L = 540-2 calories at 100° C. (Joly- Callendar), tt = 3-33, doo = 26-30 c.c, & = i c.c, ft =0-9970 - froL {v—w). 750 mm. Hg. = 1 megadyne per sq. cm.*

9°4

VAQUERO— VAR

Table

of Properties of

*Saturated Steam **

Terap. Cent.

Coaggre-

Total

Latent

Specific

Saturation-

gation, c,

Heat.H,

Heat, L,

Heat, S,

Pressure, p,

cub. cms.

calories.

calories.

cals./deg.

ram. of Hg.

0°

74–43

595–2

595–2

• 4786

4–6

20°

58–81

604–7

584–7

• 4796

17–6

40°

47–19

614–0

574–0

• 4818

55–4

60°

38–68

623–1

536–1

• 4860

149–4

80 °

31–60

63I–9

551–9

•4926

355–0

IOO°

26–30

640–3

540–2

•5027

760–0

120°

21–93

648–1

527–8

•5163

1490–4

140

18-73

655-1

5H-5

•5347

2715-8

160

1 6 00

661-4

500-3

•5571

4647

180°

13-76

6669

485-3

•5834

7534

200

11-92

671-6

469-3

•6134

The values of the coaggregation-volume c, which form the start- ing-point of the calculation, are found by taking # = 10/3 for con- venience of division in formula (13). The unit of heat assumed in the table is the calorie at 20° C, which is taken as equal to 4-180 joules, as explained in the article Calorimetry. The latent heat L (formula 9) is found by subtracting from H (equation 15) the values of the heat of the liquid h given in the same article. The values of the specific heat in the next column are calculated for a constant pressure equal to that of saturation by formula (16) to illustrate the increase of the specific heat with rise of pressure. The specific heat at any given pressure diminishes with rise of temperature. The values of the saturation-pressure given in the last column are calculated by formula (25), which agrees with Regnault's observations better than his own empirical formulae. The agreement of the values of H with those of Griffiths and Dieterici at low temperatures, and of the values of p with those of Reg- nault over the whole range, are a confirmation of the accuracy of the foregoing theory, and show that the behaviour of a vapour like steam may be represented by a series of thermodynamically consistent formulae, on the assumption that the limiting yalue of the specific heat is constant, and that the isothermals are generally similar in form to those of other gases and vapours at moderate pressures. Although it is not possible to represent the properties of steam in this manner up to the critical temperature, the above method appears more satisfactory than the adoption of the in- consistent and purely empirical formulae which form the basis of most tables at the present time.

A similar method of calculation might be applied to deduce the thermodynamical properties of other vapours, but the required

ex- perimental data are in most cases very imperfect or even entirely wanting. The calorimetric data are generally the most deficient and difficult to secure. An immense mass of material has been collected on the subject of vapour-pressures and densities, the greater part of which will be found in Winkelmann's Handbook, in Landolt's and Bornstein's Tables, and in similar compendium^. The results vary greatly in accuracy, and are frequently vitiated by errors of temperature measurement, by chemical impurities and surface condensation, or by peculiarities of the empirical formulae employed in smoothing the observations; but it would not be within the scope of the present article to discuss these details. Even at the boiling-points the discrepancies between different observers are frequently considerable. The following table contains the most probable values for a few of these points which have been determined with the greatest care or frequency : —

Table of Boiling-Points at Atmospheric Pressure on Centigrade Scale

Hvdrogen . . — 252°-6

Oxygen . . -i82°-8

Carbon dioxide . — 78°-3

Sulphur dioxide . — lo°-o

Aniline . 4-i84°-i

Naphthalene . -t-2i8°-o

Alphabetical Index of Symbols A, 6, C, Empirical constants in formulae; section 14.

6, Minimum volume or co-volume of vapour, equation (13). C, Concentration of solution, gm. mols. per c.c. c, Coaggregation-volume of vapour, equation (13). D, d, Density of liquid and vapour. E, Intrinsic energy of vapour. g,

Acceleration of gravity. H, Total heat of vapour.

h, Heat of the liquid; height of capillary ascent. L, Latent heat of vaporization. M, Modulus of logarithms. m. Molecular weight. n, Index of in expression for c, equation (13).

Benzophenone .

+305°–8

Mercury .

+356°–7

Sulphur .

+444 –5

Cadmium

+756°

Zinc.

+916

p,

p,

Q, R,

T,

t,

V,

w,

Osmotic or capillary pressure.

Pressure of vapour.

Cooling effects in adiathermal expansion.

Constant in gas equation, pv^KS.

Radius of curvature, formula (1).

Specific heat of vapour at constant pressure.

Specific heat of liquid, equation (23).

Specific heat of vapour at constant volume; section 8.

Surface tension of liquid.

Temperature Centigrade.

Ideal volume of vapour, equation (13).

Specific volume of solid or liquid, equation (5).

Specific volume of vapour or steam.

Specific volume of water or liquid.

Temperature on thermodynamic scale.

Entropy of vapour or liquid. (H. L. C.)

1 Complete tables of the properties of steam have been worked out on the basis of Callendar's formulae by Professor Dr R. Mollier of Dresden, Neue Tabellen und Diagramme fur Wasserdampf, published by J. Springer (Berlin, 1906).

VAQUERO, a Spanish word meaning a cowherd or herdsman, and so particularly used in Mexico and Spanish America for the whole class of men employed on the large cattle-ranches or vaquerias. The word, like the corresponding Fr. vacher, cow- herd, comes from the Med. Lat. vaccarius (vacca, cow).

VAR, a department in S.E. France. It was formed in 1790 of a part of Lower Provence, but in i860 it was reduced by the transfer of the district of Grasse to the newly formed

department of the Alpes Maritimes, which is the reason why the Var does not now flow in the department to which it gives its name. It is bounded N. by the department of the Basses Alpes (the Verdon river forming the boundary), E. by that of the Alpes Maritimes (the Siagne stream forming the limit), S. by the Mediterranean, and W. by the department of the Bouches du Rh6ne. Its area is 2266 sq. m., its greatest length is about 62 m., and its greatest breadth about 56 m.

The surface of the department is very hilly, the highest point being the Signal des Chens (5620 ft.) at its north-east corner. These calcareous hills are much fissured and very dry on the highest plateaux, but are rich in springs, which is the cause of very beautiful verdure in the valleys. To the W. is the chain (3786 ft.) of the Ste Baume, wherein is the celebrated grotto (now a frequented pilgrimage place) wherein St Mary Magdalene is said to have taken refuge. This chain is connected with the hills (2329 ft.) above Toulon. The thickly wooded Montagnes des Maures (2556 ft.), which extend above the coast from Hyeres to near Frejus are separated from the Ste Baume chain by the Gapeau stream and from that of the Esterel by the Argens river: the Maures chain, with the Argens valley, forms a sort of geological island in Provence, be^ng composed of granite, gneiss and schists. To the north of the Argens valley and in the north-eastern portion of the department rises the Esterel chain, the highest summit of which (the Mont Vinaigre) attains 2021 ft.: this chain is mainly composed of igneous rocks, with some schists and porphyry. The principal river in the department is the Argens, which traverses it from W. to E., and falls into the sea near Frejus after a course of about 68 m. Its chief tributary is the Nartuby, on which stands Draguignan, the chief town, while other streams are the Arc, the Huveaune and the Gapeau. The

extreme north-western extremity of the department borders for 2.\ m. the Durance, which separates it from the depart- ment of Vaucluse. The coast line, which is one of the most pictur- esque and varied in France, runs first W. to E., from the Gulf of La Ciotat to Cape Camarat, and then S.W. to N.E., from the Gulf of St Tropez to that of La Napoule. The shore is dotted (from W. to E.) successively by the sand-covered remains of the Phocaean city of Tauroentum ; the little ports of Bandol and St Nazaire ; the peninsula of Cape Sici6 (on which rises the chapel of Notre Dame de la Garde, and a famous lighthouse, 11 78 ft.) with its eastward projection Cape Cepet (338 ft.), bristling with fortifications, to protect the great harbour of Toulon, to the north-east; the roads of Toulon; those of Giens, on the site of the Gallo- Roman town of Pomponiana; the curious peninsula of Giens, formerly an island, but now attached to the mainland by two long spits of sand, between which lies the lagoon of Les Pesquiers, with its salines; the great anchorage of Hyeres, shut off from the Mediterranean by the hilly and wooded islands of Porquerolles, Port Cros and Le Levant; the bold promontories of the Montagnes des Maures, that divide the coast into lovely bays; Cape Camarat (1066 ft.), with a lighthouse; the deep Gulf of St Tropez, with perhaps the best natural anchorage in all Provence; the Gulf of Frejus, where, owing to the accumulated alluvial deposits at the mouth of the Argens, the Roman port of Forum Julii is now occupied by the inland town of Frejus; the red porphyry headlands of the Esterel chain, with the roads of Agay between them; and Cape Roux (i486 ft.) looking towards Cannes, still farther N.E. The department is divided into three arrondisse- ments (Draguignan, Brignoles and Toulon), 30 cantons and 148 communes. The climate is remarkably fine and mild on the coast, where there is complete shelter from the wind, St Raphael (with Valescure above it) and Hyeres

being now much frequented winter

resorts. The department now forms the bishopric of Frejus (4th century), which is in the ecclesiastical province of Aix en Provence: in 1801 there was annexed to it the episcopal see of Toulon, founded in the 5th century, and in the ecclesiastical province of Aries. There are in the department 135 m. of broad gauge railways, and 148J m. of narrow gauge lines. The principal towns are 'Toulon, La Seyne, Hyeres, Draguignan, its political capital, Brignoles and Frejus. There are a number of mines (chiefly iron and coal) in the department, and salt is extracted from the marshes near Hyeres, while there are manufactories of pottery and extensive vineyards. La Seyne is the principal centre of industrial activity. Cut flowers are largely exported from Hyeres. In 1901 the population of the department was 326,384. (W. A. B. C.)

VARALLO SESIA, a town of Piedmont, Italy, in the province of Novara, from which it is 34 m. N.N.W. by rail, situated in the valley of the Sesia, 1480 ft. above sea-level. Pop. (1901) 3330 (town); 4265 (commune). The churches of S Gaudenzio, S Maria delle Grazie and S Maria di Loreto, all contain works by Gaudenzio Ferrari (1471-1546), who was born in the neigh- bouring Val Duggia, while the Sacro Monte, a place of pilgrimage rising above the town (1995 ft.), is approached by a path leading past forty-five chapels containing groups of life-size painted terra-cotta figures representing scenes from sacred history, with backgrounds in fresco (by Ferrari and others), to the pilgrimage church built by Pellegrino Tibaldi after 1578. In the works mentioned, as Burckhardt remarks, Ferrari's whole development may be traced.

VARCHI, BENEDETTO (1502–1565), Florentine historian. He fought in the defence of Florence during the siege by the Mediceans and imperialists in 1530, and was exiled after the surrender of the city. In 1536 he took part in Piero Strozzi's unsuccessful expedition against Medicean rule, but seven years later he was called back to Florence by Cosimo I., who gave him a pension and commissioned him to write a history of the city; the work covers the period from 1527 to 1538. Varchi also wrote a number of plays, poems, dialogues and translations from the classics. His history, in sixteen books, was first published in Florence in 1721.

VARDANES, the name of two Parthian kings.

Vardanes I., succeeded Artabanus II., probably his father, in a.d. 40 (Joseph. Ant. xx. 3, 4), but had continually to fight against his rival Gotarzes {q.v.). The coins show that he was in full possession of the throne from 42 to 45. In 43 he forced Seleucia on the Tigris to submit to the Parthians again after a rebellion of seven years (Tac. Ann. xi. 9). Ctesiphon, the residence of the kings on the left bank of the Tigris, opposite to Seleucia, naturally profited by this war; and Vardanes is therefore called founder of Ctesiphon by Ammianus Marc, xxiii. 6. 23. He also prepared for a war against Rome, with the aim of reconquering Armenia (cf. Joseph, Ant. xx. 3, 4), but did not dare to face the Roman legions (Tac. Ann. xi. 10). In a new war with Gotarzes he gained a great success against the eastern nomads. He is praised by Tacitus as a young and highly gifted ruler of great energy (cf. Philostratus, Vita Apollon. Tyan. i. 21. 28), but lacking in humanity. In the summer of 45 he was assassinated while hunting, and Gotarzes became king again.

Vardanes II. rebelled against his father Vologaeses I. in a.d. 54 (Tac. Ann. xiii. 7). We know nothing more about him and it is not

certain whether the coins of a young beardless king, which are generally attributed to him, really belong to him (Wroth, Catalogue of the Coins of Parthia, p. L. ff.).

(Ed. M.)

VARENIUS, BERNHARDUS [Bernhard Varen] (1622–1650), German geographer, was born at Hitzacker on the Elbe, in the Liineburg district of Hanover. His early years (from 1627) were spent at Uelzen, where his father was court preacher to the duke of Brunswick. Varenius studied at the gymnasium of Hamburg (1640–42), and at Konigsberg (1643–45) an< i Leiden (1645–49) universities, where he devoted himself to mathematics and medicine, taking his medical degree at Leiden in 1649. He then settled at Amsterdam, intending to practise medicine. But the recent discoveries of Tasman, Schouten and other Dutch navigators, and his friendship for Blaeu and

other geographers, attracted Varenius to geography. He died in 1650, aged only twenty-eight, a victim to the privations and miseries of a poor scholar's life.

In 1649 he published, through L. Elzevir of Amsterdam, his Descriptio Regni Japoniae, an excellent compilation. In this was included a translation into Latin of part of Jodocus Schouten 's account of Siarn {Appendix de religione Siamensium, ex Descriptione Belgica Iodoci Schoutenii) , and chapters on the religions of various peoples. Next year (1650) appeared, also through Elzevir, the work by which he is best known, his Geographia Generalis, in which he endeavoured to lay down the general principles of the subject on a wide scientific basis, according to the knowledge of his day. The work is divided into — (1) absolute geography, (2) relative geography and (3) comparative geography. The first investigates mathematical facts relating to the

earth as a whole, its figure, dimensions, motions, their measurement, &c. The second part considers the earth as affected by the sun and stars, climates, seasons, the difference of apparent time at different places, variations in the length of the day, &c. The third part treats briefly of the actual divisions of the surface of the earth, their relative positions, globe and map -construction, longitude, navigation, &c.

Varenius, with the materials at his command, dealt with the subject in a truly philosophic spirit; and his work long held its position as the best treatise in existence on scientific and com- parative geography. The work went through many editions. Sir Isaac Newton introduced several important improvements into the Cambridge edition of 1672; in 1715 Dr Jurin issued another Cam- bridge edition with a valuable appendix; in 1733 the whole work was translated into English by Dugdale; and in 1736 Dugdale's second edition was revised by Shaw. In 1716 an Italian edition appeared at Naples; in 1750 a Dutch translation followed; and m 1755 a French version, from Shaw's edition, came out at Paris. Among later geographers d'Anville and A. von Humboldt especially drew attention to Varen's genius and services to science.

*SeeBreusing, " Lebensnachrichten von Bernhard Varenius " (Geogr. Mittheil., 1880); H. Blink's paper on Varenius in Tijdschr. van net Nederl. Aandrijksk. Genotsckap (1887), ser. ii. pt. 3; and F. Ratzel's article " Bernhard Varenius," in AUvweine Deutsche- R'nj*ra£hie,, yol. xxxix. (Leipzig, 1 895).*

VARESE, a town of Lombardy, Italy, in the province of Como, 18 m. by rail W, of that town, and 37 m. N.W. of Milan, 1253 ft. above sea-level. Pop. (1901) 7692 (town); 17,666 (commune). It is a well-to-do place, beautifully situated near the Lake of Varese,

and for this reason a favourite summer and autumn resort of the Milanese, who have numerous country houses in the vicinity. Among them the Villa Litta and the Villa Ponte may be specially mentioned. The principal church is that of S. Victor (rebuilt 1580–1615 and 1795), to which is attached an ancient baptistery (dating from the 9th century but rebuilt in the 13th). The fine campanile of the church is 246 ft. high. There is an archaeological museum with pre- historic antiquities from the lake-dwellings on an island in the Lake of Varese. To the N.W. (a journey of 25 hours) is the pilgrimage church of the Madonna del Monte (2885 ft.), approached by a path which passes fourteen chapels adorned with 17th-century frescoes and groups in stucco illustrating the mysteries of the rosary. Varese is the seat of active silk- spinning, tanning, paper-making and the manufacture of organs and vehicles. Excellent wine is made. Vacese is a junction! for Porto Ceresio and Laveno.

VARIA (mod. Vicovaro), an ancient village of Latium, Italy, in the valley of the Anio, on its right bank, and on the Via Valeria, 8 m. N.E. of Tibur (Tivoli). It was probably an independent town and not within the territory of Tibur, and Horace speaks of it as Sabine. Some remains of its walls, in rectangular blocks of travertine, still exist. One mile to the east is a picturesque gorge of the Anio, in which may be seen remains of the ancient aqueducts which supplied Rome, con- sisting partly of rock-cut channels and partly of ruined bridges: above it is the monastery of S Cosimato. Close to this point begins the valley of the Digentia (mod. Licenza) in which Horace's Sabine farm was situated. On the hill at the east of the entrance is the village of Cantalupo or Bardella, which has now assumed the name of Mandela, being identified thus

(correctly) with Horace's " rugosus frigore pagus " (Epist. i. 1 8, 104). An inscription of the Christian period, found at S Cosimato, speaks of the Massa Mandelana (Corp. Inscr. Lat. xiv. 3482). About 3 m. up the valley, close to the road on the west (right) bank of the stream, are traces of a Roman dwelling-house in opus reticulatum with remains of two mosaic pavements; this is generally identified with the villa of Horace, and probably corresponds fairly closely with its site. That the Fons Bandusiae was near the Sabine farm is not a necessary inference from Od. iii. 13, in which alone it is mentioned; though the scholiasts state it; indeed a fountain of this name near Venusia is mentioned in a bull of 1103. On the other hand, that there was an abundant fountain near the Sabine farm is clear from Epist. i. 16. 12, and Sat. ii. 6. 2. It is generally identified with the Fonte dei Ratini, but the spring of Vigna la Corte, a little farther north, is still more plentiful. Some have supposed that the site of the villa was higher up the hillside, above Rocca Giovane. For Horace speaks of having written Epist. i. 10 " post fanum putre Vacunae," and an inscription recording a temple of Victoria restored by Vespasian was copied at Rocca Giovane in the 16th century (Corp. Inscr. Lat. xiv. 3485). The identification of Victoria with the Sabine goddess Vacuna is not, however, absolutely certain: and there is here, as elsewhere in Roman literature, a play on the con- nexion of the name with vacare, " to take a holiday." In any case, the site of the Sabine farm can be approximately, if not exactly, fixed as in the neighbourhood of Rocca Giovane.

See T. Berti, La Villa di Orazio (Rome, 1886); G. Boissier, Nouvelles promenades archiologiques (Paris, 1886). (T. As.)

VARIATION AND SELECTION, in biology. Since the

publication in 1859 of Charles Darwin's Origin of Species, the theory of evolution of animals and plants (see Evolution) has rested on a linking of the conceptions of variation and selection. Living organisms vary, that is to say, no two individuals are exactly alike; the death-rate and the multiplication-rate are to a certain extent selective, that is to say, on the average, in the long run, they favour certain variations and oppress other variations. Co-operation of the two factors appears to supply a causal theory of the occurrence of evolution; the suggestion of their co-operation and the comparison of the possible results with the actual achievements of breeders in producing varieties were the features of Charles Darwin's theoretical work which made it a new beginning in the science of biology, and which reduced to insignificance all earlier work on the theory of evolution. P. Geddes, J. H. Stirling, E. Clodd and H. F. Osborn have made careful studies of pre-Darwinian writers on evolution, but the results of their inquiries only serve to show the greatness of the departure made by Darwin.

Several of the ancients had a vague belief in continuity between the inorganic and the organic and in the modifying or variation-producing effects of the environment. Medieval writers contain nothing of interest on the subject, and the speculations of the earliest of the modern evolutionists, such as C. Bonnet, were too vague to be of value. G. L. L. Buffon, in a cautious, tentative fashion, suggested rather than stated the mutability of species and the influence of the forces of nature in moulding organisms. Immanuel Kant, in his Theory of the Heavens (1755), foreshadowed a theory of the develop- ment of unformed matter into the highest types of animals and plants, and suggested that the gradations of structure revealed by comparative anatomy pointed to the existence of blood relationship of all

organisms, due to derivation from a common ancestor. He appeared to believe, however, that the successive variations and modifications had arisen in response to mechanical laws of the organisms themselves rather than to the influence of their surroundings. J. G. von Herder suggested that increase by multiplication with the consequent struggle for existence had played a large part in the organic world, but his theme remained vague and undeveloped. Erasmus Darwin, the grandfather of Charles Darwin, set forth in Zoorwmia a much more definite theory of the relation of

variation to evolution, and the following passage, cited by Clodd, clearly expresses it: —

"When we revolve in our minds the metamorphoses of animals, as from the tadpole to the frog; secondly, the changes produced by artificial cultivation, as in the breeds of horses, dogs and sheep; thirdly, the changes produced by conditions of climate and season, as in the sheep of warm climates being covered with hair instead of wool, and the hares and partridges of northern climates becoming white in winter; when, further, we observe the changes of structure produced by habit, as shewn especially by men of different occupa- tions ; or the changes produced by artificial mutilation and prenatal influences, as in the crossing of species and production of monsters: fourth, when we observe the essential unity of plan in all warm- blooded animals — we are led to conclude that they have been alike produced from a single living filament."

G. R. Treviranus, in the beginning of the roth century, laid stress on the indefiniteness of variation, but assumed that some of it was adaptive response to the environment, and some due to sexual crossing. J. B. P. Lamarck was the first author to work out a connected theory of descent and to suggest that the

relationships of organic forms were due to actual affinities. He believed that life was an expanding, growing force, and that animals responded to the environment by developing new wants, seeking to satisfy these by new movements and thus by their own striving producing new organs which were transmitted to their descendants. Variation was in fact a purposive response.

In 1813 W. C. Wells definitely propounded the theory of natural selection, but applied it only to certain human characters. In 183 1 Patrick Matthew, in the appendix to a book on naval timber and arboriculture, laid stress on the extreme fecundity of nature " who has in all the varieties of her offspring a prolific power much beyond (in many cases a thousandfold) what is necessary to fill up the vacancies caused by senile decay. As the field of existence is limited and pre- occupied, it is only the hardier, more robust, better-suited-to- circumstance individuals, who are able to struggle forward to maturity, these inhabiting only the situations to which they have superior adaptation and greater power of occupancy than any other kind; the weaker and less circumstance-suited being prematurely destroyed. This principle is in constant action; it regulates the colour, the figure, the capacities and instincts; those individuals in each species whose colour and covering are best suited to concealment or protection from enemies, or defence from inclemencies or vicissitudes of climate, whose figure is best accommodated to health, strength, defence and support; whose capacities and instincts can best regulate the physical energies to self advantage according to circum stances—in such immense waste of primary and youthful life those only come to maturity from the strict ordeal by which nature tests their adaptation to her standard of perfection and fitness to continue their kind by reproduction." G. St

Hilaire and afterwards his son Isodore regarded variation as not indefinite but directly evoked by the demands of the environment. L. von Buch laid stress on geographical isolation as the cause of production of varieties, the different conditions of the environment and the segregated interbreeding gradually producing local races. K. E. von Baer and M. J. Schleiden regarded l variation and the production of new or improved structures as an unfolding of possibilities latent in the stock. Robert Chambers, in the once famous Vestiges of Creation, interested and shocked his contemporaries by his denial of the fixity of species and his insistence on creation by progressive evolution, but had no better theory of the cause of variation than to suppose that organisms — " from the simplest and oldest to the highest and most recent " were possessed of " an inherent impulse, imparted by the Almighty both to advance them from the several grades and modify their structure as circum- stances required." In 1852 C. Naudin compared the origin of species in nature with that of varieties under cultivation. Herbert Spencer from 1852 onwards maintained the principle of evolution and laid special stress on the moulding forces of the environment which called into being primarily new functions and secondarily new structures. ,-

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Although the pre-Darwinian writers amongst them invoked nearly every principle that Darwin or his successors have suggested, they failed to carry conviction with regard to evolu- tion, and they neither propounded a coherent philosophy of variation nor suggested a mechanism by which variations that appeared might give rise to new species. The anticipations of Darwin were little more than formal and verbal. As T. H. Huxley pointed out

in his essay on the reception of the Origin of Species in the second volume of Darwin's Life and Letters, " The suggestion that new species may result from the selective action of external conditions upon the variations from their specific type which individuals present — and which we call ' spontaneous ' because we are ignorant of their causation — is as wholly unknown to the historian of scientific ideas as it was to biological specialists before 1858. But that suggestion is the central idea of the Origin of Species, and contains the quintessence of Darwinism."

C. Darwin opened his argument by consideration of plants and animals under domestication. He pointed to the efflo- rescence of new forms that had come into existence under the protection of man. A multitude of varieties of cultivated plants and domesticated animals existed, and these differed amongst themselves and from their nearest wild allies to an extent that, but for the fact o» their domestication, would entitle them to the systematic rank ot species. Some of these changes he sup- posed to have been the result of new conditions, including abundance of food and protection from enemies, but most he attributed to the accumulated results of selective breeding. No doubt such domesticated species might revert, and it has been shown that many do revert when restored to wild con- ditions, but such reversion is natural if we reflect that the domestic varieties are under the guardianship of man and have been selected according to his whim and advantage. Compar- ing domesticated varieties with species and varieties in nature, Darwin showed that the distinction between varieties and species was chiefly a matter of opinion, and that the discovery of new Unking forms often degraded species to varieties. Species, in fact, were not fixed categories, but halting-places, often ex- tremely difficult to choose, for the surveying mind of the sys-

tematist. He considered that a struggle for existence was the inevitable result of the operation of the principle of Malthus in the animal and vegetable worlds. The struggle would be most acute between individuals and varieties of the same species, with the result that " any being, if it vary however slightly, in any manner profitable to itself, under the complex and somewhat varying conditions of life, will have a better chance of surviving, and thus be naturally selected." Under natural selection the less well-adapted forms of life would on the average have a heavier death-rate and a lower multi- plication-rate. He did not suggest that every variation and every character must have a " selection value," although he pointed out that, because of our ignorance of animal physiology, it was extremely rash to set down any characters as valueless to their owners. It is even more important to notice that he did not suggest that every individual with a favourable variation must be selected, or that the selected or favoured animals were better or higher, but merely that they were more adapted to their surroundings.

With regard to variation, Darwin was urgent in stating his opinion that the laws of variation were not understood and that the phrase " chance " variation was a wholly incorrect expression. He thought it probable that circumstances affect- ing the reproductive system of the parents had much influence in producing a plastic condition of the progeny. He doubted, but did not exclude, the importance of the direct effect of differences of climate and food and of increased use and disuse, except so far as the individual was concerned, but his opinion as to these Lamarckian factors changed from time to time. He laid much stress on the unity of the organism in every stage of its existence, with the resulting correlation of variations, so that the favouring of one particular variation entailed modi- fications

of correlated structures. He recognized the existence

of the large variations, but he believed these to be of little value in evolution, and he attached preponderating import ance to relatively ;minute indeterminate variations. On the other hand, he was far from advocating the view that has been pithily expressed as the ″ selection of the fit from the fortuitous "; he recognized that variations, although perhaps suggested or excited by the environment, were determined by internal causes. He showed how different varieties in a species, or species in a genus, tended to display parallel variation, clearly indicating that the range and direction of variation were limited or determined by the nature of the organism.*

Alfred Russel Wallace, the co-discoverer of the Darwinian principles, had sent to Darwin early in 1858 an outline of a theory of the origin of species. Darwin found that it was, in all essential respects, identical with his own theory at the exposition of which he had been working for many years. With an unselfish generosity which must always shine in the history of science, and indeed of the human race, Darwin proposed at once to communicate his correspondent's essay to the Linnaean Society of London, but was persuaded by his friends to send with it an outline of his own views. Accordingly, on the same evening, in July 1858, both communications were made to the Linnaean Society. When Wallace found how much more fully Darwin Was equipped for expounding the new views, he exhibited an unselfish modesty that fully re- paid Darwin's generosity, henceforth described himself as a follower of Darwin, entitled his most important publication on the theory of evolution Darwinism, and did not issue it until 1889, long after the world had given full credit to Darwin. In most respects his ideas were closely parallel with those of Darwin. He believed that

species had been formed by means of natural selection. He insisted that the great powers of increase of all organisms led to a tremendous struggle for existence, and that variability extended to every part and organ of every organism; that the variability was large in amount in proportion to the size of the. part affected, and occurred in a considerable proportion of the individuals of those large and dominant species which might be supposed to be breaking up into new species. He pointed to the changes wrought on domesticated organisms by the artificial selection of similar variations, and drew the inference that there must be parallel occurrences under wild nature. In the sphere of nature, with its vast numbers and constant pressure, not every more favoured individual would survive, nor every surviving individual be the more favoured, but throughout the changes and chances there would be a constant and important bias in favour of the individuals more fitted to their conditions. Wallace, however, brought into his scheme a factor excluded by Darwin. He believed that behind the natural world lay a spiritual world, irruptions from which had disturbed the natural sequence of causation, certainly in the production of the higher emotional and mental qualities of man, probably in the appearance of self-consciousness, and possibly in the first origin of life.

It is to be remembered that the origin of species by the modification of pre-existing species, — in fact, the doctrine of organic evolution,— although first made credible by Darwin and Wallace, does not depend upon their theory of the relation of natural selection to variation. The theory of evolution is supported by a great ::ange of evidence, much of which was first collected by Darwin, and which has been enormously increased by subsequent workers excited by his genius. Such evidence relates to the facts of classification, structure,

develop- ment, and geographical and geological distribution. It now remains to examine in closer detail the further knowledge that has been gained with regard to variation and the bearing of that on the Darwinian posit'on.

Magnitude of Variation, — Darwin was well aware that varia- tion ranged from differences so minute as to become apparent only on careful measurement to those large departures from the normal which may be called abnormalities, malformations or monstrosities. He was of the opinion that the summation of minute differences had played a preponderating if not

exclusive part in the formation of specie's.- Wallace, whilst insisting that the range of observed and measured variation was much larger in proportion to the size of the organisms or parts of organism affected than was generally believed, leaned to the Darwinian view in excluding from the normal factors in the origin of species variations of the extremer ranges of magnitude. Later writers, and in particular W. Bateson and H. de Vries, have urged that as species are discontinuous— that is to say, marked off by structural differences of considerable magnitude — it is more probable that they have arisen from similarly discontinuous variations. De Vries gave the name " mutations " to such considerable variations (it is to be noted that a further concept, that of the mode of origin, has been added to the word mutation, and that the conception of relative size is being removed from it), and Bateson, de Vries and other writers have added many striking cases to those recorded by Darwin. It is doubtful, however, if there is any philosophical basis for distinguishing between variations merely by their magnitude. Differences which at their

first appearance are very minute may result in the kind of variations which certainly would be classed as discontinuous. When the cells of the morula stage of an embryo are shaken asunder, each, instead of forming the appropriate part of a single organism, may form a complete new organism. And similarly in the development of a complicated organism, the suppression or doubling of a single cell or group of cells may bring about striking differences in the symmetry of the adult, or the reduction or increase in the number of metameric organs. A slight change in the structure or activity of a gland, by altering the internal secretion, may produce widespread alterations even in an adult organism; and we have good reason to suppose that, if compatible with viability, such minute changes would have even a greater ultimate effect if they occurred in an embryo. Even amongst the extreme advocates of the theory of mutations, the import- ance of magnitude is being discounted by their suggestion that some of the minute variations which have hitherto been regarded by them as insignificant " fluctuating variations " may be significant mutations. This in effect is to say that not magnitude but something else has to be sought for if we are to pick out amongst observed variations those which may be the material for the differentiation of species. So far as magnitude is concerned, the attack on the Darwinian position has failed, and it is agreed that species may be discontinuous and none the less have been produced from minute variations.

Causes of Variation. — Darwin was careful to insist that we did not know the laws of variation, and that when variation was attributed to " chance " no more should be read into the statement than an expression of our ignorance of the causation. It cannot now be doubted that a very large amount of observed variation, and especially of the indefinite variation which is sometimes spoken of as

fluctuating variation, and which is usually distributed indefinitely round a mean, is directly associated with or induced by the environment. On various grounds attempts have been made to exclude such variation from the material for the making of species. The variations which de Vries has called mutations, and which were at first associated by Bateson with what he called discontinuous variations as the exclusive source of new species, are now supposed by de Vries to be distinguished from fluctuating variations by their mode of origin. Such mutations are not the product of the environment, but are an outcrop of the constitution of the germinal material of the varying organism, the result either of causes as yet undetected, or of the premuta- tions and eliminations suggested by the work of Mendel (see Mendelism). These attempts to reject environmental varia- tion rest on several grounds. In the first place the variations in question are " acquired characters." When Darwin and Wallace framed their theories it was practically assumed that acquired characters were inherited, and the continuous slow action of the environment, moulding each generation to a slight extent in the same direction, was readily accepted by a generation inspired by Sir C. Lyell's doctrine of uniformi-

tarianism in geological change, as a potent force. A. Weismann, however, from theoretical considerations and from analysis of supposed cases has at the least thrown doubt on the trans- mission of acquired characters. And so the newer school dis- card acquired characters and all the Lamarckian factors and leave the board clear for " mutations." Analysis of any acquired character, however, shows that there are two factors involved. The organism is not a passive medium; the amount and nature of the response it makes to the action of environment depends on its own qualities, and these qualities, on any theory of inheritance, pass

from generation to generation. Successful organisms, or well-adapted organisms, are those that have responded to the environment, whether by large or small varia- tions, in suitable fashion. It is the character as acquired that affords the opportunity for selection, but the quality of respond- ing to the environment so as to produce that character is trans- mitted. The conceptions of Weismann afford no ground for rejecting fluctuating variations from the materials for the production of species.

In the second place, it has been urged, particularly by de Vries, that experiment and observation have shown that the possible range of fluctuating variation is strictly limited. Breeders, he says, who try to build up qualities by the selection of the fluctuating variations that occur soon find that they reach a maximum beyond which their efforts fail, unless they turn to the more rarely occurring but heritable mutations. Something will be said later in this article as to the limitation of variation; here it is necessary only to say that de Vries is introducing no new idea. It is well known that some races and some organs in plants and animals are extremely variable, and that others are much less variable, and further, that whilst some of these differences may be due to intrinsic causes, others can be modified by experiment. As Sir W. T. Thiselton-Dyer has pointed out, what is called " specific stability " is a familiar obstacle to the producer of novelties, but one which he fre- quently succeeds in breaking down by cultural and other methods. In a survey of the palaeontological history of plants and animals, it is plain that extreme stability and extreme mutability both have occurred, sometimes having persisted for untold ages, sometimes having succeeded one another for vary- ing periods. As yet no solid reason has been alleged for exclud- ing fluctuating variations, on account of their limitation, from the materials for

specific change. J. Cossar Ewart and H. M. Vernon have adduced experimental evidence as to the induction of variation by such causes as difference in the ages of the parents, in the maturity or freshness of the conjugating germ cells, and in the condition of nutrition for the embryos. Such cases show in the plainest way the co-operation of external or environmental and internal or constitutional factors.

With our present knowledge it is impossible to discriminate between variation that may or that may not be the material for the differentiation of species by scrutinizing either magnitude or probable causation. It is equally impossible to draw an exact line between variation induced by the environment and variation that may be termed intrinsic. Extrinsic and in- trinsic factors are involved in every case, although there is a range from instances in which the external factor appears to be extreme to instances where the intrinsic factor is dominant. Even the results of mutilation involve an intrinsic factor, for they range, according to the organ and organism affected, from complete regeneration to the most imperfect healing. In the effects of exercise, of physiological activity and the gross results of such external agencies as food, tempeiature, climate, light, pressure and so forth the intrinsic factor appears to become more important. The interplay of extrinsic and intrinsic factors also differs with the age of the organism affected: the more nearly adult it may be, the more direct appears to be the influence of the environment; the more nearly embryonic the organism may be, the less direct is the result of a force im- pressed from without. The old organism is more stable and responds in obvious ways to direct assaults from without; the young organism is at once less stable and more profoundly

modified by environmental change, replying in terms less easy to predict from knowledge of the nature and amount of the impinging agency. And finally, there are a series of variations, amongst which no doubt are the mutations of de Vries and the disintegrations and recombinations of the unit factors with which Mendel and his followers have worked, in which the external or environmental factor is most remote from the actual result.

Correlated Variation. — Every organism is an individual, its different parts, organs and functions being associated in a degree of intimacy that varies, but that corresponds roughly with the integration of the individual and its place in the ascending scales of animal or vegetable life. One aspect of organic individuality is the correlation of variations, the fact that when one part varies, other parts vary more or less sim- ultaneously. So far, our knowledge of correlation is almost entirely empirical, and the arrangement of the observed facts cannot be brought into exact harmony with our guesses at their causation.

Much correlation is the inevitable result of organic structure. The various parts of a living organism affect each other in adult life and during growth. If, for instance, the testes fail to develop normally, the secretion which they discharge into the blood is abnormal in character and amount, with the result that the characters of the remotest parts of the body are more or less profoundly affected. It is now known that similar internal secretions, or hormones, pass into the blood from every organ and tissue, so reaching and affecting every part of the body. If we reflect on the multitude and complexity of such actions and reactions in operation from the youngest stages to the end of the life of each individual, we cannot be surprised at any correlation. Change

in the size of any part or organ, however it may have been produced, must bring with it many others changes, directly or indirectly. A difference in calibre, elasticity or branching of a blood vessel, the smallest variation in a nerve or group of vessel-cells, any anatomical or physio- logical divergence, is reflected throughout the organism. Much of the character of organisms is due to various symmetries, radial, bilateral, metameric and so forth, and these symmetries arise, partly at least, from the mode of growth by cell division and the marshalling of groups of cells to the places where they are destined to proliferate. Here, again, a variation in the order, nature and number of the divisions, in itself simple, may result in symmetrical or correlated changes in all the progeny of the affected embryonic part.

Every new individual starts life (see Reproduction) as a mass of germinal material derived from one or from two parents, but with a coherent individuality of its own. This individuality is the result of the particular selection of qualities it receives from its parents, a selection that obviously differs in different cases, as, save in the case of " identical twins," which are supposed to be the product of a single fertilized ovum, no individual pair of brothers, or pair consisting of brother and sister, are alike. We are still ignorant of the causes that deter- mine the associated selection of inherited qualities that go to the making of any individual. Those who have followed up the work of Mendel believe that the qualities of the new individual are a precise selection from and reconstruction of the parental qualities, and that were complete analysis possible, the char- acters of the new individual could be predicted with chemical accuracy. On other views of inheritance, there would be required for prediction knowledge not only of the immediate parents but of the whole line of ancestry, with the result that

prediction could reach only some degree of probability for any single individual and be accurate only for the average of a sufficient number of individuals. But whatever be the theory of the mode of inheritance, or the mechanism by which the germinal plasm of an individual is made up, it is plain that there is correlation between the various qualities of an individual due to the mode of origin of its germ plasm as a selected individual portion of the parental germ plasm.

Observed cases of correlation cover almost every kind of

anatomical and physiological fact, and range from simple cases such as the relation between height of body and length of face to such an unexpected nexus as that between fertility and height in mothers of daughters. The statistical investigation of correlations forms a new branch of biological inquiry, generally termed " Biometrics," inaugurated by F. Galton and carried on by Karl Pearson and the late W. F. R. Weldon.

We quote from the article " Variation and Selection," in the tenth edition of this Encyclopaedia, an exposition of the biometric method by Weldon: —

The characters of individual animals or plants depend upon so many complex conditions, most of which are generally unknown to us, that the statements we can make concerning them are of a peculiar kind. We cannot predict with any exactness the char- acters of a single unborn individual; but if we consider a large number of unborn individuals, we can predict with considerable accuracy the percentage of individuals which will have the mean character proper to their generation, or will differ from that mean character within any assigned limits. So long as we confine our attention to one or two individuals, we fail to detect any order in

the occurrence of variations; but when we examine large numbers we find that it is possible to arrange them in an orderly series, which can be easily and simply described. The series into which we can arrange the results of observing phenomena of complex causa- tion, whether exhibited by living organisms or not, have certain properties in common, which are dealt with by the theory of chance. Many of the properties of such series, and the methods of de- scribing them, are dealt with elsewhere (see Probability : Law of Error) : and the frequency with which the mean value or any deviation from the mean value of a character occurs in a race of animals or of plants may probably always be expressed in terms of one or other of the series there described. The theory of chance was applied to the study of human variation by Quetelet; but the most important applications of this theory to biological prob- lems are due in the first instance to Francis Galton, who used the theory of correlation in describing the relation between the deviation of one character in an animal body from the mean proper to its race and that of a second character in the same body (cor- relation as commonly understood), or between deviation of a parent from the mean of its generation and deviation of offspring from the mean of the following generation (inheritance). The conceptions indicated by Galton have been extended and added to by Karl Pearson, who has also developed the theory of chance so as to provide a means of describing many series of complex results in a simpler and more accurate way than was hitherto possible.

The conception of a race of animals or of plants as a group of individuals capable of being arranged in an orderly series with respect to the condition of a particular character enables us to define the " type " of that character proper to the race. Table I. shows the number of female swine which had a

given number of " Miiller's glands " on the right fore leg, in a sample of 2000 swine observed by Davenport in Chicago. If, we take the whole number of glands in the series, and divide this by the whole number of swine, we obtain the mean number of glands per swine. For many purposes this is the most convenient " type " of the series. Two

Table I.

Number of

Number of

Number of

— — — — ^ Number of

Glands.

Swine.

Glands.

Swine.

15

6

134

I

209

7

72

2

365

8

22

3

482

9

8

4

414

10

2

5

277

other ways of determining a "type" will be obvious by reference to the diagram, fig. I, in which the observed results are recorded by the thick continuous line, and the form of Pearson's " generalized probability curve " best fitted to represent them by a dotted line. The ordinate of the dotted curve which contains its " centre of gravity " has, of course, for its abscissa the " mean " number of glands; the maximum ordinate of the curve is, however, at 2-98, or sensibly at 3 glands, showing what Pearson has called the " modal " number of glands, or the number occurring most frequently. The ordinate which divides the area of the dotted curve into two equal areas is the median of Galton: it lies in this case nearly at 3-38 glands. The best simple measure of the frequency of deviations from the mean character is the " standard deviation " or " error of mean square " of the system (see article Probability), in this case equal to 1-68 glands.

In cases of nearly symmetrical distribution about the mean, the three " types," the mean, the median and the mode, may sensibly coincide.

For example, in Powis's table of the frequency of statures in male Australian criminals between 40 and 50 years

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of age (Biometrika, vol. i. part I, p. 41), the mean stature is 66-91 in., the modal 66-96 in., the median lying between the

Scak or &AN03

Fig. 1.

two. In other cases the difference between the three may be con- siderable. As an example of extreme asymmetry we may take de Vries's record of the frequency with which given numbers of petals occur in a certain race of buttercups. Pearson has shown (Phil. Trans., A., 1893) tnat this frequency may be closely repre- sented by the curve whose equation is

y = 0-2 1 i2253c _0 - 332 (7 -3253 - x) 3 - 142 . The curve, and the observations it represents, are drawn in fig. 2. The two are compared numerically in Table II. Here the mode is at 4-5 petals, the mean at 5-6 petals, the median lying of course between the two.

Table II.

Numbers of petals .

5

6

7

8

9

10

11

Frequency observed.

133

55

23

7

2

2

Frequency given by

Pearson's curve .

136–9

4»"5

22–6

9–6

3–4

o–8

0–2

The distributions represented in figs. I and 2 may be taken as examples of three common forms of series into which the indi– viduals of a race may be arranged with respect to a single character; a compari– son of them will show how little can be learnt from a mere statement of racial type, without some knowledge of the way in which deviations from the type are distributed.

The variability of structures which are repeated in the body of the same indi– vidual (serial homologues) has been studied by Pearson

and his pupils with important results. The simplest of such repeated elements are the cells of the tissues, more complex are cell- aggregates, from hairs, scales, teeth and the like, up to limbs or metameres in animals, or the - ""> leaves and their homologues in plants. Serially homologous structures, borne on the same body, are commonly differ- entiated into sets, the mean character of a set produced in one part of the body, or during one period of life, differing from the mean character of a set produced in a different region or at a different time. Such differentiation may be measured by determining the correlation between the position or the time of pro- duction and the character of the organs produced, the methods by which the correlation is measured being those de- scribed in the article Error, Law of. An excellent example of structures differentiated according to position is given by the appendages borne on the stem of an ordinary flowering plant — the one or two seed leaves; the stem leaves, which may or may not be differentiated into secondary sets; and the various floral organs borne at the apex of the stem or its lateral branches. The change which often occurs in the mean character and varia- bility of the flower produced at different periods of the flowering*

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Fig. 2.

season by the same plant is an example of differentiation associated with time of production; as this kind of differentiation is less familiar than differentiation according to the region of production, it may be well to give an example. In a group of plants of Aster prenanthoides, examined by G. H. Shull (American Naturalist, xxxvi., 1902), the mean number of bracts, ray-florets and disc-florets, and the standard deviation of each, was determined on four different days, with the following result : —

Table III.

Sept. 27.

Sept. 30.

Oct. 4.

Oct. 8.

Mean No. of bracts

47–41

44–34

43–83

41–92

Standard deviation

5–52

5–15

5–28

4–89

Mean No. of ray-florets

30–77

28–71

28–25

26–34

Standard deviation

3–99

3–57

3–50

3–01

Mean No. disc-florets .

56–43

5i–7i

49–16

45–78

Standard deviation

3-99

4-99

4-88

4-78

Notwithstanding this differentiation, the mean character of a series of repeated organs is often constant through a considerable region of the body or a considerable period of time; and the standard deviation of an " array " of repeated parts, chosen from such an area, or within such limits of time, may be taken as a measure of the individual variability of the organism which pro- duces them. If such an array of repeated organs be chosen from the proper region of the body, within proper limits of time, in each of a large series of individuals belonging to a race, and if all the arrays so chosen be added together, a series will be formed from which the racial variability can be determined. Thus a series of arrays of beech leaves, gathered, subject to the precautions indicated, from each of 100 beech trees in Buckinghamshire by Professor Pearson, gave 16-1 as the mean number of veins per leaf, the standard devia- tion of the veins in the series being 1-735. The number of leaves gathered from each tree was 26, and the frequency of leaves with any observed number of veins in the whole series of 2600 leaves was as follows: —

Table IV.

No. of veins . No. of leaves .

10 1

11

7

12

34

13

no

14 318

15 16 17

479 595 5i6

18 19

3o7|i8i

20 36

21 15

22

1,

The whole series contains 2600 leaves. If a leaf from this series be chosen at random, it is clearly more likely to have sixteen veins than to have any other assigned number; but if a first leaf chosen at random should prove to have some number of veins other than sixteen, a second leaf, chosen at random from the same series, is still more likely to have sixteen veins than to have any other assigned number. If, however, a series of leaves from the same tree be examined in pairs, the fact that one leaf from the tree is known to possess an abnormal number of veins makes it probable that the next leaf chosen from the same tree will also be abnormal — or, in other words, the fact that leaves are borne by the same tree estab-lishes a correlation between them. Professor Pearson has measured this correlation. Taking each leaf of his series, with an assigned number of veins, he has determined the array of

pairs of leaves which can be formed by pairing the chosen leaf with all others from its own tree in succession. The pairs so formed were collected in a table, from which the correlation between the first leaf and the second leaf of a pair, chosen from one tree, could be determined by the methods indicated in the article Probability. The mean and standard deviation of all first leaves or of all second leaves will clearly be the same as those already determined for the series of leaves; since every leaf in the series is used once as a first member and once as a second member of a pair. The coefficient of cor- relation is 0-5699, which indicates that the standard deviation of a n array is equal to that of the leaves in general multiplied by V 1 — (o-5699) 2 ; and performing this multiplication, we find 1-426 as the standard deviation of an array. The variability of an array of such a table — that is, of any line or column of it — is the mean variability of pairs of leaves, each pair chosen from one tree, and having one leaf of a particular character; it may therefore be taken as a fair measure of the variability of such a tree. We see therefore that while leaves, gathered in equal numbers from each of 100 trees, are distributed about their mean with a standard deviation of 1-735 veins, the leaves gathered from a single tree are distributed about their mean with a standard deviation of 1-426 veins, the ratio be- tween variability of the race and variability of the individual tree being V 1 — (0-5699) 2 =0-822.

The correlation between undifferentiated sets of serial homologues, produced by a single individual, is the measure of what Pearson has called homotyposis. In an elaborate memoir on the homo- typosis in plants (Phil. Trans., vol. 197 A., 1901), from which the foregoing statements about beech leaves are taken, Pearscn has given the correlation between such sets of organs in a large number of plants: he

and his pupils have subsequently determined the correlation between structures repeated in the bodies of individual animals. The results obtained are sometimes puzzling, because it is

sometimes difficult to choose the whole series of structures osberved from a region of the body which is not affected by differentiation. In spite of this difficulty, however, the values of the correlation coefficients so far obtained cluster fairly well round the mean value of all of them, which is almost exactly ^. From this result it follows (see Probability) that the standard deviation of the array, which we have taken as a measure of individual variability, is equal to the standard deviation of the race multiplied by

1— (— J or by — . These resultscannot be accepted as final, but

thej' are based on so many investigations of animals and plants, of such widely different kinds, that they may confidently be expected to hold for large classes of organic characters. We may therefore conclude that for large classes of characters, both animal and vegetable, the variability of an individual, as measured by the standard deviation of its undifferentiated but repeated organs, is a constant fraction of the variability of its race, as measured by the standard deviation of the corresponding series of organs produced by all the individuals of its race.

Among the most important structures produced in repeated series are the reproductive cells ; and Pearson points out that if the varia- bility of animals or of plants be supposed to

depend upon that of the germ-cells from which they arise, then the correlation between brothers in the array produced by the same parents will give a measure of the correlation between the parental germ-cells, the determination requiring, of course, the same precautions to avoid the effects of differentiation as are necessary in the study of other repeated organs. After a large series of measurements, involving the most varied characters of human brothers, Pearson has shown that the correlation has a value very nearly equal to f ; so that the varia- bility of human children obeys the same law as that of other repeated structures, the standard deviation of an array, produced by the same parents, havi-ng an average value equal to the st andard de viation of the whole filial generation multiplied by

■*\j 1 ~ (—) or by — . Such measurements of fraternal correlation*

in the lower animal as Pearson and his pupils have at present made give values very close to 5. The evidence that the correlation between sexually produced brethren is the same as that existing between the asexually repeated organs on an individual body renders it impos- sible to accept Weismann's view that one of the results produced by the differentiation of animals and plants into two sexes is an increase in the variability of their offspring. Warren has shown by direct observation that the correlation between brothers among the broods produced parthenogenetically by one of the Aphides has a value not far from the J observed in sexually produced brethren (Biometrika, vol. i., 1902); he has obtained a fairly concordant result for the broods of parthenogenetic Daphnia (Proc. Roy. Soc. vol. !xv., 1899). Finally, Simpson has measured the correlation between the pairs of young produced by the simple asexual division of Paramoecium (Biometrika, vol. i. part 4, 1902), and after

some necessary corrections the value he obtains is 0.56, a value which probably does not, if we remember the difficulties of the inquiry, differ very significantly from 3. There is therefore in a large class of cases an indication that the variability of an array of brethren, produced either sexually or asexually, is a constant fraction of the variability of the race to which the brethren belong.

Variation and Mendelism. — The conceptions of the disciples of Mendel, amongst whom W. Bateson is pre-eminent, would appear to simplify the problem of variation, especially on its mechanical and physiological sides. Their experimental work shows that many facts of inheritance correspond with the theory that the essential fabric of an organism is a mosaic of unit characters. Such units frequently occur in pairs, one member of the pair being characterized by the presence, the other by the absence of a problematical body at least comparable with a ferment, the result of the presence or absence being a notable modification of the whole organism or of parts of it. According to their view, in the formation of the germ cells a segregation of the unit pairs occurs — that is to say, the peculiar body or ferment is handed on to one daughter-cell but not to the other. A similar kind of segregation may take place in the formation of the repeated parts of an organism, so that sym- metrical repetition may be compared with normal heredity, and be due to the presence of similar factors in the divisions of the embryonic cells, whilst the differentiation of repeated parts may be due to the unequal distribution of such factors and be comparable with variation. On such an interpretation, varia- tion would result from asymmetrical division and normal inheritance from symmetrical division. It is equally clear that there is a broad analogy between the kind

of characters on which systematists often have to rely for the separation of

species and those which Mendelian workers have shown to behave in accordance with the Mendelian theories of mosaic inheritance with segregation. The analogy possibly may be extended to such cases as the occurrence of flora or fauna with alpine characters on the summits of mountains separated by broad zones of tropical climate. Segregated inheritance may have produced the appropriate combinations which were latent in the capacities of the race, and the exigencies of the environment protected them in the suitable localities. It is to be noticed, however, that the Mendelian conceptions are in no sense an alternative to Darwinism; at the most they would serve to assist in explaining the mechanism of variation, and by enlarging our idea of the factors, increase the rate at which we may suppose selection to work.

Limitation of Variations; Orthogenesis. — Darwin and his generation were deeply imbued with the Butlerian tradition, and regarded the organic world as almost a miracle of adaptation, of the minute dovetailing of structure, function and environ- ment. Darwin certainly was impressed with the view that natural selection and variation together formed a mechanism, the central product of which was adaptation. From the Butlerian side, too, came the most urgent opposition to Dar- winism. How is it possible, it was said, that fortuitous varia- tions can furnish the material for the precise and balanced adaptations that all nature reveals? Selection cannot create the materials on which it is supposed to operate; the begin- nings of new organs, the initial stages of new functions cannot be supposed to have been useful. Moreover, many naturalists, especially those concerned with palaeontology, pointed to the existence of orthogenetic series, of long lines of ancestry, which

displayed not a sporadic differentiation in every direction, but apparently a steady and progressive march in one direction. E. D. Cope put such a line of argument in the most cogent fashion; the course of evolution, both in the production of variations and their selection, seemed to him to imply the existence of an originative, conscious and directive force, for which he invented the term ″ bathmism ″ (Gr. | 3a0/x6s, a step or beginning). On the other hand, dislike of mystical interpreta- tions of natural facts has driven many capable naturalists to another extreme and has led them to insist on the ″ all-powerful- ness of natural selection ″ and on the complete indefiniteness of variation. The apparent opposition between the conflicting schools is more acute than the facts justify. Both sides concur in the position assumed by Darwin, that the word ″ chance ″ in such a phrase as ″ chance variation ″ does not mean that the occurrences are independent of natural causation and so far undetermined, but covers in the first place our ignorance of the exact causation. The implication of the phrase may go farther, suggesting that there is no connexion between the appearance of the variation and the use to which it may be put. No doubt a large amount of variation is truly indefinite, so that many meaningless or useless variations arise, and in one sense it is a mere coincidence if a particular variation turn out to be useful. But there are several directions in which the field of variation appears to be not only limited but defined in a certain direction. Obviously variations depend on the constitution of the varying organism; a modification, whether it be large or small, is a modification of an already definite and limited structure. When beetles, or medusae, or cats vary, the range of possible variation is limited and determined by the beetle, medusa or cat constitution, and any possible further differentiation or specialization must be in a

sense at least orthogenetic — that is to say, a continuation of the line along which the ancestors of the individual in question have been forced. Darwin himself showed that different species in a genus, or varieties in a species, tended to show parallel variations, whilst comparative anatomy has made known a multitude of cases where allied series of animals or plants show successive stages of parallel but inde- pendent variations of important organs and functions. The phenomena of convergence are to some extent other instances of the same kind and supply evidence that organisms, so to say, fall into grooves, that their possibilities of change are defined

and limited by their past history. Variation, again, as has been shown in this article, is limited by correlation; as any change involves other changes, the possibilities are limited by the organic whole. Finally, it is important to remember that the fundamental characteristic of a living organism is its power of response to environment, a response or series of responses being necessary in a continuous environment for the normal facies of the organism to appear, and necessary in a shifting environment if the organism is to change suitably and not to perish. A continuous environment both from the point of view of production of variation and selection of variation would appear necessarily to result in a series with the appearance of orthogenesis. The past history of the organic world displays many successful series and these, as they have survived, must inevitably display orthogenesis to some extent; but it also displays many failures which indeed may be regarded as show- ing that the limitation of variation has been such that the organisms have lost the possibility of successful response to a new environment.

Selection and Adaptation. — Although knowledge of variation has become much wider and more definite, the estimation in which natural selection is held has changed very little since Darwin and Wallace first expounded their theories. Variation provides the material for selection, and although opinions may differ as to the nature of that material, the modes by which it comes into existence and their relative values and perma- nences, there is an increasingly wide consensus of opinion that all such material has to pass through the sieve of natural selec- tion and that the sifted products form new varieties and species, and new adaptations. It appears to be necessary to distinguish between the production of species and the production of adapta- tion. We have still to admit with Darwin that it is difficult or impossible to assign utility to all the characters that dis- tinguish species, and particularly to those characters by which systematists identify species. The modern tendency for a more complete and detailed separation of individual forms into specific and sub-specific groups, and the immensely larger range of material at the disposal of systematic experts, have combined to make it increasingly difficult to imagine conditions of the environment under which the species of systematists would have been produced by selection. On the other hand, the work of modern systematists shows an extraordinarily exact relation between their species and geographical locality, and the fact of divergent evolution can be almost demon- strated in museum collections when localities have been recorded exactly. The decision as to whether it is the course of variation or the course of selection that has been different in different localities can be made only by the field naturalist and the experimental breeder.

With regard to adaptations, it is becoming more

and more apparent, as experimental knowledge advances, that it is a fundamental property of every living organism in every stage of its existence to display adaptive response to its environment. To what extent such responses are transmitted to offspring, and what part they play in the formation of the adaptive characters that are conspicuous in many animals, remain dubious, but it is at least clear that natural selection can favour those individuals and those races which show the greatest power of responsive plasticity in the individual. There remains open a wide field for inquiry as to the precise relations between selec- tion and variation on the one hand, and their products, specific differences and adaptive structures, but the advance of know-, ledge has supplied no alternative to the Darwinian principles.

In the broadest way variation in organisms is primarily the necessary result of the absence of uniformity in the distribution of physical forces on the globe, in fact is a mere necessary response to the variation of inorganic conditions. So, also, in the broadest way, the result of the existence of variation is equally inevitable. Some individuals happen to fit the environ- ment better, or to respond to the environment better, and these on the average will survive their less fortunate neighbours. It is plain that whilst the existence of variation can be demon-

strated and the occurrence of evolution established by induction and deduction, the part played by selection must remain largely theoretical.

We append, however, again from the late Professor Weldon's article, a summary of the lines on which it seems possible that the actual process of selection may be demonstrated.

Selection and its results can be adequately studied only in those cases which admit of statistical tabulation. In any race of animals, the number of young produced in a season is almost always greater than the number which survives to attain maturity; it is not certain that every one of those which become mature will breed, and not all of those which breed contribute an equal number of offspring to the next generation. At every stage some individuals are prevented from contributing to the next generation, and if the continual process of elimination affects individuals possessing any one character more strongly than it affects others, so that a relation is established between individual character and the chance of pro- ducing a certain number of young, selection is said to occur.

, We may distinguish broadly two ways by which such selective elimination of individuals from the number of those who contribute to the next generation may occur, viz. a differential destruction, which prevents certain classes of individuals from breeding by killing them, and a series of processes leading to differential fertility among the survivors, without necessarily involving any differential death-rate. A third form of selection, which may affect the composition of the next generation without of necessity involving a differential death-rate or a differential fertility, is assortative mating, or the tendency of those members of one sex which exhibit a particular character to mate only with members of the other sex which exhibit the same or some other definite character.

Differential fertility may be induced in either of two ways. Indi- viduals may not be able to pair unless they possess a character which is absent, or insufficiently developed, in some members of the race. The kind of selection involved may then be measured by comparing those animals which pair with the general body

of adults. This is what Darwin especially intended to denote by the term " sexual selection." Or, again, individuals of certain character may be able to pair, but the fertility of their union may not be the same as that of unions between individuals with other characters. This kind of selection, called by Pearson " reproductive " or " genetic " selection, may be measured by finding the correlation between the characters of the individuals which pair and the number of young produced. For an attempt to treat the whole problem of dif- ferential fertility and assortative mating numerically, see Pearson, The Grammar of Science, 2nd edition, London, 1900.

Assortative mating exists when individuals which mate are not paired at random, but a definite correlation is established between the characters of one mate and those of the other. This kind of selection is measured by the correlation between deviation of either mate from the type, and deviation of the other. Pearson has shown that Galton's function has a value of 0-28 for stature of middle-class Englishmen and their wives.

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(P. C. M.)

VARIATIONS, in music, the term given to groups of pro- gressively developed versions of a complete self-contained theme, retaining the form of that theme though not necessarily its melody. This at least is the classical sense of the term, though there are modern developments of the variation form to which this definition is at once too broad and too precise to apply. The aesthetic principle of variations appeared at very early stages of music; and it soon became something far more definite than the use of ornamental versions of a melodic phrase, a use which must have been natural almost as soon as music was articulate at all. During the 16th century

principles aesthetically indistinguishable from some types of variation-form inevitably arose in the polyphonic treatment of Gregorian hymns verse by verse. Accordingly, the hymns and Magnificats of Palestrina might without great extravagance be described as contrapuntal sets of variations on ecclesiastical tunes, like very free examples of the type shown later in

extreme simplicity and formality by Haydn's variations on his Austrian national anthem in the " Emperor " quartet (Op. 76, No. 3).

Already in the 16th century instrumental music was assuming such independence as it could attain by means of a primitive variation-form, growing partly out of the habit of playing vocal madrigals on the virginals or similar keyed instruments, or singing the top part as a solo to an instrumental accompaniment, with an overwhelming weight of ornaments beneath which the original madrigal was quite unrecognizable. (See, for example, the " diminutions " given in the 30th volume of Breitkopf & Hartel's complete edition of Palestrina's works.) A favourite plan, of which numerous examples may be found in the Fitz- william Virginal Book, was to put together several popular or original tunes, with an ornamental variation sandwiched between each. Sometimes, however, sets of variations on a single tune were produced, with essentially modern effect, as in Byrd's variations on " The Carman's Whistle." Such varia- tions were naturally grouped in order of increasing complexity and brilliance. Some of the keyboard passages in which the early English variation-writers indulged are of extraordinary difficulty, even from the standpoint of modern pianoforte technique.

In the 17th century a highly artistic form of variation arose, very favourable to the earliest composers of the transition period, because of the simplicity of its principle, which relieved the composer of all the graver problems of formal organization. This was the ground-bass, a single phrase placed in the bass and repeating itself as long as the composer had fresh harmonies and superstructure with which to vary it. In typical examples the ground-bass was derived from the dance forms of the passacaglia and the chaconne, which in classical music resembled each other in being in slow time, and did not otherwise differ

markedly, except that in the passacaglia the theme could be transferred now and then to the treble or to an inner part, a purely natural aesthetic resource which makes no radical differ- ence to the art-forrn. The genius of Purcell was cruelly hampered by the lack of possibilities for organizing large musical forms in his time, and nothing is more significant than the avidity with which he seizes upon the ground-bass as a means of giving coherence to his ideas.

By the time cf Bach and Handel a lighter type of variation- work, less capable of high organization, and more like Byrd's variations on " The Carman's Whistle," had arisen. Bach's Aria variata alia maniera Italiana is an instance of this; and so is the air et doubles that appears now and then in Handel's instrumental works. The principle of this form is simply to take a symmetrical melody (generally in binary form) and embroider it. Such variations are called doubles whenever each variation divides the rhythm systematically into quicker notes than the one before. The most familiar example is that known as " The Harmonious Blacksmith •' in Handel's E major suite. Sometimes the air itself was stated in a tangle of ornamentation, while the doubles made it float in a simplified form over an accompaniment of increasingly rapid flow. (See, for example, Handel's D minor suite and the little set in B flat on a theme afterwards varied in the noblest modern style by Brahms.)

But Bach had meanwhile applied the principle of the ground- bass to variations on a complete symmetrical movement in binary form. His Air and 30 Variations, commonly known as the " Goldberg " variations, is (with the exception of Bee- thoven's 33 Veranderungen on a waltz by Diabelli) not only the most gigantic set of variations in the world, but one of the three largest compositions in any form ever written for a single instrument. Of course in so large

a work the conception of the

ground-bass, as a clearly recognizable theme repeated with no more than slight ornament, would be inadequate whatever the variety of the superstructure: but so steady is the drift of Bach's bass that he is enabled to represent it by countless alternative harmonies and analogous chromatic progressions, without weakening its individuality. The grouping of the thirty variations is extremely subtle in balance and climax, the more so because there are no means within the terms of Bach's art for making a free coda to the work, his ground-bass being both too long and too purely a bass to be taken as the theme of a fugue, like that in his great passacaglia for organ. Yet Bach contrives to round off the work perfectly by the simple direction aria da capo at the end. There is no question of retaining or varying the melody of the aria, which indeed is so ornamental as to be pointless and unrecognizable as a basis for variations; nor could it, like the above-mentioned Italian examples of Handel, be simplified, since most of its ornaments are integral parts of the phrases.

The next chapter in the history of the variation form is intimately connected with the sonata style. A set of variations used as a movement for a sonata inevitably tends to be varia- tions on the melody. The sonata style implies the identification of themes by their melodies rather than by their texture, the very term " theme " being primarily used in a melodic con- notation (see Melody). Hence a set of exclusively harmonic variations would not be in the sonata style. Now, most of the best sets of variations by Mozart and Haydn are movements in their sonata works; and this should always be remembered in discussing the tendency of their treatment of the form. Few of their independent sets are of any importance, since most are very early works, or were written for pupils, or intended as encore pieces for

concerts. Haydn shows a great fondness for a special form which, even if earlier specimens can be found, he may properly be said to have invented. It con- sists of alternating variations on two themes, the first a highly organized complete binary melody, and the other a shorter binary melody, often beginning with the same figure as the first, but clearly contrasted with it, inasmuch as, whichever theme is in the major, the other is in the minor. The first theme usually returns as if it were going to be unvaried, but its first repeat is an ornamental variation. The form is rarely worked out far enough to include more than one variation of the second theme; but the effect is always that of a happy blend of a clearly marked variation form with a more con- trasted scheme a little more highly organized than the round- and-round symmetry of a minuet and trio, but not so elaborate as a rondo. The only later example exactly corresponding to Haydn's form is the first allegretto of Beethoven's pianoforte trio in E flat, Op. 70, No. 2; although, with a wider range of key, a free application of the principle of alternating themes is magnificently illustrated by the slow movement of his C minor symphony.

Beethoven in his last works invented another variation-form on two themes, in which the first theme is very free in structure and the second theme is a more rigid melody in a different key and time. The examples of this are the slow movement of the 9th Symphony and the Lydian figured chorale in the A minor quartet. A fine later development of this is the slow movement of Brahms's F major string quintet, Op. 88, in which the alternation of the two keys gives rise, in the last line of the movement, to one of the most astonishing and subtle dramatic strokes in all music.

In sonata works, Beethoven's examples of the normal variation form based on a single theme are as wonderful as may be expected from him;

but nothing is more significant than his strict adherence in sonata works to the melodic principle of variation. He uses the form as an unsurpassable means of obtaining repose in slow movements. The extreme case of this is the slow movement of the sonata, Op. 57 (commonly called Appas- sionato), which is described in the article on Sonata Forms. In this and in many other instances, his method is aesthetically that of the air et doubles, as being the simplest possible means

of obtaining variety and climax without leaving the funda- mental key. Until his latest works, such sets of variations are never finished. Their dramatic force is that of a repose which is too unearthly to last; and at the first sign of dramatic motion or change of key the sublime vision " fades into the light of common day," a light which Beethoven is far too great an idealist to despise. (See the andante of the B fiat trio, Op. 97; and the slow movement of the violin concerto, which contains two episodic themes in the same key.) In his later works Beethoven found means, by striking out into foreign keys or foreign rhythms, of organizing a coda which, as it were, finally spins down in fragmentary new Variations, or even returns to the plain theme. Thus he was able to end his sonatas, Opp. 109 and in, with solemn slow movements in which, with the utmost richness of detail and novelty of idea, the melodic variation form is nevertheless paramount. Beethoven also found many ways of combining melodic variations with the principles of the rondo and other more highly organized continuous movements. Thus the finale of the Eroica Symphony has not only the theme but many ideas of the variations and fugue-passages in common with the brilliant set of variations for pianoforte on a theme from Prometheus, Op. 35;

and the Fantasia for pianoforte, chorus and orchestra, and the choral finale of the 9th Symphony, are sets of melodic variations with freely developed connecting links and episodes. In the case of the 9th Symphony, a second thematic idea eventually combines with the figures of the first theme in double fugue.

But Beethoven's highest art in variation-form is to be found in his independent sets of variations. In some of the earliest of these, notably in the 24 on a theme by Righini (which was his chief bravura performance as a young pianoforte player), he far transcends not only the earlier or sonata-form idea of melodic variations, but fuses their resources with those of the ground-bass, and adds to them his own unparalleled grasp of rhythmic organization. Beethoven is the first composer who can be said to have discovered that a theme consists not only of melody and harmony but of rhythm and form. With earlier composers the form of the theme was automatically preserved in consequence of the preservation of either its melody or its harmony; but Beethoven had an unerring judgment as to when the form of a theme might be definite enough to remain as a basis for a variation which departed radically from both the harmony and the melody. The climax in the history of variations dates from the moment when Beethoven was just about to begin his 9th Symphony, and received from A. Diabelli a waltz which that publisher was sending round to all the musicians in Austria so that each might contribute a variation to be published for the benefit of the sufferers in the late Napoleonic wars. Diabelli's theme was absurdly prosaic, but it happened to be perhaps the sturdiest piece of musical anatomy that Beethoven or any composer since has ever seen. Not only was its harmonic form exceptionally clear and firm, but its phrase-rhythm was as simple, recognizable and heterogeneous as its other qualities. Its melodic merit was nil, yet

it had plenty of recognizable melodic figures. All these prosaic technicalities are far more likely to impress a great composer as good prac- tical resources than those high poetic qualities which critics discuss incessantly, but which are to a great artist the air he breathes. Diabelli's waltz moved Beethoven to defer his work on the 9th Symphony !

The shape of Diabelli's theme may be illustrated by a diagram

Tonic. Dominant. Rising sequence, Close in dominant.

which represents its first sixteen bars ; the upright strokes being the bars, and the brackets and dots (together with the names under- neath) indicating the way in which the rhythm is grouped by correspondence of phrase and changes of harmony. The second part also consists of sixteen bars, moving harmonically back from the dominant to the tonic, and rhythmically of exactly the same structure as the first part. This harmonic and sequential plan, together with this straightforward square tapering rhythmic structure, is so formal in effect that Beethoven can substitute.

for it almost anything equally familiar that corresponds, in its proportions. Thus, the alternation of tonic and dominant in the first eight bars may be represented by another familiar form in which three bars of tonic and a fourth of dominant are answered by three bars of dominant and a fourth of tonic; as in variation 14 (which must be reckoned in half- bars). Again, the antithesis of tonic and dominant is accompanied in Diabelli's theme by a part of the melodic figure being repeated a step higher at the change of harmony ; and this naturally produces such devices as the answering of the tonic by the supertonic in variation 8, and, still more surprisingly, by the flat supertonic in variation 30. In so

enormous and resource- ful a work, occupying fifty minutes in performance, it is natural that some variations should drift rather farther from the anatomy of the theme than can be explained by any strict principle ; and so the jocular transformation of the beginning of Diabelli's bass into the theme of Mozart's Notte e giorno faticar leads to a couple of extra bars at the end of its second part ; otherwise the fughetta (variation 24) and variations 29 and. 31 are the only cases in which any considerable part of the structure of the theme is lost, except the fugue (variation 32), which is simply an elaborate movement on a salient feature of what must by courtesy be called Diabelli's melody. A free fugue is a favourite solution of the difficult problem of the coda in a set of variations.

But for the works of Brahms, which invariably retain the classical conceptions while developing them in a thoroughly modern and living language, it can hardly be claimed that the art of variation-writing has advanced since Beethoven. The term is now used for a somewhat nondescript method of stringing together a series of short fantasias on a theme; a method which may be legitimate and artistic in individual cases, but hardly constitutes an art form. There is this great disadvantage in variations that neglect the anatomy of the theme, that the only way in which, in the absence of other means of. connexion, they can show any coherence at all is by more or less frequently harping on scraps of the melody. The effect is (except in unusually happy examples such as the Eludes symphoniques of Schumann . and the Enigma Variations of Elgar) curiously apologetic; because no ambitious composer in the "free" modern variation style thinks a melodic varia tion quite worthy of his dignity, and so the melodic allusions become the more tiresome from their furtive manner. Many "advanced" specimens of variation-form

undoubtedly owe their origin to a vague impulse of revolt from the unsound statements of unobservant writers of mid-i9th century text-books, who contented themselves with laying down crude rules such as that a variation might " either retain the melody and change the harmony, or retain the harmony and change the melody," &c, without any attempt to see how the classical composers really analysed their themes. It is very characteristic of Schumann's modesty and grasp of facts that he, who was the first to produce serious art in a free non-anatomical variation style, did not call his experiments variations without qualifica- tion. Hq never. wrote a sat in which the anatomy of the theme was of real importance to the whole; and, with him, whenever at least the initial melodic figure of his theme is not traceable throughout a section, that section is simply an episode. But Schumann knows this perfectly well, and acknowledges it. The Etudes symphoniques are called variations only in those sections which are fairly strict variations. Elsewhere they are simply numbered as etudes. The slow movement of the F major string quartet (in which a second theme masquerades as the first variation, and some of the other variation-like sec- tions are quite free) is called andante quasi variazione; and even the strictest of all his variation works is called Impromptus, on a theme by Clara Wieck, Op. 5. There is, no doubt, great scope for a variation-form which is neither melodic nor anatomic, and we have not a word to say against the legitimacy of many forms of effective modern fantasia-variations; but the fact remains that it is very hazardous to talk of an " advance " in the variation-form, when even the best fantasia-variations are not only unconnected with any classical type but evidently unable to get nearly as far from either the melody or the harmony of their theme as the 25th of Bach's " Goldberg " variations or many variations in the earliest sets by

Beethoven. Indeed, the only sound classification of composers of modern variations, from the time of Mendelssohn onwards, is that

■*which distinguishes the composers who seem to know their theme from th6se who do not. (D. F T.)*

VARIATIONS, CALCULUS OF, in mathematics. The cal- culus of variations arose from the attempts that were made by Origin mathematicians in the 17 th century to solve problems of the of which the following are typical examples, (i) It Calculus. - IS re q U i rec [t determine the form of a chain of given length, hanging from two fixed points, by the condition that its centre of gravity must be as low as possible. This problem of the catenary was attempted without success by Galileo Galilei (1638). (ii) The resistance of a medium to the motion of a body being assumed to be a normal pressure, proportional to the square of the cosine of the angle between the normal to the surface and the direction of motion, it is required to deter- mine the meridian curve of a surface of revolution, about an axis in the direction of motion, so that the resistance shall be the least possible. This problem of the solid of least resistance was solved by Sir Isaac Newton (1687). (iii) It is required to find a curve joining two fixed points, so that the time of descent along this curve from the higher point to the lower may be less than the time along any other curve. This problem of the brachistochrone was proposed by John (Johann) Bernoulli

(1696).

The contributions of the Greek geometry to the subject consist of a few theorems discovered by one Zenodorus, of whom little is known. Extracts from his writings have been pre- served in the writings of Pappus of Alexandria and Theon of Smyrna. He proved that of all curves of given peri- meter the circle is that which encloses the largest area. The problems from which the subject grew up have in common the character of being concerned with the maxima and minima of quantities which can be expressed by integrals of the form

Early history.

/:

F(x, y, y^dx,

in which y is an unknown function of x, and F is an assigned function of three variables,′ viz. x, y, and the differential coefficient of y with respect to x, here denoted by y′; in special cases x or y may not be explicitly present in F, but y′ must be. In any such problem it is required to determine y as a function of x, so that the integral may be a maximum or a minimum, either absolutely or subject to the condition that another integral or like form may have a prescribed value. For example, in the problem of the catenary, the integral

*J **

'y(i+y ,T)idx

must be a minimum, while the integral

{i+y′)ldx*

/:

has a given value. When, as in this example, the length of the sought curve is given, the problem is described as isoperimetric. At the

end of the first memoir by James (Jakob) Bernoulli on the infinitesimal calculus (1690), the problem of determining the form of a flexible chain was proposed. Gottfried Wilhelm Leibnitz gave the solution in 1691, and stated that the centre of gravity is lower for this curve than for any other of the same length joining the same two points. The first step towards a theory of such problems was taken by James Bernoulli (1697) in his solution of the problem of the brachistochrone. He pointed out that if a curve, as a whole, possesses the maximal or minimal property, every part of the curve must itself possess the same property. Beyond the discussion of special problems, nothing was attempted for many years.

The first general theory of such problems was sketched by Leon- hard Euler in 1736, and was more fully developed by him in his Buler treatise Melhodus inveniendi . . . published in 1744.

He generalized the problems proposed by his predecessors by admitting under the sign of integration differential coefficients of order higher than the first. To express the condition that an integral of the form

rXl F{x,y,y′,y″,...y.″))dx Xo

may be a maximum or minimum, he required that, when y is changed into y--u, where u is a function of x, but is everywhere ″ infinitely ″ small, the integral should be unchanged. Resolving the integral into a sum of elements, he transformed this condition into an equation of the form

v , [3F i 3F ,

z itAx ldy—dxo9 + dZW~y ■ +{ —V″dT»w ;r u =0t

and he concluded that the differential equation obtained by equating to zero the expression in

the square brackets must be satisfied. This equation is in general of the 2Kth order, and the 2» arbitrary

J x

constants which are contained in the complete primitive must be adjusted to satisfy the conditions that y, y′, y , . . . y(n_1) have given values at the limits of integration. If the function y is required also to satisfy the condition that another integral of the same form as the above, but containing a function instead of F, may have a prescribed value, Euler achieved his purpose by replacing F in the differential equation by F+X<£, and adjusting the constant A so that the condition may be satisfied. This arti- fice is known as the isoperimetric rule or rule of the undetermined multiplier. Euler illustrated his methods by a large number of examples.

The new; theory was provided with a special symbolism by Joseph Louis de la Grange (commonly called Lagrange) in a series of memoirs published in 1760-62. This symbolism , was afterwards adopted by Euler (1764), and Lagrange ag ge ' is generally regarded as the founder of the calculus of variations. Euler had been under the necessity of resolving an integral into a sum of elements, recording the magnitude of the change pro- duced in each element by a slight change in the unknown function, and thence forming an expression for the total change in the sum under consideration. Lagrange proposed to free the theory from this necessity. Euler had allowed such changes in the position of the curve, along which the integral, to be made a maximum or minimum, is taken, as can be produced by displacement parallel to the axis of ordinates. Lagrange admitted a more general change of position, which was called variation. The points of the curve being specified by their co-ordinates, x, y, z, and differentiation

*along the curve being denoted, as usual, by the symbol d, Lagrange considered the change produced in any quantity Z, which is ex- pressed in terms of x, y, z, dx, dy, dz, d 2 x, . . . when the co-ordinates *, y, z are changed by ″ infinitely ″ small increments. This change he denoted by 8Z, and regarded as the variation of Z. He ex- pressed the rules of operation with & by the equations*

idZ = dbZ, hfZ=fhZ. By means of these equations fdZ can be transformed by the process of integration by parts into such a form that differentials of varia- tions occur at the limits of integration only, and the _.. transformed integral contains no differentials of varia- mhois tions. The terms at the limits and the integrand of y ‘

the transformed integral must vanish separately, if the variation of the original integral vanishes. The process of freeing the original integral from the differentials of variations results in a differential equation, or a system of differential equations, for the determination of the form of the required curve, and in special terminal conditions, which serve to determine the constants that enter into the solution of the differential equations. Lagrange’s method lent itself readily to applications, of the generalized prin- ciple of virtual velocities to problems, of mechanics, and he used it in this way in the Mecanique analytique (1788). The terminology and notation of mechanics are still largely dominated by these ideas of L a g ran S e ‘ f° r his methods were powerful and effective, but they are rendered obscure by the use of ″ infinitely ″ small quantities, of which, in other departments of mathematics, he subsequently became an uncompromising opponent. The same ideas were: applied by Lagrange himself, by Euler, and by other mathematicians to various extensions of the cal- culus of variations. These include problems concerning

integrals of which the limits are variable in accordance mania's with assigned conditions, the extension of Euler's rule of method. the multiplier to problems in which the variations are restricted by conditions of various types, the maxima and minima of integrals involving any number of dependent variables, such as are met with in the formulation of the dynamical Principle of Least Action, the maxima and minima of double and multiple integrals. In all these cases Lagrange's methods have been applied successfully to obtain the differential equation, or system of differen- tial equations, which must be satisfied if the integral in question is a maximum or a minimum. This equation, or equations, will be referred to as the principal equation, or principal equations, of the problem.

The problems and method of the calculus admit of more exact formulation as follows : We confine our attention to the case where the sought curve is plane, and the function F p orm uIa- contains no differential coefficients of order higher than ti otto t the first. Then the problem is to determine a curve ine p/ rs ^ joining two fixed points (xo, yo) and (xi, yi) so that the problem, line integral

C Xl F{x, v, y')dx J taken along the curve may be a maximum or a minimum. When it is said that the integral is a minimum for some curve, it is meant that it must be possible to mark a finite area in the plane of (x, y), so that the curve in question lies entirely within this area, and the integral taken along this curve is less than the integral taken along any other curve, which joins the same two points and lies entirely within the delimited area. There is a similar definition for a maxi- mum. The word extremum is often used to connote both maximum and minimum. The problem thus posed is known as the First Problem of the Calculus of Variations. If we begin with any curve*

joining the fixed end points, and surround it by an area of finite breadth, any other curve drawn within the area, and joining the same end points, is called a variation of the original curve, or a varied curve. The original curve is defined by specifying y as a function of x. Necessary conditions for the existence of an extremum can be found by choosing special methods of variation.

One method of variation is to replace y by y +eu, where u is a function of x, and t is a constant which may be taken as small as we please. The function u is independent of e. It is differentiable, and its differential coefficient is continuous within the interval of integration. It must vanish at x = Xo and at x = x x . This method of variation has the property that, when the ordinate of the curve is but slightly changed, the direction of the tangent is but slightly changed. Such variations are called weak variations. By such a variation the integral is changed into

'FOe, y--m, y'+tu')dx.

Weak varia- tions.

J Xq

and the increment, or variation of the integral, is

/:

\F(x,y+€u, y'+tu')~F{x, y, y')\dx.

In order that there may be an extremum it is necessary that Th first t ' le var ' at ' on should be one-signed. We expand the^ex- varla-

lloa.

I dx.

pression under the sign of integration in powers of e. The first term of the expansion contributes to the variation the term

fxi/dF , 3F ,

This term is called "the first variation. The variation of the integral cannot be one-signed unless the first variation vanishes. On trans- forming the first variation by integration by parts, and observing that u vanishes at x =Xo and at x —X\, we find a necessary condition for an extremum in the form

J xo \dy dx dy J

It is a fundamental theorem that this equation cannot hold for all admissible functions u, unless the differential equation

dx dy' dy

is satisfied at every point of the curve along which the integral

is taken. This is the principal equation for this problem. The

Station- curves that are determined by it are called the stationary

curves, or the extremals, of the integral. We learn that

_ the integral cannot be an extremum unless it is taken

curves, , ° ..

along a stationary curve.

A difficulty might arise from the fact that, in the foregoing argu- ment, it is tacitly assumed

that y, as a function of x, is one-valued ; and we can have no a priori ground for assuming that this is the case for the sought curve. This difficulty might be met by an appeal to James Bernoulli's principle, according to which every arc of a stationary curve is a stationary curve between the end points of the arc — a principle which can be proved readily by adopting such a method of variation that the arc of the curve between two points is displaced, and the rest of the curve is not. But another method of meeting it leads to important developments. This is the method p ara . of parametric representation, introduced by K. Weier-

metric strass. According to this method the curve is defined method ^ v specifying * an d V as one-valued functions of a para- meter 8. The integral is then of the form

fittx, y, x, y)de,

where the dots denote differentiation with respect to 6, and Ms a homogeneous function of x, y of the first degree. The mode of dependence of x and y upon 8 is immaterial to the problem, pro- vided that they are one-valued functions of 8. A weak variation is obtained by changing x and y into x--eU, y+ev, where u and v are functions of 6 which have continuous differential coefficients and are independent of c. It is then found that the principal equations of the problem are

All- da dx

if= ±M-. a U

dx ' do dy dy

These equations are equivalent to a single equation, for it can be proved without difficulty that, when / is homogeneous of the first degree in x, y

y

where

y \ de dx dx) x\d8dy dy\

&>f av

dydx dxdy

+fi(,xy-yx),

I ?1 = _ Li!L=J OH

"y 2 dx 1 xy dxdy X* dy 1 '

The stationary curves obtained by this method are identical with those obtained by the previous method.

The formulation of the problem by the parametric method often enables us to simplify the formation and integration of the principal equation. A very simple example is furnished by the p—i.1 m problem: Given two points in the plane of (x, y) on the … e same side of the axis of x, it is required to find a curve ° e . joining them, so that this curve may generate, by revolu- ca eno ' tion, about the axis of x, a surface of minimum area. The integral to be made a minimum is

fl 1 y(x*+?)ide,

and the principal equation is

d \ V*] =0

o» I (i 2 +j 2)i J ' of which the first integral is

yx{x 2 --y 2)~1=c, or

H'+(£)'|v

and the stationary curves are the catenaries y — c cosh((#— a)1c. The required minimal surface

is the catenoid generated by the revolution of one of these catenaries about its directrix.

The parametric method can be extended without difficulty so as to become applicable . to more general classes of problems. A simple example is furnished by the problem of forming the equa- tions of the path of a ray of light in a variable medium. "" "' According to Fermat's principle, the integral fuds- is a ara y- minimum, ds representing the element of arc of a ray, and n the refractive index. Thus the integral to be made a minimum is*

fyixt+f+^ldd.

The equations are found at once in forms of the type

and, since (x 2 ^-y 2 +z 2)ld8 = ds, these equations can be written in the usual forms of the type

ds \ ds) dx

ds

The formation of the first variation of an integral by means of a weak variation can be carried out without difficulty in the case of a simple integral involving any number of dependent variables and differential coefficients of arbitrarily high orders, and also in the cases of double and multiple integrals; and the quantities of the type til, which are used in the process, may be regarded as equiva- lent to Lagrange's Sx, dy, . . . The same process may not, however, be applied to isoperimetric problems. If the first varia- tion of the integral which is to be made an extremum, Ruleof subject to the condition that another integral has a pre- themal- scribed value, is formed in this way, and if it vanishes, the tlpller. curve is a stationary curve for this integral. If the prescribed

value of the other integral is unaltered, its first variation must vanish; and, if the first variation is formed in this way, the curve is a stationary curve for this integral also. The two integrals do not, however, in general possess the same stationary curves. We can avoid this difficulty by taking the variations to be of the form eiMi+e2«2, where ci and tt are independent constants; and we can thus obtain a completely satisfactory proof of the rule of the undeter- mined multiplier. A proof on these lines was first published by P. Du Bois-Reymond (1879). The rule had long been regarded as axiomatic.

The parametric method enables us to deal easily with the problem of variable limits. If, in the First Problem, the terminal point (,, yi) is movable on a given guiding curve*

where (xi+e«t, yi+rtii) is on the curve (xi, yO=o, and u u V\ denote the values of u, ■.» at (x u y x). It follows that the required curve must be a stationary curve, and that the condition

dx dyi dy dxi The corresponding condition in the case of

must hold at (x u yC). the integral

***F{x, y, y′)dx*

is found from the equations

df

fx

JXe

Vat table limits.

dx

3F

to be

K dy''

dV

</>+(&–•) flro–*

This discussion yields an important result, which may be stated as follows : Let two stationary curves of the integral be drawn from the same initial point A to points P, Q, which are near together, and let the line PQ be of length v, and make an angle w with the axis of x (fig. 1). The excess of the integral taken along AQ, from A to Q, above the in– tegral taken along AP, from A to P, is expressed, correctly to the first order in v, by the formula

> j Ffe y, ji′) + (tan u–y′)–^~, j

Fig. 1.

Trans– versals of sta– tionary curves.

dy′

In this formula x, y are the co–ordinates of

x P, and y′ has the value belonging to the point P and the stationary curve AP. When the coefficient of v cos w in the formula vanishes, the curve AP is said to be cut transversely by the line PQ, and a curve which cuts a family of stationary curves transversely is described as a transversal of those curves. In the problem of variable limits, when a terminal point moves on a given guiding curve, the integral cannot be an extremum unless the stationary curve along which it is taken is cut transversely by the guiding curve at the terminal point. A simple example is afforded by the shortest line, drawn on a surface, from a point to a

given curve, lying on the surface. The required curve must be a geodesic, and it must cut the given curve at right angles. The problem of variable limits may always be treated by a method of which the following is the principle: In the First Problem let the .„ __ initial point (xo, yo) be fixed, and let the terminal point tlvl"'' ^ Xu –^ move on a nxe d tiding curve d. Now, whatever method t ' le termma ' point may be, the integral cannot be an extremum unless it is taken along a stationary curve. We have then to choose among those stationary curves which are drawn from (x , yo) to points of G that one which makes the integral an extremum. This can be done by expressing the value of the integral taken along a stationary curve from the point (x , %) to the point (Xi, yCl in terms of the co-ordinates x u y u and then making this expression an extremum, in regard to variations of x it yi, by the methods of the differential calculus, subjecting fe, yi) to the condition of moving on the curve C 1#

An important example of the first variation of integrals is afforded by the Principle of Least Action in dynamics. The kinetic energy T is a homogeneous function of the second degree in the differential coefficients q u q 2 , . . . q n of the co-ordinates o lt q 2 , . . . q„ with respect to the time t, and the'potential energy V is a function of these

co-ordinates. The energy equation is of the form Principle *p 1 \r = p

where E is a constant. A course of the system is defined when the co-ordinates 5 are expressed as functions of a single parameter 0. The action A of the system is defined as the integral

t '2Tdt, taken along a course from the initial position (g<°>) to the final

*position (g (1)), but / and h are not fixed. The equations of motion are the principal equations answering to this integral. To obtain them it is most convenient to write *(g) for T, and to express the integral in the form*

/j2(E-V)S{(20}i<»,*

where q′ denotes the differential coefficient of a co-ordinate q with respect to 0, and, in accordance with the parametric method, the limits of integration are fixed, and the integrand is a homogeneous function of the g″s of the first degree. There is then no difficulty in deducing the Lagrangian equations of motion of the type

*dt dq dg + dg =0 * These equations determine the actual course of the system. Now if the system, in its actual course, passes from a given initial position (S* *) toa variable final position (5), the action A becomes a function of the q′s, and the first method used in the problem of variable limits shows that, for every q*

5A = 3T dq ~ dq ' When the kinetic energy T is expressed as a homogeneous quadratic function of the momenta dT/dq, say

of least action

r

*t =*M*"S §).(»-=»">.*

**nd the differential coefficients of A are introduced instead of those of T, the energy equation becomes a non-linear partial differential equation of the first order for the determination of A as a function of the q′s. This equation is*

Principle of vary- ing action.

,_ /, dA dA

&”(b “dTrdq)

+V = E.

A complete integral of this equation would yield an expression for A as a function of the q’s containing n arbitrary constants, a u Oj, ... a,, of which one a„ is merely

Principle of vary- ing action general- ized.

Condition

otlnteg-

rabllllty.

additive to A; and the courses of the system which are compatible with the equations of motion are determined by equations of the form dA , dA , 5A ,

ia~r bi ‘da- 2 =b2 ‘---da^:r bn - 1

where the b’s are new arbitrary constants. It is noteworthy that the differential equations of the second order by which the geodesies on an ellipsoid are determined were first solved by this method (C. G. J. Jacobi, 1839).

It has been proved that every problem of the calculus of varia- tions, in which the integral to be made an extremum contains only one independent variable, admits of a similar trans- formation ; that is to say, the integrals of the principal equations can always be obtained, in the way described above, from a complete integral of a partial differential equation of the first order, and this partial differential equation can always be formed by a process of elimination. These results were first proved by A. Clebsch (1858).

Among other analytical developments of the theory of the first variation we may note that the necessary and sufficient condition that an

expression of the form

F(x, y, y′,. . .yW) should be the differential coefficient of another expression of the form

Fi(, y, y′,...y (n – 1 >) is the identical vanishing of the expression*

*dF_d_ dF d? 3F_ ,_ .d> JF_*

dy dxdy′^dx dy″ ••■~ K 1 > dx″ a/″>′ The result was first found by Euler (1744). A differential equation*

<>fe y, y′, y′)=o*

is the principal equation answering to an integral of the form

/Ffey, y′)dx if the equation

d d d($> dx dy″~ dy′ is satisfied identically. In the more general case of an equation of the form

(x, y, y′,. . .y< !n))=o

the corresponding condition is that the differential expression obtained by Lagrange's process of variation, viz.,

d(j> (PHy

Condition that a differ- ential equation may arise from a problem of the calculus of varia- tions.

*dy ■′′‘dy′ dx′′″′**

must be identical with the ″ adjoint ″ differential expression

Ty 5 y-dxW 5 y) +d&W′ y i~--- + dW n w&fr) ■

This matter has been very fully investigated by A. Hirsch (1897).

To illustrate the transformation of the first variation of multiple integrals we consider a double integral of the form

fj

First variation of a double Integral.

tff{

dt dz

Hi !!E.jL.m dw ty —±.§i d ' w 4-H — dp dx - ' dq dy~~ dr dx 2 ' ds 3×6y ' dt dy 2*

I dxdy.

Each term must be transformed so that no differential coefficients of w are left under the sign of double integration. We exemplify the process by taking the term containing d′w/ dx 2 . We have

ip p?dxdy= rr) I {&¥) -# if) ■ p I dxdy J J dr dx 1 - 1 J J I dx\dr 3x / dx\dr/ dx) J*

= ff\h ® M)~h\ w £x (J7) \ + w &(w)] dxd y

The first two terms are transformed into a line integral taken round the boundary s′, and we thus find

JTfrW dxd y =/ cos (>″) J ff If ~ w Tx&) \ ds '+ff w ^ (If) dxd y<*

where v denotes the direction of the normal to the edge s′ drawn outwards. The double integral on the right-hand side contributes a term to the principal equation, and the line integral contributes terms to the boundary conditions. The line integral admits of further transformation by means of the relations

dw dw , . dw , .

■^=^ cosfe lO-apcosCy, «),

Jcos{x, r)cos(y,v)-^; jp ds'=-J~gp j cosfe j-)cos(y, v)^ j waV.

918

It becomes

VARIATIONS, CALCULUS OF

/■

cos\x,v)^- £ds'

+/ [a7 S COSc0s(- y ' v) fr \ - cos| >' v) Tx &)] wds '- In forming the first term within the square brackets we then use the relations

■v-,cos(x, y) = /COs(>1, v),-sjiCOs(y, v) — -;cos(x, v),

The

second

variation.

Ts'Tr = ~ cos ^' ai a7+ cos (. >)aySF.

where p' denotes the radius of curvature of the curve s'.

The necessity of freeing the calculus of variations from de- pendence upon the notion of infinitely small quantities was realized by Lagrange, and the process of discarding such quantities was partially carried out by him in his Thiorie des fenctions analytiques (1797). In accordance with the interpretation of differentials which he made in that treatise, he interpreted the variation of an integral, as expressed by means of his symbol 5, as the first term, or the sum of the terms of the first order, in the development in series of the complete expression for the change that is made in the value of the integral when small finite changes are made in the variables. The

quantity which had been regarded as the variation of the integral came to be regarded as the first variation, and the discrimination between maxima and minima came to be regarded as requiring the investigation of the second variation. The first step in this theory had been taken by A.M. Legendre in 1786. In the case of an integral of the form

^F(, y, y′)dx

Legendre defined the second variation as the integral

*J x£ \ Tf^^ 2 Iy–d9 nyiy+ W′ {by) I ***■ To this expression he added the term jo(6y) 2 \ which vanishes*

identically because Sy vanishes at x—xn and at x=xi. He took a to satisfy the equation

d 2 F (d 2 F da\ _ I d 2 F y

dy′– V dy 2+ dxj ~ \dydy ,+a) ‘ and thus transformed the expression for the second variation to

xSf s y′+ m& y^ dx ‘

where

/;

/:

W–s

a 2 F a 2 F

7 + a–

‘dy′ 2 dydy

From this investigation Legendre deduced a new condition for the existence of an extremum. It is necessary, not only that the varia- tion should vanish, but also that the second

*variation . , should be one-signed. In the case of the First Problem ** dr * Legendre concluded that this cannot happen unless d 2 F/d/ 2 cenai ion. ^ as ^g game sign at all points of the stationary curve between the end points, and that the sign must be +for a minimum and —for a maximum. In the application of the perametric method the function which has been denoted by fi takes the place of d 2 F/dy′ 2 . The transformation of the second variations of integrals of various types into forms in which their signs can be determined by inspec- tion subsequently became one of the leading problems of the calculus of variations. This result came about chiefly through the publica- , . . tion in 1837 of a memoir by C. G. J. Jacobi. He trans-*

formedLegendre′sequationfortheauxiliaryfunctionainto

a linear differential equation of the second order by the substitution d 2 F . a 2 F 1 dw

3yd7 +a ~ dy′ 2 wdx′ and he pointed out that Legendre′s transformation of the second variation cannot be effected if the function iv vanishes between the limits of integration. He pointed out further, that if the stationary curves of the integral are given by an equation of the form

y=(x,a, b), where a, b are arbitrary constants, the complete primitive of the equation for w is of the form

where A, B are new arbitrary constants. Jacobi stated these pro- positions without proof, and the proof of them, and the extension of the results to more general problems, became the object of numerous investigations. These investigations were, for the most part, and for a long time, occupied almost exclusively with analytical developments; and the geometrical interpretation which Jacobi had given, and which he afterwards emphasized in his Vorlesungen iiber Dynamik, was neglected until

rather recent times. According to this interpretation, the stationary curves which start from a point (xo, y

Fig. 2.

of points such as (xo, yo) and (Jo, »jo) were afterwards called con- jugate points by Weierstrass. The proof that the in- tegral can.iot be an extremum if the arc of the curve Conju- between the fixed end points contains a pair of conjugate f t

points was first published by G. Erdmann (1878). points.

Examples of conjugate points are afforded by antipodal points on a sphere, the conjugate foci of geometrical optics, the kinetic foci of analytical dynamics. If the terminal points are a pair of conjugate points, the integral is not in general an extremum; but there is an exceptional case, of which a suitably chosen arc of the equator of an oblate spheroid may serve as an example. In the problem of the cate- noid a pair of conjugate points on any of the catenaries, which are the stationary curves of the problem, is such that the tangents to the catenary at the two points A and A′ meet on the axis of revolution (fig. 2). When both the end points of the required curve move on fixed guiding curves

Co, Ci, a stationary curve C, joining a point Ao of Co to a point Ai of Ci, cannot yield an extremum unless it is cut transversely by Co at Ao and by G at Ai. The en- velope of stationary curves which set out from Co towards Ci, and are cut transversely by Co at points near Ao, meets C at a point D ; and the envelope of stationary curves which proceed from Co to G, and are cut transversely by G at points near Ai, meets C at a point Di. The curve C, drawn from Ao to Ai, cannot yield an extremum if Do or Di lies between A and Ai, or if Do lies

between Ai and Di. These results are due to G. A. Bliss (1903). A simple example is afforded by the shortest line on a sphere drawn from one small circle to another. In fig. 3 Do is that pole of the small circle A0B0 which occurs first on great circles cutting A0B0 at right angles, and proceeding towards A1B1; Di is that_ pole of the small circle A1B1 which occurs first on great circles cutting A1B1 at right angles, and drawn from points of A0B0 towards A1B1. The arc A0A1 is the required shortest line, and it is distinguished from BoBj by the above criterion.

Jacobi's introduction of conjugate points is one of the germs from which the modern theory of the calculus of variations has sprung. Another is a remark made by Legendre (1786) in regard to the solution of Newton's problem of the Sources solid of least resistance. This problem requires that a ofWeler- curve be found for which the integral strass's

Jyy'^J+y'^dy "

should be a minimum. The stationary curves are given by the equation _ y/ 8 (1-f-y' 2)- 2 = const.)

a result equivalent to Newton's solution of the problem; but Legendre observed that, if the integral is taken along a broken ljne, consisting of two straight lines equally inclined to the axis of x in opposite senses, the integral can be made as small as we please by sufficiently diminishing the angle of inclination. Legendre's remark amounts to admitting a variation of Newton's curve, which is not a weak variation. Variations which are not weak are such that, while the points of a curve are but slightly displaced, the tangents undergo large changes of direction. They are distinguished as strong variations. A general theory of strong variations in con- nexion with the First Problem, and of the conditions which

are sufficient to secure that the integral taken along a stationary curve may be an extremum, was given by Weierstrass in lectures. He delivered courses of lectures on the calculus of variations in several years between 1865 and 1889, and his chief discoveries in the subject seem to have been included in the course for 1879. Through these lectures his theory became known to some students and teachers in Europe and America, and there have been published a few treatise^ and memoirs devoted to the exposition of his ideas.

In the First Problem the following conditions are known to be necessary for an extremum. I. The path of integration must be a stationary curve. II. The expression d 2 F/dy′ 2 , or the expres- sion denoted by /1 in the application of the parametric method, must not change sign at any point of this curve between the end points. III. The arc of the curve between the end points must not contain a pair of conjugate points. All these results are obtained by using weak variations. Additional

Fig. 3.

Neces- sary COO- ditlons.

results, relating to strong as well as weak variations, are obtained by a method which permits of the expression of the variation of an integral as a line integral taken along the varied curve. Let A, B be the end points, and let the stationary curve AB be drawn. If the end points A, B are not a pair of conjugate points, and if the point conjugate to A does not lie on the arc AB, then we may find a point A′, on the backward continuation of the stationary curve B A beyond A, so near to A that the point conjugate to A′ lies on the

forward continuation of the arc AB beyond B. This being the case, it is possible to delimit an area of finite breadth, so that the arc AB of the stationary curve joining A, B lies entirely within the area, and p.. . no two stationary curves drawn through A′ intersect within

*otsta- *^ e area. Through any point of such an area it is possible tlonary *° draw one, and only one, stationary curve which passes curves. through A′ . This family of stationary curves is said to con- stitute a. field of stationary curves about the curve AB. We suppose that such a field exists, and that the varied curve AQPB lies entirely within the delimited area. The variation of the integral /F(x, y, y′)dx is identical with the line integral of F taken round a contour consisting of the varied curve AQPB and the stationary curve AB, in the sense AQPBA. The line integral may, as usual, be replaced by the sum of line integrals taken round a series of cells, the external boundaries of the set of cells being identical with the*

given contour, and the in- ternal boundaries of ad- B jacent cells being traversed twice in opposite senses. We may choose a suitable set of cells as follows. Let Q, P be points on the be the stationary curves of

Let P follow Q in the sense

AQPB in which the varied curve is described. Then the contour consisting of the stationary curve A′Q, from A′ to Q, the varied curve QP, front Q to P, and the stationary curve A′P, from P to A′, is the boundary of a cell (fig. 4). Let us denote the integral of F taken along a stationary curve by round brackets, thuS (A′Q), and the integral of F taken along any other curve brackets, thus [PQ]. If the varied curve is divided

Fig. 4.

varied curve, and let A′Q, A′P the field which pass through Q, P.

General expres- sion for variation of an Integral.

by square . ~, -

into a number of arcs such as QP we have the result

[AQPBHAB) =2[(A′Q) +[QP]- (A′P)j, and the right-hand member can be expressed as a line integral taken along the varied curve AQPB.

To effect this transformation we seek an approximate expression for the term (A′Q)+[QP]-(A′P) when Q, P are near together. Let As denote the arc QP, and \j/ the angle which the tangent at P to the varied curve, in the sense from A to B, makes with the axis of x (fig. 5). Also let be the angle which the tangent at P to the stationary curve A′P, in the sense from A′ to P, makes with the axis of x. We evaluate (A′Q) — (A′P) approximately by means of a result which we obtained in connexion with the problem of variable limits. Observing that the angle here denoted by \j/ is equivalent to the angle formerly denoted by tt+w (cf. fig. 1), while tan 4> is equivalent to the quantity formerly denoted by y′, we obtain the approximate equation

*(A′Q) -(A′P) = -As. cos * J F(*o»,p) + (tan 1>-p)% L , A . _ *• °P) p = tan*

which is correct to the first order in As. Also we have

[QP] =As . cos \//F(x,y, tan

(A′Q)+[QP]-(A′P) =E(x,y, tan 0, tan f)As, where

E(x, y, tan <£, tan ^)

*= cos * j F(*,y, tan)-F(,;y,£)—(tan _£)|E j^*

When the parametric method is used the function E takes the form

(4.+4X . —(xg+4)

Fig. 5.

where X. m are the direction cosines of the tangent at P to the curve AQPB, in the sense from A to B, and /, m are the direction cosines of the tangent at P to the stationary curve A'P, in the sense from A' to P. The function E, here introduced, has been called Weierstrass's excess function. We learn that the variation of the integral, that Weler- is to say ' tne excess of tne integral of F taken along the strass's varied curve above the integral of F taken along the excess original curve, is expressible as the line integral JEds function. ta ^ en alo "g tne varied curve. We can therefore state a sufficient (but not necessary) condition for the existence of an extremum in the form: — When the integral is taken along a

Develop- ments connected with the excess function.

stationary curve, and there is no pair of conjugate points on the arc of

the curve terminated by the given end points, the integral is certainly

an extremum if the excess function has the same sign at all points

of a finite area containing the whole of this arc within

it. Further, we may specialize the excess function by Su ^ fcteE '

identifying A′ with A, and calculating the function for a

point P on the arc AB of the stationary curve AB, and an necessa, y

arbitrary direction of the tangent at P to the varied curve, ^u,′

This process is equivalent to the introduction of a particular

type of strong variation. We may in fact take, as a varied curve,

the arc AQ of a neighbouring stationary curve, the straight line

QP drawn from Q to a point of the arc AB, and the arc PB of the

stationary curve AB (fig. 6). The sign of the variation is then the

same as that of the

function E(x, y, tan , ^^~B

tan tj/),_ where (sc, y) is

the point P, >// is the .

angle which the straight

line QP makes with the F IG – 6 –

axis of x, and is the angle which the tangent at P to the curve

APB makes with the same axis. We thus arrive at a new necessary

(but not sufficient) condition for the existence of an extremum of

the integral JFds, viz. the specialized excess function, so calculated,

must not change sign between A and B.

The sufficient condition, and the new necessary condition, asso- ciated With the excess function, as well as the expression for the variation as /Eds, are due to Weierstrass. In applica- tions to special problems it is generally permissible to identify A′ with A, and to regard QP as straight. The direction of QP must be such that the integral of F taken along it is finite and real. We shall describe such direc- tions as admissible. In the statement of the sufficient condition, and the new necessary condition, it is of course understood that the direction specified by \j/ is admissible. The excess function generally vanishes if >p = 4>, but it does not change sign. It can be shown without difficulty that, when ^ is very nearly equal to , the sign of E is the same as that of

(tan^-tan0)'cos(-p) / = tanA and thus the necessary condition as to the sign of the excess function includes Legendre's condition as to the sign of 3 1 F/d/ 2 .*

Weierstrass's conditions have been obtained by D. Hilbert from the observation that, if p is a function of x and y, the integral

f\v(.y.p)+W-p)(§) y _ p \dx,*

*taken along a curve joining two fixed points, has the same value for all such curves, provided that there is a field of stationary curves, and that * is the gradient at the point {x, y) of that stationary curve of the field which passes through this point.*

An instructive example of the excess function, and the condi- tions connected with it, is afforded by the integral

*f yiy′*dx or f y*x 3 #*de. The first integral of the principal equation is Example*

y 2 i V 2 = const. , of the

and the stationary curves include the axis of x, straight. lines excess parallel to the axis of y , and the family of exponentialcurves function. y=ae cx . A field of stationary curves is expressed by the equation

y=y exp {c(x-xo)}, and, as these have no envelope other than the initial point (x , y), there are no conjugate points. The function /1 is bxy- i , and this is positive for curves going from the initial point in the positive direction of the axis of x. The value of the excess function is

y 2 cos t£(cotV-3 cot 2 0+2 tan f cot 3 tf>). The directions ^ = and \p = T are inadmissible. On putting ^ = \t we get 2;y 2 cot 3 4>; and on putting ^ = |x we get — 2y i cot i . Hence t i 1 nr, mtegral taken along A Q' PB is greater than that taken along APB, and the integral taken along AQPB is less than that taken along APB, when Q'Q are sufficiently near to P on the ordinate of P (fig. 7). It follows that the . y integral is neither a maximum '<* nor a minimum.

It has been proved by Weierstrass that the excess function cannot be one-signed if the function / of the para- metric method is a rational function of x and {/. This result includes the above example, and the problem of ;

the solid of least resistance, ■■ —

for which, as Legendre had seen, there can be no solu- tion if strong variations are admitted. As another example of the calculation of excess functions, it may be noted that the value of the excess function in the problem of the catenoid is 2ysin'\(4,-

Fig. 7.

Field ol sta- tionary curves and trans- versals.

*In general it is not necessary that a field of stationary curves should consist of curves which pass through a fixed point. Any family of stationary curves depending on a single para- meter may constitute a field. This remark is of im- portance in connexion with the adaptation of Weierstrass's results to the problem of variable limits. For the purpose of this adaptation A. Kneser (1900) introduced the family of stationary curves which are cut transversely by an assigned curve. Within the field of these curves we can construct the transversals of the family ; that is to say, there is a finite area of the plane, through any point of which there passes one stationary curve of the field and one curve which cuts all the stationary curves of the field transversely. These curves provide a system of curvilinear co-ordinates, in terms of which the value of JFdx, taken along any curve within the area, can be expressed. The value of the integral is the same for all arcs of stationary curves of the field which are intercepted between any two assigned transversals. In the above discussion of the First Problem it has been assumed that the curve which yields an extremum is an arc of a single curve, which must be a stationary curve. It is conceivable that the re- quired curve might be made up of a finite number of arcs of different stationary curves meeting each other at finite angles. It can be shown that such a broken curve cannot yield an extremum unless both the expressions dF/dy′ and F — y′(dF/dy′) are continuous at the corners. In the parametric method df/dx and df/dy must be continuous at the corners. This result limits very considerably Discon- *′ le possibility of such discontinuous solutions,*

though it ilnuous does not exclude them. An example is afforded by the solutions P r °blem of the catenoid. The axis of x and any lines parallel to the axis of y satisfy the principal equation; and the conditions here stated show that the only discontinuous solution of the problem is presented by the broken line ACDB

(fig. 8). A broken line A ″ like AA′B′B is excluded.

Discontinuous solutions have generally been sup- posed to be of special im- portance in cases where the required curve is re- stricted by the condition of not crossing the boun- dary of a certain limited area. In such cases part of the boundary may Problems of this kind were I. Todhunter. In recent

axis of x

have to be taken as part of the curve.

investigated in detail by J. Steiner and _.

times the theory has been much extended by C. Caratheodory.

In any problem of the calculus of variations the first step L ..„ formation of the principal equation or equations; and the second Exist- step is ' he somt ' on °f the equation or equations, in accord-

*ence- anCe • WIt * 1 t ' le ass ig ne d terminal or boundary conditions.*

theorems. If this solution cannot be effected, the methods of the calculus fail to answer the question of the existence or non- existence of a solution which would yield a maximum or minimum of the integral under consideration. On the other hand, if the exist- ence of the extremum could be established independently, the existence of a solution of the principal equation, which would also satisfy the boundary

conditions, would be proved. The most famous example of such an existence-theorem is Dirichlet's principle, according to which there exists a function V, which satisfies the equation

d-V , d-V . d'V _

a.v 2i "ay- + dz~° at all points within a closed surface S, and assumes a given value at each point of S. The differential equation is the principal equation answering to the integral*

*'=///! (f)M£)M©>**

taken through the volume within the surface S. The theorem of the existence of V is of importance in all those branches of mathe- matical physics in which use is made of a potential function, satisfy- ing Laplace's equation; and the two-dimensional form of the theorem is of fundamental importance in the theory of functions of a complex variable. It has been proposed to establish the existence of V by means of the argument that, since I cannot be negative, there must be, among the functions which have the prescribed boundary values, some one which gives to I the smallest possible value. This unsound argument was first exposed by Weierstrass. He observed that precisely the same argu- ment would apply to the integral fx 2 y' i dx taken along a curve from the point (-1, a) to the point (1, b). On the one hand, the principal equation answering to this integral can be solved, and it can be proved that it cannot be satisfied by any function y at all points of the interval — 1

Dlrkh-

ht's

principle.

of this kind. This has been effected by Hilbert

for the two-dimen- sional form of the problem.

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VARICOSE VEINS (Lat. varix, a dilated vein), a condition of the veins which mostly occurs in those parts of the blood- stream which are farthest from the heart and occupy a de- pendent position. Thus they are found in the legs and thighs; in the lowest part of the bowel (piles; see Haemorrhoids), and in the spermatic cord (varicocele) . Any condition which hinders the return of blood from the veins is apt to cause their per- manent dilatation; thus is explained the occurrence of varicose

veins in the leg from the wearing of a tight garter, and of piles as the result of the pressure of an ovarian tumour or of a pregnant uterus, or of disease of the liver.

Sometimes the trouble is begun by a direct injury to the vein, which, by setting up an inflammation, weakens the coats of the vein, which then yield under the pressure of the blood- stream. In the case of varicocele, the dilatation of the veins is probably of developmental origin; many other causes are given, but not one of them appears satisfactory. Examina- tion of a varicose vein shows that it is increased in length as well as in capacity. In some parts of its course the vein has its coats much thickened, but at those places where there is most dilatation the walls are very thin. Veins thus affected give rise to pains and achings, and they are, moreover, liable to attacks of inflammation which end in clotting of the blood (thrombosis). This is a dangerous condition, as a sudden or violent movement is apt to cause the detachment of a piece of the clot, which, carried up to the brain or the lung, may cause sudden death. Less serious results of varicose veins are swell- ing of the parts below (oedema), ulceration and abscess.

As regards treatment, the wearing of a well- fitting elastic stocking will prove beneficial in the case of a moderate dilatation of the veins of the leg; the individual must avoid long standing and fatigue. It is well also to have the foot of the bed raised three or four inches, 30 that during the night the veins may be kept as empty as possible. If the case is more serious, the thinned veins threatening to give way, it will be advisable, provided the dilatations are fairly well localized, and the general condition of the patient permits, to excise the diseased parts, tying the cut ends of the veins, and closing the surface wounds with fine sutures. Should a varicose vein be

plugged with clot, it will be advisable to tie it high up where the coats are healthy, and to remove the lower part by dissection. This will render the person safe from the very serious risk of a piece of the clot being carried to the heart, and will also permanently rid him of his trouble. It may be said generally that any operative treatment for varicose veins in the lower extremity is best associated with the application of a ligature upon the large surface vein just before it enters the common femoral vein below the fold of the groin. This operation removes the risk of the downward pressure of blood in the veins whose dilatation has rendered the valves useless.

I n the case of a varicose vein being opened by accident or disease, it is quite possible for the individual to bleed to death. The first-aid treatment for the serious haemorrhage should consist in laying the patient on the floor, raising the limb upon the seat of a chair, and fixing a pad over the open vessel by a handkerchief or bandage.

Varicose veins of the spermatic cord (varicocele) of the left side are met with in adolescents. The dilatation is, in all probability, of developmental origin, making its appearance at puberty. It is, as a rule, of no serious moment, and, unless present in an extreme degree, had best be treated merely by a suspension bandage. If, however, it is causing real physical distress, it may be treated by excision of an inch or two of the bunch of dilated veins. The presence of varicocele is apt to cause inconvenience or even dis- comfort to men living in India or the tropics, but the Englishman who intends spending his life in temperate climes will do well to ignore a varicocele. It will become less and less noticeable as time goes on. (E. O.)*

VARIOLITES (Lat. variola, smallpox), in petrology, a group of dark green basic igneous

rocks which, especially on weathered surfaces, exhibit pale coloured spots that give them a pock- marked appearance. In some conditions these spots weather out prominently; they are grey, pale green, violet or yellowish, while the matrix of the rock is usually dark green. The vario- lites are related most closely to the basalts or diabases. They are nearly always much decomposed, and, since they are also fine-grained rocks, their original composition may be much obscured by secondary changes. The variolitic spots are rounded in outline and are often about a quarter of an inch in diameter, but may much exceed this size. They have a radiate structure and are sometimes, though not generally, zoned with concentric circles of different appearance and composition. Many authors have compared them with the spherulites of the acid rocks (obsidians and rhyolites), and undoubtedly some kinds of variolite are merely glassy spherulitic varieties of basalt. The tachylyte selvages of the dolerite dikes of the west of Scotland, for example, often contain large brown spherulites which are easily visible in hand specimens. These spherulites consist of very thin divergent fibres, and their nature is often difficult to determine on account of the indefiniteness of the

optical characters of minerals in this state. It seems probable, however, that they are mostly felspar embedded in dark brown glass. Small phenocrysts or skeleton crystals of olivine, augite and plagioclase felspar may occur in these tachylytes.

Other variolites are glassy or partly crystalline facies of olivine- free dolerites, occurring as thin dikes or intrusions, or at the margins of dolerite masses. In these the felspars are well crystallized as thin rods, with square or forked ends, radiating outwards from a centre. They are commonly oligoclase, and sometimes assume branching or feathery

forms. Some authors would call these ″ sphaero-crystals ″ rather than spherulites ; they are an intermediate stage between the latter and the stellate groupings of felspar which occur frequently in igneous rocks. In the same rocks augite spherulites occur also, but this mineral forms plumose growths, branching and curved, which spread through the glassy base and do not interfere with the felspar spherulites. They have much resemblance to the feathery ice crystals which form on window-panes. Occasionally olivine- dolerites have a coarsely spherulitic structure with long rods of plagioclase felspar converging to a point; one example of these rocks from Skye contains variolites over three inches in diameter.

Another group of variolites includes the most famous rock of this type, which comes from the Durance, in France. Pebbles of this were well known to collectors for a long time before they were traced to their source at Mont Genevre. They were proved to belong to a diabasic rock which shows well-marked ″ pillow-structure ″ or ″ spheroidal jointing.″ Each pillow has a marginal portion which is variolitic, but towards the centre of the block-shaped masses the structure becomes coarse and groups of radiate felspars make their appearance. It is doubtful whether the variolite is an intrusive rock or a lava flow. Many of these pillow lavas (or spilites) occur in the Devonian rocks of Germany, and often they have variolitic facies which seem to belong to the same group as the rock of the Durance. Their spheru- lites are very often oligoclase felspar or decomposition products after a felspathic mineral. In other cases they consist of chlorite or pale green amphibole, both of which may be secondary after pyroxene. The ground mass is very fine grained and is filled with chlorite, epidote, leucoxene, and other secondary minerals. There is much reason to believe that it was originally in large measure vitreous but has

suffered devitrifaction. Sometimes little steam cavities occur and may serve as a nucleus from which the variolite has grown. The radiate structure of the varioles is often nearly obliterated in these much-decomposed rocks, in fact it may never have been very perfect. Variolites are found also in several parts of the Swiss Alps at Jatluga on Lake Onega, in Anglesey, the Lleyn district and Fishguard in Wales, in Cornwall, and in more than one place in Ireland.

Finally, there is a group of spotted rocks formerly known to French petrographers as the variolites du Drac from the locality in which they are found, but they have been proved to be merely vesicular, rotten diabases, with steam cavities filled with white calcite and other secondary minerals. (J. S. F.)

VARISCITE, a native hydrous aluminium phosphate, A1P04-2H 2 0, named by A. Breithaupt, in 1837, in consequence of its occurrence in the Saxon Voigtland (Variscia) . It is a green mineral generally occurring as an incrustation or in nodules. A compact nodular variety was discovered about 1894 in Cedar Valley, near Old Camp Floyd, Utah, and was described Ly Dr G. F. Kunz as utahlite. Its beautiful apple-green colour has led to its use, when cut and polished, as an ornamental stone. The term utahlite must be distinguished from utahite, the name given by A. Arzruni to a basic ferric sulphate, 3(FeO) 2 S04-4H 2 0, from Utah.

VARLEY, CORNELIUS (1781-1873), English water-colour painter, a younger brother of John Varley (q.v.), was born at Hackney, London, on the 21st of November 1781. He was educated by his uncle, a philosophical instrument maker, and under him acquired a knowledge of the natural sciences; but about 1800 he joined his brother in a tour through Wales, and began the study of art. He was soon engaged in teaching

drawing. From 1803 till 1859 he was an occasional exhibitor in the Royal Academy; and he also contributed regularly to the displays of the Water-Colour Society, of which, in 1803, he was one of the founders, and of which he continued a member till 1821. His works consist mainly of carefully finished classical subjects, with architecture and figures. He published a series of etchings of " Boats and other Craft on the River Thames," and during his life as an artist he continued deeply interested in scientific pursuits. For his improvements in the camera lucida, the camera obscura and the microscope he received the Isis gold medal of the Society of Arts; and at the International

Exhibition of 1851 he gained a medal for his invention of the graphic telescope. He died at Hampstead on the 2nd of October 1873.

VARLEY, JOHN (1778-1842), English water-colour painter, was born at Hackney, London, on the 17th of August 1778. His father, a man of scientific attainments and tutor in the family of Lord Stanhope, discouraged his leanings towards art, and placed him under a silversmith. But on his parent's death Varley escaped from this uncongenial employment, and, after working with a portrait painter, engaged himself at the age of sixteen to an architectural draughtsman, who took him on a provincial tour to sketch the principal buildings in the towns they visited. His spare hours were employed in sketching from nature, and in the evenings he was permitted, like Turner and Girtin, to study in the house of Dr Munro. In 1798 he ex- hibited his first work, a " View of Peterborough Cathedral," in the Royal Academy. In 1799 he visited North Wales, and in its wild mountain scenery found the subjects best suited to his brush. He returned to the same district in 1800, and again in 1802, and

the impressions then received powerfully in- fluenced the whole course of his art. In 1804 he became a foundation member of the Water- Colour Society, and con- tributed over forty works to its first exhibition. He had married in the previous year; and, in order to provide for the wants of an increasing family, he was obliged to produce for the dealers much work of a slight and commonplace char- acter. He also taught drawing, and some of his pupils, such as John Linnell and William Hunt, afterwards became cele- brated. He was a firm believer in astrology, skilful in casting horoscopes; and some curious instances were related of the truth of his predictions. It was at his house that his friend William Blake sketched his celebrated " Visionary Heads." Varley died at London on the 17th of November 1842.

Varley's landscapes are graceful and solemn in feeling, and simple and broad in treatment, being worked with a full brush and pure fresh transparent tints, usually without any admixture of body- colour. Though his works are rather mannered and conventional, they are well considered and excellent in composition. Some of his earlier water-colours, including his " Views of the Thames," were painted upon the spot, and possess greater individuality than his later productions, which are mainly compositions of mountain and lake scenery, produced without direct reference to nature. Among his literary works are Zodiacal Physiology (1828); Observations on Colour and Sketching from Nature (1830); A Practical Treatise on Perspective, and Principles of Landscape Design for Young Artists.

***VARNA**, a fortress, seaport, departmental capital and episcopal city of Bulgaria; on the Bay of Varna, an inlet of the Black Sea, in 43 12' N. and 27 56' E. Pop. (1906) 37,155. Varna is built on the hilly north shore of the bay, overlooking the estuary of the river Devna or Pravadi, which flows seaward through a*

magnificent valley surrounded by mountains. It is the eastern terminus of the Varna-Rustchuk railway, opened in 1867, and is connected with all parts of the kingdom by branches of this line. The so-called " Varna quadrilateral," which has played an important part in Bulgarian military history, consists of the fortresses of Varna, Shumla, Rustchuk and Silistria (q.v.). Varna is the third city of the kingdom in population, after Sofia and Philippopolis, and ranks with Burgas as one of the two principal seaports. Its deep and capacious bay is sheltered from northerly and north-easterly winds, and the construction of modern harbour works has greatly increased the facilities for trade. The principal exports a e cattle and dairy produce, grain, lamb and goat skins, and cloth (shayak); the imports include coal, iron and machinery, textiles, petroleum and chemicals. In 1907 the port was entered by 869 ships of 926,449 tons, the largest number of vessels being Bulgarian and the greatest tonnage Austro- Hungarian. Wine is largely produced in the department, and in the city there are breweries, distilleries, tanneries and cldth factories; cotton-spinning was introduced by a British firm. There is a large and commercially important colony of Greeks; the Tews, Turks and gipsies are also numerous. Much of the city has been constructed since 1878, and the barracks, post office, college for'girls and National Bank are handsome modern

buildings. Near Varna is the summer palace of the king of Bulgaria.

Varna has been identified with the ancient Milesian colony of Odessus on the coast of Moesia Inferior. It figures largely in the history of more recent times, and close by was fought in 1444 the battle in which Murad II. slew Wladislaus III. of Poland and Hungary, and routed his forces commanded by Hunyadi Janos.

Varna was occupied in 1828 by the Russians, in 1854 by the allies, who here organized the invasion of the Crimea, and in 1877 by the Egyptian troops summoned to the de- fence of Turkey against the Russians. By the treaty of Berlin (1878) it was ceded to Bulgaria. It has long been the seat of a Greek metropolitan and since 1870 of a Bulgarian bishop.

VARNHAGEN VON ENSE, KARL AUGUST (1785-1858), German biographer, was born at Diisseldorf on the 21st of February 1785. He studied medicine at Berlin, but devoted more attention to philosophy and literature, which he after- wards studied more thoroughly at Halle and Tubingen. He began his literary career in 1804 as joint-editor with Adelbert von Chamisso (q.v.) of a Musenalmanach. In 1809 he joined the Austrian army, and was wounded at the battle of Wagram. Soon afterwards he accompanied his superior officer, Prince Bentheim, to Paris, where he carried on his studies. In 181 2 he entered the Prussian civil service at Berlin, but in the follow- ing year resumed his military career, this time as a captain in the Russian army. He accompanied Tettenborn, as adjutant, to Hamburg and Paris, and his experiences were recorded in his Geschichte der Hamburger Ereignisse (London, 1813), and his Geschichte der Kriegszilge des Generals von Tettenborn (181 5). At Paris he entered the diplomatic service of Prussia, and in 1 8 14 acted under Hardenberg at the congress of Vienna. He also accompanied Hardenberg to Paris in 1815. He was resident minister for some time at Karlsruhe, but was recalled in 1819, after which, with the title of " Geheimer Legationsrat," he lived chiefly at Berlin. He had no fixed official appointment, but was often employed in important political business. In 1 8 14 he married Rahel Antonie Friederike, originally called Levin, afterwards Robert, and sister of the poet, Ludwig Robert (1778-1832). She was

born in 1771 at Berlin, where she died in 1833. By birth she was a Jewess; but before her marriage she made profession of Christianity. Although she never wrote anything for publication, she was a woman of remarkable intellectual qualities, and exercised a powerful influence on many men of high ability. Her husband, who was devotedly attached to her, found in her sympathy and en- couragement one of the chief sources of his inspiration as a writer. After her death he published a selection from her papers, and afterwards much of her correspondence was printed. Varnhagen von Ense never fully recovered from the shock caused by her death. He himself died suddenly in Berlin on the 10th of October 1858.

He made some reputation as an imaginative and critical writer, but he is famous chiefly as a biographer. He possessed a remark- able power of grouping facts so as to bring out their essential significance, and his style is distinguished for its strength, grace and purity. Among his principal works are Goethe in den Zeug- nissen der Mitlebenden (1824); Biographische Denkmale (5 vols., 1824-30; 3rd ed., 1872); and biographies ot General von Seydlitz (1834), Sophia Charlotte, queen ot Prussia (1837), Field-Marshal Schwerin (1841), Field-Marshal Keith (1844), and General Billow von Dennewitz (1853). His Denkwiirdtgheiten und vermischte Sehriften appeared in 9 vols, in 1843-59, the two last volumes appearing after his death. His niece, Ludmilla Assing, between i860 and 1867, edited several volumes of his correspondence with eminent men, and his Tagebucher (14 vols.,_ 1861-70). Blatter aus der preussischen Geschichte' appeared in 5 vols. (1868-69); his correspondence with Rahel in 6 vols. (1874-75); and with Carlyle (1892). His selected writings appeared in 19 vols, in 1871-76. There is also an extensive literature dealing with Rahel Varnhagen von Ense; see especially her husband's Rahel, ein Buch des

Andenkens (3 vols., 1834) '< Aus Rahels Herzens- leben (1877); E. Schmidt- Weissenfels, Rahel und ihre Zeit (1857); Briefwechsel zwischen Karoline von Humboldt, Rahel und Varnhagen von Ense (1896); O. Berdrow, Rahel Varnhagen (1900).

VARNISH, a liquid consisting of a gum or resin dissolved in alcohol (spirit, varnish) or an oil (oil varnish), which on

application to wooden and other surfaces improves their appear- ance and permanency (see Painter- Wokk).

VARRO, MARCUS TERENTIUS (116-27 B.C.), Roman polymath and man of letters, was born at Reate in the Sabine country. Here he imbibed in his earlier years a good measure of the hardy simplicity and strong seriousness which the later Romans attributed to the men of the early republic — charac- teristics which were supposed to linger in the Sabine land after they had fled from the rest of Italy. The chief teacher of Varro was L. Aelius Stilo, the first systematic student, critic and teacher of Latin philology and literature, and of the anti- quities of Rome and Italy. Varro also studied at Athens, especially under the philosopher Antiochus of Ascalon, whose aim it was to lead back the Academic school from the scepticism of Arcesilaus and Carneades to the tenets of the early Platonists, as he understood them. He was really a stoicizing Platonist; and this has led to the error of supposing Varro to have been a professed Stoic. The influence of Antiochus is clearly to be seen in many remains of Varro's writings. The political career of Varro seems to have been late and slow; but he arrived at the praetorship, after having been tribune of the people, quaestor and curule aedile. In

politics and war he followed Pompey's lead; but it is probable that he was discontented with the course on which his leader entered when the first triumvirate was formed, and he may thus have lost his chance of rising to the consulate. He actually ridiculed the coalition in a work entitled the Three-Headed Monster (Tpwapavos in the Greek of Appian). He did not, however, refuse to join the commission of twenty by whom the great agrarian scheme of Caesar for the resettlement of Capua and Campania was carried into execution (59 B.C.). Despite the difference between them in politics, Varro and Caesar had literary tastes in common, and were friends in private life. Under Pompey Varro saw much active service: he was attached to Pompey as pro-quaestor, probably during the war against Sertorius in Spain. We next find him, as legate, in command of a fleet which kept the seas between Delos and Sicily, while Pompey was suppressing the pirates, and he even won the " naval crown," a coveted reward Qf per- sonal prowess. A little later he was legate during the last Mithradatic war. In the conflict between Caesar and the Pompeian party Varro was more than once actively engaged. In his Civil War (ii. 17-20) Caesar tells how Varro, when legate in Spain along with Afranius and Petreius, lost his two legions without striking a blow, because the whole region where he was quartered joined the enemy. Caesar curiously intimates that, though Varro did his best for Pompey from a sense of duty, his heart was really with the other leader. Nevertheless he pro- ceeded to Epirus before the battle of Pharsalia, and awaited the result at Dyrrachium in the company of Cicero and Cato. Like Cicero, Varro received harsh treatment from Mark Antony after the Pompeian defeat. Some of his property was actually plundered, but restored at the bidding of Caesar, to whom Varro in gratitude immediately dedicated one of his most important writings. The dictator employed the scholar in aiding him

to collect and arrange great stores of Greek and Latin literature for the vast public library which he intended to found. We have glimpses of Varro at this time in the Letters of Cicero. He appears as harsh and severe, and a poor stylist. The formation of the second triumvirate again plunged Varro into danger. Antony took possession anew of the property he had been compelled to surrender, and inserted Varro's name on the list of the proscribed. His friends, however, afforded him protection. He was able to make peace with the triumvirs, but sacrificed his property and much of his beloved library. He was permitted to spend in quiet study and in writing the last fifteen years of his life. He is said to have died (27 B.C.) almost pen in hand.

Varro was not surpassed in the compass of his writings by any ancient, not even by any one of the later Greek philosophers, to some of whom tradition ascribes a fabulous number of separate works. In a passage quoted by Gellius, Varro himself, when over seventy years of age, estimated the number of " books " he had written at 490; but " book " here means, not merely such a work

as was not subdivided into portions, but also a portion of a sub- divided work. For example, the Menippean Satires numbered 150, and are all counted separately in Varro's estimate. Jerome made or copied a catalogue of Varro's works which has come down to us in a mutilated form. From this and from other extant materials Ritschl has set down the number of the distinct literary works at 74 and the number of separate " books ' at about 620. The later years of the author's life were therefore even more fruitful than the earlier. The complete catalogue may be roughly arranged under three heads — (1) belles lettres, (2) history and antiquities, (3) technical treatises on philosophy, law, grammar, mathematics, philology and other subjects.

The first of these three classes no doubt mainly belonged to Varro's earlier life. In poetry he seems to have attempted nothing that was very elaborate, and little of a serious character. His genius tended naturally in the direction of burlesque and satire. In belles lettres' he showed himself throughout, both in matter and form, the pupil and admirer of Lucilius, after whom he wrote satires. One poetical work probably consisted of short pieces in the style Of the more satirical poems of Catullus. It is doubtful whether, as has often been supposed, Varro wrote a philosophical poem some- what in the style of Lucretius ; if so, it should rather be classed with the prose technical treatises. One curioos production was an essay in popular illustrated literature, which was almost unique in ancient times. Its title was Imagines, and it consisted of 700 prose bio- graphies of Greek and Roman celebrities, with a metrical elogium for each, accompanied in each case by a portrait. But the lighter works of Varro have perished almost to the last line, with the ex- ception of numerous fragments of the Menippean Satires. The Menippus whom Varro imitated lived in the first half of the 3rd century B.C., and was born a Phoenician slave. He became a Cynic philosopher, and is a figure familiar to readers of Lucian. He flouted life and all philosophies but the Cynic in light compositions, partly in prose and partly in verse. A careful study of the fragments does not justify Mommsen's glowing account. That the remains exhibit Variety and fertility, that there are in them numerous happy strokes of humour and satire, and many felicitous phrases and descriptions, is true, but the art is on the whole heavy, awkward and forced, and the style rudely archaic and untasteful. The Latin is frequently as rough and uncouth as that of Lucilius. No doubt Varro contemned the Hellehizing innovations by which the hard and rude Latin o f his youth was transformed into

the polished literary language of the late republican and the Augustan age. The titles of the Menippean Satires are very diverse. Sometimes personal names are chosen, and they range from the gods and demi- gods to the slaves, from Hercules to Marcipor. Frequently a popular proverb or catchword in Greek or Latin supplies the designation: thus we have as titles ″ I've got You ″ ("Ex« at); "You don't Know what Evening is to Bring ″ {Nescis quid vesper serus vehat); "Know Thyself" (TvS£l otum—bv). Occasionally the heading indicates that the writer is flying at some social folly, as in ″ Old Men are Children for the Second Time ″ (Am iraiSis 01 ykpovrcs) and in the ″ Bachelor ″ (Caelebs). In many satires the philosophers were pounded, as in the ″ Burial of Menippus ″ and ″ Concerning the Sects ″ (IIep2 alpeakav). Each composition seems to have been a genuine medley or lanx satura: any topic might be introduced which struck the author's fancy at the moment. There are many allusions to persons and events of the day, but political bitterness seems to have been commonly avoided. The whole tone of the writer is that of a laudator temporis acti, who can but scoff at all that has come into fashion jn his own day. From the numerous citations in later authors it is clear that the Menippean Satires were the most popular of Varro's writings. Not very unlike the Menippean Satires were the Libri Logistorici, or satirical and practical expositions, possibly in dialogue form, of some theme most commonly taken from philosophy on its ethical side. A few fragments in this style have come down to us and a number of titles. These are twofold: that is to say, a personal name is followed by words indicating the subject—matter, as Marius de Fortuna, from which the contents may easily be guessed, and Sisenna de Historia, most likely a dialogue in which the old annal- ist of the name was the chief speaker, and discoursed of the principles on which history should be 1 written. Among the

lighter and more popular works may be mentioned twenty-two books of Orations (probably never spoken), some funeral eulogies (Laudationes) , some " exhortations " {Suasiones), conceivably of a political character, and an account of the author's own life.

The second section of Varro's works, those on history and anti- quities, form to the present day the basis on which a large part of our knowledge of the earlier Roman history, and in particular of Roman constitutional history, ultimately rests. These writings were used as a quarry by the compilers and dilettanti of later times, such as Pliny, Plutarch, Gellius, Festus, Macrobius, and by Christian champions like Tertullian, Arnobius and Augustine, who did not disdain to seek in heathen literature the means of defending their faith. These men have saved for us a few remains from the great wreck made by time, fudging from what has been casually preserved, if any considerable portion of Varro s labours as anti- quarian and historian were to be now discovered, scholars might

find themselves compelled to reconstruct the earlier history of the Roman republic from its very foundations. Varro's greatest predecessor in this field of inquiry, the man who turned over the virgin soil, was Cato the Censor. His example, however, seems to have remained unfruitful till the time of Varro's master, Lucius Aelius Stilo Praeconinus. From his age to the decay of Roman civilization there were never altogether wanting men devoted to the study of their nation's past; but none ever pursued the task with the advantages of Varro's comprehensive learning, his indefatigable industry and his reverent yet discriminating regard for the men and the institutions of the

earlier ages. The greatest work of this class was that on Antiquities, divided into forty-one books. Of these the first twenty-five were entitled the Antiquities of Human Things (Antiquitates Rerum Humanarum), while the remaining sixteen were designated the Antiquities of Things Divine (Antiquitates Rerum Divinarum). The book was the fruit of Varro's later years, in which he gathered together the material laboriously amassed through the period of an ordinary lifetime. The second division of the work was dedicated to Caesar as supreme pontiff. The design was as far- reaching as that of the Natural History of Pliny. The general heads of the exposition in the secular portion of the book were four — (i) " who the men are who act {qui agant), (2) the places in which they act (ubi), (3) the times at which they act (quando), (4) the results of their action (quid agant)." In the portion relating to divine affairs there were divisions parallel to these four, with a fifth, which dealt with the gods in whose honour action in divine affairs is taken. Our knowledge of this great book is to a large extent derived from the works of the early Christian writers, and especially from Augustine's De Civitate Dei. These writers naturally quote in the main from the religious section. It is a great misfortune that no similar series of citations from the secular part of the Antiquitates has come down to us. Most of the other historical and antiquarian writings of Varro were special elaborations of topics which he could not treat with sufficient fulness and minuteness in the larger book. The treatise on the Genealogy of the Roman People dealt mainly with the relation of Roman chronology to the chronology of Greece and the East. Dates were assigned even to. mythological occurrences, because Varro be- lieved in the theory of Euhemerus, that all the beings worshipped as gods had once lived as men. To Varro's researches are mainly due the traditional dates assigned to the era of the

kings and to that of the early republic. Minor writings of the same class were the De Vita Populi Romani, apparently a kind of history of Roman civilization; the De Familiis Trojanis, an account of the families who "came over" with Aeneas; the Aetia (Atria), an explanation of the origin of Roman customs, on which Plutarch drew largely in his Quaestiones Romanae; a Tribuum Liber, used by Festus; and the constitutional handbook written for the instruction of Pompey when he became consul. Nor must the labour expended by Varro in the study of literary history be forgotten. His activity in this direction, as in others, took a wide range. One of his greatest achievements was to fix the canon of the genuine plays of Plautus. The " Varronian plays " were the twenty which have come down to us, along with one which has been lost.

The third class of treatises, which we have called technical, was also numerous and very varied. Philosophy, grammar, the history and theory of language, rhetoric, law, arithmetic, astronomy, geometry, mensuration, agriculture, naval tactics, were all repre- sented. The only works of this kind which have come down to our days are the De Lingua Latina (in part) and the De Re Rustica. The former originally comprised twenty-five books, three of which (the three succeeding the first) are dedicated to a P. Septimius who had served with the author in Spain, and the last twenty-one to Cicero. The whole work was divided into three main sections, the first dealing with the origin of Latin words, the second with their inflexions and other modifications, the third with syntax. The books still preserved (somewhat imperfectly) are those from the fifth to the tenth inclusive. The Latin style is harsh, rugged and far from lucid. As Mommsen remarks, the clauses of the sentences are often arranged on the thread of the relative pronoun like thrushes on a string. The arrangement of the

subject-matter, while pretending to much precision, is often far from logical. The fifth, sixth and seventh books give Varro's views on the etymology of Latin words. The principles he applies are those which he had learned from the philosophers of the Stoic school — Chrysippus, Antipater and others. The study of language as it existed in Varro's day was thoroughly dominated by Stoic influences. Varro's etymologies could be only a priori guesses, but he was well aware of their character, and very clearly states at the outset of the fifth book the hindrances that barred the way to sound knowledge. He was thoroughly alive to the importance of not arguing merely from the forms and meanings of words as they existed in his day, and was fully conscious that language and its mechanism should be studied historically. The books from the eighth to the tenth in- clusive are devoted to the inflections of words and their other modi- fications. These Varro classes all under the head of " declinatio," which implies a swerving aside from a type. Thus Herculi from Hercules and manubria from manus are equally regarded as examples of declinatio. Varro adopts a compromise between the two opposing

schools of grammarians, those who held that nature intended the declinationes of all words of the same class to proceed uniformly (which uniformity was called analogia) and those who deemed that nature aimed at irregularity (anomalia). The matter is treated with considerable confusion of thought. But the facts incidentally cited concerning old Latin, and the statements of what had been written and thought about language by Varro's predecessors, are of extreme value to the student of Latin. The other extant prose work, the De Re Rustica, is in three books, each of which is in the form of a dialogue, the circumstances and in the main the interlocutors being different lor each. The dramatic introductions and a few of

the interludes are bright and interesting, and the Latin style, though still awkward and unpolished, is far superior to that of the De Lingua Latina.

Authorities. — The fragments of the different treatises have been partially collected in many separate publications of recent date, The best editions of the De Lingua Latina are those by C. O. Miiller and by L. Spengel (re-edited by his son in 1885). The most recent and best recension of the De Re Rustica is that of Keil (Leipzig, 1884). Of modern scholars Ritschl has deserved best of Varro. Several papers in his Opuscula treat ot the nature of Various works which have not come down to us. The work of G. Boissier, Etude sur la vie el les ouvrages de M. T. Varron (1861), though superficial, is still useful; but a comprehensive work on Varro, on the present level of scholarship, is greatly needed. (J. S. R.)

VARRO, PUBLIUS TERENTIUS, surnamed Atacintjs (c. 82-36 B.C.), Latin poet, was born near the river Atax in Gallia Narbonensis. He was perhaps the first Roman born beyond the Alps who attained eminence in literature. He seems to have taken at first Ennius and Lucilius as his models, and wrote an epic, entitled Bellum Sequanicum, eulogizing the exploits of Caesar in Gaul and Britain, and also Satires, of which Horace (Satires, i. 10) speaks slightingly. Accordingly to Jerome, Varro did not begin to study Greek literature until his thirty-fifth year. The last ten years of his life were given up to the imita- tion of Greek poets of the Alexandrian school. Quintilian (Instil, x. 1, 87), who describes him as a "translator," speaks of him in qualified terms of praise. Although not vigorous enough to excel in the historical epic or in the serious work of the Roman satura, Varro yet possessed in considerable measure the lighter gifts which we admire in Catullus.

His chief poem of the later period was the Argonautae, closely modelled on the epic of Apollonius Rhodiiis. The age was prolific of epics, both historical and mythological, and that of Varro seems to have held a high rank among them. It is highly spoken of by Ovid (Am. i. 15, 21, A.A. iii. 335, Tristia, ii. 439) and Statius (Silvae, ii. 7, 77), and Propertius (ii. 34, 85) awards equal praise to his erotic elegies. Varro was also the author of a Cosmographia, or Chorographia, a geographical poem imitated from the Greek of Eratosthenes or of Alexander of Ephesus, surnamed Lychnus; and of an Ephemeris, a hexameter poem on weather-signs after Aratus, from which Virgil has borrowed. Fragments in A. Riese's edition of the fragments of the Menippean Satires of Varro of Reate; see also monographs by F. Wiillner (1829) and R. Unger (1861).

VARTHEMA (Barthema, Vertomannus, &c), LUDOVICO DI, of Bologna (fl. 1502-15 10), Italian traveller and writer. He was perhaps a soldier before beginning his distant journeys, which he undertook apparently from a passion for adventure, novelty and the fame which (then especially) attended success- ful exploration. He left Europe near the end of 1502; early in 1503 he reached Alexandria and ascended the Nile to Cairo. From Egypt he sailed to Beirut and thence travelled to Tripoli, Aleppo and Damascus, where he managed to get himself enrolled, under the name of Yunas (Jonah), in the Mameluke garrison — doubtless after adopting Islam. From Damascus he made the pilgrimage to Mecca and Medina as one of the Mameluke escort of the Hajj caravan (April-June 1503); he describes the sacred cities of Islam and the chief pilgrim sites and ceremonies with remarkable accuracy, almost all his details being confirmed by later writers. With the view of reaching India, he embarked at Jidda, the port of Mecca, and sailed down the Red Sea and through the Straits of Bab-el-

Mandeb to Aden, where he was arrested and imprisoned as a Christian spy. He gained his liberty — after imprisonment both at Aden and Radaa— through the partiality of one of the sultanas of Yemen, made an extensive tour in south-west Arabia (visiting Sana, &c), and took ship at Aden for the Persian Gulf and India. On the way he touched at Zaila

and Berbera in Somaliland; he then (early in 1504?) ran across to the Indian port of Diu in Gujarat, afterwards famous as a Portuguese fortress. From Diu he sailed up the Gulf of Cambay to Gogo, and thence turning back towards the Persian Gulf made Julfar (just within the entrance of the gulf), Muscat and Ormuz. From Ormuz he seems to have journeyed across Persia to Herat, returning thence south-west to Shiraz, where he entered into partnership with a Persian merchant, who accompanied him during nearly all his travels in South Asia. After an unsuccessful attempt to reach Samarkand, the two returned to Shiraz, came down to Ormuz, and took ship for India. From the mouth of the Indus Varthema coasted down the whole west coast of India, touching at Cambay and Chaul; at Goa, whence he made an excursion inland to Bijapur; at Cannanore, from which he again struck into the interior to visit Vijayanagar on the Tungabudra; and at Calicut (1505?), where he stops to describe the society, manners and customs of Malabar, as well as the topography and trade of the city, the court and government of its sovereign (the Zamorin), its justice, religion, navigation and military organization. No- where do Varthema's accuracy and observing power show themselves more strikingly. Passing on by the " backwater of Cochin," and calling at Kulam (Quilon), he rounded Cape Comorin, and passed over to Ceylon (1506?). Though his stay here was brief (at

Colombo?), he learnt a good deal about the island, from which he sailed to Pulicat, slightly north of Madras, then subject to Vijayanagar. Thence he crossed over to Ten- asserim in the Malay Peninsula, to Banghella, perhaps near Chittagong, at the head of the Bay of Bengal, and to Pegu, in the company of his Persian friend and of two Chinese Christians (Nestorians ?) whom he met at Banghella. After some success- ful trading with the king of Pegu, Varthema and his party sailed on to Malacca, crossed over to Pider (Pedir) in Sumatra, and thence proceeded to Bandan (Banda) and Monoch (one of the Moluccas), the farthest eastward points reached by the Italian traveller. From the Moluccas he returned westward, touched at Borneo, and there chartered a vessel for Java, the " largest of islands," as his Christian companions reckoned it. He notes the use of compass and chart by the native captain on the transit from Bornei to Giava, and preserves a curious, more than half-mythical, reference to supposed Far Southern lands. From Java he crossed over to Malacca, where he and his Persian ally parted from the Chinese Christians; from Malacca he returned to the Coromandel coast, and from Negapatam (?) in Coromandel he voyaged back, round Cape Comorin, to Kulam and Calicut. Varthema was now anxious to resume Christianity and return to Europe; after some time he succeeded in desert- ing to the Portuguese garrison at Cannanore (early in 1506?). He fought for the Portuguese in various engagements, and was knighted by the viceroy Francisco d' Almeida, the navigator Tristan da Cunha being his " sponsor." For a year and a half he acted as Portuguese factor at Cochin, and on the 6th of December 1507 (?) he finally left India for Europe by the Cape route. Sailing from Cannanore, Varthema apparently struck Africa about Malindi, and (probably) coasting by Mombasa and Kilwa arrived at Mozambique, where he notices the Portuguese

fortress then building, and describes with his usual accuracy the negroes of the mainland. Beyond the Cape of Good Hope he encountered furious storms, but arrived safely in Lisbon after sighting St Helena and Ascension, and touching at the Azores. In Portugal the king received him cordially, kept him some days at court " to learn about India," and confirmed the knighthood con- ferred by d' Almeida. His narrative finally brings him to Rome, where he takes leave of the reader. As Richard Burton says {Pilgrimage to . . . Meccah, 1855, vol. ii. p. 352): "For correct- ness of observation and readiness of wit " Varthema " stands in the foremost rank of the old Oriental travellers." In Arabia and in the Indian archipelago east of Java he is (for Europe and Christendom) a real discoverer. Even where passing over ground traversed by earlier European explorers, his keen intelli- gence frequently adds valuable original notes on peoples, manners, customs, laws, religions, products, trade, methods of war, &c.

Varthema's work {Itinerario de Ludouico de Varthema Bolognese . . .) was first published in Italian at Rome in 15 10 (ad instdtia de Lodouico de Henricis da Corneto Vicetino). Other Italian editions appeared at Rome, 1517, at Venice, 1518, 1535, 1563, 1589, &c., at Milan, 1519, 1523, 1525, &c. Latin translations appeared at Milan, 151 1 (by Archangelus Madrignanus) ; and at Nuremberg, 1610 (Frankfort, 161 1); as well as in the Novus Orbis of Simon Grynaeus (Basel, 1532). German versions came out at Augsburg, 1515 (Strassburg, 1516); at Strassburg, by Michael Herr, in his New Welt, from Grynaeus, 1534; at Leipzig, by Hieronymus Megiserus, 1610 (and 1615), &c. A Spanish translation was issued at Seville, 1520 (from the Latin), and a French at Lyons, 1556. Dutch versions were printed at Antwerp, 1563 (from Grynaeus), at Utrecht, 1615 (from the Leipzig German of 1610), and again at

Utrecht, 1655. The first English translation was of 1576–1577 (in Richard Eden's History of Travayle) ; an extract from Varthema was inserted in Samuel Purchas's Pilgrimage (London, 1625–1626); and in 1863 appeared the Hakluyt Society edition by J. W. Jones and G. P. Badger (Travels of Ludovico di Varthema, London). (C. R. B.)

VARUNA, in early Hindu mythology, the greatest, with Indra, of the gods of the Rig Veda. He is invoked with his double Mitra in some dozen hymns. As contrasted with Indra the war god, Varuna is the lord of the natural laws, the up-holder of the physical and moral order of the universe. His power is limitless, his anger at wrong-doing unassuageable, and he is omniscient. He makes the sunshine; the wind is his breath; river valleys are hollowed out at his command. Unlike Indra, Varuna has no myths related of him. In the later Vedic period he is specially connected with the nocturnal heavens. Ultimately in post- Vedic mythology he becomes the Hindu Neptune. The earlier conception of Varuna is singularly similar to that of Ahuramazda, of the Avesta. The name Varuna may be Indo-European, identifiable, some believe, with the Greek ovpavbs (Uranus), and ultimately referable to a root var, "to cover," Varuna thus meaning " the Encompasser." Among Varuna's aliases are Jalapati, " Lord of Water," and Amburaja, " King of Water."

See A. A. Macdonell, Vedic Mythology (Strassburg, 1897).

VASA, or Nikolaistad, in the grand duchy of Finland, capital of the province of Vasa, on the east coast of the Gulf of Bothnia, 327 m. by rail north-west of Helsingfors. Pop. (1904) 18,028. It has two classical lyceums for boys and three for girls, a school of navigation, and a large number of primary schools. There is a shipyard and a considerable export trade. Vasa was founded on the coast of the Gulf of

Bothnia in 1606, but after the great fire of 1852, as the sea had already receded for a considerable distance, the town was rebuilt nearer to the shore and received the official name of Nikolaistad. The population of the province (1904) was 295,187.

VASARI, GIORGIO (1511–1571), Italian painter and architect, whose main distinction, however, rests on his valuable history of Italian art, was born at Arezzo on the 30th of July 1511. At a very early age he became a pupil of Guglielmo da Marsiglia, a very skilful painter of stained glass, to whom he was recom- mended by his own kinsman, the painter Luca Signorelli. At the age of sixteen he went to Florence, where he studied under Michelangelo and Andrea del Sarto, aided by the patronage of the Medici princes. In 1529 he visited Rome and studied the works of Raphael and others of his school. The paintings of Vasari were much admired by the rapidly degenerating taste of the ifith century; but they possess the smallest amount of merit, being in the main feeble parodies of the powerful works of Michelangelo. Vasari was largely employed in Florence, Rome, Naples, Arezzo and other places. Many of his pictures still exist, the most important being the wall and ceiling paintings in the great hall of the Palazzo Vecchio in Florence, and his frescoes on the cupola of the cathedral, which, however, were not completed at the time of his death. As an architect he was perhaps more successful: the loggia of the Uffizi by the Arno, and the long passage connecting it with the Pitti Palace, are his chief works. Unhappily he did much to injure the fine medieval churches of S. Maria Novella and Santa Croce, from both of which he removed the original rood-screen and loft, and remodelled the retro-choir in the degraded taste of his time. Vasari enjoyed a very high repute

during his lifetime and amassed a considerable fortune. He built himself in 1547 a fine house in Arezzo, and spent much labour in decorating its walls and vaults with paintings. He was elected one of the municipal council or priori of his native town, and finally rose to the supreme office of gonfaloniere. He died at Florence on the 27th of June 1571.

Personally Vasari was a man of upright character, free from vanity, and always ready to appreciate the works oi others: in spite of the narrow and meretricious taste of his time, he expresses a warm admiration of the works of such men as Cimabue and Giotto, which is very remarkable. As an art historian of his country he must always occupy the highest rank. His great work was first published in 1550, and after- wards partly rewritten and enlarged in 1568, bearing the title Dclle Vite de' piu eccellenti pittori, scultori, ed architeltori. It was dedicated to Cosimo de' Medici, and was printed at Florence by the Giunti; it is a small quarto illustrated with many good woodcut portraits. This editio princeps of the complete work is usually bound in three volumes, and also contains a very valuable treatise on the technical methods employed in all branches of the arts, entitled Le Tre Arti del discgno, cioe architettura, pittura, e scoltura. His biographies are written in a very pleasant style, interspersed with amusing stories. With a few exceptions Vasari's judgment is acute and unbiased. And though modern criticism — with all the new materials opened up by research — has done valuable work in upsetting a good many of his traditional accounts and attributions, the result is a tendency very often to under- estimate Vasari's accuracy and to multiply hypotheses of a rather speculative character. The work . in any case remains a classic, however it may be supplemented by the more critical research of modern days.

Vasari gives a sketch of his own biography at the end of his Vite, and adds further details about himself and his family in his lives of Lazzaro Vasari and Francesco Salviati. The best edition of Vasari's works is that published at Florence by Milanesi (1878–1882), which embodies the valuable notes in the earlier edition by Le Monriier (1846); another, by Venturi, was begun in 1896.' The Lives has been translated into French, German and English (by Mrs Foster, London, 1850).

VASCULAR SYSTEM. I. Anatomy.— The circulatory or blood vascular apparatus consists of the central pump or heart, the arteries leading from it to the tissues, the capillaries, through the walls of which the blood can give and receive substances to and from the tissues of the whole body, and the veins, which return the blood to the heart. As an accessory to the venous system, the lymphatics, which open finally into the great veins, help in returning some of the constituents of the blood. Separate articles are devoted to the heart, arteries, veins and lymphatic system, and it only remains here to deal with the capillaries.

The blood capillaries form a close network of thin-walled tubules from t«W t0 snW 0I an inch in diameter, permeating, with a few exceptions, the whole of the body, and varying somewhat in the closeness of its meshwork in different parts. In the smallest capillaries, in which the arteries end and from which the veins begin, the walls are formed only of somewhat oval endothelial cells, each containing an oval nucleus and j'oined to its adjacent cells by a serrated edge, in the inter- stices of which is a small amount of intercellular cement, easily demonstrated by staining the preparation with nitrate of silver. Here and there the cement substance is more plentiful, and these spots when small are known as stigmata, when large as stomaia. As the capillaries approach the arteries on the one hand and the veins on the

other they blend and become larger, and a delicate connective tissue sheath outside the endothelium appears, so that the transition from the capillaries into the arterioles and venules is almost imperceptible; indeed, the difference between a large artery or vein and a capillary, apart from size, is practically the amplification and differentiation of its connective tissue sheath.

Embryology. — The first appearance of a vascular system is outside the body of the embryo in the wall of the yolk sac, that is to say, in the mesoderm or the middle one of the three embryonic layers.

The process is a very early one and in the chick is seen to begin at the end of the first day of incubation. The first occurrence is a network made up of solid cords of cells forming in certain places solid cell masses called the blood islands of Pander. The central cells of these islands divide by karyokinesis and gradually float away into the vessels which are now being formed by fluid from the exterior, finding its way into the centre of the. cell cords and pressing the peripheral cells flat to form the endothelial lining. These free cells from the blood islands are known as erythroblasts and are the primitive corpuscles of the foetal blood. They have a large reticular nucleus and at first are colourless though haemoglobin gradually develops within them and the blood becomes red (see Blood). The erythroblasts continue to multiply by karyokinesis in early foetal life, especially in the liver, spleen, bone marrow and lymphatic glands, though later on their formation only occurs in the red bone marrow. In most of the erythroblasts the nucleus soon becomes contracted, and the cell is then known as a normoblast, while ulti- mately the general view is that the nucleus disappears by extrusion from the cell and the non-nucleated red blood plates or erythrocytes remain. The leucocytes

or white blood corpuscles appear later than the red, and are probably formed from lymphoid tissue in various parts of the body. The blood vessels thus formed in the so-called vascular area gradually travel along the vitelline stalk into the body of the embryo, and two vessels larger than the rest are formed one on each side of the stalk. These are the vitelline veins, which, as they pass towards the caudal end of the embryo, become the two primitive aortae, and these fuse later on to form the heart. After the inversion of the pericardial region and formation of the head fold (see Coelom and Serous Membranes) the front of the developing heart becomes the back, and the vitelline veins now enter it from behind. It must be understood that most of our knowledge of the early history of the blood vessels is derived from the study of lower mammals and birds, and that this is being gradually checked by observations on human embryos and on those of other primates. It seems probable that in these mammals, owing to the small size- of the yolk sac, the vessels of the embryo establish an early communication with those of the chorion before the vitelline veins are formed (see Quain's Anatomy, vol. i., London, 1908). The later stages of the embryology of the vascular system are sketched in the articles on Heart, Arteries, Veins and Lymphatic System (a v.). , (F.G. P.)

II. History of Discovery

Galen, following Erasistratus (ob. 28b B.C.) and Aristotle, clearly distinguished arteries from veins, and was the first to overthrow the old theory of Erasistratus that the arteries contained air. According to him, the vein arose from the liver in two great trunks, the vena porta and vena cava. The first was formed by the union of all the ab- dominal veins, which absorbed the chyle prepared in the stomach and intestines, and carried it to the liver, wher it was converted into blood. The vena cava

arose in the liver, divided into two branches, one ascending through the diar phragm to the heart, furnishing the proper veins of this organ; there it received the vena azygos, and entered the right ven- tricle, along with a large trunk from the lungs, evidently the pulmonary artery. The vena azygos was the superior vena cava, the great vein which carries the Venous blood from- the head and upper extremities into the right auricle. The descending branch of the great trunk supposed to originate in the liver was the inferior vena cava, below the junction of the hepatic vein. The arteries arose from the left side of the heart by two trunks, one having thin walls (the pulmonary veins), the other having thick walls (the aorta). The first was supposed to carry blood to the lungs, and the second to carry blood to the body. The heart consisted of two ventricles, com- municating by pores in the septum; the lungs were parenchy- matous organs communicating with the heart by the pulmonary veins. The blood-making organ, the liver, separates from the blood subtle vapours, the natural spirits, which, carried to the heart, mix with the air introduced by respiration, and thus form the vital spirits; these, in turn carried to the brain, are elaborated into animal spirits, which are distributed to all parts of the body by the nerves. 1 Such were the views of Galen, taught until early in the 16th century.

Jacobus Berengarius of Carpi (ob. 1530) investigated the stracture of the valves cf the heart. Andreas Vesale or Vesalius (1514-1564) Contributed largely to anatomical know- „

ledge, especially to the anatomy of the circulatory organs. He determined the position of the heart in the chest; 1 See' Burggraeve's Histoire de I'anatomie (Paris, 1880). ■

VASCULAR SYSTEM

he studied its structure, pointing out the fibrous rings at the bases of the ventricles; he showed that its wall consists of layers of fibres connected with the fibrous rings; and he de- scribed these layers as being of three kinds — straight or vertical, oblique, and circular or transverse. From the disposition of the fibres he reasoned as to the mechanism of the contraction and relaxation of the heart. He supposed that the relaxation, or diastole, was accounted for principally by the longitudinal fibres contracting so as to draw the apex towards the base, and thus cause the sides to bulge out; whilst the contraction, or systole, was due to contraction of the transverse or oblique fibres. He showed that the pores of Galen, in the septum between the ventricles, did not exist, so that there could be no communication between the right and left sides of the heart, except by the pulmonary circulation. He also investi- gated minutely the internal structure of the heart, describing the valves, the columnae carneae and the musculi papillares. He described the mechanism of the valves with much accuracy. He had, however, no conception either of a systemic or of a pul- monary circulation. To him the heart was a reservoir from which the blood ebbed and flowed, and there were two kinds of blood, arterial and venous, having different circulations and serving different purposes in the body. Vesalius was not only a great anatomist: he was a great teacher; and his pupils carried on the work in the spirit of their master. Prominent among them was Gabriel Fallopius (1523–1562), who studied the anastomoses of the blood vessels, without the art of in- jection, which was invented by Frederick Ruysch (1638–1731) more than a century later. Another pupil was Columbus Col mb s (Matthieu Reald Columbo, ob. 1 560) , first a prosector

in the anatomical rooms of Vesalius and afterwards his successor in the chair of anatomy in Padua; his name has been mentioned as that of one who anticipated Harvey iii the discovery of the circulation of the blood. A study of his writings clearly shows that he had no true knowledge of the circulation, but only a glimpse of how the blood passed from the right to the left side of the heart. In his work there is evidently a sketch of the pulmonary circulation, although it is clear that he did not understand the mechanism of the valves, as Vesalius did. As regards the systemic circulation, there is the notion simply of an oscillation of the blood from the heart to the body and from the body to the heart. Further, he up- holds the view of Galen, that all the veins originate in the liver; and he even denies the muscular structure of the heart. 1 Servetus. In I553 Michael Servetus (1 51 i-i 553), a pupil or

junior fellow-student of Vesalius, in his Christianismi Restitutio, described accurately the pulmonary circulation. 2 Servetus perceived the course of the circulation from the right to the left side of the heart through the lungs, and he also recognized that the change from venous into arterial blood took place in the lungs and not in the left ventricle. Not so much the recognition of the pulmonary circulation, as that had been made previously by Columbus, but the discovery of the re- spiratory changes in the lungs constitutes Servetus's claim to be a pioneer in physiological science.

Andrea Cesalpino (1519-1603), a great naturalist of this period, also made important contributions towards the dis- Cesalpino. coverv °f the circulation, and in Italy he is regarded

as the real discoverer. 3 Cesalpino knew the pul- monary circulation. Further, he was the

first to use the

1 An interesting account of the views of the precursors of Harvey will be found in Willis's edition of the Works of Harvey, published by the Sydenham Society. Compare also P. Flourens, Histoire de la decouverte de la circulation du sang (Paris, 1854), and Professor R. Owen, Experimental Physiology, its Benefits to Mankind, with an Address on Unveiling the Statue of W. Harvey, at Folkestone, 6th August 188 1.

J See Willis, Servetus and Calvin (London, 1877).

3 A learned and critical series of articles by Sampson Gamgee in the Lancet, in 1876, gives an excellent account of the controversy as to whether Cesalpino or Harvey was the true discoverer of the circulation; see also the Harveian oration for 1882 by George Johnston (Lancet, July 1882), and Professor G. M. Humphry, Journ. Anat. and Phys., October 1882.

term " circulation," and he went far to demonstrate the systemic circulation. He experimentally proved that, when a vein is tied, it fills below and not above the ligature. The following passage from his Quaestiones Medicae (lib. v. cap. 4, fol. 125), quoted by Gamgee, shows his views: —

" The lungs, therefore, drawing the warm blood from the right ventricle of the heart through a vein like an artery, and returning it by anastomosis to the venal artery (pulmonary vein), which tends towards the left ventricle of the heart, and air, being in the meantime transmitted through the channels of the aspera arteria (trachea and bronchial tubes), which are extended near the venal artery, yet not communicating with the aperture as Galen thought, tempers with a touch only. This circulation of the blood (huic sanguinis

circulationi) from the right ventricle of the heart through the lungs into the left ventricle of the same exactly agrees with what appears from dissection. For there are two receptacles ending in the right ventricle and two in the left. But of the two only one intro- mits; the other lets out, the membranes (valves) being constituted accordingly."

Still Cesalpino clung to the old idea of there being an efflux and reflux of blood to and from the heart, and he had confused notions as to the veins conveying nutritive matter, whilst the arteries carried the vital spirits to the tissues. He does not even appear to have thought of the heart as a con- tractive and propulsive organ, and attributed the dilatation to " an effervescence of the spirit," whilst the contraction— or, as he termed it, the " collapse " — was due to the appro- priation by the heart of nutritive matter. Whilst he imagined a communication between the termination of the arteries and the commencement of the veins, he does not appear to have thought of a direct flow of blood from the one to the other. Thus he cannot be regarded as the true discoverer of the cir- culation of the blood. More recently Ercolani has „. put forward claims on behalf of Carlo Ruini as being covery the true discoverer. Ruini published the first edition of cleat- of his anatomical writings in 1598, the year William !f;!^2. 0/ Harvey entered at Padua as a medical student. This claim has been carefully investigated by Gamgee, who has come to the conclusion that it cannot be maintained. 4

The anatomy of the heart was examined, described and figured by Bartolomeo Eustacheo (c. 1500–1574) and by Julius Caesar Aranzi or Arantius (c. 1 530–1 589), whose name is asso- ciated with the fibro-cartilaginous thickenings on the free edge of the semilunar valves (corpora Arantii). Hieronymus Fab- ricius of Acquapendente (1537–1619), the immediate

predecessor and teacher of Harvey, made the important step of describing the valves in the veins; but he thought they had a subsidiary office in connexion with the collateral circulation, supposing that they diverted the blood into branches near the valves; ' thus he missed seeing the importance of the anatomical and experi- mental facts gathered by himself. At the time when Harvey arose the general notions as to the circulation may be .briefly summed up as follows: the blood ebbed and flowed to. and from the heart in the arteries and veins; from the right side at least a portion of it. passed to the left side through the vessels in the lungs, where it was mixed with air; and, lastly, there were two kinds of blood — the venous, formed originally in the liver, and thence passing to the heart, from which it went out to the periphery by the veins and returned by those to the heart; and the arterial, containing "spirits" produced by the mixing of the blood and the air in the. lungs— sent out from the heart to the body and returning to the heart iby the same vessels. The pulmonary circulation was understood so far, but its relation to the systemic circulation was unknown. The action of the heart, also, as a propulsive organ was not recognized. It was not until 1628 that Harvey ti arv ey announced his views to the world by publishing his treatise De Motu Cordis et Sanguinis. His conclusions are given in the following celebrated passage:—

" And now I may be allowed to give in brief my view of the circulation of the blood, and to propose it for general adoption. Since all things, both argument and ocular demonstration, show that the blood passes through the lungs and heart by the auricles and

4 Gamgee, " Third Historical Fragment," in Lancet, 1876.

ventricles, and is sent for distribution to all parts of the body, where it makes its way into the veins and pores of the flesh, and then flows by the veins from the circumference on every side to the centre, from lesser to the greater veins, and is by them finally discharged into the vena cava and right auricle of the heart, and this in such a quantity, or in such a flux and reflux, thither by the arteries, hither by the veins, as cannot possibly be supplied by the ingestor, and is much greater than can be required for mere purposes of nutrition, it is absolutely necessary to conclude that the blood in the animal body is impelled in a circle, and is in a state of ceaseless motion, that this is the act or function which the heart performs by means of its pulse, and that it is the sole and only end of the motion and contraction of the heart ″ (bk. x. ch. xiv. p. 68).

Opposed to Caspar Hofmann of Nuremberg (1571–1623), Veslingius (Vesling) of Padua (1598–1649), and J. Riolanus the younger, this new theory was supported by Roger Drake, a young Englishman, who chose it for the subject of a graduation thesis at Leiden in 1637, by Werner Rolfinck of Jena (1599– 1673), and especially by Descartes, and quickly gained the ascendant; and its author had the satisfaction of seeing it confirmed by the discovery of the capillary circulation, and uni– Caplllary versally adopted. The circulation in the capillaries clrcuia– between the arteries and the veins was discovered by tioa. Marcellus Malpighi (1628–1694) of Bologna in 1661.

He saw it first in the lungs and the mesentery of a frog, and the discovery was announced in the second of two letters, Epistola de Pulmonibus, addressed to Borelli, and dated 166 1. 1 Malpighi actually showed the capillary circulation to the aston– ished eyes of Harvey.

Anthony van Leeuwenhoek (163 2–1 7 23) in 1673 repeated Malpighi's observations, and studied the capillary circulation in a bat's wing, the tail of a tadpole and the tail of a fish. William Molyneux studied the circulation in the lungs of a water newt in 1683. 2

The idea that the same blood was propelled through the body in a circuit suggested that life might be sustained by renewing the blood in the event of some of it being lost. About of blood. 1660 Lower, a London physician (died 1691), succeeded in transferring the blood of one animal directly from its blood vessels into those of another animal. This was first done by passing a " quill " or a " small crooked pipe of silver or brass " from the carotid artery of one dog to the jugular vein of another. 3 This experiment was repeated and modified by Sir Edmund King (1629–1709), Thomas Coxe (1615–1685), Gayant and Denys with such success as to warrant the opera- tion being performed on man, and accordingly it was carried out by Lower and King on the 23rd of November 1667, when blood from the arteries of a sheep was directly introduced into the veins of a man. 4 It would appear that the operation had previously been performed with success in Paris.

*The doctrine of the circulation being accepted, physiologists next directed their attention to the force of the heart, the Force of pressure of the blood in the vessels, its velocity, bean and and the phenomena of the pulse wave. Giovanni velocity Alphonso Borelli (1608–1679) investigated the circula- tion during the lifetime of Harvey. He early conceived the design of applying mathematical principles to the explana- Boretti t * on °^ an i ma –l functions; and, although he fell into many errors, he must be regarded as the founder of animal mechanics. In his De Motu Animalium (1680–85) he stated his theory of the circulation in eighty propositions, and in*

prop, lxxiii., founding on a supposed relation between the bulk and the strength of muscular fibre as found in the ventricles, erroneously concluded that the force of the heart was equal to the pressure of a weight of 180,000 lb. He also recognized and figured the spiral arrangement of fibres in the ventricles. The question was further investigated by James Keill, a Scottish physician (1673–1719), who in his Account of Animal Secretion, the Quantity of Blood in the Human Body, and Muscular Motion (1708) attempted to estimate the velocity of blood in the aorta, and gave it at 52 ft.

1 See his Opera Omnia, vol. i. p. 328.

2 Lowthorp, Abridgement of Trans. Roy. Soc., 5th ed. vol. iii. p. 230.

○ *Ibid. p. 231. * Ibid. p. 226.*

KeUt.

Hales.

per minute. Then, allowing for the resistance of the vessels, he showed that the velocity diminishes towards the smaller vessels, and arrived at the amazing conclusion that in the smallest vessels it travels at the rate of j in. in 278 days,— a good example of the extravagant errors made by the mathe- matical physiologists of the period. Keill further described the hydraulic phenomena of the circulation in papers communi- cated to the Royal Society and collected in his Essays on Several Parts of the Animal Oeconomy (1717). In these essays, by estimating the quantity of blood thrown out of the heart by each contraction, and the diameter of the aortic orifice, he calculated the velocity of the blood. He stated (pp. 84, 87) that the blood sent into the aorta with each contraction would form a cylinder 8 in. (2 oz.) in length and be driven along with a velocity of 156 ft. per

minute. Estimating then the resistances to be overcome in the vessels, he found the force of the heart to be "little above 16 oz.," — a remarkable difference from the computation of Borelli. Keill's method was ingenious, and is of historical interest as being the first attempt to obtain quantitative results; but it failed to obtain true results, because the data on which he based his calculations were inaccurate. These calculations attracted the attention not only of the anatomico-physiologists, such as Haller, but also of some of the physicists of the time, notably of Jurin and D. Bernoulli. Jurin (died 1750) gave the force of the left ventricle at 9 lb 1 oz., and that of the right ventricle at 6 lb 3 oz. He also stated with remarkable clearness, considering that he reasoned on the subject as a physicist, without depending on experimental data gathered by himself , the influence on the pulse induced by variations in the power of the heart or in the resistance to be overcome. 5 The experimental investigation of the problem was supplied byStephen Hales (1677-1761), rector of Teddington in Middlesex, who in 1708 devised the method of estimating the force of the heart by inserting a tube into a large artery and observing the height to which the blood was impelled into it. Hales is the true founder of the modern experimental method in physiology. He observed in a horse that the blood rose in the vertical tube, which he had connected with the crural artery, to the height of 8 ft. 3 in. perpendicular above the level of the left ventricle of the heart. But it did not attain its full height at once: it rushed up about half-way in an instant, and after- wards gradually at each pulse 12, 8, 6, 4, 2, and sometimes 1 in. When it was at its full height, it would rise and fall at and after each pulse 2, 3 or 4 in.; and sometimes it would faE 12 or 14 in., and have there for a time the same vibrations up and down at and after each pulse as it had when it was at its full height, to

which it would rise again after forty or fifty pulses. 6 He then estimated the capacity, of the left ventricle by a method of employing waxen casts, and, after many such experiments and measurements in the horse, ox, sheep, fallow deer and dog, he calculated that the force of the left ventricle in man is about equal to that of a column of blood 75 ft. high, weighing 515 lb, or, in other words, that the pressure the left ventricle has to overcome is equal to the pressure of that weight. When we contrast the enormous estimate of Borelli (180,000 lb) with the under-estimate of Keill (16 oz.), and when we know that the estimate of Stephen Hales (1677-1761), as corroborated by recent investigations by means of elaborate scientific appliances, is very near the truth, we recognize the far higher service rendered to science by careful and judicious experiment than by speculations, however in- genious. With the exception of some calculations by Dan Bernoulli (1700-1782) in 1748, there was no great contribution to haemadynamics till 1808, when two remarkable papers ap- peared from Thomas Young (1773-1829). In the first, entitled " Hydraulic Investigations," which appeared youok? in the Phil. Trans., he investigated the friction and dis- charge of fluids running in pipes and the velocity of rivers, the

s Jones, Abridgement of Phil. Trans. (3d ed., 1749), vol. v. p. 223. See also for an account of the criticisms of D. Bernoulli the elder and others, Haller's Elementa Physiologiae, vol. i. p. 448.

• Hales, Statical Essays, containing Haemostatics, &c. (1733), vol. ii. p. 1.

resistance occasioned by flexures in pipes and

rivers, the propagation of an impulse through an elastic tube, and some of the phenomena of pulsations. This paper was preparatory to the second, " On the Functions of the Heart and Arteries," — the Croonian lecture for 1808 — in which he showed more clearly than had hitherto been done (1) that the blood pressure gradually diminishes from the heart to the periphery; (2) that the velocity of the blood becomes less as it passes from the greater to the smaller vessels; (3) that the resistance is chiefly in the smaller vessels, and that the elasticity of the coats of the great arteries comes into play in overcoming this resistance in the interval be- tween systoles; and (4) that the contractile coats do not act as propulsive agents, but assist in regulating the distribution of blood. 1

The next epoch of physiological investigation is characterized by the introduction of instruments for accurate measurement, Use of and the graphic method of registering phenomena, lastm- now so largely used in science. 2 In 1825 appeared ments - E. and Wilhelm Weber's (1804-1801) WeUenlehre, and in 1838 Ernest Weber's (1 795-1878) Ad Notat. Ana- tom. et Physiolog. i., both of which contain an exposition of E. H. Weber's schema of the circulation, a scheme which presents a true and consistent theory. In 1826 Jean Louis Marie Poiseuille invented the haemadynamometer. 3 This was adapted with a marker to a recording cylinder by Lud- wig in 1847, s0 as to form the instrument named by Alfred Volkmann (1801-1877) the kymograph. Volkmann devised the haemadromometer for measuring the velocity of the blood in 1850; for the same purpose Vierordt constructed the haema- tachometer in 1858; Chauveau and Pierre Lortet (1792-1868) first used their haemadromograph in i860; and lastly, Ludwig and Dogiel obtained the best results as regards velocity by the " stream- clock " in 1867. As regards the pulse, the

first sphygmograph was constructed by Karl Vierordt (1818–1884) in 1856; and Etienne Marey's form, of which there are now many modifications, appeared in i860. In 1861 Jean Chauveau (b. 1827) and Marey obtained tracings of the variations of pressure in the heart cavities (see below), by an experi- ment which is of great historical importance. During the past twenty-five years vast accumulations of facts have been made through the instruments of precision above alluded to, so that the conditions of the circulation, as a problem in hydrodynamics, have been thoroughly investigated. Since 1845, when the brothers Weber discovered the inhibitory action of the vagus, and 1858, when Claude Bernard (1813–1878) formulated his researches showing the existence of a vaso-motor system of nerves, much knowledge has been acquired as to the relations of the neivous to the circulatory system. The Webers, John Reid (1816–1895), Claude Bernard and Carl Ludwig (1809–1849) may be regarded as masters in physiology equal in standing to those whose researches have been more especially alluded to in this historical sketch. The Webers took the first step towards recognizing the great principle of inhibitory action; John Reid showed how to investigate the functions of nerves by his classical •research on the eighth pair of cranial nerves; Claude Bernard developed the fundamental conception of vaso-motor nerves; and Ludwig showed how this conception, whilst it certainly made the hydraulic problems of the circulation infinitely more complicated than they were even to the scientific imagination of Thomas Young, accounted for some of the phenomena and indicated at all events the solidarity of the arrangements in the living being. Further, Ludwig and his pupils used the evidence supplied by some of the phenomena of the circulation to explain even more obscure phenomena of the nervous system, and they taught pharmacologists how to study in a

scientific manner the physiological action of drugs. (J. G. M.)

1 See Miscellaneous Works, ed. Peacock (2 vols., London,

18 55); , .

2 See Marev, La Methode graph, dans les sc. exper. (Paris,

3 Magendic's Journal, vol. viii. p. 272.

XXVII. 30

III. Physiology The unicellular animal immersed in water absorbs nutritive matter and oxygen, and excretes waste materials with its whole surface. Owing to the small mass of the protozoa _ the metabolic products can penetrate throughout the general whole. With the evolution of the multicellular organs principles of themetazoa and the division of physiological labour oti l he £ lr ~ a circulatory mechanism became of immediate need. A double-layered animal like the common water polype Hydra can exist, it is true, without such a mechanism, but communities of polypes, such as the sponges, form channels for the circulation of water. With the development of the three-layered animal the coelom or body cavity arose by the splitting of the mesoderm, and it was in this body cavity that the evolution of the cir- culatory system took place, an evolution which finally became perfected in the higher members of the metazoa into a closed vascular system filled with red blood. The evolution of the red matter, haemoglobin, as a special carrier of oxygen was necessitated by the increasing mass and muscular activity of the higher animal, in comparison with the size of the oxygen-absorbing surface — the gill or lung. The blood vascular system of the invertebrata such as the Arthropoda and Insecta, is not generally a

closed system, but consists of a pulsatile heart whence proceed arteries which open into lacunar spaces forming part of the coelom. The lacunae exist between the organs and tissues of the body, and the blood from these spaces is returned to a venous sinus whence the heart draws its supply through valved openings. The movements of the animal help to return the blood from the tissue spaces to the heart, while the heart by its rhythmic contraction drives the blood into the arteries. Somewhere in the course of this system are placed the gills and renal organs, and it appears to be a matter of indifference whether the gills be placed on the arterial or venous side of the system, both arrangements being found in different types. In some types (mussel, earthworm), the whole blood passes through the renal organs at each circulation, in others (crayfish) only parts. In the earthworm the vascular system is closed, the arteries and veins being connected by capillaries in place of lacunae. The movement of tissue juices may be maintained by physico-chemical forces alone, e.g. by the forces of osmosis and adsorption, as is seen in the movements of sap in the vascular bundles of plants, in the streaming of protoplasm in the plant cell and in the marvellous rhythmic to-and-fro movements of the richly granular juice contained in the veins of the spreading protoplasmic sheet of myxomycetes. Such agencies come into play in the lacunar or capillary part of the circulation of the metazoa and are assisted by the movements of the body wall and of the alimentary organs. The evolution of a special pumping organ, the heart, associated with the aeration of the body fluids in the gills, led to the perfection of the efficient system of circulation which is found ; in the vertebrata.

The blood is to be regarded as alive in as strict a sense as any other component of the living body. It is a tissue consisting of

mobile elements — the blood corpuscles — and a plasma — a colloidal albuminous fluid which is analogous to the more solid intercellular material of other tissues. The primary sources of its elements are the blood-forming organs — the bone marrow, the haemolymph and lymphatic glands and other lymphatic tissue, and the spleen. It circulates as the middleman between the tissues, conveying from the ali- mentary canal the products of digestion — sugar, fat, amino- acids and salts; oxygen from the lungs; carbonic acid, urea and other waste products of the tissues to the lungs and kidneys; internal secretions from one organ to another; and acts not only as a carrier, but deals with the material remitted to it on the way. One other function of the blood, a most important one, must not be omitted, that of defence against the invasion of bacteria and their toxins, and other parasites.

The blood is contained in a continuous system of vessels; arteries lead from the heart and divide into a multitude of

capillary vessels, and these lead into the veins which finally pass back to the heart. The heart is to be regarded as a double organ, each half consisting of an auricle and a ventricle. The light half contains dark venous blood ottbecir- which has been returned from the body and is sent to eolation the lungs: the left heart contains the bright oxygenated blood which has been returned from the lungs and is distributed to the body. There are thus two circu- lations—the one pulmonary, from the right side of the heart to the pulmonary artery

and thence to the capillaries of the lungs and to the left heart by the pulmonary veins— the other systemic, from the left side of the heart, by the aorta, to the arteries and capillaries of the body tissues and organs, whence the blood returns by the veins to the right side of the heart.

A schematic representation is given of the circulatory system in the accompanying diagram. The venous blood flows into the right auricle (RA) from the superior vena cava and the inferior vena cava. The right ventricle (RV) drives through the lungs the blood received from the right auricle. The right auriculo-ventricular valve, or tricuspid, and the pulmonary semilunar valve are represented directing the flow of blood in this direction. From the pulmonary capillaries the blood

Fig. i . — GeneralCourse of Circulation and some of the Principal Vessels. H′, right ventricle; H, left ventricle; A, A, A, aorta; h, part of left auricle; P, pul- monary artery, going to lungs; P, pulmon- ary veins; v, ascend- ing or lower vena cava; e, trachea or wind-pipe ; p, p′, bronchial tubes; a′, a, right and left carotid arteries; v, »′, veins from root of neck (internal jugular and sub-clavian), joining to form descending or upper vena cava ; i, hepatic artery /, hepatic vein; I, superior mesenteric artery, going to mes-entery and bowels ; L, portal vein, going to liver; k′, renal artery; k, renal vein; V, inferior vena cava, splitting into the two iliac veins, v, v.

Fig. 2. — Scheme of the Circulation of the Blood in Man, stand- ing erect. The venous system is stippled. C, rigid cranial wall; N, muscles and cutaneous wall of neck; T, thoracic wall; A, muscular and cutaneous wall of ab-domen ; D, diaphragm ; L, muscles and cutaneous wall of limbs; P, peri- cardium; AO, aorta; S. V. C, I. V. C, venae cavae; P.V, portal vein;

V, valves in veins of neck, or legs; RA, LA, right and left auricles; RV, LV, right and left ventricles.

returns by the pulmonary veins (PV) into the left auricle (LA), and so through the left auriculo-ventricular or mitral valve

into the left ventricle (LV). By the left ventricle the blood is driven through the aortic semilunar valve, and is distributed to the systemic arteries, and so to the capillaries of the various organs and back to the veins. The muscular wall of the auricles and that of the right ventricle are much thinner than that of the left ventricle. This is so, because the energy required of the left ventricle must exceed that of the right ventricle, inasmuch as the resistance in the systemic system exceeds that in the pulmonary circuit.

The heart fills with venous blood during its expansion or diastole, and forces the blood into the arteries during its con- traction or systole. The large arteries are of less capacity than the corresponding veins, and their walls are essentially extensile and elastic. The pulmonary arteries are especially extensile structures. The small arteries and arterioles are essentially muscular tubes and can vary considerably in diameter. The arterioles open into the capillaries, and these are so numerous that each organ may be regarded as a sponge full of blood. The skeletal muscles and the muscular walls of the viscera at each contraction express the blood within them, and materially influence the circulation. The whole muscular system, as well as the heart, must therefore be re- garded as a pump to the vascular system. The capillary wall is composed of a single layer of flattened cells, separating the blood within from the tissues without. Through this layer, which is of extraordinary tenuity, there takes place an ex-

change of material between the blood and the tissues, an exchange which depends on the physico-chemical conditions which characterize the living state of the cells. The phenomena of adsorption and osmosis come into play here, but the condi- tions still await complete elucidation. The veins are of larger calibre 1 than the corresponding arteries, and have tough and in extensile walls. Their walls are muscular, and contract on local stimulation. The veins are not, as a rule, distended with blood to their full potential capacity. The latter is so great that the whole blood of the body can collect within the veins.

The heart and lungs are placed within the thoracic cavity (T), the floor of which is formed by the muscular diaphragm (D); the heart is itself enclosed in a tough inextensile bag, the pericardium (P), the function of which is to check over- dilatation of the heart. The pericardium bears to the muscular wall of the heart the same relation as the leather case of a football does to the bag within. In particular, it prevents over-distension of the heart during muscular efforts.

The abdominal organs and blood vessels are encompassed by the muscular wall of the abdomen (A), and may be regarded as enclosed in a sphere of muscle. Above is the dome of the diaphragm (T), and below the basin-like levator ani, closing the outlet of the pelvis; in front are the recti muscles, behind the quadrati lumborum and the spine; while the oblique and transverse muscles complete the wall at either side. The brain is enclosed in a rigid and unyielding box of bone — the cranium, while the limbs are encompassed by the extensile and, in health, taut and elastic skin.

The heart's energy is spent in maintaining a pressure of blood in the elastic arteries, and by the difference of pressure in the arteries and veins the blood is kept flowing through the

capillaries into the veins. The movements of the body and particularly of respiration help to return the blood from the capillaries and veins back to the heart, valves being set in the veins to direct the blood in this direction. The blood is a viscous fluid and its viscosity varies; it is propelled by a heart which varies both in rate and energy; it circulates through a system of muscular and elastic arteries and veins, which varies in capacity and may alter in elasticity. The width of bed through which it flows varies greatly at different parts of the circuit, and the resistance offered to the moving blood is very much greater in the capillary-sized vessels than in the large arteries and veins. The blood continually varies, both in quantity and in quality, as it effects exchanges through the capillary walls with the tissues. The problems of the

circulation'are thus far from simple. They resolve themselves mainly into. a consideration of (1) the physiology of the heart;

Fig. 3. — The Thoracic Viscera. In this diagram the lungs are turned to the side, and the pericardium removed to display the heart, a, upper, a', lower lobe of left lung; b, upper, b', middle, b", lower lobe of right lung; c, trachea; d, arch of aorta; e, superior vena cava; /, pulmonary artery; g, left, and h, right auricle; k, right, and /, left ventricle; m, inferior vena cava; n, descending aorta; 1, innominate artery; 2, right, and 4, left common carotid artery ; 3, right, and 5, left subclavian artery ; 6, 6, right and left innominate vein ; 7 and 9, left and right internal jugular veins; 8 and 10, left and right subclavian veins; 11, 12, 13, left pulmonary artery, bronchus and vein; 14, 15,

16, right pulmonary bronchus, artery and vein; 17 and 18, left and right coronary arteries.

(2) the physical characters of the circulation; (3) the control of the heart and vessels by the nervous system.

A. Keith, in Journal of Anatomy and Physiology.

FlG. 5. — Showing the Attach- ments of the Heart, a, a, auricular base of ventricle ; c, c, aortic base of ven- tricles; d, d, arterial meso- cardium ; e, e, venous meso- cardium ;/,ascending aorta ; g, pulmonary aorta: h, superior vena cava: i, in- ferior vena cava, perforat- ing diaphragm and peri- cardium ; I, m, n, structures at the root of the lung — bronchus, pulmonary ar- tery, and pulmonary veins ; o, vortex at apex; p, pec- tinate musculature of right auricle; r, superficial mus- culature of right ventricle.

The Action of the Heart.

The permanent position and general arrangements of the heart are described in a separate article, and it is only necessary here to allude to certain points of physiological importance; The substance

From Hill's Manual of Physiology, by permission of Edward Arnold.

Fig. 4.- — Diagram of Cham- bers of Heart and Large

Vessels.

A, Vena cava, superior.

B, Vena cava, inferior.

C, Pulmonary artery.

D, Aorta.

E, Right auricle.

F, Right ventricle.

G, Left auricle, into which

open the four pulmon- ary veins. H, Left ventricle.

The arrows point the course of the blood.

of the heart is composed of a special kind of muscular tissue which must be regarded as a syncytium in which no distinct and separate cells occur, a complex plexus of branching and anastomosing fibres, forming one functional whole. The fibres are nucleated, have a cross-striated structure and are surrounded by delicate connec- tive tissue sheaths. The cross-striations are due to the primitive fibrils which as in skeletal muscle are differentiated into alternate doubly and singly refracting substances. These fibrils are embedded in a granular nucleated sarcoplasm. Between the bundles of fibres are thin layers of connective tissue containing closely spun networks of capillaries. The muscle of the auricles consists of a circular layer common to both and a deeper layer separate for each chamber. The auriculo-ventricular ring consists of connective tissue surround- ing the auriculo-ventricular orifices and separating the auricular from the ventricular muscle with the exception of an important band, the auriculo-ventricular bundle. The superficial fibres of the ventricles appear to have origin in the auriculo-ventricular ring, to wind about the heart spirally and to end in the tendons of the papillary muscles or pass up to the ring again on the inner surface of the heart. The middle layers "consist of bundles of fibres running more or less circularly round the ventricles.

The greater part of the heart lies free in the

pericardial sac. The pericardium is reflected from the wall of the sac on to the wall of the heart and attaches the heart at the point where the venae cavae and aort& leave the sac. This_ part of the peri- cardium gives a fixation point to the auricles, for it is attached to the rpots of the lungs and thereby to the thoracic wall, to thi diaphragm and ″ to the structures at ths root of the neck. On opening the chest the "formal fulcra fcf the^ movement ;o#′ : ,the: auricles are lost, and this renders it difficult to record the exact movements of the heart. The attached part of the heart is called the bdse< and the venous part of the base is the beginning and the ar- terial part the end of the tube, coiled on itself, from which in the em- bryo the heart develops. The longitudinal and circular muscle fibres of the _ ventricles are anta- gonists. The circular fibres by their contrac- tion tend to lengthen the apex-base diameter, the longitudinal fibres resist this and the two to- gether wring the blood out of the heart. The apex is maintained as

a fixed point by this antagonistic action, and thus the longitudinal fibres are enabled to expand the auricles by pulling down the floor of these chambers. This action is important, as it contributes to the filling of the auricles simultaneously with the emptying of the ventricles. Tracings of the jugular pulse give evidence of such action.

In the case of the auricles the longitudinal musculi pectinati not only help the circular fibres to expel the blood, but draw up the base of the ventricle to meet its load of blood. Thus the base of the ventri- cular part (or floor of the auricles) is pulled up during auricular systole, and down during ventricular systole. The posterior and upper borders of the left auricle lie against the unyielding structures of the posterior mediastinum, the pulmonary artery and bronchi, the floor and

anterior part in contact with the base of the ventricle and ascending aorta respectively. The latter parts alone are free to move during systole. Thus the left ventricular base, is drawn up and the aorta back on auricular systole (A. Keith).

As regards the valves of the heart — (1) the tricuspid guards the right auriculo-ventricular opening, and consists of three flaps of fibrous tissue, covered, like all the internal surfaces of the heart, with the smooth shining membrane, the_ endocardium. The flaps are continuous at their base, forming an annular membrane surrounding the opening. The bicuspid or mitral consists of two cusps and guards the left auriculo-ventricular opening. The under surface and free' edge of each cusp of these

Fig. 6. — Cavities of the Right Side of the Heart, a, superior, and b, inferior vena cava; c, arch of aorta; d, pulmonary artery; e, right, and /, left auricular appendage ; g, fossaovalis ; h, Eustachian valve; k, mouth of coronary vein; /, m, n, cusps of the tricuspid valve; 0, 0, papillary muscles; p, semilunar valve ; 2, corpus Arantii ; r, lunula.

The valves of the heart.

valves aie attached by chordae tendinae to two papillary muscles; these are pillars of muscle which rise up from the inner surface of the ventricles.

The edges of these valves which come into opposition are exceed- ingly thin and delicate, while the outer parts, which bear the full systolic pressure of the blood, are tough. The cardiac muscle, by its contraction, limits the size of the auriculo- ventricular orifices and

so maintains the competency of the valves. It is the papillary muscles and chordae tendineae which pull down the diaphragm formed by the closed valves (the floor of the auricles), thus expanding the auricles and enabling the valvular as well as the muscular parts of the wall of the ventricles to approach together and wring out the blood. The thin, moist, film-like edges of the valves of the heart come into perfect apposition and prevent all leakage, while the fibrous parts give strength and support. The ventricles are never completely emptied, for some blood remains in contact with the auriculo-ventricular valves up to the end of systole and ensures

Left anterior cusp of pulmonary valve

Modes of examin- ing the living heart.

Left posterior cusp of pulmonary valve'

Left posterior cusp of aortic valve" — Left coronary artery- —

Anterior cusp of mitral valve

Posterior cusp of mitral valve'

Left ventricle

From Young and Robinson, Cunningham's Text-Book of Anatomy.

Fig. 7. — The Bases of the Ventricles of the Heart, showing the auriculo-ventricular, aortic and pulmonary orifices and their valves.

their closure. Incompetency of the valves may arise when the right heart is greatly dilated. The aortic and pulmonary valves consist of three semilunar, pocket-shaped cusps. A fibrous nodule is placed centrally in the free edge of each cusp, whence numerous tendinous fibres radiate to the attached borders of the cusp. The rest of the free edges which come into

apposition are thin and delicate. Opposite the cusps are bulgings of the aortic walls — the sinuses of Valsalva. From the anterior one arises the right coronary artery and from the left posterior, the left coronary artery, these vessels supply the substance of the heart with blood. Eddies formed in the sinuses during the period of systolic output bring the semi- lunar valves into apposition, so that they close without noise or jar at the moment when the intraventricular becomes less than the aortic pressure. The auriculo-ventricular valves are likewise floated up by eddies, and brought into apposition at the moment the intra- ventricular pressure surmounts that in the auricles.

The heart in size is about equal to the closed fist of a man. The average weight of the heart in the new-born baby is about 24 grms., in the adult 300 grms. The percentage which the heart weight bears to the whole body weight is 0-76 in the new-born and 0-46 in the adult. While the whole body increases in weight 21-fold, the heart increases only 12-74-fold (Vierordt, Karl, 1818-1884). The average weight of the male and female heart is almost the same. The average volume of the whole heart is about 270 c.c. The capacity, estimated by filling the heart with wax, is for each auricle

about 100-150 c.c, and 150-230 c.c. for each ventricle. There are considerable sources of error in such measure- ments. The muscle of the left ventricle is about 1-6 cm. in thick- ness, and of the right ventricle 0-5 cm, The left ventricle has twice the muscular mass of the right. The cir- cumference of the left auriculo-ventricular orifice is about 14-0 cm.; of the right, about 12-5 cm.; of the aortic orifice, 8-0 cm.; of the pulmonary orifice, 9-0 cm. The average diameter of the vena cava superior is about 23 mm. ; of the vena cava inferior,

34 mm. ; of each of the four pulmonary veins

about 13–14 mm. ; of the pulmonary artery, 28 mm. ; of the aorta, 32 mm.

The physiologist or physician has many means at his disposal of examining the heart's action. By palpation with the hand over the region of the heart, its stroke, the cardiac impulse, can be felt. By auscultation with the ear directly, or with use of the' stethoscope the sounds of the heart can be heard. By percussion the anatomical limits of the organ can be defined. The cardiac impulse can be re- corded by tambour methods of registration, the heart sounds by means of the microphone and capillary electrometer, while the volume and movements of the heart can be studied with the help of the Rontgen rays

The impulse is caused by the sudden hardening of the muscular mass of the ventricles against the wall of the thorax. It is syn- chronous with the beginning of systole. The position _. at which the impulse is felt varies with changing posture cardiac of the body, as different parts of the impulse thorax come in turn in contact with the ventricle. In the supine position it is usually to be felt in the fifth intercostal space 3i inches from the midsternal line. The chest wall is driven out by the systole only where the heart muscle touches it; at other places it is slightly drawn in. This indrawing is attributed to the expulsion of the blood out of the thorax by the left ventricle. The thorax is a closed cavity and the vacuum therein produced by systolic output into the arteries of the head, limbs and abdomen is filled by (1) the drawing of air into the lungs, (2) the drawing of venous blood into the great veins and right auricle, (3) the slight indrawing of the chest wall. The impulse is recorded by placing a small cup, or receiving tambour, over the spot where it is most evident, and connecting the inside of the cup by a tube to a recording tam- bour. The cup can be closed by a rubber dam, or an air-tight

junction can be effected by pressing it upon the skin. The stroke of the heart is transmitted as a wave of compression to the air within the system of tambours. The recording tambour is brought to write on a drum, moved by clockwork, and covered with a paper smoked with lamp-black. From the record so obtained we can obtain information as to the time rela- tions of the heart-beat, but no accurate information as to its energy or amount of contraction.

Conus arteriosus

'Right anterior cusp of pulmonary valve

'Right coronary artery

Anterior cusp of aortic valve

_Right posterior cusp of ~ aortic valve - Anterior (infundibular) cusp of tricuspid valve

_Right (marginal) cusp of tricuspid valve L^Posterior (septal) cusp of tricuspid valve

Right ventricle

From HOI'S Manual of Physiology, by permission of Edward Arnold.

Fig. 8. — Position of the Valves of the Heart in Systole and Diastole.

From Young and Robinson, Cunningham's Text-Book of Anatomy. Fig. 9. — The Relation of the Heart to the Anterior Wall of the^ Thorax. 1, II, ill, IV, v, vi, the upper six costal cartilages.

The movements of the heart consist of a series of contractions which succeed each other with a certain rhythm. The period of contraction is called the systole and that of relaxation u ove the diastole. The two auricles contract and relax syn- „] eat ' so t chronously, and these movements are followed by the .. synchronous

contraction and relaxation of the ventricles. uear t. Finally, there is a short period when the whole heart is in diastole. The whole series of movements is known as the cardiac

cycle. Taking 75 as the average number of heart-beats per minute, each cardiac cycle will occupy -8 seconds. Of this period

auricular systole occupies -i second

auricular diastole occupies -7 „

ventricular systole occupies -3 „

ventricular diastole occupies -5 „ In 1861 Chauveau and Marey obtained direct records of the heart of a horse, and determined the sequence and duration of the events happening in the heart, and measured the endo-cardiac pressure by an instrument termed the cardiac sound. The sound — a two- way tube — was pushed down the jugular vein until the orifice of one tube lay in the right ventricle and of the other in the right auricle. The tubes were connected with recording tambours which wrote on a moving drum covered with smoked paper.

Another tambour was used to record the cardiac impulse. The tracings so obtained (fig. 10) teach us the following facts: (1) The auricular contraction is less sudden than the ventricular, and lasts only a very short time, as indicated by the line ab. The ventricle, on the other hand, contracts suddenly and forcibly and remains contracted a considerable time, as shown by the line c′d′ and by the flat top to the curve which succeeds d′. (2) The auricular movement precedes the ventricular, and the latter coincides with the impulse of the apex against the wall of the chest. (3) The contraction of the auricle influences the

pressure in the ventricle as shown by the small rise a′b′, and that of the ventricle influences the pressure in the auricle somewhat as shown by the waves cd. Much labour has been spent in the contrivance of rapidly acting spring pressure gauges, freed as far as possible from inertia, in order to investigate more exactly the changes of intracardiac pressure, which were first described by Chauveau and Marey. As the intraventricular pressure

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Fig. 10. — Tracings from the Heart of a Horse, by Chauveau and Marey. The upper tracing is from the right auricle, the middle from the right ventricle, and the lowest from the apex of the heart. The horizontal lines represent time, and the vertical amount of pressure. The vertical dotted lines mark coincident points in the three movements. The breadth of one of the small squares represents one-tenth of a second.

may rise 150 mm. of mercury in one-tenth of a second, it is no easy matter to contrive an instrument which will respond as rapidly and yet yield an accurate result without overshooting the mark. The final result of a most careful inquiry is the confirmation in almost every point of Chauveau and Marey's pressure curves. Karl Hurthle's differential manometer has proved to be an instrument of great value and precision. A double-bored tube cannula is intro- duced so that one tube reaches the right auricle and the other the right ventricle. In observations on the left side of the heart, one tube is placed in the left ventricle and the other in the aorta, and each of these tubes is brought into connexion with a tambour. The two tambours are placed one on either side of the fulcrum of a lever. This lever works against a light spring, which in its turn sets in motion a writing-style. The style records the pressure changes on a drum covered with smoked paper. By this means there can be recorded the exact moment at which the

auricular pressure exceeds that in the ventricle, that is to say, the moment when the auriculo-ventricular valves open; likewise the moment when the ventricular pressure becomes greater than that in the auricles, and the auriculo-ventricular valves shut. Similarly, there can be recorded the moment when the intraventricular pressure exceeds that in the aorta and the semilunar valves open, and the moment at which the diastole of the ventricle begins, when the aortic pressure becomes the greater, and the semilunar valves shut. The smoothness with which the heart works is shown by the fact that neither the opening nor the closing of the valves is marked by any peak or point on the pressure curves.

iDt.jug.rcta

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hepatic v;

The absence of a mechanism for preventing regurgitation of blood from the auricles of birds and mammals is remarkable, for in fishes, amphibia and reptiles this is effected by valves guarding the sino-auricular junction. In the warm-blooded vertebrata with the appearance of the diaphragm the sinus becomes merged into the right auricle, and the venous cistern formed by the superior and inferior venae cavae, the innominate, iliac, hepatic and renal veins takes the place of the sinus. Six pairs of valves prevent re- tat-jugular. gurgitation from this cistern, viz. those placed in the 'common, femoral, the sub-clavian and jugular veins. The cistern when filled holds some 400 . c.c. of blood; in the liver there is some 500 c.c. of blood, and this can be expressed into the cistern by abdominal pressure; in the portal venous system, when dis- tended, another 500 c.c. may be held, which can be expressed*

through the liver into the cistern. A large volume of blood is thus at the disposal % , . of the heart for it to draw on"™'!" during diastole. Respiration by the aspirating action of the thorax sucks this blood into the heart, while the inspiratory de- scent of the diaphragm squeezes the abdominal contents and forces blood from the liver and cistern into the heart. These forces take the place of the sinus and are far more efficient. The intra-abdominal pressure may be raised on bending or straining till it becomes equi- valent to the pressure of a column of mercury 80-100 mm. high (Keith). Under such con- ditions the pericardium prevents the right side of the heart being over-distended with ven- ous blood.

With these facts in view, we

fern, ring

A. Keith, in Journal of Anatomy and Physiology.

Fig. 11. — Diagram of the Venous Cistern from which the Heart is filled. The abdominal or infra- diaphragmatic part of the cis- tern is indicated in black; the thoracic or supra-diaphrag- matic is stippled.

can now describe the complete course of a cardiac cycle. We will start at the moment when the blood is pouring from the venae cavae and pulmonary veins into the two auricles. The auricles are relaxed and their cavities open into the ventricles by the funnel- shaped apertures formed by the dependent segments of the tricuspid and mitral valves. The blood passes freely through these apertures into the ventricles. The small positive pressure which is always present in the venous cistern (aided by the respiratory forces)

Jugular a t 3 se

Apex

23 s a

Carotid

*rtAA^*

From Diseases 0/ the Heart, by James Mackenzie, M.D., by permission.

Fig. 13 .—Tracings of the Jugular Pulse Apex Beat, Carotid and Radial Pulses., The perpendicular lines represent the time of the following events. :— I, the beginning of the auricular systole; 2, the beginning of ventricular systole; 3, the appearance of the pulse in the carotid ; 4, the appearance of the pulse in the radial ; 5, the closing of the semilunar valves; 6, the opening of the tricuspid valves.

is at this time. filling the right heart, while the positive pressure in the pulmonary veins is filling the left heart. The auricular systole now takes place. The circular muscle bands compress the blood out of the auricles into the ventricles, while the longi- tudinal bands aid in this and pull up the base of the ventricles to meet the load of blood. As the contraction starts from the mouths of the venae cavae, and sweeps towards the ventricles, there can

occur but little regurgitation of blood into the venous cistern, but the cessation of flow into the auricle during its systole does produce a slight rise of pressure in the cistern, as is shown by tracings taken from the jugular pulse. The function of the auricles is to rapidly complete the filling of the ventricles.

The auriculo-ventricular valves are floated up and brought into apposition by eddies set up in

the blood which streams into the ventricles, and close without noise or jar at the moment when the intra-ventricular pressure exceeds in the least that in the auricles. The systole of the ventricles immediately following that of the auricles closes the auriculo-ventricular valves, and as the intra-ventricular pressure rises above that in the pulmonary artery and aorta re- spectively the semilunar valves open and the blood is expelled these elastic vessels are in their turn expanded by the expulsive force of the heart so as to receive the blood. The papillary muscles, by contracting synchronously with the muscular wall of the vent- ricles, pull down and flatten the dome-like diaphragm formed by the closed auriculo-ventricular valves, thus shortening the longitudinal diameter of the ventricles, while at the same time they enlarge the auricles and so help to fill these cavities. The outflow of blood from the ventricles is rapid at first. It becomes slower as the big arteries become distended and the pressure of blood rises within them, and ceases finally when the pressure becomes equal to that in the ventricles. As the outflow diminishes the semilunar pockets arc filled by eddies of blood, and their thin edges are brought nearer and nearer, until finally they come into apposition. The closure is

effected without jar or noise at the moment when the outflow ceases and the ventricles begin to expand. The heart, as a good pump should, works with the least possible jar. During the contraction of the ventricles blood has been pouring from the veins into the auricles, and directly the ventricular systole ceases the auriculo-ventricular valves open, and the blood be- gins to fill the expanding ven- tricular cavities. For a brief moment the ventricles remain dilated and at rest, then the auricles contract again, and the cycle of changes, once more, is repeated. During the

first period of ventricular systole — the period of rising tension- all the valves are closed and the ventricle is getting up pressure. This period has been measured

, and is found to occupy ;-02″— 04″.

From Further Aimncts in Physiology, by The second period is that of permission. systolic output, and lasts about

Fig 13.— Diagrammatic repre- 2″, that is, from the moment sentation of the Cardiac Cycle when the semilunar valves open and of the Carotid and Jugular to the moment when they close. Pulses in relation to standard The upstroke of the pulse curve movements. The scale of ab taken in the aorta, or in the scissae is 1 mm. to t fa sec. carotid artery in man, can be S.C. = semilunar valve closure; taken as marking the moment A. O. = auriculo - ventricular when the semilunar valves open, valves open. The broken lines while the dicrotic notch on the indicate those portions of the pulse curve marks their closure, respective curves over which The second sound of the heart there is doubt or controversy. occurs immediately after their

closure, and can be used to mark the time of this event on the impulse curve.

The intra-ventricular pressure curve may rise or fall during the output period according to the state of the peripheral resistance. If the carotid pulse be recorded synchronously with the impulse curve, the time relations can be determined for the human heart. The beginning of the upstroke of the impulse curve marks the beginning of systole, that of the pulse curve marks the opening of the semilunar valves, and the dicrotic notch, which precedes the dicrotic wave, marks the closure of these valves and the end of the output. The first sound of the heart is synchronous′ with the upstroke of the impulse curve. The maximal systolic pressure

exerted by the heart varies with the degree of diastolic filling and with the obstruction to outflow. The heart responds to the latter by a greater output of energy, and this it does with little loss in rapidity of action. The total fluid pressure to which the wall of the heart is submitted rapidly increases as the radii of curvature become greater. Hence the greater energy required of a dilated heart, its tendency to hypertrophy and liability to fail. By its reserve power the heart may throw out three or even six times the volume of the normal output per minute, and may maintain its output when the aortic pressure is twice its normal value.

The maximal and minimal pressures have been accurately recorded in the heart by a manometer fitted with a valve arranged

so that either only a rise or a fall of pressure is recorded. In the right ventricle of the dog the maximal pressures recorded equalled 35–62 mm. of mercury, in the left ventricle 1 14–135 mm., in the auricles 2–20 mm. (Michael Jager, 1795–1838). A negative pressure, of considerable amount but of very fleeting duration, sometimes occurs in the ventricles at the beginning of diastole. This is produced by the elastic rebound of the fleshy columns of the inner wall of the heart, which become pressed together as the blood is wrung out of the ventricular cavities. The entry of the first few drops of blood from the auricles abolishes this negative pressure, and it has no important influence on the filling of the heart.

*When the ear is applied over the cardiac region of the chest, or a stethoscope is employed, two sounds are heard, the first, heard most intensely over the apex, is a duller and longer sound than the second, which is shorter and sharper and is heard '" e best over the base of the heart. The syllables lub, dupp *"""" * #*

express fairly well the characters of the two sounds, and heart,

the accent is on lub when the stethoscope is over the apex, thus — liib-dupp — liib-dupp— lub-dupp, and on the second sound when over the base, thus — lub-dupp— lub-dupp — lub-dupp. The sounds of the heart have been successfully recorded by means of the micro- phone. Hurthle inserted the microphone in the primary circuit of an E. Du Bois-Reymond induction coil, and placed the nerve of a frog-muscle preparation in the secondary circuit. The muscle, being attached to a lever, recorded its contraction on a revolving drum at the moment when the sound of the heart reached the microphone and closed the primary circuit. A capillary electro- meter can be inserted in place of the frog-muscle indicator, and the movements of the electrometer photographed on a sensitized plate moved by clockwork (Willern Einthovenj. Each sound gives rise to a succession of vibrations of the mercury meniscus of the capillary electrometer. The first sound is formed of many component tones derived from the sudden tension, and consequent vibration, of the ventricular muscle, and of the auriculo-ventricular valves with their chordae tendineae. The first sound can be resolved by a trained musical ear into two tones, one deep and the other high. The deeper tone alone is heard on the contraction of the excised and bloodless heart, while the higher tone is produced by throwing the aurjcuTc-ventricular valves into tension (John Berry Haycraft). In the cold-blooded animal, such as the turtle, the heart muscle does not become tense rapidly enough to produce a sound (Allen). This sound is not produced by fluid friction as the blood rushes through the arterial orifices, for the velocity of outflow is too small to produce in this way any noise. Nor is it produced by sudden opening of the semilunar valves, for these open quietly and without jar at the

moment when the intra-ventricular pressure rises above that in the aorta.

The second sound of the heart is produced by the tension of the semilunar valves in the aorta and pulmonary artery at the moment when the ventricles pass into, diastole. These valves close without any jar or shock so soon as the arterial pressures rise to the slightest degree above that in the ventricles. In the next moment the ventricles dilate, and the Valves, no longer supported on one side, become taut. The elastic vibrations of the walls of the distended arteries probably share in the production of this sound.

When the sounds and the impulse are recorded together the record shows that the first sound begins about o-oi sec- before the cardiagram marks the beginning of systole, and for the first 0-06 sec. of its duration this sound is heard only over the apex. Over the base of the heart the first sound is heard just at the time when the semilunar valves open and the output begins. The first sound ceases before the ventricular contraction is over, for it is the sudden tension, not the continuance of contraction, that causes it. The beginning of the second sound marks the sudden tension of the semilunar valves which immediately follows their closure.

For practical purposes it is important to bear in mind what is happening in the heart whilst one listens to its sounds. During the first sound we have (1) contraction of the ventricles, closure of the auriculo-ventricular valves and impulse of the apex against the chest ; (2) rushing of the blood into the aortic and pulmonary artery, and filling of the auricles. With the second sound we have closure of the semilunar valves from the elastic recoil of the aorta and pulmonary artery, relaxation of the ventricular walls, opening of the auriculo-ventricular valves so as to allow the

passage of blood from auricle to ventricle, and diminished pressure of apex against chest wall. With the long pause there are (1) gradual refilling of the ventricle from the auricle, and (2) contraction of the auricle so as to entirely fill the ventricle. The sound of the tricuspid valve is heard loudest at the junction of the lower right costal cartilages w~ith the sternum, of the mitral over the apex beat, of the aortic semilunar valves in the direction of the aorta where it comes nearest to the surface at the second right costal cartilage, and of the valves of the pulmonary orifice over the third left costal cartilage, to the left and external to the margin of the sternum. The sounds are changed in character by valvular lesion or muscular weakness of the heart, and afford important signs to the physician. Murmurs are produced by eddies setting some part of the membranous walls or valve flaps in vibration.

If a stethoscope be placed over a large artery, a murmur will be

Fig. 14. — Scheme of a Cardiac Cycle. The inner circle shows what events occur in the heart, and the outer the relation of the sounds and silences to these events.

heard, caused by the blood rushing through the vessel narrowed by the pressure of the instrument. The fluid escapes into a wider

portion of the vessel beyond the point of pressure, and the sound is caused by the eddies set up there throwing the membranous wall of the vessel into vibration. Such a sound is heard over an aneurism. The placental bruit heard during pregnancy is a sound of this kind, arising from pressure on the uterine arteries.

In cases of insufficient aortic valves a double blowing murmur may be heard, the first being due to the rush of blood into the vessel, and the second to the regurgitation of the blood back into the ventricle. These mur- murs are produced by eddies of blood setting the mem- branous parts into vibration.

Occasionally a murmur is produced by the displacement of air in the bronchial vessels by the beat of the heart, and may simulate the murmur of aortic incompetence. By placing a stethoscope over the jugular vein on the right above the collar bone a murmur is heard, the bruit de diable, particularly if the subject turn his head to the left. This is held to be due to the vibration of the blood in the jugular vein rushing from the dilated to the contracted part. It is more marked during auricular diastole and during inspiration.

*In the lower vertebrates, as the frog, the heart is directly nourished by the blood which fills the cavities in its sponge-like structure. In The * ne warm-blooded vertebrates there is a special arrange-*

autrttioa ment °f coronary vessels. The two coronary arteries (right of the an ^ ' e fr) originate at the root of the aorta from the sinuses

heart. °^ Valsalva. Their branches penetrate the muscular sub-

stance and end in a rich plexus of capillaries. From these arise the radicles of the coronary veins which open into the right auricle by the coronary sinus and other small veins. These openings are valved. The heart in contracting exerts a greater pressure than that of the coronary arteries, and so arrests the flow in these during the height of systole, and squeezes the blood within the coronary capil- laries and veins on into the right auricle. On

diastole the coronary system fills again. Sudden occlusion of any large part of the coronary arteries produces irregular and inco-ordinate contractions, followed by death of the heart. Gradual occlusion of the coronary arteries by degenerative changes in advanced life is one of the causes of the distressing form of cardiac distress known as angina pectoris. The work of the left ventricle is calculated by the formula W =WP+mv i , where V = volume of blood in c.c. expelled per beat, P = mean pressure in aorta, m = mass of the blood expelled on systole, and v = the velocity imparted to it. The volume of the output has been determined directly by inserting the stromuhr in the ascending aorta (Robert Adolf Tigerstedt), and indirectly by determining (1) how much oxygen is absorbed per minute, (2) the difference in the oxygen content of the arterial and venous blood, (3) the number of heart beats. If 1000 c.c. of oxygen are absorbed from the air breathed in a minute, and the arterial blood contains 1 o % more oxygen than the venous, it is clear that 100 X 100 c.c. of blood must have passed through the lungs in that time, and if the heart beat 100 times, the output for each beat would be 100 c.c. From the determinations made on animals the output is calculated for man to be 60-100 c.c. The velocity of the output can be calculated if the volume of the output is known, the duration of the period of output, and the diameter of the aorta. The pressure is measured with a manometer. The velocity is much greater at the orifice than in the aorta, for the blood can flow from the aorta during the whole cardiac cycle, while the whole of it must escape through the orifice into the aorta during the period of output. The work spent on maintaining the velocity is not, however, more than A of the whole and is generally neglected in the calculation. The output is not greater than 60-100 c.c. (3 oz.) (Tigerstedt, Nathan Zuntz), and the mean arterial pressure in a

healthy man, determined by the sphygmometer, is not more than no mm. of mercury (L. Hill). The work of the right heart can be reckoned to be J that of the left, for the pressure in the pulmonary artery does not exceed 30 mm. The total work of the heart during the day may be taken as equal to 20,000 kilogr.- metres, and this would be equivalent to 50 calories out of the total 2500 calories which a man takes in as food. A labourer does about 150,000 kilogrm. - metres of external work a day. The work of the heart is increased two or three times over during severe muscular labour. It has been estimated that the heart requires per diem, to maintain its energy, an amount of solid food (water-free) equal to the weight of solids in the heart itself, i.e. about 60 grms. of sugar or proteid. 30 c.c. of blood must be circulated per minute

The work of the heart.

through the coronary arteries of a dog to maintain the vigour of the heart.

The use of oxygen per grm. of weight per minute is high for the heart. Thus for the whole body of the dog there was used •017 c.c. per grm. per min., for the heart 045 -083, _. and for the active secretory glands -07-1-0 (Barcroft rt//fc/ y and Dixon). It has long been known that the heart of rfreu/a . frog or tortoise can be kept beating normally for hours tion ot after removal from the body, if it is provided with t /, e heart. an artificial circulation of blood or a suitable solution of salts. Sydney Ringer worked out the necessary ingredients of this solution to be

Sodium chloride Potassium „ Calcium ,, .

0-7%

0-03 %

The excised mammalian heart can be kept beating in the same way provided the nutritive fluid is oxygenated and the heart kept at body temperature. A solution containing one-third defibrinated blood and two-thirds Ringer's salt solution is most suitable. A mammalian heart thus; was restored to activity 7 days after death. The beat of the heart of a child was restored 20 hours after death from pneumonia. The excised heart of a cat was kept beating for 4 days. The heart of a monkey was restored after freezing the body of the animal. The nerves of the excised heart retain their action for some time if the nutritive fluid is immediately circulated through the coronary arteries. Thus the heart's action can be conveniently studied when taken from the body of a mammal.

The cause of the heart beat has naturally been one of the most continued objects of inquiry, and the point of view shifts with each advance of our experimental methods, and the wider extension of the inquiry throughout the animal world. '« e £ auSe H. Allen in 1757 was the first to announce that the activity ? *~f of the heart is not dependent on its connexion with the ? e *y nervous system. The excised heart, properly fed, con- tinues to beat. The heart of a dog continued to work effectively and the animal to keep in health for months after division of all the nerves passing to the heart. The heart, it is true, is controlled and influenced constantly by the nervous system — attuned to the general needs of the body — but this control is not essential to life. The above dog, when exercised, became fatigued quickly, owing to the lack of the nervous control of the heart- When in 1848 Robert Remak discovered that groups of nerve cells are contained in the heart of the frog, the causation of the beat was attributed to the activity of these ganglia.

Confirmation of this view was found in the experiment of Her- mann Stannius which demonstrates that the apex of the heart ceases to beat rhythmically if physiologically separated from the rest of the heart by ligature or momentary application of a clamp. The sinus, on the other hand, which contains ganglion cells, continues its beat as before when separated. Further experi- ment has shown that the beat of the heart cannot be ascribed to the rhythmic activity of the ganglion cells, which in the mammalian heart lie scattered in the base of the heart, in the neighbourhood of the venous opening and in the auriculo-ventricular groove. That this is so is shown by the fact that every strip of heart muscle, whether free of ganglion cell or not, is capable of rhythmic activity under suitable conditions (Walter Gaskell, 1847- , Theodor Wilhelm Engelmann, Alfred Win. Porter). The inherent power of rhythmic contraction is most clearly seen in the embryonic heart, for the pulsation of the chick's heart became visible by the 24th to 48th hour of incubation, while the migration of the ganglion cells into the heart from the sympathetic system does not take place until the sixth day (His.). The heart muscle is pervaded by a network of nerve fibrils, and the supporters of the neurogenic theory have had to fall back upon this network as the cause of the beat. The " myogenic " theorists place the causation in the muscle itself.

The pulsating " umbrella ' of the jelly-fish is formed of a network of nerve fibril and contractile elements, and this can be excited to contract by irritating any one of the sensory endings of the nervous network which are situated on the edge of the " umbrella." In the manifestation of a " refractory period " the " umbrella " behaves like the heart. _ Against this view we may cite the experiment of Tulius Bernstein (1839), who clamped off the

apex of the frog's heart to destroy the physiological continuity, kept the animal alive till the nerve network had degenerated and then found the apex could be mechanically excited to contract. Moreover, skele- tal muscle-fibres can be thrown into rhythmic contraction by the application of a suitable solution of salts (Wilhelm Biedermann, 1854), and it is probable that heart muscle is excited to rhythmic activity by such means. At any rate the beat is profoundly affected by varying slightly the nature and percentage of salts supplied in the nutritive fluid. Carlson has recorded experiments upon the heart of the horseshoe crab (Limultts) which show that its beat at any rate depends on the integrity of the median nerve (and its ganglion cells) which runs down the heart. On the other hand, Gaskell has shown that any small bridge of heart muscle left connecting the auricle and ventricle of the tortoise heart will transmit the wave of contraction, while if the nerve passing from

sinus to ventricle be left, and the muscular connexions entirely severed, no wave passes. In contradistinction to cross-striated muscle, the structural unit of the heart is not also a functional unit, for the heart-cells are, from the earliest stage of development, joined together by branches into networks and bands so as to form one functional whole, and hence excitation of any one part leads to the contraction of the whole. The first part to begin to functionate in the embryo, is the venous end, and the waves of contraction passing thence spread over the developing ventricular segment. The muscle-cells of the ventricles are thicker, less sarcoplasmic and more clearly striated than the auricular muscle, which is more embryonic in structure. The contraction lasts longer in the ventricular

than in the auricular muscle, while the automatic rhythm not only persists longer in the auricles, but is of greater frequency, as is clearly seen when the cavities of the heart are divided from each other. The venous orifices of the heart are least sensitive to injury, beat longest after death, and are the first to recover after arrest. Owing to the more powerful automatism of the venous extremity, the contraction normally proceeds thence, and. passing as a peristaltic wave over the auricles and ventricles, finally reached the arterial orifices. This peristaltic form of con- traction is invariable in all periods of development and in all hearts, both of invertebrate and vertebrate animals. The peristalsis may, with difficulty, be artificially reversed by the application of a powerful rhythmic stimulus to the ventricular end. Antiperistalsis does not, however, take place easily, because the comparatively slow excitatory process in the ventricle has little effect on the auricular muscle. The latter, by initiating more rapid contraction-waves, over-dominates the former. The frequency of the whole heart is accelerated by warming the auricles, while the period of systole is alone shortened on warming the ventricles.

The sequence in the beat of the three chambers of the heart is attributed by Gaskell to the delay that occurs in the excitatory wave passing through the muscular connexions in the sino-auricular and auriculo-ventricular junctions. He showed that such delay could be imitated by moderately clamping a strip of heart muscle; the compressed part transmitted the wave less readily, so that the part above and below the clamp contracted in sequence.

In the mammalian heart there has recently been discovered a remarkable remnant of primitive fibres persisting in the neighbour- hood of the venous orifices (representing the sinus). These fibres are in close connexion with the vagus

and sympathetic nerves, and

form the sino-auricular node of A. Keith and Martin Flack. If this node is squeezed by a !'y.z'-''_ 1^MSC^^/'^BSBfck. clamp, it prevents the

effect of excitation of the vagus reaching the heart. The auricle and ventricles of the mam- malian heart are connected through the septum by a remarkable bundle of muscle fibres which is believed to convey the ex- citatory wave from the Fig. 15. — The Right Auricle andVentricle one cavity to the other, of a Calf's Heart, exposed to show the The root of this auriculo- course and connexions of the auriculo- ventricular bundle lies in ventricular bundle. 1 , central cartil- the right auricle, the main age exposed by dissection; 2, the part is buried in the inter- main bundle; 3, auricular fibres from ventricular septum; its which the main bundle arises; 4, branches and twigs are right septal division; 5, moderator distributed to all parts of band; 6, a cusp of the tricuspid valve; either ventricle; the papil- 7, posterior group of the musculi lary muscles and fleshy papillaries; 8, orifice of the coronary columns, in particular, sinus; 9, above orifice of the inferior receive a direct supply. vena cava (10); 11, orifice of the The muscle ■ fibres are of superior vena cava; 12, septal wall a peculiar type, known of the right auricle; 13, appendix of as the cells of Pur- the right auricle; 14, septal wall of kinje. By this bundle it the infundibulum; 15, beginning of is believed every part of the pulmonary artery; 16, apex of the ventricle is brought the right ventricle. (After A. Keith, in into synchronous contrac- Journal of Anatomy and Physiology.) tion. To its degeneration

has been ascribed certain cases of disturbed cardiac rhythm, when the ventricle no longer follows the sequence of auricle. The evidence

of such degeneration is, at present, not convincing.

The contraction of the heart, like that of other muscle, is accom- panied by an electrical change. The part in contraction is at different potential to the part at rest. Thus an electrical wave accompanies the wave of contraction. This has been studied by means of the capillary, or the string, electrometer (Sir John Scott Burdon-Sanderson and Page, Einthoven, Gotch). The photographic records obtained with these instruments afford us a most beautiful

The

electrical change of the heart.

method of recording the rhythm of normal and abnormal hearts in man, for they can be obtained by connecting the right hand and left foot of a patient with the instrument. Einthoven, by making

since / \ erte- 1 p "-« I ates. \^/ N

Medulla .'

Fig. 16. — Electrical Changes of Heart. A, diphasic variation of auricle; R — V, diphasic variation of ventricle. R = base nega- tive; V = apex negative to base. After auricular contraction the ventricular is delayed — an example of arhythmia. (Einthoven.) The string galvanometer is the best method for elucidating dis- orders of cardiac rhythm, use of the telephone wires, recorded in his laboratory the electrical changes of the hearts of patients seated in a hospital 2 m. away.

The heart during the period of systole is refractive to artificial excitation, but its susceptibility returns with diastole. The force and amplitude of any cardiac contraction depend on the previous activity of the heart and on

such physical conditions as the degree of diastolic filling, the resistance to systolic outflow, temperature, &c, but are independent of the strength of the artificial stimulus so long as the latter is efficient. Owing to the refractory period, the slow rate of contraction and the independence of the amplitude of contraction on the strength of stimulus, the heart under ordinary conditions cannot be thrown, by rapidly repeated excitation, into a complete state of tetanic spasm. The refractory period can be shortened by heat (40 C), or by calcium and sodium salts until tetanus is obtainable. The cardiac muscle is rich in sarcoplasm, and on this depends its power of slow, sustained contraction. The heart-muscle, besides rhythmically contracting, possesses " tone," and this tone varies with the conditions of metabolism, temperature, &c. Chloroform, for example, produces a soft dilated, strychnine, adrenalin or ammonia a tonically contracted heart. The mam- malian heart ceases to beat at temperatures below 7 C. and above 44 Cm and passes into " heat rigor " at 45 C.

The Cardiac Nerves. — In 1845 the brothers Weber made the astonishing discovery that the vagus nerve, when excited, slowed or even arrested the action of the heart. This was the first proof of the ex- istence of inhibitory nerves. The cardiac inhibitory nerves have since been found in all classes of verte brates and in many invertebrate: Some years later v. Beyeld (1862) and Moses and Il'ya Cyon (1843—) discovered the existence of nerve fibres which, when excited, augmented and accelerated the beat of the heart. These nerves arise from 1-5 thoracic anterior spinal nerve roots and have their " cell stations " in the first thoracic and inferior cervical ganglia, whence they pass to the heart partly in company with the cardiac branches of the vagus, and partly as separate twigs. The vagus cardiac fibres arise by the middle of the lowermost group of vagus roots,

and have their/ cell- stations in the ganglion cells of the heart. _ These ganglion cells lie chiefly in the sub-pericardial tissue in the posterior wall of the auricles between and around the orifices of the venae cavae and pulmonary veins and between the aorta and pulmonary artery. The minute structure of these ganglia and the terminations of the nerves have been studied particularly by Dogiel. The inhibitory fibres arise from a centre in the spinal bulb which is in tonic action and constantly bridles the heart's action. When the vagi are divided the frequency of the heart increases and the blood pressure rises. The vagus centre is reflexly excited by the inhalation of chloroform, ammonia or other vapour irritant tothe air passages, also by the want of oxygen in the blood in asphyxia. It may be excited by irritation of the abdominal nerves, e.g. a blow on the abdomen, and by increased pressure in the cerebral vessels. The acceleratory and augmenting fibres

origins and vaso-

HeartN

Fig. 17.— The pneumogastric motor systems are in medulla, that of the sym- pathetic in upper portion of cord. The arrows in- dicate direction of nerve currents. In the heart R represents a reflex centre, I an inhibitory centre and A an accelerating centre.

likewise have their centre in the spinal bulb, and are in tonic action, antagonizing more or less the action of the vagal centre. The K vagus nerve works

directly on the cardiac muscle, and produces some change (signalized by a positive variation

in the electrical state of the heart) which results in a depression of the excitability, the con- ductivity, the force and the frequency of the heart. After the vagal arrest the heart beats more forcibly, owing, it is thought, to the greater accumulation of contractile material dur- ing the period of rest. The converse of all these effects occurs on stimu- lation of the accelerator nerves. Excitation of these nerves may excite to renewed efforts an excised heart, which has t- tt … T , r> i / di • , u • • J ust ceased to ‘ beat

From Howell’s r «f ^°| s{und?ra Cof ” * pem ” ss ”’ tt after withdrawal of the*

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Zero pressure .

supply of nutritive solution. Hence it is thought by some that the accelerator nerves

Fig. i 8. — B, arterial blood pressure. K, record of volume of kidney. Inhibi- tion of heart on faradizing vagus nerve.

tonically exert a sustaining influence on the heart.

The alkaloid atropin paralyses the vagal . nerve endings in the heart, while nicotine paralyses the ganglion cells. Muscarin obtained from poisonous fungi slows and finally arrests the heart. Adrenalin, the active principle of the medulla of the supra-renal glands, augments its power. Chloroform depresses it and in poisonous dose throws the heart into paralytic dilatation. A great many of the cardiac vagal fibres convey impulse to the spinal bulb (centripetal), and reflexly influence the heart frequency, the breathing and the tonus of the blood vessels. In particular certain fibres, termed depressor (discovered by Ludwig and Cyon, 1866), cause dilatation of the arterioles and a fall of arterial pressure by inhibiting the tonic action of the vaso-motor centre in the spinal bulb. The depressor fibres arise from the root of the aorta, and over-distension of this part excites them, as evidenced not only by the above effect, but also by the electrical variation (action current) which has been observed passing up the depressor nerve. Sensory impressions originating in the heart do not as a rule enter into consciousness. They are carried by the cardiac nerves to the sym- pathetic ganglia, and thence to the upper thoracic region of the spinal cord, where they come into relation with the sensory nerves from the pectoral region, upper limb, shoulder, neck and head. The impressions are not felt in the heart, but referred to these sensory cutaneous nerves. Thus cardiac pain is felt in the chest wall and upper limbs and particularly on the left side. The function of the cardiac nerves is to co-ordinate the beat of the heart with the needs of the body and to co-ordinate the functions of

other organs with the needs of the heart. For example, an undue rise of arterial pressure, induced, let us say, by compression of the abdomen, excites the centre of the vagus and produces slowing of the heart and a consequent lowering of arterial pressure. The heart of a mammal, however, continues to functionate after a section of all the branches of the cardiac plexus has been made, so that the nervous control and co-ordination of the heart are not absolutely essential to the continuance of life.

Water flowing through a tube from a constant head of pressure encounters a resistance occasioned by the friction of the h ir I movm £ water particles against each other and against the physical stat i onar y [ayer t hat wets the wall of the tube. Part of SC OI ™— e P °tential energy of the head of pressure is spent in en— ... ″ dowing the fluid with kinetic energy, the greater part in clrcula- overcoming this resistance is rubbed down into heat. The Won. narrower the tube is made, the greater the friction, until

finally the flow ceases, the total energy being then in— sufficient to overcome the resistance.

The resistance may be measured at any point in the tube by inserting a side tube in the vertical position. The water rises to a certain height in the side tube, indicating the head of pressure spent in overcoming the resistance between the point of measurement and the orifice. If the lower end of the side tube is bent thus J and inserted so that its orifice faces the stream, the water will rise higher than it did in the first case. The extra rise indicates the head of pressure spent in maintaining the velocity of flow. Such a method has been used to measure the velocity of flow in the vascular system (Napoleon Cybulski). When a stream of water is transmitted intermittently by the frequent strokes of a

pump through

a long elastic rubber tiibe, the fluid does not issue in jets as it would in the case of a rigid tube, tout flows out continuously. The elastic tube is distended by the force of the pump, and its elasticity main- tains the outflow between the strokes. The continuous outflow here depends on the elasticity of the tube and the resistance to flow.

In the vascular system an area of vessels of capillary size is placed between the large arteries and veins. This area opposes a great resistance to flow. The arteries also are extensile elastic tubes. The effect of the peripheral resistance, as it is called, is to raise the pressure on the arterial side and lower it on the venous. The re- sistance to flow is situated chiefly, not in the capillaries, but in the small arteries, where the velocity is high; for "skin friction" — that is, the friction of the moving concentric layers of blood against one anpther "and against the layer: which wets the wall of these blood vessels is proportional to the surface area and to the viscosity of the blood — is nearly proportional to the square of the velocity of flow, and is inversely proportional to the sectional area of the vessels. Owing to the resistance to the capillary outflow, the large arteries are expanded by each systolic output of the heart, and the elasticity of their walls comes into play, causing the outflow to continue during the succeeding diastole of the heart. The condi- tions are such that the intermittent flow from the heart is converted into a continuous flow through the capillaries. If the arteries were rigid tubes, it would be necessary for the heart to force on the whole column of blood at one and the same time; but, owing to the elasticity of these vessels, the heart is saved from such a prolonged and jarring strain, and can pass into diastolic rest, leaving the elasticity of the

distended arteries to maintain the flow. As a result of disease, the elastic tissue may degenerate and the arteries become rigid. Besides the saving of heart-strain, there are other advantages in the elasticity of the arteries. It has been found that an intermittently acting pump maintains a greater outflow through an elastic than through a rigid tube; that is to say, if the tubes be of equal bore: The four chief factors which co-operate in producing the conditions of pressure and velocity in the vascular system are — (i) the heart-beat, (2) the peripheral resistance, (3) the elasticity of the arteries, (4) the quantity of blood in the system. Suppose the body to be in the horizontal position and the vascular system to be brought to rest by, say, excitation of the vagus nerve and arrest of the heart. A sufficiency of blood to distend it collects within the venous cistern. The arterial system, owing to its elasticity and contractility, empties. If the heart now begin to beat, blood is taken from the venous system and is driven into the arterial system. The arteries receive more blood than can escape through the capillary vessels, and the arterial side of the system becomes distended, until equilibrium is reached, and as much blood escapes into the venous side per unit of time as is delivered by the heart. The flow in the capillaries and veins has now become a constant one and if the side pressure be measured it will be found to fall from the arteries to the capillaries, and from the capillaries to the venae cavae. In the large arteries there is a large side pressure which rises and falls with the pulses of the heart. The pulse waves spread out over a wider and wider area as the arteries branch. They finally die away in the arterioles. An increase or decrease in the energy of the heart-beat will increase or decrease respectively the velocity of flow and pressure of the blood. An increase or decrease in the total width of the arterioles

respectively will lessen or raise the resistance; increase or decrease the velocity; lower or raise the blood pressure. A loss of blood, other conditions remaining the same, would cause a decrease in pressure and velocity. As a matter of fact, such a loss is compensated for by the adjustability of the vascular system. Tissue lymph passes from the tissues into the blood, and the blood vessels of the limbs and abdomen constrict, and thus the pressure is kept up, and an efficient circulation main- tained through the brain, lungs and coronary vessels of the heart.

The whole vascular system is lined within by a layer of flattened cells, the endothelium; each cell is exceedingly thin and cemented to its fellows by a wavy border of an interstitial protoplasmic substance. The endothelium affords a s '™««" smooth surface along which the blood can flow with ff *f ease. Outside it there exists in the arteries and veins .*

*a middle and an external coat. The middle coat varies resse *• greatly in thickness and contains most of the non-striated muscle-cells, which in the smaller arteries and arterioles form' a particularly well developed band. In the larger arteries (fig. 19) a great deal of yellow elastic tissue, together with some white, fibrous tissue, pervades the middle coat. At the inner and outer border of this coat the elastic fibres fuse to form an internal and external fenestrated membrane. This coat endows the arteries with extensibility, elasticity and contractilitv. The outside coat consists mostly of white fibrous tissue and not only protects the arteries, but by its rigidity prevents over-distension. In the veins (fig. 20), where the middle coat is somewhat thinner and contains less elastic tissue, the outer coat ' consists mostly of muscle-fibres. The valves of the veins are formed of fibrous and elastic tissue covered with endothelium. As the arterioles*

branch into capil- laries the muscular and elastic elements become less and less, until in the capillaries themselves there is left only the layer of endo- thelium, supported by some stellate connective tissue cells The

capillaries form networks which accommodate themselves to the structure of the organs, e.g. longitudinal networks in muscle, loops

in the papillae of the skin, close-meshed networks round the . A alveoli of glands, cells of liver, &c. In the liver the blood penetrates into the substance of the liver- cells. As the capillaries join together to form the vennules, muscle fibres again appear and

From Young and Robinson, Cunningham's Text-Book oj Anatomy.

Fig. 19. — Transverse Section through the Wall of a Large Artery. A, tunica intima; B, tunica media; C, tunica externa.

From Young and Robinson, Cunningham's Text-Book of Anatomy.

Fig. 20. — Transverse Section of the Wall of a Vein. A, tunica intima; B, tunica media ; C, tunica externa.

coat the walls of the latter. The veins have a greater capacity than the arteries. Blood vessels, the vasa vasorum, supply the walls of the large vessels with nutrition.

T. externa

T. media T. intima

C B A»

From Young and Robinson, Cunningham's Text-Book of Anatomy.

Fig. 21. — Structure of Blood Vessels (diagrammatic). A 1 , capil- lary — with simple endothelial walls. A 2 , larger capillary — with connective tissue sheath, " adventitia capillans"; B, capillary arteriole — showing muscle cells of middle coat, few and scattered; C, artery— muscular elements of the tunica media forming a continuous layer.

The vaso-motor nerves end in a plexus of fibrils among the muscle- fibres. Ganglion cells occupy the larger nodes of the nerve plexus. The ends of a torn artery retract, coil up within the external coat and prevent haemorrhage. The arteries contract when mechanically irritated and remain contracted for a long time after excision. They tend to contract when submitted to increased blood pressure. The capillaries cannot contract of themselves, but their lumen can be widened or narrowed by the varying contractility or turgidity of the tissues in which they run.

The arteries successfully withstand elastic strain of the pulse 70 times a minute throughout the years of a long life. It has proved possible to stitch divided arteries and veins together so perfectly that the circulation can continue through them. A kidney has thus been successfully transplanted from one dog to another, and has continued to functionate normally.

The elastic coefficients of the several layers of the coat of an artery increase from within out, and thus great strength is obtained with the use of a small amount of material. Over-expansion of the arteries is checked by an external coat of inextensible connective tissue. The elasticity of a healthy artery is almost perfect, while the breaking strain is - very great and far above that exerted by the

blood pressure. The small arteries and arterioles are essentially muscular tubes, and can, under the influence of the central nervous system, vary considerably in diameter.

By the expulsion of the blood at each systole the walls of the aorta are suddenly distended. From the aorta a wave of The pulse, distension ripples down the walls of the arteries. This wave of distension is called the pulse. As the pulse is distributed over an ever-widening field its energy is expended and it disappears finally in the arterioles. From a wounded artery the blood flows out in pulses, from a wounded vein

continuously. To stop the haemorrhage the ligature must be applied between the wound and the heart in the case of the artery, and between the peripheral parts and the-wound in the case of the vein. The pulse travels about 20 times as fast as the blood flows in the arteries (7-8 metres per second). By feeling the pulse we can tell whether the heart-beat is frequent, quick, strong, regular, &c, and whether the wall of the artery is normal and the pressure in the arteries high or low. Frequency expresses the number per minute, quickness the duration of a single beat. The pulse is a most important guide to the physician. The pulse can be registered graphically by means of a sphygmograph. A lever rests on the radial artery and transmits the pulse to a system of levers which magnifies the movement and records it on a smoked surface moved by clockwork.

In such a record, or sphygmograph, the upstroke corresponds to systolic output of the left ventricle, marking the opening of the aortic valves, and the pouring of the blood into the arteries.

The downstroke represents the time during which the blood is flowing out of the arteries into

the capillaries. There are sub- sidiary waves on the downstroke. The chief of these is called the dicrotic wave, the notch preceding which marks the closure of the semilunar valves. The dicrotic wave is caused by the jerk back of the blood towards the heart when the outflow ceases, and is most manifest when the systole is short and sharp and the output of blood from the arterioles rapid, in other words when the heart- beat is strong, the systolic pressure high and the diastolic pressure low. A smaller wave, predicrotic, preceding this occurs during the period of output and sometimes is placed on the ascending limb of the pulse curve. This occurs when the peripheral resistance is great, and the pulse is then termed anacrotic.

Fig. 22. — Anacrotic Pulse.

Fig. 23. — Dicrotic Pulse.

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*1 • ' ' t * ! 1 !*

Figs. 22, 23 and 24 from AUchin's Manual of Medicine, by permission of Macmillan & Co. Ltd.

Fig. 24. — Normal Pulse, and Time Tracing in ^ sec.

A, Primary wave. C, Dicrotic wave.

B, Predicrotic wave. D, Post-dicrotic wave.

The form of these waves is modified by the pressure of application of the sphygmograph, and by instrumental errors ; and we have no scale by which we can measure the blood pressure in sphygmograph tracings. To do this another instrument, the sphygmomanometer, is employed.

The pulse may pass through the arterioles and reach the capillaries when the arterioles are dilated or when the capillaries are only filled

at each systole, as may be seen in the pink of the nail when the arm is held above the head, and in cases of aortic regurgitation.

A venous pulse may be recorded in the jugular vein; it exhibits oscillations synchronous with auricular and ventricular systole, and affords us important information in certain cases of heart disease. The normal average pulse rate is 72 per minute, in woman about 80; but individual variations from 40–100 have been observed consistent with health. In the newborn the pulse beats on the average 130–140 times a minute; in a one-year-old child 120–130; three years 100; ten years 90; fifteen years 70–75. Active muscular exercise may increase the pulse rate to 130. Nervous excitement, extreme debility and rise of body temperature also increase it markedly. The pulse is more frequent when one stands than when one sits, or lies down, and this is especially so in states of debility. The taking of food, especially hot food, increases it. By placing tambours on, say, the carotid and radial arteries and recording the two pulses syn- chronously, it has been found that the pulse occurs later, the further the seat of observation is from the heart. The velocity with which the pulse wave travels down the arteries has been determined thus. It is about 7–8 metres per second. The wave length of the pulse is obtained by multiplying the duration of the inflow of blood into the aorta by the velocity of the pulse wave. It is about 3 metres. As the return of venous blood and pulmonary circulation is favoured during inspiration so that the output of the left ventricle during the first part of inspiration is lessened and subsequently increased,

the sphygmograph reveals respiratory

oscillations; the whole line of the tracing falls during the first part of inspiration and rises sub- sequently.

The circulation in the capillaries may be studied by placing under the microscope a transparent membrane such as the web of the _. frog's foot, tail of tadpole, wing of bat, &c. By a special

caoltlarv illumination one may see the shadow of the blood cor- clrcula- puscles moving through the retinal vessels of one's own eye, tion anc ' even calculate the velocity of flow. The diameter

of the smaller capillaries is such as to permit the passage of the red blood corpuscles in single file only; their length is abcut ^th of an inch. The endothelial cells confine the blood from direct contact with the tissue lymph and so prevent its coagulation, but allow and regulate the exchange of material between the blood and lymph. This exchange is regulated by the vital activity of the cells, and does not follow such laws as pertain to filtration and diffusion through dead membranes. There is evidence to show that the cells of the hepatic capillaries are capable of protoplasmic movement and of phagocytosis. The pressure in the capillaries stands in closer relationship to that in the veins than to that in the arteries; for example, a rise of pressure in the venae cavae, other things remaining the same, raises the pressure in the hepatic capillaries to a like amount, while a rise of pressure in the aorta does not, for most of the arterial pressure is spent in overcoming the peripheral resistance. The filling of the capillaries in the skin varies greatly with tempera- ture, posture, &c. When the hand is cold the arterioles are so constricted that blood only passes through the wider and more direct capillaries. As the skin becomes warm it flushes, the arterioles dilating and all the

capillary networks becoming filled with blood. Muscular movements express the blood out of the capillaries, as may be seen by the blanching of the skin which occurs on clenching the hand. Raising the hand blanches, and lowering it congests the capillaries. The pressure and velocity in the capillaries thus constantly vary, owing to alterations in hydrostatic pressure, the pressure of the body against external objects, the contraction of the muscles, and the contraction of the arterioles. It is not possible therefore to set any definite figure to the capillary pressure or velocity. In the frog's web, with the foot confined and at rest, the velocity is about i mm. per second. We continually make slight movements to counteract the hydrostatic effect and prevent the congestion of blood in the capillaries of lower parts of the body. It is this tendency to congestion which makes it so difficult to stand absolutely motion- less for any length of time. The red corpuscles, being the heavier, occupy the axis, and the white corpuscles the peripheral layer of the capillary stream. If an irritant is placed on the membrane it will be observed that the capillaries become wider and crowded with corpuscles, the flow slackening and finally becoming arrested owing to the passing out of the plasma through the damaged capillary wall. The white corpuscles creep out between the endothelial cells into the tissues. Such are the first phenomena of inflammation. After obstruction of an artery collateral pathways are in most parts rapidly formed, for the anastomatic capillaries, stimulated by the increased blood flow, develop into arterioles and arteries.

Numerous anastomoses exist between the veins, so that if the flow of blood be obstructed in one direction it readily finds a passage inanother. Muscularmovement.alterationsof posture and respiratory movements particularly

forward the venous circulation. The barber's pole of the barber surgeon was grasped to increase the flow in the old blood-letting days. The valves in the veins allow the blood to be forced only towards the heart. The pressure in the veins varies according to the hydrostatic pressure of the blood column above the point of measurement. In the horizontal position, when this factor is almost eliminated, the pressure in the large veins is about equal to 5-10 mm. of mercury, and even may become negative on taking a deep inspiration. There thus arises the danger of air being sucked into a wounded jugular vein. If air does thus gain entry it may fatally obstruct the circulation.

The venous circulation is impeded by (1) a lessening of heart power, (2) valvular defects, such as incompetence or narrowing of the orifice which they guard, (3) obstruction to the filling of the heart, as in cases of pericardial effusion, (4) obstruction of the pulmonary circulation as in coughing, by pleuritic effusion, &c The results of venous congestion are a less efficient arterial circulation, a dusky appearance of the skin, a fall of cutaneous temperature, and an effusion of fluid into the tissue spaces producing oedema and dropsy. This last effect is not due to increased capillary pressure producing increased transudation as has been supposed, for no such increase in venous and capillary pressure persists under the conditions. It is due to the altered nutrition 01 the capillary endothelium and the tissues, which results from the deficient circulation.

If for any reason the left ventricle fail to maintain its full systolic output, it ceases to receive the full auricular input, and in consequence the pulmonary vessels congest. This tells back on the right heart, and the right ventricle is unable to empty itself into the congested pulmonary vessels, and this in its

turn leads to venous congestion. The final result of any obstruction thus is a pooling of the blood in the venous cistern. Dyspnoea results from cardiac insufficiency.

The flow la the veins.

rhage and

traastw

skin.

It is excited by the increased venosity of the blood acting on the respiratory centre. Both excess of carbon dioxide and deficiency of oxygen excite this centre. The increased respiratory movements aid the circulation.

The venous side of the vascular system, owing to the great size of the veins, has a large potential capacity, while many of the capil- laries in each organ are empty and collapsed, except at those periods of vaso-dilatation and nyperaemia which accompany extreme activity of function. The vascular system cannot be regarded as a closed system, for the blood- plasma, .whenever the capillary pressure is increased, transudes through the capillary wall into the tissue- spaces and enters the lymphatics. Thus, if fluid be transfused into the circulatory system, it not only collects in the capacious reservoirs of the veins and capillaries — especially in the lungs, liver and abdominal organs— but leaks into the tissue-spaces. Hence the pressure in the vascular system cannot be raised above the normal for any length of time by the injection of even enormous quantities of fluid. The lymphatics of tissue-spaces must be regarded as part of the vascular system. There is a constant give and take between the blood-plasma and the tissue lymph. If the fluid part of the blood be increased, then the capillary transudation becomes greater, and the excess of

fluid is excreted from the kidneys and glands of the alimentary canal. If the fluid part of the blood diminish, then fluid passes from the tissue-spaces into the ff aemor . blood, and the sensation of thirst arises, and more drink is taken. The circulation may be greatly aided by the trans- fusion of salt solution (o-8 %) or blood after severe hemor- rhage, or in states of surgical shock. Only the blood of man must be used. The direct giving of blood by connecting the radial artery of a relation to the median vein of a patient has been used as a means of effecting restoration. Blood may be withdrawn from the system slowly to the extent of 4 %, rapidly to the extent of 2 % of the bodyweight, without lowering the arterial pressure, owing to the com- pensatory contraction of the arterioles and the rapid absorption of fluid from the tissues into the blood. The withdrawal of the tissue-lymph excites extreme thirst and the great need for water which occurs after severe hemorrhage. About 75 % by weight of the tissues, excluding fat and bone, consists of water. The quantity of blood in the body is about ^ th of the body weight. That of tissue-lymph is unknown, but it must be considerable, probably greater than that of the blood. The lymphatics drain off the excess of fluid which transudes from the capillaries, and finally return it to the vascular system. The interchange between tissue, blood and lymph depends on the forces of the living cells, which are as yet far from complete elucidation.

We may define the velocity of the blood at any point in a vessel as the length of the column of blood flowing by that point in a second. In the case of a tube, supplied by a constant head of pressure, we can divide the tube and measure the outflow per second; knowing the volume of this, and the cross area of the artery, we can determine the length of the column. This kind of experiment cannot be done on the living

animal, because the opening of the vessel alters the resistance to flow, and the loss of blood also changes the physiological conditions. To determine the velocity other means must be devised. Ludwig invented an instrument called the stromuhr, consisting of two bulbs mounted on a rotating platform pierced with two holes. One bulb is filled with oil— the other with blood. The bulbs are connected together by a tube at their upper end, and the lower end of the one full of oil is brought over the hole in the platform. The central end of the artery is connected to the same hole and the peripheral end to the other, over which stands the bulb full of blood. The blood being allowed to flow displaces the oil out of the one bulb into the other; directly this happens, the bulbs are rotated and the one full of oil is again brought over the central end of the artery. The number of rotations per minute is counted, and the volume of the bulb being known we obtain the volume of blood that passes through the instrument per minute. In another instrument, the haemo- dromograph of Chauveau, there is inserted into the artery aJLtube in which hangs a small pendulum; the stem of the pendulum passing through a rubber dam which closes the vertical limb of the tube. The pendulum is deflected by the flow, and the greater the velocity the greater the deflection. The deflection can be recorded by connecting the free end of the pendulum to a tam- bour arrangement. This instrument allows us to record and measure the variations of velocity during systole and diastole of the heart, but it can only be used in the vessels of large animals. Still other methods have been employed by Cybulski and Stewart. The general relations of the velocity of the blood in the arteries, capillaries and veins is expressed by the curve shown in fig. 26. The velocity in the large arteries may reach 500 mm. per second

The,.

velocity of blood flow.

Fig. 25.— Ludwig's Stromuhr.

in systole and fall to 150 mm. in diastole. The smaller the artery the less is this difference and the more uniform the rate of flow.

1 Capillaries i

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Fig. 26. — Diagram showing General Relations of the Velocity of the Blood in the Arteries, Capillaries and Veins.

The flow in the large veins is approximately equal to that in the large arteries. In the jugular vein of a dog the mean velocity was found to be 225 mm. and in the carotid 260 mm. per second. The velocity in the capillaries has been measured by direct observation with the microscope. It is very small, e.g. 0–5–1 mm. per second. The variation of velocity in different parts of the vascular system is explained by the difference in width of bed through which the stream flows. The vascular system may be compared to a stream which on entering a field is led into a multitude of irrigation channels, the sum of the cross sections of all the channels being far greater than that of the stream. The channels unite together again and leave the field as one stream. If the flow proceeds uniformly for any given unit of time, the same volume must flow through any cross section of the system. Thus the greatest velocity is where the total bed is narrowest, and slowest where the bed widens to the dimensions of a lake.

The blood in leaving the heart may take a short

circuit through the coronary system of the heart and so back to the right heart, or it may take a long and devious course to the toes and back, or through the intestinal capillaries, portal system accessary am j j, e p at j c capillaries. It is obvious, then, that the time 1 t an y two particles of blood take to complete the circuit ™v* e may be widely different. Experiments have been made to t j n ' determine how rapidly any substance, like a poison, which enters the blood may be distributed over the body. A salt such as potassium ferrocyanide is injected into the jugular vein, and the blood collected in successive samples at seconds of time from the opposite jugular vein. These samples are tested for the presence of the salt, or a strong solution of methylene blue is injected into the jugular vein, and the moment determined with a stop watch when the blue colour appears in the carotid artery.

The velocity of flow also can be determined in any organ by injecting salt solution into an artery, and observing, with the aid of a Wheatstone's bridge arrangement, the galvanometric change in electrical resistance which occurs in the corresponding vein when the salt solution reaches it. The moment of injection and that of the alteration in resistance are observed with a stop-watch (Stewart).

It has been determined that the blood travelling fastest can complete the circuit in about the time occupied by 25 to 30 heart-beats, say in 20 to 30 seconds; a result which shows how rapidly methods must be taken to prevent the absorption of poisons — for example, snake-poison. The blood travelling fastest in the pul- monary circuit occupies only about one-fifth of the time spent by that in the systemic circuit. That some of the blood takes a very long time to return to the heart is shown by the long time it takes to wash the vascular system free of blood by the injection

of salt solution.

That the blood is under different pressure in the various parts of the The system has long been known. From a divided artery the

pressure blood flows out in forcible spurts, while from a vein it relation flows out continuously and with little force. It takes la the very little pressure of the fingers to blanch the capillaries

vascular of the skin, but an appreciable amount to obliterate the Mystem. radial artery.

Stephen Hales (1733) was the first to measure the blood pressure. He inserted a brass tube into the femoral vein of a horse and con-nected it to a long glass tube held vertically, using the trachea of a goose as a flexible tube, and found the blood rose to the height of 8 ft., oscillated there with each heart-beat, and rose and fell some- what with inspiration and expiration. In the vein he found the pressure to be only about 12 in. Poiseuille (1828) adapted to the same purpose the mercurial manometer, a U-shaped tube con-taining mercury, which, being 13-5 times heavier than blood, allowed the manometer to be brought to a convenient height.

From Howell's Text-Book of Pkysiology, by permission ol W. B. Saunders Co.

Fig. 27.

-Diagram showing Systolic, Mean and Diastolic Pressure.

The introduction of rubber tubing for the connexions made the method, of inquiry comparatively simple. The tubing connecting the arterial cannula and the manometer was filled with a suitable fluid to prevent coagulation of the blood; also to prevent more than a trace of blood entering the connexions. A satura-ted

solu- tion of sodium sulphate, or a 1 % solution of sodium citrate, may be employed for this purpose. Ludwig (1847) added a float provided with a writing style to the mercurial manometer, and brought the style to write on a drum covered with smoked paper and driven slowly round by clockwork — a kymograph By this means tracings of the arterial blood pressure are obtained, and the influence upon the blood pressure of various agents recorded and studied. For the veins a manometer filled with salt solution is used, as mercury is too heavy a fluid to record the far slighter changes of venous pressure. The manometer may be connected with a recording tambour.

The arterial blood-pressure record obtained with the mercurial manometer exhibits cardiac and respiratory oscillations as shown in fig. 18. The method gives us a fairly accu- rate record of the mean pressure, but the mass of the mer- cury causes such in- ertia that the instru- ment is quite una.ble to faithfully record the systolic and dia- stolic variations of pressure. To effect this record, delicate spring manometers of rapid action and small inertia have been in- vented. A mercury manometer provided with maximum and minimum valves has also been employed to indicate the maximal systolic and minimal diastolic pressure. To determine the blood pressure in man, an instrument called the sphygmometer is used. The writer's sphygmometer consists of a rubber bag covered with silk which is filled with air, and con- nected by a short length of tube to a manometer. This manometer con- sists of a graduated glass tube, open at one end. A small hole is in the side of the tube near this end. A meniscus of water is introduced up to the side hole — 'the zero mark on the scale— by placing the open end of the tube in water. The bag is now con- nected to the gauge so that the side hole is closed by the rubber tube. Covering the rubber bag with the hand and

pressing it on the radial artery until the pulse (felt beyond) is obliter- ated, one reads the height to which the meniscus rises in the manometer, and this gives us the systolic pressure in the artery. The air above the me- niscus acts as a spring, converting the instrument into a spring manometer. It is empirically graduated in mm. Hg.

It is very necessary to remember that the blood pressures, taken in differ- ent vessels and postures, vary with the hydrostatic pressure of the column of blood above the point of measure- ment. Thus in the standing posture the arterial pressure in the arteries of the leg is higher than in the arm by the height of the column of blood that separates the two points of measure- ment. In the horizontal posture the pressure is practically the same in all the big arteries. The pressure in the ascending aorta is kept about the same in all postures, while that of the leg arteries varies widely. The effect of gravity_ is compensated there by active changes in heart force, splanchnic dilatation, &c. (L. Hill). The systolic pressure of young men, taken in the radial artery with the arm at the same level as the heart, may be taken to be about no mm. of Hg. In men of 40-60 years the systolic pressure is often about 140 mm., but in some robust men it is no higher than in youth.

The venous pressure in man may be measured by finding the pressure just required to prevent a cutaneous vein refilling after it has been emptied beyond a valve. There is no accurate method

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FiG.28— Hill's Sphyg- mometer.

moaary circula- tion.

of measuring the capillary pressure. It and the venous pressure constantly vary from nothing to a positive amount with rest or movement of muscles, change of posture, &c.

The arterial pressure is raised during exertion by the more forcible beat of the heart — e.g. pressures of 140-190 mm. Hg have been observed immediately after a 3-mile race. It rapidly sinks to a lower level than usual after the exertion is over, e.g. 90 mm. Hg, owing to the quieter action of the heart and the persistence of the cutaneous dilatation of the blood vessels which is evoked by the rise of body temperature. The writer has observed in athletes rectal temperatures of 102-105° F. after long races. After meals there is an increase in cardiac force to maintain the flow through the dilated splanchnic vessels. Mental excitement raises the pressure— e.g. the writer's pressure may be no mm. before and 125 mm. Hg after giving a lecture. The origin of the blood pressure in the arteries is the energy of the heart. The pressure gradient depends on the peripheral resistance. In the arterials the pressure is spent, and little of it reaches the capillaries. The return of the capillary blood to the veins and the pressure in the veins is due partly to the re- mainder of the cardiac force, but more largely to the contraction of the skeletal muscles and the viscera, to the action of gravity in changes of posture and to the respiratory pump.

The pulmonary artery, carrying venous blood, divides and sub- divides, and the smallest branches end in a plexus of capillaries on the walls of the air-cells of the lung. From this plexus The pal- ^ e t,i oot j ; s drained by the radicles of the four pulmonary veins which open into the left auricle. The pressure in the pulmonary artery is less than one-third the aortic pressure, and the blood takes only one-

third of the time to complete the pulmonary circuit that it takes to make the systemic. The four chief factors which influence the pulmonary circulation are: (1) the forc« and output of the right ventricle; (2) the diastolic filling action of the left auricle and ventricle; (3) the diameter of the pulmonary capillaries, which varies with the respiratory ex- pansion of the lungs; (4) the intrathoracic pressure.

In inspiration the lungs are distended in consequence of the greater positive pressure on the inner surfaces being greater than the negative pressure on their outer pleural surfaces. The negative pressure in the intrathoracic cavity results from the enlargement of the thorax by the inspiratory muscles. When the elastic lungs are distended by a full inspiration they exert an elastic traction amounting to about 15 mm. Hg. The heart and vessels within the thorax are submitted to this traction — that is, to the pressure of the atmosphere minus 15 mm. Hg — while the vascular system of the rest of the body bears the full atmospheric pressure. The thin- walled auricles and veins yield more to this elastic traction than the thick-walled ventricles and arteries. Thus inspiration exerts a suction action, which furthers the filling of the veins and auricles. This action is assisted by the positive pressure exerted by the descending diaphragm on the contents of the abdomen. Blood is thus both pushed and sucked into the heart in increased amount during inspiration.

Experiment has shown that the blood vessels of the lungs when distended are wider than those of collapsed lungs. Suppose an elastic bag having minute tubes in its walls be dilated by blowing into it, the lumina of the tubes will be lessened, and the same occurs in the lungs if they are artificially inflated with air; but if the bag be placed in a glass bottle, and the

pressure on its outer surface be diminished by removing air from the space between the bag and the side of the bottle, the bag will distend and the lumina of the tubes be increased. Thus it is evident that inspiration, by increas- ing the calibre of the pulmonary vessels, draws blood into the lungs, and the movements of the lungs become an effective force in carrying on the pulmonary circulation. It has been estimated that there is about one-twelfth of the whole blood quantum in the lungs during inspiration, and one-fifteenth during expiration. The great degree of distensibility of the pulmonary vessels allows of frequent adjust- ments being made, so that within wide limits, as much blood in a given time will pass through the pulmonary as through the systemic system. The limits of their adjustment may, however, be exceeded during violent muscular exertion. The compressive action of the skeletal muscles returns the blood to the venous cistern, and if more arrives than can be transmitted through the lungs in a given time, the right heart becomes engorged, breathlessness occurs, and signs of venous congestion appear in the flushed face and turgid veins. The weaker the musculature of the heart the more likely is this to occur; hence the breathlessness on exertion which characterizes cardiac affections. The training of an athlete consists largely in developing and adjusting his heart to meet this strain. Similarly the weak heart may be trained and improved by carefully adjusted exercise. Rhythmic compression of the thorax is the proper method of resuscitation from suffocation, for this not only aerates the lungs, but produces a circulation of blood. By compressing the abdomen to fill the heart, and then compressing the thorax to empty it, the valves meanwhile directing the flow, a pressure of blood can be maintained in the aorta even when the heart has ceased to beat, and this if patiently continued may lead to renewal of the

heart-beat. There is no certain evidence that the pulmonary arteries are controlled by vaso-motor nerves. In the intact animal

circula- tion.

The

cerebral circula- tion.

it is difficult to determine whether a rise of pressure in the pul- monary artery is induced really by constriction of the pulmonary system, or by changes in the output of the heart;' hence different observers have reached conflicting conclusions. In the case of lungs which have been supplied with an artificial circulation and a constant head of pressure to eliminate the action of the heart, no diminution in outflow has been observed in exciting the branches of the vagus or sympathetic nerves which supply the lungs, or by the injection of adrenalin (Sir Benjamin C. Brodie (1783-1862), and Dixon, Burton-Spitz).

The portal circulation is peculiar in that the blood passes through two sets of capillaries. Arterial blood is conveyed to the capillary networks of the stomach, spleen, pancreas and intestines by branches of the abdominal aorta. The portal vein is ' .

formed by the confluence of the mesenteric veins with the po a splenic vein, which together drain these capillaries. The portal blood breaks up into a second plexus of capillaries within the substance of the liver. The hepatic veins carry the blood from this plexus into the inferior vena cava. Ligation of the portal vein causes intense congestion of the abdominal vessels, and so dis- tensile are these that they can hold nearly all the blood in the body : thus the arterial pressure quickly falls, and the animal dies just as if it had been bled to death. The portal

circulation is largely maintained by the action of the respiratory pump, the peristaltic movements of the intestine and the rhythmic contractions of the spleen; these agencies help to drive the blood through the second set of capillaries in the liver. The systole of the heart may tell back on the liver and cause it to swell, for there are no valves between it and the inferior vena cava. Obstruction in the right heart or pulmonary circula- tion at once tells back on the liver. The increased respiration which results from muscular exercise greatly furthers the hepatic circulation, while it increases the consumption of food material. Thus exercise relieves the over-fed man. The liver is so vascular and extensile that it may hold one-quarter of the blood in the body.

The circulation of the brain is somewhat peculiar, since this organ is enclosed in a rigid bony covering. The limbs, glands and viscera can expand considerably when the blood pressure rises, but the expansion of the brain is confined. By the expression of venous blood from the veins and sinuses the brain can receive a larger supply of arterial blood at each pulse. Increase in arterial pressure increases the velocity of flow through the brain, the whole cerebral vascular system behaving like a system of rigid tubes when the limits of expansion have been reached. For as the pressure transmitted directly through the arteries to the capillary veins must always be greater than that transmitted through the elastic wall of the arteries to the brain tissue, the expansion of the arteries can- not obliterate the lumina of the veins. The pressure of the brain against, the skull wall is circulatory in origin: in the infant's fontanelle the brain can be felt to pulse with each heart-beat and to expand with expiration. The expiratory impediment to the venous flow produces this expansion. A blood clot on the

brain or depressed piece of bone raise the brain pressure by obliterating the capillaries in the compressed area and raising the pressure therein to the arterial pressure. The arterial supply to the brain by the two carotid and two vertebral arteries is so abundant, and so assured by the anastomosis of these vessels in the circle of Willis, that at least two of the arteries in the monkey can be tied without grave effect. Sudden compression of both carotids may render a man unconscious, but will not destroy life, for the centres of respiration, &c, are supplied by the vertebral arteries. The vertebral arteries in their passage to the brain are protected from compression by the cervical vertebrae.

Whether the muscular coat of the cerebral arteries is supplied with vaso-motor nerves is uncertain. Hiirthle and others observed a rise of pressure in the peripheral end of the carotid artery on stimulating the cervical sympathetic nerve. The writer found this to be so only when the cervical sympathetic nerve was excited on the same side as the carotid pressure was recorded. If the circle of Willis was constricted, excitation of either nerve ought to have the effect; it is possible that the effect was produced by the vaso-constriction of the extra-cranial branches of the carotid. After establishing an artificial circulation of the brain Wiggins found that adding adrenalin to the nutritive fluid reduced the outflow, and it is supposed that adrenalin acts by stimulating the ends of the vaso- motor nerves, rather than by stimulating the muscular coats of the arteries. The veins of the pia and dura mater have no middle muscular coat and no valves. The venous blood emerges from the skull in man mainly through the opening of the lateral sinuses into the internal jugular vein; there are communications between the cavernous sinuses and the ophthalmic veins of the facial system, and with the venous plexuses of the

spinal cord. The points of emergence of the veins are well protected from closure by compres- sion. The brain can regulate its own blood supply by means of the cardiac and vaso-motor centres. Deficient supply to these centres excites increased frequency of the heart and constriction of the arteries, especially those of the great splanchnic area. Cerebral excitement has the same effect, so that the active brain is assured of a greater blood supply (Bayliss and L. Hill).

The cir- culation during muscular activity.

■ *In each unit of time the same quantity of blood must, on the average, flow through the lesser and greater circuit, for otherwise the circulation would not continue. Likewise, the average velocity at any part of the vascular system must be in- versely proportional to the total cross-section at that part. In other words, where the bed is wider, the stream is slower ; the total sectional area of the capillaries is roughly estimated to be 700 times greater than that of the aorta or venae cavae. Any general change in velocity at any section of this circuit tells both backwards and forwards on the velocity in all other sections, for the average velocity in the arteries, veins and capillaries, these vessels being taken respectively as a whole, depends always on the relative areas of their total cross-sections.*

The vascular system is especially constructed so that considerable changes of pressure may be brought about in the arterial section, without any (or scarcely any) alteration of the pressures in the venous or pulmonary sections of' the circulatory system. A high- pressure main (the arteries) runs to all the organs, and

this is supplied with taps ; for by means of the vaso-motor nerves which control the diameter of the arterioles, the stream can be turned on here or there, and any part flushed with the blood, while the supply to the remaining parts is kept under control. Normally, the sum of the resistances which at any moment opposes the outflow through the capillaries is maintained at the same value, for the vascular system is so co- ordinated by the nervous system that dilatation of the arterioles in any one organ is compensated for by constriction in another. Thus the arterial pressure remains constant, except at times of great activity. The great splanchnic area of arterioles acts as " the resist- ance box " of the arterial system. By the constriction of these arterioles during mental or muscular activity the blood current is switched off the abdominal organs on to the brain and muscles, while by dilating during rest and digestion they produce the contrary effect. The constriction of the splanchnic vessels does not sensibly diminish the capacity of the total vascular system, for the veins possess little elasticity. Thus variations of arterial pressure, brought about by constriction or dilatation of the arterial system, produce little or no effect on the pressure in the great veins or pulmonary circuit. The contraction of the abdominal muscles, on the other hand, greatly influences the diastolic or filling pressure of the heart. It is obviously of the utmost importance that the heart should not be over-dilated by an increased filling pressure during the period of diastole.

When a man strains to lift a heavy weight he closes the glottis, and by contracting the muscles which are attached to the thorax raises the intrathoracic pressure. The rise of intrathoracic pressure aids the pericardium in supporting the heart, and prevents over-dilatation by resisting the increase in venous

blood pressure. This increase results from the powerful and sustained contraction of the abdominal and other skeletal muscles. In the diagram already given it is clear that the contraction of T will counteract the contraction of A. At the same time the rise of intrathoracic pressure supports the lungs, and prevents the blood, driven out from the veins, from congesting within the pulmonary vessels. Over-dilatation both of the heart and lungs being thus prevented, the blood expressed from the abdomen is driven through the lungs into the left ventricle, and so into the arteries. So long as the general and intense muscular spasms continue, there is increased resistance to the outflow of the blood through the capillaries both of the abdominal viscera and the limbs. The arterial pressure rises, therefore, and the flow of blood to the central nervous system is increased. The rise of the intra- thoracic and intra-abdominal pressures, and the sustained contrac- tion of the skeletal muscles, alike hinder the return of venous blood from the capillaries to the heart, and, owing to this, the face and limbs become congested until the veins stand out as knotted cords. It is obvious that at this stage the total capacity of the vascular system is greatly diminished, and the pressure in all parts of the system is raised. It is during such a muscular effort that a degener- ated vessel in the brain is prone to rupture and occasion apoplexy. The venous obstruction quickly leads to diminished diastolic filling of the heart, and to such a decreased velocity of blood flow that the effort is terminated by the lack of oxygen in the brain. During any violent exercise, such as running, the skeletal muscles alternately contract and expand, and the full flood of the circulation flows through the locomotor organs. The stroke of the heart is then both more energetic and more frequent, and the blood circulates with in- creased velocity. Under these conditions the filling of

the heart is maintained by the pumping action of the skeletal and respiratory muscles. The abdominal wall is tonically contracted, and the reserve of blood is driven from the splanchnic vessels to fill the dilated vessels of the locomotor organs. The thorax is tonically elevated and the thoracic cavity enlarged, so that the pulmonary vessels are dilated. At each respiration the pressure within the thoracic cavity becomes less than that of the atmosphere, and the blood is aspirated from the veins into the right side of the heart and lungs; conversely, at each expiration the thoracic pressure increases, and the blood is expressed from the lungs into the left side of the heart. While the respiratory pump at all times renders important aid to the circulation of the blood, its action becomes of supreme importance during such an exercise as running. The runner pants for breath, and this not only increases the intake of oxygen, but

Influence of pos- ture on the cir- culation.

Such is

maintains the diastolic filling of the heart. It is of the utmost importance that man should grasp the fact that the circulation of the blood depends not only on the heart, but on the vigour of the respiration and the activity of the skeletal muscles. Muscular exercise is for this reason a sine qud uon for the maintenance of vigorous mental and bodily health. Under the influence of the muscular system comes not only the blood but the lymph. The lymphatics form a subsidiary system of small valved vessels, and drain the tissues of the excess of lymph, which transudes from the capillaries of the organs during functional activity, or in con- sequence of venous obstruction. The larger lymphatics open into the veins at the root of the neck. It is chiefly by the compressive action of the skeletal and visceral muscles, and the aspirating action of the respiratory pump, that

the lymph is propelled onwards. It must be borne in mind that the descent of the diaphragm during inspiration compresses the abdominal organs, and thus aids the aspirating action of the thorax in furthering the return to the heart both of venous blood and of lymph.

The circulation remains efficient not only in the horizontal but also in the erect position, and just as much so when a man, like a gymnast, is ceaselessly shifting the position of his body. Yet in a man standing six feet the hydrostatic pressure of a column of blood reaching from the vertex to the soles of the feet is equal to 14 cm. of mercury. The blood, owing to its weight, continually presses downwards, and under the influence of gravity would sink if the veins and capillaries of the lower parts were sufficiently extensile to contain it. actually the case in the snake or eel, for the heart empties so soon as one of these animals is immobilized in the vertical posture. This does not occur in an eel or snake immersed in water, for the hydrostatic pressure of the column of water outside balances that of the blood within. During the evolution of man there have been developed special mechanisms by which the determination of the blood to the lower parts is prevented, and the assumption of the erect posture rendered possible. The pericardium is suspended above by the deep cervical fascia, while below it is attached to the central tendon of the diaphragm. Almost all displacement of the heart is thus prevented. The pericardium supports the right heart when the weight of a long column of venous blood suddenly bears. upon it, as, for example, when a man stands on his head. The abdominal viscera are slung upwards to the spine, while below they are sup- ported by the pelvic basin and the wall of the abdomen, trie muscles of which are arranged so as to act as a natural waist-band. In tame hutch rabbits, with large patulous abdomens, death may result in from 15

to' 30 minutes if the animals are suspended and im- mobilized in the erect posture, for the circulation through the brain ceases and the heart soon becomes emptied of blood. If, however, the capacious veins of the abdomen be confined by an abdominal bandage, no such result occurs. Man is naturally provided with an efficient abdominal belt, although this in many is rendered toneless by neglect of exercise and gross or indolent living. The splanchnic arterioles are maintained in tonic con- traction by the vaso-motor centre, and thus the flow of blood to the abdominal viscera is confined within due limits. The veins of the limbs are broken into short segments by valves, and these support the weight of the blood in the erect posture. The brain is confined within the rigid wall of the skull, and by this wall are the cerebral vessels supported and confined when the pressure is increased by the head-down posture. Every contraction of the skeletal muscles compresses the veins of the body and limbs, fot these are confined beneath the taut and elastic skin. The pressure of the body against external objects has a like result. Guided by the valves of the veins, the blood is by such means continually driven upwards into the venae cavae. If the reader hangs one arm motionless, until the veins at the back of the hand become con- gested, and then either elevates the limb or forcibly clenches the fist, he will recognize the enormous influence which muscular exercise, and continual change of posture, has on the return of blood to the heart. It becomes wearisome and soon impossible for a man to stand motionless. When a man is crucified- — that is to say, immobilized in the erect posture — the blood slowly sinks to the most dependent parts, oedema and thirst result, and finally death from cerebral anaemia ensues. In man, standing erect, the heart is situated above its chief reservoir — the abdominal veins. The blood is raised by the action of the respiratory move- ments, which act both as a

suction and as a force pump, for the blood is not only aspirated into the right ventricle by the expansion of the thoracic cavity, but is expressed from the abdomen by the descent of the diaphragm. When a man faints from fear, his muscular system is relaxed and respiration inhibited. The blood in consequence sinks into the abdomen, the face blanches and the heart fails to fill. He is resuscitated either by compression of the abdomen, or by being placed in the head-down posture. To prevent faintness and drive the blood-stream to his brain and muscles, a soldier tightens his belt before entering into action. Similarly, men and women with lax abdominal wall and toneless muscles take refuge in the wearing of abdominal belts, and find comfort in prolonged immersion in baths. It would be more rational if they practised rope-hauling, and, like fishermen, hardened their abdominal muscles.

VASCULAR SYSTEM

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In the mature foetus the fluid brought from the placenta by the umbilical vein is partly conveyed at once to the vena cava ascendens by means of the ductus venosus and partly flows through Foetal. tWQ {,^[,^5 tnat unite with the portal vein, returning the blood from the intestines into the substance of the liver, thence to be carried back to the vena cava by the hepatic vein. Having thus been transmitted through the placenta and the liver, the blood that enters the vena cava is purely arterial in character; but, being mixed in the vessels with the venous blood returned from the trunk and lower extremities, it loses this character in some degree by the time that it reaches the heart. In the right auricle, which it then enters, it would also be mixed with the venous blood brought down from the head and upper extremities by the descending vena cava were it not that a provision exists to impede (if it

does not entirely prevent) any further admixture. This consists in the arrangement of the Eustachian valve, which directs the arterial current (that flows upwards through the ascending vena cava) into the left side of the heart, through the foramen ovale — an opening in the septum between the auricles — whilst it directs the venous current (that is being returned by the superior vena cava) into the right ventricle. When the ventricles contract, the arterial blood contained in the left is propelled into the ascending aorta, and supplies the branches that proceed to the head and upper extremities before it undergoes any further admixture, whilst the venous blood contained in the right ventricle is forced into the pulmonary artery, and thence through the ductus arteriosus — branching off from the pulmonary artery before it passes to the two lungs— into the descending aorta, mingling with the arterial currents which that vessel previously conveyed, and thus supplying the trunk and lower extremities with a mixed fluid. A portion of this is conveyed by the umbilical arteries to the placenta, in which it undergoes the renovating in- fluence of the maternal blood, and from which it is returned in a state of purity. In consequence of this arrangement the head and upper extremities are supplied with pure blood returning from the placenta, whilst the rest of the body receives blood which is partly venous. This is probably the explanation of the fact that the head and upper extremities are most developed, and from their weight occupy the inferior position in the uterus. At birth the course of the circulation undergoes changes. As soon as the lungs are distended by the first inspiration, a portion of the blood ofthe pulmonary artery is diverted into them and undergoes aeration; and, as this portion increases with the full activity of the lungs, the ductus arteriosus gradually shrinks, and its cavity finally becomes obliterated. ' At the same time the foramen ovale is closed by

a valvular fold, and thus the direct communication between the two auricles is cut off. When these changes have been accomplished, the circulation, which was before carried on upon the plan of that of the higher reptiles, becomes that of the complete warm-blooded animal, all the blood which has been returned in a venous state to the right side of the heart being transmitted through the lungs before it can reach the left side or be propelled from its arterial trunks. After birth the umbilical arteries shrink and close up and become the lateral ligaments of the bladder, while their upper parts remain as the superior vesical arteries. The umbilical vein becomes the ligamentum teres. The ductus venosus also shrinks and finally is closed. The foramen ovale is also closed, and the ductus arteriosus shrivels and becomes the ligamentum arteriosum.

The blood vessels are supplied with constrictor and dilator nerve fibres which regulate the size of the vascular bed and the distribu- tion of the blood to the various organs. The arteries may be Thevaso- com p arec j to a high pressure main supplying a town. By means of the vaso-motor nerves the arterioles (the house taps) can be opened or closed and the current switched on to or off any organ according to its functional needs. If all the arterioles be dilated at one and the same time, the aortic pressure falls, and the blood taking the pathways of least resistance, gravi- tates to the most dependent parts of the vascular system, just as if all the taps in a town were opened at once the pressure in the main would fail, and only the taps in the lower parts of the town would receive a supply. The discovery of the vaso-motor nerves is due to Claude Bernard (1851). He discovered that by section of the cervical sympathetic nerve he could make the ear of a rabbit flush, while by stimulation of this nerve he could make it blanch. Claude Bernard had the good fortune to make the

further discovery that stimulation of certain nerves, such as the chorda tyfnpani supplying the salivary gland, produces an active dilatation of the blood vessels. The vaso-constrictor fibres issue in the anterior spinal roots, from the second thoracic to the second lumbar root, and pass to the sym- pathetic chain of ganglia. The fibres are of small diameter, and probably arise from -cells situated in the lateral horn of the grey matter of the spinal cord. They each have a cell station in one other ganglion and proceed as post-ganglionic fibres to the cervical sympathetic, to the mesenteric nerves and to the nerves of the limbs. Nicotine paralyses ganglion cells, and by applying this test to the various ganglia the cell stations of the vaso-constrictor fibres sup- plying each organ have been mapped out. The vaso-dilator fibres have not so restricted an origin, for they issue in the efferent roots in all parts of the neural axis. The two kinds of nerves, although antagonistic in action, end in the same terminal plexus which

motor

surrounds the vessels. The presence of vaso-dilator fibres in the common nerve trunks is masked, on excitation, by the overpowering action of the vaso-constrictor nerves. The latter are, however, more rapidly fatigued than the former, and by this and other means the presence of vaso-dilator fibres can be demonstrated in almost all parts of the body. The nervi-erigentes to the penis and the chorda tympani supplying the salivary glands are the most striking examples of vaso-dilator nerves. The vaso-dilator nerves for the limbs issue in the posterior spinal roots (Bayliss). The posterior roots contain the afferent nerves (touch, pain, &c). Excitation of these fibres causes refiexly a rise of blood pressure directly, a vasodilata- tion of the part the nerves supply. Thus it is assured that the

irritated or injured part receives immediately a greater supply of blood. The vaso-motor centre exerts a tonic influence over the calibre of the arterial and portal systems.

Much labour has been done since to determine the origin and exact distribution of the vaso-motor nerves to the various organs, and the reflex conditions under which they come normally into action, and, as the fruit, our knowledge of these inquiries has come to a condition of considerable exactness. This knowledge is of great practical importance to the physician, and it is worth noting that it has been obtained entirely by experiment on living but anaes- thetized animals. No dissections of the dead animal could have informed us of the vaso-motor nerves. Vaso-motor effects can be studied by (1) inspection of the flushing or blanching of an organ; (2) measuring the venous outflow; (3) recording the pressure in the artery going to and the vein leaving the organ; (4) observations on the volume of an Organ. To make these observations, the organ is enclosed in a suitable air-tight box or plethysmography an opening being contrived for the vessels of the organ to pass through so that the circulation may continue. The box is filled with air or water and is connected with a recording tambour (see fig. 18).

The chief effects of vaso-constriction are an increased resistance and lessened flow through the organ, diminished volume and tension of the organ, the venous blood issues from it darker in colour and the pressure rises in the artery and falls in the vein of the organ, and its temperature sinks. Lastly, if a large area be constricted the general arterial pressure rises.

The centre is situated in the spinal bulb beneath the middle of the floor of the fourth ventricle. The tone of the vascular system is

not disturbed when the great brain and mid brain is destroyed as far as the region of the pons Varolii, but as soon as the spinal bulb is injured or destroyed the arterial pressure falls very greatly, and the animal passes into the condition of surgical shock if kept alive by artificial respiration. Painting the floor of the fourth ventricle with a local anaesthetic, e.g. cocaine, has the same lowering effect on the blood pressure. Division of the cervical spinal cord or of the splanchnic nerves lowers the blood pressure greatly. The one lesion cuts off the whole body, the other the abdominal organs from the tonic influence of the centre. The fall of pressure is due almost entirely to the pooling of the blood in the portal veins and vena cava inferior. On the other hand, electrical excitation of the lower end of the divided cord or splanchnic nerves raises the pressure .by restoring the vascular tone. If an animal be kept alive after division of the spinal cord in the lower cervical region, as it may be, for the phrenics, the chief motor nerves of respiration, come off above this region, it is found that the vascular tone after a time becomes restored and the condition of shock passes away. By no second section of the spinal cord can the general condition of shock be reproduced, but a total obstruction of the cord once more causes a general lossof the vascular tone. From the experimental result, so obtained, it is argued that subsidiary vaso-motor centres exist in the spinal cord, and there is evidence to show that these centres may be excited reflexly. After the lumbar cord has been destroyed the tone of the vessels of the lower limbs is recovered in the course of a few days. In this case the recovery is attributed to the ganglionic and nervous structures which are intercalated between the spinal cord and the muscular walls of the blood vessels. There are thus three mechanisms of control, the bulbar centre influenced par-

ticularly by the visual, auditory and vestibular nerves, the spinal centres and the peripheral ganglionic structures.

The vaso-motor centre is reflexly excited by the afferent nerves, and its ever- varying tonic action is made up of the balance of the " pressor " and " depressor " influences which thus reach it, and from the quality of the blood which circulates through it. Pressor effects, i.e. those causing increased constriction arid rise of arterial pressure, may be produced by stimulating the central end of almost any afferent nerve, and especially that of a cutaneous nerve. Depressor effects are always obtained by stimulating the depressor nerve, and may be obtained by stimulating the afferent nerves under special conditions. That these reflex vaso-motor effects frequently occur is shown by the blush of shame, the blanching of the face by fear, the blanching of the skin by exposure to cold and the flushing which is produced by heat. The rabbit's ear blanches if its feet are put into cold water. The vaso-motor mechanism is one of the most important of those mechanisms which control the body heat. Stimulation of the nasal mucous membrane causes flushing of the vessels of the head, constriction elsewhere and a rise of arterial pressure. Food in the mouth, or even the sight or

smell of food, cause dilatation of the vessels of the salivary gland. The mucous membrane of the air passages flush and secrete more actively when a draught of cold air strikes the skin. Ice placed on the abdomen constricts not only the vessels in the skin but those in the kidney. Many other examples might be given of the control which the vaso-motor system exerts, but the above are sufficient to suggest the

influence which the physician can bring to bear on the blood supply of the various organs.

Discussion has taken place as to whether depressor reflexes are brought about by lessening of the vaso-constrictor tone or by ex- citation of vaso-dilator nerves. Proof of an undoubtable character seems to have been produced that after division of the vaso-con- strictor nerves dilatation of a limb can be brought about reflexly by stimulating the depressor nerve, and in this case the effect must be produced by active excitation of the vaso-dilator nerves.

Under certain unusual conditions, e.g. deficient supply of oxygen, the vaso-motor centre exhibits rhythmical variations in tonicity which make themselves visible as rhythmical rises and falls of arterial pressure of slow tempo. A waxing and waning of respira- tion (Cheyne-Stokes breathing) frequently accompanies these waves. Such are observed in sleep, especially in children and in hibernating animals.

Bibliography. — References to all the authoritative papers up to 1892 on the circulation of the blood will be found in Tigerstedt's Lehrbuch der Physiologie des Kreislaufs, and up to 1905-1908 in the articles on the circulation published in Nagel's Handbuch der Physiologie des Menschen, viz. "Allgemeine Physiologie des Herzens, Die Innervation der Kreislaufsorgane," by F. B. Hofmann, " Die Mechanik der Kreislaufsorgane," by O. Frank. An elementary intro- duction to the subject will be found in Leonard Hill's Manual of Physiology, and a more extensive treatment of it in the same author's article on the "Mechanism of the Circulation," and Gaskell's article on the " Heart " in Schafer's Text-Book of Physiology, or in one of the larger text-books of physiology, such as that of Howell, Stewart Halliburton or Starling. (L.

E. H.)

IV. Pathology of the Vascular System

On account of its intimate relations with every part of the body, the circulation is prone to disturbances arising from a great series of causes. Some of these produce effects which may be regarded as functional — mere changes in metabolism, whose disturbances react upon the rest of the body; others give rise to definite structural alterations. In considering the pathology of the circulation, it is useful to divide it into that of the heart, that of the blood vessels and that of the blood.

The heart is liable to changes in the pericardium, malforma- tions, changes in the myocardium, changes in the Aearti endocardium, valvular lesions and functional dis- orders.

(1) The pericardium may become the seat of morbid changes in various cardiac enlargements, it may become stretched or dis- tended; but the most common and important of the changes is an inflammatory one, i.e. pericarditis. This may arise by way of the blood stream, as in rheumatism, scarlatina and other infective diseases, or by way of the lymph stream. The micro-organisms chiefly responsible for the production of pericarditis are the pneumo- coccus, the different varieties of streptococci and staphylococci, the bacillus tuberculosis, the bacillus coli, and sometimes the gono- coccus. In the acute form of the disease the shining serous membrane becomes first dull and lustreless, the blood Vessels engorged and an exudation of serum takes place; then fibrin is deposited both on the visceral and parietal layers. When the fluid is insufficient to keep the surfaces apart, the separation at each diastole gives rise to the well-known " friction rub." Sometimes the amount of exuda- tion pent up in the pericardial sac is so great as to necessitate its being drawn off. The

fluid may be serous or sero-fibrinous, or may be haemorrhagic, or have undergone a putrefactive change. An effusion of serous fluid into the pericardial sac causes considerable embarrassment to the course of the blood, by rendering the negative pressure, normally present in the sac, positive. The reason for the interference with the circulation brought about by this alteration of pressure is that the auricles are by compression rendered incap- able of accommodating the blood-return from the veins. Analogous effects are produced by pressure upon the heart from without, whether by aneurysm or tumour, and pleural effusion or pneumo- thorax, affecting the viscera from without. In pericarditis it has further to be remembered that the effect of the process itself upon the muscle fibres lying beneath the membrane is to cause a softening of texture and weakening of function, whereby the driving power of the heart is diminished. In obliteration of the pericardium, again, the presence of the adhesions between these two layers leads to interference with the contraction of the myocardium, whereby its functions are interfered with. Acute ventricular dilatation may be associated with pericarditis particularly when the latter is of rheumatic origin and is the result of the myocardial softening

referred to. Pericardial effusions usually undergo absorption, but various adhesions, and thickenings known as "white spots," may remain. Effusions other than inflammatory are found in the peri- cardium, i.e. hydropericardium, a dropsical accumulation, may be mistaken for an inflammatory one. It occurs in scarlatina, Bright's disease, as part of a general dropsy, or occasionally from some mechanical difficulty interfering with the local circulation. When the fluid is abundant, it may produce the effects noticed under the inflammatory

effusion, and the pericardium may become soddened and its endothelium degenerated. Haemopericardium, or blood in the pericardium, may occur apart from the amount that may be mixed with inflammatory effusions. It is associated with foreign bodies penetrating from the oesophagus, rupture of an aneurysm, or occasionally associated with scurvy and purpura. Gas and air may sometimes distend the pericardium. It is also liable to new growths, which are usually secondary in character, and tuberculosis and hydatids are sometimes found.

(2) Malformations. — We are ignorant of the causes which lead to imperfect development of the heart. Many of its malformations are of purely pathological interest, but others, such as deficiencies of the intraventricular septum, non-closure of the foramen ovale, patency of the ductus arteriosus, or malformations of the valves, pro- duce a series of secondary effects resultant on the deficient aeration of the blood and sluggishness of the circulation and of venous con- gestion. The train of symptoms is similar to those mentioned below under acquired valvular lesions, but dropsy is very rare.

(3) The Myocardium. — The coverings of the heart muscle can- not long be diseased without affecting the contractile substance itself. Any morbid changes in the lung tissues which impede the circulation through them, and more particularly emphysema, lead to change in the substance of the right ventricle, while morbid changes in the systemic arteries lead to changes in the left ventricle. In hypertrophy we have an increase of substance. Tangl found by direct measurement that the muscle cells are increased in diameter. The hypertrophy may be due to increased work thrown upon the muscle, as in athletics (idiopathic hypertrophy), or pay be compensatory, when the muscle is trying to overcome a circu- latory defect, as in valvular stenosis or regurgitation. Hyper-

trophy, when within physiological limits, is to be considered as a means of adaptation. When occurring in pathological cir- cumstances, it must be regarded as a method of compensation. Every structure and every function in a healthy body has greater or lesser reserve of energy. In healthy conditions the ordinary demands made upon various organs are far below their possible responses, and if these be excessive in extent or duration, the organs adapt themselves to the conditions imposed on them. In abnormal circumstances the process of hypertrophy is brought about by the power which the structures have of responding to the demands made upon them; and so long as the process is adequate, all disturbances may be averted. As an example of such readjust- ment may be cited the fact that in chronic renal cirrhosis, with increased thickness of the middle tunic of the arteries, there is hypertrophy of the left ventricle.

Dilatation of the heart is due to the inability of the heart muscle to expel the contents of its cavities. It may occur from temporary overstress or in the failing "compensation of valvular disease, or may accompany pathological changes in the muscle such as myo- carditis or one of the degenerations.

From the presence of toxic substances in the blood (whether introduced from without or arising within tha body) the cells of the cardiac muscle fibres are apt to undergo what is termed cloudy swelling — the simplest form of degenerative process. The cells become larger and duller, with a granular appearance, and the nuclei are less distinct. As a result of interference with nutrition, whether by simple diminution or perverted processes, fatty de- generation ensues. It may be associated, but is not necessarily connected, with adipose accumulation and encroachment commonly termed infiltration. In true fatty degeneration the muscle cells have part of their protoplasm

converted into adipose tissue. The fibres become granular, and the cells lose their definition, while the nuclei are obscure.

The myocardium undergoes both acute and chronic reaction changes. In the former there is enlargement of the nuclei, with proliferation but without karyokinesis. The muscle cells become swollen and lose their striation, while they are softer in texture and altered in outline. The intermuscular tissues are swollen, and may be invaded by leucocytes ; this may end in abscess for- mation or in the production of newly formed fibrous tissue. Chronic processes affecting the myocardium give rise to a large amount of fibrosis, and the newly formed fibrous tissue separates and com- presses the areas of muscle fibres, giving rise to what is commonly known as chronic interstitial myocarditis.

Restitution or recovery may occur to a varying extent in almost all of the disease-processes which have been considered, but it has to be kept in view that in certain of the degenerative affections there is little if any possibility of getting rid of the results of the process, which in the reactive changes terminating in the formation of much fibrous tissue, or its conversion into adipose or calcareous material, the same holds true. Many of the changes, which are

no doubt in their essence conservative, lead to far-reaching con- sequences, by their interference with nutritive possibilities.

Diseased conditions of the myocardium are frequently associated with atheromatous degenerations of the coronary arteries, and angina pectoris is said to depend upon such

state of malnutrition.

The causes which operate by means of the myocardium are almost invariably of a secondary character. The various degenera- tions already detailed, and the different forms of myocarditis, as well as simple debility of the muscle, are all examples of changes due to general or local disturbance. All processes which directly or indirectly interfere with the energy of the walls of the heart produce twofold effects, by diminishing the aspiratory or suction- pump action during diastole, and by lessening its expulsive or force-pump action during systole. The immediate result upon the heart itself of such disturbances is dilatation of that cavity immediately affected. This may occur under perfectly healthy conditions. In these, however, the dilatation is evanescent, while in the circumstances now under consideration it is permanent, and, although compensated, it leads to persistent dilatation. Upon the blood vessels the result, whether on account of diminished aspiratory or propulsive energy, is that the amount of blood in the arterial system is decreased, while it is increased in the venous. It is not a necessary consequence that because there is less blood in the drteries the arterial pressure will be diminished, or the venous pressure increased because the veins contain more than their normal amount of blood, seeing that the blood pressure depends upon many different factors. It is a fact, nevertheless, that in consequence of the alteration in the relative amount of blood in the arteries and veins there is a considerable disturbance of blood pressure. Gravitation may overcome the contractile and elastic factors, and several consequences arise from the resulting venous engorgement. Frpm transudation, oedema of the de- pendent parts of the body and the serous membranes occurs. From the sluggish nature of the current, the blood absorbs too much carbonic acid and loses

too much oxygen, hence cyanosis is the result. On account, also, of the slowness of the circulation, there is a longer period for radiation of heat, and the superficial parts of the body accordingly become cold.

The engorgement of internal organs leads to distinct changes in them. The solid viscera, such as the liver, the spleen, the kidney and the lung, become enlarged and hyperaemic, and if the disturb- ance be continued, cyanotic atrophy ensues. Change in structure, with loss of function, takes place from blocking of the vessels by blood-clot, whether due to coagulation on the spot, or by the conr veyance thither of clots formed elsewhere; a cirrhotic termina- tion also is not infrequent, although there is still some-doubt whether in this latter condition other concomitant causes have not at the same time been operative. The brain, although suffering less from hyperaemia, is subject to disturbance of the circulation through it, while it is a common seat of embolic and thrombotic processes. The heart itself, lastly, suffers in consequence of the disturbed circulation through it, and by undergoing venous stasis, with weakening of its walls and increase of its fibrous tissue, it completes the final link in a vicious circle. Effusion into the serous sacs, such as the pleura, the pericardium and the peritoneum, leads to great disturbance of the viscera with which they are con- nected. The mucous membranes, both respiratory and digestive, become the seat of catarrhal changes in consequence of the back- ward pressure and impure blood.

(4) Changes in the Endocardium. — In endocarditis, or inflamma- tion of the lining membrane of the heart, that portion of the mem- brane which covers the valves is invariably affected first. Two varieties of endocarditis are described, simple and infective or ulcerative, but it is difficult to separate

them pathologically. Both result from poisoning of the membrane by micro-organisms and their toxins; the main difference seems to lie in the variety of micro-organism present. Simple endocarditis may be associated with a variety of diseases, acute rheumatism and scarlet fever being the most frequent. In many fatal cases of chorea associated with endocarditis the micrococcus rheumaticus has been found in the endocardium, while the streptococci present in tonsilitis have produced endocarditis in animals. The membrane covering the valves loses its smoothness, granulations or elevations forming on the free edges; then the endothelium proliferates and is de- stroyed and fibrin becomes deposited, producing what is termed a " vegetation." In the lower layers of this vegetation micro organisms can be demonstrated. Finally, portions of the vegeta- tions may be broken off and carried as emboli in the bloodstream, or two valves may become glued together, narrowing the opening and producing stenosis, or the deformed valves may be unable to close properly and regurgitation takes place. Thus the lesions of val- vular disease are produced. In infective or ulcerative endo- carditis, occurring in conjunction with such diseases as pyaemia, septicaemia, smallpox and pneumonia, pyogenic micrococci are carried into the blood stream, and purulent deposits take place around the valves. In this case, however, the emboli are septic, and when carried to distant tissues produce there ulceration and pus-formation. Numerous abscesses may occur in the wall of the heart muscle itself.

(5) Valvular Lesions. — All the valves of the heart are not equally liable to disease; those most frequently affected are the aortic and mitral valves. We have seen how the lesions of the valves are brought about. A valvular lesion may act in two ways: it may impede the onward How of the blood by narrowing the orifice, or the mal-closure of the valves may allow a

reflux of blood. Either of these processes may occur at any of the valvular orifices of the heart. Obstruction is usually complicated by some regurgitation as well, though the converse does not hold good. An increase of the quantity of blood in the auricles, particularly the left, has a less marked effect on the heart itself than an increase in the con- tents of the ventricles, owing to the left auricle being in. continuity with the pulmonary system; whereas if the amount of blood in the left ventricle be doubled the ventricle must dilate in order to accommodate it. The reserve power of the heart is called upon to meet the dilatation, the muscular tissues becoming hyper- trophied. and a more powerful systole is produced. As the left is the chief ventricle to undergo this change, the apex of the heart becomes displaced downwards. Similar changes take place in the right ventricle in pulmonary stenosis or tricuspid incompetency. Changes in the right ventricle other than primary valvular disease of the right side of the heart are frequently, preceded by mitral incoippetence, and are due to extra pressure being thrown upon the pulmonary semilunar valves by the pressure m the overfull pulmonary system. In mitral regurgitation the accumulation of blood in the right auricular cavity leads to its dilatation and an engorgement of tfje pulmonary vessels, pulmonary oedema and induration of the lung, which in turn affects the right heart. Should compensatory hypertrophy of the right ventricle fail to be estab- lished, we get the general venous congestion, dropsy and sequence before alluded to.

(6) Functional Cardiac Disorders. — Cardiac rhythm may be modified in several ways; there may be variation in either the length or the strength of the beat, or the beats may not be asyn- chronous. In palpitation or tachycardia its frequency is increased. This increase depends upon the inhibition of the action of

the cardio-inhibitory centre, impulses passing to it from the stomach (as in dyspepsia) or from other organs. Tachycardia is also produced by toxic action, as in diphtheria and Graves's dfeease. In bradycardia the frequency is diminished. It may be diie to toxins or to degenerative changes. Intermittence may simulate brady- cardia, though the actual rate of the beat is not lessened; but the weak beats fail to reach the periphery. Various irregularities may take place, dependent upon perverted nerve action. It is con- sidered that the intrinsic nerve elements play a large part in these, and in some forms of disease the irregularity is of myocardial origin.

The blood vessels possess the properties of contractility and elasticity in different degrees. Their contractility is char- acterized by great tonicity, considerable rhythmic : action' and little or no rapidity of contraction. Their y e f se i£° elasticity stores up energy in a potential condition, and this may be liberated in kinetic form as required. The vessels are supported in various degrees by the different tissues in which they are found. In the more solid viscera they are strongly supported, as in the liver and kidney, while in those which are less dense, as in the case of the brain and the lungs, they are not so well sustained.

In many conditions the contractility and elasticity of the blood vessels become diminished according as they may be involved in various pathological processes— purulent, tuberculous or syph- ilitic. Chronic toxic conditions lead to numerous degenerations, such as fatty degeneration or hyaline degeneration of' muscle fibre, apparently as the effect of coagulative processes. The tissues assume a somewhat glassy appearance, with a distinct tendency towards segmentation. Calcareous infiltration'is brought about by the deposition of lime salts in tissues which have previously

under- gone fatty or fibroid changes; it particularly affects the arteries in senile affections. In consequence of many toxic agencies as part of a senile change, and as the effect Of long-continued 'stress, the blood vessels undergo a loss of their normal properties. This is compensated by the growth of an excessive amount of fibrous tissue, leading to various forms Of arterial sclerosis, of which the best known are endarteritis obliterans, which affects the smaller arteries and is due to a toxic irritant and may occur at any agei and endarteritis deformans (atheroma), which affects the larger arteries during middle age, and is usually due to mechanical irritation. As the result of these fibrous changes there is interference with the blood current, since the vessels become unyielding yet frangible, instead of distensile «nd elastic, tubes. The sclerotic changes lead, moreover, to dilatation of blood vessels, as well as to the formation of definite aneurysms. They also pave the way for coagulation of blood within them, i.e. thrombosis, while in certain situations, more particularly in the brain and in -the kidney, rupture is apt to take place. Upon the heart also these changes bring about far-reaching effects. Dilatation, accompanied by hyper- trophy, is a certain result of generalized arterial degeneration,

while changes in the coronary arteries lead to some of the definite results in the walls of the heart which have already been considered. Veins are subject also to mechanical and toxic effects. The pressure of abdominal tumours, the effects of the weight of a column, of blood on a long vein, constipation or bbstruction to the venous return may cause dilatations or varicosity. The dilatation thins the walls of the veins and the valves become incompetent;

the dilated vessel then becomes twisted and the surrounding tissues thickened by the growth of fibrous tissue. The thinned walls may rupture, and, owing to the loss of the valves> extensive haemor- rhages may take place. Thrombosis may follow the slowing of the blood current, and phleboliths are produced by the deposit of lime salts in it. Phlebitis is an acute inflammation of a vein. ' Apart from injury it usually follows invasion by a septic thrombus, as in the well-known phlegmasia alba Mens, when an infective clot from the uterine sinuses reaches the iliac veins. The pathology of the blood itself is treated under Blood.

VASE (through Fr. from La.i. vai, a, vessel pi. vasa, of which the singular vasum is rarely found; the ultimate root is prob- ably was-, to cover, seen in Lat; vestis, clothing, Eng. " vest," Gr. iotifc, and also in " wear," of garments), a vessel, par- ticularly one of , ornamental form or decoration; the term is often confined to such vessels which are uncovered and with two. handles, and whose height is great in proportion to their width. It is the general term applied to the decorative pottery, of the ancient Greets and Romans, of whatever shape (see CERAMICS).*

VASELINE, or mineral jelly, the Paraffinum molle of the British Pharmacopoeia, a commercial product of petroleum which is largely employed in pharmacy, both alone and as a vehicle for the external application of medicinal agents, especi- ally when local action rather than absorption is desired, and as a protective Coating for metallic surfaces. " Vaseline " is a registered proprietary name (coined from the German Wasser, water, the Greek e\au>v, oil, and the termination Mte), and is strictly applicable only to the material manufactured by one company (the Chesebrough Manufacturing Company), but it is commonly applied in a generic sense. As met with in. com merce, vaseline is a semi-solid mixture of

hydrocarbons, having* a melting-point usually ranging from a little below to a few degrees above ioo° F. It is colourless, or of a pale yellow colour, translucent, fluorescent, amorphous and devoid of taste and smelL It does not oxidize on exposure to the air, and is not readily acted on by chemical reagents. It is soluble in chloro- form, benzene, carbon bisulphide and oil of turpentine. It also dissolves in warm ether and in hot alcohol, but separates from the latter in flakes on cooling.

The process employed by the Chesebrough Manufacturing Com- pany in the manufacture of vaseline is said to consist essentially in the careful distillation of selected crude petroleum, vacuum-stills being used to minimize dissociation, and filtration of the residue through granular animal charcoal. The filters are either steam- jacketed, or are placed in rooms heated to 120° F., or higher. The first runnings from the filters are colourless, and when they become coloured to a certain extent they are collected for use as a lubricant under the name of " filtered cylinder oil." (B. R.)

VASILKOV, a town of Russia, in the government of Kiev, 23 m. by rail S.W. of the city of Kiev. Pop. 18,000, chiefly agri- cultural. Vasilhov was founded in the 10th century, but laid waste during the Mongol invasion of 1230^42. In 1320 it was taken by the Lithuanians, and later by the; Poles, under whom it remained until 1686, when it was annexed to Russia.

VASLUI, the capital of the department of Vaslui, Rumania; on a hill at the confluence of the Berlad and Vaslui rivers, and on the railway from Jas'sy to Galatz. Pop. (1900) 13,405. There are a fine pld church and ruins of a palace built in 1471 by Stephen the Great. The chief trade is in corn, wine, cattle and timber. A fair is held yearly, on the first ten days of September. ' -

VASSAL (Fr. vassal, vassaul, vassault, &c,), the tenant and follower of a feudal lord (see Feudalism) . The etymology of the word has beerr a matter of considerable dispute: The late Henri de Tourville, in his Histoire de la formation par- iicutariste, maintained that vassal is derived from the German (last, a guest, meaning an outsider to whom a portion of a free domain was assigned in return for rent and certain fixed services. This derivation has a Somewhat fantastic aii, and seems to have

been framed to suit an hypothesis. The commonly accepted etymology is from the Breton gwaz, Welsh gwds, a lad or a servant. As the word in its Latin form vassus was at first uniformly employed in the sense of slave, this explanation is the more acceptable of the two. If it is correct we may say that "vassal" was analogous in origin to the name of " boy " given to a coloured servant by Europeans in Asia and Africa, The word gained in dignity under the Frankish empire through the vassi dotninici, i.e. servants of the royal household, great officers of state, who were sent on extraordinary missions into the provinces, to act as assessors to the counts in the courts, or generally to settle any questions in the interests of the central power. Sometimes they were sent to organize and govern a march, sometimes they were rewarded with benefices, and as, with the growth of feudalism, these developed into hereditary fiefs, the word vassus or vassallus was naturally retained as im- plying the relation to the king as overlord, and was extended to the hoWers of all fiefs whether capital or mediate. As feudal independence increased, the word vassal lost every vestige of its original servile sense, and, since it had come to imply a purely military relation, acquired rather the meaning of " free warrior." Thus in medieval French poetry vasselage is commonly used in the spnse of " prowess in arms," or generally of

any knightly qualities. In this sense it also became acclimatized in England, and "vassal " came to be used as equivalent to free-born, soldierly, valiant and loyal, in which sense it is commonly used in medieval poetry. In countries which were not feudally organized— in Castile, for instance — vassal meant simply subject, and during the revolutionary period acquired a distinctly offensive signifi- cance as being equivalent to slave. The diminutive form vasseletus. for the son of a vassal, after strange fortunes returijed to something of its original sense of " household servant" in the modern " valet " (q.v.) (see also Vavassor).

See Dictionnaire' de I'ancienne longite francaise (Paris, 1895), for numerous examples of the use of the word vassal; also Du Cange; Glossafium, s. "Vassus."

VASSAR COLLEGE, a non-sectarian institution for the higher education Of women, about 2 m. E. of Poughkeepsie, New Ydrk, U.S.A. It was incorporated in i86r as Vassar Female College (which was.changed to Vassar College in 1867), and was named in honour of its founder, 1 Matthew Vassar, who transferred to a board of trustees of his own selection about $400,000 (increased by his. will" to twice that amount) and the tract of about 200 acres of land upon which the college was built. Building began in June 1861, and the institution was opened on 1 the 20th of September 1865, with John Howard Raymond 2 (18 14-1878) as president, and Hannah W. Lyman (1816-1871) as lady principal; it had a faculty of eight professors and twenty instructors and teachers, and an enrolment of 353 pupils. The first graduating class was that of 1867, and comprised four' members, to whom were given temporary certificates stating that they were ". entitled to be admitted to the First Degree of Liberal Arts, " as the propriety of awarding the degree of " bachelor " to

"Matthew Vassar (1791-1868) was born at East bejrelj&m, Tud- deiiham parish, Norfolk, England, on the 29th of April 179!, son of a Baptist who emigrated to the United States in 1796, settled 3 rq. E. of Poughkeepsie in 1797 and in 1801 established a brewery there. The brewery was burned in 1811, and Matthew took up the business and in 1812 established an " ale and oyster saloon " and a brewery, from which he became wealthy. He was a prominent member of the Baptist church.! He got the idea of founding a college for women from his niecS, Lydia Booth, a school teacher. He died on the 23rd of June 1868 while reading his farewell report to the Board of Trustees, His nephew, MAtthew Vassar, Jun, (1809-1881), was born in Poughkeepsie, became manager of his uncle's brewery, was a member of the Board of Trustees of Vassar College, and its treasurer until his death, gave in all about $500,000 to the institu- tion, and with his brother, John Guy Vassar (1811-1888), also one of the trustees and. a benefactor of the college, gave to the college the Vassar Brothers' Laboratory.

•Raymond graduated at Union College in • 1832; studied law and then (at Hamilton, N.Y.) theology; in 1839-49 taught rhetoric and English literature at Madison (now Colgate) University, at Hamilton, N.Y. ; Was professor of belles-lettres at Rochester University in 1 850-56 ;- and organized the Brooklyn Polytechnic Institute in 1856-65.

women was questioned at that time; in 1868 these certificates were replaced by diplomas bestowing the degree Of A.B. The present equipment includes more than twenty buildings, and the campus has an area of about 400 acres. The college confers the baccalaureate degree in arts (A.B.) upon the completion of. the regular

course of four years, and a second degree in arts (A.M.) upon Bachelors of Arts of Vassar or any approved college who have completed (by examination and thesis) a course of advanced non-professional study. In iooo^ro there were about ninety professors and instructors and 1040 students. The college had in 1909 total productive funds of about $1,360,006, yielding an income of about $600,000. James Monroe Taylor (b. 1848), a graduate of the university of Rochester and of Rochester Theological Seminary, became president of the college in 1886.

See Benson J. Lossing's Vassar College and its Founder {Hew York, 1867) and Frances A. Wood's Earliest Years at. Vassar (Pough- keepsie, N.Y., 1909).

VASTO (anc. Histonium), a fortified town of the Abruzzf, Italy, in the province of Chieti, situated high on an olive-clad slope, about a mile from the Adriatic, 32 m. direct S.E; : by E. of Chieti and 131 m. by rail from Ancona, 525 ft. above sea- level. Pop. (1901), 10,090 (town); 15,542 (commune). It is surrounded by medieval walls, and commands fine views extend- ing to the Tremiti Islands and Monte Gargano. The churches of S. Pietro and S. Giuseppe have Gothic facades. There is a medieval castle. The municipal buildings contain a collection of Roman antiquities and inscriptions. There are manufactures of earthenware, woollen cloth and silk; but the inhabitants are chiefly employed in the culture of the olive and in fishing.

The ancient Histonium was a town of the Frentani, and an Oscan inscription of the period of its independence speaks of censors there, probably officers of the whole community of the Frentani (see R. S. Conway, Italian Dialects, i. 208, Cam^ bridge, 1897). Though hardly mentioned in history, it was a flourishing municipal town under the Roman Empire, as is shown by the numerous

inscriptions found there. One of these mentions its Capitolium or temple of Jupiter, Jurio and Minerva. It lay on the line of the ancient road which prolonged the Via Flaminia to the S.E., and reached the coast here after haying passed through Anxanum (Lanciano). It was, and still is, subject to severe earthquakes. (T. As.)

VATICAN COUNCIL, THE, of 1869 and 1870, the last ecumeni- cal council of the Roman Catholic Church, and the most im- portant event in her historical development since the Tridentine synod. The preliminaries were surrounded by the closest secrecy. As early as the end of the year 1864, Pius IX. had commissioned the cardinals resident in Rome to tender him their opinions as to the advisability of a council. The majority pronounced in favour of the scheme, dissentient voices being rare. After March 1865 the convocation of the council was no longer in doubt. Thirty ^six carefully selected bishops of diverse nationalities were privately interrogated with regard to the tasks which, in their estimation, should be assigned to the prospective assembly. Some of them proposed, inter alia, that the doctrine of papal infallibility should be elevated to the rank of a dogma. In public, however, Pius IX. made no mention of his design till the 26th of June 1867, when Catholic bishops from every country were congregated round him in Rome on the occasion of the great centenary of St Peter. On the 29th of June 1868 the bull Aeterni Patris convened the council to Rome, the date being fixed for the 8th of December 1869. And since the Roman Catholic Church claims that all baptized persons belong to her, special bulls were issued, with invitations to the bishops of the Oriental Churches, to the Protestants and to the other non-Catholics, none of which groups complied with the request.

The object of the council was long a mystery. The Bull of Convocation was couched in perfectly general terms and specified no*

definite tasks — a circumstance which at first en- sured a favourable reception for the scheme, as it allowed ample scope to hope and imagination. But, among liberal Catholics,

this mood underwent a complete reversal when information began to leak out as to the object of the Curia in convening the council. The first— -epbch-making^revelation was given, M February 1869, by an article in the Civilta Catlolica, a periodical conducted under Jesuit auspices. It was there stated, as the view of many Catholics in France, that the council would be of very brief duration, since the majority of its members were in agreement. As a presumptive theme of the deliberations; it mentioned inter alia the proclamation of papal infallibility. The whole proceeding wis obviously, an attempt, from the Jesuit side, to gauge the prevalent opinion with regard to this favourite doctrine of ultramontanism. The repudiation was energetic and unmistakable, especially in Germany. Certainr articles On "The Council and the Civilta,!' .^published by Dollinger in the Allgemeine Zeitung, worked like a thunderbolt; Unions of the laity, designed to repel the encroachments of ultraniontanism, sprang .up immediately; and all manner of old ideas for the remodelling of the clergy were broached: anew. It; must, however, be admitted that counter demonstrations were not lacking. The attitude adopted by the German Episco pate well exemplifies ; the ecclesiastical situation of that period. The bishops tried to allay the excitement by- publishing a pastoral letter drawn • up in common; but in a written address to the pope they declared against the contemplated definition of infallibility In France also a violent conflict broke out. Here it was principally the writings of Bishop Maret in Paris (Du concile ginfral et de la paix religieuse, 2 vols., 1869), and' of Bishop Dupanloup of Orleans, which gave expression to*

the. pre valent unrest, and led to those literary controversies in which Archbishop Manning of Westminster and Dechamps of-Mechlin came forward to champion the opposite cause. In Italy the free-thinkers considered the moment opportune for renewing their agitations on a larger scale. They even attempted— •. though with no success worth the name-^to counteract the Vatican Council by a rival council in Naples. That the pro- jected dogma had weighty opponents among the higher clergy of Austria-Hungary, Italy and North America was demonstrated during the progress of the council; but, before it met all was qifiet in these countries.., The credit of inviting the European; governments to consider their attitude towards the forthcoming synod; belongs to the' president of the Bavarian ministry, Prince Chlodwig of Hohenlohe-Schillingsftirst, the future imperial chancellor. In his circular note to the Powers of the 9th :of April 1869 he analysed the political import of the doctrine of papal infallibility, 1 and proposed a common course of action; But his overtures met with no response. In view of the strained international situation, none of the Powers approached 1 was willing to take a step which might easily have : resulted in ■ a bitter conflict with the Church; and the studied vagueness of the Curia in its official pronouncements on the council enabled thetai to assume an attitude of reserve and suspension of judgt meht. France was equally inactive, though it rested with her to decide whether the couhcil could even meet in Rome: foij the withdrawal of her troops from the papal state would have been the signal for a patriotic Italy to sweep this last impedi-? ment to national unity from the face of the earth.

On none of the previous ecumenical councils did the Roman see exercise so pronounced an influence as on the Vatican. As early as the year 1865 a committee of cardinals had been

formed as a " special directive congregation for the affairs of the future general council," a title which was usually abbreviated to that of" Central Commission." Among the earliest preliminaries, a number of distinguished theologians and canonists were retained as consultors to the council. In the selection of these the pre- ference for men of ultramontane tendencies was so pronounced-f- Dollinger, for instance, was not invited— that the influences at work in the convocation of the council were obvious long before its opening. Under the control of the Central Commission were six sub-commissionS: (1) for dogma; (2) for matters of ecclesi- astical discipline; (3) for the religious orders; (4) for the Oriental Churches and the missions; (5) for the secular policy of the Church; 1 The note was drafted by Dollinger (see Infallibility).

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(6) for the ceremonial of the council. The pope nominated the presidents of the council (Cardinals Reisach, de Luca, Bizarri, Bilio and Capalti); also the secretaries and the remaining officials. Again, before the proceedings began, he determined the order of business on his own initiative (Multiplices inter d. d. Nov. 27, i860), — thus precluding, the members of the synod from any opportunity of co-operating in the task. In these regulations the right of fixing the subjects for debate was reserved to the pope. The members of the synod, it is true, enjoyed the privilege of proposing motions; but these motions could never reach the stage of discussion, except by the papal- sanction. Another fact of great importance was the strict privacy in which the labours of the council were to be conducted, the members being pledged to silence on every point. For their deliberations, two forms of assembly, analogous to those em-i ployed at Trent, were instituted: the congregationes generates and the sessiones.

The General Congregations, presided over by cardinals, were employed in considering the schemata (drafts) submitted to the synod; and provisory. votes— not regarded as binding— were there taken. The sessions witnessed the definitive voting, the results of which were to be 'immediately promul- gated as ecclesiastical law by the pope. The form of this pro- mulgation was in itself, sufficiently characteristic; for the pope was represented as the real agent, while the acknowledgment of the share of the council was confined to the phrase sacro appro- banie concilia. In contrast to this, we may refer to the synods of Constance and Trent (C. Mirbt, Quellen u.s.w., pp. 1 5 5-202, and the articles Constance, Council of, and Trent, Council of).' In the event of the drafts submitted by. the Curia not being unanimously adopted by the General Congregations, they were to be remitted, together with the objections raised, to special committees chosen from the body of the council. These com- mittees {congregationes speciales depntationes), the presidents of which were also nominated by the pope, were four in number: (1) for matters of belief; (2) for questions of ecclesiastical dis- cipline; (3) for the religious orders; (4) for affairs of the Oriental Churches. The whole proceedings took place in the church of St Peter, the- south transept of which had been prepared especially for the purpose. That the acoustic properties of the structure were unequal to the demands made upon them was obvious from the first day, and occasioned numerous complaints. On the 8th of December the first session met, and the council was solemnly opened by Pius IX. From beginning to end it was dominated by the '' Infallibility " problem. At the elections to the committees the fact was already obvious; for the leaders of the synodal majority in favour of the dogma took excellent care that no one should be chosen who was known to lean toward the opposite side. The order of*

procedure excited considerable dissatisfaction in many; and a series of petitions, with alter- native suggestions, was submitted to the pope, but without suc- cess. The very first transactions of the council gave proof that numerous bishops held the theory that their convocation im- plied the duty of serious and united work, and that they were by no means inclined to yield a perfunctory assent to the papal propositions, which — in part at least — stood in urgent need of emendation. The Curia awoke to this unpleasant fact during 'the discussion upon the first draft kid before the council,— the schema De Fide, — and some perplexity was the result; for on the 8th of December the second session had already been announced for the 6th of January. Since the consideration of the schema could not possibly be completed by that date, and since it was now futile to hope that the doctrine of infallibility would be carried by acclamation, and without debate, in that session, — Archbishop Darboy informing Cardinal de Luca that, in this event, a hundred bishops would leave Rome at once, — the second session, on the 6th of January, was reduced to a mere formality, the delegates again declaring their allegiance to the Professio Fidei Tridentinae, to which they had already pledged themselves at ordination. On the loth of January the schema De Fide was referred to the committee " for matters of belief,!' to receive further revision.

From the 10th of! January to the 22nd of February 1876 the

council was occupied with proposals concerning ecclesiastical discipline and with questions of church life. On this occasion it became evident that the synod was not blind to the necessity for many and various reforms. Even the College of Cardinals and the Curia did not escape. Complaint was made, for instance, that the papal chair and the Roman Congregations were

filled almost exclusively by Italians; while the controlof the Church Was too much centralized in ;Rome. Again, the treatment of impedi- ments to marriagesyof licences and of the scales of charges, was submitted to. criticism. The fact was elicited that the resolu- tions of provincial synods, when transmitted to Rome for appro- bation, were there subjected to arbitrary changes, so that the contents no longer corresponded with those to which the bishops had affixed their signatures. Even the desire for national assemblies and for ecumenical councils, held at regular intervals, found expression. The delicate subject of the compulsory celibacy of the clergy was also discussed; the notorious defects of the Roman Breviary were considered, and a long debate ensued with regard to the policy of drawing up a short catechism for the whole of Catholic Christendom. Even the proposals which led to these declarations of opinion— many of : which were neither anticipated nor desired— were hot accepted by the council, but returned for revision to the respective committees.

That matters progressed slowly was undeniable. It was the third month, and not one of the- proposals uhder consideration had been despatched. That this unexpected delay was a natural sequel to the character of the proposals themselves was a fact which the Curia declined to recognize. Consequently, as that body could rely; upon a complacent majority, it resolved to proclaim a new order of procedure, by means of which it would be possible to end these unwelcome : discussions and quicken the pace of the council. By the papal decree of the 20th of February the influence of the committees was increased; the majority was allowed to cut short a debate by accepting a motion for its closure; a plurality of votes was declared suffi- cient to carry a proposal; and the voting itself was modified by the

institution of a ″ conditional affirmative ″ (placet′ iuxta modum) in addition to the regular affirmative and negative (placet and non placet). Since neither the presidents nor the majority of the council could well be expected to employ the extensive powers thus placed at their disposal with much consideration for the rights of the minority; protests; by the weaker party against the new regulations "were hahtled in to the pope, but to no effect. ■ ■

The main object, however, of this alteration in procedure was to ensure that if the council could not be induced to accept the doctrine of infallibility by acclamation, it should at least do so by resolution. Front the first the general interest was almost exclusively concentrated on this question, which divided the members of the synod into two hostile camps. The adherents of the contemplated dogma — among whom Archbishop Manning of Westminster and Bishop Senestrey of Regensburg admittedly held the leading position— circulated petitions to the pope requesting the introduction of a proposal to meet their views; and, as a result of their efforts, the signatures of 480 bishops were obtained. This manoeuvre aroused the other side. Petitions to; the opposite effect were now similarly distributed, and signed by 136 bishops. On the 9th of February the committee of examination— as was only to be expected — resolved to re- commend the pope to grant the wishes of the majority. The remarkable feature of the situation created by these agitations was not that the majority of members declared in favour of the dogmatization of infallibility — that was a foregone conclu- sion in view of the strides made by ultramontanism in the Roman Catholic Church— but that so many could be found with courage enough to withstand the aspiration to which Pius IX. had given open expression on every possible occasion. The Weight of their opposition was accentuated by

the fact that the finest intellects and the ablest theologians of Catholi- cism were included in their ranks. The presence of striking personalities, whose devotion to the Church was beyond question, — Archbishop Scherr of Munich, Melchers of Cologne, Bishop

Ketteler of Mainz, Bishop Hefele of Rottenburg, Cardinal Schwarzenberg of Prague, Cardinal Rauscher of Vienna, Arch- bishop Haynald of Kalossa, Bishop Strossmayer of Sirmium, Archbishop Darboy of Paris, Bishop Dupanloup of Orleans, to say nothing of the others, — assured this group an influence which, in spite of itself, the opposing faction was bound to feel. If the minority indeed had formed one compact phalanx, the council might possibly have taken a different course; but this it was not, and the fatal truth could not be concealed from the pope and his advisers. The bond which united its members was not a repudiation of the doctrine of infallibility itself, but simply a common sentiment that its elevation to the rank of dogma was inopportune at the time. Some — possibly many — may have entertained serious doubts with regard to that doctrine; but, if such was the case, they succeeded in repressing and disciplining their suspicions, and the greatest anxiety was shown to avoid the least attempt at founding their resistance on a dogmatic basis. And here the weakness of the opposition is at once manifest; it lacked a clear and positive goal.

In outside circles the proceedings at Rome were followed with strained attention, and the battle round the question of infallibility was waged with equal violence in France and Germany. In the one country public interest was focused on the writings of Gratry, the former Oratorian; in the other on the trenchant

attacks of Dollinger. In England, Newman protested against the dogma. The progress of the council was marked by a plethora of controversial literature with which it was almost impossible to keep pace; articles and pamphlets were poured forth in increasing volume month after month, and even yet no classified collection of them is extant. Among them all, none exceeded in influence the Romische Briefe, first published in the Augsburg Allgemeine Zeitung, which gave a regular account of the most intimate transactions of the council, and maintained a high reputation for accuracy in spite of all attempts to discredit their authen- ticity. Important service in disseminating information among widely extended circles was done by the brochure Ce qui se passe au concile (May 1870), which revealed a number of pro- ceedings never intended for publicity.

Among the secret propositions submitted to the council by the Curia was the schema De Ecclesia Christi, which was dis- tributed to the members on the 21st of January. This con- tained fifteen sections, in which were defined the nature of the Church, the position of the pope in the Church, and, more especially, the relationship between the Church and the State. In case the harmony between these two magnitudes is disturbed, the responsibility lies with the State, because it thereby dis- regards the rights and duties of the Church (cap. 13). The divine law is binding on temporal sovereigns, but the adminis- tration of that law is a question which can only be decided by the supreme doctrinal authority of the Church (cap. 14). In addition to the education of youth, the Church demands ab- solute freedom in the training of its clergy and the abroga- tion of all restrictions on the religious orders, &c. Thus the superiority of Church to State was here enunciated in the same drastic terms as in the Syllabus oi Pius IX.

(1864) — a declara- tion of war against the modern political and social order, which in its day provoked the unanimous condemnation of public opinion. When, in spite of the injunction of secrecy, the schema became known outside Rome, its genuineness was at first impugned; but as soon as the authenticity of the text was established beyond the possibility of doubt, this attempt to dogmatize the principles of the notorious Syllabus excited the most general indignation, even in the strongholds of Catholicism — France and Austria. It almost appeared as if both governments, incensed by these encroachments on the sphere of the State, were at last bent upon bringing pressure to bear on the future deliberations of the council; but the international situation enabled the Curia to persist in its attitude of strict negation towards the despatches of Count Beust and Count Daru. On political grounds Napoleon was not inclined to employ any form of coercion against the synod;

Bismarck maintained a like reserve; and although Lord Acton influenced Gladstone in the contrary direction, Lord Clarendon followed Odo Russell, his charge d'affaires in Rome, who was himself adroitly kept in hand by Manning. Thus the danger that the attitude of the secular powers might imperil the liberties of the council was averted for the second time.

From the 22nd of February to the 18th of March no meetings of the General Congregations took place, on account of struc- tural alterations in the aula itself. During this interval all uncertainty as to whether the question of infallibility would actually be broached was dispelled. On the 6th of March a supplementary article to section 11 of the schema De Ecclesia, dealing with the primacy of the Roman see, was transmitted to the members, and in it the much disputed doctrine received formal expression. But before the animated discussions

which centred round this problem could begin, it was imperative to conclude the debate on the schema De Doctrina Catholica. From the deputation " for matters of faith " it returned to the plenum in a considerably modified form, and there it occupied the attention of the assembly for a full month, beginning with the 1 8th of March. Even in this later stage it frequently gave rise to trenchant criticism; but the greatest sensation was created by a speech of Bishop Strossmayer, who took exception to the terms of the proposal on the ground that it described Pro- testantism as the fountain-head of naturalism and as an unclean thing (pestis). There followed a dramatic scene: the orator was interrupted by the president and compelled by the outcries of the indignant fathers to quit the tribune. Nevertheless, Strossmayer by his courageous protest succeeded in modifying the objectionable clauses. The bishops of the minority were still dissatisfied with several passages in the schema, but, desirous of concentrating their whole available force in opposi- tion to the next proposal, they suppressed their doubts; and the result was that, on the 24th of April, in the third public session, the Constitutio dogmatica de Fide Catholica 1 was adopted unanimously and immediately confirmed by the pope.

Meanwhile, the elaboration of the all-important business of the council had been quietly proceeding. Influenced by the alarming number of amendments to the schema De Ecclesia, and anxious above all to ensure an early acceptance for the dogma of infallibility, the deputation abandoned the idea of subjecting the entire doctrine of the Church to debate, and resolved to eliminate everything save the one question of papal authority, and to submit this to the council alone. That this procedure directly challenged criticism was obvious enough, and, within the synod, several speakers drew

attention to the capriciousness of a method which required them to consider the infallibility of the pope before the nature of the Church herself had been defined. The event, however, justified the wire-pullers of the council in their policy, for the path they chose obviated the danger that the discussion might lose itself in a maze of generalities. It is impossible to give a short and, at the same time, an adequate account of the debate: lengthy disquisitions were the order of the day, and the disputants did not scruple to indulge in verbose repetition of arguments worn threadbare by their predecessors. A pleasant impression is left by the great candour of the opposi- tion speakers, who, in the course of the next few weeks, made every point against the doctrine which in their position it was possible to make. In the general debate, begun on the 13th of May, Bishop Hefele of Rottenburg, author of the well-known Konziliengeschichte, criticized the dogma from the standpoint of history, adducing the fact that Pope Honorius I. had been condemned by the sixth ecumenical council as a heretic (680). Others were of opinion that the doctrine implied a radical change in the constitution of the Church: one speaker even charac- terized it as sacrilege. The contention that the dogma was necessitated by the welfare of the Church, or justified by con- temporary conditions, met with repeated and energetic repudia- tion. The champions of infallibility were, indeed, confronted with no slight task : — to establish their theory by Holy Writ and tradition, and to defend it against the arguments of history. 1 Mirbt, Quellen, 371-77.*

But to them it was no hypothesis waiting to be verified, but an already existing truth, the possession of which no extraneous attacks could

for a moment affect. On the 3rd of June the general debate was closed, and forty prospective orators com- pulsorily silenced.

In the special debate, which dealt with the proposal in detail, every important declaration with regard to the pope was im- pugned by one party and upheld by the other. The main assault was naturally directed upon the fourth section, " con- cerning the doctrinal authority of the pope," and Archbishop Guidi of Bologna, in particular, incurred the resentment of the majority through his outspoken utterances on the subject. Im- mediately after the session he was summoned to the Vatican, and, on defending his attitude by an appeal to tradition, received from Pius IX. the celebrated answer, " I am the tradition." From the beginning of July onwards it became increasingly evident that the council was on the verge of ex- haustion: the great heat was positively dangerous to members accustomed to a colder climate, and the opinion gained ground that the spokesmen of both parties had sufficiently elucidated their views for the benefit of the conclave. Many delegates who had announced their intention of speaking relinquished the privilege, and on the 13th of July it was found possible to conclude the debate. On that day the voting in the 85th General Congregation, on the whole schema, showed that, out of 601 members present, 451 had voted placet, 88 non placet and 62 placet iuxta modum. That the number of prelates who rejected the placet would amount to 1 50 had not been expected. The question was now: Could the doctrine of infallibility be raised to dogmatic rank when it was repudiated by so formidable a minority? At the height of the crisis several leaders of the opposition attempted, by a direct appeal to the pope, to secure a modification in the terms of the dogma, which might enable them to give their assent. On the evening of the 15th of July six bishops were accorded an audience with Pius

IX., in which they preferred their modest requests. Ketteler threw himself at the feet of the pope and implored him to restore peace to the Church by a little act of compliance. The touching scene appeared to have made some impression on Pius IX.; but, after the deputation had left, opposing influences gained the ascendant, and the result was simply that the clauses on which everything hinged received an addition the reverse of con- ciliatory (General Congregation, 16th July). The bishops who had hitherto formed the recalcitrant minority were now face to face with the final decision. On the one hand was their loyalty to the pope, allied with the desire to avoid any demonstration calculated to impair the prestige of the Church; on the other, their conviction that the very doctrine which the council was about to proclaim as dogma was a gigantic error. There was but one way out of the impasse, — to leave Rome before the : deciding session, — and on the 16th of July the pope met their wishes and accorded the leave of absence previously withheld. A section of the dissentient bishops reiterated their views in a letter to Pius IX., and agreed to direct their subsequent actions in common— a compact which was not observed. On the 18th of July, in the fourth public session, the dogma was accepted by 535 dignitaries of the Church, and at once promulgated by the pope; only two members repeated their non placet, and these submitted in the same session. The council continued its labours for a few more weeks, but its main achievement was over, and the remainder of its time was occupied with affairs of secondary importance. When, coincident with the outbreak of the Franco-German War, the papal state collapsed, the pope availed himself of the altered situation, and prorogued the council by the bull Postquam Dei munere (October 20). The Italian government at once protested against his statement that the liberties of the council would be prejudiced by the incorporation of

Rome into the kingdom of Italy.

The resolutions of the Vatican Council entirely revolutionized the position of the pope within the Church. He is first accredited with " complete and supreme jurisdictionary authority over the whole Church, not simply in matters of faith and morality,

but also in matters touching the discipline and governance of the Church; and this authority is a regular and immediate authority, extending over each ' and every Church and over each and every pastor and believer" (Sessio iv. "cap. 3, fin.; Mirbt, Quellen, p. 380). These words conceded to the pope a universal episcopate in the entire Church, in virtue of which he may, at any time, in any diocese, exercise the functions of the regular bishop: the individual bishop forfeited the independence which he had formerly enjoyed, and the episcopate as a whole was dispossessed of that position which, in preceding centuries, had enabled it to champion the true welfare of the Church against a decadent papacy. Nor was this all: it is laid down " as a dogma revealed by God, that the Roman pontiff, when he speaks ex cathedra, — that is to say, when, in virtue of his supreme apostolical authority, and in the exercise of his office as pastor' and instructor of all Christians, he pronounces any doctrine touching faith or morality to be binding on the whole Church,— is, by reason of the divine assistance promised to ■ him in the person of St Peter, endowed with that infallibility which, according to the will of the Redeemer, is vouchsafed to the Church when she desires to fix- a doctrine of faith or morality; and that consequently all such decisions of the Roman pontiff are per se immutable and independent of the subsequent assent of the Church. But if any man,— which Heaven forefend !" proceeds the document, "shall venture to deny this definition, let him be accursed!" (Sessio iv. cap. 4; Mirbt, Quellen, p. 381). These clauses

contain the doctrine of papal infallibility, and make the recognition of that doctrine incumbent on all Catholic Christians. But how are we to recognize whether the decision of the pope is given " in the exercise of his doctrinal office," or not? No criterion is assigned, and no authentic interpreta- tion has been accorded from the chair of St Peter. Thus great uncertainty prevails with regard to utterances ex cathedra, and the result has been that every papal declaration has tended to be invested with the halo of infallibility. Again, the dogma; implies a fundamental change' in the position of the ecumenical councils, which, in conjunction with the papacy, had till then been supposed to constitute the representation of the Roman Catholic Church. By the Vaticanum they lost every vestige of actual, independent authority, for their function of. defining the doctrine of the Church now passed to the pope; and, though in the future they may still be convened, their indispensabiKty is a thing of the past. They have ceased to form a constituent organ of the Church, and are sunk to the level of a decorative or consultative assembly. Thus the decrees of the council possess a double significance; they have not only erected the papacy into the sole tribunal for questions of belief, but have at the same time radically transformed the constituti6n of the Church. The two factors which previously served to check the papal ambition have been shorn of their strength, and the papacy has attained the status of an absolute monarchy. The concurrent loss of the papal states, so far from enfeebling this new absolutism, tended, in spite of the protests of the Curia, to increase its strength, for its position now became unassail- able, and it was enabled to concentrate its energies on a purely international policy ta a greater extent than formerly:*

The bishops, who, on the council, had impugned the doctrine of papal infallibility, submitted without exception to the pro- mulgated dogma. Confronted with the alternative of either seceding from the Church or adopting a theory which they had previously attacked, they resorted to the " sacrifice of reason," many with bleeding hearts; many, as it would seem ■, without any pangs of conscience. But though they submitted they failed to carry with them the whole of the theologians and lay men who had ranged themselves at their side in the battle against the dogma; and after the conclusion of the council a new Church, was formed, which, in contrast with thz fin de Steele Catholicism which, by the Vatican Synod, had cut itself loose from the; traditions of the past, was termed Old Catholic (see the special article).

In the sphere of politics also the Vaticanum was attended by important results. The secular governments could not remain

indifferent to the prospect that the proclamation of papal infallibility would invest the dicta of the medieval popes, as to the relationship between Church and State, with the character of inspired doctrinal decisions, and confer dogmatic authority on the principles enunciated in the Syllabus of Pius IX. Nor was the fear of these and similar consequences diminished by the proceedings of the council itself. The result was that on the 30th of July 1870, Austria annulled the Concordat arranged with the Curia in 1855. In Prussia the so-called Kulturkampf broke out immediately afterwards, and in France the synod so accentuated the power of ultramontanism, that, in late years, the republic has taken effectual steps to curb it by revoking the Concordat of 1801 and completely separating the Church from the State.

The antecedent history of the council was long; its subse- quent history is a chapter which has not yet been closed. That the dogma was carefully prepared beforehand, mainly by the Society of Jesus, is a demonstrable and demonstrated fact, notwithstanding the denials emanating from writers belonging to the society.

The general position of Roman Catholicism was consolidated by the Vatican Council in more respects than one; for not only did it promote the centralization of government in Rome, but the process of unification soon made further progress, and the attempts to control the intellectual and spiritual life of the Church have now assumed dimensions which, a. few decades ago, would have been regarded as anachronistic. On the other hand, however, a counter-movement can be traced in all countries with a predominant Catholic population,— the so- called Reformed Catholicism, which may wear a different aspect in different districts and different strata of society, but is every- where distinguished by the same fundamental aspiration towards increased liberty. Thus the victory gained by ultra- montane influences within the Church— a victory for which the Vaticanum was largely responsible— closes one period of develop- ment, but a second has already begun, the keynote of which is the search for a modus vivendi between this Vatican system and the Catholicism which is rooted in the intellectual life of the modern world.

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1877, 1883, 1887); and Th. Grauderath, S.J., Geschichte dts Vati- kanischen Kvnzils (ed. K.

Kirch, 3 vols., Freiburg im Breisgau, 1903–6). The last-mentioned work represents the Jesuitico- Uirial standpoint (cf. C. Mirbt, " Die Geschichtschreibung des Vatikanischen Konzils," Historische Zeitschrift, Band 101, 1908, pp. 520–600). The most important collections of the acta are : Collectio Lacensis, tome vii. (Freiburg, 1890); E. Friedberg, Sammlung der Aktenstucke zum ersten Vatikanischen Konzil (Tubingen, 1872); J- Friedrich, Documenta ad iliustrandum Concilium Vaticanum (Nordlingen, 1871) ; A. v. Roskovany, Romanus Pontifex, tomes 7–16,

*1 PP A – ?7– I0 _ (I i ltr ^ e> * 8 7i–79>– For the dogmatic resolutions see also L. Mirbt, Quellen zur Geschichte des Papsttums (ed. 2, Tubingen IQOi), pp. 371–82, For the internal history of the councils one ot the main sources is Quirinus, Romische Briefe vom Konzil (Munich, 1870). Also, I Friedrich, Tagebuch wdhfend des Vati- kanischen Konzils (Nordlingen, 1871); Lord Acton, Zur Geschichte des Vatikanischen Konziles (Munich, 1871, Eng. in Hist. Essays, 1907) • J. r–essler, Das Vahkanische Concilium (Vienna, 1871); Manning rhe. True Story of the Vatican Council (London, 1877); E. Ollivie', LEghseet Vital au concile du Vatican (2 vols., Paris, 1879); Purcefl! Life of Cardinal Manning (2 vols., London, 1896). Cecconi's great work, La Storia del Concilio ecumenico Vaticano (4 vols., Rome, 1873 79), is incomplete. For criticism of the council, see Janus, Der Papst und das Konzil (Leipzig, 1869), revised by J. Friedrich under the title F. v. Dolltnger, Das Papsttum (Munich, 1892). Also, Glad- stone s Vatican Decrees and Vaticanism (London, 1874). (C. M.)*

VATKE, JOHANN KARL WILHELM (1806–1882), German Protestant theologian, was born at Behndorf, near Magdeburg, on the 14th of March 1806. After acting as Privatdozent in Berlin, he was appointed in 1837 professor extraordinarius. Vatke was one of the founders of the newer

Hexateuch criticism. In the same year in which David Strauss published his Life of Jesus, Vatke issued his book, Die Religion des Alten Testa- ments nack den kanonischen Buchern entwickelt, which contained

the seeds of a revolution in the ideas held about the Old Testa- ment. Since, however, his book was too philosophical to be popular, the author's theories were practically unnoticed for a generation, and the new ideas are now associated especially with the names of A. Kuenen and J. Wellhausen (qq.v.). He died on the 18th of April 1882.

His other works include: Die menschliche Freiheit in ihrem Verhdltniss zur Siinde und zur gottlichen Gnade (1841), Historisch-kritische Einleitung in das Alte Testament (1886), and Religions- philosophie (1888). See O. Pfleider.er, Development of Theology (1890), and T. K. Cheyne, Founders of Old Testament Criticism (1893).

VATTEL, EMERIC (Emer) DE (1714–1767) Swiss jurist, the son of a Protestant minister, was born at Couvet, in the princi- pality of Neuchatel. on the 25th of April 1714. He studied at Basel and Geneva. During his early years his favourite pursuit was philosophy; and, having carefully examined the works of G. W. Leibnitz and C. Wolff, he published in 1741 a defence of Leibnitz's system against J. P. de Crousaz. In the same year Vattel, who was born a subject of the king of Prussia, repaired to Berlin in the hope of obtaining some public employment from Frederick IL, but was disappointed in his expectation. Two years later he proceeded to Dresden, where he experienced a very favourable reception from Count Bruhl, the minister of Saxony. In 1746 he obtained from the elector, Augustus III., the title of councillor of embassy, accompanied

with a pension, and was sent to Bern in the capacity of the elector's minister. His diplomatic functions did not occupy his whole time, and much of his leisure was devoted to literature and jurisprudence. Among other works he published Loisirs philosophiques (1747) and Melanges de litter ature, de morale, et de politique (1757). But his reputation chiefly rests on his Droit des gens, ou Principes de la loi naturelle appliquis a la conduite et aux affaires des nations et des souverains (Neuchatel, 1758). During the same year he was recalled from Switzerland, to be employed in the cabinet of Dresden, and was soon afterwards honoured with, the title of privy councillor. His labours now became so intense as to exhaust his strength, and his health broke down. After a period of rest he returned to Dresden in 1766; but his renewed exertions soon produced a relapse, and he made another excursion to Neuchatel, where he died on the 28th of December 1767. His last work was entitled Questions de droit nature!, ou Observations sur le traits du droit de la nature, par Wolf (Bern,

1762).

Vattel's Droit des gens, which is founded on the works of Wolff, had in its day a great success, in truth, greater than it deserved. His principal and only merit consists in his having rendered the ideas of that author accessible to the political and diplomatic world. The Droit des gens passed through many editions, and was translated into various languages (English in 1760).

VAUBAN, SfiBASTIEN LE PRESTRE DE (1633–1707), marshal of France, the most celebrated of military engineers (see Fortification), was born at Saint-Leger-Vauban (Yonne). At the age of ten he was left an orphan in very poor circumstances, and his boyhood and youth were spent amongst the peasantry of his native

place. A fortunate event brought him under the care of the Carmelite prior of Semur, who undertook his educa- tion, and the grounding in mathematics, science and geometry which he thus received was of the highest value in his subse- quent career. At the age of seventeen Vauban joined the regiment of Conde in the war of the Fronde. His gallant conduct won him within a year the offer of a commission, which he declined on account of poverty. Conde then employed him to assist in the fortification of Clermont-en-Argonne. Soon afterwards he was taken prisoner by the royal troops; but though a rebel he was well treated, and the kindness of Mazarin converted the young engineer into a devoted servant of the king. He was employed in the siege of St Menehould (which he had helped to storm as a Frondeur) and won a lieutenancy in the regiment of Burgundy, and at Stenay he was twice wounded. Soon afterwards he besieged and took his own first fortress, Clermont; and in May 1655 he received his com- mission as an ingSnieur du roi, having served his apprenticeship under the Chevalier de Clerville. one of the foremost engineers

of the time. Between that year and the peace of 1659 he had taken part in or directed ten sieges with distinction, had been several times wounded, and was rewarded by the king with the free gift of a company in the famous Picardy regiment. About this time he married a cousin, Jeanne d'Aulnay. After the peace Vauban was put in charge of the construction of several im- portant defences, amongst other places at Dunkirk, where his work continued until the year before his death. On the renewal of war in 1662 he conducted, under the eyes of the king, the sieges of Douai, Tournai and Lille. At Lille he so distinguished himself that he received a lieutenancy in the guard (ranking as

a colonelcy).

The peace of Aix-la-Chapelle confirmed France in the posses- sion of new fortresses, which Vauban now improved or rebuilt. Hitherto the characteristic features of his method of fortifica- tion had not been developed, and the systems of preceding engineers were faithfully followed. Colbert and Louvois were profoundly interested in the work, and it was at the request of the latter that the engineer drew up in 1669 his Mimoire pour servir a I 'instruction dans la conduite des sieges (this, with a memorandum on the defence of fortresses by another hand, was published at Leiden in 1740). On the renewal of war Vauban again conducted the most important sieges (Rhein- bergen and Nijmwegen 1672, Maestricht and Trier 1673, Besancon 1674). In the latter year he also supervised the only defence in which he ever took part, that of Oudenarde. This was followed by the reduction of Dinant, Huy and Limburg. At this time he wrote for the commandants of Verdun and Le Quesnoy, valuable Instructions pour la difense (MS. Dep6t des Fortifications, Paris; see also Quincy, Art de la guerre, Paris, 1740). In 1676 he was made marichal de camp. He took Conde, Bouchain and other places in that year, Valenciennes and Cambrai in 1677, Ghent and Ypres in 1678.

It was at this time that Vauban synthesized the methods of attacking strong places, on which his claim to renown as an engineer rests far more than on his systems of fortification. The introduction of a systematic approach by parallels (said to have been suggested by the practice of the Turks at Candia in 1668) dates from the siege of Maestricht, and in principle remains to this day the standard method of attacking a fortress. The peace of Nijmwegen gave more territory to France, and more fortresses had to be adapted. Vauban was named com- missaire-ge'ne'ral des fortifications on the death of De Clerville, and wrote in 1679 a

memorandum on the places of the new frontier, from which it appears that from Dunkirk to Dinant France possessed fifteen fortresses and forts, with thirteen more in second line. Most of these had been rebuilt by Vauban, and further acquisitions, notably Strassburg (1681), involved him in unceasing work. At Saarlouis for the first time appeared Vauban's " first system " of fortification, which remained the accepted standard till comparatively recent times. He never hesitated to retain what was of advantage in the methods of his predecessors, which he had hitherto followed, and it was in practice rather than in theory, that he surpassed them. In 1682 his "second system," which introduced modifications of the first designed to prolong the resistance of the fortress, began to appear; and about the same time he wrote a practical manual entitled Le Diredeur-Ge'nSral des fortifications (Hague, 1683-85). Having now attained the rank of lieut.-general, he took the field once more, and captured Courtrai in 1683, and Luxemburg in the following year. The unexpected strength of certain towers designed by the Spanish engineer Louvigni (fl. 1673) at Luxemburg suggested the tower-bastions which are the peculiar feature of Vauban's second system (see Augoyat, Mimoires inedits du Ml. de Vauban, Paris, 1841) which was put into execution at Belfort in the same year (Provost du Vernois, De la fortification depuis Vauban, Paris, 1861). In 1687 he chose Landau as the chief place of arms of Lower Alsace, and lavished on the place all the resources of his art. But side by side with this development grew up the far more important scheme of attack. He instituted a company of miners, and the elaborate experiments carried out under his

supervision resulted in the establishment of all the necessary formulae for military mining (TrailS des mines, Paris, 1740 and 1799; Hague, 1744); while at the siege of Ath in 1697,

having in the meanwhile taken part in more sieges, notably that of Namurin 1692 (defended by the great Dutch engineer Coehoorn), he employed ricochet fire for the first time as the principal means of breaking down the defence. He had indeed already used it with effect at Philipsburg in 1688 and at Namur, but the jealousy of the artillery at outside interference had hindered the full use of this remarkable invention, which with his other improvements rendered the success of the attack almost certain. After the peace of Ryswick Vauban rebuilt or improved other fortresses, and finally New Breisach, fortified on his " third system " — which was in fact a modification of the second and was called by Vauban himself systeme de Landau perfectionnS. His last siege was that of Old Breisach. in 1703, when he reduced the place in a fortnight. On the 14th of January of that year Vauban had been made a marshal of France, a rank too exalted for the technical direction of sieges, and his active career came to an end with his promotion. Soon afterwards appeared his Traite de I'attaque des places, a revised and amplified edition of the older memoir of 1669, which contains the methods of the fully developed Vauban attack, the main features of which are the parallels, ricochet fire and the attack of the defending personnel by vertical fire (ed. Augoyat, Paris, 1829).

But Louis XIV. was now thrown on the defensive, and the war of the Spanish Succession saw the gradual wane of Vauban's influence, as his fortresses were taken and retaken. The various captures of Landau, his chef-d'oeuvre, caused him to be regarded with disfavour, for it was not realized that the greatness of his services was rather in the attack than in the defence. In the darkness of defeat he turned his attention to the defence; but his work De la defense des places (ed. by General Valaze, Paris, 1829) is of far less worth than the

Attaque, and his far- seeing ideas on entrenched camps (Traite des fortifications de campagne) were coldly received, though therein may be found the elements of the ″ detached forts ″ system now universal in Europe. The close of his life, saddened by the consciousness of waning influence and by failing health, he devoted largely to the arrangement of the voluminous manuscripts (Mes oisiveUs) which contained his reflections on war, administration, finance, agriculture and the like. In 1689 he had had the courage to make a representation to the king in favour of the republication of the Edict of Nantes, and in 1698 he wrote his Projet d'une dix m '- royale (see Ecanomistes financieres du XVIII' siecle, Paris, 1851), a remarkable work foreshadowing the principles of the French Revolution. Vauban was deeply impressed with the deplorable condition of the peasantry, whose labour he regarded as the main foundation of all wealth, and protested in particular against the unequal incidence of taxation and the exemptions and privileges of the upper classes. His dix n ' h royale, a tax to be impartially applied to all classes, was a tenth of all agricultural produce payable in kind, and a tenth of money chargeable on manufacturers and merchants. This work was published in 1707, and instantly suppressed by order 6f the king. The marshal died heart- broken at the failure of his efforts a few days after the publication of the order (March 30, 1707). At the Revolution his remains were scattered, but in 1808 his heart was found and deposited by order of Napoleon in the church of the Invalides.

Vauban's attention was closely engaged, not only in general military matters, but in political and financial reform and the inland navigation of France. He carried out the rearmament of the French infantry with flint- lock muskets and the socket bayonet. The order

of St Louis was suggested by him, and lastly may be mentioned the fortress-models which he con- structed, most of which are in the Invalides at Paris, and some in the Berlin Zeughaus. The actual total of his work as an engineer is worth recording. He conducted forty sieges and took part in more than three hundred combats, while his skill and experience were employed on the construction or re- building of more than 160 fortresses of all kinds. Mes oisivetis

long remained unpublished, and of the twelve volumes of manuscript seven are lost. The remainder were published in Paris, 1841-45, in an abridged form, and of the five manuscript volumes three are in public hands, and two belong to the families of two famous engineers, Augoyat and Haxo. At the Hague (173 7-1 742) appeared, dedicated to Frederick of Prussia, De Hondt's edition of De Vattaque et defense, &c, and of this work an improved edition appeared subsequently. But the first satis- factory editions are those of Augoyat and Valaze mentioned above.

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VAUCLUSE, a department of south-eastern France, formed in 1793 out of the countship of Venaissin, the principality of Orange, and a part of Provence, and bounded by Drome on the N., Basses-Alpes on the E., Bouches-du-Rh6ne (from which it is separated by the Durance) on the S., and Gard and Ardeche (from which it is separated by the Rhone) on the W. It has also an enclave, the canton of Valreas, in the department of Drdme. Pop. (1906) 239,178. Area, 1381 sq. m. The western third of Vaucluse belongs to the Rhone valley, and consists of the rich and fertile plains of Orange, Carpentras and Cavaillon. To the east, with a general west-south-west direction and parallel to one another, are the steep barren ranges of Ventoux, Vau- cluse and Luberon, consisting of limestones and sandstones. The first-mentioned, which is the most northerly, has a maxi- mum

elevation of 6273 ft.; the culminating peak, on which is a meteorological observatory, is isolated and majestic. The Vau- cluse chain does not rise above 4075 ft. The most southerly range, that of Luberon (3691 ft.), is rich in palaeontological remains of extant mammals (the lion, gazelle, wild boar, &c). The Rhone is joined on the left by the Aygues, the Sorgue (rising in Petrarch's celebrated fountain of Vaucluse, which has given its name to the department), and the impetuous Durance. The Sorgue has an important tributary in the Ouveze and the Dur- ance in the Coulon (or Calavon). These and other streams feed the numerous irrigation canals (Canal de Pierrelatte, Canal de Carpentras, &c.) to which is largely due the success of the farmers and market-gardeners of the department. The climate is that of the Mediterranean region. The valley of the Rhone suffers from the mistral, a cold and violent wind from N.N.W.; but the other valleys are sheltered by the mountains, and produce the oleander, pomegranate, olive, jujube, fig, and other southern trees and shrubs. The mean annual temperature is 55 F. at Orange and 58° at Avignon; the extremes of temperature are 5 and 105 F. Snow is rare. The south wind, which is frequent in summer, brings rain. The average annual rainfall is 29 in. in the hill region and 22 in the plains.

Wheat, potatoes, and oats are the most important crops; sugar- beet, sorghum, millet, ramie, early vegetables and fruits, among which may be mentioned the melons of Cavaillon, are also cultivated, and to these must be added the vine, olive and mulberry. The truffles of the regions of Apt and Carpentras. and the fragrant herbs of the

Ventoux range, are renowned. Sheep are the principal live-stock, and mules are also numerous. Lignite and sulphur are mined; rich deposits of gypsum, fire-clay, ochre, &c, are worked. Mont- mirail has mineral springs of

some repute. The industrial establish- ments include silk mills, silk-spinning factories, oil mills, flour mills, paper mills, wool-spinning factories, confectionery establishments, manufactories of pottery, earthenware, bricks, mosaics, tinned provisions, chemicals, candles, soap and hats, breweries, puddling works, iron and copper foundries, cabinet workshops, blast furnaces, sawmills, edge-tool workshops and nursery gardens. Coarse cloth, carpets, blankets, and ready-made clothes are also produced. The department is served by the Paris-Lyon-Mediterranee railway, and the Rhone is navigable for 40 m. within it. It is divided into 4 ar- rondissements (Avignon, Apt, Carpentras and Orange), 22 cantons and 150 communes. Avignon, the capital, is the seat of an arch- bishop. The department belongs to the region of the XV. army corps and to the academie (educational circumscription) of Aix, and has its appeal court at Nimes.

Avignon, Apt, Carpentras, Cavaillon, Orange and Vaison, the most noteworthy towns, are treated separately, and the in- teresting abbey of Senanque, of Romanesque architecture. Other places of interest are Gordes, with a town hall of Renaissance architecture; Pernes, which has a church of the nth century and medieval fortifications; La Tour d'Aigues, with fine ruins of the Renaissance chateau of the barons of Central Bonnieux, near which there is a bridge of the 2nd or 3rd century over the Calavon; Venasque, of Gallo-Roman or even earlier origin, with a baptistery of the 8th or 9th century; and Le Thor, with a fine church in the Provencal Romanesque style.

VAUD (Ger. Waadt), one of the cantons of south-western Switzerland. Its total area is 1255-2 sq. m. (thus ranking aftej the Orisons, Bern and the Valais), of which 1056-7 sq. m. are reckoned as "productive" (forests covering 320-1 sq. m. and vineyards 24-9 sq. m., this

last region being more extensive than in any other canton). Of the rest, i6oj sq. m. are occupied by the portions of various lakes partly in the canton (Geneva, 1235 sfi. m.; Neuchatel, $^ sq. m.; and Morat, 35 sq. m.) and 4-3 by glaciers, the loftiest point in the canton being the Diablerets (10,650 ft.). The canton is of very irregular shape, as it owes its artificial existence solely to historical causes. It includes practically the whole northern shore of the Lake of Geneva, while it stretches from the " Alpes Vaudoises " and Bex, on the S.E., to the Jura and the French frontier, on the N.W. A long narrow tongue extending past Payerne (Peterlingen) to the Lake of Neuchatel is just disconnected with the Avenches region that forms an " enclave " in the canton of Fribourg, while in the canton of Vaud, Fribourg holds the two " enclaves " of Vuissens and Surpierre. A small stretch of the right bank of the Rhone (from Bex to the Lake of Geneva) is within the canton, while various short streams flow down into the Lake of Geneva. But the more northerly portion of the canton, beyond the Jorat range, to the north of Lausanne, and in particular the valley of the Broye, belongs to the Aar, and so to the Rhine basin. The canton is thus hilly rather than mountainous, save at its south- eastern extremity. It is well supplied with railways, including that along the northern shore of the Lake of Geneva, while from Bex through Vallorbes runs the main Simplon .line towards Paris. There are also numerous " regional " or small-gauge railways, as well as mountain lines from Montreux past Glion up the Rochers de Naye, and from Vevey up the Mont Pelerin, not to speak of that (" Montreux-Oberland " line) direct to the head of the Sarine valley and so by the Simme valley to the Lake of Thun. In 1900 the population was 281,279, of whom 243,463 were French-speaking, 24,372 German-speaking, and 10,667 Italian-speaking, while 242,811 were Protestants (Calvinists, whether

of the larger Sglise nationale or of the smaller eglise libre, founded in 1847), 36,980 Romanists, and 1076 Jews. Agriculture is the main occupation of the inhabitants: the land is much subdivided and very highly cultivated.

The vineyards give employment to great numbers of people. Much more white wine is produced than red wine. The best white wines of the canton are Yvorne (near Aigle) and La C6te (west of Lausanne), while the vineyard of Lavaux (east of Lausanne) pro- duces both red and white wine. There is not very much industry in the canton, though at Ste Croix in the Jura watches and musical boxes are made, while at Payerne tobacco is grown. Many foreigners reside in the canton, partly for reasons of health, partly on account of the educational advantages that it offers. They chiefly favour Lausanne, Vevey and the collection of hamlets known as

" Montreux," as well as Chateaux d'Oex, in the upper Sarine valley. Lausanne (q.v.) is the political capital of the canton. Next in point of population comes the " agglomeration " known as Montreux (q.v.), with 14,144, and Vevey {q.v.), with 11,781. Other important villages or small towns are Yverdon (7985 inhab.), Ste Croix (5905 inhab.), Payerne (5224 inhab.), Nyon (4882 inhab.), Morges (4421 inhab.), Aigle (3897 inhab.), and Chateau d'Oex (3025 inhab.). In educational matters the canton holds a high place. The academy of Lausanne dates from 1537, and was raised to the rank of a uni- versity in 1890; and there are a very large number of schools and educational establishments at Morges, Lausanne, Vevey, and else- where. Pestalozzi's celebrated institution flourished at Yverdon from 1806 to 1825. Among the remarkable historical spots in the canton are

Avenches (the chief Roman settlement in Helvetia), Grandson (q.v.) (scene of the famous battle in 1476 against Charles the Bold), and the castle of Chillon (where Bonivard, the prior of St Victor at Geneva, was imprisoned from 1530 to 1536 for defending the freedom of Geneva against the duke of Savoy).

The canton is divided into 19 administrative districts, which com- prise 388 communes. _ The cantonal constitution dates from 1885. The government consists of a Grand Conseil, or great council (one member to every 300 electors or fraction over 150), for legislative and a conseil d'ital, or council of state, of seven members (chosen by the Grand Conseil) for executive purposes. In both cases the term of office is four years. Six thousand citizens can compel consideration of any project by the legislature (" initiative," first in 1845), and the referendum exists in its " facultative " form, if demanded by 6000 citizens, and also in case of expenditure (not included in the budget) of over half a million francs. The two members of the Federal Stdnderath are named by the Grand Conseil, while the fourteen members of the Federal Nationalraih are chosen by a popular vote. Capital punishment was abolished in 1874.

The early history of the main part of the territories comprised in the present canton is identical with that of south-west Switzer- land generally. The Romans conquered (58 B.C.) the Celtic Hel- vetii and so thoroughly colonized the land that it has remained a Romance-speaking district, despite conquests by the Bur- gu.ndia.ns (5th century) and Franks (532) and the incursions of the Saracens (10th century). It formed part of the empire of Charlemagne, and of the kingdom of Transjurane Burgundy (888-1032), the memory of " good queen Bertha," wife of King Rudolph II., being still held in high honour. After the ex- tinction of the house of Zahringen (1218) the counts of

Savoy gradually won the larger part of it, especially in the days of Peter II., ″ le petit Charlemagne″ (d. 1268). The bishop of Lausanne (to which place the see had probably been trans- ferred from Aventicum by Marius the Chronicler at the end of the 6th century), howeyer, still maintained the temporal power given to him by the king of Burgundy, and in, a; 12 5 had become a prince of the empire. (We must be careful to distinguish between the present canton of Vaud and the old medieval Pays de Vaud: the districts forming the present canton very nearly correspond to the Pays Romand.) Late in the 15th century Bern began to acquire lands to the south from the dukes of Savoy, and it was out of those conquests that the canton was formed in 1798. In 1475 she seized Aigle and (in concert with Fribourg) fichallens and Grandson as well as Orbe (the latter held of the county of Burgundy). Vaud had been occupied by Bern for a time (1475–1476), but the final conquest did not take place till 1536, when both Savoyard Vaud and the bishopric of Lausanne (including Lausanne and Avenches) were overrun and annexed by Bern (formally ceded in 1564), who added to them (1555) Chateau d'Oex, as her share of the domains of the debt-laden count of the Gruyere in the division of the spoil she made with Fribourg. Bern in 1526 sent Guillaume Farel, a, preacher from Dauphine, to carry out the Reformation at Aigle, and after 1536 the new religion was imposed by force of arms and the bishop's residence moved to Fribourg (permanently from 1663) . Thus the whole land became Protestant, save the -district of Echallens. Vaud was ruled very harshly by bailiffs from Bern. In 1588 a plot of some nobles to hand it over to Savoy was crushed, and in 1723 the enthusiastic idealist Davel lost his life in an attempt to raise it to the rank of a canton. Political feeling was therefore much excited by the outbreak of the French Revolution, and a Vaudois, F. C. de la

Harpe, an exile and a patriot, persuaded the Directory in Paris to inarch on Vaud in virtue of alleged rights conferred by a treaty of 1565. The French troops were received enthusiastically, and the ″ Lemanic

republic ″ was proclaimed (January 1798), succeeded by the short-lived Rhodanic republic, till in March 1798 the canton of Leman was formed as a district of the Helvetic republic. This corresponded precisely with the present canton minus Avenches and Payerne, which were given to the canton of Vaud (set up in 1803). The new canton was thus made up of the Bernese con- quests of 1475, 1475-76, 1536 and 1555. The constitutions of 1803 and 1814 favoured the towns and wealthy men, so that an agitation went on for a radical change, which was effected in the constitution of 1831. Originally acting as a mediator, Vaud finally joined the anti-Jesuit movement (especially after the radicals came into power in 1845), opposed the Sonderbund, and accepted the new federal constitution of 1848, of which Druey of Vaud was one of the two drafters. From 1839 to 1846 the canton was distracted by religious struggles, owing to the attempt of the radicals to turn the church into a simple depart- ment of state, a struggle which ended in the splitting off (1847) of the "free church." The cantonal feeling in Vaud is very strong, and was the main cause of the failure of the project of revising the federal constitution in 1872, though that of 1874 was accepted. In 1879 Vaud was one of the three cahtbris which voted (though in vain) against a grant in aid of the St Gotthard railway. In 1882 the radicals obtained a great majority, and in 1885 the constitution of 186 1 was revised.

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(W. A. B. C.)

VAUDEVILLE, a term now generally given to a musical drama of a light, humorous or comic description interspersed with songs and dances. In English usage " vaudeville " is practically synonymous with what. is more generally known as " musical comedy," but in America it is applied also to a music- hall variety entertainment. This modern sense is developed from the French vaudeville of the 18th century, a popular form of light dramatic composition, consisting of pantomime, dances, songs and dialogue, written in couplets. It is generally ac- cepted that the word is to be identified with vau-de-vire, the name given to the convivial songs of the 1 5th century. This name originated with a literary association known as

the " Com' pagnons Gattois," i.e. " boon companions " or " gay comrades " in the valley of the Vire and Virene in Normandy. The most famous oi the authors of these songs was Olivier Basselin (q.v.). When in the 17th century the term had become applied to topical, satiric verses current in the towns, it was corrupted

i. into its present form, either from a vau le yille, or voix de ville. VAUGELAS, CLAUDE FAVRE. Seigneur de, Baron de Peroges (1 595–1 650), French grammarian and man of letters, – was born at Meximieu, department of Ain, on the 6th of January 1595. He became gentleman-in-waiting to Gaston d'Orleans, and continued faithful to this prince in his disgrace, although his fidelity cost him a pension from the crown on which he was largely dependent. His thorough knowledge of the French language and the correctness of his speech won for him a place among the original academicians. On the representation. Of his colleagues his pension was restored so that he might have

. leisure to pursue his admirable Remarques sur la languefran^aise

VAUGHAN, C. J.— VAUGHAN, H.

(1647). In this work he maintained that words and expressions were to be judged by the current usage of the best society, of which, as an habitue' of the Hotel de Rambouillet, Vaugelas was a competent judge. He shares with Malherbe the credit of having purified French diction. His book fixed the current usage, and the classical writers of the 17 th century regulated their practice by it. Protests against the academical doctrine were not lacking. Scipion Dupleix in his Liberty de lalangue franqaise dans sa puretS (1651) pleaded for the richer and freer language of the 16th century, and Francois de la Mothe le Vayer took a similar standpoint in his Lettres

d. Gabriel Naudi touchant les Remarques sur la langue franqaise. Towards the end of his life Vaugelas became tutor to the sons of Thomas Francis of Savoy, prince of Carignari.' He died in Paris in February 1650. His translation from Quintus Curtius, La Vie d' Alexandre (post-humously published in 1653) deserves notice as an application of the author's own rules.

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VAUGHAN, CHARLES JOHN (1816-1897), English scholar and divine, was educated at Rugby and Cambridge, where he was bracketed senior classic with Lord Lyttelton in 1838. In 1839 he was elected fellow of Trinity College, Cambridge, and for a short time studied law. He took orders, however, in 1841, and became vicar of St Martin's, Leicester. Three years later he was elected headmaster of Harrow. He resigned the head- mastership in 1859 and accepted the bishopric of Rochester, but afterwards withdrew his acceptance. In 1880 he was appointed vicar of Doncaster. He was appointed master of the Temple in 1869, and dean of Llandaff in 1879. In 1894 he was elected president of University College, Cardiff, in recognition of the prominent part he took in its foundation. Vaughan was a well-known Broad Churchman, an eloquent preacher arid an able writer on theological subjects, his numerous works including lectures, commentaries and sermons; he was joint-author with the Rev. John Llewelyn Davies (b. 1826)— also a well-known Cambridge scholar and Broad Churchman — of a well-known

translation of Plato's Republic.

VAUGHAN, HENRY (1622–1695), called the ""Silurist," English poet and mystic, was born of an ancient Welsh family at Newton St Briget near Scethrog by Usk, Brecknockshire, on the 17th of April 1622. His grandfather, Thomas Vaughan, was the son of Charles Vaughan of Tretower Castle, and had acquired the farm of Newton by marriage. From 1632 to 1638 he and his twin brother Thomas, noticed below, were privately educated by the Rev. Matthew Herbert, rector of Llangattock, to whom they both addressed Latin verses expressing their gratitude. Anthony a Wood, who is the main authority for Vaughan's biography, says that Henry was entered at Jesus College, Oxford, in 1638, but no corroboration of the statement is forthcoming, although Thomas Vaughan's matriculation is entered, nor does Henry Vaughan ever allude to residence at the university. 1 He was sent to London to study law, but turning his attention to medicine, he became a physician, and settled first at Brecon and later at Scethrog to the practice of his art. He was regarded, says Wood, as an " ingenious person, but proud and humorous." It seems likely that he fought on the king's side in the Welsh campaign of 1645, an(i was present at the battle of Rowton Heath. In 1646 appeared Poems, with the Tenth Satyre of Juvenal Englished, by Henry Vaughan, Gent. The poems in this volume are chiefly addressed to " Amoret," and the last is on Priory Grove, the home of the " matchless Orinda," Mrs Katharine Philips. A second volume of secular

1 Two poems in the Eucharistica Oxoniensia (1641) are signed '' H. Vaughan, Jes. Coll.," but are probably by a contemporary of the same name, noticed by Wood. See Mr E. K. Chambers's bio- graphical note in vol. ii. of Vaughan's Works.

verse, Olor Iscanus, which takes its name from the opening verses addressed to the Isca (Usk), was published by a friend, probably Thomas Vaughan, without the author's consent, in 1651. The book includes three prose translations from Latin versions of Plutarch' and Maximus of Tyre, and one in praise of a country life from Guevara. The preface is dated 1647, and the reason for Vaughan's reluctance to print the book is to be sought in the preface to Silex Scintillans: or Sacred Poems and Pious Ejaculations (r6so). There he says: " The first that with any effectual success attempted a diversion of this foul and overflowing stream (of profane poetry) was the blessed man, Mr George Herbert, whose holy life and verse gained many pious converts, of whom I am the least." He further expresses his debt in " The Match," when he says that his own " fierce, wild blood … is still tam'd by those bright fires which thee inflam'd." His debt to Herbert extended to the form of his poetry and sometimes to the actual expressions used in it, and a long list of parallel passages has been adduced. His other works are The Mount of Olives: or Solitary Devotions, with a translation, Man in Glory, from the Latin of Anselm (1652); Flores Solitudinis (1654), consisting of two prose translations from Nierembergius, one from St Eucherius, and a life of Pauiinus, bishop of Nola; Hermetical Physick, translated from the Naturae Sanctuarium of Henricus Nollius; Thalia Rediviva; The Pass-Times and Diversions of a Country Muse (1678), which includes some of his brother's poems. Henry Vaughan died at Scethrog on the 23rd of April 1695, and was buried in the church- yard of Llansantffraed. •

As a poet Vaughan comes latest in the so-called " meta- physical " school of the 17th century. He is a disciple of Donne, but follows him mainly as he saw him reflected in George Herbert. He analyses his experiences, amatory

and sacred, with excessive ingenuity, striking out, every now arid then, through his ex- treme intensity of feeling and his close observation of nature, lines and phrases of marvellous felicity. He is of imagination all compact, and is happiest when he abandons himself most completely to his vision. It is, as Canon H. C. Beeching has said, "undoubtedly the mystical element in Vaughan's writing by Tphich he takes rank as a poet . . . it is easy to see that he has a passion for Nature for her own Sake, that he has observed her moods; that indeed the world is to him no less than a veil of the eternal spirit, whose presence may be felt in any, even the smallest part." In this imaginative outlook on Nature he no doubt exercised great influence on Wordsworth, who is known to have possessed a copy of his poems, and it is difficult to avoid seeing in " The Retreat " the germ of the later poet's " Ode on Intimations of Immortality." By this poem, with " The World," mainly because of its magnificent opening stanza, " Beyond the Veil," and " Peace," he is best known to the ordinary reader.

The complete works of Henry Vaughan were edited for the Fuller Worthies Library by Dr A. B. Grpsart in 1871. The Poems of Henry Vaughan, Silurist, were edited in 1896 by Mr E. K. Chambers, with an introduction by Canon H. C. Beeching, for the Muses' Library.

VAUGHAN, HERBERT (1832-1903), cardinal and arch- bishop of Westminster, was born at Gloucester on the 15th of April 1832, the eldest son of lieutenant-colonel John Francis Vaughan, head of an old Roman Catholic family, the Vaughans of Courtfield, Herefordshire. His mother, a daughter of John Rolls of The Hendre, Monmouthshire, was intensely religious; and all the daughters of the family entered convents, while six of the eight sons took priest's orders, three of them rising to the episcopate, Roger becoming archbishop of Sydney, and John

bishofi of Sebastopolis. Herbert spent six years at Stonyhurst, and was then sent to study with the Benedictines at Downside, near Bath, and subsequently at the Jesuit school of Brugelette, Belgium, which was afterwards removed to Paris. In 1851 he went to Rome. After two years of study at the Accademia dei nobili ecclesiastici, where he became a friend and disciple of Manning, he took priest's order's at Lucca in 1854. On his return to England he became for a period

vice-president of St Edmund's College, Ware, at that time the chief seminary for candidates for the priesthood in the south of England. Since childhood he had been filled with zeal for foreign missions, and he conceived the determination to found a great English missionary college to fit young priests for the work of evangelizing the heathen. With this object he made a great begging expedition to America in 1863, from which he returned with £11,000. St Joseph's Foreign Missionary College, Mill Hill Park, London, was opened in 1869. Vaughan also became proprietor of the Tablet, and used its columns vigorously for propagandist purposes. In 1872 he was consecrated bishop of Salford, and in 1892 succeeded Manning as archbishop of Westminster, receiving the cardinal's hat in 1893. Vaughan was a man of very different type from his predecessor; he had none of Manning's intellectual finesse or his ardour in social reform, but he was an ecclesiastic of remarkably fine presence and aristocratic leanings, inlransigeant in theological policy, and in personal character simply devout.

It was his most cherished ambition to see before he died an adequate Roman Catholic cathedral in Westminster, and he laboured

untiringly to secure subscriptions, with the result that its foundation stone was laid in 1895, and that when he died, on the 19th of June 1903, the building was so far complete that a Requiem Mass was said there over his body before it was removed to its resting-place at Mill Hill Park.

See the Life of Cardinal Vaughan, by J. G. Snead Cox (2 vols., London, 191 o).

VAUGHAN, THOMAS (1622-1666), English alchemist and mystic, was the younger twin brother of Henry Vaughan, the " Silurist." He matriculated from Jesus College, Oxford, in 1638, took his B.A. degree in 1642, and became fellow of his college. He remained for some years at Oxford, but also held the living of his native parish of Llansantfread from 1640 till 1649, when he was ejected, under the Act for the Propagation of the Gospel in Wales, upon charges of drunkenness, im- morality and bearing arms for the king. Subsequently he lived at his brother's farm of Newton and in various parts of London, and studied alchemy and kindred subjects. He married in 1651 and lost his wife in 1658. After the Restoration he found a patron in Sir Robert Murray, with whom he fled from London to Oxford during the plague of 1665. He appears to have had some employment of state, but he continued his favourite studies and actually died of the fumes of mercury at the house of Samuel Kem at Albury on the 27 th of February 1666. Vaughan regarded himself as a philosopher of nature, and although he certainly sought the universal solvent, his pub- lished writings deal rather with magic and mysticism than with technical alchemy. They also contain much contro- versy with Henry More the Platonist. Vaughan was called a Rosicrucian, but denied the imputation. He wrote or trans- lated Anthroposophia Theomagica (1630); Anima Magica Abscondita (1650); Magia Adamica and Coelum Terrae (1650); The Man-Mouse taken in a Trap (1650); The Second Wash; or the

Moor Scoured once more (1651); Lumen de Lumine and Aphorisimi Magici Eugeniani (1651); The Fame and, Confession of the Fraternity of R.C. (1652); Aula Lucis (1652); Euphrates (1655); Nollius' Chymist's Key (1657); A Brief Natural History (1669). Most of these pamphlets appeared under the pseudonym of Eugenius Philalethes. Vaughan was probably, although it is by no means certain, not the famous adept known as Eirenaeus Philalethes, who was alleged to have found the philosopher's stone in America, and to whom the Introitus Apertus in Occlusum Regis Palatium (1667) and other writings are ascribed. In 1896 Vaughan was the subject of an amaz- ing mystification in the MSmoires d'une ex-Palladiste. These formed part of certain alleged revelations as to the practice of devil-worship by the initiates of freemasonry. The author, whose name was given as Diana Vaughan, claimed to be a descendant of Thomas and to possess fampy papers which showed amongst other marvels that he had made a pact with Lucifer, and had helped to found freemasonry as a Satanic society. The inventors of the hoax, which took in many

eminent Catholic ecclesiastics, were some unscrupulous Paris journalists.

The Magical Writings of Thomas Vaughan were edited by Mr A. E. Waite in 1888. His miscellaneous Latin and English verses are included in vol. ii. of Dr A. B. Grosart's Fuller Worthies Library edition of the Works of Henry Vaughan (1871). A manuscript book of his, with alchemical and autobiographical jottings made between 1658 and 1662, forms Brit. Mus. Sloane MS. 1741. Biographical data are in Mr E. K. Chambers's Muses Library edition of the Poems of Henry Vaughan (1896), together with an account and criticism of the MSmoires d'une ex-Palladiste. These fabrications were also discussed by Mr A. E. Waite, Devil-Worship in France (1896), and finally exposed by M. Gaston Mery, La Virile sur Diana Vaughan.

(E. K. C.)

VAUGHAN, WILLIAM (1577–1641), English author and colonial pioneer, son of Walter Vaughan (d. 1598), was born at Golden Grove, Carmarthenshire, his father's estate, in 1577. He was descended from an ancient prince of Powys. His brother, John Vaughan (1572–1634), became 1st earl of Carbery; and another brother, General Sir Henry or Harry Vaughan (1587– 1659), was a well-known royalist leader. William was educated at Jesus College, Oxford, and took the degree of LL.D. at Vienna. In 1616 he bought a grant of land in the south coast of New– foundland, to which he sent two batches of settlers. In 1622 he visited the settlement, which he called Cambriol, and returned to England in 1625. Vaughan apparently paid another visit to his colony, but his plans for its prosperity were foiled by the severe winters. He died at his house of Torcoed, Carmarthen– shire, in August 1641.

His chief work is The Golden Grove (1600), a general guide to morals, politics and literature, in which the manners of the time are severely criticized, plays being denounced as folly and wickedness. The section in praise of poetry borrows much from earlier writers on the subject. The Golden Fleece . . . transported from Cambriol Colchis . . . by Orpheus fun., alias Will Vaughan, which contains information abput Newfoundland, is the most interesting of his other works.

VAULT 1 (Fr. voute, Ital. volta, Ger. Gavolbe), in architecture, the term given to the covering over of a space with stone or brick in arched form, the component parts of which exert a thrust and necessitate a counter resistance. In the case of vaults built under the level of the ground, the latter gave all that was required, but, when raised aloft, various expedients had to be employed, such as great thickness of walls in the case of barrel or continuous

vaults, and cross walls or buttresses when intersecting vaults were employed. The simplest kind of vault «is that known as the barrel, wagon Or tunnel vault, which is generally semicircular in section, and may be "regarded as a continuous arch, the length of which is in excess of its diameter; like the arch (q.v.), the same provision is required as regards its temporary support whilst the voussoirs constituting one of its rings are being placed in position, for until the upper voussoir, or keystone, is introduced it is not self-supporting. At the present day, when timber of all kinds is easily procurable, this temporary support is given by centring, consisting of a framed truss with semicircular or segmental head, which carries the voussoirs until the ring of the whole arch is completed and is then, with a barrel vault, shifted on to support other rings; in early times, and particularly in Chaldaea and Egypt, where timber was scarce, other means of support had to be contrived, and it would seem that it was only in Roman times that centring was regularly employed.

The earliest example known of a vault is that found under the Chaldaean ziggurat at Nippur in Babylonia, ascribed to about 4000 B.C., which was built of burnt bricks cemented with clay mortar. The earliest tunnel vaults in Egypt are those at Requaqnah and Denderah, c. 3500 B.C.; these were built in unburnt brick in three rings over passages descending to tombs: in these cases, as the span of the vault was only 6 ft., the bricks constituting the voussoirs were laid flatwise, and adhered suffi- ciently to those behind to enable the ring to be completed without other support; in the granaries built by Ramessu II. , still in part existing behind the Ramesseum, at Thebes, the span was 12 ft., and another system was employed; the lower part of 1 For the form of safe so called see Safes.

the arch was built in horizontal courses, up to about one-third of the height, and the'rings above were inclined back at a slight angle, so that the bricks of each ring, laid flatwise, adhered till the ring was completed, no centring of any kind being required; the vault thus formed was elliptic in section, arising from the method of its construction. A similar system of construction was employed for the vault over the great hall at Ctesiphon, where the material employed was burnt bricks' or tiles of great dimensions, cemented with mortar; but the span was close upon 83 ft., and the thickness of the vault was nearly 5 ft. at the top, there being four rings of brickwork. It is probable that the great vaults of the Assyrian palaces were constructed in the same way, but with unburnt bricks dried only in the sun: one of the drains discovered by Layard at Nimrud was built in rings sloping backwards. From the fact that each Assyrian monarch on his accession to the throne commenced his reign by the erection of a palace, it is probable that, owing to the ephemeral construction of these great vaults, half a century was the term of their existence. This may also account for the fact that no domed structures exist of the type shown in one of the bas reliefs from Nimrud (figi 1); the tradition qi their

Fig. 1.

erection, however, would seem to have been handed down to their successors in Mesopotamia, viz. to the Sassanians, who in their palaces at Serbjstan and Firuzabad built domes of similar form to those shown in the Nimrud sculptures, the, chief differr ence being that, constructed in rubble stone and cemented with mortar, they still exist, though probably abandoned on the Mahommedan invasion in the 7th century.

In all the instances above quoted in Chaldaea and Egypt the bricks, whether burnt or sun-dried, were of the description to which the term "tile" would now be given; the dimensions varied from i8or 20in. to 10 in., being generally square and about 4 to 2 in. thick,, and they were not shaped as voussoirs, the connecting medium being thicker at the top than at the bottom. The earliest Egyptian examples of regular voussoirs in stone belong to the XXVIth Dynasty (c. 650 B.C.) in the additions made then to the temple of Medinet-Abou, and here it is probable that centring of some kind was provided as the vaults are built in rings, so that the same centring could be shifted on after the completion of each ring. The earliest example of regularly shaped voussoirs, and of about the same date, is found in the cloaca at Graviscae in Etruria, with a span of about 14 ft., the Voussoirs of which are from 5 to 6 ft. long. The cloaca maxima in Rome, built by Tarquin (603 b&.) to drain the marshy ground between the Palatine and the Capitoline Hills, was according to Commendatore Boni vaulted over in the*

Fig. 2.

1st century B.C., the vault being over 800 ft. long, 10 ft. in span, with three concentric rings of voussoirs.

So far, all the vaults mentioned have been barrel vaults, which, when not built underground, required continuous walls of great thickness to resist their thrust; the earliest example of the next variety, the intersecting barrel vault, is said to be over a small hall at Pergamum,in Asia Minor, but its first em- ployment over halls of great dimensions is due to the Romans. When two semicircular barrel vaults of the same diameter cross one another (fig. 2) their intersection (a true ellipse) is known as a groin, down which the thrust of the vault is carried to the cross walls; if a series of two or more barrel vaults intersect one another, the weight is carried on to the piers at their intersection and the thrust is trans- mitted to the outer cross walls; thus in the Roman reservoir at Baiae, known as the piscina mira- bilis, a series of five aisles with semicircular ■. barrel vaults are intersected by twelve cross aisles, the vaults heing carried on 48 piers and thick external walls. The width of these aisles being only about 13 ft. there was no great difficulty in the construction of these vaults, but in the Roman Thermae the tepidarium had a span of 80 ft., more than twice that of an English cathedral, so that its construction both from the statical and economical point of view was of the greatest im- portance. Theresearches of M. Choisy {L'Artde bdtir ckez les Romains), based on a minute examination of those portions of the vaults which still remain in situ, have shown that} on a comparatively slight centring, consisting of trusses placed about 10 ft. apart and covered with planks laid from truss to truss, were laid — to begin with — two layers of the Roman brick (measuring nearly 2 ft. square and 2 iii: thick) ; on these and on the trusses transverse rings of brick were built with longi- tudinal ties at intervals; on the brick layers and embedding the rings and cross ties concrete was thrown in horizontal layers the haunches being filled in solid, and the*

surface sloped on either side and covered over with a tile roof of low pitch laid direct on the concrete. The rings relieved the centring from the weight imposed; and the two layers of bricks carried the concrete till it had set. As the walls carrying these vaults were also built in concrete with occasional bond courses of brick, the whole structure was homogeneous. One of the important ingredients of the mortar was a volcanic ' deposit found near Rome, known as pozzolana, which, when the concrete had set, not only made the concrete as solid as the rock itself, but to a certain extent neutralized the thrust of the vaults, which formed shells equivalent to that of a metal lid, the Romans, however, do not seem to have recognized the extra- ordinary value of this pozzolana mixture, for they otherwise provided amply for the counteracting of any thrust which might exist by the erection of cross walls and buttresses. In the tepidaria of the Thermae and in the basilica of Constantine in order to bring the thrust well within the walls, the main barrel vault of the hall was brought forward on each side and rested on detached columns, which constituted the principal architectural decoration. In cases where the cross vaults intersecting were not of the same span as those of the main vault, the arches were either stilted so that their soffits might be of the same height, or they formed smaller intersections in the lower part of the vault; in both of these cases, however, the intersections or groins were twisted, for which it was veiy difficult to form a centring, and, moreover, they were of dis- agreeable effect : though every attempt was made to mask this in the decoration of the vault by panels and reliefs modelled in stucco.*

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The widest hall vaulted by the Romans was that

of the throne room in the palace 'of Diocletian on the Palatine Hill, and this had the enormous span of ioq ft., its. thrust being counteracted by other halls on, either Iside with buttresses outside. In provincial' towns and in other parts of the ; Roman Empire, where the material pozzolana was not procurable, the Romans had to trust to their mortar as a cementing medium, but this, though excellent of its kind, was not of sufficient cohesive strength to allow of the erection of vaults of more than about 40 ft. span, which were generally built in rubble masonry; There still, exist in Asia Minor ..and Syria some vaulted halls, generally attached to thermae, which are. carried on walls of grea,t thickness. There were' Bran} varieties of the Roman vault, whether continuous or intersected, such as those employed oyer the cotridors on the Colosseum and the theatre of Mar cellus, but in these Cases the springing of the vault was above the summit of the Arches of the main front, so that there was no intersection; on the other hand, over the corridors were either elliptical or semicircular, or over the staircases rising vaults, all of which were more difficult to construct; there were also numerous solutions of vault over circular halls, of which that of the Pantheon was the most important example, having a diameter of 142 ft., and over the hemicycles,: which were sometimes of great size; that known as Canopus in Hadrian's villa atiTivoli had a diameter of 75 ft., and was vaulted over with a series of ribs, between which were alternating rampant flat and semicircular webs and cells; in the same villa and in Rome were octagonal halls with various other combinations of vault. Another type of vault not yet referred to isthat of the Tabularium arcade where the cloister vault was employed. Fig. 3 compared with fig. 2 will show the : difference ; in the*

r .– , x ■ >•----->.» former the angles of

intersection are inset and in the latter they*

are groins with.- pr6r jecting angles at the base, which die away at the summit.

The vault of the basilica commenced .by. ' Diocletiah and completed by > Con- stantine, Was the last great work carried out by the Romans, and two centuries pass before the next important development is found in the church of Sta Sophia at Con- stantinople. It is probable that the realization of the great advance in the science of vaulting shown in .this church owed something to the eastern tradition of dome Vaulting seen in the Assyrian domes, which are known to us only^by the repre- sentations in the bas-relief from Nimrud (fig. 1), because in the great water cisterns in Constantinople, known as the'Yeri Batan Serai (the -underground palace) and Bin bir-derek (cistern with a thousand and one columns), both built by Constantine, we find the intersecting groin vaults of the Romans already replaced by small . cupolas or domes. These domes* however, «(re of small dimensions when compared with that projected and carried out! by Justinian in Sta Sophia. Previous to this the greatest dome was that of the Panthe6n at Rome, but this was carried on an immense wall 20 ft. thick, and with the exception of small .niches or recesses in the thickness of the wall could not be extended* so that Justinian apparently instructed his architect to provide an immense hemi cycle or apse at the eastern end, a similar apse at the western end, and great arches Oft, either -side, -the. .walls under which . would be pierced with windows.*

'■ The 'diagram (fig. 4) shows the outlines of the solution of the problem. If a iemispherical dome is eut by four vertical planes, the intersection gives four semicircular arches ; if cut in addition by a horizontal plane tangent to the, top of these arches, it describes a circle; that portion of the : sphere which is below this circle and between the^aircTiesi ''forming a spherical spandrii;

is the rtendentive (fig. 5), and its radius is equal to the diagonal of the squareon which

the four arches rest. Having obtained a, circle for the base" of the dome, it is not necessary that the upper portion of the dome should

Fig. 3.

Fig, 4.

Fig. 5.

— AA, penden- tive.

spring from the same level as the arches, or that its domical surface should be a continuation of that of the pendentive. The first and second dome of Sta Sophia apparently fell down, so that Justinian determined to raise it, possibly to give greater lightness to the structure, but mainly in order to obtain increased light for the interior of the church. This was effected by piercing it with forty windows— the effect of which was of an extraordinary nature, as, the light streaming through these windows gave to the dome the appear- ance of.beihg suspended in the air. The pendentive which carried the dome rested on four great arches, the thrust of those crossing the church being counteracted by immense buttresses which tra- versed the aisles, arid the other>tw6 partly by smaller arches in the apse, the thrust being carried to the outer waUVjMid to a certain ex- tent by the side walls which Were built under tW arches. From the description giy#h by Procopius we gather that theicentring employed for the gr^t arches cpusisteci of a wall erected to support them during their erection,; ' The construction of the peridenrives is-not known, but it is surmised that to the top of the pendentives they were built in horizontal courses of brick, projecting one oyer the other, the projecting angles being cut off afterwards and covered

with stucco in which the mosaics were embedded ; this, was the method employed in the erection of the Perigprdian denies to which we shall return; these, however, Were of leS6 diameter thaft. those of Sta Sophia, being only about, 40 to 6b: ft. .instead of: 107 'ft;'. The apotheosis of Byzantine architecture, 4i fact, was reached hi Sta Sophia, for although ft formed the model on which all subsequent; Byzantine churches were based, so far as their plan was cotiotfrntd, no domes approaching' the former in dimensions were eVeft attempted. The principal -difference in some later examples' is that wWcfi took place in the form of the pendentive on which the dome was carried. Instead of the spherical,, spandrii of Sta Sophia, large niches were formed in the angles, 3s: in the .mosque of Parrtascus, which was built by Byzantine workmen for the Shjerif al Walid in a.d. 705; these gave, an octagonal base on; which* ; the hemispherical dome rested (fig". 6);for again, as in "the S^Sjariian palaces iof Serbistan and Firuzab^d; of, the 4th 'and 4^'»'cjen- ■''■«...■,.*

tury of our: em, TvhenVa eenfes of con- ..•'' r .~' t'"'^ centric arch rings, pr6jectin^ ohe m front of the other, were built, giving also an octagonal base; each of these penden- tives is known as a squinch.

There is one other : remarkable vault, also built by Justinian, in the church of S. Sergius and Bacchus in Constantinople. The central area of this' church was octa- gonal on plan,' and the dome is divided into sixteen compartments;, of these eight consist, of broad flat bands rising Fig. 6. — BB, niche or from the centre of each qf the walls, squinch pendentive., , and the alternate eight are Concave cells

over the angles of the octagon,' -which externally and internally give to the roof the appearance of an umbrella.

Aithough the dome constitutes the principal characteristic of the Byzantine church, throughout Asia Minor are numerous examples in which the naves are vaulted with the semicircular barrel vault, and this is the type of vault found throughout 1 the south of France in the nth and 12th centuries, the only change being the occasional substitution of the pointed barrel vault, adopted not only on account of its exerting a less thrust, but because, as pointed out by Fergusson (vol. iL p. 46), the roofing tiles were laid directly on the vault and a less amount of filling in at the top was required. The continuous thrust of the barrel vault in these cases was met either by semicircular or pointed barrel vaults on the aisles; which had only half the span- of the naVe; of this there is an interesting example hi the chapel of St John in the ToWer of London — and sometimes by half -barrel vaults, i The great thickness of the walls, however, required in such constructions would seem to have led to another sdlutiori

of the problem of roofing Over churches with incombustible material, viz. that which is found throughout Perigord and La Charente, where a scries of domes carried on pendentives covered over the nave, the chief peculiarities of these domes being the fact that the arches, carrying them form part of the pendentives, which are all built in horizontal courses.

The intersecting and groined vault of the Romans. was em- ployed in the early Christian churches in Rome, but only over the aisles, which were comparatively of small span, but in these there was a tendency to raise the centres of these Vaults, which became slightly domical; in all these cases centring was employed.

Reference has been made to the twisting of the groins in Roman work, where the intersecting barrel vaults were not of the same diameter; their construction must at all times have been somewhat difficult, but where the barrel vaulting was carried, round over the choir aisle and was intersected, as in St Bartholomew's, Srnithfield,,by semicones, instead of cylinders, it became worse and the groins more complicated; this would seem to have led to a change of system, and to the introduction of a new feature, which completely revolutionized the con- struction of the vault. Hitherto the intersecting features' were geometrical surfaces, of which the diagonal groins were, the intersections, elliptical in form, generally weak in construction and often twisting (Plate I. fig. 13). The medieval builder reversed the process, and set up the diagonal ribs first, which were utilized as permanent centres, and on these he carried his vault or web, which henceforward took its shape from the ribs. Instead of the elliptical curve which was given by the intersection of two semicircular barrel vaults, or cylinders, he employed the semicircular arch for the diagonal ribs; this, how- ever, raised the centre of the square bay vaulted above the level of the transverse arches and of the wall ribs, and thus gave the appearance of a dome to the vault, such as may be seen in the nave of Sant' Ambrogio, Milan. To meet this, at first tjie trans- verse and wall ribs were stilted, or the upper part of their arches was raised, as in the Abbaye-aux-Hommes at Gaen, and the abbey of Lessay, in Normandy. The problem was ultimately solved by the introduction of the pointed arch for the trans- verse and wall ribs — the pointed arch had long been known and employed, on account of its much greater strength and of the less thrust it exerted on the walls. When employed for the ribs of a vault, however narrow the span might be, by adopting a pointed arch, its summit eould be made to range in

height with the diagonal rib; and, moreover, when utilized for the ribs of the annular vault, as in the aisle round the apsidal termination of the choir, it was not necessary that the half ribs on the outer side should be in the same plane as those of the inner side; for when the opposite ribs met in the centre of the annular vault, the thrust was equally transmitted from one to the other, and being already a broken arch the change of its direction was not noticeable.

The first introduction of the pointed arch rib would seem to have taken place in the choir aisles of the abbey of St Dermis, near Paris, built by the Abbd Suger in 1135, and it was in the church at Vezelay (1140) that it was extended to the square bay of the' porch. Before entering into the question of the web or stone shell of the vault carried on the ribs, the earlier develop- ment of the great vaults which were thrown over the naves of a cathedral, or church, before the introduction of the pointed arch rib, shall here be noted. As has been pointed out the aisles had already in the early Christian churches been coverfcd over with groined vaults, the only advance made in the later develop- ments being the introduction of transverse ribs 1 dividing the bays into square compartments; but when in the 12th century*

1 Transverse ribs under the vaulting surfaces had been employed from very early times by the Romans, and utilized as permanent stone centrings for their vaults; perhaps the earliest examples are those in the corridor of the Tabularium in Rome, which is divided into square bays, each vaulted with a cloister dome. Transverse ribs are also found in the Roman Piscinae and in the Nyfnphaeum at Nimes; they were not introduced by the Romanesque masons till the nth century.

the first attempts were made to vault over the

naves, another difficulty presented itself, because the latter We're twice the width of the aisles, so that it became necessary to include tW6 bays of the aisles to form one square bay in the nave:' This, was, an immense space to vault over, and, moreover, it%>lkfwed that every alternate pier served no purpose, so faicsis Ui6 support of the nave vault was concerned, and'this womd sWm to haye^sug-r gested an alternative; viz. to provide a supplementary rib across the church and between the transverSe ribs. This resulted in what is known as a sexpartite, or six-celled vault, of which one of the earliest examples is found in the Abbaye-aux-Hommes (S. Etienne) at Caen. This church, built by William the Con- queror, was Originally constructed to carry a timber roof only, but riearly a century later the upper part of the nave walls were partly rebuilt, in order that it might be covered with a vault. The immense size, however, of the square vault over the nave necessitated some additional support, so that an intermediate rib was thrown across the church, dividing 1 the square compart- ment into six cells,- and called the sexpartite vault (fig. 7);

Sexpartite.

this was adopted in the cathedrals of Sens (ri'7'0), jLaon (1195), Noyon (n 90},, Paris' (1223-35), and Bourges, (1250). The, intermediate rib, however, had the disadvantage of partially obscuring One side of the clerestory windows, and it threw unequal weights on the ' alternate piers, so that in the cathedral of Soisspns (1205) a quadripartite (fig. 8) or

Fig. 8.— Quadripartite.

four-celled vault was introduced, the width of each bay being half the span of the nave, and corresponding therefore with the aisle piers. To this there are some exceptions, in Sant'

*Ambrogio, Milan, and San Michele, Pavia (the original vault), and in the cathedrals of; Spires, Mainz and Worms, where the quadripartite vaults are nearly square, the intermediate piers of the aisles being of much smaller dimensions. In England sexpartite vaults exist at Canterbury (1 175) (set out by William of Sens), Rochester (1 200), Lincoln (12 15), Durham (east tran : sept) * and St Faith's chapel, Westminster; Abbey.*

In' the earlier stage of rib Vaulting, the arched ribs consisted of independent or ' separate Voussoirs down to the springing; the difficulty, however, of working the ribs separately led to two other important changes: (1) the lower part of the transverse diagonal

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and wall ribs were all worked out of one stone; and (2) the lower courses were all made horizontal, constituting what is known as the tas-de-charge (q.v.) or solid springer. Fig. 9 is a diagram made by

Professor Willis taken from the south transept of Westminster Abbey. The horizontal courses rise to N. or about half the height of the vault, but the ribs are freed from one another from the point M. The tas-de-charge, or solid springer, had two ad- vantages: (1) it enabled the stone courses to run straight through the wall, so as to bond the whole together much better;

Ni and (2) it lessened the span of ' the vault, which then required a centring of smaller dimen- sions. As soon as the ribs were completed, the web or stone; shell Fig. 9. — AB, springing of trans- of the vault was laid on them. In verse and diagonal ribs; P, some English work, as may be seen centre of the same; DE, longi- in fig. 9, each course of stone was tudinal ridge rib; DF, inter- of

uniform height from one side section of webs; M, top of solid to the other; bat, as the diagonal springer; KNi starting level rib was longfejyQian either the of web; LK, spririging of wall transverse or wsfcH rib, the course rib; EBD, bosses at inter- dipped towards the former, and it section of ribs. the apex of the vault were cat*

to fit one another. At an early period, in consequence of the great span of the vault and the very slight rise or curvature of the web, it was thought .better to simplify the construction of the web by introducing intermediate ribs between the wall rib and the diagonal rib and between the diagonal and the transverse ribs ; and in order to meet the thrust of these intermediate rios a ridge rib was required, and the prolongation of this rib to the wijll rib hid the junction of the web at the summit, which Was not aways very sightly, and constituted the ridge rib. In France, on the other hand, the web courses were always laid horizontally, and thjey are therefore of unequal height, increasing towards the diagonal riOi Each course atjw was given a slight rise i($We centre, so as to increase its strenjrffe; this enabled the French masons to dispense with the intermediate rib, which was not introduced by them till the 15th century, and then more as a decorative than a constructive feature, as the domical form given to the French web rendered unnecessary the ridge rib, which, with some few exceptions, exists only in England. In both English and French vaulting centring was rarely required for the building of the web, a template (Fr. cere?) being employed to support the stones of each ring until it was com- plete. In Italy, Germany and Spain the French method of building the web was adopted, with horizontal courses and a domical form. Sometimes, in the case of comparatively narrow compartments, and more especially in clerestories, the wall rib was stilted, and*

this caused a peculiajs twisting of the web, as may be seen in fig. 9, where tfce springing of the wall rib is at K: to these twisted surfaces the teVm " ploughshare vaulting " is given.

'One of the earliest examples of the introduction of the inter- mediate rib is found in the nave of Lincoln Cathedral, and there the ridge rib is not carried to the wall rib. It was soon found, however, tfcat the construction of the web was much facilitated by additional ribo, and consequently there was a tendency to increase their number, sji'that in the nave of Exeter Cathedral three intermediate ribs were provided between the wall rib and the diagonal rib. In order to mask the junction of the various ribs, their intersections were ornamented with richly carved bosses, and this practice increased on the introduction of another short rib, known as the Heme, a term M France given to the ridge rib. Lierne ribs in English vaults are sport ribs crossing between the main ribs, and were employed chiefly a»,.jdecorative features, as, for instance, in toe stellar vault (see filate I. fig. 16), one of the best examples of wfcich exists in t||e vault of the oriel window of Crosby Hall, London. The tendency to increase the number of ribs led to singular results in some cases, as in the choir of Gloucester (see Plate II. fig. 17), where the ordinary diagonal ribs become mere ornamental mouldings on the surface of an intersected pointed barrel vault, and again in the cloisters, where the introduction of the fan vault, forming a concave-sided conoid, returned to the principles of the Roman geometrical vault. This is further shown in the construction of these fan vaults, for although in the earliest examples each of the ribs above the tas-de-charge was an independent feature, eventually it was found easier to carve them and the web out ofthe solid stone, so that the rib and web were purely decorative and had no constructional or independent functions. The

fan vault would seem to have owed its origin to the employ- ment of centrings of one curve for all the ribs, instead of having separate centrings for the transverse, diagonal wall and intermediate ribs; it was facilitated also by the introduction of the four-centred arch, because the lower portion of the arch formed part of the fan, or conoid, and the upper part could be extended at pleasure with a greater radius across the vault. The simplest version is that found

in the cloisters of Gloucester Cathedral, where the fans meet one another at the summit, so that there are only small compartments between the fans to be filled up. In later examples, as in King's College chapel, Cambridge (see Plate II. fig. 18), on account of the great dimensions of the vault, it was found necessary to introduce transverse ribs, which werq required to give greater strength. Similar transverse ribs are found in Henry VII. 's chapel (see Plate II. fig. 19) and in the divinity schools at Oxford, where a new development presented itself. One of the defects of the fan vault at Gloucester is the appearance it gives of being half sunk in the wall; to remedy this, in the two buildings just quoted, the complete conoid is detached and treated as a pendant.

One of the most interesting examples of the fan vault is that over the staircase leading to the hall of Christ Church, Oxford, and here the complete conoid is displayed in its centre carried on a central column. This vault, not built until 1640, is an exceptional example of the long continuance of traditional workmanship, probably in Oxford transmitted in consequence of the late vaulting of the entrance gateways to the colleges. Fan vaulting is peculiar to England, the only example approaching it in France being the pendant of the Lady chapel at Caudebec, in Normandy, In France, Germany and Spain the multiplication of

ribs in the 15th century led to decorative vaults of various kinds, but with some singular modifications. Thus in Germany, recognizing that the rib was no longer a necessary constructive^feature, they cut it off ab- ruptly, leaving a stump only; in France, on the other hand, they gave still more importance to the rib, by making it of greater depth, piercing it with tracery and hanging pendants from it, and the web became a horizontal stone paving laid on the top of these deep- rated vertical webs. This is the cha- racteristic of the great Renaissance work in France? and Spain; but it soon gave way to Italian influence, when the construction of vaults reverted to the geometrical sur- faces of the Romans, without, hoWever, always that eco- nomy in centring to which they had at- tached so much im- portance, and more p 1G- i _ especially in small

structures. In large vaults, where it constituted an important element in expense, the chief boast of some of the most eminent

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Fig. 11. architect? has been that centring was dispensed with, as in the case of the dome at Florence, built by Brunelleschi, and Ferguson cites as an example the great dome of the church at

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Plate I.

Fig. 13.— INTERSECTING GROINED VAULTING. Early example. St John's Chapel, Tower of London.

Fig. 14.— INTERSECTING RIBBED VAULTING. Late example. Chapter House, Bristol Cathedral.

Photo, F. Frith &- Co. Lid.

Fig. 15.— EARLY ENGLISH VAULTING. Winchester XXVII.960. Cathedral, Waynfleet's Chantry.

Pholo, P. Prilk & Co. Lid.

Fig. 16.— EARLY ENGLISH LIERNE VAULTING, Tower of Salisbury Cathedral.

Plate II.

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Photo, The Photochrome Co.

Fig. 17.— DECORATED OR LIERNE VAULTING,

Choir of Gloucester Cathedral.

(See also Plate VIII., Fig. 82, Architecture.)

Fkolo, G. W. Wilsm 6 Co.*

Fig. 18— FAN VAULTING. King's College Chapel, Cambridge.

Fig. 19— FAN VAULTING. Henry VII. Chapel, Westminster,

Mousta in Malta, erected in the first half of the 19th century, which was built entirely without centring of any kind. Fig. 10 is a plan and section of the vault of Henry VII. 's chapel and fig. 11 a perspective view, in which

it will be seen that the transverse rib thrown across the chapel carries the pendant, the weight of the latter probably preventing a rise in the haunches.

There are two other ribbed vaults in India which form no part of the development of European vaults, but are too remarkable to be passed over; one carries the central dome of the Jumma Musjid at Bijapur (a.d. 1559), and the other is the tomb of Mahommed (a.d. 1626–1660) in the same town. The vault of the latter was constructed over a hall 135 ft. square, to carry a hemispherical dome. The ribs, instead of being carried across the angles only, thus giving an octagonal base for the dome, are carried across to the further pier of the octagon (fig. 12) and consequently intersect one

another, reducing the cen- tral opening to 97 ft. in diameter, and, by the weight of the masonry they carry, serving as counterpoise to the thrust of the dome, which is set back so as to leave a passage about 12 ft. wide round the interior. The internal diameter of the dome is 124 ft., its height 175 ft. and the ribs struck from four centres have their springing 57 ft. from the floor of the hall. The Jumma Musjid dome was of smaller dimensions, on a square of 70 ft. with a diameter of 57 ft., and was carried on piers only instead of immensely thick

–Plan of Bijapur Dome.

the tomb; but any thrust which might exist was

Fig. 12.–

walls as in

counteracted by its transmission across aisles to the outer wall.

(R. P. S.)

VAUQUELIN, LOUIS NICOLAS (1763–1829), French chemist, was born at Saint-Andre-d'Hebertot in Normandy on the 16th of May 1763. His first acquaintance with chemistry was gained as laboratory boy to an apothecary in Rouen (1777–1779), and after various vicissitudes he obtained an introduction to A. F. Fourcroy, in whose laboratory he was an assistant horn 1783–1791. At first his work appeared as that of his master and patron, then in their joint-names; but in 1790 he began to publish on his own authority, and between that year and 1833 his name is associated with 376 papers. Most of these were simple records of patient and laborious analytical operations, and it is perhaps surprising that among all the substances he analysed he only detected two new elements — beryllium (1798) in beryl and chromium (1797) in a red lead ore from Siberia. Either together or successively he held the offices of inspector of mines, professor at the School of Mines and at the Polytechnic School, assayer of gold and silver articles, professor of chemistry in the College de France and at the Jardin des Plantes, member of the Council of Industry and , Commerce, commissioner on the pharmacy laws, and finally professor of chemistry to the Medical Faculty, to which he succeeded on Fourcroy's death in 1809. His lectures, which were supplemented with practical laboratory teaching, were attended by many chemists who subsequently attained distinction. He died at his birthplace on the 14th of November 1829.

VAUQUELIN DE LA FRESNAYE, JEAN (1536–1608), French poet, was born at the chateau of La Fresnaye, near Falaise in Normandy, in 1536. He studied the humanities at Paris and law at Poitiers and Bourges. He fought in the civil wars under Marshal Matignon and was wounded at the siege of Saint-L6 (1574). Most of his life was spent at Caen, where he was president, and he died there in 1608. La Fresnaye was a

disciple of Ronsard, but, while praising the reforms of the Pleiade, he laid stress on the continuity of French literary history. He was a student of the trouveres and the old chroniclers, and desired to see French poetry set on a national basis. These views he expounded in an Art poitique, begun at the desire of Henry III. in 1574, but not published until 1605.

His Foresteries appeared in 1555; his Diverses po&sies, including the Art poetique, the Satyres frangoises, addressed to various dis-

tinguished contemporaries, and the Idylles, with some epigrams and sonnets, appeared in 1605. Among his political writings may be noted Pour la monarchic du royaume contre la division (1569).

The Art poitique was edited by G. Pellissier in 1885. It is summar- ized for English readers in vol. ii. of Mr George Saintsbury's History of Criticism. A notice of the poet by J. Travers is prefixed to an edition of the CEuvres diverses (Caen, 1872).

VAUVENARGUES, LUC DE CLAPIERS, Marquis de (1715- 1747), French moralist and miscellaneous writer, was born at Aix in Provence on the 6th of August 1715. His family was poor though noble; he was educated at the college of Aix, where he learned little — neither Latin nor Greek— but by means of a translation acquired a great admiration for Plutarch." He entered the army as sub-lieutenant in the king's regiment, and served for more than ten years, taking part in the Italian cam- paign of Marshal Villars in 1733, and in the disastrous expedition to Bohemia in support of Frederick the Great's designs on Silesia, in which the French were abandoned by their ally. Vauvenargues took part in Marshal Belle-Isle's winter retreat from

Prague. On this occasion his legs were frozen, and though he spent a long time in hospital at Nancy he never completely recovered. He was present at the battle of Dettingen, and on his return to France was garrisoned at Arras. His military career was now at an end. He had long been desired by the marquis of Mirabeau, author of L' Ami des hommes, and father of the statesman, to turn to literature, but poverty prevented him from going to Paris as his friend wished. He wished to enter the diplomatic service, and made applications to the ministers and to the king himself. These efforts were unsuccess- ful, but Vauvenargues was on the point of securing his appoint- ment through the interveption of Voltaire when an attack of smallpox completed the ruin of his health and rendered diplo- matic employment out of the question. Voltaire then asked him to submit to him his ideas of the difference between Racine and Corneille. The acquaintance thus begun ripened into real and lasting friendship. Vauvenargues removed to Paris in 1745, and lived there in the closest retirement, seeing but few friends, of whom Marmontel and Voltaire were the chief. Among his correspondents was the archaeologist Fauris de Saint- Vincens. Vauvenargues published in 1746 an Introduction d la connaissance de I'espril humain, with certain Reflexions and Maximes appended. He died in Paris on the 28th of May 1747.

The bulk of Vauvenargues's work is very small, but its interest is very considerable. In the Introduction, in the Reflexions and in the minor fragments, it consists, in fact, of detached and somewhat desultory thoughts on questions of moral philosophy and of literary criticism. Sainte-Beuve has mildly said that as a literary critic Vauvenargues " shows inexperience." His literary criticism is indeed limited tc a repetition in crude form of the stock ideas of his time. Thus he exaggerates immensely the value of Racine and Boileau, but

depreciates Corneille and even Moliere. As a writer he stands far higher. His style is indeed, according to strict academic judgment, somewhat incorrect, and his few excursions into rhetoric have the artificial and affected character which mars so much 18th-century work. His strength, however, is not really in any way that of a man of letters, but that of a moralist. He did not adopt the complete philosophe attitude; in his letters, at any rate, he poses as " neutral " between the religious and the anti-religious school. In some of his maxims about politics there is also traceable the hollow and confused jargon about tyrants and liberty which did So much to bring about the struggles of the Revolution. It is in morals proper, in the discussion and application of general principles of conduct, that Vauvenargues shines. He is not an exact psychologist, much less a rigorous metaphysician. His terminology is popular and loose, and he hardly attempts the co-ordination of his ideas into any system. His real strength is in a department which the French have always cultivated with greater success than any other modern people — the expression in more or less epigram- matic language of the results of acute observation of human conduct and motives, for which he had found ample leisure in his campaigns. The chief distinction between Vauvenargues

and his great predecessor La Rochefoucauld is that Vauven- argues, unlike La Rochefoucauld, thinks nobly of man, and is altogether inclined rather to the Stoic than to the Epicurean theory. He has indeed been called a modern Stoic, and, allow- ing for the vagueness of all such phrases, there is much to be said for the description.

An edition of the CEuvres of Vauvenargues, slightly enlarged, appeared in the year of his death. There were some subsequent editions, superseded by that of M. Gilbert (2 vols., 1857), which contains some correspondence, some Dialogues of the Dead, " cha- racters " in imitation of Theophrastus and La Bruyere, and numerous short pieces of criticism and moralizing. The best comments on Vauvenargues, besides those contained in Gilbert's edition, are to be found in four essays by Sainte-Beuve in Causeries du lundi, vols. iii. and xiv., and in Villemain's Tableau de la literature francaise auXVIII"" sitele.

See also M. Pal6ologue, Vauvenargues (1890); and Selections from . . . La Bruyere and Vauvenargues, with memoir and notes by Miss Elizabeth Lee (1903).

VAUX, CALVERT (1824-1895), American architect and land- scape gardener, was born in London on the 24th of December 1824. He was educated at Merchant Taylors' School and in the office of Lewis N. Cottingham (1787-1847). In 1850 he went to America and became A. J. Downing's architectural partner. In 1856 and 1866 Vaux was associated with F. L. Olmsted in the plans for the improvement of various parks. He designed the Belvidere in Central Park, New York, and built a number of country houses in Newport, besides many town houses and public institutions.

VAUX OF HARROWDEN, THOMAS VAUX, 2ND Baron (1510- 1556), English poet, eldest son of Nicholas Vaux, 1st Baron Vaux, was born in 1510. In 1527 he accompanied Cardinal Wolsey on his embassy to France; he attended Henry VIII. to Calais and Boulogne in 1532; in 1531 he took his seat in the House of Lords, and was made Knight of the Bath at the corona- tion of Anne Boleyn. He was captain of the Isle of Jersey until 1536. He married Elizabeth Cheney, and died in October 1556. Sketches of Vaux and his

wife by Holbein are at Windsor, and a finished portrait of Lady Vaux is at Hampton Court. Two of his poems were included in the Songes and Sonetles of Surrey (Tottel's Miscellany, 1557). They are " The assault of Cupid upon the fort where the lover's hart lay wounded, and how he was taken," and the " Dittye . . . representinge the Image of Deathe," which the gravedigger in Shakespeare's Hamlet misquotes. Thirteen pieces in the Paradise of Dainty Devices (1576) are signed by him. These are reprinted in Dr A. B. Grosart's Miscellanies of the Fuller Worthies Library (vol. iv., 1872).

VAUXHALL, a district on the south bank of the river Thames, in London, England, included in the metropolitan borough of Lambeth. The manor was held by Falkes de Breaute (whence the name, falkes Hall) in the time of John and Henry III. About 1661 public gardens were laid out here, known as the New Spring Garden, and later as Spring Gardens, but more familiar under the title of Vauxhall Gardens. They soon became the favourite fashionable resort of the metropolis; but as a place of general entertainment they underwent great development from 1732 under the management of Jonathan Tyers (d. 1767) and his sons Thomas and Jonathan. In 1832, with the approval of George IV., who frequented the gardens before his accession, the epithet Royal was added to their title. By the middle of the 19th century, however, Vauxhall had lost its high reputation; in 1859 the gardens were finally closed, and the site was quickly built over.

VAVASSOR (Med. Lat. valvassor, vasvassor; Fr. vavassour, vavassor, vasseur, &c), in its most general sense a mediate vassal, i.e. one holding a fief under a vassal. The word was, however, applied at various times to the most diverse ranks in the feudal hierarchy, being used practically as the synonym of vassal. Thus tenants-in-chief of the crown are described by the Emperor Conrad {Lex Lamgob. lib. iii. tit.

8, § 4) as valvassores majores as distinguished from mediate tenants, valvassores ■ minores. Gradually the term without qualification was found convenient for describing sub-vassals, tenants-in-chief being called capitanei

or barones (see Baron); Its implication, however, still varied in different places and times. Bracton (lib. i. cap. 8, § 2) ranks the magnates seu valvassores between b.arons and knights; for him they are ″ men of great dignity,″ and in this order they are found in a charter of Henry II. (n66). But in the regestum of Philip Augustus (fol. 158) we find that five vavassors are reckoned as the equivalent of one knight. Finally, Du Cange quotes two charters, one of 1187, another of 1349, in which vavassors are clearly distinguished from nobles.

The derivation of the word vavassor is very obscure. The fanciful interpretation of Bracton, vas sortitum ad valetudinem (a vessel chosen to honour), may be at once rejected. Others would derive it from vassi ad valvas (at the folding-doors, valvae), i.e. servants of the royal antechamber. Du Cange, with more justice, regards it merely as an obscure variant of vassus. (W. A. P.)

VAYGACH (variously Waigats, Waigatch, &c), an island off the Arctic coast of Russia, between it and Novaya Zemlya, bounded S. by the narrow Yugor Strait, and N. by that of Kara. It is roughly oblong in form; its length from S.E, to N.W. is 70 m.< and its greatest breadth 28. Its greatest elevation scarcely exceeds 300 ft. For the most part it consists of tundra, with frequent marshes and small lakes. Slight rocky ridges run generally along its length, and the coast has low cliffs in places. The island consists in the main of limestone, and its elevation above the sea is geologically recent. Raised beaches are frequently to be traced. The rocks are heavily scored by ice, but this was

probably marine ice, not that of glaciers. Grasses, mosses and Arctic flowering plants are abundant, but there are no trees excepting occasional dwarf willows. Foxes and lemmings are met with, but whereas animals are few, birds are very numerous; a variety of ducks, waders, &c, frequent the marshes and lakes. The island is visited periodically by a few Samoyedes; they formerly considered it sacred, and some of their sacrificial piles, consisting of drift-wood, deer's horns and the skulls of bears and deer, have been observed by travellers. In spite of their conversion to Christianity, the Samoyedes still regard these piles with superstition. The origin of the name Vaygach is as dubious as its orthography; it has been.held to be Dutch (waaien, to blow, and gat, a strait, hence " windy strait ") or Russian, in which case it is probably a surname.

Comparatively little was known of the interior of the island until Mr F. G. Jackson made the circuit of it on foot in 1893 (see his Great Frozen Land, London, 1895; also H. J. Pearson, Beyond Petsora Eastward, London, 1899).

VECTOR ANALYSIS, in mathematics, the calculus of vectors.

The position of a point B relative to another point A is specified

by means of the straight line drawn from A to B. It may

equally well be specified by any equal and parallel line drawn

in the same sense from (say) C to D, since the position of D

relative to C is the same as that of B relative to A. A straight

line conceived in this way as having a definite

length, direction

*and sense, but no definite location in space, is called a vector. — 4 — -**

It may be denoted by AB (or CD), or (when no confusion is

likely to arise) simply by AB. Thus a vector may be used to

specify a displacement of translation (without rotation) of a

rigid body. Again, a force acting on a particle, the velocity

or momentum of a particle, the state of electric or magnetic

polarization at a particular point of a medium, are examples

of physical entities which are naturally represented by vectors.

The quantities, in the other hand, with which we are familiar in ordinary arithmetical algebra, and which have merely magni- tude and sign, without any intrinsic reference to direction, are distinguished as scalars, since they are completely specified by their position on the proper scale of measurement. The mass of a body, the pressure of a gas, the charge of an electrified Conductor, are instances of scalar magnitudes. It is convenient to emphasize this distinction by a difference of notation; thus scalar quantities may be denoted by italic type, vectors (when they are represented by single symbols) by ″ black ″ or ″ Claren- don ″ type.

There are certain combinations of vectors with one another,

and with scalars, which have important geometrical or physical significance. Various systems of ″ vector analysis ″ have been devised for the purpose of dealing methodically with these; we shall here confine ourselves to the one which is at present in. most general use. Any such calculus must of course begin with definitions of the fundamental symbols and operations; these are in the first instance quite arbitrary conventions, but it is convenient so to frame them that the analogy with the processes of ordinary algebra may as far as possible be main- tained.

As already explained, two vectors which are represented by equal and parallel straight lines drawn in the same sense are regarded as identical. Again, the product of a scalar m into a vector A is naturally defined as the vector whose direction is the same as that of A, but whose length is to that of A in the ratio m, the sense (more- over) being the same as that of A or the reverse, according as m is positive or negative. We denote it by «A. The particular case where m = -i is denoted by— A, so that a change of sign simply reverses the sense of a vector.

As regards combinations of two vectors, we have in the first place the one suggested by composition of displacements in kinematics, or of forces or couples in statics. Thus if a rigid body receive in

succession two translations represented by AB and BC, the final result is equivalent to the translation represented by AC. It is convenient, therefore, to regard AC as in a sense the ″ geometric sum ″ of AB and BC, and to write

AB+BC = AC. This constitutes the definition of vector addition; and it is evident at once from

fig. I that

BC + AB = AD + DC = AC = AB + BC . Hence, A and B being any two vectors, we have

A+B=B+A, _. . . (1)

i.e. addition of vectors, like ordinary arithmetical addition, is subject to the ″ commutative iaw.″ As regards subtraction, we define A — B

as the equivalent of A + (—B); thus in fig. 1, if AB=A, BC = B, we have

A—r—B=AC, A—B=DB.

When the sum (or difference) of two vectors is to be further dealt with as a single vector, this may be indicated by the use of curved brackets, e.g. (A+B). It is easily seen from a figure that

(A+B)+C=A+(B+C) (2)

and so on; i.e. the ″ associative law ″ of addition also holds. Again, if nt be any scalar quantity, we have

w(A—r—B)=mA+mB (3)

or, in words, the multiplication of a vector sum by a scalar follows the ″ distributive law.′ The truth of (3) is obvious on reference to the similar triangles in fig. 2, where

OP = A, PQ = B, OP′=»»A, P′Q′=mB.

Fig. 1.

Fig. 2.

It will be noticed that the proofs of (1) and (3) involve the funda- mental postulate of the Euclidean geometry.

The definition of ″ work ″ in mechanics give6

us another important mode of combination of vectors. The product of the absolute magnitudes A, B (say) of two vectors A, B into the cosine of the angle between their directions is called the scalar product of the two vectors, and is denoted by A .B or simply AB. Thus

AB = ^Scos« = BA, ... (4) so that the " commutative law of multiplication " holds here as in ordinary algebra. The " distributive law " is also valid, for we have

A(B+C)=AB+AC (5)

the proof of this statement being identical with that of the statical theorem that the sum of the works of two forces in any displacement of a particle is equal to the work of their resultant.

For an illustration of the next mode of combination of vectors we may have recourse to the geometrical theory of the rotation of a

rigid body about a fixed point 0. As explained under Mechanics,

the state of motion at any instant is specified by a vector OI repre- senting the angular velocity. The instantaneous velocity of any other point P of the body is completely determined by the two

vectors OI and OP, viz. it is a vector normal to the plane of OI and OP, whose absolute magnitude is 01 .OP. sin 6, where $ denotes the inclination of OP to OI, and its sense is that due to a right-handed rotation about OI. A vector derived according to this rule from any two given vectors A, B is called their vector product, and is denoted by A XB or by [AB]. This type of combination is frequent in electro-magnetism ; thus if C be the current and B the magnetic induction, at any point of a conductor, the mechanical force on the latter

is represented by the vector [CB]. It will be noticed in the above kinematical example that if the r61es of the two vectors 01, OP were interchanged, the resulting vector would have the same absolute magnitude as before, but its sense would be reversed. Hence

[AB] = -[BA], _ (6)

so that the commutative law does not hold with respect to vector pro- ducts. On the other hand, the distributive law applies, for we have

_[A(B+C)] = [AB]+[AC], . . .(7)

as may be proved without difficulty by considering the kinematical interpretation.

Various types of triple products may also present themselves, the most important being the scalar product of two vectors, one of which is itself given as a vector product. Thus A[BC] is equal in absolute value to the volume of the parallelepiped constructed on three edges OA, OB, OC drawn from a point O to represent the vectors A, B, C respectively, and it is positive or negative according as the lines OA, OB, OC follow one another in right- or left-handed cyclical order. It follows that

A[BC] = B[CA] = -B[AC]=&c. ... (8) In order to exhibit the correspondence between the shorthand methods of vector analysis and the more familiar formulae of Cartesian geometry, we take a right-handed system of three mutually perpendicular axes Ox, Oy, Oz, and adopt three fundamental unil- vectors i,j, k, having the positive directions of these axes respectively. As regards the scalar products of these unit-vectors, we have, by (4),

p=p = tf=i,jk = kj=]i~o. ... (9) Any other vector A is expressed in terms of its scalar projections Ai, A 2 , As on the co-ordinate axes by the formula

A=/Ai+yA 2 +/fA s (10)

For the scalar product of any two vectors we have

AB = (/Ai-h/A 2 +/(A3)(/B 1 +yB 1! +AB s)=AiB 1 4-A J Bt+A 3 B i „(ii) as appears on developing the product and making use of (9). In particular, forming the scalar square of A we have

Ai J 4-A+A 3 2 , ... (12) where A denotes the absolute value of A.

Again, the rule for vector products, applied to the fundamental units, gives

W*1 = [/*] = [A 1] -o, } .

m = - W] =/. w] = - i/*j =y. it/] = - [//] =h. \ w .

Hence

[AB] = [(/A 1 +yA 2 +AA,)(/B 1 +yB 2 +AB 3)]

=/(A 2 B 3 -A,B 2)+y(A 3 B,-A 1 B 8)+ft(AiB,-A 2 B 1)

= -[BA] (* 4)

The correspondence with the formulae which occur in the analytical theory of rotations, &c, will be manifest. If we form the scalar product of a third vector C into [AB], we obtain C[AB] = A„ B lt Ci

A 2 , B 2 , Q (15)

A3, B 3 , C 3 in agreement with the geometrical interpretation already given.

In such subjects as hydrodynamics and electricity we are intro- duced to the notion of scalar and vector fields. With every point P of the region under consideration there are associated certain scalars (e.g. density,

electric or magnetic potential) and vectors (e.g. fluid velocity, electric or magnetic force) which are regarded as functions of the position of P. If we treat the partial-differential operatorf d/dx, d/dy, d/dz, where #, y, z are the co-ordinates of P, as if they were scalar quantities, we are led to some remarkable and signtn cant expressions. Thus if we write

V=(4+4+| z). • ■ • (16) and operate on a scalar function , we obtain the vector*

v=/^+y^,+A Tz .*

'dx rj dy

(17)

This is called the gradient of and sometimes denoted by " grad "', its direction is that in which most rapidly increases, and its magni tude is equal to the corresponding rate of increase. Thus

«>•-(!) :*

sr(D ;

A repetition of the operation v gives

(18)

(19)

9 6 4-

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*In the theory of attractions this expression is interpreted as measur- ing the degree of attenuation of the quantity at P; if we reverse the sign we get the concentration,^^*

Again, if we form the scalar product of the operator v into a vector A we have

*A= dl+jfy+K^ (/A.+yAs+AA^+f ^ . (2o)

If A represent the velocity at any point (x, y, z) of a fluid, the latter expression measures the rate at which fluid is flowing away from the neighbourhood of P. By a generalization of this idea, it is called the divergence of A, and we write

vA = divA (21)

The vector product [vA] has also an important significance. We find

l*A]- [(i fx+JTy+ k Ii) tfAi+/A,+AA,)]

_ . /3Aj 3AA . /3Ai_9A_ 3 \ , , (dA* 3AA ' \dy dz J + 1\ dz dx) +H \dx dy)

(22)

If A represent as before the velocity of a fluid, the vector last written will represent the (doubled) angular velocity of a fluid element. Again if A represent the magnetic force at any point of an electro-magnetic field, the vector [vA] will represent the electric current. In the general case it is called the curl, or the rotation, of A, and we write

[yA] = curl A, or rot A. . . (23)

These definitions enable us to give a compact form to two im- portant theorems of C. F. Gauss and Sir G. G. Stokes. The former of these may be written

/div A.dV=fAndS, . . . (24) where the integration on the left hand includes all the volume- elements dV of a given region, and that on the right includes all the surface-elements dS of the boundary, n denoting a unit vector drawn outwards normal to dS. Again, Stokes's theorem takes the form f Ads =/ curl A . ndS, . . . (25) where the integral on the right

extends over any open surface, whilst on the left ds is an element of the bounding curve, treated as a vector. A certain convention is implied as to the relation between the positive directions of n and ds.

It is to be observed that the term " vector " has been used to include two distinct classes of geometrical and physical entities. The first class is typified by a displacement, or a mechanical force. A polar vector, as it is called, is a magnitude associated with a certain linear direction. This may be specified by any one of a whole assemblage of parallel lines, but the two "senses" belonging to any one of the lines are distinguished. The members of the second class, that of axial vectors, are primarily not vectors at all. An axial vector is exemplified by a couple in statics; it is a magnitude asso- ciated with a closed contour lying in any one of a system of parallel planes, but the two senses in which the contour may be described are distinguished. It was therefore termed by H. Grassmann a Plangrosse or Ebenengrosse. Just as a polar vector may be indicated by a length, regard being paid to its sense, so an axial vector may be denoted by a certain area, regard being paid to direction round the contour. A theory of " Plangrossen " might be developed through- out on independent lines; but since the laws of combination prove to be analogous to those of suitable vectors drawn perpendicular to the respective areas, it is convenient for mathematical purposes to include them in the same calculus with polar vectors. In the case of couples this procedure has been familiar since the time of L. Poinsot (1804). In the Cartesian treatment of the subject no distinction between polar and axial vectors is necessary so long as we deal with congruent systems of co-ordinate axes. But when we pass from a right-handed to a left-handed system the formulae of transformation are different in the two cases. A polar vector

(e.g. a displacement) is reversed by the process of reflection in a mirror normal to its direction, whilst the corresponding axial vector (e.g. a couple) is unalter-ed.

References. — The methods of vector analysis are chiefly used as a means of condensed expression of various important relations which are of frequent occurrence in mathematical physics, more especially in electricity. They are freely employed, for example, in many recent German treatises. The historical development of the sub- ject can only be briefly referred to. The notions of scalar and vector products originated independently with Sir W. R. Hamilton (1843) (see Quaternions) and H. Grassmann (1844), but were associ- ated with various other conceptions of which no use is made in the simplified system above sketched. The present currency of this latter system is due mainly to the advocacy of O. Heaviside and J. W. Gibbs, although for the systematic physical interpretation of the various combinations of symbols which constantly recur in electricity and allied subjects we are indebted primarily to the classical treatise of J. C. Maxwell on Electricity and Magnetism (1873). For further details and applications of the calculus refer- ence may be made to the following : 0. Heaviside, Electro- Magnetic Theory (London, 1894); J. W. Gibbs, Vector Analysis (2nd ed., New York, 1907); M. Abraham, Die Maxwellsche Theorie d. Elektrizitdt (Leipzig, 1904); the articles by H. E. Timerding and M.

Abraham in vol. iv. of the Encycl. d. Math. Wiss. (Leipzig, 1901-2) ; A. H. Bucherer, Elemente d. Vektor-Analysis (Leipzig, 1905). For an account of other systems of vector analysis see H. Hankel, Theorie d. complexen Zahlensysteme (Leipzig, 1867); and A. N. Whitehead, Universal Algebra, vol. i. (Cambridge, 1898). (H. Lb.)

VEDDAHS, or Weddahs (from Sanskrit veddha, " hunter "), a primitive people of Ceylon, probably representing the Yakkos or " demons " of Sanskrit writers, the true aborigines of the island. During the Dutch occupation (1644-1796) they were found as far north as Jaffna, but are now confined to the south- eastern district, about the wooded Bintenna, Badulla and Nil- gala hills, and thence to the coast near Batticaloa. They are divided into two classes, the Kele Weddo or jungle Veddahs, and the Can Weddo, or semi-civilized village Veddahs. The Veddahs exhibit the phenomenon of a race living the wildest of savage lives and yet speaking an Aryan dialect. Craniometrical evidence strongly favours the theory, now generally accepted, that they represent a branch of the pre-Aryan Dravidians of southern India, and that their ancestors probably made a settle- ment in the island of Ceylon in prehistoric times, detaching them- selves from a migrating horde which passed through the island to find at last a permanent home in the continent of Australia.

The true jungle veddahs are almost a dwarfish race. They are dark-skinned and fiat-nosed, slight of frame and very small of skull, and average no more than 5 ft. Their black hair is shaggy rather than lank. They are a shy, harmless, simple folk, living chiefly by hunting; they lime birds, catch fish by poisoning the water, and are skilled in getting wild honey; they have bows with iron-pointed arrows and breed hunting dogs. They dwell in caves or bark huts, and their word for house is Sinhalese for a hollow tree, rukula. They count on their fingers, and make fire with the simplest form of fire-drill twirled by hand. They are monogamous, and their conjugal fidelity contrasts strongly with the vicious habits of the Sin- halese. Their religion has been described as a kind of demon- worship, consisting of rude dances and shouts raised to scare away the evil spirits, whom they confound

with their ancestors.

The Veddahs are not to be confounded with the Rodiyas of the western uplands, who are a much finer race, tall, well- porportioned, with regular features, and speak a language said to be radically distinct from all the Aryan and Dravidian dialects current in Ceylon. There is, however, in Travancore, on the mainland, a low-caste " Veda " tribe, nearly black, with wavy or frizzly hair, and now speaking a Malayalim (Dravidian) dialect (Jagor), who probably approach nearer than the insular Veddahs to the aboriginal pre-Dravidian " negrito " element of southern India and Malaysia.

See Percival, Description of Island of Ceylon (1805); Cordiner, Description of Ceylon (1807); John Davy, Ceylon and its Inhabitants (1821); Stirr, Ceylon and the Singhalese (1850), Sir Emerson Tennent, Ceylon (1859): J. Baily, Trans, of Ethnol. Soc., New Series, vol. ii. (1863); Rolleston, Trans, of Brit. Ass. (1872); B. F. Hartshorne, Fortnightly Review, New Series, vol. xix. p. 406. The , most elaborate monograph is that of Professor Virchow, Uber die Weddds von Ceylon und ihre Beziehungen zu den Nachbarstammen (Berlin, 1882). See also E. B. Tylor, Primitive Culture; A. Thomson, " Osteology of Veddahs," in Journ. Anthrop. Institute (1889), vol. xix. p. 125; L. de Zoysa, " Origin of Veddahs," in Journal, Ceylon Branch, Royal Asiatic Society, vol. vii.

VEDDER, ELIHU (1836-), American artist, was born in New York City on the 26th of February 1836. He studied under the genre and historical painter Tompkins H. Matteson (1813-1884), at Sherburne, N.Y., later under Picot, in Paris, and then, in 1857-61, in Italy. After 1867 he lived in Rome, making occasional visits to America. He was elected to full membership in the National Academy of Design, New York, in 1865. He devoted himself to the painting of genre pictures, which, however, attracted only

modest attention until the publication, in 1884, of his illustrations to the Rubaiyat of Omar Khayyam; these immediately gave him a high place in the art world. Important decorative work came later, notably the painting symbolizing the art of the city of Rome, in the Walker Art Gallery of Bowdoin College, Maine, and the five lunettes (in the entrance hall) symbolical of government,

and the mosaic " Minerva" in the Congressional Library at Washington. Among his better-known pictures are: "Lair of the Sea Serpent," in the Boston Museum of Fine Arts; " Young Marsyas," " Cumaean Sibyl," " Nausicaa," in the collection of J Pierpont Morgan; and " Genii and Fisherman," in the collection of Martin Brimmer, Boston.

VEDETTE, a French military term (formed from Lat. videre, to see), adopted into English and other languages for a mounted sentry or outpost, whose function it is to bring information, give signals or warnings of danger, etc., to the main body of troops.

YEERE, a town in the province of Zeeland, Holland, on the island of Walcheren, 4 m. N.N.E. of Middelburg, with which it is connected by canal (1867-72). It contains several interesting architectural remains of the days of its former prosperity, many of its quaintly gabled Old houses dating from the 16th century. There is a fine Gothic church dating from 1348, but subsequently in part destroyed and used for secular purposes; the town hall (1475) has a fine gable filled with sculpture, and contains' Some interesting antiquities.

VEGA, GARCILASO DE LA (1503-1536), Spanish soldier and poet, was born at Toledo on the 6th

of February 1503. His father, Garcilaso (Garcias Laso or GarcilaSso) de la Vega, was counsellor of state to Ferdinand and Isabella, and for some time their ambassador at the court of Rome; by his mother he was descended from the illustrious house of Guzman. At the age of seventeen he was attached to the bodyguard of Charles V., and fought against the insurgent Comuncros, being wounded at the battle of Olias near Toledo. He afterwards served in the north of Italy, and gained great distinction by his bravery at the battle of Pavia in 1525. In the following year he married a lady-in-waiting to Queen Eleanor. He took part in the repulse of the Turks from Vienna in 1529, was present at the coronation of the emperor at Bologna in 1530, and was charged with a secret mission to Paris in the autumn of the same year". In 1 53 1 he accompanied the duke of Alva to Vienna, where, for conniving at the clandestine marriage of his nephew to a maid-of-honour, he was imprisoned on an island in the Danube. During this captivity he composed the fine cancjog, " Con un manso ruido de agua corriente y clara." ReleaseS and restored to favour in June 1532, he went to Naples on t|p staff of Don Pedro de Toledo, the newly appointed viceroy by whom he was twice sent on public business of importance to Barcelona, in 1533 and 1534. After having accompanied the emperor on the expedition to Tunis (1535), where he received two severe wounds, he was employed as a confidential agent at Milan and Genoa in negotiations connected with the proposed invasion of Provence, and joined the expedition when it took the field. Being with Charles in the neighbourhood of Frejus during the retreat from Marseilles, Garcilaso de la Vega was ordered to storm a fort at Muy, which had checked the advance of the afmy^ In the successful discharge of this duty he was mortally wounded and died twenty-one days afterwards, at Nice (14th of October 1-S36)- His poems Were entrusted to his friend Boscan,

who was preparing them for publication along with his own when death overtook him in 1540. The volume ultimately appeared at Barcelona in 1543, and has often been reprinted. Garcilaso's share in it consists principally of three eglogas or pastorals, which the Spaniards regard as among the finest works of the kind in their language, and which for sweetness of versification and delicacy of expression take a high rank in modern European literature. In addition to the pastorals, there are thirty-seven sonnets, five canciones, two elegies and a blank verse epistle, all influenced by Italian models. The poems rapidly gained a wide popularity; and within a century of their appearance they were edited as classics by Francisco Sanchez (1577), Herrera (1580) and Tamayo de Vargas (1622). An English translation of his works was published by Wiffen in 1823. Garcilaso's delicate charm has survived all changes of taste, and by universal consent he ranks among the most accomplished and artistic of Spanish poets.

See E. Fernandez de Navarrete, " Vida de Garcilaso de la Vega," in the Documentos ineditos para la historia de Espaiia, vol. xvi. ;

Francesco Flamini, " Imitazioni italiani In Garcilaso de la Vega," in the Biblipteca delle scuole italiane (Milano 1899).

VEGA, GARCILASO DE LA, called " Inca " (c. 1535–1616), historian of Feni, was born at Cuzco. His father, Sebastiano Garcilaso (d. 1559), was a cadet of the illustrious family of La Vega, who had gone to Peru in the suite of Pedro de Alvarado, and his mother was of the Peruvian blood-royal, a circumstance of which he was very proud as giving him a right to the title which he claimed by invariably subscribing himself "Irica/' About 1560 he removed to Spain, and after serving against the Moors incurred the hatred of Philip II. and was

imprisoned at Valladolid. He died in Spain in i 616. A diligent student of the language and traditions of his maternal ancestors, Garcilaso left a valuable work on Peruvian history; the first part, en- titlei Comenlarios reales que tratan del origert de los Yncas, was first published at Lisbon in 1609, and the second part, Historia general del Peru, in 1617;

His history is a source from which all subsequent writers on the subject have largely drawn, and still continues to be one of the chief authorities on ancient Peru. An English translation by Sir Paul Rycaut was published in 1688; one of the first part of the work by Sir C. R. Markham for the Hakluyt Society (London, 1869-71); and the book has also been translated into French. Garcilaso also wrote a history of Florida, La Florida del Ynca, historia del adelantddq Hernando ds Soto (Lisbon, 1605, and again Madrid, 1723). An edition of his works in seventeen volumes was published at Madrid in 1800. See W. H. Prescott, History of the Conquest of Peru, vol. i. (London, 1902) ; Sir C. R. Markham, The Jncas of Peru (1910).

VEGA CARPIO, LOPE FELIX DE (1562-1635), Spanish dramatist and poet, was born on the 25th of November 1562 at Madrid. His father and mother, Felix de Vega Carpio and Francisca Hernandez Flores, originally came from the valley of Carriedo in AstuHas, where the hamlet of Vega still exists. Lope began his studies at the Theatine college in Madrid, and according to his admiring biographer, Perez de Montalban, his precocity was extraordinary. On leaving college he entered the service of Don Jer6nimo Manrique, bishop of Avila, and appears to have then begun the composition of his earlier dramas. He quitted the bishop's service to enter the university of Alcala de Henares, where he devoted himself to what was called philo- sophy. The date of Lope's matriculation is unknown, as his name does not appear in the university books; but it seems probable that he

was in residence between 1576 and 158^ He took part in the expedition to the Azores in 1582, and from 1583 to 1587 was secretary to the marques de las Navas. In February 1588 he was banished for circulating criminal libels against his mistress, Elena OsOrio, whom he has celebrated under the name of Filis. He defied the law by returning to Madrid soon afterwards and eloping with Isabel de Urbina, daughter of Philip II. 's herald; he married her by proxy on the 10th of May 1588, and joined the Invincible Armada, losing his brother in one of the encounters in the Channel. He settled for a short while at Valencia, where he made acquaintance with a circle of young poets who were afterwards to be his ardent supporters in found- ing the new comedy. He joined the household of the duke of Alva, with whom he remained till 1595. Soon afterwards he lost his wife; he was prosecuted for criminal conversation in 1596, became secretary to the marquis de Malpica (afterwards count de Lemos), and in 1598 married a second wife, Juana de Guardo, by whom he had two children (Carlos, who died in 1612, and Feliciana Felix); but she died, shortly after giving birth to the latter, in'1613. During this wife's lifetime the poet had by a mistress, Micaelade Luxan, two other children — Marcela del Carpio, who became a nun in 162 1, and Lope Felix del Carpio y Luxan, who chose the profession of arms and perished at sea about 1634. Widowed a second time in 1613, Lope sought a iei9ge in the church. After having been for some time affiliated to a tertiary order, he took priest's orders.

At this juncture, about 1614, he was in the very zenith of his glory. A veritable dictator in the Spanish world of letters, he wielded over all the authors of his nation a power similar to that which was afterwards exercised in France by Voltaire. At this distance of time Lope is to us simply a great dramatic poet, the founder of the Spanish theatre; but to his

contemporaries he was

much more. His epics, his pastorals, his odes, his sonnets, now forgotten, all placed him m the front rank of authorship. Such was his prestige that he dealt with : his noble patrons almost on a footing of equality. The duke of Sessa in particular, his Maecenas from 1605 onwards, was also his personal friend, and the tone of Lope's letters to him is one of frank familiarity, modified only by some forms of deference. Lope's fame, too, had travelled abroad : foreigners of distinction passing through Madrid made a point of visiting him; papal legates brought him the compliments of their master; in 1627 Urban VIII., a Barberini, sent him the diploma' of' doctor of theology in the Collegium Sapientiae and the cross of the order of St John df Jerusalem (whence the poet's titles of " Doctor " and " Frey "}. His last days were full of sadness; the death of his son Lope, the elopement of his daughter; Antonia Clara, wounded him to the soul. Montalban tells us that every Friday the poet scourged himself so severely that the walls of his room Were sprinkled with his blood. His death, on the 27th of August 1635, was followed by national mourning.

Leaving out of account certain theories which in the long run greatly influenced his manner of writing, Lape belonged in literature to what may be called the school of good sense ; he boasted that- he was a Spaniard pur sang, and steadfastly maintained that a writer's business is to write so as to make himself understood. When brought face to face with the coterie of the precieux and quint- essencUs, Lope takes the position of a defender of the language of ordi- nary life, the good old Castilian tongue. In the dispute which arose between the

partisans of the two : school#,pf cuitos and llanos,, he ranged himself on the side of the latter, lit the riiatteV of versifica- tion he refuses to admit that the long Italian verse has the advantage of the Castilian octosyllabic. : Unfortunately the books that he read, his literary connexions, his fear of Italian criticism, all exercised an influence upon his naturally rqbust spirit, and, like so many others, he caught the prevalent contagion of mannerism and of pompous phraseology. His literary culture was chiefly Latin- Italian ; and, if he defends the tradition of the nation and the pure simplicity of the old Castilian against " lps de la nueva poesia," that is to say, the innovators of the school of Gongora and against the jargon of the cultos, still he does not wish to be taken for an uninformed person, a writer devoid of classical training : he especially emphasizes the fact that he has passed through the university, and is continually accentuating the difference between the ingenios cientlficos (those who know Latin) and legos ignorantes (ignorant laymen). With what a sense of superiority, for example,' does he mention that Cervantes was not to his mind sufficiently cientifico (preface to Las Fortunas de Diana), the fact being that Cervantes had been neither at Alcala nor at Salamanca!

*For a rapid survey of the works of Lope, it is convenient to begin with those which the Spaniards include under the name of Obras Sueltas, the title of the large collection of the poet's non-dramatic works (Madrid, 21 vols. 4*0, 1776^79). We shall enumerate the most important of these, as far as possible in the order of publication;. The Arcadia (1598), a pastoral romance, inspired by Sannazaro, is One of the poet's most wearisome productions. La Dragontea (1598) is a fantastic history in verse of Sir Francis Drakes last r expedition and death. Isidro (1599), a narrative of the*

life of Isidore, patron of Madrid, is called a Castilian poem on account of the rhythm in which it is composed — quintillas of octosyllabic verse. The Hermosura de Angelica (1602), in three books, is a sort of continuation of the Orlando Furioso, in octaves after the fashion

a drama, is La Dorotea (1632). Lope describes it as an "action in prose," but it is rather a " romance in dialogue "; for, although divided into acts, the narrative Js dramatic in form only. Of all Lope's productions 1 Dorotea shows most observation and study; the style also is unusually simple and easy. Of all this mass of' obras sueltas, filling more than twenty volumes, very Tittle (leaving Dorotea out of account) holds its own in the judgment of posterity. The lyrical element alone retains some vitality. From the Rimqs^and other collections of detached pieces one could compile' a pleasing anthology of sonnets, epistles, elegies and romances; to which it would be proper to add the Gatomaquia, a burlesque poem published along with other metrical pieces in 1634 by Lope. under the pseu- donym of Tome de Burguillos. But here the list would end., -, .

It is, however, to his dramatic writings that Lope owes his eminent place in literary history. It is very curious to notice hoW h€ himself always treats the art of comedy-writing as one of the humblest of trades {de .pope lucrattdo), and protests against the supposition that in writing for the stage his aim is glory and not money. The reason is not far to seek. The Spanish drama, which, if riot literally the creation of Lope, at least owes' to him its definitive fornv- i the three^act comedy — was. totally- regardless of the precepts of the school, the pseudo-Aristptelianism of . the doctors. of the period. Lope accordingly, who stood in awe of the criticism of the cientificos, felt bound.

to prove that, from the point; of view of literary art, he attached 'no Value to the " rustic fruits bf his humble Vega.- ''lit his Arte Nuevo de hacer comedias en este Uenipo (1609), Lope begins by showing that; he knows ;as well as any one the established rules of poetry, and then excuses himself for his inability to follow them on the ground that the " vulgar " Spaniard cares nothing about thent. " Let us then speak to hint in the language of fools,' since it is he whopays us." Another reason which made it necessary for him to, speak deprecatingly of his dramatic works, is the circumstance that the vast majority of them were written in haste and to order. The' poet does not hesitate to confess that " more than a hundre'd of my comedies have taken only twenty-four hours to pass from my brain to the boards of the theatre." Perez de Montalban, who has a great -admiration for this kind of cleverness, tells how, sit Toledo, on. a certain occasion,. Lope composed fifteen acts in fifteen days — that is to say, five entire comedies, which he read to his friends step by step With the process of their composition. On another occasion, When pressed by a manager who wanted something for the carnival, Lope took Montalban as a collaborator; the two friends .parcelled out the comedy between them, Lope qndertakmg the first act, Montalban the second, and the third, to save time, was divided between them. In two 'days they had finished tbe first two acts, and on the third Montalban rose at two in the morning and at eleven he had: finished. Then he went in search of Lope, whqj wheh questioned £s ip his progress, replied: " I got up at five, finished the act, breakfasted, wrote an epistle of fifty tercets, arid have now finished waterjlg the garden, and a rather tough business it has been.''' Nevertheless, Lope did write dramas in Which the plan is more fully matured and the execution more carefully carried put; still, hurried composition, and reckless production are after a,U among the*

distinctive marks of his theatrical works. . Towards the close of his career Lope somewhat modified the severe and' disdainful judgments he had formerly passed upon his dramatic performances; he seems to have had a presentiment that posterity, in spite of the grave defects of his, work in that department, would nevertheless place it much higher than La Dragontea, the Jerusalem Conquistada and other works of which he himself thought so much. We may certainly credit Lope with creative power, with the instinct Which enabled him to reproduce the facts of history or those supplied bythe imagination in a multitude of dramatic situations with an.astonish ing cleverness and flexibility of expression; but unfortunately, instead of concentrating his talent upon the production of a limited number of works which he might have brought to perfection, he dissipated it, so to say, and scattered it to the winds.

The catalogue of Lope's comedies has been drawn up by himself; and,, in spite of some discrepancies hi his figures, it is established that up to 1664' he had composed, in round numbers, as many, as 230. In 1609 the figure had risen- to 483, in 161 8 to 800, in 1620 to 900, in 1625 to 1070, and in 1632 to 1500. Ultimately Montalban in the Fama Postuma (1636) set down the total of Lope's dramatic productions at 1800 plays and more than 400 autos sacramentales. Of this number there are 637 plays which are known to us by their titles' (from the lists of the Perep-ino) ; but the printed or MS. text of only 458 is actually accessible, besides some 50 autos and a few entremeses. Very many of these pieces were printed during Lope's lifetime,, either in collections of varios autores or as separate issues by booksellers who surreptitiously bought from the actors the manu- scripts of their r61es or else caused the unpublished comedy to be written down from memory by

persons whom they sent to attend the first representation. Such pieces therefore as dp not figure in the collection published under Lope's own direction or, under that of his friends cannot be regarded as perfectly authentic, and it would be unfair to hold their author responsible for all the faults and defects they exhibit. On the ; other hand, there exist comedies in Lope's own handwriting which have not yet been printed.

The classification of this enormous mass of dramatic literature is

a task of great difficulty, inasmuch as the terms usually employed, such as comedy, tragedy and the like, do not apply here. There is not explicitness enough in the division current in Spain, which recognizes three categories:— (1) comedias de capa y espada, the subjects of which are drawn from everyday life and in which the persons appear as simple caballeros; (2) comedias de ruido or de tedtro, in which kings and princes are the leading characters and the action is accompanied with a greater display of dramatic machinery ; (3) comedms divinas or de santos. Some other arrangement must be attempted. In the first place, Lope's work belongs essentially to the drama of intrigue; be the subject what 'it may,' it is always the plot that determines everything else. Lope in the whole range of his dramatic works has no piece comparable to La Verdad Sospechosa of Ruiz de Alarcon, the most finished example iii Spanish literature of the comedy of character; and the comedy of manners is represented only by El Galdn Castrucho, El Anzuelo de Fenisa, and one or two others. It is from history, and particularly Spanish history, , that Lope has borrowed more than from any other source. It would in fact be difficult to say what national

and patriotic subjects, from the reign of the half-fabulous King Pelayo down to the_ history of his own age, he has not put upon the stage. But it is to the, class of capa y espada — also called novelesco, because the subjects are almost always love intrigues complicated with affairs of honour — that Lope's most celebrated plays belong. In these he has, most fully displayed his powers of imagination (the subjects being all invented) and his skill in elaborating a plot. Among the plays of this class which are those best known in Europe, and most frequently imitated and translated, may be specially mentioned Los Kimilletei de Madrid, La Boba para los Otros y Discreta para si, El Perro del Hortelano, La Viuda de Valencia, and El Maestro de Danzar. In some of them Lope has sought to set forth some moral maxim, and illustrate its abuse by a living example. Thus, on the theme that "poverty is no crime," we nave the play entitled Las Flores de Don Juan, in which he shows in the history of two brothers the triumph of virtuous poverty over opulent vice; at the same time he attacks indirectly the institution of primogeniture, which often places in the hands of an unworthy person the honour and substance of a family when the younger members would be much better qualified for the trust. Such pieces are, however, rare in Lope's repertory; in common with all other writers of his order in Spain, with the occasional exception of Ruiz de Alarc6n, his sole aim is to amuse and stir his public, not troubling himself about its instruction. The strong point of such writers is and always will be their manage- ment of the plot. As has been said by Le Sage, a good judge: " The Spaniards are our masters in the art of planning and skilfully working out a plot; they know how to set forth their subject with infinite art and in the most advantageous light." It is not necessary to dwell here upon the other varieties of comedy represented- in Lope's works, that is, the comedias divinas,

fiestas (mythological dramas for the most part), entremeses and autos. In none of them has he produced anything of the highest order, or even comparable to the better performances of his contemporaries and successors.

To sum up, Lope found a poorly organized drama, plays being composed sometimes in four acts, sometimes in three; and, though they were written in verse, the structure of trie versification was left far too much to the caprice of the individual, writer. The style of drama then in vogue he adopted, because the Spanish public liked it. The narrow framework it afforded he enlarged to an extra- ordinary degree, introducing everything that could possibly furnish material for dramatic situations,— the Bible, ancient mythology, the lives of the saints, ancient history, Spanish history, the legends of the middle ages, the writings of the Italian novelists, current events, Spanish life in the 17th century. Before him manners and the conditions of persons and characters had been barely sketched ; with fuller observation and more careful description he created real types, arid gave to each social order the language and drajsery appropriate to it. The old comedy was awkward and poor in its versification ; he introduced order into the use of all the forms of national poetry, from the old romance couplets to the rarest lyrical combinations borrowed from Italy. Hence he was justified in saying that those who should come after him had only to go on along the path which he had opened up.

BiBLfocJRArttY.— Hugo Albert Rennert, The Life of Lope de Vega (Glasgow, 1904) ; C. A. de la Barrera, Nueva Biografia de Lope de Vega (Madrid, 1890); C. Perez Pastor, Procesode Lope dfij^egapor libelos contra unos comicos (Madrid, iqoi), to which is appended Datos desconocidos para la vida de'Lope de Vega. For Lope's literary theories and doctrine of dramatic art, reference may be made to M.

*Menindez y Pelayo, Historia de las Ideas EstUicas en Espafta, and to A. Morel Fatio, La-Comedie espagnole du XVII"" siecle (8vo, Paris, 1885). The Obras Sueltas were published by Francisco Cerda y Rico (21 vols. 4*0, Madrid, 1776-1779). A complete edition of the Obras de Lope de Vega, edited by M. Menendezy Pelayo, has been undertaken by the Spanish Academy. Rennert's biography contains an admirable bibliography of Lope's plays and autos,*

(A. M.-FA.; J. F.-K.)

VEGETABLE (Late LaL vegetabilis, full of life, .animating, from vegetare, frequentative of vegere to quicken, arouse, vegetus,

vigorous, active, cf. vigor, strength, vigour, &c), a word used as a general term for plants (q.t>.), and specifically, in popular, language, of such plants as can be eaten by man or animals, whether cooked or raw, and whether the whole of such plants are edible, or only the leaves' or the roots or tubers. Among such edible or culinary plants or portions of plants, a further distinction is made popularly between " fruits " and " vege- tables;" for which see Fruit.

For the botany and cultivation of vegetables see under the specific names, e.g. Potato, Turnip, &c. &c, and generally, Horticulture.

VEGETABLE MARROW, Citcurbila Pepo, var. ovifera, the most important of the gourds (q.v.), used as an esculent, furnish- ing in good seasons. a very large supply for the table: They are best when eaten quite young and not over-boiled, the. flesh being then tender, and the flavour sweet and nutty. The Custard Marrow, or crown gourd, bears a peculiar4ooking flattened fruit with scalloped edges, which has a sweeter and less nutty flavour than the true marrow. A very distinct form known as Pen-y-Byd has a delicate creamy white nearly globular

fruit, with a firm flesh. The bush marrows are more bushy in habit and taller and more sturdy in growth.

Vegetable marrows require a warm' situation and a rich soil free from stagnant moisture. They do well on a rubbish or old-dung heap, or in a warm border on little hillocks made up with any fermenting material, to give them a slight warmth at starting. The seeds should be sown in a warm pit in April, and forwarded under glass, but in a very mild heat; the plants must be shifted into larger pots, and be gradually hardened previous to being planted Out, when the mild weather sets in in May or June. The use of hand-glasses makes it possible to transplant earlier than would otherwise be advisable. The seeds may be sown early in May in pots under a hand-glass, or towards the end of May in the open ground, if heat is not at command. The true vegetable marrow bears fruit of an oblong-elliptical shape, about 9 in. long, pale- greenish while young, with whitish flesh, and scarcely any indication of ribs; when mature it is of. a pale yqllow cplour. There is a variety which is more oblong, grows" td 15 or 18 in., and has the surface slightly marked by irregular longitudinal obtuse ribs. The shoots may be allowed to run along the surface of the ground, of they may be trained against a wall or paling, or on trellUes. As; the gourds cross readily, care is necessary to keep any particular variety true. One of the best vegetable marrows is called Moore's Vegetable Cream.

VEGETARIANISM, a comparatively modern word, which came into use about the year 1847, as applied to the practice of living upon foods from which fish, flesh and fowl are excluded. There have from time to time been various sects or schools of thought that have advocated narrower views,. Some of; these have excluded all animal products— such as milk and eggs and cheese, Some have excluded all cooked foods,

and. have preached the virtues of fruits and nuts and grains in their natural ripe state. Some havp abstained, from all underground-growa roots and tubers, and have claimed special benefits from using only those fruits and vegetables that are grown in the sunlight. Some have given upall grain and pulse foods, and have : declared that old age can be best resisted by living entirely upon fruits salads, nuts, soft water and milk products. Some have added fish to their dietary; but, speaking generally, all who are called vegetarians will be found to abstain from the use of flesh and fowl and almost invariably also from fish as food.

Jhe fact, however, must not be overlooked that. while vege- tarian societies claim as " vegetarians " all who abstain from, flesh foods, there is a large and growing number of people ,who repudiate the name of " vegetarian " because of its associations but who none the less, for some of the reasons detailed bejqw, abstain from eating anything that has been killed. The Qrder. of the Golden Age, for example, with its headquarters at Bafr- combe Hall, Paignton, South Devon, adopted the word* " Fruitarian " and " Fruitarianism " to denote the dietary of its members. The rule laid down by the Order is abstinence so far as possible from all foods which are obtained by the cruel infliction of pain, and the minimum that is set is complete "abstinence from flesh and fowl," while net-caught fish may be used by associate membefs.*

, The reasons that are advanced for the practice of f ruitarianism or vegetarianism are very comprehensive, but the principal ones . may be considered to be the following :—

1. Health. — (a) On the ground that animals are affected by

diseases which are communicable, and are actually com- municated, to man by the ingestion of their flesh, e.g. parasites, tuberculosis; (0) on the ground that the flesh of artificially fed animals is full of excretory substances, and that, therefore, under modern conditions, flesh-eating is injurious, and may be a cause of excretory substance and uric acid deposits or rapid tissue-destroying diseases in man; e.g. gout, cancer.

2. Economy. — On the ground that the assimilable nutriment

from a given weight of selected fruit and grain and nut and vegetable foods will cost less than the same nutriment obtained from flesh foods.

3. Social Economy. — On the ground that an acre of cultivable

land under fruit and vegetable cultivation will produce from two to twenty times as much food as if the same land were utilized for feeding cattle.

4. Racial Improvement.— On the ground that the aim of every

prosperous community should be to have a large proportion of hardy country yeomen, and that horticulture and agri- culture demand such a high ratio of labour, as compared with feeding and breeding cattle, that the country popula tion would be greatly increased by the substitution of a fruit and vegetable for an animal dietary.*

5. Character Improvement. — On the ground that after the virtues

of courage and valour and fearlessness have

been taught in the lower stages of evolution, the virtue of gentle humane- ness and extended sympathy for all that can suffer should be taught in the higher cycles of the_ evolutionary spiral. Flesh-eating entailing necessarily an immense volume of pain upon the sentient animal creation should be abstained from by the ″ higher classes ″ in the evolutionary scale.

Organizations have been established to advocate this method of living under the name of "Vegetarian Societies ″ in many- countries — chiefly the United Kingdom, America, Germany, France, Austria, Holland and Australia. Propagandism is carried on by lectures, literature, cookery demonstrations and restaurants. In England, the oldest and one of the most im- portant societies is ″ The Vegetarian Society,″ of which the headquarters are at Oxford Street, Manchester. There are also several small London societies, and an active London Associa- tion. A few provincial towns, too, have small societies. An attempt has been made to organize the various vegetarian societies of the world under the title of ″ The Vegetarian Federal Union.″ The headquarters of the London societies and of the ″ Union ″ are at Memorial Hall, Farringdon Street, E.G.

There are nominally about 35 organized societies in exist- ence, but the extent to which public opinion and practice in the matter of dietary has been affected by vegetarianism is not to be gauged by the membership of such organizations. There are in England a number of vegetarian restaurants and boarding- houses, one hospital and one or two sanatoria. In Germany and America there are many institutions where flesh is only prescribed in special cases. Flesh food is not included in the dietary of the chief hospitals and orphanages of the native states of India, excepting in the wards devoted to Europeans.

The athletic side of the movement has been represented in national and international races by vegetarians winning the Berlin and Dresden walking match (125 m.), the Carwardine Cup (100 m.) and Dibble Shield (6 hours) cycling races (1901 and 1902), the amateur championship of England in racquets and in tennis (held by Mr Eustace Miles for a series of years), the cycling championship of India (3 years), half-mile running championship of Scotland (1896), world's amateur cycle records for all times from 4 hours to 13 hours (1902), loo miles championship York- shire Road Club (1899, 1901).

In the religious world the Seventh-Day Adventists (who are connected with many sanatoria and the manufacture of food specialities) and some Bible Christians, the worshippers of Vishnu and the Swami Narang and Vishnoi sects, amongst others, preach abstinence from flesh food. The Salvation Army, the Tolstoyans and the Doukhobors encourage it. A number of orders in the Roman Catholic church (e.g. the Trappists) and in the Hindu faith (e.g. the Dadupanthi Sadus) are pledged abstainers.

The general question of food values is discussed it the article Dietetics; see also Nutrition. But there is no doubt that;

whatever may be the view taken as to the extreme theory of vegetarianism, it has had considerable effect in modifying the excessive meat-consuming regime of previous days, and in intro- ducing new varieties of vegetable cooking into the service of the table.*

The literature on the subject is considerable, but the two classics are perhaps Tlte Ethics of Diet, by Howard Williams, and The Perfect Way in Diet, by Dr Anna Kingsford. In former years the ." Vegetarian Society" was the most active in producing literature, but since about 1901

the Order of the Golden Age has come to the front with new and up-to-date books, booklets and leaflets, and the Ideal Publishing Union has reprinted much of the earlier literature. The chief periodicals are the Vegetarian (weekly), the Herald of the Golden Age (monthly), the Vegetarian Messenger (monthly), the Vegetarian (American monthly), the Children's Garden (monthly). (J. O.)

VEGETIUS (Flavjkjs Vegetixjs Renatus), a celebrated military writer of the 4th century. Nothing is known of his life, station and military experience, save that in MSS. he is called vir illustris and also comes. His treatise, Epitoma rei mifitaris, sive inslitutorutn rei militaris libri quinque, was dedi- cated to the reigning emperor (? Theodosius the Great).' His sources, according to his own statement, were Cato, Cornelius Celsus, Frontinus, Paternus and the imperial constitutions of Augustus, Trajan and Hadrian. The book, which is a con- fused and unscientific compilation, has to be used with great caution, but is none the less invaluable to the student of the ancient art of war.

The first book is a plea for army reform, and vividly portrays the military decadence of the empire. The third contains a series of military maxims which were (rightly enough, considering the similarity in the military conditions of the two ages) the foundation of military learning- for every European commander, from William the Silent to Frederick the Great. When the French Revolution arid the " nation in arms " came into history, we hear little more of Vegetius. Some of the maxims may be mentioned here as illustrating the principles of a war for limited political objects (see Army) with which he deals. " All that is advantageous to the enemy is disadvantageous to you, and all that is useful to you, damages the enemy"; " No man is to be employed in the field who is not trained and tested in discipline "; " It is

better to beat the enemy through want, surprises and care for difficult places (i.e. through manoeuvre) than by a battle in the open field "—maxims that-have guided the leaders of professional armies in all countries and at all times, as witness the Chinese generals Sun and Wu (see E. F. Calthrop, The Book of War, London, 1908). His " seven normal dispositions for battle," once in honour amongst European stu- dents of the art of war, are equally ludicrous if applied to present- day conditions. His book on siegecraft is important as containing the best description of late empire and medieval siege matters, &c, and from it amongst other things we learn details of the siege engine called onager, which afterwards played a great part in sieges. The fifth book is an account of the material and personnel, of this Roman navy.

In manuscript, Vegetius's work had a great vogue from the first, and its rules of siegecraft were much studied in the middle ages. It was translated into English, French and even Bulgarian before the invention of printing. The first printed editions are assigned to Utrecht (1473), Cologne (1476), Paris (1478), Rome (in Veteres de re mil. scriptores, 1487), and Pisa (1488). A German translation by Ludwig Hohenwang appeared at Ulm in 1475. Vegetius's position as the premier military critic was thenceforward assured. As late as the 18th century we find so eminent a soldier as Marshal Puysegur basing his own works on this acknowledged model, and the famous Prince de Ligne wrote " C'est un livre d'or." The fullest and most important modern edition is that of Karl Lang (Leipzig, 1869). An English version through the French was published by Caxton in 1489. For a detailed critical estimate of Vegetius's works and influence see Max Jahns, Gesch. der Kriegswissenschaften, i. 109–125.

VEGLIA (Slavonic, Krk), an island in the

Adriatic Sea, Off the west coast of Croatia, from which it is separated by the Can,ale della Morlacca. It is situated in the Gull of Quarnero, and is separated from the island of Cherso, lying on the S.W., by the Canale di Mezzo. Together with Cherso and Lussih, the three principal islands of the Quarnero group, it forms the. administrative district of Lussin, belonging to the Austrian crownland of Istria. Veglia is the largest island of the Quarnero group, having an area of 146 sq. m. It is 24 m. long and about 14 m. across at its widest part. The surface is mostly rugged and: mountainous; but the central, southern elhi : western districts are fertile. The principal town is Veglia (pop. 2074),

situated on the south-west coast, with a good harbour and ati interesting cathedral.

VEII, an ancient town of Etruria, Italy, situated about 10 m. N. by W. of Rome by road. It is mentioned in the earliest history of Rome as a constant enemy, being the nearest Etruscan city to Rome. The story of the slaughter of the Fabii, who had encamped in the territory of Veii, and of whom but one boy escaped, is well known. After constant warfare, the last war (the fourteenth, according to the annalists) broke out in 406 B.C. The Romans laid siege to the city, and, after a ten years' siege, M. Furius CarnjUus took it by storm in 396, by means, so we are told, of a tunnel leading into the citadel. According to the legend, the emissarium of the Alban Lake was constructed in obedience to the Delphic oracle, which declared that, until it was drained, Veii could not be taken. The territory of Veii was three years afterwards divided among the Roman plebs. Veii is mentioned in connexion with the defeat of the Romans at the Allia in 390 B.C., after

which many Roman soldiers fled there, while a project was actually broached for abandoning Rome for Veii, which was successfully opposed by Camillus. From this time onwards we hear little or nothing of Veii up to the end of the Republic. Propertius speaks indeed of the shepherds within its walls. Augustus, however, founded a municipality there {municipium Augustum Veiens), inscriptions of which have been found down to the time of Constantius, after which, at some date unknown, the place was deserted. The medieval castle of Isola Farnese, on a hill to the south of the city, 1 is first mentioned in a document of a.d. 1003; but Veii itself had disappeared to such an extent that its very site was uncertain, though some scholars identified it correctly, until the excavations of the 19th century finally decided the question. Veii was not on a high road, but was reached by branch roads from the Via Clodia. The site is characteristic — ■ a plateau, the highest point of which is 407 ft. above sea-level, divided from the surrounding country by deep ravines, and accessible only on the west, where it was defended by a wall and fosse. Remains of the city walls, built of blocks of tufa 2 ft. high, may be traced at various points in the circuit. The area covered measures about 1 sq. m. There are no other remains on the site of the city earlier than the Roman period, and these are now somewhat scanty. The site of the Forum has been discovered on the west side of the plateau; a statue of Tiberius, now in the Vatican, and the twelve Ionic colqmns now decorating the colonnade on the W. side of the, 1 Piazza Colonna at Rome were found there. The acropolis was at the eastern extremity of the site, where the two ravines converge; it is connected with the rest of the plateau by a narrow neck, and here a large number of ex-votos in terra-cotta, indicating the presence of a temple, and dating at earliest from the 3rd century B.C., have been found. The first discovery of them was

made in 1655— 1667, when remains of the temple (of Juno?) to which they belonged were also found (R. Lanciani, Pagan and Christian Rome, London, 1892, p. 64). In the deep ravine to the N. of the site of the town, traversed by the Cremera brook, are the ruins of two ancient bridges and of some baths of the Roman period; and here is also the Ponte Sodo, a natural tunnel, artificially enlarged, through which the stream passes. Out- side the city tombs have been discovered at various times. The earliest belonged to the Villanova period (8th and 9th centuries, B.C.), probably before the coming of the Etruscans. Others are cut in the rock and are Etruscan. The most famous is the Grotta Campana found in 1843, which contains paintings on the walls with representations of animals, among the earliest in Etruria. There are also several tumuli. To a later .period belongs a columbarium cut in the rock, with niches for urns.

See L. Canina, L'antica cittd. di Veio (Rome, 1847); G. Dennis; Cities and Cemeteries of Etruria (London, 1883), i. 1 sqq.

(T. As.)

VEIL (O.Fr. veile, mod. voile, from Lat. velum, cloth, awning, sail), a cloth or piece of other fabric used as a means of con-

1 Some have considered Isola Farnese to have been the arx of Veii, but this is unlikely.

cealing something from the view, as in the veils of the Jewish tabernacle, which hung before the Holy Place, and before the Most Holy Place. The word is, however, chiefly used of. a covering for the face and head, as worn by women. The veiling of the face by women is a practice among the Mohammedan races of the East and among those peoples which have, corne under the influence of Islam. It is observed only when outride the harem and not by slaves or by

the very poor, and rarely by the Bedouin women. The face- veil (burka') is a long strip of white muslin covering the whole of the face except the eyes and reaching nearly to the feet. Among the poorer classes the burka' is made of coarse black crepe, or the tarhah, the head-veil, is drawn round the lower part of the face. There is also the double veil or yashmak, serving as a head- and face-veil (see India, § Indian Costume). In European countries the veil has played a large part in the head-dress of women. It took many shapes in the early middle ages and could be brought over the face as a covering or protection. Later it became a mere orna- mental appendage, hanging down from the high, peaked and elaborate head-dresses then worn. In modern times it has become a piece of gauze, lace or net attached to the hat or bonnet and used as a protection against dust, light or wind. '

VEINS, in anatomy. The veins (Lat. vena) are blood Vessels which return the blood from the capillaries toward the heart. As they approach that organ they join together to form larger and larger trunks. In man and other mammals three venous systems are recognized: (1) the general venous system; (2) ,the pulmonary system; and (3 the hepatic portal system. (See also Vascular System.)

The general venous system consists of superficial and deep veins; the former lie in the superficial fascia and are often visible through the skin. They are usually accompanied by lymphatic vessels though not as a rule by arteries, and, sooner or later, they empty their blood into the deep veins, often passing through special openings in the deep fascia to do so. The deep veins always accompany arteries, and are therefore known as venae comiles. With small and medium-sized arteries — that is to say, arteries whose diameter is not much greater than that of an ordinary lead pencil — there are t\yo Of these venae comites,

one on each side, connected by occasional cross communications, but arteries of a larger calibre have only one companion vein. In the scalp arid face the .superficial veins are remarkable for accompanying, more or less closely, corresponding arteries — more or less closely because the arteries in this region are very tortuous (see Arteries), and so are sometimes near their veins and sometimes far away, since the veins run a comparatively straight course. Frontal, superficial temporal, posterior auricuitir and occipital veins are found in the scalp, their names indicating the areas they drain. Like all other superficial veins, they anastomose freely with one another and also at certain places communicate, through foramina in the skull, with the intracranial blood sinuses; these communications are known as emissary veins, and act as safety-valves to the sinuses. The frontal vein on the forehead passes down on the inner side of the eyelids, where it is known as the angular, and then becomes the facial vein, which runs down to an inch in front of the angle of the jaw, whence it passes into the neck to join the common facial. In the greater part of its course it lies some distance behind the facial artery. The superficial temporal vein runs down in front of the ear, where it joins the internal maxillary vein from the pterygoid plexus and so forms the temporO- maxillary trunk, which passes down, embedded in the parotid gland, to about the angle of the jaw. Here it divides into an anterior branch, which joins the facial vein to form the common facial, and a posterior, which receives the posterior auricular vein and in this way forms the external jugular.

The external jugular vein is easily recognized through the skin and platysma muscle on the side of the neck, and eventually pierces the deep fascia above the middle of the clavicle to join the subclavian vein. The occipital vein

sinks deeply into the back of the neck and so forms the beginning of the vertebral vein.

The intracranial blood sinuses Me between two layers of the dura mate!" and differ from the veins in having fibrous walls which do not contract or expand. The superior longitudinal sinus runs~along the upper margin of the falx cerebri (see Brain), while the inferior longitudinal sinus' runs along the lower margin; these drain the surface of the brain, and the blood passes backward in both. Where the falx meets the tentorium cerebelli, the inferior longitudinal sinus receives the veins of Galen from the interior of the brain and : then passes backward as the straight sinus to join the superior longitudinal sinus at the internal occipital protuberance (see Skull). This meeting-place is known as the torculaf Herophili, and from it the blood passes outward and downward through the right and left lateral sinuses, which groove the cranium (see Skull) until they

reach the posterior lacerated foramina, through which .they pass to form the beginning of the internal jugular -veins. Most of the blood from the base of the brain passes into the cavernous sinuses ■which lie in the middle cranial fossa, one on each side of the pituitary fossa. These receive the ophthalmic veins from the orbit in front and, after running backward for about : an inch, divide into the superior and inferior petrosal sinuses, the former of which joins the lateral sinus within the cranium, but the latter runs to the posterior lacerated foramen, after passing through which it joins the lateral sinus, which is now becoming the internal jugular vein.

The internal jugular vein (fig. 5, I.J.) thus

formed run down at first behind and then to the outer side: of the internal and common carotid arteries and at the root of the neck joins the subclavian vein of its own side to form the innominate vein. In its course down the neck it receives the common facial vein already mentioned, as well as tributaries from the tongue, pharynx, larynx and thyroid body. The deep veins of the head and face tend to form plexuses rather than venae comites; of these, pterygoid, deep temporal, pharyngeal and suboccipital plexuses are recognized.*

Veins of the Upper Extremity,— On the dorsum of the hand and in front of the wrist superficial Venous plexuses are easily seen through the skin. From these the blood passes up the forearm chiefly on its flexor surface by the radial, median and anterior and posterior ulna veins. Just below the bend 6f the elbow the median vein com municates with the deep veins and then divides into two branches like the limbs of a y . Of these the inner is the median basilic and is noticeable as the vein from which patients were usually bled, while the outer is the median cephalic. After a course of an inch or two the median basilic is joined by the anterior and posterior ulnar veins and the median cephalic by the radial. After this j unction the median basilic is continued up the injier side of the arm as the basilic which pierces the deep fascia about the middle of the arm and in the axilla joins the venae comites of the brachial artery to form the axillary vein, which lies on the inner side of its artery. The median cephalic vein after joining the radial runs up the outer side of the arm as the cephalic and a little below the clavicle passes through the costa- coracoid membrane to enter the upper part of the axillary vein. At the outer border of the first rib the axillary vein becomes the subclavian (fig. 5, S.), which lies in front of and below its artery and is separated from it by the scalenus anticus

muscle. The arrange- ment of the superficial veins, especially in front of the elbow, js liable to great variation and often differs on the right and left sides of the same body.

Veins of the Lower Extremity. — The superficial veins of the lower extremity begin in a venous arch on the dorsum of the foot. From the inner extremity of this the internal saphenous vein runs up, in front of the inner ankle, along the inner side of the leg, and, passing behind the inner side of the knee, continues up the thigh, gradually working forward until it reaches the saphenous opening in the deep fascia of the thigh a little below the spine of the pubis. Here it pierces the deep fascia {fascia lata) to enter the common femoral vein. In this long course it has many valves and receives numerous tributaries, one of which, the saphenous collateral, runs up nearly parallel to it and on its outer side and joins it just below the saphenous opening. From the inner end of the dorsal arch of the foot the external saphenous vein runs up behind the outer, ankle along the mid line of the calf to pierce the deep fascia in the popliteal space behind the knee to open into the popliteal vein. Among the deep veins venae comites are found until the popliteal artery is reached, while above this superficial, deep and common femoral veins accompany their respective arteries. In the groin the common femoral vein lies on the inner side of its artery.

Veins of the Abdomen, — The common femoral vein, after passing deep to Poupart's ligament, becomes the external iliac (fig. 5, E.I.) which runs along thebrim of the true pelvis and, after a course of some three inches, joins the internal iliac (fig. 5, I.I.) which drains the pelvis and so forms the common iliac vein. In front of the body of the fifth lumbar vertebra the common iliac veins of the two. sides unite to form the inferior vena cava (fig. 5, I.V.C.), a very large trunk which runs up on

the, right of the abdominal aortja to an open-ing in the diaphragm (q.v.). On its way it receives, spermatic or ovarian veins from the genital glands, renal veins (fig. 5, R.V.) from the kidneys, and lumbar veins (fig. 5, L;V.) from the abdominal walls. Before reaching the diaphragm it lies in a groove in the back of the liver (q.v.) ana receives the hepatic veins from that organ. The hepatic portal system which lies in the abdomen will be treated later.

Veins of the Thorax.— The inferior vena cava, af^er piercing the diaphragm, has a very short_ thoracic course and opens into the lower and back part of the right auricle of trie heart ''(.q.v.). The right and left innominate veins (fig. 5, R.J. and L.I.) are formed behind the sternal end of the clavicle by the union of the subclavian and internal jugulars of their own side. The left vein is much longer than the right and runs nearly horizontally behind the upper half of the manubrium sterni to join its fellow on the right side of that bone just below the first rib. By the junction of these the. superior vena cava (fig. 5, S.V.C.) is formed, which runs down to the right auricle of the heart. The chief tributaries of the innominate veins are the vertebral, the internal mammary and the inferior thyroid.

The intercostal veins open into the azygos veins, which begin in the

abdpmen sometimes by a vertical trunk joining the lumber veins known as the ascendikg lumbar, sometimes on the right side by a communication with the inferior vena cava. The right azygqs vein is known as the vena azygos major (fig. 5, A.M.) and passes through the aortic opening of 'the diaphragm. Entering the thorax, it runs up in front of the thoracic vertebrae,, to the right of the aorta and thoracic duct, and receives the intercostal veins of the right side. At the level of the fourth thoracic

vertebra it arches forward to open into the posterior'surf ace of the superior vena cava.

On the left side, the upper intercostal veins join to form the left superior intercostal vein (fig. 5, L.S.I.), .which opens into, the left innominate. Lower down the intercostal veins trom the •fourth to the seventh spaces form the superior hemiazygos vein or hemiazygos accessoria (fig. 5, H.A.), which runs down on the left of the spinal column and, crossing it about the level of the eighth or ninth thoracic vertebra, opens into the vena azygos major. The lower intercostal veins on the left side join the inferior hemiazygos vein (fig. 5, H.V.), which runs up and opens either into the superior hemiazygos or into the azygos major below the opening of that vein.

Pulmonary Venous System. — The veins emerging from the lungs bring back the oxygenated blood from those organs to the left ventricle of the heart and also the greater part, if not all, ofthe.blood carried by the bronchial arteries to nourish the lungs. The existence of bronchial veins is asserted, but they are extremely difficult to demonstrate; and if present are quite incapable of returning all the blood which the bronchial arteries carry to the lungs. There are three, pulmonary veins coming out of the right lung, while on the, left there are only two. On the right side, 1 however, two of the three veins usually unite in the root of the liing, so that there are ; as a rule ;two pulmonary veins entering the left auricle of the heart on each side, but it is not uncommon to find three on the right side or one on the left. The pulmonary veins have no valves and return the blood carried to the lungs by the pulmonary arteries as well as most, if not all, of that carried by the bronchial arteries.

Hepatic Portal System. — The veins which drain the blood from the stomach, intestines, spleen

and pancreas unite to form a large vein which begins behind the head of the pancreas and ends by dividinginto right and left branches in the transverse fissure of the liver. This is the portal vein which lies in front of the inferior vena cava and is about three inches long. Its formative tribu>- taries are the superior and inferior mesenteric and the splenic veins. These accompany the arteries of the same name, and their most usual method of termination is that the inferior mesenteric runs up and joins the splenic to the left of the middle line of the body, and this, after running horizontally to a point a little to the right of the middle line, joins the superior mesenteric, and so the portal vein is formed. There are two marked characteristics of the portal system; one is that it has no valves and the other that it begins and ends in capillaries, since the two terminal branches of the portal Vein branch and rebranch in a manner already described in the Article LlVERi In the lower part of the rectum the veins run partly into the portal and partly into the general system, and in this dependent position they are liable to become varicose > and to form haemor- rhoids or piles.

The histology of the veins corresponds very closely to that of the arteries (q.v.)', their walls are, however, much thinner and there is less muscular and elastic tissue. At certain .places, especially where tributaries come in, the endothelial lining is raised to form semilunar pocket-like Valves. In most cases there are two cusps to feach valve, but three or one are sometimes found. The opening of the pocket is of course arranged so that it shall only be filled when there is a tendency to regurgitation of the blood.

Embryology.

The vitelline or omphalo-mesenteric veins, returning the blood from the yolk sac, are the first to appear, and later on, with the

formation of the : placenta, the umbilical veins develop. Both these open into the hinder (caudal) part of the heart, which is already being con- stricted off as the sinus venosus (see fig. 1).

While this is going on the veins' from the different body segments are' received into two longitudinal trunks on each side, the anterior (cephalic) of which is the primitive jugular or anterior cardinal (fig. 1, P. J.), and the posterior (caudal), the posterior cardinal : or simply cardinal vein ; (fig. # 1, P.C.). As the heart is at first situated in the region which will later be the neck frf the embryo, the primitive jugular receives Very few segmental veins, and the cardinal very many. These two trunks join one another on each side and open into the side of the sinus venosus (S.V.) by a transverse communication which is called the duct of Cuvier (D.C.). The condition of the vend'us system at this stage is shown in the accompanying diagram

(fi e- ')■ . . ..,.■■

As the vitelline veins run from the yolk sac to the heart along

S.V,

P.C.

ZL

S.V.

P.C.

Fig. 1.

VEINS

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each side of the primitive fore-gut they pick

up the mesenteric veins from the intestines as well as the splenic and pancreatic veins as soon as these viscera aire formed. The liver, however, is developed right across their path, and both they and the umbilical veins break up into a mass of capillaries in it, leaving that part of them which lies between the liver and the heart to form the primitive hepatic veins (fig. 2, H.V.). ' While the vitelline veins are lying on each side of the fore-gut (future duodenum) they are connected by three transverse channels, the anterior and posterior of which appear on the ventral side of the gut, the middle on the dorsal side (see fig. 2).

Fig. 3.

This figure of eight does not persist, however, because the anterior (cephalic) part of it on the left and the posterior (caudal) part on the right become obliterated, and what is left forms the portal vein (fig. 3, P.V.). The two umbilical veins unite at the umbilicus (fig. 3) and soon all the blood from the placenta passes through the left one, the right becoming rudimentary.

The left umbilical vein on reaching the liver now joins the left branch of the portal vein and establishes a new communication with the left hepatic vein. This is the ductus venosus (fig. 3, D.V.), and, as soon as it is formed, there is ho longer any need that all the blood returning from the placenta should 'pass through the' liver capillaries. The development of the cardinal veins must now be returned to. As the heart moves from the neck into the thorax the primitive jugulars elongate and it is now recognized becprne the internal jugulars in the greater part of their extent. When the arms be'gin to bud out subclavian veins are developed (fig. 4, S.) and an oblique connecting vein (figs. 4 and 5, L.I.) is established,

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Fig. 4.

Fig. 5.

between the point of junction of the left subclavian with the primitive jugular and the hinder part of the primitive jugular of the right side. This connexion becomes the left innominate vein, while the hinder part of the primitive jugular persists as the left superior intercostal vein (fig. 5, L.S.I.). On the right side that part of the primitive jugular between the subclavian and the junction with the left innominate becomes the right innominate (figs; 4 and 5, R.I.) while the hinder (caudal) part of the right primitive jugular and the right duct of Cuvier become the superior vena cava (figs.- 4 arid 5. S.V.C.). The external jugular is a later formation. The right and left posterior cardinal veins receive the intercostal and

lumbar segmental veins and: are continued into the lower limbs as the internal iliac and eventually the sciatic veins (figs, 4 and 5, I.L), the primitive bloodpath from the thighs. The veins from the primitive kidneys open into the segmental veins, and when the permanent kidney is formed (see Urinary System) a Large renal vein on each side is established; There are, however, many cross communications (fig. 4, T.C.) between the right and left posterior cardinal veins, some of which become very important later on, though most of them are transitory. The probable origin of the inferior vena cava is to be sought in a pair of veins called subcardinals which have been found in the rabbit embryo lying parallel and a little ventral to the posterior cardinals: (fig. 4, R.S.C.-L.S.C.) and effecting a junction with the renals and transverse communications (T.C.) as they cross these. Posteriorly (caudal) they join the cardinals, but anteriorly the right

one establishes a communication with the ductus venosus (fig. 4, D.V.) a little below the point at which that vessel joins the left hepatic. It is from the right one of these that the greater part of the inferior vena cava is formed. It will now be seen that the adult vena cava is formed by contributions from four embryonic veins, most anteriorly the hepatic, then the ductus venosus, then the right subcardinal and posteriorly the right posterior cardinal (F. T. Lewis, Am. J. of Ahat. vol. 1, 229, 1902). The anterior (cephalic) part of' the right posterior cardinal forms the vena aey^os major, and an inspection of fig. 4 will show that in the adult this may rise from the renal, from an ascending lumbar vein or, by a cross communication above the renal, from the inferior vena cava. The left posterior cardinal becomes obliterated below and its segmental tributaries find their way by cross communications to the vena cava (fig. 5). Above (cephalad) the left renal vein the left cardinal forms the hemiazygos (fig. 5, H.V.) and, higher still, the hemiazygos accessoria (fig. 5, H.A.). These open into the azygos major by persistent cross communications which lie dorsal to the heart when that organ reaches its permanent position. • It must be mentioned in this connexion that some modern authorities doubt whether the azygos veins of mammals are really persistent cardinals except quite in their anterior parts, just before they join the ducts of Cuvier. The left duct of Cuvier is only represented in the human adult by the oblique vein of Marshall on the dorsum of the left auricle. The external iliac veins (figs. 4 and 5, E.I.). become fully developed, like their arteries, when the blood changes its course from the back to the front of the thigh. After bjrth tjhe umbilical vein an(j the, ductus venosus become converted into fibrous cords and the circulation in the pulmonary veins is established. (For further details see Development of the Human Body, by J. P.

McMurrich, London, 1906. In this will be found the literature: of the subject up to that date, the writings of F. Hpchsterter being the most important. See also Quain's Anat. vol. i., 1908.)

Comparative Anatomy. —. In the Acrania (Amphipxits) , although there is no heart, the blood vessels returning ,the blood to the subpharyngeal region are distinctly of a Vertebrate type. There is a siibintestirtal vessel or vein bringing the blood from the intestine to the—liver and breaking up into capillaries in that organ just as the portal vein does in the higher forms. From the liver a hepatic vein carries the blood forward to the region pelow the pharynx where the heart is formed in Vertebrata. There is no renal portal system. In the Cyclo— stomata (lampreys and hags) the cardinal veins are formed a«a the blood from the caudal vein passes directly into the posterior cardinals without any renal portal system. In fishes the single caudal vein divides into two branches, each of which runs forward to the put^r side of its respective kidney and ends by giving numerous brariches to that viscus. The blood returning from the kidney passes into the beginning of its own posterior cardinal vein or sinus, which lies on the inner side of the kidney, This constitutes a renal portal system. , The cardinal veins, and ducts of Cuvier closely resemble the arrangement already detailed, in the human foetus, while the hepatic portal system from the intestine to' the liver is constant in this and all other vertebrates. ■

In the Dipnoi (mud—fish), a pulmonary vein from, the lung—like swim—bladder is formed and an inferior vena cava or postcaval vein, carries the blood from the kidneys to the heart. This is its first appearance in the vertebrate phylum. In the lower fishes there is a' vein of the lateral line on each side, but in the Dipnoi these coalesce and form a median

anterior (ventral) abdominal vein which is, constant in the Amphibia. Subclavian and iliac veins return {he blood from the fins and open respectively into the junction of the anterior, and posterior cardinals and into the Caudal vein.

In the tailed Amphibia (Urodeld) the postcaval and posterior cardinal veins are well developed, the former vessel running from the Hght cardinal vein a little in front of ^cephalad) the kidney to the hepatic vein, in this way closely foreshadowing man's embryology. In the Anura (frogs and toads) the posterior cardinals are usually suppressed, but these are very specialized animals. : The anterior abdominal vein in amphibians joins the portal vein close to the liver.

In the Reptilia the renal portal circulation persists, but is rudi- mentary in birds and; disappears in mammals. The anterior ab- dominal or epigastric vein of amphibians and reptiles returns the blood from the allantois in the embryo and in higher forms becomes

the umbilical veins returning the blood from the placenta; there is, therefore, a continuous line of ascent from the lateral line veins of the fish to the umbilical vein of man. In reptiles, birds, mono- tremes, marsupials and many rodents, insectivores, bats and un- gulates, a left superior vena cava (precaval vein) is present as well as a right: it passes ventral t6 the root of the left lung and then dorsal to the left auricle of the heart until it reaches the coronary sinus to open into the right auricle. Its course is indicated in man by the left superior intercostal vein, the vestigial fold of Marshall (see Coklom and Serous Membranes) and the oblique vein of

Marshall. It can be readily reconstructed from figs. 4 and 5 if the transverse communication (L.I.) is obliterated. In some mammals the post- caval vein is double, especially in its hinder (caudal) part, and this sometimes occurs as a human abnormality (see F. W. McClure, Am. Journ. of Anal. vol. 2, 1903, and vol. 5, 1906, also Anat. Anzeiger, Bd. 29, 1906).

Except in Cetacea, one or both azygos veins are always present in mammals. When there is only one it is usually the right, though a few forms among the marsupials, rodents and ungulates have only the left (F. E. Beddard, P.Z.S., 1907, p. 181). In many of the lower mammals the external jugular vein is much larger than the internal and returns most of the blood from the brain through an opening called the postglenoid foramen. For, this reason it was formerly regarded as the representative of the primitive jugular. It is now, however, thought that the internal jugular is that representative, and that the arrangement of man,, in which the internal jugular drains the interior of the cranium, is the more generalized and primitive.

For further details and literature see R. Wiedersheim's Compara- tive Anatomy of Vertebtates, translated by W. N. Parker (London, 1907). (F. G. P.)

VEINS, in geology, masses of rock which occupy fissures in other rocks. They may have originated in many different ways and present a great variety of forms and structures. We may classify them in three groups: (i.) veins of igneous rock, (ii.) of sedimentary, and (iii.) of minerals deposited by water or by gases.

Veins of igneous rock are practically the same as dikes; yet a distinction is sometimes made that dikes are narrow, often straight-walled and run for considerable distances, while veins are irregular, discontinuous and oi limited extent. Where granite invades sedimentary or

metamorphic rocks it very commonly emits vast numbers of dikes. The margin of the granite is full of blocks of all sizes, so that it is often impossible to say where the solid granite ends and the fringe of veins begins. An intrusion plexus of this sort seldom extends for more than a few hundred yards; many granites, on the other hand, have sharp and well-defined margins and send few veins into the country rock.

In plutonic rock areas veining is also very common. Great intrusive masses have not as a rule been injected in one stage but have been slowly enlarged by gradual or repeated inflows, and often the earliest portions had consolidated before the last were introduced. Very frequently the older rocks are of a different character, being usually more basic than those which succeed them, and this makes the veining more obvious. For instance, it is common to find peridotite traversed by many veins of gabbro, or diorite injected with numerous veins of granite, though in either case the rocks are part of one plutonic boss or laccolite. The crystalline structure of the vein-rock and the surrounding mass is usually quite similar and there may be no fine-grained edges to the veins; these facts establish that the older mass though solid had not yet cooled down, so that the veining is directly connected with the injection process and the two rocks have been derived from the same source, but one is slightly later than the other. , „

Among the Laurentian or Lewisian gneisses, which . resemble granites, diorites and gabbros in composition, but have a banded or foliated structure, veining of this type is almost universal. The veins are of all sizes and of very irregular shape.. Frequently they run along the foliation of the gneiss, but often also they cross it. obliquely or at right angles. Such gneisses were produced by the injection of a partly differentiated and

consequently non-homo- geneous magma, by successive stages, under a rock crust which was in movement or was subjected to intermittent pressures during consolidation.

*In certain cases *he new material introduced into the rpck by these veins bulks almost as largely as the original substance. A shale, slate or phyllite is sometimes so filled with threads of- granite that its composition and appearance are completely altered, Thin pale*

threads of quartz and felspar, not more than a tenth of an inch in thickness may be seen following the bedding planes, or the- cleavage and sometimes also the slip -cleavage. The distanoe between the veins may be no greater than the breadth of the veins themselves, and thus a striped or banded rock is produced, resembling a gniess but of dual origin, a mixed rock which is described properly as a ″ composite ″ or ″ synthetic ″ gneiss. The French geologists who first insisted on the importance of this group of rocks have called the process lit par lit (bed-by-bed) injection. The best examples of this in Britain are to be found around the granites of Mull and northern Sutvherlandshire. The rocks invaded by granite in this manner often show intense contact alteration and are tc a large extent recrystallized.

The short irregular veins which commonly occur within areas of granite, diorite, gabbro and other plutonic rocks are often much more coarsely crystalline than the rock around them. This is, no doubt partly due to the high temperature of the whole complex and to slow crystallization, but it may also be ascribed to the action of vapours dissolved in the magma and gradually released as it solidi- fies. Such coarse-grained igneous rocks are called , pegmatites (q.vj. It 'is clear that they are not .purely igneous but are partly pneumatolytic.' :.

With 'the pegmatites we may class the fine-grained acid veins (aplites) which are found not only 'in granites but also >jn many diabases. They occur in irregular streaks or' l as long branching well-defined veins, and are usually more rich in quartz and felspar than the surrounding rock. Formerly tHtey wfere often described as contemporaneous or as segregation veins; but no vein can be in strict accuracy contemporaneous with the rock which it intersects, and many of them gjve evidence of having been intruded into their present situation, since their minerals are so arranged as to show flexion structure'. But they are always intimately connected, as their mineral composition indicates, with the- 'rock mass in which they lie, and they represent merely the last part of the magma to consolidate. The fissures they occupy are presumably due to contraction, seeing that they are not accompanied by displacement, brecciation or faulting.

Veins of sedimentary rock are few and of little importance. They occur where sediment has gathered in cavities of other rocks. Lava streams, for example, when they cool become split up into irregular blocks, and in the crevices between these ashes, sand and clay will settle. Submarine lavas are often traversed by great numbers of thin veins of sandstone, arid a similar phenomenon may also be noted in the tuff of submarine necks or other ash beds. Cracks in limestone. and dolomite are widened by the solvent action of percolating waters andmay be filled with gravel, soil, clay and sand. In the Carbdriiferous Limestone, for instance, veins of bedded sandstone sometimes pass down from overlying Triassic deposits. The upper- surface of the chalk in the south of England has frequently many deep funnel-shkped pipes which are occupied by Tertiary oij recent accuMtrlsj| ions.. , ._ … |

‘ The’ tiifd group of veins, namely, those which have been filled by deposits; from solution in water or in vapours, is of the greatest importance– as including a vety –large number of tnineral veins ah& ore–bodies; ■ ‘They are also” the source of the great majority of the firiely crystallized specimens of ‘minerals. :

The– deposrtihydrogen, given out as gases, react on one another, producing Jyellow en–crustations of Bulpnui 1 ; and copper oxide (tenorke) .and a great variety–of othej minerals (alum, iron sulphite* realgar, borates and fluoride) are foutid about fumaroles of Vesuvius andothjer volcanoes.*

Most veins, however, are not of superficial origin but– have been formed at some depth. The heat given out by masses of rocks which were rhjecfed in a molten state is no .doubt sufficiently high to volatilize many minerals. The pressure, however, , also must be. taken into account, as it tends to retain these substances in a liquid condition. Water vapour is always the most abundant gas in a volcanic magma, and next to it are carbonic acid, sulphurous acid; sulphuretted hydrogen and hydrochloric acid. The physical condition of the substances passing outwards from an igneous mass through fissures in the superincumbent rocks will depend on the nature of the substances, on the temperature and the pressure. Near the granite the heat is so great, at first at any rate, that gaseous materials must gjeatjy preponderate; but farther away many of them, will be condensed and hot aqueous solutions of complex composition will fill the cracks.

Veins, deposited by. the action of gases and vapours are said to be of “pneumatolytic,” origin;, where hot aqueous solutions have

been the principal agency in their formation they are " hydato- genetic." It is often very difficult to ascertain to which of these classes a mineral vein belongs, especially as we are in ignorance of the behaviour of many substances at high temperatures and under great pressures.

The veins which yield tin-ores in Cornwall and in most other tin- producing countries are generally regarded as typical pneumatolytic deposits. Tin forms a volatile fluoride which may be decomposed by water, forming tin oxide, the fluorine passing" into hydrofluoric acid which may act as a catalytic agent or carrier by again combining with tin. Around tin-bearing veins and in the material which fills them there are usually many minerals containing fluorine, such as topaz, fluor-spar and white mica. Some borates too are volatile at high temperatures, and minerals containing boron (especially tourmaline) are very common in tin veins. Also since ore deposits of this character are found nearly invariably in granite or in the rocks which have been invaded by granite there is good reason to hold that fluoric and boric gases were important agents in the production of tin veins. It is not necessary, however, to believe that all the materials which are found in these veins were introduced as vapours, for as the temperature sank currents of hot water would follow which would fill up any cavities.

The tin veins of Cornwall often contain copper ores in their upper parts and at greater distances from the granite, a fact which indicates that the copper salts were deposited from solution at lower temperatures than the tin ores. A very large number of important ore deposits have been laid down by hot waters emanating from deep-seated intrusive masses. Nearly all the principal gotdfields (except

gravels or placers) are in districts where igneous dikes, veins and sills abound, and it is often perfectly clear that the intro- duction of the gold ores is intimately connected with the intrusive masses. The Witwatersrand deposits, although by many con- sidered to be old auriferous gravel, have been regarded as owing their value to gold deposited from vapours emanating from certain of the dikes which traverse the banket rock or conglomerate. The importance of these hot ascending currents of water, proceeding from eruptive magmas, has been fully recognized, and is now pro- bably the most widely accepted theory of the genesis of mineral veins.

The water falling on the earth's surface will to a large extent percolate downwards into the rocks, and it will dissolve mineral matters, especially at the greater depths, owing to the increased temperature and pressure; conversely, as it ascends it will lay down deposits or veins. This is the theory of " lateral secretion," at one time in great favour, but now regarded as of less importance. Ferruginous waters on passing through limestone rocks may de- posit their iron as haematite or siderite, removing a proportionate amount of lime, and in this way great bodies of ironstone have been formed, as in Cumberland and Yorkshire, partly along the bedding of the limestone but also in veins, pockets and irregular masses. Many lead and zinc veins probably belong also to this class. By analysis it has been proved that in nearly all the common rocks there exist very minute quantities of such metals as gold, silver, lead, copper, zinc. If these can be extracted in solution in water they might conceivably be deposited subsequently in fissures in the rocks.

Controversy has raged between opposing schools of geologists, one considering that most mineral veins owe their existence to currents of hot water ascending from deep-seated igneous

rocks, and the other that the metals were derived from the country rocks of the veins and were extracted from them by cold descending currents of water. There are cases which can be explained on one of these hypotheses only, and sufficiently establish that both of them are valid ; but the general opinion at the present time is in favour of the first of these explanations as the most general.

The fissures in which veins have been deposited owe their origin to a variety of causes. Many of them are lines of fault, the walls of which have been displaced before the introduction of the vein minerals. Others seem to be of the same nature as joints, and are due either to contraction of the rocks on solidification, to folding or to earthquake shocks. In the vicinity of intrusive masses many fissures have been produced by the contraction of rock masses which had been greatly heated and then slowly cooled. Veins often occur in groups or systems, which have a parallel trend and may some- times be followed for many miles. The larger veins may branch and the branches sometimes unite after a time, enclosing masses of country rock or " horses." Cross-courses are fissures which inter- sect the lodes; they are often barren, and at other times carry an entirely different suite of minerals from those of the mineral veins. A peculiar group of veins has been described from the Bendigo district of Australia ; they are saddle-shaped and _ in transverse section resemble an inverted U. The beds in which they occur are folded sharply into arches and troughs, and _ in folding they have separated at the crests of the arches, leaving hollows which were subsequently filled up with ore.

The minerals occurring in the veins are sometimes classified as "ores" and "gangue": the former being those which are of value while the others are unprofitable. The commonest of the gangue minerals are quartz, calcite,

barytes and fluor-spar. Usually a large number of minerals occurs in each vein, and the natural association or " pangenesis " of certain minerals which frequently

are found together is a practical guide of much value to the engineer and prospector. A definite sequence in the order of deposit of the constituent minerals can often be recognized, the earlier being situated oh the walls of the fissures or enclosed and surrounded by the later, and the microscopic study of veinstone shows that they have often a complicated history.

Many types of structure are met with in veinstones and vein deposits. Some are structureless, homogeneous or massive, like the quartz veins which are often found in districts composed of slate or phyllite. Others are banded, with sheets of deposit, each consisting of one mineral, usually parallel to the walls of the lode. These veins are often symmetrical, with corresponding layers fol- lowing one another inwards from the walls on each side.

The veinstones are frequently crushed either by faulting or by irregular movements of the walls, and in such cases the veinstones have a shattered or brecciated appearance. If the crushing took place while the ore deposits were still being introduced, the broken rock is often cemented together into a compact mass. Rounded masses of rock or of veinstone are often met with, looking exactly like pebbles, but they are analogous to crush-conglomerates, as the fragments have been shaped by the movements of the walls of the vein. Frequently these movements have reopened a fissure which had been filled up, and a new vein is subsequently formed alongside of the old one; this process may be repeated several times.

The mineral-bearing solutions may exert a powerful influence on the walls of the veins,

removing certain constituents and depositing others; in this way the walls of the vein become ill defined. The commonest change of this kind is silicification, and rocks of many different kinds, such as slate, limestone, andesite and felsite, are often completely replaced by quartz in the vicinity of mineral veins which have a quartzose gangue. Tin veins in granite and slate may be surrounded by a zone of rock which has been impregnated with cassiterite and is worth working for the metal. These changes are of a " metasomatic " type involving replacement of the original rock-substance by introduced materials. Many of the best examples of this are furnished by limestone, which is one of the rocks most easily affected by percolating solutions.

The distinction between mineral veins and other veins is to a large extent artificial. With improvement of methods of mining and extraction deposits formerly unprofitable become payable, and in all cases veins vary considerably in the amount of ore they carry. The rich parts are sometimes called shcots or bonanzas, while the barren portions are often left standing in the mine. Near the ground surface the veinstones become oxidized and the metallic minerals are represented by oxides, carbonates, hydrates, or in the case of gold and silver veins they may be rich in the metals them- selves. Below the zone where oxidizing surface-waters percolate a different series of minerals occurs, such as sulphides, arsenides and tellurides. If the ores are insoluble they will tend to be concentrated in the upper part of the vein rock, which may be greatly enriched in this way. Pyritic veins are changed to rusty-looking masses, " gossans," owing to the oxidation of the iron at the surface. Though instances are known of veins which come to an end when followed downwards, it seems probable that the majority of veins descend to great depths, and there is little reason to believe that they

become less rich in the heavy metals. (J. S. F.)

VEIT, PHILIPP (1793–1877), German painter, one of the leaders of the German romantic school, was born in Berlin. Having received his first art education in Dresden and Vienna, he was strongly influenced by, and joined the group of, the Nazarenes in Rome, where he worked for some years before taking up his abode in Frankfort. In this city, where his most important works are preserved at the Staedel Institute, he was active front 1830 to 1843, as director of the art collections and as professor of painting. From 1853 to his death in 1877 he held the post of director of the municipal gallery at Mayence. Like his fellow-Nazarenes he was more draughtsman than painter, and though his sense of colour was stronger than that of Over- beck or Cornelius, his works are generally more of the nature of coloured cartoons than of paintings in the modern sense. His principal work is the large fresco of "The Introduction of Christianity into Germany by St Boniface," at the Staedel Institute in Frankfort. In the cathedral of that city is his " Assumption," whilst the Berlin National Gallery has his painting of " The Two Marys at the Sepulchre." To Veit is due the credit of having been the first to revive the almost forgotten technique of fresco painting.

See Kunst, Kiinstler und Kunstwerke, by Valentin Veit.

VEITCH, JOHN (1820–1804), Scottish poet, philosopher, and historian of the Scottish border, son of a Peninsular veteran, was born at Peebles on the 24th of October 1829, and educated at Edinburgh University. He was assistant lecturer successively

to Sir William Hamilton and A. Campbell Fraser (1856–60). In i860 he was appointed to the chair of logic, metaphysics and rhetoric at St Andrews, and in 1864 to the corresponding chair at Glasgow. In philosophy an intuitionist, he dismissed the idealist arguments with some abruptness, and thereby lost much of the influence gained by the force of his personal character. He died on the 3rd of September 1894. He will be remembered chiefly for his work on Border literature and antiquities.

He published translations of Descartes' Discours de la tnithode (1850) and Miditationes (1852); an edition of Sir W. Hamilton's lectures with memoir (1869, in collaboration with H. L. Mansel); Tweed, and other Poems (1875); History and Poetry of the Scottish Border (1877; ed. 1893); Institutes of Logic (1885); Knowing and Being (1889); Merlin (1889); Dualism and Monism (1895); Border Essays (1896). See Memoir by his niece, Mary R. L. Bryce (1896).

VEJfiR DE LA FRONTERA, a town of southern Spain, in the province of Cadiz, on the right bank of the river Barbate and on the Cadiz–Tarifa railway. Pop. (1900) 11,298. Vejer de la Frontera occupies a low hill overlooking the Straits of Gibraltar and surrounded by orchards and orange groves. It contains several ancient churches and convents, and the architecture of many of its houses recalls the period of Moorish rule, which lasted from 711 until the town was captured by St Ferdinand of Castile in 1248. Agriculture and fruit–farming are the chief industries; fighting bulls are also bred in the neighbourhood.

VELARIUM, the curtain or awning extended above the audi– torium of the Reman theatres and amphitheatres to protect the spectators from sun and rain.

VELAZQUEZ, DIEGO RODRIGUEZ DE SILVA Y (1599–

1660), the head of the Spanish school of painting and one of the greatest painters the world has known, was born in Seville early in June 1599, the year in which Van Dyck also first saw the light at Antwerp. His European fame is of comparatively recent origin, dating from the first quarter of the 19th century. Till then his pictures had lain immured in the palaces and museum of Madrid; and from want of popular appreciation they had to a large extent escaped the rapacity of the French marshals during the Peninsular War. In 1828 Sir David Wilkie 1 wrote from Madrid that he felt himself in the presence of a new power in art as he looked at the works of Velazquez, and at the same time found a wonderful affinity between this master and the English school of portrait painters, being specially reminded of the firm, square touch of Raeburn. He was struck by the sense of modernness of impression, of direct contact with nature, and of vital force which pervaded ail the work of Velazquez, in landscape as well as in portraiture. Time and criticism have now fully established his reputation as one of the most consummate of painters, and accordingly Ruskin says of him that " everything Velazquez does may be taken as absolutely right by the student." At the present day his marvellous technique and strong individuality have given him a power in European art such as is exercised by no other of the old masters. Although acquainted with all the Italian schools, and the friend of the foremost painters of his day, he was strong enough to withstand every external influence and to work out for himself the development of his own nature and his own principles of art. A realist of the realists, he painted only what he saw; consequently his imagination seems limited. His religious conceptions are of the earth earthy, although some of his works, such as the " Crucifixipn " and the '' Christ at the Column," are characterized by an intensity of pathos in which he ranks second to no painter.

His men and women seem to breathe, his horses are full of action and his dogs of life, so quick and close is his grasp of his subject. England was the first nation to recognize his extraordinary merit, and it owns by far the largest share of his works outside of Spain. 2

1 See Cunningham's Life, vol. ii.

- *Of the 274 works attributed to Velazquez by Mr Curtis, 121 are in the United Kingdom, while France has but 13, .Austria-Hungary 12, Russia 7, and Germany about the same number. Beruete, who only ■Hows 90 known pictures to be genuine works of Velazquez, allots 14 to the United Kingdom, which number still considerably exceeds that of any other country save Spain.*

But Velazquez can only be seen in all his power in the gallery of the Prado at Madrid, where over sixty of his works are pre- served, including historical, mythological and religious subjects, as well as landscapes and portraits. It is hardly creditable to the patriotism of Seville, his native town, that no example of his work is to be seen in the gallery of that city. Seville was then in the height of its prosperity, " the pearl of Spain," carrying on a great trade with the New World, and was also a vigorous centre of literature and art. For more than a hundred years it had fostered a native school of painting which ranked high in the Peninsula, and it reckoned among its citizens many whose names are prominent in Spanish literature.

Velazquez was the son of Rodriguez de Silva, a lawyer in Seville, descended from a noble Portuguese family, and was baptized on the 6th of June 1599. Following a common Spanish usage, he is known by his mother's name Velazquez. There has been considerable diversity of opinion as to his full name, but he was known to his contemporaries as Diego de Silva

Velazquez, and signed his name thus. He was educated, says Palomino, by his parents in the fear of God, and was in- tended for a learned profession, for which he received a good training in languages and philosophy. But the bent of the boy was towards art, and he was placed under the elder Herrera, a vigorous painter who disregarded the Italian influence of the early Seville school. From his works in Seville we can see that Herrera was a bold and effective painter; but he was at the same time a man of unruly temper, and his pupils could seldom stay long with him. Velazquez remained but one year — long enough, however, to influence his life. It was probably from Herrera that he learned to use long brushes, or, as J. E. Hodgson, R.A., suggested, brushes with long bristles, by means of which his colours seem to be floated on the canvas by a light, fluent touch, the envy and despair of his successors. From Herrera's studio Velazquez betook himself to a very different master, the learned and pedantic Pacheco, the author of a heavy book on painting, and, as we see by his ; works at Madrid, a dull, commonplace painter, though at times he could rise to a rare freedom of handling and to a simple, direct realism that is in direct contradiction to the cult of Raphael preached by him in his writing. A portrait by Pacheco, owned by Sir Frederick Cook, which shows this master's full power, was exhibited at Burlington House in 1907. In Pacheco's school Velazquez remained for five years, studying proportion and perspective, and seeing all that was best in the literary and artistic circles of Seville. Here also he fell in love with his master's daughter Juana, whom he married in 1618 with the hearty approval of Pacheco, who praises his hand and heart, claiming at the same time all the credit of having been his master. The young painter set himself to copy the commonest things about him— earthenware jars of the country people, birds, fish> fruit and flowers of the market-place. To

paint well and thoroughly what he saw, to model with his brush, and to colour under the influence of light and shade were for him the vital purpose, the first lesson, in his art. It was with deliberate purpose that Velazquez painted these bodegones (tavern-pieces) , as they were called; for we are told that he said he would rather be the first painter of common things than the second in higher art. Carrying out this idea still further, Velazquez felt that to master the subtlety of the human face he must make, this a special study, and he accordingly engaged a peasant lad to be his servant and model, making innumerable studies in charcoal and chalk, and catching his every expression. We see this model, probably, in the laughing boy of the Hermitage " Break- fast," or in the youngest of the " Musicians " acquired for the Berlin Museum in 1906. In such work as this, and in his studies by the wayside, Velazquez laid the foundation of his subsequent mastery of expression, of penetration into character, and of rendering the life of his sitter to the quick. He saw the world around him teeming with life and objects interesting to the painter, and he set himself to render these. His manner is as national as that of Cervantes. He lived and died racy of the soil. The position and reputation of Velazquez were now

assured at Seville. There his wife bore him two daughters — all his family so far as is known. The younger died in infancy, while the elder, Francisca, in due time married Bautista del Mazo. a painter, whose large family is that which is represented in the important picture in Vienna which was at one time called the "Family of Velazquez." This picture is now by common consent given to Mazo. In the gallery at Madrid there is a portrait of Juana, his wife,

holding a drawing-tablet on her knee. There was formerly in the possession of Lord Dudley another portrait of his wife by Velazquez, painted, perhaps, in the first year of their happy marriage. Of this early Seville manner we have an excellent example in " El Aguador " (the Water-Carrier) at Apsley House (London). Firm almost to hardness, it displays close study of nature. One can see in it the youthful struggle to portray the effects of light stealing here and there over the prominent features of the face, groping after the effects which the painter was to master later on. The brushwork is bold and broad, and the outlines firmly marked. As is usual with Velazquez at this time, the harmony of colours is red, brown and yellow, reminding one of Ribera. For sacred subjects we may turn to the " Adoration of the Magi " at Madrid, dated 1619, and the " Christ and the Pilgrims of Emmaus " in the collection of Don Manuel de Soto in Zurich, in both of which we have excellent examples of his realism. In the " St John in the Desert " we again find his peasant boy transformed into the saint.

But Velazquez was now eager to see more of the world. Madrid, with its fine Titians, held out strong inducements. Accordingly, in 1622, fortified with letters of introduction to Fonseca, who held a good position at court, he spent some months there, accompanied only by his servant. Here he painted the portrait of the poet Gongora, a commission from Pacheco, but the picture known by that name in the gallery at Madrid cannot with certainty be identified as Velazquez's portrait; it is more probably by Zurbaran. The impression which Velazquez made in the capital must have been very strong, for in the following year he was summoned to return by Olivares, the all-powerful minister of Philip IV., fifty ducats being allowed to defray his expenses. On this occasion he was accompanied by his father-in-

law. Next year (1624) he received from the king three hundred ducats to pay the cost of the removal of his family to Madrid, which became his home for the remainder of his life. Weak and worthless as a king, Philip had inherited the art-loving propensities of his race, and was proud to be considered a poet and a painter. It is one of the best features of his character that he remained for a period of thirty-six years the faithful and attached friend of Velazquez, whose merit he soon recognized, declaring that no other painter should ever paint his portrait. By his equestrian portrait of the king, painted in 1623, Velazquez secured admission to the royal service with a salary of twenty ducats per month, besides medical attendance, lodgings and payment for the pictures he might paint. The portrait was exhibited on the steps of San Felipe, and was received with enthusiasm, being vaunted by poets, among them Pacheco. It has unfortunately disappeared, having prob- ably perished in one of the numerous fires which occurred in the royal palaces. The Prado, however, has two portraits of the king (Nos. 1070 and io7i)in which the harshness of the Seville period has disappeared and the tones are more delicate. The modelling is firm, recalling that of Antonio Mor, the Dutch portrait painter of Philip II., who exercised a considerable influence on the Spanish school. In the same year the prince of Wales (after- wards Charles I.) arrived at the court of Spain. We are told that he sat to Velazquez, but the picture has disappeared. 1

In 1628 Rubens' visited Madrid on a diplomatic mission for nine months, and Velazquez was appointed by the king to be his guide among the art treasures of Spain. Rubens was then

1 In 1847 Mr John Snare of Reading exhibited a picture which had come from the sale of Lord Fife in 1809, and which he maintained to be the long-lost work. This led to much controversy;

but the claim was rejected by experts, and the picture is said to be now in America.

at the height of his fame, and had undertaken as a commission from Olivares the large pictures which now adorn the great hall in Grosvenor House (London). These months might have been a new turning-point in the career of a weaker man than Velazquez, for Rubens added to his brilliant style as a painter the manner of a fascinating courtier. Rubens had a high opinion of the talent of Velazquez, as is attested by Fuensalida, but he effected no change in the style of the strong Spaniard. He im- pressed him, however, with the desire to see Italy and the works of her mighty painters. In 1627 the king had given for competi- tion among the painters of Spain the subject of the Expulsion of the Moors. Velazquez bore off the palm; but his picture was destroyed in a fire at the palace in 1734. Palomino, however, describes it. Philip III. points With his baton to a crowd of men and women driven off under charge of soldiers, while Spain, a majestic female, sits looking calmly on. The triumph of Velazquez was rewarded by his being appointed gentleman usher. To this was shortly afterwards added a daily allowance of twelve reals, the same amount as was allowed to the court barbers, and ninety ducats a year for dress, which was also paid to the dwarfs, buffoons and players about the king's person — truly a curious estimate of talent at the court of Spain. As an extra payment he received (though it was not paid for five years) one hundred ducats for the picture of Bacchus, painted in 1629 (No. 1058 of the Madrid gallery). The spirit and aim of this work are better understood from its Spanish name, " Los Borrachos " or " Los Bebedores " (the Topers), who are paying mock homage to a half-naked ivy-crowned young man seated on a wine barrel. It is like a story by Cervantes, and is brimful of jovial humour. One can easily see in this

picture of national manners how Velazquez had reaped the benefit of his close study of peasant life. The painting is firm and solid, and the light and shade are more deftly handled than in former works. Al- together, this production may be taken as the most advanced example of the first style of Velazquez. It is usual to divide his artistic career by his two visits to Italy, his second style following the first visit and his third the second. Roughly speaking, this somewhat arbitrary division may be accepted, though it will not always apply, for, as is usual in the case of many great painters, his styles at times overlap each other. Velazquez rarely signed his pictures, and the royal archives give the dates of only his more important works. Internal evidence and history, as regards his portraits, supply to a certain extent the rest.

In 1629 Philip gave Velazquez permission to carry out his desire of visiting Italy, without loss of salary, making him besides a present of four hundred ducats, to which Olivares added two hundred. He sailed from Barcelona in August in the company of the marquis de Spinola, the conqueror of Breda, then on his way to take command of the Spanish troops at Milan. It was during this voyage that Velazquez must have heard the details of the surrender of Breda from the lips of the victor, and he must have sketched his fine head, known to us also by the portrait by Van Dyck. But the great picture was not painted till many years later, for Spinola had fallen into disfavour at court. In Venice Velazquez made copies of the ″ Crucifixion ″ and the ″ Last Supper ″ of Tintoretto, which he sent to the king, and in Rome he copied Michelangelo and Raphael, lodging in the Villa Medici till fever compelled him to remove into the city. Here he painted the″ Forge of Vulcan "(No. 1059 of the Madrid gallery), in which Apollo narrates to the astonished Vulcan, a village blacksmith, the news of the infidelity

of Venus, while four Cyclops listen to the scandal. The mythological treatment is similar to that of the " Bacchus ": it is realistic and Spanish to the last degree, giving a picture of the interior of an Andalusian smithy, with Apollo thrown in to make the story tell. The conception is common- place, yet the impression it produces is undoubted from the vividness of the representation and the power of expression. The modelling of the half-naked figures is excellent. Altogether this picture is much superior to the other work painted at the same time, " Joseph's Coat," which now hangs in the Escorial. Both these works are evidently painted from the same models.

In looking at these two pictures the spectator is especially struck by the fact that they betray no trace of the influence of the Italians. Velazquez remained true to himself. At Rome he also painted the two beautiful landscapes of the gardens. of the Villa Medici, now in the Madrid museum (1106 and 1107), full of sparkle and charm. Landscape as an expression of art never had attraction for the Spaniards; but Velazquez here shows how great a master he was in this branch. The silvery views of Aranjuez, which at one time passed under his name, are now considered to be the work of his pupil Mazo. After a visit to Naples in 1631, where he worked with his countryman Ribera, and painted a charming portrait of the Infanta Maria, sister of Philip, Velazquez returned early in the year to Madrid.

He then painted the first of many portraits of the young prince, Don Baltasar Carlos, the heir to the throne, dignified and lordly even in his childhood, caracoling in the dress of a field-marshal on his prancing steed. The Wallace collection includes an example which is

probably a copy by Mazo; but the finest in the United Kingdom is the well-known picture at Grosvenor House, a masterly example of the second manner of Velazquez. The colour is warm and bright, the workmanship solid and fused like enamel, while light and air pervade every corner. The scene is in the riding-school of the palace, the king and queen looking on from a balcony, while Olivares is in attend- ance as master of the horse to the prince. Don Baltasar died in 164.6 at the age of seventeen, so that judged by his age this picture must have been painted about 1641, two years before the fall of Olivares. This powerful minister was the early and constant patron of the painter. His impassive, saturnine face is familiar to us from the many portraits painted by Velazquez, a face which, like his royal master's, seems never to have known a smile, and in which are written pride and disdain. Two are of surpassing excellence — the full-length formerly in the Holford collection (exhibited at Burlington House in 1887), stately and dignified, in which he wears the green cross of Alcantara and holds a wand, the badge of his office as master of the horse; the other the great equestrian portrait of the Madrid gallery (No. 1069), in which he is flatteringly represented as a field-marshal in all his pomp during an action. It is difficult to overpraise the excellence of this work, either as regards its dramatic power or its masterly execution. In these portraits Velazquez has well repaid the debt of gratitude which he owed to his first patron, whom he stood by in his fall, thus exposing himself to the risk — and it was not a light one — of incurring the anger of the jealous Philip. The king, however, showed no sign of malice towards his favoured painter. ..Faithful in few things, Philip kept true to Velazquez, whom he visited daily in his studio in the palace, and to whom he stood in many attitudes and cos- tumes, as a huntsman with his dogs, as a warrior in command of his

troops, and even on his knees at prayer, wearing ever the same dull uninterested look. His pale face and lack-lustre eye, his fair flowing hair and moustaches curled up to his eyes, and his heavy projecting Austrian under-lip are known in many a portrait and nowhere more supremely than in the wonderful canvas of the London National Gallery (No. 745), where he seems to live and breathe. Few portraits in the whole range of art will compare with this work, in which the consummate handling of Velazquez is seen at its best, for it is in his late and most per- fect manner. 1 From one of the equestrian portraits of the king, painted in 1638, the sculptor Montanes modelled a statue which was cast in bronze by the Florentine sculptor Tacca, and which now stands in the Plaza del Oriente at Madrid, " a solid Velazquez," as it has been well named by Ford. This portrait exists no more; but there is no lack of others, for Velazquez

1 In this and in all his portraits Philip wears the golilla, a stiff linen collar projecting at right angles from the neck. It was invented by the king, who was so proud of it that he celebrated it by a festival, followed by a procession to church to thank God for the blessing (Madame D'Aulnoy, Voyage d'Espagne). The golilla was thus the height of fashion and appears in most of the male portraits of the period; In regard to the wonderful structure of Philip's moustaches, it is said that, to preserve their form, they were encased during the night in perfumed leather covers called bieffteras.

was in constant and close attendance on Philip, accompanying him in his journeys to Aragon in 1642 and 1644, and was doubt- less present with him when he entered Lerida as a conqueror. It was then that he painted the great equestrian portrait (No. 1066 of the Madrid gallery) in which the king is represented as a great commander leading his troops — a r61e which

Philip never played except in a theatrical pageant. All is full of ani- mation except the stolid face of the king. It hangs as a pendant to the great Olivares portrait — fit rivals of the neighbouring Charles V. by Titian, which doubtless fired Velazquez to excel himself, and both remarkable for their silvery tone and their feeling of open air and harmony combined with brilliancy. The light plays on the armour and scarf thrown to the wind, showing how completely Velazquez had mastered the effects he strove to reach in his early days. Of these two great works the Wallace collection includes small but excellent copies.

But, besides the forty portraits of Philip by Velazquez, or attributed to him, we have portraits of other members of the royal family, of Philip's first wife, Isabella of Bourbon, and her children, especially of her eldest son, Don Baltasar Carlos, of whom, besides those already mentioned, there is a beautiful full-length in a private room at Buckingham Palace. Cavaliers, soldiers, churchmen and poets of the court, as for example the Quevedo at Apsley House (shown in Burlington House in 1887), sat to the painter and, even if forgotten by history, will live on his canvas. The Admiral Pulido Pareja from Lord Radnor's collection, now at the National Gallery, is said to have been taken by Philip for the living man; nevertheless, A. de Beruete is emphatic in denying Velazquez's authorship of this picture, which he attributes to Mazo. It has been remarked that the Spaniards have always been chary of committing to canvas the portraits of their beautiful women. Queens and infantas may be painted and exhibited, but ladies rarely. One wonders who the beautiful woman can be that adorns the Wallace collec- tion, the splendid brunette so unlike the usual fair-haired female sitters to Velazquez. She belongs to this period of his work, to the ripeness of his middle period. Instinct with life, her bosom

seems to heave and the blood to pulsate through her veins. The touch is firm but free, showing the easy strength of the great master. Rarely has flesh been painted with such a glow, yet with such reserve. This picture is one of the ornaments of the Wallace collection. But, if we have few ladies of the court of Philip, we have in great plenty his buffoons and dwarfs. Even these deformed or half-witted creatures attract our sympathy as we look at their portraits by Velazquez, who, true to his nature, treats them gently and kindly, as in " El Primo " (the Favourite), whose intelligent face and huge folio with ink-bottle and pen by his side show him to be a wiser and better-educated man than many of the gallants of the court. "El Bobo de Coria," " El Nino de Vallecas" and " Pablillos," a buffoon evidently acting a part, all belong to this middle period. From these commissioned portraits of the menials of the court it is pleasant to turn to one of the greatest of historical works, the " Surrender of Breda," often known as " Las Lanzas," from the serried rank of lances breaking the sky, which is believed to have been painted about 1647. It represents the moment when the vanquished Justin of Nassau in front of his Dutch troops is submissively bending as he offers to his conqueror Spinola the keys of the town, which, with courteous grace, the victor refuses to accept, as he lays his hand gently on the shoulder of his de- feated foe. Behind Spinola stand the Spanish troops bearing their lances aloft, while beyond is a long stretch of the Low Country, dotted with fortifications and giving the impression of vast space and distance. The picture is full of light and air, and is perhaps the finest example of the silvery bluish style of Velazquez. In conception it is as fine as in execution, and one looks in vain for a trace of " the malicious pencil " which Sir William Stirling-Maxwell discerned in the treatment of Justin and his gallant Dutchmen.

The greatest of the religious paintings by Velazquez belongs also to this middle period, the " Christ on the Cross " (Madrid gallery, No. 1055). Palomino says it was painted in 1638 for

the convent of San Placido. It is a work of tremendous power and of great originality, the moment chosen being that immedi- ately after death. The Saviour's head hangs on his breast and a mass of dark tangled hair conceals part of the face. The beautiful form is projected against a black and hopeless sky from which light has been blotted out. The figure stands absolutely alone, without any accessory. The skull and serpent described by Sir William Stirling-Maxwell were added by some pious bungler at a much later date. The picture was lengthened to suit its place in an oratory; but this addition has since been removed. To the same period belongs the great " Boar Hunt " at the National Gallery, a magnificent work in spite of some restorations. The smaller " Boar Hunt " in the Wallace col- lection is from the brush of Mazo; and the " Conversation, a Group of Thirteen Persons," at the Louvre, a picture which in conception has much in common with these hunting scenes, probably owes its origin to the same artist. A. de Beruete emphatically denies Velazquez's authorship of this much be- lauded picture, which he describes as a " mediocre imitation, probably by Mazo."

Velazquez's son-in-law Mazo had succeeded him as usher in 1634, and he himself had received steady promotion in the royal household, receiving a pension of 500 ducats in 1640, in- creased to 700 in 1648, for portraits painted and to be painted, and being appointed inspector of works in the palace in 164.7. Philip now entrusted him with the carrying out

of a design on which he had long set his heart, the founding of an academy of art in Spain. Rich in pictures, Spain was weak in statuary, and Velazquez was commissioned to proceed to Italy to make purchases. Accompanied by his faithful slave Pareja, whom he taught to be a good painter, he sailed from Malaga in 1649, land- ing at Genoa, and proceeding thence by Milan to Venice, buying Titians, Tintorettos and Veroneses as he went. A curious conversation which he is said to have had with Salvator Rosa is reported by Boschini, 1 in which the Spaniard with perfect frankness confesses his want of appreciation of Raphael and his admiration of Titian, "first of all Italian men." It seems a possible story, for Velazquez bought according to his likings and painted in the spirit of his own ideals. At Modena he was re- ceived with much favour by the duke, and doubtless here he painted the portrait of the duke at the Modena gallery and two splendid portraits which now adorn the Dresden gallery, for these pictures came from the Modena sale of 1746. They presage the advent of the painter's third and latest manner, a noble example of which is the great portrait of Innocent X. in the Doria palace at Rome, to which city Velazquez now pro- ceeded. There he was received with marked favour by the pope, who presented him with a medal and gold chain. Of this portrait, thought by Sir Joshua Reynolds to be the finest picture in Rome, Palomino says that Velazquez took a copy to Spain. There exist several in different galleries, some of them possibly studies for the original or replicas painted for Philip. One of the most remarkable is that in Apsley House, exhibited in Burlington House in 1887. The modelling of the stern impassive face comes near to perfection, so delicate are the gradations in the full light; all sharpness of outline has disappeared; and the features seem moulded by the broad and masterly brushwork. When closely examined, the work seems coarse,

yet at the proper distance it gives the very essence of living flesh. The handling is rapid but unerring. Velazquez had now reached the manera abreviada, as the Spaniards call this bolder style. This is but another way of saying that his early and laborious studies and his close observation of nature had given to him in due time, as to all great painters, the power of representing what he saw by simpler means^ and with more absolute truth. At Rome he painted also a portrait of his servant Pareja, probably the picture of Lord Radnor's collection, which procured his election into the academy of St Luke. Philip was now wearying for his re- turn; accordingly, after a visit to Naples, where he saw his old friend Ribera, he returned to Spain by Barcelona in 1651, taking with him many pictures and 300 pieces of statuary, which he 1 See Stirling-Maxwell's Velazquez and his Works, p. 161.

afterwards arranged and catalogued for the king. Undraped sculpture was, however,' abhorrent to the Spanish Church, and after Philip's death these works gradually disappeared.

Isabella of Bourbon had died in 1644, and' the king had married Mariana of Austria, whom Velazquez now painted in many attitudes. He was specially chosen by the king to fill the high office of " aposentador major," which imposed on him the duty of looking after the quarters occupied by the court whether at home or in their journeys — a responsible function, which was no sinecure and interfered with the exercise of his art. Yet far from indicating any decline, his works of this period are amongst the highest examples of his style. The dwarf " Don Antonio el Ingles " (the Englishman) with his dog, " Aesop," " Menippus " and " the Sculptor Montafies," all in the Madrid gallery, show his surest and freest manner. To these may be added the charming portraits of the royal children in the Louvre

and Vienna, among the choicest of his works. It is one of these infantas, Margarita Maria, the eldest daughter of the new queen, that is the subject of the well-known picture " Las Menifias " (the Maids of Honour), 1062, in the Madrid gallery, painted in 1656, where the little lady holds court, surrounded by her ladies-in-waiting, her dwarfs and her mastiff, while Velazquez is seen standing at his easel. This is the finest portrait we have of the great painter. It is a face cf much dignity, power and sweetness — like his life, equable and serene, unruffled by care. " Las Menifias " was the picture of which Luca Giordano said that it was the " theology of painting," another way of expressing the opinion of Sir Thomas Lawrence, that this work is the philosophy of art, so true is it in rendering the desired effect. The result is there, one knows not by what means, as if by a first intention without labour, absolutely right. The story is told that the king painted the red cross of Santiago on the breast of the painter, as it appears to-day on the canvas. Velazquez did not, however, receive the honour till 1659, three years after the execution of this work. Even the powerful king of Spain could : not make his favourite a belted knight without a commission to inquire into the purity of his lineage on both sides of the house. The records of this commission have been found among the archives of the order of Santiago by M. Villaamil. Fortunately the pedigree could bear scrutiny, as for generations the family was found free from all taint of heresy, from all trace of Jewish or Moorish blood and from contamination by trade or commerce. The difficulty connected with the fact that he was a painter was got over by his being painter to the king and by the declaration that he did not sell his pictures. But for this royal appointment, which enabled him to escape the censorship of the Inquisition, we should never have had his splendid " Venus and Cupid,"

formerly belonging to Mr Morritt of Rokeby Hall and bought by the National Art Collections Fund for £45,000 for the National Gallery in 1905. It is painted in his latest manner and is worthy of comparison with Titian. 2 There were in truth but two patrons of art in Spain — the church and the art-loving king and court. Murillo was the artist favoured by the churchy while Velazquez was patronized by the crown. One difference, however, deserves to be noted. Murillo, who toiled for a rich and powerful church, left scarcely sufficient means to pay for his burial, while Velazquez lived and died in the enjoyment of good salaries and pensions. Yet on occasions Philip gave commissions for religious pictures to Velazquez — among others, and belonging to this later period, the " Coronation of the Virgin" (Madrid, 1056), splendid in colour — a harrrony of red, blue and grey — but deficient in religious feeling and dignity. It was painted for the oratory of the queen, doubtless Mariana, in the palace at Madrid. Another royal commission for the hermitage of Buen Retiro was the " St Anthony the Abbot and St Paul the Hermit," painted in 1659, the landscape

2 Some uncertainties in the proprietorial history of this picture have led to considerable discussion concerning its authenticity. But the suggestion that Mazo's signature could be detected on it was repudiated by an expert committee in 1910 who carefully examined the painting.

of which excited the warm admiration of Sir David Wilkie (No. 1057 in the Prado). The last of his works which we shall name is "Las Hilanderas " or the Spinners (Madrid, 1061), painted about 1656, representing the interior of the royal tapestry works. The subject is

nothing, the treatment every- thing. It is full of light, air and movement, splendid in colour and marvellous in handling. This picture, Raphael Mengs said, seemed to have been painted not by the hand but by the pure force of will. We see in it the full ripeness of the power of Velazquez, a concentration of all the art- knowledge he had gathered during his long artistic career of more than forty years. In no picture is he greater as a colourist. The scheme is simple — a harmony of red, bluish- green, grey and black, which are varied and blended with consummate skill.

In 1660 a treaty of peace between France and Spain was to be consummated by the marriage of the infanta Maria' Theresa with Louis XIV., and the ceremony was to take place in the Island of Pheasants, a small swampy island in the Bidassoa. Velazquez was charged with the decoration of the Spanish pavilion and with the whole scenic display. In the midst of the grandees of the first two courts in Christendom Velazquez attracted much attention by the nobility of his bearing and the splendour of his costume. .On the 26th of June he returned to Madrid, and On the 31st of July he was stricken with fever. Feel- ing his end approaching, he signed hiB will, appointing as his sole executors his wife and bis firm friend Fuensalida, keeper of the royal records. He died on the 6th of August 1660, passing away in the full possession of his great powers, and leaving no work behind him to show a trace of decay. He was buried in the Fuensalida vault of the church of San Juan, and within eight days his wife Juana was laid beside him. Unfortunately this church was destroyed by the French in 181 1, so that his place of interment is now unknown. There was much difficulty in adjusting the tangled accounts out- standing between Velazquez and the treasury, and it was not till 1666, after the death of Philip, that they were finally settled.

Velazquez can hardly be said to have formed a school of painting. Apart from the circumstance that his occupations at court would have prevented this, his genius was too personal for transmission by teaching. Yet his influence on those immediately connected with him was considerable. In 1642 he befriended young Murillo on his arrival in Madrid, received him into his house, and directed his studies for three years. His son-in-law Mazo painted in his manner, and doubtless many pictures by Mazo are attributed to the master. Carreno, though never a pupil, was a favourite and had the good sense to appreciate him and imitate him. His faithful slave Pareja studied his methods and produced work which by the favour of Velazquez procured his manumission from Philip. But the appreciation of the fine talent of Velazquez passed away quickly in Spain, as that country began to fall to pieces.

In addition to the standard works by Palomino (1724), Cean Bermudez (1800) and Pacheco (1649), see the biographical notice by Don Pedro de Madrazo in his Cataloso del Museo del Prado (1872); Velazquez and his Works' (1855) ^na ■Annals of Artists of Spain (1848), by W. Stirling (afterwards SirW. Stirling-Maxwell); Ford's Handbook to Spain (1855) and his article in the English Cyclopaedia; Velazquez and Murillo, by Charles B. Curtis (1883) ; the works of W. Burger (T- Thore) ; Gesch. d. Malerei, by Woltmann and Woermann; Sir Edmund Head's Handbook of Spanish Painting (1848) ; Works of Velazquez (prints), by G. W. Reid (1872); Gaz. d. Beaux Arts, art. "Velazquez," by Paul Lefort (second period, 1879-82); Carl Justi, Diego Velazquez u. sein Jahrhundert (2 vols., Bonn, 1888); The Life of Velazquez, by Sir Walter Armstrong (London, 1896); Velazquez, by R. A. M. Steven- son (London, 1899); Velazquez outside the Prado Museum, by Don Manuel Mesonero Romanos (Madrid, 1899) ; The Life and Works of Don Diego Velazquez, by Don

Jacinto Octavio Picon (Madrid, 1899); Days with Velazquez, by C. Lewis. Hind (London, 1906); and, finally, Don A. de Beruete's standard work on the subject, Velazquez (London, 1906), which contains reproductions of all the master's paintings of which the author admits the authenticity.

(J. F. W.;P. G. K.)

VELEIA, an ancient town of Aemilia, Italy, situated about 20 m. S. of Placentia. , It is mentioned by Pliny among the towns of the eighth region, though the Veleiates were Ligurians

by race. Its inhabitants were in the census of Vespasian found to be remarkable for their longevity. Nothing further was known of it until 1747, when some ploughmen found the famous Tabula alimentaria, now in the museum at Parma. This, the largest inscribed bronze tablet of antiquity (4 ft. 6 in. by 9 ft. 6 in.) contains the list of estates in the territories of Veleia, Libarna, Placentia, Parma and Luca, in which Trajan had assigned before 102 B.C. 72,000 sesterces (£720) and then 1,044,000 sesterces (£10,440), on a mortgage bond to forty-six estates, the total value of which was reckoned at over 13,000,000 sesterces (£130,000), the interest on which at 5% was to serve for the support of 266 boys and 36 girls, the former receiving 16, the latter 12 sesterces a month. See Ligures Baebiani for a similar inscription. Excavations were begun on the site in 1760, and Were at first successful; the forum and basilica, the thermae and the amphitheatre, private houses, &c, with many statues (twelve of marble from the basilica, and a fine bronze head of Hadrian) and inscriptions were discovered. Pre-Roman cremation tombs have also been found, with objects of bronze and iron of no great value. But later excavations which were carried on at intervals up to 1876 have given less fruitful

results. The oldest dated monument is a bronze tablet ■ with a portion of the text of the Lex Rubria of 49 B.C. which dealt with the administration of justice in Cisalpine Gaul in connexion with the extension to it of the privileges of the Roman franchise, the latest an inscription of A.d. 276. How and when it was abandoned is uncertain: the previously pre- valent view that it was destroyed by a landslip was proved to be mistaken by the excavations of 1876. Most of the objects found are in the museum at Parma.

See Gt Arrtolini, Le Ravine di Veleia (Milan, 1831); G. Mariotti in Notizie degli Scavi (1877), 157; E. Bormann in Corpus Inscript. Latin (Berlin, l«88), xi. 204 sqq. (T. As.) ,

Vf LEZ-MALAGA, a town of southern Spain, in the province of Malaga, finely situated in a fertile valley at the southern base of the lofty Sierra de Alhama, and on the left bank of the small river Velez, 1 m. from its mouth and 27 m. by road E.N.E. of Malaga. Pop. (1900) 23,586. V61ez-Malaga formerly was a place of considerable commercial importance, but its prosperity has much declined; there is no railway, and the town suffered severely in the earthquakes of 1884 and the floods of 1907. The vegetation of the neighbourhood is most luxuriant, includ- ing the aloe, palm, sugar-cane, prickly pear, orange, vine, olive and sweet potato. Velez-Malaga was held by the Moors from 711 to 1487, when it was captured by Ferdinand of Castile. Under Moorish rule the citadel was built and the town became an important trading station and fortress. Its harbour, the V61ez estuary, affords good anchorage and is well sheltered.

VELIA (Gr. TeXij, later 'EX£a), an ancient town of Lucania, Italy, on the hili now crowned by the medieval castle of Castellammare della BruCa, 440 ft. above sea-level, on the S.W. coast, if m. N.W. of the modern railway station of Asc6a, 25 m. SiE. of Paestum. Remains 6i the city walls, with traces of one gate and Several towers, of a total length of over 3 m., still exist, and belong to three different periods, in all of which the crystalline limestone of the locality is used. Bricks were also employed in later times; their form is peculiar to this place, each having two rectangular channels on one side, and being about 15 in. square, with a thickness of nearly 4 in. They all bear Greek brick-stamps. There are some remains of cisterns on the site, and various other traces of buildings. The towr was mainly celebrated for the philosophers who bore its nam*; (see Eleatic School). About 530 B.C. the Phocaeans, driven from Corsica, seized it from the Oenctrians. Its coins were widely diffused in S. Italy, and it kept its independence even in Roman times, and onlv became a municipium after the Social War.*

See W. Schlenning in Jahrbuch des K. Deutschen Arch. Instiluts (1889), iv. 169 sqq, (T. As.)

VELIUS LONGUS (2nd cent, a.d.), Latin grammarian during the reign of Trajan (or Hadrian), author of an extant treatise on Orthography (H. K.eil, Grammatici Latixi, vii.). He is

mentioned by Macrobius (Saturnalia, iii. 6, 6) and Servius (on Aen. x. 245) as a commentator on Virgil.

See M. Schanz, Geschichte der romischen Litteratur, iv. 1 (1904); Teuffel, Hist, of

Roman Literature (Eng. trans., 1900), 343, 2.

VELLEIUS PATERCULUS, MARCUS (c. 19 b.c.c. a.d. 31), Roman historian. Although his praenomen is given as Marcus by Priscian, some modern scholars identify him with Gaius Velleius Paterculus, whose name occurs in an inscription on a north African milestone (C.I.L. viii. 10, 311). He belonged to a distinguished Campanian family, and early entered the army. He served as military tribune in Thrace, Macedonia, Greece and the East, and in a.d. 2 was present at the interview on the Euphrates between Gaius Caesar, grandson of Augustus, and the Parthian king. Afterwards, as praefect of cavalry and legatus, he served for eight years (from a.d. 4) in Germany and Pannonia under Tiberius. For his services he was rewarded with the quaestorship in 7, and, together with his brother, with the praetorship in 15. He was still alive in 30, for his tory contains many references to the consulship of M. Vinicius in that year. It has been conjectured that he was put to death in 31 as a friend of Sejanus, whose praises he celebrates in a most fulsome manner.

He wrote a compendium of Roman history in two books dedicated to M. Vinicius, from the dispersion of the Greeks after the siege of Troy down to the death of Livia (a.d. 29). The first book brings the history down to the destruction of Carthage, 146 B.C.; portions of it are wanting, including the beginning. The later history, especially the period from the death of Caesar, 44 B.C., to the death of Augustus, a.d. 14, is treated in much greater detail. Brief notices are given of Greek and Roman literature, but it is strange that no mention is made of Plautus, Horace and Propertius. The author is a vain and shallow courtier, and destitute of real historical insight, although generally trustworthy in his statements of .individual facts. He may be regarded as a courtly annalist rather than an

historian. His knowledge is superficial, his blunders numerous, his chronology inconsistent. He labours at portrait- painting, but his portraits are daubs. On Caesar, Augustus and above all on his patron Tiberius, he lavishes praise or flattery. The repetitions, redundancies, and slovenliness of expression which disfigure the work may be partly due to the haste with which (as the author frequently reminds us) it was written. Some blemishes of style, particularly the clumsy and involved structure of his sentences, may perhaps be ascribed to insufficient literary training. The inflated rhetoric, the strain- ing after effect by means of hyperbole, antithesis and epigram, mark the degenerate taste of the Silver Age, of which Paterculus is the earliest example. He purposed to write a fuller history of the later period, which should include the civil war between Caesar and Pompey and the wars of Tiberius; but there is no evidence that he carried out this intention. His chief authori- ties were Cato's Origines, the Annalesoi Q. Hortensius, Pompeius Trogus, Cornelius Nepos and Livy.

Velleius Paterculus was little known in antiquity. He seems to have been read by Lucan and imitated by Sulpicius Severus, but he is mentioned only by the scholiast on Lucan, and once by Priscian. The text of the work, preserved in a single ^adly written and mutilated MS. (discovered by Beatus Rhenanus in 1515 in the abbey of Murbach in Alsace and now lost), is very corrupt. Editio princeps, 1520; early editions by the great scholars Justus Lipsius, J. Gruter, N. Heinsius, P. Burmann; modern editions, Ruhnken and Frotscher (1830–39), J. C. Orelli (1835), F. Kritz (1840, ed. min. 1848), F. Haase (1858), C. Halm (1876), R. Ellis (1898) (reviewed by W. Warde Fowler in Classical Review, May 1899); on the sources see F. Burmeister, " De Fontibus Vellei Paterculi," in Berliner Studien fur classische

Philologie (1894), xv – English translation by J. S. Watson in Bohn's Classical Library.

VELLETRI (anc. Velitrae), a town and episcopal see of the province of Rome, Italy, at the south-east foot of the outer ring wall of the Alban crater, 26 m. S.E. of Rome by rail, 1 155 ft. above sea-level. Pop. (1901) 14,243 (town), 18,734 (commune). It is the seat of the bishop of Ostia, and has a statue of Pope Clement VIII. Good wine is made in the fertile vineyards of the district, and there is a government experimental

station for viticulture. Velletri is the junction of the Terra- cina line and a branch to Segni on the main line to Naples. Velletri has a fine view of the Volscian mountains and over the Pomptine Marshes to the Circeian promontory. The town contains a few objects of interest; at the highest point is the prominent municipal palace; containing a few ancient inscrip- tions j among them one relating to a restoration of the amphi- theatre under Valentinian and Valens. The internal facade of the Palazzo Ginetti is finely decorated with stucco, and has a curious detached baroque staircase by Martino Lunghi the younger, which Burckhardt calls unique if only for the view to which its arched colonnades serve as a frame. The lofty campanile of S. Maria in Trivio, erected in 1353 in gratitude for the liberation of the city from a plague which devastated it in 1348, is in the style of contemporary brick campanili in. Rome, but built mainly of black selce, with white marble columns at the windows. The cathedral (the see of the titular bishop of Ostia) was reconstructed in 1660, but contains traces of the older structure. Of the ancient town nothing practically remains above ground; scanty traces of the city walls have been excavated (and covered again) near the railway station, and the present walls are entirely medieval.

The ancient city of Velitrae was Volscian in Republican times, and it is the only Volscian town of which an inscription in that language is preserved (4th century B.C.). It mentions the two principal magistrates '■ as medix. It was, however, a member of the Latin League in 499 B.C., so that in origin it may have been Latin and have fallen into Volscian hands later. It was important as commanding the approach to the valley between the Alban and Volscian mountains. In 494 it was taken from the Volscians and became a Roman colony. This was strengthened in 404, but in 393 Velitrae regained its freedom and was Rome's strongest opponent; it was only reduced in 338, when the freedom of Latium finally perished. Its resistance was punished by^he destruction of its walls and the banishment of its town councillors to Etruria, while their lands were handed over to Roman colonists. We hear little or nothing of it subsequently except as the home of the gens Octavia, to which the Emperor Augustus belonged. The neighbourhood contains some remains of villas, but not pro-portionately very many; there are more on the side towards Lanuvium (W.). The Via Appia passed considerably below the town (some 5 m. away), which was reached by a branch road from it, diverging at the post station of Sublanuvio. During the whole of the middle ages it was subject to the papacy.

(T. As.)

VELLORE, a town of British India, in the North Arcot district of Madras, on the river Palar and the South Indian railway, 87 m. W. of Madras city. ' Pop. (1901) 43,537. It has a strongly built fortress, which was famous in the wars of the Carnatic. It dates traditionally from the 13II1 century, but more > probably only from the 17th. It –is a fine example of Indian military architecture, and contains a temple adorned with admirable sculptures. In 1780 it withstood a siege for

two years by Hyder Ali. After the fall of Seringapatarh (1799) Vellore was selected as the residence of the sons of Tippoo Sahib, and to their intrigues has been attributed the mutiny of the sepoys here in 1806. An American mission manages a high school, raised to the rank of a college in 1898; and the police training school for the presidency is also situated here. Vellore has a large grain trade, and flowers are cultivated in the vicinity.

VELVET, a silken textile fabric having a short dense piled surface. In all probability the art of velvet-weaving originated in the Far East; and it is not till about the beginning of the 14th century that we find any mention of the textile. The peculiar properties of velvet, the splendid yet softened depth of dye-colour it exhibited, at once marked it out as a fit material for ecclesiastical vestments, royal and state robes, and sump- tuous hangings; and the most magnificent textures of medieval times were Italian velvets. These were in many ways mbst effectively treated for ornamentation, such as by varying the colour of the pile, by producing pile of different lengths (pile

upon pile, or double pile), and by brocading with plain silk, with uncut pile or with a ground of gold tissue, &c. The earliest sources of European artistic velvets were Lucca, Genoa, Florence and Venice, and Genoa continues to send out rich velvet textures. Somewhat later the art was taken up by Flemish weavers, and in the 16th century Bruges attained a re- putation for velvets not inferior to that of the great Italian cities.

VELVETEEN, a cotton cloth made in imitation of velvet. The term is sometimes applied to a mixture of silk and cotton. Some velveteens are

a kind of fustian, having a rib of velvet pile alternating with a plain depression. The velveteen, trade varies a good deal with the fashions that control the production of velvet. Velveteens are commonly woven in sheeting looms, and manufacturers are able to alternate the two kinds of goods according to the demand.

VENAFRUM, an ancient town of Campania, Italy, close to the boundaries of both Latium adjectum and Samnium. Its site is occupied by the modern Venafro, a village with ■ 47 16 inhabitants (1901), on the railway from Isernia to Caianello, 15 m. S.W.- of the former, 658 ft. above sea-level. Ancient authors tell us but little about it, except that it was one of those towns governed by a prefect sent yearly from Rome, and that in the Social War it was taken by the allies by treachery. Augustus founded a colony there and provided for the con- struction of an aqueduct (cf. the long decree relating to it in Corp. Inscr. Lat. x. No. 4842). It seems to have been a place of some importance. Its olive oil was the best in Italy, and Cato mentions its brickworks and iron manufactures. The original line of the Via Latina probably ran through Venafrum, making a detour, which the later road seems to have avoided (cf . Latina, Via). Rufrae was probably dependent on it. Roads also ran from Venafrum to Aesernia and to Telesia by way of Allifae. Of ancient remains hardly anything is left — some traces of an amphitheatre and fragments of polygonal wallsonly. (T. As.)

VENDACE, the name of a Brjfish freshwater fish of the genus Coregonus, of which two other species are indigenous in the fresh waters of the British Islands, the gwyniad and the pollan. The vendace (C. vandesius) is restricted to some lochs in Dum- friesshire, Scotland; it is, however, very similar to a species (C. albula) which inhabits some of the large and deep lakes of northern Europe. From its general resemblance to a dace the French

name of the latter, vandoise, was transferred to it at the period when French was the language of the court and aristo- cracy of Scotland. So great is the local celebrity of the fish that a story has been invented ascribing to Mary Queen of Scots the merit of having introduced it into the Lochmaben lochs. It is considered a great delicacy, and on favourable day's' when the shoals rise to the surface, near the edges of the loch, great numbers may be taken. : It spawns in November. In length it scarcely exceeds 8 in.

VENDEE, a maritime department of western France, formed in 1790 out of Bas-Poitou, and taking its name from an unim- portant tributary of the Sevre Niortaise. It is bounded by Loire-Inferieure and Maine-et-Loire on the N., by Deux-Sevres on the E., by Charente-Inferieure on the S. and by the Atlantic Ocean on the W. for 93 m. Pop. (1906) 442,777. Area, 2708 sq. m. The islands of Yeu (area, 8^ sq. m.) and Noirmoutier (q.v.) are included. The Sevre Nahtaise on the N.E. and the Sevre Niortaise on the S., besides other streams of minor im- portance, form natural boundaries. The department falls into three divisions — woodland (Bocage), plain (Cdte) and marsh (Marais).

The highest point (748 ft.) is situated in the woodland, which occupies the greater part of Vendee, on the water-parting between the Loire and the rivers of the coast. This region, which, geo- logically, is composed of granite, gneiss, mica-schist, schist and lias, abounds in springs, and is fresh and verdant; the landscape is characterized by open fields surrounded by trees, which supplied ambushes and retreats to the Vendeans in the civil war at the end pf the i8th century. The marshes, raised above the sea-level within historic times (four centuries ago), consist of two portions, the Breton marsh in the north and the Poitevin marsh in the south; "the latter

extends into the departments of Charente-Inferieure and Deux-Sevres. The region includes productive salt marshes and

fertile cultivated areas artificially drained. Its area is constantly being increased by the alluvium of the rivers and the secular elevation of the coast. The celebrated beds of sea-shells near St Michel en l'Herm — 2300 ft. long, 985 ft. broad and from 30 to 50 ft. deep — show to what extent the coast has risen. The plain of Vendee lying between the Bocage and the Poitevin marsh is bare and treeless, but fertile, though poor in springs ; geologically it is composed of lias and oolite. The department is drained by the Sevre Nantaise (tributary of the Loire) and the Boulogne (a feeder of Lake Grandlieu in Loire-Inferieure), both draining into the basin of the Loire; and by the Vie, the Lay (with the Yon), and the Sevre Niortaise (with the Autise and the Vendee), which flow into the Atlantic. The climate is that of the Girondine region , mild and damp, the temperature rarely rising above 77" or falling below 18 F.; 120 to 150 days of rain give an average annual rainfall of 25 in. The woodland is colder than the plain, and the marsh is damp and unhealthy.

The department is agriculturally prosperous. Wheat is the most important crop, oats, potatoes, clover, lucerne and mangold- wurzels ranking next. Beans, flax and colza may also be mentioned. Wine is grown in the south of the department. The rearing of live stock flourishes in the Bocage and the marsh, the pastures of the latter nourishing fine oxen and horses, and sheep famous for the excellence of their mutton. Cider-apples, pears, peaches, plums, cherries and walnuts are among the fruits grown. Coal is mined in the south-east of the department (basin of Vouvant) and antimony is found; limestone is quarried. The spinning and weaving of wool, cotton and flax is carried on, and there are potteries, paper-

mills, tan-yards, dye-works, manufactories of hats, boots and shoes, glass and lampblack, flour-mills, distilleries, oil-works, tile-works and shipbuilding yards. Sardines and tinned foods are prepared. The sardine fishery is active on the coast and there are extensive oyster- beds near Sables-d'Olonne. Corn, cattle, mules, fish, salt, wine, honey, wood, glass and manure are exported; wine, wood, building material, coal, phosphates and petroleum are among the imports. Sables-d'Olonne is the principal fishing and commercial port.

Vendee is served by the Ouest-Etat railway and has 81 m. of navigable rivers and canals. The department forms the diocese of Lucon, has its court of appeal and educational centre at Poitiers, and is included in the district of the XL Army Corps (headquarters at Nantes). There are three arrondissements (La Roche-sur-Yon, Fontenay-le-Comte and Sables-d'Olonne), 30 cantons, and 304 communes. The principal towns are La Roche-sur-Yon, Les Sables-d'Olonne, Fontenay-le-Comte and Lucon, which are treated under separate headings. Other places of interest are Foussais, Nieul-sur-1' Autise and Vouvant, with Romanesque churches; Pouzauges, which has a stronghold of the 13th century; Maillezais, with the ruins of its old cathedral ; Talmont and Tiffauges, both possessing ruined castles; and Le Bernard with noteworthy mega-lithic remains.

VENDEE, WARS OF THE, a counter-revolutionary insur- rection which took place during the French Revolution (q.v.), not only in Vendee proper but also in Lower Poitou, Anjou, Lower Maine and Brittany. The district was mainly inhabited by peasants; it contained few important towns, and the bourgeois were but a feeble minority. The ideas of the Revolu- tion were slow in penetrating to this ignorant peasant population, which had always been less civilized than the majority of Frenchmen, and

in 1789 the events which roused enthusiasm throughout the rest of France left the Vendeans indifferent. Presently, too, signs of discontent appeared. The priests who had refused to submit to the Civil Constitution of the Clergy perambulated these retired districts, and stigmatized the revolu- tionists as heretics. In 1791 two " representatives on mission " informed the Convention of the disquieting condition of Vendee, and this news was quickly followed by the exposure of a royalist plot organized by rae marquis de la Rouerie.

The signal for a widespread rising was the introduction of conscription acts for the recruiting of the depleted armies on the eastern frontiers. In February 1793 the Convention de- creed a levy on the whole of France, and on the eve of the ballot the Vendee, rather than comply with this requisition, broke out in insurrection. The Vendean peasant refused to join the republican army, not for want of fighting qualities or ardour, but because the army of the old regime was recruited from bad characters and broken men, and the peasant, ignorant of the great change that had followed the Revolution, thought that the barrack-room was no place for a good Christian. In March 1793 the officer commanding at Cholet was killed, and republicans were massacred at Machecoul and St Florent. Giving rein to their ancient antipathy, the revolted peasantry- attacked the towns, which were liberal in ideas and republican

La sympathies. The leaders of these first risings were men of humble birth, such as J. Cathelineau, a pedlar, J. N. Stofflet, a gamekeeper, and the barber Gaston. Gholet,

Bressuire, Fontenay-le-Comte and Samur were surprised. The influence of the priests kept up the fanaticism of the peasants, and a great manifestation of religious feeling took place on Easter eve, but the republican soldiers taken prisoners were often maltreated and even tortured.

These first successes of the Vendeans coincided with grave republican reverses on the frontier—war with England, Holland and Spain, the defeat of Neerwinden and the defection of Dumouriez. The emigres then began to throw in their lot with the Vend6ans. Royalist nobles like the marquis de Bonchamp, F. A. Charette de la Contrie, Gigot d'Elbee, Henri de la Rochejaquelein and the marquis de Lescure placed themselves at the head of the peasants. Although several of these leaders were Voltairians, they held up Louis XVI., who had been executed in January 1793, as a martyr to Catholicism, and the Vendeans, who had hitherto styled them- selves the Christian Army, now adopted the name of the Catholic and Royal Army.

The Convention took measures against the Smigres and the refractory priests. By a decree of the 10th of March 1793 every person accused of taking part in the counter-revolutionary revolts, or of wearing the white cockade (the royalist emblem), was declared an outlaw. The prisoners were to be tried by military commissions, and the sole penalty was death with confiscation of property. The Convention also sent repre- sentatives on mission into Vendee to effect the purging of the municipalities, the reorganization of the national guards in the republican towns, and the active prosecution of the revolu- tionary propaganda. These measures proving insufficient, a decree was promulgated on the 30th of April 1793 for the despatch of regular troops; but, in spite of their failure to capture Nantes (where Cathelineau was mortally

bounded), the successes of the Vendeans continued. On the 31st of July, therefore, at Barere's suggestion, it was decreed that the- woods of the Vendee should be burnt, the harvest carried off to safe places in rear of the army, the cattle seized, the women and children concentrated in camps in the interior, and that every male from the age of sixteen in the neighbouring regions should be called upon to take arms. Further, on the 1st of August, the troops that had formed the garrison of Mainz, which were unavailable against foreign enemies by the terms of their capitulation to the Austrians, were ordered to Vendee. The programme was carried out by the so-called " infernal columns."

At the end of August 1793, the republicans had three armies in the Vendee — the army of Rochelle, the army of Brest and the Mayencais; but their generals 'were either ciphers, like C. P. H. Ronsin, or divided among themselves, like J. A. Rossignol and J. B. C. Canclaux. They were uncertain whether to cut off the Vendeans from the sea or to drive them westwards; and moreover, their men were undisciplined. Although the peasants had to leave their chiefs and work on the land, the Vendeans still remained formidable opponents. They were equipped partly with arms supplied by England, and partly with fowling-pieces, which at that period were superior to the small-arms used by the regular troops, and their intimate knowledge of the country gave them an immense advantage. They gathered and burst like a storm on their enemies, and, if repulsed, dispersed at the famous order, " Egaillez-vous les gars," to unite again some days later.

The dissensions of the republican leaders and the demoralizing tactics of the Vendeans resulted in republican defeats at Chan- tonnay, Torfou, Coron, St Lambert, Mohtaigu and St Fulgent. The Convention resolved to bring the war to an end before October, and placed the

troops under the undivided command, first of Jean Lechelle and then of Louis Turreau, who had as subordinates such men as Marceau, Kleber and Westermann. On the 7th of October the various divisions concentrated at Bressuire, took Chatillon after two bloody engagements, and defeated the Vendeans at Cholet, Beaupreau and La Trem-

blaye. After this repulse, the royalists, under Stofflet and La Rochejaquelein, attempted to rouse the Cotentin and crossed the Loire. Beaten back at Granville, they tried to re-enter the Vendee, but were repulsed at Angers. They re-formed at Le Mans, where they were defeated by Westermann, and the same officer definitively annihilated the main body of the insurgents at Savenay (December 1793).

Regular warfare was now at an end, although Turreau and his " infernal columns " still continued to scour the disaffected districts. After the 9th Thermidor attempts were made to pacify the country. The Convention issued conciliatory proclamations allowing the Vendeans liberty of worship and guaranteeing their property. General Hoche applied these measures with great success. He restored their cattle to the peasants who submitted, " let the priests have a few crowns," and on the 20th of July 1795 annihilated an emigre expedition which had been equipped in England and had seized Fort Penthievre and Quiberon. Treaties were concluded at La Jaunaie (February 15, 1795) and at La Mabillaie, and were fairly well observed by the Vendeans; and nothing remained but to cope with the feeble and scattered remnant of the Ven- deans still under arms, and with the Chouans (q.v-.). On the 30th of July 1796 the state of siege was raised in the western departments.

During the Hundred Days there was a revival of the Vendean war, the suppression of which occupied a large corps of Napoleon's army, and

in a measure weakened him in the northern theatre of war (see Waterloo Campaign).

In 1832 again an abortive insurrection broke out in support of the Bourbons, at the instigation of the duchess of Berry; the Vendean hero on this occasion was the baron de Charette.

There are numerous articles on the Vendean insurrection of 1793 in the Revue du Bas^Poitou, Revue historique de I'Anjou, Revue de Bretagne, de Vendee et d'Anjou, Revue historique de I'Ouest, Revue historique et archeologique du Maine, and La Vendee historique. See also R. Bittard des Portes, " Bibliographic historique et critique des guerres de' Vendee et de la Chouannerie" in the Revue du Bas—Poitou (1903 seq.); C. L. Cbassin,, £tudes sur la Vendee et la Chouannerie (La Preparation de la guerre— La Vendee patriote—Les Pacifications de I'Ouest), Paris, 1892 seq., 11 vols, (the best general work on' the subject); C; Port, Les Origines de la Vendee (Paris, 1888); C. Leroux-Cesbron, " Correspondance des representants en mission a l'armee de l'ouest (1794-95) " >n the Nouvelle Revue retrospective (1898); Blachez, Bonchamps et V insurrection vendeenne (Paris, 1902); P. Mautouchet, Le Conventionnel Philippeaux (Paris, 1901), On 1815 a modern work is Les Cent Jours en Vendue; le general Lamarque, by B. Lasserre (Paris, 1907) ; on 1832 see La Vendee, by Vicomte A. de Courson (1909). (R. A.)*

• *VENDfiMIAIRE (from Lat. vindemia, vintage), the name given during the French Revolution to the first month of the year in the Republican Calendar. Vendemiaire began ori : the 22nd, 23rd or 24th of September, and ended on the 22nd, 23rd or 24th of October according to the year, and was the season of the vintage in the wine districts of northern France. In accordance with the suggestion of Fabre*

d'Eglantine, each of the days of the republican year was consecrated to some useful object. For' instance, 1 Vendemiaire was the festival of the grape, 10 Vendemiaire of the vat, 13 Vendemiaire of the pumpkin, 15 Vendemiaire of the ass, 20 Vendemiaire of the wine-press, and 30 Vendemiaire of the cask. The most im- portant event in this month was the quelling of the royalist rising on 13 Vendemiaire year IV. (4th of October 1795), in which General Bonaparte (afterwards the emperor Napoleon)' distinguished himself by his energy and skill in using artillery. See Baron R. de Larcy, Le 13 Vendemiaire (Paris, 1872).

VENDETTA (Ital. from Lat. vindicta, revenge, vindicate, to defend oneself), the term applied to the custom of the family feud, by which the nearest kinsman of a murdered man was obliged to take up the quarrel and avenge his death. From being an obligation upon the nearest, it grew to be an obligation on all the relatives, involving families in bitter private wars among themselves. It is a development of that stage in civiliza- tion common to all primitive communities, when the injury done was held to be more than personal, a wrong done to the whole gens .

The term originated in Corsica, where the vendetta has long played an important part in the social life. If the murderer could not be found, his family were liable to fall victims to the vendetta. The feud was sometimes complicated by the ven- detta transfer sale, when each of two branches of a family had a murder to revenge on the other. In Corsica it was regarded as the most sacred family duty. Mediators (parolanti) sometimes intervened successfully to end the feuds, and extort an oath to forgo vengeance. The custom still

survives in Corsica in its complete form, and partially in Sardinia, Sicily, Montenegro, Afghanistan, among the Mainotes of Greece, the Albanians, Druses and Bedouins.

VENDOME, LOUIS JOSEPH, Due de (1654–1712), marshal of France, was the son of Louis, 2nd duke of Vend6me, and the great-grandson of Henry IV. and Gabrielle d'Estrees. Entering the army at the age of eighteen he soon distinguished himself by his vigour and personal courage in the Dutch wars, ; and by 1688 he had risen to the rank of lieutenant-general. In the war of the Grand Alliance he rendered conspicuous service under Luxemburg at Steinkirk and under Catinat at Marsaglia, and in 1695 he was placed in command of the army operating in Cata- lonia where he took Barcelona. Soon afterwards he received the marshalate. In 1702, after the first unsuccessful campaign of Catinat and Villeroi, he was placed in command of the Franco- Spanish army in Italy (see Spanish Succession War). During three campaigns in that country he proved himself a worthy antagonist to Prince Eugene, whom at last he defeated at Cassano by his magnificent courage and command over his troops, converting the defeat that his indolent brother, the Grand Prior, had incurred into a glorious success.. Next year, after holding his own as before, he was sent to Flanders to repair the disaster of Ramillies with the result that his successors Marsin and Philip of Orleans were totally defeated, while in the new sphere Vend6me was merely the mentor of the pious and un- enterprising duke of Burgundy, and was unable to prevent the defeat of Oudenarde. He therefore retired in disgust to his estates, but it was not long before he was summoned to take command of the army of Philip in Spain, and there he won his last victories, crowning his work with the battle of Villaviciosa. Before the end of the war he died suddenly at Vinaros on the nth of June 171 2.

Vendome was one of the most remarkable soldiers in the history of the French army, and second only to Villars amongst the generals of France of the 18th century. He had, besides the skill and the fertile imagination of the true army leader, the brilliant courage of a soldier. But the real secret of his uniform success was his extraordinary influence over his men.

*VENDdME, a town of north-central France, capital of an arrondissement in the department of Loir-et-Cher, 22 m. N.W. of Blois by rail. Pop. (1906) town, 7381; commune, 9804. Vend&me is situated on the Loir, which here divides into nume- rous arms intersecting the town. On the south it is overlooked by an eminence on which stand ruins of the castle of the counts of Vend6me, dating in part to the nth century. The abbey- church of the Trinity (12th to 15th century) has a fine facade in the florid Gothic style. The belfry, surmounted by a stone steeple, stands isolated in front of the church; it belongs to the middle of the 12th century, and is one of the finest examples of Transition architecture. Abbey buildings of various periods lie round the church. The church of La Madeleine (1 5th century) is surmounted by a stone spire, an indifferent imitation of that of the abbey. The fine tower of St Martin (16th century) is all that remains of the church of that name. The town hall occu- pies the old gate of St George; its river front is composed of two large crenelated and machicolated towers, connected by a pavilion. The ancient hospital of St Jacques afterwards became * college of the Otatorians, and now serves as a lyc6e for boys; the charming chapel, dating from the 15th century, in the most florid Gothic style, is preserved. The town has a well-known archaeological and scientific society, and possesses a library with more than three hundred MSS., and a museum, m6stly archaeological, in front of which stands a statue of the poet*

Ronsard. There is also a statue of Marshal Rocharribeau, bora at Venddme in 1725. There are some interesting houses of the 15th and 16th centuries. Vend6me has a sub-prefecture and a tribunal of first instance. The river supplies motive power to flouMnills, and the town manufactures gloves, paper and carved mouldings; and carries on tanning and nursery-gardening to- gether with trade in butter and cheese.

Vend6me (Vindocinum) appears originally to have been a Gallic oppidum, replaced later by a feudal castle, around which the modern town arose. Christianity was introduced by St Bienheure in the 5th century, and the important abbey of the Trinity (which claimed to possess a tear shed by Christ at the tomb of Lazarus) was founded about 1030. When the reign of the Capetian dynasty began, Vend6me was the chief town of a countship belonging to Bouchard, called " the Venerable," who died in the monastery of Saint-Maur-des-Fosses in 1007. The succession passed by various marriages to the houses of Nevers, Preuilly and Montoire. Bouchard VII., count of Venddme and Castres (d. c. 1374), left as his heiress his sister Catherine, the wife of John of Bourbon, count of la Marche. The countship of Vend6me was raised to the rank of a duchy and a peerage of France for Charles of Bourbon (1515); his son Anthony of Bourbon,' king of Navarre, was the father of Henry IV., who gave the duchy of Venddme in 1598 to his natural son Caesar (1594-1665). Caesar, duke of Vend6me, took part in the disturb- ances which went on in France under the government of Richelieu and of Mazarin, and had as his sons Louis, duke of Venddme (161 2-1669), who married a niece of Mazarin, and Francis;' duke of Beaufort. The last of the family in the male line (1645-1712) was Louis XIV.'s famous general, Louis Joseph, duke of Vend6me (q.v.). The title of duke of Vend6me is now borne by Prince Emmanuel of

Orleans, son of the duke of Alencon .

See J. de Petigny, Histoire arcMologique du Venddmois (2nd ed., 1882). .'■:.-,

VENEER, a thin layer of wood, ivory, pearl or other material of high decorative value fixed to a poorer surface by glue or other adhesive to improve , its appearance. Wood veneers are exceedingly common: only the best woods are used and the layer may be as thin as paper — a circumstance due to improve- ments in the machinery for cutting the logs. The surface to which the veneer is to be attached is prepared perfectly smooth, a film of glue applied, and then the veneer laid on. It is now ironed perfectly flat, all superfluous glue being pressed out, and then allowed to dry in a press. The surface is now ready for polishing.

VENER [Wener or Vtiner; often written, with, the addition of the definite article, Venern], the largest lake in Sweden and the third largest in Europe. It has an area of 2149 sq. m.; a maximum length of 87 m.; an extreme breadth of 44 m.; a maximum depth of 292 ft.; and an altitude above sea-level of 144 ft., though the Surface sometimes rises as much as: 10 ft. or more, for the lake is the recipient of the waters of numerous streams, the largest being the Klar, which drains the forests of Vermland and Kopparberg to the north. It is drained by the Gota river southward, to the Cattegat. It is divided into two basins by two peninsulas and a group of islands, the western half being known as Lake Dalbo. The northern shores are high, rocky and in part wooded, the southern open and low, though isolated hills occur, such as the Kinnekulle (988. ft.), an abrupt hill exhibiting a remarkable series of geological strata. Several islands fringe this shore; of these Lecko has a fine medieval castle. This lake and Lake Vetter contain degenerate species of marine fauna, left after the retreat of the sea in which both were

formerly included.

By means bf the Dalsland Canal from Kopmannabro, midway on the west shore of Dalbo, the lake,, which is the scene of a; busy traffic in timber, iron and agricultural produce, has communication with Fredrikshald in Norway; and it is traversed from Venefsborg on the south to SiStorp on the east by the G6ta (q.v.) Canal route. The principal lake-ports are— oh the north Karlstad (q.v.) and Kristinehamn, with iron-works and tobacco factory; on the east Mariestad, chief town of the district of Skaraborg, taking its name from the queen of Charles IX.' (1599-1611) ; on the south Lidkopihg, near the Kinnekulle, and Venersborg at the outflow of the Gfitft',

with its old bridge and canal of the 17th century, a museum, and iron foundries, tanneries and match and paper factories.

VENERABLE (Lat. veneraiilis, worthy of reverence, venerari, to reverence, to worship, allied to Venus, love; the Indo-Germ. root is wen-, to desire, whence Eng. " win," properly to struggle tor, hence to gain), worthy of honour, respect and reverence, especially a term applied to dignified or honourable age. It is specifically used as a title of address given to archdeacons in the Anglican Church. It was naturally a term of respectful address from early times; thus St Augustine (Epist. 76, 88, 139) cites it of bishops, and Philip I. of France was styled venerabilis and venerandus (see Du Cange, Gloss, s.v. Venerabilitas). In the Roman Church the granting of the title " venerable " is the first step in the long process _of ■ the canonization of saints (see Canonization).

VENEREAL DISEASES (from " venery," i.e. the pursuit of Venus, the goddess of love), a general term for the diseases resulting from impure sexual intercourse. Three distinct affections are included under this term — gonorrhoea, local con- tagious ulcers, known as chancres, and syphilis. At one time these were regarded as different forms of the same disease. They are, however, three distinct diseases, due to Separate causes, and have nothing in common except their habitat. The cause in each case is a definite specific , virus, a micro- organism. In the case of gonorrhoea the virus attacks the mucous membranes, especially that of the urethra, the vagina and the uterus. Chancres attack the mucous membranes and the skin. In syphilis the whole system comes under the influ- ence of the poison.

Though these three affections are generally acquired as the result of impure sexual intercourse, there are other methods of contagion, as, for example, when the accoucheur is poisoned whilst delivering a syphilitic woman, the surgeon when operat- ing on a syphilitic patient, the wet-nurse who is suckling a syphilitic infant, and so on. An individual may be attacked by any one or any two of the three, or by all at the same time, as the result of one and the same connexion. But they do not show themselves at the same time. In other words, they have different stages of incubation. In gonorrhoea the disease appears very rapidly. So also in the case of the soft chancres, the first symptoms commencing as a rule three or four days after inoculation. It is different, however, with syphilis, the period of incubation being twenty-eight days, though it may be much longer. The length of the period of incubation, there- fore, is of great diagnostic help in the case of syphilis.

For many years the term " venereal disease "

*was used very loosely, though the writers before the year 1786 had a tolerably clear idea that three distinct diseases were included under the term: the lues venerea, now called syphilis, gonorrhoea, and a condition leading to bubo and associated with a multiple chancre which is known at the present day as " soft sores." John Hunter, as the result of an unfortunate experiment, taught that there was but a single venereal poison which mani- fested itself in different ways. It took the French school many years of hard work to show that the poison of syphilis was distinct from that producing a soft sore, and that the virus of a soft sore was incapable, when pure, of causing gonorrhoea**

The evidence brought forward by Ricord, by Lancereaux and by Fournier was convincing. It has been confirmed by bacteriology, and it has happened by a remarkable coincidence that the truth of the French teaching about syphilis was first established on the firm basis of experiment in France itself, when Professor Metchhikoff at the Institut Pasteur in Paris gave in his adherence to Schaudinn's work, which showed that the Spirochaeta pallida germ was the cause of the disease.

A. Gonorrhoea. Gonorrhoea is a specific inflammation of the mucous membrane of the urethra and other passages, by the reception into it of germs known as diplococci (5i?rX6os, double; k6kkos, berry— the germs being double, like the halves of a walnut). After the illus- trious discoverer, the germ is often spoken of as the gonococcus of Neisser. Gonorrhoea is apt to be a very serious disease, and it sometimes ends fatally.

The germs find entrance during coitus and multiply at enormous rate, spreading to all the glands and crevices of the membrane, and setting free in their development a toxin which causes great irritation of the passage with

inflammation and swelling. They remain quietly incubating for three or four days, or even longer; then acute inflammation comes on, with profuse discharge of thick yellow matter, with much scalding during micturition, and there may be so much local pain that it is difficult for the person to move about. Microscopic examination of the discharge shows abundant pus corpuscles and epithelial cells from the membrane, together with swarms of diplococci (gonococci).

The inflammatory process may extend backwards and give rise to acute prostatitis (see Prostate Gland), with retention of urine; to the duct of the testes and give rise to acute epididymitis (swollen testicle) ; and to the bladder, causing acute cystitis. It may also cause local abscesses, or, by irritation, set up crops of warts.

The treatment of acute gonorrhoea is best carried out if the patient can lie up for a while. He must avoid all fermented drinks and rich foods, and sexual and other excitement, and he should drink freely of such things as barley-water, in order to dilute, and lessen the irritation of, the urine. Hot baths are comforting. Laxatives should be freely given. The urethra should be frequently washed out with a warm solution of permanganate of potash, a grain to the pint, and, later, a weak solution of one of the zinc or silver salts may be used as an injection.

Capsules of copaiba or oil of sandalwood, and a paste of cubebs pepper, have a beneficial influence, and, later, if the man is de-pressed, quinine and iron will be found useful.

In ten days or a fortnight the inflammation gradually subsides, a thin watery discharge remaining which is known as gleet. But inasmuch as this discharge contains gonococci it may, though scarce noticeable, set up acute specific

inflammation in the opposite sex.

In the case of the female the inflammation is apt to extend to the uterus and along the Fallopian tubes, perhaps to give rise to an abscess in the tube (salpingitis) which, bursting, may cause fatal peritonitis.

A lingering gleet may be due to the presence of a definite ulcera- tion in the urethra, as shown by examination with a slender tube illuminated by electricity — the endoscope. The ulcer having been induced to heal by the application of a nitrate of silver lotion, all discharges cease. Chronic inflammation is necessarily associated with the formation of interstitial fibrous tissue, and the contraction of this new formation causes narrowing of the urethra, or stricture. Thus gleet and stricture are often associated, and the occasional passage of a large bougie may suffice to cure both. Often, however, a stricture of the urethra proves rebellious in the extreme, and leads to diseases of the bladder and kidneys which may prove fatal.

One of the most important points in the management of a case of gonorrhoea is to prevent all risk of the septic discharge coming into contact with the eye. It sometimes happens that the patient inadvertently introduces the germs into his own eye by his finger, or that his eye, or the eye of some member of the household, becomes inoculated by the use of an infected towel. If this happen, prompt and energetic measures must be taken to save the eye.

If so be that at the time of delivery a woman be the subject. of gonorrhoea, there is great probability of the eyes of the infant being affected. The symptoms appear on the third day after birth, and the disease may end in complete blindness. The name of the disease is ophthalmia neonatorum (see Blindness).

By the term gonorrhoeal rheumatism it is implied that the gonococci have been carried by the blood stream to one or more joints in which an acute inflammation has been set up. It is apt to occur in the third week of the disease, and it may end in permanent stiffness of the joints or in abscess.

In rare cases the germs find their way to the pleura or pericardium, setting up an inflammation which may even end fatally.

For a man to marry whilst there is the slightest risk of his still being the subject of gonorrhoea would be to subject his wife to the probability of infection, ending with chronic inflammation of the womb or of septic peritonitis. Yet it is often extremely difficult to say when a man is cured. That there is no longer any discharge does not suffice to show that he has ceased to be infective. Nothing less than repeated examinations of the urethral mucus by the microscope, ending in a negative result, should be accepted as evidence of the cure being complete. And these examinations should be made after he has returned to his former ways of eating, drinking and forking.

B. Local Contagious Ulcers. Chancroid, soft chancre of soft sore is so named in contradistinction to the Hunterian sore of syphilitic infection, the one characteristic of which is its hardness. The soft chancre is a contagious ulcer of the genitals, due to the inoculation of a distinct form of micro-organism, the bacillus of Ducrey; and, provided that the specific germ of syphilis is not inoculated at the same time, the chancre is not followed by constitutional affection. In other words, the disease is purely local, and if some of the discharge of one of these ulcers is inoculated on another part of the body of the individual a sore of an exactly similar nature appears. This reproduction of the sore can be

done over and over again on the same individual.

always with the same result. But in the case of the Hunterian sore, inoculation of the individual from the primary sore gives no result, because, as explained below, the constitutional disease has rendered the individual proof against further infection. The soft sore is often multiple. It makes its appearance about three days after the exposure, and as it increases in size free suppuration takes place. It is often of about the size of a silver threepence. Its base remains soft. In individuals broken down in health, the ulceration is apt to extend with great rapidity, and is then spoken of as phagedaenic.

Just as an individual may contract syphilis and gonorrhoea at the same connexion, so also he may be inoculated simultaneously with the bacilli of the soft chancre and the spirochaete of syphilis. In this case the soft chancres may make their appearance, as usual, within the first three or four days, but though passing through the customary stages they may refuse quite to heal, or, having healed, they may become indurated in the second month, constitutional symptoms following in due course.

The virulence of soft sores being due to the presence of harmful germs, the surface of the sores should be touched with pure carbolic acid, which has the effect of destroying the germs and converting the sores into healthy ulcers. Or the chancres may be treated by the application of lint soaked in weak carbolic lotion. If the sore happens to be under a tight prepuce, and the germs are of great activity — as is apt to happen in such a case— ulceration

may extend with extreme rapidity. It is advisable, therefore, to remove or to lay open the prepuce, in order that the sores may be effectively dealt with.

Bubo. — The bacilli from the soft sore are apt to find their way into the lymphatic vessels, and so to reach the glands in the groin, when they set up destructive inflammation. Under the influence of rest the inflammation may subside, but if it continues and suppura- tion threatens, the gland had better be laid open and scraped out. If a speck of the contents of the abscess be inoculated on to the skin, a soft chancre is again produced.

C. Syphilis.

The cause of . syphilis, whether inherited or acquired, is the presence in the blood and tissues of the same organism, which can be demonstrated in the various secondary . lesions, in the blood and in the internal organs. The name of the germ is Spirochael0, pallida; 1 it is a protozoon of spiral form, from 4 to 20 n in length and j m in diameter, with a flagellum at either extremity. It possesses motility of three kinds — a lashing, a corkscrew and a to-and-f ro movement. It stains pale pink with Giemsa's fluid. At the time of writing (1910) it has not been found practicable to make an artificial cultivation of the spirochaete. But it may generally be found in primary and secondary syphilitic lesions by the aid of a y 2 in. oil-immersion lens — and abundant patience. The pale, spiral, hair-like germ is also found in children who inherit syphilis. Inoculations of the spirochaete in monkeys have pro- duced the characteristic primary (Hunterian) sores, which have proved infective to other monkeys. And in the reproduced primary sores, as also in the secondary lesions following them, the same specific micro-organism has been demonstrated.

Syphilis is an infective fever, and its life-history may well be compared with that of vaccinia. A child is vaccinated on the arm with vaccine lymph — for two or three days nothing is observed; but on the fourth day redness appears, and by the eighth day a characteristic vaccine vesicle is formed, which bursts and sets free a discharge which dries into a scab. If on the eighth day the clear lymph in the vesicle is introduced at another point in the child's skin, no characteristic local effect follows. The system is " pro- tected " by the previous inoculation; this protection will last for some years, and perhaps for life. There is, then, exposure to a poison; its introduction locally; a period of incubation; a charac-teristic appearance at the seat of inoculation; a change in the constitution of the individual, and protection for a variable period. So with syphilis. The syphilitic poison is introduced at the seat of an abrasion either on the genital organs or on some other: part of the surface of the body. The poison lies quiescent for a variable period. The average period is four weeks. A cartilaginous, button-like hardness appears at the seat of inoculation. If this is irritated in any way, an ulceration takes place; but ulceration is an accident, not an essential. From the primary seat the system becomes infected. The virus, passing along the lymphatic vessels, attacks the nearest chain of lymphatic glands. If the original sore is in the genital organs, the glands in the groin are first attacked; if in the hand, the glands of the elbow or armpit; if on the lip, the glands below the jaw. The affected glands are indurated and painless; they may- become inflamed, just as the primary lesion may, but the inflammation is an accident, not an essential. In due course the poison may affect the whole glandular system. The body generally is so altered that various skin eruptions, often symmetrical, break out. Any irritation of the mucous membrane is followed by superficial

ulcerations, and in the later stages of the

1 From xatrrt, long hair, on account of the waving, hair-like appear- ance of the germ.

disease skin-eruptions, scaly, pimply, pustular or tuberculous in type, appear. These eruptions do not itch. The individual is as a general rule protected against a second attack of syphilis, although there have been rare cases recorded in which individuals have been attacked a second time. In weakly people, in severe cases, or in cases that have not been properly treated by the surgeon, syphilitic deposits termed gummata are formed, which are very apt to break down and give rise to deep ulcerations. Gummata may attack any part ; the skin, muscles, liver and brain are the favourite, sites.

It by no means follows that because the infecting sore is small, unimportant or quickly healed, the attack, of which the sore is the first {primary) symptom, will be mild. The most serious train of symptoms may follow the healing of a primary sore which has been so unimportant as scarcely to have attracted the attention of the individual, or actually to have escaped notice. Indeed, it not infrequently happens that the most serious forms of secondary or tertiary symptoms succeed a sore which was regarded as of such trivial nature that the individual declined to submit himself to treatment, or quickly withdrew himself from ' it to enter Si fool's paradise. The advisability of ceasing from treatment should always be determined by the surgeon, never by the patient; mercurial treatment must be continued long after the disappear- ance of the secondary eruptions. It is the disease which the surgeon has to cure, not the symptoms. The patient is apt to think only of the symptoms.

" Is the disease curable? " This is the

question constantly put by the patient on his coming for treatment. The answer is: ″ Yes; beyond doubt.″ But the individual must be made to understand the necessity of his submitting himself trustfully and patiently t6 a prolonged course of treatment. A second question is as to whether, inthe course of the disease, his hair will fall out, his body will be covered with sores and his face with blotches, and if his bones will be attacked. , Here, again, the answer will be that prompt submission to treatment will render all such calamities extremely improbable. Another question often put is as to whether the disease is contagious or infectious. Obviously, if a man has a primary sore or a secondary eruption upon the lip or tongue he should use his own glass, cup or spoon, and should refrain from kissing any one. If due care thus be taken no danger is likely to ensue.

The diagnosis of syphilis is often difficult. The first appearance of the: sore about four weeks after exposure to the risk of infectiqn, its hardness, the indolent enlargement of the associated lymphatic glands, and the occurrence of rash or of sore throat, are all helpful. But when the primary sore occurs on the finger, the face or, indeed, in any extra-genital region, it is apt to be lacking in the usual characteristics, and so the diagnosis may for a while be missed. In the case of doubt, the blood of the patient should be submitted tp the delicate test known as the Wassermann reaction.

The General Treatment of Syphilis. — It is impracticable to lay down a hard and fast line for the treatment of the disease, for no two individuals are exactly alike, neither does the disease follow a strict path in all cases. But experience has amply shown that in the early stages of the disease, mercury, at least for the present, is the only drug on which reliance can be placed. Guaiacum was at one time extensively used, and somehow or another

sarsaparilla acquired a bubble reputation; but the practical surgeon of to-day ignores these drugs in the treatment of syphilis. Still, mercury must be prescribed with great judgment. For a man worn out by alcoholic or other excesses, or with health broken down by tuberculosis or other exhausting disease, mercury must be given with great caution. In times past, its feckless administration until profuse salivation was set up, or until the teeth fell out and the very jawbones became diseased, deservedly brought the mercurial treatment into disrepute. " Better the disease than the remedy," said public opinion, and not without reason. But this- miscarriage of treatment is absolutely a thing of the past. Before placing a patient under mercurial treatment it ought to be seen that there is no unwholesome condition of his gums, and that his teeth are put in a satisfactory state; unless this is done, the administration of small doses of mercury may have the effect of producing salivation, and, in consequence, a temporary cessation of the treatment. In any case the glims must be watched, and the treatment stopped if tenderness occurs.

There are several ways of giving mercury: (a) by the mouth; (&) by rubbing a mercurial ointment into the skin; (c) by injei> tion into the muscles; (d) 'by inhalation of mercurial vapour. In- unction is especially suited for those whom mercury given by the mouth causes diarrhoea or other disturbance; in a private; house, however, it is found " dirty " and objectionable.

The fumigation-treatment is carried out by seating the naked man on a cane-bottomed chair and covering him over with a blanket; calomel being volatilized, its fumes are. carried under the blanket along with steam.

Treatment by intra-muscular injections is increasing in popularity, but in carrying it

out, great care must be taken that no septic germs are introduced. The preparation of mercury is given in solution or mixed with oil, and is usually injected about once a week into the muscles of the buttock or loin. The "grey oil," which is much used for injections, consists of finely divided metallic mercury in

some fluid fat. Calomel is also used suspended in Olive oil. After a few months of weekly injections there should be some weeks of rest from treatment.

But the most usual, and, perhaps, the most satisfactory method of administering mercury is by the mouth, in the form of pills or mixtures. The pills generally contain metallic mercury finely divided, as in " blue pill" and as in pills made of "grey powder, ' or as calomel, or some other salt of mercury, such as the bichloride or tannate. The preparation given in a mixture is usually a solu- tion of perchloride of mercury.

Whilst the individual is undergoing mercurial treatment his diet must be regulated. Plain meat, roast and boiled, and vegetables which cannot cause indigestion or diarrhoea, will form his chief food. Spirits and liqueurs should be absolutely forbidden, biit a

flass or two of wholesome wine or beer may occasionally be allowed, f there is any secondary eruption of the tongue, mouth or throat, smoking must be forbidden. The dress must be warm, arid there should be no exposure to extremes of cold or heat, nor should excessive work or amusement be undertaken. Briefly, it may be said that the subject of syphilis should live low and think high. It has been said by an English physician who delighted

in epigrams, "Syphilis once, syphilis ever"; but this is not true. If the in- dividual places himself unreservedly and continuously under the treatment of a trustworthy practitioner, he may confidently look forward to a cure; and, if so be that he is eventually married, may depend upon his children showing no sign of his unfortunate infection.

Unlike whooping-cough-; smallpox or pleurisy, syphilis is not a disease which, left untreated, cures itself in the course of time. Syphilis is a disease which peculiarly calls for treatment, and that treatment, to be effectual, must be prolonged. To: promote the healing of an ulcer, or to get rid of a cutaneous eruption, the result of syphilis, is not to treat syphilis. It is merely to free the patient of a symptom of the disease. To cure syphilis — and the disease is curable — the treatment must be patient and prolonged. And it must be for the surgeon to say to the individual that he may con- sider himself as cured, not for the patient to take upon himself the assumption that, because no secondary or tertiary symptoms have been seen for a certain number of months, he is cured.

In the midst of the uncertainties which surround the subject of syphilis, the question sometimes arises as to whether the treatment by mercury, for instance, is of the importance which is ascribed to it. Two instances may be given in proof of its Undoubted value. First, a woman who has been infected and never properly treated, becomes pregnant, and though, perhaps, showing signs of good health in every other respect, has a miscarriage; pregnancy and miscarriage follow each other at short intervals, four, six or eight times. Then, at last, she is put upon mercurial treatment, and, going to her full time, bears a healthy infant. Second, an infected but healthy-looking woman, who has not been properly treated, produces a child who, in the course of a few weeks,

becomes shrivelled and wan. His food does him no good, and daily he becomes more miserable. At last some mercurial ointment is spread upon his " binder," and he quickly becomes healthy and happy, and, in due course, if the treatment is persevered in, is entirely cured.

When should the Treatment of Syphilis be begun? — The answer to this important question is: " As soon as the disease is diagnosed." As soon as it is seen that the primary sore is hard, and that the glands in anatomical association with it are swollen, mercury should be administered. It may not prevent the outbreak of the secondary symptoms, but it may greatly modify them. But if a surgeon is in doubt as to whether a sore is truly an infecting one, he should wait before condemning the individual as syphilitic, and placing him under the necessity of submitting himself to perhaps a two years' treatment, which, after all, may not have been necessary. Time would quickly clear up doubt.

Abortive Treatment. — —When it is remembered that the germs of syphilis have been incubating at the seat of inoculation for a month, more or less, before the primary sore or chancre makes its appearance, it may be taken for granted that the removal of the sore ' by wide dissection, or its destruction by cautery, will not prevent the occurrence of secondary symptoms. For during those weeks the germs were finding their way into the lymphatics and the blood vessels and were producing a general infection.

When the disease has undergone,, a sufficient treatment by mercury, or when a patient presents himself with lesions which denote the fact that the disease has passed into the tertiary stage, a solution of iodide of potassium is given in combination with that of perchloride of mercury, or the iodide, is given by itself. In these conditions the effect of the potassium salt is often most remarkable. It

is a drug of the greatest value, and, recognized as such, is apt to be found an important ingredient in popular " blood mixtures." If given, however, in doses larger than can be borne by the patient, its poisonous effects are manifested by a metallic taste, by watering of the eyes and by the breaking out on the back and shoulders of scattered pimples. • > !

Thus, mercury in some form is the recognized and proper treatment for syphilis in the secondary stage, and iodide of potassium in the tertiary. And, for as much as one cannot say where the secondary stage ends and the tertiary begins, it is a common practice to com-

bine the mercuric with the potash salt in the treatment of certain phases of the disease.

In 1910 attention was hopefully directed towards Professor Ehrlich's treatment of syphilis by a complex preparation of arsenic, conveniently spoken of as " 606."

Gummata. — The most characteristic form of the generalized syphilitic infection, which may not manifest itself for several years after the reception of the virus, is a new growth in various organs — the liver, testes or brain, the muscles (tongue and jaw-muscles especially), the periosteum, the skin and the lungs. The deposits are called gummata from the tenacious appearance of the fresh-cut surface and of the discharge oozing from it. The structure consists of small round cells among thin fibres ; it closely resembles granula-tion-tissue, only that the cells are smaller and the intercellular substance (fibres) denser.: Molecular death, or necrosis, overtakes, this ill-organized, new formation at various central points, owing to the inadequacy of the blood supply. One remarkable feature of the process is the overgrowth of cells in the inner coat of the arteries within the affected

area, which may obliterate the vessel. Gummata, and the ulcers left by them, constitute the tertiary manifestations of syphilis.

In a large proportion of cases only the secondary symptoms occur, and not the tertiary, the virus having presumably exhausted itself of been destroyed by treatment in the earlier manifestations.

Inherited Syphilis. — In the syphilis of the offspring it is necessary to distinguish two classes of effects— there are the effects of general intra-uterine mal-nutrition, due to the placental syphilis of the mother; and there are the true specific effects acquired by inherit- ance from either parent and conveyed, along with all other inherited qualities, in the sperm-elements or in the ovum. These two classes of effects are commingled in such a way as not to be readily dis- tinguished; but it is probable that the ill-organized growth of bone, at the epiphysial line in the long bones (sometimes amounting to suppuration), and on the surfaces of the membrane-bones of the skull (Parrot's nodes) is a result of general placental mal-nutrition, like the corresponding errors of growth in rickets. The rashes and fissures of the skin, the snuffles and such- like well-known symptoms in the offspring are characteristic effects of the specific taint; so also the peculiar overgrowth in the liver, the interstitial pneumonia alba of the lungs and the like. As in rickets, it is in many cases some months after birth before the congenital syphilitic effects show themselves, while other effects come to light during childhood and youth.

It must be remembered that the moist eruptions and ulcera- tions about the mouth and anus of the infant, as well as the skin affections generally, are charged with the spirochaetes and are highly contagious.

From the second to the sixth year there is commonly a rest in the symptoms that are regarded as characteristic, but the tibiae may become thickened from periostitis, or a joint may become swollen and painful, and resolve under mercurial treatment.

The characteristic physiognomy gradually manifests itself if the child is not treated with mercury — the flattened nose, the square forehead, the radiating lines from the mouth, the stunted figure and pallid face. During the second dentition, the three signs, as pointed out by Jonathan Hutchinson, may be looked for — the notched incisor teeth of the upper jaw, interstitial corneitis and syphilitic deafness. Perforation of the soft or hard palate may occur, and ulcerations of the skin and cellular tissue. Destruction of the nasal bones, caries of the forehead and skull, of the long bones, may also take place.

Colles' Law. — A woman giving birth to a syphilitic infant cannot be inoculated with syphilis by the infant when she is suckling it; in other words, though the mother may have shown no definite signs of syphilis, she is immune; whereas the syphilitic infant put to the breast of a healthy woman may inoculate her nipple and convey syphilis to her. This is known as Colles' Law, and it is explained by the theory that, the mother's blood being already infected, her skin is proof against a local cultivation of germs in the form of a Hunterian sore.

Syphilis and Marriage. — The question as to how soon it would be safe for a person with secondary syphilis to marry is of extreme importance, and the disregard of it may cause lasting mental distress to the parent and permanent physical injury to the offspring. A man who finds himself to be the subject of secondary syphilis when he is engaged to be married would do well honourably to free

himself from responsibility. But should a person who has been under regular and continuous treatment desire to marry, consent may be given when he has seen no symptoms of his disease for two full years. But even then no actual promise can be made that his troubles are at an end.

The transmission of syphilis to the third generation is quite possible, but it is difficult of absolute proof because of the chance of there having been intercurrent infection of the offspring of the second generation.

References. — A. Fournier, Treatment of Syphilis, trans. C. F. Marshall (1906); R. Clement Lucas, Brit. Med. Journal (1908); A Manual of Venereal Diseases, by Sir Alfred Keogh and others (1907) ; Power and Murphy, A System of Syphilis (1908). (E. 0.*)

9**6

VENETI

VENETI, the name given to two ancient European tribes. (i) A Celtic people in the N.W. of Gallia Celtica, whose ter- ritory corresponded roughly to the department of Morbihan. They were the most powerful maritime people on the Atlantic and carried on a considerable trade with Britain. Their name still remains in the town of Vannes. In the winter of 57 B.C., with some of their neighbours, they took up arms against the Romans, and in 56 were decisively defeated in a naval engage- ment, details of which are given in Caesar's Bell. Gall. iii. and Dio Cassius xxxix. 40-43.

For criticisms of these narratives, and a discussion of the question of the scene of operations, see T. R. Holmes, Caesar's Conquest of Gaul (1899), pp. 205, 663, 674, and for the extent of their territory, p. 509.

(2) The inhabitants of a district in the north of Italy (also called 'Ewoi, Heneti, by the Greeks). The extent of their territory before their incorporation by the Romans is un- certain. It was at first included in Cisalpine Gaul, but under Augustus was known as the tenth region of Italy (Venetia and Histria). It was bounded on the W. by the Athesis (Adige), or, according to others, by the Addua (Adda); on the N. by the Carnic Alps; on the E. by the Timavus (Timavo) or the Formio (Risano) ; on the S. by the Adriatic Gulf. From the earliest times the Veneti appear to have been a peaceful people, chiefly engaged in commercial pursuits. They carried on an extensive trade in amber, which reached them overland from the shores of the Baltic. They were especially famous for their skill in the training and breeding of horses, attributed to their stay in Thrace, whence they brought the cult of Diomede into their Italian home. Homer (//. ii. 85) speaks of the Paphla- gonian Heneti as breeders of " wild mules," and their fond- ness for horses is regarded as a proof of their descent from the "horse-taming" Trojans. Dionysius, tyrant of Syracuse, who assisted them to repel the attacks of the Liburnian pirates, is said to have kept a stud in their country. Herodotus men- tions a curious [marriage custom, which seems of Eastern origin. Once a year the marriageable maidens of a village were collected together. Each young man chose a bride, for whom he had to pay a sum of money in proportion to her beauty. The sums thus obtained were used by the public officials to dower the less beautiful and thus afford them the chance of obtaining a husband. According to the pseudo- Scymnus of Chios (Periegesis, 400) the Veneti were fond of wearing black, a custom even now prevalent amongst them. They were a flourishing and wealthy people, and noted for their uprightness and morality.

The first historical menticm of the Veneti

occurs in connexion with the capture of Rome by the Gauls, whose retreat is said to have been caused by an irruption of the Veneti into their territory (Polybius ii.' 18). At the request of the Romans they rendered them assistance in their wars against the Gauls north and south of the Po, and ever afterwards remained their loyal allies. Some time during the Second Punic War they passed, not by right of conquest but by force of circumstances, under Roman rule. At first they possessed complete autonomy in internal administration; in 89 Gnaeus Pompeius Strabo be- stowed upon them the jus Latinum; they probably obtained the full franchise from Caesar at the same time as the Trans- padane Gauls (49). Under the Empire Venetia and Istria were included in the tenth region of Italy, with capital Aquileia. Down to the time of the Antonines the country enjoyed great prosperity, which was interrupted by the invasion of the Qtiadi and Marcomanni and a destructive plague. From that time it was devastated at intervals by the barbarians^-by the Alamanni, Franks and Juthungi in 286; by the Goths under Alaric (beginning of the 5th century); by the Huns under Attila (452), who utterly destroyed Aquileia and several other cities. Under Theodoric the Great (ruler of Italy from 493-526) the land had rest, and in 568 was occupied by the Lom- bards. The most important river of Venetia was the Athesis (Adige); its chief towns Patavium (see Padda), Aquilfeia (q.v.), Altinum (Altino), Belunum (Belluno, still a considerable town).

Language. — We have nearly 100 inscriptions which record the language spoken by the tribe in pre-Roman days, the bulk of which we owe to the admirable and devoted excavations carried out at Este since 1890 by Prof. A. Prosdocimi arid Signi A. Alfonsi. But a not unimportant number have' also come to light at Verona and Padua, and at different points along tie great North and South route of the Brenner Pass,

especially at Bozen; and there are a few more scanty and scattered monu- ments in the Carinthian Alps now preserved chiefly in the Museums at Klagenfurt and Vienna (the K.K. Naturhistoriscftes Museum, Ethnographische Abteilung). All but a few of these Venetic inscriptions were seen and transcribed by the: present writer in the spring of 1908, and their texts with a careful collection of the local and personal names of the district made by Miss S. E- Jackson, will, appear as the first part of ″ The Pre-Italic Dialects″ in the Proceedings of the British Academy.

The alphabet of the inscriptions, in all its varieties, is probably (in spite of Pauli, Die Vetietef, p. 226, whose judgment seems somewhat arbitrary) either dprived from or at least influenced by some form of the Etruscan alphabet, since it not merely coin- cides with that alphabet in several characteristic signs, such as the use of the compound symbol vh (3 ^) with the value of/, but lacks the symbols for the mediae B D G. These, or the sounds which had descended from them in Venetic, were represented by using symbols which in the Western Greek alphabets denoted kindred sounds;)fc. 2 where we should expect d (zoto,″ he gave "), $ 4> where we should expect b (4>ohivos, "Boius"), T (i.e. x) where we should expect g (-e-xo, ″ ego "). But though we find the symbols in positions where they correspond to the mediae in kindred languages, it is uncertain what the precise variety of sound which they denoted was; thus, for example, Venetic -e-xo, is certainly equivalent, to the Latin ego, but we cannot be certain that the sound of the two words was precisely- the same. The symbol for 6 is not used to denote d (since that is represented by 2). In the inscriptions of Padua and Verona the sign is O and seems there to denote some variety of sound closely akin to /; the word which at Padua and Verona is written •e-kupe- Oari-s- (probably meaning ″

charioteer ") appears as ecupetaris in Latin alphabet in an inscription published by Elia Lattes (" Iscrizioni Inedite Venete ed Etrusche," Rendiconti del R. 1st. Lomb. di Sc. e Le.tt., Serie ,ll. voL 34, 1901). The full Venetic alphabet at its best period is preserved for us on several curious and interesting dedicatory objects found at Este, which were offered to the goddess of the place called Rehtia, a name obviously equivalent to Latin Rectia, some of whose prerogatives, to judge from the long nails which aire offered to heir, frequently, accompanied by small Wedges, would seem to have been those of the goddess whom Horace calls Necessitas (Odes, i. 35, 17)." The offerings in question are thin bronze plates of whose surface the greater part is covered by alphabetic signs, with an inscrip tion stating that such and such a worshipper makes an offering of the plate to the Goddess Rectia. Besides the letters of the alphabet in their order, these plates contain a kind of catalogue of the most common combination of letters, and although none of the plates is now completely preserved this characteristic and their general likeness to One another provide enough' material to place the alphabet of Este beyond all doubt. It is written from right to left, and the alternate lines curi round so that the letters proceed in the opposite direction and stand with their feet turned towards those in the preceding line. This charac- teristic, technically known as " serpentine boustrophedon,"

with the sign for h (I|1), points to some connexion with tha alphabets : of the East Italic (" Sabellic ".): inscriptions (see Sabeixic). ' '

The alphabet of Este then, in what the archaeological remains show to have been the 4th and 3rd centuries B.C., was as follows:— r

<3 , $c,1v,% z, t|1 h, ^ 0,M, 1 /, 1 «. 1 n,

*<[$, M i, Q r, and * s, X <> A »> O —<* Q '*, tx, O *' ;*

Pauli (Die Venetez, p. 229) compares it to the Western Greek alphabet as used in Elis, but it is difficult to point to any especial

mark of affinity with this particular branch of the Western alphabet, while there are some marked differences, such as X instead of Elean T, Q instead of Elean (prevailingly) ^ and j^. >1£ instead of I and 'I' instead of the regular Western though the latter symbol is not quoted as occurring in Elis itself (B. S. Roberts, Greek Epigraphy, i. 390).

Even the few words that have already been cited from the in— scriptions will have shown that the language belongs to the Indo— European group. Unfortunately the inscriptions of Este; although numerous, belong to only_ two classes, dedications and epitaphs; hence the forms with which they supply us, though "attested by welcome repetition, are somewhat limited in number. The typical beginning for a dedication is mexo . . ■ ■ zona—s—to sahnateh rehtiiah, i.e. " me dedit Rectiae Sanatrici," " so and so gave me to the Healing Goddess Rectia"; and sometimes the form of the verb is simply z—o—to. The correspondence of these two forms with the Greek middle aorist of the verb (4—5oro), and with the Latin donare is obvious, and the present writer is convinced, for reasons which it is impossible to state fully here, that the dots which, it will be observed, are placed on either side of the last sound of their syllable, denote the accent of the word; the moet striking evidence being the coincidence in position of the dots with the place of the Greek accent on kindred words; for example, the cognomen Lehvo—s— on an inscription of Vicenza

is clearly identical with the Latin Laeviis and the Greek XotfAt. These signs are altogether absent from some words, e.g. from the Accusative iux° (presumably a proclitic) and syllables containing the letter HI, whose form would make the dots a cumbrous addition. One other inscription of special linguistic interest should be cited here; it appears to be the artist's inscription of a vase, of the 6th century B.C. found recently at Padua —

*voOo kluSeari-s- vhax-s-to, \ where the first name appears to be identical with the Latin Otho and to explain its aspirate, and the last word appears to be the Venetic equivalent of the Latin fecit, but to be in the middle voice without any augment: If this interpretation be correct- — and the use of *iroiij*

In the archaeological aspect the Venetic remains are particularly interesting as representing very fully the culture of what is known as the early Iron Age, the monuments of which were discovered in the excavations at Villanova, and are now admirably exhibited in the Museum at Bologna. The earliest begin, according to the generally accepted dating, from the nth century B.C. The remains at Este begin a very little later, but no inscriptions appear upon them until we reach the pottery of the 6th century B.C. It remains therefore to be determined whether this Venetic language was the proper speech of the people who, as it is generally supposed, brought with them the early Iron culture into Italy from north of the Alps in the nth century B.C., or whether it was the language of the people of the soil whom they conquered. So far as the scanty linguistic evidence at present extends, in the place names and the personal names of the Ligurian and the Venetic districts, it appears to the present writer on the whole to be more in favour of the second 1 view. This probability would become a certainty if we could accept as established the view of Professor Ridgeway and others, which

identifies the authors of the early Iron culture with the Umbrians of historical times and ascribes to them the Umbro-Safine language (which with Latin constitutes the Italic division of the Indo- European languages), and which almost certainly was the language originally spoken by the patrician class at Rome (see further Sabini). Even now it must be admitted that this view possesses a high degree of probability.

The chief authority on the Venetic inscriptions published up to 1908 is Carl Pauh (Atiital. Studten, vol. 3, " Die Veneter," Leipzig, 1891), but so far as the present writer's observation may be trusted the text which Pauli gives of the inscriptions is somewhat defective. Some were reported by Mommsen, Die Insehriften NorditaUschen Alphabets (Zurich, 1853) ; the rest have been recorded in the Notizie degli Scavi /as they appeared, by Ghirardini in the volumes for 1880 and 1888, by Prosdocimi in that for 189a. These articles contain careful accounts of the archaeological remains. (R; S. C.)

***VENETIA**, a territorial division of northern Italy, lying between the Alps and the Adriatic, and stretching from the frontier of Carinthia and Istria (Austria) in the north-east to the lower Po and Lombardy in the south-west. It comprises the provinces of Belluno, Padua, Rovigo, Treviso, Udine, Venice, Verona and Vicenza, and has an area of 9476 sq. m. Pop. (1.8&1) 2,814,173; (1901) 3,192,897. The crops principally grown are maize, wheat, rice, grapes, mulberry leaves, tobacco, chestnuts,*

1 Some further details will be found in the Preliminary Report presented to the British Academy published in the Athenaeum, August 8th, 1908.

potatoes and hemp.' Copper and lignite are mined, and turf is dug. The chief industries

are the manufacture of woollens, cottons, silks, glass, laces, tobacco, straw-plait, paper, sugar and hemp, the breeding of silkworms, iron-founding and working, timber-cutting and shipbuilding. At Mira is a large candle factory. The peasantry suffer much from pellagra.

The territory differs much in character; the Po and other smaller rivers which fall into the Adriatic terminate in a huge and continually advancing delta which extends right along the coast, and is liable to inundation. The shore lagoons are, however, rendered healthy by the ebb and flow of the tide, which is much more considerable than elsewhere in the Mediterranean. To the north of the Po at the foot of the mountains is a fertile territory, while the mountains themselves are not productive. The chief towns in the various provinces, with their communal population in 1901, are: Belluno 19,050; total of province 214,803, number of communes 66; Padua 81,242; Monselice 11,571, Este 10,779, Piove di Sacco 10,021; total of province 444,360, number of communes, 103; Rovigo 10,735, Adria 15,711; total of province 222,057, number of communes 63; Treviso 32,793, Castelfranco Veneto 12,440, Monte- belluna 10,284, Conegliano 10,252; total of province 416,945, number of communes. 95; Udine 36,899, Pordenone 12,409, S. Vito al Tagliamento 10,160; total of province 614,270, number of com- munes 179; Venice 148,471, Chiogeia 31,218, Cavarzere 16,388, Mira 12,169, Mestre 11,625; total or province 399,823, number of communes 50; Verona 73,917, Legnago 14,535,; total of province 427,018, number of communes 113; Vicenza 43,703, Bassano 15,097; Schio 13,524; Arzignano 10,426, Lonigo 10,300; total of province 453,621, number of communes 123. Railway communication in Venetia is fairly good; there is a main line from Milan to Mestre (the junction for Venice^ and thence to Trieste by a line near the coast, or by Treviso, Udine

and Pontebba (Pontafel) into Austria. Another route into Austria, the Brenner, leaves the Milan- Venice line at Verona, which is connected with Modena (and so with central and southern Italy) by a railway through Mantua. Another main line runs from Bologna to Ferrara, Rovigo and Padua, joining the Milan-Venice line at the last-named place. Intercommunication between the main lines is secured by branch railways and steam tramways. The Po, however, forms somewhat of an obstacle, but is crossed by the main lines to Modena and Bologna near Mantua and Rovigo respectively.

The district which later bore the name of Venetia was in- habited, under the Roman Republic, by a variety of tribes- Celts, Veneti, Raeti, &c. Under Augustus, Venetia and Histria formed the tenth region of Augustus, the latter including the Istrian peninsula as far as the river Arsia, i.e. with the exclusion of the strip along the E. coast (Liburnia). In all directions, indeed, it extended farther than Venetia in the modern sense, being bounded on the S. by the Po and its main (north) arm, extending on the W. as far as the Adda and on the N. into a part of southern Tirol. It was thus far the largest of the regions of Italy, but possessed comparatively few towns; though such as there Were, with the large territories, acquired considerable power and influence. The easiness of the Brenner pass and the abundance of communication with the sea led to the rise of such towns as Verona, Padua and Aquileia: and Milan only became more important than any of these when the German attacks on Italy were felt farther west.

When the Roman Empire fell the towns were many of them destroyed by Attila, and the inhabitants took refuge in the islands of the lagoons. It is to this that Venice owes its origin, under Byzantine protection, early in the 9th century a.d. For the gradual growth of Venetian supremacy over the whole territory,

and for its subsequent history, see Venice.

VENEtTE, JEAN DE (c. 1307–c. 1370), French chronicler, was born at Venette, near Compiegne. He became prior of the Carmelite convent in the Place Maubert, Paris, in 1339, and was provincial of France from 1341 to 1366. In 1368 he was still living, but probably died within a year or two of that date. His Latin Chronicle, covering the years 1340 to 1368, was published by Achery (Spicilegium, vol. iii.) with the continua- tions of the chronicle of William of Nangis, though it has every claim to be considered as an independent work. During the years 1358 and 1359 the entries were contemporary with the events recorded; the earlier portion of the work, if it was begun as early as 1340, was subjected to revision later. Jean de Venette was a child of the people, and his sympathies were entirely with the peasants. His point of view is thus directly

opposed to that of Froissart. His democratic sympathies led him to support fitienne Marcel, and though he returned to his allegiance to the kings of France he remained a severe critic, Jean de Venette also wrote a long French poem, La Vie des trois Maries, about 1347.

See Lacurne de Sainte-Palaye in MSmoires de V Academie, vols. viii. and xiii. ; GeVaud and Deprez in Melanges de I'ecole de Rome (1899), vol. xix. ; and A. Molinier, Les Sources de Vhistoire de France (1964), tome iv.

VENEZUELA, 1 a republic of South America; facing the Caribbean sea, and bounded E. by British Guiana and Brazil, S. by Brazil and W. by Colombia. Its boundary with Colombia is unfixed, a decision by the king of Spain, as arbitrator, in March 1891, having been rejected

by Venezuela. The boundary dispute with British Guiana was settled in October 1899 by ah arbitration court in Paris. The line is subject to any question between the two countries and Brazil. The boundary with Brazil was fixed by a special commission in 1880. The republic lies between lat. i° 40′ S. and 12 26′ N., long. 50 40′ and 73* 31′ W., and has an area of 599,538 sq. m. according to the Venezuelan Year Book of 1906. This area, however, was subject to the settlement of the Colombia boundary line, and the measurement is only approximate. ' ' •*

Topography.— —The surface of Venezuela is broken into three very irregular divisions by its mountain systems: (1) the mountainous area of the N.W. and N.; (2) the Orinoco basin with the llanos on its northern border and great forested areas in the S. and S.W. ; and (3) the Guiana highlands. A branch of the eastern chain of the Andes enters Venezuela in the west about 7° N. lat., and under the name of the Sierra Nevada de Merida proceeds north-eastwards towards Trieste Gulf. This branch consists of parallel chains enclosing elevated valleys, in one of which lies the town of Merida at the height of 5410 ft., overlooked by the highest summit of the chain (Picacho de la Sierra, 15,420 ft.). The sierra contains the water-parting between the basin of the Orinoco and those of the small rivers on the north-west- Hence it may be considered to terminate where the Rio Cojedes, which drains the elevated valley in which Barquisimeto stands, after rising on its western slopes flows eastwards into the basin of the Orinoco. Beyond the Cojedes begin two parallel ranges known as the Maritime Andes of Venezuela, which stretch east and west along the coast. The valley, between these two ranges is the most densely peopled part of Venezuela. Above Caracas the highest peak of the system, Silla de Caracas, rises to 8531 ft. Behind the wide bay between Cape Codera and Cumana there is an interruption in

the Maritime Andes; but both ranges reappear between Cumana and the Gulf of Paria. West of the Maritime Andes low ranges (3500–5000 ft.) trend northwards from the end of the Sierra de Merida towards the coast on the east side of the Lake of Maracaibo, while the region on the west of that lake consists of lagoon-studded lowlands. East and south of the Sierra de Merida and the Maritime Andes the region is thinly pop- ulated and little known. It consists of two portions — a vast, hilly or mountainous area, densely wooded, in the south-east and south, and level plains in the north-west between the Orinoco and the Apure and the mountains. The latter is known as the llanos of the Orinoco, a region described by Humboldt as a vast " sea of grass," with islands of wood scattered here and there. Since the time of Humboldt, however, the aspect of these plains would seem to have changed. On the occasion of Karl F. Appun's visit in 1850 trees seem still to have been comparatively rare; but a different aspect was presented when Dr P. Jonas visited the llanos in 1878. From the Galera, the southernmost range of hills north of the Orinoco basin, the traveller saw a vast plain thickly grown with low trees. As far as Calabozo (about one-third of the distance between the hills and the Apure) it was now chaparros (Curatella americana) , now mimosas, which were the prevailing feature of the landscape. But towards the south the open grass-covered spaces increased in number and area. To the south of Calabozo woods of consider- able extent were seen. This change is due to the decline of horse- and cattle-rearing in the llanos, partly in consequence of political disturbances and partly of a murrain which broke out in 1843 among horses, mules and asses. The decline in stock-raising would also suspend the practice of burning off the dead grass to improve the new pasturage. Along the Brazilian frontier and about the sources of the Orinoco tributaries on the eastern slopes of

the Andes there are extensive forests, sometimes broken with grassy campos. The surface of the llanos is almost a dead level, the general elevation

1 The name means ” little Venice,” and is a modification of the name of Venecia (Venice), originally bestowed by Alonzo de Ojeda in 1499 on an Indian village, composed of pile dwellings on the shores of the Gulf of Maracaibo, which was called by him the Gulf of Venecia.

varying from about 375 to 400 it., rising almost imperceptibly to 600–800 ft. around its immediate margins, So uniform is the level over a great part of these plains that in the rainy season hundreds of square miles iare submerged, and the country is coveted with a network of connecting channels. When the Orinoco is reached its lower basin is contracted between the Guiana highlands and the northern sierras, and its tributaries begin to come in more nearly at right angles, showing that the margins of the actual valley are nearer and higher. About 62? 30' the great river reaches what may be considered sea-level, and from this point numerous channels find their way across the silted-up delta plain to the sea. This region, together with that of the Guiana frontier, is heavily forested. In the extreme S. (territory of Amazonas) and S.E. the surface again rises into mountain ranges, which include the Parima and Pacaraima sierras on and .adjacent, to the Brazilian frontier, with a number of short spurs reaching northward toward the Orinoco, such as the Mapichi, Maraguaca, Maigualida, Matos, Rincote and Usupamo. All this region belongs to the drainage basin of the Orinoco, and rivers of large volume flow down between these spurs. Some of the culminating points in these ranges are the Cerros Yaparana (7175 ft.) and Duida (8120 ft.) in the Parima sierras near the upper Orinoco, the Sierra de Maraguaca (8228 ft.), and the

celebrated flat-topped Mt Roraima (8530 ft.) in the Pacaraima sierras on f.he boundary line with Brazil and British Guiana. Near the Orinoco the general elevation drops to about 1500 ft. All this region is densely forested, and is inhabited only by scattered tribes of Indians.

Probably not less than four-fifths of the territory of Venezuela belong to the drainage basin of the Orinoco (q.v.). The Orinoco is supposed to have 436 tributaries, of which, among the largest, the Caroni-Paragua, Aro, Caura, Cuchivero, Suapure, Sipapoand Ventuari have their sources in the Guiana highlands ; the Suata, Manapere and Guaritico in the' northern sierras; and the Apure, Uricana, Arauca, Capanaparo, Meta, Vichada and Guaviare (the last three being Colombian rivers) in the llanos and Andes. The Apur6 receives two large tributaries from the northern sierras — the Guarico and Portuguesa. Apart from these, the rivers of Venezuela are small and, except those of the Maracaibo basin, are rarely navigable. The larger are the Guanipa and Guarapiche, which flow eastwards to the Gulf of Paria ; the Aragua, Unare and Tuy, which flow to the Caribbean coast E. of Caracas; the Yaracui, Aroa and Tocuyo to the same coast W. of Caracas; anditheMotatan, Chama, Escalante, Catatumbo, Apan and Palmar, which discharge intoLake Maraoaibo. The hydrography of the region last mentioned, where the lowlands are flat and the rainfall heavy, is extremely complicated owing to the great number of small' rivers and of lakes on or near the lower river courses. The deep lower courses of these streams and the small neighbouring lakes were once part of the great lake itself, which is being slowly filled by silt. The lakes of Venezuela are said to number 204. The largest are the Maracaibo (q.v.); El Zulia, with an area pf 290 sq. m., a short distance S. of Maracaibo among a large number of lakes,

lagoons and swamps; Valencia, near the city of that name, in the Maritime Andes, about 1350 ft above sea-level, with an area of 216 sq. m. ; Laguneta, in the state of Zulia; and Taciragua, a coastal lagoon in the state of Miranda. There are numerous lagoons in the llano districts caused by. the periodical floods of the rivers, and extensive esteros and cienagas, in part due to the same causes, but these either dry up in the dry season or are greatly reduced in area.*

The coast outline of Venezuela is indented with a large number of gulfs and bays, comparatively few of which, however, are open to foreign commerce. The larger indentations are the Gulf of Mara- caibo, or Venezuela, which extends inland through the Lake of Maracaibo, with which it is connected by a comparatively narrow channel, and is formed by the peninsulas of Goajira.and Paraguana; the Gulf of Paria, between the peninsula of that name and the island of Trinidad ; the Gulf of Coro, opening into the Gulf of Mara- caibo ; the Gulf of Cariaco, between the peninsula of Araya and the state of Bermudez; the Golfo Triste, on the E. coast of the state of Lara; and the small Gulf of Santa Fe\ on the northern coast of Bermudez. Besides these there are a number of small indentations-, sheltered anchorages formed by islands and reefs like that of Puerto Cabello, and estuaries and also open roadsteads, like those of La Guaira and Cariipano, which serve important ports. The islands on the coast forming part of the national territory number 71, with an aggregate area of 14,633 sq. m., according to official calculations. The largest of these is the island of Margarita, N. of the peninsula of Araya, in the vicinity of which is the island of Tortuga and several groups of islets, generally uninhabited. (A. J. L.)

Geology. — Geologically Venezuela consists of three distinct regions: (1) South of the Orinoco a great mass of granite, gneiss,

pyroxenite and other crystalline rocks, continuous with that of Guiana and probably of Archean age. This mass also form's the bed of the Orinoco from its junction with the Apure: nearly to its mouth, and it probably extends northwards for some distance beneath the more recent deposits of the plain. (2) The llanos. covered by deposits of Quaternary or late Tertiary age. (3) The mountain ranges of the north-west and north. These ranges appear to belong to two systems. The Cordillera of Merida is one of the

branches of the Andes, and the strike of the folds which compose it is usually from south-west to north-east. The Caribbean chain along the north coast is part of the Antillean system, and here the strike of the folds is nearly west to east or west-south-west to east-north-east. The two systems of folds meet about Barquisimeto, where the structure becomes very complex and is not thoroughly understood. The rocks of Falcon are believed by Sievers to belong to the Andean system; while the outlying peninsula of Paraguana probably belongs, geologically, to the same massif as Goajira and the Sierra Nevada de Santa Maria in Colombia. The oldest rocks in the country are the granites, gneisses, &c, of the southern massif and the crystalline schists which form the axis of the Cordillera and the Caribbean chain. In the latter range a few Ordovician fossils have been found, but in general the oldest strata which have yielded organic remains belong to the Cretaceous system. The Cretaceous beds form a band along each side of the Cordillera and along the southern flank of the Caribbean chain, and they spread over the greater part of the provinces of Falcon and Lara. The Lower Cretaceous consists chiefly of sandstones and shales and the Middle Cretaceous of very

fossiliferous limestone. There is con- siderable difference of opinion as to the chronology of the succeeding beds, and the boundary between the Cretaceous and Tertiary systems is drawn at various horizons by different observers. The Cerro de Oro series is the most important group of these beds and takes a con- siderable share in the formation of the mountain ranges. It belongs either to the Upper Cretaceous or to the Lower Tertiary, or possibly in part to the one and in part to the other. 1 (P. La.)

Climate. — The climate of Venezuela is everywhere tropical except where modified by altitude. In the Maritime Andes at and above the altitude of Caracas it may be described as semi- tropical, and in the still higher regions of western Venezuela it approaches the mild temperate. On the coast and the northern slopes of the Mari- time Andes the tropical heat is greatly modified by the trade-winds. At La Guaira the mean temperature for the year is 85 ° F., at Caracas (3025 ft.) it is 71-2° (or 66-2° accord- ing to an official return), at Cumana it is 83 , at Valencia 76 , Coro 82 , Barquisimeto 78 , Yaritagua 8o-6°, Mdrida 61°, Trujillo 72°, and Mara- caibo 8i°. South of the sierras, however, the climate is much drier and hotter. The low temperatures of the night in these regions lower the mean annual temperatures. At Calabozo, for instance, the mean is about 88°, though the maximum in summer is not far from 100°. At Ciudad Bolivar, which, is less sheltered from the trade- winds, the mean is 83 ° and the maximum 9 1 •4°. The lowest temperatures re- corded in official reports are those of Mucuchfes, in the state of Merida, where the maximum is 68°, the minimum 43° and the mean 56°. The year is divided into two seasons, the dry and wet, the latter occurring from April to October, when the temperature is also the highest. On the llanos the dry season destroys the pasturage

completely; dries up the small streams and lagoons, and compels many animals of semi-aquatic habits to aestivate. At Caracas the annual rainfall ranged from 602 to 863 millimetres between 1894 and 1902. In general the slimate of Venezuela is healthy wherever the ocean winds have free access. Sheltered places in the lowlands, especially near streams and lagoons, are malarial and enervating, and at some points on the coast are subject to dangerous fevers. The sanitary condition is generally bad, and many forms of disease prevail that are not due to the climate.

Fauna. — The fauna and flora of Venezuela are similar in nearly all respects to those of the neighbouring regions of Guiana, Brazil and Colombia, the open llanos of the Orinoco being something of

1 See G. P. Wall, " On the Geology of a part of Venezuela and of Trinidad," Quart. Journ. Geol. Soc. London, vol. xvi. (i860), pp. 460–70, pi. xxi. ; H. Karsten, Geologie de la Colombie Bolivarienne (Berlin, 1886); W. Sievers, " Karten zur physikalischen Geographic von Venezuela," Peternt. Mittheil. vol. xlii. (1896), pp. 125–29, pi x.

a neutral district between the great forested regions on the E., S. and W. Among the animals indigenous to the country are seven species of the eat family, including the puma, the jaguar and the ocelot ; the wild dog (Canis Azarae) ; several representatives of the marten family, including two species of Galictis, two of the otter (Lutra brasiliensis and L. pieronura} and one of the skunk; two species of bear (Ursus ornatus and U. nasutus) ; and the " kinkajou." There are six species of monkey corresponding to those of Guiana and the Amazon valley, the sloth and ant-eater, 12 known genera of rodents, including many species of Mures, the cavy, the capybara, the paca, the nutria, the agouti, the tree porcupine, Loncheres cristata,

Echimys cayen and the Brazilian hare. Among the pachy- derms the tapir is found in the forests of the Orinoco. There are two species of the peccary, Dicotyles torquatus and D. labiatus. There are also 2 species of deer, Cervus rufus and C. simplicornis. There are 3 species of opossum. On the coast and in the Orinoco there may be found the manatee and the dolphin. The Reptilia include 1 1 species of the crocodile, alligator and lizard, including the savage jacari of the Amazon, several species of turtle, 4 species of batrachians, and 29 species of serpents, including the striped rattlesnake (Crotalus durissus), Lachesis mulus, and a rather rare species of Cophias. Among the non-venomous species, the commonest are the boa-constrictor, the anaconda (Eunectes murinus) and the

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Coluber variabilis. Bird life is represented chiefly by migratory species, particularly of genera that inhabit the shores of streams and lagoons. The shallow lagoons of the llanos, like those of the Argentine pampas, are favourite fishing grounds for these birds. In the garzeros of Venezuela are to be found nearly every kind of heron, crane, stork and ibis, together with an incredible number of Grallatores. Ducks are also numerous in species and individuals, including a small bird called the guiriri, in imitation of its cry. Birds of prey are numerous. One species, the guacharo (Steatornis caripensis), or oil-bird, is commonly said to occur only in Venezuela, though it is found in Colombia and Ecuador also. They live in caves, especially in Caripe, and are caught in large numbers for the oil extracted from them, which is commonly known as

" Caripe butter." The bell-bird (Chasmorhynchus carunculatus) is common in the forests of the Orinoco. Insect life is perhaps poorer and less varied than in Brazil, but in the 14 orders of insects there are no less than 98 families, each including many genera and species. There are 8 families of Colepptera, 6 of Orthoptera, 23 of Hymenoptera, 14 of Lepidoptera and 7 of Diptera. Locusts are very numerous in the interior, and commit great ravages. Molluscs are common on the coasts, including the pearL oyster, and in the fresh-water streams and lakes. The coral polyp is also found in Venezuelan waters. The domestic animals

of Venezuela— the horse, ass, ox, sheep, goat, hog, dog, cat, &c— are not indigenous.

Flora. — The flora of Venezuela covers a wide range because of the vertical climatic zones. The coastal zone and lower slopes of all the mountains, including the lower Orinoco region and the Maracaibo basin, are clothed with a typical tropical vegetation. There is no seasonal interruption in vegetation. The tropical vegetation extends to an altitude of about 1300 ft., above which it may be classed as semi-tropical up to about 3500 ft., and temperate up to 7200 ft., above which the vegetation is Alpine. Palms grow everywhere; among them the coco-nut palm (Cocos nucifera) is the most prominent. There are some exotics in this zone, like the mango, which thrive so well that they are thought to be indigenous. The cacau is at its best in the humid forests of this region and is cultivated in the rich alluvial valleys, and the banana thrives everywhere, as well as the exotic orange and lemon. On the mountain slopes orchids are found in great profusion. Sugar-cane is cultivated in the alluvial valleys and coffee on their slopes

up to a height of about 2000 ft. Among the many tropical fruits found here are bananas, guavas, mangoes, cashews, bread- fruit, aguacates, papayas, zapotes, granadillas, oranges, lemons and limes. In the next zone are grown many of the cereals (includ- ing rice), beans, tobacco, sugar-cane, peaches, apricots, quinces and strawberries. . The llanos have- seme distinguishing characteristics. They are extensive grassy plains, the lowest being the bed of an incient inland lake about which is a broad terrace {mesa), the talus perhaps of the ancient encircling highlands. The lower level has extensive lagoons and swampy areas and suffers less from the kmg periodical drought. Its wild grasses are luxuriant and a shrubby jrowth is found along many of its streams. The decline in stock-breeding resulted in a considerable growth of trees and chaparral over the greater part of the plain. A large part of the chaparral consists of the ckaparro, a low evergreen oak of hardy characteristics, mixed with mimosa, desmauthus, zonia and others Much of this region is covered with tamdote, a tall, worthless, grass with sharp stiff blades. One of the most remarkable palms of the Orinoco region is the ″ moriche ″ {Mawitia' ftexuosa). The fruit is edible and its juice is made into beer; the sap of the tree is made into wine, ana its pith into bread; the leaves furnish an excellent thatch, and the fibre extracted from their midribs is used for, fish lines, cordage, hammocks, nets, &c. ; and the wood is hard and makes good building material. The fruit of the Gutiielma is 4lso widely used for food among the natives. -Among other forest trees of economic importance are the silk-cotton tree (Bombaxceiba), the pala de vaca, or cow-tree (Brosimum galactodendrqti) r whose sap resembles milk and is used for that purpose; the Inga saman, the Hevea guayanensis, celebrated in the production of rubber, and the Attalea speciosa, distinguished for the length of its leaves.*

The principal economic plants of the country are cacau, coffee, Cassava (manioc) called " mandioca " in Brazil, Indian corn, beans, sweet potatoes, taro, sugar-cane, cotton and tobacco. Of these coffee and sugar-cane were introduced by Europeans.

Population. — The population of, Venezuela is largely a matter of conjecture, no census having been taken sincfe the third general census of 1891, which gave a total population of 2,32,3, 527, of which 1,137,139 were males and 1,186,388 females, and there were 42,898 foreign residents. The official Handbook of Vene- zuela for 1904 estimated the population for the preceding year as 2,663,6^1. The population consists of a small percentage of whites of European - descent, chiefly Spaniards, various tribes and settlements of Indians, largely of the Arawak and Garib families, and a large percentage of mestizos, or mixed bloods. There is a large admixture Of" African blood. Hiibner estimates the mixed of all races at 93 , the highest among all the South American nationalities, and the Creoles at 1 only; but this is clearly incorrect. Perhaps a closer approximation would be to rate the Creole element (whites of European descent) at 10%, as in Colombia, and the mixed races at 70%, the remainder consisting of Africans, Indians and resident foreigners.

Territorial Divisions. — The territorial divisions of Venezuela have been subjected to many changes. Under the constitution of the 27th of April 1904, the republic was divided into 13 states, 1 federal district and 5 territories, the names of which are as follows, those of the capital cities being given in brackets: Federal District (Caracas and La Asuncion); Aragua (La Victoria); Bermudez (Cumana); Bolivar (Ciudad Bolfvar); Carabobo (Valencia) ; Falcon (Coro) ; Guarico (Calabpzo) ; Lara (Barquisimeto) ; Merida (Merida); Miranda (Ocumare); Tachira (San Crist6bal);

Trujillo (Trujillo); Zamora (San Carl6s); Zulia (Maracaibo), with the following territories: Ainazbnas (San Fernando de Atabapo): Col6n (Gran Roque);

Cristobal Col6n (Cristobal Col6n) ; Delta-Amacuro (San Josede Amacuro) ; Yaruari (Guacipati).

On the 5th of August 1909, however, a new division was pro- mulgated, giving 20 states, I federal district and 2 territories. Under this division some of the recognized administrative units were greatly altered in area or even abolished, and the capital status of several cities was apparently affected. The division was as follows: Federal District (Caracas); Anzoategui (Barcelona) ; Apure (San Fernando de Apure); Aragua (La Victoria); Bolivar (Ciudad Bolivar) ; Carabobo (Valencia) ; Cojedes (San Carlos); Falcon (Coro); Guarico (Calabozo); Lara (Barquisi- meto) ; Merida (Merida) ; Miranda (Ocumare); Monagas (Maturin); Nueva Esparta (La Asuncion); Partuguesa (Guanare); Sucre (Cumana) ; Tachira (San Cristobal) ; Trujillo (Trujillo) ; Yaracuy (San Felipe); Zamora (Barinas); Zulia (Maracaibo), with the following territories : Amazonas (San Fernando de Atabapo) ; Delta-Amacuro (Tucupita).

Communications and Commerce. — There has been no great de- velopment of railway construction in Venezuela, partly on account of political insecurity and partly because of the backward industrial state of the country. In 1908 there were only 13 railway lines with a mileage of about 540 m., including the short lines from Caracas to El Valle and La Guaira to Maiquetia and Macuto, and the La Vela and Coro. The longest of these is the German line from Caracas to Valencia (in m,), and the next longest the Great Tachira, running from Encontrada on Lake Maracaibo inland to Uraca (71 m.;, with a projected extension to San Cristobal. Another line in the Lake Maracaibo

region is known as the Great La Ceiba, and runs from a point near the lake to the vicinity of Valera and Trujillo. An important line connects the thriving city of Bar- quisimeto with the port of Tucacas. The best known of the Venezuelan railways is the short line from La Guaira to Caracas (22J m.), which scales the steep sides of the mountain behind La Guaira and reaches art elevation of 3135 ft. before arriving at Caracas. It is a British enterprise, and is one of the few railways in Venezuela that pay a dividend. The Puerto Cabello and Valencia line (34 m.) is another British undertaking and carries a good traffic. A part of this line is built with a central cog- rail. Probably a return; to settled political sand industrial conditions in Venezuela will result in a large addition to its railway mileage, as a means of bringing the fertile inland districts into direct communication with the coast. '

In steamship lines the republic has almost nothing to show. A regular service is maintained on Lake Maracaibo, one on Lake Valencia, and another oa the Orinoco, Apure and Portuguesa rivers, starting from Ciudad Bolivar.

The coast of Venezuela has an aggregate length of 1876 m., and there are 32 ports, large and small, not including those of Lakes Maracaibo and Tacarigua, and the Orinoco. The great majority of these have only a limited commerce, restricted to domestic exchanges. The first-class ports are La Guaira, Puerto Cabello, Ciudad Bolivar, Maracaibo and Carupano, and the second-class are Sucre, Juan Griego, Guiria, Cano Colorado, Guanta, Tucacas, La Vela and Porlamar. The commerce of these ports, both in the foreign and domestic trade, is small, tariff regulations being onerous, and the people too impoverished to be consumers of much beyond the barest necessaries of life. The total foreign trade in 1908 amounted to

*$9,778,810 imports and $14,560,830 exports, the values being in U.S. gold. The exports to the United States were valued a * $5,550,073 and to France $5,496,627. The principal exports were coffee, cacau, divi-divi, rubber, hides and skins, cattle and asphalt. The imports include manufactured articles of all kinds, hardware and building materials, earthenware and glassware, furniture, drugs and medicines, wines, foodstuffs, coal, petroleum and many other things. The coasting trade is largely made up of products destined for exportation, or imports trans-shipped from the first-class ports to the smaller ones which have no direct re- lations with foreign countries. In the absence of statistical returns it is impossible to give the values of this branch of trade. The exchanges of domestic products are less important than they should be. The Orinoco trade is carried on almost wholly through Port of Spain, Trinidad, where merchandise and produce is trans- ferred between light draught river boats and foreign ocean-going steamers. The distance from Port of Spain to Ciudad Bolivar is 299 m. and the traffic is carried by foreign-owned steamers. Under the administration of President Cipriano Castro this traffic was suspended for a long time, and trans-shipments were made at La Guaira. Above Ciudad Bolivar transportation is effected by two or three small river steamers and a great number of small craft (lauchas, bungos, balandras. Sic.), using sails, oars and punting poles.*

Agriculture. — The principal industries of Venezuela are agri- cultural and pastoral. Both have suffered heavily from military operations, but still they have remained the basis of Venezuelan wealth and progress. Much the greater part of the republic is fertile and adapted to cultivation. Irrigation, which has not been used to any great extent, is needed in some parts of the country for the best results,

but in others, as in the valleys and on the northern slopes of the Maritime Andes, the rainfall is sufficiently well distri- buted to meet most requirements. The long dry season of the

llanos and surrounding slopes, which have not as yet been devoted to cultivation, will require a different system of agriculture with systematic irrigation. In colonial times the llanos were covered with immense herds of cattle and horses and were inhabited by a race of hardy, expert horsemen, the llaneros. Both sides in the War of Independence drew upon these herds, and the llaneros were among the bravest in both armies. The end of the war found the llanos a desert, both herds and herdsmen having nearly disappeared. Successive civil wars prevented their recovery, and these great plains which ought to be one of the chief sources of meat supply for the world are comparatively destitute of stock, and the only source of revenue from this industry is the small number of animals shipped to the West Indies. The breeding of goats and swine is an important industry in some regions. The climatic conditions are not so favourable as in Argentina, but these are counterbalanced to some extent by the great river system of the Orinoco, whose large navigable tributaries cross the plains from end to end, and whose smaller streams from the surrounding highlands provide superior opportunities for water storage and irrigation. On the mesas alfalfa could be substituted for the native grasses and be used for stock when the pasturage of the lower plains is not available. Other industries of the colonial period were the cultivation of indigo and tobacco. The former has nearly disappeared, but the latter is still one of the more important products of the country. The

best known tobacco-producing localities are Capadare, Yaritagua, Merida, Cumanacoa, Guanape, Guaribe and Barinas. The best quality is that from the Capadare district, in the state of Falc6n, which rivals that of the Vuelta Abajo of Cuba. No effort is made to improve the Venezuelan product, a part of which is exported to Cuba for cigar making. The principal agricultural products are coffee, cacau (cacao), sugar, Indian corn and beans. Coffee was introduced from Martinique in 1784 and its exportation began five years later. It is grown at elevations of 1600 to 3000 ft., and the yield is reported to be J to i lb per tree, which is much less than the yield in Sao Paulo, Brazil. An official work (Veloz Goiticoa, Venezuela, Washing- ton, 1904) gives the number of coffee trees in Venezuela as 250,000,000 belonging to 33,000 estates; the output was 42,806 tons in 1907. Several grades are produced in Venezuela, determined by geographi- cal position, altitude and method of curing and preparing for market. The Maracaibo type from the mountain-slopes of Merida, Trujillo and Tachira is perhaps the best known and brings the best price. Cacau (Theobroma cacao) is an indigenous product and is extensively cultivated on the Caribbean slopes. It requires a high temperature (about 80° F.), rich soil and a high degree of humidity for the best development of the tree. The tree has an average height of 12-13 ft., begins bearing five years after planting, requires little attention beyond occasional irrigation, bears two crops a year (June and December), and produces well until it is forty years of age- — the yield being from 490 to 600 lb per acre of 100 trees. There are two grades of Venezuelan cacau — the criollo or native, and the trinitario, or Trinidad, the first being superior in quality. The best cacau comes from the vicinity of Caracas and is marketed under that name. The exportation of 1907 was about 14,000 tons. Sugar

Mining. — The principal minerals are gold, copper, iron, sulphur,

coal, asphalt and petroleum. Silver,, tin, lead, mercury and

Crecious stones are listed among the mineral resources of the country, ut no mines have been developed, arid they are possibilities only. Gold is found throughout a wide area, but chiefly in the Yuruari region, about 100 m. S.W. of the principal mouth of the Orinoco and near the borders of British Guiana, where the famous El CaJlao minesare. These mines have produced as much as 181,040–2 Spanish oz. in one year (1886) and a total of 1,32p,929 > 09 oz. from 1871 to 1890, while another report gives an output valued at $23,000,000 U.S. gold in the fifteen years from 1884 to 1899. The production since then has greatly declined. There are 14 copper mines in the country, those at Aroa, 70 m. W. of Puerto Cabello and in railway communication with Tucacas (89 m.), being the most productive. They date from 1605 and now belong to an English company. The output from 1878 to 1 89 1 was 329,218 tons of ore and 53,053 tons of regulus, valued at £2,794)986. Iron of a good quality has been found in the Imataca region, Delta–Amacuro territory, 53 m. from the ″ Boca Grande ″ of the Orinoco. The principal coal deposits developed are at Naricual, near Barcelona, and a railway has been constructed to bring the output to the port of Guanta. Asphalt is taken from several deposits — from Maracaibo, Cuman4 and Pedernales in the Orinoco delta. The latter place also yields petroleum. Sulphur is mined near Carupano, and salt in Zulia and on the peninsula of Araya. The latter is a government monopoly, and the high prices at which it is sold constitute a serious prejudice to the people and to industries like that of meat packing.

Pearl Fisheries. — –One of the oldest of

Venezuelan industries, the Margarita pearl fisheries, was prohibited in 1909 for an indefinite time because of the threatened extinction of the oyster beds. The industry dates from the first exploration of this coast and was probably carried on before that by the natives. The fisheries are established about the islands of Margarita, Cpche and Cubagua, the best producing beds being at El Tirano and Macanao, the first N.E. and the other N.W. of Margarita. The natives engaged in the fishery used some 400 sailboats of 3 to 15 tons capacity, and the beds were raked in search of pearl oysters. In: 1900 a concession was granted for an exclusive right to fish for pearls, &c., between Margarita and the coast, the contractor to use submarine apparatus.

Manufactures. — There are few manufacturing industries in Vene- zuela, and these usually of the parasitic type, created by official favour and protected by high tariffs on imports in, competition. The manufactures of this class include aerated waters, beer, candles, chocolate, cigarettes, cotton fabrics, hats, ice, matches, boots and shoes, drugs and medicines. There are a number of electric plants, three of. which use water power, one at El Encantado, 10 m. from Caracas, one at Merida, and the third at San Cristobal, Tachira. The plants using steam for motive power are at Caracas, Maracajbo, Valencia and Puerto Cabello; There has been sonie development in the manufacture of agricultural machinery and implements, vehicles, pianos and furniture, and some older industries,' -such, as tanning leather and the manufacture of saddles and harness, the milling of wheat and Indian corn, distilling, soap-making, &c. At Guanta there is a factory for the manufacture of patent fuel from Naricual coal and asphalt.' In 1901 there was one saladero, or meat-packing establishment, in the Orinoco- Apurd region,, but it did not prove successful

because of the high cost of salt.

Government. — The government of Venezuela is that of a federal republic of nominally independent, self-governing states, administered according to the provisions of the consti- tution of the 27th of April 1904, modified or revised on the 5th of August 1909. The legislative potter is nominally vested in a national Congress of two houses — the Seriate and Chamber of Deputies— which meets at Caracas every two years on the 23rd of May, the session lasting 90 days. The Senate consists of two members from each state, or 40 members, who are elected by the state legislatures for a period of four years. A senator must be a native-born citizen and not less than thirty years of age. The Chamber consists of popular representatives, elected by direct vote, in the proportion of one deputy for each 35,000 of population, each state being entitled to at least One deputy, or two iii case its population exceeds 15,000, the federal district and territories being entitled to representatives on the same terms. A deputy must also be a native-born citizen, not less than twenty-one years of age, and is elected for a period of four years.

The executive power is vested by the constitution in a presi- dent, two vice-presidents and a cabinet if ministers. The president and vice-presidents, who ■asust be Venezuelans , by birth and more tnan thirty years old, are elected by an electoral body or council composed of members of the national Congress, one member from each state and the Federal District. This

council elects by an absolute majority of votes. The presi- dential term is four years

(it was six years under the constitution of 1904), and the president cannot succeed himself. The powers of the executive, direct and implied, are very broad and permit the exercise of much absolute authority. The president is assisted by a cabinet of seven ministers and the governor of the federal district, their respective departments being interior, foreign relations, finance and public credit, war and marine, fomento (promotion), public works and public instruction. The ministers are required to countersign all acts relating to their respective departments, and are held respon- sible both before Congress and the courts for their acts. The department of fomento is charged with the supervision of all matters relating to agriculture, stock-raising, mines, industries, commerce, statistics, immigration, public lands, posts, tele- graphs and telephones. The department of the interior is also charged with matters relating to the administration of justice, religion and public worship.

The judicial power is vested in a supreme federal court, called the Corte Federal y de Casacion, and such subordinate tribunals as may be created by law. As the laws and pro- cedure are uniform throughout the republic and all decrees and findings have legal effect everywhere, the state judicial organizations may be considered as taking the place of district federal courts, although the constitution does not declare them so. The federal court consists of 7 members, representing as many judicial districts of the republic, who are elected by Congress for periods of six years (Const. 1904), and are eligible for re-election. It is the supreme tribunal of the republic, having original jurisdiction in cases of impeachment, the con- stitutionality of laws, and controversies between states or officials. It is also a court of appeal (Casacion) in certain cases, as

defined by law. The judicial organization of the states includes in each a supreme court of three members, a superior court, courts of first instance, district courts and municipal courts. The judicial terms in the states are for three years. In the territories there are civil and criminal courts of first instance, and municipal courts. The laws of Venezuela are well codified both as to law and procedure, in civil, criminal and commercial cases.

The state governments are autonomous and consist of legis- lative assemblies composed of deputies elected by ballot for a period of three years (Const. 1904), which meet in their respective state capitals on the 1st of December for sessions of thirty days, and for each a president and two vice-presidents chosen by the legislative assembly for a term of three years. The states are divided into districts and these into municipios, the executive head of which is a jefe politico. There is a municipal council of seven members in each district, elected by the municipios, and in each municipio a communal junta appointed by the municipal council. The governors of the federal territories are appointees of the president of the republic, and the jefe politico of each territorial municipio is an appointee of the governor. The Federal District is the seat of federal authority, and consists of a small territory surrounding Caracas and La Guaira, known in the territorial division of 1904 as the West district, and the island of Margarita and some neighbouring islands, known as the East district.

There are two classes of citizens in Venezuela — native-born and naturalized. The first includes the children of Venezuelan parents born in foreign countries; the latter comprises four classes: natives of Spanish- American republics, foreign- born persons, foreigners naturalized through special laws and foreign women married to Venezuelans. The power of

granting citizenship to foreigners is vested in the president of the republic, who is also empowered to refuse admission to the country to undesirable foreigners, or to expel those who have violated the special law (April 11, 1903) relating to their conduct in Venezuelan territory. The right of suffrage is exercised by Venezuelan males over 21 years of age, and all electors are eligible to public office except where the constitution declares otherwise. Foreign companies are permitted to transact

business in Venezuela, subject to the laws relating to non- residents and also to the laws of the country governing national companies.

Army. — The military forces of Venezuela consist nominally of about 20 battalions of infantry, of 400 men each and 8 batteries of artillery, of 200 men each. There is also a battalion of marines employed about the ports and in the arsenals. The organization and equipment is defective, and the force deficient in numbers and discipline. The police force and fire companies in the larger cities are organized on a military basis, and are sometimes used for military purposes. For a people so accustomed to revolutionary outbreaks, the Venezuelans are singularly deficient in military organization. There is no lack of officers of the highest grades, but the rank and file are not uniformed, equipped or drilled, and military campaigns are usually irregular in character and of com- paratively short duration. It should be said that Venezuela has a modern military organization so far as law can make it. It is drawn in imitation of European models, and makes military service compulsory for all Venezuelans between 21 and 50 years. This national torce is divided into actives and reserves, the strength of the first being fixed by Congress, and all the rest, of unknown number, belong to the latter. The provisions of the law, however have

never been enforced, and the actives or regular army are recruited by impressment rather than through conscription. There is a military academy at Caracas, and battalion schools are provided for officers and privates, but they are of little value.

Education. — In popular education Venezuela has done almost nothing worthy of record. As in Chile, Peru and Colombia, the ruling classes and the Church have taken little interest in the educa- tion of the Indians and mestizos. Venezuela, it is true, has a com- prehensive public instruction law, and attendance at the public schools is both gratuitous and nominally compulsory. But outside the cities, towns and large villages near the coast there are no schools and no teachers, nor has the government done anything to provide them. This law has been in force since about 1870, but on the 30th of June 1908 there were only 1150 public schools in the republic with a total enrolment of 35,777 pupils. There are a number of parochial and conventual schools, the church being hostile to the public-school system. An overwhelming majority of the people is illiterate and is practically unconscious of the defect. In 1908 the educational facilities provided by the republic, not including some private subventioned schools, were two universities and thirty- three national colleges. The universities are at Caracas and Merida, the latter known as the Universidad de los Andes. The Caracas institution dates from early colonial times and numbers many prominent Venezuelans among its alumni. The national college corresponds to the lyceum and high school of other countries. There are law, medical and engineering schools in the country, but one rarely hears of them. The episcopal seminaries are usually good, especially the one at Caracas. In addition to these, there are normal, polytechnic, mining and agricultural schools, the last at Caracas and provided with

a good library and museum. There are several mechanics' schools (Artes y Oficios) in the larger cities, and a large number of private schools. Further educational facilities are provided by a national library with about 50,000 volumes, a national museum,, with a valuable historical collection, the Cajigal Observatory, devoted to astronomical and meteorological work, and the Venezuelan Academy and National Academy of History — the first devoted to the national language and literature, and the second to its history.

Religion. — The Roman Catholic is the religion of the state, but freedom of worship is nominally guaranteed by law. The president, however, is empowered to deny admission into the country of foreigners engaged in special religious work not meeting his approval. Practically no other form of worship exists in the country than that of the Roman Catholic Church, the Protestant and other denominations holding their services in inconspicuous chapels or private apartments in the larger cities, where considerable numbers of foreigners reside. The state contributes to the support of the Church, builds its churches and provides for the salaries of its clergy, and at the same time it has the right to approve or reject all ecclesiastical appointments and to permit or forbid the execution of all decrees of the Roman See relating to Venezuela. The Church hierarchy consists of one archbishop (Caracas) and four suffragan bishops (Merida, Guayana, Barquisimeto and Guarico).

Finance. — The financial situation in Venezuela was for a long time extremely complicated and discreditable, owing to defaults in the payment of public debts, complications arising from the guarantee of interest on railways and other public works, responsibility for damages to private property during civil wars and bad administra- tion. To meet increasing obligations, taxation has been extended and

heavily increased; The public revenues are derived from customs taxes and charges on imports and exports, transit taxes, cattle taxes, profits on coinage, receipts from state monopolies, receipts from various public services such as the post office, telegraph, Caracas waterworks, &c, and sundry taxes, fines and other sources. From 60 to 70% of the revenue is derived from the custom-house, and the next largest source is the transit tax. The official budget

returns for 1904-6 show the revenues and expenditures to have been —

	1904.	I9°5.	1906.
	Bolivares.	Bolivares.	Bolivares.
Revenue . .	57.576.74*	49.385.379	49.293. o6 7
Expenditure . .	52,925,521	54,718,163	51,874,694

A considerable part of the expenditure since 1903 consists of pay- ments on account of foreign debts which Venezuela was compelled to satisfy. To meet these, taxes were increased wherever possible, thus increasing both sides of the budget beyond its normal for those years.

The public debt of Venezuela dates back to the War of Indepen- dence, when loans were raised in Europe for account of the united colonies of Colombia, Ecuador and Venezuela. The separation of the Colombian republic into its three original parts took place in 1830, and in 1 834 the foreign debt contracted was divided among the three, Venezuela being chafged with 28J , or £2,794,826, of which £906,430 were arrears of interest. Other items were afterwards added

to liquidate other obligations than those included in the above, chiefly on account of the internal debt. Several con- versions and compositions followed, interest being paid irregularly. In 1880-81 there was a consolidation and conversion of the re- public's foreign indebtedness through a new loan of £2,750,000 at 3, and in 1896 a- new loan of 50,000,000 bolivares (£1,980,198) for railway guarantees and other domestic obligations. In August 1904 these loans and arrears of interest brought the foreign debt up to £5,618^25, which in 1905 was converted into a " diplomatic '' debt of £5,229,700 (3%). During these years Venezuela had been pursuing the dangerous policy of granting interest guarantees on the construction of railways by foreign corporations, which not only brought the government into conflict with them on account of defaulted payments, but also through disputed interpretations of contracts and alleged arbitrary acts on the part of .government officials. In the civil wars the government was also held responsible for damages to these properties and for the mistreatment of foreigners residing in the country. Some of these claims brought Venezuela into conflict with the governments of Great Britain, Germany and Italy in 1903, and Venezuelan ports were blockaded and there was an enforced settlement of the claims (about £104,417), which were to be paid from 30% of the revenues of the La Guaira and Puerto Cabello custom-houses. This settlement was followed by an adjust- ment of all other claims, payment to be effected through the same channels. In 1908 (July 31) the total debt of Venezuela (according to official returns) consisted of the following items : —

Bolivares.

Consolidated internal debt 63,171,818

Diplomatic debt (Spanish, French and Dutch) . 7,014,569 „ (French, 1903-4) . . . 5,733.490 „ of 1905 132,049,925

Unconsolidated debt in circulation , . . 4,561,742

Total . 212,531,544 or, at 25J bolivares per £, £8,417,091

The currency of Venezuela is on a gold basis, the coinage of silver and nickel is restricted, and the state issues no paper notes. Foreign coins were formerly legal tender in the republic, but this has been changed by the exclusion of foreign silver coins and the acceptance of foreign gold coins as a commodity at a fixed value. Under the currency law of the 31st of March 1879, the thousandth part of a kilogramme of gold was made the monetary unit and was called a bolivar, in honour of the Venezuelan liberator. The denominations provided for by this law are —

Gold: 100, 50, 20, 10 and 5 bolivares.

Silver: ,5, 2, 1 bolivares; 50, 20 centimos.

Nickel: 12 j and 5 centimos. These denominations are still in use except the silver 20-centitnos piece, which was replaced by one of 25 cintimos in 1891, The silver $- bolivar piece is usually known as a ″ dollar,″ and is equiva- lent to 481 pence, or 96J cents U.S. gold. The old ″ peso ″ is no longer used except in accounts, and 1 is reckoned at 4 bolivares, being sometimes described as a ″ soft ″ dollar. Silver and nickel are legal tender for 50 and 20 bolivares respectively. Paper currency is issued by the banks of Venezuela, Caracas and Maracaibo under the provisions of a general banking law, and their

notes, although not legal tender, are everywhere accepted at their face value.

The metric weights and measures have been officially adopted by Venezuela, but the old Spanish units are still popularly used throughout the country. (A. J. L.)

History. — The coast of Venezuela was the first part of the American mainland sighted by Columbus, who, during his third voyage in 1498, entered the Gulf of Paria and sailed along the coast of the delta of the Orinoco. In the following year a much greater extent of coast was traced out by Alonzo de Ojeda, who was accompanied by the more celebrated Amerigo Vespucci. In 1550 the territory was erected into the captain-generalcy of Caracas, and it remained under Spanish rule till the early part of the 19th century. During this period

negro slaves were introduced; but less attention was given by the Spaniards to this region than to other parts of Spanish America, which were known to be rich in the precious metals.

In 1810 Venezuela rose against the Spanish yoke, and on the 14th of July 181 1 the independence of the territory was proclaimed. A war ensued which lasted for upwards of ten years and the principal events of which are described under Bolivar (q.v.), a native of Caracas and the leading spirit of the revolt. It was not till the 30th of March 1845 that the independence of the republic was recognized by Spain in the treaty of Madrid. Shortly after the battle of Carabobo (June 24, 1821), by which the power of Spain in this part of the world was broken, Venezuela was united with the federal state of Colombia, which embraced the present Colombia and Ecuador; but the Venezuelans were averse to the Confederation,

and an agitation was set on foot in the autumn of 1829 which resulted in the issue of a decree (December 8) by General Paez dis- solving the union, and declaring Venezuela a sovereign and independent state. The following years were marked by re- curring attempts at revolution, but on the whole Venezuela during the period 1 836-1 846 was less disturbed than thd neigh- bouring republic owing to the dominating influence of General Paez, who during the whole of that time exercised practically dictatorial power. In 1849 a successful revolution broke out and Paez was driven out of the country. The author of his expulsion, General Jose Tadeo Monagas, had in 1847 been nominated like so many of his predecessors, to the presidency by Paez, but he was able to win the support of the army and assert his independence of his patron. Paez raised the standard of revolt, but Monagas was completely victorious. For ten years, amidst continual civil war, Monagas was supreme. The chief political incident of his rule was a decree abolishing slavery in 1854. General Juan Jose Falcon, after some years of civil war and confusion, maintained himself at the head of affairs from 1863 to 1868. In 1864 he divided Venezuela into twenty states and formed them into a Federal republic. The twenty parties whose struggles had caused so much strife and bloodshed were the Unionists, who desired a centralized govern ment, and the Federalists, who preferred a federation of semi- autonomous provinces. The latter now triumphed. A revolt headed by Monagas broke out in 1868, and Falcon had. to fly the country. In the following year Antonio Guzman Blanco succeeded in making himself dictator, after a long series of battles in which he was victorious over the Unionists.*

For two decades after the close of these revolutionary troubles in 1870 the supreme power in Venezuela was, for all practical purposes, in the hands of Guzman Blanco. He

evaded the clause in the constitution prohibiting the election of a pre- sident for successive terms of office by invariably arranging for the nomination of some adherent of his own as chief of the executive, arid then pulling the strings behind this figurehead. The tenure of the presidential office was for two years, and at every alternate election Guzman Blanco was declared to be duly and legally chosen to fill the post of chief magistrate of the republic. In 1889 there was an open revolt against the dictatorial system so long in vogue; and President Rojas Paul, Blanco's locum tenens, was forced to flee the country and take refuge in the Dutch colony of Curajoa. A scene of riot and disorder was enacted in the Venezuelan capital Statues of Blanco, which had been erected in various places in the city of Caracas, were broken by the mob, and wherever a portrait of the dictator was found it was torn to pieces. No follower of the Blanco regime was safe. An election was held and General Andueza Palacios was nominated president. A move- ment was set on foot for the reform of the constitution, the principal objects of this agitation being to prolong the pre- sidential term to four years, to give Congress the right to choose the president of the republic, and to amend certain sections concerning the rights of persons taking part in armed insurrec- tion arising out of political issues. All might have gone well for President Palacios had he not supposed that this extension of the presidential, period might be made to apply to. himself.

His attempt to force this question produced violent opposition in 1 891, and ended in a rising headed by General- Joaquin Crespo. This

revolt, which was accompanied by severe fighting, ended in 1892 in the triumph of the insurgents, Palados and his followers being forced to leave the country ' to save their lives. General Crespo became all-powerful; but he did not immediately accept the position of president. The reform of the constitution was agreed to, and in 1894 General Crespo was duly declared elected to the presidency by Congress for a period of four years. One of the clauses of the reformed constitution accords belligerent rights to all persons taking up arms against the state authority, provided they can show that their action is the outcome of political motives. Another clause protects the property of rebels against confiscation. Indeed, a premium on armed insurrection is virtually granted.

In April 1895 the long-standing dispute as to the boundary between British Guiana and Venezuela was brought to a crisis by the action of the Venezuelan authorities in; arresting Inspectors Barnes and Baker, of the British Guiana police, with a few of their subordinates, on the Cuyuni river, the charge being that they were illegally exercising the functions of British officials in Venezuelan territory. Messrs Barnes and Baker were subsequently released, and in due course made their report on the occurrence. For the moment nothing more was heard of this boundary .question by the public, but General Crespo instructed the Venezuelan minister in Washington' to ask for the assistance of the United States in the event of any demand being made by the British Government for an indemnity. Whilst this frontier difficulty was still simmering, an insurrec- tion against General Crespo was fomented by Dr J. P. Rojas Paul, the representative of the Blanco regime, and came to a head in October 1895, risings occurring in the J northern and southern sections of the republic. Some desultory

fighting took place for three or four months, but the revolt was never popular, and was completely suppressed early in 1896. The Guiana boundary question began now to assume an acute stage, the Venezuelan .minister in Washington having persuaded President Cleveland to take up the cause of Venezuela in vindi- cation of the principles of the Monroe doctrine. On the 18th of December 1895 a message Was sent to the United Spates Congress by President Cleveland practically stating that any attempt on the part of. the British Government to enforce its claims upon Venezuela as regards the boundary between that country and Guiana without resort to arbitration would be considered as a casus belli by his government. The news of this message caused violent agitation in Caracas and other towns. A league was formed binding merchants not to deal in goods of British origin; patriotic associations were estab- lished for the purpose of defending Venezuela against British aggression, and the militia were embodied. The question was subsequently arranged in 1899 by arbitration, and by the pay- ment of a moderate indemnity to the British officers and men who had been captured. Diplomatic relations between the two countries, which had been broken off in consequence of the dispute, were resumed in 1897: :

In 1898 General Crespo was succeeded as president by Sendr Andrade, who had represented Venezuela in Washington during the most acute stage of the frontier question. Towards the end of the year a revolutionary movement took place with the object of ousting Andrade from power. The insurrection was crushed, but in one of the final skirmishes a chance bullet struck General Crespo, who was in command of the government troops, and he died from the effects of the wound. A subsequent Tevolt overthrew President Andrade in 1000. General Cipriaho Castro then became president. During 1901 and 1902 the internal condition of the country remained

disturbed, and fighting went on continually between the government troops and the revolutionists. . ■ ■ ' 1

The inhabitants of Venezuela have a right to vote for the -members of Congress, but in reality this privilege is not exercised by them. Official nominees are as a rule returned without any opposition, the details of the voting having been previously

arranged by the local authorities in conformity with instructions from headquarters. In these circumstances the administration of public affairs fell into the hands of an oligarchy, who governed the country to suit their own convenience. President Castro was for eight years a dictator, ruling by corrupt and revolution- ary methods, and in defiance of obligations to the foreign creditors of the country. The wrongs inflicted by him on companies and individuals of various nationalities, who had invested capital in industrial enterprises in Venezuela, led to a blockade of the Venezuelan ports in 1903 by English, German and Italian warships. Finding that diplomacy was of no avail to obtain the reparation from Castro that was demanded by their subjects, the three powers unwillingly had recourse to coercion. The president, however, sheltered himself behind the Monroe doctrine and appealed to the government of the United States to inter- vene. The dispute was finally referred by mutual consent to the Hague Court of Arbitration. The Washington government had indeed no cause to be well disposed to Castro, for he treated the interests of Americans iii Venezuela with the same high-handed contempt for honesty and justice as those of Europeans. The demand of the United States for a revision of what is known as the Olcott Award in connexion with the Orinoco Steamship Company was in 1905 rnet by a refusal to reopen the case. Meanwhile the country, which up to the blockade of 1903 had been

seething with revolutions, now became much quieter. In 1906, the president refused to allow M. Taigny, the French minister, to land, on the ground that he had brbken the quarantine regulations. In consequence, France broke off diplomatic relations. In the following year, by the decision of the Hague Tribunal, the Venezuela government had to pay the British, German and Italian claims, amounting to £691,160; but there was still £840,600 due to other nationalities, which remained to be settled. The year 1907 was marked by the repudiation of the debt to Belgium, and fresh difficulties with the United States. Finally, in 1908 a dispute arose with Holland on the ground of the harbouring of refugees in Curacoa. The Dutch Minister was expelled, and Holland replied by the despatch of gunboats, who destroyed the Venezuelan fleet and blockaded the ports. In December General Castro left upon a visit to Europe, nominally for a surgical operation. In his absence a rising against the, dictator took place at Caracas, and his adherents were seized and imprisoned. Juan Vincenti Gomez, the vice- president, now placed himself at the head of affairs and formed an administration. He was installed as president, in June 1910.

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VENGURLA^–VENICE

VENGURLA, a seaport on the west coast of India in Ratnagiri district, Bombay. Pop. (rooi) 10,018. It was an early site of both Dutch and English factories, and was formerly the port for communication with the garrisons in the Southern Mahratta country. In the neighbourhood are the " Bumt Islands," with the Vengurla Rock lighthouse.

VENICE (Veneeia), a city and seaport of Italy, occupying one of the most remarkable sites in the world. At the head of the Adriatic, between the mountains and the sea, lies that part of the Lombard plain known as the Veneto. The whole of this plain has been formed by the dtbris swept down from the Alps by the rivers Po, Ticino, Oglio, Adda, Mincio, Adige, Brenta, Piave, Livenza, Tagliamento and Isonzo. The substratum of the plain is a bed of boulders, covered during the lapse of ages by a deposit of rich alluvial soil. The rivers when they debouch from the mountains assume an eastern trend in their effort to reach the sea. The result is that the plain is being gradually extended in an easterly direction, and cities like Ravenna, Adria and Aquileia, which were once seaports, lie now many miles inland. The encroachment of land on sea has been calculated at the rate of about three miles in a thousand years. A strong current sets round the head of the Adriatic from east to west. This current catches the silt brought down by the rivers and projects it in long banks, or lidi, parallel with the shore. In process of time some of these banks, as in the case of Venice, raised themselves above the level of the water and became the true shore-line, while behind them lay large surfaces of water, called lagoons, formed partly by the fresh water brought down by the fivers, partly by the salt-water tide which found its way in by the channels of the river mouths. Along the coast - line, roughly speaking between the Apennines at Rimini and the Carnic Alps at Trieste, three main systems of lagoons were thus created, the lagoon of Grado or Marano to the east, the lagoon of Venice in the middle, and the lagoon, of Comacchio to the south-west (for plan, see HarbouIi). All three are dotted with small islands, possibly the remains of some earlier lido. These islands are little else than low mud banks, barely rising above the water-level. .On a group of these mud banks about the middle

of the lagoon of Venice stands the city of Venice. It would be difficult to imagine a site less adapted for the foundation and growth of a great community. The soil is an oozy mud which can only be made capable of carrying buila- ings by the artificial means of pile-driving; there is no land fit for agriculture or the rearing of cattle; the sole food supply is/fish from the lagoon, and there is no drinking-water save sufch as could be stored from the rainfall. Yet the group of islands called Rialto, in mid-Venetian lagoon, were first the asylum and then the magnificent and permanent home of a race that took a prominent part in the medieval and Renaissance history of Europe. The local drawbacks and difficulties once surmounted, Venice by her geographical position became the seaport nearest the heart of Europe.

Ethnography and Early History- ^As to the ethnography of the race little is known that is certain. It has : frequently been said that the lagoon population was originally composed of refugees from the mainland seeking asylum from the incursions of Huns, Goths and Lombards; but it is more probable that, long before the date of the earliest barbarian inroad, the lagoon islands already had a population of fisherfolk. In any case we may take it that the lagoon- dwellers were racially identical with the inhabitants of the neighbouring mainland, the Heneti or Veneti. That the Heneti themselves were immigrants is generally ad- mitted. The earlier ethnographers, like Strabo, put forward three theories as to the original home of the race. Strabo himself talks of Arnforic Heneti, and supposes them to have come from the neighbourhood of Brittany; another theory gives us Sarmatian Heneti, from the Baltic provinces; while the most widely accepted view was that they reached Italy from Paphlagonia. Modern scholarship has rejected these theories. Pauli and Kretschmer, proceeding on the basis of language, have reached conclusions which in the

main are identical. Pauli, who has published all the known inscriptions of the

Heneti, holds that the language is Ulyfian, closely connected with Messapiah. Kretschmer goes further and divides the Illyrian language into two sharply defined dialects,' the northern dialect being represented by the Heneti. The result is that in the present condition of our knowledge we must conclude that the Heneti were a branch of the Illyrian people. The Eheti of Paphlagonia, the Veneti of Brittany and the Venedl of the Baltic, are probably quite distinct, and the similarity of name is merely a coincidence. '

The dwellings of the primitive settlers in the lagoons were, in all probability, rude huts made of long reeds, such as may be seen to this day in the lagoon. of Grado. A ditch was cut deep into the mud so as to retain the water at low tide, and there the boats of the fishermen lay. The ground about the hut was made solid and protected from corrosion by a palisade of wattled osiers, thus creating the earliest form of the fonda- tnenta, or quay, which runs along the side of so many Venetian canals and is so prominent a feature in the construction of the city. Gradually, as time went on, and probably with the influx of refugees from the mainland, bricks made of lagoon mud came to take the place of wattle and reeds in the construction of the houses. Groups' of dwellings, such as are still to be seen on some of the small canals at Burario, clustered together along the banks of the deeper channels which traverse the lagoon islands and give access to the tide. It is : these channels which determined the lines of construction; the dwellings fol- lowed their windings, and that accounts for the extraordinarily complex network of calles and canals, which characterizes modern Venice. The alleys or Colli number 2327, with a total length of 8oJ m.; the canals number 177 and measure -28 m. The whole site of Venice is

dominated by the existence of one great main canal, the Grand Canal, which, winding through the town in the shape of the letter S, divides it into two equal parts. This great canal was probably at one time the bed ©if a river flowing into the lagoons near Mestre. The smaller canals all serve as arteries to the' Grand Canal. One other broad' canal, once the bed of the Brenta, divides the island of theGiudecca from the rest of the city and' takes its name from that island. The ordinary Venetian house was built round a courtyard, and was one storey high; on the roof was an open loggia for drying clothes; in front, between the house and the Water, ran the fondamenta. The earliest churches were built with' cemeteries for the dead; and thus we find the nucleus of thecity of Venice, little isolated groups of dwellings each on its separate islet, scattered, as Cassiodorus i 1 says, like sea-birds" nests over the face of the waters. Some of the islets were still Uninhabited; covered with a dense low growth which served as cover 'for game and even for wolves.

With the destruction of the mainland cities by repeated barbarian invasions; and thanks to the gradual development of Venice as a centre of coasting trade in the^northerh Adriatic, the aspect of the city changed. Brick and more rarely stone took the place of wood and wattle. The assaults of the Dal- matian pirates, attracted by the growing wealth of the city, necessitated the building of strong castellated houses^ Of which no example has come down to our day, 1 'but we may gather what they were like from Petrarch's description of his house on the Riva degli Schiavoni, with its two flanking tdwers, probably retaining the primitive form, and also from the repre- sentations of protecting tow'ers which occur in Carpaccio'a pictures. The canals too were guarded by chains stretched across their mouths and by towers in some eases, as, for exi ample,

in the case of the' Torresella Canal, which takes its name from these defence works. These houses ■■ clustered round the churches which now began to be built in considerable numbers, and formed the various contrude of the city. ■ The Cronica altinate in the vision of Fra Mauro gives us a picturesque account of the founding of the various parishes, Olivblo or Castello, St Raffaello, St Salvador©; Sta Maria Formosa/ 5.' Giovanni in Bragora, the Apostoli and Sta Ghristini. Tradition has it that the earliest church in Venice wasS. Giacomo di Rialto, _ "Secretary to Theodofic the Great, in a letter dated a.d. 523.

said to have been founded in 432. The canals between these clusters of houses were deepened and cleared out, and in some cases trees were planted along the banks, or fondamenta; we hear of the cypresses on San Giorgio Maggiore,.of an ancient mulberry tree at San Salvadore, of a great elder tree near the Procuratie Vecchie where the magistrates were wont to tie their horses. There were vineyards and orchards (broli) on land reclaimed from the sea, and lying between the various clusters of houses, which had not yet been consolidated into one continuous city. The canals were crossed by wooden bridges without steps, and in the case of the wide Grand Canal the bridge at Rialto was carried on boats. Gradually, how- ever, stone bridges came into use. The earliest of these was the bridge of San Zaccaria, mentioned in a document of 1 1 70. The Rialto bridge was designed in 1178 by Nicolo Barattieri, and was carried on pontoons. In 1255 and 1264 it was rebuilt, still in wood. It was carried on beams and could be raised in the middle, as we see it in Carpaccio's picture of "The Miracle of the Cross." The present bridge, the work of Antonio or Giovanni Contino, whose nickname was da

Ponte, dates from 1588-91, and cost 250,000 ducats. The same archie tect was responsible for the lofty "Bridge of Sighs" (1595- 1605), connecting the ducal palace with the state prisons (1591-97) on the opposite side of the narrow canal on the east of the Rio del Palazzo.

The early bridges were inclined planes and could easily be crossed by horses. It was not till the city became more populous and when stone-stepped bridges were introduced that the use of horses died out. As late as 1.365 the Doge Lorenzo Celsi owned a famous stud of chargers, and in 1400 the Doge Michele Steno's stables, where the present Zecca stands, were famous throughout Italy. In 1392 a law put an end to riding in the Merceria, on account of the crowd, and all horses and mules were obliged to carry bells to warn foot-passengers. The lanes and alleys of the early city were unpaved and filthy with slops from the houses. But in the 13th century the Venetians began to pave the more frequented streets with brick; Ferries or tragketti for crossing the canals were also established as early as the 13th century; we find record of ferries at San Gregorio, San Felice, San Toma, San Samuele, and so on, and also of longer ferries to the outlying islands like Murano and Chioggia, or to the mainland at Mestre and Fusina. The boatmen early erected themselves into gilds.

Gondolas. — The characteristic conveyances on the canals of Venice — which take the place of cabs in other cities— rare the gondolas, flat-bottomed boats, some 30 ft. long by 4 or 5 ft. wide, curving out of the water at the ends, with ornamental bow and stern pieces and an iron beak (Jerro), resembling a halberd, which is the highest part of the: boat-. The gondolier stands on a poppa at the stern with his face towards the bow, and propels the gondola with a single oar. There is a low cabin (Jelze) for passengers; the ordinary gondolas

can take four or six persons, and larger ones (barca or battello) take eight. Gondolas are mentioned as farback as 1094, and, prior to a sumptuary edict passed by the great council in the 16th century, making black their compulsory colour, they were very different in appearance from now. Instead of the present boat, with its heavy black cabin and absence of colouring, the older forms had an awning of rich stuffs or gold embroideries, sup- ported on a light arched framework open at both ends; this is the gondola still seen in Carpaccio's and Gentile Bellini's pictures (c. 1500). Since 1880 services of omnibus steamers (now municipal) have also been introduced.

Byzantine Archikfture. — We can trace the continuous growth of Venice through the successive styles of Byzantine, Gothic, early Renaissance and late Renaissance architecture. The whole subject is magnificently treated in Ruskin's Stones of Venice. The two: most striking buildings in Venice, St Mark's and the Doge's Palace, at once give us an example of the two earlier styles, the Byzantine and the Gothic, at least in their general design, though both are so capricious in develop- ment and in decoration that they may more justjy be con-

sidered as unique specimens rather than as typical examples of- their respective styles.. In truth, owing to its isolated position on the very verge of Italy, and to its close con- nexion with the East, Venetian architecture was an inde^- pendent development. Though displaying a preponderance of Oriental characteristics, it retained a quality of its own quite unlike the styles evolved by other Western countries.

The Byzantine style prevailed in Venice during the nth and 12th centuries. The arches of this period are semicircular and usually highly stilted. Sculptured ornamentation, flowing

scroll- work of semi-conventional foliage mingled with grotesque animals, birds or dragons, is freely applied to arches and string courses. The walls are built of solid brickwork and then covered with thin slabs of rich and costly marbles. Sculptured panels, with conventional motives, peacocks, eagles devouring hares, peacocks drinking from a cup on a tall pillar, are let into both exterior and interior walls, as are roundels of precious marbles, sawn from columns of porphyry, serpentine, verd antique, &c. The adoption of veneer for decora- tion prohibited any deep cutting, and almost all the sculpture is shallow. Only in the capitals, which are of extraordinary richness and variety, do we get any deep or bold relief. Dentil mouldings, of which examples may still be seen in the remains of the palace of Blachernae at Constantinople, are characteristic of Venetian orna- mentation at this period, and remain a permanent feature in Venetian architecture down to the nth century. The dome is the leading idea or motif in Byzantine ecclesiastical architecture; the domes are placed over square, not circular apartments, and their bases are brought to a circle by means of pendentives. In exterior elevation the chief effect is produced by the grouping of the domes. In the interior the effect is gained by broad masses of chromatic decoration in marble- veneer and mosaics on a gold ground to cover the walls and vaults, and by elaborate pavements of opus sectile and opus Alexandrinum. Owing to the marshy site the foundations of buildings in Venice offered considerable difficulties, A trench was dug in the soft upper mud until the stratum of stiff blue clay was reached. Piles of elm, oak, white poplar or larch were driven into this clay to the depth of 16 to 20 ft. or until absolute resistance was encountered. The heads of the piles were from 10 to 11 in. in diameter and they were driven in almost in contact. On this surface of pile heads was laid a platform of

two layers of squared oak beams; and on this again the foundations proper were built. In some cases, however, as for example in the ducal palace itself, if the clay appeared sufficiently firm, the piles were dispensed with and the. foundations went up directly from the oak platform which rested immediately on the clay. During the middle ages the walls of Venetian buildings were constructed invariably of brick. They were usually solid, "but in some cases they were built a sacco — that is to say, two thin outer walls were built and the space between them was filled with grouted rubble. The delicate creamy Isttian stone, which is now so prominent a feature in Venetian architecture, did not come into common use till after the nth century, when the Istrian coast became permanently Venetian. Before 1405 the mortar used in Venice, was made of lime from Istria, which possessed no hydraulic qualities and was consequently very perishable, a fact which to a large extent accounts for the fall of the Campanile of San Marco. But when Venice took possession of the mainland her builders were able to employ a strong hydraulic dark lime from Albettone, which formed a durable cement, capable of resisting salt water and the corrosive sea air.

The church of St Mark's, originally the private chapel of the doge, is unique among the buildings of the world in respect of its unparalleled richness of material and decoration. It grew with the growing state whose religious centre it was, and was adorned with the spoils of countless other buildings, both in the East and on the Italian mainland. A law of the republic required every merchant trading to the East to bring back some material for the adornment of the fane. Indeed, the building has been compared to the treasure den of a gang of "sea sharkers," and from a museum of sculpture of the most varied kind, nearly every century from the 4th down to the latest

Renaissance being represented The present church is the third on this site. Soon after the con- centration at Rialto (see History below), a small wooden church was erected about the year 828 for the reception of the relics of St Mark, which had been brought from Alexandria when the Moslems pulled down the church where he was buried. St Mark then became the patron saint of Venice in place of St Theodore, This church was burned in 976 along with the ducal palace in the insurrection against the Doge Candiano IV, Pietro Orseolo and his successors rebuilt the church on a larger scale in the form of a basilica with three eastern apses and no transept, and Byzantine workmen were employed. As*

the state grew in wealth and importance the church grew with it. About the year 1063 the Doge Contarini resolved to re- model St Mark's. There can be no doubt that Byzantine artists had a large share in the work, but it is equally certain that Lombard workmen were employed along with the Orientals, and thus St Mark's became, as it were, a workshop in which two styles, Byzantine and Lombard, met and were fused together, giving birth to a new style, peculiar to the district, which may fairly be called Veneto-Byzantine.

In plan (see the article Architecture) St Mark's is a Greek cross of equal arms, covered by a dome in the centre, 42 ft. in diameter, and by a dome over each of the arms. The plan is derived from the Church of the Holy Apostles at Constantinople, now covered by the mosque of Mahommed II., and bears a strong resemblance to

the plan of St Front at Perigueux in France (1120). The addition of a narthex before the main front and a vestibule on the northern side brings the whole western arm of the cross to a square on plan. In elevation the facade seems to have connexion with the five-bayed facade of the Kahriyeh Jam6, or mosaic mosque, at Constantinople. The exterior facade is enriched with marble columns brought from Alexandria and other cities of the East, and bearing in many cases incised graffiti. Mosaics are employed to decorate the spandrils of the arches. Only one of the original mosaics now exists, the one over the doorway at the north-western, or St Alipio, angle. Its subject, which is of high historical value as a record of costume, represents the translation of the body of St Mark, and gives us a view of the west facade of the church as it was at the beginning of the 13th century before the addition of the ogee gables, with alternat- ing crockets and statues, and the intermediate pinnacled canopies placed between the five great arches of the upper storey. The top of the narthex forms a wide gallery, communicating with the interior at the triforium level. In the centre of this gallery stand the four colossal bronze horses which belonged to some Graeco-Roman triumphal quadriga, and were brought to Venice by the Doge Enrico Dandolo after the fall of Constantinople in 1204; they were carried off by Napoleon to Paris in 1797, and restored by Francis of Austria in 1815.

Mosaic is the essential decoration of the church, and the architec- tural details are subordinated to the colour scheme. These mosaics belong to very various dates. The Doge Domenico Selvo began the decoration of the church in 1071, though it is uncertain whether any of his work can be now identified. The mosaics of the domes would seem to belong to the 12th century, probably before 1150. The mosaics of the atrium date from 1200 to 1300 ;

the subjects are taken from Old Testament story. The baptistery mosaics represent the life of St John. The mosaics in the chapel of St Isidore (finished by Andrea Dandolo), giving us the life of the saint, were executed in 1355. In the sacristy is a series of 10th-century mosaics, and in other parts of the church are inferior and later mosaics from cartoons by later Venetian masters. Below the mosaics the walls and arches are covered with rare marbles, por- phyries and alabaster from ancient columns sawn into slices and so arranged in broad bands as to produce a rich gamut of colour.

The eastern crypt, or confessio, extends under the whole of the choir and has three apses, like the upper church. The body of St Mark formerly rested here, but is now within the high altar. Below the nave is another crypt. The floors of both crypts have sunk considerably and are often under water; this settlement accounts for the inequalities of the pavement. The original part of the magnificent mosaic pavement probably dates from the middle of the 12th century, if we may judge from the pavement at Murano, exactly similar in style, material and workmanship, which bears the date 11 40. The pavement consists partly of opus Alexandrinum of red and green porphyry mixed with marbles, partly of tesselated work of glass and marble tesserae.

The choir stands about 4 ft. above the nave and is separated from it by a marble rood-screen, on the architrave of which stand fourteen figures, the signed work of Jacobello and Pietro Paolo delle Masegne, 1394.

The Pala d'oro, or retable of the high altar, is one of the chief glories of St Mark's. It is one of the most magnificent specimens of goldsmiths' and jewellers' work in existence. It was ordered in 976 at Constantinople by the Doge Pietro I. Orseolo, and was enlarged and

enriched with gems and modified in form, first by a Greek artificer in 1105, and then by Venetians between 1209 and 1345. It is composed of figures of Christ, angels, prophets and saints, in Byzantine enamel run into gold plates. It is about 1 1 ft, 6 in. wide, and about 4 ft. 8 in. high. It contains 1300 great pearls, 400 garnets, 90 amethysts, 300 sapphires, 300 emeralds, 15 rubies, 75 balas rubies, 4 topazes, 3 cameos; the gems, except where they have been replaced, are cut en cabochon. The treasury of St Mark's contains a magnificent collection of church plate and jewels.

Fine examples of Venetian Byzantine palaces — at least of the facades— are still to be seen on the Grand Canal and in some of the small canals. The interiors have been modified

*past recognition of their original disposition. The Byzantine palace seems to have had twin angle-towers — gemihas angulares tunes — such as those of the Ca' Molin on the Riva degli Schiavoni, where Petrarch lived. The Byzan- restored (1880) Fondaco ' dei Turchi (13th century), tine now the Museo Civico, also has two angle-towers. The P*taets. facades presented continuous colonnades on each floor with semi- circular high stilted arches, leaving a very small amount of wall space. The buildings were usually battlemented in fantastic form. A good specimen may be seen in Lazzaro Sebastiani's picture of the piazzetta, in the Museo Civico. There on the right we see the handsome building of the old bakery, occupy- ing the site of the present library; it has two arcades of Saracenic arches and a fine row of battlements. Other specimens still in existence are the municipal buildings, Palazzo Loredan and Palazzo Farsetti — if, indeed, these are not to be considered rather as Romanesque-^and the splendid Ca' da Mosto, all on the Grand Canal. The richest ornamentation was applied to the arches and string courses,*

while plaques of sculpture, roundels and coats of arms adorned the facades. The remains of a Byzantine facade now almost entirely built into a wall in the Rio di Ca' Foscari offer us excellent illustra- tion of this decorative work.

*Fig. 1. — Square of St Mark and surrounding buildings. The original campo was bounded on the west by the canal B, with the 6th-century church of S. Geminiano, C, on its west bank. The first enlargement of the square was effected by Doge Sebastiano Ziani in 1 176, when he filled up the canal and rebuilt the Church on a new site at D, thus nearly doubling the size of the square. Lastly, the square was extended southwards in the 1 6th century, when the new palace of the procurators, K, was built by Scattibzzi. Gentile Bellini's picture shows a line of houses along FF, reaching up to the great campanile, A. Napoleon L in 1805-10 pulled down the church of S. Geminiano and built a new block at the west end of the square, L. The dates of the various parts of the' existing ducal palace are indicated on the plan; the rebuilding was carried on in the following order, P, Q, R, S, T, U, V. At Z is the treasury of St Mark, which was originally one of the toWers belonging to the old ducal palace; E, site of old houses; G, clock- tower; H, old palace of procurators; J, old library; M„ two columns; N, Ponte della Paglia; O, Bridge of Sighs; W, Giants' Staircase; X, sacristy of St Mark; Y, Piazzetta. **

Gothic Architecture.— Venetian Gothic, both ecclesiastical and domestic, shares most of the characteristics of north Italian Gothic generally, though in domestic architecture it displays one peculiarity which we shall presently note. The material, brick and terra- cot ta, is the determining cause of the characteristics of north Italian Gothic

1 This palace was originally the property of

the Pesaro family, and afterwards of the duke of Este, and finally of the republic, which used it as a dwelling-place for royal guests before letting it to Turkish merchants. The word Fondaco (derived through Arabic from the Greek iravSoxtiov), as applied to some of the Venetian palaces, denotes the mercantile headquarters of a foreign trading nation. Those still existing are the Turkish and the German (F. de' TedtscM), the latter now converted into the post office.

Flatness and lack of deep, shadows, owing to the impossibility of obtaining heavy cornices in that material, mark the style. The prevalence of sunlight led to a restriction of the windows and exaggeration of wall space. The development of tracery was hindered both by the material and by the relative insignificance of the windows. On the other hand, the plastic quality of terra- cotta, suggested an abundance of delicate ornamentation on a small scale, which produced its effect by its own individual beauty without broad reference to the general scheme. Coloured marbles and frescoes served a like purpose. The exteriors of the north Italian Gothic churches are characterized by the flatness of the roof ; the treatment of the west facade as a mere screen wall, masking the true lines of the aisle roofs; the great circular window in the west front for lighting the nave; the absence of pinnacles owing to the un- importance of the buttresses ; the West-end porches with columns resting on lions or other animals. The peculiarity of Venetian domestic Gothic to which we have referred is this: we frequently find tracery used to fill rectangular, not arched, openings. The result is that the tracery itself has to support the structure above it — is, in fact, constructional — whereas in' most other

countries' the tracery is merely, as it were, a pierced screen filling in a construc- tional arch. Hence the noticeable heaviness of Venetian tracery.

The ducal palace, like St Mark's, is a symbol and an epitome of the race which evolved it. Soon after the concentration the- at Rialto the doge Angelo Particiaco began an official

ducal residence for the head of the state. It was probably

palace. a gmai^ strongly fortified castle; one of its massive angle-towers is now incorporated in St Mark's and serves as the? treasury. During the earlier years of the republic the dudii palace was frequently destroyed and rebuilt. It was burnt in 976 and again in x 106. At the close of the 12th century (1173-1179), Sebastian Sani ae^ored an4 enlarged the palace. ■ Of hi work some traces stilt remain, in Ae richly sculptured bands built, in at intervals along the i^h^totury f acacle on the Ufa, Sod part of the handsome larch- wood beams which, formed the loggia of the piazzetta facade, stiljt" visible on the. inner wall of the present loggia. The present magnificent building was a sloir growth extending over three centuries and expanding gradually as the republic gre^ in riches: > ? ;*

The. palace as we now see it f was begun about 1300 by Doge Pietto Gradenigo, who soon after the closing of the gre^t. council gave .its permanent form to the Venetian constitution. It is there- fore2,ia a sense, contemporaneous with the early manhood of the state. Gradenigo built the facade along the Rio. About 1309 the arcaded facade along the lagoon front was taken in hand, and set the design for the whole of the external frontage of the palace. Towards the end of the 14th century, this facade, with its lower colonnade, upper loggia with handsome Gothic tracery, and the vast impending upper

storey, which give to the whole building its striking appearance and audacious design, had been carried as far as the tenth column on the piazzetta side. At this point, perhaps out of regard for the remains of Ziani's palace, the work seems to have been arrested for many years, but in 1424 the building was resumed and carried as far as the north-west, or judgment, angle, near St Mark's, thus completing the sea and piazzetta facades as we now see them. The great gateway, the Porta della Carta, was added in 1430-42 from designs by Bartholomeo Buono (or Bon) and his son. The block of buildings in the interior, connecting the Porta della Carta to the Rio wing, was added about 1462 by the doge Cnstoforo Moro. In 1479 a fire consumed the earlier buildings along the Rio, and these were replaced (1480-1550) by the present Renaissance structure.

The two main facades, those towards the sea and the piazzetta, consist of a repetition of the same design, that which was begun in the early years of the 14th century. The name of the architect who began the work and thus fixed the design of the. whole is not certainly known, but it must have been a man of an earlier genera- tion than that of Filippo Calendario, who is often stated to have been the chief architect of the older portion. Calendario was an accomplice in the conspiracy of Marino Faliero, and was executed together with the doge in 1355. It appears probable that a Venetian architect and sculptor named Pietro Baseggio was the chief master- builder in the first half of the 14th century. The design of these' facades is very striking and unlike that of any other building in the world. It consists of two storeys with open colonnades, forming a long loggia on the ground and first floors, with seventeen arches on the sea front and eighteen on the other facade. Above this is a lofty third storey, pierced with a few large windows, with pointed arches once filled with

tracery, which is now lost. The whole surface of the ponderous upper storey is covered with a diaper pattern in slabs of creamy white Istrian stone and red Verona marble, giving a delicate rosy-orange hue to the building. Very beautiful sculpture, executed with an ivory-like minuteness of finish, is used to decorate the whole building with Wonderful profusion.

At each of the three free angles is a large group immediately over the lower column. At the south-east angle is the " Drunkenness of Noah," at the south-west the " Fall of Man," and at the north-west the " Judgment of Solomon." Over each, at a much higher level, is a colossal figure of an archangel— Raphael, Michael and Gabriel.

The great internal court is surrounded with arcading. From the interior of the court access is given to the upper loggia by a very beautiful staircase of early Renaissance style, built in the middle of the 15th century by Antonio Rizzo. Two colossal statues of Neptune and Mars at the top of these stairs were executed by Jacopo Sansovino in 1554— hence the name "giants' staircase." Owing to a fire which •gutted a great part of the palace in 1574, the internal appearance of the rooms was completely changed, and the fine series of early Paduan and Venetian paintings which decorated the walls of the chief rpoms was lost. At present the magnificent council chambers for the different legislative bodies of the Venetian republic and the state apartments of the doges are richly decorated with gilt carving and panelling in the style of the later Renaissance. On. the walls of the chief council chambers are a magnificent series of oil-paintings by Tintoretto and other less able Venetians — among them Tintoretto's masterpiece, " Bacchus and Ariadne," and his enor- mous picture of Paradise; the largest oil-painting in the world.

Among the many Gothic churches of Venice the largest are the Franciscan church of Santa Maria Gloriosa del Frari (1250- 1280), and the Dominican church of SS. Giovanni e

Gothic churches.

Paolo (1 260-1400). The Frari is remarkable for its fine choir-stalls and for the series of six eastern chapels which from outside give a very good example of Gothic brick- work, comparable with the even finer apse of the now dese- crated church of San Gregprio. The church of SS. Giovanni e Paolo was the usual burying- place of the doges, and contains many noble mausoleums of various dates. Besides these two churches we may mention Santo Stefano, an interesting build- ing of central Gothic, " the best ecclesiastical example of it in Venice." The apse is built over a canal. The west entrance is later than the rest of the edifice and is of the richest Re- naissance Gothic, a little earlier than the Porta della Carta.

But it is in the domestic architecture of Venice that we find the most striking and characteristic examples of Gothic. The introduction of that style coincided with the consolidation of the Venetian constitution and the m^iacea. development of Venetian commerce both in the Levant and with England and Flanders. The wealth which thus accrued found architectural expression in those noble palaces, so characteristic of Venice, which Tine the Grand and smaller canals. They are so numerous that we cannot do more than call, attention to one or two.

The most striking example is undoubtedly the Ca' d' Oro, so called from the profusion of gold employed on its facade. It was built for Marino Contarini in 1421, rather a late period in the development of the style.

Marino kept a minute entry of his expenses, 1 a

*document of the highest value, not merely for the history of the building, but also for the light it throws on the private life of the great patricians who gave to Venice such noble examples of art. Contarini Was to some extent his own architect. He had the assistance of Marco d' Amadeo, a mast'er*builder, and of Matteo Reverti, a Milanese sculptor, who were joined later on by Giovanni Buono and his son Bartolomeo. Other artists, of whom we know nothing else, such as Antonio Busetto, Antonio Foscolo, Gasparino Rosso, Giacomo da Como, Marco da Legno and others, were called in to help in evolving this masterpiece of decorated architecture, affording us an example of the way in which the ducal palace and other monuments of Venice grew out of the collaboration of numerous nameless artists. By the year 143 1 the fagade was nearly completed, and Contarini made a bargain with Martino and Giovanni Benzon for the marbles to cover what was yet unfinished. The facade is a triumph of graceful elegance; so light is the tracery, so rich the decoration, so successful the breach of symmetry which gives us a wing upon the left-hand side but none upon the right. But Con- tarini was not content to leave the marbles as they were. He desired to have the facade of his house in colour. The contract forthis work, signed with Master Zuan de Franza, conjures up a vision of the Ca d' Oro ablaze with colour and gleaming with the gold ornamentation from which it took its name.*

Other' notab^ examples of this style are the Palazzo Ariani at San Raffaeile, with its handsome window in a design of intersect- ing circles; the beautiful window with the symbols of the four Evangelists in the spandrils, in_ the facade of a house at San Stae ; the row of three Giustinian palaces at S, Barnaba ; the Palazzo Priuli at Sari Severo, with a 1 remarkably graceful angle- window, where the columnar mullion carries down the angle of the*

wall ; the flamboyant balconies of the Palazzo Contarini Fasan ; the Palazzo Bernardo on a side canal near S. Polo,, a late central Gothic building (1380–1400) which Ruskin describes as "of the finest kind and superb in its effect of colour when seen from the side. Taken as a whole, after the ducal palace this is the noblest effect of all in Venice."

Early Renaissance. — Towards the close of the 15th century Venetian architecture began to feel the influence of the classical revival; but, lying far from Rome and retaining still her connexion with the East, Venice did not fall under the sway of the classical ideals either so quickly or so completely as most Italian cities. Indeed, in this as in the earlier styles, Venice struck out a line for herself and developed a style of her own, known as Lombardesque, after the family of the Lombardi (Solari) who came from Carona on the Lake of Lugano and may be said to have created it.

The essential point about the style is that it is intermediary between Venetian Gothic and full Renaissance. We find it retaining some traces of Byzantine influence in the decorated surfaces of applied marbles, and in the roundels of porphyry and verd antique, while it also retained certain characteristics of Gothic, as, for instance, in the pointed arches of the Renaissance facade in the courtyard of the ducal palace designed by Antonio Rizzo (1499). Special notes of the style are the central grouping of the windows, leaving comparatively solid spaces on each side, which gives the effect of

Churches.

Fig. 2. — Ca' d' Oro, as originally built.

•a main building with wings; the large amount of window space; the comparative flatness of the facades ; the employment of a cornice to each storey; the effect of light and shade given by the balconies; and in churches by the circular pediments on the facades.

The most perfect example of this style in ecclesiastical archi- tecture is the little church of the Miracoli built by Pietro Lombardo in 1480. The church is without aisles, and has a Semicircular roof, and the choir is raised twelve steps above the floor of the nave. The walls, both internally and externally, are encrusted with marbles. The facade has the characteristic circular pediment with a large west window surrounded by three smaller windows separated by two orna- mental roundels in coloured marble and of geometric design. Below the pediment comes an arcade with flat pilasters, which runs all round the exterior of the church. Two of the bays contain round-headed windows; the other three are filled in with white marble adorned by crosses and roundels in coloured marble. The lower order contains the flat pilastered portal with two panelled spaces on each side.

Similar results are obtained in the magnificent facade of the Scuola di San Marco, at SS. Giovanni e Paolo, which has six semi- circular pediments of varying size crowning the six bays, in the upper order of which are four noble Romanesque windows. The lower order contains the handsome portal with a semicircular pediment, while four of the remaining bays are filled with quaint 3cenes in surprisingly skilful perspective. The facade of San Zaccaria (1457-1515), the stately design of Anton Marco Gambello •nd Mauro Coducci, offers some slight modifications in the use of

Palaces,

the semicircular pediment, the line of the aisle roof being indicated by quarter-circle pediments abutting on the facade of the nave San Salvadore, the work of Tullio Lombardo (1530), is severer and less highly ornamented than the preceding examples, but its plan is singularly impressive, giving the effect of great space in a com- paratively small area. In this connexion we must mention the Scuola of S. Giovanni Evangelista at the Frari, with its fore-court and screen adorned by pilasters delicately decorated with foliage in low relief, and its noble staircase whose double flights unite on a landing under a shallow cupola. This also was the work of Pietro Lombardo and his son Tullio.

Early Renaissance palaces occur frequently in Venice and form a pleasing contrast with those in the Gothic style. The Palazzo Dario with its dedication, Urbis genio, the superb Manzoni-Montecuculi-Polignac, with its friezes of spread-eagles in low relief, and the Vendramini-Calergi or Non nobis palace, whose facade is characterized by its round- headed windows of grouped twin lights between columns, are among the more important; though beautiful specimens, such as the Palazzo Trevisan on the Rio della Paglia, and the Palazzo Corner Reali at the Fava, are to be found all over the city.

Later Renaissance— —When we come to the fully developed Renaissance, architecture in Venice ceases to possess that peculiarly individual imprint which marks the earlier Library styles. It is still characterized by great splendour; ofSaa indeed, the library of San Marco, built by Jacopo Ma ″ !0 - Sansovino in 1536, is justly considered the most sumptuous example of Renaissance architecture in the world. It is rich, ornate, yet hardly florid, distinguished by splendid effects of light and shade, obtained by a far bolder use of projections than had hitherto been found in the somewhat flat design of Venetian facades. The columned,

round-headed windows are ".set in deeply between the pillars which carry the massive entablature, and this again is surmounted by a balustrade with obelisks at each angle and figures marking the line of each bay. The Istrian stone of Which the edifice is built has taken a fine patina, which makes the whole look like some richly embossed casket in oxidized silver.

The full meaning of the change which had come over Venetian architecture, of the gulf which lies between the early Lombard- esque style, so purely characteristic of Venice, and the fully developed classical revival, which now assumed undisputed sway, may best be grasped by comparing the old and the new Procuratie. Not more than eighty years separate these two buildings; the old Procuratie were built by Bartolomeo Buopo about 1500, the new by Scamozzi in 1580, yet it is clear that each belongs to an entirely different world of artistic ideas. The Procuratie Vecchie is perhaps the longest arcaded facade in the world and certainly shows the least amount of wall space; the whole design is simple, the moulding and ornamenta- tion severe. The Procuratie Nuove, which after all is merely Scamozzi's continuation of Sansovino's library, displays all the richness of that ornate building.

Among the churches of this period we may mention San Geminiaho, designed by Sansovino, and destroyed at the beginning of the 19th century to make room for the ball-room built by Napoleon _ for Eugene Beauharnais. The churches of San Giorgio Churches. Maggiore and of the Redentore, a votive church for liberation from the plague, are both by Palladio. In 1632 Baldassare Longhena built the fine church of Santa Maria della Salute, also a votive church, erected by the state to commemorate the cessation of the plague of 1630. This noble pile, with a large and handsome dome, a secondary cupola over the altar, and a striking

portal and flight of steps, occupies one of the most conspicuous sites in Venice on the 1 point of land that separates the mouth of the Guidecca from the Grand Canal. In plan it is an octagon with chapels projecting one on each side. The volute buttresses, each crowned with a statue, add quaintly but happily to the general effect. After Longhena's date church architecture in Venice declined upon the dubious taste, of baroque; the facades of Sari Moise and of Santa Maria del'Giglio are good specimens of this style.

The palaces of the later Renaissance are numerous arid frequently grandiose though frigid in design. The more remarkable are Sansovino's Palazzo Corner, Longhena's massive and imposing Palazzo Pesaro, the Palazzo Rezzonico, from ftoacea. designs by Longhena with the third storey added by Massari, Sammicheli's Palazzo Corner at San Polo, and Massari's well-propor- tioned and dignified Palazzo Grassi at San Samuele, built in 1 740.

Modem Buildings.— In recent times the general prosperity of the city, which is on the ascendant, has brought about a revival of domestic and civic architecture. The architects Rupolo and Sardi have erected a considerable number of build- ings, in which they have attempted, and with considerable success, to return either to Venetian Gothic or to the early Renaissance Lombardesque style. The most striking of these modern buildings are the new wing of the Hotel dTtalie, San Moise, and the very successful fish market at Rialto, designed by Laurenti and carried out by Rupolo, in which a happy return to early Venetian Gothic has been effected in conjunction with a skilful adaptation of one of the most famous of the old houses of Venice, the Stalon, or palace of the

Quirini family.

Gild Halls. — Among the most remarkable buildings in Venice are the scuole, or gild halls, of the various confraternities. They were pious foundations created for mutual benefit and for purposes of charity. The scuole were divided into the six scuole grandi, so called from their numbers; wealth and privileges, and the scuole minori or fragile, which in most cases were associated with an art or craft. The scuole minori were usually attached to some church in the quarter where the particular trade flourished. They had their special altar dedicated to the patron of the gild, a private burying- place, and a room in which they held their chapter. The six scuole grandi, San Teodoro, S. Maria della Carita, S. Giovanni Evangelista, San Marco, della Misericordia and San Rocco, on the other hand, built themselves magnificent gild halls. We have already mentioned two of these, the Scuola di San Giovanni Evangelista and the Scuola di San Marco, both of them masterpieces of the Lombardesque style. The Scuola di San Marco is now a part of the town hospital, and besides its facade, already described, it is remarkable for the handsome carved ceiling in the main hall (1463). Other beautiful ceilings are to be found in the great hall and the hall of the Albergo in the Scuola della Carit&, now the Accademia. They are the work of Marco Cozzi of Vicenza and were executed between 1461 and 1464. The design of the former is a trellis crossing the ceiling diagonally; in each of the lacunae is carved a cherubim with eight wings; the figures and the trellis are gilded; the ground is a rich ultramarine. But the most magnificent of these gild halls is the Scuola di San Rocco, designed by Bartolomeo Buono in 1517 and carried out by Scarpagnino and Sante Lombardo. The facade on the Campo is large and pure in conception. The great staircase and the lower and upper halls contain the unrivalled

series of paint- ings by Tintoretto, which called forth such unbounded enthusiasm on the part of Ruskin.

Campanili. — Among the more striking features of Venice we must reckon the campanili or bell-towers (see Campanile). These were at one time more numerous than at the present day; earth-quakes and subsidence of foundations have brought many of them down, the latest to fall being the great tower of San Marco itself, which collapsed on July 14th, 1902. Its reconstruction was at once undertaken, and completed in 1910. In a few other cases, for example at San Giorgio Maggiore, the fallen campanili were restored ; but for the most part they were not replaced. The Venetian cam-panile usually stands detached from the church. It is almost invariably square; the only examples of round campanili in this part of Italy are to be found at Ravenna and at Caorle to the east of Venice; while inside Venice itself the solitary exception to the square plan was the campanile of San Paternian, built in 999 and now demolished, which was a hexagon. The campanile is usually a plain brick shaft with shallow pilasters running up the faces. It has small angle-windows to light the interior inclined plane or staircase, and is not broken into storeys with grouped windows as in the case of the Lombard bell-towers. Above the shaft comes the arcaded bell-chamber, frequently built of Istrian stone; and above that again the attic, either round or square or octagonal, carrying either a cone or a pyramid or a cupola, sometimes sur- mounted by a cross or a gilded angel which serves as a weather-cock. Cressets used to be kept burning at night on some of the campanili to serve as beacons for those at sea. Among the existing campanili the oldest are San Geremia, dating from the nth century, San Samuele from the 12th, San Barnaba and San' Zaccaria from the 13th. The campanile of S. Giovanni Elcmosinario at Rialto (1398- 1

400) is called by Ruskin ″ the most interesting piece of central Gothic remaining comparatively intact in Venice.′

Public Monuments.— Venetian sculpture is for the most part ancillary to architecture; for example, Antonio Rizzo′s ″ Adam ″ and "Eve" (1464), which face the giants′-staircase in the ducal palace, are parts of the decorative scheme; Sansovino′s splendid monument to Tomaso Rangone is an essential feature of the facade of San Gjuliano. The most successful Venetian sculpture is to be found in the many noble sepulchral private monuments. The jealousy of the Venetian republic forbade the erection of monuments to her great men. The sole exception is the superb equestrian statue in honour of the General Bartolomeo Colleoni, which stands on the Campo′ SS. Giovanni e Paolo. By his will Colleoni left his

The arsenal.

vast fortune to Venice on condition that a monument should be raised to him at St Mark′s. He meant the great piazza, but by a quibble the republic evaded the concession of so unique an honour and claimed to have fulfilled the conditions of the bequest by erecting the- monument at the Scuola of St Mark. The republic entrusted the work to the Florentine Verrocchio, who dying before the statue was completed begged the government to allow his pupil Lorenzo di Credi to carry it to a conclusion. The Venetians, however, called in Alessandro Leopardi, who cast the great equestrian group and added the pure and graceful pedestal. The monument was un- veiled on the 21st of March 1496. Leopardo was also the creator (1505) of the three handsome bronze sockets in front of St Mark′s which held the flagstaffs of the banners of Cyprus, Morea and Crete, • when the republic was mistress of those territories.

By the side of the sea in the piazzetta, on to which the west facade of the ducal palace faces, stand two ancient columns of Egyptian granite, one red and the other grey. These great monoliths were brought as trophies to Venice by Doge Domenico Michieli in 1 126, after his victories in Syria. In 1180 they were set up with their present fine capitals and bases by a Lombard engineer, Niccolo de' Barattieri. The grey column is surmounted by a fine bronze lion of Byzantine style, cast in Venice for Doge Ziani about 1 1 78 (this was carried off to Paris by Napoleon in 1797, and sent back in pieces in 18 16; but in 1893 it was put together again) ; and in 1329 a marble statue of St Theodore, standing upon a crocodile, was placed on the other column. Among modern monuments the most successful is that to Goldoni at San Bartolomeo near the Rialto. It is the work of the sculptor dal Zotto.

Institutions. — Perhaps the most famous institution of Venice is the arsenal, whose history and activity has continued unbroken from the earliest days of the republic down to the present time. The arsenal was founded about the year 1104 by the doge Ordelap Falier. Before that date Venetian shipping was built at the spot near the piazzetta, known as the terra nova, where the royal gardens now are. The arsenal, which was famous in Dante's day, received its first enlargement in 1304, when, on the design of Andrea Pisano, new building sheds and the rope walk or Tana were erected. Pisano's building sheds, nine in a row, with peculiarly shaped roofs, were still standing intact — one of the most interesting medieval monuments of Venice — until recently, but they have been modified past recognition. In 1325 the second addition, the arsenate nuovo, was made, and a third, the arsenate nuovissimo, in 1473; a fourth, the Riparto delle Galeazze, about 1539; and in 1564 the fifth enlarge-

ment, the Canal delle Galeazze e Vasca, took place. After the fall of the republic the arsenal continued to occupy the attention of the various governments. In 1810 the site of the suppressed convent and church of the Celestia was added. The entire circuit of the arsenal, about two miles in extent, is protected by a lofty wall with turrets. The main door of the arsenal is the first example in Venice of the purely classical style. It is a noble portal, erected in 1460, apparently from designs by Fra Giocondp, with the lion of St Mark in the attic. The statuary, with Sta Giustina on the summit of the' tympanum, was added in 1571 and 1578. The whple design was modified in 1688 so as to represent a triumphal arch in honour of Morosini Peloponnesiaco, who brought from Athens to Venice the four lions in Pentelic marble which now stand before the gate. (On the largest of these lions is cut a runic inscription recording an attack on the Piraeus in the I Ith century by Norse warriors of the Varangian guard, under Harold Hardrada, afterwards — 1047— kirtg of Norway.) The arsenal suffered frequently and severely from fires, the worst being those of 1509 and 1569; yet such was the wealth of Venice that in the following year she put upon the seas the fleet that crushed the Turks at Lepanto in 1571.

The Lido, which lies about 2 m. S.E. of Venice and divides the lagoon from the sea, is rapidly becoming a fashionable bathing-place. The point of San Nicolo del Lido is strongly fortified to _. Llda protect the new entrance to the port (see harbour). Inside the fortress lies the old Protestant burying-ground, with tombs of Sackville, of John Murray, of Sir Francis Vincent, last ambassador but one from Great Britain to the republic, of Consul Smith, whose collection of books forms the nucleus of the King's library in the British Museum, and of Catherine Tofts, the singer, Smith's first wife. At Sant' Elisabetta is the bathing

establishment.

Libraries. — The library of San Marco contains upwards of 35,00b printed volumes and about 10,000 manuscripts. The library is said to owe its origin to Petrarch's donation of his books to the republic. Most of these have now disappeared. In 1635 Fra Fortunato Olmo found in a room over the great door of St Mark's a number of books which he supposed to be Petrarch's gift. He sent a list to Tomasini, who published it in his Petrarca Redivivus (Patavii, 1 635). These codices passed to the Marciana, and Zanetti catalogued them as the Fondo antico. It is very doubtful whether these books really belonged to Petrarch. We may date the true foundation of the library to the donation of Cardinal Bessarion. Bessarion had intended to bequeath his books to the Benedictines of San Giorgio Maggiore, but Pietro Morosini, Venetian ambassador at Rome, pointed out the inconvenience of housing his library on an island that could not easily be reached. The cardinal therefore obtained a bull from Pone Paul II., permitting him to recall his

original donation, and in a letter dated from' the baths of Viterbo, May 13th, 1468, he made over his library to the republic. The

Erincipal treasures of the collection, including splendid Byzantine ook-covers, the priceless codices of Homer, the Grimani Breviary, an early Dante, &c. , are exhibited under cases in the Sala Bessarione in the Zecca or mint where the library has been installed. Another library was left to the public by the munificence of Count Quirini- Stampalia, who bequeathed his collections and his house at Santa Maria Formosa to be held in trust for

students. The state archives are housed in the Franciscan monastery at the Frari. They contain the voluminous and invaluable records of the Venetian republic, diplomatic, judicial, commercial, notarial, &c._ Under the republic the various departments of state stored their records in various buildings, at the ducal palace, at the Scuola di San Teodoro, at the Camerlenghi. The Austrian government gathered all these into one building and arranged the vast masses of papers in fairly con- venient order. Though the state papers of Venice have suffered from fire and the series begins comparatively late, yet their fullness and the world-wide sweep of Venetian interests render this collection an inexhaustible storehouse of data for students. Among other learned institutions we may mention the Ateneo Veneto, the De- putazione per la Storia Patria, and the Royal Institute of Science, Letters and Art, which has its seat in the Palazzo Loredan at Santo Stefano.

Harbour.— Under the republic commercial shipping used to enter Venice by the port of San Nicolo del Lido and lie along the quay called the Riva degli Schiavoni, in the basin of San Marco, and up the broad Giudecca Canal. But with the decline of Venice the trade of the port fell off; the mouth of the Lido entrance became gradu- ally silted up owing to the joint action of the tide and the current, and for many years complete stagnation characterized the port. Under Austrian rule a revival began, which has been continued and intensified since Venice became part of united Italy. When the railway bridge brought Venice into touch with the mainland and the rest of Europe, it became necessary to do something to reopen the harbour to larger shipping. The Austrians, abandoning the nearer Lido entrance to the lagoons, resolved to deepen and keep open the Malamocco entrance. This is 8 m. distant from Venice, and can only be reached by a long and tortuous

channel across the lagoon, whose course is marked out by those groups of piles which are so characteristic a feature of the lagoon landscape. The channel required constant dredging and was altogether incon- venient; yet for many years it remained the main sea approach to Venice. A dock was constructed at the western or farther end of the Giudecca Canal, near the railway. The unification of Italy, the growing prosperity of the country, above all the opening of the Suez Canal, which restored to Venice the full value of her position as the port farthest into the heart of Europe, brought about an immense expansion of trade. The government accordingly resolved to reopen the Lido entrance to the lagoon, and thus to afford a shorter and more commodious access from the sea. As at the Malamocco entrance so at the Lido, two moles were run out in a south-westerly direction; the westerly is about 2 m., the easterly about 3 m. in length. The natural scour thus created has given a depth of 26 ft. of water through the sand-bank. The mean rise and fall of the tide is about 2 ft., but under certain con- ditions of wind the variation amounts to 5 ft. and over. The health of the city depends, of course, to a large extent on this ebb and flow. The government also turned its attention to the inadequate accommodation at the docks, and proposals for a new quay on the western side of the present basin, and for a second basin 900 yds. long and 170 yds. wide, were the result.

Trade. — A comparison between the exports and imports of the years 1886 and 1905 will give an exact idea of the rate at which the port of Venice developed. In 1886 the total value of exports to foreign countries amounted to £7,239,479; of imports, £8,788,012. In 1905 the exports to foreign countries valued £11,650,932, the imports £13,659,306. As has been the case throughout her history, the trade of Venice is still mainly a transit trade.

Wheat, coal, cotton, petroleum, wood, lime and cement are brought into Venice for shipment to the Levant or for distribution over Italy and Europe.

Venice became very celebrated in the 15th century for textiles. Its damasks and other silk stuffs with patterns of extraordinary beauty surpassed in variety and splendour those of the other chief centres of silk-weaving, such as Florence and Genoa. In addition to the native stuffs, an immense quantity of costly Oriental carpets, wall-hangings and other textiles was imported into Venice, partly for its own use, and partly for export throughout western Europe. On occasions of festivals or pageants the balconies, the bridges, the boats, and even the facades of the houses, were hung with rich Eastern carpets or patterned textiles in gold and coloured silk. The glass manufactory of Murano (q.v.), a small island about 1 J m. to the north of Venice, was a great source of revenue to the republic. Glass drinking cups and ornamental vessels, some decorated with enamel painting, and " silvered " mirrors were produced in great quantities from the 14th century downwards, and exported. Like many other arts in Venice, that of glass-making appears to have been imported from Moslem countries, and the influence of Oriental design can be traced in much of the Venetian glass. The art of making stained-

glass windows was not practised by the Venetians ; almost the only fine glass in Venice is that in a south transept window in the Dominican church, which, though designed by able Venetian painters, is obviously the work of foreigners.

The ancient glass-bead industry (conterie), which some years since suffered severely from over-production, has now regained its position through the union of the different factories, by which the output is controlled in such a way

as to render trade profitable. Venetian beads are now sent in large quantities to the various colonies in Africa, and to India, Sumatra and Borneo. Similarly, the glass industry has revived. New amalgams and methods of colour- ing have been discovered, and fresh forms have been diligently studied. Special progress has been made in the production of mirrors, electric lamps, candelabra and mosaics. New industries are those of tapestry, brocades, imitation of ancient stuffs, cloth of silver and gold, and Venetian laces. The secret of lace-making was believed to have been lost, but the late Signor Fambri discovered at Chioggia an old woman who knew it, and placed her at the head of a lace school. Fambri was ruined by his enterprise, but other manufacturers, more expert than he, drew profit from his initiative, and founded flourishing factories at Pellestrina and Burano. Other important industries are wood-carving (of an artistic excellence long unknown), artistic iron- working, jewelling, bronze-casting, the production of steam-engines, machinery, matches (largely exported to Turkey, Egypt, Russia, Austria-Hungary and Greece), clock-making, wool-weaving and the manufacture of chemical manures.

Population. — In 1548 the population of Venice numbered 158,069; in 1607-29, 142,804; in 1706, 140,256; in 1785, 139,095; in 1881, 132,826. The municipal bulletin of the 31st of December 1906 gives a total of 169,563, not including 4835 soldiers.

Administration. — Venice is administered by a prefect repre- senting the crown and responsible to the central government at Rome, from whom he receives orders. Under his cognizance come questions of public order, health and elections to parlia- ment. The two arms of the police, the Carabinieri and the Publica Sicurezza, are at his disposal. Purely local matters, however, are in the hands of the

municipio or town council. At the head of the town council is the Sindaco or mayor, elected by the council itself.

Under the republic, and until modern times, the water supply of Venice was furnished by the storage of rain-water supplemented by water brought from the Brenta in boats. The famous Venetian pozzi, or wells for storing rain-water from the roofs and streets, consisted of a closed basin with a water-tight stratum of clay at the bottom, upon which a slab of stone was laid ; a brick shaft of radiating bricks laid in a permeable jointing material of clay and sand was then built. At some distance from the shaft a square water-tight wall was built, and the space between it and the shaft was filled in with sand, which was purified of all saline matter by repeated washings ; on the ground-level perforated stones set at the four corners of the basin admitted the rain-water, which was discharged from the roofs by lead pipes ; this water filtered through the sand and percolated into the shaft of the well, whence it was drawn in copper buckets. The present water supply, introduced in 1884, is brought from the commune of Trebaseleghe, where it is collected from 120 artesian wells. It is carried under the lagoon to Sant' Andrea, where the reservoirs are placed.

Of the 19,000 houses in Venice only 6000 have drains and sinks, all the others discharge sewage through pipes directly or indirectly into the canals. With the rise and fall of the tide the discharge pipes are flushed at the bottom. An important investigation undertaken by the Bacterioscopical Laboratory, with regard to the pollution of the Venetian canals by the city sewage, led to the discovery that the water of the lagoons possesses auto-purifying power, not only in the large canals but even in the smallest rami- fications of the waterways. The investigation was carried out with scrupulous scientific rigour upon samples of

water taken in every part of the city, at all states of the tide and under various atmospheric conditions.

The church is ruled by the patriarch of Venice, the metropolitan of the province formed by the Veneto. The patriarch of Venice is usually raised to the purple. The patriarchate dates from 1451, when on the death of Domenico Michiel, patriarch of Grado, the seat of that honour was transferred from desolate and insalubrious Grado to the cathedral church of Castello in Venice, and Michiel's successor, Lorenzo Giustinian, assumed the title of patriarch of Venice. On the fall of the republic St Mark's became the cathedral church of the patriarch. There are thirty parishes in the city of Venice and fifteen in the lagoon islands and on the littoral.

In recent times there has been a good deal of activity in Venice in regard to the preservation of its artistic and architectural trea- sures. Some of the earlier activity was unfortunately misplaced. St Mark's suffered on two occasions: first during the restoration of the north facade in 1843, and again during that of the south facade.

begun in 1865 and finished in 1878. The latter fagade was com- pletely reconstructed upon 2200 piles driven to great depths, with the result that the general harmony of the monument — the effect of time and of atmospheric conditions — was completely lost. A lively agitation all over Europe, and particularly in England (con- ducted by Ruskin and William Morris), led the Italian government to discard the Austrian plan of restoration, at least as regards the interior of the Basilica, and to respect the ancient portions which had stood the test of

time and had escaped " renewal " by man. In 1880 a Vigilance Committee was appointed to watch over the restoration of the interior. The committee secured much verde antico and porphyry for the restoration of the pavement, in place of the common marbles which it had been intended to use, and organized special workshops for the restoration and preservation of the ancient mosaics, which it had been intended to detach and replace. Pieces already detached were restored to their original positions, and those blackened by damp and dust were carefully cleaned. Breaks were filled up with cubes obtained from fragments of contemporary mosaics previously demolished. In this way the mosaics of the two arches of the atrium and those of the Zeno chapel were cleaned and preserved—

Contemporaneously with the restoration of the southern facade of St Mark's, the restoration of the colonnade of the ducal palace towards the Piazzetta and the Mole was undertaken at a cost of £23,000. The chief work was executed at the south-west angle, where the columns of the arcade had become so broken and distorted as to menace the safety of the whole building. The corner towards the Ponte della Paglia was also restored, and the hideous device of walling up the five last arches, adopted in the 1 16th century by the architect Da Ponte, was removed without prejudice to the stability of the structure. In order to lighten the palace the Venetian Institute of Science, Letters and Arts removed its headquarters and its natural history collection to Santo Stefano. For the same reason the Biblioteca Marciana with its 356,000 volumes was moved to the Old Mint, opposite the ducal palace. The space thus cleared has been used for the rearrangement of the Archaeological and Artistic Museum. Side by side with these changes has proceeded the reorganization of the Royal Gallery of Ancient Art, which, created by Napoleon I. for the

students of the adjoining Academy of Fine Arts, gradually acquired such importance that in 1882 the government divided it from the academy and rendered it autonomous. The gallery now constitutes a unique collection of Venetian paintings from the most ancient artists down to Tiepolo, one hall only being reserved for other Italian schools and one for foreign schools. Altogether the gallery contains twenty rooms, one heing assigned to ■the complete cycle of the " History of Saint Ursula," by Garpaccior another to Giambellino and to the Celliniani;' and a whole wall of a third being occupied by the famous Veronese " II Gonvito in casa di Levi." Titian's " Presentazione al Tempio," painted for the Scuola della Carita, which is now the seat of the gallery, has been placed in its original position. The hall of the Assumption has been left untouched. Nineteenth-century pictures have been eliminated as foreign to the character of the collection, and inferior works relegated to a side passage. The reorganization of the Archaeological and Artistic Museum and of the Royal Gallery of Ancient Art coincided with the inauguration in April 1895 of a series of biennial International Art Exhibitions, arranged in order to celebrate the silver wedding of the king and queen of Italy. A special brick structure was erected in the public gardens to receive the works of contemporary artists, both Italian and foreign. The selection of works was made by an international jury from which Venetian artists were excluded. The second exhibition, visited by 336,500 persons, was held in 1897, and a third in 1899. The success of this exhibition (visited by 407,930 persons) led to the organization of a fourth exhibition in 1901, largely devoted to the works of Ruskin. The institution of these exhibitions furnished Prince Giovanelli with an opportunity to found at Venice a Gallery of Modern Art, for which a home was found in the Palazzo Pesaro, bequeathed to the city by Princess Bevilacqua*

fe. Masa.

History.— It is usually affirmed that the state of Venice owes its origin to the barbarian invasions of north Italy; that it was founded by refugees from the mainland cities who sought asylum from the Huns in the impregnable shallows and mud banks of the lagoons; and that the year 452, the year when Attila sacked Aquileia, may be taken as the birth-year of Venice. That is true in a measure. Venice, like Rome and other famous cities, was an asylum city. But it is nearly certain that long before Attila and his Huns swept down upon the Venetian plain the little islands of the lagoon already had a population of poor but hardy fisherfolk living in quasi-inde- pendence, thanks to their poverty and their inaccessible site. This population was augmented from time to time by refugees from the mainland cities • of Aquileia, Concordia, Opitergium Altinum and Patavium. But these did not mingle readily

with the indigenous population ; as each wave of barbarian invasion fell back, these refugees returned to their mainland homes,. and it required the pressure of many successive incur- sions to induce them finally to abandon the mainland for the lagoon, a decision which was not reached till the Lombard invasion of 568. On each occasion, no doubt, some of the refugees remained behind in the islands, and gradually built and peopled the twelve lagoon townships, which formed the germ of the state of Venice and were subsequently concen- trated at Rialto or in the city we now know as Venice. These twelve townships were Grado, Bibione, Caorle, Jesolo, Heraclea, Torcello, Murano, Rialto, Malamocco, Poveglia, Chioggia and Sottomarina. The effect of the final Lombard invasion is shown by the resolve to quit the mainland and the rapid build- ing of churches which is recorded by the Cronaca altinale. The people who finally abandoned the mainland and took their priests with them are the people who

made the Venetian re- public. But they Were hot as yet a homogeneous population. The rivalries of the mainland cities were continued at closer quarters inside the. narrow circuit of: the lagoons, and there Was, moreover, the initial schism between the indigenous fisher population and the town-brea' refugees,' and these facts con- stitute the first of the problems which now affronted the growing community: the internal problem of fusion and development. The second problem of prime importance was the external problem of independence. The early history of the republic is chiefly concerned with the solution of these two problems.

To. take the problem of independence first. There is little doubt that the original lagoon population depended for its administration, as far as it had any, upon the larger 'cities of the mainland. There is a tradition that Venice was founded by "consuls from Padua"; and- Padua claimed complete control of the course of the Brenta down to its mouth at Mala- mocco. The destruction of the mainland cities, and the flight of their leading inhabitants to the lagoons, encouraged the lagoon population to assert a growing independence, and led them to advance the doctrine that they were " born inde- pendent." Their development as a maritime people, engaged in small trading and intimately acquainted with their home waters, led Belisarius to seek their help in his task of recovering Italy from the Goths. He was successful; and the lagoons became, theoretically at least, a part of the Eastern empirel But the empire was vast and weak, and its capital lay far away; in practice, , no doubt, the lagoon population enjoyed virtual independence, though later the Byzantine claim to suzerainty became one of the leading factors in the formation of the state. It was from Byzantium that the Venetian people received the first recognition of their existence as a separate community. Their maritime importance

compelled Narses t the imperial commander, to seek their aid in transporting his army from Grado ; and when the Paduans appealed to the Eunuch. to restore their rights over the Brenta, the Venetians replied by declaring that islands of the lagoon and the river mouths that fell into the estuary were the property of those who had rendered them, habitable and serviceable. Narses declined to intervene, Padua was powerless to enforce its claims and Venice established a virtual independence of the mainland. Nor was it long before Venice made a similar assertion to the imperial representative, Longinus. He was endeavouring to treat with Alboin and the Lombards, and desired to assure himself of Venetian support. He invited the Venetians to give him an escort to Constantinople, which they did, and also to , acknowledge themselves subjects of the empire. But they replied that ″ God who is our help and protector has saved us that we might dwell upon these waters. This second Venice which we have raised in the lagoons is our mighty habitation; no power of emperor or of prince can touch us.″ That was an explicit statement of Venetian aims and contentions: the place and people had made each other and now belonged exclusively to each other. Longinus admitted that the Venetians were indeed ″ a great people with a Strong habitation "; but by dint of promising large concessions and trading privileges, he

induced the Venetians to make an act of submission— though not upon oath. The terms of this pact resulted in the first diploma conferred on Venice as a separate community (584). But it was inevitable that, when the barbarians, Lombard or Frank, were once established on the mainland of Italy, Venice should be brought first into trading and then

into political relations with their near neighbours, who as masters of Italy also put forward a claim to sovereignty in the lagopns. It is between the two claims of east and west that Venice struggled for and achieved recognized independence.

Turning to the ether problem, that of internal fusion and consolidation, we find that in 466, fourteen years after the fall of Aquileia, the population of the twelve lagoon townships met at Grado for the election of one tribune from each island for the better government of the separate communities, and above all to put an end to rivalries "which had already begun to play a disintegrating part. But when the lagoon population was largely augmented in 568 as the result of Alboin's invasion, these jealousies were accentuated, and in 584 it was found expedient to appoint twelve other tribunes, known as the Tribuni Majores, who formed a kind of central committee to deal with all matters affecting the general weal of the lagoon communities. But the Tribuni Majores were equally powerless to allay the jealousies of the growing townships which formed the lagoon community. Rivalry in fishing and in trading, coupled with ancient anti- pathies inherited from the various mainland cities of origin, were no doubt the cause of these internecine feuds. A crisis was reached when Christopher, patriarch of Grado, convened the people of the lagoon at Heraclea, and urged them to suppress the twelve tribunes and to choose a single head of the state. To this they agreed, and in 697 Venice elected her first doge, Paulo Lucio Anafesto.

The growing importance of the lagoon townships, owing to their maritime skill, their expanding trade created by their position between east and west, their monopoly of salt and salted fish, which gave them a strong position in the mainland markets, rendered it inevitable that a clash must come over the question of*

independence, when either east or west should claim that Venice belonged to them; and inside the lagoons the growing prosperity, coupled with the external threat to their liberties, concentrated the population into two well-defined parties — what may be called the aristocratic party, because it leaned towards imperial Byzantium and also displayed a tendency to make the dogeship hereditary, and / the democratic party, connected with the original population of the lagoons, aspiring to free institutions, and consequently leaning more towards the church and the Frankish kingdom which protected the church. The aristocratic party was captained by the town-ship of Heraclea, which had given the first doge, Anafesto, to the newly formed community. The democratic party was cham- pioned first by Jesolo and then by Malamocco.

The advent of the Franks determined the final solution. The emperor Leo, the Isaurian, came to open rupture with Pope Gregory II. over the question of images. The pope appealed to Liutprand, the powerful king of the Lombards, to attack the imperial possessions in Ravenna. He did so, and expelled the exarch Paul, who took refuge in Venice and was restored to his post by the doge of the Heraclean or Byzantine party, Orso, who in return for this assistance received the imperial title of hypatos, and trading rights in Ravenna. The pope, however, soon had cause for alarm at the spread of the Lombard, power which he had encouraged. Liutprand pro- ceeded to occupy territory in the Ducato Romano- The pope, looking about for a saviour, cast his eyes on Charles Martel, whose victory at Tours had riveted the attention of the world. Charles's son, Pippin, was crowned king of Italy, entered the peninsula at the head of the Franks, defeated the Lombards, took Ravenna and presented it to the pope, while retain- ing a feudal superiority. Desiderius, the last Lombard king,

endeavoured to recover Ravenna. Charlemagne, Pippin's son, descended upon Italy, broke up the Lombard kingdom (774), confirmed his father's donation to the pope, and in

reprisals for Venetian assistance to the exarch, ordered the pope, to expel the Venetians from, the Pentapolis. Venice was now brought face to face with the Franks under their powerful sovereign, who soon showed that he intended to claim the lagoons as part of his new kingdom. In, Venice the result of this : menace was a decided reaction towards Byzantium. In opposition to the Frankish claim, Venice resolved to affirm her dependence on the Eastern empire But the democratic party, the Frankish party in Venice, was powerful. Feeling ran ; high.; A crisis was rapidly approaching. The Byzantine. Doge Giovanni Galbaio attacked Grado, the see of the Francophil Patriarch Giovanni, captured it, and flung the bishop from the tower of his palace. But the murdered patriarch was succeeded by his no less Francophil nephew Fortunatus, a strong partisan, a restless and indomitable man, who along with Obelerio of Malamocco now assumed the lead of the democratic party. He and his followers plotted the murder of the doge, were dis- covered, and sought safety at the court of Charlemagne, , where Fortunatus strongly urged the Franks to attack the lagoons. . Meantime the internal politics of Venice had been steadily preparing the way for the approaching fusion at Rialto. The period from the election of the first doge to the appearance of the Franks was characterized by fierce struggles between Heraclea and Jesolo. At length the whole population agreed to fix their capital. at Malamocco, a compromise between the two incompatible parties, marking an important step towards final fusion at Rialto.*

That central event of early Venetian history was reached when Pippin resolved to make good his title as king of Italy. He turned his

attention to the lagoon of Venice, which had been steadily growing in commercial and maritime importance, and had, on the whole, shown a sympathy for Byzantium rather than for the Franks. Pippin determined to subdue the lagoons. He gathered a fleet at Ravenna, captured Chioggia, and pushed on up the Lido towards the capital of the lagoons, at Malamocco. But the Venetians, in face of the danger, once more removed their capital, this time to Rialto, that group of islands we now call Venice, lying in mid-lagoon between the lidi and the mainland. Thjs step was fatal to Pippin's designs. The intricate water-ways and the stubborn Venetian defence baffled all his attempts to reach Rialto; the summer heats came on; the, Lido was unhealthy. Pippin was forced to retire. A treaty between Charlemagne and Nicephorus (810) recognized the Venetians as subjects of the Eastern empire, while preserving to them the trading rights on the mainland of Italy which they had acquired under Liutprand.

The concentration at Rialto marks the beginning of . the history of Venice as a full-grown state. The external menace tp their , independence had welded together the place and the people; the same pressure had brought about the fusion of the conflicting parties in the lagoon townships into one homo- geneous whole. There was for the future one Venice and one Venetian people dwelling at Rialto, the city of compromise, between the dangers from the mainland, exemplified by Attila and Alboin, and the perils from the sea, illustrated by Pippin's attack. The position of Venice was now assured. The state was a vassal of a weak and distant empire, which would leave it, virtually free to pursue its own career; it was an independent tributary of a near and powerful kingdom with which it could trade, and trade between east and west became henceforth the note of its development.

The first doge elected in Rialto was Angelo Particiaco, a Heraclean noble, with a strong bias towards Byzantium, and his reign was signalized by the building of the first church of San Marco, and by the translation of the saint's body from Alexandria, as though to affirm and to symbolize the creation of united Venice.

The history of Venice during the next two hundred years is marked externally by the growth of the city, thanks to an ever-expanding trade, both down the Adriatic, which brought the republic into collision with the Dalmatian pirates- and led to their final conquest, in 1000, by the doge Pietro Orseolo II.,

and also on the mainland, where Venice gradually acquired trading rights, partly by imperial diploma, partly by the estab- lishment and the supply of markets on the mainland rivers, the Sile and the Brenta. Internally this period is characterized by the attempt of three powerful families, the Particiachi, the Candiani and the Orseoli, to create an hereditary dogeship, and the violent resistance offered by the people. We find seven of the Particiachi, five Candiani and three Orseoli reigning in almost unbroken succession, until, with the ostracism of the whole Orseolo family in 1032, the dynastic tendency was crushed for ever. During the same period we also note the development of certain families, thanks to the accumulation of wealth by trade, and here we get the beginnings of that commercial aristocracy whose evolution was the dominant factor in the constitutional history of the republic.

The growing wealth of Venice soon attracted the cupidity of her piratical neighbours on the

coast of Dalmatia. The Swift Liburnian vessels began to raid the Lido, compelling the Venetians to arm their own vessels and thus to form the nucleus of their famous fleet, the importance of which was recognized by the Golden Bull of the emperor Basil, which conferred on Venetian merchants privileges far more extensive than any they had hitherto enjoyed, on condition that the Venetian fleet was to be at the disposition of the emperor. But the Dalmatian raids continued to harass Venetian trade, till, in 1000, the great doge Pietro Orseolo II. attacked and captured Curzola and stormed the piratical stronghold of Lagosta, crushing the freebooters in their citadel. The doge assumed the title Of duke of Dalmatia, and a great step was taken towards the supremacy of Venice in the Adriatic, which was essential to the free development of her commerce and also enabled her to reap the pecuniary advantages to be derived from the Crusades. She now commanded the route to the Holy Land and could supply the necessary transport, and from the Crusades her growing aristocracy reaped large profits. Orseolo's victory was commemorated and its significance affirmed by the magnificent symbolical ceremony of the "wedding of the sea" {Sposalizio del Mar), celebrated hence forward every Ascension day. The result of the first three Crusades was that Venice acquired trading rights, a Venetian quarter, church, market, bakery, &c, in many of the Levant cities, e.g. in Sidon (1102) and in Tyre (n 23). The fall of Tyre marks a great advance in development of Venetian trade; the republic had now passed beyond the Adriatic, and had taken an important step towards that complete command of the Levant which she established after the Fourth Crusade.

This expansion of the trade of Venice resulted in the rapid development of the wealthier classes, with a growing tendency to draw together for the purpose of securing to

themselves the entire direction of Venetian politics in order to dominate Venetian commerce. To achieve their object, a double line of conduct was imposed upon them: they had to absorb the powers of the doge, and also to deprive the people of the voice they possessed in the management of state affairs by their presence in the condone or general assembly of the whole community, which was still the fountain of all authority. The first step towards curtailing the power of the doge was taken in 1032, when the family of the Orseoli was finally expelled from Venice and the doge Domenico Flabianico was called to the throne. A law was then passed forbidding for the future the election of a doge-consort, a device by which the Particiachi, the Candiani and the Orseoli had each of them nearly succeeded in carrying out their dynastic ambitions. Further, two ducal councillors were appointed to assist the doge, and he was compelled, not merely permitted, to seek the advice of the more prominent citizens at moments of crisis. By this reform two important offices in the Venetian constitution — the privy council (consiglieri ducali) and the senate (the pregadi or invited) — came into being. Both were gradually developed on the lines desired by the aristocracy, till we reach the year

The growth of Venetian trade and wealth in the Levant, roused the jealousy of Genoa and the hostility of the imperial court at Constantinople, where the Venetians are said to have numbered 200,000 and to have held a large quarter of the city in terror by their brawls. The emperor Manuel I., urged on by the Genoese and other rivals of Venice, seized the pretext. The Venetians were arrested and their goods con- fiscated. Popular feeling at Venice ran so high that the state was rashly swept into war with the empire. To provide the requisite funds for this vast undertaking, a forced loan of 1% on net incomes was raised; the money bore

interest at the rate of 4%. The bonds were negotiable, and afford us the earliest instance of the issue of government stock. The doge Vitale Michiel II; led the expedition in person. It proved a disastrous failure, and on the return of the shattered remnants (1171) a great constitutional reform seemed necessary. The Venetians resolved to create a deliberative assembly, which should act with greater caution than the condone, which had just landed the state in a ruinous campaign. Forty members were elected in each of the six divisions of the city, giving a body of 480 members, who served for one year and on retiring named two deputies for each sesiiere to nominate the council for the succeeding year. This was the germ of the great council, the Maggior, Consiglio, which was rendered strictly oligarchic in 1 296. As the duties of this council were to appoint all officers of state, including the doge, it is clear that by its creation the aristocracy had considerably curtailed the powers of the people, who had hitherto elected the doge in general assembly; and at the creation of Michiel's successor, Sebastiano Ziani (1172), the new doge was presented to the people merely for confirmation, not for election. The assembly protested, but was appeased by the empty formula, "This is your doge art it please you." Moreover, still further to limit the power of the doge, the number of ducal councillors was raised from two to six. In 1 198, on the election of Enrico Dandolo, the aris- tocracy carried their policy one step farther, and by the promissione ducale, or coronation oath, which every doge was required to swear, they acquired a powerful weapon for the suppression of all that remained of ancient ducal authority. The promissione ducale was binding on the doge and his family, and could be, and frequently was, altered at each new election, a commission, Inquisitori sopra il doge defunto, being appointed to scrutinize the actions of the deceased doge and to add to the

new oath whatever provisions they thought necessary to reduce the dogeship to the position of a mere figurehead in the state.

In spite of the check to their trade received from the emperor Manuel in 1171, Venetian commerce continued to flourish, the Venetian fleet to grow and the Venetians to amass wealth. When the Fourth Crusade was proclaimed at Soissons, it was to Venice that the leaders applied for transport, and she agreed to furnish transport for 4500 horses, 9000 knights, 20,000 foot, and provisions for one year: the price was 85,000 silver marks of Cologne and half of all conquests. But Zara and Dalmatia had revolted from Venice in 1166 and were as yet unsubdued. Venetian supremacy in the Adriatic had been temporarily shaken. The 85,000 marks, the price of transport, were not forthcoming, and the Venetians declined to sail till they were paid. The doge Dandolo now saw an opportunity to benefit Venice. He offered to postpone the Teceipt of the money if the Crusaders would reduce Zara and Dalmatia for the republic, These terms were accepted. Zara was recovered, and while still at Zara the leaders of the Crusade, supported by Dandolo, re- solved for their own private purposes to attack Constantinople, instead of making for the Holy Land. Boniface, marquis of Monferrat, desired to make good the claim to Salonica, and the Venetians doubtless wished to upset the Greek empire, which had recently shown itself so friendly to their rivals the Genoese. Constantinople fell (1204), thanks chiefly to the ability of the Venetians under Dandolo. The city was sacked, and a Latin empire, with Baldwin of Flanders as emperor, was established at Constantinople (see Roman Empire, Later).

VENICE

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tn the partition of the spoils Venice claimed

and received, in her own phrase, ″ a half and a quarter of the Roman empire.″ To her fell the Cyclades, the Sporades, the islands and the eastern shores of the Adriatic, the shores of the Propontis and the Euxine, and the littoral of Thessaly, and she bought Crete from the marquis of Monferrat. The accession of territory was not only vast, it was of the highest importance to Venetian commerce. She now commanded the Adriatic, the Ionian islands, the archipelago, the Sea of Marmora and the Black Sea, the trade route between Constantinople and western Europe, and she had already established herself in the seaports of Syria, and thus held the trade route between Asia Minor and Europe. She was raised at once to the position of a European power. In order to hold these possessions, she borrowed from the Franks the feudal system, and granted fiefs in the Greek islands to her more powerful families, on condition that they held the trade route open for her. The expansion of commerce which resulted from the Fourth Crusade soon made itself evident in the city by a rapid development in its archi- tecture and by a decided strengthening of the commercial aristocracy, which eventually led to the great constitutional reform — the closing of the Maggior Consiglio in 1296, whereby Venice became a rigid oligarchy. Externally this rapid success awoke the implacable hatred of Genoa, and led to the long and exhausting series of Genoese wars which ended at Chioggia in 1380.

The closing of the great council was, no doubt, mainly due to the slowly formed resolution on the part of the great com- mercial families to secure a monopoly in the Levant trade which the Fourth Crusade had placed definitely in their hands. The theory of the government, a theory expressed throughout the whole commercial career of the republic, the theory which made Venice a rigidly protective state, was that the Levant trade belonged solely to Venice and her

citizens. No one but a Vene- tian citizen was permitted to share in the profits of that trade. But the population of Venice was growing rapidly, and citizenship was as yet undefined. To secure for themselves the command of trade the leading commercial families resolved to erect themselves into a close gild, which should have in its hands the sole direction of the business concern,, the exploita- tion of the East. This policy took definite shape in 1297, when the Doge Pietro Gradenigo proposed and carried the following measure: the supreme court, the Quarantia, was called upon to ballot, one by one, the names of all who for the last-four years had held a seat in the great council created in 1171. Those who received twelve favourable votes became members of the great council. A commission of three was appointed to submit further names for ballot. The three commissioners at once laid down a rule — which contains the essence of the act — that only those who could prove that a paternal ancestor had sat in the great council should be eligible for election: This measure divided the community into three great categories: (1) those who had never sat in the council themselves and whose ancestors had never sat ; these were of course the vast majority of the popula- tion, and they were excluded for ever from the great council: (2) those whose paternal ancestors had sat in the council; these were eligible and were gradually admitted to a seat, their sons becoming eligible on majority: (3) those who were of the council at the passing of this act or had sat during the four preceding years; their sons likewise became eligible on attain- ing majority. As all offices were filled by the great council, exclusion meant political disfranchisement. A close caste was created which very seldom and very reluctantly admitted new members to its body. The Heralds' College, the awogadori di comun, in order to ensure purity of blood, were ordered to open a register of all marriages and

births among members of the newly created caste, and these registers formed the basis of the famous Libro d'oro.

The closing of the great council and the creation of the patrician caste brought about a revolution among those who suffered disfranchisement. In the year 1300 the people, led by Marin Bocconio, attempted to force their way into the great council

and to reclaim their rights. The doors were opened,' the ring- leaders were admitted and immediately seized and hanged. Ten years later a more serious revolution, the only revolution that- seriously shook the state, broke out and was also crushed. This conspiracy was championed by Bajamonte Tiepolo, and seems to have been an expression of patrician protest against the serrata, just as Bocconio's revolt had represented popular in- dignation. Tiepolo, followed by members of the Quirini family and many nobles with their followers, attempted to seize the Piazza on the 15th of June 13 10. They were met by the Doge Pietro Gradenigo and crushed. Quirini was killed, and Tiepolo and his followers fled.

The chief importance of the Tiepoline conspiracy lies in the fact that it resulted in the establishment of the Council of' Ten 1 . Erected first as a temporary committee of public safety to hunt down the remnant of the conspirators and to keep a vigilant watch on Tiepolo's movements, it was finally made permanent in I 33S- The secrecy of its deliberations and the rapidity with which it could act made it a useful adjunct to the constitution, and it gradually absorbed many of the more important functions of the state.

With the creation of the Council of Ten the main lines of the Venetian constitution were completed. At the basis of the pyramid we get the great council, the elective body composed

of all who enjoyed the suffrage, i.e. of the patrician caste. Above the great council came the senate, the deliberative and legislative body par excellence. To the senate belonged all questions relating to foreign affairs, finance, commerce, peace and war. Parallel with the senate, but extraneous to the main lines of the constitution, came the Council of Ten. As a committee of public safety it dealt with all cases of conspiracy; for example, it tried the Doge Marino Falier and the General Carmagnola; on the same ground all cases affecting public morals came within its extensive criminal jurisdiction. In the region of foreign affairs it was in communication with envoys abroad, and its orders would override those of the senate. It also had its own departments of finance and war. Above the senate and the Ten came the Goliegio or cabinet, the adminis- trative branch of the constitution. All affairs of state passed through its hands. It was the initiatory body; and it lay with the Collegio to send matters for deliberation either before the senate or before the Ten. At the apex of the pyramid came the doge and his council, the point of highest honour and least weight in the constitution.

To turn now to the external events which followed on the Fourth Crusade. These events are chiefly concerned with the long struggle with Genoa over the possession of the Levant and Black Sea trade. By the establishment of the Latin empire Venice had gained a preponderance. But it was impossible that the rival Venetian and Genoese merchants, dwelling at close quarters in the Levant cities, should not come to blows.- They fell out at Acre in 1253. The first Genoese war began and ended in 1258 by the complete defeat of Genoa. But in 1261 the Greeks, supported by the Genoese, took advantage of the absence of the Venetian fleet from Constantinople to seize the city and to restore the Greek empire in the person of

Michael VIII. Palaeologus. The balance turned against Venice again. The Genoese were established in the spacious quarter of Galata and threatened to absorb the trade of the Levant. To recover her position Venice went to war again, and in 1264 destroyed the Genoese fleet off Trepani, in Sicilian waters. This victory was decisive at Constantinople, where the emperor abandoned the defeated Genoese and restored Venice to her former position. The appearance of the Ottoman Turk and the final collapse of the Latin empire in Syria brought about the next campaign between the rival maritime powers– Tripoli (1289) and Acre (1291) fell to the Mussulman, and the Venetian title to her trading privileges, her diplomas from the Latin empire, disappeared. To the scandal of Christendom,' Venice at once entered into treaty with the new masters of Syria and obtained a confirmation of her ancient trading rights J Genoa replied by attempting to close the Dardanelles. Venice

made this 'action a. casus belli. The Genoese won a victory in the gulf of Alexandretta (1294); but on the other hand the Venetians under Ruggiero Morosini forced the Dardanelles and sacked the Genoese quarter of Galata. The decisive engage ment, however, of this campaign was fought at Curzola (1299) in the Adriatic, when Venice suffered a crushing defeat; 1 A peace, honourable to both parties, was brought about by Matteo Visconti, lord of Milan, in that same year. But the quarrel between the republics, both fighting for trade supremacy — that is to say, for their lives — could not come to an end till one or other was thoroughly crushed. .The fur trade Of the Black Sea furnished the pretext for the next war (1353–54)1 which ended in the crushing defeat of Venice at Sapienza, and the loss of her

entire fleet. But though Venice herself seemed to lie open to the Genoese, they took no advantage of their victory; they were probably too exhausted. The lord of Milan again arranged a peace. (1355).

We have now reached the last phase of the struggle! for mari- time supremacy- Under pressure from Venice the emperor John V. PalaeologuB granted possession of. the island of Tenedos to the republic. The island commanded the entrance to the Dardanelles. Genoa determined to oppose the concession, and war broke out. ■■ The Genoese Admiral Luciano Doria sailed into the Adriatic, attacked and defeated Vettor Pisani at Pola in Istria, and again Venice and the lagoons lay at the mercy of the enemy. Doria resolved to blockade and starve Venice, to surrender. He was master of the sea, and the flow of provisions from the mainland was cut off. by Genoa's ally, Francesco I. Carrara, lord' of Padua. Doria seized Chioggia as a base of operations and drew his fleet inside the lagoons. The situation was extremely critical for Venice, but she rose to the occasion. Vettor Pisani was placed in command, and by a stroke of naval genius he grasped the weakness of Doria's position. Sailing to Chioggia he blocked the channel leading from the lagoon to^the sea, and Doria was caught in a trap. Pisani stationed himself outside the Lido, on the open sea, to intercept relief should any appear, and Doria, instead of block- ading Venice, was himself blockaded in Chioggia. For many months the siege went on; but Pisani gradually assumed ; the offensive as Genoese spirits and food ran low. Finally, in June 1380 the flower of the Genoese fleet surrendered at dis- cretion. Genoa never recovered from the blow, and Venice remained undisputed mistress of the Mediterranean and the Levant trade.

The defeat of Genoa and the establishment of Venetian supremacy in the Mediterranean brought

the state to a further step in its development. The undisputed mastery of the eastern trade increased its bulk in Venice.- But as. the city became the recognized mart for exchange of goods between east and west, the freedom of the western outlet assumed the aspect of a. paramount question. ' It was useless for Venice to accumu- late eastern merchandise if she could not freely pass it on to the west. If the various states on the immediate mainland could levy taxes on Venetian gdods in transit, the Venetian merchant would inevitably suffer in profits. The geographical position of Venice and her commercial policy alike compelled her to attempt to secure the command of the rivers and roads of the mainland, at least up to the mountains, that is to say, of the north-western outlet, just as she had obtained com- mand of the south-eastern inlet. She was compelled to turn her attention, though reluctantly, to the mainland of Italy. Another consideration drove her in the same direction. During the long wars with Genoa, after the defeats of Curzola, Sapienza, Pola, above all during the crisis of the war of Chioggia, it had been brought home to the Venetians that, as they owned no meat or corn-producing territory, a crushing defeat at sea and a blockade on the mainland exposed them to the grave danger of being starved into surrender. Both these pressing neces- sities, for a free outlet for merchandise and for a food-supplying area, drove Venice on to the mainland, and compelled her to initiate a policy which eventually landed her in the disastrous wars of Cambrai. The 1 period with which we are now dealing 1*

is the epoch of the despots, the signori, arid in pursuit of expan- sion on the mainland Venice was 'brought into collision first with; the Scaligeri of Verona, then with the Carraresi of Padua, and finally with the Visconti of Milan. Hitherto Venice had enjoyed the advantages of isolation; the lagoons were

virtually impregnable; she had no land frontier to defend. But when she touched the mainland she at once became possessed of a frontier which could be attacked, and found herself compelled either to expand in self-defence or to lose the territory she had acquired.

Venice had already established a tentative hold on the im- mediate mainland as early as 1339. She was forced into war by Mastino della Scala, lord of Padua, Vicenza, Treviso, Feltre and Belluno, as well as of Verona who imposed a duty on the transport of Venetian goods. A league against the Scala domination was formed, arid the result was the fall of the family. Venice took possession of Padua, but in the terms of the league she at once conferred the lordship on the Carraresi, retaining Treviso and Bassano for herself. But it is not till we come to the opening of the next century that Venice de^ finitely acquired land possessions and found herself committed to all the difficulties and intricacies of Italian mainland polities'. On the death of Gfetri Galeazzo Visconti in 1402, his large pos- sessions broke up, His neighbours and his generals seized what was nearest to hand: Francesco II. Carrara, lord of Padua, attempted to seize Vicenza and Verona. But Venice had been made to* suffer at the hands of Carrara* who had levied heavy dues on transit, and moreover during the Chioggian War had helped the Genoese and cut off the food supply from the main- land. She was therefore forced in self defence to crush the family of Carrara and to make herself permanently mistress of the iminediate mainland. Accordingly when Gian Galeazzo's widow applied to the republic for help against' Carrara it was readily' granted, arid, after some years of fighting, the posses sions of the Carraresi, Padua, Treviso, Bassano, commanding the Val Sugana route, as well as Vicenza and Verona, passed definitely under Venetian rule. This expansion of mainland*

territory was followed in 1420 by the acquisition of Friuli after a successful war with the emperor Sigismund, thus bringing the possessions of the republic up to the Carnic and Julian Alps, their natural frontier on the north-east.

*Venice was soon made to feel the' consequences of having become a mainland power, the difficulties entailed ; by holding possessions which others coveted, and the weakness of a land frontier. To the west the new duke of Milan, Filippo Maria Visconti, was steadily piecing together the fragments of his father's shattered duchy. He was determined to recover Verona arid ViCenza from Venice, and intended, as his father had" done, to make himself master of all north Italy. The conflict ■ between Venice and Milan led to three wars in 14*216, 1427 and 1429. Venice was successful on the whole. She established her hold permanently on Verona and Vicenza, and acquired besides both' Brescia and Bergamo; and later she occupied Crema. The war of Ferrara and the peace of Bagnolo (1484) gave her Rovigo and the Polesihe. This, with the excep tion of a brief tenure of Cremona (1499-15 12), formed her permanent territory down to the fall of the republic. 1 Her frontiers nOw ran from the seacoast near Monfalc6ne, following the line of the Carnic and Julian and Raetian Alps to the Adda, down the course of that river till it joins the Po, and therie'e along the line of the Po back to the sea. But long and exhausting wars were entailed ' upon her for the maintenance of her hold. The rapid formation of this land empire, and the obvious intention to expand, called the attention not only of Italy but of Europe to this power which seemed destined to become supreme in north Italy, and eventually led to the league of Cambrai for the dismemberment of Venice. Contemporane- ously other events were menacing the ascendancy and exhaust- ing the treasury of the republic. In*

1453 Constantinople fell to the Ottoman Turks, and although Venice entered at once into treaty with the new power and desired to trade With it, not to fight with it, yet it was impossible that her possessions

in the Levant and the archipelago should hot eventually • bring her into collision with the expanding, energy of the Mussulman. Europe persistently refused to assist the republic to preserve a trade in which she had established a rigid monopoly, and Venice was left to fight the Turk single-handed. The first Turkish war lasted from 1464 to 1479, and ended in' the loss of Negropont and several places in the Morea, and the pay- ment by Venice of an annual tribute for trading rights. She was consoled, however, by the acquisition of Cyprus, which came into her possession (1488) on the extinction of the dynasty of Lusignan with the death of James II. and his son James III., Caterina Cornaro, James II.'s widow, ceding the kingdom of Cyprus to Venice, since she could not hope to maintain it un- aided against the Turks. The acquisition of Cyprus marks the extreme limit of Venetian expansion in th£ Levant; from this date onward there is little to record save the gradual loss of her maritime possessions.

Exhausting as the Turkish wars were to the Venetian treasury, her trade was still so flourishing that she might have survived the strain had not the discovery of the Cape ioiite. to the Indies cut the tap-root of her commercial prosperity by diverting the stream of traffic from the Mediterranean to the Atlantic. When Diaz rounded the Cape in i486 a fatal blow was struck, at; Venetian commercial supremacy. The discovery of the Cape route saved the breaking of bulk between India and

Europe, and saved the dues exacted by the masters of Syria and Egypt. Trade passed into the hands of the Portuguese, the Dutch and the English. Venice lost her monopoly of oriental traffic.

To complete her misfortunes, the European powers, the church and the small states of Italy, partly frorn jealous greed of her possessions, partly on the plea of her treason to Christendom in making terms with Islam, partly from fear of her expansion in north Italy, coalesced at Cambrai in 1508 for the partition of Venetian possessions. The war proved disastrous for Venice, The victory of Agnadello (1510) gave the allies the complete command of Venetian territory down to the shores of the lagoon. But the mutual jealousy of the allies saved her. The pope; having recovered the Romagna and secured the objects for which he had joined the league, was unwilling to see all north Italy in the hands of foreigners, and quitted the union. The emperor Maximilian failed to make good his hold On (Padua, and was jealous of the French. The league broke up, and the mainland cities of the Veneto returned of their own accord to their allegi- ance to St Mark. But the republic never recovered from the blow, coming as it did on the top of the Turkish wars and the loss of her trade by the discovery of the Cape route. She ceased to be a great power, and was henceforth entirely concerned in the effort to preserve her remaining possessions and her very in- dependence. The settlement of the peninsula by Charles V.'s coronation at Bologna in 1530 secured the preponderance to Spain, and the combination of Spain and the church dominated. the politics of Italy. Dread of the Turks and dread of Spain were the two terrors which haunted Venice till the republic fell. That she retained her independence so long was, due to a double accident: the impregnability of the lagoons and the jealousies of the great powers.

But the decline was a slow process. Venice still possessed considerable wealth and extensive possessions. Between 1499 and 1 7 16 she went to war four tiroes with the Turks, emerging from each campaign with some further loss of maritime territory. The fourth Turkish war (1570–1573) was 'signalized by the glorious victory of Lepanto (1571), due chiefly to the prowess of the Venetians under their doge Sebastian Venier. But her allies failed to support her. They reaped no fruits from the victory, and Cyprus was taken from her after the heroic defence of Famagusta by Bragadino, who was flayed alive, and his skin, stuffed with straw,, borne in triumph to Constantinople. The fifth Turkish war (1645–1668) entailed the loss of Crete; and though Morosini, reconquered the Morea for a brief space in 1685, that province was finally lost to Venice in 1716.*

So far as European politics are concerned, the latter years of the republic are made memorable by one iihportant event i the

resistance which Venice, under the guidance of Fra Paolo Sarpi, offered to the growing claims of the Curia Romana, advanced by Pope Paul V: Venice was placed under interdict (1606), but she asserted the rights of tdmporal sovereigns with a courage which was successful and won for her the esteem and approval of most European sovereigns.

But the chief glory of her declining years was undoubtedly her splendid art. Giorgione, Titian,' Sansovino, Tin toret; Paolo Veronese and Palladib all lived and worked after the disastrous wars of the league of Cambrai. The chief characteristic of Venice during these years is that she became the great pleasure-city of Europe. The end of the republic 'came when the French Revolution burst over Europe. Napoleon was determined to destroy the oligarchical government, and seized the pretext

that Venice was hostile to him and a menace to his line of retreat while engaged in his Austrian campaign of 1797. The peace of Leoben left Venice without an ally. The governrrient resolved to offer no resistance to the conqueror, and the' doge Lodovico Manin- abdicated on the 12th of May- 1797. •■' Oh the 17th of October Napoleon handed Venice over to Austria by the peace of Campo Formio, and between 1798 and 1814 she passed from France to Austria and Austria to France till the coalition of that latter year assigned her definitely to Austria. In 1848 a revolu- tion broke out and a provisional republican government under Daniele Manin (q.V;) maintained itself for a brief space. In 1866 the defeat of Austria by the Prussians led to the incorporation of Venice in United Italy.

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1755) ; C. A. Marin, Storia civile e politico del Commerciode> ' Venesiam (Venice, 1798) ; H. F. Brown, Studies in the History of Venice (London, 1907); M. Samedo, Diarii (Venice, 1879–1903). (H. F. B.)

■■. VENISON (pronounced venzon), originally a word meaning a beastof any kind killed in the chase, but.now only applied to the flesh of the deer prepared for eating. The O. Fr. veneisittij venoison, &c, mod. venaison, meant the flesh of the deer or boar, the principal beasts of the chase (Lat. •oenatib, hunting).

VENLO, a frontier town in the province of Limburg, Holland, on the right bank of the Maas, and a junction station 43 m. by rail N.N.E. of Maastricht. Pop. 15,000. It is joined by a bridge over the Maas, with the opposite – village of Blerik. Venlo, with narrow streets irregularly builtjis not of the ordinary Dutch type in architectural styles The picturesque town hall (1595), the only building of special interest, contains some interesting paintings , by Hubert Goltzius (1526–M5S3). The church dates from 1304. There is a college for the higher education of Roman Catholic priests. The leading industries are distilling, brewing, tanning, spinning, vneedlemaking and tobacco manufacture. There is also a considerable trade by river with Rotterdam. •

VENN, HENRY (1725–1797), English evangelical divine, was born at Barnes, Surrey, and educated at Cambridge. He took orders in 1747, and was elected fellow of Queens' College, Cambridge, in 1749. After holding a curacy at : Barton, Cambridgeshire, he became curate of St Matthew, Friday Street, London, and of West Horsley, Surrey, in 1750, and then of Clapham in 1754. In the preceding year he was thd&n lecturer of St Swithin's, Londoft Stone. He was vicar of Huddersfield from 1759 to 1771, when he exchanged to ihe living of Yelling, Huntingdonshire. Besides being a leader

Of the evangelical revival, he was well known as the author of The Compkat Duly of Man (London, 1763), a work in which he intended to supplement the teaching embodied in the anonymous Whole Duty of Man. His son, John Venn (1750–1813), was one of the founders of the Church Missionary Society, and his grandson, Henry Venn (1796–1873), was honorary secretary of that society from 1841 to 1873.

VENOSA (anc. Venusia, q.v.), a town and bishop's see of the Basilicata in the province of Potenza, Italy, on the eastern side of Mount Vulture, 52 m. by rail S.S.E. of Foggia, 1345 ft. above sea-level. Pop. (1901) 8503. The castle was built in 1470 by Pirro di Balzo, and contains four stables each for fifty horses. Many fragments of Roman workmanship are built into the walls of the cathedral, which is due to him also. The abbey church of SS. Trinita is historically interesting; it was consecrated in 1059 by Pope Nicholas II. and passed into {he hands of the Knights of St John in the time of Boniface VIII. (1295–1303). In the central aisle is the tomb of Alberada, the first wife of Robert Guiscard and mother of Bohemund. An inscription on the wall commemorates the great Norman brothers William Iron Arm (d. 1046), Brogo (murdered at Venosa in 1051), Humfrey (d. 1057) and Robert Guiscard (d. at Corfu in 1085). The bones of these brothers rest together in a simple stone sarcophagus opposite the tomb of Alberada. The church also contains some 14th-century frescoes. Behind' it is a larger church, which was begun for the Benedictines about 11 50, from the designs of a French architect, in imitation of the Cluniac church at Paray-le-Monial, but never carried beyond the spring of the vaulting. The ancient amphitheatre adjacent furnished the materials for its walls.

See A. Avena, Monumenli dell' Italia Meridionale (Naples, 1902), 323 sqq. ; O. de Lorenzo, Venosa e la Regione del Vulture (Bergamo,

1906).

*VENTILATION (Lat. ventilare, from ventus, wind), the pro- cess and practice of keeping an enclosed place supplied with proper air for breathing; and so, by analogy, a term used for exposing any subject to the winds of public criticism. The air which we breathe consists chiefly of two gases, oxygen and nitrogen, with certain small proportions of other gases, such as carbonic acid (carbon dioxide), ozone and argon. Oxygen, which is the active and important constituent, and on which life and combustion depend, forms about one-fifth of the whole, while nitrogen, which is inert and acts as a diluent, forms nearly four-fifths. Of this mixture each adult person breathes some «6oo gallons or 425 cub. ft. in twenty-four hours. In air that has passed through the lungs the proportion of oxygen is reduced and that of carbon dioxide increased. Of the various impurities that are^ found in the air of inhabited rooms, carbonic acid gas forms the best practical index of the efficiency of the ventilation. The open air of London and other large inland towns contains about four parts by volume of the gas in 10,000 of air. In the country, and in towns near the sea, two to three and a half parts in 10,000 is a more usual proportion. Authori- ties on ventilation usually take four parts in 10,000 as the standard for pure air, and use the excess over that quantity in estimating the adequacy of the air supply. But they differ as to the proportion to which the carbonic acid may be allowed Standard t0 " se UIK * er a K 00 ^ system of ventilation. It is at purity, generally admitted that the air in which people dwell and sleep should not under any circumstances be allowed to contain more than*

ten parts in 10,000. This has been accepted as the permissible proportion by Carnelley, Haldane and Anderson, after an extensive examination of the air of middle and lower class dwellings.

The rate at which an adult expires carbonic acid varies widely with his condition of repose, being least in sleep, greater Kate of m w aking rest, and very much greater in violent con- exercise. As a basis on which to calculate the air

woption necessary for proper ventilation we may take the ' production of carbonic acid by an adult as o-6 ciib. ft. per hour Hence he will produce per hour, in 6000 cub. ft. of air, a pollution amounting to one part of carbonic*

acid in 10,000 of air. If the excess of carbonic acid were to be kept down to this figure (1 in 10,000), it would be necessary to supply 6000 cub. ft. of fresh air per hour; if the permis- sible excess be two parts in 10,000 half this supply of fresh air will suffice; and so on. We therefore have the following relation between (1) the quantity of air supplied per person per hour, (2) the excess of carbonic acid which results, and (3) the total quantity of carbonic acid present, on the assumption that the fresh air that is admitted contains four parts by volume

in 1 0,000 :■

Air supplied per Adult per Hour.

Carbonic Acid (Parts by Volume in 10,000).

Cubic Feet.

Excess due to Respiration.

Total Quantity.

1000 1200 1500 2000 3000

6 5 4 3

,2

10

9 8

7 6

Some investigators have maintained that, in addition to an in- creased proportion of carbonic acid, air which has passed through the lungs contains a special poison. This view, however, is not accepted by others; J. S. Haldane and Lorrain Smith, for instance, conclude ″ that the immediate dangers from breathing air highly vitiated by respiration arise entirely from the excess of carbonic acid and deficiency of oxygen ″ (Journ. Path, and Bact. 1892, 1, 175). Car- bonic acid, however, is not the only agent that has to be reckoned with in badly ventilated rooms, for the unpleasant effects they pro- duce may also be due, to increase of moisture and temperature and to the odours that arise from lack of cleanliness. Again, though there may be no unduly large proportion of carbonic acid present, the air of an apartment may be exceedingly impure when the criterion is the number of micro-organisms it contains. This alsomay be greatly reduced by efficient ventilation. Comparisons carried out by Carnelley, Haldane and Anderson (.Phil. Trans., 1887, 178 B, 61) between schools known′ to be well ventilated (by mechanical means) and schools ventilated at haphazard or not ventilated at all showed that the average number of micro-organisms was 17 per litre in the former, and in the others 152. Results of great interest were obtained by the experiment of stopping the mechanical ventilators for a few hours or days. Tested by the proportion of carbonic acid, the air of course became very bad; tested by the number of micro-organisms,

it remained comparatively pure, the number being, in fact, scarcely greater than when ventila- tion was going on, and far less than the average in " naturally ventilated " schools. This proves in a striking way the advantage of systematic ventilation.

*In the ventilation of buildings four main points have to be considered: (1) the area of floor to be provided for each person; (2) the cubic capacity of the room required Ventila- tor each occupant; (3) the allowance to be made Hon of for the vitiation of the air by gas or oil burners; *«""■«»• and {4; the quantity of fresh air which must be brought in and of vitiated air that must be extracted for each indi- vidual. The first will depend upon the objects to which the room is devoted, whether a ward of a hospital or a school or a place of public assembly. The purity of the air of a room depends to a great extent on the proportion of its cubic capacity to the number of inmates. The influence of capacity is, however, often overrated. Even when the allowance of space is very liberal, if no fresh air be supplied, the atmosphere of a room quickly falls below the standard of purity specified above; on the other hand, the space per inmate may be almost indefinitely reduced if sufficient means are provided for systematic ventilation. Large rooms are good, chiefly because of their action as reservoirs of air in those cases (too common in practice) where no sufficient provision is made for continuous ventilation, and where the air is changed mainly by intermittent ventilation, such as occurs when doors' or windows are opened. With regard to the third point, in build- ings lighted by gas or oil the calculations for the supply of fresh and the extraction of foul air must include an allowance for the vitiation of air by the products of combustion. The rate at which this takes place may be roughly estimated in the case of gas by treating each cubic foot*

of gas burnt per hour as equal

to one person. Thus an ordinary burner giving a light of about twenty candles and burning 4 cub. ft. of gas per hour vitiates the air as much as four persons, and an incandescent burner as much as one and a half persons. A small reading- lamp burning oil uses the air of four men; a large central table lamp uses as much air as seven men.

As to the fourth point there is great diversity of opinion. To preserve the lowest standard of purity tolerated by sanitarians, ventilation must go on at the rate per person of 1000 cub. ft. per hour, and 3000 cub. ft. per hour are required to preserve the higher standard on which some authorities insist. E. A. Parkes advised a supply of 2000 cub. ft. of air per hour for persons in health and 3000 or 4000 cub. ft. for sick persons. In the case of a public assembly hall no great harm will occur to an audience occupying the room for a comparatively short time if 30 cub. ft. of air per minute are provided for each person. The United States book on school architecture gives a practical application to its remarks on this subject as follows: —

The amount of fresh air which is allowed to hospital patients is about 2500 cub. ft. each per hour. Criminals in French prisons have to content themselves with 1500 cub. ft. per hour. Assuming that we care two-thirds as much for the health of our children as we do for that of our thieves and murderers, we will make them an allowance of 1000 cub. ft. each per hour, or about 16 cub. ft. per minute. Forty-eight children will then need an hourly supply of 48,000 cub. ft. Definite provision must therefore be made for withdrawing this quantity

of foul air. No matter how many inlets there may be, the fresh air will only enter as fast as the foul escapes, and this can only find an outlet through ducts intended for that purpose, porous walls and crevices serving in cool weather only for inward flow. What, then, must be the size of the shaft to exhaust 48,000 ft. per hour? In a shaft 20 ft. high, vertical and smooth inside, with a difference in temperature of 20 , the velocity will be about 2J ft. per second, or 9000 ft. per hour; that is, it will carry off 9000 cub. ft. of air per hour for every square foot of its sectional area. To convey 48,000 cub. ft., it must have a sectional area of 5} sq. ft.

A general idea of the floor area, cubic space and fresh air supply per inmate allowed by law or by custom in certain cases is given in the table below: —

Cubic Feet of

Cubic

Fresh Air

Class of Building.

Floor Area in Feet

Capacity in Feet per

supplied and Foul Air

per Person.

Person. 1

extracted per Person.

Schools .

9 to 10

200

1,800

Barracks

70

720

1,800

Prisons .

90

800

1,800

Concert halls and

theatres

9

108

2,000

Billiard and smoke-

rooms .

2,000

Hospitals

120

1,440

2,000 to 3,000

Public libraries

20

2,400

2,500

Turkish baths.

70

800

5,000

Workshops

120

1,440

5.000

Cowsheds, per cow .

90

1,100

10,000

Stables ; per horse

120

1,600

12,000

1 In calculating the cubic capacity per person the height should not be measured beyond 12 ft.

above the floor.

The supply of fresh air indicated in the table should not be regarded as entirely satisfactory, for the standard of purity suggested is low, and ought to be exceeded, but it might deter many from moving in the matter if a proper and higher standard were to be laid down at first.

One of the most important points is the proper warming of the fresh air introduced into buildings, for unless that be done, when a cold day occurs all the ventilating arrangements will probably be closed. The fact should not be lost sight of that the air in a room may on the one hand be quite cold and yet very foul, and on the other, warm and yet perfectly fresh. To avoid draught the air should enter through a large number of small orifices, so that the currents may be thoroughly diffused. This is done by gratings. The friction of their bars, however, seriously diminishes their capacity for passing air, and careful

experiments show conclusively that very ample grating area is required to deliver large volumes. The same remark applies to extracting-flues. Owing to the small size and the roughness of the surface the velocity of the upward current is small, and the quantity of air that passes out is often much less than is requisite.

Means of Ventilation. — In order that the atmosphere of a room should be changed by means of air currents, thereby securing proper ventilation, three things are necessary; (1) an inlet or inlets for the fresh air, (2) an outlet or outlets for the vitiated air, and (3) a motive force to produce and maintain the current. In systems which are distinguished by the general name of mechanical or artificial ventilation special provision is made for driving the air, by fans, or by furnaces, or by

other contrivances to be described more fully below. In what is called natural ventilation no special appliance is used to give motive force, but the forces are made use of which are supplied by (1) the wind, (2) the elevated temperature of the room's atmosphere, and (3) the draught of fires used for heating.

Natural Ventilation. — The chief agent in domestic ventilation is the chimney; when a bright fire is burning in an open grate, it rarely happens that any other outlet for foul air from a room need be provided. The column of hot air and burnt gases in the chimney is less heavy, because of its high temperature, than an equal column of air outside; the pressure at the base is therefore less than the pressure at the same level outside. This supplies a motive force compelling air to enter at the bottom through the grate and through the opening over the grate, and causing a current to ascend. The motive force which the chimney supplies has not only to do work on the column of air within the chimney, chlmner in setting it in motion and in oveifoming frictional re- . ., sistance to its flow: it has also to set the air entering the raug ' room in motion and to overcome frictional resistance at the inlets. From want of proper inlets air has to be dragged in at a high velocity and against much resistance, under the doors, between the window sashes and through many other chinks and crevices. Under these conditions the air enters in small streams or narrow sheets, ill- distributed and moving so fast as to form disagreeable draughts, the pressure in the room is kept so low that an opened door or window, lets in a deluge of cold air, and the current up the chimney is much reduced. If the attempt is made to stop draughts by applying sand-bags and listing to the crevices at which air streams in, matters only become worse in other respects; the true remedy of course lies in providing proper inlets. The discharge of air

by an ordinary open fire and chimney varies widely, depending on the rate of combustion, the height and section and form of the chimney, and the freedom with which air is entering the room. About 10,000 cub. ft. per hour is probably a fair average, about enough to keep the air fresh for half a dozen persons. Even when no fire is burning the chimney plays an important part in ventilation; the air within an inhabited room being generally warmer than the air outside, it is only necessary that an up-current should be started in order that the chimney should maintain it, and it will usually be found that a current is, in fact, passing up.

When a room is occupied for any considerable length of time by more than about half a dozen persons, the chimney outlet should be supplemented by others, which usually take the form of gratings in the ceiling or cornices in communication with flues leading to the open air. These openings should be protected from down-draught by light flap valves of oiled silk or sheet mica.

With regard to inlets, a first care must be to avoid such currents of cold air as will give the disagreeable and dangerous sensation of draught. At ordinary temperatures a current of outer air /»!»/«

to which the body is exposed will be felt as a draught if its velocity exceeds 3, or even 2 ft. per second. The current entering a room may, however, be allowed to move with a speed much greater than this without causing discomfort, provided its direction keeps it from striking directly on the persons of the inmates. To secure this, it should enter, not horizontally nor through gratings on the floor, but vertically through openings high enough to carry the entering stream into the upper atmosphere of the room, where it will mix as completely as possible with warm air before its

presence can be felt. A favourite form of inlet is the Sheringham (fig. 1). When opened it forms a wedge-shaped project ion into the room, and admits air in an upward stream through the open top. It should be placed at a height

*of t 5 he° r f,o 6 or!- o'thlr huetsTe *»■ — Sheringham Air In.e, _ made by using hollow perforated blocks of earthenware, called air-bricks, built into the wall; these are often shaped on the inner*

Other outlets.

roio

VENTILATION

Tobla tube.

Fig. 2. — Tobin Tube.

side like an inverted louvre-board or Venetian blind, with slots

that slope so as to give an upward inclination to the entering

stream.

In another and most valuable form of ventilator, the Tobin tube,

the fresh air enters vertically upwards. The usual arrangement of Tobin tube (shown in front elevation and section in fig. 2) is a short vertical shaft of metal plate or wood which leads up the wall from the floor level to a height of 5 or

6 ft. Its lower end communicates with the outer air through an

air-grating in the wall; from its upper end, which is freely open, the current of fresh air rises in a smooth stream. Various forms of

section may be given to the tube: if placed in a corner it will be triangular or segmental; against a flat wall a shallow rectangular form is most usual, or it may be placed in a channel so as to be flush with the face of the wall; a lining of wood forming a dado may even be made to serve as a Tobin tube by setting

*n. ^^^ it out a little way from the wall. T V <^-I« ^ e tube ' s often furnished with a I »*j nr" regulating valve, and contrivances — i- — '..-* Il" 1 may be added for cleansing the*

*entering air. A muslin or canvas bag hung in the tube, or a screen stretched diagonally across it, may be used to filter out dust; the same object is served in some degree by forcing the air, as it enters the tube at the bottom, to pass in close contact with the surface of water in a tray, by means of a deflecting plate. These complications have a double drawback: they require frequent attention to keep them in order, and by put'^ng resistance in the way of the stream they are apt to reduce the efficiency of the ventilation. 1 The air entering by a Tobin tube may be warmed by a coil of hot pipes within the tube or by a small gas-stove (provided, of course, with a flue to discharge outside the pro- ducts of combustion), or the tube may draw its supply, not directly from the outer atmosphere, Short b ut f rom a hot-air flue. The opening, should always be about the level of a man's head, but the tube need not extend down to the floor: all that is essential is that it should have sufficient length to let the air issue in a smooth vertical current without eddies (fig. 3). *

These inlets are at once so simple and effective that no hesitation need be felt in introducing them freely in the rooms of dwelling- houses. When no special provision is made for them in the walls, the advantage of a current entering vertically may still be in

some degree secured by help of certain makeshift contrivances. One of these, suggested by Dr Hinkes Bird, is to open one sash of the window a few inches and fill up the opening by a board ; air then enters in a zig- zag course through the space between the meeting rails of the sashes. Still another plan is to have a light frame of wood or metal or glass made to fit in front of the lower sash when the window is opened, forming virtually a Tobin tube in front of the window.

As an example of the systematic ventilation of dwelling-rooms on a large scale, the following particulars may be quoted of arrange- _ ments that have been successfully used in English Arrange- barracks. One or more outlet-shafts of wood fitted with flap valves to prevent down-draught are carried from the highest part of the room, discharging some feet above the roof under a louvre. The number and size of these shafts are such as to give about 12 sq. in. of sectional area per head, and the chimney gives about 6 sq. in. more per head. About half the air enters cold through air-bricks or Sheringham valves at a height of about 9 ft. from the floor, and the other half is warmed by passing through flues behind the grate. The inlets taken together give an area of about 11 sq. in. per head. A fairly regular circulation of some 1200 cub. ft. per head per hour is found to take place, and the proportion of carbonic acid ranges from 7 to 10 parts in 10,000.

1 When the air is not filtered, and when it has been warmed before entering, the vertical direction of the stream is readily traced by dust, which is deposited on the wall in a nearly upright column, spreading slightly fan-wise as it rises. With cold air the deposit of dust is comparatively slight. The difference is due to the fact, noticed and explained by Mr John Aitken, that air quickly de- posits any suspended particles when it is brought into

contact with a surface colder than itself, but retains them in suspension if the surface be warmer than the air. Another domestic illustration of the same fact is given by the greater dustiness of walls and furniture in a stove-heated room than in a room heated by an open fire.

Fig. 3.- Tobin Tube.

Venttta- ttoo by

and door.

ments in barracks.

WIND'

Fig. 4. — Sectional Plan of Buchan's Exhaust Cowl.

In the natural ventilation of churches, halls and other large rooms we often find air admitted by gratings in the floor or near it ; or the inlets may consist, like Tobin tubes, of upright flues j nubile rising to a height of about 6 ft. above the floor, from which buildlnxs. the air proceeds in vertical streams. If the air is to be warmed before it enters, the supply may be drawn from a chamber warmed by hot-water or steam pipes or by a Jtove, and the tempera- ture of the room may be regulated by allowing part of the air to come from a hot chamber and part from outside, the two currents mixing in the shaft from which the inlets to the room draw their supply. Outlets usually consist of gratings or plain openings at or near the ceiling, preferably at a considerable distance from points vertically above the inlet tubes. One of the chief difficulties in natural ventilation is to guard them against down-draught through the action of the wind. Numberless forms of cowl have been devised with this object, with the further intention of turning the wind to useful account

by making it assist the up-current of foul air. Some of these exhaust cowls are of the revolving class, made to various designs and dimensions and put in rotation by „ . . the force of the wind. Revolving cowls are liable to fail C n W ls" by sticking, and, generally speaking, fixed cowls are to be preferred. They are designed in many forms, of which Buchan's may be cited as a good example. Fig. 4 shows this ventilator in horizontal section: oa is the vertical exhaust flue through which the foul air rises; near the top this expands into a polygonal chamber, bbbb, with vertical sides, consisting partly of perforated sheet-metal plates; outside of these are fixed vertical curved guide-plates, c,c,c,c; the wind, blowing between 1 these and the polygonal chamber, sucks air from the centre through the ' perforated sides. The efficient working of an exhaust cowl, however, depends almost entirely upon the favourable conditions of the wind. 2 The two things that supply motive force in automatic or natural ventilation by means of exhaust cowls and similar appliances — the difference of tempera- ture between inner and outer air, and the wind — are so variable that even the best arrangements of inlets and outlets give a somewhat uncertain result. As an example, it is evident that on a hot day with little movement in the air this mode of ventilation would be practically ineffectual. Under other condi- tions these automatic air-extractors not infrequently become inlets, thus reversing the whole system and pouring cold air on the heads of the inmates of the apartment or hall. To secure a strictly uniform delivery of air, unaffected by changes of season or of weather, it is necessary that the influence of these irregular motive forces be as far as possible minimized, and recourse must consequently be had to some mechanical force as a means of driving the air and securing adequate ventilation of the building.

Artificial Ventilation.— — Buildings may be mechanically ventilated on the vacuum system, the plenum system, or on a system com- bining the best points of both. In nearly every case of the appli- cation to modern buildings of mechanical means of ventilation the combined system in one form or another is adopted. In the vacuum system the motive force is applied at the outlets; the vitiated air is drawn from the rooms, and the pressure of the atmosphere in them is slightly less than the pressure outside. Upon the foul air being withdrawn fresh air finds its way in by means of conveniently placed inlets. In the plenum the motive force is applied at the inlets; fresh air is forced in and drives the vitiated air before it until it escapes at the outlets provided. The pressure within the room is greater than outside. The plenum method has distinct advantages: it makes the air escape instead of coming in as a cold draught at every crevice and casual opening to the outer air; it avoids drawing foul air from sewers and basement; and with it, more easily than with the other, one may guard against the dis- turbing influence of wind. In the plenum method the air is driven by fans; in the vacuum method suction is produced by fans or by heating the column of air in a long vertical shaft through which the discharge takes place. Water jets and steam jets have also been employed to impel or extract the air. Whatever system of venti- lation is adopted, it is most important that windows capable of being widely opened should also be provided to aerate at frequent intervals the whole building, either as a whole or in sections, and they should be so arranged that no corner can be left stagnant or unswept by the purifying current. The Victoria Hospital at Glasgow and the Royal General Hospital at Birmingham are, however, ventilated on the plenum system without the aid of open windows, with what are said to be satisfactory results. In the case of hospitals, it is evident that

aeration by means of open windows could not in Great Britain be effected except on warm and sunny

2 For an account of tests of various forms of ventilating cowls, see S. S. Hellyer, The Plumber and Sanitary Houses.

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days, but in the case of concert halls, theatres and similar buildings, it is possible (and most essential) thoroughly to aerate the building between each occupation.

The extraction of foul air should in most cases be effected at the top of a room or building, so as to utilize the natural tendency of warm air to rise ; but at Birmingham and elsewhere the outlets are near the floor, the fresh air being brought in

Bxtrac-

mat d half- way up the walls and directed towards the ceiling air.

The air inlets should be Tobin tubes or similar devices, placed some 4 or 5 ft. above the floor, and so arranged that the air should be passed in contact with radiators or pipes to warm it before entering. In the case of a building for one of the American legislatures, the warmed fresh air is allowed to enter on the level in front of the desk of each member, so that he secures a proper volume of fresh air for his own use before it is breathed by his neighbour.

The introduction of rapidly revolving, but silent, fans, driven by electricity, is a great advance which places within the reach of the engineer or architect the means for solving the problem Fans, j ven tilation of buildings, and

has been to a large extent

responsible for the rapid progress of the art of ventilation. The fan and motor combined extend the advantages of positive mechanical ventilation to all who have access to electric current, with the further benefit that the extreme simplicity of the electric driving of the fans greatly facilitates the control and distribution of ventilating effect. The moderate power required by these fans for a given duty has contributed greatly to their extended use. They should deliver into a chamber of considerable size, so that the velocity of the air may become reduced before it passes into the distributing flues. The question of silence in running, in such places as houses of parliament, law courts, churches and chapels, is of paramount importance, and no fan should be accepted until it is proved by actual working to be noiseless.

In some instances revolving pumps of the Root's blower type are used (see Bellows and Blowing Machines). At the Dundee College a battery of five of these blowers, each discharging over 150,000 cub. ft. of air per hour, is driven easily by a gas engine of two horse-power. The air is passed through two filters of coarsely woven fabrics which serve to remove all particles of impurity. The rooms are heated by having coils of Perkins's high-pressure hot-water pipes (see Heating) in the main distributing flues. The inlets are flat upright tubes extending up the side walls to a height of nearly 6 ft., and open at the top. Outlets are generally provided in the end walls, one group near the ceiling, another a few feet from the foot. They are fitted with doors which allow one or other to be closed; the high-level outlets are used in warm weather, when the fresh air that comes in is comparatively cool ; the low-level ones are used in cold weather, when the fresh air, having been heated before it enters, would tend to rise and pass out too

directly if the outlets near the ceiling were open. The outlet shafts communicate with a louvred tower or turrets on the roof. Each room receives a volume of air equal to its cubic capacity in about 12 minutes, so that the atmosphere is completely changed five times in an hour. The inlets are proportioned to do this without allowing the velocity with which air enters to exceed 6 ft. per second.

The water-spray ventilator is a mechanical ventilator using a jet of water to impel the air. A nozzle at the top of a circular air-shaft delivers a conical sheet of water, which impinges on the sides of the shaft a little way below and carries down with it a considerable stream of air. This ventilator is used either to force air into rooms or to draw it out; in the former case a small stove is often added to heat the supply.

In the early days of mechanical ventilation extraction by a hot-air shaft was a more common mode of ventilating hospitals and other p public buildings than now. The heat was applied by a

«onft C ″ furnace or stove at the bottom of the shaft, or by coils hot-air °^ hot-water or steam pipes. In the lecture theatre of the shaft Paris Conservatoire des Arts A. J. Morin employed this

means of extraction, and arranged that the fresh air should enter through the ceiling and the foul air be drawn off through the floor from under the seats; this reversal of the natural direction of the current is of course only possible when a sufficient external motive force is applied.

In theatres and similar buildings clusters of gas jets or sunlight burners, fixed at the ceiling level at the base of a metal shaft which is connected with the open air, serve as

effective ventilating agents by extracting the foul air which collects in the upper part of the hall.

To ensure the admission of the desired amount of air into a room, and to arrive at the proper allowance of inlets and outlets, it is _. necessary to ascertain the direction and velocity of the

measur – rnovement OI the air through them. The quantity of air meot ' passing through a given opening is found by multiplying of air. tne area °f tne opening expressed in square feet by the velocity of the current of air stated in lineal feet per minute, the product being the number of cubic feet passing per minute. Where the air is admitted through gratings only the clear area should be calculated, the amount of solid material being deducted from the gross superficies of the grating. The velocity of the air current may be determined by means of an anemometer (g.».).

Water– spray venti– lator.

We may conclude with a short summary of the methods adopted of ventilating a number of typical buildings of various classes of different countries.

. The Smallpox Hospital at Bradford consists of two wards, 75 ft. by 15 ft., placed back to back, with a space of about 3 ft. between them enclosed by walls forming a foul–air chamber of the same length as the wards, and reaching to the ceiling. At this level are outlets for the vitiated air — one over each bed. A furnace at the base of a tall shaft withdraws through these outlets the air which passes through the furnace on its way to the outer air. The windows are tightly closed and fresh air enters from a chamber below through gratings in the floor at the foot of each bed.

The New York General Hospital was stated in 1875 to contain 163 beds. In the wards there is one window to each bed, each pier between the windows containing a foul-air extracting flue running from the base of the building and connected in the roof with large trunks leading to an exhaust fan. The heating is by steam coils placed in the basement in such a way that by a valve the cool fresh air can be sent either through or around the heating coil. The warmed fresh air is conveyed through an air-tight iron pipe fitted in each extracting shaft and is admitted to the wards through slits in the window-sills forming a jet directed upward on the principle of Tobin tubes. The outlet openings for the foul air are placed one beneath each bed, with extra outlets for occasional use at the top and base of the external walls. The placing of the fresh- air supply pipes in an inaccessible position inside the foul air ducts cannot be approved for hospital ventilation, as it is quite possible that in time, through the decay of the pipe joints or of the pipes themselves, communication may be established between the fresh and foul air, thus entirely upsetting the system of ventilation.

The City Hospital of Hamburg, containing 130 beds, was opened in 1890. The buildings are one storey high and are heated on the ancient Roman hypocaust principle. Beneath the entire floor run longitudinally a number of brick and concrete flues about 30 in. square, covered on the top with marble tiles, forming the floor of the wards. In these flues are placed the steam heating pipes. Warmed .fresh air is admitted through large radiators in the centre of the wards, the vitiated air escaping through openings in the ridge of the roof. Mr H. Percy Adams adopted a similar hypocaust method for warming the chapel and the dining-hall at the King Edward VII. Tuberculosis Sanatorium at Midhurst, Sussex, except that the radiators are

omitted from the centre of the rooms and placed in recesses in the side walls.

In the Houses of Parliament at Westminsterf which were designed and built for the public business in 1836, considerable attention is devoted to the question of the purification of the air, but the arrange- ments are lamentably antiquated and ineffectual in their working. The supply of fresh air is drawn by fans from the terrace at the river front, and, after being warmed and moistened or cooled by water-spray or blocks of ice, as the temperature may require, passes through exceedingly tortuous and restricted air passages to the various chambers, where it is admitted through large gratings in the floor, which are covered by, porous matting to prevent draughts. The outlets for the vitiated air are in the ceilings of the apartments, and from these the air has to be dragged down to the base of the ventilating shaft in the Victoria tower, where an up-current is main- tained by a large furnace.

The French Chamber of Deputies, according to a report made by M. Frelat in 1891, is much overcrowded, the allowance of floor space for each member being only 30 square centimetres. The apparatus is powerful enough to change the air every six minutes, but to avoid draughts it can only be worked slowly. Fresh air is driven down by a fan through openings in the ceiling, and vitiated air removed at the floor, giving a downward system of ventilation.

For the ventilation of the new Sessions House at the corner of Newgate Street and Old Bailey, London, opened in 1907, an ela- borate system on the plenum downward principle was installed^ The fresh air, drawn in at the basement by powerful fans, passed in turn through purifying screens, on which water was constantly playing, and over steam-heated coils, before entering the distributing trunks ; into these sufficient cold air also was admitted to reduce it to the

required temperature. Branch ducts conveyed this warmed fresh air to the points of inlet just below the ceiling. The outlets for the vitiated air were placed near the floor level, an electric fan drawing it up and discharging it at the roof. It was claimed that 600 tons of filtered and warmed or cooled fresh air were passed through the building every hour.

In the Capitol at Washington in .America the upward system is installed. Fresh air, warmed by coils in the basement, is delivered by means of fans through openings in the floors of the various chambers and galleries, and the extractors are placed in the ceilings. This foul air passes out of the building through louvre ventilators placed on the roof ridge. Some of the vitiated atmo- sphere, however — that from the corridors and galleries — is drawn by means of a fan to the basement and blown up a lofty shaft.

The Grand Opera House in Vienna is ventilated on a most ela- borate and complete system, the arrangements there giving ex- cellent results. The scheme for heating and ventilating this

building was designed by D. Bohm. The building measures 397 ft. by 299 ft., and the theatre will hold about 2700 persons. Ventila- tion is effected by two fans, the lower for propulsion, the upper for extraction. The latter is aided also by the heat produced by the great pendant which has ninety burners. The heating is effected by steam, and the air enters the hall at a temperature of from 63 to 65 F., the points of entrance being at the floor and the risers of the seating. Each gallery and compartment of the theatre, in- cluding the stage, has a separate installation of heating apparatus and supply duct so that any one

portion may be warmed and venti- lated independently of the rest. The velocity of the incoming air is between 1 and 2 ft. per second. The driving fan in the basement sends air into the building at the rate of 1059 cub. ft. per head per hour by means of electricity. The temperature in different parts of the house can be observed in a central control office, and here also are the levers which control the valves regulating the air supply, both hot and cold. During a performance the super- intendent of heating and ventilation is on duty in this office and secures to each part of the building its proper supply of fresh air at a proper temperature.

For the ventilation of mines see Mining, and for that of railway tunnels see Tunnel.

Authorities. — The following are the principal publications on ventilation: J. S. Billings, Ventilation and 'fleating; Leeds, Treatise on Ventilation ; Carpenter, Heating, and Ventilating Buildings.

(J. Bt.) VENTIMIGLIA (Fr. Vintimille, anc. Album Inlimilium or Albintimilium) , a frontier fortress, seaport and episcopal see of Liguria, Italy, in the province of Porto Maurizio, 94 m. W. by S. of Genoa by rail, and 4 m. from the Franco-Italian frontier, 45 ft. above sea-level. Pop. (1901) 3452 (town); 11,468 (com- mune). The present Gothic cathedral is built on the ruins of an earlier Lombard church, and this again on a Roman building, possibly a temple. The ruins of the ancient town are situated in the plain of Nervia, 3 m. to the E. of the modern. It was a municipium with an extensive territory, and of some import- ance under the Empire, but was plundered by the partisans of Otho in a.d. 69. Remains of a theatre are visible, and remains of many other buildings have been discovered, among them traces of the ancient city walls, a fine mosaic, found in 1852 but at once destroyed,

and a number of tombs to the west of the theatre. The caves of the Balzi Rossi have proved rich in palaeolithic remains of the Quaternary period.

See Notizie degli Scavi, passim, especially 1877, 288 (G. Rossi). VENTNOR, a watering-place in the Isle of Wight, England, X2% m. S. by W. of Ryde by rail. Pop. of urban district (1901) 5866. It is finely situated in the Undercliff district, at the foot of St Boniface Down, which reaches a height of 787 ft. The town is built on a succession of terraces sloping towards the sea, and from its sheltered situation, equable temperature, and comparatively dry atmosphere is regarded as one of the best resorts in England for consumptive invalids. In the middle of the 19th century it was only a small fishing harnlet, now it extends along the shore for a distance of about 2 m., including Bonchurch to the east. It possesses assembly rooms, a literary and scientific institution, an esplanade, a pier and extensive recreation grounds. The churches of Ventnor are all modern, but that of St Boniface at Bonchurch is a small Norman building, perhaps the oldest in the island. Among the benevolent and charitable institutions are the royal national hospital for consumptives (founded in 1869), the seaside home of the London city mission, the St Catherine's home for consump- tives and the convalescent home of the Royal Hants Hospital. VENTRILOQUISM (Lat. venter, belly, and loqui, to speak), the art of producing the voice in such a manner that it shall appear to proceed, not from the speaker's own mouth, but from some place altogether distant from him. The art of ventrilo- quism was formerly supposed to result from a peculiar use of the stomach (whence the name) during the process of inhalation. As a matter of fact, the words are formed in the normal manner, but the breath is allowed to escape very slowly, the tones being muffled by

narrowing the glottis and the mouth opened as little as possible, while the tongue is retracted and only its tip moves. Gestures and facial expression are employed at the same time to assist in the deception by stimulating the imagina- tion of the listeners and to distract their attention from the speaker. " Thus," says Huxley, " if the ventriloquist desire

to create the belief that a voice issues from the bowels of the earth, he imitates, with great accuracy, the tones of such a half stifled voice, and suggests the existence of some one uttering it by directing his answers and gestures towards the ground. The gestures and tones are such as would be produced by a given cause; and, no other cause being apparent, the mind of the bystander insensibly judges the suggested cause to exist." Ventriloquism, which is still a recognized form of conjuring en tertainment, is of ancient origin. Traces of the art are found in Egyptian and Hebrew archaeology. Eurykles of Athens was the most celebrated of Greek ventriloquists, who were called after him Euryklides, and also Engastrimanteis (belly-prophets). It is not impossible that the priests of ancient times were masters of this art, and that to it may be ascribed such miracles as the speaking statues of the Egyptians, the Greek oracles, and the stone in the river Pactolus, the sound of which put robbers to flight. Many uncivilized races of modern times are adepts in ventriloquism, as the Zulus, the Maoris and the Eskimos. It is well known in Hindustan and China, where it is practised by travelling magicians.

See De la Chapelle, Le Ventriloque, ou I ' engastrimythe (London, 1772); E. Schultz, Die Kunst des Bauchredens (Erfurt, 1895); Sievers, Grundziige der Phonetic (Leipzig, 1901); Russel, Ventrilo- quism (London, 1898).

VENUE (derived through the French, from Lat. venire, to come), in English law the term

denoting the place from which a jury must come for the trial of a case. The word occurs early in constitutional documents, for it was for a long time one of the essentials of trial by jury that the jury should belong to the neighbourhood {vicinelum, visne) in which the cause of action arose or the alleged crime was committed (see Jury). This was founded on the idea that the jurors were in the nature of witnesses for or against the character or innocence of the party. The phrase duodecim legates homines— de vicineto, or its equivalent, is found in the Constitutions of Clarendon (1164), the Assize of the Forest (1184) and in Glanvill.

Civil Matters. — Civil actions came to be classified as local and transitory, the former where the cause of action could only arise in a particular county, such as trespass to land, the latter where it might have arisen in any county, such as debt. In the latter case the plaintiff might lay the venue where he pleased, i.e. try the cause in any part of England subject to the power of the court or a judge to change the place of trial. The law on the subject is now only of antiquarian interest, for under the rules of the Supreme Court (Ord. xxxvi. r. 1), " there shall be no local venue for the trial of any action, except where otherwise provided by statute, but in every action in every division the place of trial shall be fixed by the court or a judge." All local venues created by statutes prior to 1875 were superseded by the rules of the Supreme Court and have not been revived by the present rules; and many of such statutes have been expressly or impliedly repealed by the Public Authorities Protection Act 1893. The present practice is to fix the place of trial in the order for directions now made in every civil action in the High Court. The place is selected by reference to the wishes of the parties, the residence of the witnesses, and with a view to

reducing the costs of litigation.

Criminal Matters.— Proceedings by indictment or criminal in- formation are not affected by the changes of procedure as to civil actions; and it is necessary to ascertain in the case of each offence the venue, i.e. the proper place of trial, which, unless otherwise provided by statute, must be the county or other jurisdiction in which acts constituting the offence have been done. Numerous acts provide for the place of trial of offences committed partly in one county and partly in another, or on the high seas or abroad, and of special offences, such as those under the Post Office, Merchant Shipping, Slave Trade, and Foreign Enlistment Acts. The place of trial may be changed by the king's bench division, where it is probable that a fair trial could not be had in the county of the venue. Until 1825 it was necessary to have as juries in criminal cases jurors from the hundred in which the offence was said to have been com- mitted, and to be very particular to specify the venue as to each act imputed to the accused. This strictness continued to some extent until the passing of the Criminal Procedure Act 1 85 1, which makes it unnecessary to state any venue in the body of an indictment, and no indictment is to be held bad for want of a proper perfect venue. Since this enactment (which applies to Ireland as well as to England) it is sufficient to state the venue in the margin of the in- dictment in this form, " Middlesex to wit," and it is unnecessary to mention the venue in the body of the indictment or information, though in certain cases such as burglary it is usual, if not essential, to give a " local description."

Scotland. — In Scottish law venue is not used

as a technical term, but there are statutory provisions for changing the place of trial in both civil and criminal cases.

United States. — In the United States venue may generally be changed by the courts; but in some states it is provided by their constitutions that provision for change of venue is to be made by the legislature. In other states the passing of local or special laws for change of venue is forbidden. (W. F. C.)

VENUS, an old Roman and Latin goddess, apparently repre- senting beauty and growth in nature, and especially in gardens, where the Roman practical sense would most naturally see these. She had two temples in Rome, one in the grove of Libitina, with whom she was wrongly identified, and the other near the Circus Maximus, both of which had as their dedication day the 19th of August, the festival of the Vinalia mstica, a fact which also points in the direction of skilled cultivation as the human work of which she was protectress. But this old Latin deity was in historical times entirely absorbed by the Greek Aphrodite, and assumed the characteristics of a cult of human love, which in her original form she had never possessed. (See Aphrodite.)

VENUS, in astronomy, the second of the major planets in the order of distance from the sun, and moving next within the orbit of the earth. Its symbol is ? . At inferior conjunction it approaches nearer to the earth than any other major planet, but in that position it is practically invisible. Its apparent motion may be described as an oscillation from one side of the sun to the other, the complete period of which is i-6 years, and the greatest elongation about 45° on each side of the sun. When east of the latter it appears as the ″ evening star ″ in the west after sunset, while near western elongation it is seen as the ″ morning star ″ before sunrise. In these aspects it was known

to the ancients as "Eairepos, Hesperus, and 'Ecocr^opos or a>

Notwithstanding the near approach of Venus to the earth, its situation relative to the sun is unfavourable to the study of its physical constitution. Near inferior conjunction only a narrow crescent of light is visible; and when, as the planet moves away, this crescent becomes broader, the distance of the planet constantly increases. When it appears as a half-moon it is at a distance of more than two-thirds that of the sun, and nearly double the distance of Mars in opposition. The difficulty of reaching any conclusion on the subject of its constitution is heightened by the seeming absence of any well-marked features on the visible part of its brilliant surface. In the telescope it presents much the appearance of burnished silver, without spot or blemish. It is true that observers have from time to time thought they could detect slight variations of shade indicating an axial rotation. As far back as 1667 G. D. Cassini thought he saw a bright spot near the southern horn, observations 1° Venus. ° wn i c h 8 ave a period of about 23 hours. In 1726 Francesco Bianchini (1662-1729), a papal chamberlain, made similar observations from which he inferred a period of more than 24 days. It was shown, however, that the observations of Bianchini could be reconciled with those of Cassini by supposing that, as he observed the planet night after night, it had made one rotation and a little more. J. H. Schroeter also found a revolution of less than 24 hours. But Sir W. Herschel, as in the case of Mercury, was never able to detect any changes from which a period of rotation could be determined. During the years 1888-1890, G. Schiaparelli made an exhaustive study of the whole subject, the results of which were summed up in five brief notes, read to the Lombardian Academy of Sciences during the year 1890. His general conclusion was that Venus always*

presents the same face to the sun, as the moon does to the earth. The same result has been reached by the observations at the Lowell Observatory. The inference that the axial rotation is at least much slower than that of the earth is strengthened by the measures of different diameters of the planet made while it was in transit across the disk of the sun in 1874 and 1882. These show no measurable ellipticity of the disk, but they are not sufficiently accurate to lead to any more precise conclusion than

that just stated. Still, the difficulty and uncertainty attending all observations hitherto made upon the disk are such that no conclusion respecting the time of rotation can be regarded as established. Against the view of Schiaparelli is to be set the great improbability that a body so distant from the sun as Venus could be permanently so acted upon as to keep its axial rotation in precise coincidence with its orbital motion. Only one way seems to be open for settling the question; this is by spectro- scopic observations of the displacement of the spectral lines at the two limbs of the planet. Attempts by this method have been made by A. A. Belopolski at Pulkova, and by the astronomers of the Lowell Observatory. It is, however, found that the amount of displacement is so small that it has evaded certain detection up to the present time. Belopolski's measures were decidedly in favour of an axial rotation, while the Lowell results were not. Other observations than those we have cited show that Venus is surrounded by an atmosphere so filled with clouds that it is doubtful whether any view of the solid body of the Atmo- planet can ever be obtained. The first evidence in sphere of favour of an atmosphere was found in the fact Veaus - that, when near inferior conjunction, the visible outline of the thin crescent extended through more than 180°. Most remarkable was an

observation by Chester Smith Lyman at New Haven during the conjunction of 1866, when the planet was just without the sun. A thin line of light was supposed to be seen all round the limb of the planet most distant from the sun. But as no such appearance was seen during the approach of the planet to the sun at the transits of 1874 and 1882, when the conditions were much more favourable, it seems likely that such observations are the result of an optical illusion. During the latter of the two transits the phenomena of this class observed were of an unexpected character. Not a trace of the planet could be seen until it began to impinge upon the solar disk. When about half of its diameter had entered upon the sun the outline outside the disk of the sun began to be marked by broken portions of an arc of light. This did not begin at the point A (fig. 1) farthest from the sun, as it should have done if dms

Fig. 1.

wholly to refraction, but immediately at the sun itself, as sfown in the cut at the point B. Portions of this arc were formed one by one at various other points of the dotted outline, and when the planet was about three-fourths upon the sun the ar was completed. But there was no strengthening of the line at the middle point, as there should have been if due to refraction. Yet refraction must have played some part in the phenomenon, because otherwise no illumination could have been visible under the circumstances. The most satisfactory explanation seems to be that of H. N. Russell, whose conclusion is that the atmosphere is so permeated with fine particles of vapour up to its outer limit as to be only translucent without being fully transparent. Thus what is seen is the irregular reflection r>f the light at an extremely small angle from the particles of vapour.

The question whether Venus has a satellite has

always inter- ested astronomers. During the 17th and 18th centuries Cassini at Paris and James Short (1710-1768) in England, as well as other observers during the same period, saw an sa fgiiue object which had the appearance of a satellite. But as no such object has been seen by the most careful search with .'he best instruments of recent times, the supposed object must be regarded as what is known to the practical astronomer a? a " ghost " produced by refraction from the lenses of the eye piece, or perhaps of the object-glass, of the telescope.

Transits ot Venus,

If the orbit of Venus lay in the plane of the ecliptic, it would be seen to pass over the disk of the sun at every inferior conjunction. But the inclination of the orbit, 3° 36', is so large that a transit is seen only when the earth and Venus pass a node of the orbit at nearly the same time. The earth passes the line of nodes about the 7th of June and the 7th of December of each year. The date of passage is about a day later in each successive century. Venus passes the node near enough to these dates to be seen against the sun only four times in a period of 243 years. The following list of dates from 1518 to 2012 shows the law of recur- rence.

1518 June 2.

1769 June 3. 1874 December 9.

1526 June 1.

1 63 1 December 7.

1882 December 6

1639 December 4.

2004 June 8.

1761 June 6.

2012 June 6.

The first of these transits actually seen was that of 1639, which was imperfectly observed by Jeremiah Horrox (1619–1641) shortly before sunset. Special interest in them was first excited by Edmund Halley a century later, who showed that the parallax of the sun could be determined by observing transits of Venus from regions of the earth's surface where the displacement by parallax was greatest. Governments, scientific organizations and individuals fitted out expeditions on a very large scale to make the necessary observations upon the four transits which have since occurred. The disappoint- ing character of the results so far as the solar parallax is concerned are stated in the article Parallax, Solar. It may be said in a general way that the observations, even when made by experienced astronomers, exhibited irregularities and discordances several times greater than one had a right to expect. Other methods of deter- mining the distance of the sun have been so perfected that the results of these transits now count but little. (S. N.)

VENUSIA (mod. Venosa, q.v.), an ancient city of Apulia, Italy, on the Via Appia, about 6 m. S. of the river Aufidus (Ofanto), and not far from the boundary of Lucania (hence Horace describes himself as " Lucanus an Apulus anceps, nam Venusinus arat finem sub utrumque colonus "). It was taken by the Romans after the Samnite war of 291 B.C., and became a colony at once, no fewer than 20,000 men being sent there, owing to its military importance. Throughout the Hannibalic wars it remained faithful to Rome, and had a further contingent of colonists sent in 200 B.C. to replace its losses in war. Some coins of Venusia of this period exist. It

took part in the Social War, and was recaptured by Quintus Metellus Pius; it then became a municipium, but in 43 B.C. its territory was assigned to the veterans of the triumvirs, and it became a colony once more. Horace was born here, the son of a freedman, in 65 B.C. It remained an important place under the Empire as a station on the Via Appia, though Mommsen's description of it {Corp. Inscr. Lai. ix. p. 45) as having branch roads to Equus Tuticus and Potentia, and Kiepert's maps annexed to the volume, do not agree with one another. Remains of the ancient city walls and of an amphitheatre still exist, and a number of inscriptions have been found there. Jewish catacombs with inscriptions in Hebrew, Greek and Latin show the importance of the Jewish popu- lation here in the 4th and 5th centuries after Christ. (T. As.)

VENUS'S FLY-TRAP {Dionaea muscipula) , a remarkable insectivorous plant, a native of North and South Carolina, first described in 1768 by the American botanist Ellis, in a letter to Linnaeus, in which he gave a substantially correct account of the structure and functions of its leaves, and even suggested the probability of their carnivorism. Linnaeus declared it the most wonderful of plants (miraculutn naturae), yet only admitted that it showed an extreme case of sensitiveness, supposing that the insects were only accidentally captured and subsequently allowed to escape. The insectivorous habit of the plant was subsequently fully investigated and described by Charles Darwin in his book on insectivorous plants.

The plant is a small herb with a rosette of radical leaves with broad leaf-like footstalks. Each leaf has two lobes, standing at rather less than a right angle to each other, their edges being produced into spike-like processes (fig. 1). The upper surface of each lobe is covered with minute circular sessile glands,

each consisting of from 20 to 30 cells filled with purplish fluid; it bears also three fine-pointed sensitive bristles arranged in a triangle (fig. 3) . These contain no fibro-vascular bundles, but present an articulation near their bases, which enables them to bend parallel to the surface of the leaf when the lobes close. When the bristles are touched by an insect the lobes close very sharply upon the hinge-like midrib, the spikes

Fig. 1. — Leaf of Venus's Fly-Trap {Dionaea muscipula), viewed laterally in its ex- panded state, slightly enlarged. (After Darwin.)

Fig. 2. — Leaf of D. muscipula closed over Insect. A, viewed from the side; B, from above;

interlock, and the insect is imprisoned (fig. 2). If Very minute, and so not worth digesting, it is able to escape between the interlocked spines ; more usually, how- ever, it is retained between the lobes, which gradually but firmly compress it, until its form is dis-tinguishable from without. The leaf thus forms itself into a temporary stomach, and the glands, hitherto dry, o mence, as soon as , excited by the ab- sorption of a trace of nitrogenous matter, to pour out an acid secretion containing a ferment or enzyme, similar to that ex- creted by the leaves of the sundew, which rapidly dissolves the soft parts of the insect. This is produced in such abundance that, when Darwin made a small opening at the base of one lobe of a leaf which had closed over a large crushed fly, the secretion con- tinued to run down the footstalk during the whole time — nine days— during which the plant was kept under observation. The closing of the leaf is due to a redistribution of water in the cells brought about by a change in the pro- toplasm which follows the stimulation of the sensi- tive bristles.

Though the bristles are exquisitely sensitive

to the slightest contact with solid bodies, yet they are far less sensitive than those of the sundew {Drosera) to prolonged pres- sure, a singular difference in evident relation to the habits of the two plants. Like the leaves of Drosera, however, those of Dionaea are completely indifferent to wind and rain. The surface of the blade is very slightly sensitive; it may be roughly handled or scratched with- out causing movement, but closes when its surface or midrib is deeply pricked or cut. Irritation of the triangular area on each lobe enclosed by the sensitive bristles causes closure. The footstalk is quite in- sensitive. Inorganic or non-nitro- genous bodies, placed on the leaves without touching the sensitive bristles, do not excite movement, but nitrogenous bodies, if in the least degree damp, cause after several hours the lobes to close slowly. So too the leaf which has closed over a digestible body ap- plies a gradual pressure, which . serves to bring the glands on both sides into contact with the body. Thus we see that there are two kinds 1

of movement, adapted for different .^^^S«Pi"'''Iil^§^*^^"— purposes, one rapid, excited me- ^^^g^A%?gJttiV«l' chanically, the other slow, excited 'SSsgjgsg&^ssjfiWife chemically. Leaves made to close*

over insoluble bodies reopen in less Fig. 3. A, sensitive bristle

than twenty-four hours, and are an d gl an ds of D. muscipula; ready, even before being fully ex- g glands, panded, to shut again. But if

they have closed over nitrogen-yielding bodies, they remain closely shut for many days, and after re-expanding are torpid, and never act again, or only after a considerable time. Even in a state of nature, the most vigorous'leaves are very rarely able to digest more than twice, or at most thrice, during their life.

VENUS'S LOOKING GLASS, a popular garden name for Campanula Speculum (or Specularia Speculum), from the old name for the plant, Speculum Veneris. It is a common

cornfield plant in the south of Europe, and is grown in gardens on account of its brilliant purple flowers.

VERA, AUGUSTO (1813–1885), Italian philosopher, was born at Amelia in the province of Perugia on the 4th of May 1813. He was educated in Rome and Paris, and, after teaching classics for some years in Geneva, held chairs of philosophy in various colleges in France, and subsequently was professor in Strass- burg and in Paris. He left Paris after the coup d'etat of 1851 and spent nine years in England. Attaching himself with enthusiasm to Hegel's system, Vera (who wrote fluently both in French and in English as well as in Italian) became widely influential in spreading a knowledge of the Hegelian doctrine, and became the chief representative of Italian Hegelianism. Without any marked originality, his writings are distinguished by lucidity of exposition and genuine philosophic spirit. In i860 Vera returned to Italy, where he was made professor of philosophy in the royal academy of Milan. In the following year he was transferred to Naples as professor of philosophy in the university there. His Prolusioni alia Storia della Filo- sofia and Lezioni sulla Filosofia della Storia were connected with his professorial work, which was specially devoted to the history of philosophy and the philosophy of history. He held this post till his death, which took place at Naples on the 13th of July 1885.

Among his numerous works may be mentioned Introduction a la philosophie d'Hegel (1855;

2nd ed., 1865); Probleme de la certi- tude (1845); Le Hegelianisme et la philosophie (1861); Melanges philosophiques (1862); Essais de philosophie Hegelienne (1864); Strauss, I'ancienne et la nouvelle foi (1873), an attack upon Strauss's last " confession," written from the standpoint of an orthodox Hegelian; and a comprehensive work in Italian, II Problema dell' Assoluto (Naples, 1872-82). His English works are an Inquiry into Speculative and Experimental Science (London, 1 856); Intro- duction to Speculative Logic and Philosophy (St Louis, 1875), and a translation of Bretschneider's History of Religion and of the Chris- tian Church. He published also translations into French with com- mentaries of Hegel's works: Logique de Hegel (Paris, 1859; 2nd ed., 1874^); Philosophie de la nature de Hegel (1863-65); Philosophie de I esprit de Hegel (1867-69) ; Philosophie de la religion de Hegel (1876-78, incomplete).

See R. Mariano, Augusto Vera (Naples, 1887) and Strauss e Vera (Rome, 1874); Karl Rosenkranz, Hegel's Naturphilosophie und deren Bearbeitung durch A. Vera (Berlin, 1868).

VERA CRUZ (officially Vera Cruz Llave), a Gulf Coast state of Mexico, bounded N. by Tamaulipas, W. by San Luis Potosi, Hidalgo, Puebla and Oaxaca, and S.E. by Chiapas and Tabasco. Pop. (1900) 981,030. It is about 50 m. wide, extending along the coast, N.W. to S.E., for a distance of 435 m., with an area of 29,201 sq. m. It was the seat of an ancient Indian civiliza- tion antedating the Aztecs and is filled with remarkable and interesting ruins; it is now one of the richest states of the republic. It consists of a low, sandy coastal zone, much broken with tidewater streams and lagoons, behind which the land rises gradually to the base of the sierras and then in rich valleys and wooded slopes to their summits on the eastern margin of the great Mexican plateau, from which rise the majestic

summits of Orizaba and Cofre de Perote. The climate is hot, humid and malarial, except on the higher elevations; the rainfall is heavy, and the tropical vegetation is so dense that it is prac- tically impossible to clear it away. At Coatzacoalcos the annual precipitation ranges from 125 to 140 in., but it steadily decreases towards the N. On the higher slopes of the sierras prehistoric terraces are found, evidently constructed to prevent the washing away of the soil by these heavy rains. More than forty rivers cross the state from the sierras to the coast, the following being navigable on their lower courses — Coatzacoalcos, San Juan, Tonto, Papaloapam, Tuxpam and Casones. Several of the lagoons on the coast are also navigable, that of Tamiahua on the northern coast, about 100 m. long, being connected with the port of Tampico by inland channels. There are several ports on the coast — Coatzacoalcos, Alvarado, Vera Cruz, Nautla, Tecolutla and Tuxpam. The products of the state are chiefly agricultural— cotton, sugar, rum, tobacco, coffee, cacao, vanilla, maize, beans and fruit. Cattle-raising is followed in some districts, cattle and hides being among the

exports. Among the forest products are rubber, cabinet woods, dye-woods, broom-root, chicle, jalap and orchids. Vera Cruz is one of the largest producers of sugar and rum in Mexico. There are a number of cotton factories (one of the largest in Mexico being at Orizaba), chiefly devoted to the making of coarse cloth for the lower classes. Tobacco factories are also numerous. Other manufactures include paper, chocolate, soap and matches. There are four lines of railway converging at Vera Cruz, two of which cross the state by different routes to converge again at Mexico city. Another, the Tehuantepec National railway, crosses in the south, and is connected with Vera Cruz (city) by the Vera Cruz & Pacific line, which traverses the state in a south-

easterly direction. The capital is Jalapa, and its principal towns are Vera Cruz, Orizaba, Cordova and Coatzacoalcos.

VERA CRUZ, a city and seaport of Mexico, in the state of Vera Cruz, on a slight indentation of the coast of the Gulf of Mexico, in 19° n′ 50″ N., 96 20′ W., slightly sheltered by some small islands and reefs. Pop. (1900) 29,164. Vera Cruz is the most important port of the republic. It is 263 m. by rail E. of the city of Mexico, with which it is connected by two lines of railway. It is built on a flat, sandy, barren beach, only a few feet above sea-level. The harbour is confined to a compara- tively narrow channel inside a line of reefs and small islands, which is exposed to the full force of northern storms . New port works were completed towards the end of the 19th century, which, by means of breakwaters, afford complete protection. In 1905 the four railway companies having terminal stations in Vera Cruz united in the organization of a joint terminal association, with union station, tracks, warehouses, quays, cranes, &c.

Vera Cruz dates from 1520, soon after the first landing there of Cortes. This settlement was called Villa Rica de Vera Cruz, but was soon after moved to the harbour of Bernal, in 1525 to a point now called Old Vera Cruz, and in 1599 to its present site. It was pillaged by privateers in 1653 and 1712, and this led to the erection of the celebrated fort of San Juan de Ulua, or Ulloa, on one of the reefs in front of the city. In 1838 it was captured by the French, in 1847 (March 29) by an American army under General Winfield Scott, who made Vera Cruz a base for his march upon the city of Mexico, and in 1861 by the French.

VERANDAH, or Veranda, a roofed gallery or portico attached to the outside of a dwelling-house or other building, usually open at the sides or partially covered by lattice-work or

glass or other screens. The roofing is slanting and supported by pillars ; a light rail or balustrade often surrounds it. The word in English is comparatively modern, having only been included by Todd in his edition of Johnson's Dictionary in 1827. But it was known earlier in India, and the occurrence of the word in modern Hindustani {varanda) and Malayan (baranda) has led some etymologists to connect the word with the Persian baramadan, to climb. It is, however, certainly of European origin, and was taken to the East by the early Portuguese navigators. It is to be found as early as the end of the 15th century and the beginning of the 16th in Spanish and Portuguese (so Minsheu, " varanda, railes to leane the brest on "), and apparently is to be referred to Lat. vara, a forked pole or rod.

VERATRUM. The Greek physicians were acquainted with a poisonous herb which they called white hellebore, and which has been supposed to represent the Veratrum album of modern botanists. Be this as it may, in modern times the name has been applied to a genus of herbaceous plants belonging to the natural order Liliaceae. Veratrum is a tall-growing herb, having a fibrous root-stock, an erect stem, with numerous broad, plicated leaves placed alternately, and terminal, much-branched clusters of greenish or purplish polygamous flowers. Each perfect flower consists of six regular petals, as many stamens, whose anthers open outwardly, and a three-celled superior ovary which ripens into a three-celled, many-seeded capsule. The genus comprises about nine species, natives of the temperate

regions of the northern hemisphere, generally growing in pastures or woods. V. album and the American species V. viride are commonly grown

in gardens as ornamental perennials, but their poisonous qualities should be kept in mind, particularly as they bear a considerable resemblance in foliage to the harmless Gentiana lutea. Both contain the potent alkaloid veratrine. (See also Hellebore.)

VERBENA. *The genus Verbena (vervain) in botany gives its name to the natural order (Verbenaceae) of which it is a member. The species are herbaceous or somewhat shrubby, erect or pro- cumbent, with opposite or whorled leaves, generally deeply cut. The sessile flowers are aggregated into close spikes. Each flower has a tubular, ribbed calyx, a more or less irregular tubular two-lipped corolla, with four (didynamous) stamens springing from the interior of the corolla-tube. The anthers are two-celled, with or without a gland-like appendage at the apex. The ovary is entire or four-lobed, and always four-celled, with a single ovule in each cell; the style is unequally two-lobed at the apex. The fruit consists of four hard nutlets within the persistent calyx. There are about eighty species known, mostly natives of tropical and subtropical America, a very few species occur- ring also in the Old World. The vervein, or vervain, V. officinalis, native of central and north Asia, Europe and North Africa, and common on dry waste ground in the south of England (rarer in the north), was the object of much superstitious veneration on the part of our pagan ancestors, who attributed marvellous properties to it, provided it were gathered in a particular manner and with much complex ceremonial. The plant is now but lightly esteemed, and its medicinal virtues are wholly discredited. The garden verbenas are derivatives from various South American species, such as V. teucrioides, a native of southern Brazil, and V. chamaedrifolia from Argentina and southern Brazil. The range of colours extends from pure white to rose-*

coloured, carmine, violet and purple. Striped forms also are cultivated. The lemon-scented verbena of gardens, so much valued for the fragrance of its leaves, was once referred to this genus under the name V. triphylla, subsequently called Aloysia, but is now referred to the genus Lippia as L. citriodora; it differs from Verbena in having two, not four, nutlets in the fruit.

The garden verbenas, although somewhat misprized for some years, have once more become popular as bedding plants, and also for pot culture. They are easily raised from seeds sown in heat in February or March, but choice varieties, like Miss Willmott and others, can only be kept true when raised from cuttings. These are best secured from old plants cut down in the autumn and started into growth in gentle heat and moisture the following spring. They root readily in a compost of sandy loam and leaf soil. Besides the garden varieties, V. venosa, a Brazilian species with bluish-violet flowers, is a popular plant for massing in beds during the summer months.

VERBOCZY, ISTVAN [Stephen Werbocz] (14657-1541), Hungarian jurist and statesman, first became known as a scholar and theologian of such eminence that he was appointed to accompany the emperor Charles V. to Worms, to take up the cudgels against Luther. He began his political career as the deputy of the county of Ugocsa to the diet of 1498, where his eloquence and scholarship had a great effect in procuring the extension of the privileges of the gentry and the exclusion of all foreign competitors for the Hungarian throne in future elections. He was the spokesman and leader of the gentry against the magnates and prelates at the diets of 1500, 1501 and 1505. At the last diet he insisted, in his petition to the king, that the law should be binding upon all the gentry alike, and firmly established in the minds of the people the principle of a national

monarchy. The most striking proof of his popularity at this time is the fact that the diet voted him two denarii per hearth for his services in 1505, a circum- stance unexampled in Hungarian history. In 151 7 VerbSczy was appointed the guardian of the infant Louis II., and was sent on a foreign mission to solicit the aid of Christendom against the Turks. On his return he found the strife of parties

fiercer than ever and the whole country in a state of anarchy. At the diet of Hatvan, on the 25th of June 1525, he delivered a reconciliatory oration which so affected the assembly that i' elected him palatine. During the brief time he held that hig, office he unselfishly and courageously endeavoured to serve both king and people by humbling the pride of the magnates who were primarily responsible for the dilapidation of the realm. But he was deposed at the following diet, and retired from public life till the election of Janos Zapolya, who realized his theory of a national king and from whom he accepted the chancellorship. He now devoted himself entirely to the study of jurisprudence, and the result of his labours was the famous Opus tripartitum juris consuetudinarii inclyti regni hungariae, which was the law-book of Hungary till 1848.

See Arpad Karolyi, Verboczy's Mission to the Diet of Worms (Hung.; Budapest, 1880); Vilmor Fraknoi, Before and after the Catastrophe of Mohdcs (Hung.; Budapest, 1876); ibid., Stephen Wer- boczi (Hung. ; Budapest, 1899). " (R. N. B.)

VERBOECKHOVEN, EUGENE JOSEPH (1790-1881), Belgian painter, was born at Warneton in West Flanders, and received instruction in drawing and modelling from his father, the sculptor Barthelemy Verboeckhoven. Subsequently he settled in Brussels and devoted himself almost exclusively to animal subjects. His paintings of sheep, of horses and of cattle in landscape,

somewhat after the manner of Potter, brought him universal fame, and were eagerly sought for by collectors. Precise and careful finish is the chief quality of his art, which is entirely objective and lacking in inspiration. Verboeckhoven visited England in 1826, Germany in 1828, and France and Italy in 1841, and died at Brussels in 1881. He was a member of the academies of Brussels, Ghent, Antwerp, St Petersburg and Amsterdam. Examples of his art are to be found in nearly all the important galleries of Europe and the United States, notably in Brussels, Antwerp, Amsterdam, Hamburg, Berlin, Munich, New York, Boston and Washington. His long life and ceaseless industry account for the enormous number of his pictures in public and private collections and in the art market. In addition to his painted work he executed some fifty etched plates of similar subjects.

VERBRUGGEN, SUSANNA (c. 1667–1703), English actress, was the daughter of an actor named Percival, and her first recorded stage appearance was in 1681 in D'Urfey's Sir Barnaby Whig. She played at Dorset Garden and the Theatre Royal, and in 1686 married William Mountfort (q.v.). By 1690 she was one of the leading actresses in Betterton's company. About a year after Mountfort's death, in 1692, she married John Verbruggen (fl. 1 688–c. 1 707) , also an actor of considerable ability.

VERCELLI (anc. Vercellae), a town and archiepiscopal see of Piedmont, Italy, in the province of Novara, 13 m. S.W. of that town by rail. Pop. (1901) 17,922 (town), 30,470 (commune). It is situated 430 ft. above sea-level on the river Sesia, at its junction with the Canterana. Vercelli is a point at which railways diverge for Novara, Mortara, Casale Monferrato and Santhia (for Turin). The walls by which Vercelli was formerly surrounded have been demolished, and their place is now occupied by boulevards, from which a fine view

of the Alps (especially the Monte Rosa group) is obtained. The streets are for the most part tortuous and narrow; there is a large market-place (Piazza Cavour) witVi a statue of Cavour (1861), The cathedral is a large building dating from the 16th century; its library contains a number of rare ancient MSS., especially the Codex Vercellensis, one of the most important MSS. of the old Latin version of the Gospels, written in the 4th or 5th century by Eusebius, bishop of Vercelli. A museum close by contains Roman antiquities. The churches of S. Andrea (a large and fine Romanesque Gothic building dating from 1219- 1224, with an interior in the French Gothic style), S. Paolo, S. Caterina and S. Cristoforo possess valuable examples of the work of Gaudenzio Ferrari (1471-1546) and of his follower Lanini. Silk-spinning is important, and Vercelli is one of the principal Italian centres of the exportation of cereals and especially of rice. There are corn and rice mills of large size,

while cotton and woollen mills and factories of artificial manure, &c, have attained importance.

Vercellae was originally the chief city of the Libici (a Ligurian tribe) and afterwards became a Roman municipium of some importance. It stood at the junction of roads to Eporedia, Novaria and Mediolanum, Laumellum (for Ticinum) and perhaps Hasta. No ancient remains exist above ground, but many inscriptions, tombs and other antiquities have been found. Remains of the theatre and amphitheatre were seen in the 16th century, and remains of ancient streets have more recently been found during drainage operations. There were apparently four principal streets all leading to the centre of the town where the Forum must have been

situated. Of the walls, however, nothing is known except from medieval documents (cf. L. Bruzza, Iscrizioni antiche Vercellesi, Rome, 1874). In the neighbourhood (near Rotto on the Sesia) are the Raudii Campi where Hannibal won his first victory on Italian soil (218 B.C.), and where in 101 B.C. Marius and Catulus routed the Cimbri. From about 1228 till 1372 Vercelli was the seat of a university. (T. As.)

VERCELLI BOOK (Codex Vercellensis) , an Early English MS. containing, besides homilies, a number of poetical and imaginative pieces: Andreas, The Fates of the Apostles, Address of the Soul to the Body, Falseness of Men, Dream of the Rood, Elene and a prose Life of Guthlac. It was found in the cathedral library of Vercelli, Piedmont, by a German jurist Friedrich Blume, in 1822, and was first described in his Iter Italicum (Berlin and Stettin, 4 vols., 1824–36). An untenable explanation of the presence of the MS. at Vercelli suggested that it had been brought there by Johannes Scotus Erigena. But the hand-writing dates from the beginning of the nth century, long after his death. According to Dr Wiilker the MS. probably belonged to the hospice for English pilgrims, founded, together with the monastery of St Andrew, by Cardinal Jacopo Guala- Bicchieri (d. 1227), a native of Vercelli and bishop of the city, in 1 219, on his return from England, where he had been papal legate from 1216 to 1218. The cardinal, a man of wide learning, possessed a large library, which he left to the monastery; and the Vercelli codex may well have been included in it.

Its contents were partially printed (by Benjamin Thorpe from Blume's transcript) in Appendix B to C. P. Cooper's Report of Rymeri Feeder a for 1836; by J. M. Kemble, The Poetry of the Codex Vercellensis, with an English translation (Aelfric Soc, 1843–56), and in a better text based directly on the MS. by

Wiilker in his edition of C. W. M. Grein's Bibliothek der A.S. Poesie (Leipzig, 1894), vol. ii. Codex Vercellensis, by Dr Richard Wiilker (Leipzig, 1894), is a facsimile of the MS.

For the description and history of the MS. see also Willker's Grundriss . . . der A.S. Litteratur (1885), pp. 237–42, and A. Napier in Zeilschrift fur deutsches Altertum (Berlin, 1889, vol. 21, new series; old series, vol. 33, p. 66), for a collation of Willker's text with the MS. For the individual poems see also Cynewulf.

VERDEN, a town of Germany, in the Prussian province of Hanover, on the navigable Aller, 3 m. above its confluence with the Weser, 22 m. S.E. of Bremen by the railway to Hanover. Pop. (1900) 9S42. The most noticeable edifices are the beautiful Gothic cathedral, the churches of St Andrew and St John, a new Roman Catholic church (1894). and the celebrated cathedral school. Its industries embrace the manufacture of agricul- tural machinery, cigar-making, brewing and distilling. Verden was the see of a bishopric founded in the first quarter of the 9th century, or earlier, and secularized in 1648. The duchy of Verden was then ceded to Sweden, passed in 1719 to Hanover and in 1810 to the kingdom of Westphalia. It was restored toHanoverin 1814, and was, with Hanover, annexed by Prussia in 1866.

See Ostenberg, Aus Verden's Vergangenheil (Stade, 1876).

VERDERER (O. Fr. verdier, Med. Lat. viridarius), a term used in English forest law for a judicial officer appointed to look after what was known as the " vert " (O. Fr. verd, green; Lat. viridis), i.e. the forest trees and underwood in the royal forests. It was the verderer's duty to keep the assizes and attend to all matters relating to trespasses (see

Forest Law).

VERDI, GIUSEPPE FORTUNINO FRANCESCO (1813–1901), Italian composer, was born on the 10th of October 1813 at Le Roncole, a poor village near the city of Busseto. His parents kept a little inn, combined with a kind of village shop. Verdi received some instruction from the village organist, but his musical education really began with his entrance into the house of business of Antonio Barezzi, a merchant of Busseto. Barezzi was a thorough musician, and under his auspices Verdi was speedily introduced to such musical society as Busseto could boast. He studied under Giovanni Provesi, who was maestro di cappella of the cathedral and conductor of the municipal orchestra, for which Verdi wrote many marches and other instrumental pieces. These compositions are now the principal treasures of the library of Busseto. Among them is Verdi's first symphony, which was written at the age of fifteen and performed in 1828. In 1832 Verdi went to Milan to complete his studies. He was rejected by the authorities of the Conservatorio, but remained in Milan as a pupil of Vincenzo Lavigna, with whom he worked until the death of Provesi in 1833 recalled him to Busseto. A clerical intrigue prevented him from succeeding his old master as cathedral organist, but he was appointed conductor of the municipal orchestra, and organist of the church of San Bartolomeo. After three years in Busseto, Verdi returned to Milan, where his first opera, Oberto, Conte di San Bonifacio, was produced in 1839. His next work, a comic opera, known variously as Un Giorno di Regno and II Finto Stanislao, was written in peculiarly distressing circumstances, the composer having had the misfortune to lose his wife and two children in the course of two months. Un Giorno di Regno was a complete failure, and Verdi, stung by disappointment, made up his mind to write no more for the

stage. He kept his word for a year, but was then persuaded by Merelli, the impresario of La Scala, to look at a libretto by Solera. The poem took his fancy, in a short time the music was written, and in 1842 the production of Nabucodonosor placed Verdi in the front rank of living Italian composers. The success of Nabucodonosor was surpassed by that of its two successors, I Lombardi (1843) and Ernani (1844), the latter of which was the first of Verdi's operas to find its way to England. With Ernani Verdi became the most popular composer in Europe, and the incessant demands made upon him reacted upon his style. For several years after the production of Ernani he wrote nothing which has survived to our time — nothing which deserved to survive. In Macbeth (1847) there are passages of some power, and passages too which indicate an approaching transition to a less conventional method of expres- sion. In Luisa Miller (1849) also there is a noticeable increase of refinement in style, which contrasts favourably with the melodramatic vulgarity of his earlier manner.

It was unfortunate that / Masnadieri, which was written for the English stage and produced under Lumley's management at Her Majesty's Theatre in 1847, should have been one of the worst of the many bad works which Verdi composed at this period of his career. Not the presence of the composer, who travelled to England to conduct the first performance, nor the genius of Jenny Lind, who sang the part of the heroine, could redeem it from failure. In 1851 Verdi won one of the greatest triumphs of his career with Rigoletto, a triumph which was fully sustained by the production two years later of 77 Trovatore and La Traviata. In these works Verdi reached the culminating point of what may be called his second manner. His development had been steady though gradual, and it is only necessary to compare the treatment of voice and orchestra in Rigoletto with that

in Ernani to realize how quickly his talent had developed during these seven years. The popularity of Rigoletto, II Trovatore and La Traviata was enormous, and consolidated Verdi's fame outside the frontiers of Italy. In 1855 he received a commission to write an opera for the Paris Opera, to be produced during the Universal Exhibition. He wrote Les Vepres Siciliennes, a work which though temporarily successful has not retained its popularity. It contains some fine music, but suffers from the composer's perhaps unconscious attempt to adopt the grandiose manner of French opera. Of

the works written during the next ten years only Un Ballo in Maschera (1859) has maintained a fitful hold upon public atten- tion. La Forza del Destino (1862) and Don Carlos, the latter of which was written for the Paris Exhibition of 1867, have the faults incident to works written during a period of transition. At this point in his career Verdi was preparing to emancipate himself from the fetters of conventionality which had hitherto hindered his development. In these two works there are indications of an aspiration towards a freer method of expression, which harmonize ill with the more conventional style of the composer's earlier years. In Aida, an opera upon an Egyptian subject, written in response to an invitation from Ismail Pasha, and produced at Cairo in 187 1, Verdi entered upon the third period of his career. In this work he broke definitely with the operatic tradition which he had inherited from Donizetti, in favour of a method of utterance, which, though perhaps affected in some degree by the influence of Wagner, still retains the main cha- racteristics of Italian music. In Aida the treatment of the orchestra is throughout masterly, and shows a richness of resource

which those who knew only Verdi's earlier works scarcely suspected him of possessing; nevertheless, the human voice was still the centre of Verdi's system. Verdi kept thoroughly abreast of modern musical development, but his artistic sense prevented him from falling into the excesses of the German school. In the Requiem, which was written in 1874 to commemorate the death of Manzoni, Verdi applied his newly found system to sacred music. His Requiem was bitterly assailed by pedants and purists, partly on the ground of its defiance of obsolete rules of musical grammar and partly because of its theatrical treatment of sacred subjects, but by saner and more sympathetic critics, of whom Brahms was not the least enthusiastic, it has been accepted as a work of genius. There are passages in it with which Protestant feeling can scarcely sympathize, but its passionate intensity and dramatic force, and the extraordinary musical beauty with which it abounds, amply atone for what to some may seem errors of taste. In 1881 a revised version of Simon Boccanegra, an earlier work which had not been successful, was produced at Milan. The libretto had been in part rewritten by Arrigo Boito, and Verdi wrote a great deal of new music for the revival, which was eminently successful. After this it was generally supposed that Verdi, who had reached an advanced age, had finally relinquished composition, but after a lapse of some years it became known that he was at work upon a new opera, and in 1887 Otello was produced at Milan. The libretto, a masterly condensation of Shakespeare's Othello, was the work of Boito. Otello recalls Aida in the general outlines of its structure, but voices and orchestra are treated with greater freedom than in the earlier work, and there is a conspicuous absence of set airs. In so far as regards the essential qualities of the music, Otello is an immense advance upon anything Verdi had previously written. It has a dramatic force and

a power of characterization for which it would be vain to look in his earlier work, and which are all the more remarkable as appearing for the first time in this high degree of development in a work written in extreme old age. All that has been said of Otello may be repeated of Falsiajf, which was produced in 1893, when the composer was in his eightieth year, with the addition that the later work contains, besides the dramatic power and musical skill of the earlier work, a fund of delicate and fanciful humour which recalls the gayest mood of Mozart. The libretto of Falstaf, which is the work of Boito, is an adaptation of The Merry Wives of Windsor, with the addition of a few passages from Henry IV. After the production of Falsiajf, Verdi wrote nothing for the stage. In 1808 he produced four sacred pieces, settings of the Ave Maria, Laudi alia Virgine (words from Dante's Paradiso), the Stabat Mater and the Te Deum, the first two for voices alone, the last two for voices and orchestra. In these pieces Verdi abandoned to a certain extent the theatrical manner of the Requiem for one more restrained and more in keeping with ecclesiastical traditions. In imaginative power and musical beauty these pieces yield to none of Verdi's works. With the exception of these and the Requiem, Verdi has written

little save for the stage. Among his minor works may be mentioned a string quartet, composed in 1873, a hymn written for the opening of the International Exhibition of 1862, two sets of songs, a Paternoster for five-part chorus, and an Ave Maria for soprano solo, with string accompaniment. The venerable composer died at Milan on the 27th of January 1901.

The following is a complete list of Verdi's operas, with the dates and places of production: Oberto (Milan, 1839); Un Giorno di Regno (Milan, 1840); Nabucodonosor (Milan,

1842); / Lombardi (Milan, 1843); Ernani (Venice, 1844); / Due Foscari (Rome, 1844); Giovanna d'Arco (Milan, 1845); Alzira (Naples, 1845); Attila (Venice, 1846); Macbeth (Florence, 1847); / Masnadieri (London, 1847); II Corsaro (Trieste, 1848); La Battaglia di Legnano (Rome, 1849); Luisa Miller (Naples, 1849); Stiff elio (Trieste, 1850); Rigoletto (Venice, 1851); II Trovatore (Rome, 1853); La Traviata (Venice, 1853); Les Vepres Siciliennes (Paris, 1855); Simon Bocca- negra (Venice, 1857; revised version, Milan, 1881); Aroldo [a revised version of Stiffelio] (Rimini, 1857); Un Ballo in Maschera (Rome, 1859); La Forza del Destino (St Petersburg, 1862); Don Carlos (Paris, 1867); Aida (Cairo, 1871); Otello (Milan, 1887); Falstaff (Milan, 1893). 'R. A. S.)

VERDICT (O. Fr. verdit, Lat. vere dictum, truly said, used in Late Latin in one word with its present significance), the decision of a jury in a criminal or civil cause, given to the court through the foreman of the jury and recorded. In English law verdicts may be " general," i.e. in criminal cases " guilty " or " not guilty," or " special," when there is some question of law which the jury wish to leave to the consideration of the court; in this case the verdict is given in the form of a statement of facts as found by the jury, and the issue is left to be found by the court in accordance with the law upon such facts as found (see Jury).

VERDIGRIS, a pigment, consisting of basic copper carbonates, made by acting upon copper plates with pyroligneous acid soaked up in cloths, exposing the plates to air, then dipping in water, and finally scraping off the greenish cruet; the plate is re-exposed and the operation repeated till it is used up. Another method consists in exposing thin copper sheets to the acid vapours rising from the residues or " marcs " of wine factories, the product being

scraped off, and the plate re- exposed. Both processes require several weeks. The pigment appears with several shades of blue and green; blue verdigris is chiefly CuO-Cu(C2H 3 02)2-6H 2 0, while light blue and green verdigris contain 2CuO-Cu(C 2 H 3 02)2-2H 2 0. Besides being used as a paint it is employed in dyeing and calico-printing, and also in the manufacture of other paints, e.g. Schweinfurt green, which is a double salt of the acetate and arsenite. A liniment or ointment is also used in medicine as a cure for warts. It is an irritant poison (hence the need that acid substances should never be cooked in copper utensils) ; the best antidote is white of egg and milk.

VERDUN, a garrison town of north-eastern France, capital of an arrondissement in the department of Meuse, on the main line of the Eastern railway between Paris and Metz,. 42 m. N.N.E. of Bar-le-Duc. Pop. (1906) 12,837. In addition the population comptie a part (soldiers, &c.) numbers 8198. Verdun is situated in a basin surrounded by vine-clad hills on the Meuse, which here forms the Eastern Canal.

Verdun as a fortress is of first-rate importance. It lies directly opposite the frontier of German Lorraine and the great entrenched camp of Metz. At the time of the war of 1870 (when it was defended for long without hope of success by General Guerin de Waldersbach) it was still a small antiquated fortress of the Vauban epoch, but in the long line of fortifica- tions on the Meuse created by Serre de Riviere in 1875 Verdun, forming the left of the " Meuse Line " barrier, was made the centre of an entrenched camp. The first lesson of 1870 being taken to heart, forts were placed (Belrupt S.E., St Michel N.E., Belleville N. and La Chaume and Regret W.) on all the sur- rounding heights that the besiegers had used for their batteries, but the

designers soon extended the line of the eastern defences as far out as the sharply defined cliffs that, rising gently for some miles from the Meuse, come to an abrupt edge and over- look the plain of Woevre. On this front, which is about si k>-

long, the most important works are (from right to left) Chatillon, Manezel, Moulainville, Eix, Mardi Gras, Lanfee, Vaux and Hardimont. At right angles to this line, the south front, the works of which are placed along one of the long western spurs of the line of heights, are forts Rozellier, St Symphorien and Haudainville, the last overlooking the Meuse. The north front, also on a spur of the ridge, is thickly studded with forts, these in some cases being but 200 yds. apart and the left fort over- looking the Meuse. Behind the east front, chiefly designed to close the valley by which the Metz-Verdun railway penetrates the line of heights, are Fort Tavannes with its outworks and a series of batteries on the adjacent spurs. On the left bank of the Meuse there is a complete semicircle of forts. At the northern end of this semicircle (besides some works in the valley itself), and crossing its fire with the left of the north front, is Fort Belle-Epine, then comes Marre, Bourrus and Bruyeres, all four being on a single ridge facing N.W. The west front is composed of Fort Germonville, Fort Bois de Sar- telles, Fort Bois du Chapitre, Fort Landrecourt and Fort Dugny, which last is within sight of Fort Haudainville over the Meuse. In second line behind these works are Fort Choisel, Chana redoubt and Fort Sartelles. In all there are 16 large forts and about 20 smaller works, the perimeter of the whole being about 30 m. and the greatest diameter of the fort-ring 9.

The chief quarter of the town lies on the slope of the left bank of the river and is dominated by the citadel which occupies the site of the old abbey of St Vanne founded in the 10th century. Several arms of the river intersect the quarter on the right bank. The whole town is surrounded by a bastioned enceinte, pierced by four gates; that to the N.E., the Porte Chaussee, flanked by two crenelated towers, is an interesting specimen of the military architecture of the 15th century. The cathedral of Notre-Dame stands on the site of two previous churches of the Romanesque period, the first of which was burnt down in 1047; a crypt and other remains of the second building consecrated in 1 147 are still to be seen, but the greater part of the present church dated from subsequent periods. Built under the influence of Rhenish architecture, Notre-Dame has double transepts and, till the 18th century when the western apse was replaced by a facade, had an apse at each extremity. A fine cloister to the S.W. of the cathedral dates from the 15th century. The hotel-de-ville (17th century) contains the museum.

Verdun is the seat of a bishop and a sub-prefect and has tribunals of first instance and of commerce, a communal college, ecclesiastical seminaries and a branch of the Bank of France. The industries include metal founding, the manufacture of sweetmeats (dragSes de Verdun), machinery, nails, files, em- broidery, linen, chairs and rope and the distillation of liqueurs. The canal port has trade in timber, agricultural produce, stone and building materials and coal.

Verdun (Verodunum), an important town at the time of the Roman conquest, was made a part of Belgica Prima. The bishopric, of which' the most celebrated holder was St Vanne (498-525), dates from the 3rd century. Verdun was destroyed during the period of the barbarian invasions, and did not re- cover till towards

the end of the 5th century. Clovis seized the town in 502, and it afterwards belonged to the kingdom of Austrasia. In 843 the famous treaty was signed here by the sons of Louis the Pious (see Germany, History). In the 10th century Verdun was definitively conquered by Germany and put under the temporal authority of its bishops. Together with Toul and Metz, the town and its domain formed the ter- ritory of the Trois-Eveches. In the nth century the burghers of the now free and imperial town began a struggle with their bishops, which ended in their obtaining certain rights in the 12th century. In 1552 Henry II. of France took possession of the Trois-Evech6s, which finally became French by the treaty of Westphalia. In 1792, after some hours of bombardment, the citizens opened their gates to the Prussians — a weakness which the Revolutionary Government punished by the execu- tion of several of the inhabitants. In 1870 the Prussians,

unable to seize the town by a coup de main, invested and bombarded it three different times, till it capitulated in the beginning of November.

VERDY DU VERNOIS, JULIUS VON (1832-), German general and military writer, was born in 1832 and entered the Prussian infantry in 1850. After some years of regimental service he came under the notice of Moltke, the newly appointed chief of the general staff , as an exceptionally gifted soldier, and at the outbreak of the war against Austria in 1866 he was appointed major on the staff of the II. Army (crown prince of Prussia) . In this capacity he took part in the campaign on the upper Elbe and in the battle of Koniggratz. Promoted shortly after this to the rank of lieutenant-colonel, he was in 1867 placed at the head of a section of the general staff, becoming thereby one of Moltke's principal confidential assistants. In this capacity he served at the headquarters of the German army

throughout the war of 1870–71, and he was frequently employed in the most important missions, as for instance on the 2nd of August, when he was sent to impress upon the III. Army headquarters the necessity of a prompt advancing into Alsace, and on the 26th of the same month, when he was sent to advise the crown prince of Saxony as to the strategical intentions of the supreme command at the crisis of the Sedan campaign. At the close of the war he continued to serve in the office of the general staff, and also lectured at the War Academy. It was in the latter position that he developed the system of thorough tactical education which is the abiding result of his work. His method may be studied in English translations of his Studies in Troop-leading, and may be summarized as the assumption of an actual military situation on the actual ground, followed by critical discussion of the successive measures that a commander, whether of a brigade, division or larger force, should take in the sequel, given his orders and his knowledge of the general situation. Moltke's own series of tactical problems, extending from 1859 to 1889, contributed very powerfully, of course, to the education of the selected young officers who passed through Verdy's hands, but Moltke dealt rather with a great number of separate problems, while Verdy developed in detail the successive events and ruling ideas of a whole day's or week's work in the same units. Moltke therefore may be said to have developed the art of forming correct ideas and plans, Verdy that of applying them, but these are 'after all merely tendencies, not sharply divided schemes, in the teaching of Prussian staff officers during the years of intellectual development between 1870 and 1888. In all this Moltke, Verdy and Bronsart von Schellendorf worked in close co-operation. In 1876 Verdy became a major-general, from 1879–1883 he held an important position in the ministry of war, and in 1881 he was promoted lieutenant-general.

In 1887 he became governor of Strassburg, in 1888 general of infantry and in 1889 minister of war. He retired from the active list in 1890. In 1894 the university of Konigsberg made him a Dr. Phil, honoris causa.

General von Verdy du Vernois's principal writings are: TTieti nahme der II. Armee am Feldzuge 1866 (Berlin, 1866) ; Im Haupt-quartier der II. Armee 18.66 (Berlin, 1900) ; Studien iiber den Krieg auf Grundlage . . . 1870(1 (Berlin, 1892-96); Im grossen Hauptquartier 1870I 1 (Berlin, 1895; English translation); Studien iiber Truppenfiihrung (Berlin, 1870; new edition, 1892, English translation) and Studien iiber den Krieg (Berlin, 1901-1906).*

VERE, the family of which is extolled by Macaulay as " the longest and most illustrious line of nobles that England has seen," appears to have derived the surname which the verse of Tenny- son has made synonymous with ancient blood, from the little village of Ver near Bayeux. Its founder, Aubrey (Albericus) de Vere, appears in Domesday Book (1086) as the holder of a great fief in Essex, Cambridgeshire and Suffolk. His son (or grandson) and namesake was a trusted officer of Henry I., from whom he received the hereditary office of great chamberlain in 1 133. It was probably he who erected the noble tower which gave name to Castle Hedingham, Essex, the bead of his fief, and which stands as the finest example of a private Norman keep. Slain in 1141, he was succeeded by his son Aubrey, who had already become count of Guines, in right of his wife, on her

grandfather's death. Through the powerful influence of his sister's husband, Geoffrey,

earl of Essex, he obtained from the empress Matilda, in 1142, the earldom of Oxford, which was afterwards confirmed to his house by Henry II. His younger son, Robert (c. 1170–1221), became 3rd earl in 1214, and, siding with the barons, became one of the twenty-five executors of Magna Carta. His marriage with a Bolebec heiress brought in what was afterwards claimed as a barony, and led to the style of Viscount Bolebec (or Bulbeck) for the earl's heirs.

Robert, the 5th earl (1240–1296), who brought into his family the chamberlainship to the queen by his marriage with the Sandford heiress, sided with Simon de Montfort, and lost for a time his earldom and offices. John, the 7th earl (1313–1360), was a distinguished soldier, fighting at Crecy and Poitiers and in all Edward III.'s wars in his time; and his marriage with a Badlesmere heiress added to the lands and titles of his house. His son, Thomas (i337–i37i),alsoasoldier, was father of Robert, 9th earl, the famous favourite of Richard II. In spite of his attainder (1388), his uncle Aubrey (c. 1340–1400), a follower of the Black Prince, was restored to the earldom, by consent of parliament in 1393, but not to the great chamberlainship. As the earldom (which had been held in fee) was granted to him in tail male, this is looked on by some as a new creation. His elder son, Richard (d. 141 7), the next earl, held a command at Agincourt, and was father of Earl John, who was beheaded as a Lancastrian, with his eldest son, in 1462. Their death was avenged by his younger son John, the 13th earl (1443–1513), who shared to the full in the triumph of the Red Rose. On the death of his nephew John, the next earl (d. 1526), the baronies (it was afterwards held) passed away to his sisters, but the earldom descended to his cousin John (d. 1540), though the crown resumed the great chamberlainship. This John, who was in favour with Henry VIII., was grandfather, through his younger son

Geoffrey, of the celebrated " fighting Veres," Sir Francis and his brother Sir Horace. His eldest son John, 16th earl (c. 1512–1562), was in favour with Edward VI., Mary and Elizabeth, and contrived to recover for his family the office of great chamberlain.

Hitherto the earls, in spite of their vicissitudes, had retained possession of their ancient seat and great estates; but Edward, the son of Earl John, was a spendthrift. A brilliant, gifted courtier, in whom Elizabeth delighted, he quarrelled with his father-in-law, Burghley, " sent his patrimony flying," patronized players, poets and musicians, and wrote excellent verse himself. His son Henry, the 18th earl (1593–1625), was twice imprisoned in the Tower as an opponent of Buckingham's policy, fought in the Palatinate and the Low Countries and died on campaign at the Hague in 1625. Then ensued the great dispute for the inheritance of his title and office (Hedingham Castle having passed away) between Robert Vere, his second cousin and heir- male, and Robert, Lord Willoughby d'Eresby, son of his aunt, Lady Mary Vere. The earldom was secured by the former, a poor officer in Holland, but the office was adjudged to Lord Willoughby, in whose descendants it is now vested. Earl Robert was slain before Maestricht in 1632, leaving an only son, Aubrey (1626–1703), 20th and last earl. His marriage with a Bayning heiress restored the fortunes of his house, and his Royalist intrigues under the Commonwealth were rewarded at the Restoration by sundry favours, among them the command of a regiment of horse, known from him as " the Oxford Blues " and still familiar as "the Blues" (Royal Horse Guards). James II. deprived him of his regiment and his lieutenancy of Essex for opposing his policy, but the prince of Orange, whom he joined, restored them. His long tenure of the ancient earldom ended in 1703, when he died, the last known male descendant of the house of

Vere. His daughter Diana having married the 1st duke of St Albans, their descendants are named De Vere Beauclerk, and received the barony of Vere (1705).

The halo surrounding the name of Vere is seen as early as 1626 in the stately panegyric of Chief Justice Crewe. ″ I suppose there is no man that hath any apprehension of gentry, or nobleness, but his affection stands to the continuance of so

noble a name and house.″ In the great days of the house, Earl John, says Stowe, rode into London city ″ with eighty gentlemen in a livery of Reading tawney, and chains of gold about their necks, before him, and one hundred tall yeomen in the like livery to follow him,″ wearing the famous badge of the blue boar (verres), which is still to be seen in Essex churches and forming the sign of Essex inns. Another badge of the Veres was the mullet in the first quarter of their shield, which, at Barnet Field, by a fatal error, was taken for the sun of York. Among the offices they held were the forestership of Essex and the keepership of Colchester Castle, and they founded the Essex religious houses of Hatfield Broadoak, Hedingham and Earls Colne.

Authorities. — Domesday Book; Abingdon Chron. and Red Book of the Exchequer (Rolls Series); Pipe Roll of 1 130 (Record Commission); Dugdale's Baronage; G. E. C(okayne)'s Complete Peerage; Doyle's Official Baronage; Collins's Historical Precedents; Morant's History of Essex; Round's Geoffrey de Mandeville and Feudal England; Nichols's ″ Descent of the Earldom of Oxford ″ (Arch. Journ. vol. ix.); Vere papers among the Round MSS. in App. ix. to 14th Report on Historical MSS. ; Lords'' Reports on the Dignity of a Peer; Palmer's Peerage Law in England. The claim- ants' cases and the appendices of documents in the contest for the great chamberlainship (1902) are

valuable for the history of the Veres. (J- H. R.)

VERE, SIR FRANCIS (1560-1609), English soldier, was the son of Geoffrey Vere of Crepping Hall, Essex, and nephew of the 1 6th earl of Oxford. He first went on active service under Leicester in 1585, and was soon in the thick of the war raging in the Low Countries. At the siege of Sluys young Vere greatly distinguished himself under Sir Roger Williams and Sir Thomas Baskerville. In 1588 he was in the garrison of Bergen-op-Zoom, which delivered itself from the besiegers by its own good fighting, and was knighted by Willoughby on the field of battle. In the next year Sir Francis became sergeant-major-general of the English troops in the Low Countries, and soon afterwards the chief command devolved upon him. This position he retained during fifteen campaigns, with almost un- broken success. Working in close co-operation with the Dutch forces under Maurice, he step by step secured the country for the cause of independence. Vere won the reputation of being the first soldier of the day, his English troops acquired a cohesion and training fitting them to face the best Spanish troops, and his camp became the fashionable training-ground of all aspiring soldiers, amongst others not only his brother Horace, but men of such note as Ferdinando (Lord) Fairfax, Gervase Markham and Miles Standish. Sir Francis served in the Cadiz expedition of 1596, and in 1598 was entrusted with the negotia- tion of the treaty whereby the Dutch agreed to take a greater share of the burden of the war than they had hitherto done. His success in this task obtained him the governorship of Brill and the rank of general. The culminating point of his career came when, in 1600, on the advice of Barneveld, the states general decided to carry the war into the enemy's country. In the battle of Nieuwport (2nd July 1600), one of the most desperately contested battles of the age, Vere

and Maurice completely defeated the veteran Spanish troops of the archduke Albert. This was followed by the celebrated defence of Ostend from July 1601 to March 1602. When James I. made peace with Spain, Vere retired from active service and spent the remainder of his days in country life in England, occupying himself with the compilation of his Commentaries of the Divers Pieces of Service wherein he had Command (1657; re- printed in Arber's English Garner, 1883). He died in 1609, soon after the truce recognized the independence of the United Provinces, and was buried in Westminster Abbey.

His younger brother Sir Horace Vere, Baron Vere of Tilbury (1565–1635), began his military career as the lieutenant of Sir Francis's Company in 1590. Thenceforward he was con- tinually on active service in the Low Countries, and, like his brother, took part in the Cadiz expedition of 1596; at Nieuw- port and Ostend Sir Horace (who had been knighted at Cadiz) held command of some importance. On his brother's retire- ment Sir Horace, as senior colonel, assumed command of the

whole English force, which he held until 1607, being opposed to Ambrosio Spinola, the most famous of the continental generals of the time, against whom he manoeuvred and fought in a manner equal to the best of his brother's, or even of Parma's, work. From 1607 to 1620 he saw but little active service except the siege of Julich (1610). In 1620 he accepted the command of the volunteers who were going to the assistance of the Elector Palatine. This famous expedition to the Rhine and the Main was from the first a forlorn hope. Opposed by his old adversary Spinola, Vere manoeuvred with success for two campaigns, but he was helpless against the armies of Tilly and Cordova, and in the end

he could only furnish scanty garrisons for Frankenthal, Heidelberg and Mannheim. Each of these places fell after a desperate resistance, and their gar- risons returned to England. In 1624 Vere was once more on service in the United Provinces. The attempted relief of Breda in the following year was considered one of the most brilliant feats of the time, and the general was made Baron Vere of Tilbury. In 1629 the sieges of Bois-le-duc (s'Hertogenbosch) and of Maestricht closed his military career. Lord Vere died suddenly in 1635 and was buried by the side of his brother in Westminster Abbey.

See Clements C. Markham, The Fighting Veres (London, 1888).

VERESHCHAGIN, VASSILI VASSILIEVICH (1842-1904), Russian artist and traveller, was born at Tcherepovets, in the government of Novgorod, on the 26th of October 1842. His father was a Russian landowner of noble birth, and from his mother he inherited Tatar blood. When he was eight years old he was sent to Tsarskoe Selo to enter the Alexander cadet corps, and three years later he entered the naval school at St Petersburg, making his first voyage in 1858. He graduated first in the list from the naval school, but left the service im- mediately to begin the study of drawing in earnest. He won a medal two years later, in 1863, from the St Petersburg Academy for his " Ulysses slaying the Suitors." In 1864 he proceeded to Paris, where he studied under Gerome, though he dissented widely from his master's methods. In the Salon of 1866 he exhibited a drawing of " Doukhobors chanting their Psalms," and in the next year he accompanied General Kauff- mann's expedition to Turkestan, his military service at the siege of Samarkand procuring for him the cross of St George. He was an indefatigable traveller — in Turkestan in 1869, the Himalayas, India and Tibet in 1873, and again in India in 1884. After a period of hard work in Paris and Munich he exhibited some of his

Turkestan pictures in St Petersburg in 1874, among them two which were afterwards suppressed on the representations of Russian soldiers — ″ The Apotheosis of War,″ a pyramid of skulls dedicated ″ to all conquerors, past, present and to come,″ and ″ Left Behind,″ the picture of a dying soldier deserted by his fellows. Vereshchagin was with the Russian army during the Turkish campaign of 1877; he was present at the crossing of the Shipka Pass and at the siege of Plevna, where his brother was killed; and he was danger- ously wounded during the preparations for the crossing of the Danube near Rustchuk. At the conclusion of the war he acted as secretary to General Skobelev at San Stefano. After the war he settled at Munich, where he produced his war pictures so rapidly that he was freely accused of employing assistants. The sensational subjects of his pictures, and their didactic aim — the promotion of peace by a representation of the horrors of war — attracted a large section of the public not usually interested in art to the series of exhibitions of his pictures in Paris in 1881 and subsequently in London, Berlin, Dresden, Vienna and other cities. He aroused much controversy by his series of three pictures of a Roman execution (the Cruci- fixion), of sepoys blown from the guns in India, and of the execution of Nihilists in St Petersburg. A journey in Syria and Palestine in 1884 furnished him with an equally discussed set of subjects from the New Testament. The ″ 181 2 ″ series on Napoleon's Russian campaign, on which he also wrcte a book, seem to have been inspired by Tolstoi's War and Peace, and were painted in 1893 at Moscow, where the artist eventually

settled. Vereshchagin was in the Far East during the Chino- Japanese War, with the American troops in the Philippines, and with the Russian troops in Manchuria. He perished in the sinking of the Russian flagship, ″

Petropavlovsk," on the 13th of April 1904. His last work, a picture of a council of war presided over by Admiral Makaroff, was recovered almost uninjured.

See E. Zabel, " Wereschtschagin " (1900), in Knackfuss's Kunslller- monographien (Bielefeld and Leipzig). The finest collection of his pictures is in the Tretiakov gallery in Moscow.

VERGA, GIOVANNI (1840-), Italian novelist, was born at Catania, Sicily. In 1865 he published Storia di una pec- catrice and / Carbonari della montagna, but his literary reputa- tion was established by his Eva and Storia di una capinera (1869). Other novels followed, the best of which are Mala- voglia (1881) and Maestro Don Gesualdo (1889). His finest work, however, is seen in his short stories and sketches of Sicilian peasantry, Medda (1874) and Vita dei campi (1880); and his Cavalleria Rusticana acquired new popularity from its drama- tization and from Mascagni's opera on this subject. Verga and Fogazzaro between them may be said to have faithfully chro- nicled the inner and popular life of southern and northern Italy.

VERGE (Lat. virga, a rod), originally a staff denoting autho- rity, whence (from the ceremony in swearing fealty to a lord) the sense of a measurement, and so boundary or border, of land, or generally a margin of space. In architecture, a verge is the edge of the tiling projecting over the gable of a roof; that on the horizontal portion being called " eaves." The term " verge board," generally now known as barge board, is the name given to the board under the verge of gables, some- times moulded, and often very richly carved, perforated and cusped, and frequently having pendants and sometimes finials at the apex.

VERGENNES, CHARLES GRAVIER, Comte de (1717-1787), French statesman, was born at

Dijon on the 20th of December 1 71 7. He was introduced to the profession of diplomacy by his uncle, M. de Chavigny, under whom he saw his first service at Lisbon. His successful conduct of French interests at the court of Trier in 1750 and the following years led to his being sent to Constantinople in 1755 at first as minister plenipoten- tiary, then as ambassador. In 1768 he was recalled, ostensibly because of a mesalliance with Mme Testa, widow of a Pera surgeon, but really because Choiseul thought him not zealous enough in provoking a quarrel between Russia and Turkey. After Choiseul's death he was sent to Stockholm with instruc- tions to help the aristocratic party of the " Hats " with advice and money. The revolution by which Gustavus III. (August 19, 1772) secured for himself the reality instead of the shadow of power was a great diplomatic triumph for France. With the accession of Louis XVI. Vergennes became foreign minister. His general policy was one of friendly relations with Austria, combined with the limitation of Joseph II. 's ambitious designs; the protection of Turkey; and opposition at all points to England. His hatred of England and his desire to avenge the disasters of the Seven Years' War led to his support of the American States in the War of Independence, a step of which the moral and financial results had not a little to do with the Revolution of 1789. Vergennes sought by a series of negotia- tions to secure the armed neutrality of the Northern Powers eventually carried out by Catherine II.; he ceded to the de- mands of Beaumarchais that France should secretly provide the Americans with arms and volunteers. In 1777 he informed the American commissioners that France acknowledged the Republic and was willing to form an offensive and defensive alliance with the new state. In domestic affairs Vergennes belonged to the old school. He intrigued against Necker, whom he regarded as a dangerous innovator, a republican, a foreigner and a Pro-

testant. In 1 78 1 he became chief of the council of finance, and in 1783 he supported the nomination of Calonne as controller general. Vergennes died on the 13th of February 1787, before the meeting of the Assembly of Notables which he is said to have suggested to Louis XVI.

See P. Fauchelle, La Diplomatic francaise el la Ligue des neutres de 1780 (1776–83) (Paris, 1893); John Jay, The Peace Negotiations of 1782–83 as illustrated by the Confidential Papers of Shelburne and Vergennes (New York, 1888); L. Bonneville de Marsangy, Le Chevalier de Vergennes, son ambassade a Constantinople (Paris, 1894), and Le Chevalier de Vergennes, son ambassade en Suede (Paris, 1898).

VERGER (M.E. vergere; O. Fr. vergier; Med. Lat. virgarius, one who bears a rod or staff, an apparitor; Lat. virga, rod), one who carries a ″ verge ″ or staff of office. The principal use of the term is ecclesiastical, and refers to the person who carries a staff as a symbol of office before a bishop or other church dignitary when taking part in a service, especially one held in a cathedral. The word has thus come to mean in general usage an official caretaker of any place of worship whose duty it is to show the building to those who wish to view it, and to find seats for the congregation at a service.

VERGNIAUD, PIERRE VICTURNIEN (1753–1793), French orator and revolutionist, was born on the 31st of May 1753 at Limoges. He was the son of a merchant of that town who lost the greater part of his means by speculation. The boy was early sent to the college of the Jesuits at Limoges, and soon achieved distinction. Turgot was then intendant of Limousin. In his presence

young Vergniaud on one occasion recited some verses of his own composition. Turgot was struck with the talent they displayed, and by virtue of his patronage Vergniaud, having gone to Paris, was admitted to the college of Plessis. It is impossible to read the speeches of Vergniaud without being convinced of the solidity of his education, and in particular of the wide range of his knowledge of the classics, and of his acquaintance — familiar and sympathetic — with ancient philo- sophy and history.

Duputy, president of the parlement of Bordeaux, with whom Vergniaud became acquainted, conceived the greatest admiration and affection for him and appointed him his secretary. Verg- niaud was thereafter called to- the bar (1782). The influence of Duputy gained for him the beginnings of a practice; but Verg- niaud, though capable of extraordinary efforts, too often re- lapsed into reverie, and was indisposed for study and sustained exertion, even in a cause which he approved. This weakness appears equally in his political and in his professional life: he would refuse practice if his purse were moderately well filled; he would sit for weeks in the Assembly in listlessness and silence, while the policy he had shaped was being gradually undermined, and then rise, brilliant as ever, but too late to avert the calamities which he foresaw. In 1789 Vergniaud was elected a member of the general council of the department of the Gironde. Being deeply stirred by the best ideas of the Revolutionary epoch, he found a more congenial sphere for the display of his great powers in his new position. About this period he was charged with the defence of a member of the national guard of B rives, which was accused of provoking dis- orders in the department of La Correze. Abandoning all reserve, Vergniaud delivered one of the great orations of his life, depicting the misfortunes

of the peasantry in language of such combined dignity, pathos and power that his fame as an orator spread far and wide.

Vergniaud was chosen a representative of the Gironde to the National Legislative Assembly in August 1791, and he forthwith proceeded to Paris. The Legislative Assembly met on the 1 st of October. For a time, according to his habit, he refrained from speaking; but on the 25th of October he ascended the tribune, and he had not spoken long before the whole Assembly felt that a new power had arisen which might control even the destinies of France. This judgment was re-echoed outside, and he' was almost immediately elected president of the Assembly for the usual brief term. Between the outbreak of the Revolution and his election to the Legislative Assembly the political views of Vergniaud had undergone a decided change. At first he had lauded a constitutional monarchy; but the flight of Louis XVI. filled him with distrust of the sovereign, and his views iii favour of a republic were rapidly developed. The sentiments and - passions which his eloquence aroused were, bowever. watchfully utilized by a more extreme party. It

happened thus even with his first Assembly speech, on the imigris. His proposal was mainly that a treble annual contri- bution should be levied on their property; but the Assembly confiscated their goods and decreed their deaths. One great blot on his reputation is that step by step he was led on to palliate violence and crime, to the excesses of which his eyes were only opened by the massacres of September, and which ultimately overwhelmed the party of Girondists which he led. The disgrace to his name is indelible that on the 19th of March 1792, when the perpetrators of the massacre of Avignon had been introduced to the Assembly by Collot d'Herbois, Vergniaud spoke indulgently of their crimes and lent the authority of his voice to their amnesty. In

language sometimes turgid, but nearly always of pure and powerful eloquence, he worked at the theme of the imigris, as it developed into that of the counter-revolution; and in his occasional appearances in the tribune, as well as in the project of an address to the French people which he presented to the Assembly on the 27th of December 1791, he shook the heart of France, and, especially by his call to arms on the 18th of January, shaped the policy which culminated in the declaration of war against the king of Bohemia and Hungary on the 20th of April. This policy in foreign affairs, which he pursued through the winter and spring of 1791-92, he combined with another — that of fanning the suspicions of the people against the monarchy, which he identified with the counter-revolution, and of forcing on a change of ministry. On the 10th of March Vergniaud delivered a power- ful oration in which he denounced the intrigues of the court and uttered his famous apostrophe to the Tuileries: " In ancient times fear and terror have often issued from that famous palace; let them re-enter it to-day in the name of the law!" The speech overthrew De Lessart, whose accusation was decreed; and Roland, the nominee of the Girondists, entered the ministry. By the month of June the opposition of Vergniaud (whose voice still commanded the country) to the king rose to fever heat. On the 29th of May Vergniaud went so far as to support the disbanding of the king's guard. But he appears to have been unaware of the extent of the feelings of animosity which he had done much to arouse in> the people, probably because he was wholly unconnected with the practices of the party of the Mountain as the instigators of actual violence. This party used Vergniaud, whose lofty and serene ideas they applauded and travestied in action. Then came the riot of the 20th of June and the invasion of the Tuileries. He rushed among the crowd, but was powerless to quell the tumult. Con- tinuing for yet a little

longer his course of feverous, almost frenzied, opposition to the throne, on the 3rd of July he electri- fied France by his bold denunciation of the king, not only as a hypocrite and a despot, but as a base traitor to the constitution. His speeches breathe the very spirit of the storm, and they were perhaps the greatest single factor in the development of the events of the time. On the 10th of August the Tuileries was stormed, and the royal family took refuge in the Assembly. Vergniaud presided. To the request of the king for protection he replied in dignified and respectful language. An extra- ordinary commission was appointed : Vergniaud wrote and read its recommendations that a National Convention be formed, the king be provisionally suspended from office, a governor appointed for his son, and the royal family be consigned to the Luxem- bourg. Hardly had the great orator attained the object of his aim — the overthrow of Louis as a sovereign — when he became conscious of the forces by which he was surrounded. He de- nounced the massacres of September — their inception, their horror and the future to which they pointed— in language so vivid and powerful that it raised for a time the spirits of the Girondists, while on the other hand it aroused the fatal opposi- tion of the Parisian leaders.

The questions whether Louis XVI. was to be judged, and if so by whom, were the subject of protracted debate in the Convention. They were of absorbing interest to Paris, to France and to Europe; and upon them the Girondist leader at last, on the 31st of December 1792, broke silence, delivering one of his

greatest orations, probably one of the greatest combinations of sound reasoning, sagacity and

eloquence which has ever been displayed in the annals of French politics. He pronounced in favour of an appeal to the people. He pictured the consequences of that temper of vengeance which animated the Parisian mob and was fatally controlling the policy of the Convention, and the prostration which would ensue to France after even a successful struggle with a European coalition, which would spring up after the murder of the king. The great effort failed; and four days afterwards something happened which still further endangered Yergniaud and his whole party. This was the discovery of a note signed by him along with Gaudet and Gensonne and presented to the king two or three weeks before the 10th of August. It contained nothing but sound and patriotic sugges- tions, but it was greedily seized upon by the enemies of the Gironde as evidence of treason. On the 16th of January 1793 the vote began to be taken in the Convention upon the punish- ment of the king. Vergniaud voted early, and voted for death. The action of the great Girondist was and will always remain inscrutable, but it was followed by a similar verdict from nearly the whole party which he led. On the 17th Vergniaud presided at the Convention, and it fell to him, labouring under the most painful excitement, to announce the fatal result of the voting. Then for many weeks he sank, exhausted, into silence.

When the institution of a revolutionary tribunal was proposed, Vergniaud vehemently opposed the project, denouncing the tribunal as a more awful inquisition than that of Venice, and avowing that his party would all die rather than consent to it. Their death by stratagem had already been planned, and on the 10th of March they had to go into hiding. On the 13th Vergniaud boldly exposed the conspiracy in the Convention. The antagonism caused by such an attitude had reached a significant point when on the 10th of April Robespierre himself laid

his accusation before the Convention. He fastened especi- ally upon Vergniaud's letter to the king and his support of the appeal to the people as a proof that he was a moderate in its then despised sense. Vergniaud made a brilliant extemporaneous reply, and the attack for the moment failed. But now, night after night, Vergniaud and his colleagues found themselves obliged to change their abode, to avoid assassination, a price being even put upon their heads. Still with unfaltering courage they continued their resistance to the dominant faction, till on the 2nd of June 1 793 things came to a head. The Convention was surrounded with an armed mob, who clamoured for the " twenty- two." In the midst of this it was forced to continue its delibera- tions. The decree of accusation was voted, and the Girondists were proscribed.

Yergniaud was offered a safe retreat. He accepted it only for a day, and then returned to his own dwelling. He was kept under surveillance there for nearly a month, and in the early days of July was imprisoned in La Force. He carried poison with him, but never used it. His tender affection for his relatives abundantly appears from his correspondence, along with his pro- found attachment to the great ideas of the Revolution and his noble love of country. On one of the walls of the Carmelite convent to which for a short time the prisoners were removed Vergniaud wrote in letters of blood: " Potius mori quamfoedari." Early in October the Convention brought forward its indictment of the twenty-two Girondists. They were sent for trial to the Revolutionary tribunal, before which they appeared on the 27 th of October. The procedure was a travesty of justice. Early on the morning of the 31st of October 1793 the Girondists were conveyed to the scaffold, singing on the way the Marseillaise and keeping up the strain till one by one they were guillotined. Vergniaud was

executed last. He died unconfessed, a philosopher and a patriot.

See Gay de Vernon, Vergniaud (Limoges, 1858); and L. de Verdiere, Biographie de Vergniaud (Paris, 1866). (T. S.)

VERHAEREN, EMILE (1855–), Belgian poet, was born at Saint-Amand, near Antwerp, on the 21st of May 1855. He was sent to school at Ghent, where he formed a friendship with Georges Rodenbach. He studied at the university of

Louvain, and there started a journal, La Semaine, which he edited in conjunction with the operatic singer Van Dyck. La Semaine was suppressed by the authorities, as was its successor, Le Type, in which Verhaeren had as fellow-workers Max Waller, Iwan Gilkin and Albert Giraud. In 1881 he was admitted to the bar at Brussels, but he soon devoted his whole energies to literature, and especially to the organs of " young Belgium," La Jeune Belgique and L 'Art moderne, making himself especially the champion of the impressionist painters. Verhaeren learnt his art of poetry from the great Flemish artists, and in his early robust works, Les Flamandes (1883) and Les Moines (1886), he displays similar qualities of strength, sometimes degenerating into violence. A period of physical weakness followed, trans- lated into terms of poetry in three volumes of verse, Les Soirs (1887), Les Debdcles (1888) and Les Flambeaux noirs (1889). Au bord de la route (1890) and Les Apparus dans mes chemins (1891) followed. Verhaeren then passed from applying his pictorial method to psychological studies to the task of indi- vidualizing the towns, villages and fields of his native country, the first outcome being his Campagnes hallucinees (1893). In Villages illusoires he describes the tragedy of the fields and farms deserted by the people in their race to the towns, and in Les Villes tentaculaires (1895) the great industrial centres devour- ing the

surrounding country. Later volumes of poems are Les Heures claires (1896), Les Visages de la vie (1899), Les Petites Lfgendes (1900), Les Forces tumultueuses (1901); Les Tendr esses premieres (1904). In 1898 he wrote a lyric drama Les Aubes, in 1900 a four-act piece Le Clottre, represented both in Brussels and Paris, and in 1901 a historical drama Philippe II.

The poems of fimile Verhaeren were translated into English by Alma Strettel (1899); and Les Aubes by Mr Arthur Symons (1898). A long list of articles dealing with Verhaeren is to be found in Poetes d'Aujourd'hui (1900) of A. van Bever and Paul Leautaud.

VERKHNE-UDINSK, a town of Asiatic Russia, in East Siberia, province of Transbaikalia, on the right bank of the Uda, at its confluence with the Selenga, 102 m. by rail E. of Lake Baikal, to which steamers ply. Pop. (1883) 4130; (1897) 8002. It was founded as a small fort in 1668, and is a centre for the overland trade in tea with China, and an emporium both for grain and animal products, exported, and for metals, machinery and manufactured goods, imported. Its yearly fair is of great importance.

VERLAINE, PAUL (1844-1896), French lyric poet, was born at Metz on the 30th of March 1844. He was the son of one of Napoleon's soldiers, who had become a captain of engineers. Paul Verlaine was educated in Paris, and became clerk in an insurance company. He was a member of the Parnassian circle, with Catulle Mendes, Sully Prudhomme, Francois Coppee and the rest. His first volume of poems, the Poemes saturniens (1866), was written under Parnassian influences, from which the Files galantes (1869), as of a Watteau of poetry, began a delicate escape; and in La Bonne Chanson (1870) the defection was still more marked. He married in 1870 Mile. Mautet. During the Commune he was involved with the authorities for having

sheltered his friends, and was obliged to leave France. In 1871 the strange young poet Jean Arthur Rimbaud came somewhat troublingly into his life, into which drink had already brought a lasting disturbance. With Rimbaud he wandered over France, Belgium, England, until a pistol-shot, fortunately ill-aimed, against his companion brought upon him two years of imprisonment at Mons. Solitude, confinement and thought converted a pagan into a Catholic, without, however, rooting out what was most human in the pagan; and after many years' silence he published Sagesse (1881), a collection of religious poems, which, for humble and passionate conviction, as well as originality of poetic beauty, must be ranked with the finest religious poems ever written. Romances sans paroles, composed during the intervals of wandering, appeared in 1874, and shows us Verlaine at his most perfect moment of artistic self-possession, before he has quite found what is deepest in himself. He returned to France in 1875. His wife had obtained a divorce from him, and Verlaine made another short stay in England, acting as a

teacher of French. After about two years' absence Verlaine was again in France. He actfd as teacher in more than one school and even tried farming. The death of his mother, to whom he was tenderly attached, dissolved the ties that bound him to " respectable " society. During the rest of his life he lived in poverty, often in hospital, but always with the heed- less and unconquerable cheerfulness of a child. After a long obscurity, famous only in the Latin Quarter, among the cafes where he spent so much of his days and nights, he enjoyed at last a European celebrity. In 1894 he paid another visit to England, this time as a distinguished poet, and lectured at London

and Oxford. He died in Paris on the 8th of January 1896. His eighteen volumes of verse (among which may be further mentioned Jadis et nagnere, 1884; Amour, 1888; Parallelement, 1889; Bonheur, 1891) vary greatly in quality as in substance; they are all the sincere expression, almost the instantaneous notation, of himself, of his varying moods, sensual passion, the passion of the mystic, the delight of the sensitive artist in the' fine shades of sensation. He brought into French verse a note of lyrical song, a delicacy in the evoca- tion of sound and colour, which has seemed almost to create poetry over again, as it provides a language out of which rhetoric has been cleansed and a rhythm into which a new music has come with a new simplicity. (A. Sy.)

His CEuvres completes (3 vols.) were published in 1899, &c. ; CEuvres posthumes (1903). See also Paul Verlaine, sa vie, son osuvre, by E. Lepelletier (1907) ; monographs by M. Dullaert (Ghent, 1896), C. Morice (1888); also Anatole France, La Vie litleraire (3rd series, 1891); J. Lemaitre, Nos contemporains (1889), vol. iv. ; E. Delille, "The Poet Verlaine," in the Fortnightly Review (March 1891); A. Symons, in the National Review (June 1892); V. Thompson, French Portraits (Boston, U.S.A., 1900); and the poet's own Confessions (1895) and his Poetes maudits (1888). _A bibliography of Verlaine with an account of the existing portraits of him is in- cluded in the Poetes d'Aujourd'hui (nth ed., 1905) of MM. A. van Bever and P. Leautaud. The Vie by Lepelletier has been trans- lated into English by E. M. Lang (1909).

VERLAT, MICHEL MARIE CHARLES (1824-1890), Belgian painter, was born at Antwerp on the 25th of November 1824. He was a pupil of Nicaise de Keyser, and studied at the Antwerp Academy. In 1842 appeared his first important picture, " Pippin the Short Killing a Lion." About 1849 he went to Paris, where he worked

under Ary Scheffer. In 1855 he won a gold medal at the Exposition Universelle at Paris with his ″ Tiger Attacking a Herd of Buffaloes,″ and in 1858 exhibited ″ Le Coup de collier ″ (now in the Antwerp Gallery) at the Paris Salon. In 1866 he was appointed director of the Academy at Weimar, where he painted some fine portraits, notably those of the grand-duchess of Saxony and of the musician Liszt. Soon after his return to Antwerp in 1875 he visited Palestine, and brought back a large number of interesting pictures, including "Vox Populi ″ (Antwerp Gallery), "The Tomb of Jesus,″ and ″ The Flight into Egypt.″ In 1885 he was appointed director of the Antwerp Academy. Other important works by Verlat are the panoramas of the battle of Waterloo and the treaty of San Stefano, ″ Christ between the Two Thieves,″ "Defending the Flock" (Antwerp Gallery), "Oxen Plough- ing in Palestine" (Antwerp Gallery), ″ Godfrey of Bouillon at the Siege of Jerusalem" (Brussels Gallery), and "Sheep-Dog Defending the Flock ″ (Brussels Gallery). He executed a series of original etchings, and published in 1879 a book on the Antwerp Academy. He died at Antwerp on the 23rd of October 1890.

VERMANDOIS, a French countship composed originally of the two burgraviates (chatellenies) of St Quentin (Aisne) and Peronne (Somme). Herbert I., the earliest of its hereditary counts, was descended in direct male line from the emperor Charlemagne, and was killed in 902 by an assassin in the pay of Baldwin II., count of Flanders. His son, Herbert II. (902- 943), a man absolutely devoid of scruples, considerably in- creased the territorial power of the house of Vermandois, and kept the lawful king of France, the unlucky Charles the Simple, prisoner for six years. His successors, Albert I., Herbert III., Albert II., Otto and Herbert IV., were unimportant. In

077 th^last male of the first house of

Vermandois, Herbert IV.,

received the countship of Valois in right of his wife. He died soon afterwards, leaving his inheritance to his daughter Adela. whose first husband was Hugh the Great, the brother of king Philip I. Hugh was one of the leaders of the first crusade, and died in 1102 at Tarsus in Cilicia. The eldest son of Hugh and Adela was count Raoul (Rudolph) I. (c. 1120–1152), who married Alix of Guyenne, sister of the queen, Eleanor, and had by her three children: Raoul (Rudolph) II., the Leper (count from 1152–67); Isabelle, who possessed from 1167 to 1183 the countships of Vermandois, Valois and Amiens conjointly with her husband, Philip of Alsace, count of Flanders; and Eleanor. By the terms of a treaty concluded in 1185 with the king, Philip Augustus, the count of Flanders kept the countship of Vermandois until his death, in 1191– At this date a new arrangement gave Eleanor (d. 1213) a life interest in the eastern part of Vermandois, together with the title of countess of St Quentin, and the king entered immediately into possession of Peronne and its dependencies.

See Anselme, Histoire genealogique de la maison royale de France (1726), i. 48–51 and 531–34; Colliette, Memoires pour I'histoire du Vermandois (1771–72). (A. Lo.)

VERMICELLI (plural of Ital. vermicello, little worm, Lat. vermicellus, diminutive of vermis, worm), the name of a kind of paste, made of the granular meal of certain hard wheats, and used as a food. It is made into worm–like threads, whence its name, and differs from macaroni only in being made solid and not in hollow tubes. " Spaghetti " (dim. of spago, a small cord) is a larger kind of vermicelli. In Italy these various pastes form a staple article of food. In other countries " ver– micelli " is used in soups and puddings, &c.

VERMIGLI, PIETRO MARTIRE, generally known as Peter Martyr (1500–1562), born at Florence on the 8th of May 1500, was son of Stefano Vermigli, a follower of Savonarola, by his first wife, Maria Fumantina. He owed his Christian names to a vow which his father, actuated by the death of several children in infancy, had made to dedicate any that survived to the Dominican saint, Peter Martyr, who lived in the 13th century. Educated in the Augustinian cloister at Fiesole, he was trans- ferred in 1519 to the convent of St John of Verdara near Padua, where he graduated D.D. about 1527 and made the acquaint- ance of the future Cardinal Pole. From that year onwards he was employed as a public preacher at Brescia, Pisa, Venice and Rome; and in his intervals of leisure he mastered Greek and Hebrew. In 1530 he was elected abbot of the Augustinian monastery at Spoleto, and in 1533 prior of the convent of St Peter ad Aram at Naples. About this time he read Bucer's commentaries on the Gospels and the Psalms and also Zwingli's De vera et falsa religione; and his Biblical studies began to affect his views. He was accused of erroneous doctrine, and the Spanish viceroy of Naples prohibited his preaching. The prohibition was removed on appeal to Rome, but in 1541 Vermigli was transferred to Lucca, where he again fell under suspicion. Summoned to appear before a chapter of his order at Genoa, he fled in 1542 to Pisa and thence to another Italian reformer, Bernardino Ochino, at Florence. Ochino escaped to Geneva, and Vermigli to Zurich, thence to Basel, and finally to Strassburg, where, with Bucer's support, he was appointed professor of theology and married his first wife, Catherine Dammartin of Metz.

Vermigli and Ochino were both invited to England by Cranmer in 1547, and given a pension of forty marks by the government. In 1548 Vermigli was appointed regius professor of

divinity at Oxford, in succession to the notorious Dr Richard Smith, and was incorporated D.D. In 1549 he took part in a great disputation on the Eucharist. He had abandoned Luther's doctrine of consubstantiation and adopted the doctrine of a Real Presence conditioned by the faith of the recipient. This was similar to the view now held by Cranmer and Ridley, but it is difficult to prove that Vermigli had any great influence in the modifications of the Book of Common Prayer made iv 1552. He was consulted on the question, but his recommenda- tions seem hardly distinguishable from those of Bucer, the

effect of which is itself disputable. He was also appointed one of the commissioners for the reform of the canon law.

On Mary's accession Vermigli was permitted to return to Strassburg, where, after some opposition raised on the ground that he had abandoned Lutheran doctrine, he was reappointed professor of theology. He befriended a number of English exiles, but had himself in 1556 to accept an offer of the chair of Hebrew at Zurich owing to his increased alienation from Lutheranism. He was invited to Geneva in 1557, and to England again in 1561, but declined both invitations, main- taining, however, a constant correspondence with Jewel and other English prelates and reformers until his death at Zurich on the 12th of November 1562. His first wife, who died at Oxford on the 15th of February 1553, was disinterred in 1557 and tried for heresy ; legal evidence was not forthcoming because witnesses had not understood her tongue; and instead of the corpse being burnt, it was merely cast on a dunghill in the stable of the dean of Christ Church. The remains were identified after

Elizabeth's accession, mingled with the supposed relics of St Frideswide to prevent future desecration, and reburied in the cathedral. Vermigli's second wife, Caterina Merenda, whom he married at Zurich, survived him, marrying a merchant of Locarno.

Vermigli published over a score of theological works, chiefly Biblical commentaries and treatises on the Eucharist. His learning was greater than his originality, and he was one of the least heterodox of the Italian divines who rejected Roman Catholicism. His views approximated most nearly to those of Martin Bucer.

Josias Simler's Oratio, published in 1563 and translated into English in 1583, is the basis of subsequent accounts of Vermigli. The best lives are by F. C. Schlosser (1809) and C. Schmidt (1858). See also Parker Soc. Publ. (General Index), especially the Zurich Letters; Strype's Works; Foxe's Acts and Monuments; Burnet's Hist., ed. Pocock; Dixon's History; and Diet, of Nat. Biogr. lviii. 253–256.

(A. F. P.)

VERMILION, a scarlet pigment composed of mercuric sulphide, HgS. It may be obtained direct from pure and bright coloured portions of the native ore cinnabar, or, artificially, by subliming a mixture of mercury and sulphur. The product is ground and levigated; and when dry it is ready for use. It is also prepared by digesting precipitated mercuric sulphide with an alkaline sulphide for some hours; it is said that Chinese vermilion owes its superiority to being made in this way. In addition to its brilliance, vermilion is a pigment of great intensity and dura- bility, remaining unaffected by acid fumes. Being costly, it is much subject to adulteration; but the fraudulent additions may easily be detected by volatilization, which in the case of pure

vermilion leaves no residue. See Figments and Mercury.

VERMIN (Fr. vermine, formed as if from Lat. verminus, vermis, a worm), the collective name applied to various classes or objectionable, harmful or destructive animals. To game-keepers and those interested in the preservation of game, all animals such as the pole-cat, weasel, stoat, hawks, owls, &c, which destroy the eggs or young of preserved birds, are classed as "' vermin," and the same term includes rats, mice, &c. It is also the collective name given to all those disgusting and objec- tionable insects that infest human beings, houses, &c, when allowed to be in a filthy and unsanitary condition, such as bugs, fleas, lice, &c,

VERMONT, a North Atlantic state of the United States of America and one of the New .England group, lying between latitude 42 44' and 45° o' 43" N., and between longitudes 3° 35' and 5 29' E. from Washington. It is bounded N. by the Canadian province of Quebec, E. by the Connecticut river, which separates it from New Hampshire, S. by Massachusetts, and W. by New York and Lake Champlain, which separates it in part from New York. Its total area is 0564 sq. m., and of this 440 sq. m. is water surface.

Surface.— Vermont is a portion of the plateau-like New England upland, broken by mountain ranges, individual mountains and high hills, rising above the general upland surface, and by deep narro.v valleys, cut below that surface. The mean elevation of the

state above the sea is about 1000 ft. Extremes range from 106 ft. at Maquam on the N.E. shore of Lake Champlain (96 ft.) to 4364 ft. at the summit of Mount Mansfield, about 25 m. E. of that lake. The most prominent feature of the

surface is the Green Mountains, which extend nearly N. and S. through the state a little W. of the middle. From the Massachusetts border N. for two-thirds the length of the state the range is only slightly broken, but farther N. it is cut deep by the valleys of the Winooski and Lamoille rivers. The crest line is generally more than 2000 ft. high, considerable areas are above 2500 ft., and the following summits exceed 4000 ft. : Mount Mansfield, 4364 ft. ; Killington Peak, 4241 ft. ; Camel's Hump, 4088 ft.; Mount Lincoln, 4078 ft.; and Jay Peak, 4018 ft. West of the Green Mountains the Taconic Mountains form a nearly parallel (but distinct) range, extending from New York and Massa- chusetts N. nearly to the centre of Vermont ; and a series of broken uplifts, known as the Red Sandrock Mountains, extend farther N. along the shore of Lake Champlain. The Taconic Mountains rise in very irregular masses to 1500-2000 ft., and reach their maximum elevation in Mount Equinox at 3816 ft. The Red Sandrock Moun- tains are similar to one another in form and structure, generally rounded on the N. and E., but with some rugged escarpments facing the lake; their highest point is Snake Mountain (1271 ft.) in Addison county. There are no mountain ranges in the state E. of the Green Mountains, but distributed along the entire E. border are a number of tall and oval or conical shaped masses known as the Granitic Mountains, and between these and the Green Mountains the country is largely occupied by high hills and deeply carved valleys. Mount Ascutney, one of the Granitic Mountains, rises abruptly from the floor of the Connecticut Valley to a height of 3320 ft. The least broken section of Vermont is on the somewhat gentle slope of the Green Mountains in the N.W. and on Grand Isle, North Hero Island, and Isle La Motte in Lake Champlain. The forms of Vermont's mountains, even to the highest summits, were to a great extent rounded by glaciation, but as the rocks vary much in texture and are often

steeply inclined, stream erosion has cut valleys deep and narrow, often mere gorges.

Where the Green Mountain range is unbroken, in the S. two-thirds of the state, it forms a water-parting between the streams which flow W. or > N.W. into Lake Champlain or the Hudson river and those flowing S.E. into the Connecticut river; but farther N. the line separating the Hudson-Champlain basin from the Connecticut basin runs among the Granitic Mountains; and extending 25 m. S. from the Canadian border is a small area that is drained N. into Lake Memphremagog, the waters of which, like those of Lake Champlain, are tributary to the St Lawrence river. North of Massachusetts the Connecticut river is wholly within New Hampshire — Vermont's eastern boundary is low-water mark on the W. bank of the Connecti- cut river. The largest and only navigable rivers of Vermont are among those flowing into Lake Champlain: the Missisquoi, the Lamoille, the Winooski and Otter Creek. The Batten Kill is the principal river flowing into the Hudson. The Deerfield, West, Williams, White, Passumpsic and Nulhegan rivers are the largest of the many streams which are tributary to the Connecticut. The Black, Barton and Clyde rivers flow into Lake Memphremagog. Vermont's rivers are generally swift, and in many places they are made very picturesque by their clear and sparkling waters, rapids, falls, gorges and wooded banks.

Lake Champlain, which lies beautifully in the valley between the Green and Adirondack mountains, belongs mostly to Vermont. The state has a shore line upon it of 1 50 m. or more, and in its N. portion are numerous islands which are attractive resorts during the summer season. On the N. border of the state is Lake Memphremagog with islands, a rugged prominence known as Owl's Head on its W. border, Jay Peak, farther back, and a beautiful farming country to the eastward. There are also a large number

of small lakes and ponds lying wholly within the state. Of these Lake Bomoseen in Rutland county and Willoughby Lake in Orleans county are the largest. Willoughby Lake is about 6 m. long by 1–1J m. wide, and its situation between two rugged mountains makes a scene of great natural beauty. All the lakes of the state were formed by glaciation.

Fauna. — The most common wild animals are deer, rabbits, squirrels, raccoons, skunks, woodchucks and muskrats. There are some porcupines, red foxes, minks and martens, but the moose, wolf and lynx are practically extinct. The ruffed grouse (or ″ partridge ") is the most common of game birds, but woodcock, ducks and geese are quite common. Prominent among a great variety of song–birds and insectivorous birds are the robin, blue bird cat bird, sparrows, meadow–lark, bobolink, thrushes, chickadee, wrens, brown thrasher, gold finch, cedar wax–wing, flycatchers, nuthatches, flicker (golden–winged woodpecker), downy and hairy woodpeckers, rose–breasted grosbeak, Baltimore oriole, barn– swallow, chimney swift, purple martin, purple finch (linnet), vireos and several species of warblers. Birds of prey comprise several species of hawks and owls, and a few eagles. A few sturgeon are taken in Lake Champlain. The lakes, ponds and streams afford some of the best trout fishing in the country, and many of them also abound in pickerel, pike, perch, black bass and land–locked salmon. There is a state fish and game commissioner, and the state has a fish

hatchery at Roxbury and a forest and game farm at Sharon. There are Federal hatcheries at Swanton (for pike perch and yellow perch) and at Holden (for trout).

Flora. — Vermont (vert mont), the Green Mountain State, was so named from the evergreen forests of its mountains, whose principal trees are spruce and fir on the upper slopes and white pine and hemlock on the lower. Among deciduous trees the state is noted for its sugar maples; birch and beech are common on the hills, and oaks, elm, hickory, ash, poplar, basswood, willow, chestnut and butternut on the less elevated areas. Among indigenous fruit-bearing trees, shrubs, vines and plants are the plum, cherry, grape, blackberry, raspberry, cranberry and strawberry. A few of the medicinal plants are ginseng, pleurisy root, snake root, blood root, blue flag and marshmallow. Orchids are very prominent among a great variety of flowering plants. Along the shore of Lake Champlain are a few species of maritime plants that remain from the time when portions of western Vermont were covered by the sea, and on the upper slopes of some of the higher mountains are a few Alpine species; these, however, are much less numerous on the Green Mountains of Vermont than on the White Mountains of New Hampshire. The state's lumber trade was important until 1890, when the white pine was nearly exhausted, although there were still spruce and hemlock.

Climate. — The state usually has long and severe winters and cool summers, but sudden changes of temperature are common at all seasons. The mean temperature for January, the coldest month, is only 17° F.; for the three winter months it is 19 F., and for the five months from November to March inclusive it is 24-3° F. For July, the warmest month, the mean temperature is 68° F. ; for the entire year it is 43 ° F. Extremes of temperature have ranged from 36 F. at Woodstock, Windsor county, in February 1896 to 97 F. at Cornwall, Addison county, in June 1901. The eastern section of the state is colder than the western, and the central or most mountainous section is still

colder; for example, the mean annual temperature of Burlington, on Lake Champlain, is 46 F., while that of Saint Johnsbury, a little farther S. and near the E. border, is only 42 ° F., and that of Northfield, still farther S. but in the middlesection, is only 41 ° F. The mean annual precipitation for the entire state is about 385 in. ; more rain falls in summer than in any other season, and more falls in the southern section than in the northern. The average annual fall of snow throughout the state is about 90 in., but at Jacksonville near the S. border it often exceeds no in. More snow falls in February than in any other month. In the Connecti cut and Hudson-Champlain valleys the winds blow mostly from either the N. or the S., but in several of the smaller valleys the pre- vailing winds are from the N.W.

Soil. — The soil is for the most part glacial drift, composed of clay, sand and gravel, and varying greatly in depth. On the higher elevations it is generally stony and sterile, but in the valleys and on many of the lower hills, where it consists largely of clay and sand, it is quite productive. The best soils are in the west section, where limestone clays or shell marls are common.

Forests. — Vermont was heavily forested with white pine, spruce and hemlock, and, in the southern part of the state and along the shore of Lake Champlain, with some hard woods. The white pine had been much cut off by 1890 and it is no longer commercially im- portant. The woodland area of the state in 1900 was estimated to be 3900 sq. m., about 43 % of the land area of the state.

Fisheries. — Lake Champlain furnishes the only commerical fishing grounds in Vermont, with the exceptions of small catches of white fish in Lake Bomoseen, Lake St Catherine in Rutland county and Lake Memphremagog. The total catch

in 1895 was 208,139 lb, valued at $7160, and in 1902 was 528,682 lb, valued at $37,669. The capital invested in fisheries in 1902 was $9417, and the number of men employed, 145. The most valuable fish taken was wall- eyed pike, and the catch of this fish and of pickerel from Lake Champlain in 1902 exceeded in value that from any other body of fresh water in the United States excepting Lake Huron and Lake Erie. The wall-eyed pike taken in 1902 were valued at $16,915 (210,936 lb); white fish, $5777 (80,191 lb); pickerel, $4144 (51,711 lb); yellow perch, $2575 (43,917 lb); sturgeon, $2051 (15,590 lb), and suckers, $1854 (37.375 H>) ; other varieties taken in smaller quantities included smelt, sun-fish and eels.

Agriculture. — Vermont is largely an agricultural state: in 1900, out of a total of 134,933 persons engaged in gainful occupations, 49,820 were engaged in agriculture, 36,180 in manufacturing and mechanical pursuits, 23,028 in domestic and personal service, 18,889 in trade and transportation, and 7016 in professional service; and of a total land area of 9124 sq. m., 7382 sq. m. (4,724,400 acres) were included in farms. The percentage of improved farm land; as in Maine, New York and Pennsylvania, increased from 1850 until 1890 and decreased after 1890 ; and in 1900 out of a total acreage of 4,724,400 acres only 2,126,624 acres (45%) were improved. Of the 33,104 farms in the state in 1900, 25,982 were farmed by their owners, 1373 by part owners, 314 by owners and tenants, 2424 by cash tenants, ^396 by share tenants, and 615 by managers; 637 farms had more than 500 acres, 3431 were between 260 and 500 acres, 5512 between 175 and 260 acres, 10,215 between 100 and 175 acres, 6513 between 50 and 100 acres, 351 1

between 20 and 50 acres, and 3285 less than 20 acres; and dairy produce was the principal source of income of more than one-half of these (16,700), live stock the principal source of

income of 7323 farms, and hay and grain of 2519 farms. The general sterility of the soil except along rivers and the bases of hills has made intensive cultivation always necessary, and the competition of new and rich western farm lands has made the agriculture of Vermont develop further toward specialization in dairying and raising live stock. In 1910 there were 495,000 neat cattle (285,000 milch cows), 94,000 horses (average value, $106), 229,000 sheep and 95,000 swine. The horses of Vermont have been famous in the development of American racing stocks; the Morgan stock is best known, and other famous Vermont strains are Messenger and Black Hawk. Hay and forage are the most important crops, and Vermont grasses for grazing have been favourably known since the close of the 18th century. In 1909 on 879,000 acres a crop of hay (excluding forage) was raised' valued at $16,155,000. The cereals are relatively unimportant. The largest cereal crop is oats, of which, in 1909, 2,608,000 bushels (valued at $1,304,000) were produced on 81,000 acres.

Mines and Quarries. — The principal mineral resource of Vermont is its building and monumental stone, including marble and granite and a small amount of limestone. The value of the total amount of stone produced in 1908 in Vermont was $7,152,624. Vermont marble is the best and most plentiful in the United States. It has been quarried since 1 785; marble monuments were first manu- factured about 1808; and at South Dorset in 1818 marble seems first to have been sawed in blocks, the earlier method having been chiselling. It is found generally throughout the western part of the state. The principal supply is in West Rutland, Proctor and Pittsford; this, the " Rutland marble," is a duller, less lustrous white, and of a greater durability than the Carrara marble, and is used largely for monuments and statuary. There are other large quarries at Dorset and East Dorset, Bennington county; the

finest marbles from this region are the white, slightly marked with pale brown and with greenish lines; they are commonly used for build- ing, the Harvard Medical School and the office of the U.S. Senate being examples. At Rutland, Proctor and Dorset many darker shades are found, including ″ moss vein, ″ olive green and various shades of blue, green, yellow and pink, which are used for ornamental purposes. There are important quarries in Franklin county (at Swanton), the stone being a dark Chazy limestone, in which pink and red (″ jasper,″ ″ lyonnaise ″ and ″ royal red ") marbles_ of Cambrian age are found. At Monkton, Addison county, there is a quarry from which other red marbles are taken; and at Roxbury, Washington county, a fine serpentine, called ″ green marble,″ or verde antique, is quarried. On Isle La Motte, Grand Isle county, there are marble quarries, the characteristic colours of the marble being ″ Fisk black ″ and ″ Fisk grey.″ The output of marble in 1908 was valued at $4,679,960 (out of a total of $7,733,920 for the entire production of. marble in the United States). Only less important and only less early to be established in Vermont was the quarrying of granite, which began in 18 12, but which has been developed chiefly since 1880, largely by means of the building of ″ granite railroads ″ which connect each quarry with a main railway line — a means of transportation as important as the logging rail ways of the Western states and of Canada. The largest granite quarries are near Barre, Washington county, a city which owes its importance to the quarries. The Barre granites, like those of Woodbury and Calais (also in Washington county) and part of those of South Ryegate, Kirby and Newark (Caledonia county), are of the biotite type; they are grey, except the stone from Newark, which is pinkish. Of the quartz- monzonite type are the whitish granites of Bethel and Rochester (Windsor county) and Randolph (Orange county), the light grey of

Dummerston (Windham county), and the darker greys of Cabot (Washington county), Derby (Orleans county), Hardwick and Groton (Caledonia county)- and Topsham (Orange county). The olive green syenite found on Mount Ascut- ney, near the Connecticut river, in Windsor county, is a hornblende- augite. Other important granite quarries are near Williamstown, Dummerston, Berlin and Woodbury. The total value of the output of granite in the state in 1908 was $2,451,933. In 1908 the output of limestone was valued at $20,731 ; there are limestone quarries in Washington and Orange counties and on Isle La Motte. Slate-quarrying and cutting is carried on in the south-western part of the state, in Rutland county; there are important quarries at Fair Haven, Poultney, Castjeton, Wells and Pawlet. In Washing- ton county there are quarries near Northfield. The industry began about 1840, though one quarry had been opened as early as 1805. There are two green varieties, called in the trade ″ sea-green ″ and ″ unfading green, ″ the former being used for a cheap roofing slate; and there are purplish varieties. In i9o8 t the value of slate produced was $1,710,491 (out of a total production for the United States of $6,316,817).

Manufactures. — The first important industry^ of the state was ″ rafting ″ lumber from Vermont through Lake Champlain and the Richelieu and St Lawrence rivers to Quebec. Burlington became a great lumber market for a trade moving in the direction of Boston after the Richelieu river was blocked to navigation and railway transportation began, and in 1882 Burlington was the third lumber

centre in the United States. Mountain streams furnish important water-power, and the typical

factory of Vermont has long been a sawmill run by a water-wheel. The value of sawmill products in 1905 was $5,888,441, and of planing-mill products $3,080,117. Closely connected with the manufacture of lumber is the making of paper and wood pulp, centralized at Bellows Falls, with water- power on the Connecticut river and with the raw materials near; the product was valued in 1905 at $3,831,448. Dairy industries have rapidly increased in value: in 1905 the value of butter and cheese was $6,416,434, more than any other single industry under the census classification. If a less arbitrary classification be followed the principal manufacturing industries would be stone manufacture and textiles. The first marble quarry was opened in Dorset in 1785 and a second at Middlebury in 1 805; and the first granite was quarried in 1812. Barre is the centre of the granite business, and the region about Rutland, especially Proctor, is the principal seat of the marble industry. The product of stone manufactures in 1905 was $9,570,436. Vermont wa,s almost the last of the New England states to develop textile manufactures, though the manufacture of woollen goods was begun in 1824. The greatest development was between 1900 and 1905; the total value of textiles in the former year was $5,407,217 (woollen goods, $2,572,646; hosiery and knit goods, $1,834,685; cotton goods, $999,886) and in the latter was $7. 773.612 (woollen goods, $4,698,405; hosiery and knit goods, $1,988,685; and cotton goods, $1,086,522). Other important manufactures are: flour and grist mill products, foundry and machine- shop products, furniture, patent medicines and compounds, roofing materials, and scales and balances, manufactured especially at St Johnsbury.

Transportation and Commerce. — Railway transportation is supplied to Vermont by parallel lines crossing diagonally every part

of the state at about equal intervals and running in general in a N.W. and S.E. direction, and by lines running N. and S. respectively along the eastern and western borders of the state. The railway map of the state thus has roughly the appearance of a gridiron. The principal railways are: the lines operated by the Boston & Maine system, extending along the eastern border from Brattleboro through Bellows Falls, and St Johnsbury to the Canada boundary (Vermont Valley, Sullivan County, and Connecticut & Passumpsic Rivers railways), with a line, the St Johnsbury & Lake Champlain railway, extending across the northern part of the state from Lunenburg to Maguam Bay; the Central Vermont railway (Grand Trunk system) which crosses the state diagonally from S.E. to N.W., connecting Burlington, Montpelier and St Albans and affording connexion to the north with Montreal and to the south over trackage shared with the Boston & Maine, with the New London Northern which is leased by this road, and the Rutland railway (New York Central system) extending along the western edge of the state and connecting Rutland with Burlington to the north and with Bellows Falls and Bennington to the south. These railways provide outlets for through freight and passenger traffic southward to Boston and New York, and to the north to St Johns and Montreal.

The southern part of the state was early opened to railways, the Sullivan County railway (operated by the Boston & Maine) having been opened in 1849; and in 1850 the state had 290 m. of railway; in 1870, 614 m. ; in 1890, 991 '42 m.; and on the 1st of January 1909, 1093-43 m. Water communication is afforded by Lake Champlain to the south, for seven months of the year, by way of the Champlain canal, via Whitehall, New York, to Troy and the Hudson river and the Atlantic coast, and to the north by way of the Richelieu river and the Chambly

canal to the St Lawrence. The commerce of the lake consists principally of coal, wood pulp and building material, besides general merchandise. The only river with traffic of commercial importance is Otter Creek, flowing northwards into the southern part of Lake Champlain and having a navigable length of 8 m. to Vergennes, with a depth to this point of 8 ft. at low water. The commerce on Lake Champlain is carried on chiefly through Burlington, the port of entry for the Vermont customs district. The tonnage of the commerce of this port amounted, accord- ing to the reports of the United States army engineers, to 107,421 tons in 1904 and to 249,174 tons in 1908, of which in the latter year nearly 80 % was lumber.

Population. — The population of Vermont in 1890 was 332,422; in 1900, 343,641; and in 1910, 355,9S6- 1 Of the total population in 1900, 298, 077 were native whites, 44,747 were foreign-born, 826 were negroes and 39 were Chinese. Of the inhabitants born in the United States, 19,974 were natives of New York, 9675 were natives of New Hampshire and 91 n were natives of Massachu- setts. Of the foreign-born, 14,924 were French Canadians, 10,616 were English Canadians and 7453 were Irish. Of the total popu- lation, 117,344 were of foreign parentage {i.e. either one or both

'According to previous censuses, the population was as follows:

(1790) 85,425; (1800) 154,465; (1810) 217,895; (1820) 235,981;

(1830) 280,652; (1840) 291,948; (1850) 314,120; (i860) 315,098; (1870) 330,551 ; (1880) 332,286. The increase between 1850 and 1000 was remarkably small.

parents were foreign-born) and 27,226 were of French Canadian and 20,228 of Irish parentage,

both on the father's and on the mother's side. Of 147,223 communicants of all churches in 1906, the largest number, 82,272, were Roman Catholics, 22,109 were Congregationalists, 17,471 Methodist Episcopalians, 8450 Baptists, 1 501 Free Baptists and 5278 Protestant Episcopalians. The principal cities are Burlington, Rutland, Barre, Montpelier (the capital) and St Albans.

Administration. — Vermont has been governed under the constitution of 1777, that of 1786 and that of 1793, with twenty- eight amendments, of which the first was adopted in 1828, the second to thirteenth in 1836, the fourteenth to twenty-third in 1850, the twenty-fourth, twenty-fifth and twenty-sixth in 1870, and the twenty-seventh and twenty-eighth in 1883. The administrative officers of the state are a governor, a lieutenant- governor, a secretary of state, a state treasurer, and an auditor of accounts, elected by popular vote, and an inspector of finance, a commissioner of taxes, a superintendent of education, a fish and game commissioner, three railroad commissioners, and various boards and commissions, of whom some are elected by the General Assembly and some are appointed by the governor with the advice and consent of the Senate. All elections and appointments are biennial. The governor has limited powers of appointment and pardon and a veto power which may be over- ridden by a majority vote in each house.

The legislative department consists of a senate of 30 members, apportioned among the counties according to population, but with the proviso that each county must have at least one senator, and a House of Representatives of 245 members, one from each township. Since 1870 elections and legislative sessions have been biennial. The powers of the two houses are equal except that revenue measures must originate in the House of Representatives.

The judiciary is composed of a supreme court of seven members, a court of chancery, a county court in each county, a probate court in each probate district, and justices of the peace. The judges of the supreme court are elected biennially by the General Assembly, and all the other judicial officers are elected by the people. Sessions of the supreme court are held in each county once a year in addition to the general session which meets at some central place selected by the judges. The court of chancery is held by the judges of the supreme court, the county by a supreme court judge with the aid of two associates elected by the people of the county.

For the administration of local affairs the state is divided into 14 counties and 245 townships. There is no special board of commissioners or supervisors as in most of the other states, the county authority being the assistant judges of the county court. The assistant judges, the sheriff and the state's attorney are elected annually by popular vote. The county treasurer is elected by the assistant judges. The more important township officials are a moderator, a board of selectmen, a clerk, a treasurer and a superintendent of schools. Any community containing thirty or more houses may, with the approval of the selectmen of the town, receive a separate village organization. Their officials are a clerk, five trustees, a collector of taxes and a treasurer.

All citizens of the United States residing in Vermont are citizens of the state. The right of suffrage is confined by the constitution to adult male citizens who have resided in the state for one year. Women have the right to vote in all elections relating to schools and school officers in cities, towns and graded school districts, and also the right to be elected to any local school position or to the office of township clerk. The original method

of revising the constitution was adopted from Pennsylvania (see History), and it was retained long after Pennsylvania had abandoned it. Thirteen censors chosen septennially were empowered to suggest amendments and to call a convention to pass upon them. The censors, being elected on a general ticket, were always more progressive than the con- vention, which was chosen on the principle of equal township repre- sentation. In spite of the repeated recommendations of the censors, the convention refused to abolish the collegiate executive and the unicameral legislative system until 1836. Propositions to establish the judiciary on a more permanent tenure were also voted down in 1814, 1822, 1857 and 1870, and the state still elects its judges for two years' terms. On its own suggestion, the council of censors was abolished in 1870 and the present method of amending the constitu- tion was adopted. Every tenth year, beginning in 1880, the Senate is authorized to propose amendments, which proposals, if concurred in by the majority of the members of the House of Representatives, are published in the principal newspapers of the state. If they are again approved by a majority of each house in the next General Assembly, they are submitted finally to a direct popular vote, a majority of the votes cast being decisive.

Miscellaneous Laws. — A married woman may hold her separate property, carry on business, sue and be sued the same as if she

were single, except that in conveying or mortgaging her real estate she must be joined by her husband. A widow has a dower interest in one-third of her husband's real estate unless barred by a jointure or an agreement. A widower is in any case entitled by vourtesy to one-

third of his wife's real estate, and he may choose between his rights by courtesy and the provisions of his wife's will. Where there is no issue and the deceased dies intestate the surviving \spouse is entitled to the whole estate, both real and personal, if it noes not exceed $2000, and if it exceeds that sum the survivor is entitled to $2000 and one-half of the remainder; if there are no kindred, the whole of the estate goes to the surviving spouse. The tauses for a divorce are adultery, sentence to confinement in the state prison for three years or more and actual confinement at the time of the suit, intolerable severity, wilful desertion for three con- secutive years or absence for seven years without being heard from, or wanton and cruel refusal or neglect of the husband to provide a suitable maintenance for his wife. The plaintiff must have resided in the state for at least the year preceding the application, and if the cause accrued in some other state or country before the parties lived together in Vermont and while neither party lived there, the plaintiff must have been a resident at least for two years preceding the action. When a divorce is granted, the defendant is not per- mitted to marry other than the plaintiff for three years, unless the plaintiff dies. The homestead of a householder or head of a family to the value of $500 is, so long as it continues to be used as the home- stead, exempt from levy or attachment other than upon causes existing at the time it was acquired and for taxes. If the owner is a married man, he cannot sell or mortgage it, except for the pur- chase money, unless his wife joins him in the execution.

Education. — The public-school system is under the supervision of a state superintendent of education, elected biennially by the General Assembly, and local schools are under union superintendents and in a few cases under town superintendents. The district system was

displaced in 1893 by a township system. The revenues for educational purposes are derived mainly from a state tax of 8 % on the general list, from local taxes, and from the interest on the permanent school fund, which (including the money paid to Vermont by the United States government when a portion of the treasury surplus was distributed among the states in 1837) amounted in 1908 to $1,120,218. The schools are open to all children between the ages of 5 and 20, and attendance for twenty-six weeks in each year is made compulsory for those who are between the ages of 8 and 15. The average number of weeks in the " legal schools " (about 95% of the public schools) was 32 weeks in 1907-1908. The chief institutions for higher instruction are the university of Vermont and State Agricultural College (1800, 1865), a land-grant college at Burlington, Middlebury College (1800) at Middlebury, Norwich University (1819) at Northfield, and the state normal schools at Randolph (1867), Johnson (1867) and Castleton (1868). _

Charitable and Penal Institutions. — The charitable and penal insti- tutions of the state are controlled by separate boards of directors, but all are subject to the general supervision of a board of visitors composed of the governor, lieutenant-governor and speaker of the House of Representatives, and a woman appointed by the governor. There are a state prison at Windsor (1808), a house of correction at Rutland (1878), an industrial school at Vergennes (1866), and hospitals for the insane at Brattleboro (1836) and Waterbury (1891). Biennial appropriations are made for the support of the deaf and dumb, the blind and imbecile children at various institu- tions in Massachusetts and Connecticut.

Finance. — The chief sources of revenue for the state are a cor- poration tax, a collateral inheritance tax (1904) and a licence tax. There is no general property tax except a special

levy of 8 % on the general list for school purposes and 5 % for the construction of roads. For the year ending on the 30th of June 1908 the total receipts were $1,822,390, the expenditures were $1,871,166. The state is prac- tically free from debt, the only obligation of this character being $ I 35>5°0 ' n 6% bonds, payable in 1910, which were issued in behalf of the Agricultural College. The banking institutions are supervised by an inspector of finance, who reports annually to the General Assembly. There were no banks in the state until 1806, when a state bank (controlled by the state) was established which was finally closed up in 1845, although as early as 1 8 12 a law was passed to close it. The first private state bank was opened in 18 17 ; an act of 183 1 provided for a safety fund guaranteeing bank circulations and derived from a 4! % tax on capital stock and a 10% tax on profits; but this law was modified in 1842, the tax being removed from banks giving specie guarantees; and a free banking act was passed in 1851. Owing to the high rate of taxation on deposits, a considerable part of the savings of the people is sent into other states.

History. — Samuel de Champlain, as governor of Quebec, entered what is now Vermont in July 1609 in an expedition against the Iroquois, and thus laid the basis for the French claim. In 1665 the French built a fort on Isle la Motte. The first English settlement was probably made at Chimney Point, in Addison township, in 1690 by a party from Albany. The first permanent white settlement was established by Massachusetts at

Fort Dummer (near the present Dummer, in the south-eastern part of the present town of Brattleboro) in 1 7 24. Similar outposts were located during the next few years at Sartwell's Fort and Bridgman's Fort in the township of Vernon (Windham county) and at Fort Hill in the township of Putney (N. of Brattleboro, in

Windham county). The territory in which these settlements had been made was involved in the boundary dispute between Massachusetts and New Hampshire, which was settled in 1741 by a decision of the king in council favourable to New Hamp- shire (q.v.). The extension of the southern boundary line by this decision due westward until it met His Majesty's other governments gave rise, however, to a controversy with New York. New Hampshire claimed that her territory extended as far to the west as those of Massachusetts and Connecticut, whereas New York, under the charter of 1664, claimed eastward to the Connecticut river. New York pro- tested against the Bennington grant in 1749, but the question did not become serious until the chief obstacle to settlement was removed by the conquest of Canada in 1760-61. From 1761 to 1763 Governor John Wentworth of New Hampshire issued 108 grants, and settlements were established in Brattleboro, Putney, Westminster, Halifax, Marlborough, Wilmington, New Fane, Rockingham, Townshend, Vernon (Hinsdale) and Dummerston (all in Windham county, except Vernon, which is in Cheshire county). A privy council decree recognizing the claims of New York was issued on the 20th of July T764, and the settlers were soon afterwards ordered to surrender their patents and repurchase the land from the proper authorities at Albany. Under the leadership of Ethan Allen, Seth Warner and Remember Baker (173 7-1 7 7 5), they refused obedience and took up arms in defence of their rights. About the close of 1771 Colonel Allen organized a regular military force among the inhabitants of the district W. of the mountains, which came to be known as the Green Mountain Boys. The trouble was "soon complicated by the conflict with the mother country. On the 13th of March 1775, a riot occurred at Westminster between the people of Cumberland county and the royal authorities, in which two of the people were killed. The Green Mountain Boys, with some help

from Connecticut, captured Fort Ticonderoga on the 10th of May 1775, and took part in the Canadian expedition of 1775 under Montgomery and Schuyler. Within the state itself battles were fought at Hubbardton on the 7th of July and Bennington on the 16th of August 1777. The representatives of the towns assembled in convention at Dorset and Westminster in 1776 (Jan. 16–17, July 24–25, September 25–28, October 30), and on the 15th of January 1777 adopted a declaration of independence, assumed the name New Connecticut and appointed Dr Jonas Fay (1737– 1818), Thomas Chittenden (1730–1797), Hemon Allen (1740– 1788), Dr Reuben Jones and Jacob Bayley a committee to submit their proceedings to the Continental Congress. The chief adviser of the committee in Philadelphia was Dr Thomas Young, a prominent physician, who had helped to draft the Pennsylvania constitution of 1776. Young advised them to call their state Vermont, and he also sent through them a circular letter, dated the nth of April 1777, urging the people to adopt a state constitution on the Pennsylvania model. The advice was followed. A convention met at Windsor (July 2–8, 1777), and drafted a document which contained almost all of the important provisions of the constitution of Pennsylvania, such as a unicameral legislature, a plural executive and a council of censors, which was not abolished until 1870. One important variation, however, was a clause in the bill of rights providing for the abolition of slavery, Vermont being the first state in America to take such action. The first legislature of the state met at Windsor in March 1778, and voted to admit sixteen towns east of the Connecticut river which were dissatisfied with the rule of New Hampshire. As a result, New York and New Hampshire formed a secret agreement to divide the state between them– selves, the mountains to be the line of division. In this crisis the British government through General Sir Frederick Haldimand offered

to recognize Vermont as a separate province and to give her very liberal terms provided she would desert the other states.

Ethan Allen (q.v.) and some of the other leaders seemed inclined to accept these overtures, but for various reasons, the chief of which was the general success of the American cause, the scheme was soon abandoned. The difficulties with New Hampshire were adjusted in 1782, the west bank of the Connecticut being accepted as the final boundary, but New York refused to abandon her claims until 1790. In the meantime, Vermont continued as an independent state without any recognition from Congress until its admission into the Union on the 4th of March 1791. The legislature wandered about from town to town until 1808, when the capital was permanently located at Montpelie'r. In presidential campaigns the state has been Federalist, 1 792–1800; Democratic–Republican, 1804–1820; Adams–Republican, 1824– 1828; Anti–Masonic, 1832; Whig, 1836–1852; and Republican since 1856. During the War of 1812 Vermont troops took part in the battles of Chippewa, Lundy 's Lane, Lake Erie and Plattsburgh ; but the only engagement in the state itself was the defence of Fort Cassin (at the mouth of Otter Creek in the N.W. corner of the present Addison county) in 1813. On the 19th of October 1864 a small band of Confederate soldiers under Lieutenant B.H. Young crossed the frontier from Canada and raided the town of St Albans. A few of the inhabitants were wounded and one was killed and about $200,000 was taken from the vaults of the local banks. St Albans was also the headquarters of an attempted Fenian invasion of Canada in 1870. Since 1815 a considerable proportion of the native stock has migrated to the W., but the loss has been partially offset

by an influx of French Canadians. The wool-growing industry has been almost entirely destroyed by the competition of Australia and the West, and the people are now engaged mainly in dairy-farming, timbering, granite- and marble-quarrying, and in keeping summer boarders.

Governors

Thomas Chittenden 1 778-1 789

Moses Robinson 1789-1790

Thomas Chittenden, 1 Federalist . . . 1 790-1 797 Paul Brigham, acting-governor, Federalist . 1797

Isaac Tichenor, Federalist …. 1 797-1 807

Israel Smith, Democratic-Republican . 1807-1808

Isaac Tichenor, Federalist …. 1808-1809

Jonas Galusha, Democratic-Republican . . 1809-1813

.Martin Chittenden, Federalist . . 1813-1815

Jonas Galusha, Democratic- Republican . . 1815-1820

Richard Skinner, ,, . . 1820-1823

Cornelius P. Van Ness, „ . . 1 823-1 826

Ezra Butler, Adams-Clay …. 1826-1828

Samuel C. Crafts, Adams-Clay. . . . 1828-1831

William A. Palmer, Anti-Masonic Fusion. . 1831-1835

Silas H. Jennison, 2 acting-governor, Whig . 1835-1836

Silas H. jennison, Whig 1836-1841

Charles Paine, „ 1841–1843

John Mattocks, 1843–1844

William Slade, „ 1844–1846

Horace Eaton, „ 1846–1848

Carlos Coolidge, „ 1848–1850

Charles K. Williams, 1850–1852

Erastus Fairbanks, „ 1 852–1 853

John S. Robinson 1853–1854

Stephen Royce, Republican …. 1 854–1 856

Ryland Fletcher, „ 1856–1858

Hiland Hall, „ 1858–1860

Erastus Fairbanks, ,, ... 1860–1861

Frederick Holbrook, ,, ... 1861–1863

J. Gregory Smith, ,, ... 1863–1865

Paul Dillingham, „ 1865–1867

John B. Page, ,, ... 1867–1869

Peter T. Washburn, 3 Republican . . 1869–1870
George W. Hendee, acting-governor, Republican 1870

John VV. Stewart, Republican …. 1870–1872

Julius Convers, ,, ... 1872–1874

Asahel Peck, ,, ... 1874–1876

Horace Fairbanks, ,, ... 1 876–1 878

Redfield Proctor, ,, ... 1 878–1 880

Roswell Farnham, ,, ... 1880–1882

John L. Barstow, „ 1882-1884

Samuel t. Pir%ree, Republican

Ebenezer J. Ormsbee, ,,

William P. Dillingham, ,,

Carroll S. Page, ,,

Levi K. Fuller, ,,

Urban A. Woodbury, ,,

Josiah Grout, ,,

Edward C. Smith, ,,

William W. Stickney, ,, John G. McCullough, Charles J. Bell,

Fletcher D. Proctor, ,,

George H. Prouty, ,,

John A. Mead, ,,

1 884-1 886 1886-1888 1 888-1 890 1 890- 1 892 1 892-1 894 1 894-1 896 1 896-1 898 1898-1900 1900-1902 1902-1904 1 904- 1 906 1906-1908 1908-1910 1910-

1 Died in office on the 25th of August 1797; succeeded by the lieutenant-governor.

○ As there was no governor elected by the people, Jennison as lieutenant-governor elect acted as governor.

' Died in office on the 7th of February 1870: succeeded by the tieutenant-governor.

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Montpelier, 1870–1871); Proceedings (1 vol., Montpelier, 1898); and Report of the Regents of the University of New York on the Boundaries of the State of New York (2 vols., Albany, 1 874–1 884).

VERMOREL, AUGUSTE JEAN MARIE (1841–1871), French journalist, was born at Denice, France, on the 21st of June 1841. A radical and socialist, he was attached to the staff of the Presse (1864) and the Liberie (1866). In the latter year he was appointed editor of the Courrier Francais, and his attacks on the government in that organ led to his imprisonment. In 1869 he was editor of the Reforme, and was again imprisoned for denouncing the government. On the overthrow of the Empire in 1870 he was released and took an active part in the Commune. He was dangerously wounded while fighting at the barricades, taken prisoner and removed to Versailles, where he died on the 20th of June 1871.

VERMOUTH, an alcoholic beverage, the basis of which consists of a fortified and aromatized white wine. The best French vermouth is made from the white wines of the Herault district. The wine is fortified with spirit up to a strength of about 15% of alcohol, and is then stored in casks exposed to the sun's rays for a year or two. Another portion of the wine is fortified up to a strength of about 50% of alcohol, and in this various aromatic and tonic materials are macerated, in casks which are exposed to the sun in the same way as the bulk of the wine. The two liquids are then mixed in such proportions as to make the strength of the ultimate product about 1 7 % of alcohol by volume. Excellent vermouth is also manufactured in Italy, the produce of that country being generally of a " sweet," that made in France of a " dry " type.

VERNACULAR (Lat. verna, dim. vernaeulus, a slave born in

his master's house), a term meaning native or indigenous,

belonging to the country where a person is born. The word

is practically confined in English usage to language, whether of

I the country as a whole or of particular dialects or idioms.

VERNE, JULES (1828–1905), French author, was born at Nantes on the 8th of February 1828. After completing his studies at the Nantes lycee, he went to Paris to study for the bar. About 1848, in conjunction with Michel Carre, he wrote librettos for two operettas, and in 1850 his verse comedy, Les P allies rompues, in which Alexandre Dumas fils had some share, was produced at the Gymnase. For some years his interests alternated between the theatre and the bourse, but some travellers' stories which he wrote for the Musie des Families seem to have revealed to him the true direction of his talent — the delineation, viz., of delightfully extravagant voyages and adventures to which cleverly prepared scientific and geo- graphical details lent an air of verisimilitude. Something of the kind had been done before, after kindred methods, by Cyrano de Bergerac, by Swift and Defoe, and later by Mayne Reid. But in his own particular application of plausible scientific apparatus Verne undoubtedly struck out a depart- ment for himself in the wide literary genre of voyages imaginaires. His first success was obtained with Cinq semaines en ballon, which he wrote for Hetzel's Magazin d' Education in 1862, and thenceforward, for a quarter of a century, scarcely a year passed in which Hetzel did not

publish one or«more of his fantastic stories, illustrated generally by pictures of the most lurid and sensational description. The most successful of these romances include: Voyage au centre de la terre (1864); De la terre a la lune (1865); Vingt mille lieues sous les mers (1869); Les Anglais au pole nord (1870); and Voyage autour du monde en quatre-vingts jours, which first appeared in Le Temps in 1872. The adaptation of this last (produced with immense success at the Porte St Martin theatre on the 8th of November 1874) and of another excellent tale, Michael Strogojf (at the Chatelet, 1880), both dramas being written in conjunction with Adolphe d'Ennery, proved the most acceptable of Verne's theatrical pieces. The novels were translated into the various European languages — and some even into Japanese and Arabic — and had an enormous success in England. But after 1877, when he published Hector Servadac, a romance of existence upon a comet, the writer's invention began to show signs of fatigue (his kingdom had been invaded in different directions and at different times by such writers as R. M. Ballantyne, Rider Haggard and H. G. Wells), and he even committed himself, somewhat un- guardedly, to very gloomy predictions as to the future of the novel. Jules Verne's own novels, however, will certainly long continue to delight readers by reason of their sparkling style, their picturesque verve — apparently inherited directly from Dumas — their amusing and good-natured national caricatures, and the ingenuity with which the love element is either sub-ordinated or completely excluded. M. Verne, who was always extremely popular in society, divided his time for the most part between Paris, his home at Amiens and his yacht. He was a member of the Legion of Honour, and several of his romances were crowned by the French Academy, but he was never enrolled among its members. He died at Amiens on the 24th of March 1905. His brother, Paul Verne, contri- buted to

the Transactions of the French Alpine Club, and wrote an Ascension du Mont Blanc for his brother's collection of Voyages extraordinaires in 1874.

VERNET, the name of three eminent French painters.

I. Claude Joseph Vernet (1714-1789), who was born at Avignon on the 14th of August 17 14, when only fourteen years of age aided his father, a skilful decorative painter, in the most important parts of his work. But the panels of sedan chairs could not satisfy his ambition, and he started for Rome. The sight of the sea at Marseilles and his voyage thence to Civita Vecchia made a deep impression on him, and immediately after his arrival he entered the studio of a marine painter, Bernardino Fergioni. Slowly but surely Claude Joseph made his way and attracted notice. With a certain conventionality in design, proper to his day, he allied the results of constant and honest observation of natural effects of atmosphere, which he rendered with unusual pictorial art. Perhaps no painter of landscapes or sea-pieces has ever made the human figure so completely a

part of the scene depicted or so important a factor in his design. " Others may know better," he said, with just pride, " how to paint the sky, the earth, the ocean; no one knows better than I how to paint a picture." For twenty years Vernet lived on in Rome, producing views of seaports, storms, calms, moon- lights, &c, when he was recalled (1753) to Paris, and executed, by royal command, the remarkable series of the seaports of France (Louvre) by which he is best known. On his return he became a member of the academy, but he had previously con- tributed to the exhibitions of 1746 and following years, and he continued to exhibit, with rare exceptions, down to the date of his death, which took place in his lodgings in the Louvre on the 3rd of

December 1789. Amongst the very numerous engravers of his works may be specially cited Le Bas, Cochin, Basan, Duret, Flipart and Le Veau in France, and in England Vivares.

II. Antoine Charles Horace Vernet (1758–1835), com- monly called Carle, the youngest child of the above-named, was born at Bordeaux in 1758, where his father was painting the view from the chateau of La Trompette (Louvre). He showed, at the age of five, an extraordinary passion for drawing horses, but went through the regular academical course as a pupil of Lepicie. Strangely enough, on arriving in Italy after carrying off the grand prix (1782), he lost all ambition and interest in his profession, so that his father had to recall him to France to prevent his entering a monastery. In Paris Carle Vernet became himself again, and distinguished himself at the exhibition of 1791 by his " Triumph of Paulus Aemilius," a work in which he broke with reigning traditions in classical subjects and drew the horse with the forms he had learnt from nature in stables and riding-schools. But the Revolution drew on, and Carle Vernet's career for awhile seemed to end in the anguish of his sister's death on the scaffold. When he again began to produce, it was as the man of another era: his drawings of the Italian campaign brought him fresh laurels; his vast canvas, the " Battle of Marengo," obtained great success; and for his " Morning of Austerlitz " Napoleon bestowed on him the Legion of Honour. His hunting-pieces, races, landscapes, and work as a lithographer (chiefly under the Restoration) had also a great vogue. From Louis XVIII. he received the order of St Michael. In 1827 he accompanied his son Horace (see below) to Rome, and died in Paris on his return, on the 17th of November 1835.

III. Emile Jean Horace Vernet (1789–1863), commonly called Horace, born in Paris on the 30th of June 1789, was one of the most characteristic, if not one of the ablest, of

the military painters of France. He was just twenty when he exhibited the " Taking of an Entrenched Camp " — a work which showed no depth of observation, but was distinguished by a good deal of character. His picture of his own studio (the rendezvous of the Liberals under the Restoration), in which he represented himself painting tranquilly, whilst boxing, fencing, drum- and horn-playing, &c, were going on, in the midst of a medley of visitors, horses, dogs and models, is one of his best works, and, together with his " Defence of the Barrier at Clichy " (Louvre), won for him an immense popularity. Enjoy- ing equal favour with the court and with the opposition, he was most improperly appointed director of the school of France at Rome, from 1828 to 1835, and thither he carried the atmo- sphere of racket in which he habitually lived. After his return the whole of the Constantine room at Versailles was decorated by him, in the short space of three years. This vast work shows Vernet at his best and at his worst: as a picture it begins and ends nowhere and the composition is all to pieces; but it has good qualities of faithful and exact representation. He died at Paris on the 17th of January 1863. The twenty works which were exhibited after his death confirmed his reputation for extraordinary facility; he had tried every sort of subject, showing affinity for all that was anecdotic rather than dramatic, failing most wherever most was demanded of him, and never reaching either beauty of colour or dignity of line. Vernet was, in short, a brilliant off-hand sketcher of all he saw, as he

said himself, " from his window," and even in this work there was a good deal of affectation of the impromptu.

See Lagrange, Joseph Vernet et la peinture au XVIII" Steele (1861) ; C. Blanc, Les Vernet (1845); A. Dayot, Les Vernet (1898).

VERNEUIL, PHILLIPPE EDOUARD POULLETIER DE

(1805–1873), French palaeontologist, was born in Paris on the 13th of February 1805. He was educated for the law, but being of independent means he was free to follow his own inclinations, and having attended lectures on geology by Elie de Beaumont he was so attracted to the subject that he devoted himself assiduously to the study of science. He spent several years in travel through various parts of Europe, specially examining the geology of the Crimea, on which he published an essay {Mem. Soc. Giol. France, 1837). He next investigated the Devonian rocks and fossils of the Bas–Boulonnais; and in 1839 accompanied Sedgwick and Murchison in a study of the older Palaeozoic rocks of the Rhenish provinces and Belgium, the palaeontological results being communicated to the Geo– logical Society of London in conjunction with D'Archiac. When Murchison commenced his geological examination of the Russian empire, he requested de Verneuil to accompany him, and the researches of the latter were incorporated in the second volume of The Geology of Russia in Europe and, the Ural Moun– tains (1845). Subsequently de Verneuil paid a visit to the United States to study the history of the palaeozoic rocks in that country, and the results were published in 1847 {Bull. Soc. Gtol. France). In later years he made numerous expedi– tions into Spain, and his observations were embodied in Carte giologique de V Espagne et du Portugal (1864), prepared in associa– tion with E. Collomb. In 1853 the Wollaston medal of the Geological Society of London was awarded to him, and in i860 he was elected a foreign member of the Royal Society. He died in Paris on the 29th of May 1873.

VERNEUIL, a town of north-western France, in the depart- ment of Eure, 34 m. S.S.W. of Evreux by rail. Pop. (1906) 3529. Verneuil, situated on the left bank of the Avre, has a number of old houses and churches. Of the latter the most important is the church of La Madeleine (nth to 17th century), the facade of which is flanked by an imposing square tower of the first half of the 16th century, similar in origin and appear- ance to the Tour de Beurre of Rouen cathedral. The church contains old stained glass, an ironwork pulpit and other works of art. The church of Notre Dame (12th and 16th centuries) possesses stone carvings of the Romanesque period and good stained glass. The Tour Grise is a fine cylindrical keep built in 1 1 20 by Henry I., who fortified Verneuil as a stronghold for the Norman frontier. The town rose to -considerable importance, and is said to have numbered as many as 25,000 inhabitants.

In 1424 the French were severely defeated by John, duke of Bedford, under the walls of Verneuil, which was then surrendered to the English; this victory confirmed the supremacy of the English over the country north of the Loire. The town was recaptured in 1449. It carries on ironfounding, dyeing and the manufacture of machinery.

VERNEY, the name of an English family which settled first of all at Fleetmarston in Buckinghamshire, then at Penley in Hertfordshire, and filially at Middle Claydon in Buckingham- shire. Its pedigree goes back to Ralph de Verney (fl. 1216- 1223), but the fortunes of the family were made by Sir Ralph Verney (d. 1478), who was lord mayor of London in 1465 and M.P. for the city in 1472. His eldest son, Sir John Verney, married Margaret, heiress of Sir Robert Whittingham of Penley, and the fourth Sir Ralph Verney married in 1525 Elizabeth, one of the six co-heiresses of John, Lord Braye. Sir Edmund Verney of Penley (d.

1600) left two sons, half-brothers, Sir Francis Verney (1584-1615), who became a soldier of fortune and a buccaneer, and died at Messina in hospital in extreme poverty, and Sir Edmund Verney (1500-1642) of Middle Claydon, Bucks. Sir Edmund accompanied Prince Charles and Buckingham on the abortive mission to Madrid in 1623, and was knight-marshal to King Charles I. When the Civil

War broke out the royal standard was entrusted to him at Nottingham, and while defending it he was slain at Edgehill in 1642. His eldest son, Sir Ralph Verney (1613-1696), 1st baronet, sat for Aylesbury in both the Short and the Long parliaments. He took the side of the parliament at the outset of the Civil War, but went abroad in 1643 rather than sign the Covenant, and his estates were sequestrated in 1646. He returned to England in 1653, and, though he refused to act against Cromwell, was subsequently reconciled to the Restora- tion government. His brother, Sir Edmund (1616-1649), had taken the king's side, and was one of those murdered in cold blood by Cromwell's soldiers at the sack of Drogheda. Sir Ralph Verney's estates and honours descended to his son, Sir John {c. 1640-17 17), who was created Viscount Fermanagh in the Irish peerage in 1703 and was father of Ralph Verney, created Earl Verney in 1743. Earl Verney's sister, Margaret Verney, by her marriage with Sir Thomas Cave, linked the Verney family a second time with the barony of Braye, and the present Lord Braye's surname is Verney-Cave. Earl Verney's eldest son, John, predeceased him in 1737, leaving a post- humous daughter, Mary (1737-1810), who was created Baroness Fermanagh in 1792. His second son, Ralph, 2nd Earl Verney {c. 1712-1791), was a friend of Edmund Burke, who entered parliament as Verney's nominee for Wendover. Earl Verney was an ardent supporter of the Whig interest, but received no reward from the party leaders. He rebuilt Claydon House with great splendour

from the plans of John Adam, but, with his financial ventures, this brought him to bankruptcy. He died childless in March 1791 and his titles became extinct.

The present Verney family, of Claydon Hall, Buckingham- shire, is descended in the male line from Felix Calvert (1596-1674) of Little Hadham, Hertfordshire. The Right Hon. Sir Harry Verney, 2nd baronet (1801-1894), was the son of General Sir Harry Calvert, G.C.B., created a baronet in 1818. He assumed the name of Verney in compliance with the will of Mary Verney, Baroness Fermanagh, mentioned above. This lady died unmarried, leaving the paternal estates and the Verney portraits to her half-sister, Catherine Calvert (Mrs Wright), known thenceforward as Mrs Verney, on whose death in 1827 they came into the possession of her cousin, Sir Harry Calvert (Verney) . Sir Harry Verney entered the House of Commons for Buckingham in 1832, and remained a member of the House with two short intervals for fifty-two years. He married in 1835 Eliza, daughter of Admiral Sir George Johnstone Hope, K.C.B., M.P., and secondly Frances Parthenope Nightingale, sister of Florence Nightingale.

Frances, Lady Verney, collected from the mass of papers pre- served at Claydon House the Memoirs of the Verney Family during the Seventeenth Century, which contain a charming picture of the life and manners of the country gentlemen of that day. A second edition, abridged and corrected by Margaret M. Verney, appeared in 2 vols, in 1904. See also the Verney Papers edited for the Camden Society in 1853-1854.

The Verneys who hold the barony of Willoughby de Broke descend from the Rev. Robert Barnard, prebendary of Win- chester, who married in 1793 the Hon. Louisa Verney Peyto, daughter of John Peyto, 14th Baron Willoughby de Broke, and co-heiress of her brother Henry, 16th baron. The

Peytos inherited the Verney estates in Warwickshire through Margaret Greville (d. 1631), sister and heiress of Fulke Greville, Lord Brooke {q.v.), who married Sir Richard Verney 'of Compton Murdac, Warwickshire. Robert John Barnard, 18th Baron Willoughby de Broke, who took in 1853 the surname of Verney in lieu of Barnard, was the grandfather of the 19th Lord Willoughby de Broke (Richard Greville Verney), who sat in the House of Commons from 1895 to 1900 for S.E. Warwick- shire and succeeded to the title in 1902.

VERNIER, PIERRE {c. 1580-1637), inventor of the instru- ment which bears his name, was born at Ornans (near Besancon) in Burgundy about 1580. He was for a considerable time com- mandant of the castle in his native town. In 1631 he pub- lished at Brussels a treatise entitled Construction, usage et proprietes du quadrant nonveau de mathematiques , in which

the instrument associated with his name is described. He died at Ornans in 1637.

The instrument invented by Vernier is frequently called a nonius, particularly in Germany, after Pedro Nunez (1492-1577), professor of mathematics at the university of Coimbra ; but this is incorrect, as the contrivance described by the latter in his work De crepusculis (1542) is a different one, although the principle is practically the same. Nunez drew on the plane of a quadrant 44 concentric arcs

divided respectively into 89, 88, 46 equal parts; and if the

alidade did not coincide with one of the divisions on the principal arc, which was

divided into 90 parts, the number of degrees in a quadrant, it would fall more or less accurately on a division line of one of the auxiliary arcs, from which the value of the measured angle could be made out. This instrument was, however, very difficult to make, and was but little used. Vernier proposed to attach to a quadrant divided into half-degrees a movable sector of a length equal to 31 half-degrees, but divided into 30 equal parts, whereby single minutes could be read off by seeing which division line of the "sector" coincided with a division line of the quadrant. The idea had been mentioned by Christopher Clavius (1537-1612) in his Opera maihematica, 1612 (ii. 5 and iii. 10), but he did not propose to attach permanently an arc divided in this way to the alidade; this happy application of the principle at all events belongs to Vernier.

The principle of the vernier is readily understood from the following account: Let AB (see fig.) be the normal scale, i.e. a scale graduated according to a standard of length, CD, a scale (placed in contact with AB for convenience) graduated so that 10 divisions equal 11 divisions of the scale AB, and EF a scale placed similarly and graduated so that 10 divisions equal 9 divisions of the scale AB. Consider the combination AB and CD. Obviously each division

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of CD is -^ th greater than the normal scale division. Let a represent a length to be measured, placed so that one end is at the zero of the normal scale, and the other end in contact with the end of the vernier CD marked 10. It is noted that graduation 4 of the vernier coincides with a division of the standard, and the determination of the excess of a over 3 scale divisions reduces to the difference of 7 divisions of the normal scale and 6 divisions of the vernier. This is -4, since each vernier division equals i-i scale division. Hence the scale reading of the vernier which coincides with a graduation of the normal scale gives the decimal to be added to the normal scale reading. Now consider the, scales AB and EF, and let /S be the length to be measured; the scale EF being placed so that the zero end is in contact with an end of 0. Obviously each division of EF is /ath less than that of the normal scale. It is seen that division 6 of the vernier coincides with a normal scale division, and obviously the excess of /3 over two normal scale divisions equals the difference between 6 normal scale divisions and 6 vernier divisions, i.e. 0-6. Thus again in this case the vernier reading which coincides with a scale reading gives the decimal to be added to the normal scale. The second type of vernier is that more commonly adopted, and its application to special appliances is quite simple. For example, the normal scale to an English barometer is graduated in ^ths of an inch. The vernier is such that 24 divisions of the normal scale equal 25 of the vernier; each of the latter therefore is 002 or K fostfi inch less than the

normal division. In the scientific barometer, the normal scale is graduated in milli metres, and the vernier so that 20 scale divisions equal 19 mm. This combination reads to 0–05 mm.

VERNIS MARTIN, a generic name, derived from a distinguished family of French artist-artificers of the 18th century, given to a brilliant translucent lacquer extensively used in the decora- tion of furniture, carriages, sedan chairs and a multitude of small articles such as snuff-boxes and fans. There were four brothers of the Martin family: Guillaume (d. 1749), Simon Etienne, Julien and Robert (1 706–1 765), the two first-named being the elder. They were the children of Etienne Martin, a tailor, and began life as coach-painters. They neither invented , nor claimed to have invented, the varnish which bears their name, but they enormously improved, and eventually brought to perfection, compositions and methods of applying them which were already more or less familiar. Oriental lacquer speedily acquired high favour in France, and many attempts were made to imitate it Some of these attempts were pass- ably successful, and we can hardly doubt that many of the examples in the possession of Louis XIV. at his death were of

European manufacture. Chinese lacquer was, however, im- ported in large quantities, and sometimes panels were made in China from designs prepared in Paris, just as English coats of arms were placed upon Chinese porcelain in its place of origin. Biographical details of the career of the brothers Martin are scanty, but we know that the eldest was already in business in 1724. Their method and work must have come rapidly into vogue, for in 1730 Guillaume and Simon Etienne Martin were granted by letters patent a twenty years' monopoly, subse- quently renewed, of making " toutes sortes d'ouvrages en relief de la Chine et du Japon." At the height of their fame the

brothers directed at least three factories in Paris, and in 1748 they were all classed together as a " Manufacture nationale." One of them was still in existence in 1785. The literature of their day had much to say of the freres Martin. In Voltaire's comedy of Nadine, produced in 1749, mention is made of a berline " bonne et brillante, tous les panneaux par Martin sont vernis "', also in his Premier discours sur I'inSgalitS des conditions he speaks of " des lambris dores et vernis par Martin." The marquis de Mirabeau in U Ami des hommes refers to the enamelled snuff-boxes and varnished carriages which came from the Martins' factory. It is the fate of all the great artists of the past to have had their names attached, by popular rumour or interested artifice, to a multitude of works which they never saw, and the Martins have suffered considerably in this respect. That the quality of their production varied between very wide limits is established by existing and undoubted examples; but it is extremely improbable that even their three factories could have turned out the infinite quantity of examples that has been attributed to them. Yet their production was large and ex- ceedingly miscellaneous, for such was the rage for their lacquer that it was applied to every possible object. Nor need we be surprised at a rage which was by no means confined to France. At its best Vernis Martin has a splendour of sheen, a perfection of polish, a beauty of translucence which compel the admiration due to a consummate specimen of handiwork. Every variety of the lacquer of the Far East was imitated and often improved upon by the Martins — the black with raised gold ornaments, the red, and finally in the wonderful green ground, powdered with gold, they reached the high-water mark of their delightful art. This delicate work, poudre and wavy-lined with gold or semi with flowers overlaid with transparent enamel, is seen at its best on small boxes, fans, needle-cases and

such-like. Of the larger specimens from the Martins' factories a vast quantity has disap- peared, or been cut up into decorative panels. It would appear that none of the work they placed in the famous hotels of old Paris is now in situ, and it is to museums that we must go for really fine examples — to the Musee de Cluny for an exquisite children's sedan chair and the coach used by the French ambas- sador to Venice under Louis XV.; to the Wallace collection for the tables with richly chased mounts that have been attributed to Dubois; to Fontainebleau for a famous commode. Even the decorations of the apartments of the dauphin at Versailles, executed, or at least begun, in 1749, have vanished; so have those at Bellevue. It has been generally accepted that of the four brothers Robert Martin accomplished the most original and the most completely artistic work. He left a son, Jean Alexandre, who described himself in 1767 as " Vernisseur du Roi de Prusse." He was employed at Sans Souci, but failed to continue the great traditions of his father and his uncles. The Revolution finally extinguished a taste which had lasted for a large part of the 18th century. Since then the production of lacquer has, on the whole, been an industry rather than an art. (J. P.-B.)

VERNON, EDWARD (1684-1757), English admiral, was born in Westminster on the 12th of November 1684. He was the second son of James Vernon, secretary of state from 1697- 1700, a scion of an ancient Staffordshire family who is best remembered by three volumes of his letters to the duke of Shrewsbury, which were published in 1841; and his mother was Mary, daughter of Sir John Buck of Lincolnshire. Edward Vernon was sent to Westminster school at the age of seven;

and remained there till he was sixteen. Outside

its walls he studied, with a view to his future profession, such branches of knowledge as geometry, geography and the construction of military weapons. He entered the navy in 1701, and from that time until 1707 took part in many expeditions in the Mediter- ranean and the West Indies. He served with Sir George Rooke at the taking of Gibraltar in July 1704; and on his return to England Queen Anne acknowledged his gallantry with the present of two hundred guineas. He next served in the West Indies with Commodore Sir Charles Wager, a brave seaman, who afterwards rose to the highest position at the admiralty in the Whig ministry of Walpole, and was pitted against Vernon both in the House of Commons and at the polling-booth. In 1715, and again in 1726, Vernon assisted in the naval operations in the Baltic, supporting Sir John Norris in the first enterprise, and on the latter serving under his old chief, Sir Charles Wager. During the long supremacy of Walpole little opportunity arose for distinction in warfare, and Vernon's energies found relief in politics. At the general election of 1722 he was returned for both Dunwich in Suffolk and Penryn in Cornwall, but chose the latter constituency. In the succeeding parliament of 1727 he was again chosen member for Penryn; but he failed to retain his seat after the dissolution in 1734. At this period the English people regarded the Spaniards as their legitimate enemies, and the ill-feeling of the two countries was fanned both in poetry and in prose. The political antagonists of Walpole charged him with pusillanimity to Spain. With Pulteney and most of his associates this battle-ground was selected rather from expediency than from principle; but Vernon represented the natural instincts of the sea-captain, and with the sailor as with the soldier the motto was " No peace with Spain." In debate he spoke often, and frequently with effect, but his language always savoured of extravagance. He pledged himself in 1739 to

capture Porto Bello with a squadron of but six ships, and the minister whom he had assailed with his invectives sent him, as vice-admiral of the blue and commander of the fleet in the West Indies, to the enterprise with the force which he had himself called sufficient. Vernon weighed anchor from Spithead on the 23rd of July 1739 and arrived off Porto Bello on 20th November. Next day the combat began with a bombardment of an outlying fort which protected the mouth of the harbour, and on the 22nd of November the castle and town surrendered with a loss on the English side of only seven men. The joy of the nation knew no bounds. Vernon's birthday was celebrated in 1740 in London with public illuminations, and 130 medals were struck in his honour. In February 1741 in a by-election at Ports- mouth Vernon was again sent to parliament. At the general election in the following May he was returned for Ipswich, Rochester and Penryn, and all but succeeded in winning Westminster. 1 He elected to sit for Ipswich. A larger squad- ron was placed under Vernon's command at the close of 1740, and with this force he resolved upon attacking Cartagena. After a fierce struggle, the castle, which stood at the harbour's entrance, was gained; but in the attack upon the city the troops and sailors failed to act in concert, and, with the numbers of his forces thinned by combat and by disease, the British admiral retired to Jamaica. The incidents of this disastrous at- tempt are described in Smollett's Roderick Random, chap, xxxi., &c. A similar enterprise in July 1741 against Santiago de Cuba met with a similar reverse, and Vernon attributed the defeat to the divided command of the British forces. During his command he did a good deal for the health of his crews. He first introduced the custom of mixing the rum served to the sailors in the West Indies with water. The word " grog " is said to be derived from the nickname of " old Grog " given him by the sailors, because he

wore a peculiar grogram boat- cloak. He landed at Bristol on the 6th of January 1743, and on the 24th of January received the freedom of the city of London. When the country dreaded the march of Prince Charles to London, the fleet in the Downs was placed under 1 Grego's Parliamentary Elections (London, 1886), pp. 95-106.

the command of Vernon; but his jealous disposition brooked no interference from the admiralty, and on the 1st of January 1746 he struck his flag and handed over the command to another. His next act was to describe his grievances in a couple of angry pamphlets, revealing the communications of his official chiefs, and for this indiscretion he was struck off the list of flag officers (April 11, 1746). He continued to represent the borough of Ipswich until his death, but with this proceeding his public services practically ceased. He died suddenly at Nacton in Suffolk, the 30th of October 1757, and was buried in the church of the village.

Vernon's gallantry was unquestioned; but his valour not infre- quently degenerated into foolhardin'ess, and he dwelt more often than is usual with British seamen on the merits of his own exploits. His politics were those of the Tory party, and his differences with the Whigs and with his colleagues in the services led to his publishing several pamphlets on his political conduct. A Memorial of Admiral Vernon from Contemporary A uthorities was printed by W. F. Vernon for private circulation in 1861.

VERNON, a town of north-western France, in the depart- ment of Eure, 19 m. E.N.E. of Evreux by road. Pop. (1906) 7274. Vernon stands on the left bank of the Seine opposite the forest of Vernon, a stone bridge uniting it to Vernonnet on the right bank, where there are important stone] quarries. The forest of Bizy lies to the south of the town. Its church is an in-

teresting building dating from the 12th to the 15th centuries, and there is a cylindrical keep built by Henry I. of England. The port on the Seine carries on trade in stone and coal, and the town has workshops for the manufacture of army engineer- ing material and manufactures benzine, aniline dyes, wooden shoes, liqueurs, &c.

Vernon in 1196 was ceded by its count to Philip Augustus, Richard I. resigning his suzerainty. The first Estates of Nor- mandy were held at Vernon in 1452.

VEROLI (anc. Verulae), a town and episcopal see of the province of Rome, Italy, 10 m. by road N.E. of Frosinone, 1870 ft. above sea-level. Pop. (1901) 2622 (town);' 12,655 (commune). The town is situated on a hill in a strong position with a fine view, on the site of the ancient Hernican town of Verulae, 7 m. S.E. of Aletrium. It retains remains of its ancient polygonal enceinte, especially near the summit of the hill, later occupied by a medieval castle. It is hardly men- tioned in history: we know that it became a municipium in 90 B.C. The cathedral treasury contains the breviary of S. Louis of Toulouse, and some interesting reliquaries, one in ivory with bas-reliefs, and two in the Gothic style, of silver

gilt *

VERON, LOUIS DESIRE (1798-1867), French publicist, was

born at Paris on the 5th of April 1798. In 1829 he founded

the Revue de Paris, and from 1838 to 1852 was owner and

director of the Constitutionnel, in which he published in Eugene

Sue's Wandering Jew. It was also during Veron's

direction and

at his suggestion that Sainte-Beuve contributed the Causeries

du lundi. From 1831-1835 he was director of the Paris Opera.

In 1852 he was elected to the Corps Legislatif as an official

candidate. He was the author of various books, of which the

best known is Memoires d'un bourgeois de Paris (1853-1855).

He died in Paris on the 27th of September 1867.

VERON, PIERRE (1831-1900), French publicist, was born in Paris on the 19th of April 1831, and in 1854 published his first book, a volume of verse. In 1858 he joined the staff of Charivari, and edited that paper from 1865-99. He was the author of a large number of novels dealing with Parisian life, and for many years his rooms in the Rue de Rivoli were the meeting-place of the most famous French literary, artistic and political cele- brities. He died in Paris on the 2nd of November 1900.

VERONA, a city and episcopal see of Venetia, Italy, the capital of the province of Verona, situated 194 ft. above sea-level in a loop made by the winding of the Adige (anc. Alhesis). Pop. (1906) 61,618 (town); 79,574 (commune). It is 93 m. E. of Milan and 71 m. W. of Venice by rail, and is also the point of departure of the main lines to Mantua and Modena and to the Brenner, while a branch line runs N.W. to Caprino, another S.E-

to Legnago, and steam tramways to Cologna Veneta, Coriano and S. Giacomo.

The basilica of S. Zeno (an early bishop of Verona who became its patron saint), which stands outside the ancient city, is one _. . of the most interesting Romanesque churches in Italy. The church was remodelled in 1139, to which period much of the existing structure belongs, including the richly sculptured west front and the open confessio or crypt, which occupies the eastern half of the church, raising the choir high above the nave. The nave, dating from the nth century, is supported by alternate columns and pillars, and contains frescoes of the nth-i4th centuries. The cloisters of S. Zeno, rebuilt in n 23, are an interesting example of brick and marble construction. Like many other churches in Verona, S. Zeno is mainly built of mixed brick and stone in alternate bands: four or five courses of fine red brick lie between bands of hard cream- coloured limestone or marble, forming broad stripes of red and white all over the wall. A similarly variegated effect in red and white is produced by building the arches of windows and doors with alternating voussoirs in brick and marble. The neighbour- hood of Verona is especially rich in fine limestones and marbles of many different kinds, especially a close-grained cream- coloured marble and a rich mottled red marble, which are largely used, not only in Verona, but also in Venice and other cities of the province. The same quarry produces both kinds, and indeed the same block is sometimes half red and half white. On the north side of the church is a lofty tower, called the tower of Peppin; while the slender brick campanile on the south dates from 1045 to 1 1 78.

The cathedral, consecrated in 1187 by Pope Urban III., stands at the northern extremity of the ancient city, by the bank of the Adige; it is inferior in size and importance to S. Zeno,

but has a fine 12th-century west front of equal interest, richly decorated with na'ive Romanesque sculpture (1135). The rest of the exterior is built in bands of red and white, with slightly pro- jecting pilasters along the walls; it has a noble cloister, with two storeys of arcading. The campanile by Sanmichele is unfinished. Its baptistery, rebuilt early in the 1 2th century , is a quite separate building, with nave and apse, forming a church dedicated to S. Giovanni in Fonte. Pope Lucius III., who held a council at Verona in n 84, is buried in the cathedral, under the pavement before the high altar. The Dominican church of S. Anastasia is a mine of wealth in early examples of painting and sculp- ture, and one of the finest buildings in Italy of semi-Gothic style. It consists of a nave in six bays, aisles, transepts, each with two eastern chapels, and an apse, all vaulted with simple quadripartite brick groining. It was begun in 1261, but not completed till 1422, and is specially remarkable for its very beautiful and complete scheme of coloured decoration, much of which is contemporary with the building. The vaults are grace- fully painted with floreated bands along the ribs and central patterns in each " cell," in rich soft colours on a white plastered ground. The eastern portion of the vaulting, including the choir and one bay of the nave, has the older and simpler decorations; the rest of the nave has more elaborate painted ornament — foliage mixed with figures of Dominican saints, executed in the 15th century. There are many fine frescoes in the interior ranging from c. 1300 (knights kneeling before the Virgin) to the 15th century, including Pisanello's beautiful painting of St George (mentioned below). This church also contains a large number of fine sculptured tombs of the 14th and 15th centuries, with noble effigies and reliefs of saints and sacred subjects. It is mainly built of red brick, with fine nave columns of red and

white marble and an elaborate marble pave- ment inlaid in many different patterns. Its general proportions are specially noble, and the exterior view is good. The church of S. Fermo Maggiore comes next in interest. With the exception of the crypt, which is older, the existing edifice was rebuilt in 13 13. The facade is of brick and marble used alter- nately. The plan is unusual, consisting of a large nave without aisles, the span being between 45 and 50 ft.; it also has two shallow transepts and an apsidal east end. The roof, which is

especially magnificent, is the finest example of a class which as a rule is only found in Venetia or in churches built by Venetian architects in Istria and other subject provinces: the framing is concealed by coving or barrel-vaulting in wood, the surface of which is divided into small square panels, all painted and gilt, giving a very rich effect. In this case the 14th and 15th century painted decorations are well preserved. Delicate patterns cover all the framework of the panelling and fill the panels themselves; at two stages, where there is a check in the line cf the coving, rows of half-figures of saints are minutely painted on blue or gold grounds, forming a scheme of indescribably splendid decoration. A simpler roof of the same class exists at S. Zeno; it is trefoil- shaped in section, with a tie-beam joining the cusps. The church of S. Maria in Organo, dating from 1481, with a facade of 1592 from Sanmichele's designs, contains paintings by various Veronese masters, and some fine choir-stalls of 1499 by Fra Gioconda. Though not built till after his death, the church of S. Giorgio in Braida, on the other side of the river, was also designed by Sanmichele, and possesses many good pictures of the Veronese school. The Romanesque church of S. Lorenzo, re- stored in 1896-1898, contains old frescoes. S. Stefano is another

Romanesque church, probably of the nth century. There are several other fine churches in Verona, some of early date. One of the 14th century is dedicated to Thomas a. Becket of Canter- bury.

The strongly fortified castle (Castel Vecchio) built by the Delia Scala lords in the 14th century stands cm the line of the wall of Theodoric, close by the river. A very picturesque Bridges battlemented bridge leads from it to the other shore, and sloping down over three arches of different sizes, the tortiika- largest next to the castle and the smallest at the other tloas - end. There are four other bridges across the Adige: one, the graceful Ponte di Pietra, rests upon ancient foundations, while the two arches nearest to the left bank are Roman; but it has been frequently restored. Remains of another ancient bridge were found in the river itself in 1891 behind S. Anastasia. The 16th-century lines of fortification enclose a very much larger area than the Roman city, forming a great loop to the west, and also including a considerable space on the left bank of the river. In the latter part of the city, on a steep elevation, stands the castle of St Peter, originally founded by Theodoric, on the site, perhaps, of the earliest citadel, mostly rebuilt by Gian Galeazzo Visconti in 1393, and dismantled by the French in 1801. This and the other fortifications of Verona were rebuilt or repaired by the Austrians, but are no longer kept up as military defences. Verona, which is the chief military centre of the Italian province of Venetia, is now being surrounded with a circle of forts far outside the obsolete city walls.

The early palaces of Verona, before its conquest by Venice, were of noble and simple design, mostly built of fine red brick, with an inner court, surrounded on the ground floor _ . by open arches like a cloister, as, for

example, the Palazzo della Ragione, an assize court, begun in the 1 2th century. The arches, round or more often pointed in form, were decorated with moulded terra-cotta enrichments, and often with alternating voussoirs of marble. The Scaligeri Palace is a fine example, dating from the 14th century, with, in the cortile, an external staircase leading to an upper loggia, above the usual arcade on the ground floor. It has a lofty campanile, surmounted by a graceful octagonal upper storey. This palace is said to have been mainly built by Can Signorio (Della Scala) about 1370. After the conquest by Venice the domestic buildings of Verona assumed quite a different type. They became feeble copies of Venetian palaces, in which one form of window, with an ogee arch, framed by the dentil moulding, is almost always used. The monotony and lifelessness of this form of architecture are shown in the meaningless way in which details, suited only to the Venetian methods of veneering walls with thin marble slabs, are copied in the solid marbles of Verona. From the skill of Fra Giocondo, Verona was for many years one of the chief centres in which the most refined and graceful forms of the early Renaissance were developed. The town hall, with its

light open loggia of semicircular arches on the ground floor, was designed by Fra Giocondo towards the end of the 15th century; its sculptured enrichments of pilasters and friezes are very graceful, though lacking the vigorous life of the earlier medieval sculptured ornamentation. Verona contains a number of handsome palaces designed by Sanmichele in the 1 6th century. The finest are those of the Bevilacqua, 1 Canossa and Pompeii families. The last of these is now the property of the city, and contains a gallery with some good pictures,

*especially of the Verona, Padua and Venice schools. As in Venice, many of the 16th-century palaces in Verona had stuccoed facades, richly decorated with large fresco paintings, often by very able painters. Verona, perhaps, had as many of these paintings as any town in Italy, but comparatively few are preserved and those only to a small extent. The domestic architecture of Verona cannot thus be now fairly estimated, and seems monotonous, heavy and uninteresting. The house of the painter Niccolo Giolfino still has its frescoes in a good state of preservation, and gives a vivid notion of what must once have been the effect of these gorgeous pictured palaces. The episcopal palace contains the ancient and valuable chapter library, of about 12,000 volumes and over 500 MSS., among them the palimpsest of the Institutiones of Gaius which Niebuhr discovered. The Piazza delle Erbe (fruit and vegetable market) Squares an< * t ^ le P' azza dei Signori, adjoining one another in the oldest part of the city, are very picturesque and beautiful, being surrounded by many fine medieval buildings, several of them of a public character (Palazzo dei Giureconsulti, Palazzo della Ragione and the lofty Torre Civica, 273 ft. high), while in the north-east corner of the latter Piazza is the fine early Renaissance Palazzo del Consiglio (1476-1492), probably designed by Fra Giocondo. In the former Piazza a copy of the lion of Venice has been erected.*

The Roman remains of Verona surpass those of any other city of northern Italy. The most conspicuous of them is the great Roman amphitheatre, a building perhaps of the end of the 1st remains, century A.D., which in general form closely resembled the Colosseum in Rome. Its axes measured 505 and 404 ft. Almost the whole of its external arcades, with three tiers of arches, have now disappeared; it was partly thrown down by an earthquake in 1184, and subsequently used to supply building materials.

Many of its blocks are still visible in the walls of various medieval buildings. The interior, with seats for about 25,000 people, has been frequently restored, till nothing of the old seats exists. There are also remains of a well-preserved Roman theatre, close to the left bank of the river. A number of fine sculptures were found in the square in front of the cathedral in 1890, and architectural fragments belonging to some public building. In 1884-86 portions of a number of fine mosaic pavements were dis- covered extending over a very large area under the cloister and other parts of the cathedral, about 7 ft. below the present ground level. They had geometric patterns with birds, trees, &c, and bore inscrip- tions in mosaic with the names of the donors. Parts oi them had been discovered previously. They seem to belong to two different buildings, both early churches of the 5th and 6th centuries a.d. (cf. Notizie degli Scavi, 1884, 401). For the two triumphal arches (Porta dei Bosari and Porta dei Leoni) see below. The Museo Lapidario contains a fine collection of Roman and Etruscan inscriptions and sculpture, mostly collected and published by Scipione Maffei in the]8th century.

Veronese Art. — In many respects the resemblance between Verona and Florence is very striking; in both cases we have a strongly fortified city built in a fertile valley, on the banks of a winding river, with suburbs on higher ground, rising close above the main city. In architectural magnificence and in wealth of sculpture and painting Verona almost rivalled the Tuscan city, and, like it, gave birth to a very large number of artists who distinguished themselves in all branches of the fine arts.

Painting in Verona may be divided into four periods, (i.) The first period is characterized by wall paintings of purely native style, Palatini. c 1° se 'y resembling the early

Christian pictures in the cata- combs of Rome. Examples dating from the 10th to the nth century have been discovered hidden by whitewash on the oldest parts of the nave walls of the church of S. Zeno. They are a very interesting survival of the almost classical . Roman style of painting, and appear to be quite free from the generally prevalent Byzantine influence, (ii.) The Byzantine period seems to have

1 The valuable collection of works of art once preserved in the Bevilacqua Palace has long been dispersed.

Sculp- ture.

lasted during the 12th and 13th centuries, (iii.) The Giottesque period begins contemporaneously with Altichiero da Zevio and Giacomo degli Avanzi, whose chief works were executed during the second half of the 14th century. These two painters were among the ablest of Giotto's followers, and adorned Verona and Padua with a number of very beautiful frescoes, rich in composition, delicate in colour, and remarkable for their highly finished modelling and detail. (iv.) To the fourth period belong several important painters. Pisanello or Vittore Pisano, a charming painter and the greatest medallist of Italy, was probably a pupil of Altichiero. 2 Most of his frescoes in Verona have perished; but one of great beauty still exists in a very perfect state in the church of S. Anastasia, high up over the arched opening into one of the eastern chapels of the south transept. The scene represents St George and the Princess after the conquest of the Dragon, with accessory figures, the sea, a mountainous landscape and an elaborately painted city in the back- ground. _ The only other existing fresco by Pisanello is an Annun- ciation in S. Fermo Maggiore. For Pisanello's pupils and other painters of subsequent date, see

Painting. These include Liberale da Verona, Domenico and Francesco Morone, Girolamo dai Libri (1474–1556), &c. Domenico del Riccio, usually nicknamed Brusasorci (1494–1567), was a prolific painter whose works are very numerous in Verona. Paolo Cagliari or Paul Veronese, and the Bonifagios, though natives of Verona, belong rather to the Venetian school. _ Verona is specially rich in early examples of decorative sculpture, (i.) The first period is that of northern or Lombardic influence, exemplified in the very interesting series of reliefs which cover the western facades of the church of S. Zeno and the cathedral, dating from the 12th-century. These reliefs represent both sacred subjects and scenes of war and hunting, mixed with grotesque monsters, such as specially delighted the rude, vigorous nature of the Lombards; they are all richly decorative in effect, though strange and unskilful in detail. Part of the western bronze doors of S. Zeno are especially interesting as being among the earliest important examples in Italy of cast bronze reliefs. They are frequently stated to be of beaten bronze, but they are really castings, apparently by the cire perdue process. They represent scenes from the life of S. Zeno, are rudely modelled, and yet very dramatic and sculpturesque in style. Parts of these doors are covered with bronze reliefs of scenes from the Bible, which are of still earlier date, and were probably brought to Verona from the Rhine provinces. Many of the 12th century reliefs and sculptured capitals in S. Zeno are signed by the sculptor but these merely constitute lists of names about whom nothing is known, (ii.) In the 13th century the sculpture seems to have lost the Lombard vigour, without acquiring any qualities of superior grace or refinement. The font in the baptistery near the cathedral is an early example of this. Each side of the octagon is covered with a large relief of a Biblical fubject, very dull in style and coarse in

execution. The font itself is inter- esting for its early form, one common in the chief baptisteries of northern Italy : like an island in the centre of the great octagonal tankisalobed marble receptacle, in which the officiating priest stood while he immersed the catechumens. A movable wooden bridge must have been used to enable the priest to cross the water in the surrounding tank._ (iii.) The next period is that of Florentine influence. This is exemplified in the magnificently sculptured tombs of the Della. Scala lords, designed with steadily growing splendour, from the simple sarcophagus of Martino I. down to the elaborate erection over the tomb of the fratricide Can Signorio, adorned with statuettes of the virtues, to the possession of which he could lay so little claim. 3 The recumbent effigies and decorative details of these tombs are very beautiful, but the smaller figures of angels, saints and virtues are rather clumsy in proportion. The latest tomb, that of Can Signorio, erected during his lifetime (c. 1370), is signed " Boninus de Campigliono Mediolanensis Dioecesis." This sculptor, though of Milanese origin, belongs really to the school of the Florentine Andrea Pisano. One characteristic of the 14th and 15th centuries in Verona v/as the custom, also followed in other Lom- bardic cities, of setting large equestrian statues over the tombs of powerful military leaders, in some cases above the recumbent effigy of the dead man, as if to represent him in full vigour of life as well as in death. That which crowns the canopy over the tomb of Can Grande is a very noble, though somewhat quaint, work, (iv.) In the 15th century the influence of Venice became paramount, though this was really only a further development of the Florentine manner, Venice itself having been directly influenced in the 14th century by many able sculptors from Florence.

The architecture of Verona, like its sculpture, passed through Lombard, Florentine and Venetian stages, (i.) The church of S. Zeno and thecathedral, both of which were mainlyrebuilt in the 12th century, are noble examples oi the Lombardic style, with few single-light windows, and with the walls decorated externally by series of pilasters, and by alternating bands of red and white, in stone or brick. The arches of this period are

2 There is every reason to doubt Vasari's statement that Pisanello was a pupil of Andrea del Castagno.

3 See an eloquent description by Ruskin, Stones of Venice, iii. pp. 70 seq.

semicircular and rest on round columns and capitals, richly carved with grotesque figures and foliage. Most of the external ornamenta- tion is usually concentrated on the western front, which often has a lofty arched porch on marble columns, resting on griffins or lions devouring their orey. (iL) The Florentine period (c. 1250 to 1400) is represented by the church of S. Anastasia, and by many more or less mutilated palaces, with fine courts surrounded by arcades in one or more storeys. The arches are mostly pointed, and in other respects the influence of northern Gothic was more direct in Verona than in Florence. Solidity of mass and simplicity of detail are among the characteristics of this period, (iii.) The Venetian period (f. 1400-1480) was one of little originality or vigour, the buildings of this date being largely rather dull copies of those at Venice. _(iv.) The early Renaissance developed into very

exceptional beauty in Verona, mainly through the genius of Fra Giocondo (1435–1514), a native of Verona, who was at first a friar in the monastery of S. Maria in Organo. He rose to great celebrity as an architect, and designed many graceful and richly sculptured buildings in Venice, Rome and even in France; he used classical forms with great taste and skill, and with much of the freedom of the older medieval archi- tects, and was specially remarkable for his rich and delicate sculptured decorations. Another of the leading architects of the next stage of the Renaissance was the Veronese Michele Sanmichele (1484–1 559) , a great military engineer, and designer of an immense number of magnificent palaces in Verona and other cities of Venetia. His buildings are stately and graceful in proportion, but show a tendency towards dull scholastic classicism. The facades of his palaces were in the lower storey only decorated by rustication, of which he made great use, while the upper part was intended to be decorated with frescoes, which (as we have said) have in most cases perished. To hirn are also due the various gates and the most important bastions in the walls of Verona. In consequence of the disastrous flood of 1882, important embankment works were executed along the Adige at a cost of £300,000. These works preclude all danger of future inundation. In addition to the Adige embankment, other hydraulic works have been either completed or undertaken. An irrigation canal, deriving water from the Sega, furnishes 11 J cubic metres per second to the fields of the upper Veronese district. The Camuzzoni industrial canal, which runs from the Chievo di S. Massimo to the suburb of Tombetta, furnishes 26 cubic metres of water per second, and generates 4000 horse-power. The cutting of this canal led to the construction of an aqueduct for drinking water, which, besides supplying the city, furnishes an ice factory with enough water to make 200 quintals of ice per day. The motive- power

generated by the Camuzzoni canal is utilized by a large nail factory, flour mills, paper mills, cotton mills and works for the distribution of electric energy.

The Adige embankment gave an impetus to building enterprise, the banks of the river being now flanked by villas and large dwelling-houses.

History. — The ancient Verona was a town of the Cenomani, a Gaulish tribe, whose chief town was Brixia. It became a Latin colony in 89 B.C. and, acquiring citizenship with the rest of Gallis Transpadana in 49 B.C., became a municipium. Tacitus wrongly speaks of it as a colony; but it appears to have received a new colony under Gallienus. In the time of Augustus it was inferior to Patavium in importance, but on a par with Mediolanum, and superior to Brixia and other towns of the district. Inscrip- tions testify to its importance — among others one which indi- cates that it was the headquarters of the collectors of the 5% inheritance tax under the Empire in Italy beyond the Po. Its territory stretched as far as Hostilia on the Padus (Po), 30 m. to the south, and was extensive on other sides also, though its exact limits are uncertain. It was an important point in the road system of the district, lying on that between Mediolanum and Aquileia, while here diverged to the north the roads up the Athesis valley and over the Brenner into Raetia, and to the south roads ran to Betriacum, Mantua and Hostilia. It was the birthplace of the poet Catullus. In a.d. 69 it became the head- quarters of the legions which were siding with Vespasian. Its fertile surroundings, its central position at the junction of several great roads, and the natural strength of its position, defended by a river along two-thirds of its circumference, all combined to make Verona one of the richest and most important cities in northern Italy, although its extent within the walls was not

large. The existing remains of walls and gates date from the period between the 3rd of April and the 4th of December of the year 265. A very handsome triumphal arch, now called the Porta de' Borsari, was restored in this year by Gallienus (as the inscription upon it, which has taken the place of an older one, cancelled to make room for it, records), and became one of

the city gates. It is a double arch, and above it are two orders of smaller arcades. The same was the case with the Porta dei Leoni, another rather similar triumphal arch on the east of the city, and with a third arch, the Arco dei Gavi, demolished in 1805. This last seems to have belonged to the 1st century a.d. ; remains of it are preserved in the amphitheatre. It took its name from the family in whose honour it was erected; the architect was one L. Vitruvius Cerdo, possibly a pupil and freedman of the famous writer on architecture. The Porta dei Leoni, on the other hand, bears the name of Tiberius Flavius Noricus, a quattuorvir iure dicundo, i.e. one of the four chief magistrates of the city (probably 2nd century a.d.). The original line of walls did not include the amphitheatre, but passed N.E. of it; it was, however, afterwards included in the enceinte as a kind of massive corner tower. 1 The emperor Constantine, while advancing towards Rome from Gaul, besieged and took Verona (312); it was here, too, that Odoacer was defeated (499) by Theodoric the Goth, Dietrich von Bern — i.e. Verona — of German legends, who built a castle at Verona and frequently resided there. He enlarged the fortified area by constructing a wall and ditch (now called Adigetto) straight across the loop, to the S.W. of the amphitheatre, and also built thermae and restored the acqueducts, which had long been out of use.

In the middle ages Verona gradually grew in size and im- portance. Alboin, the Lombard

king, captured it in 568, and it was one of the chief residences of the Lombard, and later of the Frankish, monarchs; and though, like other cities of northern Italy, it suffered much during the Guelph and Ghibelline struggles, it rose to a foremost position both from the political and the artistic point of view under its various rulers of the Scaliger or Delia Scala family. The first prominent member of this family and founder of his dynasty was Mastino I. della Scala, who ruled over the city from 1260 till his death in 1277. Verona had previously fallen under the power of a less able despot, Ezzelino da Romano, who died in 1259. Alberto del-la Scala (died in 1301) was succeeded by his eldest son Bartolomeo, who was confirmed as ruler of Verona by the popular vote, and died in 1304. It was in his time that Romeo and Juliet are said to have lived. Alboino, the second son, succeeded his brother, and died in 131 1, when the youngest son of Alberto, Can Grande, who since 1308 had been joint-lord of Verona with his brother, succeeded to the undivided power. Can Grande (Francesco della Scala, d. 1329) was the best and most illustrious of his line, and is specially famous as the hospitable patron of Dante (q.v.). Other princes of this dynasty, which lasted for rather more than a century, were Giovanni (d. 1350), Mastino II. (d. 1351), Can Grande II. (d. 1359) and Can Signorio (d. 1375). In 1389 Gian Galeazzo Visconti, duke of Milan, became by conquest lord of Verona. Soon after his death the city fell by treacherous means into the hands of Francesco II. di Carrara, lord of Padua. In 1404-1405 Verona, together with Padua, was finally conquered by Venice, and remained subject to the Venetians till the overthrow of the republic by Napoleon in 1797, who in the same year, after the treaty of Campo Formio, ceded it to the Austrians with the rest of Venetia. They fortified it strongly in 1814, and with Peschiera, Mantua and Legnago it formed part of the famous quadrilateral

which until 1866 was the chief support of their rule in Italy.

See the various works by Scipione Maffei (Verona Illustrata, 1728; Museum Veronense, 1749); and Th. Mommsen in Corp. Inscr. Latin (Berlin, 1883), v. p. 327 (with bibliography); A. Wiel, The Story of Verona (London, 1902); Notizie degli scavi, passim; E. Giani, V Antico teatro di Verona (Verona, 1908).

(J. H. M.;T. As.)

VERONA, CONGRESS OF, the last of the series of inter- national conferences or congresses based on the principle enunciated in Art. 6 of the treaty of Paris of November 20th, 18T5 (see Europe, History). It met at Verona on the 20th

1 The view of some scholars is that the original walls were earlier than the time of Gallienus, who reconstructed them on the old lines, taking in, however, the amphitheatre.

of October 1822. The emperor Alexander I. of Russia was present in person. There were also present Count Nesselrode, the Russian minister of foreign affairs; Prince Metternich, representing Austria; Prince Hardenberg and Count Berns- torff, representing Prussia; MM. de Montmorency and Chateau- briand, representing France; and the duke of Wellington, representing Great Britain in place of Lord Londonderry (Castlereagh), whose tragic death occurred on the eve of his setting out to the congress.

In the instructions 'drawn up by Londonderry for his own guidance, which had been handed to Wellington by Canning without alteration, was clearly defined the attitude of Great Britain towards the three questions which it was

supposed would be discussed, viz. the Turkish Question (Greek insurrec- tion) , the question of intervention in favour of the royal power in Spain, together with that of the revolted Spanish colonies, and the Italian Question. As regards the latter it was laid down that Great Britain could not charge herself with any superintendence of a system in which she had merely acquiesced, and the duty of the British minister would be merely to keep himself informed, and to see that nothing was done " incon- sistent with the European system and the treaties." To make this attitude quite clear, Wellington was further instructed not to hand in his credentials until this question had been disposed of, his place being meanwhile taken by Lord Londonderry (Stewart), Castlereagh's half-brother and successor in the title, who had fulfilled the same function at Troppau and Laibach. In the Spanish Question Wellington was to give voice to the uncompromising opposition of Great Britain to the whole principle of intervention. In the Turkish Question, the prob- able raising of which "had alone induced the British govern- ment to send a plenipotentiary to the congress, he was to suggest the eventual necessity for recognizing the belligerent rights of the Greeks, and, in the event of concerted interven- tion, to be careful not to commit Great Britain beyond the limits of good offices.

The immediate problems arising out of the Turkish Question had, however, been settled between the emperor Alexander and Metternich, to their mutual satisfaction, at the preliminary conferences held at Vienna in September, and at Verona the only question raised was that of the proposed French interven- tion in Spain. The discussion was opened by three questions formally propounded by Montmorency: (1) Would the Allies withdraw their ministers from Madrid in the event of France being compelled to do so? (2) In case of

war, under what form and by what acts would the powers give France their moral support, so as to give to her action the force of the Alliance, and inspire a salutary fear in the revolutionaries of all countries ? (3) What material aid would the powers give, if asked by France to intervene, under restrictions which she would declare and they would recognize?

The reply of Alexander, who expressed his surprise at the desire of France to keep the question " wholly French, " was to offer to march 150,000 Russians through Germany to Piedmont, where they could be held ready to act against the Jacobins whether in Spain or France. This solution appealed to Metter- nich and Montmorency as little as to Wellington; but though united in opposing it, four days of " confidential communica- tions " revealed a fundamental difference of opinion between the representative of Great Britain and those of the continental powers on the main point at issue. Wellington, firmly based on the principle of non-intervention, refused to have anything to do with the suggestion, made by Metternich, that the powers should address a common note to the Spanish government in support of the action of France. Finally, Metternich proposed that the Allies should " hold a common language, but in separate notes, though uniform in their principles and objects." This solution was adopted by the continental powers; and Wellington, in accordance with his instructions not to counten- ance any intervention in Spanish affairs, took no part in the conferences that followed. On the 30th of October the powers handed in their formal replies to the French memorandum.

Russia, Austria and Prussia would act as France should in respect of their ministers in Spain, and would give to France every countenance and assistance she might require, the details " being reserved to be specified in a treaty."

Wellington, on the other hand, replied on behalf of Great Britain that " having no knowledge of the cause of dispute, and not being able to form a judgment upon a hypothetical case, he could give no answer to any of the questions."

Thus was proclaimed the open breach of Great Britain with the principles and policy of the Great Alliance, which is what gives to the congress its main historical interest.

See Cambridge Modern Hist., chap. i. " The Congresses," by W. Alison Phillips, and for authorities, ibid. p. 787. (W. A. P.)

VERONAL, in medicine, diethylmalonyl urea or diethyl- barbituric acid (CuHs^CICO NH^CO, extensively used as a hypnotic. It is prepared by condensing diethylmalonic ester with urea in the presence of sodium ethylate, or by acting with ethyl iodide on the silver salt of malonyl urea; it forms a white crystalline powder, which is odourless, and has a slightly bitter taste. Its introduction followed the investigations of Emil Fischer and J. v. Merling on the pharmacological properties of certain open and closed ureides. Led thereto by the impression that hypnotic action appears to be largely dependent on the presence of ethyl groups, they prepared diethylacetyl urea, diethylmalonyl urea, and dipropylmalonyl urea. All three were found to be hypnotics: the first was about equal in power to sulphonal, whilst the third was four times as powerful, but its use was attended by prolonged after- effects. Veronal was found to be midway. It is best given in cachets (10 to 15 grains). As it does not affect the circulatory or respiratory systems, or temperature, it can be employed in many diseased conditions of the heart and lungs as well as in mental disturbances, acute alcoholism, morphinomania and kidney disease. If taken during a prolonged period it seems to lose its effect. A soluble salt of veronal has

been introduced under the name of medinal. Although the toxicity of veronal is low, 13 s grains having been taken in a single dose without serious results, the unreasonable consumption by persons suffering from insomnia has led to many deaths, and it has been suggested that the sale should be restricted by the Pharmacy Acts.

VERONICA, ST. According to the most recent version of the legend, Veronica was a pious woman of Jerusalem, who, moved with pity by the spectacle of Jesus carrying His cross to Golgotha, gave Him her kerchief in order that He might wipe the drops of agony from His brow. The Lord accepted the offering, and after using the napkin handed it back to her with the image of His face miraculously impressed upon it. This, however, is not the primitive form of the legend, which a close examination shows to be derived from the following story related by Eusebius in his Historia Ecclesiastica (vii. 18). At Caesarea Philippi dwelt the woman whom the Lord healed of an is^ue of blood (Matt. ix. 20), and at the door of her house stood, on one side a statue of a woman in an attitude of supplication, and on the other side that of a man stretching forth his hand to the woman. It was said that the male figure represented Christ, and that the group had been set up in recognition of the miraculous cure. Legend was not long in providing the woman of the Gospel with a name. In the West she was identified with Martha of Bethany; in the East she was called Berenike, or Beronike, the name appearing in as early a work as the Acta Pilati, the most ancient form of which goes back to the 4th century. Towards the 6th century the legend of the woman with the issue of blood became merged in the legend of Pilate, as is shown in the writings known in the middle ages as Cura sanitatis Tiberii and Vindicta Salvaloris. According to the former of these accounts Veronica, in memory of her cure,

caused a portrait of the Saviour to be painted. The emperor Tiberius, when afflicted with a grievous sickness, commanded the woman to bring the portrait to him, worshipped Christ before her eyes, and was cured. The legend continued to gather accretions, and a miraculous origin came to be assigned to the image. It

appears that in the 12th century the image began to be identi- fied with one preserved at Rome, and in the popular speech the image, too, was called Veronica. It is interesting to note that the fanciful derivation of the same Veronica from the words Vera icon (ekoiv) " true image " — -is not, as has been thought, of modern origin, since it occurs in the Otia Imperialia (iii. 25) of Gervase of Tilbury (fl. 1211), who says: " Est ergo Veronica pictura Domini vera." In several churches the office of St Veronica, matron, is observed on various dates.

See Acta Sanctorum, February, i. 449-57; L. F. C. Teschendorf, Evangeiia apocrypha (2nd ed., Leipzig, 1877), p. 239; E. von Dobschutz, Christus'bilder (Leipzig, 1899); H. Thurston, The Stations of the Cross (London, 1906). (H. De.)

VERRES, GAIUS (c. 120-43 B.C.), Roman magistrate, notori- ous for his misgovernment of Sicily. It is not known to what gens he belonged. He at first supported Marius and the popu- lar party, but soon went over to the other side. Sulla made him a present of land at Beneventum, and secured him against punishment for embezzlement. In 80, Verres was quaestor in Asia on the staff of Cn. Cornelius Dolabella, governor of Cilicia. The governor and his subordinate plundered in concert, till in 78 Dolabella had to stand his trial at Rome, and

was convicted, mainly on the evidence of Verres, who thus secured a pardon for himself. In 74, by a lavish use of bribes, Verres secured the city praetorship, and, as a creature of Sulla, abused his authority to further the political ends of his party. He was then sent as governor to Sicily, the richest of the Roman pro- vinces. The people were for the most part prosperous and contented, but under Verres the island experienced more misery and desolation than during the time of the first Punic or the recent servile wars. The corn- growers and the revenue col- lectors were ruined by exorbitant imposts or by the iniquitous cancelling of contracts; temples and private houses were robbed of their works of art; and the rights of Roman citizens were disregarded. Verres returned to Rome in 70, and in the same year, at the request of the Sicilians, Cicero prosecuted him. Verres entrusted his defence to the most eminent of Roman advocates, Q. Hortensius, and he had the sympathy and support of several of the leading Roman nobles. The court was com- posed exclusively of senators, some of whom might have been his personal friends. But the presiding judge, the city praetor, M'. Acilius Glabrio, was a thoroughly honest man, and his assessors were at least not accessible to bribery. Verres vainly tried to get the trial postponed till 69 when his friend Metellus would be the presiding judge, but in August Cicero opened the case. The effect of the first brief speech was so overwhelming that Hortensius refused to reply, and recommended his client to leave the country. Before the expiration of the nine days allowed for the prosecution Verres was on his way to Massilia. There he lived in exile till 43, when he was proscribed by Antony, the reason alleged being his refusal to surrender some of his art treasures which Antony coveted. Verres may not have been quite so black as he is painted by Cicero, on whose speeches we depend entirely

for our knowledge of him, but there can hardly be a doubt that he stood pre-eminent among the worst specimens of Roman provincial governors. Of the seven Verrine orations only two were actually delivered; the re- maining five were compiled from the depositions of witnesses, and published after the flight of Verres.

VERRIUS FLACCUS, MARCUS (c. 10 B.C.), Roman gram- marian and teacher, flourished under Augustus and Tiberius. He was a freedman, and his manumitter has been identified with Verrius Flaccus, an authority on pontifical law; but for chronological reasons the name of Veranius Flaccus, a writer on augury, has been suggested (Teuffel-Schwabe, Hist, of Roman Lit. 199, 4). He gained such a reputation by his methods of instruction that he was summoned to court to bring up Gaius and Lucius, the grandsons of Augustus. He removed there with his whole school, and his salary was greatly increased on the condition that he took no fresh pupils. He died at an advanced age during the retgn of Tiberius (Suetonius, De Grammaticis, 17), and a statue in his honour was erected at Praeneste, in a marble

recess, with inscriptions from his Fasti. Flaccus was also a distinguished philologist and antiquarian investigator. For his most important work (De Verborum Significatu) see Festus, Sextus. Of the calendar of Roman festivals (Fasti Praenestini) engraved on marble and set up in the forum at Praeneste, some fragments were discovered (1771) at some distance from the town itself in a Christian building of later date, and some consular fasti in the forum itself (1778). The collection was subsequently increased by two new fragments.

Other lost works of Flaccus were: De OUhographia: De Obscuris Catonis, an elucidation of obscurities in the writings of the elder Cato; Saturnus, dealing with questions of Roman ritual; Rerum memoria

dignarum libri, an encyclopaedic work much used by Pliny the elder ; Res Etruscae, probably on augury.

For the fragments of the Fasti see Corpus Inscriptionum Latinarum, i. pp. 311, 474; G. Gatti, ″ Due nuovi Frammenti del Calendario di Verrio Flacco,″ in Atti delta r. Accademia dei Lincei, 5th sen, vol. 5, pt. 2, p. 421 (1898); Winther, De fastis Verrii Flacci ab Ovidio adhibitis (1885) ; J. £. Sandys, Classical Scholarship (ed. 1906), vol. i., index, s.v. ″ Verrius "; fragments of Flaccus in C. O. MUller's edition of Festus; see also H. Nettleship, Lectures and Essays.

VERROCCHIO, ANDREA DEL (1435–1488), Italian gold- smith, sculptor and painter, was born at Florence. He was the son of Michele di Francesco de' Cioni, and took his name from his master, the goldsmith Giuliano Verrocchi. Except through his works, little is known of his life. As a painter he occupies an important position from the fact that Leonardo da Vinci and Lorenzo di Credi worked for many years in his bottega as pupils and assistants. Only one existing painting can be attributed with absolute certainty to Verrocchio's hand, the celebrated ″ Baptism of Christ,″ originally painted for the monks of Vallombrosa, and now in the academy of Florence. The figures of Christ and the Baptist are executed with great vigour and refinement of touch, but are rather hard and angular in style. The two angels are of a much more graceful cast; the face of one is of especial beauty, and Vasari is probably right in saying that this head was painted by the young Leonardo. Other pictures from Verrocchio's bottega probably exist, as, for example, two in the National Gallery of London formerly attributed to Ant. Pollaiuolo — ″ Tobias and the Angel ″ (No 781) and the very lovely ″ Madonna and Angels ″ (No. 296), both very brilliant and jewel-like in colour. This exquisite painting may possibly have been

painted from Verrocchio's design by Lorenzo di Credi while he was under the immediate influence of his wonderful fellow-pupil, Da Vinci. 1

In examining Verrocchio's work as a sculptor we are on surer ground. One of his earliest works was the beautiful marble medallion of the Madonna, over the tomb of Leonardo Bruni of Arezzo in the church of Santa Croce at Florence. In 1472 Verrocchio completed the fine tomb of Giovanni and Piero de' Medici, between the sacristy and the lady chapel of San Lorenzo at Florence. This consists of a great porphyry sarcophagus enriched with magnificent acanthus foliage in bronze. Above it is a graceful open bronze grill, made like a network of cordage. In 1474 Verrocchio began the monument to Cardinal Forteguerra at the west end of Pistoia cathedral. The kneeling figure of the cardinal was never completed, and now lies in a room of La Sapienza, but the whole design is shown in what is probably Verrocchio's original clay sketch, now in the South Kensington Museum. Though this work was designed by Verrocchio, the actual execution of it was entrusted to his assistant, the Floren- tine Lorenzetto. In 1476 Verrocchio modelled and cast the fine but too realistic bronze statue of David, now in the Bargello (Florence) ; and in the following year he completed one of the reliefs of the magnificent silver altar -frontal of the Florentine baptistery, that representing the " Beheading of St John." Verrocchio's other works in the precious metals are now lost, but Vasari records that he made many elaborate pieces of plate and jewelry, such as morses for copes, as well as a series of silver statues of the Apostles for the pope's chapel in the Vatican. Between 1478 and 1483 he was occupied in making the bronze group of the " Unbelief of St Thomas," which still stands in

'See Crowe and Cavalcaselle, Painting in Italy (London, 1864), ii. pp. 400 seq.

one of the external niches of Or San Michele (Florence). He received 800 florins for these two figures, which are more

remarkable for the HIIl1^**. excellence of their

technique than for their sculpturesque beauty. The atti- tudes are rather rigid and the faces hard in expression. Verroc- chio's chief master- piece was the colossal bronze equestrian statue of the Vene- tian general Barto- lommeo Colleoni, which stands in the piazza of SS. Gio- vanni e Paolo at Venice. Verrocchio received the order for this statue in 1479, but had only completed the model when he died in 1488. Si In spite of his request J^^SBK^m^^BKUl^^^B^^^Si that the casting should

be entrusted to his Clay sketch for the monument of Cardinal pupil Lorenzo di Credi, Forteguerra, showing the kneeling por- tne work was given trait 01 the cardinal, which is not in the ., , T

actual monument; a very poor modern t0 Alessanaro .Leo- figure occupies its place. pardi by the Venetian

senate, and the statue was gilt and unveiled in 1496. 1 There appears to be no doubt that the model was completed by Verrocchio himself, and that nothing more than its reproduction in bronze should be attributed to the much feebler hand of Leopardi. who, however, has set his own name alone on the belly-band of the horse — ALEXANDER- LEOPARDVS V. F. OPUS. This is perhaps the noblest equestrian statue in the world, being in some respects superior to the antique bronze of Marcus Aurelius in Rome and to that of Gattamelata at Padua by Donatello.

The horse is designed with wonderful nobility and spirit, and the easy pose of the great general, combining perfect balance with absolute ease and security in the saddle, is a marvel of sculpturesque ability. Most remarkable skill is shown by the way in which Verrocchio has exaggerated the strongly marked features of the general, so that nothing of its powerful effect is lost by the lofty position of the head. According to Vasari, Verrocchio was one of the first sculptors who made a practical use of casts from living and dead subjects. He is said also to have produced plastic works in terra-cotta, wood and in wax decorated with colour. As a sculptor his chief pupil was Francesco di Simone, the son of that Simone whom Vasari wrongly calls a brother of Donatello. Another pupil was Agnolo di Polo (Paolo), who worked chiefly in terra-cotta.

Verrocchio died in Venice in 1488, and was buried in the church of St Ambrogio in Florence.

See also Hans Mackowsky, ″ Verrocchio . . . Mit 80 Abbildungen ″ (1901), Kiinster Monographien, No. 52. (J. H. M.)

VERSAILLES, a town of northern France, capital of the department of Seine-et-Oise, 12 m. by road W.S.W. of Paris, with which it is connected by rail and tram. Pop. (1906) town, 45,246; commune, 54.1820. Versailles owes its existence to the palace built by Louis XIV. It stands 460 ft. above the sea, and its fresh healthy air and nearness to the capital attract many residents. The three avenues of St Cloud, Paris and Sceaux converge in the Place dArmes. Between them stand the former stables of the palace, now occupied by the artillery and engineers. To the south lies the quarter of Satory, the oldest part of Ver- sailles, with the cathedral of St Louis, and to the north the new quarter, with the church of Notre Dame. To the west a gilded 1 See Gay, Cart, ined, i. p.

iron gate and a stone balustrade shut off the great court of the palace from the Place d'Armes. In this court, which slopes upwards from the gate, stand statues of Richelieu, Conde, Du Guesclin and other famous Frenchmen. At the highest point there is an equestrian statue in bronze of Louis XIV., and to the right and left of this stretch the long wings of the palace, while behind it extend the Cour Royale and the smaller Cour de Marbre, to the north, south and west of which rise the central buildings. The buildings clustered round the Cour de Marbre, which include the apartments of Louis XIV., project into the gardens on the west considerably beyond the rest of the facade. To the north the Chapel Court and to the south the Princes Court, with vaulted passages leading to the gardens, separate the side from the central buildings. On the other is the inscription, " A toutes les gloires de la France," which Louis Philippe justified by forming a collection of works of art (valued at £1,000,000), commemorating the great events and persons of French history. The palace chapel (1696-1710), the roof of which can be seen from afar rising above the rest of the building, was the last work of J. Hardouin-Mansart.

The ground-floor of the north wing on the garden side contains eleven halls of historical pictures from Clovis to Louis XVI., and on the side of the interior courts a gallery containing casts of royal funereal monuments. The Halls of the Crusades open off this gallery, and are decorated with the arms of crusaders and with modern pictures dealing with that period. On the first floor of the north wing on the garden side are ten halls of pictures com- memorating historical events from 1795 to 1830; on the court side is the Gallery of Sculpture, which contains the Joan of Arc of the princess Marie of Orleans; and there are seven halls chiefly devoted to French campaigns

and generals In Africa, Italy, the Crimea and Mexico, with some famous war pictures by Horace yernet. The second storey has a portrait gallery. In the north wing is also the theatre built under Louis XV. by Jacques-Ange Gabriel, which was first used on the 16th of May 1770 on the marriage of the dauphin (afterwards Louis XVI.) and Marie Antoinette. Here, on the 2nd of October 1789, the celebrated banquet was given to the Gardes du Corps, the toasts at which provoked the riots that drove the royal family from Versailles; and here the National Assembly met from the 10th of March 1871 till the proclamation of the constitution in 1875, and the Senate from the 8th of March 1876 till the return of the two chambers to Paris in 1879. On the ground-floor of the central buildings are the halls of celebrated warriors (once the anteroom of Madame de Pompadour), marshals, constables and admirals, and the suite of rooms known as the Dauphin's Apartments, now given up to historical portraits. The Galerie Basse, once known as the Gallery of Louis XIII., leads to the rooms surrounding the Marble Court, a series of which contains many plans of battles. The lobbies of the ground-floor are full of busts, statues and tombs of kings and celebrated men. The famous staterooms are on the first floor. On the garden side, facing the north, are a series of seven halls, some of them decorated with tapestries representing the life of Louis XIV. Among them may be mentioned the Hall of Hercules, till 17 10 the upper half of the old chapel, where the dukes of Chartres, Maine and Burgundy were married, and Bossuet, Massillon and Bourdaloue preached; the Hall of Mercury, where the coffin of Louis XIV. stood for eight days after his death; and the Hall of Apollo, or throne room. To the front of the palace, facing the west, are the Galleries of War and Peace, with allegorical pictures, and the Glass Gallery, built by Mansart in 1678 (235 ft. long,. 35 wide and 42 high), having 34 arches, 17 of which are filled with windows

looking on the gardens and 17 with large mirrors. The gallery is overloaded with ornament, and the pictures by Charles Lebrun, the trophies and figures of children by Antoine Coysevox, and the inscriptions attributed to Boileau and Racine, all glorify Louis XIV. This gallery was used by him as a throne room on state occasions. Here the king of Prussia was proclaimed emperor of Germany on the 18th of January 1871. Connected with the Gallery of Peace are the queen s apartments, occupied successively by Marie Therese, Marie Leczinska and Marie Antoinette, where the duchess of Angoulteie was born, the duchess of Burgundy died, and Marie Antoinette was almost assassinated on the 6th of October 1789. Behind the Glass Gallery on the side of the court are the rooms of Louis XIV. The CEil de Bceuf, named from its oval window, was the anteroom where the courtiers waited till the king rose. In it is a picture representing Louis XIV. and his family as Olympian deities; and it leads to the bedroom in which Louis XIV. died, after using it from 1701, and which Louis XV. occupied from 1732 to 1738. In the south wing of the palace, on the ground-floor, is the Gallery of the Republic and the First Empire, the rooms of which contain paintings of scenes in the life of Napoleon I. A sculpture gallery contains busts of celebrated scholars, artists, generals and public men from the time of Louis XVI. onwards. In the south wing is also the room where the Chamber

of Deputies met from 1876 till 1879, and where the Congress has since sat to revise the constitution voted at Versailles in 1875 and to elect the president of the republic. The first floor is almost entirely occupied by the Battle Gallery (394 ft. long and 43 wide), opened in 1836 on the site of rooms used by Monsieur the

brother of Louis XIV. and the duke and duchess of Chartres. It is lighted from above, and the walls are hung with pictures of French victories. In the window openings are the names of soldiers killed while fight- ing for France, with the names of the battles in which they fell, and there are more than eighty busts of princes, admirals, constables, marshals and celebrated warriors who met a similar death. An- other room is given up to the events of 1830 and the accession of Louis Philippe, and a gallery contains the statues and busts of kings and celebrities.

The gardens of Versailles were planned by Andre Le N6tre. The ground falls away on every side from a terrace adorned with ornamental basins, statues and bronze groups. Westwards from the palace extends a broad avenue, planted with large trees, and having along its centre the grass of the ″ Tapis Vert "; it is continued by the Grand Canal, 200 ft. wide and 1 m. long. On the south of the terrace two splendid staircases lead past the Orangery to the Swiss Lake, beyond which is the wood of Satory. On the north an avenue, with twenty-two groups of three children, each group holding a marble basin from which a jet of water rises, slopes gently down to the Basin of Neptune, remarkable for its fine sculptures and abundant water. The Orangery (built in 1685 by Mansart) is the finest piece of architecture at Versailles; the central gallery is 508 ft. long and 42 wide, and each of the side galleries is 375 ft. long. There are 1200 orange trees, one of which is said to date from 1421, and 300 other kinds of trees.

The alleys of the parks are ornamented with statues, vases and regularly cut yews, and bordered by hedges surrounding the shrubberies. Between the central terrace and the Tapis Vert is the Basin of Latona or the Frogs, with a white marble group of Latona with Apollo and Diana. Beyond the Tapis Vert is the large Basin

of Apollo, who is represented in his chariot drawn by four horses; there are three jets of water, one 60, the others 50 ft. in height. The Grand Canal is still used for nautical displays; under Louis XIV. it was covered with Venetian gondolas and other boats, and the evening entertainments usually ended with a display of fireworks. Around the Tapis Vert are numerous groves, the most remarkable being the Ballroom or Rockery, with a waterfall ; the Queen's Shrubbery, the scene of the intrigue of the diamond necklace; that of the Colonnade, with thirty-two marble columns and a group of Pluto carrying off Prosperine, by Francois Girardon ; the King's Shrubbery, laid out in the English style by Louis Philippe; the beautiful Grove of Apollo, with a group of that god and the nymphs, by Girardon; and the Basin of Enceladus, with a jet of water 75 ft. high.

Among the chief attractions of Versailles are the fountains and waterworks made by Louis XIV. in imitation of those he had seen at Fouquet's chateau of Vaux. Owing to the scarcity of water at Versailles, the works at Marly-le-Roi were constructed in order to bring water from the Seine ; but part of the supply thus obtained was diverted to the newly erected chateau of Marly. Vast sums of money were spent and many lives lost in an attempt to bring water from the Eure, but the work was stopped by the war of 1688. At last the waters of the plateau between Versailles and Rambouillet were collected and led by channels (total length 98 m.) to the gardens, the soil of which covers innumerable pipes, vaults and aqueducts.

Beyond the present park, but within that of Louis XIV., are the two Trianons. The Grand Trianon was originally erected as a retreat for Louis XIV. in 1670, but in 1687 Mansart built a new palace on its site. Louis XV., after establishing a botanic garden, made Gabriel build in 1766 the small pavilion of the Petit Trianon, where the machinery is still shown by

which his supper-table came up through the floor. It was a favourite residence of Marie Antoinette, who had a garden laid out in the English style, with rustic villas in which the ladies of the court led a mimic peasant-life. The Grand Trianon is a one-storeyed building with two wings, and has been occupied by Monsieur (Louis XIV.'s brother), by the Great Dauphin, Napoleon I., and Louis Philippe and his court. The gardens of the Grand Trianon are in the same style as those of Versailles, and there is a museum with a curious collection of state carriages, old harness, &c.

Apart from the palace, there are no buildings of interest in Versailles; the church of Notre Dame, built by Mansart, the cathedral of St Louis, built by his grandson, the Protestant church and the English chapel being in no way remarkable. The celebrated tennis-court (Jeu de Paume) is now used as a museum. The large and sumptuous palace of the prefecture was built during the second empire, and was a residence of the president of the republic from 1871 to 1879. The library consists of 60,000 volumes; and the military hospital formerly accom- modated 2000 people in the service of the palace. There are statues of General Hoche and of Abbe de l'Epee in the town. A school of horticulture was founded in 1874, attached to an excellent garden, near the Swiss Lake.

Versailles is the seat of a bishopric, a prefect and a court of assizes, and has tribunals of first instance and of commerce, a board of trade-arbitrators, a chamber of commerce and a branch of the Bank of France, and, among its educational establishments, lycees and training colleges for both sexes and a technical school. It is an important garrison town and has a school of military engineer- ing and artillery. Distilling, boot and shoe making, and market- gardening employ many of the people, but the town has no specially characteristic industry. The links of the Paris

Golf Club are at La Boulie near Versailles.

Louis XIII. often hunted in the woods of Versailles, and built a small pavilion at the corner of what is now the rue de la Pompe and the avenue of St Cloud. In 1627 he entrusted Jacques Lemercier with the plan of a chateau. In 1661 Louis Levau made some additions which were further developed by him in 1668. In 1678 Mansart took over the work, the Galerie des Glaces, the chapel and the two wings being due to him. In 1682 Louis XIV. took up his residence in the chateau. It is estimated that 20 million pounds were spent on the palace, gardens and works of art, the accounts for which were destroyed by the king. Till his time the town was represented by a few houses to the south of the present Place d'Armes; but land was given to the lords of the court and new houses sprang up, chiefly in the north quarter. Under Louis XV. the parish of St Louis was formed to the south for the increasing population, and new streets were built to the north on the meadows of Clagny, where in 1674 Mansart had built at Louis XIV.'s orders a chateau for Madame de Montespan, which was now pulled down. Under Louis XVI. the town extended to the east and received a muni cipality; in 1802 it gave its name to a bishopric. In 1783 the armistice preliminary to the treaty of peace between Great Britain and the United States was signed at Versailles. The states-general met here on the 5th of May 1789, and on the 20th of June took the solemn oath in the Tennis Court by which they bound themselves not to separate till they had given France a constitution. Napoleon neglected, and Louis XVIII. and Charles X. merely kept up, Versailles, but Louis Philippe restored its ancient splendour at the cost of £1,000,000. In 1870 and 1871 the town was the headquarters of the German army besieging Paris. After the peace Versailles was the seat of the French National Assembly while the commune was

triumphant in Paris, and of the two chambers till 1879, being declared the official capital of France.

See A. P. Gille, Versailles et les deux Trianons, with illustrations by M. Lambert (Tours, 1899, 1900); P. de Nolhac, La Creation de Versailles (Versailles, 1901); J. E. Farmer, Versailles and the Court under Louis XIV. (New York, 1905).

VERS DE SOCIETE, a term for social or familiar poetry, which was originally borrowed from the French, and has now come to rank as an English expression (see Fennell, The Stam- ford Dictionary of Anglicised Words). The use of the phrase as an English one is first met with at the opening of the 19th century. It is to be observed that it has come to bear a meaning which is not wholly equivalent to that of the French original. It was said of the blind philosopher, M. C. J. Pougens (1755- 1833), that his petits vers de sociitS procured great success for him in the salons of Paris, and several of the rhymesters of the early 18th century were prominent for their adroitness in composing petits vers sur des sujets ligers. The prince of such graceful triflers was the Abbe de Chaulieu (1639-17 20), of whom it was said that he made verses solely for the amusement

of his friends, and without the smallest intention of seeing them in print. The best of his effusions have preserved a certain freshness because of the neatness with which they are turned, but it can scarcely be said that they have any pre- tension to be called poetry. They were inspired by incidents in the private life of the day, and were largely addressed to a few friends of exalted rank, who

were hardly less witty than the author himself, such as the due de Nevers, the marquis de Lassay, the duchesse de Bouillon and the marquis de la Fare. In the collections of Chaulieu's works, which were very often reprinted, side by side with his own pieces will be found petits vers de sociili indited by these great friends of his, and often quite as well turned as his own. To write such verses, indeed, was almost an accomplishment of good breeding. An enormous collection of them was brought together by Titon du Tillet (1676–1762), in his Parnasse francois, where those who are curious on the subject may observe to satiety how ingenious and artificial and trifling the vers de sociite of the French 18th century could be. The fashion for them followed upon the decline of an interest in rondeaux, ballades and villanelles, and Chaulieu himself had not a little to do with throwing those ingenuities out of fashion, his attack on Benserade, who went so far as to turn the whole of Ovid's Metamorphoses into ron-deaux. being, according to his editor of 1732, " the first work which displayed the delicacy of the Abbe de Chaulieu's taste, and his talent for poetry." Of the writers of vers de sociite in France, J. B. Rousseau had the most poetical faculty; he was, in fact, a poet, and he wrote a " Billet a. Chaulieu " which is a gem of delicate and playful charm. But, as a rule, the efforts of the French versifiers dans les petits genres were not of considerable poetic value.

If in England the expression vers de sociite carries with it more literary dignity, this is mainly due to the genius of one man. Prior's Poems on Several Occasions, collected in 1709, presents us with some of the earliest entirely characteristic specimens of vers de sociite, arid with some of the best. Here the poet consciously, and openly, resigns the pretension of high effort and an appeal to Parnassus. He

is paying a visit at Burghley House, where the conversation turns on the merits and adventures of Mr Fleetwood Shepherd; Prior then and there throws off, in extremely graceful verse, a piece appro- priate to the occasion. He addresses it, and he dates it (May 14, 1689); and this is a typical example of vers de societt. It will be seen that Prior, who learned much from his residence in the heart of the French world of fashion between 1711 and 1 7 1 5 , treats very much the same subjects as Chaulieu and La Fare were treating, but he does so with more force of style and dignity of imagination. As the 18th century progressed, the example of Prior was often followed by English poets, without, however, any general recapture of his forcible grace. The vers de sociite tended to be merged in the epistle and in the epigram. Swift, however, when he was neither coarse nor frigid, sometimes achieved a genuine success, as in the admir- able verses on his own death. The odes of Ambrose Philips (1671–1749) addressed by name to various private persons, and, most happily, to children, were not understood in his own age, but possess some of the most fortunate characteristics of pure vers de societe. In his " Welcome from Greece," a study in otlava rima, Gay produced a masterpiece in this delicate class, but most of his easy writings belong to a different category. Nothing of peculiar importance detains us until we reach Cowper, whose poems for particular occasions, such as those on " Mrs Throckmorton's Bullfinch " and " The Distressed Travellers," are models of the poetic use of actual circumstances treated with an agreeable levity, or an artful naivete. In a later age, Byron, who excelled in so many departments of poetry, was an occasional writer of brilliant vers de sociiti, such as the epistle " Huzza, Hodgson," but to find a direct successor to Prior it is necessary to pass Henry Luttrell (1765- 1851) and W. R. Spencer (1769–18,34), and to come down to W. M. Praed

(q.v.) . A certain character was given to English vers de sociiti by Hood and Barham, but the former was too much

addicted to a play upon words, the latter was too boisterous, to be considered as direct continuers of the tradition of Prior. That tradition, however, was revived by Frederick Locker, afterwards Locker-Lampson (1821-1895), whose London Lyrics, first printed in 1857 and constantly modified until 1893, is in some respects the typical modern example of pure vers de sociite. Locker was a simple, clear and easy writer; he successfully avoided the least appearance of that effort which is fatal to this kind of verse. His " Rotten Row," with its reminiscences of the early sixties,

" But where is now the courtly troop That once rode laughing by? I miss the curls of Cantelupe, The laugh of Lady Di,"—

touches of real portraiture — is a perfect example of vers de societe. Since the days of Locker, those who have attempted to strike the lighter lyre in English have been very numerous. Almost immeasurably superior to the rest has been Mr Austin Dobson, who is, however, something more than a writer of vers de sociite.

Collections of vers de sociite of much excellence have been pub- lished by J. K. Stephen (1859-92), Andrew Lang (b. 1844), A. D. Godley (b. 1856), Owen Seaman (b. 1861) and A. R. Ropes (" Adrian Ross ") (b. 1859). (E. G.)

VERSE (from Lat. versus, literally a line or furrow drawn by turning the plough, from vertere, and afterwards signifying an arrangement of syllables into feet), the name given to an assemblage of words so placed together as to produce a metrical effect. The art of making, and the science of analysing, such verses is known as Versification.

According to Max Miiller, there is an analogy between versus and the Sanskrit term, vritta, which is the name given by the ancient grammarians of India to the rule determining the value of the quantity in vedic poetry. In modern speech, verse is directly contrasted with prose, as being essentially the result of an attention to determined rules of form. In English we speak of " a verse " or " verses," with reference to specific instances, or of " verse," as the general science or art of metrical expression, with its regulations and phenomena. A verse, which is a series of rhythmical syllables, divided by pauses, is destined in script to occupy a single line, and was so understood by the ancients (the crrixos of the Greeks). The Alexandrian scholiast Hephaestion speaks distinctly of verses that ceased to be verses because they were too long; he stigmatizes a pentameter line of Callimachus as arixov xnripntTpov. There is no danger, therefore, in our emphasiz- ing this rule, and in saying that, even in Mr Swinburne's most extended experiments the theory is that a verse fills but one line in a supposititious piece of writing.

It is essential that the verse so limited should be a complete form in itself. It is not, like a clause or a sentence in prose, unrecurrent and unlimited, but it presents us with a successive and a continuous cadence, confined within definite bounds. There has been a constant discussion as to what it is in which this succession and this continuity consist, and here we come at once to the principal difficulty which makes the analysis of the processes of the poets so difficult. To go back to the earliest European tradition, it is universally admitted that the ancient Greeks considered the art of verse as a branch of musk, and as such co-ordinated it with harmony and orchestral effect. This appears from definite statements preserved in the fragments

of Aristoxenus of Tarentum, a grammarian who lived in the age of Alexander the Great, and whom we shall see to have been the first who laid down definite laws for prosody as a department of musical art (hovo-lktj). It was found necessary, in order to compose a work of musical value, to work out a system of disciplined and linked movement. This system, or arrangement, was called rhythm, and this is common to all the arts of melody. Harmony, consisting in the reproduction of the sound of human voices or of musical instruments, and orchestrics, dealing with the movements of the human body, were expressed in metrical art by that arrangement of syllables which is known as rhythm. The science of metre is the teaching of those laws on which

depends the rhythmical forms of poetry. This science has been, from the earliest ages of criticism, divided into a study of the general principles upon which all these forms are builded, and upon the special types into which they have gradually developed.

In considering ancient versification, it is necessary to give attention to Latin as well as to Greek metre, because although the Roman poets were in the main dependent upon the earlier tradition, there were several points at which they broke away, and were almost entirely independent. Roman verse, though essentially the same as Greek verse, was modified by the national development of Italian forms of poetry, by a simplified imitation of Greek measures, and by a varied intensity in the creation of new types of the old Greek artistic forms (Volkmann). In later times there was a tendency to consider the laws of metre as superior to, and almost independent of, the native impulse of the poet; and this is where

the study of the okl poetry itself is most salutary, as checking us in our tendency to bow too slavishly to the rules of the grammarians. No doubt, in the archaic times, theory and practice went hand in hand. The poet, held in constant check by the exigencies of music, was obliged to recognize the existence of certain rules, the necessity of which was confirmed by the delicacy of his ear. These he would pass down to his disciples, with any further discoveries which he might himself have made. For instance, what we are somewhat vaguely told of the influence of a poet like Archilochus, to whom the very invention of trochaic and iambic metre is, perhaps fabulously, attributed, points to the probability that in Archilochus the Ionian race produced a poet of extraordinary daring and delicacy of ear, who gathered the wandering rhythms that had existed, and had doubtless been used in ah uncertain way before his time, into a system which could be depended upon, and not in his hands only, to produce certain effects of welcome variety. His system would engage the attention of theorists, and we learn that by the time of Plato schools of oral metrical education Were already in existence, where the science of sounds and syllables was already beginning to be recognized, as may be seen in the Cratylus. Before long, the teachings in these peripatetic schools would be preserved, for safety's sake, in writing, and the theoretic literature of versification would begin. In fact, we read in Suidas of a certain Lasus of Hermione who wrote an Art of Poetry, and the age of this, the earliest of recorded authorities on the formal laws of verse, is fixed for us by the fact that he is spoken of as having been the master of Pindar. Of the writings of Lasus and his followers, however, nothing remains, and the character of their teaching is problematical. In the 3rd century B.C., however, we come upon a figure which preserves a definite character; this is

Aristoxenus, the disciple of Aristotle, who gave his undivided attention to rhythm, and who lives, unfortunately only in fragments, as the most eminent musical critic of antiquity. The brief fragments of his Elements of Rhythm (pvdfiLKa OToix&a) > originally written in three books, are of unsurpassed value to us as illustrating the attitude of classical Greece to the interrelation of verse and music. The third book of Aristoxenus dealt specifically with Xe£is, or the application of rhythm to artistically composed and written verse.

It is certain that, after the time of Alexander the Great, the theories of verse tended somewhat rapidly to release themselves from the theories of music, and when, in the successive ages of Greek criticism, much attention was given to the laws of versification, less and less was said about harmony and more and more about metre. Rules, often of a highly arbitrary nature, were drawn up by grammarians, who founded their laws on a scholiastic study of the ancient poets. The majority of the works in which these rules were collected are lost, but an enchiridion of Greek metres, by Hephaestion, a scholiast of the 2nd century a.d., has been preserved. First printed in 1526, editions and translations of Hephaestion's manual have not been infrequent.

It is from Hephaestion that most of our ideas or. the subject of classical prosody are obtained. His work, as we possess it, seems to be a summary, made by himself, for use in schools, of an exhaustive

treatise he had published on the Greek metrical system as a whole, in 48 books. The pre-eminent importance of Hephaestion was exposed to the learned world of Europe by Th. Gaisford, in 1810. A contemporary of Hephaestion, Herodian, who was one of the most eminent of Alexandrian grammarians, gave close attention to prosody, and was believed to have summed up everything

that could be known on the subject of verse by critics of the 2nd century A.D., in his Me7dXij wpoaipliLa, in twenty books. As Herodian, throughout his life, seems to have concentrated his attention on the study of Homer, it is supposed that he started with a consideration of the metre and accent of the Iliad. The almost complete loss of his treatises is regrettable. Philoxenus was the author of a very early work, lltpi fiirpw; but this is entirely lost. In the musical cyclopaedia of Quintilian, there was included a chapter on the elements of the rhythmic art, and in this the metres recognized at the time were recorded and described. Among the Latin authorities on versification, the leading place is taken, in the 1st century B.C., by Terentius Varro, whose systematic treatment of metre in his works De sermorie latino and De lingua lalina is often referred to But we know more of Terentianus Maurus, who flourished in the second half of the 2nd century A.D., since we possess from his hand a hand- book to metre, written in verse, in which, in particular, the Horatian metres are carefully analysed. He follows Caesius Bassus, the friend of Nero, who had dedicated to his imperial patron a work on prosody, of which fragments exist. Three tracts, attributed to the rhetor C, Marius Victorinus (one entitled De ratione metrorum), belong, to the 4th century, and are still quoted by scholars. Another early authority was Flavius Mallius Theodorus, whose De Melris has been frequently reprinted.

The metrical theory of the Byzantine grammarians was entirely in unison with the old tradition of the Alexandrian schools, and depended on the authority of Hephaestion. Michael Psellus, in the 9th century, wrote abundantly on the subject, and towards the close of the Empire the verse-handbooks of Isaac Tzetzes (d. 1138) and of his brother Joannes were in general use. A large number of

other Byzantine scholiasts and theorists are mentioned in this connexion by Gleditsch. "Very little attention was paid to metrical science in medieval and even Renaissance days. It is much to the honour of English scholarship that the earliest modern writer who made a rational study of ancient metre was Richard Bentley, in his Schediasma de metris Teren- iianis, printed at Cambridge in 1726. He was soon followed by the Germans, in particular by Hermann, Boeckh and J. A. Apel. To this day, German scholarship easily leads in the rational and accurate study of classical versification.

The chief principle in ancient verse was quantity, that is, the amount of time involved in the effort to express a syllable. Accordingly, the two basal types which lie at the foundation of classical metre are ".longs " and " shorts." The convention was that a long syllable was equal to two short ones: accord- ingly there was a real truth in calling the succession of such " feet " metre, for the length, or weight, of the syllables forming them could be, and was, measured. What has to be realized in speaking of ancient metre is that the value of these feet was defined with exactitude, not left uncertain, as it is in modern European verse, when accent is almost always made the guiding principle. In Greek verse, there might be an ictus (stress), which fell upon the long syllable, but it could only be a regulat- ing element, and accent was always a secondary element in the construction of Greek metre, The " feet " recognized and described by the ancient grammarians were various, and in their apparent diversity sometimes difficult to follow, but the comprehension of them is simplified if the student realizes that the names given to them are often superfluous. The main distinction between feet consists in the diversity of the relation between the strong and the weak syllables. There are naturally only two

*movements, the quick and the slow. Thus we have the anapaest (—>-' — , short-short-long) and the dactyl (— *— ' ■-', long-short-short), which are equal, and differ only as regards the position of their parts. To these follow two feet which must be considered as in their essence non^metrical, as it is only in combination with others that they can become*

metrical. These are the spondee (, long-long) and

the pyrrhic (s ' •', short-short). Of more essential character are the two descriptions of slow feet, the iamb (•— ' — , short- long) and the trochee (— — ', long-short). Besides these definite types, the ingenuity of formalists has invented an

almost infinite number of other " feet." It is, perhaps, necessary to mention some of the principal of these, although they are, in the majority of cases, purely arbitrary. In the rapid measures we find the tribrach (-"~ v - - , short short short), the molossus (, long-long-long), the amphibrach

*(w — w , short -long-short), the amphimacer (— *-' — , long short-long), the bacchius (^ , short-long-long) and the*

antibacchius (w , long-long-short). There is a foot of

four syllables, the choriamb (— w — '• — , long-short-short- long), which is the fundamental foot in Aeolic verse — very frequently mentioned, but very seldom met with.

It must not be forgotten that the prosodical terminology of the Greeks, which is often treated by non-poetical writers as something

scientific and even sacrosanct, dates from a time when ancient literature had lost all its freshness and impulse, and was exclusively the study of analysts and gram- marians. Between the life of Pindar, for instance, and that of Hephaestion, the great metrical authority, there extends a longer period than between Chaucer and Professor Skeat; and to appreciate the value of the rules of Greek prosody we must recollect that those rules were invented by learned and academic men to account for phenomena which they observed, and wished to comprehend, in writings that had long been classical, and were already growing positively archaic. The fact seems to be that the combination of long and short syllables into spondees, iambs, dactyls and anapaests, forms the sole genuine basis of all classical verse.

Metre is a science which pays attention to all the possible regular arrangements which can be made of these four indis- pensable and indestructible types. Of the metres of the ancients by far the most often employed, and no doubt the oldest, was the dactylic hexameter, a combination of six feet, five successive dactyls and a spondee or trochee: —

*L—^ >—^— U^^ L..—^ U^.^ L^*

This was known to the ancients as ″ epic ″ verse, in contrast to the various lyrical measures. The poetry of Homer is the typical example of the use of the epic hexameter, and the character of the Homeric saga led to the fashion by which the dactylic hexameter, whatever its subject, was styled ″ heroic metre.″ The earliest epics, doubtless, were chanted to the accompaniment of a stringed instrument, on which the pulsa- tion of the verse (

We pass, by a natural transition, to the pentameter, which

is the most frequently employed of what are known as the syncopied forms of dactylic verse. It was used with the hexa- meter, to produce the effect which was early called elegiac, and its form shows the appropriateness of this custom: —

"Cynthia [prima fu- | it, || Cynthia | finis e- | rit."

A hexameter, full of energy and exaltation, followed by a descending and melancholy pentameter, had an immediate tendency to take a complete form, and this is the origin of the stanza. The peculiar character of this two-line stanza has been fixed for all time by a brilliant epigram of Schiller, which is itself a specimen of the form: —

" Im Hexameter steigt des Springquells fliissige Saule, Im Pentameter drauf fallt sie melodisch herab."

Such a distich was called an elegy, k'Xeyetor', as specially suitable to an eXeyos or lamentation. It is difficult to say with certainty whether the distich so composed was essential as an accompani- ment to fluter-music in the earliest times, or how soon there came to be written purely literary elegies towards which the melody stood in a secondary or ornamental relation. It has, however, been observed that even when the distich had obviously come to be a purely intellectual or lyrical thing, there remained in the sound of the pentameter the trace of lamentation, in which its primitive use at funeral services was clearly preserved. Other grammarians, however, among whom Casar, in his work on the origin of elegiac verse, is prominent, — do not believe in the lugubrious essence of the pentameter, and think that the elegiacal couplet was originally erotic, and was adapted to mournful themes by Simonides. If we may credit a passage in Athenaeus, it would seem that the earliest-

known elegists, such as Callinus and Solon, wrote for recitation, pure and simple, without the accompaniment of any instrument.

Trochaic verse is called by the ancient grammarians head- less (a.K€a\ov) , because it really consists of iambic verse deprived of its head, or opening syllable. The iambic measure (•~ y — w — •— ' —) becomes trochaic if we cut off the first "short," and make it run — ^ — "— '- — s-' — . The pure trochaic trimeter and tetrameter had a character of breathless speed, and sometimes bore the name of choric (pv$iibs xop&os), because it was peculiarly appropriate to the dance, and was used for poems which expressed a quickly stepping sentiment. It is understood that, after having been known as a musical movement, it was first employed in the composition of poetry by Archilochus of Paros, in the 7th century B.C.

Iambic metre was, next to the dactylic hexameter, the form of verse most frequently employed by the poets of Greek antiquity. Archilochus, again, who seems to have been a great initiator in the arts of versification, is credited with the invention of the iambic trimeter also, but it certainly existed before his time. Murray believes the original iambic measure, in its popular familiarity, to have sprung from the worship of the homely peasant gods, Dionysus and Demeter. It was not far removed from prose; it gave a writer opportunity for expressing popular thoughts in a manner which simple men could appreciate, being close to their own unsophisticated speech. In particular, it presented itself as a heaven-made instrument for the talent of Euripides, "who, seeing poetry and meaning in every stone of a street, found in the current iambic trimeter a vehicle of expression in some ways more flexible even than prose."

It was not, however, until the invention of the lyric proper, whether individual to the poet,

or choral, that the full richness of possible rhythms became obvious to the Greeks. The lyric inspiration came originally from the island of Lesbos, and it passed down through the Asiatic archipelago to Crete before it reached the mainland of Greece. The Lesbians cultivated a monodic ode-poetry in strophes and monostrophes, the en- chanting beauty of which can still be realized in measure from what remains to us of the writings of Sappho and Alcaeus There is a stanza known as the Sapphic and another as the Alcaic.

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The Sapphic runs as follows: —

VERSE

The stanza of Alcaeus runs:-

,_ |.

These marvellous inventions suited the different moods of these strongly contrasted lyrists, the " violet-crowned, pure, softly smiling Sappho," and the fiery, vehement soldier who was Alcaeus. We must give them peculiar attention, since they were the two earliest models for the lyric passion which has since then expressed itself in so many stanzaic forms, but in none of so faultless a perfection as the original Lesbian types.

The name of Stesichorus of Himera points to the belief of antiquity that he was the earliest poet who gave form to the choral song; he must have been called the " choir-setter " because he arranged and wrote for choirs semi-epic verse of a new kind, " made up of halves of the epic hexameter, inter- spersed with short variations — epitrites, anapaests or mere syncopae — just enough to break the dactylic swing, to make the verse lyrical " (Gilbert Murray). But it appears to be to Arion that the

artistic form of the dithyramb is due. We are all among innovators and creators in this glorious 5th century B.C. Simonides gathered the various inventions together, and exercised his genius upon them all: he was the earliest universal lyrist of the world: he treated the styles of verse, as Shelley or as Victor Hugo did, with an impartial mastery.

After the happy event of the Persian War, Athens became the centre of literary activity in Greece, and here the great school of drama developed itself, using for its vehicle, in dialogue, monologue and chorus, nearly all the metres which earlier ages and distant provinces had invented. The verse-form which the dramatists preferred to use was almost exclusively the iambic trimeter, a form which adapted itself equally well to tragedy and to comedy. Aeschylus employed for his choruses a great number of lyric measures, which Sophocles and Euripides reduced and regulated. With the age of the dramatists the creative power of the Greeks in versification came to an end, and the revival of poetic enthusiasm in the Alexandrian age brought with it no talent for fresh metrical inventions, and the time had now arrived when the harvest of Greek prosody was completely garnered.

Latin Metre. — Very little is known about the verse-forms of the original inhabitants of Italy, before the introduction of Greek influences. The earliest use of poetry as a national art in Italy is to be judged by inscriptions in what is called the Saturnian metre. Already, the first Latin epic poets, Livius Andronicus in his Odyssia, Naevius in his Bellum Punicum, the Scipios in their Elogia, combined their rude national sense of folk-song with a consciousness of the quantitative rules of the Greeks. But the same writers, in their dramas, undoubtedly used Greek metres without adaptation, and it is therefore likely that the ancient Saturnian

measure was already looked upon as barbarous, and it makes no further reappearance in Latin literature (cf. Gleditsch). The introduction of Greek dramatic metre marks the start of regular poetry among the Latins, which was due, not to men of Roman birth, but to poets of Greek extraction or inhabiting the Greek-speaking provinces of Italy. These writers, bearing the stamp of a widely recognized cultivation, threw the old national verse back into oblivion. Latin verse, then, began in a free but loyal modification of the principles of Greek verse. Plautus was particularly ambitious and skilful in this work, and, aided by a native genius for metre, he laid down the basis of Latin dramatic versification. Terence was a feebler and at the same time a more timid metrist. In satire, the iambic and trochaic measures were carefully adapted

by Ennius and Lucilius. The dactylic hexameter followed, and Ennius, in all matters of verse a daring innovator, directly imitated in his Annates the epic measure of the Greeks. To him also is attributed the introduction of the elegiac distich, hexameter and pentameter. The dactylic hexameter was forthwith adopted as the leading metre of the Roman poets, and, as Gleditsch has pointed out, the basis upon which all future versification was to be erected was firmly laid down before the death of Ennius in 169 B.C. Lucilius followed, but perhaps with some tendency to retrogression, for the Latin critics seem to have looked upon his metre as wanting both in melody and elasticity. Lucretius, on the other hand, made a further advance on the labours of Ennius, in his study of

" the rise And long roll of the Hexameter."

Lest, however, this great form of verse should take too exclusive a place in the imagination of the Romans, a younger generation, with Laevius and Terentius Varro at their head,

began to imitate the lyrical measures of the Greeks with remarkable success. Varro, who has been styled the earliest metrical theorist of Rome, opened up a new field in this direction by the example of his Menippean satires. These poets left the rigid school of Ennius, and sought to emulate the Alexandrians of their own age: we see the result in the lyric measures used so gracefully and with such brilliant ease by Catullus. The versification of the Romans reached its highest point of polish in the Augustan age, in the writings of Tibullus, Propertius, Virgil and particularly Ovid, who is considered to mark the highest level of various excellence which has ever been reached by a master of Latin versification. In Horace has been traced a tendency to archaism in the study of verse, and in his odes and epodes he was not content with the soft Alexandrian models, but aimed at achieving more vigorous effects by an imitation of the older Greek models, such as Alcaeus and even Archilochus. After the Augustan age, it was no longer the Greek poets, ancient or recent, who were imitated, but the Augustans them- selves were taken as the inapproachable models of Roman verse.

We have hitherto spoken of classical versification as it was regarded by those whom, without offence, we may describe as pedants. But there is precious evidence of the mode in which metre was regarded by poets, and by one of the greatest artists of antiquity. In his Art of Poetry Horace has been speaking of the need of method in composition — " tantum series juncturaque pollet " — and this reminds him that he has said nothing of the art of verse. The succeeding twenty-four lines contain all that this great poet thought it needful to supply on the subject with which Alexandrian grammarians could fill as many volumes. Although he is actually writing in dactylic hexameters, he does not mention this form of

verse; he is chiefly occupied in describing, rather unscientifically, the iambic trimeter, and in praising the iamb, pes citus. He applauds, still somewhat vaguely, the stately versification of the precursors, Ennius and Accius, and blames the immodulata poemata of careless modern writers, whose laxity is condoned by popular ignorance. The only way to escape such faults is to study the Greeks by night and by day, but Horace evidently means by his exemplaria Graeca, not the scholiasts with their lists of metres and their laborious rules, but the old poets with their fine raptures. On Italian ground he points to Plautus, and laments that the Romans of his own day, fascinated by softer cadences, have lost their veneration for the vigorous beauty of the Plautinos numeros. And Horace closes with a queer suggestion, which may be taken as we please, that a poet in an age of flagging inspiration must trust to his fingers as well as his ears.

Modern Versification. — The main distinction between classical and modern versification consists in the negligence shown by the moderns to quantity, which is defined as the length or short- ness of the sound of syllables, as determined by the time required to pronounce them. This dimension of sound was rigid in the case of Greek and Latin poetry, until, in what is known as the

Middle Greek period, there came in a general tendency to relax the exact value of sounds and syllables, and to introduce accent, which is a measure of quality rather than of quantity. A syllable, in modern verse, is heavy or light, according as it is accented or unaccented — that is to say, according as it receives stress from the voice or not. In the word " tulip,"

for instance, the syllables are of equal length, but the accent is′ strongly upon the first. It is mainly a question of force with us, not of time as with the ancients. There is, however, an element of quantity in modern verse, as there was of accent in ancient verse. The foot, in modern verse, takes a less prominent place in itself than it did in Greece, and is regarded more in relation to the whole line of which it makes a part. A mere counting of syllables is useless. In Milton′s

″ From haunted spring and dale, Edg′d with poplar pale,″

an ancient scholiast would have found it impossible to discover any harmony, for he would have had no means of measuring the value of the heavy accent on ″ edg′d,″ followed by a pause, and would have demanded another syllable in the second line to turn the whole into verse. The first poet to whom it occurred that it was needless to attach such predominant importance to quantity was Gregory of Nazianzen (d. 389), a Christian bishop of the Greek Church. In two important poems by Gregory all prosodical discipline is found to have disappeared, and the rule of verse has come to be accentual, with a heavy stress on the penultimate syllable. About the same time, the Greek fabulist Babrius employed a choliambic metre having a strong accent on the penultimate. The poets of the transition loved to cultivate a loose iambic trimeter in twelve syllables, and shorter octo- syllabic forms called ″ anacreontic,″ although they were far enough from repeating the splendid effects of Anacreon. In these the old laws of quantity were more and more generally superseded by stress, and in all this we may see the dawn of the free accentual versification of modern Europe.

Romance Languages.— The prosodies of Provence, France, Italy and Spain were derived from the

decayed and simplified forms of Latin verse by a slow and sometimes almost intangible transition. In these modern metres, however, when they came to be independent, it was found that all syllables in the line were of equal value, and that the sole criterion of measure was the number of these in each case. The relics of ancient versi- fication, deprived of all the regulated principles of rhythmical art, received in return the ornament of obligatory and difficult rhyme, without which the weak rhythm itself would practically have disappeared. A new species of rhythm, depending on the varieties of mood, was introduced, and stanzaic forms of great elaboration and beauty were invented. The earliest standard work which exhibits in full the definitions of Romance versi- fication is the Leys a" Amors of an unknown Provencal gram- marian, written in 1356. 1 Another medieval treatise of great importance is the De Vulgari Eloquentia, written by Dante in 1304. There is this difference between these two works, that the former, written long after the flourishing period of the troubadours, analyses what has been accomplished in the past, while the other, standing at the starting-point of Italian poetry, describes what has to be done in the future. Both of these authorities quote the ten-syllable line of five equal feet as most to be admired and as forming the basis of poetry. But the octosyllabic, almost in the earliest times, became a main favourite with the poets, and may be said to be the most fre- quently used of all lyrical measures in medieval Romance poetry. The earliest specimen of all, however, a mere refrain excepted, is the fragment of the Provencal " Boethius," and this is decasyllabic, like all French poems of the Charlemagne cycle. The typical French heroic verse, the alexandrine of six feet, is not found in the old epic poetry. In Provencal and early French the position of the caesura in each line was fixed by strict rules; in Italian

these were relaxed. Dante gives very minute, although somewhat obscure, accounts of the essence and invention of stanzaic form (cobla in Provencal), in which 1 But see the article Provencal Literature.

the Romance poetries excelled from the first. The stanza was a group of lines formed on a regular and recurrent arrangement of rhymes. It was natural that the poets of Provence should carry to an extreme the invention of stanzaic forms, for their language was extravagantly rich in rhymes. They invented complicated poetic structures of stanza within stanza, and the canzo as written by the great troubadours is a marvel of in- genuity such as could scarcely be repeated in any other language. The extreme fulness and elaboration of the Provencal poets, however, has been serviceable as placing a very high ideal of structural skill before the poets of all succeeding times, and it was of immense value in directing the experiments of the earliest poet-artists of Italy and France.

In French poetry, successive masters corrected the national versification and drew closer round it the network of rules and principles. The alexandrine was invented in the 12th century, as a counterpart to the hexameter of the ancients, by Alexander de Bernay. A great part is played in French metre by masculine and feminine verse: the former is a verse which closes with a letter which is not e mute; the latter a verse which closes with e mute, or with e mule followed by s, or by the consonants nt. Masculine rhyme is that which combines two masculine verses, and feminine that which unites two feminine verses; and in regular verse such couplets must be alternated. Elision is the rule by which, in the scansion of a verse, the letter e at the end of a word is suppressed when it immediately precedes e mute or a non-aspirated h. These and other immutable rules were laid down by Malherbe, and by

Boileau in his Art Poitique (1674), and for more than a century they were implicitly followed by all writers of verse. It was the genius of Victor Hugo which first enfranchised the prosody of France, not by rebelling against the rules, but by widening their scope in all directions, and by asserting that, in spite of its limitations, French verse was a living thing. The richness of Hugo's rhymes is proverbial, and the boldness and flow of his alexandrines exceeded everything which had been so much as dreamed of before his time. The revolution he brought about proved universal, and disciples like Theophile Gautier could, say, in the face of the critics and grammarians of the classic school, " If we suspected that Victor Hugo had written a single bad verse, we should not dare to admit it to ourselves, in a cellar, without a candle." Boileau and Hugo, therefore, have been the two lawgivers of the French Parnassus. The rules of French verse being, in fact, very severe, and weakness, excess of audacity and negligences of all sorts being very harshly repressed, it is not surprising that, as the personal authority of Hugo declined, various projects were started for lightening the burden of prosodical discipline. Since 1880 those projects have been numerous, and a great many poets of genuine inspiration have written in different forms of what is called " free verse."

Teutonic. — In very early times the inhabitants of the Ger- manic countries developed a prosodical system which owed nothing whatever to classical sources. The finest examples of this Teutonic verse are found in Icelandic and in Anglo- Saxon. The line consisted of two sections, each containing two strongly stressed syllables, and of these four long syllables three were alliterated. It is plain that there can be detected in ancient Teutonic verse but three severe and consistent rules, viz. that the section, the strong accentuation, and above

all the alliteration must be preserved. We find this to be the case in High and Low German, Icelandic, Anglo-Saxon, and in the revived alliterative English poetry of the 14th century, such as " Piers Plowman." There are differences, however, which depend on such facts as that the Icelandic poems are mainly lyrical and the Anglo-Saxon epics are narrative. As time wei;t on, under the pressure of south European practice, alliteration ceased to be regarded as the sole and sufficient ornament of Teutonic verse, and rhyme was occasionally used, but this was a concession which proved fatal to the type. With this use of rhyme, the High German poetry begins to cease, while England becomes the centre of

Teutonic metrical composition. In Icelandic poetry there was a highly artificial verse-system known as court-verse (drdUkvaeU), which consisted of alliterative groups of two lines each, arranged in staves of eight lines. When we consider primitive Teutonic verse closely, we see that it did no,t begin with any conscious art, but, as Vigfussen has said, " was simply excited and emphatic prose " uttered with the repetition of catchwords and letters. The use of these was presently regulated. Alliteration of stressed ropt-syllables formed the basis of Teutonic verse, as quantity had formed the basis of Greek verse. A study of the " Heliand " and the " Lay of Hildebrand " in Old German, of the " Atli " and " Harbard " lays in Icelandic, and of the writings attributed to Beowulf, Caedmon and Cynewulf in Anglo-Saxon, will show the general unity and the local divergences of this class of verse.

English Metre. — The first writer in whom there has been discovered a distinct rebellion against the methods of Anglo- Saxon

versification is St Godric, who died in 1170. Only three brief fragments of his poetry have been preserved, but there is no doubt that they show, for the first time, a regular composition in feet. A quotation will show the value of St Godric 's invention: —

" Sainte | Nicholaes, | Godes | druth, Tymbre us | faire | scone | hus, At thy I burth,] at thy | bare, Sainte | Nicholaes, | bring uswel thare."

From this difficult stanza down to the metres of modern English the transition seems gradual and direct, while the tradition of Anglo-Saxon alliterative prosody is abruptly broken. The fragments of St Godric appear to be independent of one another, and therefore indicate that the division of lines into feet is not accidental. They are much less dubious, and more firm as the basis of an hypothesis, than the famous quatrain 1 about the singing of the monks of Ely, which is perhaps a little earlier in date than the fragments of St Godric. This has much picturesque beauty, but if it is carefully examined the actual scheme of it as metre seems to evade detection. The Ely singer warbled, not knowing what he sang, but St Godric knew perfectly well, and must have been a deliberate innovator. There is still more definition of feet in the Poema Morale, printed by Dr Morris, which is supposed to date from about 1200. In longer pieces, and particularly in the Ormulum, and in the Brut of Layamon, which belong to the early part of the 13th century, we find, on the whole, less definite abandonment of the Anglo-Saxon system of prosody, but nevertheless a prominence given both to rhyme and to rhythm. In Layamon, particularly, the recognition of a recurrent verse of four accents is unquestionable. The place of this poet in the history of prosody is very carefully noted by Guest, who remarks that in Anglo-Saxon verse, the syllables which take the alliteration are always accented, while in the later metres,

where alliteration was combined with rhyme, the former is often thrown upon ian unaccented syllable. ″ Layamon appears to take a middle course. It would seem he gave accents both to his rhyming and his alliterative syllables; but the former were often obliged to content themselves with a false accent.″ An advance was made about fifty years later in Genesis and Exodus, a poem published by Professor Skeat, which has such great value in the proof it gives of the extension of verbal melody, that Saintsbury lias said that ″ it contains more of the kernel of English prosody, properly sq called, than any [other] single poem before Spenser.″ The phenomenon which we meet with in all these earliest attempts at purely English verse is the unconscious deter- mination of writers, who had no views about prosody, to follow their national instinct in the direction of grouped feet and rhymes. This is further emphasized in Horn and Havelok, and′ in the smoother octosyllabics of the 14th-century metrical romances, where the rhymes become very frequent, with an

1 Merie suneen 5e muneches binnen Ely, da Cnut cn[in]ing reu 5er by; ″ RoweS, cnifhjtes, noer the land and here we fies muneches sseng.″

occasional short line or bob, to prevent monotony of effect. Few of these romances have much literary value, but their prosodical value is very great, for we see in them the normal movement of English verse becoming fixed to certain principles beyond any possibility of escape : —

″ So fair [he spak-] e him withal, He light- I ed down- | B in | the hall, Bounde I his mare | among | them all, Ana to I the board- | e won.″

This, from Sir Percevale, is, it must be allowed, an unusually correct example; the uncouth 14th-century writers did not commonly

arrive at their effect without much more irregularity and wavering than this, but the design is evident even in their worst examples. Between 12 10 and 1340 not a single English poem of importance is known to have been written in the old alliterative measure of the Anglo-Saxons. But at the latter date there set in a singular reaction in favour of alliteration, a movement which culminated, after producing some beautiful romances, in the satires of Langland. Those writers, and they were many, who preserved foot-scansion and rhyme, during this alliterative reaction, became ever closer students of contemporary French verse, and in the favourite octo-syllabic metre " the uncompromising adoption of the French, or syllabically uniform, system is the first thing noticeable " (Saintsbury). This tendency of Middle English metre culmin- ates in the work of John Gower, which is singularly polished in its rhyming octosyllabics, although unquestionably nerve- less still, and inelastic.

It is, however, to Chaucer that we turn for far greater con- tributions to English verse. He it was who first, with full consciousness of power as an artist, adopted the use of elaborate stanzas, always in following of the French; he it was who first gained freedom of sound by a variation of pause, and by an alternation of trochaic and iambic movement. It is the lack of these arts which keeps Gower and his predecessors so stiff. In particular Chaucer, in his first period, invented rime-royal, a stanzaic form (in seven decasyllabic lines, rhymed a b a b b C c), peculiarly English in character, which was dominant in our literature for more than two hundred years; it was used in the long romance of Troilus and Creseide, where English metre for the first time displays its beauty to the full. The importance of rime-royal is displayed in the fact that its sixth and seventh lines actually form the

decasyllabic couplet, which is commonly held to be a later discovery of Chaucer's, in The Legend of Good Women. This is the heroic verse, in which The Canterbury Tales are mainly composed, and this metre of five accents, with couplet-rhyme, became so powerful in the future history of English poetry that it may almost be taken as the central and most characteristic of our verse-forms, as the alexandrine couplet is in French and Dutch prosody. It seems to have been originally called riding-rhyme, the name by which Gascoigne describes it (1575).

It is impossible here to do more than indicate very briefly those fluctuations which English prosody underwent when the learned and vivid example of Chaucer was withdrawn. The metres of Lydgate and his successors were discordant and feeble; their ears had learned but very incorrectly the lesson of the master. Lydgate, in particular, went back to an earlier type, and showed himself more skilful in the old eight-syllable measure than in the new decasyllable. More interesting to the prosodical student than the work of these or later Chau- cerians is the influence exercised throughout the 1 5th and early 16th centuries by the popular ballads, of which " Chevy Chase " is believed to be the oldest surviving example, while " The Tale of Gamelyn " is the longest. The introduction of the loose, elastic ballad-quatrain, with its melodious tendency to refrain, was a matter of great importance in the metamorphosis of British verse. The degenerate forms employed by the English 1 5th-century poets in attempting more regular prosody were in some measure connected by the greater exactitude of the Scotch writers, particularly of Dunbar, who was by far the most accomplished metrist between Chaucer and Spenser.

But Wyatt (1 503–1 542) was long considered the father of modern English verse, and though we now plainly enough perceive that before his day all the essential discoveries and inventions had been made, he nevertheless deserves great honour as a pioneer. He introduced, from France and Italy, the prosodical principles of the Renaissance— order and coherency, concentration and definition of sound— and that although his own powers in metre were far from being highly developed. He and his more gifted disciple Surrey introduced into English verse the sonnet (not of the pure Italian type, but as a quatorzain with a final couplet) as well as other short lyric forms. To Surrey, moreover, we owe the introduction from Italian of blank verse, the rhymeless metre of five accents, which has taken so prominent a place in subsequent English poetry.

With the heroic couplet, with blank verse, and with a variety of short lyric stanzaic measures, the equipment of British verse might now be said to be complete. For the moment, however, towards the middle of the 16th century, all these excellent metres seemed to be abandoned in favour of an awkward couplet of fourteen feet, which may have had some relation with the French alexandrine. It was always, as Saintsbury says, " a very uncertain and risky metre, settling down with a dangerous acquiescence into doggerel and sing-song." It was to break up this nerveless measure that the remarkable reforms of the close of the century were made, and the discoveries of Wyatt and Surrey were brought, long after their deaths, into general practice. In drama, the doggerel of an earlier age retired before a blank verse, which was at first entirely pedestrian and mechanical, but struck out variety and music in the hands of Marlowe and Shakespeare. But the central magician was Spenser, in whom there arose a master of pure verse whose range and skill were greater than those of any previous

writer of English, and before whom Chaucer himself must withdraw. It is not too much to say that Spenser took all the elements of English verse, as they had existed in more or less timid and undeveloped shape for four centuries, and that he moulded them together into an instrument capable, for the first time, of expressing, or accompanying, every passion, every emotion, every variety of sentiment or instinct, which stirs the human breast. His great work was that of solidification and emanci- pation, but he also created a noble form which bears his name, that Spenserian stanza of nine lines closing with an alexandrine, which lends itself in the hands of great poets, and great poets only, to magnificent narrative effects.

It was at this moment that a final attempt was made to dis- establish the whole scheme of English metre, and to substitute for it unrhymed classic measures. In the year 1579 this heresy was powerful at Cambridge, and a vigorous attempt was made to include Spenser himself among its votaries. It failed, and with this failure it may be said that all the essential questions connected with English poetry were settled.

There is enough to fill a score of volumes in the mode in which the poets from Spenser downwards have employed the laws of English verse, but he was the latest of the legislators who laid down the framework of those laws. It is not possible in this place to enter into such themes as the rise and fall of Elizabethan dramatic blank verse; the perfection of the song and the develop- ment of the sonnet; the extraordinary virtuosity of Milton; the contest between enjambement (which permits the extension of the sentence beyond the limits of the distich) and the couplet as introduced by Waller; the victory of that couplet, and its use from 1670 to 1800; the slow growth of ode, which had been one of Spenser's inventions; the

revivals of pro- sodical taste in the 19th century; the extraordinary advance in freedom of anapaestic movement.

It may generally be remarked in connexion with the very various, copious and often chaotic criticism of English verse, that it has been a misfortune, from the earliest times, that pedantic and chimerical theories have too often invaded the study of metre. They had tended, from the times of the Alex- andrian grammarians down to our own, to treat as a dead thing that vivid and elastic art of poetry whose very essence is its life.

In modern times not a few theorists have allowed themselves to diverge into the most extraordinary chains of musical and even of mathematical conjecture and have been easily led, in the practice of their ingenious learning, to forget that what they are talking about is' the vehicle in which tremulous and ardent thoughts are conveyed to the hearts of men. The poet knows the law by instinct, but he treats it as a living guide; he varies the pause, he manipulates the accent, he gives the vital element of freedom to the verse which he has founded upon discipline. It is extremely doubtful whether any youthful poet wa3 even helped by prosodical instruction; his earliest measures are imitative; he does not compose consciously in " tribrachs " and " iambs "; he would gape in astonishment if asked tq define the " pyrrhichian hypothesis "; his bursts of enthusiasm are not modified by a theory of "trisyllabic equivalence." The old formula of verse, " variety in unity," holds good in all languages, countries and times; the delicate rapture involved in a brilliant combination of rhyme and metre is a matter which is regulated; indeed, on a consideration of the laws of prosody, but depends on other and wider qualities of a moral and an aesthetic order.

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VERSECZ (Ger. Werschetz), a town of Hungary, in the county of Temes, 23s m. S.S.E. of Budapest by rail. Pop. (1900) 25,199. It has a handsome parish church and is the seat of a Greek Orthodox bishop. Versecz is one of the principal wine- producing centres in Hungary, and the red wines and brandy produced here enjoy a great reputation. Near the town are remains of a Roman castle, and a Roman rampart and trench which extend for about 60 m. to the north. During the revolu tionary period of 1848–49 the Hungarians defeated the Servians here on the nth of July 1848, while on the 19th of January 1849 the town was occupied by the Austrian troops.*

VERTEBRATA, a large branch of the animal kingdom, of which the characteristic members are mammals, birds, reptiles, batrachians, fish and cyclostomes, the craniate vertebrates of modern zoology. These include all the animals which possess ″ vertebrae,″ pieces of bone or

cartilage jointed to form a "backbone" or spinal column (see Spinal Cord), although in some of the lower members of the group the segmentation of the spinal column is imperfect. That such animals formed a natural group was understood from the earliest times. Aristotle placed them together as " Enaima," or sanguineous animals, distinguishing them from the " Anaima," which he believed to be bloodless. Later it was discovered that the so-called blood- less animals contained uncoloured blood, and the vertebrates were distinguished as red-blooded, until G. L. C. F. D. Cuvier showed the existence of red blood in some other animals. C. Linnaeus made Mammalia, Aves, Amphibia and Pisces the first four classes of the animal kingdom, but suggested no cor-porate name for them. In 1788 A. J. G. K. Batsch united them into a great division, for which he proposed the name " Knoch- enthiere," bony animals. J. B. P. Lamarck carried the idea further, and first clearly recognized the importance of the vertebral column in classification; to him is due the division of the animal kingdom into Vertebrata, which included all the craniate vertebrates, and Invertebrata, which included all other animals. These names and the dichotomy they imply have persisted from their convenience, although zoological science has come to recognize that the groups are not morphologically

equivalent and that the division is not logical. Cuvier showed that there were four groups in the animal kingdom, each corre-sponding to a definite type or plan of structure, and that craniate vertebrates composed only one of these groups, in-vertebrates including three. In the progress of zoology it has become clear that the coelomate animals fall into a very large number of

distinct groups or types, and that the vertebrates are only one class amongst many morphologically distinct classes. It has been shown further that amongst the animals that Lamarck would have placed in the Invertebrata there are several which, although devoid of vertebrae or cranium, must be associated with vertebrates in any natural system. Closer investigation of the anatomy and embryology of the craniate vertebrates showed that the possession of a jointed vertebral column was not a fundamental characteristic of the group. In some creatures, such as sturgeons and lampreys, the position of the jointed vertebral column is occupied by an unjointed rod, the so-called notochord, whilst all the Vertebrata pass through an embryonic stage in which a similar elastic unjointed notochord exists as the precursor of the jointed column. It was further found that all the vertebrates of Lamarck displayed either in the embryonic condition alone, or both in embryonic and adult conditions, a set of passages leading from the anterior- lateral portion of the body into the cavity of the pharynx, and known as gill-slits, because in those creatures in which they become functional for aquatic respiration they lodge the gills or branchial tufts. Further, it was found that in all verte- brates the great central mass of the nervous system, known as the brain and spinal cord, is in reality a hollow tube with more or less thickened walls, developed as a strand of tissue along the dorsal surface of the embryo, which sinks downwards and inwards to form a hollow tube lying dorsal to the notochord.

In 1866 A. Kowalewsky, in a memoir that is one of the classics of vertebrate morphology, worked out the development of Amphioxus, then recognized as the simplest of the vertebrate group, and compared it with the development of an Ascidian, one of a group then termed Tunicate Mollusca, and showed that the latter

creature, in its larval stage, possessed, like Amphioxus, a notochord, gill-slits and a hollow dorsally placed nerve-tube. In 1877 E. Ray Lankester published a classifica- tion of the animal kingdom in which he definitely associated all the Tunicates with the vertebrates, and subdivided Verte- brata as follows: Branch A., Urochorda, which contained the Tunicates and was characterized by the limitation of the notochord to the caudal region; Branch B., Cephalochorda, containing Amphioxus, in which the notochord extended from the extreme tip of the tail to that of the snout; Branch C, Craniata, containing the Cyclostomes, Pisces, Batrachia, Reptilia, Aves and Mammalia, in which the anterior extremity of the notochord ended in the base of a cranium. Later, F. M. Balfour adopted the system of Lankester, but proposed to replace the term Vertebrata, which was anatomically mis- leading, by the new term Chordata, as the latter term laid stress on the existence of the notochord as the fundamental character of the group. A. Kowalewsky had shown as early as 1866 that the marine worm Balanoglossus, described by Delia Chiaje at the end of the 18th century, possessed a set of gill- slits similar to those of Amphioxus and Tunicates. From 1884 to 1886 W. Bateson published a series of studies in which he suggested that there was present in Balanoglossus a representa- tive of the notochord, and that a portion at least of its nervous system was a hollow, dorsally placed tube. On these grounds, coupled with the presence of gill-slits, he proposed to add yet a lower branch to the Chordata, to include Balanoglossus and to be termed Hemichorda, but neither Bateson nor zoologists who have written since have accepted the vertebrate affinities of Balanoglossus with complete confidence. Still more diffidently, S. F. Harmer and others have suggested that Cephalodiscus and Phoronis, still more lowly marine invertebrates, have claims to be associated with the Chordata.

It may be accepted definitely that Amphioxus and the Tuni- cates must be associated with the craniate vertebrates of Lamarck.

With regard to the terms Vertebrata and Chordata, usage stiil differs. Those who wish to make the names of the larger groups significant labels prefer the term Chordata, and on the whole seem to be prevailing, but there remain many zoologists who prefer the designation with historical associations, and regaid it as immaterial if, in the advance of knowledge, the connotation may have been so changed that the term has become conven- tional rather than verbally significant.

The characters and affinities of the lower groups that have been included under Chordata are discussed in the articles Hemichorda, Balanoglossus, Phoronidea, Pterobranchia, Tunicata and Amphioxus, so that it is necessary here to deal only with the general characters of the Chordata or Verte- brata Craniata, and to consider the views that have been advanced with regard to the origin of vertebrates.

The Vertebrata Craniata share with the Cephalochordata the fundamental characters of the group Chordata. They are bilater- ally symmetrical animals with a well-marked metameric segmenta- tion of the muscles and muscle septa, with a gut opening by an anterior ventral mouth, with lateral gill-slits in the embryo or adult, and with a ventro-posterior anus; with a dorsal tubular central nervous system, under which lies in the embryo or adult an unsegmented notochord of endodermal origin; with the body prolonged posteriorly to the anus to form a metamerically segmented tail containing notochord, nervous system and muscles; with a spacious coelomic cavity and separate blood-vascular system. They differ from the Cephalochordata in the extreme cephalization of the anterior segments of the body, including the formation of an enlarged

brain with paired sense organs, the nose, eyes and auditory apparatus, and the formation of a cranium, and in the structure 01 the skeleton, heart, liver and organs of excretion and reproduction.

Evidence points to the origin of the Cephalochordata and the Craniata from a common ancestor in which metameric segmenta- tion of the mesoblast and the nervous system was complete and regular. This condition has been retained by Amphioxus, but in the Craniata has been much modified. The lateral mesoblastic plates with their contained coelom are unsegmented in craniates, although traces of the primitive segmentation are visible in the development of Cyclostomes. The dorsal mesoblastic somites with the segmental musculature derived from them retain the segmental condition in Amphioxus and in the trunk region of craniates, but in the head region of the latter there has taken place a fusion or cephalization more pronounced in the higher forms, where the head is distinct from the trunk, than in lower forms where the head passes gradually into the trunk. The exact number of somites which have been cephalized is difficult to estimate, and certainly varies in different cases, but it appears to be certain that three, immediately anterior to the otic region, have been transformed into the optic muscles. Those behind the otic region (metaotic somites) vary from nine to eleven, and in Cyclostomes give rise to segmental muscles in series with those of the trunk. In true fish and higher Craniates the anterior one or two of these metaotic somites practically disappear, whilst of the remainder none form complete segmental muscles, but various portions of them give rise to muscles associated with the branchial apparatus (epibranchial and hypobranchial), the dorsal portions fading, away. In other words, the metameric series continued from the trunk to the anterior end of

the body in the ancestral form, retained by the Cephalochorda, and of which traces remain in the development of the Craniata, has been modified in the adult Craniata by the suppression of certain portions and the specialization of other portions to form an unsegmented structure. The process of cephalization, with, however, less complete destruction of the segmental arrangement, has also affected the anterior nerves of Craniata and brought about the distinction between cranial and spinal nerves which is a feature of the Craniates. The ancestral form must be supposed to have given off from its central nervous system lateral nerves segmentally arranged in pairs. Each member of each pair possessed two roots, a dorsal and a ventral root, possibly remaining separate, as in the Cephalochordata and the cranial nerves of Craniata, possibly joining to form a common trunk, as in the spinal nerves of Craniata. The ventral roots consisted of motor fibres passing straight outwards to innervate the segmental muscles derived from the dorsal somites; the dorsal roots took a longer course, arching outwards and round the body to supply the visceral muscles, the mucous membranes, the skin and the sense organs connected with these. It appears, moreover, that the ventral roots remained in strict association with the muscular somites to which they corresponded, and wandered beyond their own segmental areas only with these muscles, whereas the ramifications of the dorsal fibres had a wider range and were less closely bound to segmental regions: Such a primitive condition has been retained by Amphioxus, but in the case of Craniata Only by the spinal nerves. Almost every great anatomist has contributed to working out the history of the cranial nerves, and it would be a hopeless task to make a just allocation of credit for the various

steps which have led to our present knowledge, but the names of C. Gegenbaur, F. M. Balfour, A. M. Marshall, J. W. van Wijhe, N. K. Koltzoff, Miss J. B. Piatt, J. Beard, H. V. Neal and E. S. Goodrich are conspicuous. The Craniates are characterized by the presence of ten pairs of cranial nerves, numbered usually I. to X., from before backwards, with a course and distribution funda- mentally identical throughout the group from the lowest fish to man, whilst in the higher forms an additional eleventh and twelfth pair have been assumed from the trunk or neck. Pairs I. and II. are the nerves of special sense of smell and sight, and in all probability are morphologically distinct from true segmental pairs. Pairs III. to X. represent various portions of primitive segmental pairs, modified in association with the cephalization of the anterior region of the body. III., IV. and VI. innervate the muscles of the eyeball, and represent the ventral roots of the three prootic somites; the dorsal root of the anterior of these three passes to the anterior portion of the head as the so-called nervus ophthalmicus profundus. The V. of human anatomy, the trigeminal, is formed almost entirely from the dorsal root of the nerve of the second prootic somite, whilst the VII. or facialis of human anatomy similarly represents the greater part of the dorsal root of the third prootic somite, whilst the remaining and lesser portion of that root forms the VIII. or auditory nerve of human anatomy. The IX. or glossopharyngeal represents the dorsal root of the first metaotic somite, the ventral root of which persists in Cyclostomes but disappears together with the somite in higher Craniates. The X. or vagus of human anatomy represents the dorsal root of the second metaotic somite. The backward extension of the vagus to supply the regions corresponding to the posterior gill-slits and internal viscera has been interpreted

variously. The explanation at first sight most probable, and that has been advocated by Gegenbaur and many other anatomists, is that the dorsal roots corresponding to a number of somites have fused to form a single system. The ventral roots of the somites in question have a varying fate, being fully represented in the Cyclostomes by nerves to musculature developed from these somites, whilst in the higher forms thay have in great part disappeared. Evidence seems to point to a similar disappearance of the dorsal roots of the branchial somites posterior to the first supplied by the vagus ; but as remnants of them have been traced in the development of the various Craniates, it seems as if the vagus were not in reality a compound nerve, but the extension of the nerve arising from a single dorsal segmental root. Notwithstanding some dubiety in detail, the main proposition remains clear: the cranial nerves of Craniates have arisen, in the course of a process of cephalization, from a primitive set of segmental nerves in series with those of the trunk, by a suppression of certain portions and an expansion and specialization of other portions. The work of a large number of anatomists has shown that the fundamental morphological characters of the cranium and brain, organs in which the Craniates are most clearly marked off from Cephalochordates, are fundamentally alike throughout the group. The original crude theory of L. Oken and the poet Goethe, that the skull was composed of expanded and fused vertebrae, was disproved by T. H. Huxley and Gegenbaur. There can be little doubt, however, that the region behind the inf undibulum, consisting of part of the optic capsules, the anterior extremity of the notochord, the parachordals (tor details as to these see article Skeleton) and the corresponding lateral and dorsal elements with their suspended visceral arches represent at least three cephalic somites, and that the process of cephalization has played an

important part in the formation of the cranium as it has in the case of the nerves and muscles of the head. The region of the cranium anterior to this is probably a forward growth of trie primitive head, produced in association with the development of the organs of smell and sight, and thus is different in kind from the posterior region. But as Amphioxus is obviously degenerate in the region of the head, no source of information exists as to the exact mode in which the development of the head of the ancestral vertebrate took place.

It is still less possible to lay down anything definite as to how far the structure of the brain of Craniates conforms with a theory of origin by a process of cephalization of metameric segments. The minute expansion at the anterior end of the nerve tube of Amphioxus cannot be called a brain, whilst the brain of all the Craniates is identical in morphological type and so complex that it must have behind it a long history of development. The embryonic Craniate brain appears as three dilatations of the neural tube, respectively the posterior or hind-brain, continuous with the spinal cord, the mid-brain and the fore-brain. From the hind-brain there arises the medulla oblongata or myelencephalon behind, and the meten-cephalon in front, the dorsal wall of which gives rise to the cerebellum. The hind-brain is closely similar in structure to the spinal cord, and gives rise to all the" segmental cranial nerves except the pathelicus and motor oculi. The sides of the mid-brain thicken and give rise to the optic lobes; its floor forms the crura cerebri, whilst the oculo- motor and palheticus nerves take origin from it. The fore-brain divides into a posterior thalamencephalon and an anterior telen-cephalon. Thickenings of the floor of the thalamencephalon give rise to the optic thalami; the paired optic lobes grow out from its sides ; the pineal body, which primitively

was a pair of dorsal eyes, grows from the roof and the infundibulum from the floor. The

telencephalon in front grows out secondarily to an extent progressively increasing in the higher groups and forms the corpora striata, the cerebral lobes and the rhinencephalon. The most plausible inter- pretation is that the mid- and hind-brains represent a cephalized continuation of the spinal cord, probably originally metamerically segmented, whilst the fore brain has been developed primitively in association with the organs of smell and hearing, and secondarily in connexion with the increasing elaboration of the higher functions of the brain and the development of the association centres of which the cerebrum is the seat.

The details of the structure and development of the sense-organs, gill-slits and visceral organs of Craniates are sufficiently discussed in the articles dealing with the separate classes of the group. It is necessary to refer, however, to new light thrown on the structure and morphology of the renal excretory organs due chiefly to the investigations of Goodrich. The excretory organs of the vast majority of invertebrate coelomate animals are essentially what are known as nephridia. Nephridia in their simplest form are excretory tubules growing from the exterior inwards, and removing from the surrounding tissues or blood vessels waste matter which they discharge to the exterior. In many cases these tubules acquire secondary openings to the coelom, termed nephrostomes and serving to remove waste matter from that space. Finally, in metamerically segmented invertebrates the nephridia frequently appear in seg- mentally disposed pairs. Gegenbaur, C. Semper, B. Hatschek, and many other anatomists have compared the kidneys of Craniates with nephridia, supposing the segmental tubules with their coelomic apertures to represent nephridia, which, instead of discharging directly to the exterior by pores in the segments in which they are situated, have come to discharge at each side into a longitudinal common duct with a posterior aperture. The excretory system of Amphioxus undoubtedly consists of true nephridia, morphologically identical with those of the invertebrate coelomates. The latter, however, may also possess a different set of organs, also frequently appearing as segmentally arranged tubules. These are the genital funnels which develop outwards from the coelom, and serve for the discharge of the genital products. It is with the latter that the segmental tubules of the Craniata are to be compared, and the possession of a different type of excretory organ is one of the most vital distinctions

between the Craniata and the Cephalochordata.

Origin of the Vertebrata. — The recorded fossil history carries us backwards with comparative ease from the highest mammals to the lowest members of the Craniates. Remains of the latter, abundant in the palaeozoic rocks, were undoubtedly true Craniates, allied with the Cyclostomes and the lower fishes, but showing no more than superficial and dubious resemblances to the members of any other group. We have to rely upon general inferences which lead to much ingenious argument and little certain result. The Craniates can be traced back to fishes not unlike the modern shark or dogfish with little dubiety. The Cyclostomes, although true Craniates, present an obviously simpler type of structure: the head is less cephalized and therefore less distinct from the trunk; lower jaw, true teeth and dermal armature are absent, whilst there are other simplifications in the structural type- Very general assent could be obtained for the proposition that one stage in the ancestry of the Vertebrates must have been not unlike a simplified Cyclostome, a bilaterally symmetrical coelomic animal, elongated and fish-like in shape, but without paired limbs, with a smooth, soft skin, a ventral mouth without teeth or lower jaw and probably surrounded by labial palps, with lateral gill-slits and a ventru- posterior anus; with an unsegmented notochord and a dorsal tubular nerve cord. The brain, however, must have been expanded, and there must have been paired organs of smell, two lateral eyes and probably two dorsal eyes, and a large paired auditory apparatus. The mesoblastic system of muscles and fibrous skeleton was highly and regularly segmented, but in the anterior region cephalization had proceeded to a considerable extent. The resemblances between such a creature and Amphioxus are so close that they cannot be dismissed. Amphioxus no doubc is

specialized in many respects, and probably degenerate in others, just as, if we go to the other pole of the Craniates, we know that although the Anthropoid Apes are the nearest living representatives of the ancestor of man, they are specialized in many respects and almost certainly degenerate in other respects. If we carry those processes of progressive change by which the Cyclostome type has passed into the low fish type, and the low fish type into the higher Craniate type, backwards towards Amphioxus we reach the conception of an ancestral creature essentially a Cephalochordate, differing no doubt from Amphioxus in various details, as one member of a group differs from another, but specially marked by the possession of better developed cranial sense organs and by the presence of a coelomostomic instead of a nephridial excretory system. Paired sense organs of an elaborate character have arisen in many groups, and there seems to be no special difficulty in supposing that those characteristic of Craniates have arisen independently in that group, Amphioxus, although in that respect partly degenerate, being degenerate from a stage in which the cephalic sense organs were extremely simple. The different type of excretory system presents even less theoretical difficulty, as both types of segmental funnel exist amongst Invertebrates and

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may even be present in the same animal. If we follow the process of progressive change still further back, we reach a stage in which cephalization had practically disappeared, and where even meta- meric segmentation was in a much less advanced condition. The tadpoles of Ascidians, and still more remotely Balanoglossus, although still less than Ampkioxus to be regarded as actual ancestral

verte- brate types, give images of some of the many phases in which the ancestral type may have been exhibited. It is needless to say that the creatures exhibiting such a stage in the ancestry of the Verte- brates would have formed simply one in the vast series of marine coelomate types which the anatomy of the Invertebrates shows us to have existed. Its distinguishing features would have been the presence of gill-slits, of the skeletal rod, known as the notochord, and of the dorsal tubular nervous system. We cannot make even profitable guesses as to the exact conditions under which these features, or the corresponding features of other coelomate types, arose in the kaleidoscopic differentiation of form, but consideration of the general morphology of the nervous system enables us to see the Chordate ancestor in its true perspective amongst other coelomic groups. In the Coelentera the nervous system appears as a diffused layer of cells and fibres, underlying, and in close connexion with, the epidermis. This diffused layer may thicken in special regions, forming rings round apertures, radial bands and so forth, whilst in the intervening areas it disappears. In the different groups of Coelomates specialized bands and strands have formed in this way from a primitive diffuse system, giving rise to the nervous patterns distinctive of the various groups, whilst a second process, that of inward migration from the epidermis, produces further changes. In the Turbellaria there have been formed two ventro- lateral cords with variously placed anastamoses; in the Trematodes, two ventral, two lateral and two dorsal cords with variously placed anastomoses, and in the Cestodes two lateral and in some cases one dorsal cord. In the Nemertea the primitive continuous sub- epidermal sheath is retained with two lateral and sometimes one dorsal thickening. In the Nematodes there are one dorsal, one ventral and at each side two*

lateral thickenings, sometimes separated cords, sometimes mere sub-epidermal bands, whilst the traces of a circum-oesophageal ring may be regarded as another specialization of the primitive complete sheath. In Balanoglossus there is a continuous sheath with a dorsal and ventral band, the latter in certain regions showing traces of a tubular structure. In Annelids and Arthropods there are two ventral bands tending to unite in the median ventral line, and a circum-oesophageal collar. In the Chor- dates there is a continuous dorsal band, which secondarily migrates inwards and becomes tubular. In almost any of these types, as the individual becomes more integrated, there is a tendency for the nervous matter of the specialized areas to become still further massed; and in bilaterally symmetrical animals with forward pro- gression and the beginning of cephalization a specially important mass forms something comparable with a brain in special relation with the sense organs of the primitive head. If the problem of vertebrate origin be considered from the wide point of view of comparative anatomy, it becomes no more difficult nor remarkable than the differentiation of any other type amongst simple, marine, unsegmented, or little segmented, wormlike creatures. It is obvious, however, that such a theory of origin cannot expect confirmation from the geological record, as it supposes a differentiation of the main chordate characters in a stage too simple to leave fossil remains. Reference must be made, however, to definite theories of the origin of Vertebrates which have been successively urged by ana- tomists. A. Dohrn, if not the inventor, was the most ingenious advocate of the Annelid theory. He recognized the fundamental importance of segmentation in vertebrate structure and sought for a highly segmented ancestor. Partly influenced by Ray Lankester's studies on degeneration, he held that the apparently simplest living members of a group

may give misleading clues with respect to the ancestral line, and he devoted much brilliant anatomical and embryological work to develop the thesis that Ampkioxus and the Tunicates were degenerate offshoots from a higher verte- brate stock. He took a Chaetopod worm as the closest living re- presentative of the stock of all segmented animals, and in particular of the Vertebrates, laying stress on the segmentation, the large coelom, the segmental excretory tubules, the vascular system with red blood, the segmentally disposed branchiae, the lateral organs of locomotion, and the tendency to form a distinct head. The chief difficulty was the nervous system, and this he explained by accepting an idea propounded many years before by De Blainville, that the dorsal surface of Vertebrates was homologous with the ventral surface of Annelids and Arthropods. He assumed that the ances- tral type was a marine creature in which reversal of surface was of little physiological moment. He supposed that a new mouth had been formed, probably by a coalescence of a pair of gill-slits on what was to be the ventral surface of the vertebrate, and that the old invertebrate mouth with the downward turn of the anterior end of the alimentary canal, between the diverging ends of the ventral nerve cords, was to be sought for in the roof of the vertebrate brain, possibly the pineal body. Dohrn's theory has failed to find acceptance for many reasons, of which the chief are the difficulty as to reversal of surfaces, the knowledge that segmentation occurs independently in

many groups of animals and in different organs, greater knowledge of the vascular, excretory and nervous systems, and in par ticular the discovery that the pineal body was a degenerate eye. F. M. Balfour from the first refused to accept Dohrn's theory and suggested that the dorsal position of the nerve Cord in Vertebrates could be accounted for by supposing

that the primitive condition was a lateral cord at each side such as were then known to occur in Nemertines, and that these cords had fused dorsally in Vertebrates, ventrally in Annelids. A. A. W. Hubrecht soon afterwards dis- covered the existence of a continuous nerve sheath in Nemertines, and he and Ray Lankester suggested a Nemertine origin for Verte- brates, and homologized the notochord with the proboscis sheath, Ray Lankester, in particular, pointing out that the tubular condition of the vertebrate nervous system was. secondary, that it consisted essentially of a dorsal band, which sank inwards, and that the canal might have been at first an epidermal water canal. These authors were emphatic in laying stress on the view that no actual Nemertine could be supposed to represent the vertebrate ancestor, but that the Nemertines were to be taken merely as showing the kind of material out of which the vertebrate structure, and in particular the vertebrate nervous system, might have arisen. The view adopted in this article as given above, is in reality an extension of the Hubrecht-Lankester theory.

The theory of vertebrate origin that has been most elaborately expounded is W. H. Gaskell's hypothesis that they are descended from Arthropods. Gaskell accepts Dohrn's view of the importance of segmentation and of the degeneracy of Amphioxus and Tunicates, but rejects the conception of a reversal of surfaces. He takes the larval stage of a Cyclostome as the most generalized living repre- sentative of the essential vertebrate type, and selects Limulus, the kingcrab, in a very general way, as the closest living representative of such an Arthropod type as might have been the vertebrate ancestor. The starting-point of Gaskell's theory is the conception of the vertebrate nervous system as a band of nervous tissue which immediately underlies and gradually grows up round a

distinct epidermal tube, the tube which forms the vesicles of the brain and the central canal of the spinal cord. Ray Lankester had already applied this to the Nemertine theory, but Gaskell urges that it affords an immediate comparison with Arthropod structures. The ventral mouth of Limulus leads vertically upwards through a ring of nervous tissue, the circumoesophageal commissure, into an expanded stomach, and from this the digestive tube runs back to theanus immediately dorsal to the ventral nerve chain. For Gaskell the infundibulum is the Arthropod oesophagus, the ventricles of the brain are the stomach, and the spinal canal leading back to fuse "with the anus at the neurenteric canal is the Arthropod digestive tract. In the Vertebrate a new digestive tract has been formed, probably from a structure corresponding to the branchial chamber of Arthropods. The lateral halves of the ventral nervous system of the Arthropod, where they diverge on either side of the oesophagus, represent the crura cerebri of Vertebrates, whilst the supra-oesophageal ganglia represent the fore-brain. Gaskell has instituted an elaborate com- parison, extending to very minute details of structure, and finds remarkable analogies between the organs of Arthropods and structures in the Vertebrates. From the palaeontological side, he points out that at the time when the earliest known Craniates were abundant, large Arthropods, essentially like Limulus, were also abundant. He thinks it probable that Vertebrates arose from a dominant invertebrate group, and points to many resemblances in detail between the Silurian Arthropods Palaeostraca and the Craniate Ostracoderms of the same horizon.

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VERTICAL (from Lat. vertex, highest paint), the direction of the line of action of gravity, as determined by the plumb- line. The angle of the vertical is the angle between the direction of the plumb-line and that of the earth's centre (see Earth, Figure of the).

VERTUE, GEORGE (1684-1756), English engraver and anti- quary, was born in St Martin's-in-the-Fields, London, in 1684. At the age of thirteen he was apprenticed to an heraldic engraver, a Frenchman, who failed in three or four years. Vertue then studied drawing at home, and afterwards worked for seven years as an engraver under Michael Vandergucht. He was patronized by Sir Godfrey Kneller, and was one of the first members of the Academy of Painting which that artist instituted in 171 1. His plate of Archbishop Tillotson, after Kneller, com- missioned by Lord Somers, established his reputation as an engraver; and he was soon in an'excellent practice, engraving portraits after Dahl, Richardson, Jervas and Gibson. In portraiture alone he executed over five hundred plates. In 171 7 he was appointed engraver to the Society of Antiquaries, and his burin was employed upon many interesting statues, tombs, portraits and other subjects of an antiquarian nature. He died on the 24th of July 1756, and was buried in the cloisters of Westminster Abbey.

From the year 171 3 Vertue had been indefatigable in his researches on all matters connected with the history of British art, and had accumulated about forty volumes of memoranda on the subject. These were purchased

by Horace Walpole, and form the basis of that author's Anecdotes of Painting in England, including an account of Vertue's life and a catalogue of his engravings. Vertue's own literary works include On Holbein and Gerard's Pictures (1740); Medals, Coins, Great Seals, Impressions, from the Elaborate Works of Thomas Simon (1753); Catalogue and Description of King Charles the First's Capital Collection of Pictures, Limnings, Statues, &c. (1757); Catalogue of the Collection of Pictures belonging to King James II., to which is added a Catalogue of Pictures and Drawings in the Closet of Queen Caroline (1758); Catalogue of the Curious Collection of Pictures of George Villiers, Duke of Buckingham (1758); Description of the Works of that Ingenious Delineator and Engraver, W. Hollar (i745)–

VERTUMNUS (or Vortumnus, "turning," "changing"), in Roman mythology, the god of the changing year with its seasons, flowers and fruits, probably of Italian origin. Like Proteus, he had the power of assuming any shape he pleased, which enabled him to win the love of Pomona (q.v.). His shrine and statue (see the well-known description in Propertius iv. 2) were in the Vicus Tuscus, and from his connexion with this busy street he was regarded as having a special interest in trade and barter. At another sanctuary on the slope of the Aventine, sacrifice was offered to him every year on the 13th of August. It is probable that he was of Etruscan origin (see Wissowa, Religion und Kultus der RSmer, 1902, p. 233).

VERULAMIUM, a Romano-British town situated in the terri- tory of the Catuvellauni, close to the modern St Albans (Hert- fordshire). Before the Roman conquest it was probably a native capital: afterwards it received the dignity of a municipium (implying municipal status and Roman citizenship). Tacitus tells us that the town was burnt by Boadicea in a.d. 61, but it

again rose to prosperity. Its site is still easily recognizable. Its walls of flint rubble survive in stately fragments, and en- close an area of 200 acres. Of the internal buildings little is known. A theatre was excavated in 1847, and parts of the forum were opened by Mr William Page in 1898; both indicate a civilized and cultivated town. The complete uncovering of the site was planned in 1910. (F. J. H.)

VERVET, a Central and South African monkey, known as Cercopitkecus pygerylhrus. It is nearly allied to the grivet (q.v.), but distinguished (as indicated by its name) by the

presence of a rusty patch at the root of the tail; and by the black (instead of grey) chin, hands and feet.

VERVIERS, a town of Belgium, in the province of Liege, not far from the Prussian frontier, and on the main line from Liege to Aix-la-Chapelle and Cologne. Pop. (1004) 49,168. It is a modern town owing its prosperity to the cloth trade which began here in the 18th century. It is situated on the Vesdre, which flows into the Ourthe a few miles before its junction with the Meuse; and the water of that river is supposed to be especi- ally good for dyeing purposes. As the river water was insufficient to maintain the local industry an artificial reservoir was con- structed at La Gileppe on the Hautes Fagnes, and an imposing aqueduct conveys the water stored on these highlands into Verviers. There are also extensive glass factories, but these have suffered from German competition, and many have been closed. A monument to a local celebrity named Chapuis - is interesting for the reason that his execution by order of the prince-bishop of Liege was the last act of sovereignty taken by that prelate.

VESICA PISCIS (Fr. amande mystique), in architecture, the term given to a pointed oval panel formed by two equal circles cutting each

other in their centres; this is a common form given to a panel in which the figure of Christ is represented. It is commonly employed in medieval seals, and especially those Of bishops and monastic establishments.

VESOUL, a town of eastern France, capital of the department of Haute-Saone, 236 m. E.S.E. of Paris on the Eastern railway to Belfort. Pop. (1906) 8702. Vesoul is. situated between the isolated conical hill of La Motte (1263 ft.) and the river Durgeon. The vine-clad hill, from which there is a fine view of the Jura and Vosges mountains, is crowned by a votive chapel which in 1855 replaced the old fortification. The medieval walls of the town, dating from the 13th and 15th centuries, still exist on its northern side, and in the narrow and winding streets are many old buildings. The church of St George dates from the 18th cen tury. In the pleasant south-eastern quarter are the promenade and the Place de la R6publique, with a monument to the Gardes Mobiles who fell in the war of 1870-71. Vesoul is the seat of a prefect, a tribunal of first instance and a court of assize, and has a lycee for boys, training colleges for both sexes, and a branch of the Bank of France. Distilling and the manu- facture of files and tapioca are among the industries. The town is a market for farm- produce and cattle.*

Vesoul (Vesulium Castrum, Visolium, Vesulum) is of ancient origin, but in existing records is first mentioned in the 9th century. It was originally a fief of the church of Besancon, and passed afterwards to the house of Burgundy, becoming, in the 13th century, capital of the bailiwick of Amont. The castle was destroyed in the 17th century. The town suffered much during the wars of religion and the Thirty Years' War. Vesoul be- longed temporarily to France after the death of Charles the Bold, duke of Burgundy; was returned to the empire when Charles VIII., king of France, broke off his

marriage with the daughter of Maximilian, king of the Romans; and again became part of France under Louis XIV. after the peace of Nijmwegen in 1678.

VESPASIAN, in full Titus Flavius Vespasianus, Roman emperor a.d. 70–79, was born on the 18th of November, a.d. 9, in the Sabine country near Reate. His father was a tax- collector and money-lender on a small scale; his mother was the sister of a senator. After having served with the army in Thrace and been quaestor in Crete arid Cyrene, Vespasian rose to be aedile and praetor, having meanwhile married Flavia Domitilla, the daughter of a Roman knight, by whom he had two sons, Titus and Domitian, afterwards emperors. Having already served in Germany, in the years 43 and 44, in the reign of Claudius, he distinguished himself in command of the 2nd legion in Britain under Aulus Plautius. He reduced Veetis (Isle of Wight) and penetrated to the borders of Somersetshire. In 51 he was for a brief space consul; in 63 he went as governor to Africa, where, according to Tacitus (ii: 97), his rule was "infamous and odious "; according to Suetonius (Vesp. 4), "upright and highly honourable." He went with Nero's

suite to Greece, and in 66 was appointed to conduct the war in Judaea, which was threatening general commotion throughout the East, owing to a widely spread notion in those parts that from Judaea were to come the future rulers of the world. Vespasian, who had a strong vein of superstition, was made to believe that he was himself to fulfil this expectation, and all manner of omens and oracles and portents were applied to him. He also found encouragement in Mucianus, the governor of Syria; and although a strict

disciplinarian and reformer of abuses, he had a soldiery thoroughly devoted to him. All eyes in the East were now upon him; Mucianus and the Syrian legions were eager to support him; and on the ist of July 69, while he was at Caesarea, he was proclaimed emperor, first by the army in Egypt, and then by his troops in Judaea. The legions of the East at once took the customary oath of allegiance. Neverthe- less, Vitellius, the occupant of the throne, had on his side the veteran legions of Gaul and Germany, Rome's best troops. But the feeling in Vespasian's favour quickly gathered strength, and the armies of Moesia, Pannonia and Illyricum soon declared for him, and made him in fact master of half of the Roman world. They entered Italy on the north-east under the leadership of Antonius Primus, defeated the army of Vitellius at Bedriacum (or Betriacum), sacked Cremona and advanced on Rome, which they entered after furious fighting and a frightful confusion, in which the Capitol was destroyed by fire. The new emperor received the tidings of his rival's defeat and death at Alexandria, whence he at once forwarded supplies of corn to Rome, which were urgently needed, along with an edict or a declaration of policy, in which he gave assurance of an entire reversal of the laws of Nero, especially those relating to treason. While in Egypt he became more and more imbued with superstition, con- sulting astrologers and allowing himself to be flattered into a belief that he possessed a divine power which could work miracles. Leaving the war in Judaea to his son Titus, he arrived at Rome in 70. He at once devoted his energies to repairing the evils caused by civil war. He restored discipline in the army, which under Vitellius had become utterly demoralized, and, with the co-operation of the senate, put the government and the finances on a sound footing. He renewed old taxes and instituted new, increased the tribute of the provinces, and kept a watchful eye upon the treasury

officials. By his own example of simplicity of life, he put to shame the luxury and extravagance of the Roman nobles and initiated in many respects a marked improvement in the general tone of society. As censor he raised the character of the senate, removing unfit and unworthy members and promoting good and able men, among them the excellent Julius Agricola. At the same time he made it; more dependent upon the emperor, by exercising an influence upon its composition. He altered the constitution • of the praetorian guard, in which only Italians, formed into nine cohorts, were enrolled. In 70 a formidable rising in Gaul, headed by Claudius Civilis, was suppressed and the German frontier made secure; the Jewish War was brought to a close by Titus's capture of Jerusalem, and in the following year, after the joint triumph of Vespasian and Titus, memorable as the first occasion on which a father and his son Were thus associated together, the temple of Janus was closed, and the Roman world had rest for the remaining nine years of Vespasian's reign. The peace of Vespasian passed into a proverb. In 78 Agricola went to Britain, and both extended and consolidated the Roman dominion in that province, pushing his arms into North Wales and the Isle of Anglesey. In the following year Vespasian died, on the 23rd of June.

The avarice with which both Tacitus and Suetonius stigmatize Vespasian seems really to have been an enlightened economy, which, in the disordered state of the Roman finances, was an absolute necessity. Vespasian could be liberal to impoverished senators and knights, to cities and towns desolated by natural calamity, and especially to men of letters and of the professor class, several of whom he pensioned with salaries of as much as £800 a year. Quintilian is said to have been the first public teacher who enjoyed this imperial

favour. Pliny's great work,

the Natural History, was written during Vespasian's reign, and dedicated to his son Titus. Some of the philosophers who talked idly of the good old times of the republic, and thus indirectly encouraged conspiracy, provoked him into reviving the obsolete penal laws against this class, but only one, Helvidius Priscus, was put to death, and he had affronted the emperor by studied insults. " I will not kill a dog that barks at me," were words honestly expressing the temper of Vespasian. Much money was spent on public works and the restoration and beautifying of Rome — a new forum, the splendid temple of Peace, the public baths and the vast Colosseum being begun under Vespasian. The roads and aqueducts were repaired, and the limits of the pomerium extended.

To the last Vespasian was a plain, blunt soldier, with decided strength of character and ability, and with a steady purpose to establish good order and secure the prosperity and welfare of his subjects. In his habits he was punctual and regular, transacting his business early in the morning, and enjoying his siesta after a drive. He had not quite the distinguished bearing looked for in an emperor. He was free in his conversation, and his humour, of which he had a good deal, was apt to take the form of rather coarse jokes. He could jest, it was said, even in his last moments. " Methinks I am becoming a god," he whispered to those around him. There is something very characteristic in the exclamation he is said to have uttered in his last illness, " An emperor ought to die standing."

See Tacitus, Histories; Suetonius, Vespasian; Dio Cassius, lxvi. ; Merivale, Hist, of the Romans under the Empire, chs. 57-60; H. Schiller, Geschichte der romischen Kaiserzeit, i. pt. 2; B. W. Henderson, Civil War and Rebellion in the Roman Empire A.D. 69-70

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VESPERS (officium vespertinum), in the Roman Catholic liturgy, that part of the daily office which follows none (nona) and precedes compline (completorium) . In it the Pater Noster, Ave Maria, Deus in Adjutorium, &c, are followed by five psalms and five antiphons, after which come the " little chapter," the hymn and the verse, which vary according to the season, the Magnificat and its antiphon, and the appropriate collect. In its general features the use of this office can be traced back to a very early date both in the Eastern Church and in the Western. Vespers may be said or sung at any time after midday, and in some circumstances even before it. (See Breviary.)

VESPERS, SICILIAN, the revolution of the Sicilians against the Angevin domination, so called because it broke out at the hour ■:■#£ Vespers on Easter Tuesday 1282. Charles I. of Anjou had ^countered more resistance in conquering Sicily than on the mainland, as the people were more independent and more strongly attached to the house of Hohenstaufen; and conse- quently his government was more oppressive and cruel. The officials and the insolent French nobility whom he established in the island rode rough-shod over the privileges of the native aristocracy and the customs of the people, and the natives were ground down by heavy taxes and degrading personal services. The debased currency ruined trade, and the government treated the Sicilians with the utmost contempt. " The outrage of personal service," wrote Amari (Guerra del Vespro, ch. iv.), " exceeded the limits of feudalism as well as of the strangest and most brutal caprices. Noble and worthy men were forced to carry viands and wine on their shoulders to the tables of the foreigner, and many young nobles were constrained to turn the spit in his kitchens like scullions or slaves." The administra- tion was more regular, and

therefore more unyielding and heartless, than that of the Hohenstaufens, and also more foreign. Hatred of Angevin rule grew day by day, until the people were driven to revolt. According to tradition, the leader of the rising was Giovanni da Procida, a Salernitan noble with Sicilian connexions, who had been in the service of Hohenstaufens, but, having lost position and property after the fall of Conradin, he had taken refuge at the court of Peter III., king of Aragon, and induced him to try to make good his claims on Sicily, which were based on the rights of his queen, Costanza, daughter of Manfred. But as a matter of fact the actual outbreak was a purely

unpremeditated popular movement. Charles at that time was making preparations for an attack on the East Roman empire,, and extorting more money than ever from the Sicilians in order to meet his expenses. Peter availed himself of the fears which Charles's ambitions were arousing to open negotiations with his various enemies, especially with the Greek emperor, Michael Palaeologus, the Italian Ghibellines, the discontented Sicilian nobles, and perhaps with Pope Nicholas III. Suddenly the people of Sicily, goaded beyond endurance, rose against their rulers, regardless of these various plots. On the 31st of March 1282 a riot broke out in a church near Palermo, in consequence, according to tradition, of the insults of a French soldier towards a Sicilian woman, and a general massacre of the French began. The rising spread to the city, where the republic was proclaimed, and then through the rest of the island; thousands of French men, women and children were butchered (there may be some exaggeration in the wholesale character of the slaughter), and by the end of April the whole of Sicily was in the hands of the rebels.

Charles at once led an expedition against the Sicilians and besieged Messina; and although the enemy had been expelled, they would hardly have been able to withstand this new in- vasion successfully had they not received assistance from Peter of Aragon and their own nobility, whose conspiracy they had so unexpectedly forestalled. This intervention, however, changed the character of the movement, and the free communes which had been proclaimed throughout the island had to submit to the royal prerogatives and to a revived feudalism. Peter, having reached Palermo in September 1282, accepted the Sicilian crown voluntarily offered to him, levied recruits, and declared war on Charles. Hostilities were carried on by land and sea, and the Angevin attacks on Messina were repulsed and followed up by raids on Calabria, where Reggio and other towns declared for King Peter. Charles proposed to settle the Sicilian question by a single combat between himself and Peter; but although the duel was agreed upon it never took place, owing to the mutual distrust of the two rivals. Peter created some discontent by conferring many offices in Sicily on Aragonese and Catalans, but at the parliament of Catania (1283) he under- took at his death to leave Aragon to his son Alphonso and Sicily to his younger son James, so that the two crowns should not be united, an arrangement which fell in with the Sicilians' aspira- tions towards independence. Pope Martin IV., unlike Nicholas III., threw the whole weight of his authority in favour of the Angevins, excommunicated Peter and the Sicilians, declaring that the former had forfeited even his rights to Aragon, con- ferred on Charles's expedition to reconquer the island the privileges of a crusade, and levied dimes throughout Christendom to supply the funds. The reason for this uncompromising attitude lies in the papal claim that Sicily was a fief of the Church, a claim which could only be enforced by means of the Angevins. But

Charles's fleet was completely destroyed off Malta by that of the Sicilians and Aragonese, commanded by the Calabrese Ruggiero di Lauria (June 1283), and a second fleet met with a similar fate a year later in the bay of Naples, on which occasion Charles's son (afterwards Charles II., lo Zoppo) was captured. The Aragonese were now masters of the sea. Risings broke out even in the mainland provinces, and while Charles was preparing for a supreme effort to re-establish his authority he died (1285). Peter died soon after, but the war went on and spread to Aragon, which the Angevins, in virtue of the pope's excommunication of Peter, were trying to conquer. In 1287 the French encountered a fresh naval disaster at the hands of Lauria, and a force which they landed in Sicily was defeated. A two years' truce was now agreed upon, and Charles II. was liberated on his promising to renounce all claims on Aragon; but the pope Nicholas IV., who was determined that no peace should be made unless the Aragonese gave up the island, absolved him from his oath and crowned him king of the Two Sicilies (1289). Alphonso died in 1291, and was succeeded by his brother James, who took possession of the Aragonese crown, leaving his brother Frederick as governor of Sicily, thus uniting the two kingdoms, in violation of King

Peter's promises. He then opened negotiations with Pope Boniface VIII. (they had been begun by Alphonso and Nicholas IV.), and eventually agreed to surrender the towns captured in the Neapolitan provinces to Charles II., and hand over Sicily to the Church, actually binding himself to assist in crush- ing the Sicilians if they resisted; in exchange he was to marry Charles's daughter, Bianca, and to receive Sardinia and Corsica, while Charles's cousin, Charles of Valois, was to renounce his claims on Aragon (1295). This treaty aroused bitter indignation in Sicily, where all classes determined to resist its execution at all

costs. They found a leader in Frederick, who, rejecting all the pope's blandishments and bribes, threw in his lot with the Sicilians. For the sequel of the war see under Frederick III. of Sicily. Peace was made with the treaty of Caltabellotta in 1302, which left Sicily an independent kingdom under Frederick for that prince's lifetime; and although at his death it was to have reverted to the Angevins, he was actually suc- ceeded by his son, and the island retained its independence for a considerable period. Undoubtedly the Vespers and its con- sequences revived Sicilian nationalism after the period of de- grading Angevin oppression, and with the new dynasty a higher civilization, nearly rivalling that which had flourished under the Hohenstaufens, an improved constitution, and fine military qualities were the outcome.

Bibliography. — The standard work on the subject is Michele Amari's Guerra del Vespro (2 vols. 8th ed., Florence, 1876), which is based on a study of the original authorities, but is too strongly prejudiced against the French; cf. L. Cadier's Essai sur V adminis- tration du royaume de Sicile par Charles I. et Charles II. d'Anjou (fasc. 59 of the Bibliotheque des icoles francaises de Rome et d'Athenes, Paris, 1891); A. de Saint-Priest, Histoire de la conquete de Naples par Charles d'Anjou (Paris, 1847-49); F. Lanzani, Storia dei communi d' Italia, lib. v. ch. 3 (Milan, 1882) ; A. Cappelli's preface to the " Leggenda di Messer Giovanni da Procida," in Miscellanea di opuscoli inediti rari dei secoli XIV. XV. (Turin, 1861). Among the original authorities, Ricobaldo Ferrarese (in Muratori, Rer. Ital. script, torn, ix.), the two biographies of Martin IV. (ibid.), Fra Corrado (ibid. torn, i.), the Catalan author of the " Gesta comitum Barcinonensium " (in Barluzio's Marca Hispanica, ch. 28) should be mentioned. A considerable list is given in Amari's Guerra

del Vespro. (L. V.)*

VESPUCCI, AMERIGO (1451–1512), merchant and adventurer, who gave his name of Amerigo to the new world as America, was born at Florence on the 9th of March 145 1. His father, Nastagio (Anastasio) Vespucci, was a notary, and his uncle, Fra Giorgio Antonio Vespucci, to whom he owed his education, was a scholarly Dominican and a friend of Savonarola. As a student Amerigo is said to have shown a preference for natural philosophy, astronomy and geography, He was placed as a clerk in the great commercial house of the Medici, then the ruling family in Florence. A letter of the 30th of December 1492 shows that he was then in Seville; and till the 12th of January 1496 he seems to have usually resided in Spain, especi- ally at Seville and Cadiz, probably as an agent of the Medici. In December 1495, on the death of a Florentine merchant, Juanoto Berardi, established at Seville, who had fitted out the second expedition of Columbus in 1493, and had also under- taken to fit out twelve ships for the king of Spain (April 9th, 1495), Vespucci was commissioned to complete the contract. As Ferdinand, on the 10th of April 1495, recalled the monopoly conceded to Columbus (this order of April 10th, 1495, was cancelled on June 2nd, 1497), ″ private ″ exploring now had an opportunity, and adventurers of all kinds were able to leave Spain for the West. Vespucci claims to have sailed with one of these ″ free- lance ″ expeditions from Cadiz on the 10th of May 1497. Touching at Grand Canary on the way, the four vessels he accompanied, going thirty- seven days on a west- south-west course, and making 1000 leagues, are said to have reached a supposed continental coast in 16° N., 70° W. from Grand Canary (June 16th, 1497). This should have brought them into the Pacific. They sailed along the coast, says Vespucci, for 80 leagues to the province of Parias (or Lariab), and then 870 leagues more, always to the north-

west, to the ″ finest harbour in the world,″ which from this description should be in British Columbia or thereabouts. Thence 10c

leagues more to north and north-east to the islands of the people called ″ Iti,″ from which they returned to Spain, reaching Cadiz on the 15th of October 1498. Still following Vespucci's own statement, he, on the 16th of May 1499, started on a second voyage in a fleet of three ships under Alonzo de Ojeda (Hojeda). Sailing south-west over 500 leagues they crossed the ocean in forty-four days, finding land in 5 S. Thence, encountering vari- ous adventures, they worked up to 15° N., and returned to Spain by way of Antiglia (Espanola, San Domingo), reaching Cadiz on the 8th of September 1500. Entering the service of Dom Manuel of Portugal, Vespucci claims to have taken part in a third American expedition, which left Lisbon on the 10th (or 15th) of May 1 501. Vespucci has given two accounts of this alleged third voyage, differing in many details, especially dates and distances. From Portugal he declares that he sailed to Bezeguiche (Cape Verde), and thence south-west for 700 leagues, reaching the American coast in 5 S. on the 7th (or 17th) of August. Thence eastward for 300 (150) leagues, and south and west to 52° S. (or 73° 30′; in his own words, ″ 13 from the antarctic pole,″ i.e. well into the antarctic continent). He returned, he adds, by Sierra Leone (June 10th), and the Azores (end of July), to Lisbon (September 7th, 1502). His second Portuguese (and fourth and last American) voyage, as alleged by him, was destined for Malacca, which he supposed to be in $3° S. (really in 2° 14' N.). Starting from Lisbon on the 10th of May 1503, with a fleet of six ships, and reaching Bahia by way of Fernando Noronha (?), Vespucci declares that he

built a fort at a harbour in 18 S., and thence returned to Lisbon (June 18th, 1504). In February 1505, being again in Spain, he visited Christopher Columbus, who entrusted to him a letter for his son Diego. On the 24th of April 1505, Vespucci received Spanish letters of naturalization; and on the 6th of August 1508 was appointed piloto mayor or chief pilot of Spain, an office which he held till his death, at Seville, on the 22nd of February 1512.

If his own account had been trustworthy, it would have followed that Vespucci reached the mainland of America eight days before John Cabot (June 16th against June 24th, 1497). But Vespucci's own statement of his exploring achievements hardly carries conviction. This statement is contained (i.) in his letter written from Lisbon (March or April 1503) to Lorenzo Piero Francesco di Medici, the head of the firm under which his business career had been mostly spent, describing the alleged Portuguese voyage of March 1 501-September 1502. The original Italian text is lost, but we possess the Latin translation by " Jocundus interpreter," perhaps the Giocondo who brought his invitation to Portugal in 1501. This letter was printed (in some nine editions) soon after it was written, the first two issues (Mundus Novus and Epistola Albericii de Novo Mundo), without place or date, appearing before 1504, the third, of 1504 {Mundus Novus), at Augsburg. Two very early Paris editions are also known, and one Strassburg (De Ora Antarctica) of 1505, edited by E. Ringmann. It was also included in the Paesi novamente relrovali of 1507 (Vicenza) under the title of Novo Mondo da Alb. Vespulio. The connexion of the new world with Vespucci, thus expressed, is derived from the argument of this first letter, that it was right to call Amerigo's discovery a new world, because it had not been seen before by any one. This prepared the way for the American name soon given to the continent, (ii.) In Vespucci's letter, also

written from Portugal (September 1504), and probably addressed to his old school- fellow Piero Soderini, gonfaloniere of Florence 1 502-1512. From the Italian original (of which four printed copies still exist, without place or date, but probably before 1507) a French version was made,- and from the latter a Latin translation, published at St Die in Lorraine in April 1507, and immediately made use of in the Cosmographiae Introductio (St Di6, 1507) of Martin Waldseemuller (Hylacomylus), professor of cosmo- graphy in St Die University. Here we have perhaps the first suggestion in a printed book that the newly discovered fourth part of the world should be called " America, because Americus discovered it." Since Alexander von Humboldt discussed the

subject in his Examen critique de Vhistoire de la gSographie du nouveau continent (1837), vol. iv., the general weight of opinion (in spite of F. A. de Varnhagen, Amerigo Vespucci, son caractere, ses (crits. . . sa vie . . . , Lima, 1865, and other pro- Vespuccian works) has been that Vespucci did not make the 1497 voyage, and that he had no share in the first discovery of the American continent.

See also R. H. Major, Prince Henry the Navigator (London, 1868), pp. 367-88; F. A. de Varnhagen, Le Premier voyage de Amerigo Vespucci (Vienna, 1869); Nouvelles recherches sur les derniers voyages du navigateur florentin (Vienna, 1869); Ainda Amerigo Vespucci, Novos estudos (Vienna, 1874); Luigi Hugues, II terzo_ viaggio di A. Vespucci (Florence, 1878); " Alcune considerazioni sul Primo Viaggio di A. Vespucci," in the Bolletino of the Italian Geographical Society, series ii. vol. x. pp. 248-63, 367-80 (Rome, 1885); " II quarto Viaggio di A. Vespucci," in the same Bolletino, year xx., vol. xxiii. pp. 532-54 (Rome, 1886) ; " Sul nome ' America ' " in the same Bolletino, series iii. vol. i. pp. 404-27, 515-30 (Rome, 1888), and an earlier study under

the same title (Turin, 1886); " Sopra due lettere di A. Vespucci," in the same, series iii. vol. iv. pp. 849–72, 929–51 (Rome, 1891); Narrative and Critical History of America, edited by Justin Winsor, vol. ii. pp. 129–86 (1886); The Letters of A. Vespucci (translation, &c, by Clements R. Markham, London, Hakluyt Society, 1894); H. Harrisse, A. Vespuccius (London, 1895); J,os. Fischer and F. R. von Weiser, The Oldest Map with the Name America . . . (Innsbruck, 1903) ; Angelo Maria Bandini and Gustavo Uzielli, Vita di Amerigo Vespucci (Florence, 1898); B. H. Soulsby in the Journal of the Royal Geo- graphical Society (London, February 1902), pp. 201–9. (C. R. B.)

VESSEL (O. Fr. vaissel, from a rare Lat. vascellum, dim. of vas, vase, urn), a word of somewhat wide application for many objects, the meaning common to them being capacity to hold or contain something. Thus it is a general term for any utensil capable of containing liquids, and for those tubular structures in anatomy, such as the arteries, veins or lymphatics, which contain, secrete or circulate the blood or lymph. Organs or structures which are largely supplied with vessels are said to be " vascular " (Lat. vasculum, another diminutive of vas). Vessel (as in French) is also a general term for all craft capable of floating on water larger than a rowing boat. The word is also familiar in Biblical phraseology in the figurative sense of a person regarded as the recipient of some Divine dispensation, a "chosen vessel," or as otte into which something is infused or poured, " vessel of wrath."

VESTA (Gr. 'Ecrrta), the goddess of fire and the domestic hearth. The cults of the Greek Hestia (q.v.) and the Latin Vesta, both of which involved the guardianship of an ever- burning sacred fire, are most probably derived from a very early custom, common to a great variety of races in different ages. Among

primitive peoples it became the custom for each village to maintain a constant fire for general use, to avoid the necessity of obtaining a spark by friction in case of the accidental extinction of all the village fires. 1 This fire, the central hearth of the village (focus publicus), became a sacred symbol of home and family life. The form of the primitive house in which the fire was preserved, probably a round hut made of wattled osiers daubed with clay, appears to have survived both in the circular prytaneum of the Greeks and in the Aedes Vestae (Temple of Vesta) in Rome. To watch this fire would naturally be the duty of unmarried women, and hence may have arisen the Roman order of virgin priestesses, the vestals, whose chief duty it was to tend the sacred fire.

The prehistoric method of getting a spark appears to have survived in the rule that, if ever the sacred fire of Vesta did go out, the negligent vestal was to be punished by scourging (Livy xxviii. n), and the fire rekindled either by friction of dry sticks, 2 or, in later times, by the sun's rays brought to a focus by a concave mirror (Plut. Numa, 9). In the prytaneum (q.v.) which existed in every Greek state, a different form of cult was developed, though the essential point, the sacred fire, was kept

1 J. G. Frazer in the Journal^ of Philology (vol. xiv. pp. 145-72), " The Worship of Vesta and its Connexion with the Greek Pry- taneum," gives many examples of a similar custom still surviving among various savage races.

2 An allusion to the earliest method of obtaining fire by rubbing two sticks together is probably contained in the myth of Prometheus, who brought fire to mortals hidden in a hollow wand.

up, just as in the Latin worship of Vesta; and in both' cases the fire was extinguished annually at the beginning of the new year, and solemnly rekindled by one of the primitive and hence sacred methods. 1 In Rome this was done on the first day of March, the Latin New Year's Day (Ovid, Fasti, iii. 137-45). Among both Greek and early Latin races, at the founding of a new colony, fire was solemnly sent from the prytaneum of the mother colony to kindle a similar sacred fire in the new settlement. Thus we find that, according to tradition, the worship of Vesta in Rome was introduced from Alba Longa (Livy i. 20, and Ovid, Fasti, iii. 46), which appears to have been the oldest of the Latin colonies in Latium. The most generally received Latin legend attributes the founding of the Roman temple of Vesta to Numa, who transferred the centre of the cult from Alba, together with the four vestal virgins, its priestesses (Plut. Numa, 10). One of the later kings, either Tarquin I. or Servius Tullius, is said to have increased the number to six (Dion. Hal. iii. 67, and Plut. Numa, 10), and it is not till the last years of the pagan period that we hear of a seventh vestal having been added (see Ambrose, Epist., ed. Pareus, p. 477; also Plut. Rom. and Cam.).

The election (caplio) of the vestal during the early period of Rome was in the hands of the king, and in those of the pontifex maximus under the republic and empire, 2 subject, however, to the following conditions (Aul. Gell. i. 12): (1) the candidate was to be more than six and less than ten years of age ; (2) she was to be patrima and matrima, i.e. having both parents alive; (3) free from physical or mental defects; (4) daughter of a free-born resident in Italy. Certain details of the election were arranged subject to the provisions of the Lex Papia, now unknown. The selected child had her hair cut off, and was

solemnly admitted by the pontifex maximus, who held her by the hand, and, addressing her by the name amata, pro- nounced an ancient formula of initiation, which is given by Aulus Gellius. In early times there were certain rules by which girls could be excused from serving as vestals, but the honour soon became so eagerly sought that these provisions were practically useless. Vows were taken by the vestal for a period of thirty years, after which she was free to return to private life and even to marry — which she very rarely did (Aul. Cell. vi. 7). This period of thirty years was divided into three decades: during the first the vestal learnt her duties; during the second she practised them; and during the third she instructed the young vestals. The special dignity of chief of the vestals {virgo vestalis maxima) was reached in order of seniority. The inscriptions on the pedestals of statues of various vestales maximae show that a number of different grades of honour were passed through before reaching the highest dignity or maxi- matus. 3

The duties of the vestals, besides the chief one of tending the holy fire (Cic. De Leg. ii. 8), consisted in the daily bringing of water from the sacred spring of Egeria, near the Porta Capena, to be used for the ceremonial sweeping and sprinkling of the Aedes Vestae. 4 They. al so offered sacrifices of salt cakes — muries and mola salsa — and poured on the altar of sacred fire libations of wine and oil, as is represented on the reverses of several first brasses and medallions of the empire. The vestals were bound to offer daily prayers for the welfare of the Roman state, and more especially in times of danger or cala- mity (Cic. Pro Font. 21). They were also the guardians of the seven sacred objects on which the stability of the Roman power was supposed to depend: the chief of these was the Palladium, a rude archaic statue of Pallas,

which was said to have been brought by Aeneas from the burning Troy. This sacred object was never shown to profane eyes, but it is represented on the reverse of a coin struck by Antoninus Pius in honour of his deified wife Faustina. Strict observance of the vow of chastity was one of the chief obliga- tions of the vestals, and its breach was punished by burial alive at a place near the Porta Collina known as the Campus Sceleratus (see Livy viii. 15 and 89; Plin. Ep. iv. 11 ; and Suet. Dom. 8). Cases of unchastity and its punishment were rare; and, as the evidence

1 Fire obtained in this way, that is, ″ pure elemental fire,″ was commonly thought to possess a special sanctity. Even throughout the middle ages in Catholic countries, at Easter, when the new year began, he old pagan rite survived (see Lights, Ceremonial Use of.)

2 From the time of Augustus the emperors themselves held the office of chief pontiff, and with it the privilege of electing the vestals.

3 These inscriptions are printed in Middleton, Ancient Rome in 1885, pp. 200–6, and in Archaeologia, xlix. 414–22.

4 The shrine of Vesta was not a lemplum, in the strict Roman sense, as it was not consecrated by the augurs, its sanctity being far above the necessity of any such ceremony. Other natural springs might be used for the daily sprinkling, but it was forbidden to use water brought in a pipe or other artificial conduit (Tac. Hist. iv. 53) ; see also Guhl and Koner, Das Leben der Griechen und Rbmer (Eng. trans, by F. Hueffer, 1875).

against the vestal was usually that of slaves, given under torture, it is probable that in many instances an innocent vestal suffered this cruel death.

*The privileges of the vestals and their influential position were very remarkable. They *ere exempt from any patria potestas, except that of the pontifex maximus, their religious father; they could dispose by will of their property, and were in most respects not subject to the Roman laws (" legibus non tenetur," Servius, on Virg. Aen. xi. 204; cf. Gaius i. 130, and Dio Cass. lvi. 10). This involved freedom from taxes, and the right to drive through the streets of Rome in carriages (plostrum and currus arcualus). Some bronze plates have been found which were once attached to the carriages of vestals; the inscription on one of them runs thus: Flaviae Publiciae v.v. maximae inmunis in jugo (see C.I.L. vi. 2146–2148; cf. also Prudentius, Contra Symm. ii. 1088). They were preceded by a lictor when appearing on state occasions, and enjoyed other semi-royal honours (Plut. Numa, 10, and Dio Cass, xlvii. 19). At theatres and other places of amusement they occupied the best seats, except at some of the nude athletic contests, from which they were excluded; they also took an important part in all the grand religious and state ceremonies, as when the pontifex maximus offered sacrifice on the occasion of a triumph before the temple of Capitoline Jupiter. They had power to pardon any criminal they met in the street on his way to execution, provided that the meeting were accidental. The vestals alone shared with the emperors the privilege of intramural burial (Serv. on Virg. Aen. xi. 206). During life they were richly dowered by the state (Suet. Aug– 31),' and had public slaves appointed to serve them (see Tac. Hist. 1. 43). They were also the guardians of the emperor's will, and of other important documents of state (Suet. /. Cdes. 83, and Aug. 101; Tac. Ann. i. 8; Plut. Anton. 58; and Appian, Bell. Civ. v. 73). Their influence in the appointment to many offices, both religious and secular, appears to have been very great. Many of the statues to the chief vestals which*

were found in the Atrium Vestae in 1 883–1884 have pedestals inscribed with a dedication re- cording that benefits had been conferred on the donor by the vestalis maxima. Lastly, they lived in a style of very great splendour; their house, the Atrium Vestae, which stood close by the Aedes Vestae, was Very large and exceptionally magnificent both in decora- tion and material (see Rome, Archaeology, § " Forum Romanum " and map).

The discovery already mentioned of a number of statues of vestalea maximae has thrown new light on the dress of the vestals. 6 With one or two exceptions the costume of these statues is much the same, they have a long sleeveless tunic (slola), girdled by the zona immediately below the breast. One only wears the diploidion over the upper part of her figure. The outer garment is an ample pallium, wrapped round the body in a great variety of folds, and in some cases brought over the head like a hood. All seem to have long hair, showing that the process of cutting off the hair at initiation was not repeated. One figure wears the suffib- ulum, a rectangular piece of white cloth bordered by a purple stripe, worn over' the head and fastened on the breast by a fibula. According to Festus (ed. Miiller, p. 348), this sacred garment was worn by the vestals only during the act of sacrificing (see also Varro, De Ling. Lat. vi. 21). In all cases the head is closely bound by vittae,. rope-like twists of woollen cloth, the ends of which usually fall in loops on each shoulder (see Servius on Virg. Aen. x. 538).

The Regia, the official fanum of the pontifex maximus, was adjacent to the vestals' house : —

" Hie locus est Vestae, qui Pallada servat et ignem; Hie fuit antiqui Regia parva Numae." 6

When Augustus, after his election to the office of pontifex maximus in 12 B.C., moved his place

of residence from the Regia to the Palatine, he built a new Aedes Vestae near his palace, in the magnifi- cent Area Apollinis. This appears to have been a copy of the older temple of Vesta. No traces of it now exist; but Pirro Ligorio, in the latter part of the 16th century, made some sketches of what then existed of this second temple, to illustrate his great MS. on Roman antiquities, which is now preserved in the royal library at Turin (see Ovid, Fasti, iv. 949–954, and Metam. xv. 864). The original course of the Sacra Via passed close to the temple of Vesta; but the road was clumsily built over in the 3rd and 4th centuries.

The chief festival in honour of Vesta, the Vestalia, was held on the 9th of June (Ovid, Fasti, vi. 249), after which the temple was closed for five days for a ceremonial cleansing. In private houses the feast was celebrated by a meal of fish, bread and herbs, eaten, not on the usual triclinium, but by the domestic hearth, in front of the effigies of the Dii Penates (Ovid, Fasti, vi. 309–310). The feast, inaugurated by Augustus in honour of Vesta Palatina, was held on the 28th of April, the anniversary of its consecration.

With regard to statues of the goddess, though the Greek Hestia was frequently represented in plastic art, yet among the Romans

6 These statues appear to have been the work of a privileged class of sculptors, who enjoyed the title of ″ fictores virginum vestalium ″ — — an honour which is recorded in some of the dedicatory inscriptions on the pedestals.

6 Ovid, Tristia, iii. 29.

Vesta appears to have been rarely so treated. The Athenian prytaneum. contained a statue of Hestia. But there was no effigy in the Roman temple of Vesta, although one is commonly shown on reverses of coins which have a representation of the temple, and it appears to have been commonly thought in Rome that a statue of Vesta did exist inside her shrine — a mistake which Ovid corrects (Fasti, vi. 297–300). No Roman statue now known can be certainly considered to represent Vesta, though a very beautiful standing figure of a female with veiled head (in the Torlonia collection) has, with some probability, had this name given to it.

The worship of Vesta appears to have died out slowly in the 4th century, after the adoption of Christianity as the state religion by Constantine, and in 382 Gratian confiscated the Atrium Vestae. Zosimus (Hist. Nov. v. 38) tells an interesting story of a visit made to it at the end of the 4th century by Serena, the wife of the Vandal Stilicho, who took a valuable necklace from one of the statues, in spite of the remonstrances of an aged woman, the last survivor of the vestal virgins. Soon after that time the building appears to have fallen into decay, its valuable marble linings and other orna- ments having been stripped from its walls.

Authorities. — For the Atrium and the Aedes Vestae see Rome, Archaeology (footnote ad loc). See also Wissowa, Relig. und Kultus der Romer (1902) and authorities under Hestia. (J. H. M. ; X.)

VESTERAS, or Westeras, a town and bishop's see of Sweden, capital of the district (Ian) of Vestmanland, on a northern bay of Lake Malar, 60 m. N.W. by W. of Stockholm by rail. Pop. (1900) 11,999. It is a considerable industrial centre and an important lake port. Its Gothic cathedral, rebuilt by Birger Jarl on an earlier

site, and consecrated in 1 271, was restored in 1850–1860, and again in 1896–1898. The episcopal library contains the valuable collection of books which Oxenstjerna, the chancellor of Gustavus Adolphus, brought away from Mainz near the end of the Thirty Years' War. A castle commands the town from an eminence; it was captured by Gustavus Vasa and rebuilt by him, and again in the 17th century, and remains the seat of the provincial government. Here Eric XIV., whose tomb is in the cathedral, was confined (1573–1575). Several national diets were held in this town, the most notable being those of 1527, when Gustavus Vasa formally introduced the Reformation into Sweden, and 1544, when he had the Swedish throne declared hereditary in his family. The original name of the town was Vestra Aros (" western mouth "), in distinction from Ostra Aros, the former name of Upsala.

VESTIBULE (from Lat. vestibulum) , the architectural term given to an antechamber next to the entrance and preceding the hall; it is also applied to the anteroom of any large apart- ment. The word is connected, like Vesta (q.v.), with the Sanscrit root mj-, to dwell, inhabit. In medieval Latin it was occasion- ally used, instead of vestiarium, for a vestry (see Du Cange, Gloss, med. lat., s.v.), which is derived from Lat. vestis, clothing.

VESTINI, an ancient Sabine tribe which occupied the eastern and northern bank of the Aternus in central Italy, entered into the Roman alliance, retaining its own independence, in 304 B.C., and issuing coins of its own in the following century. A northerly section round Amiternum near the passes into Sabine country probably received the Caerite franchise soon after. In spite of this, and of the influence of Hadria, a Latin colony founded about 290 B.C. (Livy, Epit. xi.), the local dialect, which belongs to the north Oscan group, survived certainly to the middle of the 2nd century B.C. (see the in-

scriptions cited below) and probably until the Social War. The oldest Latin inscriptions of the district are C.I.L. ix. 3521, from Furfo with Sullan alphabet, and 3574, " litteris anti- qutssimis," but with couraverunt, a form which, as inter- mediate between coir- or coer- and cur-, cannot be earlier than 100 B.C. (see Latin Language). The latter inscription contains also the forms magist®es (nom. pi.) and ueci (gen. sing.), wruch show that the Latin first spoken by the Vestini was not that of Rome, but that of their neighbours the Marsi and Aequi (qq.v.). The inscription of Scoppito shows that at the time at which it was written the upper Aternus valley must be counted Vestine, not Sabine, in point of dialect.

See further Paeligni and Sabini, and for the inscriptions and further details, R. S. Conway, The Italic Dialects, pp. 258 ff., on which this article is based. (R. S. C.)

VESTMENTS. The word " vestment " (Lat. vestimentum, fr. vestire, to clothe), meaning generally simply an article of clothing, is in the usage of the present day practically confined to the ceremonial garments worn in public worship; in this sense it may be used equally of the robes or "ornaments" of the ministers or priests of any religion. Ecclesiastical vest- ments, with which the present article is solely concerned, are the special articles of costume worn by the officers of the Christian Church " at all times of their ministration "—to quote the Ornaments Rubric of the English Book of Common Prayer, i.e. as distinct from the " clerical costume " worn in everyday life. Ecclesiastical vestments may again be divided into two categories: (1) liturgical vestments, (2) non-liturgical vestments. Liturgical vestments, as their name implies, are those which are especially associated with the various functions of the liturgy. Of these again, according to the fully developed rules of the Catholic Church, there

are three classes: (ij vest- ments worn only at the celebration of mass — chasuble, maniple, pontifical gloves, pontifical shoes, the pallium and the papal fanone and subcinctorium; (2) vestments never worn at mass, but at other liturgical functions, such as processions, administra- tion of the sacraments, solemn choir services, i.e. cope and surplice; (3) vestments used at both — alb, amice, girdle, stole, dalmatic, tunicle. Non-liturgical vestments are those, e.g. cappa magna, rochet, which have no sacral character, have come into use from motives of convenience or as insignia of dignity, and are worn at secular as well as ecclesiastical functions.

In the controversies as to the interpretation of the Anglican ″ Ornaments Rubric ″ (see below) the term ″ vestments ″ has been applied particularly to those worn at the celebration of mass, which is what is meant when it is said that ″ the vestments ″ are worn at such and such a church. This restric- tion of the term has some historical justification: in the First Prayer Book of Edward VI. the word ″ vestment ″ is used as synonymous with but one liturgical garment — the chasuble, the ″ mass vestment ″ par excellence; in the Prayer Book of J 559 "vestments" are eliminated altogether, "ornaments" being substituted as a more comprehensive term. As to the use of the word, it must be further stated that it is also techni- cally applied to altar cloths, the altar being ″ vested ″ in frontal (antependium) and super-frontal (see Altar).

The subject of ecclesiastical vestments is not only one of great interest from the point of view of archaeology and art, but is also of importance, in so far as certain ″ ornaments ″ •have become historically associated with certain doctrines on which the opinion of the Christian world is sharply divided. The present article can only give a brief outline of a subject as intricate as it is vast, frequently

also extremely obscure, and rendered still more obscure by the fact that those who have applied themselves to it have too often done so in anything but a scientific spirit. It will deal briefly (1) with the general idea and the historical evolution of ecclesiastical vestments, (2) with the vestments as at present worn (a) in the Roman Catholic Church, (b) in the Oriental Churches, (c) in the Reformed Churches, (d) in the Anglican Church. The more important vestments are dealt with in some detail under their separate headings; here it will only be necessary to give short descriptions of those which cannot be conveniently treated separately.

1. The Origin andIdeaofEcclesiasticalVestments.—^—Th.elit \irgica\ vestments of the Catholic Church, East and West, are not, as was at one time commonly supposed, borrowed from the sacer- dotal ornaments of the Jewish ritual, although the obvious analogies of this ritual doubtless to a certain extent determined their sacral character; they were developed independently out of the various articles of everyday dress worn by citizens of the Graeco-Roman world under the Empire. The officers of the Church during the first few centuries of its existence were content to officiate in the dress of civil life, though their garments were expected to be scrupulously clean and of decent quality. The few scattered references in contemporary records to the dress of the clergy all point to this as the only recognized rule.

Thus in the 37th of the so-called " Canons of Hippolytus " we read: " As often as the bishops would partake of the Mysteries, the presbyters and deacons shall gather round him clad in white, quite particularly clean clothes, more

beautiful than those of the rest of the people." Thus, too, St Jerome, in his commentary on Ezek. xliv. 19, says that " We, too, ought not to enter the Holy of Holies in our everyday garments . . . when they have become defiled from the use of ordinary life, but with a clean conscience, and in clean garments, hold in our hands the Sacrament of the Lord."

When, in the year 289, St Cyprian was led to martyrdom, he wore, according to Eusebius {Hist, eccles. iv. cap. 11), an under tunic (linea), an upper tunic (dalmatica, tunica) and mantle (lacerna, byrrus). This was the ordinary type of the civil costume of the time. The tunica, a loose sack-like tunic with a hole for the head, was the innermost garment worn by all classes of Roman citizens under the republic and empire. It was either sleeveless (colobium) or sleeved (tunica manicata or manuleata), and originally fell about to the knee, but later on reached to the ankles (tunica talaris). St Augustine (De doctr. christ. iii. cap. 10, n. 20) says that to wear talares et tunicas manicatas was a disgrace among the ancient Romans, but that in his own day it was no longer so considered in the case of persons of good birth. The tunica was originally of white wool, but in the 3rd century it began to be made of linen, and from the 4th century was always of linen. About the 6th century the long tunica alba went out of fashion in civil life, but it was retained in the services of the Church and developed into the various forms of the liturgical alb (q.v.) and surplice (q.v.). The tunica dalmatica was a long, sleeved upper tunic, originating, as its name implies, in Dalmatia, and first becoming fashionable at Rome in the 2nd century; it is the origin of the liturgical dalmatic and tunicle (see Dalmatic). Another over-dress of the Romans was the paenula, a cloak akin to the. poncho of the modern Spaniards and Spanish Americans, i.e. a

large piece of stuff with a hole for the head to go through, hanging in ample folds round the body. This was originally worn only by slaves, soldiers and other people of low degree; in the 3rd century, however, it was adopted by fashionable people as a convenient riding or travelling cloak; and finally, by the sumptuary law of 382 (Cod. Theod. xiv. 10, 1, de habitu . . . intra urban) it was prescribed as the proper everyday dress of senators, instead of the military chlamys, the toga being reserved for state occasions. This was the origin of the

principal liturgical vestment, the chasuble (q.v.).

As late as the 6th century these garments were common both to the clergy and laity, and, so far as their character was concerned, were used both in the liturgy and in everyday life. IVleanwhile, however, a certain development had taken place. By the 4th century the garments worn at liturgical functions had been separated from those in ordinary use, though still identical in form. It is in the 4th century, too, that the first distinctive vest- ment makes its appearance, the 6>fiO(j>6pLov worn by all bishops in the East; in the 5th century we find this in use at Rome under the name of pallium (q.v.), as the distinctive ornament of the pope (see fig. 1). About the same time the ovarium, or stole (q.v.), becomes fixed in liturgical use. The main development and definition of the i-cclesiastiral vestments, however, took nlace between the xxvii. ?.■»

Fig. 1. — Pope Honorius (d. 638). From a mosaic in S. Agnese in Rome.

6th and the 9th centuries. The secular fashions altered with changes of taste; but the Church retained the dress with the other traditions of the Roman Empire. At Rome, especially, where the popes had succeeded to a share of the power and pretensions of the Caesars of the West, the

accumulation of ecclesiastical vestments symbolized a very special dignity: in the second quarter of the 9th century the pope, when fully vested, wore a camisia girdled, an alb (linea) girdled, an amice (anagolaium) , a tunicle (dalmatica minor), a dalmatic (dalmatica major), stole (orarium), chasuble (planeta) and pallium. With the exception of the pallium, this was also the costume of the Roman deacons. By this time, moreover, the liturgical character of the vestments was so completely established that they were no longer worn instead of, but over, the ordinary dress.

Hitherto the example of the Roman Church had exercised no exclusive determining influence on ritual development even in the West. The popes had, from time to time, sent the pallium or the dalmatic — specifically Roman vestments — as gifts of honour to various distinguished prelates; Britain, converted by a Roman mission, had adopted the Roman use, and English missionaries had carried this into the newly Christianized parts of Germany; but the great Churches of Spain and Gaul preserved their own traditions in vestments as in other matters. From the 9th century onwards, however, this was changed; everywhere in the West the Roman use ousted the regional uses.

This change synchronized with the revival of the Western Empire under Charlemagne, a revival which necessarily gave an impulse to the claims of the see of Rome. The adoption of the Roman liturgical dress had, however, at most an indirect connexion with these claims. Charlemagne was active in prescribing the adoption of the Roman use; but this was only as part of his general policy in the organization of his em- pire. A renovation of the Gal- ilean Church was not the least crying need; and, in view of the confusion of rites (Gallican, Gothic, Roman, Ambrosian) in the Frankish empire, Charle- magne recognized that this in- novation could only be effectu- ally carried

out by a closer connexion with Rome in ritual as in other matters. Charle- magne's activity in this respect was, in effect, but the comple- tion of a process that had been going on since the 6th century. Whatever effect the reinvigora- tion of the papacy may have had in hastening the process, the original impulse towards the adoption of the Roman rite had proceeded, not from Rome, but from Spain and Gaul; it was the natural result of the lively intercourse between the Churches of these countries and the Holy See. Nor was the process of assimilation by any means one-sided. If Spain and Gaul borrowed from Rome, they also exercised a reciprocal influ- ence on the Roman use; it is interesting to note in this con- nexion, that of the names of

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Fig. 2. — Stigand, Archbishop of Canterbury (1052-1070) ; trom the Bayeux Tapestry. Note the absence of the mitre, the chasuble short or tucked up in front, the maniple still carried in the left hand.

the liturgical vestments a very large proportion are not of Roman origin, and that the non-Roman names tended to supersede the Roman in Rome itself. 1

1 Apart from the archiepiscopal pallium, the Churches of Spain and Gaul had need to borrow from Rome only the dalmatic, maniple and liturgical shoes. On the other hand, it was from Spain and Gaul that Rome probably received the orarium (stole) as an ensign, of the major orders. Father Braun, to whose kindness the writer is indebted for the above account of the causes of the ritual changes in the Carolingian epoch, adds that the papacy was never narrov- minded in its attitude towards local rites, and that it was not until the close of the middle ages, when diversity had become confusion and worse, that it began to insist upon uniformity.

Even then it allowed those rites to survive which could prove a tradition of 200 years.

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VESTMENTS

The period between the 9th fend the 13th centuries is that of the final development of the liturgical vestments in the West. In the 9th century appeared' the pontifical gloves; in the 10th, the mitre; in the nth, the use of liturgical shoes and stockings was reserved for cardinals and bishops. By the 12th century, mitre and gloves were worn by all bishops, and in many cases they had assumed a new ornament, the rationale, a merely honorific decoration (supposed to symbolize doctrine and wisdom), sometimes of the nature of a highly ornamental broad shoulder collar with dependent lappets; sometimes closely resembling the pallium; rarely a " breast-plate " on the model of that of the Jewish high priest. 1 This elaboration of the pontifical vestments was contemporaneous with, and doubtless partly determined by, the assimilation of the bishops during those centuries to the type of the great feudal nobles whose ambitions and love of pomp they shared.

In an age when, with the evolution of the feudal organiza- tion of society, even everyday costume was becoming a uni- form, symbolizing in material and colour the exact status of the wearer, it was natural that in the parallel organization of the Church the official vestments should undergo a similar process of differentiation and definition. With this process, which in all its essential features was completed in the nth century, doctrinal developments had little or nothing to do, though from the 9th century onwards liturgiologists were busy expounding the mystic symbolism of garments which, until their imagination set to work, had for the most part

no symbolism whatever (see below). Yet in view of later con- troversies, the changes made during this period, notably in the vestments connected with the mass, are not without significance. Hitherto the chasuble had been worn indifferently by all ministers ar. the eucharist, even by the acolytes; it had been worn also at processions and other non- liturgical functions; it was now exalted into the mass vestment par excellence, worn by the celebrant only, or by his immediate assistants (deacon and subdeacon) only on very special occasions. New vestments were de- vised to take the place, on less solemn occasions, of those hallowed by associa- tion with the holy sacrifice; thus the processional cope (q.v.) appeared in the nth century and the surplice (q.v.) in the 12th. A change, too, came over the general character of vestments. Up to the 9th century these had been very plain, without ornament save such tra- ditional decorations as the clavi of the dalmatic; what splendour they had was due to their material and the ample folds of their draperies. But from this time onwards they tend to become more and more elaborately decorated with embroidery and jeweller's work (see, e.g. the articles Chasuble and Cope).

Very significant, too, is the parting of the ways in the development of liturgical vestments in the East and West. During the first centuries both branches of the Church had used vest- ments substantially the same, developed from common originals; the alb, chasuble, stole and pallium were the equivalents of the cnxo- pvov, favtikuov, iiphpiov and

1 The rationale is worn only over the chasuble. It is now used only by the bishops of Eichstatt, Cracow, Paderborn and Toul, by the special concession of various popes. See Braun, Liturg. Cewandung, pp. 676–700.

From Braun's Lilurgische

Cewandung, by permission of B. Herder.

Fig. 3. — Monumental Figure of Bishop Johannes of Lubeck (d. 1350) in Lubeck Cathedral.

6i(io(j>6pu}v. While, however, between the 9th and 13th centuries, the Western Church was adding largely to her store of vestments, that of the East increased her list by but three, the kvxe'iptov and bn/xavlKia (see Maniple) and the aaxnos (see Dalmatic). The living force of development in the Latin Church was symbolized in her garments; the stereotyped orthodoxy of the Greek Church in hers. With the exception of the mitre, intro- duced in the 15th or 16th century, the liturgical costume of the Eastern clergy remains now practically what it was in the 9th century.

In the Western Church, though from the 9th century onwards the Roman use had been the norm, considerable alterations continued to be made in the shape and decoration of the litur- gical vestments, and in this respect various Churches de- veloped different traditions (see, e.g. Chasuble). The definition

Fig. 4. — Dr Henry Sever . (d. 1471). From a brass in the chapel of Merton College, Oxford. He is vested in surplice, stole and cope.

Fig. 5. — Thomas Cranley, Archbishop of Dublin (d. 1417). From a brass in New College Chapel, Oxford. In addition to the vestments shown in fig. 3 he wears the archi- episcopal pallium.

of their use by the various orders of the clergy in the several liturgical functions, however, was established by the close of the 13th century and still continues in force. Before discussing the changes made in the various Reformed Churches, due to the doctrinal developments of the 16th century, we may therefore give here a list of the vestments now worn by the various orders of clergy in the

Roman Catholic Church and the Oriental Churches.

Roman Catholic Church. — As the sacrifice of the' mass is the central mystery of the Catholic faith, so the seven orders of the hierarchy culminate in that of priest, who alone is em- powered to work the daily miracle of the altar (see Order, Holy). The vestments worn by the priest when celebrating mass are then the most important. The cassock (q.v.), which must always be worn under the vestments, is not itself a liturgical garment. Over this the priest, robing for mass, puts on the amice, alb, girdle (cingulum), stole, maniple and chasuble. Taking the other orders downwards: deacons wear amice, alb, girdle, stole, maniple 2 and dalmatic; subdeacons, amice, alb, girdle, maniple a"nd tunicle; the vestment proper to the minor orders, formerly the alb, is now the surplice or cotta. Bishops, as belonging to the order of priesthood with completed powers, wear the same vestments as the priests, with the addition of

2 The stole and maniple alone are symbolical of order, i.e. of the relation to the sacrifice of the mass.

VESTMENTS

1059

From a photograph by Conjugi Cane, Rome. Fig. 6. — Pope Leo XIII. in his Vest- ments as Supreme Pontiff.

the pectoral cross, the pontifical gloves, the pontifical ring, the \ liturgical sandals and caligae, a tunicle worn over the stole j and under the chasuble, and the mitre (see fig. 3). Arch- bishops, on solemn occasions, wear the pallium over the chasuble (see fig. 5). Bishops also carry a pastoral staff (q.v.), as symbol of their pastoral office. Finally, the pope,

when celebrating mass, wears the same vestments as an ordinary bishop, with the addition of the subcinctorium (see Alb), a dalmatic, worn over the tunicle and under the chasuble, and the or ale or fanone

(see Amice). It should be noted that the litur- gical head-dress of the pope is the mitre, not the tiara, which is the symbol of his supreme office and jurisdiction (see Tiara).

Of the liturgical vest- ments not immediately or exclusively associated with the sacrifice of the mass the most con- spicuous are the cope and surplice. The biretta, too, though not in its origin or in some of its uses a liturgical vest- ment, has developed a distinctly liturgical cha- racter (see Biretta). Besides the strictly litur- gical vestments there are also numerous articles of costume worn at choir services, in processions, or on ceremonial occa- sions in everyday life, which have no sacral character; such are the almuce {q.v.), the cappa and mozzetta (see Cope), the rochet (q.v.), the pileolus, a skull- cap, worn also sometimes under mitre and tiara. These are generally ensigns of dignity; their form and use varies in different Churches, and they often represent special privileges conferred by the popes, e.g. the cappa of the Lateran basilica worn by the canons of Westminster cathedral, or the almuce worn, by concession of Pope Pius IX., by the members of the Sistine choir.

The character of the vestments, the method of putting them on, and the occasions on which they are severally to be worn, are regu- lated with the minutest care in the Missal and the Caeremoniale.

Oriental Churches. — As already stated, the vestments of the great historical Churches of the East are derived from the same Graeco-Roman originals as those of the West, but in contra-

distinction to the latter they have remained practically stereo- typed, both in character and number, for a thousand years; in the East, however, even more than in the West the tendency to gorgeous ornamentation has prevailed.

An Orthodox bishop, vested for the holy liturgy, wears over his cassock — (1) the ort.xa.pMv, or alb (q.v.); (2) the ^TriTpax^ioc, or stole (q.v.) ; (3) the fun), a narrow stuff girdle clasped behind, which holds together the two vestments above named; (4) the tn-i/iavUia, liturgical cuffs, corresponding, possibly, to the pon- tifical gloves of the West; 1 (5)' the iiri.yova.Tiov, a stiff lozenge- shaped piece of stuff hanging at the right side by a piece of riband from the girdle or attached to the aivi\iov, or chasuble; (7) the i>ixcxj)bp<.ov, the equivalent of the Western pallium (q.v.). Be- sides these, the bishop also wears a pectoral cross (iyn6\iriov) and a medal containing a relic (iYa.va.yia.). He also has a mitre (q.v.), and carries a crozier (iixavlxiov), a rather short staff ending in two curved branches decorated with serpents' heads, with a cross between them.

The vestments of.a priest are the sticharion, epitrachelion, girdle, epimanikia and phainolion (see Chasuble). He wears all these vestments only at the celebration of the eucharist and on other very solemn occasions; at other ministrations he wears only the epitrachelion and phainolion over his cassock. A dignitary in

1 Thii is the view of Dr Adrian Fortescue (The Orthodox Eastern Church, p. 406); according to Braun (Lit. Gewandung, p. 100) they were originally merely the ornamental cuffs (\upla) of the episcopal sticharion, which were detached for purposes of convenience.

priest's orders is distinguished by wearing the

epigonation; and in

Russia the use of the mitre is sometimes conceded to distinguished

priests by the tsar. The deacon

wears the sticharion, without a

girdle, the epimanikia and ; the

orarion (aipb.pi.ov, Lat. orarium, see

Stole) hanging over his left

shoulder. The lesser orders wear

a shorter sticharion and an orarion

wound round it. •

On less solemn occasions bishops wear the mandyas (jtavSvas), a cope-like garment fastened at the lower corners as well as at the neck, and the kalimaukion (naXruiabiaov), a tall, brimless hat, with a veil hanging down behind, and, in place of the oiaubviov they carry a short staff with an ivory cross-piece. The kalimaukion is also worn by the other clergy in ordinary life, and with their vest- ments at processions, &c.

The general character of the vest- ments is much the same in the other Oriental rites. The stich- arion answers to the Armenian shabik, the Nestorian kutina, the Coptic tuniah or stoicharion; the epimanikia to the Arm. pasban (which, however, resemble rather the Latin maniple), the NestOrian _

mndo, and the Coptic kiman ; F A Orthodox Eastern

for-uZ^^lroTo, Copdc A S: Patriarch in full Pontifical, rashil ; the girdle to the Arm. kodi, Nestorian zunro ; the phainolion to the

Nestorian phaino and Arm. shurtshar, both of which are, however, cope-shaped. 2 Armenian priests, besides, wear a mitre (see Mitre, fig. 3), and a collar-like ornament probably derived from the apparel of the Western amice (q.v.). The liturgical handker- chief, which in the Greek Church has become the epigonation, has retained its original form in the Armenian.

The Liturgical Colours. — In another respect the vestments of the Eastern differ from those of the Western Church. In the East there is no sequence of liturgical colours, nor, indeed, any definite sense of liturgical colour at all; the vestments are usually white or red, and stiff with gold embroidery. In the West the custom, long universal, of marking the seasons of the ecclesiastical year and the more prominent fasts and festivals by the colour of the vestments of clergy and altar dates, approximately, from the 12th century: the subject is men- tioned (c. 1200) in the treatise of Innocent III., De sacro altaris mysterio (cap. 10), where the rules are laid down which are still essentially those of the Roman Church, 3 though the liturgical colours were only four, violet belonging to the category of black — as that of mourning. Custom in this respect was, however, exceedingly varied for a long time, numerous important Churches having their own " uses," and it was not until the time of the Reformation that the Roman use was fixed and became the norm of the Churches of the Roman obedience.

According to the rubric of the Roman Missal (Ht. xviii.) the liturgical colours are five: white, red, green, violet, black. Though, in the embroidery of vestments, many colours may be used, these 1 five above named must severally give the dominant tone of colour on the occasions for which they are appointed. Gold brocades or cloth-of-gold may, however, be substituted for red, green and white, and silver for white. The following is a list of

the occasions to which the various colours are appropriated : —

White.— Trinity Sunday, all festivals of Christ (except those connected with the Passion), festivals of the Blessed Virgin, of the Holy Angels and Confessors, of holy virgins and women (not being martyrs), nativity of St John the Baptist, festivals of the chains of St Peter and of his see (cathedra Petri), Conversion of St Paul, All Saints, consecration of churches and altars, anniversary of election and coronation of popes, and of election and consecration of bishops. White is also worn during the octaves of these festivals, on ordinary days (for which no special colour is provided) between Easter and Whitsuntide, at certain special masses connected with the saints falling under the above category, and at bridal masses.

2 By the sub-committee of Convocation in their Report (1908) these vestments are wrongly classed as copes, i.e. as derived not from the paenula but from the lacerna or birrus (see Cope, footnote).

3 The Church of the Holy Sepulchre at Jerusalem seems already to have had its canon of liturgical colours.

White is also the colour proper to sacramental processions, and generally to all devotions connected with the exposition of the Blessed Sacrament. At baptisms the priest wears a violet stole during the first part of the service, i.e. the exorcization then changes it for a white one. White is worn at the funerals of children.

Red. — Saturday before Whitsunday, Whitsunday

and its octave; all festivals in commemoration of the sufferings of Christ, i.e. festival of the instruments of the Passion, of the Precious Blood, of the invention and elevation of the Cross ; all festivals of apostles, except those above noted ; festivals of martyrs ; masses for a papal election; the Feast of the Holy Innocents, when it falls on a Sunday (violet if on a week-day), and its octave (always red). In England red vestments are worn at the mass (of the Holy Spirit) attended by the Roman Catholic judges and barristers at the opening of term, the so-called " Red Mass."

Green. — Sundays and week-days between Epiphany and Sep- tuagesima, and between Trinity and Advent, except festivals and their octaves and Ember days.

Violet. — Advent; the days between Septuagesima and Maundy Thursday; vigils that fall on fast days, and Ember days, except the vigil before Whitsunday (red) anfl the Ember days in Whitsun week (red). Violet vestments are also worn on days of intercession, at votive masses of the Passion, at certain other masses of a pro- nouncedly intercessory and penitential character, at intercessory processions, at the blessing of candles on Candlemas Day, and at the blessing of the baptismal water. A violet stole is worn by the priest when giving absolution after confession, and when administer- ing Extreme Unction.

Black. — Masses for the dead and funeral ceremonies of adults; the mass of the pre- sanctified on Good Friday. 1

Benediction of Vestments. — In the Roman Catholic Church the amice, alb, girdle, stole, maniple, chasuble must be solemnly blessed by the bishop or his delegate, the prayers and other forms to be observed being set forth in the Pontificate (see Benediction). Other vestments — e.g. dalmatic, tunicle, surplice —

are sometimes blessed when used in connexion with the sacrifice of the mass, but there is no definite rule on the subject. The custom is very ancient, Father Braun giving evidence as to its existence at Rome as early as the 6th century {Liturg. Gewandung, p. 760, &c).

Mystic Meaning of Vestments. — It is clear from what has been said above that the liturgical vestments possessed originally no mystic symbolic meaning whatever; it was equally certain that, as their origins were forgotten, they would develop such a symbolic meaning. The earliest record of any attempt to interpret this symbolism that we possess is, so far as the West is concerned, the short exposition in the Explicalio Missae of Germanus, bishop of Paris (d. 576), the earliest of any elaboration that of Hrabanus Maurus (d. 856). From the latter's time onward a host of liturgists took up the theme, arguing from the form, the material, the colour and the fashion of wearing the various garments to symbolical interpretations almost as numerous as the interpreters themselves. The Report of the five bishops divides them into three schools: (1) the moralizing school, the oldest, by which — as in the case of St Jerome's treatment of the Jewish vestments — the vestments are explained as typical of the virtues proper to those who wear them; (2) the Christological school, i.e. that which considered the minister as the representative of Christ and his garments as typical of some aspects of Christ's person or office — e.g. the stole is his obedience and servitude for our sakes; (3) the allegorical school, which treats the priest as a warrior or champion, who puts on the amice as a helmet, the alb as a breastplate, and so on. We cannot even outline here the process of selection by which the symbolic meanings now ;stereotyped in the Roman Pontifical were arrived at. These are taken from the various schools of interpretation mentioned above, and

are now formulated in the words used by the bishop when, in ordaining to any office, he places the vestment on the ordinand with the appropriate words, e.g. ″ Take the amice, which signifies discipline in speech,″ while other interpretations survive in

1 In the Anglican Church, in the numerous cases when the liturgical colours are used, these generally follow the Roman use, which was in force before the Reformation in the important dioceses of Canter- bury, York, London and Exeter. Some Churches, however, have adopted the colours of the use of Salisbury (Sarum). The red hangings of the Holy Table, usual where the liturgical colours are not used, are also — like the cushions to support the service books — supposed to be a survival of the Sarum use.

the prayers offered by the priest when vesting, e.g. with the amice, ″ Place on my head the helmet of salvation,″ &c. For the symbolic meanings of the various vestments see the separate articles devoted to them.

Protestant Churches. — In the Protestant Churches 2 the cus- tom as to vestments differs widely, corresponding to a similar divergence in tradition and teaching. At the Reformation two tendencies became apparent. Luther and his followers re- garded vestments as among the adiaphora, and in the Churches which afterwards came to be known as ″ Lutheran ″ many of the traditional vestments were retained. Calvin, on the other hand, laid stress on the principle of the utmost simplicity in public worship; at Geneva the traditional vestments were absolutely abolished, and the Genevan model was followed by the Calvinistic or ″ Reformed ″ Churches throughout Europe. The Church of England, in which the Lutheran and Calvinistic points of view struggled for the mastery, a struggle which resulted in a compromise, is separately dealt with below. At the present day the Lutheran Churches of Denmark and Scan-

dinavia retain the use of alb and chasuble in the celebration of the eucharist (stole, amice, girdle and maniple were disused after the Reformation), and for bishops the cope and mitre. The surplice is not used, the ministers conducting the ordinary services and preaching in a black gown, of the 16th-century type, with white bands or ruff. In Germany the Evangelical Church (outcome of a compromise between Lutherans and Reformed) has, in general, now discarded the old vestments. In isolated instances {e.g. at Leipzig) the surplice is still worn; but the pastors now usually wear a barret cap, a black gown of the type worn by Luther himself, and white bands. In Prussia the superintendents now wear pectoral crosses (instituted by the emperor William II.). In the " Reformed " Churches the minister wears the black " Geneva " gown with bands. It is to be noted, however, that this use has been largely dis- continued in the modern " Free " Churches. On the other hand, some of these have in recent times adopted the surplice, and in one at least (the Catholic Apostolic Church) the tradi- tional Catholic vestments have been largely revived.

Anglican Church. — The subject of ecclesiastical vestments has been, ever since the Reformation, hotly debated in the Church of England. For a hundred years after the Eliza- bethan settlement the battle raged round the compulsory use of the surplice and square cap, both being objected to by the extreme Calvinists or Puritans. This question was settled after 1662 by the secession of the Nonconformist clergy, and no more was heard of the matter until the " Oxford movement " in the 19th century. At the outset the followers of Newman and Pusey were more concerned with doctrine than with ritual; but it was natural that a reassertion of Catholic teaching should be followed by a revival of Catholic practice, and by the middle of the century certain "

Ritualists," pleading the letter of the Ornaments Rubric in the Prayer Book, had revived the use of many of the pre-Reformation vestments. Into the history of the resulting controversies it is impossible to enter. Popular passion confused the issues, and raged as violently against the substitution of the surplice for the Geneva gown in the pulpit as against the revival of the " mass vestments." The law was invoked, and, confronted for the first time with the intricacies of the Ornaments Rubric, spoke with an uncertain voice. In 1870, however, the " vestments " were definitely pronounced illegal by the Privy Council (Hebbert v. Purchas), and since the " Ritualists " refused to bow to this decision, parliament intervened with the Public Worship Regulation Act of 1874, which set up a disciplinary machinery for enforcing the law, and at the same time reconstituted the Court of Arches (q.v.). The recalcitrant clergy refused to obey. an act passed solely by the secular authority (convocation not having been consulted) or to acknowledge the jurisdiction of a court which had been robbed of its " spiritual " character. Prosecutions

2 The term " Protestant " is used here in its widest sense of those Churches which reformed their doctrine and discipline as a result of the religious revolution of the 16th century (see Reformation).

" on the complaint of two parishioners " (too often qualified ad hoc by a temporary residence) followed; and since the act had provided no penalty save imprisonment for contempt of court, there followed the scandal of zealous clergymen being lodged in gaol indefinitely " for conscience' sake.'' This result revolted public opinion; the bishops

acquired the habit (ren- dered easier by the personal expense involved in setting the law in motion) of vetoing, under the power given to them in the act, all prosecutions; and the act became a dead letter. The " persecution " had meanwhile produced its natural result: the use of the forbidden vestments rapidly spread; and since there was no central authority left competent to command obedience, every incumbent — intrenched in his freehold as a " corporation sole" — became a law unto himself. The outcome has been that in the Church of England, and in many of her daughter Churches, there exists a bewildering variety of " uses," varying from that of Sarum and that of Rome down to the closest possible approximation to the Geneva model.

Some explanation of this state of things may be ventured. Apart from those clergy (still the majority) who follow in all essentials the post-Reformation traditions of the English Church, there are three schools among those who justify the use of the ancient " eucharistic " l vestments: (1) a small number who affect to ignore the rules of the Prayer Book altogether, on the ground that no local or national Church has the right to alter the doctrines or practice of the Catholic Church, of which they are priests in virtue of their ordination, and whose prescriptions and usages they are in conscience bound to follow; (2) those who maintain that the Ornaments Rubric, in the phrase " second year of King Edward VI.," prescribes the ornaments in use before the first Prayer Book; (3) those who hold that under the Rubric the ornaments pre- scribed in the first Prayer Book are to be " had in use." The attitude of the first group needs no comment: it makes every priest the arbiter of what is or is not " Catholic," and is destruc- tive of that principle of definite authority which is the very foundation of Catholicism. The attitude of the second group is based on a

mistake as to the technical meaning of ″ the second year of Edward VI.,″ the second Prayer Book not having come into use till the third year. 2 As to the third group, their contention seems now to be admitted, though not all its implica- tions. What, then, are the vestments sanctioned by the Orna- ments Rubric ? In its present form this dates from the Prayer Book revision of 1662. It runs: ″ And here it is to be noted that such ornaments of the church and of the ministers thereof at all times of their ministration shall be retained and be in use, as was in the Church of England by the authority of parliament in the second year of the reign of King Edward VI.″ The wording of this was taken from the last section of Elizabeth's Act of Uniformity, prefixed to the Prayer Book of 1559. In the Act, however, these words were added: ″ until other order shall be therein taken by the authority of the Queen's Majesty, with the advice of the Commissioners appointed and authorized under the Great Seal of England, for causes ecclesiastical, or of the Metropolitan.″ The Rubric in the Prayer Book of 1559 ran: "... the minister at the time of the Communion, and at all other times in his ministration, shall use, &c. . . . according to the Act of Parliament set in the beginning of this book.″ 3

1 This term is incorrect (save in the case of chasuble and maniple), but is that commonly employed by the ″ High Church ″ clergy.

2 Edward VI. came to the throne on the 28th of January 1547 ; his ' second year,″ therefore, lasted from the 28th of January 1548 to the

27th of January 1549. The first Prayer Book passed parliament on the 2 1 st of January 1549, but did not receive the royal assent till later, probably March, and was not in compulsory use till Whitsunday, June9th, 1549. The old rule, however, was that ″ every act of parlia- ment in which the commencement thereof

*is not directed to be from a specific time, doth commence from the first day of the session of parliament in which such act is passed ″ (33 Geo. III. c. 13). The evidence is now clear that the Rubric refers to the first Prayer Book. This was decided in Liddell v. Westerton (1857), and is admitted in the Report of the five bishops to Convocation on The Ornaments of the Church and its Ministers (1908), which adduces conclusive evidence. * This was inserted, probably by the Privy Council, as a memo- randum or interpretation of the clause in the Act of Uniformity.*

Clearly it was the intention of the government, consistently with the whole trend of its policy, to cover its concession to the Protestant party dominant in the Commons by retaining some of the outward forms of the old services until such time as it should be expedient to ″ take other order.″ Then followed a period of great confusion. If the ″ massing vestments ″ continued anywhere in use, it was not for long. Whatever the letter of the law under the rubric, the. Protestant bishops and the commissioners made short work of such ″ popish stuff ″ as chasubles, albs and the like. As for copes, in some places they were ordered to be worn, and were worn at the Holy Com- munion, 4 while elsewhere they were thrown into the bonfires with the rest. 5

The difficulty seems to have been not to suppress the chasuble, of the use of which after 1559 not a single authoritative instance has been ad- duced, but to save the surplice, which the more zealous Puritans looked on with scarcely less disfavour. At last, in 1565, Queen Elizabeth determined to secure uniformity, and wrote to Archbishop Parker bidding him pro- ceed by order, injunction or censure, ″ according to the order and appoint- ment of such laws and ordinances as are provided by act of parliament, and the true meaning thereof, so that uniformity may be

enforced." The result was the issue in 1566 by the archbishop of the statutory Advertise- ments, which fixed the vestments of the clergy as follows: (1) In the ministration of the Holy Communion in cathedral and collegiate churches, the principal minister to wear a cope, with gospeller and epistoler agreeably; 6 at all other prayers to be said at the Communion table, to use no copes but surplices;

(2) the dean and prebendaries to wear surplice and hood;

(3) every minister saying public prayers, or ministering the sacraments, to wear " a comely surplice with sleeves."

This has been decided by the judicial committee of the Privy Council (Hebbert v. Purchas, 1870; Ridsdale v. Clifton, 1877) to have been the "other order" contemplated in the Act of Uniformity of Elizabeth, and it was held that from this time the cope and surplice alone were legal vestments in the Church of England. The authority of the Advertisements, indeed, was and is disputed; but their lordships in their judg- ment pointed out that they were accepted as authoritative by the canons of 1603 (Can. 24 and 58), and argued convincingly that the revisers of the Prayer Book in 1662, in restoring the

Tomlinson {The Prayer Book, Articles and Homilies, p. 122 seq.) argues that this was a " fraud rubric " inserted without authority, and utterly perverting the meaning of the proviso in the Act of Uniformity. This argument is dealt with in the bishop's Report, p. 66.

4 Resolutions of 1561, " Item that there be used only but one apparel; as the cope in the ministration of the Lord's Supper." See Report, p. 68.

6 See Machyn's Diary (Camden Soc. 42; London,

1848), p. 208, for St Bartholomew's day, 1559: " All the roods, and Manes and Johns, and many other of the church goods, both copes, crosses, censers, altar cloths, rood cloths, books, banners, . . . with much other gear about London," were " burned with great wonder."

6 Yet later the cope seems to have been authoritatively pro- scribed with the rest. In the Acts of the Privy Council (1578-1580), p. 208, is the following entry: " A letter to Sir Walter Ashton, Knight, Mr. Deane of Lichefield, etc. . . . touching certaine copes, vestments, tunicles and such other Popishe stuffe informed by letter from the Dean of Lichefield to be within the cathedral churche of Lichefield; they . . . are required to assemble themselves together in the towne of Lichefield and to cause the said Popishe stuffe to be sought out and brought before them, and thereupon to deface the same . . . and to see the same effectuallie done, and thereof to advertise their Lordships."

Fig. 8. — Anglican Priest in Cassock, Surplice, and Narrow Black Scarf. Brass of Wil- liam Dye (d. 1567) at Westerham, Kent.

rubric of 1559, had no idea of legalizing any vestments other than those in customary use under the Advertisements, and the canons (cf . Report of sub-committee of Convocation, pp. 48, 49) . The law, then, is perfectly clear, so far as two decisions of the highest court in the realm can make it so. But apart from the fact that the authority of the Privy Council, as not being a " spiritual " court, is denied by many of the clergy, no one claims that its .decisions are irreversible in the light of fresh evidence.

Thirty years after the Ridsdale judgment, the ritual confusion in the Church of England was worse than ever, and the old ideal expressed in the Acts of Uniformity had given place to a desire to sanctify with some sort of authority the parochial ″ uses ″ which had grown up. In this respect the dominant opinion in the Church, intent on compromise, seems to have been expressed in the Report presented in 1908 to the con- vocation of the province of Canterbury by the sub-committee of five bishops appointed to investigate the matter, namely, that under the Ornaments Rubric the vestments prescribed in the first Prayer Book of Edward VI. are permitted, if not enjoined. Even if this be> so, the question arises, what vestments were prescribed in the Prayer Book of 1 549 ? It has been commonly assumed, and tie assumption has been translated into practice, that the rubrics of, 1549 prescribed the use of all the old ″ mass vestments.″ This, however, is not the case. In the short rubric before the communion service the celebrating priest is directed to ″ put upon him … a white alb plain with a vestment or cope,″ while the assisting priests or deacons are to wear ″ albs with tunicles.″ In the additional explanatory notes at the end of the book, after directions as to the wearing of surplice and hood in quire, in cathedral and collegiate churches (they are not made obligatory elsewhere), bishops are directed to wear, besides the rochet, a surplice or alb, and a cope or vestment, with a pastoral staff borne either by themselves or their chaplains. 1 Thus the alternative use of cope or chasuble (vestment) is allowed at the celebration of Holy Communion— an obvious compromise; of the amice, girdle (cingulum), maniple and stole there is not a word, 5 and the inference to be drawn is that these were now disused. The cingulum, indeed, which symbolized chastity (i.e. Celibacy), would naturally have been discarded now that the clergy were allowed to marry, while the stole

had become intimately associated with the doctrine of holy orders elaborated by the medieval schoolmen and rejected by the Reformers (see Order, Holy). If this be so, the case is exactly parallel with that of the Lutheran Churches which, about the same time, had discarded all the " mass vestments " except the alb and chasuble. It becomes, then, a question whether the present-day practice of many of the clergy, ostensibly based on the rubric of 1549, is in fact covered by this. The revived use of the stole is the most curious problem involved; for this, originally due to a confusion of. this vestment with the

1 There is no mention of mitre, gloves, dalmatic, tunicle, sandals and caligae, which were presumably discontinued.

- *It has been argued that the term " vestment " covers all these. The Report of 1908 (Appendix A, p. 109) says cautiously that the word " may perhaps in some cases stand for the chasuble with the amice, stole and fanon, the alb being mentioned separately," but adds that " very many of the instances commonly cited for this (e.g. those in Essays on Ceremonial, p. 246) are quite inconclusive, as ' vestment ' is often a convertible term with ' chasuble ' ; and it does not seem to be at all conclusively established that ' vestment ' with ' alb ' mentioned separately, and ' cope ' given as an alterna- tive, in a document with the precision and directive force of a Rubric, means more than the actual chasuble." Father Braun (Die liturg. Gewandning in der Englischen Staatskirche) endorses this opinion. He gives reasons for believing that in the Church of England, under the first Prayer Book, as in the Lutheran Churches, while chasuble and alb were retained, stole, maniple, amice and girdle were discontinued. With this the bishop of Exeter (Orna- ments Rubric, p. 30) would*

seem to agree, when he says that " the customs of the present day do not fully accord with any reason- able interpretation of the rubric. The stole, now nearly universal, is only covered by the rubric if the word ' vestment ' be taken to include it (a very dubious point), and then only at Holy Com- munion."

traditional Anglican black scarf, has now become all but uni- versal among the clergy of all schools of thought (see Stole) .

The five bishops in their Report, tracing the various vestments to their origins, conclude that they are meaningless in them- selves, and therefore things indifferent. This appears gravely to misread history. The chasuble and the rest, whatever their origin, had become associated during the middle ages with certain doctrines the rejection of which at the Reformation was symbolized by their disuse. 3 Their revival has proceeded pari passu with that of the doctrines with which they have long since become associated. With the truth or falsehood of these doctrines we are not here concerned; but that the revived vestments are chiefly valued because of their doctrinal significance the clergy who use them would be the last to deny. Nor is the argument that they are a visible manifesta- tion of the continuity of the Church anything but a double- edged weapon; for, as Father Braun pertinently asks, if these be their symbolism, Of what was their disuse in the Church of England for nigh on 300 years a symbol? 4

In 1910 the question of the " permissive use of vestments," in connexion with that of the revision of the Prayer Book generally, was still under discussion in the convocations of the two provinces. But there was little chance that any change in the rubric, even in the improbable event of its receiving the sanction of parliament, would produce any appreciable

effect. It is often forgotten that " extreme " ritual is no longer an "innovation" in the English Church; it has become the norm in a large number of parishes, and whole generations of Church people have grown up to whom it is the only familiar type of Christian worship. To attempt to "enforce the law " (whatever the law may be) would, therefore, seriously wound the consciences of a large number of people who are quite unconscious of having broken it. Formally to legalize the minimum enjoined by the rubrics of 1549 would, on the other hand, offend the " Protestant " section of the Church, without reconciling those who would be content with nothing short of the Catholic maximum. <

Authorities.— All previous works on vestments have been largely superseded by Father Joseph Braun's Die liturgische Ge- wandung (Freiburg-im-Breisgau, 1907), a monument of careful and painstaking research, profusely illustrated. This contains a list of medieval writers on the subject, another of the inventories used by the author, and one of more modern works. W. B. Marriott's Vestiarium Christianum (1868), though it must now be read with caution, is still of much value, notably the second part, which gives texts (with translations); of passages bearing on the subject taken from early and medieval writers, with many, interesting plates. Of other works may be mentioned Mgr. L. Duchesne's Origines du culte chretien (Paris, 1903), and especially C. Rohault de Fleury's La Messe (Paris, 1883-89). See also F. X. Kraus, Realencyklopadie der christlichen Altertilmer (Freiburg-i.-B., 1882, 1886); Smith and Cheetham, Diet, of Christian Antiquities (ed. 1893) and The Catholic Encyclopedia (New York, 1907 onwards).

For the vestment question in the Church of England see the Report of the sub-committee of Convocation on The Ornaments of the Church and its Ministers (1908); Hierurgia Anglicana, documents and extracts illustrative of the

ceremonial of the Anglican Church after the Reformation, new ed. revised and enlarged by Vernon Staley (1902–3); J. T. Tomlinson, The Prayer Book, Articles and Homilies (1897), a polemical work from the Protestant point of view, but scholarly and based on a mass of contemporary authorities to which references are given; the bishop of Exeter, The Ornaments Rubric (London, 1901), a pamphlet. For the legal aspect of the question see G. T. Talbot, Modern Decisions on Ritual (London, 189 4). .. (W. A. P.)

3 This is also the view taken by Father J. Braun, S.J., in his paper on liturgical dress in the Church of England, contributed to Stimmen aus Maria–Ldach (1910, Heft 7, Freiburg–im–Breisgau). In this he criticizes the bishops' Report in a sympathetic spirit, but points out how intimately the symbolism of the vestments had become associated with the doctrine of the Sacrifice of the Mass, and how logical was the action of the Reformers in rejecting certain of these vestments.

4 He sees in the revival of " vestments " "an energetic condemna– tion of the English Reformation." He adds that this is, of course, unintentional (allerdings ohne das sein zu wollen). A more intimate acquaintance with the language commonly used by many of the more extreme " Ritualists " would have shown him that there has been, and is, no lack of such intention.

VESTRIS, GAETANO APPOLINO BALDASSARE (1729–1808), Frenrh ballet dancer, was born in Florence and made his dibut at the Opera in 1749. By 17 51 his success and his vanity had grown to such a point that he is reported to have said, " There are but three great men in

Europe— the king of Prussia, Voltaire and I." He was an excellent mimic as well as dancer. From 1770 to 1776 he was master and com- poser of ballets, retiring, in favour of Noverre, with a pension. Two other pensions fell to him, when he gave up his positions of first dancer and of first dancer of court ballets, amounting in all to 9200 livres. Vestris married a dancer, Anna Heinel (1 753"i8o8), of German origin, who had a wonderful success at the Opera. He reappeared at the age of seventy-one On the occasion of his grandson's debut. By the dancer Mile. Allard, Vestris had a son, Marie Auguste Vestris Allard (1760-1842), also a ballet dancer, who surpassed his father, if possible, in both talent and vanity. His son, Auguste Armand Vestris (b. c 1 795), who took to the same profession, made his debut at the Opera in 1800, but left Paris for Italy and never reappeared in France. Gaetano's brother, Angelo Vestris (1730-1809), married Marie Rose Gourgaud, the sister of the actor Dugazon (q.v.).

VESTRIS, LUCIA ELIZABETH (1797-1856), English actress, was born in London in January 1797, the daughter of Gaetano Stefano Bartolozzi (1757-1821) and granddaughter of Fran- cesco Bartolozzi, the engraver. In 1813 she married Auguste Armand Vestris (see above), who deserted her four years later. With an agreeable contralto voice and a pleasing face and figure, Madame Vestris had made her first appearance in Italian opera in the title-role of Peter Winter's II raito di Proserpina at the King's Theatre in 181 5. She had an im- mediate success in both London and Paris, where she played Camille to Talma's Horace in Horace. Her first hit in English was at Drury Lane in James Cobb's (1756-1818) Siege of Bel- grade (1820). She was particularly a favourite in " breeches parts," like Cherubino in the Marriage of Figaro, and in Don Giovanni, and with such introduced songs as " Cherry Ripe," "Meet me by

> moonlight alone," "I've been roaming," etc. In 1 83 1, having accumulated a fortune, she became lessee of the Olympic Theatre, and began the, presentation of a series of burlesques and extravaganzas- for which she made this house famous. She married Charles James Mathews in 1838, accompanying him to America and aiding him in his subsequent managerial ventures. Her last appearance (1854) was; for his benefit in an adaptation of Madame de Girardin'.s La J pie fait peur, called Sunshine through Clouds, and she died in London on the 8th of August 1856. Her musical accomplishments and education were not sufficient to distinguish her in grand opera, and in high comedy she was only moderately successful. But in plays like Loan of a Lover, Paul Pry, Naval Engagements, etc., she was delightfully arch and bewitching.

VESTRY (O. Fr. vestiaire, Lat. vestiarium, a wardrobe), a place or room adjoining a church, where the vestments of the minister are kept. Hence the name applied to an assembly of the parishioners, usually convened in the vestry, to transact the business of the parish. In populous parishes it obtains by custom in some, and by the " Adoptive " Vestries Act 1831 in others, to choose yearly a select number of parishioners, called a " select vestry," to manage the concerns of the parish. (See Parish.)

VESUVIANITE, a rock-forming mineral of complex com- position. It is a basic calcium and aluminium silicate con- _ aining small amounts of iron, magnesium, water,

/^>7p. fluorine, etc., and sometimes boron; the ap-

^^ ' ' proximate formula is H5Ca6(Al,Fe) 3 Si 5 0i8. It

crystallizes in the tetragonal system, but often exhibits optical anomalies, and the

optical sign varies from positive to negative. Well-devel- oped crystals are of frequent occurrence. They ^^J-j—y usually have the form of four- or eight-sided — prisms terminated by the basal planes © and

pyramid-planes (p in fig.) ; the prism-planes are vertically Striated and the basal planes smooth and bright. Crystals are

transparent to translucent, vitreous in lustre and vary in colour from brown to green; a sky-blue variety, called cyprine, owes its colour to the presence of a trace of copper. The specific gravity is 3-4 and the hardness 65. The name vesuvianite was given by A. G. Werner in 1795, because fine crystals of the mineral are found at Vesuvius; these are brown in colour and occur in the ejected limestone blocks of Monte Somma. Several other names have been applied to this species, one of which, idocrase of R. J. Haiiy (1796), is now in common use.

Vesuvianite is typically a mineral of contact-metamorphic origin, occurring most frequently in crystalline limestones at their contact with igneous rock-masses; it also occurs in serpentine, chlorite- schist and gneiss, and is usually associated with garnet, diopside, wollastonite, &c. Localities which have yielded fine crystallized specimens are the Ala valley near Turin, Piedmont, Monte Somma (Vesuvius), Monzoni in the Fassa valley, Tirol, Achmatovsk near Zlatonst in the Urals, the River Wilui district near Lake Baikal in Siberia (" wiluite "), Christiansand in Norway, &c. When found in transparent crystals of a good green or brown colour it is occasionally cut as a gem-stone. A compact variety, closely resembling jade in appearance, has been used as an ornamental stone. (L. J. S.) ,

VESUVIUS (also Vesevus in ancient poets), a volcano rising from the eastern margin of the

Bay of Naples in Italy, about 7 m. E.S.E. of Naples, in the midst of a region which has been densely populated by a civilized community for more than twenty-five centuries. Hence the mountain has served as a type for the general popular conception of a volcano, and its history has supplied a large part of the information on which geological theories of volcanic action have been based. The height of the mountain varies from time to time within limits of several hundred feet, according to the effects of successive eruptions, but averages about 4000 ft. above sea-level (in June 1900, 4275 ft., but after the eruption of 1906 considerably less). Vesuvius consists of two distinct portions. On the north- ern side a lofty semicircular cliff, reaching a height of 3714 ft., half encircles the present active cone, and descends in long slopes towards the plains below. This precipice, known as Monte Somma, forms the wall of an ancient prehistoric crater of vastly greater size than that of the present volcano. The continuation of the same wall round its southern half has been in great measure obliterated by the operations of the modern vent, which has built a younger cone upon it, and is gradually filling up the hollow of the prehistoric crater. At the time of its greatest dimensions the volcano was perhaps twice as high as it is now. By a colossal eruption, of which no historical record remains, the upper half of the cone was blown away. It was around this truncated cone that the early Greek settlers founded their little colonies.

At the beginning of the Christian era, and for many previous centuries, no eruption had been known to take place from the mountain, and the volcanic nature of the locality was perhaps not even suspected by the inhabitants who planted their vine- yards along its fertile slopes, and built their numerous villages and towns around its base. The geographer Strabo, however,

detected the probable volcanic origin of the cone and drew attention to its cindery and evidently fire-eaten rocks. From his account and other references in classical authors we gather that in the first century of the Christian era, and probably for hundreds of years before that time, the sides of the mountain were richly cultivated, as they are still, the vineyards being of extraordinary fertility. The wine they produce is known as Lacrimae Ckristi. But towards the top the upward growth of vegetation had not concealed the loose ashes which still remained as evidence of the volcanic nature of the place. On this barren summit lay a wide flat depression, surrounded with rugged walls of rock, which were festooned with wild vines. The present crater-wall of Monte Somma is doubtless a relic of that time. It was in this lofty rock-girt hollow that the gladiator Spartacus was besieged by the praetor Claudius Pulcher; he escaped by twisting ropes of vine branches and descending through un- guarded fissures in the crater-rim. A painting found in Pompeii in 1879 represents Vesuvius before the eruption {Notizie degli scavi, 1880, pi. vii.)-

After centuries of quiescence the volcanic energy began again

to manifest itself in a succession of earthquakes, which spread alarm through Campania. For some sixteen years after 63 these convulsions continued, doing much damage to the sur- rounding towns. At Pompeii, for example, among other de- vastation, the temple of Isis was' shaken into ruins, and, as an inscription records, it was rebuilt from the foundations by the munificence of a private citizen. On the 24th of August 79 the earthquakes, which had been growing more violent, culmi- nated in a

tremendous explosion of Vesuvius. A contemporary account of this event has been preserved in two letters of the younger Pliny to the historian Tacitus. He was staying at Misenum with his uncle, the elder Pliny, who was in command of the fleet. The latter set out on the afternoon of the 24th to attempt to rescue people at Herculaneum, but came too late, and went to Stabiae, where he spent the night, and died the following morning, suffocated by the poisonous fumes which were ex- haled from the earth. This eruption was attended with great destruction of life and property. Three towns are known to have been destroyed — Herculaneum at the western base of the volcano, Pompeii on the south-east side, and Stabiae, still farther south, on the site of the modern Castellamare. There is no evi- dence that any lava was emitted during this eruption. But the abundant steam given off by the volcano seems to have con- densed into copious rain, which, mixing with the light volcanic dust and ash, gave rise to torrents of pasty mud, that flowed down the slopes and overwhelmed houses and villages. Hercu- laneum is believed to have been destroyed by these " water lavas," and there is reason to suppose that similar materials filled the cellars and lower parts of Pompeii. Comparing the statements of Pliny with the facts still observable in the district, we perceive that this first recorded eruption of Vesuvius belongs to that phase of volcanic action known as the paroxysmal, when, after a longer or shorter period of comparative tranquillity, a volcano rapidly resumes its energy and the partially filled-up crater is cleared out by a succession of tremendous explosions. For nearly fifteen hundred years after the catastrophe of 79 Vesuvius remained in a condition of less activity. Occasional eruptions are mentioned, e.g. in a.d. 203, 472 and 685, and nine in the middle ages down to 1500. None, however, was of equal im- portance with the first, and their

details are given vaguely by the authors who allude to them. By the end of the 15th century the mountain had resumed much the same general aspect as it presented before the eruption described by Pliny. Its crater- walls, some s m. in circumference, were hung with trees and brushwood, and at their base stretched a wide grassy plain, where cattle grazed and the wild boar lurked in the thickets. The central tract was a lower plain, covered with loose ashes and marked by a few pools of hot and saline water. At length, after a series of earthquakes lasting for six months and gradu- ally increasing in violence, the volcano burst into renewed paroxysmal activity on the 16th of December 1631. Vast

clouds of dust and stones, blown out of the crater and funnel of the volcano, were hurled into the air and carried for hundreds of miles, the finer particles falling to the earth even in the Adri- atic and at Constantinople. The clouds of steam condensed into copious torrents, which, mingling with the fine ashes, pro- duced muddy streams that swept far and wide over the plains, reaching even to the foot of the Apennines. Issuing from the flanks of the mountain, several streams of lava flowed down towards the west and south, and reached the sea at twelve or thirteen different points. Though the inhabitants had been warned by the earlier convulsions of the mountain, so swiftly did destruction come upon them that 18,000 are said to have lost their lives.

Since this great convulsion, which emptied the crater, Vesuvius has never again relapsed into a condition of total quiescence. At intervals, varying from a few weeks or months to a few years, it has broken out into eruption, sometimes emitting only steam, dust and scoriae, but frequently also streams of lava. The years 1766-67, 1779, 1794, 1822, 1872 and 1906 were marked by special activity. The last completely altered the aspect of the cone,

considerably reducing its height.

The modern cone of the mountain has been built up by suc- cessive discharges of lava and fragmentary materials round a vent of eruption, which lies a little south of the centre of the prehistoric crater. The southern segment of the ancient cone, answering to the semicircular wall of Somma on the north side, has been almost concealed, but is still traceable among the younger accumulations. The numerous deep ravines which indented the sides of the prehistoric volcano, and still form a marked feature on the outer slopes of Somma, have on the south side served as channels to guide the currents of lava from the younger cone. But they are gradually being filled up there and will ultimately disappear under the sheets of molten rock that from time to time rush into them from above. On one of the ridges ' between these radiating valleys an observatory for watching the progress of the volcano was established by the Neapolitan^ government, and is still supported as a national institution. A continuous record of each phase in the volcanic changes has been taken, and some progress has been made in the study of the phenomena of Vesuvius" and in prognosticating the occur- rence and probable intensity of eruptions. The foot of the cone is reached from Naples by electric railway, and thence a wire- rope railway (opened in 1880) carries visitors to within 150 yds. of the mouth of the crater.

See John Phillips, Vesuvius (1869); Pompei e la Regime Sotter- rata dal Vesuvio nelV Anno 79 (Naples, 1879); L. Palmieri, Vesuvio e la sua Storia (Milan, 1880) ; H. J. Johnstone-Lavis, " The Geology of Monte Somma and Vesuvius " (1884), in Quart. Journ. Geol. Soc. vol. xl. p. 85; J. L. Lobley, Mount Vesuvius (London, 1889); F. Furchheim, Bibliografia del Vesuvio (Naples, 1897); T.-McK. Hughes, " Herculaneum," in Proc. Camb. Antiq. Soc. No. xlviii. p. 25 (Cambridge, 1908). (A. Ge.; T. As.)

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George Waiter Prothero, M.A., Litt.D., LL.D.

Editor of the Quarterly Review. Honorary Fellow, formerly Fellow of King’s I

College, Cambridge. Fellow of the British Academy. Professor of History in the J \i/;ik««, tv v,™ n r v*,~i*nn University of Edinburgh, 1894-1899. Author of Life and Times of Simon de Mont- 1 wuuam lv - > Am & 01 *-ngiano. fort ; &c. Joint-editor of the Cambridge Modern History. I

G. W. R. Major George William Redway. f nnM—.,,,.. ,. . a

Author of The War of Secession, 1861-1862; Fredericksburg: a Study in War. \ wutt « In ess Km part).

G. W. T. Rev. Griefithes Wheeler Thatcher, M.A., B.D. f Wahhabis; Waqidi;

Warden of Camden College, Sydney, N.S.W. Formerly Tutor in Hebrew and Old \ Ya'qfibl; Yaqut; Testament History at Mansfield College, Oxford. [Zamakhshari; Zuhair.

INITIALS AND HEADINGS OF ARTICLES

IX

H. Ch.

H. C. H.

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H. W. C. D.

H. W. R.*

A.

I. J. C.

Hugh Chisholm, M.A.

Formerly Scholar of Corpus Christi College, Oxford. Editor of the Ilth edition of" the Encyclopaedia Britannica. Co-editor of the ioth edition.

Rev. Horace Carter Hovey, A.M., D.D.

Fellow of the American Association for the Advancement of Science, the Geological Society of America, the National Geographic Society and the Societede Sp£!eologie. * Author of Celebrated American Caverns; Handbook of Mammoth Cave of Kentucky; &c.

Victoria, Queen;

Walter, John;

Ward, Mrs Humphry;

Wilde, Oscar;

Wordsworth, William (in pari)

Wyandotte Cave.

nd

Hippot.yte Delehaye, S.J.

Bollandist. Joint Editor of the Acta Sanctorum; and the Analecla BoUandiana

Herbert Edward Ryle, M.A., D.D.

Dean of Westminster. Bishop of Winchester, 1903-1911. Bishop of Exeter, 1901- 1903. Formerly Hulsean Professor of Divinity in the University of Cambridge; and Fellow of King's College. Author of On Holy Scripture and Criticism; &c. &c.

Hans Friedrich Gadow, M.A., Ph.D., F.R.S.

Strickland Curator and Lecturer on Zoology in the University of Cambridge. Author of " Amphibia and Reptiles " in the Cambridge Natural History; &c.

Sir Henry Hardinge Cunynghame, K.C.B., M.A.

Assistant Under-Secretary, Home Office, London. Vice-President, Institute of Electrical Engineers. Author of various works on Enamelling, Electric Lighting, &c.

Rev. Henry Herbert Williams, M.A.

Fellow, Tutor and Lecturer in Philosophy, Hertford College, Oxford. Chaplain to the Bishop of Llandaff.

Henry Jackson, M.A., Litt.D., LL.D., O.M. f

Regius Professor of Greek in the University of Cambridge, and Fellow of Trinity J College. Fellow of the British Academy. Author of Texts to illustrate the History of\ Greek Philosophy from Thales to Aristotle. I

Henry James Chaney, I.S.O. (1842-1906).

Formerly Superintendent of the Standards Department of the Board of Trade, and Secretary to the Royal Commission on Standards. Represented Great Britain at the International Conference on the Metric System, 1901. Author of Treatise on Weights and Measures.

Horace Lamb, M.A., LL.D., D.Sc, F.R.S.

Professor of Mathematics in the University of Manchester. Formerly Fellow Assistant Tutor of Trinity College, Cambridge. Member of Council of the Royal Society, 1894-1896. Royal Medallist, 1902. President of London Mathematical Society, 1902-1904. Author of Hydrodynamics ; &c.

Henry Lewis Jones, M.A., M.D., F.R.C.P., M.R.C.S.

Medical officer in charge of the Electrical Department and Clinical Lecturer on Medical Electricity at St Bartholomew's Hospital, London. Author of Medical Electricity ; &c.

Hector Munro Ciiadwick, M.A.

Fellow and Librarian of Clare College, Cambridge, and University Lecturer in Scandinavian. Author of Studies on Anglo-Saxon Institutions.

Herbert Murray Vaughan, M.A., F.S.A.

Keble College, Oxford. Author of The Last of the Royal Stuarts; The Medici Popes; The Last Stuart Queen.

Henry Richard Tedder, F.S.A.

Secretary and Librarian of the Athenaeum Club, London.

Henry Sturt, M.A.

Author of Idola Theatri ; The Idea of a Free Church ; Personal Idealism.

Henry Sweet, M.A., Ph.D., LL.D.

University Reader in Phonetics, Oxford University. Corresponding Member of the Academies of Munich, Berlin, Copenhagen and Helsingfors. Author cf A History of English Sounds since the Earliest Period ; A Primer of Phonetii s ; &c.

Henry William Carless Davis, M.A.

Fellow and Tutor of Balliol College, Oxford. Fellow of All Souls College, Oxford, 1895-1902. Author of England under the Normans and Angevins; Charlemagne.

Rev. Henry Wheeler Robinson, M.A.

Professor of Church History in Rawdon College, Leeds. Senior Kennicott Scholar, Oxford, 1901. Author of ” Hebrew Psychology in Relation to Pauline Anthropo- logy ” in Mansfield College Essays; &c.

Israel Abrahams, M.A.

Reader in Talmudic and Rabbinic Literature in the University of Cambridge. Formerly President, Jewish Historical Society of England. Author of A Short History of Jewish Literature ; Jewish Life in the Middle A ges ; Judaism ; &c.

Isaac Joslin Cox, Pn.D.

Assistant Professorof History in the University of Cincinnati. President of the Ohio Valley Historical Association. Author of The Journeys of La Salle and his Companions; &c.

-I Vincent, St; Vitus, St.

Westcott, Brooke Foss.

Viper.

Watch {in pari).

Examining 1 Will: Philosophy.

Xenocrates;

Xenophanes of Colophon; Zeno of Elea.

Weights and Measures:

Scientific and Commercial.

Wave.

X-Ray Treatment.

Woden.

Wales: Geography and Statistics and History.

Wood, Anthony a.

Vischer, Friedrich Theodor.

Volapuk.

Wace, Robert; Walter of Coventry; William I., King of England; William II., King of England; William of Malmesbury; William of Newburgh.

Zechariah (in part) .

Wise, Isaac Mayer; Zunz, Leopold.

Wilkinson, James.

J.

A. H.

J.

Bt.

J.

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J.

E. 0.

J. A. E. James Alfred Ewing, C.B., LL.D., F.R.S., M.Inst.CE. f

Director of (British) Naval Education. Hon. Fellow of King's College, Cambridge. J \ir a H T am pc

Professor of Mechanism and Applied Mechanics in the University of Cambridge, 1 '

1890-1903. Author of The Strength of Materials ; &c. I

J. A. F. John Ambrose Fleming, M.A., D.Sc, F.R.S. _ |

Pender Professor of Electrical Engineering in the University of London. Fellow of J Voltmeter' Wattmeter* University College, London. Formerly Fellow of St John's College, Cambridge, 1 whoatcfnJa'c p . H „ * and University Lecturer on Applied Mechanics. Author of Magnets and Electric "neaisione S Bridge. Currents. [

John Allen Howe. f

Curator and Librarian of the Museum of Practical Geology, London. Author of 1 Wealden; Wenlock Group.

The Geology of Building Stones. I

James Bartlett. f

Lecturer on Construction, Architecture, Sanitation, Quantities, &c, at King's J Wall-eoverinffS College, London. Member of the Society of Architects. Member of the Institute of 1 Junior Engineers. I

John Burroughs. -f whitman to»i +

See the biographical article: Burroughs, John. \ waumau > wau –

Julius Emtl Olson, B.L. _ f

Professor of Scandinavian Languages and Literature at the University of Wisconsin. -I. Vinland.

Author of Norwegian Grammar and Reader. [_

J. F.-K. James Fitzmaueice-Kellv, Litt.D., F.R.Hist.S. f

Gilmour Professor of Spanish Language and Literature, Liverpool University. Vlllaniediana, Count de; Norman McColl Lecturer, Cambridge University. Fellow of the British Academy. "1 Villena, Enrique de; Member of the Royal Spanish Academy. Knight Commander of the Order of Zorrilla y Moral Jose. Alphonso XII. Author 01 A History of Spanish Literature; &c. [' ■ "

J. P. M'L. John Fergusson M'Lennan. j Wer woIf (in pari).

See the biographical article : M Lennan, John Fergusson. t

J. Ga. James Gairdner, C.B LL.D. J York, House of.

See the biographical article : Gairdner, James. i_

J. G. H. Joseph G. Horner, A.M.I. Mech.E. j' .. ,. ,

Author of Plating and Boiler Making; Practical Metal Turning; &c. \ WelOing (,»» part).

J. G. M. John Gray McKendrick, M.D., LL.D., F.R.S. , F.R.S. (Edin.). f vision-

Emeritus Professor of Physiology in the University of Glasgow. Professor of -j „ . ' Physiology, 1876-1906. Author of Life in Motion; Life of Helmhollz; &c. |_ V01C6.

J. G. R. John George Robertson, M.A., Ph.D. f

Professor of German Language and Literature, University of London. Editor of the J w . , ˆ -,. . , . w ,. Modem Language Journal. Author of History of German Literature ; Schiller after | Wielana, l/nristopu. Martin.

a Century; &c. I

J. G. So. Sir James George Scott, K.C.I.E. [

Superintendent and Political, Officer, Southern Shan States. Author of Burma; "j Wa. The Upper Burma Gazetteer. t

J. H. F. John Henry Freese MA jxenophon (in part).

Formerly Fellow of St John s College, Cambridge. I

J. H. M. John Henry Middleton, M.A., Litt.D., F.S.A., D.C.L. (1846-1806). f

Slade Professor of Fine Art in the University of Cambridge, 1 886-1895. Director Vltrovius; of the Fitzwilliam Museum, Cambridge, 1 889-1 892. Art Director of the South H Wren, Sir Christopher; Kensington Museum, 1892-1896. Author of The Engraved Gems of Classical Zuccaro I.-II. Times; Illuminated Manuscripts in Classical and Medieval Times. [_

I- J. L.* Rev. John James Lias, M.A. r

Chancellor of Llandaff Cathedral. Formerly Hulsean Lecturer in Divinity and Lady J w.,-.! wiliiom rAˆ. Margaret Preacher, University of Cambridge. Author of Miracles, Science and) wara > "Uiiam ueorge. Prayer ; &c. [

J. L. W. Jessie Laidlay Weston. f _. .. _ , . .

Author of Arthurian Romances unrepresented in Malory. | WOltrarn von iJiSCnenbaen.

J. Mac. James MacQueen, F.R.C.V.S. r

Professor of Surgery at the Royal Veterinary College, London. Editor of Fleming's

Operative Veterinary Surgery (2nd edition); Dun's Veterinary Medicines (ioth-{ Veterinary Science {in part):

edition); and Neumann's Parasites and Parasitic Diseases of the Domesticated J

Animals (2nd edition). t I

J. Mu.* John Muir, A.M., LL.D. ' f

Member of the American Academy of Arts and Letters. President of the Sierra Club and the American Alpine Club. Visited the Arctic regions on the United-! yosemite. States steamer " Corwin " in search of the De Long expedition. Author of The Mountains of California; Our National Parks; &c. !

J. M. G. John Miller Gray (1850-1894). t r

Art Critic. Curator of the Scottish National Portrait Gallery, 1884-1894. Author J Wilkie, Sir David. of David Scott, R.S.A.; Jamas and William Tassie.]_

J. M. J. John Morris Jones, M.A. f

Professor of Welsh at the University College of North Wales, Bangor. Formerly I Wales: Literature and Research Fellow of Jesus College, Oxford. Author of The Elucidarium in Welsh; 1 Language.

J. M. M. John Malcolm Mitchell. r _ –

Sometime Scholar of Queen's College, Oxford. Lecturer in Classics, East London -j WinckelmanH {in part). College (University of London). Joint-editor of Grote's History of Greece. |_

J. Si.

J. S. N.

J. S. R. J.T.*

J. T. Be.

J. T. C.

J. V. B. J. W.

J. We. J. W. G.

J. W. He.

K. G. K. G. J. K. S.

L.

L. D.*

L. F. V.-H.

L. J. S.

L. R. P.

L. V.*

j Winckelmann (in part)

Wyttenbach, Daniel Albert.

James Sime, M.A. (1843-1895).

Author of A History of Germany; &c.

Joseph Shield Nicholson, M.A., Sc.D. f

Professor of Political Economy at Edinburgh University. Fellow of the British J Wages;

Academy. Author of Principles of Political Economy; Money and Monetary 1 Wealth.

Problems; &c. I

James Smith Reid, M.A., LL.M., Litt.D., LL.D.

Professor of Ancient History in the University of Cambridge and Fellow and Tutor J of Gonvillc and Caius College. Hon. Fellow, formerly Fellow and Lecturer, of Christ's College. Editor of Cicero's Academica; De Amicitia; &c.

Rev. John Telford. [Wesley (Family);

Wesleyan Methodist Connexional Editor. Editor of the Wesleyan Methodist J \y es i e y John' Magazine and the London Quarterly Review. Author of Life of John Wesley; „. , „ .*. ,. . _, ,

Life of Charles Wesley; &c. I Wesleyan Methodist Church.

Vladimir: Government [in part) Volga (in part); Vologda: Government (in part) Vyatka: Government (in part). Warsaw: Poland (in part); Yakutsk (in part); Yeniseisk (in part).

John Thomas Bealby.

Joint -author of Stanford's Europe. Formerly Editor of the Scottish Geographical Magazine. Translator of Sven Hedin's Through Asia, Central Asia and Tibet; &c.

Joseph Thomas Cunningham, M.A., F.Z.S.

Lecturer on Zoology at the South-Western Polytechnic, London. Formerly Fellow of University College, Oxford, and Assistant Professor of Natural History in the University of Edinburgh. Naturalist to the Marine Biological Association.

James Vernon Bartlet, M.A., D.D.

Professor of Church History, Mansfield College, Oxford. Author of The Apostolic Age; &c.

James Williams, M.A., D.C.L., LL.D.

All Souls Reader in Roman Law in the University of Oxford, and Fellow of Lincoln College. Barrister-at-Law of Lincoln's Inn. Author of Law of the Universities; &c.

Julius Wellhausen, D.D.

See the biographical article: Wellhausen, Julius.

John Walter Gregory, D.Sc, F.R.S.

Professor of Geology in the University of Glasgow. Professor of Geology and Mineralogy in the University of Melbourne, 1900-1904. Author of The Dead Heart of A ustratia ; &c.

James Wycliffe Headlam, M.A.

Staff Inspector of Secondary Schools under the Board of Education. Formerly Fellow of King's College, Cambridge, and Professor of Greek and Ancient History at Queen's College, London. Author of Bismarck and the Foundation of the German Empire; &c.

Karl Frif.drich Geldner, Ph.D.

Professor of Sanskrit and Comparative Philology in the University of Marburg. Author of Vedische Studien; &c. •

KiNfiSLF.v Garland Jayne.

Sometime Scholar of Wadham College, Oxford. Author of Vasco da Gama and his Successors.

Kathleen Schlesinger.

Editor of The Portfolio of Musical Archaeology. Author of The Instruments of the Orchestra.

Count Lutzow, Litt.D., D.Ph., F.R.C..S. f

Chamberlain of H.M. the Emperor of Austria, King of Bohemia. Hon. Member of the Royal Society of Literature. Member of the Bohemian Academy, &c. Author \ Zizka, John. of Bohemia: a Historical Sketch; The Historians of Bohemia (Ilchester Lecture, Oxford, 1904) ; The Life and Times of John Hus ; &c- •

Louis Duchesne.

See the biographical article: Duchesne, Louis M. O.

Leveson Francis Vernon-Harcourt, M.A., M.Inst. C.E. (1839-1907).

Professor of Civil Engineering at University College, London, 1882ˆ1905. Author of Rivers and Canals ; Harbours and Docks; Civil Engineering as applied in Con- struction ; &c.

Whitebait.

Vinet, Alexandre R,

Warranty; Water Rights;

Will (Law);

Women (Early Law); Writ.

Zechariah (in part).

Victoria: Geology; Western Australia: Geology.

Windthorst, Ludwig.

Zend-Avesta; Zoroaster.

Matthew Arnold Prizeman, 1903. j

Xavier, Francisco de.

Vielle; Viol; Virginal; Wind Instruments; Xylophone.

{ Victor I.-II. (Popes).

Weir.

Leonard James Spencer, M.A.

Assistant in the Department of Mineralogy, British Museum. Formerly Scholar of Sidney Sussex College, Cambridge, and Harkness Scholar. Editor of the Minera- logical Magazine.

Lewis Richard Farnf.ll, M.A., Litt.D. f

Fellow and Senior Tutor of Exeter College, Oxford. University Lecturer in Classical J 7 P1IS Archaeology; and Wilde Lecturer in Comparative Religion. Author of Cults of) ‘

Greek States ; Evolution of Religion. I

Luioi Villari.

Italian Foreign Office (Emigration Department). Formerly Newspaper Corre- spondent in the East of Europe. Italian Vice-Consul in New Orleans, 1906 ; Phila- delphia, 1907 ; and Boston, 1907-1910. Author of Italian Life in Town and Country ; &c.

r Vivianite; Wad; I Wavellite; Willemite; J Witherite; Wollastonite; I

Zeolites; Zoisite.

Victor Emmanuel II.

L.

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LNITIALS AND HEADINGS OF ARTICLES

M. Ca. M. H. S.

N. W. T.

P. A. K.

P. C. M.

P. Gi.

P. G. H. P. G. K.

P. S.

P Vi. R. A. W.

R. C. D.

R. G. R. G. M. R. He.

R. J. M.

Zionism.

Lccien Wolf. |

Vice-President, formerly President, of the Jewish Historical Society of England. *i Joint-editor of the Bibliotheca Anglo-judaica. I

Lady Broome (Mary Anne Broome).

Author of Station- Life in New Zealand; Stories About; Colonial Memories; &c.

Malcolm Bell.

Author of Pewter Plate; Sir E. Burne-Jones: a Record and Review.

Margaret Bryant.

Rt. Rev. Makdell Creighton, D.C.L., LL.D.

Sec the biographical article: Creighton, Mandell.

Moritz Cantor, Ph.D. J

Honorary Professor of Mathematics in the University of Heidelberg. Ilofrat of “1 Vieta, Francois. the German Empire. Author of Vorlesungen uber die Geschichte der Mathematik ; &c. t

Marion II. Spielmann, F.S.A.

Formerly Editor of the Magazine of A rt. Member of Fine Art Committee of Inter- national Exhibitions of Brussels, Paris, Buenos Aires, Rome, and the PVanco-British Exhibition, London. Author of History of “Punch” ; British Portrait Painting to the opening of the igth Century; Works of G. ¥. Walls, R.A.; British Sculpture and Sculptors of To-Day ; Henriette Ronner ; &c.

i Western Australia: History.

\ Watts, George Frederick. I Virgil: The. Virgil Legend. \ Waldenses.

Wauters, Emile; Wood-engraving {in pari).

Northcote Wiiitridge Thomas, M.A. _ I

Government Anthropologist to Southern Nigeria. Corresponding Member of the j Societe o” Anthropologic de Paris. Author of Thought Transference; Kinship and Marriage in Australia; &c.

Prince Teter Alexeivitch Kkopotkin.

See the biographical article: Kropotkin, Prince P. A.

Peter Chalmers Mitchell, M.A., D.Sc, LL.D., F.Z.S., F.R.S.

Secretary of the Zoological Society of London. University Demonstrator in Com- parative Anatomy and Assistant to Linacre Professor at Oxford, 1888-1891. Author of Outlines of Biology ; &c.

Peter Giles, M.A. , LL.D., Litt.D. f w –

Fellow and Classical Lecturer of Emmanuel College, Cambridge, and University J A. Reader in Comparative Philology. Formerly Secretary of the Cambridge Philo- 1 Y. logical Society. Author of Manual of Comparative Philology. 1 2

Week;

Werwolf (in part) ;

Witchcraft.

Vladimir: Government (in part) ; Volga (in part) ; Vologda: Government (in part) ; Vyatka: Government (in part); Warsaw: Poland

(in part) ; Yakutsk (in part); Yeniseisk (in part).

I Zoological Gardens;

1 Zoological Nomenclature.

Philip Gilbert Hamerton. Sec the biographical article:

Hamerton, Philip Gilbert.

Wood-engraving (in part).

L

Paul George Konodv.

Art Critic of The Observer and The Daily Mail. Formerly Editor of The Artist. J Watteau, Antoine. Author of The Art of Walter Crane; Velasquez, Life and Work; ike. _

Philip Schidrowhv, Ph.D., F.C.S. r

Member of the Council, Institute of Brewing; Member of the Committee of the J Whisky; Society of Chemical Industry. Author of numerous articles on the Chemistry and | Wine. Technology of Brewing, Distilling; &c. [

Paul Vinogradoff, D.C.L.. LL.D.

See the biographical article: Vinogradoff, Paul.

Colonel Robert Alexander Wahab, C.B., C.M.G., CLE.

Formerly H.M. Commissioner, Aden Boundary Delimitation. Served with Tirah Expeditionary Force, 1897-1898, and on the Anglo-Russian Boundary Commission,

Pamirs, 1895.

Romesh Chitnder Dutt, CLE. (1848 -1 000).

Fellow of the Royal Society of Literature; Member of the Royal Asiatic. Society. Barrister-at-Law, Middle Temple. Formerly Revenue Minister of Baroda State, and Prime Minister of Baroda State. Author of Economic History of India in the

V-ictorian Age, 1837-1900; &c.

Richard Gafnett, LL.D.

See the biographical article:

‘ Village Communities; . VHIenage.

Yemen.

Vidyasagar, Iswar Chandra.

Garrett, Richard.

Wakefield, Edward Gibbon.

Reginald Godfrey Marsden.

Barrister-at-Law, Inner Temple.

Sir Reginald Hennell, D.S.O., C.V.O.

Colonel in the Indian Army (retired). Lieutenant of the King’s Body-Guard of the I Yeomen of the Guard. Served in the Abyssinian Expedition, 1867-68: Afghan J W.ar, 1879-80; Burmah Campaign, 1886-87. Author of History of the Yeomen of \ the Guard, 14S5- 1904; &c.

J Wreck {in part).

Yeomen of the Guard.

Ronald John McNeill, M.A.

Christ Church, Oxford. Barrister-at-Law, Lincoln’s Inn. St James’s Gazette (London).

Formerly Editor of the-] Wentworth {Family).

INITIALS AND HEADINGS OF ARTICLES

xm

R. K. D.

R. L.*

R. L. P.

Sir Robert Kennaway Douglas.

Formerly Professor of Chinese, Kind's College, London. Keeper of Oriental Printed Books and MSS. at the British Museum, 1892-1907. Member of the Chinese Consular Service, 1858-1865. Author of The Language and Literature of China; Europe and the Far East; &c.

Richard Lydexker, F.R.S., F.G.S., F.Z.S.

Member of the Staff of the Geological Survey of India, 1874-1882. Catalogue of Fossil Mammals, Reptiles and Birds in the British Museum ; of all Lands; The Game Animals of Africa; &c.

Author of The Deer

Wade, Sir Thomas F.

Viscaoha; Vole; Walrus (in part) ; Water-Deer; Weasel; Whale (in part); Whale-fishery; Wolf (in pari)', Wombat; Zebra (in part); Zoological Distribution.

Reginald Lane Poole, M.A., Ph.D., LL.D.

Keeper of the Archives of the University of Oxford and Fellow of Magdalen College. I

Fellow of the British Academy. Editor of the English Historical Review. Author -\ Wycliffe (in part).

of Wyclijfe and movements for Reform ; &c.

R. Mu.* Rev. Robert Munro, B.D., F.S.A. (Scot.)

Barclay Manse, Old Kilpatrick, N. B.

R. N. B. Robert Nisbet Bain (d. 1909).

Assistant Librarian, British Museum, 1883-1909. Author of Scandinavia: the Political History of Denmark, Norway and Sweden, 1513-1900; Tlie First Romanovs, 1613-1725 ; Slavonic Europe : the Political History of Poland and Russia from 146Q to I7g6 ; &c.

R. P. S. R. PriENE Spiers, F.S.A., F.R.I.B.A.

Formerly Master of the Architectural School, Royal Academy, London. Past President of the Architectural Association. Associate and Fellow of King's College, * London. Corresponding Member of the Institute of France. Editor of Fergusson's History of Architecture. Author of Architecture: East and West; &c.

J Vitrified Forts.

Vladimir, St;

Voluinsky, Artemy Petrovich; Vorontsov (Family); Vorosmarty, Mihaly; Wallqvist, Olaf; Wesselenyi, Baron; Wielopolski, Aleksander; Witowt;

Wladislaus I.-IV. of Poland. Zamoyski, Jan; Zolkiewski, Stanislaus; Zrinyi, Count (1 508-1 566); . Zrinyi, Count (1620-1664).

Villa; Window.

Robert Seymour Conway, M.A., D.Lttt. f

Professor of Latin and Indo-European Philology in the University of Manchester. J v i sp ; Formerly Professor of Lathi 1 in University College, Cardiff ; and Fellow of Gonville |

R. S. C.

and Caius College, Cambridge. Author of The Italic Dialects.

R. W. F. H. Robert William Frederick Harrison.

Barristcr-al-Law, Inner Temple. Assistant Secretary of the Royal Society, London.

S. A. C. Stanley Arthur Coos.

Lecturer in Hebrew and Syriac, and formerly Fellow, Gonville and Caius College, Cambridge. Editor for the Palestine Exploration Fund. Author of Glossary of Aramaic Inscriptions; The Laws of Moses and the Code of Hammurabi; Critical Notes on Old Testament History; Religion of Ancient Palestine; &c.

S. N. Simon Newcomb, D.Sc, LL.D.

See the biographical article : Newcomb, Simon.

S. P. Stephen Paget, F.R.C.S.

Surgeon to the Throat and Ear Department, Middlesex Hospital. Hon. Secretary, Research Defence Society. Author of Memoirs and Letters of Sir James Paget ; &c.

T. As. Thomas Ashby, M.A., D.Lttt.

Director of the British School of Archaeology at Rome. Formerly Scholar of Christ Church, Oxford. Craven Fellow, 1897. Conington Prizeman, 1906. Member of the Imperial German Archaeological Institute. Author of The Classical Topography of the Roman Campagna.

T. A. A. Thomas Andrew Archer, M.A.

Author of The Crusade of Richard I. ; &c.

T. A. C. Timothy Augustine Coghlan, I.S.O.

Agent-General for New South Wales. Government Statistician, New South Wales, 1886-1905. Honorary Fellow of the Royal Statistical Society. Author of Wealth and Progress of New South Wales ; Statistical Account of A ustralia and New Zealand ; Sec.

T. Ba. Sir Thomas Barclay.

Member of the Institute of International Law. Officer of the Legion of Honour. Author of Problems of International Practice and Diplomacy; &c. M.P. for Black- burn, 1910.

T. H. B. Thomas Hudson Beare, M.Inst.C.E., M.Inst.M.E.

Regius Professor of Engineering in the University of Edinburgh. Author of papers in the Transactions of the Societies of Civil and Mechanical Engineers, 1894-1902.

/

Violin.

Zebulun; Zedekiah; Zephaniah.

Zodiacal Light

Vivisection.

Vetulonium; Vicenza; Viterbo; Volci; Volsinii; Volterra; • Volturno.

Vincent of Beauvais.

Victoria: Geography and

Statistics; Western Australia: Geography

and Statistics.

War: Laws of; Waters, Territorial.

Water Motors.

XIV

r. r. g.

T. W.-D. T. W. F.

U. B. W. Ay.

W. A. B. C.

W. A. J. F. W. A. P. W. B.* W. C. U. W. E. G. W. F. C. W. Hy.

W. H. F. W. I. G.

W. M.

W. MacD.*

INITIALS AND HEADINGS OF ARTICLES

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J.

Terrot Reaveley Glovek, M.A.

Fellow and Classical Lecturer at St John's College, Cambridge. Professor of Latin, Queen's University, Kingston, Canada, 1896-1901. Author of Studies in Virgil; &c.

Walter Theodore Watts-Dunton.

See the biographical article: Watts-Dunton, Walter Theodore.

Virgil (in part).

Wyoherley, William.

Author of Mechanics of S Y arn *

Thomas William Fox.

Professor of Textiles in the University of Manchester. Weaving.

Count Ugo Balzani, Litt.D.

Member of the Realc Accademia dei Lincei. Sometime President of the Reale Societa Romana di Storia Patria. Corresponding Member of the British Academy ; Author of The Popes and the Hohenstaufen ; &c.

Wilfrid Airy, M.Inst. C.E.

Sometime Scholar of Trinity College, Cambridge. Technical Adviser to the Standards Department of the Board of Trade. Author of Levelling and Geodesy ; &c.

Rev. William Augustus Beevoort Coolidge, M.A., F.R.G.S., Ph.D.

Fellow of Magdalen College, Oxford. Professor of English History, St David's College, Lampeter, 1880-1881. Author of Guide du Ilaut Dauphini; The Range of the Todi; Guide to Grindelwald ; Guide to

Switzerland; The Alps in Nature and in History; &c. Editor of the Alpine Journal, 1880-1881; &c.

Walter Armitage Justice Ford.

Sometime Scholar of King's College, Cambridge. Teacher of Singing at the Royal College of Music, London.

Walter Alison Phillips, M.A.

Formerly Exhibitioner of Morton College and Senior Scholar of St John's College, Oxford. Author of Modern Europe; &c.

William Burton, M.A., F.C.S.

Chairman of the Joint Committee of Pottery Manufacturers of Great Britain. Author of English Stoneware and Earthenware ; &c.

William Cawthorne Unwin, F.R.S., LL.D., M.Inst.C.E., M.Inst.M.E.

Emeritus Professor, Central Technical College, City and Guilds of London Institute. Author of Wrought Iron Bridges and Roofs ; Treatise on Hydraulics ; &c.

Sir William Edmund Garstin, G.C.M.G.

British Government Director, Suez Canal Co. Formerly Inspector-General of Irrigation, Egypt. Adviser to the Ministry of Public Works in Egypt, 1904-1908.

William Feilden Craies, M.A.

Barrister-at-Law, Inner Temple. Lecturer on Criminal Law, King's College, London. Editor of Archbold's Criminal Pleading (23rd edition).

William Henry.

Founder and Chief Secretary of the Royal Life Saving Society. Associate of the J Order of St John of Jerusalem. Joint Author of Swimming (Badminton Library) ; &c.

Sir William Henry Flower, F.R.S.

See the biographical article: Flower, Sir W. H.

Villani, Giovanni.

Weighing Machines.

Vevey; Vienne: Town; Vorarlberg; Walensee; Winkelried, Arnold von; Winterthur; Zug: Canton; Zug: Town; Zug, Lake of; Zurich: Canton; Zurich: Town; Zurich, Lake ot.

Wolf, Hugo.

Walther von der Vogelweide; Wycliffe (in part).

Wedgwood, Josiah.

Windmill.

Victoria Nyanza (in part).

Wager; Warrant; Witness.

Water Polo.

Walrus (in part); Whale (in part) ; Wolf (in part) ; Zebra (in part).

William Lawson Grant, M.A. f

Professor of Colonial History, Queen's University, Kingston, Canada. Formerly J ^|yii sfln gjj, Daniel. Beit Lecturer on Colonial History, - Oxford University. Editor of Acts of the Privy j *

Council (Canadian Series). I

William Minto, M.A.

See the biographical article : MlNTO, WILLIAM.

William MacDonald, LL.D., Ph.D.

Professor of American History in Brown University, Frovidence, R.I. Formerly Professor of History and Political Science, Bowdoin. Member of the American" Historical Association, &c. Author of History and Government of Maine; &c Editor of Select Charters and other documents illustrative of American History.

i Wordsworth, William (in parti.

Washington, George.

William Matthew Flinders Fetrie, F.R.S., D.C.L., Litt.D. See the

biographical article : Petrie, W. M. Flinders.

William Michael Rossetti.

See the biographical article: Rossetti, Dante Gabriel.

William Oscar Scroggs, Ph.D.

Assistant Professor of History and Economics at Louisiana State University Formerly Goodwin and Austin Fellow, Harvard University.

William Prtdeaux Courtney.

See the biographical article: Courtney, L. H, Baron.

J* Weights and Measures: \ Ancient Historical. J Vivarini; \ Zurbaran, Francisco.

J Walker, William.

J Walpole, Horatio; \ Wilkes, John.-

William Price James.

Barrister-at-Law, Inner Temple. Romantic Professions; &c.

High Bailiff, Cardiff County Court. Author of \ Watson, William (poet).

INITIALS AND HEADINGS OF ARTICLES

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W. P. R.

W. Ri.

W. S. R.

W. T. Ca.

W. Wr.

W. W. F.'

W. W. R.*

W. Y. S.

Hon. William 1'ember Reeves.

Director of the London School of Economics. Agent-General and High Com- missioner for New Zealand, 1896-1909. Minister of kducatiou, Labour and Justice, -I Vogel Sir JllliUS New Zealand, 1891-1896. Author of 'The Long White Cloud: a History of Nevj '

Zealand; &c. t

William Ridgeway, M.A., D.Sc, Litt.D. f

Disney Professor of Archaeology, and Brereton Reader in Classics, in the University of Cambridge. Fellow of Gonville and Caius College. Fellow of the British | Villanova. Academy. President of the Royal Anthropological Institute, 1908. Author of The Early Age of Greece; &c. ˆ~

William Smyth Rockstro. f Wagner: Biography (in part);

Author of A Great History of Music from the Infancy of the Greek Drama to the Present '\ Weber Period; &c. L

William Thomas Calman, D.Sc., F.Z.S. f Water-flea;

Assistant in charge of Crustacea, Natural History Museum, South Kensington, ~i Wood-louse Author of " Crustacea," in a Treatise on Zoology, edited by Sir E. Kay Lankestcr. I

Williston Walker, Ph.D., D.D.

Professor of Church History, Yale University. Author of History of the Congrega- tional Churches in the United States; The Reformation; John Calvin; &c.

William Warde Fowler, M.A.

Fellow of Lincoln College, Oxford

Winthrop, John (1588-1649).

Sub-rector, 1881-1904. Gifford Lecturer, J Vulcan.

Edinburgh University, 1908. Author of The City-State of the Greeks and Romans; "■ ~

The Roman Festivals of the Rep;

William Walker Rockwell, Lic.Theol.

Assistant Professor of Church History, Union Theological Seminary, Ne

William Young Sellar, I.L.D.

See the biographical article: Sellar, William Young.

York.

Westminster, Synods of.

-j Virgil (in part).

PRINCIPAL UNSIGNED ARTICLES

Vicksburg.

Vienna.

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Wakefield.

Waldeck-Pyrmont.

Wallingford.

Walnut.

War Game.

Warrington.

Warwick.

Warwickshire.

Washington.

Water.

Waterford.

Watertown.

Wax Figures.

Weimar.

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Wells.

West Indies.

Westmeath.

Westminster.

Westmorland.

Westphalia.

West Point (N.Y.).

West Virginia.

Wexlord.

Weymouth.

Wheat.

Wheeling.

Whig and Tory.

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Whitby.

White Plains.

Whooping-Cough.

Wicklow.

Wiesbaden.

Wig.

Wigan.

Wight, Isle of.

Wigtownshire.

Wilkes-Barre.

Williamsburg (Va.).

Willow.

Wilmington (Del.).

Wilton.

Wiltshire.

Winchester.

Windsor.

Winnipeg.

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of. Woolwich. Worcester. Worcestershire. Worms. Wrestling. Writing. Wiirttemberg. Wtirzburg.

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Park. Yew. Yezo. York. Yorkshire. Yorktown. Ypsilanti. Yucatan. Yukon. Zante. Zanzibar. Zeeland. Zeuxis. Zinc.

Zirconium. Zuider Zee.

ENCYCLOPAEDIA BRITANNICA

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VETCH, in botany, the English name for Vicia sativa, also known as tare, a leguminous annual herb with trailing or climb- ing stems, compound leaves with five or six pairs of leaflets, reddish-purple flowers borne singly or in pairs in the leaf-axis, and a silky pod containing four to ten smooth seeds. The wild form, sometimes regarded as a distinct species, V. angusti- folia, is common in dry soils. There are two races of the cultivated vetch, winter and spring vetches: the former, a hardy form, capable of enduring frost, has smoother, more cylindrical pods with smaller seeds than the summer variety, and gives less bulk of stem and leaves. The spring vetch is a more delicate plant and grows more rapidly and luxuriantly than the winter variety.

The name vetch is applied to other species of the genus Vicia, Vicia orobus, bitter vetch, and V. sylvalica, wood vetch, are British plants. Another British plant, Hippocrepis, is known as horseshoe vetch from the fact of its pod breaking into several horseshoe- shaped joints. Anlhyllis wdneraria is kidney-vetch, a herb with heads of usually yellow flowers, found on dry banks. Astragalus is another genus of Legumi- noaae, and is known as milk-vetch.

Vetches are a very valuable forage crop. Being indigenous to Britain, and not fastidious in regard to soil, they can be cultivated successfully under a great diversify of circumstances, and are well adapted for poor soils. By combining the winter and spring varieties, and making several sowings of each in its season at intervals of two or three weeks, it is practicable to have them fit for use from May till October, and thus to carry out a system of soiling by means of vetches alone. But it is usually more expedient to use them in combination with grass and clover, beginning with the first cutting of the latter in May, taking the winter vetches in June, recurring to the Italian ryegrass or clover

as the second cutting is ready, and afterwards bringing the spring vetches into use. Each crop can thus be used when in its best state for cattle food, and so as gratefully to vary their dietary.

Winkr Vetches. — There is no botanical difference between winter and spring vetches, and the seeds being identical in appearance, caution is required in purchasing seed to get it of

the right sort. Seed grown in England is found the most suitable for sowing in Scotland, as it vegetates more quickly, and produces a more vigorous plant than that which is home- grown. As the great inducement to cultivate this crop is the obtaining of a supply of nutritious green food which shall be ready for use about the ist of May, so as to fill up the gap which is apt to occur betwixt the root crops of theprcviousautumnand the ordinary summer food, whether for grazing or soiling, it is of the utmost importance to treat it in such a way that it may be ready for use by the time mentioned. To secure this, winter tares should be sown in August if possible, but always as soon as the land can be cleared of the preceding crop. They may yield a good crop though sown in October, but in this case will probably be very little in advance of early-sown spring vetches, and possess little, if any, advantage over them in any respect. The land on which they are sown should be dry and well sheltered, clean and in good heart, and be further enriched by farmyard manure. Not less than 3$ bushels of seed per acre should be sown, to which some think it beneficial to add half a bushel of wheat. Rye is frequently used for this purpose, but it gets reedy in the stems, and is rejected by the stock. Winter beans are better than either. The land having been ploughed rather deeply, and well harrowed, it is found advantageous to deposit the seed in rows, either by a drilling-machine or by ribbing. The latter is the best practice, and the ribs should be at least a foot apart and rather deep, [that the roots may be well developed before top-growth takes place. As soon in spring as the state of the land and weather admits of it, the crop should be hoed betwixt the drills, a top-dressing at the rate of 40 bushels of soot or 2 cwt. of guano per acre applied by sowing broadcast, and the roller then used for the double purpose of smoothing the surface so as to admit of the free use of the scythe and of pressing down the plants which may have been loosened by frost. It is thus by early sowing, thick seeding and liberal manuring that this crop is to be forced to an early and abundant maturity. May and June are the months in which winter vetches are used to advantage. A second growth will be produced from the roots if the crop is allowed to stand; but it is much better practice to plough up the land as the crop is

cleared, and to sow turnips upon it. After a full crop of vetches, land is usually in a good state for a succeeding crop. When the whole process has been well managed, the gross amount of cattle food yielded by a crop of winter vetches, and the turnip crop by which it is followed in the same summer, will be found considerably to exceed what could be obtained from the fullest crop of turnips alone, grown on similar soil, and with the same quantity of manure. It is useless to sow this crop where game abounds.

Spring vetches, if sown about the ist of March, will be ready for use by the ist of July, when the winter vetches are just cleared off. To obtain the full benefit of this crop, the land on which it is sown must be clean, and to keep it so a much fuller allowance of seed is required than is usually given in Scotland. When the crop is as thick set as it should be, the tendrils intertwine, and the ground is covered by a solid mass of herbage, under which no weed can live. To secure this, not less than 4 bushels of seed per acre should be used if sown broadcast, or 3 bushels if in drills. The latter plan, if followed by hoeing, is certainly the best; for if the weeds are kept in check until the crop is fairly established, they have no chance of getting up afterwards. With a thin crop of vetches, on the other hand, the land is so certain to get foul, that they should at once be ploughed down, and something else put in their place. As vetches are in the best state for use when the seeds begin to form in the pods, repeated sowings are made at intervals of three weeks, beginning by the end of February, or as early in March as the season admits, and continuing till May. The usual practice in Scotland has been to sow vetches on part of the oat break, once ploughed from lea. Sometimes this does very well, but a far better plan is to omit sowing clover and grass seeds on part of the land occupied by wheat or barley after a crop of turnips, and having ploughed that portion in the autumn to occupy it with vetches, putting them instead of ” seeds ” for one revolution of the course.

When vetches are grown on poor soils, the most profitable way of using them is by folding sheep upon them, a practice very suitable also for clays, upon which a root crop cannot safely be consumed in this way. A different course must, however, be adopted from that followed when turnips are so disposed of. When sheep are turned in upon a piece of tares, a large portion of the food is trodden down and wasted. Cutting the vetches and putting them into racks does not much mend the matter, as much is still pulled out and wasted, and the

manure unequally distributed over the land. To avoid those evils, hurdles with vertical spars, betwixt which the sheep can reach with head and neck, are now used. These are set close up to the growing crop along a considerable stretch, and shifted forward as the sheep eat up what is within their reach. This requires the constant attention of the shepherd, but the labour is repaid by the saving of the food, which being always fresh and clean, does the sheep more good. A modification of this plan is to use the same kind of hurdles, but instead of shifting them as just described, to mow a swathe parallel to them, and fork, this forward within reach of the sheep as required, repeating this as often during the day as is found necessary, and at night moving the sheep close up to the growing crop, so that they may lie for the next twenty-four hours on the space which has yielded food for the past day. During the night they have such pickings as have been left on the recently mown space and so much of the growing crop as they can get at through' the spars. There is less labour by this last mode than the other, and having practised it for many years, we know that it answers well. This folding upon vetches is suitable either for finishing off for market sheep that are in forward condition, or for recently weaned lambs, which, after five or six weeks' folding on this clean, nutritious herbage, are found to take on more readily to eat turnips, and to thrive better upon them, than if they had been kept upon the pastures all the autumn. Sheep folded upon vetches must have water always at command, otherwise they will not prosper.

As spring-sown vetches are in perfection at the season when

pastures usually get dry and scanty, a common practice is to cart them on to grass land and spread them out in wisps, to be eaten by the sheep or cattle. It is, however, much better either to have them eaten by sheep where they grow, or to cart them to the homestead.

VETERAN, old, tried, experienced, particularly used of a soldier w r ho has seen much service. The Latin veteranus (veins, old), as applied to a soldier, had, beside its general application in opposition to tiro, recruit, a specific technical meaning in the Roman army. Under the republic the full term of service with the legion was twenty years; those who served this period and gained their discharge (missio) were termed emeriti. If they chose to remain in service with the legion, they were then called veierani. Sometimes a special invitation was issued to the emeriti to rejoin; they were then styled evocati.

The base of Lat. vetus meant a year, as seen in the Gr. eras (for Feros) and Sanskrit vatsa; from the same hase comes Vilnius, a calf, properly a yearling, vitellus, a young calf, whence 0. Fr. veel, modern, veau,

English “veal,” the flesh of the calf. The Teutonic cognate of vitulus is probably seen in Goth, withrus, lamb, English ” wether,” a castrated ram.

VETERINARY SCIENCE (Lat. veterinarius, an adjective meaning ” connected with beasts of burden and draught,” from veterinus, ” pertaining to yearlings,” and vitulus, ” a calf “), 1 the science, generally, that deals with the conformation and structure of the domesticated animals, especially the horse; their physiology and special racial characteristics; their breed- ing, feeding and general hygienic management; their pathology, and the preventive and curative, medical and surgical, treat- ment of the diseases and injuries to which they are exposed; their amelioration and improvement; their relations to the human family with regard to communicable maladies; and the supply of food and other products derived from them for the use of mankind. In this article it is only necessary to deal mainly with veterinary science in its relation with medicine, as other aspects are treated under the headings for the par- ticular animals, &c. In the present edition of the Encyclopaedia Britannica the various anatomical articles (see Anatomy for a list of these) are based on the comparative method, and thv, anatomy of the lower animals is dealt with there and in the separate articles on the animals.

History.

There is evidence that the Egyptians practised veterinary medicine and surgery in very remote times; but it is not until we turn to the Greeks that wc obtain any very definite informa- tion with regard to the state of veterinary as well as human medicine in antiquity. The writings of Hippocrates (460-377 B.C.) afford evidence of excellent investigations in comparative pathology. Diodes of Carystus, who was nearly a contem- porary, was one of the first to occupy himself with anatomy, which he studied in animals. Aristotle, too, wrote on physiology and comparative anatomy, and on the maladies of animals, while many other Greek writers on veterinary medicine are cited or copied from by Varro, Columella and Galen. And we must not overlook Mago of Carthage (200 B.C.), whose work in twenty-eight books was translated into Greek and was largely used by Varro and Columella.

1 Regarding the origin of the word ” veterinary,” the following occurs in D’Arboval’s Dictionnaire de medecine et de chirurgie vetSrinaires, edited by Zundel (1877), iii. 814: ” Les mots veterinaria et veterinarius 6taient employes par les Romains pour designer: le premier, la medecine des bites de somme; le second, pour indiquer

celui qui la pratiquait; le mot veterinae indiquait les betes de somme, et etait la contraction de veheterinae, du verbe vehere, porter, tirer, trainer. L'etymologie reelle du mot veterinaire, ou plutrYt du mot veterinarius des Romains, serait d'apres Lenglet encore plus ancienne; elle viendrait du ecltique, d'ou le mot serait passe chez les Romains; cet auteur fait venir le mot de vee, betail (d'ou 1'allemand Vkh), teeren, etre maladc (d'ou l'allemand Zekren, consomption), aeris ou arts, artiste, m6decin (d'ou Tallemand Arzty

VETERINARY SCIENCE

Amongst

the

Romans.

Until after the conquest of Greece the Romans do not appear to have known much of veterinary medicine. Varro (116-28 B.C.) may be considered the first Roman writer who deals with animal medicine in a scientific spirit in his De Re Rustica, in three' books, which is largely derived from Greek writers. Celsus is supposed to have written on animal medicine, and Columella (rst century) is credited with having utilized those relating to veterinary science in the sixth and seventh parts of his De Re Rustica, one of the best works of its class of ancient times; it treats not only of medicine and surgery, but also of sanitary measures for the suppression of contagious diseases. From the 3rd century onwards veterinary science had a literature of its own and regular practitioners, especially in the service of the Roman armies (mulomedici, vetefhtatii). Perhaps the most renowned veterinarian of the Roman empire was Apsyrtus of Bithynia, who in 322 accompanied the expedition of Cunstantine against the Sar- matians in his professional capacity, and seems to have enjoyed a high and well-deserved reputation in his time. He was a keen observer; he distinguished and described a number of diseases which were badly defined by his predecessors, recognized _ the contagious nature of glanders, farcy and anthrax, and prescribed isolation for their suppression; he also made interesting observations on accidents and diseases of horses' limbs, and waged war against certain absurd empirical practices then prevailing in the treatment of disease, indicating rational methods, some of which are still successfully employed in veterinary therapeutics, such as splints for fractures, sutures for wounds, cold water for the reduction of prolapsed vagina, hot baths for tetanus, &c. Not less eminent was Hierocles, the successor of Apsyrtus, whose writings he largely copied, but with

improvements and valuable additions, especially tn the hygiene and training of horses. Pelagonius, again, was a writer of empirical tendency, and his treatment of disease in general was most irrational. Publius Vcgctius (not to be confounded with Flavius Vegetius Renatus, who wrote on the military art) was a popular author of the end of the 5th century ,_ though less distin- guished than Apsyrtus, to whom and to Pelagonius he was to a great extent indebted in the preparation of his Mulomedicina sive Ars Veterinaria. He appears to have been more of a horse-dealer than a veterinary practitioner, and knew next to nothing of anatomy, which seems to have been but little cultivated at that period. He was very superstitious and a believer in the influence of demons and sorcerers; nevertheless, he gives some interesting observations de- rived from his travels. He nad also a good idea of aerial infection, recognized the utility of disinfectants, and describes some operations not referred to by previous writers, such as removal of calculi from the bladder through the rectum, couching for cataract, the extirpa- tion of certain glands, and several serious operations on the horse's foot. Though inferior to several works writien by his predecessors, the Mulomedieina of Vegetius maintained its popularity through many centuries. Of most of the ancient veterinary writers we know little beyond what can be gathered from the citations and extracts in the two great collections of Hippiatrica and Geoponica compiled by order of Constantine Porphyrogenitus in the 10th century.

It is unnecessary to dwell here on the progress of the veterinary art during the middle ages. Towards the close of the medieval period the subject was much cultivated in the cavalry schools of Italy; and Spain also had an organized system of good practitioners in the 15th century, who have left many books still extant. Ger- many was far behind, and literature on the subject did not exist until the end of the 15th century, when in 1492 there was published anonymouslv at Augsburg a Pferdearzneibuchlein. In the following century the "influence of the Italian writers was becoming manifest, and the works of Fugger and Fayser mark the commencement of a new era. Fayser's treatises, Von der Gestiiterei and Von der Zucht der Kriegs- und Burger-Pferde (i52°-97)> are remarkable for originality and good sense. In Great Britain animal medicine was perhaps in a more advanced condition than in Germany, if we accept the evidence of the Ancient Laws and Institutes of Wales (London, 1841); yet it was largely made up of the grossest super- stitions. 1 Among the Celts the healer of horse diseases and the shoer were held in high esteem, as among the more civilized nations of Europe, and the court farrier enjoyed special privileges. 2 The earliest known works in English

appeared anonymously towards the commencement of the 16th century, viz. Vropertees and Medcynesjor a Horse and Mascal of Oxen, Horses, Skeepes, Hogges, Dogges. The word " mascal " shows that the latter work was in its origin Italian. There is no doubt that in the 15th century the increasing taste for horses and horsemanship brought Italian riding- masters and farriers into England; and it is recorded that Henry VIII. brought over two of these men who had been trained by Grisone in the famous Neapolitan school. The knowledge so introduced became popularized, and assumed a concrete form in Blundeville's Foure Chiefest Offices belonging to Horsemanship (1566), which contains many references to horse diseases, and, though mainly a compilation, is yet enriched with original observations. In the

1 See Leechdoms. Wortcunning and Starcraf I of Early England (3 vols. 8vo, London, 1864).

- See Fleming, Horse-shoes and Horse-Shoeing (London, 1869).

15th century the anatomy of the domesticated animals, formerly almost entirely neglected, began to receive attention. A work on comparative anatomy by Volcher Koyter was issued at Nuremberg in 1573; about the same time a writer in Germany named Copho or Cophon published a book on the anatomy of the pig, in which were many original remarks on the lymphatic vessels; and Jehan Hervard in France produced in 1504 his rather incomplete Hippo- Osteologie. But by far the most notable work, and one which main- tained its popularity for a century and a half, was that of Cano Ruini, a senator of Bologna, published in 1598 in that city, and entitled Dell' Anatomia e delV Infirmity del Cavallo, e suoi Remedii. Passing through many editions, and translated into French and German, this book was for the most part original, and a remarkable one for the time in which it was composed, the anatomical portion being especially praiseworthy. English books of the 17th century exhibit a strong tendency towards the improvement of veterinary medicine and surgery, especially as regards the horse. This is even more notable in the writings of the 18th century, among which may be particularized Gibson's Farrier's New Guide (1719), Method of Dieting Horses (1721) and (best of all) his New Treatise on the Diseases of Horses, besides Braken's, Burdon's, Bridge's and Bartlet's treatises. Veterinary anatomy was greatly advanced by the Anatomy of an Horse (1683) of Snape, farrier to Charles II., illustrated with copperplates, and by the still more complete and original work of Stubbs, the Anatomy of the Horse (1766), which decidedly marked a new era in this line of study. Of foreign works it may suffice to mention that of Solleysel, Veritable parfait mareschal (1664), which passed through many editions, was

translated into several languages, and was borrowed from for more than a century by different writers. Sir VV. Hope's Compleat Horseman (1696) is a translation from Solleysel by a pupil.

Modern Schools and Colleges. — The most important era in the history of modern veterinary science commenced with the institution of veterinary schools. France was the first to take the p rance great'initiative step in this direction. Buff on hadrecom- an aCon- mended the formation of veterinary schools, but his tlnentul recommendations were not attended to. Claude Bourgelat ˆ ur0 pe t (17 12-1799), an advocate at Lyons and a talented hippolo- [

gist, through his influence with Bertin, prime minister under Louis XV., was the first to induce the government to establish a veterinary school and school of equitation at Lyons, in 1761. This school he himself directed for only a few years, during which the great benefits that had resulted from it justified an extension of its teaching to other parts of France. Bourgelat; therefore, founded (1766) at Alfort, near Paris, a second veterinary school, which soon became, and has remained to this day, one of the finest and most advanced veterinary schools in the world. At Lyons he was replaced by the Abbe Rozier, a learned agriculturist, who was killed at the siege of Lyons after a very successful period of school management, during which he had added largely to agricultural and physical knowledge by the publication of his Journal de Physique and Cours d' Agriculture. Twenty years later the Alfort school added to its teaching staff several distinguished professors whose names still adorn the annals of science, such as Dauberton, who taught rural economy ; Vic d'Azyr, who lectured on comparative anatomy ; Fourcroy, who undertook instruction in chemistry; and_ Gilbert, one of its most brilliant pupils, who had veterinary medicine and surgerv for his department. The last-named was also a distinguished agriculturist and published many important treatises on agricultural as well as veterinary subjects. The position he had acquired, added to his profound and varied knowledge, made him most useful to France during the period of the Revolution. It is chiefly to him that it is indebted for the celebrated Rambouillet flock of Merino sheep, for the conservation of the Tuilcries and Versailles parks, and for the creation of the fine experimental agricultural estab- lishment organized in the ancient domain of Sceaux. The Alfort school speedily became the nursery of veterinary science, and the source whence all similar institutions obtained their first teachers and their guidance. A third government school was founded in 1825 at Toulouse; and these three schools have produced thousands of thoroughly educated veterinary surgeons and many professors of high scientific repute, among whom may be named Bouley, Chauveau,

Colin, Joussaint, St Cyr, Goubaux, Arloing, Galtier, Nocard, Trasbot, Neumann, Cadiot and Lcclainche. The opening of the Alfort school was followed by the establishment of national schools in Italy (Turin, 1769), Denmark (Copenhagen, 1773), Austria (Vienna, 1775), Saxony (Dresden, 1776), Prussia (Hanover, 1778; Berlin, 1790)" Bavaria (Munich, 1790), Hungary (Budapest, 1787) and Spain (Madrid, 1793); and soon government veterinary schools were founded in nearly every European country, except Great Britain and Greece, mostly on a munificent scale. Probably all, but especially those of France and Germany, were established as much with a view to training veterinary surgeons for the army as for the requirements of civil life. In 1907 France possessed three national veterinary schools, Germany had six, Russia four (Kharkov, Dorpat, Kazan and Warsaw), Italy six, Spain five, Austria-Hungary three (Vienna, Budapest and Lemberg), Switzerland two (Zurich and Bern), Sweden two (Skara and Stockholm), Denmark, Holland, Belgium and Portugal one each. In 1849 o- government veterinary

school was established at Constantinople, and in 1861 the government of Rumania founded a school at Bucharest. The veterinary schools of Berlin, Hanover and Vienna have been raised to the position of universities.

In 1790 St Bel (whose real name was Vial, St Bel being a village near Lyons, where was his paternal estate), after studying at the Lyons school and teaching both at Alfort and Lyons, came ATJ ed to England and published proposals for founding a school

*^ ' in which to instruct pupils in veterinary medicine and surgery. The Agricultural Society of Odiham, which had been meditating sending two young men to the Alfort school, elected him an honorary member, and delegated a committee to consult with him respecting his scheme. Some time afterwards this committee detached themselves from the Odiham Society and formed an institution styled the Veterinary College of London, of which St Bel was appointed professor. The school w r as to be commenced and maintained by private subscription. In March 1792 arrange- ments were made for building temporary stabling for fifty horses and a forge for shoeing at St Pancras. The college made rapid progress in public estimation, notwithstanding considerable pecuniary embarrassments. As soon as the building was ready for the recep- tion of animal patients, pupils began to be enrolled ; and among the earliest were some who afterwards gained celebrity as veterinarians, as Bloxam t Blaine, R.

Lawrence, Field and Bracy Clark. On the death of St Bel in August 1793 there appears to have been some difficulty in procuring a suitable successor; but at length, on the recommendation of John Hunter and Cline, two medical men were appointed, Coleman and Moorcroft, the latter then practising as a veterinary surgeon in London. The first taught anatomy and physiology, and Moorcroft, after visiting the French schools, directed the practical portion of the teaching. Unfortunately, neither of these teachers had much experience among animals, nor were they well acquainted with their diseases; but Coleman (1765-1839) had as a student, in conjunction with a fellow- student (afterwards Sir Astley Cooper), performed many experiments on animals under the direction of CJine. Moorcroft, who remained only a short time at the college, afterwards went to India, and during a journey in 1S19 was murdered in Tibet. Coleman, by his scientific researches and energetic management, in a few years raised the college to a high standard of usefulness; under his care the progress of the veterinary art was such as to qualify its practitioners to hold commissions in the army ; and he himself was appointed veterinary surgeon- general to the British cavalry. In 1831 he was elected a fellow of the Royal Society. Owing to the lack of funds, the teaching at the college must have been very meagre, and had it not been for the liberality of several medical men in throwing open the doors of their theatres to its pupils for instruction without fee or reward, their professional knowledge would have been sadly deficient. The board of examiners was for many years chiefly composed of eminent members of the medical profession. Coleman died in 1839, and with him disappeared much of the interest the medical profession of London took in the progress of veterinary medicine. Vet the Royal Veterinary College (first styled ” Royal ” during the presidentship of the duke of Rent) continued to do good work in a purely veterinary direction, and received such public financial support that it was soon able to dispense with the small annual grant given to it by the government. In the early years of the institution the horse was the only animal to which much attention was given. But at the instigation of the Royal Agricultural Society of England, which gave £200 per annum for the purpose, an addi- tional professor was appointed to investigate andteach the treatment of the diseases of cattle, sheep and other animals; outbreaks of disease among these were also to be inquired into by the_ officers of the college. This help to the institution was withdrawn in 1875, but renewed and augmented in 1886. For fifteen years the Royal Agricultural Society annually voted a sum of £500 towards the expenses of the department of comparative pathology, but in 1902 this grant was reduced to £200.

As the result of representations made to the senate of the uni- versity of London by the governors of the Royal Veterinary College, the university in 1906 instituted a degree in veterinary science (B.Sa). The possession of this degree does not of itself entitle the hclder to practise as a veterinary surgeon, but it washoped that an increasing number of students would, while studying for the diploma of the Royal College of Veterinary Surgeons, also adoptthe curriculum which is necessary to qualify for the university examina- tions and obtain the degree of bachelor of science. To provide equipment for the higher studies required for the university degree, the Board of Agriculture and Fisheries in 1906 made a grant to the college of £800 per annum. At this school post-graduate instruc- tion isgivenon the principles of bacteriological research, vaccination and protective inoculation, the preparation of toxins and vaccines and the bacteriology of the specific diseases of animals.

The London Veterinary School has been the parent of other schools in Great Britain, one of which, the first in Scotland, was founded by Professor Dick, a student under Coleman,_ and a man of great per- severance and ability. Beginning at Edinburgh in 1819-20 with only one student, in three years he gained the patronage of the Highland and Agricultural Society of Scotland, which placed a small gum of money at the disposal of a committee appointed by itself

to take charge of a department of veterinary surgery it had formed. This patronage, and very much in the way of material assistance and encouragement, were continued to the time of Dick's death in 1866. During the long period in which he presided over the school considerable progress was made in diffusing a sound knowledge of veterinary medicine in Scotland and beyond it For many years his examining board, whijh gave certificates of proficiency under the auspices of the Highland and Agricultural Society, waa composed of the most distinguished medical men in Scotland, such as Goodsii; Syme, Lizars, Ballingall, Simpson and Knox. By his will Dick vested the college in the lord provost and town council of Edinburgh as trustees, and left a large portion of the fortune he had made to maintain it for the purposes for which it was founded. In 1859 another veterinary school w r as established in Edinburgh by John Gamgee, and the Veterinary College, Glasgow, was founded in 1863 by James McCalL Gamgee's school was discontinued m 1865; and William Williams established in 1873 the "New Veterinary College," Edinburgh. This school was transferred in 1904 to the university, Liverpool. In 1900 a veterinary school was founded in Dublin.

In 1844 the Royal College of Veterinary Surgeons (to be carefully

distinguished from the Royal Veterinary College) obtained its charter of incorporation. The functions of this body were until 1881 limited almost entirely to examining students taught in the veterinary schools, and bestowing diplomas of membership on those who successfully passed the examinations conducted by the boards which sat in London and Edinburgh. Soon after the Royal College of Veterinary Surgeons obtained its charter of incorporation, a difference arose between the college and Dick, which resulted in the latter seceding altogether from the union that had been established, and forming an independent examining board, the Highland and Agricultural Society of Scotland granting certificates of proficiency to those students w r ho were deemed competent. This schism operated very injuriously on the progress of veterinary education and on professional advancement, as the competition engendered was of a rather deteriorating nature. After the death of Dick in 1866, the dualism in veterinary licensing was suppressed and the Highland Society ceased to grant certificates. Now there is only one portal of entry into the profession, and the veterinary students of England, Ireland and Scotland must satisfy the examiners appointed by the Royal College of Veterinary Surgeons before they can practise their profession.

Before beginning their professional studies students of veterinary medicine must pass an examination in general education equivalent in every respect to that required of students of human medicine. The minimum length of the professional training is four years of three terms each, and during that course four searching examinations must be passed before the student obtains his diploma or licence to

Kractise as a veterinary surgeon. The subjects taught in the schools ave been increased in numbers conformably with the requirements of ever extending science, and the teaching is more thorough and practical. During the four years' curriculum, besides the pre- liminary technical training essential to every scientist, the student must study the anatomy and physiology of the domesticated animals, the pathology and bacteriology of the diseases to which these animals are exposed, medicine, surgery, hygiene, dietetics and meat inspec- tion, and learn to know the results of disease as seen post mortem or in the slaughter-house.

In 1881 an act of parliament was obtained protecting the title of the graduates of the Royal College of Veterinary Surgeons and conferring other advantages, not the least of which is the power granted to the college to remove the names of unworthy members from its register. In some respects the Veterinary Surgeons Act is superior to the Medical Act, while it places the profession on the same level as other

learned bodies, and prevents the public being misled hy empirics and imposters.

In 1876 the college instituted a higher degree than membership — that of fellow (F.R.C.V.S.), which can only be obtained after the graduate has been five years in practice, and by furnishing a thesis and passing a severe written and oral examination en pathology and bacteriology, hygiene and-sanitary science, and veterinary medicine and surgery. Only fellows can be elected members of. the examining boards for the membership and fellowship diplomas. The graduates of the Royal College of Veterinary Surgeons registered from its foundation in 1844 until 1907 numbered about 6000.

In the British army a veterinary service was first instituted at the beginning of the 19th century, when veterinary surgeons with the relative rank of lieutenant were appointed to regiments of cavalry, the royal artillery and the royal wagon train. After the Crimean War, and consequent on the abolition of the East India Company (which then possessed its own veterinary service), the number of veterinary surgeons employed was increased, and in 1878 they were constituted a ” department, ” with distinctive uniform, instead of being regimental officers as was previously the case. At the same time they were all brought on to a general roster for foreign service, so that every one in turn has to serve abroad. In 1903 the officers of the department were given substantive rank, and in 1904 were constituted a ” corps, ” with a small number of non-commissioned officers and men under their command and specially trained by them. In 1907 the Army Veterinary Corps consisted of 167 officers, and 220,

non-commissioned officers and men. The men are stationed at the veterinary hospitals, Woolwich depot, Aldershot, Bulford and the Curragh, but when trained arc available for duty under veterinary officers at any station, and a proportion of them are employed at the various hospitals in South Africa. Owing to their liability to service abroad in rotation, it follows that every officer spends a considerable portion of his service in India, Burma, Egypt or South Africa. Each tour abroad is five years, and the average length of service abroad is about one-half the total. This offers a wide and varied field for the professional activities of the corps, but naturally entails a corresponding strain on the individuals. Commissions us lieutenants are obtained by examination, the candidates having previously

qualified as members of the Royal College of Veterinary Surgeons. Promotion to captain and major is granted at five and fifteen years' service respectively, and subsequently, by selection, to lieutenant-colonel and colonel, as vacancies occur. The director- general has the honorary rank of major-general.

The Indian civil veterinary department was at first recruited from the A. V. Corps, but candidates who qualified as members of . ., the R.C.V.S. were subsequently granted direct appoint-

ments by the India Office, by selection. The service is paid and pensioned on the lines of the other Indian civil services, and offers an excellent professional career to those whose constitu- tion permits them to live in the tropics. The work comprises the investigation of disease in animals and the management of studs and farms, in addition to the clinical practice which falls to the share of all veterinary surgeons.

In India there are schools for the training of natives as veterinary surgeons in Bombay, Lahore, Ajmere and Bengal. The courses extend aver two and three years, and the instruction is very thorough. The professors are officers of the Indian civil veterinary depart- ment, and graduates are given subordinate appointments in that service, or find ready employment in the native cavalry or in civil life.

In the United States of America, veterinary science made very slow progress until 1884, when the Bureau of Animal Industry was established in connexion with the Department of Agriculture at Washington. The immediate cause of the formation of the bureau was the urgent need by the Federal government of official information concerning the nature and prevalence of animal diseases, and of the means required to control and eradicate them, and also the necessity of having an executive agency to carry out the measures necessary to stop the spread of disease and to prevent the Importation of contagion into the country, as well as to conduct investigations through which further knowledge might be obtained. In 1907 the bureau consisted of ten divisions, employing the services of 815 veterinary surgeons. It deals with the investigation, control and eradication of contagious diseases of animals, the inspection and quarantine of live stock, horse-breeding, experiments in feeding, diseases of poultry and the inspection of meat and dairy produce. It makes original investiga- tions as to the nature, cause and prevention of communicable diseases of live stock, and takes measures for their repression, frequently in conjunction with state and territorial authorities. It prepares tuberculin and mallein, and supplies these substances free of charge to

public health officers, conducts experiments with immunizing agents, and prepares vaccines, sera and antitoxins for the protection of animals against disease. It prepares and publishes reports of scientific investigations and treatises on various subjects relating to live stock. The diseases which claim most attention are Texas fever, sheep scab, cattle mange, venereal disease of horses, tuberculosis of cattle and pigs, hog cholera, glanders, anthrax, black-quarter, and parasitic diseases of cattle, sheep and horses. The effect of the work of the bureau on the health and value of farm animals and their products is well known, and the people of the United States now realize the immense importance of veterinary science.

Veterinary schools were established in New York City in 1846, Boston in 1848, Chicago in 1883, and subsequently in Kansas City and elsewhere, but these, like those of Great Britain, were private institutions. The American Veterinary College, N.Y., founded in 1875, is connected with New York University, and the N.Y. State Veterinary College forms a department of Cornell University at Ithaca. Other veterinary schools attached to state universities or agricultural colleges are those in Philadelphia, Pa.-; Columbus, Ohio; Ames, Iowa; Pullman, Washington; Auburn, Alabama; Manhattan, Kansas; and Fort Collins, Colorado. Other veterinary colleges are in San Francisco; Washington, D.C. (two) ; Grand Rapids, Michigan; St Joseph, Missouri; and Cincinnati, Ohio. In Canada a veterinary schocl was founded at Toronto in 1862, and four years later another school was established at Montreal. _ . For some years the Montreal school formed a department

“ of McGill University, but in 1902 the veterinary branch was discontinued. Veterinary instruction in French is given by the faculty of comparative medicine at Laval University. _ The Canadian Department of Agriculture possesses a fully equipped veterinary sanitary service employing about 400 qualified veterinary surgeons as inspectors of live stock, meat and dairy produce.

A’ew Zealand,

South Africa.

In the Australian commonwealth there is only one veterinary school, which was established in Melbourne, Victoria, in 1888. The Public Health Departments of New South Wales, „

Western Australia, Tasmania and the other states employ A ” str *‘ta’ qualified veterinary surgeons as inspectors of live stock, cowsheds,

meat and dairy produce.

There is no veterinary school in New Zealand, but the Depart- ment of Agriculture has arranged to establish one at Wellington in connexion with the investigation laboratory and farm of the division of veterinary science at Waflaceville. The government employs about forty qualified veterinarians as inspectors of live stock, abattoirs, meat-works and dairies.

In Egypt a veterinary school with French teachers was founded in 1830 at Abu-Zabel, near Cairo, by Clot-Bey, a doctor of medicine. This school was discontinued in 1842, The Public Health Etrvot

Department in 1901 established at Cairo a new veterinary ˆsyP •

school for the instruction of natives. Ten qualified veterinary surgeons are employed in the sanitary service.

Each of the colonics Natal, Cape Colony, Transvaal, Orange River Colony, Swaziland, Bechuanaland and Rhodesia has a veterinary sanitary police service engaged in dealing with the contagious diseases of animals. Laboratories for the investigation of disease and the preparation of antitoxins and protective sera have been established at Grahamstown, Pretoria and Pictermaritzburg.

Characteristics of Veterinary Medicine.

Veterinary medicine has been far less exposed to the vagaries of theoretical doctrines and systems than human medicine. The explanation may perhaps be that the successful practice of this branch of medicine more clearly than in any other depends upon the careful observation of facts and the rational deductions to be made therefrom. No special doctrines seem, in later times at least, to have been adopted, and the dominating sentiment in regard to disease and its treatment has been a medical eclecticism, based on practical experience and anatomico- pathological investigation, rarely indeed on philosophical 01 abstract theories. In this way veterinary science has become pre-eminently a science of observation. At times indeed it has to some extent been influenced by the doctrines which have controlled the practice of human medicine — such as those of Broussais, Hahnemann, Brown, Rasori, Rademacher and others — yet this has not been for long: experience of them when tested upon dumb unimaginative animals soon exposed their fallacies and compelled their discontinuance.

Of more moment than the cure of disease is its prevention, and this is

now considered the most important object in con- nexion with veterinary science. More especially is this the case with those contagious disorders that depend for their existence and extension upon the presence of an infecting agent, and whose ravages for so many centuries are written largely in the history of civilization. Every advance made in human medicine affects the progress of veterinary science, and the invaluable investigations of Davaine, Pasteur, Chauveau, Lister and Koch have created as great a revolution in veterinary prac- tice as in the medicine of man. In " preventive medicine " the benefits derived from the application of the germ theory are new realized to be immense; and the sanitary police measures based on this knowledge, if carried rigorously into operation, must eventually lead to the extinction of animal plagues. Bacteriology has thrown much light on the nature, diagnosis and cure of disease both in man and animals, and it has developed the beneficent practice of aseptic and antiseptic surgery, enabling the practitioner to prevent exhausting suppuration and wound infection with its attendant septic fever, to ensure the rapid healing of wounds, and to undertake the more serious operations with greater confidence of a success- ful result.

The medicine of the lower animals differs from that of man in no particular so much, perhaps, as in the application it makes of utilitarian principles. The life of man is sacred; but in the case of animals, when there are doubts as to complete restora- tion to health or usefulness, pecuniary considerations gener- ally decide against the adoption of remedial measures. This feature in the medicine of domesticated animals brings very prominently before us the value of the old adage that " pre- vention is better than cure." In Great Britain the value of

veterinary pathology in the relations it bears to human medicine, to the public health and wealth, as well as to agriculture, has not been sufficiently appreciated; and in consequence but little allowance has been made for the difficulties with which the practitioner of animal medicine has to contend. The rare instances in which animals can be seen by the veterinary surgeon in the earliest stages of disease, and when this would prove most amenable to medical treatment; delay, generally due to the inability of those who have the care of animals to perceive these early stages; the fact that animals cannot, except in a negative manner, tell their woes, describe their sensations or indicate what and where they suffer; the absence of those comforts and conveniences of the sick-room which cannot be called in to ameliorate

their condition; the violence or stupor, as well as the attitude and structural peculiarities of the sick creatures, which only too frequently render favourable positions for recovery impossible; the slender means generally afforded for carrying out recommendations, together with the oftentimes intractable nature of their diseases; and the utilitarian in- fluences alluded to above — all these considerations, in the great majority of instances, militate against the adoption of curative treatment, or at least greatly increase its difficulties. But notwithstanding these difficulties, veterinary science has made greater strides since 1877 than at any previous period in its history. Every branch of veterinary knowledge has shared in this advance, but in none has the progress been so marked as in the domain of pathology, led by Nocard in France, Schiitz and Kitt in Germany, Bang in Denmark, and McFadyean in England. Bacteriological research has discovered new dis- eases, has revolutionized the views formerly held regarding many others, and has pointed the way to new methods of prevention and cure. Tuberculosis, anthrax, black- quarter, glanders, strangles and tetanus furnish ready examples of the progress of knowledge concerning the nature and causation of disease. These diseases, formerly attributed to the most varied causes — including climatic changes, dietetic errors, peculiar condition of the tissues, heredity, exposure, close breeding, overcrowding and even spontaneous origin — have been proved beyond the possibility of doubt to be due to infection by specific bacteria or germs.

In the United Kingdom veterinary science has gained distinc- tion by the eradication of contagious animal diseases. For many years prior to 1865, when a government veterinary department was formed, destructive plagues of animals had prevailed almost continuously in the British islands, and scarcely any attempt had been made to check or extirpate them. Two exotic bovine diseases alone (contagious pleuro -pneumonia or lung plague and foot-and-mouth disease) are estimated to have caused the death, during the first thirty years of their prevalence in the United Kingdom, of 5,549,780 cattle, roughly valued at £83,616,854; while the invasion of cattle plague (rinderpest) in 1865-66 was calculated to have caused a money loss of from £5,000,000 to £8,000,000. The depredations made in South Africa and Australia by the lung plague alone are quite appalling; and in India the loss brought about by contagious diseases among animals has been stated at not less than £6,000,000 annually. The damage done by tuberculosis — a contagious disease of cattle, transmissible to other animals and tq man by means of the milk and flesh of diseased beasts — cannot be even guessed at; but it must be enormous considering how widely this malady is diffused. But that terrible pest of all ages,

cattle plague, has been promptly suppressed in England with comparatively trifling loss. Foot-and-mouth disease, which frequently proved a heavy infliction to agriculture, has been completely extirpated. Rabies may now be included, with rinderpest, lung plague and sheep-pox, in the category of extinct diseases; and new measures have been adopted for the suppression of glanders and swine fever. To combat such diseases as depend for their continuance on germs derived from the soil or herbage, which cannot be directly controlled by veterinary sanitary measures, recourse has been had to pro- tective inoculation with attenuated virus or antitoxic sera.

The Board of Agriculture and Fisheries has an efficient staff, of trained veterinary inspectors, who devote their whole time to the work in connexion with the scheduled diseases of animals, and are frequently employed to inquire into other diseases of an apparently contagious nature, where the circumstances are of general importance to agriculturists.

Veterinary science can offer much assistance in the study and prevention of the diseases to which mankind are liable. Some grave maladies of the human species are certainly derived from animals, and others may yet be added to the list. In the training of the physician great benefit would be derived from the study of disease in animals — a fact which has been strangely overlooked in England, as those can testify who understand how closely the health of man may depend upon the health of the creatures he has domesticated and derives subsistence from, and how much more advantageously morbid processes can be studied in animals than in our own species.

Although as yet few chairs of comparative pathology have been established in British universities, on the European continent such chairs are now looked upon as almost indis- pensable to every university. Bourgelat, towards the middle of the 1 8th century, in speaking of the veterinary schools he had been instrumental in forming, urged that ” leurs portes soient sans cesse ouvertes a ceux qui, charges par l’etat de la conservation des hommes, auront acquis par le nom qu’ils se seront fait le droit d’interroger la nature, chercher de& analogies, et verifier des idees dont la conformation ne peut etre qu’utile a l’espece humaine.” And the benefits to be mutually derived from this association of the two branches of medicine inspired Vicq d’Azyr to elaborate his Nouveau plan de la constitution de la mtdecine en France, which he presented in the National Assembly in 1790. , His fundamental idea was to make veterinary teaching a preliminary {le premier degrg) and, as it were, the principle of instruction in human medicine. His proposal went so far as to insist upon a veterinary

school being annexed to every medical college established in France. This idea was reproduced in the Rapport sur Vinstruction publique which Talleyrand read before the National Assembly in 1790. In this project veterinary teaching was to form part of the National Institution at Paris. The idea was to initiate students of medicine into a knowledge of diseases by observing those of animals. The suffering animal always appears exactly as it is and feels, without the intervention of mind obscuring the symptomatology, the symptoms being really and truly the rigorous expression of its diseased condition. From this point of view, the dumb animal, when it is ill, offers the same diffi- culties in diagnosis as does the ailing infant or the comatose adult.

Of the other objects of veterinary science there is only one to which allusion need here be made: that is the perfectioning of the domestic animals in everything that is likely to make them more valuable to man. This is in an especial manner the province of this science, the knowledge of the anatomy, physiology and other matters connected with these animals by its students being essential for such improvement.

Diseases of Domestic Animals.

Considerations of space forbid a complete or detailed descrip- tion of all the diseases, medical and surgical, to which the domesticated animals are liable. Separate articles are devoted to the principal plagues, or murrains, which affect animals — Rinderpest, Foot and Mouth Disease, Pleuro- Pneumonia, Anthrax, &c. Reference will be made here only to the more important other disorders of animals which are of a communic- able nature.

Diseases of the Horse.

Every horseman should know something of the injuries, lame- nesses and diseases to which the horse is liable. Unfortunately not very much can be done in this direction by book instruction; indeed, there is generally too much doctoring and too little nursing of sick animals. Even in slight and favourable cases of illness recovery is often retarded by too zealous and injudicious medication ; the object to be always kept in view in the treatment of animal patients is to place them in those conditions which allow nature to

operate most freely in restoring health. This can best be rendered in

the form of nursing, which sick animals greatly appreciate. How- ever indifferent a horse may be to caressing or kind atten- Nurslag. t ; on during health, when ill he certainly appreciates both, and when in pain will often apparently endeavour to attract notice and seek relief from those with whom he is familiar. Fresh air and cleanliness, quiet and comfort, should always be secured, if passible. The stable or loose-box should be warm, without being close, and free from draughts. If the weather is cold, and especially if the horse is suffering from inflammation of the air-passages, it may be necessary to keep up the temperature by artificial means ; but great care should be taken that this does not render the air too dry to breathe. The surface of the body can be kept warm by rugs, and the legs by woollen bandages. Yet a sick horse is easily fatigued and annoyed by toe much clothing, and therefore it is better to resort to artificial heating of the stable than to overload the body or impede movement by heavy wrappings. If blankets are used, it is well to place a cotton or linen sheet under them, should the horse have an irritable skin. For bedding, long straw should be employed as little as possible, since it hampers movement. Clean old litter, sawdust or peat-moss litter is the best. If the hoofs are strong, and the horse likely to be confined for some w r ecks, it affords relief to take off Lhe shoes. Tying up should he avoided, if possible, unless it is urgently required, the horse being allowed to move about or lie down as he may prefer.

When a sick horse has lost his appetite, he should be tempted to eat by offering him such food as will be enticing to him. It should be given frequently and in small quantities, but should not Food for k c | urcec [on him; food will often be taken if offered from * sfc * the hand, when it will not be eaten out of the manger.

horse. Whether the animal be fed from a bucket or from a

manger, any food that is left should be thrown away, and the receptacle well cleaned out after each meal. As a rule, during sickness a horse requires laxative food, in order to allay fever or inflammatory symptoms, while supporting the strength. The following list comprises the usual laxative foods employed: green grass, green wheat, oats and barley, lucerne, carrots, parsnips, gruel, bran mash, linseed and bran mash, boiled barley, linseed tea, hay tea and linseed oil. Green grass, lucerne, and similar articles of food if cut when in a wet state, should be dried before being given. Boiled grain should be cooked with very little water, so that it may be floury and comparatively dry when ready; a little salt should be mixed with it. One gallon of good gruel may be made with a pound of meal and cold water, which should be stirred till it boils, and afterwards permitted to simmer over a gentle

fire till the fluid is quite thick. To make a bran mash, scald a stable bucket, throw out the water, put in 3 lb of bran and I oz. of salt, add i \ pints of boiling water, stir up well, cover over and allow the mash to stand for fifteen or twenty minutes until it is well cooked. For a bran and Unseed mash, boil slowly for two or three hours 1 lb of linseed, so as to have about a couple of quarts of thick fluid, to which 2 lb of bran' and I oz. of salt may be added. The whole should be stirred up, covered over and allowed to steam as before described. The thicker the mash the more readily will the horse eat it. I.inseed tea is made by boiling I lb of lin- seed in a couple of gallons of water until the grains are quite soft. It may be economically made by using less water to cook the linseed, and afterwards making up the quantity of water to about a gallon and a half. Hay tea may be prepared by filling a bucket, after scalding it, with good sweet hay, pouring in as much boiling water as the bucket will hold, covering it over, and allowing it to stand until cold, when the fluid may be strained off and given to the horse. This forms a refreshing drink. Linseed oil, in quantities of from 1 oz. to 6 oz. daily, may be mixed with the food; it keeps the bowels in a lax condition, has a good effect on the skin and air- passages, and is useful as an article of diet. When debility has to be combated, as in low fever or other weakening diseases, strengthen- ing and other easily digested food must be administered, though some of the foods already mentioned, such as boiled grain, answer this purpose to a certain extent. Milk, eggs, bread and biscuits, malt, corn, Sec, are often prescribed with this object. Milk may be given skimmed or unskimmed; a little sugar may be mixed with it; and one or two gallons may be given daily, according to circum- stances. One or two eggs may be given beaten up with a little sugar and mixed with milk, three or four times a day, or more frequently; or they may be boiled hard and powdered, and mixed in the milk. A quart of stout, ale or porter may be given two or three times a day, or a half to one bottle of port wine daily. Scalded oats, with a little salt added, are very useful when convalescence is nearly completed. As a rule, a sick horse should have as much water as he likes to drink, though it may be necessary in certain cases to restrict the quantity, and to have the chill taken off; but it should never be warmer than 75 to 8o°.

As little grooming as possible should be allowed when a horse is very weak; it should be limited to sponging the mouth, nostrils, eyes and forehead with clean water, to which a little eucalyptus or sanitas may be added. Rub the legs and ears with the hand, take off the clothing, and shake or change it once a day, and if agreeable rub over the body with a soft cloth. Exercise is of course

not required during sickness or injury, and the period at which it is

allowed will depend upon circumstances. Care must be taken that it is not ordered too early, or carried too far at first.

Much care is required in administering medicines in the form of ball or bolus; and practice, as well as courage and tact, is needed in order to give it without danger to the administrator or the animal. The ball should be held between the fingers ˆ d ™ /s ” of the right hand, the tips of the first and_ fourth being “[JJ brought together below the second and third, which are me ae ‘ placed on the upper side of the ball; the right hand is thus made as small as possible, so as to admit of ready insertion into the mouth. The left hand grasps the horse’s tongue, gently pulls it out and places it on that part of the right side of the lower jaw which is bare of teeth. With the right hand the ball is placed at the root of the tongue. The moment the right hand is withdrawn, the tongue should be released. This causes the ball to be carried still farther back. The operator then closes the mouth and. watches the left side of the neck, to note the passage of the ball down the gullet. Many horses keep a ball in the mouth a considerable time before they will allow it to go down. A mouthful of water or a handful of food will generally make them swallow it readily. It is most essential to have the ball moderately soft ; nothing can be more dangerous than a hard one.

To administer a drink or drench requires as much care as giving a ball, in order to avoid choking the horse, though it is unattended with risk to the administrator. An ordinary glass or stone bottle may be used, providing there are no sharp points around the mouth ; but cither the usual drenching- horn or a tin vessel with a narrow mouth or spout is safer. It is necessary to raise the horse’s head, so that the nose may be a little higher than the horizontal line. The drink must be given by a person standing on the right side (the attendant being in front or on the left side of the horse), the cheek being pulled out a little, to form a sack or funnel, into which the medicine is poured, a little at a time, allowing an interval now and again for the horse to swallow. If any of the fluid gets into the windpipe (which it is liable to do if the head is held too high), it will cause coughing, whereupon the head should be instantly lowered. Neither the tongue nor the nostrils should be interfered with. Powders may be given in a little mash or gruel, well stirred up, or in the drinking water.

If a wide surface is to be fomented (as the chest, abdomen or loins), a blanket or other large woollen cloth should be dipped in water as hot as the hand can comfortably bear it, moderately wrung out and applied to the part, the heat and moisture being retained by covering it with a waterproof sheet or dry rug. When it has lost some of its

heat, it should be removed, dipped in warm water and again applied. In cases of acute inflammation, it may be necessary to have the water a little hotter; and, to avoid the inconvenience of removing the blanket, or the danger of chill when it is removed, it may be secured round the body by skewers or twine, the hot water being poured on the outside of the top part of the blanket by any convenient vessel. To foment the feet, they should be placed in a bucket or tub (the latter with the bottom resting wholly on the ground) containing warm water; a quantity of moss litter put in the tub or bucket prevents splashing and retains the heat longer.

Poultices are used for allaying pain, softening horn or other tissues, and, when antiseptic, cleansing and promoting healthy action in wounds. To be beneficial they should be large and always kept moist. For applying poultices to the feet, o""* 8 * a piece of sacking, or better a poultice-boot, supplied by saddlers, may be used with advantage. Poultices are usually made with bran, though this has the disadvantage of drying quickly, to prevent which it. may be mixed with linseed meal or a little linseed oil. Antiseptic poultices containing lysol, izal, carbolic acid or creolin, are very useful in the early treatment of foul and punctured wounds. A charcoal poultice is sometimes employed when there is an offensive smell to be got rid of. It is made by mixing linseed meal with boiling water and stirring until a soft mass is produced; with this some wood charcoal in powder is mixed, and when ready to be applied some more charcoal is sprinkled on the surface. It may be noted that, in lieu of these materials for poultices, spongiopiline can be usefully employed. A piece ol sufficient size is steeped in hot water, applied to the part, covered with oiled silk or water- proof sheeting, and secured by tapes. Even an ordinary sponge, steeped in hot water and covered with waterproof material, makes a good poulticing medium; it is well adapted for the throat, the space between the branches of the lower jaw, as well as for the lower joints of the Umbs.

Enemata or clysters are given in fevers, constipation, colic, &c, to empty the posterior part of the bowels. They can be administered by a large syringe capable of containing a quart or more of water, with a nozzle about 12 in. long, or by a large Enemata funnel with a long nozzle at aright angle. Water, soap and

water, or oil may be employed. To administer an enema,

clysters.

one of the horse's fore feet should be held up, while the operator

introduces the nozzle, smeared with oil or lard, very gently and steadily into the rectum, then injects the water. The quantity injected will depend on the nature of the malady and the size of the horse; from 2 or 3 quarts to several gallons may be used.

The epizootic diseases affecting the horse are not numerous, and may generally be considered as sp'ecific and infectious or contagious in their nature, circumstances of a favourable kind leading

Epizootic and con- tagious

to their extension by propagation of the agent upon which

their existence depends. This agent, in most of the diseases ma ‘ a dies, has been proved to be a micro-organism, and

there can be little doubt that it is so for all of them.

Glanders (q.v.), or equinia, one of the most serious maladies of

the horse, ass and mule, prevails in nearly every part of the world.

Glanders- ˆ * s a contagious, inoculable disease, caused by the bacillus

farcv ‘ wwittei, and specially affects the lungs, respiratory mucous

membrane and the lymphatic system. The virulent agent of glanders appears to establish itself most easily among horses kept in foul, crowded, badly ventilated stables, or among such as are over-worked, barliy fed or debilitated. Glanders, however, is always due to contagion, and in natural infection it may be contracted by inhalation of the bacilli, by ingestion of the virus with food or water, or by inoculation of a wound of the skin or a mucous membrane. Carnivorous animals — lions, tigers, dogs and cats — have become infected through eating the flesh of glandered horses; and men attending diseased horses are liable to be infected, especially if they have sores on the exposed parts of their bodies. Though in man infection through wounds is the readiest way of receiving the disease, the bacillus may also obtain access through the digestive organs, the lungs and mucous membranes of the eyes, nose and lips.

In descriptions of the equine disease sometimes a distinction is made

between glanders with nasal ulcers and other symptoms of respiratory disease, and glanders of the skin, or farcy, but there is no essential difference between them. Glanders and farcy are due to the same causal organism, and both may be acute or chronic. Acute glanders is always rapidly fatal, and chronic glanders may become acute or it may terminate by apparent recovery.

The symptoms of acute glanders are initial fever with its accompaniments, thirst, loss of appetite, hurried pulse and respiration, emaciation, languor and disinclination to move. Sometimes the legs or joints are swollen and the horse is stiff; but the characteristic symptoms are a greyish -yellow viscid discharge from one or both nostrils, a peculiar enlarged and nodulated condition of one or both submaxillary lymphatic glands, which though they may be painful very rarely suppurate, and on the nasal membrane small yellow pimples or pustules, running into deep, ragged-edged ulcers, and sometimes on the septum large patches of deep ulceration. The discharge from the nose adheres to the nostrils and upper lip, and the infiltrated nasal lining, impeding breathing, causes snuffling and frequent snorting. The lymphatic vessels of the face are often involved and appear as painful subcutaneous ” cords ” passing across the cheek. These vessels sometimes present nodules which break and discharge a glutinous pus. As the disease progresses, the ulcers on the nose increase in number, enlarge or become con- fluent, extend in depth and sometimes completely perforate the septum. The nasal discharge, now more abundant and tenacious, is streaked with blood and offensive, the respiration is noisy or roaring, and there may be coughing with bleeding from the nose. Painful oedematous swellings appear on the muzzle, throat, between the fore legs, at the flank or on the limbs, and ; ‘ farcy buds ” may form on some of the swollen parts. Symptoms of congestion of the lungs, or pneumonia and pleurisy, with extreme prostration, diarrhoea and gasping respiration, precede death, which is due to asphyxia or to exhaustion.

Chronic or latent glanders generally presents few definite symptoms. The suspected animal may have a discharge from the nose, or an enlarged submaxillary gland, or both, and small unbroken nodules may exist on the septum, but usually there is no visible ulceration of the nasal membrane. In some horses suspicion of glanders may be excited by lameness and sudden swelling of a joint, by profuse staling, sluggishness, loss of condition and general unthriftiness, or by refusal of food, rise of temperature, swollen fetlocks, with dry hacking cough, nasal catarrh and other symptoms of a common cold. With rest in the stable the horse improves, but a one-sided nasal discharge continues, the submaxillary gland enlarges, and, after an interval, ulcers appear

in the nose or ” farcy buds ” form on a swollen leg. In occult glanders the horse may appear to be in good health and be able to perform ordinary work. In these cases the existence of glanders can only be discovered by resorting to inoculation or the mallein test.

In cutaneous glanders, or farcy, symptoms occur on the skin of a limb, usually a hind one, or on the body, where the lymphatics become inflamed and ulcerated. The limb is much swollen, and the animal moves with pain and difficulty. The lymphatic vessels appear as prominent lines or “cords, ” hard and painful on manipula- tion, and along their course arise nodular swellings — the so-called “farcy buds. ” These small ahscesses break and discharge a yellow, glutinous, blood-stained pus, leaving sores which heal very slowly. There is a rise of temperature with other symptoms of constitutional disturbance.

Medical treatment of glanders or farcy should not be attempted. The disease is dealt with under the Contagious Diseases (Animals) ;\cts. Horses which present suspicious symptoms, or those which

have been in contact, or have stood in the same stable with glandered horses, should be isolated and tested with mallein. Animals which are found affected should immediately be destroyed, and their harness, clothing and the utensils employed with them thoroughly cleansed, while the stalls, horse-boxes and places which the horses have frequented should be disinfected. Forage left by glandered horses should be burned or fed to cattle.

Mallein, which is almost indispensable in the diagnosis of latent glanders, was discovered in 1888 by Helman, a Russian military veterinary surgeon, and the first complete demonstration of its diagnostic value was given in 1891 by Kalning, also of Russia. Mallein, prepared for the diagnosis of glanders in animals, is the sterilized and filtered liquid-culture of glanders bacilli. It there- fore does not contain even dead bacilli, but it has in solution certain substances which are added to the liquid by the bacilli during their growth (McFadyean). Employed under proper precautions and subcutaneously injected in a glandered horse, mallein causes a marked rise of temperature and an extensive painful swelling at the seat of injection.

Epizootic lymphangitis is a contagious eruptive disease of the horse caused by the cryptococcus farciminosus, and characterized by nodular swellings and suppuration of the superficial „ . ,. lymphatics. Infection can be transmitted by mediate lymohan- or immediate contagion. The eruption usually appears ^// on the limbs, but it may

occur on the body or on the head and neck. The symptoms closely resemble those of cutaneous glanders or farcy, from which this disease may readily be distin- guished by microscopic examination of the pus discharged from the sores, or by testing the horse with mallein. Glanders and epizootic lymphangitis may coexist in the same animal. It is a scheduled disease, and treatment should not be attempted.

Strangles is a specific contagious eruptive fever peculiar to horses, and is more especially incidental to young animals. It is particu- larly characterized by the formation of abscesses in the strangles lymphatic glands, chiefly those between the branches of *

the lower jaw (submaxillary). Various causes have been ascribed for its production, such as change of young horses from field to stable, from grass to dry feeding, from idleness to hard work, irritation of teething, and change of locality and climate. But the sole cause is infection by the strangles streptococcus. Languor and feverishness, diminution of appetite, cough, redness of the nasal membrane, with discharge from the eyes and nose, and thirst are among the earliest symptoms. Then there is difficulty in swallowing, coincident with the development of swelling between the branches of the lower jaw, which often causes the water in drinking to be returned through the nose and the masticated food to be dropped from the mouth. The swelling is hot and tender, diffused, and uni- formly rounded and smooth; at first it is hard, with soft, doughy margins; but later it becomes soft in the centre, where an abscess is forming, and soon “points ” and hursts, giving exit to a quantity of pus. Relief is now experienced by the animal ; the symptoms subside, and recovery takes place. In some cases the swelling is so great or occurs so close to the larynx that the breathing is interfered with, and even rendered so difficult that suffocation is threatened. In other cases the disease assumes an irregular form, and the swelling, instead of softening in the centre, remains hard for an indefinite time, or it may subside and abscesses form in various parts of the body, sometimes in vital organs, as the brain, lungs, liver, kidneys, &c, or in the bronchial or mesenteric glands, where they generally produce serious consequences. Not unf requently a pustular eruption accompanies the other symptoms. The malady may terminate in ten days or be protracted for months, sometimes terminating fatally from complications, even when the animal is well nursed and kept in a healthy stable.

Good nursing is the chief part of the treatment. The strength should be maintained by soft nutritious food, and the body kept warm and comfortable; the stable or loose-box must have plenty of fresh air and

be kept clean. The swelling may be fomented with warm water or poulticed. The poultice may be a little bag con- taining bran and. linseed meal mixed with hot water and applied warm to the tumefaction, being retained there by a square piece of calico, with holes for the ears and eyes, tied down the middle of the face and behind the ears. If the breathing is disturbed and noisy, the animal may be made to inhale steam from hot water in a hucket or from bran mash. If the breathing becomes very difficult, the windpifx, must be opened and a tube inserted. Instead of the swelling being poulticed, a little blistering ointment is sometimes rubbed over it, which hastens pointing of the abscess. When the abscess points, it may be lanced, though sometimes it is better to allow it to break spontaneously.

It is important to distinguish strangles from glanders, and the distinction can, with certainty, be ascertained by resorting to the mallein test for glanders, or by microscopical examination of the pus from the strangles abscess.

Under influenza several diseases are sometimes included, and in different invasions it may (and doubtless does) assume vary- ing forms. It is a specific fever of a low or asthenic j a ff aenzat type, associated with inflammation of the mucous mem- brane lining the air-passages, and also sometimes with that of

other organs. At various times it has prevailed extensively over different parts of the world, more especially during the 18th and 19th centuries. Perhaps one of the most widespread outbreaks recorded was that of 1872, on the American continent. It usually radiates from the district in which it first appears. The symptoms have been enumerated as follows: sudden attack, marked by ex- treme debility and stupor, with increased body -tempera litre, quick weak pulse, rigors and cold extremities. The head is pendent, the eyelids swollen and half closed, eyes lustreless, and tears often flowing down the face. There is great disinclination to move ; the body sways on the animal attempting to walk; and the limb-joints crack.- The appetite is lost and the mouth is hot and dry; the bowels are constipated and the urine scanty and high-coloured; there is nearly always a deep, painful and harassing cough; on auscultation of the chest, crepitation or harsh blowing sounds arc audible; and the membrane lining the eyelids and nose assumes either a bright pink colour or a dull leaden hue. A white, yellowish or greenish-coloured discharge flows from the nostrils. In a few days the fever and other symptoms subside, and convalescence rapidly sets in. In unfavourable cases the fever increases, as well as the prostration,

the breathing becomes laboured, the cough more painful and deep, and auscultation and percussion indicate that the lungs are seriously involved, with perhaps the pleura or the heart. Glots sometimes form in the latter organ, and quickly bring about a fatal termination. When the lungs do not suffer, the bowels may, and with this complication there are, in addition to the stupor and torpor, tension and tenderness of the abdominal walls when pressed upon, manifestations of colic, great thirst, a coated tongue, yellow- ness of the membranes of nose and eyes, high-coloured urine, con- stipation, and dry faeces covered with mucus. Sometimes rheu- matic swelling and tenderness takes place in the muscles and joints of the limbs, which may persist for a long time, often shifting from leg to leg, and in-o!ving the sheaths of tendons. At other times acute inflammation of the eyes supervenes, or even paralysis.

In this disease good nursing is the chief factor in the treatment. Comfortable, clean and airy stables or loose-boxes should be pro- vided, and the warmth of the body and limbs maintained. Cold and damp, foul air and uncleanliness, are as inimical to health and as antagonistic to recovery as in the case of mankind. In influenza it has been generally found that the less medicine the sick animal receives the more likely it is to recover. Nevertheless, it may be necessary to adopt such medical measures as the following. For constipation administer enemata of warm water or give a dose of linseed oil or salines. For fever give quinine or mild febrifuge diuretics (as liquor'of acetate of ammonia or spirit of nitrous ether), and, if there is cough or nervous excitement, anodynes (such as extract of belladonna). When the fever subsides and the prostration is great, it may be necessary to give stimulants (carbonate of ammonia, nitrous ether, aromatic ammonia) and tonics, both vege- table (gentian, quassia, calumba) and mineral (iron, copper, arsenic). Some veterinary surgeons administer large and frequent doses of quinine from the onset of the disease, and, it is asserted, with excellent effect. If the abdominal organs are chiefly involved, demulcents may supplement the above (linseed boiled to a jelly, to which salt may be added, is the most convenient and best), and drugs to allay pain (as opium and chloral hydrate). Olive oil is a safe laxative in such cases. When nervous symptoms are mani- fested, it may be necessary to apply wet cloths and vinegar to the head and neck; even blisters to the neck have been recommended. Bromide of potassium has been beneficially employed. To combat inflammation of the throat, chest or abdomen, counter-irritants may be resorted to, such as mustard, soap liniment or the ordinary white liniment composed of oil of turpentine, solution of ammonia and olive oil. The food should be soft mashes and gruel of

oatmeal, with carrots and green food, and small and frequent quantities of scalded oats in addition when convalescence has been established.

Dourine, maladie du coit, or covering disease of horses, is a contagious malady caused by the Trypanosoma equiperdum, and characterized by specific lesions of the male and female Dour- genital organs, the lymphatic and central nervous sys-

ae ‘ ° *r terns. It occurs in Arabia and continental Europe, and ˆdisease ˆas recent ‘y been carried from France to the United States of America (Montana, Nebraska, the Dakotas, Iowa and Illinois) and to Canada. In some of its features it resembles human syphilis, and it is propagated in the same manner. From one to ten days after coitus, or in the stallion not unfrequently after some weeks, there is irritation, swelling and a livid redness of the external organs of generation (in stallions the penis may shrink), followed by unhealthy ulcers, which appear in successive crops, often at considerable intervals. In mares these are near the clitoris, which is frequently erected, and the animals rub and switch the tail about, betraying uneasiness. In horses the eruption is* on the penis and sheath. In the milder forms there is little constitutional disturbance, and the patients may recover in a period varying from two weeks to two months. In the severe forms the local swell- ing increases by intermittent steps. In the mare the vulva is the seat of a deep violet congestion and extensive ulceration; pustules appear on the perinaeum, tail and between the thighs; the lips of the vulva are parted, exposing the irregular, nodular, puckered,

ulcerated and laraaceous-looking mucous membrane. If the mare happen to be pregnant, abortion occurs. In all cases emaciation sets in; lameness of one or more limbs occurs; great debility is manifested, and this runs on to paralysis, when death ensues after a miserable existence of from four or five months to two years. In horses swelling of the sheath may be the only symptom for a long time, even for a year. Then there may follow dark patches of extravasated blood on or swellings of the penis; the testicles may become tumefied; a dropsical engorgement extends forward beneath the abdomen and chest; the lymphatic glands in different parts of the body may be enlarged; pustules and ulcers appear on the skin; there is a discharge from the eyes and nose; emacia- tion becomes extreme; a weak and vacillating movement of the posterior limbs gradually increases, as in the mare, to paralysis ; and after from three months to three years death puts an end to loathsomeness and great suffering. This malady appears to be spread only by the act of coition. The indications for its suppres- sion and extinction are therefore obvious. They are (1) to prevent diseased

animals coming into actual contact, especially per coitum, with healthy ones; (2) to destroy the infected; and (3) as an addi- tional precautionary measure, to thoroughly cleanse and disinfect the stables, clothing, utensils and implements used for the sick horse. Various medicines have been tried in the treatment of slowly developing cases of dourine, and the most successful remedy is atoxyb — a prepaiation of arsenic.

Horse-pox, which is somewhat rare, is almost, if not quite, identical with cow-pox, being undistinguishable when inoculated on men and cattle. It most frequently attacks the limbs, though it may appear on the face and other parts of the body. rae ”

There is usually slight fever; then swelling, heat and J > ox ” tenderness are manifest in the part which is to be the seat of erup- tion, usually the heels; firm nodules form, increasing to one-third or one-half an inch in diameter; the hair becomes erect; and the skin, if light-coloured, changes to an intense red. On the ninth to the twelfth day a limpid fluid oozes from the surface and mats the hairs together in yellowish scabs ; when one of these is removed, there is seen a red, raw depression, whereon the scab was fixed. In three or four days the crusts fall off, and the sores heal spontaneously. No medical treatment is needed, cleanliness being requisite to prevent the pocks becoming sloughs. If the inflammation runs high, a weak solution of carbolic acid may be employed.

• Diseases of Cattle.

The diseases of the bovine species are not so numerous as those of the horse, and the more acute contagious maladies are dealt with under Rinderpest and other articles already mentioned.

Tuberculosis is a most formidable and widespread disease of cattle, and it is assuming greater proportions every year, in con- sequence of the absence of legislative measures for its Taber* suppression. It is a specific disease, contracted through cutosis cohabitation, and caused by the Bacillus tuberculosis, dis- covered by Koch in 1882. Infection takes place by inhalation of the bacilli or their spores, derived from the dried expectorate or other discharges of tuberculous animals; by ingestion of the bacilli carried in food, milk or water, or by inoculation of a wound of the skin or of a mucous or serous membrane. Occasionally the disease is transmitted by an infected female to the foetus in utero. Its infective properties and communicability to other species render it a serious danger to mankind through the con- sumption of the milk or flesh of tuberculous

cows. The organs chiefly involved are the lymphatic glands, lungs, liver, intestine and the serous membranes — the characteristic tubercles or ” grapes ” varying in size from a millet seed to immense masses weighing several pounds. The large diffused nodular growths are found principally in the chest and abdomen attached to the membranes lining these cavities.

The symptoms somewhat resemble those of contagious pleuro-pneumonia (q-v.) in its chronic form, though tubercles, sometimes 111 large numbers, are often found after death in the bodies of cattle which exhibited no sign of illness during life and which when killed were in excellent condition. When the lungs are extensively involved there are signs of constitutional disturbance, irregular appetite, fever, difficult breathing, dry cough, diarrhoea, wasting and debility, with enlarged throat glands, and, in milch cows, variation in the quantity of milk. Auscultation of the chest dis- covers dullness or absence of respiratory sounds over the affected parts of the lungs. If the animal is not killed it becomes more and more emaciated from anaemia, respiratory; difficulty, defective nutrition and profuse diarrhoea. Tuberculosis of the mammary glands usually begins as a slowly developing, painless, nodular induration of one quarter of the udder. The milk at first may be normal in quantity and quality, but later it becomes thin or watery and assumes a blue tint. Cattle with tubercular lesions unaltered by retrogressive changes may appear to be in an ordinary state of health, and in such animals the existence of _ the disease can only be discovered by resorting to the tuberculin test. Tuber- culin, as prepared for the purpose of diagnosis, is a sterilized culture of tubercle bacilli, and when employed with proper precautions it causes a marked rise of temperature in affected cattle, but in

no n tuberculous animals it has no appreciable action. Medical treatment is of little if any avail. Preventive measures are of the utmost importance. Animals proved free of tuberculous taint should alone be bred from, and those found diseased should be at once completely segregated or slaughtered. Before being used as food the flesh should be well cooked, and the milk from tuber culous cows should be boiled or heated to a temperature of 155° F.

Black-quarter, or black-leg, is a specific, inoculabte disease which occurs in young stock from a few months to two years old, in Black-

various parts of the country, and generally in low-lying Quarter damp situations. It was classed with anthrax until 1879. when its nature was investigated by Arloing, Cor- nevua and Thomas, who termed it symptomatic anthrax {Charbon symptomatique) — a misleading name for a disease which is perfectly distinct from anthrax. This disease is caused by the Bacillus Chauvaei, and natural infection takes place through small wounds of the legs and feet or other parts. At first it is a local disease affecting usually a hind quarter, though sometimes the character- istic swelling forms on the shoulder, neck, breast, loins or flank. The chief symptoms are sudden loss of appetite, accelerated pulse and respiration, high temperature, debility, lameness or stiffness, followed by the formation of a small, painful swelling which rapidly increases in extent, becomes emphysematous, and in the centre cold and painless. Incision of the tumour gives escape to a red, frothy, sour-smelling fluid. This disease runs its course very rapidly and nearly always terminates fatally, even when medical treatment is promptly applied. Infection can be prevented by- resorting to protective inoculation by one of the methods intro- duced by Arloing, Kitt and others. The natural virus-muscle from the lesion, dried, reduced to powder and attenuated by heat at a high temperature, and a pure culture of the causal organism, are employed as vaccines. The vaccine is introduced subcutane- ously at the tip of the tail or behind the shoulder. Immunity lasts for about twelve months.

Abortion, or the expulsion of the foetus before viability, is a contagious disease in cows. In a herd a case of abortion or pre-Abortloa mature birth from accident or injury sometimes occurs, but when a number of pregnant females abort the cause is due to specific infection of the womb. The microbe of abortion inducescatarrhofthe uterus and the discharge contains the infective agent. The virus may be transmitted by the bull, by litter, attendants, utensils, or anything which has been contaminated by the discharge from an infected cow. Whenever abortion occurs in a shed the cow should be at once isolated from the others, if they are pregnant, and cleansing and disinfection immediately resorted to, or preferably the pregnant cows should be quickly removed out of the shed and every care should be taken to keep them away from the affected cow and its discharges; the litter and the aborted foetus being burned or otherwise completely destroyed, and the cowshed thoroughly disinfected with quicklime. To prevent further infection, the hinder parts of the in-calf cows should be washed and disinfected from time to time. ,

Contagious mammitis is a common disease in milch cows. It has been investigated by Nocard and Mollereau, and proved Con- to ˆ e caused by a streptococcus which is transmitted

taeious froro one cow to another by the hands of the milkers. mammitis. The microbe gains access to the quarter by the teat and induces catarrhal inflammation of the milk ducts and sinuses, with induration of the gland tissue. This disease develops slowly, and except in cases complicated by suppuration, there is little or no constitutional disturbance, though sometimes the affected cows lose condition. The milk at first preserves its normal appear- ance, but is less in quantity; it curdles quickly, is acid, and when mixed with good milk produces clotting; then it becomes thin and watery, and finally viscous, yellowish and foetid. At the base of the teat of the affected quarter induration begins and gradually extends upwards, and if not checked the disease passes From one quarter to another until the whole udder is attacked. Prevention can be secured by washing and disinfecting the udder and teats and the milkers' hands before and after milking. Diseased cows should be isolated, their milk destroyed or boiled and fed to pigs, and after each milking the teats should be injected with a warm solution of boracic acid or sodium fluoride. Infected cowsheds should be thoroughly cleansed and disinfected.

Parturient paralysis, or mammary toxaemia, also known as milk fever, though neither a febrile nor a contagious malady, was until quite recently a very fatal affection of dairy cows. It is caused by a nerve poison which is formed in the udder soon after parturition; and, according to Schmidt, the toxin enters the circulation and affects especially, the central nervous system and the muscles, and in a less degree all the organs of the body. This disease usually attacks good milking cows within a few days of an easy labour and seldom before the third or fourth parturition. In twenty-four to forty-eight hours after calving the cow becomes excited and restless, strikes at the abdomen with the hind feet, whisks the tail, lows, grinds the teeth, staggers, falls, makes ineffectual attempts to rise, and eventually lies comatose, stretched on her side with the head extended or inclined towards the shoulder. The eyes are dull, injected and insensitive ; general

sensation, voluntary motion and the power of swallowing are lost. Secretion of milk fails, digestion is suspended, fermentation of the contents of the paunch sets in, with tympany, constipation and retention of urine. The pulse becomes feeble or imperceptible. Respiration is slow, sometimes stertorous or groaning, and the temperature is low or subnormal. If not treated the animal dies in two or three days from prolonged coma or heart failure;

The curative treatment of this disease continued very unsatis- factory until 1897, when Schmidt, a veterinarian of Kolding, Denmark, introduced the method of injecting the teats with a solution of potassium iodide in conjunction with insufflation of atmospheric air. The immediate results of this line of treatment were astonishing. Rapid recovery became the rule, and in most cases the comatose condition disappeared in less than six hours, and the average mortality (40 to 60%) was reduced to 6%. Afterwards chinosol and other antiseptics were substituted for the potassium salt, and later pure oxygen or atmospheric air alone was injected into the udder, with the result of increasing the recoveries to 99 %.

Cowpox is a contagious disease of much less frequent occurrence now than formerly, probably owing to improved hygienic manage- ment. In many localities the disease appears in all cowpox. heifers which have recently calved on certain farms. There is usually a slight premonitory fever, which i3 generally overlooked; this is succeeded by some diminution in the quantity of the milk, with some increased coagulability, and by the appear-, ance of the eruption or ” pox ” on the udder and teats. In well- observed cases the udder is hot and tender on manipulation for a day or two previous to the development of small pale-red nodules about the size of peas; these increase in dimensions to from three- fourths to one inch in diameter by the eighth or tenth day, when their contents have become fluid and they present a depressed centre. This fluid, at first clear and limpid, becomes yellowish white as it changes to pus, and soon dries up, leaving a hard, button- shaped black crust, which gradually becomes detached. On the teats, owing to the handling of the milker or to the cow lying on, the hard ground or on straw, the vesicles are early ruptured and sores are formed, which often prove troublesome and may cause inflammation of the udder.

Actinomycosis, though affecting man, horses, pigs and other creatures, is far more common in the bovine species. _ The fungus {Actinomyces) may be found in characteristic nodules in various parts of the body, but it usually invades the bones mycos’ts of the jaws, upper and lower, or the soft parts in the ‘ neighbourhood of .these; as the tongue, cheeks, face, throat and glands in its vicinity. About the head the disease appears to com* mence with slight sores on the gums or mucous membrane of the mouth or with ulcers alongside decaying teeth, and these extend slowly into the tissues* If the jaw is affected; a. large rounded tumour grows from it, the dense outer bone becoming absorbed before the increasing soft growth within. Soon the whole becomes ulcerated and purulent discharges take place, in which are found the minute, hard, yellow granules which contain the fungus.

When the tongue is affected, it becomes enlarged and rigid; hence the designation of ” wooden tongue ” given to it by the Germans. In the course of time the surface of the organ becomes ulcerated, and yellowish masses or nodules may be seen on the surface. Sometimes the entire face is involved, the lips and nostrils becoming swollen, hard and immovable, often rendering respiration difficult. Around the throat there are rounded dense swellings, implicating the glands. When the disease is well-defined and of. slight extent, the parts involved may be removed by the knife, wholly or partially. If the latter only, then the remaining affected tissues should be dressed with tincture of iodine or iodized carbolic acid. Chromic acid has also been found useful. A course of potassium iodide internally is sometimes curative and always beneficial.

Diseases of Sheep.

The contagious diseases of the sheep (other than those of foot- and-mouth disease, anthrax, rinderpest, black-quarter) are com- paratively few.

The formidable disorder of sheep-pox is confined chiefly to the con- tinent of Europe. It is extremely contagious and fatal, and in these and some other characteristics resembles human smallpox. : .

From three to twelve days after being exposed to infec- Mp ”

tinn the sheep appears dull and listless, and eats little, if ^** anything; the temperature rises; there are frequent tremblings; tears flow from the eyes; and there is a nasal discharge. Red patches appear inside the limbs and under the abdomen ; and on them, as well as on other parts where the skin is thin, dark red spots show themselves, which soon become papules, with a deep hard base. These are generally conical, and the apex quickly becomes white from the formation of pus. This eruption is char- acteristic and unmistakable ; and the vesicles or pustules may remain isolated (discrete pox) or coalesce into large patches (con- fluent pox). The latter form of the disease is serious. In bad cases the eruption may develop on the eyes and in the respiratory and digestive passages. The course of the disease lasts about three weeks or a month, and the eruption passes through the same

Swine fever.

stages as that of cowpox. The mortality may extend from w% in mild outbreaks to 90 or 95 % in very virulent ones. Diseased animals should be sheltered, and fed on nourishing food, especially gruels of oatmeal flour or linseed; acidulated water may be allowed. If there is sloughing of the skin or extensive sores, oxide of zinc ointment should be applied. But treatment should not be adopted unless there is general infection over a wide extent of country. All diseased animals should be destroyed, as well as those which have been in contact with them, and thorough disin- fection resorted to.

Foot-rot is a disease of the claws of sheep. It occurs most frequently in badly drained, low-lying, marshy land, and is caused by the Bacillus necrophorus. Infection appears to be Poot-roU transmitted by cohabitation, litter, manure and in- fected pastures. The disease begins at the sole or between the claws and gradually extends, causing changes in the bones and tendons, with suppuration, degeneration of horn and sloughing. The symptoms are lameness, foot or feet hot, tender and swollen at the coronet; the horn soft and rotten. Affected sheep when feeding may rest on the knees, or, if fore and hind feet are involved, they lie down. consJ”antly. The claws must be cleansed, loose and underrun horn removed, abscesses opened, and the foot thor- oughly disinfected and protected from, further infection by an appropriate bandage. Some cases require daily dressing, and all affected feet should receive frequent attention. When large numbers of sheep are attacked they should be slowly driven through a foot-bath containing an antiseptic solution. Pastures on which foot-rot has been contracted should be avoided, the feet examined every month or oftener, and where necessary pared and dressed with pine tar.

Diseases of the Pig. The pig may become affected with anthrax, foot-and-mouth disease and tuberculosis, and it also has its own particular variola. But the contagious diseases which cause enormous destruction of pigs are swine fever and swine erysipelas in Great Britain, hog cholera and swine plague in the United States, and swine erysipelas and swine plague in France, Germany and other countries of the European continent.

Swine fever is an exceedingly infectious disease, caused by a bacillus, and associated with ulceration of the intestine, enlarge- ment of the lymphatic glands, and limited disease of other organs. It is spread with great facility by mediate as well as immediate contagion ; the virus can be carried by apparently healthy pigs from an infected piggery, by litter, manure, food, attendants, dogs, cats, vermin, crates, troughs or anything which has been soiled by the discharges from a diseased pig. It is generally very rapid in its course, death ensuing in a very few

days, and when the animal survives, recovery is pro- tracted. After exposure to infection the animalˆ exhibits signs of illness by dullness, weakness, shiverings, burying itself in the litter, disinclination to move, staggering gait, great thirst, hot dry snout, loss of appetite, and increased pulse, respiration and temperature (105 F.). Red and violet patches appearon the skin; there is a hacking cough; nausea is followed by vomiting ; diarrhoea ensues; the hind legs become paralysed; stupor sets in, and the animal perishes. Treatment should not be attempted. Notification of the existence of swine fever is compulsory, and outbreaks are dealt with by the Board of Agricultnre and Fisheries. To suppress the disease kill all affected pigs and those which have been in contact with them; burn or deeply bury the carcasses and litter, and cover with quicklime. Disinfect everything that may have been contaminated with the virus.

Diseases of the Dog. The contagious diseases of the dog are likewise very few, but the one which attracts most attention is common and generally serious. This is what is popularly known as distemper. It is peculiar to the canine species, for there is no evidence temper. t ˆ at j t can ˆ >e convC y ec i to other animals, though the different families of Carnivora appear each to be liable to a similar disease. Distemper is a specific fever which most frequently attacks young dogs, its effects being primarily developed in the respiratory passages, though the brain, spinal chord and abdominal organs may subsequently be involved. Highly bred and pet dogˆs suffer more severely than the commoner and hardier kinds. It is a most infectious disease, and there is much evidence to prove that it owes its existence and prevalence solely to its virulence. One attack confers immunity from another. The symptoms are rigors, sneezing, dullness, loss of appetite, desire for warmth, and increased temperature, respiration and pulse. The eyes are red, and the nose, at first dry and harsh, becomes smeared with the discharge which soons begins to flow from the nostrils. _ Suppuration also begins at the eyes; vision is more or less impaired by the mucus and pus, and often the cornea becomes ulcerated, and even per- forated. There is a cough, which in some cases is so violent as to induce vomiting. Deliihty rapidly ensues, and emaciation is soon apparent; diarrhoea in the majority of cases sets in;the body emits an unpleasant odour; ulceration of the mouth is noticed; the nostrils become obstructed by the discharge from them; con-

vulsions generally come on; signs of brottchitis, pneumonia, jaundice or other complications manifest themselves; and in some instances there is a pustular or vesicular eruption on the skin. In fatal cases the animal dies in a state of marasmus. Many which recover are affected with chorea for a long time afterwards. Here, again, good nursing is

all-important. Comfort and cleanliness, with plenty of fresh air, must be ensured. Debility being the most serious feature of the disease, the strength should be maintained or restored until the fever has run its course. Light broth, beef tea, or bread and milk, or these alternately, may be allowed as diet. Preparations of quinine, given from the commencement of the attack in a little wine, such as sherry, have proved very bene- ficial. Often a mild laxative is required. Complications should be treated as they arise. The disease being extremely infectious, pre- cautions should be adopted with regard to other dogs. Protective vaccines and antidistemper sera have been introduced by Lignieres, Copeman, Phisalix and others, but their action is uncertain.

The formidable affliction known as hydrophobia (q.v.) or rabies is treated of under that name.

Principal Parasites of Domestic A nimals. Perhaps the commonest worm infesting the horse is Ascaris equorum, or common lumbricoid. The males are from 6 to 8 in. long; females 7 to 17 in. They are found in almost i n torse. every part of the intestine. When present in considerable numbers they produce slight intermittent colicky pains, an unthrifty condition of the skin, with staring coat. Although the horse feeds well, it does not improve in condition, but is ” tucked up J ‘ and anaemic. Among the principal remedies is a mixture of tartar emetic, turpentine and linseed oil. Santonin, ferrous sulphate, common salt and arsenic are also employed. Sclerostomum equinum or palisade worm is a moderate-sized nematode, having a straight body with a somewhat globular head — males | to i\ in., females 1 in. to 2 in. long. This worm is found in the intestines, especially the double colon and caecum. The embryos are developed in the eggs after their expulsion from the host, and are lodged in moist mud, where, according to Cobbold, they change their first skin in about three weeks, after which they probably enter the body of an intermediate bearer, whence they are conveyed in food or water to the digestive canal of the horse, the ultimate host. They then penetrate the mucous membrane and enter the blood vessels, where they are sexually differentiated and give rise to aneurism. After a time they resume their wanderings and reach the large intestine, where they form small submucous cysts and rapidly acquire sexual maturity.- They are most dangerous when migrating from one organ to another. They are found in the anterior mesenteric artery, but they alsoj produce aneurism of the coeliac axis and other abdominal blood vessels, including the aorta. These parasitic aneurisms are a frequent cause of fatal colic in young horses.

Sclerostomum tetracanthum, or four-spined sclerostome, is about the same size as the palisade worm, and like it is found in the colon, caecum and small intestine. It finds its way to the bowel in water or green fodder swallowed by the horse. It is a true blood-sucker, and its development is very similar to that of the S. equinum, except that it directly encysts itself in the mucous membrane and does not enter the blood vessels. The symptoms of its presence are emacia- tion, colicky pains, harsh unthrifty coat, flabby muscles, flatu- lence, foetid diarrhoea, anaemia, great weakness and, sometimes, haemorrhagic enteritis. Treatment of equine sclerostomiasis fre- quently fails, as the remedies cannot reach the encysted parasites. As vermicides, thymol, areca, ferrous sulphate, tartar emetic, arsenic, sodium chloride, oil of turpentine, lysol, creolin and carbolic acid have been found useful.

Oxyurts curvula, or pin worm, is a common parasite of the large intestine. The anterior part of the body is curved and the tail sharply pointed. The male is seldom seen. The female measures I to Iˆ in. in length. It is found in the caecum, colon and rectum, and it causes pruritus of the anus, from which it may be found pro- jecting. This parasite is best treated by means of a cathartic, followed by a course of mineral tonics, and repeated rectal injections of sodium chloride solution, infusion of quassia or diluted creolin.

The cestodes or taeniae of the horse are insignificant in size and they produce no special symptoms. Three species — Anoplocephala perfohata (26-28 mm. long), A. plicata (rˆ-Scm.) and A. tnamtllana (1-3 cm.) — have been described. The first is found in the small intestine and caecum, rarely in the colon ; the second occurs in the small intestine and stomach; the third in the small intestine. Generally a horse may be proved to be infested with tape-worm by finding some of the ripe segments or proglottides in the faeces. The best remedy is male fern extract with turpentine and linseed oil. ,

Gastrophilus equi, or the common bot-fly, is classed with the parasites on account of its larval form living as a parasite. The bot-fly deposits its eggs on the fore-arm, knee and shank of the horse at pasture. In twenty-four hours the ova are hatched and the embryo, crawling on the skin, causes itching, which induces the horse to nibble or lick the part, and in this way the embryo is carried by the tongue to the mouth and swallowed. In the stomach the embryo attaches itself to the mucous membrane, moults three times, in- creases in size and changes from a blood-red to a yellowish-brown

colour. The bot remains in the stomach till the following spring, when it detaches itself, passes into the food and is discharged with the faeces. When very numerous, bots may cause symptoms of indigestion, though frequently their presence in the stomach is not indicated by any sign of ill-health. They are difficult to dislodge or kill. Green food, iodine, naphthalin, hydrochloric acid and vegetable bitters have been recommended ; but the most effective remedy is a dose of carbon bisulphide given in a gelatin capsule, repeated in twelve hours, and followed twelve hours later by an aloetic ball.

Of the parasites which infest cattle and sheep mention will only

be made of Distomum hepaticum, or common fluke, which causes

liver-rot or distomiasis, a very fatal disease of lambs and

rf h ˆeep under two years old. It occurs most frequently anas eep* a f ter a we ˆ season on low-lying, marshy or undrainedland,- but it may be carried to other pastures by sheep which have been driven through a fluke-infested country. and sheep allowed to graze along ditches by the roadside may contract the parasite. For a full description of its anatomy and development see Trematodes. Preventive treatment comprises the destruction of flukes and snails; avoidance of low-lying, wet pastures draining infested land, and top-dressing with salt, gas-lime, lime water or soot; supplying sheep with pure drinking water; placing rock-salt in the fields, and providing extra food and a tonic lick consisting of salt, aniseed, ferrous sulphate, linseed and peas-meal.

Husk, hoose or verminous bronchitis of calves is caused by Strongylus micrurus, or pointed-tailed strongyle, a thread-worm i to 3 in. long, and S. piilmonaris, a similar but smaller nematode; and the corresponding disease of sheep is due to S. filaria and S. rufescens. The male S. filaria is I to 2 in., and the female 2 to 4 in. longˆ. They are white in colour and of the thickness of ordinary sewing cotton. The 5”. rufescens is thinner and shorter than S. filaria and its colour is brownish red. The development of these strongyles is not accurately known. When expelled and deposited in water or moist earth, the embryos may live for many months. Iloose occurs in spring and continues until autumn, when it may be most severe. In sheep the symptoms are coughing, at first strong, with long intervals, then weak and frequent, leaving the sheep distressed and wheezing; discharge from the nose, salivation, occasional retching with expulsion of

parasites in frothy mucus, advancing emaciation, anaemia and weakness. In calves the symptoms are similar but less acute. Various methods of cure have been tried. Remedies given by the mouth are seldom satisfactory. Good results have Followed fumigations with chlorine, burning sulphur, tar, &c, and intra-tracheal injections of chloroform, iodine and ether, oil of turpentine, carbolic acid, and opium tincture, or chloroform, ether, creosote and olive oil. The system should be supported with as much good nourishing food as possible.

The principal parasites which infest the alimentary canal of cattle or sheep arc strongyles and taeniae. The strongyles of the fourth stomach are S. contortus, or twisted wire-worm (male 10 to 20 mm., female 20 to 30 mm. long), S. convoluhis (female ro to 13 mm.), S. ceroicornis (female 10 to 12 mm.), S. gracilis (female 3 to 4 mm.), and an unnamed species (female 9 mm. long) discovered by McFadyean in 1896. In the contents of the stomach the contortus may easily be recognized, but the other parasites, owing to their small size or situation in the mucous membrane, may be overlooked in an ordinary post-mortem examination. The contortus, which is best known, may serve as the type. It lives on the blood which it abstracts from the mucous membrane, and, according to the state of reoletion, its body may be red or white. The ova of this worm are discharged m the faeces and spread over the pastures by infected sheep. The ova hatch in a few days, and, according to Ransom, within a fortnight embryos one-thirtieth of an inch long may be found encased in a chUinoid investment, which protects them from the effects of excessive cold, heat or moisture. When the ground is damp and the temperature not too low, the embryos creep up the leaves of grasses and other plants, but when the temperature is below 40 F. they are inactive (Ransom). Sheep feeding on infected pasture gather the young worms and convey them to the fourth stomach, where they attain maturity in two or three weeks. In wet weather the embryos may be washed into ponds and ditches, and cattle and sheep may swallow them when drinking. Strongyles cause loss of appetite, irritation and inflam- mation of the stomach and bowel, diarrhoea, anaemia, progressive emaciation, and, if not destroyed or expelled, a lingering death from exhaustion, The success or failure of medicinal treatment depends on the degree of infestation. A change of pasture is always de- sirable, and as remedies a few doses of oil of turpentine in linseed oil, or a solution of'lysol or cyllin, and a powder consisting of arsenic, ferrous sulphate, areca, nux vomica and common salt may be tried. The ox may be the bearer of three and the sheep of twelve species of taeniae, and of these the commonest is Moniezia {taenia} expanse, which is more frequently

found in sheep than in cattle. It is the longest tapeworm, being from 6 to 30 ft. in sheep and from 40 to 100 ft. in cattle. Its maximum breadth is f- in.; it is found in the small intestine, and sometimes in sufficient numbers in lambs to obstruct the bowel. Infested animals are constantly spreading the ripe segments over the pastures, from which the ova or embryos

are gathered by sheep. The symptoms are inappetence, dry harsh wool, weakness, anaemia arid diarrhoea with segments of the worms in the faeces. Various drugs have been prescribed for the expulsion of tapeworms, but the most useful are male fern extract, turpentine, kamala, kousso, aloes and linseed oil. Very young animals should be supported by dry nourishing food and tonics, including salt and ferrous sulphate.

The principal round-worms of the intestine of ruminants are Ascaris vitulorum, or calf ascarid, Strongylus filicollis, S. venlricosus, Sderoslomum hyposiomum, Anckylostomum cernuum and Tricho-cephalus affinis, or common whip-worm, which sometimes causes severe symptoms in sheep. For a full account of the development of Cysticercus bovis, or beef measle, the larval form of Taenia saginala of the human subject, see Tapeworms. Another bladder-worm, found in the peritoneum of sheep and cattle, is Cysticercus tenui- collis, or slender-necked hydatid, the larval form of Taenia marginata of the dog. It seldom produces serious lesions. An important hydatid of ruminants in Coenurus cerebralis, which produces in sheep, cattle, goats and deer gid or sturdy, a peculiar affection of the central nervous system characterized by congestion, compression of the brain, vertigo, inco-ordination, and other symptohis of cerebro- spinal paralysis. This bladder-worm is the cystic form of Taenia coenurus of the dog. It is found in the cranial cavity, resting on the brain, within its substance or at its base, and sometimes in the spinal canal. The symptoms vary with the position and number of the vesicles. In an ordinary case the animal feeds intermittently or not at all, appears unaccountably nervous or very dull, more or less blind and deaf, with glazed eye, dilated pupil, the head twisted or inclined always to one side — that occupied by the cyst — and when moving the sheep constantly tends to turn in the same direction. When the vesicle is deep-seated or within the cerebral lobe, the sheep carries the head low, brings the feet together and turns round and round like a dog preparing to lie down. W r hen the developing cyst exerts pressure at the base of the cerebellum, the sheep re- peatedly falls and Tolls o\ r er. In other cases the chief symptoms may be frequent falling, always on the same side, high trotting action with varying length of step, advancing by rearing and leaping, complete motor paralysis, and in

spinal cases posterior paralysis with dragging of the hind limbs. Medicinal treatment is of no avail, but in some cases the hydatid can be removed by trephining the skull. Gid may be prevented by attending to the treatment of dogs infested with the tapeworm.

The helminthes of the pig, although not very detrimental to the animal itself, are nevertheless of great importance as regards the entozoa of man. Allusion must be made to Trichinella spiralis, which causes trichinosis. The male is rVt-h, fl be

the female Jth in. long, and the embryos j&th to ˆth in. p ™'

The ova measure TsVT» tn * n – i n their long diameter; they are hatched within the body of the female worm. When scraps of trichinqus flesh or infested rats have been ingested by the pig, the cysts en- closing the larval trichinae arc dissolved by the gastric juice in about eighteen hours, and the worms are found free in the intestine. In twenty-four to forty-eight hours later these larvae, having under- gone certain transformations, become sexually mature; then they copulate, and after an interval the embryos leave the body of the female worm and immediately begin to penetrate the intestinal wall in order to pass into various voluntary muscles, where they become encysted. About twelve days elapse from the time they begin their wandering. Usually each larva is enveloped in a capsule, but two or even three larvae have been found in one investment. They have been known to live in their capsules for. eighteen months to two years.

Cysticercus cellulosae is the larval form of Taenia solium of man (see Tapeworms). " Measlv pork " is caused by the presence in the flesh of the pig of this entozoon, which is bladder-like in form. It has also been discovered in the dog. Other important parasites of the pig are Stephanurus dentatus, or crown-tailed strongyle, Echinorhynchus gigas, or thorn-headed worm, Ascaris suis, or pig ascarid, and Strongyloides suis. For these the most useful remedies arc castor oil seeds, given with the food, and oil of turpentine in milk, followed by a dose of Epsom salts.

Of all the domesticated animals the dog is by far the most fre- quently infested with worms. A very common round-worm is Ascaris marginata (3 to 8 in. long), a variety of the ascarid (A. mysiax) of the cat. It occurs in the intestine or stomach of young dogs. The symptoms arc emaciation, drooping belly, irritable skin, irregular appetite, vomiting the worms in mucus, colic and diarrhoea. The treatment comprises the administration of areca or santonin in milk, followed by a dose of purgative medicine. A nematode, Filaria immitis, inhabits

the heart of the dog, and its larvae may be found in the blood, causing endocarditis, obstruction of the vessels, and fits, which often end in death. Spiroptera sanguinolenta may be found in theˆ dog encysted in the wall of the stomach. Other nematodes of the dog are Anchylostomuni trigonocephalum, which causes frequent bleeding from the nose and pernicious anaemia, and Trichocephalus depressiusculus, or whip-worm, which is found in the caecum. The dog harbours eight species of taeniae and five species of Bothriocephalus, Taenia serrata, about 3 ft. in length, is found in about 10% of

fa the dog.

English dogs, most frequently in sporting dogs and those employed on farms, owing to their eating the viscera of rabbits, &c, in which the larval form (Cysticercus pisiformis) of this tapeworm dwells'. T. marginaia is the largest cestode of the dog. It varies in length from 5 to 8 ft., and is fuund in the small intestine of 30% of dogs in Great Britain ; its cystic form (C. tenuicollis) occurs in the peritoneum of sheep. T. coenurus causes gid in sheep as previously stated. It seldom exceeds 3 ft. in length. Dogs contract this parasite by eating the heads of sheep infested with the bladder- worm (Coenurus cerebralis). Dipyiidium caninum, T. cucumerina, or melon seed tapeworm, is a very common parasite of dogs. It varies in length from 3 to 15 in.; its larval form (Cryptocystis trichodectis et pulicis) is found in the abdomen of the dog-flea (Pulex serraiiceps), the dog- louse (Trichodectis latus) and in the flea (P. irriians) of the human subject. The dog contracts this worm by swallowing fleas or lice containing the cryptocysts. T. echinococcus may be distinguished from the other tapeworms by its small size. It seldom exceeds i in. in length, and consists of four segments including the head. The fourth or terminal proglottis when ripe is larger than all the rest. Its cystic form is Echinococcus veterinorum, which causes hydatid disease of the liver, lunge, and other organs of cattle, pigs, sheep, horses, and even man. This affection may not be discovered during life. In well-marked cases the liver is much deformed, greatly enlarged, and increased in weight; in the ox the hydatid liver may weigh from 50 to 100 lb or more. Another tapeworm (T. serialis) sometimes occurs in the small intestine. Its cystic form is found in rodents. Bothriocephalus latus, or broad tapeworm, about 25 ft. long and I in. broad, is found in the intestine of the dog and sometimes in man. Its occurrence appears to be confined to certain parts of the European continent. Its larval form

is met with in pike, turbot, tench, perch, and other fishes. The heart-shaped bothriocephalus (B. cordatus) infests the dog and man in Greenland. For the expulsion of tapeworm male fern extract has been found the most effectual agent; areca powder in linseed oil, and a combination of areca. colocynth and jalap, the dose varying according to the age, size and condition of the dog, have also proved beneficial.

The parasites which cause numerous skin affections in the domesticated animals may be arranged in two groups, viz. _ _ animal parasites or Dermatozoa, and vegetable parasites

erma- or D ernm [pfiyi es _ The dermatozoa, or those which * produce pruritus, mange, scab, &c, are lice, fleas, ticks,

acari or mange mites, and the larvae of certain flies. The lice of the horse are Haematopinus macrocephalus, Trichodecles pilosus and T. pubescens; those of cattle, H. eurysternus, or large ox-louse, H. vituli, or calf-louse, and T. scalaris, or small ox-louse; and sheep may be attacked by T. sphaerocephalus. or sheep-louse, and by the louse-like ked or fag (Melophagus ovinus) which belongs to the

fmpiparous diptera. Dogs may be infested with two species of ice, H. piliferus and T. latus, and the pig with one, II. urius.

Ticks belong to the family Ixodidae of the order Acarina. A few species have been proved responsible for the transmission of diseases caused by blood parasites, and this knowledge has greatly increased the importance of ticks in veterinary practice. The best known ticks are Ixodes ricinus, or castor-bean tick, and I. hexagonus, which are found all over Europe, and which attack dogs, cattle, sheep, deer and horses. Rhipicephalus annulatus, or Texan fever-tick of the United States, Rh. decnloralus, or hlue-tick of South Africa, and Rh. australis, or scrub-tick of Australia, transmit the parasite of red water or bovine piroplasmosis. Rh. appendiculatus carries the germs of East Coast fever, Rh- bursa is the bearer of the parasite of ovine piroplasmosis, and Rh. evertsi distributes the germs of equine biliary fever. Amblyomma hebraeum conveys the parasite of ” heart-water ” of cattle and sheep, and TIaemaphysalis leachi transmits the parasite of canine piroplasmosis. Hyalommaaegyptium, or Egyptian tick, Rh. simus and Rh. capensis, are common in most parts of Africa.

The acari of itch, scab or mange are species of Sarcoptes, which burrow in the skin; Psoroptes, which puncture the skin and live on the surface sheltered by hairs and scurf ; and Chorioptes, which live in colonies and simply pierce the epidermis. Representatives of these

three genera have been found on the horse, ox and sheep ; varieties of the first genus (Sarcoptes) cause mange in the dog and pig; and Chorioptes cynoiis sometimes invades the ears of the dog and cat. These parasites live on the exudation produced by the irritation which they excite. Another acarus (Demodex folliculorum) invades the dog's skin and sometimes occurs in other animals. It inhabits the hair follicles and sebaceous glands, and causes a very intractable acariasis — the follicular or demodecic mange of the dog (see Mite). A useful remedy for mange in the horse is a mixture of sulphur, oil of tar and whale oil, applied daily for three days, then washed off and applied again. For the dog, sulphur, olive oil and potassium carbonate, or oil of tar and fish oil, may be tried. Various approved patent dips are employed for scab in sheep. A good remedy for destroying lice may be compounded from Stavesacre powder, soft soap and hot water, applied warm to the skin. Follic- ular mange is nearly incurable, but recent cases should be treated by daily rubbing with an ointment of 5 parts cyllin and 100 parts of lanoline.

The vegetable parasites, or Dermatophytes, which cause tinea or ringworm in horses, cattle and dogs, belong to five distinct genera: Trichophyton, Microsporum, Eidamella, Achorion and Oospora. Ringworm of the horse is either aTricho- Dermato- phytosis produced by one of four species of iungi (7'richo- P h y tea * phyton mentagropkytes, T. flavum, T. equinum and T. verrucosum) , or a Microsporosis caused by Microsporum audouini. Ringworm of cattle is always a Trichophytosis, and due to T. mentagropkytes.. Four different dermatophytes (J\ caninum, M. audouini var. caninum, Eidamella spinosa and Oospora canina) affect the dog, producing Trichophytic, Microsporous and Eidamellian ringworm and favus. Little is known of ringworm in sheep and swine. The fungi attack the roots of the hairs, which after a time lose their elasticity and break off, leaving a greyish-yellow, bran-like crust of epidermic products, dried blood and sometimes pus. In favus the crusts are yellow, cupped, almost entirely composed of fungi, and have an odour like that of mouldy cheese. Ringworm may affect any part of the skin, but occurs principally on the head, face, neck, back and hind quarters. It is very contagious, and it may be communicated from one species to another, and from animals to man. The affected parts should be carefully scraped and the crusts destroyed by burning; then the patches should be dressed with iodine tincture, solution of copper sulphate or carbolic acid, or with oil of tar.

Bibliography.— Modern veterinary literature affords striking evidence of the progress made by the science; excellent text-books, manuals and treatises on every subject belonging to it are numerous, and arc

published in every European language, while the abundant periodical press, with marked ability and discrimination, records and distributes the ever- increasing knowledge. The substantial advances in veterinary pathology, bacteriology, hygiene, surgery and preventive medicine point to a still greater rate of progress. The schools in every way are better equipped, the education and training — general and technical — of students of veterinary medicine are more comprehensive and thorough, and the appliances for observation and investigation of disease have been greatly improved. Among the numerous modern works in English on the various branches of veterinary science, the following may be mentioned; McFadvean, Anatomy of the Horse: a Dissection Guide (London, 1902) ; Chauvcau, Comparative Anatomy of the Domesticated Animals (London, 1891); Cuyer, Artistic Anatomy of Animals (London, 1905) ; Share- Jones, Surgical Anatomy of the Horse (London, x 907j; Jowett, Blood-Serum Therapy and Preventive Inoculation (London, 1906); Swithinbank and Newman, The Bacteriology of Milk (London, 1905); Fleming, Animal Plagues (London, 1882); Merillat, Animal Dentistry (London, 1905) ; Liautard, Animal Castration (9th ed., London, 1902); Moussu and Dollar, Diseases of Cattle, Sheep, Goats and Swine (London, 1905); Reeks, Common Colics of the Horse (London, 1905); Sessions, Cattle Tuberculosis (London, 1905); Scwell, Dogs: their Management (London, 1897); Hobday, Surgical Diseases of the Dog and Cat (London, 1906); Hill, Management and Diseases of the Dog (London, 1905); Sewell, The Dog's Medical Dictionary (London, 1907); Goubaux and Barrier, Exterior of the Horse (London, 1904); Reeks, Diseases of the Foot of the Horse (London, 1906); Robcrge, The Foot of the Horse (London, 1894); Jensen, Milk Hygiene: a Treatise on Dairy and Milk Inspection, &?c. (London, 1907); Smith, Manual of Veterinary Hygiene (London, 1 905) ; Fleming, Human and Animal Variolae (Condon, 1881); Hunting, The Art of Horse- shoeing (London, 1899); Fleming, Horseshoeing (London, 1900) ; Dollar and Wheatley, Handbook of Horseshoeing (London, 1898) ; Lungwitz, Text-Book of Horseshoeing (London, 1904); Axe, The Horse: its Treatment in Health and Disease (9 vols., London, 1905); Hayes, The Points of the. Horse (London, 1904); Robertson, Equine Medicine (London, 1883); Hayes, Horses on Board Ship (London, 1902); FitzWygram, Horses and Stables (London, 1901); Liautard, Lameness of Horses (London, 1888); Walley, Meat Inspection (2nd ed., London, 1901); Osrertag, Handbook of Meat Inspection (London, 1907); Courtcnay, Practice of Veterinary Medicine and Surgery (London, 1902); Williams, Principles and Practice of Veterinary Medicine (8th ed., London, 1897); J. Law, Text-book of Veterinary Medicine (5 vols., New r York, 1905); Cadiot and Dollar, Clinical Veterinary Medicine and Surgery (London, 1900);

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(G. Fl.; J. Mac.)

VETO (Lat. for ” I forbid “), generally the right of preventing any act, or its actual prohibition; in public law, the constitu- tional right of the competent authority, or in republics of the whole people in their primary assembly, to protest against a legislative or administrative act, and to prevent wholly, or for the time being, the validation or execution of the same.

It is generally stated that this right was called into existence in the Roman republic by the tribunicia potestas, because by this authority

decisions of the senate, and of the consuls and other magistrates, could be declared inoperative. Such a state- ment must, however, be qualified by reference to the facts that intcrdico, interdicimus were the expressions used, and, in general, that in ancient Rome every holder of a magistracy would check a negotiation set on foot by a colleague, his equal in rank, by his opposition and intervention. This was a consequence of the position that each of the colleagues possessed the whole power of the magistracy, and this right of intervention must have come into existence with the introduction of colleagued authorities, i.e. with the commencement of the republic. In the Roman magistracy a twofold power must be distinguished: the positive management of the affairs of the state entrusted to each indi- vidual, and the power of restraining the acts of magistrates of equal or inferior rank by his protest. As the tribuni plcbis possessed this latter negative competence to a great extent, it is customary to attribute to them the origin of the veto.

In the former kingdom of Poland the precedent first set in 1652 was established by law as a constant right, that in the imperial diet a single deputy by his protest ” Nie pozwalam,” i.e. ” I do not permit it,” could invalidate the decision sanctioned by the other members. The king of France received the right of a suspensory veto at the commencement of the French Revolution, from the National Assembly sitting at Ver- sailles in 1789, with regard to the decrees of the latter, which was only to be valid for the time being against the decisions come to and during the following National Assembly, but during the period of the third session it was to lose its power if the Assembly persisted in its resolution. By this means it was endeavoured to diminish the odium of the measure; but, as is well known, the monarchy was soon afterwards entirely abol- ished. Similarly the Spanish Constitution of 181 2 prescribed that the king might twice refuse his sanction to bills laid twice before him by two sessions of the cortes, but if the third session repeated the same he could no longer exercise the power of veto. The same was the case in the Norwegian Constitution of

1814.

In the French republic the president has no veto strictly so called, but he has a power somewhat resembling it. He can, when a bill has passed both Chambers, by a message to them, refer it back for further deliberation. The king or queen of England has the right to withhold sanction from a bill passed by both houses of parliament. This royal prerogative has not been exercised since 1692 and may now be considered obsolete. The governor of an English colony with a

representative legis lature has the power of veto against a bill passed by the legis- lative body of a colony. In this case the bill is finally lost, just as a bill would be which had been rejected by the colonial council, or as a bill passed by the English houses of parliament would be if the crown were to exert the prerogative of refusing the royal assent. The governor may, however, without refusing his assent, reserve the bill for the consideration of the crown. In that case the bill does not come into force until it has either

actually or constructively received the royal assent, which is in effect the assent of the English ministry, and therefore indirectly of the imperial parliament. Thus the colonial liberty of legisla- tion is made legally reconcilable with imperial sovereignty, and conflicts between colonial and imperial laws are prevented. 1

The constitution of the United States of America contains in art. i., sect. 7, par. 2, the following order: —

” Every bill which shall have passed the House of Representatives and the Senate shall, before it become a law, be presented to the president of the United States; if he approve, he” shall sign it, if not, he shall return it with his objections to that house in which it shall have originated, who shall enter the objections at large on their journal and proceed to reconsider it. If, after such recon- sideration, two-thirds of that house shall agree to pass the bill, it shall be sent, together with the objections, to the other house, by which it shall likewise be reconsidered, and, if approved by two- thirds of that house, it shall become a law. Every order, resolution or vote to which the concurrence of the Senate and House of Repre- sentatives may be necessary (except on a question of adjournment) shall be presented to the president of the United States, and, before the same shall take effect, shall be approved by him, or, being dis- approved by him, shall be repassed by two-thirds of the Senate and House of Representatives, according to the rules and limitations prescribed in the case of a bill.”

In all states of the Union except one the governors, in the same manner or to a modified extent, possess the right of vetoing bills passed by the legislature. Here, therefore, we have again a suspensory veto which is frequently exercised.

According to the constitution of the German empire of 1871, the imperial legislation is executed by the federal council and imperial diet; the emperor is not mentioned. In the federal council the simple majority of votes decides. But in the case of bills concerning the army, the navy and certain specially noted taxes, as well as in the case of

decisions concerning the alteration of orders for the administration, and arrangements for the execution of the laws of customs and taxes, the proposal of the federal council is only accepted if the Prussian votes are on the side of the majority in favour of the same (art. vii., sect. 3). Prussia presides in the federal council. The state of things is therefore, in fact, as follows: it is not the German emperor, but the same monarch as king of Prussia, who has the right of veto against bills and decisions of the federal council, and therefore can prevent the passing of an imperial law. The superior power of the presidential vote obtains, it is true, its due influence enly in one legislative body, but in reality it has the same effect as the veto of the head of the empire.

The Swiss federal constitution grants the president of the Confederation no superior position at all; neither he nor the federal council possesses the power of veto against laws or decisions of the federal assembly. But in some cantons, viz, St Gall (1831), Basel (1832) and Lucerne (1841), the veto was introduced as a right of the people. The citizens had the power to submit to a plebiscite laws which had been debated and accepted by the cantonal council (the legislative authority), and to reject the same. If this plebiscite was not demanded within a certain short specified time, the law came into force. But, if the voting took place, and if the number of persons voting against the law exceeded by one vote half the number of persons entitled to vote in the canton, the law was rejected. The absent voters were considered as having voted in favour of the law. An attempt to introduce the veto in Zurich in 1847 failed, Thurgau and SchafThausen accepted it later. Meanwhile another arrangement has quite driven it out of the field. This is the so-called ” refer- endum “—properly speaking, direct legislation by the people — which has been introduced into most of the Swiss cantons. Formerly in all cantons — with the exception of the small moun- tainous districts of Uri, Schwyz, Untcrwaldcn, Zug, Glarus and Appenzell — it was not a pure democracy, but a representative constitution that prevailed: the great councillors or cantonal councillors periodically chosen by the people were the possessors of the sovereign power, and after deliberating twice passed the bills definitely. Now they have only to discuss the bills, which

1 A.V. Dicey , Introduction to the Study of the Law of Uie Constitution, pp. in seq. (6th ed., London, 1902); Sir H. Jenkyns, British Rule and Jurisdiction beyond the Seas, pp. 1 13 seq. (London, 1902).

aw printed and sent to all voters with an explanatory message; then the people on a certain day vote for the acceptance or re- jection of the law by writing ” yes ” or ” no ” on a printed voting paper, which is placed in an urn under official control. In some cantons important financial resolutions involving large state expenses are also submitted to the decision of the people. In the revised federal constitution of 1874, under certain sup- positions which have no further interest for us at presentˆ a facultative referendum or Initiative (i.e. the possibility of de- manding a plebiscite under exceptional circumstances) was introduced for federal laws. Since that period it has often been employed and has operated like a veto. It is evident that by the compulsory referendum in the cantons the mere veto is rendered superfluous.

In examining the question as to what position the veto occupies in jurisprudence, we must separate quite different conceptions which are comprised under the same name.

1. The veto may be a mere right of intervention on the part of a magistrate against the order of another official, or against that of an authority of equal or inferior rank. This was the case in ancient Rome. To this class belong also those cases in which, as in the French republic, the president makes his ” no ” valid against decisions of the general councillors, and the prefect does the same against decisions of the communal councillors. The use of the expres- sion here is quite justifiable, and this veto is not confined to bills, but refers particularly to administrative measures. It affords a guarantee against the abuse of an official position. _

2. The veto may be a safety-valve against precipitate decisions, and so a preventive measure. This task is fulfilled by the suspensory veto of the president of the United States. Similarly, to this class belong the above-mentioned prescriptions of the Spanish and Norwegian constitutions, and also the veto of the governor of an English colony against decisions of the legislature; for this protest is only intended to prevent a certain want of harmony between the general and the colonial legislation, by calling forth a renewed investigation. This veto is neither an interference with the com- petence of an authority, nor a division of the legislative power among different factors, but simply a guarantee against precipitancy in the case of a purely legislative measure. The wisdom of estab- lishing this veto power by the constitution is thus manifest.

3. It is wrong to apply the term veto to what is merely the negative side of the sanctioning of the laws, in other words, an act of sovereignty. It would not be in accordance with the nature of a constitutional monarchy to declare the monarch's consent to, a law unnecessary, or make it a compulsory duty; the legislative power is divided between him and the chambers. The sovereign must therefore be perfectly at liberty to say " yes " or " no " in each single case according to his opinion. If he says the latter, we speak of it as his veto, but this — if he possesses an absolute and not merely a suspensory veto — is not an intervention and not a preventive measure, but the negative side of the exercise of the legislative power, and therefore an act of sovereignty. That this right belongs fully and entirely to the holder of sovereign power — -however he may be called — is self-evident. One chamber can also by protest prevent a hill of the other from coming into force. The " placet of the temporal power for church affairs — when it occurs — also involves in this manner in itself the veto or non placet." Where in pure democracies the people in their assembly have the right of veto or referendum, the exercise of it is also a result of the sovereign rights of legislature. (For the question of the conflict between the two houses of England, see Representation.)

The peculiar power of- veto possessed by the (Prussian) president of the federal council of Germany lies on the boundary between (2) and (3). (A. v. 0.)

VETTER [Vatter or Wetter, often written, with the addition of the definite article, Vettern], a lake of southern Sweden, 80 m. long, and 18 m. in extreme breadth. It has art area of 733 sq. m., and a drainage area of 2528 sq. m.; its maximum depth in 390 ft., and its elevation above sea-level 289 ft. It drains eastward by the Motala river to the Baltic. Its waters are of remarkable transparency and blueness, its shores pictur- esque and steep on the east side, where the Omberg (863 ft.) rises abruptly, with furrowed flanks pierced by caves. The lake is subject to sudden storms. Its northern part is crossed from Karlsborg to Motala (W. to E.) by the Gota canal route. At the southern end is the important manufacturing town of Jonkoping, and 15 m. N. of it the picturesque island of Vising, with a ruined palace of the 17th century and a fine church. Vadstena, 8 m. S. of Motala, with a staple industry in lace, has a convent (now a hospital) of St Bridget or Birgitta (1383), a beautiful monastic church (1395-1424) and a castle of King

Gustavus Vasa. At Alvastra, 16 m. S. again, are ruins of a Cistercian monastery of the nth century. Close to Motala are some of the largest

mechanical- workshops in Sweden, building warships, machinery, bridges, &c.

VETULONIUM, or Vetulonia (Etruscan Velfuna),a,n ancient town of Etruria, Italy, the site of which is probably occupied by the modern village of Vetulonia, which up to 1887 bore the name of Coionna. It lies 1130 ft. above sea-level, about 10 m. direct N.W. of Grosscto, on the N.E. side of the hills which project from the flat Maremma and form the promontory of Castiglione. The place is little mentioned in ancient literature, though Silius Italicus tells us that it was hence that the Romans took their magisterial insignia (fasces, curule chair,- purple toga and brazen trumpets), and it was undoubtedly one of the twelve cities of Etruria. Its site was not identified before 1881, and the identification has been denied in various works by C. Dotto dei Dauli, who places it on the Poggio Castiglione near Massa Marittima, where scanty remains of buildings (possibly of city walls) have also been found. This site seems to agree better with the indications of medieval documents. But certainly an Etruscan city was situated on the hill of Coionna, where there are remains of city walls of massive limestone, in almost hori- zontal courses. The objects discovered in its extensive necro- polis, where over icoo tombs have been excavated, are now in the museums of Grosscto and Florence. The most important were surrounded by tumuli, which still form a prominent feature in the landscape.

See G. Dennis, Cities and Cemeteries of Etruria (London, 1883), ii. 263; Notizie degli Scavi, passim; I. Falchi, Ricerche di Vetulonia (Frato, 1881), and other works, especially Vetulonia e la sua necropoli antiehissima (Florence, 1891); G. Sordini, Vetulonia (Spoleto, 1894) and references. (T. As.)

VEUILLOT, LOUIS (1813-1883), French journalist and man of letters., was born ot humble parents at Boynes (Loiret) on the nth of October 1 8 1 3 . When Louis Veuillot was five years old his parents removed to Paris. After a very slight education he entered a lawyer's office, and was sent in 1830 to serve on a Rouen paper, and afterwards to Perigueux. He returned to Paris in 1837, and a year later, visited Rome during Holy Week. There he embraced extravagant ultramontane sentiments, and was from that time an ardent champion of Catholicism. The results of his conversion appeared in Peler- inage en Suisse (1839), Rome e-t Larette (1841) and other works. In 1843 he entered the staff of the Univers religieux. His violent methods of journalism had already provoked more than one duel, and for his polemics against the university of Paris in the Univers he was imprisoned for a short time. In 1848 he became editor of the paper,

which was suppressed in i860, but revived in 1867, when Veuillot recommenced his ultra- montane propaganda, which brought about a second suppression of his journal in 1874. When his paper was suppressed Veuillot occupied himself in writing violent pamphlets directed against the moderate Catholics, the Second Empire and the Italian government. His services to the papal see were fully recognized by Pius IX., on whom he wrote (1878) a monograph. He died on the 7th of March 1S83.

Some of his scattered papers were collected in Melanges religieux, historiques et litteraires (12 vols., 1857-75), and his Correspondance (6 vols., 1883-85) has great political interest. His younger brother, Eugene Veuillot, published (1901-4) a comprehensive and valuable life, Louis Veuillot.

VEVEY [German Vivis], a small town in the Swiss canton of Vaud and near the eastern extremity of the Lake of Geneva. It is by rail 12 m. S.E. of Lausanne or 3ˆ m. N.W. of the Veraex- Montreux railway station, while it is well served by steamers plying over the Lake of Geneva. In 1900 it had a population of 11,781, of whom 8878 were French-speaking, while there were 82.77 Protestants to 3424 Romanists and 56 Jews. It is the second town in point of population in the canton, coming next after Lausanne, though inferior to the ” agglomeration ” known as Montreux. It stands at the mouth of the Veveyse and commands fine views of the snowy mountains seen over the glassy surface of the lake. The whole of the surrounding

country is covered with vineyards, which (with the entertain- ment of foreign visitors) occupy the inhabitants. Every twenty years or so (last in 1889 and 1905) the Fete des Vigncronsis held here by an ancient gild of vinedressers, and attracts much attention. Besides a railway line that joins the Montreux- Bernese Oberland line at Chamby (5 m. from Vevey and i-£ rm below Les Avants) there is a funicular railway from Vevey up the Mont Pelerin (3557 ft.) to the north-west.

Vevey was a Roman settlement [Viviscus] and later formed part of the barony of Vaud, that was held by the counts and dukes of Savoy till 1536, when it was conquered by Bern. In 1798 It was freed from Bernese rule and became part of the canton du Leman (renamed canton de Vaud in 1803) of the Helvetic Republic.

(W. A. B. C.)

VEXILLUM (Lat. dim. of velum, piece of cloth, sail, awning, or from vehere, veetum, to carry), the name for a small ensign consisting of a square cloth suspended from a cross-piece fixed to a spear. The vexillum was strictly the ensign of the maniple, as signum was of the cohort, but the term came to be used for all standards or ensigns other than the eagle (aqmla) of the legion (see Flag). Caesar {B.G. ii. 20) uses the phrase vexillum Proponere of the red flag hoisted over the general's tent as a signal for the march or battle. The standard-bearer of the maniple was styled vexillarius, but by the time of the Empire vexillum and vexillarius had gained a new significance. Tacitus uses these terms frequently both of a body of soldiers serving apart from the legion under a separate standard, and also with the addition of some word implying connexion with a legion of those soldiers who, after serving sixteen years with the legion, continued their service, under their own vexillwn, with the legion. The term is also used for the scarf wrapped round a bishop's pastoral staff (q.v.). Modern science has adopted the word for the web or vein of a feather of a bird and of the large upper petal of flowers, such as the pea, whose corolla is shaped like a butterfly.

VEXIO, or Wexio, a town and bishop's see of Sweden, capital of the district (l-an) of Kronoberg, 124 m. N.E. of Malm6 by rail. Pop. (1900) 7365. It is pleasantly situated among low wooded hills at the north end of Lake Vexio, and near the south end of Lake Helga. Its appearance is modern, for it was burnt in 1843. The cathedral of St Siegfrid dates from about 1300, but has been restored, the last time in 1898. The Smaland Museum has antiquarian and numismatic collections, a library and a bust of Linnaeus. There are iron foundries, a match factory, &c. At Ostrabo, the episcopal residence without the town, the poet Esaias Tegner died in 1846, and he is buried in the town cemetery. On the shore of Lake Helga is the royal estate of Kronoberg, and on an island in the lake the ruins of a former castle of the same name.

VEZELAY, a village of France, in the department of Yonne, 10 m. W.S.W. of Avallon by road. Its population, which was over Lo,ooo in the middle ages, was 524 in 1906. It is situated on the summit and slopes of a hill on the left bank of the Cure, and owes its renown to the Madeleine, one of the largest and most beautiful basilicas in France. The Madeleine dates from the 1 2th century and was skilfully restored by Viollet-le-Duc. It consists of a narthex, with nave and aisles; a triple nave, without triforium, entered from the narthex by three door- ways; transepts; and a choir with triforium. The oldest

portion of the church is the nave, constructed about 1125. Its groined vaulting is supported on wide, low, semicircular arches, and on piers and columns, the capitals of which are embellished with sculptures full of animation. The narthex was probably built about 1140. The central entrance, leading from it to the nave, is one of the most remarkable features of the church; it consists of two doorways, divided by a central pier supporting sculptured figures, and is surmounted by a tympanum carved with a representation of Christ bestowing the Holy Spirit upon His apostles. The choir and transepts are later in date than the rest of the church, which they surpass in height and grace of proportion. They resemble the eastern portion of the church of St Denis, and were doubtless built in place of a Romanesque choir damaged in a fire in 1165. A

crypt beneath the choir is perhaps the relic of a previous Romanesque church which was destroyed by fire in n 20. The west facade of the Madeleine has three portals; that in the centre is divided by a pier and surmounted by a tympanum sculptured with a bas-relief of the Last Judgment. The upper portion of this front belongs to the 13th century. Only the lower portion of the northernmost of the two flanking towers is left, and of the two towers which formerly rose above the transept that to the north has disappeared. Of the other buildings of the abbey, there remains a chapter-house (13th century) adjoining the south transept. Most of the ramparts of the town, which have a circuit of over a mile, are still in existence. In particular the Porte Neuve, consisting of two massive towers flanking a gateway, is in good preservation. There are several interesting old houses, among them one in which Theodore of Beza was born. Of the old parish church, built in the 17th century, the clock-tower alone is left. A mile and a half from V£zelay, in the village of St Pere-sous-Vezelay, there is a remarkable Burgundian Gothic church, built by the monks of Vezelay in the 13th century. The west facade, flanked on the north by a fine tower, is richly decorated; its lower portion is formed of a projecting porch surmounted by pinnacles and adorned with elaborate sculpture.

The history of Vezelay is bound up with its Benedictine abbey, which was founded in the Qth century under the influence of the abbey of Cluny. This dependence was soon shaken off by the younger monastery, and the acquisition of the relics of St Magdalen, soon after its foundation, began to attract crowds of pilgrims, whose presence enriched both the monks and the town which had grown up round the abbey and ac- knowledged its supremacy. At the beginning of the 12th century the exactions of the abbot Artaud, who required money to defray the expense of the reconstruction of the church, and the refusal of the monks to grant political independ- ence to the citizens, resulted

in an insurrection in which the abbey was burnt and the abbot murdered. During the next fifty years three similar revolts occurred, fanned by the counts of Nevers, who wished to acquire the suzerainty over Vezelay for themselves. The monks were, however, aided by the influence both of the Pope and of Louis VII., and the towns- men were unsuccessful on each occasion. During the 12th century Vezelay was the scene of the preaching of the second crusade in 1146, and of the assumption of the cross in 1190 by Richard Cceur de Lion and Philip Augustus. The influence of the abbey began to diminish in 1280 when the Benedictines of St Maximin in Provence affirmed that the true body of St Magdalen had been discovered in their church; its decline was precipitated during the wars of religion of the 16th century, when Vezelay suffered great hardships.

VIANDEN, an ancient town in the grand duchy of Luxem- burg, on the banks of the Our, close to the Prussian frontier. Pop. (1905) 2350. It possesses one of the oldest charters in Europe, granted early in the 14th century by Philip, count of Vianden, from whom the family of Nassau- Vianden sprang, and who was consequently the ancestor of William of Orange and Queen Wilhelmina of Holland. The semi-mythical foundress of this family was Bertha, ” the White Lady ” who figures in many German legends. The original name of Vianden was Viennensis or Vienna, and its probable derivation is from the Celtic Vien (rock). The extensive ruins of the ancient castle stand on an eminence of the little town, but the chapel which forms part of it was restored in 1849 by Prince Henry of the Netherlands. The size and importance of this castle in its prime may be gauged from the fact that the Knights* Hall could accommodate five hundred men-at-arms. A re-markable feature of the chapel is an hexagonal hole in the centre of the floor, opening upon a bare subterranean dungeon. This has been regarded as an instance of the ” double chapel,” but it seems to have been constructed by order of the crusader Count Frederick II. on the model of the Church of the Holy Sepulchre. In the neighbourhood of Vianden are other ruined castles, notably those of Stolzemburg and Falkenstein. The

little town and its pleasant surroundings have been praised by many, among others by Victor Hugo, who resided here on several occasions. During his last visit he wrote his fine work V Annie terrible. In the time of the Romans the Vianden ■ valley was covered with vineyards, but at the present day its chief source of wealth is derived from the

rearing of pigs.

VIANNA DO CASTELLO, a seaport and the capital of the district of Vianna do Castello, Portugal; at the mouth of the river Lima, which is here crossed by the iron bridge of the Oporto- Vale n pa do Minho railway. Pop. (1900) 10,000. Vianna do Castello has manufactures of lace and dairy produce. Its fisheries are important. Salmon and lampreys are exported, both fresh and preserved. The administrative district of Vianna do Castello coincides with the northern part of the ancient province of Entre Minho e Douro (q.v.). Pop. (1900) 215ˆ267; area, 857 sq. m.

VIAREGGIO, a maritime town and sea-bathing resort of Tus- cany, Italy, in the province of Lucca, on the Mediterranean, 13 m. N.W. of Pisa by rail, 7 ft. above sea-level. Pop. (1006) 14,863 (town); 21,557 (commune). Being sheltered by dense pine-woods on the north, and its malaria having been banished by drainage, it is frequented as a winter resort, and in summer by some thousands for its sea-bathing. In 1740 the population was only 300, and in 1841, 6549. The body of Shelley was burned on the shore near Viareggio after his death by drowning in 1822. The town possesses a school of navigation and a technical school, and carries on some shipbuilding.

VIATICUM (a Latin word meaning ” provision for a journey”; Gr. to. k65ia), is often used by early Christian writers to denote the sacrament of the Eucharist, and is sometimes also applied to baptism. Ultimately it came to be employed in a restricted sense to denote the last communion given to the dying. The 13th canon of the council of Nicaea is to the effect that ” none, even of the lapsed, shall be deprived of the last and most neces- sary viaticum (e

VIBORG, a town of Denmark, capital of the ami (county) of its name, lying in the bleak midland district of Jutland, though the immediate situation, on the small Viborg lake, is picturesque. Pop. (1901) 8623. It has a station on the railway running cast and west between Langaa and Vemb. The most notable building is the cathedral (1130-1169, restored 1864- 1876). The Black Friars’ church is of the 13th century, and the museum possesses specimens of the Stone, Bronze and Iron Ages, also medieval antiquities. The Borgevold Park borders the lake on the site of a former castle. The industries embrace distilleries, iron foundries and manufactures of cloth. The

country to the south attains to a certain degree of beauty near Lake Hald, where the ground is slightly elevated. .

VIBORG (Finnish Viipuri), capital of a province of the same name in Finland, is situated at the head of the Bay of Viborg in the Gulf of Finland, at the mouth of the Saima Canal and on the railway which connects St Petersburg with Helsingfors. Population of the town (1904) 34,672, of the province 458,269. The Saima Canal (37 m. long), a fine engineering work, connects with the sea Lake Saima— the principal lake of Finland, 249 ft. above sea-level— and a series of others, including Puruvcsi, Orivesi, Hoytiiinen and Kallavesi, all of which are navigated by steamers, as far north as lisalmi in 63 30′ N. lat. Viborg is thus the seaport of Karelia and eastern Savolaks, with the towns of Vilmanstrand (2393 inhabitants in 1904), St Michel (3933), Myslott (2687), Kuopio (13,519) and lisalmi, with their numerous saw-mills and iron-works. Viborg stands most picturesquely on the glaciated and dome-shaped granite hills surrounding the bay, which is protected at its entrance by the naval station of Bjorkd and at its head by several forts. The castle of Viborg, built in 1293 by Marshal Torkel Knutson, was the first centre for the spread of Christianity in Karelia, and for establishing the power of Sweden; it is now used as a prison. Its lofty and elegant tower has fallen into decay. The court-house (1839), the town-house, the gymnasium (1641; with an excellent library), and the museum are among the principal buildings of the city. There are also a lyceum and two higher schools for girls, a school of navigation and several primary schools, both public and private, a literary and an agricultural society, and several benevolent institutions. There are foundries, machine works and saw-mills, and a considerable export of timber and wood products. The coasting trade is also considerable.

The environs are most picturesque and are visited by many tourists in the summer. The park of Monrepos (Old Viborg), in a bay dotted with dome-shaped islands, is specially attractive. The scenery of the Saima Canal and of the Finnish lakes with the grand as of Pungaharju; the Imatra rapids, by which the Vuokscn discharges the water of Lake Saima into Lake Ladoga, with the castle of Kexholm at its mouth; Serdobol and Valamo monastery on Lake Ladoga — all visited from Viborg — attract many tourists from St Petersburg as well as from other parts of Finland.

VIBURNUM, in medicine, the dried bark of the black haw or Viburnum prunijolium, grown in India and North America. The black haw contains viburnin and valerianic, tannic, gallic, citric and malic acids. The British Pharmacopoeial prepara- tion is the Exlraclum Vihurni Prunifolii liquidum; the United Slates preparation is the fluid extract prepared from the Viburnum opulus. The physiological action of viburnum is to lower the blood pressure. In overdose it depresses

the motor functions of the spinal cord and so produces loss of reflex and paralysis. Therapeutically the drug is used as an anti- spasmodic in dysmenorrhoea and in menorrhagia.

VICAIRE, LOUIS GABRIEL CHARLES (1848-1900), French poet, was born at Belfort on the 25th of January 184S. He served in the campaign of 1870, and then settled in Paris to practise at the bar, which, however, he soon abandoned for literature. His work was twice ” crowned ” by the Academy, and in 1892 he received the cross of the Legion of Honour. Born in the Vosges, and a Parisian by adoption, Vicaire remained all his life an enthusiastic lover of the country to which his family belonged — La Bresse — spending much of his time at Amberieu. His freshest and best work is his Emaux bressans (1884), a volume of poems full of the gaiety and spirit of the old French chansons. Other volumes followed: Le Livre de la pairie, UHeure en-change (1S90), A la bonne franquette (1892), Au bois joli (1894) and Le Clos des fees (1897). Vicaire wrote in collaboration with Jules Truflier two short pieces for the stage, Fleurs d’avril (1890) and La Farce du mart refondu (1895); also the Miracle de Saint Nicolas (18S8). With his friend Henri Beauclair he produced a parody of the Decadents entitled Les Diliquescences and signed Adore Floupette. His fame rests on his Ltmaux bressans and on his Rabelaisian drinking songs; the religious and fairy poems.

charming as they often are, carry simplicity to the verge of affectation. The poet died in Paris, after a long and painful illness, on the 23rd of September 1 900.

See Henri Corbel, Un Poete, Gabriel Vicaire (1902).

VICAR (Lat. vicarius, substitute), a title, more especially ecclesi-astical, describing various officials acting in some special way for a superior. Cicero uses the name vicarius to describe an under-slave kept by another as part of his private property. The vicarius was an important official in the reorganized empire of Diocletian. It remained as a title of secular officials in the middle ages, being applied to persons appointed by the Roman emperor to judge cases in distant parts of the empire, or to wield power in certain districts, or, in the absence of the emperor, over the whole empire. The prefects of the city at Rome were called Vicani Romae, In the early middle ages the term was applied to representatives of a count administering justice

for him in the country or small towns and dealing with unimportant cases, levying taxes, &c. Monasteries and religious houses often employed a vicar to answer to their feudal lords for those of their lands which did not pass into mortmain.

The title of i(vicar of Jesus Christ," borne by the popes, was introduced as their special designation during the 8th century, in place of the older style of " vicar of St Peter " (or vicafius prin- cipis apostolorum) . In the early Church other bishops commonly described themselves as vicars of Christ (Du Cange gives an example as late as the 9th century from the capitularies of Charles the Bald); but there is no proof in their case, or indeed in that of " vicar of St Peter " given to the popes, that it was part of their formal style. The assumption of the style " vicar of Christ ;; by the popes coincided with a tendency on the part of the Roman chancery to insist on placing the pontiff's name before that of emperors and kings and to refuse to other bishops the right to address him as" brother " (MasLatrie, s." Sabinien," p. 1047). It was not till the 13th century that the alternative style " vicar of St Peter " was definitively forbidden, this pro hibition thus coinciding with the extreme claims of the pope to rule the world as the immediate " vicar of God " (see Innocent

hi.).

All bishops were looked upon as in some sort vicars of the pope, but the title vicarius sedis apostolicae came especially to be ap- plied as an alternative to legalus sedis apostolicae to describe papal legates to whom in certain places the pope delegated a portion of his authority. Pope Benedict XIV. tells us in his treatise De synodo dioecesana that the pope often names vicars-apostolic for the government of a particular diocese because the episcopal see is vacant or, being filled, the titular bishop cannot fulfil his functions. The Roman Catholic Church in England was governed by vicars-apostolic from 1685 until 1850, when Pope Pius IX. re-established the hierarchy. Vicars-apostolic at the present day are nearly always titular bishops taking their titles from places not acknowledging allegiance to the Roman Catholic Church. The title is generally given by the pope to bishops sent on Eastern missions.

A neighbouring bishop was sometimes appointed by the pope vicar of a church which happened to be without a pastor. A special vicar was appointed by the pope to superintend the spiritual affairs of Rome and its suburbs, to visit its churches, monasteries, &c, and to correct abuses. It became early a custom for the prebendaries and canons of a cathedral to employ " pfiest -vicars " or " vicars-choral " as their

substitutes when it was their turn as hebdomedary to sing High Mass and conduct divine office. In the English Church these priest-vicars remain in the cathedrals of the old foundations as beneficed clergy on the foundation; in the cathedrals of the new foundation they are paid by the chapters. ” Lay vicars ” also were and are employed to sing those parts of the office which can be sung by laymen.

In the early Church the assistant bishops (chorepiscopi) were sometimes described as vicarii episcoporum. The employment of such vicars was by no means general in the early Church, but towards the 13th century it became very general for a bishop to employ a vicar-general, often to curb the growing authority of the archdeacons. In the middle ages there was not a very clear

distinction drawn between the vicar and the official of the bishop. When the voluntary and contentious jurisdiction came to be distinguished, the “former fell generally to the vicars, the latter to the officials. In the style of the Roman chancery, official docu- ments are addressed to the bishops or their vicars for dioceses beyond the Alps, but for French dioceses to the bishops or their officials. The institution of vicars- general to help the bishops is now general in the Catholic Church, but it is not certain that a bishop is obliged to have such an official. He may have two. Such a vicar possesses an ordinary and not a delegated juris- diction, which he exercises like the bishop. He cannot, however, exercise functions which concern the episcopal order, or confer benefices without express and particular commission. In the Anglican Church a vicar-general is employed by the archbishop of Canterbury and some other bishops to assist in such matters as ecclesiastical visitations. In the Roman Catholic Church bishops sometimes appoint lesser vicars to exercise a more limited authority over a limited district. They are called ” vicars-forane ‘ ” or rural deans. They are entrusted especially with the surveillance of the parish priests and other priests of their districts, and with matters of ecclesiastical discipline. They are charged especially with the care of sick priests and in case of death with the celebration of their funerals and the charge of their vacant parishes. In canon law priests doing work in place of the parish priest are called vicars. Thus in France the cure or head priest in a parish church is assisted by several vicaires.

Formerly, and especially in England, many churches were appropriated to monasteries or colleges of canons, whose custom it was to appoint one of their own body to perform divine service in such churches, but in the 13th century such corporations were obliged to appoint permanent paid vicars who were called perpetual vicars. Hence in England the distinction between rectors, who draw both the

greater and lesser tithes, and vicars, who are attached to parishes of which the great tithes, formerly held by monasteries, are now drawn by lay rectors. (See Appro- priation.)

See Du Cange, Glossarium mediae el injiniae Laiinitatis, ed, L. Favre (Niort, 1883, &c); Migne, Encyclopedic tkeologique, series i. vol. 10 (Droit Canon) ; Comte de Mas Latrie, Tresor de chronologic (Paris, 1889); and Sir R. J. PhilHmore, Ecclesiastical Law of the Church of England (2nd ed. 1895). (E. O'N.)

VICE. (1) (Through Fr. from Lat. vitium), a fault, blemish, more specifically a moral fault, hence depravity, sin, or a par- ticular form of depravity. In the medieval morality plays a special character who acted as an attendant on the devil was styled " the Vice," but sometimes took the name of specific vices such as Envy, Fraud, Iniquity and the like. He was usually dressed in the garb that is identified with that of the domestic fool or jester, and was armed with a wooden sword or dagger. (2) (M.E. vyce, vise or vyse; Fr. vis; Lat. vitis, a vine, or bryony, i.e. something that twists or winds), a portable or fixed tool or appliance which holds or grips an object while it is being worked; a special form of clamp. The tool consists essentially of movable jaws, either jointed by a hinge or moving on slides, and the closing motion is applied by a screw, whence the name, as of something which turns or winds, or by a lever, ratchet, &c. (see Tools). (3) (Lat. vice, in place of, abl. sing, of a noun not found in the nom.), a word chiefly used as a prefix in combination with names of office-holders, indicating a position subordinate or alternative to the chief office-holder, especially one who takes second rank or acts in default of his superior, e.g. vice-chairman, vice-admiral, &c.

VICE-CHANCELLOR, the deputy of a chancellor (q.v.). In the English legal system vice-chancellors in equity were formerly important officials. The first vice-chancellor was appointed in 1813 in order to lighten the work of the lord chancellor and the master of the rolls, who were at that time the sole judges in equity. Two additional vice-chancellors were appointed in 1841. The vice-chancellors sat separately from the lord chancellor and the lords justices, to whom there was an appeal from their decisions. By the Judicature Act 1873

they became judges of the High Court of Justice, retaining their titles, but it was enacted that on the death or retirement of any one his

successor was to be styled “judge.” Vice-chancellor Sir J. Bacon (i 708-1895) was the last to hold the office, resigning in 1886.

Vice-chancellor is also the title given to the judge of the duchy court of Lancaster. For the vice-chancellor of a university, see Chancellor.

VICENTE, GIL (1470-1540), the father of the Portuguese drama, was born at Guimaraes, but came to Lisbon in boyhood and studied jurisprudence at the university without taking a degree. In 1493 we find him acting as master of rhetoric to the duke of Beja, afterwards King Manoel, a post which gave him admission to the court; and the Cancioneiro Geral contains some early lyrics of his which show that he took part in the famous seroes do paco. The birth of King John III. furnished the occasion for his first dramatic essay — The Neatherd’s Monologue, which he recited on the night of the 7th-8th June 1502 in the queen’s chamber in the presence of King Manoel and his court. It was written in Spanish out of compliment to the queen, a daughter of Ferdinand and Isabella, and because that language was then the fashionable medium with the higher classes. This manger-hymn, which was a novelty in Portugal, so pleased the king’s mother, the infanta D. Beatriz, that she desired Gil Vicente to repeat it the following Christmas, but he composed instead the Castilian Pastoral Auto, a more developed piece in which he introduced six characters. The infanta, pleased again, required a further diversion for Twelfth Day, whereupon he produced the Auto of the Wise Kings. He had now estab- lished his reputation as a playwright, and for the nest thirty years he entertained the courts of Kings Manoel and John III., accompanying them as they moved frcm place to place, and providing by his autos a distraction in times of calamity, and in times of rejoicing giving expression to the feelings of the people. Though himself both actor and author, Gil Vicente had no regular company of players, but it is probable that he easily found students and court servants willing to get up a part for a small fee, especially as the plays would not ordinarily run for more than one night. The Auto of the Sybil Cassandra (produced at the monastery of Euxobregas at Christmas 1503), the Auto of St Martin (played in the church at Caldas on the feast of Corpus Christi 1504), and a mystery play, the Auto of the Four Seasons, all belong, like their predecessors, to the religious drama, but in 1505 Gil Vicente wrote a comedy of real life, Who has Bran to sell? a title given it by the public. It is a clever farce depicting an amorous poor squire and his ill-paid servants, and opens a rich portrait-gallery in which the dramatist includes every type of Portuguese society, depicting the fail- ings of each with the freedom of a Rabelais. The next three years saw no new play, but in 1506 Gil Vicente delivered before the court at Almeirim a sermon in verse on

the theme Non vela, volo, et deficior, in which he protested against the intolerance shown to the Jews, just as in 1531 he interfered to prevent a massacre of the ” New Christians ” at Santarem. The Auto of the Soul, a Catholic prototype of Goethe’s Faust, containing some beautiful lyrics, appeared in 1508, and in 1509 the Auto da India, a farce which has the eastern enterprise of his country- men for background, while the Auto da Fama (1516) and the Exhortation to War (1513) are inspired by the achievements that made Portugal a world-power. If the farce of The Old Man of the Garden (1514) breathes the influence and spirit of the Celestina, the popular trilogy of the Boats of Hell, Purgatory and Glory (1517, 1518, 1519) is at once a dance of death, full of splendid pageantry and caustic irony, and a kind of Portuguese Divina Commedia. The Auto of the Fairies (1516), the Farce of the Doctors (1519) and the Comedy of Rubena (1521) ridicule unchaste clerics and ignorant physicians with considerable freedom and a medieval coarseness of wit, and the Farce of the Gipsies is interesting as the first piece of the European theatre dealing professedly with that race. Ignes Pereira, usually held to be Gil Vicente’s masterpiece, was produced in 1523 before King John III. at the convent of Christ at Thomar, and owed

its origin to certain men of bom saber, perhaps envious partisans of the classical school. They pretended to doubt his author- ship of the autos, and accordingly gave him as a theme for a fresh piece the proverb: ” I prefer an ass that carries .me to a horse that throws me.” Gil Vicente accepted the challenge, and furnished a triumphant reply to his detractors in this comedy of ready wit and lively dialogue. The Beira Judge (1526), the Forge of Love (1525) and The Beira Priest (1526) satirize the maladministration of justice by ignorant magistrates and the lax morals of the regular clergy, and the Farce of the Muleteers (1526) dramatizes the type of poor nobleman described in Cleynart’s Letters. The Comedy of the Arms of the City of Coimbra (1527) has a considerable antiquarian interest, and the facetious Ship of Love is full of quaint imagery, while the lengthy Auto of the Fair (1527), with its twenty-two characters, may be described as at once an indictment of the society of the time from the standpoint of a practical Christian and a telling appeal for the reform of the church. In an oft-quoted passage, Rome personified comes to the booth of Mercury and Time, and offers her indulgences, saying, ” Sell me the peace of heaven, since I have power here below “j but Mercury refuses, declaring that Rome absolves the whole world and never thinks of her own sins. The play concludes with a dance and hymn to the Blessed Virgin. The Triumph of Winter (1529) exposes the unskilful pilots and ignorant seamen who cause the loss of ships and lives on the route to

India, and the Auto da Lusilania (1532) portrays the household of a poor Jewish tailor, ending with a curious dialogue between ” All the World ” and ” Nobody.” The Pilgrimage of the Aggrieved (1533) is an attack on discontent and ambition, lay and clerical. After representing the Auto da festa for the Conde de Vimioso (1535), and dramatizing the romances of chivalry in D. Duardos and Amadts de Gaula, Gil Vicente ended his dramatic career in 1536 with a mirthful comedy, The Garden of Deceptions. He spent the evening of life in preparing his works for the press at the instance of King John III., and died in 1540, his wife Branca Bezerra having predeceased him. Four children were born of their union, and among them Paula Vicente attained distinction as a member of the group of cultured women who formed a sort of female academy presided over by the infanta D. Maria.

The forty-four pieces comprising the theatre of Gil Vicente fall from the point of view of language into three groups: (1) those in Portuguese only, numbering fourteen; (2) those in Spanish only, numbering eleven; and (3) the bilingual, bein£ the remainder, nineteen in all. They are also from their nature divisible as follows : a. Works of a religious character or of devotion. Most of these are a development of the mystery or miracle play of the middle ages; and they may be subdivided into (1) Biblical pieces; (2) pieces founded on incidents in the life of a saint; and .(3) religious allegories. In this department Gil Vicente reaches his highest poetical flights, and the Auto of the Soul is a triumph of elevation of idea and feeling allied to beauty of expression, b. Aristocratic works, or tragi- comedies, the composition of which was the result of his contact with the court; these, though often more spectacular than strictly dramatic, are remarkable for opulence of invention and sweetness of versification, c. The popular theatre, or comedies and farces. Gil Vicente’s plays contain some evidence of his knowledge and appreciation of French poetry; e.g. The Beira Judge wears a general likeness to the products of the Geres de la Basoche, and his Testa- ment of Maria Parda is reminiscent of the better-known work of Francois Villon. Most of the plays are written in the national redondilka verse, and are preceded by initial rubrics stating the date when, the place where, in whose presence, and on what occasion each was first performed, and these make up the annals of the first thirty-four years of the Portuguese drama. Most of them were put on the stage at the different royal palaces; some, however, were played in hospitals, and, it is said, even in churches, though this is doubtful; those of which the subjects are liturgical at the great festivals of Christmas, Epiphany and Maundy Thursday, others on the happening of some event of importance to the royal family or the nation. Many of the plays contain songs, either

written and set to music by the author, or collected by him from popular sources, while at the close the characters leave the stage singing and dancing, as was the custom in the medieval comedies.

Though so large a proportion of his pieces are" in Spanish, they are all eminently national in idea, texture and subject. No other Portuguese writer reflects so faithfully the language, types, customs and colour of his age as Gil Vicente, and the rudest of his dramas are full of genuine comic feeling. If they never attain to perfect

art, they possess the supreme gift of life. None of them are, strictly speaking, historical, and he never attempted to write a tragedy. Himself a man of the people, he would not imitate the products of the classical theatre as did Sa de Miranda and Ferreira, but though he remained faithful to the Old or Spanish school in form, yet he had imbibed the critical spirit and mental ferment of the Renaissance without its culture or erudition. Endowed by nature with acute observation and considerable powers of analysis, Gil Vicente possessed a felicity of phrase and an unmatched knowledge of popular superstitions, language and lore. Above all, he was a moralist, with satire and ridicule as his main weapons ; but if his invective is often stinging it is rarely bitter, while more than one incident in his career shows that he possessed a kindly heart as well as an impartial judgment, and a well-balanced outlook on life. If he owed his early inspiration to Juan de Encina, he repaid the debt by showing a better way to the dramatists of the neighbouring country, so that he may truly be called the father of the rich Spanish drama, of Lope de Vega and Calderon. Much of his fame abroad is due to his position as an innovator, and, as Dr Garnett truly remarked, " One little corner of Europe alone possessed in the early 16th century a drama at once living, indigenous and admirable as literature."

Gil Vicente perhaps lacks psychological depth, but he possesses a breadth of mental vision and a critical acumen unknown in any-medieval dramatist. In his attitude to religion he acts as the spokesman of the better men of his age and country. A convinced but liberal-minded Catholic, he has no sympathy with attacks on the unity of the Church, but he cries out for a reform of morals, pillories the corruption and ignorance of the clergy and laity, and pens the most bitter things of the popes and their court. He strove to take a middle course at a time when moderation was still possible, though, had he

lived a few years longer, in the reign of religious fanaticism inaugurated by the Inquisition, his bold stand for religious toleration would have meant his imprisonment or exile, if not. a worse fate. He is a great dramatist in embryo, who, if he had been born fifty years later and preserved his liberty of thought and expression, might with added culture have surpassed Calderon and taken his place as the Latin and Catholic rival of Shakespeare.

Some of the plays were printed in Gil Vicente's lifetime, but the first collected edition, which included his lyrics, was published after his death by his son Luiz (Lisbon, 1562), with a dedication to King Sebastian. A second edition appeared in 1586, with various omissions and alterations made at the instance of the Inquisition. A critical edition of the text in 3 vols, came out at Hamburg (1834), with a glossary and introductory essay on Vicente's life and writings, and a poor reprint of this edition is dated Lisbon 1852. He has never found a translator, doubtless because of the difficulty of rendering his form and explaining his wealth of topical allusions.

Authorities. — Dr Theophilo Braga, Gil Vicente e as origens do tkeatro national (Oporto, 1898); J. I. de Brito Rebello, Gil Vicente (Lisbon, 1902); "The Portuguese Drama in the 16th Century — Gil Vicente," in the Manchester Quarterly (July and October 1897); introduction by the Conde de Sabugosa to his edition of the Auto defesta (Lisbon, 1906). (E. Pr.) ■

VICENZA, a town and episcopal see of Venetia, Italy, capital of the province of Vicenza, 42 m. W. of Venice by rail, 131 ft. above sea-level. Pop. (10,01) 32,200 (town); 47,558 (com- mune). It lies at the northern base of the Monti Berici, on both sides of the Bacchiglione, at its confluence with the Retrone. It was surrounded by 13th-century walls, once about 3 m. in circumference, but these are now in great part demolished. Though many of the streets are narrow and irregular, the town has a number of fine buildings, many of them the work of Andrea Palladio. The best of these is the town hall, otherwise known as the basilica, one of the finest works of the Renaissance period, of which Palladic himself said that it might stand comparison with any similar work of antiquity. It is especially noteworthy owing to the difficulty of the task the architect had to accom- plish — that of transforming the exterior of the Palazzo della Ragione, a Gothic building of the latter half of the 15th century, which the colonnades of the basilica entirely enclose. It was begun in 1549, but not finished till 1614, long after his death. He also designed many of the fine palaces which give Vicenza its individuality; only two of them, the Barbarano and Chieri- cati palaces (the latter containing the picture gallery),

have two orders of architecture, the rest having a heavy rustica basis with only one order above it. Many palaces, however, have been wrongly attributed to him which are really the work of Scamozzi and others of his successors. The famous Teatro Olrmpico was begun by him, but only finished after his death; it is a remarkable attempt to construct a theatre in the ancient style, and the stage, with the representation of streets ascending at the back, is curious. The cathedral, which is Italian Gothic,

dating mainly from the 13th century, consists of a nave with eight chapels on each side, and a very high Renaissance domed choir; it contains examples of the Montagnas and of Lorenzo da Venezia. The churches of S. Lorenzo (1 280-1344) and S. Corona (1260-1300), both of brick, are better examples of, Gothic than the cathedral; both contain interesting works of art—the latter a very fine ” Baptism of Christ,” by Giovanni Bellini. In S. Stefano is an imposing altar-piece by Palma Vecchio. The church of SS. Felice e Fortunato was restored in a.d. 975, but has been much altered, and was transformed in 1613. . The portal is of 1154, and the Lombardesque square brick tower of 1160. Under it a mosaic pavement with the names of the donors, belonging to the original church of the Lombard period (?), was discovered in 1895 (see F. Berchet, 777. Relazione delV Ujjicio Regionale per la conservazione dei monumenti del Venelo, Venice, 1895, p. in). None of the churches of Vicenza is the work of Palladio. Of the Palladian villas in the neighbourhood, La Rotonda, or Villa Palladiana, i£ m. S.E., deserves special mention. It is a square building with Ionic colonnades and a central dome, like an ancient temple, but curiously unlike a Roman villa. Vicenza also contains some interesting remains of the Gothic period besides the churches mentioned — the lofty tower of the town hall (1174-1311-1446; the Piazza contains two columns of the Venetian period, with S. Theodore and the Lion of S. Mark on them) and several palaces in the Venetian style. Among these may be especially noted the small Casa Pigafetta dating from 1481, but still half Gothic, prettily decorated. Some of these earlier houses had painted facades. The fine picture of ” Christ bearing the Cross ” (wrongly ascribed to Giorgione), according to Burckhardt once in the Palazzo Loschi, is now in the Gardner collection at Boston, U.S.A. The most im- portant manufacture is that of silk, which employs a large proportion of the inhabitants. Great numbers of mulberry trees are grown in the neighbourhood. Woollen and linen cloth, leather, earthenware, paper, and articles in gold and silver are also made in Vicenza, and a considerable trade in these articles, as well as in corn and wine, is carried on.

Vicenza is the ancient Vicelia, an ancient town of Venetia. It was of

less importance than its neighbours Venetia and Patavium, and we hear little of it in history. It no doubt acquired Roman citizenship in 49 B.C., and became a muni- cipiiw; and is mentioned two years later apropos of a dispute between the citizens and their slaves. Remains of a theatre and of a late mosaic pavement with hunting scenes have been found, three of the bridges across the Bacchiglione and Retrone are of Roman origin, and arches of the aqueduct exist outside Porta S. Croce. A road diverged here to Opitergium (mod. Oderzo) from the main road between Verona and Patavium (Padua) : see T, Mommsen in Corp. Inscr. Latin, v. (Berlin, 1883), p. 304. It suffered severely in the invasion of Attila.by whom it was laid waste, and in subsequent incursiens. It was for some time during the middle ages an independent republic, but was subdued by the Venetians in 1405. Towards the end of the 15th century it became the seat of a school of painting strongly influenced by Mantegna, of which the principal repre- sentatives were, besides Bartolomeo Montagna, its founder, his son Benedetto Montagna, Giovanni Speranza and Gio- vanni Buonconsiglio. Good altar-pieces by the former exist in S. Bartolommeo, S. Corona, and the cathedral, and several pictures also in the picture gallery; while his son Benedetto had greater merits as an engraver than a painter. Some works by both of the last two exist at Vicenza — the best is a Pieta in tempera in the gallery by Buonconsiglio, by whom is also a good Madonna at S. Rocco. Andrea Palladio (1518-1580) was a native of Vicenza, as was also a contemporary, Vincenzo Scamozzi (1552-1616), who was largely dependent on him, but is better known for his work on architecture {ArchitsUura universale, i6r5). Palladio inaugurated a school of followers who continued to erect similar buildings in Vicenza even down to the French Revolution. (T. As.)

. See G. Pettina, Vicenza (Bergamo, 1905).

VICEROY (from O. Fr. viceroy, mod. viceroi, i.e. Lat. vice, in place of, and roy or roi, king) , the governor of a kingdom or colony to whom is delegated by his sovereign the power to exercise regal authority in his name. The lord-lieutenant of Ireland and the governor-general of India are frequently referred to as viceroys, but the title has no official recognition in British government.

VICH, a city of north-eastern Spain, in the province of Barcelona, on the river Gurri, a small right-hand tributary of the Ter, and on the

Granollers-Ripoll railway. Pop. (1900) 11,628. Vich is an ancient episcopal city, with narrow, ill- paved streets and many curious old houses irregularly built on the slope of a hill, which rises above one of the side valleys of the Ter basin. The cathedral, founded about 1040 and built chiefly in the 14th century, was to some extent modernized in 1803. Its Gothic cloisters (1340) are remarkable for the beauti- ful tracery in their windows, and there is a fine altar of sculp- tured marble. Some valuable manuscripts are preserved in the library of the chapter- ho use, and the museum contains an interesting archaeological collection, besides statuary, pic- tures, &c. The city is locally celebrated for the manufacture of sausages; other industries include tanning and the weaving of linen and woollen fabrics.

Vich, the Ausa of the ancient geographers, was the chief town of the Ausetani; in the middle ages it was called Ausona and Vicus Ausonensis, hence Vic de Osona, and simply Vich.

VICHY, a town of central France in the department of Allier, on the right bank of the Allier, $$ m. S. by E. of Moulins by rail. Pop. (1906) 14,520. Vichy owes its importance to its mineral waters, which were well known in the time of the Romans. They afterwards lost their celebrity and did not regain it till the 17th century, in the latter half of which they were visited and written of by Madame de Sevigne. Within the town or in its immediate vicinity there are between thirty and forty springs, twelve of which are state property, four of these having been tapped by boring. The waters of those which are outside the town are brought in by means of aqueducts. The most celebrated and frequented are the Grande Grille, L'H6pital, the Celestins, and Lardy. The most copious of all, the Puits Carre, is reserved for the baths. All these, whether cold or hot {maximum temperature, 113 F.), are largely charged with bicarbonate of soda; some also are chalybeate and tonic. The waters, which are limpid, have an alkaline taste and emit a slight odour of sulphuretted hydrogen. They are recom- mended in cases of stomachic and liver complaint, also for diabetes, gravel and gout. Large quantities are bottled and exported. A luxurious bathing establishment, the property of the state, was opened in 1903. In addition to this, Vichy has the hydropathic establishments of Lardy, Larbaud and L'Hopital, and a large military hospital, founded in 1843. A fine casino and two public parks add to its attraction. The promenade commands a splendid view of the mountains of Auvergne. Cusset, about 1 m. distant, has similar mineral waters and a bathing establishment.

VICKSBURG, a city and the county-seat of Warren county, Mississippi, U.S.A., on the Mississippi and Yazoo rivers, 1 44 m. by rail W. of

Jackson, and 236 m. N. by W. of New Orleans. Pop. (1890} 13,373; (I 9°°) I 4 > 834, of whom 8147 were negroes; (1910 census) 20,814, being the second largest city In Mississippi. It is served by the Alabama & Vicksburg, the Vicksburg, Shreveport & Pacific, and the Yazoo & Mississippi Valley railways, and by steamboat lines. It is built among the Walnut Hills, which rise about 260 ft. above the river. Among the principal buildings and institutions are the court-house, standing on one of the highest hills, a fine Federal building, the city hall, a state charity hospital, an

1 The channel of the Mississippi has changed greatly: until 1876 the entire city was on the Mississippi, which made a bend forming a tongue of land opposite the city; in 1876 the river cut across this tongue and formed an island, making the northern part of the city front on the shallow " Lake Centennial." The Federal govern- ment, by turning the Yazoo through a canal across the upper end of the old channel, gave the city a river front once more.

infirmary, a sanatorium, a public library, the medical college of the university of Mississippi, All Saints' Episcopal College (Protestant Episcopal, 1909) for girls, Saint Francis Xavier's Academy, and Saint Aloysius College (Roman Catholic). The Civil War battle-ground has been converted into a beautiful National Military Park, embracing 1283 acres and containing numerous markers, memorials and monuments, including one (1910) to Lieut. General Stephen Dill Lee, who was super intendent of the Military Park from 1899 until his death in 1908. On the bluffs just beyond the northern limits of the city and ad- joining the Military Park is the Vicksburg National Cemetery, in which are the graves of 16,892 Federal soldiers (12,769 unknown). The principal industry of Vicksburg is the construction and repair of rolling stock for steam railways. It has also a dry dock and cotton compresses; and among its manufactures are cottonseed oil and cake, hardwood lumber, furniture, boxes and baskets. In 1905 the factory products were valued at $1,887,924. The city has a large trade in long-staple cotton grown in the surrounding country. It is a port of entry but has practically no foreign trade.

The French built Fort St Peter near the site of Vicksburg early in the 18th century, and on the 2nd of January 1730 its garrison was murdered by the Yazoo Indians. As early as 1783 the Spanish erected Fort Nogales, and in 1798 this was taken by some United States troops and renamed Fort McHenry. The first permanent settlement in the vicinity was made about 1811 by Rev. Newell (or Newit) Vick (d. 1819), a Methodist preacher. In accordance with his will a town was laid out in 1824; and Vicksburg was incorporated as a town in 1825,

and was chartered as a city in 1836. The campaigns of which it was the centre in 1862 and 1863 are described below. Vicks- burg was the home of Seargent Smith Prentiss from 1832 to

1845-

See H. F. Simrall, ” Vicksburg: the City on the Walnut Hills,” in L. P. Powell’s Historic Towns of the Southern States (New York,

1900).

Campaign of 1862-63. — Vicksburg is historically famous as being the centre of interest of one of the most important cam- paigns of the Civil War. The command of the Mississippi, which would imply the severance of the Confederacy into two halves, and also the reopening of free commercial navigation from St Louis to the sea, was one of the principal objects of the Western Union armies from the time that they began their southward advance from Illinois, Missouri and Kentucky in February 1S62. A series of victories in the spring and summer carried them as far as the line Memphis-Corinth, but in the autumn they came to a standstill and were called upon to repulse the counter-advance of the Southern armies. These armies were accompanied by a flotilla of thinly armoured but powerful gunboats which had been built on the upper Mississippi in the autumn of 1861, and had co-operated with the army at Fort Donelson, Shiloh and Island No. 10, besides winning a victory on the water at Memphis.

At the same time a squadron of sea-going vessels under Flag-officer Farragut had forced the defences of New Orleans (q.v.) and, accompanied by a very small military force, had steamed up the great river. On reaching Vicksburg the heavy vessels again forced their way past the batteries, but both at Vicksburg and at Port Hudson they had to deal, no longer with low-sited fortifications, but with inconspicuous earth- works on bluffs far above the river-level, and they failed to make any impression. Farragut then returned to New Orleans. From Helena to Port Hudson the Confederates maintained complete control of the Mississippi, the improvised fortresses of Vicksburg, Port Hudson and Arkansas Post (near the mouth of Arkansas river) being the framework of the defence. It was to be the task of Grant’s army around Corinth and the flotilla at Memphis to break up this system of defences, and, by joining hands with Farragut and clearing the whole course of the Mississippi, to cut the Confederacy in half.

The long and painful operations by which this was achieved group themselves into four episodes: (a) the Grenada expedition

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VICKSBURG

of Grant's force, (b) the river column under McClemand and Sherman, (c) the operations in the bayoux, and {d) the final " overland " campaign from Grand Gulf. The country in which these operations took place divides itself sharply into two zones, the upland east of the river, upon which it looks down from high bluffs, and the levels west of it, which are a maze of bayoux, backwaters and side channels, the intervening land being kept dry near the river itself by artificial banks (levees) but elsewhere swampy. At Vicksburg, it is important to observe, the bluffs trend away from the Mississippi to follow the course of the Yazoo, rejoining the great river at Memphis. Thus there are two obvious lines of advance for the Northern army, on the upland (Memphis and Grand Junction on Grenada- Jackson), and downstream through the bayou country (Memphis-Helena-Vicksburg) . The main army of the defenders, who were commanded by Lieut.-General J. C. Pemberton, between Vicksburg and Jackson and Grenada, could front either north against an advance by Grenada or west along the bluffs above and below Vicksburg.

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The first advance was made at the end of November 1862 by two columns from Grand Junction and Memphis on Grenada. The Confederates in the field, greatly outnumbered, fell back without fighting. But Grant’s line of supply was one long single-line, ill-equipped railway through Grand Junction to Columbus, and the opposing cavalry under Van Dorn swept round his flank and, by destroying one of his principal magazines (at Holly Springs), without further effort compelled the abandon- ment of the advance. Meantime one of Grant’s subordinates, McClemand, was intriguing to be appointed to command an expedition by the river-line, and Grant meeting half-way an evil which he felt himself unable to prevent, had sent Sherman with the flotilla and some 30,000 men to attack Vicksburg from the water-side, while he himself should deal with the Confederate field army on the high ground. But the scheme broke down completely when Van Dorn cut Grant’s line of supply, and the Confederate army was free to turn on Sherman. The latter, ignorant of Grant’s retreat, attacked the Yazoo bluffs above Vicksburg (battle of Chickasaw Bayou) on Decem- ber 29th; but a large portion of Pemberton’s field army had arrived to help the Vicksburg garrison, and the Federals were

easily repulsed with a loss of 2000 men. McClernand now appeared and took the command out of Sherman’s hands, informing him at the same time of Grant’s retreat. Sherman thereupon proposed, before attempting fresh operations against Vicksburg, to clear the country behind them by destroying the Confederate garrison at Arkansas Post. This expedition was completely successful: at a cost of about 1000 men the fort and its 5000 defenders were captured on theiith : o£ January 1863. McClernand, elated at his ■ victory, would have continued to ascend the Arkansas, but such an eccentric operation would have been profitless if not dangerous, and Grant, authorized , by the general-in-chief, Halleck, per- emptorily ordered McClernand back to the Mississippi.

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Retreating from the upland, Grant sailed down the river and joined McClernand and Sherman at Milliken’s Bend at the beginning of February, and, superseding the resentful McClernand, assumed command of the three corps (XIII., McClernand; XV. ; Sherman; XVII., McPherson) available. He had already imagined the daring solution of his most difficult problem which he afterwards put into . execution, but for the present he tried a series of less risky expedients to reach the high ground beyond Pemberton’s flanks, without indeed much confidence in their success, yet desirous in these unhealthy flats of keeping up the spirits of his army by active work, and of avoiding, at a crisis in the fortunes of the war, any appearance of discouragement. Three such attempts were made in all, with the co-operation of the flotilla under Captain David D. Porter. First, Grant endeavoured to cut a canal across the bend of the Mississippi at Vicksburg, hoping thus to isolate the fortress, to gain a water connection with the lower river, and to land an army on the bluffs beyond Pemberton’s left flank. This was unsuccessful. Next he tried to make a practicable channel from the Mississippi to the upper Yazoo, and so to turn Pemberton’s right, but the Confederates, warned in time, constructed a fort at the point where Grant’s advance emerged from the bayoux. Lastly, an advance through a maze of creeks (Steele’s Bayou expedition), towards the middie Yazoo and Haines’s Bluff, encountered the enemy, not on the bluffs, but in the low-lying woods and islands, and these so harassed and delayed the progress of the expedition that: Grant recalled it. Shortly afterwards Grant determined on the manoeuvre in rear of Vicksburg which established his repu- tation. The troops marched overland from Milliken’s Bend to New Carthage, and on the 16th of April Porter’s gunboat flotilla and the transports ran past the Vicksburg batteries. All this, which involved careful arrangement and hard work, was done by the 24th of April. General Banks, with a Union army from New Orleans, was now advancing up the river to invest Port Hudson, and by way of diverting attention from the Mississippi, a cavalry

brigade under Benjamin Grierson rode from La Grange to Baton Rouge (600 m. in 16 days), destroying railways and magazines and cutting the telegraph

wires en route. Sherman's XV. corps, too, made vigorous demonstrations at Haines's Bluff, and in the confusion and uncertainty Pemberton was at a loss.

On the. 30th of April McClemand and the XIII. corps crossed the Mississippi 6 m. below Grand Gulf, followed by McPherson. The nearest Confederate brigades, attempting to oppose the advance at Port Gibson, were driven back. Grant had now deliberately placed himself in the middle of the enemy, and although his engineers had opened up a water-line for the barges carrying his supplies from Milliken's Bend to New Carthage, his long line of supply curving round the enemy's flank was very exposed. But his resolute purpose outweighed all text-book strategy. Having crossed the Mississippi, he collected wheeled transport for five days' rations, and on Sherman's arrival cut loose from his base altogether (May 7th). Free to move, he aimed north from the Big Black river, so as to interpose between the Confederate forces at Vicksburg and those at Jackson. A fight took place at Raymond on the 12th of May, and Jackson was captured just in time to forestall the arrival of reinforcements for Pemberton under General Joseph E Johnston. The latter, being in supreme command of the Confederates, ordered Pemberton to come out of Vicksburg and attack Grant. But Pemberton did not do so until it was too late. On May i6th< Grant, with all his forces well in hand, defeated him in the battle of Champion Hill with a loss of nearly 4000 men, and sharply pursuing him drove him into Vicksburg. By the 19th of May Vicksburg and Pemberton's army in it was invested by land and water. Grant promptly assaulted his works, but was repulsed with loss (May 19th); the assault was repeated on the 22nd of May with the same result, and Grant found himself compelled to resort to a blockade. Reinforcements were hurried up from all quarters, Johnston's force (east of Jackson), was held off by a covering corps under Blair (afterwards under Sherman), and though another un- successful assault was made on the 25th of June, resistance was almost at an end. On the 4th of July, the day after, far away in Pennsylvania, the great battle of Gettysburg had closed with Lee's defeat, the garrison of Vicksburg, 37,000 strong, surrendered.

VICO, GIOVANNI BATTISTA (1668-1744), Italian jurist and philosopher, was born at Naples on the 23rd of June 1668. At the university he made

rapid progress, especially in juris- prudence, though preferring the study of history, literature, juridical science and philosophy. Being appointed tutor to the nephews of the bishop of Ischia, G. B. Rocca, he accom- panied them to the castle of Vatolla, near Cilento, in the province of Salerno. There he passed nine studious years, chiefly de- voted to classical reading, Plato and Tacitus being his favourite authors, because " the former described the ideal man, and the latter man as he really is." On his return to Naples he found himself out of touch with the prevailing Cartesianism, and lived quietly until in 1697 he gained the professorship of rhetoric at the university, with a scanty stipend of 100 scudi On this he supported a growing family and gave himself to untiring study. Two authors exercised a weighty influence on his mind — Francis Bacon and Grotius. He was no follower of their ideas; indeed often opposed to them; but he derived from Bacon an increasing stimulus towards the investigation of certain great problems of history and philosophy, while Grotius proved valuable in his study of philosophic jurispru- dence. In 170S he published his De ratione sludiorum, in 1710 De antiquissima Italorum sapientia, in 1720 De universi juris uno principle et fine uno, and in 1721 De constantia jurispru- dentis. On the strength of these works he offered himself aa a candidate for the university chair of jurisprudence, but as he had no personal or family influence was not elected. With calm courage he returned to his poverty and his favourite studies, and in 1725 published the first edition of the work that forms the basis of his renown, Principii d } una scienza nuova. In 1730 he produced a second edition of the Scienza nuova, so much altered in style and with so many substantial additions that it was practically a new work. In 1735 Charles III. of Naples marked his recognition of Vico's merits by

appointing him historiographer-royal, with a yearly stipend of 100 ducats. Soon after his mind began to give way, but during frequent intervals of lucidity he made new corrections in his great work, of which a third edition appeard in 1744, prefaced by a letter of dedication to Cardinal Trojano Acquaviva. He died on the 20th of January of the same year. Fate seemed bent on persecuting him to the last. A fierce quarrel arose over his burial between the brotherhood of St Stephen, to which he had belonged, and the university professors, who desired to escort his corpse to the grave. Finally the canons of the cathedral, together with the professors, buried the body in the church of the Gerolimini.

Vico has been generally described as a solitary soul, out of harmony with the spirit of his time and often directly opposed to it. Yet a closer inquiry into the social conditions of Vico's time, and of the studies then flourishing, shows him to have been thoroughly in touch with them.

Owing to the historical past of Naples, and its social and economic

condition at the end of the 17th century, the only study that really flourished there was that of law; and this soon penetrated from the courts to the university, and was raised to the level of a science. A great school of jurisprudence was thus formed, including many men of vast learning and great ability, although little known outside their immediate surroundings. Three men, however, obtained a wider recognition. By his exposition of the political history of the kingdom, based on a study of its laws and institutions and of the legal conflicts between the state and the court of Rome, Pietro Giannone was the initiator of what has been since known as civil history. Giovan Vincenzo Gravina wrote a history of Roman law, specially distinguished for its accuracy and elegance. Vico raised the problem to a higher plane, by tracing the origin of law in the human mind and explaining the historical changes of the one by those of the other. Thus he made the original discovery of certain ideas which constitute the modern psychologico-historic method. This problem he proceeded to develop in various works, until in his Scienza nuova he arrived at a more complete solution, which may be formulated as follows: If the principle of justice and law be one, eternal and immutable, why should there be so many different codes of legislation? These differences are not caused by difference of nationality only, but are to be noted in the history of the same people, even in that of the Romans. This problem is touched upon in his Orations or Inaugural Addresses {Orazioni Prolusioni) and in his Minor Works {Scritti minori). Finally he applied himself to its solution in his Universal Law (Diritto universale), which is divided into two books. The first of these, De uno et universi funs principio et fine uno, was subdivided into two parts; so like wise was the second, with the respective titles of De constantia philologiae and De constantia jurisprudent's.

The following is the general idea derived from these researches. Vico held God to be the ruler of the world of nations, but ruling, not as the providence of the middle ages by means of continued miracles, but as He rules nature, by means of natural laws. If, therefore, the physicist seeks to discover the laws of nature by study of natural phenomena, so the philosopher must seek the laws of historical change by the investigation of human events and of the human mind. According to Vico, law emanates from the conscience of mankind, in whom God has infused a sentiment of justice and is therefore in close and continual relation with the human mind, and participates in its changes. This sentiment of justice is at first confused, uncertain and almost instinctive; — is, as it were, a divine and religious inspiration instilled by Heaven into the primi- tive tribes of the earth. It is an unconscious, universal sentiment, not the personal, conscious and rational sentiment of the superior few. Hence the law to which it gives birth is enwrapped in religious forms which are likewise visible and palpable, inasmuch as primitive man is incapable of abstract, philosophical

ideas. This law is not the individual work of any philosophical legislator, for no man was, or could be, a philosopher at that time. It is first displayed in the shape of natural and necessary usages consecrated by religion. The names of leading legislators, which we so often find recorded in the history of primitive peoples, are symbols and myths, merely serving to mark an historic period or epoch by some definite and personal denomination. For nations, or rather tribes, were then distinguished by personal names only. The first obscure and con- fused conception of law gradually becomes clearer and better defined. Its visible and religious forms then give way to abstract formulae, which in their turn are slowly replaced by the rational manifestation of the philosophic principles of law that gains the victory in the final stage of development, designated by Vico as that of civil and human law. This is the period of individual and philosophic legislators. Thus Roman law has passed through three great periods — the divine, the heroic and the human — which are like- wise the three chief periods of the history of Rome, with which it is intimately and intrinsically connected. Nevertheless, on careful examination of these three successive stages, it will easily be seen that, in spite of the apparent difference between them, all have a common foundation, source and purpose. The human and civil

philosophic law of the third period is assuredly very different in form from the primitive law; but in substance it is merely the abstract, scientific and philosophic manifestation of the same senti- ment of justice and the same principles which were vaguely felt in primitive times. Hence one development of law may be easily translated into another. Thus in the varied manifestations of law Vico was able to discover a single and enduring principle (De unimrsi juris uno principio etfine uno). On these grounds it na3 been sought to establish a close relation between Vico and Grotius. The latter clearly distinguished between a positive law differing in different nations and a natural law based on a general and unchanging prin- ciple of human nature, and therefore obligatory upon all. But Vico was opposed to Grotius, especially as regards his conception of the origin of society, and therefore of law. Grotius holds that its origin was not divine, but human, and neither collective, spontaneous nor unconscious, but personal, rational and conscious. He believed, moreover, that natural law and positive law moved on almost constant and immutable parallel lines. But Vico maintained that the one was continually progressing towards the other, positive law showing an increasing tendency to draw nearer to natural and rational law. Hence the conception that law is of necessity a spontaneous birth, not the creation of any individual legislator; and hence the idea that it necessarily proceeds by a natural and logical process of

evolu- tion constituting its history. Vico may have derived from Grotius the idea of natural law; but his discovery of the historic evolution of law was first suggested to him by his study of Roman law. He saw that the history of Roman jurisprudence was a continuous progress of the narrow, rigorous, primitive and almost iron law of the XII. Tables towards tiie wider, more general and more humane jus gentium. Having once derived this conception from Roman history, he was easily and indeed necessarily carried on to the next— that the positive law of all nations, throughout history, is a continual advance, keeping pace with the progress of civilization, towards the philosophic and natural law founded on the principles of human nature and human reason.

As already stated, the Scienza nuova appeared in three different editions. The third may be disregarded ; but the first and second editions are almost distinct works. In the former the author sets forth the analytical process by which the laws he discovered were deduced from facts. In the second he not only enlarges his matter and gives multiplied applications of his ideas, but also follows the synthetic method, first expounding the laws he had dis- covered and then proving them by the facts to which they arc applied. In this edition the fragmentary and jerky arrangement, the intricate style, and a peculiar and often purely conventional terminology seriously checked the diffusion of the work, which accordingly was little studied in Italy and remained almost un- known to the rest of Europe. Its fundamental idea consists in that which Vico, in his peculiar terminology, styles " poetical wisdom " (sapienza poetica) and " occult wisdom " {sapienza riposta), and in the historical process by which the one is merged in the other. He frequently declares that this discovery was the result of the literary labours of his whole life.

Vico was the first thinker who asked, Why have we a science of nature, but no science of history? Because our glance can easily be turned outwards and survey the exterior world; but it is far harder to turn the mind's eye inwards and contemplate the world of the spirit. All our errors in explaining the origin of human society arise from our obstinacy in believing that primitive man was entirely similar to ourselves, who are civilized, i.e. developed by the results of a lengthy process of anterior historic evolution. We must learn to issue from ourselves, transport ourselves back to other times, and become children again in order to comprehend the infancy of the human race. As in children, imagination and the senses prevailed in those men of the past. They had no abstract ideas ; in their minds all was concrete, visible and tangible. All the phenomena, forces and laws of nature, together with mental conceptions, were alike personified. To suppose that all mythical stories are fables invented by the philosophers is to write history backwards and confound the instinctive, impersonal, poetic wisdom of the earliest times with the civilized, rational and abstract occult

wisdom of our own day. But how can we explain the formation of this poetic wisdom, which, albeit the work of ignorant, men, has so deep and intrinsic a philosophic value? The only possible reply is that already given when treating of the origin of law. Providence has instilled into the heart of man a sentiment of justice and goodness, of beauty and of truth, that is manifested differently at different times. The ideal truth within us, constituting the inner life that is studied by philosophers, becomes transmuted by the facts of history into assured reality. For Vico psychology and history were the two poles of the new world he discovered. After having extolled the work of God and proclaimed Him the source of all knowledge, he adds that a great truth is continually flashed on us and proved to us by history, namely, " that this world of nations is the work of man, and its explanation therefore only to be found in the mind of man." Thus poetical wisdom, appearing as a spon- taneous emanation of the human conscience, is almost the product of divine inspiration. From this, by the aid of civilization, reason and philosophy, there is gradually developed the civil, cccult

wisdom. The continual, slow arid laborious progress from the one to the other is that which really constitutes history, and man be- comes civilized by rendering himself the conscious and independent possessor of all that in poetical wisdom remained impersonal, unconscious, that came, as it were, from without by divine afflatus.

Vico gives many applications of this fundamental idea. .The religion of primitive peoples is no less mythical than their history, since they could only conceive of it by means of myths. On these lines he interprets the whole history of primitive Rome. One book of the second edition of the Scienza nuova h devoted to " The Discovery of the True Homer." Why all the cities of Greece dispute the honour of being his birthplace is because the Iliad and the Odyssey are not the work of one, but of many popular poets, and a true creation of the Greek people which is in every city of Greece. And because the primitive peoples are unconscious and self ignorant Horner is represented as being blind. In all parts of history in which he was best versed Vico pursues a stricter and more scientific method, and arrives at safer conclusions. This is the case in Roman history, especially in such portions as related to the history of law. Here he sometimes attains, even in details, to divinations of the truth afterwards confirmed by new documents and later research. The aristocratic origin of Rome, the struggle between the patricians and the plebeians, the laws of the XII. Tables, not, as tradition would have it, imported from Greece, but the natural and spon taneous product of ancient Roman customs, and many other similar theories were discovered by Vieo, and expounded with his usual originality, though not always without blunders and exaggerations. ;

Vico may be said to base his considerations on the history of two nations. The greater part of his ideas on poetical wisdom were derived from Greece. Nearly all the rest, more especially the transi- tion from poetical to occult wisdom, was derived from Rome. Having once formulated his idea, he made it more general in order to apply it to the histpry of all nations. From the savage state, through the terror that gives birth to religions, through the creation of families by marriage, through burial rites and ■ piety towards the dead, men approach civilization with the 'aid of poetic wisdom, and pass through three periods — the divine, heroic and. human— •- in which they have three forms of government, language, litera- ture, jurisprudence and civilization. The primary government is aristocratic. Patrician tyranny rouses the populace to revolt, and then democratic equality is established under a republic. Democratic excesses cause the rise of an empire,; which, becoming corrupt, declines into barbarism, and, again emerging from it, re- traces the same course. This is the 'law of cycles, constituting that which is designated by Vico as the " eternal ideal 'history,- or rather course of humanity, invariably followed by all nations." It must not be held to imply that one nation imitates the course pursued by another, nor that the points of resemblance between them are transmitted by tradition from one to the other, but merely that all are subject to one law, inasmuch as this is based on the human nature common to all alike. Thus, while on the one hand the various cycles traced and retraced by all nations are similar and yet independent, on the other hand, being actually derived from Roman history, they become converted in the Scienza nudva into a bed of Procrustes, to which the history of all nations has to be fitted by force. And wherever Vico's historical^ know- ledge failed he was led into increased error by this artificial and arbitrary effort.

It has been justly observed by many that this continuous cyclical movement entirely excludes the progress of humanity towards a better future. It has been replied that these cvcles are similar without being identical, and that, if one might differ from another, the idea of progress was not necessarily excluded by the law of cycles. Vico undoubtedly considered the poetic wisdorh of the Middle Ages to be different from that of the Greeks and Romans, and Christianity to be very superior to the pagan religion. But he never investigated the question whether, since there is a law of progressive evolution in the history of different nations, separately examined, there may not likewise be another law ruling the general history of these nations, every one of which must. have rcpresenteil a new period, as it were, in the history of humanity at. large. There- fore, although the Scienza nuova cannot be said absolutely to deny the law of progress, it must be allowed that Vico not only failed to solve the problem but even shrank from attacking it.

Vico founded no school, and though during his lifetime and for a while

after his death he had many admirers both in Naples and the northern cities, his fame and name were soon obscured, especially as the Kantian system dominated the world of thought. At the beginning of the 19th century, however, some Neapolitan exiles at Milan called attention to the merits of their great countryman, and his reinstatement was completed by Michelet, who in. 1827 translated the Scienza nuova and other works with a laudatory introduction. Vico's writings suffer through their author's not having followed a regular course of studies, and his style is very involved. He was a deeply religious man, but his exemption of Jewish origins from the canons of historical inquiry which he elsewhere applied was probably due to the conditions of his age, which preceded the dawn of Semitic investigation and regarded the Old Testament and the Hebrew religion as sui generis.

VICTOR— VICTOR, SEXTUS AURELIUS

25

For Vico's personal history see his autobiography, written at the request of the Conte di Forcia, and his letters; also Cantom, G. B. Vico, Studii Critici e Comparative (Turin, 1867); R. Flint, Vico (Edinburgh and London, 1884). For editions of Vico's own works, see Opere, ed. Giuseppe Ferrari, with introductory essay, " La Mentc de Vico " (6 vols., Milan, 1834-35), and Michelet, CEuvres Chais-ies de Vico (2 vols., Paris, 1835). A full list is given in B. Croce, Bibliograjla Vickiana (Naples, 1904J. See also O. Kle mm , G. B. Vico als Gesch icktsph ilosoph und V olkerpsycholog (Leipzig. 1906) ; M. H. Rafferty in Journal of the Society of Com- parative Legislation, New Series, xvii., xx.

VICTOR, the name taken by three popes and two antipopes.

Victor I. was bishop of Rome from about 190 to 198. He submitted to the opinion of the episcopate in the various parts of Christendom the divergence between the Easter usage of Rome and that of the bishops of Asia. The bishops, particu- larly St Ircnacus of Lyons, declared themselves in favour of the usage of Rome, but refused to associate themselves with the excommunication pronounced by Victor against their Asiatic colleagues. At Rome Victor excommunicated Theodotus of Byzantium on account of his doctrine as to the person of Christ. St Jerome attributes to Victor some opuscula in Latin, which are believed to be recognized in certain apo- cryphal treatises of St Cyprian.

Victor II., the successor of Leo IX., was consecrated in St Peter's, Rome, on the 13th of April 1055. His father was a Swabian baron, Count Hartwig von Calw, and his own baptismal name was Gebhard. At the instance of

Gebhard, bishop of Regensburg, uncle of the emperor Henry III., he had been appointed while still a young man to the see of Eichstadt; in this position his great talents soon enabled him to render important services to Henry, whose chief adviser he ultimately became. His nomination to the papacy by Henry, at Mainz, in September 1054, was made at the instance of a Roman deputation headed by Hildebrand, 'whose policy doubtless was to detach from the imperial interest one of its ablest supporters. In June 1055 Victor met the emperor at Florence, and held a council, which anew condemned clerical marriages, simony and the alienation of the estates of the church. In the. follow- ing year he was summoned to Germany to the side of the emperor, and was with him when he died at Botfeld in the Harz on the 5th of October 1056. As guardian of Henry's infant son, and adviser of the empress Agnes, Victor now wielded enormous power, which he began to use with much tact for the maintenance of peace throughout the empire and for strengthening the papacy against the aggressions of the barons. He died shortly after his return to Italy, at Arezzo, on the 28th of July 1057. His successor was Stephen IX. (Frederick of Lorraine). (L. D.)*

Victor III. (Dauferius Epifani), pope from the 24th of May 1086 to the 16th of September 1087, was the successor of Gregory VII. He was a son of Landolfo V., prince of Bene- vento, and was born in 1027. After studying in various monasteries he became provost of St Benedict at Capua, and in 1055 obtained permission from Victor II. to enter the cloister at Monte Cassino, changing his name to Desiderius. He succeeded Stephen IX. as abbot in 1057, and his rule marks the golden age of that celebrated monastery; he promoted literary activity, and established an important school of mosaic. Desiderius was crealed cardinal priest of Sta Cecilia by Nicholas II. in 1059, and as papal vicar in south Italy conducted frequent negotiations between the Normans and the pope. Among the four men suggested by Gregory VII. on his death-bed as most worthy to succeed him was Desiderius, who was favoured by the cardinals because of his great learning, his connexion with the Normans and his diplomatic ability. The abbot, however, declined the papal crown, and the year 1085 passed without an election. The cardinals at length proclaimed him pope against his will on the 24th of May 1086, but he was driven from Rome by imperialists before his consecration was complete, and, laying aside the papal insignia at Terracina, he retired to his beloved monastery. As vicar of the Holy See he convened a synod at Capua on the 7th of March 1087, resumed the papal insignia

on the 2 1 st of March, and received tardy consecration at Rome on the 9th of May. Owing to the presence of the antipope, Clement III. (Guibert of Ravenna), who had powerful partisans, his stay at Rome was brief. He sent an army to Tunis, which defeated the Saracens and compelled the sultan to pay tribute to the papal see. In August 1087 he held a synod at Bene-

vento, which renewed the excommunication of Guibert; banned Archbishop Hugo of Lyons and Abbot Richard of Marseilles as schismatics; and confirmed the prohibition of lay investiture. Falling ill at the synod, Vicar returned to Monte Cassino, where he died on the 16th of September 1087. He was buried at the monastery and is accounted a saint by the Benedictine order. His successor was Urban II.

Victor III., while abbot of Monte Cassino contributed personally to the literary activity of the monastery. He wrote Dialogi de miraculis S. Benedicii, which, along with his Epistolae, are in J. P. Migne, Patrol, hat. vol. 149, and an account of the miracles of Leo IX. (in Acta Sanctorum, 39th of April). The chief sources for his life are the " Chronica monasterii Casincnsis," in the Mon. Germ. hist. Script vu., and the Vitae in J. P. Migne, Patrol, hat. vol. 149, and in J. M. Wattcrich, Pontif. Roman. Vitae.

See J. Langen, Geschichte defromischen Kirche von Gregor VII. bis Innocenz III. (Bonn, 1893); F. Grcgorovius, Rome in the Middle Ages, vol. 4, trans, by Mrs G. W. Hamilton (London, 1900-2); K. J. von Hcfele, Conciliengeschichte (2nd cd., 1873-90), vol. 5; Hirsch, " Desiderius von Monte Cassino als Papst Victor III.," in Forschungen zur deutschen Geschichte, vol. 7 (Gottingen, 1867); H. II. Milman, History of Latin Christianity, vol. 3 (repub. London, 1S99).

Victor IV. was a title taken by two antipopes. (1) Gregorio Conti, cardinal priest of Santi Dodici Apostoli, was chosen by a party opposed to Innocent II. in succession to the antipope Anacletus II., on the 15th of March IJ38, but through the in- fluence of Bernard of Clairvaux he was induced to make his submission on the 29th of May. (2) Octavian, count of Tusculum and cardinal deacon of St Nicola in carcere Tulliano, the Ghi- belline antipope, was elected at Rome on the 7th of September 1159, m opposition to Alexander III., and supported by the emperor Frederick Barbarossa. Consecrated at Farfa on the 4th of October, Victor was the first of the series of antipopes supported by Frederick against Alexander III. Though the excommunication of Frederick by Alexander in March 1160 made only a slight impression in Germany, this pope was never- theless able to gain the support of the rest of western Europe, because since the days of Hildebrand the power of the pope over the church in the various countries had increased so greatly that the kings of France and of England could not view with indifference a revival of such imperial control of the papacy as had been exercised by the emperor Henry III. He died at Lucca on the 20th of April 1164 and was succeeded by the anti- pope Paschal III. (1 164-1 168) .

See M. Meyer, Die Wahl Alexanders III. und Victors IV. n$Q (Gottingen, 1871); and A. Hauck, Kirchengeschichte Deutschlands, Band iv. (C. H.

Ha.)

VICTOR, GAIUS JULIUS (4th cent, a.d.), Roman writer on rhetoric, possibly of Gallic origin. His extant manual (in C. Halm's Rketores Latini Minores, 1863) is of some importance as facilitating the textual criticism of Quintilian, whom he closely follows in many places.

VICTOR, SEXTUS AURELIUS, prefect of Pannonia about 360 (Amm. Marc. xxi. 10), possibly the same as the consul (jointly with Valentinian) in 373 and as the prefect of the city who is mentioned in an inscription of the time of Theodosius. Four small historical works have been ascribed to him on more or less doubtful grounds — (1) Origo Gcntis Rotnanae, (2) De Viribus Illustrious Romas, (3) De Caesaribus, (4) De Vita et Moribtts Imperatorum Romanorum execrpta ex Libris Sex. Aur. Victoris. The four have generally been published together under the name Historia Romana, but the fourth piece is a rechauffe of the third. The second was first printed at Naples about 1472, in 4to, under the name of Pliny (the younger), and the fourth at Strassburg in 1505.

The first edition of all four was (hat of A. Schottus (8vo, Ant- werp, 1579). The most recent edition of the De Caesaribus is by F. Pichlmayr (Munich, 1892).

VICTOR AMEDEUS II. (1666-1732), duke of Savoy and first king of Sardinia, was the son of Duke Charles Emmanuel II. and Jeanne de Savoie-Nemours. Born at Turin, he lost his father in 167s, and spent his youth under the regency of his mother, known as " Madama Reale " (madame royale), an able but ambitious and overbearing woman. He assumed the reins of government at the age of sixteen, and married Princess Anne, daughter of rhilip of Orleans and Henrietta of England, and niece of Louis XIV., king of France. That sovereign was determined to dominate the young duke of Savoy, who from the first resented the monarch's insolent bearing. In 1685 Victor was forced by Louis to persecute his Waldensian subjects, because they had given shelter to the French Huguenot refugees after the revoca- tion of the edict of Nantes. With the unwelcome help of a French army under Marshal Catinat, he invaded the Waldensian valleys, and after a difficult campaign, characterized by great cruelty, he subjugated them. Nevertheless, he became more anxious than ever to emancipate himself from French thraldom, and his first sign of independence was his visit to Venice in 16S7, where he conferred on political affairs with Prince Eugene of Savoy and other personages, without consulting Louis. About this time

the duke plunged into a whirl of dissipation, and chose the beautiful but unscrupulous Contessa di Verrua as his mistress, neglecting his faithful and devoted wife. Louis having dis- covered Victor's intrigues with the emperor, tried to precipitate hostilities by demanding his participation in a second expedi- tion against the Waldensians. The duke unwillingly complied, but when the French entered Piedmont and demanded the cession of the fortresses of Turin and Verrua, he refused, and while still professing to negotiate with Louis, joined the league of Austria, Spain and Venice. War was declared in 1690, but at the battle of Staffarda (18th of August 1691), Victor, in spite of his great courage and skill, was defeated by the French under Catinat. Other reverses followed, but the attack on Cuneo was heroically repulsed by the citizens. The war dragged on with varying success, until the severe defeat of the allies at Marsiglia and their selfish neglect of Victor's interests induced him to open negotiations with France once more. Louis agreed to restore most of the fortresses he had captured and to make other concessions; a treaty was signed in 1696, and Victor appointed generalissimo of the Franco-Piedmontese; forces in Italy operating against the imperialists. By the treaty of Ryswick (1697) a general peace was concluded. On the out- break of the war of the Spanish Succession in 1700 the duke was again on the French side, but the insolence of Louis and of Philip V. of Spain towards him induced him, at the end of the two years for which he had bound himself to them, to go over, to the imperialists (1704). At first the French were successful and captured several Piedmontese fortresses, but after besieging Turin, which was skilfully defended by the duke, for several months, they were completely defeated by Victor and Prince Eugene of Savoy (1706), and eventually driven out of the other towns they had captured. By the peace of Utrecht (17 13) the Powers conferred the kingdom of Sicily on Victor Amedeus, whose government proved efficient and at first popular. But after a brief stay in the island he returned to Piedmont and left his new possessions to a viceroy, which caused much discontent among the Sicilians; and when the Quadruple Alliance decreed in 1718 that Sicily should be restored to Spain, Victor was unable to offer any opposition, and had to content himself with receiving Sardinia in exchange.

The last years of Victor Amedeus's life were saddened by domestic troubles. In 1715 his eldest son died, and in 1728 he lost his queen. After her death, much against the advice of his remaining son and heir, Carlino (afterwards Charles Emmanuel III.), he married the Contessa di San Sebastiano, whom he created Marchesa di Spigno, abdicated the crown and retired to Chambery to end his days (1730). But his second wife, an ambitious intrigante, soon tired of her quiet life, and induced him to return to Turin and attempt to revoke his abdication. This led to a quarrel with his son, who with quite unnecessary harshness, partly due to his minister the

Marquis d'Ormea,

arrested his father and confined him at Rivoli and later at Mon- calieri; there Victor, overwhelmed with sorrow, died on the 31st of October 1732.

Victor Amedeus, although accused not without reason of bad faith in his diplomatic dealings and of cruelty, was undoubtedly a great soldier and a still greater administrator. He not only won for his country a high place in the council of nations, but he doubled its revenues and increased its prosperity and industries, and he also emphasized its character as an Italian state. His infidelity to his wife and his harshness towards his son Carlino are blemishes on a splendid career, but he more than expiated these faults by his tragic end.

See D. Carutti, Storia del Regno di Vittorio Amedeo II. (Turin, 1856); and E. Parri, Vittorio Amedio II. ed Eugenio di Savoia (Milan, 1888). The Marchesa VitcUeschi's work, The Romance of Savoy (2 vols., London, 1905), is based on original authorities, ana is the most complete monograph on the subject.

VICTOR EMMANUEL II. (1820-1878), king of Sardinia and first king of Italy, was born at Turin on the 14th of March 1830, and was the son of Charles Albert, prince of Savoy- Carignano, who became king of Sardinia in 1831. Brought up in the bigoted and chilling atmosphere of the Piedmontese court, he received a rigid military and religious training, but little intellectual education. In 1842 he was married to Adelaide, daughter of the Austrian Archduke Rainer, as the king desired at that time to improve his relations with Austria. The young couple led a somewhat dreary life, hidebound by court etiquette, which Victor Emmanuel hated. He played no part in polities during his father's lifetime, but took an active interest in military matters. When the war with Austria broke out in 1848, he was delighted at the prospect of distinguishing himself, and was given the command of a division. At Goito he was slightly wounded and displayed great bravery, and after Custozza defended the rearguard to the last (25th of July 1848). In the campaign of March 1849 he commanded the same division. After the disastrous defeat at Novara on the 23rd of March, Charles Albert, having rejected the peace terms offered by the Austrian field-marshal Radetzky, abdicated in favour of his son, and withdrew to a monastery in Portugal, where he died a few months later. Victor Emmanuel repaired to Radetzky's camp, where he was received with every sign of respect, and the field-marshal offered not only to waive the claim that Austria should occupy a part of Piedmont, but to give him an extension of territory, provided he revoked the constitution and substituted the old blue Piedmontese flag for the Italian tricolour, which savoured too much of revolution. But although the young king had not yet sworn to

observe the charter, and in any cage the other Italian princes had all violated their constitutional promises, he rejected the offer. Consequently he had to agree to the temporary Austrian occupation of the territory comprised within the Po, the Sesia and the Ticino, and of half the citadel of Alessandria, to disband his Lombard, Polish and Hungarian volunteers, and to withdraw his fleet from the Adriatic; but he secured an amnesty for all the Lom- bards compromised in the recent revolution, having even threatened to go to war again if it were not granted. It was the maintenance of the constitution in the face of the over- whelming tide of reaction that established his position as the champion of Italian freedom and earned him the sobriquet of Re Galanluomo (the honest king). But the task entrusted to him was a most difficult one: the army disorganized, the treasury empty, the people despondent if not actively disloyal, and he himself reviled, misunderstood, and, like his father, accused of treachery. Parliament having rejected the peace treaty, the king dissolved the assembly; in the famous pro- clamation from Moncalieri he appealed to the people's loyalty, and the new Chamber ratified the treaty (9th of January 1850). This same year, Cavour (q.v.) was appointed minister of agri- culture in D'Azeglio's cabinet, and in 1852, after the fall of the latter, he became prime minister, a post which with brief in- terruptions he held until his death.

In having Cavour as his chief adviser Victor Emmanuel was

most fortunate, and but for that statesman's astounding diplomatic genius the liberation of Italy would have been impossible. The years from 1850 to 1859 were devoted to restor- ing the shattered finances of Sardinia, reorganizing the army and modernizing the anLiquated institutions of the kingdom. Among other reforms the abolition of the foro ecclesiastico (privileged ecclesiastical courts) brought down a storm of hostility from the Church both on the king and on Cavour, but both remained firm in sustaining the prerogatives of the civil power. When the Crimean War broke out, the king strongly supported Cavour in the proposal that Piedmont should join France and England against Russia so as to secure a place in the councils of the great Powers and establish a claim on them for eventual assistance in Italian affairs (1854). The following year Victor Emmanuel was stricken with a threefold family misfortune; for his mother, the Queen Dowager Maria Teresa, his wife, Queen Adelaide, and his brother Ferdinand, duke of Genoa, died within a few weeks of each other. The clerical party were not slow to point to this circumstance as a judgment on the king for what they deemed his sacrilegious policy. At the end of

1855, while the allied troops were still in the East, Victor Emmanuel visited Paris and London, where he was warmly welcomed by the emperor Napoleon III. and Queen Victoria, as well as by the peoples of the two countries.

Victor Emmanuel's object now was the expulsion of the Austrians from Italy and the expansion of Piedmont into a North Italian kingdom, but he did not regard the idea of Italian unity as coming within the sphere of practical politics for the time being, although a movement to that end was already beginning to gain ground. He was in communication with some of the conspirators, especially with La Farina, the leader of the Societd, Nazionale, an association the object of which was to unite Italy under the king of Sardinia, and he even com>- municatcd with Mazzini and the republicans, both in Italy and abroad, whenever he thought that they could help in the expulsion of the Austrians from Italy. In 1859 Cavour's diplomacy succeeded in drawing Napoleon III. into an alliance, against Austria, although the king had to agree to the cession of Savoy and possibly of Nice and to the marriage of his daughter Clothilde to Prince Napoleon: These conditions were very painful to him, for Savoy was the hereditary home of his family, and he was greatly attached to Princess Clothilde and disliked the idea of marrying her to a man who gave little promise of proving a good husband. But he was always ready to sacrifice his own personal feelings for the good of his country. He had an interview with Garibaldi and appointed him commander of the newly raised volunteer corps, the Cacciatori delle Alpi. Even then Napoleon would not decide on immediate hostilities, and it required all Cavour's genius to bring him to the point and lead Austria into a declaration of war (April 1859). Although the Franco Sardinian forces were successful in the field, Napoloon, fearing an attack by Prussia and disliking the idea of a too powerful Italian kingdom on the frontiers of France, insisted on making peace with Austria, while Venetia still remained to be freed. Victor Emmanuel, realizing that he could not continue the campaign alone, agreed most unwillingly to the armistice of Villafranca. When Cavour heard the news he hurried to the king's headquarters at Monzambano, and in violent, almost disrespectful language implored him to continue the campaign at all hazards, relying on his own army and the revolutionary movement in the rest of Italy. But the king on this occasion showed more political insight than his great minister and saw that by adopting the heroic course proposed by the latter he ran the risk of finding Napoleon on the side of the enemy, whereas by waiting all might be gained. Cavour resigned office, and by the peace of Zurich (10th of November 1859) Austria ceded Lombardy to Piedmont but retained Venetia; the central Italian princes who had been deposed by the revolu tion were to be reinstated, and Italy formed into a confederation of independent states. But this solution was most unacceptable to Italian

public opinion, and both the king and Cavour deter- mined to assist the people in preventing its realization, and

consequently entered into secret relations with the revolutionary governments of Tuscany, the duchies and of Romagna. As a result of the events of 1859-60, those provinces were all annexed to Piedmont, and when Garibaldi decided oil the Sicilian expedition Victor Emmanuel assisted him in various ways. He had considerable influence with Garibaldi, who, although in theory a republican, was greatly attached to the bluff soldier-king, and on several occasions restrained him from too foolhardy courses. When Garibaldi having conquered Sicily was determined to invade the mainland possessions of Francis II. of Naples, Victor Emmanuel foreseeing international difficulties wrote to the chief of the red shirts asking him not to cross the Straits; but Garibaldi, although acting throughout in the name of His Majesty, refused to obey and continued his victorious march, for he knew that the king's letter was dictated by diplomatic considerations rather tharr by his own personal desire. Then, on Cavour's advice, King Victor decided to participate himself in the occupation of Neapolitan, territory, lest Garibaldi's entourage should proclaim the republic of create anarchy. When he accepted the annexation of Romagna offered by the inhabitants themselves the pope excommunicated him, but. although a devout Catholic, he continued in his course undeterred by ecclesiastical thunders, and led his army in person through the Papal States, occupying the Marches and Umbria, to Naples. On the 29th of October he met Garibaldi, who handed over his conquests to the king. The whole peninsula, except Rome and Venice, was now annexed to Piedmont, and on the 1 8th of February 1861 the parliament proclaimed Victor Emmanuel king of united Italy.

The next few years were occupied with preparations for the liberation of Venice, and the king corresponded with Mazzini; Klapka, Tiirr and other conspirators against Austria in Venetia itself, Hungary, Poland and elsewhere, keeping his activity secret even from his own ministers. The alliance with Prussia and the war with Austria of 1866, although fortune did not favour Italian arms, added Venetia to his dominions..

The Roman question yet remained unsolved, for Napoleon, although he. had assisted Piedmont in 1859 and had reluctantly consented to the annexation of the central and southern provinces, and of part of the Papal States, would not permit Rome to be occupied, and maintained a French garrison there to protect the pope. When war with Prussia appeared imminent he tried to obtain Italian assistance, and Victor Emmanuel was very anxious to fly to the assistance of the man who had helped him to expel the Austrians from Italy, but he could not do so unless Napoleon gave him a free hand in Rome. This the emperor would not do until it was too

late. Even after the first French defeats the chivalrous king, in spite of the advice of his more prudent councillors, wiahed to go to the rescue, and asked Thiers, the French representative who was imploring him for help, if with 100,000 Italian troops France could be saved, but Thiers could give no such undertaking and Italy remained neutral. On the 20th of September 1870, the French troops having been withdrawn, the Italian army entered Rome, and on the 2nd of July i87r Victor Emmanuel made his solemn entry into the Eternal City, which then be- came the capital of Italy.

The pope refused to recognize the new kingdom even before the occupation of Rdme, and the latter event rendered relations between church and state for many years extremelysdelicate: The king himself was anxious to be reconciled with the Vatican; but the pope, or rather his entourage, rejected all overtures, and the two sovereigns dwelt side by side in Rome until death without ever meeting. Victor Emmanuel devoted himself to his duties as a constitutional king with great conscientious- ness, but he took more interest in foreign than in domestic politics and contributed not a little to improving Italy's inter- national position. In 1873 he visited the emperor Francis Joseph at Vienna and the emperor William at Berlin. He received an enthusiastic welcome in both capitals,: but the visit to Vienna was never returned in Rome, for Francis Joseph as a Catholic sovereign feared to offend the pope, a circumstance

which served to embitter Austro-Italian relations. On the 9th of January 1878, Victor Emmanuel died of fever in Rome, and was buried in the Pantheon. He was succeeded by his son Humbert.

Bluff, hearty, good-natured and simple in his habits, yet he always had a high idea of his own kingly dignity, and his really statesmanlike qualities often surprised foreign diplomats, who were deceived by his homely exterior. As a soldier he was very brave, but he did not show great qualities as a military leader in the campaign of 1S66. He was a keen sportsman and would spend many days at a time pursuing chamcis or stcinbock in the Alpine fastnesses of Piedmont with nothing but bread and cheese to eat. He always used the dialect of Piedmont when conversing with natives of that country, and he had a vast fund of humorous anecdotes and proverbs with which to illustrate his arguments. He had a great weakness for female society, and kept several mistresses; one of them, the beautiful Rosa Vercellone, he created Countess Mirariori e Fontanafredda and married morganatically in 1869; she bore him one son.

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VICTOR EMMANUEL III. (1869-), king of Italy, son of King Humbert I. and Queen Margherita of Savoy, was born at Naples on the nth of November 1869. Carefully educated by his mother and under the direction of Colonel Osio, he outgrew the weakness of his childhood and became expert in horsemanship and military exercises. Entering the army at an early age he passed through the various grades and, soon after attaining his majority, was appointed to the command of the Florence Army Corps. During frequent journeys to Germany he enlarged his military experience, and upon his appointment to the command of the Naples Army Corps in 1896 displayed sound military and administrative capacity. A keen huntsman, and passionately fond of the sea, he extended his yachting and hunting excursions as far east as Syria and as far north as Spitsbergen. As representative of King Humbert he attended the coronation of Tsar Nicholas II. in 1896, the Victorian Jubilee celebrations of 1897, and the festivities connected with the coming of age of the German crown prince in 1900. The prince's intellectual and artistic leanings were well known; in particular, he has made a magnifi- cent collection of historic Italian coins, on which subject he became a recognized authority. At the time of the assassina- tion of his father, King Humbert (the 29th of July 1900), he was returning from a yachting cruise in the eastern Mediterranean. Landing at Reggio di Calabria he hastened to Monza, where he conducted with firmness and tact the preparations for the burial of King Humbert and for his own formal accession, which took place on the 9th and nth of August 1900. On the 24th of October 1896 he married Princess Elena of Montenegro, who, on the 1st of June i9or, bore him a daughter named Yolanda Margherita, on the 19th of November 1902 a second daughter named Mafalda, and on the 15th of September 1904 a son, Prince Humbert.

VICTORIA [ALEXANDBINA VICTORIA), Queen of the United Kingdom of Great Britain and Ireland, Empress of India (1819-1901), only child of Edward, duke of Kent, fourth son of King George III., and of Princess Victoria Mary Louisa of Saxe-Coburg-Gotha (widow of Prince Emich Karl of Lein- ingen, by whom she already had two children), was born at Kensington Palace on the 24th of May 1819. The duke and duchess of Kent had been living at Amorbach, in Franconia, owing to their straitened circumstances, but they returned to London on purpose that their child should be born in England. In 181 7 the death of Princess Charlotte (only child of the prince regent, afterwards George IV., and wife of Prince

Leopold of Saxe-Coburg-Gotha, afterwards king of the Belgians), had left the ultimate succession to the throne of England, in the younger

generation, so uncertain that the three unmarried sons of George III., the dukes of Clarence (afterwards William IV.), Kent and Cambridge, all married in the following year, the two elder on the same day. All three had children, but the duke of Clarence's two baby daughters died in infancy, in 1819 and 1821; and the duke of Cambridge's son George, born on the 26th of March 1819, was only two months old when the birth of the duke of Kent's daughter put her before him in the succession. The question as to what name the child should bear was not settled without bickerings. The duke of Kent wished her to be christened Elizabeth, and the prince regent wanted Georgiana, while the tsar Alexander I., who had promised to stand sponsor, stipulated for Alexandrina. – The baptism was performed in a drawing-room of Kensington Palace on the 24th of June by Dr Manners Sutton, archbishop of Canterbury. The prince regent, who was present, named the child Alexandrina; then, being requested by the duke of Kent to give a second name, he said, rather abruptly, " Let her be called Victoria, after her mother, but this name must come after the other." 1 Six weeks after her christening the princess was vaccinated, this being the first occasion on which a member of the royal family underwent the operation.

In January 1820 the duke of Kent died, five days before his brother succeeded to the throne as George IV. The widowed duchess of Kent was now a woman of thirty-four, handsome, homely, a German at heart, and with little liking for English ways. But she was a woman of experience, and shrewd; and fortunately she had a safe and affectionate adviser in her brother, Prince Leopold of Coburg, afterwards (1831) king of the Belgians, who as the husband of the late Princess Charlotte had once been a prospective prince consort of England. His former doctor and private secretary, Baron Stockmar (q.v.), a man of encyclopaedic information and remarkable judgment, who had given special attention to the problems of a sovereign's position in England, was afterwards to play an important r61e in Queen Victoria's life; and Leopold himself took a fatherly interest in the young princess's education, and contributed some thousands of pounds annually to the duchess of Kent's income. Prince Leopold still lived at this time at Claremont, where Princess Charlotte had died, and this became the duchess of Kent's occasional English home; but she was much addicted to travelling, and spent several months every year in visits to watering-places. It was said at court that she liked the demonstrative homage of crowds; but she had good reason to fear lest her child should be taken away from her to be educated according to the views of George IV. Between the king and his sister-in-law there was little love, and when the death of the duke of Clarence's second infant daughter Elizabeth in 1821 made it pretty certain that Princess Victoria would eventually become queen, the duchess felt that

the king might possibly obtain the support of his ministers if he insisted that the future sovereign should be brought up under masters and mistresses designated by himself. The little princess could not have received a better education than that which was given her under Prince Leopold's direction. Her uncle considered that she ought to be kept as long as possible from the knowledge of her position, which might raise a large growth of pride or vanity in her and make her un- manageable; so Victoria was twelve years old before she knew that she was to wear a crown. Until she became queen she never slept a night away from her mother's room, and she was not allowed to converse with any grown-up person, friend, tutor or servant without the duchess of Kent or the Baroness Lehzen, her private governess, being present. Louise Lehzen, a native of Coburg, had come to England as governess to the Princess Fecdore of Leiningen, the duchess of Kent's daughter

1 The question of her name, as that of one who was to be queen, remained even up to her accession to the throne a much-debated one. In August 1831, in a discussion in parliament upon a grant to the duchess of Kent, Sir M. W, Ridley suggested changing it to Elizabeth as " more accordant to the feelings of the people " ; and the idea of a change seems to have been powerfully, supported. In 1836 William IV. approved of a proposal to change it to Charlotte ; but, to the princess's own delight, it was given up.

by her first husband, and she became teacher to the Princess Victoria when the latter was five years old. George IV. in 1827 made her a baroness of Hanover, and she continued as lady-in- attendance after the duchess of Northumberland was appointed official governess in 1S30, but actually performed the functions first of governess and then of private secretary till 1842, when she left the court and returned to Germany, where she died in 1870. The Rev. George Davys, afterwards bishop of Peter- borough, taught the princess Latin; Mr J. B. Sale, music; Mr West all, history; and Mr Thomas Steward, the writing master of Westminster School, instructed her in penmanship.

In 1830 George IV. died, and the duke of York (George III.'s second son) having died childless in 1827, the duke of Clarence became king as William IV. Princess Victoria now became the direct heir to the throne. William IV. cherished affectionate feelings towards his niece; unfortunately he took offence at the duchess of Kent for declining to let her child come and live at his court for several months in each year, and through the whole of his reign there was strife between the two; and Prince Leopold was

no longer in England to act as peacemaker.

In the early hours of the 20th of June 1S37, William IV. died. His thoughts had dwelt often on his niece, and he repeatedly said that he was sure she would be " a good woman and a good queen. It will touch every sailor's heart to have a girl queen to fight for. They'll be tattooing her face on their arms, and I'll be bound they'll all think she was christened after Nelson's ship." Dr Howley, archbishop of Canterbury, and the marquis of Conyngham, bearing the news of the king's death, started in a landau with four horses for Kensington, which they reached at five o'clock. Their servants rang, knocked and thumped; and when at last admittance was gained, the primate and the marquis were shown into a lower room and there left to wait. Presently a maid appeared and said that the Princess Victoria was " in a sweet sleep and could not be disturbed." Dr Howley, who was nothing if not pompous, answered that he had come on state business, to which everything, even sleep, must give place. The princess was accordingly roused, and quickly came downstairs in a dressing-gown, her fair hair flowing loose over her shoulders. Her own account of this interview, written the same day in her journal (Letters, i. p. 97), shows her to have been quite prepared.

The privy council assembled at Kensington in the morning; and the usual oaths were administered to the queen by Lord Chancellor Cottenham, after which all present did homage. There was a touching incident when the queen's uncles, the dukes of Cumberland and Sussex, two old men, came forward to perform their obeisance. The queen blushed, and descending from her throne, kissed them both, without allowing them to kneel. By the death of William IV., the duke of Cumberland had become King Ernest of Hanover, and immediately after the ceremony he made haste to reach his kingdom. Had Queen Victoria died without issue, this prince, who was arro-' gant, ill-tempered and rash, would have become king of Great Britain; and, as nothing but mischief could have resulted from this, the young queen's life became very precious in the sight of her people. She, of course, retained the late king's ministers in their offices, and it was under Lord Melbourne's direction that the privy council drew up their declaration to the kingdom. This document described the queen as Alexandrina Victoria, and all the peers who subscribed the roll in the House of Lords on the 20th of June swore allegiance to her under those names. It was not till the following day that the sovereign's style was altered to Victoria simply, and this necessitated the issuing of a new declaration and a re-signing of the peers' roll. The public proclamation of the queen took place on the 21st at St James's Palace with great pomp.

The queen opened her first parliament in person, and in a well-written speech, which she read with much feeling, adverted to her youth and to the

necessity which existed for her being guided by enlightened advisers. When both houses had voted loyal addresses, the question of the Civil List was considered, and a week or two later a message was brought to parliament

requesting an increase of the grant formerly made to the duchess of Kent. Government recommended an addition of £30,000 a year, which was voted, and before the close of the year a Civil List Bill was passed, settling £385,000 a year on the queen.

The duchess of Kent and her brothers, King Leopold and the duke of Saxe-Coburg-Gotha, had always hoped to arrange that the queen should marry her cousin, Albert (q.v.) of Saxe-Coburg- Gotha, and the prince himself had been made acquainted with this plan from his earliest years. In 1836 Prince Albert, who was born in the same year as his future wife, had come on a visit to England with his father and with his brother, Prince Ernest, and his handsome face, gentle disposition and playful humour had produced a favourable impression on the princess. The duchess of Kent had communicated her projects to Lord Mel- bourne, and they were known to many other statesmen, and to persons in society; but the gossip of drawing-rooms during the years 1837-38 continually represented that the young queen had fallen in love with Prince This or Lord That, and the more imaginative babblers hinted at post-chaises waiting outside Ken- sington Gardens in the night, private marriages and so forth.

The coronation took place on the 28th of June 1838. No more touching ceremony of the kind had ever been performed in Westminster Abbey. Anne was a middle-aged married woman at the time of her coronation; she waddled M y 0fl , and wheezed, and made no majestic appearance upon her throne. Mary was odious to her Protestant subjects, Eliza- beth to those of the unreformed religion, and both these queens succeeded to the crown in times of general sadness; but the youthful Queen Victoria had no enemies except a few Chartists, and the land was peaceful and prosperous when she began to reign over it. The cost of George IV. 's coronation amounted to £240,000; that of William IV. had amounted to £50,000 only; and in asking £70,000 the government had judged that things could be done with suitable luxury, but without waste. The traditional banquet in Westminster Hall, with the throwing down of the glove by the king's champion in armour, had been dispensed with at the coronation of William IV., and it was resolved not to revive it. But it was arranged that the sove-reign's procession to the abbey through the streets should be made a finer show than on previous occasions; and it drew to London 400,000 country visitors. Three ambassadors for different reasons became objects of great interest on the occasion. Marshal Soult, Wellington's old foe, received a hearty popular welcome as a military hero; Prince Esterhazy, who represented Austria, dazzled society by his Magyar uniform, which was

encrusted all over, even to the boots, with pearls and diamonds; while the Turkish ambassador, Sarim Effendi, caused much diversion by his bewilderment. He was so wonder-struck that he could not walk to his place, but stood as if he had lost his senses, and kept muttering, " All this for a woman I "

Within a year the court was brought into sudden disfavour with the country by two events of unequal importance, but both exciting. The first was the case of Lady Flora Hastings. The In February 1830 this young lady, a daughter of the "Bed- marquis of Hastings, and a maid of honour to the ˆ5 a f n , er duchess of Kent, was accused by certain ladies of the bedchamber of immoral conduct. The charge having been laid before Lord Melbourne, he communicated it to Sir James Clark, the queen's physician, and the result was that Lady Flora was subjected to the indignity of a medical examination, which, while it cleared her character, seriously affected her health. In fact, she died in the following July, and it was then discovered that the physical appearances which first provoked suspicion against her had been due to enlargement of the liver. The queen's conduct towards Lady Flora was kind and sisterly from the beginning to the end of this painful business; but the scandal was made public through some indignant letters which the marchioness of Hastings addressed to Lord Melbourne pray- ing for the punishment of her daughter's traducers, and the general opinion was that Lady Flora had been grossly treated at the instigation of some private court enemies. While the agitation about the affair was yet unappeased, the political*

crisis known as the " Bedchamber Plot " occurred. The Whig ministry had introduced a bill suspending the Constitution of Jamaica because the Assembly in that colony had refused to adopt the Prisons Act passed by the Imperial Legislature. Sir Robert Peel moved an amendment, which, on a division (6th May), was defeated by a majority of five only in a house of 583, and ministers thereupon resigned. The duke of Wellington was first sent for, but he advised that the task of forming an administration should be entrusted to Sir Robert Peel. Sir Robert was ready to form a cabinet in which the duke of Welling- ton, Lords Lyndhurst, Aberdeen and Stanley, and Sir James Graham would have served; but he stipulated that the mistress of the robes and the ladies of the bedchamber appointed by the Whig administration should be removed, and to this the queen would not consent. On the 10th of May she wrote curtly that the course proposed by Sir Robert Peel was contrary to usage and repugnant to her feelings; the Tory leader then had to inform the House of Commons that, having failed

to obtain the proof which he desired of her majesty's confidence, it was impossible for him to accept office. The ladies of the bedchamber were so unpopular in consequence of their behaviour to Lady Flora Hastings that the public took alarm at the notion that the queen had fallen into the hands of an intriguing coterie; and Lord Melbourne, who was accused of wishing to rule on the strength of court favour, resumed office with diminished prestige. The Tories thus felt aggrieved; and the Chartists were so prompt to make political capital out of the affair that large numbers were added to their ranks. On the 14th of June Mr Attwood, M.P. for Birmingham, presented to the House of Commons a Chartist petition alleged to have been signed by 1,280,000 people. It was a cylinder of parchment of about the diameter of a coach- wheel, and was literally rolled up on the floor of the house. On the day after this curious document had furnished both amusement and uneasiness to the Commons, a woman, describing herself as Sophia Elizabeth Guelph Sims, made application at the Mansion House for advice and assistance to prove herself the lawful child of George IV. and Mrs Fitzherbert; and this incident, trumpery as it was, added fuel to the disloyal flame then raging. Going in state to Ascot the queen was hissed by some ladies as her carriage drove on to the course, and two peeresses, one of them a Tory duchess, were openly accused of this unseemly act. Meanwhile some monster Chartist demon- strations were being organized, and they commenced on the 4th of July with riots at Birmingham. It was an untoward coinci- dence that Lady Flora Hastings died on the 5th of July, for though she repeated on her deathbed, and wished it to be published, that the queen had taken no part whatever in the proceedings which had shortened her life, it was remarked that the ladies who were believed to have persecuted her still retained the sovereign's favour. The riots at Birmingham lasted ten days, and had to be put down by armed force. They were followed by others at Newcastle, Manchester, Bolton, Chester and Macclesfield.

These troublous events had the effect of hastening the queen's marriage. Lord Melbourne ascertained that the queen's dis- The positions towards her cousin, Prince Albert, were un-

queen's changed, and he advised King Leopold, through M. marriage. y an

described, in the queen 's declaration to the privy council, as a Protestant prince; and Lord Palmerston was obliged to ask Baron Stockmar for assurance that Prince Albert did not belong to any 3ect of Protestants whose rules might prevent him from taking the Sacrament according to the ritual of the English Church. He got an answer couched in somewhat ironical terms to the effect that Protestantism owed its existence in a measure to the house of Saxony, from which the prince descended, seeing that this house and that of the landgrave of Hesse. had stood quite alone

against Europe in upholding Luther and his cause. Even after this certain High Churchmen held that a Lutheran was a " dissenter," and that the prince should be asked to subscribe to the Thirty-Nine Articles.

The queen was particularly concerned by the question of the prince's future status as an Englishman. It was impractic- able for him to receive the title of king consort; but the queen naturally desired that her husband should be placed by act of parliament in a position which would secure to him precedence, not only in England, but in foreign courts. Lord Melbourne sought to effect this by a clause introduced in a naturalization bill; but he found himself obliged to drop the clause, and to leave the queen to confer what precedence she pleased by letters-patent. This was a lame way out of the difficulty, for the queen could only confer precedence within her own realms, whereas an act of parliament bestowing the title of prince consort would have made the prince's right to rank above all royal imperial highnesses quite clear, and would have left no room for such disputes as afterwards occurred when foreign princes chose to treat Prince Albert as having mere courtesy rank in his wife's kingdom. The result of these political diffi- culties was to make the queen more than ever disgusted with the Tories. But there was no other (law in the happiness of the marriage, which was solemnized on the 10th of February 1840 in the Chapel Royal, St James's. It is interesting to note that the queen was dressed entirely in articles of British manu- facture. Her dress was of Spitalfields silk; her veil of Honiton lace; her ribbons came from Coventry; even her gloves had been made in London of English kid — a novel thing in days when the French had a monopoly in the finer kinds of gloves.

From the time of the queen's marriage the crown played an increasingly active part in the affairs of state. Previously, ministers had tried to spare the queen all disagree- able and fatiguing details. Lord Melbourne saw her affairs. every day, whether she was in London or at Windsor, and he used to explain all current business in a- benevolent, chatty manner, which offered a pleasant contrast to the style of his two principal colleagues, Lord John Russell and Lord Palmerston. A statesman of firmer mould than Lord Melbourne would hardly have succeeded so well as he did in making rough places smooth for Prince Albert. Lord John Russell and Lord Palmerston were naturally jealous of the prince's interference — and of King Leopold's and Baron Stockmar 's-ˆin state affairs; but Lord Melbourne took the common-sense view that a husband will control his wife whether people wish it cr not. Ably advised by his private secretary, George Anson, and by Stockmar, the prince thus soon took the de facto place of the sovereign's private secretary, though he had no official status as such; and his system of classifying and annotating the queen's papers and letters resulted in the preservation of what the editors of the Letters of Queen Victoria (1907) describe as " probably the most extraordinary collection of state documents

in the world " — those up to 1861 being contained in between 500 and 600 bound volumes at Windsor. To confer on Prince Albert every honour that the crown could bestow, and to let him make his way gradually into public favour by his own tact, was the advice which Lord Melbourne gave; and the prince acted upon it so well, avoiding every appearance of intrusion, and treating men of all parties and degrees with urbanity, that within five months of his marriage he obtained a signal mark of the public confidence. In expectation of the queen becoming a mother, a bill was passed through parliament providing for the appointment of Prince Albert as sole regent in case the

queen, after giving birth to a child, died before her son or

daughter came of age.

The Kegency Bill had been hurried on in consequence of the

attempt of a crazy pot-boy, Edward Oxford, to take the queen's

... 4 life. On ioth June 1840. the queen and Prince Albert Attempts … ~ . . xT-ii •

on the were driving up Constitution Hill in an open carriage,

q wen's when Oxford tired two pistols, the bullets from which Iife ' flew, it is said, close by the prince's head. He was

arrested on the spot, and when his lodgings were searched a quantity of powder and shot was found, with the rules of a secret society, called " Young England," whose members were pledged to meet, " carrying swords and pistols and wearing crape masks." These discoveries raised the surmise that Oxford was the tool of a widespread Chartist conspiracy — ■ or, as the Irish pretended, of a conspiracy of Orangemen to set the duke of Cumberland on the throne; and while these delusions were fresh, they threw well-disposed persons into a paroxysm of loyalty. Even the London street dogs, as Sydney Smith said, joined with O'Connell in barking " God save the Queen." Oxford seems to have been craving for notoriety; but it may be doubted whether the jury who tried him did right to pronounce his acquittal on the ground of insanity. He feigned madness at his trial, but during the forty years of his subsequent confinement at Bedlam he talked and acted like a rational being, and when he was at length released and sent to Australia he earned his living there as a house painter, and used to declare that he had never been mad at all. His acquittal was to be deprecated as establishing a dangerous precedent in regard to outrages on

the sovereign. It was always Prince Albert's opinion that if Oxford had been flogged the attempt of Francis on the queen in 1842 and of Bean in the same year would never have been perpetrated. After the attempt of Bean — who was a hunchback, really insane — parliament passed a bill empowering judges to order whipping as a punishment for those who molested the queen; but some- how this salutary act was never enforced. In 1S50 a half-pay officer, named Pate, assaulted the queen by striking her with a stick, and crushing her bonnet. He was sentenced to seven years' transportation; but the judge. Baron Alderson, excused him the flogging. In 1869 an Irish lad, O'Connor, was sentenced to eighteen months' imprisonment and a whipping for presenting a pistol at the queen, with a petition, in St James's Park; but this time it was the queen herself who privately remitted the corporal punishment, and she even pushed clemency to the length of sending her aggressor to Australia at her own expense. The series of attempts on the queen was closed in 1S82 by Maclean, who fired a pistol at her majesty as she was leaving the Great Western Railway station at Windsor, He, like Bean, was a genuine madman, and was relegated to Broadmoor.

The birth of the princess royal, on the 21st of November 1840, removing the unpopular King Ernest of Hanover from Birth ˆ e P os ftion of heir-presumptive to the British crown,

of the was a subject of loud congratulations to the people.

ptiocesa A curious scare was occasioned at Buckingham Palace, royal. when the little princess was a fortnight old, by the

discovery of a boy named Jones concealed under a bed in the royal nursery. Jones had a mania for palace-breaking. Three times he effected a clandestine entry into the queen's residence, and twice he managed to spend. several days there. By day he concealed himself in cupboards or under furniture, and by night he groped his way into the royal kitchen to cat whatever he could find. After his third capture, in March 1841, he coolly boasted that he had lain under a sofa, and listened to a private conversation between the queen and Prince Albert. This third time he was not punished, but sent to sea, and turned out very well. The incident strengthened Prince Albert's hands in trying to carry out sundry domestic reforms which were being stoutly resisted by vested interests. The royal residences and grounds used to be under the control of four different officials — the lord chamberlain, the lord steward, the master of the horse and the commissioners of woods and forests. Baron Stockmar, describing the confusion fostered by this state of things, said —

"The lord steward finds the fuel and lays the lire; the lord chamberlain lights it. The lord chamberlain provides the lamps; the lord steward must clean, trim and light them. The inside cleaning of windows belongs to the lord chamberlain's depart- ment, but the outer parts must be attended to by the office of woods and forests, so that windows remain dirty unless the two departments can come to an understanding."

It took Prince Albert four years of firmness and diplomacy before in 1845 he was able to bring the queen's home under the efficient control of a master of the household.

At the general election of 1841 the Whigs returned in a minority of seventy-six, and Lord Melbourne was defeated on the Address and resigned. The queen was affected sir Robert to tears at parting with him; but the crisis had been Peel's fully expected and prepared for by confidential com- mmtstr yˆ munications between Mr Anson and Sir Robert Peel, who now became prime minister (see Letters of Queen Victoria, i. 341 et seq.). The old difficulty as to the appointments to tho royal household was tactfully removed, and Tory appoint- ments were made, which were agreeable both to the queen and to Peel. The only temporary embarrassment was the queen's continued private correspondence with Lord Melbourne, which led Stockmar to remonstrate with him; but Melbourne used his influence sensibly; moreover, he gradually dropped out of politics, and the queen got used to his not being indis- pensable. On Prince Albert's position the change had a marked effect, for in the absence of Melbourne the queen relied more particularly on his advice, and Peel himself at once dis- covered and recognized the prince's unusual charm and capacity. One of the Tory premier's first acts was to propose that a royal commission should be appointed to consider the best means for promoting art and science in the kingdom, and he nominated Prince Albert as president. The International Exhibition of 1851, the creation of .the Museum and Science and Art Department at South Kensington, the founding of art schools and picture galleries all over the country, the spread of musical taste and the fostering of technical education may be attri- buted, more or less directly, to the commission of distinguished men which began its labours under Prince Albert's auspices.

The queen's second child, the prince of Wales (see Edward VII.) , was born on the 9th of November 1:841; and this event " filled the measure of the queen's domestic Birth of happiness," as she said in her speech from the throne the prince at the opening of the session of 1842. It is unnecessary of WaIe f' from this point onwards to go seriatim through the domestic history of the reign, which is given in the article English History. At this time there was much political unrest at home, and serious difficulties abroad. As regards internal politics, it may be remarked that the queen and Prince

Albert were much relieved when Peel, who had come in as the leader of the Protectionist party, adopted Free Trade and re- pealed the Corn Laws, for it closed a dangerous agitation which gave them much anxiety. When the country was in distress, the queen felt a womanly repugnance for festivities; and yet it was undesirable that the court should incur the The court reproach of living meanly to save money. There and the was a conversation between the queen and Sir Robert couatr y Peel on this subject in the early days of the Tory adminis- tration, and the queen talked of reducing her establishment in order that she might give away larger sums in charities. " I am afraid the people would only say that your majesty was returning them change for their pounds in halfpence," answered Peel. " Your majesty is not perhaps aware that the most unpopular person in the parish is the relieving officer, and if the queen were to constitute herself a relieving officer for all the parishes in the kingdom she would find her money go a very little way, and she would provoke more grumbling than thanks." Peel added that a sovereign must do all things in order, not seeking praise for doing one particular thing well, but striving to be an example in all respects, even in dinner-giving.*

Meanwhile the year 1842 was ushered in by splendid fetes in honour of the king of Prussia, who held the prince of Wales at the font. In the spring there was a fancy-dress ball at Bucking- ham Palace, which remained memorable owing to the offence

which it gave in France. Prince Albert was costumed as Edward III., the queen as Queen Philippa, and all the gentle- men of the court as knights of Poitiers. The French chose to view this as an. unfriendly demonstration, and there was some talk of getting up a counter-ball in Paris, the duke of Orleans to figure as William the Conqueror. In June the queen took her first railway journey, travelling from Windsor to Paddington on the Great Western line. The master of the horse, queen's whose business it was to provide for the queen's first rail- ordinary journeys by road, was much put out by this Y ay innovation. He marched into the station several

tourney. ˆ ours before the start to inspect the engine, as he would have examined a steed; but greater merriment was occasioned by the queen's coachman, who insisted that, as a matter of form, he ought to make-believe to drive the engine. After some dispute, he was told that he might climb on to the pilot engine which was to precede the royal train; but his scarlet livery, white gloves and wig suffered so much from soot and sparks that he made no more fuss about his rights in after trips. The motion of the train

was found to be so pleasant I hat the queen readily trusted herself to the railway for a longer journey a few weeks later, when she paid her first visit to Scotland. A report by Sir James Clark led to the queen's visiting Balmoral in 1848, and to the purchase of the Balmoral estate in 1852, and the queen's diary of her journeys in Scotland shows what constant enjoyment she derived from her Highland home. Seven years before this the estate of Osborne had been pur- chased in the Isle of Wight, in order that the queen might have a home of her own. Windsor she considered too stately, and the Pavilion at Brighton too uncomfortable. The first stone of Osborne House was laid in 1845, and the royal family entered into possession in September 1846.

In August 1843 the queen and Prince Albert paid a visit to King Louis Philippe at the chateau d'Eu. They sailed from Relations Southampton f° r Treport in a yacht, and, as it hap- with pened to be raining hard when they embarked, the

foreign loyal members of the Southampton Corporation remem- bered Raleigh, and spread their robes on the ground for the queen to walk over. In 1844 Louis Philippe returned the visit by coming to Windsor. It was the first visit ever paid by a king of France to a sovereign of England, and Louis Philippe was much pleased at receiving the Order of the Carter. He said that he did not feel that he belonged to the " Club " of European sovereigns until he received this decoration. As the father of King Leopold of Belgium's con- sort, the queen was much interested in his visit, which went off with great success and goodwill. The Isar Nicholas had visited Windsor earlier that year, in which also Prince Alfred, who was to marry the tsar's grand-daughter, was born.

In 1846 the affair of the " Spanish marriages " seriously troubled the relations between the United Kingdom and France. Louis Philippe and Guizot had planned the marriage of the duke of Montpensier with the infanta Louisa of Spain, younger sister of Queen Isabella, who, it was thought at the time, was not likely ever to have children. The intrigue was therefore one for placing a son of the French king on the Spanish throne. (Sec Spain, History.) As to Queen Victoria's intervention on this question and on others, these words, written by \V. E. Gladstone in 18755 raay be quoted: —

"Although the admirable arrangements of the Constitution have now shielded the sovereign from personal responsibility, they have left ample scope for the exercise of direct and personal influence in the whole work of government. . . . The sovereign as compared with her ministers has, because she is the sovereign, the advantage of long experience, wide survey, elevated position and entire dis- connexion from the bias of party. Further,

personal and domestic relations with the ruling families abroad give openings in delicate cases for saying more, and saying it at once more gently and more efficaciously, than could be ventured in the formal correspondence and rude contacts of government. We know with how much truth, fulness and decision, and with how much tact and delicacy, the queen, aided by Prince Albert, took a principal part on behalf of the nation in the painful question of the Spanish marriages."

The year 3848, which shook so many continental thrones,

sove- reigns.

left that of the United Kingdom unhurt. Revolutions broke out in Paris, Vienna, Berlin, Madrid, Rome, Naples, Venice, Munich, Dresden and Budapest. The queen and Prince Albert were affected in many private ways by the events abroad. Panic-stricken princes wrote to them for political assistance or pecuniary aid. Louis Philippe abdicated and fled to Eng- land almost destitute, being smuggled over the Channel by the cleverness of the British consul at Havre, and the queen employed Sir Robert Peel as her intermediary for providing him with money to meet his immediate wants. Subsequently Clare- mont was assigned to the exiled royal family of France as a resilience. During a few weeks of 1848 Prince William of Prussia (afterwards German emperor) found an asylum in England.

*In August 1849 tne queen and Prince Albert, accompanied by the little princess royal and the prince of Wales, paid a visit to Ireland, landing at the Cove of Cork, which from that day was renamed Queenstown. The recep- I8 S 49 r p * tion was enthusiastic, and so was that at Dublin. "Such a day of jubilee," wrote The Times, "such a night of rejoicing, has never been beheld in the ancient capital of Ireland since first it arose on the banks of the Liffey." The queen was greatly pleased and touched. The project of estab- lishing a royal residence in Ireland was often mooted at this time, but the queen's advisers never urged it with sufficient warmth. There was no repugnance to the idea on the queen's part, but Sir Robert Peel thought unfavourably of it as an " empirical " plan, and the question of expense was always mooted as a serious consideration. There is no doubt that the absence of a royal residence in Ireland was felt as a slur upon the Irish people in certain circles.*

During these years the queen's family was rapidly becoming larger. Princess Alice (afterwards grand duchess of Hesse) was born on the 25th of April 1843; Prince Alfred (afterwards duke of Edinburgh and duke of Saxe-Coburg-Gotha) on the 6th of August 1844; Princess Helena (Princess Christian) on the 25th of May 1846; Princess Louise (duchess of Argyll) on the iSth of March 1S4S; and Prince Arthur (duke of Con- naught) on

the j st of May 1850.

At the end of 1S51 an important event took place, which ended a long-standing grievance on the part of the queen, in Lord Palmerston's dismissal from the office of foreign secre- 7tte tary on account of his expressing approval of Louis queen and Napoleon's coup d'etat in Paris. The circumstances LordPai are of extreme interest for the light they throw on mefstottt the queen's estimate of her constitutional position and authority. Lord Palmerston had never been persona grata at court. His Anglo-Irish nature was not sympathetic with the somewhat formal character and German training of Prince Albert; and his views of ministerial independence were not at all in accord with those of the queen and her husband. The queen had more than once to remind her foreign secretary that his des- patches must be seen by her before they were sent out, and though Palmerston assented, the queen's complaint had to be continually repeated. She also protested to the prime minister (Lord John Russell) in 1848, 1849 and 1850, against various instances in which Palmerston had expressed his own personal opinions in matters of foreign affairs, without his despatches being properly approved either by herself or by the cabinet. Lord John Russell, who did not want to offend his popular and headstrong colleague, did his best to smooth things over; but the queen remained exceedingly sore, and tried hard to get Palmerston removed, without success. On the T2th of August 1850 the queen wrote to Lord John Russell the following important memorandum, which followed in its terms a private memorandum drawn up for her by Stockmar a few months earlier (Letters, h. 282): —*

" With reference to the conversation about Lord Palmerston which the queen had with Lord John Russell the other day, and Lord Palmerston's disavowal that he ever intended any disrespect to her by the various neglects of which she has had so long and so often to complain, she thinks it right, in order to avoid any mis- takes for the future, to explain what it is she expects from the foreign secretary.

" She requires —

" I. That he will distinctly state what he proposes in a given case, in order that the queen may know as distinctly to what she has given her royal sanction.

" 2. Having given her sanction to a measure, that it be not arbitrarily

altered or modified by the minister. Such an act she must regard as failing in sincerity to the crown, and justly to be visited by the exercise of her constitutional right of dismissing that minister. She expects to be kept informed of what passes between him and the foreign ministers, before important decisions are taken, based upon that intercourse; to receive the foreign despatches in good time, and to have the drafts for her approval sent her in sufficient time to make herself acquainted with their contents before they must be sent off. The queen thinks it best that Lord John Russell should show this letter to Lord Palmerston."

Lord Palmerston took a copy of this letter, and promised to attend to its direction. But the queen thoroughly distrusted him, and in October 1851 his proposed reception of Kossuth nearly led to a crisis. Then finally she discovered (December 13) at the time of the coup d' Stat, that he had, of his own initiative, given assurances of approval to Count Walewski, which were not in accord with the views of the cabinet and with the "neutrality which had been enjoined" by the queen. This was too much even for Lord John Russell, and after a short and decisive correspondence Lord Palmerston resigned the seals of office.

The death of the duke of Wellington in 1852 deeply affected the queen. The duke had acquired a position above parties, Death of and was the trusted adviser of all statesmen and of the the duke court in emergencies. The queen sadly needed such of Wet- a counse ii orj f or Prince Albert's position was one full Prince ' °f difficulty, and party malignity was continually Albert's putting wrong constructions upon the advice which he position, gave, and imputing to him advice which he did not give. During the Corn Law agitation offence was taken at his having attended a debate in the House of Commons, the Tories declaring that he had gone down to overawe the house in favour of Peel's measures. After Palmerston's en-forced resignation, there was a new and more absurd hubbub. A climax was reached when the difficulties with Russia arose which led to the Crimean War; the prince was accused by the peace party of wanting war, and by the war party of plotting surrender; and it came to be publicly rumoured that the queen's husband had been found conspiring against the state, and had been committed to the Tower. Some said that the queen had been arrested too, and the prince wrote to Stockmar: " Thou- sands of people surrounded the Tower to see the queen and me brought to it." This gave infinite pain to the queen, and at length she wrote to Lord Aberdeen on the subject. Eventually, on 31st January 1854, Lord John Russell took occasion to deny most emphatically that Prince Albert interfered unduly with foreign affairs, and in both houses the statesmen of the two parties delivered feeling panegyrics of the prince, asserting at the same time his entire constitutional right to give private advice to the sovereign on matters of state. From this time it may be said that Prince Albert's position was

established on a secure footing. He had declined (1850) to accept the post of commander-in-chief at the duke of Wellington's suggestion, and he always refused to let himself be placed in any situation which would have modified ever so slightly his proper relations with the queen. The queen was very anxious that he should receive the title of " King Consort," and that the crown should be jointly borne as it was by William III. and Mary; but he himself never spoke a word for this arrangement. It was only to please the queen that he consented to take the title of Prince Con- sort (by letters patent of June 25, 1857), and he only did this when it was manifest that statesmen of all parties approved the change. For the queen and royal family the Crimean War time was a very busy and exciting one. Her majesty personally supcr- Tbe intended the committees of ladies who organized

Crimean relief for the wounded; she helped Florence Nightin- War – gale in raising bands of trained nurses; she visited

the crippled soldiers in the hospitals, and it was through her resolute complaints of the utter insufficiency of the hospital accommodation that Netley Hospital was built. The jcxvttt. 2

distribution of medals to the soldiers and the institution of the Victoria Cross (February 1857) as a reward for individual instances of merit and valour must also be noted among the incidents which occupied the queen's time and thoughts. In 1855 the emperor and empress of the French visited the queen at Windsor Castle, and the same year her majesty and the prince consort paid a visit to Paris.

The queen's family life was most happy. At Balmoral and Windsor the court lived in virtual privacy, and the queen and the prince consort saw much of their children. Count- j he less entries in the queen's diaries testify to the anxious queen affection with which the progress of each little member and her of the household was watched. Two more children am V' had been born to the royal pair. Prince Leopold (duke of Albany) on the 7th of April 1853, and on the 14th of April 1857 their last child, the princess Beatrice (Princess Henry of Battenberg), bringing the royal family up to nine — four sons and five daughters. Less than a year after Princess Beatrice's birth the princess royal was married to Prince Frederick William of Prussia, afterwards the emperor Frederick. The next marriage after the princess royal's was that of the princess Alice to Prince Louis (afterwards grand duke) of Hesse-Darmstadt in 1862. In 1863 the prince of Wales married the princess Alex- andra of Denmark. In 1866 the princess Helena became the wife of Prince Christian of Schleswig-Holstein. In 1871 the princess Louise was wedded to the marquis of Lome, eldest son of the duke of Argyll. In 1874 Prince Alfred, duke of Edin- burgh, married Princess

Marie Alexandrovna, only daughter of the tsar Alexander II. The duke of Connaught married in 1879 the princess Louise of Prussia, daughter of the soldier- prince Frederick Charles. In 1882 Prince Leopold, duke of Albany, wedded the princess Helen of Waldeck-Pyrmont. Finally came the marriage of Princess Beatrice in 1885 with Prince Henry of Battenberg.

On the occasion of the coming of age of the queen's sons and the marriages of her daughters parliament made provision. The prince of Wales, in addition to the revenues of the duchy of Cornwall, had £40,000 a year, the princess £io,ooo, and an addition of £36,000 a year for their children was granted by parliament in 1889. The princess royal received a dowry of £40,000 and £8000 a year for life, the younger daughters £30,000 and £6000 a year each. The dukes of Edinburgh, Connaught and Albany were each voted an income of £15,000, and £10,000 on marrying.

*The dispute with the United States concerning the " Trent " affair of 1861 will always be memorable for the part played in its settlement by the queen and the prince consort. The In 1 86 1 the accession of Abraham Lincoln to the presi- American dency of the United States of America caused the Civil War * Southern States of the Union to revolt, and the war began. During November the British West India steamer " Trent " was boarded by a vessel of the Federal Navy, the " San Jacinto," and Messrs Slidell and Mason, commissioners for the Confederate States, who were on Lheir way to England, were seized. The British government were on the point of demanding reparation for this act in a peremptory manner which could hardly have meant anything but war, but Prince Albert insisted on revising Lord Russell's despatch in a way which gave the American government an opportunity to concede the surrender of the prisoners without humiliation. The memorandum from the queen on this point was the prince consort's last political draft. The year 1861 was the saddest in the queen's life. On 16th March, her mother, the duchess of Kent, died, and on 14th December, while the dispute with America about the Death of u Trent " affair was yet unsettled, the prince consort the prince breathed his last at Windsor. His death left a void cons ˆ rt * in the queen's life which nothing could ever fill. She built at Frogmore a magnificent mausoleum where she might be buried with him.*

Never again during her reign did the queen live in London, and Buckingham Palace was only used for occasional visits of a few days.

At the time of the prince consort's death the prince of Wales was in. his

twenty-first year. He had spent several terms at Marriage e ˆ c ˆ ° tne two universities of Oxford and Cambridge, of the and he had already travelled much, having visited*

prime of most of Europe, Egypt and the United States. Wales, fiis marriage was solemnized at Windsor on the ioth of March 1863. The queen witnessed the wedding from the private pew or box of St George's Chapel, Windsor, but she wore the deep mourning which she was never wholly to put off to the end of her life, and she took no part in the festivities of the wedding.

In foreign imperial affairs, and in the adjustment of serious parliamentary difficulties, the queen's dynastic influence abroad and her position as above party at home, together with the respect due to her character, good sense and experience, still remained a powerful element in the British polity, as was shown Ausira- on rnore than one occasion. In 1866 the Austro-prussiaa Prussian War broke out, and many short-sighted people War were tempted to side with France when, in 1867,*

Napoleon III. sought to obtain a "moral compensation" by laying a claim to the duchy of Luxemburg. A conference met in London, and the difficulty was settled by neutralizing the duchy and ordering the evacuation of the Prussian troops who kept garrison there. But this solution, which averted an imminent war, was only arrived at through Queen Victoria's personal intercession. In the words of a French writer —

" The queen wrote both to the king of Prussia and to the emperor Napoleon. Her letter to the emperor, pervaded with the religious and almost mystic sentiments which predominate in the queen's mind, particularly since the death of Prince Albert, seems to have made a deep impression on the sovereign who, amid the struggles of politics, had never completely repudiated the philanthropic theories of his youth, and who, on the battlefield of Solferino, covered with the dead and wounded, was seized w r ith an unspeakable horror of war."

Moreover, Disraeli's two premierships (1868, 1874-80) did a good deal to give new encouragement to a right idea of the Disraeli constitutional function of the crown. Disraeli thought and that the queen ought to be a power in the state. His

Glad- notion of duty — at once a loyal and chivalrous one —

s one. was ˆ at k e was obliged to give the queen the best of his advice, but that the final decision in any course lay with her, and that once she had decided, he was bound, what- ever might be his own opinion, to stand up

for her decision in public. The queen, not unnaturally, came to trust Disraeli implicitly, and she frequently showed her friendship for him. At his death she paid an exceptional tribute to his " dear and honoured memory " from his iC grateful and affectionate sovereign and friend." To something like this position Lord Salisbury after 1886 succeeded. A somewhat different con- ception of the sovereign's functions was that of Disraeli's great rival, Gladstone, who, though his respect for the person and office of the sovereign was unbounded, not only expected all people, the queen included, to agree with him when he changed his mind, but to become suddenly enthusiastic about his new ideas. The queen consequently never felt safe with him. Nor did she like his manner — he spoke to her (she is believed to have said) as if she w r ere a public meeting. The queen was opposed to the Disestablishment of the Irish Church (1869) — – the question which brought Gladstone to be premier— and though she yielded with good grace, Gladstone was fretful and astonished because she would not pretend to give a hearty assent to the measure. Through her secretary, General Grey, the queen pointed out that she had not concealed from Gladstone " how deeply she deplored " his having felt himself under the necessity of raising the question, and how appre- hensive she was of the possible consequences of the measure; but, when a general election had pronounced on the principle, when the bill had been carried through the House of Commons by unvarying majorities, she did not see what good could be gained by rejecting it in the Lords. Later, when through the skilful diplomacy of the primate the Lords had passed the second reading by a small but sufficient majority (179 to 146), and after amendments had been adopted, the queen licrself wrote —

" The queen … is very sensible of the prudence and, at the same time, the anxiety for the welfare of the Irish Establishment which the archbishop has manifested during the course of the debates, and she will be very glad if the amendments which have been adopted at his suggestion lead to a settlement of the ques- tion ; but to effect this, concessions, the queen believes, will have to be made on both sides. The queen must say that she cannot view without alarm possible consequences of another year of agita- tion on the Irish Church, and she would ask the archbishop seriously to consider, in case the concessions to which the government may agree should not go so far as he may himself wish, whether the postponement of the settlement for another year may not be likely to result in worse rather than in better terms for the Church. The queen trusts, therefore, that the archbishop will himself consider, and, as far as he can, endeavour to induce the others to consider, any concessions that may be offered by the House of Commons in the most conciliatory spirit."

The correspondence of which this letter forms a part is one of the few published witnesses to the queen's careful and active interest in home

politics during the latter half of her reign- but it is enough to prove how wise, how moderate and how steeped in the spirit of the Constitution she was. Another instance is that of the County Franchise and Redistribution Bills of 1884-85. There, again, a conflict between the two houses was imminent, and the queen's wish for a settlement had considerable weight in bringing about the curious but effective conference of the two parties, of which the first suggestion, it is believed, was due to Lord Randolph Churchill.

In 1876 a bill was introduced into parliament for conferring on the queen the title of " Empress of India." It met with much opposition, and Disraeli was accused of ministering simply to a whim of the sovereign, whereas> in fact, ^JU" the title was intended to impress the idea of British suzerainty forcibly upon the minds of the native princes, and upon the population of Hindustan. The prince of Wales's voyage to India in the winter of 1875-76 had brought the heir to the throne into personal relationship with the great Indian vassals of the British crown, and it was felt that a further demonstra- tion of the queen's interest in her magnificent dependency would confirm their loyalty.

The queen's private life during the decade 1870-80 was one of quiet, broken only by one great sorrow when the Princess Alice died in 1878. In 1867 her majesty had started in author- ship by publishing The Early Days ■ of the Prince uf™ Consort, compiled by General Grey; in 1869 she gave to the world her interesting and simply written diary entitled Leaves from the Journal of our Life in the Highlands, and jn 1874 appeared the first volume of The Life and, Letters of the Prince Consort (2nd vol. in 1880), edited by Sir Theodore Martin. A second instalment of the Highland journal appeared in 1885. These literary occupations solaced the hours of a life which was mostly spent in privacy. A few trips to the- Continent, in which the queen .was always accompanied by her youngest daughter, the Princess Beatrice, brought a little variety into the home-life, and aided much in keeping up the good health which the queen enjoyed almost uninterruptedly. So far as public ceremonies were concerned, the prince and princess of Wales were now coming forward more and more to represent the royal family. People noticed meanwhile that the queen had taken a great affection for her Scottish man-servant, John Brown, who had been in her service since 1849; she made him her constant personal attendant, and looked on him more as a friend than as servant. When he died in 1883 the queen's grief was intense.*

From 1880 onwards Ireland almost monopolized the field of domestic politics. The queen was privately opposed to Gladstone's Home Rule policy; but she observed in public a constitutional reticence on the subject. In the year, however, of the Crimes Act 1887, an event took place which was of

more intimate personal concern to the queen, and of more attractive import to the country and the empire at large. June 20th was the fiftieth anniversary of her accession to jubilee. the throne, and on the following day, for the second time in English history, a great Jubilee celebration was held to commemorate so happy an event. The country threw

itself into the celebration with unchecked enthusiasm; large sums of money were everywhere subscribed; in every city, town and village something was done both in the way of rejoicing and in the way of establishing some permanent memorial of the event. In London the day itself was kept by a solemn service in Westminster Abbey, to which the queen went in state, surrounded by the most brilliant, royal, and princely escort that had ever accompanied a British sovereign, and cheered on her way by the applause of hundreds of thousands of her subjects. The queen had already paid a memorable visit to the East End, when she opened the People's Palace on the 14th of May. On the 2nd of July she reviewed at Buckingham Palace some 28,000 volunteers of London and the home counties. On the 4th of July she laid the foundation stone of the Imperial Institute, the building at Kensington to which, at the instance of the prince of Wales, it had been determined to devote the large sum of money collected as a Jubilee offering, and which was opened by the queen in 1S93. On the 9th of July the queen reviewed 60,000 men at Aldcrshot; and, last and chief of all, on the 23rd of July, one of the most brilliant days of a brilliant summer, she reviewed the fleet at Spithead.

The year 1888 witnessed two events which greatly affected European history, and in a minor, though still marked, degree Thequeca the life of the English court. On the 9th of March and the emperor William I. died at Berlin. He was

Bismarck. succeec ied by his son, the emperor Frederick III., regarded with special affection in England as the husband of the princess royal. But at the time he was suffering from a malignant disease of the throat, and he died on the 15th of June, being succeeded by his eldest son, the emperor William II., the grandson of the queen. Meanwhile Queen Victoria spent some weeks at Florence at the Villa Palmieri, and returned home by Darmstadt and Berlin. In spite of the illness of the emperor Frederick a certain number of court festivities were held in her honour, and she had long con- versations with Prince Bismarck, who was deeply impressed by her majesty's personality. Just before, the prince, who was still chancellor, had taken a very strong line with regard to a royal marriage in which the

queen was keenly interested— the proposal that Prince Alexander of Battenberg, lately ruler of Bulgaria, and brother of the queen's son-in-law, Prince Henry, should marry Princess Victoria, the eldest daughter of the emperor Frederick. Prince Bismarck, who had been anti- Battenberg from the beginning, vehemently opposed this mar- riage, on the ground that for reasons of state policy it would never do for a daughter of the German emperor to marry a prince who was personally disliked by the tsar. This affair caused no little agitation in royal circles, but in the end state reasons were allowed to prevail and the chancellor had his way.

The queen had borne so well the fatigue of the Jubilee that during the succeeding years she was encouraged to make some- what more frequent appearances among her subjects. In May 1888 she attended a performance of Sir Arthur Sullivan's Golden Legend at the Albert Hall, and in August she visited Glasgow to open the magnificent new municipal buildings, remaining for a couple of nights at Blythswood, the seat of Sir Archibald Campbell. Early in 1889 she received at Windsor a special embassy, which was the beginning of a memorable chapter of English history: two Matabele chiefs were sent by King Lobengula to present his respects to the " great White Queen," as to whose very existence, it was said, he had up till that time been sceptical. Soon afterwards her majesty went to Biarritz, and the occasion was made memorable by a visit which she paid to the queen-regent of Spain at San Sebas- tian, the only visit that an English reigning sovereign had ever paid to the Peninsula.

The relations between the court and the country formed matter in 18S9 for a somewhat sharp discussion in parliament and in the press. A royal message was brought by Mr W. PI. Smith on the 2nd of July, expressing, on the one hand, the queen's desire to provide for Prince Albert Victor of Wales, and,

on the other, informing the house of the intended marriage of the prince of Wales's daughter, the Princess Louise, to the earl (afterwards duke) of Fife. On the proposal of Mr Smith, seconded by Gladstone, a select committee mentary was appointed to consider these messages and to grant to report to the house as to the existing practice and as theptince to the principles to be adopted for the future. The ° aIld ˆ s S evidence laid before the committee explained to the country for the first time the actual state of the royal income, and on the proposal of Gladstone, amending the proposal of the government, it was proposed to grant a fixed addition of £36,000 per annum to the prince of Wales, out of which he should be expected to provide for his children without further application to the country. Effect was given to this proposal in a bill called " The Prince of Wales's Children's Bill," which was carried in spite of the persistent opposition of a small group of Radicals.*

In the spring of 1890 the queen visited Aix-les-Bains in the hope that the waters of that health resort might alleviate the rheumatism from which she was now frequently tsanni suffering. She returned as usual by way of Darmstadt, and shortly after her arrival at Windsor paid a visit to Baron Ferdinand Rothschild at Waddesdon Manor. In February she launched the battleship " Royal Sovereign " at Portsmouth; a week later she visited the Horse Show at Islington. Her annual spring visit to the South was this year paid to the little town of Grasse.

At the beginning of 1892 a heavy blow fell upon the queen in the death of the prince of Wales's eldest son Albert Victor, duke of Clarence and Avondale. He had never been jy eat ˆ of a robust constitution, and after a little more than of the a week's illness from pneumonia following influenza; tfuAe of he died at Sandringham. The pathos of his death areace. was increased by the fact that only a short time before it had been announced that the prince was about to marry his second cousin, Princess May, daughter of the duke and duchess of Teck.

The death of the young prince threw a gloom over the country, and caused the royal family to spend the year in such retirement as was possible. The queen this year paid a visit to Costebelle, and stayed there for some quiet weeks. In 1893 the country, on the expiration of the royal mourning, began to take a more than usual interest in the affairs of the royal family. On the 19th of February, the queen ■

left home for a visit to Florence, and spent it in the Villa Palmieri. She was able to display remarkable energy in visiting the sights of the city, and even went as far afield as San Gimignano; and her visit had a notable effect in strengthening the bonds of friendship between the United Kingdom and the Italian people. On 28th April she arrived home, and a few days later the prince of Wales's second son, George, duke of York (see George V.), who by his brother's death had been left in the direct line of succession to the throne, was betrothed to the Princess May, the marriage being celebrated on 6th July in the Chapel Royal of St James's Palace.

In 1894 the queen stayed for some weeks at Florence, and on her return she stopped at Coburg to witness the marriage between two of her grandchildren, the grand duke –

of Hesse and the Princess Victoria Melita of Coburg. On the next day the emperor William officially announced the betrothal of the Cesarevitch (afterwards the tsar Nicholas II.) to the princess Alix of Hesse, a granddaughter whom the queen had always regarded with special affection. Aftet a few weeks in London the queen went northwards and stopped at Manchester, where she opened the Ship Canal. Two days

afterwards she celebrated her seventy-fifth birthday in quiet at Balmoral. A month later (June 23) took place the birth of a son to the duke and duchess of York, the child receiving the thoroughly English name of Edward.

In 1895 the queen lost her faithful and most efficient private secretary, General Sir Henry Ponsonby, who for many years

Batten- berg.

had helped her in the management of her most private affairs and had acted as an intermediary between her and her ministers Death of wu:ri singular ability and success. His successor was Prince Sir Arthur Bigge. The following year, 1896, was

*Henry of marked by a loss which touched the queen even more nearly and more personally. At his own urgent request Prince Henry of Battenberg, the queen's son-in-law, was permitted to join the Ashanti expedition, and early in January the prince was struck down with fever. He was brought to the coast and put on board her majesty's ship *' Blonde," where, on the 20th, he died.*

In September 1S96 the queen's reign had reached a point at which it exceeded in length that of any other English The sovereign; but by her special request all public

Diamond celebrations of the fact were deferred until the follow- Jubiiee. | n g j une? which marked the completion of sixty years from her accession. As the time drew on it was obvious that the celebrations of this Diamond Jubilee, as it was popularly called, would exceed in magnificence those of the Jubilee of 1887, Mr Chamberlain, the secretary for the colonies, induced his colleagues to seize the opportunity of making the jubilee a festival of the British empire. Accordingly, the prime ministers of all the self-governing colonics, with their families, were invited to come to London as the guests of the country to take part in the Jubilee procession; and drafts of the troops from every British colony and dependency were brought home for the same purpose. The procession was, in the strictest sense of the term, unique. Here was a display, not only of Englishmen, Scotsmen, Irishmen, Welsh- men, but of Mounted Rifles from Victoria and New South Wales, from the Cape and from Natal, and from the Dominion of Canada. Here were Hausas from the Niger and the Gold Coast, coloured men from the West India regiments, zaptiehs from Cyprus, Chinamen from Hong

Kong, and Dyaks — now civilized into military police — from British North Borneo. Here, most brilliant sight of all, were the Imperial Service troops sent by the native princes of India; while the detachments of Sikhs who marched earlier in the procession received their full meed of admiration and applause. Altogether the queen was in her carriage for more than four hours, in itself an extraordinary physical feat for a woman of seventy-eight. Her own feelings were shown by the simple but significant message she sent to her people throughout the world: " From my heart I thank my beloved people. May God bless them." The illuminations in London and the great provincial towns were magnificent, and all the hills from Ben Nevis to the South Downs were crowned with bonfires. The queen herself held a great review at Aldershot; but a much more significant display was the review by the prince of Wales of the fleet at Spithead on Saturday, the 26th of June. No less than 165 vessels of all classes were drawn up in four lines, extending altogether to a length of 30 m.

The two years that followed the Diamond Jubilee were, as regards the queen, comparatively uneventful. Her health remained good, and her visit to Cimiez in the spring of 1898 was as enjoyable and as beneficial as before. In May 1899, after another visit to the Riviera, the queen performed what proved to be her last ceremonial function in London: she proceeded in " semi-state " to South Kensington, and laid the foundation stone of the new buildings completing the Museum —henceforth to be called the Victoria and Albert Museum — which had been planned more than forty years before by the prince consort.

Griefs and anxieties encompassed the queen during the last year of her life. But if the South African War proved more The serious than had been anticipated, it did more to

queen's weld the empire together than years of peaceful last year, progress might have accomplished. The queen's frequent messages of thanks and greeting to her colonies and to the troops sent by them, and her reception of the latter at Windsor, gave evidence of the heartfelt joy with which she saw the sons of the empire giving their lives

for the defence of its integrity; and the satisfaction which she showed in the Federation of the Australian colonies was no less keen. The reverses of the first part of the Boer cam- paign, together with the loss of so many of her officers and soldiers, caused no small part of that " great strain " of which the Court Circular spoke in the ominous words which first told the country that she was seriously ill. But the queen faced the new situation with her usual courage, devotion and strength of will. She reviewed the departing regiments; she entertained the wives and children of the Windsor soldiers who had gone to the war; she showed by frequent messages her watchful

interest in the course of the campaign and in the efforts which were being made throughout the whole empire; and her Christmas giFt of a box of chocolate to every soldier in South Africa was a touching proof of her sympathy and interest. She relinquished her annual holiday on the Riviera, feeling that at such a time she ought not to leave her country. Entirely on her own initiative, and moved by admiration for the fine achievements of " her brave Irish " during the war, the queen announced her intention of paying a long visit to Dublin; and there, accordingly, she went for the month of April 1900, staying in the Viceregal Lodge, receiving many of the leaders of Irish society, inspecting some 50,000 school children from all parts of Ireland, and taking many a drive amid the charming scenery of the neighbourhood of Dublin. She went even further than this attempt to conciliate Irish feeling, and to show her recognition of the gallantry of the Irish soldiers she issued an order for them to wear the shamrock on St Patrick's Day, and for a new regiment of Irish Guards to be constituted.

In the previous November the queen had had the pleasure of receiving, on a private visit, her grandson, the German Em- peror, who came accompanied by the empress and by two of their sons. This visit cheered the queen, and the successes of the army which followed the arrival of Lord Roberts in Africa occasioned great joy to her, as she testified by many published messages. But independently of the public anxieties of the war, and of those aroused by the violent and unexpected out- break of fanaticism in China, the year brought deep private griefs to the queen. In 1899 her grandson, the hereditary prince of Coburg, had succumbed to phthisis, and in iqoo his father, the duke of Coburg, the queen's second son, previously known as the duke of Edinburgh, also died (July 30). Then Prince Christian Victor, the queen's grandson, fell a victim to enteric fever at Pretoria; and during the autumn it came to be known that the empress Frederick, the queen's eldest daughter, was very seriously ill. Moreover, just at the end of the year a loss which greatly shocked and grieved the queen was experienced in the sudden death, at Windsor Castle, of the Dowager Lady Churchill, one of her oldest and most intimate friends. These losses told upon the queen at her advanced age- Throughout her life she had enjoyed excellent health, and even in the last few years the only marks of age were rheumatic stiffness of the joints, which prevented walking, and a diminished power of eyesight. In the autumn of 1900, however, her health began definitely to fail, and though arrangements were made Death for another holiday in the South, it was plain that her of the strength was seriously affected. Still she continued Queen, the ordinary routine of her duties and occupations. Before Christmas she made her usual journey to Osborne, and there on the 2nd of January she received Lord Roberts on his return from South Africa and handed to him the insignia of the Garter. A fortnight later she commanded a second visit from the field- marshal; she continued to

transact business, and until a week before her death she still took her daily drive. A sudden loss of power then supervened, and on Friday evening, the i8th of January, the Court Circular published an authoritative announcement of her illness. On Tuesday, the 22nd of January 1901, she died.

Queen Victoria was a ruler of a new type. When she ascended the throne the popular faith in kings and queens was on the decline. She revived that faith; she consolidated her throne; she not only captivated the affections of the multitude, but

won the respect of thoughtful men; and all this she achieved by methods which to her predecessors would have seemed im- practicable — methods which it required no less shrewdness to discover than force of character and honesty of heart to adopt steadfastly. Whilst all who approached the queen bore witness to her candour and reasonableness in relation to her ministers, all likewise proclaimed how anxiously she considered advice that was submitted to her before letting herself be persuaded that she must accept it for the good of her people.

Though richly endowed with saving common sense, the queen was not specially remarkable for high development of any specialized intellectual force. Her whole life, public and private, was an abiding lesson in the paramount importance of character. John Bright said of her that what specially struck him was her absolute truthfulness. The extent of her family connexions, and the correspondence she maintained with foreign sovereigns, together with the confidence inspired by her personal character, often enabled her to smooth the rugged places of international relations; and she gradually became in later years the link between all parts of a demo- cratic empire, the citizens of which felt a passionate loyalty for their venerable queen.

By her long reign and unblemished record her name had become associated inseparably with British institutions and imperial solidarity. Her own life was by choice, and as far as her position would admit, one of almost austere simplicity and homeliness; and her subjects were proud of a royalty which involved none of the mischiefs of caprice or ostentation, but set an example alike of motherly sympathy and of queenly dignity. She was mourned at her death not by her own country only, nor even by all English-speaking people, but by the whole world. The funeral in London on the ist and 2nd of February, including first the passage of the coffin from the Isle of Wight to Gosport between lines of warships, and secondly a military procession from London to Windsor, was a memorable solemnity: the greatest of English sovereigns, whose name would in history mark an age,

had gone to her rest.

There is a good bibliographical note at the end of Mr Sidney Lee's article in the National Dictionary of Biography. See also the Letters of Queen Victoria (1907), and the obituary published by The Times, from which some passages have been borrowed above. (H . Ch.)

VICTORIA (or Vittoria), TOMMASSO LUDOVICO DA

(r. 1540-c. 1013), Spanish musical composer, was born at Avila (unless, as Haberl conjectures, his title of Presbyter Abulensis refers not to his birthplace but to his parish as priest, so that his name would indicate that he was born at Vittoria). In rS73 he was appointed as Maestro di Cappella to the Collegium Germani- cum at Rome, where he had probably been trained. Victoria left Rome in rˆSg, being then appointed vice-master of the Royal Chapel at Madrid, a post which he held until 1602. In r6o3 he composed for the funeral of the empress Maria the greatest requiem of the Golden Age, which is his last known work, though in 1613 a contemporary speaks of him as still living. He was not ostensibly Palestrina's pupil; but Palestrina had the main influence upon his art, and the personal relations between the two were as intimate as were the artistic. The work begun by Morales and perfected by Palestrina left no stumbling-blocks in Victoria's path and he was able from the outset to express the purity of his ideals of religious music without having to sift the good from the bad in that Flemish tradition which had entangled Palestrina's path while it enlarged his stvlc. From Victoria's first publication in 1572 to his last requiem (the Ojjkium Defunctorum of 1605) there is practically no change of style, all being pure church music of unswerving loftiness and showing no inequality except in concentration of thought. Like his countryman and predecessor Morales, he wrote no secular music; 1 yet he differs from Morales, perhaps more than can be accounted for by his later date, in that his devotional spirit is impulsive rather than ascetic. His work

1 One French song is mentioned by Hawkins, but no secular music appears in the prospectus of the modern complete edition of his works published by Breitkopf and Hartel.

is the crown of Spanish music: music which has been regarded as not constituting a special school, since it absorbed itself so thoroughly in the Rome of Palestrina. Yet, as has been aptly pointed out in the admirable article " Vittoria " in Grove's Dictionary of Music and Musicians, Roman music owes so much to that Spanish school which produced Guerrero, Morales and Victoria, that it might fairly be called the Hispano- Roman

school. In spite of the comparative smallness of Victoria's output as compared with that of many of his contemporaries, there is no mistaking his claim to rank with Palestrina and Orlando di Lasso in the triad of supreme 16th-century masters. In any extensive anthology of liturgical polyphony such as the Muska Divina of Proske, his work stands out as impressively as Palestrina's and Lasso's; and the style, in spite of a resemblance to Palestrina which amounts to imitation, is as individual as only a successful imitator of Palestrina can be. That is to say, Victoria's individuality is strong enough to assert itself by the very act of following Palestrina's path. When he is below his best his style does not become crabbed or harsh, but over-facile and thin, though never failing in euphony. If he seldom displays an elaborate technique it is not because he conceals it, or lacks it. His mastery is unfailing, but his methods are those of direct emotional effect; and the intellectual qualities that strengthen and deepen this emotion are themselves innate and not sought out. The emotion is reasonable and lofty, not because he has trained himself to think correctly, but because he does not know that any one can think otherwise. His works fill eight volumes in the complete edition of Messrs Breitkopf and Hartel. (D. F. T.)

VICTORIA, a British colonial state, occupying the south- eastern corner of Australia. Its western boundary is in 140° 58′ E.; on the cast it runs out to a point at Cape Howe, in 150 E. long., being thus rudely triangular in shape; the river Murray constitutes nearly the whole of the northern 1 boundary, its most northerly point being in 34° S. lat.; the southern boundary is the coast-line of the Southern Ocean and of Bass Strait; the most southerly point is Wilson's Promontory in 39° S. lat. The greatest length east and west is about 480 m.; the greatest width, in the west, is about 250 m. The area is officially stated to be 87,884 sq. Tn.

The coast-line may be estimated at about 800 m. It begins about the 141st meridian with bold but not lofty sand- stone cliffs, worn into deep caves and capped by grassy undu- lations, which extend inland to pleasant park-like lands. Capes Bridgewater and Nelson form a peninsula of forest lands, broken by patches of meadow. To the east of Cape Nelson lies the moderately sheltered inlet of Portland Bay, consisting of a sweep of sandy beach flanked by bold granite rocks. Then comes a long unbroken stretch of high cliffs, which, owing to insetting currents, have been the scene of many calamitous wrecks. Cape Ot way is the termination of a wild mountain range that here abuts on the coast. Its brown cliffs rise vertically from the water; and the steep slopes above are covered with dense forests of exceedingly tall timber and tree-ferns. Eastwards from this cape the line of cliffs gradually diminishes in height to about 20 to 40 ft. at the entrance to Port Phillip. Next comes Port Phillip Bay, at the head of which stands the city of Melbourne. When the tide recedes from this bay through

the narrow entrance it often encounters a strong current just outside; the broken and somewhat dangerous sea thus caused is called "the Rip." East of Port Phillip Bay the shores consist for 15 m. of a line of sandbanks; but at Cape Schanck they suddenly become high and bold. East of this comes Western Port, a deep" inlet more than half occupied by French Island and Phillip Island. Its shores are flat and uninteresting, in some parts swampy. The bay is shallow and of little use for navigation. The coast continues rocky round Cape Liptrap. Wilson's Promontory is a great rounded mass of granite hills, with wild and striking scenery, tree-fern gullies and gigantic gum-trees, connected with the mainland by a narrow sandy isthmus. At its extremity lie a multitude of rocky islets, with steep granite edges. North of this cape, and

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opening to the east, lies Comer Inlet, which is dry at low water. The coast now continues low to the extremity of the colony. The slight bend northward forms a sort of bight called the Ninely Mile Beach, but it really exceeds that length. It is an unbroken line of sandy shore, backed by low sandhills, dn which grows a sparse dwarf vegetation. Behind these hills comes a succession of lakes, surrounded by excellent land, and beyond these rise the soft blue outlines of the mountain masses of the interior. The shores on the extreme east are somewhat higher, and occasionally rise in bold points. They terminate in Cape Howe, off which lies Gabo Island, of small extent but containing 1 an important lighthouse and signalling station.

The western half of Victoria is level or slightly undulating, and as a rule tame in its scenery, exhibiting only thinly timbered grassy lands, with all the appearance of open parks. . The north-west corner of the colony, equally flat, is dry and sometimes sandy, and frequently bare of vegetation, though in one part some seven or eight millions of acres are covered with the dense brushwood known as " mallee scrub." This wide western plain is slightly broken in two places. In the south the wild ranges of Cape Otway are covered over a considerable area with richly luxurious but almost impassable forests. This district has been reserved as a state forest and its coast forms a favourite holiday resort, the scenery being very attractive. The middle of the plain is crossed by a thin line of mountains, known, as the Australian Pyrenees, at the western extremity of which_ there are

several irregularly placed transverse ranges, the chief being the Grampians, the Victoria Range and the Sierra Range. Their highest point is Mount William (3600 feet). The eastern half of the colony is wholly different. Though there is plenty of level land, it occurs in small patches, and chiefly in the south, in Gippsland, which extends from Corner Inlet to Cape Howe. But a great part of this eastern half is occupied with the complicated mass of ranges known collectively as the Australian Alps. The whole forms a plateau averaging from 1000 to 2000 ft. high, with many smaller table-

lands ranging from 3000 to 5000 ft. in height. The highest peak, Bogong, is 6308 ft. in altitude. The ranges are so densely covered with vegetation that it is extremely difficult to penetrate them. About fifteen peaks over 5000 ft. in height have been measured. Along the ranges grow the giant trees for which Victoria is famous. The narrow valleys and gullies contain exquisite scenery, the rocky streams being overshadowed by groves of graceful tree-ferns, from amid whose waving fronds rise the tall smooth stems of the white gums. Over ten millions of acres are thus covered with forest-clad mountains which in due time will become a very valuable asset of the state. The Australian Alps arc connected with the Pyrenees by a long ridge called the Dividing Range (1500 to 3000 ft. high).

Victoria is fairly well watered, but its streams are generally too small to admit of navigation. This, however, is not the case with _. the Murray river (

‘ 670 m. (or 1250 m. if its various windings be followed) formfc the boundary between New South Wales and Victoria; it receives a number of tributaries from the Victorian side. The Mitta Mitta, which rises in the heart of the. Australian Alps, is Igo m. long. The Ovens, rising among the same mountains, is slightly shorter. The Goulburn (340 m.) Bows almost entirely through well-settled agricultural country, and is deep enough to be used in its lower part for navigation. The valley of this river is a fertile grain- producing district. The Campaspe (150 m.) has too little volume of water to be of use for navigation ; its valley is also agricultural, and along its banks there lie a close succession of thriving town- ships. The Loddon (over 200 m.) rises in the Pyrenees. The upper part flows through a plain, to the right agricultural and to the left auriferous, containing nearly forty thriving towns, including Bendigo (formerly named Sandhurst) and Castlemaine. In the lower part of the valley the soil is also fertile, but the rainfallis small. To the west of the Loddon is the Avoca river with a length of 140 in.; it is of slight volume, and though it flows towards the Murray it loses itself in marshes and salt lagoons before reaching that river.

The rivers which flow southwards into the ocean are numerous. The Snowy river rises in New South Wales, and in Victoria Mows entirely through wild

and almost wholly unoccupied territory.

VICTORIA (AUSTRALIA)

The Tambo (120 m. long), which rises in the heart of the Australian Alps, crosses the Gippsland plains and falls into Lake King, one of the Gippsland lakes; into the same lake falls the Mitchell river, rising also in the Australian Alps. The Mitchell is navigated for a short distance. The Latrobe empties itself into Lake Wellington after a course of 135 m.; it rises at Mount Baw Baw. The Yarra Yarra rises in the " Black Spur " of the Australian Alps. Emerging in a deep valley from the ranges, it follows a sinuous course through the undulating plains called the " Yarra Flats," which are wholly enclosed by hills, on whose slopes are some of the best vineyards of Australia; it finds its way out of the Flats between high and pre- cipitous but well-wooded banks, and finally reaches Port Phillip Bay below Melbourne. Owing to its numerous windings its course through that city and its suburbs is at least thirty miles. Nearer to the sea its waterway, formerly available for vessels drawing 16 ft., has now been deepened so as to be available for vessels drawing 20 ft. The Barwon, farther west, is a river of considerable length but little volume, flowing chiefly through pastoral lands.. The Hopkins and Glenelg (280 m.) both water the splendid pastoral lands of the west, the lower course of the former passing through the fertile district of Warrnambool, well known throughout Australia as a potato-growing region.

In the west there are Lakes Corangamite and Colac, due north of Cape Otway. The former is intensely salt; the latter is fresh, having an outlet for its waters. Lakes Tyrrell and Hindmarsh lie in the plains of the north-west. In summer they are dried up, and in winter are again formed by the waters of rivers that have no outlet. In the east are the Gippsland lakes, formed by the waters of the Latrobe. Mitchell and Tambo, being dammed back by the sandhills of the Ninety Mile Beach. They are connected with Bass Strait by a narrow and shifting channel through a shallow bar; the government of Victoria has done a great deal of late years to deepen the entrance and make it safer. The upper lake is called Lake Wellington; a narrow passage leads into Lake Victoria, which is joined to a wider expanse called Lake King. These arc all fresh-water lakes and are visited by tourists, being readily accessible from Melbourne. (T. A. C.)

Geology. — Victoria includes a more varied and complete geo- logical sequence than any other area of equal size in Australia. Its geological foundation consists of a Band of Archean and Lower Palaeozoic rocks, which forms the backbone of the state. The sedimentary rocks in this foundation have been thrown into folds, of which the axes trend approximately north and south. The Lower Palaeozoic and Archean rocks

build up the Highlands of Victoria, which occupy the whole width of the state at its eastern end, extending from the New South Wales border on the north to the shore of the Southern Ocean on the south. These Highlands- constitute the whole of the mountainous country of Gippsland and the north-eastern districts. They become narrower to the west, and finally, beyond the old plateau of " Dundas, disappear beneath the recent loams of the plains along the South Australian border. The Lower Palaeozoic and Archean rocks bear upon their surface some Upper Palaeozoic rocks, which occur iri belts running north and south, and have been preserved by infolding or faulting; such are the Grampian Sandstones in the west; the Cathedral Mountain Sandstones to the north-east of Melbourne; the belt of Devonian and Lower Carboniferous rocks that extends across eastern Victoria, through Mount Wellington to Mansfield; and finally, far to the east, is the belt of the Snowy river porphyries, erupted by a chain of Lower Devonian volcanoes. Further Upper Palaeozoic rocks and the Upper Carboniferous glacial beds occur in basins on both northern and southern flanks of the Highlands. The Mesozoic rocks are confined to southern Victoria; they build up the hills of southern Gippsland and the Otway Ranges; and farther west, hidden by later rocks, they occur underthe coast of the western district. Between the southern mountain chain and the Victorian Highlands occurs the Great Valley of Victoria, occupied by sedimentary and volcanic rocks of Kainozoic age. The North- western Plains, occurring between thenorthern foot of the Highlands and the Murray, are occupied by Kainozoic sediments.

*Victoria has a fairly complete geological sequence, though it is poorer than New South Wales in the Upper Carboniferous and Lower Mesozoic. The Archean roc*ks form two blocks of gneisses and schists, which build up the Highlands of Dundas in the west, and of the north-eastern part of Victoria. They were originally de- scribed as metamorphosed Silurian rocks, but must be of Archean age. Another series of Archean rocks is more widely developed, and forms the old framework upon which the geology of Victoria has been built up. They are known as the Heathcotian series, and consist of phyllites, schists and amphibolites ; while their most characteristic feature is the constant association of foliated diabase and beds of jasperoids. Volcanic agglomerates occur in the series it the typical locality of Heathcote. The Heathcotian rocks form the Coibinabbin Range, which runs for 40 m. northward and southward, east of Bendigo. They are also exposed on the surface at the eastern foot of the Grampian Range, and at Dookie, and on the southern coast in Waratah Bay; they have been proved by bores under Rushworth, and they apparently underlie parts uf the Gipps- land coalfields. The Cambrian rocks have so far only been de-*

finitely proved near Mansfield. Mr A. M. Howkt has there collected some fragmentary remains of Olenellus and worm tubes of the Cambrian genus Salterella. These beds at Mansfield contain phos- phatic limestones and wavellite.

The Ordovician system is well developed. It' consists of slates and quartzites; and some schists around the granites of the western district, and in the Pyrenees, are regarded as metamorphic Ordovician. The Ordovician has a rich graptolitic fauna, and they have been classified into the following divisions : —

Upper Ordovician . Darriwill Series

i Castlemaine Series

Lower Ordovician . .] Bendigo Series

(Lancefield Series

The Ordovician beds are best developed in a band running norths north-west and south-south-east across Victoria, of which the eastern boundary passes through Melbourne. This Ordovician band begins on the south with the block forming the plateau of Arthur's Seat and Mornington Peninsula, as proved by Ferguson. This outlier is bounded to the north by the depression of Port Phillip and the basalt plains west of Melbourne. It reappears north of them at Lancefield, whence it extends along the Highlands, past Ballarat, with southern outliers as far as Steiglitz. It forms the whole of the Ballarat Plateau, and is continued northward through the goldfields of Castlemaine, Bendigo and the Pyrenees, till it dips under the North- Western Plains. Certain evidence as to the age of the rocks in the Pyrenees has not yet been collected, and they may be pre-Ordovician. Some Upper Ordovician rocks occur in the mountains of eastern Gippsland, as near Woods Point, and in north-eastern Victoria, in Wombat Creek.

The Silurian system consists of two divisions: the lower or Mel- bournian, and the upper or Yeringian. Both consist in the main of sandstones, quartzites and shales; but the upper series includes lenticular masses of limestone, at Lillydale, Loyola and along the Thomson river. The limestones are rich in typical Silurian corals and bryozoa, and the shales and sandstones contain brachio- pods and trilobites. The Silurian rocks are well exposed in sections near Melbourne; they occur in a belt running from the southern coast at Waratah Bay, west of Wilson's Promontory, north-north-west- ward across Victoria, and parallel to the Ordovician belt, which underlies them on the west. The Silurian rocks include the gold- fields of the Upper Yarra, Woods Point, Walhalla and Rushworth, while the

limestones are worked for lime at Lillydale and Waratah Bay. The Devonian system includes representatives of the lower, middle and upper series. The Lower Devonian series includes the porphyries and their associated igneous rocks, along the valley of the Snowy river. They represent the remains of an old chain of volcanoes which once extended north and south across Victoria. The Middle Devonian is mainly formed of marine sandstones, and lime- stones in eastern Gippsland. It is best developed in the valleys of the Mitchell, the Tambo and the Snowy rivers. The Upper Devonian rocks include sandstones, shales and coarse conglomerates. At the close of Middle Devonian times there were intense crustal disturbances, and the granitic massifs, which formed the primitive mountain axis of Victoria, were then intruded.

The Carboniferous system begins with the Avon river sandstones, containing Leptdodendron, and the red sandstones, with Lower Carboniferous fish, collected by Mr Geo; Sweet near Mansfield. Probably the Grampian Sandstone, the Cathedral Mountain Sand- stone, and some in the Mount Wellington district belong to the same period. The Upper Carboniferous includes the famous glacial deposits and boulder clays, by which the occurrence of a Carboni- ferous glaciation in the Southern Hemisphere was first demonstrated. These beds occur at Heathcote, Bendigoˆ the Loddon Valley, southern Gippsland and the North-Eastern district. The beds comprise boulder clay, containing ice-scratched boulders, and sometimes rest upon ice- scratched, moutonn6 surfaces, and some lake deposits, similar to those laid down in glacial lakes. The glacial beds are overlain by sandstones containing Gangamopteris, and Kitson's work in Northern Tasmania leaves no doubt that they are on the horizon of the Greta or Lower Coalˆ Measures of New South Wales.

The Mesozoic group is represented only by Jurassic rocks, which form the mountains of southern Gippsland and include its coal- fields. The rocks contain fossil land plants, occasional fish remains and the claw of a dinosaur, &c. The coal is of excellent quality. The mudstones, which form the main bulk of this series, are largely composed of volcanic debris, which decomposes to a fertile soil. These rocks trend south-westward along the Bass Range, which reaches Western Port- They skirt the Mornington Peninsula,, underlie part of Port Phillip and the Bellarine Peninsula, and are exposed in the Barrabool Hills to the south-west of Geelong; thence they extend into the Otway Ranges, which are wholly built of these rocks and contain some coal seams. Farther west they disappear below the recent sediments and volcanic rocks of the Warrnambool district. They are exposed again in the Portland Peninsula, and rise again to form the Wannon Hills, to the south of Dundas.

The Kainozoic beds include three main series: lacustrine, marine and

volcanic. The main lacustrine series is probably of OHgocene

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age, and is important from its thick beds of brown coal, which are thickest in the Great Valley of Victoria in southern Gippsland. A cliff face on the banks of the Latrobe, near Morwell, shows go ft. of it, and a bore near Morwell is recorded as having passed through 850 ft. of brown coal. Its thickness, at least in patches, is very great. The brown coals occur to the south-east of Melbourne, under the basalts between it and Geelong. Brown coal is also abundant under the Murray plains in north-western Victoria. The Kainozoic marine rocks occur at intervals along the southern coast and in the valleys opening from it. The most important horizon is apparently of Miocene age. The rocks occur at intervals in eastern Victoria, along the coast and up the river valleys, from the Snowy river westward to Alberton. At the time of the deposition of these beds Wilson's Promontory probably extended south-eastward and joined Tasmania; for the mid- Kainozoic marine deposits do not occur between Alberton and Flinders, to the west of Western Port. They extend up the old valley of Port Phillip as far as Kcilor to the north of Melbourne, and are widely distributed under the volcanic rocks of the Western Plains. They are exposed on the floors of the volcanic cauldrons, and have been found by mining operations under the volcanic rocks of the Ballarat plateau near Pitfield. The Miocene sea extended up the Glenelg valley, round the western border of the Dundas Highlands, and spread over the Lower Murray Basin into New South Wales; its farthest south-eastern limit was in a valley at Stawell. Some later marine deposits occur at the Lakes Entrance in eastern Gippsland, and in the valley of the Glenelg.

The volcanic series begins with a line of great dacite domes including the geburite-dacite of Macedon, which is associated with solvsbergites and trachy-dolerites. The eruption 0/ these domes was followed by that of sheets of basalt of several different ages, and the intrusion of some trachyte dykes. The oldest basalts are associated with the Oligocene lake deposits; and fragments of the large lava sheets of this period form some of the table-topped moun- tains in the Highlands of eastern Victoria. The river gravels below the lavas have been worked for gold, and land plants discovered in the workings. At Flinders the basalts are associated with Miocene limestones. The largest development of the volcanic rocks are a series of confluent sheets of basalt, forming the Western Plains, which occupy over 10,000 sq. m. of south-western Victoria. They are crossed almost continuously by the South- Western railway for 166 m. from Melbourne to Warrnambool. The volcanic craters built up by later eruptions are well preserved: such arc Mount Elephant, a simple breached cone; Mount Noorat, with a large primary crater and four secondary craters on its

flanks; Mount Warrenheip, near Ballarat, a single cone with the crater breached to the north-west. Mount Franklin, standing on the Ordovician rocks north of Daylesford, is a weathered cone breached to the south-east. In addition to the volcanic craters, there are numerous volcanic cauldrons formed by subsidence, such as Bullen- merri and Gnotuk near Camperdown, Keilembete near Terang, and Tower Hill near Port Fairy. Tower Hill consists of a large volcanic cauldron, and rising from an island in a lake on its floor is a later volcanic crater.

The Pleistocene, or perhaps Upper Pliocene, deposits of most interest are those containing the bones of giant marsupials, such as the Diprotodon and Palorchestes, which have been found near Geelong, Castlemaine, Lake Kolungulak, &c; at the last locality Diprotodon and various extinct kangaroos have been found in association with the dingo. There is no trace in these deposits of the existence of man, and J. W. Gregory has reasserted the striking absence of evidence of man's residence in Victoria, except for a very limited period. There is no convincing evidence of Pleistocene glacial deposits in Victoria. Of the many records, the only one that can still be regarded as at all probable is that regarding Mount Bogong.

The chief literature on the geology of Victoria is to be found in the maps and publications of the Geological Survey— a branch of the Mines Department. A map of the State, on the scale of eight inches to the mile, was issued in 1902. The Survey has published numerous quarter-sheet maps, and maps of the gold fields and parishes. The geology is described in the Reports, Bulletins and Memoirs of the Survey, and in the Quarterly Reports of the Mining Registrars. Statistics of the mining industry are stated in the Annual Report of the Secretary for Mines. See also the general summary of the geology of Victoria, by R. Murray, issued by the Mines Department in 1887 and 1895. Numerous papers on the geology of the State are contained in the Trans. R. Soc. Victoria, and on its mining geology in the Trans, of the Austral. Inst. Min. Engineers. The physical geography has been described by J. W. Gregory in the Geography of Victoria (1903). (J. W. G.)

Flora. — The native trees belong chiefly to the Myrtaceae, being largely composed of Eucalypti or gum trees. There are several hundred species, the most notable being Eucalyptus amygdalina, a tree with tall white stem, smooth as a marble column, and without branches for 60 or 70 ft. from the ground. It is singularly beautiful when seen in groves, for these have all the appearance of lofty pillared cathedrals. These trees are among the tallest in the world, averaging in some districts about 300 ft. The longest ever measured was found prostrate on the Black Spur: it measured

470 ft. in length; it was 81 ft. in girth near the root. Eucalyptus globulus or blue gum has broad green leaves, which yield the eucalyptus oil of the pharmacopoeia. Eucalyptus roslrata is ex- tensively used in the colony as a timber, being popularly known as red gum or hard wood. It is quite unaffected uy weather, and almost indestructible when used as piles for piers or wharves. Smaller species of eucalyptus form the common " bush." Mela- leucas, also of Myrtacea kind, are prominent objects along all the coasts, where they grow densely on the sand-hills, forming " ti-tree " scrub. Eucalyptus dumosa is a species which grows only C to 12 ft. high, but with a straight stem; the trees grow so close together that it is difficult to penetrate the scrub formed by them. Eleven and a half million acres of the Wimmera district are covered with this " mallee scrub," as it is called. Recent legislation has made this land easy of acquisition, and the whole of it has been taken up on pastoral leases. Five hundred thousand acres have recently been taken up as an irrigation colony on Californian principles and laid out in 40-acre farms and orchards. The Leguminosae are chiefly represented by acacias, of which the w r attle is the commonest. The black wattle is of considerable value, its gum being marketable and its bark worth from £5 to £10 a ton for tanning purposes. The golden wattle is a beautiful tree, whose rich yellow blossoms fill the river-valleys in early spring with delicious scent. The Casuarinae or she-oaks are gloomy trees, of little use, but of frequent occurrence. Heaths, grass-trees and magnificent ferns and fern-trees are also notable features in Victorian forests. But European and subtropical vegetation has been introduced into the colony to such an extent as to have largely altered the characters of the flora in many districts.

Fauna.— The indigenous animals belong almost wholly to the Marsupialia. Kangaroos are tolerably abundant on the grassy plains, but the process of settlement is causing their extermination. A smaller species of almost identical appearance called the wallaby is still numerous in the forest lands. Kangaroo rats, opossums, wombats, native bears, bandicoots and native cats all belong to the same class. The wombat forms extensive burrows in some districts. The native bear is a frugivorous little animal, and very harmless. Bats are numerous, the largest species being the flying fox, very abundant in some districts. Eagles, hawks, turkeys, pigeons, ducks, quail, snipe and plover are common; but the characteristic denizens of the forest .are vast flocks of parrots, parakeets and cockatoos, with sulphur-coloured or crimson crests. The laughing, jackass (giant kingfisher) is heard in all the country parts, and magpies are numerous everywhere. Snakes are numerous, but less than one-fourth of the species are venomous, and they are all very shy. The deaths from snake-bite do not average two per annum. A great change is rapidly taking place in the fauna of the country, owing to cultivation and acclimatization. Dingoes have nearly

disappeared, and rabbits, which w r ere introduced only a. few years ago, now abound in such numbers as to be a positive nuisance. Deer are also rapidly becoming numerous. Sparrows and swallows are as common as in England. The trout, which has also been acclimatized, is taking full possession of some of the streams.

*Climate.— Victoria enjoys an exceptionally fine climate. Roughly speaking, about one-half of the days in the year present a bright, cloudless sky, with a bracing and dry atmosphere, pleasantly warm but not relaxing. These days are mainly in the autumn and spring. During forty-eight years, ending with 1905, there have been on an average 132 days annually on which rain has fallen more or less (chiefly in winter, but rainy days do not exceed thirty in the year. The average yearly rainfall was 25-61 in. The disagreeable feature of the Victorian climate is the occurrence of north winds, which blow on an average about sixty days in the year. In winter they, are cold and dry, and have a slightly depressing effect; but in summer they are hot and dry, and generally bring with them disagreeable clouds of dust. The winds themselves blow for periods of two or three days at a time, and if the summer has six or eight such periods it becomes relaxing and produces languor. These winds cease with extraordinary suddenness, being replaced in a minute or two by a cool and bracing breeze from the south. The temperature often falls 40° or 50 F. in an hour. The maximum shade temperature at Melbourne in 1905 was 108-5°, and the minimum 32 ,. giving a mean of 56-1°. The temperature never falls below freezing-point, except for an hour or two before sunrise in the coldest month. Snow has been known to fall in Melbourne for a few minutes two or three times during a long period of years. It is common enough, however, on the plateau; Ballarat, which is over 1000 ft. high, always has a few snowstorms, and the roads to Omeo among the Australian Alps lie under several leet of snow in the winter. The general healthiness of the climate is shown by the fact that the average death-rate for the last five years has been only 12*71 of the population.*

Population. — As regards population, Victoria maintained the leading position among the Australasian colonies until the end of 1891, when New South Wales overtook it. The population in 1905 was r, 218,571, the proportion of the sexes being nearly equal. In i860 the population numbered 537,847; in 1870,

720,599; in 1880, 860,067; and in 1890, 1,133,266. The state had gained little, if anything, by immigration during these years, for the excess of immigration over emigration from 1861 to 1870 and from 1881 to 1890 was counterbalanced by the excess of departures during the period

1871 to 1880 and from 1891 to 1905. The mean population of Melbourne in 1905 was 51 1,900.

The births in 1905 numbered 30,107 and the deaths 14,676, representing respectively 24-83 and 12-10 per 1000 of the popula- tion. The birth-rate has fallen markedly since 1875, as the following statement of the averages arranged in quinquennial periods shows: —

Period.

Births per iooo of Population.

Period.

Births per iooo of Population.

1861-65 1866-70

1871-75 1876-80

43-3Q

39-27 35-69 31-43

1881-85

1886-90

1891-95

1 896- 1 900

1901-1905

30-76 32-72 31-08 26-20 24-97

The number of illegitimate births during 1905 was 1689, which gives a proportion of 5-61 to every 100 births registered. The death-rate has greatly improved. Arranged in quinquennial periods the death-rates were: —

Period.

Deaths per iooo of Population.

Period.

Deaths per iooo of Population.

1861 -65 1866-70

IS7I-75

1876-80

I7-36

16-52 15-64 14-92

1881-85

1886-90

1891-95

1 896-1 900

1901-1905

14-65 16-07 14-10

I3-67

12-71

*The marriages in 1905 numbered 8774, which represents a rate of 7-24 per 1000 persons. This was the highest number reached during a period ol fourteen years, and was 564 more than in 1904 and 1 169 more than in 1903. In the five years 1871-75 the marriage- rate stood at 6-38 per iooo; in 1876-80, 6-02; in 1881-85, 7*37; in 1886-90, 8-13; in 1901-5, 6-86.*

Outside Melbourne and suburbs, the most important towns are Ballarat (49,648), Bendigo (43,666), Geelong (26,642), Castlemaine (8063), Warrnambool (6C00), Maryborough (6000) and Stawell

(5 2 00).

Religion. — The Church of England, as disclosed at the census of 1901, had 432,704 adherents; the Roman Catholic Church came next with 263,710; the Presbyterians had 190,725; Weslcyans and Methodists, 180,272 ; Congregationalists, 17,141 ; Baptists, 32,648; Lutherans, 13,935; Jews, 5907; and the Salvation Army, whose Australian headquarters are in Melbourne, 8830.

Education. — There were in 1905 1930 state schools, in which there were 210,200 children enrolled, the teachers numbering 4689. There were also 771 private schools with 2289 teachers and a net enrolment of 43,014 children; the majority of them being connected with one or other of the principal religious denominations. The total cost of primary instruction in 1905 was £676,238, being ns. 2d. per head of population and £4, 14s. 40!. per head of scholars in average attendance. Melbourne University maintains its high position as a teaching body. In 1905 the number of matriculants was 493 and the graduates 118.

Crime is decreasing. In 1905 the number of persons brought before the magistrates was 48,345. Drunkenness accounted for 14,458, which represents 1 1 -92 per 1 000 of the population : in 1901 the proportion was 14-43. Charges against the person numbered 1932, and against property 4032.

Administration. — As one of the six states of the Common- wealth, Victoria returns six senators and twenty-three repre- sentatives to the federal parliament. The local legislative authority is vested in a parliament of two chambers, both elective — the Legislative Council, composed of thirty-five members, and the Legislative Assembly, composed of sixty-eight members. One-half of the members of the Council retire every three years. The members of the Assembly are elected by universal suffrage for the term of three years, but the chamber can be dissolved at any time by the Governor in council. Members of the Assembly are paid £300 a year.

The whole of Victoria in 1905 was under the control of munici- palities, with the exception of about 600 sq. m. in the mountain- ous part of Wonnangatta, and 64 sq. m. in French Island. The number of municipalities in that year was 206; they comprised 11 cities, 11 towns, 38 boroughs and 146 shires.

Finance. — The public revenue in 1905 showed an increase on that of the three previous years, being £7,515,142, equal to £6, 45. 2d. per head of population; the expenditure amounted to £7,343,742, which also showed a slight increase and was equal to £6, is. 4d. per inhabitant. The public revenue in five-yearly periods since 1880 was: 1880, £4,621,282; 1885, £6,290,361; 1890, £8,519,159; 1895. £6,712,512; and 1901, £7,722,397. The chief sources of revenue in 1905 were: Customs duties (federal refunds), £2,017,378; other taxation, £979,029; railway receipts, £3,609,120; public lands, £408,836; other sources, £501,379. Dtie main items of expenditure were : railways (working expenses), £2,004,601 ;

public instruction, £661,794; interest and charges on public debt, £1,884,208; other services, £2,793,139. On the 30th of June 1905 the public debt of the state stood at £51,513,767, equal to £42, 9s. 7d. per inhabitant. The great bulk of the proceeds of loans was applied to the construction of revenue-yielding works, only about three millions sterling being otherwise used.

Up to 1905 the state had alienated 26,346,802 acres of the public domain, and had 17,994,233 acres underlease; the area neither alienated nor leased amounted to 11,904,725 acres.

The capital value of properties as returned by the municipalities in 1905 was £210,920,174, and the annual value £11,743,270. In 1884 the values were 104 millions and £8,099,000, and in 1891, 203 millions and £i3-734 I ooo; the year last mentioned marked the highest point of inflation in land values, and during the following years there was a vast reduction, both in capital and in annual values, the lowest point touched being in 1895; since 1895 a gradual improvement has taken place, and there is every evidence that this improvement will continue. The revenues of municipalities are derived chiefly from rates, but the rates are largely supplemented by fees and licences, and contributions for services rendered. Ex- cluding government endowments and special grants, which in 1905 amounted to £90,572, the revenues of the municipalities in the years named were: 1880, £616,132; 1885, £789,429; 1890, £i-273>855; 1895, £1,038,720; 1900, £1,036,497; 1905, £1,345,221. In addition to the municipalities there are other local bodies empowered to levy rates; these and their revenues in 1905 were: Melbourne Harbour Trust, £189,983; Melbourne and Metropolitan Board of Works, £390,441 ; Fire Boards, £53,279. The Board of Works is the authority administering the metropolitan water and sewerage works. Excluding revenue from services rendered, the amount of taxation levied in Victoria reached in 1905 £4,621,608; of this the federal government levied £2,488,843, the state government £979,029, the municipalities £986,009, and the Melbourne Harbour Trust £167,727.

Productions and Industry: Minerals. — About 25,40c persons find employment in the goldfields, and the quantity of gold won in 1905 was 810,050 oz., valued at £3.173.744, a decrease of 10,96702. as compared with 1904. The dividends paid by gold-mining com- panies in 1905 amounted to £454,431, which, although about the average of recent years, showed a decline of £168,966 as compared with the sum distributed in 1904. Up to the close of 1905 the total value of gold won from the first discovery in 1S51 was £273,236,500. No other metallic minerals are systematically worked, although many valuable deposits are known to exist. Brown coal, or lignite, occurs extensively, and attempts have

frequently been made to use the mineral for ordinary fuel purposes, but without much success. Black coal is now being raised in increasingly large quantities. The principal collieries are the Outrim Howitt, the Coal Creek-Proprietary, the Jumbunna and the Korumburra, all in the Gipps- land district. The production of coal in 1905 was 155,185 tons, valued at £79,060; £4100 worth of silver and £11,159 worth of tin were raised; the value of other minerals produced was £93>39 2 » making a total mineral production (exclusive of gold) of £i87,7n..

Agriculture. — Judged by the area under tillage, Victoria ranks first among the states of the Australian group. The area under crop in 1905 was 4,269,877 acres, compared with 2,116,000 acres in 1891 and 1,435,000 acres in 1881. Wheat-growing claims the chief attention, 2,070,517 acres being under that cereal in 1905. The areas devoted to other crops were as follows: maize, 11,785 acres; oats, 312,052 acres; barley, 40,938 acres; other cereals, 14,212 acres; hay, 591,771 acres; potatoes, 44,670 acres; vines, 26,402 acres; green foliage, 34,041 acres; other tillage, 73,574 acres; land in fallow comprised 1,049,915 acres. Victorian wheat is of exception- ally fine quality, and usually commands a high price in the London market. The average yield per acre in 1905 was 11-31 bushels; except for the year 1903, the total crop and the average per acre in 1905 were the highest ever obtained. The yield of oats was 23-18 bushels per acre, of barley 25-95, a "d of potatoes 2-58 tons. Great progress has been made in the cultivation of the grape vine, and Victoria now produces more than one-third of the wine made in Australia.

Live Stock. — The number of sheep in 1905 was 11,455,115. The quality of the sheep is steadily _ improving. Systematic attention to stock has brought about an improvement in the weight of the fleece, and careful observations show that between 1861 and 1871 the average weight of wool per sheep increased about one-third; between 1871 and 18S1 about one pound was added to the weight

per fleece, and there has been a further improvement since the year named. The following were the number of sheep depastured at the dates named: 1861, 6,240,000; 1871, 10,002,000; 1881, 10,267,000; 1891, 12,928,000; 1901, 10,841,790. The horses number 385,513, the swine 273,682, and the horned cattle 1,737,690; of these last, 649 T ioo were dairy cows. Butter-making has greatly increased since 1890, and a fairly large export trade has arisen. In 1905, 57,606,821 lb of butter were made, 4,297,350 lb of cheese and 16,433,665 lb of bacon and hams.

Manufactures.— There has been a good deal of fluctuation in the amount of employment afforded by the factories, as the following figures show: hands employed, 1885, 49,297; 1890, 56,639; 1893, 39,473; 1895, 46,095; 1900, 64,207; 1905, 80,235. Of the hands last named, 52,925 were males and 27,310 females. The total number of establishments was 4264, and the horse-power of machinery actually used, 43,492. The value of machinery was returned at £6,187,919, and of land and buildings £7,771,238. The majority of the establishments were small; those employing from 50 to 100 hands in 1905 were 161 , and upwards of 100 hands, 124.

Commerce.— Excluding the coastal trade, the tonnage of vessels entering Victorian ports in 1905 was 3,989,903, or about 3 J- tons per inhabitant. The imports in the same year were valued at £22,337,886, and the exports at £22,758,828. These figures repre- sent £18, 8s. 5d. and £18, 15s. 6d. per inhabitant respectively. The domestic produce exported was valued at £14,276,961; in 1891 the value was £13,026,426; and in 1881, £12,480,567. The compara- tively small increase over the period named is due mainly to the large fall in prices of the staple articles of local production. There has, however, been some loss of trade due to the action of the New South Wales government in extending its railways into districts formerly supplied from Melbourne. The principal articles of local production exported during 1905 with their values were as follows: butter and cheese, £1,576,189; gold (coined and bullion), £1,078,560; wheat, £1,835,204; frozen mutton, £275,195; frozen and preserved rabbits and hares, £220,940; skins and hides, £535,086; wool, £2,501,990; horses, £278,033 ; cattle, £293,241 ; sheep, £326,526 ; oats, £165,585; flour, £590,297; hay and chaff, £97,471; bacon and ham, £89,943; jams and jellies, £73,233; fruit (dried and fresh), £125,330. The bulk of the trade passes through Melbourne, the imports in 1905 at that port being £18,112,528.

Defence. — The Commonwealth defence forces in Victoria number about 5700 men, 4360 being partially paid militia and 1000 unpaid volunteers. There are also 18,400 riflemen belonging to rifle clubs. Besides these there are 200 naval artillerymen, capable of being employed either as a light artillery land force, or on board war vessels. The total expenditure in 1905 for purposes of defence in the state was £291,577.

Railways. — The railways have a total length of 3394 m., and the cost of their construction and equipment up to the 30th of June 1905 was £41,259,387; this sum was obtained by raising loans, mostly in London, on the security of the general re\ r enues of the state. In 1905 the gross railway earnings were £3,582,266, and the working expenses £2,222,279; so that the net earnings were £! .359.987i which sum represents 3-30 % on

the capital cost.

Posts and Telegraphs. — Victoria had a length of 6338 m. of tele- graph line in operation in 1905; there were 969 stations, and the business done was represented by 2,256,482 telegrams. The post- offices, properly so-called, numbered 1673 ; during that year 119,689,000 letters and postcards and 59,024,000 newspapers and packets passed through them. The postal service is carried on at a profit; the revenue in 1905 was £708,365, and the expenditure £627,735. Telephones are widely used; in 1905 the length of telephone wire in use was 28,638 m., and the number of telephones 14,134; the revenue from this source for the year was £102,396.

Banking. — At the end of 1905 the banks of issue in Victoria, eleven in number, had liabilities to the extent of £36,422,844, and assets of £40,511,335. The principal items among the liabilities were: notes in circulation, £835,499; deposits bearing interest, £ 2 3.˚55‘743: and deposits not bearing interest, £12,068,153. The chief assets were: coin and bullion, £8,056,666; debts due, £29,918,226; property, £1,919,230; other assets, £617,213. The money in deposit in the savings banks amounted to £10,896,741, the number of depositors being 447,382. The total sum on deposit in the state in 1905 was, therefore, £46,020,637, which represents £37- I 5 S – 4d. per head of population.

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(T. A. C.)

History. — The first discoverer of Victoria was Captain Cook, in command

of H.M.S. " Endeavour," who sighted Cape Everard, about half-way between Cape Howe and the mouth of the Snowy river, on the 19th of April 1770, a few days prior to his arrival at Botany Bay. The first persons to land in Victoria were the supercargo and a portion of the crew of the merchant ship " Sydney Cove," which was wrecked at the Fumeaux Islands in Bass Strait on the gth of February 1797. In the same year, Mr Bass, a surgeon in the navy, discovered the strait which bears his name and separates Victoria from Tasmania. Lieut. Grant in the" Lady Nelson" surveyed the; south coast in 1800, and in 1801 Port Phillip was for the first time entered by Lieut. Murray. In 1802 that harbour was surveyed by Captain Flinders, and in the same year Mr Grimes, the surveyor-general of New South Wales, explored the country in the neighbour- hood of the present site of Melbourne. In 1804 Lieut. -Colonel Collins, who had been sent from England, formed a penal settlement on the shores of Port Phillip, but after remaining a little more than three months near Indented Head, he removed his party to Van Diemen Land. Victoria was visited in 1824 by two sheep farmers named Hume and Ho veil, who rode overland from Lake George, New South Wales, to the shores of Corio Bay. In 1826 a convict establishment was attempted by the government of New South Wales at d %yg

Settlement Point, near French Island, Western Port Bay, but it was abandoned shortly afterwards. In 1834 Messrs Edward and Francis Henty, who had taken part in the original expedition to Swan river, West Australia, and afterwards migrated to Van Diemen Land, crossed Bass Strait, established a shore whaling station at Portland Bay, and formed sheep and cattle stations on the river Wannon and Wando rivulet, near the site of the present towns of Merino, Casterton and Coleraine. In 1835 a number of flock owners in Van Diemen Land purchased through Batman from the aborigines a tract of 700,000 acres on the shores of Port Phillip. The sale was repudiated by the British government, which regarded all unoccupied land in any part of Australia as the property of the crown, and did not recognize the title of the aborigines. Batman, however, remained at Port Phillip, and commenced farming within the boundaries of the present city of Melbourne. He was followed by John Pascoe Fawkner and other settlers from Van Diemen Land, who occupied the fertile plains of the new territory. In 1836 Captain Lonsdale was sent to Melbourne by the government of New South Wales to act as resident magis- trate in Port Phillip. The first census taken in 1838 showed that the population was 3511, of whom 3080 were males and 431 females. In 1839 Mr Latrobe was appointed superintendent of Port Phillip, and a resident judge was nominated for Melbourne, with jurisdiction over the territory which now forms the state of Victoria. The years 1840 and 1841 were periods of depression owing to the decline in the value of all descriptions of live stock,

for which the first settlers had paid high prices; but there was a steady immigration from Great Britain of men with means, attracted by the profits of sheep-farming, and of labourers and artisans who obtained free passages under the provisions of the Wakefield system, under which half the proceeds from the sale and occupation of crown lands were expended upon the introduction of workers. The whole district was occupied by sheep and cattle graziers, and in 1841 the population had increased to 11,738. Melbourne was incorporated as a town in 1842, and was raised to the dignity of a city in 1847. I n that same year the first Anglican was ordained, and in 1848 the first "Roman Catholic bishop. The third census (taken in 1846) showed a population of 3 2,870.

The elective element was introduced into the Legislative Council of New South Wales in 1842, in the proportion of twenty-four members to twelve nominated by the crown, and the district of Port Phillip, including Melbourne, returned six members. But the colonists were not satisfied with government

from and by Sydney; an agitation in favour of separation commenced, and in 1851 Victoria was formed into a separate colony with an Executive Council appointed by the crown, and a Legislative Council, partly elective and partly nominated, on the same lines as that of New South Wales. The population at that date was 77,435. Gold was discovered a few weeks after the colony had entered upon its separate existence, and a largo number of persons were attracted to the mines, first from the neighbouring colonies — some of which, such as South Australia, Van Diemcn's Land and West Australia, were almost denuded of able-bodied men and women — and subsequently from Europe and America. Notwithstanding the difficulties with which the local government had to contend, the task of maintaining law and order was fairly grappled with; the foundations of a liberal system of primary, secondary and university education were laid; roads, bridges and telegraphs w r ere constructed, and Melbourne was provided with an excellent supply of water.

Local self-government was introduced in 1853, and the Legislature found time to discuss a new Constitution, which not Local self- only eliminated the nominee element from the Legis- govera- lature, but made the executive government responsible menU to the people. The administration of the gold-fields was not popular, and the miners were dissatisfied at the amount charged for permission to mine for gold, and at there being no representation for the gold-fields in the local Legislature. The discontent culminated, at Ballarat in December 1854, in riots in which there was a considerable loss of life both amongst the miners and the troops.

Eventually, an export duty on gold was substituted for the licence fee, but every miner had to take out a right which enabled him to occupy a limited area of land for mining, and also for residence. The census taken in 1854 showed a population of 236,778. The new Constitution was proclaimed in 1855, and the old Executive Council was gazetted as the first responsible ministry. It held office for about sixteen months, and was succeeded by an administration formed From the popular party. Several changes were made in the direction of democratizing the government, and vote by ballot, manhood suffrage and the abolition of the property qualification followed each other in rapid succession. To several of these changes there Was strenuous opposition, not so much in the Assembly which represented the manhood, as in the Council in which the property of the colony was supreme. The crown lands were occupied by graziers, termed locally " squatters," who held them under a licence renewable annually at a low rental. These licences were very valuable, and the goodwill of a grazing farm or " run" commanded a high price. Persons who desired to acquire freeholds for the purpose of tillage could only do so by purchasing the land at auction, and the local squatters, unwilling to be deprived of any portion of a valuable property, were generally willing to pay a price per acre with which no person of small means desirous of embarking upon agricultural pursuits could compete. The result was that although the population had increased in r86i to 540,322, the area of land under crop had not grown proportionately, and Victoria was dependent upon the neighbouring colonies and even more distant countries for a considerable portion of its food. A series of Land Acts was passed, the first in i860, with the view of encouraging a class of small freeholders. The principle underlying all these laws was that residence by landowners on their farms, and their cultivation, were more important to the state than the sum realized by the sale of the land. The policy was only partially successful, and by a number of ingenious evasions a large proportion of the best land in the colony passed into the posses- sion of the original squatters. But a sufficient proportion was purchased by small farmers to convert Victoria into a great agricultural country, and to enable it to export large quantities of farm and dairy produce.

The greater portion of the revenue was raised by the taxation through the customs of a small number of products, such as spirits, tobacco, wine, tea, coffee, &c. But an agitation arose in favour of such an adjustment of the import duties as would protect the manufactures which at that time were being com-

menced. A determined opposition to this policy was made by a large minority in the Assembly, and by a large majority in the Council, but by

degrees the democratic party triumphed. The victory was not gained without a number of political crises which shook the whole fabric of society to its foundations. The Assembly tacked the tariff to the Appropriation Bill, and the Council threw out both. The result was that there was no legal means of paying either the civil servants or the contractors, and the government had recourse to an ingenious though questionable system by which advances were made by a bank which was recouped through the crown " confessing " that it owed the money, whereupon the governor issued his warrant for its payment without any recourse to parliament. Similar opposition was made by the Council to payment of members, and to a grant made to Lady Darling, the wife of Governor Sir Charles Darling, who had been recalled by the secretary of state on the charge of having shown partiality to the democratic party. Indeed on one occasion the dispute between the government and the Council was so violent that the former dismissed all the police, magistrates, county court judges and other high officials, on the ground that no provision had been made by the Council, which had thrown out the Appropriation Bill, for the payment of salaries.

Notwithstanding these political struggles, the population of the colony steadily increased, and the Legislature found time to pass some measures which affected the social life and the commercial position of the colonies. State aid to religion was abolished, and divorce was made comparatively easy. A system of free, compulsory and secular primary education was introduced. The import duties were increased and the transfer of land was simplified. In 1880 a fortnightly mail service via Suez between England and Melbourne was introduced, and in 1880 the first International Exhibition ever held in Victoria was opened. In the following year the census showed a popu- lation of 862,346, of whom 452,083 were males and 410,263 females. During the same year the lengthy dispute between the two houses of parliament, which had caused so much incon- venience, so many heartburnings and so many political crises, was brought to an end by the passage of an act which reduced the qualifications for members and the election of the Legis- lative Council, shortened the tenure of their seats, increased the number of provinces to fourteen and the number of members to forty-two. In 1883 a coalition government, in which the Liberal or protectionist and the Conservative or free-trade party were represented, took office, and with some changes remained in power for seven years. During this political truce several important changes were made in the Constitution. An act for giving greater facilities for divorce was passed, and with some difficulty obtained the royal assent. The Victorian railways were handed over to the control of three commissioners, who to a considerable extent were made independent of the govern- ment, and the civil service was placed under the supervision of an independent board. In 1887 the

representatives of Victoria met those of the other British colonies and of the United Kingdom in London, under the presidency of Lord Knutsford, in order to discuss the qtiestions of defence, postal and telegraphic communication, and the contribution of Australia to the Imperial navy. In 1888 a weekly mail service was established via Suez by the steamers of the P. & 0. and the Orient Companies, and the second Victorian International Exhibition was opened. In 1890 all the Australian colonies, including New South Wales and New Zealand, sent representatives to a conference at Melbourne, at which resolutions were passed in favour of the establishment of a National Australian Convention empowered to consider and report upon an adequate scheme for the Federal Constitution. This Convention met in Sydney in 1891 and took the first step towards federation (see Australia).

In 1801 the coalition government resigned and a Liberal administration was formed. An act passed in that year placed the railways again under the control of the government. Measures of a democratic and collectivist tendency have since obtained the assent of the Legislature. The franchise of

property-holders not resident in an electorate was abolished and the principle of " one man one vote " was established. Acts have been passed sanctioning Old Age Pensions; pro- hibiting shops, except those selling perishable goods, from keeping open more than eight hours; compelling the pro- prietors to give their assistants one half-holiday every six days; preventing persons from working more than forty-eight hours a week; and appointing for each trade a tribunal com- posed of an equal number of employers and employed to fix a minimum wage. (See Australia.)

Victoria enjoyed a large measure of prosperity during the later 'eighties and earlier 'nineties, and its financial prosperity enabled the government to expend large sums in extending railway communication to almost every locality and to com- mence a system of irrigation. The soil of Victoria is on the whole more fertile than in any other colony on the mainland of Australia, and in no portion of the continent is there any locality equal in fertility to the western district and some parts of Gippsland. The rainfall is more equable than in any portion of Australia, but the northern and north-western districts, which are the most remote from the sea and the Dividing Range, are subject to droughts, which, although not so severe or so frequent as in the interior of the continent, are sufficiently disastrous in their effects.

The results of the expenditure upon irrigation have not been so successful as was hoped. Victoria has no mountains covered with snow, which in Italy and South America supply with water the rivers at the season of the year when the land needs irrigation, and it was necessary to construct large and expensive reservoirs. The cost of water is therefore greater than the ordinary agriculturist who grows grain or breeds and fattens stock can afford to pay, although the price may not be too high for orchardists and vine-growers. In 1892 the prosperity of the colony was checked by a great strike which for some months affected produc- tion, but speculation in land continued for some time longer, especially in Melbourne, which at that time contained nearly half the population, 500,000 out of a total of 1,140,105. There does not seem to have been any other reasons for this increase in land values, for there was no immigration, and the value of every description of produce had fallen— except that the working classes were prosperous and well paid, and that the purchase of small allotments in the suburbs was a popular mode of investment. In 1893 there was a collapse. The value of land declined enormously, hundreds of persons believed to be wealthy were ruined, and there was a financial panic which caused the suspension of all the banks, with the exception of the Australasia, the Union of Australia, and the New South Wales. Most of them resumed payment, but three went into liquidation. It was some years before the normal condition of prosperity was restored, but the great resources of the colony and the energy of its people discovered new markets, and new products for them, and enabled them materially to increase the export trade. (G. C. L.)

VICTORIA, a city and port of Brazil, capital of the state of Espirito Santo, on the W. side of an island at the head of the Bay of Espirito Santo, 270 m. N.E. of Rio de Janeiro, in lat. 20 18′ S., long. 40 20′ W. Pop. (1902, estimated) 9000. The city occupies the beach and talus at the base of a high, wooded mountain. The principal streets follow the water-line, rising in terraces from the shore, and are crossed by narrow, steep, roughly paved streets. The buildings are old and of the colonial type. The governor's residence is an old convent, with its church at one side. The entrance to the bay is rather tortuous and difficult, but is sufficiently deep for the largest vessels. It is defended by five small forts. The harbour is not large, but is safe and deep, being completely shut in by hills. A large quay, pier, warehouses, &c, facilitate the hand- ling of cargoes, which were previously transported to and from the anchorage by lighters. Victoria is a port of call for coasting steamers and a shipping port in the coffee trade. The other exports are sugar, rice and mandioca (manioc) to home ports. Victoria was founded in 1535 by Vasco Fernando Coutinho,

on the S. side and nearer the entrance to the bay, and received the name of Espirito Santo. The old site is still occupied, and is known as Villa Velha

(Old Town). The name of Victoria was adopted in 1558 in commemoration of a crushing defeat inflicted by Fernando da Sa on the allied tribes of the Aimores, Tapininguins and Goitacazes in that year. It was attacked (1592) by the freebooter Cavendish, who was repelled by one of the forts at the entrance to the bay.

VICTORIA, the capital of British Columbia and the principal city of Vancouver Island, in the S.E. corner of which it is finely situated (48 25′ 20″ N., 123 22′ 24″ W.), on a small arm of the sea, its harbour, however, only admitting vessels drawing 18 ft. Pop. (1906) about 25,000. It is the oldest city in the province. It has fine streets, handsome villas and public buildings, government offices and churches. The high school is affiliated with McGill University, in Montreal. Victoria is connected with the mainland by cable, and is a favourite tourist resort for the whole west coast of North America. Till 1858 Victoria was a post of the Hudson's Bay Company. The city was incorporated in 1862, and according to the census of 1886 the population was 14,000, including Chinese and Indians, spread over an area of 4 sq. m. Until the redistribution of the fleet in 1905, the headquarters of the British Pacific squadron was at Esquimalt, a fine harbour about 3 m. W. of Victoria. This harbour, though spacious, is not much used by merchant vessels. It is provided with a large dry-dock and is defended by fortifications of a modern type.

VICTORIA FALLS, the greatest waterfall in the world, forming the most remarkable feature of the river Zambezi, Central Africa. The falls are about midway in the course of the Zambezi in 17 51'" S., 25° 41′ E. For a considerable dis- tance above the falls the river flows over a level sheet of basalt, its valley bounded by low and distant sandstone hills. Its

clear blue waters are dotted with numerous tree-clad islands. These islands increase in number as the river, without quicken- ing its current, approaches the falls, whose nearness is indicated only by a veil of spray. At the spot where the Zambezi is at its widest— over i860 yds. — it falls abruptly over the edge of an almost vertical chasm with a roar as of continuous thunder,

sending up vast columns of vapour. Hence the native name Musi'Oa-tunya, " Smoke does sound there." The chasm ex- tends the whole breadth of the river and is more than twice the depth of Niagara, varying from 256 ft. at

the right bank to J43 ft. In the centre. Unlike Niagara the water does not fall into an open basin but is arrested at a distance of from So to 240 ft. by the opposite wall of the chasm. Both walls are of the same height, so that the falls appear to be formed by a huge crack in the bed of the river. The only outlet is a narrow channel cut in the barrier wall at a point about three- fifths from the western end of the chasm, and through this gorge, not more than 100 ft. wide, the whole volume of the river pours for 130 yds. before emerging into an enormous zigzag trough (the Grand Canon) which conducts the river past the basalt plateau. The tremendous pressure to which the water is subjected in the confinement of the chasm causes the perpetual columns of mist which rise over the precipice.

The fall is broken by islands on the lip of the precipice into four parts. Close to the right bank is a sloping cataract 36 yds. wide, called the Leaping Water, then beyond Boaruka Island, about 300 yds. wide, is the Main Fall, 473 yds. broad, and divided by Livingstone Island from the Rainbow Fall 535 yds. wide. At both these falls the rock is sharp cut and the river maintains its level to the edge of the precipice. At the left bank of the river is the Eastern Cataract, a millrace resembling the Leaping Water. From opposite the western end of the falls to Danger Point, which overlooks the entrance of the gorge, the escarpment of the chasm is covered with great trees known as the Rain Forest; looking across the gorge the eastern part of the wall (the Knife Edge) is less densely wooded.

At the end of the gorge the river has hollowed out a deep pool, named the Boiling Pot. It is some 500 ft. across; its surface, smooth at low water, is at flood-time troubled by slow, enormous swirls and heavy boilings. Thence the channel turns sharply westward, beginning the great zigzag mentioned. This grand and gloomy canon is over 40 m. long. Its almost perpendicular walls are over 400 ft. high, the level of the escarp- ment being that of the lip of the falls. A little below the Boiling Pot, and almost at right angles to the falls, the canon is spanned by a bridge (completed in April 1905) which forms a link in the Cape to Cairo railway scheme. This bridge, 650 ft. long, with a main arch of 500 ft. span, is slightly below the top of the gorge. The height from low-water level to the rails is 420 ft.

The volume of water borne over the falls varies greatly, the level of the river in the canon sinking as much as 60 ft. between the full flood of April and the end of the dry season in October. When the river is high the water rolls over the main falls in one great unbroken expanse; at low water (when alone it is possible to look into the grey depths of the great chasm) the falls are broken by crevices in the rock into numerous cascades.

The falls are in the territory of Rhodesia. They were dis- covered by David Livingstone on the 17th of November 1855, and by him named after Queen

Victoria of England. Living- stone approached them from above and gained his first view of the falls from the island on its lip now named after him. In 1S60 Livingstone, with Dr (afterwards Sir John) Kirk, made a careful investigation of the falls, but until the opening of the railway from Bulawayo (1905) they were rarely visited. The land in the vicinity of the falls is preserved by the Rhodesian government as a public park.

See Livingstone's Missionary Travels and Researches- in South Africa (London, 1857) for the story of the discovery of the falls, and the Popular Account of Dr Livingstone's Expedition to the Zambesiˆand its Tributaries 1858-1S64 (London, 1894) for a fuller description of the falls and .a theory as to their origin. How I crossed Africa, by Major Serpa Pinto (English trans., London, 1881), contains a graphic account of the visit paid to the falls by the Portuguese explorer. In the Geographical Journal for January 1905 is an article by A. J. C. Molyncux on " The Physical History of the Victoria Falls." The article is illustrated by excellent photo- graphs and gives a bibliography. Consultalso" The Gorge and Basin of the Zambesi below the Victoria Falls," by G. W. Lamplugh in the Geog, Jour. (1908), vol. xxxi. (F. R. C.)

VICTORIA NYANZA, the largest lake in Africa and chief reservoir of the Nile, lying between o° 20′ N. to 3 S. and 31 40′ to 34 52′ E. Among the fresh-water lakes of the world it is exceeded in size by 'Lake Superior only and has an area of over 26,000 sq. m., being nearly the size of Scotland. In shape it is an irregular quadrilateral, but its shores, save on the west, are deeply indented. Its greatest length, taking into account the principal gulfs, N. to S. is 250 m., its greatest breadth 200 m. Its coast-line exceeds 2000 m. It fills a depression in the central part of the great plateau which stretches between the western (Albcrtine) and eastern rift-valleys (see Africa, § 1), and has an elevation of about 3720 ft. above the sea. 1 Its greatest ascertained depth is some 270 ft., which compares with soundings of 2000 ft. on Tanganyika and 2500 ft. on Nyasa. Victoria Nyanza is remarkable for the severe and sudden storms which sweep across it, rendering navigation dangerous. It contains many groups of islands, the majority being near the coast-line. The lake is full of reefs, many just below the surface of the water, which is clear and very fresh. It is abundantly stocked with fish. Geological research shows that the land surrounding the lake consists of gneiss, quartz and schistose rocks, covered, in the higher regions, with marl and red clay, and in the valleys with a rich black loam.

Shores and Islands. — The shores of the lake present varied aspects. The western coast, which contains no large indentations, is, in its southern part, backed by precipices of 300 or more ft. high, behind which rise downs to thrice the height of the cliffs. Going north, the hills give way to papyrus and ambach swamps, which mark the delta of the Kagera. Beyond the mouth of

that river the hills reappear, and increase in height, till on reaching the N.W. corner of thenyanza they rise some 500 ft. above the water. This western shore is marked by a continuous fault line which runs parallel to the lake at a short distance inland. The northern coast of the lake is very deeply indented and is marked throughout its length by rocky headlands jutting into the waters. This high land is very narrow, and the streams which rise on its northern face within a mile or two of the nyanza drain north away from the lake. On a promontory about 30 m. east of the Katonga (see below) is Entebbe, the port of Uganda and seat of the British administration. The chief indenta- tions on the north side are Murchison Bay and Napoleon Gulf, the entrance to the last named being partly filled by the triangular- shaped island of Buvuma or Uvuma (area 160 sq. m.). Napoleon Gulf itself is deeply indented, one bay, that of Jinja, running N.W. and being the outlet of the Nile, the water here forcing its way through the rock-bound shore of the lake. The north-east corner of the lake is flat and bare. A narrow channel, partly masked by islands, leads into Kavirondo Gulf, which, with an average width of 6 m., extends 45 m. E. of the normal coast-line— a fact taken advantage of in building the railway from Mombasa to the lake. A promontory, 174 ft. above lake-level, jutting into the small bay of Ugowe, at the north-east end of Kavirondo Gulf, is the point where the railway terminates. The station is known as Port Florence. On the south side of the gulf tall hills approach, and in some cases reach, the water's edge, and behind them towers the rugged range of Kasagunga with its saw-like edge. Proceeding south the shore trends generally south-west and is marked with many deep inlets, the coast presenting a succession of bold bluffs, while inland the whole district is distinctly mountainous. At the S.E. corner of the lake Speke Gulf projects eastward, and at the S.W. corner Emin Pasha Gulf pushes southward. Here the coast is barren and hilly, while long ridges of rock run into the lake.

_ The largest island in the lake, Ukerewe, on the S.E. coast, imme- diately north of Speke Gulf, is almost a peninsula, but the strip of land connecting it with the shore is pierced by two narrow channels about j of a mile long. Ukerewe is 25 m. long, and 12 broad at its greatest width. It is uninhabited, wooded and hilly, rising 650 ft. above the lake. At the N.W. corner of the nyanza is the Sesse' archipelago, consisting of sixty-two islands. The largest island in this group, namely, Bugala, is narrow, resembling the letter S in shape, and is almost cut in two in the middle. Most of these islands are densely forested, and some of them attain considerable elevation. Their scenery is of striking beauty. Forty-two were inhabited. 2 Buvuma Island, at the entrance of Napoleon Gulf, has already been mentioned. Between it and as far as the mouth of Kavirondo Gulf are numerous other islands, of which the chief are Bugaia, Lolui, Rusunga and Mfwanganu. In general char- acteristics and the beauty of their scenery

these islands resemble those of the Sesse" archipelago. The islands are of ironstone forma- tion overlying quartzite and crystalline schists.

Rivers. — The Kagera, the largest and most important of the lake

1 For the altitude see Geog. Jour., March 1907 and July 1908. a To prevent the spread of sleeping sickness the inhabitants were removed to the mainland (1909).

affluents, which has its rise in the hill country east of Lake Kivu, and enters the west side of the nyanza just north of i" S., is described in the article Nile, of which it is the most remote head-stream. The other rivers entering Victoria Nyanza from the west are the Katonga and Ruizi, both north of the Kagera. The Katonga rises in the plateau east of the Dweru branch of Albert Edward Nyanza, and after a sluggish course of 155 m. enters Victoria Nyanza in a wide swamp at its N.W. corner. The Ruizi (180 m.) is a deep, wide and swift stream with sinuous course flowing in part through great gorges and in part through large swamps. It rises in the Ankole district and reaches the nyanza a little north of the Kagcra. Be- tween the Katonga and the Nile outlet, the rivers which rise close to the lake drain away northward, the watershed being the lake shore. On the N.E. side of the nyanza, however, several con- siderable streams reach the lake — notably the Sio, Nzoia and Lukos (or Yala). The Nzoia (150 m.), the largest of the three, rises in the foothills, of the Elgeyo escarpment and flows swiftly over a rocky bed in a south-westerly direction, emptying into the lake south of Berkeley Bay. On the east side the Mara Dabagh enters the lake between 1° and 2 S. It is, next to the Kagera, the largest of the lake tributaries. All the rivers mentioned are per- ennial, and most of them bring down a considerable volume of water, even in the dry season. On the S., S.E. and S.W. shores a number of short rivers drain into the lake. They traverse a tree- less and arid region, have but an intermittent flow, and are of little importance in the hydrography of the district. The only outlet of the lake is the Nile (q.v.).

Drainage Area, Rainfall and Lake Level. — The very important part played by the Victoria Nyanza in the Nile system has led to careful study of its drainage basin and rainfall and the perplexingvariations in the level of the lake. The area drained by the lake covers, with the lake itself, 92,240 sq. m. In part it is densely forested, part consists of lofty mountains, and a considerable portion is somewhat arid tableland. According to the calculations of Sir William Garstin the rainfall over the whole area

averages 50 in. a year. Allowing that as much as 25% of this amount enters the lake, this is equivalent to a total of 138,750,000,000 cub. metres in a year. Measurements at the Ripon Falls show that 18,000,000,000, or some 13% of this amount, is taken off by the Nile, and when allow- ance has been made for the annual rise and fall of the lake-level it is apparent that by far the greater part of the water which enters the nyanza is lost by evaporation; in fact, that the amount drawn off by the river plays a comparatively small part in the annual oscillation of the water surface. Rain falls more or less in every month, but is heaviest during March, April, May and again in September, October and November. The level of the lake is chiefly affected by the autumn rains and generally reaches its maximum in July. The annual rise and fall is on an average from I to 3 ft., but between November 1900 and June 1901 a difference of 42 in. was recorded. Considerable speculation was caused by the fact that whereas in 1878-79 the lake-level was high, from 1880 to 1890 the level was falling, and that after a few years (1892-95) of higher level there was, from 1896 to 1902, again a steady fall, amounting in seven years to 30 in. in the average levels of the lake. In 1903, however, the level rose and everywhere the land gained from the lake in the previous years was flooded. These variations are attributed by Sir William Garstin to deficiency or excess of rainfall. Any secular shrinking of the lake in common with the lakes of Central Africa generally must be so gradual as to have no practical importance. It must also be remembered that in such a vast sheet of water as is the nyanza the wind exercises an influence on the level, tending to pde up the water at different parts of the lake. The winds may also be the cause of the daily variation of level, which on Speke Gulf has been found to reach 20 in.; but this may also partake of the character of a " seiche." Currents setting towards the north or north-west have been observed in various parts of the lake.

Discovery and Exploration.- — The quest for the Nile sources led to the discovery of the lake by J. H. Speke in 1ˆ58, and it was by him named Victoria in honour of the queen of England. In 1862 Speke and his companion, J. A. Grant, partially explored the N.W. shore, leaving the lake at the Nile outlet. Great differences of opinion existed as to its size until its circum- navigation in 1874 by H. M. Stanley, which proved it to be of vast extent. The invitation sent by King Mtesa of Uganda through Stanley to the Christian missionaries led to the despatch from England in 1876 of the Rev. C. T. Wilson, to whom we owe our first detailed knowledge of the nyanza. Mr Wilson and Lieut. Shergold Smith, R.N., made, in 1877, the first voyage across the nyanza. Lieut. Smith and a Mr O'Neill, both members of the Church Missionary Society, were in the same year murdered on Ukerewe Island. In 1889 Stanley further explored the lake, discovering Emin Pasha Gulf, the entrance to which is masked by several

islands. In 1890 the ownership of the lake was divided by Great Britain and Germany, the first

degree of south latitude being taken as the boundary line. The southern portion, which fell to Germany, was visited and described by scientists of that nation, whose objects, however, were not primarily geographic. At the instance of the British Foreign Office a survey of the northern shores of the lake was carried out in 1899-1900 by Commander B. Whitehouse, R.N. The same officer, in 1903, undertook, in agreement with the German government, a survey of the southern shores. Com- mander WhiLehouse's work led to considerable modification of the previously accepted maps. He discovered numerous islands and bays whose existence had previously been unknown.

Previously to 1896 navigation was confined to Arab dhows, which trade between the south end of the lake and Uganda, and to canoes. In the year named a small steamer (the " Ruwen- zori ") was launched on the lake by a Zanzibar firm, while in 1000 a somewhat larger steamer (the " William Mackinnon"), built in Glasgow at the instance of Sir W. Mackinnon, and afterwards taken over by the British government, made her first trip on the lake. In 1903, the year in which the railway from Mombasa to the lake was completed, a steamer of 600 tons burden was launched at Port Florence. Since that date trade has considerably increased.

See Nile and Uganda and the British Blue-book Egypt No. 2 (1904), which is a Report by Sir Wm. Garstin upon the Basin of the Upper Nile. This report, besides giving (pp. 4-24) much original information upon the Victoria Nyanza, summarizes the informa- tion of previous travellers, whose works are quoted. In 1908 the British Admiralty published a chart of the lake (scale 4 in. to the mile) from the surveys of Commander Whitehouse. Non-official books which deal with the lake include: C. T. Wilson, Uganda and the Soudan (London, 1882); (Sir) F. D. Lugard, The Rise of our East African Empire, vol. ii. (London, 1893); Franz Stuhlmann, Mit Emin Pasha, &c. (Berlin, 1894) ; Paul Kollmann, The Victoria Nyanza (English translation; London, 1899J; E. G. Ravenstein, " The Lake-level of the Victoria Nyanza," Geographical Journal, October 1901; Sir H. H. Johnston, The Uganda Protectorate (London, 1902). In most of these publications the descriptions of the lake occupy but a small part. (W. E. G.; F. R. C.)

VICTORINUS, GAIUS MARIUS (4 th century a.d.), Roman grammarian, rhetorician and neo-Platonic philosopher, an African by birth (whence his surname Afer), lived during the reign of Constantius II. He taught rhetoric at Rome (one of his pupils being Jerome), and in his old age became a convert to Christianity. His conversion is said to have greatly influenced

that of Augustine. When Julian published an edict forbidding Christians to lecture on polite literature, Victorinus closed his school. A statue was erected in his honour as a teacher in the Forum Trajanum.

His translations of platonic writers are lost, but the treatise De Definitionibus (ed. T. Stangl in Tulliana ei Mario- Victoriniana, Munich, 1888) is probably by him and not by Boetius, to whom it was formerly attributed. His manual of prosody, in four books, taken almost literally from the work of Aphthonius, is extant (H. Keil, Grammatici Latini, vi.). It is doubtful whether he is the author of certain other extant treatises attributed to him on metrical and grammatical subjects, which will be found in Keil. His com- mentary on Cicero's. De Invenlione (in Halm's Rhetores Latini Minores, 1863) is very diffuse, and is itself in need of commentary. His extant theological writings, which will be found in J. P. Migne, Cursus Patrologiae Latinae, viii., include commentaries on Galatians, Ephesians and Philippians; De Trinitate contra Arium; Ad Justinum Manichaeum de Vera Came Ckristi; and a little tract on " The Evening and the Morning were one day " (the genuineness of the last two is doubtful). Some Christian poems under the name of Victorinus are probably not his.

See G. Geiger, C. Marius Victorinus Afer,- ein neuplatonischer Philosoph (Metten, 1888); G. Koffmann, De Mario Victorino philosopho Christiana (Breslau, 1880); R. Schmid, Marius Vic- torinus Rhetor und seine Beziehungen zu Augustin (Kiel, 1895) ; Gore in Dictionary of Christian _ Biography, iv.; M. Schanz, Geschichte der romischen Liiteratur, iv. 1 (1904) ; Teuffel, Hist, of Roman Literature (Eng. tr., 1900), 408.

VICTOR-PERRIN, CtAUDE, Dtjke of Belluno (1764- 1841), marshal of France, was born at La Marche (Vosges) on the 7th of December 1764. In 1781 he entered the army as a private soldier, and after ten years' service he received his discharge and settled at Valence. Soon afterwards he joined the local volunteers, and distinguishing himself in the war on the Alpine frontier, in less than a year he had risen to the

command of a battalion. For his bravery at the siege of Toulon in 1793 he was raised to the rank of general of brigade. He afterwards served for some time with the army of the Eastern Pyrenees, and in the Italian campaign of 1796-97 he so acquitted himself at Mondovi, Roveredo and Mantua that he, was promoted to be general of division. After commanding for some time the forces in the department of La Vendee, he was again employed in

Italy, where he did good service against the papal troops, and he took a very important part in the battle of Marengo. In 1802 he was governor of the colony of Louisiana for a short time, in 1S03 he commanded the Batavian army, and afterwards he acted for eighteen months (1805-6) as French plenipotentiary at Copenhagen. On the outbreak of hostilities with Prussia he joined the V. army corps (Marshal Lannes) as chief of the general staff. He distinguished himself at Saalfeld and Jena, and at Friedland he commanded the I. corps in such a manner that Napoleon gave him the marshal- ate. After the peace of Tilsit he became governor of Berlin, and in 1S08 he was created duke of Belluno. In the same year he was sent to Spain, where he took a prominent part in the Peninsular War (especially at Espinosa, Talavera, Barrosa and Cadiz), until his appointment in 181 2 to a corps command in the invasion of Russia. Here his most important service was in protecting the retreating army at the crossing of the Beresina. He took an active part in the wars of 1813-14, till in February of the latter year he had the misfortune to arrive too late at Montereau-sur-Yonne. The result was a scene of violent recrimination and his supersession by the emperor, who transferred his command to Gerard. Thus wounded in his amour-propre, Victor now transferred his allegiance to the Bourbon dynasty, and in December 1814 received from Louis XVIII. the command of the second military division. In 1S15 he accompanied the king to Ghent, and on the second restoration he was made a peer of France, He was also president of a commission which inquired into the conduct of the officers during the Hundred Days, and dismissed Napoleon's sympathizers. In 1821 he was appointed war minister and held this office for two years. In 1830 he was major-general of the royal guard, and after the revolution of that year he retired altogether into private life. His death took place at Paris on the ist of March 1841.

His papers for the period 1793-1800 have been published (Paris,

1846).

VICTUAL, food, provisions, most commonly in the plural, " victuals." The word and its pronunciation came into English from the 0. Fr. vitaille. The modern French and English spelling are due to a pedantic approximation to the Latin original, victualia, a neuter plural substantive formed from viclualis, v-ictus, nourishment, provisions (vivere, to live). The most familiar use of the term is in " licensed victualler," to which the Licensing Act 1872 (§ 27) has applied the wide significance of any person selling any intoxicating liquor under a licence

from a justice of the peace. Properly a " victualling house " is one where persons are provided with food and drink but not lodgings, and is thus distinct from an inn, which also provides the last. g VICUQSA, one of

lll? tne ” ***wo w ˆ living ˆ ‘**** *South American re- presentatives of the camel-tribe, a Came- tidae (see Tylopoda). From its relative the guanaco the vicugna {Lama vicunia) differs by its inferior stature, more slender build and shorter head, as well as by the absence of bare patches or*

Head of Vicugna.

callosities on the hind limbs. The general colour of the woolly coat is orange-red. Vicugnas live in herds on the bleak and elevated parts of the mountain range bordering the region of perpetual snow, amidst rocks and precipices, occurring in various parts of Peru, in the southern part of Ecuador, and as far south as the middle of Bolivia. The wool is extremely delicate and soft, and highly valued for the purposes of weaving, but the quantity which each animal produces is not great.

VIDA, MARCO GIROLAMO (c. 1489-1566), Italian scholar and Latin poet, was born at Cremona shortly before the year 1490. He received the name of Marcantonio in baptism, but changed this to Marco Girolamo when he entered the order of the Canonici Regolari Lateranensi. During his early manhood he acquired considerable fame by the composition of two didactic poems in the Latin tongue, on the Game of Chess (Scacchiae Ludus) and on the Silkworm (Bombyx). This reputa- tion induced him to seek the papal court in Rome, which was rapidly becoming the headquarters of polite learning, the place where students might expect advancement through their literary talents. Vida reached Rome in the last years of the pontificate of Julius II. Leo X., on succeeding to the papal chair (1513), treated him with marked favour, bestowed on him the priory of St Sylvester at Frascati, and bade him compose a heroic Latin poem on the life of Christ. Such was the origin of the Ckristiad, Vida’s most celebrated, if not his best, per- formance. It did not, however, see the light in Leo’s lifetime. Between the years 1520 and 1527 Vida produced the second of his masterpieces in Latin hexameters, a didactic poem on the Art of Poetry (see Baldi’s edition, Wiirzburg, 1881). Clement VII. raised him to the rank of apostolic protonotary, and in 1532 conferred on him the bishopric of Alba. It is probable that he took up his residence in this town soon after the death of Clement; and here he spent the greater portion of his remain- ing years. Vida attended the council of Trent, where he enjoyed the society of Cardinals Cervini, Pole and Del Monte, together with his friend the poet Flaminio. A record of their conversations may be studied in Vida’s Latin dialogue De Republica. Among his other writings should be mentioned three eloquent orations in defence of Cremona against Pavia, composed upon the occasion of some dispute as to precedency between those two cities. Vida died at Alba on the 27th of September 1566.

See the Life by Lancetti (Milan, 1840).

VIDAME (Lat. vice-dominus) , a French feudal title. The vidame was originally, like the avoue (advocatus) , an official chosen by the bishop of the diocese, with the consent of the count (see Advocate). Unlike the advocate, however, the vice-dominus was at the outset an ecclesiastic, who acted as the bishop's lieutenant {locum tenens) or vicar. But the causes that changed the character of the advocatus operated also in the case of the vidame. During the Carolingian epoch, indeed, advocatus and vice-dominus were interchangeable terms; and it was only in the nth century 'that they became generally differentiated: the title of avoue being commonly reserved for nobles charged with the protection of an abbey, that of vidame for those guarding an episcopal see. With the crystallization of the feudal system in the 12th century the office of vidame, like that of avoue, had become an hereditary fief. As a title, however, it was much less common and also less dignified than that of avoue. The advocati were often great barons who added their function of protector of an abbey to their own temporal sovereignty; whereas the vidames were usually petty nobles, who exercised their office in strict subordination to the bishop. Their chief functions were: to protect the temporalities of the see, to represent the bishop at the count's court of justice, to exercise the bishop's temporal jurisdiction in his name (placitum or curia vice-domini) and to lead the episcopal levies to war. In return they usually had a house near the episcopal palace, a domain within and without the city, and sometimes the right to levy certain dues on the city. The vidames usually took their title from the see they represented, but not infrequently they styled themselves, not after their official fief, but after

their private seigneuries. Thus the vidamc de Picquigny was the representative of the bishop of Amiens, the vidame de Gerberoy of the bishop of Beauvais. In many sees there were no vidames, their function being exercised by viscounts or chatelains. With the growth of the central power and of that of the municipalities the vidames gradually lost all importance, and the title became merely honorary

See A. Luchaire, Manuel des institutions frangaises (Paris, 1892); Du Cange,, Glossarium (ed. Niort, 1887), s. " Vice-dominus " ; A. Mallet, " Etude hist, sur les avoues et les vidames," in Position des theses de I'Ecole des chartes (an. 1870-72).

VIDIN (formerly written Widin or Widdin), a fortified river-port and the capital of a department in the extreme N.E. of Bulgaria; on the right bank of the river Danube, near the Servian frontier and 151 m. W.N.W. of Sofia. Pop. (1906) 16,168, including about 3000 Turks and 1500 Spanish

Jews — descendants of the refugees who fled hither from the Inquisition in the 16th century. Vidin is an episcopal see and the head- quarters of a brigade; it was formerly a stronghold of some importance, and was rendered difficult to besiege by the sur- rounding marshes, formed where the Topolovitza and other streams join the Danube. A steam ferry connects it with Calafat. on the Rumanian bank of the Danube, and there is a branch railway to Mezdra, on the main line Sofia-Plevna. The city consists of three divisions — the modern suburbs extending beside the Danube, the citadel and the old town, still sur- rounded by walls, though only four of its nine towers remain standing. The old town, containing several mosques and synagogues and a bazaar, preserves its oriental appearance; the citadel is used as a military magazine. There arc a modern cathedral, a school of viticulture and a high school, besides an ancient clock-tower and the palace {Konak) formerly occupied by the Turkish pashas. Vidin exports cereals and fruit, and is locally celebrated for its gold and silver filigree. It has important fisheries and manufactures of spirits, beer and tobacco.

Vidin stands on the site of the Roman town of Bononia in Moesia Superior, not to be confounded with the Pannonian Bononia, which stood higher up the Danube to the north of Sirmium. Its name figures conspicuously in the military annals of medieval and recent times; and it is specially memorable for the overthrow of the Turks by the imperial forces in 1689 and for the crushing defeat of the hospodar Michael Sustos by Pas van Oglu in 1801. It was again the scene of stirring events during the Russo-Turkish Wars of 1854-55 and 1877-78, and successfully resisted the assaults of the Servians in the Servo-Bulgarian War of 1886-87.

VIDOCQ, FRANCOIS EUGENE (1775-1857), French detective, was born at Arras in 1775 (or possibly 1773). After an adven- turous youth he joined the French army, where he rose to be lieutenant. At Lille he was imprisoned as the result of a quarrel with a brother officer, and while in gaol became involved, possibly innocently, in the forgery of an order for the release of another prisoner. He was sentenced to eight years' hard labour, and sent to the galleys at Brest, whence he escaped twice but was recaptured. For the third time he succeeded in getting free, and lived for some time in the company of thieves and other criminals in Paris and elsewhere, making a careful study of their methods. He then offered his services as a spy to the Paris police (1800). The offer was accepted, on condition that he should extend his knowledge of the criminal classes by himself serving a further term in prison in Paris, and subse- quently Vidocq was made chief of the reorganized detective department of the Paris police, with a body of ex-convicts under his immediate command. In this capacity Vidocq was ex- tremely successful, for he possessed unbounded energy and a real genius for hunting down criminals. In 1827, having saved a considerable sum of money, he retired from his post and started a paper-

mill, the work-people in which were drawn entirely from ex-convicts. The venture, however, was a failure, and in 1832 Vidocq re-entered the police service and was em- ployed mainly in political work, though given no special office.

Anxious to get back to his old detective post he himself foolishly organized a daring theft. The authorities were unable to trace the thieves, who at the proper moment were " discovered " by Vidocq. His real part in the matter became known, however, and he was dismissed from service. He subsequently started a private inquiry agency, which was indifferently successful, and was finally suppressed. Vidocq died in great poverty in 1857. Several volumes have been published under his name, the best known of which is MSmoires de Vidocq (1828). It is, however, extremely doubtful whether he wrote any of them.

See Charles Ledru, La Vie, la mort el les derniers moments de Vidocq (Paris, 1857).

VIDYASAGAR, ISWAR CHANDRA (1820-1891), writer and social reformer of Bengal, was born at Birsinha in the Midnapur district in 1820, of a Kulin Brahman family. He was removed to Calcutta at the age of nine, was admitted into the Sanskrit College, and carried on his studies in the midst of privations and extreme poverty. In 1839 he obtained the title of Vidyasagar (= " Ocean of learning ") after passing a brilliant examination, and in 1850 was appointed head pandit of Fort William College. In 1846 appeared his first work in Bengali prose, The Twenty- Five Tales of a Betai. This was succeeded by his Sakuntala in 1855, and by his greatest work, The Exile of Sita, in 1862. These are marked by a grace and beauty which Bengali prose had never known before. The literature of Bengal, previous to the 19th century, was entirely in verse. Ram Mohan Roy, the religious reformer of Bengal, created the literary prose of Bengal early in the 19th century by his numerous translations and religious tracts; and lsw T ar Chandra Vidyasagar and his fellow-worker, Akhay Kumar Datta, added to its power and beauty about the middle of that century. These three writers are generally re- cognized as the fathers of Bengali prose literature. As a social reformer and educationist, too, Iswar Chandra rnade his mark. He associated himself "with Drinkwater Bethune in the cause of female education; and the management of the girls' school, called after Bethune, was entrusted to him in 1S51. And when Rosomoy Datta resigned the post of secretary to the Sanskrit College of Calcutta, a new post of principal was created, and Iswar Chandra was appointed to it. Iswar Chandra's influence in the education department was now unbounded. He simpli- fied the method of learning Sanskrit, and thus spread a know- ledge of that ancient tongue among his countrymen. He was consulted in all educational matters by Sir Frederick Halliday, the first*

lieutenant-governor of Bengal. And when the great scheme of education under Sir Charles Wood's despatch of 1854 was inaugurated in India, Iswar Chandra established numerous aided schools under that scheme in the most advanced districts of Bengal. In 1858 he resigned his appointment under govern- ment, and shortly afterwards became manager of the Metro-politan Institution, a private college at Calcutta. But a greater task than literary work or educational reforms claimed his attention. He had discovered that the ancient Hindu scriptures did not enjoin perpetual widowhood, and in 1855 he startled the Hindu world by his work on the Remarriage of Hindu Widows. Such a work, from a learned and presumably orthodox Brahman, caused the greatest excitement, but Iswar Chandra remained unmoved amidst a storm of indignation. Associating himself with the most influential men of the day, like Prosonno Kumar Tagore and Ram Gopal Ghosh, he appealed to the British government to declare that the sons of remarried Hindu widows should be considered legitimate heirs. The British govern- ment responded; the act was passed in 1856, and some years after Iswar Chandra's own son was married to a widow. In the last years of his life Iswar Chandra wrote works against Hindu polygamy. He was as well known for his charily and wide philanthropy as for his educational and social reforms. His large income, derived from the sale of school-books, was devoted almost entirely to the succour of the needy; hundreds of young men owed their education to him; hundreds of widows depended on him for their daily breath The Indian government made him a Companion of the Indian Empire in 1S80. He died on the 29th of July i8gr. (R. C. D.)

VIEIRA, ANTONIO (1608-1607.1, Portuguese Jesuit and writer, the " prince of Catholic pulpit-orators of his time,' was born in Lisbon on the 6th of February 1608. Accompanying his parents to Brazil in 1615 he received his education at the Jesuit college at Bahia. He entered the Jesuit novitiate in 1625, and two years later pronounced his first vows. At the age of eighteen he was teaching rhetoric, and a little later dogmatic theology, at the college of Olinda, besides writing the u annual letters " of the province. In 1635 he received the priesthood. Pie soon began to distinguish himself as an orator, and the three patriotic sermons he delivered at Bahia (1638-40) are remarkable for their imaginative power and dignity of language. The sermon for the success of the arms of Portugal against Holland was considered by the Abbe Raynal to be " perhaps the most extraordinary discourse ever heard from a Christian pulpit. 55 When the revolution of 1640 placed John IV. on the throne of Portugal, Brazil gave him its allegi- ance, and Vieira was chosen to accompany the viceroy's*

son to Lisbon to congratulate the new king. His talents and aptitude for affairs impressed John IV. so favourably that he appointed him royal preacher, gave him free access to the palace and constantly consulted him on the business of the state. Pos- sessed of great political sagacity and knowledge of the lessons of history, Vieira used the pulpit as a tribune from which he propounded measures for improving the general and particularly the economic condition of Portugal. His pen was as busy as his voice, and in four notable pamphlets he advocated the crea- tion of companies of commerce, the abolition of the distinction between Old and New Christians, the reform of the procedure of the Inquisition and the admission of Jewish and foreign traders, with guarantees for their security from religious per- secution. Moreover, he did not spare his own estate, for in his Sexagesima sermon he boldly attacked the current style of preaching, its subtleties, affectation, obscurity and abuse of metaphor, and declared the ideal of a sermon to be one which sent men away " not contented with the preacher, but discon- tented with themselves." In 1647 Vieira began his career as a diplomat, in the course of which he visited England, France, Holland and Italy. In his Papel Forte he urged the cession of Perntimbuco to the Dutch as the price of peace, while his mission to Rome in 1650 was undertaken in the hope of arranging a marriage between the heir to the throne of Portugal and the only daughter of King Philip IV. of Spain. His success, freedom of speech and reforming zeal had made him enemies on all sides, and only the intervention of the king prevented his expulsion from the Company of Jesus, so that prudence coun- selled his return to Brazil.

In his youth he had vowed to consecrate his life to the con- version of the negro slaves and native Indians of his adopted country, and arriving in Maranhao early in 1653 he recom- menced his apostolic labours, which had been interrupted during his stay of fourteen years in the Old World. Starting from Para, he penetrated to the banks of the Tocantins, making numerous converts to Christianity and civilization among the most savage tribes; but after two years of unceasing labour, during which every difficulty was placed in his way by the colonial authorities, he saw that the Indians must be with- drawn from the jurisdiction of the governors, to prevent their exploitation, and placed under the control of the members of a single religious society. Accordingly in June 1654 he set sail for Lisbon to plead the cause of the Indians, and in April 1655 he obtained from the king a series of decrees which placed the missions under the Company of Jesus, with himself as their superior, and prohibited the enslavement of the natives, except in certain specified cases. Returning with this charter of freedom, he organized the missions over a territory having a coast -line of 400 leagues, and a population of 200,000 souls, and in the next six years (1655-61) the indefatigable mis- sionary set the crown on his work. After a time, however, the colonists, attributing the shortage of slaves and the

con- sequent diminution in their profits to the Jesuits, began actively to oppose Vieira, and they were joined by members of the

*secular clergy and the other Orders who were jealous of the monopoly enjoyed by the Company in the government of the Indians. Vieira was accused of want of patriotism and usurpa- tion of jurisdiction, and in 1661, a,*ter a popular revolt, the authorities sent him with thirty-one other Jesuit missionaries back to Portugal. He found his friend King John IV. dead and the court a prey to faction, but, dauntless as ever in the pursuit of his ambition, he resorted to his favourite arm of preaching, and on Epiphany Day, 1662, in the royal chapel, he replied to his persecutors in a famous rhetorical effort, and called for the execution of the royal decrees in favour of the Indians. Circumstances were against him, however, and the count of Castclmelhor, fearing his influence at court, had him exiled first to Oporto and then to Coimbra; but in both these places he continued his work of preaching, and the reform of the Inquisition also occupied his attention. To silence him his enemies then denounced him to that tribunal, and he was cited to appear before the Holy Office at Coimbra to answer points smacking of heresy in his sermons, conversations and writings. He had believed in the prophecies of a 16th-century shoemaker poet, Bandarra, dealing with the coming of a ruler who would inaugurate an epoch of unparalleled prosperity for the church and for Portugal, and in the Quinto Imperio or Clavis Propheiarum he had endeavoured to prove the truth of his dreams from passages of Scripture. As he refused to submit, the Inquisitors kept him in prison from October 1665 to December 1667, and finally imposed a sentence which pro- hibited him from teaching, writing or preaching. It was a heavy blow for the Company, and though Vieira recovered his freedom and much of his prestige shortly afterwards on the accession of King Pedro II., it was determined that he should go to Rome to procure the revision of the sentence, which still hung over him though the penalties had been removed. During a six years' residence in the Eternal City Vieira won his greatest triumphs. Pope Clement X. invited him to preach before the College of Cardinals, and he became confessor to Queen Christina of Sweden and a member of her literary academy. At the request of the pope he drew up a report of two hundred pages on the Inquisition in Portugal, with the result that after a judicial inquiry Pope Innocent XI. suspended it for five years (1676-81). Ultimately Vieira returned to Portugal with a papal bull exempting him from the jurisdiction of the grand inquisitor, and in January 16S1 he embarked for Brazil. He resided in Bahia and occupied himself in revising his sermons for publication, and in 1687 he became superior of the province. A false accusation of complicity in an assassination, and the intrigues of members of his own Company, clouded his last months, and on the 18th of July 1697 he passed away.*

His works form perhaps the greatest monument of Portuguese prose. Two

hundred discourses exist to prove his fecundity, while his versatility is shown by the fact that he could treat the same subject differently on half a dozen occasions. His letters, simple and conversational in style, have a deep his- torical and political interest, and form documents of the first value for the history of the period. As a man, Vieira would have made a nobler figure if he had not been so great an egotist and so clever a courtier, and the readiness with which he sus- tained directly opposite opinions at short intervals with equal warmth argues a certain lack of sincerity. His name, how- ever, is identified with great causes, justice to the Jews and humanity to the Indians, and the fact that he was in advance of his age led to many of his troubles, while his disinterested- ness in money matters is deserving of all praise.

Principal works: SsrmOes (Sermons) (15 vols., Lisbon, 1679- 1748); there are many subsequent editions, but none com- plete; translations exist in Spanish, Italian, German and French, which have gone through several editions. Historic do Futuro (Lisbon, 1718; 2nd ed., ibid., 1755); this and the Quinto Imperio and the Clavis Prophetarum seem to be in essence one and the same book in different redactions. Cartas (Letters) (3 vols., Lisbon, I 735~46). Noticias reconditas do modo de proceder a Inquisicao de Portugal com os sens presos (Lisbon, r82T). The Arte de Furtar published under Vieira's name in many editions is now known aot

to be his. A badly edited edition of the works of Vieira in 27 volumes appeared in Lisbon, 1854-58, There are unpub- lished MSS. of his in the British Museum in London, and in the Bibliotheque Nationale in Paris. A bibliography of Vieira will be found in Sommervogel, Bibliotheque de la compagnie de Jesus, viii. 653-85.

Authorities. — Andre de Barros, Vida (Lisbon, 1746) — a pane- gyric by a member of the same society; D. Francisco Alexandre Lobo, bishop of Vizeu, " Historical and Critical Discourse," Obras (Lisbon, 1849), vol. ii. — a valuable study; Joao Francisco Lisboa, Vida (5th ed., Rio, 1891) — he is unjust to Vieira, but may be con- sulted to check the next writer; Abbe E. Carel, Vieira, sa vie et ses ceuvres (Paris, 1879); Luiz Cabral, Vieira, biog., caraclere, elo- quence (Paris, 1900); idem, Vieira pregador (2 vols., Oporto, 1901); Sotero dos Reis, Curso de litteratura Portugueza e Brazileira, iii. 121-244. (E- Pa.)

VIELE-GRIFFIN, FRANCIS (1864-), French poet, was born at Norfolk, Virginia, U.S.A., on the 26th of May 1864. He was educated in France,

dividing his time between Paris and Touraine. His volumes include Cueille d'avril (1885); Les Cygnes (1887; new series, 1892); La Chevauchee d'Yeldis (1893); Swanhilde, a dramatic poem (1894); Laus Veneris (1895), a volume of translations from Swinburne; Poemes et Potsies (1895), a collection containing much of his earlier work; Phocas le jardinier (1898); and La Ligende ailte de Wieland le Forgeron (1899), a dramatic poem. M. Viele-Grifnn is one of the most successful writers of the vers litre, the theory of which he expounded, in conjunction with MM. Paul Adam and Bernard Lazare, in the pages of a periodical entitled Entretiens politiques et littiraires (1890-92). He is at his best in the adaptation of the symbolism of old legend to modern uses.

VIELLE, viole, mile, a French term, derived from Lat. fidi- cula, embracing two distinct types of instruments; (1) from the 1 2th to the beginning of the 15th century bowed instru- ments having a box-soundchest with ribs, (2) from the middle or end of the 15th century, the hurdy-gurdy (q.v.). The medieval word vielle or mile has often been incorrectly applied to the latter instrument by modern writers when dealing with the 13th and 14th centuries. The instruments included under the name of vielle, whatever form their outline assumed, always had the box-soundchest consisting of back and belly joined by ribs, which experience has pronounced the most perfect con- struction for bowed instruments. The most common shape given to the earliest vielles in France was an oval, which with its modifications remained in favour until the guitar-fiddle, the Italian lyra, asserted itself as the finest type, from which also the violin was directly evolved. (K. S.)

VIEN, JOSEPH MARIE (1716-1809), French painter, was born at Montpellier on the 18th of June 1716. Protected by Comte de Caylus, he entered at an early age the studio of Natoire, and obtained the grand prix in 1745. He used his time at Rome in applying to the study of nature and the development of his own powers all that he gleaned from the masterpieces around him ; but his tendencies were so foreign to the reigning taste that on his return to Paris he owed his admission to the academy for his picture " Daedalus and Icarus " (Louvre) solely to the indignant protests of Boucher. When in 1776, at the height of his established reputation, he became director of the school of France at Rome, he took David with him amongst his pupils. After his return, five years later, his fortunes were wrecked by the Revolution; but he undauntedly set to work, and at the age of eighty (1796) carried off the prize in an open govern- ment competition. Bonaparte acknowledged his merit by making him a senator. He died at Paris on the 27th of March 1809, leaving behind him several brilliant pupils, amongst whom were Vincent, Regnault, Suvee, Menageot, Taillasson and others of high merit ; nor should the name of his wife, Marie Therese Reboul (1728-1805), herself a member of the

academy, be omitted from this list. Their son, Marie Joseph, born in 1761, also distinguished himself as a painter.

VIENNA (Ger. Wien; Lat. Vindobona), the capital of the Austrian empire, the largest city in the Austro-Hungarian monarchy, and the fourth city in Europe as regards popula- tion. It is situated on the right bank of the Danube, at the base at the Wiener Wald, and at the beginning of the great

plain which separates the Alps from the Carpathians. This plain is continued on the opposite bank of the Danube by the valley of the March, which constitutes the easiest access to the north. Thus Vienna forms a junction of natural ways from south to north, and from west to east. It also lies on the frontier which separates from one another three races, the German, the Slavonic and the Hungarian.

Curiously enough, Vienna has for a long time turned its back, so lo speak, on the magnificent waterway of the Danube, the city being built about 1ˆ m. away from the main stream. Only an arm of the river, the Danube Canal, so called because it was regulated and widened in 1598, passes through the city, dividing it into two unequal parts. It is true that the river forms at this point several arms, and the adjoining districts were subjected to periodical inundations, wdiile navigation was by no means easy here. But in 1870 works for the regulation of the river were started with the object of making it quite safe for navigation, and of avoiding the dangers of inundation. By these magnificent works of regulation the new bed was brought nearer to the town, and the new river channel has an average width of 915 ft. and a depth of 10 ft. On its left bank stretches the so-called inundation region, 1525 ft. wide, while on the right bank quays have been con- structed with numerous wharfs and warehouses. By these works of regulation over 2400 acres of ground were gained for building purposes. This new bed of the Danube was com- pleted in 1876. In conjunction with this work the entire Danube Canal has been transformed into a harbour by the construction of a lock at its entrance, while increased accom- modation for shipping has also been provided at the other end of the canal known as the winter harbour. Into the Danube Canal flows the small stream, called Wien, now arched over almost in its entirety. Vienna extends along the right bank of the Danube from the historic and legendary Kahlenberg to the point where the Danube Canal rejoins the main stream, being surrounded on the other side by a considerable stretch of land which is rather rural than suburban in character.

Vienna is officially divided into twenty-one districts or Bezirke. Until 1892 it contained only ten of the present districts; in that year nine outlying districts were incorporated with the town; in 1900 Brigittenau was created out of part of the old district of Leopoldstadt, and in 1905 the Floridsdorf

district was made up by the incorporation of the following former suburbs: Aspern-an-der-Donau, Donaufeld, Floridsdorf, Gross Jedlersdorf, Hirschstetten, Jedlesee, Kagran, Leopoldau, Lobau-Insel and Stadlau. By the incorporation of the suburbs in 1892, the area of Vienna was more than trebled, namely, from 2i| sq. m. to 69 sq. m.; while a new increase of about one-fifth of its total area was added by the incorporation of 1902. A feature of the new city is the unusually large propor- tion of woods and arable land within its bounds. These form nearly 60% of its total area, private gardens, parks and open spaces occupying a further 13%. While from the standpoint of population it takes the fourth place among European capitals, Vienna covers about three times as much ground as Berlin, which occupies the third place. But the bulk of its inhabitants being packed into a comparatively small portion of this area, the working classes suffer greatly from overcrowding, and all sections of the community from high rents.

The inner city, or Vienna proper, was formerly separated from the other districts by a circle of fortifications, consisting of a rampart, fosse and glacis. These, however, were removed in 1858-60, and the place of the glacis has been taken by a magnificent boulevard, the Ring-Strasse, 2 m. in length, and about 150 ft. in average width. Another series of works, consisting of a rampart and fosse, were constructed in 3704 to surround the whole city at that time, i.e. the first ten districts of modern Vienna. This second girdle of fortifications was known as the Lines (Linien), and a second wide boulevard (Gurtel-Strasse) follows their course round the city. This second or outer girdle of fortifications formed the boundary

between the city and the outlying suburbs, but was removed in 1892, when the incorporation of the suburbs took place.

The inner town, which lies almost exactly in the centre of the others, is still, unlike the older parts of most European towns, the most aristocratic quarter, containing the palaces of the emperor and of many of the nobility, the government offices, many of the embassies and legations, the opera house and the principal hotels. Leopoldstadt which together with Brigit-tenau are the only districts on the left bank of the Danube Canal, is the chief commercial quarter, and is inhabited to a great extent by Jews. Mariahilf, Neubau and Margarethen are the chief seats of manufacturing industry. Landstrasse may be described as the district of officialism; here too are the British and German embassies. Alsergrund, with the enormous general hospital, the military hospital and the municipal asylum for the insane, is the medical quarter.

Near the centre of the inner city, most of the streets in which are narrow and irregular, is the cathedral of St Stephen, the most important medieval building in Vienna, dating in its present form mainly from the 14th and 15th centuries, but incorporating a few fragments of the original 12th-century edifice. Among its most striking features are the fine and lofty tower (450 ft.), rebuilt in 1860-64; the extensive catacombs, in which the emperors were formerly interred; the sarcophagus (1513) of Frederick III.; the tombs of Prince Eugene of Savoy; thirty- eight marble altars; and the fine groined ceiling. A little to the south-west of the cathedral is the Hofburg, or imperial palace, a huge complex of buildings of various epochs and in various styles, enclosing several courtyards. The oldest part of the present edifice dates from the 13th century, and extensive additions have been made since 1887. In addition to private rooms and state apartments, the Hofburg contains a library of about 800,000 volumes, 7000 incunabula and 24,000 MSS., including the celebrated " Papyrus Rainer "; the imperial treasury, containing the family treasures of the house of Habsburg-Lorraine, and other important collections.

In the old town are the two largest of the liofe, extensive blocks of buildings belonging to the great abbeys of Austria, which are common throughout Vienna. These are the Schotten- hof (once belonging to the " Scoti," or Irish Benedictines) and the Molkerhof, adjoining the open space called the Freiung, each forming a little town of itself. As in most continental towns, the custom of living in flats is prevalent in Vienna, where few except the richer nobles occupy an entire house. Of late the so-called " Zinspalaste " . (" tenement palaces ") have been built on a magnificent scale, often profusely adorned without and within with painting and sculpture. Other notable buildings within the line of the old fortifications are the Gothic Augustine church, built in the 14th century, and containing a fine monu-ment of Canova; the Capuchin church, with the burial vault of the Habsburgs; the church of Maria-Stiegen, an interesting Gothic building of the t4th century, restored in 1820; the handsome Greek church, by T. Hansen (1813-1891), finished in 1858; the Minorite church, a Gothic edifice of the 14th century, containing an admirable mosaic of Leonardo da Vinci's " Last Supper " by Raffaeli, executed in 1806-14 by order of Napoleon and placed here in 1846. Other churches worth mentioning are the Schottenkirche, built in the 13th century, reconstructed in the 17th and restored by H. von Ferstel (1828-1883), con- taining the tombs of the count of Starhemberg, the defender of Vienna against the Turks in 1683, and of Duke Heinrich Jasomirgott (d. 1177) ; the church of St Peter, reconstructed by Fischer von Erlach in i702-r3, and the University church, erected by the Jesuits in 1625-31, both in the baroque style with rich frescoes; lastly, the small church of St Ruprecht, the oldest church in Vienna, first built in 740, and several times reconstructed; and the old

Rathaus. At the corner of the Graben, one of the busiest thoroughfares, containing the most fashionable shops in Vienna, is the Stock im Eisen, the stump of a tree, said to be the last survivor of a holy grove round which the original settlement of Vindomina sprang up. It is lull of nails driven into it by travelling journeymen.

The Ring-Strasse ranks as one of the most imposing achievements of modern street architecture. Opposite the Hofburg, the main body of which is separated from the Ring-Strasse by the Hofgarten and Volksgarten, rise the handsome monument of the empress Maria Theresa (erected 1888) and the imperial museums of art and natural history, two extensive Renaissance edifices with domes (erected 1870-89), matching each other in every particular and grouping finely with the new part of the palace. Hans Makart's painted dome in the natural history museum is the largest pictorial canvas in the world. Adjoining the museums to the west is the palace of justice (1881), and this is closely followed by the houses of parliament (1883), in which the Grecian style has been successfully adapted to modern requirements. Beyond the houses of parliament stands the new Rathaus, an immense and lavishly decorated Gothic building, erected in 1873-83. It was designed by Friedrich Schmidt (1825-1891), who may be described as the chief exponent of the modern Gothic tendency as T. Hansen and G. Semper, the creators respectively of the parliament house and the museums, are the leaders of the Classical and Renaissance styles which are so strongly represented in Viennese architecture. Opposite the Rathaus, on the inner side of the Ring, is the new court theatre, another specimen of Semper's Renaissance work, finished in 1880. To the north stands the new T building of the university, a Renaissance structure by H. von Ferstel, erected in 1873-84 and rivalling the Rathaus in extent. Near the uni- versity, and separated from the Ring by a garden, stands the votive church in Alsergrund, completed in 1879, and erected to commemorate the emperor's escape from assassination in r8s3, one of the most elaborate and successful of modern Gothic churches (Ferstel). The other important buildings of the Ring-Strasse include the magnificent opera house, built 1861-69, by E. Van dcr Null (1812-1868) and A. von Siccardsburg (1813-1868), the sumptuous interior of which vies with that of Paris; the academy of art, built in 1872- 76; the exchange, built in ˆ72-77, both by Hansen; and the Austrian museum of art and industry, an Italian Renais- sance building erected by Ferstel in 1868-71. On the north side the Ring-Strasse gives place to the spacious Franz Josef's quay, flanking the Danube Canal. The municipal districts out- side the Ring also contain numerous handsome modern buildings. Vienna possesses both in the inner city and the outlying dis- tricts numerous squares adorned with artistic monuments. One of the finest squares in the world for the beauty of the buildings which encircle it is the Rathausplate, adjoining the Ring-Strasse.

Vienna is the intellectual as well as the material capital of Austria — emphatically so in regard to the German part of the empire. Its university, established in 1365, is now attended by nearly 6000 students, and the medical faculty en- joys a world-wide reputation. Its scientific institutions are headed by the academy of science. The academy of art was founded in 1707.

Museums. — In the imperial art-history museum are stored the extensive art-collections of the Austrian imperial family, which were formerly in the Hofburg, in the Belvedere, and in other places. It contains a rich collection of Egyptian, Greek, Roman and Etruscan antiquities; of coins and medals, and of industrial art. The last contains valuable specimens of the industrial art of the middle ages and of the Renaissance period in gold, silver, bronze, glass, enamel, ivory, iron and wood. The famous salt-cellar (satiera) of Benvenuto Cellini, executed in 1539-43 for Francis I. of France, is here. Then comes the collection of weapons and armour, including the famous Ambras collection, so called after the castle of Ambras near Innsbruck, where it was for a long time stored. The picture gallery, which contains the collection formerly preserved in the Bel- vedere palace, contains masterpieces of almost every school in the world, but it is unsurpassed for Us specimens of Rubens, Dtirer and the Venetian masters. Next come the imperial treasury at the Hof- burg, already mentioned; the famous collection of drawings and engravings known as the Albertina in the palace of the archduke Frederick, which contains over 200,000 engravings and 16,000 draw- ings; the picture gallery of the academy of art; the collection of the Austrian museum of art and industry; the historical museum of the city of Vienna; and the military museum at the arsenal.

Besides, there are in. Vienna a number of private picture galleries of great importance. The largest is that belonging to Prince Liechtenstein, containing about 800 paintings, and specially rich in important works by Rubens and Van Dyck; the picture gallery of Count Harrach, with over 400 paintings, possessing numerous examples of the later Italian and French schools; that of Count Czernin, with over 340 paintings; and that of Count Schonborn, with no pictures. The imperial natural history museum contains a mineralogical, geological and zoological section, as well as a pre- historic and ethnographical collection. Its botanic collection contains the famous Vienna herbarium, while to the university is attached a fine botanical garden. Besides the Ilofburg library, there arc important libraries belonging to the university and other societies, the corporation and the various monastic orders.

Parks, &c. — The Prater, a vast expanse (2000 acres) of wood and park on the east side of the city, between the Danube and the Danube Canal, is greatly frequented by all classes. The exhi bition of 1873 was held in this park, and several of its buildings, including the large rotunda, have been left standing. Other parks are the Hofgarten, the Volksgarten and the Town Park, all adjoin- ing the Ring-Strasse; the Augarten in the Leopoldstadt, the Belve- dere Park in the Landstrasse, the Esterhazy Park in Mariahilf, and the Turkenschanz Park in Dohling. Among the most popular resorts are the parks and gardens belonging to the imperial chateaux of Schonbrunn and Laxenburg.

Government and Administration. — Vienna is the residence of the emperor of Austria, the seat of the Austrian ministers, of the Reichsrat and of the Diet of Lower Austria. It is also the seat of the common ministries for the Austro-Hungarian monarchy, of the foreign ambassadors and general consuls and the meeting-place, alternately with Budapest, of the Austro-Hungarian delegations. It contains also the highest judicial, financial, military and administrative official authorities of Austria, and is the see of a Roman Catholic archbishop. Vienna enjoys autonomy for communal affairs, but is under the control of the governor and the Diet of Lower Austria, while the election of the chief burgomaster requires the sanction of the sovereign, advised by the prime minister. The municipal council is composed of 158 members elected for a period of six years. The long struggle between the municipality and the Austrian ministry arising out of the refusal tc sanction the election (1895) of Dr Lueger, the anti-Semitic leader and champion, recalls in some respects the Wilkes incident in London. In this instance the ultimate success of the corporation greatly strength- ened the Obscurantist and reactionary element throughout Austria.

The cost of the transformation of Vienna, which has been in progress since 1858, cannot be said to have fallen heavily on the population. Great part of the burden has been borne throughout by the " City Extension Fund," realized from the utilization of the ground formerly occupied by the fortifications and glacis. The subsequent regulation of the former suburbs has to a large extent covered its own expenses through the acquisition by the town of the improved area. The municipal finance has on the whole been sound, and notwithstanding the extra burdens assumed on the incorporation of the suburbs, the equilibrium of the communal budget was maintained up to the fall of the Liberal administration. In spite of shortsighted parsimony in the matter of schools, &c, and increased resources through the allocation to the municipality of a certain percentage of new state and provincial taxation, their anti-Semitic successors have been unable to avoid a deficit, and have been obliged to increase the rates. But the direct damage done in this and other ways would seem. to be less

than that produced by the mistrust they inspired for a time among the propertied classes, and the consequent paralysing of enterprise. Their violent anti-Magyar attitude has driven away a certain amount of Hungarian custom, and helped to increase the political difficulties of the cis-Leithan government.

Vienna is situated at an altitude of 550 ft. above the level of the sea, and possesses a healthy climate. The mean annual temperature is 48-6° F., and the range between January and July is about 40 F. The climate is rather changeable, and rapid falls of temperature are not uncommon. Violent storms occur in spring and autumn, and the rainfall, including snow, amounts to 25 in. a year. Vienna has one of the best supplies of drinking water of anv European capital. The water is brought by an aqueduct direct from the Alps, viz. from the Schnee- berg, a distance of nearly 60 m. to the south-west. These magnificent waterworks were opened in 1873, and their sanitary

influence was soon felt, in the almost complete disappearance of typhoid fever, which had numerous victims before.

Great enlargements, by tapping new sources of supply, were made in 1891-93, while since 1902 works have been in progress for bringing a new supply of pure water from the region of the Salza, a distance of nearly 150 m. Another sanitary work of great importance was the improvement carried out in the drainage system, and the regulation of the river Wien. This river, which, at ordinary times, was little more than an ill-smelling brook at one side of an immense bed, was occasionally converted into a formid- able and destructive torrent. Now half the bed of the river has been walled over for the metropolitan railway, while the other half has been deepened, and the portion of it within the town has been arched over. A beginning was thus made for a new and magnificent avenue in the neighbourhood of the Ring-Strasse.

Population. — In 1800 the population of the old districts was 231,050; in 1840, 356,870; in 1857, 476,222 (or with suburbs, 587,235); in i86g, 607,514 (with suburbs, 842,951); in 1880, 704,756 (with suburbs, 1,090,119); in 1890, town and suburbs, 1,364,548; and in 1900, 1,662,269, including the garrison of 26,629 men. Owing to the peculiarities of its situation, the population of Vienna is of a very cosmopolitan and hetero- geneous character. Its permanent population (some 45-5% are born in the city) is recruited from all parts of Austria, and indeed of the entire monarchy. The German element is, of course, the most numerous, but there are also a great number of Hungarians, Czechs and other Slavs.

Previous to the loss of the Italian provinces, a considerable pro- portion came from Italy (30,000 in 1859), including artists, members of the learned professions and artisans who left their mark on Viennese art and taste. The Italian colony now numbers about 2500 (chiefly navvies and masons), in addition to some 1400 Austrian subjects of that nationality. At present the largest and most regular contributions to the population of Vienna come from the Czech provinces of Bohemia and Moravia, next in importance being those from Lower Austria and Styria. This steady and increasing influx of Czechs is gradually infusing a large proportion of. Slav blood in what Bismarck (in 1864) described as the German capital of a Slav empire. Formerly the Czech labourers, artisans and domestic servants who' came to Vienna were somewhat ashamed of their mother-tongue, and anxious to conceal that evidence ot their origin as speedily as possible. The revival of the nationality agitation has produced a marked change in this respect. The Czech immigrants, attracted to Vienna as to other German towns by the growth of industry, are now too numerous for easy absorption, which is further retarded by their national organization, and the provision of separate institutions, churches, schools (thus far private) and places of resort. The consequence is that they take a pride in accentuating their national characteristics, a circumstance which threatens to develop into a new source of discord. In 1900 the population included 1 ,386, 115 persons of German nationality, 102,974 Czechs and Slovaks, 4346 Poles, 805 Ruthenians, 1329 Slovenes, 2ji Serbo-Croatians, and 1368 Italians, all Austrian subjects. To these should be added 133,144 Hungarians, 21,733 natives of Germany (3782 less than in 1890), 2506 natives of Italy, 1703 Russians, 1176 French, 1643 Swiss, &c. Of this heterogeneous population 1,461,891 were Roman Catholics, the Jews coining next in order with 146,926. Protestants of the Augsburg and Helvetic Confessions numbered 54,364; members of the Church of England, 490; Old Catholics, 975; members of the Greek Orthodox Church, 3674; Greek Catholics, 2521; and Mahommedans, 889.

As a general rule, the Viennese are gay, pleasure-loving and genial. The Viennese women are justly celebrated for their beauty and elegance; and dressing as a fine art is cultivated here with almost as great success as in Paris. As a rule, the Viennese arc passionately fond of dancing; and the city of Strauss, J. F.K.Lanner (1801-1S43) and J. Gungl (1810-1889) gives name to a " school " of waltz and other dance music. Opera, especially in its lighter form, flourishes, and the actors of Vienna maintain with success a traditional reputation of no mean order. Its chief place in the history of art Vienna owes to its musicians, among whom are counted Haydn, Mozart, Beethoven and Schubert. The Viennese school of painting is of modern origin; but some of its members, for instance, Hans Makarl (1840-1884), have acquired a European reputation.

Trade. — Vienna is the most important commercial and industrial centre of Austria. For a long time the Austrian government, by failing to keep the Danube in a proper state for navigation, let slip the opportunity of making the city the great DanubiaB

metropolis which its geographical position entitles it to be. But during the last quarter of the 19th century active steps were taken to foster the economic interests of the city. The regulation of the Danube, mentioned above, the conversion of the entire Danube Canal into a harbour, the construction of the navigable canal Danube- March-Oder — all gave a new impetus to the trade of Vienna. The fast-growing activity of the port of Trieste and the new and shorter railway line constructed between it and Vienna also contribute to the same effect. Vienna carries on an extensive trade in corn, flour, cattle, wine, sugar and a large variety of manu- factured articles. Besides the Danube it is served by an extensive net of railways, which radiate from here to every part of the empire. The staple productions are machinery, railway engines and car- riages, steel, tin and bronze wares, pottery, bent and carved wood furniture, textiles and chemicals. In the number and variety of its leather and other fancy goods Vienna rivals Paris, and is also renowned for its manufacture of jewelry and articles of precious metals, objeis d'art, musical instruments, physical chemicals and optical instruments, and artistic products generally. Its articles of clothing, silk goods and millinery also enjoy a great reputation for the taste with which they are manufactured. Books, artistic publications, paper and beer are amongst the other principal products. The building trade and its allied trades are also active.

History. — For several centuries Vienna filled an important role as the most advanced bulwark of Western civilization and Christianity against the Turks, for during the whole of the middle ages Hungary practically retained its Asiatic character. The story of Vienna begins in the earliest years of the Christian era, with the seizure of the Celtic settlement of Vindomina by the Romans, who changed its name to Vindobona, and estab- lished a fortified camp here to command the Danube and protect the northern frontier of the empire. The fortress grew in importance, and was afterwards made a municipium; and here Marcus Aurelius died in 180. On the decline of the Roman empire Vindobona became (the prey of successive barbarian invaders. Attila and his Huns were among the temporary occupants of the place (5th century), and in the following century it came into the possession of the Avars, after which its name disappears from history until towards the close of the 8th century, when Charlemagne expelled the Avars

and made the district between the Enns and the Wiener Wald the boundary of his empire. In the time of Otho II. (976) this " East Mark " (Ostmark, Oesterreich, Austria) was granted in fief to the Baben- bergers, and in the reign of Frederick Barbarossa (n 56) it was advanced to the rank of a duchy. There is no certain record that the site of Vindobona was occupied at the time of the formation of the Ostmark, though many considerations make it probable. It is not likely that the Avars, living in their "ring" encampments, destroyed the Roman municipium; and Bees, the Hungarian name for Vienna to this day, is sus- ceptible of a Slavonic interpretation only, and would seem to indicate that the site had been occupied in Slavonic times. The frequent mention of " Wiene " in the oldest extant version of the Nibelimgenlied points in the same direction. Passing over a doubtful mention of " Vwienni " in the annals of 1030, we find the " civitas " of Vienna mentioned in a document of 1 1 30, and in 11 56 it became the capital and residence of Duke Heinrich Jasomirgott. In 1237 Vienna received a charter of freedom from Frederick II., confirmed in 1247. In the time of the crusades Vienna increased so rapidly, in consequence of the traffic that flowed through it, that in the days of Ottacar II. of Bohemia (1251-76), the successor of the Babenbergers, it had attained the dimensions of the present inner town. A new era of power and splendour begins in 1276, when it became the capital of the Habsburg dynasty, after the defeat of Ottacar by Rudolph of Habsburg. From this time on it has shared the fortunes of the house of Austria. In 1477 Vienna was besieged unsuccessfully by the Hungarians, and in 1485 it was taken by Matthew Corvinus. Of more importance were the two sieges by the Turks (1529 and 1683), when the city was saved on the first occasion by the gallant defence of Count Niclas von Salm (1459-1530), and on the second by Riidiger von Starhemberg (1638-1701), who held out until the arrival of the Poles and Germans under John Sobieski of Poland. The suburbs, however, were destroyed on both occasions. In 1805, and again in 1809, Vienna was for a short time occupied by the French. In 1814-15

it was the meeting-place of the congress which settled the political affairs of Europe after the overthrow of Napoleon. In 184S the city was for a time in the hands of the revolutionary party; but it was bombarded by the imperial forces and compelled to surrender on 30th October of the same year. Vienna was not occupied by the Prussians in the war of 1866, but the invaders marched to within sight of its towers. In 1873 a great international exhibi- tion took place here.

While Berlin and Budapest have made the most rapid progress of all European cities, having multiplied their population by nine in the period 1800-90, Vienna— even including the extensive annexations of 1892— only increased sevenfold. Many causes conspired to this end, but most of them date from the years 1859, 1866 and 1867. The combined effect of

these successive blows, aggravated by the long period of decentralizing policy from Taaffe to Badeni, is still felt in the Kaiserstadt. The gaiety of Vienna had for centuries depended on the brilliancy of its court, recruited from all parts of Europe, including the nobility of the whole empire, and on its musical, light-hearted and con- tented population. Even before it fell from its high estate as the social centre of the German-speaking world, it had suffered severely by the crushing defeats of 1 859 and the consequent exodus of the Austrian nobles. These were held responsible for the misfortunes of the army, and to escape the atmosphere of popular odium retired to their country seats and the provincial capitals. They have never since made Vienna their home to the same extent as before. The change thus begun was con- firmed by the exclusion of Austria from the German Confedera- tion and the restoration of her Constitution'to Hungary, events which gave an immense impetus to the two rival capitals. Thus within eight years the range of territory from which Vienna drew its former throngs of wealthy pleasure-seeking visitors and more or less permanent inhabitants — Italian, German and Hungarian — was enormously restricted. Since then Vienna has benefited largely by the enlightened efforts of its citizens and the exceptional opportunities afforded by the removal of the fortifications. But a decline of its importance, similar to that within the larger sphere which it influenced prior to 1859, has continued uninterruptedly within the Habs burg dominions up to the present day. Its commercial classes constantly complain of the increasing competition of the provinces, and of the progressive industrial emancipation of Hungary. The efforts of the Hungarians to complete their social and economic, no less than their political, emancipation from Austria and Vienna have been unremittingly pursued. The formal recognition of Budapest as a royal residence and capital in 1S92, and the appointment of independent Hungarian court functionaries in November 1893, mark new stages in its progress. It would no longer be correct to speak of Vienna as the capital of the dual monarchy. It merely shares that distinction with Budapest.

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VIENNA, CONGRESS OF (1814-1815). The fall of Napoleon was only achieved by the creation of a special alliance between Great Britain, Austria, Russia and Prussia. By the Treaty of Chaumont of March 10, 1814, these four powers bound them- selves together in a bond which was

not to be dissolved when peace was concluded. W'hen Napoleon had been beaten, France conceded to these allies by a secret article of the first Treaty of Paris of May 30, 1814, the disposition of all countries which Napoleon's fall had freed from French suzerainty. This stupendous task was reserved for a general congress, and it was agreed to meet at Vienna. The visit of the allied sovereigns to England and the pressing engagements of the emperor Alexander and Lord Castlereagh delayed the congress until the

autumn, when all Europe sent its representatives to accept the hospitality of the impoverished but magnificent Austrian court.

Metternich, though he had not yet completely established his position, acted as chief Austrian representative, and he was naturally in his capacity as host the president of the congress. Friedrich v. Gentz acted as secretary both to him and the congress and did much of the routine work. Alexander of Russia directed his own diplomacy, and round him he had gathered a brilliant body of men who could express but not control their master's desires. Of these the chief were foreigners, according to the traditions of Russian diplomacy. Capo d'lstria, Nessel- rorie, Stein, Pozzo di Borgo were perhaps the best men in Europe to manage the Russian policy, while Czartoriski repre- sented at the imperial court the hope of Polish nationality. Frederick William III. of Prussia was a weaker character and, as will be seen, his policy was largely determined by his ally. Prince von Hardenberg, who by no means shared all the views of his master but was incapacitated by his growing infirmities, was first Prussian plenipotentiary, and assisting him was Baron von Humboldt. Great Britain was represented by Lord Castle- reagh, and under him were the British diplomats who had been attached to the foreign armies since 1813, Clancarty, Stewart and Cathcart. Castlereagh brought with him decided views, which however were not altogether those of his cabinet, and his position was weakened by the fact that Great Britain was still at war with the United States, and that public opinion at home cared for little but the abolition of the slave trade. When parliamentary duties called Castlereagh home in February 1815, the duke of Wellington filled his place with adequate dignity and statesmanship until the war broke out.

France sent Prince Talleyrand to conduct her difficult affairs. No other man was so well fitted for the task of maintaining the interests of a defeated country. His rare diplomatic skill and supreme intellectual endowments were to enable him to play a deciding part in the coming congress. All the minor powets of Europe were represented, for all felt that

their in- terests were at stake in the coming settlement. Gathered there also were a host of publicists, secretaries and courtiers, and never before had Europe witnessed such a collection of rank and talent. From the first the social side of the congress im- pressed observers with its wealth and variety, nor did the statesmen disdain to use the dining-table or the ballroom as the instruments of their diplomacy.

All Europe awaited with eager expectation the results of so great an assembly. The fate of Poland and Saxony hung in the balance; Germany awaited an entirely new reorganization; Italy was again ready for dismemberment; rumours went that even the pope and the sultan might be largely affected. Some there were who hoped that so great an opportunity would not be lost, but that the statesmen would initiate such measures of international disarmament as would perpetuate the blessings of that peace which Europe was again enjoying after twenty years of warfare.

It was not long, however, before the allies displayed their intention of keeping the management of affairs entirely in their own hands. At an informal meeting on the 22nd of September the four great powers agreed that all subjects of general interest were to be settled by a committee consisting of Austria, Russia, Prussia and Great Britain together with France and Spain. At the same time, however, it was decided by a secret protocol that the four powers should first settle among themselves the distribution of the conquered territories, and that France and Spain should only be consulted when their final decision was announced.

This was the situation which Talleyrand had to face when he arrived on the 24th of September. His first step when he was admitted to the European committee, which was in the plans of the allies to act so colourless a part, was to ignore the position of the Four and to assert that only the congress as a whole could give the committee full powers. This would have meant an almost indefinite delay, for how was it possible to decide the exact rights of all the different states to a

voice in affairs ? After some heated discussion a compromise was arrived at. The opening of the congress was postponed, and Sweden and Portugal were added to the European com- mittee, but the Four still persisted in the informal meetings which were to decide the important questions. Meanwhile separate committees were formed for the discussion of special problems. Thus a special committee was appointed consisting of the five German powers to discuss the constitution which was to replace the Holy Roman Empire, another to settle that of Switzerland, and others for other minor questions. Talleyrand had, how- ever, already shaken the position of the allies. He had posed as the defender of the public rights of Europe and won to his side the smaller powers and much of the public opinion of

Europe, while the allies were beginning to be regarded more in the light of rapacious conquerors than as disinterested defenders of the liberties of Europe.

Had the Four remained united in their views they would still have been irresistible. But they were gradually dividing into two unreconcilable parties upon the Saxon-Polish question. Alexander, exaggerating the part he had played in the final struggle, and with some vague idea of nationality in his brain, demanded that the whole of Poland should be added to the Russian dominions. Austria was to be compensated in Italy, while Prussia was to receive the whole of Saxony, whose unfor- tunate monarch had been the most faithful of Napoleon's vassals.

It was Castlereagh that led the opposition to these almost peremptory demands of Alexander. A true disciple of Pitt, he came to the congress with an overwhelming distrust of the growing power of Russia, which was only second to his hatred of revolutionary France. He considered that the equilibrium of Europe would be irretrievably upset were the Russian boundaries to be pushed into the heart of Germany. Thus while willing, even anxious that Prussia should receive Saxony, in order that she might be strong to meet the danger from the East, he was prepared to go to any lengths to resist the claims of Russia. For Austria Saxony was really of more vital interest than Poland, but Castlereagh, despite a vigorous resistance from a section of the Austrian court, was able to win Metternich over to his views. He hoped to gain Prussia also to his side, and by uniting the German powers to force Alexander to retire from the position he had so uncompromisingly laid down. With the Prussian statesmen he had some success, but he could make no impression on Frederick William. Alexander used to the utmost that influence over the mind of the Prussian monarch which he had been preparing since the beginning of 1813. Against Castlereagh he entered the lists personally, and memor- andum after memorandum was exchanged. Despite the warning letters of the British cabinet which, dismayed at the long con- tinuance of the American War, counselled caution on a question in which England had no immediate interest, Castlereagh yielded no inch of his ground. But Metternich wavered on the question of Saxony, and December saw the allies hopelessly at difference. It seemed by no means unlikely that the armies which had conquered Napoleon would soon be engaged in conflict with one another.

It was Talleyrand's opportunity. As Castlereagh and Metter- nich began to regard the position as hopeless they began to look upon him as a possible ally. Talleyrand had constantly defended the rights of France's old ally Saxony in the name of the principle which his master Louis XVIII. represented. His passionate appeal on behalf of " legitimacy " was par- ticularly adapted to the necessities of the situation. Alex- ander was driven

into transports of rage by this championship of the ancien regime by one who had been a servant of its bitterest foe. But Castlereagh saw that war could only be avoided if one party was made stronger than the other. The reluctant consent of the British cabinet was obtained and Talleyrand was approached as an equal. He came boldly to the front in the middle of December as the champion of Saxony; and, as Russia and Prussia were still obstinate, Metternich and Castlereagh demanded the admission of France to the secret council. This was refused, and on the 3rd of January

1815 a secret treaty of defensive alliance was signed between France, Austria and Great Britain. For some time affairs . hung in the balance, but Alexander could not mistake the tone of his opponents. Gradually a compromise was arranged, and by the end of the month all danger was past. Eventually Austria and Prussia retained most of their Polish dominions, and the latter power only received about two-fifths of Saxony. The rest of Poland was incorporated as a separate kingdom in the Russian dominions with a promise of a constitution of its own. Talleyrand had rescued France from its humiliating position, and set it as an equal by the side of the allies. Hence- forward he made no effort for the rights of the whole congress.

Meanwhile other affairs had been progressing more har- moniously under the direction of special committees, which included representatives of the powers specially interested. Switzerland was given a constitution which led it in the direc- tion of its later federalism. In Italy Austria retained her hold on Lombardy and Venetia, Genoa was assigned to the kingdom of Sardinia, while Parma went to Marie Louise, the legitimate heir, Carlo Ludivico, having to be content with the reversion after her death, the congress meanwhile assigning Lucca to him as a duchy; the claims of the young Napoleon to succeed his mother in Parma were only destroyed by the efforts of France and England. The other petty monarchs were restored^ and Murat's rash attempt, after Napoleon's return from Elba, to make himself king of united Italy, gave back Naples to the Bourbons, an event which would have been brought about in any case in the course of the next few years (see Murat. Joachim). Holland was confirmed in the possession of Belgium and Luxemburg, Limburg and Liege were added to her dominions. Sweden, who had sacrificed Finland to Russia, obtained Norway.

German affairs, however, proved too complicated for complete solution. It was difficult enough to decide the claims of the states in the scramble for

territory. Eventually, however, by methods of compromise, this was adjusted fairly satisfactorily. The greater states gained largely, especially Prussia, who was given large accessions of territory on the Rhine, partly as a compensation for her disappointment in the matter of Saxony, partly that she might act as a bulwark against France. Some disputes between Baden and Bavaria remained unsettled, and many questions arising out of the new federal constitution of Germany, which had been hurriedly patched together under the influence of the news of Napoleon's return, had to be post- poned for further discussion, and were not settled until the Final Act agreed upon by the conference of German statesmen at Vienna in 1821.

Other more general objects, such as the free navigation of international rivers and the regulation of the rights of precedence among diplomatists (see Diplomacy), were managed with much address. Castlereagh's great efforts were rewarded by a de- claration that the slave trade was to be abolished, though each power was left free to fix such a date as was most convenient to itself. The Final Act, embodying all the separate treaties, was signed on the 9th of June 1815, a few days before the battle of Waterloo.

Before the work of the congress was completed Napoleon was again at Paris, and the closing stages were hurried and ill- considered. One negotiation of supreme importance was cut short for this reason. Castlereagh had left Vienna with the hope that the powers would solemnly guarantee their territorial settlement and promise to make collective war on whoever dared to disturb it. This guarantee was to include the Otto- man dominions, in whose interests, indeed, it had been brought forward. Alexander made no objection provided that the Porte would submit all outstanding claims to arbitration. The distance of Constantinople from Vienna and the obstinacy of the sultan would probably have prevented a settlement, but the return of Napoleon rendered all such proposals almost absurd, and the scheme was dropped.

Thus the congress of Vienna failed to institute any new system for securing the stability of the European polity, nor did

it recognize those new forces of liberty and nationality which had really caused Napoleon's downfall. Following the tradi- tion of all preceding congresses, it was mainly a scramble for territory and power. Territories were distributed among the powers with no consideration for the feelings of their in- habitants, and in general the right of the strongest prevailed. For this reason it has often met with a condemnation that has perhaps been unmerited. It is true that the map of Europe shows to-day but little trace of its influence; but much of its work was determined by conditions over Which statesmen had little control. Europe was not ready for the recognition of nationality and liberalism. What it wanted most of all was

peace, and by establishing something like a' territorial equili- brium the congress did much to win that breathing space which was the cardinal need of all.

Bibliography. — The treaties and acts of the congress may be consulted in J. L. Kliiber, Aden ties Wiener Congresses (9 vols.); Comte d'Angeberg, Le Congres de Vienna (4 vols.). British and Foreign State Papers, vol. ii., gives some of the documents in English, and the Final Act is found in many collections. For the diplomacy, Wellington's Supplementary Despatches, vols. ix. and x., Castle- reagh's Letters and Despatches, vol. x. p Talleyrand's Memoirs, vols, ii. and iii., the works of Gentz (see Gentz, F. Von) and the Memoirs of Hardenberg and Czartoryski are very usefu!. Other records left by contemporaries are those of Miinster, D. D. de Pradt, J. de Maistre and Gagern. The comte A. de La Garde C ha mbonas, Souvenirs du congres de Vienne (ed. with introduction and note by Comte Fleury, Paris, 1901), gives an interesting picture of the congress from its personal and social side. Ot later works a great many historians both of the Napoleonic era and of the 19th century include chapters on the congress; Sorel, V Europe et la Revolu tion franchise, vol. viii., and the various volumes of the Slaaten- Geschichte der Neuesten Zeil give much information. In English the best account is that by Dr A. W. Ward in chs. xix. and xxi. of vol. ix. of the Cambridge Modern History (1906), which gives also a fairly complete bibliography, pp. 867-875. There ie also a list of authorities in Lavisse and Rambaud's Histoire Ginerale, vol. x. (C. K. W.)

VIENNE, a river of central France, a left-hand tributary of the Loire, watering the departments of Correze, Haute- ViennCj Charcnte, Vienne and Indre-ct-Loire. Length, 219 m.; area of basin, 8286 sq. m. Rising on the plateau of Millevaches 14 m. N.W. of Ussel (department of Correze) at a height of 27S9 ft., the Vienne flows westward, between the highlands of Limousin on the south and the plateau of Gentioux and the Blond mountains on the north. The first large town on its banks is Limoges (Haute- Vienne), below its confluence with the Taurion: in this part of its course the river supplies motive power to paper-mills and other factories. The river next reaches St Junicn, below which it turns abruptly northwards to Confolens (Cbarentc). Flowing through a picturesque and now wider valley, and passing in its course the churches and chateaux of Chauvigny, the river proceeds to the confluence of the Clain just above Chatellerault. Below that town it receives the Creuse (rising on the plateau of Millevaches and reaching the Vienne after a course of 159 m.) ; and turns north- west, uniting with the Loire below the historic town of Chinon. There is little river-traffic on the Vienne, and that only below its confluence with the Creuse (30 m.).

VIENNE, a department of west-central France, formed in 1790 out of Poitou (four-fifths of its present area), Touraine (one-seventh) and Berry, and bounded by Deux-Sevres on the W., Charente on the S., Haute- Vienne on the S.E., Indre on the E., Indre-et-Loire on the N.E. and N., and Maine-et -Loire on the N.W. Pop. (1906) 333,621. Area, 2719 sq. m. The river Vienne, which gives its name to the department, with its tributaries the Creuse (subtributary the Gartempe) on the east and the, Clain on the west, flows from sc-uth to north. The general slope of the department is in the same direction, the highest point (764 ft.) being in the south-east and the lowest (115 ft.) at the junction of the Vienne and the Creuse. In the south the Charente, on the north-west the Dive, and in the west some streams belonging to the basin of the Sevre- Niortaise drain small portions of the department. The average temperature is 54° F. The prevailing winds are from the south-west and west. The annual rainfall is 24 in.

Wheat, oats and barley arc the principal cereals' cultivated, other important crops being lucerne, sainfoin, clover, mangel- wurzcls and potatoes. Colza and hemp arc grown to a limited extent. The district of Poitiers grows good red wine, and the white wine of Trois-Mou tiers near Loudun is well known. The breeding of live stock in all its branches is fairly active. Poitou is famous for its mules, and the geese and turkeys of the department are highly esteemed. Oak, ash, alder and birch are the principal forest trees, and among the fruit trees arc the chestnut, walnut and almond. Freestone is quarried. The most important industrial establishments are the national arms manufactory at Chatellerault and the cutlery works near that town. In other parts of the department are wool-spinning mills, hemp-spinning mills, manufactories of serges and coarse cloth, vinegar, candles, goose and goat skins, leather, tiles and pottery, paper-works, breweries, distilleries, lime-kilns and numerous flour-mills. Corn, wine, brandy, vegetables, fruit, chestnuts, fodder, cattle, stone, cutlery, arms and dressed hides are exported; butcher's beasts, colonial produce and coals are im- ported. The department is served by the Ouest-Etat and Orleans railways. Vienne forms part of the diocese of Poitiers, has its court of appeal and educational centre at Poitiers, and belongs to the region of the IX. army corps. The capital is Poitiers, and the department is divided for purposes of administration into 5 arrondissements (Poitiers, Chatellerault, Civray, Loudun, Mont- morillon), 3 1 cantons and 300 communes. The more noteworthy towns are Poitiers, Chatellerault, Loudun, Montmorillon and Chau- vigny, these being separately treated. Other places of interest are St Maurice, Civray and St Savin, which have Romanesque churches, the abbey church of St Savin being remarkable for its mural

paintings; Liguge, with an abbey church of the 15th and 16th centuries; Charroux, which has a Romanesque octagonal tower and other remains of a famous abbey ; and Sanxay, near which there are ruins of a theatre and other Gallo-Roman remains. Vienne is rich in megalithic monuments.

VIENNE, the chief town of an arrondisscment of the depart- ment of the Isere, France. Historically the first, it is by population (24,610 in 1901) the second city of the department of the Isere, after Grenoble; and the third, after Valence, of the Dauphine. It is situated on the left bank of the Rhone just below the junction of the Gere with the Rhone, and about 20 m. by rail S. of Lyons. On the N., E. and S. the town is sheltered by low hills, the Rhone flowing along its western side. Its site is an immense mass of ancient debris, which is constantly yielding interesting antiquities. On the bank of the Gere are traces of the ramparts of the old Roman city, and on the Mont Pipet (E. of the town) are the remains of an amphitheatre, while the ruined castle there was built in the 13th century on Roman substructures. Several of the ancient aqueducts (one only is now actually in use) are still to be seen, while in the neighbourhood of the city some bits of the old Roman roads may still be found.

The streets of the town are narrow and tortuous, but it possesses two Roman monuments of the first class. One is the temple of Augusta and Livia, a rectangular building of the Corinthian order, erected by the emperor Claudius, and inferior only to the Maison Carree at Nimes. From the 5th century to 1793 it was a church (Notre Dame de Vie), and the " festival of reason " was celebrated in it at the time of the Revolution. The other, in the more modern part of the town, is the Plan de V Aiguille, a truncated quadrangular pyramid about 52 ft. in height and resting on a portico with four arches. Many theories have been advanced as to what this singular structure really was (some imagine that it was the tomb of Pontius Pilatus, who, according to the |legend, died at Vienne), but it is now generally believed to have been part of the spina of a large circus, the outlines of which have been traced. The church of St Peter belonged to an ancient Benedictine abbey and was rebuilt in the 9th century. It is in the earliest Romanesque style, and forms a basilica, with tall square piers, reminding one of Lucca, while the two ranges of windows in the aisles, with their coupled marble columns, recall Ravenna from within and the Basse (Euvre of Beauvais from without. The porch is in the earliest Romanesque style. This church has of late years been completely restored, and since 1895 shelters the magnificent Musee Lapidaire (formerly housed in the temple of Augusta and Livia). The former cathedral church (primatial as well as metropolitan) of St Maurice contains some of the best forms of the true N. Gothic, and was constructed at various periods between 1052 and 1533. It is a basilica, with three aisles, but no apse or transepts. It is 315 ft. in length, 1 18 ft. wide and 89 in height. The most striking portion is the

W. front (1533), which rises majestically from a terrace overhanging the "Rhone. But the statuary was much injured by the Protestants in 1562. The church of St Andre le Bas was the church of a second Benedictine monastery, and later the chapel of the earlier kings of Provence. It wa3 rebuilt in 1152, in the later Romanesque style. The town library and art museum are now in the corn hall, which has been

reconstructed for that purpose. A suspension bridge leads from the city to the right bank of the Rhone, where the industrial quarter of Ste Colombe now occupies part of the ancient city. Here is a tower, built in 1349 by Philip of Valois to defend the French bank of the Rhone, as distinguished from the left bank, which, as part of the kingdom of Provence, was dependent on the Holy Roman Empire. This state of things is also recalled by the name of the village, St Romain en Gal, to the N.W. of Ste Colombe.

The Gere supplies the motive power to numerous factories. The most important are those which produce cloth (about 30 factories, turning out daily about 15,000 yds. of cloth). There are numerous other industrial establishments (paper mills, iron foundries, brick works, refining furnaces, &c).

Vienne was originally the capital of the Allobroges, and became a Roman colony about 47 B.C. under Caesar, who embellished and fortified it. A little later these colonists were expelled by the Allobroges; the exiles then founded the colony of Lyons (Lugdunum). It was not till the days of Augustus and Tiberius that Vienne regained all its former privileges as a Roman colony. Later it became the capital of the Provincia Viennen-sis, In 257 Postumus was proclaimed emperor here, and for a few years from that day onwards Vienne was the capital of a short-lived provincial empire. It is said to have been converted to Christianity by Crescens, the disciple of St Paul. Certainly there were Christians here in 177, as in the Greek letter (preserved to us by Eusebius) addressed at that date by the churches of Vienne and Lyons to those of Asia and Fhrygia mention is made of " the " deacon of Vienne. The first bishop certainly known is Verus, who was present at the Council of Aries in 314. About 450 Vienne became an archbishopric and continued one till 1790, when the see was suppressed. The archbishops disputed with those of Lyons the title of " Primate of All the Gauls." Vienne was con- quered by the Burgundians in 438, and in 534 was taken by the Franks. Sacked in 558 by the Lombards and in 737 by the Saracens, the government of the district was given by Charles the Bald in 869 to a certain Count Boso, who in 879 was pro- claimed king of Provence, and was buried on his death in 887 in the cathedral church of St Maurice. Vienne then continued to form part of the kingdom of Provence or Aries till in 1032 it reverted to the Holy Roman Empire. The sovereigns of that kingdom, as well as the emperors in the 12th century (in particular*

Frederick Barbarossa in n 53), recognized the rights of the archbishops as the rulers (in the name of the emperor) of Vienne. But the growing power of the counts of Albon, later Dauphins of the neighbouring county of the Viennois, was the cause of many disputes between them and the archbishops. In 1349 the reigning Dauphin sold his Dauphine to France, but the town of Vienne was not included in this sale, and the archbishops did not give up their rights over it to France till 1449, when it first became French. In 7311-12 the fifteenth General Council was held at Vienne, when Clement V. abolished the order of the Knights Templar. Vienne was sacked in 1562 by the Protestants under the baron des Adrets, and was held for the Ligue 1590-95, when it was taken in the name of Henri IV. by Montmorency. The fortifications were demolished between 1589 and 1636. In 1790 the archbishopric was abolished, the title " Primate of All the Gauls ' being attributed to the archbishops of Lyons. Among famous natives of Vienne may be mentioned St Julian (3rd century) and Nicholas Chorier (1612-1692), the historian of the Dauphine, while Gui de Bourgogne, who was archbishop 1090-1119, became pope in ni9as Calixtus II. (d. 1124).*

See A. Allmer et A. de Terrebasse, Inscriptions antiques et du moyen dge de Vienne en Dauphine (6 vols., Vienne, 1875-76); CI. Charvet, Fastes de la ville de Vie.nne (Vienne, 1S69) ; U. Chevalier, Collection des Cartulaires Dauphinois, in vol. i. (Vienne, 1869). is that of St Andr6 le Bas, and in vol. ii. (1S91) a description of that of St Maurice; N. Chorier, Recherches sur les antiquitis de la ville de Vienne (Vienne, 1658); E. A. Freeman, Article in the Saturday Review for Feb. 6, 1875; F. Raymond, Le Guide Viennois (Troyes, 1897)- (W. A. B. C.)

VIENNE, COUNCIL OF, an ecclesiastical council, which in the Roman Catholic Church ranks as the fifteenth ecumenical synod. It met from October 16, 1311, to May 6, 1312, under

the presidency of Pope Clement V. The transference of the Curia from Rome to Avignon (1300) had brought the papacy under the influence of the French crown; and this position Philip the Fair of France now endeavoured to utilize by de- manding from the pope the dissolution of the powerful and wealthy order of the Temple, together with the introduction of a trial for heresy against the late Pope Boniface VIII. To evade the second claim, Clement gave way on the first. Legal trials and acts of violence against the Templars had begun as early as the year 1307 (see Templars); and the principal object of the council was to secure a definite

decision on the question of their continuance or abolition. In the committee appointed for preliminary consultation, one section was for the immediate condemnation of the order, and declined to allow it any opportunity of defence, on the ground that it was now superfluous and simply a source of strife. The majority of the members, however, regarded the case as non-proven, and demanded that the order should be heard on its own behalf; while at the same time they held that its dissolution was unjustifi- able. Under pressure from the king, who was himself present in Vienne, the pope determined that, as the order gave occasion for scandal but could not be condemned as heretical by a judicial sentence {de jure), it should be abolished per modum provisionis seu ordinationis apostolicae; in other words, by an administra- tive ruling based on considerations of the general welfare. To this procedure the council agreed, and on the 22nd of March the order of the Temple was suppressed by the bull Vox damantis; while further decisions as to the treatment of the order and its possessions followed later.

In addition to this the discussions announced in the opening speech, regarding measures for the reformation of the Church and the protection of her liberties, took place; and a part of the Constitutions found in the Clementinum, published in 1317 by John XXII., were probably enacted by the council. Still it is impossible to say with certainty what decrees were actually passed at Vienne. Additional decisions were necessitated by the violent disputes which raged within the Franciscan order as to the observance of the rules of St Francis of Assisi, and by the multitude of subordinate questions arising from this. Resolutions were also adopted on the Beguines and their mode of life (see Beguines), the control of the hospitals, the institu- tion of instructors in Hebrew, Arabic and Chaldaic at the universities, and on numerous details of ecclesiastical discipline and law.

See Mansi, Collectio Conciliorum, vol. xxv. ; Hefele, Concilien- geschichte, vol. vi. pp. 532-54.

VIERGE, DANIEL (1851-1904), Spanish painter and draughtsman, was born in Madrid in 1851. He went to Paris in 1S67 to seek his fortune, fired by the vivid energy of his national temperament. He became attached to the Monde illuslre in 1870, just before the Franco-Prussian War broke out, and, like other artists in the paper, came under the powerful influence of Edmond Morin, the first newspaper draughtsman in France who sought to impart to drawings for journals the character of a work of art. Vierge's earlier drawings, therefore, partake greatly of Morin's style; such are, " The Shooting in the Rue de la Paix," " The Place d'Armes at Versailles," " The Loan," " The Great School-Fete of Lyons," " Anni- versary of the Fight of Aydes " and " Souvenir of Coulmiers." Vierge lost no time in proving the

extraordinary vigour and picturesqueness of his art. Apart from the contribution of his own original work, he was required by his paper to redraw upon the wood, for the engraver, the sketches sent in by artist-corre- spondents, such as Luc Ollivier Merson in Rome and Samuel Urrabieta (Vierge's brother) in Spain. From 1871 to 1878 his individuality became more and more pronounced, and he produced, among his best-known drawings, " Christmas in Spain," " The Republican Meeting in Trafalgar Square," " Attack on a Train in Andalusia," " Feast of St Rosalia in Palermo;" " In the Jardin d'Acclimatation," " The Burning of the Library of the Escurial, 1872," " Grasshoppers in Algiers," " Brigandage in Sicily," " Night Fete in Constantinople,"

" Episode of the Civil War in Spain," " Marriage of the King of Spain " and " The Bull Fight." About this time he illustrated with remarkable dash and skill Victor Hugo's Annie terrible (Michel Levy, 1874, and Hugues, 1879), " 1813 " (Hugues, 1877) and Les Mislrables (1882). His masterpiece of illustration is Michelet's History of France (1876), consist- ing of 26 volumes containing 1000 drawings. In 1879 he was drawing for La Vie moderne, and then proceeded to illustrate Pablo de Segovia. While engaged upon this work he was attacked by paralysis in the right arm, but with characteristic energy and courage he set himself to acquire the necessary skill in drawing with the left, and calmly proceeded with the illus- trations to the book. In 1801 he illustrated L'Espagnole, by Bergerat, and in 1895 Le Cabaret des trois vertus. In 1898 he held, at the Pelletan Gallery in Paris, an exhibition of his drawings for Chateaubriand's Le Dernier Abenc&rage (" The Last of the Abencerrages "), and in the following year a com- prehensive exhibition of his work (including the illustrations to Don Quixote) at the Art Nouveau Gallery, also in Paris. In r898 Vierge contributed to L'Image, a magazine devoted to the encouragement of engraving upon wood; and two years later, at the International Exhibition at Paris, he was awarded a grand prix. In 1902 he exhibited at the New Salon a scene from, the Franco-Prussian War. He died at Boulogne-sur-Seine in May 1904.

See Roger Marx, Vintage (1898) ; Beraldi, La Gravure au ig siecle.*

VIERSEN, a town of Germany, in the Prussian Rhine pro- vince, 11 m. by rail S.W. from Crefeld, and at the junction of lines to Miinchen-Gladbach, Venlo, &c. Pop. (1905) 27,577. It has an evangelical and four Roman Catholic churches, among the latter the handsome parish church dating from the 15th century, and various educational establishments. Viersen is one of the chief seats in the lower Rhine country for the manu- facture of velvets, silks (especially umbrella covers) and plush.

VIERZON, a town of central France, in the department of Cher, 20 m.

N.W. of Bourges by rail. The Cher and the Yevre unite at the foot of the hill on which lie Vierzon-Ville (pop. (1906) town, 11,812) and Vierzon-Village (pop. town, 2026; commune, 9710); Vieraon-Bourgneuf (pop. town, 1482) is on the left bank of the Cher. The town has a port on the canal of Berry and is an important junction on the Orleans railway; there are several large manufactories for the production of agricultural machines, also foundries, porcelain, brick and tile works and glass works. A technical school of mechanics and a branch of the Bank of France are among the institutions of the town.

VIETA (or Viete), FRANCOIS, Seigneur de la Bigotiere (1540-1603), more generally known as Frakciscus Vieta, French mathematician, was born in 1340 at Fontenay-le-Comte, in Poitou. According to F. Ritter, 1 Vieta was brought up as a Catholic, and died in the same creed; but there can be no doubt that he belonged to the Huguenots for several years. On the completion of his studies in law at Poitiers Vieta began his career as an advocate in his native town. This he left about 1567, and somewhat later we find him at Rennes as a councillor of the parlemenc of Brittany. The religious troubles drove him thence, and Rohan, the well-known chief of the Huguenots, took him under his special protection. He recom- mended him in 1 580 as a " maitre des requetes " (master of requests) ; and Henry of Navarre, at the instance of Rohan, addressed two letters to Henry III. of France on the 3rd of March and the 26th of April 1585, to obtaiD Vieta's restoration to his former office, but without result. After the accession of Henry of Navarre to the throne of France, Vieta filled in 1589 the position of councillor of the parlement at Tours. He afterwards became a royal privy councillor, and remained so till his death, which took place suddenly at Paris in February 1603, but in what manner we do not know; Anderson, the editor of his scientific writings, speaks only of a " praeceps et immaturum autoris fatum."

1 Bolletino Boncompagni (Rome, 1868), vol. i. p. 227, n. 1.

We know of one important service rendered by Vieta as a royal officer. While at Tours he discovered the key to a Spanish cipher, consisting of more than 500 characters, and thenceforward all the despatches in that language which fell into the hands of the French could be easily read. His fame now rests, however, entirely upon his achievements in mathe- matics. Being a man of wealth, he printed at his own expense the numerous papers which he wrote on various branches of this science, and communicated them to scholars in almost every country of Europe. An evidence of the

good use he made of his means, as well as of the kindliness of his character, is fur- nished by the fact that he entertained as a guest for a whole month a scientific adversary, Adriaan van Roomen, and then paid the expenses of his journey home. Vieta's writings thus became very quickly known; but, when Franciscus van Schooten issued a general edition of his works in 1646, he failed to make a complete collection, although probably nothing of very great value has perished.

The form of Vieta's writings is their weak side. He indulged freely in nourishes; and in devising technical terms derived from the Greek he seems to have aimed at making them as unintelligible as possible. None of them, in point of fact, has held its ground, and even his proposal to denote unknown quantities by the vowels a, e, 1, o, u, y — the consonants b, c, &c. t being reserved for general known quantities — has not, been taken up. In this denotation he foiiowed, perhaps, some older contemporaries, as Ramus, who designated the points in geometrical figures by vowels, making use of consonants, r, s, t, &c, only when these were exhausted. Vieta is wont to be called the father of modern algebra. This does not mean, what is often alleged, that nobody before him had ever thought of choosing symbols different from numerals, such as the letters of the alphabet, to denote the quantities of arithmetic, but that he made a general custom of what until his time had been only an exceptional attempt. All that is wanting in his writings, especially in his Isagoge in artem analyticam (1591), in order to make them look like a modern school algebra, is merely the sign of equality — a want which is the more striking because Robert Recorde had made use of our present symbol for this purpose since" 1557, and Xylander had employed vertical parallel lines since 1575. On the other hand, Vieta was well skilled in most modern artifices, aiming at a simplification of equations by the substitution of new quantities having a certain connexion with the primitive unknown quantities. Another of his works, Rtcensio canonica ejfectionum geometricarum, bears a stamp_ not less modern, being what we now call an algebraic geometry — in other words, a collection of precepts how to construct algebraic expressions with the use of rule and compass only. 'While these writings were generally intelligible, and therefore of the greatest didactic importance, the principle of homogeneity, first enunciated by Vieta, was so far in advance of his times that most readers seem to have passed it over without adverting to its value. That principle had been made use of by. the Greek authors of the classic age; but of later mathematicians only Hero, Diophantus, &c, ventured to regard lines and surfaces as mere numbers that could be joined to give a new number, their sum. It may be that the study of such sums, which he found in the works of Diophantus, prompted him to lay it down as a prin- ciple that quantities occurring in an equation ought to be homo- geneous, all of them lines, or surfaces, or solids, or supersolids— – an

equation between mere numbers being inadmissible. During the three centuries that have elapsed between Vieta's day and our own several changes of opinion have taken place on this subject, till the principle has at last proved so far victorious that modern mathematicians like to make homogeneous such equations as are not so from the beginning, in order to get values of a symmetrical shape. Vieta himself, of course, did, not see so far as that; never- theless the merit cannot be denied him of having indirectly suggested the thought. Nor are his. writings lacking in actual inventions. He conceived methods for the general resolution of equations of the second, third and fourth degrees different from those of Ferro and Ferrari, with which, however, it is difficult to believe him to have been unacquainted. He devised an approximate numerical solution of equations of the second and third degrees, wherein Leonardo of Pisa must have preceded him, but by a method every vestige of which is completely lost. He knew the connexion existing between the positive roots of an equation (which, by the way, were alone thought of as roots) and the coefficients of the different powers of the unknown quantity. He found out the formula for deriving the sine of a multiple angle, knowing that of the simple angle with due regard to the periodicity of sines. This formula must have been known to Vieta' in 1593. In that year Adriaan van Roomen gave out as a problem to ah mathematicians an equation of the 45th degree, which, being recognized by Vieta as depending on the equation between sin and sin #/45, was resolved by him at once, all the twentyUhree positive roots of which the said equation

was capable being given at the same time (see Trigonometry). Such was the first encounter of the two scholars. A second took place when Vieta pointed to Apollonius's problem of taction as not yet being mastered, and Adriaan van Roomen gave a solution by the hyperbola. Vieta, however, did not accept it, as there existed a solution by means of the rule and the compass only, which he published himself in his Apollonms Callus (1600). In this paper Vieta made use of the centre of similitude of two circles. Lastly he gave an infinite product for the number x (see Circle, Squaring OF).

Vieta's collected works were issued under the title of Opera Mathematica by F. van Schooten at Leiden in 1646. (M. Ca.)

VIEUXTEMPS, HENRI (1820-1881), Belgian violinist and composer, was born at Venders, on the 20th of February 1820. Until his seventh year he was a pupil of Lecloux, but when De Beriot heard him he adopted him as his pupil, taking him to appear in Paris in 1828. From 1833 onwards he spent the greater part of his life in concert tours, visiting all parts of the world with Uniform success. He first appeared in London at a Philharmonic concert on the 2nd of June 1834, and in the following year studied composition with Reicha in Paris, and began to produce a long

series of works, full of formidably difficult passages, though, also of pleasing themes, and fine musical ideas, which are consequently highly appreciated by violinists. From 1846 to 1852 he was solo violinist to the tsar, and professor in the conservatorium in St Petersburg. From 187 1 to 1873 he was teacher of the violin class in the Brussels Conservatoire, but was disabled by an attack of paralysis in the latter year, and from that time could only superintend the studies of favourite pupils. lie died at Mustapha, in Algiers, on the 6th of June 1881. He had a perfect command of technique, faultless intonation and a marvellous command of the bow. His staccato was famous all over the world, and his tone was exceptionally rich and full.

VIGAN, a town and the capital of the province of Ilocos Sur, Luzon, Philippine Islands, at the mouth of the Abra river, about 200 m. N. by W. of Manila. Pop. of the municipality (1903) 14,945; after the census of 1903 was taken there were united to Vigan the, municipalities of Bantay (pop. 7020), San Vicente (pop. 5060), Santa CataKna (pop. 5625) and Coayan (pop. 6201), making the total population of the municipality 38,851. Vigan is the residence of the bishop of Nueva Segovia and has a fine cathedral, a substantial court-house, other durable public buildings and a monument to Juan de Salcedo, its founder. It is engaged in farming, fishing, the manufacture of brick, tile, cotton fabrics and furniture, and the building of boats. The language is Ilocano.

VIGfiE-LEBRUN, MARIE-ANNE ELISABETH (1755-1842), French painter, was born in Paris, the daughter of a painter, from whom she received her first instruction, though she bene- fited more by the advice of Doyen, Greuze, Joseph Vernet and other masters of the period. When only about twenty years of age she had already risen to fame with her portraits of Count Orloff and the duchess of Orleans, her personal charm making her at the same time a favourite in society. In 1776 she married the painter and art-critic J. B. P. Lebrun, and in 1783 her picture of " Peace bringing back Abundance" (now at the Louvre) gained her the membership of the Academy, When the Revolution broke out in 1789 she escaped first to Italy, where she worked at Rome and Naples. At Rome she painted the portraits of Princesses Adelaide and Victoria, and at Naples the " Lady Hamilton as a Bacchante " now in the collection of Mr Tankerville Chamberlayne; and then jour- neyed to Vienna, Berlin and St Petersburg. She returned to Paris in 1781, but went in the following year to London, where she painted the portraits of Lord Byron and the prince of Wales, and in 1808 to Switzerland. Her numerous journeys, and the vogue she enjoyed wherever she went, account for the numerous portraits from her brush that are to be found in the great collections of many countries. Having returned to France from Switzerland, she lived first at her country house near Marly and then in Paris, where she died at the age of eighty-seven, in 1842,

haying been widowed for twenty-nine years. She published her own memoirs under the. title of Souvenirs (Paris, 1835-37). Among her many sitters was

Marie Antoinette, of whom she painted over twenty portraits between 1779 and 1789. A portrait of the artist is in the hall of the painters at the Urfizi,and another at the National Gallery. The Louvre owns two portraits of Mme Lebrun and her daughter, besides five other portraits and an allegorical com- position.

A full account of her eventful life ia given in the artist's Souvenirs, and in C. Fillet's Mme Vig6e~Le Brun (Paris, 1890). The artist's autobiography has been translated by Lionel Slraehey, Memoirs of Mme Vigee-Lebfun (New York, 1903;, fully illustrated.

VIGEVANO, a town and episcopal see of Lombardy, Italy, in the province of Pavia, on the right bank of the Tfcino, 24 m. by rail S.W. Jrom Milan on the line to Mortara, 381 ft. above sea-level. Pop. (1961) 18,043 (town); 23,560 (commune). It is a medieval walled town, with an arcaded market-place, a cathedral, the Gothic church of S. Francesco, and a castle of the Sforza family, dating from the 14th century and adorned with a loggia by Bramante and a tower imitating that of Filarete in the Castello Sforzesco at Milan. It is a place of some importance in the silk trade and also produces excellent macaroni. There is a steam tramway to Novara.

VlGFtJSSON, GtoBRANDR (1828-1889), the foremost Scandinavian scholar of the 19th century, was born of a good and old Icelandic family in Brei5af jord in 1828. He was brought up, till he went to a tutor's, by his kinswoman, Kristin Vfgfuss- dottir, to whom, he records, he " owed not only that he became a man of letters, but almost everything." He was sent to the old and famous school at Bessastad and (when it removed thither) at Reykjavik; and in 1849, already a fair scholar, he came to Copenhagen University as a bursarius in the Regense College. He was, after his student course, appointed stipendiarius by the Arna-Magnaean trustees, and worked for fourteen years in the Arna-Magnaean Library till, as he said, he knew every scrap of old vellum and of Icelandic written paper in that whole collection. During his Danish life he twice revisited Iceland (last in 1858), and made short tours in Norway and South Germany with friends. In 1866, after some months in London, he settled down in Oxford, which he made his home for the rest of his life, only quitting it for visits to the great Scandi- navian libraries or to London (to work during two or three

long vacations with his fellow-labourer, F. Y. Powell), or for short trips to places such as the Isle of Man, the Orkneys and Shetlands, the old mootstead of the West Saxons at Downton, the Roman station at Pevensey, the burial-place of Bishop Brynjulf's ill-fated son at Yarmouth, and the like. He held the office of Reader in Scandinavian at the university of Oxford (a post created for him) from 1884 till his death. He was a Jubilee Doctor of Upsala, 1877, and received the Danish order of the Dannebrog in 1885. Vfgfusson died of cancer on the 31st of January 1889, and was buried in St Sepulchre's Cemetery, Oxford, on the 3rd of February. He was an excellent judge of literature, reading most European languages well and being acquainted with their classics. His memory was remarkable, and if the whole of the Eddie poems had been lost, he could have written them down from memory. He spoke English well and idiomatically, but with a strong Icelandic accent. He wrote a beautiful, distinctive and clear hand, in spite of the thousands of lines of MS. copying he had done in his early life.

By his Tunatdl (written between October 1854 and April 1855) he laid the foundations for the chronology of Icelandic history, in a series of conclusions that have not been displaced (save by his own additions and corrections), and that justly earned the praise of Jacob Grimm. His editions of Icelandic classics (1858-68), Biskopa Sogur, Bardar Saga, Forn Sogur (with Mobius), Eyrbyggia Saga and Flateyar-bok (with Unger) opened a new era of Icelandic scholar- ship, and can only fitly be compared to the Rolls Series editions of chronicles by Dr Stubbs for the interest and value of their prefaces and texts. Seven years of constant and severe toil (1866-73) were given to the Oxford Icelandic-English Dictionary, incomparably the best guide to classic Icelandic, and a monumental example of single-handed work. His later series of editions (1874-85) included Orkney inga and Hutonar Saga, the great and complex mass of Icelandic historical sagas, known as Sturlunga, and the Corpus Poeticum Boreale, in which he edited the whole body of classic Scandinavian poetry. As an introduction to the Sturlunga, he wrote a complete though concise history of the classic Northern

literature and its sources. In the introduction to the Corpus, he laid the foundations of a critical history of the Eddie poetry and Court poetry of the North in a series of brilliant, original and well- supported theories that are gradually being accepted even by those who were at first inclined to reject them. His little Icelandic Prose Reader (with F. York Powell) (1879) furnishes the English student with a pleasant and trustworthy path to a sound knowledge of Icelandic. The Grimm Centenary Papers (1886) give good examples of the range of his historic work, while his Appendix on Icelandic currency to Sir G. W. Dasent's Burnt Njal is a model of methodical investigation into an intricate and somewhat import ant subject. As a writer in his own tongue he at once gained a high position by*

his excellent and delightful Relations of. Travel-in Norway and South Germany. In English, as his " Visit to Grimm " and his powerful letters to The Times show, he had attained no mean skill. His life is mainly a record of well-directed and efficient labour in Denmark and Oxford. (F. Y. P.)

VIGIL (Lat. vigilia, "watch"), hi the Christian Church, the eve of a festival. The use of the word is, however, late, the vigiliae (pernoctationes, iravvvx^s) having originally been the services, consisting of prayers, hymns, processions and some- times the eucharist, celebrated on the preceding night in pre- paration for the feast. The oldest of the vigils is that of Easter Eve, those of Pentecost and Christmas being instituted somewhat l&ter. With the Easter vigil the eucharist was specially asso- ciated, and baptism with that of Pentecost (see Whitsunday). The abuses connected with nocturnal vigils 1 led to their being attacked, especially by Vigilentius of Barcelona (c. 400), against whom Jerome fulminated in this as in other matters. The custom, however, increased, vigils being instituted for the other festivals, including those of saints.

In the middle ages the nocturnal vigilia were-^ except in the monasteries, gradually discontinued, matins and vespers on the preceding day, with fasting, taking their place. In the Roman Catholic Church the vigil is now usually celebrated on the morning of the day preceding the festival, except at Christmas, when a midnight mass is celebrated, and on Easter Eve. These vigils are further distinguished as privileged and unprivileged. The former (except that of the Epiphany) have special offices; in the latter the vigil is merely commemorated. The Church of England has reverted to early custom in so far as only " Easter Even " is distinguished by a special collect, gospel and epistle. The other vigils are recognized in the calendar (including those of the saints) and the rubric directs that " the collect appointed for any Holy-day that hath a Vigil or Eve, shall be said at the Evening Service next before." VIGILANCE COMMITTEE, in the United States, a self- constituted judicial body, occasionally organized in the western frontier districts for the protection of life and property. The first committee of prominence bearing the name was organized in San Francisco in June 1851, when the crimes of desperadoes who had immigrated to the gold-fields were rapidly increasing in numbers and it was said that there were venal judges, packed juries and false witnesses. At first this committee was com- posed of about 200 members; afterwards it was much larger: The general committee was governed by an executive committee and the city was policed by sub committees. Within about thirty days four desperadoes were arrested, tried by the execu tive committee and hanged, and about thirty others were banished. Satisfied with the results, ' the committee then quietly adjourned, but it was revived five years later. Similar committees were common in other parts of California and in the mining districts of Idaho and Montana. That in Montana exterminated in*

1863-64 a band of outlaws organized under Henry Plummer, the sheriff of Montana City; twenty-four of the outlaws were hanged within a few months. Committees or societies of somewhat the same nature were formed in the Southern states during the Reconstruction period (1865— 72) to protect white families from negroes artd " carpet-baggers," and besides these there were the Ku-Klux-Klan (q.v.) and its branches; the Knights of the White Camelia, the Pale Faces,-and the Invisible Empire of the South, the principal object of which was to control the negroes by striking them with terror.

1 The 35th canon of the council of Elvira (305) forbids T,r omen to attend them.

See H. H. Bancroft, Popular Tribunals (2 vols., San Francisco, 1887) ; and T. J. Dimsdale, The Vigilantes of Montana (Virginia City, 1866).

VIGILANTIUS (fl. c. 400), the presbyter, celebrated as the author of a work, no longer extant, against superstitious prac- tices, which called forth one of the most violent and scurrilous of Jerome's polemical treatises, was born about 370 at Cala- gurris in Aquitania (the modern Cazeres or perhaps Saint Bertrand de Comminges in the department of Haute-Garohne), where his father kept a " statio " or inn on the great Roman road from Aquitania to Spain. While still a youth his talent became known to Sulpicius Severus, who had estates in that neighbourhood, and in 395 Sulpicius, who probably baptized him, sent him with letters to Paulinus of Nola, where he met with a friendly reception. On his return to Severus in Gaul he was ordained; and, having soon afterwards inherited means through the death of his father, he set out for Palestine, where he was received with great respect by Jerome at Bethlehem. The stay of Vigilantius lasted for some time; but, as was almost inevitable, he was dragged into the dispute then raging about Origen, in which he did not see fit wholly to adopt Jerome's attitude. On his return to the West he was the bearer of a letter from Jerome to Paulinus, and at various places where he stopped on the way he appears to have expressed himself about Jerome in a manner that when reported gave great offence to that father, and provoked him to write a reply (Ep. 61). Vigilantius now settled for some time in Gaul, and is said by one authority (Gcnnadius) to have afterwards held a charge in the diocese of Barcelona. About 403, some years after his return from the East, Vigilantius wrote his celebrated work against superstitious practices, in which he argued against relic worship, as also against the vigils in the basilicas of the martyrs, then so common, the sending of alms to Jerusalem,

the rejection of earthly goods and the attribution of special virtue to the unmarried state, especially in the case of the clergy. He thus covers a wider range than Jovinian, whom he surpasses also in intensity. He was especially indignant at the way in which spiritual worship was being ousted by the adoration of saints and their relics. All that is known of his work is through Jerome's treatise Contra Vigilantium, or, as that contro- versialist would seem to prefer saying, " Contra Dormitantium." Notwithstanding Jerome's exceedingly unfavourable opinion, there is no reason to believe that the tract of Vigilantius was exceptionally illiterate, or that the views it advocated were exceedingly "heretical." Soon, however, the great influence of Jerome in the Western Church caused its leaders to espouse all his quarrels, and Vigilantius gradually came to be ranked in popular opinion among heretics, though his influence long remained potent both in France and Spain, as is proved by the polemical tract of Faustus of Rhegium (d. c. 490).

VIGILIUS, pope from 537 to 555, succeeded Silvcrius and was followed by Pelagius I. He was ordained by order of Belisarius while Silverius was still alive; his elevation was due to Theodora, who, by an appeal at once to his ambition and, it is said, to his covetousness, had induced him to promise to disallow the council of Chalcedon, in connexion with the " three chapters " controversy. When, however, the time came for the fulfilment of his bargain, Vigilius declined to give his assent to the condemnation of that council involved in the imperial edict against the three chapters, and for this act of disobedience he was peremptorily summoned to Con- stantinople, which he reached in 547. Shortly after his arrival there he issued a document known to history as his Judicalum (548), in which he condemned indeed the three chapters, but expressly disavowed any intentions thereby to disparage the council of Chalcedon. After a good deal of trimming (for he desired to stand well with his own clergy, who were strongly orthodox, as well as with the court), he prepared another docu- ment, the Constituent ad Imperatorem, which was laid before the so-called fifth " oecumenical " council in 553, and led to his condemnation by the majority of that body, some say even to his banishment. Ultimately, however, he was induced

to assent to and confirm the decrees of the council, and was allowed after an enforced absence of seven years to set out for Rome. He died, however, at Syracuse, before he reached his destination, on the 7th of June 555.

V1G1NTISEXV1RI, in Roman history, the collective name given in republican times to " twenty-six " magistrates of in- ferior rank. They were divided into six boards, two of which were abolished by Augustus. Their number was thereby reduced to twenty and their name altered to Vigintiviki (" the twenty "). They were originally nominated by the higher magistrates,

but subsequently elected in a body at a single sitting of the comitia tribula; under the empire they were chosen by the senate. The following are the names of the six boards: (1) Tresviri capitales (see Tresviri); (2) Tresviri monetales; (3) Quatuorviri mis in urbe purgandis, who had the care of the streets and roads inside the city; (4) Duoviri viis extra urbem purgandis (see Duoviri), abolished by Augustus; (5) Decemviri stlitibus judicandis (see Decemviri); (6) Qualuor praefecti Capuam Cumas, abolished by Augustus. The members of the last-named board were appointed by the praetor urbanus of Rome to administer justice in ten Campanian towns (list in Mommsen), and received their name from the two most important of these. They were subsequently elected by the people under the title of quatuorviri jure dicundo, but the date is not known.

See Mommsen, Rbmisches Staatsrecht, ii. (1887), p. 592.

*VIGLIUS, the name taken by Wigle van Aytia van Zuichem (1507-1577), Dutch statesman and jurist, a Frisian by birth, who was born on the 19th of October 1507. He studied at various universities — Louvain, Dole and Bourges among others — devoting himself mainly to the study of jurisprudence, and after- wards visited many of the principal seats of learning in Europe. His great abilities attracted the notice of Erasmus and other celebrated men, and his renown was soon wide and general. Having lectured on law at the universities of Bourges and Padua, he accepted a judicial position under the bishop of Munster which he resigned in 1535 to become assessor of the imperial court of justice {Reichskammergericht). He would not, however, undertake the post of tutor to Philip, son of the emperor Charles V.; nor would he accept any of the many lucrative and honourable positions offered him by various European princes, preferring instead to remain at the uni- versity of Ingolstadt, where for five years he occupied a pro- fessorial chair. In 1542 the official connexion of Viglius with the Netherlands began. At the emperor's invitation he became a member of the council of Mechlin, and some years later president of that body. Other responsible positions were entrusted to him, and he was soon one of the most trusted of the ministers of Charles V., whom he accompanied during the war of the league of Schmalkalden in 1546. His rapid rise in the emperor's favour was probably due to his immense store of learning, which was useful in asserting the imperial rights where disputes arose between the empire and the estates. He was generally regarded as the author of the edict against toleration issued in 1550; a charge which he denied, maintaining, on the contrary, that he had vainly tried to induce Charles to modify its rigour. When the emperor abdicated in 1555 Viglius was anxious to retire also, but at the instance of King Philip II. he remained at his post and was rewarded by being made coadjutor abbot of St Bavon, and in other ways. In *$$9> when Margaret, duchess of Parma, became regent of the Netherlands, Viglius was an important*

member of the small circle who assisted her in the work of government. He was president of the privy council, member, and subsequently president, of the state council, and a member of the committee of the state council called the consulia. But his desire to resign soon returned. In 1565 he was allowed to give up the presi- dency of the state council, but was persuaded to retain his other posts. However, he had lost favour with Margaret, who accused him to Philip of dishonesty and simony, while his ortho- doxy was suspected. When the duke of Alva arrived in the Netherlands Viglius at first assisted him; but he subsequently

opposed the duke's scheme of extortion, and sought to induce Philip himself to visit the Low Countries. His health was now impaired and his work was nearly over. Having suffered a short imprisonment with the other members of the state council in 1576, he died at Brussels on the 5th of May 1577, and was buried in the abbey of St Bavon.

Viglius was an advocate of peace and moderation, and as such could not expect support or sympathy from men engaged in a life-and-death struggle for liberty, or from their relentless enemies. He was undoubtedly avaricious, and accumulated great wealth, part of which he left to found a hospital at his native place, Zwichem, and a college at the university of Louvain. He married a rich lady, Jacqueline Damant, but had no children.

He wrote a Tagebuch des Schmalkaldischen Dcmaukriegs, edited by A. von Druffel (Munich, 1877), and some of his lectures were published under the title Commenlarii in decern Institutionum titulos (Lyons, 1564). His Vita et opera historica are given in the Analecta Belgicaoi C. P. Hoynck van Papendrecht (the Hague, 1743). See L. P. Gachard, Correspondance de Philippe II. sur les affaires des Pays-Bas (Brussels, 1848-79) ; and Correspondance de Marguerite d'Aulrichc, duchesse de Parme, avec Philippe II. (Brussels, 1S67-81); and E. Poullet, Correspondance de cardinal de Granvelle (Brussels,

1877-81).

VIONE, PAUL DE (1843-1901), Belgian sculptor, was born at Ghent. He was trained by his father, a statuary, and began by exhibiting his " Fra Angelico da Fiesole " at the Ghent Salon in 1868. In 1872 he exhibited at the Brussels Salon a marble statue, " Heliotrope " (Ghent Gallery), and in 1875, at Brussels, "Beatrix" and " Domenica." He was employed by the government to execute caryatides for the conservatoire at Brussels. In 1876

at the Antwerp Salon he had busts of E. Hiel and W. Wilson, which were afterwards placed in the communal museum at Brussels. Until 1882 he lived in Paris, where he produced the marble statue " Immor- tality " (Brussels Gallery), and "The Crowning of Art," a bronze group on the facade of the Palais des Beaux-Arts at Brussels. His monument to the popular heroes, Jean Breydel and Tierre de Coninck, was unveiled at Bruges in 1887. At his death he left unfinished his principal work, the Anspach monu- ment, which was erected at Brussels under the direction of the architect Janlet with the co-operation of various sculptors. Among other notable works by De Vigne may be mentioned " Volumnia " (1875); " Poverella " (1878); a bronze bust of " Psyche " (Brussels Gallery), of which there is an ivory replica; the marble statue of Marnix de Ste Aldegonde in the Square du Sablon, Brussels; the Metdepenningen monument in the cemetery at Ghent; and the monument to Canon de Haerne at Courtrai.

See E. L. Detage, Les Artistes Beiges contemporains (Brussels), and O. G. Destree, The Renaissance of Sculpture in Belgium (London,

1895)-

VIGNETTE (Fr. for " little vine "), in architecture, a running ornament, representing, as its name imports, a little vine, with branches, leaves and grapes. It is common in the Tudor period, and runs or roves in a large hollow or casement. It is also called trayle. From the transference of the term to book- illustration resulted the sense of a small picture, vanishing gradually at the edge.

VIGNY, ALFRED DE (1797-1863), French poet, was born at Loches (Indre-et-Loire) on the 27th of March 1707. Sainte- Beuve, in the rather ill-natured essay which he devoted to Vigny after his death, expresses a doubt, whether the title of count which the poet bore was well authenticated, and hints that no very ancient proofs of the nobility of the family were forthcoming; but it is certain that in the 18th century persons of the name occupied positions which were not open to any but men of noble birth. For generations the ancestors of Alfred de Vigny had been soldiers, and he himself joined the army, with a commission in the Household Troops, at the age of sixteen. But the Revolutionary and Napoleonic wars were over, and after twelve years of life in barracks he retired, preserving, however, a very high estimate of the duties and career of the soldier. While still serving he had made his

mark, if as yet unrecognized, by the publication in 1822 of a volume of poems, and in 1826 by another, together with the famous prose romance of Cinq-Mars. Sainte-Beuve asserts that the poet antedated some of his most

remarkable work. This may or may not be the case; he certainly could not ante- date the publication. And it so happens that some of his most celebrated pieces — Eloa, Dolorida, Mbise — appeared (1822-23) before the work of younger members of the Romantic school whose productions strongly resemble these poems. Nor is this originality limited to the point which he himself claimed in the Preface to his collected Poems in 1837 — that they were " the first of their kind in France, in which philosophic thought is clothed in epic or dramatic form." Indeed this claim is disputable in itself, and has misled not a few of Vigny's recent critics. It is in poetic, not philosophic quality, that his idiosyn- crasy and precursorship are most remarkable. It is quite certain that the other Alfred — Alfred de Musset — felt the influence of his elder namesake, and an impartial critic might discern no insignificant marks of the same effect in the work of Hugo himself. Even Lamartine, considerably Vigny's elder and his predecessor in poetry, seems rather to have been guided by Vigny than Vigny by him. No one can read Dolo- rida or Le Cor without seeing that the author had little to learn from any of his French contemporaries and much to teach them. At the same time Vigny, from whatever cause, hardly made any further public appearance in poetry proper during the more than thirty years of his life, and his entire poems, including posthumous fragments, form but one very small pocket volume. Cinq-Mars, which at least equalled the poems in popularity, will hardly stand the judgment of posterity so well. It had in its favour the support of the Royalist party, the immense vogue of the novels of Walter Scott, on which it was evidently modelled, the advantages of an exquisite style, and the taste of the day for the romance as opposed to the novel of analysis. It therefore gained a great name both in France and abroad. But any one who has read it critically must acknowledge it to be disappointing. The action is said to be dramatic; if it be so, it can only be said that this proves very conclusively that the action of drama and the action of the novel are two quite different things. To the reader who knows Scott or Dumas the story is singularly uninteresting (far less interesting than as told in history); the characters want life; and the book generally stagnates.

Its author, though always as a kind of outsider (the phrase constantly applied to him in French literary essays and histories being that he shut himself up in a tour d'ivoire), attached himself more or less to the Romantic movement of 1830 and the years immediately preceding and following it, and was stimulated by this movement both to drama and to novel- writing. In the year before the revolution of July he pro- duced at the Theatre Francais a translation, or rather paraphrase, of Othello, and an original piece, La Martchale d'Ancre. In 1832 he published the curious bookStello, contain- ing studies of unlucky youthful poets — Gilbert, Chatterton, Chenier — and in 1835 he brought out his drama of

Chatterton, which, by the hero's suicide, shocked French taste even after five years of Romantic education, but had a considerable success. The same year saw the publication of Servitude et grandeur militaires, a singular collection of sketches rather than a con- nected work in which Vigny's military experience, his idea of the soldier's duties, and his rather poetical views of history were all worked in. The subjects of Chatterton and Othello naturally suggest a certain familiarity with English, and in fact Alfred de Vigny knew English well, lived in England for some time and married in 1828 an Englishwoman, Lydia Bunbury. His father-in-law was, according to French gossip, so conspicuous an example of insular eccentricity that he never could remember his son-in-law's name or anything about him, except that he was a poet. By this fact, and the kindness of casual Frenchmen who went through the list of the chief living poets of their country, he was sometimes able to dis- cover his daughter's husband's designation. In 1845 Alfred de

Vigny was elected to the Academy, but made no compromise in his " discourse of reception," which was unflinchingly Romantic. Still, he produced nothing save a few scraps; and, beyond the work already enumerated, little has to be added except his Journal d'un poete and the poems called Les Destinies, edited, with a few fragments, by Louis Ratisbonne after his death. Among his dramatic work, however, should be mentioned Quitte pour la peur and an adaptation of the Merchant of Venice called Shylock. Les Destinies excited no great admiration in France, but they contain some exceedingly beautiful poetry of an austere kind, such as the magnificent speech of Nature in " La Maison du berger " and the remarkable poem entitled " La Colere de Samson." Vigny died at Paris on the 17th of September 1863.

His later life was almost wholly uneventful, and for the most part, as has been said, spent in retirement. His reputation, however, is perfectly secure, ft may, and probably will, rest only on his small volume of poems, though it will not be lessened, as far as qualified literary criticism is concerned, should the reader proceed to the rest of the work. The whole of his non-dramatic verse does not amount to 5000 lines; it may be a good deal less. But the range of subject is comparatively wide, and extraordinary felicity of execution, not merely in language, but in thought, is evident throughout. Vigny, as may be seen in the speech of Nature referred to above, had the secret — very uncommon with French poets — of attaining solemnity without grandiosity, by means of an almost classical precision and gravity of form. The defect of volubility, of never leaving off, which mars to some

extent his great contemporary Hugo, is never present in him, and he is equally free from the looseness and disorders of form which are sometimes blemishes in Musset, and from the effeminacy of Lamartine, while once more his nobility of thought and plentifulness of matter save him from the reproach which has been thought to rest on the technically perfect work of Theophile Gautier. The dramatic work is, perhaps, less likely to interest English than French readers, the local colour of Chatterton being entirely false, the sentiment conventional in the extreme, and the real pathos of the story exchanged for a commonplace devotion on the poet's part to his host's wife. In the same way, the finest passages of Othello simply disappear in Vigny's version. In his remaining works the defect of skill in managing the plot and characters of prose fiction, which has been noticed in Cinq-Mars, reappears, together (in the case of the Journal d'un pocte and elsewhere) with signs of the fastidious and slightly affected temper which was Vigny's chief fault as a man. In his poems proper none of these faults appears, and he is seen wholly at his best. It should be said that of his posthu- mous work not a little had previously appeared piecemeal in the Revue des deux mondes, to which he was an occasional contributor. The prettiest of the complete editions of his works (of which there are several)is to be foundin what is called thePetitebibliotheqtmCharpenlier. For many years the critical attention paid to him was not great. Recently there has been a revival of interest as shown by mono- graphs: M. Paleologue's " Alfred de Vigny " in the Grands ecrivains frangais (iSor); L. Dorison's Alfred de Vigny, poite-phUosophe (1892) and Un symbole social (1894); G. Asse's Alfred de Vigny et les Mitwns originates de sa poesie (1895); E. Dupuy's La Jeunesse des Romantiques (1905) ; and E. Lauvriere's Alfred ae Vigny (Paris, 1910). But in most of these rather excessive attention has been paid to the philosophy " of a pessimistic kind which succeeded Vigny s early Christian Romanticism. This, though not unnote- worthy, is separable from his real poetical quality, and concentra- tion on it rather obscures the latter, which is of the rarest kind. It should be added that an interesting sidelight has been thrown on Vigny by the publication (1905) of his Fragments inidits sur P. et T. CornetUe. (G Sa j

VIGO, a seaport and naval station of north-western Spain, in the province of Pontevedra; on Vigo Bay (Ria de Vigo) and on a branch of the railway from Tuy to Corunna. Pop. (1900) 23,250- Vigo Bay, one of the finest of the Galician fjords, extends inland for 19 m., and is sheltered by low mountains and by the islands (Islas de Cies, ancient Insulae Siccae) at its mouth. The town is built on the south-eastern shore, and occupies a hilly site dominated by two obsolete forts. The older streets ate steep, narrow and tortuous, but there is also a large modern quarter. Vigo owes its importance to its deep and spacious harbour, and to its fisheries. It is a port of call for many lines trading between Western Europe and South America.

Shipbuilding is carried on, and large quanti- ties of sardines are canned for export. In 1909, 2041 ships of 2,710,691 tons (1,153,564 being British) entered at Vigo; the imports in that year, including tin and tinplate, coal, machinery, cement, sulphate of copper and foodstuffs, were

valued at £481,752; the exports, including sardines, mineral waters and eggs, were valued at £554,824. The town contains flour, paper and sawmills, sugar and petroleum refineries, tanneries, distilleries and soap works; it has also a large agri- cultural trade and is visited in summer for sea-bathing.

Vigo was attacked by Sir Francis Drake in 1585 and 1589. In 1702 a combined British and Dutch fleet under Sir George Rooke and the duke of Ormonde destroyed a Franco-Spanish fleet in the bay, and captured treasure to the value of about £1,000,000; numerous attempts have been made to recover the larger quantity of treasure which was supposed, on doubtful evidence, to have been sunk during the battle. In 17 19 Vigo was captured by the British under Viscount Cobham.

VIJAYANAGAR, or Bijanacak (" the city of victory "), an ancient Hindu kingdom and ruined city of southern India. The kingdom lasted from about 1336 to 1565, forming during all that period a bulwark against Mahommedan invasion from the north. Its foundation, and even great part of its history, is obscure; but its power and wealth are attested by more than one European traveller, and also by the character of the existing ruins. At the beginning of the 14th century Mahommedan raiders had effectually destroyed every Hindu principality throughout southern India, but did not attempt to occupy the country permanently. In this state of desolation Hindu nationality rose again under two brothers, named Harihara and Bukka, of whom little more can be said than that they were Kanarese by race. Hence their kingdom was afterwards known as the Carnatic. At its widest extent, it stretched across the peninsula from sea to sea, from Masulipatam to Goa; and every Hindu prince in the south acknowledged its supremacy. The site of the capital was chosen, with strategic skill, on the right bank of the river Tungabhadra, which here runs through a rocky gorge. Within thirty years the Hindu Rayas of Vijayanagar were able to hold their own against the Bahmani sultans, who had now established their independence of Delhi in the Deccan proper. Warfare with the Mahommedans across the border in the Raichur doab w-as carried on almost unceasingly, and with varying result. Two, or possibly three, different dynasties are believed to have occupied the throne of Vijayanagar as time went on; and its final downfall may be ascribed to the domestic dissensions thus produced. This occurred in 1565, when the confederate sultans of Bijapur, Ahmednagar and Golconda, who had divided amongst themselves the Bahmani dominions, over- whelmed the Vijayanagar army

in the plain of Talikota, and sacked the defenceless city. The Raya fled south to Penukonda, and later to Chandragiri, where one of his descendants granted to the English the site of Fort St George or Madras. The city has ever since remained a wilderness of immense ruins, which are now conserved by the British government.

See R. Sewell, A Forgotten Empire (1900) ; and B. S. Row, History of Vijayanagar (Madras, 1906)..

VIKING. The word " Viking," in the sense in which it is used to-day, is derived from the Icelandic (Old Norse) Vikingr (m.), signifying simply a sea-rover or pirate. There is also in Icelandic the allied word vik in g (f .) , a predatory voyage. Asa loan-word viking occurs in A.S. poetry (vicing or wicing), e.g. in Widsith, Byrnoth, Exodus. During the Saga Age (900-1050), in the beginning of Norse literature, vikingr is not as a rule used to designate any class of men. Almost every young Icelander of sufficient means and position, and a very large number of young Norsemen, made one or more viking expedi- tions. We read of such a one that he went "a-viking" (fara i viking, vera i viking, or very often fara, &c, vestan i viking). The procedure was almost a recognized part of education, and was analogous to the grand tour made by our great-grandfathers in the 18th century. But the use of vikingr in a more generic sense is still to be found in the Saga Age. If the designation of this or that personage as mikill vikingr or rawoa vikingr (red viking) be not reckoned an instance of such use, we have it at all events in the name of a small quasi-nationality, the J6msvi- kingar, settled at Jomsborgon the Baltic (in modern Pomerania),

to whom a saga is dedicated: who possessed rather peculiar institutions evidently the relic of what is now called the Viking Age, that preceded the Saga Age by a century. Another instance of such more generic use occurs in the following typical passage from the Landn&mabik (Sturlabok), where it is recorded how Harald Fairhair harried the vikings of the Scottish isles — that famous harrying which led to most of the settlement of Iceland and the birth of Icelandic literature: —

" Haraldr en harfari herjaSi vestr am haf . . . Hann lagSi " undir sig allar Sudreyjar. . . . En er hann for vestann slogust " i eyjernar vikingar ok Skotar ok Irar ok herjuft'u ok raentu " vida " (Landn., ed. Jonsson, 1906, p. 135).

It is in this more generic sense that the word " viking " is now generally

employed. Historians of the north have dis- tinguished as the " Viking Age " (Vikingertiden) the time when the Scandinavian folk first by their widespread piracies brought themselves forcibly into the notice of all the Christian peoples of western Europe. We cannot to-day determine the exact homes or provenance of these freebooters, who were a terror alike to the Prankish empire, to England and to Ireland and west Scotland, who only came into view when their ships anchored in some Christian harbour, and who were called now Normanni, now Dacii, now Danes, now Lochlannoch; which last, the Irish name for them, though etymologically " men of the lakes or bays," might as well be translated " Norsemen," seeing that Locklann was the Irish for Norway. The exact etymology of vlkingr itself is not certain: for we do not know whether vtk is used in a general sense (bay, harbour) in this connexion, or in a particular sense as the Vik, the Skagerrack and Christiania Fjord. The reason for using " viking " in a more generic sense than is warranted by the actual employ- ment of the word in Old Norse literature rests on the fact that we have no other word by which to designate the early Scandi- navian pirates of the 9th and the beginning of the 10th century. We cannot tell for the most part whether they came from Denmark or Norway, so that we cannot give them a national name. " Normanner " is used by some Scandinavian writers (as by Steenstrup in his classical work Normannerne). But " Normans " has for us quite different associations. And even those who have preferred not generally to use the word " vikings " to designate the pirates and invaders, have adhered to the term " Viking Age " for the period in which they were most active (cf. Munch, Del Norske Folks Historie, Deel I. Bd. i. p. 356; Steenstrup and others, Danmarks Riges Historie, bk. ii. &c). At the same time, the significance which the word " viking " has had in our language is due in part to a false etymology, connecting the word with "king"; the effect of which stiU remains in the customary pronunciation vi-king instead of vik-ing, now so much embedded in the language that it is a pedantry to try and change it.

We may fairly reckon the " Viking Age " to lie between the date of the first recorded appearance of a northern pirate fleet (a.d. 789) and the settlement of the Normans in Normandy by the treaty of St Clair-sur-Epte, A.D. 911 or 912. 1 For a few years previous to that date our chief authority for the history of the piracies and raids in the Frankish empire fails us:' we know that the Norsemen had a few years before that date been driven in great numbers out of Ireland; and England had been in a sense pacified through the concession of a great part of the island to the invaders by the peace of Wedmore, A.D. 878. Although, outside the information we get from Christian chroniclers, this age is for the people of the north one of complete obscurity, it is evident that the Viking Age corresponds with some universal disturbance or unrest among the Scandinavian nations, strictly

analogous to the unrest among more southern Teutonic nations which many centuries before had heralded the break-up of the Roman empire, an epoch known as that of the Folk-wanderings (Vdlkerwander- ungen). We judge this because we can dimly see that the

1 W. Vogel gives the former date; 912 is that more commonly accepted. 'The Annates Vedastini.

impulse which was driving part of the Norse and Danish peoples to piracies in the west was also driving the Swedes and perhaps a portion of the Danes to eastward invasion, which resulted in the establishment of a Scandinavian kingdom (GarBariki) in what is now Russia, with its capital first at Novgorod, after- wards at Kiev. 3 This was, in fact, the germ of the Russian empire. If we could know the Viking Age from the other, the Scandinavian side, it would doubtless present far more interest than in the form in which the Christian chroniclers present it. But from knowledge of this sort we are almost wholly cut off. We have to content ourselves with what is for the greater part of this age a mere catalogue of embarka- tions and plunderings along all the coasts of western Europe without distinctive characteristics.

The Viking Raids. — The detail of these raids is quite beyond the compass of the present article, and a summary or synopsis must suffice. For all record which we have, the Viking Age was inaugurated in a.d. 789 by the appearance in England on our Dorset coast of three pirate ships " from Ilaerethaland " (Hardeland or Hardyssel in Denmark or Hordeland in Norway), which are said in the Anglo-Saxon Chronicle to be " the first ships of the Danish men " who sought the land of England. They killed the port-reeve, took some booty and sailed away. Other pirates appeared in 793 on a different coast, Northumbria, attacked a monastery on Lindisfarne (Holy Island), slaying and capturing the monks; the following year they attacked and burnt Jarrow; after that they were caught in a storm, and all perished by shipwreck or at the hands of the country- men. In 795 a fleet appeared off Glamorganshire. They attacked Man in 798 and Iona in 802. But after this date for the lifetime of a generation the chief scene of viking exploits was Ireland, and probably the western coasts and islands of Scotland.

The usual course of procedure among the northern adven- turers remains the same to whatever land they may direct their attacks, or during whatever years of the gth century these attacks may fall. They begin by more or less desultory raids, in the course of which they seize upon some island, which they generally use as an arsenal or point d'appui for attacks on the mainland. At first the raids are made in the summer: the first wintering in any new scene of plunder forms an epoch so far as that

country or region is concerned. Almost always for a period all power of resistance on the part of the inhabitants seems after a while and for a limited time to break down, and the plunderers to have free course wherever they go. Then they show an ambition to settle in the country, and some sort of division of territory takes place. After that the northerners assimilate themselves more or less to the other inhabitants of the country, and their history merges to a less or greater extent in that of the country at large. This course is followed in the history of the viking attacks on Ireland, the earliest of their continuous series of attacks. Thus they begin by seizing the island of Rechru (now Lambay) in Dublin Bay (a.d. 795) ; in the course of about twenty years we have notice of them on the northern, western and southern coasts; by a.d. 825 they have already ventured raids to a considerable distance inland. And in a.d. 832 comes a large fleet (" a great royal fleet," say the Irish annals) of which the admiral's name is given, Turgesius (Thorgeis or Thorgisl?). The new invader, though with a somewhat chequered course, extended his conquests till in A.D. 842 one-half of Ireland (called Lethcuinn, or Con's Half) seems to have submitted to him; and we have the curious picture of Turgesius establishing his wife Ota as a sort of voha, or priestess, in what had been one of Ireland's most famous and most literary monasteries, Clonmacnoise. Turgesius was, however, killed very soon after this (in 845); and though in A.D. 853 Olaf the White was over-king of Ireland, the vikings' power on the whole diminished. In the end, territory was — if by no formal treaty — ceded to their influence; and the (Irish) kingdoms of Dublin and Waterford were established on the island.

- *The word garftr (fort) is preserved in the " gorod " of Novgorod.*

This brief sketch may be taken as the prototype of viking invasion of any region of western Christendom which was the object of their continuous attacks. Of such regions we may distinguish five. Almost simultaneously with the attacks on Ireland came others, probably also from Norway, on the western regions (coasts and islands) of Scotland. Plunderings of Iona are mentioned in a.d. 802, 806. In the course of a genera- tion almost all the monastic communities in western Scotland had been destroyed. But details of these viking plunderings are wanting. On the continent there were three distinct regions of attack. First the mouth of the Scheldt. There the Danes very early settled on the island of Walcheren, which had in fact been given by the emperor Louis the Pious in fief to a Danish fugitive king, Harald by name, who sought the help of Louis, and adopted Christianity. After the partition of the territory of Charlemagne's empire among the sons

of Louis the Pious, Walcheren and the Scheldt-mouth fell within the possessions of the emperor Lothair, and in the region sub- sequently distinguished as Lotharingia. From this centre, the Scheldt, the viking raids extended on either side; some- times eastward as far as the Rhine, and so into Germany proper, the territory assigned to Louis the German; at other times westward to the Somme, and thus into the territory of Charles the Bald, the future kingdom of France. In the event, toward the end of the 9th century all Frisia between Walcheren and the German Ocean seems to have become the permanent possession of the invaders. In like fashion was it with the next district, that of the Seine, only that here no important island served the pirates for their first arsenal and winter quarters. The serious attacks of the pirates in any part of the empire distant from their own lands begin about the time of the battle of Fontenoy between Louis' sons (a.d. 841). The first wintering of the vikings in the Seine territory (a.d. 850) was in " Givoldi fossa," the tomb of one Givoldus, not far from the mouth of the river, but no longer exactly determinable. Their first attack on Paris was in a.d. 845: a much more important but unsuccessful one took place in a.d. 885-87, un- successful that is so far as the city itself was concerned; but the invaders received an indemnity for raising the siege and leave to pass beyond Paris into Burgundy. The settlement of Danes under Rollo or Rolf on the lower Seine, i.e. in Normandy, dates from the treaty of St Clair-sur-Epte, a.d. 912 (or 911).

The third region is the mouth of the Loire. Here the island point d'appui was Noirmoutier, an island with an abbey at the Loire mouth. The northmen wintered there in a.d. 843. No region was more often ravaged than that of the lower Loire, so rich in abbeys — St Martin of Tours, Marmoutiers, St Bene- dict, &c. But the country ceded to the vikings under Hasting at the Loire mouth was insignificant and not in permanent occupation.

Near the end of the gth century, however, the plundering expeditions which emanated from these three sources became so incessant and so widespread that we can signalize no part of west France as free from them, at the same time that the vikings wrought immense mischief in the Rhine country and in Burgundy. The defences of west France seem quite to have broken down, as did the Irish when Turgesius took " Con's half," or when in a.d. 853 Olaf the White became over-king of Ireland. Unfortunately at this point our best authority ceases; and we cannot well explain the changes which brought about the Christianization of the Normans and their settlement in Normandy as vassals, though recalcitrant ones, of the West Frankish kings.

For the viking attacks in the 5th (or 6th) territory, our own country, the course of events is much clearer. As a part of English history it is, however, sufficiently known, and the briefest summary thereof must suffice. That will

show how in its general features it follows the normal course. The first appearance of the vikings in England we saw was in a.d. 789. The first serious attacks do not begin till 838. The island of Sheppey, however, was attacked in 835, and in the following year the vikings entrenched themselves there. The first wintering

of the pirates in England was on the contiguous island of Thanet in a.d. 850. The breakdown of the English defences in all parts of the country save Wessex dates from 868: in Wessex that occurs in 877-88. But the position is suddenly recovered by Alfred in 878, by the battle of Acthandune, as suddenly though not so unaccountably as it was later in West Francia. As Rollo was to do in 9r2, the Danish leader Guthorm received baptism, taking the name of Aethelstan, and settled in his assigned territory, East Anglia, according to the terms of the peace of Wedmore. But the forces which Alfred de- feated at Aethandune represented but half of the viking army in England at the time. The other half under Half dan (Ragnar Lodbrog's son ?) had never troubled itself about Wessex, but had taken firm possession in Northumbria.

The six territories which we have signalized — Ireland, Western Scotland, England, the three in West Francia which merge into each other by the end of the 9th century — do not comprise the whole field of viking raids or attempted invasion. For farther still to the east they twice sailed up the Elbe (a.d. 851, 880) and burnt Hamburg. Southwards they plundered far -up the Garonne, and in the north of Spain; and one fleet of them sailed all round Spain, plundering, but attempting in vain to establish themselves in this Arab caliphate. They plundered on the opposite African coast, and at last got as far as the mouth of the Rhone, and thence to Luna in Italy.

What we found in the case of the Irish "raids, that at first they are quite anonymous, but that presently the names of the captains of the expeditions emerge, is likewise the case in all other lands. In Ireland, besides the important and successful Turgesius, we read of a Saxulf who early met his death, as well as of Ivar (Ingvar), famous also in England and called the son of Ragnar Lodbrog, and of Oisla, Ivar's comrade; finally (the vikings in Ireland being mostly of Norse descent) of the well- known Olaf the White, who became king of all the Scandinavian settlements in Ireland. In France, Oscar is one of the earliest and most successful of the invaders. Later the name of Ragnar (probably Ragnar Lodbrog) appears, along with Weland, Hast- ing and one of the sons of Ragnar, Bjorn. Farther to the east we meet the names of Rurik, Godfred and Siegfried. In the eastern region the viking leaders seem to have been closely connected with one of the Danish royal families, the kings of Jutland. The practical though short-lived conquest of England begins under Ivar, Ubbe and Halfdan, reputed sons of Ragnar, and is completed by the last of the three in conjunction with the Guthorm above

mentioned. This is, of course, what we should expect, that larger acquaintance gives to the Christian chroniclers more knowledge of their enemy. Precisely the same process in a converse sense develops the casual raids of early times into a scheme of conquest. For at the outset the Christian world was wholly strange to these northmen. We have, it has been said, hardly any means of viewing these raids from the other side. But one small point of light is so suggestive that it may be cited here. The mythical saga of Ragnar Lodbrog is undoubtedly concerned with the Viking Age, though it is im- possible now to identify most of the expeditions attributed to this northern hero, stories of conquest in Sweden, in Finland, in Russia and in England, which belong to quite a different age from this one. In the Christian chronicles the name of Ragnar is associated with an attack on Paris in a.d. 845, when the adventurers were (through the interposition of St Germain, say the Christians) suddenly enveloped in darkness — in a thick fog ? — and fell before the arms of the defenders. In Saxo Grammaticus's account of Ragnar Lodbrog, this event seems to be reflected in the story of an expedition of Ragnar's to Bjarma- land or Perm in Russia. For Bjarmaland, though it gained a local habitation, is also in Norse tradition a wholly mythical and mythological place, more or less identical with the under- world (Niflhel, mist-hell). So it appears in the history given by Saxo Grammaticus of the voyage to Bjarmaland of one " Gorm the old." It " looks like a vaporous cloud " and is full of tricks and illusions of sense. We see then that in virtue of some quite historical misfortune to the viking invaders

connected with a mist and with a great sickness which invaded the army, the place they have come to (in reality Paris) is in Scandinavian tradition identified with the mythic Bjarmaland; and later, in the history of Saxo Grammaticus, it is identified with the geographical Bjarmaland or Perm. (Saxo Grammat., Hist. Dan. p. 452, Gylfaginning (Edda Snorra); Acta SS. 18th May and nth Oct.; Steenstrup, Normannerne, i. p. 97 seq.; Keary, The Vikings in Western Christendom, pp. 162, 260.)

No example could better than this bring home to us the strangeness of the Christian world to the first adventurers from the north, nor better explain the process of familiarity which gradually extended the sphere of their ambition. The expedition which we have made mention of took place almost in the middle of the oth century, and exactly fifty years after the effective opening of the Viking Age. But after this date events developed rapidly. It was fourteen years later (in a.d. 859) that Ragnar's son Bjbrn Ironside and Hasting made their great expedition round Spain to the

Mediterranean. In 865 or 866 came to England what we know as the Army, or the Great Army, whose first attacks were in the north of England. Five kings are mentioned in connexion with this veritable invasion of England, and many earls. Their course was not unchequered; but it was only in Wessex that they met with any effective resistance, and the victory of Ashdown (871) put no end to their advance; for, as we know, Alfred himself had at last to wander a fugitive in the fastnesses of Selwood Forest. Much was retrieved by the victory of Aethandune; yet even after the peace of Wedmore as large a part of the land lay under the power of the Danes as of the English.

It is from this time that we discern two distinct tendencies in the viking people. While one section is ready to settle down and receive territory at the hands of the Christian rulers, with or without homage, another section still adheres to a life of mere adventure and of plunder. A large portion of the Great Army refused to be bound by the peace of Wedmore, made some further attempts on England which were frustrated by Alfred's powerful new-built fleet, and then sailed to the continent and spread devastation far and wide. We see them under command of two Danish " kings," Godfred and Siegfried, first in the country of the Rhine-mouth or the Lower Scheldt; after- wards dividing their forces and, while some devastate far into Germany, others extend their ravages on every side in northern France down to the Loire. The whole of these vast countries, Northern Francia, with part of Burgundy, and the Rhineland, seem to lie as much at their mercy as England had done before Aethandune, or Ireland before the death of Turgesius. But in every country alike the wave of viking conquest now begins to recede. The settlement of Normandy was the only permanent outcome of the Viking Age in France. In England under Edward the Elder and Aethelflaed, Mercia recovered a great portion of what had been ceded to the Danes. In Ireland a great expulsion of the invaders took place in the beginning of the roth century. Eventually the Norsemen in Ireland con- tented themselves with a small number of colonies, strictly confined in territory around certain seaports which they them- selves had created: Dublin, Waterford and Wexford; though as the whole of Ireland was divided into petty kingdoms, it might easily happen that the Norse king in Ireland rose to the position — not much more than nominal — of over-king (Ard-Ri) for the whole land.

Character of the Vikings. — Severe, therefore, as were the viking raids in Europe, and great as was the suffering they inflicted — on account of which a special prayer, A furore Normannorum libera nos, was inserted in some of the litanies of the West — if they had been pirates and nothing more their place in history would be an insignificant one. If they had been no more than what the Illyrian pirates had been in the early history of Rome, or than the Arabic corsairs were at this time in southern Europe, the

disappearance of the evil would have been quickly followed by its oblivion. But even at the out- set the vikings were more than isolated bands of freebooters. As we have seen, the viking outbreak was probably part of a xxvrn. 3

national movement. We know that at the same time that some Scandinavian folk were harrying all the western lands, others were founding Garoariki (Russia) in the east; others were pressing still farther south till they came in contact with the eastern empire in Constantinople, which the northern folk knew as MikillgarSr (Mikklegard) ; so that when Hasting and Bjorn had sailed to Luna in the gulf of Genoa the northern folk had almost put a girdle round the Christian world. There is every evidence that the vikings were not a mere lawless folk — that is, in their internal relations — but that a system of laws existed among them which was generally respected. The nearest approach to it now preserved is probably the code of laws attributed to the mythic king FroSi (the Wise) and preserved in the pages of Saxo Grammaticus. It contains provisions for the partition of booty, punishments for theft, desertion and treachery. But some of the clauses securing a comparative liberty for women appear less characteristic of the Viking Age (cf. Alexander Bugge, Vikingerne, vol. i. p. 49). Women, indeed, did not take part in their first expeditions. In the constitution of the J6mborg state and again in that of the eastern Vaerings (a Scandinavian body in the service of the Ea3t Roman Empire) we see a constitution which looks like the foretaste of that of the Tempiars or the Teutonic Knights. Steenstrup thinks the code cited by Saxo may be identical with the laws which Rollo promulgated for his Norman subjects. In any case, they fall more near the viking period than any other northern table of laws. A certain republicanism was professed by these ad- venturers. " We have no king," one body answered to some Frankish delegates. We do read frequently of kings in the accounts of their hosts; but their power may not have extended beyond the leadership of the expedition; they may have been kings ad hoc. On the other hand, the whole character of northern tradition (Teutonic and Scandinavian tradition, alike) forbids us to suppose that any would be elected to that office who was not of noble or princely blood. They were not entirely un- lettered; for the use of runes dates back considerably earlier than the Viking Age. But these were used almost exclusively for lapidary inscriptions. What we can alone describe as a literature, first the early Eddie verse, next the habit of narrat- ing sagas: these things the Norsemen learned probably from their Celtic subjects, partly in Ireland, partly in the western islands of Scotland; and they first developed the new literature on the soil of Iceland. Nevertheless, some of the Eddie songs do seem to give the very form and pressure of the viking period. 1 In certain material possessions — those, in fact, belonging to their trade, which was war and naval adventure — these viking folk were ahead

of the Christian nations: in shipbuilding, for example. There is certainly a historical connexion between the ships which the tribes on the Baltic possessed in the days of Tacitus and the viking ships (Keary, The Vikings in Western Europe, pp. ro8-g) : a fact which would lead us to believe that the art of shipbuilding had been better preserved there than elsewhere in northern Europe. Merchant vessels must of course have plied between England and France or Frisia. But it is certain that even Charlemagne possessed no adequate navy, though a late chronicler tells us how he thought of building one. His descendants never carried out his designs. Nor was any English king before Alfred stirred up to undertake the same task. And yet the Romans, when threatened by the Carthaginian power, built in one year a fleet capable of holding its own against the, till then, greatest maritime nation in the world. The viking ships had a character apart. They may have owed their origin to the Roman galleys: they did without doubt owe their sails to them. 2 Equally certain it is that this special type of shipbuilding was developed in the Baltic, if not before

1 More especially the beautiful series contained in _ book iii. of the Corpus Poeticum Boreale, and ascribed by the editors of that collection to one poet — "the Helgi Poet." Here vikings are mentioned by name — e.g. : —

" VartJ ara ymr, ok iarna glymr ; Brast rond vir» r6nd; rero vikingar."

2 " Sail " in every Teutonic language is practically the same word, and derived from the Latin sagulum.

the time of Tacitus, long before the dawn of the Viking Age. Their structure is adapted to short voyages in a sea well studded with harbours, not exposed to the most violent storms or most dangerous tides. To the last, judging by the specimens of Scandinavian boats which have come down to us, they must have been not very seaworthy; they were shallow, narrow in the beam, pointed at both ends, and so eminently suitable for manoeuvring (with oars) in creeks and bays. The viking ship had but one large and heavy square sail. When a naval battle was in progress, it would depend for its manoeuvring on the rowers. The accounts of naval battles in the sagas show us, too, that this was the case. The rowers in each vessel, though among the northern folk these were free men and warriors, not slaves as in the Roman and Carthaginian galleys, would yet need to be supplemented by a contingent of fighting men, marines, in addition to their crew. Naturally the ship- building developed: so that vessels in the viking time would be much smaller than in the Saga Age. In saga literature we

read of craft (of " long ships ") with 20 to 30 benches of rowers, which would mean 40 to 60 oars. There exist at the museum in Christiania the remains of two boats which were found in the neighbourhood: one, the G6kstad ship, is in very tolerable preservation. It belongs probably to the nth century. On this boat there are places for 16 oars a side. It is not probable that the largest viking ships had more than 10 oars a side. As these ships must often, against a contrary wind, have had to row both day and night, it seems reasonable to imagine the crew divided into three shifts (as they call them in mining districts), which would give double the number of men available to fight on any occasion as to row. 1 Thus a 20-oared vessel would carry 60 men. But some 40 men per ship seems, for this period, nearer the average. In 896, toward the end of our age, it is incidentally mentioned in one place that five vessels carried 200 vikings, an average of 40 per ship. Elsewhere about the same time we read of 12,000 men carried in 250 ships, an average of 48.

The round and painted shields of the warriors hung outside along the bulwarks: the vessel was steered by an oar at the right side (as whaling boats are to-day), the steerboard or star- board side. Prow and stern rose high ; and the former was carved most often into the likeness of a snake's or dragon's head: so generally that " dragon " or " worm " (snake) became synony- mous with a war-ship. The warriors were well armed. The byrnie or mail-shirt is often mentioned in Eddie songs: so are the axe, the spear, the javelin, the bow and arrows and the sword. The Danes were specially renowned for their axes; but about the sword the most of northern poetry and mythology clings. An immense joy in battle breathes through the earliest Norse literature, which has scarce its like in any other literature; and we know that the language recognized a peculiar battle fury, a veritable madness by which certain were seized and which went by the name of " berserk's way " (berserksgangr) . 2 The courage of the vikings was proof against anything, even as a rule against superstitious terrors. " We cannot easily realize how all-embracing that courage was. A trained soldier is- often afraid at sea, a trained sailor lost if he has not the pro- tecting sense of his own ship beneath him. The viking ventured upon unknown waters in ships very ill-fitted for their work. He had all the spirit of adventure of a Drake or a Hawkins, all the trained valour of reliance upon his comrades that mark a soldiery fighting a militia " (The Vikings in Western Christendom, p. 143). He was unfortunately hardly less marked for cruelty and faithlessness. Livy's words, " mhumana crudelitas, per- fidia plus quara Punica," might, it is to be feared, have been applied as justly to the vikings as to any people of western

1 Steenstrup (Normannerne, i. p. 352), to get the number of men on (say) a 30-oared vessel, adds but some 20 more. This seems an unlikely limitation, throwing an impossible amount of work upon the crew, and

leaving each ship terribly weak supposing a naval battle had to be undertaken — as with some rival viking fleet, even before any Christian nation possessed a fleet.

1 Cf. Grett. 5. ch. 42, Njala, ch. 104, &c, and many other sources.

Europe. It is also true, however, that they showed a great capacity for government, and in times of peace for peaceful organization. Normandy was the best-governed part of France in the nth century; and the Danes in East Anglia and the Five Burgs were in many regards a model to their Saxon neigh- bours (Steenstrup, op, cit. iv. ch. 2). Of all European lands England is without doubt that on which the Viking Age has left most impression: in the number of original settlers after 878; in the way which these prepared for Canute's conquest; and finally in that which she absorbed from the conquering Normans. England's gain was France's loss: had the Normans turned their attention in the other direction, they might likely enough have gained the kingdom in France and saved that country from the intermittent anarchy from which it suffered from the nth till the middle of the 15th century.

Sources of Viking History.— These are, as has been said, almost exclusively the chronicles of the lands visited by the vikings. For Ireland we have, as on the whole our best authority, the Annates Ultonienses (C. O'Conor, Scr. Rev. Hib. iv.), supplemented by the Annals of the Four Masters (ed. O'Donovan) and the Chronicon Scottorum (ed. Henessy). Finally, The War of the Gaidhill with the Gaill (ed. Todd); Three Fragments of Irish History (O'Donovan); cf. W. F. Skene, Celtic Scotland. For England the Anglo-Saxon Chronicle, Annates Lindisfarnenses (in Pcrtz, Monumenta, vol. xix.) ; Simeon of Durham, Historic, Dunelmi Ecclesiae. For the Frankish empire the chief sources of our information are The Annales Regnl Francorum, Annales Bertiani (Pertz, vol. i.) in three parts (the first anonymous, the second by Prudentius, the third by Hincmar, a.d. 830ˆ82). The Annates' Xantenses (a.d. 876, 873 ; Pertz, vol. ii.) are the authorities for the northern and eastern regions, and the Annates Fuldenses (which begin with Pipin of Herestel and go down to A.D. 900; Pertz, vol. i.) for Germany. Toward the end of the 9th century the Annales Vedastini (Pertz, vols. i. and ii.) are almost the exclusive authority for the western raids. In the historians of Normandy, especially in Dudo of St Quentm, much incidental matter may be found.

References to the Viking Age in a general way are to be found in a vast number of books, especially histories of the Scandinavian countries, of which Munch's Det Norske Fclks Historic (1852, &c.) is the most distinguished; JV J. A. Worsaae has written Minder om de Danske og Nord-Mandene i England, Skotland oglrland (1851), an antiquarian rather

than an historical study; ,G. B. Depping, VHistoire des expeditions maritimes des Normands (1843), a not very critical work, and E. Mabille, " Les Invasions Normandes dans la Loire" (£cole des chartes bill. t. 30, 1869). A completer work than either of these is W- Vogel's Die Normannen und das Frtin- kische Reich (1906). It does not, however, break any fresh ground. J. C. H. Steenstrup's Normannerne (1876-82), in four volumes, is not a continuous history, but a series of studies of great learning and value; C. F. Keary, The Vikings in Western Europe (1891) is a history of the viking raids on all the western lands, but ends a.d. 888. A. Bugge's Vikingerne (1904-6) is a study of the moral and social side of the vikings, or, one should rather say, of the earliest Scandi- navian folk. (C. F. K.)

VIKRAMADITYA, a legendary Hindu king of Uzjain, who is supposed to have given his name to the Vikram Samvat, the era which is used all over northern India, except in Bengal, and at whose court the " nine gems " of Sanskrit literature are also supposed to have flourished. The Vikram era is reckoned from the vernal equinox of the year 57 B.C., but there is no evidence that that date corresponds with any event in the life of an actual king. As a matter of fact, all dates in this era down to the 10th century never use the word Vikram, but that of Malava instead, that being the tribe that gives its name to Malwa, The name Vikramaditya simply means " sun of power," and was adopted by several Hindu kings, of whom Chand- ragupta II. (Chandragupta Vikramaditya), who ascended the throne of the Guptas about A.D. 375, approaches most nearly to the legend.

See Alexander Cunningham, Book of Indian Eras (1883); and Vincent Smith, Early History of India U9

VILAS, WILLIAM FREEMAN (1840-1908), American political leader and lawyer, was born in Chelsea, Vermont, on the 9th of July 1840. His father, Levi B. Vilas, a lawyer and Democratic politician, emigrated in 1851 to Madison, Wisconsin. William graduated at the university of Wisconsin in 1858, and at the Albany (New York) Law School in i860, and began to practise law in Madison with his father. In 1862 he recruited and be- came captain of Company A of the Twenty-Third Wisconsin

Volunteers., of which he was made lieutenant -colonel in 1863, ind which he commanded in the siege of Vicksburg. In August 1863 he resigned his commission and resumed his law practice. He was professor of law in the university of Wisconsin in 1868-85, and again in 1880-02, and in 1875-78 was a member of the commissicn which revised the statutes of

Wisconsin. From 1876 to 1S86 he was a member of the National Democratic Committee, and virtually the leader of his party in his state; he was a delegate to the National Democratic Conventions of 1876, 1880 and 1884, and was permanent chairman of the last. In 1885 he was a member of the state Assembly. He was postmaster-general in President Grover Cleveland's cabinet from March 1885 until January 1888, and was then secretary of the interior until March 1880. From i8or until 1897 he was a member of the United States Senate, in which, during President Cleveland's second term, he was recognized as the chief defender of the Administration, and he was especially active in securing the repeal of the silver- purchase clause of the Sherman Act. He was a delegate to the Democratic National Convention of 1896, but withdrew after the adoption of the free-silver plank. He then became one of the chief organizers of the National (or Gold) Democratic party, attended the convention at Indianapolis, and was chairman of its committee on resolutions. In 1881-85 and in 1898-1905 he was a regent of the university of Wisconsin; and he was a member (1897-1903) of the commission which had charge of the erection of the State Historical Library at Madison, and in 1906-8 of the commission for the con- struction of the new state capitol. He died at Madison on the 27th of August 1908.

With E. E. Bryant he edited v-ols. i. to xx., except vol. v., of the Imports of the Wisconsin Supreme Court.

VILL, the Anglicized form of the word villa, used in Latin documents to translate the Anglo-Saxon tun, township, " the unit of the constitutional machinery, the simplest form of social organization " (Stubbs, Const. Hist. § 39). The word did not always and at all times have this meaning in Latin- English documents, but " vill " and " township " were ultimately, in English law, treated as convertible terms for describing a village community, and they remained in use in legal nomenclature until the ecclesiastical parishes were con- verted into areas for civil administration under the Poor Law Acts. This technical sense is derived from the late Latin use of villa for views, a village. Thus Fleta (vi. c. 51), writing in the time of Edward I., distinguishes the villa, as a collection of habitations and their appurtenances, from the mansio, a single house, nulli viiina, and the manor, which may embrace one or more villae. In classical Latin villa had meant " country- house," " farm," " villa " (see Villa); but the word was pro- bably an abbreviation of vicula, diminutive of viens, and in the sense cf vlcus it is used by Apuleius in the 2nd century. Later it even displaced civitas, for city; thus Rutilius Numa- tianus in his Itinerarium speaks of villae ingmles, oppida parva; whence the French ville (see Du Cange, Glossarium lat. s.v. Villa). In the Frankish empire villa was also used of the royal and imperial palaces or seats with their appurtenances. In the sense of a small collection of habitations the word came into general use in

England in the French form "village." From villa, too, are derived villein and villenage (q.v.) (see also Village Communities).

VILLA, the Latin word (diminutive of vicus, a village) for a country-house. This term, which in England is usually given to a small country-house detached or semi-detached in the vicinity of a large town, is being gradually superseded by such expressions as " country " or " suburban house," " bungalow," &c, but in Italy it is still retained as in Roman times and means a summer residence, sometimes being of great extent. References to the villa are constantly made by Roman writers. Cicero is said to have possessed no less than seven villas, the oldest of which was near Arpinum, which he inherited. Pliny the younger had three or four, of which the example near Laurentium is the best known from his descriptions.

There is too wide a divergence in the various conjectural restorations to make them of much value, but the remains of the villa of Hadrian at Tivoli, which covered . an area over seven miles long and in which reproductions were made of all the most celebrated buildings he had seen during his travels, those in Greece seeming to have had the most attraction for him, and the villas of the 16th century on similar sites, such as the Villa d'Este near Tivoli, enable one to form some idea of the exceptional beauty of the positions selected and of the splendour of the structures which enriched them. According to Pliny, there were two kinds of villas, the villa urbana, which was a country seat, and the villa rustica, the farm-house, occupied by the servants who had charge generally of the estate. The Villa Boscorcale near Pompeii, which was excavated in 1893-94, was an example of the villa rustica, in which the principal room was the kitchen, with the bakery and stables beyond and room for the wine presses, oil presses, hand mill, &c. The villas near Rome were all built on hilly sites, so that the laying out of the ground in terraces formed a very important element in their design, and this forms the chief attraction of the Italian villas of the 16th century, among which the following are the best known: the Villa Madama, the design of which, attributed to Raphael, was carried out by Giulio Romano in 1520; the Villa Medici (1540); the Villa Albani, near the Porta Salaria; the Borghese; the Doria Pamphili (1650); the Villa di Papa Giulio (1550), designed by Vignola; the Aldobrandini (1592); the Falconieri and the Montdragon Villas at Frascati, and the Villa d'Este near Tivoli, in which the terraces and staircases are of great importance. In the proximity of other towns in Italy there are numerous villas, of which the example best known is that of the Villa Rotunda or Capra near Vicenza, which was copied by Lord Burlington in his house at Chiswick.

The Italian villas of the 16th and 17th century, like those of Roman times, included not only the country residence, but the whole of the other

buildings on the estate, such as bridges, casinos, pavilions, small temples, rectangular or circular, which were utilized as summer-houses, and these seem to have had a certain influence in England, which may account for the numerous examples in the large parks in England of similar erections, as also the laying out of terraces, grottos and formal gardens. In France the same influence was felt, and at Fontainebleau, Versailles, Meudon and other royal palaces, the celebrated Le Notre transformed the parks surrounding them and introduced the cascades, which in Italy are so important a feature, as at St Cloud near Paris. (R. P. S.)

VILLACH, a town in Carinthia, Austria, 24 m. W. of Klagen- furt by rail. Pop. (1900) 9690. It is situated on the Drave, near its confluence with the Gail, in a broad fertile basin at the foot of the Dobratsch or Villacher Alp (7107 ft.). The parish church is an interesting Gothic edifice of the 15th century. The principal industry of Villach consists in the fabrication of various lead wares, and is mostly dependent on the lead mines of Bleiberg, which is situated about 9 m. to the west. This village (pop. 3435) is one of the richest lead-mining centres in Europe. The ores found here comprise silver-free galena, sulphate of zinc and calamine. The mines were already worked during the middle ages. Warmbad Villach, a watering-place with hot sulphur baths, and Mittewald, a favourite summer resort, whence the ascent of the Dobratsch can be made, are in the neighbour- hood of Villach. Some of the prettiest Carinthian lakes are to be found near Villach, as the Ossiacher-see, on whose southern shore stands the ruined castle of Landskron, dating from the middle of the 16th century, the Worther-see and the small but lovely Faaker-see.

Villach is an old town, which was given by Heinrich II. to the bishopric of Bamberg in 1007. During the middle ages it was an important centre of commerce between Germany and Italy. With the advent of new trade routes at the beginning of modern times the town lost its importance, and in 1745 the citizens nearly decided to emigrate en masse. Its trade revived during the French occupation of 1809-13, and it

continued to improve during the 19th century. The Turks were defeated here in 1492 by Maximilian I., and an engagement between the Austrians and the French took place here on the 21st of August 1813.

VILLA DEL PILAR, a city of Paraguay, 104 m. S. by E. of Asuncion, on the left bank of the navigable river Paraguay, which receives the Bermejo from the right immediately opposite. Pop. (1910) about 10,000. Villa del

Pilar is a thriving modern city, containing barracks, law courts, a national college, several schools and a branch of the Agricultural Bank. It has a fine harbour, and is one of the principal centres in the republic for the exportation of oranges.

VILLAFRANCA DI VERONA, a town of Venctia, Italy, in the province of Verona, n m. S.S.W. of Verona, on the railway to Mantua, 174 ft. above sea-level. Pop. (1901) 5037 (town); 9635 (commune). It has considerable silk industries. Here preliminaries of peace were signed between Napoleon III. and the Austrians in 1859 after the battle of Solferino. Five miles to the N. is Custozza, where the Italians were defeated by the Austrians in 1S48 and 1S66. Villafranca is a common place name in Italy.

VILLAGE COMMUNITIES/ The study of village communities has become one of the fundamental methods of discussing the ancient history of institutions. It would be out of the question here to range over the whole field of human society in search for communal arrangements of rural life. It will be sufficient to confine the present inquiry to the varieties presented by nations of Aryan race, not because greater importance is to be attached to these nations than to other branches of humankind, although this view might also be reasonably urged, but principally because the Aryan race in its history has gone through all sorts of experiences, and the data gathered from its historical life can be tolerably well ascertained. Should the road be sufficiently cleared in this particular direction, it will not be difficult to connect the results with similar researches in other racial surroundings.

The best way seems to be to select some typical examples, chiefly from the domain of Celtic, Slavonic and Germanic social history, and to try to interpret them in regard to the general conditions in which communal institutions originate, grow and decay. As the principal problem will consist in ascertaining how far land was held in common instead of being held, as is usual at present, by individuals, it is advisable to look out for instances in which this element of holding in common is very clearly expressed. We ought to get, as it were, acclima- tized to the mental atmosphere of such social arrangements in order to counteract a very natural but most pernicious bent prompting one to apply to the conditions of the past the key of our modern views and habitual notions. A certain acquaint- ance with the structure of Celtic society, more especially the society of ancient Wales, is likely to make it clear from the out- set to what extent the husbandry and law of an Aryan race may depend on institutions in which the individual factor is greatly reduced, while the union first of kinsmen and then of neighbours plays a most decisive part.

F. Seebohm has called our attention to the interesting surveys of Welsh tracts of country made in the 14th century, soon after these regions passed

into the hands of English lords. The frag- ments of these surveys published by him and his commentary on them are very illuminating, but further study of the docu- ments themselves discloses many important details and helps to correct some theories propounded on the subject. Let us take up a concrete and simple case, e.g. the description of Astret Canon, a trev or township (irillata) of the honour of Denbigh, surveyed in 1334. In the time of the native Welsh princes it was occupied entirely by a kindred (progenies) of free tribesmen descended from a certain Canon, the son of Lawaurgh. The kindred was subdivided into four gavells or bodies of joint-tenants. On the half-gavell of Monryk ap Canon, e.g. there are no less than sixteen coparceners, of whom eight possess houses. The peculiarity of this system of land tenure consists in the fact that all the tenants of these gavells derive their position

on the land from the occupation of the township by their kindred, and have to trace their rights to shares in the original unit. Although the village of Astret Canon was occupied under the Survey by something like fifty-four male tenants, the majority of whom were settled in houses of their own, it continued to form a unit as well in regard to the payment of tungpound, that is, of the direct land tax and other services and pay- ments, but also in respect of the possession and usage of the soil. On the other hand, movable property is owned in severalty. Services have to be apportioned among the members of the kindreds according to the number of heads of cattle owned by them. From the description of another township — Pireyon — we may gather another important feature of this tribal tenure. The population of this village also clustered in gavells, and we hear that these gavells ought to be considered as equal shares in respect of the arable, the wood and the waste of the town- ship. If the shares were reduced into acres there would have fallen to each of the eight gavells of Pireyon ninety-one acres, one rood and a half and six perches of arable and woodland, and fifty-three and one-third of an acre and half a rood of waste land. But as a matter of fact the land was not divided in such a way, and the rights of the tenants of the gavell were realized not through the appropriation of definite acres, but as propor- tionate opportunities in regard to tillage and as to usages fn pasture, wood and waste. Pastoral habits must have greatly contributed to give the system of landholding its peculiar character. It was not necessary, it would have been even harmful, to subdivide sharply the area on which the herds of cows and the flocks of sheep and goats were grazing. Still Welsh rural life in the 14th century had already a definite though subordinate agricultural aspect, and it is important to notice that individual appropriation had as yet made very slight progress in it.

We do not notice any systematic equalization betw'een members of the tribal communities of the trevs. In fact, both differences in the ownership of cattle and differences of tribal standing, established by complex reckonings

of pedigree and of social rank, led to marked inequalities. But there was also the notion of birthright, and we find in the laws that every free tribesman considered himself entitled to claim from his kindred grazing facilities and five crws for tillage. Such a claim could be made unconditionally only at a time when there was a superabundance of land to dispose of. In the 14th century, to which our typical descriptions refer, this state of things had ceased to be universal. Although great tracts of Welsh land were undoubtedly still in a state of wilderness, the soil in more conveniently situated regions was beginning to be scarce, and considerable pressure of population was already felt, with a consequent transition from pastoral pursuits to agriculture. The tract appropriated to the township of Astret Canon, for instance, contained only 574 acres of land of all kinds. In this case there was hardly room for the customary five erws per head of grown-up males besides commons. And yet although the population lived on a small pittance, the system of tribal tenure was not abandoned.

Although there are no rearrangements or redivision within the tribe as a whole, inside every gavell, representing more narrow circles of kinsmen, usually the descendants of one great- grandfather, i.e. second cousins, the shares are shifted and readjusted according to one of two systems. In one case, that of the trevcyvriv or joint-account village, every man receives " as much as another yet not of equal value " — which means, of course, that the members of such communities were provided with equal allotments, but left to make the best of them, each according to chance and ability. This practice of reallotment was, however, restricted in the 14th century to taeog trevs, to villages occupied by half-free settlers. The free tribesmen, the priodarii of Wales, held by daddenhud, and reallotted shares within the trev on the coming of each new generation or, conversely, on the going out, the dying out, of each older generation. In other words: at the demise of the last of the grandfathers in a gavell, all the fathers took

equal rank and claimed equal shares, although formerly some of the portions had been distributed equally only between the grandfathers or their offspring (stirps). The right to claim redivision held good only within the circle of second cousins. Members of the kindred who stood further than that from each other, that is, third cousins, were not entitled to reallot- ment on the strength of daddcnhud.

Another fact which is brought out with complete evidence by the Welsh Surveys is that the tenure is ascribed to com- munities of kinsmen and not to chiefs or headmen. The latter certainly existed and had exerted a powerful influence on the disposal of common land as well as on government and justice. But in the view of 14th-century surveys each township is owned not by this or the other elder, but by numerous bodies of coparceners. The gavell of Owen Gogh, for instance, contained twenty-six coparceners. In this way there is a clear attribution of rights of communal ownership, if we like to use the term, and not merely of rights of maintenance. Nor is there any warrant for a construction of these arrangements on a supposed patriarchal system.

Let us now compare this description of Celtic tribal tenure with Slavonic institutions. The most striking modern ex- amples of tribal communities settled on a territorial basis are presented by the history of the Southern Slavs in the Balkan Peninsula and in Austria, of Slovenes, Croats, Serbs and Bul- garians, but it is easy to trace customs of the same kind in the memories of Western Slavs conquered by Germans, of the Poles and of the

different subdivisions of the Russians. A good clue to the subject is provided by a Serb proverb which says that a man by himself is bound to be a martyr. One might almost suggest that these popular customs illustrate the Aristo- telian conception of the single man seeking the " autarkeia," a complete and self-sufficient existence in the society of his fellow-men, and arriving at the stage of the tribal village, the •ykvm, which is also a Kcofirj, as described in the famous intro- ductory chapter of the Greek philosopher's Politic. The Slavs of the mountainous regions of the Balkans and of the Alps in their stubborn struggle with nature and with human enemies have clustered and still cluster to some extent e.g. in Montenegro) in closely united and widely spreading biotner- hoods {bratstva) and tribes (plemena). Some of these brother- hoods derive their names from a real or supposed common ancestor, and are composed of relatives as well as of affiliated strangers. They number sometimes hundreds of members, 1 of guns, as the fighting males are characteristically called. Such are — the Vukoticf, Kovacevici, as one might say in Old English — the Vukotings or Kovachevings, of Montenegro. The dwell- ings, fields, and pasturages of these brotherhoods or kindreds are scattered over the country, and it is not always possible to trace them in compact divisions on the map. But there was the closest union in war, revenge, funeral rites, marriage ar- rangements, provision for the poor and for those who stand in need of special help, as, for instance, in case of fires, inunda- tions and the like. And corresponding to this union there existed a strong feeling of unity in regard to property, especially property in land. Although ownership was divided among the different families, a kind of superior or eminent domain stretched over the whole of the bratstva, and was expressed in the participation in common in pasture and wood, in the right to control alienations of land and to exercise pre-emption. If any of the members of the brotherhood wanted to get rid of his share he had to apply first to his next of kin within the family and then to the further kinsmen of the bratstva.

As the Welsh -kindred {progenies) were subdivided into gavells formed of extended family communities, even so the Bosnian, Montenegrin, Servian, Slovene tribes fell into house communities, Kutas, Zadrugas, which were built up on the principle of keeping blood-relatives and their property to- gether as long as possible. They consisted generally of some 15 to 20 grown-up persons, some 6 or 7 first and second cousins with their wives and children, living in a hamlet around the 1 They range from 80 or 90 to 700.

central house of the domadn, the house leader. In some in- stances the number of coparceners increased to 50 or even to 70. The members of the united house community, which in fact is a small village or hamlet, joined in meals and work. Their rights in the undivided household of the hamlet

were apportioned according to the pedigree, i.e. this apportion- ment took account first of the stirpes or extant descendants of former scions of the family, so that, say, the offspring of each of two grandfathers who had been brothers were considered as equal sharers although the stirps, the stock, of one was represented only by one person, while the stirps of the other had grown to consist of two uncles and of three nephews all alive. There was no resettlement of shares, as in the case of Wales, but the life of the house community while it existed unbroken led to work in common, the contributions to which are regulated by common consent and supervised by the leader. Grounds, houses, implements of agriculture (ploughs, oxen, carts) and of viniculture — casks, cauldrons for the making of brandy, &c, are considered to be common capital and ought not to be sold unless by common consent. Divisions were not prohibited. Naturally a family had to divide sooner or later, and the shares have to be made real, to be converted into fields and vineyards. But this was an event which marks, as it were, the close of the regular existence of one union and the birth of similar unions derived from it. As a rule, the kula kept together as long as it could, because co-operation was needed and isola- tion dangerous — for economic considerations as well as for the sake of defence.

Attention, however, should be called more particularly to the parallel phenomena in the social history of the Russians, where the conditions seem to stand out in specially strong contrast with those prevailing among the mountain Slavs of the Balkans and of the Alps. In the enormous extent of Russia we have to reckon with widely different geographical and racial areas, among other, with the Steppe settlements of the so-called Little Russians in the Ukraina and the forest settlements of the Great Russians in the north. In spite of great divergencies the economic history of all these branches of Slavonic stock gravitates towards one main type, viz. towards rural unions of kinsmen, on the basis of enlarged households. In the south the typical village settlement is the dvoris'e'e, the big court or hamlet consisting of some four to eight related families holding together; in the north it is the pettite, the big oven, a hamlet of somewhat smaller size in which three to five families are closely united for purposes of common husbandry.

It is interesting to notice that even the break-up of the joint household does not lead to an entire severance of the ties between its members. They mostly continue in another form, viz. in the shape of an open-field system with intermixture of strips, compulsory rotation of crops, commons of pasture, of wood, sometimes shifting allotments as regards meadows. There is, e.g. an act of division between six brothers from the north of Russia of the year 1640. They agree to divide bread and salt, house and liberties, money, cloth and stores of all kinds and to settle apart. As to arable, Shumila is to take the upper strip in the field by the settlement, and next to

him Tretjak, then Maxim, then Zaviala, then Shestoy, then Luke. In the big harvest furlong likewise, and in the small likewise, and by the meadow likewise and so on through all the furlongs. So that in this case and in innumerable other cases of the same kind the open-field system with its inconvenient intermixture of plots and limited power of every husbandman to manage his land appears as a direct continuation of the joint tribal households.

Another fact to be noticed is the tendency to form artificial associations on the pattern of the prevailing unions of kinsmen. People who have no blood-relations to appeal to for clearing the waste, for providing the necessary capital in the way of cattle and plough implements, for raising and fitting out buildings, join in order to carry on these economic under- takings, and also to help each other against enemies and aggressors. The members of these voluntary associations,

which at once call to mind German, Norse and English gilds, are called " siabri," " skladniki," and the gilds themselves " sp61kie," in south Russia. In a district of the Ukraina called the " Ratensky Sharostvo " there were no fewer than 278 such gilds interchanging with natural kindreds. The organization of all these unions could in no way be called patriarchal. Even in cases when there is a definite elder or headman (bol- shoy), he was only the first among equals and exercised only a limited authority over his fellows: all the important decisions had to be taken by the council of the community.

In Great Russia, in the districts gathered under the sway of the Moscow tsars, the basis of the household community and of the rural settlements which sprang from it was modified in another direction. The entire agricultural population was subjected to strict supervision and coercive measures for purposes of military organization and taxation. Society was drilled into uniformity and service on the principle that every man has to serve the tsar, the upper class in war and civil administration, the lower class by agricultural labour. A consequence of the heavy burden laid on the land and of the growth of a landed aristocracy somewhat resembling the gentry and the noblesse of the West was a change in the management of land allotments. They became as much a badge of service and a basis for fiscal requirements as a means of livelihood. The result was the practice of reallotments according to the strength and the needs of different families. The shifting of arable (peredel) was not in this case a reapportionment of rights, but a consequence of the correspondence between rights and

obligations. But although this admeasurement of claims appears as a comparatively recent growth of the system, the fundamental solidarity between kinsmen or neighbourly asso- ciates grouped into villages was in no way an invention of the tsars or of their officials: it was rooted in traditional customs and naturally suggested by the practices of joint households. When these households become crowded in cer- tain areas, open-field systems arise; when they are burdened with public and private service their close co-operation pro- duces occasional or periodical redivisions of the soil between the shareholders.

Let us now pass to village communities in Teutonic countries, including England. A convenient starting-point is afforded by the social and economic conditions of the southern part of Jutland.

Now the Saxon or Ditmarschen portion of this region gives us an opportunity of observing the effects of an extended and highly systematized tribal organization on Germanic soil. The independence of this northern peasant republic, which reminds one of the Swiss cantons, lasted until the time of the Reformation. We find the Ditmarschen organized in the 15th, as they had been in the 10th century, in a number of large kindreds, partly composed of relatives by blood and partly of "cousins" who had joined them. The membership of these kindreds is based on agnatic ties — that is, on relationship through males — or on affiliation as a substitute for such agnatic kinship. The families or households are grouped into brother- hoods, and these again into clans or " Schlachten " (Geschlechter), corresponding to Roman genks. Some of them could put as many as 500 warriors in the field. They took their names from ancestors and chieftains: the Wollersmannen, Henne- mannen, Jerremannen, &c— that is, the men of Woll, the men of Henne, the men of Jerre. . In spite of these personal names the organization of the clans was by no means a monarchical one: it was based on the participation of the full-grown fight- ing men in the government of each clan and on a council of co-opted elders at the head of the entire federation. We need not repeat here what has already been stated about the mutual support which such clans afforded to their members in war and in peace, in judicial and in economic matters.

Let us notice the influence of this tribal organization on husbandry and property. The regular economic arrangement was an open-field one based on a three-field and similar systems. The furlongs were divided into intermixed strips with com-

pulsory rotation on the usual pattern. And it is interesting to notice that in these economic surroundings indivisible holdings corresponding to the organic unities' required for efficient agriculture arose of themselves. In spite, of the equal right of all coheirs to an estate, this estate does not get

divided according to their numbers, but either remains undivided or else falls into such fractions, halves or fourths, which will enable the farming to be carried on successfully, without mischievous interruption and disruption. Gradually the people settled down into the custom of united succession for agrarian units. The Hufe or Hof , the virgate, as might have been said in England, goes mostly to the eldest son, but also sometimes to the youngest, while the brothers of the heir either remain in the same household with him, generally unmarried, or leave the house after having settled with the heir, who takes charge of the holding, as to an indemnity for their relinquished claims. This indemnity is not equivalent to the market price, but is fixed, in case of dispute or doubt, by an award of impartial and expert neighbours, who have to consider not only the claims of interested persons but also the economic quality and strength of the holding. In other words, the heir has to pay so much as the estate can conveniently provide without being wrecked by the outlay.

This evidence is of decisive importance in regard to the formation of unified holdings; we are on entirely free soil, with no vestige whatever of manorial organization or of coercion of tenants by the lord, and yet the Hufe, the normal holding, comes to the fore as a result of the economic situation, on the strength of considerations drawn from the efficiency of the farming. This " Anerben " system is widely spread all through Germany. The question whether the eldest or the youngest succeeds is a subordinate one. Anyhow, manorial authority is not necessary to produce the limitation of the rights of succes- sion to land and the creation of the system of holdings, although this has been often asserted, and one of the arguments for a servile origin of village communities turns on a supposed incom- patibility between unified succession and the equal rights of free coheirs.

We need not speak at any length about other parts of Germany, as space does not permit of a description of the innumerable combinations of communal and individual elements in German law, the various shapes of manorial and political institutions with which the influence of blood relationship, gild and neigh- bourly union had to struggle.

But we must point out some facts from the range of. Scandi- navian customs. In the mountainous districts of Norway we notice the same tendency towards the unification of holdings as iu the plains and hills of Schleswig and Holstein. The bonder of Gudbrandsdalen and Telemarken, the free peasantry tilling the soil and pasturing herds on the slopes of the hills since the days of Harold Harfagr to our own times, sit in Odal- gaards, or freehold estates, from which supernumerary heirs are removed on receiving some indemnity, and which are pro- tected from alienation into strange hands by the privilege of pre-emption exercised by relatives of the seller. Equally suggestive are some facts on the Danish side of the

Straits, viz. the arrangements of the bids which correspond to the hides and virgates of England and to the Hufen of Germany. Here again we have to do with normal holdings independent of the number of coheirs, but dependent on the requirements of agriculture — on the plough and oxen, on certain constant relations between the arable of an estate and its outlying com- mons, meadows and woods. The bol does not stand by itself like the Norwegian gaard, but is fitted into a very close union with neighbouring bols of the same kind. Practices of coaration, of open-field intermixture, of compulsory rotation of lot-meadows, of stinting the commons, arise of themselves in the villages of Denmark and Sweden. Laws compiled in the 13th century but based on even more ancient customs give us most inter- esting and definite information as to Scandinavian practices of allotment.

We catch a glimpse, to begin with, of a method of dividing

fields which was considered archaic even in those early times. The Swedish laws • use the expression " forniskift," which means ancient mode of allotment, and another term corre- sponding to it is " hamarskift," which may possibly be con- nected with throwing the hammer in order to mark the boundary of land occupied by a man's strength. The two principal features of form or hamar skift are the irregularity of the resulting shapes of plots and the temporary character of their occupation. The first observation may be substantiated by a description like that of Laasby in Jutland: " These lands arc to that extent scattered and intermixed by the joint owners that it cannot be said for certain what (or how much) they are." Swedish documents, on the other hand, speak expressly of practices of shifting arable and meadows periodically, some- times year by year.

Now the uncertainty of these practices based on occupa- tion became in process of time a most inconvenient feature of the situation and evidently led to constant wrangling as to rights and boundaries. The description of Laasby which I have just quoted ends with the significant remark: " They should be compelled to make allotment by the cord." This making of allotments by the cord is the process of rebning, from reb, the surveyor's cord, and the juridical procedure necessary for it was called " solskift " — because it was a division following the course of the sun.

The two fundamental positions from which this form of allotment proceeds are: (1) that the whole area of the village is common land (Jaellesjord) , which has to be lotted out to the single householders; (2) that the partition

should result in the creation of equal holdings of normal size (b61s). In some cases we can actually recognize the effect of these allotments by ancient solskift in the 18th century, at a time when the Danish enclosure acts produced a second general revolution in land tenure.

The oldest twelve inhabitants, elected as sworn arbitrators for effecting the allotment, begin their work by throwing to- gether into one mass all the grounds owned by the members of the community, including dwellings and farm-buildings, with the exception of some privileged plots. There is a close correspondence between the sites of houses and the shares in the field. The first operation of the surveyors consists in marking out a village green for the night-rest and pasture of the cattle employed in the tillage (forti), and to assign sites to the houses of the coparceners with orchards appendant to them (tofts); every householder getting exactly as much as his neighbour. From the tofts they proceed to the fields on the customary notion that the toft is the mother of the field. The fields are disposed into furlongs and shots, as they were called in England, and divided among the members of the village with the strictest possible equality. This is effected by assigning to every householder a strip in every one of the furlongs constituting the arable of the village. Meadows were often treated as lot meadows in the same way as in Eng land. According to the account of a solrebning executed in '5'3 (Oester Hoejsted), every otting, the eighth part of a bol (corresponding to the English oxgang or bovate), got a toft of 40 roods in length and 6 in breadth. One of the coparceners received, however, 8 roods because his land was worse than that of his neighbours. Of the arable there were allotted to each otting two roods' breadth for the plough in each furlong and appendant commons " in damp and in dry " — in meadow and pasture. After such a " solskift " the peasants held their tenements in undisturbed ownership, but the eminent demesne of the village was recognized and a revision of the allotment was possible. Many such revisions did actually take place, and in such cases all rights and claims were apportioned accord- ing to the standard of the original shares. Needless to say that these shares were subjected to all the usual limitations of champion farming.

After having said so much about different types of village communities which occur in Europe it will be easier to analyse the incidents of English land tenure which disclose the work-

ing of similar conceptions and arrangements. : Features which have been very prominent in the case of the Welsh Slavs, Germans or Scandinavians recur in the English instances some- times with equal force and at other times in a mitigated shape.*

There are some vestiges of the purely tribal form of com- munity on English

soil. Many of the place-names of early Saxon and Anglican settlements are derived from personal names with the suffix ing, as designations like Oakington, the town of the Hockings.

True, it is just possible to explain some of these place-names as pointing to settlements belonging to some great man and therefore taking their designation from him with the adjunct of an ing indicating possession. But the group of words in question falls in exactly with the common patronymics of Saxon and German families and kindreds, and therefore it is most probable, as Kemble supposed, that we have to do in most of these instances with tribal and family settlements, although the mere fact of belonging to a great landowner or a monastery may have been at the root of some cases.

A very noticeable consequence of tribal habits in regard to landownership is presented by the difficulties which stood in the way of alienation of land by the occupiers of it. The Old English legal system did not originally admit of any aliena- tion of folkland, land held by folkright, or, in other words, of the estates owned under the ordinary Customary law of the people. Such land could not be bequeathed out of the kindred and could not be sold without the consent of the kinsmen. Such complete disabilities cculd not be upheld indefinitely, however, in a growing and progressive community, and we find the ancient folkright assailed from different points of view. The Church insists on the right of individual possessors to give away land for the sake of their souls; the kings grant exemption from folkright and constitute privileged estates held by book and following in the main the rules of individualized Roman law; the wish of private persons to make provision for daughters and to deal with land as with other commodities produces con- stant collisions with the customary tribal views. Already, by the end of the Saxon period transfer and alienation of land make their way everywhere, and the Norman conquest brings these features to a head by substituting the notion of tenure — that is, of an estate burdened with service to a superior — for the ancient notion of tribal folkland.

But although the tribal basis of communal arrangements was shaken and removed in England in comparatively early times, it had influenced the practices of rural husbandry and landholding, and in the modified form of the village com- munity it survived right through the feudal period, leaving characteristic and material traces of its existence down to the present day.

To begin with, the open-field system with intermixture of strips and common rights in pasture and wood has been the prevailing system in England for more than a thousand years. Under the name of champion farming it existed everywhere in the country until the Inclosure Acts of the 1 8th and roth centuries put an end to it; it may be found in operation even

now in some of its features in backward districts. It would have been absurd to build up these practices cf compulsory rotation of crops, of a temporary relapse of plots into common pasture between harvest and ploughing time, of the interdependence of thrifty and negligent husbandmen in respect of weeds and times of cultivation, &c, from the point of view of individual appropriation. On the other hand, it was the natural system for the apportionment of claims to the shareholders Of an organic and perpetual joint-stock company.

Practices of shifting arable are seldom reported in English evidence. There are some traces of periodical redivisions of arable land in Northumberland: under the name of runrig system such practices seem to have been not uncommon in the outer fields, the non-manured portions of townships in Scotland, both among the Saxon inhabitants of the lowlands and the Celtic population of the highlands. The joining of small tenants for the purpose of coaration, for the formation of the big,

heavy ploughs, drawn by eight oxen, also produced sometimes the shifting in the possession of strips between the coparceners of the undertaking. But, as a rule, the arable was held in severalty by the different members of the township.

On the other hand, meadows were constantly owned by entire townships and distributed between the tenements entitled to shares from year to year either by lot or according to a definite order. These practices are in full vigour in some places even at the present day. Any person living in Oxford may witness the distribution by lot on Lammas day (ist of August) of the Lammas meadows, that is, the meadows inclosed for the sake of raising hay-grass in the village of Yarnton, some three miles to the north of Oxford.

Let us, however, return for a moment to the arable. Although held in severalty by different owners it was subjected to all sorts of interference on the part of the village union as repre- sented in later ages by the manorial court framing by-laws and settling the course of cultivation. It might also happen that in consequence of encroachments, disputes and general uncertainty as to possession and boundaries, the whole distri- bution of the strips of arable in the various fields had to be gone over and regulated anew. In an interesting case reported from a Cartulary of Dunstable in Bedfordshire, all the possessions of the villagers in a place called Segenhoe were thrown together in the 12th century and redivided according to an

award of experts chosen by a meeting of the villagers from among the oldest and wisest inhabitants.

Exactly as in the Danish examples quoted before, the strips were apportioned, not to the single owners, but to the normal holdings, the hides, and the actual owners had to take them in proportion to their several rights in the hides. This point is very important. It gives the English village community its peculiar stamp. It is a community not between single members or casual households, but between determined holdings constructed on a proportional scale. Although there was no provision for the admeasurement and equalization of the claims of Smith and of Brown, each hide or ploughland of a township took as much as every other hide, each virgate or yardland as every other yardland, each bovate or oxgang as every other oxgang. Now the proportions themselves, although varying in respect of the number of acres included in each of these units in different places, were constant in their relation to each other. The yardland was almost everywhere one-fourth of the hide or ploughland, and corresponded to the share of two oxen in an eight-oxen plough; the oxgang was reckoned at one-half of the yardland, and corresponded to the share of one ox in the same unit of work. The constant repetition of these fractions and units proves that we have to do in this case with phenomena arising not from artificial devices but from the very nature of the case. Nor can there be a doubt that both the unit and the fractions were produced by the application to land of the chief factor of working strength in agrarian husbandry, the power of the ploughteam for tillage.

The natural composition of the holdings has its counterpart, as in Schleswig-Holstein and as in the rest of Germany, in the customs of united succession. The English peasantry worked out customary rules of primogeniture or of so-called Borough English or claim of the youngest to the land held by his father. The German examples adduced in the beginning of this article teach us that the device is not suggested primarily by the interest of the landlord. Unified succession takes the place of the equal rights of sons, because it is the better method for preserving the economic efficiency of the household and of the tenement corresponding to it. There are exceptions, the most notorious being that of Kentish gavelkind, but in agricultural districts the holding remains undivided as long as possible, and if it gets divided, the division follows the lines not of the casual number of coheirs, but of the organic elements of the ploughlands. Fourths and eighths arise in connexion with natural fractions of the ploughteam of eight oxen.

One more feature of the situation remains to be noticed, and it is the one which is still before

the country, that is, the commons which have survived the wholesale

process of inclosure. They were an integral part of the ancient village community from the first, not only because the whole ground of a township could not be taken up by arable and meadows, at a time when population was scanty, but because there existed the most intimate connexion between the agricultural and pastoral part of husbandry in the time of the open-field system. Pasture was not treated as a commodity by itself but was mostly considered as an adjunct, as appendant to the arable, and so was the use of woods and of turf. This fact was duly emphasized, e.g. in an Elizabethan case reported by Coke — Tyrringham's case. The problem of admeasurement of pasture was regulated in the same way as that of the appor- tionment of arable strips, by a reference to the proportional holdings, the hides, yardlands and oxgangs of the township, and the only question to be decided was how many heads of cattle and how many sheep each hide and yardland had the right to send to the common pasturage grounds.

When in course of time the open-field system and the tenure of arable according to holdings were given up, the right of free- holders and copyholders of the old manors in which the ancient townships were, as it were, encased, still held good, but it became much more difficult to estimate and to apportion such rights.

In connexion with the individualistic policy of inclosure the old writ of admeasurement of commons was abolished in 1837 (3 & 4 Will. IV.). The ordinary expedient is to make out how much commonable cattle could be kept by the tene- ments claiming commons through the winter. It is very characteristic and important that in the leading modern case on sufficiency of commons — in Robertson v. Hartopp— it was admitted by the Court of Appeal that the sufficiency has to be construed as a right of turning out a certain number of beasts on the common, quite apart from the number which had been actually turned out at any given time. Now a vested right has to be construed from the point of view of the time when it came into existence. The standards used to estimate such rights ought not to be drawn from modern practice, which might help to dispense altogether with commons of pasture by stable feeding, substitutes for grass, &c. but ought to correspond to the ordinary usages established at a time when the open-field system was in full vigour. The legal view stands thus at present, but we cannot conceal from ourselves that after all the inroads achieved by individual appropriation it is by no means certain that the reference to the rights and rules of a previous period will continue to be recognized. However this may be, in the present commons we have certainly a system which draws its roots from customs, as to the origin of which legal memory does not ran.

We may, in conclusion, summarize very briefly the principal results of our

inquiry as to the history of European village communities. It seems that they may be stated under the following heads: (1) Primitive stages of civilization disclose in human society a strong tendency towards mutual support in economic matters as well as for the sake of defence. (2) The most natural form assumed by such unions for defence and co-operation is that of kinship. (3) In epochs of pastoral husbandry and of the beginnings of agriculture land is mainly owned by tribes, kindreds and enlarged households, while individuals enjoy only rights of usage and possession. (4) In course of time unions of neighbours are substituted for unions of kinsmen. (5) In Germanic societies the community of the township rests on the foundation of efficient holdings — bols, hides, hufen — kept together as far as possible by rules of united or single succession. (6) The open-field system, which prevailed in the whole of Northern Europe for nearly a thousand years, was closely dependent on the customs of tribal and neighbourly unions. (7) Even now the treatment of commons represents the last manifestations of ancient communal arrangements, and it can only be reasonably and justly interpreted by reference to the law and practice of former times.

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VILLALBA, a town of north-western Spain, in the province of Lugo; on the left bank of the river Ladra, one of the head- streams of the Mifto, and at the junction of the main roads from Ferrol and Mondonedo to the city of Lugo. Pop. (1000) 13,572. Villalba is the chief town of the district watered by the Ladra, Tamboga and other small streams — a fertile plateau 1500 ft. above sea-level. Cloth and pottery are manufactured, and there is some trade in grain and live stock. The nearest railway station is Otero, 15 m. S. by E., on the Lugo-Corunna line.

VILLAMEDIANA, COUNT DE (1582-1622), Spanish poet, was born at Lisbon towards the end of 1582. His father, a distinguished diplomatist, upon whom the dignity of count was conferred in 1603, entrusted the education of the brilliant boy (Juan de Tassis y Peralta) to Luis Tribaldos de Toledo,

the future editor of Mendoza's Guerras de Granada, and to Bartolome Jimenez Paton, who subsequently dedicated Mercurius Trismcgistus to his pupil. On leaving Salamanca the youth married in 1601, and succeeded to the title on the death of his father in 1607; he was prominent in the dissipated life of the capital, acquired a bad reputation as a gambler, was forbidden to attend court, and resided in Italy from i6ij to 1617. On his return to Spain, he soon proved himself a fearless, pungent satirist. Such public men as Lerma, Rodrigo Calder6n and Jorge de Tobar writhed beneath his murderous invective; the foibles of humbler private persons were exposed to public ridicule in verses furtively passed from hand to hand. So great was the resentment caused by these envenomed attacks that Villamediana was once more ordered to withdraw from court in 1618. He returned on the death of Phiiip III. and was appointed gentleman in waiting to Philip IV. 's young wife, Isabel de Bourbon, daughter of Henri IV. Secure in his position, he scattered his scathing epigrams in profusion; but his ostentatious attentions to the queen supplied his countless foes with a weapon which was destined to destroy him. A fire broke out while his masque. La- Gloria de Niguea, was being acted before the court on the 15th of May 1622, and Villamediana carried the queen to a place of safety. Suspicion deepened; Villamediana neglected a significant warning that his life was in peril, and on the 21st of August 1622 he was murdered as he stepped out of his coach. The responsibility for his death was divided between Philip IV. and Olivares; the actual assassin was either Alonso Mateo or Ignacio Mendez; and naturally the crime remained unpunished.

Villamediana's works, first published at Saragossa in 1629, contain not only the nervous, blighting verses which made him widely feared and

hated, but a number of more serious poems embodying the most exaggerated conceits of gongorism. But, even when adopting the perverse conventions of the hour, he remains a poet of high distinction, and his satirical verses, more perfect in form, are instinct with a cold, concentrated scorn which has never been surpassed. (J. F.-K.)

VILLANELLE, a form of verse, originally loose in construc- tion, but since the 16th century bound in exact limits of an arbi- trary kind. The word is ultimately derived from the Latin villa, a country house or farm, through the Italian villano, a peasant or farm hand, and a villanelle was primarily a round song taken up by men on a farm. The Spaniards called such a song a villancejo or villancete or a villancico, and a man who impro- vised villanelles was a villanciquero. The villanelle was a pastoral poem made to accompany a rustic dance, and from the first it was necessary that it should contain a regular system of repeated lines. The old French villanelles, however, were irregular in form. One of the most celebrated, the " Rosette, pour un peu d'absence " of Philippe Desportes (1545-1606), is a sort of ballade, and those contained in the Astrle of d'Uife, 1610, are scarcely less unlike the villanelles of modern times. It appears, indeed, to have been by an accident that the special and rigorously denned form of the villanelle was invented. In the posthumous poems of Jean Passerat (1534-1602), which were printed in 1606, several villanelles were discovered, in different forms. One of these became, and has remained, so deservedly popular, that it has given its exact character to the subsequent history of the villanelle. This famous poem runs as follows; —

" J'ai perdu ma tourterelle: Est-ce point celle que j'oi? Je vcux aller apres elle.

Tu regrettes ta femelle? Helas! aussi fais-jc moi : J'ai perdu ma tourterelle.

Si ton amour est fidelc, Aussi est ferme ma foi: Je veux aller apres elle.

Ta plainte se renouvelle? Toujours plaindre je me dois : J'ai perdu ma tourterelle.

En ne voyant plus la belle Plus rien de beau je ne vois: Je veux aller apres elle.

Mort, que tant de fois j'appelle, Prends ce qui se donnc a toi: J'ai perdu ma tourterelle, Je veux aller apres elle."

This exquisite lyric has continued to be the type of its class, and the villanelle, therefore, for the last three hundred years has been a poem, written in tercets, on two rhymes, the first and the third line being repeated alternatively in each tercet. It is usual to confine the villanelle to five tercets, but that is not essential; it must, however, close with a quatrain, the last two lines of which are the first and third line of the original tercet. The villanelle was extremely admired by the French poets of the Parnassej and orie of them, Theodore de Banville, compared it to a ribband of silver and gold traversed by a thread of rose-colour. Boulmier, who was the first to point out that Passerat was the inventor of the definite villanelle, published collections of these poems in 1878 and 1879, and was preparing another when he died in 1881. When, in 1877, so many of the early French forms of verse were introduced, or reintroduced, into English literature, the villanelle attracted a great deal of attention; it was simultaneously cultivated by W. E. Henley, Austin Dobson, Lang and Gosse. Henley wrote a large number, and he described the form itself in a specimen beginning : —

" A dainty thing's the Villanelle, Sly, musical, a jewel in rhyme, It serves its purpose passing well."

It has since then been very frequently used by English and American poets. There are several excellent examples in English of humorous villanelles, especially those by Austin Dobson and by Henley.

See Joseph Boulmier, Les Villanelles (Paris, 1 878; 2nd enlarged edition, 1879). (E. G.)

VILLANI, GIOVANNI {c. 1275-1348), Italian chronicler, was the son of Villano di Stoldo, and was born at Florence in the second half of the 13th century; the precise year is unknown. He was of good burgher extraction, and, following the traditions of his family, applied himself to commerce. During the early years of the 14th century he travelled in Italy, France and the Netherlands, seeing men and things with the sagacity alike of the man of business and of the historian. Before leaving Florence, or rather in the interval between one journey and another, he had at least taken some part in that troubled period of civil contentions which Dino Compagni has described and which swept Dante Alighieri into banishment. In 1301 Villani saw Charles, count of Valois, ruining his country under the false name of peacemaker, and was witness of all the misery which immediately followed. Somewhat later he left Italy, and in September 1304 he visited Flanders. It is not well ascertained when he returned to his native city. He was certainly living there shortly after the emperor Henry VII. visited Italy in 1312, and probably he had been there for some time before. While still continuing to occupy himself with commerce, he now began to take a

prominent part in public affairs. In 1316 and 1317 he was one of the priors, and shared in the crafty tactics whereby Pisa and Lucca were induced to conclude a peace with Florence, to which they were previously averse. In 1317 he also had charge of the mint, and during his administration of this office he collected its earlier records and had a register made of all the coins struck in Florence. In 1 32 1 he was again chosen prior; and, the Florentines having just then undertaken the rebuilding of the city walls, he and some other citizens were deputed to look after the work. They were afterwards accused of having diverted the public money to private ends, but Villani clearly established his innocence. He was next sent with the army against Castruccio Castracani, lord of Lucca, and was present at its defeat at Altopascio. In 1328 a terrible famine visited many provinces of Italy, including Tuscany, and Villani was appointed to guard Florence from

the worst effects of that distressing period. He has left a record of what was done in a chapter of his Chronicle, which shows the economic wisdom in which the medieval Florentines were often so greatly in advance of their age. In 1339, some time after the death of Castruccio, some rich Florentine merchants, and among them Villani, treated for the acquisition of Lucca by Florence for 80,000 florins, offering to supply the larger part of that sum out of their own private means; but the negotiations fell through, owing to the discords and jealousies then existing in the government {Chron. x. 143). The following year Villani superintended the making of Andrea Pisano's bronze doors for the baptistery. In the same year he watched over the raising of the campanile of the Badia, erected by Cardinal Giovanni Orsini {Chron. x. 177). In 1341 the acquisi- tion of Lucca was again under treaty, this time with Martino della Scala, for 250,00c florins. Villani was sent with others as a hostage to Ferrara, where he remained for some months. He was present in Florence during the unhappy period that elapsed between the entry of Walter of Brienne, duke of Athens, and his expulsion by the Florentines (1342-43). Involved through no fault of his own in the failure of the commercial company of the Bonaccorsi, which in its turn had been drawn into the failure of the company of the Bardi, Villani, towards the end of his life, suffered much privation and for some time was kept in prison. In 1348 he fell a victim to the plague described by Boccaccio.

The idea of writing the Chronicle was suggested to Villani under the following circumstances: " In the year of Christ 1300 Pope Boniface VIII. made in honour of Christ's nativity a special and great indulgence. And I, finding myself in that blessed pilgrim- age in the holy city of Rome, seeing her great and" ancient remains, and reading the histories and great deeds of the Romans as written by Virgil, Sallust, Lucan, Livy, Valerius, Paulus Orosius and other masters of history who wrote the exploits and deeds,

both great and small, of the Romans and also of strangers, in the whole world . . . considering that our city of Florence, the daughter and offspring of Rome, is on the increase and destined to do great things, as Rome is in her decline, it appeared to me fitting to set down in this volume and new chronicle all the facts and beginnings of the city of Florence, in as far as it has been possible to me to collect and discover them, and to follow the doings of the Florentines at length . . . and so in the year 1300, on my return from Rome, I began to compile this book, in honour of God and of the blessed John, and in praise of our city of Florence." Villani's work, written in Italian, makes its appearance, so to speak, unexpectedly in the historical^ literature of Italy, just as the history of Florence, the moment it emerges from the humble and uncertain origin assigned to it by legend, rises suddenly into a rich and powerful lite of thought and action. Nothing but scanty and partly legendary records had preceded Villani's work, which rests in part on. them. The Gesta Florentinorum of Sanzanome, starting from these vague origins, begins to be more definite about 1125, at the time of the union of Fiesole with Florence. The Chronica de Origins Civitatis seems to be a compilation, made by various hands and at various times, in which the different legends regarding the city's origin have been gradually collected. The Annales Florentini Primi (ino-1173) and the Annales Florentini Secundi (1107-1247), to- gether with a list of the consuls and podestas from 1197 to 1267, and another chronicle, formerly attributed, but apparently with- out good reason, to Brunetto Latini, complete the series of ancient Florentine records. To these must, however, be added a certain quantity of facts which were to be found in various manuscripts, being used and quoted by the older Florentine and Tuscan writers under the general name of Gesta Florentinorum. Another work, formerly reckoned among the sources of Villani, is the Chronicle of the Malespini; but grave doubts are now entertained as to its authenticity, and many hold that at best it is merely a remodel- ling, posterior to Villani's time, of old records from which several chroniclers may have drawn, either without citing them at all or only doing so in a vague manner.

The Historie Fiorentine, or Cronica universale, of Villani begins with Biblical times and comes down to 1348. The universality of the narrative, especially in the times near Villani's own, while it bears witness to the author's extensive travels and to the compre- hensiveness of his mind, makes one also feel that the book was inspired within the walls of the universal city. Whereas Dino Compagni's Chronicle is confined within definite limits of time and place, this of Villani is a general chronicle extending over the whole of Europe. Dino Compagni feels and lives in the facts of his history; Viilani looks at them and relates them calmly and fairly, with a^ serenity which makes him seem an outsider, even when he is mixed up in them. While very important for Italian history in the 14th

century, this work is the cornerstone of the

early medieval history of Florence. Of contemporary events Villani has a verv exact knowledge. Having been a sharer in the public affairs and' in the intellectual and economic life of his native city, at a time when in both it had no rival in Europe, he depicts what he saw with the vividness natural to a clear mind accustomed to business and to the observation of mankind. He was Guelph, but without passion; and his book is much more taken up with an inquiry into what is useful and true than with party considerations. He is really a chronicler, not an historian, and has but little method in his narrative, often reporting the things which occurred long ago just as he heard them and without criticism. Every now and then he falls into some inaccuracy ; but such defects as he has are largely compensated for by his valuable qualities. He was for half a century eyewitness of his history, and he provides abundant information on the constitution of Florence, its customs, industries, commerce and arts; and among the chronicleis throughout Europe he is perhaps unequalled for the value of the statistical data he has preserved. As a writer Villani is clear and acute; and, though his prose has not the force and colouring of Compagni's, it has the advantage of greater simplicity, so that, taking his work as a whole, he may be regarded as the greatest chronicler who has written in Italian. The many difficulties connected with the publication of this important text have hitherto prevented the preparation of a perfect edition. However, the Chronicle has been printed by L. A. Muratori in tome xiii. of the Rerum Italicarum Scriptores (Milan, 1728). and has been edited by I. Moutier and F. G. Dragomanni (Florence, 1844). Among other editions is one published at Trieste in 1857 and another at Turin in 1879. Selections have been trans- late-l'into English by R. E. Selfe (1896).

Yillani's Chronicle was continued by two other members of his family. (1) Matteo Villani, his brother, of whom nothing is known save that he was twice married and that he died of the plague in 1363, continued it down to the year of his death. Matteo's work, though inferior to Giovanni's, is nevertheless very valuable. A more prolix writer than his brother and a less acute observer, Matteo is well informed in his facts, and for the years of which he writes is one of the most important sources of Italian history. (2) Filippo Villani, the son of Matteo, flourished in the end of the 14th and the beginning of the 15th century. In his continuation which goes down to 1364, though showing greater literary ability, he is very inferior as an historian to his predecessors. His most valuable work was a collection of lives of illustrious Florentines. Twice, in 1401 and 1404, he was chosen to

explain in public the Divina Commedia. The year of his death is unknown.

See P. Scheffer-Boichorst, Florentiner Sludien (Leipzig, 1874); G. Gervinus, " Geschichte der Florentinen Historiographie " in his Historische Schriflm (1833); U. Balzani, Le cronache Italians ml medio evo (Milan, 1884); A. Gaspary, Geschuhte der italienischen Literatur (Berlin, 1885); O. Knoll, Beitrdge zur italienischen Historio- graphie im 14. Jahrhunderl (Gottingen 1876), and O. Hartwig, " G. Villani und die Leggenda di Messer Gianni di Procida " in Band xxv. of H. von Sybel's Historische Zeitschrift. (U. B.)

VILLANOVA, the name given to an ancient cemetery in the neighbourhood of Bologna, Italy, and generally applied by archaeologists to all the remains of that period, and to the period itself, owing to the discovery therein of a large number of the characteristic remains of the earliest Iron Age of Italy. The antiquities of this culture are widely spread over upper Italy and differ essentially from, those of the previous epoch known as Terramara, and they have been described by some as following at a considerable interval, for they show a great advance in metal work. The chief cemeteries of the Villanova period are at Bologna, Este, Villanova, Golasecca, Trezzo, Rivoli and Oppiano. As there can be no doubt that the Terramara culture was that of the aboriginal Ligurians (see. however, Terramara), so the Villanova is that of the Umbrians, who, according to the historians, were masters of all northern Italy, as far as the Alps at the time of the Etruscan conquest (c 1000 B.C.). They contain cist-graves, the bottoms, sides and tops being formed of flat unhewn stones, though sometimes there are only bottom and top slabs: the dead were burnt, and the remains are usually in urns, each grave containing as a rule but one ossuary; sometimes the vessel is covered with a flat stone or a dish inverted, sometimes the urns are deposited in the ground without any protection. The vases are often hand-made and adorned with incised linear ornament, though in later times the bones were often placed in bronze urns or buckets. Though iron is steadily making its way into use, flat, flanged, and socketed and looped celts of bronze are found in con- siderable numbers. Brooches of many kinds, ranging from the most primitive safety-pin fashioned out of a common

bronze pin (such as those found in the Bronze Age settlement at Peschiera on Lake Maggiore), through many varieties, are in universal use. Representations of the human figure are practically unknown, but models of animals of a rude and primitive kind are very common, probably being votive offerings. These are closely parallel to the bronze figures found at Olympia, where human figures were likewise rare. All these objects are decorated in repousse with geometric designs. The culture of the Villanova period is part of the Hallstatt civilization, though the contents of the Hallstatt (q.v.) graves differ in several marked features from the anti- quities of the ordinary Villanova period, there is no breach of continuity

between Hallstatt and Villanova, for the types of Vadena, Este, Golasecca and Villanova are found in the Hallstatt culture. The connexion between the north and the south of the Alps is never interrupted. The chief difference lies in the fact that the Celts of the Danubian region made greater advances in the development of weapons and defensive armour than their kindred in northern Italy. The Po and Danube regions alike are characterized by bronze buckets, cists, girdles and the like, wrought in repoussi with animal and geometric designs; but the introduction of iron into Italy is considerably posterior to its development in the Hallstatt area.

See Montelius, La Civilisation primitive en lialie; Ridgeway, Early Age of Greece, vol. i. ; Brizio, in C. R. Acad. Inscr. (1906), 315 sqq. ; Grenier, in Melanges de I'ecole francaise (1907), 325 sqq.; Pigorini and Vaglieri have contributed articles to the Rendiconli del Lincei and the Notizie degli scavi from 1907 onwards. (W. Ri.)

VILLANUEVA DE LA SERENA, a town of western Spain, in the province of Badajoz, near the left bank of the river Guadiana, and on the Madrid-Badajoz railway. Pop. (1900) 13,489. Villanucva is a clean and thriving place, with good modern public buildings — -town hall, churches, convents and schools. It is the chief town of an undulating plain. La Serena, locally celebrated for red wine and melons. Grain and hemp are also cultivated, and live stock extensively reared in the neighbourhood.

VILLANUEVA Y GELTRD, a seaport of north-eastern Spain, in the province of Barcelona; on the Barcelona-Tarragona section of the coast railway. Pop. (1900) 11,850. Villanueva is a busy modern town, with manufactures of cotton, woollen and linen goods, and of paper. It has also iron foundries and an important agricultural trade. The harbour affords safe and deep anchorage; it is a lifeboat station and the head- quarters of a large fishing fleet. The coasting trade is also considerable. Villanueva has a museum, founded by the Catalan poet, historian and diplomat, Vittorio Balaguer (1824- 1901), which contains collections of Roman, Egyptian and prehistoric antiquities, besides paintings, engravings, sculptures, coins and a large library, including many valuable MSS.

VILLARD, HENRY (1835-1900), American journalist and financier, was born in Speyer, Rhenish Bavaria, on the 10th of April t835. His baptismal name was Ferdinand Heinrich Gustav Hilgard. His parents removed to Zweibriicken in 1839, and in 1856 his father, Gustav Leonhard Hilgard (d.1867), became a justice of the Supreme Court of Bavaria, at Munich. Henry was educated at the gymnasium of Zweibriicken, at the French semi-military academy in Phalsbourg in 1840-50, at the gymnasium of Speyer in 1850-52, and at the universities of Munich and Wilrzburg in 1852-53; and in 1853, having had a disagreement with his father, emigrated —

without his parents' knowledge — to the United States. It was at this time that he adopted the name Villard. Making his way westward in 1854, he lived in turn at Cincinnati, Belleville (Illinois), Peoria (Illinois) and Chicago, engaged in various employments, and in 1856 formed a project, which came to nothing, for establish- ing a colony of " free soil " Germans in Kansas. In 1856-57 he was editor, and for part of the time was proprietor, of the Racine (Wis.) Volksblatt, in which he advocated the election of John C. Fremont (Republican). Thereafter he was associ- ated (in 1857) with the Staats-Zeitung, Frank Leslie's and the Tribune, of New York, and with the Cincinnati Commercial

in 1859-60; was correspondent of the New York Herald in 1861 and of the New York Tribune (with the Army of the Potomac) in 1862-63, and in 1864 was at the front as the representative of a news agency established by him in that year at Washington. In 1865 he became Washington corre- spondent of the Chicago Tribune, and in 1866 was the corre- spondent of that paper in the Prusso-Austrian War. He began to take an interest in railway financiering in 1871, was elected president of the Oregon & California railroad and of the Oregon Steamship Company in 1876, was receiver of the Kansas Pacific railway in 1876-78, organized the Oregon Railway & Naviga- tion Company in 1879, the Oregon Improvement Company in 1880, and the Oregon & Transcontinental Company in 1881, becoming in that year president of the Northern Pacific rail- way, which was completed under his management, and of which he remained president until 1883. In 1887 he again became connected with the Northern Pacific, and in 1880 was chosen chairman of its finance committee. He was actively identified with the financing of other Western railway projects ' until 1893. In 1881 he acquired the New York Evening Post and the Nation. In 1883 he paid the debt of the state uni- versity of Oregon, and gave to the institution $50,000, and he also gave to the town of Zwcibriicken, the home of his boyhood, an orphan asylum (1891). He died on the 12th of November 1900.

See Memoirs of Henry Villard, Journalist and Financier, 1835- 1900 (2 vols., Boston, 1904).

VILLA REAL, the capital of the district of Villa Real, Portugal; 10 m. N. of the river Douro and 47 m. by road E.N.E. of Oporto. Pop. (1900) 6716. The town has a large transit trade in wine, mineral w T aters and live stock, especially pigs. The administrative district of Villa Real corresponds with the western part of the ancient province of Traz os Montes {q.v.).

Pop. (1900) 242,196; area, 1650 sq. m. There are alkaline waters and baths at Vidago (near Chaves) and at Pedras Salgadas (near Villa Pouca d'Aguiar). The district adjacent to the Douro is known as the Paiz do vinho, or " wine country "; here are the vineyards from which " port " wine is manufactured.

VILLARET DE JOYEUSE, LOUIS THOMAS (1750-1812), French admiral, was born at Auch, of a noble family of Lan- guedoc. He was originally destined for the church, but served for some time in the royal guard, which he had to leave at the age of sixteen after killing one of his comrades in a duel. He then entered the navy, and in 1773 was lieutenant on the " Atalante " in Indian waters. In 1778 he distinguished him- self at the siege of Pondicherry, and was promoted captain. He afterwards served under Suffren, took part in the battle of Cuddalore, and in 1781 was taken prisoner after a fierce encounter with an English vessel. He was released in 1783, and, unlike the majority of naval officers, did not emigrate during the Revolution. In 1791 he was in command of the " Prudente " in the waters of San Domingo, and in 1794 was appointed rear-admiral and assisted the Conventional, St Andre, in the reorganization of the fleet. Villaret was in com- mand of the French fleet at the battle of the First of June. He was appointed a member of the Council of the Ancients in 1796, and was sentenced to deportation in the following year on ac- count of his royalist sympathies. He escaped arrest, however, and until the Consulate lived in obscurity at Oleron. In 1801 he commanded the squadron w T hich transported the French army to San Domingo, and the following year was made captain- general of Martinique, which he surrendered to the English in 1809 after a brave defence. In 181 1, after some hesitation on the part of Napoleon, Villaret was rewarded for his services with the command of a military division and the post of governor- general of Venice. He died at Venice.

VILLARI, PASQUALE (1827-), Italian historian and statesman, was born at Naples on the 3rd of October 1827. He studied together with Luigi la Vista under Francesco de Sanctis. He was implicated in the riots of the 1 5th of May T848 at Naples, against the Bourbon government, and had to take

refuge in Florence. There he devoted himself to teaching and historical research in the public libraries, and in 1859 he published the first volume of his Storia di Girolamo Savona- rola e de suoi tempi, in consequence of which he was appointed professor of history at Pisa. A second volume appeared in 1861, and the work, which soon came to be recognized as an Italian classic, was translated into various foreign languages. It was followed by a work of even greater critical value, Niccold Machiavelli e i suoi tempi (1877-82). In the mean- while Villari had left Pisa and was*

transferred to, the chair of philosophy of history at the Institute of Studii Superior! in Florence, and he was also appointed a member of the council of education (1862). He served as a juror at the international exhibition of that year in London, and contributed an important monograph on education in England and Scotland. In 1869 he was appointed under-secretary of state for education, and shortly afterwards was elected member of parliament, a position which he held for several years. In 1884 he was nominated senator, and in 1891-92 he was minister of education in the Marchcse di Rudini's first cabinet. In 1893-94 he collected a number of essays on Florentine history, originally published in the Nuova Anlologia, under the title of / primi due secoli delta storia di Firenze, and in 1901 he produced Le Invasioni bar- bariche in Italia, a popular account in one volume of the events following the dissolution of the Roman empire. All these works have been translated into English by the historian's wife, Linda White Villari. Another side of Villari's activity was his interest in the political and social problems of the day, and although never identified with any political party, his speeches and writings have always commanded considerable public attention.

Among his other literary works may be mentioned : Saggi Critici (1868); Arte, Storia, e Filosofia (Florence, 1884); Scriiti varii (Bologna; 1894) ; another volume of Saggi Critici (Bologna, 1896); and a volume of Discussioni critiche e discorsi (Bologna, 1905), containing his speeches as president of the Dante Alighieri Society. His most important political and social essays are col- lected in his Lettere Meridionali ed altri scritti sulla questione sociale in Italia (Turin, 1885), and Scritti sulla questione sociale in Italia (Florence/1902). The Lettere Meridionali (originally published in the newspaper UOpinione in 1875) produced a deep impression, as they were the first exposure of the real conditions of southern Italy. A selection of Villari's essays, translated by his wife, has been published in England (1907).

See also Francesco Baldasseroni, Pasquale Villari (Florence, 1907;.

VILLA RICA, the largest city in the interior of Paraguay, on the railway from Asuncion (70 m. N.W.) to Encarnacion. Pop. (1910) about 25,000. Situated in a rich agricultural region watered by the upper Tepicuary, with finely timbered mountains extending to the E. and W., Villa Rica has an im- portant trade in tobacco and yerba mate. It is to a great extent modern, and contains some fine buildings, including a national college, a church, many schools, and a branch of the Agricultural Bank.

VILLARREAL, a town of eastern Spain, in the province of Castcll6n de la Plana; 4 m. from the Mediterranean Sea, near the right bank of the river Mijares, and on the Barcelona- Valencia railway. Pop. (1900) 16,068.

Villarreal has a station on the light railway between Onda and the seaports of Castellon de la Plana and Burriana. Under Moorish rule, and up to the expulsion of the Moriscoes in 1609, it was the headquarters of a flourishing trade, and in modem times its industries have revived. Palm-groves, churches with blue- tiled cupolas, and houses with flat roofs and view-turrets {miradores) to some extent preserve the Moorish character of the town. There are extensive orange-groves, watered by the irrigation canal of Castellon, which is a good example of Moorish engineering skill. The local industries include manufactures of paper, woollen goods and spirits.

VILLARS, CLAUDE LOUIS HECTOR DE, Prince de Mar-

TIGNES, MAIQUIS AND DlIC DE VlLLARS AND VlCOMTE DE MELUN

(1653-1734), marshal of France, one of the greatest generals of French history, was born at Moulins on the 8th of May 1653, and entered the army through the corps of pages in 1671. He

served in the light cavalry in the Dutch wars, and distinguished himself by his daring and resourcefulness. But in spite of a long record of excellent service under Turenne, Condi and Luxembourg, and of his aristocratic birth, his promotion was but slow, for he had incurred the enmity of the powerful Louvois, and although he had been proprietary colonel {mestre tie camp) of a cavalry regiment since 1674, thirteen years elapsed before he was made a marshal de camp. In the interval be- tween the Dutch wars and the formation of the League of Augs- burg, Villars, who combined with his military gifts the tact and subtlety of the diplomatist, was employed in an unofficial mission to the court of Bavaria, and there became the constant companion of the elector, with whom he took the field against the Turks and fought at Mohacs. He returned to France in 1690 and was given a command in the cavalry of the army in Flanders, but towards the end of the Grand Alliance War he went to Vienna as ambassador. His part in the next war (see Spanish Succession Was), beginning with Friedlingen (1702) and Ilochstett (1703) and ending with Denain (1712), has made him immortal. For Friedlingen he received the marshalate, and for the pacification of the insurgent Cevennes the Saint-Esprit order and the title of duke. Friedlingen and Hochstett were barren victories, and the campaigns of which they formed part records of lost opportunities. Villars's glory thus begins with the year 1709 when France, apparently help- less, was roused to a great effort of self-defence by the exorbi- tant demands of the

Coalition. In that year he was called to command the main army opposing Eugene and Marlborough on the northern frontier. During the famine of the winter he shared the soldiers' miserable rations. When the campaign opened the old Marshal Boufflers volunteered to serve under him, and after the terrible battle of Malplaquet (q.v.) , in which he was gravely wounded, he was able to tell the king: " If it please God to give your majesty's enemies another such victory, they are ruined." Two more campaigns passed without a battle and with scarcely any advance on the part of the invaders, but at last Marlborough manoeuvred Villars out of the famous Ne plus ultra lines, and the power of the defence seemed to be broken. But Louis made a last effort, the English contingent and its great leader were withdrawn from the enemy's camp, and Villars, though still suffering from his Malplaquet wounds, outmanoeuvred and decisively defeated Eugene in the battle of Denain. This victory saved France, though the war dragged on for another year on the Rhine, where Villars took Landau, led the stormers at Freiburg and negotiated the peace of Rastatt with Prince Eugene.

He played a conspicuous part in the politics of the Regency period as the principal opponent of Cardinal Dubois, and only the memories of Montmorency's rebellion prevented his being made constable of France. He took the field for the last time in the War of the Polish Succession (1734), with the title " marshal-general of the king's armies," that Turenne alone had held before him. But he was now over eighty years of age, and the war was more diplomatic than earnest, and after opening the campaign with all the fire and restless energy of his youth he died at Turin on the 17th of June 1734.

Villars's memoirs show us a " fanfaron plein d'honneur," as Voltaire calls him. He was indeed boastful, with the gas- conading habit of his native province, and also covetous of honours and wealth. But he was an honourable man of high courage, moral and physical, and a soldier who stands above all his contemporaries and successors in the 18th century, on the same height as Marlborough and Frederick.

The memoirs, part of which was published in 1734 and afterwards several times republished in untrustworthy versions, were for the first time completely edited by the Marquis de Vogue in 1884-92.

VILLA VICIOSA, a seaport of northern Spain, in the province of Oviedo; on the Ria de Villaviciosa, an estuary formed by the small river Villaviciosa which here enters the Bay of Biscay. Pop. (1900) 20,995. The town is the headquarters of a large fishery, and has some coasting trade. Its exports are chiefly agricultural produce. Villaviciosa suffers from the competition

of the neighbouring ports of Gijon and Aviles, and from the lack of railway

communication. It is connected by good roads with Siero (13 m.) and Infiesto (9 m.) on the Oviedo-Infiesto railway.

VILLEFRANCHE-DE-ROUERGUE, a town of France, capital of an arrondissement in the department of Aveyron, 36 m. W. of Rodez by road. Pop. (1906) town, 6297; commune, 3352. Villefranche, which has a station on the Orleans railway, lies amongst the hills on the right bank of the Aveyron at its junction with the Alzou. One of the three bridges that cross the river belongs to the 13th century, and the straight, narrow streets are full of gabled houses of the 13th and 14th centuries. One of the principal thoroughfares passes beneath the porch of Notre-Dame, the principal church of Villefranche. Notre-Dame was built from 1260 to 1 58 1, the massive tower which surmounts its porch being of late Gothic architecture. The remarkable wood- work in the choir dates from the 15th century. A Carthusian monastery overlooking the town from the left bank of the Aveyron derives much interest from the completeness and fine preservation of its buildings, which date from the 15th century. They include a fine refectory and two cloisters, the smaller of which is a masterpiece of the late Gothic style. The manufacture of leather, animal-traps, hosiery, bell-founding, hemp-spinning, &c, are carried on. Quarries of phosphates and mines of argentiferous lead are worked near Villefranche.

Villefranche, founded about 1252, owes its name to the numerous immunities granted by its founder Alphonse, count of Toulouse (d. 1271), and in 1348 it was so flourishing that sumptuary laws were passed. Soon afterwards the town fell into the hands of Edward, the Black Prince, but was the first place in Guienne to rise against the English. New privileges were granted to the town by King Charles V., but these were taken away by Louis XI. In 1588 the inhabitants repulsed the forces of the League, and afterwards murdered a governor sent by Henry IV. The town was ravaged by plague in ˆ63, 1558 and 1628, and in 1643 a revolt, excited by the exactions of the intendants, was cruelly repressed.

VILLEFRANCHE-SUR-SAONE, a manufacturing town of east- central France, capital of an arrondissement in the department of Rhone, on the Morgon near its junction with the Saone, 21m. N. by W. of Lyons by rail. Pop (1906) 14,794. Among its industries the chief are the manufacture of working clothes, the manufacture, dyeing and finishing of cotton fabrics, the spinning of cotton thread, copper founding and the manufacture of machinery and agricultural implements. The wines of Beau- jolais, hemp, cloth, linen, cottons, drapery goods and cattle . are the principal articles of trade. An old Renaissance house is used as the town hall. The church of Notre-Dame des Marais, begun at the end of the 14th and finished in the 16th century, has a tower and spire (rebuilt in 1862), standing to the right

of the facade (15th century), in which are carved wooden doors. Villefranche is the seat of a sub-prefect and has tribunals of first instance and of commerce, a chamber of commerce and a com- munal college among its public institutions.

Founded in 1212 by Guichard IV. count of Beaujeu, Ville- franche became in the 14th century capital of the Beaujolais. As a punishment for an act of violence towards the mayor's daughter, Edward II. was forced to surrender the Beaujolais to the duke of Bourbon.

VILLEGAS, ESTEBAN MANUEL DE (1389-1669), Spanish poet, was born at Matute (Logrono) on the 5th of February 1589, matriculated at Salamanca on the 20th of November 1610, and challenged attention by the mingled arrogance and accomplish- ment of Las Erilicas (1617), a collection of clever translations from Horace and Anacreon, and of original poems, the charm of which is marred by the writer's petulant vanity. Marrying in 1626 or earlier, Villcgas practised law at Najera till 1659, when he was charged with expressing unorthodox views on the subject of free will; he was exiled for four years to Santa Maria de Ribaredonda, but was allowed to return for three months to Najera in March 1660. It seems probable that the rest of the sentence was remitted, for the report of the local inquisition lays stress on Villegas's simple piety, on the extravagance of his attire,

ridiculous in a man' of his age, and on the eccentricity of his general conduct and conversation, so marked as to suggest ." a kind of mania or lesion of the imagination/' In his version of Boetius (1665), Villegas showed that he had prdfited by his experience, for he made no attempt to translate the last book (in which the problem of free will is discussed), and reprinted the Latin text without comment. He died at NaVjera on the 3rd of September 1669. His tragedy El Hipilito, imitated from Euripides, and a series of critical dissertations entitled Variae Philologiae, finished in 1650, are unpublished; and " a book of satires," found among his papers by the inquisitors, was con- fiscated. .

VILLEHARDOUIN, GEOFFROY DE (c. 1160-c. 1213), the first vernacular historian of France, and perhaps of modern Europe, who possesses literary merit, is rather supposed than known to have been born at the chateau from which he took his name, near Troyes, in Champagne, about the year 1160. Not merely his literary and historical importance, but almost all that is known about him, comes from his chronicle of the fourth crusade, or

Conqutte de Constantinople. Nothing is positively known of his ancestry, for the supposition (originating with Du Cange) that a certain William, marshal of Champagne between 1 163 and 1 1 79, was his father appears to be erroneous. Ville- hardouin himself, however, undoubtedly held this dignity, and certain minute and perhaps not very trustworthy indications, chiefly of an heraldic character, have led his most recent bio- graphers to lay it down that he was not born earlier than 1150 or later than 1164. He introduces himself to us with a certain abruptness, merely specifying his own name as one of a list of knights of Champagne who with their count, Thibault, took the cross at a tournament held at Escry-sur-Aisne in Advent 1199, the crusade in contemplation having been started by the preaching of Fulk de Neuilly, who was commissioned thereto by Pope Innocent III. The next year six deputies, two appointed by each of the three allied counts of Flanders, Champagne and Blois, were despatched to Venice to negotiate for ships. Of these deputies Villehardouin was one and Quesnes de Bethune, the poet, another. They concluded a bargain with the seigniory for transport and provisions at a fixed price. Villehardouin had hardly returned when Thibault fell sick and died; but this did not prevent, though it somewhat delayed, the enterprise of the crusaders. The management of that enterprise, however, was a difficult one, and cost Villehardouin another embassy into Italy to prevent if possible some of his fellow-pilgrims from breaking the treaty with the Venetians by embarking at other ports and employing other convoy. He was only in part suc- cessful, and there was great difficulty in raising the charter- money among those who had actually assembled (in 1202) at Venice, the sum collected falling far short of the stipulated amount. It is necessary to remember this when the somewhat erratic and irregular character of the operations which followed is judged. The defence that the crusaders were bound to pay their passage-money to the Holy Land, in one form or other, to the Venetians, is perhaps a weak one in any case for the attack on two Christian cities, Zara and Constantinople; it becomes weaker still when it is found that the expedition never went or attempted to go to the Holy Land at all. But the desire to discharge obligations incurred is no doubt respectable in itself, and Villehardouin, as one of the actual negotiators of the bargain, must have felt it with peculiar strength.

The crusaders set sail at last, and Zara, which the Venetians coveted, was taken without much trouble. The question then arose whither the host should go next. Villehardouin does not tell us oi any direct part taken by himself in the debates on the question of interfering or not in the disputed succession to the empire of the East — debates in which the chief ecclesiastics present strongly protested against the diversion of the enterprise from iLs proper goal. It is quite clear, however, that the mar- shal of Champagne, who was one of the leaders and inner counsellors of

the expedition throughout, sympathized with the majority,- and it is fair to point out that the temptation of chivalrous adventure was probably as great as that of gain.

He narrates spiritedly enough the dissensions and discussions in the winter camp of Zara and at Corfu, but is evidently much more at ease when the voyage was again resumed, and, after a fair passage round Greece, the crusaders at last saw before them the great city of Constantinople which they had it in mind to attack. When the assault was decided upon, Ville-hardouin himself was in the fifth " battle," the leader of which was Mathieu de Montmorency. But, though his account of the siege is full of personal touches, and contains one reference to the number of witnesses whose testimony he took for a certain wonderful fact, he does not tell us anything of his own prowess. After the flight of the usurper Alexius, and when the blind Isaac, whose claims the crusaders were defending, had been taken by the Greeks from prison and placed on the throne; Villehardouin, with Montmorency and two Venetians, formed the embassy sent to arrange terms. He was again similarly distinguished when it became necessary to remonstrate with Alexius, the blind man's son and virtual successor, on the non- keeping of the terms. Indeed Villehardouin's talents as a diplomatist seem to have been held in very high esteem, for later, when the Latin empire had become a fact, he was charged with the delicate business of mediating between the emperor Baldwin and Boniface, marquis of Montferrat, in which task he bad at least partial success. He was also appointed marshal of " Romanie "—a term very vaguely used, but apparently signifying the mainland of the Balkan Peninsula, while his nephew and namesake, afterwards prince of Achaia, took a great part in the Latin conquest of Peloponnesus. Villehardouin himself before long received an important command against the Bulgarians. He was left to maintain the siege of Adrianople when Baldwin advanced to attack the relieving force, and with Dandolo had much to do in saving the defeated crusaders from utter destruction, and conducting the retreat, in which he commanded the rearguard, and brought his troops in safety to the sea of Rodosto, and thence to the capital. As he occupied the post of honour in this disaster, so he had that (the command of the vanguard) in the expedition which the regent Henry made shortly afterwards to revenge his brother Baldwin's defeat and capture. And, when Henry had succeeded 10 the crown on the announcement of Baldwin's death, it was Ville- hardouin who fetched home his bride Agnes of Montferrat, and shortly afterwards commanded under him in a naval battle with the ships of Theodore Lascaris at the fortress of Cibotus. In the settlement of the Latin empire after the truce with Lascaris, Villehardouin received the fief of Messinople (supposed to be Mosynopolis, a little inland from the modern Gulf of Lagos, and not far from the ancient Abdera) from Boniface of Montferrat,

with the record of whose death the chronicle abruptly closes.

In the foregoing account only those particulars which bear directly on Villehardouin himself have been detailed; but the chronicle is as far as possible from being an autobiography, and the displays of the writer's personality, numerous as they are, are quite involuntary, and consist merely in his way of handling the subject, not in the references (as brief as his functions as chronicler will admit) to his own proceedings. . The chronicle of Villehardouin is justly held to be the very best presentation we possess of the spirit of chivalry-rˆnot the designedly exalted and poetized chivalry of the romances, not the self-conscious and deliberate chivalry of the 14th century, but the Unsophisticated mode of thinking and acting which brought about the crusades, stimulated the vast literary development of the 12th and 13th centuries, and sent knights-errant, principally though not wholly of French blood, to establish principalities and kingdoms throughout Europe and the nearer East. On the whole, no doubt, it is the more masculine and practical side of this enthusiastic state of mind which Ville- hardouin shows. No woman makes any but the briefest appear- ance in his pages, though in reference to this it must of course be remembered that he was certainly a man past middle life when the events occurred, and perhaps a man approaching old age when he set them down. Despite the strong and graphic touches here and there, exhibiting the impression which the beauty of sea and land, the splendour of Constantinople, the magnitude' of the effete but still imposing Greek power, made on him, there is not only an entire absence of dilation on such- subjects as a modern would have dilated on (that wa-, to be expected), but an absence likewise of the elaborate and painful description of detail in which contemporary

trouveres would have indulged. It is curious, for instance, to compare the scanty references to the material marvels of Constan- tinople which Villehardouin saw in their glory, which perished by ˆack and fire under his very eyes, and which live chiefly in the melancholy pages of his Greek contemporary Nicetas, with the elaborate descriptions of the scarcely greater wonders of fabulous courts at Constaniinople itself, at Babylon, and elsewhere, to be found in his other contemporaries, the later chanson de geste writers and the earlier embroiderers of the Arthurian' romances and romans d'avcntures. And this later contrast is all the more striking that Villehardouin agrees with, and not impossibly borrows from, these very writers in many points of style and phraseology. The brief chapters of his work have been justly compared to the laisses or tirades of a chanson in what may be called the vignetting of the subject of each, in the absence of

any attempt to run on the narra- tive, in the stock forms, and in the poetical rather than prosaic word-order of the sentences. Undoubtedly this half-poetic style {animated as it is and redeemed from any charge of bastardy by the freshness and vigour which pervade it) adds not a little to the charm of the book. Its succession of word pictures, conventional and yet vigorous as the illuminations of a medieval manuscript, and in their very conventionality free from all thought of literary presentation, must charm all readers. The sober lists of names with which it opens; the account of the embassy, so business-like in its eiti males of costs and terms, and suddenly breaking into a fervent description of how the six deputies, " prostrating them- selves on the earth and weeping warm tears, begged the doge and people of Venice to have pity on Jerusalem " ; the story immediately following, how the young count Thibault of Champagne, raising himself from a sickbed in his joy at the successful return of his ambassadors, " leva sus et chcvaucha, et laz! com grant do mages, car onques puis ne chevaucha que cele foiz," compose a most striking overture. Then the history relapses into the business vein and tells of the debates which took place as to the best means of carrying out the vow after the count's decease, the rendezvous, too ill kept at Venice, the plausible suggestion of the Venetians that the balance due to them should be made up by a joint attack on their enemy, the king of Hungary. Villehardouin does not in the least conceal the fact that the pope (" I'apostoilles de Rome," as he calls him, in the very phrase of the chansons) was very angry with this; for his own part he seems to think of little or nothing but the reparation due to the republic, which had loyally kept its bargain and been defrauded of the price, of the infamy of breaking company on the part of members of a joint association, and perhaps of the unknightliness of not taking up an adventure whenever it presents itself. For here again the restoration of the disinherited prince of Constantinople supplied an excuse quite as plausible as the liquida- tiun of the debt to Venice. A famous passage, and one short enough to quote, is that describing the old blind doge Dandolo, who had " Grant ochoison de remanoir (reason for staying at home), car viels horn ere, et si avoit les yaulx en la teste biaus et n'en veoit gote (goutte)," and yet was the foremost in fight.

It would be out of place to attempt any further analysis of the Conquele here. But it is not impertinent, and is at the same time an excuse for what has been already said, to repeat that Villehaf- douin's book, brief as it is, is in reality one of the capital books of literature, not merely for its merit, but because it is the most authentic and the most striking embodiment in contemporary literature of the sentiments which determined the action of a great and important period of history. There are but very few books which hold this position, and Villehardouin's is one of them. If even.' other contemporary record of the crusades perished, we should still be able by

aid of this to understand and realize what the mental attitude of crusaders, of Teutonic knights, and the rest was, and without this we should lack the earliest, the most undoubtedly genuine, and the most characteristic of all such records. The very inconsistency with which Villehardouin is chargeable, the absence of compunction with which he relates the changing of a sacred religious pilgrimage into something by no means unlike a mere filibustering raid on the great scale, add a charm to the book. For, religious as it is, it is entirely free from the very slightest touch of hypocrisy or indeed of self-consciousness of any kind. The famous description of the crusades, gesta Dei per Francos, was evidently to Villehardouin a plain matter-of-fact description, and it no more occurred to him to doubt the divine favour being extended to the expeditions against Alexius or 1'heodore than to doubt that it was shown to expeditions against Saracens and Turks.

The person of Villehardouin reappears for us once, but once only, in the chronicle of his continuator, Henri de Valenciennes. There is a great gap in style, though none in subject, between the really poetical prose of the first historian of the fifth crusade and the Latin empire and the awkward mannerism (so awkward that it has been taken to represent a " disrhymed " verse chronicle) of his follower. But the much greater length at which Villehardouin appears on this one occasion shows us the restraint which he must have exercised in the passages which deal with himself in his own work. He again led the vanguard

in the emperor Henry's expedition against Burilas the Bulgarian, and he is represented by the Valenciennes scribe as encouraging his sovereign to the attack in a long speech. Then he disappears altogether, with the exception of some brief and chiefly diplo- matic mentions. Du Cange discovered and quoted a deed of donation by him dated 1207, by which ccitain properties were devised to the churches of Notre Dame de Foissy and Notre Dame de Troyes, with the reservation of life interests to his daughters Alix and Damerones, and his sisters Emmeline and Haye, ah of whom appear to have embraced a monastic life. A letter addressed from the East to Blanche of Champagne is cited, and a papal record of 1.212 styles him still "marshal of Romania. " The next year this title passed to his son Erard; and 1213 is accordingly given as the date of his death, which, as there is no record or hint of his having returned to France, may be supposed to have happened at Messinople, wh ere also he must have written the Conquete.

The book appears to have been known in the ages immediately succeeding his own; and, though there is no contemporary manu- script in existence, there are some half-dozen which appear to date from the end of the 13th or the course of the 14th century, while one at least appears to be a copy

made from his own work in that spirit of unintelligent faithfulness which is much more valuable to posterity than more pragmatical editing. The first printed edition of the book, by a certain Blaise de Vigenere, dates from 1585, is dedicated to the seigniory of Venice (Villehardouin, it should be said, has been accused of a rather unfair predilection for the Venetians), and speaks of either a part or the whole of the memoirs as having been printed twelve years earlier. Of this earlier copy nothing seems to be known. A better edition, founded on a Nether- landish MS., appeared at Lyons in 1601. But both these were completely antiquated by the great edition of Du Cange in 1657, wherein that learned writer employed all his knowledge, never since equalled, of the subject, but added a translation, or rather paraphrase, into modern French which is scarcely worthy either of himself or his author. Dom Brial gave a new edition from different MS. sources in 1823, and the book figures with different degrees of dependence on Du Cange and Brial in the collections of Petitot, Buchon, and Michaud and Poujoulat. All these, however, liave been superseded for the modern student by the editions of Natalis de Wailly (1872 and 1874), in which the text is critically edited from all the available MSS. and a new translation added, while there is a still later and rather handier one by E. Bouchet (2 vols., Paris, 1891)', which, however, rests mainly on N. de Wailly for text. The charm of Villehardouin can escape no reader; but lew readers will fail to derive some additional pleasure from the two essays which Sainte- Beuve devoted to him, reprinted in the ninth volume of the Cauteries du lundi. See also A. Debidour, Les Chraniqueurs (1888). There are English translations by T. Smith (1829), and (more literally) Sir F. T. Marzials (Everyman's Library, J908). (G. Sa.)

VILL6LE, JEAN BAPTISTE GUILLAUME MARIE ANNE

SlSRAPHIN. Comte de (1773-1854), French statesman, was born at Toulouse on the 14th of April 1773 and educated for the navy. He joined the " Bayonnaisc " at Brest in July 1788 and served in the West and East Indies. Arrested in the Isle of Bourbon under the Terror, he was set free by the revolution of Thermidor (July 1794). He acquired some property in the island, and married in 1799 the daughter of a great proprietor, M. Desbassyns de Richemont, whose estates he had managed. His apprenticeship to politics was served in the Colonial Assembly of Bourbon, where he fought successfully to preserve the colony from the consequences of perpetual interference from the authorities in Paris, -and .on the other hand to prevent local discontent from appealing to the English for protection. The arrival of General Decaen, sent out by Bonaparte in 1802, restored security to the island, and five years later Villele, who had now realized a large fortune, returned to France. He was mayor of his commune, and a member of the council of the Haute-Garonne under the Empire. At the restoration of 1814 he at once declared for royalist

principles. He was mayor of Toulouse in 1814-15 and deputy for the Haute-Garonne in the " Chambrc Introuvable " of 1815. Villele, who before the promulgation of the charter had written some Observations sur le projet de constitution opposing it, as too democratic in character, naturally took his place, on the extreme right with the ultra-royalists. In the new Chamber of 1816 Villdle found his party in a minority, but his personal authority nevertheless increased. He was looked on by the

ministerialists as the least unreasonable of his party, and by the " ultras " as the safest of their leaders. Under the electoral law of 1817 the Abbe Gregoire, who was popularly supposed to have voted for the death of Louis XVI. in the Convention, was admitted to the Chamber of Deputies. The Conservative party gained strength from the alarm raised by this incident and still more from the shock caused by the assassination of the due de Berri. The due de Richelieu was compelled to admit to the cabinet two of the crrefs of the Left, Villele and Corbiere. Villele resigned within a year, but on the fall of Richelieu at the end of 1821 he became the real chief of the new cabinet, in which he was minister of finance. Although not himself a courtier, he was backed at court by Sosthenes de la Rochefoucauld and Madame du Cayla, and in 1822 Louis XVIII. gave him the title of count and made him formally prime minister. He immediately proceeded to muzzle opposition by stringent press laws, and the discovery of minor liberal conspiracies afforded an excuse for further repression. Forced against his will into interference in Spain by Mathieu de Montmorency and Chateaubriand, he contrived to reap some credit for tbe monarchy from the successful campaign of 1823. Meanwhile he had consolidated the royal power by persuading Louis XVIII. to swamp the liberal majority in the upper house by the nomination of twenty-seven new peers; he availed himself of the temporary popularity of the monarchy after the Spanish campaign to summon a new Chamber of Deputies. This new and obedient legislature, to which only nineteen liberals were returned, made itself into a septennial parliament, thus providing time, it was thought, to restore some part of the ancien regime. Villele's plans were assisted by the death of Louis XVIII. and the accession of his bigoted brother. Prudent financial administration since 1815 had made possible the conversion of the state bonds from 5 to 4%. It was proposed to utilize the money set free by this operation to indemnify by a milliard francs the emigres for the loss of their lands at the Revolution; it was also proposed to restore their former privileges to tbe religious congregations. Both these propositions were, with some restrictions, secured. Sacrilege was made a crime punishable by death, and the ministry were preparing a law to alter the law of equal

inheritance, and thus create anew the great estates. These measures roused violent opposition in the country, which a new and stringent press law, nicknamed the "law of justice and love," failed to put down. The peers rejected the law of inheritance and the press law; it was found necessary to disband tbe National Guard; and in November 1827 seventy-six new peers were created, and recourse was had to a general election. The new Chamber proved hostile to Villele, who resigned to make way for the thort-lived moderate ministry of Martignac.

The new ministry made Villele's removal to the upper house a condition of taking office, and he took no further part in public affairs. At the time of his death, on the 13th of March 1854, he had advanced as far as 1816 with his memoirs, which were completed from his correspondence by his family as Mfmoires et correspondance du comte de Villele (Paris, 5 vols.,

1 83 7-90).

See also C. de Mazade, IS Op position royalisle (Paris, 1894); J. G. Hyde de Neuville. Notice sur le comte de Villele (Paris, 1899); and M. Chotard, " L'CEuvre fmancifere de M. de Villele," in Annates des sciences politiques (vol. v., 1890).

VILLEMAIN, ABEL FRANCOIS (1790-1867), French politician and man of letters, was born in Paris on the 9th of June 1790. He was educated at the lycee Lou is le Grand, and became assistant master at the lycee Charlemagne, and subsequently at the £cole Normale. In 181 2 he gained a prize from the Academy with an eloge on Montaigne. Under the restoration he was appointed, first, assistant professor of modern history, and then professor of French eloquence at the Sorbonne. Here he delivered a series of literary lectures which had an extra- ordinary effect on his younger contemporaries. Villemain had the great advantage of coming just before the Romantic move- ment, of having a wide and catholic love of literature without

being an extremist. All, or almost all, the clever young men of the brilliant generation of 1830 passed under his influence; and, while he pleased the Romanticists by his frank apprecia- tion of the beauties of English, German, Italian and Spanish poetry, he had not the least inclination to decry the classics — either the classics proper of Greece and Rome or the so-called classics of France. In 1819 he published a book on Cromwell, and two years later he was elected to the Academy. Ville- main was appointed by the restoration government " chef de rimprimerie et de la libraine," a post involving a kind of irregular censorship of the press, and afterwards to the office of master of requests. Before the revolution of July he had been deprived of his office for his liberal tendencies, and had been elected

deputy for fivreux. Under Louis Philippe he re- ceived a peerage in 1832. He was a member of the council of public instruction, and was twice minister of that department, and he also became secretary of the Academy. During the whole of the July monarchy he was thus one of the chief dispensers of literary patronage in France, but in his later years his reputation declined. He died in Paris on the 8th of May

1867.

Villemain 's chief work is his Cours de la Htterature francaise (5 vols., 1828-29). Among his other works are: Tableau de la litter aturedu moyen dge (2 vols., 1846); Tableau de la Htterature au XVIIP siecle (4 vols., 1864); Souvenirs contemporains (2 vols., 1856) ; Histoire de Gregoire VII. (2 vols,, 1873; Eng. trans.. 1874).

Among notices on Villemain may be cited that of Louis de Lomenie (1841), E. Mirecourt (1858), J. L. Dubut (1875). See also Sainte- Beuve, Portraits (1841, vol. iii.), and Causeries du lundi (vol. xi. " Notes et pens£es ").

VILLENA, ENRIQUE DE (1384-1434), Spanish author, was born in 1384. Through his grandfather, Alphonso de Aragon, count de Denia y Ribagorza, he traced his descent from Jaime II. of Aragon and Blanche of Naples. He is commonly known as the marquess de Villena; but, although a marquessate was at one time in the family, the title was revoked and annulled by Henry III. Villena's father, Don Pedro de Villena, was killed at Aljubarrota; the boy was educated by his grand- father, showed great capacity for learning and was reputed to be a wizard. About 1402 he married Maria de Albornoz, sefiora del Infantado, who speedily became the recognized mistress of Henry III.; the complaisant husband was rewarded by being appointed master of the military order of Calatrava in 1404, but on the death of Henry at the end of 1406 the knights of the order refused to accept the nomination, which, after a long contest, was rescinded in 1415. He was present at the coronation of Ferdinand of Aragon at Saragossa in 1414, retired to Valencia till 1417, when he moved to Castile to claim com- pensation for the loss of his mastership. He obtained in return the lordship (senorio) of Miesta, and, conscious of his unsuita- hility for warfare or political life, dedicated himself to literature. He died of fever at Madrid on the 15th of December 1434. He is represented by a fragment of his Arte de irobar (1414), an indigestible treatise composed for the Barcelona Consistory of Gay Science; by Los Trabajos de Hercules (1417), a pedantic and unreadable allegory; by his Tratado de la Consolacidn and his handbook to the pleasures and fashions of the table, the Arte cisoria, both written in 1423; by a commentary on Psalm viii. ver. 4, which dates from 1424; by the Libro de Aojamiento (1425), a ponderous dissertation on the evil eye and its effects; and by a

translation of the Aeneid, the first ever made, which was finished on the 10th of October 1428. His treatise on leprosy exists but has not been published. Villena's writings do not justify his extraordinary fame; his subjects are devoid of charm, and his style is so uncouth as to be almost unintelligible. Yet he has an assured place in the history of Spanish literature; he was a generous patron of letters, his translation of Virgil marks him out as a pioneer of the Re- naissance, and he set a splendid example of intellectual curiosity. Moreover, there is an abiding dramatic interest in the baffling personality of the solitary high-born student whom Lope de Vega introduces in Forjlar kasta morir, whom Ruiz de Alarcfin presents in La Cueva de Salamanca, and who reappears in the

19th century in Larra's Macias and in Hartzenbusch's play La Redcma encantada. (J. F.-K.)

VILLENA, a town of eastern Spain, in the province of Alicante; on the right bank of the river Vinalapo, and at the junction of railways from Valencia, Alicante, Albacete and Yecla. Pop. (1900) 14,099. Villena is a labyrinth of winding alleys, which contain some interesting examples of Moorish domestic archi- tecture. It is dominated by a large and picturesque Moorish castle. The surrounding hills are covered with vines, and to the east there is an extensive salt lagoon. Silk, linen, flour, wine, brandy, oil, salt and soap are the chief industrial products.

VILLENAGE (Villainage, Villanage, Villeinage), a medieval term (from villa, villanus), pointing to serfdom, a condition of men intermediate between freedom and slavery. It occurs in France as well as in England, and was certainly im- norted into English speech through the medium of Norman French. The earliest instances of its use are to be found in the Latin and French versions of English documents in the nth and 1 2th centuries (cf. Domesday Book; Liebermann, Glossary to the Gesetze der Angelsachsen, s.v. villanus, vilain). The history of the word and of the condition is especially instructive in English usage.

The materials for the formation of the villein class were already in existence in the Anglo-Saxon period. On the one hand, the Saxon ceorls (twihyndemen) , although considered as including the typical freemen in the earlier laws (ˆEthelberht, Hlothhere and Edric, Ine), gradually became differentiated through the action of political and economic causes, and many of them had to recognize the patronage of magnates or to seek livelihood as tenants on the estates of the latter. These ceorls, silting on

gafol-land, were, though personally free, considered as a lower order of men, and lapsed gradually into more or less oppressive subjection in respect of the great landowners. It is characteristic in this connexion that the West Saxon laws do not make any distinction between ceorls and laets or half-freemen as the Kentish laws had done: this means that the half-free people were, if not Welshmen, reckoned as, members of the ceorl class. Another remarkable indication of the decay of the ceorl's estate is afforded by the fact that in the treaties with the Danes the twihynde ceorls are equated with the Danish leysings or freedmen. It does not mean, of course, that their condition was practically the same, but in any case the fact testifies to the gulf which had come to separate the two principal subdivisions of the free class — the ceorl and the thane. The Latin version of the Rcctitudines Singularum Personarum, a document compiled probably in the nth century, not long before the Conquest, renders geneat (a peasant tenant of a superior kind performing lighter services than the gebur, as he was burdened with heavy week-work) by villanus; but the gebur came to be also considered as a villanus according to Anglo- Norman terminology. The group designated as geburs in Anglo-Saxon charters, though distinguished from mere slaves (thcow baerde-burbaerde, Kemble, Cod. Dipt. 1079), undoubtedly included many freedmen who in point of services and economic subjection were not very much above the slaves. Both ceorls and geburs disappear as separate classes, and it is clear that the greater part of them must have passed into the rank of villeins.

In the terminology of the Domesday Inquest we find the villeins as the most numerous element of the English popula- tion. Out of about 240,000 households enumerated in Domes- day 1 00,000 are marked as belonging to villeins. They are rustics performing, as a rule, work services for their lords. But not all the inhabitants of the villages were designated by that name. Villeins are opposed to socmen and freemen on one hand, to bordarii, cottagers and slaves on the other. The distinction in regard to the first two of these groups was evi- dently derived from their greater freedom, although the differ- ence is only one in degree and not in kind. In fact, the villein is assumed to be a person free by birth, but holding land of which he cannot dispose freely. The distinction as against bordarii and cottagers is based 011 the size of the holding: the villeins are holders of regular shares in the village — that is, of the

virgates, bovates or half-hides which constitute the principal subdivisions in the fields and contribute to form the plough- teams — whereas the bordarii hold smaller plots of some 5 acres, more or less, and coUarii are connected with mere cottages and crofts. Thus the terminology of Domesday takes note of two kinds of differences in the status of rustics: a legal one in con- nexion with the right to dispose of property in land, and an economic one reflecting the opposition between the holders of shares in the fields and the

holders of auxiliary tenements. The feature of personal serfdom is also noticeable, but it provides a basis only for the comparatively small group of servi, of whom only about 25,000 arc enumerated in Domesday Book. The contrast between this exceptionally situated class and the rest of the population shows that personal slavery was rapidly dis- appearing in England about the time of the Conquest. It is also to be noticed that the Domesday Survey constantly mentions the terra vittanorum as opposed to the demesne in the estates or manors of the time, and that the land of the rustics is taxed separately for the geld, so that the distinction between the property of the lord and that of the peasant dependent on him is clearly marked and by no means devoid of practical importance. The Domesday Survey puts before us the state of things in England as it was at the very beginning of the Norman and at the close of the Saxon period. The development of feudal society, of centralizing kingship and ultimately of a system of common law, brought about great changes which all hinge on the fundamental fact that the kings, while increasing the power of the state in other respects, surrendered it completely as regards the relations between the peasants and their lords. The protection of the assizes was tendered in civil matters to free tenants and refused to villeins. The royal courts refused to entertain suits of villeins against their lords, although there was a good deal of vacillation before this position was definitely taken up. Bracton still speaks in his treatise of the possibility for the courts to interfere against intolerable cruelty on the part of the lord involving the destruction of the villein's waynage, that is, of his ploughteam, and in the Notebook of Bracton there are a couple of cases which prove that 13th-century judges occasionally allowed themselves to entertain actions by persons holding in villenage against their lords. Gradually, however, the exception of villenage became firmly settled. As the historical and practical position was developing on these lines the lawyers who fashioned English common law in the 12th and 13th centuries did not hesitate to apply to it the teaching of Roman law on slavery. Bracton fits his definition of villenage into the Romanesque scheme of Azo's Summa of the Institutes, and the judges of the royal courts made sweeping inferences from this general position. To begin with, the relation between the villein and his lord was regarded as a personal and not a praedial one. Everyone born of villein stock belonged to his master and was bound to undertake any service which might be imposed on him by the master's or the steward's command. The distinction between villeins in gross and villeins regardant, of which much is made by modern writers, was suggested by modes of pleading and does not make its appearance in the Year-Books before the 15th century. Secondly, all independent proprietary rights were denied to the villein as against his lord, and the legal rule " quicquid servo acquiritur domino acquiri- tur " was extended to villeins. The fact that a great number of these serfs had been enjoying protection as free ceorls in former ages made itself felt, however,

in three directions. (1) In criminal matters the villein was treated by the King's Court irrespectively of any consideration as to his debased condition. More especially the police association, organized for the keeping of the peace and the presentation of criminals — the frankpledge groups were formed of all " worthy of were and wite," villeins as well as freemen. (2) Politically the villeins were not elimin- ated from the body of citizens: they had to pay taxes, to serve in great emergencies in the militia, to serve on inquests, &c, and although there was a tendency to place them on a lower footing in all these respects yet the fact of their being lesser members of the commonwealth did not remove the fundamental

qualification of citizenship. (3) Even in civil matters villeins were deemed free as regards third persons. They could sue and be sued in their own name, and although they were able to call in their lords as defendants when proceeded against, there was nothing in law to prevent them from appearing in their own right. The state even afforded them protection against extreme cruelty on the part of their masters in respect of life and limb, but in laying down this rule English lawyers were able to follow the precedents set by late Roman juris- prudence, especially by measures of Hadrian, Antonine and Constantine the Great.

There was one exception to this harsh treatment of villeins, namely, the rustic tenantry in manors of ancient demesne, that is, in estates which had belonged to the crown before the Conquest, had a standing-ground even against their lords as regards the tenure of their plots and the fixity of their services. Technically this right was limited to the inhabitants of manors entered in the Domesday Survey as terra regis of Edward the Confessor. On the other hand the doctrine became effective if the manors in question had been granted by later kings to subjects, because- if they remained in the hand of the king the only remedy against ejectment and exaction lay in petitioning for redress without any definite right to the latter. If, however, the two conditions mentioned were forthcoming, villeins, or, as they were technically called, villein socmen of ancient demesne manors, could resist any attempt of their lords to encroach on their rights by depriving them of their holdings or increasing the amount of their customary services. Their remedy was to apply for a little writ of right in the first case and for a writ of monstraverunt in the second. These writs entitled them to appear as plaintiffs against the lord in his own manorial court and, eventually, to have the question at issue examined by way of appeal, on a writ of error, or by reservation on some legal points in the upper courts of the king. A number of cases arising from these privileges of the men of ancient demesne

are published in the Notebook of Bracton and in the Abbreviatio placitorum. This exceptional procedure does not simply go back to the rule that persons who had been tenants of the king ought not to have their condition altered for the worse in con- sequence of a royal grant. If this were the only doctrine applicable in the case there would be no reason why similar protection should be denied to all those who held under grantees of manors escheated after the Conquest. A material point for the application of the privilege consists in the fact that ancient demesne has to be proved from the time before the Conquest, and this shows clearly that the theory was partly derived from the recognition of tenant right in villeins of the Anglo-Saxon period who, as we have said above, were mostly ceorls, that is, freeborn men.

In view of the great difference in the legal position of the free man and of the villein in feudal common law, it became very important to define the exact nature of the conditions on which the status of a villein depended. The legal theory as to these conditions was somewhat complex, because it had to take account of certain practical considerations and of a rather abrupt transition from a previous state of things based on different premises. Of course, persons born from villein parents in lawful wedlock were villeins, but as to the condition of illegitimate children there was a good deal of hesitation. There was a tendency to apply the rule that a bastard follows the mother, especially in the case of a servile mother. In the case of mixed marriages, the condition of the child is determined by the free or villein condition of the tenement in which it was born. This notion of the influence of the tene- ment is well adapted to feudal notions and makes itself felt again in the case of the pursuit of a fugitive villein. He can be seized without further formalities if he is caught in his ”’ nest/’ that is, in his native place. If not, the lord can follow him in fresh pursuit for four days; once these days past, the fugitive is maintained provisionally in possession of his liberty, and the lord has to bring an action de natho habendo and has to assume the burden of proof.

So much as to the proof of villenage by birth or previous condition. But there were numbers of cases when the dis- cussion as to servile status turned not on these formal points but on an examination of the services performed by the person claimed as a villein or challenged as holding in villenage. In both cases the courts had often recourse to proof derived not from direct testimony but from indirect indications as to the kind of services that had been performed by the supposed villein. Certain services, especially the payment of fnerchel — the fine for marrying a daughter — were considered to be the badge of serfdom. Another service, the performance of which established a presumption as to villenage, was compulsory service as a reeve. The courts also tried to draw a distinction from the amount and regularity of agricultural services to which a tenant

was subjected. Bracton speaks of the contrast between the irregular services of a serf, " who could not know in the evening what he would have to do in the morning," and services agreed upon and definite in their amount. The customary arrangements of the work of villeins, however, render this contrast rather fictitious. The obligations of down- right villeins became to that degree settled and regular that one of the ordinary designations of the class was custumarii. Therefore in most cases there were no arbitrary exactions to go by, except perhaps one or the other tallage imposed at the will of the lord. The original distinction seems to have been made not between arbitrary and agreed but between occasional services and regular agricultural week-work. While the occasional services, even when agricultural, in no way established a presumption of villenage, and many socmen, freemen and holders by serjeanty submitted to them, agri- cultural week-work was primarily considered as a trait of villenage and must have played an important paTt in the process of classification of early Norman society. The villein was in this sense emphatically the man holding " by the fork and the flail."

This point brings us to consider the matter-of-fact conditions of the villeins during the feudal period, especially in the 12th, 13th and t4th centuries. As is shown by the Hundred Rolls, the Domesday of St Paul, the Surveys of St Peter, Glouc, Glastonbury Abbey, Ramsey Abbey and countless other records of the same kind, the customary conditions of villenage did not tally by any means with the identification between villenage and slavery suggested by the jurists. It is true that in nomen- clature the word " servi " is not infrequently used (e.g. in the Hundred Rolls) where villani might have been mentioned, and the feminine nief (nativa) appears as the regular parallel of villanus, but in the descriptions of usages and services we find that the power of the lord loses its discretionary character and is in every respect moderated by custom. As personal depend- ents of the lord native villeins were liable to be sold, and we find actual sales recorded: Glastonbury Abbey e.g. sells a certain Philipp Hardyng for 20 shillings. But such transfers of human chattels occur seldom, and there is nothing during the English feudal period corresponding to the brisk trade in men character- istic of the ancient world. Mercliet was regarded, as has been stated already, as a badge of serfdom in so far as it was said to imply a " buying of one's own blood " (serms de sanguine sua emando). The explanation is even more characteristic than the custom itself, because fines on marriage may be levied and were actually levied from people of different con- dition, from the free as well as from the serf. Still the tendency to treat mtrchet as a distinctive feature of serfdom has to be noted, and we find that the custom spread for this very reason in consequence of the encroachments of powerful lords: in the Hundred Rolls it is applied indiscriminately to the whole rustic population of certain hundreds in a way which can hardly be

explained unless by artificial extension. Heriot, the surrender of the best horse or ox, is also considered as the ■ common incident of villein tenure, although, of course, its very name proves its intimate connexion Tvith the outfit of soldiers (here-geatu).

Economically the institution of villenage was bound up

with the manorial organization — that is, with the fact that the country was divided into a numbered" districts in which central home farms were cultivated by the help of work supplied by villein households.

The most important of villein services is the week-work per- formed by the peasantry. Every virgater or holder of a bovate has to send a labourer to do work on the lord's faxm for some days in the week. Three days is indeed the most common standard for service of this kind, though four or even five occur sometimes; as well as two. It must be borne in mind in the case of heavy charges, such as four or five days' week-work, that only one labourer from the whole holding is meant, while generally there were several men living on every holding — otherwise the service of five days would be impossible to perform. In the course of these three days, or whatever the number was, many require- ments of the demesne had to be met. The principal of these was ploughing the fields belonging to the lord, and for such ploughing the peasant had not only to appear personally as a labourer, but to bring his oxen and plough, or rather to join with his oxen and plough in the work imposed on the village: the heavy, costly plough with a team of eight oxen had to be made up by several peasants contributing their beasts and implements towards its composition. In the same way the villagers had to go through the work of harrowing with their harrows, and of removing the harvest in their vans and carts. Carriage duties in carts and on horseback were also apportioned according to the time they took as a part of the week-work. Then came innumerable varieties of manual work for the erection and keeping up of hedges, the preservation of dykes, canals and ditches, the threshing and garnering of corn, the tending and shearing of sheep and so forth. All this hand-work was reckoned according to customary standards as day-work and week-work. But besides all these services into which the regular week-work of the peasantry was differentiated, stood some additional duties. The ploughing for the lord, for instance, was not only imposed in the shape of a certain number of days in the week, but took sometimes the shape of a certain number of acres which the village had to plough and to sow for the lord irrespectively of the time employed on it. This was sometimes termed

gafolearth. Exceedingly burdensome services were required in the seasons when farming processes are, as it were, at their height — in the seasons of mowing and reaping, when every day is of special value and the working power of the farm hands is strained to the utmost. At that time it was the custom to call up the whole able-bodied population of the manor, with the exception of the housewives for two, three or more days of mowing and reaping on the lord's fields; to these boon-works the peasantry was asked or invited by special summons, and their value was so far appreciated that the villagers were usually treated to. meals in cases where they were again and again called off from their own fields to the demesne. The liberality of the lord actually went so far, in exceptionally hard straits, that some ale was served to the labourers to keep them in good humour.

In the 14th century this social arrangement, based primarily on natural economy and on the feudal disruption of society , began to give way. The gradual spread of intercourse rendered un- necessary the natural husbandry of former times which sought to produce a complete set of £oods in every separate locality. Instead of acting as a little world by itself for the raising of corn, the breeding of cattle, the gathering of wool, the weaving of linen and common cloths, the fabrication of necessary imple- ments of all kinds, the local group began to buy some of these goods and to sell some others, renouncing isolation and making its destiny dependent on commercial intercourse. Instead of requiring from its population all kinds of work and reducing its ordinary occupations to a hard-and-fast routine meeting in a slow and unskilled manner all possible contingencies, the local group began to move, to call in workmen from abroad for tasks of a special nature, and to send its own workmen to look out for profitable employment in other places. Instead of managing the land by the constant repetition of the same

processes, by a customary immobility of tenure and service, by communalistic restrictions on private enterprise and will, local society began to try improvements, to escape from the bounds of champion farming. Instead of producing and collecting goods for immediate consumption, local society came more and more into the habit of exchanging corn, cattle, cloth, for money, and of laying money by as a means of getting all sorts of exchangeable goods, when required. In a word, the time of commercial, contractual, cash intercourse was coming fast. What was exceptional and subsidiary in feudal times came to obtain general recognition in the course of the 14th and 15th centuries, and, for this very reason, assumed a very different aspect. A similar transformation took place in regard to government. The local monarchy of the manorial lords was fast giving way to a central power which maintained its laws, the circuits of its judges, the fiscal claims of its exchequer, the police interference of its civil officers all through the country, and, by prevailing

over the franchises of manorial lords, gave shape to a vast dominion of legal equality and legal protection, in which the forces of commercial exchange, of contract, of social intercourse, found a ready and welcome sphere of action. In truth both processes, the economic and the political one, worked so much together that it is hardly possible to say which influenced the other more, which was the cause and which the effect. Government grew strong because it could draw on a society which was going ahead in enterprise and well-being; social intercourse progressed because it could depend on a strong government to safeguard it.

If we now turn to the actual stages by which this momentous passage from the manorial to the commercial arrangement was achieved, we have to notice first of all a rapid development of contractual relations. We know that in feudal law there ran a standing contrast between tenure by custom — villein tenure — and tenure by contract — free tenure. While the manorial system was in full force this contrast led to a classification of holdings and affected the whole position of people on the land. Still, even at that time it might happen that a freeholder owned some land in villenage by the side of his free tenement, and that a villein held some land freely by agreement with his lord or with a third person. But these cases, though by no means infrequent, were still' exceptional. As a rule people used land as holdings, and those were rigidly classified as villein or free tenements. The interesting point to be noticed is that, without any formal break, leasing land for life and for term of years is seen to be rapidly spreading from the end of the 13th century, and numberless small tenancies are created in the 14th century which break up the disposition of the holdings. From the close of the 13th century downwards countless transactions on the basis of leases for .terms of years occur between the peasants themselves, any isuit- ably kept set of 14th-century court rolls containing entries in which such and such a villein is said to appear in the halimolt and to surrender for the use of another person named a piece of land belonging to the holding. The number of years and the conditions of payment are specified. Thus; behind the screen of the normal shares a number of small tenancies arise which run their economic concerns independently from the cumbersome arrangements of tenure and service; and, needless to add,, all these tenancies are burdened with money rents.

Another series of momentous changes took place in the arrangement of services. Even the manorial system admitted the buying off for money of particular dues in kind and of specific performance of work. A villein might be allowed to bring a penny instead of bringing a chicken or to pay a rent instead of appearing with his oxen three times a week on the lord's fields. Such rents were called mai or mail in contrast with the gafol, ancient rents which had been imposed inde-> pendently , apart from any buying off of customary services. There were even whole bodies of peasants called

Molmen, because they had bought off work from the lord by settling with him on the basis of money rents. As time went on these practices oi commutation became more and more frequent. There were, for both sides, many advantages in arranging their mutual

relations on this basis. The lord, instead of clumsy work, got clear money, a much-coveted means of satisfying needs and wishes of any kind — instead of cumbrous performances which did not come always at the proper moment, were carried out in a half-hearted manner, yielded no immediate results, and did not admit of convenient rearrangement. The peasant got rid of a hateful drudgery which not only took up his time and means in an unprofitable manner, but placed him under the rough control and the arbitrary discipline of stewards or reeves and gave occasion to all sorts of fines and extortions.

With the growth of intercourse and security money became more frequent and the number of such transactions increased in proportion. But it must be kept in mind that the con- version of services into rents went on very gradually, as a series of private agreements, and that it would be very wrong to suppose, as some scholars have done, that it had led to a general commutation by the middle or even the end of the 14th century. The 14th century was marked by violent fluctua- tions in the demand and supply of labour, and particularly the tremendous loss in population occasioned in the middle of this century by the Black Death called forth a most serious crisis. No wonder that many lords clung very tenaciously to customary services, and ecclesiastical institutions seem to have been especially backward in going over to the system of money rents. There is evidence to show, for instance, that the manors of the abbey of Ramsey were managed on the system of enforced labour right down to the middle of the 15th century, and, of course, survivals of these customs in the shape of scattered services lived on much longer. A second drawback from the point of view of the landloids was called forth by the fact that commutation for fixed rents gradually lessened the value of the exactions to which they were entitled. Money not only became less scarce but it became cheaper, so that the couple of peace for which a day of manual work was bought off in the beginning of the 13th century did not fetch more than half of their former value at its end. As quit rents were customary and not rack rents, the successors of those who had redeemed their services were gaining the whole surplus in the value of goods and labour as against money, while the successors of those who had commuted their right to claim services for certain sums in money lost all the corresponding difference. These

inevitable consequences came to be perceived in course of time and occasioned a backward tendency towards services in kind which could not prevail against the general movement from natural economy to money dealings, but was strong enough to produce social friction and grave disturbances.

The economic crisis of the 14th century has its complement in the legal crisis of the 15th. At that time the courts of law begin to do away with the denial of protection to villeins which, as we have seen, constituted the legal basis of villenage. This is effected by the recognition of copyhold tenure (see Copyhold).

It is a fact of first-rate magnitude that in the 15th century customary relations on one hand, the power of government on the other, ripened, as it were, to that extent that the judges of the king began to take cognizance of the relations of the peasants to their lords. The first cases which occur in this sense are still treated not as a matter of common law, but as a manifestation of equity. As doubtful questions of trust, of wardship, of testamentary succession, they were taken up not in the strict course of justice, but as matters in which redress was sorely needed and had to be brought by the exceptional power of the court of chancery. But this interference of 15th-century chancellors paved the way towards one of the greatest revolutions in the law; without formally enfranchising villeins and villein tenure they created a legal basis for it in the law of the realm: in the formula of copyhold — tenement held at the will of the lord and by the custom of the manor — the first pan lost its significance and the second prevailed, in down- right contrast with former times when, on the contrary, the second part had no legal value and the first expressed the view

of the courts. One may almost be tempted to say that these obscure decisions rendered unnecessary in England the work achieved with such a flourish of trumpets in France by the emancipating decree of the 4th of August 1789.

The personal condition of villenage did not, however, dis- appear at once with the rise of copyhold. It lingered through the 16th century and appears exceptionally even in the 17th. Deeds of emancipation and payments for personal enfranchise- ment are often noticed at that very time. But these are only survivals of an arrangement which has been destroyed in its essence by a complete change of economic and political conditions.

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VILLENEUVE, PIERRE CHARLES JEAN BAPTISTS SIL- VESTRE (1763-1806), French admiral, was born at Valensoles in Provence on the 31st of December 1763. He entered the French royal navy as a " garde du Pavilion. 5 ' Although he belonged to the corps of " noble " officers, who were the object of peculiar animosity to the Jacobins, he escaped the fate of the majority of his comrades, which was to be massacred, or driven into exile. He sympathized sincerely with the general aims of the Revolu- tion, and had a full share of the Provencal fluency which enabled him to make a timely and impressive display of " civic " sentiments. In the dearth of trained officers he rose with what for the French navy was exceptional rapidity, though it would have caused no surprise in England in the case of an officer who had good interest. He was named post-captain in 1793, and rear-admiral in 1796. At the close of the year he was appointed to take part in the unsuccessful expedition to Ireland which reached Bantry Bay, but the ships which were to have come to Brest from Toulon with him arrived too late, and were forced to take refuge at L'Orient. He accompanied the expedition to Egypt, with his flag in the " Guillaume Tell " (86). She was the third ship from the rear of the French line at the battle of the Nile, and escaped from the general destruction in company with the " Gcnereux " (7S). Villeneuve reached Malta on the 23rd of August. His conduct was severely blamed, and he defended himself by a specious letter to his colleague Blanquet- Duchayla on the 12th of November 1800, w r hen he had returned to Paris. At the time, Napoleon approved of his action. In a letter written to him on the 21st of August 1798, three weeks after the battle, Napoleon says that the only reproach Villeneuve had to make against himself was that he had not retreated sooner, since the position taken by the French commander-in- chief had been forced and surrounded. When, however, the emperor after his fall dictated his account of the expedition to Egypt to General Bertrand at St Helena, he attributed the defeat at the Nile largely to the " bad conduct of Admiral Villeneuve." In the interval Villeneuve had failed in the exe- cution of the complicated scheme for the invasion of England in 1805. Napoleon must still have believed in the admiral's capacity and good fortune, a qualification for which he had a great regard, when he selected him to succeed Latouche Treville upon his death at Toulon in August 1804. The duty of the Toulon squadron was to draw Nelson to the West Indies, return rapidly, and in combination with other French and Spanish ships, to enter the Channel

with an overwhelming force. It is quite obvious that Villeneuve had from the first no confidence in the success of an operation requiring for its execution an amazing combination of good luck and efficiency on the part of the squadrons concerned. He knew that the French were net efficient, and that their Spanish allies were in a far worse state than themselves. It required a very tart order from Napoleon to drive him out of Paris in October 1804. He took the

command in November. On the 17th of January 1805 he left Toulon for the first time, but was driven back by a squall which dismasted some of his awkwardly handled ships. On the 3rd of March he was out again, and this time he headed Nelson by some weeks on a cruise to the West Indies. But Villcneuve's success so far had not removed his fears. Though on taking up his command he had issued an order of the day in which he spoke boldly enough of the purpose of his cruise, and his de- termination to adhere to it, he was racked by fears of what might happen to the force entrusted to his care. For the details of the campaign see Trafalgar. In so far as the biography of Villeneuve is concerned, his behaviour during these trying months cannot escape condemnation. He had undertaken to carry out a plan of which he did not approve. Since he had not declined the task altogether, it was clearly his duty to execute his orders at all hazards. If he was defeated, as he almost certainly would have been, he could have left the responsibility for the disaster to rest on the shoulders of Napoleon who assigned him the task. But Villeneuve could not free him- self from the conviction that it was his business to save his fleet even if he ruined the emperor's plan of invasion. Thus after he returned to- Europe and fought his confused action with Sir R. Calder oft" Ferrol on the 22nd of July 1805, he first hesi- tated, and then, in spite of vehement orders to come on, turned south to Cadiz. Napoleon's habit of suggesting alternative courses to his lieutenants gave him a vague appearance of excuse for making for that port. But it was one which only a very weak man would have availed himself of, for all his instructions ought to have been read subject to the standing injunction to come on to the Channel — and in turning south to Cadiz, he was going in the opposite direction. His decision to leave Cadiz and give battle in October 1805, which led directly to the battle of Trafalgar, cannot be justified even on his own principles. He foresaw defeat to be inevitable, and yet he went out solely because he learnt from the Minister of Marine that another officer had been sent to supersede him. In fact he ran to meet the very destruction he had tried to avoid. No worse fate would have befallen him in the Channel than came upon him at Trafalgar, but it might have been incurred in a manly attempt to obey his*

orders. It was provoked in a spasm of wounded vanity. At Trafalgar he showed personal courage, but the helpless incapacity of the allies to manoeuvre gave him no opportunity to influence the course of the battle. He was taken as a prisoner to England, but was soon released. Shortly after landing in France he committed suicide in an inn at Rennes, on the 22nd of April 1806. Among the other improbable crimes attributed to Napoleon by the fear and hatred of Europe, was the murder of Villeneuve, but there is not the faintest reason to doubt that the admiral died by his own hand.

The correspondence of Napoleon contains many references to Villeneuve. Accounts of the naval operations in which he was concerned will be found in James's Naval History. Troudc, in his Batailles navales de la France, vol. in., publishes several of his letters and orders of the day. (D. H.)

VILLENEUVE-LfiS-AVIGNON, a town of south-eastern France, in the department of Gard on the right bank of the Rhone opposite Avignon, with which it is connected by a suspension bridge. Pop. (1906) 2582. Villeneuve preserves many remains of its medieval importance. The church of Notre Dame, dating from the 14th century, contains a rich marble altar and remarkable pictures. The hospice, once a Franciscan convent, part of which is occupied by a museum of pictures and antiquities, has a chapel in which is the fine tomb of Innocent VI. (d. 1362). The church and other remains of the Carthusian monastery of Val-de-Benediction, founded in 1356 by Innocent VI., are now used for habitation and other secular purposes. A gateway and a rotunda, built as shelter for a fountain, both dating from about 1670, are of architectural note. On the Mont Andaon, a hill to the north-east of the town, stands the Fort of St Andre (14th century), which is entered by an imposing fortified gateway and contains a Romanesque chapel and remains of the abbey of St Andrg. The other buildings of

interest include several old mansions once belonging to cardinals and nobles, and a tower, the Tour de Philippe le Bel, built in the 14th century, which guarded the western extremity of the Pont St Benezet (see Avignon).

In the 6th century the Benedictine abbey of St Andre was founded on Mount Andaon, and the village which grew up round it took its name. In the 13th century the monks, acting in concert with the crown, established a bastide, or " new town," which came to be called Villeneuve. The town was the resort of the French cardinals during the sojourn of the popes at Avignon, and its importance, due largely to its numerous re- ligious establishments, did not decline till the Revolution.

VILLENEUVE-SUR-LOT, a town of south-western France, capital of an arrondisscmcrit in the department of Lot-et-Garonne, 22 m. N. by E. of

Agen on a branch line of the Orleans railway. Pop. (1906) town, 6078; commune, 13,540. Villeneuve is divided into two unequal portions by the river Lot, which here runs between high banks. The chief quarter stands on the right bank and is united to the quarter on the left bank by a bridge of the 13th century, the principal arch of which, con- structed in the reign of Louis XIII. in place of two older arches, has a span of 118 ft. and a height of 59 ft. On the left bank portions of the 13th century ramparts, altered and surmounted by machicolations in the 1 5th century, remain, and high square towers rise above the gates to the north-east and south- west, known respectively as the Porte de Paris and Porte de Pujols. On the right bank boulevards have for the most part taken the place of the ramparts. Arcades of the 13th century surround the Place La Fayette, and old houses of the 13th, 14th and 15th centuries are to be seen in various parts of the town. The church of St "fitienne is in late Gothic style. On the left bank of the Lot, 2 m. S.S.W. of Villeneuve, are the 13th-century walls of Pujols, The buildings of the ancient abbey of Eysses, about a mile to the N.E., which are mainly of the 17th century, serve as a departmental prison and peni- tentiary settlement. The principal hospital, the hospice St Cyr, is a handsome building standing in beautiful gardens. Villeneuve has a sub-prefecture, tribunals of first instance and of commerce and communal colleges for both sexes. It is an important agricultural centre and has a very large trade in plums {prunes d'ente) and in the produce of the market gardens which surround it, as well as in cattle, horses and wine. The preparation of preserved plums and the tinning of peas and beans occupy many hands; there are also manufactures of boots and shoes and tin boxes. The important mill of Gajac stands on the bank of the Lot a little above the town.

Villeneuve was founded in 1254 by Alphonse, count of Poitiers, brother of Louis IX., on the site of the town of Gajac, which had been deserted during the Albigensian crusade.

VILLEROI, FRANCOIS DE NEUFVILLE, Due de (1644-1730), French soldier, came of a noble family which had risen into prominence in the reign of Charles IX, His father Nicolas de Neufville, Marquis de Villeroi, marshal of France (1598-1685), created a duke by Louis XIV., was the young king's governor, and the boy was thus brought up in close relations with Louis. An intimate of the king, a finished courtier and leader of society and a man of great personal gallantry, Villeroi was marked out for advancement in the army, which he loved, but which had always a juster appreciation of his incapacity than Louis. In 1693, without having exercised any really important and responsible command, he was made a marshal. In 1695, when Luxembourg died, he obtained the command of the army in Flanders, and William III. found him a far more complaisant opponent than the "little hunchback." In 1701 he was sent to Italy to

supersede Catinat and was soon beaten by the inferior army of Eugene at Chiari (see Spanish Succession War)'. In the winter of 1701 he was made prisoner at the surprise of Cremona, and the wits of the army made at his expense the famous rhyme:

" Par la faveur de Bellone, et par un bonheur sans 6gal, Nous avons conserve" Cremone — et perdu notre general."

In the following years he was pitted against Marlborough in

the Low Countries. Marlborough's own difficulties with the Dutch and other allied commissioners, rather than Villeroi's own skill, put off. the inevitable disaster for some years, but in 1706 the duke attacked him and thoroughly defeated him at Ramillies (q.v.). Louis consoled his old friend with the remark, " At our age, one is no longer lucky," but superseded him in the command, and henceforward Villeroi lived the life of a courtier, much busied with intrigues but retaining to the end the friendship of his master. He died on the 18th of July 1730 at Paris.

VILLERS LA VILLE, a town of Belgium in the province of Brabant, 2 m. E. of Quatre Bras, with a station on the direct line from Louvain to Charleroi. Pop. (roo4) 1166. It is chiefly interesting on account of the fine ruins of the Cistercian abbey of Villers founded in 1147 and destroyed by the French republicans in 1795. In the ruined church attached to the abbey are still to be seen the tombstones of several dukes of Brabant of the 13th and 14th centuries. VILLETTE, CHARLES, Marquis de (1 736-1 793), French writer and politician, was born in Faris on the 4th of December 1736, the son of a financier who left him a large fortune and the title of marquis. After taking part in the Seven Years' War, young Villette returned in 1763 to Paris, where he made many enemies by his insufferable manners. But he succeeded in gaining the intimacy of Voltaire, who had known his mother and who wished to make a poet of him. The old philosopher even went so far as to call his protege the French Tibullus. In 1777, on Voltaire's advice, Villette married Mademoiselle de Varicourt, but the marriage was unhappy, and his wife was subsequently adopted by Voltaire's niece, Madame Denis. During the Revolution Villette publicly burned his letters of nobility, wrote revolutionary articles in the Chronique de Paris, and was elected deputy to the Convention by the department of Seine-et-Oise. He had the courage to censure the September massacres and to vote for the imprisonment only, and not for the death, of Louis XVI. He died in Paris on the 7th of July 1793.

In 1784 he published his (Euvres, which are of little value, and in 1792 his articles in the Chronique de Paris appeared in book form under the title Lettres choisies sur les principaux entitlements de la Revolution.

VILLIERS, CHARLES PELHAM (1802-1898), English states- man, son of George Villiers, grandson of the 1st carl of Clarendon of the second (Villiers) creation, and brother of the 4th earl (<7.r.), was born in London on the 3rd of January 1802, and educated at St John's College, Cambridge. He read for the bar at Lincoln's Inn, and became an associate of the Bentha- mites and " philosophical radicals " of the day. He was an assistant commissioner to the Poor Law Commission (1832), and in 1833 was made by the master of the Rolls, whose secretary he had been, a chancery examiner of witnesses, holding this office till 1852. In 1835 he was elected M.P. for Wolverhampton, and retained his seat till his death. He was the pioneer of the free-trade movement, and became prominent with Cobden and Bright as one of its chief supporters, being indefatigable in pressing the need for free trade on the House of Commons, by resolution and by petition. After free trade triumphed in 1846 his importance in politics became rather historical than actual, especially as he advanced to a venerable old age; but he was president of the Poor Law Board, with a seat in the Cabinet, from 1859 to 1866, and he did other useful work in the Liberal reforms of the time. Like Bright, he parted from Mr Gladstone on Home Rule for Ireland. He attended parliament for the last time in 1895, and died on the 16th of January r898.

VILLIERS DE L'ISLE-ADAM, PHILIPPE ATJGUSTE MATHIAS, Comte de (1838-1889), French poet, was born at St Brieuc in Brittany and baptized on the 28th of November 1838. He may be said to have inaugurated the Symbolist movement in French literature, and Axel, the play on which he was engaged during so much of his life, though it was only published after his death, is the typical Symbolist drama. He began with a volume of Premieres Patsies (1856-58). This was

followed by a wild romance of the supernatural, Isis (1862), and by two plays in prose, Elen (1866) and Morgane (1866). La Revolte, a play in which Ibsen's Doll's House seems to be anticipated, was represented at the Vaudeville in 1870; Contes cruels, his finest volume of short stories, in 1883, and a new series in 1889; Le Nouveau Monde, a drama in five acts, in 1880; L'&ve future, an amazing piece of buffoonery satirizing the pretensions of science, in 1886; Tribulat Bonhomet in 1887; Le Secret de I'ichafaud in 1888; Axel in 1890. He died in Paris, under the care of the Freres Saint-Jean-de-Dieu, on the 19th of August 1889. Villiers has left behind him a legend probably not more fantastic than the truth. Sharing many of the opinions of Don Quixote, he shared also Don Quixote's life. He was the descendant of a Grand Master of the Knights of Malta, famous

in history, and his pride as an aristocrat and as an idealist were equal. He hated mediocrity, science, prog- ress, the present age, money and " serious " people. In one division of his work he attacked all the things which he hated with a savage irony; in another division of his work be dis- covered at least some glimpses of the ideal world. He remains a remarkable poet and a remarkable satirist, imperfect as both. He improvised out of an abundant genius, but the greater part of his work was no more than improvisation. He was ac customed to talk his stories before he wrote them. Sometimes he talked them instead of writing them. But he has left, at all events, the Contes cruels, in which may be found every classic quality of the French conte, together with many of the qualities of Edgar Allan Poe and Ernst Hoffman ; and the drama of Axel, in which the stage takes a new splendour and a new subtlety of meaning. Villiers's influence on the younger French writers was considerable. It was always an exaltation. No one in his time followed a literary ideal more romantically.

(A. Sy.) See also R. du Pontavice de Heussey, Villiers de V Isle- Adam (1893), a biography, English trans. (1904) by Lady Mary Loyd ; ■ S. Mallarme 1 , Les Miens. Villiers de I Isle-Adam (1892) ; R. Martincau, Un vivant el deux morts (1901), bibliography. A selection from his stories, Histoires souveraines, was made by his friends (Brussels,

1899).

VILLINGEN, a town of Germany in the grand duchy of Baden, pleasantly situated amid well-wooded hills, 52 m. by rail N. of Schaffhausen. Pop. (1905) 9582. It is in part still surrounded by walls, with ancient gate towers. It is the chief seat of the watch-making industry of the Black Forest. It also produces musical-boxes, glass and silk, and has a Gothic church of the 13th century and another of the nth, a 15th- century town hall, with a museum of antiquities, and music, technical and agricultural schools.

VILLOISON, JEAN BAPTISTE GASPARD D'ANSSE (or Dannse) DE (1750-1805), French classical scholar, was born at Corbeil-sur-Seine on the sth of March 1750 (or 1753; authori- ties differ). He belonged to a noble family (De Ansso) of Spanish origin, and took his surname from a village in the neighbour- hood. In 1773 he published the Homeric Lexicon of Apollonius from a MS. in the abbey of Saint Germain des Pres. In 1778 appeared his edition of Longus's Daphnis and Chive. In 1 781 be went to Venice, where he spent three years in examining the library, his expenses teing paid by the French government. His chief discovery was a 10th-century MS. of the Iliad, with ancient scholia and marginal notes, indicating supposititious, corrupt or transposed verses. After leaving Venice, he accepted the invitation of the duke of Saxe- Weimar to his court. Some of the fruits of his researches in the library of the palace were collected into

a volume {Epislolae Vinarienses, 1783), dedicated to his royal hosts. Hoping to find a treasure similar to the Venetian Homer in Greece, he returned to Paris to prepare for a journey to the East. He visited Constantinople, Smyrna, the Greek islands, and Mount Athos, but the results did not come up to his expectation. In 1786 he returned, and in 1788 brought out the Codex Venetus of Homer, which created a sensation in the learned world. When the revolution broke out, being banished from Paris, he lived in retirement at Orleans, occupying himself chiefly with the transcription of the notes

in the library of the brothers Valois (Valesius). On the restora- tion of order, having returned to Paris, he accepted the pro- fessorship of modern Greek established by the government, and held it until it was transferred to the College de France as the professorship of the ancient and modern Greek languages. He died soon after his appointment, on the 23th oi April 1805. Another work of some importance, Anecdota Graeca (1781), from the Paris and Venice libraries, contains the Ionia (violet garden) of the empress Eudocia, and several fragments of lamblichus, Porphyry, Procopius of Gaza, Choricius and the Greek grammarians. Materials for an exhaustive work con- templated by him on ancient and modern Greece are preserved in the royal library of Paris.

See J. Dacier, Notice kistorique sur la vie ei les outrages de Villoison (1806); Chardon de la Rochette, Melanges de critique et de philologie, iii. (1812) ; and especially the article by his friend and pupil E. Quatremere in Nouvelle biographic generate, xiii., based upon private information.

VILLON, FRANCOIS (1431-c. 1463), French poet (whose real surname is a matter of much dispute, so that he is also called De Montcorbier and Des Loges and by other names, though in literature Villon is the sole term used), was born in 1431, and, as it seems, certainly at Paris. The singular poems called Testaments, which form his chief if not his only certain work, arc largely autobiographical, though of course not fully trust- worthy. But his frequent collisions with the law have left more certain records, which have of late been ransacked with extraordinary care by students, especially by M. Longnon. It appears that he was born of poor folk, that his father died in his youth, but that his mother, for whom he wrote one of his most famous ballades, was alive when her son was thirty years old. The very name Villon was stated, and that by no mean authority, the president Claude Fauchet, to be merely a common and not a proper noun, signifying ” cheat ” or “rascal”; but this seems to be a mistake. It is, however, certain

that Villon was a person of loose life, and that he continued, long after there was any excuse for it in his years, the reckless way of living common among the wilder youth of the university of Paris. He appears to have derived his surname from a friend and benefactor named Guillaume de Villon, chaplain in the collegiate church of Saint-Benoit-le- Bestourne, and a professor of canon law, who took Villon into his house. The poet became a student in arts, no doubt early, perhaps at about twelve years of age, and took the degree of bachelor in 1449 and that of master in 1452. Between this year and 1455 nothing positive is known of him, except that nothing was known against him. Attempts have been made, in the usual fashion of conjectural biography, to fill up the gap with what a young graduate of Bohemian tendencies would, could, or might have done; but they are mainly futile.

On the 5th of June 1455 the first important incident of his life that is known occurred. Being in the company of a priest named Giles and a girl named Isabeau, he met, in the rue Saint-Jacques, a certain Breton, Jean le Hardi, a master of arts, who was with a priest, Philippe Chermoye or Sermoise or Sermaise. A scuffle ensued; daggers were drawn; and Sermaise, who is accused of having threatened and attacked Villon and drawn the first blood, not only received a dagger- thrust in return, but a blow from a stone which struck him down. Sermaise died of his wounds. Villon fled, and was sentenced to banishment — a sentence which was remitted in January 1456, the formal pardon being extant, strangely enough, in two different documents, in one of which the culprit is described as " Francois des Loges, autrement dit Villon," in the other as " Francois de Montcorbier." That he is also said to have described himself to the barber-surgeon who dressed his wounds as Michel Mouton is less surprising, and hardly needs an addition to the list of his aliases. It should, however, be said that the documents relative to this affair confirm the date of his birth, by representing him as twenty- six years old or thereabouts. By the end of J456 he was again in trouble. In his first broil " la femme Isabeau " is only

generally named, and it is impossible to say whether she had anything to do with the quarrel. In the second, Catherine de Vaucelles, of whom we hear not a little in the poems, is the declared cause of a scuffle in which Villon was so severely beaten that, to escape ridicule, he fled to Angers, where he had an uncle who was a monk. It was before leaving Paris that he composed what is now known as the Petit testament, of which we shall speak presently with the rest of his poems, and which, it should be said, shows little or no such mark of profound bitterness and regret for wasted life as does its in every sense greater successor the Grand testament. Indeed, Villon's serious troubles were only beginning, for hitherto he had been rather injured than guilty. About Christmas-time the chapel of the college of Navarre was broken open, and five hundred gold crowns stolen.

The robbery was not dis- covered till March 1457, and it was not till May that the police came on the track of a gang of student-robbers owing to the indiscretion of one of them, Guy Tabarie. A year more passed, when Tabarie, being arrested, turned king's evidence and accused Villon, who was then absent, of being the ring-leader, and of having gone to Angers, partly at least, to arrange for similar burglaries there. Villon, for this or some other crime, was sentenced to banishment: and he did not attempt to return to Paris. In fact for four years he was a wanderer; and he may have been, as each of his friends Regnier de Montigny and Colin des Cayeux certainly was, a member of a wandering thieves' gang. It is certain that at one time (in 1457), and probable that at more times than one, he was in correspondence with Charles d'Orleans, and it is likely that he resided, at any rate for some period, at that prince's court at Blois. He had also something to do with another prince of the blood, Jean of Bourbon, and traces are found of him in Poitou, in Dauphin!, &c. But at his next certain appearance he is again in trouble. He tells us that he had spent the summer of 1461 in the bishop's prison (bishops were fatal to Villon) of Meung. His crime is not known, bdt is supposed to have been church-robbing; and his enemy, or at least judge, was Thibault d'Aussigny, who held the see of Orleans. Villon owed his release to a general gaol-delivery at the accession of Louis XL, and became a free man again on the 2nd of October.

It was now that he wrote the Grand testament, the work which has immortalized him. Although he was only thirty at the date (1461) of this composition (which is unmistakable, because given in the book itself), there seems to be ho kind of aspiration towards a new life, nor even any hankering after the old. Nothing appears to be left him but regret; his very spirit has been worn out by excesses or sufferings or both. Even his good intentions must have been feeble, for in the autumn of 1462 we find him once more living in the cloisters of Saint-Benoit, and in November he was in the Chatelet for theft. In default of evidence the old charge of the college of Navarre was revived, and even a royal pardon did not bar the demand for restitution. Bail was, however, accepted, but Villon fell promptly into a street quarrel, was arrested, tortured and condemned to be hanged, but the sentence was commuted to banishment by the parlement on the 5th of January 1463. The actual event is unknown: but from this time he disappears from history. Rabelais indeed tells two stories about him which have almost necessarily been dated later. One is a countryside anecdote of a trick supposed to have been played by the poet in his old age at Saint Maixent in Poitou, whither he had retired. The other, a coarse but poihted jest at the expense of England, is told as having been addressed by Villon to King Edward V. during an exile in that country. Now, even if King Edward V. were not evidently out of the question, a passage of the story refers to the well-known scholar and man of science, Thomas Linacre, as court

physician to the king, and makes Villon mention him, whereas Linacre was only a young scholar, not merely at the time of Edward V.'s supposed murder, but at the extreme date (1489) which can be assigned to Villon's life. For in this year the first edition of the poet's work appeared, obviously not published by himself.

and with no sign in it of his having lived later than the date (1461) cf the Grand testament. It would be easy to dismiss these Rabelaisian mentions of Villon as mere humorous inven- tions, if it were not that the author of Pantagruel was born almost soon enough to have actually seen Villon if he had lived to anything that could be caJled old age, that he almost certainly must have known men who had known Villon, and that the poet undoubtedly spent much time in Rabelais's own country on the banks of the lower Loire.

The obscurity, the unhappiness and the evil repute of Villon's life would not be in themselves a reason for the minute investiga- tion to which the events of that life have been subjected, and the result of which has been summed up here. But his poetical work, scanty as the certainly genuine part of it is, is of such extraordinary qualitv, and marks such an epoch in the history of European litera- ture, that he has been at all times an interesting figure, and, like all very interesting figures, has been often praised for qualities quite other than those wnich he really possessed. Boileau's famous verses, in which Villon is extolled for having first known how to smooth out the confused art of the old romancers, are indeed a prodigy of blundering or ignorance or both. As far as art or the technical part of poetry goes, Villon made not the slightest advance on his predecessors, nor stood in any way in front of such contemporaries as his patron Charles d'Orleans, His two Testaments (so called by the application to them of a regular class-name of medieval poetry and consisting of burlesque legacies to his acquaintances) are made up of eight-line stanzas of eight-syllabled verses, varied in the case of the Grand testament by the insertion of ballades and rondeaux of very great beauty and interest, but not formally different in any way from poems of the same kind for more than a century past. What really distinguishes Villon is the intenser quality of his poetical feeling and expression, and what is perhaps arrogantly called the modern character of his subjects and thought. Medieval poetry, with rare exceptions, and, with exceptions not quite so rare, classical poetry, are distinguished by their lack of what is now called the personal note. In Villon this note sounds, struck with singular force and skill. Again, the simple joy of living which distinguishes both periods — the medieval, despite a common opinion,

scarcely less than the ancient — has disappeared. Even the riot and rollicking of his earlier days are mentioned with far less relish of remembrance than sense of their vanity. This sense of vanity, indeed, not of the merely religious, but of the purely mundane and even half-pagan kind, is Villon's most prominent characteristic. It tinges his narrative, despite its burlesque bequests, all through; it is the very keynote of his most famous and beautiful piece, the Ballade des dames du temps jadis, with its refrain, " Mais ou sont les nciges d'antan ? " as well as of his most daring piece of realism, the other ballade of La Grosse Margot, with its burden of hopeless entanglement in shameless vice. It is nowhere more clearly sounded than in the piece which ranks with these two at the head of his work, the Regrets de la Belle Ileaulmiere, in which a woman, once young and beautiful, now old and withered, laments her lost charms. So it is almost throughout his poems, including the grim Ballade des pendus, and hardly excluding the very beautiful Ballade pour sa mere, with its description of sincere and humble piety. It is in the profound melancholy which the dominance of this note has thrown over Villon's work, and in the_ suitableness of that melancholy to the temper of all generations since, that his charm and power have consisted, though it is difficult to conceive any time at which his poetical merit could be ignored.

His certainly genuine poems consist of the two Testaments with their codicil (the latter containing the Ballade des pendus, or more properly £pitaphe en forme de ballade, and some other pieces of a similarly grim humour), a few miscellaneous poems, chiefly ballades, and an extraordinary collection (called Le Jargon ou jobelin) of poems in argot, the greater part of which is now totally unintelligible, if, which may perhaps be doubted, it ever was otherwise. Besides these, several poems of no inconsiderable interest are usually printed with Villon's works, though they are certainly, or almost certainly, not his. The chief are Les Kepues Franches, a curious series of verse stories of cheating tavern-keepers, &c, having some resemblance to those told of George Peele, but of a broader and coarser humour. These, though in many cases " common form " of the broader tale-kind, are not much later than his time, and evi- dence to reputation if not to fact. Another of these spurious pieces is the extremely amusing monologue of the Franc Archier de Bag- nolet, in which one of the newly constituted archers or regularly trained and paid soldiery, who were extremely unpopular in France, is made to expose his own poltroonery. The third most important piece of this kind is the Dialogue de Mallepaye el de Baillevent, a dramatic conversation between two penniless spendthrifts, which is not without merit. These poems, however, were never attributed to Villon or printed with his works till far into the 16th century.

It has been said that the first dated edition of Villon is of 1489, though some have held one or more than one undated copy to be still earlier.

Between the first, whenever it was, and 1542 there were very numerous editions, the most famous being that (1533)

of Clement Marot, one of whose most honourable distinctions is the care he took of his poetical predecessors. The Pleiade movement and the classicizing of the grand siecle put Villon rather out of favour, and he was not again reprinted till early in the 18th century, when he attracted the attention of students of old French like Le Duchat, Bernard de la Monnoye and Prosper Marchand. The first critical edition in the modern sense — that is to say, an edition founded on MSS. (of which there are in Villon's case several, chiefly at Paris and Stockholm) — was that of the Abbe J. H. R. Promp- sault in 1832. The next was that of the " Bibliophile Jacob " (P. Lacroix) in the Bibliolkeuue Elzevirienne (Paris, 1854). The standard edition is Giuvres completes de Francois Villon, by M. Auguste Longnon (1892). This contains copies of the documents on which the story of Villon's life is based, and a bibliography. The late M. Marcel Schwob discovered new documents relating to the poet, but died before he could complete his work, which was posthumously published in 1905. See also A. Campaux, F. Villon, sa vie el ses muvres (1859); A' Longnon, jltude biographique (1877); and especially G. Paris, Francois Villon (1901), a book of the first merit. A complete translation of Villon was written by Mr John Payne (1878) for the Villon Society. There are also translations of individual poems in Mr Andrew Lang's Ballads and Lyrics of Old France (1872) and in the works of D. G. Rossetti and Mr Swinburne. Among critical studies of Villon may be mentioned those by Sainte-Beuve in the Causeries du hmdi, vol. xiv., by Theo- phile Gautier in Grotesques, and by R. L. Stevenson in his Familiar Studies of Men and Books (1882). An unedited ballad by Villon, with another by an unknown poet of the same date, was published by W. G. C. Bijvanck (1891) as Un poete inconnu. M. Pierre d'Alheim published (1892) an edition of Le Jargon with a translation into ordinary French. (G. Sa.)

VILNA, or Wilno, a Lithuanian government of West Russia, having the Polish government of Suwalki on the W., Kovno and Vitebsk on the N., and Minsk and Grodno on the E. and S. Area, 16,176 sq. m.; pop. (1906 estimate) 1,806,300. Vilna lies on the broad marshy swelling, dotted with lakes, which separates Poland from the province of East Prussia and stretches E.N.E. towards the Valdai Plateau.

Its highest parts are a little more than 1000 ft., above sea-level. On its western and eastern boundaries it is deeply trenched by the valleys of the Niemen and the S. Dvina. It is chiefly built up of Lower Tertiary deposits, but in the north Devonian sandstones appear on the surface. The Tertiary deposits consist of Eocene clay, slates, sandstones, limestones and chalk, with gypsum, and are partly of marine and partly of terrene origin. The

whole is overlain with thick layers of Glacial boulder clay and post-Glacial deposits, containing remains of the mammoth and other ex- tinct mammals. Interesting discoveries of Neolithic implements, especially of polished stone, and of implements belonging to the Bronze Age and the early years of the Christian epoch, have been made. Numerous lakes and marshes, partly covered with forests, and scarcely passable except when frozen, as well as wet meadow- land, occupy a large area in the centre of the government. The Niemen, which flows along the southern and western borders for more than 200 m., is the chief artery of trade, and its importance in this respect is enhanced by its tributary the Viliya, which flows west for more than 200 m. through the central parts of Vilna, receiving many affluents on its 'course. Among the tributaries of the Niemen is the Berezina, which acquired renown during Napoleon's retreat in 1S12; it flows in a marshy valley in the south-east. The S. Dvina for 50 m. of its course separates Vilna from Vitebsk. The climate of the government is only slightly tempered by its proximity to the Baltic Sea (January, 2i°-8; July, 64°-5); the average temperature at the town of Vilna is only 43°"5- But in winter the thermometer descends very low, a minimum of 30 F. having been observed. The flora and fauna are inter mediate between those of Poland and middle Russia.

The government is divided into seven districts, the chief towns of which are Vilna, Vileiki, Disna, Lida, Oshmyany, Zventsyany and Troki.

VILNA, or Wilno, a town of Russia, capital of the govern- ment of the same name, 436 m. S.S.W. of St Petersburg, at the intersection of the railways from St Petersburg to Warsaw and from Libau to the mouth of the Don. Pop. (1883) 93,760-, (1900) 162,633. With its suburbs Antokol, Lukishkij Pogul- yanka and Sarechye, it stands on and around a knot of hills (2450 ft.) at the confluence of the Vileika with the Viliya. Its streets are in part narrow and not very clean; but Vilna is an old town, rich in historical associations. Its imperial palace, and the cathedral of St Stanislaus (13S7, restored 1 801), con- taining the silver sarcophagus of St Casimir and the tomb of Prince Vitoft, are fine buildings. There is a second cathedral, that of St Nicholas, built in 1596-1604; also several churches dating

from the 14th to the 16th centuries. The Ostra Brama chapel contains an image of the Virgin greatly venerated by Orthodox Greeks and Roman Catholics alike. The museum of antiquities has valuable historical collectioas. The ancient castle of the Jagellones is now a mass of ruins. The

old university, founded in 1578, was restored (1803) by Alexander I., but has been closed since 1832 for political reasons; the only departments which remain in activity are the astronomical observatory and a medical academy. Vilna is an archiepiscopal see of the Ortho- dox Greek Church and an episcopal see of the Roman Catholic Church, and the headquarters of the governor-general of the Lithuanian provinces and of the III. army corps. The city possesses a botanical garden and a public library, and is adorned with statues to Catherine II. (1903), the poet Pushkin and Count M. Muraviev (1898). It is an important centre for trade in timber and grain, which are exported; and has theological seminaries, both Orthodox Greek and Roman Catholic, a military school, a normal school for teachers and professional schools. It is the seat of many scientific societies (geographical, medical and archaeological), and has a good antiquarian museum and a public library.

History. — The territory of Vilna has been occupied by the Lithuanians since the 10th century, and probably much earlier; their chief fortified town, Vilna, is first mentioned in 1128. A temple to the god Perkunas stood on one of its hills till 1387, when it was destroyed by Prince Jagiello, after his baptism. After 1323, when Gedymin, prince of Lithuania, abandoned Troki, Vilna became the capital of Lithuania. The formerly independent principalities of Minsk and Lidy, as well as the territory of Disna, which belonged to the Polotsk principality, were annexed by the Lithuanian princes, and from that time Vilna, which was fortified by a stone wall, became the chief city of the Lithuanian state. It was united with Poland when its prince, Casimir IV., was elected (1447) to the Polish throne. The piague of 1 ˆSS, a fire in 1610 and still more the wars between Russia and Poland, which began in the 17th century, checked its further growth. The Russians took Vilna in 1655, and in the following year it was ceded to Russia. The Swedes captured it in 1 702 and in 1 706. The Russians again took possession of it in 1788; and it was finally annexed to Russia in 1795, after the partition of Poland. Its Polish inhabitants took an active part in the risings of 1831 and 1863, for which they were severely punished by the Russian government.

VILVORDE, a town of Belgium in the province of Brabant, 9 m. N. of Brussels and on the Senne. Pop. (1904) 14,418. The old castle of Vilvorde, which often gave shelter to the dukes of Brabant in their days of trouble, is now used as a prison. The younger Tcniers lived and died at a farm outside Vilvorde, and is buried in the parish church of Dry Toren.

VINCENNES, a town of northern France, in the department of Seine, on a wooded plateau i| m. E. of the fortifications of Paris, with which it is connected by rail and tram. Pop. (1906) town, 29,79:; commune, 34,185. Its celebrated castle, situated to the south of the town and on the northern

border of the Bdis de Vincennes, was formerly a royal residence, begun by Louis VII. in 1164, and more than once rebuilt. It was frequently visited by Louis IX., who held informal tribunals in the neigh- bouring wood, a pyramid marking the spot where the oak under which he administered justice is said to have stood. The chapel, an imitation of the Sainte Chapelle at Paris, was begun by Charles V. in 1379, continued by Charles VI. and Francis I., consecrated in 1552 and restored in modern times. In the sacristy is the monument erected in r8r6 to the memory of the duke of Enghien, who was shot in the castle moat in 1804. Louis XI. made the castle a state prison in which Henry of Navarre, the great Conde, Mirabeau and other distinguished persons were afterwards confined. Under Napoleon I. the castle became a magazine of war-material. Louis XVTII. added an armoury, and under Louis Philippe numerous case- mates and a new fort to the east of the donjon were constructed. The place now serves as a fort, arsenal and barracks. It forms a rectangle 417 yds. long by 245 yds. wide. The enclosing wall

was originally flanked by nine towers, which were cut down to its level between 1808 and 1811, and now serve as bastions. The donjon is a square tower, 170 ft. high, with turrets at the corners. The Bois de Vincennes, which covers about 2300 acres and stretches to the right bank of the Marne, contains a race-course, a military training-ground, a school of military explosives (pyrotechnic), several artificial lakes, an artillery polygon and other military establishments, an experimental farm, the redoubts of Gravelle and La Faisanderie and the normal school of military gymnastics. The wood, which now belongs to Paris, was laid out during the second empire on the same lines as the Bois de Boulogne. On its south border is the asylum of Vincennes, founded in 1855 for the benefit of con- valescents from the hospitals. In the town there is a statue of General Daumesnil, celebrated for his defense of the castle against the allies in 1814 and 1815. Vincennes has a school of military administration and carries on horticulture and the manufacture of ironware of various kinds, rubber goods, chemicals, perfumery, mineral waters, &c.

VINCENNES, a city and the county-seat of Knox county, Indiana, U.S.A., in the S.W. part of the state, on the E. bank of the Wabash river, about 117 in. S.W. of Indianapolis. Pop. (1890) 8853; (1900) 10,249, of whom 736 were foreign-born; (1910 census) 14,893. It is served by the Baltimore & Ohio South-Western, the Cleveland, Cincinnati , Chicago & St Louis, the Evansville & Terre Haute, and the Vandalia railways. Extensive levees, 15 m. in length, prevent the overflow of the Wabash river, which for nine months in the year is navigable from this point to the Ohio. The city is level and well drained, and has a good water-supply system. In Vincennes are a Roman Catholic cathedral, erected in 1835, one of the oldest in the West, occupying the site of a church built early in the 18th century; Vincennes

University (1806), the oldest educational institution in the state, which in 1910 had 14 instructors and 236 students; St Rose Female Academy, and a public library. Coal, natural gas and oil are found near Vincennes. The city is a manufactur- ing and railway centre, and ships grain, pork and neat cattle. The total value of the factory products in 1905 was $3,172,279. Vincennes was the first permanent settlement in Indiana. On its site Francois Margane, Sieur de Vincennes, established a French military post about 1731, and a permanent settlement was made about the fort in 1735. After the fall of Quebec the place remained under French sovereignty until 1777, when it was occupied by a British garrison. In 1778 an agent of George Rogers Clark took possession of the fort on behalf of Virginia, but it was soon afterwards again occupied by the British, who called it Fort Sackville and held it until February 1779, when it was besieged and was captured (on the 25th of February) by George Rogers Clark, and passed finally under American juris- diction. The site of the fort is marked by a granite shaft erected in 1905 by the Daughters of the Revolution. Vincennes was the capital of Indiana Territory from 1800 to 1813, and was the meeting-place in 1805 of the first General Assembly of Indiana Territory. In 1839 it was incorporated as a borough, and it became a city in 1856.

See J. Law, The Colonial History of Vincennes (Vincennes, 1858); W. H. Smith, " Vincennes, the Key to the North-West," in L. P. Powell's Historic Towns of the Western States (New York, 1901) ; " The Capture of Vincennes by George Rogers Clark," Old South Leaflets, No. 43 (Boston, n.d.) ; also chap. ii. of J. P. Dunn's Indiana (Boston,

1892).

VINCENT (or Vincentius), ST, deacon and martyr, whose festival is celebrated on the 22nd of January. In several of his discourses St Augustine pronounces the eulogy of this martyr, and refers to Acts which were read in the church. It is doubtful whether the Acts that have come down to us (Acta Sanctorum, January, ii. 394-397) are those referred to by St Augustine, since it is not certain that they are a contemporary document. According to this account, Vincent w 7 as born of noble parents in Spain, and was educated by Valerius, bishop of Saragossa, who ordained him to the diaconate. Under the persecution of Diocletian, Vincent was arrested and taken to Valencia. Having stood firm in his profession before Dacianus,

the governor, he was subjected to excruciating tortures and thrown into prison, where angels visited him, lighting his dungeon with celestial light and relieving his sufferings. His warders, having seer, these wonders through the chinks of the wall, forthwith became Christians. He was afterwards brought out and laid upon a soft mattress in order that he might regain sufficient strength for new torments; but, while Dacianus was meditating punishment, the saint gently breathed his last. The tyrant exposed his body to wild beasts, but a raven miraculously descended and protected it. It was then thrown into the sea, but was cast up on the shore, recovered by a pious woman and buried outside Valencia. Prudentius devoted one of his hymns {Peristeph. v.) to St Vincent, and St Augustine attests that in his lifetime the festival of the saint was celebrated throughout the Christian world (Serm. 276, n. 4).

See T. Ruinart, Ada marlyrum sincera (Amsterdam, 1713), pp. 364-66; Le Nam de Tillemont, M£moires pour servir & I'histoire ecclesiastigue (Paris, 1701, seq-), v. 215-225, 673-675. (H. De.)

VINCENT OF BEAUVAIS, or Vincentius Bellovacensis (c. 1190-c. 1264), the encyclopaedist of the middle ages, was probably a native of Beauvais. 1 The exact dates of his birth and death are unknown. A tolerably old tradition, preserved by Louis a Valleoleti (c. 1413), gives the latter as 1264 ; 2 but Tholornaeus de Luca, Vincent's younger contemporary (d. 1321), seems to reckon him as living during the pontificate of Gregory X. (1271-76). If we assume 1264 as the year of his death, the immense volume of his works forbids us to think he could have been born much later than 11 90. Very little is known of his career. A plausible conjecture makes him enter the house of the Dominicans at Paris between 1225 and 1220, from which place a second conjecture carries him to the Dominican monastery founded at Beauvais in 1228-29. There is no evidence to show that the Vincent who was sub-prior of this foundation in 1246 is the encyclopaedist; nor indeed is it likely that a man of such abnormally studious habits could have found time to attend to the daily business routine of a monastic establishment. It is certain, however, that he at one time held the post of " reader " at the monastery of Royaumont {Mons Regalis), not far from Paris, on the Oisc, founded by St Louis between 1228 and 1235. St Louis read the books that he compiled, and supplied the funds for procuring copies of such authors as he required for his compilations. Queen Margaret, her son Philip and her son-in-law, Theobald V, of Champagne and Navarre, are also named among those who urged him to the composition of his " little works," especially the De Institutione Principum. Though Vincent may well have been summoned to Royaumont even before 1240, there is no actual proof that he lived there before the return of Louis IX. and his wife from the Holy Land, early in the summer of 1254. But it is evident that he must have written his work De Erwdilione

Filiorum Regalnim (where he styles himself as " Vincentius Belvacensis, deordinepraedicatorum, qualiscumque lector in monasterio de Regali Monte ") after this date and yet before January 1260, the approximate date of his Tractatus ConsoiatoHus, When he wrote the latter work he must have left Royaumont, as he speaks of returning from the funeral of Prince Louis (15th January 1260) "ad nostram domum," a phrase which can hardly be explained otherwise than as referring to his own Dominican house, whether at Beauvais or elsewhere.

The Speculum Majus, the great compendium of all the knowledge of the middle ages, as it left the pen of Vincent, seems to have con- sisted of three parts only, viz. the Speculum Naturale, Doctrinale and Historiale. Such, at least, is £chard's conclusion, derived from an examination of the earliest extant MSS. All the printed editions, however, consist of four parts, the additional one being entitled Speculum Morale. This has been clearly shown to be the production of a later hand, ancl'i? ascribed by £chard to the period between 1310 and 1325. In arrangement and style it is quite different from

1 He is sometimes styled Vincentius Burguiidus; but, according to M. Daunou, this appellation cannot be traced back further than the first half of the 15th century.

s Apparently confirmed by the few enigmatical lines preserved by fichara from his epitaph —

" Pertulit iste necem post annos mille ducentos, Sexaginta decern sex habe, sex mihi retentos."

the other three parts, and indeed it is mainly a compilation from Thomas Aquinas, Stephen de Bourbon, and two or three other contemporary writers.

The Speculum Naturale fills a bulky folio volume of 848 closely printed double-columned pages. It is divided into thirty-two books and 3718 chapters. Jt is a vast summary of all the natural history known to western Europe towards the middle of the 13th century'. It is, as it were, the great temple of medieval science, whose floor and walls are inlaid with an enormous mosaic of skilfully arranged passages from Latin, Greek, Arabic, and even Hebrew authors. To each quotation, as he borrows it, Vincent prefixes the name of the book and author from whom it is taken, distinguish- ing, however, his own remarks by the word " actor." The Speculum Naturale is so constructed that the various subjects are dealt with according to the order of their creation ; it is in fact a gigantic commentary on Genesis i. Thus book i. opens with an account of the Trinity and its

relation to creation; then follows a similar series of chapters about angels, their attributes, powers, orders, &c, down to such minute points as their methods of communicating thought, on which matter the author decides, in his own person, that they have a kind of intelligible speech, and that with angels to think and to speak are not the same process. The whole book, in fact, deals with such things as were with God " in the beginning." Book ii. treats of our own world, of light, colour, the four elements, Lucifer and his fallen angels, thus corresponding in the main with the sensible world and the work of the first day. Books iii. and iv. deal with the phenomena of the heavens and of time, which is measured by the motions of the heavenly bodies, with the sky and all its wonders, fire, rain, thunder, dew, winds, &c. Books v.xiv. treat of the sea and the dry land: they discourse of the seas, the ocean and the great rivers, agricultural operations, metals, precious stones, plants, nerbs, with their seeds, grains and juices, trees wild and cultivated, their fruits and their saps. Under each species, where possible, Vincent gives a chapter on its use in medicine, and he adopts for the most part an alphabetical arrangement In book vi. c. 7 he incidentally discusses what would become of a stone if it were dropped down a hole, pierced right through the earth, and, curiously enough, decides that it would stay in the centre. Book xv. deals with astronomy — the moon, stars, and the zodiac, the sun, the planets, the seasons and the calendar. Books xvi. and xvii. treat of fowls and fishes, mainly in alphabetical order and with reference to their medical qualities. Books xviii.-ˆxxii. deal in a similar way with domesticated and wild animals, including the dog, serpents, bees and insects; they also include a general treatise on animal physiology spread over books xxi.-xxn. Books xxiii.-xxviii. discuss the psychology, physiology and anatomy of man, the five senses and their organs, sleep, dreams, ecstasy, memory, reason, &c. The remaining four books seem more or less supplementary ; the last (xxxii.) is a summary of geography and history down to the year 1250, when the book seems to have been given to the world, perhaps along with the Speculum Historiale and possibly an earlier form of the Speculum Doctrinale.

The Speculum Doctrinale, in seventeen books and 2374 chapters, is a summary of all the scholastic knowledge of the age and does not confine itself to natural history. It is intended to be . a practical manual for the student and the official alike; and, to fulfil this object, it treats of the mechanic arts of life as well as the subtleties of the scholar, the duties of the prince and the tactics of the general. The first book, after defining philosophy, &c, gives a long Latin vocabulary of some 6000 or 7000 words. Grammar, logic, rhetoric and poetry are discussed in books ii. and Hi., the latter including several well-known fables, such as the Hon and the mouse. Book iv. treats of the virtues, each of which has two chapters of quotations allotted to it, one in prose and the other in verse. Book v. is of a

somewhat similar nature. With book vi. we enter on. the practical part of the work; it deals with the ars oeconomica, and gives directions for building, gardening, sowing, reaping, rearing cattle and tending vineyards; it includes also a kind of agricul- tural almanac for each month in the year. Books vii.-ix. have reference to the ars potztica; they contain rules for the education of a prince and a summary of the forms, terms and statutes of canonical, civil and criminal law. Book xi. is devoted to the artes mechanicae, viz. those of weavers, smiths, armourers, merchants, hunters, and even the general and the sailor. Books xii.xiv. deal with medicine both in practice and in theory: they contain practical rules for the preservation of health according to the four seasons of the year, and treat of various diseases from fever to gout. Book xv. deals with, physics and may be regarded as a summary of the Speculum Naturale. Book xvi. is given up to mathematics, under which head are included music, geometry, astronomy, astrology, weights and measures, and metaphysics. It is noteworthy that in this book Vincent shows a knowledge of the Arabic numerals, though he does not call them by this name. With him the unit is termed "digitus"; when multiplied by ten it becomes the "articulus"; while the combination of the articulus and the digitus is the " numerus compositus." In this chapter (xvi. 9), which is super scribed " actor," he clearly explains liow the value of a number increases tenfold with every place it is moved to the left. He i$ even acquainted with the later invention of the " cifra " or cipher

The last book (xvii.) treats of theology or (as we should now say) mythology, and winds up with an account of the Holy Scriptures and of the Fathers, from Ignatius and Dionysius the Afeopagite to Jerome and Gregory the Great, and even of later writers from Isidore and Bede, through Alcuin, Lanfranc and Anselm, down to Bernard of Clairvaux and the brethren of St Victor.

As the fifteenth book of the Speculum Doctrinale is a summary of the Speculum Naturale, so the Speculum Historiale may be regarded as the expansion of the last book of the same work. It consists of thirty-one books divided into 3793 chapters. The first book opens with the mysteries ol God and the angels, and then passes on to the works of the six days and the creation of man. It includes disserta- tions on the various vices and virtues, the different arts and sciences, and carries clown the history of the world to the sojourn in Egypt. The next eleven books (ii.xii.) conduct us through sacred and secular history down to the triumph of Christianity under Constantine. The story of Barlaam and Josaphat occupies a great part of book xv.; and book xvi. gives an account of Daniel's nine kingdoms, in which account Vincent differs from his professed authority, Sigebert of Gemhloux, by reckoning England as the fourth instead of the fifth. In the

chapters devoted to the origines of Britain he relies on the Brutus legend, but cannot carry his catalogue of British or English kings further than 735, where he honestly con fesses that his authorities fail him. Seven more books bring us to the rise of Mahomet (xxiii.) and the days of Charlemagne (xxiv.). Vincent's Charlemagne is a curious medley of the great emperor of history and the champion of romance. He is at once the gigantic eater of Turpin, the huge warrior eight feet high, who could lift the armed knight standing on his open hand to a level with his head, the crusading conqueror of Jerusalem in days before the crusades, and yet with all this the temperate drinker and admirer of St Augustine, as his character had filtered down through various channels from the historical pages of Einhard. Book xxv. includes the first crusade, and in the course of book xxix., which contains an account of the Tatars, the author enters on what is almost contemporary history, winding up in book xxxi. with a short narrative of the crusade of St Louis in 1250. One remarkable feature of the Speculum Historiale is Vincent's constant habit of devoting several chapters to selections from the writings of each great author, whether secular or profane, as he mentions him in the course of his work. The extracts from Cicero and Ovid, Origen and St John, Chrysostorh, Augustine and Jerome are but specimens of a useful custom which reaches its culminating point in book xxviii., which is devoted entirely to the writings of St Bernard. One main fault of the Speculum Historiale is the unduly large space devoted to miracles. Four of the^ medieval historians from whom he quotes most frequently are Sigebert of Gembloux, Hugh of Fleury, Helinand of Froidmont, and William of Malmesbury, whom he uses for Continental as well as for English history.

Vincent has thus hardly any claim to be reckoned as an original writer. But it is difficult to speak too highly of his immense in- dustry in collecting, classifying and arranging these three huge volumes of 80 books and 9885 chapters. The undertaking to com- bine all human knowledge into a single w r hole was in itself a colossal one and could only have been born in a mind of no mean order. Indeed more than six centuries passed before the idea was again resuscitated; and even then it required a group of brilliant French- men to do what the old Dominican had carried out unaided.. The number of writers quoted by Vincent is almost incredible: in the Speculum Naturale alone no less than 350 distinct works arc cited, and to these must be added at least 100 more for the other two Specula. His reading ranges from Arabian philosophers and naturalists to Aristotle, Eusebius, Cicero, Seneca, Julius Caesar (whom he calls Julius Celsus), and even the Jew, Peter Alphonso. But Hebrew, Arabic and Greek he seems to have known solely through one or other of the popular Latin versions. He admits that his quotations are not always exact, but asserts that this was the fault of careless copyists.

A list of Vincent's works, both MS. and printed, will be found in the Histoire litlcraire de France, vol. xviii., and in Jacques Echard's Scriptores cdinis pracdicatorum (1 7 19-2 1) . The Tractatus consolalorius pro morle amid and the Liber de eruditions filiofum regalium (dedi- cated to Queen Margaret) were printed at Basel in December 1480. The Liber de Institutione Principum, a treatise on the duties of kings and their functionaries, has never yet been printed, and the only MS. copy the writer of this article has been able to consult does not contain in its prologue all the information which Echard seems to imply is to be found there. The so-called first edition of the Speculum Afajus, including the Speculum Morale, ascribed to Johann Menteiin and long celebrated as the earliest work printed at Strassburg, has lately been challenged as being only an earlier edition of Vincent's three genuine Specula (c. '1468-70"), with which has been bound up the Speculum Morale first printed by Menteiin (c. 1473-76). The edition most frequently quoted is that by the Jesuits (4 vols., Douai, 1624).

See J. B. Bourgeat, fitudes sur Vincent de Beauvais, tkeologien, pkilosophe, encyclopHiste (Paris, 1856); E. Boutaric, Examen des sources du Speculum historiale de Vincent de Beauvais (Paris, 1863), and in tome xvii. of the Revue des questions historiques (Paris, 1875);

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W. Wattenbach, Deutschlands GesckicMsquellen. vol. ii. 118-14 1 B. Haureau, Notices . . . de MSS. latins de la BiUiotheque Nationals, tome v. (1892) ; and E. Male, L'arlrel-igieuxdu XIII' siede en France.

(T. A. A.)

VINCENT, GEORGE (1796-1831?), English landscape and marine painter, was born at Norwich in June 1796. lie studied art under " Old " Crome, and at the age of fifteen began to contribute to the Norwich exhibition. From 1814 till 1823 he exhibited occasionally at the Royal Academy, and also in the Water-Colour Exhibition and the British Institution. In iSrg he removed from Norwich to London, and he was a contributor to the Suffolk Street gallery from its foundation in 1824 till 1830. He possessed great artistic abilities; but he fell into dissipation, and his works became slight and hastily executed. Finally he dropped out of sight, and he is believed to have died about 1831. His most important work, a " View of Greenwich Hospital," wasshowninthelntemationalExhibitionof 1862. His" London from the Surrey Side ot Waterloo Bridge " is also a fine work.

VINCENT, MARY ANN (1818-1887), American actress, was born in Portsmouth, England, on the 18th of September 1S18, the daughter of an

Irishman named Farlin. Left an orphan at an early age, she turned to the stage, making her first appearance in 1834 as Lucy in The Review, at Cowes, Isle of Wight. The next year she married J. R. Vincent (d. 1850), an actor, with whom she toured England and Ireland for several years. In 1846 Mrs J. R. Vincent went to America to join the stock company of the old National theatre in Boston. Here she became a great favourite. No actress in America, except Mrs Gilbert, has ever been such " a dear old lady " to so wide a circle of constant admirers. She died in Boston on the 4th of September 1887. Her memory is honoured by the Vincent Memorial Hospital, founded in that city in 1890 by popular subscription, and formally opened on the 6th of April 1891, by Bishop Phillips Brooks, as a hospital for wage- earning women and girls.

VINCENT DE PAUL, ST (1576-1660), French divine, founder of the " Congregation of Friests of the Mission," usually known as Lazarites (?.».), was born on the 24th of April r.576 at Touy, near Dax, in Gascogne, and was educated by the Franciscans at Dax and at Toulouse. He was ordained priest in 1600. Voyaging from Toulouse to Narbonne, he was captured by Barbary pirates, who took him to Tunis and sold him as a slave. He converted his third master, a renegade Italian, and escaped with him to Aigucs-Mortes near Marseilles in June 1607. After short stays at Avignon and Rome, Vincent found his way to Paris, where he became favourably known to Monsieur (after- wards Cardinal) de Berulle, who was then founding the con- gregation of the French Oratory. At Berulle's instance he became curate of Clichy near Paris (161 1); but this charge he soon exchanged for the post of tutor to the count of Joigny at Folleville, in the diocese of Amiens, where his success in dealing with the spiritual needs of the peasants led to the " missions " with which his name is associated. In 1617 he accepted the curacy of Chatillon-les-Dombes (or sur-Chala- ronne), and here he received from the countess of Joigny the means by which he was enabled to found his first " confr£rie de charite," an association of women who ministered to the poor and the sick. In 1619 Louis XIII. made him royal almoner of the galleys. Among the works of benevolence with which his name is associated are the establishment of a hospital for galley slaves at Marseilles, the institution of two establishments for foundlings at Paris, and the organization of the " Filles de la Charite," to supplement the work of the confrlries, whose members were mainly married women with domestic duties. He died at Paris on the 27th of September 1660, and was buried in the church of St Lazare. He was beatified by Benedict XIII. in 1729, and canonized by Clement XII. in 1737, his festival (duplex) being observed on the 19th of July. The Society of St Vincent de Paul was founded by Frederic Ozananr and others in 1833, in reply to a charge brought by some free-thinking contemporaries that the church no longer had the strength to inaugurate a practical

enterprise. In a. variety of ways it does a great deal of social service similai

to that of gilds of help. Its administration has always been in the hands of laymen, and it works through local " conferences " or branches, the general council having been suspended because it declined to accept a cardinal as its official head.

Lives by Maynard (4 vols., Paris, i860); Bougaud (2 vols., Paris, 1891); E. de Broglie (5th edition, Paris, 1899); Letters (2 vols., Paris, 1882); A. Loth (Paris, 1880); H. Simard (Lyons, 1894).

VINCENT OF LERINS, ST, or Vincentis Lerinensis (d. c. a.d. 450), an ecclesiastical writer of the Western Church of whose personal history hardly anything is known, except that he was a native of Gaul, possibly brother of St Loup, bishop of Troyes, that he became a monk and priest at Lerinum, and that he died in or about 450. Lerinum (Lerins, off Cannes) had been made by Honoratus, afterwards bishop of Aries, the seat of a monastic community which produced a number of eminent churchmen, among them Hilary of Aries. The school did not produce an extensive literature, but it played an important part in resisting an exaggerated Augustinianism by reasserting the freedom of the will and the continued exist- ence of the divine image in human nature after the fall. As regards Vincent he himself tells us that only after long and sad experience of worldly turmoil did he betake himself to the haven of a religious life. In 434, three years after the council of Ephesus, he wrote the Cornmonitorium adversus prof anas omnium haerelicorum novilates, in which he ultimately aims at Augustine's doctrine of grace and predestination. In it he discusses the " notes " which distinguish Catholic truth from heresy, and (cap. 2) lays down and applies the famous threefold test of orthodoxy — quod ubique, quod semper, quod ab omnibus creditum est. It is very striking that in his appeal to tradition Vincent assigns no part to the bishops as such — apart from the council; he appeals to the ancient " teachers," not to any apostolic succession. His " semi-Pelagian " opposition to Augustine is dealt with by Prosper of Aquitania in his Pro Auguslini doclrina responsiones ad capitula objectionum Vin- cenliarnarium. It explains why the Commonitorium has reached us only in a mutilated form.

The Commonitorium has been edited by Baluze (Paris, 1663, 1669 and 1684) and by Kliipfe! (Vienna, 1809). It also occurs in vol. f. of Migne's Patrol. Ser. Lot. (1846). A full summary is given in A. Harnack's History of Ddgnta, iii. 230 ff. See also F. H. Stanton, Place of Authority in

Religion, pp. 1 67 ff. ; A. Cooper-Marsdin, The School of Lerins (Rochester, 1905).

VINCENT FERRER, ST (1355-1419), Spanish Dominican preacher, was born of respectable parentage at Valencia on the 23rd of January 1355. In February 1374 he took the Domini- can habit, and after spending some years in teaching, and in completing his theological studies, he was licensed to preach. He graduated as doctor of theology at Lerida in 1374, and his sermons in the cathedral of Valencia from 1385 onwards soon became famous. Cardinal Peter de Luna took him with him to Paris in 1391; and on his own election to the pontificate as antipope Benedict XIII. made Ferrer his confessor and master of the sacred palace. Finding, however, the ecclesiastical atmosphere of Avignon an uncongenial one, he in 1397 resumed his work as a preacher, and Spain, France, Italy, Germany and Great Britain and Ireland were successively visited by him; and in every case numerous conversions were the result pf his eloquence, which is described as having been singularly power- ful and moving. In 1412 he was delegated by his native city to take part in the election of a successor to the vacant crown of Aragon; and in 1416 he received a special invitation to attend the council of Constance, where he supported the cause of the Flagellants (q.v.). He died at Vannes on the 5th of April 1419, and was canonized by Calixtus III. in 1455, his festival (duplex) being observed on the 5th of April.

See A. Sorbelli, II irattalo di S. Vincenzo Ferrer intorno al Grande Scisma d' Occidente (Bologna, 1906).

VINCI, LEONARDO (1690-1730), Italian musical composer, was bom at Strongoli in Calabria in 1690 and educated at Naples under Gaetano Greco in the Conservatorio dei Poveri di Gesu Cristo. He became kneˆwn first by his comic operas in

Neapolitan dialect in 171 9; he also composed many serious operas. He was received into the Congregation of the Rosary at Formiello in 1728 and died by poisoning in 1730, not 1732, as is generally stated. His comic operas, of which he Zite '« Galera (1722) is the best, are full of life and spirit; in his serious operas, of which Didone Abbandonata (Rome, 172S) and Artaserse (Rome, 1730) are the most notable, have an incisive vigour and directness of dramatic expression deservedly praised by Burney. The well-known air " Vo solcando," from Artaserse, is a good example of his style.

VINDELICIA, in ancient geography, a country bounded on the S. by Raetia, on the N. by the Danube and the Vallum Hadriani, on the E. by the Oenus (Inn), on the W. by the territory of the Helvetii. It thus corresponded to the

N.E. portion of Switzerland, the S.E. of Baden, and the S. of Wiirt- temberg and Bavaria. Together 'with the neighbouring tribes it was subjugated by Tiberius in 15 B.C., and towards the end of the 1st century a.d. was made part of Raetia {q.v.). Its chief town was Augusta Vindelicorum (Augsburg). Its in- habitants were probably of Celtic origin (cf. the recurrence of Vind- in other Celtic names — Vindobona, Vindonissa); some authorities, however, regard them as German. According to Dio Cassius (liv. 22) they were an agricultural people, and later writers (e.g. Isidorus, Origines, i. 4), describe the country as very fertile.

VINDHYA, a range of mountains in Central India. It forms a well-marked, though not quite continuous, chain across India, separating the Ganges basin from the Deccan. Starting on the west in Gujarat, the Vindhyas cross Malwa and the central portions of India, until their easternmost spurs abut on the valley of the Ganges at Rajmahal. They thus roughly form the northern side of the triangle, of which the other two sides are the Eastern and Western Ghats. They have an elevation of 1500 to 4500 ft., nowhere exceeding 5000 ft. Geo- logically they give their name to the " Vindhyan formation," one of the recognized rock systems of India. In legendary tradition they formed the demarcating line between the Madya- desha or middle land of the Sanskrit invaders and the non- Aryan Deccan, and they are still largely inhabited by aboriginal races such as the Bhils.

VINE. The grape-vine, botanically Vitis, is a genus of about thirty species, widespread in the north temperate zone, but richest in species in North America. The best known and longest cultivated species is the old-world grape-vine, Vitis vinifera; a variety of this, silvestris, occurs wild in the Medi- terranean region, spreading eastwards towards the Caucasus and northwards into southern Germany, and may be regarded as the parent of the cultivated vine. It is of interest to note that grape-stones have been found with mummies in Egyptian tombs of not later age than 3000 years. The seeds have the characteristics of those of V. vinifera, but show some very slight variations from the type of seed now prevalent. Among the Greeks in the time of Homer wine was in general use. The cultivation of the vine must also have been introduced into Italy at a very early period. In Virgil's time the varieties in cultivation seem to have been exceedingly numerous; and the varied methods of training and culture now in use in Italy are in many cases identical with those described by Columella and other Roman writers. Grape-stones have been found among the remains of Swiss and Italian lake dwellings of the Bronze period, and others in tufaceous volcanic deposits near Montpellier, not long before the historic era.

The old-world species is also extensively cultivated in California, but the grape industry of the eastern United States has been developed from native

species, chiefly V. Labriisca and V. aestivalis and their hybrids with V. vinifera. Some of the American varieties have been introduced into France and other countries infested with Phylloxera, to serve as stocks on which to graft the better kinds of European vines, because their roots, though perhaps equally subject to the attacks of the insects, do not suffer so much injury from them as the European species.

VINE

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The vine requires a high summer temperature and a pro- longed period in which to ripen its fruit. Where these are forthcoming, it can be profitably cultivated, even though the winter temperature be very low. Tchihatchef mentions that at Erivan in Russian Armenia the mean winter temperature is 7°-i C. and falls in January to -30 C, and at Bokhara the mean temperature of January is 4 C. and the minimum 22 C, and yet at both places the vine is grown with success. In the Alps it is profitably cultivated up to an altitude of 1870 ft., and in the north of Piedmont as high as 3180 ft. At the present time the limit of profitable cultivation in Europe passes from Brittany, lat. 47 30', to beyond the Rhine by Liege and through Thuringia to Silesia in lat. 51 55'. In former centuries vines were cultivated to the north of this region, as, for instance, in Holland, in Belgium largely, and in England, where they might still be grown. Indeed, experiments have been made in this direction near Cardiff in South Wales. The yield is satisfactory, and the wine made, the variety known as Gamay noir, is described as being like still champagne. In the middle ages, owing to various causes, the better wines of France and Germany could not be obtained in England except at prohibitive prices; but when this state of things ceased, and foreign wine could be imported, the English con sumers would no longer tolerate the inferior productions of their own vineyards. It is also probable that the English mixed sugar or honey with the wine and thus supplied artificially that sweetness which the English sun denied. It is a curious fact that at the present day much or even most of the wine of finest quality is made at or near to the northern limits of possible cultivation with profit. This circumstance is probably explained by the greater care and attention bestowed both on the cultivation of the vine and on the manufacture of the wine in northern countries than in those where the climate is more propitious. The relative inferiority of the wines made at the Cape of Good Hope and in Australia is partly due to variations of climate, the vine not yet having adapted itself to the new conditions, and partly to the deficient skill of the manufacturers. That such inferiority may be expected to disappear is suggested by the success of vine-culture in Madeira and the Canary Islands.

The development of other species of Vitis, such as the curious .succulent species of the Soudan and other parts of equatorial Africa, or the numerous kinds in India and Cochin China, is of course possible under suitable conditions; but it is obvious that an extremely long period must elapse before they can successfully compete with the product of many centuries.

[Sec also generally the article Wine. For currants and raisins, both produced by varieties of the grape-vine, see the respective articles.]

Apart from their economic value, vines are often cultivated for purely ornamental purposes, owing to the elegance of their foliage, the rich coloration they assume, the shade they afford, and their hardihood.

Vines have woody climbing stems, with alternate, entire or palmately lobed leaves, provided at the base with small stipules. Opposite some of these leaves springs a tendril, by aid of which the plant climbs. There are numerous transitional states between the ordinary form of tendril and the inflorescence. The flowers are small, green and fragrant, and are arranged in dense clusters. Each has a small calyx in the form of a shallow rim, sometimes five-lobed or toothed; five petals, which cohere by their~tips and form a cap or hood, which is pushed off when the stamens are ripe; and five free stamens, placed opposite the petals and springing from a fleshy ring or disk surrounding the ovary; each bears a two- celled anther. The anomalous position of the stamens in front of the petals is explained by the abortion or non-development of an outer row of stamens, indications of which are sometimes seen on the hypogynous disk encircling the ovary. The ovary bears a sessile stigma and is more or less completely two-celled, with two erect ovules in each cell. This ripens into the berry and seed. The cultivated vine has usually hermaphrodite flowers; but as it occurs in a wild state, or as an escape from cultivation, the flowers manifest a tendency towards unisexuality : – that is, one plant bears flowers with stamens only, or only the rudiments of the pistil, while on another plant the flowera are bisexual. Exclusively female flowers without stamens do not appear

to have been observed. Seedling plants from the cultivated vines often produce unisexual flowers, thus reverting to the ferai type. Perhaps the explanation of the fact that some of the cultivated varieties are, as gardeners say, " bad setters," — i.e. do not ripei? uheir fruit owing to imperfect fertilization, — is to be sought in this natural tendency to dioecism.

Ftc 1. — Vine.

1. Foliage, tendril and inflorescence, reduced.

2. Flower after fall of petals, magnified.

3. Fruit, reduced.

The conformation of the vine stem has elicited ,a vast amount of explanatory comment. The most generally accepted explanation is the " sympodial " one. According to this, the shoot of the vine is a " sympodium," consisting of a number of " podia " placed one over the other in longitudinal series. Each podium consists of a portion of the stem bearing one or more leaves, each with an axillary bud or buds, and terminating in a tendril or an inflorescence. In V. Lab- rusca there is a tendril opposite to each leaf, so that the podium bears only a single leaf. In other species there is a definite arrange- ment of the leaves, some with and others without tendrils opposite to them, the numerical order remaining constant or nearly so. These arrangements have doubtless some reference to climatic phenomena, continuity of growth being arrested by cold and pro- moted by warmth. In any case, it is obvious that these facts might be turned to practical ends in cultivation. A vine, for instance, that produces bunches of grapes at each joint is preferable to one in which there are several barren joints, as a larger quantity can be grown within a smaller area. The practice of pruning or " stopping " is, consciously or unconsciously, regulated by the mode of growth. The tendril or inflorescence, according to the views above explained, though in reality terminal, is bent to one side; hence it appears to be lateral and opposite to the leaf. While the tendril is thus diverted from its original direct course, the axillary bud of the leaf opposite the tendril begins a new. podium, by lengthening into a shoot which assumes the direction the tendril had prior to its deflexion. This new podium, now in a direct line with its predecessor, produces leaves and ends in its turn in a tendril or inflorescence. A third podium succeeds the second, and so on. Other authorities explain the formation of the tendril and its anomalous position opposite to a leaf by supposing that the end of the stem bifurcates during growth, one division forming the shoot, the other the tendril or inflorescence. It is not possible within the limits at our command to specify the facts and arguments by which these theories are respectively supported. Practically the tendrils assist the plant in its native state to scramble over rocks or trees. As in the case of similar formations generally, they are endowed with a sensitiveness to touch which enables them to grasp and coil themselves round any suitable object which comes in their way, and thus to support the plant. The seeds or grape-stones are somewhat club-shaped, with a narrow neck-like portion beneath, which expands into a rounded and thickened portion above. On the inner or central side of the seed is a ridge bounded on either side by a shallow groove. This ridge indicates the point of union of the ' raphe " or seed-stalk with the seed; it serves to distinguish the varieties of V. vinifera from those of other species. In endeavouring to trace the filiation and affinities of the vine, the

*characters afforded bv the seed are specially valuable, because they have not been wittingly interfered with by human agency. Characters derived I from the size, colour or flavour of the berry are of less value fe**

historical or genealogical purposes than those which are the outcome of purely natural conditions.

The vine is hardy in Britain so far as regards its vegetation, but not hardy enough to bring its fruit to satisfactory maturity, so that for all practical purposes the vine must be regarded as a tender fruit. Planted against a wall or a building having a south aspect, or trained over a sunny roof, such sorts as the Black Cluster, Black Prince, Pitmaston White Cluster, Royal Muscadine, Sweetwater, &c., will ripen in the warmest English summers so as to be very pleasant eating; but in cold summers the fruit is not eatable in the raw state, and can only be converted into wine or vinegar. For outdoor culture the long-rod system is generally preferred.

When the plant is grown under, glass, the vine border should occupy the interior of the house and also extend outwards in the front, but it is best made by instalments of 5 or 6 ft. as fast as the previous portions become well filled with roots, which may readily be done by packing up a turf wall at the extremity of the portion to be newly made; an exterior width of 15 ft. will be sufficient. If the soil beyond this is very unfavourable, the roots should be prevented from entering it by building a wall at the extreme edge of the border. Inside borders require frequent and thorough waterings. In well-drained localities the border may be partially below the ground level, but in damp situations it should be made on the surface; in either case the firm solid bottom should slope outwards towards an efficient drain. A good bottom may be formed by chalk rammed down close. On this should be laid at least a foot thick of coarse, hard, rubbly material, a layer of rough turf, grass side downwards, being spread over it to prevent the compost from working down. The soil itself, which should be 2i or 3 ft. deep, never less than 2 ft., should consist of five parts rich turfy loam, one part old lime rubbish or broken bricks, including a little wood ashes or burnt earth (ballast), one part broken charcoal, and about one part of half-inch bones, the whole being thoroughly mixed and kept dryish till used. It is well after the borders are completed to remove the top soil, in which no roots are to be found, every two or three years, and to replace it with a mixture of good loam, rotten manure, lime rubbish and bone meal, to the depth of 6 or 7 in. A mulch of half-decayed stable litter is useful to prevent loss of moisture in summer.

Young vines raised from eyes, i.e. buds having about \ in. wood above and I in. below, are generally preferred for planting. The eyes being selected from well-ripened shoots of the previous year are planted about the end cf January, singly, in small pots of light loamy compost, and after standing in a warm place for a few days should be plunged in a propagating bed, having a bottom heat of 75°, which should be increased to 85 when they have produced several leaves, the atmosphere being kept at about the same temperature or higher by sun heat during the day, and at about 75° at night. As soon as roots are freely formed the plants must be shifted into 6-inch pots, and later on into 12-inch ones. The shoots are trained up near the glass, and, with plenty of heat (top and bottom) and of water, with air and light, and manure water occasionally, will form firm, strong, well-ripened canes in the course of the season. To pre- pare the vine for planting, it should be cut back to within 2 ft. of the pot early m the season, and only three or four of the eyes at the base should be allowed to grow on. The best time for planting is m spring, when the young shoots have just started The vines should be planted inside the house, from I to 2 ft from the front wall, and from 6 ft. to 8 ft. apart, the roots being placed an inch deeper in the soil than before, carefully disentangled and spread outwards from the stem, and covered carefully and firmly with friable loam, without manure. When the shoots are fairly developed, the two strongest are to be selected and trained in. When forcing is commenced, the vinery is shut up for two or three weeks without fire heat, the mean temperature ranging about 50 . Fire heat must be at first applied very gently, and may range about 55 at night, and from 65 to 70° by day, but a few degrees more may be given them as the buds break and the new shoots appear. When they are in flower, and onwards during the swelling of the berries, 85° may be taken as a maximum, running up to 90 with sun heat and the temperature may be lowered somewhat when the fruit is npe. The temperature must, however, be regu- lated according to the variety, Muscats requiring a higher tempera- ture from the time their bunches show than Hamburghs.- As much ventilation as the state of the weather will permit should be given A moist growing atmosphere is necessary both for the swelling fruit and for maintaining the health of the foliage. A due amount of moisture may be kept up by the use of evaporating troughs and by syringing the walls and pathways two or three times a day but the leaves should not be syringed. When the vines are in flower and when the fruit is colouring, the evaporating troughs should be kept dry, but the aridity must not be excessive, lest the red spider and other pests should attack the leaves. In the course ol the season the borders (inside) will require several thorough soakings of warm water— the first when the house is shut up this being repeated when the vines have made young shoots a few inches long, again when the vines are in flower, and still again when the berries are taking the second swelling after stoning. Outside borders require watering in very dry

summer weather only

1 here are three principal systems of pruning vines, termed the

long-rod, the short-rod and the spur systems, and good crops have been obtained by each of them. It is admitted that larger bunches are generally obtained by the long-rod than by the spur system. 1 he principle of this mode of priming is to train in at considerable length, according to their strength, shoots of the last year's growth for producing shoots tu bear fruit in the present; these rods are atterwards cut away and replaced by young shoots trained up d " nn .6,, tne Preceding summer; and these arc in their turn cut out in the following autumn after bearing, and replaced by shoots of that summer's growth. By the short-rod system, short instead of long rods are retained; they are dealt with in a similar manner, the spur system has, however, become the most general. In this case the vines are usually planted so that one can tie trained up under each rafter, or up the middle of the sash, the latter method being preferable. The shoots are cut back to buds close to the stem, which should be encouraged to form alternately at equal distances right and left, by removing those buds from the original shoot which are not conveniently placed. The young shoots from these buds are to be gently brought tc a horizontal position, by bending them a little at a time, and tied in, and usuallv opposite about the fourth leaf the rudiments of a bunch will be developed, the leaf directly opposite the bunch must in all cases be preserved, and the young shoot is to be topped at one or two joints beyond the incipient fruit, the latter distance being preferable if. there is plenty of room for the foliage to expand; the lateral shoots, which will push out after the topping, must be again topped above their first or second joints. If the bunches arc too numerous they must be thinned before the flowers expand, and the berries also must be properly thinned out and regulated as soon as they are w-ell set, care being taken, in avoiding overcrowding, that the bunches be not made too thin and loose.

The cultivation of vines in pots is very commonly practised with good results, and pot-vines are very useful to force for the earliest crop. The plants should be raised from eyes, and grown as strong as possible in the way already noted, in rich turfy loam mixed with about one-third of horse dung and a little bone dust.. The tempera- ture should be gradually increased from 6o° to 80°, or 90″ by sun heat, and a bottom heat a few degrees higher must be maintained during their growth. As the roots require more room, the plants should be shifted from 3-inch pots into those of 6, 12 or 15 in. in diameter, in any of which larger sizes they may be fruited in the following season, but, to be successful in this, the young rod pro- duced must be thoroughly matured after it has reached its limit of growth. The periodical thorough cleansing of the vine stems and every part of the houses is of the utmost importance.

The number of varieties of grapes possessing some merit is con- siderable, but a very few of them will be found sufficient to supply all the wants, of the cultivator. For general purposes nothing approaches the Black Hamburgh (including Frankeiuhal) in merit.

Fungoid Diseases. — The. most destructive uirrn of fungoid disease

1. Vine leaf attacked by mildew, Uncinula necator (Erysiphe Tuck-

en), which forms white patches on the upper face, reduced.

2. Grapes similarly attacked.

3. Portion of the mycelium of the fungus bearing spores (conidia).

s, on erect branches,

4. Perithecium or " fruit " of the fungus with its curled append-

ages.

5. Ascus from perithecium containing six spores.

which attacks the vine is caused by a mildew, Uncinula necator (Ery- szphe Tuckeri) (fig. 2). The disease was first noticed in England in

VINE

1845; in 1848 it appeared at Versailles; by 1 85 1 it had spread through ail the wine-producing countries of Europe, being specially virulent in the lands bordering on the Mediterranean; and in the following year it made its appearance in Madeira. Like the Phyllo- xera (q.v. ; also Wine), the mildew is in its origin probably American. The disease is characterized by the appearance of a mycelium forming white or greyish -white patches on the young leaves; this spreads quickly and attacks the older leaves and branches, and ultimately reaches the grapes. At first these are marked only by small brown spots; but the spots spread and fuse together, the skin of the grape is destroyed, and the flesh decays, the seed only remaining apparently untouched. The disease spreads by the mycelium growing over the epidermis of the plant. The hyphae composing the mycelium are provided with haustoria which project into the cells of the

affected part (fig. 3). Some of ft the hyphae which project from the leaf bear spores (conidia), which are constricted off one at a time, and by their means the fungus is distributed (fig. 2, 3). The perithecia are only produced exceptionally in Europe, but this stage of the life-history is common in the United States and causes a widely spread disease among the American vines. The mildew is in its turn attacked by a fungus of the same tribe, Cicinnobohis Cesatii, which lives parasitically within the hyphae of its host, and at times even succeeds in de- stroying it. The means which have proved most efficacious, both as a remedy and a pre- ventive of this disease, is to scatter flowers of sulphur over "Wthe vines, before the morning dew has evaporated. An- other method is to boil one Fig. 3.— Uncinula necatot (Erysiphe Pf rt 01 June with three parts Tuckeri). A and B, mycelium (m), °[sulphur, and to sprinkle with haustoria (ft). (After de Bary.) the fixture over the affected In A several cells of the epidermis P la " ts –

are indicated. Another fungus which at-

tacks vines, especially those or America, is Plasmopara viticola, which has also been introduced from America to Europe. The mycelium spreads through the green parts of the plant, attacking the leaves, twigs and unripe grapes. On the upper side of the leaf, where it is first visible, it forms pale green irregular spots, which become darker in colour. On the under side of the leaf these patches are white and are composed of the spore-bearing hyphae. The leaf ultimately becomes dried up and brittle. The grapes which are attacked cease to grow, turn brown or white, and ulti- mately dry up and fall off. This disease has been successfully treated with a spray of copper sulphate and lime, or sulphate of iron; solutions of these salts

prevent the conidia from germinating. Anthracnose is the name usually given to a disease which was formerly known as " charbon," " pech " or " brenner." This disease is caused by the parasitism of Sphaceloma ampelinum, one of the Pyrenomycetous fungi (fig. 4). The fungus assails all the green parts of the vine, and injures the leaves and young shoots as much as it does the grape itself. The first sign of its presence is the appearance of a minute spot, which is greyish in the centre, with a brown border. This spot increases in size; in the stalks it assumes an oval shape, with its long axis parallel to the stalk, whilst in the leaves and grapes it is more or less circular in outline. The centre of the spots on the grapes becomes darker as the disease advances, and a red line appears dividing the dark brown border into an outer and an inner rim and giving a very characteristic appearance to the diseased plant. The surrounding tisane enlarges, so that the spots appear as if sunk in depressions, and hear a considerable resemblance to hailstone wounds. Later the spofi on the leaves often drop out. The berries do not shrivel up as those do that are affected by the black rot. The mycelium of Sphace- loma grows just beneath the cuticle of the vine, through which it soon bursts, giving rise to a number of minute hyphae, which bear conidia. These are minute, oval, colourless spores, which serve to spread the disease over the. vineyard and from place to place. The com- plete life-history of this form is at present unknown; and informa- tion as to where the fungus passes the winter, and in what form, would probably afford some useful indications as to the method that should be adopted to combat the disease. Anthracnose has been known in Europe for many years, but has only been observed in America since 1881, whither it was probably imported from the old world. As a preventive to its attacks the copper sulphate sprays and a solution (50%) of iron sulphate have been found very useful, as well as care in planting on well-drained soil that docs not lie

too low, the disease seldom appearing in dry, well-exposed vine- yards. A great deal of confusion still exists with regard to this disease. A similar disease which of late has frequently been found in England, and which is ascribed to the fungus Gloeosporium ampelophagum, is very similar to it. In their mode of attack, in the symptoms they produce, and in the result upon the grapes and the vine the two fungi are so much alike that for practical purposes they may be regarded as identical. Massee recom- mends that the shoots should be dredged with flowers of sulphur at intervals of ten days, while the disease continues to spread, a small quantity of quicklime in a finely powdered con-

Fig. 4. — Charbon or AnthracnoseofVine, caused by Sphace- loma ampelinum.

1. Portion of twig with discoloured patches, caused by the fun- gus.

2. Fruit attacked by thefungus(reduced).

dition being added and every application, not so

Fig. 5. — Black Rot of Grapes, Guignardia Bidweilii.

1. Grapes attacked by the fun- gus; the fruit becomes black, hard and shrivelled.

2. Fructification of the fungus, entire and in section; the latter shows the asci containing as- cospores, much enlarged.

3. Single ascus, more enlarged, showing the eight contained spores.

the quantity of lime being increased at as to exceed the sulphur, however. The iron sulphate solution should be used while the vines are in a dormant condition, and diseased parts should be cleared away and burned.

The black rot, like the Uncinula and Plasmopara, is also American in its origin. It has been known and ob- served there since 1848, but appeared for the first time in France in 1885. The disease is caused by a fungus, Guignardia Bidweilii (fig. 5) (Pkoma uvicola), one of the Fyrenomycetes, and by some authorities it has been considered to be a further stage in the Hfe-history of Sphaceloma ampelinum. The fungus is most conspicuous on the grapes, but the leaves and stemB

Harlig's Lekrbuch der Pjlanzenkrankkeiten, by permission of Julius Springer.

Fig. 6. — Rosellinia (Demaiophora) necatrix.

A. Mycelium of the fungus attacking root of vine (reduced).

B. fortion of vine root, showing masses of fructification (perithecia) of

the fungus (reduced).

are also affected. The grapes are not assailed until nearly full-grown, when a brownish spot appears, which spreads over the

whole grape. The latter for a time retains its plumpness, but on the appearance of little black pustules, which first occur on the part primarily affected, the grape begins to shrivel. This continues until the grape ts

reduced to a black hard mass, with the folds of skin pressed closely against the seed. The disease spreads from grape to. grape, so that as a rule many of the grapes in a bunch are destroyed. The hyphae of the mycelium of this fungus are septate, with numerous short branches. The pustules on the surface are due to fructifications, pycnidia and spermagonia. The fungus passes the winter in the withered grapes which fall to the ground, and on these the mature form of the fungus (fig. 5, 2 and 3) is produced; hence every care should be taken to collect these and burn them. The use of the copper solutions mentioned above may also be recommended as a preventive.

Among the other fungi which infest the vine may be mentioned Phyllostictaviiicola and Ph. Labruscae, which, when theattackisscvere, cause the destruction of the leaves, the only part they assail. These, like the foregoing, are members of the Pyrennmycetes, while many other allied fungi have been described as causing spots on the leaves. Cercospora Vitis (Cladosporium viticolum), which has club-shaped spores of a green-broˆvn colour, also attacks the leaves; but, unless the season is extremely unfavourable, it does little harm.

A ■ very disastrous root-disease of the vine is due to the rav- ages of another pyrenomycetous fungus, Rosellinia (Dem&topkora) necatrix (fig. 6), which forms subterranean strings of mycelium- — so-called rhizomorphs. The diseased roots have been confounded with those attacked by Phylloxera. The only mode of combating the malady seems to be to uproot the plants and burn them. Isola- tion of the diseased areas by means of trenches has also been prac- tised.

VINEGAR, a dilute solution of impure acetic acid, prepared by the acetous fermentation of alcohol or of substances which yield alcohol when suitably decomposed (ordinary vinegar), or obtained from the products resulting on the dry distillation of wood (wood vinegar). Ordinary or table vinegars, which contain, in addition to acetic acid, small quantities of alcohol, higher acids such as tartaric and succinic, various esters, albu- minous substances, &c, are produced solely by acetous fer- mentation, wood vinegar being only employed in certain arts. Ordinary vinegar has been known from the earliest times, and its power of combining with or dissolving mineral substances caused the alchemists to investigate its preparation and properties. They failed, however, to obtain pure acetic acid, although by distillation they prepared more concentrated solu- tions (spiriius Veneris). In 1697 Stahl showed that vinegar could be concentrated by freezing out part of the water, and, better, in 1702, by neutralizing the acid with an alkali and dis- tilling the salt with oil of vitriol. A notable improvement was made in 1789 by Lowitz, who showed that the dilute acid could be concentrated by repeatedly passing it over charcoal powder, and by cooling

he obtained a crystalline substance named in 1777 by Durande, "glacial acetic acid." The presence of an acid substance in the products of the dry distillation of wood was mentioned by Glauber in 1648 and received the name of pyroligneous acid. Its identity with acetic acid was demon- strated by Vauquelin in 1800.

The mechanism of acetous fermentation is described under Fermentation; here we only treat of the actual processes. There are two methods in use: the " quick " process, proposed in 1720 by Boerhaave and introduced by Schutzenbach in 1823 (analogous processes were proposed at about the same time by Wagmann in Germany and by Ham in England), and the older or " slow " process.

In the " quick " process advantage is taken of the fact that the fermentation proceeds more quickly when a large surface of the liquid is exposed to air- Any alcoholic liquid can be treated. The apparatus consists essentially of a vat divided into three portions: the lowest, which is separated from the one above by a grid or false bottom, serves for the collection of the vinegar; the central portion, which is by far the largest, is the chamber wherein the fermentation is effected; and it is separated from the topmost section by a disk perforated with holes about the size of quills through which thin strings lead into the upper part of the central section. The purpose of this disk is to subdivide the liquid placed upon it into drops so as to increase the surface of the liquid. The sides of the vat enclosing the lowest portion are provided with a ring of holes to admit air to the tub; and the vat is enclosed with a tightly fitting lid perforated by ahole through which the liquor to be fermented is admitted and the air drawn upwards from the base escapes. The central chamber is filled with some material of large surface. The commonest are beech-wood shavings, which, before use, must be carefully freed

from all extractives by washing and steaming, then dried, and finally soured by immersion in hot vinegar for twenty-four hours. The fermented wort, prepared in various ways and of varying com- position, or wine, is warmed to about 38 C. and then fed into the upper chamber. Falling on to the shavings, the surface is largely in- creased, and the fermentation which ensues maintains the tempera- ture at about 37 , and draws a current of air upwards through the shavings, which after a time become covered with the so-called mother of vinegar. If the liquid contains only 4% of alcohol, it is completely converted into acetic acid, but stronger liquors require to be passed through the vat three or four times. Some of the alcohol (and consequently some acetic acid) is carried away by the air which escapes to the top of the vat; this is avoided in some factories by leading the air over or into water, whereby the alcohol and aldehyde are recovered. The same is effected in Singer's generators, which are coupled together in tiers.

For making wine-vinegar by the slow process, full-bodied wines about one year old and containing 10% of alcohol (this amount being obtained, when necessary, by blending) are preferred ; and they are clarified by standing with beech shavings upon which the lees deposit. The fermentation is carried out in casks holding from 50 to 100 gallons ; these casks are repeatedly extracted with water in order to prevent any impurity finding its way into the vinegar; also it is found that the casks foul after about six years' use, when it is necessary to remove the deposits of argol, yeast sediments, &c., and re-extract with water, after which they are again fit for use. In conducting the fermentation the cask is one-third filled with boiling strong vinegar and allowed to stand for eight days. Nine pints of the wine are now added every day until the cask is two- thirds full, and the mixture is allowed to stand for fourteen days. After this interval from 10 gallons to half the contents of the cask are drawn off, and more wine added. The working temperature is about 25 . The progress of the operation is shown by the white froth which appears on a spatula after immersion in the liquid; if it be reddish, more wine must be added. In certain parts of France, Holland and of the Rhine district a different procedure is adopted. Two casks, fitted with false bottoms on which are placed vine cuttings, are taken; one cask is completely filled with the wine, whilst the other is only half filled. The acetification proceeds more rapidly in the second cask, and after twenty-four hours half the contents of the first cask are transferred to it, and the process repeated. The product is settled in casks containing birch wood, and after fourteen days it is put upon the market.

In preparing malt vinegar, an infusion of malt is prepared by extracting it with water at 72 , then at a higher temperature and finally at the boiling-point. After cooling the extracts are fer- mented with yeast, and the product kept for some months before acetification. This step can be effected by the quick process as described above, or by the slow process. In the latter the liquid at 25° is transferred to barrels lying on their sides and the fermentation allowed to proceed. When the process is complete the product is filtered through rapes in a fining tun. This is a cask fitted with a false bottom in which are placed spent tanner's wood, shavings, or, better, the pressed stalks and skins of grapes and raisins from wine manufacture. Household vinegar is made in upright casks; after twenty-four hours it is transferred to a similar cask, and the process repeated in a third and fourth cask. Malt vinegar is sold in four strengths designated 18, 20, 22, 24, the last being " proof " vinegar, containing 6% of acetic acid and having a specific gravity of 1-019. These numbers represent the grains of dry pure sodium carbonate, which are neutralized by one fluid ounce of the vinegar.

Several other vinegars are made. Crystal vinegar is ordinary vinegar decolorized by treatment with animal charcoal. Ale vinegar is prepared from strong sour pale ale; it has a tendency to putrefy. Glucose or sugar

vinegar is made by first fermenting amylaceous substances to alcohol, and then acetifying the alcohol. Compound table vinegars are made by digesting ordinary vinegar with condiments such as pepper, garlic, capers, &c. ; whilst aromatic vinegars popularly used in vinaigrettes on account of their refreshing, stimulating pungency are obtained by distilling ordinary vinegar with plants, perfumes and aromatic substances. Medicinal vinegars are prepared either by digestion or distillation of vinegar with various drugs. Vinegar, however, is not now much used in medicine, although occasionally taken, under a false impression, in order to reduce obesity.

Wood vinegar is not used in cooking, as it lacks those substances which render ordinary vinegar palatable. It is largely manu- factured for conversion into pure acetic acid and acetom ; and also for use as an antiseptic and wood preservative. (See Acetic Acid.)

VINELAND, a borough of Cumberland county, New Jersey U.S.A., in the southern part of the state, about 34 m. S. ot Philadelphia and about 115 m. S.W. of New York. Pop. (1890)3822; (1900)4370, including jgoforeign-boru; (1905 state census) 4593; (1910) 5282. Area, r sq. m. It is served by the Central of New Jersey and the West Jersey & Seashore railways, and by electric railway to Miilville and Bridgeton. Vineland is situated at an altitude of 90-118 ft. above the sea. on a

generally level or slightly undulating plain, and has unusually broad, straight and well-shaded streets. The borough main- tains a public library, a public park of 40 acres, artesian water- works, a sewerage system and an electric lighting plant. It is the seat of the New Jersey Training School for Feeble- Minded Girls and Boys (1888), the State Home for the Care and Training of Feeble-Minded Women (1888), and the State Home for Disabled Soldiers, Sailors, Marines and their Wives. The Vineland Historical and Antiquarian Society (organized in 1864) has a library (8000 volumes in 1509) housed in the Society's building, and it maintains a free lecture course. Saloons for the sale of intoxicating liquors have never been allowed in Vineland. The surrounding country is largely de- voted to the growing of small fruits, grapes, peaches, pears and apples, and the raising of sweet potatoes; and within the borough are manufactured unfermented grape juice wine, boots and shoes, clothing, carpets, rugs, chenille curtains, pearl buttons, flint-glass tubes and bottles, and iron castings.

Vineland was founded in 1861 by Charles K. Landis (1835- 1000), who

conceived the idea of creating a settlement in the almost uninhabited " Pines " of Southern New Jersey, and after purchasing a large tract he laid out a village with small farms adjoining. The settlers, largely from New England and the Middle States, received the land at moderate prices on agreeing to make certain stipulated improvements. The township of Landis (pop. in 1910, 643s), named in honour of the founder of the settlement, was incorporated in 1864, having formerly been a part of Millville; from it Vineland was separated and was incorporated as a borough in 1880.

See The Founder's Own Story of the Founding of Vineland (Vineland, 1903), a pamphlet published by the Vinelanu Historical and Antiquarian Society.

VINER, SIR ROBERT (1631-1688), lord mayor of London, was born in Warwick, but migrated in early life to London, where he was apprenticed to his uncle, Sir Thomas Viner (1558- 1665), a goldsmith, who was lord mayor of London in 1653-54, and who was created a baronet in 166 1. Soon Robert became a partner in his kinsman's business, and in 1666 an alderman of the city of London; in 1665 he was made a knight, and in the following year a baronet. He was sheriff during the year of the great fire in London, and was chosen lord mayor in 1674. Combining like his uncle the business of a banker with that of a goldsmith, Viner was brought much into contact with Charles II. and with the court. The king attended his mayoral banquet, and the lord mayor erected an equestrian statue in his honour on a spot now covered by the Mansion House. Having been appointed the king's goldsmith in 1661, Sir Robert was one of those who lent large sums of money for the expenses of the state and the extravagances of the court; over £400,000 was owing to him when the national exchequer suspended payment in 1672, and he was reduced to the necessity of com- pounding with his creditors. He obtained from the state an annuity of £25,000. Viner died at Windsor on the 2nd of September 1688.

See Viner: a Family History, published anonymously (1885).

VINET, ALEXANDRE RODOLPHE (1797-1847), French critic and theologian, of Swiss birth, was born near Lausanne on the 17th of June 1797. He was educated for the Protestant ministry, being ordained in 1819, when already teacher of the French language and literature in the gymnasium at Basel; and during the whole of his life he was as much a critic as a theologian. His literary criticism brought him into contact with Sainte-Beuve, for whom he procured an invitation to lecture at Lausanne, which led to his famous work on Port- Royal. Vinet's Chrestcmathie franqaise (1829), his Eludes sur la lilterature franqaise au XIX"" siicle (1849-51), and his Histoire ie la litlirature franqaise au X VIII"" slide, together with his Eludes sur Pascal, Etudes sur les mcralisles aux XVI"" el

XVII”” siecles, Histoire de la predication parmi les Riformls de France and other kindred works, gave evidence of a wide knowledge of literature, a sober and acute literary judgment and a distinguished faculty of appreciation. He adjusted his

theories to the work under review, and condemned nothing so long as it was good work according to the writer’s own standard. His criticism had the singular advantage of being in some sort foreign, without the disadvantage which attaches in French eyes to all criticism of things French written in a foreign language. As theologian he gave a fresh impulse to Protestant theology, especially in French-speaking lands, but also in England and elsewhere. Lord Acton classed him with Rothe. He built all on conscience, as that wherein man stands in direct per- sonal relation with God as moral sovereign, and the seat of a moral individuality which nothing can rightly infringe. Hence he advocated complete freedom of religious belief, and to this end the formal separation :>f church and state {Memoire en faveur de la liberty des cultes (1826), Essai sur la conscience (1829), Essai sur la manifestation des convictions religieuses (1842). Accordingly, when in 1845 the civil power in the canton of Vaud interfered with the church’s autonomy, he led a secession which took the name of VEglise libre. But already from 1 83 1, when he published his Discours sur quelques sujets religieux (Nomieaux discours, 1841), he had begun to exert a liberalizing and deepening influence on religious thought far beyond his own canton, by bringing traditional doctrine to the test of a living personal experience (see also Frommel, Gaston). In this he resembled F. W. Robertson, as also in the change which he introduced into pulpit style and in the permanence of his influence. Vinet died on the 4th of May 1847 at Clarens (Vaud). A considerable part of his works was not printed till after his death.

His life was written in 1875 by Eugene Rambcrt, who re-edited the Chrestomathie in 1876. See also L. M. Lane, Life and Writings of A. Vinet (1800) ; L. Molines, Etude sur Alexandre Vinet (Paris, 1890) ; V. Rossel, Hist, de la litt. franqaise hors de France (Lausanne, r895); V. Rivet, Etudes sur les origines de la pensee religieuse de Vinet (Paris, 1896); A. Schumann, Alex. Vinet (1907). A uniform edition of his works was begun in 1908, sec Revue de theologie el philosopkie (Lausanne, 1908, 234 sqq.). (J. V; B.)

VINGT-ET-UN (colloquially, ” Van John “), a round game of cards, at which any number of persons may play, though five or six are enough. The right to deal having been decided, the dealer gives one card face downwards to each person, in- cluding himself. The others thereupon look

at their cards and declare their stakes — one, two, three or more counters or chips — according to the value of their cards. When all have staked, the dealer looks at his own card and can double all stakes if he chooses. The amount of the original stake should be set by each player opposite his card. Another card is their dealt, face downwards, all round; each player looking at bis own. The object of the game is to make 21, by the pips or. the cards, an ace counting as 1 or n, and the court cards as 10 each. Hence a player who receives an ace and a ten-card scores 21 at once. This is called a "natural"; the holder receives twice — sometimes thrice — the stake or the doubled stake. If the dealer has a natural too, the usual rule is that the other natural pays nothing, in spite of the rule of " ties pay the dealer." The deal passes to the player who turns up the natural, unless it occurs in the first round of a deal or the dealer has a natural too. If the dealer has not a natural, he asks each player in turn, beginning with the player on his left, if he wishes for another card or cards, the object still being to get to 21, or as near up to it as possible. The additional cards are given him one by one, face upwards, though the original cards are not exposed. If he requires no additional card, or when he has drawn sufficient, he says, " Content," or " I stand." If a player overdraws, i.e. if his cards count more than 21, he pays the dealer at once. When all are either overdrawn or content, the dealer may "stand" on his own hand, or draw cards, 'ill he is overdrawn or stands. All the hands are then shewn, the dealer paying those players whose cards are nearer to 21 than his own, and receiving from all the others, as " ties pay the dealer." If the dealer's cards, with the additions, make exactly 21, he receives double the stake, or doubled stake; if a player holds 21, he receives double likewise, but ties still pay the dealer. If a player receives two

similar cards he may put his stake on each and draw on them separately, receiving or paying according as he stands success- fully or overdraws, but the two cards must be similar, i.e. he cannot draw on both a knave and a queen, or a king and a ten, though their values are equal for the purpose of counting. A natural drawn in this way, however, only counts as 21, and does not turn out the dealer. Similarly a player may draw on three cards, or even four, should they be dealt him. A player who overdraws on one of such cards must declare and pay immediately, even though he stands on another. After a hand is played, the " pone " (Latin for " behind ") — the player on the dealer's right — collects and shuffles the cards played, the dealer dealing from the remainder of the pack, till it is exhausted, when he takes the cards the pone holds, after the pone has cut them. It is a great advantage to deal, as the dealer receives from all who have already

withdrawn, even if he overdraws himself.

French Vingt-et-un, or vingt-et-un with variations, is played by any number of persons. The first deal is played as in the ordinary game. In the second (" Imaginary Tens ") each player is supposed to hold a ten-card and receives one card from the dealer, face down- wards; he is then considered to hold a ten-card plus the one dealt, and stands or draws, receives or pays, as in the ordinary game. If he receives an ace he holds a natural. In the third deal (" Blind Vingt-et-un ") each player receives two cards, and draws or stands without looking at either. The fourth deal is " Sympathy and Antipathy," each player staking, and declaring which of the two he backs: two cards are then dealt to him: if they are of the same colour, it is "sympathy"; if of different colours, "antipathy." At the fourth deal (Rouge-et-noir) , each player, having received three cards, bets that the majority will be either black or red, as he chooses. In " Self and Company " every one stakes but the dealer, who then sets out two cards, face upwards, one for himself and one for the players. If the two cards are pairs, the dealer wins; if not, he deals till one of the cards exposed is paired, paying or receiving according as that card belongs to himself or the ' company." The seventh deal is " Paying the difference." Each player receives two cards, face upwards. The dealer pays or receives a stake for the difference in number between the pips on his own cards and those of each player. The ace counts as one. The eighth deal is " Clock." The stakes are pooled. The dealer deals the cards out, face upwards, calling " one " for the first, " two " for the second, and so on, the knave being 11, queen 12, and king 13. If any of the cards dealt correspond to the number called, the dealer takes the pool ; if none correspond, he forfeits that amount. At the end of this (the eighth) deal, the next player deals.

VINITA, a city and the county-seat of Craig county, Okla- homa, U.S.A., in the N.E. part of the state, about 135 m. E.N.E. of Guthrie. Pop. (1900) 2339; (1907) 3157, including 624 Indians and 479 negroes; (igio) 4082. Vinita is served by the Missouri, Kansas & Texas and the St Louis & San Francisco railways. In the city are the Sacred Heart Institute (Roman Catholic), and a hospital for masons. Vinita is situated in an agricultural and stock-raising region, and lead, zinc, oil and natural gas are found in the vicinity; the city's water supply is obtained from artesian wells. Bricks are manufactured. The first settlement was made here in 1870 and Vinita was chartered as a city in 1898.

VINLAND (Old Norse, V inland, i.e. Vineland or Wineland), some region on the eastern, coast of North America, visited and named by the Norsemen in the beginning of the nth century. The word first appeared in print in Adam of Bremen's De scriptio Insularum Aquilonis, an appendix to his Gesta Hamma- burgensis Ecdesiae Pontificum, published by Lindenbrog

in 1595. In pursuit of historical study, Adam visited the Danish court during the reign of the well-informed monarch Svend Estridsson (1047-1076), and Writes that the king " spoke of an island (or country) in that ocean discovered by many, which is called Vinland, because of the wild grapes [iiites] that grow there, out of which a very good wine can be made. Moreover, •hat grain unsown grows there abundantly [fruges ibi non seminatas abiindare] is not a fabulous fancy, but is based on trustworthy accounts of the Danes." This passage offers im- portant corroboration of the Icelandic accounts of the Vinland voyages, and is, furthermore, interesting " as the only un- doubted reference to Vinland in a medieval book written be- yond the limits of the Scandinavian world " (Fiske). Adam's

information concerning Vinland did not, however, impress his medieval readers, as he placed the new land somewhere in the Arctic regions: " All those regions which are beyond are filled with insupportable ice and boundless gloom." These words show the futility of ascribing to Adam's account Columbus's knowledge of lands in the West, as many overzealous advocates of the Norse discoveries have done. The importance of the information, meagre as it is, lies in the fact that Adam received from the lips of kinsmen of the explorers (as the Danes in a sense were) certain characteristic facts (the finding of grapes and unsown grain) that support the general reliability of the Icelandic sagas which tell of the Vinland voyages (in which these same facts are prominent), but which were not put into writing by the Norsemen until later — just how much later it is not possible to determine. The fact that the Icelandic sagas concerning Vinland are not contemporaneous written records has caused them to be viewed by many with suspicion; hence such a significant allusion as that by Adam of Bremen is not to be overlooked. To the student of the Norse sources, Adam's reference is not so important, as the internal evidence of the sagas is such as to give easy credence to them as records of exploration in regions previously unknown to civilization. The contact with savages would alone prove that.

During the middle ages the Scandinavians were the first to revive geographical science and to practise pelagic navigation. For six centuries previous to about 800, European interest in practical geographical expansion was at a standstill. During the 6th and 7th centuries, Irish anchorites, in their " passion for solitude," found their way to the Hebrides, Orkneys, Shet- lands, Faroes and Iceland, but they were not interested in colonization or geographical knowledge. The discovery of new lands in the West by the Norsemen came in the course of the great Scandinavian exodus of the 9th, 10th and nth centuries — the Viking Age — when Norsemen, Swedes and Danes swarmed over all Europe, conquering kingdoms and founding colonies. The main stream of Norsemen took a

westerly course, striking Great Britain, Ireland and the Western Isles, and ultimately reached Iceland (in 874), Greenland (in 985) and Vinland (in 1000). This western migration was due mainly to political dissatisfaction in Norway, doubtless augmented by a restless spirit of adventure. The chiefs and their followers that settled Iceland were " picked men," the flower of the land, and sought a new home from other motives than want or gain. They sought political freedom. In Iceland they lived active, not to say tumultuous, lives, and left fine literary records of their doings and achievements. The Icelandic colony was an interesting forerunner of the American republic, having a prosperous population living under a republican government, and main- taining an independent national spirit for nearly four centuries.

Geographically Iceland belongs to America, and its coloniza- tion meant, sooner or later, the finding of other lands to the West. A century later Greenland was peopled from Iceland, and a colony existed for over four hundred years, when it was snuffed out, doubtless by hostile Eskimos. Icelandic records, among them the Vinland sagas, also a Norwegian work of the 13th century, called Speculum regale (The King's Mirror), and some papal letters, give interesting glimpses of the life of this colony. It was from the young Greenland colony that an attempt was made to establish a new outpost in Vinland, but plans for permanent settlement were given up on account of the hostility of the natives, with whom the settlers felt powerless to grapple. Gunpowder had not yet been invented.

Icelandic literature consists mainly of the so-called " sagas," or prose narratives, and is rich in historical lore. In the case of the Vinland sagas, however, there are two independent narra- tives of the same events, which clash in the record of details. Modern investigators have been interested in establishing the superiority of one over the other of the two narratives. One of them is the " Saga of Eric the Red " as found in the collection known as Hauk's Book, so called because the manuscript was made by Hauk Erlendsson, an Icelander who spent much of his life in Norway. It was copied, in part by Hauk himself, between

the years 1305 and 1334, the date of his death, and probably during the period 1310-20. It is No. 544 of the Arne- Magnaean collection in Copenhagen. Another manuscript that tells the same story, with only verbal variations, is found in No. 557 of the same collection: This manuscript was made later than Hauk's, probably in the early part of the 15th century, but it is not a copy of Hauk's. Both were made independently from earlier

manuscripts. The story as found in these two manuscripts has been pronounced by competent critics, especi- ally Professor Gustav Storm of the university of Christiania, as the best and the most trustworthy record.

The other saga, which by chance 'came to be looked upon as the chief repository of facts concerning the Viniand voyages, is found in a large Icelandic work known as the Flatey Book, as it was once owned by a man who lived on Flat Island (Flatey), on the north-western coast of Iceland. This collection of sagas, completed in about 1380, is " the most extensive and most perfect of Icelandic manuscripts," and was sent to Denmark in 1662 as a gift to the king. It was evidently the general ex- cellence of this collection that gave the version of the Viniand story that it contained precedence, in the works of early investi- gators, over the Viniand story of Hauk's Book. (Reeves's Finding of Wineland contains fine photographs of all the vellum pages that give the various Viniand narratives.)

According to Flatey Book saga, Biarni Heriulfsson, on a voyage from Iceland to Greenland in the early days of the Greenland colony, was driven out of his course and sighted new lands to the south-west. He did not go ashore (which seems strange), but sailed northward to Greenland. Fifteen years later, according to this account, Leif Ericsson set out from Greenland in search of the lands that Biarni had seen, found them and named them — Helluland (Flat-stohe-land) , Markland (Forestland) and Viniand. After his return to Greenland, several successive expeditions visited the new lands, none of which (strangely enough) experienced any difficulty in finding Leif's hut in the distant Viniand.

According to the Viniand saga in Hauk's Book, Leif Ericsson, whose father, Eric the Red, had discovered and colonized Green- land, set out on a voyage, in 999, to visit Norway, the native land of his father. He visited the famous King Olaf Tryggvason, who reigned from 995 to 1000, and was bending his energies toward Christianizing Norway and Iceland. He immediately saw in Leif a likely aid in the conversion of the Greenlanders. Leif was converted and consented to become the king's emissary to Greenland, and the next year (rooo) started on his return voyage. The saga says that he was " tossed about " on this long voyage, and came upon an unknown country, where he found " self- sown wheatfields, and vines," and also some trees called " mosur," of which he took specimens. Upon his arrival in Greenland, Leif presented the message of King Olaf, and seems to have attempted no further expeditions. But his visits to the new lands aroused much interest, and his brother Thorstein made an unsuccessful attempt to find them. Later, in 1003, an Icelander, Thorfinn Karlsefni, who was visiting the Greenland colony, and who had married Gudrid, the widow of Leif's brother Thorstein, set out with four vessels and 160 followers to found a colony in the new lands. Here they remained three

years, during which time a son, Snorri, was bom to Thorfinn and Gudrid. This expedition, too, found " grapes and self-sown wheat," though seemingly not in any great abundance. Concerning the southern- most region of Viniand, the saga says: "They found self-sown wheatfields in the lowlands, but vines everywhere on higher places. . . . There were great numbers of wild animals in the woods." Then the saga relates that one morning a large number of men in skin canoes came paddling toward them and landed, staring curiously at them: " They were swarthy men and ill-looking, and the hair of their heads was ugly; they had large eyes and broad cheeks." Later the saga says: "Noˆ snow came there, and all of their live stock lived by grazing, and thrived." The natives appeared again the next spring, and a clash occurred. Fearing continued trouble with them, Karlsefni resolved to return to Greenland. This he did a year later, and

spent the winter of 1006-7 there, whereupon he settled in Iceland. From him and Gudrid a number of prominent ecclesiastics claimed descent, and also Hauk Erlendsson. The Viniand story was doubtless a cherished family possession, and was put into writing, when writing sagas, instead of telling them, came into fashion. And here It is important to remember that before the age of writing in Iceland there was a saga-telling age, a most remarkable period of intellectual activity, by the aid of which the deeds and events of the seething life of the heroic age was carried over into the age of writing. " Among the medieval literatures of Europe, that of Iceland is unrivalled in the profusion of detail with which the facts of ordinary life are recorded, and the clearness with which the individual character of numberless real persons stand out from the historic back- ground " (Origines Islandicae). Icelandic literary history says that Ari the Learned (born in 1067) was " the first man in this land who wrote in the Norse tongue history relating to times ancient and modern." Among his works is the Book of Settlements, " a work of thorough and painstaking research unequalled in medieval literature " (Fiskc). His work The Book of Icelanders is unfortunately lost, but an abridgment of it, Libellus Islandorum, made by Ari him3elf, contains a significant reference to Viniand. It tells that the colonists in Greenland found " both broken cayaks (canoes) and stone implements, whereby it may be seen that the same kind of folk had been there as they which inhabited Viniand, and whom the men of Greenland (i.e. the explorers) called the 'skraelings' (i.e. inferior people)." From this allusion one cannot but think that so keen and alert a writer as Ari had given some attention to Viniand in the lost work. But of this there is no other proof. We are left to affirm, on account of definite references in various sagas and annals to Leif Ericsson and the discovery of Viniand, that the saga as preserved in Hauk's Book (and also in No. 557) rested on a strong viva voce tradition that was early put into writing by a competent hand. Dr Finnur Jonsson of Copenhagen says: "The classic form

of the saga and its vivid and excellent tradition surely carry it back to about 1200." This conservative opinion does not preclude the possi- bility, or even probability, that written accounts of the Viniand voyages existed before this date. Vigfusson, in speaking of the sagas in general, says: " We believe that when once the first saga was written down, the others were in quick succession committed to parchment, some still keeping their form through a succession of copies, other changed. . . . That which was not written down quickly, in due time, was lost and forgotten for ever."

The fact that there are discrepancies between the two ver- sions as they appear in the Hauk's Book and in the Flatey Book does not justify the overthrow of both as historical evidence. The general truth of the tradition is strengthened by the fact that it has come down from two independent sources. One of them must be the better, however, and this it is the province of competent scholars to determine. The best modem scholarship gives the precedence to the Hauk's Book narrative; as it harmonizes better with well-established facts of Scandinavian history, and is besides a more plausible account. In accordance with this decision, Biarni Heriulfson's adventure should be eliminated, the priority of discovery given to Leif Ericsson, and the honour of being the first European colonists on the American continent awarded to Thorfinn Karlsefni and his followers. This was evidently the only real attempt at colonization, despite the numerous contentions to the contrary. Under date of 1121 the Icelandic annals say: " Bishop Eric of Greenland went in search of Viniand." Nothing further is recorded. The fact that his successor as bishop was appointed in 1 1 23 would seem to indicate that the Greenlanders had information that Eric had perished. •

The only important phase of the Viniand voyages that has not been definitely settled is the identifications of the regions visited by Leif and Thorfinn. The Danish antiquarian Rafn, in his monumental Antiquitates Americanae, published in 1837, and much discussed in America at that time, held for Rhode Island as Leif's landfall and the locality of Thorfinn 's colony. Pro- fessor E. N. Horsford, in a number of monographs (unfortunately

of no historical or scientific value), fixed upon the vicinity of Boston, where now stand a Leif Ericsson statue and Horsford's Norumbega Tower as testimonials to the Norse explorers. But in 1887 Professor Storm announced his conviction that the lands visited by the Norsemen in the early part of the nth century were Labrador, Newfoundland and Nova Scotia. And a careful reading of the Hank's Book narrative seems to show

that the numerous details of the saga fit Nova Scotia remarkably well, and much better than any other part of the continent. This view has in recent years been quite generally accepted by American scholars. But in 1910 Professor M. L. Fernald, a botanist of Harvard University, published a paper in Rhodora, vol. 12, No. 134, in which he contends that it is most probable that the " vinber " of the sagas were not " grapes/' but " wine-berries," also known as the mountain or rock cranberries. The " self-sown wheat " of the sagas he identifies as strand wheat, instead of Indian corn, or wild rice, and the mosur trees as the canoe birch. He thinks the natives were Eskimos, instead of American Indians, as stoutly maintained by John Fiske. Pro- fessor Fernald concludes his paper by saying that: " The mass of evidence which the writer has in hand, and which will soon be ready for publication, makes it clear that, if we read the sagas in the light of what we know of the abundant occurrence north of the St Lawrence of the ' vinber ' (V actinium Vilis-Idaea or possibly Ribes triste, R. prostratum, or R. lacuslre), ' hveiti ' (Elymus arenarius), and ' mosur ' (Belula alba, i.e. B. papyri/era of many botanists), the discrepancies in geography, ethnology and zoology, which have been so troublesome in the past, will disappear; other features, usually considered obscure, will become luminous; and the older and less distorted sagas, at least in their main incidents, will become vivid records of actual geographic exploration."

It is possible that Professor Fernald may show conclusively that Leif's landfall was north of the St Lawrence. That the " vinber " were mountain cranberries would explain the fact, mentioned in the Flaley Book saga, that Leif filled his after- boat with " vinber " in the spring, which is possible with the cranberries, as they are most palatable after having lain under the snow for the winter. But Thorfinn Karlsefni found no abundance of " vinber," in fact one of his followers composed some verses to express his disappointment on this score. " Vines " were found only in the southernmost regions visited by Karlsefni. It is to be noted that the word " vines " is more prominent in the Hank's Book narrative than the word " vinber." At present it does not seem likely that Professor Fernald's argument will seriously affect Professor Storm's contention that Thorfinn's colony was in Nova Scotia. At any rate, the incontrovertible facts of the Vinland voyages are that Leif and Thorfinn were historical characters, that they visited, in the early part of the nth century, some part of the American continent south-west of Greenland, that they found natives whose hostility prevented the founding of a permanent settlement, and that the sagas telling of these things are, on the whole, trustworthy descriptions of actual experience.

Bibliography. — The bibliography of this subject is large, but adequate documents, accounts and discussions may be found in the following modern works: Gustav Storm, Studies on the Vine- land Voyages

(Copenhagen, 1889); Arthur M. Reeves, The Finding of Wineland, the Good (London, 1890 and 1895); John Fiske, The Discovery of America, vol. 1. (Boston, 1892) ; Juul Dieserud, " Norse Discoveries in America," in Bulletin of the American Geographical Society, vol. xxxiii. (New York, 1901); Gudbrandr Vigfusson and F. Yorke Powell, Origines Islandicae (Oxford, 1905); and Julius E. Olson and others, The Northmen, Columbus and Cabot, q8 5-1 503 (New York, 1906), the first volume of Original Narratives of Early American History. (J. E. O.)

VINOGRADOFF, PAUL (1854-), Anglo-Russian jurist, was born at Kostroma in Russia. He became professor of history in the university of Moscow, but his zeal for the spread of education brought him into conflict with the authorities, and consequently he was obliged to leave Russia. Having settled in England, Vinogradoff brought a powerful and original mind to bear upon the social and economic conditions of early

England, a subject whiqh he had already begun to study in Moscow. His Villainage in England (1892) is perhaps the most important book written on the peasantry of the feudal age and the village community in England; it can only be compared for value with F. W. Maitland's Domesday Book and Beyond. In masterly fashion Vinogradoff here shows that the villein of Norman times was the direct descendant of the Anglo-Saxon freeman, and that the typical Anglo-Saxon settlement was a free community, not a manor, the position of the freeman having steadily deteriorated in the centuries just around the Norman Conquest. The status of the villein and the conditions of the manor in the 12th and 13th centuries are set forth with a legal precision and a wealth of detail which shows its author, not only as a very capable historian, but also as a brilliant and learned jurist. Almost equally valuable was Vinogradov's essay on " Folkland " in vol. viii. of the English Historical Review (1893), which proved for the first time the real nature of this kind of land. Vinogradoff followed up his Villainage in England with The Growth of the Manor (1905) and English Society in the nth Century (1908), works on the lines of his earlier book. In 1903 he was appointed Corpus professor of jurisprudence in the university of Oxford, and subsequently became a fellow of the British Academy. He received honorary degrees from the principal universities, was made a member of several foreign academies and was appointed honorary professor of history at Moscow.

VINOY, JOSEPH (1803-1880), French soldier, was originally intended for the Church, but, after some years at a seminary, he decided upon a military career, and entered the army in 1823. When he was a sergeant in the 14th line infantry, he took part in the Algerian expedition of 1830. He won his com- mission at the capture of Algiers, and during the subsequent campaigns he rose by good service to the rank of colonel. He returned to

France in 1850, and in the Crimean War served under Canrobert as general of brigade. For his brilliant con- duct at the Malakoff he was promoted general of division, and he led a division of Niel's corps in the campaign of Solferino. Retired on account of age in 1865, he was recalled to active service on the outbreak of the war of 1870, and after the early reverses was put at the head of the XIII. army corps, which, fortunately for France, did not arrive at the front in time to be involved in the catastrophe of Sedan. By a skilful retreat he brought his corps intact to Paris on September 7th. Vinoy during the siege commanded the III. army operating on the south side of the capital and took part in all the actions in that quarter. On Trochu's resignation he was appointed to the supreme command, in which capacity he had to negotiate the surrender. During the commune he held important commands in the army of Versailles, and occupied the burning Tuileries and the Louvre on May 23rd. He was in the same year made grand chancellor of trie Legion of Honour.

Vinoy wrote several memoirs on the war of 1870-71; Operations de Varmee pendant le siege de Paris (1872), L Armistice et la com- mune (1872), V Armee francaise (1873).*

VINT, a Russian card-game. It is generally considered as the immediate ancestor of Bridge (q,v.). Vint means in Russian " screw," and is given to the game because the four players, each in turn, propose, bid and overbid each other until one, having b > d higher than the others care to follow, makes the trump, his vis-a-vis becoming his partner. It has many points of resemblance to Bridge. The cards have the same rank; the score of tricks is entered under the line, and points for slam, penalties and honours above the line; while the value of the different suits is the same as in Bridge: spades, clubs, diamonds, hearts and " no trumps." In a " no trump " declaration aces only count as honours; in a suit declaration both the aces and the five next highest cards. During the progress of the bidding and declaring, opportunity is taken by the players to indicate by their calls their strength in the various suits and the high cards they hold, so that, when the playing begins, the position of the best cards and the strength of the different hands can often be fairly accurately estimated.

The leads are subject to much the same rules as those in Bridge.

See The Laws and Principles of Vint, edited by Frank W. Haddan (London, 1900).

VINTON, FREDERIC PORTER (1846-), American

portrait painter, was born at Bangor, Maine, on the 29th of January 1S46. He was a pupil of Duveneck, of William M. Hunt in Boston, of Leon Bonnat and Jean Paul Laurens in Paris, and of the Royal Academy of Munich. In 1891 he was elected a full member of the National Academy of Design, New York.

VIOL, a generic term for the bowed precursors of the violin (q.v.), but in England more specially applied to those immediate predecessors of the violin which are distinguished in Italy and Germany as the Gamba family. The chief characteristics of the viols were a flat back, sloping shoulders, "c "-shaped sound-holes, and a short finger-board with frets. All these features were changed or modified in the violin, the back becoming delicately arched, the shoulders reverting to the rounded outline of the guitar or troubadour fiddle, the shape of the sound-holes changing from " c " to " f," and the finger- board being carried considerably nearer the bridge. The viols, of which the origin may be traced to the 13th and 14th cen- tury German Minnesinger fiddle, characterized also by sloping shoulders, can hardly be said to have evolved into the violin. The latter was derived from the guitar-fiddle through the Italian lyre or viol-lyra family, distinguished as da braccio and da gamba, and having early in the 17th century the outline and " f " sound-holes of the violin. The viol family consisted of treble, alto, tenor and bass instruments, being further differentiated as da braccio or da gamba according to the position in which they were held against the arm or between the knees. The favourite viol da gamba, or division viol, frequently had a man or a woman's head instead of the scroll finish to the peg- box, and sometimes a few fine wire sympathetic strings tuned an octave higher than the strings in the bridge.

Michael Praetorius mentions no less than five sizes of the viol da gamba, the largest corresponding to the double bass, and in a table he notes the various accordances in use for each. He carefully distinguishes these instruments as violen and the viole da braccio (our violin family) as geigen. Of the latter he gives six sizes, the highest being the pochette with vaulted back, a rebec in fact, and the lowest corresponding to the violoncello, which he calls bass viol or geige da braccio.

The viols were very popular in England in the 16th and 17th centuries, holding their own for a long time after the introduction of the louder-toned violin; they are fully described and figured in the musical works of the period, and more especially in Christopher Simpson's Division Viol (1667), Thomas Mace's Mustek's Monu- ment (1676) and John Playford's Introduction to the Skill of Music.

(K. S.) VIOLA [Fr. viole, Ger. Bratsche, Ital. viola, alto], the tenor member of the violin family. The construction of the viola is the same, but on a larger scale, as that of the violin (q.v.). The instrument is pitched a perfect fifth below the violin.

VIOLET. The violets comprise a large botanical genus {Viola) — in which more than 200 species have been described — found principally in temperate or mountain regions of the northern hemisphere; they also occur in mountainous districts of South America and South and Tropical Africa, while a few are found in Australasia. The species are mostly low-growing herbs with alternate leaves provided with large leafy stipules (fig. 1). The flowers, which are solitary, or rarely in pairs, at the end of slender axillary flower-stalks, are very irregular in form, with five sepals prolonged at the base, and five petals, the lowest one larger than the others and with a spur, in which collects the honey secreted by the spurs of the two adjoining stamens. The five anthers are remarkable for the coloured processes which extend beyond the anther cells and form a sort of cone around the style (fig. 2). The ovary is superior and one-celled, with three parietal placentas and numerous ovules; it bears a single style, which ends in a dilated or hood-like stigma (fig. 3). The fruit is a capsule bursting loculicidally,

i.e. through the centre of each of the three valves. By the contraction of the valves the small smooth seeds, which form

Fig. 1. — Leaf of Viola tricolor (Pansy) showing the large leafy stipules (sj.

Fig. 2. — Two Stamens

of Viola tricolor (Pansy), with their two anther lobes and the processpextend- ing beyond them. One of the stamens has been deprived of its spur; the other shows its spur, c.

a row down the centre, are shot out to some little distance from the parent plant. The irregular construction of the flower is connected with fertilization by insect agency. To reach the honey in the spur of the flower, the insect must thrust its proboscis into the flower close under the globular head of the stigma. This lies in the anterior part of a groove fringed with hairs on the inferior petal. The anthers shed their pollen into this groove, either of themselves or when the pistil is shaken by the insertion of the bee's proboscis. The proboscis, passing down this groove to the spur, becomes dusted with pollen; as it. is drawn back, it presses up the lip-like valve of the stigma so that no pollen can enter the stigmatic chamber; but as it enters the next flower it leaves some pollen on the upper surface of the valve, and thus cross-fertilization is effected. In the sweet violet, V. odorata and other species, inconspicuous permanently closed or " cleistogamic "

flowers (fig. 4) occur of a

Fig. 3. — Pistil of Viola tricolor (Pansy). 1. Vertical section to show the ovules o, attached to the parietes. Two rows of ovules are seen, one in front and the other in profile, p, a thickened line on the walls forming the placenta; c, calyx; d r ovary; s, hooded stigma terminating the short style. 2. Horizontal section of the same, p, placenta ; 0, ovules; s, suture, or median line of carpel.

Ftg. 4. — CleistogamicFlower of Viola sylvatica. 1. Flower, 2. Flower

more highly magnified and cut open, a, anther; 5, pistil; st, style; v, stigmatic surface.

greenish colour, so that they offer no attractions to insect visitors and their form is correspondingly regular. The anthers are so situated that the pollen on escaping comes into contact with the stigma; in such flowers self-fertilization is compulsory and very effectual, as seeds in profusion are produced.

Several species of Viola are native to Great Britain. Viola canina (fig. 5) is the dog violet, many forms or subspecies of which are recognized ;_ V. odorata, sweet violet, is highly prized for its fragrance, and in cultivation numerous varieties have originated. The Neapolitan or Parma violet (var. pallida plena) is a form with very sweet-scented, double, pale lavender flowers; var. s-ulphtirea has shining deep green leaves and lemon-yellow flowers, deeper yellow in the centre, and with a pale-violet spur. Sweet violets like a rich, fairly heavy soil, with a north or north-west aspect if possible;

they are readily increased by dividing the crowns after flowering. Other species known in gardens are: V. altaica, flowers yellow or

Fig. 5.— Dog Violet (Viola canina).

1. Floral diagram of Viola, showing arrangement of parts in hori-

zontal plan, b, pair of bracteoles below the flower; j, sepals; p, petals; st, stamens; 0, ovary.

2. Frutt, split open.

violet with yellow eye; V. bifiora, a pretty little species 3-4 in. high with small yellow flowers, the large petal being streaked with black; V. calcarala, flowers light blue or white, or yellow in var. iiava\ V. cornuta, flowers pale blue — there are a few good varieties of this, including one with white flowers; V. cucullata, a free-flowering American species with violet-blue or purple flowers; V, Munbyana, a native of Algeria, with large violet or yellow flowers; V. peduta, the bird's -foot violet, with pedately divided leaves and usually bright blue flowers; V. rothomagensis, a native of western Europe, with flowers bright blue striped with black, and sometimes called the Rouen violet ; and V. suavis, a native of Asia Minor, the Russian violet, with pale-blue sweet-scented flowers. The garden pansies or heartseases are derivatives from V. tricolor, a cornfield weed, or V. altaica, a native of the Altai mountains. (See Pansy.) " Bedding violas," which differ from pansies in some slight technical details, have been raised from V. cornuta and V. lutea by crossing with the show pansies. The application of an infusion of violet leaves was at one time believed to have the power of reducing the size of cancerous growths, but its use is now discredited.

VIOLIN, a musical instrument consisting essentially of a resonant box of peculiar form, over which four strings of different thicknesses are stretched across a bridge standing on the box, in such a way that the tension of the strings can be adjusted by means of revolving pegs to which they are severally attached at one end. The strings are tuned, by means of the pegs, m fifths, from the second or A string, which is tuned to a fundamental note of about 435 vibrations per

second at the modern normal pitch: thus giving v?_-j^— –

as the four open notes. To produce other notes of the scale the length of the strings is varied by stopping them with the fingers on a finger-board, attached to a " neck " at Lhe end of which is the " head " in which the pegs arc inserted. The strings are set in vibration by drawing across them a bow strung with horse-hair, which is rosined to increase adhesion.

The characteristic features which, in combination, distinguish the violin (including in that family name its larger brethren the viola and the violoncello) from other stringed instruments are: the restriction of the strings to four, and their tuning in fifths; the peculiar form of the body, or resonating chamber, especially the fully moulded back as well as front, or belly; the shallow sides or " ribs " bent into characteristic curves; the acute angles of the corners where the curves of the ends and middle " bouts " or waist ribs meet; and the position and shape of the sound-holes, cut in the belly. By

a gradual process of development in all these particulars the modern violin was evolved from earlier bowed instruments, and attained its highest perfection at the hands of the great Italian makers in the 16th, 17th and early 18th centuries, since which time, although many experiments have been made, no material improvement has been effected upon the form and mode of construction then; adopted.

The body, or sounding-box, of the violin is built up of two arched plates of' thin wood, the belly and the back, united by side pieces or ribs to. form a shallow box. The belly is cut from soft elastic wood, pine being universally used for this purpose, while the back is made of a close-grained wood, generally sycamore or maple. Both back and belly are carved to their model from the solid, but for utilitarian reasons are generally, though not always, built up of tw r o longitudinal sections; while the sides or ribs, of very thin sycamore or maple, usually in six sections, are bent on a mould, by the aid. of heat, to the required form. Into the corners are glued corner-blocks of soft wood, which help to retain the ribs in their sharply recurved form, and materially strengthen the whole structure. Into the angle of the joints between the sides and the back and belly are glued thin lining strips, bent to the mould, giving a bearing surface for the glued joint along the whole outline of the instrument; while, in addition, end blocks are inserted at the head and bottom of the body, the former to receive the base of the neck, and the latter the " tail pin " to which is attached the tail-piece, carrying the lower (fixed) ends of the strings. The belly is pierced with two sound- holes in the form of TT near, and approximately parallel to, the

" bouts." The size, shape and position of these holes have an important influence on the character of the tone of the instrument, and present distinctive variations in the instruments of the different great makers.

The neck, made of maple, is glued and now always mortised into the block at the upper end of the body, 1 bearing against a small semicircular projection of the back, and is inclined at such an angle that the finger-board, when glued on to its upper surface, may lie clear of the belly, over which it projects, but in such relation to the height of the bridge as to allow the strings to be stretched nearly parallel to, and at a convenient distance above, its own surface.

The bridge, cut out of maple, in the peculiar form devised by Stradivari in the 17th century, and not since materially departed from, is in the violin about ii in. high by if in, wide, and tapers in thickness from about 5 in. at the base to ˆ at the crown; but the dimensions of this very important member vary for different instru- ments according to the arch of the belly, the strength of the wood and other considerations. It is placed on the belly exactly midway between the sound-holes and in such a position as to stand

on a transverse line dividing the surface into two approximately equal areas, that is, about ij in. below the middle, the lower end of the body being wider than the upper part or shoulders; whereby a greater length is rendered available for the vibrating portion of the strings.

A short distance behind the right foot of the bridge, the sound- post, a rod of soft pine about j in. thick, is fixed inside the body in contact with the belly and the back, and serves directly, not only to sustain the belly against the pressure of the bridge under the tension of the strings, but to convey vibrations to the back. It also exer- cises a very important influence on the nodal arrangement of these vibrating plates. The pressure of the other foot of the bridge, where the tension of the fourth string is far less than that of the first string, is partly sustained by the bass-bar — a strip of wood tapering from the middle to both ends, which is glued underneath the belly and extends to within rather less than 2 in. of the ends of the instrument. This fitting not only serves to strengthen the belly mechanically, but exerts a profound effect upon the vibrations of that plate.

The fixed structure is completed by the head, which surmounts the neck and consists primarily of a narrow box into the sides of which are inserted the pegs round which the free ends of the strings are wound. The head is finished by an ornamentation w r hich in the hands of the Italian makers followed the traditional pattern of a scroll, or volute, offering the skilled craftsmen infinite scope for boldness and freedom in its execution; but sometimes, especially in the Tirolean instruments, it was carved in the form of an animal's head, usually a lion's.

The strings, fastened at one end to an ebony tail-piece or tongue, which is itself attached by a gut loop to the pin at the base of the instrument, pass over the bridge, along the finger board and over the nut (a dwarf bridge forming the termination of the finger-board) to the pegs. The effective vibrating portion of the strings is accord- ingly the length between the nut and the bridge, and measures now

1 Up to about the year 1800 the old Italian makers, including Stradivari (in his earlier instruments), usually strengthened the attachment of the neck by driving nails, frequently three and some- times four, through the top block into the base of the neck, which was not mortised into the block.

in an ordinary full-Bized violin about 13 in. The portion of the strings to which the bow is applied lies over the space, measuring about 2\ in.,

between the bridge and the free end of the finger- board. The strings are manufactured from so-called catgut, made from the intestines of lambs, and range in thickness from the first to the third or D string from -026 to -046 in. more or less. The necessary weight is given to the string of lowest pitch, G, without unduly sacrificing its elasticity, by winding a thin gut string with fine silver wire to about the same thickness as the A string.

An ornamental feature characteristic of nearly all violins is the purfling, a very thin slip of wood with margins of ebony or (rarely) whalebone, inlaid in thin strips close to # the edge of both plates, and following the entire outline of the instrument. In some in- struments, especially of the Brescian school, a double line of purfling was inserted.

The total number of pieces of wood of which the .violin is composed amounts to about 70, varying, as the plates are made in one piece or built together, and with the number of sections in which the ribs are put together. Of this number 57 pieces are built into the permanent structure, while 13. may be described as fittings. The whole of the permanent structure is cemented together with glue alone, and it is a striking testimony to the mechanical condi- tions satisfied by the design, that the instrument built of such slender material withstands without deformation the considerable stresses applied to it. It is worthy of remark that after the lapse of so many years, since it attained perfect musical efficiency, no unessential adjunct has entered into the construction of this in- strument. No play of fancy has grafted anything beyond quite minor ornamentation on a work of art distinguished by its simplicity of pure outline and proportion.

The following are the exact principal dimensions of a very fine specimen of Stradivari's work, which has been preserved in perfect condition since the latter end of the 17th century : —

Length of body = 14 in. full.

Width across top = &H m – bare.

Width across bottom = 8J in.

Height of sides (top) . . . = i T ; ^ „

Height of sides (bottom) . . . = 1/3 > >

The back is in one piece, supplemented a little in width at the lower part, after a common practice of the great makers, and is cut from very handsome wood; the ribs are of the same wood, while the belly is formed of two pieces of soft pine of rather fine and beautifully even grain. The sound-holes, cut with perfect precision, exhibit much grace and freedom of design.

The scroll, which is very char- acteristic of the maker's style and beautifully modelled, harmonizes admirably with the general modelling of the instrument. The mode! i? flatter than in violins of the earlier period, and the design bold, while displaying all Stradivari's microscopic perfection of workmanship. The whole is coated with a very fine orange-red- brown varnish, untouched since it left the maker's hand in 1690, and the only respects in which the instrument has been altered since that date are in the fitting of the longer neck and stronger bass-bar necessitated by the increased compass and raised pitch of modern violin music.

The measurements given above are the same as those of a well- known Stradivari of later date (1714).

The acoustics of the violin are extremely complex, and not- withstanding many investigations by men of science, and the enunciation of some plausible hypotheses with regard to details of its operation as a musical instrument, remain as a whole obscure. So far as the elementary principles which govern its action are concerned, the violin follows familiar laws (see Sound). The different notes of the scale are produced by vibrating strings differing in weight and tension, and varying in length under the hand of the player. The vibrations of the strings are conveyed through the bridge to the body of the instrument, which fulfils the common function of a resonator in reinforcing the notes initiated by the strings. So far first principles carry us at once. But when we endeavour to elucidate in detail the causes of the peculiar character of tone of the violin family, the great range and variety in that character obtained in different instruments, the extent to which those qualities can be controlled by the bow of the player, and the mode in which they are influenced by minute variations in almost every component part of the instrument, we find ourselves faced by a series of problems which have so far defied any but very partial solution.

The distinctive quality of the musical tones of the violin is generally admitted to be due largely to its richness in the upper harmonic or partial tones superimposed on the fundamental notes produced by the simple vibrations of the strings.

The characteristic tone and its control by the player are un- doubtedly conditioned in the first place by the peculiar path of the

vibrating string under the action of the rosined bow. This takes the form not of a symmetrical oscillation but of a succession of alternating bound and free movements, as the string adheres to the bow according to the pressure applied and, releasing itself by its elasticity, rebounds.

The lightness of the material of which the strings are made conduces to the

production of very high upper partial tones which give brilliancy of sound, while the low elasticity of the gut causes these high constituents to be quickly damped, thus softening the ultimate quality of the note._

In order that the resonating body of the instrument may fulfil its highest purpose in reinforcing the complex vibrations set up by the strings vibrating in the manner above described, not only as a whole, but in the number of related segments whose oscillations determine the upper partial tones, it is essential that the plates, and consequently the Dody of air contained between them, should respond sensitively to the selective impulses communicated to them. It is the attainment of this perfect selective responsiveness which marks the construction cf the best instruments. Many factors contribute to this result. The thickness of the plates in different parts of their areas, the size and form of the interior of the body, the size and shape of the sound-holes through which the vibrations of the contained air are communicated to the external air, and which also influence the nodal points in the belly, according to the number of fibres of the wood cut across, varying with the angle at which the sound-holes cross the grain of the wood. Their position in this respect also affects the width of the central vibrating portion of the belly under the bridge.

All these important factors are influenced by the quality and elasticity of the wood employed.

Much has been written and many speculations have been ad- vanced with regard to the superiority in tone of the old Italian instruments over those of modern construction. This superiority has sometimes been disputed, and, judging from the many examples of second-rate instruments which have survived from the 17th and 18th centuries, it is certain that antiquity alone does not confer upon violins the merits which have frequently been claimed for it. When, however, we compare the comparatively £ew really fine specimens of the Italian school which have survived in good condition, with the best examples of modern construction in which the propor- tions of the older masterpieces have been faithfully followed, and in which the most careful workmanship of skilled, hands has been embodied, it cannot be denied that the former possess a superiority in the quality of their tone which the musical ear immediately recognizes. After taking into account the practical identity in dimensions and construction between the classical and many of the best modern models, the conclusion suggests itself that the difference must be attributed to the nature of the materials used, or to the method of their employment, as influenced by local conditions and practice. The argument, not infrequently advanced, that the great makers of Italy had special local sources of supply, jealously guarded, for wood with exceptional acoustical properties, can hardly be sustained. Undoubtedly they exercised great care in the selec- tion of sound and

handsome wood; but there is evidence that some of the finest wood they used was imported from across the Adriatic in the ordinary course of trade; and the matter was for them, in all probability, largely one of expense. There is good reason to suppose that a far larger choice of equally good material is accessible to modern makers.

There remains the varnish with which the completed instrument is coated. Tins was an item in the manufacture which received most careful attention at the hands of the great makers, and much im- portance has been attachedto the superiority of their varnish over that used in more recent times — so much so that its composition has been attributed to secret processes known only to themselves. The probability is that they were able to exercise more personal selection of the materials used than has been generally practised by makers dependent upon commercial products under modern conditions, and the general result has been analogous to that seen in the pigments employed by modern painters as compared with those made up for themselves by the old masters who could ensure perfect purity in their ingredients. But that the Italian makers individually or collectively attempted, or were able, to preserve as a secret the composition of the varnish they used is unlikely. Instruments exhibiting similar excellence in this respect were too widespread in their range, both of period and locality, to justify the assumption that the general composition of the finest varnish of the early makers was not a matter of common knowledge in an industry so flourishing as that of violin-making in the 17th and early 18th centuries. The excellence of an instrument in respect of its varnish depended on the quality of the constituent materials, on the proportions in which they were combined, and, perhaps mainly, on the method of its application. The most enduring and perfect varnish used for violins is an oil varnish, and the best results there- with can only be obtained under the most advantageous conditions for the drying process. In this respect there can be no doubt that the southern climate placed the makers whose work lies in higher latitudes at a disadvantage. In a letter to Galileo in 1638 concern- ing a violin he had ordered from Cremona, the writer states that

" it cannot be brought to perfection without the strong heat of the sun "; and all recorded experience indicates the great importance of slow drying of the varnish under suitable conditions. Stradivari himself wrote to account for delay in the delivery of an instrument because of the time required for the drying of the varnish.

That a perfect varnish conduces to the preservation of a fine tone in the

instrument is generally admitted; and its operation in this respect is due, not merely to the external protection of the wood from deterioration, but especially to its action, when supplied under favourable conditions to wood at a ripe stage of seasoning (when that process has proceeded far enough, but not so far as to allow the fibres to become brittle), in soaking into the pores of the wood and preserving its elasticity. This being so. successful varnishing will be seen to be an operation of great delicacy, and one in which the old masters found full scope for their skill and large experience. The effects, upon the vibrational qualities of the wood, of thickness of coat, texture and gradual absorption into the pores of the wood under favourable conditions of drying, are great and far-reaching, as is proved in the survival through two centuries of the great qualities of the specimens most fittingly created in this respect.

After the early part of the 18th century the use of the fine oil varnish employed by the great makers was gradually abandoned, con- currently with the decline of the instrument maker's art in Italy. Except in the hands of the fast -diminishing hand of craftsmen trained in the old traditions, its place was taken by the newer spirit varnishes which, with their quick-drying qualities and ease of application, satisfied the requirements of the more cheaply manufactured instruments of the period following the death of Stradivari; and before the end of the century these inferior varnishes had quite supplanted the old recipes.

Having regard to all these considerations it is not unreasonable to conclude that the varnish of the old instruments contributed probably the most important single element of their superiority in tone to their more modern copies. It must, however, be borne in mind that the instrument makers of the l6th and 17th centuries carried on a great and flourishing and a highly aveloped craft J and that their best creations owe their distinction largely to causes similar to those which produced the great art works of the same period. The violin makers had a lifelong training in their craft. The productions of the famous among them were eagerly sought after. Throughout western Europe the highest in the land were true amateurs of music, and vied with one another to secure the masterpieces of Brescia and Cremona. In such circumstances the trained judgment and wide experience of the craftsman were naturally concentrated upon securing the preliminary conditions of high excellence in his work: the choice of sound and handsome wood; perfection of design and workmanship; the composition of his varnish, and the utmost care and skill in applying it under the best conditions; and, not least important, time tor deliberate and thoughtful production. The masterpieces of that period were not constructed upon any exact or scientific system, but were the pro- ducts of development of a traditional craft working on empirical lines. Such theories of their construction as have been propounded are based on analysis of an already

perfected organism ; and careful historical research has revealed no record or trace of laws or rules by which the great makers worked.

Elaborate attempts have been made, notably by Savart early in the 19th century, to educe from experiments on the elasticities and vibration periods of various specimens of wood used in some of the older instruments an exact system for the adjustment of these factors to the production of the best results; but data obtained by experiments with test specimens of regular shape do not carry us very far when applied to so complex and irregular a structure as the violin. The vibrating plates of the violin are neither sym- metrical nor uniform in dimensions. They are not free plates, but are fixed round the whole edge of a very irregular outline; and these conditions, taken together with their unsym metrically arched form, held under pressure by the tension of the strings, establish a state of complex stresses under vibration which have so far escaped analysis. Their vibratory movements are moreover influenced by so many accessory features of the instrument, such as the bass-bar, already described, the reaction of the sound-post, and the different pres- sures by the two feet of the bridge, that it is impossible to figure closely the vibrations of any given area of the instrument. It is certainly very remarkable that so precise a pattern of irregular form should have been arrived at empirically, and should have survived as the standard, apparently for all time. Not only is the arch of the plates unsymmetrical in its longitudinal section, but, as is less commonly noticed, the upper bouts, especially in violins of the Cremona school, are slightly shallower than the lower; so that the edges of the belly are not strictly parallel to those of the back, but the two plates converge in the direction of the head. Probably the most successful attempts at analysing the vibrations of the violin have been those made by Sir William Huggins, by means of direct tactile observation with the finger holding a small rod of soft wood upon various spots on the surface of the vibrating plates. ■ By this method he made a number of observations partially con- firming, and in part correcting the determinations of previous investigators. He found that the position of maximum vibration of

the belly is close to the foot of the bridge, under the fourth string, while that of least vibration is exactly over the top of the sound-post. The back, which is strongly agitated, also has its point of least vibration where the sound-post rests upon it. With the sound-post removed the belly vibrated almost equally on both sides of its area, while the vibration of the back was very feeble, and the tone became very poor; supporting the view that in the complete instrument the vibrations of the back are derived from the belly mainly through the sound-post. Pressure on that point in the belly normally in contact with the top of the sound-pest partially restored the proper character though not the power of the tone; indicating the im- portant function of the sound-post in establishing a nodal point which largely

determines the normal vibration of the belly. Modifications of the material of which the sound-post was made produced a pro- found effect upon the quality, but comparatively small effect upon the power of the tone. Of the part played by the sides in trans- mitting vibrations from belly to back, the most important share is borne by the middle bouts, or incurved sides at the waist of the instrument.

Experiments made lately afford some interesting evidence as to the nature of the vibrations set up in a sounding-box in response to those of a string at various pitches and under various conditions of bowing. These observations were made on a monochord and restricted to one portion of a sounding-board of regular shape. Experiments on similar lines made with an actual violin body might throw further light upon the behaviour of that instrument as a resonator; but such researches entail prolonged investigation.

Two phenomena, familiar to violin players, are suggestive of further lines of research that may help to elucidate the problems of the localization of the principal responses in the body of the violin, and of the action of the wood under vibration. Many violins, especially old and inferior ones, fail to resonate clearly and fully to particular notes, the sounds produced being commonly known as " Wolf " notes; and these notes are, certainly sometimes and possibly always, associated with particular spots in the body of the instrument; for, if pressure be applied at these spots, the resonance of the respective " Wolf " notes is improved. This observation suggests that the region concerned has been cut, or has become disproportionately thin in relation to the normal thick- ness of the plate; and, when stimulated by the appropriate note, sets up a local system of vibrations, which interfere with, instead of sharing, the proper vibrations of the plate as a whole; this inter- fering vibration being damped by local pressure. These defects are said to develop with age and constant use, and to be minimized by the use of thin strings but aggravated by thick ones; a circum- stance which tends to support the hypothesis of thin regions in the plate, which might be expected to respond more truly to the vibra- tions of lighter, than to those of heavier strings. Detailed investi- gation of these phenomena on the lines of the experiments already referred to may have valuable results. Another well-known char- acteristic of the violin is that a new instrument, or one that has been long in disuse, is found to be " sleepy," that is, it fails to speak readily in response to the bow, a defect wdiich gradually disappears with use. Experiments made to test the effect of prolonged trans- verse vibrations upon strips of suitable wood have shown that such treatmer-t increases the flexibility of the wood, which returns to its normal degree of rigidity after a period of rest. No conclusive interpretation of these experiments has yet been offered ; but they indicate the probability of modifications of the internal viscosity of the wood, by molecular changes under the influence of continued vibratory movement.

The function of the bridge, as above mentioned, is to communicate the vibrations of the strings to the resonating body of the violin. This communication is made mainly, though not entirely, through the left foot of the bridge, which under the comparatively low tension of the G string rests with light pressure upon the belly, which at that point has accordingly greater freedom of movement' than under the other foot, in proximity to which the sound-post, extending from back to belly, maintains that region of the plates in a state of relative rigidity, under the high tension of the E string. The view, however, maintained by some writers that the right foot of the bridge communicates no vibrations directly to the belly is inaccurate. The main object of placing the sound-post some dis- tance behind, instead of immediately under, the bridge foot is to allow the belly under that foot to vibrate with some freedom. This has been proved by the destructive effect produced upon the tone by fixing the sound-post immediately under the foot of the bridge.

The form into which the bridge is fretted after the pattern devised by Stradivari has given rise to some speculation ; but the justifica- tion of this form is probably to be found in the explanation pro- pounded by Sir William Huggins, namely, that the strings, when agitated by the bow, vibrate in a plane oblique to the vertical axis of the bridge; the vibrations may be accordingly resolved into two components, one horizontal along the length of the bridge, the other vertical — that is, in a direction favourable for setting the belly into vibration across its lines of support.

It is advantageous to maintain simplicity in direction of the vibrations communicated to the body, and therefore to eliminate

the transverse vibrations before they reach the belly. This is accomplished by a certain lateral elasticity of the bridge itself, attained by under-cutting the sides so as to allow the upper half of the bridge to oscillate or rock from side to side upon its central trunk; the work done in setting up this oscillation absorbing the transverse vibrations above mentioned.

The function of the sound-post is on the one hand mechanical, and on the other acoustical. It serves the purpose of sustaining the greater share of the pressure of the strings, not so much to save the belly from yielding under that pressure, as to enable it to vibrate more freely in its several parts than it could do, if unsup- ported, under the etresses which would be set up in its substance by that pressure. The chosen position of the post, allowing some freedom of vibration under the bridge, ensures the belly's proper vibrations

being directly set up before the impulses are transmitted to the back through the sound-post: this transmission being, as already shown, its principal function- The post also by its contact with both vibrating plates is, as already shown, a governing factor in determining the nodal division of their surfaces, and its position therefore influences fundamentally the related states of vibration of the two plates of the instrument, and the compound oscillations set up in the contained body of air. This is an important element in determining the tone character of the instrument.

The immediate ancestors of the violins were the viols, which

were the principal bowed instruments in use from the end of the

15th to the end of the 17th century, during the latter

s ory ‘ part of which period they were gradually supplanted by the violins; but the bass viol did not go out of use finally until towards the later part of the iSth century, when the general adoption of the larger pattern of violoncello drove the viol from the field it had occupied so long. The sole survivor of the viol type of instrument, although not itself an original member of the family, is the double bass of the modern orchestra, which retains many of the characteristic features of the viol, notably the flat back, with an oblique slope at the shoulders, the high bridge and deep ribs. Excepting the marine trumpet or bowed monochord, we find in Europe no trace of any large bowed in- struments before the appearance of the viols; the bowed instruments of the middle ages being all small enough to be rested on or against the shoulder during performance. The viols probably owe their origin directly to the minnesinger fiddles, which possessed several of the typical features of the violin, as distinct from the guitar family, and were sounded by a bow. These in their turn may be traced to the ” guitar fiddle ” (q.v.), a bowed instrument of the 13th century, with five strings, the lowest of which was longer than the rest, and was attached to a peg outside the head so as to clear the nut and finger-board, thus providing a fixed bass, or bourdon. This instrument had incurved sides, forming a waist to facilitate the use of the bow, and was larger than its descendants the fiddles and violins. None of these earlier instruments can have had a deeper compass than a boy’s voice. The use of the fidel in the hands of the troubadours, to accompany the adult male voice, may explain the attempts which we trace in the 13th century to lengthen the oval form of the instrument. The parentage of the fiddle family may safely be ascribed to the rebec, a bowed instrument of the early middle ages, with two or three strings stretched over a low bridge, and a pear-shaped body pierced with sound-holes, having no separate neck, but narrowed at the upper end to provide a finger-board, and (judging by pictorial representations, for no actual example is known) surmounted by a carved head holding the pegs,

in a manner similar to that of the violin. The bow, which was short and clumsy, had a considerable curvature. So far it is justifiable to trace back the descent of the violin in a direct line; but the earlier ancestry of this family is largely a matter of speculation. The best authorities are agreed that stringed instruments in general are mainly of Asiatic origin, and there is evidence of the mention of bowed instruments in Sanskrit documents of great antiquity. Too much genealogical importance has been attached by some writers to similarities in form and construction between the bowed and plucked instruments of ancient times. They prob- ably developed to a great extent independently; and the bow is of too great and undoubted antiquity to be regarded as a development of the plectrum or other devices for agitating the plucked string. The two classes of instrument no doubt were

Discant Viol. Tenor VM. ™£ Gamba.

under mutual obligations from time to time in their develop- ment. Thus the stringing of the viols was partly adapted from that of the lute; and the form of the modern Spanish guitar was probably derived from that of the fidel.

The Italian and Spanish forms (ribeba, rabc) of the French name rebec suggest etymologically a relationship, which seems to find confirmation in the striking similarity of general appear- ance between that instrument and the Persian rebab, mentioned in the 1 2th century, and used by the Arabs in a primitive form to this day. The British crwth, which has been claimed by some writers as a progenitor of the violin, was primarily a plucked instrument, and cannot be accepted as in the direct line of ancestry of the viols.

The viol was made in three main kinds — discant, tenor and bass — answering to the cantus, medius and bassus of vocal music. Each of these three kinds admitted of some variation in dimensions, especially the bass, of which three distinct sizes ultimately came to be made — (i) the largest, called the concert bass viol; (2) the division or solo bass viol, usually known by its Italian name of viola da gamba; and (3) the lyra or tabla- ture bass viol. The normal tuning of the viols, as laid down in the earliest books, was adapted from the lute to the bass viol, and repeated in higher in- tervals in the rest. The fundamental idea, as in the lute, was that the outermost strings should be two octaves apart — hence the intervals §{= of fourths with a third in the middle. The highest, or discant viol, is not a treble but an alto instrument, the three viols answering to the three male voices. As a treble instrument, not only for street violf and dance music, but in orchestras, the rebec or geige did duty until the invention of the violin, and long after- wards. The discant viol first became a real treble instrument in the hands of the French makers, who converted it into the

quinton.

The earliest use of the viols was to double the parts of vocal concerted music; they were next employed in special composi- tions for the viol trio written in the same compass. Develop' Many such works in the form of " fantasies " or meat at " fancies," and preludes with suites in dance form, by thertols, the masters of the end of the 16th and 17th centuries, exist in manuscript; a set by Orlando Gibbons, which are good specimens, has been published by the English Musical Antiquarian Society. Later, the viols, especially the bass, were employed as solo instruments, the methods of composition and execution being based on those of the lute. Most lute music is in fact equally adapted for the bass viol, and vice versa. Li the 17th century, when the violin was coming into general use, con J structive innovations began which resulted in the abandonment of the trio of pure six-stringed viols. Instruments which show these innovations are the quinton and the viola d'amore. The first-mentioned is of a type intermediate between the viol and the violin. In the case of the discant and tenor viol the lowest string, which was probably found to be of little use, was aban- doned, and the pressure on the bass side of the belly thus con- siderably lightened. The five strings were then spread out, as it were, to the compass of the six, so as to retain the fundamental principle of the outer strings being two octaves apart. This was effected by tuning the lower halt of the instrument in fifths, as in the violin, and the upper half in Quinteor

fourths. This innovation altered the Treble Qumtm ' Tenor Quinto. tuning of the treble and tenor viols, thus — One half of the instrument was therefore tuned like a viol, the other half as in a violin, the middle string forming the division. The tenor viol thus improved was called in France the quinte, and the treble corresponding to it the quinton. From the numerous specimens which survive it must have been a popular instru- ment, as it is undoubtedly a substantially excellent one. The

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relief in the bass, and the additional pressure caused by the higher tuning in the treble, gave it greater brilliancy, without destroying the pure, ready and sympathetic tone which charac- terizes the viol. While the tendency in the case of the discant and tenor was to lighten and brighten them, the reverse process took place in that of the bass. The richer and more sonorous tones of the viola da gamba were extended downwards by the addition of a string tuned to double bass A. Marais, a French virtuoso, is usually credited with

this improvement; and this extended compass is recognized in the classical viola da gamba writings of Sebastian Bach and De Caix d'Hervelois. The result, however, was not universally satisfactory, for Abel used the six-stringed instrument; and the seven strings never came into general use in England, where the viola da gamba was more generally employed and survived longer than elsewhere.

The chief defect of the viols was their weakness of tone; this the makers thought to remedy in two ways: first by additional strings in unisons, fifths and octaves; and secondly by sympathetic strings of fine steel wire, laid under the finger- board as close as possible to the belly, and sounding in sympathy with the notes produced on the bowed strings. The sympathetic strings were attached to ivory pegs driven into the bottom block, and, passing through the lower part of the bridge, or over a very low bridge of their own, were stretched to pitch either by means of additional pegs or by wrest pins driven into, the sides of the head, and tuned with a key. Originally six, seven or eight wire strings were used, tuned to the diatonic scale of the piece to be performed. Later on a chromatic set of twelve was employed, and occasionally viols were made with twenty-four wire strings, two for each semitone in the scale. This system of reinforcement was applied to all the various sizes of viols in use during that period.

The improvements which resulted in the production of the violin proceeded on different lines. They consisted in increas- ing the resonance of the body of the instrument, by making it lighter and more symmetrical, and by stringing it more lightly. These changes transformed the body of the viol into that of the violin, and the transformation was completed by rejecting the lute tuning with its many strings, and tuning the instrument by fifths, as the fiddle had been tuned. The tenor viol appears to have been the first instrument in which the change was made, and thus the viola or tentr may probably be claimed as the father of the modern violin family. Violas were used in church music before the modern violin period, and violins as we know them were at first called " Piccoli Violini " to distinguish them from the earlier and larger instruments. A tenor viol of date 1500 is still extant, bearing in general out- line the typical features of the violin, as distinct from the viol family. This instrument was exhibited in 1872 in the Loan Exhibition of Musical Instruments at South Kensington with the label " Pietro Zanure, Brescia, 1509." From existing specimens we know that a bass violin, precursor of the violon- cello, with a tuning an octave below the tenor, appeared shortly after that instrument. A double bass violin, tuned B c . a fourth below the violon-

Tenor Violin. Violoncello. P ^>.„ ceUo am j usuaUy known as

the " basso da camera," com- pleted the set of instruments in violin shape;

but from the difficulty attending its manipulation it never came into general use. The celebrated double bass player, Dragonetti, occasionally used the basso da camera, and an English player named Hancock, who dispensed with the highest or E string, is still remembered for his performances on this unusual instrument. The tenor and violoncello are made on the same general model and principles as the violin, but with modifications. Tenor Both are, relatively to their pitch, made in smaller pro- vktlinand portions than the violin, because, if they were con- structed to dimensions having the same relation to pitch and tension of strings as the violin, they would Bot only have an overpowering tone but would be unmanageable

vMon- ceUo.

*from their size. These relatively diminished dimensions, both in the size of the instrument and in the thickness of the wood and strings, give to the tenor and violoncello a graver and more sympathetic tone. To some extent the reduced size is com- pensated by giving them a greater proportional height in the ribs and bridge; an increase hardly perceptible in the tenor, but very noticeable in the violoncello. To lighten the tension and thus allow greater freedom of vibration to the belly on the bass side, as with the lowest string of the violin, the two lowest of the- tenor and violoncello are made of thin gut, covered with fine metal wire; thus providing the necessary weight without inconvenient thickness. If the tension of the lowest string, or the two lowest strings, be increased, not only c™~f will they be elevated in pitch, but the violin will tora- *" produce a more powerful tone; if the bass string be lowered, the contrary will take place. By adapting the music to this altered tuning (scordatura) some novel effects are pro- duced. The following are the principal scordature which have been occasionally employed by various players:—*

Tartini, Biber.

Caatrucci. (Scotch Reels.)

Paganini.

The violoncello is less amenable to the scordatura than the violin; the only classical instance is the J

tuning employed by Bach in his fifth sonata, fcjj~ 5ˆ= which consists in lowering the first string by a ~£ tone. Bach.

The early Italian school is chiefly represented by the Brescian makers, Gaspar da Said, Giovanni Paolo Maggini, Giovita Rodiani and Zanetto Peregrino. It is, however, Barf somewhat misleading to denominate it the Brescian Italian school, for its characteristics are shared by the earliest

«•«”»• makers of Cremona and Venice. To eyes familiar with the geometrical curves of the later Cremona school, most of the violins of these makers have a rude and uncouth appearance. The height of the model varies; the pattern is attenuated; the /-holes share the general rudeness of design, and are set high in the pattern. Andreas Amati of Cremona, the eldest maker of that name, effected some improvements on this primitive model; but the violin owes most to his sons, Antonio and Geronimo, who were partners. They introduced the substantial improvements which developed the Brescian violin into the modern instrument. These improvements were in their inception probably of an artistic rather than a scientific nature. Painting and inlaying had long been employed in the decoration of stringed instruments; but the brothers Amati were the first who applied to the violin the fundamental law of decorative art, that the decorative and constructive elements should be blended in their conception: in other words, the construction should be itself decorative and the decoration itself constructive. Nicholas Amati (1 596-1684), son of Geronimo, made some slight improvements in the model, and his pupil Antonio Stradivari (1644-173 7) finally settled the typical Cremona pattern, which has been generally followed; for the majority of .violins since made, whether by good or bad makers, are copies of Stradivari. Besides the last-named, the following makers worked generally on the Amati model — Cappa, Gobetti, the Grancino family, Andreas Guarnieri and his son Giuseppe, the Ruggieri family and Serafin of Venice. The Bergonzi family, Alessandro Gagliano, the earlier members of the Gua- dagnini family, and Panormo were either pupils or followers of Stradivari. But excepting Carlo Bergonzi and Stradivari's two sons, Omobono' and Francesco, there is no evidence of*

any having actually worked with or for him, Landolfi, Storioni, and Carlo Giuseppe Testore, a pupil of Giovanni Grancino, leaned to the model of Giuseppe Guarnieri del Gesu. Some resemblances, especially in the matter of the varnish, are traceable between the works of makers who lived contemporaneously in the same town, e.g. in Naples, Milan and Venice.

A high model was adopted by Jacob Stainer of Absam, near Hall in Tirol, whose well-known pattern was chiefly followed by

*the makers of England, Tirol and Germany, down to English' the middle of the 18th century. It thenceforward fell a*rf into disuse, owing to the superior musical qualities of the*

Preach Cremona violin. The school of Stainer is represented by

Albani, Hornsteiner, the Klotz family (who made large numbers of instruments excellent in their kind), Schorn of Salz- burg and Withalm of Nuremberg, and others. The English makers may be divided into three successive groups: (1) an antique English school, having a character of its own (Rayman, Urquhart, Pamphilon, Barak Norman, Duke, of Oxford, &c); (2) imitators of Stainer, at the head of whom stands Peter Wamsley (Smith, Barrett, Cross, Hill, Aireton, Norn's, &c); (3) a later school who leaned to the Cremona model (Banks, Duke, of Holborn, Betts, the Forsters, Gilkes, Carter, Fendt, Parker, Harris, Matthew Hardie of Edinburgh, &c). The early French makers have little merit or interest (Bocquay, Gavinies, Pierray, Guersan, &c), but the later copyists of the Cremona models (Lupot, Aldric, Chanot the elder, Nicholas, Pique, Silvestre, Vuillaume, &c.) produced adˆ mirable instruments, some of which rank next in merit to the first-rate makers of Cremona.

The general form of the violin, as finally developed under the hands of the leading makers, resolved itself into two main types, the high and the flat models, of which the latter, on the lines ultimately adopted by Stradivari, has survived asthe most efficient pattern for ail modern instruments. The distinction is one of degree only, the maximum difference of actual measurement in extreme cases amounting to little more than a quarter of an inch in the convexity of the belly above ihe top line of the ribs; but the difference in character of tone of the two types is, in the main, well marked. Speaking generally, the tone of the high-built instru- ment is less powerful and sweeter, and it speaks more readily, but responds less completely to gradations of tone under the action of the bow than the flatter type, which, yields a tone of greater carrying power and flexibility, susceptible to more subtle variation by the player, and with a peculiar penetrating quality lacking in the highly arched model. These differences in tone probably depend less upon any direct effect of variations in depth of the sounding- box than on the incidental effects of cutting the wood to the higher or lower arch; for it would seem that the best results in tone have been attained in instruments with a fairly constant volume of contained air, the depth of the sides being roughly in inverse pro- portion to the height of arch in the best examples of the different models. In the high-cut arch the fibres of the wood on the upper surface are necessarily cut shorter, with the result that the plate as a whole does not vibrate so perfectly as in the flatter model, and this has a weakening effect on the tone. Again, the higher arch, with steeper curves towards the sides, necessitates the inclina- tion of the sound-holes at a considerable angle to the main horizontal plane of the instrument; and it is conceivable that, under such con- ditions, the vibrations of the upper layer of air within the body are dissipated too readily, before the composite vibrations of the whole mass of air inside the

instrument have attained their full harmonic value. Apart from these acoustical considerations, the question is probably one of material, the flatter construction demanding the use of a very strong and elastic wood in relation to the most suitable thickness, in order to withstand the pressure of the bridge, a resistance which the higher arch renders possible with a stiffer and more brittle material; and the effect of these qualities upon tone must be taken into account in estimating the tone characters of the two types of instrument.

Broadly speaking, the higher-arched type found favour with the earlier makers up to- the end of the Amati period. Stainer in Tirol inclined particularly in the direction of this model, which he appears to have developed on independent lines, the tradition that he learnt his craft from the Amati being no longer tenable. The flatter model was gradually evolved by Stradivari as he outgrew the immediate influence of the Amati and developed on his own incomparable lines a somewhat larger and more powerful instru- ment, adapted to the requirements of the increasing class of solo players.

The violins as a distinctive family of instruments cannot

be fully discussed without reference to the bow (q.t.) as an essential adjunct, on account of the very important r . . part taken by the bow in determining, as already mentioned, the peculiar form of the vibrations of the string, and in controlling, in the hand of a skilled player, the subtle gradations of tone produced from the instrument. The evolu- tion of the modern bow has taken place almost entirely since the violin attained its final form, and has followed, more completely perhaps than the instrument itself, the develop- ment of violin music and the requirements of the player. It reached its highest perfection at the hands of the celebrated Frangois Tourte of Paris, about 1780, whose bows have served as a model for all succeeding makers, even more exclusively than the violins of Stradivari controlled the pattern of later instruments; and at the present time Tourte bows are valued beyond any others.

For more than 250 years the violin and its larger brethren have held the leading position among musical instruments. For them have been written some of the most inspired works of the great musicians. Famous composers, such as Tartini, Corelli, Spohr and Viotti have been great violinists, and by their compositions, as much as by their talents as virtuosi, have largely developed the capacity of the violin as a vehicle of profound musical expression. To the listener the violin speaks with an intensity, a sympathy, and evokes a thrill of the senses such as no other instrument can produce. For the player it seems to respond to every pulse of his emotions.

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VIOLLET, PAUL MARIE (1840-), French historian, was born at Tours on the 24th of October 1840. After serving his native city as secretary and archivist, he became archivist to the national archives in Paris in 1866, and later librarian to the faculty of law. In 1890 he was appointed professor of civil and canon law at the ecole des chartes. His work mainly concerns the history of law and institutions, and on this subject he published two valuable and scholarly books — Droit public: Histoire des institutions politiques et administratives de la Francs (1890-98), and Precis de Vkistoire du droit francais (1886).

V10LLET-LE-DUC, EUGENE EMMANUEL (1814-1879), French architect and writer on archaeology, was born in Paris on the 21st of January 1814. He was a pupil of Achille Leclere, and in 1836-37 spent a year studying Greek and Roman architecture in Sicily and Rome. His chief interest was, however, in the art of the Gothic period, and, like Sir Gilbert Scott in England, he was employed to "restore " some of the chief medieval buildings of France, his earliest works being the abbey church of Vezelay, various churches at Poissy, St Michel at Carcassonne, the church of Semur in Cote-d'Or, and the fine Gothic town halls of Saint-Antonin and Narbonne, all carried out between 1840 and 1850. From 1845 to 1856 he was occupied on the restoration of Notre Dame in Paris in conjunction with Lassus, 1 and also with that of the abbey of St Denis. In 1849 he began the restoration of the fortifications of Carcassonne and of Amiens cathedral; and in later years he restored Laon cathedral, the chateau of Pierrefonds, and many other important buildings. He was an intimate friend of Napoleon III., and during the siege of Paris (1871) gave valuable help as an engineer to the beleaguered army. He held many important offices, both artistic and political, and was for many years inspector-general of the ancient buildings throughout a large part of France. His last work was the general scheme

1 He published in 1867-69 a fine work showing his not very successful coloured decoration applied to the chapels of Notre Dame.

for the Paris exhibition buildings in 1878. He died on the 17th of September 1879 at Lausanne.

As a designer Viollet-le-Due occupied only a secondary place; but as a writer on medieval architecture and the kindred arts he takes the highest rank. His two great dictionaries are the standard works in their class, and are most beautifully illustrated with very skilful drawings by his own hand. Viollet- le-Duc was a man of the most varied and brilliant .abilities, endowed with a power of work which has seldom been equalled. He was at once an artist, a man of science, a learned archaeologist and a scholar. The map m his Le Massif du Mont Blanc, showing the rock contours and the glaciers of Mont Blanc, is a model of its kind, which combines great artistic beauty with the accuracy of the most skilful engineer. His strong poetical fancy enabled him to reconstruct the life and buildings of the middle ages in the most vivid way.

His principal literary works were the Dictionnaire de I' architecture francaise du XI. au XVI. siecle (1854-68); Dictionnaire du mobilier francais (1858-75); V Architecture militaire au moyen Age (1854); Entretiens sur I 'architecture (1863-72) ; Cites et mints americaines (1863) ; Memoirs sur la defense de Paris (1871) ; Habitations modernes (1874-77); Histoire d'une maison (1873) ; Histoire d'une forteresse (1874); Histoire de V habitation humaine (1875); Le Massif du Mont Blanc (1876) ; L'Art russe (1877) ; Histoire d'un hotel-de-mlle et d'une cathedrale (1878) ; La Decoration appliquee aux edifices (1879); as well as many minor works dealing with separate buildings.

VIOLONCELLO (Fr. violoncelle, Ger. Violoncell, Ital. violon- cello), the bass member of the violin family. Although the word violoncello is a diminutive, signifying " small violone," or double bass, the instrument is really a bass violin, formed on a different model from the violone, which has the sloping shoulders and flat back of the viol family, whereas those of the violoncello are rounded as in the violin. The construction of the violoncello is therefore the same as that of the violin (q.v.) but on a much larger scale. It is either held, on account of its size, between the performer's knees, or rests on the floor supported on a foot or spike.

VIONVILLE, a village of Lorraine, between Metz and the French frontier, celebrated as the scene of the battle of Vion- ville (Rezonville or Mars-la-Tour), fought on the 16th of August 1870 between the French and the Germans (see Metz and Franco-German War).

VIOTTI, GIOVANNI BATTISTA (1753-1824), Italian violinist and musical

composer, was born at Fontanetto in the province of Turin on the 23rd of May 1753. He learned the rudiments of music from his father, a blacksmith who played the horn; and in 1764 Giovannini taught him the violin for a year. Two years later he was placed at the cost of the prince de la Cis^erne under the violinist G. Pugnani at Turin, where he became violinist in the court chapel. In 1780 Viotti, having already made himself a name, travelled through Germany and Poland to Russia, where the empress Catherine honoured him with marks of extraordinary favour. He next appeared in London, in company with Pugnani, and at once achieved a brilliant and lasting reputation. In 1782 he was equally successful in Paris. Two years later he was appointed leader of the prince de Soubise's private orchestra; and in 1788 he undertook the direction of the opera, raising the perfor- mances, with Cherubim's assistance, to a very high level. He had also started an Italian opera in co-operation with the barber Leonard, which was opened in 1780 in the Tuileries, being subsequently amalgamated with the Theatre de la Foire St Germain in 170c and finally merged in the new Theatre Feydeau in 1791.,. In 1791 the Revolution compelled Viotti to fly to London, where he took part in the Hanover Square concerts; but being suspected to be an agent of the Revolu- tionary Committee in Paris he was compelled to retire for a time to the neighbourhood of Hamburg, which he subsequently quitted, although the date of his departure, often given as 1795, does not seem probable. It is possible that he was already in 1794 in London, where he took shares in a wine business, and he resided almost uninterruptedly there until 1819, when

he once more settled in Paris, resumed the direction of the opera, and retired in 1822 with a pension. He died in London on the 10th (or 3rd) of March 1824.

Viotti ***s playing was distinguished by an extreme purity of style*** *a magnificent tone, and an inexhaustible variety of poetical and imaginative expression. Among his works are 29 violin concertos, a series of symphonies concertantes for two violins, 45 duos, 18 trios and 21 quartets, and a great number of sonatas, notturnos and other instrumental works. His school was worthily perpetu- ated by his pupil Rode.*

VIPER. The vipers constitute a family of Old- World poisonous snakes, with a pair of poisonous fangs in the maxillary bones, which are short and movable. The main anatomical features are described in the article Snakes. In the present article only the Viperinae, namely those without an external pit between the eye and the nose, are described. Pit vipers, or Crotalinae, are treated under Snakes, and those which are possessed of a rattle under Rattlesnake. The true vipers comprise about nine genera with some forty species, which can be distinguished as follows:—

Causus in Africa, and Azemiophis feae in Burma, are the only vipers which have the head covered with large symmetrical shields, while in the other genera the head shields are broken up into small shields, or into still more numerous scales. C. rhombeatus, common from the Gambia to the Cape.

Atractaspis, small burrowing snakes in Africa, without post- frontal bones.

Echis and Atheris have only one row of subcaudal shields. £. carinata, scarcely exceeding 20 in. in length, is very poisonous and easily overlooked on account of its light brown coloration, with pale spots and delicate markings on the keels of the scales of the back. It is a desert type, having the lateral scales strongly keeled and directed downwards, by means of which it shuffles itself into the sand; by folding itself and rubbing the scales together

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Fig. 1. — Echis carinata. The " Krait " of India, it produces a rustling sound. It ranges from India, where it is known as the " Krait," called " Kuppur " in Sind, through North Africa. This desert type is replaced farther south in Africa, where vegeta- tion flourishes, by the closely allied genus, Atheris, which, however, possesses a prehensile tail and vivid coloration and has assumed truly arboreal habits.

Cerastes is another desert form, but is restricted to Africa; the arrangement of the scales of the sides of the body is similar to that of

VIRBIUS

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Echis, but it has two rows of subcaudals, C. comutus, the " horned viper " of North Africa, irom Algeria to Palestine, has a large horny spike above each eye. This, the " Efa " of the Arabs, buries itself in the sand, with only the eyes, nostrils and the horns appearing above the surface. It attains a length of 2\ ft. C. vipera is hornless. Bitis s. Echidna s. Clotho has two rows of shields on the underside of the very short tail; the thick head is much depressed, like the body. The nasal shields arc separated from the rostral by small scales, otherwise much resembling the genus Vipera. B, arietans, the " puff-adder" of nearly the whole of Africa, an ugly, very dangerous brute growing to a length of 4 or 5 ft. B. naHcornis, the West African nose-horned viper, has a pair of erectile scales on the nose. Scarcely smaller and less bulky than the puff-adder and just as poisonous, it is yet very handsomely marked with a series of large pale, dark-edged spots and oblique crosses on a purplish or reddish brown ground. Especially handsome are the young, which at birth are as much as 1 ft. in length. On

one occasion one of these snakes, after giving birth to twenty-one young (which bit and killed mice within five minutes of being born), became very ill-tempered, and when two adult males were placed in her cage she bit one with such violence as to break off one of her fangs, which she left, about three-quarters of an inch in length, sticking

Fig. 2. — Atheris burtoni. (Length, 12 in.)

in his back. He, however, appeared not to suffer the slightest inconvenience, and was never the worse tor it (see Proc. Z00L Soc 1871, p. 638).

Vipera. — The head is covered with small scales and a few larger shields. The eye is separated from the labials by small scales; the nasals are in contact with the rostral shield or separated by one naso-rostral. The scales of the body are strongly keeled; two'rows of subcaudals on the short tail. This genus of about ten species with numerous local varieties ranges over Europe, Asia and the greater part of Africa.

V. berus, the common European viper, ranging from Wales to Saghalien Island and from Caithness to the north of Spain, from the northern boundary of Persia to beyond the Arctic circle in Scandinavia. _ It inhabits all sorts of situations, but prefers heaths, moors and mixed woods with sunny slopes. It ascends the Alps up to 6000 or 7000 ft. The coloration is very variable, grey, brown, reddish or entirely black specimens occurring in the same country. The much-spoken-of black zigzag line along the back is so often indistinct, that it cannot be relied upon as a safe character. The full-grown males are smaller than the females, and have usually darker markings and a lighter ground colour. A specimen which is 2 ft. long is rare, and is invariably a female. The chief food is mice,

which are hunted after sunset. They cannot climb and they avoid going into water. The pairing takes place from March to May

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Fig. 3. — Bitis nasicornis.

and the young are born about four months later. During the pairing, and for hibernation, they often collect in considerable numbers. Whilst most snakes readily take proper food in cap- tivity, these vipers prefer starving themselves to death, a feat which they accomplish within six to nine months according to conditions. As a rule their bite is not fatal to man, but the consequences are often serious and protracted. For treatment see Snakes.

V. aspis is the more southern and western continental European viper; it is slightly snub-nosed, and this feature is still more pro- nounced in V. laiasiei of Spain and Portugal. In V. ammodytes of south-eastern Europe the raised portion is produced into a soft, scaly appendage.

V. russelli, the " Daboia," is one of the most poisonous snakes of India, Ceylon, Java, Burma and Siam. It is pale brown with three longitudinal series of black, light-edged rings which sometimes encircle reddish spots. It grows to a length of about 5 ft.

(H. F. G.)

VIRBIUS, an old Italian divinity, associated with the worship of Diana at Aricia (see Diana). Under Greek influence, he was identified with Hippolytus (q-v-), who after he had been trampled to death by the horses of Poseidon was restored to life by Asclepius and removed by Artemis to the grove at Aricia, which horses were not allowed to enter. Virbius was the oldest priest of Diana, the first " king of the grove " (Rex Nemorensis). He is said to have established the rule that any candidate for the office should meet and slay in single combat its holder at the time, who always went about armed with a drawn sword in anticipation of the struggle. Candidates had further to be fugitives (probably slaves), and as a preliminary had to break off a bough from a specified tree. By the eponymous nymph Aricia, Virbius had a son of the same name, who fought on the side of the Rutulian Turnus against Aeneas. J. G. Frazer formerly held Virbius to be a wood and tree spirit, to whom horses, in which form tree spirits were often represented, were offered in sacrifice. His identification with Hippolytus and the manner of the latter's death would explain the exclusion of horses from his grove. This spirit might easily be confounded with the sun, whose power was supposed to be stored up in the warmth- giving tree. Sauer (in Roscher's Lexikon) also identifies

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VIRCHOW

Hippolytus with the " health-giving sun," and Virbius with a healing god akin to Asclepius. Frazer's latest view is that he is the old cult associate of Diana of Aricia (to whom he is related as Attis to Cybele or Adonis to Venus), the mythical predecessor or archetype or the kings of the grove. This grove was probably an oak grove, and the oak being sacred to Jupiter, the king of the grove (and consequently Virbius) was a local form of Jupiter. A. B. Cook suggests that he may be the god of the stream of Nemi.

See Virgil, Aen. vii. 761 and Servius, ad loc, Ovid, Fasti, iii. 265, vi. 737,

Metam. xv. 497; Suetonius, Caligula, 35; Strabo, v. p. 239; G. Wissowa, Religion und Kultus der Rbmer (1902), according towhom Virbius was a divinity who assisted at childbirth (cp. the nixi di); J. G. Frazer, Golden Bough (1900), ii. p. 313, iii. p. 4.56. and Early History of the Kingship (1905), pp. 24, 281 ; A. B. Cook in Classical Review, xvi. p. 372.

VIRCHOW, RUDOLF (1821-1902), German pathologist and politician, was bom on the 13th of October 1821 at Schivelbein, in Pomerania, where his father was a small farmer and shopkeeper. As a boy he attended the Volkssckule of his native village, and at the age of seventeen, having passed through the gymnasium of Koslin, went to Berlin to study medicine. He took his doctor's degree in 1843, and almost immediately received an appointment as assistant-surgeon at the Charite 1 Hospital, becoming pro-rector three years later. In 1847 he began to act as Privatdozent in the university, and founded with Reinhardt the Archiv fiir pathologische Anatomie und Physiologic, which, after his collaborator's death in 1852, he carried on alone, and in 1848 he went as a member of a government commission to investigate an outbreak of typhus in upper Silesia. About the same time, having shown too open sympathy with the revolu- tionary or reforming tendencies of 1848, he was for political reasons obliged to leave Berlin and retire to the seclusion of Wurzburg, the medical school of which profited enormously by his la'jours as professor of pathological anatomy, and secured a wide extension of its reputation. In 1856 he was recalled to Berlin as ordinary professor of pathological anatomy in the university, and as director of the Pathological Institute formed a centre for research whence has flowed a constant stream of original work on the nature and processes of disease. On the 14th of October 1901 his eightieth birthday was celebrated in Berlin amid a brilliant gathering of men of science, part of the ceremonies taking place in the new Pathological Museum, near the Charite, which owes its existence mainly to his energy and powers of organization. On that occasion all Europe united to do him honour, many learned societies sent delegates to express their congratulations, the king of Italy gave him his own portrait on a gold medallion, and among the numerous addresses he received was one from Kaiser Wilhelm II., who took the oppor- tunity of presenting him with the Grand Gold Medal for Science. In the early part of 1902 he slipped from a tramcar in Berlin and fractured his thigh; from this injury he never really recovered, and his death occurred in Berlin on the 5th of September 1902.

Wide as were Virchow's studies, and successful as he was in all, yet the foremost place must be given to his achievements in pathological investigation. He may, in fact, be called the father of modern pathology, for his view, that every animal is constituted by a sum of vital units, each of which manifests the characteristics of life, has almost uniformly dominated the theory of disease.since the middle of the 19th century, when

it was enunciated. The beginnings of his doctrine of cellular pathology date from the earliest period in his career. When, towards the end of his student-days in Berlin, he was acting as clinical assistant in the eye department of the Berlin Hospital, he noticed that in keratitis and corneal wounds healing took place without the appearance of plastic exudation. This observation led him to further work, and he succeeded in showing that in vascular organs the presence of cells in inflammatory exudates is not the result of exudation but of multiplication of pre-existing cells. Eventually he was able to prove that the biological doctrine of omnis cellula eceUtda applies to pathological processes as well as to those of normal growth, and in his famous book on

Cdlular-pathologie, published at Berlin in 1858, he established what Lord Lister described as the " true and fertile doctrine that every morbid structure consists of cells which have been derived from pre-existing cells as a progeny." But in addition to bringing forward a fundamental and philosophical view of morbid pro- cesses, which probably contributed more than any other single cause to vindicate for pathology the place which he claimed for it among the biological sciences, Virchow made many important contributions to histology and morbid anatomy and to the study of particular diseases. The classification into epithelial organs, connective tissues, and the more specialized muscle and nerve, was largely due to him; and he proved the presence of neuroglia in the brain and spinal cord, discovered crystalline haematoidine, and made out the structure of the umbilical cord. Medical science further owes to him the classification of new growths on a natural histological basis, the elucidation of leucaemia, glioma and lardaceous tumours, and detailed investigations into many diseases — tuberculosis, pyaemia, diphtheria, leprosy, typhus, &c. Among the books he published on pathological and medical subjects may be mentioned Vorlesungen uber Pathologic, the first volume of which was the Cellular-pathologie (1858), and the remaining three Die Kran-khaften Geschwillste (1863-67); Hand- buch der speziellen Pathologic und Therapie (3 vols., 1854-62), in collaboration with other German surgeons; Gesammelte Abhand- lungen zur wisscnschaftlichen Medizin (1856); Vier Reden Uber Leben und Kranksein (1862) ; Untersuchungen uber die Entwick- lung des Schddelgrundes (1857); Lekre von den Trichinen (1865); Ueber den Hunger-typhus (1868); and Gesammelte Abhandlungen aus dem Gebiete der offentlichen Medizin und der Seuchenlehre (1879). In England his pathological work won general recogni- tion. The Royal Society awarded him the Copley medal in 1892, and selected him as Croonian lecturer in the following year, his subject being the position of pathology among the biological sciences; and in 1898 he delivered the second Huxley memorial lecture at Charing Cross Hospital.

Another science which Virchow cultivated with conspicuous success was

anthropology, which he did much to put on a sound critical basis. At the meeting of the Naturforscherversammlung at Innsbruck in 1869, he was one of the founders of the German Anthropological Society, of which he became president in the following year; and from 1869 onwards he presided over the Berlin Anthropological Society, also acting as editor of its pro- ceedings in the Zeiischrift fiir Ethnologic. In ethnology he published a volume of essays on the physical anthropology of the Germans, with special reference to the Frisians; and at his instance a census, which yielded remarkable results, was carried out among school children throughout Germany, to determine the relative distribution of blondes and brunettes. His archaeo- logical work included the investigation of lake dwellings and other prehistoric structures; he went with Schliemann to Troy in 1879, fruits of the expedition being two books, ZurLandeskunde der Troas (1880) and Alt-trojanische Graber und Schadel (1882); in 1881 he visited the Caucasus, and on his return published Das Grdberfeld von Koban im Lande der Osseten; and in 1888 he accompanied Schliemann to Egypt, Nubia and the Peloponnese.

As a politician Virchow had an active career. In 1862 he was elected a member of the Prussian Lower House. Professing advanced Liberal and democratic views, he was a founder and leader of the Fortschrittspartei, and the expression Kultur- kampf had, it is believed, its origin in one of .his electoral manifestoes. For many years he was chairman of the finance committee, and in that capacity may be looked upon as a chief founder of the constitutional Prussian Budget system. In 1880 he entered the Reichstag as representative of a Berlin constituency, but was ousted in 1893 by a Social Democrat. In the Reichstag he became the leader of the Opposition, and a vigorous antagonist to Bismarck. In the local and municipal politics of Berlin again he took a leading part, and as a member of the municipal council was largely responsible for the trans- formation which came over the city in the last thirty years of the 19th century. That it has become one of the healthiest cities in the world from being one of the urihealthiest is

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attributable in great measure to his insistence on the necessity of sanitary reform, and it was his unceasing efforts that secured for its inhabitants the drainage system, the sewage farms and the good water-supply, the benefits of which are reflected in the decreased death-rate they now enjoy. In respect of hospitals and the treatment of the sick his energy and know- ledge were of enormous advantage to his country, both in times of peace and of war, and the unrivalled accommodation for medical treatment possessed by Berlin is a standing tribute to his name, which will be

perpetuated in one of the largest hospitals of the city.

Of his writing on social and political questions may be mentioned Die Erzizhung des IVeibes (1865) ; Uebzr die national Entwicklung und Bedeutung der Naturwissenschaften (1865) ; Die A-ufgaben der Naturwissenschaften in dem neuen nationalen Leben Deutschlands (1871); Die Freiheit der Wissenschaft im modernen Stoat (1877), in which he opposed the idea of Haeckel — that the principles of evolution should be taught in elementary schools — on the ground that they were not as yet proved, and that it was mischievous to teach a hypothesis which still remained in the speculative stage.

See Lives by Becher (Berlin, 1894) and Pagel (Leipzig, 1906) ; Rudolf Virr,how als Palholog by Marchand (Munich, 1902); Rudolf Virchovj als Arzt by Ebstein (Stuttgart, 1903) ; Gedachtnisrede auf R. Virchow (Berlin, 1903) ; and Briefs Virchows an seine Eltcrn 183Q-1864, by Marie Rabl (Leipzig, 1907). A bibliography of his works was published at Berlin in 1901.

VIRE, a town of north-western France, capital of an ar- rondissement in the department of Calvados, 47 m. S.W. of Caen by rail. Pop. (1906) 6228. Vire stands on an eminence surrounded on three sides by the Vire and crowned by the remains of a 12th-century chateau. The church of Notre Dame (13th to 15th century), and the picturesque Tour de l'Horloge (r3th century), beneath which runs the chief street, are the principal buildings. A library and a small museum with good collections of porcelain, pictures and curiosities, are installed in the town hall (17th and 18th centuries). In the public garden there is a statue of Marshal Jacques Goyon, comte de Matignon (1525-1597); and the native poets C. J. L. Chenedolle and P. L. R. Castel are represented, the former by a marble bust, the latter by a bronze statue. Vire grew up around a castle built in the 12th century by Henry I. of England, and in the middle ages was one of the important strongholds of Normandy. South-west of the town is the gorge called Vaux-de-Vire, in which was situated the mill of Olivier Basselin (15th century), the fuller and reputed author of the satiric songs, hence known as "vaudevilles" (see Basselin, Olivier).

VIRELAY, the title applied to more than one fixed form of verse, from the French virer, to turn or veer. The history and exact character of the virelay are more obscure than those of any other of the old French forms. It is possible that it is connected with the Provencal ley. Historians of poetry have agreed in stating that it is a modification of the medieval lai, but it is curious that no example of the lai is forthcoming, except the following, which was first printed by the Pere Mourgues in his Traite de la Poesie : —

” Sur l’appui du Monde Que faut-il qu’on fonde D’espoir?

Cette mer profonde Et debris feconde Fait voir

Calme au matin l’onde Et Forage y gronde Le Soir. ‘

But this appears to be, not a complete poem, but a fragment of a virelay, v.‘hich proceeds by shifting or ” veering ” the two rhymes to an extent limited only by the poet’s ingenuity. This is the Old Virelay (virelai ancien), of which examples have been rare in recent literature. There is, however, a New Virelay {virelai nouveau), the newness of which is merely relative, since it was used by Alain Chartier in the 15th century. In French the old and popular verses beginning —

” Adieu vous dy triste Lyre, C’est trop appreter a rire,”

form a perfect example of the New Virelay, and in English we have at least one admirable specimen in Mr Austin Dohson’s “July”-

” Good-bye to the Town! good-bye! Hurrah! for the sea and the sky! ”

The New Virelay is entirely written on two rhymes, and begins with two lines which arc destined to form recurrent refrains throughout the whole course of the poem, and, reversed in order, to close it with a couplet. The virelay is a vaguer and less vertebrate form of verse than the sonnet, the ballad or the villanelle, and is of less importance than these in the history of prosody. (E. G.)

VIRGIL (Publius Vekgilius Maro), the great Roman poet, was born on the 15th of October in the year 70 B.C., on a farm on the banks of the Mincio, in the district of Andes, not far from the town of Mantua. In the region north of the Po a race of more imaginative susceptibility than the people of Latium formed part of the Latin-speaking population. It was favourable to his development as a national poet that he was born and educated during the interval of comparative calm between the first and second civil wars, and that he belonged to a generation which, as the result of the social war, first enjoyed the sense of an Italian nationality. Yet it was only after Virgil had grown to manhood that the province to which he belonged obtained the full rights of Roman citizen- ship. It is remarkable that the two poets whose imagination seems to have been most powerfully possessed by the spell of Rome — Ennius and Virgil — were born outside the pale of Roman citizenship.

The scenery familiar to his childhood, which he recalls with affection both in the Eclogues and the Georgics, was that of the green banks and slow windings of the Mincio and the rich pastures in its neighbourhood. Like his

friend and contem- porary Horace, he sprung from the class of yeomen, whose state he pronounces the happiest allotted to man and most conducive to virtue and piety. Virgil, as well as Horace, was fortunate in having a father who, though probably uneducated himself, discerned his genius and spared no pains in giving it the best culture then obtainable in the world. At the age of twelve he was taken for his education to Cremona, and from an expression in one of the minor poems attributed to him, about the authenticity of which there cannot be any reasonable doubt, it may be inferred that his father accompanied him. Afterwards he removed to Milan, where he continued engaged in study till he went to Rome two years later. The time of his removal to Rome must have nearly coincided with the publication of the poem of Lucretius and of the collected poems of Catullus.

After studying rhetoric he began the study of philosophy under Siron the Epicurean. One of the minor poems written about this time in the scazon metre tells of his delight at the immediate prospect of entering on the study of philo- sophy, and of the first stirring of that enthusiasm for philosophical investigation which haunted him through the whole of his life. At the end of the poem, the real master- passion of his life, the charm of the Muses, reasserts itself {Catateplon v.).

Our next knowledge of him is derived from allusions in the Eclogues, and belongs to a period nine or ten years later. Of what happened to him in the interval, during which the first civil war took place and Julius Caesar was assassinated, we have no indication from ancient testimony or from his own writings. In 42 B.C., the year of the battle of Philippi, we find him " cultivating his woodland Muse " under the protection of Asinius Pollio, governor of the district north of the Po. In the following year the famous confiscations of land for the benefit of the soldiers of the triumvirs took place. Of the impression produced on Virgil by these confiscations, and of their effect on his fortunes, we have a vivid record in the first and ninth eclogues. Mantua, in consequence of its vicinity to Cremona, which had been faithful to the cause of the re- public, was involved in this calamity; and Virgil's father was

driven from his farm. By the influence of his powerful friends, and by personal application to the young Octavian, Virgil obtained the restitution of his land. In the meantime he had taken his father and family with him to the small country house of his old teacher Siron (Catalepton x.).

Soon afterwards we hear of him living in Rome, enjoying, in addition to the

patronage of Pollio, the favour of Maecenas, intimate with Varius, who was at first regarded as the rising poet of the new era, and later on with Horace. His friendship with Gallus, for whom he indicates a warmer affection and more enthusiastic admiration than for any one else, was formed before his second residence in Rome, in the Cisalpine province, with winch Gallus also was connected both by birth and office. The pastoral poems, or " eclogues," commenced in his native district, were finished and published in Rome, probably in 37 B.C. Soon afterwards he withdrew from habitual residence in Rome, and lived chiefly in Campania, either at Naples or in the neighbourhood of Nola. He was one of the companions of Horace in the famous journey to Brundisium; and it seems not unlikely that, some time before 23 B.C., he made the voyage to Athens which forms the subject of the third ode of the first book of the Odes of Horace. ft

The seven years from 37 to 30 B.C. were devoted to the com- position of the Georgics. In the following year he read the poem to Augustus, on his return from Asia. The remaining years of his life were spent on the composition of the Azneid. In 19 B.C., after the Aeneid was finished but not finally corrected, he set out for Athens, intending to pass three years in Greece and Asia and to devote that time to perfecting the poem. At Athens he met Augustus, and was persuaded by him to return with him to Italy. While visiting Megara under a burning sun, he was seized with illness, and, as he continued his voyage without interruption, he grew rapidly worse, and died on the 21st of September, in his fifty-first year, a few days after landing at Brundisium. In his last illness he called for the cases con- taining his manuscripts, with the intention of burning the Aeneid. He had previously left directions in his will that his literary executors, Varius and Tucca, should publish nothing of his which had not already been given to the world by himself. This pathetic desire that the work to which he had given so much care, and of which such great expectations were formed, should not survive him has been used as an argument to prove his own dissatisfaction with the poem. A passage from a letter of his to Augustus is also quoted, in which he speaks as if he felt that the undertaking of the work had been a mistake. This dissatisfaction with his work may be ascribed to his passion for perfection of workmanship, which death prevented him from attaining. The command of Augustus overrode the poet's wish and rescued the poem.

Virgil was buried at Naples, where his tomb was long regarded with religious veneration. Horace is our most direct witness of the affection which he inspired among his contemporaries. The qualities by which he gained their love were, according to his testimony, candor — sincerity of nature and goodness of heart — and pittas — the union of deep affection for kindred, friends and country with a spirit of reverence. The statement of his biographer, that he was known in Naples by the name " Par-

thenias," is a testimony to the exceptional purity of his life in an age of licence. The seclusion of his life and his devotion to his art touched the imagination of his countrymen as the finer qualities of his nature touched the heart of his friends. It had been, from the time of Cicero, 1 the ambition of the men of finest culture and most original genius in Rome to produce a national literature which might rival that of Greece; and the feeling that at last a poem" was about to appear which would equal

1 Cf. Tusc. Disp. ii. 2 : " Quamobrem hortor omnes qui f'icereid possunt, ut hujus quoque generis laudem jam languenti Graeciae eripiant," &c. These words apply specially to philosophical litera ture, but other passages in the same and in other works imply that Cicero thought that the Romans had equal aptitudes for other de- partments of literature; and the practice of the Augustan poets in each appropriating to himself a special province of Greek literary art seems to indicate the same ambition.

or surpass the greatest among all the works of Greek genius found a voice in the lines of Properlius —

." Cedite Roman! scriptotes, cedite Graii; Ncscio quid majus nascitur Iliade."

The feeling of his countrymen and contemporaries seems justified by the personal impression which he produces on modern readers— an impression of sanctity, as of one who habitually lived in a higher and serener sphere than that of this world. The veneration in which his name w T as held during the long interval between the overthrow of Western civilization and the revival of letters affords testimony of the depth of the impression which he made on the heart and imagination of the ancient world. The traditional belief in his pre-eminence has been on the whole sustained, though not with absolute una- nimity, in modern times. By the scholars and men of letters of the 16th, 17th and 18th centuries it was never seriously questioned. During the first half of the 19th century his right to be ranked among the great poets of the world was disputed by some German and English critics.

The effect of this was a juster estimate of Virgil's relative position among the poets of the world. It may still be a matter of individual opinion whether Lucretius himself was not a more powerful and original poetical force, whether he does not speak more directly to the heart and imagination of our own time. But it can hardly be questioned, on a survey of Roman litera- ture, as a continuous expression of the national mind, from the age of Naevius to the age of Claudian, that the position of Virgil is central and commanding, while that cf Lucretius is in a great measure isolated. If we could imagine the place of Virgil in Roman literature vacant, it would be much the same as if we imagined the place of Dante vacant in

modern Italian, and that of Goethe in German literature. The serious efforts of the early Roman literature — the efforts of the older epic and tragic poetry — found their fulfilment in him. The revelation of the power and life of Nature, first made to Lucretius, was able to charm the Roman mind, only after it had passed into the mind of Virgil.

Virgil is the only complete representative of the deepest senti- ment and highest mood of his countrymen and of his time. In his pastoral and didactic poems he gives a living voice to the whole charm of Italy, in the Aeneid to the whole glory of Rome. He was in the maturity of his powers at the most critical epoch of the national life, one of the most critical epochs in the history of the world. Keeping aloof from the trivial daily life of his con- temporaries, he was moved more profoundly than any of them by the deeper currents of emotion in the sphere of government, religion, morals and human feeling which were then changing the world; and in uttering the enthusiasm of the hour, and all the new sensibilities that were stirring in his own heart and imagina- tion, he had, in the words of Sainte-Beuve, " divined at a decisive hour of the world what the future would love." He was also by universal acknowledgment the greatest literary artist whom Rome produced. Virgil had a more catholic sympathy with the whole range of Greek poetry, from Homer and Hesiod to Theocritus and the Alexandrians, than any one else at any period of Roman literature. The effort of the preceding genera- tion to attain to beauty of form and finish of artistic execution found in him, at the most susceptible period of his life, a ready recipient of its influence. The rude dialect of Latium had been moulded into a powerful and harmonious organ of literary expression by a long series of orators; the Latin hexameter, first shaped by Ennius to meet the wants of his own spirit and of his high argument, had been smoothed and polished by Lucretius, and still more perfected by the finer ear and more careful industry of Catullus and his circle; but neither had yet attained their final development. It was left for Virgil to bring both diction and rhythm to as high a pitch of artistic perfection as has been attained in any literature. This great work was accomplished by the steady devotion of his genius to his appointed task. For the first half of his life he prepared himself to be the poet of his time and country with a high ambition and unresting industry. The second half of his career

was a religious consecration of all his powers of heart, mind and spirit to his high office.

Virgil's fame as a poet rests on the three acknowledged works of his early

and mature manhood — the pastoral poems or Eclogues, the Georgics and the Aeneid — all written in that hexameter verse which Tennyson has called

" The stateliest measure ever moulded by the lips of man."

The pastoral poems or Eclogues — a word denoting short selected pieces — were composed between the years 42 and 37 B.C., when Eclogues. Virgil was between the age of twenty-eight and thirty- three. By his invocation to the " Sicelides Musae " and " Arethusa," and by many other indications, he avows the purpose of eliciting from the strong Latin language the melody which the " Sicilian shepherd " drew out of the " Doric reed," and of expressing that tender feeling for the beauty of Italian scenes which Theocritus had expressed for the beauty of Sicily.

The earliest poems in the series were the second, third and fifth ; and these, along with the seventh, are the most purely Theocritean in character. The first and ninth, which probably were next in order, are much more Italian in sentiment, are much more an expression of the poet's own feelings, and have a much more direct reference both to his own circumstances and the circumstances of the time. The first is a true poetical reflex of the distress and confusion which arose out of the new distribution of lands, and blends the poet's own deep love of his home, and of the sights and sounds familiar to him from childhood, with his Italian suscepti- bility to the beauty of nature. The ninth is immediately connected in subject with the first. It contains the lines which seem accurately to describe the site of Virgil's farm, at the point where the range of hills which accompany the river for some distance from the foot of the Lago di Garda sinks into the plain about 14 or 15 m. above Mantua. The sixth is addressed to Varus, who succeeded Pollio as governor of the Cisalpine district. Its theme is the creation of the world (according to the Epicurean cosmogony), and the oldest tales of mythology. 1 The fourth and eighth are both closely associated with the name of Virgil's earliest protector, Pollio. The fourth celebrates the consulship of his patron in 40 B.C., and also the prospective birth of a child, though it was disputed in antiquity, and still is disputed, who was meant by this child whose biith was to be coincident with the advent of the new era, and who, after fining the other great offices of state, was to " rule with his father's virtues the world at peace." 2 The main purpose of the poem, however, is to express the longing of the world for a new era of peace and happiness, of which the treaty of Brundisium seemed to hold out some definite hopes. There is no trace in this poem of Theocritean influence. The ideas are derived partly from Greek representations of the Golden Age, and partly, it is supposed, from the later Sibylline prophecies, circulated after the burning in the time of Sulla of the old Sibylline books, and possibly tinged with Jewish ideas. Some of the

phraseology of the poem led to a belief in the early Christian church that Virgil had been an unconscious instrument of inspired prophecy. The date of the eighth is fixed by a reference to the campaign of Pollio against the Dalmatians in 39 B.C. It is founded on the QapfiaKevrpla of Theocritus, but brings before us, with Italian associations, two love tales of homely Italian life. The tenth reproduces the Daphnis of Theocritus, and is a dirge over the unhappy love of Gallus and Lycoris. As in the other poems, the second and eighth, of which love is the burden, it is to the romantic and fantastic melancholy which the passion assumes in certain natures that Virgil gives a voice.

There is no important work in Latin literature, with the exception of the comedy of Terence, so imitative as the Eclogues. But they are not, like the comedies of Terence, purely exotic as well as imitative. They are rather composite, partly Greek and partly Italian, and, as a vehicle for the expression of feeling, hold an undefined place between the objectivity of the Greek idyll and the subjectivity of the Latin elegy. For the most part, they express the sentiment inspired by the beauty of the world, and the kindred sentiment inspired by the charm of human relationships. Virgil's susceptibility to the beauty of nature appears in the truth with which his work suggests the charm of Italy — the fresh life of an Italian spring, the delicate hues of the wild flowers and the quiet beauty of the pastures and orchards of his native district. The representative character of the poems is enhanced by the fidelity and grace with which he has expressed the Italian peasant's love of his home and of all things associated with it. The supreme charm of the diction and rhythm is universally recognized. The power of varied harmony is as conspicuous in Virgil's earliest poems as in the maturer and more elaborate workmanship of the Georgics and Aeneid. The Italian language, without sacrifice of the fulness, strength and majesty of its tones, acquired a more tender grace and more liquid flow from the gift — the " molle atque facetum " — which the Muses of country life bestowed on Virgil.

1 In the Georgics also Virgil attempts to combine science with the poetic fancies which filled its place in older times.

- *See Virgil's Messianic Eclogue: Its Meaning, Occasion and Sources, three studies by J. B. Mayor, W. Warde Fowler and R. S. Conway (1907).*

But these Muses had a more serious and dignified function to fulfil than that of glorifying the picturesque pastime, the " otia dia," of rural life. The Italian imagination formed an ideal of Oeorsics, the happiness of a country life nobler than that of passive susceptibility to the sights and sounds of the outward world. It is stated that Maecenas, acting on the principle of

employing the poets of the time in favour of the conservative and restorative policy of the new government, directed the genius of Virgil to the subject of the Georgics. No object could be of more consequence in the eyes of a statesman whose master inherited the policy of the popular leaders than the revival of the great national industry, associated with happier memories of Rome, which had fallen into abeyance owing to the long unscttlement of the revolutionary era as well as to other causes. Virgil's previous life and associations made it natural for him to identify himself with this object, while his genius fitted him to enlist the imagination of his countrymen in its favour. It would be a most inadequate view of his purpose to suppose that, like the Alexandrian poets or the didactic poets of modern times, he desired merely to make useful information more attractive by the aid of verse. His aim was rather to describe with realistic fidelity, and to surround with an atmosphere of poetry, the annual round of labour in which the Italian yeoman's life was passed ; to bring out the intimate relation with nature into which man was brought in the course of that life, and to suggest the delight to heart and imagination which he drew from it; to contrast the simplicity, security and sanctity of such a life with the luxury and lawless passions of the great world ; and to associate the ideal of a life of rustic labour with the beauties of Italy and the glories of Rome. This larger conception of the dignity of his subject separates the didactic poem of Virgil from all other didactic, as distinct from philosophic, poems. He has produced in the Georgics a new type of didactic, as in the Aeneid he has produced a new type of epic, poetry.

The subject is treated in four books, varying in length from 514 to 566 lines. The first treats of the tillage of the fields, of the constella- tions, the rise and setting of which form the farmer's calendar, and of the signs of the weather, on which the success of his labours largely depends. The second treats of trees, and especially of the vine and olive, two great staples of the national wealth and industry of Italy; the third of the rearing of herds and flocks and the breeding of horses; the fourth of bees.

As he had found in Theocritus a model for the form in which his idler fancies were expressed, he turned to an older page in Greek literature for the outline of the form in which his graver interest in rural affairs was to find its outlet. The Works and Days of Hesiod could not supply an adequate mould for the systematic treatment of all the processes of rural industry, and still less for the treatment of the larger ideas to which this was sub- sidiary, yet that Virgil considered him as his prototype is shown by the line which concludes one of the cardinal episodes-of the poem —

" Ascraeumque cano Romana per oppida carmen." Virgil accepts also the guidance of the Alexandrian poets who treated the science of their day — astronomy, natural history and geography — in the metre and diction of

epic poetry. But, in availing himself of the work of the Alexandrians, Virgil is like a great master making use of mechanical assistants. A more powerful influence on the form, ideas, sentiment and diction of the Georgics was exercised by the great philosophical poem of Lucretius, of which Virgil had probably been a diligent student since the time of its first appearance, and with which his mind was saturated when he was engaged in the composition of the Georgics. Virgil is at once attracted and repelled by the genius and attitude of the philosophic poet. He is possessed by his imaginative conception of nature, as a living, all-pervading power; he shares his Italian love of the beauty of the world, and his sympathy with animal as well as human life. He recognizes with enthusiasm his contemplative elevation above the petty interests and passions of Hie. But he is repelled by his apparent separation from the ordinary beliefs, hopes and fears of his fellow-men. Virgil is in thorough sympathy with the best restorative tendencies — religious, social and national — of his time; Lucretius was driven into isolation by the anarchic and dissolving forces of his.

So far as any speculative idea underlying the details of the Georgics can be detected, it is one of which the source can be traced to Lucretius — the idea of the struggle of human force with the forces of nature. In Virgil this idea is modified by Italian piety and by the Italian delight in the results of labour. In the general plan of the poem v'irgil follows the guidance of Lucretius rather than that of any Greek model. The distinction between a poem addressed to national and one addressed to philosophical sympathies is marked by the prominence assigned in the one poem to Caesar as the supreme personality of the age, in the other to Epicurus as the supreme master in the realms of mind. The invocation to the " Di agrestes," to the old gods of mythology and art, to the living Caesar as the latest power added to the pagan Pantheon, is both a parallel and a contrast to the invocation to the all-pervading principle of life, personified as " Alma Venus." In the systematic treatment of his materials, and the interspersion of episodes dealing with the deeper poetical and human interest of the subject, Virgil adheres to the practice of the older poet. He uses his connecting

links and formulas, such as " principles" " nunc age," &c. t but uses them more sparingly, so as to make the logical mechanism of the poem less rigid, while he still keeps up the liveliness of a personal address. All his topics admit of being vitalized by attributing to natural processes the vivacity of human relationships and sensibility, and by association with the joy which

the ideal farmer feels in the results of his energy. Much of the argument of Lucretius, on the other hand, is as remote from the genial presence of nature as from human associations. Virgil makes a much larger use than Lucretius of ornament borrowed from older poetry, art, science and mythology. There is uniformity of chastened excellence in the diction and versification of the Georgies, contrasting with the imaginative force of isolated expressions and the majesty of isolated lines and passages in Lucretius. The J ' vivida vis " of imagination is more apparent in the older poet ; the artistic perfection of Virgil is even more conspicuous in the Georp.cs than in the Eclogues or the Aeneid.

The principal episodes of the poem, in which the true dignity and human interest of the subject are brought out, occur in the first and second books. Other shorter episodes add variety to the different books. These episodes are not detached or isolated ornaments, but give a higher unity to the poem, and are the main ground of its permanent hold upon the world. There is indeed one marked exception to this rule. The long episode with which the whole poem ends — the tale of the shepherd Aristaeus, with which is connected the more poetical fable of Orpheus and Eurydice — has only the slightest connexion with the general ideas and senti- ment of the poem. It is altogether at variance with the truthful realism and the Italian feeling which pervade it. But we are distinctly told that the original conclusion had contained the praises of Gallus, the friend of Virgil's youth, who, about the time when Virgil was finishing the poem, had gained distinction in the war against Cleopatra, and had in consequence been made the first governor of the new province of Egypt. Such a conclusion might well have been in keeping with the main purpose of the poem.

After the fall of Gallus, owing to his ambitious failure in his Egyptian administration, and his death in 26 B.C., the poet, accord- ing to the story, in obedience to the command of the emperor, substituted for this encomium the beautiful but irrelevant fable of Orpheus and Eurydice, in which he first displayed the narrative skill, the pathos and the magical power of making the mystery of the unseen world present to the imagination which characterize the Aeneid.

The cardinal episodes of the poem, as it now stands, are the passages in bk. 1. from line 464 to the end, and in bk. ii. from 136 to 176 and from 475 to 542. The first, introduced in connexion with the signs of the weather, recounts the omens which accom- panied the death of Julius Caesar, and shows how the misery of Italy and the neglected state of the fields are the punishment for the great sin of the previous generation. In the second of these passages the true keynote of the poem is struck in the invocation to Italy —

” Salve, magna parens frugum, Saturnia tellus, Magna virum.” The thought of the beauties of the land, of the abundance and variety of its products, of its ancient cities and mighty works of man, its brave and hardy races, the great men who had fought for her in old times, and of him, the greatest among her sons, who was then defending Rome against her enemies in the farthest East, inspires the poet, and gives dignity to the trivial details of farm life. But a still higher and more catholic interest is given to the subject in the greatest of the episodes — the most perfect passage in all Latin poetry — that from line 458, ” O fortunatos nimium,” to the end. The subject is there glorified by its connexion not only with the national well-being but with the highest life and purest happiness of man. The old delight in the labours of the field blends with the new delight in the beauty of nature, and is associated with that purity and happiness of family life which was an Italian ideal, and with the poetry of those religious beliefs and observances which imparted a sense of security, a constantly recurring charm, and a bond of social sympathy to the old rustic life.

The Georgics is not only the most perfect, but the most native of all the works of the ancient Italian genius. Even where he borrows from Greek originals, Virgil makes the Greek mind tributary to his national design. The Georgics, the poem of the land, is as essen- tially Italian as the Odyssey, the poem of the sea, is essentially Greek. Nature is presented to us as she is revealed in the soft luxuriance of Italian landscape, not in the clearly defined forms of Greek scenery. The poem shows the Italian susceptibility to the beauty of the outward world, the dignity and sobriety of the Italian imagination, the firm and enduring structure of all Roman work- manship, while it is essentially Italian in its religious and ethical feeling.

The work which yet remained for Virgil to accomplish was the addition of a great Roman epic to literature. This had been the AtaeftL ear ‘i es t effort of the national imagination, when it first departed from the mere imitative reproduction of Greek originals. The work which had given the truest expression to the genius of Rome before the time of Virgil had been the Annates

of Ennius. This had been supplemented by various historical poems but had never been superseded. It satisfied the national imagination as an expression of the national life in its vigorous prime, but it could not satisfy the newly developed sense of art ; and the expansion of the national life since the dˆys of Ennius, and the changed conditions into which it passed after the battle of Actium, demanded a newer and ampler expression. It had been Virgil’s earliest ambition to write an heroic poem on the traditions of Alba Longa ; and he had been repeatedly urged by Augustus to celebrate his exploits. The problem before him was to compose a work of art on a large scale, which should represent a great action of the heroic age, and

should at the same time embody the most vital ideas and sentiment of the hour — which in substance should glorify Rome and the present ruler of Rome, while in form it should follow closely the great models of epic poetry and reproduce all their sources of interest. It was his ambition to be the Homer, as he had been the Theocritus and Hesiod, of his country.

Various objects had thus to be combined in a work of art on the model of the Greek epic: the revival of interest in the heroic fore- time; the satisfaction of national sentiment; the expression of the deeper currents of emotion of the age; the personal celebration of Augustus. A new type of epic poetry had to be created. It was desirable to select a single heroic action which should belong to the cycle of legendary events celebrated in the Homeric poems, and which could be associated with Rome. The only subject which in any way satisfied these conditions was that of the wanderings of Aeneas and of his final settlement in Latium. The story, though not of Roman origin but of a composite growth, had long been familiar to the Romans, and had been recognized by official acts of senate and people. The subject enabled Virgil to tell again of the fall of Troy, and to weave a talc of sea-adventure similar to that of the wanderings of Odysseus. It was also recommended by the claim which the Julii, a patrician family of Alban origin, made to descent from lulus, the supposed son of Aeneas and founder of Alba Longa.

The Aeneid is thus at once the epic of the national life under its new conditions and an epic of human character. The true keynote of the poem is struck in the line with which the proem closes —

" Tantae molis erat Romanam condere gentem." The idea which underlies the whole action of the poem is that of the great part played by Rome in the history of the world, that part being from of old determined by divine decree, and carried out through the virtue of her sons. The idea of universal empire is thus the dominant idea of the poem. With^ this idea that of the unbroken continuity of the national life is intimately associated. The reverence for old customs and for the traditions of the ^ past was a large element in the national sentiment, and has a prominent place in the Aeneid. So too has the feeling of local attachment and of the power of local association over the imagination. The poem is also characteristically Roman in the religious belief and observances which it embodies. Behind all the conventional machinery of the old Olympic gods there is the Roman apprehension of a great inscrutable power, manifesting itself by arbitrary signs, exacting jealously certain observances, working out its own secret purposes through the agency of Roman arms and Roman counsels.

The poem is thus a religious as well as a national epic, and this explains the large part played in the development of the action by special revelation,

omens, prophecies, ceremonial usages and prayer. But, while the predominant religious idea of the poem is that of a divine purpose carried out regardlessly of human feeling, in other parts of the poem, and especially in that passage of the sixth book in which Virgil tries to formulate his deepest convictions on individual destiny, the agency of fate seems to yield to that of a spiritual dispensation, awarding to men their portions according to their actions.

The idealization of Augustus is no expression of servile adulation. It is through the prominence assigned to him that the poem is truly representative of the critical epoch in human affairs at which it was written. The cardinal fact of that epoch was the substitution of personal rule for the rule of the old commonwealth over the Roman world. Virgil shows the imaginative significance of that fact by revealing the emperor as chosen from of old in the counsels of the supreme ruler of the world to fulfil the national destiny, as the descendant of gods and of heroes of old poetic renown; as one, moreover, who, in the actual work done by him, as victor in a great decisive battle between the forces of the Western and the Eastern world, as the organizer of empire and restorer of peace, order and religion, had rendered better service to mankind than any one of the heroes who in an older time had been raised for their great deeds to the company of the gods.

Virgil's true and yet idealizing interpretation of the imperial idea of Rome is the basis of the greatness of the Aeneid as a repre- sentative poem. It is on this representative character and on the excellence of its artistic execution that the claim of the Aeneid to rank as one of the great poems of the world mainly rests. The inferiority of the poem to the Iliad and the Odyssey as a direct representation of human life is so unquestionable that we are in danger of underrating the real though secondary interest which the I poem possesses as an imitative epic of human action, manners

and character. In the first place it should be remarked that the action is chosen not only as suited to embody the idea of Rome, but as having a peculiar nobleness and dignity of its own. It brings before us the spectacle of the destruction of the city of greatest name in poetry or legend, of the foundation of the imperial city of the western seas, in which Rome had encountered her most powerful antagonist in her long struggle for supremacy, and that of the first rude settlement on the hills of Rome itself. The scenes through which the action is carried are familiar, yet full of great memories and associations — Troy and its neighbourhood, the seas and islands o(Greece, the coasts of Epirus, familiar to all travellers between Italy and the East, Sicily, the site of Carthage, Campania, Latium, the Tiber, and all the country within sight of Rome. The personages of the action are prominent in poetry and legend, or by their ethnical names stir the sentiment of national enthusiasm — Aeneas and Anchises, Dido, Acestes, Evander, Turnus. The spheres of activity in which they are engaged are war and sea-adventure. The passion of love is a powerful addition to the older sources of interest. The Aeneid revives, by a conventional compromise between the present and the remote past, some image of the old romance of Greece; it creates the romance of " that Italy for which Camilla the virgin, Euryalus, and Turnus and Nisus died of wounds." It might be said of the manner of life represented in the Aeneid, that it is no more true to any actual condition of human society than that represented in the Eclogues. But may not the same be said of all Idealizing restoration of a remote past in an age of advanced civilization? The life represented in the Oedipus Tyrannus or in King Lear is not the life of the Periclean nor of the Elizabethan age, nor is it conceivable as the real life of a prehistoric age. The truth of such a representation is to be judged, not by its relation to any actual state of things ever realized in the world, but by its relation to an ideal of the imagination — the ideal conception of how man, endowed with the gifts and graces of a civilized time, but yet not without the buoyancy of a more primitive age, might play his part under

circumstances which would afford scope for the passions and activities of a vigorous personality, and for the refined emotions and subtle reflection of an era of high intellectual and moral cultivation. The verdict of most readers of the Aeneid will be that Virgil does not satisfy this condition as it is satisfied by Sophocles and Shakespeare. Yet there is a courtesy, dignity and consideration for the feelings of others in the manners of his chief personages, such as might be exhibited by the noblest in an age of chivalry and in an age of culture. The charm of primitive simplicity is present in some passages of the Aeneid, the spell of luxurious pomp in others. The delight of voyaging past beautiful islands is enhanced by the suggestion of the adventurous spirit which sent the first explorers abroad. Where Virgil is least real, and most purely imitative, is in the battle-scenes of the later books. They afford scope, however, to his patriotic desire to do justice to the martial energy of the Italian races; and some of them have a peculiar beauty from the pathos with which the deaths of some of the heroes are described.

But the adverse criticisms of the Aeneid are chiefly based on Virgil's supposed failure in the crucial test of the creation of char- acter. And his chief failure is pronounced to be the " pious Aeneas." Is Aeneas a worthy and interesting hero of a great poem of action? Not, certainly, according to the ideals realized in Achilles and Odysseus, nor according to the modern ideal of heroism. Virgil wishes to hold up in Aeneas an ideal of pious obedience and per- sistent purpose — a religious ideal belonging to the ages of faith combined with the humane and self-sacrificing qualities belonging to an era of moral enlightenment. His own sympathy is with his religious ideal rather than with that of chivalrous romance. Yet that there was in his own imagination a chord responsive to the chivalrous emotion of a later time is seen in the love and pathos which he has thrown into his delineations of Pallas, Lausus and Camilla. But he felt that the deepest need of his time was not military glory, but peace, reconciliation, the restoration of law, order and piety.

In Dido Roman poetry has added to the great gallery of men and women, created by the imaginative art of different times and peoples, the ideal of a true queen and a true woman. On the episode of which she is the heroine the most passionate human interest is concentrated. It has been objected that Virgil does not really sympathize with his own creation, that he gives his approval to the cold desertion of her by Aeneas. But if he does not condemn his hero, he sees in the desertion and death of Dido a great tragic issue in which a noble and generous nature is sacrificed to the larger purpose of the gods. But that Virgil really sympathized with the creation of hib imagination appears, not only in the sympathy which she still inspires, but in the part which he assigns to her in that shadowy realm —

” Conjunx ubi pristinus illi Respondet curis, aequatque Sychaeus amorem.”

Even those who have been insensible to the representative and to the human interest of the Aeneid have generally recognized the artistic excellence of the poem. This is conspicuous both in the conception of the action and the arrangement of its successive stages and in the workmanship of details. Each of the first eight

books has a large and distinct sphere of interest, and they each contribute to the impression of the work as a whole. In the first book we have the storm, the prophecy of Jove and the building of Carthage; in the second the destruction of Troy; in the third the voyage among the islands and coasts of the Mediterranean; in the fourth the tragedy of Dido; in the fifth the rest in the Sicilian bay, at the foot of Mount Eryx; in the sixth the revelation of the spiritual world of Virgil’s imagination, and of the souls of those who built up the greatness of Rome in their pre-ˆxistent state; in the seventh the arrival of the Trojans at the mouth of the Tiber and the gathering of the Italian clans; in the eighth the first sight of the hills of Rome, and the prophetic representation of the great crises in Roman history, leading up to the greatest of them all, the crowning victory of Actium. Among these books we may infer that Virgil assigned the palm to the second, the fourth and the sixth, as he selected them to read to Augustus and the imperial family. The interest is generally thought to flag in the last four books; nor is it possible to feel that culminating sympathy with the final combat between Turnus and Aeneas that we feel with the combat between Hector and Achilles. Yet a personal interest is awakened in the ad- ventures and fate of Pallas, Lausus and Camilla. Virgil may himself have become weary of the succession of battle-scenes- — ” eadem horrida bella ” — which the requirements of epic poetry called upon him to portray. There is not only a less varied interest, there is greater inequality of workmanship in the later books, owing to the fact that they had not received their author’s final revisal. Yet in them there are many lines and passages of great power, pathos an,d beauty. Virgil brought the two great instrument of varied and continuous harmony and of a rich, chastened and noble style to the highest perfection of which the Latin tongue was capable. The rhythm and style of the Aeneid is more unequal than the rhythm and style of the Georgics, but is a larger and more varied instrument. The note of his supremacy among all the poetic artists of his country is that subtle fusion of the music and the meaning of language which touches the deepest and most secret springs of emotion. He touches especially the emotions of reverence and of yearning for a higher spiritual life, and the sense of noble- ness in human affairs, in great institutions, and great natures; the sense of the sanctity of human affections, of the imaginative spell exercised by the past, of the mystery of the unseen world. This is the secret of the power which his words have had over some of the deepest and greatest natures in all ages. (W. Y. S. ; T. R.*

G.)

Bibliography

Appendix Vergiliana. — Under this collective name there are current several poems of some little length and some groups of shorter pieces, all attributed to Virgil in antiquity. Virgil wrote a Culex, but not the Culex now extant, though it passed for his half a century after his death. The Aetna, the Ciris and the Copa are clearly not Virgil's. The Moretum is said to have been translated by him from a Greek poem by his teacher Parthenius; it is an exquisite piece of work, familiar perhaps to English readers in Cowper's translation. The case of the Catalepton (VarA \em-6v) is peculiar. Two of these little poems (Tte kinc indnes and ViUula quae Sironts) are generally accepted as Virgil's; opinion varies as to the rest, with very little to go upon, but generally rejecting them. The whole are printed in the larger editions of Virgil. For English readers the most obvious edition is that of Robinson Ellis (1907), who has also edited the Aetna separately.

Manuscripts. — Gellius {Nodes Atticae, ix. 14, 7) tells us of people who had inspected idiographum librum Vergilii, but this has of course in all probability long since perished. There are, however, seven very ancient MSS. of Virgil. (1) The Mediceus at Florence, with a note purporting to be by a man, who was consul in 494, to say he had read it. (2) The Palatums Vaticanus of the 4th or 5th century. (3) The Vaticanus of the same period. (4) The " Schedae Vaticanae. " (5) The " Schedae Berolinenses," perhaps of the 4th century. (6) The " Schedae Sangallenses." (7) The " Schedae rescriptae Veronenses " — the last three of insignificant extent. For a full account of the MSS., see Henry, Aeneidea, 1., and Ribbeck, Prolegomena ad Verg. '

Ancient Commentators. — Commentaries on Virgil began to be written at a very early date. Suetonius, V. Verg. 44, mentions an Aeneidomastix of Carvilius Pictor and other works on Virgil's " thefts " and " faults," besides eight " volumina " of Q. Octavius Avitus, setting out in parallel passages the " likenesses " (dfioidnjra was the name of the work) between Virgil and more ancient authors, M. Valerius Probus (latter part of 1st century a.d.) wrote a com- mentary, but it is doubtful for how much of what passes under his name he is responsible, if for any of it. At the end of the 4th century come the commentaries of Tiberius Claudius Donatus and of Servius, the former writing as a teacher of rhetoric, the latter of style and grammar. The work of Servius was afterwards expanded by another scholar, whose additions greatly added to its worth, as they are drawn from older commentators and give us very valuable information on the old Roman religion and constitution, Greek and Latin legends, old Latin and

linguistic usages. In this enlarged form the commentary of Servius and the Saturnalia of Macrobius (also of the end of the 4th century) are both of great interest to the student of Virgil. There are, further, sets of Scholia in MSS. at Verona and Bern, which draw their materia! from ancient

commentaries. See H. Nettleship, Essays in Latin Literature, xi., and Comparetti, Vergil in the Middle Ages, ch. 5.

Editions. — The editions of Virgil are innumerable; Heyne (1767-1800), Forbiger (1872-75) and Ribbeck (1859-66) in Germany, Benoist (1876) in France, and Conington (completed by Nettleship, and edited by Haverfield) in England, are perhaps the most im- portant. Good school editions in English have been produced by Page, Sidgwick and Fapillon. Conington's work, however, is with- out question the best in English.

Translations. — Famous English translations have been made by Dryden and by a host of others since his day. Since the middle of the 19th century the most important are Conington (Aeneid in verse, whole works in prose) ; J. W. Mackail (Aeneid and Georgics in prose) ; William Morris (Aeneid in verse) ; Lord Justice Bowen (Eclogues and Aeneid, i.-vi. in verse); Canon Thornhill (verse); C. J. Billson (verse, 1906); J. Rhoades (verse, new ed., 1907). For essays on translating Virgil, see Conington, Miscellaneous Works, vol. i. ; R. V". Tyrrell, Latin Poetry (appendix).

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Havelock Fisher t 1895); Gibbon, Critical Observations on the Sixth Book of the Aeneid (1770); Boissier, La Religion romaine d'Auguste aux Antonins (1S84) (with section on sixth Aeneid); Ettig, Aclieruntica (Leipziger Studien, 1891) ; Norden, " V.-studien " (in Hermes, vol. 28, 1S93), on sixth Aeneid, and papers in Neue Jahrbiicher fur kl. Altertum (1901); Dieterich, Nekyia (1893) (on Apocalypse of Peter and ancient teaching on the other life — a valuable book); Henry, Aeneidea (1873-79) (a book of very great learning, wit, sense and literary judgment; the author, an Irish physician, gave twenty years to it, examining MSS., exploring Virgil's country, and reading every author whom Virgil could have used and nearly every ancient writer who used Virgil).

Virgil-literature: Sainte-Beuve, Etude sur Virgile (one of the great books on Virgil) ; Comparetti, Virgilio nel medio Evo (1872) — Eng. tr., Vergil in tlie Middle Ages, by E. F. M. Benecke (1895) (a book of very great and varied interest); Heinzc, Virgil's epische Technik (1902); VV. Y. Sellar, Roman Poets of the Augustan Age: Virgil (2nd ed. 1883); Glover, Studies in Virgil (1904). Essays in the following: F. W. H. Myers, Essays [Classical] (i883),themost famous English essay on Virgil; J. R. Green, Stray Studies (1876) (an excellent study of Aeneas); W. Warde Fowler, A Year with the Birds (on Virgil's bird-lore) ; Nettleship, Essays in Latin Literature (1884); Tyrrell, Latin Poetry (1898); Patin, Essais sur la poesie Latine (4th ed. 190c) (one of the finest critics of Latin literature); Goumv, Les Latins (1892) (a volume of very bright essays); J. W. Mackail, Latin Literature (3rd ed. 1899). (T. R. G.)

The Virgil Legend. Virgil's great popularity in the middle ages is to be partly explained by the fact that he was to a certain extent recognized by the Church. He was supposed to have prophesied the coming of Christ in the fourth Eclogue, and by some divines the Aeneid was held to be an allegory of sacred things. This position was sufficiently emphasized by Dante when he chose him from among all the sages of antiquity to be his guide in the Divina Commedia. Ancient poets and philosophers were commonly transformed by medieval writers into necromancers; and Virgil and Aristotle became popularly famous, not for poetry and science, but for their supposed knowledge of the black art. Naples appears to have been the home of the popular legend of Virgil, which represented him as the special protector of the city, but was probably never quite independent of learned tradition.

One of the earliest references to the magical skill of Virgil 1 occurs in a letter of the imperial chancellor Conrad of Querfurt (1194),

1 The Irish apostle to Carinthia, St Virgilius, bishop of Salzburg (d. 784), who held original views on the subject of antipodes, may have been the real

eponym of the legend.

reproduced by Arnold of Lubeck in the continuation of the Chronica Slavorum of Helmold. John of Salisbury alludes to the brazen fly fabricated by Virgil; HeHnand (d. 1227) speaks of similar marvels in a work from which Vincent of Beauvais has borrowed,- and Gervase of Tilbury, in his Otia Imperialia (1212), and Alexander of Neckam (d. 1217), in De Naturis Rerum, have reproduced these traditions, with additions. German and French poets did not overlook this accessory to their repertory. The Roman de Cleo- mades of Adenes li rois (12th century) and the Image du Monde of Gauthier de Metz (1245) contain numerous references to the prodigies of the enchanter. Reynard the Fox informs King Lion that he had from the wise Virgil a quantity of valuable receipts. He also plays a considerable part in the popular folk-tale The Seven Wise Masters, and appears in the Gesta Romanorum and that curious guidebook for pilgrims, the Mirabilia Romae. He is to be found in John Gower's Confessto Amantis and in John Lydgate's Bochas. A Spanish romance, Vergilios, is included by E. de Ochoa in his Tesoro (Paris, 1838), and Juan Ruiz, archpriest of Hita (d. c. 1360), also wrote a poem on the subject. Many of the tales of magic throughout Europe were referred to Virgil, and gradually developed into a completely new life, strangely different from that of the real hero. They were collected in French under the title of Les Failz Merveilleux de Virgille (c. 1499), a quarto chapbook of ten pages, which became extremely popular, and was printed, with more or less additional matter, in other languages. The English version, beginning "This is rcsonable to wryght the mervelus dedes done by Virgilius," was printed about 1520. We are told how Virgil beguiled the devil at a very early age, in the same fashion as the fisherman persuaded the jinnee in the Arabian Nights to re-enter Solomon's casket. Another reproduction of a widely spread tale was that of the lady who kept Virgil suspended in a basket. To revenge the affront the magician extinguished all the fires in the city, and no one could rekindle them without subject- ing the lady to an ordeal highly offensive to her modesty. Virgil made for the emperor a castle in which he could see and hear every- thing done or said in Rome, an ever-blooming orchard, statues of the tributary princes which gave warning of treason or rebellion, and a lamp to supply light to the city. He abducted the soldan's daughter, and built for her the city of Naples upon a secure foundation of eggs. At last, having performed many extraordinary things, he knew that his time was come. In order to escape the common lot he placed all his treasures in a castle defended by images unceasingly wielding iron flails, and directed his confidential servant to hew him in pieces, which he was to salt and place in a barrel in the cellar, under which a lamp was to be kept burning. The servant was assured that after seven days his master wo.uld revive, a young man. The directions were carried out; but

the emperor, missing his medicine-man, forced the servant to divulge the secret and to quiet the whirling flails. The emperor and his retinue entered the castle and at last found the mangled corpse. In his wrath he slew the servant, whereupon a little naked child ran thrice round the barret, crying, " Cursed be the hour that ye ever came here," and vanished.

For the legends connected with Virgil see especially D. Com- paretti, Virgilio nel medio evo (2nd ed., Florence, 1896; English trans., E. F. M. Benecke, 1895). The chief original source for the Neapolitan legends is the 14th-century Cronica di Partenope. See further W. J. Thorns, Early Eng. Prose Romances (1858) ; G. Brunet, Les Faitz merveilleux de Virgile (Geneva, 1867) ; E. Dumeril, "Virgile enchanteur " (Melanges archeolog-iques, 1850); Gervase of Tilbury, Otia Imper. (ed. Liebrecht, 1856); P. Schwubbe, Virgilius per mediam aetatem (Paderborn, 1852); Siebcnhaar, De fabulis quae media aetate de Virgilio circumf. (Berlin, 1837); J. G. T. Graesse, Beitrdge zur Litt. u. Sage des Mittelalters (1850); Bartsch, " Gedicht auf. d. Zaub. Virgil " (Pfeiffer's Germania, iv. 1859); F. Liebrecht, " Der Zauberer Virgilius " (ibid. x. 1865); K. L. Roth, " Uber d. Zaub. Virgilius" (ibid. iv. 1859); W. Victor, " Der Urspruug der Virgilsage " (Zeit. f. rom. Phil. i. 1877); A. Graf, Roma nella memoria e nelle imaginazioni del medio evo (Turin, 1882); F. W. Genthe, Leben und Fortleben des Publius Virgilius Maro als Dichterund Zauberer (2nd ed., Magdeburg, 1857).

CM. Br.)

VIRGIL, POLYDORE (c. 1470-1555), English historian, of Italian extraction, otherwise known as P. V. Castellensis, was a kinsman of Cardinal Hadrian Castellensis, a native of Castro in Etruria. His father's name is said to have been George Virgil; his great-grandfather, Anthony Virgil, " a man well skilled in medicine and astrology," had professed philo- sophy at Paris, as did Polydore's own brother and protege John Matthew Virgil, at Pavia, in 1517. A third brother was a London merchant in 1511. Polydore was born at Urbino, is said to have been educated at Bologna, and was probably in the service of Guido Ubaldo, duke of Urbino, before 1498, as in the dedication of his first work, Liber Proverbiorum (April 1 498) ; he styles himself this prince's client. Polydore's second book, De Inventoribus Rerum, is dedicated to Guido's tutor,

Ludovicus Odaxius, from Urbino, in August 14QQ. After being chamberlain to Alexander VI. he came to England in 1 501 as deputy

collector of Peter's pence for the cardinal. As Hadrian's proxy, he was enthroned bishop of Bath and Wells in October 1504. It was at Henry VII. 's instance that he com- menced his Historia Anglica — a work which, though seemingly begun as early as 1505, was not completed till August 1533, the date of its dedication to Henry VIII., nor published till 1534. In May 1514 he and his patron the cardinal are found supporting Wolsey's claims to the cardinalship, but he had lost the great minister's favour before the year was out. A rash letter, reflecting severely on Henry VIII. and Wolsey, was intercepted early in 1515, after which Polydore was cast into prison and supplanted in his collectorship (March and April). He was not without some powerful supporters, as both Catherine de' Medici and Leo X. wrote to the king on his behalf. From his prison he sent an abject and almost blas- phemous letter to the offended minister, begging that the fast approaching Christmas — a time which witnessed the restitution of a world — might see his pardon also. He was set at liberty before Christmas 151 5, though he never regained his collector- ship. In 1525 he published the first edition of Gildas, dedicating the work to Tunstall, bishop of London. Next year appeared his Liber de Prodigiis, dedicated from London (July) to Francesco Maria, duke of Urbino. Somewhere about 1538 he left England, and remained in Italy for some time. Ill-health, he tells us, forbade him on his return to continue his custom of making daily notes on contemporary events. About the end of 1551 he went home to Urbino, where he appears to have died in 1555. He had been naturalized an Englishman in October 1 5 10, and had held several clerical appointments in England. In 1508 he was appointed archdeacon of Wells, and in 1513 prebendary of Oxgate in St Paul's cathedral, both of which offices he held af '. :r his return to Urbino.

The first edition of the Historia Anglica (twenty-six books) was printed at Basel in 1534; the twenty- seventh book, dealing with the reign of Henry VIII. down to the birth of Edward VI. (October I53&). was added to the third edition of 1555. Polydore claims to have been very careful in collecting materials for this work, and takes credit for using foreign historians as well as English ; for which reason, he remarks, the English, Scotch and French will find several things reported in his pages far differently from the way in which they are told in current national story. In his search after information he applied to James IV. of Scotland for a list of the Scottish kings and their annals; but not even his friendship for Gavin Douglas could induce him to give credit to the historical notions of this accomplished bishop, who traced the pedigree of the Scots down from the banished son of an Athenian king and Scott a the daughter of the Egyptian tyrant of the Israelites. A similar scepticism made htm doubt the veracity of Geoffrey of Monmouth, and thus called forth Leland's Defensio Gallofridi and Assertio Incomparabilis Arturii. This doubting instinct led to his being

accused of many offences against learning, such as that of burning cartloads of MSS. lest his errors should be discovered, of purloining books from libraries and shipping them off by the vesselful to Rome. As a matter of fact, it is of course mainly from the time of Henry VI., where our contemporary records begin to fail so sadly, that Poly dore's work is useful. He must have been personally acquainted with many men whose memories could carry them back to the beginning of the Wars of the Roses. Dr Brewer speaks somewhat harshly of him as an authority for the reign of Henry VIII. , and indeed his spite against Wolsey is evident ; but it is impossible to read his social and geographical accounts of England and Scotland without gratitude for a writer who has preserved so many interesting details. Polydore's Adagio. (Venice, April 1498) was the first collection of Latin proverbs ever printed – , it preceded Erasmus's dv two years, and the slight misunderstanding that arose for the moment out of rival claims gave place to a sincere friendship. A second series of RibUcat proverbs (553 in number) was dedicated to Wolsey's follower, Richard Pace, and is preceded by an interesting letter (June 1519), which gives the names of many of Polydore's English friends, from More and Archbishop Warham to Linacre and Tunstall. The De Inventoribus, treating of the origin of all things whether ecclesiastical or lay (Paris, 1499), originally consisted of only seven books, but was increased to eight in 1521. It was exceedingly popular, and was early translated into French (1521), German (1537), English (1546) and Spanish (1551). All editions, however, except those following the text sanctioned by Gregory XIII. in 1576, are on the Index Expurgatorius. The De Prodigiis also achieved a great popularity, and was soon translated into Italian (1543), English (1546) and Spanish (1550). This treatise

takes the form of a Latin dialogue between Polydore and his Cambridge friend Robert Ridley. It takes place in the open air, at Polydore's country house near London. Polydore's duty is to state the problems and supply the historical illustrations; his friend's to explain, rationalize and depreciate as best he can. Here, as in the Historia Anglica, it is plain that the writer plumes himself specially on the excellence of his Latin, which in Sir Henry Ellis's opinion is purer than that of any of his contemporaries.

VIRGINAL, or Pair of Virginals, a name applied in England, and also recognized on the continent of Europe, to the spinet, and more especially to the small pentagonal and to the rectangular models. The word virginal, bestowed because it was pre-eminently the instrument for girls, denotes before all a keyboard instrument, having for each note one string only, plucked by means of a quill attached to a jack. 1 The fine instrument in the Victoria and Albert Museum, known as Queen Elizabeth's virginal, is an Italian pentagonal spinet, elaborately emblazoned with the coat of arms of the queen, and having a compass of just over four octaves. King Henry

VIII. and his daughters, Queen Mary and Queen Elizabeth, were all accomplished performers on the virginal. (K. S.)

VIRGINIA, or Verginia, in Roman legendary history, daughter of L. Virginius, a plebeian centurion. Her beauty attracted the notice of the decemvir Appius Claudius, who instructed Marcus Claudius, one of his clients., to claim her as his slave. Marcus accordingly brought her before Appius, and asserted that she was the daughter of one of his female slaves, who had been stolen and passed off by the wife of Virginius as her own child. Virginius presented him- self with his daughter before the tribunal of Appius, who, refusing to listen to any argument, declared Virginia to be a slave and the property of Marcus. Virginius thereupon stabbed her to the heart in the presence of Appius and the people. A storm of popular indignation arose and the decem- virs were forced to resign. The people for the second time "seceded" to the Sacred Mount, and refused to return to Rome until the old form of government was re-established.

See Livy iii. 44-58; Dion. Halic. xi. 28-45, whose account differs in some respects from Livy's; Cicero, De finibus, ii. 20; Val. Max. vi. I. 2; for a critical examination of the story and its connexion with the downfall of the decemvirs, see Sir G. Cornewall Lewis, Credibility of Early Roman History, ii.; Schwegler, Romische Geschichte, bk. xxx. 4, 5; also E. Pais, Ancient Legends of Roman History (Eng. trans. 1906), p. 185, according to whom the legends of Virginia and Lucretia (two different versions of one and the same story, connecting the history of Roman liberty with the martyrdom of a woman) are nothing but late elaborations of legends connected with the cults of Ardea.

VIRGINIA, one of the more N. of the S.E. Atlantic states of the United States of America, lying between latitudes 36 30′ and 39 30′ N., and longitude 75° 15′ and &3 40′ W. It is bounded on the N.W. by Kentucky and West Virginia, the irregular boundary line following mountain ridges for a part of its course; on the N.E. by Maryland, from which it is separated by the Potomac river; on the S. by North Carolina and Tennessee, the boundary line being nominally a parallel of latitude, but actually a more irregular line. Virginia has an area of 42,627 sq. m., of which 2365 sq. m. are water surface, including land-locked bays and harbours, rivers and Lake Drummond. The state has a length of about 440 m. E. and W., measured along its S. boundary; and an extreme breadth N. and S. of about 200 m.

Physical Features. — Virginia is crossed from N. to S. or N.E. to S.W. by four distinct physiographic provinces. The easternmost is the Coastal Plain Province, and forms a part of the great Coastal Plain bordering the S.E. United States from New York Harbour to the Rio Grande. This province

occupies about 11,000 sq. m. of the state, and is known as " Tidewater Virginia." After the plain had been raised above sea-level to a higher elevation than it now occupies, it was much dissected by streams and then depressed, allowing the sea to invade the stream valleys. Such is the origin of the branching bays or " drowned river valleys," among which may be noted the lower Potomac, Rappahannock, York and James rivers. Chesapeake Bay itself is the drowned lower course of the Susquehanna river, to which the other streams mentioned were

1 The mechanism is described under Pianoforte and Spiket.

tributary previous to the depression which transformed them into bays. The land between the drowned valleys is relatively flat, and varies in height from sea-level on the E. to 150-300. ft. on the W. border. Passing westward across the " fall-line," the next province is the Piedmont, a part of the extensive Piedmont Belt reaching from Pennsylvania to Alabama. This is the most ex- tensive of the subdivisions of Virginia, comprising 18,000 sq. m. of its area, and varying in elevation from 150-300 ft. on the E. to 700-1200 ft. along the foot of the Blue Ridge at the W. The slop- ing surface is gently rolling, and has resulted from the uplift and dissection of a nearly level plain of erosion developed on folded, crystalline rocks. Occasional hard rock ridges rise to a moderate elevation above the general level, while areas of unusually weak Triassic sandstones have been worn down to form lowlands. W. of the Piedmont, and like it consisting of crystalline rocks, is the Blue Ridge, a mountain belt from 3 to 20 m. in breadth, narrowing toward the N., where it passes, into Maryland, and broadening southward toward its great expansion in W. North Carolina and E. Tennessee, where it is transformed into massive mountain groups. In elevation the Blue Ridge of Virginia varies from 1460 ft. at Harper's Ferry, where the Potomac river breaks through it in a splendid water-gap, to 5719 ft. in Mt. Rogers, Grayson county. About 2500 sq. m. of the state are comprised in this province. W. of the Blue Ridge is the Newer Appalachian or Great Valley Province, characterized by parallel ridges and valleys developed by erosion on folded beds of sandstone, limestone and shales, and comprising an area of about 10,400 sq. m. in Virginia. The belts of non-resistant rock have been worn away, leaving longitudinal valleys separated by hard rock ridges. A portion of this province in which weak mcks predominate gives an unusually broad valley region, known as the Valley of Virginia, drained by the Shenandoah river, and the headwaters of the James, Roanoke, New, and Holston rivers, which dissect the broad valley floor into gently rolling low hills. At the N., near the mouth of the

Shenandoah, the valley is about 250 ft. above sea-level, but rises south-westward to an eleva- tion of more than 1600 ft. at the S. boundary of the state.

The rivers of the state flow in general from N.W. to S-E-, across the Blue Ridge, the Piedmont and the Coastal Plain, following courses which were established before erosion had produced much of the present topography. But in the Newer Appalachians the streams more often follow the trend of the structure until they empty into one of the larger, transverse streams. . Thus the Shen- andoah flows N.E. to the Potomac, the Holston S.W. toward the Tennessee. A part of this same province, in the S.W. part of the state, is drained by the New river, which flows N.W. across the ridges to the Kanawha and Ohio rivers in the Appalachian Plateau. In the limestone regions caverns and natural bridges occur, among which Ltiray Cavern and the Natural Bridge are well known. The drowned lower courses of the S.E. flowing streams are navigable, and afford many excellent harbours. Chesapeake Bay covers much land that might otherwise be agriculturally valuable, but repays this loss, in part at least, by its excellent fisheries, including those for oysters. In the S.E., where the low, flat Coastal Plain is poorly drained, is the Great Dismal Swamp, a fresh-water marsh covering 700 sq. in., in the midst of which is Lake Drummond, 2 m. or more in diameter. Along the shores of Chesapeake Bay and the Atlantic Ocean are low, sandy beaches, often enclosing lagoons or salt marshes.

Fauna. — Till about the middle of the 18th century the bison and the elk roamed the W. part of the state. The Virginia deer is common in the bottomlands; a few beaver still frequent the remoter streams; in the higher portions are still a few black bears and pumas, besides the lynx, the Virginia varying hare, the wood- chuck, the red and the fox squirrel and flying "squirrels. The grey squirrel is plentiful in wooded districts. On the Coastal Plain are the musk-rat, the eastern cotton-tail, chipmunk, grey fox, common mole and Virginia opossum. In colonial times the Atlantic right-whale was killed in some numbers off the coast.

Many species of water and shore birds migrate along the coast, where also others breed, as the royal, common and least terns and black skimmer; practically all the ducks are migrant species, though the wood-duck breeds. Swan, geese and brant winter on the coast. The yellow-crowned night-herori and the little blue heron nest rarely. The turkey-buzzard and the barn-owl are resident. Red-headed and red-bellied woodpeckers, orchard orioles, yellow- winged sparrows, the cardinal, the blue grosbeak, the Carolina wren and the mocking-bird arc characteristic of the lower elevations. The ruffed grouse and wild turkey are found in the wooded moun- tainous districts, while the quail (here called " partridge ") is a game bird of the open stubble fields.

Of reptiles, the rattlesnake and copperhead are the only poisonous species, but numerous harmless varieties are common. In the salt marshes of the coast occurs the diamond-backed terrapin. Trout abound in the mountain streams, and black bass in the rivers of the interior. The cat-fish grows to a large size in the sluggish rivers. On the coast, the striped bass, sea-bass, drum, sheepshead, weakfish, bluefish and Spanish mackerel are important as food fishes. There are valuable oyster fisheries in Chesapeake Bay.

Flora. — The Coastal Plain of Virginia is covered with pine forests

which merge westward with the hard woods of the Piedmont Belt, where oaks formerly prevailed, but where a second growth of pine now constitutes part of the forest. Even on the Coastal Plain the Jersey and oldfield pines of to-day replace more Valuable species of the original growth. The Blue Ridge and Newer Appalachian regions are covered with pine, hemlock, white oak, cherry and yellow poplar; while that portion of these provinces lying in the S.W. part of the state still contains valuable forests of hickory and walnut, besides oak and cherry. On the Coastal Plain the cypress grows in the Dismal Swamp, river birch along the streams,, and sweet gum and black gum in swampy woods. Other characteristic plants of the Coastal Plain are the cranberry, wild rice, wild yam, wax myrtle, wistaria, trumpet flower, passion flower, holly and white alder. Many of these species spread into the Piedmont Belt. Rhododendron, mountain laurel and azaleas are common in the mountains. The blackberry, black raspberry, huckleberry, blue- berry, wild ginger and ginseng are widely distributed. '

*Climate. — The climate of Virginia is generally free from extremes of heat and cold. In the Coastal Plain region the temperature is quite stable from day to day, as a result of the equalizing effect of the numerous bays which indent this province. The mean winter temperature is 39-8 , the mean summer temperature 77-2 J , with a mean annual of 58-6°. Killing frosts do not occur before the middle of October, nor later than the last part of April. In the Piedmont Province temperature conditions are naturally less stable, owing to the distance from the sea and to the greater inequality of surface topography. In autumn and winter sudden temperature changes are experienced, though not frequently. The mean winter temperature of this province is 35-8°; mean summer temperature, 75"; mean annual, 55-9°. Killing frosts may occur as early as the first of October and. as late as the last of May. The greatest variability in temperature conditions in the state occurs in the Blue Ridge, Newer Appalachian Provinces, w r herc the most rugged and variable topography is likewise found. The mean winter temperature for this section is 33-8°; mean summer temperature, 71*3 ; mean annual, 53-2°.*

Soil. — Marshy soils are found along the lowest portions of the Coastal

Plajn, and are exceedingly productive wherever reclaimed by draining, as in _ portions of the' Dismal Swamp. Other portions of the Coastal Plain afford more valuable soils, sandy loams over- lying sandy clays. On the higher elevations the soil is light and sandy, _ and such areas remain relatively unproductive. The crystalline rocks of the Piedmont area are covered with residual soils of variable composition and moderate fertility. Passing the high and rugged Blue Ridge, which is infertile except in the inter- vening valleys of its S.W. expansion, we' reach the Newer Appal- achians, where fertile limestone soils cover the valley floors. The Valley of Virginia is the most productive part of the state.

Forests. — The woodland area of Virginia was estimated in 1900 at _ 23,400 sq. m.,_or 58% of thearea of the state. The timber area originally comprised three divisions: the mountain regions growing pine and hard woods and hemlock; the Piedmont region producing chiefly oaks with some pine; and the lands below the " Fall Line, which were forested with yellow pine. Most of the pine of the mountain region has been cut, and the yellow pine and hard woods have also largely disappeared. The production of timber has, however, steadily increased. In 1900 the value of the product was $12,137,177, representing chiefly yellow pine.

Fisheries. — Oysters are by far the most valuable of the fisheries products, but, of the 400,000 acres of waters within the state suitable for oyster culture, in 1909 only about one-third was used for that purpose. Next in importance were the catches of men- haden, shad, clams, squeteague and alewives; while minor catches were made of crabs, croaker, bluefish, butterfish, catfish, perch and spotted and striped bass.

Agriculture. — -Tobacco was an important crop in the earlier history of the colony, and Virginia continued to be the leading tobacco-producing state of the Union (reporting in 1850 28-4% of the total crop) until after the Civil War, which, with the division of the state, caused it to fall into second place, Kentucky taking the lead; and in 1900 the crop of North Carolina also was larger. The state's production of tooacco in 1909 was 120,125,000 ib, valued at $10,210,625.

The production of Indian corn in 1909 was 47,328.000 bus., valued at $35,023,000; of wheat, 8,848,000 bus., valued at $10,175,000; of oats, 3,800,000 bus., valued at $2,052,000; of rye, 184,000 bus., valued at $155,000; of buckwheat, 378,000 bus., valued at $287,000; the hay crop was valued at $8,060,000 (606,000 tons). The amount of the cotton crop in 1909 was 10,000 500-ftj bales.

The value of horses in 3910 was $34,561,000 (323,000 head); of mules, $7,020,000 (54,000 head); of neat cattle, $20,034,000 (875,000 head);

of swine, $5,031,000 (774,000 head); of sheep, $2,036,000 (522,000 head).

Minerals. — The value of all mineral products in 1908 ‘ was $13,127,395. By far the most valuable single product was bitu- minous coal ($3,868,524; 4,250,042 tons). The existence of this mineral in the vicinity of Richmond was known as early as 1776, and the mining of it there began in 1775, but it was practically

*discontinued about the middle of the 19th century. The most important coalfields of the state lie in the Appalachian regions in the S.W. part of the state, though there are also rich deposits in the counties of Henrico, Chesterfield and Goochland, and in parts of Powhatan and Amelia counties. In the S.E. portion of the Kanawha basin, including Tazewell, Russell, Scott, Buchanan, Wise and Lee counties, occur rich deposits of coal, which are of great value because of their proximity to vast deposits of iron ores. In Tazewell county is the famous Pocahontas bed, which produces one of the most valuable grades of coking and steam coal to be found in the United States. There are remarkably rich deposits of iron ore in the Alleghanies, and the W. foothills of the Blue Ridge, from which most of the iron ore of the state is procured, are lined with brown hematite. Iron-mining — perhaps the first in the New Woild — was begun in Virginia in 1608, when the Virginia Company shipped a quantity of ore to England; and in 1619 the Company established on Falling Creek, a tributary of the James river, a colony of about 150 iron- workers from Warwickshire, Staffordshire and Sussex, who had established there several ore-reducing plants under the general management of John Berkeley of Gloucester, England, when on the 22nd of March 1622 the entire colony, excepting a girl and a boy, were massacred by the Indians. The first blast-furnace in the colony seems to have been owned by Governor Spotswood, and was built and operated at the head of the Rappahannock river about 17*5 by a colony of German Protestants. Immediately after the War of Independence Virginia became an important iron-producing state. The industry waned rapidly toward the middle of the 19th century, but was renewed upon the discovery of the high-grade ores in the S.W. part of the state and the development of railway facilities. The product of iron ore in 1908 was 692,223 long tons, valued at $1,465,691. The product of pig-iron in 1908 was 320,458 long tons, valued at $4,578,000.*

Manganese ore-mining began in Virginia in 1857 in the Shenandoah Valley, and the product increased from about 100 tons in that year to

about 5000 tons (mined near Warminster, Nelson county; in 1868 and 1869. Thereafter Virginia and Georgia supplied most of this mineral produced in the United States, and the greater part of it has been shipped to England. Between 1885 and 1891 the average annual production was about 15,000 tons, the greatest output— 20,567 tons — being mined in 1886. After 1891 the product declined rapidly, amounting in 1907 to 800 tons valued at $4800.

In the production of pyrite, which is found in Louisa county and is used for the manufacture of sulphuric acid employed in the treat- ment of wood pulp for paper-making and in the manufacture of superphosphates from phosphate rock, Virginia took first rank in 1902 with an output valued at $501,642, or 64-7 % of the total yield of this mineral in the United States; and this rank was maintained in 1908, when the product wa3 I 16,340 long tons, valued at $435,522. Limestone is found in the region west of the Blue Ridge, and has been quarried extensively, the product, used chiefly for flux, being valued in 1908 at $645,385.

Virginia was by far the most important state in 1908 in the pro- duction of soapstone, nearly the whole product being taken from a long narrow belt running north-east from Nelson county into Albemarle county; more than 90% of the output was sawed into slabs for laundry and laboratory appliances. The product of talc and soapstone in 1908 was 19,616 short tons, valued at $458,252.

The value of mineral waters produced in 1908 was $207,1 15. The state has many mineral springs occurring in connexion with faults in the Appalachian chain of mountains; in 1908, 46 were reported, making the state third among the states of the United States in number of springs, and of these several have been in high medical repute. At 18 of these resorts are situated, some of which have at times had considerable social vogue. White Sulphur Springs, in Greenbrier county, impregnated with sulphur, with therapeutic application in jaundice, dyspepsia, &c. ; Alleghany Springs, in Montgomery county, calcareous and earthy, purgative and diuretic; Rawley Springs in Rockingham county, Sweet Chalybeate Springs in Alleghany county, and Rockbridge Alum Springs in Rockbridge county, classed as iron springs and reputed of value as tonics, and the thermal springs, Healing Springs (88° F.) and Hot Springs (no F.), both in Bath county are noted medicinal springs.

The value of metals produced in 1908 was as follows: gold (which is found in a belt that extends from the Potomac river to Halifax county and varies from 15 to 25 in. in width), $3600 (174 fine oz. tro;')" copper, $3312 (25,087 lb); and lead, $1092 (13 short tons). Minerals produced in small quantities include gypsum, millstones, salt and sandstone, and among those

found Dut not produced (in 1902) in commeicial quantities may be mentioned allanite, alum, arsenic, bismuth, carbonite, felspar, kaolin, marble, plumbago, quartz, serpentine and tin. Asbestos was formerly mined in the western and south-western parts of the state. Barytes is mined near Lynchburg; the value of the output in 1907 was $32,833, since which date the output has decreased.

Manufactures.— Virginia's manufacturing establishments increased very rapidly in number and in the value of their products during the last two decades of the 19th century. The number of all establishments increased from 5710 in 1880 to 8248 in 1900; the capital invested from $26,968,990 to $103,670,988, the average

number of wage-earners from 40,184 to 72,702, the total wages from $7,425,261 to $22,445,720, and the value of products from $51 ,770, 992 to $132,172,910. The number of factories 1 increased from 3186 in 1900 to 3187 in r905, the capital invested from $92,299,589 to $147,989,182, the average number of wage-earners from 66,223 to 80,285, the total wages from $20,269,026 to $27,943,058, and the value of products from $108,644,150 to $148,856,525. The manu- facture of all forms of tobacco is the most important industry; the value of its products in 1905 was $16,768,204. Since 1880 there has been a rapid development in textile manufacture, for which the water power of the Piedmont region is used. A peculiar industry is the grading, roasting, cleaning and shelling of peanuts.

Transportation and Commerce. — Four large railway systems prac- tically originate in the state and radiate to the S. and W. : the Southern railway, with its main line traversing the state in the direction of its greatest length leaving Washington to run south-west through Alexandria, Charlottesville, Lynchburg and Danville to the North Carolina line, with connexions to Richmond and a line to Norfolk on the east ; the Atlantic Coast line with its main lines running S. from Richmond and Norfolk; the Seaboard Air line, having its main lines also running to the S. from Richmond and Norfolk; the Norfolk & Western crossing the state from east to west in the southern part with Norfolk its eastern terminus, passing through Lynchburg and leaving the state at the south-western corner at Bristol, and the Chesapeake & Ohio crossing the state from east to west farther north than the Norfolk & Western from Newport News on the coast through Richmond to the _ West Virginia line. Of more recent construction is the Virginian railway, a project of H. H. Rogers, opened for traffic in 1909, which connects the coal region of West Virginia with Norfolk, crossing the southern part of the state from E. to W., and is designed chiefly for heavy freight traffic. The N. W. part of the state is entered by the .Baltimore & Ohio, which has a line down the Shenandoah Valley to Lexington.

Connexion between Richmond and Washington is by a union line (Richmond, Fredericksburg & Potomac and Washington Southern railways) operated jointly by the Southern, Atlantic Coast line, Seaboard Air line, Chesapeake & Ohio, Pennsylvania, and Baltimore & Ohio railways. In 1850 there were 384 m. of railway in Virginia; in 1880, 1839 in., and in 1890 it had nearly doubled, having increased to 3,359-54 m., a gain coincident with the newly awakened industrial activity of the Southern States and an era of railway building throughout this section. The railway mileage in 1900 was 3,789-58, and in January 1909 it was 4,348-53.

Hampton Roads at the mouth of the James river, which forms the harbour for the leading ports of the state, Norfolk and Newport News, affords one of the best anchorages of the Atlantic coast. It gives shelter not only to vessels plyingto its adjoining ports but serves as a harbour of refuge for shipping bound up or down the Atlantic coast, and Is frequently used for the assembling of naval fleets. There is a large foreign trade and a regular steamship service to Boston, Providence, New York, Philadelphia and Savannah from Norfolk, and there is a considerable traffic on Chesapeake Bay, the Rappahannock, York, James and Elizabeth rivers. Fredericksburg at the head of navigation on the Rappahannock and West Point on the York have traffic of commercial importance in lumber and timber, oysters and farm produce, cotton and tobacco especially being shipped in coastwise vessels from West Point. Petersburg and Richmond on the James are connected with regular steamship lines with Norfolk, Richmond's water trade being chiefly in coal, oil, logs and fertilizer. Steamboats plying on Chesapeake Bay connect Alexandria with Norfolk. From the Elizabeth river on which Norfolk is situated lead the Albemarle & Chesapeake Ganal and the Dismal Swamp Canal, which connect with the waters of Albemarle Sound. Traffic through these canals consists chiefly of forest products, logs, lumber and shingles.

*Population. — The population of Virginia in 1890 was 1,655,980; in 1900, 1,854,184; and in 1910, 2,061,612.? Of the total population in 1900, 1,173,787 were native whites, 19,461 were foreign-born, 660,722 (or 35-7% of the total population) were negroes, 354 were Indians, 243 were Chinese and 10 were Japanese. The state was fifth among the states and Territories in the number of negro inhabitants, but showed a marked decrease in the ratio of negroes to the total population in the decade from 1S90 to 1 goo, the percentage of the total popula- tion in 1890 having been 38*4,*

Of the inhabitants born in the United States 53,235 were natives of North Carolina, 12,504 were natives of Maryland, and 10,273 were natives of Pennsylvania. Of the foreign-born 4504 were

1 Statistics for 1890 represent the value of all manufactures; those for 1900 (from this point) and 1905 show values under the factory system, excluding neighbourhood industries and hand trades.

2 According to previous censuses the population was as follows: (1790), 747,610; (1S00), 880,200; (1810), 974,600; (1820), 1,065,366; (1830), 1,211,405; (J840), 1,239,797;. (1850), 1,421,661; (1860), 1,596,318; (1S70), 1,225,163; (1880), I,5I2.565-

Germans, 3534 were natives of Ireland and 3425 of England. Of the total population 52,264 were of foreign parentage {i.e. either one or both parents were foreign-born) and 9769 were of German, 8235 of Irish and 4792 of English parentage, both on the father's and on the mother's side. Out of the total of 793,546 members of religious denominations in 1906, more than half, 415,987, were Baptists; the Methodists numbered 200,771 ; and there were 39,628 Presbyterians, 28,700 Roman Catholics, 28,487 Protestant Episcopalians, 26,248 Disciples of Christ, and I.S,oio Lutherans. Virginia in 1900 had 46-2 inhabitants to the square mile. The prin- cipal cities of the state are: Richmond (the capital), Norfolk, Petersburg, Roanoke, Newport News, Lynchburg, Portsmouth and Danville.

Government, — Virginia has had six state constitutions: the first was adopted in 1776, the second in 1S30, the third in 1851, the fourth in 1864, the fifth in 1869, and the sixth, the present, in 1902. Amendments to the present constitu- tion may be proposed in either house of the General Assembly, and if they pass both houses of that and the succeeding General Assembly by a majority of the members elected to each house and are subsequently approved by a majority of the people who vote on the question at the next general election they become a part of the constitution. A majority of the members in each house of the General Assembly may at any time propose a convention to revise the constitution and, if at the next succeeding election a majority of the people voting on the question approve, the General Assembly must provide for the election of delegates. To be entitled to vote one must be a male citizen of the United States and twenty-one years of age; have been a resident of the state for two years, of the county, city, or town for one year, and of the election precinct for thirty days next preceding the election; have paid, at least six months before the election, all state poll taxes assessed against him for three years next preceding the election, unless he is a veteran of the Civil War; and have registered after the adoption of the constitution (1902). For registration prior to 1904 one of four additional qualifications was required: service in

the army or navy of the United States, of the Con- federate States, or of some state of the United States or of the Confederate States; direct descent from one who so served; ownership of property upon which state taxes amounting to at least one dollar were paid in the preceding year; or ability to read the constitution or at least to show an understanding of it. And to qualify for registration after 1904 one must have paid all state poll taxes assessed against him for the three years immediately preceding his application, unless he is a veteran of the Civil War; and unless physically unable he must " make application in his own handwriting, without aid, suggestion or memorandum, in the presence of the regis- tration officers, stating therein his name, age, date and place of birth, residence and occupation at the time and for two years next preceding, whether he has previously voted, and, if so, the state, county and precinct in which he voted last'"; and must answer questions relating to his qualifications.

Executive. — The governor, lieutenant-governor, attorney-general, secretary of the commonwealth, treasurer, superintendent of public instruction and commissioner of agriculture are elected for a term of four years, every fourth year from igog L and each new administra- tion begins on the 1st of February. The governor must be at least thirty years of age, a resident of the state for five years next pre- ceding his election; and, if of foreign birth, a citizen of the United States for ten years. He appoints numerous officers with the con- currence of the Senate, has the usual power of vetoing legislative bills, and has authority to inspect the records of officers, or to employ accountants to do so, and to suspend, during a recess of the General Assembly, any executive officer at the seat of government except the lieutenant-governor; he must, however, report to the General Assembly at its next session the cause of any suspension and that body determines whether the suspended officer shall be restored or removed.

Legislature. — The General Assembly consists of a Senate and a House of Delegates. The Constitution provides that the number of senators shall not be more than forty nor less than thirty-three, and that the number of delegates shall not be more than one hundred nor less than ninety. Senators and delegates are elected by single districts (into which the state is apportioned once every ten years, according to population), the senators for a term of four years, the delegates for a term of two years. The only qualifications for

senators and delegates are those required of an elector and residence in their districts; there are, however, a few disqualifications, such as holding certain offices in the state or a salaried Federal office. The General Assembly meets regularly at Richmond on the second Wednesday in January of each even-numbered year, and the governor must call an extra session on the application of two-thirds of the members of both houses, and

may call one whenever he thinks the interests of the state require it. The length of a regular session is limited to sixty days unless three-fifths of the members of each house concur in extending it, and no extension may exceed thirty days. Senators and delegates are paid S500 each for each regular session and $250 for each extra session. Any bill may originate in either house, but a bill of special, private or local interest must be referred to a standing committee of five members appointed by the Senate and seven members appointed by the House of Dele- gates, before it is referred to the committee of the house in which it originated. The governor's veto power extends to items in appro- priation bills, and to overcome his veto, whether of a whole bill or an item of an appropriation bill, a two-thirds vote in each house of the members present is required, and such two-thirds must include in each house a majority of the members elected to that house. When- ever the governor approves of the general purpose of a bill, but disapproves of some portion or portions, he may return the bill with his recommendations for amendment, and when it comes back to him, he may, whether his recommendations have been adopted or not, treat it as if ir. were before him for the first time.

Judiciary. — The administration of justice is vested principally in a supreme court of appeals, circuit courts, city courts and courts of a justice of the peace. The supreme court of appeals consists of five judges, but any three of them may hold a court. They are chosen for a term' of twelve years by a point vote of the Senate and the House of Delegates. The court sits at Richmond, Staunton and WytheviUe. The concurrence of at least three judges is necessary to the decision of a case involving the constitutionality of a law. Whenever the docket of this court is crowded, or there is a case upon it in which it is improper for a majority of Lhe judges to sit, the General Assembly may provide for a special court of appeals, to be composed of not more than five nor less than three judges of the circuit courts and city courts, in cities having a population of ic.ooo or more. The state is divided into thirty judicial circuits and in each of these a circuit judge is chosen for a term of eight years by a joint vote of the Senate and the House of Delegates. The jurisdiction of the circuit courts was extended by the present Constitution to include that which, under the preceding Constitution, was vested in county courts, and the principal restriction is that they shall not have original jurisdiction in civil cases for the recovery of personal property amounting to less than $20. Similar to the circuit court is the corporation court in each city having a population of 10,000 or more; the judge of each of these corporation courts is chosen for a term of eight years by a joint vote of the Senate and the House of Delegates, and he may hold a circuit as well as a corporation court. Circuit courts and corporation courts appoint the commissioners in chancery. Three justices of the peace are elected in each magis- terial district for a term of four years.

There are also justices of the peace (elected) and police justices (appointed) in cities, and in various minor cases a justice's court has original jurisdiction, either exclusive or concurrent with the circuit and corporation courts. In each city having a population of 70,000 or more a special justice of the peace, known as a civil justice, is elected by a joint vote of the Senate and the House of Delegates for a term of four years.

Local Government. — Each county is divided into magisterial districts, varying in number from three to eleven. Each district elects a supervisor for a term of four years, and the district supervisors constitute a county board of supervisors, which represents the county as a corporation, manages the county property and county business, levies the county taxes, audits the accounts of the county, and recommends for appointment by the circuit court a county sur- veyor and a county superintendent of the poor. Each county also elects a treasurer, a sheriff, an attorney and one or more commissioners of the revenue, each for a term of four years, and a clerk, who is clerk of the circuit court, for a term of eight years. The coroner is appointed by the circuit court for a term of two years. Each magisterial district elects, besides a supervisor and justices of the peace, a constable and an overseer of the poor, each for a term of four years. The Constitution provides that all " communities " with a population less than 5000, incorporated after its adoption, shall be known as towns, and that those with a population of 5000 or more shall be known as cities. In each city incorporated after its adoption, the Constitution requires the election in each of a mayor, a treasurer and a sergeant, each for a term of four years, and the election or appointment of a commissioner of the revenue for an equal term; that in cities having a population of 10,000 or more the council shall be composed of two branches; that the mayor shall have a veto on all acts of the council and on items of appro- priation, ordinances or resolutions, which can be overridden only by an affirmative vote of two-thirds of the members elected to each branch; and that no city shall incur a bonded indebtedness ex- ceeding 18% of the assessed value of its real estate.

Miscellaneous Laws. — A married woman may manage her separate

property as if she were single, except that she cannot by her sole act deprive her husband of his courtesy in her real estate. A widow is entitled to a dower in one-third of the real estate of which her husband was seized at any time during coverture If the husband dies intestate, leaving no descendants and no paternal or maternal kindred, the whole of "his estate

goes to his widow absolutely. If the husband dies intestate, leaving a widow and issue, either by her or by a former marriage, the widow is entitled to at least one-third of his personal estate; if he leaves no issue by her, she is entirled to so much of his personal estate as was acquired by him by virtue of his marriage with her prior to the 4th of April 1877; if he leaves no issue whatever, she is entitled to one-half of his personal estate. A widower is entitled by courtesy to a life interest in all his wife's real estate: if she dies intestate, he is entitled to all her personal estate; if she dies intestate, leaving no descendants and no paternal or maternal kindred, he is entitled to her whole estate absolutely. The causes for an absolute divorce are adultery; impotency; desertion for three years; a sentence to confinement in the peni- tentiary; a conviction of an infamous offence before marriage unknown to the other; or, if one of the parties is charged with an offence punishable with death or confinement in the penitentiary, and has been a fugitive from justice for two years; pregnancy of the wife before marriage unknown to the husband, or the wife's being a prostitute before marriage unknown to the husband. One party must be a resident of the state for one year preceding the commencement of a suit for a divorce. When a divorce is obtained because of adultery, permission of the guilty party to marry again is in the discretion of the court. Marriages between whites and negroes and bigamous marriages are void. The homestead of a householder or head of a family to the value of $2000 and properly recorded is exempt from levy, seizure, garnishment or forced sale, except for purchase money, for services of a labouring person or mechanic, for liabilities incurred by a public officer, fiduciary or attorney for money collected, for taxes, for rent or for legal fees of a public, officer. If the owner is a married man his homestead cannot be sold except by the joint deed of himself and his wife ; neither can it be mortgaged without his wife's consent except for purchase money or for the erection or repair of buildings upon it- The exemption continues after his death so long as there is an unmarried widow or an unmarried minor child. The family library, family pictures, school books, a seat or pew in a house of worship, a lot in a burial ground, necessary wearing apparel, a limited amount of furniture and household utensils, some of a farmer s domestic animals and agricultural implements, and the wages of a labouring man who is a householder are exempt from levy or distress. A law enacted in 1908 forbids the employment of children under fourteen years of age in any factory, workshop, mercantile establishment, or mine within the state, except that orphans or other children dependent upon their own labour lor support or upon whom invalid parents are dependent may be so employed after they are twelve years of age, and that a parent may work his or her own children in his ur her own factory, workshop, mercantile establishment or mine. Charitable and Penal Institutions. — Virginia has four hospitals for the insane: the Eastern State Hospital O1773), at Williams- burg; the South-Western State Hospital

(1887), at Marion; the Western State Hospital (1828), with an epileptic colony, at Staun- ton; and the Central State Hospital (1870; for negroes), at Peters- burg. For the care of the deaf and blind there is the Virginia School for Deaf and Blind (1839), at Staunton, and the Virginia School for Coloured Deaf and Blind Children (1908), at Newport News. The State Penitentiary is at Richmond. The Prison Association of Virginia with an Industrial School (1890) at Laurel Station, the Negro Reformatory Association of Virginia with a Manual Labour School (1897) at Broadneck Farm, Hanover, and the Virginia Home and Industrial School for white girls (1910) at Bon Air take care of juvenile offenders; these are all owned and controlled by self-perpetuating boards of trustees, but are supported by the state, receiving an allowance per capita. For each state hospital for the insane there is a special board of directors consisting of three members appointed by the governor with the concurrence sf the Senate, one every two years, and over them all is the com- missioner of state hospitals for the insane, who is appointed by the governor with the concurrence of the Senate for a term of four years. The members of the special boards under the chairmanship of the commissioner constitute a general board for all the hospitals, and the superintendent of each hospital is appointed by the general board. Each school for the deaf and blind is managed by a board of visitors appointed by the governor with the concurrence of the Senate. About five-sixths of the convicts are negroes. Some of them are employed on a state farm at Lassiter, Goochland county, on which there is a tuberculosis hospital, and some of them on the public roads; in 1909 there were 350 men at the state farm, 14 road camps with about 630 men, and 1273 men and 96 women in the penitentiary at Richmond. When a prisoner has served one- half of his term and his conduct has been good for two years (if he has been confined for that period) the board of directors may parole him for the remainder of his term, provided there is satisfactory assurance that he will not be dependent on public charity. The Prison Association of Virginia, the Negro Reformatory

Association of Virginia and the Virginia Home and Industrial School for girls are each under a board of trustees appointed, by the General Assembly, and each is authorized to establish houses of correction, reformatories and industrial schools. A general supervision of all state, county, municipal and private charities and corrections is vested by a law enacted in 1908 in a board of charities and correc- tions consisting of five members appointed by the governor with the concurrence of the Senate.

Education.— The public free school system is administered by a state board of education, a superintendent of public instruction, division superintendents, and district and county school boards. The state board of education consists of the governor; the attorney- general; the superintendent of public instruction, who is ex officio its president; three experienced

educators chosen quadrennially by the Senate from members of the faculties of the University of Virginia, the Virginia Military Institute, the Virginia Polytechnic Institute, the State Female Normal School at Farmville, the School for the Deaf and Blind, and the College of William and Mary; and two division superintendents, one from a county and one from a city, chosen biennially by the other members of the board. This board prescribes the duties of the superintendent of public instruc- tion and decides appeals from his decisions; keeps the state divided into school divisions, comprising not less than one county or city each; appoints quadrennially, with the concurrence of the Senate, one superintendent for each school division and prescribes his powers and duties; selects textbooks; provides for examination of teachers; and appoints school inspectors. In each county an electoral board, consisting of the attorney for the Commonwealth, the division superintendent and one member appointed by the judge of the circuit court, appoints a board of three school trustees for each district, one each year. The division superintendent and the school trustees of the several districts constitute a county school board. The elementary schools are maintained from the proceeds of the state school funds, consisting of interest on the literary fund, a portion of the state poll tax, a property tax not less than one mill nor more than five mills on the dollar, and special appropriations; county funds, consisting principally of a property tax; and district funds, consisting principally of a property tax and a dog tax. A law enacted in 1908 encourages the establish- ment of departments of agriculture, domestic economy and manual training in at least one high school in each congressional district. A law enacted in 1910 provides a fund for special aid from the state to rural graded schools with at least two rooms. With state aid normal training departments are maintained in several of the high schools in counties which adopt the provisions of the statute. All children between the ages of eight and twelve years are required to attend a public school at least twelve weeks in a year (six weeks consecutively) unless excused on account of weakness of mind or body, unless the child can read and write and is attending a private school, or unless the child lives more than two miles from trie nearest school and more than one mile from an established public school wagon route. The State Female Normal School, at Farm- ville, is governed by a board consisting of the state superintendent and thirteen trustees appointed by the governor with the con- currence of the Senate for a term of four years. The Virginia Normal and Industrial Institute, at Petersburg, is governed by a board of visitors consisting of the superintendent of public instruc- tion and four other members appointed by the governor with the concurrence of the Senate for four years. In 1908 the General Assembly made an appropriation for establishing two state normal and industrial schools for women, one at Harrisonburg and the other at Fredericksburg, both under a board of trustees consisting of the superintendent of public

instruction and ten other members appointed by the governor with the concurrence of the Senate. The Virginia Agricultural and Mechanical College and Polytechnic Institute, at Blacksburg, is governed by a board consisting of the state superintendent and eight visitors appointed by the governor with the concurrence of the Senate. The Virginia Military Institute, at Lexington, is governed by a board of visitors consisting of the adjutant general, the superintendent of public instruction and nine other members appointed by the governor with the concurrence of the Senate. The University of Virginia (q.v.), at Charlottesville, was founded in 1817 and opened in 1825. The College of William and Mary (1693), at Williamsburg, became a state institution in 1906 and is likewise governed under a board appointed by the governor. Other institutions of higher learning which are not under state control are: Washington and Lee University (non- sectarian, 1749), at Lexington; Hampden-Sidney College (Presby- terian,ˆi776), at Hampden-Sidney; Richmond College (Baptist, 1832), at Richmond; Randolph- Macon College (Methodist Episco- pal, 1S32), at Ashland; Emory and Henry College (Methodist Episcopal, 1838), at Emory; Roanoke College (Lutheran, 1853), at Salem; Bridgewater College (German Baptist, 1879), at Bridge- water; Fredericksburg College (Presbyterian, 1893), at Fredericks- burg; Virginia Union University (Baptist, 1899), at Richmond; and Virginia Christian College (Christian, 1903), at Lynchburg.

Finance.— Revenue for state, county and municipal purposes is derived principally from taxes oh real estate, tangible personal property, incomes in excess of $tooo, wills and administrations,

deeds, seals, lawsuits, banks, trust and security companies, insurance companies, express companies, railway and canal corporations, sleeping-car, parlour-car and dining-car companies, telegraph and telephone companies, franchise taxes, poll taxes, an inheritance tax and taxes on various business and professional licences. The tax laws require that property shall be assessed at its full value by commissioners of the revenue elected by counties and cities. The revenue is collected by county and city treasurers, clerks of courts, and the state corporation commission, consisting of three members appointed by the governor with the concurrence of the General Assembly in joint session. The total receipts in the fiscal year 1908-1909 amounted to $5,536,510 and the total disbursements to $5,796,980. By the 1st of January 1861 Virginia had incurred a debt amounting to nearly $39,000,000, principally in aid of internal improvements. She was unable to pay the interest on this during

the Civil War, and in March 1871 the principal together with the overdue interest amounted to about $47,000,000. The General Assembly passed an act at that time for refunding two-thirds of it, claiming that the other third should be paid by West Virginia. But the advocates of a " forcible readjustment " of the debt carried the election in 1879 with the aid of the negro vote, and after prolonged negotiations in 1892 a settlement was effected under which a debt amounting to about $28,000,000 was again refunded. In 1908 this had been reduced to about $24,000,000. The sinking fund consists of damages recovered against defaulting revenue collectors, railway stock and appropriations from time to time by the legislature.

History. — Virginia was the first permanent English settle- ment in North America. From. 15S3 to 15S8 attempts had been made by Sir Walter Raleigh and others to establish colonies on the coast of what is now North Carolina. The only result was the naming of the country Virginia in honour of Queen Eliza- beth. But glowing accounts were brought back by the early adventurers, and in 1606 an expedition was sent out by the London Company, which was chartered with rights of trade and settlement between 34 and 41 N. lat. It landed, at a place which was called Jamestown, on the 13th of May 1607, and resulted in the establishment of many plantations along the James river. The purpose of the company was to build up a profitable commercial and agricultural com- munity; but the hostility of the natives, unfavourable climatic conditions and the character of the colonists delayed the growth of the new community. John Smith became the head of the government in September 1608, compelled the colonists to submit to law and order, built a church and prepared for more extensive agricultural and fishing operations. In 1609 the London Company was reorganized, other colonists were sent out and the boundaries of the new country were fixed, according to which Virginia was to extend from a point 200 m. south of Old Point Comfort, at the mouth of Chesapeake Bay, to another point 200 m. north, " west and northwest to the South Sea."

The government of the country was in the hands of the London Company, which in turn committed administrative and local affairs to a governor and council who were to reside in the colony. Before the arrival of the " government " and their shiploads of settlers the original colony was reduced to the direst straits. Captain Christopher Newport (d. 1618), Sir Thomas Gates and Sir George Somers, the new authorities, reached Jamestown at last with 150 men, but finding things in such a deplorable state all agreed (June 10, 1610) to give up the effort to found a colony on the James arid set sail for New- foundland. At the mouth of the river they met Lord Delaware, however, who brought other colonists and plentiful supplies; and they returned, set up a trading post at what is now Hampton and undertook to bring the hostile natives to subjection. In ion, 650

additional colonists landed, the James and Appo- mattox rivers were explored and " plantations " were estab- lished at Henrico and New Bermuda. In 161 7 Virginia fell into the hands of a rigid Puritan, Captain Samuel Argall. The colonists were compelled on pain of death to accept the doctrine of the trinity, respect the authority of the Bible and attend church. This rigid regime was superseded in 1619 by a milder system under Sir George Yeardley (d. 1627). Twelve hundred new colonists arrived in 1619. At the same time negro slaves and many "indentured " servants were imported as labourers.

At the beginning Virginia colonists had held their land and improvements in common. But in 1616 the land was par- celled out and the settlers were scattered along the shores of the

James and AppomattOA rivers many miles inland. Twenty thousand pounds of tobacco were exported in 1619. The com- munity had now become self-supporting, and the year that witnessed these changes witnessed also the first representative assembly in North America, the Virginia' House of Burgesses, a meeting of planters sent from the plantations to assist the governor in reforming and remaking the laws of the colony. In 1621 a constitution was granted whereby the London Company appointed the governor and a council, and the people were to choose annually from their counties, towns, hundreds and plantations delegates to the House of Burgesses. The popular assembly, like the English House of Commons, granted supplies and originated laws, and the governor and Council enjoyed the right of revision and veto as did the king and the House of Lords at home. The Council sat also as a supreme court to review the county courts. This system remained unchanged until the revolution of 1776. But in 1624 the king took the place and exercised the authority of the London Company.

Before 1622 there was a population of more than 4000 in Virginia, and the many tribes cf Indians who were still the pro- prietors of the soil over a greater portion of the country naturally became jealous, and on the 22nd of March of that year fell upon the whites and slew 350 persons. Sickness and famine once again visited the colony, and the population was reduced by nearly one-half. These losses were repaired, however; the tobacco industry grew in importance, and the settlers built their cabins far in the interior of lowland Virginia. This rapid growth was scarcely retarded by a second Indian attack, in April 1641, which resulted in the death of about 350 settlers. By 1648 the population had increased to 15,000.

Virginia was neither cavalier nor roundhead, but both. Sir William Berkeley had been the governor since 1641, and though he was loyal enough to the crown, it was without difficulty that his authority was

overthrown in March 1652 and that of Cromwell proclaimed in its stead. Richard Bennett, a Puritan from Maryland, now ruled the province. Bennett and his Puritan successors, Edward Digges and Samuel Mathews, made no serious change in the administration of the colony except to extend greatly the elective franchise. But this policy was reversed in 1660, when Berkeley was restored to power. The return of Berkeley was the beginning of a reaction which concentrated authority, both in the House of Burgesses and in the Council, in the hands of the older families, and thus created a privileged class. The governor, supported by the great families, retained the same House of Burgesses for sixteen years lest a new one might not be submissive. The increasing mass of the population dwelt along the western border or on the less fertile ridges which make up the major part of the land even in tide-water Virginia. These poorer people — who were not, however, " poor whites " — developed an abiding hostility towards the oligarchy. They desired a freer land-grant system, protection against the inroads of the Indians along the border, and frequent sessions of an assembly to be chosen by all the freeholders. But a new code of laws outlawed many of these people as dissenters, and in 1676 a burdensome tax was laid by the unrepresentative assembly. The Indians had again attacked the border farmers, and the governor had refused assistance, being willing, it was generally believed, that the border pop- ulation should suffer while he and his adherents enjoyed a lucrative fur trade with the Indians. Under these circum- stances, Nathaniel Bacon (1647-1676), whose grandfather was a cousin of Francis Bacon, took up the cause of the borderers and severely punished the Indians at the battle of Bloody Run. But Berkeley meanwhile had outlawed Bacon, whose forces now marched on the capital demanding recognition as the authorized army of defence. This was refused, and civil war began, in which the governor was defeated and Jamestown was burned. But Bacon fell a victim to malaria and died in October in Gloucester county. Berkeley closed the conflict with wholesale executions and confiscations. Censured by the king, he sailed to England to make his defence, but died in London in 1677 without having seen Charles. Virginia

remained in the hands of the reactionary party and was governed by men whose primary purpose was to " make their fortunes " at the expense of the colonials. Even the accession of William and Mary scarcely affected the fortunes of the " fifth kingdom," though Middle Plantation, a hamlet not far from Jamestown, became Williamsburg and the capital of the province in 1691, and the clergy received a head, though not a bishop, in the person of James Blair (1656-1743), an able Scottish churchman, who as

commissary of the bishop of London became a counter- poise to the arbitrary governors, and who as founder and head of the College of William and Mary (established at Williams- burg in 1603) did valiant service for Virginia. Under the stimulus of Blair's activity religion and education prospered as never before. The powers and duties of the vestry were defined, the position of the parish priest was fixed and his salary was regularly provided for at the public expense, and peda- gogues were brought over from Scotland.

By 1700 the population of Virginia had reached 70,000, of whom 20,000 were negro slaves. The great majority of whites were small farmers whose condition was anything but desirable and who constantly encroached upon the Indian lands in the Rappahannock region or penetrated the forests south of the James, several thousand having reached North Carolina. Be- tween 1707 and 1740 many Scottish immigrants, traders, teachers and tobacco-growers settled along the upper Rappahannock, and, uniting with the borderers in general, they offered strong resistance to the older planters on the James and the York.

Tobacco^growing was the one vocation of Virginia, and many of the planters were able to spend their winters in London or Glasgow and to send their sons and daughters to the finishing schools of the mother country. Negro slavery grew so rapidly during the first half of the eighteenth century that the blacks outnumbered the whites in 1740. The master of slaves set the fashion. Handsome houses were built along the banks of the sluggish rivers, and numerous slaves were employed. There was as great a social distance between the planters and their families on the one side and the masses of people in Virginia on the other as that which separated the nobles from the yeo- manry in Europe; and there was still another chasm between the small farmers and the negroes.

In 1 7 16 an expedition of Governor Alexander Spotswood over the mountains advertised to the world the rich back- country, now known as the Valley of Virginia; a migration thither from Pennsylvania and from Europe followed which revolutionized the province. The majority of blacks over whites soon gave way before the influx of white immigrants, and in 1756 there was a population of 292,000, of whom only 120,000 were negroes, and the small farmer class had grown so rapidly that the old tide- water aristocracy was in danger of being overwhelmed. The " West " had now appeared in American history. This first West, made up of the older small farmers, of the Scottish settlers, of the Germans from the Palatinate and the Scottish-Irish, far outnumbering the people of the old counties, demanded the creation of new counties and proportionate representation in the Burgesses. They did not at first succeed, but when the Seven Years' War came on they proved their worth by fighting the battles of the community

against the Indians and the French. When the war was over the prestige of the up-country had been greatly enhanced, and its people soon found eastern leaders in the persons of Richard Henry Lee and Patrick Henry. In 1763-1765 an investigation of the finances of the colony, forced by the up-country party, showed widespread corruption, and resulted in the -collapse of the tide-water oligarchy, which had been in power since 1660. In the meantime the Presby- terians, who had been officially recognized in Virginia under the Toleration Act in 1699, and had been guaranteed religious autonomy in the Valley by Governor Gooch in 1738, had sent missionaries into the border counties of eastern Virginia. The Baptists about the same time entered the colony both from the north and the south and established scores of churches. The new denominations vigorously attacked the methods and

immunities of the established church, whose clergy had grown lukewarm in zeal and lax in morals. When the clergy, refusing to acknowledge the authority of the Burgesses in reducing their stipends, and, appealing to the king against 1 the Assembly, entered the courts to recover damages from the vestries, Patrick Henry at Hanover court in 1763 easily con- vinced the jury and the people that the old church was well- nigh worthless. From this time the old order was doomed, for the up-country, the dissenters and the reformers had combined against it. But the passage of the Stamp Act hastened the catastrophe and gave the leaders of the new combination, notably Henry, an opportunity to humiliate the British ministry, whom ndt even the tide-water party could defend. The repeal of the Stamp Act, followed as it was by the Townshend scheme of indirect taxation, displeased Virginia quite as much as had the former more direct system of taxation. When the Burgesses undertook in May 1769 to declare in vigorous resolutions that the right and power of taxation, direct and indirect, rested with the local assembly, the governor hastily dissolved them, but only to find the same men assem- bling in the Raleigh tavern in Williamsburg and issuing forth their resolutions in defiance of executive authority. Patrick Henry and Richard Henry Lee, with Thomas Jefferson, a new up-country leader of great ability, were the leaders.

In 1774 Lord Dunmore, the governor, led an army to the Ohio river to break an Indian coalition which had been formed to check the rapid expansion of Virginia over what is now Kentucky and West Virginia. The up-country again furnished the troops and did the fighting at Point Pleasant (?.».), where on the 10th of October the power of the Indians was completely broken. But the' struggle with England had reached a crisis, and Virginia supported with zeal the revolutionary movement and took the lead in the Continental Congresses which directed the succeeding war (see United States). In 1775 Patrick Henry organized a regiment of militia and compelled the governor to seek safety on board an English man-of-war in

Chesapeake Bay. The war now assumed continental proportions, and the Virginia leaders decided in May 1776 that a declaration of independence was necessary to secure foreign assistance. When the Continental Congress issued the famous Declaration Virginia had already assembled in convention to draft a new Constitution. Although Henry, Lee and Jefferson exercised great power, they were unable to secure a Constitution which embodied the demands of their party: universal suffrage, proportional representation and religious freedom. A drafts for such a Constitution was submitted by Jefferson, but the Conservatives rejected it. The system which was adopted 1 allowed the older counties, which must be conciliated, a large majority of the representatives in the new Assembly, on the theory that the preponderance of property (slavery) in that section required this as security against the rising democracy. In place of the former governor, there was to be an executive chosen annually by the Assembly; the old Council was to be followed by a similar body elected by the Assembly; and the judges were likewise to be the creatures of the legislature. The Assembly was divided into two bodies, a Senate and a House of Delegates. The legislature would be all-powerful, and yet representation was so distributed that about'one-third of the voters living in the tide-water region would return nearly two-thirds of the members of the legislature. The franchise/ though not universal, was generously bestowed; it was a very liberal freehold system.

The recruiting ground for the American army in Virginia was the up-country among the Scottish-Irish and the Germans who had long fought the older section of the colony. In 1770 Norfolk was again attacked, and great damage was also done to the neighbouring towns. In January 1781 Benedict Arnold captured Richmond and compelled governor and legislature to flee beyond the Blue Ridge mountains, where one session of the Assembly was held. The last campaign of the war closed at Yorktown on the 19th of October 178T.

Virginia leaders, including Henry, were the first to urge the

formation of a national government with adequate powers to supersede the lame confederacy. In 1787, under the pre- sidency of Washington, the National Convention sat in Phila- delphia, with the result that the present Federal Constitution was submitted to the states for ratification during 1787-1789. In Virginia the tide-water leaders urged adoption, while the up- country men, following Henry, opposed; but after a long and a bitter struggle, in the summer of 1788 the new instrument was accepted, the low-

country winning by a majority of ten votes, partly through the influence of James Madison. Thus the eastern men, who had reluctantly supported the War of Inde- pendence, now became the sponsors for the national government, and Washington was compelled to rely on the party of slavery, not only in Virginia but in the whole South, in order to administer the affairs of the nation.

In 1784, Virginia, after some hesitation, ceded to the Federal government the north-west territory, which it held under the charter of 1609; in 1792 another large strip of the territory of Virginia became an independent state under the name of Kentucky. But the people of these cessions, especially of Kentucky, were closely allied to the great up-country party of Virginia, and altogether they formed the basis of the Jeffersonian democracy, which from 1794 opposed the chief measures of the Washington administration, and which on the passage of the Alien and Sedition laws in 1798 precipitated the first great constitutional crisis in Federal politics by the adoption in the Kentucky and Virginia legislatures of the resolutions, known by the names of those states, strongly asserting the right and duty of the states to arrest the course of the national government whenever in their opinions that course had become unconstitutional. Jefferson was the author of the Kentucky resolutions, and his friend Madison prepared those passed by the Virginia Assembly. But these leaders restrained their followers sharply whenever the suggestion of secession was made, and the question of what was meant by arresting the course of Federal legislation was left in doubt. The election of 1800 rendered unnecessary all further agitation by putting Jefferson in the President's chair. The up-country party in Virginia, with their allies along the frontiers of the other states, was now in power, and the radical of 1776 shaped the policy of the nation during the next twenty-five years. Virginia held the position of leadership in Congress, controlled the cabinet and supplied many justices of the Supreme Court.

Virginia played a leading rdle in the War of 1812, and up to 1835 her influence in the new Western and North-Western states was overwhelming. But the steady growth of slavery in the East and of a virile democracy in the West neutralized this influence and compelled the assembling of the constitutional convention of 1829, whose purpose was to revise the fundamental law in such a way as to give the more populous counties of the West their legitimate weight in the legislature. The result was failure, for the democracy of small farmers which would- have taxed slavery out of existence was denied proportionate representation. The slave insurrection under Nat Turner (q.v.) in 1831 led to a second abortive effort, this time by the legislature, to do away with the fateful institution. The failure of these popular movements led to a sharp reaction in Virginia, as in the whole South, in favour of slavery. From 1835 to 1861 many leading Virginians defended slavery as a blessing and as part of a divinely

established order.

In 1850 a third Convention undertook to amend the Constitu- tion, and now that the West yielded its bitter hostility to slavery, representation was so arranged that the more populous section was enabled to control the House while the East still held the Senate; the election of judges was confided to the people; and the suffrage was broadened. Although the West was not pleased, the leaders of the slave-holding counties threatened, secession .

In the national elections of i860 Virginia returned a majority of unionist electors as against the secession candidates, Breckin- ridge and Lane, many of the large planters voting for the continuance of the Union, and many of the smaller slave-owners supporting the secessionists. The governor called an extra

session of the legislature soon after the Federal election, and this in turn called a Convention to meet on the 13th of February 1861. The majority of this body consisted of Unionists, but the Con- vention passed the ordinance of secession when the Federal government (April 17) called upon the state to supply its quota of armed men to suppress " insurrection " in the lower Southern states. An alliance was made with the provisional government of the Confederate States, on April 25, without waiting for the vote of the people on the ordinance. The Convention called out 10,000 troops and appointed Colonel Robert E. Lee of the United States army as commander-in-chief. On the 23rd of May the people of the eastern counties almost unanimously voted approval of the acts of the Convention, and the western counties took steps to form the state of West Virginia (q.v.). Richmond soon became the capital of the Confederacy.

The Civil War was already begun, and Virginia was of neces- sity the battle-ground. Of the six great impacts made upon the Confederacy, four were upon Virginian soil: the first Man- assas campaign (1861), the Peninsular battles (1862), second Manassas (1862), Fredeiicksburg, Chancellorsville (1862-63) and the great Wilderness-Petersburg series of attacks (1864-65). About 50,000 men were killed in Virginia, and probably 100,000 died of wounds and disease. The principal battles were: the first Manassas, or Bull Run (July 21, 1861); those around Richmond (June 26- July 2, 1861); second Manassas (August 29-30); Fredericksburg (December 12, 1862); Mechanicsville (May 2 and 3, 1863); the Wilderness (May 5 and 6); Spottsylvania (May 8); North Anna and Bethesda church (May 29-30) ; Cold Harbor (June 3) ; the battles around Petersburg (June 15, July 30 and November 1, 1864); and Five Forks (April 1) and Appomattox (April 8-9, 1865).

With the surrender of the Confederate army under Genera! Lee to Grant at Appomattox the task of reconstruction began. President Lincoln offered a very liberal plan of re-establishing the civil authority over the counties east of the Alleghany mountains, and Governor Francis H. Pierpont set up in Rich- mond a government, based upon the Lincoln plan and supported by President Johnson, which continued till the 2nd of March 1867, when the famous reconstruction order converting the state into Military District No. 1 was issued. General John M. Schofield was put in charge, and under Ms authority a constitutional Convention was summoned which bestowed the suffrage upon the former slaves, who, led by a small group of whites, who had come into the sta.te with the invading armies, ratified the 14th and 15th amendments to the Federal Constitu- tion and governed the community until 1869. Then the secessionists and Union men of 1861 united and regained control. Virginia was readmitted to the Union on the 26th of January 1870. The Constitution of the reconstruction years was unchanged until 1902, when the present fundamental law was adopted.

In national elections the state has supported the Democratic party, except in i860, when its vote was cast for John Bell, the candidate of the Constitutional Union party.

Governors of Virginia Under the Company

Edward Maria Wingfield, President of the

Council .....

John Ratcliffe, President of the Council John Smith, ,, ,, ,,

George Percy, ,, ,, ,, .

Thomas West, Lord Delaware, " Governor and

Captain General " . George Percy, Deputy Governor . Sir Thomas Dale, "High Marshal " and

Deputy Governor ..... Sir Thomas Gates, Acting Governor Sir Thomas Dale, ,, ,,

George Yeardlcy, Lieutenant or Deputy

Governor .....

Samuel Arga 11 .Lieutenant or Deputy Governor

Nathaniel Powell, Acting Governor

Sir George Yeardlcy, Governor

Sir Francis Wyatt, ,, ...

1607 (April to Sept.)

1 607- 1 608 1608-1609 1609-1610

1610-1618

*161 1 (March to May**

161 1 (May to Aug.)

1611-1612

1612-1616

1616-1617 1617-1619

l6i9(April 9 to 19)

1619-1621 1621-1624

VIRGINIA, UNIVERSITY OF

125

Under ike Crown Sir Francis Wyatt, Governor. Sir George Yeardley, „ Francis West (elected by Council) John Poet „ .

Sir John Harvey, Governor . John West (elected by Council) Sir John Harvey, Governor . Sir Francis Wyatt, „ .

Sir William Berkeley, ,, . Richard Kemp (elected by Council) Sir William Berkeley, Governor

Under the Commonwealth Richard Bennett (elected by General Assembly) Edward Digges (elected by House of Burgesses) Samuel Mathews (elected by House of Bur- gesses) . . . . . .

Under the Crown Sir William Berkeley, Governor . Francis Morrison (or Moryson), Deputy

Governor …..

Herbert Jeffreys, Lieutenant Governor . Sir Henry Chicheley, Deputy Governor Thomas, Lord Culpeper, Governor Nicholas Spencer, President of

the Council Francis, Lord Howard of Effingham, Lieu- tenant Governor …. Nathaniel Bacon, President of the Council Francis Nicholson, Lieutenant Governor Sir Edmund Andros, Governor Francis Nicholson, Lieutenant Governor George Hamilton Douglas, Earl of Orkney.

Governor-in-Chief . Edward Nott, Lieutenant Governor Edmund Jenings, President of the Council Robert Hunter, Lieutenant Governor 1 . Alexander Spotswood, Lieutenant Governor Hugh Drysdale, ,, ,,

Robert Carter, President of the Council William Gooch, Lieutenant Governor . William Anne Keppcl, Earl of Albemarle,

Governor-in-Chief 1 …. James Blair, President of the Council , Sir William Gooch, Governor John Robinson, President of the Council Thomas Lee, „ ,, ,,

Lewis Rurwell, „ ,, „

Robert Dinwiddie, Lieutenant Governor John Campbell, Earl of Loudon, Governor

General of the American Colonies 1 John Blair, President of the Council Francis Fauquier, Lieutenant Governor Sir Jeffrey Amherst, Governor-in-Chief 1 John Blair, President of the Council Norborne Berkeley, Baron de Botetourt

Govemor-in- Chief …. William Nelson, President of the Council John Murray, Earl of Dunmore, Governor'

in-Chtef …..

State Patrick Henry Thomas Jefferson Thomas Nelson, jun. . Benjamin Harrison Patrick Henry . Edmund Randolph Beverley Randolph Henry Lee Robert Brooke

James Wood, Democratic-Republican James Monroe, „

John Page, „

William H. Cabell, „ John Tyler, sen., „ James Monroe, ,,

George Win. Smith (acting), Democratic Re- publican …. Peyton Randolph (acting) James Barbour, Anti-Democrat Wilson Cary Nicholas, Republican James Patton Preston, ,, Thomas Mann Randolph, ,,

James Pleasants, jun., ,,

ohn Tyler, State Rights Democrat William Branch Giles, Democrat .

1624-1626 1626-1627 1627-1628 1628-1629 1 629-1 635 1635-1636 1 636-1 639

I 639-1 641

1641-1644 1644-1645 1645-1652

1 652- 1 655 1 655-1 657

I 657-1 660

1660-1677

I 661-1662

1 677-1 678

I 678-1 680

1680-1683 1683-1684

1684-1687 1687-1690

I 690- I 692

1 692- 1 69 8

I 698-I 704

I 704-1 737

1705-1706 1 706-1710 1707

1710-1722 1722-1726 . 1 726-1727 1727-1740

1 737-1 754

1 740-1 74i

1741-1749

1749 (June to Sept.)

1 749-i75>*

1 750-I 751

1751-1758

1756-1763

I75S (Jan. to June)

1 758-1768

1 763-1768

1768 (March toOct.)

1 768-1770 1770-1771

I77I-I775

1 776-1 779 1779-1781 1781

1781-1784 1 784-1 786 1786-1788 1788-1791 1791-1794 1 794-1 796 1 796- 1 799 1 790-1802 1 802-1805 1 805- 1 808 1 808-1 81 1 1811

1811

1811-1812

1812-1814

1814-1816

1816-1S19

1819-1822

1822-1825

1825-1827

1 82 7- 1 830

John Floyd, Democrat . . .

Littleton Waller Tazewell, Democrat

Wyndham Robertson (acting), Democrat

David Campbell, Whig

Thomas W. Gilmer, Whig .

John M. Patton (acting), ,,

John Rutherford (acting), „

John Munford Gregory (acting), Whig .

James McDowell, ,,

William Smith, Democrat

John Buchanan Floyd, Democrat

Joseph Johnson, „

Henry Alexander Wise, ,,

John Letcher, ...

William Smith,

1 830-1 834 1 834-1 836

1836-1S37

1 837- 1 840 1 840-1 841 1 841

1 841-1842 1 842-1 843 1843-1846 1 846-1 849 1849-1852 1852-1856 1 856- 1 860 1 860-1 864 1864-1865

Never in Virginia.

Francis H. Pierpont (provisional), Republican 1865-1867 Henry Horatio Wells, „ „ 1868-1870 Gilbert Carlton Walker, „ 1870-1874 James Lawson Kemper, Conservative – 1874-1878 Frederick Wm. Mackey Holliday, ” Debt- Paying ” 1878-1882

William Ewan Cameron, Readjuster . . 1882-1886

Fitzhugh Lee, Democrat 1886ˆ1890

Philip W. McKinney, Democrat . . . 1890-1894

Charles Triplett O’Ferrall, Democrat . . 1894-1898

James Hoge Tyler, „ . . 189S-1902

Andrew Jackson Montague, ,, . – 1902-1906

Claude Augustus Swanson, „ . . 1906-1910

William Hodges Mann, ,, . . 1910

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VIRGINIA, UNIVERSITY OF, a state institution for higher education, situated at Charlottesville among the foot-hills of the Blue Ridge Mountains. Its buildings, arranged around

a large rectangular lawn and erected from a plan prepared by Thomas Jefferson, are noted for their architectural effect. At the head of the lawn is the Rotunda, modelled after the Roman Pantheon and now containing the university library; and at the foot of the lawn are three modern recitation and laboratory buildings. On the sides are grouped buildings for each individual professor and dormitories for students. There are also a chapel, a gymnasium, a hospital, and on the summit of Mount Jefferson Hill, a mile south-west of the campus, is the M'Cormick Observatory. The university comprises twenty- six independent schools, but the courses of instruction given in these are so co-ordinated as to form six departments: two academic — the college and the department of graduate studies; and four professional — law, medicine, engineering and agri- culture. The institution owns 522 acres of land, has productive endowment funds amounting to $1,978,000, and receives from the state an annual appropriation of $80,000. It is governed by a rector, chosen by and from nine visitors, and a board of visitors appointed by the governor and two visitors ex officio, the state superintendent of public instruction and the president of the university; and the corporate name of the university is " The Rector and Visitors of the University of Virginia." In 1004 Edwin Anderson Alderman (b. 1861) was elected president. In 1910 the faculty and officers numbered no, the students (men only) 803, and the number of volumes in the libraries 88,000.

The university traces its beginning to an act of the legislature in January 1803 for incorporating the " Trustees of Albemarle Academy." In 1814, before the site of this proposed institu- tion had been chosen, Thomas

Jefferson was elected a trustee, and under his influence the legislature, in February 1816, authorized the establishment of Central College in lieu of Albemarle Academy. The corner-stone of Central College was laid in October 1817, and Jefferson, who was rector of its board of trustees, evolved a plan for its development into the univer- sity of Virginia. The legislature, thanks to the efforts of Joseph Carrington Cabell, a close personal friend of Jefferson, adopted the plan in 1818 and 1819, and seven independent schools — ancient languages, modern languages, mathematics, natural philosophy, moral philosophy, chemistry and medicine — were opened to students in March 1825; a school of law was opened in 1826. In 1837 the School of Medicine became a department of three individual schools; and in 1850 the School of Law became a department of two schools. After the gift of $500,000 by Andrew Carnegie there were established in 1909 the Andrew Carnegie School of Engineering, the James Madison School of Law, the James Monroe School of International Law, the James Wilson School of Political Economy, the Edgar Allan Poe School of English and the Walter Reed School of Pathology.

Under Jefferson's plan only two degrees were granted: " Grad- uate," to any student who had completed the course of any one school; and " Doctor " to a graduate in more than one school who had shown powers of research. But in 1831 for the Doctor's degree the faculty substituted, following British custom, the degree of Master of Arts. The college now grants the degrees of " Bachelor of Arts," " Cultural Bachelor of Science " and " Voca- tional Bachelor of Science "; the Department of Graduate Studies, the degreesof " Graduate in a School," " Master of Arts," " Master of Science " and " Doctor of Philosophy "; the Department of Law, the degree of "Bachelor of Laws"; the Department of Medicine, the degree of " Doctor of Medicine " ; the Department of Engineering, the degrees of " Civil Engineer," " Mechanical Engineer," " Electrical Engineer," " Mining Engineer " and "Chemical Engineer"; and the Department of Agriculture, the degree of " Bachelor of Science in Agriculture."

See J. S. Patton, Jefferson, Cabell and the University of Virginia (New York, 1906).

VIRGIN ISLANDS, a group of small islands in the West Indies, about 100 in number, for the most part uninhabited. They extend E. from Puerto Rico, lying between 17 and 18° 50′ N., and 64° 10′ and 65° 30′ W., their total area being about 465 sq. m. The islands are mostly rocky, or sandy and barren, but such portions as are under cultivation yield sugar, maize, coffee, cotton and indigo. Guinea grass grows abundantly on the hillsides, affording excellent pasturage; the forests,

though few, include the mahogany and other useful trees. The coasts abound with fish. The climate is more healthy than that of the other West Indian islands, and the heat is not so great. Some of the islands belong to the United States, some to Denmark and some to Great Britain. The United States' possessions (once dependencies of Puerto Rico, but ceded by Spain in 1898) have an area of about 150 sq. m. and include Culebra or Snake Island, and Vieques or Crab Island. The chief Danish islands are St Thomas (?.!>.), St Croix (q.v.) and St John (q.v.), the total area being about 240 sq. m. Of the British portion of the group the principal are Tortola, Anegada, Virgin Gorda, Jost van Dyke, Peter's Island and Salt Island, in all numbering 32, with an area of 58 sq. m. With the exception of the island of Sombrero they form one of the five presidencies in the colony of the Leeward Islands. The inhabitants are peasant proprietors, mainly engaged in raising cattle and in burning charcoal, but some are fishermen and boatmen. The chief town is Roadtown (pop. 400) at the head of a splendid harbour on the S. of Tortola, and what trade there is is mostly with St Thomas. Sombrero is maintained as a lighthouse by the British government. Population of the presidency, mostly negroes (1891) 4639; (1901) 4908.

The Virgin Islands were discovered by Columbus in his second voyage, in 1494, and named Las Virgpnes, in honour of St Ursula and her companions. In 1666 the British established them- selves on Tortola, which has ever since remained in their pos- session. In the 1 7th century the Virgin Islands were favourite resorts of the buccaneers. The Danish islands of St Thomas and St John were taken by the British in 1801, but restored in the following year. In 1807 they surrendered to the British, and continued in their hands till 1815, when they were again restored.

VIRGINIUS RUFUS, LUCIUS (a.d. 15-97), Roman patriot and soldier, three times consul (a.d. 63, 69, 97), was born near Comum, the birthplace of the two Plinys. When governor of upper Germany under Nero (68), after he had put down the revolt of Julius Vindex in Gaul, he was more than once uTged by his troops to assume the supreme power; but he firmly refused, and further declared that he would recognize no one as emperor who had not been chosen by the senate. Galba, on his accession, aware of the feelings of the German troops and uncertain as to the intentions of Virginius, induced him to accom- pany him to Rome. But Virginius, as always, remained loyal to the head of the. state. After the death of Otho, the soldiers again offered the throne to Virginius, but he again refused it. Considering themselves slighted, they drew their swords upon him, and he only saved himself from their hands by making his escape through the back of the tent. But the soldiers never forgave the fancied insult. Under Vitellius, during a military disturb- ance at Ticinum, one of Virginius's slaves was arrested and charged with the design of murdering the emperor.

Virginius was accused of being implicated in the conspiracy, and his death was loudly demanded by the soldiers. To his credit Vitellius refused to sacrifice so valuable a servant, on whose loyalty he could depend, to the vengeance of a capricious army. Virginius subsequently lived in retirement, chiefly in his villa at Alsium, on the coast of Etruria, till his death in 97, in which year he held the consulship, together with the emperor Nerva. At the public burial with which he was honoured, the historian Tacitus (then consul) delivered the funeral oration. The younger Pliny, his neighbour and ward, has recorded the lines which Virginius had ordered to be engraved upon his tomb:

" Hie situs est Rufus, pulso qui Vindice quondam Imperium asseruit non sibi sed patriae."

See Tacitus, Hist. i. ii. ; Dio Cassius lxiii. 24-27, lxiv. 4, lxviii. 2; Pliny, Epp. ii. 1, vi. 10; Juvenal viii. 221, with Mayor's note; L. Paul in Rheinisches Museum (1899), liv. pp.

602-30.

VIRGO ("the Virgin "), in astronomy, the sixth sign of the zodiac (q.v.), denoted by the symbol TT3F. It is also a constella- tion mentioned by Eudoxus (4th century B.C.) and Aratu's (3rd century B.C.) ; Ptolemy catalogued 32 stars, Tycho Brahe 33,*

VIRUES— VISCHER (FAMILY)

Hevelius 50. The Greeks represented this constellation as a virgin, but different fables are current as to the identity of the maid. She is variously considered to be: Justitia, daughter of Astraeus and Ancora, who lived before man sinned, and taught him his duty, and when the golden age ended she returned to heaven; according to Hesiod the virgin is the daughter of Jupiter and Themis; others make her to be Erigone, daughter of Icarius, or Parthene, daughter of Apollo. The most interesting stars of this constellation are: a Virginia, or Spica, a star of the first magnitude with a very faint companion; and y Virginis, a binary star, having components of the third magnitude.

VIRUES, CHRISTOBA1 DE (isso?-i6is?), Spanish dramatist and poet, was born at Valencia about the middle of the 16th century, joined the army, fought at Lepanto, and retired to his native place with the rank of captain shortly before 1 586. The first-fruit of his leisure was El Monserrate (1 587), a dull poem on a repulsive subject which had the honour of being praised by Cervantes, and of being reprinted in 1601. Shortly afterwards Virues returned to Italy and issued a recast of his'poem entitled El

Monserrate segundo (1602). His Obras tr&gicus y Uricas (1609) include five tragedies: La Gran Setniramis, La Cruel Casawdra, Atila furioso, La Injdice ilarcela and Elisa Dido. The date of his death is unknown, but he is conjectured to have been alive as late as 1614. Virues belongs to the school of dramatists displaced by Lope de Vega, and his methods were out of fashion before his plays were printed; yet he is an interesting figure, chiefly because of the very extravagances which destroy the effect of his best scenes.

VISBY, or Wisby, the capital of the Swedish island and administrative district (ten) of Gotland, in the Baltic Sea. Pop. (1900) 8376. It is the seat of a bishop, the port of the island, and a favourite watering-place. It is picturesquely situated on the west coast, 150 m. S. by E. of Stockholm by sea. The houses cluster beneath and above a cliff (klinl) 100 ft. high, and the town is thoroughly medieval in appearance. The remains from its period of extraordinary prosperity from the nth to the 14th century are of the highest interest. Its walls date from the end of the 13th century, replacing earlier forti- fications, and enclose a space much larger than that now covered by the town. Massive towers rise at close intervals along them, and nearly forty are in good preservation. Between them are traces of bartizans. The cathedral church of St Mary dates from 1190-1225, but has been much altered in later times: it has a great square tower at the west end and two graceful octagonal towers at the east, and contains numerous memorials of the 17th century. There are ten other churches, in part ruined, none of which is used for service. Among those of chief interest St Nicholas', of the early part of the 13th century, formerly belonged to a Dominican monastery. It retains two beautiful rose-windows in the west front. The church of the Holy Ghost (Helgeands-Kyrka) in a late Roman- esque style (c. 1 2 50) is a remarkable structure with a nave of two storeys. The Romanesque St Clement's has an ornate south portal, and the churches of St Drotten and St Lars, of the 12th century, are notable for their huge towers. St Catherine's, of the middle of the 13th century, is Gothic, with a pentagonal apse. It belonged to a Franciscan convent, of the buildings of which there are slight ruins. Among ancient remains in the vicinity may be mentioned Galgberget, the place of execution, with tall store pillars still standing; and the remarkable stone labyrinth of Trbjeborg. Modern buildings include the Gotland museum of antiquities, and the high school, with a museum and library. The artificial harbour, somewhat exposed, lies south of the ancient Hanseatic harbour, now filled up and covered with gardens. The town is the terminus of railways to north and south. It is the headquarters of the army division of Gotland troops, and there are some modern forts.

The name Visby is derived from the old Norse ve (sanctuary) and by (town). This was no doubt a place of religious sacrifice in heathen times.

At any rate it was a notable trading-place and emporium as early as the Stone Age, and continued to enjoy its importance as such through the Bronze and Iron Ages, as is

proved, inter alia, by the large number of Arabic, Anglo-Saxon and other coins which have been found on the island. See Gotland and Sea Laws.

VISCACH A, or Biscacha, a large South American burrowing rodent mammal belonging to the family Chinchillidae and com- monly known as Lagostomus trichodactytus, although some writers prefer the name Viscacia. With the cheek-teeth formed of a number of parallel plates in the manner characteristic of the family, the viscacha is distinguished from the other members of that group by having only three hind toes; while it is also the heaviest-built and largest member of the group, with smaller ears than the rest. It has a long tail and shaggy fur; the general colour of the latter being dark grey, with conspicuous black and white markings on the face. Viscachas inhabit the South American pampas between the Uruguay river and the Rio Negro in Patagonia, where they dwell in warrens covering from 100 to 200 sq. ft. and forming mounds penetrated by numerous burrows. The ground around the " viscachera " is cleared from vegetation, the refuse of which is heaped upon the mound. Anything the rodents may meet with on their journeys, such as thistle-stalks or bones, are collected and deposited on the viscachera. Deep down in the burrows dwell the viscachas, from which in frequented districts they seldom emerge till evening, unless to drink after a shower. Their chief food is grass and seeds, but they also consume roots. When alarmed, they rush to their burrows, and if these are disturbed utter a growling sound. A pair of prairie burrowing owls (Speotyto) are almost invariably inhabit- ants of a viscachera (see Rodentia). (R. L.)*

VISCHER, the name of a family of Nuremberg sculptors, who contributed largely to the masterpieces of German art in the 15th and 16th centuries.

1. Hermann, the elder, came to Nuremberg as a worker in brass in 1453 and there became a " master " of his gild. There is only one work that can be ascribed to him with certainty, the baptismal font in the parish church of Wittenberg (1457). This is decorated with figures of the Apostles.

2. His son, Petex, the elder, was born about 1455 in Nurem- berg, where he died on the 7th of January 1529. He became " master " in 1489, and in 1494 was summoned by the Electoral Prince Philipp of the Palatinate to Heidelberg. He soon returned, however, to Nuremberg, where he worked with the help of his five sons, Hermann, Peter, Hans, Jakob and Paul. His

works are: the tomb of Bishop Johannes IV., in the Breslau cathedral (1496); the tomb of Archbishop Ernest, in Magde- burg cathedral (1497); the shrine of Saint Sebald in the Sebal- duskirche at Nuremberg, between 1508 and 1519; a large grille ordered by the Fugger brothers in Augsburg (lost); a relief of the " Crowning of the Blessed Virgin " in the Erfurt cathedral (a second example in the Wittenberg Schlosskirche, 1521); the tombstones for Margareta Tucherin in the Regensburg cathedral (1521), and for the Eisen family in the Agidienkirche at Nuremberg (1522); the epitaph for the cardinal Albrecht of Brandenburg in the collegiate church at Aschaffenburg (I 5 2 5)l the tomb of the electoral prince Frederick the Wise in the Schlosskirche at Wittenberg (1521); the epitaph of the duchess Helene of Mecklenburg in the cathedral at Schwerin. Besides these works there are a number of others ascribed to Peter the elder with less certainty. In technique few bronze sculptors have ever equalled him, but his designs are marred by an excess of mannered realism and a too exuberant fancy. His chief early work, the tomb of Archbishop Ernest in Magde- burg cathedral (1495), is surrounded with fine statuettes of the Apostles under semi-Gothic canopies; it is purer in style than the magnificent shrine of St Sebald, a tall canopied bronze structure, crowded with reliefs and statuettes in the most lavish way. The general form of the shrine is Gothic, 1 but the details are those of the 16th-century Italian Renaissance treated

1 This great work is really a canopied pedestal to support and enclose the shrine, not the shrine itself, which is a work of the 14th century, having the gabled form commonly used in the middle ages for metal reliquaries.

with much freedom and originality. Some of the statuettes of saints attached to the slender columns of the canopy are modelled with much grace and even dignity of form. A small portrait figure of Peter himself, introduced at one end of the base, is a marvel of clever realism: he has represented himself as a stout, bearded man, wearing a large leathern apron and holding some of the tools of his craft. This gorgeous shrine is a remarkable example of the uncommercial spirit which animated the artists of that time, and of the evident delight which they took in their work. Dragons, grotesques and little figures of boys, mixed with graceful scroll foliage, crowd every possible part of the canopy and its shafts, designed in the most free and unconventional way and executed with an utter disregard of the time and labour which were lavished on them.

See R. Bauer, Peter Vischer und das oXte N&rnberg (1886); C. Headlam, Peter Vischer (1901).

VISCHER, FRIEDRICH THEODOR (1807-1887), German writer on the philosophy of art, was born at Ludwigsburg on the 30th of June 1807, and was the son of a clergyman. He was educated at Tubingen, and began life in his father's profession. In 1835 he became Privatdozent in aesthetics and German literature at his old university, was advanced in 1837 to extra-ordinary professor, and in 1844 to full professor. In conse- quence, however, of his outspoken inaugural address, he was suspended for two years by the Wurttemberg government, and in his enforced leisure wrote the first two volumes of his Aesthetik, oder Wissenschaft des Schonen (1846), the fourth and last volume of which did not appear till 1857. Vischer threw himself heartily into the great German political movement of 1848-40, and shared the disappointment of patriotic democrats at its failure. In 1855 he became professor at Zurich. In 1866, his fame being now established, he was invited back to Germany with a professorship at Tubingen combined with a post at the Polytechnikum of Stuttgart. He died at Gmunden on the 14th of September 1887. His writings include literary essays collected under the titles Kriiische Gange and Altes and Neues, poems, an excellent critical study of Goethe's Faust (1875), and a successful novel, Auch Einer (1878; 25th ed., 1904). Vischer was not an original thinker, and his monumental Aesthetik, in spite of industry and learning, has not the higher qualities of success. He attempts the hopeless task of explain- ing art by the Hegelian dialectic. Starting with the definition of beauty as " the idea in the form of limited appearance," he goes on to develop the various elements of art (the beautiful, sublime and comic), and the various forms of art (plastic art, music and poetry) by means of the Hegelian antitheses — form and content, objective and subjective, inner conflict and recon- ciliation. The shape of the work also is repellently Hegelian, consisting of short highly technical paragraphs containing the main argument, followed by detailed explanations printed , in different type. Still, Vischer had a thorough knowledge of every branch of art except music, and much valuable material is buried in his volumes. In later life Vischer moved consider- ably away from Hegelianism, and adopted the conceptions of sensuous completeness and cosmic harmony as criteria of beauty; but he never found time to rewrite his great book. His own work as a literary artist is of high quality; vigorous, im- aginative and thoughtful without academic technicality.

See O. Keindl, F. T. Vischer, ErinnerungsUatter (1888); J. E. von Gunthert, F. T. Vischer, ein CharakterbUd (1888); I. Frapan, ViscJier-Erinnerungen (1889); T. Ziegler, F. T. Vischer (Vortrae) (1893) ; J. G. Oswald, F. T. Vischer als Dichter (1896). (H. St.),

VISOOKTI, the name of a celebrated Italian family which long ruled Milan; they claimed descent from King Desiderius, and in the nth century possessed estates on Lakes Como and Maggidre. A certain Ottone, who

distinguished himself in the First Crusade, is mentioned in 1078 as viscount of Milan. The real basis for the family's dominion was laid, however, by another Ottone, a canon of Desio, appointed archbishop of Milan by Pope Urban IV. in 1262 through the influence of Cardinal Ubaldini, The Delia Torre family, who then con-

trolled the city, opposed the appointment, and not until his victory at Desic in 1277 was Ottone able to take possession of his see. He imprisoned Napoleone Delia Torre and five of his relatives in iron cages, and directed his later efforts toward the advancement of his nephew Matteo. He died on the 18th of August 1295, aged eighty years. Matteo, born at Invorio on the 15th of August 1255, succeeded his uncle as political leader of Milan, and although an uprising of tL-i Delia Torre in 1302 compelled him to take refuge at Verona, his steadfast loyalty to the imperial cause in Italy earned him the gratitude of Henry VII., who restored him to Milan in 13 10 and made him imperial vicar of Lombardy. He brought under his rule Piacenza, Tortona, Pavia, Bergamo, Vercelli, Cremona and Alessandro. An able general, he yet relied for his conquests more on diplomacy and bribery, and was esteemed as a model of the prudent Italian despot. Persevering in his Ghibelline policy, and quarrelling with Pope John XXII. over an appointment to the archbishopric of Milan, he was excommunicated by the papal legate Bertrand du Puy in 1322. He at once abdicated in favour of his son Galeazzo, and died at Crescenzago on the 24th of June of the same year. He left besides Galeazzo several sons: Marco, Lucchino, Giovanni and Stefano. Galeazzo I. (1277-1328), who ruled at Milan from 1322 to 1328, met the Holy Army which the pope had sent against the Visconti at Vaprio on the Adda (1324), and defeated it with the aid of the emperor Louis the Bavarian. In 1327 he was imprisoned by the emperor at Monza because he was thought guilty of making peace with the church, and was released only on the intercession of his friend Castruccio Castracane. By his wife Beatrice d'Este he had the son Azzo who succeeded him. His brother Marco com- manded a band of Germans, conquered Pisa and Lucca and died in 1329. Azzo (1302-1339), who succeeded his father in r328, bought the title of imperial vicar for 25,000 florins from the same Louis who had imprisoned Galeazzo I. He con- quered ten towns, murdered his uncle Marco (1329), suppressed a revolt led by his cousin Lodrisio, reorganized the administra- tion of his estates, built the octagonal tower of S. Gottardo, and was succeeded in turn by his uncles Lucchino and Gio- vanni. Lucchino made peace with the church in 1341,. bought Parma from Obizzo d'Este and made Pisa dependent on Milan. Although he showed ability as general and governor, he was jealous and cruel, and was poisoned in 1349 by his wife Isabella Fieschi. Giovanni, brother of the preceding, archbishop of Milan and lord of the city from 1349 to 1354, was one of the most notable characters of his time. He befriended Petrarch,

extended the Visconti sway over Bologna (1350), defied Pope Clement VI., annexed Genoa (1353), and died on the 5th of October 1354 after having established the rule of his family over the whole of northern Italy except Piedmont, Verona, Mantua, Ferrara and Venice. The Visconti from the time of Archbishop Giovanni were no longer mere rivals of the Delia Torre or dependants on imperial caprice, but real sove- reigns with a recognized power over Milan and the surrounding territory. The state was partitioned on the death of Giovanni among his brother Stefano's three sons, Matteo II., Galeazzo II. and Bernabo. Matteo II., who succeeded to Bologna, Lodi, Piacenza and Parma, abandoned himself to the most revolt- ing immorality, and was assassinated in 1355 by direction of his brothers, who thenceforth governed the state jointly and with considerable ability. Galeazzo II., who held his court at Pavia, was handsome and distinguished, the patron of Petrarch, the founder of the. university of Pavia and a gifted diplomat. He married his daughter Violante to the duke of Clarence, son of Edward III. of England, giving a dowry .of 200,000 gold florins; and his son Gian Galeazzo to Isabella, daughter of King John of France. He died in 1378. Bernabo, who held his court at Milan., was involved in constant warfare, to defray the expenses of which he instituted very oppressive taxes. He fought Popes Innocent VI. and Urban V., who proclaimed a crusade against him. He fought the em- peror Charles IV., who declared the forfeiture of his fief. He

endeavoured to exercise sole power in the state after the death of his brother, but his young nephew Gian Galeazzo plotted against him and put him to death (1385). Gian Galeazzo, the most powerful of the Visconti, became joint ruler of the Milanese territories on the death of his father in 1378 .and sole ruler on the death of his uncle seven years later. He founded the cathedral of Milan, built the Certosa and the bridge across the Ticino at Pavia, improved the university of Pavia and established the library there, and restored the university at Piacenza. His bureaucratic government was excellent; he was an able and economical administrator, and was reputed to be one of the wealthiest princes of his time. He was ambitious to reduce all Italy under the sway of the Visconti. He conquered Verona in 1387; and in the following year, with the aid of the Venetians, took Padua. He plotted successfully against the rulers of Mantua and Ferrara, and now that the whole of Lombardy lay prostrate before him he turned his attention to Tuscany. In 1399 he bought Pisa and seized Siena. The emperor Wenceslaus had already con- ferred on him the title of duke of Milan for 100,000 florins, reserving only Pisa, and refused to take arms against him. Gian Galeazzo took Perugia, Lucca and Bologna (1400-1),

and was besieging Florence when he died of the plague (3rd of September 1402) at the age of fifty-five years. His sons, Giovanni Maria and Filippo Maria, were mere boys at the time of his death, and were taken under the protection of the celebrated condottiere Facino Cane de Cosale; but most of Gian Galeazzo's conquests were lost to his self-seeking generals. Giovanni Maria was proclaimed duke of Milan in 1402, dis- played an insane cruelty, and was killed in 1412 by Ghibelline partisans. Filippo Maria, who became nominal ruler of Pavia in 1402, succeeded his brother as duke of Milan. Cruel and extremely sensitive about his personal ugliness, he nevertheless was a great politician, and by employing such powerful con- dottieri as Carmagnola, Piccinino and Francesco Sforza he managed to recover the Lombard portion of his father's duchy. From his marriage with the unhappy widow of the above- mentioned Facino Cane he received a dowry of nearly half a million florins. He died in 1447, the last of the Visconti in direct male line, and was succeeded in the duchy, after the shortlived Ambrosian republic, by Francesco Sforza, who had married his daughter Bianca in 1441 (see Sforza). Valeniina (1366- 1408), a daughter of Gian Galeazzo and a sister of the preceding, married Louis of Orleans in 1387, and it was from her that Louis XII. of France derived his claims to the duchy of Milan. Gahriei.k, an illegitimate brother, gained possession of Pisa and other towns, but was despoiled and beheaded (1407) by Charles VI. : s governor of Genoa, under whose protection he had placed himself. Among collateral branches of the Vis- conti family were the counts of Saliceto, counts of Zagnano, lords of Brignano, marquis of San Giorgio di Borgoratto, marquis of lnvorio and Marquis Delia Motta. Other branches attained to some prominence in the local history of Bari and of Tarento. Tebaldo Visconti of Piacenza became Pope Gregory X. in 1 271. Among the Visconti lords of Fontaneto was Gaspare, who died in 1505 archbishop of Milan. An Ignatius Visconti was sixteenth general of the Jesuits (1751-55).

There is a contemporary history of the principal members of the family by Paolo Giovio, bishop of Nocera, which may be had in several editions. See J. Burckhardt, The Civilization of the Re- naissance in Italy, trans, by S. G. C. Middlemore (London, 1898) ; J. A. Symonds, Age of the Despots (N'ew York, 1888); C. Magenta, / Visconti e gli Sforza net Castello di Pavia (1883) ; A. Medin, 2″ Visconti nella poesia contemporanea (Milan, 1891); F. Mugnier, " Lettres des Visconti de Milan " in Memoires et documents de la societe savoisienne d'histoire et d'archeologie, vol. x. of the second series (1896). (C. H. Ha.)

VISCONTI-VENOSTA, EMILIO, Marquis (1820-), Italian statesman, was born at Milan on the 22nd of January 1829. A disciple of Mazzini, he took part in all the anti- Austrian conspiracies until the ineffectual rising at Milan on the 6th of February 1853, of which he had foretold the failure,

induced him to renounce his Mazzinian allegiance. Continuing,

nevertheless, his anti-Austrian propaganda, he rendered good service to the national cause, but being molested by the Austrian police, was obliged in 1859 to escape to Turin, and during the war with Austria of that year was appointed by Cavour royal commissioner with the Garibaldian forces. Elected deputy in i860, he accompanied Farini on diplomatic missions to Modena and Naples, and was subsequently despatched to London and Paris to acquaint the British and French governments with the course of events in Italy. As a recompense for the tact displayed on this occasion, he was given by Cavour a permanent appointment in the Italian foreign office, and was subsequently appointed under-secretary of state by Count Pasolini. Upon the latter's death he became minister of foreign affairs (24th March 1863) in the Minghetti cabinet, in which capacity he negotiated the September Convention for the evacuation of Rome by the French troops. Resigning office with Minghetti in the autumn of 1864, he was in March 1866- sent by La Marmora as minister to Constantinople, but was almost immediately recalled and reappointed foreign minister by Ricasoli. Assuming office on the morrow of the second battle of Custczza, he succeeded in preventing Austria from burdening Italy with a proportion of the Austrian imperial debt, in addition to the' Venetian debt proper. The fall of Ricasoli in February 1867 deprived him for a time of his office, but in December 1869 he entered the Lanza-Sella cabinet as foreign minister, and retained his portfolio in the succeeding Minghetti cabinet until the fall of the Right in 1876. During this long period he was called upon to conduct the delicate negotiations connected with the Franco-German War, theoccupation of Romeby the Italians, and the consequent destruction of the temporal power of the pope, the Law of Guarantees and the visits of Victor Emmanuel II. to Vienna and Berlin. Upon the occasion of his marriage with the daughter of the marquis Alfieri di Sostegno, grand- niece of Cavour, he was created marquis by the king. For a time he remained a member of the parliamentary opposition, and in 1886 was nominated senator. In 1894, after eighteen years' absence from active political life, he was chosen to be Italian arbitrator in the Bering Sea question, and in 1896 once more accepted the portfolio of foreign affairs in the Di Rudini cabinet at a juncture when the disasters in Abyssinia and the indiscreet publication of an Abyssinian Green Book had rendered the international position of Italy exceedingly difficult. His first care was to improve Franco-Italian relations by negotiating with France a treaty with regard to Tunis. During the negotiations relating to the Cretan question and the Graeco-Turkish War y he secured for Italy a worthy part in the European Concert and joined Lord Salisbury in saving Greece from the loss of Thessaly. Resigning office in May 1898, on a question of internal policy, he once more retired to private

life, but in May 1899 again assumed the management of foreign affairs in the second Pelloux cabinet, and continued to hold office in the succeeding Saracco cabinet until its fall in February 1901. During this period his attention was devoted chiefly to the Chinese problem and to the maintenance of the equilibrium in the Mediterranean and the Adriatic. In regard to the Mediterranean he established an Italo-French agreement by which France tacitly undertook to leave Italy a free hand in Tripoli, and Italy not to interfere with French policy in the interior of Morocco; and, in regard to the Adriatic, he came to an understanding with Austria guaranteeing the status quo in Albania. Prudence and sagacity, coupled with unequalled experience of foreign policy, enabled him to assure to Italy her full portion of influence in international affairs, and secured for himself the unanimous esteem of European cabinets. In recognition of his services he was created Knight of the Annun- ziata by Victor Emmanuel III. on the occasion of the birth of Princess Yolanda Margherita of Savoy (1st of June 1901). In February 1906 he was Italian delegate to the Morocco con- ference at Algeciras.

An account of Visconti- Venosta's early life (down to 1859) is given in an interesting volume by his brother Giovanni Visconti- Venosta, Rieordi di Gioventi (Milan, 1904).

VISCOUNT (through O. Fr. viscomte, mod. vicomle, from Low Lat. vice-comes, cf . Portug. visconde, Ital. visconte) , the title of the fourth rank of the European nobility. In the British peerage it intervenes between the dignities of earl and baron. The title is now purely one of honour, having long been dissociated from any special office or functions.

In the Carolingian epoch the vice-comites, or missi comilis, were the deputies or vicars of the counts, whose official powers they exercised by delegation, and from these the viscounts of the feudal period were undoubtedly derived. Soon after the counts became hereditary the same happened in the case of their lieutenants; e.g. in Narbonne, Nimes and Alby the viscounts had, according to A. Molinier, acquired hereditary rights as early as the beginning of the ioth century. Viscount- cies thus developed into actual fiefs, with their own jurisdiction, domain and seigniorial rights, and could be divided or even transmitted to females. Viscounts, however, continued for some time to have no more than the status of lieutenants, call- ing themselves either simply vice-comites, or adding to this title the name of the countship from which they derived their powers. It was not till the 12th century that the universal tendency to territorialize the feudal

dominions affected the viscountcies with the rest, and that the viscounts began to take the name of the most important of their patrimonial domains. Thus the viscounts of Poitiers called themselves viscounts of Thouars, and those of Toulouse viscounts of Bruniquel and Montelar. From this time the significance of the title was extremely various. Some viscounts, notably in the duchy of Aquitaine and the county of Toulouse, of which the size made an effective centralized government impossible, were great barons, whose authority extended over whole provinces, and who disputed for power on equal terms with counts and dukes. Elsewhere, on the other hand, e.g. in the lie de France, Champagne, and a great part of Burgundy, the vicomtes continued to be half feudatories, half officials of the counts, with the same functions and rank in the feudal hierarchy as the chatelains; their powers were jealously limited and, with the organization of the system of prtvdts and baillis in the 1 2th century, practically disappeared. In the royal domains especially, these petty feudatories could not maintain them- selves against the growing power of the crown, and they were early assimilated to the prevdts; thus there is no record of a vicomle at Paris after 1027.

In Normandy, where from the first the central power had been strong, vicomtes appeared at a very early date as deputies of the counts (afterwards dukes) of the Normans: " They are both personal companions and hereditary nobles." When local Norman counts began in the nth century, some of them had vicomtes under them, but the normal vicomle was still a deputy of the duke, and Henry I. largely replaced the hereditary holders of the vicomte's by officials. " By the time- of the Conqueror the judicial functions of the viscount were fully recognized, and extended over the greater part of Normandy." Eventually almost the whole of Normandy was divided into administrative viscountcies or bailiwicks by the end of the 1 sth century. When the Normans conquered England, they applied the term viscounte or vicecomes to the sheriffs of the English system (see Sheriff), whose office, how- ever, was quite distinct and was hardly affected by the Conquest.

Nearly four centuries later " viscount " was introduced as a peerage style into England, when its king was once more lord of Normandy. John, Lord Beaumont, K.G., who had been created count of Boulogne in 1436, was made Viscount Beau- mont, February 12, 1440, and granted precedence over all barons, which was doubtless the reason for his creation. Within a year the feudal vicomtl of Beaumont in Normandy was granted to him and the heirs male of his body on the ground that he traced his descent from that district. In 1446 Lord Bourchier, who held the Norman countship of Eu, was similarly made a viscount. The oldest viscountcy now on the roll is that of Hereford, created in 1550; hut the Irish viscountcy of Gorman-

ston is as old as 1478. The dignity was sparingly conferred in the peerage

of England till recent times, when the number of viscounts was increased by bestowing the dignity on retiring speakers (e.g. Viscounts Canterbury, Hampden, Peel, Selby) and ministers who accepted peerages {e.g. Viscounts Melville, Halifax, Knutsford, Llandaff, Cross, Ridley, Goschen, St Aldwyn, Morley of Blackburn, Wolverhampton).

A viscount is " Right Honourable," and is styled " My Lord." His wife, also " Right Honourable," is a " viscountess," and is styled "My Lady." All their sons and daughters are " Honourable." The coronet first granted by James I. has on the golden circlet a row of fourteen small pearls set in contact, of which number in representations nine are shown. The scarlet parliamentary rcbe of a viscount has two and a half doublings of ermine.

See A. Luchaire, Manuel des institutions francaises (Paris, 1892), bibliography on p. 282; Stapleton s Rotuli Scaccarii Normanniae; Powicke's " The Angevin Administration of Normandy " (Eng. Htst. Rev. vols, xxi., xxii.) ; Lords' Reports on the Dignity of a Peer; Courthope Nicolas's Historic Peerage.

VISHNU (Sanskrit, " the worker," from root vish, "to work "), a solar deity, in later Hindu mythology a god of the first im- portance, one of the supreme trinity with Brahma and Siva, but in the Rig Veda only a minor deity. In the Vedic scriptures his only anthropomorphic characteristics are the frequently mentioned strides that he takes, and his being a youth vast in body. His essential feature is the three strides (vi-kram) with which he traverses, the universe. Two of these steps are visible to men, but the third or highest is beyond mortal sight. These steps are symbolic of the rising, culminating and setting of the sun, or alternatively the course of the solar deity through the three divisions of the universe. To-day Vishnu is adored by the Vishnavite sects as the equal or even the superior of Brahma, and is styled the Preserver. He is represented with four arms, and black in colour; in one hand he holds a club and in the others a shell, a discus and a lotus respectively. He rides on the Garuda, half man and half bird, having the head, wings, beak and talons of an eagle, and human body and limbs, its face being white, its wings red and its body golden. In his character as preserver of men Vishnu has from time to time become incarnate to rid the world of some great evil (see also Bkahjianism and Hinduism).

See A. A. Macdonell, Vedic Mythology (Strassburg, 1897) ; Sir W. Muir, Original Sanskrit Texts, iv. 63-298; Sir M. Monier- Williams, Brahmanism and Hinduism, iii. v. vi.

VISION (from Lat. videre, to sec), or Sight, the function, in physiology, of the organ known as the eye (q.v.). The sense of vision is excited by the influence of light on the retina, the special terminal organ 'connected with

the optic nerve. By excitation of the retina, a change is induced in the optic nerve fibres, and is conveyed by these to the brain, the result being a luminous perception, or what we call a sensation of light or colour. If light were to act uniformly over the retina, there would be no image of the source of the light formed on that structure, and consequently there would be only a general consciousness of light, without reference to any particular object. One of the first conditions, therefore, of vision for useful purposes is the formation of an image on the retina, To effect this, just as in a photographic camera, refractive structures must be placed in front of the retina which will so bend luminous rays as to bring them to a focus on the retina, and thus produce an image. Throughout the animal kingdom various arrange- ments are found for this purpose; but they may be all referred to three types, namely — (1) eye-specks or eye-dots, met with in Medusae, Annelidac, &c; (2) the compound eye, as found in insects and crustaceans; and (3) the simple eye, common to all vertebrates. The eye-specks may be regarded simply as expansions of optic nerve filaments, covered by a transparent membrane, but having no refractive media, so that the creature would have the consciousness of light only, or a simple luminous impression, by which it might distinguish light from darkness. The compound eye consists essentially of a series of transparent

cone-like bodies, arranged in a radiate manner against the inner surface of the comea, with which their bases are united, while their apices are connected with the ends of the optic filaments. As each cone is separated from its neighbours, it admits only a ray of light parallel with its axis, and its apex represents only a portion of the image, which must be made up, like a mosaic-work, of as many parts as there are cones in the eye. When the cones are of considerable length, it is evident, from their form and direction, their apices being directed in- wards, that the oblique rays emanating from a luminous surface will be cut off, and that only those rays proceeding along the axis of the cone will produce an effect. Thus distinctness or sharpness of definition will be secured. The size of the visual field will depend on the form of the eye, the outermost cones marking its limits. Consequently the size of the visual field will depend on the size of the segment of the sphere forming its surface. The eyes of many insects have a field of about half a sphere, so that the creature will see objects before and behind it as well as those at the side. On the other hand, in many the eyes have scarcely any convexity, so that they must have a narrow field of vision. For anatomical details, and diseases of the eye, see

Eye ; the pathological aspects of vision itself are treated at the end of this article.

1. Physical Causes of Vision A luminous sensation may be excited by various modes of irritation of the retina or of the optic nerve. Pressure, cutting or electrical shocks may act as stimuli, but the normal excitation is the influence of light on the retina. From a physical point of view, light is a mode of movement occurring in a medium, termed the aether, which pervades all space; but the physiologist studies the operation of these movements on the sentient organism as resulting in consciousness of the particular kind which we term a luminous impression. Outside of the body, such movements have been studied with great accuracy; but the physiological effects depend upon such complex conditions as to make it impossible to state them in the same precise way. Thus, when we look at the spectrum, we are conscious of the sensations of red and violet, referable to its two extremities: the physicist states that red is produced by 392 billions of impulses on the retina per second, and that violet corresponds to 757 billions per second; but he has arrived at this informa- tion by inductive reasoning from facts which have not at present any physiological explanation. We cannot at present trace any connexion, as cause and effect, between 302 billions of impulses on the retina per second and a sensation of red. Below the red and above the violet ends of the spectrum there are vibrations which do not excite luminous sensations. In the first case, below the red, the effect as a sensation is heat; and above the violet the result is that of chemical activity. Thus the method of dispersion of light, as is followed in passing a ray through a prism, enables us to recognize these general facts: (1) rays below the red excite thermal impressions;

(2) from the lower red up to the middle of the violet, the thermal rays become gradually weaker until they have no effect;

(3) from the lower red to the extreme violet, they cause luminous impressions, which reach their greatest intensity in the yellow; and (4) from about the end of the yellow to far beyond the extreme violet, the rays have gradually a less and less luminous effect, but they have the power of exciting such chemical changes as are produced in photography. In general terms, therefore, the lower end of the spectrum may be called thermal, the middle luminous, and the upper actinic or chemical; but the three merge into and overlap one another. It may be observed that the number of vibrations in the extreme violet is not double that of the low red, so that the sensibility of the eye to vibrations of light does not range through an octave. The ultra-violet rays may act on the retina in certain condi- tions, as when they are reflected by a solution of sulphate of quinine, constituting the phenomenon of fluorescence. Far above the violet are the Rontgen

radiations and probably others.

2. Optical Arrhhgement» of the Eye

1. General. — When light traverses any homogeneous trans- parent medium, such as the air, it passes on in a straight course with a certain velocity; but if it meet with any other trans- parent body of a different density, part of it is reflected or returned to the first medium, whilst the remainder is propagated through the second medium in a different direction and with a different velocity. Thus we may account for the phenomena of reflection of light (q.v.) and of refraction (q.v.) . Let ab, in fig. r, be a plane surface of some trans- parent substance, say a sheet of glass; a ray, cd, perpendi- cular to the surface, will pass through without refraction; but an oblique ray, ef, will be sent in the direction eh. If the ray eh had passed from a dense into a rarer medium, then the direction would have been eg. It might also be shown that the

Fig. 1. — Refraction of Light.

sine of the angle of incidence always bears a certain ratio to the sine of the angle of refraction; this ratio is termed the index of refraction. Thus, if a ray pass from air into water, the sine of the angle of incidence will have to the sine of the angle of the refraction the ratio of 4:3, or f.

Before a ray of light can reach the retina, it must pass through a number of transparent and refractive surfaces. The eye is a nearly spherical organ, formed of transparent parts situated behind each other, and surrounded by various membranous structures, the anterior part of which is also transparent. The transparent parts are- — (1) the cornea; (2) the aqueous kumour % found in the anterior chamber of the eye; (3) the crystalline lens, formed by a transparent convex body, the anterior sur- face of which is less convex than the posterior; and (4) the vitreous humour, filling the posterior chamber of the eye. The ray must therefore traverse the cornea, aqueous humour, lens and vitreous humour. As the two surfaces of the cornea are parallel, the rays practically suffer no deviation in passing through that structure, but they are bent or refracted during their transmission through the other media.

From the optical point of view, the eye may be regarded as a dioptric system consisting of various refractive media. In such a system, as shown by K. F. Gauss, there are six cardinal points, which have a certain relation to each other. These are —

(1) Two focal points : every ray passing through the first focal point becomes, after its refraction, parallel to the axis, and every ray which

before refraction is parallel to the axis passes after its refraction to the second focal point; (2) two principal points: every ray which passes through the first point before refraction passes after refrac- tion through the second, and every ray which passes through any point of a plane elevated on a perpendicular axis from the first principal point (the first principal plane) passes through the corre- sponding point of an analogous plane raised upon the axis at the second principal point (the second principal plane) ; and (3) two nodal points, which correspond to the optical centres of the two principal planes just alluded to. The distance of the first principal point from the first focal point is called the anterior focal length, and the term posterior focal length is applied to the distance of the posterior focal point from the second principal point. Listing has given the following measurements in millimetres from the centre of the cornea for the cardinal points in an ideal eye :■

Anterior focal point . 12-8326

Posterior focal point . 22-6470

First principal point . 2-1746

Second principal point. 2-5724

First nodal point Second nodal point Anterior focal length Posterior focal length

7-2/50

76398

15-0072

20 0746

A view of such an ideal eye is shown in fig. 2.

The remaining measurements of such an eye are as follows :—

Radii of Curvature Of anterior face of cornea =» 8 millimetres. Of anterior face of lens =10 „ Of posterior face of lens = 6 „

Indices of Refraction

*Aqueous humour .... W =I *3379*

Crystalline lens .... if- 1-4545

*Vitreous humour .... W = I *3379*

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The optical constants of the human eye may be still further simplified by assuming that the two principal points and the two

Fig. 2. — Transverse Section of an Ideal or Schematique Eye.

*A, summit of cornea; SC, sclerotic; S, Schlemm's canal; CH. choroid; I, iris; M, ciliary muscle; R, retina; N, optic nerve; HA. aqueous humour; L, crystalline lens, the anterior of the double lines on its face showing its form during accommoda- tion; HV, vitreous humour; DN, internal rectus muscle; DE, external rectus; YY', principal optical axis; <&4», visual axis, making an angle of 5° with the optical axis; C, centre of the ocular globe. The cardinal points of Listing: HiHa, principal points; K1K2, nodal points; FiFs, principal focal points. The dioptric constants according to Giraud-Teulon : H, principal points united; $1*2, principal foci during the repose of accommodation; 'i'2, principal foci during the maximum of accommodation ; O, fused nodal points.*

*nodal points respectively are identical. Thus we may construct a reduced eye, in which the principal point is 2-3448 mm. behind the cornea and the single nodal point is 1-4764 mm. in front of the posterior surface of the lens. The refracting surface, or lens, has a radius of 5 mm and is 3 mm. behind the cornea; and the index of refraction is that of the aqueous humour, or VV"> or T *3379-*

2. The Formation of an Image on the Retina. — This may be well illustrated with the aid of a photographic camera. If properly focused, an inverted image will be seen on the glass plate at the back of the camera. It may also be observed by bringing the eyeball of a rabbit near a candle flame. The action of a lens in forming an inverted image is illustrated by fig. 3, where the pencil of rays proceeding from a is brought

to a focus at a', _ and those from 1 b at J'; conse- quently the image of ab is inverted as at b'a'. The three character- istic features of (2) it is sharp and and

Fig. 3.— Inversion bv Action of a Lens.

the retinal image are: (1) it is reversed well defined if it be accurately

focused on the retina. (3) its size depends on the visual angle. If we look at a distant object, say a star, the rays reaching the eye are parallel, and in passing through the refractive media they are focused at the posterior focal point — that is, on the retina. A line from the luminous point on the retina passing through the nodal point is called the line of direction. If the luminous object be not nearer than, say, 60 yds. the image is still brought to a focus on the retina without any effort on the part of the eye. Within this distance, supposing the condition of the eye to be the same as in looking at a star, the image would be formed somewhat behind the posterior focal point, and the effect would be an indistinct impression on the retina. To obviate this, for near distances, accommodation, so as to adapt the eye, is .effected by a mechanism to be afterwards described.

When rays, reflected from an object or coming from a lumin- ous point, are not brought to an accurate focus on the retina, the image is not distinct in consequence of the formation of circles of diffusion, the production of which will be rendered evident by fig. 4. From the point A luminous rays enter the eye in the form of a cone, the kind of which will depend

on the pupil. Thus it may be circular, or oval, or even tri- angular. If the pencil is focused in front of the retina, as at

Fig. 4. — -Formation of Circles of Diffusion.

d, or behind it as at/, or, in other words, if the retina, in place of being at F, be in the positions G or H, there will be a luminous circle or a luminous triangular space, and many elements of the retina will be affected. The size of these diffusion circles depends on the distance from the retina of the point where the rays are focused: the greater the distance, the more extended will be the diffusion circle. Its size will also be affected by the greater or less diameter of the pupil. Circles of diffusion maj' be studied by the following experiment, called the experiment of Scheiner: —

Fig. 5. — Diagram illustrating the Experiment of Scheiner.

Let C be a lens, and DEF be screens placed behind it. Hold in front of the lens a card perforated by two holes A and B, and allow rays from a luminous point a to pass through these holes. The

f>oint on the screen E will be the focus of the rays emanating rom a ; if a were removed farther from the lens, the focus would be on F, and if it were brought near to C, the focus would then be on D. The screens F and D show two images on the point a. If, then, we close the upper opening in AB, the upper image m on F and the lower image n on D disappear. Suppose now that the retina be substituted for the screens D and F, the contrary will take

place, in consequence of the reversal of the retinal image. If the eye be placed at 0, only one image will he seen; but if it be placed either in the plane of F or D, then two images will be seen, as at Mm, or nn; consequently, in either of these planes there will be circles of diffusion and indistinctness, and only in the plane E will there' be sharp definition of the image.

*To understand the formation of an image on the retina, suppose a line drawn from each of its two extremities to the nodal point and continued onwards to the retina, as in fig. 6, where the visual angle is *. It is evident that its size will depend on the size of the object and the distance of the object from the eye. Thus, also, objects of different sizes, c, d, e in fig. 6, may be in- cluded in the same visual angle, as they are at different distances from the eye. The size of the retinal image may be calculated if we know the size of the object, its dis- tance from the nodal point 0, and the distance of the nodal point from the posterior focus.*

Fig. 6.— The Visual Angle.

Let A be the size of the object, B its distance from the nodal point, and C the distance of from the retina, or 15 mm.; then the size of the retinal image i = (A-ris)/B. The smallest visual angle in which two distinct points may be observed is 60 seconds; below this, the two sen- sations fuse into onej and the size of the retinal image

r ~ 7 ~ 5 ˆ S t \ ˆ11 _

a1

j/l 1

corresponding to this angle is '004 mm., nearly the diameter of a single retinal rod or cone. Two objects, therefore, included in a visual angle of less than 60 seconds, appear as one point. A small visual angle is in most eyes a condition of sharpness of definition. With a large angle, objects appear less sharply marked. Acuteness is determined by a few retinal elements, or even only one, being affected. A very minute image, if thrown on a single retinal element, is apparently sufficient to excite it. Thus it is possible to see a brilliant point in an angle even so small as \ of a second, and a sharp eye can see a body the -gˆth of a line in diameter — that is,

about the sfoth part of an inch.

3. The Optical Defects oj the £.ye. — As an optical instrument, the eye is defective; but from habit, and want of attention, its defects are not appreciated, and consequently they have little or no influence on our sensations. These defects are chiefly of two kinds — (1) those due to the curvature of the refractive surfaces, and (2) those due to the dispersion of light by the refractive media, (a) Aberration of Sphericity. — Suppose, as in fig. 7, M A K fH to be a refractive

*surface on which parallel rays from L to S impinge, it will be seen that those rays passing near the circumfer- ence are brought to a focus at F 1 , and those passing near _ _ _ , *\ , .. . the centre at F 8 —*

Fig. 7.-Sphencal Aberrat.on. intermed i at e rays

being focused at N. Thus on the portion of the axis between F 1 and F 2 there will be a series of focal points, and the effect will be a blurred and bent imags. In the eye this defect is to a large extent corrected, by the following arrangements: (1) the iris cuts off the outer and more strongly refracted rays; (2) the curvature of the cornea is more ellipsoidal than spherical, and consequently those farthest from the axis are least deviated; (3) the anterior and posterior curvatures of the lens are such that the one corrects, to a certain extent, the action of the other; and (4) the structure of the lens is such that its power of re- fraction diminishes from the centre to the circumference, and consequently the rays farthest from the axis are less refracted. (6) Astigmatism. — Another defect of the eye is due to different meridians having 'different degrees of curvature. This defect is known as astigmatism. It may be thus detected. Draw on a sheet of white paper a vertical and a horizontal line with ink, crossing at a right angle; at the point of distinct vision, it will be found impossible to see the lines with equal distinct- ness at the same time; to see the horizontal line distinctly the paper must be brought near the eye, and removed from it to see the vertical. In the cornea the vertical meridian has generally a shorter radius of curvature, and is consequently more refractive than the horizontal. The meridians of the lens may also vary; but, as a rule, the asymmetry of the cornea is greater than that of the lens. The optical explana- tion of the defect will be understood with the aid of fig. 8. Thus, suppose the vertical meridian C A D to be more strongly curved than the horizontal F A E, the rays which fall onCAD will be brought to a focus G, and those falling on FA E at B. If we divide the pencil of rays at successive points, G, H, I, K, B, by a section perpendicular to A B, the various forms it would present at these points are seen in the figures underneath, so that if the eye were placed at G, it would see a horizontal line a a'; if at H, an ellipse with the long axis a a' parallel to A B; if at I, a circle; if at K, an ellipse, with the

long axis, 6 c, at right angles to A B; and if at B, a vertical line b c. The degree of astigmatism is ascertained by measuring the difference of re- fraction in the two chief meridians; and the defect is corrected by the use of cylindrical glasses, the curvature of which, added

to that of the minimum meridian, makes its focal length equal to that of the maximum meridian.

Fig. 8. — Diagram illustrating Astigmatism.

(c) Aberration of Refrangibility. — When a ray of white light traverses on a lens, the different rays composing it, being unequally refrangible, are dispersed: the violet rays (see fig. 9), the most refran- A

gible, are brought to a focus at e,

*and the red rays, * ‘ > ■ [ ) ~~^< ^ ^^^ rf*

less refrangible, ,_ at d. If a screen were placed at e, B

a series of con- Fro. 9. — Diagram illustratingthe Dispersion of centric coloured” Light by a Lens,

circles would be formed, the central being of a violet, and the circumference of a red colour. The reverse effect would be produced if the screen were placed at d. Imagine the retina in place of the screen in the two positions, the sensa- tional effects would be those just mentioned. Under ordinary circumstances, the error of refrangibility due to the optical construction of the eye is not observed, as for vision at near distances the interval between the focal point of the red and violet rays is very small. If, however, we look at a candle flame through a bit of cobalt blue glass, which transmits only the red and blue rays, the flame may appear violet surrounded by blue, or blue surrounded by violet, according as we have accommodated the eye for different distances. Red surfaces always appear nearer than violet surfaces situated in the same plane, because the eye has to be accommodated more for the red than for the violet, and consequently we imagine them to be nearer. Again, if we contemplate red letters or designs on a, violet ground the eye soon becomes fatigued, and the designs may appear to move.

(d) Defects due to Opacities, &c, in the Transparent Media.— When small opaque particles exist in the transparent media, they may cast their shadow on the retina so as to give rise to images which are projected outwards by the mind into space, and thus appear to exist outside of the body. Such phenomena are termed entoptic. They may be of two kinds: (1) extra- retinal, that is, due to opaque or semi-transparent bodies in any of the

refractive structures anterior to the retina, and presenting the appearance of drops, striae, lines, twisted bodies, forms of grotesque shape, or minute black dots dancing before the eye; and (2) intra-retinal, due to opacities, &c, in the layers of the retina, in front of Jacob's membrane. The intra-retinal may be produced in a normal, eye in various ways, (r) Throw a strong beam of light, on the edge of the sclerotic, and a curious branched figure will be seen, which is an image of the retinal vessels. The construction of these images, usually called Ptirkinje's figures, will be understood from fig. 10. Thus, in the figure to the left, the rays passing through the sclerotic at b", in the direction b" c, will throw a shadow of a vessel at c on the retina at b', and this will appear as a dark line at B. If the light move from b" to a", the retinal shadow will move from b' to. a', and the line in the field of vision will pass from B to A.

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It may be shown that the distance c. b' corresponds to the distance of the retinal vessels from the layer of rods and cones.

If the light enter the' cornea, as in the figure to the right, and if the light be moved, the image will be displaced in the same direc- tion as the light, if the movement does not extend beyond the

middle of the tf ' J' cornea, but in the

Fig. 10. — Purkinje's Figures. opposite direction

In the eye to the right the illumination is to the light through the sclerotic, and in the one to the when the latter left through the cornea. ; s moved up and

down. Thus, if o be moved to a', d will be moved tod', the Shadow on the retina from c to c', and the image b to V . If, on the other hand, a be moved above the plane of the paper, d will move below, consequently c will move above, and V will appear to sink, (2) The retinal vessels may also be seen by looking at a strong light through a minute aperture, in front of which a rapid to-and-fro movement is made. Such experiments prove that the sensitive part of the retina is its deepest and most external layer (Jacob's membrane).

4. Accommodation, or the Mechanism of Adjustment for Different Distances. — When a camera is placed in front of an object, it is necessary

to focus accurately in order to obtain & clear and distinct image on the sensitive plate. This may be done by moving either the lens or the sensitive plate backwards or forwards so as to have the posterior focal point of the lens corresponding with the sensitive plate. For similar reasons, a mechanism of adjustment, or accommodation for different distances, is necessary in the human eye. In the normal eye, any number of parallel rays, coming from a great distance, are focused on the retina. Such an eye is termed emmetropic (fig. n, A). Another form of eye (B) may be such that parallel rays are brought to a focus in front of the retina. This form of eye is myopic or short- sighted, inasmuch as, for dis- tinct vision, the object must be brought near the eye, so as to catch the divergent rays, which are then focused on the retina. A third form is seen in C, where the focal point, for ordinary distances, is behind the retina, and consequently the object must be held far off, so as to allow only the less divergent or parallel rays to reach the eye. This kind of eye is called hyper- metropic, or far-sighted. For ordinary distances, at which objects must be seen distinctly in everyday life, the fault of A, Emmetropic or normal eye; the myopic eye may be corrected B,ˆ Myopic or short-sighted by the use of concave anc J G f

long-sighted :> eye™ etrOP ‘ C ° the hypermetropic by convex glasses. In the first case, the concave glass will move the posterior focal point a little farther back, and in the second the convex glass will bring it farther forwards; in both cases, however, the glasses may be- so adjusted, both as regards refractive index and radius of curvature, as to bring the rays to a focus on the retina, and consequently secure distinct vision.*

From any point 63 metres distant, rays may be regarded

as almost parallel, and the point will be seen without any effort of accommodation. This point, either at this distance or in infinity, is called the punctum remotum, or the most distant point seen without accommodation. In the myopic eye it is much nearer, and for the hypermetropic there is really no such point, and accommodation is always necessary. If an object were brought too close to the eye for the refractive media to focus it on the retina, circles of diffusion would be formed, with the result of causing indistinctness of vision, unless the eye possessed some power ot adapting itself to different distances. That the eye has some such power of accommodation is proved by the fact that; if we attempt to look through the meshes of a net at a distant object, we cannot see both the meshes and the object with equal distinctness at the same time. Again, if we look continuously at very near objects, the eye speedily becomes fatigued. Beyond a distance of 65 metres, no accommodation is necessary; but within it, the condition of the eye must be adapted to the diminished distance until we reach a point near the eye which may be regarded as the limit of visibility for near objects. This point, called the punctum

proximum, is usually 12 centimetres (or 4-8 inches) from the eye. The range of accommodation is thus from the punctum remotum to the punctum proximum.

The mechanism of accommodation has been much disputed, but there can be no doubt it is chiefly effected by a change in the curvature of the anterior surface of- the crystalline . lens. If we hold a lighted candle in front and a little to the side of an eye to be examined, three reflections may be seen in the eye, as represented in fig. 12. The first, a, is erect, large and bright, from the anterior surface of the cornea; the second, b, also erect, but dim, from the anterior surface of the crystalline lens; and the third, c, inverted, and very dim, from the posterior surface of the lens, or perhaps the concave surface of the vitreous humour to which the convex surface of the lens is adapted. Suppose the three images to be in the position shown in the figure for Fig. 12— Reflected distant vision, it will be found that the middle Images in the Eye. image b moves towards a, on looking at a near object. The change is due to an alteration of the curvature of the lens, as shown in fig- !3- The changes occurring during accommodation are:

Fig. 13. — Mechanism of Accommodation. A, The lens during accommodation, showing its anterior surface advanced; B, The lens as for distant vision; C, Position of the ciliary muscle.

(1) the curvature of the anterior surface of the crystalline lens increases, and may pass from 10 to 6 mm.; (2) the pupil con- tracts; and (3) the intraocular pressure increases in the posterior part of the eye. An explanation of the increased curvature of the anterior surface of the lens during accommodation has been thus given by H. von Helmholtz. In the normal condition, that is, for the emmetropic eye, the crystalline lens is flattened anteriorly by the pressure of the anterior layer of the capsule; during accommodation, the radiating fibres of the ciliary muscles pull the ciliary processes forward, thus relieving the tension of the anterior layer of the capsule, and the lens at once bulges forward by its elasticity.

By this mechanism the radius of curvature of the anterior

surface of the lens, as the eye accommodates from the far to the near point, may shorten from 10 mm. to 6 mm. The ciliary muscle, however, contains two sets of fibres, the longitudinal or meridional, which run from before backwards, and the circular or equatorial (Muller's muscle), which run, as

their name indicates, around the band of longitudinal fibres forming the muscle. Direct observation on the eye of an animal immediately after death shows that stimulation of the ciliary nerves actually causes a forward movement of the ciliary processes, and there can be little doubt that the explanation above given applies to man, probably most mammals, and to birds and most reptiles. In birds, which are remarkable for acuteness of vision, the mechfjism is somewhat peculiar. In them the fibres of the ciliai | ft luscle have a strong attachment posteriorly, and when these. contract they pull back the inner posterior layers of the cornea, and thus relax that part of the ciliary zone called the ligamentum pectinatum. In a state of rest this structure in the bird's eye is tense, but in accommodation it becomes relaxed. Thus by a somewhat different mechanism in the bird, accommodation consists in allowing the anterior surface of the lens to become more and more convex. In reptiles generally the mechanism resembles that of the bird; but it is said that in snakes and amphibia there is a movement forwards of the lens as a whole, so as to catch rays at a less divergent angle. When the eye is directed to a distant object, such as a star, the mechanism of accommodation is at rest in mammals, birds, reptiles and amphibia, but in fishes and cephalopods the eye at rest is normally adjusted for near vision. Consequently accommodation in the latter is brought about by a mechanism that carries the lens as a whole backwards. There is still some difficulty in explaining the action of the equatorial (circular) fibres. Some have found that the increased convexity of the anterior surface of the lens takes place only in the central portions of the lens, and that the circumferential part of the lens is actually flattened, presumably by the contraction of the equatorial fibres. Seeing, however, that the central part of the lens is the portion used in vision, as the pupil contracts during accommodation, a flattening of the margins of the lens can have no optical effect. Further, another explanation can he offered of the flattening. As just stated, during accommoda- tion the pupil contracts, and the pupillary edge of the iris, thinned out, spreads over the anterior surface of the capsule of the lens, which it actually touches, and this part of the iris, along with the more convex central part of the lens, bulges into the anterior chamber, and must thus displace some of the aqueous humour. To make room for this, however, the circumferential part of the iris, related to the ligamentum pectinatum, moves backwards very slightly, while the flatten- ing of the circumferential part of the lens facilitates this movement.

Helmholtz succeeded in measuring with accuracy the sizes of these reflected images by means of an instrument termed an ophthal- mometer, the construction of which is based on the following optical principles: When a luminous ray traverses a plate of glass having parallel sides, if it fall perpendicular to the plane of the plate, it will pass through without deviation; but if it fall obliquely on the

filate (as shown in the left-hand diagram in fig. 14) it undergoes a ateral deviation, but in a direction parallel to that of the incident ray, so that to an eye placed behind the glass plate, at the lower A, the luminous point, upper A, would be in the direction of the pro- longed emergent ray, and thus there would be an apparent lateral displacement of the point, the amount of which would increase with the obliquity of the incident ray. If, instead of one plate, we take two plates of equal thickness, one placed above the other, two images will be seen, and by turning the one plate with reference to the other, each image may he displaced a little to one side. The instrument consists of a small telescope (fig. 14) T, the axis of which coincides with the- plane separating the two glass plates C C and B B. When we look at an object X Y, and turn the plates till we see two objects xy, xy touching each other, the size of the image X Y will be equal to the distance the one object is displaced to the one side and the other object to the other side. Having thus measured the size of the reflection, it is not difficult, if we know the size of the object reflecting the light and its distance from the eye, to calculate the radius of the curved surface (Appendix to M'Ken- dricks's Outlines of Physiology, 1878). The general result is that, in accommodation for near objects, the middle reflected image

Fk;. 14. — Diagrammatic View of the Ophthalmo- meter of Helmholtz.

becomes smaller, and the radius of curvature of the anterior surface of the lens becomes shorter.

5. Absorption and Reflection pf Luminous Rays from the Rye. —When light enters the eye, it is partly absorbed by the black pigment of the choroid and partly reflected. The reflected rays are returned through the pupil, not only following the same direction as the rays enter- ing the eye, but uniting to form an image at the same point in space as the luminous object. The pupil of an eye appears black to an observer, because the eye of the obsetver does not receive any of those reflected rays. If, however, we strongly illuminate the retina, and hold a lens in front of the eye, so as to bring the reflected rays to a focus nearer the eye, then a virtual and erect, or a real and re- versed, image of the retina will be seen. Such is the principle of the ophthalmoscope, invented by Helm- holtz in 1851. Eyes deficient in pig- ment, as in albinos, appear luminous, reflecting light of a red or pink colour; but if we place in front of such an eye a card perforated by a round hole of the diameter of the pupil, the hole will appear quite dark, like the pupil of an ordinary eye. In many animals a portion of the fundus of the eyeball has no pigment, and presents an iridescent appearance. This is called a tapelum. It probably renders the eye more sensitive to light of feeble intensity.

6. Functions of the Iris. — The iris constitutes a diaphragm which regulates the amount of light entering the eyeball. The aperture in the centre, the pupil, may be dilated by contraction of a system of radiating fibres of involuntary muscle, or con- tracted by the action of another system of fibres, forming a sphincter, at the margin of the pupil. The radiating fibres are controlled by the sympathetic, while those of the circular set are excited by the third cranial nerve. The variations in diameter of the pupil are determined by the greater or less intensity of the light acting on the retina. A strong light causes contraction of the pupil; with light of less intensity, the pupil will dilate. In the human being, a strong light acting on one eye will often cause contraction of the pupil, not only in the eye affected, but in the other eye. These facts indicate that the phenomenon is of the nature of a reflex action, in which the fibres of the optic nerve act as sensory conductors to a centre in the encephalon, whence influences emanate which affect the pupil. It has been ascertained that if the fibres of the optic nerve be affected in any way, contraction of th« pupil follows. The centre is in the anterior pair of the corpora quadrigemina, as destruction of these bodies causes immobility of the pupil. On the other hand, the dilating fibres are derived from the sympathetic; and it has been shown that they come from the lower part of the cervical, and upper part of the dorsal, region of the cord. But the iris seems to be directly susceptible to the action of light. Thus the pupil of the eye of a dead animal will contract if exposed to light for several hours, whereas, if the eye on the opposite side be covered, its pupil will remain widely dilated, as at the moment of death.

The pupil contracts under the influence — (1) of an increased intensity of light; (2) of the effort of accommodation for near objects; (3) of a strong convergence of the two eyes; and (4) of such active substances as nicotine, morphia and physostig- mine; and it dilates under the influence — (1) of a diminished intensity of light; (2) of vision of distant objects; (3) of a strong excitation of any sensory nerve; (4) of dyspnoea; and (5) of such substances as atropine and hyoscyamine. The chief function of the iris is to so moderate the amount of light entering

the eye as to secure sharpness of definition of the retinal image. This it accomplishes by (1) diminishing the amount of light reflected from near objects, by cutting off the more divergent rays and admitting only those approaching a parallel direction, which, in a normal eye, are focused on the retina; and (2) preventing the error of spherical aberration by cutting

off divergent rays which would otherwise impinge near the margins of the lens, and would thus be brought to a focus in front of the retina.

3. Specific Influence of Light on hie Retina The retina is the terminal organ of vision, and all the parts in front of it are optical arrangements for securing that an image will be accurately focused upon it. The natural stimulus of the retina is light. It is often said that it may be excited by mechanical and electrical stimuli; but such an observation really applies to the stimulation of the fibres of the optic nerve. It is well known that such stimuli applied to the optic nerve behind the eye produce always a luminous impression; but there is no proof that the retina, strictly speaking, is similarly affected. Pressure or electrical currents may act on the eyeball, but in doing so they not only affect the retina, consisting of its various layers and of Jacob's membrane, but also the fibres of the optic nerve. It is possible that the retina, by which is meant all the layers except those on its surface formed by the fibres of the optic nerve, is affected only by its specific kind of stimulus, light. This stimulus so affects the terminal apparatus as to set up actions which in turn stimulate the optic fibres. The next question naturally is — What is the specific action of light on the retina? A. F. Holmgren, and also J. Dewar and J. G. M'Kendrick, have shown that when light falls on the retina it excites a variation of the electrical current obtained front the eye by placing it on the cushions of a sensitive galvanometer. One electrode touches the vertex of the cornea and the other the back of the eyeball. The corneal vertex is positive to the back of the eye, or to the transverse section of the optic nerve. Consequently a current passes through the galvanometer from the cornea to the back. Then the impact of light causes an increase in the natural electrical current — during the continuance of light the current diminishes slowly and falls in amount even below what it was before the impact — and the withdrawal of light is followed by a rebound, or second increase, after which the current falls in strength, as if the eye suffered from fatigue.

It was also observed in this research that the amount of electrical variation produced by light of various intensities corresponded pretty closely to the results expressed by G. T. Fechner's law, which regulates the relation between the stimulus and the sensational effect in sensory impressions. This law is, that the sensational effect does not increase proportionally to the stimulus, but as the logarithm of the stimulus. Thus, sup- posing the stimulus to be io, 100 or 1000 times increased, the sensational effect will not be io, 100 or 1000 times, but only 1, 2 and 3 times greater.

Such electrical phenomena probably result either from thermal or chemical changes in the retina. Light produces chemical changes in the retina. If a frog be killed in the dark, and if its retina be exposed only to yellow rays, the retina has peculiar purple colour, which is at once destroyed by

exposure to ordinary light. The purple matter apparently is decom- posed by light. An image may actually be fixed on the retina by plunging the eye into a solution of alum immediately after death. Thus it would appear that light affects the purple- matter of the retina, and the result of this chemical change is to stimulate the optic filaments; if the action be arrested, we may have a picture en the retina, but if it be net arrested, the picture is evanescent; the purple-matter is used up, and new matter of a similar kind is formed to take its place. The retina might, therefore, be compared to a sensitive photographic plate having the sensitive matter quickly removed and replaced; •od it is probable that the electrical expression of the chemical changes is what has been above described.

(a) Phosgenes. — Luminous impressions may also be pro- duced by pressure on the eyeball. Such impressions, termed phosgenes, usually appear as a luminous centre surrounded by coloured or dark rings. Sometimes they seem to be small bright scintillations of various forms. Similar appearances may be observed at the moments of opening or of closing a strong electrical current transmitted through the eyeball.

(b) The Retina's Proper Light. — The visual field, even when the eyelids are closed in a dark room, is not absolutely dark. There is a sensation of faint luminosity which may at one moment be brighter than at another. This is often termed the proper light of the retina, and it indicates a molecular change, even in darkness.

(c) The Excitability of the Retina. — The retina is not equally excitable in all its parts. At the entrance of the optic nerve, as was shown by E. Mariotte in 1668, there is no sensibility to light. Hence, this part of the retina is called the blind spot. If we shut the left eye, fix the right eye on the cross seen in fig. 15, and move the book towards and away from the eye, a position will be found when the

round spot disappears, that is « ˆ

when its image falls on the en- ˆ ˆ

trance of the optic nerve There ˆ ig ._ Diagram f or the is also complete insensibility to Study of the BKnd Spot. colours at that spot. The diameter

of the optic papilla is about i-8 mm., giving an angle of 6°; this angle determines the apparent size of the blind spot in the visual field, and it is sufficiently large to cause a human figure to disappear at a distance of two metres.

The yellow spot in the centre of the retina is the most sensitive to light, and it is chiefly employed in direct vision. Thus, if we fix the eye on a word in

the centre of this line, it is distinctly and sharply seen, but the words towards each end of the line are vague. If we wish to see each word distinctly, we ” run the eye ” along the line — that is, we bring each successive word on the yellow spot. This spot has a horizontal diameter of 2 mm., and a vertical diameter of -8mm.; and it corresponds in the visual field to an angle of from 2 to 4 . The fossa in the spot, where there are no retinal elements except Jacob’s membrane, consisting here entirely of cones (2000 in number), is the area of most acute sensibility. This fossa has a diameter of only -2 mm., which makes the angle ten times smaller. Thus the field of distinct vision is extremely limited, and at the same moment we see only a very small portion of the visual field. Images of external objects are brought successively on this minute sensitive area, and the different sensations seem to be fused together, so that we are conscious of the object as a whole.

Towards the anterior margin of the retina sensitiveness to light becomes diminished; but the diminution is not uniform, and it varies in different persons.

(d) Duration and Persistence of Retinal Impressions. — To excite the retina, a feeble stimulus must act for a certain time; when the retina is excited, the impression lasts after the cessa- tion of the stimulus; but if the stimulus be strong, it may be of yery short duration. Thus the duration of an electricaJ spark is extremely short, but the impression on the retina is so powerful, and remains so long, as to make the spark visible. If we rotate a disk having white and black sectors we see con- tinuous dark bands. Even if we paint on the face of the disk a single large round red spot, and rotate rapidly, a continuous red band may be observed. Here the impressions of red on the same area of retina succeed each other so rapidly that before one disappears another is superadded, the result being a fusion of the successive impressions into one continuous sensation. This phenomenon is called the persistence of retinal impressions. An impression lasts on the retina from ■£$ to ˆ of a second. The cinematograph owes its effects to persist ence of retinal impressions.*

(e) The Phenomena of Irradiation. — If we look at fig. 16, the white square in the black field appears to be larger than the black square in the white field, although both are of precisely

Fig.

[6. — Illustrating the Effect of Irradiation.

the same size. This is due to irradiation. The borders of clear surfaces advance in the visual field, and encroach on ^^^^^^^^^ obscure surfaces. Prob-

^^^^^^^^^H I ably, even with the most

^^H|^^^^H ^^^m I cxac t accommodation, ^ H II I diffusion images form round

^^H ^H ^fl I the image of a white

Hmjh ^^^B I f ace on a black ground,

^^^^^^^^^|] forming a kind of penum-

*^^^^^^^^^ * bra,thuscausingittoappear*

■*• larger than it really is.*

(/) Intensity of Light required to excite the Retina. — Light must have a certain intensity to produce a luminous impres- sion. It is impossible to fix the minimum intensity necessary, as the effect will depend, not only on the intensity of the stimulus, but on the degree of retinal excitability at the time. Thus, after the retina has been for some time in the dark, its excita- bility is increased; on the other hand, it is much diminished by fatigue. Aubert has stated that the minimum intensity is about 300 times less than that of the full moon. The sensi- bility of the eye to light is measured by the photometer.

(f>) Consecutive Retinal Images. — Images which persist on the retina are either positive or negative. They are termed positive when the bright and obscure parts of the image are the same as the bright and obscure parts of the object; and negative when the bright parts of the object are dark in the image, and vice versa. Positive images are strong and sharply marked when an intense light has acted for not less than ^ of a second. If the excitation be continued much longer, a nega- tive and not a positive image will be seen. If, when the positive image is still visible, we look on a very brilliantly illuminated surface, a negative image appears. Negative images are seen with greatest intensity after a strong light has acted for a considerable time. These phenomena may be best studied when the retina is very excitable, as in the morning after a sound sleep. On awakening, if we look steadily for an instant at the window and then close the eyes, a positive image of the

*window will appear; if we then gaze fixedly at the window for one or two minutes, close the eyes two or three times, and then look at a dark part of the room, a negative image will R e£ * be seen floating before us. The positive image o ranee is due to excitation of the retina, and the negative to fatigue. If we fatigue a small Yellow area of the retina with white light, and then allow a less intense light to fall on it, the fatigued area responds feebly, and conse- Green quently the object, such as the window pane, appears to be dark. Greenish*

seen to be red, and in a green light, green. Colour depends on the nature of the body and on the nature of the light falling on it, and a sensation of colour arises when the body reflects or transmits the special rays to the eye. If two rays of different rates of vibration, that is to say, of different colours, affect a surface of the retina at the same moment, the effects are fused together and we have the sensation of a third colour different from its cause. Thus, if red be removed from the solar spec- trum, all the other colours combined cause a sensation of green- ish yellow. Again red and violet give purple, and yellow and blue, white. Yellow and blue, however, only give white when pure spectral colours are mixed. It is well known that a mixture of yellow and blue pigments do not produce white, but green; but, as was explained by Helmholtz, this is because the blue pigment absorbs all the rays at the red end of the spectrum up to the green, while the yellow pigment absorbs all the rays at the violet end down to the green, and as the only rays reflected into the eye are the green rays, the sub- stance appears green. Finally, if colours are painted on a disk in due proportions and in a proper order, the disk will, when quickly rotated, appear white, from the rapid fusion of colour effects.

When we examine a spectrum, we see a series of colours merging by insensible gradations the one into the other, thus: — red, orange, yellow, green, blue and violet. These are termed simple colours. If two or more coloured rays of the spectrum act simultaneously on the same spot of the retina, they may give rise to sensations of mixed colours. These mixed colours are of two kinds: (1) those which do not correspond to any colour in the spectrum, such as purple and white, and (2) those which do exist in the spectrum. White may be produced by a mixture of two simple colours, which are then said to be complementary. Thus, red and greenish blue, orange and cyanic blue, yellow and indigo blue, and greenish yellow and violet all produce white. Purple is produced by a mixture of red and violet, or red and bluish violet. The following table by Helmholtz shows the compound colours produced by mixing other colours: —

Yellowish green

blue

Cyanic

blue

4. Sensations of Colour

1. General Statement. — Colour (q.v.) is a special sensation excited by the action on the retina of rays of light of a definite wave-length. On the most likely hypothesis as to the physical nature of light, colour depends on the rate of vibra- tion of the luminiferous aether, and white light is a compound of all the colours in definite proportion. When a surface reflects solar light into the eye without affecting this proportion, it is white, but if it absorbs all the light so as to reflect nothing, it appears to be black. If a body held between the eye and the sun transmits light unchanged, and is transparent, it is colourless, but if translucent it is white. If the medium transmits or reflects some rays and absorbs others, it is coloured. Thus, if a body absorbs all the rays of the spectrum but those which cause the sensation of green, we say the body is green in colour; but this green can only be perceived if the rays of light falling on the body contain rays having the special rate of vibration required for this special colour. For if the surface be illumin- ated by any other pure ray of the spectrum, say red, these red rays will be absorbed and the body will appear to be black. As a white surface reflects all the rays, in red light it will be

Violet

Indigo

Cyanic

Greenish

Green

Yellowish

Yellow

blue

blue

blue

green

Purple

Deep

White

White

Whitish

Golden

Orange

rose

rose

yellow Yellow

yellow Yellow

Deep

White

White

Whitish

rose

rose

yellow Whitish

White

White

Whitish

Yellowish

rose

green

green

green

White

Green

Green

Green

Blue

Water blue

Greenish blue

Water

Water

blue

blue

tndigo

blue

This table shows that if we mix two simple colours not so far separated in the spectrum as the complementary colours, the mixed colour contains more white as the interval between the colours em- ployed is greater, and that if we mix two colours farther distant in the spectrum than the com- plementary colours, the Fig. 17. — Form of Double Slit for the mixture is whiter as the Partial Superposition of Two Spectra, interval is smaller. By mixing more than two simple colours, no new colours are produced, but only different shades of colour.

2. Modes of Mixing Colour Sensations. — Various methods have been adopted for studying the effect of mixing colours.

(a) By Superposing Two Spectra. — This may be done in a simple way by having a slit in the form of the letter V (see fig. 17), of which the two portions ab and be form a right angle; behind this slit is placed a vertical prism, and two spectra are obtained.

as seen in fig. 18, in which i/ea is the spectrum of the slit ab, and cejd that of the slit cd; the coloured spectra are contained

in the triangle gef, and, by arrangement, the effects of mixture of any two simple colours may be observed.

(J) By Method of Re- flection. — Place a red Fig. 18. — Diagram of Double Spectrum wa fer on b, in fig. 19, and partially superposed. a blue wafeJr on d> and

so angle a small glass plate a as to transmit to the eye a reflection of the blue wafer on d in the same line as the rays transmitted from the red wafer on b. The sensation will be that of purple; and by using wafers of different colours, many experiments may thus be performed.

(c) By Rotating Disks which quickly superpose on the same Area of Retina the Impres- sions of Different Wave-lengths. — Such disks may be con- structed of cardboard, on which coloured sectors arc painted, as shown in fig. 20, representing diagrammatically the arrangement Of Sir Isaac Newton. The angles of the sectors were thus given by him: —

Fig. 19. — Diagram showing Lam- bert s Method of mixing Sensa- tions of Colour.

Red

• 60° 45-5′

Green

■ 6o° 455′

Orange

- 34 l°-5′

Blue .

• 54 41

Yellow

■ 54 4i’

Indigo

. 34- 10-5′

Violet

• 60° 4!

)-5′

Gnat,

for the complementary colours; for example, for blue and red, the line SB = the amount of blue, and the line SR = the amount of red required to form white. Again, any point, say M : on the surface of the triangle, will represent a mixed colour, the composi- tion of which may be ob- tained by mixing the three fundamental colours in the proportions represented by the length of the lines M to green, MV and MR. But 1= the line VM passes on to -“■*•**

the yellow Y ; we may then F IU . 2 i. —Geometrical Representation replace the red and green of the Relations of Colours as shown

by the yellow, in the pro- b Newton . portion of the length 01 the

line MY, and mix it with violet in the proportion of SV. The same colour would also be formed by mixing the amount MY of yellow with MS of white, or by the amount RM of red with the amount MD of greenish blue.

The following list shows characteristic complementary colours, with their wave-lengths (M in millionths of a millimetre:—

With sectors of such a size, white will be produced on rotating the disk rapidly. This method has been carried out with great efficiency by the colour-top of J. Clerk-Maxwell. It is a flat top, on the surface of which disks of various colours may be placed. Dancer has added to it a method by which, even while the top is rotating rapidly and the sensation of a mixed colour is strongly perceived, the eye may be able to see the simple colours of which it is composed. This is done by placing on the handle of the top, a short distance above the _ _. . , _ . Goloured surface, a thin black

*Fl DˆiS?1Sc Nˆ° ,0Ur **. grated by holes of various size and pattern, and weighted a little on one side. This disk vibrates to and fro rapidly, and breaks the continuity of the colour impression; and thus the constituent colours are readily seen.*

3. The Geometric Representation of Colours. — Colours may be arranged in a linear series, as in the solar spectrum. Each point of the line corresponds to a determinate impression of colour; the line is not a straight line, as regards luminous effect, but is better represented by a curve, passing from the ted to the violet. This curve might be represented as a circle in the circumference of which the various colours might be placed, in which case the complementary colours would be at the extremities of the same diameter. Sir Isaac Newton arranged the colours in the form of a triangle, as shown in fig. 21. If we place three of the spectral colours at three angles, thus — green, violet and red — the sides of the triangle include the inter- mediate colours of the spectrum, except purple.

The point S corresponds to white, consequently, from the inter- section of the lines which join the complementary colours, the straight lines from green to S, RS and VS represent the amount of green, red and violet necessary to form white; the same holds good

furjlli

Red, X 656. Orange, X 608. Gold-yellow, X 574. Yellow, X 567. Greenish yellow, X 564.

Blue-green, X 492. Blue, X400. Blue, X 482. Indigo-blue, X464. Violet, X 433.

By combining colours at opposite ends of the spectrum, the effect of the intermediate colours may be produced; but the lowest and the highest, red and violet, cannot thus be formed. These are therefore fundamental or primary colours, colours that cannot be produced by the fusion of other colours. If now to red and violet we add green, which has a rate! of vibration about midway between red and violet, we obtain a sensation of white. Red, green and violet are therefore the three funda- mental colours.

4. Physiological Characters of Colours. — Colour physiologically is a sensation, and it therefore does not depend only on the physical stimulus of light, but also on the part of the retina affected. The power of distinguishing colours is greatest when they fall on, or immediately around, the yellow spot, where the number of cones is greatest. In these regions more than two hundred different tints of colour may be distinguished. Out- side of this area lies a middle zone, where fewer tints are per- ceived, mostly confined to shades of yellow and blue. If intense coloured stimuli are. employed, colours may be perceived even to the margin of the periphery of the retina, but with weak stimuli coloured objects may seem to be black, or dark like shadows. In passing a colour from the periphery to the centre of the yellow spot, remarkable changes in hue may be observed. Orange is first grey, then

yellow, and it only appears as orange when it enters the zone sensitive to red. Purple and bluish green are blue at the periphery, and enly show the true tint in the central region. Four tints have been found which do not thus change: a red obtained by adding to the red of the spectrum a little blue (a purple), a yellow of 574-5 X, a green of 495 X and a blue of 471 X.

The question now arises, How can we perceive differences in colour? We might suppose a molecular vibration to be set up in the nerve-endings synchronous with the undulations of the luminiferous aether, without any change in the chemical con- stitution of the sensory surface, and we might suppose that where various series of waves in the aether corresponding to different colours act together, these may be fused together, or to interfere so as to give rise to a vibration of modified form or rate that corresponded in some way to the sensation. Or, to adopt another line of thought, wc might suppose that the effect of different rays (rays differing in frequency of vibration and in physiological effect) is to promote or retard chemical changes in the sensory surface, " which again so affect the sensory nerves as to give rise to differing states in the nerves and the nerve centres, with differing concomitant sensations." The former of these thoughts is the foundation of the Young-Helmholtz theory, while the latter is applicable to the theory of E. Hering.

5. Theories of Colour- Perception.— A theory widely accepted by physicists was first proposed by Thomas Young and

afterwards revived by Helmholtz. It is based on the assumption that three kinds of nervous ele- ments exist in the retina, the excitation of which give respectively sensa- tions of red, green and violet. These may be regarded as fundamental sensations. Homogene- ous light excites all three, but with different intensities according to the length of the wave. Thus long waves will excite most strongly fibres sensitive to red, medium waves those sensitive to green, and short waves those sensi- tive to violet. Fig. 22 shows graphically the irritability of the three

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FlG. 22. — Diagram showing the Irrita- bility of the Three Kinds of Retinal Elements.

I, red; 2, green; 3, violet. R, O. Y, G, B, V, initial letters of colours.

sets of fibres. Helmholtz thus applies the theory: —

" 1. Red excites strongly the fibres sensitive to red and feebly the other two — sensation: Red.

2. Yellow excites moderately the fibres sensitive to red and

green, feebly the violet— sensation : Yellow.

3. Green excites strongly the green, feebly the other two-

sensation: Green.

4. Blue excites moderately the fibres sensitive to green and

violet, and feebly the red— sensation : Blue.

5. Violet excites strongly the fibres sensitive to violet, and feebly

the other two — sensation : Violet.

6. When the excitation is nearly equal for the three kinds of

fibres, then the sensation is White.' 1 The Young-Helmholtz theory explains the appearance of the consecutive coloured images. Suppose, for example, that we look at a red object for a considerable time ; the retinal elements sensitive to red become fatigued. Then (1) if the eye be kept in darkness, the fibres affected by red being fatigued do not act so as to give a sensation of red ; those of green and of violet have been less excited, and this

excitation is sufficient to give the sensation of pale greenish blue; (2) if the eye be fixed on a white surface, the red fibres, being fatigued, are not excited by the red rays contained in the white light ; on the contrary, the green and violet fibres are strongly excited, and the consequence is that we have an intense complementary image; (3) if we look at a bluish green surface, the complementary of red, the effect will be to excite still more strongly the green and violet fibres, and consequently to have a still more intense complementary image; (4) if we regard a red surface, the primitive colour, the rod fibres arc little affected in consequence of being fatigued, the green and violet fibres will be only feebly excited, and therefore only a very feeble complementary image will be seen; and (5) if we look at a surface of a different colour altogether, this colour may combine with that of the consecutive image, and produce a mixed colour; thus, on a yellow surface, we will see an image of an orange colour.

Every colour has three qualities: (1) hue, or tint, such as red, green, violet; (2) degree of saturation, or purity, according to the amount of white mixed with the tint, as when we recognize a red or green as pale or deep; and (3) intensity, or luminosity, or brightness as when we designate the tint of a red rose as dark or bright. Two colours are identical when they agree as to these three qualities. Observation shows, however, that out of one hundred men ninety-six agree in identifying or in discrimin- ating colours, while the remaining four show defective apprecia- tion. These latter are called colour-blind. This defect is about ten times less frequent' in women. Colour-blindness is congen- ital and incurable, and it is due to an unknown condition of the retina or nerve centres, or both, and must be distinguished from transient colour-blindness, sometimes caused by the excessive use of tobacco and by disease. When caused by tobacco, the sensation of blue is the last to disappear. Absolute inability to distinguish colour is rare, if it really exists; in some rare cases there is only one colour sensation; and in a few

cases the colour-blind fails to distinguish blue from green, or there is insensibility to violet. Daltonism, or red-green blind- ness, of which there are two varieties, the red-blind and the green-blind, is the more common defect. Red appears to a red- blind person as a dark green or greenish yellow, yellow and orange as dirty green, and green is green and brighter than the green of the yellow and orange. To a green-blind person red appears as dark yellow, yellow is yellow, except a little lighter in shade than the red he calls dark yellow, and green is pale yellow.

According to the Young-Helmholtz theory, there are three funda- mental colour sensations, red, green and violet, by the combination of which all other colours may be formed, and it is assumed that there exist in the retina three kinds of nerve elements, each of which is specially responsive

to the stimulus of waves of a certain frequency corresponding to one colour, and much less so to waves of other frequencies and other colours. If waves corresponding to pure red alone act on the retina, only the corresponding nerve element for red would be excited, and so with green and violet. But if waves of different frequencies are mixed (corresponding to a mixture of colours), then the nerve elements will be set in action in proportion to the amount and intensity of the constituent excitant rays in the colour. Thus if all the nerve elements were simultane- ously set in action, the sensation is that of white light;; if that corre- sponding to red and green, the resultant sensation will be orange or yellow ; if mainly the green and violet, the sensation will be blue and indigo. Then red-blindness may be explained by supposing that the elements corresponding to the sensation of red are absent ; and

freen-blindness, to the absence of the elements sensitive to green, f to a red-blind person the green and violet are equal, and when to a green-blind person the red andV violet are equal, they may have sensations which to them constitute white, while to the normal eye the sensation is not white, but bluish green in the one case and green in the other. In each case, to the normal eye, the sensation of green has been added to the sensations of red and blue. It will be evident, also, that whiteness to the colour-blind eye cannot be the same as whiteness to the normal eye. No doubt this theory explains certain phenomena of colour-blindness, of after-coloured images, and of contrast of colour, but it is open to various objections. It has no anatomical basis, as it has been found to be impossible to demonstrate the existence of three kinds of nerve elements, or retinal elements, corresponding to the three fundamental colour sensations. Why should red to a colour-blind person give rise to a sensation of something like green, or why should it give rise to a sensation at all ? Again, and as already stated, in cases of colour- blindness due to tobacco or to disease, only blue may be seen, while it is said that the rest of the spectrum seems to be white. It is difficult to understand how white can be the sensation if the sensa- tions of red and green are lost. On the other hand, it may be argued that such colour-blind eyes do not really see white as seen by a normal person, and that they only have a sensation which they have been accustomed to call white. According to this theory, we never actually experience the primary sensations. ,Thus we never see primary red, as the sensation is more or less mixed with primary green, and even with primary blue (violet). So with regard to primary green and primary violet. Helmholtz, in his last work on the subject, adopted as the three primary colours a red bluer than spectral red, (a) a green lying between 540 X and 560 X (6, like the green of vegetation), and a blue at about 470 X (c, like ultra- marine), all, however, much more highly saturated than any colours existing in the spectrum.

In Handbuch der Physiologischen Ogtik (Hamburg and Leipzig, 1896) Helmholtz pointed out that luminosity or brightness plays a more important part in colour perception than has been supposed. Each spectral colour is composed of certain proportions of these fundamental colours, or, to. put it in another way, a combination of two of them added to a certain amount of white.

Hering's theory proceeds on the assumption of chemical changes in the retina under the influence of light. It also assumes that certain fundamental sensations are excited by light or occur during the absence of light. These fundamental sensations are white, black, red, yellow, green and blue. They are arranged in pairs, the one colour in each pair being, in a sense, complementary to the other, as white to black, red to green, and yellow to blue. Hering also supposes that when rays of a certain wave-length fall on visual substances assumed to exist in the retina, destructive or, as it is termed, katabolic changes occur, while rays having other wave- lengths cause constructive or anabolic changes. Suppose that in a red-green substance katabolic and anabolic changes occur in equal amount, there may be no sensation, but when waves of a certain wave-length or frequency cause katabolic changes in excess, there will be a sensation of red, while shorter waves and of greater fre- quency, by exciting anabolic changes, will cause a sensation of green. In like manner, katabolism of a yellow-blue visual sub- stance gives rise to a sensation we call yellow, while anabolism, by shorter waves acting on the same substance, causes the sensation of blue. Again, katabolism of a white-black visual substance

gives white, while anabolism, in the dark, gives rise to the sensation of blackness. Thus blackness is a sensation as well as whiteness, and the members of each pair are antagonistic as well as comple- mentary. In the red end of the spectrum the rays cause kataboHsm of the red-green substance, while they have no effect on the yellow- blue substance. Here the sensation is red. The shorter waves of the spectral yellow cause katabolism of the yellow-blue material, while katabolism and anabolism of the red-green substance are here equal. Here the sensation is yellow. Still shorter waves, corre- sponding to green, now cause anabolism of the red-green substance, while their influence on the yellow-blue substance, being equal in amount as regards katabolism and anabolism, is neutral. Here the sensation is green. Short waves of the blue of the spectrum cause anabolism of the yellow-blue material, and as their action on the red-green matter is

neutral, the sensation is blue. The very short waves at the blue end of the spectrum excite katabolism of the red-green substance, and thus give violet by adding red to blue. The sensation orange is experienced when there is excess of kata- bolism, and greenish blue when there is excess of anabolism in both substances. Again, when all the rays of the spectrum fall on the retina, katabolism and anabolism in the red-green and yellow-blue matters are equal and neutralize each other, but katabolism is great in the white-black substance, and we call the sensation white. Lastly, when no light falls on the retina, anabolic changes are going on and there is the sensation of black.

Hering's theory accounts satisfactorily for the formation of coloured after-images. Thus, if we suppose the retina to be stimu- lated by red light, katabolism takes place, and if the effect continues after withdrawal of the red stimulus, we have a positive after-image. Then anabolic changes occur under the influence of nutrition, and the effect is assisted by the anabolic effect of shorter wave-lengths, with the result that the negative after-image, green, is perceived. Perhaps the distinctive feature of Hering's theory is that white is an independent sensation, and not the secondary result of a mixture of primary sensations, as held by the Young- Helmholtz view. The greatest difficulty in the way of the acceptance of Hering's theory is with reference to the sensation of black. Black is held to be due to anabolic changes occurring in the white-black substance. Suppose that anabolism and katabolism of the white-black sub- stance are in equilibrium, unaccompanied by stimulation of either the red-green or the yellow-blue substances, we find that we have a sensation of darkness, but not one of intense blackness. This " darkness " has still a certain amount of luminosity, and it has been termed the " intrinsic light " of the retina. Sensations of black differing from this darkness may be readily experienced, as when we expose the retina to bright sunshine for a few moments and then close the eye. We then have a sensation of intense black-ness, which soon, however, is succeeded by the darkness of the " intrinsic light." The various degrees of blackness, if it is truly a sensation, are small compared with the degrees in the intensity of whiteness. In the consideration of both theories changes in the cerebral centres have not been taken into account, and of these we know next to nothing.

6. The Contrast of Colours. — If we look at a small white, grey or Slack object on a coloured ground, the object appears to have the colour complementary to the ground. Thus a circle of grey paper on a red ground appears to be of a greenish-blue colour, whilst 011 a blue ground it will appear pink. This effect is heightened if we place over the paper a thin sheet of tissue paper; but it disappears at once if we place a black ring or border round the grey paper. Again, if we place two comple- mentary colours side by side, both appear to be increased in intensity. Various

theories have been advanced to explain these facts. Helmholtz was of opinion that the phenomena consist rather in modifications of judgment than in different sensory impressions; J. A. F. Plateau, on the other hand, attempted to explain them by the theory of consecutive images.

5. The Movements or the Eye

1. General Statement. — The globe of the eye has a centre of rotation, which is not exactly in the centre of the optic axis, but a little behind' it. On this centre it may move round axes of rotation, of which there are three — an antero-posterior, a vertical and a transverse. In normal vision, the two eyes are always placed in such a manner as to be fixed on one point, called the fixed point or the point of regard, A line passing from the centre of rotation to the point of regard is called the line of regard. The two lines of regard form an angle at the point of regard, and the base is formed by a line passing from the one centre of rotation to the other. A plane passing through both lines of regard is called the plane of regard. With these

definitions, we can now describe the movements of the eyeball, which are of three kinds: (1) First position. The head is erect, and the line of regard is directed towards the distant horizon. (2) Second position. This indicates all the movements round the transverse and horizontal axes. When the eye rotates round the first, the line of regard is displaced above or below, and makes with a line indicating its former position an angle termed by Helmholtz the angle of vertical displacement, or the ascensional angle; and when it rotates round the vertical axis, the line of regard is displaced from side to side, forming with the median plane of the eye an angle called the angle of lateral displacement. (3) Third order of positions. This includes all those which the globe may assume in performing a rotatory movement along with lateral or vertical displacements. This movement of rotation is measured by the angle which the plane of regard makes with „

the transverse plane, an W"

angle termed the angle of rotation or of torsion.

The two eyes move together as a system, so that we direct the two lines of regard to the same point in space.

The eyeball is moved by six muscles, which are described in the article Eye (Anatomy), The relative attach- ments and the axes of rotation are shown in fig- 23.

The term visual field is given to the area in- tercepted by the treme visual lines which pass through the centre of the pupil, the amount of dilatation of which determines its size. It follows the movements of the eye, and is dis-

placed with it. Each point in the visual field has a corre- sponding point on the retina, but the portion, as already ex- plained, which secures our attention is that falling on the yellow spot.

2. Simple Vision with Two Eyes. — When we look at an object with both eyes, having the optic axes parallel, its image falls upon the two yellow spots, and it is seen as one object. If, however, we displace one eyeball by pressing it with the finger, then the image in the displaced eye does not fall on the yellow spot, and we see two objects, one of them being less dis- tinct than the other. It is not necessary, however, in order to see a single object Fig. 24. — Diagram with two eyes that the two images fall to illustrate the on the two yellow spots; an object is Physiological Re- always single if its image fall on corre- Rerinae W °

spending points in the two eyes.

The eye may rotate round three possible axes, a vertical, horizontal and antero-posterior. These movements are effected by four straight muscles and two oblique. The four straight muscles arise from the back of the orbit, and pass forward to be inserted into the front part of the eyeball, or its equator, if we regard the anterior and posterior ends of the globe as the poles. The two obliques (one originating at the back of the orbit) come, as it were, from the nasal side — the one goes above the eycb'dl, the other below, while both are inserted into the eye- ball on the temporal side, the superior oblique above and the inferior oblique below. The six muscles work in pairs. The internal and external recti turn the eye round the vertical axis,

Fig. 23. — Diagram of the Attachments of the M uscles of the Eye and of their Axes of Rotation, the latter being shown by dotted lines. (Fick.)

The axis of rotation of the rectus internus and rectus externus being vertical, that is, perpendicular to the plane of the paper, cannot be shown.

so that the line of vision is directed to the right or left. The superior and inferior recti rotate the eye round the horizontal axis, and thus the line of vision is raised or lowered. The oblique muscles turn the eye round an axis passing through the centre of the eye to the back of the head, so that the superior oblique muscle lowers, while the inferior oblique raises, the visual line. It was also shown by Helmholtz that the oblique muscles sometimes

cause a slight rotation of the eyeball round the visual axis itself. These movements are under the control of the will up to a certain point, but there are slighter move- ments that are altogether involuntary. Helmholtz studied these slighter movements by a method first suggested by F. C. Donders. By this method the apparent position of after- images produced by exhausting the retina, say with a red or green object, was compared with that of a line or fixed point gazed at with a new position of the eyeball. The ocular spectra soon vanish, but a quick observer can determine the coincidence of lines with the spectra. After producing an after-image with the head in the erect position, the head may be placed into any inclined position, and if the attention is then fixed on a diagram having vertical lines ruled upon it, it can easily be seen whether the after-image coincides with these lines. As the after-image must remain in the same position on the retina, it will be evident that if it coincides with the vertical lines there must have been a slight lotation of the eyeball. Such a coin- cidence always takes place, and thus it is proved that there is an involuntary rotation. This minute rotation enables us to judge more accurately of the position of external objects.

3. The horopter is the locus of those points of space which are projected on retinal points. While geometrically it may be conceived as simple, as a matter of fact it is generally a line of double curvature produced by the intersection of two hyper- boloids, or, in other words, it is a twisted cubic curve formed by the intersection of two hyperboloids which have a common generator. The curves pass through the nodal point of both eyes. An infinite number of lines may be drawn from any point of the horopter, so that the point may be seen as a single point, and these lines lie on a cone of the second order, whose vertex is the point. When we gaze at the horizon, the horopter is really a horizontal plane passing through our feet. The horopter in this instance is the ground on which we stand. Experiments show " that the forms and the distances of these objects which are situated in, or very nearly in, the horopter, are perceived with a greater degree of accuracy than the same forms and distances would be when not situated in the horopter " (M'Kendrick, Life of Helmholtz, 1890, p. lysetseq.).

An object which is not found in the horopter, or, in other words, does not form an image on corresponding points of the retinae, is seen double. When the eyeballs are so acted upon by their muscles as to secure images on non-corresponding points, and consequently double vision, the condition is termed strabismus, or squinting, of which there are several varieties treated of in works on ophthalmic surgery. It is important to observe that in the fusion of double images we must assume, not only the correctness of the theory of corresponding points of the retina, but also that there are corresponding points in the brain, at the central ends of the optic fibres. Such fusion of images may occur without consciousness — at all events, it is possible to imagine that the cerebral effect (except as regards

consciousness) would be the same when a single object was placed before the two eyes, in the proper position, whether the individual were conscious or not. On the other hand, as we are habitually conscious of a single image, there is a psychical tendency to fuse double images when they are not too dissimilar.

4. Binocular Perception of Colour. — This may be studied as follows. Take two No. 3 eye-pieces of a Hartnack's micro- scope, or two eye-pieces of the same optical value from any microscope, place one in front of each eye, direct them to a clear window in daylight, keep them parallel, and two luminous fields will be seen, one corresponding to each eye. Then converge the two eye-pieces, until the two luminous circles cross, and the central part, like a bi-convex lens, will appear clear and

bright, while the outer segments will be much less intense, and may appear even of a dim grey colour. Here, evidently, the sensation is due to a fusion of impressions in the brain. With a similar arrangement, blue light may be admitted by the one eye-piece and red by the other; and on the convergence of the two, a resultant colour, purple, will be observed. This may be termed the binocular vision of colours. It is remarkable that by a mental effort this sensation of a compound colour may be decomposed into its constituents, so that one eye will again see blue and the other red.

6. The Psychical Relations of Visual Perceptions 1. General Characters of Visual Perceptions. — All visual perceptions, if they last for a sufficient length of time, appear to be external to ourselves, erect, localized in a position in space and more or less continuous.

(a) Visual Sensations are referred to the Exterior. — This appears to be due, to a large extent, to habit. Those who have been born blind, on obtaining eyesight by an operation, have imagined objects to be in close proximity to the eye, and have not had the distinct sense of exteriority which most individuals possess. Slowly, and by a process of education, in which the sense of touch played an important part, they gained the knowledge of the external relations of objects. Again, phos- genes, when first produced, appear to be in the eye, but when conscious of them, by an effort of imagination, we may transport them into space, although they never appear very far off.

(b) Visual Sensations are referred to Erect Objects. — Although the images of objects are inverted on the retina we see them erect. The explanation of the effect is that we are conscious not of the image on the retina, but of the luminous object from which the rays proceed, and we refer the sensation in the direction of these rays. Again, in running the eye over the object, say a tall pole, from base to apex, we are not conscious of the different images

on the retina, but, of the muscular move- ments necessary to bring the parts successively on the yellow spot.

(c) , Visual Sensations are referred to a Position in Space. — The localization of a luminous point in space can only be determined by observing its relations to other luminous points with a given position of the head and of the eye. For example, in a perfectly dark room, if we look at a single luminous point, we cannot fix its exact position in space, but we may get some information of a vague character by moving the head or the eye. If, however, a second luminous point appears in the dark- ness, we can tell whether it is nearer or farther distant, above or below the first. So with regard to other luminous points we observe their reciprocal relations, and thus we localize a number of visual impressions. There are three principal directions in space: the transverse (breadth-), the vertical (height) and the sagittal (depth). Luminous points may be localized either in the transverse or vertical directions. Here we have to do simply with localization on a surface. A number of points may be observed simultaneously (as when the eye is fixed) or successively (as when the eye moves). If the move- ment of the eye be made rapidly, the series of impressions from different points may be fused to- • g

gether, and we are conscious of • f

a line, the direction of which is • e

indicated chiefly by the muscular • £

sensations felt in following it. a <,.....£

The case is different as regards

points in the sagittal direction. . ˆ B

We see only a single point of ……...►•*

this line at a time; it may be 3 …. .

a transverse series of retinal …… 4

elements, A B, and each of these ••■••• S

formed by a number of smaller Fig. 25 —Diagram illustrating 1 . – t . i ■ the Localization of Visual

elements, 1, 2, 3, 4, situated in Perc tions .

the axis of each principal element ;

it may be. on the other hand, the transverse line a b situated

in space and formed by a series of points in juxtaposition.

Each of these points will impress a retinal element, and the result will be the perception of a transverse line ; but this will not be the same for the points c, d, e, f, g, situated in space in a linear series, in the sagittal direction; only one of those points, c, will impress the corresponding retinal element, and we can see only one point at a time in the line eg. By accommodating successively, however, for the various points at different and considerable distances along the line eg, we may excite retinal elements in rapid succession. Thus, partly by the fusion of the successive impressions on the retina, and partly from the muscular sensations caused by repeated accommoda- tions and possibly of ocular movements, we obtain a notion of depth in space, even with the use of only one eye. It is, how- ever, one of the chief effects of binocular vision to give precision to the notion of space in the sagittal direction.

(d) Visual Sensations are Continuous. — Suppose the image of a luminous line falls on the retina, it will appear as a line although it is placed on perhaps 200 cones or rods, each of which may be separately excited, so as to cause a distinct sensation. Again, on the same principle, the impression of a superficial surface may be regarded as a kind of mosaic, made up of individual portions corresponding to the rods or cones on which the image of the surface falls. But in both cases the sensation is continuous, so that we see a line or a surface. The individual images are fused together.

2. Notions derived from Visual Perceptions. — When we look at any object, we judge of its size, the direction of its surfaces (unless it be a point), its distance from the eye, its apparent movement or fixedness and its appearance of solidity.

(a) Apparent Sz'ze.— This, so far as regards a comparatively small object, depends on the size of the retinal image, as deter- mined by the visual angle. • With a very large object, there is an appreciation of

.„ . , ,- . „. size from the muscular

Illusion, of S,ze and D.stance. sensations derived from the

movements of the eyeball as we " range " the eye over it. It is difficult to appreciate the distance separating two points between which there are other ■ points, as contrasted with an apparently similar distance without intermediate points. For example, the distance A to B appears to be greater than from B to C, in fig. 26.

(4) Direction. — As the retina is a curved surface, a long straight line, especially when seen from a distance, appears curved. In fig. 27 a curious illusion of direction, first shown _ — ^^^ „_ by J- K. F. Zoellner

A. B

Fig. 26. — Diagram to i

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Fig. 27.-

It

Zoellner's Figure showing an Illusion of Direction.

is depicted. If these lines be looked at somewhat obliquely, say from one corner, they will appear to converge or diverge, and the oblique lines, on each side of the vertical lines, will appear not to be exactly opposite each other. But the ver- tical lines are parallel, and the oblique lines are continuous across them. The effect is evidently due to an error of judgment, as it may be con- trolled by an intense effort, when the lines will be seen as they really are.

(c) Apparent Distance. — We judge of distance, as regards large objects at a great distance from the eye — (1) from their apparent size, which depends on the dimensions of the visual angle, and (2) from the interposition of other objects between the eye and the distant object. Thus, at sea, we cannot form,

Fig. 28. — Illustrating Stereoscopic Vision.

without great experience, an aocurate estimate of how many miles we are off the coast, and all know how difficult it is to estimate accurately the width of a river. But if objects be interposed between the eye and the distant object, say a few vessels at different distances at sea, or a boat in the river, then we have certain materials on which to form a judgment, the accuracy of which, however, even with these aids, will depend on experience. When we look at a near object, we judge of its distance chiefly by the sense of effort put forth in bringing the two lines of regard to converge upon it.

(d) The Movement of a Body. — If the eye be fixed, we judge of movement by successive portions of the retina being affected, and possibly also by a feeling of an absence of muscular contractions necessary to move the eyeballs. When the eye moves, so as to "follow" the object, there is a sense of muscular effort, which is increased when, in addition, we require to move the head.

(e) The Apparent Solidity of an Object.— If we look at an object, say a cube, first with the right eye and then with the left, it will be found that the two images of the object are some what different, as in fig. 28. If, then, by means of a stereoscope, or by holding a card between the two eyes, and causing a slight convergence of the eyes, the two images are brought upon corresponding points of the two retinae, the image will at once be seen in relief.

See also article " Vision " by W. H. R. Rivers in Schafer's Text- Book of Physiology, vol. ii. p. 1026. (J G- M.)*

7. Errors of Refraction and Accommodation and their Curative Treatment

The following is a classification of the diseases of vision, from a medical point of view (see also Eye: diseases): —

a. Errors of refraction: hyperopia, myopia, astigmatism, aniso-

metropia, aphakia.

b. Errors of accommodation : —

(1) Loss of accommodation (a) From advancing years (presby-

opia), or from debility. (&) From paralysis (cycloplegia) due to — I; Drugs such as atropine.

2. Systemic poisons: diph-

theria, innuenza,syphilis, &c.

3. Diseases of the nervous

system, concussion of the brain.

(2) Spasm of accommodation.

(3} Meridional asymmetrical accommodation by means of which low errors of astigmatism are corrected, producing eye-strain.

Hyperopia or Hypermetropia (H.) (Far-sight; German = Uebersicht). — This is a condition of the refraction of the eye in which, with the eye at rest, parallel rays of light focus beyond the retina, which means that the image of a distant object is not in focus when it meets the retina, because the eye is too short antero-posteriorly. Most eyes at birth are hyperopic, but as the child grows the eye also grows; when, however, this does not take place, or does not take place sufficiently, normal development is thus arrested. There are other con- ditions that cause hyperopia, but this shortening of the antero- posterior axis is by far the commonest.

Hyperopia is corrected by convex glasses (fig. 20), and the measurement of the hyperopia is that convex glass which enables the hyperopic eye, at rest, to see distinctly objects at a distance. When the hyperopia is not too high it can also be corrected by the eye itself by means of the ciliary muscle (muscle of accommodation) which causes the crystalline lens to become more convex, and thus brings about the same result as placing a convex glass before the eye.

In young people when the error is not too high this work is done unconsciously, vision appears to be perfect, and it is only by placing the eye under the influence of atropine that

the defect is revealed. In the normal eye distant objects are focused on the retina without the use of the ciliary muscle,

Fig. 29. — Showing Parallel Rays focused on the Retina of a Hyperopic Eye by means of a Convex Lens.

which is only employed when looking at near objects; but the hyperope has

to use this muscle all his waking hours for both near and distant vision, so that his eyes are never at rest. Fortunately he has some compensation for this extra work, for in most hyperopes the ciliary muscle becomes more or less hypertrophied; but even so, if near work is at all excessive, or if the defect is associated with astigmatism or anisometropia, symptoms of eye-strain will sooner or later show themselves (see Eye-strain, below).

In older people a very common symptom is blurring of the type while reading; the book has to be put down and the eyes rested for some minutes before reading can be resumed. This is due to the fatigued ciliary muscle giving way and becoming unable to focus.

As we advance in years we lose accommodation power (see Presbyopia, below), so that the time comes to every hyperope, if he live long enough, when he not only has to use glasses for reading (at an earlier period than the normal person), but he also finds that he is gradually losing his distant vision. This is very alarming to many, until it is explained that all that has happened is the loss of power to correct the defect, which defect, of course, has always existed, and which in future will have to be corrected by suitable glasses. The higher the hyperopia the sooner will these symptoms manifest themselves.

In quite young children, sometimes the earliest sign of the presence of hyperopia is a convergent strabismus (internal squint). As a rule, this squint is nothing more than an over- convergence brought about by over-accommodation in those who cannot dissociate their convergence and accommodation; if we Temove the necessity for over-accommodation by correcting the defect with suitable glasses, the over-convergence disappears and the squint is cured.

The total hyperopia of the eye is divided into manifest hyperopia and latent hyperopia. Manifest hyperopia is ex- pressed in amount by the strongest convex glass that allows clear distant vision when the eye is not under atropine. Latent hyperopia is the additional hyperopia which is revealed under atropine. With advancing years the latent hyperopia becomes more and more manifest, and between the ages of 45 and 50 the total hyperopia is entirely manifest.

In addition to the symptoms already described, a very common one among young hyperopes is spasm of the ciliary muscle. This cramp of the muscle causes distant objects to be very indistinct, improvement only taking place with a concave glass, and near work has to be approached very close to the eyes, thus giving a wrong idea that the child is suffering from myopia; by paralysing the ciliary muscle with atropine the spasm disappears and the true nature of the defect is revealed.

The treatment essentially consists in ascertaining the total hyperopia of the eye, and this can only be done satisfactorily, when latent hyperopia is present, by paralysing the accommoda- tion, using atropine for those under 25, and homatropine for those between the ages of 25 and 35 or 40. Over 40 (and when the hyperopia is high, even at an earlier age) no cyclo-

plegic is necessary— in fact it is in many cases dangerous, as an attack of glaucoma may be induced. (See Eye: diseases.)

Having found the total hyperopia, we . learn the amount of the latent hyperopia, and, roughly speaking, the convex glass required is equal to the whole of the manifest hyperopia added to, from one-third to a half, of the latent; but the treat- ment varies with the age of the individual and the amount of the hyperopia, and is too complicated to be detailed here.

Myopia (M.) (Short-sight). — Typical myopia is due to an elongation of the anteroposterior diameter of the eye, so that the retina is situated behind the principal focus, and only diyer-

Fig. 30.

gent rays of light from a near point (fig. 30), or parallel rays made divergent by a concave glass (fig. 31), can come to a

Fig. 31. focus on the retina. In other words, the far point of a myope is at a short distance in front of the eye, the distance being the measure of the myopia. '

A myope can see distinctly at a distance when the eye is at rest (i.e. when accommodation is not being used), with that concave glass whose focal length is equal to the distance of the far point from the eye, and the converse is true; the measure- ment of myopia is that concave glass with which the myopic eye sees distinctly objects at a distance, and its focal length is equal to the distance of the myope's far point from the eye.

The Causes of Myopia. — Although myopia is hereditary, it is, with few exceptions, not congenital. We have seen that almost all eyes are hyperopic at birth. The savage is rarely myopic: it is civilization that is responsible for it; the necessity for constantly adapting the eye for near objects means undue con- vergence. We find that myopia generally first shows itself at the age of 8 to 10, when school work begins in earnest— that is, when convergence is first used in excess — and there is no doubt that it is excessive convergence that is mostly responsible for the development of myopia. The over-used internal recti constantly pulling at the sclerotic tend to lengthen the antero-posterior diameter of the eye, and as this lengthening of the antero- posterior axis necessitates greater convergence still, a vicious

circle is produced, and the myopia gradually increases. The hereditary character of myopia is explained by the existence in such eyes of an " anatomical predisposition " to myopia. The sclera is unusually thin, and consequently less able to resist the pull of the internal recti, and the relative position of the recti and the position of the optic nerve, both of which may be hereditary, may be factors in the production of this defect. Anything which causes young subjects to approach their work too near the eyes may be the starting-point. Bad illumination, or the light coming from the wrong direction (for instance, in front), or defective vision produced by corneal nebulae, or lamellar cataract, &c, all necessitate over-convergence in. order to obtain clearer images, and myopia may be produced.

It is interesting to note that when the work is approached very near the eye, but convergence is not used, as in the case of watchmakers, who habitually use a strong convex glass in one eye, there is no special tendency to myopia.

Some of the more common symptoms of myopia are: — (i) Distant objects are seen indistinctly. (2) Near objects are seen distinctly, and the near point is much nearer than in the normal eye. (3) Acuteness of vision is often lowered, and especially is this the case in high myopia. (4) Eye-strain is often present, due to overuse of the muscles of convergence, and this may lead to (5) an external or divergent squint.

(6) Floating black specks are often complained of, these are generally muscae volitantes, but often, especially in high myopia, may be actual opacities floating in the vitreous.

(7) Myopes often stoop and become " round shouldered "from their habit of poring over their work.

A small amount of myopia, if it is stationary, is in no sense a serious defect of the eye, the possessors of it are often quite unconscious of anydeficiency in vision, and in fact brag that they have better vision than their fellows. The reason of this is that they learn in early life to recognize indistinct distant objects by the aid of other senses in a way that the ordinary individual can hardly understand, and in later life they can postpone the wearing of glasses for near work for many years, and sometimes until extreme old age. Unfortunately myopia is, as a rule, not stationary; it almost always tends to increase, and if this increase leads to very high

myopia such serious changes may occur in the eyes as to lower the visual acuity enormously and sometimes lead to total loss of vision.

The treatment of myopia is general and local.

General Treatment. — The most important part of this is the pre- ventive treatment (prophylaxis), especially in its application to children. All children who have one or both parents myopic are specially " marked down " for this defect, for they have probably inherited an anatomical predisposition. Bearing in mind that excessive convergence is the most potent cause of myopia, the most rigid attention should be paid to the ophthalmic hygiene of the schoolroom. This room should be large, lofty and well ventilated, •and have good-sized high windows on one wall, preferably on the north side. Each scholar should have an adjustable seat and desk so arranged that his head is upright and the work not too near his eyes. These desks should be arranged in rows so placed that the pupils sit with the light on their left. Schoolbooks must be clearly printed and the type should not be too small. The school work that needs close application of the eyes should be continued only for a short period at a time, the period alternating with other work which does not require the use of the eyes, such as mental arithmetic, black-board demonstrations, recitation, or play. Schoolmasters should teach more — that is, they should explain and impart know- ledge by demonstrations and simple lectures, and reduce as much as possible the time spent in " home preparations, " which is usually work done by bad light and when the student is physically and mentally tired. Even in the nursery the greatest care should be taken. The little ones should be supplied with large toys, a large box of plain wooden bricks being the best form; picture books should be discouraged, and close work that entails undue con- vergence, such as sewing, threading beads, &c, ought to be forbidden. The nursery governess can teach the alphabet, small words and even simple arithmetic with the bricks. No child with a tendency to myopia, or with a myopic family history should be allowed to learn to write or draw until at least seven years old. The child's bed should no£ be allowed to face the window, preferably it should be back to the light- Students, or those engaged in literary or other work which entails close application for many hours a day, should be advised to regulate their work, if they are free to do so, by working for shorter periods and taking longer intervals of rest, they should be specially careful not to approach their work too near to the eyes and they should always work in a good light.*

Local Treatment. — This consists in correcting the error with a concave glass. The testing must be done when the eye is under atropine in all those under 25, and under homatropine between the ages of 25 and 35 or 40. Over 40 no cycloplegic is required. Except when playing rough games the glasses must be worn always. The wearing of glasses for near work

produces at first considerable rebellion in children, because they can see near work so much better without a glass. The object of enforcing this treatment is to make the muscle of accommodation do its proper work, and not only do we do this, but we also do away with the excess of convergence over accommodation, and lastly, make excessive convergence impossible, because, with the glasses on, the near work has to be held at some considerable distance from the eyes. In other words, we have practically made the eyes normal,

and it is only by doing this that we can prevent the increase of myopia. Adults who have never worn their correction (especially if the myopia is high) must have a weaker glass for near work. Each case must be treated on its own merits. So-called malignant myopia, which is high myopia with, serious changes in the" eye, must be treated ina special manner and with the greatest care.

Astigmatism. 1 — The principal seat of astigmatism is the cornea, the curvature of one meridian being greater than that of the other. In regular astigmatism, which is the only form that can as a rule be treated by glasses, the meridians of greatest and least curvature are at right angles to each other, and the intermediate meridians pass by regular gradations from one to the other. Rays of light passing through such an astigmatic surface do not focus at one point, but form many points, with the result that the image is more or less indistinct according to the amount of the error. In uncorrected astigmatism a clock-face viewed at a distance of 4 or 5 yds. will appear to have certain figures distinct, and others (at right angles) indistinct; for instance, figures XI and V may appear quite black, while figures U and VIII are grey and indistinct. If one of the principal meridians be emmetropic the astigmatism is simple; if both be hyperopic, or if both be myopic, it is compound; and if one meridian be hyperopic and the other myopic, it is styled mixed astigmatism. Generally the vertical meridian or one near it is the most convex, and this is called direct astigmatism (astigmatism " according to the rule "). When the horizontal meridian or one near it is the most convex, the term inverse astigmatism is used (astigmatism " against the rule ")■ When the meridians are oblique, that is, about 45 , it is called oblique astigmatism. Low degrees of astigmatism (of the cornea) are corrected by the ciliary muscle, producing an astigmatism of the crystalline lens, the opposite of that of the cornea, and so neutralizing the defect. This work is done unconsciously, vision is generally quite good and no suspicion is entertained of anything wrong until some symptom of eye-strain shows itself (see Eye-strain, below), and the detection of it is one of the most important duties of the oculist. The only certain method of detecting and consequently correcting a low error of astigmatism, in all below the age of 50, is by paralysing the ciliary muscle with atropine or homatropine and thus preventing it from correcting the

defect, and revealing the true refraction of the eye. As- tigmatism is corrected by cylindrical glasses combined with spherical convex or concave glasses if hyperopia or myopia co-exist, and the correction must be worn always in the form of rigid pince-nez or spectacles.

Presbyopia (Old Sight) .—A normal-sighted child at the age of ten has his near point of accommodation 7 cms. from the eye, and as age advances this near point recedes gradually. At the age of 40 it has receded to 22 cms., in other words at this age fine print cannot be read nearer to the eye than 22 cms. Between the ages of 45 and 50 the person who has apparently enjoyed good sight up till then, both for distance and near, finds that by artificial light he cannot read the newspaper unless he holds it some distance from the eyes, and he has to give up consulting " Bradshaw " because he cannot distinguish between 3's and 8's. Another symptom often complained of is the " running together of letters," so that the book has to be closed and the eyes rested before work can be resumed. This loss of accommodation power is due to the gradual hardening of the crystalline lens from age, and convex glasses have to take its place, in order to make reading possible and comfortable. In hyperopia the presbyopic period is earlier, and in myopia it is later than normal (see above).

It is unwise for the presbyope to select the glasses for himself, as astigmatism or anisometropia may be present and must, of course, be corrected; the eyes should be properly tested, and this testing should be repeated every two or three years, as, not only does the old sight increase, but changes in the static refraction of the eyes are probably taking place. When an error of refraction exists with the presbyopia, glasses for distance, as Well as reading, have to be worn, and to avoid the trouble 1 1 See also § Astigmatism, above.

of constantly changing, the two should be combined as bi-focal glasses. The upper portion of the bi-focal corrects the distant, and the lower the near vision, and in the best form the division between the two is invisible. When properly fitted these bi-focals prove the greatest boon to the presbyope.

Anisometropia (Odd Sight) is a condition in which the re- fraction of the two eyes is different. There are three varieties, (r) Binocular vision exists. As a rule a very small difference is present, and the difference is generally in the astigmatism; consequently eye-strain is very commonly manifested, and the correction by suitable glasses is imperative. (2) The eyes are used alternately. For instance, one eye may be hyperopic or emmetropic, and the

other myopic; in such a case the former will be used for distant and the latter for near vision, and although binocular or stereoscopic vision is lost, glasses may never be required and any attempt at a correction of the defect may be useless. However, if eye-strain is present, the attempt should be made. (3) One of the eyes is permanently excluded. When the difference between the eyes is great the most defective eye is little used and tends to become amblyopic (partially blind), if it is not so already. This condition is very common in squint, and the treatment in such cases consists in providing the defective eye with its correcting glass, completely covering up the good eye and practising for certain periods every day, and thus forcing the defective eye to work. This eye may never take its share in binocular vision, but it may become very useful, especially if disease or damage should affect the good eye ; and the improvement of the vision of the eye materially assists the treatment of the squint. When one eye is irre- mediably lost, the other should be very carefully tested, and if any error exists it ought to be corrected and the glass worn always.*

Aphakia is the absence of the crystalline lens through dis- location, or removal by operation, or injury. A strong convex glass has to be worn in front of such an eye in order 1.0 obtain c'oar vision even for distance, and a still stronger one for near vision; after cataract operation astigmatism is generally present and the convex glass must be combined with a cylinder: these glasses are best worn in the form of bi-focals (see Pres- byopia, above).

Eye-Strain. — Eye-strain is a symptom, or group of symptoms, produced by the correction, or attempt at correction, by the ciliary muscle of an error of refraction, or a want of balance between the external muscles of the eye (heterophoria). Where gross errors exist either in the refraction or in the muscular equili- brium, the correction cannot be made, and consequently no attempt is made to correct the defect, and eye-strain is not produced. The smaller the error the more likely is the eye- strain to be present, and also, unfortunately, the more likely is it to be overlooked. It is important to recognize what may be the different manifestations of eye-strain. They may be grouped under three headings : (1) manifestations on the eye and lids, such as conjunctivitis, blepharitis, iritis, cyclitis, glaucoma and cataract. (2) Peripheral irritation: (a) with pain: head- aches and megrim; (6) without pain: epileptic attacks and choreiform movements of the facial muscles: vertigo, nausea, vomiting. (3) Nerve waste: nerve exhaustion, neurasthenia, brain-fag. This last form of eye-strain is as common as it is subtle. It is subtle because the sufferer never suspects the eyes to be at fault; all his waking hours he is unconsciously correcting a low degree of astigmatism, or anisometropia, or heterophoria, which means a constant nerve waste; and when he begins near work he starts with a big deficit, and further sirain results.

Insomnia is a prominent symptom of eye-strain; this leads to depression, which in its turn may lead to the alcoholic or morphia habit. There is no form of functional nerve disorder that may not be caused by, or aggravated by, eye-strain.

The treatment of eye-strain consists in correcting all errors of refraction (and in the case of astigmatism and anisometropia, even the smallest) and in wearing the correction always. A ?inaU amount of heterophoria will generaDv. in a short time.

disappear when the error is corrected; if not, it must be corrected by prisms or decentring. (E. C.)*

VISITATION (Lat. from visitare, frequentative form of visere, to look at, go to see, visit, videre, to see), an act of visiting, or going to see, a formal visit. The use of the word for an act of divine retributive justice, or generally of an occurrence of grave import, such as a plague or famine, is due mainly to Biblical phraseology, as in " the day of visitation " (Isa. x. 3). For the duty of bishops of the Roman Church to visit periodically the tombs of the apostles Peter and Paul at Rome, the Visitatio Liminium Apostolorum, see Bishop. The specific application of the term is to a formal periodical visit paid by a superior authority to an institution or to a district for the purpose of investigation, examination or the like. There are three classes of such visitations: ecclesiastical, charitable and heraldic. Ecclesiastical visitations, originally the periodical journeys of personal inspection to ascertain the temporal and spiritual condition of each parish, form part of the functions of an arch- bishop, a bishop and an archdeacon. All charitable corporations are at law subject to visitation; the functions of the " visitors " have been largely taken over by the Board of Charity Commissioners. Colleges at a university are regarded in law as charitable institutions, and each college has a " visitor " whose duty it is to represent the founder and see that his wishes are carried out. Heraldic visitations were perambulations made by a king-at-arms or other high heraldic officer with a commission under the Great Seal to examine into pedigrees and claims to bear arms. The results of these visitations were entered in " Visitation Books," which are in the nature of official records; their admissibility as evidence, though claimed, is judicially questioned as containing merely experts' statements from the families to whom they refer (D'Arcy de Knayth Peerage Case, 1001). These heraldic visitations ceased about

1686.

In addition to these specific meanings may be mentioned the festival of the " Visitation of Mary," in commemoration of the visit of the Virgin to Elizabeth, mother of St John the Baptist, celebrated in the Roman, Greek

and other churches on the 2nd of July, and the office of the English Church, the " Visitation of the Sick," ordered for the spiritual comfort and benefit of sick persons.

For the international law relating to the right of belligerent vessels to " visit and search " neutral vessels in time of war, see Search, Right of.

VISITING CARDS. The use of cards of personal identifica- tion for social purposes is generally supposed to have had its origin at the court of Louis XIV. of France, that centre of the etiquette of the 17th century. But there appears to be little doubt that, in a rougher and ruder form, this mark of intercourse dates from much earlier times, and that the Chinese, and possibly other Oriental nations also, had in bygone ages employed such mediums of communication on calling at the houses of absent friends. When and where visiting cards first came into vogue in Europe is a matter of some uncertainty. It is probable, how- ever, that they were first used in Germany — and as early as the 16th century. A German visiting card recently discovered in Venice bears this inscription: Johannes Westerholt Westphalus scribebat, Patavti, 4 Martii 1$ x 60. Concerning this, Professor Dr Kirmis (Daheim, September 30th, 1905) remarks that the German students in Padua were wont, on quitting the university, to pay farewell calls at the houses of the professors, and, in the event of not finding them within, to leave their names on paper billets; and he adds that the custom must, until that time, have been unknown in Italy, for this card of the student Wester- holt was sent by Professor Giacomo Contarini on the 15th of January 1572 to Venice as a curiosity. Under the reign of Louis XIV., however, the fashion appears to have become firmly established in France, Small strips of paper were at first em- ployed for the purpose of the communication; but gradually they attained a more elaborate finish and execution. Ladies especially seem to have been the pioneers in this direction, and to have embellished their cards with hand drawings, sometimes taking the form of " hearts " and other amorous tokens of affection, Under Louis XV. ; the reign of exquisite extravagance

and refined taste, visiting cards were furnished with deli- cate engravings, frequently masterpieces of that art, showing some fanciful landscape, or a view of the town or place where the person resided. A further stage in the development of this custom was the autograph signature at the foot of the card beneath the engraved view. England followed the lead of France, and visiting cards became a universal fashion in Europe towards the close of the 18th century. But though in almost every European country there are

variations in the size and shape of the card and the way of describing the quality of the person whom it represents, the modern tendency is everywhere in favour of simplicity and the avoidance of ostentation.

A valuable collection of visiting cards is that of the Gabinetto della Stampe in Rome and the Museo Civico in Venice.

VISOKO (or Visoki), a town of Bosnia, on the river Bosna, 15 m. N.W. of Serajevo by rail. Pop. (1895), about 5000. Visoko has a brisk trade in leather, carpets and tobacco.

Between the 13th and 16th centuries Visoko was only second to Jajce as a stronghold of the Bosnian rulers. There were fortified palaces at Sutje£ka, and Bobovac, among the mountains on the north. Bobovac, which had withstood many previous assaults, was betrayed to the Turks in 1463; at Sutjecka there is a Franciscan monastery, founded in 1391, often razed by the Turks, and finally rebuilt in 1821. Just below Visoko lay the town of Podvisoko, called Sotto Visochi by the Ragusans, which was the chief mart of the country from 134S to 1430.

VISOR (also spelled viser, vizor, vizard or visard), a term now used generally of the various forms of movable face-guards in the helmet of medieval and later times. It meant properly a mask for the face, and is an adaptation of the O-Fr. visiere, mod. visibre, as is seen by the M.E. forms viser, visere. It is thus to be referred to the Fr. vis, face, Lat. visus, from videre, to see. In this sense the word ” visor J? is modern, the movable guard for the upper part of the face being known as an ” aventail ” or ” ventail,” and that for. the lower part a ” beaver ” (see Helmet).

VISTULA (Ger. Weichsel, Polish Wisla), one of the chief rivers of Europe, rising in Austria and flowing first through Russian and then through Prussian territory. Its source is in Austrian Silesia on the northern slopes of the West Beskiden range of the Carpathian mountains.

The stream runs through a mountain valley, in a.N.N.W. direction to Schwarzwasser, where it leaves the mountains, turns E. and N.E., and forms part of the Austro-German frontier. Returning within Austrian territory (Galicia), it passes Cracow, and thereafter forms a long stretch of the frontier with Russia (Poland), bending gradually towards the north, until at Zawichost \t runs due N. and enters Poland. Here it at first bisects the high-lying plateau of southern Poland, but leaves this near Jozefow, and flows as farasthejimction with the Pilica in a broad valley between wooded bluffs. Crossing the plain of central and northern Poland, it passes Warsaw, and at the junction of the Bug sweeps W. and N.W. to pass Plock and Wloclawek (sec further Poland for its course within this territory), ft

enters Prussia 10 m. above Thorn, turns N.E. on receiving the Brahc, passes Graudenz and turns towards the north. From this point it throws off numerous branches and sweeps from side to side of a broad valley, having steep banks on the side upon which it impinges, and on the other being bordered by extensive flat lands. Nearing the Baltic Sea it forms a delta, dividing into two main arms, the left or western of which bears the name of Vistula, and flows directly to Danzig Bay, while the right is called the Nogat, and flows into the Frisches Haff. The enclosed deltaic tract is very fertile. Parts of it are known as Werder (cf. the English " islands " or " holms " in the Fens and other low-lying tracts of the east). In the lower part of the delta the Haff Canal leads from the main river to the Frisches Haff; there are also various natural channels in that direction, but the main river passes on towards the N.W., having a tendency to run parallel to the coast, and reaching Danzig Bay with a direct course only through an artificial cut constructed in 1888-96. The river broke a new channel into the bay, at a point between this cut and the old mouth at Neufahrwasser, on the night of the ist-2nd of February 1840. The important seaport of Danzig, however, is on the old channel, and this channel is. used by shipping, which enters it by a canal at Neufahrwasser. The Nogat, formerly inconsider- able, had become so much deepened and broadened by natural means in the early part of the 19th century that it carried more water than the Vistula itself [i.e. the other' main deltaic branch). In 1845-57 the outflow of the Nogat was stopped and an artificial

channel was formed for it, so as to restore the proper head of water

to the Vistula.

Shifting banks form a serious impediment to navigation, and these and floods (principally in spring and midsummer) necessitate careful works of regulation. The river is ice-bound at Warsaw, on an average, from about the 20th of December to the 10th of March. The navigation of the Vistula is considerable up to Cracow, and the river forms a very important highway of commerce in Poland {q.v.) and Prussia. For small craft it is navigable above Cracow up to the Austro-German frontier, where the Przemsa enters it. This river and the Pilica, Bzura, Brahe, Schwarzwasser and Ferse are the chief left bank tributaries; on the right the Vistula receives the Skawa, Raba, Dunajec, Wisloka and San before reach ing Poland, the Wieprz and Bug in Poland, and the Drewenz in Prussia. The Brahe and the Bromberg Canal give access from the Vistula to the Netze and so to the Oder. The river is rich in fish. Its total length is about 650 m., and its drainage, area approaches 74,000 sq. m.

See H. Keller, Memel-, Pregel- und Weichselslrom, ihre Strontge- biete, &c, vols. iii. and iv. (Berlin, 1900).

V ITALIAN US, bishop of Rome from 657 to 672, succeeded Eugenius I. and was followed by Adeodatus. In the mono- thelite controversy then raging he acted with cautious reserve, refraining at least from express condemnation of the Typus of Constans II. The chief episode in his uneventful pontificate was the visit of Constans to Rome; the pope received him "almost with religious honours," a deference which he requited by stripping all the brazen ornaments of the city — even to the tiles of the Pantheon — and sending them to Constantinople. Archbishop Theodore was. sent to Canterbury by Vitalian.

VITEBSK, a government of western Russia, with the govern- ment of Pskov on the N., Smolensk on the E., Mogilev, Minsk and Vilna on the S., and Courland and Livonia on the W., having an area of 16,978 sq. m. Except on its south-eastern and northern borders, where there are low hills, deeply eroded by the rivers, its surface is mostly flat, or. slightly undulating, and more than a million acres are occupied by immense marshes, while there are as many as 2500 small lakes. It is mainly built up of Devonian red sandstones and red clays, but the Carboniferous formations— both the Lower, characterized by layers of coal, and the Upper — crop out in the east. The whole is covered with Glacial and post-Glacial formations, in which remains of extinct mammals and stone implements are found in large quantities. There are numerous burial-mounds containing bones and iron implements and ornaments. The soil is for the most part unproductive. The W. Dyina rises not far from the north-eastern angle of the government, and flows through it, or along its southern boundary, for 530 m. From its confluence with the Kasplya, i.e. for more than 450 m., it is navigable; and, through a tributary, the Ulyanka, .it is connected with the Dnieper by the Berezina Canal. The Mezha and Kasplya, tributaries of the W. Dvina, are navigable in spring. The climate is relatively mild, the average yearly temperature at the city of Vitebsk being 40 F. (January i6°-4; July 64°-3). The population was estimated at 1,740,700 in 1906. The government is divided into eleven districts, the chief towns of which are Vitebsk, Drisa, Dvinsk, formerly Diina- burg, Gorodok, Lepel, Lyutsyn, Nevel, Polotsk, Ryezhitsa, Sebezh and Velizh.

VITEBSK, a town of Russia, capital of the government of the same name, on both banks of the W. Dvina, and on the railway from Smolensk to Riga, 85 m. N.W. from the former. Pop. (1885) 54,676; (1897) 65,871. It is an old town, with decaying mansions of the nobility, and dirty Jewish quarters, half of its inhabitants being Jews. There are two cathedrals, founded in 1664 and 1777 respectively. The church of St Elias, a fine example of the Old Russian style Gf architecture, founded in 1643, was burned down in 1904. The manufactures are insignificant, and the poorer classes support themselves by gardening, boat-building and the flax trade, while the merchants carry on an active business with Riga in corn, flax,

hemp, tobacco, sugar and timber.

Vitebsk (Dbesk, Vitbesk and Vitepesk) is mentioned for the first time in 102 1, when it belonged to the Polotsk princi- pality. Eighty years later it became the chief town of a separate

principality, and so continued until 1320, when it came under the dominion of the Lithuanians. In the 16th century it fell to Poland. Under the privileges granted to the city by the Polish sovereigns it flourished, but it soon began to suffer from the wars between Russia and Poland, during which it was thrice taken by the Russians and burned. Russia annexed it finally in 1772.

VITELLI, V1TELL0ZZ0 (?-iso2), Italian condottiere. Together with his father, Niccolo, tyrant of Citta di Castello, and his brothers, who were all soldiers of fortune, he instituted a new type of infantry armed with sword and pike to resist the German men-at-arms, and also a corps of mounted infantry armed with arquebuses. Vitellozzo took service with Florence against Pisa, and later with the French in Apulia (1496) and with the Orsini faction against Pope Alexander VI. In 1500 Vitellozzo and the Orsini made peace 'with the pope, and the latter's son Cesare Borgia, being determined to crush the petty tyrants of Romagna and consolidate papal power in that province, took the condoltieri into his service. Vitellozzo distinguished himself in many engagements, and in isor he advanced against Florence, moved as much by a desire to avenge his brother Paolo, who while in the service of the republic had been suspected of treachery and put to death (1499), as by Cesare's orders. In fact, while the latter was actually nego- tiating with the republic, Vitelli seized Arezzo. Forced by Borgia and the French, much against his will, to give up the city, he began from that moment to nurture hostile feelings towards his master and to aspire to independent rule. He took part with the Orsini, Oliverotto da Fermo and other captains in the conspiracy of La Magione against the Borgia; but mutual distrust and the incapacity of the leaders before Cesare's energy and the promise of French help, brought the plot to naught, and Vitelli and other condotlieri, hoping to ingratiate themselves with Cesare once more, seized Senigallia in his name. There they were decoyed by him and arrested while their troops were out of reach, and Vitelli and Oliverotto were strangled that same night (31st of December 1502).

See vol. iii. of E. Ricotti's Storia delta compasnie di ventura (Turin, 1845), in which Domenichi's MS. Vita di Vitellozzo Vitelli is quoted; C. Yriarte,

Cesar Borgia (Paris, 1889); P. Villari, Life and Times of N. Machiavelli (English ed., London, 1892); see also under Alexander VI. and Cesare Borgia.

VITELLIUS, AULUS, Roman emperor from the 2nd of January to the 22nd of December a.d. 69, was born, on the 24th of September a.d. 15. He was the son of Lucius Vitel- lius, who had been consul and governor of Syria under Tiberius. Aulus was consul in 48, and (perhaps in 60-61) proconsul of Africa, in which capacity he is said to have acquitted himself with credit. Under Galba, to the general astonishment, at the end of 68 he was chosen to command the army of Lower Germany, and here he made himself popular with his subalterns and with the soldiers by outrageous prodigality and excessive good nature, which soon proved fatal to order and discipline. Far from being ambitious or scheming, he was lazy and self- indulgent, fond of eating and drinking, and owed his elevation to the throne to Caecina and Valens, commanders of two legions on the Rhine. Through these two men a military revolution was speedily accomplished, and early in 69 Vitellius was pro- claimed emperor at Colonia Agrippinensis (Cologne), or, more accurately, emperor of the armies of Upper and Lower Ger- many. In fact, he was never acknowledged as emperor by the entire Roman world, though at Rome the senate accepted him and decreed to him the usual imperial honours. He advanced into Italy at the head of a licentious and ruffianly soldiery, and Rome became the scene of riot and massacre, gladiatorial shows and extravagant feasting. As soon as it was known that the armies of the East, Dalmatia and Illyricum had declared for Vespasian, Vitellius, deserted by many of his adherents, would have resigned the title of emperor. It was said that the terms of resignation had actually been agreed upon with Primus, one of Vespasian's chief supporters, but the praetorians refused to allow him to carry out the agreement,

and forced him to return to the palace, when he was on his way to deposit the insignia of empire in the temple of Concord. On the entrance of Vespasian's troops into Rome he was dragged out of some miserable hiding-place, driven to the fatal Gemonian stairs, and there struck down. " Yet I was once your emperor," were the last and, as far as we know, the noblest words of Vitellius. During his brief administration Vitellius showed indications of a desire to govern wisely, but he was completely under the control of Valens and Caecina, who for their own ends encouraged him in a course of vicious excesses which threw his better qualities into the background.

See Tacitus, Histories ; Suetonius, Vitellius; Dio Cassius Ixv.; Merivale, Hist, of the Romans under the Empire, chs. 56, 37; H. Schiller, Geschichle der romischen Kaiserzeit, i. pt. I ; W. A. Spooner's ed, of the Histories of

Tacitus (introduction) ; B. W. Henderson, Civil War and Rebellion in the Roman Empire, AJ).6g-ˆo(igo8).

VITERBO, a city and episcopal see of the province of Rome, Italy, 54 m. by rail N.N.W. of Rome, ro73 ft. above sea-level. Pop. (1901) 17,344 (town), 21,258 (commune). It lies on the old high road between Florence and Rome, and besides the railway to Rome it has a branch line (25 m.) going N.E. to Attigliano, on the railway from Rome to Florence. It is picturesquely surrounded by luxuriant gardens, and enclosed by walls and towers, which date partly from the Lombard period. The streets are paved with large lava blocks, of which the town is also built. It has many picturesque medieval towers and other edifices (the Palazzo degli Alcssandri is perhaps the most interesting), for which indeed it is one of the best towns in central Italy, and some elegant fountains; among the latter may be mentioned the Gothic Fontana Grande (1279, restored in 1424) and Fontana della Rocca by Vignola (1566). The citadel (Rocca) itself, erected by Cardinal Albornoz in 1345, is now a barrack. The Palazzo Patrizi is a building of the early Renaissance in the Florentine style. The cathedral, a fine basilica, of the 12th (?) century, with columns and fantastic capitals of the period, originally flat-roofed and later vaultedy with 16th-century restorations, contains the tomb of Pope John XXI., and has a Gothic campanile in black and white stone. It is more probable that it was S. Silvestro (now Chiesa del Gesil) and not the cathedral that, in 1271, was the scene of the murder, on the steps of the high altar, during public worship, of Henry, son of Richard of Cornwall, by Guy de Montfort (see Dante, Inf. xii. 118). In front of the cathedral Pope Adrian IV. (Nicholas Breakspcar) compelled the emperor Frederick I. to hold his stirrup as his vassal. " The old epis- copal palace with a double loggia built on to it (recently restored to its original form) is a Gothic building of the 13th century, in which numerous conclaves have been held. The church of S. Rosa exhibits the embalmed body of that saint, a native of Viterbo, who died in her eighteenth year, after working various miracles and having distinguished herself by her invectives against Frederick II. (1251), some ruins of whose palace, destroyed after his death, exist. S. Francesco, a Gothic church (before 1256), contains the fine Gothic tombs of Popes Clement IV. and Adrian V., and has an external pulpit of the 15th century. The town also contains a few small Roman- esque churches (S. Maria Nuova, S. Andrea, S. Giovanni in Zoccoli, S. Sisto, &e.) and several other Gothic churches. S. Maria della Cella is noteworthy among the former as having one of the earliest campanili of any size in Italy (9th century). The town hall, with a medieval tower and a 1 5th-century portico, contains some Etruscan sarcophagi from sites in the neighbourhood, and a few good paintings. At one corner of the picturesque square in front of it is a Roman sarcophagus with a representation of the hunt of Meleager, with an inscrip-

tion in honour of the fair Galiana, to win whom, it is said, a Roman noble laid siege to Viterbo in 1133; Close by te' the elegant Gothic facade of S. Maria della Salute, in white and red marble with sculptures. The Gothic cloisters of S. Maria della Verita just outside the town are strikingly beautiful. The church contains frescoes by Lorenzo da Viterbo (1469) and a fine majolica pavement. A mile and a half to the north-east

is the handsome early Renaissance pilgrimage church of the Madonno della Quercia; the facade is adorned with three lunettes by Andrea delia Robbia. The fine wooden roof of the interior is by Antonio da Sangallo the younger (1519-25). The adjoining monastery has a pleasing cloistered court. A mile and a quarter farther is the town of Bagnaia, with the Villa Lante, still belonging to the family of that name, with fine fountains and beautiful trees, ascribed to Vignola. The inhabitants of Viterbo are chiefly dependent on agriculture; hemp is a specialty of the district, and tobacco and various grains are largely grown, as well as the olive and the vine. There are in the vicinity numerous mineral springs; the warm sulphur spring of Bollicame, about 2 m. off, is alluded to by Dante (Inf. xiv. 79).

Viterbo is by some identified with Surrina nova, which is only mentioned in inscriptions, while some place it at the sulphur springs, called the Bollicame, to the west of Viterbo on the line of the Via Cassia, where Roman remains exist. This might well be the site of the Roman town. Here the Via Cassia was joined by the Via Ciminia, passing east of the Lacus Ciminius, while a road branched off to Ferentum. See E. Bormann in Corp. Inscr. Lai. xi. (Berlin, 1888), p. 454; H. Nissen, Italische Landeskunde (Berlin, 1902), ii. 343, The forgeries of the Dominican Annio da Viterbo (d. 1502) were directed to prove that Viterbo was the site of the Fanum Voltumnae (see, however, Montefiascone). There are no archaeological remains in Viterbo itself, except a few courses of masonry under the bridge which connects the cathedral with the city, near the cathedral, possibly the pier of an older bridge. But the site is not unreasonably considered to be ancient, and the name to be derived from Veins urbs; tombs, too, have been found in the neighbourhood, and it is not an unlikely assumption that here, as elsewhere, the medieval town occupies the Etruscan site. It was fortified by the Lom- bard king Desiderius (the decree ascribed to him, now in the municipal palace, has long been recognized as a forgery of Annio). It is the centre of the territory of the "patrimony of Peter," which the countess Matilda of Tuscany gave to the papal see in the 12th century; in the 13th century it became a favourite papal residence. Popes .Urban IV. (r26i), Gregory X. (1271), John XXI. (1276), Nicholas III. (1277) and Martin

IV. (1281) were elected here, and it was at Viterbo that Alexander IV. (1261), Clement IV. (1268), Adrian V. (1276) and John XXI. (1277) died. (T. As.)

VITET, LODOVIC (1802-1873), French dramatist and poli- tician, was born in Paris on the 18th of October 1802. He was educated at the Ecolc Normale. His politics were liberal, and he was a member of the society " Aide-toi, le ciel t'aidera." On the triumph of liberal principles in i83oGuizot created an office especially for Vitet, who became inspector-general of historical monuments. In 1834 he entered the Chamber of Deputies, and two years later was made a member of the Council of State. He was consistent in his monarchist principles, and abstained from taking any part in politics during the second empire. The disasters of 1870-71 reawakened Vitet's interest in public affairs, and he published in the Revue des deux monies his optimistic " Lettres sur le siege de Paris." He died in 1873.

Vitet was the author of some valuable works on the history of art, and his Monographic de I'&glisc Notre Dame de Noyon (1845) especially did much to awaken popular interest in architecture. In the early days of the Romantic movement he wrote some vivid dramatic sketches of the time of the League. They are : Les Barricades, scenes hisioriques (1826), Les Stats de Blois, scenes (1827), and La Mart de Henri III. (1829), all three being published together in 1844 with the title of La Ligue. The best of these is the Etats de Blois, in which the murder of the duke of Guise is described in the most convincing "manner.

VITORIA, an episcopal city of northern Spain, and capital of the province of Alava; on the Miranda de Ebro-Alsasua section of the Northern railways, among the southern outliers of the Cantabrian mountains, and on the left bank of the river Zadorra, a left-hand tributary of the Ebro. Pop. (1900) 30,7or. The city is built on a hill 1750 ft. high, and overlooks the plain

of Alava. Its oldest part, the Campillo or Villa-Suso, occupies the top of the hill; some of the walls and towers by which it was formerly defended still remain. Below it is Vitoria Antigua, with narrow tortuous lanes; on the still lower level ground is the modern town, with wide streets, an arcaded market-place and shady promenades. The cathedral of Santa Maria in the Campillo dates from 1181, but has been considerably spoiled by late additions: the church of San Miguel also dates from the 1 2th century; it has an exceptionally beautiful altar, carved in wood by J. Velazquez and G. Hernandez, in the 16th century. The town hall and the palace of the provincial assembly contain some fine paintings and interesting relics connected with the history of Alava. Vitoria, from its favourable position on the main lines from Madrid to France and to the port of San Sebas-

tian, is an important centre of trade in wine, wool, horses, mules and hardware; other industries are paper-making, carriage- building, cabinet-making, tanning and the manufacture of earthenware. There is a branch railway from Vitoria to Villarreal. The city is lighted by electricity; its trade and population have largely increased since 1875.

Vitoria was founded in 58 r by Leovigild, king of the Visi- goths; but its importance dates from the roth century. In 1 181 Sancho the Wise of Navarre granted it a charter and forti- fied it.

Battle of Vitoria: — For the operations which preceded the battle of Vitoria see Peninsular War. On June 21st, 1813, the French army in Spain (about 65,000 men with 150 guns), under King Joseph Bonaparte, held an extended position in the basin of Vitoria, south (with the exception of the extreme right) of the river Zadorra. The left rested on the heights of Puebla, north of the Puebla Pass, and Puebla de Arganzon, through which ran the Miranda- Vitoria Bayonne road, Joseph's line of communication with France. Thence the line stretched to the ridge of Margarita, the troops so fair being under General Gazan, with a second supporting line under D'Erlon between Arinez and Hermandad and a reserve behind Arinez. The right under Reille guarded the Bilbao-Vitoria road, occupying heights on the north bank of the Zadorra, and also the villages and bridges of Abechuco and Gamarra Mayor, as well as a ridge near Ariaga on the south bank.

There were no troops between Hermandad and Ariaga, except a mass of cavalry near Ali. The Zadorra, fordable in certain spots only, was spanned by bridges at Puebla de Arganzon, Nanclares, Villodas, Tres Puentes, Mendoza, Abechuco and Gamarra Mayor, which French guns commanded; but, for some reason, none of these had been destroyed. The faults of the French position and their occupation of it were its extension; that it was in prolongation of and (on the right especially) very close to their line of retreat, so that if the right were driven back this line could be at once seized ; that the centre was not strongly held; and that all bridges were left intact.

The Allies (nearly 80,000, with 90 guns), under Wellington, had moved from the river Bayas at daylight to attack Joseph, in four columns, the right being under Hill (20,000, including Morillos's Spaniards), the right centre and left centre under Wellington (30,000) and the left under Graham (20,000, includ- ing Longa's Spaniards). As the columns marched across the intersected country between the Bayas and Zadorra, extending from near Puebla de Arganzon to the Bilbao-Vitoria road, they kept touch with each other; and as they neared the Zadorra the battle opened all along the line soon after 10 a.m. Welling- ton's instructions to Graham were to

undertake no manoeuvre which would separate his column from those on the right; but, with this proviso, to seize the Vitoria-Bayonne road if the enemy appeared, decidedly in retreat. Hill after a sharp contest gained the Puebla heights, too weakly held; and pushing through the pass carried the village of Subijana de Alava. The right centre column having reached Villodas, was waiting for Hill to gain further ground, when the bridge at Tres Puentes was observed to. be unguarded, probably because it was commanded from the south bank; and, the French attention being now turned towards their flanks, it was surprised and rushed by Wellington with the

Light division, supported quickly by cavalry and other troops, who maintained themselves on the south bank. Joseph's

English Miles

Redrawn from Major-General C. W. Robinson's Wetlinstott's Campaigns, by permission 01 Hugh Rees, Ltd.

centre was partially forced, while his left was hard pressed by Hill; and, fearing that Gazan and D'Erlon might be cut off from Reille, he ordered them to withdraw to a ridge farther back, which they did, holding Arinez in front. Here there was no hard fighting; but, as Wellington had now passed three divisions, many guns and the cavalry (which, however, from the nature of the ground could be but little used) across the Zadorra, Margarita, Hermandad and Arinez soon fell to the Allies.

On the left, Graham, having turned the heights north of Zadorra with Longa's Spaniards, seized Gamarra Menor close to the Bayonne road. He also with heavy loss carried Gamarra Mayor and Abechuco, but the bridges south of these villages, though more than once taken, were always recaptured by Reille. At length, when a brigade from the Allied centre had been pushed up from Hermandad against Reille's flank, he withdrew from the obstinately defended bridges, and before this Gazan and D'Erlon had also fallen back, fighting, to a third position on a ridge between Armentia and Ali west of Vitoria. Here, at about 6 p.m., they made a last stand, being compelled in the end to yield; and as Graham having now crossed the bridges was close to the Bayonne road, the main body of Joseph's army fled by a bad cross road towards Pampeluna, abandoning artillery, vehicles and baggage (of which an enormous quantity was parked near Vitoria), Reille afterwards joining it through Betonia. The Allies then occupied

Vitoria and pursued the French until nightfall. All Joseph's equipages, ammunition and stores, 143 guns, a million sterling in money, and various trophies fell into Wellington's hands, the French loss in men being nearly 7000, that of the Allies over 5000, of whom 1600 were Portuguese and Spaniards. This decisive victory practically freed Spain from French domination. (C. W. R.)

VITRE, a town of north-western France, capital of an arrondissement in the department of Ille-et-Vilaine, situated on a hill rising from the left bank of the Vilaine, 24 m. E. of Rennes by rail. Pop. (1006) town, 7106; commune, 10,092. The town largely retains its feudal aspect. The ramparts on the north side and on the west, consisting of a machicolated wall with towers at intervals, are still standing. Only one gateway remains of the original castle, founded towards the end of the nth century; the rest was rebuilt in the 14th and 15th centuries (the best period of Breton military architecture) and restored in recent times. It is now occupied by a prison, a museum of natural history and painting and the town library. The church of Notre-Dame, formerly a priory of the abbey

of St Melaine of Rennes, dates from the 15th and 16th centuries. An outside stone pulpit is a fine example of 16th-century sculpture. The church possesses a fine enamelled triptych of the 16th century. A tower of the 16th century is all that remains of the church of St Martin. The chateau of Les Rochers 3 m. from Vitre was the residence of Madame de Sevigne.

Vitre was formerly a Breton barony, and belonged in the 10th century to the younger branch of the counts of Rennes. In 1295 it passed to Guy IX., baron of Laval, on his marriage with the heiress, and afterwards successively belonged to the families of Rieux, Coligny and La Tremoille. The town was seized by Charles VIII. in 1488. Protestantism spread under the rule of the houses of Rieux and Coligny; Vitre became a Huguenot stronghold; and a Protestant church was estab- lished, which was not suppressed till the revocation of the edict of Nantes in 1683. Philip Emmanuel, duke of Mercceur, the head of the members of the League in Brittany, besieged the town in vain for five months in 1589. The estates of Brittany, over which the barons of Vitre and of Leon alternately presided, met here several times.

VITRIFIED FORTS, the name given to certain rude stone enclosures whose walls have been subjected in a greater or less degree to the action of fire. They are generally situated on hills offering strong defensive positions. Their form seems to have been determined by the contour of the flat summits which they enclose. The walls vary in size, a few being up- wards of 12 ft. high, and are so broad that they present the appearance of embankments. Weak parts of the defence are strengthened by double or

triple walls, and occasionally vast lines of ramparts, composed of large blocks of unhewn and unverified stones, envelop the vitrified centre at some distance from it. No lime or cement has been found in any of these structures, all of them presenting the peculiarity of being more or less consolidated by the fusion of the rocks of which they are built. This fusion, which has been caused by the applica- tion of intense heat, is not equally complete in the various forts, or even in the walls of the same fort. In some cases the stones are only partially melted and calcined; in others their adjoining edges are fused so that they are firmly cemented together; in many instances pieces of rock are enveloped in a glassy enamel -like coating which binds them into a uniform whole; and at times, though rarely, the entire length of the wall presents one solid mass of vitreous substance.

Since John Williams — one of the earliest of British geologists, and author of The Mineral Kingdom — first described these singular ruins in 1777, about fifty examples have been dis- covered in Scotland. The most remarkable are Dun Mac Uisneachain (Dun Macsnoichan), the ancient Beregonium, about 9 m. N.N.E. of Oban; Tap o' Noth, in Aberdeenshire; Craig Phadraic, or Phadrick, near Inverness; Dun Dhardhail (Dunjardil) in Glen Nevis; Knockfarrail, near Strathpeffer; Dun Creich, in Sutherland; Finhaven, near Aberlemno; Barryhill, in Perthshire; Laws, near Dundee; Dun Gall and Burnt Island, in Buteshire; Anwoth, in Kirkcudbright; and Cowdenknowes, in Berwickshire. Dun Mac Uisneachain is the largest in area, being 250 yds. long by 50 yds. broad. In the Tap o' Noth the walls are about 8 ft. high and between 20 and 30 ft. thick. In Dun Mac Uisneachain, Barryhill and Laws the remains of small rectangular dwellings have been found.

For a long time it was supposed that these forts were peculiar to Scotland; but they are found also in Londonderry and Cavan, in Ireland; in Upper Lusatia, Bohemia, Silesia, Saxony and Thuringia; in the provinces on the Rhine, especi- ally in the neighbourhood of the Nahe; in the Ucker Lake, in Brandenburg, where the walls are formed of burnt and smelted bricks; in Hungary; and in several places in France, such as Chateauvieux, Peran, La Courbe, Sainte Suzanne, Puy de Gaudy and Thauron. They have not been found in England or Wales.

In some continental forts the vitrified walls are supported by masses of unvitrified stone built up on each side. This,

in all probability, constituted an essential feature in the Scottish forts. Except on the hypothesis of buttresses of a similar kind, it is impossible to explain the vast quantities of loose stones which are found both inside and outside many of the vitrified walls.

The method by which the fusion of such extensive fortifications was produced has excited much conjecture. Williams main- tained that the builders found out, either during the process of smelting bog-ore, or whilst offering sacrifices, the power of fire in vitrifying stone, and that they utilized this method to cement and strengthen their defences. This view has been keenly controverted, and it has been suggested that the vitrified summits were not forts but the craters of extinct volcanoes, an hypothesis long since abandoned; that they are not so much forts as vitrified sites, and that the vitrescence was produced by fires lighted during times of invasion, or in religious celebrations; and, lastly, that if they were forts they must originally have been built of wood and stone, and that their present appearance is due to their being set on fire by a besieging enemy. The theory of Williams has, with modi- fications, been accepted by the principal authorities. It is Supported by the following facts: —

(i) The idea of strengthening walls by means of fire is not sin- gular, or confined to a distinct race or area, as is proved by the burnt-earth enclosure of Aztalan, in Wisconsin, and the vitrified stone monuments of the Mississippi valley. (2) Many of the Primary rocks, particularly the schists, gneisses and traps, which contain large quantities of potash and soda, can be readily fused in the open air by means of wood fires — the alkali of the wood serving in some measure as a flux. (3) The walls are chiefly vitrified at the weakest points, the naturally inaccessible parts being un- verified. (4) When the forts have been placed on materials prac- tically infusible, as on the quartzose conglomerates of the Old Red Sandstone, as at Craig' Phadraic, and on the limestones of Dun Mac Uisneachain, pieces of fusible rocks have been selected and carried to the top from a considerable distance. (5) The vitrified walls of the Scottish forts are invariably formed of small stones which could be easily acted upon by fire, whereas the outer ram- parts, which are not vitrified, are built of large blocks. (6) Many of the continental forts are so constructed that the fire must have been applied internally, and at the time when the structure was being erected. (7) Daubree, in an analysis which he made on vitrified materials taken from four French forts, and which he sub- mitted to the Academy of Paris in February 18S1, found the pre- sence of natron in such great abundance that he inferred that sea-salt was used to facilitate fusion. (8) In Scandinavia, where there are hundreds of ordinary forts, and where for centuries a system of signal fires was enforced by law, no trace of vitrifaction has yet been detected.

A great antiquity has been assigned to vitrified forts, without sufficient proof. Articles of bronze and iron have been found in the Scottish forts, while in Puy de Gaudy a Roman tile has been discovered soldered to a piece of vitrified rock. In a few of the German forts Professor Virchow found some of the logs used as fuel in vitrifying the walls, and he concluded from the even- ness of their cut surfaces that iron and not stone implements must have been used. These results indicate that these structures were possibly in use as late as the early centuries of the Christian era. It has been suggested that they were built as refuges against the Norsemen. Much in the situation and character of the forts favours this supposition. This is especially the case with reference to the Scottish forts. Here the vitrified summits are invariably so selected that they not only command what were the favourite landing-places of the vikings, but are the best natural defences against attacks made from the direction of the seacoast. In Saxony and Lusatia the forts are known as Schvedenburgen, and in the Highlands of Scotland as the fortresses of the Feinne — designations which also seem to point to an origin dating back to the times of the vikings.

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Burgen und Walle im Thuringer Zentralbecken (Halle, 1889); Bug, Schlesische Heidenschanzen (Grottkau, 1890); Gohausen, Die Befestigungsweisen der Vorzeit und des Mittelalters (Wiesbaden, 1898).

(R. Mu.) VITRIOL, a name given to sulphuric acid and to certain sulphates. Oil of vitriol is concentrated sulphuric acid. Blue or Roman vitriol is copper sulphate; green vitriol, ferrous sulphate (copperas); white vitriol, zinc sulphate; and vitriol of Mars is a basic iron sulphate.*

VITRUVIUS (Marcus Vitruvius Poixio), Roman architect and engineer, author of a celebrated work on architecture. Nothing is known concerning him except what can be gathered from his own writings. Owing to the discovery of inscriptions relating to the Gens Vitruvia at Formiae in Campania (Mola di Gaeta), it has been suggested that he was a native of that city, and he has been less reasonably connected with Verona on the strength of an existing arch of the 3rd century, which is inscribed with the name of a later architect of the same family name — i " Lucius Vitruvius Cerdo, a freedman: of Lucius." From Vitruvius himself wc learn that he was appointed, in the reign of Augustus, together with three others, a superintendent of balistae and other military engines, a post which, he says, he owed to the friendly influence of the emperor's sister, probably Octavia {De Arckitectura, i. pref.). In another passage (v. 1) he describes a basilica and adjacent aedes Augusti, of which he was the architect. From viii. 3 it has been supposed that fie had served in Africa in the time of Julius Caesar, probably as a military engineer, but the words hardly bear this interpretation. He speaks of himself as being low in stature, and at the time of his writing bowed down by age and ill-health (ii. pref.). He appears to have enjoyed no great reputation as an architect, and, with philosophic contentment, records that he possessed but little fortune. Though a great student of Greek philosophy and science, he was unpractised in literature, and his style is very involved and obscure. To a great extent the theoretical and historical parts of his work are compiled from earlier Greek authors, of whom he gives a list at i. 1 and viii. 3. The practical portions, on the contrary, are evidently the result of his own professional experience, and are written with much sagacity, and in a far clearer style than the more pedantic chapters, in which he gives the somewhat fanciful theories of the Greeks. Some sections of the latter, especially those on the connexion between music and architecture, the scale of harmonic pro- portions, and the Greek use of bronze vases to reverberate and strengthen the actors' voices in the theatre, are now almost wholly unintelligible. Vitruvius's name is mentioned by Frontinus in his work on the aqueducts of Rome; and most of what Pliny says {Hist. Nat. xxxv. and xxxvi.) about methods of wall-painting, the preparation of the stucco surface, and other practical details in building is taken almost word for word from Vitruvius, especially from vi. 1, though without any acknow- ledgment of the source.

The treatise De Arckitectura Libri Decern is dedicated to Augustus. Lost for a long time, it was rediscovered in the 15th century at St Gall; the oldest existing MS. dates from the 10th century. From the early Renaissance down to a com- paratively recent time the influence of this treatise has been remarkably great. Throughout the period of the classical revival

VITRY-LE-FRANgOIS— VITTORIA

Vitruvius was the chief authority studied by architects, and in every point his precepts were accepted as final. In some cases a failure to understand his meaning led to curious results; for example, the medieval custom, not uncommon in England, of placing rows of earthenware jars under the floor of the stalls in church choirs, appears to have been an attempt to follow out suggestions raised by Vitruvius as to the advantages of placing bronze vases round the auditorium of theatres. Bramante, Michelangelo, Palladio, Vignola and earlier architects were careful students of the work of Vitruvius, which through them has largely influenced the architecture of almost all European countries.

Bk. i. operis with a dedication to Augustus. C. I is on the science of architecture generally, and the branches of knowledge with which the trained architect ought to be acquainted, viz. grammar, music, painting, sculpture, medicine, geometry, mathematics and optics; c. 2 is on the general principles of architectural design; c. 3 on the considerations which determine a design, such as strength, utility, beauty; c. 4 on the nature of different sorts of ground for sites; c. 5 on walls of fortification; c. 6 on aspects towards the north, south and other points; c. 7 on the proper situations of temples dedicated to the various deities.

Bk. 11. relates to materials (preface about Dinocrates, architect to Alexander the Great). C. 1 is on the earliest dwellings of man; c. 2 on systems of Thales, Heraclitus, Democritus, &c; c. 3 on bricks, c. 4 on sand; c. 5 on lime; c. 6 on pozzolana; c. 7 on kinds of stone for building; c. 8 on methods of constructing walls in stone, brick, concrete and marble, and on the materials for stucco; c. 9 on timber, time for felling it, seasoning, &c. ; and c. 10 on the fir trees of the Apennines.

Bk. iii., on styles, has a preface on ancient Greek writers. C. 1 is on symmetry and proportion; c. 2 on various forms of Greek temples, e.g in antis, prostyle, peripteral, dipteral, hypaethral; 1 c. 3 on inter-col umniation — pyenostyle, systyle, eustyle, &c. ; c. 4 on foundations, steps and stylobates; c. 5 on the Ionic order, its form and details.

Bk. iv., on styles and orders, has a preface to Augustus on the scope of the work. The subjects of its nine chapters are — (1) the Corinthian, Ionic and

Doric orders; (2) the ornaments of capitals, &c; (3) the Doric order; (4) proportions of the cella and pronaos; (5) sites of temples; (6) doorways of temples and their archi- traves; (7) the Etruscan or Tuscan order of temples; (8) circular temples; (9) altars.

Bk. v., on public buildings, has a preface on the theories of Pythagoras, &c. Its twelve chapters treat — (1) of fora and basilicae, with a description of his own basilica at Fanum; (2) of the adjuncts of a forum (aerarium, prison and curia) ; (3) of theatres, their site and construction; (4) of laws of harmonics; (5) bf the arrangement of tuned bronze vases in theatres for acoustic purposes; (6) of Roman theatres; (7) of Greek theatres; £8) of the selection of sites of theatres according to acoustic principles; (9) of porticus and covered walks; (10) of baths, their floors, hypocausts, the construc- tion and use of various parts; (n) of palaestrae, xysti and other Greek buildings for the exercise of athletes; (12) of harbours and quays.

Bk. vi. is on sites and planning, and the preface treats of various Greek authors. C. 1 is on selection of sites; c. 2 on the planning of buildings to suit different sites; c. 3 on private houses, their construction and styles, the names of the different apartments; c. 4 on the aspects suited for the various rooms; c. 5 on buildings fitted for special positions; c. 6 on farms and country houses; c. 7 on Greek houses and the names of various parts; c. 8 on con- struction of houses in wood, stone, brick or concrete.

Bk. vii., mostly on methods of decoration, has a preface (as usual) on the opinions of ancient Greek writers, with lists of Greek sculptors, architects and writers on architecture, and of Roman architects. C. 1 has for its subject pavements and roads, their construction, mosaic floors; c. 2 is on white stucco for walls (opus albarium); c. 3 on concrete vaults, gypsum mouldings, stucco prepared for painting; c. 4 on building of hollow walls to keep out the damp, wall decoration by various processes; c. 5 on methods and styles of wall painting, the debased taste of his time; c. 6 on fine stucco made of pounded marble — three coats to receive wall paintings; c. 7 on colours used for mural decoration; c. 8 on red lead {minium) and mercury, and how to use the latter to extract the gold from worn- out pieces of stuff or embroidery; c. 9 on the preparation of red lead and the method of encaustic painting with hot wax, finished by friction; cc. 10-14 on artificial colours — black, blue, purple; c. 10 white lead and ostrum, i.e. murex purple and imitations of murexdye.

1 The excavations made in 1887 have shown that Vitruvius was right in describing the great temple of Olympian Zeus at Athens as being octastyle. The previously almost universal opinion that it was decastyle had led to the needless theory that the passage con- taining this statement was corrupt.

Bk. yiiL is on hydraulic engineering, and the preface on theories of the ancients. C. I treats of the finding of good water ; c. 2 of rain- water and rivers — rivers in various countries; c. 3 of hot springs, mineral waters, with an account of the chief medicinal springs of the world; c. 4 of selection of water by observation and experi- ment; c. 5 of instruments for levelling used by aqueduct engineers; c. 6 of construction of aqueducts, pipes of lead, clay, &c, and other matter on the subject of water-supply.

Bk. ix. is on astronomy. The preface treats of Greek sciences, geometry, the discovery of specinc gravity by Archimedes, and' other discoveries of the Greeks, and of Romans of his time who have vied with the Greeks — Lucretius in his poem De Rerum Natura, Cicero in rhetoric, and Varro in philology, as shown by his_ De Lingua Latina. 2 The subjects of the eight chapters are — (1) the signs of the zodiac and the seven planets; (2) the phases of the moon; (3) the passage of the sun through the zodiac; (4) and (5) various constellations; (6) the relation of astrological influences to nature; (7) the mathematical divisions of the gnomon; (8) various kinds of sundials and their inventors.

Bk. x. is on machinery, with a preface concerning a law at ancient Ephesus compelling an architect to complete any public building he had undertaken; this, he says, would be useful among the Romans of his time. 8 The chapters are — (1) on various machines, such as scaling-ladders, windmills, &c. ; (2) on windlasses, axles, pulleys and cranes for moving heavy weights, such as those used by Chersiphron in building the great temple of Diana at Ephesus, and on the discovery by a shepherd of a quarry of marble required to build the same temple; (3) on dynamics; (4) on machines for drawing water; (5) on wheels for irrigation worked by a river; (6) on raising water by a revolving spiral tube; (7) on the machine of Ctesibius for raising water to a height; (8) on a very complicated water engine, the description of which is not intelligible, though Vitruvius remarks that he has tried to make the matter clear; (9) on machines with wheels to register the distance travelled, either by land or water; (10) on the construction of scorbiones for hurling stones, (11) and (12) on balistae and catapults; (13) on battering- rams and other machines for the attack of a fortress; (14) on shields (testudines) to enable soldiers to fill up the enemy's ditches; (15) on other kinds of testudines ; (16) on machines for defence, and examples of their use in ancient times. (J. H. M.)

The best edition is by Rose (2nd ed., Leipzig, 1899); see also Nohl, Index Vtlruvianus £1876) ; Tolles, Vitruvs Aesthetik (1906) ; Sontheimer, Vitruv und seine Zeit (1908). There rs a good transla- tion by Gwilt (1826; reprinted, 1874).

The name of Vitruvius has been given to several works on modern architecture, such as Campbell, Vitruvius Britannicus (London, 1715-71), a series of illustrations of the chief buildings of the 18th' century in England, including many works of the brothers Adam; one of these brothers, William Adam, produced a similar work illus- trating the buildings which he had designed for Scotland, under the title of Vitruvius Scoticus (Edinburgh, 1790). Thurah, Le Vitruve danois (Copenhagen, 1746—49), is a similar collection of modern buildings in Denmark.

VITRY-LE-FRANCOIS, a town of north-eastern France, capital of the department of Marne, on the right bank of the Marne, 20 m. S.E. of Chalons, on the railway from Paris to Strassburg. Pop. (1906) 7985. The Marne-Rhine canal, the Haute-Marne canal, and the lateral canal of the Marne unite at Vitry, Its church of Notre-Dame is a 17th-century building with fine' 18th-century monuments. A convent of the Re'collets now contains' the town hall, the court-house, a library and a small museum. There is a bronze statue of P. P. -Royer-Collard (1763-184 5), the politician and philosopher, a native of the district. The industrial establishments include important cement works and the manufacture of faSence is carried on. The present town was built in 1545 on a uniform plan by Francis I. to replace the older one of Vitry-en-Perthois, 2% m. to the north- east, burned in the previous year by Charles V.

VITTEL, a Watering-place of north-eastern France, in the department of Vosges, 31 m. W. of Epinal by rail. Pop. (1906) 1954. The waters resemble those of Contrexeville, but are lighter in character; they are bottled and exported in large quantities. They are prescribed in cases of gravel, gout, &c. Vittel has been considerably developed in recent years, and is well supplied with hotels, a fine casino and park, &c.

VITTORIA, a town of Sicily in the province ol Syracuse, 95 m. W.S.W. of Syracuse by rail (42 m. direct), founded in 1605 by Giovanni Alphonso Henriquez, who named it after his mother, the famous Vittoria Colonna- It is a prosperous town

1 Vitruvius names Cicero and Lucretiits as post nostram memoriam nascentes.

3 The architect being at that time also the contractor.

in the centre of a fertile district, with the largest wine trade in Sicily. Pop. (1901) 30,832 (town), 32,219 (commune).

VITTORIO, a town and episcopal residence of the province of Treviso, Venetia, Italy, 25 m. by rail N. of Treviso, 466 ft. above sea-level. Pop. (1901) 2977 (town), 19,133 (commune). It is a summer resort, with sulphur and saline springs (51 8° to 59° F.), and was formed in 1879 by the union of Ceneda (the epis copal see) and Serravalle. The cathedral contains paintings by Pomponio Amalteo (a pupil of Pordenone) and others. At Serravalle is a church with a fine altar-piece (1547) by Titian. It is a seat of the silkworm breeding and silk-throwing industries.

VITUS, ST (German, Veit; French, Guy). According to the legend, where he is associated with Modestus and Crescentia, by whom he had been brought up, St Vitus suffered martyrdom at a very early age under the emperor Diocletian. Son of a Sicilian nobleman who was a worshipper of idols, Vitus was converted to the Christian faith without the knowledge of his father, was denounced by him and scourged, but resisted all attacks on his profession. Admonished by an angel, he crossed the sea to Lucania and went to Rome, where he suffered martyr- dom. His festival is celebrated on the 15th of June. The Passion of St Vitus has no historical value, but his name occurs in the Martyrologium hieronymianum. In 836 the abbey of Corvey, in Saxony, received his relics, and became a very active centre of his cult. In the second half of the 9th century the monks of Corvey, according to Helmold's Chronica Slavorum, evangelized the island of Riigen, where they built a church in honour of St Vitus. The islanders soon relapsed, but they kept up the superstitious cult of the saint (whom they honoured as a god) , returning to Christianity three centuries later. At Prague, too, there are some relics of the saint, who is the patron of Bohemia and also of Saxony, and one of the fourteen " pro- tectors " {Nothheljer) of the church in Germany. Among the diseases against which St Vitus is invoked is chorea, also known as St Vitus's Dance.

See Acta sanctorum, June, iii. 1013-42 and vi. 137-40; Bibliotheca hagiographica Latina (Brussels, 1899), n. 8711-23; J. H. Kessel, " St Veit, seine Geschichte, Verehrung und bildliche Dar- stellungen," in Jahrbucher des Vereins von Alterthwnsfreunden itn Rheinlande (1867), pp. 152-83. (H. De.)

VIVALDO, UGOLINO and SOBLEONE DE (fl. 1201-1315), Genoese explorers, connected with the first known expedition in search of an ocean way from Europe to India. Ugolino, with his brother Guido or Vadino Vivaldo, was in command of this expedition of two galleys, which he had organized in con- junction with Tedisio Doria, and which left Genoa in May 1291 with the purpose of going to India " by the Ocean Sea " and bringing back useful things for trade. Planned primarily for commerce, the enterprise also aimed at proselytism. Two Franciscan friars accompanied Ugolino. The galleys were well armed and sailed down the Morocco coast

to a place called Gozora (Cape Nun), in 28 47′ N., after which nothing more was heard of them. Early in the next (14th) century, Sorleone de Vivaldo, son of Ugolino, undertook a series of distant wander- ings in search of his father, and even penetrated, it is said, to Magadoxo cr> the Somali coast. In 1455 another Genoese seaman, Antcniotto Uso di Mare, sailing with Cadamosto in the service of Prince Henry the Navigator of Portugal, claimed to have met, near the mouth of the Gambia, with the last descendant of the survivors of the Vivaldo expedition. The two galleys, he was told, had sailed to the Sea of Guinea; in that sea one was stranded, but the other passed on to a place on the coast of Ethiopia-Mena or Amenuan, near the Gihon (here probably meaning the Senegal) — where the Genoese were seized and held in close captivity.

See Jacopo Doria, " Annales " (under a.d. 1291) in Pertz, Monu- menta Germaniae historica. Scriptures, xviii. 335 (1863); the " Conocimiento de todos los Reinos," ed. Marcos Jimenez de la Espada in the Boletin of the Geographical Society of Madrid, vol. ii., No. 2, pp. in, 113, 117-18 (Madrid, February, 1877); Canale, Degli anhchi navigatori « scopntori Genovesi (Genoa, 1846); G. H. Pertz, Der dlteste Versuch atr Entdeckvng des Seewcges nacn Osiindien (Berlin, '850); Annali di Geagrafia e di Stalistica composli . . da Giacomo Grtl&erj. (Genoa, 1802); Belgrano, "... Annali . . . di

Caffaro," in Archiv. Slor. Ital., 3rd series, ii. 124, &c., and in AUi delta Sac. Lig. di Storia Patria, xv. 320 (1881); W. Heyd, Histoire du commerce du Levant (the improved French edition of the Geschichte des Levantehandels) , ii. 140-43 (Paris, 1886) ; C. R. Beazley, Dawn oj Modern Geography, iii. 413-19, 551 (Oxford, 1906).

VIVARINI, the surname of a family of painters of Murano (Venice), who produced a great quantity of work in Venice and its neighbourhood in the 1 5th century, leading on to that phase of the school which is represented by Carpacdo and the Bellinis.

Antonio Vivakini (Antonio of Murano) was probably the earliest of this family. He came from the school of Andrea da Murano, and his works show the influence of Gentile da Fabriano. The earliest known date of a picture of his, an altar-piece in the Venetian academy, is 1440; the latest, in the Lateran museum, 1464, but he appears to have been alive in 1470. He worked in company with a certain " Joannes de Alemania," who has been (with considerable doubt) regarded as a brother (Giovanni of Murano), but no trace of this painter exists of a date later than 1447. After 1447 Antonio painted either alone or in combination with his younger brother Barto- lommeo. The works of Antonio are well drawn for their epoch, with a certain noticeable degree of softness, and with good

flesh and other tints. Three of his principal paintings are the " Virgin Enthroned with the Four Doctors of the Church," the ■" Coronation of the Virgin," and " Sts Peter and Jerome." The first two (in which Giovanni co-operated) are in the Venetian academy, the third in the National Gallery, London. This gallery contains also specimens of the two under-named painters.

Bartolommeo Vivaeini is known to have worked from 1450 to 1499. He learned oil-painting from Antonello da Messina, and is said to have produced, in 1473, the first oil picture done in Venice. This is in the church of S. Giovanni e Paolo — a large altar-piece in nine divisions, representing Augustine and other saints. Most of his works, however, including one in the National Gallery, are in tempera. His outline is always hard, and his colour good; the figures have much dignified and devout expression. As " vivarino " means in Italian a goldfinch, he sometimes drew a goldfinch as the signature of his pictures.

Luigi or Alvise Vivarini, born about 1446, painted in 1475 and on to 1502, when he died. It has sometimes been supposed that, besides the Luigi who was the latest of this pictorial family, there had also been another Luigi who was the earliest, this supposition being founded on the fact that one picture is signed with the name, with the date 1414. There is good ground, however, for considering this date to be a forgery of a later time. The works of Luigi show an advance on those of his predecessors, and some of them are productions of high attainment; one of the best was executed for the Scuo'a di S. Girolamo in Venice, representing the saint caressing his lion, and some monks decamping in terror. The architecture and perspective in this work are superior. Other works by Luigi are in Treviso and in Milan. He painted some remarkable portraits. (W. M. R.)

VIVERO, a town of north-western Spain, in the province of Lugo; on the Ria de Vivero, an estuary formed by the river Landrove, which here enters the Bay of Biscay. Pop. (1900) 12,843. Vivero is an old-fashioned and picturesque town, connected with the opposite bank of the estuary by a bridge of twelve arches and a causeway. Its fishing fleet, its coasting trade and the agricultural products of the fertile country around are important. The only means of communication with the interior is by the road to Cabreiros, for Lugo and Ferrol.

VIVES, JUAN LUIS (1492-1540), Spanish scholar, was born at Valencia on the 6th of March r492. He studied at Paris from 1509 to 1512, and in 1519 was appointed professor of humanities at Louvain. At the instance of his friend Erasmus he prepared an elaborate commentary on Augustine's De Civitate Dei, which was published in 1522 with a dedication to Henry VIII. Soon afterwards he was invited to England, and is said to have acted

as tutor to the princess Mary, for whose use he wrote De rationt studii puerilis epistolae dime

VIVIAN, ist BARON— VIVISECTION

(1523). While in England he resided at Corpus Christi College, Oxford, where he was made doctor of laws and lectured on philosophy. Having declared himself against the king's divorce from Catherine of Aragon, he lost the royal favour and was confined to his house for six weeks. On his release he withdrew to Bruges, where he devoted himself to the com- position of numerous works, chiefly directed against the schol- astic philosophy and the preponderant authority of Aristotle. The most important of his treatises is the De Gauds corruptarum Arlium, which has been ranked with Bacon's Organon. He died at Bruges on the 6th of May 1540.

A complete edition of his works was published by Gregorio Mavins y Siscar (Valencia, 1782). Adolfo Bonilla y San Martin's Luis Vives y la filosofia del renacimiento (Madrid, 1903) is a valuable and interesting study which includes an exhaustive bibliography of Vives's writings arid a critical estimate of previous monographs. The best of these are A. J. Namechc, " Memoire sur la vie ct les ecrits de Jean Louis Vives " in Mcmoires couronnes par VAcad&mie Royale i!'-s sciences ct belles-lettres de Bruxelles (Brussels, 1841), vol. xv. ; A. Lange's article in the Encyklopddie ties gesammten Erziehungs- und Unlerrichlswesens (Leipzig, 1887), vol. ix.; Berthe Vadier, Vn Moraliste, du XVI m ' Steele: Jean-Louis Vives el son livre de V educa- tion de la femme chrctienne (Geneva, 1892) ; G. Hoppe, Die Psy- clwlogie von Juan Luis Vives (Berlin, 1901).

VIVIAN, RICHARD HUSSEY VIVIAN, ist Baron (1775- 1842), British cavalry leader, came of a Cornish family. Edu- cated at Harrow and Exeter College, Oxford, Vivian entered the army in 1793, and less than a year later became a captain in the 28th foot. Under Lord Moira he served in the campaign of 1794 in Flanders and Holland. At the end of the expedition, the 28th bore a distinguished part in Lord Cathcart's action of Gueldermalsen. In 1798 Vivian was transferred to the 7th Light Dragoons (now Hussars), and in Sir Ralph Abercromby's division was present at the battles of Bergen and Alkmaar (19th September to 6th October 1799). In 1800 he received his majority, and in 1804 he became lieut.-colonel of the 7th. In command of this regiment he sailed to join Baird at Corunna in 1808, and took part in Lord Paget's cavalry' fights at Sahagun and Benavcntc. During the retreat of Moore's army the 7th were constantly employed with the rearguard. Vivian was present at Corunna, and returned with the remainder of the army to England. It was not until late in 1813 that the 7th returned to the Peninsula, and Vivian (now colonel and A.D.C. to t he prince regent) was soon taken away to command a cavalry brigade

under Hill. With this corps he served throughout the fighting on the Nive (9th-i3th December). At the begin- ning of 1814 he was transferred to a cavalry brigade of Beres- ford's corps, and took a marked part in the action of Gave de Pau and the battle of Orthes. In the advance on Toulouse Vivian fought a brilliant action at Crois d'Orade on the Ers (8th April), when he was very severely wounded. At the beginning of 1815 he was made K.C.B.; he had been a major- general for several months. In April Sir Hussey Vivian was appointed to command a brigade of Uxbridge's cavalry, and at Waterloo his regiments, with those of Vandeleur's brigade, made the final charge of the day between Hougoumont and La Haye Sainte, sweeping everything before them. This service was rewarded by the thanks of both houses of parliament, the K.C.H. and the orders of Maria Theresa and St Vladimir from the emperors of Austria and Russia. He sat in the House of Commons as member for Truro from 1821 to 1831; he was then made commander of the forces in Ireland, and given the G.C.H. In 1835 he became master-general of the ordnance. In 1837 he received the G.C.B., and in 1841, being then M.P. for East Cornwall, was created Baron Vivian in the English peerage. A year later he died at Baden-Baden. He was twice married (first in 1804), and the title descended in the direct line. His natural son, Sir Robert John Hussey Vivian (1802-1887), was a famous soldier in India, who in 1857 was made K.C.B. and in 1871 G.C.B., having previously attained the rank of general.

VIVIANITE, a mineral consisting of hydrated iron phosphate Fes(P0 4)2-|-8H»0, crystallizing in the monoclinic system. The crystals possess a perfect cleavage parallel to the plane of

symmetry and are usually bladedˆ in habit; they are soft (H=|l, flexible and sectile The specific gravity is 2-6. When unaltered and containing no ferric oxide, the mineral is colourless, but on exposure to the light it very soon becomes of a characteristic indigo-blue colour. Crystals were first found in Cornwall (at Wheal Jane, near Truro, associated with pyrrhotite) by J. G. Vivian, after whom the species was named by A. G. Werner in 1817. The mineral had, however, been earlier known as a blue powdery substance, called " blue iron- earth," met with in peat-bogs, in bog iron-ore, or with fossil bones and shells. (L- J- S.)

VIVISECTION, literally the cutting (sedio) of living (vivas) animals, a word which might be applied to all surgical operations whether practised upon the lower animals or on man. As conventionally used, however, it has exclusive reference to experiments upon the lower animals undertaken for the advance- ment of medical sciences. There are a number of people who, calling themselves anti-vivisectionists, strongly object to these experiments

on the lower animals; and it must be conceded that the humane reasons which they advance against it can only be set aside as " sentimental " if considerations of a wider humanity can show that the arguments of the anti- vivisectionists really run counter to human progress. The supporters of vivisection, properly considered, must not be confused with those who would make a barbarous use of this means of research. What is at stake here is the right to use it properly and at all. It would be possible for cruelty of an unnecessary kind to result if the practice of vivisection were unrestricted; and the purpose of this article is to give some account of the method of experiments on animals as sanctioned by law in the United Kingdom, and to justify that method by setting forth the chief historical discoveries that have been made by the help of vivisection. Such experiments have for their object the advancement of the sciences of physiology and pathology. From the earliest periods experimental vivi- sections have occasionally been practised, but before the days of anaesthetics it was difficult to execute them, and not less difficult to draw conclusions. The invention of anaesthetics has greatly extended the scope of the experimental method, because an animal can be kept unconscious and quiet, without even a quiver of a muscle, during prolonged operations. Further, the introduction of the antiseptic method has made it possible to subject all tissues and regions of the body to surgical inter- ference, and this has also had the effect of increasing the possi- bilities of experimental research.

In 1906 a British Royal Commission was appointed to inquire into the whole subject under the chairmanship of Lord Selby, on whose death Mr A. J. Ram, K.C., took the chair. The Commission sat from October 1906 to March 1908, and heard no fewer than 11,761 questions and answers. In view of attempts on the part of the anti-vivisectionists to misrepresent the nature of the evidence given before the Commission, in January 1908 the supporters of experi- ments on animals founded the Research Defence Society, under the presidency of Lord Cromer; by July 1910 this society had some 3500 members. Its official address is 21 Ladbroke Square, London, W.

I. Methods Employed. — The present act relating to experi- ments on animals was passed in 1876. At that time the majority of these experiments were physiological. There was, it may be fairly said, no such thing as bacteriology, no general following up of Pasteur's work. A few experiments were made in pathology, for instance in tubercle; and a few in surgery, in pharmacology, and in the action of poisons, especially snake venom. But the chief use of experiments on animals was for the advancement of physiology. The evidence given before the Royal Commission (1873) was almost entirely on physiological matters, on the discoveries of Harvey, Bell, Magendie and Claude Bernard, on the Handbook for the Physiological

Laboratory, and so forth. The act, therefore, was drafted with a view to physiology, without much concern for pathology, and without foreknowledge of bacteriology. At the time oi writing (1910), 95% of the experiments are inoculations. Every experi- ment must be made in a registered place open to govern- ment inspection. But inoculation experiments are sometimes

permitted in non-registered places, for the immediate study of outbreaks of disease, or in circumstances which render it im- practicable to use a registered place. Every experiment must be made under a licence; and every application for a licence must be recommended by the signatures of two out of a small body of authorities specified in the act — presidents of certain learned societies and professors of certain universities and colleges. The word " experiment " is not allowed to cover the use of more than one animal.

Most experiments are made not under a licence alone, but under a licence plus one or more certificates, and the wording and working of these certificates must be clearly understood, because it is over them that the question arises as to the amount of pain inflicted by these experiments. Under the licence alone, the animal must be kept under an anaesthetic during the whole of the experiment; and "if the pain is likely to continue after the effect of the anaesthetic has ceased, or if any serious injury has been inflicted on the animal," it must be killed forthwith under the anaesthetic. Thus, under the licence alone, it is impossible to make an inoculation; for the experiment consists, not in the introduction of the needle under the skin, but in the observation of the results of the inoculation. A guinea-pig inoculated with tubercle cannot be kept under an anaesthetic till the disease appears. The disease is the experiment, and it is therefore an experiment made without an anaesthetic, and not authorized by the licence alone. Again, under the licence alone it would have been impossible to work out the thyroid treatment of myxoedema, or the facts of cerebral localization. For to remove the thyroid gland, or to remove a portion of the surface of the brain, is to inflict a serious injury on the animal. The operation is done under profound anaesthesia— it would be impracticable otherwise; the wound is treated and dressed by the antiseptic method- — suppuration would invalidate the result. But a serious injury has been inflicted. Nevertheless, the animal must not be killed forthwith: the result must be watched. These and the like experiments cannot therefore be made under the licence alone. For the removal of such disabilities as these, the act empowers the home secretary to allow certain

certificates, to be held with the licence. They must be recommended by two signatures, and various restrictions are put upon them by the home secretary. On July n, 1898, the home secretary was asked, in the House of Commons, what were the conditions and regulations attached by the Home Office to licences and certificates; and he answered —

" The conditions are not always the same, but may vary according to the nature of the investigation. It is hardly possible, therefore, for me to state all the conditions attached to licences and certificates. The most important conditions, however (besides the limitations as to place, time and number of experiments), and the conditions most frequently imposed, are those as to reporting and the use of antiseptics. The latter condition is that the animals are to be treated with strict antiseptic precautions, and if these fail and pain results, they are to be killed immediately under anaesthetics. The reporting conditions arc, in brief, that a written record, in a pre- scribed form, is to be kept of every experiment, and is to be open for examination by the inspector; that a report of all experiments is to be forwarded to the inspector; and that any published account of an experiment is to be transmitted to the secretary of state. Another condition requires the immediate destruction under anaesthetics of an animal in which severe pain has been induced, after the main result of the experiment has been attained."

The home secretary attaches to licences and certificates such endorsements as he thinks fit. The bare text of the act, now thirty-four years old, is a very different thing from the administra- tion of the act; and the present writer is in a position to say that the act is administered with great strictness, under a careful system of inquiry and reference.

The certificates are distinguished as A, B, C, E, EE and F. Certificate D, which permitted the testing, by experiments, of " former discoveries alleged to have been made," has fallen into disuse. Certificate C permits experiments to be made by way of illustration of lectures. They must be made under the provisions contained in the act as to the use of anaesthetics. Certificates E and EE permit experiments on dogs or cats; certificate F permits experiments on horses, asses or mules.

These certificates are linked with Certificate A or Certificate B,

It is round these two certificates, A and B, that the controversy as to the pain caused by experiments on animals is maintained.

Certificate A permits experiments to be made without anaesthesia. It is worded as follows: "Whereas A. B, of [here insert address and profession] has represented to us (i.e. two authorities) that he proposes, if duly

authorized under the above-mentioned act, to perform on living animals certain experiments described below: We hereby certify that, in our opinion, insensibility in the animal on which any such experiment may be performed cannot be pro- duced by anaesthetics without necessarily frustrating the object of such experiment." All inoculations under the skin, all feeding experiments and the like, are scheduled under this certificate. They must be scheduled somehow: they cannot legally be made under a licence alone. Though the only instrument used is a hypodermic needle, yet every inoculation is officially returned as an experiment, calculated to give pain, performed without an anaesthetic. It is for inoculations and the like experiments, and for them alone, and for nothing else, that Certificate A is allowed (or A linked with E or F). This want of a special certificate for inoculations, and this wresting of Certificate A for the purpose, have led to an erroneous belief that " cutting operations " are permitted by the act without an anaesthetic. But, as the home secretary said in parliament, in March 1897, " Certificate A is never allowed except for inoculations and similar trivial operations, and in every case a condition is attached to prevent unnecessary pain." And again he wrote in. 1898, •" Such special certificates (dispensing with anaesthetics) are granted only for inoculations, feeding and similar procedures involving no cutting. The animal has to be killed under anaesthetics if it be in pain, so soon as the result of the experiment is ascertained."

Certificate B permits the keeping alive of the animal after the initial operation of an experiment. It is worded as follows; " Whereas A. B. of [here insert address and profession] has repre- sented to us (i.e. two authorities) that he proposes, if duly authorized under the above-mentioned act, to perform on living animals certain experiments described below, such animals being, during the whoie of the initial operation of such experiments, under the influence of some anaesthetic of sufficient power to prevent their feeling pain: We hereby certify that, in our opinion, trie killing of the animal on which any such experiment is performed before it recovers from the influence of the anaesthetic administered to it would necessarily frustrate the object of such experiment." Certificate B (or B linked with EE or F) is used for those experiments which consist in an operation plus subsequent observation of -the animal. The section of a nerve, the removal of a secretory organ, the establishment of a fistula, the plastic surgery of the intestine, the sub-dural method of inoculation — these and the like experiments are made under this certificate. We may take, to illustrate the use of Certificate B, Horsley's observations on the thyroid gland. The removal of the gland was the initial operation ; and this was performed under an anaesthetic, and with the antiseptic method. Then the animal was kept under observation. The experiment is neither the opera- tion alone nor the observation alone, but. the two together. The purpose of this certificate

is set forth in the inspector's report for 1909. " In the experiments performed under Certificate B, or B linked with EE, 1704 in number, the initial operations are performed under anaesthetics from the influence of which the animals are allowed to recover. The operations are required to be performed antiseptically, so. that the healing of the wounds shall, as far as possible, take place without pain. If the antiseptic precautions fail, and suppuration occurs, the animal is required to be killed. It is generally essential for the success of these experi- ments that the wounds should heal cleanly, and the surrounding parts remain in a healthy condition. After the heating; of the wounds the animals are not necessarily, or even generally, in pain, since experiments involving the removal of important organs, including portions of the brain, may be performedˆ without giving rise to pain after the recovery from the operation; and after the section of a part of the nervous system, the resulting degenerative changes are painless. In the event of a subsequent operation being necessary in an experiment performed under Certificate B, or B linked with EE, a condition is attached to the licence requiring; all operative procedures to be carried out under anaesthetics of sufficient power to prevent the animal feeling pain ; and no observations or stimulations of a character to cause pain are allowed to be made without the animals being anaesthetized. In no case has a cutting operation more severe than a superficial venesection (the opening of a vein just under the skin) been allowed to be performed without anaesthetics."

From this brief account of the chief provisions of the act, we come to consider the general method of experiments on animals in the United Kingdom, and the qaestion of the infliction of pain on them. The figures for a representative year may be given. The total number of licensees in 1909, in England and Scotland, was 483: of whom 135 performed no experiments during the

year. The total number of experiments was 86,277, being 2357 less than in 1908. They were made as follows : —

Under Licence alone 1 ,980

,, Certificate C 196

Certificate A 81,566

,, Certificates A + E 595

,, Certificates A + F 228

Certificate B 1,385

Certificates B + EE , . 319

„ Certificate F . 8

The experiments performed under Certificate A (or A + E, or A + F) were mostly inoculations; but a few were feeding experiments, or the administration of various substances by the mouth or by inhalation, or the abstraction of blood by puncture or by simple venesection. Inoculations into deep parts, involving a preliminary incision, are required to be per- formed under anaesthetics (Certificate B).

" It will be seen," says the report for 1909, " that the operative procedures in experiments performed under Certificate A, without anaesthetics, are only such as are attended by no considerable, if appreciable, pain. The certificate is, in fact, not required to cover these proceedings, but to allow of the subsequent course of the experiment. '

The animals most used for inoculations are mice, rats, guinea- pigs and rabbits. It is not once in a thousand times that a dog or a cat is used for inoculation. The act of inoculation is not in itself painful. A small area of the skin is carefully shaved and cleansed, that it may be aseptic, the hypodermic needle is sterilized and the method of hypodermic injection or of vaccina- tion is the same as it is in medical practice. "A guinea-pig that will rest quietly in your hands before you commence to inject it, will remain perfectly quiet during the introduction of the needle, under the skin; and the moment it is returned to the cage it resumes its interrupted feeding. Arteries, veins and most of the parts of the viscera are without the sense of touch. We have actual proof of this in what takes place when a horse is bled for the purpose, of obtaining curative serum. With a sharp lance a cut may be, made in the skin so quickly and easily that the animal does nothing more than twitch the skin-muscle of the neck, or give his head a shake, while of the further pro- ceeding of introducing a hollow needle into the vein, the animal takes not the slightest notice. Some horses, indeed, will stand perfectly quiet during the whole operation, munching a carrot, nibbling at a wisp of hay, or playing with a button on the vest of the groom standing at its head." These sentences, written in the Medical Magazine (June 1898) by Dr Sims Woodhead, Professor of Pathology at Cambridge, are sufficient evidence that inoculations and the like experiments are not painful at the time. In a few instances cultures of micro-organisms have been made in the anterior chamber of the eye, by the introduction of a needle behind the cornea. This might be thought painful, but cocaine renders the surface of the eye wholly insensitive. Many operations of ophthalmic surgery are done under cocaine alone, and the anterior

chamber of the eye is so far insensitive that a man may have blood or pus (hypopyon) in it, and hardly be conscious of the fact. The results of inoculation are in some cases negative, in others positive; the positive results are, in the great majority of cases, not a local change, but a general infection which may end in recovery, or in death. The diseases thus induced may, in many cases, fairly be called painless — such are septicaemia in a mouse, snake-venom in a rat, and malaria in a sparrow. Rabbits affected with rabies do not suffer in the same way as dogs and some other animals, but become subject to a painless kind of paralysis. It is probable that animals kept for inoculation have, on the whole, less pain than falls to the lot of a like number of animals in a state of nature or in subjection to work: they are well fed and sheltered, and escape the rapacity of larger animals, the inevitable cruelties of sport, and the drudgery and sexual mutilation that man inflicts on the higher domestic animals.

The present writer has, of course, seen the mice that are used for the study of cancer (Imperial Cancer Research Fund), and the guinea-pigs that are used at the Lister Institute for the

testing of the London milk-supply, lest the milk should convey tubercle. He did not see, among all the many animals, one that appeared to be suffering: save that a very few of the mice were incommoded, or, if the word be applicable to mice, distressed, by large tumours. Of the guinea-pigs that had been inoculated, not one seemed to be in any pain. A nodule of tubercle, or a tuberculous gland, is painless in us, and therefore cannot be painful in a guinea-pig. It is not denied that the study of some diseases (plague, tetanus) causes some pain to rats and rabbits; but this pain is hardly to be compared with the pain and horror of these diseases in man.

We come now to Certificate B. If it were lawful, under Certificate B, io make an incision under an anaesthetic, to call this the " initial operation," and then, without an anaesthetic, to make painful experiments, through the incision, on the deeper structures, doubtless much pain might be inflicted under this certificate. But experiments of this kind can be, and are, made under the licence alone, the animal being kept under an anaesthetic all the time, and killed under it. " No experiments requiring anything of the nature of a surgical operation, or that would cause the infliction of an appreciable amount of pain, are allowed to be performed without an anaesthetic " (Inspector's Report for 1899). " These certificates (B) are granted on condition that antiseptic precautions are used; and if these fail, and pain continues after the anaesthetics have ceased to operate, the animal is immediately killed painlessly " (Letter from the Home Secretary, 1898).

Of experiments made under this certificate (which must be linked with Certificate EE for any experiment on a dog or a cat), three instances may

be given here: an operation on the brain, a removal of part or the whole of a secreting gland, and the establishment of a fistula. It is to be noted that, for these and the like operations, profound anaesthesia and th'e strict observ- ance of the antiseptic method are matters of absolute necessity for the success of the experiment: the operation could not be performed without anaesthesia; and the experiment would come to nothing if the wound suppurated. It is to be noted, also, that these operations are such as are performed in surgery for the saving of life or for the relief of pain.

As to operations on the brain, it must be remembered that the surface of the brain is not sensitive. Therefore the removal or destruction of a portion of the surface. of the brain, or the division of some tract of central nervous tissue, though it might entail some loss of power or of control, does not cause pain: a wound of the brain is painless. Tension within the .cranial cavity, as in cases of cerebral tumour or cerebral abscess, may indeed cause great pain; and, if the aseptic method failed, in an experiment, inflammation and tension would ensue: in that case the animal must be killed.

The removal of part or the whole of a secreting gland {e.g. the thyroid, the spleen, the kidney) is performed by the same methods, and with the same precautions, as in human surgery. Profound anaesthesia, and the use of a strict antiseptic pro- cedure, are of absolute necessity. The skin over the part to be removed must be shaved and carefully cleansed for the opera- tion; the instruments, sponges and ligatures must be sterile, not capable of infecting the wound; and when the operation is over, the wound must be carefully closed with sutures, and left to heal under a proper surgical dressing.

The establishment of a fistula, again, is an operation practised, as a matter of course, in large numbers of surgical cases. The stomach, the gall- bladder, the large intestine, are opened for the relief of obstruction, and kept open, either for a time or per- manently, according to the nature of the case. Under anaes- thesia, the organ that is to be opened is exposed through an incision made through the structures overlying it, and is secured in the wound by means of fine sutures. Then, when it has become adherent there, it is opened by an incision made into it; no anaesthetic is needed for this purpose, because these internal organs are so unlike the skin in sensitiveness that an incision is hardly felt: the patient may say that he " felt a prick," or he may be wholly unconscious that anything has been done. A

fistula thus established is not afterward painful, though there may be some discomfort now and again.

The classical instance is the case of Alexis St Martin, who was shot in the stomach in 1822, and recovered, but with a fistula. He let Dr Beaumont make experiments on him for nine years: " During the whole of these periods, from the spring of 1824 to the present time (1833), he has enjoyed general good health . . .active, athletic and vigorous; exercising, eating and drinking like other healthy and active people. For the last four months he has been unusually plethoric and robust, though constantly subjected to a continuous series of experiments on the interior of the stomach ; allowing to be introduced or taken out at the aperture different kinds of food, drinks, elastic catheters, thermometer tubes, gastric juice, chyme, &c, almost daily, and sometimes hourly. Such have been this man's condition and circumstances for several years past; and he now enjoys the most perfect health and constitutional soundness, with every function of the system in full force and vigour " (Beaumont, Experiments and Observations on tki Gastric Juice, 1838).

We come now to the question, What anaesthetics are used in these experiments, and are they properly administered ? The anaesthetics used are — (1) chloroform, ether, or a mixture containing chloroform and ether; (2) morphia, chloral, ure- thane. It is sometimes said that morphia is not an anaesthetic. That depends on the quantity given. Not a month passes in this country without somebody killing himself or herself with morphia or chloral. They die profoundly anaesthetized: they cannot, be roused; even the pain of a strong electric shock is not enough to rouse them. So it is with animals. The doses given to them are enormous and produce complete insensibility. On this point the evidence given before the Royal Commission of 1906-8 by Mr Thane, Professor Schafer, Sir Lauder Brunton, Sir Henry Morris, Professor Dixon, Dr Dudley Buxton and Professor Starling is absolutely conclusive. " As to the statements/' says Sir Lauder Brunton, " that chloral and opium or morphia are not narcotics, and do not remove pain, there is no other word for it, it is simply a lie; you may as well say that chloroform does not remove pain. If you give any animal a sufficiently large dose of chloral or opium, you so completely abolish sensi- bility that there is nothing you can do that will awaken its sensibility. The animal is as senseless as a piece of board."

With regard to chloroform, ether and the A.C.E. mix- ture (alcohol, chloroform and ether) it is absolutely certain that animals can be kept, with these anaesthetics, profoundly unconscious for three or four or more hours. Nothing on this point is more worthy of consideration than the evidence in veterinary surgery, given before the Royal Commission by Mr Hobday, one of the very foremost veterinary surgeons in this country

(Reports of Evidence, vol. iv. Q. 162S4-16523). The opponents of all experiments on animals are apt to believe that dogs and cats must be bound and fastened on boards, and then have the anaesthetic given to them. That is not the case. They can take the anaesthetic first, and then be put in position; just as we, for many of the operations of surgery, are bound in position. And, of course, dogs and cats cannot lie on their backs as we can. " The usual thing we do," said Professor Starling, in his evidence before the Royal Commission, " is to give the animal, half an hour before the experiment, a hypodermic injection of morphia, of about a quarter of a grain — from a quarter to a third. The effect of that is, that the dog becomes sleepy and stupid, and then sometimes it will He down quietly, and if it is very sleepy you can put a mask over its nose con- taining the chloroform, alcohol and ether mixture, which it takes quite quietly. If, at the time one wants to begin the operation, the animal is not fully under the influence of morphia — if it still seems restless — it is put in a box, and there it has some wool saturated with the A.C.E. mixture put in the box. The air gradually gets saturated, the dog gets mere and more sleepy, and finally subsides at the bottom of the box,"

A few words must be said here about curare. It was said, some years ago, t>y an opponent of experiments on animals, that " curare is used daily throughout England," whereas, it is seldom used at all, and is never used alone in any sort or kind of operation on any animal in this country: in every such case a recognized anaesthetic must be given, and is given. In large doses curare not only abolishes the movement of the voluntary muscles, but also acts as an anaesthetic: in small doses it acts only on the voluntary

muscles, i.e. on the endings of the motor nerves going to these muscles. For example, suppose that the object of the experi- ment is to observe and record the action of a nerve on the contraction of certain blood vessels. The nerve gives off some branches to muscles, and other branches to blood vessels. If the animal be anaesthetized, and the nerve, stimulated, muscles and vessels will both contract; but, if curare be given, as well as an anaesthetic, the vessels alone will contract, without the muscles: for curare does not act on the endings of motor nerves going to blood vessels. But, as a practical matter, curare is very hard to obtain, and is often impure, and is very seldom used. One of the inspectors said to the Royal Commission that he had once seen it used, fifteen years ago. Professor Gotch said that he had not used it, in his own work, Tor twenty years. Professor Schafer said that he had not used it for years. And Sir Lauder Brunton said that he did not think he had used it at all since the passing of the act of 1876. The fear that, in a case where curare was being used, the effect of the anaesthetic might " pass off," and the animal be left under curare alone, is not reasonable. The dosage and administration of anaesthetics is not left to

chance. If, for example, an animal is receiving a definite percentage of chloroform vapour, it is of necessity under the influence of the chloroform: and the anaesthesia will gradually become not less but more profound. (See the evidence given before the Royal Commission by Professor Langley and Professor Waller.)

It may be interesting to compare the pain, or death, or dis- comfort among 86,277 animals used for experiments in Great Britain in 1909, with the pain, or death, or discomfort of an equal number of the same kinds of animals, either in a state of nature, or kept for sport, or used for the service of human profit or amusement. But it would be outside the purpose of this article to describe the cruelties which are inseparable from sport, and from the killing of animals for food, and from fashion; neither is this the place to describe the millions of mutilations which are practised on domestic animals by farmers and breeders. As one of the Royal Commissioners recently said, the farmyards, at certain times of the year, simply "seethe with vivisection." The number of animals wounded in sport, or in traps, cannot be guessed. Against this, vast amount of suffering we have to put an estimate of the condition of 86,277 animals used for medical science. Ninety-five per cent, of them were used for inoculation. In many of these inoculations the result was negative: the animal did not take any disease, and thus did not suffer any pain. In many more, e.g. cancer in mice, tubercle in guinea-pigs, the pain or discomfort, if any, may fairly be called trivial or inconsiderable. It could hardly be said that these small animals suffer much more than an equal number of the same kind of animals kept in little cages to amuse children. There remain 3888 animals which were submitted to operation under an anaesthetic . In the greater number of these cases tjie animal was killed then and there under the anaesthetic, without recovering consciousness. In the remaining cases the animal was allowed to recover, and to be kept for observation; but no further observation of any kind, which could cause pain, was allowed to be made on it, unless it were again placed under an anaesthetic. Many of these cases, thus allowed to recover after an operation, may fairly be compared to an equal number of domestic animals after one of the formal operations of veterinary surgery. These observations made under Certificate B form but a very small proportion of the total number of experiments on animals in the United Kingdom; and they have led, in recent yearsj to discoveries of the very utmost importance for human life and health.

II. Scientific Results. — We come now to consider the results of experiments on animals, but we must remember that not we alone, but animals also, owe a great debt to them. Great epizootic diseases like anthrax, swine-fever, chicken cholera, silkworm disease, pleuro-pneumonia, glanders, Texas cattle fever, blackleg, tuberculosis in cattle, have killed yearly millions of animals, and have been brought under better

control by these experiments. The advantages that have been obtained for man may be arranged under two heads — (A) Physiology, (B) Pathology, Bacteriology and Therapeutics.

A. Physiology t. The Blood. — Galen (a.d. 131) confuted the doctrine of Erasis- tratus, that the arteries contained weupa, the breath of life, proving

by experiment that they contain blood. " Ourselves, having tied the exposed arteries above and below, opened them, and showed that they were indeed full of blood." Kealdus Columbus (1559), though he did not discover the general or " systematic " circulation of the blood, yet seems to have discovered, by experi- ment, the pulmonary circulation. " The blood is carried through the pulmonary artery to the lung, and there is attenuated; thence, mixed with air, it is carried through the pulmonary vein to the left side of the heart. Which thing no man hitherto has noted or left on record, though it is most worthy of the observance of all men. . . . And this is as true as truth itself; for if you will look not only in the dead body but also in the living animal, you will always find this pulmonary vein full of blood, which assuredly it would not be if it were designed only for air and vapours. . . . Verily I pray you, O candid reader, studious of authority, but more studious of truth, to make experiment on animals. You will find the pulmonary vein full of blood, not air or fuligo, as these men call it, God help them." Harvey's treatise De Motu Cordis et Sanguinis in Animalibus was published at Frankfort in. 1621. It begins thus: "When by many dissections of living animals, as they came to hand, — Cum multis vivorum dissectionibus, uti ad manum dabantur, – — I first gave myself to observing how I might discover, with my own eyes, and not from books and the writings of other men, the use and purpose of the movement of the heart in animals, forthwith I found the matter hard indeed and full of difficulty; so that I began to think, with Frascatorius, that the movement of the heart was known to God alone. ... At last, having daily used greater disquisition and diligence, by frequent examination of many and various living animals — multa frequenter et varia animalia viva introspiciendo — I came to believe that I had succeeded, and had escaped and got out of this labyrinth, and therewith had dis- covered what I desired, the movement and use of the heart and the arteries. And from that time, not only to my friends but also in public in my anatomical lectures, after the manner of the Academy, I did not fear to set forth my opinion in this matter." Here, and again at the end of the Preface, and again in the eighth chapter of the De Afotu, he puts his experiments in the very foreground of the argument. Take the headings of his first four chapters: 1. Causae, quibus ad scribendum auctor

permotus fuerit. 2. Ex vivorum dissections, qualis fit cordis motus. 3. Arteriarum motus qualis , ex vivorum dissectione. 4. Motus cordis et auricularum qualis, ex vivorum dissectione. He nad, of course, help from other sources — from anatomy and from physics; but it is certain, from his own words, that he attributed his discovery, in a very great measure, to experiments on animals. Malpighi (1661), professor of medicine at Bologna, by examining with a microscope the lung and the mesentery of the live frog, made out the capillary vessels. He writes to Borelli, professor of mathematics at Pisa, that he has failed in every attempt to discover them by injecting fluids into the larger vessels, but has succeeded by examining the tissues with the microscope: " Such is the divarication of these little vessels coming off from the vein and the artery, that the order in which a vessel ramifies is no longer preserved, but it looks like a network woven from the offshoots of both vessels " {De Pulmonibus, 1661). Stephen Hales (1733), rector of Farringdon and minister of Tedding- ton, and a Fellow of the Royal Society, made the first exact esti- mates of the blood pressure, the real force of the blood, by inserting one end of a vertical glass tube into the crural artery of a mare, and noting the rise of the blood in the tube {Statical Essays, con- taining Hatmostaticks, Gfe., r/Jj). John Hunter, born 1738, made many observations on the nature and processes of the blood; and, above all, he discovered the facts of collateral circulation. These facts were fresh in his mind when he first ventured, in December 1785, to tie the femoral artery in " Hunter's canal " for the cure of aneurism in the popliteal space. The experiment that gave him his knowledge of the collateral circulation was made on one of the deer in Richmond Park: he tied its external carotid arterv, to see what effect would be produced on the shedding of the antle'r. Some days later he found that the circulation had returned in the antler. He had the buck killed, and found that the artery had been completely closed by the ligature, but the small branches coming from it, between the heart and the ligature, were enlarged and were in communication with others of its branches beyond the ligature; and by this Collateral circulation the flow of blood to the antler had been restored. Among later observations on the circulation must be mentioned the use of the mercurial mano- meter by Poiseuille (1828) and Ludwig (1849), the study of the blood pressure within the heart by Hering (1849) and the per- manent tracing of the pressure curves by Chauveau and Marey (1863). Finally came the study of those more abstruse problems of the circulation that the older physiologists had left alone — the influences of the central nervous system, the relations between blood pressure and secretion, the automatism of the heart-beat, and the influence of gravitation. Professor Starling, in 1906, writes as follows of this part of physiology: "Among the researches of the last thirty years, those bearing on the circulation of the blood must take an important place, both for their physiological interest and for the weighty t influence they have exerted on our knowledge and

treatment of disorders of the vascular system, such as heart

disease. We have learned to measure accurately the work done

by the great heart-pump; and by studying the manner in which this work is affected by different conditions, we are enabled to in- crease or diminish it, according to the needs of the organ. Ex- periments in what is often regarded as the most transcendental department of physiology — i.e. that which treats of muscle and nerve — have thrown light on the wonderful process of ‘ com- pensation ‘ by which a diseased heart is able to keep up a normal circulation," And Dr James Mackenzie, writing in 19 10 of certain irregularities of the circulation during pregnancy (venous pulse in the neck and irregular beat of the heart), says, very emphatically, that these conditions in patients have been interpreted by ex- periments on animals. " The outcome oi these researches [Wencke- bach's clinical studies], as well as those of a great number of other observers, has been to elucidate the nature and meaning of a great number of abnormal conditions of the heart. It might be said with truth that, whereas a few years ago irregular action of the heart was one of the most obscure symptoms in clinical medicine, it is now one of the best understood. It is needless to repeat that this advance would havebeen absolutely impossible without the knowledge gained by experiment " (Research Defence Society, May

1910).

2. The Lacteals. — AselHus (1622) by a single experiment demon- strated the flow of chyle along the lacteals. The existence of these minute vessels had been known even to Galen and Erastis- tratus, but they had made nothing of their knowledge. Asellius says: "I observed that the nerves of the intestines were quite distinct from these white threads, and ran a different course. Struck with this new fact, I was silent for a time, thinking of the bitter warfare of words among anatomists as to the mesenteric veins and their purposes. When I came to myself, to satisfy my- self by an experiment, I pierced one of the largest cords with a scalpel. I hit the right point, and at once observed a white liquid like milk flowing from the divided vessel." Jehan Pecquet (1647), in the course of an experiment on the heart, observed the flow of chyle into the subclavian vein, and its identity with the chyle in the lacteals; and by further experiment found the thoracic duct, and the chyle flowing up it: "I perceived a white sub- stance, like milk, flowing from the vena cava ascendens into the

rricardium, at the place where the right auricle had been found these vessels (the thoracic duct) all along the dorsal ver- tebrae, lying on the spine, beneath the aorta. They swelled below a ligature; and when I relaxed it, I saw the milk carried to the orifices that I had observed in the

subclavian vein." The existence of this duct, which is empty and collapsed after^ death, had been overlooked by Vesalius and all the great anatomists of his time.

3. The Gastric Juice. — Our knowledge about digestion dates back to the end of the 17th century, when Valisnieri first ob- served that the stomach of a dead animal contained a fluid which acted on certain bodies immersed in it — " a kind of aqua fortis." In 1752 Reaumur began his observations on this fluid, making birds swallow fine fenestrated tubes containing grain or meat, or sponges with threads attached; and observed that digestion con- sists in the dissolution of food, not in any sort of mechanical action or trituration. His observations were extended and perfected by Spallanzani (1777). Then came a period of uncertainty, with- out further advance; until in 1823 the French Academy offered a prize for the best work on the subject, and Tiedemann and Gmelin submitted their observations to them : " The work of Tiedemann and Gmelin is of especial interest to us on account of the great number of their experiments, from which came not only the absolute proof of the existence of the gastric juice, but also the study of tne transformation of starch into glucose. Thus the theory of digestion entered a new phase: it was finally recog- nized, at least for certain substances, that digestion is not simply dissolution, but a true chemical transformation " (Claude Bernard, Physiologie operatoire, 1879). Beaumont's experiments on Alexis St Martin {vide supra) were published in 1838. They were, of course, based on the work of the physiologists: " I make no claim to originality in my opinions as respects the existence and opera- tion of the gastric juice. My experiments confirm the doctrines (with some modifications) taught by Spallanzani and many of the most enlightened physiological writers " (Beaumont's preface to his book). Eberle, in 1834, showed how this knowledge of the gastric juice might be turned to a practical use.^ by extracting it from the mucous membrane of the stomachs of animals after death: hence came the invention of the various preparations of pepsin. Later, Blondlot of Nancy, in 1842, studied the gastric juice by the method of a fistula, like that of St Martin. More recent observa- tions have been made on the movements of the stomach, during digestion, and on the influences of the nervous system on the process.

The stomach is, of course not the only organ of digestion: the liver, the pancreas and the intestinal glands, all are concerned. The recent work of Pawlow and of Starling has greatly advanced our knowledge of the actions of the secretions from these organs. The whole chain of processes, nervous and chemical, psychical and physical, from the taking of food into the mouth to the expulsion of the waste residue, is now viewed in its entirety; and especial study has been given to the influences, nervous or chemical, which

are exercised, as it were, on a particular tract of the digestive

system, at the bidding of another tract. Pawlow, recognizing the importance of keeping the animals under the most normal condi- tions that were possible, and of studying the different tracts of the digestive system in animals not anaesthetized, yet free from pain or distress, made use of fistulae established at different points of the digestive canal, and was able to study the digestive juices at different stages during digestion, without causing pain to the animals. The work of Pawlow has been further developed by Professor Starling's recent work on the chemical substances produced in the body, during the act of digestion, to promote digestion.

4. Glycogen. — Claude BernarcTs work on the assimilation and destruction of sugar in the body was begun in 1843. His discovery of the glycogenic action of the liver was made by keeping two dogs on different diets, one with sugar, the other without it, then killing them during digestion, and testing the blood in the veins coming from the liver: " What was my surprise when I found a considerable quantity of sugar in the hepatic veins of the dog that had been fed on meat only, and had been kept for eight days without sugar ! ... Finally, after many attempts— -apres beaucoup d'essais et

flusieurs illusions que je Jus oblige de rectifier par des tdtonnements — succeeded in showing, that in dogs fed on meat the blood passing through the portal vein (from the stomach) does not contain sugar before it reaches the liver; but when it leaves the liver and comes by the hepatic veins into the inferior vena cava, this same blood contains a considerable quantity of a sugary substance (glucose) " (Nouvelle fonction dufoie, Paris, 1853).

5. The Pancreas. — The 17th century was a time of very fanciˆ ful theories about the pancreas (Lindanus, Wharton, Bartholini), which need not be recalled here. But Sylvius (Francois de Bois) had the wisdom to see that the pancreas must be estimated, not according to its position, but according to its structure, as of the nature of the salivary glands. He urged his pupil, Regnier de Graaf, to study it by experiment, and de Graaf says: " I put my hand to the work; and though many times I despaired of success, yet at last, by the blessing of God on my_ work and prayers, in the year 1662 I discovered a way of collecting the pancreatic juice." By the method of a fistula he collected and studied the secretion of the pancreas; and by further experiment he refuted Bartholin's theory that the pancreas was a sort of appanage or " biliary vesicle " of the spleen. But he got no help from

the chemistry of his time; he could no more discover the amylolytic action of the pancreatic secretion than Galvani could discover wireless telegraphy. Still, he did good work; and Claude Bernard, 180 years later, went back to de Graaf s method of the fistula. His observations, begun in 1846, received a prize from the French Academy in 1850. Sir Michael Foster says of them: "Valentin, it is true, had in 1844 not only inferred that the pancreatic juice had an action on starch, but confirmed his view by actual experiment with the juice expressed from the gland; and Eberle had suggested that the juice had some action on fat; but Bernard at one stroke made clear its threefold action. He showed that it on the one hand emulsified, and on the other hand split up into fatty acids and glycerine, the neutral fats; he clearly proved that it had a powerful action on starch, converting it into sugar; and lastly, he laid bare its remarkable action on proteid matters." At a later date it was discovered that the pancreas, beside its work in digestion, has an " internal secretion": that it, like the thyroid gland and the suprarenal capsules, helps to keep the balance of the general chemistry of the whole body. Professor Schafer, writing in 1 894, says on this subject: " It was discovered a few years ago by von Mering and Minkowski that if, instead of merely diverting its secretion, the pancreas is bodily removed, the metabolic processes of the organism, and especially the metabolism of carbo-hydrates, are entirely deranged, the result being the production of permanent diabetes. But if even a very small part of the gland is left within the body, the carbo-hydrate metabolism remains unaltered, and there is no diabetes. The small portion of the organ which has been allowed to remain (and which need not evenbe left in its proper place, but may be trans-planted under the skin or elsewhere) is sufficient, by the exchanges which go on between it and the blood generally, to prevent those serious consequences to the composition of the blood, and the general constitution of the body, which result from the complete removal of this organ." This fact, that complete removal of the pancreas, in a cat or a dog, may cause fatal diabetes, is of import- ance, because the pancreas in some cases of diabetes in man is diseased: but, at present, experiments on animals have not led to any certain or specific cure of diabetes in man.

6. The Growth of Bone. — The experiments made by du Hamel (1739-1843) on the growth of bone by deposit from the periosteum (the thin membrane ensheathing each bone) rose out of Belchier's observation (1735) that the bones take up the stain of madder mixed with the food. Du Hamel studied the whole subject very carefully, and discovered this bone-producing power of the peri- osteum, which is an important fact in all operations on the bones. As he puts it, in the title of one of his own memoirs, Les os croissent en grosseur par I'addition de couches osseuses qui tirenl leur origine du perioste, comtnt le corps' ligneux des Arbres augniente en grosseur par I'addition de couches ligneuses qui se forment dans

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feeding pigs at one time with dyed food, at another with undyed food, he obtained their bones in concentric layers alternately stained and unstained. His facts were confirmed by Bazan (1746) and Boehmer (1751); but his conclusions, unfortunately, were opposed by Haller. Still, he brought men to study the whole subject of the growth of bones, in length as well as in thickness, and the whole modelling of the bones, in adult life, by deposit and absorption. Bichat, John Hunter, Troja and Cruvcilhier took up his work in physiology and in surgery. Later, from the point of view of surgery, Syme (1837) and Stanley (1849) made experiments on the growth of bone, and on the exfoliation of dead bone; and, after them, Oilier, whose influence on this part of surgical practice has been of the very highest value.

7. The Nervous System. — A. The Nerve-Roots.— Through all the centuries between Galen, who lived in the time of Commodus, and Sir Charles Bell, who lived in the time of George III., no great advance was made in our knowledge of the nervous system. The way of experiment, which had led Galen far ahead of his age, was neglected, and everything was overwhelmed by theories. Bell in London and Magendie in Paris took up the experimental study of the nervous system about where Galen had left it. The question of priority of discovery does not concern us here: we may take Sir Michael Foster's judgment, that Magendie brought exact and full proof of the truth which Bell bad divined rather than demonstrated, that the anterior and posterior roots of spinal nerves have essentially different functions — " a truth which is the very foundation of the physiology of the nervous system." The date of Bell's work is 1811, An Idea of a New Anatomy of the Brain, submitted for the Observation of the Author's Friends. In it he says : " Considering that the spinal nerves have a double root, and being of opinion that the properties of the nerves are derived from their connexions with the parts of the brain, I thought that I had an opportunity of putting my opinion to the test of experiment, and of proving at the same time that nerves of different endowments were in the same cord (the same nerve-trunk) and held together by the same sheath. On laying bare the roots of the spinal nerves I found that I could cut across the posterior fasciculus of nerves, which took its origin from the spinal marrow, without convulsing the muscles of the back; but that on touching the anterior fasciculus with the point of the knife, the muscles of the back were immediately convulsed. Such were my reasons for concluding that the cerebrum and cerebellum were

fiarts distinct in function, and that every nerve possessing a double unction obtained that by having a double root. I now saw the meaning of the double connexion of the nerves with the spinal marrow, and also the cause

of that seeming intricacy in the con- nexions of nerves throughout their course, which were not double at their origins." His other work, on the cranial nerves, which are " not double at their origins," bore fruit at once in surgery. Sir John Erichsen says of it: " Up to the time that Sir Charles Bell made his experiments on the nerves of the face, it was the common custom of surgeons to divide the facial nerve for the relief of neuralgia, tic douleureux ; whereas it exercises, and was proved by Sir Charles Bell to exercise, no influence over sensation, and its division consequently for the relief of pain was a useless operation."

B. Reflex Action. — The observations made by Sir Robert Boyle, Redi, Le Gallois and others on the reflex movements of decapitated vipers, frogs, eels and butterflies were of no great use from the point of view of physiology; but they led toward the discovery that nerve-power is stored m the spinal cord, and is liberated thence in action independent of the higher cerebral centres. Marshall Hall (1832-1837) discovered, by his experiments, that reflex actions are the work of definite groups of cells, set at certain points or levels in the cord; he proved the segmental structure of the cord, the exist- ence of nerve-centres in it, and thus foreshadowed the discovery of the like centres in the brain. In his earlier writlngs t (1832-33) he extended the principles of the doctrines of reflex action to the larynx, the pharynx and the sphincter muscles; later, in 1837, he demonstrated the course of nerve-impulses within the cord, from one level to another, and the effects of direct stimulation of the cord. Also he noted the effects of opium and of strychnine on reflex action; and the reflex character of the convulsions that occur in certain diseases.

C. The Medulla Oblongata and the Cerebellum. — Flourens, who was among the earliest students of the use of chloroform, is best known for his experiments on the respiratory centre and the cere- bellum. He localized the cells in the medulla that govern the reflex movement of respiration. Afterward came the discovery of cardiac and other centres in the neighbourhood of the respiratory centre. He snowed also that the cerebellum is concerned with the equilibra- tion and co-ordination of the muscles ; that an animal, a few days old, deprived of sensation and consciousness by removal of the cerebral hemispheres, was yet able to stand and to move forward, but when the cerebellum also was removed, lost all power of co-ordination (Recherckes experimentales, Paris, 1842). And from the observations made by him and by others, it was found that the semicircular canals of the internal cars are the terminal organs of the sense of equilibra- tion.

D. The Vaso-Motor Nerves. — Claude Bernard, studying the sym- pathetic nervous system, discovered the vaso-motor nerves that

control the calibre of the arteries. The question of priority between him and Brown Sequard need not be considered here. His first account of his work was communicated to the Societe de Biologie in December 1851. The following account of it is from his Lecons de physiologic operatoire (1879): —

" Let me remind you how I was led to discover the vaso-motor nerves. Starting from the clinical observation, made long ago, that in paralysed limbs you find at one time an increase of cold and at another an increase of heat, I thought that this contradiction might be explained by supposing that, side by side with the general action of the nervous system, the sympathetic nerve might have the function of presiding over the production of heat ; that is to say, that in the case where the paralysed limb was chilled, I supposed the sympathetic nerve to be paralysed, as well as the motor nerves; while in the paralysed limbs that were not chilled the sympathetic nerve had retained its function, the systematic nerves alone having been attacked. This was a theory, that is to say, an idea, leading me to make experiments; and for these experiments I must find a sympathetic nerve-trunk of sufficient size, going to some organ that was easy to observe ; and must divide the trunk to see what would happen to the heat-supply of the organ. You know that the rabbit's ear, and the cervical sympathetic of this animal, offered us the required conditions. So I divided this nerve; and, at once, the experiment gave the lie direct to my theory — Je coupai done ce filet et aussitot V experience donna a mon hypothhse le plus eclatant dementi. I had thought that the section of the nerve would suppress the function of nutrition, of calorification, over which the sympathetic system had been supposed to preside, and would cause the hollow of the car to become chilled; and here was just the opposite, a very warm ear, with great dilatation of its vessels." The experiments of Budge and Waller (1853) and of Schiff (1856) threw light on the action of these vaso-motor nerves, and on the place of the vaso- motor centre in the cord; and in 1858 Claude Bernard, by his experiments on the chorda tympani and the submaxillary gland, demonstrated their twofold influence, either to dilate or to constrict the vessels. " It is almost impossible to exaggerate the importance of these labours of Bernard on the vaso-motor nerves, since it is almost impossible to exaggerate the influence which our knowledge of the vaso-motor system, springing as it does from Bernard's researches as from its fount and origin, has exerted, is exerting, and in widening measure will continue to exert, on all our physiological and pathological conceptions, on medical practice, and on the conduct of human life. There is hardly a physiological discussion of any width in which we do not sooner or later come on vaso-

motor questions " (Foster, Life of Claude Bernard),

E. Cerebral Localization.— -The study of the motor and sensory centres of the cerebral hemispheres began in clinical observation. Observation of cases, and examination of the brain after death (Bouillard, 1825, Dax, 1836, Broca, 1861), led men to believe that a particular area of the left frontal lobe of the brain did indeed govern and permit the use of speech. Physiological experiments had nothing to do with the discovery of the speech centres. " Bouillard in 1825 collected a series of cases to show that the faculty of speech resided in the frontal lobes. In 1861 his views were brought by Aubertin before the notice of the Anthropological Society of Paris. Broca, who was present at the meeting, had a patient under his care who had been aphasic for twenty-one years, and who was in an almost moribund state. The autopsy proved of great interest, as it was found that the lesion was confined to the left side of the brain, and to what we now call the third frontal convolution. ... In a subsequent series of fifteen typical cases examined, it was found that the lesion had destroyed; among other parts, the posterior part of the third frontal in fourteen " (Hamilton, Text-Book of Pathology). From this clinical fact, that the movements of speech depend on the integrity of a special area of the brain's surface, and from the facts of " Jacksonian epilepsy," and similar observations in medicine and surgery, began the experimental work of cerebral localization, by Hitzig, Goitz, Schiff, Ferrier, Yco, Horsley, Beevor and many more. It would be hard to find a more striking instance of the familiar truth that science and practice work hand in hand.

Again, the experimental method has thrown a flood of light on the minute anatomy of the central nervous system. For example, we have what is called Marchi's method; it was described to the Royal Commission (1906-8) by Dr Head and Sir Victor Horsley. It was found, by Professor Waller, that nerve-fibres, separated from the ncrvc-cclls which nourish them, degenerate in a definite way. The application of this law experimentally has been of great value. "' Let me," says Dr Head, " just take a simile. Imagine a wall covered with creepers arising from several stems. If we wished to know from which of these stems any one branch takes its origin, we could cut one stem, and every leaf arising from it would die, marking out among the healthy foliage the offshoots of the divided stem. This is the principle that has been used in tracing the paths in the nervous system. Gowers, by applying this method, discovered the ascending tracts in the lateral columns of the spinal cord." If a microscopic section of a spinal cord, containing some fibres thus degenerate, be treated with osmic acid (Marchi's method), the degenerate fibres show dark: and in this way their course may be traced at all levels of the cord.

Indeed, it may truly be said that, alike in anatomy and in physio- logy, the

whole present knowledge of the brain, the spinal cord and the nerves, is in great measure due to the use of experiments on animals. And this knowledge is daily applied to the diagnosis and treatment of diseases and injuries of the central nervous system. " In the case of operations on the brain, you have to form your opinion as to what is_ going on entirely from your knowledge of the physiology of the brain: and that we owe, of course, in the greatest measure to the discoveries of Hitzig and Fritsch and Ferrier. That has all happened since 1870; and we are now able to cure epilepsy, we are able to cure abscess of the brain, and we are able to cure tumours of the brain. Then, in operations on the spinal cord, the same thing prevails. In fact, the first operation on the spinal cord I am responsible for, so that I know the history of the subject. The technique of that operation I owe entirely to experiments on animals. As regards operations on the peripheral nerves, Bell's operative treatment of neuralgia was guided entirely by his experiments on animals. Then we come to the great subject of nerve suture. The initial work bearing upon that subject was carried out by Flourens, who was the first, to my knowledge, to make experiments on animals, to suture nerves together, to investigate their function " (Sir Victor Horsley, evidence before the Royal Commission, vol. iv. p. 124).

[These notes cover a part only of the results that have been obtained in physiology by the help of experiments on animals. The work of Boyle, Hunter, Lavoisier, Despretz, Regnault and Haldane, on animal heat and on respiration; of Petit, Dupuy, Breschet and Reid, on the sympathetic system; of Galvani, Volta, Harier, du Bois-Reymond and Fniiger, on muscular contraction — all these subjects have been left out, and many more. In his evidence before the Royal Commission (1875), Mr Darwin said : "lam fully convinced that physiology can progress only by the aid of experiments on living animals. I cannot think of any one step which has been made in physiology without that aid."]

B. Pathology, Bacteriology and Therapeutics

1, Inflammation— Pathology is so intimately associated with the work of the microscope, that it is a new study, in comparison with physiology. In 1850 the microscope was not in general use as it is now; nor did men have the lenses, microtomes and stain- ing fluids that are essential to modern histology. Bacteriology, again, is even younger than pathology. In 1875 it had hardly begun to exist. For example, in the evidence before the Royal Commission (1875) on e of the witnesses said that they " believed they were beginning to get an idea of the nature of tubercle." Anthrax was the first disease studied by the methods of bacteriology; and in his evidence concerning this disease, Sir John Simon speaks of bacteriology as of a discovery wholly new and unexplored. Then, in 1881, came Koch's discovery of the bacillus of tubercle. But a great advance was made, in

days before 1875, by the more general use of the microscope. Every change in the tissues during inflam- mation — the slowing of the blood stream in the capillary vessels, the escape of the leucocytes through their walls into the surround- ing tissues, the stagnation of the blood in the affected part — all these were observed in such transparent structures as the web or the mesentery of the frog, the bat's wing, or the tadpole's tail, irritated by a drop of acid, or a crystal of salt, or a scratch with a needle. It was in the course of observations of this kind that Wharton Jones observed the rhythmical contraction of veins, and Waller and Cohnheim observed the escape of the leucocytes, diapedesis, through the walls of the capillaries. From these simple experiments under the microscope arose alt our present knowledge of the minute pro- cesses of inflammation. Later came the work of Metschnjkoff and others, showing the importance of diapedesis in relation to the presence of bacteria in the tissues.

2 . Suppuration and Wound-Infection —FmcticaMy every case of sup- puration, wound-infection or " blood-poisoning," all abscesses, boils, carbuncles, and all cases of puerperal fever, septicaemia, or pyaemia, are due to infection, either from without or from within the body, by various forms of micro-organisms. The same is true of every case of erysipelas, or cellulitis, or acute gangrene — in short, of the whole multitude of " septic " diseases. The work done on these micro- cocci, and on other pathogenic micro-organisms, involved the study of the phases, antagonisms and preferences of each kind, their range of variation and of virulence, their products, and the influences on them of air, light,, heat and chemical agents. The beginning of Lister's work was in Pasteur's study of the souring of milk, about 1856. Pasteur's discovery, that lactic fermentation was due to a _ special micro-organism, opened the way for modern surgery. Lister had been long studying the chemical changes in decomposing blood and other animal fluids; now he brought these studies into line with Pasteur's work. Thus, in 1867, in his first published writing on the antiseptic treatment of compound fractures, he speaks as_ follows: " We find that a flood of light has been thrown upon this most important subject by the philosophic writing of M. Pas- teur, who has demonstrated, by thoroughly convincing evidence, that it is not to its oxygen, or to any of its gaseous constituents, that the air owes this property (of producing decomposition), but to minute particles suspended in it, which are the germs of various low forms of life long since revealed by the microscope, and regarded

as merely accidental concomitants of putrescence; but now shown by Pasteur to be its essential cause." The present antiseptic method includes

the aseptic method. That is to say, the instru- ments and other accessories of an operation are " sterilized " by heat; and, where heat cannot be applied, as to the patient's skin and the surgeon's hands, antiseptics are used. Modern surgery is both antiseptic and aseptic.

3. Anthrax. — The bacillus of anthrax (charbon, malignant pustule, wool-sorter's disease) was the first specific micro-organism discovered. Raver and Davaine (1850) observed the petits bdtonnets in the blood of sheep dead of the disease; and in 1863, when Pasteur's observations on lactic-acid fermentation were published, Davaine recognized that the bdtonneis were not blood crystals, but living organisms. Koch afterward succeeded in cultivating the bacillus, and in reproducing the disease in animals by inocula- tion from these cultures. Pasteur's discovery of preventive in-oculation of animals against the disease was communicated to the Academie des Sciences in February 1881; and in May of that year he gave his public demonstration at Pouilly-le-Fort. Two months later, at the International Medical Congress in London, he spoke as follows of this discovery : "... La rnethode que je viens de vous cxposcr pour obtenir des vaccins du charbon etait a peine connue qu'elle passait dans la grande pratique pour preVenir I'affectJon charbonneuse. La France perd chaque annee pour une valeur de plus de vingt millions d'animaux frappes du charbon, plus de 30 millions, m'a dit une des personnes autorisees de notre Ministere de 1" Agriculture; mais des statistiques exactes font encore defaut. On mc demanda de mettre & l'epreuve les reVultats qui precedent par une grande experience publique, a Pouilly-le-Fort, pres de Melun. . . . Je la resume en quelques mots; 50 moutons furent mis a ma disposition, nous en vaccinarttcs 25, les 25 autres nesub- irent aucun traitement. Quinze jours apres environ, les 50 moutons furent inocules par le microbe charbonneux le plus virulent. Les 25 vaccines resisterent ; les 25 non-vaccines moururent, tous char- bonneux, en cinquante heures. Dcpuis lors, dans mon laboratoire, on ne peut plus suffire a preparer assez de vaccin pour les demandes des fermiers. En quinze jours, nous avons vaccine dans les d6parte- ments voisins de Paris pres de 20,000 moutons et un grand nombre de boeufs, de vaches et de chevaux." The extent of this preventive vaccination may be judged from the fact that a single institute, the Sero-Therapeutic Institute of Milan, in a single year (1897-ˆ98) sent out 165,000 tubes of anti-charbon vaccine, enough to inoculate 33-734 cattle and 98,792 sheep. In France, during the years 1882-93, more than three million sheep and nearly half a million cattle were inoculated. In the Annates de VInstitui Pasteur, March 1894, M. Chamberland published the results of these twelve years in a paper entitled " Resultats pratiques des vaccinations contre le charbon et le rouget en France." The mortality from charbon, before vaccination, was 10 % among sheep and 5 % among cattle, according to estimates made by veterinary surgeons all over the

country. Vvith vaccination, the whole loss of sheep was about 1 %; the average for the twelve years was 0-94. The loss of vaccinated cattle was still less; for the twelve years it was 0-34, or about one-third %. The annual reports sent to M. Chamber- land by the veterinary surgeons represent not more than half of the work. " A certain number of veterinary surgeons neglect to send their reports at the end of the year. The number of reports that come to us even tends to become less each year. The fact is, that many veterinary surgeons who perform vaccinations every year content themselves with writing, 'The results are always very good; it is useless to send you reports that are always the same.' We have every reason to believe, as a matter of fact, that those who send no reports are satisfied; for if anything goes wrong with the herds, they do not fail to let us know it at once by special letters."

The following tables, from M. Chamberland's paper, give the results of Pasteur's treatment against charbon during 1882-93, and against rouget (swine- measles) during 1886-92. It is to be noted that the mortality from rouget among swine, in years before vaccination, was much higher than that from charbon among sheep and cattle: " It was about 20%; a certain number of reports speak of losses of 60 and even 80%; so that almost all the veterinary surgeons are loud in their praises of the new vaccination." It would be too much to say that every country, in every year, has obtained results with this anthrax- vaccine equal to those which have been obtained in France. Nor would it be reasonable to advocate the compulsory or wholesale use of the vaccine in the British Islands, where anthrax is rare. For the general value of the vaccine, however, we have this striking fact, that the use of it has steadily increased year by year. A note from the Pasteur Institute, dated November 29, 1909, says: ' Dcpuis 1882 jusqu'au I er Janvier 1909, il a 6te* expˆdie, pour la France, 8,400,04 × 1 doses de vaccin anti-charbon neu x pour moutons, 1,300,000 pour bceufs. Pour I'etranger, 8,500,000 doses pour moutons, 6,200,000 pour bceufs. Le nombre de doses augmente d'annce en annce, de sorte que pour 1'annee 1908 seule il faut compter en tout 1,500,000 doses pour moutons (France et etranger) 1,100,000 pour bceufs." (Two doses are used for each animal.) It remains to be added that a serum- treatment, introduced by Sclavo, has been found of considerable **aiue in cases of anthrax (malignant pustule) occurring in man.*

Vaccination against Charbon (France)

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4. Tubercle, — Laennec, who in 1816 invented the stethoscope, recognized the fact that tubercle is a specific disease, not a simple degeneration of the affected tissues. Villemin, in 1865, communi- cated to the Academie des Sciences the fact that he had produced the disease in rabbits by inoculating them with tuberculous- matter; and he appealed to these inoculations — en void les preuves — to show that La iuberculose est une affection specifique: Sa cause reside dans un agent inoculable: J J inoculation se fait trbs-bien de I'homme au lapin: La tubercidose appartient done a la classe des maladies virulentes. In 1868 Chauveau produced the disease not by inocula- tion but by admixture of tuberculous matter with the animals' food. In 1880, after a period of some uncertainty and confusion

of doctrines, Cohnheim reaffirmed the infeetivity of the disease,

and even made the proof of tubercle depend on inoculation alone : " everything is tuberculous that can produce tuberculous disease by inoculation in animals that are susceptible to the disease; and nothing is tuberculous that cannot do this." In 1881 Koch dis- covered the tubercle bacillus, and, in spite of the tragic failure of his tuberculin in 1890-91, a vast amount of practical advantage has already issued out of Koch's discovery, both by way of cure and by way of prevention. It has been proved, by experiment on animals, that the sputa of phthisical patients are infective ; and this and the like facts have profoundly influenced the nursing and general care of such cases. Bacteriology has brought about (under the safe- guard of modern methods of surgery) a thorough and early surgical treatment of all primary tuberculous sores or deposits — the excision of tuberculous ulcers, the removal of tuberculous glands and the like. It has helped us to make an early diagnosis, in obscure cases, by finding tubercle bacilli in the sputa, or in the discharges, or in a particle of the tissues. It has proved, past all reasonable doubt, that tabes mesenterica, a disease that kills every year in England alone many thousands of children, may arise from infection of the bowels by the milk of tuberculous cows. And it has helped to bring about the present rigorous control of the milk trade and the meat trade.

The " new tuberculin," now that the use of the opsonic index has guided physicians to a better understanding of the tuberculin treatment, has been found of great value, and is giving excellent results in suitable cases. Moreover, tuberculin is used, because of the reaction that it causes in

tuberculous animals, as a test for the detection of latent tuberculosis in cattle. An injection of one to two cubic centimetres under the skin of the neck is followed by a high temperature if the animal be tuberculous. If it be not, there is no rise of temperature, or only a very slight rise. For example, in 1899 this test was applied to 270 cows on farms in Lancashire: 180 reacted to the test, 85 did not, 5 were " doubtful." Tuberculous disease was actually found in 175 out of the 180. Eber of Dresden used the test on 174 animals, of whom 136 reacted, 32 did not react and 6 were doubtful. Of the 136, 22 were slaughtered, and were all found to have tubercle; of the 32, 3 were slaughtered, and were found free. The opinion of Professor M'Fadyean, one of the highest authorities on the subject, is as follows: " I have most implicit faith in tuberculin as a test for tuberculosis when it is used on animals standing in their own premises and undisturbed. It is not reliable when used on animals in a market or slaughter-house. A considerable number of errors at first were found when I examined animals in slaughter-houses after they had been conveyed there by rail, &c. Since that, using it on animals in their own premises, I have found that it is practically infallible. I have notes of one particular case where 25 animals in one dairy were tested, and after- wards all were killed. There was only one animal which did not react, and it was the only animal not found to be tuberculous when killed." This test has now been in regular use for many years in many countries, and it is accepted everywhere as of national importance.

5. Diphtheria. — The Bacillus diphtherias (Klebs-Lofner bacillus) was described by Klebs in 1875, and obtained in pure culture by Loftier in i88d. Behring and Kitasato, in 1890, succeeded in immunizing animals against the disease. The first cases treated with diphtheria antitoxin were published in 1893 by Behring, Kossel and Hiibncr. In England the antitoxin treatment was begun in the latter part of 1894. Besides its curative use, the antitoxin has also been used as a preventive, to stop an outbreak of diphtheria in a school or institute or hospital or village, and with admirable success. (See Diphtheria.)

6. Tetanus (lock-jaw). — Experiments on animals have taught us the true nature of this disease, and have led to the discovery of an antitoxin which has given fairly good results. We possess, moreover, a preventive treatment against the disease; though, unfortunately, the time of latency, when the antitoxin is most needed, cannot be recognized. The old, mischievous doctrine that tetanus was due to acute inflammation of a nerve, tracking up from a wound to the central nervous system, was abolished once and for ever by Sternberg (1880), Carle and Rattone (1884) and Nicolaier (1884), who proved that the disease is due to infection by a specific flagellate organism in superficial soil. " It is said to be present in almost all rich garden soils, and that the presence of horse-dung favours its

occurrence. There seems to be no doubt as to the ubiquity of the tetanus germ " (Poore, Milroy Lectures, 1899). The work of discovering and isolating the bacillus was full of difficulty. Nicolaier, starting from the familiar fact that the disease mostly comes from wounds or scratches contaminated with earth, studied the various microbes of the soil, and inoculated rabbits with garden mould. He produced the disease, and succeeded in finding and cultivating the bacillus, but failed to obtain a pure culture. Kitasato, in 1899, obtained a pure culture. Others studied the chemical products of the bacillus, and were able to produce the symptoms of the disease by injection of these chemical products obtained from cultures, or from the tissues in cases of tetanus. It has been proved that the infection tends to remain local; that the bacilli in and near the wound pour thence into the

blood their chemical products, and that these have a selective action, like strychnine, on the cells of the central nervous system. There- fore the rule that the Wounded tissues should be at once excised, in all cases where this can possibly be done, has received confirma- tion. Before Nicolaier, while men were still free to believe that tetanus was the result of an acute ascending neuritis, this rule was neither enforced nor explained.

As a preventive against tetanus, in man or in animals, the antitoxin has proved of the very utmost value. This has been shown in a striking way in America. "One of the wounds most commonly followed by lock-jaw is the blank-cartridge wound of the hand common on the glorˆus Fourth of July. The death-rate from these wounds is appalling. An active campaign has been conducted throughout the medical profession to reduce this mortality. All over the country, surgeons and medical journals have advised the injection of tetanus antitoxin in every case of blank-cartridge wound. The American Medical Association has compiled statistics of Fourth of July fatalities for the past six years. In 1903, the Fourth of July tetanus cases numbered 416. Then physicians began a more general use of antitoxin in all cases of blank-cartridge and common cracker wounds. As a result of this campaign of prophylaxis by antitoxin injections, from 416 cases of tetanus in 1903 the number dropped to 105 cases in 1904, 104 cases in 1905, 89 cases in 1906, 73 cases in 1907 and 55 cases in 1908. This reduction in the number of tetanus cases took place while the number of accidents remained practically the same each year, and while the number of deaths from causes other than tetanus was steadily rising from 60 in 1903 to 108 in 1908. It is thus evident that the saving of at least 300 lives from tetanus has been accomplished each year through the prophylactic use of antitoxin in the cases of Fourth of July wounds alone " (James P. Warbasse, M.D., The Conquest of Disease through Animal Experi-

mentation, Appleton & Co., 1910). .

The preventive use of the serum in veterinary practice has yielded admirable results. In some parts of the world tetanus is terribly common among horses. Nocard of Lille has reported as follows: " The use of anti-tetanus serum as a preventive has been in force for some years in veterinary practice in cases of wounds or surgical procedures. To this end the Pasteur Institute has supplied 7000 doses of anti-tetanus serum, a dose being 10 cubic centimetres ; a quantity which has sufficed to treat preventively 3100 horses in those parts of the country where tetanus is endemic. Among these there has been no death from tetanus. In the case of one horse, injected five days after receiving a wound, tetanus developed, but the attack was slight. During the same time that these animals were injected, the same veterinary surgeon observed, among animals not treated by injection, 259 cases of tetanus " (Lancet, August 7, 1897).

7. Rabies (hydrophobia). — The date of the first case treated by Pasteur's preventive method — Joseph Meister, an Alsatian shepherd- boy — is July 1885. The existence of a specific micro-organism of rabies was a matter of inference. The incubation period of the disease is so variable that no preventive treatment was possible unless this incubation period could be regulated. Inoculations of the saliva of a rabid animal, introduced under the skin of animals, sometimes failed; and if they succeeded, the incubation period of the disease thus induced was hopelessly variable. Next, Pasteur used not saliva, but an emulsion of the brain or the spinal cord; because the central nervous system is the chief seat of the poison. But this emulsion, introduced under the skin, was also uncertain in action, and gave no fixed incubation period. Therefore, he argued, as the poison has a selective action on the nerve cells of the central nervous system, and a sort of natural affinity with them, it must be introduced directly into them, where it will have its proper environ- ment; the emulsion must be put not under the skin, but under the dura mater (the membrane enveloping the brain). These sub- dural inoculations were the turning-point of his work. By trans-mitting the poison through a series of rabbits, by subdural inoculation of each rabbit with a minute quantity of nerve tissue from the rabbit that had died before it, he was able to intensify the poison, to shorten its period of incubation, and to fix this period at six days. Thus he obtained a poison of exact strength, a definite standard of virulence, virus fixe: the next rabbit inoculated would have the disease in six days, neither more nor less. By gradual drying, after death, of the cords of rabid animals, he was able to attenuate the poison contained in them. The spinal cord of a rabbit that has died of rabies slowly loses virulence by simple drying. A cord dried for four days is less virulent than a cord dried for three, and more virulent than a cord dried for five. A cord dried for a fortnight has lost all virulence; even a large dose of it will not produce the disease. By this method of drying,

Pasteur was able to keep going one or more series of cords, of known and exactly graduated strengths, according to the length of time they had been dried, ranging from absolute non-virulence through every shade of virulence.

As with fowl cholera and anthrax, so with rabies: the poison, attenuated till it is innocuous, can yet confer immunity against a stronger dose of the same poison. A man, bitten by a rabid animal, has at least some weeks of respite before the disease can break out; and during that time of respite he can be immunized against the disease, while it is still dormant. He begins with a dose of poison attenuated past all power of doing harm, and advances day by day

to more active doses, guarded each day by the dose of the day before, till he has manufactured within himself enough antitoxin to make him proof against any outbreak of the disease. (See Hydrophobia.)

8. Cholera. — The specific organism of Asiatic cholera, the "comma-bacillus," was discovered by Koch in 1883; but such a multitude of difficulties arose over it that it was not universally recognized as the real cause of the disease before 1892, the year of the epidemic at Hamburg. The discovery of preventive inoculation was the work of many men, but especially of Haffkine, one of Pasteur's pupils.- Ferran's earlier inoculations in Spain (1885) were a failure. Haffkine's first inoculations were made in 1893. At Agra, in April 1893, he vaccinated over 900 persons; and from Agra went to many other cities of India- Altogether, in twenty- eight months (April 1893-July 1895) no less than 42,179 persons were vaccinated (many of them twice) in towns, cantonments, gaols, tea estates, villages, schools, &c, " without having to record a single instance of mishap or accident of any kind produced by our vaccines." (See Cholera.)

9. Bubonic Plague. — The Bacillus pestis was discovered in 1894 by Kitasato and Yersin, working independently. The preventive treatment was worked out by Haffkine in 1896: " Twenty healthy rabbits were put in cages. Ten of them were inoculated with Haffkine's plague vaccine. Then both the vaccinated rabbits and the other ten rabbits that had not been vaccinated were infected with plague. The unprotected rabbits all died of the disease, and in their bodies innumerable quantities of the microbes were found. But the vaccinated rabbits remained in good health. Professor Haffkine then vaccinated himself and his friends. This produced some fever, from which, after a day or two, they recovered. Plague broke out in

Byculla Gaol, in Bombay, in January 1897. About half the prisoners volunteered to be inoculated. _ Of these, 3 developed plague on the day of inoculation, and it is probable that they had already plague before the treatment was carried out. Of the remaining 148 who were inoculated, only 2 were afterwards attacked with plague, and both of them recovered. At the same time, of the 173 who had not been vaccinated, 12 were attacked, and out of these- 6 died." (See Plague.)

10. Typhoid Fever. — The Bacillus typhosus was discovered by Kiebs, Eberth and Koch in 1880-81. The first protective inocula- tions in England were made at Netley Hospital in 1896 by Sir Almroth Wright and Surgeon-Major Semple: 16 medical men and 2 others offered themselves as subjects. The first use of the vaccine during an actual outbreak of typhoid was in October 1897 at the Kent County Asylum: " All the medical staff and a number of attendants accepted the offer. _ Not one of those vaccin- ated — 84 in number — contracted typhoid fever ; while of those unvaccinated, and living under similar conditions, 16 were attacked. This is a significant fact, though it should in fairness be stated that the water was boiled after a certain date, and other precautions were taken, so that the vaccination cannot be said to be altogether responsible for the' immunity. Still, the figures are striking^" (Lancet, March 1898). In 1899 Wright vaccinated against typhoid more than 3000 of the Indian army, at Bangalore, Rawal Pindi and Lucknow. Government has now sanctioned voluntary inoculation against typhoid, at the public expense, among the British troops. " All regiments leaving for the tropics are offered this inoculation, and each year a larger percentage of the soldiers are accepting it. Here are some of the statistics: In August and September 1905, 150 men of a single regiment were inoculated: of these, 23 refused to accept a second inoculation. The regiment reached India, September 28. A month later, typhoid fever broke out; and during the following few months 63 cases were observed in the regiment. With but two exceptions, the disease attacked only the men who had not been inoculated, and both of these exceptions were men who had refused a second inoculation. Careful experi- ments were made with the second battalion of Royal Fusiliers in India in 1905 and 1906. The average strength of this regiment was 948 men. During the two years, 284 were inoculated with Wright's anti-typhoid vaccine. The regiment had a total of 46 cases of typhoid. Thirty-five of these were men who had not been inoculated; 9 had been inoculated. Five of the uninoculated died; none of the inoculated died. Another Indian regiment, the 17th Lancers, in 1905, 1906 and 1907 inoculated about one-third of its men. During the three years it had 293 cases of typhoid fever. There were 44 deaths, with not a single death of an inoculated man. During the first half of 1908, in the largest seven Indian stations where careful records were kept, out of a total of 10,420 soldiers, 2207 volunteered for inoculation. Typhoid developed in

2 % of the uninoculated, and in less than 1 % of the inoculated men. Forty-five deaths occurred. Five per cent of these deaths were among the uninoculated and 1% was among the inoculated men. ... In the United States army, a medical board has strongly recommended anti-typhoid vaccinations, and vaccination is now offered to those who desire it. Already 2000 soldiers have volun- tarily received inoculation. The German army has adopted the same means of prophylaxis, and is pushing it vigorously " (Warbasse, toe. cit.).

Beside the preventive treatment, bacteriology has given us

" Widal's reaction " for the early diagnosis of the disease — a matter of the very highest practical importance. A drop of blood, from the finger of a patient suspected to be suffering from typhoid fever, is diluted fifty or more times, that the perfect delicacy of the test may be ensured; a drop of this dilution is mixed with a nutrient fluid containing living bacilli of typhoid, and a drop of this mixture is observed under the microscope. The motility of the bacilli is instantaneously or very quickly arrested, and in a few minutes the bacilli begin to aggregate together into clumps. This " clumping " is also made visible to the naked eye by the subsidence of the agglutinated bacilli to the bottom of the containing vessel. The amazing delicacy of " Widal's test " is but a part of the wonder. Long after recovery, a fiftieth part of a drop of the blood will still cause clumping: it has eyen been obtained from an infant whose mother had typhoid shortly before the child was born. A drop of blood from a case suspected to be typhoid can now be sent by post to be tested a hundred miles away, and the answer telegraphed back.

11. Malta Fever (Mediterranean fever). — The Micrococcus Meli- tensis was discovered in 1.887 by Sir David Bruce. The work of dis- covering and preparing an immunizing serum was done at Netley Hospital. In this fever, as in typhoid and seme others, Widal's test is of great value: " The diagnosis of Malta fever from typhoid is, of course, a highly important practical matter. It is exceedingly difficult in the early stages" (Manson). Even in a dilution of I in 1000, the blood of Malta fever can give the typical reaction with the Micrococcus Melitensis; and this occurred in a case at Netley of acci- dental inoculation with Malta fever: one of three cases that have happened there. The case is reported in the, British Medical Journal, October 16, 1897: " It appears that he had scratched his hand with a hypodermic needle on September 17, when immunizing a horse for the preparation of serum-protective against Malta fever; and his blood, when examined, had a typical reaction with the micrococcus of Malta fever in 1000-fold dilution. The horse, which has been immunized for Malta fever for the last eight months, was immediately bled, and we are informed that the patient has now had two injections, each of 30 cub. cm. of the

serum. He is doing well, and it is hoped that the attack has been cut short." About 50 cases of the fever, by April 1899, had been treated at Netley. The Lancet, April 15, 1899, says that the treatment was "with marked benefit: whereas they found that all drug treatment failed, the antitoxin treatment had been generally successful." Happily, it has now been proved that the usual source of infection with Malta fever is the drinking of the milk of infected goats: thus, by the avoidance, or by the careful and thorough boiling of the milk, the fever may be prevented: and prevention is better than cure. In 1904 a commission was sent out to Malta by the Royal Society, at the request of our government, to discover how the fever is conveyed to man. They found that it is not conveyed by air, or by drinking-water, or by pollution of sewage, or by contact; nor are its germs carried, like those of malaria, yellow fever and sleeping sickness, by insects. They found that it might be conveyed in food. There- fore Bruce examined the milch-goats, since goats' milk is universally drunk in Malta. The goats looked healthy enough, but it was found that the blood of 50% of them gave the Widal reaction, and that some 10% of them were actively poisonous: monkeys fed on milk from one of them, even for one day, almost invariably got the disease. On the 1st of July 1906, an official order was issued forbidding the supply of goats milk to our garrison. The year before, there had been 643 cases among our soldiers alone. In 1906, up to the 1st of July, there were 123 cases. During the resc of the year, including the three worst months for the fever, there were 40 cases. In 1907 there were II cases; in 1908 there were 5 cases; in 1909 there was 1 case; in 1910, by latest accounts, none.*

12. Epidemic Meningitis. — The history of the serum treatment of epidemic meningitis affords an admirable example of the place of experiments on animals in the advancement of medical practice. This form of meningitis is one of the worst ways in which a man can die. Dr Robb, who had charge of the Belfast fever hospitals during an epidemic in Belfast, calls it " the most terrible in its manifestations, and the most disastrous in its death-rate, of all the epidemic diseases met with in English-speaking countries." Very little is known as to the way in which it spreads, and the public health authorities cannot prevent its sudden appearance in a town. " Many of those attacked," says Dr Robb, " died within a few hours of the onset, and that after terrible suffering; while many of those who survived the acute attack lingered on for weeks and months, going steadily downhill in spite of every effort to save them. Again, many of those who did survive were left permanently maimed.' That is the usual picture of the disease when it is left to. the older methods of treatment.

By means of inoculation experiments, Dr Flexner and Dr Jobling, of the Rockefeller Institute, proved that the disease is due to a particular kind of germ, diplococcus intracellularis. They obtained these germs from the

bodies of patients who had died of the disease; they cultivated the germs all by themselves, in test tubes, apart from all other kinds of germs; and they were able to reproduce the disease in monkeys by injecting under the skin a minute quantity of this pure culture of the germs. It may be worth noting

that the disease in monkeys is less violent and less painful than it is in man. By the help of these experiments, Flexner and Jobling were able to prepare a serum for the treatment of the disease, in the same way as the serum is prepared which has been such a blessing to the world in cases of diphtheria. This serum for the treatment of epidemic meningitis was first used in the spring of

1907.

The contrast between cases without serum treatment and cases with serum treatment is very plain. We may first give the_ records before the use of the serum. Of 4000 cases in New York in 1904, 75% died; Baker reports from Greater New York 2113 cases with 1636 deaths, giving 77-4% mortality; Chalmers reports from Glasgow (1907) 998 cases with 683 deaths, giving 68-4% mortality; Bailie reports in Belfast (1907) 623 cases with 493 deaths.ˆ giving 79-2 % mortality: Ker reports that in the Edinburgh epidemic there was 78% mortality; Robertson reports from Leith (1907) 62 cases with 74-4% mortality; Tumour reports from the Transvaal 200 cases with 74% mortality. Amongst patients treated in hospitals the death-rate was no better. Of 202 cases in Ruchill Hospital, Glasgow, 79-2% died; of 108 cases in Edinburgh Fever Hospital, 80-5% died; of 275 cases in Belfast Fever Hospital, 72-3% died; and Dunn reports that in the Boston Children's Hospital, during the eight years 1899-1907, the mortality varied from 69% to 80%. Contrast with these the results in cases treated with Flexner's and Jobling's Serum: —

Cases.

Died.

Mortality per cent.

City Hospital, Cincinnati. Dr Dunn, Boston …. Johns Hopkins Hospital, Baltimore . Rhode island Hospital Lakeside Hospital, Cleveland . Edinburgh Fever Hospital Mount Sinai Hospital (Children) Municipal Hospital, Philadelphia Belfast Fever Hospital

45 40 22 17 29

33 15 21

98

14 9 4 6

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13

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9 29

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35-2 37-7 43-3 13-3 427 29-6

These figures speak for themselves. Similar results have been obtained with similar treatment in France and Germany. " From these figures," says Dr Robb, " it will be seen that the death-rate in cases not treated with scrum averaged some 75 . This has been reduced in cases treated with the serum to less than half, and in many instances much below that figure." " My own experience has been that of 275 cases under my care in hospital, before the use of the serum was commenced, 72-3 died; while of the 98 cases treated with serum 29-6% died. No selection of cases was made: every case sent into hospital since September 1907 has been treated in this way. No change in the severity of the attack was observed: in the three months immediately before the serum arrived with us 45 cases came under treatment, of whom 37, or 82 , died; and in the first four months after we began its use in hospital 30 cases were treated, of whom 8 died, a mortality of 26-6; while of the 34 cases occurring in the city in the same period, but not sent into hospital, and not treated with the serum, over 80% died. Great as this change in the death-rate has been, it is not more strik- ing than the improvement in the course run by the cases; for whereas it was common to have cases running on into weeks and even months, such cases are no longer met with " (R. P. S. pamphlet, 1909).

13. Malaria. — I-averan, in 1880, discovered the Plasmodium malariae, an amoeboid organism, in the blood of malarial patients. In 1894 Manson

took, as a working Theory of malaria, the old belief that the mosquito is the intermediate host of the .parasite. In 1895 came MacCulIum's observations on an allied organism, Haltertdium. In 1897, after two years 1 work, Ross found bodies, pigmented like the Plasmodium, in the outer coat of the stomach of the grey or " dapple-winged " mosquito, after it had been fed on malariafblood. In February 1898 he started work in Calcutta: " Arriving there at a non-fever season, he took up the study of what may be called " bird malaria.' In birds, two parasites have become well known — (1) the Halteridium, (2) the Proteosoma of Labb£. Both have flagellate forms, and both are closely allied to the Plasmodium malariae. Using grey mosquitoes and proteosoma-Infected birds, Ross showed by a large number of observations that it was only from blood containing the proteosoma that pigmented cells in the grey mosquito could be got ; therefore that this cell is derived from the proteosoma, and is an evolutionary stage of that parasite " CManson, 1898). These pigmented cells give issue to innumerable swarms of spindle-shaped bodies, " germinal rods "; and in infected mosquitoes Ross found these rods in the glands of the proboscis. Finally, he completed the circle of development, by infecting healthy sparrows by causing mosquitoes to bite them. It would be hard to surpass Ross's work, and that done in Italy by Grassi and others, for fineness and carefulness. He says, for instance, " out of 245 grey mosquitoes fed on birds with proteosoma, J 78, or 72%, con- tained pigmented cells; out of 249 fed on blood containing halter-

idium, immature proteosoma, &c, not one contained a single pigmented cell. . . . Ten mosquitoes fed on the sparrow with numerous proteosoma contained 1009 pigmented cells, or an average of ioi each. Ten mosquitoes fed on the sparrow with moderate proteosoma contained 292 pigmented cells, or an average of 29 each. Ten mosquitoes fed on the sparrow with no proteosoma contained no pigmented cells."

By these and the like observations it was made practically certain that malaria is transmitted from man to man by a special kind of mosquito. Then came the final experiments on man. In 1900 Sambon, Low and Terzi made their famous experiment on them- selves in the neighbourhood of Ostia. They put up a little mosquito- proof hut in a neighbourhood "saturated with malaria." In this little hut they lived through the whole of the malaria season, without taking a grain of quinine, and not one of them had a touch of the fever. Then another experiment was made. A consignment of mosquitoes containing blood from a case of malaria was sent from Rome to the London School of Tropical Medicine. Dr Manson and Dr Warren then submitted themselves to being bitten by these mosquitoes, and in due time suffered malarial fever. On these proven facts was founded the whole plan of campaign against malaria. The nature, habits and breeding-places of the mosquito of malaria (Anopheles

maciilipennis) have been studied with infinite care, and are now thoroughly recognized. The task is to destroy its eggs and its larvae, to break the cycle of its life, and to do away with its favourite breeding-places,

14. Yellow Fever. — A special mosquito (Stegomyia) conveys yellow fever from man to man. The germ, like the germ of rabies, has not yet been made visible under the microscope. It is probably a very minute spirochaete, which undergoes a slow evolution in the body of the mosquito told off for that purpose. The earlier experi- ments (1810-20) made on themselves by Chervin, Potter, Firth and others were truly heroic, but proved nothing. Finlay (1880- 1900) experimented with mosquitoes on himself and other volunteers, and certainly proved the transmissibility of the fever through mosquitoes. Sanarelli (1898) prepared an immunizing serum which gave good results: but the germ which he took to be the specific cause of the fever, having found it in cases of the fever, is not now accepted by bacteriologists as specific. But the great work, which

C roved to the world the way of infection of yellow fever, was done yr the Army Commission of the United States (1900). This Com- mission was sent to Havana, and the experiments were carried out by Drs Walter Reed, Carrol, Lazear and Agramonte in the Army Camp in Havana. A hut was constructed with two compart- ments, divided from each other by a wire mosquito-proofscreen. In one compartment they placed infected mosquitoes, which had bitten a yellow fever patient within the first three days of the fever. More than twenty volunteers offered themselves for experiment. In one set of experiments, clothing and other material, soiled by" the vomit or blood or excretions from cases of the fever, were placed in one of the rooms, and some of the experimenters slept for 21 con- secutive nights in contact with these materials, and in some cases in the very sheets on which yellow fever patients had died. Not one of these experimenters took the fever. In another set of experi- ments, 22 of the experimenters submitted themselves to be bitten by the infected mosquitoes, and in each instance they took the disease. It was thus proved, past all reasonable doubt, that yellow fever cannot be conveyed by ordinary infection, but must be transmitted from man to man through the agency of the mosquito. It might be said, by the opponents of all experiments on animals, that the discovery of these facts has nothing to do with " vivisection." But, as Professor Osier said in his evidence before the Royal Commission (vol. iv. p. 158), these experiments would never have been thought of if it had not been for previous experiments on animals. " The men who made these investigations spent their lives in laboratories, and their whole work has been based on experimentation on animals. They could not otherwise, of course, have ventured to devise a series of experiments of this sort." Out of this work came the wiping out of yellow fever (q.v.) from Cuba after the Spanish-American War, and from the area of the Panama Canah

15. Sleeping-Sickness. — Experiments on animals have proved that sleeping-sickness is due to specific germs carried by tse-tse flies from man to man. By measures taken to prevent this way of infection, legions of human, lives have been saved or safeguarded.

16. Infantile Paralysis. — Flexner, of the Rockefeller Institute, has proved, by experiments on animals, the infective nature of this disease, and its transmissibility by inoculation: a discovery of the very utmost value and significance.

17. Myxoedema. — Our knowledge of myxoedema, like our know- ledge of cerebral localization, began not in experimental science but in clinical observation (Gull, 1873; Ord, 1877). In 1882- 1883 Reverdin and Kocher published cases where removal of the thyroid gland for disease (goitre) had been followed by symptoms such as Gull and Ord had described. In 1884 Horsley, by removal of the thyroid gland of monkeys, produced in them a chronic myxoedema, a cretinoid state, the exact image of the disease in man: the same symptoms, course, tissue-changes, mental and physical hebetude, the same alterations of the excretions, the temperature and the voice. In 1888 the Clinical Society of London

published an exhaustive report, of 215 pages, on 119 cases of the disease, giving all historical, clinical, pathological, chemical and experimental facts; but out of 215 pages there is but half a page about treatment, of the useless old-fashioned sort. In 1890 Horsley published the suggestion that a graft of thyroid gland from a newly killed animal should be transplanted beneath the skin in cases of myxoedema: " The justification of this procedure rested on the remarkable experiments of Schiff and von Eisselsberg. I only became aware in April 1890 that this proposal had been in fact forestalled in 1889 by Dr Bircher in Aarau. Kocher had tried to do the same thing in 1883, but the graft was soon absorbed; but early in 1889 he tried it again in five cases, and one greatly im- proved." In 1891 George Murray published his Note on the Treat- ment of Myxoedema by Hypodermic Injections of an Extract of the Thyroid Gland of a Sheep. Later, the gland was administered in food. At the present time tabloids of thyroid extract are given. Wc could not have a better example how experiments on animals are necessary for the advancement of medicine. Now, with little bottles of tabloids, men and women are restored to health who had become degenerate in body and mind, disfigured and debased. The same treatment has given back mental and bodily growth to countless cases of sporadic cretinism. Moreover, the action of the thyroid gland has been made known, and the facts of "

internal secretion " have been in part elucidated. (Claude Bernard, speaking of the thyroid, the' thymus anc 1 the suprarenal capsules, said: "We know abso- lutely nothing about the functions of these organs; we have not so much as an idea what use and importance they may possess, because experiments have told us nothing about them, and anatomy, left to itself, is absolutely silent on the subject.")

18. The Action of Drugs. — Even in the 18th century medicine was still tainted with magic and with gross superstition: the 1721 Pharmacopoeia contains substances that were the regular stock-in-trade of witchcraft. Long after 1721 neither clinical observation, nor anatomy, nor pathology brought about a reason- able understanding of the action of drugs: it was the physiologists, more than the physicians, who worked the thing out — Bichat, Magendie, Claude Bernard. Magendie's study of upas and strych- nine, Bernard's study of curare and digitalis, revealed the selective action of drugs: the direct influence of strychnine on the central nerve-cells, of curare on the terminal filaments of motor nerves.

Two instances may be given how experiments on animals have elucidated the action of drugs. A long list might be made — aconite, belladonna, chloride of calcium, cocain, chloral, ergot, morphia, salicylic acid, strophanthus, the chief diuretics, the chief diaphoretics — all these and many more have been studied to good purpose bv this method; but it must suffice to quote here (ij Sir Thomas Eraser's account of digitalis, and (2) Sir Thomas Lauder Brunton's account of nitrite of amyl: —

""i. Digitalis was introduced as a remedy for dropsy; and on the applications which were made of it for the treatment of that disease, a slowing action upon the cardiac movements was observed, which led to its acquiring the reputation of a cardiac sedative. . . . It was not until the experimental method was applied in its investiga- tion, in the first instance by Claude Bernard, and subsequently by Dybkowsky, Pelikan, Meyer, Bohm and Schmiedeberg, that the true action of digitalis upon the circulation was discovered. It was shown that the effects upon the circulation were not ia any exact sense sedative, but, on the contrary, stimulant ˆnd tonic, rendering the action of the heart more powerful, and increasing the tension of the blood vessels. The indications for its use in disease were thereby revolutionized, and at the same time rendered more exact; and the striking benefits which are now afforded by the use of this substance in most (cardiac) diseases were made avail- able to humanity."

" 2. In the spring of 1867 I had opportunities of constantly observing a patient who suffered from angina pectoris, and of obtaining from him numerous sphygmographic tracings, both during the attack and during the interval. These showed that during the attack the pulse became quicker, the

blood-pressure rose and the arterioles contracted. ... It occurred to me that if it was possible to diminish the tension by drugs instead of by bleeding, the pain would be removed. I knew from unpublished experiments on animals by Dr A. Gamgee that nitrite of amyl had this power, and therefore tried it on the patient. My expectations were per- fectly answered."

19. Snake Venom. — Sewall (1887) showed that animals could be immunized, by repeated injection of small doses of rattlesnake's venom, against a sevenfold fatal dose. Kanthack (1891) immun- ized animals against cobra venom: afterward Fraser, Calmette and many others worked at the subject. Fraser's work on the anti- dotal properties of the bile of serpents is of the very highest interest and value, both in physiology and in sero-therapy. Calmette's work is an admirable instance of the delicacy and accuracy of the experimental method. The different 'venoms were measured in decimal milligrammes, and their action was estimated by the body-weights of the animals inoculated; but of course this estimate of virulence was checked according to the susceptibility of the animals; guinea-pigs, rabbits and especially rats being more sus- ceptible than dogs.

" The following table gives'the relative toxicity, for I kilogramme of rabbit, of the different venoms that I have tested ": —

1. Venom of Naja .... 0-25 milligramme per

kilogramme of rabbit. One gramme of this venom kills 4000 kilogrammes of rabbit: activity = 4,000,000.

2. Venom of Hoplocephalus . . 0-29 . 3,450,000.

3. Venom of Pseudechis . . . 1-25 . 800,000.

4. Venom of Pelias herus . 4-00 . 250,000.

By experiments in vitro Calmette studied the influence of heat and chemical agents on these venoms; and, working by various methods, was aole to immunize animals: —

" I have got to immunizing rabbits against doses of venom that are truly colossal. I have several, vaccinated more than a year ago, that take without the least discomfort so much as forty milli- grammes of venom of Naja tripudians at once. Five drops of serum from these rabbits wholly neutralize in vitro the toxicity of one milligramme of Naja venom. ... It is not even necessary that the serum should come from an animal vaccinated against the same sort of venom as that in the mixture. The serum of a rabbit immunized against the venom of the cobra or the viper acts in- differently on all the venoms that I have tested."

In 1895 he had prepared a curative serum: " If you first inocu- late a rabbit with such a dose of venom as kills the control-animals in three hours; and then, an hour after injecting the venom, inject under the skin of the abdomen four to five cubic centimetres of serum, recovery is the rule. When you interfere later than this, the results are uncertain; and out of all my experiments the delay of an hour and a half is the most that I have been able to reach."

In 1896 four successful cases were reported in the British Medical Journal, In 1898 Calmette reports: —

" It is now nearly two years since the use cf my antivenomous serum was introduced in India, in Algeria, in Egypt, on the West Coast of Africa, in America, in the West Indies, Antilles, &c. It has been very often used for men and domestic animals (dogs, horses, oxen), and up to now none of those that have received an injection of serum have succumbed. A great number of obser- vations have been communicated to me, and not one of them refers to a case of failure ". {Brit. Med. Journ., May 14, 1898; see also Boston Medical and Surgical Journal, April 7, 1898).

It is of course impossible that " antivenene ' should be always at hand, or that it should bring about any great decrease in the number of deaths from snake-bite, which in India alone are 30,000 annually; but at least something has been accomplished with it.

The account given above of the chief discoveries that have been made by the help of experiments on animals, in physi- ology, pathology, bacteriology and therapeutics, might easily have been lengthened if we added to it other methods of treat- ment that owe less, but yet owe something, to these experi- ments. Nevertheless the facts quoted in this article are sufficient to indicate the great debt that medicine owes to the employment of vivisection. (S. P.)

VIZAGAPATAM, a town and district of British India, in the Madras presidency. The town stretches 3 m, along the coast, and has a station on a short branch of the East Coast railway, 484 m. N.E. of Madras. Pop. (1901) 40,892. It lies on a small bay, the south extremity of which is bounded by a promontory known as the Dolphin's Nose, and its northern extremity by the suburb of Waltair. The town or fort, as it is called, is separated from trfe Dolphin's Nose by a small river, which forms a bar where it enters the sea, but is passable for vessels of 300 tons during spring tides. An English factory was established here early in the 17th century, which was cap- tured by the French in 1757, but shortly afterwards recovered. The town owes much to the munificence of the neighbouring raja of Vizianagram, A water supply has been provided at a cost of

£30,000. Waltair is the European quarter. There is a considerable Roman Catholic population and a branch of the London Mission. The exports by sea include manganese ore, rice and sugar. Some weaving is carried on, and there is a speciality of ornamental boxes, &c, carved out of sandal-wood, hern, ivory, porcupine quills and silver.

The District or Vizagapatam has an area of 17,222 sq. m., being one of the largest districts in India. It is a picturesque and hilly country, but for the most part unhealthy. The surface is generally undulating, rising towards the interior, and crossed by streams, which are dry except during the rainy season. The main portion is occupied by the Eastern Ghats. The slopes of these mountains are clothed with luxuriant

vegetation, amid which rise many tall forest trees, while the bamboo grows profusely in the valleys. The drainage on the east is carried by numerous streams direct to the sea, and that to the west flows into the Godavari through the Indravati or through the Sabari and Siller rivers. To the west of the range is situated the greater portion of the extensive zamindari of Jaipur, which is for the most part very hilly and jungly. In the extreme north a remarkable mass of hills, called the Nim- giris, rise to a height of 5000 ft. The plain along the Bay of Bengal is a vast sheet of cultivation, green with rice fields and gardens of sugar-cane and tobacco. There are great varieties of climate in the district. Along the coast the air is soft and relaxing, the prevailing winds being south-easterly. The average annual rainfall at Vizagapatam exceeds 40 in. Pop. (iqoi) 2,933,650, showing an increase of 4-7% in the decade. The principal crops are rice, millets, pulses and oil-seeds, with some sugar-cane, cotton and tobacco. The coast portion of the district is traversed throughout by the East Coast railway, opened from Madras to Calcutta in 1904; and a line through the hills from Vizianagram to Raipur in the Central Provinces has been sanctioned. The chief seaports are Bimlipatam and Vizagapatam.

On the dissolution of the Mogul empire Vizagapatam formed part of the territory known as the Northern Circars, which were ceded to the East India Company by treaties in 1765 and 1766. It was long before British authority was established over the hilly tract inland, inhabited by aboriginal tribes, and still ad- ministered under a peculiar system, which vests in the collector the powers of a political agent. This tract, forming more than two-thirds of the whole district, is known as the Agency.

See The Vizagapatam District Gazetteer (Madras, 1907).

VIZETELLY, HENRY (3820-1894), English publisher, was born in London on the 30th of July 1820, the son of a printer. He was early apprenticed as a wood engraver, and one of his first blocks was a portrait of " Old Parr." Encouraged by the success of the Illustrated London News, Vizetclly in 1843, with his brother James Thomas Vizetelly (1817-1897) and Andrew Spottiswoode (1 787-1866), started the Pictorial Times, which was published successfully for several years. In 1855, in partnership with Boyne, he started a threepenny paper called the Illus- trated Times, which four years later was merged in the Penny Illustrated Paper. In 1865 Vizetelly became Paris corre- spondent for the Illustrated London News. During the years he remained in Paris he published several books — Paris in Peril (1882), The Story of the Diamond Necklace (1867) and a free translation of Topin's Man in the Iron Mask. In 1872 he was transferred to Berlin, where he wrote Berlin under the New Empire (1879). In 1887 he established a publishing house in London, issuing numerous translations of French and Russian authors. In 3888 he was prosecuted for publishing a transla- tion of Zola's La Terre, and was fined £100 ; and when he reissued Zola's works in 1889 he was again prosecuted, fined £200 and imprisoned for three months. In 1893 he wrote a volume of autobiographical reminiscence called Glances Back through Seventy Years, a graphic picture of literary Bohemia in Paris and London between 1840 and 1870. He died on the 1st of January 1894. His younger brother, Frank Vizetelly (1830-3883), was a clever artist and journalist ; he went to Egypt as war correspondent for the Illustrated London News and was never heard of after the massacre of Hicks Pasha's army in Kordofan.

VIZEU, or Viseu, an episcopal city and the capital of the district of Vizeu, Portugal, at the terminus of a branch of the Figueira da Foz-Guarda railway, and on the Ribeira d'Asnos, a sub-tributary of the Mondego. Pop. (1900) 8057. The cathedral, which was founded in the 12th century, contains pictures by the native artist Grao Vasco (16th century). The city stands near the ruins of the ancient Vacca, or Cava de Viriato, a Roman military colony founded by Decius Brutus and captured by Viriathus (2nd century B.C.). The adminis- trative district of Vizeu coincides with the central and northern parts of the ancient province of Beira (q.v.). Pop. (1900) 402,259; area, 1937 sq. m.

VIZIADRUG, Vijayadttrg Oh Ghesia, a port on the W. coast of India in Ratnagiri district, Bombay, 170 m. S. of Bom- bay city. Pop. (1901) 2339. It is one of the best harbours on the west coast, being without any bar, and may be entered in all weathers; even to large ships it affords safe shelter dur- ing the south-west monsoon. At the beginning of the 18th century the pirate chief Angria made Viziadrug the capital of a territory stretching for 150 m. along the coast and from 30 to 60 m. inland. The fort was taken by Admiral Watson and Colonel Clive in 1 756.

VIZIANAGRAM, a town of British India, in the Vizagapatam district of Madras, 17 m. from the seaport of Bimlipatam, on the East Coast railway, 522 m. N.E. of Madras. Pop. (1001) 37,270. It has a small military cantonment. It contains the residence of a zamindar of the same name, who ranks as the first Hindu nobleman of Madras. His estate covers about 3000 sq. m., with a population of 900,000. The estimated income is £380,000 , paying a permanent land revenue of £34,000. The town possesses many fine buildings, entirely supported by the raja. It has a college and two high schools.

The ruling family, which claims descent from a high official at the court of Golconda, established itself in Vizagapatam in the 17th century. In 1754 Viziarama Raz made an alliance with the French, but his son, on succeeding, fell out with them, captured Vizagapatam from them and ceded it to the British in 1758. The next raja, another Viziarama, was entirely under the influence of his half-brother Sita Ram, whose power, how- ever, became so great a menace that he was forced to retire in 3793. A period of decay now set in. The raja was incompetent, and, his estate having been sequestrated for debt, revolted and was defeated and killed in 3794. The next raja, Narayana Babu, was no more successful, and his estate had been long under the management of the British government when he died in 3845. Viziarama Gajapati Raz, who succeeded him and took over full powers in 3852, was a man of ability, and received the titles of maharaja and K. C.S.I. ; as also was his son, the maharaja Ananda Raz, G.C.I. E. He died in 1897, and was succeeded by Raja Pusapati Viziarama Gajapati Raz, during whose minority (till 3904) the estate was again under government administration.

VIZIER, more correctly Vizir (Arabic Wazir), literally " burden-bearer " or " helper," originally the chief minister or representative of the Abbasid caliphs. The office of vizier, which spread from the Arabs to the Persians, Turks, Mongols, and other Oriental peoples, arose under the first Abbasid caliphs (see Mahommedan Institutions, and Caliphate, C § i) and took shape during its tenure by the Barmecides (q.v.). The vizier stood between sovereign and subjects, representing the former in all matters touching the latter. This withdrawal of the head of the state from direct contact with his people was unknown to the Omayyads, and was certainly an imitation of Persian usage; it has even been plausibly conjectured that the name is but the Arabic adaptation of a Persian title. In modern usage the term is used in the East generally for any important official under the sovereign.

VIZZOLA TICINO, a village of Lombardy, Italy, in the province of Milan, 6 m. W. of Gallarate and 31 m. N.W. of Milan, 725 ft. above sea-level. Pop. (3901) 469. It is situated on the TicinO, and is remarkable as having one of the largest electric works in Europe, worked by water-power from the

Ticino brought by a canal 45 m. long, constructed in 3889-93 by the Societa. Lombarda per Distribuzione di Energia Elettrica. Gallarate, Sesto Calende, Saronno and other neighbouring places are supplied from here with electricity.

VLAARDINGEN, a river port of Holland, in the province of South Holland, on the Maas, 6 m. by rail W. of Rotterdam. Pop. 37,000. A very old town and the seat of a former mar- graviate belonging to the counts of Holland, Vlaardingen is now chiefly important as the centre of the great herring and cod fisheries of the North Sea. Its only ornaments are the old market-place and the gardens formed by the purchase in 182$

of a seat called the Hof . The chief industries are those connected with the large fishing trade.

VLACHS. The Vlach (Vlakh, Wallach) or Ruman race constitutes a distinct division of the Latin family of peoples, Distriba- widely disseminated throughout south-eastern Europe, ttonoi both north and south of the Danube, and extending tie Vlach sporadically from the Russian river Bug to the ”” ■ Adriatic The total numbers of the Vlachs may be

estimated at 10,000,000 or 11,000,000. North of the Danube, 5,400,000 dwell in Rumania; 1,250,000 are settled in Transyl- vania, where they constitute a large majority of the population; and a still greater number are to be found in the Banat and other Hungarian districts west and north of Transylvania. Close upon 1,000,000 inhabit Bessarabia and the adjoining parts of South Russia, and about 230,000 are in the Austrian province of Bukovina. South of the Danube, about 500,000 are scattered over northern Greece and European Turkey, under the name of Kutzo-Vlachs, Tzintzars or Aromani. ■ In Servia this element is preponderant in the Timok valley, while in Istria it is represented by the Cici, at present largely Slavon- ized, as are now entirely the kindred Morlachs of Dalmatia. Since, however, it is quite impossible to obtain exact statistics over so wide an area, and in countries where politics and racial feeling are so closely connected, the figures given above can only be regarded as approximately accurate; and some writers place the total of the Vlachs as low as 9,000,000. It is note- worthy that the Rumans north of the Danube continually gain ground at the expense of their neighbours; and even the long successful Greek propaganda among the Kutzo-Vlachs were checked after i860 by the labours of Apostolu Margaritis and other nationalists.

A detailed account of the physical, mental and moral characteristics of the Vlachs, their modern civilization and their historical develop- ment, will be found under the headings Rumania and Macedonia.

All' divisions of the race prefer to style themselves Romani, Romeni, Rumeni or Aromani; and it is from the native pro- nunciation of this name that we have the equivalent expres- sion Ruman, a word which must by no means be confined to that part of the Vlach race inhabiting the present kingdom of Rumania.

The name " Vlachs," applied to the Rumans by their neigh- bours but never adopted by themselves, appears under many

allied forms, the Slavs saying Volokh or Woloch, the

Greeks Vlachoi, the Magyars Oldh, and the Turks, at a later date, Iffidk. In its origin identical with the English Wealh or Welsh, it represents a Slavonic adaptation of a generic term applied by the Teutonic races to all Roman provincials during the 4th and 5th centuries. The Slavs, at least in their principal extent, first knew the Roman empire through a Teutonic medium, and adopted their term Volokh from the Ostro-Gothic equivalent of the Anglo-Saxon Wealh. It thus finds its analogies in the German name for Italy— Welschiand {WiUischland), in the Walloons o{ the Low Countries and the Wattgau of Tirol. A n early instance of its application to the Roman population of the Eastern empire is found (c. 550- 600) in the Traveller's Song, where, in a passage which in all probability connects itself with the early trade-route between the Baltic staple of Wollin and Byzantium, the gleeman speaks of Caesar's realm as Walaric, " Welshry." In verse 140 he speaks of the Rum-walas, and it is to be observed that Rum is one of the words by which the Vlachs of eastern Europe still know themselves.

The Vlachs claim to be a Latin race in the same sense as the Spaniards or Provencals — Latin by language and culture,

and, in a smaller degree, by descent. Despite the character. ' om ? predominance of Greek, Slavonic and Turkish

influence, there is no valid objection to this claim, which is now generally accepted by competent ethnologists. The language of the Vlachs is Latin in structure and to a great extent in vocabulary; their features and stature would not render them conspicuous as foreigners in south Italy; and that their ancestors were Roman provincials is attested not only

by the names " Vlach " and " Ruman " but also by popular and literary tradition. In their customs and folk-lore both Latin and Slavonic traditions

assert themselves. Of their Roman traditions the Trajan saga, the celebration of the Latin festivals of the Rosalia and Kalendae, the belief in the striga (witch), the names of the months and days of the week, may be taken as typical examples. Some Roman words connected with the Christian religion, like biserica (basilica) = a church, botes =baptizo, duminica = Sunday, preot {presbyter) = priest, point to a continuous tradition of the Illyrian church, though most of their ecclesiastical terms, like their liturgy and alphabet, were derived from the Slavonic. In most that concerns political organization the Slavonic element is also preponderant, though there, are words like impirai= imperator, and domn=dominus, which point to the old stock. Many words relating to kinship are also Latin, some, like vitrig (vitricus)= father-in-law, being alone preserved by this branch of the Romance family. But if the Latin descent of the Vlachs may be regarded as proven, it is far less easy to determine their place of origin and to trace their early migrations.

The centre of gravity of the Vlach or Ruman race is- at present unquestionably north of the Danube in the almost circular territory between the Danube, Theiss and Dniester; /<» and corresponds roughly with the Roman province orltfna. of Dacia, formed by Trajan in A.D. 106. From this home. circumstance the popular idea has arisen that the race itself represents the descendants of the Romanized population of Trajan's Dacia, which was assumed to have maintained an unbroken existence in Walachia, Transylvania and the neighbour provinces, beneath the dominion of a succession of invaders. The Vlachs of Pindus, and the southern region generally, were, on this hypothesis, to be regarded as later immigrants from the lands north of the Danube. In 1:871, E. R. Roesler published at Leipzig, in a collective form, a series of essays entitled Rom&nische Studied, in which he absolutely denied the claim of the Rumanian and Transylvanian Vlachs to be regarded as autochthonous Dacians. He laid stress on the statements of Vopiscus and others as implying the total withdrawal of the Roman provincials from Trajan's Dacia by Aurelian, in A.D. 272, and on the non-mention by historians of a Latin population in the lands on the left bank of the lower Danube, during their successive occupation by Goths, Huns, Gepidae, Avars, Slavs, Bulgars and other barbarian races. He found the first trace of a Ruman settlement north of the Danube in a Transylvanian diploma of 1222. Roesler's thesis has been generally regarded as an entirely new departure in critical ethnography. As a matter of fact, his conclusions had to a great extent been already anticipated by F. J. Sulzer in his Geschichte des Transolpinischen Daciens, published at Vienna in 1781, and at a still earlier date by the Dalmatian historian G. Lucio (Lucius of Trail) in his work De Segno Dalmatiae et Croatiae, Amsterdam, 1666.

The theory of the later immigration of the Rumans into their present abodes

north of the Danube, as stated in its most extreme form by Roesler, commanded wide acceptance, and in Hungary it was politically utilized as a plea for refusing parity of treatment to a race of comparatively recent intruders. In Rumania itself Roesler's views were resented as an attack on Ruman nationality. Outside Rumania they found a determined opponent in Dr J. Jung, of Innsbruck, who upheld the continuity of the Roman provincial stock in Trajan's Dacia, disputing from historic analogies the total withdrawal of the provincials by Aurelian; and the reaction against Roesler was carried still farther by J. L. Pic, Professor A. D. Xenopol of Jassy, B.'P. Hasdeu, D. Onciul and many other Rumanian writers, who maintain that, while their own race north of the Danube repre- sents the original Daco-Roman population of this region, the Vlachs of Turkey and Greece are similarly descended from the Moeso-Roman and Illyro-Roman inhabitants Of the pro- vinces lying south of the river. On this theory the entire Vlach race occupies almost precisely the same territories to-day as in the 3rd century.

On the whole it may be said that the truth lies between the two extremes. Roesler is no doubt so far right that after 272, and throughout the early middle ages, the bulk of the Ruman people lay south of the Danube. Pic's view that the population of the Roman provinces of Moesia and Illyria were Hellenized rather than Romanized, and that it is to Trajan's Dacia alone that we must look for the Roman source of the Vlach race, conflicts with what we know of the Latinizing of the Balkan lands from inscriptions, martyrologies, Pro- copius's list of Justinian's Illyrian fortresses and other sources. This Roman element south of the Danube had further received a great increase at the expense of Trajan's colonial foundation to the north when Aurelian established his New Dacia on the Moesian side of the river. On the other hand, the analogy supplied by the withdrawal of the Roman provincials from Riparian Noricum tells against the assumption that the official withdrawal of the Roman colonists of Trajan's Dacia by Aurelian entailed the entire evacuation of the Carpathian regions by their Latin speaking inhabitants. As on the upper Danube the continuity of the Roman population is attested by the Vici Romanisci of early medieval diplomas and by other traces of a Romanic race still represented by the Ladines of the Tirol, so it is reasonable to suppose a Latin-speaking population continued to exist in the formerly thickly colonized area embracing the present Transylvania and Little Walachia, with adjoining Carpathian regions. Even as late as Justinian's time (483-565), the official connexion with the old Dacian province was not wholly lost, as is shown by the erection or restoration of certain fortified posts on the left bank of the

lower Danube.

We may therefore assume that the Latin race of eastern Europe never wholly lost touch of its former trans-Danubian Early strongholds. It was, however, on any showing greatly

mlgrs- diminished there. The open country, the broad plains (tons. f w }, a t ; s now the Rumanian kingdom, and the Banat

of Hungary were in barbarian occupation. The centre of gravity of the Roman or Romance element of Ulyricum had now shifted south of the Danube. By the 6th century a large part of Thrace, Macedonia and even of Epirus had become Latin-speaking.

What had occurred in Trajan's Dacia in the 3rd century was consummated in the 6th and 7th throughout the greater part of the South-IUyrian provinces, and the Slavonic and Avar conquests severed the official connexion with eastern Rome. The Roman element was uprooted from its fixed seats, and swept hither and thither by the barbarian flood. Nomadism became an essential of independent existence, while large masses of homeless provincials were dragged as captives in the train of their conquerors, to be distributed in servile colonies. They were thus in many cases transported by barbarian chiefs- Slav, Avar and Bulgarian — to trans-Danubian and Pannonian regions. In the Acts of St Demetrius of Thessalonica (d. A.D. 306) we find an account of such a Roman colony, which, having been carried away from South-IUyrian cities by the Avar khagan (prince) , and settled by him in the Sirmian district beyond the Save, revolted after seventy years of captivity, made their way once more across the Balkan passes, and finally settled as an independent community in the country inland from Salonica. Others, no doubt, thus transported northwards never returned. The earliest Hungarian historians who describe the Magyar invasion of the 9th century speak of the old in- habitants of the country as Romans, and of the country they occupied as Pascua Romanorum; and the Russian Nestor, writing about 1100, makes the same invaders fight against Slavs and Vlachs in the Carpathian Mountains. So far from the first mention of the Vlachs north of the Danube occurring only in r222, as Roesler asserts, it appears frum a passage of Nicetas of Chonae that they were to be found abeady in 1164 as far afield as the borders of Galicia; and the date of a passage in the Nibelvngenlied, which mentions the Vlachs, under their leader Ramunc, in association with the Poles, cannot well be later than 1 200. Nevertheless, throughout the early middle ages the bulk of

the Ruman population lay south of the Danube. It was in the Balkan lands that the Ruman race and language took their characteristic mould. It is

here that this new Illyrian Romance first rises into historic prominence. Already in the 6th century, as we learn from the place-names, such as Sceptecasas, Bur- gualtu, Clisura, &c, given by Procopius, the Ruman language was assuming, so far as its Latin elements were concerned, its typical form. In the somewhat later campaigns of Com- mentiolus (587) and Priscus, against the Avars and Slavs, we find the Latin-speaking soldiery of the Eastern emperor making use of such Romance expressions as torna frate! (turn, brother!), or sculca (out of bed) applied to a watch (cf. Ruman a se culca = Italian coricarsi + ex-(s-) privative). Next we find this warlike Ruman population largely incorporated in the Bulgarian kingdom, and, if we are to judge from the names Paganus and Sabinus, already supplying it with rulers in the 8th century. The blending and close contact during this period of the surviving Latin population with the Slavonic settlers of the peninsula impregnated the language with its large Slavonic ingredient. The presence of an important Latin element in Albanian, the frequent occurrence of Albanian words in Rumanian, and the remarkable retention by both languages of a suffix article, may perhaps imply that both alike took their characteristic shapes in the same region. The fact that these peculiarities are common to the Rumans north of the Danube, whose language differs dialectically from that of their southern brothers, shows that it was this southern . branch that throughout the early periods of Ruman history was exer- cising a dominating influence. Migrations, violent trans- plantation, the intercourse which was kept up between the most outlying members of the race, in its very origin nomadic, at a later period actual colonization and the political influen:e of the Bulgaro-Vlachian empire, no doubt contributed, to propa- gate these southern linguistic acquisitions throughout that northern area to which the Ruman race was destined almost imperceptibly to shift its centre of gravity.

Byzantium, which had ceased to be Roman, and had become Romanic, renewed its acquaintance with the descendants of the Latin provincials of Illyncum through a Slavonic medium, and applied to them the name of Vlach, which the Slav himself had borrowed from the Goth. The first mention of Vlachs in a Byzantine source is about the year 976, when Cedrenus (ii. 439) relates the murder of the Bulgarian tsar Samuel's brother " by certain Vlach wayfarers," at a spot called the Fair Oaks, between Castoria and Prespa. From this period onwards the Ruman inhabitants of the Balkan peninsula are constantly mentioned by this name, and we find a series of political organiza- tions and territorial divisions connected with the name of Vlachia. A short synopsis may be given of the most important of these, outside the limits of Rumania itself .

1. The Bulgaro-Vlach Empire. — After the overthrow of the older Bulgarian tsardom by Basil Bulgaroktonos (976-1025), the Vlach population of Thrace, Haemus and the Moesian lands r- fwfc ˆ f passed

once more under Byzantine dominion ; and in ˆ

1 1 85 a heavy tax, levied in kind on the cattle of these y-,ˆ warlike mountain shepherds, stirred the Vlachs to revolt divisions. against the emperor Isaac Angelus, and under the leader- ship of two brothers, Peter and Asen, to found a_ new Bulgaro- Vlachian empire, which ended with Kalin.an II. in 1257. The dominions of these half-Slavonic half-Ruffian emperors extended north of the Danube over a great deal of what is now Rumania, and it was during this period that the Vlach population north of the river seems to have been most largely reinforced. The 13th- century French traveller Rubruquis speaks of all the country between Don and Danube as A sen's land or Blakia.

2. Great Walachia (Me-y6.\rj BXax&et). — It is from Anna Comnena, in the second half of the nth century, that we first hear of a Vlach settlement, the nucleus of which was the mountainous region of Thessaly. Benjamin of Tudela, in the succeeding century, gives an interesting account of this Great Walachia, then completely independent. It embraced the southern and central ranges of Pindus, and extended over part of Macedonia, thus including the region in which the Roman settlers mentioned in the Acts of St Demetrius had fixed their abode. After the Latin conquest of Constantinople in 1204, Great Walachia was included in the enlarged despotate of Epirus, but it soon reappears as an independent principality under its old name, which, after passing under the yoke

of the Serb emperor Dushan, was finally conquered by the Turks in 1393- Many of their old privileges were accorded to the in- habitants, and their taxes were limited to an annual tribute. Since this period the Megalovlachites have been largely Hellenized, but they are still represented by the flourishing Tzintzar settlements of Pindus and its neighbourhood (see Macedonia).

3. Little Walachiaitewpa. B\axia)was a name applied by Byzantine writers to the Ruman settlements of Aetolia and Acarnania, and with it may be included " Upper Walachia," or A-w/3Xaxa. Its inha- bitants are still represented by the Tzintzars of the Aspropotamo and the Karaguni (Blaqk Capes) of Acarnania.*

4. The Morlachs (Mavrovlachi) of the West. — These are already mentioned as Nigri Latini by the presbyter of Dioclea (c. 11 50) in the old Dalmatian littoral and the mountains of what is now Montenegro,

Herzegovina and North Albania. Other colonies ex- tended through a great part of the old Servian interior, where is a region still called Stara Vlaska or " Old Walachia." The great commercial staple of the east Adriatic shores, the republic of Ragusa, seems in its origin to have been a Ruman settlement, and many Vlach traces survived in its later dialect. Philippus de Diversis, who described the city as it existed in 1440, says that " the various officers of the republic do not make use either of Slav or Italian, with which they converse with strangers, but a certain other dialect only partially intelligible to us Latins," and cites words with strong Ruman affinities. In the mountains above Ragusa a number of Vlach tribes are mentioned in the archives of that city, and the original relationship of the Kagusans and the nomadic Alpine repre- sentatives of the Roman provincials, who preserved a traditional knowledge of the old lines of communication throughout the penin- sula, explains the extraordinary development of the Ragusan com- merce. In the 14th century the Mavrovlachi or Morlachs extended themselves towards the Croatian borders, and a large part of mari- time Croatia and northern Dalmatia began to be known as Morlacchia. A Major Vlachia was formed about the triple frontier of Bosnia, Croatia and Dalmatia, and a " Little Walachia " as far north as Pozega. The Morlachs have now become Slavonized (see Dalmatia).

5. Cici of Istria. — The extreme Ruman offshoot to the north-west is still represented by the Cici of the Val d'Arsa and adjoining Istrian districts. They represent a 15th-century Morlach colony from the Isles of Veglia, and had formerly a wider extension to Trieste and the counties of Gradisca and Gorz. The Cici have almost entirely abandoned their native tongue, which is the last remaining representative of the old Morlach t> and forms a connecting link between the Daco-Roman (or Rumanian) and the Illyro- or Macedo-Roman dialects.

6. Rumans of Transylvania and Hungary.~As already stated, a large part of the Hungarian plains were, at the coming of the Magyars in the uth century, known as Pascua Romanorum. At a later period privileged Ruman communities existed at Fogaras, where was a Silva. Vlachorum, at Marmaros, Deva, Hatzeg, Hunyad and Lugos, and in the Banat were seven Ruman districts. Tw r o of the greatest figures in Hungarian history, the 15th-century rulers John Corvinus of Hunyad and his son King Matthias, were due to this element. For its later history see Transylvania.

See, in addition to the books already mentioned, J. L. Pic, ttber die Abstammung der Rumdnen (Leipzig, 1880); A. D. Xenopol, Les Roumains aw moyendge (Jassy, 1886); B. P. Hasdeu, " Stratii si Substratu : Genealogia poporeloru balcanice," in Annalele Academiel, ser. II, vol. 14 (Bucharest, 1893); D. Onciul, " Romltnii in Dacia Trajana," &c, in

Enciclopedia Romdna, vol. iii. (Bucharest, 1902).

VLADIKAVKAZ, a town and fortress of Russia in northern Caucasia, the capital of the province of Terek. Pop. (1900) 49,924. It strnds on a plateau, at an altitude of 2345 ft., on both banks of the Terek, where that river issues from the Darial gorge. It is 434 m. by rail S.E. from Rostov-on-the-Don, and has regular communication with Tifiis (133 m.) by coach through the Darial Pass (Georgian military road) of the Caucasus. Moreover, a line of failway, running eastwards to the Caspian ports of Petrovsk ami Baku, connects Vladikavkaz, or rather the station Beslan, 14 m. N. of it, with the Transcaucasian railway, i.e. with Tifiis, Poti and Batum. Russians, Armenians and Jews constitute the bulk of the population, which also con- tains Ossetes, Chechens, Ingushes and others. There are dis- tilleries and a number of smaller factories. The fort, around which the town has grown up, was built in 1784. The town is an episcopal see of the Orthodox Greek Church.

VLADIMIR, ST (c. 956-1015), grand duke of Kiev and of all Russia, was the youngest son of Svyatoslav I. and his mistress Malushka. In 970 he received Great Novgorod as his apanage. On the death of Svyatoslav in 972, a long civil war took place between his sons Yaropolk and Oleg, in which Vladimir was involved. From 977 to 984 he was in Scandinavia, collect- ing as many of the viking warriors as he could to assist him

to recover Novgorod, and on his return marched against Yaro- polk. On his way to Kiev he sent ambassadors to Ragvald, prince of Polotsk, to sue for the hand of his daughter Ragnilda. The haughty princess refused to affiance herself to " the son of a bondswoman," but Vladimir attacked Polotsk, slew Ragvald, and took Ragnilda by force. Subsequently (980) he captured Kiev also, slew Yaropolk by treachery, and was proclaimed prince of all Russia. In 981 he conquered the Chervensk cities, the modern Galicia; in 983 he subdued the heathen Yatvyags, whose territories lay between Lithuania and Poland; in 985 he led a fleet along the central rivers of Russia to conquer the Bulgarians of the Kama, planting numerous fortresses and colonies on his way. At this time Vladimir was a thoroughgoing pagan. He increased the number of the irebishcha, or heathen temples; offered up Christians (Theodore and Ivan, the proto-martyrs of the Russian Church) on his altars; had eight hundred concubines, besides numerous wives; and spent his whole leisure in feasting and hunting. He also formed a great council out of his boyars, and set his twelve sons over his subject principalities. In the year 987, as the result of a consultation with his boyars, Vladimir sent envoys to study the religions of the various neighbouring nations whose representatives had been urging him to embrace their respective faiths. The result is amusingly described by the chronicler Nestor. Of the Mussul- man Bulgarians of the Volga the

envoys reported " there is no gladness among them; only sorrow and a great stench; theii religion is not a good one." In the temples of the Germans they saw "no beauty"; but at Constantinople, where the full festival ritual of the Orthodox Church was set in motion to impress them, they found their ideal. " We no longer knew whether we were in heaven or on earth, nor such beauty, and we know not how to tell of it." If Vladimir was impressed by this account of his envoys, he was yet more so by the offer of the emperor Basil II. to give him his sister Anna in marriage. In 988 he was baptized at Kherson in the Crimea, taking the Christian name of Basil out of compliment to his imperial brother-in-law; the sacrament was followed by his marriage with the Roman princess. Returning to Kiev in triumph, he converted his people to the new faith with no apparent difficulty. Crypto-Christians had been numerous in Kiev for some time before the public recognition of the Orthodox faith. The remainder of the reign of Vladimir was devoted to good works. He founded numerous churches, including the splendid Desya- tinnuy Sobor or " Cathedral of the Tithes " (989), established schools, protected the poor and introduced ecclesiastical courts. With his neighbours he lived at peace, the incursions of the savage Petchcnegs alone disturbing his tranquillity. His nephew Svyatpolk, son of his brother and victim Yaropolk, he married to the daughter of Boleslaus of Poland. He died at Berestova, near Kiev, while on his way to chastise the insolence of his son, Prince Yaroslav of Novgorod. The various parts of his dis- membered body were distributed among his numerous sacred foundations and were venerated as relics. The university of Kiev has rightly been named after the man who both civilized and Christianized ancient Russia. His memory was also kept alive by innumerable folk ballads and legends. With him the Varangian period of Russian history ceases and the Christian period begins.

See Memorials (Rus.) published by the Commission for the ex- amination of ancient documents (Kiev, 1881, &c); I. Komanin and M. Istomin, Collection of Historical Materials (Rus.) (Kiev, 1890, &c.) ; O. Partitsky, Scandinavianism in Ancient Russia (Rus.) (Lemberg, 1897); A. Lappo-Danilevsky, Scythian Antiquities (Rus.) (Petersburg, 1887); J. Macquart, Osteuropaische u. ostasia- tische Streifzuge (Leipzig, 1903) ; L. C. Goetz, Das Kiever Hohlen- kloster als Kulturzentrum des vormongolischen Russlands (Passau, I9°4)- (R- N. B.)

VLADIMIR, a government of middle Russia, bounded W. by the governments of Moscow and Tver, N. by Yaroslav and Kostroma, E. by Nizhuiy-Novgorod, S. by Tambov and Ryazan, with an area of 18,815 sq. m. It belongs to the eastern part of the central plateau of middle Russia, which has an average elevation of 800 to 950 ft., and is grooved by river valleys to a depth of

300 ft. to 450 ft. below the general level, so that the country has a hilly appearance.

The lacustrine depression of the middle Volga and Oka extends into the east of the government. The Upper Carboniferous lime- stones, of which it is mostly built up, are overlain by Permian sandstones towards the east, and patches of Jurassic clays— denuded remnants of formerly extensive deposits — are scattered over its surface. The whole is covered with a thick sheet of boulder clay, considered to be the bottom moraine of the North-European ice- sheet, and overlaid, in its turn, in the depressions, by extensive lacustrine clays and sands. The geology, especially of the western parts, has been investigated by Professor Nikitin, who has ascer- tained that under the Glacial and post-Glacial deposits — the lower strata of which contain remains 01 the mammoth and rhinoceros and the upper fossils of extensive prehistoric forests — occur Lower Cretaceous deposits and deposits intermediate between the Cre- taceous and the Jurassic ("Volga" deposits). Upper" Jurassic (Kellaway and Oxford) and Upper Carboniferous deposits are also found, and at Gorbatov Permian marls.

The soil is for the most part unfertile, save in the district of Yuriev, where are patches of black earth, which have occasioned a good deal of discussion among Russian geologists. Iron ore is widely diffused, and china clay and gypsum are met with in several places. Peat is of common occurrence. Forests cover extensive tracts in the south-east. The climate resembles that of Moscow, but is a little colder, and still more continental: the average yearly temperature at the city of Vladimir is 38 F. (Januarv, 16 ; July,

66.5).

The Oka flows through the government for 85 m., and is navigable throughout. Of its tributaries, the Klyazma is navigable to Kovrov, and even to Vladimir in summer; and timber is floated on the Teza. Small lakes are numerous; that of Pleshcheyevo or Pereyaslavl (5 m. in length) has historical associations, Peter the Great having there acquired in his boyhood his first experiences in navigation. The marshes extend to more than half a million acres.

The population was estimated in 1906 as 1,730,400. It is thoroughly Great Russian. The Finnish tribes, Muroma and Merya, which formerly inhabited the region, have been absorbed by the Slavs, as also have the Karelians,

who are supposed to have formerly inhabited the territory. The descendants of the few hundred Kare- lian families, which were settled by Peter the Great on the shores of Lake Pereyaslavl, still, however, preserve their own language. The government is divided into thirteen districts, the chief towns of which are Vladimir, Alexandrov, Gorokhovets, Kovrov, Melenki, Murom, Pereyaslavl Zalyeskiy, Pokrov, Shuya, Sudogda, Suzdal, Vyazniki and Yuriev Polskiy. Ivanovo-Voznesensk, Gusevsk and Kholui are important industrial towns. The zemstvos (district councils) make considerable efforts to foster education and improve the sanitary arrangements.

The soil is not very fertile, and the standard of agriculture is low, the inhabitants being largely engaged in. manufactures. In 1900 1,908,1200 acres (15.8% of the entire area) were under cereals. Cherries and apples are exported in considerable quantities.

The cultivation of flax, both for local manufactures and for export — especially about Melenki — is important ; so also is that of hemp. Natural pastures are numerous, and support large herds of cattle. The principal crops are rye, oats, wheat, barley and potatoes. The peasants hold 5,591,000 acres in communal owner- ship: of this 60% is arable land, 3,802,800 acres belong to private owners, 552,300 acres to the crown and 370,000 acres to the imperial family. The only important mineral is alabaster.

Vladimir ranks third among the governments of European Russia for manufactures. It has some 500 large factories, which employ over 100,000 persons (one-third women); the principal establish- ments are cotton, linen and silk mills, dye-works, and rope, paper, cardboard, oil, chemical, machinery, glass and iron works, tanneries and distilleries. Wood, coal, petroleum and peat are all used as fuel.

A distinctive feature of Vladimir is the great variety of petty trades carried on by peasants who still continue to cultivate their allotments. While in some villages almost all the male population leave their homes and travel all over Russia as carpenters, masons, iron-roof makers, or as oedlars or travelling merchants, other villages have their specialties in some branch of manufactured produce. Nearly 30,000 carpenters leave Vladimir every year. Whole .villages are engaged in painting sacred pictures or ikons; and although the ikons are sold at a shilling the hundred, the aggregate trade is valued at £150,000 a year; and the Vladimir (or rather Suzdal) pictures are sold all over Russia and the Balkan peninsula. In other villages some 1200 men are employed in making sickles, knives and locks. Wooden vessels, boxes and baskets, lapli (shoes made of lime-tree bark, which are worn in Great Russia and are produced by the million), wheels and sledges,

sieves, combs, woollen stockings and gloves, sheep-skins and sheep-skin gloves, felt, toys, earthenware, and all kinds of woven fabrics, are specialties of other villages. In these petty trades Vladimir occupies the first rank in Russia, the annual production being one-third of the total output for ihf A'hole country.

The movement of shipping on the Volga and its tributaries and sub-tributaries, the Oka, Klyazma and Teza. is considerable. The

principal ports are Murom on the Volga and Kovrov a'nd Vyazniki on the Klyazma. Timber, wood for fuel and manufactured goods are the chief exports.

Numbers of Palaeolithic stone implements, intermingled with bones of the mammoth and the rhinoceros, and still greater numbers of Neolithic stone implements, have been discovered. There are a great number of burial-mounds belonging to the Bronze and Iron periods, and containing decorations in amber and gold; nearly 2000 such burial-mounds are scattered round Lake Pleshcheyevo, some of them belonging to the pagan period and some to the early Christian. Coins from Arabia, Bokhara, Germany and Anglo-Saxon lands are found in great quantities. (P. A. K. ; J. T. Be.)

VLADIMIR, a town of Russia, capital of the government of the same name known in history as Vladimir-on- the- Klyazma, to distinguish it from Vladimir in Volhynia. It is picturesquely situated on the Klyazma and Lybed, 118 m. by rail E.N.E. of Moscow. Pop. (1884) 18,420; (1900) 32,029. The city is an archiepiscopal see of the Orthodox Greek church. The Lybed divides it into two parts. Extensive cherry orchards occupy the surrounding slopes, and in each is a small watch-tower, with cords drawn in all directions to be shaken by the watcher when birds alight. The kreml stands on a hill and contains two very old cathedrals — the Uspenskiy (1150; restored in 1891), where all the princes of Vladimir have been buried, and the Dmitri- evskiy (1 197; restored in 1834-1835). Several churches date from the 12th century, including one dedicated to the Birth of Christ, in which St Alexander Nevski was buried. The " Golden Gate "— a triumphal gate surmounted by a church — was built by the grand duke Andrei Bogolyubskiy in 11 58.

Vladimir was founded in the 12th century. It first comes into notice in 1151, when Andrei Bogolyubskiy secretly left Vyshgorod — the domain of his father in the principality of Kiev — and migrated to the newly settled land of Suzdal, where he became (1137) grand prince of the principalities of Vladimir, Suzdal and Rostov. In 1242 the principality was overrun by the Mongols under Batu Khan, and he and his successors asserted their

suzerainty over it until 1328. During this period Vladimir became the chief town of the Russian settlements in the basin of the Oka, and it disputed the superiority with the new principality of Moscow, to which it finally succumbed in 1328. In the 14th century it began to decay.

VLADIMIR-VOLHYNSKIY, a town of Russia, in the govern- ment of Volhynia, 19 m. N.N.E. of the spot where the frontiers of Russia, Poland and Galicia meet and 300 m. W.N.W. of Kiev. Pop. (18S5) 8752; (1897) 9695, three-fourths Jews. Though not mentioned in the annals before 988, Vladimir was probably in existence in the 9th century under the name of Ladomir. In the 10th century it was the capital of the princi- pality of Volhynia. The Tatars and the Lithuanians destroyed it several times, but it always recovered, and only fell into decay in the 17th century. It was finally annexed to Russia after the first division of Poland (1772). The ruins in and near the town include remains of a church supposed to have been built by Vladimir, grand duke of Kiev, in the ioth-nth centuries, and of another built in 1160 by his descendant Mstislav. This latter was apparently very well built, and its length exceeded that of the temple of St Sophia at Kiev. The town contains a good archaeological museum.

VLADIVOSTOK, the chief Russian seaport and naval station on the Pacific Ocean, situated at the southern extremity (43 7′ N. and 131 55′ E.) of the Maritime Province, not far from the point where that government touches both Manchuria and Korea (Cho-sen). It is connected by rail with Khabarovsk (479 m. N.N.E.), the capital of the Amur region, and with Chita in Transbaikalia (1362 m.) via Ninguta, Kharbin, Tsitsikar and Khailar. Pep. (1900) 38,000. The town stands on Peter the Great Gulf, occupying the northern shore of one of its horn-like expansions, which the Russians have called the Golden Horn. The depth of the Eastern Bosporus ranges from 13 to 20 fathoms, and that of the Golden Horn from 5 to 13, the latter affording a spacious harbour. The hills are covered with forests of oak, lime, birch, maple, cork, walnut, acacia, ash, aspen, poplar, elm, apple, pear and wild cherry, with a rich undergrowth of the most varied shrubs. Excellent timber is supplied by

oak and cedar forests not far off. The climate, however, is severe, as compared with that of corresponding latitudes in Europe. Though standing in almost the same parallel as Marseilles, Vladivostok has an average annual temperature of only 40 F., and, although the gulf itself never freezes, a thin ice-crust forms along the shores in December and remains until April. The town has several handsome buildings, a monument to Admiral Nevelskiy (1897), a cathedral, a museum, an observa- tory, an Oriental institute (opened in 1890), professional schools, a naval hospital,

mechanical and naval works, steam saw-mills and flour-mills. The drawback of Vladivostok is that it has not, and cannot have, a well-developed hinterland, despite the great efforts which have been made by the Russian government to supply the Usuri region (to the north of Vladivostok) with Russian settlers. The town of Vladivostok was founded in 1860-1861, and from 1865 to 1900 was a free port.

VODENA (Turk, and Bulg. Voden, anc. Edessa, q.v.), a city of European Turkey, in the vilayet of Salonica, western Macedonia; at the source of the small river Bistritza, which flows east and south into Lake Yenijc, and on the railway from Salonica to Monastir. Pop. (1905) about 25,000, consisting of Turks, Slavs and Greeks. The town stands on a rocky height commanding views of Pindus and Olympus; the approaching slopes are richly wooded, and traversed by picturesque waterfalls, from which the name of Vodena (Slav. voda, water) is probably derived. Vodena is the see of a Greek archbishop, and possesses numerous churches and mosques, besides unimportant remains of Roman and Byzantine build- ings. It has manufactures of cotton, tobacco and leather, and a large trade in wine, silk cocoons and red pepper.

VODEYSHANKAR, GOWRISHANKAR (1805-1892), native minister of the state of Bhaunagar in Kathiawaj, Bombay, was born on the 21st of August 1805, of a family of Nagar Brahmins. He rose from being a revenue officer to be state minister in r847. His success in this capacity was such that on the death of the reigning chief, in 1870, he was appointed joint administrator in concert with a British official. The experiment was in every respect successful. Under the simple and economical forms used in native states, improvements suggested by British experience were introduced. The land revenue was based on a cash system, the fiscal and customs systems were remodelled and tree planting was encouraged. The town of Bhaunagar received the great boon of the Gowri- shankar Waterworks, on which six lakhs of rupees were spent. The Bhaunagar state also warmly pressed for railway com- munication with the continent of India, and thus began a movement which has spread a network of railway lines over the peninsula of Kathiawar. The British government re- warded these many services of Gowrishankar with the distinc- tion of C.S.I, in 1877. He helped to establish the Rajkumar College at Rajkot, for the education of native princes, and also the Rajasthanik Court, which, after settling innumerable dis- putes between the land-owning classes and the chiefs, has since been abolished. In 1879 Gowrishankar resigned office, and devoted himself to the study of the higher literature of that Vedanta philosophy which through his whole life had been to him a solace and a guide. In 1884 he wrote a work called 'Svartipanu- sandhan, on the union of the soul with Deity, which led to a letter of warm congratulation from Max Müller, who also published a short biography of him. In 1887 he put

on the robe of the Sanyasi or ascetic, the fourth stage, according to the Hindu Shastras, in the life of the twice-born man, and in this manner passed the remainder of his life, giving above ten hours each day to Vedantic studies and holy contemplation. He died, revered by all classes, in December 1892.

See Javerital U. Yajnik, Gowrishankar Udayashankar (Bombay,

1889).

VODKA, Vodki or Wodky, the Russian national spirituous beverage. Originally vodka was made almost entirely from rye, barley malt to the extent of 15 to 20% being used to effect saccharincaiion (see Spirits), but at the present day potatoes and maize are the staple raw materials from which

this spirit is manufactured, and, as a' rule, green rye malt is now used instead of barley. The distillation is conducted by means of live steam in a double still of the "patent " type. Vodka as manufactured contains from 90 to 96% of alcohol, but it is diluted, previous to retailing, to a strength of 60 to 40%. It is illegal to sell it with less than 40% of alcohol.

VOETIUS (Voet), GYSBERTUS (1588-1676), Dutch theo- logian, was born at Heusden, Holland. He studied at Leiden, and in i6ti became pastor of Blymen, whence in 1617 he returned to Heusden. In 1619 he played an influential part in the Synod of Dort, and in 1634 was made professor of theology and Oriental science at Utrecht. Three years later he "became pastor of the Utrecht congregation. He was an advocate of the extremest form of Calvinism against the Arminiaus; but his personal influence was good, and the city of Utrecht perpetuated his memory by giving his name to the street in which he had lived.

VOGEL, EDUARD (1820-1856), German traveller in Central Africa, was born at Krefeld on the 7th of March 1829. He studied mathematics and astronomy at Leipzig and Berlin, and in 1851 engaged in astronomical work in London. In 1853 he was chosen by the British government to take supplies to Heinrich Baith, then in the western Sudan; and Vogel met Barth at Kuka in Bornu (1854). During 1854 and 1855 he explored the countries round Lake Chad and the "upper course of the Benue. On the 1st of December 1855 he left Kuka for the Nile Valley, and nothing further was heard of him. Several search expeditions were organized to ascertain his fate and to recover his papers; it was not until 1873 that Gustav Nachtigal on reaching Wadai learnt that Vogel had been murdered in that

country in February 1856.

See Erinnerungen an einen Verschollenen (Leipzig, 1863), by Vogel's sister, E. Polko, and Der Afrikaforschcr Eduard Vogel (Hamburg, 1889).

VOGEL, SIR JULIUS (1835-1899), British colonial statesman, son of Albert Leopold Vogel, was born in London on the 24th of February 1835, was educated at University College school, London, and emigrated to Victoria during the exciting years which followed the discovery of goldfields there. He became editor of a newspaper at Maryborough, stood for the Legislative Assembly and was defeated, and in 1861 left Victoria, carried in the mining rush to Otago, New Zealand, where much gold had just been found. Settling in Dunedin, he bought a half-share in the Olago Daily Times, and was soon its editor and a member of the Otago Provincial Council. He made his paper the most influential in the colony, and was returned to tie House of Representatives. In 1866 he was head of the Otago Provincial Executive; by 1869 he had made his mark in the New Zealand parliament, and was treasurer in the ministry of Sir William Fox. Without delay he brought forward a scheme for the construction of trunk railways and other public works, the purchase of land from the Maori tribes, and the introduction of immigrants, all to be done with money borrowed in London. At that time New Zealand hardly contained a quarter of a million of white settlers, was exhausted by the ten years' struggle with the Maori, not then ended, and was depressed by the low price of her staple product, wool, and the abatement of a gold-fever. Yet Vogel's sanguine, energetic appeals and remarkable gift of persuasion induced the House of Assembly to adopt a modified version of his scheme. For the next six years he was the most powerful man in the colony. Millions were borrowed, railways were pushed on, immigrants — state and voluntary — streamed in. Lasting peace was made with the Maori, a telegraph line laid to Australia, a steam mail service secured across the Pacific to San Francisco; a government life insurance office, and a public trust office, were established, both of which proved useful and were well-managed. During a visit to London on the colony's financial business, Vogel succeeded in arranging for the in- scription of colonial loans at the Bank of England, an arrange- ment afterwards confirmed by the imperial parliament. In 1875 he was knighted.

In 1874 Vogel, until that time a supporter of the Provincial system, decided to abolish it. In this, with the aid of Sir E. W. Stafford and Sir H. A. Atkinson, he succeeded. In the struggle, however, he broke with many of his old allies, and in 1876 sud- denly quitted New Zealand to take the post

of agent-general in London. This he held until 1880, and while holding it nego- tiated a loan for five millions. Having become connected with certain public companies, and the New Zealand government objecting thereto, he had to resign his position. An attempt, too, which he made in 1880 to enter the House of Commons as Conservative member for Penryn was unsuccessful. In 1884 he returned to New Zealand, was at once elected to parliament, and formed a coalition ministry with the Radical leader, Sir R. Stout. They held office for three years, but though Vogel showed some of his old financial skill, they were not years of prosperity for the colony, or triumph for the government. A deficit, a rejected scheme of taxation and a crushing defeat at the polls ended Vogel's career as a minister. After a few months of failure as leader of an outnumbered Opposition he gave up the contest, left New Zealand for the last time, and for the last eleven years of his life lived quietly near London. Throughout his life he had from time to time to struggle with deafness, lameness and acute bodily pain, while an impul- sive, speculative nature led him once and again into financial difficulties. The persistency with which he faced trouble and embarrassment, the hopefulness he showed under stress of ill fortune, the sympathy and pleasantness of manner which won him friends at all times, were elements in his curious and interesting character no less remarkable than the fertility and imaginative power of his busy brain.

Vogel was among the pioneers of Imperial Federation; he would have extended Great Britain's influence in the Pacific Ocean had he been allowed. He was the first minister to secure the second reading of a Women's Franchise Bill in New Zealand. As long ago as 1874 he endeavoured to save the New Zealand forests from the reckless destruction by axe and lire which has since gone on. In 1889 a novel from his pen, Anno Domini 2000, was published, and reached a second edition. He died at East Molesey on the 13th of March 1899. His wife, who was the daughter of William Clayton, govetnment architect, New Zealand, two sons and a daughter survived him. Another son had been killed in the Matabele War in South Africa. VogeJ was a Jew of the Ashkenazi rite. (W. P. R.J

VOGHERA (anc. Iria), a town of Lombardy, Italy, in the province of Pavia, and 19 m. by rail S.S.W. of that city, 305 ft. above sea-level, on the Staffora (a tributary of the PoJ. Pop. (1901) 14,453 (town); 20,442 (commune). The fortifications erected by the Visconti in the middle ages have given place to shady promenades. The large church of San Lorenzo dates from the nth century, but was remodelled in the baroque style about the beginning of the 17th. The suppressed church of S. Ilario (Chiesa Rossa), so called from the red colour of the brick of which it is built, dates from the 10th century. The neighbourhood produces much silk, in which, as well as in com and wine, an active trade is carried on. The ancient Iria took its name from the river on which it was situated. It was on the road

from Placentia to Dertona, and was made a colony by Augustus (colonia Forum lulium Iriensium) .

VOGLER, GEORG JOSEPH (1740-1814), usually known as Abbe 1 or Abt (Abbot) Vogler, German organist and composer, was born at Pleichach in Wiirzburg on the 15th of June 1749. His father, a violin maker, while educating him in the Jesuit college, encouraged his musical talent, which was so marked that at ten years old he could not only play the organ well, but had also acquired a fair command of the violin and some other instruments. In 1771 he went to Mannheim, where he com- posed a ballet for the elector Karl Theodor, who sent him to Bologna in 1774 to study under the Padre Martini. Dis- satisfied with the method of that learned theorist, he studied for five months under Valotti at Padua, and afterwards pro- ceeded to Rome, where, having been ordained priest, he was admitted to the famous academy of Arcadia, made a knight of

the Golden Spur, and appointed protonotary and chamberlain to the pope.

On his return to Mannheim in 1755 Vogler was appointed court chaplain and second " maestro di cappella." He now established his first great music school. His pupils were devoted to him, but he made innumerable enemies, for the principles upon which he taught were opposed to those of all other teachers. He had invented a new system of fingering for the harpsichord, a new form of construction for the organ, and a new system of musical theory founded upon that of Valotti. Mozart condemned the fingering as " miserable," and many rumours to his discredit have survived to this day owing to Mozart's share in the prejudice felt against him. The proposed change in the construction of the organ consisted in simplifying the mechanism, introducing free-reeds in place of ordinary reed-stops, and substituting unisonous stops for the great " mixtures " then in vogue. The theoretical system, though professedly based upon Valotti's principles, was to a great extent empirical. Nevertheless, in virtue of a certain substratum of truth which seems to have underlain his new theories, Vogler undoubtedly exercised a powerful influence over the progress of musical science, and numbered among his disciples some of the greatest geniuses of the period.

In 1778 the elector removed his court to Munich. Vogler followed him thither in 1780, but, dissatisfied with the reception accorded to his dramatic compositions, soon quitted his post. He went to Paris, where after much hostility his new system was recognized as a continuation of that started by Rameau. His organ concerts in the church of St Sulpice attracted con- siderable attention. At the request of the queen, he composed the opera Le Patriolisme, which was produced before the court at Versailles. His travels were wide, and extended over Spain, Greece, Armenia, remote

districts of Asia and Africa, and even Greenland, in search of uncorrupted forms of national melody. In 1786 he was appointed "kapellmeister" to the king of Sweden, founded his second music school at Stockholm, and attained extraordinary celebrity by his performances on an instrument called the " orchestrion "—a species of organ in- vented by himself. 1 In 1790 he brought this instrument to London, and performed upon it with great effect at the Pantheon, for the concert-room of which he also constructed an organ upon his own principles. The abbe's pedal-playing excited great attention. His most popular pieces were a fugue on themes from the " Hallelujah Chorus," composed after a visit to the Handel festival at Westminster Abbey, and A Musical Picture for the Organ, by Knecht, containing the imitation of a storm.

From London Vogler proceeded to Rotterdam and the chief towns on the Rhine. At Esslingen he was presented with the " wine of honour," reserved for the use of sovereigns. At Frankfort he attended the coronation of the emperor Leopold II. He then visited Stockholm, and after a long residence there, interrupted by endless wanderings, once more established himself in Germany, where his compositions, both sacred and dramatic, received at last full credit. We hear of him at Berlin in 1800, at Vienna in 1804 and at Munich in 1806. While at Frankfort in 1807 he received an invitation from Louis I., grand duke of Hesse-Darmstadt, offering him the appointment of " kapellmeister," with the order of merit, the title of privy councillor, a salary of 3000 florins, a house, a table supplied from the duke's own kitchen, and other privileges, which deter- mined him to bring his wanderings at last to a close.

At Darmstadt he opened his third and most famous music school, the chief ornaments of which were Gansbacher, Weber and Meyerbeer, whose affection for their old master was un- bounded. One of Vogler's latest exploits was a journey to Frankfort in 1810, to witness the production of Weber's Sylvana. He continued to work hard to the last, and died suddenly of apoplexy at Darmstadt on the 6th of May 1814. He was a

1 Robert Browning's poem on " Abt Vogler extemporizingˆ on ao instrument of his own invention " has made his name familiar to I the literary public.

brilliant and accomplished performer, and an excellent if an eccentric teacher; but his own compositions have not survived.

VOGT, KARL CHRISTOPH (1817-1895), German naturalist and geologist, was born at Giessen on the 5th of July 1817. In 1847 he became professor of zoology at Giessen, and in 1852 professor of geology and afterwards also of zoology at Geneva, where he died on the 5th of May 1895. His earlier publications were on zoology; he dealt with the Amphibia (1839), Reptiles (1840), with Mollusca and Crustacea (1845) and more generally with the invertebrate fauna of the Mediterranean (1854).

His separate works include Im Gebirg und auf den Gletschern (1843); Physiologische Briefe (1845-46); Grundriss der Geologie (i860); and Lehrbuch der Geologie und Petrefactenkunde (2 vols., 1846-47; ed. 4, 1879). An English version of his Lectures on Man: his Place -in Creation and in the History of the Earth was published by the Anthropological Society of London in 1864.

VOGTLAND, or Voigtland, a district of Germany, forming the S.W. corner of the kingdom of Saxony, and also embracing parts of the principality of Reuss and of the duchies of Saxe- Altenburg and Saxe-Weimar. It is bounded on the N. by the principalities of Reuss, in the S.E. by Bohemia, and on the S.W. and W. by Bavaria. Its character is generally mountainous, and geologically it belongs to the Erzgebirge range. It is extremely rich in mineral ores — silver, copper, lead and bismuth. The name denoted the country governed for the emperor by a Vogt (bailiff or steward) , and was, in the middle ages, known as terra advocatorum. The Vogte are first met with in the country in the roth century, and the office shortly afterwards appears to have become hereditary in the princely line of Reuss. But this house was not in undivided possession, rival claims being raised from time to time; and after being during the middle ages a bone of contention between Bohemia, the burgraves of Nuremberg and the Saxon house of Wettin, it passed gradually to the Wettins, falling by the division of 1485 to the Ernestine branch of the family. The elector Augustus I. made it one of the circles of his dominions.

See Limmer, Geschichle des Vogtlandes (Gera, 1825-28, 4 vols.) ; Simon, Das Vagtland (Meissen, 1904) ; C. F. Collmann, Das Vogtland im Mittelaller (Greiz, 1892) ; and Metzner, Vogttdndische Wanderungen (Annaberg, 1902).

VOGul, EUGENE MELCHIOR, Comte de (1848-), French author, was born at Nice on the 25th of February 1848. He served in the campaign of 1870, and on the conclusion of the war entered the diplomatic service, being appointed suc- cessively attache to the legations at Constantinople and Cairo and secretary at St Petersburg. He resigned in 1882, and from 1893 to 1898 was deputy for Ardeche. His connexion with the Revue des deux mondes began in 1873 with his Voyage en Syrie el en Palestine, and

subsequently he was a frequent contributor. He did much to awaken French interest in the intellectual life of other countries, especially of Russia, his sympathy with which was strengthened by his marriage in 1878 with a Russian lady, the sister of General Annenkov. De Vogue was practically the first to draw French attention to Dostoievski and his successors. He became a member of the French Academy in 1 888.

His works include: Hisloires orienlales (1879); Portraits du siicle (1883); he Fits de Pierre le Grand (1884); Histoires d'hiver (1885); Le Roman russe (1886); Regards hisloriques et Ulleraires (1892); Caurs russes (1894); Devant le siicle (1896); Jean d' Agrhie (1898) ; Le Rappel des ombres (1900) ; Le Mailre de la mer (1903) ; Maxime Gorky (1905).

VOICE (Fr. voix, from Lat. vox) , the sound produced by the vibrations of the vocal cords, two ligaments or bands of fibrous elastic tissue situated in the larynx. It is to be distinguished from speech, which is the production of articulate sounds intended to express ideas. Many of the lower animals have voice, but none has the power of speech in the sense in which man possesses that faculty. There may be speech without voice, as in whispering, whilst in singing a scale of musical tones we have voice without speech. (See Song; and for speech see Phonetics; also the articles on the various letters of the alphabet.)

1. Physiological Anatomy. — The organ of voice, the larynx,

is situated in man in the upper and fore part of the neck, where it forms a well-known prominence in the middle line (see details under Respiratory System). It opens below into the trachea or windpipe, and above into the cavity of the pharynx, and it consists of a framework of cartilages, connected by elastic membranes or ligaments, two of which constitute the true vocal cords. These cartilages are movable on each other by the action of various muscles, which thus regulate the position and the tension of the vocal cords. The trachea conveys the blast of air from the lungs during expiration, and the whole apparatus may be compared to an acoustical contrivance in which the lungs represent the wind chest and the trachea the tube passing from the wind chest to the sounding body con- tained in the larynx. Suppose two tight bands of any elastic membrane, such as thin sheet india-rubber, stretched over the end of a wide glass tube so that the margins of the bands touched each other, and that a powerful blast of air is driven through the tube by a bellows. The pressure would so distend the margins of the membrane as to open the aperture and allow the air to escape; this would cause a fall of pressure, and the edges of the membrane would spring back by their elasticity to their former position; again the pressure would increase, and ˆgain the edges of the membrane would be dis- tended, and those actions would be so quickly repeated as to cause the

edges of the membrane to vibrate with sufficient rapidity to produce a musical tone, the pitch of which would depend on the number of vibrations executed in a second of time. In other words, there would be a rapid succession of puffs of air. The condensation and rarefaction of the air thus produced are the chief cause of the tone, as H. von Helmholtz has pointed out, and in this way the larynx resembles the siren in its mode of producing tone. It is evident also that the intensity or loudness of the tone would be determined by the amplitude of the vibrations of the margins of the membrane, and that its pitch would be affected by any arrangements effecting an increase or decrease of the tension of the margins of the membrane. The pitch might also be raised by the strength of the current of air, because, the great amplitude of the vibrations would increase the mean tension of the elastic membrane. With tones of medium pitch, the pressure of the air in the trachea is equal to that of a column of mercury of

1-2 3

Fig. i.

Fig. 2.

Fig. 1. — Cartilages and Ligaments of the Larynx, seen from the front; abt. half nat. size. I, epiglottis; 2, hyoid bone; 3, small cornu of hyoid bone; 4, middle thyro-hyoid ligament; 5, great cornu of h'yoid bone; 6, small nodules of cartilage (cartilago triticea)- 7, the lateral thyro-hyoid ligament; 8, left lamina or wing of thyroid cartilage; 9, cricoid cartilage; 10, lower cornu of thyroid cartilage; 11, part of cricoid united to the thyroid by the middle crico-thyroid ligament; 12, second ring of trachea. (From Krause.)

Fig. 2. — Cartilages and Ligament of Larynx, seen frombehind; half natural size. I, epiglottis; 2, lesser cornu of hyoid bone-; 3, greater cornu of hyoid; 4, lateral thyro-hyoid ligament; 5, car- tilago triticea; 6, upper cornu of thyroid; 7, thyro-epiglottic liga- ment; 8, cartilages of Santorini; 9, arytenoid cartilages; 10, left lamina of thyroid; 11, muscular process of arytenoid cartilage; 12, inferior cornu of thyroid; 13, first ring of trachea; 14, posterior membranous wall of trachea; 15, lamina of cricoid cartilage. (From Krause.)

160 mm.; with high pitch,. 020 mm.; and with notes of very high pitch, 945 mm. ; whilst in whispering it may fall as low

as that represented by 30 mm. of water. Such is a general

conception of the mechanism of voice.

The cartilages form the framework of the larynx. They consist

of three single pieces (the thyroid, the cricoid and the cartilage of the epiglottis) and of three pairs (two arytenoids, two cornicula laryngis or cartilages of Santorini, and two cunei- form cartilages or cartilages of Wris- berg), see figs. 1 and 2. The epiglottis, the cornicula laryngis, the cuneiform cartilages and the apices of the aryten- oids are composed of yellow or elastic fibro-cartilage, whilst the cartilage of all the others is of the hyaline variety, resembling that of the costal or rib cartilages. These cartilages are bound together by ligaments, some of which are seen in figs. 1 and 2, whilst the re- mainder are represented in fig. 3. The ligaments specially concerned in the pro- duction of voice are the inferior thyro-arytenoid ligaments, or true vocal cords. These are composed of fine elastic fibres attached behind to the anterior pro- jection of the base of the arytenoid

*Fig. 3.— Right Half of the cartilages, processus vocalis, 3 in fig. 3, Larynx, from a vertical g nd in ””> ? to . the middle ? f the ? n 5 Ie and slightly oblique sec- ˆ tWe – e , n th ° ™S S < * laminae ? f ˆe tion; abt tw2- thirds th ˆ ld ram !?F;, ˆhey are .pmrtically nat. size. 1, epiglottis; continuous with the lateral crico-thyroid*

2, arytenoid cartilage; laments 6 in fig. 3. .,..,,.

*3, processus vocahs of The cawˆ of the larynx is divided into arytenoid; 4, cricoid an u ˆ er and ˆu P °, rt ˆ n by J h , e cartilage; 5/ capsular J a “° w a Pf rtur e of the gloths or chink thyro-hyoid ligament; between the edges of the true vocal 6, lateral crico-thyroid 1 c ? rds ‘ ˆ r l ma **>«<«• Immediately ligament; 7, posterior ? bove th . e £ w (vocal cords between crico-thyroid ligament; * hese and the false vocal cords, there 8, inferior thyro-aryten- J s on . <» ch Slde . , a "« ss or P ouc1 } oid ligament, or true term ? d t f he ventn i le of Morgagm, and vocal cord; 9, thvroid °Pf. mn S . rom each ventricle there is a cartilage; 10, superior st {!! J maI!er r f eces ** the ˆryngeal pouch thvro-arytenoid ˆiga- ™ h * ch P ass f s for th e, s P ace of half an inch me'nt, or false vocal »*ween the superior vocal cords 111- cord; n, thyro-ary- side and the thyroid cartilage outside epiglottideus muscle; If? 1 "!?, 8 hl 8 h as . thc upper border of 12, middle thyro-hyoid that ;. can ' a S e at ft e side ?** aperture of the glottis is smaller cornu of hvoid J”??? ilar, wide in front and narrow bone. (From Krause.) benind : and, when seen from above by*

means or the laryngoscope, it presents the view represented in fig. 4. The aperture is bounded in front by the epiglottis, e, behind by the summits of

*the arytenoid carti- lages, ar, and on the sides by two folds of mucous membrane, the aryteno-epiglottic folds, ae. The rounded elevations corresponding to the cornicula laryngis and cunei- form cartilages, c, and also the cushion of the epiglottis, e, are readily seen in the laryngoscopic picture. The *" glottis, o, is seen in the form of a long narrow fissure, bounded by the ~ti true vocal cords, ii t whilst above them we have the false vocal cords, is, and between the true and fake _ T . ,.. cords the opening of the ventricle, v.*

*r 4— Laryngoscopic View The rima glottidis, between the true of the Glottis. ./, tongue ; vocal cords, in the adult male mea- *, epiglottis; Ac, pharyngo- sures about 23 mm., or nearlv an epiglottic fold; g, pha- inch from before backwards, ' and ryngo-laryngeal groove; from fi to 12 mm. across its widest aˆ,aryteno-epiglottic fold; part, according to the degree of c, cuneiform cartilage; or dilatation. In females and in males cartilage of Wrisberg ; before puberty the antero-posterior ar, arytenoid cartilage ; diameter is about 17 mm. and its r, inter-arytenoid fold; transverse diameter about 4 mm. o, glottis; v, ventricle; The vocal cords of the adult male H, inferior or true vocal are in length about 15 mm., and cord; fc, superior or false of the adult female about n mm. vocal cord. (From Mandl.) The larynx is lined with a layer of epithelium, which is closely adherent to underlying structures, more especially over the true vocal cords. The cells of the epithelium, in the greater portion of the larynx, are of the columnar ciliated variety, and by the vibratory action of the cilia mucus is driven upwards, but over the true*

vocal cords the epithelium is squamous. Patches of squamous epithelium are also found in the ciliated tract above the glottis, on the under surface of the epiglottis, on the inner surface of the arytenoid cartilages, and on the free border of the upper or false cords. Numerous mucous glands exist in the lining membrane of the larynx, more especially in the epiglottis. In each laryngeal pouch there are sixty to seventy such glands, surrounded by fat.

We are now in a position to understand the action of the muscles of the larynx by which the vocal cords, forming the rima glottidis, can be tightened or relaxed, and by which they can be approximated or separated. Besides certain extrinsic muscles — sterno-hyoid, omohyoid,

sterno-thyroid and thyro-hyoid — which move the larynx as a whole, there are intrinsic muscles- -which move the cartilages on each other. Some of ' these are seen in fig. 5. These muscles are (a) the crico-thyroid, {b) the pos-« terior crico-arytenoid, (c) the lateral crico-arytenoid, (d) the thyro-ary tenoid, .. v. (e) the arytenoid,, and (f) the aryteno- epiglottidean. Their actions will be X3 -ˆ readily understood with the aid of thej 2 .. diagrams in fig. G. (1) The crico-thyroid is a short thick triangular muscle, itsU'"*

fibres passing from the cricoid cartilage obliquely upwards and outwards to be inserted into the lower border of the thyroid cartilage and to the outer . border of its lower horn. When the – muscle contracts, the cricoid and thyroid cartilages are approximated. In this action, however, it is not the thyroid that is depressed on the cricoid, as is generally stated, but, the thyroid being fixed in position by the action of the extrinsic muscles, the anterior border of the cricoid is drawn upwards, whilst its posterior border, in conse- quence of a revolution around the axis uniting the articulations between the lower cornua of the cricoid and the thyroid, is depressed, carrying the ary- tenoid cartilages along with it. Thus the vocal cords are stretched. (2) The ihyro-arytenoid has been divided by anatomists into . two parts— one, the internal, lying close to the true vocal cord, and the other, external, imme- diately within the ala of the thyroid cartilage. Many of the fibres of the anterior portion pass from the thyroid cartilage with a slight curve (concavity inwards) to the processus vocalis at the base of the arytenoid cartilage. They are thus parallel with the true vocal cord, and when they contract the ary- tenoids are drawn forwards, carrying with them the posterior part of the cricoid and relaxing the vocal cords. Thus the thyro-arytenoids are the antagonists of the crico- thyroids. K. F. W. Ludwig has pointed out that certain fibres (portio- ary-vocalis) arise from the side of the cord itself and pass obliquely back to the processus vocalis. These will tighten the parts of the cord in front and relax the parts behind their points of attachment. Some of the fibres of the outer portion run obliquely upwards from the side of the cricothyroid membrane, pass through the antero-posteriot fibres of the inner portion of the muscle, and finally end in the tissue of the false cord. These fibres have been supposed to render the edge of the cord more prominent. Other fibres inserted into the processus vocalis will rotate slightly the arytenoid outwards, whilst a few passing up into the aryteno-epiglottidean folds may assist in depressing the epiglottis (Quain). (3) The posterior and lateral crico-arytenoid muscles have antagonistic actions, and may be con- sidered together. The posterior arise from the posterior surface of the cricoid cartilage, and passing upwards and outwards are attached to the outer angle of the base of the arytenoid. On the other hand, the lateral arise from the upper border of the cricoid as far back as the articular surface for the arytenoid, pass backwards and upwards, and are also inserted into the outer angle of the base of the arytenoid before the attachment of the posterior crico-arytenoid. Imagine the pyramidal form of the arytenoid cartilages. To the inner angle of tne triangular base are attached, as already described, the true vocal cords; and to the outer angle the two muscles in question. The posterior crico-arytenoids draw the outer angles backwards and inwards, thus rotating the inner angles, or processus vocalis, out- wards, and, when the two muscles act, widening the rima glottidis. This action is opposed by the lateral crico-thyroids, which draw the outer angle forwards and outwards, rotate the

inner angles inwards,

, Fig. 5. — Muscles of the left side of the larynx, seen from within; abt. two- thirds nat. size. 1, hyo- epiglottic ligament, seen in profile; 2, epiglottis; 3, aryteno – epiglottic muscle ; 4, Santorini's cartilage; 5, oblique ary- tenoid muscle; 6, trans- verse arytenoid muscle, seen in profile; 7, pos- terior crico – arytenoid ;

8 , lateral crico-ary te noid ;

9, lower cornu of thyroid cartilage t cut through ;

10, insertion of posterior portion of crico-thyroid muscle; 11, left lamina of thyroid cartilage cut through; 12, long thyro- epiglottic muscle (a var- iety) ; 13, inferior thyro- arytenoid ; 14, thyro- epiglottic; 15, superior thyro – arytenoid; 16, median thyro-hyoid liga- ment. (From Krause.)

and thus approximate the cords. (4) The arytenoids pass from the one arytenoid cartilage to the other, and in action these cartilages will be approximated and slightly depressed. (5) The aryteno-epi- dollidean muscles arise near the outer angles of the arytenoid ; their fibres pass obliquely upwards, decussate and are inserted partly into

Fig. 6. — Diagrams explaining the action of the muscles of the larynx. The dotted lines show the positions taken by the cartilages and the true vocal cords by the action of the muscle, and the arrows show the general direction in which the_ muscular fibres act. A, Action of crico-thyroid : 1, cricoid cartilage; 2, arytenoid cartilage; 3, thyroid cartilage; 4, true vocal cord; 5, thyroid cartilage, new position ; 6, true vocal cord, new position. B, Action of arytenoid :

1, section of thyroid; 2, arytenoid; 3, posterior border of epi- glottis; 4, true vocal cord; 5, direction of muscular fibres; 6; arytenoid, new position; 7, true vocal cord, new position. C, Action of lateral erico-arytenoid ; same description as for A and B; 8, posterior border of epiglottis, new position; 9, arytenoid

.. in new position. D, Action 01 posterior crico-arytenoid; same description. (From Beaunis and Bouchard.)

the outer and upper border of the opposite cartilage, partly into the aryteno-epiglottic fold, and partly join the fibres of the thyro- arytenoids.

In action they assist in bringing the arytenoids together, whilst they also draw down the epiglottis, and constrict the upper aperture of. the larynx. The vocal cords will be also relaxed by the elasticity of the parts.

2. Physiology of Voice Production. — The vocal cords are tightened by the action, of the cricothyroid, or, as it might Muscular be more appropriately termed, the thyro-cricoid median- muscle. It stretches the thyro-arytenoid ligaments, Jims. tne j ree ec jg es f which, covered by mucous membrane, form the vocal cords. The adductors of the cords are the lateral cricoarytenoids, while the posterior cricoarytenoids are the abductors. The arytenoid muscle brings the cords together. Many of the fibres of the thyro-arytenoid are inserted obliquely into the sides of the cord, and in contraction they tighten the cord by pulling on the edge and making it curved instead of straight. Some such action is indicated by the elliptical shape of the rima glottidis in passing from the chest register to the middle register. Other fibres, however, running parallel with the cord may tend to relax it in' certain circum- stances. All the muscles except the thyro-cricoid (which is innervated by the superior laryngeal) receive nerve filaments from the inferior laryngeal branch of the vagus, the fibres being derived from the accessory roots. Both the abductor and adductor nerves come therefore from the inferior laryngeal. When an animal is deeply anaesthetized stimulation of the inferior laryngeal nerve causes abduction of the cord, but if the anaesthesia is slight, then we have adduction. The tonic contraction of the abductors is stronger than that of the adductors, so in a state of rest the glottis is slightly open. The centre of innervation is in the medulla oblongata, and this is dominated by a centre in the Rolandic region of the cerebral cortex.

The intensity or loudness of voice depends on the amplitude

Qenerat physio- lexical char- acters.

of the movement of the vocal cords. Pitch depends on the number of vibrations per second; and the length, size and degree of tension of the cords will determine the number of vibrations. The more tense the cords the higher the pitch, and the greater the length of the cords the lower will be the pitch. The range of the human voice is about three octaves — that is, from fai (87 vibrations per second) to soL. (768 vibra- tions). In men, by the development of the larynx, the cords become more elongated than in women, in the ratio of 3 to 2, so that the male voice is of lower pitch and is usually stronger. At the age of puberty the larynx grows rapidly, and the voice of a boy "breaks" in consequence of the lengthening of the cords, generally falling an octave in pitch. A similar change, but very much less in amount, occurs at the same period in the female. At puberty in the female there is an increase of about one-third in the size of the glottis, but it is

nearly doubled in the male, and the adult male larynx is about one-third greater than that of the female. In advanced life the upper notes of the register are gradually weakened and ultimately disappear, whilst the character of the voice also changes, owing to loss of elasticity caused by ossification, which first begins about middle life in the thyroid cartilage, then appears in the cricoid, and much later in the arytenoid. Eunuchs retain the voices of childhood; and by careful train- ing it is possible in normal persons to arrest the development of the larynx so that an adult male can still sing the soprano parts sometimes used in cathedral choirs. The ranges of the different varieties of voice are shown in the following diagram, where the dotted lines give the range of certain remarkable voices, and the figures represent vibrations per second, taking the middle C of the piano as 256 vibrations per second.

doa sis la.

Boll fa.

mil

la, sol< fai mil

la, Sola

fa.

2048. Upper note of Lucrezia Ajugari

T365. Upper note of Nilsson in // Plaulv Magic 1 this note.

1 152. Ajugari trilled o

1024.

lai soli fa,

la- sol- fa-

341-

288.

256.

240.

MidC

in

piano.

IQ2.

l6o.

128.

I06.

S 7 – .

Bass.

Soprano.

Mezto-aapnao.

Ajugari.'

Sessi, ai octavCs.

Farinelli, $i octaves.

Gaspard Foreter, 3 octaves. 32. Beginnbgof musical tone.

A basso named Gaspard Forster passed from fa_ x to la 3 ; the younger of the sisters Sessi had a contralto voice from doj to fa 6 ; the voice of Catalani ranged three and a half octaves; a eunuch singer, Farinellij passed from lai to re^; Nilsson, in // Flauto Magicif, could take fa s ; and Mozart states that he heard in Parma in 1770 a singer, Lucrezia Ajugari, range from sola to doe, which she gave purely, whilst she could execute trills on re 6 . The latter is the most highly pitched voice referred to in musical literature, an octave and a half above the highest ordinary soprano. It will be observed that the lowest note of Gaspard Forster's voice is not much above the pitch at which

the perception of musical tone begins, and that from this note to the upper note of Lucrezia Ajugari there is a range of nearly six octaves, whilst the extreme range of ordinary voices, from the lowest bass to the highest soprano, is a little over three octaves. It is also interesting to observe that

the range of the human ear for the perception of musical tone is from do_ t to doio, or from about 32 to 32,768 vibrations per second- eleven octaves.

3. The Voice Registers. — The voice has been divided by writers into three registers — the lower or chest, the middle and the small or head register. In singing, the voice changes in volume and in quality in passing from one register into another. There is remarkable diversity of opinion as to what happens in the larynx in passing through the various registers. There has also been much discussion as to the production of falsetto tones. Lehfeldt and Johannes Muller held that a weak, blast of air caused only a portion of the cords, as regaris length, to vibrate; M. J. Ortel noticed that when a falsetto tone is produced nodal lines are formed in the cords parallel to their edges, an observation supporting the first contention; M. Garcia was of opinion that as the voice rose in pitch into falsetto only the ligamentous edges of the cords vibrated; and W. R. E. Hodgfcinson showed, by dusting finely powdered indigo into the larynx and observing the blue specks with the laryngoscope, that " in the deeper note of the lower register the vibrating margin extended from the thyroid carti- lage in front to a point behind the junction of the ligamentous and cartilaginous portions of the cord." In singing falsetto tones these additional parts are not thrown into action. Some remarkable and instructive photographs obtained by French show that in proceeding from the lowest to the highest notes of the lower register the cords became lengthened by one-eighth of an inch in a contralto singer's larynx; the same singer, in passing into the middle register, showed a shortening of the cords by one-sixteenth of an inch, and another increase in length when the upper part of the middle register was reached.

4. Condition of the Larynx in the Various Registers. — In singing, one can readily observe that the tone may appear to come chiefly from the chest, from the throat or from the head, or it may show the peculiar quality of tone termed falsetto. Authorities differ much in the nomenclature applied to these varieties of the voice. Thus the old Italian music masters spoke of the voce di petto, voce di gola and voce di testa. Madame Seiler describes five conditions, viz. the first series of tones of the chest register, the second series of tones of the chest register, the first series of tones of the falsetto register, the second series of tones of the falsetto register, and the head register. French writers usually refer to two registers only, the chest and the head; whilst Behnke gives three registers for male voices (lower thick, upper thick and upper thin) and five for the voices of women and children (lower thick, upper thick, lower thin, upper thin and small). These distinctions are of more import- ance practically than as implying any marked physiological differences in the mechanism of the larynx during the pro- duction of the tones in the different registers. By means of the laryngoscope it is possible to see the condition of the rima glottidis and the cords in passing through all the range of the voice.

In 1807 Bozzini First showed that it was possible to see into the dark cavities of the body by illumining them with a mirror, and in 1829 W. Babington first saw the glottis in this way. In 1854 Garcia investigated his own larynx and that of other singers, and three years later Tiirck, and especially J. N. Czermak, perfected the construction of the laryngoscope. In 1883 Lennox Browne and Emil Behnke obtained photographs of the glottis in the living man. The laryngoscope is a small mirror, about the diameter of a shilling, fixed to the end of a long handle at an angle of 125 to 130 . This mirror is gently pushed towards the back of the throat, and if sufficient light be thrown into the mouth from a lamp, and if the eye of the observer be in the proper position, by angling the small mirror it is not difficult to get a view of the glottis. The light fromthe lamp is reflected by the mirror down on the glottis; from this it is reflected back to the mirror, and then by the mirror it is finally reflected to the eye of the observer. Usually the observer has in front of his eye a mirror by which a powerful beam of light

can be thrown from a lamp into the mouth and throat. In the centre of the mirror there is a small hole through which the eye of the observer sees the image in the small mirror at the back of the throat. By placing a second plane mirror in front of the face, an observer can easily study the mechanism of his own larynx.

Suppose the picture of the larynx to be examined in the small mirror at the back of the throat, an image will be seen as in fig. 4. During calm breathing, the glottis is lance-shaped, between the yellowish white cords. A deep inspiration causes the glottis to open widely, and in favourable circumstances one may look into the trachea. When a sound is to be made, the vocal cords are brought close together, either along their whole length, as in fig. 7, or only along the ligamentous portion, the space between the arytenoids being still open, as in fig. 8. Then when the sound begins the

Fig. 7. Fig. 8.

Fig. 7. — Arrangement of Glottis previous to Emission of a Sound.

b, epiglottis; rs, false cord; ri, true vocal cord; ar, arytenoid

cartilages. (From Mandl.) Fig. 8. — Closure of the Ligamentous Portion of Glottis, b, epiglottis ;

rs, false cord ; ri, true vocal cord ; or, space between arytenoids ;

ar, arytenoid cartilages; c, cuneiform cartilages; rap, ary-epiglottic

fold; ir, inter-arytenoid fold. (From Mandl.)

glottis opens (fig. 4), the form of the opening influencing the kind of voice, whilst the degree of tension of the cords will determine the pitch.

During inspiration the edges of the true vocal cords may occa- sionally be close together, as in sobbing, and during inspiration the false cords are easily separated, even when they touch, and during expiration, owing to dilatation of the ventricles, they come together, and may readily close. Thus, from the plane of the cords, the true cords are most easily closed during inspiration and the false cords during expiration. J. Wyllie clearly showed in 1865 that the false vocal cords play the chief part in closure of the glottis during expiration. Lauder Brunton and Cash have confirmed J. WylHe's results, and have shown further that the function of the false cords is to close the glottis and thus fix the thorax for muscular effort.

During the production of the chest voice, the space between the arytenoid cartilages is open, and between the vocal cords there is an ellipsoidal opening which gradually closes as the pitch of the sound rises (see figs. 9, 10, 11). During head voice, the opening between

Fig. 9. Fig. 10.

Fig. 9. — Chest Voice, Deep Tone, b, epiglottis; or, glottis; rs, false

vocal cord; ri, true vocal ccrd; rap, ary-epiglottidean fold; ar,

arytenoid cartilages. (From Mandl.) Fig. 10. — Chest Voice, Medium Tone, or/, ligamentous portion of

glottis; ore, portion of glottis between arytenoids; remaining

description as in fig. 7. (From Mandl.)

the arytenoids is completely closed ; the portion between the vocal cords is open, but in place of being almost a narrow straight slit as in chest voice, it is wide open so as to allow an escape of more air (see fig. 12). Paralysis of the motor fibres causes aphonia, or loss of voice. If one cord is paralysed the voice may be lost or become falsetto in tone. Sometimes the cords may move in breathing or during coughing, but be motionless during an attempt at the pro- duction of voice- Rarely, incomplete unilateral paralysis of the recurrent nerve, or the existence of a tumour on each cord, thus making them unequal in length, may cause a double tone, or diphthongia. Hoarseness is caused by roughness or swelling of the cords.

5. The quality of the human voice depends on the same laws that determine the quality, clang-tint or timbre of the- tones produced by any musical instrument. Musical tones are formed by the vibrations of the true vocal

cords. These tones may be either pure or mixed, and in both cases they are

strengthened by the resonance of the air in the air-passages and in the pharyngeal and oral cavities. If mixed— that is,

Fig. 11

Fig. 12.

Fig. 11. — Ghest Voice, High Tone. Description same as for figs. 7

and 8. (From Mandl.) Fig. r2. — Head Voice. Deep Tones. I, tongue; e, epiglottis;

Pe, pharyngo-epiglottidean folds; ae, ary-epiglottic folds; rs,

false cords; ri, true vocal cords; g, pharyngo- laryngeal groove;

ar, arytenoid cartilages; c, cuneiform cartilages; 0, glottis;

r, inter-arytenoid folds. (From Mandl.)

if the tone is compounded of a number of partials — one or more of these will be strengthened by the cavities above the cords acting as a resonator; and so strongly may these partials be thus reinforced that the fundamental one may be obscured, and a certain quality or timbre will be communicated to the car. Further, Helmholtz has shown that special forms of the oral cavity reinforce in particular certain partials, and thus give a character to vowel tones, — indeed to such an extent that each vowel tone may be said to have a fixed pitch. This may be proved by putting the mouth in a certain form, keep- ing the lips open, and bringing various tuning forks sounding feebly in front of the opening. When a fork is found to which the resonant cavity of the mouth corresponds, then the tone of the fork is intensified, and by thus altering the form and capacity of the oral cavity its pitch in various conditions may be determined. Thus, according to Helmholtz, the pitch corresponding to the vowels may be expressed: —

Vowels . . . OU O A AI E I EU U

Tone . . . ta.2 sib3 si[?4 soU si!? 6 ree do& sol&

cr or or or or

re fa 3 fa 2 fa 3 is.2*

No. of vibrations . 170 470 940 1536 1920 2304 1024 1536

or or or or or

576 341 170 341 170

R. Kocnig has fixed the pitch of the vowels differently, thus:

Vowels . . OU O A EI

Tone sib sit» 3 sib* sii>H sif> 6*

No. of vibrations . 235 470 940 1880 3760

F. C. Donders has given a third result, differing from each of the above; and there is little doubt that much will depend on the quality of tone peculiar to different nationalities. By means of Koenig's manometric flames with revolving mirror the varying quality of tone may be illustrated: with a pure tone, the teeth in the flame-picture are equal, like the serrations of a saw, whilst usually the tone is mixed with partials which show themselves by the unequal serrations. Thus quality of voice depends, not merely on the size, degree of elasticity and general mobility of the vocal cords, but also on the form of the resonating cavities above, and very slight differences in these may produce striking results.

6. Vowel Tones. — A vowel is a musical tone produced by the vibrations of the vocal cords. The tone produced by the vocal cords is a mixed one, composed of a fundamental and partials, and certain of the partials are strengthened by the resonance of the air in the air-passages and in the pharyngeal and oral cavities. In this respect the quality of the human voice depends on the same laws as those determining the quality or timbre of the tones produced by any musical instruˆment. The pitch of the note of a musical instrument, however, depends on the pitch of the first or fundamental tone, while the partials are added with greater or less intensity so as to

give a special character £0 the sound; and in the case of a vowel tone the pitch does not appear to depend on that of the fundamental tone but on the pitch of the resonance cavity, as adjusted for the sounding of any particular vowel. When we wish to pronounce or sing a vowel the oral cavity must be adjusted to a certain form, and it is only when it has that form that the vowel can be sounded. The nature of vowel tones has been investigated by means of the phono- graph by Fleeming Jenkin and Ewing, L. Hermann, Pipping, Boeke, Lloyd, McKendrick and others. E. W.

Scripture has worked with the gramophone. These observers may be ranged in two divisions — those who uphold the theory of relative as opposed to those who contend for the theory of fixed pitch. Assuming that a vowel is always a compound tone, composed of a fundamental and partials, those who uphold the relative pitch theory state that if the pitch of the fundamental is changed the pitch of the partials must undergo a relative change, while their opponents contend that whatever may be. the pitch of the tone produced by the larynx, the pitch of the partials that gives quality or character to a vowel is always the same, or, in other words, vowel tones have a fixed pitch. Helmholtz held that all the partials in a vowel tone were harmonic to the fundamental tone, that is that their periods were simple multiples of the period of the fundamental tone. Hermann, however, has conclusively shown that many of the partials are inharmonic to the fundamental. This practically upsets the theory of Helmholtz. The methods by which this problem can be investigated are mainly two. The pitch of the oral cavity for a given vowel may be experimentally determined, or an analysis may be made of the curve-forms of vowels on the wax cylinder of the phonograph or the disk of the gramo- phone. By such an analysis, according to Fourier's theorem, the curve may be resolved into the partials that take part in its formation, and the intensity of those partials may be thus determined. The observations of Donders, Helmholtz, Konig and others as to the pitch of the resonating cavities gave different results. Greater success has followed the attempts made by Hermann, Boeke, McKendrick, Lloyd and Marichelle to analyse the curves imprinted on the phonograph. (Examples of such phonograms are given by McKendrick in the article on "Vocal Sounds" in Schafer's Physiology, ii. 1228; see also Phonogkaph.)

The following is an instructive analysis by Boeke of the curves representing the tones of a cornet, and it illustrates the laws that govern the production of quality in such an instrument : —

Note .. 183456789 10 Partials.

/ =i7ovibs. . 1 1 -os 122 1-15 1-01 0-S0 0-53 0-28 0-13 0-10

c' =256 „ . 1 092 081 0-53 6-39 0-20 007 0-04 0-06 0-04

g' =.384 ,, . 1 o – j6 046 0-14 o-og 006 007 oˆ2 oai 0-01

C" = 5I2 1. . I OC)2 0'3° OI4 OlS OCX) OO7 006 O-03 002 ,,

These figures represent the relative intensities of the partials enter- ing into the formation of the note, and it will be observed that the intensity gradually diminishes. This analysis may be contrasted with that of the vowel dd sung by Boeke (aet. 50) on the notes/ and. c' t and the same

vowel sung on the notes g' and e" by his son (aet. 12).

Pitch .

/ =170-6 vibs

Man, aet. 50, singing da.

1 3 4 S £> 7 8 gio Partials.

86 0-46 174 1 -go 1-55 0-51 0-5^ 0-43 0-44

19 196 1-25 060 0-56 0-23 0-05 006 010 ,,

Boy, aet. 12, singing da.

Pitch ..12 3 4 s 6 Partials.

£ ; =384vibs. . 1 122 267 045 0-17 006 „ ^=640 „ . 1 809 1-45 0-53 .. .. „

It will be observed that in both these cases the intensity of the partials does not fade away gradually as we proceed from the lower to the higher partials, as with the cornet, but that certain partials are intensified more than others, namely, those printed in black. In other words, the form of the resonating cavity develops particular partials, and these modify the quality of the tone. If we multiply the vibrational number of the fundamental tone by the number of the partial we obtain the pitch of the resonance cavity; or if we take the mean of the

partials reinforced we obtain the pitch of the mean resonance. Lloyd applies this method to the foregoing figures as follows:-

Partials. Reinforced.

Mean Partial.

Pitch in

Complete

Vibration.

Man's aa. f = 170-6 vibs. . '.'1 . £'=256 „ .' .

Boy's aa. ; g' =384 vibs.

(" = 640 ,, ...

4-6 3-4

2-4 1-3

4.96 3-39

2-82

2-04

846 868

1084 1307

This analysis shows: (1) that the man's resonance rises slightly (half-semitone) in ascending seven semitones in the middle of his register; (2) that the boy's resonance rises three semitones in ascending nine semitones in the upper half of his register; and (3) in the mid-register the boy's resonance is to the man's as 5:4. Thus, as we sing a vowel in an ascending scale the pitch of the oral cavity slightly changes, or, in other words, the pitch of the resonating cavity for a given vowel may be slightly altered. It would appear that both theories are partially true; they are not mutually exclusive. The view of Dondcrs that each vowel has an oral cavity of unchangeable and fixed pitch is too exclusive, and, on the other hand, it cannot be denied that each vowel has a predominant partial or predominant partials which give it a definite character, and which must be produced by the oral cavity as a whole, or by the double resonance of portions of the cavity, as suggested by Lloyd. As we sing a vowel in an ascending scale the form of the resonance cavity may slightly change, but not sufficiently to alter the quality of the vowel. Thus we still detect the vowel tone. A singer almost instinctively chooses such vowels as best suit the re- sonating arrangements of his or her voice, and avoids vowels or words containing vowels that would lead to the production of notes of inferior quality.

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VOIRON, a town of France in the department of the Isere. Pop. (1901) 12,625. It stands at a height of 950 ft., on the Morge (a tributary of the Isere). It is a manufacturing town, and contains numerous factories which produce a sort of cloth named after the town, and also silk-weaving factories (2000 looms, with an annual output of eight to nine million yards). There are also paper-making factories in the town. The fine church of St Bruno was built 1864-73 at the expense of the monks of the Grande Chartreuse. Voiron is the starting-point of the steam tramways to St Laurent du Pont, 12 m. (for the Grande Chartreuse), and to Charavines, 105- m. (for the Lac de Paladru). Voiron long formed part of Savoy ; but in 1355 was exchanged (with the rest of the region between the Rhone »nd the Isere, watered by the Guiers Mort) by the count with France for Faucigny and Gex.

VOISENON, CLAUDE HENRI DE FUZSE, Abbe de (1708-75), French dramatist and man of letters, was born at the chateau

of Voisenon near Melun, on the 3th of July 1708. At the age of ten he addressed an epistle in verse to Voltaire, who asked the boy to visit him. From this introduction dated a friendship that lasted for fifty years. Voisenon made his d£but as a dramatist with L'Hettreuse ressemblance in 1728, followed in 1739 by a three-act comedy VEcole du monde at the Theatre francais. This was preceded by a verse prologue, L'Ombre de Moliere, and a month later Voisenon produced a criticism on his own piece in Le Retour de Vombre de MoU&re. A duel in which he was the aggressor inspired him with remorse, and he entered the priesthood, becoming vicar-general to the bishop of Boulogne. He received the abbey of Jard, which

made no demands on him. He became closely attached to Madame du Chatelet, the mistress of Voltaire (g.v.) f and was intimate with the comte de Caylus and Mademoiselle Quinault Dufresne. He made witty but by no means edifying contributions to the Mtrennes de Saint-Jean, the Bals de Bois, &c. In 1744 he pro- duced the Manages assortis and in 1746 his masterpiece, the Coquette fixee. He lived on. terms of the closest intimacy with Charles Simon Favart and his wife. His pen was always at the service of any of his friends, and it was generally supposed, though on insufficient grounds, that he had a considerable share in Favart's most successful operas. Voisenon had, strange to say, scruples all his life about the incongruity between his way of living and his profession, but he continued to write indecent stories for private circulation, and wrote verses in honour of Madame du Barry, as he had done for Madame de Pompadour. He was elected to the Academy in 1762. On the disgrace of his patron, the due de Choiseul, he lost his pensions and honours, but soon recovered his posUion. He was intimate with the chancellor Maupeou, and was suspected of writing on his behalf in defence of the abolition of the parlement. This and some other incidents brought him into general disgrace. Early in 1775 he retired to the chateau de Voisenon, where he died on the 22nd of November of the same year.

His CEuvres completes were published by his executrix, Madame de Turpin, in 1781.

*VOITURE, VINCENT (1598-1648), French poet, was the son of a rich merchant of Amiens. He was introduced by a school- fellow, the comte d'Avaux, to Gaston d'Orleans, and accom- panied him to Brussels and Lorraine on diplomatic missions. Although a follower of Gaston, he won the favour of Richelieu, and was one of the earliest academicians. He also received appointments and pensions from Louis XIII. and Anne of Austria. He published nothing in book form, but his verses and his prose letters were the delight of the coteries, and were copied, handed about and admired moie perhaps than the work of any contemporary. He had been early introduced to the Hotel de Rambouillet, where he was the especial friend of Julie d'Angennes, who called him her " dwarf king." His ingenuity in providing amusement for the younger members of the circle ensured his popularity, which was never seriously threatened except by Antoine Godeau, and this rivalry ceased when Richelieu appointed Godeau bishop of Grasse. When at the desire of the due de Montausier nineteen poets contributed to the. Guirlande de Julie, which was to decide the much-feted Julie in favour of his suit, Voiture refused to take part. The quarrel between the Uranistes and the Jobelins arose over the respective merits of a sonnet of Voiture addressed to a certain Uranie, and of another composed by Isaac de *Benserade, till then unknown, on the subject of Job. Another famous piece of his of the same kind, La Belle Malineuse, is less exquisite,*

but still very admirable, and Voiture stands in the highest rank of writers of vers de societi. His prose letters are full of lively wit, and, in some cases, as in the letter on Richelieu's policy (Letter LXXIV.), show considerable political penetration. He ranks with Jean de Balzac as the chief director of the reform in French prose which accompanied that of Malherbe in French verse. Voiture died at the outbreak of the Fronde, which killed the society to which he was accustomed, on the 26th of May 1648.

1 See A. Roux, CEuvres de M. de Voiture (Paris, 1856) ; and C. A. Sainte-Beuve, Causeries du lundi, vol. xii.

VOIVODE (also Vaivode, Vayvode, Wayvode, &c, Med. Gr. (3o/365os), a title in use among certain Slavonic peoples, meaning literally " leader of an army " (SI. voi, host, army; voiditi, to lead), and so applied at various periods and in various eastern European countries to rulers, governors or officials of varying degree. It is best known as the title of the princes of Moldavia and Wallachia. In these states the title remained in use from the earliest times until 1658 in the case of the first state, and until 17 16 in that of the second, when it gave way to Hospodar (q.ti.). During the period of Hungarian domination of Transylvania (1004-1526) it was governed by a voivode as an Hungarian province, the last voivode raising himself to the position of an independent prince. In Poland the title was used of certain administrative officials; Polish historians latinized it by paiatinus. At the present day voivode is used, in its original sense of a high military officer, in the Monte- negrin . army, where it corresponds to the general officer in other European armies.*

VOKES, the name of a family of English actors. Frederick Mortimer Vokes (1846-1888), the son of a costumier, made his first appearance on the stage in 1854. In 1861 he, his sisters Jessie (1851-1884), Victoria (1853-1894) and Rosina (1858- 1894), and Walter Fawdon (Vokes), first as the "Vokes Children " and then as the " Vokes Family," began to perform at music halls and at the pantomimes, and by their agility and humour made the name well known to English and American theatre-goers. Fred Vokes was a man of real inventiveness as well as rare acrobatic skill.

VOLAPtJK, the first artificial language (see Universal Languages) to attain any measure of practical success. First published in 1880, it was the work of J. M. Schleyer (b. 1839), a south-German priest. Volapiik is not, like the earliest attempts of the kind, an a priori language, but is based mainly on English, the rest of the vocabulary being made up from Latin and the

Romance languages. The borrowed words are reduced to a monosyllabic form and are often altered in a very arbitrary manner. Thus the name Volapiik itself is made up of the two English words, world and speak, the first in the genitive, the three vowels, a, e, i, being used to express the three cases, genitive, dative and accusative respectively; the nomina- tive is expressed by the bare root, and J is added to form the plural. The grammar of Volapiik is therefore partly borrowed, like the vocabulary, partly original. Adjectives end in -ik. The persons of the verb are indicated by adding the pronouns ob " I," 61 " thou," om " he," &c, plural 065 " we," &c; the tenses and the passive are indicated by prefixes, the moods by suffixes following the person-endings, many other inflections being used as well, so that the Volapiik verb boasts of no less than 505,440 different forms.

Although founded on English, Volapiik is mainly German in structure. It gets rid of the German word-order and the irregularities of German grammar, but it is often impossible to understand a Volapiik text without thinking in German. The following is a specimen of the language: —

Lofob "kemenis valik vola lolik, patiko etis pekulivol, kels kon- fidoms Volapuke, as bale medas gletikun netasfetana.

" 1 love all my fellow-creatures of the whole world, especially those cultivated (ones) who believe in Volapiik as (being) one of the greatest means of nation -binding."

Here honfid governs the dative just as its German equivalent does, and " cultivated " is used in the sense of the German gebildeler.

The history of Volapiik has an interest greater than that of the language itself. It has proved (1) that people in general are ready to adopt an artificial language, and (2) that an artificial language is easier to learn than any national language, and supplies an efficient means of communication between those who have no other language in common. Volapiik had no special philological merits to recommend it; yet, after a few years' incubation in south Germany, it spread, first to France (about 1885) and then in a feW years over the whole civilized world, so that in 1889, when the third Volapiik congress met

at Paris, there were 283 Volapiik societies all over the world, and the total number of Volapiik students was estimated at over a million. At this congress every one — even the waiters — spoke Volapiik, and the permanent triumph of the language seemed certain. But the year of its zenith was the beginning of a decline even more rapid than its rise. It fell to pieces through dissensions in its own camp, the first cause of which was the

opposition of the inventor to those of his disciples who aimed at making the language mainly an instrument of com- mercial correspondence, and advocated the greatest possible simplification of grammar and vocabulary. The divergence of views between the inventor and his colleagues became more and more marked; and after the third congress the breach between M. Schleyer and the Volapiik Academy (founded at the second congress in 1887) became a definite one: the director of the Academy proposed a totally new scheme of grammar, and other members proposed others, although one Of the objects of the foundation of the Academy was the pre- servation of the integrity of the language. A new director, M. Rosenberger of St Petersburg, was elected in 1893; and from this moment the Academy dissociated itself from Volapiik and began to construct a new international language, Idiom Neutral (see Universal Languages). (H. Sw.)

VOLCAE, a Celtic people in the province of Gallia Nar- bonensis, who occupied the district between the Garumna (Garonne), Cerbenna mons (Cevcnncs), and the Rhodanus (or even farther to the east in earlier times), corresponding roughly to the old province of Languedoc. They were divided into two tribes, the Arecomici on the east and the Tectosages (whose territory included that of the Tolosates) 011 the west, separated by the river Arauris (HerauLt) or a line between the Arauris and Orbis (Orbe). The Volcae were free and indepen- dent, had their own laws, and possessed the jus Ldtii. The chief town of the Tectosages was Tolosa (Toulouse) ; of the Arecomici, Nemausus (Nimes); the capital of the province and residence of the governor was Narbo Martius (Narbonne). It was said that there was an early settlement of Volcae Tectosages near the Hercynia Silva in Germany; Tectosages was also the name of one of the three great communities of Gauls who invaded and settled in Asia Minor in the country called after them Galatia.

See A. Holder, Altcettischer Sprachschatz, i. ii. (1896, 1904), s.vv. "Arecomici" and "Tectosagi"; T. R. ■ Holmes, Caesar's Conquest of Gaul (1899) p. 513; A. Desjardins, GGographie de la Gauie romaine, i. (1876).
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VOLCANO, an opening in the earth's crust, through which heated matter is brought, permanently or temporarily, from the interior of the earth to the surface, where it usually forms a hill, more or less conical in shape, and generally with a hollow or crater at the top. This hill, though not an essential part of the volcanic mechanism, is what is commonly called the volcano. The name seems to have been applied originally to Etna and some of the Lipari Islands, which were regarded as the seats of Hephaestus, a Greek divinity identified with Vulcan, the god of fire in Roman mythology. All the pheno- mena connected directly or indirectly with volcanic activity are comprised under the general designation of vulcanism or vulcanicity —

words which are also written less familiarly as volcanism and volcanicity; whilst the study of the phenomena forms a department of natural knowledge known as vulcanology. Vulcanicity is the chief superficial expression of the earth's internal igneous activity.

It may happen that a volcano will remain for a long period in a state of moderate though variable activity, as illustrated by the normal condition of Stromboli, one of the Lipari Islands; but in most volcanoes the activity is more decidedly inter- mittent, paroxysms of greater or less violence occurring after intervals of comparative, or even complete, repose. If the period of quiescence has been very protracted, the renewed activity is apt to be exceptionally violent. Thus, Krakatoa before the great eruption of 1883 had been dormant for some- thing like two centuries, and it is believed that the Japanese

volcano Bandaisan previously to the gigantic outburst of 188S had been silent for more than a thousand years. A volcano may indeed remain so long dormant as to be mistaken for one completely extinct. The volcanoes of central France are regarded as extinct, inasmuch as no authentic historical record of any eruption is known, but there are not wanting signs that in some parts of this volcanic region the subterranean forces may yet be slumbering rather than dead.

Premonitory Symptoms. — A volcanic eruption is usually preceded by certain symptoms, of which the most common are local earthquakes. The mountain, or other eruptive centre, may be thrown by internal activity into a state of tremor; the tremors perhaps continuing intermittently for months or even years, and becoming more frequent and violent as the crisis approaches. At first they are usually confined to the volcano and its immediate neighbourhood, but may sub- sequently extend to a considerable distance, though probably never developing into earthquakes of the first magnitude. The sudden opening of a subterranean crack, by rupture of a rock under strain, or the rapid injection of lava into such a fissure, will tend to produce a jar at the surface. For at least sixteen years before the first recorded eruption of Vesuvius in a.d. 79 earthquakes had been frequent in the Campania and had wrought havoc in the cities of Herculaneum and Pompeii. Again, the formation of Monte Nuovo, near Pozzuoli, in 1538, was heralded by local earthquakes beginning several years in advance of the eruption. So too in recent years many volcanic outbursts have been preceded by a succession of earthquakes; but as volcanoes are frequently situated in areas of marked seismic activity, the

shocks antecedent to an eruption may not, unless exceptionally violent, receive much attention from local observers.

It commonly happens that a volcanic outburst is announced by subterranean roaring and rumbling, often compared to thunder or the discharge of artillery underground. Other precursory symptoms may be afforded by neighbouring springs, which not unusually flow with diminished volume, or even fail altogether. Possibly fissures open underground and drain off the water from the springs and wells in the immediate locality. Occasionally, however, an increased flow has been recorded. In some cases thermal springs make their appearance, whilst the temperature of any existing warm springs may be increased, and perhaps carbon dioxide be evolved. A disturbed state of the atmosphere is by no means a constant forerunner of an eruption, some of the greatest outbursts having occurred in a period of atmospheric stability: indeed the air is often felt to be close and still.

Immediately before a renewed outburst in an old volcano, the floor of the crater is generally upheaved to a greater or less extent, whilst the discharge of vapour from any fumaroles is increased. Where a crater has been occupied by water, forming a crater-lake, the water on the approach of an erup- tion becomes warm, evolves visible vapour, and may even boil. In the case of cones which are capped with snow, the internal heat of the rising lava usually causes a rapid melting of the snow-cap, resulting perhaps in a disastrous deluge.

It seems probable that by attention to the premonitory symptoms a careful local observer might in many cases foretell an eruption.

It generally happens that a great eruption is preceded by a preliminary phase of feeble activity. Thus, the gigantic catastrophe at Krakatoa on the 27th of August 1883, so far from having been a sudden outburst, was the culmination of a state of excitement, sometimes moderate and sometimes violent, which had been in progress for several months.

Emission of Vapour. — Of all volcanic phenomena the most constant is the emission of vapour. It is one of the earliest features of an eruption; it persists during the paroxysms, attaining often to prodigious volume; and it lingers as the last r elic of an outburst, so that long after the ejection of ashes and lava has ceased an occasional puff of vapour may be :the only memento of the disturbance.

By far the greatest proportion of the vapour is steam, which sometimes occurs almost to the exclusion of other gaseous products. Such, at least, is the usual and probably correct view, though it is opposed by A. Brun, who

regards the volcanic vapours as chiefly composed of chlorides with steam in only subordinate amount. In the case of a mild eruption, like that occurring normally at Stromboli, the vapours may be discharged in periodical puffs, marking the explosion of bubbles rising more or less rhythmically from the seething lava in the volcanic cauldron. S. Wise observed at the volcano of Sangay, in Ecuador, no fewer than 267 explosions in the course of an hour, the vapour here being associated, as is so often the case, with ashes. During a violent eruption the vapour may be suddenly shot upwards as a vertical column of enormous height, penetrating the passing clouds. For a short distance above the vent the superheated steam sometimes exists as a transparent vapour, but it soon suffers partial condensation, forming clouds, which, if not dispersed by winds, accumulate over the mountain. When the vapour is free from ash it forms rolling balls of fleecy cloud, but usually it carries in mechanical association more or less finely divided lava as volcanic dust and ashes, whereby it becomes yellow, brown, or even black, sometimes as foul as the densest smoke. In a calm atmo- sphere the dust-laden vapour may rise in immense rings with a rotatory movement, like that of vortex-rings. Frequently the vapours, emitted in a rapid succession of jets, form cumulus clouds, or are massed together in cauliflower-like forms. The well-known " pine-tree appendage " of Vesuvius (pint) vul- canico) , noted by the younger Pliny in his first letter to Tacitus on the eruption in the year 70, is a vertical shaft of vapour terminating upwards in a canopy of cloud, and compared popularly with the trunk and spreading branches of the stone- pine. Whilst in some cases the cloud resembles a gigantic expanded umbrella, in others it is more mushroom-shaped. In a great eruption, the height of the mountain itself may appear dwarfed by comparison with that of the column of vapour. During the eruption of Vesuvius in April 1906, the steam and dust rose to a height of between 6 and 8 m. At Krakatoa in 1883 the column of vapour and ashes reached an altitude of nearly 20 m.; whilst it was estimated by some authorities that during the most violent explosions the finely divided matter must have been carried to an elevation of more than 30 m. The emission of vast volumes of vapour at high tension naturally produces much atmospheric disturbance, often felt at great distances from the centre of eruption.

Electrical Excitement. — It is probably to the uprushing current of vapour that much of the electrical excitement which invari- ably accompanies an eruption may be referred. The friction of the steam rushing in jets through the volcanic vent must produce electrical disturbance, and indeed an active volcano has been aptly compared to a hydroelectric machine of gigantic power. Another cause of excitement may be found in the mutual friction of the ejected cinders and ashes as they rise and fall in showers through the air. Much trituration of volcanic material may go on in the crater and

elsewhere during the eruption, whereby the solid lava is reduced to a fine dust. Other means of generating electricity are found in the chemical reactions effected in the volcano and in the sudden condensa- tion of the emitted vapour. L. Palmieri, in the course of his investigations at the observatory on Vesuvius, found that the vapours free from cinders carried a positive charge, whilst the cinders were negative.

The electrical phenomena attending an eruption are often of great intensity and splendour. The dark ash-laden clouds of vapour are shot through and through by volcanic lightning, sometimes in rapid horizontal flashes, then in oblique forked streaks, or again in tortuous lines compared to fiery serpents, whilst the borders of the cloud may be brilliant with electric scintillations, often forming balls and stars of fire. During the great eruption of Krakatoa remarkable phenomena were observed by ships in the Strait of Sunda, luminous balls like "St Elmo's fire" appearing at the mast-heads and the

yard-arms, whilst the volcanic mud which fell upon rigging and deck was strongly phosphorescent.

Quite distinct from any electrical phenomena is that inter- mittent reddish glare which is often seen at night in clouds hanging over an active crater, and which is simply a glow due to reflection from the incandescent lava and stones in the volcanic cauldron below.

Volcanic Rain and Mud. — The condensation of the vast volumes of steam exhaled during an eruption produces torrents of rain, which, mingling to a greater or less extent with the volcanic ashes, forms a hot muddy stream known in Italy as lava d'acqua and lava di fango, and in South America as moya. Deluges of such mud-lava may rush violently down the moun- tain-side and spread over the neighbouring country with terribly destructive effect, whence they are greatly dreaded by those who dwell at the base of a volcano. The solidified volcanic mud, often mingled with larger fragments of lava, is known as lu$ or tufa. Herculaneum was buried beneath a flood of mud swept down from Vesuvius during the Plinian eruption of 70, and the hard tufaceous crust which thus sealed up the ill- fated city came in turn to be covered by lava-flows from sub- sequent eruptions: hence the difficulty of excavating at Herculaneum compared with similar work at Pompeii, where there was probably much less mud, since the city, having been at a greater distance from the volcanic centre, was overwhelmed in great measure by loose ashes, capable of removal with com- parative ease.

It sometimes happens that volcanic mud is formed by the mingling of hot ashes not directly with rain but with water from streams and lakes, or even, as in Iceland, with melted snow. A torrent of mud was one of the earliest symptoms of the violent eruption of Mont Pele in Martinique in 1902. This mud had its source in the Etang Sec, a crater-basin high up on the S.W. side of the mountain. By the explosive discharge of ashes and vapours mingled with the water of the tarn there was produced a vast volume of hot muddy matter which on the 5th of May suddenly escaped from the basin, when a huge torrent of boiling black mud, charged with blocks of rock and moving with enormous rapidity, rolled like an avalanche down the gorge of the Riviere Blanche. If a stream of lava obstructs the drainage of a volcano, it may give rise to floods.

Ejected Blocks.— When a volcano after a long period of re- pose starts into fresh activity, the materials which have accu- mulated in the crater, including probably large blocks from the disintegration of the crater-walls, have to be ejected. If the lava from the last eruption has consolidated as a plug in the throat of the volcano, the conduit may be practically closed, and hence the first effort of the renewed activity is to expel this obstruction. The hard mass becomes shattered by the explosions, and the angular fragments so formed are hurled forth by the outrushing stream of vapour. When the discharge is violent, the vapour, as it rushes impetuously up the volcanic duct, may tear fragments of rock from its walls and project them to a considerable distance from the vent. Such ejected blocks, by no means uncommon in the early stages of an eruption, are often of large size and naturally vary accord- ing to the character of the rocks through which the duct has been opened. They may be irregular masses of igneous rocks, possibly lavas of earlier eruptions, or they may be stratified, sedimentary and fossiliferous rocks representing the platform on which the volcano has been built, or the yet more deeply seated fundamental rocks. By Dr H. J. Johns ton-La vis, who specially studied the ejected blocks of Vesuvius, the volcanic materials broken from the cone are termed ” accessory ” ejecta, whilst other fragmentary materials he conveniently calls “accidental” products, leaving the term “essential” ejecta for plastic lava, ashes, crystals, &c. Masses of Cretaceous or Apennine limestone ejected from Somma are scattered through the tuffs on the slopes of Vesuvius; and objects carved in such altered limestone are sold to tourists as ” lava ” orna- ments. Under the influence of volcanic heat and vapours, the ejected blocks suffer more or less alteration, and may contain

in their cavities many crystallized minerals. Certain blocks of sandstone ejected occasionally at Etna are composed of white granular quartz, permeated with vitreous matter and encased in a black scoriaceous crust of basic lava.

A rock consisting of an irregular aggregation of coarse ejected materials, including many large blocks, is known as a " volcanic agglomerate." Any fragmental matter discharged from a volcano may form rocks which are described as " pyroclastic."

Cinders, Ashes and Dust. — After the throat of a volcano has been cleared out and a free exit established, the copious dis- charge of vapour is generally accompanied by the ejection of fresh lava in a fragmentary condition. If the ejected masses bear obvious resemblance to the products of the hearth and the furnace, they are known as " cinders " or " scoriae," whilst the small cinders not larger than walnuts often pass under their Italian name of " lapilli " (q.v.). When of globular or ellipsoidal form, the ejected masses are known as "bombs" {o.v.) or " volcanic tears." Other names are given to the smaller fragments. If the lava has become granulated it is termed " volcanic sand "; when. in a finer state of division it is called ash, or if yet more highly comminuted it is classed as dust; but the latter terms are sometimes used interchangeably. The pulverized material, consisting of lava which has been broken up by the explosion, or triturated in the crater, is often dis- charged in prodigious quantity, so that after an eruption the country for miles around the volcano- may be covered with a coating of fine ash or dust, sometimes nearly white, like a fall of snow, but often of greyish colour, looking rather like Portland cement, and in many cases becomirg reddish by oxidation of the ferruginous constituents. Even when first ejected the ash is sometimes cocoa-coloured. This finely divided lava insinu- ates itself into every crack and cranny, reaching the interior of houses even when windows and doors are closed. A heavy fall of ash or cinders may cause great structural damage, crushing the roofs of buildings by sheer weight, as was markedly the case at Ottajano and San Guiseppe during the eruption of Vesuvius in April 1906. On this occasion the dry ashes slipped down the sides of the volcanic cone like an avalanche, forming great ash- slides with ridges and furrows rather like barrancos, or ravines, caused by rain. The burial of Ottajano and San Ginseppe in 1906 by Vcsuvian ejecta, mostly lapilli, has been compared with that of Pompeii in 79.

Deposits of volcanic sand and ashes retain their heat long after ejection, so that rain will cause them to evolve steam, and if the rain be heavy and sudden it may produce explosions with emis- sion of great clouds of vapour. The fall of ash is at first prejudicial to vegetation, and is often accompanied or followed by acid rain; but ultimately the ash may prove beneficial to the soil, chiefly in consequence of the alkalis which it contains. The " May dust " of Barbados was a rain of volcanic ash which fell in May 1812 from the eruption of the Soufridre in St Vincent. It is estimated that the amount of dust which during this eruption fell on the surface of Barbados, 100 m. distant from the eruptive centre, was about

3,000,000 tons. The distance to which ash is carried depends greatly on the atmospheric conditions at the time of the eruption. Ashes from Vesuvius in an eruption in the year 472 were carried, it is said, as far as Constantinople. During an eruption of Cotopaxi, on the 3rd of luly 1880, observed by E. Whymper, an enormous black column of dust-laden vapour was shot vertically upwards with such rapidity that in less than a minute it rose to a height estimated at 20,000 ft. above the cratcr-rim, or nearly 40,000 ft above sea-level, when it was dispersed by the wind over a very wide area. It is believed that the amount of dust in this discharge must have been more than 2,000,000 tons. Enormous quantities of dust ejected from Krakatoa in 1S83 were carried to prodigious distances, samples having been collected at more than a thousand miles from the volcano; whilst the very fine material in ultra- microscopic grairts which remained suspended for months in the higher regions of the atmosphere seems to have enjoyed an almost world-wide distribution, and to have been responsible for the re-markable sunsets at that period.

The ash falling in the immediate vicinity of a volcanic vent will generally be coarser than that carried to a distance, since the particles as they are wafted through the air undergo a kind of sifting. Professor J. W. Judd, who made an exhaustive examination of the products of the eruption of Krakatoa, found that the dust near the volcano was comparatively coarse, dense and rather dark- coloured, in consequence of the presence of numerous fragments of

heavy, dark, crystalline minerals, whilst thedust at a distance was excessively fine and perfectly white. According to this observer, the particles tended to fall in the following order: magnetite, pyroxenes, felspar, glass. The finely comminuted material, carried to a great height in the atmosphere, consisted largely of delicate threads and attenuated plates of vitreous matter, in many cases hollow and containing air-bubbles. The greater part of the dust was formed by the mutual attrition of fragments of brittle pumice as they rose and fell in the crater, which thus became a powerful "dust-making mill." By this trituration of the pumiceous lava, carried on for a space of three months during which the eruption lasted, the quantity of finely pulverized material must have been enormous; yet the amount of ejected matter was probably very much less than that extruded during some other historical eruptions, such as that of Tomboro in Sumbawa, in 1815. The explosions at Krakatoa were, however, exceptionally violent, having been sufficient to project some of the finely pulverized lava to an altitude estimated to have been at least 30 m. It is

usually impossible during a great eruption to determine the height of the column of " smoke," since it hangs over the country as a pall of darkness.

The great black cloud, which was so characteristic a feature in the terrible eruptions in the West Indies in 1902, was formed of steam with sulphur dioxide and other gases, very heavily charged with incandescent sand or dust, forming a dense mixture that in some respects behaved like a liquid. Unlike the Krakatoa dust, which was derived from a vitreous pumice, the .solid matter of the black cloud was largely composed of fragments of crystalline minerals. According to Drs Anderson and Flett it is not impossible that on the afternoon of the 17th of May 1902, the solid matter ejected from the Soufriere of St Vincent amounted to several billions of tons, and that some of the dust fell at distances more than 2 (MX) m. east of the centre of eruption.

In Mexico and Central America, under the favourable influence of warmth and moisture, rich soils are rapidly formed by the decom- position of finely divided volcanic ejecta. Vast areas in North America, especially in Nebraska and Kansas, are covered with thick deposits of volcanic dust, partly from recent eruptions but princi- pally from volcanic activity in geologic time. The dust is used in the arts as an abrasive agent.

Lava.— The volcanic cinders, sand, ashes and dust described above are but varied forms of solidified lava. Lava is indeed the most characteristic product of volcanic activity. It consists of mineral matter which is, or has been, in a molten state; but the liquidity is not due to simple dry fusion. The magma, or subterranean molten matter, may be regarded as composed essentially of various silicates, or their constituents, in a state of mutual solution, and heavily charged with certain vapours or gases, principally water-vapour, superheated and under pressure. In consequence of the peculiar constitution of the magma, the order in which minerals separate and solidify from it on cooling does not necessarily correspond with the inverse order of their relative fusibility. The lava differs from the magma before eruption, inasmuch as water and various volatile substances may be expelled on extrusion. The rapid escape of vapour from the lava contributes to the explosive phenomena of an eruption, whilst the rate at which the vapour is disengaged depends largely on the viscosity of the magma.

The lava on its immediate issue from the volcanic vent is probably at a white heal, but the temperature is difficult of determination since the molten matter is usually not easy of approach, by reason of the enshrouding vapour. Determinations of temperature are generally made at a short distance from the exit, when the lava has undergone more or less cooling, or on a small stream from a subordinate vent. A. Bartoli, using a platinum electric resistance pyrometer, found that a stream of lava near a

bocca, or orifice of emission, on Etna, in the eruption of 1892, had at a depth of one foot a temperature of 1060 C. In the lavas of Vesuvius and Etna thin wires of silver and of copper have frequently been melted. Probably the lava at the surtacc of the stream has a temperature of something like noo° C, but this must not be assumed to be its temperature at the volcanic focus. C. Docltcr, in some experiments on the melting-point of lava by means of an electric furnace, found that a lava from Etna softened at from 962 to 970 C. and became fluid at 1010° to 1040 , whilst a Vesuvian lava softened at 1030 to 1060 6 and acquired fluidity at ioSo c to 1090 . These, results were obtained at ordinary atmospheric pressure, but it has been assumed that the melting-point of lava at a great depth would, through pressure alone, exceed that obtained in the laboratory. On the other hand the presence of water and of certain volatile fluxes in the magma lowers the fusing-point, and hence the extruded lava from which these have largely escaped may be much less fusible than the original magma.*

Determinations of the melting-points of various glasses formed by the fusion of certain igneous rocks have been made by J. A. Douglas, with the meldometer of Professor J. Joly. The results give

temperatures ranging from 1260 C. for rhyolite to 1070 for dolerite from the Clee Hills in Shropshire. The melting-points of the rocks in a glassy condition as here given are, however, lower than those of the corresponding rocks in a crystalline state.

It should be noted that all determinations of the melting-points of minerals and rocks involving ocular inspection of the physical state of the material are liable to considerable error, and the only accurate method seems to be that of determining the point at which absorption of heat abruptly occurs — the latent heat 01 fusion. This has been done in the refined investigations by Mr A. L. Day and his colleagues in the Geophysical Laboratory of the Carnegie Institution at. Washington.

It is believed that the temperature of lava in the volcanic conduit may be in some cases sufficiently high to fuse the neighbouring rocks, and so melt out a passage through them in its ascent. The wall- rock thus dissolved in the magma will not be without influence on the composition of the lava with which it becomes assimilated.

Many interesting observations are on record with regard to the heating effect of lava on metals and other objects with which it may have come in contact. Thus, after the destruction of Torre del Greco by a current of lava from Vesuvius- in 1794, it was found that brass in the houses under the lava had suffered decomposition, the copper having become crystallized;

whilst silver had been not only fused but sublimed. This indicates a temperature of upwards of 1000 C. Panes of glass in the windows at Torre del Greco on the same occasion suffered devitrification.

Notwithstanding the high temperature of lava on emission, it cools so rapidly, and the consolidated lava conducts heat so slowly, that vegetable structures may be involved in a lava-flow without being entirely destroyed. A stream of lava on entering a wood, as in the sylvan region on Etna, may burn up the undergrowth but leave many of the larger trees with their crunks merely carbonized. On Vesuvius a lava-flow has been observed to surround trees while the foliage has been apparently uninjured. A vertical trunk of a coniferous tree partially enveloped in Tertiary basalt occurs at Gribon in the Isle of Mull, as described by Sir A. Geikie and others ; plant-remains in basalt from the Bo'ness coalfield in Linlithgow- shire have been noticed by H. M. Cadell ; and attention has been called by B. Hobson to a specimen of scdriaceous basalt, from Mexico, which shows the impression of ears of maize and even relics of the actual grains. In consequence of the slow transmission of heat by solid lava, the crust on the surface of a stream may be crossed with impunity whilst the matter is still glowing at a short distance below. Lichens may indeed grow on lava which remains highly heated in the interior.

The solidified surface of a sheet of lava may be smooth and shining, sometimes quite satiny in sheen, though locally wrinkled and perhaps even ropy or hummocky, the irregularities being mainly due to superficial movement after partial solidification. The " corded lava " has a surface similar to that often seen on blast- furnace slag, and is suggestive of a tranquil flow. After a lava stream has become crusted over on cooling, the subjacent lava, still moving in a viscous condition, tends to tear the crust, forming irregular blocks, or clinkers, which are carried forward by the flow and ultimately left in the form of confused heaps, perhaps of con- siderable magnitude. The front of a stream may present a wall of scoriaceous fragments looking like a huge pile of coke. As the clinkers are carried along, on the surface of the lava, they produce by mutual friction a crunching noise; and the sluggish flow of the lava-stream laden with its burden has been compared with that of a glacier. Since the upper part of the stream moves more rapidly than the lower, which is retarded by cooling in contact with the bed-rock, the superficial clinkers are carried forward and, rolling over the end, may become embedded in the lava as it advances. Scoriae formed on the top of a stream may thus find their way to the base. Rock- fragments or other detrital matter occurring in the path of the lava will be caught up by the flow and become involved in the lower part of the molten mass; whilst the rocks over which the lava travels may suffer more or less alteration by the heat of the stream.

The rapidity of a lava flow is determined partly by the slope of the bed over which it moves and partly by the consistency of the lava, this being dependent on its chemical composition and on the condi- tions of cooling. In an eruption of Mauna Loa, in Hawaii, in 1855, the lava was estimated to flow at a rate of 40 m. an hour; and at an eruption of Vesuvius in 1805 a velocity of more than 50 m. an hour, at the moment of emission, was recorded. The rapidity of flow is, how- ever, rapidly checked as the stream advances, the retardation being very marked in small flows. Where lava travels down a steep incline there is naturally a great tendency to form a rugged surface, whilst a quiet flow over a flat plane favours smoothness. If the lava meet a precipice it may form a cascade of great beauty, the clinkers rapidly rolling down with a clatter, as described by Sir W. Hamilton in the eruption of Vesuvius in 1771, when the fiery torrent had a perpendicular fall of 50 ft.

In Hawaii the smooth shining lava, often superficially waved and

lobed, is known as pahoehoe, whilst the rugged clinker beds are

termed aa. These terms are now used in general terminology,

having been introduced by American geologists. The fields of aa

, often contain lava-balls and bombs. It may be said that the

pahoehoe corresponds practically with the Fladen lava of German vulcanologists, and the aa with their Schollen lava. Rugged flows are known in Auvergne as ckeires. The surface of a clinker-field has often a horribly jagged character, being covered with ragged blocks bristling with sharp points. In the case of an obsidian-flow a most dangerous surface is produced by the keen edges and points of the fragmentary volcanic glass.

If, after a stream of lava has become crusted over, the underlying magma should flow away, a long cavern or tunnel may be formed. Should the flow be rapid the roof may collapse and the fragments, falling on to the stream, may be carried forward or become absorbed in the fused mass. The walls and roof of a lava-cave arc occasionally adorned with stalactites, whilst the floor may be covered with stalagmitic deposits of lava. The volcanic stalactites are slender, tubular bodies, extremely fragile, often knotted and rippled. Beautiful examples of lava stalactites from Hawaii have been described by Professor E. S. Dana. Caverns may also be formed in lava-flows by the presence of large bubbles, or by the union of several bubbles. It

may happen, too, that certain monticules thrown up on the surface of the lava are hollow, of which a famous example is furnished by the Caverne de Rosemond, at" the base of Piton Barry, in the Isle of Reunion.

It is of great interest to determine whether molten lava contracts or expands on solidification, but the experimental evidence on this subject is rather conflicting. According to some observers a piece of solid lava thrown on to the surface of the same lava in a liquid state will sink, while according to others it floats. It has often been observed that cakes formed by the natural fracture of the crust on the lava of Kilauea sink in the liquid mass, but it has been suggested that the fragments are drawn down by convection-currents. On the other hand a solid piece, though denser than the corresponding liquid, may be buoyed up for a time by the viscous condition of the molten lava. Moreover, the presence of minute vesicles may lighten the mass. Although the minerals of a rock-magma may separately contract on crystallization it does not follow that the magma itself, in which they probably exist in a state of solution, will undergo on crystallization a similar change of volume. On the whole, however, there seems reason to believe that lava on solidifying almost always diminishes in volume and consequently increases in density.

According to the experiments of C. Doelter the specific gravity of molten lava is invariably less than that of the same lava when solid, though in some cases the difference is but slight. In a vitreous or isotropic condition the lava has a lower density than when crystalline. The differences are illustrated by the following table, where the figures give the specific gravity: —

Natural solid lava.

Liquid.

Rapidly cooled, glassy.

Slowly

cooled,

crystalline.

Lava of Etna ˆ . „ Vesuvius

2-83 2-83-2-85

2-58-2-74 2-68-2-74

2-71-2-75

2-69-2-75

2-81-2-83 2-77-2-81

Experiments by Dr C. Barus showed that a diabase of specific gravity 3-017 formed a glass of sp. gr. 2-717, and melted to a liquid of sp. gr. 2-52. J. A. Douglas on examining various igneous rocks found that in all cases the rock in a vitreous state had a lower sp. gr. than in a crystalline condition, the difference being greatest in the acid plutonic rocks. A. Harker, however, has called attention to the fact that the glassy selvage of certain basic dykes in Scotland is denser than the same rock in a crystalline condition in the interior of the dykes.

Physical Structureˆ of Lavas. — An amorphous vitreous mass may result from the rapid cooling of a lava on its extrusion from the volcanic vent. The common type of volcanic glass is known as obsidian (q.v.). Microscopic, examination usually shows that even in this glass some of the molecules of the magma have assumed definite orientation, forming the incipient crystalline bodies known as microlites, &c._ By the increase of these minute enclosures, in number and magnitude, the lava may become devitrified and assume a Hthoidal or stonj; structure. If the molten magma consolidate slowly, the various silicates in solution tend to separate by crystalliza- tion as their respective points of saturation are reached. Should the process be arrested before the entire mass has crystallized, the crystals that have been developed will be embedded in the residual magma, which may, on consolidation, form a vitreous base. It is believed that in many cases the lava brings up, through its conduit, myriads of crystals that have been developed during slow solidification in the heart of the volcanic apparatus. Showers of crystals of leucite have occurred at Vesuvius, of labradorite at Etna, and of pyroxene at Vesuvius, Etna and Stromboli. These " intratelluric crystals" were probably floating in the molten magma, and had they remained in suspension, this magma might on consolidation have enveloped them as a ground-mass or base. A rock so formed is generally known as a " porphyry," and the structure as porphyritic. In such a lava the large crystals, or phenocrysts, evidently represent an early phase of consolidation, and the minerals of the matrix a later stage. It is notable that the intratelluric crystals often lack sharpness of outline, as though they

had suffered corrosion by attack of the molten magma, whilst they may contain vitreous enclosures, suggesting that the surrounding mass was liquid during their consolidation. It is believed that the more slowly consolidation has occurred, the larger generally are the crystals; and the higher the temperature of the magma the greater the corrosion or

resorption. Possibly under certain con- ditions the phenocrysts and the ground-mass may have solidified simultaneously.

In some cases the entire igneous mass assumes a crystalline structure, or becomes " noncrystalline." Such a structure is well displayed when the magma has consolidated at considerable depths, cooling slowly under great pressure, and forming rocks which are termed " plutonic " or " abyssal " to distinguish them from rocks truly volcanic, or those which, if not effusive, like lava-flows, have at least solidified very near to the surface as dykes and sills. Volcanic and plutonic rocks pass, however, into each other by gradual transi- tion. The dyke-rocks, or intrusive masses, form an intermediate group sometimes distinguished under the name of " hypabyssal " rocks, as suggested by W. C. Brogger. Lavas extruded in sub-marine eruptions may have solidifiea under a great weight of sea- water, and therefore to that extent rather under plutonic conditions. Chemical Composition of Lavas. — Lavas are usually classified roughly, from a chemical point of view, in broad groups according to the proportion of silica which they contain. Those in which the proportion of silica reaches 66 % or upwards are said to be acid or acidic, whilst those in which it falls to 55 % or below are called basic lavas. The two series are connected by a group of intermediate com- position, whilst a small number of igneous rocks of exceptional type are recognized as ultrabasic. Professor F. W. Clarke has suggested a grouping of igneous rocks as per-silicic, medio-silicic and sub- silicic, in which the proportion of silica is respectively more than 60, between 50 and 60, or less than 50%. _ By far the greater part of all lavas consists of various silicates, either crystallized as definite minerals or unindividualized as volcanic glass. In addition, however, to the mineral silicates, a volcanic rock may contain a limited amount of free acid and basic oxides, repre- sented by such minerals as quartz and magnetite. Rhyolite may be cited as a typical example of an acid lava, andesite as an intermediate and basalt as a basic lava. The various volcanic rocks are described under their respective headings, so that it is needless to refer here to their chemical or mineralogical composition. It may, however, be useful to cite a few selected analyses of some recent lavas and ashes: —

I.

II.

III.

IV.

V.

VI.

Silica

48-28

49-73

50-00

68-99

61-88

49- 20

Alumina

I8-. W

18-46

•3-99

16-07

18-30

14-90

Ferric oxide

I-I2

6-95

5-13

263

t-97

4-5″

Ferrous oxide .

7-88

5-59

9-10

I-IO

4-32

12-75

Manganous oxide

0-28

0-28

Magnesia . . .

3-72

3-99

4-06

I-o8

2-71

3-90

Lime

9-20

10-71

io-8i

3-16

6-32

9-20

Soda .

2-84

3-50

V02

4-04

3-17

1 96

Potash

7-25

1-07

2-87

i-Sl

1-09

o-95

Titanium dioxide

1-28

0-82

0-31

1-72

Phosphorus pentoxide

0-51

0-09

0-42

Loss on ignition

0-62

0-24

0-19

O-IO

100-96

TOO'OO

99-22

100 00

100-35

99-89

I. From Vesuvius, eruption of 1906; by M. Pisani. II. „ Etna. Mean of several analyses by Silvestri and Fuchs (Mercalli). III. „ Stromboli, 1891 ; by Ricciardi. IV. ,, Krakatoa eruption of 1883; by C.Winkler. V. ,, Mont Pele, Martinique, eruption of 1902; by M. Pisani. VI. ,, Kilauea, Hawaii; by O. Silvestri.

In the course of the life of a volcano, the lava which it emits may undergo changes, within moderate limits, being at one time more acid, at another more basic. Such changes are sometimes connected with a shifting of the axis of eruption. Thus at Etna the lavas from the old axis of Trifoglietto in the Valle del Bove were andesites, with about 55% of silica, but those rising in the present conduit are doleritic, with a silica-content of only about 50%. It seems probable that, 10 a limited extent, changes in the character of a lava may sometimes be due to contact of the magma with different rocks underground: if these arc rich in silica, the acidity of the lava wilt naturally increase; while if they are rich in calcareous and ferro-magnesian constituents, the basicity will increase : the variation is consequently apt to be only local, and probably always slight.

By von Richthofcn and some others it has been held that during a long period of igneous activity a definite order in the succession of the erupted rocks is everywhere constant; but though some striking coincidences may be cited, it can hardly be said that this generalization has been satisfactorily established. It has, however, often been observed, as emphasized by Professor Iddings, that a volcanic centre will start with the emission of

lavas of neutral or intermediate type, followed in the course of a geological period by

acid and basic lavas, and ending with those of extreme composition, indicating progressive chance in the magma.

The old idea of a universal magma, or continuous pyrosphere, has been generally abandoned. Whatever may have been the case in a primitive condition of the interior of the earth, it seems necessary to admit that the magma must now exist in separate reservoirs. The independent activity of neighbouring volcanoes strikingly illustrated in Kilauea and Mauna Loa in Hawaii, only 20 m. apart, suggests a want of communication between the conduits; and though the lavas are very similar at these two centres, it would seem that they can hardly be drawn from a common source. Again, the volcanoes of southern Italy and the neighbouring islands exhibit little or no sympathy in their action, and emit lavas of diverse type. The lavas of Vulcano, one of the Lipari Isles, are rhyolitic, whilst those of Stromboli, another of the group, are basaltic.

It is believed that the magma in a subterranean reservoir, though originally homogeneous, may slowly undergo certain changes, whereby the more basic constituents migrate to one quarter whilst the acid segregate in another, so that the eanal, at successive periods, may bring up material of different types. The cause of this " mag- matic differentiation," which has been the subject of much discus- sion, is of fundamental importance in any broad study of the genetic relations of igneous rocks.

It has often been observed that all the rocks from a definite igneous centre have a general similarity in chemical and minera- logical characters. This relationship is called, after Professor Iddings, " consanguinity," and appears to be due to the fact that the rocks are drawn from a common source. Professor Judd pointed out the existence of distinct " petrographical provinces," within which the eruptive rocks during a given geological period have a certain family likeness and have appeared in definite succession. Thus he recog- nized a Bri to- Icelandic petrographical province of Tertiary and recent lavas. It has been shown by A. Barker that alkali igneous rocks are generally associated with the Atlantic type of coast-line and sub-alkali rocks with the Pacific type.

Although changes in the character of an erupted product from a given centre are usually brought about very slowly, it has often been supposed

that even in the course of a single prolonged eruption, or series of eruptions, the character of the lava may vary to some extent. That this is not, however, usually the case has been re- peatedly proved. M. H. Arsandaux, for instance, analysed the bombs of augite-andesite thrown out from Santorin at the beginning of theeruption of 1866, others ejected in 1867, and others again at the close of the eruption in 1868; and he found no important variation in the composition of the magma during these successive stages. Moreover, Professor A. Lacroix found that the material extruded from Vesuvius in 1906 remained practically of the same composition from thebeginningtotheend of theeruption, and further, that it presented great analogy to that of 1872 and even to that of 1631.

AH the Vesuvian lavas are of the type of rock known as leuco- tephrite or leucitetephrite, or they pass, by the presence of a little olivine, into leucite-basamte. Leucite is characteristic of the lavas of Vesuvius, whilst it is excessively rare in those of Etna, where a normal doleritic type prevails. Nepheline, a felspathoid related to leucite, is characteristic of certain lavas, such as those of the Canary Islands, which comprise nepheline-tephrites andnepheline-basanites. Most of the lavas from the volcanoes of South America consist of hypersthene-andesite, and it is notable that the fragmental ejecta- menta from the eruptions of St Vincent and Martinique in 1902 and from Krakatoa in 1883 were evidently derived from a magma of this Pacific type.

It commonly happens that acid lavas are paler in colour, less dense and less fusible than basic lavas, and they are probably drawn in some cases from shallower depths. As a consequence of the ready fusibility of many basic lavas, they flow freely on emission, running to great a'stances and forming far spreading sheets, whilst the more acid lavas rapidly become viscid and tend to consolidate nearer to their origin, often in hummocky masses. The shape of a volcanic mountain is consequently determined to a large extent by the chemical character of the lavas which it erryts. In the Hawaiian Islands, for instance, where the lavas are highly basic and fluent, they form mountains which, though lofty, are flat domes with very gently sloping sides. Such is the fluidity of the lava on emission that it flows freely on a slope of less than one degree. In consequence, too, of this mobility, it is readily thrown into spray and even pro jected by the expansive force of vapour into jets, which may rise to the height of hundreds of feet and fall back still incandescent, producing the appearance of "fire fountains." The emission is not usually accompanied, however, by violent explosions, such as are often associated with the eruption of magmas of less basic and more viscous nature. The viscosity of the lava at Kilauea was estimated by G. F. Becker to be about fifty times as great as that of water. It may be pointed out that the fusibility of a lava depends not on the mere fact that it is basic, but rather on the character of the bases. A lava from Etna or Vesuvius may

be really as basic as one from Hawaii.

Capillary Lava. — A filamentous form of lava well known at Kilauea, in Hawaii, is termed Pelt's hair, after Pele, the reputed goddess of the Hawaiian volcanoes. It resembles the capillary slag much used in

the arts under the name of " mineral wool " — a material formed by injecting steam into molten slag from an iron blast-furnace. It is commonly supposed that Pele's hair has been formed from drops of lava splashed into the air and drawn out by the wind into fine threads. According, however, to Major G. E. Dutton, the filaments are formed on the eddying surface of the lava by the elongation of minute vesicles of water-vapour expelled from the magma. C. F. W. Krukenberg, who examined the hair microscopically, figured a large number of fibres, some of which showed the presence of minute vesicles and microscopic crystals, the former when drawn out rendering the thread tubular. In a spongy vitreous scoria from Hawaii, described as " thread-lace," a polygonal network of delicate fibres forms little skeleton cells. Capillary lava is not confined to the Hawaiian volcanoes: it is known, for example, in Reunion, and may be formed even at Vesuvius.

Pumiceous Lava. — The copious disengagement of vapour in a glassy lava gives rise to the light cellular or spongy substance, full of microscopic pores, known as pumice (q.v.). it is usually, though not invariably, produced from an acid lava, and may some- times be regarded as the solidified loam of an obsidian. During the eruption of Krakatoa irr 1883 enormous quantities of pumice were ejected, and were carried by the sea to Vast distances, until they ultimately became water-logged and sank. Professor Judd found the pumice to consist of a vitreous lava greatly inflated by imprisoned vapours; the walls of the air-cells were formed of the lava drawn out into thin plates and threads, often with delicate fibres running across the cavities. Having been suddenly cooled, it was extremely brittle, and its ready pulverization gave rise to much of the ash ejected during this eruption. It has been shown by Dr Johnston- Lavis that a bed of pumiceous lava, especially if basic, is generally vitreous towards the base, becoming denser, darker and more crys- talline upwards, until it may pass superficially into scoria. The change is explicable by reduction in the temperature of the magma consequent on the conversion of water into steam.

Water in Lavas.— Whether an eruption is of an explosive or a tranquil character must depend largely, though not wholly, on the chemical composition of the magma, especially on the extent to which it is aquiferous. By relief of pressure on the rise of the column in the volcanic channel, or otherwise, more or less steam will be disengaged, and if in large quantity this must become, with other vapours, a projectile agency of

enormous power. The precise physical condition in which water exists in the magma is a matter of speculation, and hence Johnston-Lavis proposed to designate it simply as H 2 0. Water above its critical point, which is about 370 C. or 698 F., cannot exist as a liquid, whatever be the pressure, neither is it an ordinary vapour. It has been estimated that the critical point would probably be reached at a depth of about 7 m. At very high temperatures the elements of water may exist in a state of dissociation.*

Much discussion has ansen as to the origin of the volcanic water, but probably it is not all attributable to a single source. Some may be.df superficial origin, derived from rain, river or sea; whilst the upward passage of lava through moist strata must generate large volumes of steam. It has often been remarked that wet weather increases the activity of a volcano, and that in certain mountains the eruptions are more frequent in winter. According, however, to Professor A. Ricco's prolonged study 01 Etna, rain has no apparent influence on the activity of this mountain, and indeed the number of eruptions in winter, when rains are abundant, seems rather less than in summer.

The popular belief that explosive action is due to the admission of water to the volcanic focus is founded mainly on the topographic relation of volcanoes to large natural bodies of water, many being situated near the shore of a continent or on islands or even on the sea-floor. Salt water gaining access to heated rocks, through fissures or by capillary absorption, would give rise not only to water- vapour but to the volatile chlorides so common in volcanic exhala- tions. Yet it is notable that comparatively little chlorine is found among the products exhaled by the volcanoes of Hawaii, though these are typically insular. L. Palmieri, however, described certain sublimates on lava at Vesuvius after the eruption of 1872 as deposits of " sea-salt," to show that they were not simply sodium chloride, but contained other constituents found in sea-water. Professor T. J. J. See believes that sea-water gains access to the heated rocks of the earth's interior by leakage through the floor of the ocean, the bottom never being water-tight, and Arrhenius supposes that it reaches the magma by capillarity through this floor.

It has been supposed that water on reaching the hot walls of a subterranean cavity would pass into the spheroidal state, and on subsequent reduction of temperature might come into direct contact with the heated surface, when it would flash with explosive violence into steam. Such catastrophes probably occur in certain cases. When, for example, a volcano becomes dormant, water commonly accumulates in the crater, and on a renewal of activity this crater- lake may be absorbed through fissures in the floor leading to the reopened duct, and thus become rapidly, even suddenly, converted into

vapour. But such incidents are accidental rather than normal, and seem incompetent to account for volcanic activity in general.

The effect of the contact of lava with water is often misunderstood.

When a stream of lava flows into the sea it no doubt immediately generates a prodigious volume of steam ; but this is only a temporary phenomenon, for the lava rapidly becomes chilled by the cold water, with formation of a superficial solid layer, which by its low thermal conductivity allows the internal mass to cool slowly and quietly. In the great eruption of Krakatoa in 1883 the sea-water gained occasional access to the molten lava, and by its cooling effect checked the escape of vapour, thus temporarily diminishing the volcanic activity. But Judd compares- this action to that of fastening down the safety-valve of a steam-boiler. The tension of the elastic fluids being increased by this repression would give rise subsequently to an explosion of greater violence; and hence the short violent paroxysms characteristic of the Krakatoa eruption were due to what he calls a " check and rally " of the subterranean forces. The action in the volcanic conduit has, indeed, been compared with that of a geyser.

The downward passage of water through fissures must be confined to the upper portion of the earth's crust known as the " zone of fracture," for it is there only that open channels can exist. Water might also percolate through the pores of the rocks, but even the pores are closed at great depths. It was shown many years ago by G. A. Daubree that water could pass to a limited extent through a heated rock against the pressure of steam in the opposite direction. According to S. Arrhenius, water may pass inwards through the sea-bottom by osmotic pressure.

As the melting points of various silicates are lowered by admixture with water, it appears that the access of surface-waters to heated rocks must promote their fusibility. Judd has suggested that the proximity of large bodies of water may be favourable to volcanic manifestations, because the hydrated rocks become readily melted by internal heat and thus yield a supply of lava.

Whilst some of the water-vapour exhaled from a volcano is undoubtedly derived from superficial sources, notably in such insular volcanoes as Stromboli, the opinion has of late years been gaining ground, through the teaching of Professor E. Suess and others, that the volcanic water must be largely referred to a deep-seated sub- terranean origin — that it is, in a

word, " hypogene " or magmatic rather than meteoric. It is held that the magma as it rises through the volcanic conduit brings up much water-vapour and other gaseous matters derived from original sources, perhaps a relic of what was present in the earth in its molten condition, having possibly been absorbed from a dense primordial atmosphere, or, as suggested by Professor T. C. Chamberlin, entrapped by the globe during its formation by accretion of planetesimal matter.

Water brought from magmatic depths to the surface, and appear- ing there for the first time, has been termed " juvenile," and it has been assumed that such water may be seen in hot springs like those at Carlsbad. Professor J. W. C-regory has suggested that certain springs in the interior of Australia may derive part of their supply from juvenile or plutonic waters.

According to A. Gautier, the origin of volcanic water may be found in the oxidation of hydrogen, developed from masses of crystalline rock, which by subsidence have been subjected to the action of subterranean heat. ,,,-.,

Volcanic Vapours. — It seems not unlikely that the vapours and gases exist in the volcanic magma in much the same way that they can exist in molten metal. It is a familiar fact that certain metals when melted can absorb large volumes of gases without entering into chemical combination with them. Molten silver, for example, is capable of absorbing from the atmosphere more than twenty times its volume of oxygen, which it expels on solidification, thus producing what is called the " spitting of silver." Platinum again can absorb and retain when solid, or occlude, a large volume of hydrogen, that can be expelled by heating the metal in vacuo. In like manner molten rock under pressure can absorb much steam. It appears that many igneous rocks contain gases locked up in their pores, not set free by pulverization, yet capable of expulsion by strong heat. The gases in rocks have been the subject of elaborate study by R. T. Chamberlin, whose results appear in Publication No. 106 of the Carnegie Institution of Washington.

Sir W. A. Tilden has found that granite, gabbro, basalt and certain other igneous rocks enclose many times their volume of gases, chiefly hydrogen and carbon dioxide, with carbon monoxide, methane and nitrogen. Thus, the basalt of Antrim in Ireland, which is a Tertiary lava, yielded eight times its volume of gas having the following percentage composition: hydrogen 36-15, carbon dioxide 32-08, carbon monoxide 20-08, methane 10, nitrogen 1-61. No doubt some of the gases evolved on heating rocks may be gener- ated by reactions during the experiment, as shown by M. W. Travers, and also by Armand Gautier. It has been pointed out by Gautier that the gas exhaled from Mont Pele during the eruption of 1902 had practically the same composition as that which he obtained on heating*

granite and certain other rocks. According to this

authority a cubic kilometre of granite heated to redness would yield not less than 26,000,000 tons of water-vapour, besides other ˆases. If then a mass of granite in the earth's crust were subject to a great local accession of heat it might evolve vast volumes of gaseous matter, capable of producing an eruption of explosive type. Judd found that the little balls of Siberian obsidian called marekanite threw off, when strongly heated, clouds of finely divided particles formed by rupture of the distended mass through the escape of vapour. Pitchstone when ignited loses in some cases as much as 10% of its weight, due to expulsion of water.

Much of the steam and other vapour brought up from below by the lava may be evolved on mere exposure to the air, and hence a stream freshly extruded is generally beclouded with more or less vapour. Gaseous bubbles in the body of the lava render it vesicular, especially in the upper part of a stream, where the pressure is relieved, and the vesicles by the onward flow of the lava tend to become elongated in the direction of movement. Vesiculation, being naturally resisted by cohesion, is not common in very viscid lavas of acid type, nor is it to be expected where the lava has been subject to great pressure, but it is seen to perfection in surface-flows of liquid lavas of basaltic character. A vesicular structure may some- times be seen even in dykes, but the cavities are usually rounded rather than elongated, and are often arranged in bands parallel to the walls of the dyke. A very small proportion of water in a lava suffices to produce vesiculation. Secondary minerals developed in a cellular lava may be deposited in the steam-holes, thus producing an amygdaloidal rock.

After the surface of a lava-stream has become crusted over, vapour may still be evolved in the interior of the mass, and in seeking release may elevate or even pierce the crust. Small cones may thus be thrown up on a lava-flow, and when vapour escapes from terminal or lateral orifices they are known as " spiracles." The steam may issue with sufficient projectile force to toss up the lava in little fountains. When the lava is very liquid, as in the Hawaiian volcanoes, it may after projection from the blow-hcle fall back in drops and plastic clots, which on consolidation form, by their union, small cones.

Vapour-vents on lava are often known as fumaroles (g.v .). The character of the gaseous exhalations varies with the temperature, and the following classification was suggested by C. Sainte-Claire Deville: (1) Dry or white fumaroles having a temperature above 500° C. and evolving compounds of chlorine, and perhaps fluorine. (2) Acid fumaroles, exhaling much steam, with hydrocholoric acid and sulphur dioxide. (3) Alkaline fumaroles, at a temperature of about ioo°, with much steam and ammonium chlorideand

some sulphuretted hydrogen. (4) Cold fumaroles, below ioo°, with aqueous vapour, carbon dioxide and sulphuretted hydrogen. (5) Mofettes, indicating the expiring phase of vulcanism. A similar sequence of emanations, following progressive cooling of the lava, has been noted by other observers. During an eruption, the gaseous products may vary considerably. Johnston-Lavis found at Vesuvius that the vapour which first escaped from the boiling lava contained much sul- phurous acid, and that hydrochloric acid and other chlorides appeared later.

If the vapours exhaled from volcanoes were derived originally from superficial sources, the lava would, of course, merely return to the surface of the earth what it had directly or indirectly absorbed. But if, as is now rather generally believed, much if not most of the volcanic vapour is derived from original subterranean sources, it must form a direct contribution from the interior of the earth to the atmosphere and hydrosphere, and consequently becomes of extreme geological interest.

Description of Special Gases and Vapours. — Hydrochloric acid, HC1, escapes abundantly from mary vents, often accompanied with the vapours of certain metallic chlorides, and is responsible for much of the acrid effects of volcanic exhalations. To avoid dangerous vapours an active volcano should be ascended on the windward side. Free hydrofluoric acid, HF, has sometimes been detected with the hydrochloric acid among Vesuvian vapours, and silicon fluoride, S1F4, has also been reported. Sulphuretted hydrogen, H 2 S, is a frequent emanation, and being combustible may contribute to the lambent flames seen in some eruptions. It readily suffers oxidation, giving rise to sulphur dioxide and water. By the interaction of hydrogen sulphide and carbon dioxide, water and carbon oxy- sulphide, COS, are formed; whilst by reaction with sulphur dioxide, water and free sulphur are produced, such being no doubt the origin of many deposits of volcanic sulphur. Hydrogen sulphide may be formed by the decomposition of certain metallic sulphides, like that of calcium, in the presence of moisture, as suggested by Anderson and Flett with regard to certain muds at the Soufriere of St Vincent. Sulphur dioxide, SO2, is one of the commonest exhalations, especially at acid fumaroles. It may be detected by its characteristic smell, that of burning brimstone, even when present in very small pro- portion and in the presence of an excess of hydrochloric acid. By hydration it readily forms sulphurous acid, which may be further oxidized to sulphuric acid. J. B. Boussingault found free sulphuric acid (with hydrochloric acid) in the water of the Rio Vinagre which issues from the volcano of Purace" in the Andes of Colombia; and it occurs also in certain other volcanic waters. _Carbon dioxide, C0 2 , is generally a product of the later stages of an eruption, and is

often evolved after all other gases have ceased to escape. Although it may sometimes be due to the decomposition of limestone, it seems to be mostly of true magmatic origin. At the well-known Grotta del Cane, at Lake Agnano, in the Phlegraean Fields near Naples, there has been for ages a copious discharge, and analyses of the air of the cave by T. Graham Young showed the presence of from 61-5 to 71 % of carbon dioxide, Gauticr, in 1907, found 96 to 97% of this gas in the vapours (excluding water-vapour) emitted from the Solfatara near Pozzuoli in the Bay of Naples. The gas by its density tends to accumulate in depressed areas, as in the Death Gulch in the Yellowstone Park and in the Upas Valley of Java. In the Eifel, in the Auvergne and in many other volcanic regions it is discharged at temperatures not above that of the atmosphere. This natural carbonic acid gas is now utilized industrially at many localities. In the gases of the fumaroles of Mont Pele, carbon monoxide, CO, was detected by H. Moissan. Probably certain hydrocarbons, notably methane or marsh-gas, CH4, often exist in volcanic gases. They might be formed by the action of water on natural carbides, such as that of magnesium, calcium, &c. Moissan found 5-46% of methane in vapour from a fumarole on Mont Pele in 1902. Free hydrogen was detected by R. Bunsen as far back as 1846 in vapours from volcanoes in Iceland. In 1861 Deville and Fouque found it, with hydrocarbons, at Torre del Greco near Naples; and in 1866 Fouque discovered it at Santorin, where some of the vapour at the immediate focus of eruption contained as much as 30% of hydrogen. It is notable that at Santorin free oxygen was also found. The elements of water may possibly exist, at the high temperature of the magma, in a state of dissociation, and certain volcanic explosions have sometimes been attributed to the combination of these elements. Oxygen is not infrequently found among volcanic emanations, but may perhaps be derived in most cases from superficial air and ground-water; and in like manner the nitrogen, often detected, may be sometimes of atmospheric origin, though in other cases derived from nitrides in the lava. In the vapours emitted by Mont Pele in 1902 argon was detected by II. Moissan, to the extent of 0-71 %; and in these from Vesuvius in 1906 argon and neon were found by Gautier. The collection of volcanic vapours offers difficulty, and it is not easy to avoid admixture with the atmo- sphere. F. A. Perret has successfully collected gases on Vesuvius.

Volcanic Flames. — Although the incandescence of the lava and stones projected during an eruption, and the reflection from incan- descent matter in the crater have often been mistaken for red flames, there can be no doubt that true combustion, though generally feeble, does occur during volcanic outbursts. Among the gases cited above, hydrogen, hydrogen sulphide and the hydrocarbons are inflammable. The flames seen in

volcanoes are generally pale and of bluish, greenish or yellowish tint. They were first examined spectro- scopically by J. Jaussen, who in 1867 detected the lines of burning hydrogen at Santorin. Subsequently he proved the presence of hydrogen, sodium and hydrocarbons in the volcanic flames of Kflauea. During the eruption of Vulcano, in the Lipari Isles, in 1888, flames with, a bluish or greenish tinge were seen by A. E. Narlian, an experienced observer resident in the island; These, however, were referred to the kindling of sulphur deposited around the fumaroles, the flames being coloured by the presence of boric acid and arsenic sulphide.

When a stream of lava flows over vegetation the combustion of the leaves and wood may be mistaken for flames issuing from the lava. In like manner brushwood may grow in the crater of a dormant volcano and be ignited by a fresh outburst of lava, thus producing flames which, from their position in the crater, may readily deceive an observer.

*Volcanic Sublimates.- — Certain mineral substances occur as sub- limates in and around the volcanic vents, forming incrustations on the lava. They are cither deposited directly from the effluent vapours, which carry them in a volatile condition, or are produced by interaction of the vapours among themselves; whilst some of the incrustations, rather loosely called sublimates, are due to reaction of the vapours on the constituents of the lava. Possibly at the temperature of the magma-reservoirs even silica and various silicates may be volatilized, and might thus yield sublimation products. Many of the volcanic sublimates occur at first as incan- descent crusts on the lava. Being generally unstable they are difficult of preservation, and are not usually well represented in collections. .**

Among the commonest sublimates is halite, or sodium chloride, NaCl, occurring as a white crystalline incrustation, sometimes accompanied, as at Vesuvius, by sylvite, or potassium chloride, KC1, which forms a similar sublimate. The two chlorides may be intimately associated. Sal ammoniac, or ammonium chloride, NH4CI, is not uncommon, especially at Etna, as a white crystalline crust, probably formed in part by the reaction of hydrochloric acid with nitrogen and hydrogen in the vapours. Bunsen, on finding it in Iceland, regarded it as a product of the distillation of organic matter. At the Solfatara, near Pozzuoli, sal ammoniac was formerly collected as a sublimate on tiles placed round a bocca or vapour- vent. . Ferric chloride, FeCl 3 , not infrequently occurs as a reddish or brownish yellow deliquescent incrustation, and because it thus colours the lava it has received the name of molysite (from Gr.

ˆoXuo-is, stain). The action of hydrochloric acid on the iron com- pounds in the lava may readily yield this chloride, which from its yellowish colour has sometimes been mistaken for sulphur. A crystalline sublimate from the

fumaroles on Vesuvius, containing ferric and alkaline chlorides, KCl-NH 1 Cl-2FeCI 3 -f-6H20, is known as kremersite, after P. Kremers. From a scoriaceous lava found on Vesuvius after the eruption of 1906, Johnston-La vis procured a yellow rhombohedral sublimate, which he proved to be a chloride of manganese and potassium, whence he proposed for it the name chlormanganokalite. It was studied by L. J. Spencer, and found to contain 4KCl-MnCla. Chlorocalcite, or native calcium chloride, CaCl 2 , has been found in cubic crystals on Vesuvian lava. Fluorite, or calcium fluoride, CaF2, is also known as a volcanic product. Lead chloride, PbCl 3 , a rare Vesuvian mineral, was named cotunnite, after Dr Colugno of Naples, The action of hydrogen sulphide on this chloride may give rise to galena, PbS, found by A. Lacroix on Vesu- vius in 1906. Atacamitc, or cupric oxychloride, CuCl 2 3Cu(OH)2, occurs as a green incrustation on certain Vesuvian lavas, notably those of 1631. Another green mineral from Vesuvius was found by A. Scacchi to be a sulphate containing copper, with potas sium and sodium, which he named from its fine colour euclorina — a word which has been written in English as euchlorinite. The copper in the sublimates on Vesuvius will sometimes plate the iron nails of a traveller's boots when crossing the newly erupted lava. Cupric oxide, CuO, occurs in delicate crystalline scales termed tenorite, after Professor G. Tenorc of Naples ; whilst cupric sulphide, CuS, forms a delicately reticulated incrustation known as covellite, after N. Covelli, its discoverer at Vesuvius.

A sublimate not infrequently found in feathery crystalline deposits on lava at Vesuvius, and formerly called " Vesuvian salt," is a potassium and sodium sulphate, (K-Na)2S04, known as aphthi- talite (from Gr. &

Boric acid, H3BO3, occurs in the crater of Vulcano so abundantly that it was at one time collected commercially. It has also led to the foundation of an industry in Tuscany, where it is obtained from the soffioni (q.v.) of the Maremma. From Sasso in Tuscany it has received the name of sassolin or sassolite. Realgar, or arsenic sulphide, AS2S2, occurs in certain volcanic exhalations and is de- posited as an orange-red incrustation, often associated with sulphur, as at the Solfatara, where orpiment, AS2S3, has also been found.

Of all volcanic products, sulphur (q.v,) is in some respects the most important. It may occur in large quantity lining the walls of the crater, as at Popocatepetl in Mexico, where it was formerly worked by the Indian " volcaneros," or on the other hand it may be a rare product, as at Vesuvius. Sulphur appears generally to owe its origin in volcanic areas to the interaction of sulphur dioxide and sulphuretted hydrogen, or to the action of water on the latter. A volcanic vent where' sulphur is deposited is truly a solfatara (salfo terra) or a soufricrc, but all volcanoes which have passed into that stage in which they emit merely heated vapours now pass under

this name (see Solfatara). The famous Solfatara, an old crater in the Phlegraean Fields, exhales sulphurous vapours, especially at the Bocca Grande, from which sulphur is deposited. In the orange- coloured sulphur of the Solfatara, realgar may be present to the extent of as much as 18%. A brown seleniferous sulphur occurring at Vulcano, one of the Lipari Islands, was termed by W. Haidinger volcanite, but it should be noted that Professor W. H. Hobbs has applied this name to an anorthoclase-augite rock ejected as bombs at Vulcano. Sulphur containing selenium is known as a volcanic product in Hawaii, whilst in Japan not only selenium but tellurium occurs in certain kinds of sulphur.

At the Solfatara, near Pozzuoli, the hot sulphurous vapours attack the trachytic rocks from which they issue, giving rise to such pro- ducts as alum, kaolin and gypsum. To some of these products, including alunogen and mendozite (soda-alum), the name solfatarite was given by C. W. Sheppard in 1 835. By prolonged action of the acid vapours on lava, the bases of the silicates may be removed, leaving the silica as a soft white chalk-like substance. The occur- rence of kaolin and other white earthy a Iteration- products led to the hills around the Solfatara being known to the Romans as the Colli leucogei.

The Hot Dust Cloud and Avalanche of Pe2£; — The terrific erup- tions in the islands of Martinique and St Vincent in the West Indies in 1902, furnished examples of a type of activity not previ- ously recognized by vulcanologists, though, as Professor A. Lacroix

has pointed out, similar phenomena have no doubt occurred elsewhere, especially in the Azores. By Drs Tempest Anderson and J. S. Flett, who were commissioned by the Royal Society to report on the phenomena, this type of explosive eruption is distinguished as the " Pclean type." Its distinctive character is found in the sudden emission of a dense black cloud of super- heated and suffocating gases, heavily charged with incandescent dust, moving with great velocity and accompanied by the dis- charge of immense volumes of volcanic sand, which are not rained down in the normal manner, but descend like a hot avalanche. The cloud, with the avalanche, is called by Lacroix a nuee Peleenne, or nuee ardente, the latter term having been applied to the fatal cloud in the eruptions at San Jorge in the Azores in 181S. In its typical form, the cloud seen at Pele appeared as a solid bank, opaque and impenetrable, but having the edge in places hanging like folds of a curtain, and apparently of brown or purplish colour. Rolling along like an inky torrent, it produced in its passage intense

darkness, relieved by vivid lightning. So much solid matter was suspended in the cloud, that it became too dense to surmount obstacles and behaved rather like a liquid. It has, however, been suggested that its peculiar movement as it swept down the mountain was due not simply to its heavy charge of solids, but partly to the oblique direction of the initial explosion. After leaving the crater, it underwent enormous expansion, and Anderson and Flett were led to suggest that possibly at the moment of emission it might have been partly in the form of liquid drops, which on solidify- ing evolved large volumes of gas held previously in occlusion. The deadly effect of the blast seems to have been mostly due to the irritation of the mucous membrane of the respiratory passages by the fine hot dust, but suffocating gases, like sulphur dioxide and sulphuretted hydrogen, were associated with the water-vapour. Possibly the incandescent dust was even hotter than the surrounding vapour, since the latter might be cooled by expansion.

It is said that the black cloud as it swept along was accom- panied by an indraught of air, not however sufficiently powerful to check its rapid advance. The current of air was likened by Anderson and Flett to the inrush of air at a railway station as an express train passes. An attempt was made to determine the temperature of the fatal blast which destroyed St Pierre, but without very definite results. Thus it was assumed that as the telephone wires were not melted the temperature was below the fusing-point of copper: possibly, however, the blast may have passed too rapidly to produce the effects which might normally be due to its temperature.

Shape of Volcanic Cones. — Those volcanic products which are solid when ejected, or which solidify after extrusion, tend to form by their accumulation around the eruptive vent a hill, which, though generally more or less conical, is subject to much variation in shape. It occasionally happens that the hill is composed wholly of ejected blocks, not themselves of volcanic origin. In this case an explosion has rent the ground, and the effluent vapours have hurled forth fragments of the shattered rock through which the vent was opened. but no ash or other fragmentary volcanic material has been ejected, nor has any lava been poured forth. This exceptional type is represented in the Eifel by certain monticules which consist mainly of fragments of Devonian slate, more or less altered. In some cases the area within a ring of such rocky materials is occupied by a sheet of water, forming a crater-lake, known in the Eifel as a maar. Piles of fragmentary matter of this character, though containing neither cinders nor lava, may be fairly regarded as volcanic, inasmuch as they arc due to the explosive action of hot subterranean vapours.

In the ordinary paroxysmal type of eruption, however, cinders and ashes are shot upwards by the explosion and then descend in showers, forming around the orifice a mound, in shape rather like the diminu- tive cone of

sand in the lower lobe of an hour-glass. Little cinder- cones of this character may be formed within the crater of a large volcano during a single eruption; whilst large cones are built up by many successive discharges, each sheet of fragmentary material mantling more or less regularly round the preceding layer. The symmetry of the hill is not infrequently affected by disturbing influences — a strong wind, for example, blowing the loose matter towards one side. The sides of a cinder cone have generally a steep slope, varying from 30 to 45 , depending on the angle of repose of the ejectamenta. Excellent examples of small scoria-cones are found among the puys of Auvergne in central France, whilst a mag-

nificent illustration of this type of hill is furnished by Fusiyama, in Japan, which reaches an altitude of 12,000 ft. How such a cone may be rapidly built up was well shown by the formation of Monte Nuovo, near Pozzuoli — a hill 400 ft. high and a mile and a half in circumference, which is known from contemporary evidence to have been formed in the course of a few days in September 1538. The shape of a cinder cone may be retained for ages, since it is not liable to suffer greatly by denudation, as the rain soaks into the loose porous mass instead of running down the outside. If lava rises in the duct of a cinder cone, it may, on accumulation in the crater, break down the wall, and thus effect its escape as a stream. Cones breached in this way are not uncommon in Auvergne.

It often happens that the cinders and ashes ejected from a volcano become mixed with water, and so form a paste, which sets readily as a hard tufaceous mass. Such natural tuff is indeed similar to the hydraulic cement known as pozzolana, which is formed artificially from volcanic ashes, and is renowned for durabihtv. Although streams of volcanic mud are commonly associated with the ashes of a cinder-cone they may also form independent structures or tuff- cones. These are generally broad-topped hills, having sides with an angle of slope as low in some cases as 15 .

Lava-cones are built up of streams of lava which have consolidated around the funnel of escape. Associated with the lava, however, there is usually more or less fragmentary matter, so that the cones are composite in structure and consequently more acute in shape than if they were composed wholly of lava. As the streams of lava in a volcano run at different times in different directions, they radiate from the centre, or flow from lateral or eccentric orifices, as irregular tongues, and do not generally form continuous sheets covering the mountain.

When lava is the sole or chief element in the cone, the shape of the hilt is determined to a great extent by the chemical composition and viscosity of the lava, its copiousness and the rapidity of flow. If the lava be highly basic

and very mobile, it may spread to a great distance before solidifying, and thus form a hiil covering a large area and rising perhaps to a great height, but remarkably flat in profile. Were the lava perfectly liquid, it would indeed form a sheet without any perceptible slope of surface. As a matter of fact, some lavas are so fluent as to run down an incline of 1°, and flat cones of basalt have in some cases a slope of only io° or even less. The colossal mass of" Mauna Loa, in Hawaii, forms a remarkably flat broad cone, spreading over a base of enormous area and rising to a height of 13,900 ft. Major Dutton, writing in 1883, said that " a moderate eruption of Mauna Loa represents more material than Vesuvius has emitted since the days of Pompeii." Yet the lava is so mobile that it generally wells forth quietly, without explosive demonstra- tion, and therefore unaccompanied by fragmentary ejectamenta. Fluent lavas like those of Hawaii are also poured forth from the volcanoes and volcanic fissures of Iceland.*

If the lava be less basic and less fusible, the hill formed by its accumulation instead of being a low dome will take the shape of a cone with sides of higher gradient: in the case of andesite cones, for instance, the slope may vary from 25 to 35 . Acid rocks, or those rich in silica, such as rhyolites and trachytes, may be emitted as very viscous lavas tending to form dome-shaped or bulbous masses. Experiment shows that such lavas may persist for a considerable time in a semi-solid condition. It is possible for a dome to increase in size not bythe lava running over the crater and down the sides but by injection of the pasty magma within the expanding bulb while still soft; or if solidified, the crust yields by cracking. Such a mode of growth, in which the dome consists of successive sheets that have been compared to the skins of an onion, has been illustrated by the experiments of Dr A. Reyer, and the structure is typically represented by the mamelons or steep-sided domes of the Isle of Bourbon. The Puy-de-D6me in Auvergne is an example of a cone formed of the trachytic rock called from its locality domite, whilst the Grand Sarcoui in the same region illustrates the broad dome- shaped type of hill. Such domes may have no summit-crater, and it is then usually assumed that the top with the crater has been removed by denudation, but possibly in some cases such a feature never existed. The " dome volcano " of von Seebach is a dome of acid lava extruded as a homogeneous mass, without conspicuous chimney or crater. Although domes are usually composed of acid rocks, it seems possible that they may be formed also of basic lavas, if the magma be protruded slowly at. a low temperature so as to be rapidly congealed.

The Spine of PeU. — A peculiar volcanic structure appeared at Mont Pele in the course of the eruption of 1902, and was the subject of careful study by Professor A. Lacroix, Dr E. A. Hoovey, A. Heilprin and other observers. It appears that from fissures in the floor of the Etang Sec a viscous andesitic lava, partly quartziferous, was poured forth_and rapidly solidified

superficially, forming a dome- shaped mass invested by a crust or carapace. According to Lacroix, the crust soon became fractured, partly by shrinkage on consolida- tion and partly by internal tension, and the dome grew rapidly by injection of molten matter. Then there gradually rose from the dome a huge monolith or needle, forming a terminal spine, which in the_ course of its existence varied in shape and height, having been at its maximum in July 1903, when its absolute height was about

5276 ft. above sea-level. The walls of the spine, inclined at from 75 to 90 to the horizon, were apparently slickensided, or polished and scratched by friction : massos were occasionally detached and vapours were continually escaping. Several smaller needles were also formed. Some observers regarded the great spine as a solidified plug of lava from a previous outburst, expelled on a renewal of activity- Lacroix, however, believed that it was formed by the extrusion of an enormous mass of highly viscid magma, perhaps partly solidified before emission, and he compared the formation of the dome in the crater to the structure on Santorin in 1866, described by Fouque as a " cum ulo- volcano." Professor H. F. Cleland has suggested a comparison with the cone of andesite in the crater of the volcano of Toluca in Mexico, and it is said that similar formations have been observed in the volcanoes of the Andes. Dr Tempest Anderson, on visiting Pcle in 1907, found a stump of the spine, consisting of a kind of volcanic agglomerate, rising from a cone of talus formed of its ruins.

The Crater. — The eruptive orifice in normal volcano — -the bocca of Italian vulcanologists— is usually situated at the bottom of a depression or cup, known as the crater. This hollow is formed and kept open by the explosive force of the elastic vapours, and when the volcano becomes dormant or extinct it may be closed, partly by rock failing from its crumbling walls and partly by the solidification of the lava which it may contain. If a renewed outburst occurs, the floor of the old crater may reopen or a new outlet may be formed at some weak point on the side of the mountain: hence a crater may, with regard to position, be either terminal or lateral. The position of the crater will evidently be also changed on any shifting of the general axis of eruption. In shape and size the crater vanes from time to time, the walls being perhaps breached or even blown away during an outburst. Hence the height of a volcanic mountain in activity, measured to the rim of the crater or the terminal peak, is not constant. Vesuvius, for example, suffered a reduction of several hundred feet during the great eruption of 1906, the east side of the cone having lost, according to V. R. Mattencci, 120 metres.

Whilst in many cases the crater is a comparatively small circular hollow around the orifice of discharge, it forms in others a large bowl- like cavity, such as is termed in some localities a " caldera." In the Sandwich Islands the craters are wide pits bounded by nearly vertical walls, showing stratified and terraced lavas and floored by a great plain of black basalt, sometimes with lakes of molten lava. Professor W. H. Pickering compares the lava-pits of Hawaii to the crater-rings in the moon. Some of the pit-craters in the Sandwich Islands are of great size, but none comparable with the greatest of the lunar craters. Dr G. K. Gilbert, however, has suggested that the ring-shaped pits on the moon are not of volcanic origin, but are depressions formed by the impact of meteorites. Similarly the " crater " of Coon Butte, near Canyon Diablo, in Arizona, which is 4000 ft. in diameter and 500 ft. deep, has been regarded as a vast pit due to collision of a meteorite of prodigious size. Probably the largest terrestrial volcanic crater is that of Aso-san, in the isle of Kiushiu (Japan), which is a huge oval depression estimated by some observers to have an area of at least 100 sq. m. Some of the large pit-craters have probably been formed by subsidence, the cone of a volcano having been eviscerated by extravasation of lava, and the roof of the cavity having then subsided by loss of support. The term caldera has sometimes been limited to craters formed by such collapse.

On the floor of the crater, ejected matter may accumulate as a conoidal pile; and if such action be repeated in the crater of the new cone, a succession of concentric cones will ultimately be formed. The walls of a perfect crater form a ring, giving the cone a truncated appearance, but the ring may suffer more or less destruction in the course of the history of the mountain. A familiar instance of such change is afforded by Vesuvius. The mountain now so called, using the term in a restricted sense, is a huge composite cone built up within an old crateral hollow, the walls of which still rise as an encircling rampart on the N. and N.E. sides, and are known, as Monte Somraa ; but the S. and SAV. sides of the ancient crater have disappeared, having been blown away during some former outburst, probably the Pliman eruption of 79. In like manner the relics of an old crater form an amphitheatre partially engirdling the Soufriere in St Vincent, and other examples of " Somma rings " are known to vulcanologists.

Much of the fragmental matter ejected from a volcano rolls down the inside of the crater, forming beds of tuff which incline towards the central axis, or have a centroclinal dip. On the contrary, the sheets of cinder and lava which form the bulk of the cone slope away from the axis, or have a dip that is sometimes described as peri- centric or qua-qua-vejsal. According to the old " crater-of -elevation theory/' bold especially by A. von Humboldt, L. von Buch and £lie de Beaumont, this inclination of the beds was regarded as mainly due to upheaval. It was contended that the volcanic

cone owed its shape, for the most part, to local distension of the ground, and was indeed comparable to a huge blister of the earth's crust, burst at the summit to form the " elevation crater." Palma, in the Canary Islands, was cited as a typical example of such a formation. This view was opposed mainly by Poulett-Scrope, Sir Charles Lyell and Constant Provost, who argued that the volcano, so far from being

bladder-like, was practically a solid cone of erupted matter: hence this view came to be known as the " crater-of-eruption theory." Its general soundness has been demonstrated whenever an insight has been obtained into the internal structure of a volcano. Thus, after the eruption of Krakatoa in 1883 a magnificent natural section of the great cone of Rakata, at the S. end of the island, was exposed — the northern half having been blown away— and it was then evident that this mountain was practically a solid cone, built up of a great succession of irregular beds of tuff and lava, braced together by intersecting dykes. The internal architecture of a volcano is rarely so well displayed as in this case, but dissections of cones, more or less distinct, are often obtained by denudation. It should be mentioned that, in connexion with the structures called laccoliths, there may have been an elevation, or folding, and even faulting, of the superficial rocks by subterranean intrusion of lava ; but this is different from the local expansion and rupture of the ground required by the old theory. It may be noted, however, that in recent years the view of elevation, in a modified form, has not been without supporters.

Where the growth of a volcanic mound takes place from within, as in certain steep-sided trachytic cones, there may be no perceptible crater or external outlet. Again, there are many volcanoes which have no crater at the summit, because the eruptions always take place from lateral outlets. Even when a terminal pit is present, the lava may issue from the body of the mountain, and in some cases it exudes from so many vents or cracks that the volcano has been described as " sweating fire."

Parasitic Cones. — In the case of a lofty volcano the column of lava may not have sufficient ascensional force to reach the crater at the summit, or at any rate it finds easier means of egress at some weak spot, often along radial cracks, on the flanks of the mountain. Thus at Etna, which rises to a height of more than 10,800 ft., the eruptions usually proceed from lateral fissures, sometimes at least half-way down the mountain-side. When fragmental materials are ejected from a lateral vent a cinder-cone is formed, and by frequent repetition of such ejections the flanks of Etna have become dotted over with hundreds of scoria-cones much like the puys of Auvergne, the largest (Monte Minardo) rising to a height of as much as 750 ft. Hills of this character, seated on the parent mountain, are known as parasitic cones, minor cones, lateral cones, &c.

Such subordinate cones often show a tendency to a linear arrange- ment, rising from vents or bocche along the floor ot a line of fissure. Thus in 1892 a chain of five cones arose from a rift on the S. side of Etna, running in a N. and S. direction, and the hills became knowii as the Monti Silvestri, after Professor Orazio Silvestri of Catania. This rift, however, was but acontinuationof a fissure from which there arose in 1886 the series of cones called the Monti Gemmcllaro, while this in turn was a prolongation of a rent opened in 1883. The eruption on Etna in the spring of 1910 took place along the same general direction, but at a much higher elevation. The tendency for erup- tions to be renewed along old lines of weakness, which can be readily opened afresh and extended, is a feature well known to vulcanologists.

The small cones which are frequently thrown up on lava streams were admirably exemplified on Vesuvius in the eruption of .1855 and figured by J. Schmidt. The name of " driblet cones " was given by J. D. Dana to the little cones and pillars formed by jets of lava projected from blowing holes at Kilauea, the drops of lava remaining plastic and cohering as they fell. Such clots may form columns and pyramids, with almost vertical sides. Steep-sided cones more or

less of this character occur elsewhere, but are usually built up around spiracles. Small cones formed by mere dabs of 1 trivially as " spatter cones."

Fissure Eruptions. — In certain parts of the world there are vast tracts of basaltic lava with little or no evidence of cones or of pyroclastic accompaniment. To explain their formation, Baron F. von Richthofen suggested that they represent great floods of lava which were poured forth not from ordinary volcanic craters with more or less explosive violence, but from great fissures in the earth's crust, whence they may have quietly welled forth and spread as a deluge over the surface of the country. The eruptions were thus effusive rather than explosive. Such phenomena, constituting a distinct type of vulcanism, are distinguished as fissure eruptions or massive eruptions— terms which suggest the mode of extrusion and the character of the extruded matter. As the lava in such outflows must be very fusible, it is generally of basaltic type, like that of Hawaii: indeed, the Hawaiian volcanoes, with their quiet emission of highly fluent lavas, connect the fissure eruptions with the " central eruptions," which are usually regarded as representing the normal type of activity. At the present day true fissure eruptions seem to be of rather limited occurrence, but excellent examples are furnished by Iceland. Here there are vast fields of black basalt, formed of sheets of lava which have issued from long chasms, studded in most cases with rows of small cones, but these generally so insignificant that they make no scenic features and might be readily

obliterated by denudation. Dr T. Thoroddsen enumerates 87 great rifts and lines of cones in Iceland, and even the larger cones of Vesuvian type are situated on fissures.

It is believed that fissure eruptions must have played a far more important part in the history of the earth than eruptions of the familiar cone-and-crater type, the latter representing indeed only

a declining phase of vulcanism. Sir Archibald GeikLe, who has specially studied the subject of fissure eruptions, regards the Tertiary- basaltic plateaus of N.E. Ireland and the Inner Hebrides as out- flows from fissures, which may be represented by the gigantic system of dykes that form so marked a feature in the geological structure of the northern part of Britain and Ireland. These dykes extend over an area of something like 40,000 sq. m. f while the outflows form an aggregate of about 3000 ft. in thickness. In parts of Nevada, Idaho. Oregon and Washington, sheets of late Tertiary basalt from fissure eruptions occupy an area of about 200,000 sq. m., and constitute a pile at least 2000 ft. thick. In India the " Deccan traps " represent enormous masses of volcanic matter, probably of like origin but of Cretaceous date, whilst South Africa furnishes other examples of similar outflows. Professor J. VV. Gregory recognized in the Kapte plains of East Africa evidence of a type of vulcanism, which he distinguished as that of " plateau eruptions. " According to him a number of vents opened at the points of inter- section of lines of weakness in a high plateau, giving rise to many small cones, and the simultaneous flows of lava from these cones united to form a far-spreading sheet.

Extrusive and Intrusive Magmas. — When the molten magma in the interior of the earth makes its way upwards and flows forth super- ficially as a stream of lava, the product is described as extrusive, effusive, effluent or eruptive; hut if, failing to reach the surface, the magma solidifies in a fissure or other subterranean cavity, it is said to be intrusive or irruptive. Rocks of the former group only are sometimes recognized as strictly " volcanic, " but the term is conveniently extended, at least in certain cases, to igneous rocks of the latter type, including therefore certain hypabyssal and even plutonic rocks.

When the intrusive magma has been forced into narrow irregular crevices it forms " veins, " which may exhibit complex ramifications, especially marked in some acid rocks; but when injected into a regularly shaped fissure, more or less parallel-sided, and cutting across the planes of

bedding, it forms a wall-like mass of rock termed a " dyke. " Most dykes are approximately vertical, or at least highly inclined in position. The inclination of a dyke to a vertical plane is termed its " hade. " In a cinder-cone, the lava as it rises may force its way into cracks, formed by pressure of the magma and tension of the vapours, and will thus form a system of veins and dykes, often radiating from the volcanic axis and strengthening the structure by binding the loose materials together. Thus, in the Valle del Bove, a huge cavity on the east side of Etna, the walls exhibit numerous vertical dykes, which by their hardness stand out as rocky ribs, forming a marked feature in the scenery of the valley. In a similar way dykes traverse the walls of the old crater of Monte Somma at Vesuvius. Exceptionally a dyke may be hollow, the lava having solidified as a crust at the margin of the fissure but having escaped from the interior while still liquid.

When molten matter is thrust between beds of tuff" or between successive lava-flows or even ordinary sedimentary strata, it forms an intrusive sheet of volcanic rock known as a " sill. " A sill may sometimes be traced to its connexion with a dyke, which represents the channel up which the lava rose, but instead, of reaching the surface the fluid found an easier path between the strata or perhaps along a horizontal rent. Although a dyke may represent a conduit for the ascent of lava which has flowed out superficially, yet if the lava has been removed at the surface by denudation the dyke terminates abruptly, so that its function as the former feeder of a lava-current is not evident. In other cases a dyke may end bluntly because the crack which it occupies never reached the surface.

Lava which has insinuated itself between planes of stratification may, instead of spreading out as a sheet or sill, accumulate locally as a lenticular mass, known as a laccolith or laccolite (q.v.). Such a mass, in many cases rather mushroom-shaped, may force the super- incumbent rocks upwards as a dome, and though at first concealed may be ultimately exposed by removal of the overlying burden by erosion. The term phacoliie was introduced by A. Harker to denote a meniscus-shaped mass of lava intruded in folded strata, along a crest or a trough. The bysmalith of Professor Iddings is a laccolith of rather plug-like shape, with a faulted roof. An intrusive mass quite irregular in shape has been termed by R. A. Daly a chonoklh (Gr. xhvri, a mould), whilst an intrusion of very great size and ill- defined form is sometimes described as a bathylilh or batholite.

Structural Peculiarities in Lava. — Many of the structures exhibited by lava are due to the conditions under which solidification has been effected. A dyke, for example, may be vitreous at the margin where it has been rapidly chilled by contact with the walls of the fissure into which it was injected, whilst the main body may be lithoidal or crystalline: hence a basalt dyke will sometimes have a selvage formed of the basaltic glass

known as tachylyte. A similar glass may form a thin crust on certain lava-flows. In a homogeneous vitreous lava, contraction on solidification may develop curved fissures, well seen in the delicate " perlitic " cracks of certain obsidians, indicating a tendency to assume a globular structure. This structure becomes very distinct by the develop- ment of " spherulitts, " or globular masses with a radiating fibrous structure, sometimes well seen in devitrified glass. Occasionally the spherulitic bodies in lava are hollow, when they are known as

lithophyses, of which excellent examples occur at Obsidian Cliff in the Yellowstone National Park, as described by Professor Iddings. Globular structure on a large scale is sometimes displayed by lavas, expecially those of basic type, such as the basalt of Aci Castelto in Sicily, which was probably formed, according to Professor Gaetano Platania, by flow of the lava into submarine silt, relics of which still occur between the spheroids. Ellipsoidal or pillow-shaped masses are not infrequently developed in ancient lava-flows, and Sir A. Geikie , has suggested the term " pillow - structure " for such formations. Dr T. Anderson has observed them in the recent lavas of Savaii.

Joints, or cracks formed by shrinkage on solidification, may divide a sheet of lava into columns, as familiarly seen in basalt, where the rock often consists of a close mass of regular polygonal prisms, mostly hexagonal. Each prism is divided at intervals by transverse joints, more or less curved, so that the portions are united by a slight ball-and-socket articulation. As the long axes of the columns lie at right angles to the cooling surface they are vertical in a horizontal sheet of lava, horizontal in a vertical dyke, and inclined or curved in other cases. It sometimes happens that in a basaltic dyke the formation of the prisms, having started from the opposite walls as chilling surfaces, has not been completed; and hence the prisms fail to meet in the middle. A spheroidal structure is often developed in basalt columns by weathering, the rock exfoliating in spherical shells, rather like the skins of an onion : such a structure is characteristically shown at the Kasekellar, known also as the Elfcn Grotto, at Bertrich, near Alf on the Mosel, where the pillars of the lava are broken into short segments which suggest by their flattened globular shape a pile of Dutch cheeses. Although prismatic jointing, or columnar structure, is most common in basalt, it occurs also in other volcanic rocks. Fine columns of obsidian, for instance, are seen at Obsidian Cliff in the Yellowstone Park, where the pillars may be 50 ft. or more in height. Such an occurrence, however, is exceptional.

Vitreous lavas often show fluxion structure in the form of streaks, bands or trains of incipient crystals, indicating the flow of the mass when viscous. The character of this structure is related to the viscosity of the lava. Those structural peculiarities which depend mainly on the presence of vapour,

such as vcsiculation, have been already noticed, and the porphyritic structure has likewise been described.

Submarine Volcanoes.

Considering how large a proportion of the face of the earth is covered by the sea, it seems likely that volcanic eruptions must frequently occur on the ocean-floor. When, as occasionally though not often happens, the effects of a submarine eruption are observed during the disturbance, it is seen that the surface of the sea is violently agitated, with copious discharge of steam; the water passes into a state of ebullition, perhaps throwing up huge fountains; shoals of dead fishes, with volcanic cinders, bombs and fragments of pumice, float around the centre of eruption, and ultimately a little island may appear above sea-level. This new land is the peak of a volcanic cone which is based on the sea-floor, and if in deep water the submarine mountain must evidently be of great magnitude. Christmas Island in the Indian Ocean, described by Dr C. W. Andrews, appears to be a volcanic mountain, with Tertiary limestones, standing in wa'ter more than 14,000 ft. deep. Many volcanic islands, such as those abundantly scattered over the Pacific, must have started as submarine volcanoes which reached the surface either by continued upward growth or by upheaval of the sea-bottom. Etna began its long geological history by submarine eruptions in a bay of the Mediterranean, and Vesuvius in like manner represents what was originally a volcano on the sea-floor. As the ejectamenta from a submarine vent accumulate on the sea-bottom they become intermingled with relics of marine organisms, and thus form fossiliferous volcanic tuffs. By the distribution of the ashes over the sea-floor, through the agency of waves and currents, these tuffs may pass insensibly into submarine deposits of normal sedimentary type.

One of the best examples of a submarine eruption resulting in the formation of a temporary island occurred in 1831 in the Mediter- ranean between Sicily and the coast of Africa, where the water was known to have previously had a depth of 100 fathoms. After the usual manifestations of volcanic activity an accumulation of black cinders and ashes formed an island which reached at one point a height of 200 ft., so that the pile of erupted matter had a thickness of about 800 ft. The new island, which was studied by Constant Prevost, became known in England as Graham's Island, in Franceas tie Julie and in Italy by various names as Isola Ferdinandea. Being merely a loose pile of scoriae, it rapidly suffered erosion by the sea, and in about three months was reduced to a shoal called Graham's

Reef. In 1891 a submarine eruption occurred near the isle of Pantellaria in. the same waters, and the eruptive centre was termed by Professor H.S.Washington and Foerstner volcano, but it gave rise to no island. A well-known instance of a temporary volcanic island was furnished by Sabrina — an islet of cinders thrown up by sub- marine eruptions in 1811, off the coast of St Michael's, one of the Azores. The island of Bogosloff, or Castle Island, in Bering Sea, about 40 m. W. of Unalaska Island, 'is a volcanic mass which was first observed in 1796 after an eruption. In 1883 another eruption in the neighbouring water threw up a new volcanic cone of black sand and ashes, known as New Bogosloff or Fire Island, situated about half a mile to the N.W. of Old Bogosloff, with which it was connected by a low beach. Another island, called Perry Island, larger than either of the others, made its appearance in the neigh- bourhood about the time of the great earthquake in California in 1906. It is reported that some of these islands have since dis- appeared.

Mud Volcanoes.

Mud volcanoes are small conical hills of clay which discharge, more or less persistently, streams of fine mud, sometimes as- sociated with naphtha or petroleum, and usually with bubbles of gas. As the mud is generally saline, the hills are known also as " salses." The gases are chiefly hydrocarbons, often with more or less sulphuretted hydrogen and carbon dioxide, and sometimes with nitrogen. Though generally less than a yard in height, the cones may in exceptional cases rise to an elevation of as much as 500 ft. The mud oozes from the top and spreads over the sides, or is spurted forth with the gases. Occasionally the discharge is vigorous, mud and stones being thrown up to a considerable height, sometimes accompanied by flames due to combustion of the hydrocarbons.

Mud volcanoes occur in groups, and have a wide distribu- tion. They are known in Iceland; in Modena; at Taman and Kertch, in the Crimea; at Baku on the Caspian; in Java and in Trinidad: Humboldt described those near Turbaco, in Colombia. In Sicily they occur near Girgenti, and a group is known at Paterno on Etna. By the Sicilians they are termed, maccalube, a word of Arabic origin. The " paint-pots" of the Yellowstone National Park are small mud volcanoes.

Many] so-called mud volcanoes appear to be due to the de- rangement of subterranean water-flow or to landslips in con- nexion with earthquakes, whilst others may be referable to certain chemical reactions going on underground; but there are others again which seem to be truly of volcanic origin. Hot water and steam escaping through clays, or crumbling tuffs

reduced to a clayey condition, may form conical mounds of pasty material, through which mud oozes and water escapes.

Geysers are closely related to volcanoes, but in consequence of their special interest they are treated separately (see Geyser). _ For natural steam-holes and other phenomena connected with declining vulcanicity, see Soffioni, Solfatara and MofettA.

Geographical Distribution of Volcanoes.

It is matter of frequent observation that volcanoes are most abundant in regions marked by great seismic activity. Although the volcano and the earthquake are not usually connected in the direct relation of cause and effect, yet in many cases they seem referable to a common origin. Both volcanic ex- trusion and crustal movement may be the means of relieving local strains in the earth's crust, and both are found to occur, as might reasonably be expected, in many parts of the earth where folding and fracture of the rocks have frequently happened and where mountain-making appears to be still in progress. Thus, volcanoes may often be traced along zones of crustal deformation, cr folded mountain-chains, especially where they run near the borders of the oceanic basins. They are frequently associated with the Pacific type of coast-line.

The most conspicuous example of linear distribution is furnished by the great belt of volcanoes, coinciding for the most part with a band of seismic disturbance, which engirdles intermittently the huge basin of the Pacific; though here, as elsewhere in studying volcanic topography, regard must be paid to dormant and extinct centres as well as to those that are active at the present time. As volcanoes are in many cases ranged along what are commonly regarded as lines of fracture, it is not surprising that the centres of most intense vulcanicity are in many cases situated at the intersection of two or more fracture-lines. On the eastern side of the Pacific Ocean the

great volcanic ring may be traced, though with many and extensive interruptions, from Cape Horn to Alaska. In South America the chain of the Andes between Corcovado in the south and Tolima in the north is studded at irregular intervals with volcanoes, some recent and many more extinct, including the loftiest volcanic mountains in the world. The grandest group of South American volcanoes, though mostly quiescent, is in Ecuador. Cotopaxi, seen in activity by E. Whymper in 1880, has, according to him, a height of 19,613 ft., whilst Sangay is said to be one of the most active volcanoes in the world. The linear arrangement, often a marked feature in the distribution of volcanoes, is well exemplified in the general north-and- south trend of the Andean ranges, the volcanoes being situated along the orographic axis. These folded mountains with their

volcanoes also illustrate the close relationship to the sea so frequently observed in volcanic topography, a relationship, however, not without many exceptions. The volcanic rock called andesite was so named by L. von Buch from its characteristic occurrence in the Andes. It is notable that the volcanic rocks throughout the great Pacific belt present much similarity in composition. The volcanoes of Ecuador have been described in detail by A. Stiibel and others (see Andes).

Central America contains a large number of active volcanoes and solfataras, many of which are located in the mountains parallel to the western coast. Conseguina, on the south side of the Gulf of Fonseca, is remarkable for its eruption in 1835, when an enormous volume of ash was ejected and the summit of the mountain blown away, Izalco, in San Salvador, came into existence in 1770, and is habitually active. In the centre of Lake Ilopango in Salvador, which possibly occupies an ancient crater, a volcanic island arose in 1880 and attained a height of 160 ft. Guatemala is peculiarly rich in volcanoes, as described by Dr Tempest Anderson, who visited the country in 1907. The Cerro Quemado, or the Volcano of Quezaltenango, was the scene of a great eruption in 1785. At the Volcano of Santa Maria there was an outburst in 1902 more violent than the simultaneous eruptions in the Lesser Antilles. The cones of Guatemala include the Volcan de Fuego and the Volcan de Agua, the former often active in historic times, whilst the latter is notable for the flood which in 1541 swept down from the mountain and destroyed Old Guatemala, but this flood was probably not of volcanic origin.

The plateau of Mexico is the seat of several active volcanoes which occur in a band stretching across the country from Colima in the west to Tuxtla near Vera Cruz. The highest of these volcanic mountains is Orizaba, or Cithattepetl, rising to an altitude of 18,200 feet, and known to have been active in the 16th century. Popocatepetl (" the smoking mountain ") reaches a height of about 17,880 ft., and from its crater sulphur was at one time systemati- cally collected. The famous volcano of Jorullo, near Toluca, at a distance of _ about 120 m. from the sea, has been the centre of much scientific discussion since it was regarded by Humboldt, who visited it in 1803, as a striking proof of the elevation theory. It came into existence rapidly during an eruption which began in September 1759, when it was said by unscientific observers that the ground became suddenly inflated from below. The cone, though not of exceptional magnitude, is situated in an elevated district, and its summit rises to about 4330 ft. above sea-level. In the neighbour- hood of Jorullo there are three subordinate qones of similar cha- racter known as volcanciios, with great numbers of small mounds of cinder and ash formed around fumaroles on the lava, and locally called hornitos, or " little ovens. " The streams of basaltic lava from Jorullo form rough barren surfaces, which pass under the name of

malpays, or bad lands.

In the United States very few volcanoes are active at the present day, though many have become extinct only in times that are geologically recent. An eruption occurred in 1857 atTres Virgines, in the south of California, and the cinder cone on Lassen's Peak (California) was also active in the middle of the 19th century. The Mono Valley craters and Mount Shasta, in California, are extinct. The Cascacfe Range contains numerous volcanic peaks, but only few show signs of activity. Mount Hood, in Oregon, exhales vapour, as also does Mount Rainier in Washington. Mount St Helens (Washington) was in eruption in 1841 and 1842; and Mount Baker (Washington), the most northern of the volcanoes connected with the Cascade Range, is said to have been active in 1843. Few volcanic peaks occur in the Rocky Mountains, but evidence of lingering activity is very marked in the geysers and hot springs of the Yellowstone National Park. The earth's internal heat is also manifested at many points elsewhere, as at Steamboat Springs on the Virginia Range, an offshoot of the Sierra Nevada, and in the Corns tock Lode.

Volcanic activity is prominent in Alaska, along the Coast Range and in the neighbouring islands. The crater of Mount Edgecumbe, in Lazarus Island, is said to have been active in 1796, but this is doubtful. Mount Fairweather has probably been in recent activity, and the lofty cone of Mount Wrangell, on Copper river, is reported to have been in eruption in 1819. In the neighbourhood of Cook's Inlet there are several volcanoes, including the island of St Augustine. Unimak Island has two volcanoes, which have supplied the natives with, sulphur and obsidian; one of these volcanoes being Mount Shishaldin, a cone rivalling Fusiyama in graceful contour. The

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VOLCANO

Aleutian volcanic belt is a narrow, curved chain of islands, extending from Cook's Inlet westwards for nearly 1600 m. It is notable that the convexity of the curve faces the great ocean, as has been observed in other cases, the arcs following the direction of the rock-folds. According to Professor 1. C. Russell, an. authority on the volcanoes of N. America, there are in the Aleutian Islands and in the peninsula no fewer than 57 craters, either active or recently extinct.

From the Aleutian Islands the volcanic band of the Pacific changes its direction, and passing to the peninsula of Kamschatka, where 14 volcanoes are said to be active, turns southwards and forms the festoon of the Kurilc Islands. Here again the convexity of the insular arc is directed towards the

ocean. This volcanic archi- pelago leads on to the great islands of Japan, where the volcanoes have been studied by Professor J. Milne, who also described those of the Kuriles. Of the 54 volcanoes recognized as now active or only recently extinct in Japan, the best known is the graceful cone of the sacred mountain Fusiyama, but others less pretentious are far more dangerous. The great eruption of Bandaisan, about 120 m. N. of Tokio, which occurred in 1888, blew off one side of the peak called Kobandai, removing, according to Professor Sekiya's estimate, about 2982 million tons of material. Aso-san in Kiushui, the southern- most large island of Japan, is notable for the enormous size of its crater. In the Bonin group of islands volcanic activity is indicated by such names as Volcano Island and Sulphur Island.

South of the Japanese archipelago the train of volcanoes passes through some small islands in or near the Loo Choo (Liu Kiu) group and thence onwards by Formosa to the Philippine Islands, where subterranean activity finds abundant expression in earthquakes and volcanoes. After leaving this region the linear arrangement of the eruptive centres becomes less distinctly marked, for almost every island in the Moluccas and the Sunda Archipelago teems with volcanoes, solfataras and hot springs. Possibly, however, a broken zone may be traced from the Moluccas through New Guinea and thence to New Zealand, perhaps through eastern Australia (for though no active volcanoes are known there, relics of com- paratively recent activity are abundant) ; or again by way of the Bismarck Archipelago, the Solomon Islands, the New Hebrides, the Fiji Islands and Kermodoc Island.

The great volcanic district in New Zealand is situated in the northern part of North Island, memorable for the eruption of Tarawera in 1886. This three-peaked mountain on the south side of Lake Tarawera, not previously known to have been active, suddenly burst into action; a huge rift opened, and Lake Rotomahana subsided, with destruction of the famous sinter terraces. The crater of Tongariro is in the solfatara stage, whilst Mount Ruapehu is regarded as extinct. On White Island in the Bay of Plenty the cone of Wharkari is feebly active.

Far to the south, on Ross Island, off South Victoria Land, in Antarctica, are the volcanoes of Erebus and Terror, the former of which is active. These are often regarded as remotely related to the Pacific zone, but Dr G. T. Prior has shown that the Antarctic volcanic rocks which he examined belonged to the Atlantic and not the Pacific type.

Within the great basin of the Pacific, imperfectly surrounded by its broken girdle of volcanoes, there is a vast number of scattered islands and groups of islands of volcanic origin, rising from deep water, and having in many

cases active craters. The most im- portant group is the Hawaiian Archipelago, where there is a chain of at least fifteen large volcanic mountains — all extinct, however, with the exception of three in Hawaii, namely Mauna Loa, Kilauea and Hualalai; and of these Hualalai has been dormant since 1811. It is notable that the two present gigantic centres of activity .though within 20 m. of each other, appear to be independent in their eruptivity. Several of the Hawaiian Islands, as pointed out by J. D. Dana, who was a very high authority on this group, consist of two volcanoes united at the base, forming volcanic twins or doublets.

The volcanic regions of the Pacific are connected with those of the Indian Ocean by a grand train of islands rich in volcanoes, stretching from the west of New Guinea through the Moluccas and the Sunda Inlands, where they form a band extending axially through Java and Sumatra. Here is situated the principal theatre of terrestrial vulcanicity, apparently representing an enormous fissure, or system of fissures, in the earth's crust, sweeping in a bold curve, with its convexity towards the Indian Ocean.

Numerous volcanic peaks occur in the string of small islands to the east of Java — notably in Flores, Sumbawa, Lombok and Bali; and one of the most terrific eruptions on record in any part of the world occurred in the province of Tombom, in the island of Sumbawa, in the year 1 8 1 5 . Java contains within its small area as many as 49 great volcanic mountains — active, dormant and extinct. The largest is Smerin, about 12,000 ft. high, but the most regularly active is said to be Gownong Lamongang, which is in almost un- interrupted activity, emitting usually only ashes and vapour, though in 1883 lava streamed forth. Many of the Javanese volcanoes present marked regularity of contour, with the sides of the cones rather symmetrically furrowed by tropical rains and probably ridged by ash-slides. The radial furrows on volcanic cones are sometimes known as " barrancos."

The little uninhabited island of Krakatoa in the Strait of Sunda

appears to be situated at a volcanic node, or the intersection of two curved fissures, and it is believed that the island itself represents part of the basal wreck of what was once a volcano of gigantic size. After two centuries of repose, a violent catastrophe occurred in 1883, whereby the greater part of the island was blown away. This eruption and its' effects were made the subject of careful study by Verbeek, Brecon and judd.

Through the great island of Sumatra, a chain of volcanoes runs longitudinally, and may possibly be continued northwards in the Bay of Bengal by Barren Island and Norcondam — the former an active and the latter an extinct volcano. On the western side of the Indian Ocean a small

volcanic band may be traced in the islands of the Mascarene group, several craters in Reunion (Bourbon) being still active. Far south in the Indian Ocean are the volcanic islands of New Amsterdam and St Paul. The Comoro Islands in the channel of Mozambique exhibit volcanic activity, whilst in East and Central Africa there are several centres, mostly extinct but some partially active, associated with the Rift Valleys. The enormous cones of Kenia and Kilimanjaroo are extinct, but on Kibo, one of the summits of the latter, a crater is still preserved. The Mfurabiro volcanoes, S. of Lake Edward, rise to a height of more than 14,700 feet. Kirunga, N. of Lake Kivu, is still partially active. Elgon is an old volcanic peak, but Ruwenzori is not of volcanic origin. On the west side of Africa, the Cameroon Peak is a volcano which was active in 1909, and the island of Fernando Po is also vol- canic. Along the Red Sea there are not wanting several examples of volcanoes, such as Jebel Teir. Aden is situated in an old crater.

Passing to the Atlantic, a broken band of volcanoes, recent and extinct, may be traced longitudinally through certain islands, some of which rise from the great submarine ridge that divides the ocean, in part of its length, into an eastern and a western trough. The northern extremity of the series is found in Jan Mayen, an island in the Arctic Ocean, where an eruption occurred in 1818. Iceland, however, with its wealth of volcanoes and geysers, is the 'most important of all the Atlantic centres. According to Dr T. Thoroddsen there are in Iceland about 130 post-glacial volcanoes, and it is known that from 25 to 30 have been in eruption during the historic period. Many of the Icelandic lava-flows, such as the immense flood from Laki (Skapta Jokull) in 1783, are referable to fissure eruptions, which are the characteristic though not the exclusive form of activity in this island. Probably this type was also responsible for the sheets of old lava in the terraced hills of the Faroe Islands, to which may have been related the Tertiary volcanoes of the west of Scotland and the north of Ireland.

An immense gap separates the old volcanic area of Britain from the volcanic archipelagoes of the Azores, the Canaries and the Cape Verd Islands. Palma — a little island in the Canary group, with a caldera or large crater at its summit, from which fissures or barrancos radiate — is famous in the history- of vulcanology, in that it furnished L. von Buch with evidence on which he founded the " crater-of- elevation " theory. The remaining volcanic islands of the Atlantic chain, all now cold and silent, include Ascension, St Helena and Tristan da Cunha, whilst in the western part of the South Atlantic are the small volcanic isles of Trinidad and Ferdinando do Noronha. St Paul's rocks appear also to be of volcanic origin.

One of the most important volcanic regions of the world is found in the

West Indies, where the Lesser Antilles — the scene of the great catastrophes of 1902— form a string of islands, stretching in a regular arc that sweeps in a N. and S. direction across the eastern end of the Caribbean Sea. Subject to frequent seismic disturbance, and rich in volcanoes, solfataras and hot springs, these islands seem to form the summit of a great earth-fold which, rising as a curved ridge from deep water, separates the Caribbean Sea from the Atlantic. The volcanoes are situated on the inner border of the curve. It is notable that the Antilles and the Sunda Islands, two of the grandest theatres of vulcanicity on the face of the earth, are situated at the antipodes of each other — one being apparently an eastern and the other a western offshoot of the great Pacific girdle.

The European volcanoes, recent and extinct, may be regarded as representing rather ill-defined branches thrown off eastwards from the Atlantic band. Vesuvius is the only active volcano on the main- land, but in the Mediterranean there are Etna on the coast of Sicily; the Lipari Islands, with Stromboli and Vulcano in chronic activity; and farther to the east the archipelago of Santorin, where new islands have appeared in historic times. Submarine eruptions have occurred also between Sicily and the coast of Africa ; one in 1S31 having given, rise temporarily to Graham's Island, and another in 1891 appearing near Pantellaria, itself a volcanic isle. Of the extinct European volcanoes, some _ of the best known are in Auvergne, in the Eifel, in Bohemia and in Catalonia, whilst the vol- canic land of Italy includes the Euganean hills, the Alban hills, the Phlegraean Fields, &c. The great lakes of Bolsena and Bracciano occupy old craters, and many smaller sheets of water are on similar sites. The volcanic islands no longer active include Ischia, with the great cone of Epomeo which was in a state of eruption in 1301 ; the Ponza Islands, Nisida, Vivcra and others near Naples; and several in the Greek archipelago, such as Milos, Kimolos and Polinos.

From the eastern end of the Mediterranean evidence of former

volcairfc activity may be traced into Asia Minor and thence to Armenia and the Caucasus. East of Smyrna there is a great desolate tract which the ancients recognized as volcanic and termed the Catacecaumene (burnt counrry). The volcanic districts of Lydia were studied by Professor H. S. Washington, in the plateau of Armenia there are several extinct volcanic mountains, more or less destroyed, of which the best known is Ararat. Nimrud Dagh on the shore of Lake Van is said to have been in eruption in the year 1441. Dr F, Oswald has described the volcanoes of Armenia. Of

the volcanoes in Persian territory not now active, Demavend, south of the Caspian, is an important example. Elburz is also described as an old volcano. It has been said that in Central Asia there are certain vents still active, and recent volcanic rocks are known from the Przhevalsky chain and other localities.

The number of volcanoes known to be actually active on the earth is generally estimated at between 300 and 400, but there is reason to believe that this estimate is far too law. If account be taken of those volcanic cones which have not been active in historic time, the total will probably rise to several thousands. The distribution of volcanoes at various periods of the earth's history, as revealed by the local occurrence of volcanic rocks at different horizons in the crust of the earth, is discussed under Geology. Periods of great earth- movement have been marked by exceptional volcanic activity.

Causes of Vulcanicity.

*In discussing the cause of vulcanicity two problems demand attention: first the origin of the heat necessary for the mani- festation of volcanic phenomena, and secondly the nature of the force by which the heated matter is raised to the surface and ejected. According to the old view, which assumed that the earth was a spheroid of molten matter invested by a com- paratively thin crust of solid rock, the explanation of the phenomena appeared fairly simple. The molten interior supplied the heated matter, while the shrinkage of the cooling crust produced fractures that formed the volcanic channels through which it was assumed the magma might be squeezed out in the process of contraction. When physicists urged the necessity of assuming that the globe was practically solid, vulcanologists were constrained to modify their views. Follow- ing a suggestion of W. Hopkins of Cambridge, they supposed that the magma, instead of existing in a general central cavity, was located in comparatively small subterranean lakes. Some authorities again, like the Rev. O. Fisher, regarded the magma as constituting a liquid zone, intermediate between a solid core and a solid shell. **

If solidification of the primitive molten globe proceeded from the centre outwards, so as to form a sphere practically solid, it is conceivable that portions of the original magma might never- theless be retained in cavities, and thus form " residual lakes." Although the mass might be for the most part solid, the outer portion, or " crust," could conceivably have a honeycombed structure, and any magma retained in the cells might serve indirectly to feed the volcanoes. Neighbouring volcanoes seem in some cases to draw their supply of lava from independent sources, favouring the idea of local cisterns or " intercrustal reservoirs." It is probable, however,

that subterranean re- servoirs of magma, if they exist, do not represent relics of an original fluid condition of the earth, but the molten material may be merely rock which has become fused locally by a temporary development of heat or more likely by a relief of pressure. It should be noted that the quantity of magma required to supply the most copious lava-flows is comparatively small, the greatest recorded outflow (that of Tomboro in Sum- bawa, in 1815) not having exceeded, it is said, six cubic miles; and even this estimate is probably too high. W T hilst in many cases the magma-cisterns may be comparatively small and temporary, it must be remembered that there are regions where the volcanic rocks are so similar throughout as to suggest a common origin, thus needing intercrustal reservoirs of great extent and capacity. It has been suggested that comparatively small basins, feeding individual volcanoes, may draw their supply from more extensive reservoirs at greater depths.

Much speculation has been rife as to the source of the heat required for the local melting of rock. Chemical action has naturally been suggested, especially that of superficial water, but its adequacy may be doubted. After Sir Humphry Davy's dis-

covery of the metals of the alkalis, he thought that their remark- able behaviour with water might explain the origin of subterranean heat; and in more recent years others have seen a local source of , heat in the oxidation of large deposits of iron, such as that brought up in the basalt of Disco Island in Greenland. It has been assumed by M'oissan and by Gautier that water might attack certain metallic carbides, if thev occur as subterranean deposits, and give rise to some of the products characteristic of volcanoes. But it seems that all such action must be very limited, and utterly inadequate to the geneial explanation of volcanic phenomena. At the same time it must be remembered that access of water to a rock already heated may have an important physical effect by reducing its melting point, and may thus greatly assist in the production of a supply of molten matter. The admission of surface-waters to heated rocks is naturally regarded as an important source of motive power in consequence of the sudden generation of vapour, but it is doubtful to what extent it may contribute, if at all, to the origin of volcanic heat. ■ . ■ -■' ■

According to Robert Mallet a competent source of sub- terranean heat for volcanic phenomena might be 'derived from the transformation of the mechanical work of compressing and crushing parts of the crust of the earth as a consequence of secular contraction. This view he worked out with much ingenuity, supporting it by mathematical reasoning and an appeal to experimental evidence. It was claimed for the theory that it explained the linear distribution of volcanoes, their relation to mountain chains, the shallow depth of the foci and the intermittence of eruptive

activity. A grave objection, however, is the difficulty of conceiving that the heat, whether due to crushing or compression, could be concentrated locally so as to produce a sufficient elevation of temperature for melting the rocks. According to the calculations of Rev. 0. Fisher, the crushing could not, under the most favourable cir- cumstances, evolve heat, enough to account for volcanic, phenomena.

Since pressure raises the melting-point of any solid that expands on liquefaction, it has been conjectured that many deep-seated rocks, though actually solid, may be potentially liquid; that is, they are maintained in a solid state by pressure only. Any local relief of pressure, such as might occur in the folding and faulting of rocks, would tend, without further accession of heat, to induce fusion. But although moderate pressure raises the fusing-point of most solids, it is believed, from modern researches, that very great pressures may have a contrary effect.

If is held by Professor S. Arrhenius that at great depths in the earth the molten rock, being above its critical point, can exist only in the gaseous condition; but a gas under enormous pressure may behave, so far as compressibility is concerned, like a rigid solid. He concludes, from the high density of the earth as a whole and from other considerations, that the, central part of our planet consists of gaseous iron (about 80% of the earth's diameter) followed by a zone of rock magma in a gaseous condition (about 15%), which passes insensibly out- wards into liquid rock (4%), covered by a thin solid crust (less than 1% of diameter). If water from the crust penetrates by osmosis through the sea-floor to the molten interior, it acts, at the high temperature, as an acid, and decomposes the siiicaLes of the magma. The liquid rock, expanded and rendered more mobile by this water, rises in fissures, but in its ascent suffers cooling, so that the water then loses its power as an acid and is displaced by silicic acid, when the escaping steam gives rise to the explosive phenomena of the volcano. The mechanism of the volcano is therefore much like that of a geyser, a comparison long ago suggested by Rev. O. Fisher and other geologists.

According to the " planetesimal theory " of Professor T. C. : Chamberlin and Dr F. R. Moulton, which assumes that the earth was formed by the accretion of vast numbers of small cosmical bodies called planetesimal s, the original heat of the earth's interior was due chiefly to the compression of the grow- ing globe by its own gravity. The heat, proceeding from the

centre outwards, caused local fusion of the rocks, though without forming

distinct reservoirs of molten magma, and the fused matter charged with gases rose in liquid threads or tongues, which worked their way upwards, some reaching the super- ficial part of the earth and escaping through fissures in the zone of fracture, thus giving rise to volcanic phenomena. It is held that the explosive activity of a volcano is due to the presence of gases which have been brought up from the interior of the earth, whilst only a small and perhaps insignificant part is played by water of superficial origin.

Entirely new views of the origin of the earth's internal heat have resulted from the discovery of radioactivity. It has been shown by the Hon. R. J. Strutt, Professor J. Joly and others that radium is present in all igneous rocks, and it is estimated that the quantity in the crust of the earth is amply sufficient to maintain its temperature. An ingenious hypothesis was enunciated by Major C. E. Dutton, who found in the radio- activity of the rocks a sufficient source of heat for the ex- planation of all volcanic phenomena. He believes that the development of heat arising from radioactivity may gradually bring about the local melting of the rocks so as to form large subterranean pools of magma, from which the volcanoes may be supplied. The supply is usually drawn from shallow sources, probably, according to Dutton, from a depth of not more than three or rarely four miles, and in some cases at not more than a mile from the surface. If the water in the local magma should attain sufficient expansive power, it will rupture the overlying rocks and thus give rise to a volcanic eruption. When the reservoir becomes exhausted the eruption ceases, but if more heat be generated by continued radioactivity further fusion may ensue, and in time the eruption be repeated. According, however, to Professor Joly, it is improbable that sufficient heat for the manifestation of volcanic phenomena could be developed by the local radioactivity of the rocks in the upper part of the earth's crust.

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VOLCANO ISLANDS, three small islands in the western Pacific Ocean, S. of the Bonin Islands, forming part of the Japanese empire (annexed in 1891). They are also known as the Magellan Archipelago, and in Japan as Kwazan-rctto (series of volcanic islands). They are situated between 24° and 26 N. and 141 and 142 E. Their names are Kita-iwo- jima (Santo Alessandro), Iwo-jima (Sulphur) and Minami- iwo-jima (Santo Agostino). Kita-iwo-jima — which, as its name (kita) implies, is the most northerly of the three — rises 2520 ft. above the water, and Minami-iwo-jima, the most southerly, to a height of 3021 it. The islands are not inhabited. With this group is sometimes included another island, Arzo- bispo, nearer the Bonin group.

VOLCEI (mod. Buccino), an ancient town of Lucania, 2128 ft. above sea-level, the chief town of the independent tribe of the Volceiani, Vulcientes or Volcentani, whose territory was bounded N. by that of the Hirpini, W. and S. by Lucania and E. by the territory of Venusia. Some pre-Roman ruins still exist (Not. Scav., 1884, 115). It became a munkipium, and in A.D.

323 had an extensive territory attached to it, includ- ing the town of Numistro, the large Cyclopean walls of which may still be seen, 2j m. below Muro Lucano. Below the town is a well-preserved Roman bridge over the Tanager (mod. Tanagro). ˆ. See G. Patroni in Notizie degli scavi (1897), 183.

VOLCI, or Vulci, an ancient town of Etruria. The circuit of the walls measures about 4 m., and scanty traces of them and of Roman buildings within them still exist. The Ponte della Badia over the Fiora, a bridge with a main arch of 66 ft. span, 98 ft. above the stream, is also Roman. An aqueduct passes over it. The former wealth of the town is mainly proved by the discoveries made in its extensive necropolis from 1828 onwards— Greek vases, bronzes and other remains — many of which are now in the Vatican. By 1856 over 15,000 tombs had, it was calculated, been opened. These were entirely sub- terranean, and little is now to be seen on the site but a great tumulus, the Cucumella, and a few smaller ones. The frescoes from the Francois tomb, discovered in 1857, illustrating Greek and Etruscan myths, are now in the Museo Torlonia at Rome. Void was one of the twelve towns of Etruria. Coruncanius triumphed over the people of Vulsinii and Volci in 280 B.C., and the colony of Cosa was founded in their territory. This seems to have led to the decline of the city, and it does not seem to have been of great importance in the Roman period, though it became an episcopal see.

See G. Dennis, Cities and Cemeteries of Etruria (London, 1883), i. 437, ii. 503; S. Gsell, Fouilles dans la nicropale de Vulci (Paris, 1891), for the excavations of 1889 (with copious references to earlier publications). (T. As.)

VOLE, a book-name (invented by Dr J. Fleming, author of a work on British animals) for the water-rat and those species of field-mice which have cheek-teeth of the same general type. Although the British representatives of this group should undoubtedly retain their vernacular designations of water-rat and short -tailed field-mouse, the term "vole" is one of great convenience in zoology as a general one for all the members of the group. Systematically voles are classed in the mammalian order Rodentia, in which they constitute the typical section of the subfamily Microtinae in the Muridae, or mouse-group. As a group, voles are characterized by being more heavily built than rats and mice, and by their less brisk movements. They have very small eyes, blunt snouts, inconspicuous ears and short limbs and tails, in all of which points they are markedly contrasted with true rats and mice. In common with lemmings and other representatives of the Microtinae, voles are, however, broadly distinguished from typical rats and mice by the structure of their three pairs of molar teeth. These, as shown in the figure, are composed of a variable

number of vertical triangular prisms, in contact with one another by two (or one) of their angles. On the number and relations of these prisms the voles, which form an exceedingly large group, rang- ing all over Europe and Asia north of (and inclusive of) the

Himalaya, and North America, are divided into genera and subgenera. Examples of some of these are afforded by the

English representatives of the group.

The first of these is the common short- tailed field-mouse, or " field-vole," Microtus agrestis, which belongs to the typical section of the type genus, and is about the size of a mouse, with a short stumpy body, and a

Upperand Lower MolarsoftheWaterˆRat f ail a ˆ 0U } °ˆ hil ˆ th « (or Water- Vole), Microtus amphibius. length of the head and

body. The hind feet have six pads on their inferior surfaces, and the colour is dull grizzled brown above and greyish white below. The molar teeth have respectively 5, 5 and 6 prisms above, and 9, 5 and 3 below. This rodent is one of the commonest of British mammals, and fre- quents fields, woods and gardens in numbers, often doing consider- able damage owing to its fondness for garden produce. It is spread over the whole of Great Britain (exclusive of the Orkneys), while on the continent of Europe its range extends from Fin- land to North Italy and from France and Spain to Russia.

The second and larger species is the water-rat, or "water- vole," which belongs to a second section of the genus, and is commonly known as Microtus {Arvicola) amphibius, although some writers employ the inappropriate specific name terrestris. U is about the size of a rat, and has long soft thick fur, of a uniform grizzled brown, except when (as is not uncommon) it is black. The tail is about half the length of the head and body, and the hind feet are long and powerful, although not webbed, and have five rounded pads on their lower surfaces. In the upper jaw the first molar has 5, the second 4 and the third 4 prisms, of which the last is irregular and sometimes divided into two, making 5. In the lower jaw the first molar has 7 prisms, of which the 3 anterior are generally not fully separated from one another, the second 5 and the third 3. The water-rat is perhaps the most often seen of all English mammals, owing to its diurnal habits. It frequents rivers and streams, burrowing in theˆ banks, and often causing con- siderable damage. Its food consists almost wholly of water-

weeds, rushes and other vegetable substances, but it will also eat animal food on occasion, in the shape of insects, mice or young birds. The female has during the summer three or four litters, each of from two to seven young. The range of the water-rat extends over Europe and North Asia from England to China, but the species is not found in Ireland, where no member of the group is native.

The red-backed field-mouse or " bank-vole " may be distinguished externally from the first species by its more or less rusty or rufous- coloured back, its larger ears and its comparatively longer tail, which attains to about half the length of the head and body. On account of an important difference in the structure of its molars, it is now very generally referred to a distinct genus, under the name of Evotomys glareolus ; these teeth developing roots at a certain stage cf existence, instead of growing permanently. Their prisms number respectively 5 and 4 and 5 above, and 7, 3 and 3 below. The habits of this species are in every way similar to those of the one first on the list. Its range in Great Britain extends northwards to Morayshire, but it is represented in an island off the Pembroke coast by a distinct form; on the continent of Europe it extends from France and Italy to southern Russia, while it is represented in northern Asia and North America by closely allied species. Fossi! voles from the' Pliocene of England and Italy with molars which are rooted as soon as developed form the genus Mimomys.

(R.L.)*

VOLGA (known to the Tatars as Etil, Ml or Atel; to the Finnish tribes as Rau, and to the ancients as Rha and Varus), the longest and most important river of European Russia. It rises in the Valdai plateau of Tver and, after a winding course of 232=; m. (1070 in a straight line), falls into the Caspian at Astrakhan- It is by far the longest river of Europe, the

Danube, which comes next to it, being only 1775 m., while the Rhine (760 m.) is shorter even than two of the chief tri- butaries of the Volga — the Oka and the Kama. Its drainage area, which includes the whole of middle and eastern as well as part of south-eastern Russia, amounts to 563,300 sq. m., thus exceeding the aggregate superficies of Germany, France and the United Kingdom, and containing a population of fifty millions. Its tributaries are navigable for an aggregate length of nearly 20,000 m. The a basin " of the Volga is not limited to its actual catchment area. By a system of canals which connect the upper Volga with the Neva, the commercial mouth of the Volga has been transferred, so to speak, from the Caspian to the Baltic, thus making St Petersburg, the capital and chief seaport of

Russia, the chief port of the Volga basin as well. Other less important canals connect it with the Western Dvina (Riga) and the White Sea (Archangel); while a railway only 45 m. in length joins the Volga with the Don and the Sea of Azov, and three great trunk lines bring its lower parts into connexion with the Baltic and western Europe.

The Volga rises in extensive marshes on the Valdai plateau, where the W. Dvina also has its origin. Lake Seliger was formerly considered to be the principal source;but that distinction is now given to yhe upper a small spring issuing beneath a chapel (57 15′ N. ; 32 30′ ‘ rt ver , E.) in the midst of a large marsh to the west of Seliger. The honour has also been claimed, not without plausibility, for the Runa rivulet. Recent exact surveys have shown these originating marshes to be no more than 665 ft. above sea-level. The stream first traverses several small lakes, all having the same level, and, after its confluence with the Runa, enters Lake Volga. A dam erected a few miles below that lake, with a storage of nearly 10,000 million cub. ft. of water, makes it possible to raise the level of the Volga as far down as the Sheksna, thus rendering it navigable, even at low water, from its 65th mile onwards.

From its confluence with the Sheksna the Volga flows with a very gentle descent towards the south-east, past Yaroslavl and Kostroma, along a broad valley hollowed to a depth of 150-200 ft. in the Permian and Jurassic deposits. In fact, its course lies through a string of depressions formerly filled with wide lakes, all linked together. When the Volga at length assumes a due south-cast direction it is a large river (8250 cub. ft. per second, rising occasionally in high flood to as much as 178,360 cub. ft.); of its numerous tribu- taries, the Unzha (365 m., 330 navigable), from the north, is the most important.

The next great tributary is the Oka, which comes from the south- west after having traversed, on its course of 950 m., all the Great Russian provinces of central Russia. 1 1 rises in the govern- conflu ment of Orel, among hills which also send tributaries to the eace ^^ Dnieper and the Don, and receives on the left the Upa, the £bv 0Jts< Zhizdra, the Ugra (300 m.), the Moskva, on which steamers ply up to Moscow, the Klyazma (395 m.), on whose banks arose the middle- Russian principality of Suzdal, and on the right the navigable Tsna (255 m.) and Moksha. Every one of these tributaries is con- nected with some important event in the history of Great Russia. The drainage area of the Oka is a territory of 97,000 sq. in, K has been maintained that, of the two rivers which unite at Nizhniy- Novgorod, the Oka, not the Volga, is the chief ; the fact is that both in length (81S m.) and in drainage area abovetheconfiuence (89,500 sq. m.), as well as in the aggregate length of its tributaries, the Volga is the inferior stream.*

At its confluence with the Oka the Volga enters the broad lacustrine depression which must have communicated with the Caspian during the post-Pliocene period by means of at least a broad strait. r acaSm Its level at low water is only 190 ft. abovethat of the ocean. ir j Be aem Immediately below the confluence the breadth of the river pKSS i ˆ St ranges from 350 to 1750 yds. There are many islands which change their appearance and position after each inundation. On the right the Volga is joined by the Sura, which drains a large area and brings a volume of 2700 to 22,000 cub. ft. of water per second, the Vetluga (465 m. long, of which 365 are navigable), from the forest-tracts of Yaroslavl, and many smaller tributaries. Then the stream turns south-east and descends into another lacustrine depression, where it receives the Kama, below Kazan. Remains of molluscs still extant in the Caspian occur extensively throughout this depression and up the lower Kama.

The Kama, 1 which brings to the Volga a contribution ranging from 52,500 to 144,400 cub. ft. and occasionally reaching 51ˆ,000 cub. ft. per second, might again be considered as the more important of the two rivers. It rises in Vyatka, takes a wide sweep towards the north and east, and then flows south and south-west to join the Volga after a course of no less than 1 150 m.

1 To the Votyaks it is known as the Budzhim-Kam, to the Chuvashcs as the Shoiga-adit and to the Tatars as the Cholman-idel or Ak-idel, all words signifying ” White river.”

The

Samara

bend.

Along the next 738 m. of its course the Volga — now 580 to 2600 yds. wide — flows south-south-west, with but one great bend at Samara. At this point, where it pierces a range of limestone hills, the course of the river is very picturesque, fringed as it is by cliffs which rise 1000 ft. above the level of the stream (which is only 54 ft. above the sea at Samara). Along the whole of the Samara bend the Volga is accompanied on its right bank by high cliffs, which it is constantly undermining, while broad lowland areas stretch along the left or eastern bank, and are intersected by several old beds of the Volga.

At Tsaritsyn the great river reaches its extreme south-western limit, and is there separated from the Don by an isthmus only 45 m. in width. The isthmus is too high to be crossed by means of a canal, but a railway to Kalach brings the Volga into some sort of connexion with the Don and the Sea. of Azov. At Tsaritsyn the river takes a sharp turn in a south-easterly direction towards the Caspian ; it enters the Caspian steppes, and a few miles above Tsaritsyn sends off a branchˆ-the Akhtub?,— which accompanies it for 330 m. before falling into the Caspian. Here the Volga The /ft r rcce ‘ ves no tributaries; its right bank is skirted by low rfrlrand mlls ‘ ˆ ut on tne left ˆ anas tomoses freely with the delta Akhtuba when its waters are high, and floods the country for

15 to 35 m. The wid th of the main stream ranges from 520 to 3500 yds. and the depth exceeds 80 ft. The delta proper begins 40 m. above Astrakhan, and the branches subdivide so as to reach the sea by as many as 200 separate mouths. Below Astrakhan navigation is difficult, and on the sand-bars at the mouth the maximum depth is only 12 ft. in calm weather.

The figures given show how immensely the river varies in volume, and the greatness of the changes which are constantly going on in the channel and on its banks. Not only does its level occasionally rise in flood as much as 50 ft. and overflow its banks for a distance of 5 to 15 m.; even the level of the Caspian is considerably affected by the sudden influx of water brought by the Volga. The amount of suspended matter brought down is correspondingly great. All along its course the Volga is eroding and destroying its banks with great rapidity; towns and loading ports have constantly to be shifted farther back.

The question of the gradual desiccation of the Volga, and its causes, has often been discussed, and in 1838 a committee which included Karl Baer among its members was appointed by the Russian academy of sciences to investigate the subject. No positive result was, however, arrived at, principally on account of the want of regular measurements of the volume of the Volga and its tributaries — measurements which began to be made on scientific principles only in 1880. Still, if we go back, two or three centuries, it is indisputable that rivers of the Volga basin which were easily navigable then are now hardly accessible to the smallest craft. The desiccation of the rivers of Russia has been often attributed to the steady destruc- tion of its forests. But it is obvious that there are other general causes at work, which are of a much more important character— causes of which the larger phenomena of the general desiccation of Eastern and Western Turkestan are contemporaneous manifestations. The gradual elevation of the whole of northern Russia and Siberia, and the consequent draining of the marshes, is one of these deeper-seated, ampler causes;

another is the desiccation of the lakes all over the northern hemisphere.

Fisheries. — The network of shallow and still limans or " cut-offs " in the delta of the Volga and the shallow waters of the northern Caspian, freshened as these are by the water of the Volga, the Ural, the Kura and the Terek, is exceedingly favourable to the breeding of fish, and as a whole constitutes one of the most productive fishing grounds in the world. As soon as the ice breaks up in the delta innumerable shoals of roach (Leuciscus rutilus) and trout (Luciotrutta leucichthys) rush up the river. They are followed by the great sturgeon (Acipenser huso), the pike, the bream and the pike perch (Lracioperca sandra). Later on appears the Caspian herring {Clupca ca-sp a), which formerly was neglected, but has now become more important than sturgeon; the sturgeon A. stellatus and " wels " {Silurus glanis) follow, and finally the sturgeon Acipenser giilde.nstadtii, so much valued for its caviare. In search of a gravelly spawning-ground the sturgeon go up the river as far as Sarepta (250 m.). The lamprey, now extensively pickled, the sterlet (A. ruthenus), the tench, the gudgeon and other fluvial species also appear in immense numbers. It is estimated that 180,000 tons of fish of all kinds, of the value of considerably over £1,500,000, are taken annually in the four fishing districts of the Volga, Ural. Terek and Kura. Seal-hunting is carried on off the

Volga mouth, and every year about 40,000 of Phoca vitulina are killed to the north of the Manghishlak peninsula on the east side of the Caspian.

Ice Covering. — In winter the numberless tributaries and sub- tributaries of the Volga become highways for sledges. The ice lasts 90 to 160 days, and breaks up earlier m its upper course than in some parts lower down. The average date of the break-up is April nth at Tver, and 14 days later about Kostroma, from w r hich point a regular acceleration is observed (April 16th at Kazan, April 7th at Tsaritsyn, and March 17th at Astrakhan).

Traffic. — The greater part of the traffic is up river, the amount of merchandise which reaches Astrakhan being nearly fifteen times less than that reaching St Petersburg by the Volga canals. The goods transmitted in largest quantity are fish, metals, manufactured wares, hides, flax, timber, cereals, petroleum, oils and salt. The down- river traffic consists chiefly of manufactured goods and timber, the latter mostly for the treeless governments of Samara, Saratov and Astrakhan, as well as for the region adjacent to the lower course of the Don. Dredging machines are kept constantly at work, while steamers are stationed near rhe most dangerous sandbanks to assist vessels that run aground. The following table shows the principal river ports, with the movement of shipping in an average year:—

Chief River Ports on the

Volga.

Entered. Cleared. Imported.

Astrakhan Tsaritsyn . Rybinsk . Nizhniy- Novgorod Saratov .

2,724 6,412 3.760

12,960 1,639

3.228 1.482 6,295

7.585 1,733

938,000

1,152,000

590,000

4,092,000 923,000

Exported.

3,734,000 462,000 172,000

84,000

I28.000

4,672,000

I,6l4,O0O

762,000

4, 1 76,000 1,051,000

Approxi- mate Value.

7,812,000 5,000,000

3,573.°°°

2,727,000 1,882,000

Formerly tens of thousands of burlaki, or porters, were employed in dragging boats up the Volga and its tributaries, but this method of traction

has disappeared unless from a few of the tributaries. Horse-power is still extensively resorted to along the three canal systems. The first large steamers of the American type were built in 1872. Thousands of steamers arc now employed in the traffic, to say nothing of smaller boats and rafts. Many of the steamers use as fuel masut or petroleum refuse. Large numbers of the boats and rafts are broken up after a single voyage.

History. — The Volga was no-t improbably known to the early Greeks, though it is not mentioned by any writer previous to Ptolemy. According to him, the Rha is a tributary of an interior sea, formed from the confluence of two great rivers, the sources of which are separated by twenty degrees of longi- tude, but it is scarcely possible to judge from his statements how far the Slavs had by that, time succeeded in penetrating into the basin of the Volga. The Arab geographers throw little light on the condition of the Volga during the great migrations of the 3rd century, or subsequently under the invasion of the Huns, the growth of the Khazar empire in the southern steppes and of that of Bulgaria on the middle Volga. But we know that in the 9th century the Volga basin was occupied by Finnish tribes in the north and by Khazars and various Turkish races in the south. The Slavs, driven perhaps to the west, had only the Volkhov and the Dnieper, while the (Mahommedan) Bulgarian empire, at the confluence of the Volga with the Kama, was so powerful that for some time it was an open question whether Islam or Christianity would gain the upper hand among the Slav idolaters. But, while the Russians were driven from the Black Sea by the Khazars, and later on by a tide of Ugrian migration from the north-east, a stream of Slavs moved slowly towards the north-east, down the upper Oka, into the borderland between the Finnish and Turkish regions. After two centuries of struggle the Russians succeeded in colonizing the fertile valleys of the Oka basin; in the 1 2th century they built a series of fortified towns on the Oka and Klyazma; and finally they reached the mouth of the Oka, there founding (in 1222) a new Novgorod — the Novgorod of the Lowlands, now Nizhniy- Novgorod. The great lacustrine depression of the middle Volga was thus reached; and when the Mongol invasion of 1239-42 came, it encountered in the Oka basin a dense agricultural population with many fortified and wealthy towns— a population which the Mongols found they could conquer, indeed, but were unable to drive before them as they had done so many of the Turkish tribes.

This invasion checked but did not stop the advance of the Russians down the Volga. Two centuries elapsed before the Russians covered the 300 m. which separate the mouths of the Oka and the Kama and took possession

of Kazan. But in the meantime a flow of Novgorodian colonization had moved eastward, along the upper portions of the left-bank tributaries of the Volga, and had reached the Urals.

With the capture of Kazan (1552) the Russians found the lower Volga open to their boats, and eight years afterwards they were masters of the mouth of the river at Astrakhan. Two centuries more elapsed before the Russians secured a free passage to the Black Sea and became masters of the Sea of Azov and the Crimea; the Volga, however, was their route. During these two centuries they fortified the lower river, settled it, and penetrated farther eastward into the steppes towards the upper Ural and thence to the upper parts of the Tobol and other great Siberian rivers.

Bibliography. — P. P. Semenov's Geographical and Statistical Dictionary (5 vols., St Petersburg;, 1863-85) contains a full biblio- graphy of the Volga and tributaries. See also V. Ragozin's Volga (3 vols., St Petersburg, 1880-81, with atlas; in Russian); . N. Bogolyubov, The Volga from Tver to Astrakhan (Russian, 1876); H. Ruskoschny, Die Wolga und ihre Zufiusse (Leipzig, 1887, vol. i.), history, ethnography, hydrography and biography, with rich bibliographical information; N. Boguslavskiy, Tke Volga as a Means of Communication {Russian, 1887), with detailed profile and maps; Pcrctvatkovich, Volga Region in tke 13th and 16th Centuries (J877); and Lender, Die Wolga (1889). (P. A. K.; J. T. Be.)

VOLHYNIA, a government of south-western Russia, bounded by the Polish governments of Lublin and Siedlce on the W., Grodno and Minsk on the N., Kiev on the E. and Podolia and Galicia (Austria) on the S., with an area of 27,690 sq. m. A broad, flat spur of the Carpathians — the Avratynsk plateau — ■ which enters from the west and stretches out eastward towards the Dnieper occupies its southern portion, reaching a maximum elevation of 1200 ft.; another branch of the Carpathians in the west of the government ranges between 700 and 900 ft. at its highest points. Both are deeply grooved in places, and the crags give a hilly aspect to the districts in which they occur. The remainder of the government, which is quite flat, with an imperceptible slope towards the marshes of Pinsk, is known as the Polyesie (see Minsk).

The population in 1906 was estimated at 3,547,500. Some three-fourths of the population are Little Russians; the other elements are White and Great Russians, Poles (5 '2%), Jews (13-2%) and Germans (5 • 7) . The government is divided into twelve districts, the chief towns of which are Zhitomir, the capital, Dubno, Kovel, Kremenets, Lutsk, Novograd Volhynskiy, Ostrog, Ovruch, Vladimir Volhynskiy, Rovno, Staro-Konstantinov and Zaslavl. The conditions of peasant ownership differ from those which prevail in other parts of Russia, and of the total area the

peasants hold ap- proximately one-half; 42 of the total is in the hands of private owners, a considerable number of Germans having settled and bought land in the government.

Forests cover nearly 50% of the area in the north (that is, in the Polyesie) and 15% elsewhere. Agriculture is well developed in the south, and in 1900 there were 4,222,400 acres (24%) under cereal crops alone. In the Polyesie the principal occupations are connected with the export of timber and firewood, the preparation of pitch, tar, potash and wooden wares, and boat-building. Lignite and coal, some graphite and kaolin, are mined, as also amber, which is often found in big lumps. Manufacturing industries are not very highly developed. The factories are confined to sugar works, dis- tilleries, woollen mills, and candle, tobacco, glass, cloth and agri- cultural machinery works. Domestic industry in the villages is chiefly limited to the making of wooden goods, including parquetry. The exports of grain and timber, chiefly to Germany and Great Britain, and of wool and cattle, are considerable.

Volhynia has been inhabited by Slavs from a remote antiquity. In Nestor's Annals its people are mentioned under the name of Dulebs, and later in the 12th century they were known as Velhynians and Buzhans (dwellers on the Bug). From the 9th century the towns of Volhynia- Vladimir, Ovruch, Lutsk and Dubno were ruled by descendants of the Scandinavian or Varangian chief Rurik, and the land of Volhynia remained

independent until the 14th century, when it fell under Lithuania, In 15G9 it was annexed to Poland, and so remained until 1795, when it was taken possession of by Russia.

VOLK, LEONARD WELLS (1828-1895), American sculptor, was born at Wellstown (now Wells) , Hamilton county, New York, on the 7th of November 1828. He first followed the trade of a marble cutter with his father at Pittsfield, Massa- chusetts. In 1848 he opened a studio at St Louis, Missouri, and in 1855 was sent by his wife's cousin, Stephen A. Douglas, to Rome to study. Returning to America in 1857, he settled in Chicago, where he helped to establish an Academy of Design and was for eight years its head. Among his principal works are the Douglas monument at Chicago and the Soldiers' and Sailors' monument at Rochester, New York, and statues of President Lincoln and Stephen A. Douglas (in the Illinois State Capitol at Springfield, III.), and of General James Shields (in Statuary Hall, Capitol, Washington), Elihu B. Washburn, Zachariah Chandler and David Davis. In i860 he made a life- mask (now in the National Museum, Washington) of Lincoln, of whom only one other, by Clark Mills in 1865, was ever made. His son, Douglas Volk (b. 1856), figure and portrait painter, who studied under J. L. Gerome in Paris,

became a member of the Society of American Artists in 1880 and of the National Academy of Design in 1899.

VOLKSRUST, a town of the Transvaal, 175 m. S.E. of Johannesburg and 308 m. N.N.W. of Durban. Pop. (1904) 2382, of whom 1342 were whites. The town lies at an ele- vation of 5429 ft. just within the Transvaal frontier and 4 m. N. of the pass through the Drakensberg known as Laing's Nek. It is the centre of a rich agricultural district. It was founded by the Boer government in 1888. As a customs port of entry it was of some importance, and it maintains its position as a distributing depot. It was created a municipality in 1903. Sandstone is quarried in the district.

VOLLENDAM, a small fishing village of Holland in the province of North Holland, adjoining Edam on the shores of the Zuider Zee. It is remarkable for the quaintness of the buildings and the picturesque costume of the villagers, who are of a singularly dark and robust type. Many artists have been attracted to settle here. Vollendam has its origin in the build- ing of the great sea-dam for the new waterway to Edam in the middle of the 14th century. On the seaward side of the dike are some houses built on piles in the style of lake dwellings.

VOLLMAR, GEORG HEINRICH VON (1850-), German Socialist, was born at Munich in 1850. He was educated in a school attached to a Benedictine monastery at Augsburg, and in 1865 entered the Bavarian army as a lieutenant in a cavalry regiment. He served in the campaign of 1866, and then entered the papal army as a volunteer. In 1869 he returned to Germany, and during the war with France served in the army railway department. He was severely wounded at Blois and pensioned. Permanently crippled by his wounds, he devoted himself to political and social studies. In 1872 he was con- verted to the principles of Social Democracy, and threw himself with great energy into political agitation. In 1877 he became editor of the party organ at Dresden, and under the Socialist law was repeatedly condemned to various terms of imprisonment, and was also expelled from that city. From 1879 to 1882 he lived at Zurich, then the headquarters of Social Democracy, when, besides attending the university, he took part in editing the Social DemakraL In 1881 he was elected member of the Reichstag, and from 1883 to 1889 was a member of the Saxon diet. After 1885 he resided in Bavaria, and it was to him that was chiefly due the great success of the Socialists in the older Bavarian provinces. He identified himself with the more moderate and opportunist section of the Socialist party, decisively dissociating himself from the doctrine of -a sudden and violent overthrow of society, and urging his associates to co-operate in bringing about a gradual development towards the Socialistic state. He refused to identify Social Democracy with the extreme views as to religion and the family advocated by Bebel, and

successfully resisted attempts made in 189 r to expel him from

the party in consequence of his opinions. He became a member of the Bavarian Diet in 1893.

In addition to a couple of books on the preservation of forests, he published Der isolierte SoziaXe Stoat (Zurich, 1880).

VOLNEY, CONSTANTIN FRANCOIS EUF, Comte d e (r 757 -I 82o”>CHASSEB, French savant, was born at Craon (Maine-et- Loire) on the 3rd of February 1757, of good family; he was at first surnamed Boisgirais from his father’s estate, but afterwards assumed the name of Volney. He spent some four years in Egypt and Syria, and published his Voyage en Egypte et en Syrie in 1787, and Considerations sur la guerre des Turcs et de la Russie in 1788. He was a member both of the States-General and of the Constituent Assembly. In 1701 appeared Les Ruines, ou mSditalions sur les revolutions des empires, an essay on the philosophy of history, containing a vision which predicts the final union of all religions by the recognition of the common truth underlying them all. Volney tried to put his politico- economic theories into practice in Corsica, where in 1792 he bought an estate and made an attempt to cultivate colonial produce. He was thrown into prison during the Jacobin triumph, but escaped the guillotine. He was some time professor of history at the newly founded Ecole Normale. In 1795 he undertook a journey to the United States, where he was accused in 1797 of being a French spy sent to prepare for the reoccupation of Louisiana by Fiance. He was obliged to return to France in 1798. The results of his travels took form in his Tableau du climat et du sol des Etats-Unis (1803). He was not a partisan of Napoleon, but, being a moderate man, a savant and a Liberal, was impressed into service by the emperor, who made him a count and put him into the senate. At the restoration he was made a peer of France. He became a member of the Institute in 1795. He died in Paris on the 25th of April 1820.

VOLO, a town and seaport of Greece, on the east coast of Thessaly, at the head of the gulf to which it gives its name. Pop. (1907) 23,319. It is the chief seaport and second in- dustrial town of Thessaly, connected by rail with the town of Larissa. The anchorage is safe, vessels loading and discharging by means of lighters. The port has a depth of 23 to 2 5 ft.

The Kastro, or citadel, of Vo’.o stands on or close to the site of Pagasae, whence the gulf took the name of Sinus Pagasaeus or Pagasicus, and which

was one of the oldest places of which mention occurs in the legendary history of Greece. From this port the Areonautic expedition was said to have sailed, and it was already a nourishing place under the tyrant Jason, who from the neighbour- ing Pherae ruled over all Thessaly. Two miles farther south stand the ruins of Demetrias, founded (290 B.C.) by Demetrius Poliorcetes, and for some time a favourite residence of the Macedonian kings. On the opposite side of the little inlet at the head of the gulf rises the hill of Episcopi, on which stood the ancient city of Iolcus. At Dimini, about 3 m. W. of Volo, several tombs have been found which yielded remains of the later Mycenean Age.

VOLOGAESES (Vologaesus, Vologases; on the coins Ologases; Armen. Valarsk; Mod. Pers. Balash), the name of five Parthian kings.

(1) Vologaeses I., son of Vonones II. by a Greek con- cubine (Tac. Ann. xii. 44), succeeded his father in a.d. 51 (Tac. Ann. xii. 14; cf. Joseph. Ant. xx. 3, 4). He gave the kingdom of Media Atropatene to his brother Pacorus, and occupied Armenia for another brother, Tiridates (Tac. Ann. xii. 50, xv. 2; Joseph. Ant. xx. 3, 4). This led to a long war with Rome (54-63}, which was ably conducted by the Roman general Corbulo. The power of Vologaeses was weakened by an attack of the Dahan and Sacan nomads, a rebellion of the Hyrcanians, and the usurpation of Vardanes II. (Tac. Ann. xiii. 7, 37; xiv. 25; xv. 1; cf. Joseph. Ant. xx. 4, 2, where he is prevented from attacking the vassal king of Adiabene by an invasion of the eastern nomads). At last a peace was concluded, by which Tiridates was ac- knowledged as king of Armenia, but had to become a vassal of the Romans; he went to Rome, where Nero gave him back the diadem (Tac. Ann. xv. iff.; Dio Cass. lxii. 19 ff., lxiii. 1 ff.) ; from that time an Arsacid dynasty ruled in Armenia under Roman supremacy. Vologaeses was satisfied with this

result, and honoured the memory of Nero (Suet. Nero, 57), though he stood in good relations with Vespasian also, to whom he offered an army of 40,000 archers in the war against Vitellius (Tac. Hist. iv. 51; Suet, Vespas. 6; cf. Joseph. Ant. vii. 5, 2, 7, 3; Dio Cass. Ixvi. n). Soon afterwards the Alani, a great nomadic tribe beyond the Caucasus, invaded Media and Armenia (Joseph. Bell. vii. 7, 4); Vologaeses applied in vain for help to Vespasian (Dio Cass. Ixvi. 1 1 ; Suet. Domitian, 2). It appears that the Persian losses in the east also could not be repaired; Hyrcania remained an independent kingdom (Joseph. Bell. vii. 7,4; Aurel. Vict. Epit. is, 4). Vologaeses I. died about a.d. 77. His reign is marked by a decided reaction against Hellenism; he built Vologesocerta (Balashkert) in the neighbourhood of Ctesiphon with the intention of drawing to this new town the inhabitants of the Greek city Seleucia (Plin. vi. 122). Another town founded by him is Vologesias on a canal of the Euphrates, south of

Babylon (near Hira; cf. Noldeke in Zeitschrtft der deulschen-morgenl. Gesellschaft, xxviii. 93 ft.). On some of his coins the initials of his name appear in Aramaic letters.

(2) Vologaeses II., probably the son of Vologaeses I., appears on coins, which bear his proper name, in 77-79, and again 121-47. During this time the Parthian kingdom was torn by civil wars between different pretenders, which reached their height during the war of Trajan, 1 14-17. Besides Vologaeses II. we find on coins and in the authors Pacorus (78-c. 105), Arta.banus III. (80-81), Osroes (106-29), Mithradates V. (c. 129-47) and some others; thus the Parthian empire seems during this whole time to have been divided into two or three different kingdoms. By classic authors Vologaeses II. is men- tioned in the time of Hadrian (c. 131), when Cappadocia, Armenia and Media were invaded by the Alani (Dio Cass. lxix. 15).

(3) Vologaeses III., 147-91. Under him, the unity of the empire was restored. But he was attacked by the Romans under Marcus Aurelius and Verus (162-65). In this war Seleucia was destroyed and the palace of Ctesiphon burnt down by Avidius Cassius (164); the Romans even advanced into Media. In the peace, western Mesopotamia was ceded to the Romans (Dio Cass. lxxi. 1 ff. ; Capitolin. Mare. Aur. 8 f. ; Verus 8, &c). Vologaeses III. is probably the king Volgash of the Parsee tradition, preserved in the Dinkart, who began the gather- ing of the writings of Zoroaster.

(4) Vologaeses IV., 191-209. He was attacked by Septimius Severus in 195, who advanced into Mesopotamia, occupied Nisibis and plundered Ctesiphon (199), but attempted in vain to conquer the Arabic fortress Atra; in 202 peace was restored.

(5) Vologaeses V., 209-c. 222, son of Vologaeses IV. Soon after his accession his brother Artabanus IV., the last Arsacid king, rebelled against him, and became master of the greater part of the empire (Dio Cass. Ixxvii. 12). But Vologaeses V. maintained himself in a part of Babylonia; his dated coins reach down to a.d. 222. (En. M.)

VOLOGDA, a government of north-eastern Russia, having the government of Archangel on the N., Tobolsk on the E., Perm, Vyatka, Kostroma and Yaroslavl on the S., Novgorod, Olonetz and Archangel on the W. This immense government, which comprises an area of 155,218 sq. m., stretches in a north- easterly direction for 800 m., from Novgorod to the Urals, and includes the broad depression drained by the Sukhona from the S.W., and the Vychegda from the N.E., both head-waters of the N. Dvina. From the basin of the Volga it is separated by a flat, swampy, wooded swelling,

where the heads of tribu- taries belonging to both Arctic and Caspian drainage-areas are closely intermingled. The eastern boundary of Vologda follows the main water-parting of the Urals, which has but few points over 3000 ft.; wide parmas, or woody plateaus, fill up the space between the main chain of the Urals and the southern spurs of the Timan Mountains, in the upper basin of the Pechora. It is above the parmas — especially over those which are nearest the Urals proper — that the highest summits of the Urals rise in the form of dome-shaped mountains (T6U-poz-iz, 5535 ft.; Kozhem-iz, 4225 ft.; Shadmaha, 4115 ft.). The Timan

Mountains are a swampy plateau, where the rivers flowing to the N. Dvina or to the Pechora take their rise in common marshes; so that on the Mylva portage boats have to be dragged a distance of only 3 m. to be transported from one system to the other.

Permian sandstones and cupriferous slates covei: most of the territory; only a few patches of Jurassic clays overlie them; in the east, in the Ural partnas, coal-bearing Carboniferous, Devonian and Silurian slates and limestones appear, wrapping the crystalline slates of the main ridge. Vast layers of boulder clay and Lacustrine deposits overlie the whole. Rock-salt and salt springs, iron ore, millstones and grindstones are the chief mineral products; but mining is in its infancy.

The river Sukhona, which rises in the south-west and flows north-east, is navigable for 375 m. After its confluence with the Vug (390 m. long), which flows from the south, it becomes the N. Dvina, which proceeds north-west, and receives the Vychegda, 740 m. long and navigable for 570 m., though it passes through a nearly uninhabited region. The Luza, a tributary of the Yug, is also navigated for more than 250 m. The Pechora, which Hows through eastern Vologda, is an artery for the export of corn and the import of fish. The Pinega, the Mezen and the Vaga, all belonging to the Arctic basin, rise in northern Vologda. In the south-west the Sukhona is connected by means of Lake Kuhina and the canal of Alexander von Wurttemberg with the upper Volga. Numberless smaller lakes occur, and marshes cover a considerable part of the surface.

The climate is severe, the average yearly temperature being 36 F. at Vologda (Jan., IO°-7; July, 63 D 5) and 32°$ at Ust-Sysolsk (Jan., 4 °-8; July, 6i°- 7).

The flora and the physical aspects vary greatly as the traveller moves

north-east down the Sukhona and up the Vychegda, towards the parmas of the Pechora. In the south-west the forests are cleared, and the dry slopes of the hills have been converted into fields and meadows; the population is relatively dense, and nearly one-quarter of the area is under crops. There is a surplus of grain, which is u?ed for distilleries, and apples are extensively cultivated. The flora is middle-Russian. Farther north-east the climate grows more severe; but still, until the Dvina is reached, corn succeeds well, and there is no lack of excellent meadows on the river- terraces. Flax is cultivated for export; but only 4% of the area is tilled, the remainder being covered with thick fir forests with occasional groups of deciduous trees (birch, aspen, elder). At about 46° E. the larch appears and soon supersedes the fir. Several plants unknown in western Russia make their appearance {Siiene taHarica, Anthyllis vulneraria, Euphorbia palustris, Filago arvensis, Lycopodium com- planatum, Sanguisorba officinalis). The Veratrum is especially characteristic; it sometimes encroaches on the meadows to such an extent as to compel their abandonment. The region of the upper Mezen {the Udora) again has a distinctive character. The winter is so protracted, and the snowfall so copious, that the Syryenians are sometimes compelled to clear away the snow from their barley -fields. But the summer is so hot (a mean of 54 ° for the three summer months) that barley ripens within forty days after being sown. The Timan plateaus are a marked boundary for the middle-Russian flora. Those to the east of them are uninhabitable; even on the banks of the rivers the climate is so severe, especially on account of the icy northern winds, that rye and barley are mostly grown only in orchards. The whole is covered with quite impenetrable forests, growing on a soil saturated with water. Mosquitoes swarm in the forests; birds are rare. The Siberian cedar begins and the lime tree disappears. Fir, cedar, pine and larch compose the forests, with birch and aspen on their outskirts. Hunting is the chief occupation of the Syryenian inhabitants.

The population was estimated in 1906 at 1,517,500, of whom 57,407 lived in towns; 90% were Great Russians and 8-4% Syryenians (q.v.). The government is divided into ten districts, the chief towns of which are Vologda, Gryazovets, Kadnikov, Nikolsk, Solvychegodsk, Totma or Totyma, Ustyug Velikiy, Ust-Sysolsk, Velsk and Yarensk. Agriculture thrives in the three south-western districts. Live-stock breeding occupies considerable numbers of people. A little salt is raised, and there are a few ironworks, but manufacturing industries are in their infancy; the chief branch is the weaving of linen in the villages. (p. A. K.; J. T. Be.)

VOLOGDA, a town of Russia, capital of the government of the same name, situated in its south-western corner on the river Vologda, above its confluence with the navigable Sukhona, 127 m. by rail N. of Yaroslavl. Pop. (1881) 17,025; (1807) 27,822. It is an old town, having many

ancient churches, including one which dates from the 12th century, and the cathedral, founded in 1568. Vologda is a considerable com- mercial centre — flax, linseed, oats, hemp, butter and eggs

being exported to both St Petersburg and Archangel. It has distilleries, tanneries, and oil, soap, tobacco, candle and fur- dressing works.

Vologda existed as a trading town as early as the 12th century. It was a colony of Novgorod, and was founded in 1 147, and carried on a brisk trade in flax, tallow, furs, corn, leather and manufactured goods. In 1273 it was plundered by the prince of Tver in alliance with the Tatars, but soon recovered. Moscow disputed its possession with Novgorod until the 15th century; the Moscow princes intrigued to find support amidst the poorer inhabitants against the richer Nov- gorod merchants, and four successive times Vologda had to fight against its metropolis. It was definitely annexed to Moscow in 1447. When Archangel was founded, and opened for foreign trade in 1553, Vologda became the chief depot for goods exported through that channel. Polish bands plundered it in 1613, and the plague of 1648 devastated it; but it main- tained its commercial importance until the foundation of St Petersburg, when Russian foreign trade took another channel.

VOLSCI, an ancient Italian people, well known in the history of the first century of the Roman Republic. They then in- habited the partly hilly, partly marshy district of the S. of Latium, bounded by the Aurunci and Samnites on the S,, the Hetnici on the E., and stretching roughly from Norba and Cora in the N. to Antium in the S. They were among the most dangerous enemies of Rome, and frequently allied with the Aequi, whereas the Hernici from 4S6 B.C. onwards were the allies of Rome. In the Volscian territory lay the little town of Velitrae(Velletri), the birthplace of Augustus. From this town we have a very interesting though brief in- scription dating probably from early in the 3rd century B.C.; it is cut upon a small bronze plate (now in the Naples Museum), which must have once been fixed to some votive object, dedi- cated to the god Dedunus (or the goddess Decluna).

The language of this inscription is clear enough to show the very marked peculiarities which rank it close beside the lan- guage of the Iguvine Tables (see Iguvittm). It shows on the one hand the labialization of the original velar Q (Volscian pis — Latin quis), and on the other hand it. palatalizes the guttural c before a following i (Volscian jar i ia = Latin jaciat). Like Umbrian a)so, but unlike Latin and Oscan, it has degraded all the diphthongs into simple vowels (Volscian se parallel to Oscan svai; Volscian deue, Old Latin and Oscan denial or deiuot). This phenomenon of what might have been taken for a piece of Umbrian text appearing in a district

remote from Umbria and hemmed in by Latins on the north and Oscan-speaking Sam- nites on the south is a most curious feature in the geographical distribution of the Italic dialects, and is clearly the result of some complex historical movements.

In seeking for an explanation we may perhaps trust, at least in part, the evidence of the Etfmicon itself. The name Volsci belongs to what may be called the CO group of tribal names in the centre, and mainly on the west coast, of Italy, all of whom were subdued by the Romani before the end of the 4th century a. c; and many of whom were conquered by the Samnites about a century or more earlier. They are, from south to north, Osci, Aurunci, Hernici, Marruci, Falisci; with these were no doubt associated the original inhabitants of Aricia and of Sidici-num, of Vescia among the Aurunciˆ and of Labici close to Hernican territory. The same formative element appears in the adjective Mans Massicus, and the names Glanica and Marica belonging to the Auruncan district, with Graviscae in south Etruria, and a few other names in central Italy (see " I due strati nella popolazione Indo-Europea dell' Italia Antica," in the Atti del Congresso Internationale di Scienze Storiche, Rome, I0O 3> P- 17)- With these names must clearly be judged the forms Tusci and Etrusci, although these forms must not be re- garded as anything but the names given to the Etruscans by the folk among whom they settled. Now the historical fortune of these tribes is reflected in several of their names (see Sabini). The Samnite and Roman conquerors tended to impose the form of their own Ethnicon, namely the suffix NO, upon

*the tribes they conquered; hence the Marruci became the Marrucini, the * Arid became Aricini, and it seems at least probable that the forms Sidicini, Carccini, and others of this shape are the results of this same process. The conclusion sug- gested is that these CO tribes occupied the centre and west coast of Italy at the time of the Etruscan invasion (see Etrueia: Language); whereas the NO tribes only reached this part of Italy, or at least only became dominant there, long after the Etruscans had settled in the Peninsula.*

It remains, therefore, to ask whether any information can be had about the language of this primitive CO folk, and whether they can be identified as the authors of any of the various archaeological strata now recognized on Italian soil. If the conclusions suggested under Sabini may be accepted as sound we should expect to find the Volsci speaking a language similar to that of the Ligures, whose fondness for the suffix sco we have noticed (see

Ligures), and identical with that spoken by the plebeians of Rome, and that this branch of Indo-European was among those which preserved the original Indo-European Velars from the labialization which befell them in the speech of the Samnitcs. The language of the inscription of Velitrae offers al first sight a difficulty from this point of view, in the conversion which it shows of q to p; but it is to be observed that the Ethnicon of Velitrae is Veliternus, and that the people are called on the inscription itself Veleslrom (genitive plural) ; so that there is nothing to prevent our assuming that we have here a settlement of Sabines among the Volscian hills, with their language to some extent {e.g. in the matter of the diphthongs and palatals) corrupted by that of the people round about them; just as we have reason to suppose was the case with the Safme language of the Iguvini, whose very name was later converted into Iguvinates, the suffix ii being much more frequent among the CO tribes than among the Salines (see Sabixi).

*The name Volsci itself is significant not merely in its suffix; the older form Vohisci clearly contains the word meaning "marsh" identical with Gr. eXos, since the change of *velos- to *volus- is phonetically regular in Latin. The name Marica (" goddess of the salt-marshes ") among the Aurunci appears also both on the coast of Ficenum and among the Ligurians; and Stephanus of Byzantium identified the Osci with the Siculi, whom there is reason to suspect were kinsmen of the Ligures. It is remarkable in how many marshy places this co or co suffix is used. Besides the Aurunci and the dea Marica and the inUmpeslaeque Graviscae (Virg. Aen. x. r84), we have the Ustica Cubans of Horace (Odes i. 17, n), the Hemici in the Trerus valley, Salricum and Glanica in the Pomptine marshes.*

For the text and fuller account of the Volscian inscription, and for other records of the dialect, see R. S. Conway, The Italic Dialects, pp. 267 sqq. (R. S. C.)

VOLSINII, an ancient town of Etruria, Italy. The older Volsinii occupied in all probability the isolated tufa rock, so strongly defended by nature, upon which in Roman times stood the town which Procopius (B.G. ii. n seq.) calls Obpˆevr̃Ss (Urbs ictus, the modern Orvieto). This conjecture, first made by 0. Mtiller, has been generally accepted by modern archaeologists; and it is a strong point in its favour that the bishop of Orvieto in 595 signs himself episcopus civitatis Bulsiniensis (Gregor. Magn. Registr. v. 57(1; cf. ii. n, vi. 27). It had, and needed, no outer walls, being surrounded on all sides except the S.W. by abrupt tufa cliffs; but a massive wall found by excavation on the S.W. side of the town may have belonged to the acropolis. No remains of antiquity are to be seen within the city; but at the foot of the hill on the N. a large Etruscan necropolis was found in 1874, dating from the 5th century B.C. The tombs, constructed of blocks of

stone and arranged in rows divided by passages (like houses in a town), often had the name of the deceased on the fagade. Many painted vases, &c, were found; some of the best are in the Museo Civico at Orvieto. Tombs with paintings have also been found to the W. of the town on the way to Bolsena.

Volsinii was reputed the richest of the twelve cities of

Etruria. Wars between Volsinii and Rome are mentioned in 392, 308 and 294 B.C., and in 265-64 B.C. the Romans assisted the inhabitants against their former slaves, who had successfully asserted themselves against their masters and took the town, Fulvius Flaccus gained a triumph for his victory, and it was probably then that the statue of Vertumnus which stood in the Vicus Tuscus at Rome was brought from Volsinii. Zonaras states that the city was destroyed and removed elsewhere, though the old site continued apparently to be inhabited, to judge from the inscriptions found there. The new city was certainly situated on the hills on the N.E. bank of the Lake of Bolsena (Lacus Volsiniensis), 12 m. W.S.W. of Orvieto, where many remains of antiquity have been found, on and above the site of the modern Bolsena (q.v.). These remains consist of Etruscan tombs, the sacred enclosure of the goddess Nortia, with votive objects and coins ranging from the beginning of the 3rd century b.c. to the middle of the 3rd century a.d., remains of Roman houses, &c, and an amphitheatre of the imperial period (E. Gabrici in Monumenti dei Lincei,xvi., 1906, 169 sqq., and in Notizie degli Scavi, 1906, 59 sqq.).

The history of the new Volsinii is somewhat scanty. Sejanus, the favourite of Tiberius, and Musonius Rufus the Stoic were natives of the place. The earliest dated inscription from the cemetery of S. Christina (discovered with its subterranean church in 1880-81) belongs to a.d. 376 and the first known bishop of Volsinii to a.d. 499. In the next century, however, the see was transferred to Orvieto. Etruscan tombs have been found on the Isola Bisentina, in the lake; and on the west bank was the town of Visentium, Roman inscriptions belonging to which have been found. The site is marked by a medieval castle bearing the name Bisenzo.

See E. Bormann in Corp. Inscr. Latin, xi., 1888, pp. 423 sqq.; Nolizie degli Scavi, passim; G. Dennis, op. rdt. (ii. 18 sqq.).

(T. As.) VOLTA, ALESSANDRO (1745-1827), Italian physicist, was born at Como on the 18th of February 1745. He is celebrated as a pioneer of electrical science, after whom the C! volt ” is named. In 1774 he was appointed professor of physics in the gymnasium of Como, and in 1777 he travelled through Switzer- land, where he formed an intimate friendship with H. B. de Saussure. In 1779 a chair of physics was founded in Pavia,

and Volta was chosen to occupy it. In 1782 he journeyed through France, Germany, Holland and England, and became acquainted with many scientific celebrities. In T791 he re- ceived the Copley medal of the "Royal Society. In 1801 Napoleon called him to Paris, to show his experiments on contact electricity, and a medal was struck in his honour. He was made a senator of the kingdom of Lombardy. In 181 5 the emperor of Austria made him director of the philosophical faculty of Padua. In 1819 he retired and settled in his native town, where he died on the 5th of March 1827. For Volta's electrical work, and his place in the history of discovery (see Electricity; also Voltmeter).

VOLTA, the largest river of the coast of Upper Guinea, between the Gambia and the Niger, with a length of about 900 m. Its mouth and the greater part of its course are in British territory. Its lower course had been known since the discoveries of the Portuguese, from whom it received (15th century) its name on account of the winding nature of its stream. It was not, however, until the last". fifteen years of the 19th century that the extent of its basin — extending far north within the bend of the Niger— -was made known.

There are two main upper branches, the iilackand the White Volta. Their sources He on the grassy plateaus north of the forest belt of the Guinea coast, the Black Volta rising (as the Baule) in about n'N. 4 50′ W. Its course is at first E. and N.E., to 12 25′ N., at which point, after receiving a tributary from nearly 14° N.— the most northerly point of the basin, — it turns sharply south. From the eleventh to the ninth parallel the river forms the boundary between the Northern Territories of the Gold Coast (British) and the French Ivory Coast colony. The southerly course of the stream ceases at 8° 15′ N. where it is deflected E., and even N., by a mountain range composed of sandstone and granite, which it finally breaks through by a narrow pass, in which its width is only some 60 yds. Elsewhere

it has a general width of 150 to 200 yds. In o° 50′ W. it re- ceives the White Volta, which flows generally south from about 13 N. and likewise breaks through a narrow gap in the plateau escarpment. Both rivers shrink greatly in the dry season, reaching their lowest level at the end of January. Below the junction the Volta flows S.E. and 5., turning, however, E. for 40 m. just north of 6°. In 7° 37′ N. it receives on the left bank a large tributary, the Oti, coming from 12° N. In its lower course, through the forest belt, the river has often a width of over half a mile, with a depth in places of 40 to 50 ft. in the rains, but in 6° 18′ N. it traverses a pass in which its width is narrowed to 30 yds. Its use as a water- way is limited by

a number of rapids, the lowest of which occur in 6° 7′ N., above the trading port of Akuse. Its mouth is also obstructed during the greater part of the year by a bar. The river is usually navigable by small vessels from its mouth for about 60 m.

The lower Volta was explored by M. J. Bonnat in 1875, but the upper basin was first traversed by the German traveller (i. A. Krausc (1886-87) an d the French captain L. G. Binger (1888). It. has since been explored by a number of colonial officials — German, French and British. Between 6° 4i / and 8° 8′ N. the Volta forms the boundary between the Gold Coast and Togoiand.

VOLTAIRE, FRANCOIS MARIE AROUET DE (1694-1778), French philosopher, historian, dramatist and man of letters, whose real name was Francois Marie Arotiet simply, was born on the 21st of November 1694 at Paris, and was baptized the next day. His father was Francois Arouet, a notary; his mother was Marie Marguerite Daumart or D'Aumard. Both father and mother were of Foitevin extraction, but the Arouets had been for two generations established in Faris, the grand- father being a prosperous tradesman. The family appear to have always belonged to the yeoman-tradesman class; their special home was the town of Samt-Loup, Voltaire was the fifth child of his parents — twin boys (of whom one survived), a girl, Marguerite Catherine, and another boy who died young, having preceded him. Not very much is known of the mother, who died when Voltaire was but seven years old. She pretty certainly was the chief cause of his early introduction to good society, the abbe de Chateauneuf (his sponsor in more ways than one) having been her friend. The father appears to have been somewhat peremptory in temper, but neither inhospitable nor tyrannical. Marguerite Arouet, of whom her younger brother was very fond, married early, her husband's name being Mignot; the eider brother, Armand, was a strong Jan- senist. and there never was any kind of sympathy between him and Francois.

The abbe de Chateauneuf instructed him early in belles- lettres and deism, and he showed when a child the unsurpassed faculty for facile verse-making which always distinguished him. At the age of fen he was sent to the College Louis-le- Grand, which was under the management of the Jesuits, and remained there till 1711. It was his whim, as part of his general liberal- ism, to depreciate the education he received; but it seems to have been a very sound and good education, which formed the basis of his extraordinarily wide, though never extra- ordinarily accurate, collection of knowledge subsequently, and (a more important thing) disciplined and exercised his literary faculty and judgment. Nor can there be much doubt that the great attention bestowed on acting— the Jesuits kept up the Renaissance practice of turning schools into theatres for the performance of

plays both in Latin and in the vernacular — had much to do with Voltaire's lifelong devotion to the stage. It must have been in his very earliest school years that the celebrated presentation of him by his godfather to Ninon de T.eni'los took^place, for Ninon died in 1705. She left him two thousand ["rancs (i to buy books with." He worked fairly, played fairly, lived comfortably, made good and lasting friends. Some curious traits are recorded of this life — one being that in the terrible famine year of Malplaquet a hundred francs a year were added to the usual boarding expenses, and yet the boys had to eat pain bis.

In August 1 71 1, at the age of seventeen, he came home, and the usual battle followed between a son who desired no profession but literature and a father who refused to consider

literature a profession at all. For a time Voltaire submitted, and read law at least nominally. The abbe tie Chateauneuf died before his godson left school, but he had already intro- duced him to the famous and dissipated coterie of the Temple, of which the grand prior Venddme was the head, and the poets Chaulieu and La Fare the chief literary stars. It does not appear that Voltaire got into any great scrapes; but his father tried to break him off from such society by sending him first to Caen and then, in the suite of the marquis de Chateauneuf, the abbe's brother, to the Hague. Here he met a certain Olympe Dunoyer (" Pimpette "), a girl apparently of respect- able character and not bad connexions, but a Protestant, penniless, and daughter cf a literary lady whose literary reputa- tion was not spotless. The mother discouraged the affair, and, though Voltaire tried to avail himself of the mania for prosely- tizing which then distinguished France, his father stopped any idea of a match by procuring a lettre de cachet, which, however, he did not use. Voltaire, who had been sent home, submitted, and for a time pretended to work in a Parisian lawyer's office; but he again manifested a faculty for getting into trouble— this time in the still more dangerous way of writing libellous poems — so that his father was glad to send him to stay for nearly a year (1714-15) with Louis de Caumartin, marquis de Saint-Ange, in the country. Here he was still supposed to study law, but devoted himself in part to literary essays, in part to storing up his immense treasure of gossiping history . Almost exactly at the time of the death of Louis XIV. he returned to Paris, to fall once more into literary and Templar society, and to make the tragedy of (Edipe, which he had already written, privately known. He was now introduced to a less questionable and even more distinguished coterie than Vend6me's, to the famous " court of Sceaux," the circle of the beautiful and ambitious duchesse du Maine. It seems that Voltaire lent himself to the duchess's frantic hatred of the regent Orleans, and helped to compose lampoons on that prince. At any rate, in May 1716 he was exiled, first to Tulle, then to Sully. Allowed to return, he again fell under suspicion of having been concerned in the composition of

*two violent libels — one in Latin and one in French — called from their first words the Puero Regnante and the J'ai vu, was inveigled by a spy named Beauregard into a real or burlesque confession, and on the 16th of May 1717 was sent to the Bastille. He there recast (Edipe, began the Henriade and determined to alter his name. Ever after his exit from the Bastille in April 1718 he was known as Arouet de Voltaire, or simply Voltaire, though legally he never abandoned his patronymic. The origin of the famous name has been much debated, and attempts have been made to show that it actually existed in the Daumart pedigree or in some territorial designation. Some arc said to maintain that it was an abbreviation of a childish nickname, " le petit volontaire," The balance of opinion has, however, always inclined to the hypothesis of an anagram on the name " Arouet le jeune/' or " Arouet 1. j.," u being changed to v and j to * according to the ordinary rules of the game.*

A further " exile " at Chatenay and elsewhere succeeded the imprisonment, and though Voltaire was admitted to an audience by the regent and treated graciously he was not trusted. (Edipe was acted at the Theatre Frangais on the 18th of Novem- ber of the year of release, and was very well received, a rivalry between parties not dissimilar to that which not long before had helped Addison's Cato assisting its success. It had a run of forty-five nights, and brought the author not. a little profit. With these gains Voltaire seems to have begun his long series of successful financial speculations. But in the spring of next year the production of Lagrange- Chancel's libels, entitled the Philip piques, again brought suspicion on him. lie was in- formally exiled, and spent much time with Marshal Villars, again increasing his store of " reminiscences." He returned to Paris in the winter, and his second play, Artemire, was pro- duced in February 1720. It was a failure, and though it was recast with some success Voltaire never published it as a whole, and used parts of it in other work. He again spent much of

his time with Villars, listening to the marshal's stones and making harmless love to the duchess. In December 1721 his father died, leaving him property (rather more than four thousand livres a year), which was soon increased by a pension of half the amount from the regent. In return for this, or in hopes of more, he offered himself as a spy — or at any rate as a secret diplomatist — to Dubois. But meeting his old enemy Beauregard in one of the minister's rooms and making an offensive remark, he was waylaid by Beauregard some time after in a less privileged place and soundly beaten.

His visiting espionage, as unkind critics put it — his secret diplomatic

mission, as he would have liked to have it put himself — began in the summer of 1722, and he set out for it in company with a certain Madame de Rupelmonde, to whom he as usual made love, taught deism and served as an amusing travelling companion. He stayed at Cambrai for some time, where European diplomatists were still in full session, jour- neyed to Brussels, where he met and quarrelled with Jean Baptistc Rousseau, went on to the Hague, and then returned. The Henriade had got on considerably during the journey, and. according to his lifelong habit, the poet, with the help of his friend Thieriot and others, had been "working the oracle" of puffery. During the late autumn and winter of 1722-23 he abode chiefly in Paris, taking a kind cf lodging in the town house of M. de Bernieres, a nobleman of Rouen, and endeavouring to procure a "privilege" for his poem. In this he was disappointed, but he had the work printed at Rouen nevertheless, and spent the summer of 1723 revising it. In November he caught smallpox and was very seriously ill, so that the book was not given to trie world till the spring of 1724 (and then of course, as it had no privilege, appeared privately). Almost at the same time, the 4th of March, his third tragedy, Manamne appeared, was well received at first, but underwent complete damnation before the curtain fell. The regent had died shortly before, not to Voltaire's advantage; for he had been a generous patron. Voltaire had made, however, a useful friend in another grand seigneur^ as profligate and nearly as intelligent, the duke of Richelieu, and with him he passed 1724 and the next year chiefly, recasting Mariamne (which was now successful), writing the comedy of Vlndiscret, and courting the queen, the ministers, the favourites and everybody who seemed worth. The end of 1725 brought a disastrous close to this period of his life. He was insulted by the chevalier de Rohan, replied with his usual sharpness of tongue, and shortly afterwards, when dining with the duke of Sully, was called out and bastinadoed by the chavelier's hire- lings, Rohan himself looking on. Nobody would take his part, and at last, nearly three months after the outrage, he challenged Rohan, who accepted the challenge, but on the morning appointed for the duel Voltaire was arrested and sent for the second time to the Bastille. He was kept in confinement a fortnight, and was then packed off to England in accordance with his own request. Voltaire revenged himself on the duke of Sully for his conduct towards his guest by cutting Maxi- milien de Bethune's name out of the Henriade.

No competent judges have ever mistaken the importance of Voltaire's visit to England, and the influence it exercised on his future career. In the first place, the ridiculous and discreditable incident of the beating had time to blow over; in the second, England was a very favourable place for French- men of note to pick up guineas; in the third, and most im- portant 01 all, his contact with a people then far more different in every conceivable way from .their neighbours than any two peoples of Europe are different now,

acted as a sovereign tonic and stimulant on his intellect and literary faculty. Before the English visit Voltaire had been an elegant trifter, an adept in the forms oF literature popular in French society, a sort of superior Dorat or BoufHers of earlier growth. He returned from that visit one of the foremost literary men in Europe, with views, if not profound or accurate, yet wide and acute on all les grands sitjets, and with a solid stock of money. The visit lasted about three years, from 1726 to 1729; and, as if

to make the visitor's luck certain, George I. died and George II. succeeded soon after his arrival. The new king was not fond of " boetry," but Queen Caroline was, and international jealousy was pleased at the thought of welcoming a distin- guished exile from French illiberality. The Walpoles, Bubb Dodington, Bolingbroke, Congreve, Sarah, duchess of Marl- borough, Pope, were among his English friends. He made acquaintance with, and at least tried to appreciate, Shake- speare. He was much struck by English manners, was deeply penetrated by English toleration for personal freethought and eccentricity, and gained some thousands of pounds from an authorized English edition of the Henriade, dedicated to the queen. But he visited Paris now and then without permis- sion, and his mind, like the mind of every exiled Frenchman, was always set thereon. He gained full licence to return in the spring of 1720.

He was full of literary projects, and immediately after his return he is said to have increased his fortune immensely by a lucky lottery speculation. The Henriade was at last licensed in France; Brutus, a play which he had printed in England, was accepted for performance, but kept back for a time by the author; and he began the celebrated poem of the Pucelle, the amusement and the torment of great part of his life. But he had great difficulties with two of his chief works which were ready to appear, Charles XII. and the Lettres sur les Anglais. With both he took all imaginable pains to avoid offending the censorship; for Voltaire had, more than any other man who ever lived, the ability and the willingness to stoop to conquer. At the end of 1730 Brutus did actually get acted. Then in the spring of the next year he went to Rouen to get Charles XII. surreptitiously printed, which he accomplished. In 1732 another tragedy, Eriphile, appeared, with the same kind of halting success which had distinguished the appearance of its elder sisters since CEdip'e. But at last, on the 13th of August 1732, he produced Zaire, the best (with Merope) of all his plays, and one of the ten or twelve best plays of the whole French classical school. Its motive was borrowed to some extent from Othello, but that matters little. In the following winter the death of the comtesse de Fontaine-M artel, whose guest he had been, turned him out of a comfortable abode. He then took lodgings with an agent of his, one Demoulin, in an out-of-the-way part of Paris, and was, for some time at least, as much occupied with contracts, specu- lation and all sorts of means of gaining money as with literature.

In the middle of this period, however, in 1733, two important books, the Leiires philosophiques sur les Anglais and the Temple du gout appeared. Both were likely to make bad blood, for the latter was, under the mask of easy verse, a satire on con- temporary French literature, especially on J. B. Rousseau, and the former was, in the guise of a criticism or rather panegyric of English ways, an attack on everything established in the church and state of France. It was published with certain "remarks" on Pascal, more offensive to orthodoxy than itself, and no mercy was shown to it. The book was condemned (June 10th, 1734), the copies seized and burnt, a warrant issued against the author and his dwelling searched. He himself was safe in the independent duchy of Lorraine . with Emilie de Breteuil, marquise du Chatelet, 1 with whom he began to be intimate in 1733; he had now taken up his abode with her at the chateau of Cirey.

If the English visit may be regarded as having finished

1 Gabrielle Emilie Le Tonnelier dc Breteuil, marquise du Chatelet (1706-1749), was the daughter of the baron de Breteuil, and married the marquis du Chatelet-Lomont in 1725. She was an accom- plished linguist, musician and mathematician, and deeply interested in metaphysics. When she first became intimate with Voltaire she was practically separated from her husband, though he occasionally visited Cirey. She is only important from her connexion with Voltaire, though an attempt has been made to treat her as an original thinker; see F. Hamel, An Eighteenth Century Marquise (1910). She wrote Institutions de physique (1740), Dissertation sur Ui nature- ct la propagation du feu (l 744) , Doutes sur les religions reculees (1792), and in 1756 published a translation of Newton's Principia.

Voltaire's education, the Cirey residence may be justly said to be the first stage of his literary manhood. He had written important and characteristic work before; but he had always been in a kind of literary Wanderjahre. He now obtained a settled home for many years and, taught, by his numerous brushes with the authorities, he began and successfully carried out that system of keeping out of personal harm's way, and of at once denying any awkard responsibility, which made him for nearly half a century at once the chief and the most pros- perous of European heretics in regard to all established ideas. It was not till the summer of 1734 that Circy, a half-dismantled country house on the borders of Champagne and Lorraine, was fitted up with Voltaire's money and became the head- quarters of himself, of his hostess, and now and then of her accommodating husband. Many

pictures of the life here, some of them not a liLtle malicious, survive. Tt was not en- tirely a bed of roses, for the "respectable Emily's" temper was violent, and after a time she sought lovers who were not so much des ceribraux as Voltaire. But it provided him with a safe and comfortable retreat, and with every opportunity for literary work. In March 17,35 the ban was formally taken off him, and he was at liberty to return to Paris, a liberty of which he availed himself sparingly.

At Cirey he wrote indefatigably and did not neglect business. The principal literary results of his early years here were the Discours en vers sur Thamme, the play of Alzire and IS Enfant prodigue (1736), and a long treatise on the Newtonian system which he and Madame du Chatelet wrote together. But, as usual, Voltaire's extraordinary literary industry was shown rather in a vast amount of fugitive writings than in substantive works, though for the whole space of his Cirey residence he was engaged in writing, adding to, and altering the Pucelle. In the very first days of his sojourn he had written a pamphlet with the imposing title of Treatise on Metaphysics. Of metaphysics proper Voltaire neither then nor at any other time understood anything, and the subject, like every other, merely served him as a pretext for laughing at religion with the usual reservation of a tolerably affirmative deism. In March 1736 he received his first letter from Frederick of Prussia, then crown prince only. He was soon again in trouble, this time for the poem of Le Mondain, and he at once crossed the frontier and then made for Brussels. He spent about three months in the Low Countries, and in March 1737 returned to Cirey. and continued writing, making experiments in physics (he had at this time a large laboratory), and busying himself with iron-founding, the chief industry of the district. The best-known accounts of Cirey life, those of Madame de Grafigny, date from the winter of 1738-39; they are somewhat spiteful but very amusing, depicting the frequent quarrels between Madame du Chatelet and Voltaire, his intense suffering under criticism, his constant dread of the surreptitious publication of the Pucelle (which nevertheless he could not keep his hands from writing or his tongue from reciting to his visitors), and so forth, The chief and most galling of his critics at this time was the Abbe Dcsfontaincs, and the chief of Desfonlaines's attacks was entitled La Volt air omanir., in reply to a libel of Voltaire's called Le. Preservatif. Both combatants had, accord- ing to the absurd habit of the time, to disown their works, Desfontaines's disavowal being formal and procured by the exertion of all Voltaire's own influence both at home and abroad. For he had as little notion of tolerance towards others as of dignity in himself. In April 1739 a journey was made to Brussels, to Paris, and then again to Brussels, which was the headquarters for a considerable time, owing to some law affairs, of the Du Chatelets. Frederick, now king of Prussia, made not a few efforts to get Voltaire away from Madame du Chatelet, but unsuccessfully, and the

king earned the lady's cordial hatred by persistently refusing or omitting to invite her. At last, in September 1740, master and pupil met for the first time at Cleves, an interview followed three months later by a longer visit. Brussels was again the headquarters in 1741, by which time Voltaire had finished the best and the second

or third best of his plays, M&rope and Mahomet. Mahomet was played first at Lille in that year; it did not appear in Paris till August next year, and Merope not till 1743. This last was, and deserved to be, the most successful of its author's whole theatre. It was in this same year that he received the singular diplomatic mission to Frederick which nobody seems to have taken seriously, and after his return the oscillation between Brussels, Cirey and Paris was resumed. During these years much of the Essai sur les mmurs and the Steele de Louis XIV. was composed. He also returned, not too well-advisedly, to the business of courtiership, which he had given up since the death of the regent. He was much employed, owing to Richelieu's influence, in the fetes of the dauphin's marriage, and was rewarded through the influence of Madame de Pompadour on New Year's Day 1745 by the appointment to the post of historiographer-royal, once jointly held by Racine and Boileau. The situation itself and its accompanying privileges were what Voltaire chiefly aimed at, but there was a salary of two thousand livres attached, and he had the year before come in for three times as much by the death of his brother. In the same year he wrote a poem on Fontenoy, he received medals from the pope and dedicated Mahomet to him, and he wrote court divertissements and other things to admira- tion. But he was not a thoroughly skilful courtier, and one of the best known of Voltairiana is the contempt or at least silence with which Louis XV. — a sensualist but no fool — received the maladroit and almost insolent inquiry Trajan est-il content? addressed in his hearing to Richelieu at the close of a. piece in which the emperor had appeared with a transparent reference to the king. All this assentation had at least one effect. He, who had been for years admittedly the first writer in France, had been repeatedly passed over in elections to the Academy. He was at last elected in the spring of 1746, and received on the gth of May. Then the tide began to turn. His favour at court had naturally exasperated his enemies; it had not secured him any real friends, and even a gcntlemanship of the chamber was no solid benefit, except from the money point of view. He did not indeed hold it very long, but. was per- mitted to sell it for a large sum, retaining the rank and privileges. He had various proofs of the instability of his hold on the king during 1747 and in 1748. He once lay in hiding for two months with the duchesse du Maine at Sceaux, where were produced the comedietta of La Prude and the tragedy of Rome sauvSe, and afterwards for a time lived chiefly at Luneville; here Madame du Chatelet had established herself at the court of King Stanislaus, and carried on a

liaison with Saint-Lambert, an officer in the king's guard. Tn September 1749 she died after the birth of a child.

The death of Madame du Chatelet is another turning-point in the history of Voltaire. He was fifty-five, but he had nearly thirty years more to live, and he had learnt much during what may be called his Cirey cohabitation. For some time, however, after Madame du Chatelet's death he was in a state of pitiable unsettlement. At first, after removing his goods from Circy, lie hired the greater part of the Chatelet town house, and then the whole. He had some idea of settling down in Paris, and might perhaps have done so if mischief had not been the very breath of his nostrils. He went on writing satiric tales like Zadig. He engaged in a foolish and undigni- fied struggle with Crebillon pere (not fils), a rival set up against him by Madame de Pompadour, but a dramatist who, in part of one play, Rhadamiste et Zenobie, has struck a note of tragedy in the grand Cornelian strain, which Voltaire could never hope to echo. Semirame (1748), Oreste (1750) and Rome sauvSe itself were all products of this rivalry. He used the most extraordinary efforts to make himself more popular than he was, but he could not help being uncomfortable.

All this time Frederick of Prussia had been continuing his invitations. Voltaire left Paris on the 15th of June 1751, and reached Berlin on the 10th of July. This Berlin visit is more or less familiar to English readers from the two great essays of Macaulay and Carlyle as well as from the Frederick of the

*latter. But these two masters of English were not perhaps the best qualified to relate the story. Both were unjust to Voltaire, and JMacaulay was unjust to Frederick as well. It is certain that al first the king behaved altogether like a king to his guest. He pressed him to remain; he gave him (the words are Voltaire's own) one of his orders, twenty thousand francs a year, and four thousand additional for his niece, Madame Denis, in case she would come and keep house for her uncle. But Voltaire's conduct was from the first Voltairian. He insisted on the consent of his own king, which was given without delay. But Frenchmen, always touchy on such a point, regarded Voltaire as something of a deserter; and it was not. long before he bitterly repented his desertion, though his resilience in Prussia lasted nearly three years. It was quite impossible that Voltaire and Frederick should get on together f(*r long. Voltaire was not humble enough to be a mere butt, as many of Frederick's led poets were; he was not enough of a gentleman to hold his own place with dignity and discretion; lie was constantly jealous both of his equals in age and reputation, such as Maupertuis, and of his juniors and inferiors, such as Baculard D'Arnaud. lie was greedy, restless, and in a way Bohemian. Frederick, though his love of teasing lor teasing's sake has been exaggerated by Macaulay, was a martinet of the first water, had a sharp though one-sided idea of justice, and had not the slightest intention of allowing Voltaire to insult or to tyrannize over his other guests and servants. If lie is to be blamed in this particular matter, the blame must be chiefly confined to his imprudence in inviting Voltaire at the beginning and to the brutality of his conduct at the end. Within Voltaire there was always a mischievous and ill-behaved child; and he was never more mischievous, more ill-behaved and more childish than in these years. He tried to get D'Arnaud exiled, and succeeded. He got into a quite unnecessary quarrel with Lessing. He had not been in the country six months before he engaged in a discreditable piece of financial gambling with Hirsch, the Dresden Jew. He was accused of something like downright forgery— that is to say, of altering a paper signed by Hirsch after he had signed it. The king's disgust at this affair (which came to an open scandal before the tribunals) was so great that he was on the point of ordering Voltaire out of Prussia, and Darget the secretary had no small trouble in arranging the matter (February 1 7 5 1) . Then it was Voltaire's turn to be disgusted with an occupation he had undertaken himself — the occupation of " buckwashing ,; the king's French verses. However, he suc- ceeded in finishing and printing the Steele de Louis XIV., while the Diclionnairt: p kilo so phi que is said to have been deviled and begun at Potsdam. But Voltaire's restless temper was brewing up for another storm. In the early autumn of 1 751 La Met trie, one of the king's parasites, and a man of much more talent than is generally allowed, horrified Voltaire by telling him that Frederick had in conversation applied to him (Voltaire) a proverb*

about " sucking the orange and flinging away its skin," and about the same time the dispute with Maupertuis, which had more than anything else to do with his exclusion from Prussia, came to a head. Maupertuis got into a dispute with one Kcinig. The king took his president's part; Voltaire took Konig's. But Maupertuis must needs write his Letters, and (hereupon (1752) appeared one of Voltaire's most famous, though perhaps not one of his most read works, the Di.'Jrihc du Doctcur Akakia. Even Voltaire did not venture to publish this lampoon on a great official of a prince so touchy as the king of Prussia without some permission, and if all tales are true he obtained this by another piece of something like forgery getting the king to endorse a totally different pamphlet on its last leaf, and affixing that last leaf to Akakia. Of this Frederick was not aware; but he did get some wind of the Diatribe itself, sent for the author, heard it read to his own great amusement, and either actually burned the MS. or be lieved that it was burnt. In a few days printed copies appeared. Frederick did not like disobedience, but he still less liked being made a fool of, and he put Voltaire under arrest. But again

the affair blew over, the king believing that the edition of Akakia confiscated in Prussia was the only one. Alas! Vol- taire had sent copies away; others had been printed abroad; and the thing was irrecoverable. It could not be proved that he had ordered the printing, and all Frederick could do was to have the pamphlet burnt by the hangman. Things were now drawing to a crisis. One day Vultahe sent Ms orders, &c.j back; the next Frederick returned them, but Voltaire had quite made up his mind to fly. A kind of reconciliation occurred in March, and after some days of good-fellowship Voltaire at last obtained the long-sought leave of absence and left Potsdam on the 26th of the month (1753). It was nearly three months afterwards that the famous, ludicrous and brutal arrest was made at Frankfort, on the persons of himself and his niece, who had met him meanwhile. There was some faint excuse for Frederick's wrath. In the first place, the poet chose to linger at Leipzig. In the second place, in direct dis-regard of a promise given to Frederick, a supplement to Akakia appeared, more offensive than, the main text. From Leipzig, after a month's stay, Voltaire moved to Gotha. Once more, on the 25th of May, he moved on to Frankfort. Frankfort, nominally a free city, but with a Prussian resident who did very much what he pleased, was not like Gotha and Leipzig. An excuse was provided in the fact that the poet had a copy of some unpublished poems of Frederick's, and as soon as Voltaire arrived hands were laid on him, at first with courtesy enough. The resident, Freytag, was not a very wise person (though he probably did not, as Voltaire would have it, spell " poesie " " poeshie "); constant references to Frederick were necessary; and the affair was prolonged so that Madame Denis had time to join her uncle. At last Voltaire tried to steal away. He was followed,

arrested, his niece seized separ- ately, and sent to join him in custody;. and the two, with the secretary Collini, were kept close prisoners at an inn called the Goat. This situation was at last put an end to by the city authorities, who probably felt that they were not playing a very creditable part. Voltaire left Frankfort on the 7th of July, travelled safely to Mainz, and thence to Mannheim, Strassburg and Colmar. The last-named place he reached (after a leisurely journey and many honours at the little courts just mentioned) at the beginning of October, and here he pro- posed to stay the winter, finish his Annals of the Empire and look about him.

Voltaire's second stage was now over. Even now, however, in his sixtieth year, it required some more external pressure to induce him to make himself independent. He had been, in the first blush of his Frankfort disaster, refused, or at least not granted, permission even to enter France proper. At Colmar he was not safe, especially when in January 1754 a pirated edition of the Essai sur Us mceurs, written long before, appeared. Permission to establish himself in France was now absolutely refused. Nor did an extremely offensive per- formance of Voltaire's — the solemn partaking of the Eucharist at Colmar after due confession — at all mollify his enemies. His exclusion from France, however, was chiefly metaphorical, and really meant exclusion from Paris and its neighbourhood. In the summer he went to Plombicres, and after returning to Colmar for some time journeyed in the beginning of winter to Lyons, and thence in the middle of December to Geneva. Voltaire had no purpose of remaining in the city, and almost immediately bought a country house just outside the gates, to which he gave the name of Les Delices. He was here practically at the meeting-point of four distinct jurisdictions — Geneva, the canton Vaud, Sardinia and France, while other cantons were within easy reach; and he bought other houses dotted about these territories, so as never to be without a refuge close at hand in case of sudden storms. At Lcs Delices he set up a considerable establishment, which his great wealth made him able easily to afford. He kept open house for visitors; he had printers close at hand in Geneva; he fitted up a private theatre in which he could enjoy what was perhaps the greatest pleasure of his whole life — acting in a play of his

own, stage-managed by himself. His residence at Geneva brought, him into correspondence (at first quite amicable) with the most famous of her citizens, J. J. Rousseau. His Orphelin de la Chine, performed at Paris in 1755, was very well received; the notorious La Pucette appeared in the same year. The earthquake at Lisbon, which appalled other people, gave Voltaire an excellent opportunity for ridiculing the beliefs of the orthodox,

first in verse (1756) and later in the (from a literary point of view) unsurpassable tale of Candide (1759). All was, however, not yet quite smooth with him. Geneva had a law expressly forbidding theatrical performances in any circumstances whatever. Voltaire had infringed this law already as far as private performances went, and he had thought of building a regular theatre, not indeed at Geneva but at Lausanne. In July 1755 a very polite and, as far as Voltaire was concerned, indirect resolution of the Consistory declared that in consequence of these proceedings of the Sieur de Voltaire the pastors should notify their flocks to abstain, and that the chief syndic should be informed of the Consistory's perfect confidence that the edicts would be carried out. Voltaire obeyed this hint as far as Les Delices was concerned, and consoled himself by having the performances in his Lausanne house. But he never was the man to take opposi- tion to his wishes either quietly or without retaliation. lie undoubtedly instigated D'Alembert to include a censure of the prohibition in his Encyclopedie article on " Geneva," a proceeding which provoked Rousseau's celebrated Lettre & D'Alembert sur les spectacles. As for himself, he looked about for a place where he could combine the social liberty of France with the political liberty of Geneva, and he found one.

At the end of 1758 he bought the considerable property of Ferney, on the shore of the lake, about four miles from Geneva, and on French soil. At Les Delices (which he sold in 1765) he had become a householder on no small scale; at Ferney (which he increased by other purchases and leases) he became a complete country gentleman, and was henceforward known to all Europe as squire of Ferney. Many of the most celebrated men of Europe visited him there, and large parts of his usual biographies are composed of extracts from their accounts of Ferney. His new occupations by no means quenched his literary activity. He did not make himself a slave to his visitors, but reserved much time for work and for his immense correspondence, which had for a long time once more included Frederick, the two getting on very well when they were not in contact. Above all, he now, being comparatively secure in position, engaged much more strongly in public controversies, and resorted less to his old labyrinthine tricks of disavowal, garbled publication and private libel. The suppression of the Encyclopedie, to which he had been a considerable con- tributor, and whose conductors were his intimate friends, drew from him a shower of lampoons directed now at " l'infame " (see infra) generally, now at literary victims, such as Le Franc de Pompignan (who had written one piece of verse so much better than anything serious of Voltaire's that he could not be forgiven), or Palissot (who in his play Les Philosophes had boldly gibbeted most of the persons so termed, but had not included Voltaire), now at Freron, an excellent critic and a dangerous writer, who had attacked Voltaire from the con- servative side, and at whom the patriarch

of Ferney, as he now began to be called, levelled in return the very inferior farce-lampoon of L'Ecossaise, of the first night of which Freron himself did an admirably humorous criticism.

How he built a church and got into trouble in so doing at Ferney, how he put " Deo erexit Voltaire " on it (1760-61) and obtained a relic from the pope for his new building, how he entertained a grand-niece of Corneille, and for her benefit wrote his well known "commentary" on that poet, are matters of interest, but to be passed over briefly. Here, too, he began that series of interferences on behalf of the oppressed and the ill-treated which, whatever mixture of motives may have prompted it, is an honour to his memory. Volumes and almost libraries have been written on the Calas affair, and

we can but refer here to the only less famous cases of Sirven (very similar to that of Calas, though no judicial murder was actually committed), Espinasse (who had been sentenced to the galleys for harbouring a Protestant minister), Lally (the son of the unjustly treated but not blameless Irish-French commander in India), D'Etalonde (the companion of La Barre),' Montbailli and others. In 176S he entered into controversy with the bishop of the diocese; he had differences with the superior landlord of part of his estate, the president De Brosses; and he engaged in. a long and tedious return match with the republic of Geneva. But the general events of this Ferney life are somewhat of that happy kind which are no events.

In this way Voltaire, who had been an old man when he established himself at Ferney, became a very old one almost without noticing it. The death of Louis XV. and the accession of Louis XVI. excited even in his aged breast the hope of re-entering Paris, but he did not at once receive any encouragement, despite the reforming ministry of Turgot. A much more solid gain to his happiness was the adoption, or practical adoption, in 1776 of Reine Philiberte de Varicourt, a young girl of noble but poor family, whom Voltaire rescued from the convent, installed in his house as an adopted daughter, and married to the marquis de Villctte. Her pet. name was " Belle et Bonne," and nobody had more (o do with the happiness of the last years of the " patriarch " than she had. It is doubtful whether his last and fatal visit to Paris was due to his own wish or to the instigation of his niece, Madame Denis; but this lady — a woman of disagreeable temper, especially to her inferiors — appears to have been rather hardly treated by Voltaire's earlier, and sometimes by his later, biographers. The suggestion which has been made that the success of Beaumarchais piqued him has nothing impossible in it. At any rate he had, at the end of 1777 and the beginning of 1778, been carefully finishing a new tragedy — Irhie — for production in the capital. He started on the 5th of February, and five days later arrived at the city which he had not seen for eight- and-twenty years.

He was received with immense rejoicings, not indeed directly by the court, but by the Academy, by society and by all the more important foreign visitors. About a fortnight after his arrival, age and fatigue made him seriously ill, and a confessor was sent for. But he recovered, scoffed at himself as usual, and prepared more eagerly than ever for the first performance of Irene, on the 16th of March. At the end of the month he was able to attend a performance of it, which was a kind of apotheosis. He was crowned with laurel in his box, amid the plaudits of the audience, and did not seem, to be the worse for it. He even began or proceeded with another tragedy — Agathocle— and attended several Academic meetings. But such proceedings in the case of a man of eighty-four were impossible. To keep himself up, he exceeded even his usual excess in coffee, and about the middle of May he became very ill. On the 30th of May the priests were once more sent for — to wit, his nephew, the abbe Mignot, the.abbe Gaultier, who had officiated on the former occasion, and the parish priest,. the cure of St Sulpice. He was, however, in a state of half- insensibility, and petulantly motioned them away, dying in the course of the. night. The legends about his death in a state of terror and despair are certainly false; but it must be regarded as singular and unfortunate that he, who had more than once gone out of his way to conform ostentatiously and with his tongue in his cheek, should have neglected or missed this last opportunity. The result was a difficulty as to burial, which was compromised by hurried interment at the abbey of Scellieres in Champagne, anticipating the interdict of the bishop of the diocese by an hour or two. On the 10th of July 1791 the body was transferred to the Pantheon, but during the Hundred Days it was once more, it is said, disentombed, and stowed away in a piece of waste ground. His heart, taken from the body when it was embalmed, and given to Madame Denis and by her to Madame de Villette, was preserved in a silver case, and when it was proposed (in 1864) to restore ft to

the other remains, the sarcophagus at Sainte Genevieve (the Pantheon) wa? opened and found to be empty.

In person Voltaire was not engaging, even as a young man. His extraordinary thinness is commemorated, among other things, by the very poor but well-known epigram attributed to Young, and identifying him at once with " Satan, Death and Sin." In old age he was a mere skeleton, with a long nose and eyes of preternatural brilliancy peering out of his wig. He never seems to have been addicted to any manly sport, and took little exercise. He was sober enough (for his day and society) in eating and

drinking generally; but drank coffee, as his contemporary, counterpart and enemy, Johnson, drank tea, in a hardened and inveterate manner. It may be presumed with some certainty that his attentions to women were for the most part platonic; indeed, both on the good and the bad side of him, he was all brain. He appears to have had no great sense of natural beauty, in which point he resembled his general ion (though one remarkable story is told of his being deeply affected by Alpine scenery); and, except in his passion for the stage, he does not seem to have cared much for any of the arts. Conversation and literature were, again as in Johnson's case, the sole gods of his idolatry. As for his moral character, the wholly intellectual cast, of mind just referred to makes it difficult to judge that. His beliefs or absence of beliefs eman- cipated him from conventional scruples; and he is not a good subject for those who maintain that a nice morality may exist independently of religion. He was good-natured when not crossed, generous to dependents who made themselves useful to him, and indefatigable in defending the cause of those who were oppressed by the systems with which he was at war. But he was inordinately vain, and totally unscrupulous in gaining money, in attacking an enemy, or in protecting himself when he was threatened with danger. His peculiar fashion of attack- ing the popular beliefs of his time has also failed to secure the approval of some who had very little sympathy with those beliefs. The only excuse made for the alternate cringing and insult, the alternate abuse and lying, which marked his course in this matter, has been the very weak plea that a man cannot fight with a system — a plea which is sufficiently answered by the retort that a great many men have so fought and have won. Voltaire's works, and especially his private letters, constantly contain the word " l'infame " and the expression (in full or abbreviated) " 6crasez l'infame. " This has been misunderstood in many ways — the mistake going so far as in some cases to suppose that Voltaire meant Christ by this opprobrious expression. No careful and competent student of his works has ever failed to correct this gross misapprehension. " L'in- fame " is not God; it is not Christ; it is not Christianity; it is not even Catholicism. Its briefest equivalent may be given as {i persecuting and privileged orthodoxy " in general, and, more particularly, it is the particular system which Voltaire saw around him, of which he had felt the effects in his ow r n exiles and the confiscations of his books, and of which he saw the still worse effects in the hideous sufferings of Calas and La Barrc.

Vast and various as the work of Voltaire is, its vastness and variety are of the essence of its writer's peculiar quality. The divisions of it have long been recognized, and may be treated regularly.

The first of these divisions in order, not the least in hulk, and, though not the first in merit, inferior to none in the amount of congenial labour spent on it, is the theatre. Between fifty and sixty different pieces (including a

few which exist only in fragments or sketches) are included in his writings, and they cover his literary life. It is at first sight remarkable that Voltaire, whose comic power was undoubtedly far in excess of his tragic, should have written many tragedies of no small excellence in their way, but only one fair second-class comedy, Nanine. His other efforts in this latter direction arc- either slight and almost insignificant in scope, or, as in the case of the somewhat famous Ecossaise, deriving all their interest from being personal libels. His tragedies, on the other hand, are works of extraordinary merit in their own way. Although Voltaire had neither the perfect versification of Racine nor the noble poetry of Corneille, he surpassed the latter certainly, and the former in the opinion of some not incompetent judges, in

playing the difficult and artificial game of the French tragedy. Zaire, among those where love is admitted as a principal motive, and Metope, among those where this motive is excluded and kept in subordination, yield to no plays of their classe in such interest as is possible on the model, in stage effect and in uniform literary merit. Voltaire knew that the public opinion of his time reserved its highest prizes for a capable and successful dramatist, and he was deter- mined to win these prizes. He therefore set al! his wonderful cleverness to the task, going so far as to adopt a little even of that Romantic disobedience to the strict classical theory which he con- demned, and no doubt sincerely, in Shakespeare.

As regards his poems proper, of which there are two long ones, the Henriade and the Pucelle, besides smaller pieces, of which a bare catalogue fills fourteen royal octavo columns, their value is very unequal. The Henriade has by universal consent been relegated to the position of a school reading book. Constructed and written in almost slavish imitation of Virgil, employing for medium a very unsuitable vehicle— the Alexandrine couplet (as reformed and rendered monotonous for dramatic purposes)— and animated neither by enthusiasm for the subject nor by real under- standing thereof, it could not but be an unsatisfactory performance. The Pucelle, if morally inferior, is from a literary point of view of far more value. It is desultory to a degree; it is a base libel on religion and history; it differs from its model Ariosto in being, not, as Ariosto is, a mixture of romance and burlesque, but a sometimes tedious tissue of burlesque pure and simple; and it is exposed to the objection— often and justly urged — that much of its fun depends simply on the fact that there were and are many people who believe enough in Christianity to make its jokes give pain to them and to make their disgust at such jokes piquant to others. Nevertheless, with all the Pucclle's faults, it is amusing. The minor poems are as much above the Pucelle as the Pucelle is above the Henriade. It is true that there is nothing, or hardly anything, that properly deserves the name of poetry in them — no passion, no sense of the beauty of nature,

only a narrow "criticism of life, " only a conven- tional and restricted choice of language, a cramped and monotonous prosody, and none of that indefinite suggestion which has been rightly said to be of the poetic essence. But there is immense wit. a wonderful command of such metre and language as the taste of the time allowed to the poet, occasionally a singular if somewhat artificial grace, and a curious felicity of diction and manner.

The third division of Voltaire's works in a rational order consists of his prose romances or tales. These productions — incomparably the most remarkable and most absolutely good fruit of his genius — – were usually composed as pamphlets, with a purpose of polemic in religion, politics, or what not. Thus Candide attacks religious and philosophical optimism, L' Homme aux quarante tcus certain social and political ways of the time, Zadigand others the received forms of moral and metaphysical orthodoxy, while some are mere lampoons on the Bible, the unfailing source of Voltaire's wit. But (as always happens in the case of literary work where the form exactly suits the author's genius) the purpose in all the best of them disappears almost entirely. It is in these works more than in any others that the peculiar quality of Voltaire- — ironic style without exaggeration — appears. That he learned it partly from Saint Evremond, still more from Anthony Hamilton, partly even from his own enemy Le Sage, is perfectly true, but he gave it perfection and completion. If one especial peculiarity can be singled out, it is the extreme restraint and simplicity of the verbal treatment. Voltaire never dwells too long on this point, stays to laugh at what he has said, elucidates or comments on his own jokes, guffaws over them or exaggerates their form. The famous " pour encourager les autrcs " (that the shooting of Byng did ;t encourage the others " very much is not to the point) is a typical example, and indeed the whole of Cand-ide shows the style at its perfection.

The fourth division of Voltaire's work, the historical, is the bulkiest of all except his correspondence, and some parts of it are or have been among the most read, but it is far from being even among the best. The small treatises on Charles XII. and Peter the Great are indeed models of clear narrative and ingenious if some- what superficial grasp and arrangement. The so-called Steele de Louis XIV. and Steele de Louis XV. (the latter inferior to the former but still valuable) contain a great miscellany of interesting matter, treated by a man of great acuteness and unsurpassed power of writing, who had also had access to much important private informa- tion. But even in these books defects are present, which appear much more strongly in the singular olla podrida entitled Essai sur les mamrs, m the Annates de I' empire and in the minor historical works. These defects are an almost total absence of any compre- hension of what has since been called _ the philosophy of history, the constant presence of gross prejudice,

frequent inaccuracy of detail, and, above all, a complete incapacity to look at anything except from the narrow standpoint of a half -pessimist and half self-satisfied pkilosophe of the 18th century.

His work in physics concerns us less than any other here; it is, however, not inconsiderable in bulk, and is said by experts to give proof of aptitude.

To his own age Voltaire was pre-eminently a poet and a philo- sopher; the unkindncss of succeeding ages has sometimes questioned

whether he had any title to either name, and especially to the latter. His largest philosophical work, at least so called, is the curious medley entitled Dictionnaire philosophique, which is compounded of the articles contribuced by him to the great Encyclopedia and of several minor pieces, No one of Voltaire's works shows his anti- religious or at least anti-ccclcsiastical animus more strongly. The various title- words of the several articles are often the merest stalking- horses, under cover of which to shoot at the Bible or the church, the target being now and then shifted to the political institutions of the writer's country, his personal foes, &c, and the whole being largely seasoned with that acute, rather superficial, common-sense, but also commonplace, ethical and social criticism which the 18th century called philosophy. The book ranks perhaps second only to the novels as showing the character, literary and personal, of Voltaire; and despite its form it is nearly as readable. The minor philosophical works are of no very different character. In the brief Traite de tnetapkysiqve the author makes his grand effort, but scarcely succeeds in doing more than show that he had no real conception of what metaphysic is.

In general criticism and miscellaneous writing Voltaire is not inferior to himself in any of his other functions. Almost all his more substantive works, whether in verse or prose, are preceded by prefaces of one sort or another, which are models of his own light pungent causerie; and in a vast variety of nondescript pamphlets and writings he shows himself a perfect journalist. In literary criticism pure and simple his principal work is the Commentaire sur Corneille, though he wrote a good deal more of the same kind — sometimes (as in his Life and notices of Moliere) independently sometimes as part of his Siecles. Nowhere, perhaps, except when he is dealing with religion, are Voltaire's defects felt more than here. He was quite unacquainted with the history of his own language and literature, and more here than anywhere else he showed the extraordinarily limited and conventional spirit which accom- panied the revolt of the French 18th

century against limits and conventions in theological, ethical and political matters.

There remains only the huge division of his correspondence, which is constantly being augmented by fresh discoveries, and which, according to Georges Bengesco, has never been fully or correctly printed, even in some of the parts longest known. In this great mass Voltaire's personality is of course best shown, and perhaps his literary qualities not worst. His immense energy and versatility, his adroit and unhesitating flattery when he chose to flatter, his ruthless sarcasm when he chose to be sarcastic, his rather un- scrupulous business faculty, his more than rather unscrupulous resolve to double and twist in any fashion so as to escape his enemies, —all these things appear throughout the whole mass of letters.

Most judgmentsjof Voltaire have been unduly coloured by sympathy with or dislike of what may be briefly called his polemical side. When sympathy and dislike are both discarded or allowed for, he remains one of the most astonishing, if not exactly one of the most admirable, figures of letters. That he never, as Carlyle complains, gave utterance to one great thought is strictly true. That his characteristic is for the most part an almost superhuman cleverness rather than positive genius is also true. But that he was merely a mocker, which Carlyle and others have also said, is not strictly true or fair. In politics proper he seems indeed to have had few or no constructive ideas, and to have been entirely ignorant or quite reckless of the fact that his attacks were destroying a state of things for which as a whole he neither had nor apparently wished to have any substitute. In religion he protested stoutly, and no doubt sincerely, that his own attitude was not purely negative; but here also he seems to have failed altogether to distinguish between pruning and cutting down. Both here and elsewhere his great fault was an inveterate superficiality. But this superficiality was accompanied by such wonderful acuteness within a certain range, by such an absolutely unsurpassed literary aptitude and sense of style in all the lighter and some of the graver modes of literature, by such untiring energy and versatility in enterprise, that he has no parallel among ready writers anywhere. Not the most elaborate work of Voltaire is of much value for matter; but not the very slightest work of Voltaire is devoid of value inform. In literary craftsmanship, at once versatile and accomplished, he has no superior and scarcely a rival.

Bibliography. — The bibliography of Voltaire is a very large subject, and it has been the special occupation of a Rumanian diplomatist of much erudition and judgment, Georges Bengesco, Bibliographic de Voltaire (4 vols., Paris, 1882-90). The best edi- tion of the works is that by Louis Moland in 52 volumes (Paris, Gamier) ; the handiest and most compact is that issued in 13 volumes royal octavo by Fume, and kept in print by the

house of Didot. Of the earlier editions, though their bulk is an objection, several are interesting and valuable. Especially may be noticed the so-called edition of Kehl, in which Voltaire himself, and later Beaumarchais, were concerned (70 vols., 1785-89) ; those of Dalibon and Baudouin. each in 97 volumes (from which " the hundred volumes of Voltaire " have become a not infrequent figure of speech); and the excellent edition of Beuchot (1829) in 72 volumes. Editions of separate or selected works are innumerable, and so are books upon Voltaire. There is no really good detailed life of him, with complete examina-

tion of his work, in any language, though the works containing materials for such are numerous (the first of importance being that of T. J. Duvernet in 1797), and sometimes (especially in the case of M, Desnoiresterres, Voltaire et la sociele francaise, 1867 and others) excellent. In English the essays of Carlyle and Viscount Morley (1872) are both in their way invaluable, and to a great extent correct one another. The principal detailed life in English is that of an American writer, James Parton (1881), which gives the facts with very considerable detail and fair accuracy, but with little power of criticism. That of Mr S. G. Tallentyre (London, 1903, 2 vols.) is gossiping and popular. Francis Espinasse's Voltaire (1882), which contains a useful bibliography, J. Churton Collins's Voltaire in England (1886), and J. R. Lotmsbury's Shakespeare and Voltaire (1902) may also be specified. (G. Sa.)

VOLTERRA (anc. Volaterrae), a town and episcopal see of Tuscany, Italy, in the province of Pisa, from which it is 51 m. by rail S.E., and 35 by road W.N.W. from Siena. Pop. (1901) 5522 (town); 14,207 (commune). It stands on a commanding olive-clad eminence 1785 ft. above sea-level, with a magnificent view over mountains and sea (the latter some 20 m. distant), and is surrounded by the massive remains of its ancient walls of large, roughly-rectangular blocks of stone, some 4% m. in circuit, enclosing an area which must have been larger than was actually needed for habitation. Tombs of the pre-Etruscan or Villanova period have been found within its circuit, but only at the north-west extremity near S. Giusto. Here the clay of w r hich the hill is formed is gradually giving way, causing landslips and the collapse of buildings, notably of the abbey church of S. Salvatore (1030). The medieval town occupies only the southern portion of this area. The most important relic of its Etruscan period is the Porta dell' Arco, an archway of dark greystone, about 20 ft. high, the corbels of which are adorned with almost obliterated heads, probably representing the guardian deities of the city. There are remains of baths and a cistern of Roman date. Volterra preserves its medi- eval character, having suffered little modification since the 16th century. The town contains many picturesque medieval towers and houses. The Palazzo dei Priori (1208-54), now the municipal palace, is especially fine, and the piazza in which it stands most

*picturesque. The museum contains a very valuable collection of Etruscan antiquities, especially cinerary urns from the ancient tombs N. and E. of the town. The urns themselves are of alabaster, with the figure of the deceased on the lid, and reliefs from Greek myths on the front. They belong to the 3rd-2nd centuries B.C. A tomb outside the town of the 6th century B.C., discovered in 1898, consisted of a round underground chamber, roofed with gradually projecting slabs of stone. The roof was supported in the centre by a massive square pillar (E. Petersen in Romische Mitteilungcn, 189S. 409; cf. id. ibid., 1904, 244 for a similar one near Florence). There are also in the museum Romanesque sculptures from the old church of S. Giusto, &c. The cathedral, consecrated in 1 120 (?), but enlarged and adorned by Kiccolo Pisano (?) in 1254, has a fine pulpit of that period, and on the high allar are sculptures by Mino da Fiesole; it contains several good pictures — the best is an " Annunciation ,1 by Luca Signorelli. The sacristy has fine carvings. The baptistery belongs to the 13th century; the font is by Andrea Sansovino, and the ciborium by Mino da Fiesole. Both these buildings are in black and white marble. S. Francesco has frescoes of 1410, and S. Girolamo tcrra-cottas and pictures. The citadel, now a house of correc- tion, consists of two portions, the Rocca Vccchia, built in *343 by Walter de Brienne, duke of Alliens, and the Rocca Nuova, built by the Florentines (1472). The inhabitants are chiefly employed in the manufacture of vases and other orna- ments from alabaster, of good quality, found in the vicinity. There are also in the neighbourhood rock-salt works and mines, as well as boracic acid works. This acid is exhaled in volcanic gas, which is passed through water tanks. The acid is deposited in the water and afterwards evaporated. It is sent to England, and used largely in the manufacture of pottery glaze.*

Volaterrae (Etruscan Velathri) was one of the most powerful of the twelve confederate cities of Etruria. During the war between Marius and Sulla it withstood the latter's troops for two years in

82-80 B.C. As a result of its resistance Sulla carried a law for the confiscation of the land of those inhabitants of Volaterrae who had had the privileges of Roman citizenship. This, however, does not seem to have been carried out until Caesar as dictator divided some of the territory of Volaterrae among his veterans. Among its noble families the chief was that of the Caecinae, who took their name from the river which runs close to Volaterrae and still retains the name Cecina. Cicero defended one of its members in an extant speech. It is included by Pliny among the municipal towns of Etruria. In the 12th and 13th centuries it enjoyed free institutions;

in 1361 it fell under the power of Florence. It rebelled, but was retaken and pillaged in 1472. Persius the satirist and the painter Daniele da Vol terra were both natives of the town. Several works of the latter are preserved there.

Sec C. Ricci, Volterra (Bergamo, 1905); E. Borraann in Corp. Inscr. Latin, xi. (Berlin, 1888), p. 324; G. Dennis, Cities and Cemeteries of Etruria (London, 1883), h\ 136. (T. As.)

VOLTMETER, an instrument for measuring difference of electric potential (see Electrostatics) in terms of the unit called a volt. The volt (so called after A. Volta) is defined to be difference of potential which acting between the terminals of a resistance of one ohm sends through it a continuous current of one ampere. A voltmeter is therefore one form of electro- meter (g.v.), but the term is generally employed to describe the instrument which indicates on a scale, not merely in arbitrary units but directly in volts, the potential difference of its terminals. Voltmeters may be divided into two classes, (a) electrostatic, (b) elect rokinetic.

Electrostatic voltmeters are based on the principle that when two conductors are at different potentials they attract one another with a force which varies as the square of the potential difference (P. D.) between them. This mechanical stress may be made the measure of the P. D. between them, if one of the conductors is fixed while the other is movable, this last being subject_to a constraint due to a spring or to gravity, means being also provided for measur- ing either the displacement of the movable conductor against the constraint or the force required to hold it in a fixed position relatively to the fixed conductor. One large class of electrostatic voltmeters consists of a fixed metal plate or plates and a movable plate or plates, the two sets of plates forming a condenser (see LEYDEN Jar). The movable system is suspended or pivoted, and when a P. D. is created between the fixed and movable plates, the latter are drawn into a new position which is resisted by the torque of a wire or by the force due to a weight. Utilizing this principle many inventors have devised forms of electrostatic voltmeter. One of the best known of these is Lord Kelvin's multicellular voltmeter. In this instru- ment (fig. 1) there are two sets of fixed metal plates, connected

Fig. 1. — Lord Kelvin's Multicellular Electrostatic Voltmeter.

together and having a quadrantal shape, that is, approximately the shape of a quarter of a circular disk_ In the space between them is suspended a " needle " which consists of a light aluminium axis, to which are affixed a number of paddle-shaped aluminium blades. This needle is suspended by a fine platinum silver wire, and its normal position is such that the aluminium paddle blades are just outside the quadrantal-shaped plates. If

the needle is connected to one terminal of a circuit, and the fixed plates or cells

to the other member of the circuit, and a difference of potential is created between them, then the movable needle is drawn in so that the aluminium blades arc more included between the fixed plates. This movement is resisted by the torsional elasticity of the suspending wire, and hence a fixed indicating needle attached to the movable system can be made to indicate directly on a scale the difference of potential between the terminals of the instrument in volts. Instruments of this kind have been constructed not only by Lord Kelvin, but also by W. E. Ayrton and others, for measuring voltages from 10,000 volts down to 1 volt. In other types o(electrostatic instruments the movable system rotates round a horizontal axis or rests upon knife edges like a scale beam ; in others again the movable system is suspended by a wire. In the former case the co-ntrol is generally due to gravity, the plates being so balanced on the knife edge that they tend to take up a certain fixed position from which they are constrained when the electric forces come into play, their displacement relatively to the fixed plates being shown on a scale and thus indicating the P. D. between them. In the case of high tension voltmeters, the movable plate takes the form of a single plate of paddle shape, and for extra high tensions it may simply be suspended from the end of a balanced arm ; or the movable system may take the form of a cylinder which is suspended within, but not touching, another fixed cylinder, the relative position being such that the electric forces draw the suspended cylinder more into the fixed one. Electrostatic volt- meters are now almost entirely used for the measurement of high voltages from 2000 to 50,000 volts employed in elect rotechnics. For such purposes the whole of the working parts are contained in a metal case, the indicating needle moving over a divided scale which is calibrated to show directly the potential difference in volts of the terminals of the instrument. One much-used electrostatic voltmeter of this type is the Kelvin multicellular vertical pattern voltmeter (fig. 2), For use at the switch-boards of electric supply stations the instrument takes another form known as the " edge-wise " pattern.

Another class of voltmeters comprises the electrokinetic volt- meters. In these instruments the potential difference between two points is measured by_ the electric current produced in a ; wire connecting to two points. ' In any case 01 potential differ- ence measurement it is essential not to disturb the potential difference being measured ; hence it follows that in electro-kinetic voltmeters the wire con- necting the two points of which the potential difference is to be FlG.2. — Round Dial Kelvin Multi- measured must be of very cellular Electrostatic Voltmeter, high resistance. The instrument 5-in. scale. For high pressure, then simply becomes an am-meter of high resistance, and may take any of the forms of prac- tically

used ammeters (see Amperemeter). Electromagnetic voltmeters may therefore be thermal, electromagnetic or electro- dynamic.

As a rule, electromagnetic voltmeters are only suitable for the measurement of relatively small potentials — to 200 or 300 volts. Numerous forms of hot-wire or thermal voltmeter have been devised. In that known as the Cardew voltmeter, a fine platinum- silver wire, having a resistance of about 300 ohms, is stretched in a tube or upon a frame contained in a tube. This frame or tube is so constructed of iron and brass (one-third iron and two-thirds brass) that its tempera- ture coefficient of linear expansion is the same as that of the platinum- silver alloy. The fine wire is fixed to one end of the tube or frame by an insulated support and the other end is attached to a motion- multiplying gear. As the frame has the same linear expansion as the wire, external changes of the temperature will not affect their relative length, but if the fine wire is heated by the passage of an electric current, its expansion will move the indicating needle over the scale, the motion being multiplied by the gear. In the Hartmann and Rraun form of hot-wire voltmeter, the fine wire is fixed between two supports and the expansion produced when a current is passed through it causes the wire to sag down, the sag being multiplied by a gear and made tc move an indicating needle over a scale. In this case, the actual working wire, being short, must be placed in series with an additional high resistance. Hot wire voltmeters, like electrostatic voltmeters, are suitable for use with alternating currents of any frequency as well as with continuous currents, since their indications depend upon the heating power of the current, which is proportional to the square .of the current and therefore to the square of the difference of potential between the terminals.

Electromagnetic voltmeters consist of a coil of fine wire connected to the terminals of the instrument, and the current produced in that wire by a difference of potential between the terminals creates a magnetic field proportional at any point to the strength of the current. This magnetic field may be made to cause a displacement

in a small piece of soft iron, as in the case of the corresponding ammeters, and this in turn may be made to displace an indicating needle over a scale so that corresponding to every given potential difference between the terminals of the instrument there is a corre- sponding fixed position of the needle on the scale. One of the most useful forms of electromagnetic voltmeter is that generally known as a movable coil voltmeter (fig. 3). In this instrument there is a fixed permanent magnet, produc- ing a. constant

magnetic field, and in the interspace between the poles is fixed a delicately pivoted coil of wire carried in jewelled bear- ings. The normal position of this coil is with its plane parallel to the lines of force of the held. The current is got in and out of the movable coil by means of fine flexible wires. The movable coil has attached to it an index needle moving over a scale, and a fixed coil of high-resistance wire is included in series with the movable coil between the terminals of the instrument. When a difference Fig. 3. — Round Dial Voltmeter of potential is made between the of Kelvin Siphon Recorder, terminals, a current passes through dead beat moving coil type, the movable coil, which then tends with front removed. to place itself with its plane more

at right angles to the lines of force of the field. This motion is resisted by the torsion of a spiral spring resembling the hair-spring of a watch having one end fixed to the coil axis, and, there is therefore a definite position of the needle on the scale corresponding to each potential difference between the terminals, provided it is within the range of the control. These instruments are only adapted for the measurement of continuous potential difference, that is to say, unidirectional potential differ- ence, but not for alternating voltages. Like the corresponding ammeters, they have the great advantage that the scales are equi- divisbnal and that there is no dead part in the scale, whereas both the electrostatic and electrothermal voltmeters, above described, labour under the disadvantage that the scale divisions are not equal but increase with rise of voltages, hence there is generally a portion of the scale near the zero point where the divisions are so close as to be useless for reading purposes and are therefore omitted. For the measurement of voltages in continuous current generating stations, movable coil voltmeters are much em ployed , generally constructed then in the " edgewise " pattern (fiR- 4).

Electt -adynamic Voltmeters. — A high-resistance electrcdynamo-

meter may be employed as a volt- meter. In this case both the fixed and movable circuits consist of fine wires, and the instrument is constructed and used in a manner similar to the Siemens dynamo- meter employed for measuring con- tinuous alternating current (see Amperemeter). Another much- used method of measuring con- tinuous current -oltages or unidirectional potential difference employs the principle of potentiometer (q.v.). In this case a high- resistance wire is connected between the points of which the potential difference is required, and from some known fraction of this resist- ance wires are brought to an electrostatic voltmeter, or to a mov- able coil electromagnetic voltmeter, according as the voltage to be measured is alternating or continuous. This measurement is applicable to the measurement of high potentials, either alternating or continuous, provided that in the case of alternating currents the high resistance

employed is wound non-inducrively and an electro- static voltmeter is used. The high-resistance wire should, moreover, be one having a negligible change of resistance with temperature. For this purpose it must be an alloy such as manganin or constantan. It is always an advantage, if possible, to employ an electrostatic voltmeter for measuring potential difference if it is necessary to keep the voltmeter permanently connected to the two points. Any form of electro kinetic voltmeter which involves the passage of a current through the wire necessitates the expenditure of energy to maintain this current and therefore involves cost of production. This amount may not by any means be an insignificant quantity. Consider, for instance, a hot-wire instrument, such as a Cardew's voltmeter. If the wire has a resistance of 300 ohms and is connected to two points differing in potential by 100 volts, the instrument passes a current of one-third of an ampere and takes up 33 watts in power. Since there are 8760 hours in a year, if such an instrument were connected continuously to the circuit it would take up energy equal to 263,000 watt-hours, or 260 Board of Trade units per annum. If the cost of production of this energy was only one penny per unit,

Fig. 4. — Edgewise Voltmeter. Stanley D'Arsonval type.

the working expenses of keeping such a voltmeter in connexion with a circuit would therefore be more than £1 per annum, representing a capitalized value of , say, £10. Electrostatic instruments, however, take up no power and hence cost nothing for maintenance other than wear and tear of the instrument.

The qualities required in a good voltmeter arc: — (i.) It should be quick in action, that is to say, the needle should come quickly to a position giving immediately the P.D. of the terminals of the instru- ment, (ii.) The instrument should give the same reading for the same P.D. whether this has been arrived at by increasing from a lower value or decreasing from a larger value; in other words, there should be no instrumental hysteresis, (iii.) The instrument should have no temperature correction; this is a good quality of electrostatic instruments, but in all voltmeters of the elcctrokinetic type which are wound with copper wire an increase of one degree centigrade in the average temperature of that wire alters the resistance by 0-4%, and therefore to the same extent alters the correctness of the indications, (iv.) It should, if possible, be available both for alternating and continuous currents, (v.) It should be portable and work in any position, (vi.) It should not be disturbed easily by external electric or magnetic fields. This last point is important in connexion with voltmeters used on the switchboards of electric generating stations, where relatively strong electric- or magnetic fields may be present, due to strong currents passing through con ductors near or on the board. It is therefore always

necessary to check the readings of such an instrument in situ. F,lectro static voltmeters are also liable to have their indications disturbed by electrification of the glass cover of the instrument; this can be avoided by varnishing the glass with a semi-conducting varnish so as to prevent the location of electrostatic charges on the glass.

See J. A. Fleming, Handbook for the Electrical Laboratory and Testing-Room (London, 1903); G. Aspinall Parr, Electrical Engineer- ing Measuring Instruments (London, 1903); K. Edgccumbe and F. Punga, " On Direct Reading Measuring Instruments for Switch- board Use," Journ. Inst. Elec. Eng. (London, 1904), 33, 620.

(J:A. F.)

VOLTURNO (arte. Volturnus, from volvere, to roll), a river of central Italy, which rises in the neighbourhood of Alfedena in the central Apennines of Samnium, runs S. as far as Venafro, and then S.E. After a course of some 75 m. it receives, about 5 m. E. of Caiazzo, the Calore, only 3 m. less in length, which runs first N. and then W., and after 37 in. reaches Benevento, near which it receives several tributaries; then curves round the mountain mass to the N. of the Caudinc Forks, and so beyond Telese joins the VoJturno. The united stream now flows W.S.W. past Capua (anc. Casilinum), where the Via Appia and Latina joined just to the N. of the bridge over it, and so through the Campanian plain, with many windings, into the sea. The direct length of the lower course is about 31 m., so that the whole is slightly longer than that of the Liri, and its basin far larger. The river has always had con- siderable military importance, and the colony of Voltunrum (no doubt preceded by an older port of Capua) was founded in 194 B.C. at its mouth on the S. bank by the Romans; it is now about one mile inland. A fort had already been placed there during the Roman siege of Capua, in order, with Puteoli, to serve for the provisioning of the army, Augustus placed a colony of veterans here. The Via Domitiana from Sinuessa to Puteoli crossed the river at this point, and some remains of the bridge are visible. The river was navigable as far as Capua.

On the 1st of October i860 the Neapolitan forces were defeated on the S. bank of the Vollurno, near S. Maria di Capua Vetere, by the Piedmontese and Garibaldi's troops, a defeat which led to the fall of Capua. (T. As.)

VOLUINSKY, ARTEMY PETROVICH (1689-1740), Russian general and statesman, son of Peter Voluinsky, one of the dignitaries at the court of Theodore III., came of an ancient family. He entered a dragoon regiment in 1704 and rose to the rank of captain; then, exchanging the military service for diplomacy, he was attached to the suite of Vice-Chancellor Shafirov. He

was present during the campaign of the Pruth, shared Shafirov's captivity in the Seven Towers and in'171.5 was sent by Peter the Great to Persia to promote Russian influence there, and if possible to find an outlet to India. In 1718 Peter made him one of his six adjutant-generals, and governor of Astrakhan. In this post Voluinsky displayed dis- tinguished administrative and financial talents. In 1723 he married Alexandra Naruishkina, Peter's cousin. The same

year he was accused of peculation and other offences to the emperor, who caned him severely and deprived him of his plenipotentiary powers, despite his undeniable services in Persia, but for which Peter could never have emerged so tri- umphantly from the difficult Persian war of 1722-23. Cath- erine I. made Voluinsky governor of Kazan for a short time, and he held the same post for two years (1728-30) under Peter 1L. But his incurable corruption and unbridled temper so discredited the government that he was deprived of the post shortly alter the accession of Anne. From 1730 to 1736 Voluinsky served in the army under Miintiich. In 1737 he was appointed the second Russian plenipotentiary at the abortive congress of Nemirov held for the conclusion of peace with the Porte. In 1738 he was introduced into the Russian cabinet by Biren as a counterpoise against Andrei Osterman. Voluinsky, however, now thought himself strong enough to attempt to supersede Biren himself, and openly opposed the favourite in the Council of State in the debates as to the in- demnity due to Poland for the violations of her territory during the war of the Polish Succession, Biren advising that a liberal indemnity should be given, whereas Voluinsky objected to any indemnity at all. Biren thereupon forced Anne to order an inquiry into Voluinsky's past career, with the result that he was tried before a tribunal of Biren's creatures and condemned to be broken on the wheel and then beheaded. On the scaffold, " by the clemency of the empress," his punishment was miti- gated to the severing of his right hand followed by decapitation. The whole business seems to have been purely a piece of vindictiveness on the part of Biren.

See R. N. Bain, The Pupils of Peter the Great (London, 1897); D. A. Korsakov, From the Lives of Russian Statesmen of the XVIIIth Century (Rus.) (Kazan, 1891). (R. N. B.)

VOLUNTEERS, a general term for soldiers who are not pro- fessionals nor permanently embodied under arms in peace. Although it would be difficult to say when the principle of volunteer organization for national defence was first adopted in England, it is certain that voluntary military societies

existed in various parts of the country in the reign of Henry VIII., who in fact granted a charter in 1537 to the " Fraternity or Guylde of Saint George: Maisters and Rulars of the said Science of Artillary as aforesaid rehearsed for long-bowes Cros-bowes and Hand-Gonnes." This ancient corps is now the Honourable ArLillery Company of London. Although the Honourable Artillery Company has always been a distinct association, it was at one time (notably during the Great Rebellion) a centre of instruction for the City-trained bands, and in later times the H.A.C., divided into artillery and infantry units, has been assimilated as regards training and obligations to the Volunteer or Territorial Forces. Charters of a similar kind were granted to a Colchester society in 1619 and to one at Bury St Edmunds in 162S. In the 16th and 17th centuries also various temporary corps outside the militia or trained-band organization were called volunteers. At Boston, Massachusetts, there is established a coips bearing the name of the " Antient and Honorable Artillery Company of Massachusetts." This company was formed in 1638 after its London prototype.

The notion of a large organized Volunteer Force, however, seems to have originated in England at the time of the Militia Bill of 1757, which was amended in 175S so as to allow the militia captains to accept volunteers instead of the ordinary militiamen who were compulsorily furnished pro rata by each parish. In 1778 the volunteers were still voluntary substitutes for militiamen, though formed in separate companies of the militia unit, but volunteer corps soon began to form themselves independently of the militia. In the meantime a large volunteer force had sprung up in Ireland. In 1779, Ireland being threatened with foreign invasion, a levy of 20,000 Protestants was made by the gentry in the north. The 20,000 Protestants had grown in 1782 to 100,000 of all arms and both creeds, and they used their strength effectively for political purposes. After the establish- ment of the parliament at Dublin, and the general peace of 1783, attempts were made to use this army for party purposes, and

the moderate men in parliament therefore hastened to disband it. But this military coup d'etat was not forgotten in England. Ireland indeed supplied 70,000 volunteers during the Napoleonic wars, practically in place of her militia quota. But the rebellion of 1798 kept alive the memory of 1782, and about 1804 the government disarmed and disbanded them.

The English and Scottish volunteers, disbanded in 1783, were promptly revived when the French Revolutionary Wars pro- duced a new and more formidable enemy. Volunteer corps, some dependent as companies upon the militia, others inde- pendent, units, were raised in 1794, volunteer service counting as militia service for the purposes of raising the county, town or parish quota. This was followed in 1798 by the formation, for purely local

defence, of the Armed Associations, the equivalent of the modern " rifle clubs." At the peace of Amiens the 340,000 volunteers then serving were nearly all disbanded, but one or two crops passed into the regular army as entire regiments, and some others managed to avoid disbandment until the renewal of the war revived the whole force. The danger of invasion was then at its height, and in a few months the force numbered 380,000 men, or 3-ˆ% of a population which already kept up a regular army and a militia. But the training of this mass was very unequal; the numbers fell off as the likelihood of invasion decreased, and in the reaction from the first enthusiasm it began to be questioned whether the volunteers could be of much value under the easy conditions of service prevailing. In 1808, therefore, the Local Militia was formed, in which the terms of enlistment and training liabilities were both stricter and better defined. Theˆgreater part of the volunteers transferred them- selves to the Local Militia, which by 1812 (aided by the ballot) had reached a strength of 215,000 as against the 70,000 of the remaining volunteers. With the general peace of 1814 all these forces except the H.A.C. and the Yeomanry (q.v.) disappeared.

After an interval of nearly half a century the warlike attitude of France caused British citizens once more to arm for' the protection of their country. The British army and navy had declined in strength and efficiency; France, on the other hand, by the energetic development of her military and naval power and the early application of steam to ships of war, brought the possibilities of the invasion of England in 1846 within measurable distance. England at this time was awakened to the gravity of the situation by the publication of a letter from Wellington to Sir John Burgoyne, 1 followed by a well- timed pamphlet by Sir Charles Napier, entitled The Defence of England by Volunteer Corps ami Militia. The French danger, in abeyance during the Crimean War, was revived in 1857, when the tone of the French press became more and more menacing. The war in China, the Indian Mutiny and diffi- culties with the United States taxed the regular army to the utmost; while at home, besides the actual garrisons, there were barely 36,000 militia. This threatening condition of affairs tended to aggravate, if not to produce, a serious commercial panic. It was then that the volunteer movement began, and the Orsini episode and the openly expressed threats of French officers were all that was necessary to free the pent-up enthusiasm.

A few rifle clubs were already in existence, and two of these, working as military bodies from the outset (1852-53), became the two senior volunteer battalions — 1st V.B. (now 4th Bn.) Devonshire Regt., and Victoria Rifles (now 9th Bn. London Regt.). But it was not until the situation became acute that the War Office took the step of raising the " Volunteer Force." A circular letter, dated 12th May 1859, from the secretary for war to the

lords-lieutenant of counties in Great Britain authorized the formation of volunteer corps. The general enrolment took place at first under the old statute (44 Geo. TIL). The main provisions of that act, however, were found inapplicable to the altered conditions under which invasion was now possible, and they failed also to provide for the maintenance of the volunteer force on a permanent footing in peace. A new act (Volunteer Act 1863) was therefore passed, the most important provision of which was that apprehended invasion should constitute a 1 See Life and Letters of Field- Marshal Sir John Burgoyne.

sufficient reason for the sovereign to call out the volunteers, in lieu of the old condition which required the actual appearance of the enemy. The volunteers were, when called out, bound to serve in Great Britain until released by a proclamation declaring the occasion to have passed. This was modified in iaoo during the South African War, a new enactment allowing the authorities to call them out at times of "imminent national danger and great emergency." In 1S71 the volunteers were removed from the control of the lords-lieutenant and placed under the War Office. In 1SS1 the infantry battalions were affiliated to the various line regiments.

The force thus brought into existence was composed of corps of light horse, mounted rifles, garrison and heavy artillery, engineers and ritle volunteers. 1 Later there existed also in connexion with the admiralty a corps of " Royal Naval Artillery Volunteers " for the coast defences. The terms of service and training liabilities underwent no alteration of principle during the forty-eight years of the force's existence. The property belonging to the corps was vested in the commanding officer and administered hy a committee of officers under the rules of the corps. These rules were in the first instance agreed on at a general meeting of officers and men, and, having received the queen's approval, became legal, and could be enforced. The commanding officer could dis- miss a man from the corps, and a volunteer not on actual service could terminate his engagement at fourteen days' notice. But, as it became the almost universal practice for the government or the regimental commander to issue clothing and equipment free, the volunteers contracted in return to serve for three, four or five years, and, if they exercised their statutory rights, were obliged to refund part of the cost. Further, when capitation grants were given for the maintenance of the corps, the volunteer had either to earn this by continued service or repay the sum lost to the corps by his resignation. These conditions materially modified the statute law in practice, and in fact the term of four years exacted from the Territorial to-day differs in little more than name from

the requirements of the former " corps rules." Military law was applicable to officers and men when training with regulars.

The formation of volunteer corps was so rapid that in the course of a few months in 1859-60 a force of ng,ooo was created. More, however, remained to be done to put an end to the ever- recurring commercial panics. The government, which in the beginning had tolerated rather than encouraged the movement, and had required the volunteer to serve and to equip himself entirely at his own expense, now followed the lead of public opinion, and decided on maintaining the volunteer force as a part of the regular defensive system. The personnel of the volunteer corps (with a few exceptions) thereupon underwent a change. The wealthy and professional classes, who had at first joined the ranks in anticipation of war, cared no longer to bear arms. Their places were taken by the artisan class, which added materially to the number and permanence of the force. But, as contributions and subscriptions now flagged, it became evident that public grants would have to be voted for its maintenance, and a scale of capitation allowances, subject to regulation, was fixed, on the recommendation of a Royal Commission. This capitation allowance per efficient volunteer was thenceforward the basis of all regimental finance and administration.

The turning-point in the history of the volunteers was the South African War. In January 1900, and on several subse- quent occasions, the volunteers were invited to supply service companies for South Africa, to be incorporated in the regular battalions to which the volunteer battalions were affiliated. About one-third of the whole force volunteered for service in South Africa, and some 20,000 served in the volunteer com- panies with the line and in the " City Imperial Volunteers," besides a. great number of volunteers whom the higher pay,

1 The light horse and mounted rifles disappeared in the end, or else were converted into yeomanry. The " rifles " title was main- tained even after the infantry had been assimilated in drill, uniform and other respects to the line battalions. For this reason even scarlet-clothed battalions had no colours, pouch-belcs instead of sashes, &c.

easier conditions and better prospects of active employment in the mounted guerrilla warfare tempted into the ranks of the yeomanry. The return of these companies infused into the force a leaven of officers and men who had been through an experience of constant small skirmishes and prolonged marching and bivouacking. Meantime the force as a whole had been subjected to a more earnest and vigorous training than it had ever had before. The establishment was greatly increased, and 24 battalions were selected for special training and included with the regular home army in

the field force. Various partial reorganizations followed in 1902-5, and at last, in 1007-8, the whole force was re-cast, re-enlisted upon somewhat different terms, and organized along with the yeomanry into the new Territorial Force (see United Kingdom: Army).

Strength of the Volunteer Force (From the Territorial Year Book 1909).

Year.

Establishment.

Strength.

Classed as Efficient.

1861

211,961

161,239

140.100

1870

244,966

193,893

170,671

1880

243.54 ft

206,537

196,938

1885 .

250,967

224,012

218,207

1 890

260,310

221,048

212,293

1895 .

260,968

23I,7< >4

224,962

1899 .

263,416

229,854

223,921

1900

339.5H

277,628

270,369

1901

34 2 .oo3

288,476

281,062

1902

345,547

268,550

256,451

1903

346.171

253,281

242,104

1904

343.246

253,909

244,537

1905

341,283

249, 6r 1

24 ‘,549

1906

338,452

255,854

246,654

1907

335,849

252,791

244,212

VOLUSENUS, FLORENTIUS [Florence VVolson, or Wolsey, in later writers Wilson, though in letters in- the vernacular he writes himself Volusene] (c. 1504-c. 1547), Scottish humanist, was born near Elgin about 1504. He studied philosophy at Aberdeen, and in the dialogue De Animi Tranquillitate says that the description of the abode of tranquillity was based on a dream that came to him after a conversation with a fellow-student on the banks of his native Lossie. He was then a student of philosophy of four years’ standing. Proceeding to Paris, he became tutor to Thomas Wyntcr, reputed son of Cardinal Wolsey. He paid repeated visits to

England, where he was well received by the king, and, after Wolsey's fall, he acted as one of Cromwell's agents in Paris. He was in England as late as 1534; and appears to have been rector of Speldhurst in Kent. In Paris he knew George Buchanan, and found patrons in the cardinal Jean de Lorraine and Jean du Bellay. He was to have gone with du Bellay on his mission to Italy in 1535, but illness kept him in Paris. As soon as he recovered he set out on his journey, but at Avignon, by the advice of his friend Antonio Bonvisi (d. 1558), he sought the patronage of the bishop of the diocese, the learned and pious Paul Sadolet, who made him master in the school at Carpentras, with a salary of seventy crowns. Volusenus paid frequent visits to Lyons (where Conrad Gesner saw him, still a young man, in 1540), probably also to Italy, where he had many friends, perhaps even to Spain. A letter addressed to him by Sadolet from Rome in 1546 shows that he had then resolved to return to Scotland, and had asked advice on the attitude he should adopt in the religious dissensions of the time. He died on the journey, however, at Vienne in Dauphine, in 1546, or early in the next year.

Volusenus's linguistic studies embraced Hebrew as well as Greek and Latin. His reputation, however, rests on the beautiful dia- logue, De Animi Tranquillitate, first printed by S. Gryphius at Lyons in 1543. From internal evidence it appears to have been composed about that time, but the subject had exercised the writer for many years. The dialogue shows us Christian humanism at its best. Volusenus is a great admirer of Erasmus, but he criticizes the purity of his Latin and also his philosophy. His own philo- sophy is Christian and Biblical rather than classical or scholastic. He takes a fresh and independent view of Christian ethics, and he ultimately reaches a doctrine as to the witness of the Spirit and the

assurance of grace which breaks with the traditional Christianity of his time and is based on ethical motives akin to those of the German Reformers. The verses which occur in the dialogue, and the poem which concludes it, give Volusenus a place among Scottish Latin poets, but it is as a Christian philosopher that he attains distinction.

The dialogue was reissued at Leiden in 1637 by the Scots writer David Echlin, whose poems, with a selection of three poems from the dialogue of Volusenus, appear, with others, in the famous Amsterdam collection Delitiae Poetarum Scotorum hujus aevi, printed by Blacv in 2 vols, in 1637. Later editions of the dialogue appeared at Edinburgh in 1707 and 1751 (the latter .edited by G. Wishart). All the reissues contain a short life

of the author by Thomas YVilson, advocate, son-in-law and biographer of Arch- bishop Patrick Adamson. Supplementary; facts are found in the letters and stats papers 01 the period, and in Sadolet's Letters.

VOLUTE (Lat. volutunt, volvere, to roll tip), in architecture, the spiral scroll of the capital of the Ionic order. As in the earliest example known, that of the archaic temple of Diana at Ephesus, the widLh of the abacus is twice that of the depth, constituting therefore a bracket-capital; it is probable that at first it consisted of an oblong block of timber, which, raised on a vertical post or column, lessened the bearing of the architrave or beam, and the first volutes or scrolls were painted on. In votive columns carrying a sphinx, as at Delphi, or statues, the oblong form of capital with largely developed volutes was long retained, but in the porticoes of the Greek temples the abacus was made square and the volute diminished in projection on each side. In the side elevation the portion of the capital which joins the two volutes is known as the cushion, and when the Ionic column was used in porticoes in the capitals of the angle columns the volute was brought out on the diagonal, so as to present the same design on front and side; this, however, at the back led to a very awkward arrange- ment with two half volutes at right angles to one another, which was not of much importance under the portico, but when, in the open peristyle of the Fompeian house, it faced the open court, another design was necessary, and the angle volute was employed on all four sides. A similar arrangement was devised by Ictinus for the capitals in the interior of the temple at Bassae (430 B.C.), and was employed in the semi- detached columns of the raised stage at Epidaurus. The Romans adopted the angle volute in the temple of Fortuna Virilis at Rome, but, except in their porticoes and as semi- detached between arches, the Ionic order was rarely employed by them, and few Roman examples are known.

The architects of the Revival in the 16th century entirely mis- understood the origin and meaning of the volutes {the upper fillet of which was always carried horizontally across under the abacus in Greek and Roman work), and mistook them for horns, which they turned down into the echinus moulding.

VONDEL, JOOST VAN DEN (1 587-1679), Dutch poet, was born at Cologne on the 17th of November 1587. His father, a halter, was an exile from Antwerp on account of his Ana- baptist opinions; but he returned to Holland when Joost was about ten years old, and settled in Amsterdam, where he carried on a hosiery business. Joost was the eldest son, and was expected to succeed to his father's shop. He was early intro- duced to the chamber of the Eglantine, however, and devoted most of his time to poetry and study. When the elder Vondel died he married Maria de Wolff, and seems to have left the management of his affairs in her capable hands. He

read the French contemporary poets, and was especially influenced by the Divine Sepmaine of Du Bartas; he made some translations from the German; he was soon introduced to the circle gathered in the house of Roemer Visscher, and with these friends began to make a close study of classical writers. His first play, Ilet Pascha, was printed in 1612, and proved to be the beginning of a long and brilliarnt literary career (see Dutch Literature), After the production of his political drama of Palamedes, or Murdered Innocence (1625), which expressed his indignation at the judicial murder of Oldenbarne veldt in 1619, Vondel had lo go into hiding, but the Amsterdam magistrates eventually satisfied themselves with exacting a small fine. In the follow- ing years he issued a number of stinging satires against the extreme Calvinists, and he entered into close relationship

with Hugo Grotius, another sufferer for his liberal opinions. Vondel had long been attracted by the aesthetic side of the Roman Catholic Church, and this inclination was perhaps strengthened by his friendship with Marie Tesselschade Visscher, for the Visscher household had been Catholic and liberal. Tesselschadc's husband died in 1634; VondcFs wife died in 1635; and the ties between the two were strengthened by time. Vondel eventually showed his revolt against the Calvinist tyranny by formally embracing the Roman Catholic faith in 1640. The step was ill-received by many of his friends, and Hooft forbade him the hospitality of his castle at Muiden. In 1657 his only surviving son, who was entrusted with the hosiery business, mismanaged affairs to such an extent that he had to take ship for the East Indies, leaving his father to face the creditors. Vondel had to sacrifice the whole of his small fortune, and became a government clerk. He was pensioned after ten years' service, and died on the 5th of February 1679.

The more important of his thirty-two dramas are: Hierusalem Verzuoesl ("Jerusalem laid desolate") (1620); Palamedes, of Ver- moorde onnooselkeyd (" Palamedes, or Murdered Innocence ") (1625); Gijsbreght van Aemstel (1637); De Gebroeders (1640), the subject of which is the ruin of the sons of Saul; Joseph in Egypten (1640), Maria Stuart, of gemartetde majesteit {1646); the pastoral of De Leeuwendalers (1648); Lucifer (1654); Salmoneus (Solomon) (1657); Jephtha '(1659) ; Koning David in ballingschap ("King David in banishment "), Koning David hersteld (" King David restored ") and Samson (1660); Batavische Gebroeders, the subject of which is the story of Claudius Civilis (1663); Adam in ballingschap (" Adam in exile ") (1664), after the Latin tragedy of Hugo Grotius. He also wrote translations from the tragedies of Seneca, Euripides and Sophocles; didactic poems, and much lyrical poetry beside what is to be found in the choruses of his dramas.

His complete works were edited by van Lennep (12 vols., 1850- 1869). A

bibliography (1888) was published by J. H. W. Unger, who revised van Lcnnep's edition in 1888-94. Lucifer was trans- lated into English verse by L. C. van Nnppen (New York, 1898). See also E. Gosse, Stud-ies in Northern Literature (1879); G. Edmundson, Milton and Vondel (1885), where Milton's supposed indebtedness to Vondel is discussed; and critical studies by A. Baumgartner, S. J- (Freiburg, 1882); C. Looten (Lille, 1889), by J. A. Alberdingk Thijm (Portretfen van Joost van den Vondel, 1876); and especially the chapters on Vondel (pp. 133-325) in W. J. A. Jonckbloet's Geschiedenis der nederlandsche letter kunde (vol. iv. 1890).

VON HOLST, HERMANN EDUARD (1841-1904), German- American historian, was born at Fellin in the province of Livonia, on the 19th of June 1841. He was educated at the universities of Dorpat and Heidelberg, receiving his doctor's degree from the latter in 1865. He emigrated to America in 1867, remaining there until 1872. He was professor of history in the newly reorganized university of Strassburg from 1872 to 1874, and at Freiburg in Baden from 1874 to 1892, and for ten years he was a member of the Baden Herrenhaus, and vice-president for four. He revisited the United States in 1878-79 and in 1884, and in 1892 he became head of the department of history at the university of Chicago. Retiring on account of ill-health in 1900, he returned to Germany and died at Freiburg on the 20th of January 1904. Both through his books and through his lectures at the university of Chicago, Von Hoist exerted a powerful influence in encouraging American students to follow more closely the German methods of historical research. His principal work is his Constitutional and Political History of th& United States (German ed., 5 vols., 1873-91; English trans, by Lalor and Mason, 8 vols, 1877-92), which covers the period from 1783 to i86r, though more than half of it is devoted to the decade 1850-60; it is written from a strongly anti-slavery point of view. Among his other writings are The Consti- tutional Laiv of the United States of America (German ed. 3 1885; English trans., 1887); JohnC. Calhoun (1882), in the American Statesmen Series; John Brown (1888), and The French Revolution Tested by Mirabeau's Career (1894).

See the Political Science Quarterly, v. 677-78; the Nation, Ixxviii. 65-67.

VONNOH, ROBERT WILLIAM (1858), American

portrait and landscape painter, was born in Hartford, Connec- ticut, on the 17th of September 1S58. He was a pupil of Boulanger and Lefebvre in Paris; became an instructor at the Cowles Art School, Boston (1884-85), at the Boston

Museum of Fine Art Schools (1885-87), and in the schools of the Pennsylvania Academy of the Fine Arts, Philadelphia (1891-96), and a member of the National Academy of Design, New York (1906), and of the Secessionists, Munich. His wife, Bessie Potter Vonnoh (b. 1872), a sculptor, was a pupil of the Art Institute, Chicago, and became a member of the National Sculpture Society.

VONONES (on coins Onones), the name of two Parthian kings. (ij Vonones I., eldest son of Phraates IV. After the assassina- tion of Orodes II. (c. a.d. 7), the Parthians applied to Augustus for a new king from the house of Arsaces. Augustus sent them Vonones (Mon. Anc. 5, g; Tac. Ann. ii. 1 f.; Joseph. Ant. xviii. 2, 4), who was living as a hostage in Rome. But Vonones could not maintain himself; he had been educated as a Roman, and was despised as a slave of the Romans. Another member of the Arsaeid house, Artabanus II,, who was living among the Dahan nomads, was invited to the throne, and defeated and expelled Vonones. The coins of Vonones (who always uses his proper name) date from a.d. 8-t2, those of Artabanus II. begin in a.d. 10. Vonones fled into Armenia and became king here. But Artabanus demanded his deposition, and as Augustus did not wish to begin a war with the Parthians he removed Vonones into Syria, where he was kept in custody (Tac. Ann. ii. 4). When he tried to escape, A.D. ig f he was killed by his guards (Tac. Ann. ii. 58, 68).

(2) Vonones II., governor of Media, was raised to the throne after the death of Gotarzes in a.d. 51 (perhaps he was his brother, cf. Joseph. AnL xx. 3, 4). But he died after a few months, and was succeeded by his son Vologaeses I. (Tac. Ann. xii. 14). (Ed. M.)

VOODOO or Vaudoux (Creole Fr. vaiidoux, a negro sorcerer, probably originally a dialectic form of Fr. Vaudois, a Walden- sian), the name given to certain magical practices, superstitions and secret rites prevalent among the negroes of the West Indies, and more particularly in the Republic of Haiti.

VOORHEES, DANIEL WOLSEY (1827-1897), American lawyer and political leader, was born in Butler county, Ohio, on the 26th of September 1827, of Dutch and Irish descent. During his infancy his parents removed to Fountain county, Indiana, near Veedersburg. He graduated at Indiana Asbury (now De Pauw) University, Greencastle, Indiana, in 1849; was admitted to the bar in 1850, and began to practise in Covington, Indiana, whence in 1857 he removed to Terre Haute. In 1858-60 he was U.S. district-attorney for Indiana; in 1861-66 and in 1869-73 he was a Democratic repre- sentative in Congress; and in 1877-97 he was a member

of the U.S. Senate. During the Civil War he seems to have been affiliated with the Knights of the Golden Circle, but he was not so radical as Vallandigham and others. He was a member of the committee on finance throughout his service in the Senate, and his first speech in that body was a defence of the free coinage of silver and a plea for the preservation of the full legal tender value of greenback currency, though in 1893 he voted to repeal the silver purchase clause of the Sherman Act. He had an active part in bringing about the building of the new Congressional Library. He was widely known as an effective advocate, especially in jury trials. In allusion to his unusual stature he was called " the Tall Sycamore of the Wabash." He died in Washington, D.C., on the 10th of April

1897.

Some of his speeches were published under the title, Forty Years of Oratory (2 vols., Indianapolis, Indiana, 1898), edited by his three sons and his daughter, Harriet C. Voorhees, and with a biographical sketch by T. B. Long.

VORARLBERG, the most westerly province of the Austrian empire, extending S. of the Lake of Constance along the right bank of the Rhine valley. It consists of three districts, Bregenx, Bludenz and Feldkirch, which are under the administrative authority of the Slatthalter (or prefect) at Innsbruck, but possess a governor and a diet of their own (twenty-one members), and send four members to the imperial parliament. Vorarl- berg is composed of the hilly region of the Bregenzerwald,

and, to its south, of the mountain valley of Montafon or of the upper 111, through which an easy pass, the Zeinisjoch (6076 ft.), leads to the Tirolese valley of Paznaun, and so to Landeck. Near Bludenz the KJoster glen parts from the 111 valley; through the latter runs the Arlberg railway (1884) — beneath the pass of that name (5912 ft.) — to Landeck and Innsbruck. The 111 valley is bounded south by the snowy chain of the Rhatikon (highest point, the Scesaplana, 9741 ft., a famous view-point), and of the Silvretta (highest point, Gross Piz Buin, 10,880 ft.), both dividing Vorarlberg from Switzerland; slightly to the north-east of Piz Buin is the Dreilanderspitze (10,539 ft.), where the Vorarlberg, Tirolese and Swiss frontiers unite.

The total area of Vorarlberg is 1004-3 SQ- rm Of this 881%, or about 886 sq. m., is reckoned "productive," 30% of this limited area being occupied by forests, while 118 sq. m. rank as " unproductive." In 1900 the total population was .129,237, all but wholly German-speaking and Romanist. The largest town is Dornbirn (pop. 13.052), but Bregenz (pop. 7595) is the political capital; Feldkirch has about 4000 inhabitants, while Bludenz has

rather more (see the separate articles on the three former). In the hilly districts the inhabitants mainly follow pastoral pursuits, possessing much cattle of all kinds. In the towns the spinning and weaving of cotton (introduced towards the end of the 18th century) is very "flourishing. Forests cover about one-sixth of the district, and form one of the principal sources of its riches. But the Vorarlberg is predominantly an Alpine region, though its mountains rarely surpass the snow- level. Ecclesiastically it is in the diocese of Brixen, whose vicar-general (a suffragan bishop) resides at Feldkirch.

The name of the district means the " land that is beyond the Arlberg Pass,' that is, as it seems to one looking at it from the Tirol. This name is modern and is a collective appellation for the various counties or lordships in the region which the Habsburgs (after they secured Tirol in 1363) succeeded in pur- chasing or acquiring — Feldkirch (1375, but Hohcncms in 1765 only), Bludenz with the Montafon valley (1394), Bregenz (in two parts, 1451 and 1523) and Sonnenberg (1455). After the annexation of Hohenems (its lords having become extinct in 1759), Maria Theresa united all these lordships into an administrative district of Hither Austria, under the name Vorarlberg, the governor residing at Bregenz. In 1782 Joseph II. transferred the region to the province of Tirol. The lordship of Blumenegg was added in 1804, but in 1805 all these lands were handed over, by virtue of the peace of Press- burg, to Bavaria, which in i8r4 gave them all back, save Hoheneck. In 1815 the present administrative arrangements were made.*

See A. Achleitner and E. Ubl, Tirol und Vorarlberg (Leipzig, 1895ˆ; J. R. von Bergmann, Landeskunde v. Vorarlberg (Innsbruck, 1S68); Max Haushofer, Tirol und Vorarlberg (Bielefeld and Leipzig, 1899) ; J. C. Hcer, Vorarlberg und Liechtenstein — Land und Leute (Feld- kirch, 1906); O. von Pfister, Das Montavon (Augsburg, 1884); J. Stafflcr, Tirol und Vorarlberg (5 vols., Innsbruck, 1839-46); A. Steinitzer, Geschichtliche und Kullurgeschichtliche Wanderungen dutch Tirol und Vorarlberg (Innsbruck, 1905); A. Waltenberger, Algdu, Vorarlberg und Westtirol (10th edition, Innsbruck, 1906). See also the list of books at the end of Tirol, and especially vol. xiiil ("Tirol u. Vorarlberg") (Vienna, 1893) of the great official work entitled Die oesterreichisch-ungarische Monarchic in Wort und Bild.

(W. A, B. C.)

VORONEZH, a government of southern Russia, bounded N. by the government of Tambov, E. by Saratov and the Don Cossacks, S. by Kharkov and W. by Kursk and Orel; area, 25,435 sq. m. It occupies the southern slopes of the middle- Russian plateau, and its average elevation is

from 450 to 700 ft. The surface is hilly, and intersected by ravines in the west (where two ranges of chalk hills separated by a broad valley run north and south), but flat and low east of the Don. Devonian sandstones crop out in the north; further south these are covered with Cretaceous deposits. Glacial clays with northern erratic boulders extend as far south as Voronezh, and extensive areas arc covered with Lacustrine clays and sands. The soil is very fertile, owing to the prevalence of black earth; it becomes, however, sandy towards the east.

Voronezh lies on the border between the forest and meadow region of middle Russia and the southern steppes; the forests disappear rapidly towards the south, and those which in the time of Peter the Great stood on the upper tributaries of the Don, and were used for shipbuilding, have now been almost entirely destroyed. Less than one-tenth of the entire area is under wood.

The Don traverses Voronezh from N. to S.E., draining it for more than 400 rn.; it is an important channel for the export of corn, tallow and other raw produce, as well as for the import of wood, floated down from the north. Its tributary the Voronezh is also navigated, and the Bityug and Khoper, both left-hand affluents of the Don, flow in part through the government. Many other small streams flowing into the Don intersect the territory, but the influence of the dry steppes begins to make itself felt; there are no lakes, and marshes persist only in the valleys. The climate is continental, and although the mean temperature at the town of Voronezh is 42-7° F., that of January is as low as 8-3°, and that of July as high as 74-2°.

The estimated pop. in 1006 was 3,097,700. The inhabitants consist in nearly equal parts of Great Russians in the north and Little Russians in the south, but there are a few Poles, Germans and Jews, both Orthodox and Karaites. The govern- ment is divided into twelve districts, the chief towns of which arc Voronezh, Biryuch, Bobrov, Boguchar, Korotoyak, Nizhne-Dyevitsk, Novo-Khopersk, Ostrogozhsk, Pavlovsk, Valuiki, Zadonsk and Zemlyansk. Agriculture is the chief occupation, and grain is exported to a considerable amount. The peasants own 67% of the land, the crown and the imperial domains 3% and private owners 30%.

The principal crops are rye, wheat, oats, barley and potatoes. Aniseed, sunflowers, tobacco and beetroot are extensively culti- vated, and much attention is paid to the growth of the pineapple. There are large tracts of excellent pasture land, on which cattle are bred; good breeds of cart-horses

and trot ting-horses are obtained. There arc nearly two hundred breeding establishments, those at Hrenovoye and Chesmenka being the most important. In many villages the inhabitants are engaged in the making of wooden fares. There are flour-mill?, distilleries, oil, sugar and woollen mills, iron works and tobacco factories.

VORONEZH, a town of Russia, capital of the government of the same name, on the river Voronezh, 5 m. above its confluence with the Don and 367 m. by rail S.S.E. of Moscow. Pop. (rgoi) 84,146. It. is one of the best - built and most picturesque provincial towns of Russia, and is sitviated on the steep bank of the river, surrounded by three large suburbs — Troitskaya, Yamskaya and Chizhovka. It has a military school of cadets, two museums, a monument (i860) to Peter the Great, a railway college, a pilgrimage church, and a theatre which figures in the history of the Russian stage. It was the birthplace of two peasant poets, who wrote some of the finest examples of Russian poetry — A. V. Koltsov (1800-1842) and I. S. Nikitin (1824-1861). A memorial to the former was erected in 186S. There are factories for cleansing wool and for the preparation of linens, woollens, bells, tallow and oil, as well as some distilleries. Voronezh is an important entrepot for corn, flax, tallow, hides, sugar, wood and coal from the Don.

The city was founded in 1586, as a fort against Tatar raids, on a site which had been occupied from the nth century by a Khazar town, but had been deserted during the 14th and 15th centuries. Four years afterwards it was burned by the Tatars, but again rebuilt, and soon became an important trading place. Peter the Great recognized its importance, and in 1695 built here a flotilla of boats for the conquest of Azov. The town was almost completely destroyed by fire in 1703, 1748 and 1773, but was always rebuilt,

VORONTSOV (or Woronzoff), the name of a Russian family, various members of which are distinguished in Russian history.

Mikhail Illarionovich Vorontsov (1714-1767), Russian imperial chancellor, was the first to become prominent. At the age of fourteen he was appointed a Kammer junker at the court of the cesarevna Elizabeth Petrovna, whom he

materially assisted during the famous coup d'etat of the 6th of December 1741, when she mounted the Russian throne on the shoulders of the Preobrazhensky Grenadiers. On the 3rd of January 1742 he married Anna Skavronskaya, the empress's cousin; and in r744 was created a count and vice-chancellor. His jealousy of Alexis Bestuzhev induced him to participate in Lestocq's conspiracy against that statesman. The empress's affection for

him (she owed much to his skilful pen and still more to the liberality of his rich kinsfolk) saved him from the fate of his accomplices, but he lived in a state of semi-eclipse during the domination of Bestuzhev (1744-175S). On the dis- grace of Bestuzhev, Vorontsov was made imperial chancellor in his stead. Though well-meaning and perfectly honest, Vorontsov as a politician was singularly timorous and irre- solute, and always took his cue from the court. Thus, under Elizabeth he was an avowed enemy of Prussia and a warm friend of Austria and France; yet he made no effort to prevent Peter III. from reversing the policy of his predecessor. Yet he did not lack personal courage, and endured torture after the Revolution of the 9th of July 1762 rather than betray his late master. He greatly disliked Catherine II., and at first refused to serve under her, though she reinstated him in the dignity of chancellor. When he found that the real control of foreign affairs was in the hands of Nikita Panin, he resigned his office (1763). Vorontsov was a generous protector of the nascent Russian literature, and, to judge from his letters, was a highly cultivated man.

Alexander Romanovich Vorontsov (1741-1805), Russian imperial chancellor, nephew of the preceding and son of Count Roman Vorontsov, began his career at the age of fifteen in the Izmailovsky regiment of the Guards. In 1759, his kinsman, the grand chancellor Mikhail Illarionovich, sent him to Strass- burg, Paris and Madrid to train him in diplomacy. Under Peter III. he represented Russia for a short time at the court of St James's. Catherine II. created him a senator and president of the Board of Trade; but she never liked him, and ultimately (1791) compelled him to retire from public life. In 1802 Alexander I. summoned him back to office and ap- pointed him imperial chancellor. This was the period of the triumph of the Vorontsovs, who had always insisted on the necessity of a close union with Austria and Great Britain, in opposition to Panin and his followers, who had leaned on France or Prussia till the outbreak of the Revolution made friendship with France impossible. Vorontsov was also an implacable opponent of Napoleon, whose " topsy-turvyness " he was never weary of denouncing. The rupture with Napoleon in 1803 is mainly attributable to him. He also took a leading part in the internal administration and was in favour of a thorough reform of the senate and the ministries. He retired in 1804. He possessed an extraordinary memory and a firm and wide grasp of history.

His " Memoirs of my Own times " (Rus.) is printed in vol. vii. of the Vorontsov A rchives.

Semen Romanovich Vorontsov (i 744-1832), Russian diplomatist, brother of Alexander Romanovich, distinguished himself during the first Turkish War of Catherine II. at Larga and Kagula in 1770. In 1783 he was appointed Russian minister at Vienna, but in 1785 was transferred to

London, where he lived for the rest of his life. Vorontsov enjoyed great influence and authority in Great Britain. Quickly acquainting himself with the genius of English institutions, their ways and methods, he was able to render important services to his country. Thus during Catherine's second Turkish War he contributed to bring about the disarmament of the auxiliary British fleet which had been fitted out to assist the Turks, and in 1793 obtained a renewal of the commercial treaty between Great Britain and Russia. Subsequently, his extreme ad- vocacy of the exiled Bourbons, his sharp criticism of the Armed Neutrality of the North, which he considered dis- advantageous to Russia, and his denunciation of the partitions of Poland as contrary to the first principles of equity and a shock to the conscience of western Europe, profoundly irritated

the empress. On the accession of Paul he was raised to the rank of ambassador extraordinary and minister plenipotentiary, and received immense estates in Finland. Neither Vorontsov's detention of the Russian squadron under Makarov in British ports nor his refusal, after the death of Bezborodko, to accept the dignity of imperial chancellor could alienate the favour of Paul. It was only when the emperor himself began to draw nearer to France that he began to consider Vorontsov as incompetent to serve Russia in England, and in February 1S00 all the count's estates were confiscated. Alexander I. on his accession at once reinstated him, but ill-health and family affairs induced him to resign his post in 1806. From that time till his death in 1S32 he continued to live in London.

Besides his valuable Note on the Russian War (Rus.) and numerous letters, Vorontsov was the author of an autobiography (in Russky Arkhiv, Petersburg, 1S81) and " Notes on the Internal Government of Russia " (Rus.) (in Russky Arkhiv, 1881).

Mikhail Semen-ovich Vorontsov (1782-1856), Russian prince and field-marshal, son of the preceding, spent his childhood and youth with his father in London, where he received a brilliant education. During 1803-4 he served in the Caucasus under Tsitsianov and Gulyakov, and was nearly killed in the Zakatahko disaster (January r5, 1804). From 1805 to 1807 he served in the Napoleonic wars, and was present at the battles of Pultusk and Friedland. From 1809 to 181 1 he participated in the Turkish War and distinguished himself in nearly every important action. He was attached to Bagration's army during the war of 181 2, was seriously wounded at Borodino, sufficiently recovering, however, to re- join the army in 1813. In 1S14, at Craonne, he brilliantly withstood Napoleon in person.

He w r as the commander of the corps of occupation in France from 1815 to 1818. On the 7th of May 1823 he was appointed governor-general of New- Russia, as the southern provinces of the empire were then called, which under his administration developed marvellously. He may be said to have been the creator of Odessa and the benefactor of the Crimea. He was the first to start steam- boats on the Black Sea (1828). The same year he succeeded the wounded Menshikov as commander of the forces besieging Varna, which he captured on the 28th of September. In the campaign of 1S29 it was through his energetic efforts that the plague, which had broken out in Turkey, did not penetrate into Russia. In 1844 Vorontsov was appointed commander- in-chief and governor of the Caucasus with plenipotentiary powers. For his brilliant campaign against Shamyl, and especially for his difficult march through the dangerous forests of Ichkcrinia, he was raised to the dignity of prince, with the title of Serene Highness. By 184S he had captured two-thirds of Daghestan, and the situation of the Russians in the Caucasus, so long almost desperate, was steadily improving. In the be- ginning of 1853 Vorontsov was allowed to retire because of his increasing infirmities. He was made a field-marshal in 1856, and died the same year at Odessa. Statues have been erected to him both there and at Tiflis. '

See V. V. Ogarkov, The Vorontsovs (Rus.) (Petersburg, 1892); Vorontsov Archiies (Rus. and Fr) (Moscow, 1870, &c.); M. P. Shelverbinin, Biography of Frince M. S. Vorontsov (Rus.) (Peters- burg, 1858). (R. N. B.)

VOROSMARTY, MIHALY (1800-1855), Hungarian poet, was born at Puszta-Nyek on the 1st of December 1800, of a noble Roman Catholic family. His father was a steward of the Nadasdys. Mihaly was educated at Szekesfejervar by the Cistercians and at Pest by the Piarists. The death of the elder Vorosmarty in 181 1 left his widow and numerous family ext remely poor. As tutor to the Perczel family, however, Voros- marty contrived to pay his own way and go through his aca- demical course at Pest. The doings of the diet of 1825 first enkindled his patriotism and gave a new direction to his poetical genius (he had already begun a drama entitled Salamon), and he flung himself the more recklessly into public life as he was consumed by a hopeless passion for Etelka Perczel, who socially was far above him. To his unrequited love we owe a whole

host of exquisite lyrics, while his patriotism found expression in the heroic epos Zaldn futdsa (1824), gorgeous in colouring, exquisite in style, one of the gems of Magyar literature. This new epic marked a transition from the classical to the romantic school. Henceforth Vorosmarty was hailed by Kisfaludy and the Hungarian romanticists as one of themselves. All this time he was living from hand to mouth. He had forsaken the law for

literature, but his contributions to newspapers and reviews were miserably paid. Between 1823 and 1831 he composed four dramas and eight smaller epics, partly historical, partly fanciful. Of these epics he always regarded Cserhalom (1825) as the best, but modern criticism has given the preference to K-U szomsed vdr (r83r), a terrible story of hatred and revenge. When the Hungarian Academy was finally established (November 17, 1830) he was elected a member of the philological section, and ultimately succeeded Karoly Kis- faludy as director with an annual pension of 500 florins. He was one of the founders of the Kisfaludy Society, and in 1837 started the Athenaeum and the Figyelmezb, the first the chief bellettristic, the second the best critical periodical of Hungary. From r830 to 1843 he devoted himself mainly to the drama, the best of his plays, perhaps, being V&masz (1833), which won the Academy's roo-gulden prize. He also published several volumes of poetry, containing some of his best work. SzDzat (1836), which became a national hymn, Az elhagyoU anya (1837) and Az uri holgyhoz (1841) are all inspired by a burning patriotism. His marriage in 1843 to Laura Csajaghy inspired him to compose a new cycle of erotics. In 1848, in conjunction with Arany and Petbfi, he set on foot an excellent translation of Shakespeare's works. He himself was responsible for Julius Caesar and King Lear. He represented Jankovics at the diet of 1848, and in 1849 was made one of the judges of the high court. • The national catastrophe profoundly affected him. For a short time he was an exile, and when he returned to Hungary in 1850 he was already an old man. A profound melancholy crippled him for the rest of his life. In r834 he wrote his last great poem, the touching A ven cigdny. He died at Pest in 1855 in the same house where Fiaroly Kisfaludy had died twenty-five years before. His funeral, on the 2TSt. of November, was a day of national mourning. His penniless children were provided for by a national subscription collected by Ferencz Deak, who acted as their guardian.

The best edition of Vorosmarty's collected works is by Pal Gyulai (Budapest, 1884). Some of them have been translated into German, e.g. Gedichte (Pest, 1857) ; Ban Marot, by Mihaly Ring (Pest, 1879) ; Aitsgewdhlte Dichte, by Paul Hoffmann (Leipzig, 1895). See Pal Gyulai, The Life of Vorosmarty (Hung.) (3rd ed., Budapest, 1890), one of the noblest biographies in the language; Brajjer, Vorosmarty, sein Leben und seine Werke (Nagy-Becskerek, 1882). (R. N. B)

VORTICELLA, the Bell-Animalcule, a genus of Peritiichous Infusoria (q.v.) characterized by the bell-shaped body, with short oral disk and collar, attached by a hollow stalk, inside and around which passes, attached spirally, a contractile bundle of myonemes. By their contraction the stalk is brought into the form of a corkscrew, the thread being now on the shorter, i.e. the inner, side of the turns; and the animal is jerked back near to the base of the stalk. As soon as the contraction of the thread ceases, the

elasticity of the stalk ex- tends the animal to its previous position. On fission, one of the two animals swims off by the development of the temporary posterior girdle of membranelles, the disk being retracted and closed over by the collar, so that the cell is ovoid: on its attachment the posterior girdle of cilia disappears and a stalk forms. The other cell remains attached to the old stalk. In the allied genera Carchesium and Zoothamnium the two produced by fission remain united, so that a branching colony is ultimately produced. The genus is a large one, and many species are epizoic on various water animals.

VORTIGERN (Guorthiciknus, Wyktgeoen), king of the Britons at the time of the arrival of the Saxons under Hengest and Horsa, The records do not agree as to the date of the arrival of these chieftains or the motives which led them to come to Britain. It seems clear, however, that Vortigern

made use of them to protect his kingdom against the Picts and Scots, and rewarded them for their services with a grant of land. Later we And the Britons at war with the new-comers, now established in Kent, and four battles are fought, in the last of which, according to the Historia Briitonum, the king's son Vortemir, their leading opponent, is slain. The Historia Briitonum is our only authority for the marriage of Vortigern with the daughter of Ilengest before the war. It also records the massacre of the British nobles after the death of Vortemir and the subsequent grant of Essex and Sussex to the invaders by Vortigern.

See Historia Briitonum, ed. Th. Mommsen in Mon. Hist. Germ. y.\.; Anglo-Saxon Chronicle, cd. Earle and Plummer (Oxford, 1899); Bedc-, Hist. Led., ed. C. Plummer (Oxford, 1896).

VOSGES, a frontier department of eastern France, formed in 1790 chiefly of territory previously belonging to Lorraine, together with portions of Franche-Comte and Champagne, and bounded N. by the department of Meurthe-et-Moselle, E. by Alsace, S.E. by the territory of Belfort, S. by the department of Haute-Saone, W. by Ilaute-Marne and N.W by Meuse. Pop. (1006) 420,812; area, 2279 sq. m. The Vosges mountains (see below) form a natural boundary on the east, their highest French eminence, the Hohneek, attaining aaSz ft. The Monts Faucilles traverse the south of the depart- ment in a broad curve declining on the north into elevated plateaus, on the south encircling the upper basin of the Saone. This chain, dividing the basins cf the Rhone and the Rhine, forms part of the European watershed between the basins of the Mediterranean and Atlantic. The

Moselle and the Meuse, tributaries of the Rhine, have the largest drainage areas in the department; a small district in the N.W. sends its waters to the Seine, the rest belongs to the basin of the Rhone. The Moselle rises in the Col de Bussang in the extreme south-east, and in a N.N.W. course of about 70 m. in the department receives the Moselotte and the Vologne on the right; the Mortagne and Meurthe on the right and the Madon on the left bank also belong to this department though they join the Moscile outside its borders. The source of the Saone is on the southern slope of the Faucilles. On the shore of Lake Gerard mer lies the beautifully situated town of Gerardmer, a well-known centre for mountain excursions.

The elevation and the northward exposure of the valleys make the climate severe, and a constant dampness prevails, owing both to the abundance of the rainfall and to the imper- meability of the subsoil. The average temperature at Epinal (1070 ft.) is 40 F. The animal rainfall at Epinal is 28 in., at St Die 32 in. and in the mountains more. Arable farming flourishes in the western districts where wheat, oats and potatoes are largely grown. The vine is cultivated on the river banks, to best advantage on those of the Moselle. Pasture is abundant in the mountainous region, where cheese-making is carried on to some extent, but the best grazing is in the central valleys. Forests, which occupy large tracts on the flanks of the Vosges, cover about one-third of the department, and are a principal source of its wealth. Sawmills are numerous in the Vosges and ihc manufacture of furniture, sabots, brushes and wood- working in general are prominent industries. The department has mines of lignite and stone quarries of various kinds. There are numerous mineral springs, of which those of Contrexe- viile, Plombieres, Vittel, Bains-les-Bains, Martigny-Ies-Bains and Bussang may be named. The manufacture of textiles is the chief industry, comprising the spinning and weaving of cotton, wool, silk, hemp and flax, and the manufacture of hosiery and of embroidery and lace, Mirecourt (pop. 5092) being an important centre for the two last. The department forms the diocese of St Die (province of Besancon), has its court of appeal and educational centre at Nancy, and belongs to the district of the XX. Army Corps. It is divided into the arrondisse- ments of Epinal, Mirecourt, Neufchatcau, Remiremont and St Die. with 29 cantons and 530 communes.

VOSGES (Lat. Vogesus or Vosagus, Ger. Wasgau or Vogesen), a mountain range of central Europe, stretching along the west

side of the Rhine valley in a N.N.E. direction, from Basel to Mainz, for a distance of 150 m. Since 1871 the southern portion, from the Ballon d 'Alsace to Mont Donon, has been the frontier between France and Germany. There is a remarkable similarity between the Vosges and the corresponding range of the Black Forest on the other side of the Rhine: both

lie within the same degrees of latitude and have the same geological formation; both are characterized by fine forests on their lower slopes, above which are open pasturages and rounded summits of a uniform altitude; both have a steep fall to the Rhine and a gradual descent on the other side. The Vosges in their southern portion are mainly of granite, with some porphyritic masses, and of a kind of red sandstone (occasionally 1640 ft. in thickness) which on the western versant bears the name of " grSs Vosgien."

Orographically the range is divided south to north into four sections : the Grandes Vosges (62 m.), extending from Belfort to the valley of the Bruche; the Central Vosges (31 m.), between the Bruche and the Col de Saverne; the Lower Vosges (30 m.), between the Col de Saverne and the source of the Lauter; and the Hardt (q.v.). The rounded summits of the Grandes Vosges are called " ballons." The departments of Vosges and Haute Sa6ne arc divided from Alsace and the territory of Belfort by the Ballon d'Alsace or St Maurice (4100 ft.). Thence northwards the average height of the range is 3000 ft., the highest point, the Ballon de Guebwiller (Gebweiler), or Soultz, rising to the east of the main chain to 4680 ft. The Col de Saales, between the Grandes Vosges and the central section, is nearly 1900 ft. high; the latter is both lower and narrower than the Grandes Vosges, the Mont Donon (3307 ft.) being the highest summit. The railway from Paris to Strassburg and the Rhine and Marne Canal traverse the Col de Saverne. No railway crosses the Vosges between Saverne and Bcltort- but there are carriage roads over the passes of Bussang from Remiremont to Thann, the Schlucht (3766 ft.) from Gerardmer to Minister, the Bonhomme from St Did to Colmar, and the pass from St Di6 to Ste Marie-aux-Mines. The Lower Vosges arc a sandstone plateau ranging from 1000 to 1850 ft. high, and are crossed by the railway from Hagenau to Sarre- guemines, defended by the fort of Bitchc.

Meteorologically the difference between the eastern and western versants of the range is very marked, the annual rainfall being much higher and the mean temperature being much lower in the latter than in the former. Gn the eastern slope the vine ripens to a height of 1300 ft. ; on the other hand, its only rivers are the 111 and other shorter streams. The Moselle, Meurthe and Sarrc all rise on the Lorraine side. Moraines, boulders and polished rocks testify the existence of the glaciers which formerly covered the Vosges. The lakes, surrounded by pines, beeches and maples, the green meadows which provide pasture for large herds of cows, and the fine views of the Rhine valley, Black Forest and snow-covered Swiss moun- tains combine to make the district picturesque. On the lower heights and buttresses of the main chain on the Alsatian side are numerous castles, generally in ruins. At several points on the main ridge, especially at St Odile above Ribeauville (Rappoltsweiler), are the remains 01 a wall of

unmortared stone with tenons of wood, 6 to 7 ft. thick and 4 to 5 ft. high, cabled the pagan wall (Mur Payen). It was used for defence in the middle ages, and archaeologists are divided as to whether it was built for this purpose by the Romans, or before their arrival.

VOSMAER, CAREL (1826-1888), Dutch poet and art-critic, was born at the Plague on the 20th of March 1826. Fie was trained to the law, and held various judiciary posts, but in 1873 withdrew entirely from legal practice. Flis first volume of poems, 1S60, did not contain much that was remarkable. His temperament was starved in the very thin air of the intellectual Holland of those days, and it was not until after the sensational appearance of Multatuli (Edward Douwes- Dekker) that Vosmaer, at the age of forty, woke up to a con- sciousness of his own talent. In 1869 he produced an exhaustive monograph on Rembrandt, which was issued in French. Vosmaer became a contributor to, and then the leading spirit and editor of, a journal which played an immense part in the awakening of Dutch literature; this was the Nederlandsche ■Spectator, in which a great many of his own works, in prose and verse, originally appeared. The remarkable miscellanies of Vosmaer, called Birds of Diverse Plumage, appeared in three volumes, in 1S72, 1874 and 1876. In 1870 he selected from these all the pieces in verse, and added other poems to them. In 1881 he published an archaeological novel called Amazone, the scene of which was laid in Naples and Rome, and which described the raptures of a Dutch antiquary in love. Vosmaer

undertook the gigantic task of translating Homer into Dutch hexameters, and he lived just long enough to see this completed and revised. In 1873 he came to London to visit his lifelong friend, Sir (then Mr) Lawrence Alma-Tadema, and on his return published Londinias, an exceedingly brilliant mock- heroic poem in hexameters. His last poem was Nanno, an idyll on the Greek model. Vosmaer died, while travelling in Switzerland, on the 12th of June 1888. He was unique in his fine sense of plastic expression; he was eminently tasteful, lettered, refined. Without being a genius, he possessed immense talent, just of the order to be useful in combating the worn- out rhetoric of Dutch poetry. His verse was modelled on Heine and still more on the Greeks; it is sober, without colour, stately and a little cold. He was a curious student in versifica- tion, and it is due to him that hexameters were introduced and the sonnet reintroduced into Holland. lie was the first, to repudiate the traditional, wooden alexandrine. In prose he was greatly inilueneed by Multatuli, in praise of whom he wrote an eloquent treatise, Een Zaaier (A Sower). He was also some- what under the influence of English prose models. (E. G.)

VOSS, JOHANN HEINRICH (1751-1826), German poet and translator, was born at Sommersdorf in Mccklcnburg-Strelitz on the 20th of February 1751, the son of a farmer. After attending (1766-69) the gymnasium at Neubrandenburg, he was obliged to accept a private tutorship in order to earn money to enable him to study at a university. At the invitation of H. C. Boie, whose attention he had attracted by poems con- tributed to the Gottingen Musenalmanach, he went to Gottingen in 1772. Here he studied philology and became one of the leading spirits in the famous Hain or Dichterbund. In 1775 Boie made over to him the editorship of the Musenalmanach, which he continued to issue for several years. He married Boie's sister Ernestine 'in 1777 and in 1778 was appointed rector of the school at Ottcrndorf in Hanover. In 1782 he accepted the rectorship of the gymnasium at Eutin, where he remained until T802. Retiring in this year with a pension of 600 thalers he settled at Jena, and in 1805, although Goethe used his utmost endeavours to persuade him to stay, accepted a call to a pro- fessorship at. Heidelberg. Here, in the enjoyment of a consider- able salary, he devoted himself entirely to his literary labours, translations and antiquarian research until his death on the 29th of March 1826.

Voss was a man of a remarkably independent and vigorous character. In 1785-95 he published in two volumes a collection of original poemc, to which he afterwards made many additions. The best of thc&c works is his idyllic poem Luise (1795), in which he sought, with much success, to apply the style and methods of classical poetry- to the expression of modern German thought and sentiment. In his Mythologische Brief e (2 vols., 1794), in which he attacked the ideas of Christian Gottlob Hcyne, in his Aniisymbnlik (2 vols., 1824-26), written in opposition to Georg Friedrich Crcuzer (1771-1858), and in other writings he made important contributions to the study of mythology. He was also prominent as an advocate of the right of free judgment in religion, and at the time when some members of the Romantic school were being converted to the Roman Catholic church he produced a strong impression by a powerful article, in Sophronizon. on his friend Friedrich von Stol- ber^'s repudiation of Protestantism (1819). It is, however, as a translator that Voss chiefly owes his place in German literature. His translations indicate not only sound scholarship but a thorough mastery of the laws of German diction and rhythm. The most famous of his translations are those of Homer. Of these the best is the translation of the Odyssey, as originally issued in 1781 . He also translated Hesiod, Theocritus, Bioii and Moschus, Virgil, 1 loraee, Tibullus, Propertius and other classical poets, and he prepared a critical edition of Tibullus. In 1818-29 was published, in 9 void,, a translation of Shakespeare's plays, which he com- pleted with the help of his sons Heinrich and Abraham, both of whom were scholars and writers of considerable ability.

J. II. Yoss's Samttiche poetische Werhe were published by his son Abraham in 1835; nc w c 'd. 1850. A good selection is in A. Sauer, Der Guttiyioer Dichterbund, vol. 1. (Ktirschner's Deutsche. National- 1-iteratnr, vol. 49. 1887). His Letters were also published by his son in 4 vols. (1829-33). Y'oss left a short autobiography, Abriss meines Lebens CiSiSJ. See also \V. Herbst, J". H. Voss (3 vo's., 1872-76); A Heussncr, J. H. Voss ah Schulmann in Eutin (1882).

VOSS, RICHARD (1851-), German dramatist and novelist, was born at Neugrape, in Pomerania, on the 2nd of

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September 1S51, the son ot a country squire. Though intended for the life of a country gentleman, he showed no inclination for outdoor life, and on his return from the war -of 1870-71, in which he was wounded, he studied philosophy at jena and Munich, and then settled at Berchtesgaden. In 1S84 Voss was appointed by the grand duke of Weimar librarian of the. Wart burg, but, in consequence of illness, he resigned the post.

Chief among his dramas are Savonarola (187S); Magda (1879); Die. Patricierin (1880); Der Mohr des Zaren (1S83).; Unehrlich Vclk (1885); Alexandra (1888); Eva (1889); Wehc dem Besiegten (1889); Die, ne-ue Zed (1891); Schuidig (1892). Among his novels may be mentioned San Sebastian (1883); Der Sohn der Volskerm (1885); Die Sabinerin (1888); Der Monch von Berchtesgaden (1891); Der ne-ue Gotl (1898) ; Die Rdcherin (1899) ; Allerlei Er kites (1902) ; and Die Lcute von Vcddar& (1902).

See 1VI. Goldmann, Richard V r oss t e'm liter arisches Charakterbild

(1900).

VOSSEVANGEN, or Voss, a village and favourite tourist- centre of Norway, in South Bergenhus ami (county), 67 m. N.W. of Bergen by rail. It was the terminus of the finely engineered Bergen & Vossevangen railway, which, however, forms part of the projected trunk line between Christiania and Bergen. Vossevangen is pleasantly situated on the Vangsvand, in fertile upland, and has a stone church of the 13th century, and a finneloft or two-storeyed timber house of the 14th century, with an outside stair. Driving roads run N.E. and S.E. from Vossevangen. The former, passing Stalheim, descends into the sombre Nacrodal, a precipitous valley terminating in the Nacrd i'jord, a head-branch of the Sogne Fjord. The latter route follows the deep but gentler valley of the Skjerve, whence -from Ovre Vasenden roads continue to Eide (iS m.) and to Ulvik (32 m.), both on branches of the

Hardanger Fjord.

VOSSIUS [Voss], GERHARD JOHANN (1577-1649), German classical scholar and theologian, was the son of Johannes Voss, a Protestant of the Netherlands, who fled from persecution into the Palatinate and became pastor in the village near Heidelberg where Gerhard was born. Johannes was a Calvinist, however, and the strict Lutherans of the Palatinate caused him once more to become a wanderer; in 1578 he settled at Leiden as student of theology, and finally became pastor at Dort, where he died in 1585. Here the son received his educa- tion, until in 1595 he entered the university of Leiden, where he became the lifelong friend of Hugo Grotius. and studied classics, Hebrew, church history and theology. In 1600 he was made rector of the high school at Dort, and devoted himself to philology and historical theology. From 1614 to 1619 he was director of the theological college at Leiden. Meantime he was gaining a great reputation as a scholar, not only in the Netherlands, but also in France and England. But in spite of the moderation of his views and his abstention from controversy, he came under suspicion of heresy, and escaped expulsion from his office only by resignation (1619). The year before he had published his valuable history of Pelagian controversies, which his enemies considered favoured the views of the Arminians or Remonstrants. In 1622, however, he was appointed professor of rhetoric and chronology, and subsequently of Greek, in the university. He declined invita- tions from Cambridge, but accepted from Archbishop Laud a prebend in Canterbury cathedral without residence, and went to England to be installed in 1629, when he was made LL.D. at Oxford. In 1632 he left Leiden to take the post of professor of history in the newly founded Athenaeum at Amsterdam, which he held till his death on the 19th of March 1649.

His son Isaak (1618-1689), after a brilliant career of scholar- ship in Sweden, became residentiary canon at Windsor in 1673. He was the author of De scptuaginta interpret-thus (1661), De poematimi cantu el vinous rhyth-mi (1673), and Variamm observationum liber (16S5).

Vossius was amongst the first to treat theological dogmas and the

heathen religions from the historical point of view. His principal works are liistoria Pelagiana sive Historia-e de controversies anas PeXagius ejusque reliquiae movcrimt (1618); Aristarchus, sive de arte grammatica (1635 and 1695; new ed. in 2 vols., 1833-35); Etymo- logicum linguae Larinae (1662; new ed. in two vols., 1762-63);

Commentariorum Rhetoricorum oratoriarum institulionum Lihri VI. (1606 and ofien) ; De Hisioricis Graecis Libri III. (1624) ; De Historici% Latinis Lihri III. (1627); De Theologia Gentili (1642); Dissertation's Trcs dc Tribus Symbolis, Aposlctico, Athanasiano ct Constantino politano (1642). Collected works published at Amster- dam \6 vols., 1695-1701).

See P. Xiceron, Mcnwires pour servir d, Vhistoire de.s hommes illuslres, vol. xiii. (Paris, 1730) ; Herzog's Realencyklopadie, art. " Vossius " ; and the article in the Allgemeine Deutsche Biographie.

VOTE and VOTING. The Latin votum, derived from vovere, to vow, meant a solemn promise, hence a wish, desire or prayer, in which senses the doublet " vow," derived through. French, is used now chiefly. " Vote " is specially employed in the sense of a registering of one's choice in elections or on matters of debate, and the political meaning ia the only one which requires comment.

Ancient. — In ancient Greece and Italy the institution of suffrage already existed in a rudimentary form at the outset of the historical period. In the primitive monarchies it was customary for the king to invite pronouncements of his folk on matters in which it was prudent to secure its assent before- hand. In these assemblies the people recorded their opinion by clamouring (a method which survived in Sparta as late as the 4th century B.C.), or by the clashing of spears on shields. This latter practice may be inferred to have obtained originally in Rome, the word sujjragium meaning literally a responsive crash. Owing to the lack of routine in the early monarchies and aristocracies of Greece and Italy the vote as yet lacked importance as an instrument of government. But in the days of their full political development the communities of these countries had firmly established the principle of government according to the will of majorities, and their constitutions required almost every important act to be directed by a formal vote. This rule applied equally to the decisions of general assemblies, administrative councils and law courts, and obtained alike in states where suffrage was universal and where it was restricted.

Tn every case the taking of votes was effected in the form of a poll. The practice of the Athenians, which is shown by inscriptions to have been widely followed in the other states of Greece, was to hold a show of hands (xˆpOTona), except on questions affecting the status of individuals: these latter, which included all lawsuits and proposals of ostracism {q.v.) t were determined by secret ballot (r/ˆia-jua, so called from the)p7}tpoi or pebbles with which the votes were cast). At Rome the method which- prevailed up to the 2nd century B.C. was that of division (discessio). Rut the economic and social depend- ence of many voters on the nobility caused the system of open suffrage to be vitiated by intimidation and

corruption. Hence a series of laws enacted between I3Q and 107 B.C. prescribed the use of the ballot (" tabella," a slip of wood coated with wax) for all business done in the assemblies of the people.

For the purpose of carrying resolutions a simple majority of votes was deemed sufficient. Regulations about a quorum seem to have been unusual, though a notable exception occurs in the case of motions for ostracism at Athens. As a general rule equal value was made to attach to each vote; but in the popular assemblies at Rome a system of voting by groups was in force until the middle of the 3rd century B.C. by which the richer classes secured a decisive preponderance (see Comiua).

As compared with modern practice the function of voting was restricted in some notable ways, (j) In the democracies of Greece the use of the lot largely supplanted polling for the election of magistrates: at Athens voting was limited to the choice of officers with special technical qualifications. (2) In accordance wkh the theory which required residence at the seat of government as a condition of franchise, the suffrage could as a rule only be exercised in the capital town. The only known exception under a centralized government was a short-lived experiment under the emperor Augustus, who arranged for polling stations to be opened at election- time in the country towns of Italy. In federal governments the election of deputies to a central legislature seems to be attested by the practice of the Achaean League, where the federal Council was probably elected in the several constituent towns. But little is known as to ancient methods of electing delegates to representa- tive institutions, and in general it may be said that the function

of suffrage in Greece and Italy throws no light upon contemporary problems, such as the use of single-area constituencies and pro- portional representation.

Modern.— The modern method of obtaining a collective expression of opinion of any body of persons may be either " open " or secret. An open expression of opinion may be by some word of assent or negation, or by some visible sign, as the holding up of a hand. Indeed any method of voting which does not expressly make provision for concealing the identity of the person registering the vote is " open." Some methods of voting still employed (as in the case of parliamentary elections for some of the English universities, where votes may be sent by post) must necessarily reveal the manner in which the elector has recorded his vote. It is in connexion with the election of members of representative bodies— especially legislative bodies — that the qualifications for and methods of voting become especially important. Practically every civilized country has accepted and put in force some form of representa- tion, which may be defined as the

theory and principles on which the obtaining of a vote is founded. These are dealt with in the article Representation, and it will be sufficient to give here the various qualifications which are considered by different countries as sufficient to give effect to the principle of representation and the methods of recording votes. In detail these are given for the United Kingdom and the United States in the articles Registration of Voters and Elections, and for other countries under their respective titles in the sections dealing with the Constitution.

The first consideration is the age at which a person should be qualified for a vote. This in a large number of countries is fixed at the age of manhood, namely, twenty-one years of age, but in Hungary the age is fixed at twenty years, in Austria twenty-four years, while in Belgium, Baden, Bavaria, Hesse, Prussia, Saxony, Japan, the Netherlands and Norway the age is twenty-five years, and in Denmark thirty years. Some countries (e.g. Austria, Germany, France) have adopted the principle of what is often termed " manhood or universal suffrage," i.e. every male adult, not a criminal or a lunatic, being entitled to a vote, but in all cases some further qualifications than mere manhood are required, as in Austria a year's residence in the place of election, or in France a six months' residence. A common qualification is that the elector should be able to read and write. This is required' in Italy and Portugal and some of the smaller European states, in some states of the United States (see Elections) and in many of the South American republics. But the most universal qualification of all is some outward visible sign of a substantial interest in the state. The word " substantial " is used here in a comparative sense, as opposed to that form of suffrage which requires nothing more for its exercise than attainment of manhood and perhaps a certain qualifying period of residence. This tangible sign of interest in the state may take the form of possession of property, however small in amount, or the payment of some amount of direct taxation, indeed in some cases, as will be seen, this is rewarded by the conferring of extra votes.

In the United Kingdom possession of freehold or leasehold property of a certain value or occupation of premises of a certain annual value gives a vote. This qualification of property may be said to be included in what is termed the " lodger " vote, given to the occupier of lodgings of the yearly value unfur- nished of not less than £10. In Hungary, the payment of a small direct tax on house property or land or on an income varying with occupation is necessary. So in Prussia, Saxony, Bavaria, Hesse, Italy (unless a certain standard in elementary education has been reached), Japan, the Netherlands, Portugal (unless the elector is able to read and write) and Russia. Some of the states in the United States also require the payment of a poll tax. On the other hand, in Russia, students, soldiers, governors of provinces and police officers are disqualified from voting; in

Portugal, bankrupts, beggars, domestic servants, workmen in government service and non-commissioned officers are not electors; it must be noted, however, that the government

of the new Portuguese republic promised in 1010 a drastic revision of the existing franchise. Italy disfranchises non- commissioned officers and men in the army while under arms, as do France and Brazil. The United Kingdom and Denmark disqualify those in actual receipt of parish relief, while in Norway, apparently, receipt of parish relief at any time is a disqualification, which, however, may be removed by the recipient paying back the sums so received. In some countries, e.g. Brazil, the suffrage is refused to members of monastic orders, &c, under vows of obedience. Apart from those countries where a modicum of education is necessary as a test of right to the franchise, there are others where education is specially favoured in granting the franchise. In the United Kingdom the members of eight universities (Oxford, Cambridge, London, Dublin University, Glasgow, Edinburgh, Aberdeen and St Andrews) send nine members to parliament; in Hungary members of the professional, scientific, learned and other classes (over 80,000) are entitled to vote without any other qualification; in Brunswick the scientific classes elect three members to the legislative chamber; in Saxony, members of scientific or artistic professions have extra votes; in Italy, members of academies and professors are qualified to vote by their position; while in the Netherlands legal qualifications for any profession or employment give a vote.

Many objections have been urged of late years to the prin- ciple of according a plurality of votes to one individual on account of superior qualifications over others which he may be considered to possess. In the United Kingdom, where, roughly speaking, the principle of representation is that of taxation, the possession of qualifying property in any number of electoral districts will give a vote in each of those districts. Whether those votes can be actually registered will of course depend on certain circumstances, such as the distance of the districts apart and whether the elections are held on the same day or not. The Radical party in the United Kingdom have of late years been hostile to any system of plurality of votes (whether gained by educational, property orother qualifications), though it may be said that the tendency of some recent electoral systems has been to introduce a steadying principle of this nature. In 1906 a bill was introduced for reducing the system of plural voting in the United Kingdom; it passed through the House of Commons, but was rejected by the House of Lords. The most remarkable system of plural voting was that intro- duced

in Belgium by the electoral law of 1894. Under it, every citizen over thirty-five years of age with legitimate issue, and paving at least 5 francs a year in house tax, has a supple- mental vote, as has every citizen over twenty-five owning immovable property to the value of 2000 francs, or having a corresponding income from such property, or who for two years has derived at least 100 francs a year from Belgian funds either directly or through the savings bank. Two supple- mentary votes are given to citizens over twenty-five who have received a diploma of higher instruction, or a certificate of higher secondary instruction, or who fill or have filled offices, or engaged in private professional instruction, implying at least average higher instruction. Three votes is the highest number allowed, while failure to vote is punishable as a mis- demeanour. In 1908-9 the number of electors in Belgium was 1,651,647, of whom 981,866 had one vote, 378,264 two votes and 291,517 three votes. In some other countries weight is given to special qualifications. In the town of Bremen the government is in the hands of a senate of 16 members and a Convent of Burgesses (Burgerschaft) of 150 members. These laltcr are elected by the votes of all the citizens divided into classes. University men return 14 members, merchants 40 members, mechanics and manufacturers 20 members, and the other inhabitants the remainder. So in Brunswick and in Hamburg legislators are returned by voters representing various interests. In Prussia, representatives are chosen by direct electors who in their turn are elected by indirect electors. One direct elector is elected from every complete number of 250 souls. The indirect electors are divided into three classes,

the first class comprising those who pay the highest taxes to the amount of one-third of the whole; the second, of those who pay the next highest amount down to the limits of the second third; the third, of all the lowest taxed. In Italy electors must either have attained a certain standard of elementary education, or pay a certain amount of direct taxation, or if peasant farmers pay a certain amount of rent, or if occupants of lodgings, shops, &c, in towns, pay an annual rent according to the population of the commune. In Japan, voters must pay either land tax of a certain amount for not less than a year or direct taxes other than land tax for more than two years. In the Netherlands, householders, or those who have paid the rent of houses or lodgings for a certain period, are qualified for the franchise, as are owners or tenants of boats of not less than 24 tons capacity, as well as those who have been for a certain period in employment with an annual wage of not less than £22, 183. 4d., have a certificate of state interest of not less than 100 florins or a savings bank deposit of not less than 50 florins.

The method now adopted in most countries of recording votes is that of secret voting or ballot (q.v.). This is carried out sometimes by a machine

(see Voting Machines). The method of determining the successful candidate varies greatly in different countries. In the United Kingdom the candidate who obtains a relative majority is elected, i.e. it is necessary only to obtain more votes than any other candidate (see Representation) .

VOTING MACHINES. The complications in the voting at American elections have resulted in the invention of various machines for registering and counting the ballots. These machines are in fact mechanical Australian ballots. The necessity for them has been emphasized by election practice in many parts of the United States, where in a single election there have been from five to ten parties on the ballot, with an aggregate of four hundred or five hundred candidates, making the paper ballots large and difficult to handle. The objections to the paper ballet are further emphasized in the results ob- tained. The number of void and blank ballots is seldom less than 5 % of the number of voters voting, and is often as high as 40%. This lost vote is often greater than the majority of the successful candidate. In close elections there is an endless dispute as to whether the disputed ballots do or do not comply with the law. The election contest and recount expenses frequently exceed the cost of holding the election, and the title of the candidates to the office is frequently held in abeyance by a protracted contest until after the term of office has expired. A number of ways have been devised for marking the Australian ballot for identification without destroying its legality. The X is a very simple and well-known mark, yet in the case of Cmdehan v. White, before the Supreme Court of Maryland, twenty-seven different ways of making the mark " X " were shown in the ballots in controversy, and all of them were a subject for judicial consideration, on which the judges of even the highest court could find room for disagreement. Wigmore in his book on the Australian ballot, system points out thirteen ways of wrongly placing the mark, and forty-four errors in the style of the mark, besides many other errors tending to invalidate the ballot, all of them having frequently occurred in actual practice. These errors are not confined to the illiter- ates, but are just as common among the best-educated people. The ballots can and have frequently been altered or miscounted by unscrupulous election officers, and the detection of (he fraud is frequently difficult and always expensive.

Voting machines were devised first by English, and later with more success by American inventors. The earlier machines of Vassie, Chamberlain, Sydserff (1869) and Davie (1870) were practically all directed toward voting for the candidates of a single office by a ball, the ball going into one compart- ment or the other according to the choice of the voter. The use of the ball is in accordance with the original idea of ballot, which means ;: a little ball "; and because of the requirement of many of the constitutions of the states of the United States, that " elections shall be by ballot," many American inventors

follow this idea of using balls to indicate their votes. Others, however, maintaining that secrecy was the essential idea of voting by ballot, and that the form of the ballot was immaterial, worked on the idea of using a key and a counter for each candi- date, the counter registering the successive impulses given to it by the key, the machine preventing the voter from giving the key more than one impulse, and preventing the voter from operating more keys than he is entitled to vote. The highest courts of four different American states have ruled that any form of voting machine that secured secrecy would be con- stitutional.

The first voting machine used in an election was the Myers Ballot Machine used at Lockport, New York, in 1892. This machine had a vertical keyboard with columns of push keys thereon, each column representing a party, and each key belonging to a candidate of that party, the keys of each horizontal line belonging to the candi- dates of the various parties for a particular office. The voter pushed one of the knobs in each office line, which knob operated its counter and locked all other possible votes fcr the same office until the voter left the booth. The operated keys were released by the operation of the second boolh door as the voter left the machine, and they were then reset by springs. The doors were so arranged that the voter must first pass through one and lock it behind him before he could open the second one to get out. This both preserved secrecy and prevented repeating. Some sixty-five or more of these machines were used in the election in the city of Rochester, N.Y., in November 1896, and with marked success.

The McTammany Machine, operated by keys which punched holes in a web of paper. On this web the votes of each candidate were all punched in a single column, each separate column representing a separate candidate. The voter does not see the web, which is removed from the machine by the election officers after the election is over, and the vote thereon is canvassed by passing the web through a pneumatic counting machine. The paper web makes a separate record of each man's ballot that can be identified by a person skilled in the use of the machine. The machine is also slow in giving returns, due to the fact that the vote has to be counted after the election.

Tn other types of machines each candidate had a separate recep- tacle, into which the machine dropped a ball for each vote that was cast for the candidate. These machines have so far not been successful. The whole development of practical voting machines has been limited to those machines In which a separate counter is provided for each candidate, the

counter being operated either directly or indirectly by the voter. Of this type is the Myers machine, as well as the other machines mentioned here.

The Rardwell Votometer had a separate counter for each candi- date, with a single key for operating all the counters on the machine. A keyhole was provided in each counter, in which the key could be inserted, and by turning it 180° the counter was operated and the key could be removed for use in another counter. The voter could operate but one counter at a time, and could not operate the counters in very rapid succession. The limited use of this_ machine can be attributed principally to the slowness with which it can be worked. The voter enters this machine by raising a bar at one end, which unlocks the counters for voting operation. Raising a similar bar at the other end as the voter passes out resets the machine for the next voter and locks it.

The Abbott Machine has attained considerable use in the state of Michigan. In this machine the counters for each office are carried on a separate slide, and the voter moves these slides for the various offices from left to right, until the counter carrying the name of the candidate of his choice in each office row is lined up with the operat- ing bar. The vertical movement of the operating bar counts the vote on each of these slides, rings a bell, which notifies the election officer that a vote has been cast, and locks the machine against further voting. The election officer then moves a slide which resets the machine for the next voter. The machine is limited in its application because two or more candidates on the same office line cannot be voted for by the same voter, although the voter may be entitled to vote for more than one candidate.

The U.S. Standard Voting Machine has had the most extensive use of any. A separate key is provided for each candidate, which keys are "arranged on the keyboard of the machine in horizontal party rows and vertical office lines. Each key is shaped like a smal'l pointer, which extends to the right from its pivot, and passes through the keyboard. The key swings downward from horizontal position and points to the name of the candidate below it. Ihe kevs are lettered consecutively by party rows, and numbered by office rows, so that each key bears a number and a letter distinguish- ing it from all others. At the left of each party row is a party lever, by the movement of which all of the keys in that party row are simultaneously placed in voted position. In states that do not have party circles "on the ballot these levers are omitted. Extending outward from the top of the machine is a rail, from which is suspended a curtain. Pivoted in the middle of the top of the machine is a lever,

which extends outwardly and has a loose connexion with a curtain. The operation of the lever by a convenient handle enables the voter to close the

curtain and, unlock the machine for voting, after which the voter cannot retire from the machine until he has voted on the machine to a certain extent. The operation of any one of the party levers rings a bell to show that he has voted, and permits the reverse movement of the curtain lever, which counts the vote, resets the machine for the next voter and opens the curtain. Before opening the curtain the vote is not counted, and the voter can take back or change his vote. Repeating is prevented by a knob on the end of the machine, which locks the curtain lever against a second movement until it is released by the election officer. At the top of the machine is a paper roll on which the voter can write the names of candidates whose names do not appear on the machine in con- nexion with keys. This roll is concealed by slides, one for each office line of keys, which slides must be lifted to expose the paper. An interlocking mechanism controls all the voting devices so that the voter cannot vote more than he is entitled to vote. These machines have been built large enough to provide for seven parties of sixty candidates each, and for thirty questions and amendments, a machine of such size carrying 480 counters, besides the total vote and protective counters.

The Dean Machine has its keyboard placed horizontally, the keys being push buttons, which are arranged in party columns and transverse office rows. Party levers are provided by which the keys of the party are moved to voted position. Considerable stress is laid on the small keyboard of this machine, the peculiar type of counter used on it, and the separate card ballot for voting for unnominated candidates.

Each state that adopts voting machines first enacts a law specifying the requirements that must be met in the construc- tion of the machines. These requirements are substantially the same in all the states, the laws being copied largely from the New York Voting Machine Law. The laws require in general that the machine shall give the voter all the facilities for expressing his choice which the Australian ballot gives him, and further require that the machine shall prevent those mistakes or frauds, which if made on an Australian ballot would invalidate it.

Many of the states have special requirements, to meet which many ingenious features have been provided on the various machines. Among these is the group of 18 supervisors in San Francisco, for which office as many as 108 candidates have appeared upon one ballot, out of which the machine must permit the voter to vote any 18 and no more, regardless of the sequence in which they are selected, or the position in which they occur.

Another of these local features is the primary election feature required by Minnesota, in which state the various parties must hold their primary

election at the same time and on the same machine. The voter announcing the party of his'preference finds the voting devices on the machine of all other parties locked against him, but the voting devices of his own party are open to his use.

Still another is the lockout, by which the voter of limited voting franchises is prevented from voting for the candidates of certain offices. Another is the endorsed candidate in a group. Here the same candidate's name is provided with two or more voting devices in a group wherein the voter is allowed to vote for two or more candidates. Special provision must then be made to keep voters from voting twice for the same candidate.

As to the important benefits attending the use of machines, there can be mentioned accuracy both in the casting and the counting of the vote, speed in getting in returns, and economy in holding elections. The improvement in accuracy is shown by the fact that the vote for each office usually runs 99% or more of the highest possible vote that could be registered by the number of voters that have voted. Speed is shown by the fact that in the city of Buffalo, with 60,000 voters voting on election day, the complete returns, including the vote on over 100 candidates for the whole city, have been collected, tabulated and announced within 75 minutes from the closing of the polls. Economy is shown by the fact that although these machines are used but one or two days in each year, election expenses are reduced to such an extent that the machines pay for them- selves in five or six elections. This is partly due to the smaller number of precincts necessary and the smaller number of election officers in each precinct and the shorter hours that they must work. The city of Buffalo has a dozen or more precincts, in each of which Soo voters or more are voted in an election day of ten hours, and in that city as many as 104 1 voters have voted in one election day on one machine (F. Ke.)

VOTKINSK— VOW

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VOTKINSK, a town and iron-works, in the Russian govern- ment of Vyatka, 40 m. N. of Sarapul and 8 m. W. from the Kama, founded in 1756. Pop. 21,000. Votkinsk was formerly one of the chief government establishments for the construc- tion of steamers for the Caspian, as well as of locomotives for the Siberian railway, and it has long been renowned for its excellent tarantasses (driving vehicles) and other smaller iron-wares, as well as for its knitted goods. Its agricultural machinery is known throughout Russia.

VOUCHER (from " to vouch/' to warrant, answer for, 0. Fr. voucher, to

cite, call in aid, Lat. vocare, to call, summon), any document in writing which confirms the truth of accounts or estab- lishes other facts, more particularly a receipt or other evidence in writing which establishes the fact of the payment of money.

VOUET, SIMON (1590-1649), French painter, was born at Paris on the 9th of January 1590. He passed. many years in Italy, where he married, and established himself -at Rome, enjoying there a high reputation as a portrait painter. Louis XIII. recalled him to France and lodged him in the Louvre with the title of First Painter to the Crown. All royal work for the palaces of the Louvre and the Luxembourg was placed in his hands; the king became his pupil; he formed a large school, and renewed the traditions of that of Fcntainebleau. Among his scholars was the famous Le Brun. Vouet was an exceedingly skilful painter, especially in decoration, and executed important works of this class for Cardinal Richelieu (Rueil and Palais Royal) and other great nobles. His better easel pictures bear a curious resemblance to those of Sassoferrato. Almost everything he did was engraved by his sons-in-law Tortebat and Dorigny.

VOUSSOIR (Ger. W olbesiein) , the French term used by architects for the wedge-shaped stones or other material with which the arch (q.v.) is constructed; the lowest stone on each side is termed the springer (Fr. coussinet sommier) and the upper one at the crown of the arch the keystone (Fr. claveau).

VOW (Lat. votum, vow, promise: cf. Vote), a transaction between a man and a god. whereby the former undertakes in the future to render some service or gift to the god or devotes something valuable now and here to his use. The god on his part is reckoned to be going to grant or to have granted already some special favour to his votary in return for the promise made or service declared. Different formalities and ceremonies may in different religions attend the taking of a vow, but in all the wrath of heaven or of hell is visited upon one who breaks it. A vow has to be distinguished, firstly, from other and lower ways of persuading or constraining supernatural powers to give what man desires and to help him in time of need; and secondly, from the ordered ritual and regularly recurring ceremonies of religion. These two distinctions must be examined a little more at length.

It would be an abuse of language to apply the term vow to the uses of imitative magic, e.g. to the action of a barren woman among the Battas of Sumatra, who in order to become a mother makes a wooden image of a child and holds it in her lap. For in such rites no prominence is given to the idea — even if it exists— of a personal relation between the petitioner and the supernatural power. The latter is, so to speak, mechanically constrained to act by the spell or magical rite; the forces liberated in fulfilment, not of a

petition, but of a •wish are not those of a conscious will, and therefore no thanks are due from the wisher in case he is successful. The deities, however, to whom vows are made or discharged are already personal beings, capable of entering into contracts or covenants with man, of understanding the claims which his vow establishes on their benevolence, and of valuing his gratitude; conversely, in the taking of a vow the petitioner's piety and spiritual attitude have begun to outweigh those merely ritual details of the ceremony which in magical rites are all-important.

Sometimes the old magical usage survives side by side with the more developed idea of a personal power to be approached in prayer. For example, in the Maghrib (in North Africa), in time of drought the maidens of Mazouna carry every evening in pro-

cession through the streets a doll called ghonja, really a dressed- up wooden spoon, symbolizing a preTslamic rain spirit. Often one of the girls carries on her shoulders a sheep, and her com- panions sing the following words: — ■

" Rain, fall, and I will give you my kid. He has a 'black head, he neither bleats Nor complains; he says not, ' I am cold.' Rain, who fillest the skins, Wet our raiment. Rain, who feedest the rivers, Overturn the doors of our houses."

Here we have a sympathetic rain charm, combined with a prayer to the rain viewed as a personal goddess and with a promise or vow to give her the animal. The point of the promise lies of course in the fact that water is in that country stored and carried in sheep-skins. 1

Secondly, the vow is quite apart from established cults, and is not provided for in the religious calendar. The Roman vow {votum), as W. W, Fowler observes in his work The Roman Festivals (London, 1899), p. 346, " was the exception, not the rule; it was a promise made by an individual at some critical moment, not the ordered and recurring ritual of the family or the State." The vow, however, contained so large an elemejit of ordinary prayer that in the Greek language one and the same word (tvxh) expressed both. The characteristic mark of the vow, as Suidas in his lexicon and the Greek Church fathers remark, was that it was a promise either of things to be offered to God in the future and at once consecrated to Him in view of their being so offered, or of austerities to be undergone. For offering and austerity, sacrifice and suffering, are equally calculated to appease an offended deity's wrath or win his goodwill.

The Bible affords many examples of vows. Thus in Judges xi. Jephthah " vowed a vow unto the Lord, and said, If thou wilt indeed deliver the

children of Amnion into my hand, then it shall be that whosoever comcth forth out of the doors of my house to meet me, when I return in peace from the children of Amnion, it shall be the Lord's, and I will offer it up for a burnt-offering." In the sequel it is his own daughter who so meets him, and he sacrifices her after a respite of two months granted her in order to "bewail her virginity upon the mountains." A thing or person thus vowed to the deity became holy or taboo; and for it, as the above story indicates, nothing could be substituted. It belonged to once to the sanctuary or to the priests who re- presented the god. In the Jewish religion, the latter, under certain conditions, defined in Leviticus xxvii., could permit it to be redeemed. But to substitute an unclean for a clean beast which had been vowed, or an imperfect victim for a flawless one, was to court with certainty the divine displeasure.

It is often difficult to distinguish a vow from an oath. Thus in Acts xxiii. 21 , over forty Jews, enemies of Paul, bound themselves, under a curse, neither to eat nor to drink till they had slain him. In the Christian Fathers we hear of vows to abstain from flesh diet and wine. But of the abstentions observed by votaries, those which had relation to the barber's art were the commonest. Wherever individuals were concerned to create or confirm a tie connecting them with a god, a shrine or a particular religious circle, a hair-offering was in some form or other imperative. They began by polling their locks at the shrine and left them as a soul-token in charge of the god, and never polled them afresh until the vow was fulfilled. So Achilles consecrated his hair to the river Spercheus and vowed not to cut it till he should return safe from Troy; and the Hebrew Nazarite, whose strength resided in his flowing locks, only cut them off and burned them on the altar when the days of his vow were ended, and he could return to ordinary life, having achieved his mission. So in Acts xviii. iS Paul " had shorn his head in Cenchreae, for he had a vow." In Acts xxi. 23 we hear of four Jews who, having a vow on them, had their heads shaved at Paul's expense. Among the ancient Chatti, as Tacitus relates {Germania, 31) , young men allowed their hair and beards to grow, and vowed to court danger in that guise

*1 Professor A. Beli n paper Quelque rites pour oblenir la pluie, in xiv M * Congres des Qrientalistes (Alger, 1905).*

until they each had slain an enemy. Robertson Smith (Religion of the Semites, ed. iooi, p. 483) with much probability explains such usages from the "widespread primitive belief that a man's life lurks in his hair, so that

the devotee being consecrated or taboo to a god, his hair must be retained during the period of taboo or purification (as it is called in Acts xxi. 26) lest it be dissipated and profaned. The hair being part and parcel of the votary, its profanation would profane him and break the taboo. The same author remarks that this is why, when the hair of a Maori chief was cut, it was, being like the rest of his person sacred or taboo, collected and buried in a sacred place or hung on a tree. And we meet with the same scruple in the initiation rite, called oyyv- a > of Eastern monks. First, the novice is care- fully denuded of the clothes, shoes and headgear, which he wore in the world, and which, being profane or unclean, would violate the taboo about to be set on him. His hair is then polled cross- wise by way of consecrating it; and in some forms of the rite the presiding monk, called " the father of the hair," collects the shorn locks and deposits them under the altar or in some other safe and sacred place. Greek nuns used to keep the hair thus shorn off, weave it into girdles, and wear it for the rest of their lives round their waists, where close to their holy persons there was no risk of its being defiled by alien contact. The rest of this rite of ffxvˆ -! especially as it is preserved in the old Armenian versions, smacks no less of the most primitive taboo. For the novice, after being thus tonsured, advances to the altar holding a taper in either hand, just as tapers were tied to the horns of an animal victim; the new and sacred garb which is to demarcate him henceforth from the unclean world is put upon him, and the presiding father laying his right hand upon him devotes him with a prayer which begins thus: —

" To thee, O Lord, as a rational whole burnt-offering, as mystic frankincense, as voluntary homage and worship, we offer up this thy servant N. or M."

From the same point of view is to be explained the prohibition to one under a vow of flesh diet and fermented drinks; for it was believed that by partaking of these a man might introduce into his body the unclean spirits which inhabited them — the brute soul which infested meat, especially when the animal was strangled, and the cardiac demon, as the Rabbis called it, which harboured in wine.

The same considerations help to explain the custom of votive offerings. Any popular shrine in Latin countries is hung with wax models of limbs that have been healed, of ships saved from wreck, or with pictures representing the votary's escape from perils by land and sea. So Cicero (de Deorum Natura, iii. 37) relates how a friend remarked to Diagoras the Atheist when they reached Samothrace: " You who say that the gods neglect men's affairs, do you not perceive from the many pictures how many have escaped the force of the tempest and reached harbour safely." Diagoras's answer, that the many more who had suffered shipwreck and perished had

no pictures to record their fate does not concern us here. It is only pertinent to remark that these volivae tabettae and offerings may have had originally another significance than that of merely recording the" votary's salvation and of marking his gratitude. The model ship may be a substitute for the entire ship which is become sacred to the god, but cannot be deposited in the shrine; the miniature limbs of wax are substitutes for the real limbs which now belong to the god. In other cases the very objects which are taboo are given to the god as when a sailor deposits his salt-stained suit before the idol.

The general idea, then, involved in vows, whether ancient or modern, is that to express which the modern anthropologist borrows the Polynesian word taboo. The votary desirous to " antedate his future act of service and make its efficacy begin at once," 1 formally dedicates through spoken formula and ritual act a lifeless object such as a ring, an animal, his hair or his entire person to the god. He so either makes sure of future blessings, or shows gratitude for those already conferred. Most of the ritual prescriptions that accompany vows are intended 1 Religion of the Semites, Lect.ix.

to guard inviolate the sanctity or taboo, the atmosphere of holiness or ritual purity, which envelops the persons or objects vowed or reserved to the god, and thereby separated from ordinary secular use.

The consideration of the moral effect of vows upon those who take them belongs rather to the history of Christian asceticism. It may, however, be remarked here that monkish vows, w r hile they may lend to a man's life a certain fixity of aim and moral intensity, nevertheless tend to narrow his interests, and paralyse his wider activities and sympathies. In particular a monk binds himself to a lifelong and often morbid struggle against the order of nature; and motives become for him not good or bad according to the place they occupy in the living context of social life, but according as they bear upon an abstract and useless ideal. (F. C. C.)

VOZNESENSK, a town of Russia, in the government of Kherson, on the left bank of the river Bug, at the head of navigation, 55 m. N.W. from Nikolayev, to which steamers ply regularly. Pop. 14,178. It is a river port of some im- portance, and holds four large fairs annually. It contains a cathedral, a public garden and distilleries and breweries.

VRANCX, SEBASTIAN, born about 1572, was a painter of the Antwerp school, of very moderate ability. Most of his pictures represent scenes of war, such as the sack of towns, cavalry combats and the like. Though occasionally vigorous in drawing, his paintings are dull and heavy in tone. The date of his death is uncertain.

VRANYA, or Vkanye, the most southerly town of the kingdom of Servia, 7J m. from the Macedonian frontier, on a slope descending from Mount Placevitza to the plain of the Upper Morava, in a picturesque and fertile country. Pop. (1900) 11,921. In the- Russo-Turkish War of 1877 it was captured by the Servian army from the Turks, and subsequently was incorporated in the kingdom. It is the capital of a depart- ment of the same name, and is an important station on the railway from Nish to Salonica, with a custom house, prin- cipally for merchandise imported into Servia via Salonica. Its inhabitants are employed chiefly in the cultivation of flax and hemp, and in the making of ropes. There is a much frequented summer resort 4ˆ m. E., called Vranyska Banya, with baths of hot sulphurous mineral water.

VRATZA, the capital of the department of Vratza, Bulgaria, on the northern slope of the Stara Planina and on a small subtributary of the Danube. Pop. (1006) 14,832. Vratza is an archiepiscopal see and the headquarters of a military division. Wine, leather and gold and silver filigree are manu- factured, and there is a school of sericulture.

VRIENDT, JULIAEN JOSEPH DE (1S42-), and AL- BRECHT FRANCOIS LIEVEN DE (1843-1900), Belgian painters, both born at Ghent, sons of a decorative painter. The two brothers were close friends, and their works show marked signs of resemblance. Having received their early training from their father at Ghent, they removed to Antwerp, where they soon yielded to the influence of the painter Baron Henri Leys. Albrecht became director of the Academy of Fine Arts at Antwerp and was succeeded by his brother. Albrecht's principal works are " Jacqueline of Bavaria imploring Philip the Good to pardon her Husband " (1871, Liege Gallery), " The Excommunication of Bouchard d'Avesnes " (1877, Brussels Gallery), " The Angelus " (1877, acquired by Leopold II., king of the Belgians), " Pope Paul III. before Luther's Portrait " O883, Antwerp Gallery), " The Citizens of Ghent paying homage to the child Charles V." (1885, Brussels Gallery), " Philip the Handsome swearing fidelity to the privileges of the Town of Fumes " (1893, Fumes town hall), " The Virgin of St Luc " (1894, triptych in Antwerp Cathedral), and the decoration of the municipal hall at Bruges, which was completed by his brother. Among Juliaen's more notable works are " The Citizens of Eisenach driving out St Elizabeth of Hungary " (1871, Liege Gallery), " Jairus's Daughter " (1888, Antwerp Gallery), mural paintings in the Palais de Justice at Antwerp (1893), and " The Christmas Carol " (1894, Brussels Gallery).

VRYHEID, a town of northern Natal, 291 m. by rail N. by W. of Durban. Pop. (1904) 2287, of whom r344 were whites. It is the chief town of a district, of the same name, rich in mineral wealth, including copper, coal and gold. The coal- fields of Hlobanc are S.E. of the town. Originally part of Zululand the district of Vryheid was ceded by Dinizulu to a party of Boers under Lucas Meyer, who aided him to crush his opponents, and was proclaimed an independent state under the title of the New Republic in 1884. In 1888 it was incor- porated with the Transvaal and in 1903 annexed to Natal (see Transvaal, § History; and Zululand, § History).

V-SHAPED DEPRESSION, in meteorology, a narrow area of low pressure usually occurring between two adjacent anti- cyclones, and taking the form of a V or tongue, as do the isobars representing it on a weather-chart. Such a depression may be regarded as a projection from a cyclonic system lying to one side of the two anticyclones. A similar depression, however, is frequently formed within a larger area of depression, i.e. an ordinary cyclone, and sometimes develops so far as to have a complete circulation of its own; it is then known as a " secondary." The line of lowest depression following the axis' of the V brings with it heavy squalls and a sudden change of wind from one direction almost to the opposite. It is pre- ceded by signs of break in the weather such as usually herald the approach of an ordinary cyclone, and is followed by the usual signs of clearance. The occurrence of a V-depression or secondary within an ordinary cyclonic system intensifies, often to a dangerous degree, the usual disturbances in the weather accompanying that system. Conditions exactly opposite to those accompanying a V-shaped depression are provided by a " wedge " (q.v.).

VULCAN (Volcanus), the Roman god of fire, and more especi- ally of devouring flame (Virg. Aen. 5. 662). Whether he was also, like Hephaestus, the deity of smiths, is very doubtful; his surname Mulciber may rather be referred to his power to allay conflagrations. In the Comitium was an " area Volcani," also called " Volcanal "; and here on the 23rd of August (Volcanalia) the Flamen Volcanalis sacrificed, and the heads of Roman families threw into the fire small fish, which the Tiber fishermen sold on the spot. This flamen also sacrificed on the 1st of May to Maia, who in an old prayer formula (Gellius 13. 23} was coupled with Volcanus as Maia Volcani. It is not easy to explain these survivals of an old cult. But in historical times the association of this god with conflagrations becomes very apparent; when Augustus organised the city in regiones and vici to check the constant danger from fireSj the magislri vicorum (officers of administrative districts) worshipped him as Volcanus quietus augustus (C.I.L. vi. 801 and 802) and on the 23rd of August there was a sacrifice to him together with Ops Opifera and the Nymphae, which suggests the need of water in quenching the flames. At Ostia, where much

of the corn was stored which fed the Roman population, the cult of this god became famous; and it is probable that the fixing of his festival in August by the early Romans had some reference to the danger to the newly harvested corn from fire in that month. (W. W. F.)*

VULGATE (from Lat. vulgus, the common people), a Latin version of the Bible prepared in the 4th century by St Jerome, and so called from its common use in the Roman Catholic Church (see Bible: Texts and Versions). Pius X. in 1908 en- trusted to the Benedictine Order the task of revising the text, beginning with the Old Testament.

VULPECULA ET ANSER ("The Fox and Goose"), in astro- nomy, a modern constellation of the northern hemisphere, introduced by Hevelius, who catalogued twenty-seven stars. Interest is attached to Nova Vulpeculae, a " new " star dis- covered by Anthelm in 1670; T Vulpeculae, a short period variable; and the famous " Dumb-bell " nebula.

VULP1US, CHRISTIAN AUGUST ˆ762-1827), German author, was born at Weimar on the 23rd of January r762, and was educated at Jena and Erlangen. In 1750 he returned to Weimar, where Goethe, who had entered into relations with Vulpius's

sister Christine ˆ765-1816), whom he afterwards married, ob- tained employment for him. Here Vulpius began, in imita- tion of Christian Heinrich Spiess, to write a series of romantic narratives. Of these (about sixty in number) his Rinaldo Rinaldini (1797), the scene of which is laid in Italy during the middle ages, is the best. In 1797 Vulpius was given an appoint- ment on the Weimar library, of which he became chief librarian in 1806. He died at Weimar on the 25th of June 1827.

VULTURE, the name of certain birds whose best-known characteristic is that of feeding upon carcases. The genus Vultur, as instituted by Linnaeus, is now restricted by ornith- ologists to a single species, V. monachus. The other species included therein by him, or thereto referred by succeeding systematists, being elsewhere relegated (see Lammergeyek). A most important taxonomic change was introduced by T. H. Huxley (Proc. Zool. Society, 1867, pp. 462-64), who pointed out the complete structural difference between the vultures of the New World and those of the Old, regarding the former as constituting a distinct family, Cathartidae (which, however, would be more properly named Sarcorhamphidae), while he united the latter with the ordinary diurnal birds of prey as Gypaetidae.

The American vulture may be said to include four genera: (1) Sarcorhamphus, the gigantic condor, the male distinguished by a large fleshy comb and wattle; (2) Gypagus, the king- vulture, with its gaudily coloured head and nasal caruncle;

King-Vulture (Gypagus papa).

(3) Caiharista, containing the so-called turkey-buzzard with its allies; and (4) Pseudogryphus, the great Californian vulture — of very limited range on the western slopes of North America. Though all these birds are structurally different from the true vultures of the Old World, in habits the Vulturidae and Sarco- rhamphidae are much alike.

The true vultures of the Old World, Vulturidae in the re- stricted sense, are generally divided into five or six genera, of which Neophron has been separated as forming a distinct subfamily, Neophroninae — its members, of comparatively small size, differing both in structure and habit considerably from the rest. One of them is the so-called Egyptian vulture or Pharaoh's hen, N. percnopterus, a remarkably foul-feeding species, living much on ordure. It is a well-known species in some parts of India, 1 and thence westward to Africa, where

1 In the eastern part of the Indian peninsula it is replaced by a smaller race or (according to some authorities) species, N. ginginianus, which has a

yellow instead of a black bill.

it has an extensive range. It also occurs .on the northern shores of the Mediterranean, and has strayed to such a distance as to have suffered capture in England and even in Norway. Of the genera composing the other subfamily, Vulturinae, Gyps numbers seven or eight local species and races, on more than one of which the English name griffon has been fastened. The best known is G. fulvus, which by some authors is accounted " British " from an example having been taken in Ireland, chough under circumstances which suggest its appearance so car from its nearest home in Spain to be due to man's inter- vention. The species, however, has a wider distribution on the European continent (especially towards the north-east) than the Egyptian vulture, and in Africa nearly reaches the Equator, extending also in Asia to the Himalaya; but both in the Ethiopian and Indian regions its range inosculates with that of several allied forms or species. Pseudogyps with two forms — one Indian, the other African — differs from Gyps by having iz instead of 14 rectnees. Of the genera Otogyps and Lophogyps nothing here need be said; and then we have Vttltur, with, as mentioned before, its sole representative, V. monachus, commonly known as the cinereous vulture, a bird which is found from the Straits of Gibraltar to the sea- coast of China. Almost all these birds inhabit rocky cliffs, on the ledges of which they build their nests.

The question whether vultures in their search for food are guided by sight of the object or by its scent has excited much interest. It seems to be now generally admitted that the sense of sight is in almost every case sufficient to account for the observed facts. (A.N.)

VURJEEVANDAS MADHOWDAS (1817-1896), Hindu mer- chant of Bombay, of the Kapole Bania caste, was born on the 28th of January 181 7 at Gogla, in Kathiawar, whence his father came to Bombay with Sheth Manoredas for trading purposes. Vur- jeevandas was educated in Bombay, started a new firm under the name of Vurjeevandas & Sons, and soon became one of the wealthiest merchants in Bombay. He was appointed a justice of the peace and a member of the Bombay Port Trust. He took a keen interest in the Royal AsiaLic Society and the Bombay university, where a prize has been established to commemorate his name. He constructed the Madhow Bang in memory of his father, and gave it to the use of poor Hindus, endowing it with nearly five lakhs of rupees. He built a rest-house in Bombay in memory of his brother Mooljibhoy, and another one at Nasik. The sanatorium which he built in memory of his youngest son

Rumhoredas at Sion Hill is a great boon to the poor people of his community. He also established a dispensary at Matoonga and a fund for the relief of indigent Hindus. He died on the 12th of January 1896.

VYATKA, or Viatka, a government of N.E. Russia, with the government of Vologda on the N., Perm on the E., Ufa and Kazan on- the S. and Nizhniy-Novgorod and Kostroma on the W., having an area of 59,100 sq. m. It has on its northern boundary the flat water-parting which separates the basins of the Northern Dvina and the Volga, and its surface is an undulat- ing plateau 800 to 1400 ft. above sea-level, deeply grooved by rivers and assuming a hilly aspect on their banks. The Kama rises in the N.E., and, after making a wide sweep through Perm, flows along its S.E. boundary, while the rest of the government is drained by the Vyatka and its numerous tributaries. Both the Kama and the Vyatka are navigable, as also are several tributaries; the Izh and Votka, which flow into the Vyatka, have important ironworks on their banks. The only railway is one from Perm to Archangel, through the town of Vyatka; the government is traversed by the great highway to Siberia, and by two other roads by which goods from the south are transported to loading-places on the Vychegda and the Yug to be shipped to Archangel. Lakes are numerous, and vast marshes exist everywhere, especially in the north. The climate is very severe, the average yearly temperature being 36 F. at Vyatka (January, 8-2°; July, 67-0°) and $f at Slobodsk (January, 3-5°; July, 65-3°)-

The estimated pop. in 1906 was 3,532,600. The bulk of

the inhabitants (78 %) are Russians; Votyaks make 12-2 %> Cheremisses 5 %, and Tatars 3! %, the remainder being Bashkirs, Teptyars and Pcrmyaks. The Votyaks (Otyaks), a Finnish tribe, call Ihemselves Ot, Ut or Ud, and the Tatars call them Ar, so that they may possibly be akin to the Ars of the Yenisei. They are middle-sized, with fair hair and eyes, often red-haired; and the general structure of the face and skull is Finnish. By their dialect thev belong to the same branch as the Permyaks.

The government is divided into eleven districts, the chief towns of which are Vyatka, Elabuga, Glazov, Kotelnich, Malmyzh, Nolinsk, Orlov, Sarapul, Slobodsk, Urzhum and Yaransk. Izhevsk and Votkinsk, or Kamsko-Votkinsk, have important ironworks. Some 55% of the surface is covered with forests, two-thirds of which belong to the crown, and hunting (especially squirrel-hunting) and fishing are of commercial importance. The peasants, who form 89% of the population, own 44% of the whole government, the crown 53% and private persons 2%. The soil is fertile, especially in the valleys of the south. Vvatka is one of the chief grain-producing governments of Russia. The principal crops are rye, wheat, oats, barley and potatoes. Flax and hemp are extensively cultivated, and large

numbers of cattle are kept, but they are mostly of inferior breed. The government has a race of good ponies that are widely exported. Domestic industries occupy large numbers of the inhabitants. The principal manufacturing establishments are tanneries, distilleries, ironworks, chemical works, glass factories, cotton and steam flour-mills, and hardware, machinery, paper and fur-dressing works. (P. A. K. ; J. T. Be.)

VYATKA, a town of Russia, capital of the government of the same name, on the Vyatka river, 304 m. by rail W.N.W. of Perm. Pop. 24,782. It is built on the steep hills which rise above the river and at their base. Its old walls have been demolished, and its old churches built anew. It is an episcopal see and has a fine cathedral. Its manufactures include silver and copper wares, and ecclesiastical ornaments, and it has an important trade in corn, leather, tallow, candles, soap, wax, paper and furs (exported), and in manufactured and grocery wares (imported). Vyatka was founded in 1181 by the Novgorodians, as Khlynov. In 1391 it was plundered by the Tatars, and again in 1477. Moscow annexed Khlynov in 1489. It received the name of Vyatka in 1780,

VYAZMA, a town of Russia, in the government of Smolensk, 109 m: by rail E.N.E. of the town of Smolensk. Pop. 15,676. It was a populous place as early as the nth century, and carried on a lively trade with Narva on the Gulf of Finland. In the 15th century it fell under the dominion of Lithuania, but was retaken by the Russians. The Poles took it again in 1611, and kept it till the peace of 1634. It is now an important centre for trade. It has a cathedral, dating from 1596.

VYERNYI (formerly Almaty), a town and fort of Asiatic Russia, capital of the province of Semiryechensk, 50 m. N. of Lake Issyk-kul, at the northern foot of the Trans-Ili Ala-tau Mountains, at an altitude of 2440 ft. Pop. 24,798. Founded in 1854, it is well-built, provided with boulevards and sur- rounded by luxuriant gardens. It has a cathedral, being an archiepiscopal see of the Orthodox Greek Church, a school of gardening and sericulture, a public library, and a few distilleries, tanneries and oil works. Situated at the intersection of two roads — from Kulja to Tashkent, and from Semipalatinsk to Kashgar — Vyernyi carries on an active trade in wheat, rice, corn, tea, oil and tobacco. It was the centre of a remarkable earthquake on the 9th of June 1887.

VYRNWY (Fyrnwy), an artificial lake or reservoir in the north- west of Montgomeryshire, N. Wales, constructed for the Liver- pool water-supply. It was formed by damming the river Vyrnwy, which runs through Montgomeryshire and joins the Severn above Shrewsbury (see Water-Supply).

VYSHNIY-VOLOCHOK, a town of Russia, in the government of Tver, 74 m. by rail N.W. of the city of Tver. Pop. 16,722. The place owes its importance to its situation in the centre of the Vyshne-Volotsk navigation system (540 m. long, constructed by Peter the Great in 1703-9), which connects the upper Volga with the Neva. The portage (volok) is less than 17 m. between the Tvertsa, a tributary of the Volga, and the Tsna, which flows into the Msta and the Volkhov (Lake Ladoga) ; but boats now prefer the Mariinsk system.

W— WAAGEN, G. F.

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Wthe twenty-third letter of the English alphabet, shows its origin in its name; it is but VV, and, as the name shows, V had the vowel value of u, while the " double « " was employed for the consonant value. In German the same symbol w is called Vey, because in that language it has the value of the English v, while the German v (Vau, fow in pronunciation) is used with the same value as/. In the English of the 9th century the uu of the old texts (and the u of the Northern) was found not to repre- sent the English w satisfactorily, and a symbol J> was adopted from the Runic alphabet. This survived sporadically as late as the end of the 13th century, but long before that had been generally again replaced by uu (ro only in Early Middle English) and by w. For w the earliest English printers had a type, but French printers had not; hence a book like the Roman Catholic version of the New Testament printed at Rheims in 1582 prints w with two s's set side by side. Throughout the history of English the sound seems to have remained the same — the consonantal u. For this value as well as for u Latin always used only V; in Greek, except in a few dialects, the consonant value was early lost (see under F). W is produced by leaving a very small opening between the slightly protruded lips while the back of the tongue is raised towards the soft palate and the nasal passage closed. The ordinary w is voiced, but according to some authorities the w in the combination w h (really kw) is not, in when, what, &c, even when the h is no longer audible. The combination WH (hw) represents the Indo-European q when changed according to Grimm's law from a stop to a spirant. Thus what corresponds philologically to the Latin quod and the first syllable of the Greek 7roS-a7r6s. In Southern English the h sound has now been generally dropped. In Scotland, along the line of former contact with Gaelic, it changes into /: Jlte = white, fori = whorl; but before i (ee) it remains in wheel. In Early English a> appeared not only before r as in write, but also before I in wlisp (lisp). In write, wring, &c, the w is now silent, though dialectically, e.g. in Aberdeenshire, it has changed to v and is still pronounced, vreel, vring, &c. In English and in other languages there is considerable difficulty in pronouncing w before long u sounds: hence it has disappeared in*

pronunciation in two (tu), but survives in Scotch Iwa, though otherwise the difficulty is more noticeable in Scottish dialects than in literary English, as in " 00 ' f = wool and in the Scottish pronunciation of English words like wood as 'ood. (P. Gi.)

WA, a wild tribe inhabiting the north-east frontier of Upper Burma. Their country lies to the east of the Northern Shan States, between the Salween river and the state of Keng-Tung, extending for about too m. along the Salween and for consider- ably less than half that distance inland to the watershed between that river and the Mekong. The boundaries may be roughly said to be the Salween on the W., the ridge over the Namting valley on the N., the hills E. of the Nam Hka on the eastern and southern sides, while the country ends in a point formed by the junction of the Nam Hka with the Salween. The Was claim to have inhabited the country where they now are since the beginning of time; but it appears more probable that they were the aborigines of the greater part of northern Siam at least, if not of Indo-China, since old records and travellers (e.g. Captain McLeod in 1S37) speak of their having been the original inhabitants with small communities left behind from Keng Tung down to Chiengmai; while the state of Keng Tung, just S.E. of the Wa country, has still scattered villages of Was and traditions that they were once spread all over the country. Their fortified village sites too are still to be found covered over with jungle. The people are short and dark-featured, with negritic features, and some believe that they are allied to the Andamanese and the Selungs inhabiting the islands of the Mergui archipelago, who have beendrivenback, or retreated, northwards to the wild country they now inhabit;

but their language proves them to belong to the Mon-Khmer family. They are popularly divided into Wild Was and Tame Was. The Wild Was are remarkable as the best authenticated instance of head-hunters in the British Empire. They were formerly supposed to be also cannibals; but it is now known that they are not habitual cannibals, though it is possible that • human flesh may be eaten as a religious function at the annual harvest feast. Their head-hunting habits have an animistic basis. In the opinion of the Wa the ghost of a dead man goes with his skull and hangs about its neighbourhood, and so many skulls posted up outside his village gate mean so many watch- dog umbrae attached to the village, jealous of theirown preserves and intolerant of interlopers from the invisible world. Thus every addition to the collection of skulls is an additional safe- guard against ill-affected demons, and a head-hunting expedition is not undertaken, as was once thought, from motives of cannibal- ism or revenge, but solely to secure the very latest thing in charms as a protection against the powers of darkness. Outside every village is an avenue of human skulls, amid groves con- spicuous from long distances. These consist of strips of the primeval jungle, huge forest trees left standing where all the remaining country is

cleared for cultivation. The undergrowth is usually cut away, and these avenues are commonly but not always in deep shade. Along one side (which side apparently does not matter) is a line of posts with skulls fitted into niches facing towards the path. The niche is cut sometimes in front, sometimes in the back of the post. In the latter case th&re is a round hole in front, through which sometimes only the teeth and empty eye-sockets, sometimes the whole skull, grins a ghastly smile. Most villages count their heads by tens or twenties, but some of them have hundreds, especially when the grove lies between several large villages, who combine or run their collections into one another. The largest known avenue is that between Hsting Ramang and Hsan Htung. Here there must be a couple of hundred or more skulls; but it is not certain that even this is the largest. It is thought necessary to add some skulls to this pathway every year if the crops arc to be good. The heads of distinguished and pious men and of strangers are the most efficacious. The head-hunting season lasts through March and April, and it is when the Wa hill fields are being got ready for planting that the roads in the vicinity become dangerous to the neighbouring Shans. The little that is known of the practice seems to hint at the fact that the victim selected was primarily a harvest victim. A Wild Wa village is a very formid- able place to attack, except for civilized weapons of offence. All the villages are perched high up on the slope of the hills, usually on a knoll or spine-like spur, or on a narrow ravine near the crest of the ridge. The only entrance is through a long tunnel. There is sometimes only one, though usually there are two, at opposite sides of the village. This tunnelled way is a few inches over 5 ft. high and not quite so wide, so that two persons cannot pass freely in it, and it sometimes winds slightly, so that a gun cannot be fired up it; moreover, the path is frequently studded with pegs in a sort of dice arrangement, to prevent a rush. None of the tunnels is less than 30 yds. long, and some are as much as 100 yds. Round each village is carried an earthen rampart, 6 to 8 ft. high and as many thick, and this is overgrown with a dense covering of shrubs, thin bushes and cactuses, so as to be quite impenetrable. Outside this is a deep ditch which would effectually stop a rush. These preparations indicate the character of the inhabitants, which is so savage and suspicious that the Wa country is still unadministered and naturally does not appear in the 1001 census returns. The total number of the Wa race is estimated at more than 50,000. (J. G. Sc.)

WAAGEN, GUSTAV FRIEDRICH (1704-1868), ‘ German art historian, was born in Hamburg, the son of a painter and nephew of the poet Ludwig Tieck. Having passed through the college

of Hirschberg, he volunteered for service in the Napoleonic campaign of 1813-1814, and on his return attended the lectures at Breslau University. He devoted himself to the study of art, which he pursued in the great European galleries, first in Ger- many, then in Holland and Italy. A pamphlet on the brothers Van Eyck led to his appointment to the directorship of the newly founded Berlin Museum in 1832. The result of a journey to London and Paris was an important publication in three volumes, Kunslwerke und Kiinstler in England und Paris (Berlin, r837~ 1839), which became the basis for his more important The Treasures of Art in Great Britain (London, 1854 and 1857). In 1844 he was appointed professor of art history at the Berlin University, and in 1861 he was called to St Petersburg as adviser in the arranging and naming of the pictures in the imperial collection. On his return he published a book on the Hermitage collection (Munich, 1864). Among his other publications are some essays on Rubens, Mantegna and Signorelli; Kunslwerke und Kiinstler in Deutschland and Die vornehmslen Kunstdcikmaler in Wien, He died on a visit to Copenhagen in 1868. In the light of more recent research his writings are not of much value as regards trustworthy criticism, though they are useful as catalogues of art treasures in private collections at the time when they were compiled. His opinions were greatly respected in England, where he was invited to give evidence before the royal commission inquiring into the condition and future of the National Gallery.

WAAGEN, WILHELM HEINRICH (1841-ˆ00), German palaeontologist, was born at Munich on the 23rd of June 1841. He was educated at Munich and Zurich, and through the influence of A, Oppel he commenced to study the rocks and fossils of the Jurassic system, and published an essay in 1865, Versuch einer Allgemeinen Classification der Schichlen des oberen Jura. In 1870 he joined the staff of the Geological Survey of India, and was appointed palaeontologist in 1874, but was obliged to retire through ill-health in 1875. He published important monographs in the Palaeontologia Indica on the palaeontology of Cutch (1873- 1876) and the Salt Range (1879-1883), dealing in the last-named work "vith fossils from the Lower Cambrian to the Trias. In 1879 he was appointed professor of mineralogy and geology in the German technical high school at Prague, and he became a contributor to the continuation of Barrande's great work on the Systeme Silurien de Bohemc. In 1890 he became professor of palaeontology at- the university of Vienna, and in 1898 the Lyell medal was awarded to him by the Geological Society of London. He died in Vienna on the 24th of March r9oo.

WABASH, a city and the county-seat of Wabash county, Indiana, U.S.A., about 42 m. S.W. of Fort Wayne. Pop. (1890) 5105, (1900) 86r8, of whom 498 were foreign-born and 134 negroes; (1910 U.S. census) 8687. It is served by the Cleveland, Cincinnati, Chicago & St Louis railway

(which has extensive shops here), by the Wabash railway, and by interurban electric lines. It has a public library, a Memorial Hall (1897), erected to the memory of Federal soldiers in the Civil War and occupied by the local " camp " of the Grand Army of the Republic, a Masonic temple, a county hospital and two parks. The city is in a fertile agricultural region, and has a considerable trade in grain and produce. Among its manufactures are furniture, agricultural implements and foundry and machine-shop products. In 1905 the factory products were valued at $2,202,932 (31-2 % more than in 1900). Wabash was settled about 1834, in- corporated as a village in r854, and first chartered as a city in 1866. It was one of the first cities in the world to be lighted with electricity, a lighting plant being established in February 1880.

WACE, HENRY (1836-), English divine, was born in London on the 10th of December 1836, and educated at Marl- borough, Rugby, King's College, London, and Brasenose College, Oxford. He was ordained in the Church of England in 1861, and held various curacies in London, heing chaplain at Lincoln's Inn in t872 and preacher in t88o. From 1875 to 1896 he was prominently connected with King's College, London, where he

was professor of ecclesiastical history, and subsequently (1883) principal. Both as preacher and writer Dr Wace, who took his D.D. degree in 1883, became conspicuous in the theological world. He was Boyle lecturer in 1874 and 1875, and Bampton lecturer in 1879; and besides publishing several volumes of sermons, he was co-editor of the Dictionary of Christian Biography (1877-1887), and editor of The Speaker's Commentary on the Apocrypha. He took a leading part as the champion of historic orthodoxy in the controversies with contemporary Rationalism in all its forms, and firmly upheld the importance of denomi- national education and of the religious test at King's College; and when the test was abolished in 1902 he resigned his seat on the council. In 1881 he was given a prebendal stall at St Paul's, and in 1889 was appointed a chaplain-in-ordinary to Queen Victoria. When he resigned the principalship of King's College in 1896 he was made rector of St Michael's, Cornhill; and in 1903 he became dean of Canterbury, in succession to Dr Farrar.

WACE, (?) ROBERT (iioo?-ii75?), Anglo-Norman chronicler, was born in Jersey. He studied at Caen; he became personally known to Henry I., Henry II., and the latter's eldest son, Prince Henry; from Henry II. he received a prebend at Bayeux and other gifts. Except for these facts he is known to us only as the author of two metrical chronicles in the Norman-French lan- guage. Of these the earlier in date is the Roman de Brut, com- pleted in 115.5, which is said to have been dedicated to Eleanor of Aquitaine (ed. A. J. V. Le Roux de Lincy, 2 vols., Rouen, 1836-1838). This is a free version of the Latin Historia Britonum. by Geoffrey of

Monmouth, in rhyming octosyllables; it was rendered into English, shortly after 1200, by Layamon, a mass- priest of Worcestershire, and is also largely used in the rhymed English chronicle of Robert Mannyng. Wace's second work, the Roman de Rou, written between r r6o and 1 1 74, has a less fabulous character than the Brut, being a chronicle of the Norman dukes from Rollo to Robert Curthose. It has been ably dissected by Gustav Korting (tiber die Quellen des Roman de Rou, Leipzig, r867), who shows that it is mainly based upon Dudo and William of JumiSges. There is also reason for thinking that Wace used the Gesta regum of William of Malmesbury. Where Wace follows no ascertainable source he must be used with caution. Un- doubtedly he used oral tradition; but he also seems to have given free play to his imagination.

The Roman de Rou is written in rhyming octosyllables, varied by assonanced alexandrines. It has been edited by F. Pluquet (2 vols. and supplement, Rouen, 1827—1829) and more completely by H. Andresen (2 vols., Heilbronn, 1877-1879). (H. W. C. D.)

WACHSMUTH, CHARLES (1829-1896), American palaeonto- logist, was born in Hanover, Germany, on the 13th of September r829. Educated as a lawyer in his native city, he abandoned the profession on account of ill-health, and in 1852 went to New York as agent for a Hamburg shipping house. Two years later, for reasons of health, he removed to Burlington, Iowa, U.S.A., where he settled. Here he was attracted by the fossils, and especially the crinoids, of the Burlington Limestone, and in a few years possessed a fine collection. In 1864 he made acquaint- ance with L. Agassiz, and in the following year paid a visit to Europe, where he studied the crinoids in the British Museum and other famous collections. He now decided to devote all his energies to the elucidation of the crinoidea, and with signal success. He made further extensive collections, and supplied specimens to the Agassiz museum at Cambridge, U.S.A., and the British Museum. Becoming acquainted with Frank Springer (1848-), a lawyer at Burlington, he stirred up his enthusiasm in the subject, and together they continued the study of crinoids and published a series of important papers. These include " Discovery of the Ventral Structure of Taxocrinus and Haplocrinus, and Conse- quent Modifications in the Classification of the Crinoidea " {Proc. Acad. Nat. Sci., Philadelphia, 1889); " The Perisomic Plates of the Crinoids " (Ibid., 1891); and a monograph on " The North American Crinoidea Camerata," published, after the death of Wacbsmuth, in the Memoirs of the Museum of Comparative Zoology at Harvard (1897). Of this last-named work a detailed

review and analysis was published by F. A. Bather, of the British

Museum, in the Geol. Mag. for 1898-1899. Wachsmuth died on the 7th of February 1896.

Obituary (with portrait) by F. A. Bather, Geol. Mag. (April 1896).

WACO, a city and the county-seat of McLennan county, Texas, nearly in the centre of the state, on both sides of the Brazos river, about 100 m. S. by W. of Dallas. Pop. (1890) 14,445; (1900) 20,686, of whom 5826 were negroes; (1910 census) 26,425. Waco is served by the Missouri, Kansas & Texas, and by other railways. Waco is the scat of Baylor University (co-educational) and of the Texas Christian University (Christian; co-educational). Baylor University was founded at Independence, Texas, by the Texas Union Baptist Association, in 1845, and was consolidated in 1886 with Waco University (Baptist, 1861, founded by Dr Rufus C. Burleson, a former president of Baylor University). It was named in honour of Robert E. B. Baylor (1793-1874), a representative in Congress from Alabama in 1830-1831, and one of its founders. In 190S- 1909 it had 40 instructors and 1296 students (664 women), of whom 647 were in the college. The Texas Christian University was founded in 1873 at Thorp's Springs as a private school, chartered as Add Ran College, transferred to the Christian Churches of Texas in 1889, and removed to Waco in 1895. Its present name was adopted in 1902, the name Add Ran College being retained for the college of arts and sciences. In 1908-1909 the university had 26 instructors and 379 students (279 in the college of arts and sciences). Waco is situated in a fertile farming region. In 1905 the factory products were valued at $2,979,800. The city was named after the Waco (or Hueco) Indians (Caddoan stock), who had a large village here until 1830, when they were nearly exterminated by the Cherokees; in 1855 they removed to a reservation, and after 1859 became incor- porated with the Wichita. The first white settlement was made in 1849. Waco was incorporated as a town in 1856; in 1909 the administration was entrusted to a mayor and four commissioners.

WAD, a black, earthy mineral consisting mainly of hydrated manganese dioxide; of importance as an ore. Being an amor- phous substance, it varies considerably in chemical composi- tion, and contains different impurities often in large amount. A variety containing much cobalt oxide is called " asbolite," while " lampadite " is a cupriferous variety. It is very soft, readily soiling the fingers, and may be considered as an earthy form of psilomelane (

WADAI, a country of north central Africa, bounded N. by Borku and Enndi, S. by the Ubangi sultanates, W. and S.W. by Kanem and Bagirmi,

and E. by Darfur. Formerly an independent Mahommedan sultanate, it was in 1909 annexed to French Equatorial Africa (French Congo). Wadai has an area estimated at 150,000 sq. m., and a population of 3,000,000 to 4,000,000.

The general level of the country is about 1500 ft. North, north-east, south-west and in the centre are ranges of hills rising another 1000 ft. West and north-west the fall to the Sahara is gradual. Here occur remarkable sand-ridges of fantastic shape— hollow mounds, pyra- mids, crosses, &c. — which are characteristic of the Libyan desert. There are also sandstone rocks of varying colours — red, blue, white, black, &c. — presenting the aspect of ruined castles, ramparts and churches. North-west is a wide district of dreary plain— part of the clay zone which stretches from the middle Niger to the Nile — covered with thorn bush and dum palms. The central and eastern regions are the most fertile, and contain large forest areas. The country belongs to the Chad drainage area, though it is possible that the Bahr-el-Ghazal (of the Chad system) may afford a connexion with the Nile (see Shari). The streams which rise in the north-eastern districts, of which the Batha (over 300 m. long) is the largest, flow west, the Batha ending in a depression, some 200 m. E. of Lake Chad, called Fittri. Another stream, the Wadi Rime, with a more northerly course than the Batha, goes in the direction of Chad, but ends in swamps in the clayey soil. These rivers are intermittent, and after seasons of drought Fittri is completely dry. In the dry season water is obtained from wells 250 to 300 ft. deep. The rivers of Dar Runga flow westward towards the Shari, but, save the Bahr Salamat, none reaches it. They only contain water in the rainy season. About 100 m. above the! Salamat-Shari confluence is Lake Iro, joined to the Salamat by a short channel. In the forests

are large herds of elephants, and hippopotami abound along the river-beds. In the north are the camel and the ostrich. Among the trees is a species of wild coffee which reaches 50 to 60 ft. and yields berries of excellent quality. The cotton plant is indigenous-.

Inhabitants and Trade. — The inhabitants consist of negroid and negro tribes, Arabs, Fula, Tibbu and half-castes. The Maba, the dominant race, arc said to be of Nubian origin; they are believed not to number more than 750,000, and live chiefly in the north-eastern district. They are in political alliance with the Arab tribes, known in Wadai as Zoruk (dark) and Homr (red). The Maba have a reputation for pride, valour, cruelty, drunken- ness and barbaric splendour.

The capital, Abeshr, is in the N.E., in about 21 E., 13° 50′ N. Thence a

caravan route crosses the Sahara via the Kufra oases to Benghazi in Barca. Another trade route goes east through Darfur to Khartum. The people possess large numbers of horses, cattle, sheep and goats. Maize, durra, cotton and indigo are cultivated, and cloth is woven. Ivory and ostrich feathers, the chief articles of export, are taken to Tripoli by the desert route, together with small quantities of coffee and other produce. There is a trade in cattle, horses and coffee with the countries to the south. Until the French conquest Wadai was a great centre of the slave trade. Slaves were obtained by raiding and in the form of tribute from Bagirmi, Kanem and other countries once dependent on Wadai. The slaves were sent chiefly to Barca. Wadai was also notorious for its traffic in eunuchs.

History. — Situated between the Sahara and the dense forest lands of equatorial Africa, Wadai early became a meeting ground of negro and Arab culture. Eastern influences and the Mahom- medan religion ultimately obtained predominance, though the sovereignty of the country reverted to the negro race. It was sometimes tributary to and sometimes the overlord of the neigh- bouring countries, such as Bagirmi and Kanem. It was made known to Europe by the writings of the Arab geographers, but it was not until Nachtigal's visit in 1873 that accurate knowledge of the land and people was obtained. About 1640 a Maba chieftain named Abd-el-Kerim conquered the country, driving out the Tunjur, a dynasty of Arabian origin. Thereafter Wadai, notorious as a great slave-raiding state, suffered from many civil and foreign wars. Mahommed Sherif, sultan from 1838 to 1858, introduced Senussiism into the country.

In the last decade of the 19th century the French advancing from the Congo and from the Niger made their influence felt in Wadai, and by the Anglo-French declaration of the 21st of March 1899 Wadai was recognized as within the French sphere. That state was then torn by civil wars. The Sultan Ibrahim (see Senussi) was murdered in 1900, and Ahmed Ghazili became sultan. He was warned by the Sheikh Senussi el Mahdi of the danger arising from the approach of the Christians (i.e. the French), but he had to meet the opposition of the princes Doud Murra (a brother of Ibrahim) and Acyl. Ahmed Ghazili and Doud Murra, though of the royal family, had non~Maba mothers; Acyl, a grandson of the Sultan Mahommed Sherif, was of pure Maba descent. Acyl, ordered to be blinded by Ahmed Ghazili, fled to Kelkele, west of Lake Fittri, and entered into friendly relations with the French. A few months later (Dec. 1901) Ahmed was dethroned. With Doud Murra, who then became sultan, the French endeavoured to come to an under- standing, and in November i903„the Wadaians agreed to recog- nize the possession of Bagirmi, Kanem, &c, by France. How- ever, in the spring of 1904, acting, it is believed, at the instigation of the Senussites, the Wadaians attacked French posts in the Shari region and carried off many slaves. At Tomba (13th of May 1904)

they suffered a severe defeat, but they renewed their raids, and there was continual fighting on the west and south- west borders of Wadai during 1905-1907. The fighting resulted in strengthening the position of the French and of their ally Acyl, and in 1908 Doud Murra, again, it is stated, at the instigation of the Senussites, proclaimed the jihad. His army was split up under aguids (feudal lords), and was beaten in detail by the French. At Joue in the Batha valley (June 16, 1908) Comman- dant Julien inflicted enormous losses on the enemy. In May

1909 Captain Fiegenschuh, with a small force of tirailleurs, and Acyi's contingents, advanced up the Batha to a place within is m. of Abeshr, where, on the 1st of June, the enemy were defeated. The next day another fight took place close to Abeshr. The Wadaians were again put to flight and the town bombarded with cannon. Doud Murra with a small following fled north, and Abeshr was occupied by the French. The prince Acyl was subsequently placed on the throne, and, under French guidance, governed Wadai proper, Dar Sila, Dar Runga and other tributary states being directly governed by French residents.

The war was not, however, ended by the occupation of Abeshr. Captain Fiegenschuh's column, operating south-east of Abeshr, was cut off by the Massalit Arabs near the Darfur frontier, but a punitive force retrieved this disaster in April following. While these operations were in progress, Lieut. Boyd Alexander (b. 1S73), who had previously crossed from the Niger to the Nile, the first British explorer to enter Wadai, passed through Abeshr on his way to Darfur. At the station of Nyeri, in Dar Tama, on the Darfur border, he was murdered on the 2nd of April igio.

In November 1010 a French column, 300 strong, under Colonel Moll, while operating in the Massalit country was at- tacked by 5000 men under Doud Murra and the sultan of the Massalit. The enemy was beaten off, but the French had over 100 casualties, including Colonel Moll killed.

See G. Nachtigal, Sahara und Sudan (3 vols., Berlin, 1879-1889) ; Captain Julien, " Le DarOuadai," Renseign. colon, comite de f Afrique francaise (1904) ; J. van Vollenhoven, " Le Voyage dc Nachtigal au Ouaclai," Rcnseign. colon. (1903); Captain Repoux, " Le Ouadai," B.S.G. Com. Bordeaux (1909) ; Commandant Bordeaux, " Deux Contre-rezzous dans l'Ouaddai," La Geog. B.S.G. Paris (1908); A. Ferrier, " La Prise d'Abecher," L' Afrique francaise (1909); A. H. Keane, "Wadai," Travel and Exploration (July 1910) ; Sir H. H. Johnston, " Lieutenant Boyd

Alexander," Geog. Jour. (July 1910); The Times, July 21st, 1910 (details of Boyd Alexander's murder). See also Senussi.

WADDING, LUKE (1588-1657), Irish Franciscan friar and historian, was born in Waterford in 1588 and went to study at Lisbon. He hecame a Franciscan in 1607, and in 1617 he was made president of the Irish College at Salamanca. The next year he went to Rome and stayed there till his death. He collected the funds for the establishment of the Irish College of St Isidore in Rome, for the education of Irish priests, opened 1625, and for fifteen years he was the rector. A voluminous writer, his chief work was the Annates Minorum in 8 folio vols. (1625-1654), re- edited in the 18th century and continued up to the year 1622; it is the classical work on Franciscan history. He published also a Bihliotheca of Franciscan writers, an edition of the works of Duns Scotus, and the first collection of the writings of St Francis of Assisi. (E. C. B.)

WADDINGTON, WILLIAM HENRY (1826-1894), French statesman, was born at St Remi-sur-1'Avre (Fure-ct-Loir) on the nth of December 1826. He was the son of a wealthy Englishman who had established a large spinning factory in France and had been naturalized as a French subject. After receiving his early education in Paris, he was sent to Rugby, and thence proceeded to Trinity College, Cambridge, where he was second classic and chancellor's medallist, and rowed for the university in the winning boat against Oxford. Returning to France, he devoted himself for some years to archaeological research. He undertook travels in Asia Minor, Greece and Syria, the fruits of which were published in two Memoires, crowned by the Institute, and in his Melanges de numismaiique el de philologie (1861). Except his essay on " The Protestant Church in France," published in 1856 in Cambridge Essays, his remaining works are likewise archaeological. They include the Fastes de Vempire r amain, and edit ions of Diocletian's edict and of Philippe Lebas's Voyage archeologique. (1868-1877). He was elected in 1865 a member of the Academic des Inscriptions et Belles-Lettres.

After standing unsuccessfully for the department of the Aisne in 1865 and 1869, Waddington was returned by that constituency at the election of 1871. He was minister of public instruction in the short-lived cabinet of the 19th of May 1873, and in 1876,

having been elected senator for the Aisne, he was again entrusted by Dufaure with the ministry of public instruction, with which, as a Protestant, he was not permitted to combine the ministiy of public worship. His most important project, a bill transferring the conferment of degrees to the state, passed the Chamber, but was thrown out by the Senate. He continued to hold his office under Jules Simon, with whom he was overthrown on the

famous seize mai 1877. The triumph of the republicans at the general election brought him back to power in the following December as minister of foreign affairs under Dufaure. He was one of the French plenipotentiaries at the Berlin Congress. The cession of Cyprus to Great Britain was at first denounced by the Fi"ench newspapers as a great blow to his diplomacy, but he obtained, in a conversation with Lord Salisbury, a promise that Great Britain in return would allow France a free hand in Tunis

Early in 1879 Waddington succeeded Dufaure as prime minister. Holding office by sufferance of Gambetta, he halted in an undetermined attitude between the radicals and the re- actionaries till the dela}" of urgent reforms lost him the support of all parties. He was forced on the 27th of December to retire from office. He refused the offer of the London embassy, and in 1880 was reporter of the committee on the adoption of the scruiin de liste at elections, on which he delivered an adverse judgment. In 1883 he accepted the London embassy, which he continued to hold till 1893. showing an exceptional tenacity in defence of his country's interests. He died on the 13th of January 1894. His wife, an American lady, whose maiden name was Mary A. King, wrote some interesting recol- lections of their diplomatic experiences- — Letters of a Diplomatists Wife, 1883-ipoo (New York, 1903), and Italian Letters (London,

1905).

WADE, BENJAMIN FRANKLIN (1800-1878), American states- man, was born near Springfield, Massachusetts, on the 27th of October 1800, of Puritan ancestry. He was reared on a farm, receiving little systematic education, and in 182 1 he removed with his family to Andover, in the Western Reserve of Ohio. Here lie spent two more years on a farm, and then, securing employment as a drover, worked his way to Philadelphia and finally to Albany, New York, where for two years he taught school, studied medicine, and was a labourer on the Erie Canal. Returning to Ohio in 1825, he studied law at Canfield, was ad- mitted to the bar in 1827, and began practice at Jefferson, Ashtabula county, where from 1831 to 1837 he was a law partner of Joshua R. Giddings, the anti-slavery leader. During 1837- 1839 and 1841-1843 he was a Whig member of the Ohio State Senate. From 1847 until 1851 he was a state district judge, and Trom 1851 until 1869 was a member of the United States Senate, first as an anti-slavery Whig and later as a Republican. In the Senate Wade was from the first an uncompromising opponent of slavery, his bitter denunciations of that institution and of the slaveholders receiving added force from his rugged honesty and sincerity. His blunt, direct style of oratory and his somewhat rough manners were characteristic. After the outbreak of the Civil War he was one of the most vigorous critics of the

Lincoln administration, whose Ohio member, Salmon P. Chase, had long been a political rival. He advocated the immediate emancipation and arming of the slaves, the execution of prominent Southern leaders, and the wholesale confiscation of Confederate property. During 1861-1862 he was chairman of the important joint-committee on the conduct of the war, and in 1862, as chairman of the Senate Committee on Territories, was instrumental in abolishing slavery in the Federal Territories. In 1864, with H. W. Davis (q.v,), he secured the passage of the Wade-Davis Bill (for the reconstruction of the Southern States), the fundamental principle of which was that reconstruction was a legislative, not an executive, problem. This bill was passed by both houses of Congress, just before their adjournment, but President Lincoln withheld his signature, and on the 8th of July issued a proclamation explaining his course and defining his " position. Soon afterward (Aug. 5) Wade and Davis published in the New York Tribune the famous " Wade-Davis Manifesto," a vituperative document impugning the President's honesty of

purpose and attacking his leadership. As long as President Johnson promised severe treatment of the conquered South, Wade supported him, but when the President definitively adopted the more lenient policy of his predecessor, Wade became one of his most bitter and uncompromising opponents. In 1867 he was elected president pro tern, of the Senate, thus becoming acting vice-president. He voted for Johnson's conviction on his trial for impeachment, and for this was severely criticized, since, in the event of conviction, he would have become president; but Wade's whole course before and after the trial would seem to belie the charge that he was actuated by any such motive. After leaving the Senate he resumed his law practice, becoming attorney for the Northern Pacific railway, and in 1871 he was a member of President Grant's Santo Domingo Commission. He died at Jefferson, Ohio, on the 2nd of March 1878. His son, James Franklin Wade (b. 1843), was colonel of the 6th United States (coloured) cavalry during the Civil War, and attained the rank of major-general in the regular army in 1903, commanding the army in the Philippines in 1903-1904

See A. G. Riddle, Life of Benjamin F. Wode (Cleveland, Ohio, 1886).

WADE, GEORGE (1673-1748), British field marshal, was the son of Jerome Wade of Kilavally, Westmeath, and entered the British army in 1690. He was present at Steinkirk in 1692, and in 1695 he became captain. In 1702 he served in Marlborough's army, earning particular

distinction at the assault, on the citadel of Luge, and in 1703 he became successively major and lieu tenant- colonel in his regiment (later the roth Foot). In 1704, with the temporary rank of colonel, he served on Lord Galway's staff in Portugal. Wade distinguished himself at the siege of Alcantara in 1706, in a rearguard action at Villa Nova in the same autumn (in which, according to Galway, his two battalions repulsed twenty-two allied squadrons), and at the disastrous battle of Almanza on the 25th of April 1707. He had now risen to the command of a brigade, and on the following ist of January (1707/8) he was promoted brigadier-general in the British army. His next service was as second in command to James (ist earl) Stanhope in the expedition to Minorca in 1708. In 1710 he was again with the main Anglo-allied army in Spain, and took part in the great battle of Saragossa on the 20th of August, after which he was promoted major-general and given a command at home. The Jacobite outbreak of 1715 brought him into promin- ence in the new r61e of military governor. He twice detected important Jacobite conspiracies, and on the second occasion procured the arrest of the Swedish ambassador in London, Count Gyltcnborg. In 17 19 he was second in command of the land forces in the successful " conjunct " military and naval expedition to Vigo. In 1724 he was sent to the Highlands to make a thorough investigation of the country and its people, and two years later, having meantime been appointed com- mander-in-chief to give effect to his own recommendations, he began the system of metalled roads which is his chief title to fame, and is commemorated in the lines —

" Had you seen these roads before they were made, You would lift up your hands and bless General Wade."

In the course of this engineering work Wade superintended the construction of no less than 40 stone bridges. At the same time, slowly and with the tact that came of long experience, he disarmed the clans. In 1742 he was made a privy councillor and lieutenant-general of the ordnance, and in 1743 field marshal. In this year he commanded the British contingent in Flanders, and was associated in the supreme command with the duke d'Aremberg, the leader of the Austrian contingent. The cam- paign, as was to be expected when the enemy was of one nation, superior in numbers and led by Saxe, was a failure, and Wade, who was seventy years of age and in bad health, resigned the command in March 1744. George II. promptly made him commander-in-chief in England, and in that capacity Field Marshal Wade had to deal with the Jacobite insurrection of 1745. in which he was utterly baffled by the perplexing rapidity of Prince Charles Edward's marches. On the appointment of the duke of Cumberland as commander-in-chief of the forces, Wade retired. He died on the 14th of March 1748.

WADE, THOMAS (1805-1875), English poet and dramatist, was born at Woodbridge, Suffolk, in 1805. He early went to London, where he began to publish verse of considerable merit under the inspiration of Byron, Keats and especially Shelley. He wrote some plays that were produced on the London stage with a certain measure of success, owing more perhaps to the acting of Charles and Fanny Kemble than to the merits of the dramatist. Wade frequently contributed verses to the maga- zines, and for some years he was editor as well as part-pro- prietor of BelVs Weekly Messenger. This venture proving financially unsuccessful, he retired to Jersey, where he edited the British Press, continuing to publish poetry from time to time until 1871. He died in Jersey on the 19th of September 1875. His wife was Liicy Eager, a musician of some repute.

The most notable of Wade's publications were: Tasso and the Sisters (1825), a volume of poems, among which " The Nuptials of Juno " in particular showed rare gifts of imagination, though like all Wade's work deficient in sense of melody and feeling for artistic form; Woman's Love (1828), a play produced at Covent Garden; The Phrenologists, a farce produced at Covent Garden in 1830; The Jew of A rr agon, a play that was " howled from the stage " at Covent Garden in 1830 owing to its exaltation of the Jew; Mundi et cordis carmina (1835), a volume of poems, many of which had previously appeared in the Monthly Repository, The Contention of Death and Love, Helena and The Shadow Seeker — these three being published in the form of pamphlets in 1837; Protha?iasia and other Poems (1839). Wade also wrote a drama entitled King Henry II., and a translation of Dante's " Inferno " in the metre of the original, both of which remain in manuscript; and a series of sonnets inspired by his wife, some of which have been published.

See Alfred H. Mills, The Poets and Poetry of the Century, vol. ui. (10 vols., London, 1891-1897); Literary Anecdotes of the igih Century, edited by Sir W. Robertson Nicoll and T. J. Wise (2 vols., London, 1 895-1 896), containing a number of Wade's sonnets, a specimen of his Dante translation and a reprint of two of his verse pamphlets.

WADE, SIR THOMAS FRANCIS (1818-1895), British diplo- matist, born in London on the 25th of August 1818, was the son of Major Wade of the Black Watch, by his wife Anne, daughter of William Smythe of Barbavilla, Westmeath. In 183S his father purchased for him a commission in the 81st Regiment. Exchanging (1839) into the 42nd Highlanders, he served with his regiment in the Ionian Islands, devoting his leisure to the congenial study of Italian and modern Greek. On receiving his commission as lieutenant in 1841 he exchanged into the 98th Regiment, then under orders for China, and landed in Hong-Kong in June 1842. The scene of the war had at that time been trans- ferred to the Yangtze-kiang, and thither Wade

was ordered with his regiment. There he took part in the attack on Chin-kiang-fu and in the advance on Nanking. In 1845 he was appointed interpreter in Cantonese to the Supreme Court of Hong-Kong, and in 1846 assistant Chinese secretary to the superintendent of trade, Sir John Davis. In 1852 he was appointed vice-consul at Shanghai. The Tai-ping rebellion had so disorganized the administration in the neighbourhood of Shanghai that it was considered advisable to put the collection of the foreign customs duties into commission, a committee of three, of whom Wade was the chief, being entrusted with the administration of the customs. This formed the beginning of the imperial maritime customs service. In 1855 Wade was appointed Chinese secretary to Sir John Bowring, who had succeeded Sir J. Davis at Hong- Kong. On the declaration of the second Chinese War in 1857, he was attached to Lord Elgin's staff as Chinese secretary, and with the assistance of H. N. Ley he conducted the negotia- tions which led up to the treaty of Tientsin (1858). In the following year he accompanied Sir Frederick Bruce in his attempt to exchange the ratification of the treaty, and was present at Taku when the force attending the mission was treacherously attacked and driven back from the Peiho. On Lord Elgin's return to China in i860 he resumed his former post of Chinese secretary, and was mainly instrumental in arranging- for the advance of the special envoys and the British and French forces to Tientsin, and subsequently towards Peking. For the purpose of arranging for a camping ground in the neighbourhood of Tungchow he accompanied Mr (afterwards Sir) Harry Parkcs on his first visit to that city, where on the next day Parkes with

Mr Loch and others was by an act of shameless treachery made prisoner. In the succeeding negotiations Wade took a leading part, and on the establishment of the legation at Peking he took up the post of Chinese secretary of legation. In 1862 he was made a Companion of the Bath. On the return of Sir Frederick Bruce to England in 1S64 he remained as charge, d'affaires, and again from i8f)o to 1S71, when he was appointed minister, he filled the acting post. The Tientsin massacre in 1870 entailed long and difficult negotiations, which were admirably conducted by Wade. On the assumption of power by the emperor T'ung- chih he, in common with his colleagues, requested an audience in accordance with the treaties, which was for the first time granted as a right. The murder of A. R. Margary near Man- wync in Yunnan in 1875 threatened at one time to cause a rupture with the Chinese government, and as a matter of fact Wade did leave Peking. But the Chinese, finding that he was inearneit, despatched Li Hung-Chang after bim to Chefoo, where the two diplomatists arranged the penalties which were to be paid for the crime, and concluded

a convention which, after a considerable interval, was ratified by the governments. Wade was then made K.C.B., and in 188.5 retired from the service. On his return to England the attractions of his old university induced him to take up his residence at Cambridge, where he was appointed the first professor of Chinese. He. died there on the 31st. of July 1895. In 1889 he was made G.C.M.G. In 1868 he had married Amelia } daughter of Sir John Herschel. (R. K. D.)

WADE (or Waad), SIR WILLIAM (1546-1623), English states- man and diplomatist, was the eldest son of Armagil Wade (d. 1 568} , the traveller, who sailed with a party of adventurers for North America in 1536. and later became (1547) one of the clerks of the privy council in London and a member of parliament. William Wade obtained his entrance into official life by serving William Cecil, Lord Burghlcy, sending information to this statesman from Paris and from Italy. He also passed some time in Strassburg; then in 1581 he became secretary to Sir Francis Walsingham and in 1583 a clerk of the privy council. He visited Vienna, Copenhagen and Madrid on public business, and in 1585 he went to Paris, being waylaid and maltreated on his return near Amiens by influential personages who disliked the object of his mission. In 1586 he went to Chartley and took possession of Mary Stuart's papers, and in 1587 was again in France. During the remainder of Elizabeth's reign Wade was much occupied in searching for Jesuits and in discovering plots against the life of the queen. James I., who knighted him in 1603. employed him in similar ways, and he was fully occupied in unravelling the plots which marked the early years of the new reign. For some time Wade was a member of parliament. He retired from public life in 1613, and died on the 21st of October 1623. Sir William was a shareholder in the Virginia company, and the Wades of Virginia claim descent from his father.

WADEBRIDGE, a market town and seaport in the St Austell parliamentary division of Cornwall, England, on the Great Western and London & South-Western railways, 38 m. W.N.W. of Plymouth. Pop. of urban district (1901), 2186. It is pic- turesquely situated at the head of the estuary of the river Camel, 7 m. from its mouth in Padstow Bay on the north coast. A stone bridge, consisting of seventeen arches, was built in 1485 over the river, and made a county bridge under James I. The parish church of Egloshayle, nearly 2 m. from the town, is in the main Perpendicular, with a beautiful tower; but part of the fabric is Early English. The neighbouring church of St Breock is Decorated and Perpendicular, with a fine font of the earlier period. An ancient round-headed cross stands near the town. There is considerable agricultural trade, and iron founding is carried on; while in the neighbourhood some copper, lead, granite and slate are worked and exported in small vessels; coal, timber and general merchandise being imported.

WADELAI, a station on the east bank of the Upper Nile in the British protectorate of Uganda, in 2 50′ N., 31 35′ E., 200 m. in a direct lineN.N.W. of Entebbe on Victoria Nyanza, and 72 m. by river below Butiaba on Albert Nyanza. The government station was built on a hill 160 to 200 ft. above the Nile at a spot

where the river narrows to 482 ft. and attains a depth of 30 ft. At this place was a gauge for measuring the discharge of the river. Wadelai was first visited by a European, Lieut. H. Chippendall, in 1875, and was named after a chieftain who, when visited by Gessi Pasha (on the occasion of that officer's circumnavigation of Albert Nyanza), ruled the surrounding district as a vassal of Kabarega, king of Unyoro. The region was annexed to the Egyptian Sudan and Wadelai's village chosen as a government post. This post was on the western bank of the Nile, i\ m. below the existing station. Here for some time Emin Pasha had his headquarters, evacuating the place in December 1888. Thereafter, for some years, the district was held by the Mahdists. In 1894 the British flag was hoisted at Wadelai, on both banks of the Nile, by Major E. R. Owen. Some twelve years later the government post was withdrawn. There is a native village at the foot of the hill.

WADHWAN, a town of India, in Kathiawar, Bombay, the capital of a petty state of the same name, and the junction of the Kathiawar railway system with the Bombay and Baroda line, 389 m. N. of Bombay. Pop. (1001) 16,223. It has con- siderable trade and manufactures. There is a school for girasias or subordinate chiefs. The civil station, under British ad- ministration, had a population in 1901 of 11,255. The state of Wadhwan has an area of 236 sq. m.; pop. (1901), 34,851; revenue, £25,000. Cotton trade and stone- quarrying are im- portant, and there are manufactures of soap and saddlery.

WADI, also written wady, in some dialects wad; Arabic for a " valley," hence a stream or river flowing through a valley, as well as the valley itself. It is a common term in place names.

WADI HALFA, or Halfa, a town of the Anglo- Egyptian Sudan, in 21 55′ N., 31 19′ E., on the right bank of the Nile, 5 rn. S. of the northern frontier of the Sudan. It is the chief town of the Haifa mudiria, is 770 m. S. of Cairo by rail and steamer, and 575 m. N.N.W. of Khartum by rail. Some 6 m. above the town is the second cataract, and on the west bank of the Nile opposite Haifa are the ruins of the ancient Egyptian city of Buhen (Bohon). Haifa is the northern terminus of the Sudan railway and the southern terminus of a steamboat service on the Nile, which, running to Shellal (Assuan), connects there with the Egyptian railways.

Wadi Haifa is a general designation including the native village of that

name, the camp, founded by the British in 1884 as their base in the operations for the relief of General Gordon, and the civil cantonment established at the same time. This cantonment occupies the site of a Nubian village, and round it has grown a thriving town, at first named Taufikia, but now called Haifa. It has a population (1907) of about 3000. The camp is i§ m. S. of Haifa. Here are the barracks, officers 3 quarters, railway works, and an esplanade along the river front. The village of Wadi Haifa is 3 m. S. of the camp.

WAD MEDANI, a town of the Anglo- Egyptian Sudan, capital of the Blue Nile mudiria, in 14 24′ N., 33 31′ E., on the left bank of the Blue Nile, no m. by rail and 147 m. by river, S.E. of Khartum. Pop. about. 20,000. It is the chief depot for grain raised in the Gezira, has oil and soap works, and is a thriving commercial centre, being on the main trade route between Khartum and Abyssinia. The town, which is of considerable antiquity, contains some fine buildings, the chief mosque having a conspicuous tower. Wad Medani was almost destroyed during the Mahdia, but its return to prosperity under Anglo-Egyptian rule was rapid. In 1909 it was connected by railway with Khartum, and thus the hindrance to trade through the Blue Nile being scarcely navigable between January and June was over- come. In 1910 railway communication between the town and Kordofan was established. (See Sudan, § Anglo- Egyptian.)

WAFER, a thin flat cake or sheet of paste, usually circular in shape. The derivation of the word, which is the same as ” wafHe,” a batter-cake cooked in waffle-irons and served hot, is given under ” Goffer,” which is adapted from the French form of the Teutonic original. As articles of stationery, wafers consist of thin brittle, adhesive disks, used for securing papers together, and for forming a basis for impressed official seals. They are

made of a thin paste of very fine flour, baked between ” wafer irons ” over a charcoal fire till the thin stratum of paste becomes dry and brittle and the flour starch is partly transformed into glutinous adhesive dextrin. The cake is cut into round disks with suitable steel punches. Bright non-poisonous colouring matter is added to the paste for making coloured wafers. They are also made of gelatin. Wafers of dry paste are used in medical practice to enclose powders or other forms of drugs, thus rendering them easy to swallow.

In ecclesiastical usage the term ” wafer ” is applied to the thin circular disk

of unleavened bread, stamped with a cross, the letters LH.S. or the Agnus Dei, which is the form of the conse- crated bread as used in the service of the Eucharist by the Roman Catholic Church.

WAGER (derived, through Fr. wagier, gagier, from Lat. vadium, a pledge), a bet orstake. Wagers in theordinary sense of the term are dealt with under the headings Gaming and Betting; but the method of wagering— in principle the putting of a decision to the hazard— has had extended employment in various cases which may be noticed here. The determination of cases, civil and criminal, by means of wager or analogous forms of procedure, was a characteristic feature of ancient law. The legis actio saeramenti at Rome — at first a real, then a fictitious, wager — and the wagers " of battle " and " of law " in England, of the highest antiquity in their origin, survived up to a com- paratively late period in the history of both legal systems. The form of the wager survived long after its reason had been for- gotten. The general prevalence of the wager form of proceeding is perhaps to be attributed to the early conception of a judge as a mere referee who decided the dispute submitted to him, not as an executive officer of the state, but as an arbitrator casually called in (see Maine, Ancient Law, c. x.).

" Wager of battle " in England was a mode of trial allowed in certain cases, viz. on a civil writ of right for recovery of land (see Writ), and on criminal appeals of treason and felony (see Appeal). Trial by battle, or single combat, was a common Teutonic custom in days when criminal " appeal " was really a prosecution by a private individual; and it remained in vogue on the continent of Europe (where hired champions were allowed) to a much greater extent than in England, where after the Con- quest it was to some extent substituted for trial by ordeal (q.v.). It was an institution suited to the days of chivalry, and may be regarded as the parent of the duel (q.v.). In England the " ap- pellant " first formulated his charge, which was proclaimed at five successive county courts. If the " appellee " did not appear he was outlawed; if he did he could plead various exemptions; and unless the court upheld them he was obliged to offer battle by throwing down his glove as gage. When an ordinary court ordered the battle, it was fought on foot with staves and leather shields; but when a court of chivalry 1 ordered it, on horse with spear and sword. If defeated, the appellee was liable to sentence of death by hanging, and an undecided fight still left him liable, though acquitted on the appeal, to trial by indictment; if the appellant yielded, the appellee was free. The right of " wager of battle " was claimed as late as 1818 by a man named Thornton, who had been acquitted at assizes of a charge of murdering a girl named Ash ford ; her brother brought an " appeal," and the judges upheld Thornton's claim, but the appellant then with- drew. Next year appeals for felony or treason were abolished by statute. 2

” Wager of law ” {vadiatio legis) was a right of a defendant in actions of simple contract, debt and detinue. It superseded the ordeal (itself called lex in the Assize of Clarendon and other

1 The medieval court of chivalry had both civil and criminal jurisdiction, and was held jointly by the lord high constable and the earl marshal. The last sitting of a court of chivalry for criminal business in England was in 1631 ; and as a civil court (for cases of honour and questions of precedence) it gradually decayed through Aant of power to enforce its decisions. There is an interesting account of the rules of battle ordered by a court of chivalry in Ashmolean MSS. 856 of the Bodleian Library (transcribed in Illus- trations of Ancient State and Chivalry, Roxburgh e Club, 1840).

2 See G. Neilson, Trial by Combat (Glasgow, 1891).

ancient constitutional records). The procedure in a wager of law is traced by Blackstone to the Mosaic law, Ex. xxii. 10; but it seems historically to have been derived from the system of compurgation, introduced into England from Normandy, a system which is now thought to have had an appreciable effect on the development of the English jury (q.v.). It also has some points of resemblance, perhaps some historical connexion, with the sponsio and the derisory oath of Roman law, and the reference to oath of Scots law (see Oath). The use of the oath instead of the real or feigned combat — real in English law, feigned in Roman law — no doubt represents an advance in legal development. The technical term sacramentum is the bond of union between the two stages of law. In the wager of law the defendant, with eleven compurgators, appeared in court, and the defendant swore that he did not owe the debt, or (in detinue) that he did not detain the plaintiff’s chattel; while the compurgators swore that they believed that he spoke the truth. It was an eminently unsatisfactory way of arriving at the merits of a claim, and it is therefore not surprising to find that the policy of the law was in favour of its restriction rather than of its extension. Thus it was not permitted where the defendant was not a person of good character, where the king sued, where the defendant was the executor or administrator of the person alleged to have owed the debt, or in any form of action other than those named, even though the cause of action were the same. No wager of law was allowed in assumpsit, even though the cause of action were a simple debt. This led to the general adoption of assumpsit — proceeding originally upon a fictitious averment of a promise by the defendant — as a means of recovering debts. Where a penalty was created by statute, it became a common form to insert a proviso that no wager of law was to be allowed in an action for the penalty. Wager of law was finally abolished in 1833 (3 & 4 William IV. c. 42).

Another form of judicial wager in use up to 1845 was the feigned issue, by which questions arising in the course of chancery pro- ceedings were sent for trial by jury in a common law court. The plaintiff averred the laying of a wager of £5 with the defendant that a certain event was as he alleged ; the defendant admitted the wager, but disputed the allegation ; on this issue was joined. This procedure was abolished by s. 19 of the Gaming Act 1845. (W.F.C.)

WAGES (the plural of " wage," from Late Lat. wadium, a pledge, 0. Fr. wagier, gagier). Wages, although one of the most common and familiar terms in economic science, is at the same time one of the most difficult to define accurately. The natural definition is that wages is the " reward for labour," but then we are at once confronted with the difficulty so well stated by Adam Smith: " The greater part of people understand better what is meant by a quantity of a particular commodity than by a quantity of labour; the one is a plain palpable object, the other an abstract notion, which, though it can be made sufficiently intelligible, is not altogether so natural and obvious." If we regard wages as the reward for a quantity of labour, it is clear that to make the meaning precise we must give a precise meaning to this abstract notion of Adam Smith. From the point of view of the labourer the quantity of labour refers not so much to the work accomplished (e.g. raising so many foot-pounds) as to " all the feelings of a disagreeable kind, all the bodily inconvenience or mental annoyance, connected with the employment of one's thoughts or muscles or both in a particular occupation " (J. S. Mill). But this analysis seems only to make the task of definition more difficult, for the class of labourers, in this wide sense of the term labour, would include the capitalist who racks his brains in making plans just as much as the navvy who digs with the sweat of his brow. Thus " profits," in the ordinary sense of the term, instead of being contrasted, would to a large extent be classified with wages, and in fact the wages of superintendence or of management is one of the recognized elements in the classical analysis of profits. It is only when we refer to the list of " occu- pations " in any civilized country that we can really form an adequate idea of the variety of classes to which the term labour, as defined by Mill, may be extended.

It may be granted that in certain economic inquiries it is extremely useful to bring out the points of resemblance between " workers " at the various stages of the social scale, and it is especially serviceable in showing that the opposition between

It may be observed that by extending the meaning of pro- duction, as is now done by most economists, to include all kinds of labour, and by substituting benefit for profit, this definition will include all grades of wages.

Having thus limited the class of those who earn " wages," the next point is to consider the way in which the wages ought to be

measured. The most obvious method is to take as the Nominal raf – e Q j ti m e-wages the amount of money earned in a waxes. certain time, and as the rate of task-wages the amount of

money obtained for a given amount of work of a given quality; and in many inquiries this rough mode of measurement is sufficient. But the introduction of money as the measure at once makes it necessary to assume that for purposes of comparison the value of the money to the wage-earners may be considered constant. This supposition does not hold good even between different places in the same country at the same time, and still less with variations in time as well as place. To the labourers, however, the amount of money they obtain is only a means to an end, and accordingly economists have drawn a sharp dis- tinction between nominal and real wages. " Labour, like com- modities," says Adam Smith, " may be said to have a real and a nominal price. Its real price may be said to consist in the quantity of the necessaries and conveniences of life which are given for it; its nominal price in the quantity of money. The labourer is rich or poor, is well or ill rewarded, in proportion to the real not to the nominal price of his labour."

Walker (op, cit. pp. 12 sqq.) has given a full analysis of the principal elements which ought to be taken into account in

estimating the real wages of labour. They may be classi- Variatioas fi e(-j as follows. (1) Variations in the purchasing power

of money may be due in the first place to causes

affecting the general level of prices in a country. Such, for instance, is a debasement of the coinage, of which a good example is furnished in English history in the reigns of Henry VIII. and Edward VI. Thorold Rogers has ascribed much of the degradation of labour which ensued to this fact; and Macaulay has given a graphic account of the evils suffered by the labouring classes prior to the recoinage of 1606. The issues of inconvertible paper notes in excess have frequently caused a disturbance of real wages, and it is generally asserted that in this case wages as a rule do not rise so quickly as com- modities. A general rise in prices due to great discoveries of the

precious metals would, if nominal wages remained the same, of course cause a fall in real wages. There are, however, good grounds for supposing that the stimulus given to trade in this case would raise wages at least in proportion; and certainly the great gold discoveries in Australia and California raised wages 'in England, as is shown in Tooke's History of Prices, vol. v. p. 284. Similarly it is possible that a general fall in prices, owing to a relative scarcity of the precious metals, may lower the prices of commodities before it lowers the price of labour, in which case there is a rise in real wages. In the controversy as to the possible advantages of bimetallism this was one of the points most fre- quently discussed. It is impossible to say a priori whether a rise or fall in general prices, or a change in the value of money, will raise or lower real wages, since the result is effected principally by indirect influences. But, apart from these general movements in prices, we must, in order to find the real value of nominal wages, consider variations in local prices, and in making this

la real wages.

estimate we must notice the principal items in the expenditure of the labourers. Much attention has been given recently by statisticians to this subject, with the view of finding a good " index number " for real wages. (2) Varieties in the form of payment require careful attention. Sometimes the payment is only partly in money, especially in agriculture in some places. In many parts of Scotland the labourers receive meal, peats, potatoes, &c. (3) Opportunities for extra earnings are sometimes of much importance, especially if we take as the wage-earning unit the family and not the individual. At the end of the 18th century Arthur Young, in his celebrated tours, often calls attention to this fact. In Northumberland and other counties a " hind " (i.e. agricultural labourer) is more valued if he has a large working family, and the family earnings arc relatively large.

(4) Regularity of employment is always, especially in modern times, one of the most important points to be considered. Apart from such obvious causes of fluctuation as the nature of the employment, e.g. in the case of fishermen, guides, &c, there are various social and industrial causes (for a particular and able investigation of which the reader may consult Professor Foxweli's essay on the subject). Under the system of production on a large scale for foreign markets, with widely extended division of labour, it seems impossible to adjust accurately the supply to the demand, and there are in consequence constant fluctuations in the employment of labour. A striking example, happily rare, is furnished by the cotton famine during the American Civil War.

(5) In forming a scientific conception of real wages we ought to take into account the longer or the shorter duration of the power to labour: the man

whose employment is healthy and who lives more comfortably and longer at the same nominal rate of wages may be held to obtain a higher real wage than his less fortunate competitor. It is worth noting/ in this respect, that in nearly every special industry there is a liability to some specia form of disease: e.g. lace-workers often suffer from diseases of th 1 eyes, miners from diseases of the lungs, &c. Thus, in attempting to estimate real wages, we have to consider all the various dis- comforts involved in the " quantity of labour " as well as all the conveniences which the nominal wages will purchase and all the supplements in kind.

In a systematic treatment of the wages question it would be natural to examine next the causes which determine the general rate of wages in any country at any time. This is a problem to which economists have given rateo f much attention, and is one of great complexity. It wages is difficult, when we consider the immense variety '» any of " occupations " in any civilized country and the nw'ijH constant changes which are taking place, even to form an adequate conception of the general rate of wages. There are thousands of occupations of various kinds, and at first sight it may seem impossible to determine, in a manner sufficiently accurate for any useful purpose, an average or general rate of wages, especially if we attempt to take real and not merely nominal wages. At the same time, in estimating the progress of the working-classes, or in comparing their relative positions in different countries, it is necessary to use this conception of a general rate of wages in a practical manner. The difficulties presented are of the same kind as those met with in the deter- mination of the value of money or the general level of prices, and may be overcome to some extent by the same methods. An " index number " may be formed by taking various kinds of labour as fair samples, and the nominal wages thus obtained may be corrected by a consideration of the elements in the real wages to which they, correspond. Care must be taken, however, that the quantity and quality of labour taken at different times and places are the same, just as in the case of commodities similar precautions are necessary. Practically, for example, errors are constantly made by taking the rate of wages for a short time (say an hour), and then, without regard to regularity of employ- ment, constructing the annual rate on this basis; and again, insufficient attention is paid to Adam Smith's pithy caution that " there may be more labour in an hour's hard work than in two hours' easy business." But, however difficult it may be to obtain

an accurate measure of the general rate of wages for practical purposes, there can be no doubt as to the value and necessity of the conception in

economic theory. For, as soon as it is assumed that industrial competition is the principal economic force in the distribution of the wealth of a community — and this is in reality the fundamental assumption of modern economic science,— a distinction must be drawn between the most general causes which affect all wages and the particular causes which lead to differences of wages in different employments. In other words, the actual rate of wages obtained in any particular occu- pation depends partly on causes affecting that group compared with others, and partly on the general conditions which determine the relations between labour, capital and production over the whole area in which the industrial competition is effective. (See A. L. Bowley's Wages in the United Kingdom in theNineteenth Century (1900), § 3, for an account of the meaning and use of the average wage.)

Thus the theory of the wages question consists of two parts, or

gives the answers to two questions: (1) What are the

Wages- causes which determine the general rate of wages?

theory. (2) Why are wages in some occupations and at some

times and places above or below this general rate?

With regard to the first question, Adam Smith, as in almost every important economic theory, gives an answer which com- bines two views which were subsequently differentiated into antagonism. " The produce of labour constitutes the natural recompense or wages of labour," is the opening sentence of his chapter on wages. But then he goes on to say that " this original state of things, in which the labourer enjoyed the whole produce of his own labour, could not last beyond the first introduction of the appropriation of land and the accumulation of stock.' 5 And he thus arrives at the conclusion that " the demand for those who live by wages, it is evident, cannot increase but in proportion to the increase of the funds which are destined to the payment of wages." This is the germ of the celebrated wages- fund theory which was carried to an extreme by J. S. Mill and others; and, although Mill abandoned the theory some time before his death, he was unable to eradicate it from his systematic treatise and to reduce it to its proper dimensions. It is im- portant to observe that in the hands of Mill this theory was by no means, as was afterwards maintained by Elliot Cairnes, a mere statement of the problem to be solved. According to Cairnes (Leading Principles of Political Economy, bk. ii.), the wages-fund theory, as given in Mill's Principles (bk. ii. ch. xi. § 1), embraces the following statements: (1) the wages-fund is a general term used to express the aggregate of all wages at any given time in possession of the labouring

population; (2) the average wage depends on the proportion of this fund to the number of people; (3) the amount of the fund is determined by the amount of general wealth applied to the direct purchase of labour. These propositions Cairnes easily reduces to mere verbal statements, and he then states that the real difficulty is to determine the causes which govern the demand and supply of labour. But the most superficial glance, as well as the most careful survey, will convince the reader of Mill's chapters on wages that he regarded the theory not as the statement but as the solution of the problem. For he applies it directly to the explanation of movements in wages, to the criticism of popular remedies for low wages, and to the discovery of what he considers to be legitimate and possible remedies. In fact, it was principally on account of the applica- tion of the theory to concrete facts that it aroused so much opposition, which would have been impossible if it had been a mere statement of the problem.

The wages-fund theory as a real attempt to solve the wages question may be resolved into three propositions, which are very different from the verbal truisms of Cairnes. (1) In any country at any time there is a determinate amount of capital uncon- ditionally destined for the payment of labour. This is the wages- fund. (2) There is also a determinate number of labourers who must work independently of the rate of wages— that is, whether the rate is high or low. (3) The wages-fund is distributed amongst the labourers solely by means of competition, masters

competing with one another for labour, and labourers with one another for work, and thus the average rate of wages depends on the proportion between wage-capital and population. It follows then, according to this view, that wages can only rise either owing to an increase of capital or a diminution of popu- lation, and this accounts for the exaggerated importance attached by Mill to the Malthusian theory of population. It also follows from the theory that any restraint of competition in one direction can only cause a rise of wages by a corresponding fall in another quarter, and in this form it was the argument most frequently urged against the action of trade unions. It is worth noting, as showing the vital connexion of the theory with Mill's principles, that it is practically the foundation of his propositions on capital in his first book, and is also the basis of the exposition in his fourth book of the effects of the progress of society on the condition of the working-classes.

It has often been remarked that, in economics as in other sciences, what eventually assumes the form of the development of or supplement to an old theory at first appears as if in direct antagonism to it, and there is reason to think that the criticism of the wages-fund theory was carried to an extreme, and that the essential elements of truth which it contains were overlooked. In many respects the theory may be regarded as a good first

approximation to the complete solution of the problem. The plan favoured by some modern economists of regarding wages simply as the price of labour determined as in the case of other prices simply by demand and supply, though of advantage from some points of view, is apt to lead to a maladjustment of emption in other directions. The supply of labour, for example, is in many ways on a different footing from the supply of commodities. The causes which the wages-fund theory emphasizes too exclusively are after all verae causae, and must always be taken into account. There can be no doubt, for example, that under certain conditions a rapid increase in the labouring population may cause wages to fall, just as a rapid decline may make them rise. The most striking example of a great improvement in the con- dition of the labouring classes in English economic history is found immediately after the occurrence of the Black Death in the middle of the 14th century. The sudden and extensive thinning of the ranks of labour was manifestly the principal cause of the great improvement in the condition of the survivors.

Again, as regards the amount of capital competing for labour, the reality of the cause admits of no dispute, at any rate in any modern society. The force of this element is perhaps best seen by taking a particular case and assuming that the general wages- fund of the country is divided into a number of smaller wages- funds. Take, for example, the wages of domestic servants when the payment of wages is made simply for the service rendered. We may fairly assume that the richer classes of the community practically put aside so much of their revenue for the payment of the wages of their servants. The aggregate of these sums is the domestic wages-fund. Now, if owing to any cause the amount available for this purpose falls off, whilst the number of those seeking that class of employment remains the same, the natural result would be a fall in wages. It may of course happen in this as in other cases that the result is not so much a direct fall in the rate of wages as a diminution of employment — but even in this case, if people employ fewer servants, they must do more work. Again, if we were to seek for the reason why the wages of governesses are so low, the essence of the answer would be found in the excessive supply of that kind of labour compared with the funds destined for its support. And similarly through the whole range of employments in which the labour is employed in perishable services and not in material products, the wages- fund theory brings into prominence the principal causes governing the rate of wages, namely, the number of people competing, the amount of the fund competed for, and the effectiveness of the competition. This view also is in harmony with the general principles of demand and supply. If we regard labour as a commodity and wages as the price paid for it, then we may say that the price will be so adjusted that the quantity demanded

will be made equal to the quantity offered at that price, — the agency by which the equation is reached being competition.

But when we turn to other facts for the verification of the theory we easily discover apparent if not real contradictions. The case of Ireland after the potato famine affords an instance of a rapidly declining population without any corresponding rise in wages, whilst in new countries we often find a very rapid increase of population accompanied by an increase in wages. In a similar manner we find that the capital of a country may increase rapidly without wages rising in proportion — as ; for example, seems to have been the case in England after the great mechanical improvements at the end of the 18th century up to the repeal of the Corn Laws — whilst in new countries where wages are the highest there are generally complaints of the scarcity of capital. But perhaps the most striking conflict of the theory with facts is found in the periodical inflations and depressions of trade. After a commercial crisis, when the shock is over and the necessary liquidation has taken place, we generally find that there is a period during which there is a glut of capital and yet wages are low. The abundance of capital is shown by the low rate of interest and the difficulty of obtaining remunerative investments. Accordingly this apparent failure of the theory, at least partially, makes it necessary to examine the propositions into which it was resolved more carefully, in order to discover, in the classical economic phraseology, the " disturbing causes." As regards the first of these propositions— that there is always a certain amount of capital destined for the employment of labour — it is plain that this destination is not really unconditional. In a modern society whether or not a capitalist will supply capital to labour depends on the rate of profit expected, and this again depends proximately on the course of prices. But the theory as stated can only consider profits and prices as acting in an indirect roundabout manner upon wages. If profits are high then more capital can be accumulated and there is a larger wages-fund, and if prices are high there may be some stimulus to trade, but the effect on real wages is considered to be very small. In fact Mill writes it down as a popular delusion that high prices make high wages. And if the high prices are due purely to currency causes the criticism is in the main correct, and in some cases, as was shown above, high prices may mean real low wages. If, however, we turn to the great classes of employments in which the labour is embodied in a material product, we find on examination that wages vary with prices in a real and not merely in an illusory sense. Suppose, for example, that, owing to a great increase in the foreign demand for British produce, a rise in prices takes place, there will be a corresponding rise in nominal wages, and in all probability a rise in real wages. Such was undoubtedly the case in Great Britain on the conclusion of the Franco-German War.

On the other hand, if prices fall and profits are low, there will so far be a tendency to contract the employment of labour. At the same time, however, to some extent the capital is applied unconditionally — in other words, without obtaining what is considered adequate remuneration, or even at a positive loss. The existence of a certain amount of fixed capital practically implies the constant employment of a certain amount of labour.

Nor is ihc second proposition perfectly true, namely, that there are always a certain number of labourers who must work inde- pendently of the rate of wages. For the returns of pauperism and other statistics show that there is always a proportion of " floating " labour sometimes employed and sometimes not. Again, although, as Adam Smith says, man is of all luggage the most difficult to be transported, still labour as well as capital may be attracted to foreign fields. The constant succession of strikes resorted to in order to prevent a fall in wages shows that in practice the labourers do not at once accept the "natural" market rate. Still, on the whole, this second proposition is a much more adequate expression of the truth than the first; for labour cannot afford to lie idle or to emigrate so easily as capital. The third proposition, that the wages-fund is distributed solely by competition, is also found to conflict with facts. Competition

may be held to imply in its positive meaning that every indi- vidual strives to attain his own economic interests regardless of the interests of others. But in some cases this end may be attained most effectively by means of combination, as, for example, when a number of people combine to create a practical monopoly. Again, the end may be attained by leaving the control to government, or by obeying the unwritten rules of long-established custom. But these methods of satisfying economic interests are opposed to competition in the usual sense of the term, and certainly as used in reference to labour. Thus on "the negative side competition implies that the economic interests of the persons concerned are attained neither by combination, nor by law, nor by custom. Again, it is also assumed, in making competition the principal distributing force of the national income, that every person knows what his real interests are, and that there is perfect mobility of labour both from employment to employment and from place to place. Without these assumptions the wages-fund would not be evenly distributed according to the quantity of labour. It is, however, obvious that, even in the present industrial system, competition is modified considerably by these disturbing agencies; and in fact the tendency seems to be more and more for combinations of masters on one side and of men on the other to take the place of the competition of individuals.

The attempted verification of the wages-fund theory leads to so many important modifications that it is not surprising to find that in recent times the tendency has been to w reject it altogether. And thus we arrive at the

develop- pg ˆ ment of Adam Smith's introductory statement, namely, from the that the produce of labour constitutes the natural P' rf " ce recompense or wages of labour. The most important omission of the wages-fund theory is that it fails to take account of the quantity produced and of the price obtained for the pro- duct. If we bring in these elements, we find that there are several other causes to be considered besides capital, population and competition. There are, for example, the various factors in the efficiency of labour and capital, in the organization of industry, and in the general condition of trade. To some extent these elements may be introduced into the old theory, but in reality the point of view is quite different. This is made abundantly clear by considering Mill's treatment of the remedies for low wages. His main contention is that population must be rigidly restrained in order that the average rate of wages may be kept up. But, as several American economists have pointed out, in new countries especially every increase in the number of labourers may be accompanied by a more than proportionate increase in the produce and thus in the wages of labour. Again, the older view was that capital must be first accumulated in order after- wards to be divided up into wages, as if apparently agriculture was the normal type of industry, and the workers must have a store to live on until the new crop was grown and secured. But the " produce " theory of wages considers that wages are paid continuously out of a continuous product, although in some cases they may be advanced out of capital or accumulated stores. According to this view wages are paid out of the annual produce of the land, capital and labour, and not out of the savings of previous years. There is a danger, however, of pushing this theory to an untenable extreme, and overlooking altogether the function of capital in determining wages; and the true solution seems to be found'in a combination of the " produce " theory with the " fund " theory.*

An industrial society may be regarded, in the first place, as a great productive machine turning out a vast variety of products for the consumption of the members of the society. The distribution of these products, so far as it is not modified by other social and moral conditions, depends upon the principle of " reciprocal demand." In a preliminary rough classification we may make three groups — the owners of land and natural agents, the owners of capital or reserved products and instruments, and the owners of labour. To obtain the produce requisite even for the necessary wants of the community a combination of these three groups must take place, and the relative reward obtained

Relative wages.

by each will vary in general according to the demands of the ethers for its services. Thus, if capital, both fixed and circulating, is scanty, whilst labour and land are both abundant, the reward of capital will be high relatively to rent and wages. This is well illustrated in the high rate of profits obtained in early societies. According to this view of the question the aggregate amount paid in wages depends partly on the general productiveness of all the productive agents and partly on the relative power of the labourers as compared with the owners of land and capital (the amount taken by government and individuals for taxes, charity, &c, being omitted). Under a system of perfect industrial competition the general rate of wages would be so adjusted that the demand for labour would be just equal to the supply at that rate. (Compare Marshall's Principles of Economics, bk. vi. ch. ii.)

If all labour and capital were perfectly uniform it would not be necessary to carry the analysis further, but as a matter of fact, instead of two great groups of labourers and capitalists, we have a multitude of subdivisions all under the in- fluence of reciprocal demand. Every subgroup tries to obtain as much as possible of the general product, which is practically always measured in money. The determination of relative wages depends on the constitution of these groups and t heir relations to one another. Under any given social conditions there must be differences of wages in different employments, which may be regarded as permanent until some change occurs in the conditions; in other words, certain differences of wages are stable or normal, whilst others depend simply on temporary fluctuations in demand and supply. A celebrated chapter in the Wealth of Nations (bk. i. ch. x.) is still the best basis for the investigation of these normal differences — which, as stated above, is the second principal problem of the wages question. First of all, a broad distinction may be drawn between the natural and artificial causes of difference, or, in Adam Smith's phraseology, between those due to the nature of the employments and those due to the policy of Europe. In the former division Natural we] iave (x) j-jˆ agreeableness or disagreeableness of difference, the employment, illustrated by two classical examples — " honour makes a great part of the reward of all honourable professions," and " the most detestable of all em- ployments—that of public executioner — is, in proportion to the work done, better paid than any common trade whatever." There is, however, much truth in Mill's criticism, that in many cases the worst paid of all employments arc at the same time the most disagreeable, simply because those engaged in them have practically no other choice. (2) The easiness and cheapness or the reverse of learning the business. This factor operates in two ways. A difficult business implies to some extent peculiar natural qualifications, and it also involves the command of a certain amount of capital to subsist on during the process of learning, and thus in both respects the natural supply of labour is limited. (3) The constancy or

inconstancy in the employment— a point already noticed under real wages. (4) The great or small trust reposed in the workmen, an important consideration in all the higher grades of labour, e.g. bankers, lawyers, doctors, &c. (5) The chance of success or the reverse. Here it is to be observed that, owing to the hopefulness of human nature and its influence on the gambling spirit, the chance of success is generally over- estimated, and therefore that the wages in employments where the chance of success is really small are lower than they ought to be. The most striking instance is furnished by the labour in gold mines, diamond fields, and the like, and the same cause also operates in many of the professions.

All these causes of differences of wages in different employ- ments may be explained by showing the way in which they operate on the demand and supply of labour in the particular group. If the " net advantages," to adopt Marshall's phrase- ology, of any group are relatively high, then labour will be directly attracted to that group, and the children born in it will be brought up to the same occupation, and thus in both ways the supply of labour will be increased. But the " net advantages " embrace the conditions just enumerated. Again, if the other

members of the community require certain forms of labour to a

greater extent, there is an increase in the demand and a rise in

their price.

In addition to these so-called natural causes of difference,

there are those arising from law, custom, or other so-called

artificial causes. They may be classified under four

headings. (1) Certain causes artificiallv restrain in- '»« a ' , . , . . i t • • 1 ' i – causes of

dustnal competition by limiting the number oi any difference. particular group. Up to the close of the 18th century, and in many instances to a much later date, the regulations of gilds and corporations limited the numbers in each trade (cf. Brentano, Gilds and Trade Unions). This they did by making a long apprenticeship compulsory on those wishing to learn the craft, by restricting the number of apprentices to be taken by any master, by exacting certain qualifications as to birth or wealth, by imposing heavy entrance fees, either in money or in the shape of a useless but expensive masterpiece. Some cf these regulations were originally passed in the interests of the general public and of those employed in the craft, but in the course of time their effect was, as is stated by Adam Smith, simply to

unduly restrain competition. The history of the craft-gilds is full of instructive examples of the principles governing wages. No doubt the regulations tended to raise wages above the natural rate, but as a natural consequence industry migrated to places where the oppressive regulations did not exist. In the time of the Tudors the decay of many towns during a period of rapid national progress was largely due to those " fraternities in evil," as Bacon called the gilds. At present one of the best examples of the survival of this species of artificial restriction is the limitation of the number of teachers qualifying for degrees in certain univer- sities. (2) In some employments, however, law and custom tend unduly to increase the amount of competition. This was to a great extent the case in the church and the scholastic professions owing to the large amount of charitable education. Adam Smith points out that even in his day a curate was " passing rich on forty pounds a year," whilst many only obtained £20 — below the wages earned by a journeyman shoemaker. In the same way state-aided education of a commercial and technical kind may result in lowering the rates (relatively) of the educated business classes. It is said that one reason why the Germans replace Englishmen in many branches is that, having obtained their education at a low rate, there are more of them qualified, and consequently they accept lower wages. The customary idea that the position of a clerk is more genteel than that of an artisan accounts largely for the excessive competition in the former class, especially now that education is practically universal. (3) In some cases law and custom may impede or promote the oircula tion of labour. At the time Adam Smith wrote the laws of settlement were still in full operation. " There is not a man of forty who has not felt most cruelly oppressed by this ill-contiived law of settlement." Differences in wages in different parts of the same country and in different occupations are still largely due to impediments in the way of the movement of labour, which might be removed or lessened by the government making provisions for migration or emigration. (4) On many occasions in the past the law often directly interfered to regulate wages. The Statute of Labourers, passed immediately after the Black Death, was an attempt in this direction, but it appears to have failed, according to the investigations cf Thorold Rogers. The same writer, however, ascribes to the celebrated Statute of Apprentices (5th of Elizabeth) the degradation of the English labourer for nearly three centuries {Agriculture and Prices, vol. v.). This, he asserts, was due to the wages'being fixed by the justices of the peace. It is, however, worth noting that Brentano, who is equally sympathetic with the claims of labour, asserts that so long as this statute was actually enforced, or the customs founded upon it were observed, the condition of the labourers was prosperous, and that the degradation only began when the statute fell into disuse (Origin of Gilds and Trade Unions. For a full account of the effect of the Statute of Apprentices see W. Cunningham's Growth of English Industry and Commerce, vol. ii.).

WAGES

Something must be said as to the power of the state to regulate wages. As far as any direct regulation is concerned, it seems to be only possible within narrow limits. The state might Slate of course institute certain complex sliding-scales for

ofwages. different classes of labour and make them compulsory, but this would rather be an official declaration of the natural market rate than a direct regulation. Any rate which the state of trade and prices would not bear could not be en- forced: masters could not be compelled to work at a loss or to keep their capital employed when it might be more advantage- ously transferred to another place or occupation. Thus the legal rate could not exceed to any considerable extent the market rate. Nor, on the other hand, could a lower rate in general be enforced, especially when the labourers have the right of combination and possess powerful organizations. And even apart from this the competition of capitalists for labour would tend to raise wages above the legal rate, and evasion would be extremely easy.

The best illustration of the failure to raise the rate of wages directly by authority is found in the English poor law system between 1796 and 1834. " In the former year (1706) r°°«oIr e ‘ the decisrve *y * atal ste P of legalizing out-relief to the wages. able-bodied, and in aid of wages, was taken/’ and " in February 1834 was published perhaps the most remarkable and startling document to be found in the whole range of English, perhaps indeed of all social history " (Fowle’s Poor Law). The essence of the system was in the justices determining a natural rate of wages, regard being paid to the price of necessaries and the size of the labourer’s family, and an amount was given from the rates sufficient to make up the wages received to this natural level. The method of administration ‘ was certainly bad, but the best administration possible could ; only have kept the system in existence a few years longer. In j one parish the poor-rate had swallowed up the whole value of the land, which was going out of cultivation, a fact which has an obvious bearing on land nationalization as a remedy for low wages. The labourers became careless, inefficient and improvident. Those who were in regular receipt of relief were often better off (in money) than independent labourers. But the most important consequence was that the real wages obtained were, in spite of the relief, lower than otherwise they would have been, and a striking proof was given that wages are paid out of the produce of labour. The Report oj the Poor Law Commissioners (1834) states emphatically (p. 48) that " the severest sufferers are those for whose benefit the system is supposed to have

been introduced and to be perpetuated, the labourers and their families." The independent labourers suffered directly through the unfair competition of the pauper labour, but, as one of the sub-reporters stated, in every district the general condition of the independent labourer was strikingly distinguishable from that of the pauper and superior to it, though the independent labourers were commonly maintained upon less money. In New Zealand and Australia in recent years a great extension has been made of the principle of state intervention in the regulation of wages.

But. although the direct intervention of the state, with the view of raising the nominal rates of wages, is, according to theory and experience, of doubtful advantage, still, when we , } °Pi consider real wages in the evident sense of the term, tioa. there seems to be an almost indefinite scope for state*

interference. The effect of the Factory Acts and similar legislation has been undoubtedly to raise the real wages of the working-classes as a whole, although at first the same argu- ments were used in opposition to these proposals as in the case of direct relief from the poor-rates. But there is a vital difference in the two cases, because in the former the tendency is to increase whilst in the latter it is to diminish the energy and self-reliance of the workers. An excellent summary of the results of this species of industrial legislation is given by John Morley {Life of Cobden, vol. i. p. 303): —

" We have to-day a complete, minute, and voluminous code for the protection of labour: buildings must be kept pure of effluvia; dangerous machinery must be fenced; children and young persons must not clean it while in motion; their hours are not only limited but fixed ; continuous employment must not exceed a given number

of hours, varying with the trade but prescribed by the law in given cases; a statutable number of holidays is imposed; the children must go to school, and the employer must have every week a certi- ficate to that effect ; if an accident happens notice must be sent to the proper authorities; special provisions are made for bake- houses, for lace-making, for collieries, and for a whole schedule of other special callings; for the due enforcement and vigilant supervision of this immense host of minute prescriptions there is an immense host of inspectors, certifying surgeons, and other authorities whose business it is to ' speed and post o'er land and ocean ' on sullen guardianship of every kind of labour, from that of the woman who plaits straw at her cottage door to the miner who descends into the bowels of the earth and the seaman who conveys the fruits and materials of universal industry to and fro between the remotest parts of the globe."

The analysis previously given of real wages shows that logically all these improvements in the conditions of labour, by diminishing the " quantity of labour " involved in work, are equivalent to a real rise in wages. Experience has also shown that the state may advantageously interfere in regulating the methods of paying wages. A curious poem, written about the time of Edward IV., on England's commercial policy (Political Songs and Poems, Rolls Series, ii. 282), shows that even in the 15th century the " truck " system was in full operation, to the disadvantage of the labourers. The cloth-makers, in particular, compelled the workers to take half of their wages in merchandise which they estimated at higher than its real value. The writer proposes that the " wyrk folk be paid in good mone," and that a sufficient ordinance be passed for the purpose, and a law to this effect was enacted in the 4th year of Edward IV. The Truck Acts have since been much further extended. Again, the legis- lation directed against the adulteration of all kinds of goods, which also finds its prototypes in the middle ages, is in its effects equivalent to a rise in real wages. 1

The power of trade unions in regulating wages is in most respects analogous in principle to that of legislation just noticed. Nominal wages can only be affected within compara- tively narrow limits, depending on the condition of ^^ s trade and the state of prices, whilst in many cases & and wages. rise in the rate in some trades or places can only be accomplished by a corresponding depression elsewhere. At the same time, however, it can Tiardly be questioned that through the unions nominal wages have on the whole risen at the expense of profits — that is to say, that combinations of labourers can make better bargains than individuals. But the debatable margin which may make either extra profits or extra wages is itself small, and the principal direct effect of trade unions is to make wages fluctuate with prices, a rise at one time being com- pensated by a fall at another. The unions can, however, look after the interests of their members in many ways which improve their general condition or raise the real rate of wages, and when nominal wages have attained a natural maximum, and some method of arbitration or sliding-scale is in force, this indirect action seems the principal function of trade unions. The effects of industrial partnership (cf. Sedley Taylor's Profit Sharing) and of productive co-operation (cf. Holyoake's History of Co-operation) ; are small in amount (compared with the total industry of any ■ country) though excellent in kind, and there seem to be no signs of the decay of the entrepreneur system.

The industrial revolution which took place about the end of the 18th century, involving radical changes in production, destroyed the old relations between capital and labour, and per- haps the most interesting part of the history of wages is m g^^ ery that covered by the 19th century. For fifty years after oa wages , the introduction of production on a large scale, the condition of the working-classes was on the whole deplorable, but

great progress has since been made. The principal results may be summed up under the effects of machinery on wages — taking both words in their widest sense. Machinery affects the condition of the working-classes in many ways. The most obvious mode is the direct substitution of machinery for labour. It is clear that any sudden and extensive adoption of labour-saving machinery

1 On this subject compare Jevons, The Stats in Relation to Labour, new edition by F. A. Hirst.

may, by throwing the labourers out of employment, lower the rate of wages, and it is easy to understand how riots arose repeatedly owing to this cause. But as a rule the effect of labour- saving machinery in diminishing employment has been greatly exaggerated, because two important practical considerations have been overlooked. In the first place, any radical change made in the methods of production will be only gradually and continuously adopted throughout the industrial world: and in the second place these radical changes, these discontinuous leaps, tend to give place to advances by small increments of invention. We have an instance of a great radical change in the steam-engine. Watt's patent for " a method of lessening " the consumption of steam and fuel in fire-engines was published on January 5, 1769, and the movement for utilizing steam-power still found room for extension for a century or more afterwards. The history of the power-loom again shows that the adoption of an invention is comparatively slow. In 1813 there were not more than 2400 power-looms at work in England. Ill 1820 they increased to 14,150. In 1853 there were 100,000, but the curious thing is that during this time the number of hand-looms had actually increased to some extent (Porter's Progress of Ike Nation, p. 186). The power-loom also illustrates the gradual continuous growth of improvements. This is clearly shown by Porter. A very good hand-weaver, twenty-five or thirty years of age, could weave two pieces of shirting per week. In 1823 a steam-loom weaver, about fifteen years of age, attending two looms, could weave nine similar pieces in a week. In 1826 a steam-loom weaver, about fifteen, attending to four looms, could weave twelve similar pieces a week. In 1833 a steam-loom weaver, from fifteen to twenty, assisted by a girl of twelve, attending to four looms, could weave eighteen pieces. This is only one ex- ample, for, as Porter remarks, it would fill many large volumes to describe the numerous inventions which during the 19th century imparted facility to manufacturing processes, and in every case we find a continuity in the improvements. This two- fold progressive character of invention operates in favour of the labourer — in the first

place, because in most cases the increased cheapness of the commodity consequent on the use of machinery causes a corresponding extension of the market and the amount produced, and thus there may be no actual diminution of employment even temporarily; and secondly, if the improvement takes place slowly, there is time for the absorp tion of the redundant labour in other employments. It is quite clear that on balance the great increase in population in the 10th century was largely caused, or rather rendered possible, by the increased use of labour-saving machinery. The way in which the working-classes were at first injured by the adoption of machinery was not so much by a diminution in the number of hands required as by a change in the nature of the employment. Skilled labour of a certain kind lost its peculiar value, and children and women were able to do work formerly only done by men. But the principal evils resulted from the wretched conditions under which, before the factory legislation, the work was per- formed; and there is good reason to believe that a deterioration of the type of labourer, both moral and physical, was effected. It is, however, a mistake to suppose that on the whole the use of machinery tends to dispense with skill. On the contrary, everything goes to prove that under the present system of pro- Pro ss auction on a large scale there is on the whole far otthe more skill required than formerly — a fact well brought working- out by Sir Robert Giffen in his essay on the progress cbsses. | t j ie wor ki n g-classes (Essays on Finance, vol. ii. p. 365), and expressed by the official reports on wages in different countries. (J. S. N.)

WAGGA-WAGGA, a town of Wynyard county, New South Wales, Australia, on the left bank of the river Murrumbidgee, 300 m. by rail W.S.W. of Sydney and 267 m. N.E. of Melbourne. Pop. (1901) 5114. The Murrumbidgee is here spanned by a steel' viaduct, the approaches of which are formed by heavy embank- ments. Wagga-Wagga has a school of art with a library attached, a fine convent picturesquely situated on Mount Erin, a good racecourse and agricultural show-grounds. There is a consider-

able amount of gold-mining in the district, which, however, is chiefly pastoral, although cereals, tobacco and wine are produced in considerable quantities.

WAGNER, ADOLF (1835-), German economist, was born at Erlangen on the 25th of March 1835. Educated at Gottingen and Heidelberg, he was professor of political science at Dorpat and Ereiburg, and after 1870 at Berlin. A prolific writer on economic problems, he brought out in his study of the subject the close relation which necessarily exists between economics and jurisprudence. He ranks without doubt as one of the most eminent German economists and a distinguished leader of the historical school. His leanings towards Christian socialism marie him one of those to whom the

appellation of " Katheder- Socialisten " or " socialists of the (professional) chair " was applied, and he was one of the founders of the Vertin fur Social- politik. In 1S71 he undertook, in conjunction with Professor E. Nasse (1829-1890), a new edition of Rau's Lehrbuch der politischen Okonomie, and his own special contributions, the Grundlegung and Finanzwissenschaft, afterwards published separ- ately, are probably his most important works. He approaches economic studies from the point of view that the doctrine of the jus naturae, on which the physiocrats reared their economic structure, has lost its hold on belief, and that the old a priori and absolute conceptions of personal freedom and property have given way with it. He lays down that the economic position of the individual, instead of depending merely on so-called natural rights or even on his natural powers, is conditioned by the contemporary juristic system, which is itself an historical product. These conceptions, therefore, of freedom and property, half economic, half juristic, require a fresh examination. Wagner accordingly investigates, before anything else, the conditions of the economic life of the community, and in sub- ordination to this, determines the sphere of the economic freedom of the individual. Among his works are Beitrage VAir Lehre von den Banken (1857), System der deutschen Zettelbankgesetzgebung (1870-1873) and Agrar- und Industriestaat (1902).

His brother, Hermann Wagner (1840-), a distinguished geographer, joined the Geographical Institute of Justus Perthes in 1868, and was editor of the statistical section of the Golhaer Almanack up to 1876. In 1872 he founded Die Bewlkerung der Erde, a critical review of area and population, and in 1880 he was appointed professor of geography at Gottingen. He was editor of the Geographisches Jahrbuch from 1S80 to 1908. His publications include Lehrbuch der Geographie (7th ed., 1903) and Methodischer Schulatlas (12th ed., 1907).

WAGNER, RUDOLPH (1805-1864), German anatomist and physiologist, was born on the 30th of June 1805 at Bayreuth, where his father was a professor in the gymnasium. He began the study of medicine at Erlangen in 1822, and finished his curriculum in 1826 at Wiirzburg, where he had attached himself mostly to J. L. Schonlein in medicine and to K. F. Heusinger in comparative anatomy. Aided by a public stipendium, he spent a year or more studying in the Jardin des Plantes, under the friendly eye of Cuvier, and in making zoological discoveries at Cagliari and other places on the Mediterranean. On his return he set up in medical practice at Augsburg, whither his father had been transferred; but in a few months he Found an opening for an academical career, on being appointed prosector at Erlangen. In 1832 he became full professor of zoology and comparative anatomy there, and held that office until 1840, 'when he was called to succeed J. F. Blumenbach at Gottingen. At the Hano- verian university he

remained till his death, being much occupied with administrative work as pro-rector for a number of years, and for nearly the whole of his residence troubled by ill-health (phthisis). In i860 he gave over the physiological part of his teaching to a new chair, retaining the zoological, with which his career had begun. While at Frankfurt, on his way to examine the Neanderthal skull at Bonn, he was struck with paralysis, and died at Gottingen a few months later on the 13th of May 1864.

Wagner's activity as a writer and worker was enormous, and his range extensive, most of his hard work having been done at Erlangen while his health was good. His graduation thesis was on the

ambitious subject of " the historical development of epidemic and contagious diseases all over the world, with the laws of their diffusion," which showed the influence of Schonlein. His first treatise was Die Naturgesckichle des Menschen (in 2 vols., Kempten, 1831). Frequent journeys to the Mediterranean, the Adriatic, and the North Sea gave him abundant materials for research on in vertebrate anatomy and physiology, which he communicated first to the Munich academy of sciences, and republished in his Beitrdge %ur vergleichenden Physiologic des Bhites (Leipzig, 1832-1833), with additions in 1838). In 1834-1835 he brought out a text-book on the subject of his chair {Lekrbuch der vergleiclienden Anatomic, Leipzig), which recommended itself to students by its clear and concise style. A new edition of it appeared in 1843 under the title of Lehrbuch der Zootomie, of which only the vertebrate section, was corrected by himself. The precision of his earlier work is evidenced by his Micromelric Measurements of the Elementary Parts of Man and Animals (Leipzig, 1834). His zoulogical labours may be said to conclude with the atlas lcones zootomicae (Leipzig, 1841). In 1835 he communicated to the Munich academy of sciences his researches on the physiology of generation and development, in- cluding the famous discovery of the germinal vesicle of the human ovum. These were republished under the title Prodromus kistoriae generalionis hominis atque animalium (Leipzig, 1836). As in zoology, his original researches in physiology were followed by a students' text-book, Lehrbuch der speciellen Physiologic (Leipzig, 1838), which soon reached a third edition, and was translated into French and English. This was supplemented by an atlas, lcones fhysiologicae (Leipzig, 1839). To the same period belongs a very interesting but now little known work on medicine proper, of a historical and synthetic scope, Grundriss der Encyklopddie und Methodologie der medicinischsn Wissenschaften nach geschichtlicher Ansicht (Erlangen, 1838), which was translated into

Danish. About the same time he worked at a translation of J. C. Prichard's Natural History of Man, and edited various writings of S. T. Sommerring, with a biography of that anatomist (1844), which he himself fancied most of all his writings. In 1843, after his removal to Gottingen, he began his great Ilandwbrterbuch der Physiologic, mil Riichsicht auf physiologische Pathologic, and brought out the fifth (supplementary) volume in 1852 ; the only contributions of his own in it were on the sympathetic nerve, nerve-ganglia and nerve-endings, and he modestly disclaimed all merit except as being the organizer. While resident in Italy for hishealth from 1845 to 1847, he occupied himself with researches on the electrical organ of the torpedo and on nervous organization generally; these he published in 1853-1854 (Neurolo- gische Untersuchungen, Gottingen), and therewith his physiological period may be said to end. His next period was stormy and con- troversial. He entered the lists boldly against the materialism of " Stoff und Kraft," and avowed himself a Christian believer, where- upon he lost the countenance of a number of his old friends and pupils, and was unfeelingly told that he was suffering from an ' atrophy of the brain." His quarrel with the materialists began with his oration at the Gottingen meeting of the Naturforscher- Versammluns in 1854,011 "MenschenschopfungundSeelensubstanz." This was followed by a series of " Physiological Letters " in the Allgemcine Zeitung, by an essay on " Glanben und Wissen," and by the most important piece of this series, "Der Kampf urn die Seele (Gottingen, 1857). Having come to the consideration of these philosophical problems late in life, he was at some disadvantage ; but he endeavoured to join as he best could in the current of con- temporary German thought. He had an exact knowledge of classical German writings, more especially of Goethe's, and of the literature connected with him. In what may be called his fourth and last period, Wagner became anthropologist and archaeologist, occupied himself with the cabinet of skulls in the Gottingen museum collected by Blumenbach and with the excavation of prehistoric remains, corresponded actively with the anthropological societies of Paris and London, and organized, in co-operation with the veteran K. E. von Baer, a successful congress of anthropologists at Gottingen in 1861. His last writings were memoirs on the convolutions of the human brain, on the weight of brains, and on the brains of idiots (1860-

1862).

See memoir by his eldest son in the Gbltinger gelchrte Anzeigen, " Nachrichten " for 1864.

WAGNEB, WILHELM RICHARD (1813-1883), German dramatic composer, poet and essay-writer, was born at Leipzig OQ the 22nd of May 1813. In 1822 he was sent to the Kreuzschule at Dresden, where he did so

well that, four years later, he trans- lated the first twelve books of the Odyssey for amusement. In 1828 he was removed to the Nicolaischule at Leipzig, where he was less successful. His first music master was Gottlieb Muller, who thought him self-willed and eccentric; and his first production as a composer was an overture, performed at the Leipzig theatre in 1830. In that year he matriculated at the university, and took lessons in composition from Theodor Weinlig, cantor at the Thomasschule. A symphony was produced at the Gewand- haus concerts in 1833, and in the following year he was appointed

conductor of the opera at Magdeburg. The post was unprofitable, and Wagner's life at this period was very unsetlled. He had composed an opera called Die Feen adapted by himself from Gozzi's La Donna Serpente, and another, Das Liebesverbot, founded on Shakespeare's Measure .for Measure, but only Das Liebesverbot obtained a single performance in 1836.

In that year Wagner married Wilhelmina Planer, an actress at the theatre at Konigsberg. He had accepted an engagement there as conductor; but, the lessee becoming bankrupt, the scheme was abandoned in favour of a better appointment at Riga. Accepting this, he remained actively employed until 1839, when he made his first visit to Paris, taking with him an unfinished opera based on Bulwer Lytton's Rienzi, and, like his earlier attempts, on his own libretto. The venture proved most unfortunate. Wagner failed to gain a footing, and Rienzi, destined for the Grand Opera, was rejected. He completed it, however, and in 1842 it was produced at Dresden, where, with Madame Schroeder Devrient and Herr Tichatschek in the principal parts, it achieved a success which went far to make him famous.

But though in Rienzi Wagner had shown energy and ambition, that work was far from representing his preconceived ideal. This he now endeavoured to embody in Der fiiegende Hollander, for which he designed a libretto quite independent of any other treatment of the legend. The piece was warmly received at Dresden on the 2nd of January 1843; but its success was by no means equal to that of Rienzi. Spohr, however, promptly discovered its merits, and produced it at Cassel some months later, with very favourable results.

On the 2nd of February 1843 Wagner was formally installed as Hofkapellmeister at the Dresden theatre, and he soon set to work on a new opera. He chose the legend of Tannhauser, collecting his materials from the ancient Tannliawser-Lied, the Volksbuch, Tieck's poetical Ersdhlung, Hoffmann's story of Der Sangerkrieg, and the medieval poem on Der Wartburgkrieg. This last-named legend introduces the incidental poem of " Loherangrin," and so led Wagner to the study of Wolfram von Eschenbach's Parzival and Titurel, with great results later on. But for the

present he confined himself to the subject in hand; and on the 19th of October 1845 he produced his Tann- hauser, with Schroeder Devrient, Johanna Wagner, 1 Tichatschek and Mitterwurzer in the principal parts. Notwithstanding this powerful cast, the success of the new work was not brilliant, for it carried still further the principles embodied in Der fiiegende Hollander, and the time was not ripe for them. But Wagner boldly fought for them, and might have prevailed earlier had he not taken part in the political agitations of 1849, after which his position in Dresden became untenable. In fact, after the flight of the king and the subsequent suppression of the riots, a warrant was issued for his arrest; and he had barely time to escape to Weimar, where Liszt was at that moment engaged in preparing Tannhauser for performance, before the storm burst upon him with alarming violence. In all haste Liszt procured a passport and escorted his guest as far as Eisenach. Wagner fled to Paris and thence to Zurich, where he lived in almost unbroken retire- ment until the autumn of 1859. During this period most of his prose works — including Oper und Drama, Uber das Dirigieren, Das Judentum in der Musik — were given to the world.

The medieval studies which Wagner had begun for his work at the libretto of Tannhauser bore rich fruit in his next opera Lohengrin, in which he also developed his principles on a larger scale and with a riper technique than hitherto. He had com- pleted the work before he fled from Dresden, but could not get it produced. But he took the score with him to Paris, and, as he himself tells us, " when ill, miserable and despairing, I sat brooding over my fate, my eye fell on the score of my Lohengrin, which I had totally forgotten. Suddenly I felt something like compassion that the music should never sound from off the ■death-pale paper. Two words I wrote to Liszt; his answer was the news that preparations were being made fcr the perform- ance of the work, on the grandest scale that the limited means of Weimar would permit. Everything that care and accessories 1 The composer's niece.

WAGNER

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could do was done to make the design of the piece understood. Liszt saw what was wanted at once, and did it. Success was his reward; and with this success he now approaches me, saying " See, we have come thus far; now create us a new work, that we may go further."

Lohengrin was, in fact, produced at Weimar under Liszt's direction on the 28th of August 1850. It was a severe trial to Wagner not to hear his own work, but he knew that it was in good hands, and he responded to Liszt's

appeal for a new creation by studying the Nibelungenlicd and gradually shaping it into a gigantic tetralogy. At this time also he first began to lay out the plan of Tristan und Isolde, and to think over the possibilities of Parsifal.

During his exile Wagner matured his plans and perfected his musical style; but it was not until some considerable time after his return that any of the works he then meditated were placed upon the stage. In 1S55 he accepted an invitation to London, where he conducted the concerts of the Philharmonic Society with great success. In 1857 he completed the libretto of Tristan und Isolde at Venice, adopting the Celtic legend modified by Gottfried of Strasburg's medieval version. But the music was delayed until the strange incident of a message from" the emperor of Brazil encouraged Wagner to complete it in 1859. In that year Wagner visited Paris for the third time; and after much negotiation, in which he was nobly supported by the Prince and Princess Metternich, Tannhduser was accepted at the Grand Opera. Magnificent preparations were made; it was rehearsed 164 times, 14 times with the full orchestra; and the sceneryand dresses w r ere placed entirely under the composer's direction. More than £8000 was expended upon the venture; and the work was performed for the first time in the French language and with the new Venusberg music on the 13th of March 1861. But, for political reasons, a powerful clique was determined to suppress Wagner. A scandalous riot was inaugurated by the members of the Parisian Jockey Club, who interrupted the performance with howls and dog-whistles; and after the third representation the opera was withdrawn. Wagner was broken-hearted. But the Princess Metternich continued to befriend him, and by 1861 she had obtained a pardon for his political offences, with permis- sion to settle in any part of Germany except Saxony. Even this restriction was removed in 1862.

Wagner now settled for a time in Vienna, where Tristan und Isolde was accepted, but abandoned after fifty-seven rehearsals, through the incompetence of the tenor. Lohengrin was, however, produced on the 15th of May 1861, when Wagner heard it for the first time. His circumstances were now extremely straitened ; it was the darkness before dawn. In 1863 he published the libretto of Der Ring des Nibelungen. King Ludwig of Bavaria was much struck with it, and in 1864 invited Wagner, who was then at Stuttgart, to come to Munich and finish his work there. Wagner accepted with rapture. The king gave him an annual grant of 1200 gulden (£120), considerably enlarging it before the end of the year, and placing a comfortable house in the outskirts of the city at his disposal. The master expressed his gratitude in a " Huldigungsmarsch." In the autumn he was formally commissioned to proceed with the tetralogy and to furnish proposals for the building of a theatre and the foundation of a Bavarian music school. All promised well, but no sooner did his position seem

assured than a miserable court intrigue was formed against him. His political indiscretions at Dresden were made the excuse for bitter persecutions': scandalmongers made his friendship with the ill-fated king a danger to both; and Wagner was obliged to retire to Triebschen near Lucerne for the next six years.

On the 10th of June 1865 at Munich, Tristan und Isolde was p-oduced for the first time, with Herr and Frau Schnorr in the principal parts. Die Meistersinger von Numberg, first sketched in 1845, was completed in 1867 and first performed at Munich under the direction of Hans von Biilow on the 21st of June 1868. The story, though an original one, is founded on the character of Hans Sachs, the poet-shoemaker of Nuremberg. The success ol the opera was very great; but the production of the Nibelung-

tetralogy as a whole still remained impracticable, though Das Rheingold and Die Walkiire were performed, the one on the 22nd of September 1869 and the other on the 26th of June 1870. The scheme for building a new theatre at Munich having been abandoned, there was no opera-house in Germany fit for so colossal a work. A project was therefore started for the erection of a suitable building at Bayreuth (?.».). Wagner laid the first stone of this in 1872, and the edifice was completed, after almost insuperable difficulties, in 1876.

After this Wagner resided permanently at Bayreuth, in a house named Wahnfricd, in the garden of which he built his tomb. His first wife, from whom he had parted since 1861, died in 1865; and in 1870 he was united to Liszt's daughter Cosima, who had previously been the wife of von Billow. Meantime Der Ring &e\ Nibclungen was rapidly approaching completion, and on the 13th of August 1876 the introductory portion, Das Rheingold, was performed at Bayreuth for the first time as part of the great whole, followed on the 14th by Die Walkiire, on the 16th by Siegfried and on the 1 7th by GbUsrdammerung. The performance, directed by Hans Richter, excited extraordinary attention; but the expenses were enormous, and burdened the management with a debt of £7500. A small portion of this was raised (at great risk) by performances at the Albert Hall in London, conducted by Wagner and Richter, in 1877. The remainder was met by the profits upon performances of the tetralogy at Munich.

Wagner's next and last work was Parsifal, based upon the legend of the Holy Grail, as set forth, not in the legend of the Morte d' Arthur, but in the versions of Chrestien de Troyes and Wolfram von Eschenbach and other less-known works. The libretto was complete before his visit to London in 1877. The music was begun in the following year, and completed at Palermo on the 13th of January 1882. The first sixteen performances took place at Bayreuth, in July andAugust 1882, under Wagner's own directing,

and fully realized all expectations.

Unhappily the exertion of directing so many consecutive performances seems to have been too much for the veteran master's strength, for towards the close of 1882 his health began to decline rapidly. He spent the autumn at Venice, and was well enough on Christmas Eve to conduct his early symphony (composed in 1833) at a private performance given at the Liceo Marcello. But late in the afternoon of the 13th of February r883 his friends were shocked by his sudden death from heart- failure.

Wagner was buried at Wahnfticd in the tomb he had himself prepared, on the 18th of February; and a few days afterwards King Ludwig rode to Bayreuth alone, and at dead of night, to pay his last tribute to the master of his world of dreams.

(W.S.R.;D. F.T.)

*In the articles on Music and Opera, Wagner's task in music- drama is described, and it remains here to discuss his progress in the operas themselves. This progress has perhaps no parallel in any art, and certainly none in music, for even Beethoven's progress was purely an increase in range and power. Beethoven, we know, lost sympathy 1 with his early works as he grew older; but that was because his later works absorbed his interest, not because his early works misrepresented his ideals. Wagner's earlier works have too long been treated as if they represented the pure and healthy childhood of his later ideal; as if Lohengrin stood to Parsifal as Haydn, Mozart and early Beethoven stand to Beethoven's last quartets. But Wagner never thus represented the childhood of an ideal, though he attained the manhood of the most comprehensive ideal yet known in art. To change the metaphor— the ideal was always in sight, and Wagner never swerved from his path towards it; but that path began in a blaze of garish false lights, and it had become very tortuous before the light of day prevailed. Beethoven was trained in the greatest and most advanced musical tradition of his time, T'or all his Wagnerian impatience, his progress was no struggle from out of a squalid environment, on the conti*ary, one of his latest discoveries was the greatness of his master Haydn. Now Wagner's excellent teacher Weinlig did certainly, as Wagner himself testifies, teach him more of good music than Beethoven,*

Haydn and Mozart could have seen in their youth; for he showed him Beethoven. But this would not help Wagner to feel that contemporary

music was really a great art; indeed it could only show him that he was growing up in a pseudo-classical time, in which the approval of persons of " good taste " was seldom directed to things of vital promise. Again, he began with far greater facility in literature than in music, if only because a play can be copied ten times faster than a full score. Wagner was always an omnivorous reader, and books were then, as now, both cheaper than music and easier to read. Moreover, the higher problems of rhythmic movement in the classical sonata forms are far beyond the scope of academic teaching, which is compelled to be contented with a practical plausibility of musical design; and the instrumental music which was con- sidered the highest style of art in 1830 was as far beyond Wagner's early command of such plausibility as it was obviously already becoming a mere academic game. Lastly, the rules of that game were useless on the stage, and Wagner soon found in Meyerbeer a master of grand opera who was dazzling the world by means which merely disgusted the more serious academic musicians of the day.

In Ricnzi Wagner would already have been Meyerbeer's rival, but that his sincerity, and his initial lack of that musical savoir /aire which is prior to the individual handling of ideas, put him at a disadvantage. Though Meyerbeer wrote much that is intrinsically more dull and vulgar than the overture to Rienzi, he never combined such serious efforts with a technique so like that of a military bandmaster. The step from Rienzi to Der Jliegende Hollander is without parallel in the history of music, and would be inexplicable if Rienzi contained nothing good and if Der Jliegende Hollander did not contain many reminiscences of the decline of Italian opera; but it is noticeable that in this case the lapses into vulgar music have a distinct dramatic value. Though Wagner cannot as yet be confidently credited with a satiric intention in his bathos, the fact remains that all the Rossinian passages are associated with the character of Daland, so as to express his vulgar delight at the prospect of finding a rich son-in-law in the mysterious Dutch seaman. Meanwhile the rest of the work (except in the prettily scored " Spinning Song," and other harmless and vigorous tunes) has more affinity with Wagner's mature style than the bulk of its much more ambitious successors, Tannh&user and Lohengrin. The wonderful overture is more highly organized and less unequal than that of Tann-hauser- and although Wagner uses less Leit-motif than Weber (see Opera, ad Jin.) and divides the piece into " numbers " of classical size, the effect is so continuous that the divisions could hardly be guessed by ear. Moreover, the work was intended to be in one act, and is now so performed at Bayreuth; and, although it is very long for a one-act opera, this is certainly the only form which does justice to Wagner's conception. 1

Spohr's appreciation of Der jliegende Hollander is a remarkable point in musical history; and his criticism that Wagner's style (in Tannhauser) "

lacked rounded periods " shows the best effect of that style on a well-disposed contemporary mind. Of course, from Wagner's mature point of view his early style is far too much cut up by periods and full closes; and its prophetic traits are so incomparably more striking than its resemblance to any earlier art that we often feel that only the full closes stand between it and the true Wagner. But Spohr would feel Wagner's works to be an advance upon contemporary romantic opera rather than a foreshadowing of an unknown future. When we listen to the free declamation of the singers at the outset of Der jliegende Hollander — a declamation which is accompanied by

1 The subsequent division into three acts, as given in all the published editions, has been effected in the crudest way by inserting a full close in the orchestral interludes at the changes of scene, and then beginning the next scene by taking up the interludes again. The true version can be recovered from the published score as follows: In act 1 skip from the last bar but four to the 41st bar of the introduction to the 2nd act; and at the end of the 2nd act skip from the last bar but five to the 8th bar of the entr'acte to the 3rd act.

an orchestral and thematic texture as far removed from that of mere recitative as it is from the forms of the classical aria — the repetition of a whole sentence in order to form a firm musical close has almost as quaint a ring as a Shakespearean rhymed tag would have in a prose drama of Ibsen. To Spohr the frequency of these incidents must have produced the impression that Wagner was perpetually beginning arias and breaking them off at once. With all its defects, Der Jliegende Hollander is the most masterly and the least unequal of Wagner's early works. As drama it stood immeasurably above any opera since Cherubini's MedSe. As a complete fusion between dramatic and musical movement, its very crudities point to its immense advance towards the solution of the problem, propounded chaotically at the beginning of the 17th century by Monteverde, and solved in a simple form by Gluck. And as the twofold musical and dramatic achieve- ment of one mind, it already places Wagner beyond parallel in the history of art.

Tannhauser is on a grander scale, but its musical execution is disappointing. The weakest passages in Der Jliegende Hollander are not so helpless as the original recitatives of Venus in the first act; or Tannhauser's song, which was too far involved in the whole scheme to be ousted by the mature " New Venusberg music " with which Wagner fifteen years later got rid both of the end of the overture and what he called bis " Palais-Royal " Venus. It is really very difficult to understand Schumann's impression that the musical technique of Tannhauser shows a remarkable improvement. Not until the third act does the great Wagner arbitrate in the struggle

between amateurishness and theatricality in the music, though at all points his epoch-making stagecraft asserts itself with a force that tempts us to treat the whole work as if it were on the Wagnerian plane of Tannhauser's account of his pilgrimage in the third act. But the history of mid-ioth-century music is unintelligible until we face the fact that, when the anti-Wagnerian storm was already at its height, Wagner was still fighting for the recognition of music which was most definite just where it realized with ultfa-Meyerbeerian brilliance all that Wagner had already begun to detest. No contemporary, un- aided by personal knowledge, could be expected to trust in Wagner's purity of ideal on the strength of Tannhauser, which actually achieved popularity by such coarse methods of climax as the revivalistic end of the overture, by such maudlin pathos as du mein holder Abendstern, and by the amiably childish grand-opera skill with which half the action is achieved by processions and a considerable fraction of the music is repre- sented by fanfares. These features established the work in a position which it will always maintain by its unprecedented dramatic qualities and by the glory reflected from Wagner's later achievements; but we shall not appreciate the marvel of its nobler features if we continue at this time of day to regard the bulk of the music as worthy of a great composer.

After even the finest things in Tannhiiuser, the Vorspiel to Lohengrin comes as a revelation, with its quiet solemnity and breadth of design, its ethereal purity of tone-colour, and its complete emancipation from earlier operatic forms. The sus- pense and climax in the first act is so intense, and the whole drama is so well designed, that we must have a very vivid idea of the later Wagner before we can see how far the quality of musical thought still falls short of his ideals. The elaborate choral writing sometimes rises to almost Hellenic regions of dramatic art; and there is no crudeness in the passages that carry on the story quietly in reaction from the climaxes — a test far too severe for Tannhauser and rather severe for even the mature works of Gluck and Weber. The orchestration is already almost classically Wagnerian; though there remains an excessive amount of tremolo, besides a few lapses into comic violence, as in the yelpings which accompany Ortrud's rage in the night-scene in the second act. But the mere tone-colours of that scene are enough to make a casual listener imagine that he is dealing with the true Wagner: the variety of tone never fails, and depends on no immoderate paraphernalia; for, far- reaching as are the results of the systematic increase of the classical pairs of wind-instruments to groups of three, this is

a. very modest reform compared to the banausic " extra attrac- tions " of every new production of Meyerbeer's.

But there is another side to the picture. With the growing certainty of touch a stiffness of movement appears which gradually disturbs the listener who can appreciate freedom, whether in the classical forms which Wagner has now abolished, or in the majestic flow of Wagner's later style. Full closes and repeated sentences no longer confuse the issue, but in their absence we begin to notice the incessant squareness of the ostensibly free rhythms. The immense amount of pageantry, though (as in Tannhdusrr) good in dramatic motive and executed with splendid stage-craft, goes far to stultify Wagner's already vigorous attitude of protest against grand-opera methods; by way of preparation for the ethereally poetic end he gives us a disinfected present from Meyerbeer at the beginning of the last scene, where mounted trumpeters career round the stage in full blast for three long minutes; and the prelude to the third act is an outburst of sheer gratuitous vulgarity. Again, the anti-Wagnerians were entirely justified in penetrating below the splendidly simple and original orchestration of the night. scene between Ortrud and Telramund, and pointing out how feebly its music drifts among a dozen vague keys by means of the diminished 7th; a device which teachers have tried to weed out of every high flown exercise since that otiose chord was first discovered in the 17 th century. The mature Wagner would not have carried out twenty bars in his flattest scenes with so little musical in- vention. We must not forget that these boyish demerits belong to the work of a man of thirty-five whose claims and aspirations already purported to dwarf the whole record of the classics. And the defects are in all respects commonplace; they have no resemblance to that uncanny discomfort which often warns the wise critic that he is dealing with an immortal.

The crowning complication in the effect of Der Jliegende Hollander, Tannhauser and Lohengrin on the musical thought of the 10th century was that the unprecedented fusion of their musical with their dramatic contents revealed some of the meaning of serious music to ears that had been deaf to the classics. Wagnerism was henceforth proclaimed out of the mouths of babes and sucklings; learned musicians felt that it had an unfair advantage; and by the time Wagner's popularity began to thrive as a persecuted heresy he had left it in the lurch.

Wagner had hardly finished the score of Lohengrin before he was at work upon the poem of Der Ring des Nibelungen. And with this he suddenly became a mature artist. On a super- ficial view this is a paradox, for there are many more violations of probability s.nd much graver faults of structure in the later works than in the earlier. Every critic could recognize the structural merits of the earlier plays, for their operatic con-

ventionalities and abruptness of motive are always intelligible as stage devices. Jealousy might prompt a doubt whether these plays were within the scope of "legitimate" music; but they were obviously stories of exceptional musical and romantic beauty, presented with literary resources unprecedented in operatic libretti. Now the later dramas are often notoriously awkward and redundant; while the removal of those convenient operatic devices which symbolize situations instead of developing them, does not readily appear to be compensated for by any superior artistic resource. But there is a higher point of view than that of story-telling. In the development of characters and intellectual ideas Wagner's later works show a power before which his earlier stagecraft shrinks into insignificance. It would not have sufficed even to indicate his later ideas. To handle these so successfully that we can discriminate defects from qualities at all, is proof of the technique of a master, even though the faults extend to whole categories of literature. The faults make analysis exceptionally difficult, for they are no longer commonplace: indeed, the gravest dangers of modern Wagnerism arise from the fact that there is hardly any non-musical aspect in which Wagner's later work is not important enough to produce a school of essentially non-musical critics who have no notion how far Wagner's mature music transcends the rest of his thought, oor how often it rises where his philosophy falls. Thus the

prominent school of criticism which appraised Wagner in the 19th century by his approximation to Darwin and Herbert Spencer, appraises him in the 20th by his approximation to Bernard Shaw; with the absurd result that Gdtterddmmerung is ruled out as a reactionary failure. It is true that its only conceivable moral is flatly the opposite of that " redemption by love " which Wagner strenuously preaches in a passage at the end which remained unset because he considered it already expressed by the music. Indeed, though Wagner's later treat- ment of love is perhaps the main source of his present popularity it seldom rises to his loftiest regions except where it is thwarted. The love that is disguised in the deadly feud between Isolde and Tristan, before the drinking of the fatal potion, rises even above the music; the love-duet in the second act depends for its greatness on its introduction, before the lovers have met, and its wonderful slow movement (shortly before thecatastrophe) where they are almost silent and leave everything to the music: the intervening twenty minutes is an exhausting storm in which the words are the sophisticated rhetoric of a 19th-century novel of passion, translated into terribly turgid Yerse and set to music that is more interesting as an intellectual ferment than effective as a representation of emotions which previous dramatists have wisely left to the imagination. But so long as we treat Wagner like a prose philosopher, a librettist, a poet, a mere musician, or anything short of the complex and many-sided artist he really is, we shall find insuperable obstacles to under-

standing or enjoying his works. A true work of art is incompar- ably greater than the sum of its ideas; apart from the fact that, if its ideas are innumerable and various, prose philosophers are apt to complain that it has none. And every additional idea that does not merely derange an art enlarges it as it were by a new dimension in space. Wagner added all the arts to each other, and in one of them he attained so consummate a mastery that we can confidently turn to it when his words and doctrines fail us. Even when we treat him merely as a dramatist our enjoyment of his later works gains enormously if we take them as organic wholes, and not as mere plots dressed up in verse and action. It matters little that Parsifal requires two nameless attendant characters in a long opening scene, for the sole purpose of telling the antecedents of the story, when a situation is thereby revealed which for subtlety and power has hardly a parallel since Greek tragedy. The vast myth of the Ring is related in full several times in each of the three main dramas, with ruthless disregard for the otherwise magnificent dramatic effect of the whole; hosts of original dramatic and ethical ideas, with which Wagner's brain was even more fertile than his voluminous prose works would indicate, assert them- selves at all points, only to be thwarted by repeated attempts to allegorize the philosophy of Schopenhauer; all efforts to read a consistent scheme, ethical or philosophical, into the result are doomed to failure; but all this matters little, so long as we have Wagner's unfailing later resources in those higher dramatic verities which present to us emotions and actions, human and divine, as things essentially complex and conflicting, inevitable as natural laws, incalculable as natural phenomena.

Wagner's choice of subjects had from the outset shown an imagination far above that of any earlier librettist; yet he had begun with stories which could attract ordinary minds, as he dismally realized when the libretto of Der jliegende Hollander so pleased the Parisian wire-pullers that it was promptly set to music by one of their friends. But with Der Ring des Nibelungen Wagner devoted himself to a story which any ordinary dramatist would find as unwieldy as, for instance, most of Shakespeare's subjects; a story in which ordinary canons of taste and prob- ability were violated as they are in real life and in great art. Wagner's first inspiration was for an opera (Siegfried's Tod, projected in r848) on the death of Germany's mythical hero; but he found that the story needed a preliminary drama to convey its antecedents. This preliminary drama soon proved to need another to explain it, which again finally needed a short introductory drama. Thus the plan of the Ring was sketched in reverse order; and it has been remarked that Gdtterdammerung

shows traces of the fact that Wagner had begun his scheme in the days when French grand opera, with its ballets and pageantry, still influenced him. There is little doubt that some redundant narratives in the Ring were of earlier conception than the four complete dramas, and that their survival is due partly to Wagner's natural affection for work on which he had spent pains, and partly to a dim notion that (like Browning's method in The Ring and the Book) they might serve to reveal the story afresh in the light of each character. Be this as it may, we may confidently date the purification of Wagner's music at the moment when he set to work on a story which carried him finally away from that world of stereotyped operatic passions into which he had already breathed so much disturbing life.

The disturbing life already appears in Der jliegende Hollander, at the point where Senta's father enters with the Dutchman, and Senta (who is already in an advanced state of Schwarmerei over the legend of the Flying Dutchman) stands rooted to the spot, comparing the living Dutchman with his portrait which hangs over the door. The conflict between her passionate fascina- tion and her disgust at her father's vulgarity is finely realized both in music and drama; but, if we are able to appreciate it, then the operatic convention by which Senta avows her passion becomes crude. Ethical and operatic points of view are similarly confused when it is asserted that the Flying Dutchman can be saved by a faithful woman, though it appears from the relations between Senta and Erik that so long as the woman is faithful to the Dutchman it does not matter that she jilts some one else. Erik would not have been a sufficiently pathetic operatic tenor if his claim on Scuta had been less complete. In Tannhduser and Lohengrin Wagner's intellectual power develops far more rapidly in the drama than in the music. The Sangerkrieg, with its disastrous conflict between the sincere but unnatural asceticism of the orthodox Minnesingers and the irrepressible human passion of Tannhauser, is a conception the vitality of which would reduce Tannhauser's repentance to the level of Robert le Diable, were it not that the music of the Sdngerkrieg has no structural power, and little distinction beyond a certain poetic value in the tones of violas which had long ago been fully exploited by Mozart and Mehul, while the music of Tannhauser's pilgrimage ranks with the Vorspiel to Lohengrin as a wonderful foreshadow- ing of Wagner's mature style. Again, the appeal to " God's judgment " in the trial by' battle in Lohengrin is a subject of which no earlier librettist could have made more than a plausible mess— which is the best that can be said for the music as music. But as dramatist Wagner compels our respect for the powerthat without gloss or apology brings before us the king, a model of royal fair-mindedness and good-nature, acquiescing in Tel- ramund's monstrous claim to accuse Elsa without evidence, simply because it is a hard and self-evident fact that the persons of the drama live in an age in which such claims seemed reason- able.

Telramund, again, is no ordinary operatic .villain; there is genuine tragedy in his moral ruin; and even the melodramatic Ortrud is a much more life-like intrigante than might be inferred from Wagner's hyperbolical stage-directions, which almost always show his manner at its worst.

In Lohengrin we lake leave of the early music that obscured Wagner's ideals, and in the Ring we come to the music which transcends all other aspects of Wagnerism. Had W'agner been a man of more urbane literary intellect he might have been less ambitious of expressing a world-philosophy in music-drama; and it is just conceivable that the result might have been a less intermittent dramatic movement in his later works, and a balance of ethical ideas at once more subtle and more, orthodox. But it is much more likely that Wagner would then have found his artistic difficulties too formidable to let the ideas descend to us from Walhalla and the Hall of the Grail at all. More than a modicum of rusticity is needed as a protection to a man who attempts such colossal reforms. This necessity had its consequences in the disquieting inequalities of Wagner's early work, and the undeniable egotism that embittered his fiery nature throughout his life; while the cut-and-dried system of culture of later Wagnerian discipleship has revenged him in a specially

sacerdotal type of tradition, which makes progress even in the study of his works impossible except through revolt. Such are the penalties exacted by the irony of fate for the world's persecution of its prophets.

Genuinely dramatic music, even if it seem as purely musical as Mozart's, must always be approached through its drama; and Wagner's masterpieces demand that we shall use this approach; but, as with Mozart, we must not stop on the threshold. With Mozart there is no temptation to do so. But with Wagner, just as there are people who have never tried to follow a sonata but who have been awakened by his music-dramas to a sense of the possibilities of serious music, so there are lovers of music who avow that they owe to Wagner their appreciation of poetry. But people whose love of literature is more independent find it hard to take Wagner's poetry and prose seriously, unless they have already measured him by his music. He effected no reform in literature; his meticulous adherence to the archaic alliteration of the Nibelungenlied is not allied with any sense of beauty in verbal sound or verse-rhythm; and his ways of expressing emotion in language consist chiefly in the pilmg-up of super- latives. Yet he was too full of dramatic inspiration to remain perpetually victimized by the conscientious affectations of the amateur author; and, where dramatic situations are not only poetical but (as in the first act of Die Walkure and the Waldweben scene in Siegfried) too elemental for strained language, Wagner is often supremely eloquent simply because he has no occasion to try to write poetry. Sometimes, too, when a great dramatic climax has

given place to a lyrical anticlimax, retrospective moods, subtleties of emotion and crowning musical thoughts press in upon Wagner's mind with a closeness that determines every word; and thus not only is the whole third act of Tristan, as Wagner said when he was working at it, of " overwhelming tragic power," but Isolde's dying utterances (which occupy the last five minutes and are, of course, totally without action or dramatic tension) were not unlike fine poetry even before the music was written. But, as a rule, Wagner's poetic diction must simply be tolerated by the critic who would submit himself to Wagner's ideas.

If we wish to know what Wagner means, we must fight our way through his drama to his music; and we must not expect to find that each phrase in the mouth of the actor corresponds word for note with the music. That sort of correspondence Wagner leaves to his imitators; and his views on " Leit-motif- hunting," as expressed in his prose writings and conversation, are contemptuously tolerant. We shall indeed find that his orchestra interprets the dramatic situations which his poetry roughly outlines. But we shall also find that, even if we could conceive the poetry to be a perfect expression of all that can be given in words and actions, the orchestra will express something greater; it will not run parallel with the poetry; the Leitmotif system will not be a collection of labels; the musical expression of singer and orchestra will not be a mere heightened resource of dramatic declamation. All that kind of pre-established harmony Wagner left behind him the moment he deserted the heroes and villains of romantic opera for the visionary and true tragedy of gods and demi-gods, giants and gnomes, with beauty, nobility and love in the wrong, and the forces of destruction and hate set free by blind justice.

Let us illustrate Wagner's mature use of Leitmotif by the theme which happens to be associated with Alberich's ring. The fact that this theme is commonly called the " Ring-motif " is a glaring instance of what Wagner has had to endure from his friends. Important as the ring is throughout the tetralogy, Wagner would no more think of associating a theme with it for its own sake than he would think of associating a theme with Wotan's hat. Why should a Ring-motif be transformed into the theme repre- senting Walhalla? Are we to guess that the connexion of ideas is that Wotan had eventually to pay for Walhalla by the ring ? But if we attend to the circumstances under which this theme arises, its purport and development become deep and natural. The Rhine-daughters have been teasing the Nibelung Alberich, and are rejoicing in the light of the Rhine-gold which shines at

the top of a rock as the sun strikes it through the water. Alberich does not think much of the gold if its only use is for these water- children's games. But one of the Rhine-daughters tells him that " he who could make the gold into a ring would become master of the world," and to these words the so-called Ring-motif is first sung (see Melody, Example 11). The Rhine-daughter sings it in a childlike, indolently graceful way which well expresses the kind of toy the ring or the world itself would be to her. One of her sisters bids her be careful, but they reassure them- selves with the thought that the Rhine-gold is safe, since no one can win it who does not renounce love. Alberich broods over what he hears, and already the theme changes its character as he thinks of such mastery of the world as he might gain by it (Melody, Ex. 12). He curses love and grasps the gold. The theme of world-mastery grows dark with the darkness of the Nibelung's mind. The waters of the Rhine change into black mists which grow grey and thin, while the now sinister theme becomes softer and smoother. Then it breaks gently forth in a noble, swinging rhythm and massively soft brazen tones, as Wotan awakes on a mountain height and gazes upon Walhalla, his newly finished palace which he has bid the giants build, so that from it he may rule the world (Melody, Ex. 13). The theme thus shows no trivial connexion with a stage-property, mechanic- ally important in the plot; but it represents the desire for power, and what that desire means to each different type of mind. The gods, as the giants plaintively admit, " rule by beauty"; hence the ' Walhalla-motif." What it becomes in the mind of the Nibelung is grimly evident when Alberich uses his ring in Nibelheim. The Rhine-daughters' exultant cry of " Rhine-gold " is there tortured in an extremely remote modulation at the end of a very sinister transformation of the theme; and the orchestra- tion, with its lurid but smothered brass instruments, its penetrat- ing low reed tones and its weird drum-roll beaten on a suspended cymbal, is more awe-inspiring than anything dreamed of by the cleverest of those composers who do not create intellectual causes for their effects.*

A famous and typical instance of Wagner's use of Leitmotif in tragic irony is the passage where Hagen gives Siegfried friendly welcome, to the melody of the curse which Alberich pronounced on the ring and all who approached it. The more subtle examples are inexhaustible in variety and resource; and perhaps the climax of subtlety is the almost entire absence of Leitmotif in the first scene of the third act of G otter dammcruitg, when Siegfried throws away his last chance of averting his doom. The Rhine-daughters appear to him, and ask him to give them the ring that is on his finger. Siegfried refuses. They laugh at his stinginess and disappear. Siegfried is piqued, and calls them back to offer them the ring. Unfortunately they tell him of its curse, and prophesy death to him if he keeps it. This arouses his spirit of contradiction; and he tells them that they

might have won it from him by coaxing, but never by threats, and that he values his life no more than the stone he tosses away as he speaks to them. In spite of the necessary allusions to the ominous theme uf the curse, which would give any less great composer ample excuse for succumbing to the listener's sense of impending doom, Wagner's music speaks to us through the child-minds of the Rhine-daughters and terrifies us with the ruthless calm of Nature.

Almost as subtle, and much more directly impressive, is the pathos of the death of Siegfried, which is heightened by an un- precedented appeal to a sense of musical form on the scale of the entire tetralogy. Siegfried's whole character and career is, indeed, annihilated in the clumsy progress towards this con- summation; but Shakespeare might have condoned worse plots for the sake of so noble a result; and indeed Wagner's awkward- ness arises mainly from fear of committing oversights. Hagen, the Nibelung's son, has managed to make Siegfried unwittingly drink a love-potion with Gutrune, which causes him to forget his own bride, Brunnhilde. Siegfried is then persuaded to transform himself by his magic Tarnhelm into the likeness of his host, Gutrune's brother Gunther, in order to bring Brunnhilde (whose name is now quite new to him) from her fire-encircled rock, so that Gunther may have her for his bride and Siegfried may wed

Gutrune. This is achieved; and Briinnhilde's horror and be- wilderment at meeting Siegfried again as a stranger in his own shape creates a situation which Siegfried cannot understand, and which Hagen pretends to construe as damning evidence that Siegfried has betrayed Gunther's honour as weii as Briinnhilde's. Hagen, Gunther and Brunnhilde therefore agree that Siegfried must die. In order to spare Gutrune's feelings it is arranged that his death shall appear as an accident in a hunting party. While the hunting party is resting Siegfried tells stories of his boyhood, thus recalling the antecedents of this drama with a charming freshness and sense of dramatic and musical repose. When he comes to the point where his memory has been clouded by Hagcn's spells, Hagen restores his memory with another magic potion. Siegfried calmly continues to tell how he found Brunnhilde asleep on the fiery mountain. Hagen affects to construe this as a confession of guilt,, and slays him as if in righteous wrath. The dying Siegfried calls on Brunnhilde to awaken, and asks " Who' hath locked thee again in sleep?" He believes that he is once more with Briinahiide on the Val- kyries' mountain height; and the harmonies of her awakening move in untroubled splendour iill the light of life fades with the light of day and the slain hero is carried to the Gibichung's hall through the moonlit mists, while the music of love and death tells in terrible triumph more of his story than he ever knew.

The bare conception of such art as this shows how perfect is the unity

between the different elements in Wagner's later music- drama. If the music of Tristan is more polyphonic than that of Lohengrin, it is because it is hardly figurative to call its drama polyphonic also. Compare the mere fairy-tale mystery of Lohengrin's command that Elsa shall never ask to know his name, with the profound fatalism of Isolde's love-potion. Apart from the gain in tragic force resulting from Wagner's masterly development of the character of Brangaene, the raw material of the story was already suggestive of that astounding combina- tion of the contrasted themes of love and death, the musical execution of which involves a harmonic range almost as far beyond that of its own day as the ordinary harmonic range of the 19th century is beyond that of the 16th. In his next work, Die Meister singer, Wagner ingeniously made poetry and drama out of an explicit manifesto to musical critics, and proved the depth of his music by developing its everyday resources and so showing that its vitality does not depend on that extreme emotional force that makes Tristan mid Isolde almost unbearably poignant. Few things are finer in music or literature than the end of the second act. of Die Meister singer, from the point where Sachs's apprentice begins the riot, to the moment when the watchman, frightened at the silence of the moonlit streets so soon after he has heard all that noise, announces eleven o'clock and bids the folk pray for protection against evil spirits, while the orchestra tells us of the dreams of Walther and Eva and ends by putting poetry even into the pedantic ineptitudes of the malicious Beckmcsser. Die Meisler singer is perhaps Wagner's most nearly perfect, work of art; and it is a striking proof of its purity and greatness that, while the whole work is in the happiest comic vein, no one ever thinks of it as in any way slighter than Wagner's tragic works. The overwhelming love-tragedy of Tristan and Isolde is hardly less perfect, though the simplicity of its action exposes its longueurs to greater notoriety than those which may be found in Die Meister singer.

These tw r o works interrupted the execution of the Ring and formed the stepping-stones to Parsifal, a work which may perhaps be said to mark a further advance in that subtlety of poetic conception which, as we have seen, gave the determining impulse to Wagner's true musical style. But in music he had no more to learn, and Parsifal, while the most solemn and concentrated of all Wagner's dramas, is musically not always unsuggestive ' of old age. Its harmonic style is, except in the Grail music, even more abstruse than in Tristan; and the intense quiet of the action is far removed from the forces which in that tumultuous tragedy carry the listener through every difficulty. Again, while the Eucharistic features in Parsifal attract some listeners, the material effect of their presentation

on the stage has been known to repel others who are beyond suspicion of prejudice. But the greatness of the art is, like its subject, worlds away from material impressions; and a wide consensus regards Wagner's last work as his loftiest, both in music and poetry. Certainly no poet would venture to despise Wagner's imaginative conception of Kundry. In his letters to his friend Mathilde Wesendonck, it appears that while he was composing Tristan he already had the inspiration of working out the identification of Kundry, the messenger of the Grail, with the temptress who, under the spell of Klingsor, seduces the knights of the Grail; and he had, moreover, thought out the impressively obscure suggestion that she was Herodias, con- demned like the wandering Jew to live till the Saviour's second coming. The quiet expression of these startling ideas is more remarkable than their adoption; for smaller artists live on still more startling ideas; but most remarkable of all is the presentation of Parsifal, both in his f oolishness and in the widsom which comes to him through pity. The chief excuse for doubting whether Wagner's last work is really his greatest is that most of its dramatic subtleties are beyond musical expression, since they do not lead to definite conflicts and blendings of emotion. Where the orchestra shows that Parsifal is becoming half-con- scious of his quest while Kundry is beguiling him with memories of his mother, — and also during the two changes of scene to the Hall of the Grail, where the orchestra mingles the agony of Amfortas and the sorrow of the knights with the tolling of the great bells, — the polyphony is almost as dramatic as in Tristan; while the prelude and the Charfreitagszauber are among the clearest examples of the sublime since Beethoven. But else- where there are few passages in which the extremely recondite harmonic style can be with certainty traced to anything but habit. This style originated, indeed, in a long experience of the profoundest dramatic impulses; but as a habit it does not seem, like the greatest things in art, the one inevitable treatment of the matter in hand. But, whatever our doubts, we may safely regard Parsifal as a work which, like Beethoven's last fugues, invites attack rather from those critics who demand what natters their own vanity than from those who wish to be inspired by what they could never have foreseen for themselves.*

In Wagner's harmonic style we encounter the entire problem of modern musical texture. Wagner effected vast changes in almost every branch of his all-embracing art, from theatre- building and stage-lighting to the musical declamation of words. Most of his reforms have since been intelligently carried out as normal principles in more arts than one; but, shocking as the statement may seem to 20th-century orthodoxy, Wagnerian harmony is a universe as yet unexplored, except by the few composers who are so independent of its bewildering effect on the generation that grew up with it, that they can use Wagner's resources as discreetly as he used them himself. The last two examples at the end of the article on Harmony show

almost all that is new in Wagner's harmonic principles. The peculiar art therein is that while the discords owe their intelligibility and softness to the smooth melodic lines by which in " resolving " they prove themselves but transient rainbow-hues on or below the surface, they owe their strangeness to the intense vividness with which at the moment of impact they suggest a mysteriously remote foreign key. Wagner's orthodox contemporaries regarded such mixtures of key as sheer nonsense; and it would seem that the rank and file of his imitators agree with that view, since they either plagiarize Wagner's actual progressions or else produce such mixtures with no vividness of key-colour and little attempt to follow those melodic trains of thought by which Wagner makes sense of them. There is far more of truly Wagnerian harmony to be found before his time than since. It was so early recognized as characteristic of Chopin that a magnificent example may be seen at the end of Schumann's little tone-portrait of him in the Carnaval: a very advanced Wagnerian passage on another principle constitutes the bulk of the development in the first movement of Beethoven's sonata Les Adieux; while even in the " Golden Age " of music, and within the limits of pure diatonic concord, the unexpectedness of many of Palestiina's

chords is hardly less Wagnerian than the perfect smoothness of the melodic lines which combine to produce them.

Wagnerian harmony is, then, neither a side-issue nor a progress per solium, but a leading current in the stream of musical evolu- tion. That stream is sure sooner or later to carry with it every reality that has been reached by side-issues and leaps; and of such things we have important cases in the works of Strauss and Debussy. Strauss makes a steadily increasing use of avowedly irrational discords, in order to produce an emotionally apt physical sensation. Debussy has this in common with Strauss, that he too regards harmonies as pure physical sensations; but he differs from Strauss firstly in systematically refusing to regard them as anything else, and secondly in his extreme sensibility to harshness. We have seen (in the articles on Harmony and Music) how harmonic music originated in just this habit of regarding combinations of sound as mere sensations, and how for centuries the habit opposed itself to the intellectual principles of contrapuntal harmony. These intellectual principles are, of course, not without their own ground in physical sensation; but it is evident that Debussy appeals beyond them to a more primitive instinct; and on it he bases an almost perfectly coherent system of which the laws are, like those of 12th-century music, precisely the opposite of those of classical harmony. The only illogical point in his system is that the beauty of his dreamlike chords depends not only on his artful choice of a timbre that minimizes their harshness, but also on the fact that they enter the ear with the meaning they have acquired through centuries of harmonic evolution on

classical lines. There is a special pleasure in the subsidence of that meaning beneath a Soothing sensation; but a system based thereon cannot be universal: Its phenomena are, however, perfectly real, and can be observed wherever artistic conditions make the tone of a mass of harmony more important than the interior threads of its texture. This is of constant occurrence in classical pianoforte music, in which thick chords are subjected to polyphonic laws only in their top and bottom notes, while the inner notes make a solid mass of sound in which numerous consecutive fifths and octaves are not only harmless but essential to the balance of tone. In Debussy's art the top and bottom are also involved in the antipolyphonic laws of such masses of sound, thus making these laws paramount.

The irrational discords of Strauss are also real phenomena in musical aesthetics. They are an extension of the principle on which gongs and cymbals and all instruments without notes of determinate pitch are employed in otherwise polyphonic music.

But it is important to realize that both these types of modern harmony are radically non-Wagnerian. Haydn uses a true Straussian discord in The Seasons, in order to imitate the chirping of a cricket; but the harshest realism in GdUerdiimmerttng (the discord produced by the horns of Hagen and his churls in the mustering-scene in the second act) has a harmonic logic which would have convinced Corelli. And of Debussy's antipolyphonic art there is less in Wagner than in Beethoven. The present in- fluence of Wagnerian harmony is, then, somewhat indefinite, since the most important real phenomena of later music indicate a revolt both from it and from earlier classical methods. It has had, however, a marked effect on weaker musical individualities. Musical public opinion now puts an extraordinary pressure on the young composer, urging him at all costs to abandon " out- of-date " styles however stimulating they may be to his invention. It is no exaggeration to say that a parallel condition in literature would be produced by a strong public opinion to the effect that any English style was hopelessly out of date unless it consisted exclusively of the most difficult types of phrase to be found in the works of Browning and Meredith. The brilliant success of Humperdinck's Hansel und Gretel, in which Wagnerian technique is applied to the diatonic style of nursery songs with a humorous accuracy undreamed of by Wagner's imitators, points a moral which would have charmed Wagner himself; but until tie revival of some rudiments of musical common sense becomes widespread, there is little prospect of the influence of Wagner's harmonic style being productive of anything better than nonsense.

The very sense of dramatic fitness has temporarily vanished from public musical opinion, together with the sense of musical form, in consequence of another prevalent habit, that of present- ing shapeless extracts from Wagner's operas as orchestral pieces without voie.es or textbooks or any hint that such adjuncts are desirable. But this vandalism, which Wagner condoned with a very bad grace, now happily begins to give way to the practice of presenting long scenes or entire acts, with the singers, on the concert-platform. This has the merit of bringing the real Wagner to ears which may have no other means of hearing him, and it fosters no delusion as to what is missing in such a presentation. The guidance of Hans Richter has given us a sure bulwark against the misrepresentation of W T agner; and so there is hope that Wagner may yet be saved from such an oblivion in fetish-worship as has lost Handel to us for so long. As with Shakespeare and Beethoven, the day will never come when we can measure the influence of so vast a mind upon the history of art. Smaller artists can make history; the greatest absorb it into that daylight which is its final cause. List of Wagner's Works

The following are Wagner's operas and music-dramas, apart from the unpublished Die Hochzett (three numbers only), Die been, and Das Liebesverbol {Das Licbesverbot was disinterred in 1910).

1. Ri-enzi, der letzle der Tribunen: grosse tragische Oper; 5 acts (183S-18.rO).

2. Der fiicgende Hollander: romanlische Oper; 1 act, afterwards cut into 3 (1S41).

3. Tannhduser und der Sdngerkrieg attf Wariburg: romanlische Oper; 3 acts (libretto, 1843; music, 1844-1845; new Venusberg music, 1860-1861).

4. Lohengrin: romantixche Oper; 3 acts (libretto, 1845; music, 1846-184$;. This is the last work Wagner calls by the title of Opera.

5. Das Rheingold, prologue in 4 scenes to Der Ring des Nibelungen; ein Buhncnfestspiel (poem written last of the series, which was begun in 1848 and finished in 1851-1S52; music, 1853-1854).

6. Die Vfaikiire: der Ring des Nibelungen, erster Tag; 3 acts (score finished, 1856).

7. Tristan und Isolde; 3 acts (poem written in 1857; music,

1 857-1 859)-

8 Siegfried: der Ring des Nibelungen, zweiter Tag; 3 acts, the first two nearly finished before Tristan, the rest between 18G5 and 1869.

9. Die Meister singer von Number g\ 3 acts (sketch of play, 1845; poem, 1861-1862; music, 1862-1867).

ro. Gotterddmmerung: der Ring des Nibelungen, driller Tag; introduction and 3 acts (Siegfried s Tod already sketched dramati- cally in 1848; music, 1870-1874}.

1 1. Parsifal: ein BithnenwAhfestspiel (a solemn stage festival play), 3 acts (poem, 1876-1877; music, 1877-1882, Charfreitags- zatiber already sketched in 1857).

As regards other compositions, the early unpublished works in- clude a symphony, a cantata, some incidental music to a pantomime, and several overtures, four of which have recently been discovered and produced. The important small published works are Eine Faust Overture (1839-1840; rewritten, 1855); the Siegfried Idylle (an exquisite serenade for small orchestra on themes from the finale ol Siegfried, written as a surprise for Frau Wagner in 1870); the Kaiscrmarsch (1871), the Huldigungsmarsch (1864) for military band (the scoring of the concert-version finished by Raff); Funf Gedichte (1862), a set of songs containing- two studies for Tristan; and the early quasi-oratorio scene for male-voice chorus and full orchestra, Das Liebesmahl der A pastel (1843). Wagner's^ retouching of (duck's Ipkigenie en Aulide and his edition of Palestrina's Stabat Mater demand mention as important services to music, by no means to be classified (as in some catalogues) with the hack-work with which he kept off starvation in Paris.

The collected literary works of Wagner in German fill ten volumes, and include political speeches, sketches for dramas that did not become operas, autobiographical chapters, aesthetic musical treatises and polemics of vitriolic violence. Their importance will never be comparable to that of his music; but, just as the reaction against Ruskin's ascendancy as an art-critic has coincided with an increased respect for his ethical and sociological thought, so the rebellious forces that are compelling Wagnerism, to grant music a constitution coincide with a growing admiration of his general mental powers. The prose works have been translated into English by W. A. Ellis (8 vols., 1892-1899). The translation by F. Jameson (1S97) of the text of the Ring (first published in the pocket edition of the full scores) is the most wonderful tour de force yet achieved in its Uae. A careful reading of the score to this English text reveals not a single false emphasis or loss of

rhetorical point in the fitting of words to notes, nor a single extra note or halt in the music; and wherever the language seems stilted or absurd the original will be found to be at least equally so, while the spirit of W'agner's poetry is faithfully reflected. Such work deserves more recognition than

it is ever Hkely to get. Rapidly as the standard of musical transla- tions was improving before this work appeared, no one could have foreseen what has now been abundantly verified, that the Ring can be performed in English without any appreciable loss to Wagner's art. The same translator has also published a close, purely literary version.

Literature. — The Wagner literature is too enormous to be dealt with here. The standard biography is that of Glasenapp (6 vols., of which five appeared between 1894 and 3909). Of readable English books we may cite Ernest Newman, A Study of Wagner (1899); H. E. Krehbiel, Studies in the Wagnerian Drama (1891); Jessie L. Weston, Legends of the Wagner Dramas (1906). The Perfect Wagnerite, by G. Bernard Shaw, though concerned mainly with the social philosophy of the Ring, gives a luminous account of Wagner's mastery of musical movement. The highest English authority on Wagner is his friend Dannreuther, whose article in Grove's Dictionary is classical.

See also Aria, Harmony, Instrumentation, Music, Opera, and Overture. (D. F. T.)

WAGON, or Waggon, a large four-wheeled vehicle for the carriage of heavy loads, and drawn by two or more horses. This is the general English use of the term, where it is more particularly confined to the large vehicles employed in the carrying of agricultural produce. It is also used of the uncovered heavy rolling stock for goods on railways. In America the term is applied also to lighter vehicles, such as are used for express delivery, police work, &c., and to various forms of four-wheeled vehicles used for driving, to which the English term " cart " would be given. The word " wagon " appears to be a direct adaptation of Du. Wagen (cf. Ger. Wagen, Swed. Vagn, &c). Skeat finds the earliest use of the word in Lord Berner's translation of Froissart (1523-1525), so that it is by no means an early word. The O.E. cognate word was wctgn, later ween, by dropping of g (cf. regn, ren, rain), modern " wain." The root of all these cognate words, meaning to carry, is seen in Lat. vekere. The term " wagon " or " waggon " is applied technically in book- binding to a frame of cane used for trimming the edges of gold leaf. In architecture a "wagon-ceiling" is a boarded roof of the Tudor time, either of semicircular or polygonal section. It is boarded with thin panels of oak or other wood ornamented with mouldings and with loops at the intersections.

WAGRAM (Deutsch-Wagkam), a village of Austria situated in the plain of the Marchfeld, n| m. N.E. of Vienna. It gives its name to the battle of the 5th and 6th of July 1S09, in which the French army under Napoleon defeated the Austrians com- manded by the archduke Charles. On the failure of his previous attempt to pass his whole army across the Danube at Aspern (see Napoleonic Campaigns and Aspern), Napoleon set himself to accumulate, around Vienna and the island of Lobau, not only his own field forces, but also every man, horse and gun available from Italy and South Germany for a final effort. Every detach- ment was drawn in within forty-eight hours' call, his rearward communications being practically denuded of their covering troops. The island of Lobau itself was converted practically into a fortress, and 150 heavy guns were mounted on its banks to command the Austrian side of the stream. Giving up, in face of this artillery, the direct defence of the river-side, the Austrians drew up in a great arc of about 6 m. radius extending from the Bisamberg, overlooking the Danube, in the west, to Markgraf- neusiedl on the east. From this point to the Danube below Lobau a gap was left for the deployment of the archduke Johann's army from Pressburg. This army, however, arrived too late. Their total front, therefore, was about 12 m. for 120,000 men, which by a forward march of a couple of hours could be reduced to about 6 m. — giving a density of occupation of about 20,000 men to the mile.

Meanwhile Napoleon reconstructed the bridge over the main stream (see Aspern) more solidly, protecting it by palisades of piles and floating booms, and organized an armed flotilla to command the waterway. On the island itself preparations were made to throw three bridges across the Lobau arm of the stream opposite Aspern and Essling, and seven more on the right, facing east between Gross Enzersdorf and the main river.

For several days previous to the greal battle the French had sent across small detachments, and hence when, on the afternoon of the 4th of July, an advanced guard was put over near Gross

Enzersdorf, the attention of the Austrians was not particularly attracted and they did not interfere. The emperor, however, had now men available for the battle, and under cover of this detachment his pontoniers made the seven bridges. Long before daylight on the 6th the troops began to stream across, and about 9 a.m. the three corps destined for the first line (Davout, Oudinot and Massena) had completed their deployment on a front of

almost to Aspern, and his right, though aided by Bernadotte, had failed to

recapture Aderklaa, from which the Austrians had driven his advanced posts early in the morning. The situation for the French looked very serious, for their troops were not fighting with the dash and spirit of former years. But Napoleon was a master in the psychology of the battlefield, and knew that on the other side things were much the same. He therefore sent

orders along the whole line

Siˆme 6ooo yds. and were moving forward to make way for the second line (Eugene and Bernadotte) and the third line (Bessicres and the guard). About noon the general advance began, the French opening outwards like a fan to obtain space for manoeuvre, Davout direct on Markgrafneusiedl and the Austrian left, Massena (slightly refused to cover the French left) byBreitcnlee on Siissenbrunn.

The Austrians held a strong position along the line of the Russbach from Deutsch-Wagram to Markgrafneusiedl with their left, whilst their right was held ready for a counter-attack intended to roll up the French attack from left to right when the proper moment should come. The movements of the great French masses in the confined space were slow, and the attack on the line of the Russbach did not declare itself till 8 p.m.; the corps did not attack simultaneously, and failed altogether to make any serious impression on the Austrian position. Massena on the left was scarcely engaged.

But, hearing of the success of his left wing on the Russbach, the archduke determined to anticipate the French next morning on that side, and four corps were directed upon Massena, who had bivouacked his troops overnight on the line Leopoldsau- Siissenbrunn-Aderklaa, the latter, a strongly built village, forming, as it were, a bridge-head to the passages of the Russbach at Deutsch-Wagram. Another corps with a strong cavalry force was also directed to pivot round Markgrafneusiedl and to attack Davout on his right; on this flank also the arrival of the archduke Johann was expected later in the day.

The Austrian movements were somewhat ill-connected; nevertheless, by n a.m. Masscna's left had been driven back >

for a gigantic counter-stroke. Davout on the right was to attack Markgrafneusiedl again. Massena was to move against the troops immediately to his front; Bernadotte and Marmont to advance respectively against Brcitenlee and Aderklaa, whilst in the gap which would thus open between them marched the 5th corps (Macdonald) on Siissenbrunn, covered by a battery of 104 guns and followed by the guard and reserve cavalry.

Macdonald formed his 30,000 men in a gigantic hollow square — on a front of one battalion, fourteen battalions deployed at six paces distance leading, whilst the remainder of the in- fantry marched in column of sections on either flank, and cavalry closed the rear. The idea w r as to compel even the weakest to go on, on pain of being trampled to death under the feet of the follow- ing men and horses, but the terror caused by the Aus-

trian round-shot tearing

■ˆ”” “» huge gaps through the

proved enough to counteract even this danger, and

the advance threw themselves down whole-

(Ardant du Pice;)

mass the men

sale. It is admitted by French authors that of the 30,000 only 3000 actually delivered the attack, about 3000 were killed or wounded, but 24,000 evaded their duty somehow, and the trail of the column appeared one mass of dead and dying, creating a terrible impression on all who saw it. Nevertheless, Macdonald leached his destination, for the guns had literally torn a gap in the opposing line, and the guards and cavalry then followed intact. At the same time Davout also had made progress, and, learning that the archduke Johann could not be counted on for that day, the archduke Charles issued orders for a retreat. The whole Austrian army was gradually withdrawn, unbeaten and still available for a renewed offensive if necessary the following day.

The French, however, were in no condition to follow up their advantage. They had seen more of the slaughter than their adversaries, and except the emperor and Davout all seem to have been completely shaken. Even in Davout's command, always the steadiest in danger, the limit of endurance had been passed, for when about 5 p. M. the advanced patrols of the archduke Johann's force appeared on their flank, panic on a scale hitherto unknown in the Grande Armee seized the whole right wing, and Napoleon had to confess that no further advance was possible with these men for several days.

Berndt {Zahl im Kriege) gives the following figures. French, i8t,70o (including 20,000 cavalry) and 450 guns engaged, of whom 23,000 men were killed and wounded, 7000 missing (16%); 11 guns and 12 eagles and colours were lost. Austrians,

128,600 (including 14,600 cavalry) men and 410 guns engaged; losses, 19,110 killed and wounded, and 6740 missing (20%); 9 guns and one colour were lost. The casualties in general officers were unusually severe, 21 French and 15 Austrians being killed and wounded.

WAGTAIL {Wagsterd and Wagstyrl, 15th century fide T. Wright, Vol. Vocabularies, ii. 221, 253; Uuagiale, Turner, 1544, p. 53), the popular name for birds of the subfamily Motacillinae, which, together with the Anthinae (see Pipit), form the passerine family Moiacillidae.

The pied wagtail Motacilla lugubrisis a common and generally distributed species in the British Islands, and common through- out northern Europe, but migrating southwards over a relatively narrow range in winter. The white wagtail, M. alba of Linnaeus, has a wide range in Europe, Asia and Africa, visiting England almost yearly, and chiefly differing from the ordinary British in its lighter-coloured tints — the cock especially having a clear grey instead of a black back. Three other species occur in England, but the subfamily with several genera and very many species ranges over the Old World, except Australia and Poly- nesia, whilst the Asiatic species reach North-West America.

Wagtails are generally parti-coloured birds, frequenting streams and stagnant water, and feeding on seeds, insects, worms, small molluscs and crustaceans. The bill is thin and elongated, and the tail is very long. The nests are made of moss, grass and roots, with a lining of hair and feather?,; four to six eggs are laid, bluish white or brown, or yellowish with spots and markings.

The genus Motacilla (an exact rendering of the English ” wagtail,” the Dutch Kwikstaart, the Italian Codatremola and other similar words), which, as originally founded by Linnaeus, contained nearly all the ” soft-billed ” birds of early English ornithologists, was restricted by various authors in succession, following the example set by Scopoli in 1769, until none but the wagtails remained in it. (A. N.)

WAHHABIS, a Mahommedan sect, the followers of Ibn ‘Abd ul-Wahhab, who instituted a great reform in the religion of Islam in Arabia in the 18th century. Mahommed ibn ‘Abd ul- Wahhab was born in i6gi (or 1703) at al-Hauta of the Ncjd in central Arabia, and was of the tribe of the Bani Tamim. He studied literature and jurisprudence of the Hanifite school. After making the pilgrimage with his father, he spent some further time in

the study of law at Medina, and resided for a while at Isfahan, whence he returned to the Nejd to undertake the work of a teacher. Aroused by his studies and his obser- vation of the luxury in dress and habits, the superstitious pilgrimages to shrines, the use of omens and the worship given to Mahomet and Mahommedan saints rather than to God, he began a mission to proclaim the simplicity of the early religion founded on the Koran and Sunna {i.e. the manner of life of Mahomet). His mission in his own district was not attended by success, and for long he wandered with his family through Arabia, until at last he settled in Dara'lyya, or Deraiya (in the Nejd), where he succeeded in converting the greatest notable, Mahommed ibn Sa'ud, who married his daugther, and so became the founder of an hereditary Wahhabite dynasty. This gave the missionary the opportunity of following the example of Mahomet himself in extending his religious teaching by force. His instructions in this matter were strict. All unbelievers {i.e. Moslems who did not accept his teaching, as well as Christians, &c.) were to be put to death. Immediate entrance into Paradise was promised to his soldiers who fell in battle, and it is said that each soldier was provided with a written order from Ibn 'Abd ul-Wahhab to the gate-keeper of heaven to admit him forthwith. In this way the new teaching was established in the greater part of Arabia until its power was broken by Mehemet Ali (see Arabia: History). Ibn 'Abd ul-Wahhab is said to have died in

1791.

The teaching of ul-Wahhab was founded on that of Ibn Tairmy3 r a (1263-1328), who was of the school of Ahmad ibn Hanbal {q.v.). Copies of some of Ibn Taimiyya's works made by ul-Wahhab are now extant in Europe, and show a close

study of the writer. Ibn Taimiyya, although a Hanbalite by training, refused to be bound by any of the four schools, and claimed the power of a mujtahid, i.e. of one who can give inde- pendent decisions. These decisions were based on the Koran, which, like Ibn Hazm {q.v.), he accepted in a literal sense, on the Sunna and Qiyds (analogy). He protested strongly against all the innovations of later times, and denounced as idolatry the visiting of the sacred shrines and the invocation of the saints or of Mahomet himself. He was also a bitter opponent of the Sufis of his day. The Wahhabites also believe in the literal sense of the Koran and the necessity of deducing one's duty from it apart from the decisions of the fourschools. They also pointed to the abuses current in their times as a reason for rejecting the doctrines and practices founded on Ijma, i.e. the universal consent of the believer or their teachers (see Mahommedan Religion). They forbid the pilgrimage to tombs and the in- vocation of saints. The severe simplicity of the Wahhabis has been remarked by

travellers in central Arabia. They attack all luxury, loose administration of justice, all laxity against infidels, addiction to wine, impurity and treachery. Under 'Abd ul- Azlz they instituted a form of Bedouin (Bedawi) commonwealth, insisting on the observance of law, the payment of tribute, miiitaiy conscription for war against the infidel, internal peace and the rigid administration of justice in courts established for the purpose.

It is clear that the claim of the Wahhabis to have returned to the earliest form of Islam is largely justified; Burckhardt (vol. ii. p. 112) says, "The only difference between his {i.e. ul- Wahhab's) sect and orthodox Turks, however improperly so termed, is that the Wahabys rigidly follow the same laws which the others neglect or have ceased altogether to observe." Even orthodox doctors of Islam have confessed that in Ibn 'Abd ul-Wahhab's writings there is nothing but what they themselves hold. At the same time the fact that so many of his followers were rough and unthinking Bedouins has led to the over-emphasis of minor points of practice, so that they often appear to observers to be characterized chiefly by a strictness (real or feigned) in such matters as the prohibition of silk for dress, or the use of tobacco, or of the rosary in prayer.

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WAI, a town in Satara district, Bombay, on the Kistna river. Pop. (igor) 13,989. It is a place of Hindu pilgrimage, with a large Brahman population, the river being lined with temples and bathing ghats. In the neighbourhood are Buddhist caves.

WAIBLINGEN, a town of Germany, in the kingdom of Wiirt- temberg, in the centre of a fruitful vine-growing district on the Rems, 10 m. N.E. from Stuttgart by the main line of railway to Nuremberg via Nordlingen and at the junction of a branch to Hessenthal. Pop. (1905) 5997. It has two Evangelical churches, one of which is a fine Gothic structure of the 15th century, restored in 1S66, a Roman Catholic church and a modern town hall. Its industries, which include the making of pottery and silk and the cultivation of fruit and vines, are considerable. Waiblingen is mentioned in the 9th century, when it had a palace of the Carolingian sovereigns. Subsequently it belonged to the dukes of Franconia, and gave a surname to the emperor Conrad II. It was in this way that the Hohenstaufen family, which was descended in the female line from Conrad, received the name of Waiblingen, corrupted by the Italians into Ghibelline.

WAILLY, NOEL FRANQOIS DE (1724-1801), French gram- marian and lexicographer, was born at Amiens on the 31st of July 1724. His life was spent in Paris, where for many years he carried on a school which was extensively patronized by foreigners who wished to learn French. In 1754 he published Principes gi-n&raux de la langue francaise, which revolutionized the teaching of grammar in France. The book was adopted as a textbook by the university of Paris and generally used throughout France, an abstract of it being prepared for primary educational purposes.

In 1 77 1 de Wailly published Moyens simples et raisonnes de diminuer les imperfections de noire orthographe, in which he advo- cated phonetic spelling. He was a member of the Institute from its foundation (1795), and took an active part in the preparation of the Dictioyinaire de V Academic. His works, in addition to those cited, include V Orthographe des dames (1782) and Le Nouveau Vocabulaire franqais, ou abregi du dictionnaire de V 'Acad&mie {1801). He died in Paris on the 7th of April 1801.

WAINEWRIGHT, THOMAS GRIFFITHS (1794-1852), English journalist and subject-painter, was born at Chiswick in October 1794. He was educated by his distant relative Dr Charles Burney, and served as an orderly officer in the guards, and as cornet in a yeomanry regiment. In 1810 he entered on a literary life, and began to write for The Literary Pocket-Book, Black- wood's Magazine and The Foreign Quarterly Review. He is, however, most definitely identified with The London Magazine, to which, from 1820 to 1823, he contributed some smart but flippant art and other criticisms, under the signatures of " Janus Weathercock," " Egomet

Bonmot " and " Herr Vinkbooms." He was a friend of Charles Lamb — who thought well of his literary productions, and in a letter to Bernard Barton, styles him the " kind, light-hearted Wainewright " — and of the other brilliant contributors to the journal. He also practised as an artist, designing illustrations to Chambcrlayne's poems, and from 1821 to 1S25 exhibiting in the Royal Academy figure pictures, including a " Romance from Undine," " Paris in the Chamber of Helen " and the " Milkmaid's Song." Owing to his extravagant habits, Waine wright's affairs became deeply involved. In 1830 he insured the life of his sister-in-law in various offices for a sum of £18,000, and when she died, in the December of the same year, payment was refused by the companies on the ground of misrepresentation. Wainewright retired to France, was seized by the authorities as a suspected person, and imprisoned for six months. He had in his possession a quantity of strychnine, and it was afterwards found that he had destroyed, not only his sister-in-law, but also his uncle, his mother-in-law and a Norfolk- shire friend, by this poison. He returned to London in 1837, but was at once arrested on a charge of forging, thirteen years before, a transfer of stock, and was sentenced to transportation for life. He died of poplexy in Hobart Town hospital in 1S52.

The Essays and Criticisms of Wainewright were published in 1880, with an account of his life, by W. Carew Hazlitt; and the history of his crimes suggested to Dickens his story of Hunted Down and to Bulwcr Lytton his novel of Lucretia. His personality, as artist and poisoner, has interested latter-day writers, notably Oscar Wilde in " Pen, Pencil and Poison " {Fortnightly Review, Jan. 1889), and A. G. Allen, in T. Seccombe's Twelve Bad Men (1894).

WAINGANGA, a river of India, flowing through the Central Provinces in a very winding course of about 360 m. After joining the Wardha the united stream, known as the Pranhita, ultimately falls into the Godavari.

WAINSCOT, properly a superior quality of oak, used for fine panel work, hence such panel- work as used for the lining or covering of the interior walls of an apartment. The word appears to be Dutch and came into use in English in the 16th century, and occurs in lists of imported timber. The Dutch word wagen- schot, adapted in English as waynskott, weynskott (Hakluyt, Voyages, i. 173, has " boords called waghenscot "), was applied to the best kind of oak, well-grained, not liable to warp and free from knots. The form shows that it was, in popular etymology, formed from wagen {i.e. wain, w f agon) and schot, a term which has a large number of meanings, such as shot, cast, partition, an enclosure of boards, cf. " sheet," and was applied to the fine wood panelling used in coach-building. This is, however, doubted, and relations have been suggested with Dutch weeg, wall, cognate with (). Eng. wah, wall, or with M. Dutch ivaeghe, Ger.

Wage, wave, the reference being to the grain of the wood when cut. The term " wainscot " is sometimes wrongly applied to a " dado," the lining, whether of paper, paint or wooden panelling, of the lower portion of the walls of a room. A (t dado " (Ifal. dado, die, cube; Lat. datum, something given, a die for casting lots; cf. 0. Fr. del, mod. de", Eng. " die ") meant originally the plane-faced cube on the base cf a pedestal between the mouldings of the base

and the cornice, hence the flat surface between the plinth and the capping of the wooden lining of the lower part of a wall, representing a continuous pedestal.

WAIST, the middle part of the human body, the portion lying between the ribs and the hip-bones, comprising the compressible parts of the trunk. The word is also applied to the central portion of other objects, particularly tc the narrowest portion of musical instruments of the violin type and to the centre of a ship. The word appears in the M. Eng. as waste, " waste of a mannys' myddel " (Prompt, parv. c. 1440), and is developed from the O, Eng. w&stm, growth, the " waist " being the part where the growth of a man is shown and developed; cf. Icel. voxlr, stature, shape; Dan. vaext, size, growth, &c. It is thus to be derived from the O. Eng. weaxan, to grow, wax.

WAITE, MORRISON REMICK (1816-1888), American jurist, was born at Lyme, Connecticut, on the 20th of November 1816, the son of Henry Matson Waite (1787-1869), who was judge of the superior court and associate judge of the supreme court of Connecticut in 1834-1854 and chief justice of the latter in 1854- 1857. He graduated at Yale in 1837, and soon afterwards removed to Maumee City, Ohio, where he studied law in the office of Samuel L. Young and was admitted to the bar in 1839. In 1850 he removed to Toledo, and he soon came to be recognised as a leader of the state bar. In politics he was first a Whig and later a Republican, and in 1849-1850 he was a member of the state senate. In 1871, with William M. Evarts and Caleb Cushing, he represented the United States as counsel before the " Alabama " Tribunal at Geneva, and in 1874 he presided over the Ohio constitutional convention. In the same year he was appointed by President U. S. Grant to succeed Judge Saimon P. Chase as chief-justice of the United States Supreme Court, and he held this position until his death at Washington, D.C., on the 23rd of March 1888. In the cases which grew out of the Civil War and Reconstruction, and especially in those which involved the interpretation of the Thirteenth, Fourteenth and Fifteenth amendments, he sympathized with the general tendency of the court to restrict the further extension of the powers of the Federal government. He concurred with the majority in the Head Money Cases (1884), the Ku-Klux Case {United Slates v. Harris, 1882), the Civil Rights Cases (1883) and

the Juillard v. Greenman (legal tender) Case (1883). Among his own most important decisions were those in the Enforcement Act Cases (r875), the Sinking Fund Case (1878), the Railroad Commission Cases (1886) and the Telephone Cases (1887).

WAITHMAN, ROBERT (i764-:8 3 3) T Lord Mayor of London, was born at Wrexham in 1764. After being employed for some time in a London linen draper's, he opened, about 1786, a draper's shop of his own, and made a considerable fortune. In 1818 he was returned to parliament, as a liberal, for the city of London. He lost his seat at the election of 1820, but regained it in 1826, and retained it till his death, taking part vigorously in the parlia- mentary debates, and strenuously supporting reform. In 1823 he was Lord Mayor of London. Waithman died in London on the 6th of February 1833. An obelisk erected by his friends in Ludgate Circus, London, adjoining the site of his first shop, commemorates his memory.

WAITS (A.S. wacan, to "wake" or "watch,"), the carol- singers and itinerant musicians who parade the streets at night at Christmas time. The earliest waits (those of the 14th and 15th centuries) were simply watchmen who sounded horns or even played a tune on a flute or flageolet to mark the hours. This appears to have been known as " piping the watch." The black book of the royal household expenses of Edward IV., under date 1478, provides for " a wayte, that nyghtcly from Mychelmas to Shreve Thorsdaye pipe the watch within this courte fowere tymes.; in the somere nightes three tymes and maketh bon gayte at every chambre doare and offyce, as well as for feare of pyckeres and pilfers." Elaborate orders as to his housing occur. Thus he was to eat in the hall with the minstrels and was to sup off half a loaf and half a gallon of ale. During his actual attendance at court he was to receive fourpence halfpenny a day or less in the discretion of the steward of the

household. He had a livery given him and during illness an extra allowance of food. Besides " piping the watch " and guarding the palace against thieves and fire, this wait had to attend at the installation of knights of the Bath. London and all the chief boroughs had their corporation waits certainly from the early 16th century, for in the privy purse accounts of Henry VIII. occurs (1532) the entry "Item, the XI daye (of October) paied to the waytes of Canterbery in rewarde . . . vijs. vjd." In 1582 Dudley, earl of Leicester, writes to the corporation of London asking that a servant of his should be admitted to the city waits. These borough waits appear, how- ever, to have been more nearly akin to the medieval troubadours or

minstrels who played to kings and nobles at and after the evening meal. The duties of the London waits, which included playing before the mayor during his annual progress through the streets and at city dinners, seem to have been typical of all 1 6th- and 17th-century city waits. The London waits had a special uniform of blue gowns with red sleeves and caps, and wore a silver collar or chain round the neck. In the 18th and early 19th century the ordinary street watchmen appear to have arrogated to themselves the right to serenade householders at Christmas time, calling round on Boxing Day to receive a gratuity for their tunefulness as well as their watchfulness. When in 1829 their place as guardians of the city's safety was taken by police, it was left for private individuals to keep up the custom,

WAITZ, GEORG (1813-18S6), German historian, was born at Flensburg, in the duchy of Schleswig, on the 9th of October 1813. He was educated at the Flensburg gymnasium and the universities of Kiel and Berlin. The influence of Ranke early diverted him from his original purpose of studying law, and while still a student he began that series of researches in German medieval history which was to be his life's work. On graduating at Berlin in August 1836, Waitz went to Hanover to assist Fertz in the great national work of publishing the Monwmoita Ger- mantae historica; and the energy and learning he displayed in that position won him a summons to the chair of history at Kiel in 1842. The young professor soon began to take an interest in politics, and in 1S46 entered the provincial diet as representative of his university. His leanings were strongly German, so that he became somewhat obnoxious to the Danish government, a fact which made an invitation in 1847 to become professor of history at Gottingen peculiarly acceptable. The political events of 1848-1849, however, delayed his appearance in his new chair. When the German party in the northern duchies rose against the Danish government, Waitz hastened to place himself at the service of the provisional government. He was sent to Berlin to represent the interests of the duchies there, and during his absence he was elected by Kiel as a delegate to the national parliament at Frankfort. Waitz was an adherent of the party who were eager to bring about a union of the German states under a German emperor; and when the king of Prussia declined the imperial crown the professor withdrew from the assembly in disappointment, and ended his active share in public life. In the autumn of 1849 Waitz began his lectures at Gottingen. His style of speaking was dry and uninteresting; but the matter of his lectures was so practical and his teaching so sound that students were attracted in crowds to his lecture-room, and the reputation of the Gottingen historical school spread far and wide. At the same time Waitz's pen was not idle, and his industry is to be traced in the list of his works and in the Proceedings of the different historical societies to which he belonged. In 1875 Waitz removed

to Berlin to succeed Pertz as principal editor of the Monumenta Germaniae historica. In spite of advancing years the new editor threw himself into the work with all his former vigour, and took journeys to England, France and Italy to collate works preserved in these countries. He died at Berlin on the 24th of May 1886. He was twice married — in 1842 to a daughter of Schclling the philosopher, and in 1S58 to a daughter of General von Hartmann.

Waitz is often spoken of as the chief disciple of Ranke, though perhaps in general characteristics and mental attitude

-WAKE, W.

he has more affinity with Pertz or Dahlmann. His special domain was medieval German history, and he rarely travelled beyond it.

Waitz's chief works, apart from his contributions to the Monumenta, are: — Deutsche Verfassungsgesckichte (8 vols., Kiel, 1844-1878; 2nd ed., 2 vols, only, 1865-1870); Schleswig-Holsteins Geschichte (2 vols., Gottingen, 1851-1854; the 3rd vol. was never published); Lubeck unlerjiirgen Wulleniiever und die europdische Polilik (3 vols. ; Berlin, 1855-1856) ; and Grundziige der PoltHk (Kiel, 1862). Among his smaller works, which, however, indicate the line of his researches, are the following : — Jahrbucher des deutschen Reichs unter Hcinrich I. (Berlin, 1837, 3rd ed., 1885) ; Vber das Lelen und die Lehre des Ulfila (Hanover, 1840); Das alte Recht der salischen Franken (Kiel, 1846); and Deutsche Kaiser von Karl dem Grosstn lis Maximilian (Berlin, 1872). In conjunction with other scholars Waitz took a leading part in the publication of the Forschungen zur deutschen Geschichte (Munich, 1862 seq.), and in the Nordalbingische Studien, published in the Proceedings of the Schleswig-Holstein Historical Society (Kiel, 1844-1851). A Bibliographische Vbersicht iiber Waitz's Werke was published by E. Steindorff at Gottingen in 1886.

Obituary notices of Waitz are to be found in the Historische Zeilschrift, new scries, vol. xx. ; in the publications for 1886 of the Berlin Akademie der Wissenschaften, the Gottingen Gesellschaft der Wissenschaften, and the Hansischer Geschichtsverein; in the Hislorisches Jahrbuch der Gorres Gesellschaft, vol. viii. ; and in the Revue historique, vol. xxxi.

WAITZ, THEODOR (1821-1864), German psychologist and anthropologist, was born at Gotha on the 17th of March 1821. Educated at Leipzig and Jena, he made philosophy, philology and mathematics his chief studies, and in 1848 he was appointed professor of philosophy in the university of Marburg. He was a severe critic of the philosophy of Fichte, Schelling and Hegel, and considered psychology to be the basis of all

philosophy. His researches brought him into touch with anthropology, and he will be best remembered by his monumental work in six volumes, Die Anthropologic der Naturvolker. He died on the 21st of May 1864 at Marburg.

In addition to his Anthropologic, the first four volumes of which appeared at Leipzig, 1859-1864, the last two posthumously, he published Grundlegung der Psychologic (1846) ; Lehrbuch der Fsycho- logie als Nalurwissenschaft (1849); AUgemeine Pddagogik (1852); and a critical edition of the Organon of Aristotle (1844).

WAKE, THOMAS (1297-1349), English barori, belonged to a Lincolnshire family which had lands also in Cumberland, being the son of John Wake (d. 1300), who was summoned to parliament as a baron in 1295, and the grandson of Baldwin Wake (d. 1282), both barons and warriors of repute. Among Thomas Wake's guardians were Piers Gaveston and Henry, earl of Lincoln, whose daughter Blanche (d. 1357) he married before 1317. This lady was the niece of Thomas, earl of Lancaster, and her husband was thus attached to the Lancastrian party, but he did not follow Earl Thomas in the proceedings which led to his death in 1322. Hating the favourites of Edward II. Wake joined Queen Isabella in 1326 and was a member of the small council which advised the young king, Edward III.; soon, however, he broke away from the queen and her ally, Roger Mortimer, and in conjunction with his father-in-law, now earl of Lancaster, he joined the malcontent barons. He was possibly implicated in the plot which cost his brother-in-law, Edmund, earl of Kent, his life in 1330, and he fled to France, returning to England after the overthrow of Isabella and Mortimer. Edward III. made him governor of the Channel Islands and he assisted Edward Bruce to invade Scotland, being afterwards sent on an errand to France. In 1341 he incurred the displeasure of the king and was imprisoned, but he had been restored and had been employed in Brittany and elsewhere when he died childless on the 31st of May 1349. His estates passed to his sister Margaret (d. 1349), widow of Edmund, earl of Kent, and her son John (d. 1352), and later to the Holand family. Wake established a house for the Austin canons at Newton near Hull; this was afterwards transferred to Haltemprice in the same neighbourhood.

WAKE, WILLIAM (1657-1737), English archbishop, was born at Blandford, Dorset, on the 26th of January 1657, and educated at Christ Church, Oxford. He took orders, and in r682 went to Paris as chaplain to the ambassador Richard Graham, Viscount Preston ˆ648-1695). Here he became acquainted with many of

the savants of the capital, and was much interested in French clerical affairs. He also collated some Paris manuscripts of the Greek Testament for John Fell, bishop of Oxford. He returned to England in 1685; in 168S he became preacher at Gray's Inn, and in 1689 he received a canonry of Christ Church, Oxford. In 1693 he was appointed rector of St James's, Westminster. Ten years later he became dean of Exeter, and in 1705 he was consecrated bishop of Lincoln. He was translated to the see of Canterbury in 1716 on the death of Thomas Tenison. During 1 718 he negotiated with leading French churchmen about a pro- jected union of the Gallican and English churches to resist the claims of Rome (see J. H. Lupton, Archbishop Wake and the Project of Union, 1896). In dealing with nonconformity he was tolerantj and even advocated a revision of the Prayer Book if that would allay the scruples of dissenters. His writings are numerous, the chief being his State of the Church and Clergy of England . . . historically deduced (London, 1703). He died at Lambeth on the 24th of January 1736/7.

Sir Isaac Wake (c. 1580-1632), the diplomatist, was a kinsman of the archbishop, lie commenced his diplomatic career in Venice, and then he represented his county for sixteen years at Turin; he was knighted in 1619, and after being sent on various special missions by James I. he was British ambassador in Paris from 1630 until his death in June 1632. Among Sir Isaac's writings is Rex platonicus, a description of the entertainment of James I. at Oxford in 1605; this was published in 1607 and has often been reprinted.

WAKE (A.S. wacan, to " wake " or " watch "), a term now restricted to the Irish custom of an all-night " waking " or watching round a corpse before burial, but anciently used in the wider sense of a vigil kept as an annual church celebration in commemoration of the completion or dedication of the parish church. This strictly religious wake consisted in an all-night service of prayer and meditation in the church. These services, popularly known as " wakes," were officially termed Vigtliae by the church, and appear to have existed from the earliest days of Anglo-Saxon Christianity. Tents and booths were set up in the churchyard before the dawn which heralded in a day devoted to feasting, dancing and sports, each parish keeping the morrow of its vigil as a holiday. Wakes soon degenerated into fairs; people from neighbouring parishes journeyed over to join in the merry-making, and as early as Edgar's reign (958-975) the revelry and drunkenness had become a scandal. The vigiliae usually fell on Sundays or saints' days, those being the days oftenest chosen for church dedications, and thus the abuse was the more scandalous. In 1445 Henry VI. attempted to suppress markets and fairs on Sundays and holy days. In

1536 an Act of Convocation ordered that the yearly " wake " should be held in every parish on the same day, viz. the first Sunday in October, but this regulation was disregarded. Wakes are specially men- tioned in the Book of Sports of James I. and Charles I. among the feasts which should be observed.

Side by side with these church wakes there existed from the earliest times the custom of " waking" a corpse. The custom, as far as England was concerned, seems to have been older than Christianity, and to have been at first essentially Celtic. Doubt- less it had a superstitious origin, the fear of evil spirits hurting or even removing the body, aided perhaps by the practical desire to keep away rats and other vermin. The Anglo-Saxons called the custom lich-wake or like-wake (A.S. lie, a corpse). With the introduction of Christianity the offering of prayer was added to the mere vigil, which until then had been characterized by formal mourning chants and recitals of the life story of the dead. As a rule the corpse, with a plate of salt on its breast, was placed under the table, on which was liquor for the watchers. These private wakes soon tended to become drinking orgies, and during the reign of Edward III. the provincial synod held in London proclaimed by its 10th canon the object of wakes to be the offering of prayer for the dead, and ordered that in future none but near relatives and friends of the deceased should attend. The penalty for disobedience was excommunication. With the Reformation and the consequent disuse of prayers for the dead the custom of " waking " in England became obsolete and died out. Many countries and peoples have been found to have a

custom equivalent to " waking," which, however, must be distinguished from the funeral feasts pure and simple.

For detailed accounts of Irish wakes see Brand's Antiquities of Great Britain (W. C. Hazlitt's edition, 1905) under "Irish Wakes."

WAKEFIELD, EDWARD GIBBON (1796-1862), British colonial statesman, was born in London on the 20th of March 1796, of an originally Quaker family. His father, Edward Wake- field (1774-1854), author of Ireland, Statistical and Political (1812). was a surveyor and land agent in extensive practice; his grandmother, Priscilla Wakefield (1751-1832), was a popular author for the young, and one of the introducers of savings banks. Wakefield was for a short time at Westminster School, and was brought up to his father's profession, which he relinquished on occasion of his elopement at the age of twenty with Miss Pattle, the orphan daughter of an Indian civil servant. The young lady's relatives ultimately became reconciled to the match, and pro- cured him an appointment as attache to the British legation at Turin. He resigned this post in 1820, upon the death of his wife, to whom he was fondly attached,

and, though making some efforts to connect himself with journalism, spent the years immediately succeeding in idleness, residing for the most part in Paris. In 1826 he appeared before the public as the hero of a most extraordinary adventure, the abduction of Miss Ellen Turner, daughter of William Turner, of Shrigley Park, Cheshire. Miss Turner was decoyed from school by means of a forged letter, and made to believe that she could only save her father from ruin by marrying Wakefield, whom she accordingly accompanied to Gretna Green. This time the family refused to condone his proceedings; he was tried with his confederates at Lancaster assizes, March 1827, convicted, and sentenced to three years' imprisonment in Newgate. The marriage, which had not been consummated, was dissolved by a special act of parliament. A disgrace which would have blasted the career of most men made Wakefield a practical statesman and a. benefactor to his country. Meditating, it is probable, emigration upon his release, he turned his attention while in prison to colonial subjects, and acutely detected the main causes of the slow progress of the Australian colonies in the enormous size of the landed estates, the reckless manner in which land was given away, the absence of all systematic effort at colonization, and the consequent discouragement of immigration and dearth of labour. He proposed to remedy this state of things by the sale of land in small quantities at a sufficient price, and the employment of the proceeds as a fund for promoting immigration. These views were expressed with extraordinary vigour and incisiveness in his Letter from Sydney (1829), published while he was still in prison, but composed with such graphic power that it has been continually quoted as if written on the spot. After his release Wakefield seemed disposed for a while to turn his attention to social questions at home, and produced a tract on the Punishment of Death, with a terribly graphic picture of the condemned sermon in Newgate, and another on incendiarism in the rural districts, with an equally powerful exhibition of the degraded condition of the agricultural labourer. He soon, however, became entirely engrossed with colonial affairs, and, having impressed John Stuart Mill, Colonel Torrens and other leading economists with the value of his ideas, became a leading though not a conspicuous manager of the South Australian Company, by which the colony of South Australia was ultimately founded. In 1833 he published anonymously England and America, a work primarily intended to develop his own colonial theory, which is done in the appendix entitled " The Art of Colonization." The body of the work, however, is fruitful in seminal ideas, though some statements may be rash and some conclusions extravagant. It contains the distinct proposal that the transport of letters should be wholly gratuitous — the precursor of subsequent reform — and the prophecy that, under given circumstances, " the Americans would raise cheaper corn than has ever been raised." In 1836 Wakefield published the first volume of an edition of Adam Smith, which he did not complete. In 1837 the New

Zealand Association was established, and he became its managing director. Scarcely, however, was this great undertaking fairly

commenced when he accepted the post of private' secretary to Lord Durham on the latter's appointment as special commissioner to Canada. The Durham Report, the charter of constitutional government in the colonies, though drawn up by Charles Buller, embodied the ideas of Wakefield, and the latter was the means of its being given prematurely to the public through The Times, to prevent its being tampered with by the government. He acted in the same spirit a few months later, when (about July 18,59), understanding that the authorities intended to prevent the despatch of emigrants to New Zealand, he hurried them off on his own responsibility, thus compelling the government to annex the country just in time to anticipate a similar step on the part of France. For several years Wakefield continued to direct the New Zealand Company, fighting its battles with the colonial office and the missionary interest, and secretly inspiring and guiding many parliamentary committees on colonial subjects, especially on the abolition of transportation. The company was by no means a financial success, and many of its proceedings were wholly unscrupulous and indefensible; its great object, however, was attained, and New Zealand became the Britain of the south. In 1846 Wakefield, exhausted with labour, was struck down by apoplexy, and spent more than a year in com- plete retirement, writing during his gradual recovery his Art of Colonization. The management of the company had meanwhile passed into the hands of others, whose sole object was to settle accounts with the government, and wind up the undertaking. Wakefield seceded, and joined Lord Lyttelton and John Robert Godley in establishing the Canterbury settlement as a Church of England colony. A portion of his correspondence on this subject was published by his son as The, Founders of Canterbury (Christ- church, 1868). As usual with him, however, he failed to retain the confidence of his coadjutors to the end. In 1853, after the grant of a constitution to New Zealand, he took up his residence in the colony, and immediately began to act a leading part in colonial politics. In 1854 he appeared in the first New Zealand parliament as extra-official adviser of the acting governor, a position which excited great jealousy, and as the mover of a resolution demanding the appointment of a responsible ministry. It was carried unanimously, but difficulties, which will be found detailed in W. Swainson's New Zealand and its Colonization (ch. 12), prevented its being made effective until after the mover's retirement from political life. In December 1854, after a fatiguing address to a public meeting, followed by prolonged ex- posure to a south-east gale, his constitution entirely broke

down. He spent the rest of his life in retirement, dying at Wellington on the 16th of May 1862. His only son, Edward Jerningham Wakefield (1820-1870), was a New Zealand politician. Three of Wakefield's brothers were also interested in New Zealand. After serving in the Spanish army William Hayward Wakefield (1S03-1848) emigrated to New Zealand in 1839. As an agent of the New Zealand Land Company he was engaged in purchasing enormous tracts of land from the natives, but the company's title to the greater part of this was later declared invalid. He remained in New Zealand until his death on the 19th of September 1848. Arthur Wakefield (1799-1843), who was associated with his brother in these transactions about land, was killed during a fight with some natives at Wairau on the 17th of June 1843. The third brother was Felix Wakefield (1807-1875), an engineer.

Wakefield was a man of large views and lofty aims, and in private life displayed the warmth of heart which commonly accompanies these qualities. His main defect was unscrupulous- ness: he hesitated at nothing necessary to accomplish an object, and the conviction of his untrustworthiness gradually alienated his associates, and left him politically powerless. Excluded from Darliamcnt by the fatal error of his youth, he was compelled to resort to indirect means of working out his plans by influencing public men. But for a tendency to paradox, his intellectual powers were of the highest order, and as a master of nervous idiomatic Englisn he is second to Cobbett alone. After every deduction it remains true that no contemporary showed equal genius as a colonial statesman, or in this department rendered equal service to his country.

For an impartial examination of the Wakefield system, see Leroy- Beaulieu, Be la colonisation chez les peuples modernes (3rd ed. pp. 562-575 and 696-700). See also R. Garnett's Life of Wakefield (1898). (R- G.)

WAKEFIELD, GILBERT (1756-1801), English classical scholar and politician, was born at Nottingham on the 22nd of February 1756. He was educated at Jesus College, Cambridge (fellow, 1776). In 1778 he took orders, but in the following year quitted the church and accepted the post of classical tutor at the Non- conformist academy at Warrington, which he held till the dis- solution of the establishment in 1783. After leaving Warrington, he took private pupils at Nottingham and other places, and also occupied himself with literary work. His most important production at this period was the first part of the Siha critica, the design of which was the " illustration of the Scriptures by light borrowed from the philology of Greece and Rome." In 1790 he was appointed professor of classics at the newly-founded Unitarian college at Hackney, but his proposed reforms and his objection to religious observances led to unpleasantness and to his resignation in the following year. From this time he sup- ported himself by

his pen. His edition of Lucretius, a work of high pretensions and little solid performance, appeared in 1796-1799, and gained for the editor a very exaggerated reputa- tion (see Munro's Lucretius, i. pp. 19, 20). His light-hearted criticism of Porson's edition of the Hecuba was avenged by the latter's famous toast: " Gilbert Wakefield; what's Hecuba to him or he to Hecuba ? " About this time Wakefield, who hated Pitt and condemned war as utterly unchristian, abandoned literature for political and religious controversy. After assailing with equal bitterness writers so entirely opposed as William Wilberforce and Thomas Paine, in January 1798 he "employed a few hours " in drawing up a reply to Bishop Watson's Address to the People of Great Britain, written in defence of Pitt and the war and the new " tax upon income." He was charged with having published a seditious libel, convicted in spite of an eloquent defence, and imprisoned for two years in Dorchester gaol. A considerable sum of money was subscribed by the public, sufficient to provide for his family upon his death, which took place on the 9th of September 1801. While in prison he corresponded on classical subjects with Charles James Fox, the letters being subsequently published.

See the second edition of his Memoirs (1804). The first volume is autobiographical; the second, compiled by J. T. Rutt and A. Wainewright, includes several estimates of his character and per- formances from various sources, the most remarkable being one by Dr Parr; see also Gentleman's Magazine (September 1801ˆ; Henry Crabb Robinson's Diary (3rd ed., 1872); John Aikin in Aikin's General Biography (1799-1815).

WAKEFIELD, a city and municipal and parliamentary borough in the West Riding of Yorkshire, England, 1753 m. N.N.W. from London. Pop. (1901) 41,413. It is served by the Great Northern, Midland and Great Central railways (Westgate station), and the Lancashire and Yorkshire and North-Eastern railways (Kirkgate station), the Great Northern Company using both stations. It lies on the river Calder, mainly on the north bank, in a pleasant undulating country, towards the eastern ! outskirts of the great industrial district of the West Riding. I The river is crossed by a fine bridge of eight arches on which stands the chapel of St Man', a beautiful structure 50 ft. long by 25 wide, of the richest Decorated character. Its endowment is attributed to Edward IV., in memory of his father Richard, duke of York, who fell at the battle of Wakefield (1460). It was completely restored in 1847. In 1888 the bishopric of Wakefield was formed, almost entirely from that of Ripon, having been sanctioned in 1878. The diocese includes about one-seventh of the parishes of Yorkshire, and also covers a very small portion of Lancashire. The cathedral church of All Saints occupies a very ancient site, but only slight traces of buildings previous to the 14th century can be seen. In the early part of that century the church was almost rebuilt, and was consecrated by Archbishop William dc Melton in 1329. Further

great alterations took place in the 15th century, and the general effect of the building as it stands is Perpendicular. The church consists of a clerestoried I nave and choir, with a western tower; the eastward extension

of the choir, the construction of the retrochoir and other works were undertaken in 1900 and consecrated in 1905 as a memorial to Dr Walsham How, the first bishop. During restoration of the spire (the height of which is 247 ft.) in 1905, records of previous work upon it were discovered in a sealed receptacle in the weather-vane. Among the principal public buildings are the town hall (1880), in the French Renaissance style; the county hall (1898), a handsome structure with octagonal tower and dome over the principal entrance; the large corn exchange (1837, enlarged 1S62), including a concert-room; the market house, the sessions house, the county offices (1S96) and the prison for the. West Riding; the mechanics' institution with large library, church institute and library, and the fine art institution. A free library was founded in 1905, and a statue of Queen Victoria unveiled in the Bull Ring at the same time. Benevolent institutions include the Clayton hospital (1879), on the pavilion system, and the West Riding pauper lunatic asylum with its branches. The Elizabethan grammar school, founded in 1592, is the principal educational establishment. Among several picturesque old houses remaining, that known as the Six Chimneys, an Elizabethan structure, is the most striking.

Formerly Wakefield was the great emporium of the cloth manu- facture in Yorkshire, but in the 19th century it was superseded in this respect by Leeds. Foreign weavers of cloth were established at Wakefield by Henry VII.; and Leland, writing in the time of Henry VIII., states that its "whole profit standeth by coarse drapery." During the 18th century it became noted for the manufacture of worsted yarn and woollen stuffs. Although its manufacturing importance is now small in comparison with that of several other Yorkshire towns, it possesses mills for spinning worsted and carpet yarns, coco-nut fibre and China grass. It has also rag-crushing mills, chemical works, soap-works and iron-works; and there are a number of collieries in the neigh- bourhood. Wakefield is the chief agricultural town in the West Riding, and has one of the largest corn markets in the north of England. It possesses agricultural implement and machine works, grain and flour mills, malt-works and breweries. A large trade in grain is carried on by means of the Calder, and the building of boats for Inland navigation is a considerable industry. There are extensive market -gar dens in the neighbourhood. In the vicinity of Wakefield is Walton Hall, the residence of the famous naturalist Charles Waterton (1782-1865). The parlia- mentary

borough returns one member. The municipal borough is under a mayor, 9 aldermen and 27 councillors. Area, 4060 acres.

In the reign of Edward the Confessor, Wakefield (Wachefeld) was the chief place in a large district belonging to the king and was still a royal manor in 1086. Shortly afterwards it was granted to William, Earl Warenne, and his heirs, under whom it formed an extensive baronial liberty, extending to the confines of Lancashire and Cheshire. It remained with the Warenne family until the 14th century, when John Warenne, earl of Warenne and Surrey, having no legitimate heir, settled it on his mistress, Maud de Keirford and her two sons. They, however, pre- deceased him, and after Maud's death in r36o the manor fell to the crown. Charles I. granted it to Henry, earl of Holland, and after passing through the hands of Sir Gcrvasc Clifton and Sir Christopher Clapham, it was purchased about 1700 by the duke of Leeds, ancestor of the present duke, who is now lord of the manor. In 1 203-1 204 William Earl Warenne received a grant of a fair at Wakefield on the vigil, day and morrow of All Saints' day. As early as 1231 the town seems to have had some form of burghal organization, since in that year a burgage there is mentioned in a fine. In 1331, at the request of John de Warenne, earl of Surrey, the king granted the "good men" of the town pavage there for three years, and in the same year the earl obtained a grant of another fair there on the vigil, day and morrow of St Oswald. There is no other indication of a borough. The battle of Wakefield was fought in 1460 on the banks of the river Calder just outside the town.

Leland gives an interesting account of the town in the 16th century, and while showing that the manufacture of clothing

was the chief industry, says also that Wakefield is "a very quik market town and meatly large, well served of flesh and fish both from sea and by rivers … so that all vitaile is very good and chepe there. A right honest man shall fare well for 2d. a meal. . . . There be plenti of se coal in the quarters about Wakefield." The corn market, held on Fridays, is of remote origin. A cattle market is also held on alternate Wednesdays under charter of 1765. The town was enfranchised in 1832, and was incorporated in 1848 under the title of the mayor, aldermen and councillors of the borough of Wakefield. Before this date it was under the superintendence of a constable appointed by the steward of the lord of the manor.

Sec Victoria County History, Yorkshire; W. S. Banks, History of Wakefield (1871); E. Parsons, History of Leeds, Qfc. (1834); T. Taylor, History of Wakefield (1886).

WAKEFIELD, a township of Middlesex county, Massachusetts, U.S.A., about 10 m. N. of Boston. Pop. (1890) 69S2; (1900) 9290, of whom

2347 were foreign-born; (1910, census) 11,404. Wakefield is served by three branches of the Boston & Maine railway and by electric interurban railway to neighbouring towns and cities. It contains the outlying villages of Greenwood, Montrose and Boyntonville; and, larger than these, W r akefield, near the centre of the township. In this village is the town hall, the gift of Cyrus Wakefield (1811-1873), and the Beebe Town Library, founded in 1856 as the Public Library of South Reading, and later renamed in honour of Lucius Beebe, a generous patron. The town park (about 25 acres), shaded by some fine old elms, extends to the S. shore of Lake Quannapowitt and contains a soldiers' monument; and in the S. part of the township are Crystal Lake and Hart's Hill (30 acres), a public park. In the township is the Wakefield Home for Aged Women, and a Y.M.C.A. building. Manufacturing is the principal industry; and among the manufactures are rattan goods, hosiery, stoves and furnaces, boots and shoes, and pianos. The value of the factory products increased from $2,647,130 in 1900 to $4,807,728 in 1905, or 81-6 %. The township owns and operates the electric lighting and gas plants and the water-works.

Within the present limits of Wakefield the first settlement was made, in 1639, in that part of the old township of Lynn which in 1644 was incorporated as Reading. In 18 12 the southern or " Old Parish " of Reading, which was strongly Democratic- Republican while the other two parishes were strongly Federalist, was set apart and incorporated as the town of South Reading. In 1868 the present name was adopted in honour of Cyrus Wakefield, who established the rattan works here. A portion of Stoneham was annexed to W T akeficld in 18S9.

Sec C. W. Eaton, " Wakefield," in S. A. Drake's History of Middle- sex County (Boston, 1880).

WAKKERSTROOM, a town and district of the Transvaal. The district occupies part of the S.E. of the Transvaal, being bounded S. by the Orange Free State and Natal. The frontier line is in part the crest of the Drakensberg. The town of Wakker- stroom, pop. (1904) 1402, lies 18 m. E. of Volksrust and 4 m. N. of the Natal frontier. It is built on the high veld, at an elevation of 5900 ft., and possesses a bracing climate. The neighbouring hills rise over 7000 ft. The plain on which the town stands is drained by the Slang and other tributaries of the Buffalo affluent of the Tugela. The district, a fertile agricultural region, was organized as one of the divisions of the Transvaal in 1859 by President M. W. Pretorius, and after his Christian names the town was called Marthinus-WesseLStroom, an unwieldy desig- nation dropped in favour of Wakkerstroom. During the war of 1880-81 the town was unsuccessfully besieged by the Boers. In 1903 a small portion of the district was annexed to Natal.

WAKLEY, THOMAS (1795-1862), English medical and social reformer, was born in Devonshire, and was early apprenticed to a Taunton apothecary. He then went to London and qualified as a surgeon, setting up in practice in Regent Street, and marrying (1820) Miss Goodchild, whose father was a merchant and a governor of St Thomas's Hospital. All through his career Wakley proved to be a man of aggressive personality, and his experiences in this respect had a sensational beginning. In August 1820 a gang of men who had some grievance against him burnt down his

house and severely wounded him in a murderous assault. The whole affair was obscure, and Wakley was even suspected, un- justly, of setting fire to his house himself; but he won his case against the insurance company which contested his claim. He became a friend of William Cobbett, with whose radicalism he was in sympathy. In 1823 he started the well-known medical weekly paper, the Lancet, and began a series of attacks on the jobbery in vogue among the practitioners of the day, who were accustomed to treat the medical profession as a close borough. In opposition to the hospital doctors he insisted on publishing reports of their lectures and exposing various malpractices, and he had to fight a number of lawsuits, which, however, only increased his influence. He attacked the whole constitution of the Royal College of Surgeons, and obtained so much support from among the general body of the profession, now roused to a sense of the abuses he exposed, that in 1827 a petition to parlia- ment resulted in a return being ordered of the public money granted to it. But reform in the college was slow, and Wakley now set himself to rouse the House of Commons from within. He became a radical candidate for parliament, and in 18,35 was returned for Finsbury, retaining his seat till 1852. In this capacity, and also as coroner for West Middlesex — an appoint- ment he secured in 1S30 — he was indefatigable in upholding the interests of the working classes and advocating humanitarian reforms, as well as in pursuing his campaign against medical restrictions and abuses; and he made the Lancet not only a professional organ but a powerful engine of social reform. He died on the 16th of May 1862, leaving three sons, the proprietor- ship of the Lancet remaining in the family.

See Samuel Squire Sprigge, Life and Times of Thomas Wakley

(1897)-

WALACHIA, or Wallachia, a former principality of south- eastern Europe, constituting, after its union with Moldavia on the 9th of November 1859, a

part of Rumania (q.v.).

WALAFRID 1 STRABO (or Strabus, i.e. " squint-eyed ") (d. 849), German monk and theological writer, was born about 80S in Swabia. He was educated at the monastery of Reichenau, near Constance, where he had for his teachers Tatto and Wettin, to whose visions he devotes one of his poems. Then he went on to Fulda, where he studied for some time under Hrabanus Maurus before returning to Reichenau, of which monastery he was made abbot in 838. There is a story — based, however, on no good evidence — that Walafrid devoted himself so closely to letters as to neglect the duties of his office, owing to which he was expelled from his house; but, from his own verses, it seems that the real cause of his flight to Spires was that, notwithstanding the fact that he had been tutor to Charles the Bald, he espoused the side of his elder brother Lothair on the death cf Louis the Pious in 840. He was, however, restored to his monastery in 842, and died on the 18th of August 849, on an embassy to his former pupil. His epitaph was written by Hrabanus Maurus, whose elegiacs praise him for being the faithful guardian of his monastery.

Walafrid Strabo's works are theological, historical and poetical. Of his theological works the most famous is the great exegetical compilation which, under the name of Glosa ordinaria or the Glosa, remained for some 500 years the most widespread and important quarry of medieval biblical science, and even survived the Re- formation, passing into numerous editions as late as the 17th century (see Hist, litteraire de la France, t. v. p. 59 ff.). The oldest known copy, in four folio volumes, of which the date and origin are un- known, but which is certainly almost entirely Walafrid's work, gives us his method. In the middle of the pages is the Latin text of the Bible; in the margins are the " glosses," consisting of a very full collection of patristic excerpts in illustration and explanation of the text. There is also an exposition of the first twentv psalms (published by Pez in Anecdota nova, iv.) and an epitome of Hrabanus Maurus' s commentary on Leviticus. An Expositio quatuor Evange- liorum is also ascribed to Walafrid. Of singular interest also is his De exordiis el incrementis rerum ecdesiasticarum, written between 840 and 842 and dedicated to Regenbcrt the librarian. It deals in 32 chapters with ecclesiastical usages, churches, altars, prayers, bells, pictures, baptism and the Holy Communion. Incidentally he introduces into his explanations the current German expressions for the things he is treating of, with the apology that Solomon had

1 In the oldest MSS. this is always spelt " Walahfrid."

set him the example by keeping monkeys as well as peacocks at his court. Of special interest is the fact that Walafrid, in his exposition of the Mass,

shows no trace of any belief in the doctrine of transub- stantiation as taught by his famous contemporary Radherttis (q.v); according to him, Christ gave to his disciples the sacraments of his Body and Blood in the substance of bread and wine, and taught them to celebrate them as a memorial of his Passion.

Walafrid's chief historical works are the rhymed Vita sancti Galli which, though written nearly two centuries after this saint's death, is still the primary authority for his life, and a much shorter life of St Othmar, abbot of St Gall (d. 759). A critical edition of tliem by E. Dummlcr is m the Momanenla Germaniae hist. Po'itae Lalira, 11. (1884), p. 259 ff. Walafrid's poetical works also include a short life of St Blaithmaic, a high-born monk of Iona, murdered by the Danes in the first half of the 9th century ; a life of St Mammas ; and a Liber de visionibus Wetiini. This last poem, like the two preceding ones written in hexameters, was composed at the com- mand of "Father " Adalgisus, and based upon the prose narrative of Heto, abbot of Reichenau from 806 to 822. It is dedicated to Wettin's brother Grimald. At the time he sent it to Grimald Walafrid hart, as he himself tells us, hardly passed his eighteenth year, and he begs his correspondent to revise his verses, because,*

as it is not lawful for a monk to hide anything from his ahbot," he fears he may be beaten with deserved stripes. In this curious vision Wettin saw Charles the Great suffering purgatorial tortures because of his incontinence. The name of the ruler alluded to is not indeed introduced into the actual text, but " Carolus Imperator " form the initial letters of the passage dealing with this subject. Many ol Walafrid's other poems are, or include, short addresses to kings and queens (Lothair, Charles, Louis, Pippin, Judith, &c) and to friends (Einliard, Grimald, Hrabanus Maurus, Tatto, Ebbo, archbishop of Reims, Drogo, bishop of Metz, &c). His most famous poem is the Hortulus, dedicated to Grimald. It is an account of a little garden that he used to tend with his own hands, and is largely made up of descriptions of the various herbs he grows there and their medicinal and other uses. Sage holds the place of honour- then comes rue, the antidote of poisons; and so on through melons, fennel, lilies, poppies, and many other plants, to wind up with the rose, which in virtue and scent surpasses all other herbs, and may r.ghtly be called the flower of flowers." The curious poem De Imagine Tetrici takes the form of a dialogue ; it was inspired by an equestrian statue of Theodoric the Great which stood in front of Charlemagne 3 palace at Aix la-Chapelle.

For a bibliography of Walafrid's historical works, and of writings dealing with them, see Potthast, BiUiotheca hist. med. aevi (Berlin, 1894), p. J102 ff. Walafrid's works are published in Migne's Patro- logia Latina, vols, cxiii. and cxiv. For further references sec the article by Eduard Reuss and

A. Hauck in Herzog-Hauck, ReaU encyklopadie (Leipzig, 1908), xx. 790.

WALCH, JOHANN GEORG (1693-1775), German theologian, was born on the 17th of June 1693 at Meiningen, where his father, Georg Walch, was general superintendent. He studied at Leipzig and Jena, amongst his teachers being J. F. Buddeus (1667-1729), whose only daughter he married. He published in 1 7 16 a work, Historia critica Latinae linguae, which soon came into wide use. Two years later he became professor extra-ordinarius of philosophy at Jena. In 1719 he" was appointed professor ordinarius of rhetoric, in 1721 of poetry, and in 1724 professor extraordinarius of theology. In 1728 he became professor ordinarius of theology, and in 1750 professor primarius. His theological position was that of a very moderate orthodoxy, which had been influenced greatly by the philosophy and controversies of the Deistic period. His university lectures and published works ranged over the wide fields of church history in its various branches, particularly the literature and the controversies of the church, dogmatics, ethics and pastoral theology. He died on the 13th of January 1775.

Of his works the most valuable were BiUiotheca theologica (1757- 1765) ; BiUiotheca pairistica (1770, new ed. 1834) ; "his edition of Luther's works in 24 vols. (1740-1752); Historiscke und theologische Emleitung in die religiosen Streiligkeilen, welche sonderlich ausser der ev.-lutherischen Kirche entslanden (5 vols., 1733 ff.); the companion work to this, Einleilung in die Religionsstreltigkeiten der evangel, luth. Kirche (l73°-i/39). and Philosophisches Lexikon (1726, 4th ed. 1775). His life, with a complete list of his writings, which amounted to 287, Leben und Charakter des Kirchenraths J. G. Walch, was published anonymously by his son C. W. F. Walch (Jena, 1777). Cf. Wilhelm Gass, Protestantische Dogmatik, iii. p. 205 sq.

His son, Johann Ernst Immanuel (1725-1778), studied Semitic languages at Jena, and also natural science and mathe- matics. In 1749 he published Einleilung in die Harmonic der

' Walafrid also edited Thetmar's Life of Louis the Pious, prefixing a preface and making a few additions, and divided Einhard's Vita Caroli into chapters, adding an introduction.

Evangelisten, and in 1750 was appointed professor extraordi- narius of theology. Five years later he became professor ordinarius of logic and

metaphysics; in 1759 he exchanged this for a professorship of rhetoric and poetry. Amongst other theological works he published Dissertaliones in Acta Apostolorum (1756-1761); Antiquitaies symbolicae (1772); and after his death appeared Observationes in Matlhaeum ex Graecis inscriptionibus (1779). He also published a periodical Der Naturforscher (1774- 1778), and during the years 1749-1756 took an active part in editing, the Zeitungen von gelehrten Sachen.

See article in AUgemeine deutsche Biographic; also Lebens~ geschichte J. E. I. Walch Qena, 1880), and J. G. Meusel's Lexikon der verstorbenen teutschen Schriftsteller, vol. xiv.

Another son, Christian Wilhelm Franz (1 726-1784), was educated at Jena under his father's direction, and as early as 1745-1747 lectured in the university in branches of exegesis, philosophy and history. He then travelled with his brother, J. E. I. Walch, for a year in Holland, France, Switzerland and Italy. On his return he was in 1750 made professor extra – ordinarius of philosophy in Jena, but in 1753 he accepted an invitation to become professor ordinarius at Gottingen. Here in 1 7 ;4 he became professor extraordinarius of theology, and three years later received an ordinary professorship. He lectured on dogmatics, church history, ethics, polemics, natural theology, symbolics, the epistles of Paul, Christian antiquities, historical theological literature, ecclesiastical law and the fathers, and took an active interest in the work of the Gbttinger Societdt der Wissen- schaften. In 1766 he was appointed professor primarius. His permanent place amongst learned theologians rests on his works on church history. Semler was much his superior in originality and boldness, and Mosheim in clearness,, method and elegance. But to his wide, deep and accurate learning, to his conscientious and impartial examination of the facts and the authorities at first hand, and to " his exact quotation of the sources and works illustrating them, and careful discussion of the most minute details," all succeeding historians are indebted. His method is critical and pragmatic, " pursuing everywhere the exact facts and the supposed causes of the outward changes of history," leaving wholly out of sight the deeper moving principles and ideas which influence its course. He died on the loth of March

1784.

His principal work was his Entwurf einer vollstdndigen Historic der Ketzereien, Spaltungen, und Religionsslreitigkeiten, bis auf die Zeit der Reformation (11 vols., Leipzig, 1 762-1785). Of his other valuable works may be mentioned Geschichte der evangelisch-lulheri- schen Religion, ah ein Beweis, dass sie die wahre sei (1753), Entwurf einer vollstdndigen Ilistorie der riimischen Pdpste (1756, 2nd ed. 1758; Eng. trans. 1759),

Entwurf einer vollstdndigen Historic der Kirchenversammlungen (1759), Grundsdtze der Kirchengeschickte des Neuen Testaments (1761, 2nd cd. 1773, 3rd ed. 1792), Bibliotheca symbolica vetus (1770), Krilische Vntersuchung vom Gcbrauch der heiligen Sckrift unter den alien Christen (1779), occasioned by the controversy between G. E. Lessing and J. M. Goeze, and to which Leasing began an elaborate reply just before his death.

On C. W. F. Walch as historian see F. Baur, Epochen der kirch- lichen Geschichtsschrcibung (1852), p. 145 sq., and Dogmengeschichte, p. 38 sq. (1867, 3rd ed.); W. Gass, Geschichte der protestantischen Dogmatik, iii. p. 267 sq. ; J. G. Meusel, Lexicon verstorbener teutschen Schriftsteller, vol. xiv. For his life, see the article in the AUgemeine deutsche Biographic

A third son, Karl Friedrich (1734-1799), devoted himself to the study of law, and became professor of law at Jena in 1759. His most important works were Introductio in controversial juris civilis recentioris (Jena, 1771) and Geschichte der in Deutschland gellenden Rechle (Jena, 1780). He died on the 20th of July 1799.

WALCOTT, CHARLES DOOLITTLE (1850-), American geologist, was born at the village of New York Mills, New York, on the 31st of March 1850. He received a school education at Utica. In 1876 he was appointed assistant on the New York State Survey, and in 1879 assistant geologist on the United States Geological Survey; in 1888 he became one of the palae- ontologists in charge of the invertebrata, in 1893 chief palae- ontologist, and in 1894 director of the Geological Survey. In 1907 he was appointed Secretary of the Smithsonian Institution. As president of the Geological Society of Washington he delivered in 1894 an important address on The United States

Geological Survey. He added largely to contemporary know- ledge of the fauna of the Older Palaeozoic rocks of North America, especially with reference to the Crustacea and brachiopoda; he dealt also with questions of ancient physical geography and with mountain structure.

His more important works include " Palaeontology of the Eureka district " {Mon. U.S. Geol. Survey, 1884) ; " Cambrian faunas of North America" {Bull. U.S. Geol. Survey, 1884); Fauna of the Lower Cambrian or Olenellus Zone (1890, issued 1891), and Fossil Medusae (Mon. U.S. Geol. Survey, 1898).

WALDECK-PYRMONT, a principality of Germany and a. constituent state of the German empire, consisting of two separate portions lying about 30 m. apart, viz. the county of Waldeck, embedded in Prussian territory between the provinces of Westphalia and Hesse-Nassau, and the

principality of Pyr- mont, farther to the north, between Lippe, Brunswick, Westphalia and Hanover. Waldeck comprises an area of 407 sq. m., covered for the most part with hills, which culminate in the Hegekopf (2775 ft.). The centre is occupied by the plateau of Corbach. The chief rivers are the Eder and the Diemel, both of which eventually find their way into the Weser. Pyrmont, only 26 sq. m. in extent, is also mountainous. The Emmer, also belonging to the Weser system, is its chief stream. The united area is thus 433 sq. m., or about half the size of Cambridge- shire in England, and the united population in 1905 was 59,127, showing a density of 138 to the square mile. The population is almost wholly Protestant. In consequence of the comparatively high elevation of the country — the lowest part being 540 ft. above the sea-level — the climate is on the whole inclement. Agriculture and cattle-rearing are the main resources of the in- habitants in both parts of the principality, but the soil is nowhere very fertile. Only 57% of the area is occupied by arable land and pasture; forests, one-tenth of which are coniferous, occupy 38 %. Oats is the principal crop, but rye, potatoes and flax are also grown in considerable quantities. Fruit is also cultivated in the principality. Iron mines, slate and stone quarries are worked at various points, and, with live stock, poultry, wool and timber form the chief exports. A few insignificant manufactures are carried en in some of the little towns, but both trade and manufactures are much retarded by the comparative isolation of the country from railways. Wildungen, in the extreme south of Waldeck, is the terminus of a branch line from Wabern, and a light railway runs from Warburg to Marburg; Pyrmont is intersected by the trunk line running from Cologne,via Paderborn, to Brunswick and Berlin.

The capital and the residence of the prince is Arolsen (pop, 28 1 r in 1905) in Waldeck; twelve smaller townships and about one hundred villages are also situated in the county. The only town in Pyrmont is Bad Pyrmont, with about 1500 inhabitants, a highly fashionable watering-place with chalybeate and saline springs. The annual number of visitors is about 23,000. Wil- dungen is also a spa of repute. The inhabitants to the north of the Eder are of Saxon stock, to the south of Franconian, a difference which is distinctly marked in dialect, costumes and manners.

Waldeck-Pyrmont has one vote in the federal council (Bundesrat) and one in the Reichstag. The constitution, dating from 1852, is a reactionary modification of one carried in 1849, which had been a considerable advance upon one granted in 18 16. The Landtag of one chamber consists of fifteen members, three of whom represent Prymont, elected indirectly for three years. In the event of the male line of the present ruling family becoming extinct, the female line will succeed in Waldeck, but Pyrmont will fall to Prussia. In terms of a treaty concluded in 1867 for ten years, renewed in 1877 for a similar period, and continued in 1887 with the

proviso that it should be terminable on two years' notice, the finances and the entire government of Waldeck-Pyrmont are managed by Prussia, the little country having found itself unable to support unassisted the military and other burdens involved by its share in the North German Confederation of 1867-1871 and subsequently as a constituent state of the German empire. The govern- ment is conducted in the name of the prince by a Prussian

" Landesdirector," while the state officials take the oath of allegiance to the king of Prussia. The prince of Waldeck reserves his whole rights as head of the church, and also the right of granting pardons, and in certain circumstances may exercise a veto on proposals to alter or enact laws. Education and similar matters are thus all conducted on the Prussian model; a previous convention had already handed over military affairs to Prussia. The budget for 1910 showed a revenue of £57,000 and a like expenditure. The public debt was £70,710, paying interest at i\%. The prince is supported by the income derived from crown lands. As regards the administration of justice, Waldeck and Pyrmont belong to the districts of Cassel and Hanover respectively.

The princes of Waldeck-Pyrmont are descendants of the counts of Schwalenberg, the earliest of whom known to history was one Widukind (d. 1137). His son Volkwin (d. n 78) acquired by marriage the county of Waldeck, and his line was divided into two branches, Waldeck and Landau, in 1397. In 1438 the land- grave of Hesse obtained rights of suzerainty over Waldeck, and the claims arising from this action were not finally disposed of until 1847, when it was decided that the rights of Hesse over Waldeck had ceased with the dissolution of the Holy Roman Empire. The Landau branch of the family became extinct in 1495, an< i m I0 3 r Waldeck inherited the county of Pyrmont, which had originally belonged to a branch of the Schwalenberg family. For a few years Waldeck was divided into Wildungen and Eisenberg, but in 1602, when the Wildungen branch died out with George Frederick, the imperial field-marshal, the whole principality was united under the rule of Christian Louis of Eisenberg. From 1692 the land has been undivided with the exception of a brief period from 1805 to 1812, when Waldeck and Pyrmont were ruled by two brothers. Frederick Anthony Ulrich (d. 1728), who succeeded his father, Christian Louis, in 1 706, was made a prince of the empire in 171 2. In 1807 Waldeck joined the confederation of the Rhine, and in 181 5 entered the German confederation. Its first constitution was granted in 1816 by Prince George II. (d. 1845). Prince Frederick (b. 1865) succeeded his father,

George Victor (1831-1893), as ruler on the 1 2th of May 1893. The most important fact in the recent history of the principality is its connexion with Prussia, to which reference has already been made.

See Curtze, Geschichte und Beschreibung des Fiirstentums Waldeck (Arolsen, 1850); Lowe, Heimatskunde von Waldeck (Arolsen, 1887); J. C. C. Hoffmeister, Historisch-genealogisches Handbuch iiber alle Grafen und Fiirslen von Waldeck seit 122S (Cassel, 1883); Bottcher, Das Staatsrecht des Fiirstentums Waldeck (Freiburg, 1884) ; A. Wagner, Die Geschichte Waldecks und Pyrmonts (Wildungen, 1888), and the Geschicktsbldtter fur Waldeck und Pyrmont (Mengeringhausen, 1901, fob).

WALDECK-ROUSSEAU, PIERRE MARIE RENE ERNEST

(1846-1904), French statesman, was born at Nantes on the 2nd of December 1846. His father, Rene Valdec-Rousseau (1809- 1882), a barrister at Nantes and a leader of the local republican party, figured in the revolution of 1848 as one of the deputies returned to the Constituent Assembly for Loire Inferieure. With Jules Simon, Louis Blanc and others he sat on the commission appointed to inquire into the labour question, making many im- portant proposals, one of which, for the establishment of national banks, was partially realized in 1850. After the election of Louis Napoleon to the presidency he returned to his practice at the bar, and for some time after the coup d'etat was in hiding to escape arrest. He came back to political life in the crisis of 1870, when he became mayor of Nantes in August and proclaimed the third republic there on the 4th of September. He shortly afterwards resigned municipal office in consequence of differences with his colleagues on the education question.

The son was a delicate child whose defective eyesight forbade him the use of books, and his early education was therefore entirely oral. He studied law at Poitiers and in Paris, where he took his licentiate in January 1869. His father's record ensured his reception in high republican circles. Jules Gr £vy stood sponsor for him at the Parisian bar, and he was a regular visitor it the houses of Stanislas Dufaure and of Jules Simon. After

six months of waiting for briefs in Paris, he decided to return home and to join the bar of St Nazaire, where he inscribed his name early in 1870. In September he became, in spite of his youth, secretary to the municipal commission temporarily appointed to carry on the town business. He organized the National Defence at St Nazaire, and himself marched out with the contingent, though no part of the force saw active service owing to lack of ammunition, their private store having been commandeered by the state. In 1873 he removed to the bar of Rennes, and six years later was returned to the Chamber of Deputies. In his electoral programme he had

stated that he was prepared to respect all liberties except those of conspiracy against the institutions of the country and of educating the young in hatred of the modern social order. In the Chamber he sup- ported the policy of Gambetta. The Waldeck-Rousseau family was strictly Catholic in spite of its republican principles; never- theless Waldeck-Rousseau supported the anti-clerical education law submitted by Jules Ferry as minister of education in the Waddington cabinet. He further voted for the abrogation of the law of 1814 forbidding work on Sundays and fSte days, for compulsory service of one year for seminarists and for the re-establishment of divorce. He made his reputation in the Chamber by a report which he drew up in 1S80 on behalf of the committee appointed to inquire into the French judicial system. But then as later he was chiefly occupied with the relations between capital and labour. He had a large share in 1884 in securing the recog- nition of trade unions. In 1881 he became minister of the interior in Gambetta's grand minislire, and he held the same portfolio in the Jules Ferry cabinet of 1883-1885, when he gave proof of great administrative powers. He sought to put down the system by which civil posts were obtained through the local deputy, and he made it clear that the central authority could not be defied by local officials. He had begun to practise at the Paris bar in 1886, and in 1889 he did not seek re-election to the Chamber, but devoted himself to his legal work. The most famous of the many noteworthy cases in which his cold and penetrating intellect and his power of clear exposition were retained was the defence of M. de Lesseps in 1893. In 1894 he returned to political life as senator for the department of the Loire, and next year stood for the presidency of the republic against Felix Faure and Henri Brisson, being supported by the Conservatives, who were soon to be his bitter enemies. He received 184 votes, but retired before the second ballot to allow Faure to receive an absolute majority. During the political anarchy of the next few years he was recognized by the moderate republicans as the successor of Jules Ferry and Gambetta, and at the crisis of 1899 on the fall of the Dupuy cabinet he was asked by President Loubet to form a government. After an initial failure he succeeded in forming a coalition cabinet which included such widely different politicians as M. Millerand and General de Galliffet. He himself returned to his former post at the ministry of the interior, and set to work to quell the discontent with which the country was seething, to put an end to the various agitations which under specious pretences were directed against republican institutions, and to restore independence to the judicial authority. His appeal to all republicans to sink their differences before the common peril met with some degree of success, and enabled the government to leave the second court-martial of Captain Dreyfus at Rennes an absolutely free hand, and then to compromise the affair by granting a pardon to Dreyfus. Waldeck-Rousseau won a great personal success in October by his successful intervention in the strikes at

Le Creusot. With the condemnation in January 1900 of Paul Deroulede and his monarchist and nationalist followers by the High Court the worst of the danger was past, and Waldeck-Rousseau kept order in Paris without having recourse to irritating displays of force. The Senate was staunch in support of M. Waldeck-Rousseau, and in the Chamber he displayed remarkable astuteness in winning support from various groups. The Amnesty Bill, passed on 19th December, chiefly through his unwearied advocacy, went far to smooth down the acerbity of the preceding years. With the object of aiding the industry of wine-Droducing, and of

discouraging the consumption of spirits and other deleterious liquors, the government passed a biil suppressing the octroi duties on the three " hygienic " drinks — wine, cider and beer. The act came into force at the beginning of iqoi. But the most important measure of his later administration was the Associa- tions Bill of iooi. Like many of his predecessors, he was con- vinced that the stability of the republic demanded some restraint on the intrigues of the wealthy religious bodies. All previous attempts in this direction had failed. In his speech in the Chamber M. Waldeck-Rousseau recalled the fact that he had endeavoured to pass an Associations Bill in 1882, and again in 1883. He declared that the religious associations were now being subjected for the first time to the regulations common to all others, and that the object of the bill was to ensure the supremacy of the civil power. The royalist bias given to the pupils in the religious seminaries was undoubtedly a principal cause of the passing of this bill; and the government further took strong measures to secure the presence of officers of un- doubted fidelity to the republic in the higher positions on the staff. His speeches on the religious question were published in 1001 under the title of Associations et congregations, following a volume of speeches on Questions sociales (1900). As the general election of 1902 approached all sections of the Opposition united their efforts, and M. Waldeck- Rousseau's name served as a battle-cry for one side, and on the other as a target for the foulest abuse. The result was a decisive victory for republican stability. With the defeat of the machinations against the republic M. Waldeck-Rousseau considered his task ended, and on the 3rd of June 1902 he resigned office, having proved himself the " strongest personality in French politics since the death of Gambetta. " He emerged from his retirement to protest in the Senate against the construction put on his Associations Bill by M. Combes, who refused in mass the applications of the teaching and preaching congregations for official recognition. His health had long been failing when he died on the 10th of August 1904.

His speeches were published as Discours parlementatres (1889); Pour la republique, 1883-1903 (1904), edited by H. Leyret; VEtat et la liberie (1906); and his Plaidoyers (1906, &c.) were edited by H. Barboux. See also H. Leyret, Waldeck-Rousseau et la troisieme rSpublique (1908), and the article France: History.

WALDEGRAVE, the name of an English family, taken from its early residence, Walgrave in Northamptonshire. Its founder was Sir Richard Waldegrave, or Walgrave, who was member of parliament for Lincolnshire in 1335; his son, Sir Richard Waldegrave (d. 1402), was speaker of the House of Commons in 1402. One of Sir Richard's descendants was Sir Edward Walde- grave (c. 1517-1561) of Borley, Essex, who was. imprisoned during the reign of Edward VI. for his loyalty to the princess, afterwards Queen Mary. By Mary he was knighted, and he received from her the manor of Chewton in Somerset, now the residence of Earl Waldegrave. He was a member of parliament and chancellor of the duchy of Lancaster. After Mary's decease he suffered a reverse of fortune, and he was a prisoner in the Tower of London when he died on the 1st of September 1561. Sir Edward's descendant, another Sir Edward Waldegrave, was created a baronet in 1643 for his services to Charles I.; and his descendant, Sir Henry Waldegrave, Bart. (1660-16S9), was created Baron Waldegrave of Chewton in 1686. Sir Henry married Henrietta (d. 1730), daughter of King James II. and Arabella Churchill, and their son was James, 1st Earl Waldegrave

(1684-1741),

Educated in France, James Waldegrave soon crossed over to England, and under George I. he declared himself a Protestant and took his seat as Baron Waldegrave in the House of Lords. Having become friendly with Sir Robert Walpole, he was sent to Paris as ambassador extraordinary in 1725, and from 1727 to 1730 he was British ambassador at Vienna. In 1729 he was created Viscount Chewton and Earl Waldegrave, and in 1730 he succeeded Sir Horatio Walpole as ambassador in Paris, filling this post during ten very difficult years. He died on the 1 ith of April 1741. Much of his diplomatic correspondence is in the British Museum.

His son James, the 2nd earl (1715-1763), was perhaps the most

intimate friend of George II., and was for a time governor of his grandson, the future king George III. He was very much in evidence during the critical years 1755-1757, when the king employed him to negotiate in turn with Newcastle, Devonshire, Pitt and Fox about the formation of a ministry. Eventually, in consequence of a deadlock, Waldegrave himself was first lord of the treasury for five days in June 1757. He died on the 28th of

April 1763, leaving some valuable and interesting Memoirs, which were published in 1821.

His brother John, the 3rd earl (1718-1784), was a soldier, who distinguished himself especially at the battle of Minden and became a general in 1772. He was a member of parliament from 1747 to 1763. His younger son, William Waldegrave (1753- 1825), entered the British navy in 1766, and after many years of service was third in command at the battle of Cape St Vincent in 1797. In 1800 he was created an Irish peer as Baron Rad- stock, and in 1802 he became an admiral. His son, George Granville, 2nd Baron Radstock (1786-1857), followed in his father's footsteps, and was made a vice-admiral in 1851- In 1857 his son, Granville Augustus William (b. 1833), became 3rd Baron Radstock.

George, 4th Earl Waldegrave (1751-1789), the eldest son of the 3rd earl, was a soldier and a member of parliament. His sons, George (1784-1794) and John James (1785-1835), were the 5th and 6th earls. In 1797 the 6th earl inherited from Horace Walpole his famous residence, Strawberry Hill, Twickenham, but his son, George Edward, the 7th earl (1816-1846), was obliged in 1842 to sell the valuable treasures collected there. His wife, Frances. Countess Waldegrave (1S21-1879), a daughter of the singer John Braham, was a prominent figure in society. He was her second husband, and after his death she married George Granville Vernon Harcourt of Nuneham Park, Oxford- shire, and later Chichester Fortescue, Baron Carlingford.

The 7th earl was succeeded by his uncle William (1788-1859), a son of the 4th earl, and in 1859 William's grandson, William Frederick (b. 1851), became the 9th earl.

WALDEN, ROGER (d. 1406), English prelate, was a man of obscure birth, little or nothing, moreover, being known of his early years. He had some connexion with the Channel Islands, and resided for some time in Jersey; and he held livings in Yorkshire and in Leicestershire before he became archdeacon of Winchester in 1387. His days, however, were by no means fully occupied with his ecclesiastical duties, and in 1387 also he was appointed treasurer of Calais, holding about the same time other positions in this neighbourhood. In 1395, after having served Richard II. as secretary, Walden became treasurer of England, adding the deanery of York to his numerous other benefices. In 1397 he was chosen archbishop of Canterbury in succession to Thomas Arundel, who had just been banished from the realm, but he lost this position when the new king Henry IV. restored Arundel in 1399, and after a short imprisonment he passed into retirement, being, as he himself says, " in the dust and under feet of men. " In 1405, through Arundel's influence, he was elected bishop of London,

and he died at Much Hadham in Hertfordshire on the 6th of January 1406. An Historia Mundi, the manuscript of which is in the British Museum, is sometimes regarded as the work of Walden; but this was doubtless written by an earlier writer.

See J. H. Wylie, History of England under Henry IV. vol. iii.

(1896).

WALDENBURG, a town of Germany, in the Prussian province of Silesia, 39 m. S.W. of Breslau by the line to Hirschberg and Goriitz Pop. (1905) 16,435. It contains a handsome town hall, three Protestant and two Roman Catholic churches. Walden- burg lies in the centre of the productive coal district of the Waldenburger Gcbirge, a branch of the Sudetic chain, and its inhabitants are largely occupied in the mining industry. Among other industrial establishments are a large porcelain and earthen- ware factory, extensive fireclay works, glassworks and a china- painting establishment; there are also numerous flax-spinneries and linen-factories in the neighbourhood. Adjoining the town on the south is the village of Oberwaldenburg, pop. (1905)

4758, with a chateau and some coal mines. Waldenburg became a town in 1426.

WALDENSES. The Waldensian valleys lie to the south-west of Turin, in the direction of Monte Viso, but include no high or snowy mountains, while the gUns themselves are (with one or two exceptions) fertile and well wooded. The principal town near the valleys is Pinerolo (Pignerol). Just to its south-west there opens the chief Waldensian valley, the Val Pellice, watered by the stream of that, name, but sometimes called inaccurately the Luserna valley, Luserna being simply a village opposite the capital, Torre Pellice; near Torre Pellice the side glens of Angrogna and Rora join the Pellice valley. To the north-west of Pinerolo, up the Chisone valley, there opens at Perosa Argen- tina the valley of St Martin, another important Waldensian valley, which is watered by the Germanasca torrent, and at Perrero splits into two branches, of which the Prali glen is far more fertile than that of Massello, the latter being the wildest and most savage of all the Waldensian valleys.

The name Waldenses was given to the members of an heretical Christian sect which arose in the south of France about 11 70. The history of the sects of the middle ages is obscure, because the earliest accounts of them

come from those who were con- cerned in their suppression, and were therefore eager to lay upon each of them the worst enormities which could be attri- buted to any. In later times the apologists of each sect reversed the process, and cleared that in which they were interested at the expense of others. In early times these sectaries produced little literature of their own; when they produced a literature at the beginning of the 15th century they attempted to claim for it a much earlier origin. Hence there is confusion on every side; it is difficult to distinguish between various sects and to determine their exact opinions or the circumstances under which they came into being. The polemical conception which has done much to perpetuate this confusion is that of the historical continuity of Protestantism from the earliest times. According to this view the church was pure and uncorrupt till the time of Constantine, when Pope Sylvester gained the first temporal possession for the papacy, and so began the system of a rich, powerful and worldly church, with Rome for its capital. Against this secularized church a body of witnesses silently protested; they were always persecuted but always survived, till in the 13th century a desperate attempt was made by Innocent III. to root them out from their stronghold in southern France. Persecution gave new vitality to their doctrines, which passed on to Wycliffe and Huss, and through these leaders produced the Reformation in Germany and England.

This view rests upon a series of suppositions, and is entirely unhistorical. So far as can be discovered the heretical sects of the middle ages rested upon a system of Manichaeism which was imported into Europe from the East (see Manichaeism). The Manichaean system of dualism, with its severe asceticism, and its individualism, which early passed into antinomianism, was attractive to many minds in the awakening of the nth century. Its presence in Europe can be traced in Bulgaria soon after its conversion in 862, 1 where the struggle between the Eastern and Western churches for the new converts opened a way for the more hardy speculations of a system which had never entirely disappeared, and found a home amongst the Paulicians (q.v.) in Armenia. The name of Cathari (see Cathaes), taken by the adherents of this new teaching, sufficiently shows the Oriental origin of their opinions, which spread from Bulgaria amongst the Slavs, and followed the routes of commerce into central Europe. The earliest record of their presence there is the condemnation of ten canonsof Orleans as Manichees in 1023, and soon after this we find complaints of the prevalence of heresy in northern Italy and in Germany. The strongholds of these heretical opinions were the great towns, the centres of civilization, because there the growing sentiment of municipal independence, and the rise of a burgher class through commerce, created a spirit of criticism which was dissatisfied with the worldly lives of the clergy and their undue influence in affairs. 1 Schmidt, Histoire des Catharcs, i, 7.

The system of Catharism recognized two classes of adherents, credentes and perfecti. The perjecti only were admitted to its esoteric doctrines and to its superstitious practices. To the ordinary men it seemed to be a reforming agency, insisting on a high moral standard, and upholding the words of Scripture against the traditions of an overgrown and worldly church. Its popular aim and its rationalistic method made men overlook its real contents, which were not put. clearly before them. It may be said generally that Catharism formed the abiding background of medieval heresy. Its dualistic system and its anti-social principles were known only to a few, but its anti- ecclesiastical organization formed a permanent nucleus round which gathered a great deal of political and ecclesiastical dis- content. When this discontent took any independent form of expression, zeal, which was not always accompanied by dis- cretion, brought the movement into collision with the ecclesi- astical authorities, by whom it was condemned as heretical. When once it was in conflict with authority it was driven to strengthen its basis by a more pronounced hostility against the system of the church, and generally ended by borrowing some- thing from Catharism. The result was that in the beginning of the 13th century there was a tendency to class all bodies of heretics together: partly their opinions had coalesced; partly they were assumed to be identical.

Most of these sects were stamped out before the period of the middle ages came to a close. The Waldenses, under their more modern name of the Vaudois, have survived to the present day in the valleys of Piedmont, and have been regarded as at once the most ancient and the most evangelical of the medieval sects. It is, however, by no means easy to determine their original tenets, as in the 13th and 14th centuries they were a body of obscure and unlettered peasants, hiding themselves in a corner, while in the 16th century they were absorbed into the general movement of the Reformation. As regards their antiquity, the attempts to claim for them an earlier origin than the end of the 12th century can no longer be sustained. They rested upon the supposed antiquity of a body of Waldensian b'terature, which modern criticism has shown to have been tampered with. The most important of these documents, a poem in Provencal, " La Nobla Leyczon," contains two lines which claimed for it the date of 1100: —

Ben ha mil e cent anez compli entierament Que fo scripta 1′ ora, car sen al derier temp.

But it was pointed out 2 that in the oldest MS. existing in the Cambridge university library the figure 4 had been imperfectly erased before the word " cent," a discovery which harmonized with the results of a criticism of the contents of the poem itself. This discovery did away with the ingenious attempts to account for the name of Waldenses from some other source than from the historical founder of the sect, Peter Waldo or Valdez. To get

rid of Waldo, whose date was known, the name Waldenses or Vallenses was derived from Vallis, because they dwelt in the valleys, or from a supposed Provencal word Vaudes, which meant a sorcerer.

Putting these views aside as unsubstantial, we will consider the relation of the Waldenses as they appear in actual history with the sects which preceded them. Already in the 9th century there were several protests against the rigidity and want of spirituality of a purely sacerdotal church. Thus Berengar of Tours (990-1088) upheld the symbolic character of the Eucharist and the superiority of the Bible over tradition. The Paterines in Milan (1045) raised a protest against simony and other abuses of the clergy, and Pope Gregory VII. did not hesitate to enlist their Puritanism on the side of the papacy and make them his allies in imposing clerical celibacy. In mo an apostate monk in Zeeland, Tanchelm, carried their views still farther, and asserted that the sacraments were only valid through the merits and sanctity of the ministers. In France, at Embrun, Peter de Bruys founded a sect known as Petrobrusians, who denied irf ant baptism, the need of consecrated churches, transubstantiation,

3 Bradshaw, in Transactions of Cambridge Antiquarian Society (1842). The text edited by Montet, 4to (1887).

and masses for the dead. A follower of his, a monk, Henry, gave the name to another body known as Henricians, who centred in Tours. The teachers of these new opinions were men of high character and holy lives, who in spite of persecution wandered from place to place, and made many converts from those who were dissatisfied at the want of clerical discipline which followed upon the struggle for temporal supremacy into which the reforming projects of Gregory VII. had carried the church.

It was at this time (1170) that a rich merchant of Lyons, Peter Waldo, sold his goods and gave them to the poor; then he went forth as a preacher of voluntary poverty. His followers, the Waldenses, or poor men of Lyons, were moved by a religious feeling which could find no satisfaction within the actual system of the church, as they saw it before them. Like St Francis, Waldo adopted a life of poverty that he might be free to preach, but with this difference that the Waldenses preached the doctrine of Christ while the Franciscans preached the person of Christ, Waldo reformed teaching while Francis kindled love; hence the one awakened antagonisms which the other escaped. For Waldo had a translation of the New Testament made into Provencal, and his preachers not only stirred up men to more holy lives but

explained the Scriptures at their will. Such an interference with the ecclesiastical authorities led to difficulties. Pope Alexander III., who had approved of the poverty of the Waldensians, prohibited them from preaching without the per- mission of the bishops (1179). Waldo answered that he must obey God rather than man; The result of this disobedience was excommunication by Lucius III. in 1184. Thus a reforming movement became heresy through disobedience to authority, and after being condemned embarked on a course of polemical investigation how to justify its own position. Some were re- admitted into the Catholic Church, and one, Durandus de Osca (1210), attempted to found an order of Pauperes Catholici, which was the forerunner of the order of St Dominic. Many were swept away in the crusade against the Albigenses (q.v.). Others made an appeal to Innocent III., protesting their ortho- doxy. Their appeal was not successful, for they were formally condemned by the Lateran council of 121 5.

The earliest definite account given of the Waldensian opinion is that of the inquisitor Sacconi about 12 so. 1 He divides them into two classes: those north of the Alps and those of Lombardy. The first class hold (1) that oaths are forbidden by the gospel,

(2) that capital punishment is not allowed to the civil power,

(3) that any layman may consecrate the sacrament of the altar, and (4) that the Roman Church is not the Church of Christ. The Lombard sect went farther in (3) and (4), holding that no one in mortal sin could consecrate the sacrament, and that the Roman Church was the scarlet woman of the Apocalypse, whose precepts ought not to be obeyed, especially those appointing fast-days. This account sufficiently shows the difference of the Waldenses from the Cathari: they were opposed to asceticism, and had no official priesthood; at the same time their objection to oaths and to capital punishment are closely related to the principles of the Cathari. Their other opinions were forced upon thern by their conflict with the authority of the Church. When forbidden to preach without the permission of the bishop, they were driven to assert the right of all to preach, without distinction of age or sex. This led to the further step of setting up personal merit rather than ecclesiastical ordination as the ground of the priestly office. From this followed again the conclusion that obedience was not due to an unworthy priest, and that his ministrations were invalid.

These opinions ,were subversive of the system of the medieval church, and were naturally viewed with great disfavour by its officials; but it cannot fairly be said that they have much in common with the opinions of the Reformers of the 16th century. The medieval church set forth Christ as present in the orderly community of the faithful; Protestantism aimed at

setting the individual in immediate communion with Christ, without the uechanical intervention of the officers of the community; the 1 D'Argentre\ Colleclio judiciorum de navis erroribus, i. 50, &c

Waldenses merely set forward a new criterion of the orderly arrangement of the church, according to which each member was to sit in judgment on the works of the ministers, and conse- quently on the validity of their ministerial acts. It was a rude way of expressing a desire for a more spiritual community. The earliest known document proceeding from the Waldensians is an account of a conference held at Bergamo in 1218 between the Ultramontane and the Lombard divisions, in which the Lom- bards showed a greater opposition to the recognized priesthood than did their northern brethren. 2

As these opinions became more pronounced persecution became more severe, and the breach between the Waldenses and the church widened. The W'aldenses withdrew altogether from the ministrations of the church, and chose ministers for themselves whose merits were recognised by the body of the faithful. Election took the place of ordination, but even here the Lom- bards showed their difference from the Ultramontanes, and recognized only two orders, like the Cathari, while the northern body kept the old three orders of bishops, priests and deacons. Gradually the separation from the church became more complete: the sacraments were regarded as merely symbolical; the priests became helpers of the faithful; ceremonies disappeared; and a new religious society arose equally unlike the medieval church and the Protestantism of the 16th century.

The spread of these heretical sects led to resolute attempts at their suppression. The crusade against the Albigensians cculd destroy prosperous cities and hand over lands from a heedless lord to one who was obedient to the church; but it could not get rid of heresy. The revival of preaching, which was the work of the order of St Dominic, did more to combat heresy, especially where its persuasions were enforced by law. The work of in- quisition into cases of heresy proceeded slowly in the hands of the bishops, who were too busy with other matters to find much time for sitting in judgment on theological points about which they were imperfectly informed. The greatest blow struck against heresy was the transference of the duty of inquiry into heresy from the bishops to Dominican inquisitors. The secular power, which shared in the proceeds of the confiscation of those who were found guilty of heresy, was ready to help in carrying out the judgments of the spiritual ccurts. Everywhere, and especially in the district round Toulouse, heretics were keenly prosecuted, and before the continued zeal of persecution the Waldenses slowly disappeared from the chief centres of population and tcok refuge in the retired valleys of the Alps. There, in the recesses of Piedmont, where the streams of the Pelice,

the An- grogne, the Clusone and others cleave the sides of the Alps into valleys which converge at Susa, a settlement of the Waldensians . was made who gave their name to these valleys of the Vaudois. In the more accessible regions north and south heresy was exposed to a steady process of persecution, and tended to assume shifting forms. Among the valleys it was less easily reached, and retained its old organization and its old contents. Little settlements of heretics dispersed throughout Italy and Provence looked to the valleys as a place of refuge, and tacitly regarded them as the centre of their faith. At times attempts were made to suppress the sect of the Vaudois, but the nature of the country which they inhabited, their obscurity and their isolation made the difficulties of their suppression greater than the advantages to be gained from it. However, in 1487 Innocent VIII. issued a bull for their extermination, and Alberto de' Capitanei, arch- deacon of Cremona, put himself at the head of a crusade against them. Attacked in Dauphins' and Piedmont at the same time, the Vaudois were hard pressed; but luckily their enemies were encircled by a fog when marching upon their chief refuge in the valley of the Angrogne, and were repulsed with great loss. After this Charles II., duke of Piedmont, interfered to save his territories from further confusion, and promised the Vaudois peace. They were, however, sorely reduced by the onslaught which had been made upon them, and lost their ancient spirit of independence. When the Lutheran movement began they were ready to sympathize with it, and ultimately to adapt their old 2 Preger, Beitrage zur Geschiehte der Waldesier.

beliefs to those of the rising Protestantism. Already there were scattered bodies of Waldenses in Germany who had influenced, and afterwards joined, the Hussites and the Bohemian Brethren.

*The last step in the development of the Waldensian body was taken in 1530, when two deputies of the Vaudois in Dauphinˆ and Provence, Georges Morel and Pierre Masson, were sent to confer with the German and Swiss Reformers. A letter addressed to Oecolompadius * gives an account of their practices and beliefs at that time, and shows us a simple and unlettered community, which was the survival of an attempt to form an esoteric religious society within the medieval church. It would appear that its members received the sacraments of baptism and the holy communion from the regular priesthood, at all events sometimes, but maintained a discipline of their own and held services for their own edification. Their ministers were called barba, a Provencal word meaning guide. They were chosen from among labouring men, who at the age of*

twenty- five might ask the body of ministers to be admitted as candidates. If their character was approved they were taught during the winter months, when work was slack, for a space of three or four years; after that they were sent for two years to serve as menial assistants at a nunnery for women, which curiously enough existed in a recess of the valleys. Then they were admitted to office, after receiving the communion, by the imposition of hands of all ministers present. They went out to preach two by two, and the junior was bound absolutely to obey the senior. Clerical celibacy was their rule, but they admit that it created grave disorders. The ministers received food and clothing from the contributions of the people, but also worked with their hands; the result of this was that they were very ignorant, and also were grasping after bequests from the dying. The affairs of the church were managed by a general synod held every year. The duties of the barbas were to visit all within their district once a year, hear their confessions, advise and admonish them; in all services the two ministers sat side by side, and one spoke after the other. In point of doctrine they acknowledged the seven sacraments, but gave them a symbolical meaning; they prayed to the Virgin and saints, and admitted auricular con- fession, but they denied purgatory and the sacrifice of the mass, and did not observe fasts or festivals. After giving this account of themselves they ask for information about several points in a way which shows the exigencies of a rude and isolated society, and finally they say that they have been much disturbed by the Lutheran teaching about freewill and predestination, for they had held that men did good works through natural virtue stimulated by God's grace, and they thought of predestination in no other way than as a part of God's foreknowledge.

Oecolampadius gave them further instruction, especially emphasizing the wrongfulness of their outward submission to the ordinances of the church: " God," he said, " is a jealous God, and does not permit His elect to put themselves under the yoke of Antichrist." The result of this intercourse was an alliance between the Vaudois and the Swiss and German Reformers. A synod was held in 1532 at Chanforans in the valley of the Angrogne, where a new confession of faith was adopted, which recognized the doctrine of election, assimilated the practices of the Vaudois to those of the Swiss congregations, renounced for the future all recognition of the Roman communion, and estab- lished their own worship no longer as secret meetings of a faithful few but as public assemblies for the glory of God.

Thus the Vaudois ceased to be relics of the past, and became absorbed in the general movement of Protestantism. This was not, however, a source of quiet or security. In France and Italy alike they were marked out as special objects of persecution, and the Vaudois church has many records of martyrdom. The most severe trial to which the Vaudois of Piedmont were sub- jected occurred in 1655. The Congregation de Propaganda Fide

established, in 1650, a local council in Turin, which exercised a powerful influence on Duke Charles Emmanuel II., who ordered that the Vaudois should be reduced within the limits of their ancient territory. Fanaticism took advantage of this order; 1 Scultetus, Annales, ii. 294, &c. ixvm. 9

and an army, composed partly of French troops of Louis XIV., partly of Irish soldiers who had fled before Cromwell, entered the Vaudois valleys and spread destruction on every side. They treated the people with horrible barbarity, so that the conscience of Europe was aroused, and England under Cromwell called on the Protestant powers to join in remonstrance to the duke of Savoy and the French king. The pen of Milton was employed for this purpose, and his famous sonnet is but the condensation of his state papers. Sir Samuel Morland was sent on a special mission to Turin, and to him were confided by the Vaudois leaders copies of their religious books, which he brought back to England, and ultimately gave to the university library at Cambridge. Large sums of money were contributed in England and elsewhere, and were sent to the suffering Vaudois.

By this demonstration of opinion peace was made for a time between the Vaudois and their persecutors; but it was a treacherous peace, and left the Vaudois with a hostile garrison established among them. Their worship was prohibited, and their chief pastor, Leger, was obliged to flee, and in his exile at Leiden wrote his Histoire genfrale des eglises vaudoises (1684). The revocation of the edict of Nantes in 1685 began a new period of persecution, which aimed at entire extermination. This was found so difficult that the remnant of the Vaudois, to the number of 2600, were at last allowed to withdraw to Geneva. But the love of their native valleys was strong among the exiles, and in r68o one of their pastors, Henri Arnaud, led a band of 800 men to the reconquest of their country. His first attempts against the French were successful; and the rupture between Victor Amadeus, duke of Savoy, and Louis XIV. brought a sudden change of fortune to the Vaudois. They were recognized once more as citizens of Savoy, and in the war against France which broke out in 1606 the Vaudois regiment did good service for its duke. The peace of Utrecht saw the greater part of the French territory occupied by the Vaudois annexed to Savoy, and, though there were frequent threatenings of persecution, the idea of toleration slowly prevailed in the policy of the house of Savoy. The Vaudois, who had undergone all these vicissitudes, were naturally reduced to poverty, and their ministers were partially maintained by a subsidy from England, which was granted by Queen Anne. The 1 8th century, however, was a time of religious decadence even among the Alpine valleys, and the outbreak of the French Revolution saw the Vaudois made sub- jects of France. This led to a loss of the English subsidy, and they applied to Napoleon for an equivalent. This was granted, and their church was organized by the state. On the restoration of the house of Savoy in 1816

English influence was used on behalf of the Vaudois, who received a limited toleration. From that time onwards the Vaudois became the objects of much interest in Protestant countries. Large sums of money were collected to build, hospitals and churches among their valleys, and they were looked upon as the possible centre of a Protestant church in Italy. Especially from England did they receive sympathy and help. An English clergyman, Dr Gilly, visited the valleys in 1823, and by his writings on the Vaudois church attracted considerable attention, 50 that he was enabled to build a college at La Torre. Moreover, Dr Gilly's book (A Visit to the Valleys of Piedmont), chancing to fall into the hands of an officer who had lost his leg at Waterloo, Colonel Beckwith, suggested an object for the energies of one who was loth at the age of twenty-six to sink into enforced idleness. Beckwith visited the valleys, and was painfully struck by the squalor and ignorance of a people who had so glorious a past. He settled among them, and for thirty-five years devoted himself to pro- mote their welfare. During this period he established no fewer than r2o schools; moreover he brought back the Italian language which had been displaced by the French in the services of the Vaudois church, and in 1840 built a church for them in Turin. He lived in La Torre till his death in 1862, and the name of the English benefactor is still revered by the simple folk of the valleys. (M. C.)

The parent church in the valleys is ecclesiastically governed by a court for internal affairs called the "Table," after the old

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stone table round which the ancient barbas used to sit, and a mission board, with an annual synod to which both the home and mission boards are subject. The total population of the Wal- densian valleys (for they also contain Roman Catholics in no small number) amounts to about 20,000 all told. In 1900 there were 16 parishes, with iS pasteurs and 22 temples, and also 2 Sunday schools (3017 children) and 194 day schools (with 4218 children); the full members {i.e. communicants) of the Wal- densian faith amounted to 12,695. There were, besides, branches at Turin (1 temple, 2 pasteurs and 750 members), in other parts of Italy, including Sicily (46 temples and as many pasteurs, while the number of members was 5613, of day scholars 2704, and of Sunday school scholars 3707). It is also reckoned that in Uruguay and the Argentine Republic there are about 6000 Waldensians; of these 1253 were in 1900 full members, while the day scholars numbered 364 and the Sunday school children

The literature on the subject of the Waldensian and other sects is copious. For their rise the most important authorities are to be found in Moneta, Adversus Calharos el Waldenses; D'Argentre\ Collectio judiciorum de novis erroribus; Alanus, Adversus haereticos; D'Achery, Spicilegia, vol. i. ; Grctser, Opera, vol. x. ; Limborch, Historia Inquisitionis, at the end of which is the Liber senientiarum of the Inquisition of Toulouse from 1307-1322. Of modern books may be mentioned Schmidt, Ilistoire des Cathares; Hahn, Gesckichte der neumanichaischen Ketzer; DieckhofT, Die Waldenser im Mittel- alter; Preger, Beitrage zur Gesckichte der Waldesier; Cantu, Gli Eretici in Italia; Comba, Storia delta Riforma in Italia, and Histoire des Vaitdois d'ltalie \ Tocco, L'Eresia net medio evo ; Montet, Histoire litteraire des Vaitdois; Lea, History of the Inquisition of the Middle Ages. Amongst books dealing with the more modern history of the Vaudois specially arc Lcgcr, Histoire des eglises vaudoises ; Arnaud, Ilistoire de la rentr&e des Vaudois ; Perrin, Histoire des Vaudois ; Monastier, Histoire de I'iglise vaudoise ; Muston, L 1 Israel des Alpes; Gilly, Excursion to the Valleys oj Pied- mont, and Researches on the Waldensians; Todd, The Waldensian Manuscripts; Melia, Origin, Persecution and Doctrines of the Waldensians; Jules Chevalier, Memoires sur les heresies en Dauphins avant le X VI s si'ecle, accompagnes de documents inedits sur les sorciers eties Vaudois (Valence, 1890); J. A. Chabrand, Vaudois et Protestants des Alpes: recherches historiques (Grenoble, 1S86); H. Haupt, article in Von Sybel's Historiscke Zeilschrift (1S89), pp. 39-68 ; W. A. B. Coolidge, articles in the Guardian for 18th August 1886 and 4th December 1889.

WALDERSEE, ALFRED, Count (183 2-1904), Prussian general field marshal, came of a soldier family. Entering the Guard Artillery of the Prussian army in 1850, he soon attracted the favourable notice of his official superiors, and he made his first campaign (that of 1866) as aide-de-camp to General of Artillery Prince Charles of Prussia, with whom he was present at Koniggratz. In the course of this campaign Count Waldersee was promoted major and placed on the general staff, and after the conclusion of peace he served on the staff of the X. Army Corps (newly formed from the conquered kingdom of Hanover). In January 1870 he became military attache" at Paris and aide- de-camp to fcng William. In the Franco- German War Lieut. – Colonel Count Waldersee, on account of both his admitted military talents and his recent experience of the enemy's army, proved a most useful assistant to the " supreme War-Lord. " He was present at the great battles around Metz, in which he played more than an orderly officer's part, and in the war against the republic he was specially sent to the staff of the grand duke of Mecklcnburg-Schwerin, who was operating against Chanzy's army on the Loir. The grand duke was a good soldier, but not a brilliant strategist, and the fortunate outcome of the

western campaign was largely due to his adviser. At the end of the war Waldersee received the First Class of the Iron Cross, and was entrusted with the exceedingly delicate and difficult post of German representative at Paris, in which his tact and courtesy were very marked. At the end of 1871 Waldersee took over the command of the r3th Uhlans at Hanover, and two years later he became chief of the staff of the Hanoverian army corps, in which he had served before 1870. In 1881 he became Moltke's principal assistant on the great general staff at Berlin, and for seven years was intimately connected with the great field marshal's work, so that, when Moltke retired in r888, Waldersee's appointment to succeed him was a foregone conclusion. Three

years later the chief of the general staff was sent to command the IX. Corps at Altona, an appointment which was interpreted as indicating that his close and intimate friendship with Bis- marck had made him, at this time of the chancellor's dismissal, a persona non grata to the young emperor. In 1898, however, he was appointed inspector-general of the III. " Army In- spection " at Hanover, the order being accompanied by the most eulogistic expressions of the kaiser's goodwill. On the despatch of European troops to quell the Boxer insurrection in China in 1900, it was agreed (hat Count Waldersee should have the supreme command of the joint forces. The preparations for his departure from Germany caused a good deal of satirical comment on what was known as the " Waldersee Rummel " or " theatricals." He arrived at the front, however, too late to direct his troops in the fighting before Peking. At the end of the war he returned to Europe. He resumed at Hanover his duties of inspector-general, which he performed almost to his death, which took place on the 5th of March 1904.

WALDO, SAMUEL LOVETT (1 783-1861), American artist, was born in Windham, Connecticut, on the 6th of April 1783. He had a studio in Charleston, South Carolina. In 1806 he went to London, where he painted portraits for some years with success. In 1809 he returned to New York, and was a con- spicuous figure in the city's art life until his death there on the 16th of February 1861. He became an associate of the National Academy in 1847. Among his works are a series of portraits of the early mayors of New York, now in the New York City Hall, a portrait of Peter Remsen, in possession of the New York Historical Society, and two portraits of John Trumbull.

WALENSEE, also called the Lake of Walenstadt, a Swiss lake between the basins of the Rhine and the Linth (Limmat), lying S.E. of the Lake of Zurich. It is formed by the Seez river (descending from the Weisstannen glen), which once certainly sent its waters to the Rhine, but now enters the lake at its eastern end. Near its western end the Linth has been diverted through the Escher canal (completed in 181 r) into the lake, from which it

soon again issues in order, by means of the Linth canal (completed in 1816), to flow into the Lake of Zurich. The Walenseehas an area of 9 sq. m., is about 9 m. in length, 1 j m. wide and 495 ft. deep, while its surface is 1388 ft. above sea-level. It forms part of the Canton of St Gall, save r| sq. m. towards its west end, which are in that of Glarus. It lies in a deep trench between two comparatively lofty ranges of mounˆ tains, so that its scenery is more gloomy than is usual with Swiss lakes. On the north shore there is but a single village of any size (Quinten), while above it rise the cliffs of the seven- peaked range of the Kurfiirsten (7576 ft.), at the west end of which the village of Amden nestles in a hollow high above the lake. On the south side the hills rise less steeply from the shore (on which are Muhlehorn and Murg) towards the fine terrace of the Kerenzenberg, on which are the frequented summer resorts of Obstalden and Filzbach, backed on the south by the singularly imposing crags of the Mfirtschcnstock (8012 ft.). The small towns of Weesen and Walenstadt are situated respectively at the western and the eastern extremities of the lake, a railway along the south shore of which connects them with each other (n m.). Since the construction of this line no steamers ply on the lake. (W. A. B. C.)

WALES (Cymru, Gwalia, Cambria), a Principality occupying the extreme middle-west of the southern part of the island of Great Britain, bounded E. by the English counties of Cheshire, Shropshire, Herefordshire and Monmouthshire; S. by the Bristol Channel; W. by St George's Channel; and N. by the Irish Sea. (For map see England, V.) Its area is 7467 sq. m. Its greatest length from N. to S. (from the Point of Air in Flint to Barry Island on the Glamorgan coast) is 136 m., while its breadth varies from 92 m. (from St Davids Head to the English border beyond Crtckhowell) to 37 m. (the distance between Aberystwyth and the Shropshire boundary at Clun Forest). Its total circuit is about 540 m., of which 390 consist of coast-line. The principal headlands are Great Ormes Head 1 in Carnarvonshire; Braich-y-Pwll, the most westerly point of

Carnarvonshire; St Davids Head, the most westerly point of South Wales; Worms Head, the western extremity of Gower; and Lavernock Point to the W. of Cardiff. The principal islands are Holy Island, off the W. coast of Anglesea; Bardsey (Ynys Enlli), near Braich-y-Pwll; and the islands of Ramsey, Grass- holm, Skomer, Skokholm and Caldy (Ynys Pyr) off the Pembroke- shire coast. The chief inlets are the mouth of the Dee, dividing Flint from Cheshire; the Menai Straits, separating Anglesea from the mainland; Carnarvon Bay; Cardigan Bay, stretching from Braich-y-Pwll to

St Davids Head; St Brides Bay; Milford Haven; Carmarthen Bay; and Swansea Bay.

In common parlance, as well as for judicial purposes of circuits, the Principality is divided into North Wales and South Wales, each of which consists of six counties.

North Wales.

Anglesea (Ynys F9n) . . Carnarvon (Sir Arfon) . Denbigh (Sir Dinbych). Flint (Sir Fflint) .... Merioneth (Sir Feirionydd). Montgomery (Sir Drefaldwyn) .

Acreage.

Population

(1901).

176,630 361,156 423,499 164,744 427,810 510,111

50,606 126,883 129,942 81,700 49,149 54,901

South Wales.

Acreage,

Population

(1901).

Brecon or Brecknock (Sir Fry-

cheiniog)

Cardigan (Sir Aberteifi) Carmarthen (Sir Gaerfyrddin) . Glamorgan (Sir Forganwg) . Pembroke (Sir Benfro) . Radnor (Sir Faesyfed) .

475.224 440,630 587,816 518,863

395.151

301, rfy

59,907 60,240 135,328 859,931 88,732 23,281

Mountains. — Almost the whole surface of Wales is mountainous or undulating. The most important hill system is that of the North Wales

mountains, covering the county of Carnarvon and parts of Merioneth and Denbigh, wherein the Snowdonian range reaches the height of 3571 ft. in Snowdon itself ; of 3484 ft. in Carnedd Llywelyn; and of 3426 ft. in Carnedd Dafydd. South of this system, and separated from it by the upper valley of the Dee, the Berwyn range extends from N.E. to S.E., and is itself adjacent to Aran-fawddy (2970 ft.), the highest point in the Cader Idris group. The system of Mid-Wales or Powys stretches from Cardigan Bay to the English border, and contains Plinlimmon (2462 ft.) in north Cardigan; Drygarn Fawr (21 15 ft.) in north Brecon; and Radnor Forest (2163 ft.) in mid-Radnor. From Plinlimmon a range of hills runs in a south-westerly direction towards St Davids, terminating in the Preselly range of north Pembroke (1760 ft.) and dividing the broad valleys of the Teifi and Towy. The three combined ranges of the Black Mountains, the Brecknock Beacons and the Black Forest sweep across south Brecon from W. to E., the chief elevations being the Carmarthen Van (2632 ft.), the Brecon Beacon (2862 ft.) and Pen-y-gader fawr (2660 ft.) near the English border.

Lakes and Rivers. — Small lakes, such as Lly n Ogwen, Llyn Safaddan (Llangorse Lake), Talyllyn, the Teifi Pools, &c, are fairly numerous in the mountainous districts, but the only natural lake of importance is Bala Lake, or Llyn Tegid, in Merionethshire, 4 m. long and about 1 m. wide. But the great reservoir known as Lake Vyrnwy, which supplies Liverpool with water, is equal in size to Bala; and the chain of four artificial lakes constructed by the Birmingham cor- poration in the valleys of the Elan and Claerwen covers a large area in west Radnorshire. The longest river in Wales is the Severn (180 m.), in Welsh Hafren, which rises in Plinlimmon, and takes a north-easterly direction through Montgomeryshire before reaching the English border. The Wye (130 m.) also rises in Plinlimmon, and forms for some 30 m. the boundary between the counties of Radnor and Brecon before encountering English soil near Hay. The Usk (56 m.) flows through Breconshire, and joins the Bristol Channel at Newport in Monmouthshire. The Dee (70 m.) traverses Bala Lake, and drains parts of the counties of Merioneth, Denbigh and Flint. The Towy (68 m.) flows through Carmarthenshire, entering Carmarthen Bay at Llanstephan; the Teifi (50 m.) rises near Tregaron and falls into Cardigan Bay below the town of Cardi- gan. The Taff (40 m.), rising amongst the Brecon Beacons, enters the Bristol Channel at Cardiff. Other rivers are the Dovey (30 m.), falling into Cardigan Bay at Aberdovcy; the Taf (25 m.), entering Carmarthen Bay at Laugharne; and the broad navigable Conway (24 m.), dividing the counties of Carnarvon and Denbigh.

Welsh Place-Names. —The place – names throughout the Principality may be said to group themselves roughly into four

divisions: (i.) Pure and unaltered Celtic names; (ii.) Corrupted or

abbreviated Celtic names; (iii.) English names; (iv.) Scan- dinavian and foreign names. To the first division belong the vast majority of place-names throughout the whole of Wales and Monmouthshire. Except in some districts of the Marches and in certain tracts lying along the South Wales coast, nearly all parishes, villages, hamlets, farms, houses, woods, fields, streams and valleys possess native appellations, which in most cases are descriptive of natural situation, e.g. Nantyffin, the boundary brook; Aberporth, mouth of the harbour; Talybont, end of the bridge; Troedyrhiw, foot of the hill; Dyjjryn, a valley, &c. Other place-names imply a personal connexion in addition to natural features, e.g. Nantygdf, the blacksmith's brook; Trefecca, the house of Rebecca; Llwyn Madoc, Madoc's grove; Pant-saeson, the Saxons' glen, &c. An historical origin is frequently commemorated, notably in the many foundations of the Celtic missionaries of the 5th, 6th and 7th centuries, wherein the word llan (church) precedes a proper name; thus every Llanddewi recalls the early labours of Dewi Sant (St David); every Llan- deilo, those of St Teilo; and such names as Llandudno, Llanafan, Llanbadam and the like commemorate SS. Tudno, Afan, Padarn, &c. To the second division — those place-names which have been corrupted by English usage — belong most of the older historic towns, in striking contrast with the rural villages and parishes, which in nearly all cases have retained unaltered their original Celtic names. Anglicized in spelling and even to some extent changed in sound are Carmarthen (Caerfyrddin); Pem- broke (Penfro) ; Kidwelly (Cydweli) ; Cardiff (Caerdydd) ; Llandovery (Llanymddyfri); while Lampeter, in Welsh Llanbedr- pont-Stephan, affords an example of a Celtic place-name both Anglicized and abbreviated. In not a few instances modern English nomenclature has supplanted the old Welsh place- names in popular usage, although the town's original appellation is retained in Welsh literature and conversation, e.g. Holyhead is Caergybi (fort of Cybi, a Celtic missionary of the 6th century) ; Presleign is Llanandras (church of St Andrew, or Andras); St Asaph is Llanelwy; the English name commemorating the reputed founder of the see, and the Welsh name recalling the church's original foundation on the banks of the El wy. Cardigan, in Welsh Aberteifi, from its situation near the mouth of the Teifi, and Brecon, in Welsh Aberhonddu, from its site near the confluence of the Usk and Honddu, are examples of corrupted Welsh names in common use — Ceredigion, Brychan — which possess in addition pure Celtic forms. In the third division, English place-names are tolerably frequent everywhere and pre- dominate in the Marches and on the South Wales coast. Even in so thoroughly Welsh a county as Cardiganshire, English place- names are often to be encountered, e.g. New Quay, High Mead, Oakford, &c. ; but many of such names are of modern invention, dating chiefly from the 18th and 19th centuries. Of the many English names occurring in south Pembroke and south Glamor- gan, some are exact or fanciful translations*

of the original Welsh, e.g. Cowbridge (Pontyfon) and Ludchurch (Eglwys Llwyd) , others are of direct external origin, as Bishopstone, Flemingstone, Butter Hill, Briton Ferry, Manselfield, &c. Names derived straight from an Anglo-Norman source are rare; Beauprc, Beaumaris, Beaufort, Fleur-de-Lis, Roche, may be cited as ex- amples of such. Scandinavian influence can easily be traced at various points of the coast-line, but particularly in south Pembrokeshire, wherein occur such place-names as Caldy, Tenby, Goodwick, Dale, Skokholm, Hakin and Milford Haven. Speci- mens of Latinized names in connexion with ecclesiastical founda- tions are preserved in Strata Florida and Valle Crucis Abbeys. Hybrid place-names are occasionally to be met with in the colonized portions of Wales, as in Gelliswick (a combination of the Celtic gelli, a hazel grove, and the Norse wick, a haven), and in Fletherhill, where the English suffix kill is practically a translation of the Celtic prefix. A striking peculiarity of the Principality is the prevalence of Scriptural place-names; a circumstance due undoubtedly to the popular religious move- ments of the 19th century. Not only are such names as Horeb, Zion, Penuel, Siloh, &c, bestowed on Nonconformist chapels,

but these Biblical terms have likewise been applied to their sur- rounding houses, and in not a few instances to growing towns and villages. A notable example of this curious nomenclature occurs in Bethesda, Carnarvonshire, where the name of the Congregational chapel erected early in the 19th century has altogether supplanted the original Celtic place-name of Cilfoden. But although English and foreign place-names are fairly numer- ous throughout Wales, yet the vast majority remain Celtic either in a pure or in a corrupted form, so that some knowledge of the Celtic language is essential to interpret their meaning.

A small glossary of some of the more common component words is appended below.

Aber, the mouth or estuary of a river— Aberystwyth, Abergwili.

Ach, water — Clydach, Clarach.

Afon, a river — a word which retains its primitive meaning in Wales, whilst it has become a proper name in England — Glanafon ; Manorafon.

Bettws, a corrupt form of the English ” bead-house,” or possibly of the Latin ” beatus ” — Bettws-y-coed, Bettws Ifan.

Blaen, the top— Blaendyffryn, Blaencwm.

Bod, house or abode — Bodfuan, Hafod.

Bron, the human breast, hence breast of hill — Brongest, Cil- bronnau.

Bryn, a hill — Brynmawr, Penbryn.

Bwlch, a gar) — Bwlchbychan, Tanybwlch.

Cae, a field — Caeglas, Tynycae.

Caer, a fortress or fortified camp — Caerlleon, Caersws.

Capel, a corrupt form of the Latin " capella " applied to chapels, ancient and recent — Capel Dewi, Capel-issaf, Parc-y-capel.

Cam, a cairn or heap of stones — Moel-trigarn.

Carnedd, a tumulus — Carnedd Llywelyn.

Cefn, a ridge — Cefn-Mably, Cefn-y-bedd.

Cil, a retreat, said to be akin to the Goidelic kit — Ciliau-Aeron, Cilcennin.

Cnwc, a knoll or mound — Cnwcglas (Anglicized into Knucklas, in Radnorshire).

Coed, a wood — Coedmawr, Penycoed.

Craig, a rock or crag — Pen-y-graig.

Crug, a heap or barrow — Crug Mawr, Trichrug.

C-win, a low valley, Anglicized into " coomb " — Cwm Gwendraeth, Blaencwm.

Din, a fortified hill, hence Dinas, a fortified town — Dinefawr, Pen Dinas.

Dot, a meadow — Dolwilym, Dolau.

Dwr, Dwfr, water — Glyndwrdu, the patrimony of the celebrated Owen Glendower, of which his Anglicized name is a corruption.

Eglwys, a corruption of the Latin ' ecclesia," a church— Eglwyswrw, Tanyrcglwys.

Gallt, in North Wales a steep slope; in South Wales a hanging wood— -

Galltyfyrddin, Penyrallt.

Gelli, a grove — Gellideg, Pengelly Forest.

Clan, a bank — GlanymSr, Glandofan.

Glytt, a glen or narrow valley — Glyncothi, Tyglyn.

Ll'an, a sacred enclosure, hence a church — a most interesting and important Celtic prefix — Llandeilo, Llansaint.

Llech, a stone — Llechryd, Trellech.

Llwyn, a grove — Penllwyn, Llwynybr&n.

Llys, a court or palace— Henllys, Llysowen.

Maes, open land, or battlefield — Maesyfed (the Welsh name for Radnorshire), Maesllwch.

Moel, bald, hence a hare hill-top — Moelfre.

Mot, the sea — BrynmcSr, GlanymSr.

Afynydd, mountain — Llanfynydd, Mynydd Du.

Nant, a ravine, hence also a brook — Nantgwyllt, Nannau, Nant- garedig.

Pant, a glen or hollow — Pantycelyn, Blaenpant.

Pare, an enclosed field — Parc-y-Marw, Penparc.

Pen, a summit — Penmaenmawr, Penmark.

Pont, a bridge, a corruption of the Latin " pons" — Pont- hirwen, Talybont.

Porth, a gate or harbour — perhaps a corrupt form of the Latin " porta " — Aberporth, Pump Porth (" the Five Gates ").

Rhiw, ascent or slope — Troedyrhiw, Rhiwlas.

Rhos, a moor — Rhosllyn, Tyr'hos.

Rhyd, a ford — Rhydyfuwch, Glanrhyd.

Sarn, a causeway, generally descriptive of the old Roman paved roads — Talsarn, Sarnau, Sarn Badrig.

Tal, an end, also bead — Taliaris, Talyllyn.

Tref, a homestead, hence cantref, a hundred — Hendref, Cantref-y-gwaelod.

Troed, a base — Troed-y-bryn.

Ty t a house, a cottage — -Tynewydd, Mynachty.

Wy, or gwy, an obsolete Celtic word for water, preserved in the names of many Welsh rivers — Elwy, Gwili, Wye or Gwy.

Ynys, an island, or hill in the midst of a bog — Ynys Enlli (the Welsh name for Bardsey Islands), Ynyshir, Clynrynys.

Yspytty, spite, a corrupt form of the Latin " hospitium." often

used of the guest-house of an abbey — Yspytty Ystwyth, Tafarn Spite.

Ystrad, a meadow or rich lowland — Ystrad Mynach, Llanfihangel Ystrad.

Population. — The total population of the twelve counties of the Principality was: 1,360,513 (1881), 1,519,035 (1891), 1,720,600 (1901). These figures prove a steady upward tendency, but the increase itself is confined entirely to the industrial districts of the Principality, and in a special degree to Glamorgan- shire; while the agricultural counties, such as Pembroke, Merioneth, Cardigan or Montgomery, present a continuous though slight decrease owing to local emigration to the centres of industry. The whole population of Wales in Tudor, Stuart and early Georgian times can scarcely have exceeded 500,000 souls, and was probably less. But with the systematic develop- ment of the vast mineral resources of the South Wales coalfield, the population of Glamorganshire has increased at a more rapid rate than that of any other county of the United Kingdom, so that at present this county contains about half the population of all Wales. It will be noted, therefore, that the vast mass of the inhabitants of Wales are settled in the industrial area which covers the northern districts of Glamorganshire and the south- eastern corner of Carmarthenshire; whilst central Wales, com- prising the four counties of Cardigan, Radnor, Merioneth and Montgomery, forms the least populous portion of the Principality. The following towns had each in 1901 a population exceeding 10,000: Cardiff, Ystradyfodwg, Swansea, Merthyr Tydfil, Aberdare, Pontypridd, Llanelly, Ogmore and Garw ; Pembroke, Caerphilly, Maesteg, Wrexham, Penarth, Neath, Festiniog, Bangor, Holyhead, Carmarthen. Only four towns in North Wales are included in these eighteen, and the combined popula- tions of these four— Wrexham (14,966), Festiniog (11,435), Bangor (11,269) and Holyhead (10,079)

— ia H rar below that of Merthyr Tydfil (69,228), the fourth largest town in Glamorgan- shire.

Industries. — The chief mineral product of the Principality is coal, of which the output amounts to over 23,000,000 tons annually. The great South Wales coalfield, one of the largest in the kingdom, covers the greater part of Monmouthshire and Glamorganshire, the south-eastern corner of Carmarthenshire, and a small portion of south Pembrokeshire, and the quality of its coal is especially suitable for smelting purposes and for use in steamships. The supply of limestone and ironstone in Glamorganshire is said to be practically unlimited. About 400,000 tons of pig iron are produced yearly, and some of the largest iron-works in the world are situated at Merthyr Tydfil and Dowlais. Copper, tin and lead works are everywhere numerous in the busy valleys of north Glamorgan and in the neigh- bourhoods of Swansea, Neath, Cardiff and Llanelly. In North Wales, Wrexham, Ruabon and Chirk arc centres of coal-mining in- dustry. There are valuable copper mines in Anglesea, and lead mines in Flint and in north Cardiganshire, which also yield a certain deposit of silver ore. Gold has been discovered and worked, though only to a small extent, in Merionethshire and Carmarthenshire. Slate quarries are very numerous throughout the Principality, the finest quality of slate being obtained in the neighbourhood of Bangor and Carnarvon, where the Penrhyn and Bethesda quarries give employment to many thousands of workmen.

By far the larger portion of Wales is purely agricultural in char- acter, and much of the valley land is particularly fertile, notably the Vale of Glamorgan, the Vale of Clwyd and the valleys of the Towy, the Teifi, the Usk and the Wye, which have long been cele- brated for their rich pastures. The holdings throughout Wales are for the most part smaller in extent than the average farms of England. Stock-raising is generally preferred to the growing of cereals, and in western Wales the oat crops exceed in size those of wheat and barley. The extensive tracts of unenclosed and often unimprovable land, which still cover a large area in the Principality, especially in the five counties of Cardigan, Radnor, Brecon, Montgomery and Merioneth, support numerous flocks of the small mountain sheep, the flesh of which supplies the highly prized Welsh mutton. The wool of the sheep is manufactured into flannel at numberless factories in the various country towns, and the supply meets an important local demand. The upland tracts also afford good pasturage for a number of cobs and ponies, which obtain high prices at the local fairs, and Pembrokeshire and Cardiganshire have long been famous for their breed of horses and ponies. The cattle of Wales present all varieties of race, the Hereford breed prevailing in the eastern counties, and Shorthorns and the black Castlemartins in the south- western parts. The great herds of goats, which in medieval times subsisted on the Welsh hills, have entirely disappeared

since the general adoption of the sheep-farming industry.

The deep-sea fisheries on the south-western coasts are of some importance; the Mumbles, Tenby and Milford Haven being the chief centres of this industry. Lobsters and crabs are caught in Cardigan Bay, and oysters are found at various points of the Pem brokeshire coast. The large rivers produce salmon , which are usually sent to the great towns for sale. The Wye, the Usk, the Dec, the Uovey, the Teih, the Towy and most of the Welsh rivers and lakes are frequented by anglers for salmon and trout.

Communications, — The two principal railways serving the Princi- pality are the London & North-Western, which passes along the North Wales coast-line by way of Conway and Bangor, crosses the Menai Strait and has its terminus at Holyhead; and the Great Western, which traverses South Wales by way of Cardiff, Landore, Llanelly and Carmarthen, and has its principal terminal station at Fishguard Harbour. The lines of the Cambrian railway serve North and Mid-Wales, and branches of the London & North-Western and the Midland penetrate into South Wales as far as Swansea. A net- work of lines connects the great industrial districts of Glamorganshire with the main line of the Great Western railway. There are steam- ship services between Holyhead and Dublin in connexion with the trains of the London & North-Western railway; and an important traffic for dairy produce, live-stock and passengers between Fish- guard and Rosslare on the Irish coast was opened in 1906 in con- nexion with the Great Western railway. There is also a boat service between Holyhead and Greenore on the Ulster coast. Steamboats likewise ply between Milford, Tenby, Swansea and Cardiff and Bristol ; also between Swansea and Cardiff and Dublin ; and there is a regular service between Swansea and Ilfracombe. The principal canals are the Swansea, the Neath, the Aberdare & Glamorgan, and the Brecon & Abergavenny, all worked in connexion with the industrial districts of north Glamorganshire.

Government. — In all acts of parliament Wales is invariably included under the term of " England and Wales," and whenever an act, or any section of an act, is intended to apply to the Principality alone, then Wales is always coupled with Monmouth- shire. The extinction of the Welsh Court of Great Sessions in 18,30 served to remove the last relic of separate jurisdiction in Wales itself, but in 1881 special legislation was once more inaugurated by the Welsh Sunday Closing Act (46 Victoria), forbidding the sale of spirituous liquors by all inn-keepers on Sundays to any but bona fide travellers throughout Wales and Monmouthshire. A separate act on

behalf of Welsh education was likewise passed in 1889, when the Welsh Intermediate Educa- tion Act made special provision for intermediate and technical education throughout the Principality and Monmouthshire. Except for the administration of these two special acts, the system of government in Wales is identical in every respect with that of England (see England and United Kingdom). Royal commissions dealing with questions peculiar to Wales have been issued from time to time, notably of recent years, in the Welsh Land Tenure Commission of 1893, and the Welsh Church Commission of 1906 (see History).

Religion. — Ecclesiastically, the whole of Wales lies within the province of Canterbury. The four Welsh sees, however, extend beyond the borders of the twelve counties, for they include the whole of Monmouthshire and some portions of the English border shires; on the other hand, the sees of Hereford and Chester encroach upon the existing Welsh counties. The diocese of St Davids (Tyddewi), the largest, oldest and poorest of the four Cambrian sees, consists of the counties of Pembroke, Carmarthen and Cardigan, almost the whole of Brecon, the greater part of Radnor, and west Glamorgan with Swansea and Gower. The cathedral church of St Davids is situated near the remote headland of St Davids in Pembrokeshire, but the episcopal residence has been fixed ever since the Reformation at Abergwili near Carmarthen, the most central spot in this vast diocese. The see of Llandaff comprises Monmouthshire, all Glamorganshire as far west as the Tawe, and some parishes in Brecon and Hereford. The diocese of Bangor consists of the counties of Anglesea; Carnarvon and large portions of Merioneth and Montgomery. The diocese of St Asaph (Llanelwy) consists of the county of Denbigh, nearly the whole of Flint, with portions of Montgomery, Merioneth and Shropshire.

Since the beginning of the 19th century dissent has been strongly represented in the Principality, the combined numbers of the various Nonconformist bodies far outstripping the ad- herents of the Church. Universally accepted statistics as to the various religious bodies it has been found impossible to

obtain, but the Report (igio) of the W T elsh Church Commission stated that, exclusive of Roman Catholics, there were 743,361 communicants or fully admitted members of some denomination, of whom 193,081 were Churchmen and 550,280 Nonconformists. The gentry and landowners are all, broadly speaking, members of the established Church, but it is impossible to name any other class of society as belonging definitely either to " Church " or " Chapel." According to the above Report, the three most powerful dissenting bodies in Wales are the Congregationalists or Independents, whose members number 175,147 throughout Wales and Monmouthshire; the Calvinistic Methodists — a direct offshoot of the

Church since the schism of 1811— with a mem- bership of 170,617; and the Baptists, 143,835. Weslcyan and Presbyterian chapels are likewise numerous, and the Unitarian or Socinian body has long been powerful in the valley of the Teifi. Nearly every existing sect is represented in Wales, in- cluding Swedenborgians and Moravians. The Roman Catholic Church has many followers amongst the labouring population of Irish descent in the industrial districts. The diocese of Newport (known till 1 896 as Newport and Mcnevia) consists of the counties of Monmouth, Glamorgan and Hereford; whilst the remaining eleven counties were in 1895 formed into the Vicariate of Wales, which in 189S was erected into a diocese under a bishop with the title of Menevia. Since the expulsion of the religious orders from France in 1903 several communities of French monks and nuns have taken up their abode in the Principality.

History. — At the time of the Roman invasion of Britain, 55 B.C., four distinct dominant tribes, or families, are enumerated west of the Severn, viz. the Decangi, owning the island of Anglesea (Ynys F6n) and the Snowdonian district; the Or- dovices, inhabiting the modern counties of Denbigh, Flint and Montgomery; the Dimetae, in the counties of Cardigan, Car- marthen and Pembroke; and the Silures, occupying the counties of Glamorgan, Brecknock, Radnor and Monmouth. It is interesting to note that the existing four Welsh sees of Bangor, St Asaph, St Davids and Llandaff correspond in the main with the limits of these four tribal divisions. On the advance of. Ostorius into western Britain, he met with considerable resist- ance from Caractacus (Caradog), king of the Silures, but after some encounters this prince was eventually captured and sent in chains to Rome. The partial conquest by Ostorius was completed under Julius Frontinus by the year 78, after which the Romans set to work in order to pacify and develop their newly annexed territory. At this period the copper mines of Mona or Anglesea, the silver mines near Plinlimmon and the gold mines in the valley of the Col.hi in Carmarthenshire were ex- ploited and worked with some success by the conquerors. In spite of the mountainous and boggy character of the country, roads were now constructed in all directions. Of these the most important are the military road leading S. from Deva (Chester) by way of Uriconium (Wroxeter) andGobannium (Abergavenny) to Isca Silurum (Caerleon-on-Usk) and Venta Silurum (Caer- went); another from Deva to Conovium (Conway), whence a road, the Sarn Helen, extended due S. to Carmarthen (Mari- dunum), by way of Loventium (Pont Llanio), which was also connected with Gobannium; from Maridunum a road led E. through the modern county of Glamorgan by way of Leucarum (Loughor) and Nidum (Neath) to Venta Silurum. With the accession of Constantine, Christianity was introduced by the Romans into the parts of Wales already colonized, and the efforts of the Roman priests were later .supplemented during the 5th,

6th and 7th centuries by the devoted labours of Celtic missionaries, of whom nearly five hundred names still remain on record. Foremost in the work oi preaching and educating were SS. David, Teilo, Illtyd and Cadoc in Dyfed, Morganwg, Gwent and Brycheiniog, comprising South Wales; Cynllo, Afan and Padarn in Ceredigion and Maesyfed, or Mid-Wales; and Deiniol, Dunawd, Beuno, Kentigern and Asaph in North Wales. To this period succeeding the fall of the Roman power is also ascribed the foundation of the many great Celtic monasteries, of which Bangor-Iscoed on the Dee, Bardsey Island, Llancarvan and Llantwit Major in the Vale of Glamorgan, Caerleon-on-Usk

and St Davids are amongst the most celebrated in early Welsh ecclesiastical annals. With the withdrawal of the Roman legions, the recognized powers of the Dux Brilanniarum, the Roman official who governed the upper province of Britain, were in the 5th century assumed by the Celtic prince Cunedda under the title of Gwledig (the Supreme), who fixed his court and residence at Deganwy, near the modern Llandudno. During the 6th century the battle of Dcorham gained by the West Saxons in 577 cut off communication with Cornwall, and in 613 the great battle of Chester, won by King Ethelfrith, pre- vented the descendants of Cunedda from ever again asserting their sovereignty over Strathclyde; the joint effect, therefore, of these two important Saxon victories was to isolate Wales and at the same time to put an end to all pretensions of its rulers as the inheritors of the ancient political claims of the Roman governors of the northern province of Britain. The 8th century saw a further curtailment of the Welsh territories under Offa, king of Mercia, who annexed Shrewsbury (Amwythig) and Hereford (Henfordd) with their surrounding districts, and constructed the artificial boundary known as Offa's Dyke running due N. and S. from the mouth of the Dee to that of the Wye. It was during these disastrous Mercian wars that there first appeared on the Welsh coasts the Norse and Danish pirates, who harried and burnt the small towns and flourishing monasteries on the shores of Cardigan Bay and the Bristol Channel. In the 9II1 century, however, the Welsh, attacked by land and sea, by Saxons and by Danes, at length obtained a prince capable of bringing the turbulent chieftains of his country into obedience, and of opposing the two sets of invaders of his realm. This was Rhodri Mawr, or Roderick the Great, a name always cherished in Cymric annals. Like Alfred of Wessex, Rhodri also built a fleet in order to protect Anglesea, " the mother of Wales," so called on account of its extensive corn- fields which supplied barren Gwynedd with provisions. In 877 Rhodri, after many vicissitudes, was slain in battle, and his dominions of Gwynedd (North Wales), Deheubarth

(South Wales) and Powys (Mid Wales) were divided amongst his three sons, Anarawd, Cadell and Mervyn. Consolidation of Cambro- British territory was found impossible; there was no settled capital; and the three princes fixed their courts respectively at Aberffraw in Anglesea, at Dynevor (Dinefawr) near Llandilo in Deheubarth, and at Mathrafal Li Powys. Howel, son of Cadell, commonly known as Howel Dda the Good, is ever celebrated in Welsh history as the framer, or rather the codifier, of the ancient laws of his country, which were promulgated to the people at his hunting lodge, Ty Gwyn ar Taf, near the modern Whitland. In Howel's code the prince of Gwynedd with his court at Aberffraw is recognized as the leading monarch in Wales; next to him ranks the prince of Deheubarth, and third in estimation is the prince of Powys. The laws of Howel Dda throw a flood of interesting light upon the ancient customs and ideas of early medieval Wales, but as their standard of justice is founded on a tribal and not a territorial system of society, it is easy to understand the antipathy with which the Normans subsequently came to regard this famous code. The dissensions of the turbulent princes of Gwynedd, Powys and Deheubarth, and of their no less quarrelsome chieftains, now rent the country, which was continually also a prey to Saxon incursions by land and to Scandinavian attacks by sea. Some degree of peace was, however, given to the distracted country during the reign of Llewelyn ap Seissyllt, the husband of Ang- harad, heiress of Gwynedd, who at length secured the over- lordship or sovereignty of all Wales, and reigned till 1022. His son, Griffith ap Llewelyn, who, after having been driven into exile, recovered his father's realm in the battle of Pencader, Carmarthenshire, in 1041, for many years waged a war of varying success against Harold, earl of Wessex, but in 1062 he was treacherously slain, and Harold placed Wales under the old king's half-brothers, Bleddyn and Rhiwallon.

With the advent of the Normans, William the Conqueror, with the object of placing a firm feudal barrier between Wales and the earldom of Mercia, erected three palatine counties along the

Cymric frontier. Thus Hugh the Wolf was placed in Chester (Caer), Roger de Montgomery at Shrewsbury and William Fitz- Osbern at Hereford. In 1081 William himself visited the Princi- pality, and even penetrated as far west as St Davids. But the most important result of this first Norman invasion was to be found in the marvellous and rapid success of Robert Fitz-Hamon, earl of Gloucester, who, accompanied by a number of knightly adventurers, quickly overran South Wales, and erected a chain of castles stretching from the Wye to Milford Haven. The rich low-lying lands of Morganwg and Gwent were thus firmly occupied, nor were they ever permanently recovered by the Welsh princes; and such natives as remained were kept in subjection by the almost impregnable fortresses of stone erected at Caerphilly, Cardiff, Cowbridge, Neath, Kidwelly and other

places. The important castles of Carmarthen and Pembroke were likewise built at this period. At the accession of William Rufus the domain of Gwynedd had been reduced to Anglesea and the Snowdonian district, and that of South Wales, or Deheubarth, to the lands contained in the basins of the rivers Towy and Teifi, known as Ystrad Tywi and Ceredigion. Griffith ap Cynan, of the royal house of Gwynedd, who had been first an exile in Ireland, and later a prisoner at Chester, once more returned to his native land, and defied the Norman barons with success, whilst Henry I. vainly endeavoured to make his liege and follower, Owen of Powys, ruling prince in Wales. Meanwhile the house of Dynevor once more rose to some degree of power under Griffith ap Rhys, whose father, Rhys ap Tudor, had been slain in 1093. The confused reign of Stephen was naturally favourable to the development of Cymric liberty, and with such strong princes as Owen, son of Griffith ap Cynan, heir to the throne of Gwynedd, and with Griffith ap Rhys ruling at Dynevor, the prospects of the Cymry grew brighter. In n 36 the army of Griffith ap Rhys met with a large English force near Cardigan, composed of the denizens of the South Wales castles and of the hated Flemish colonists, who had been lately planted by Henry I. in Dyfed. A fierce engagement took place wherein the Norman and Flemish troops were utterly routed, and the victorious Cymry slew thousands of their fugitives at the fords of the Teifi close to the town of Cardigan. The following year (1137) saw the deaths of the two powerful princes, Griffith ap Cynan, " the sovereign and protector and peacemaker of all Wales," and Griffith ap Rhys, " the light and the strength and the gentleness of the men of the south." With the accession of Henry II. peace was made with Owen of Gwynedd, the successor of Griffith ap Cynan, and with Rhys ap Griffith of South Wales. In 1169 Owen Gwynedd died and was buried in Bangor cathedral after a reign of 33 years, wherein he had successfully defended his own realm and had done much to bring about that union of all Wales which his grandson was destined to complete. On the other hand, " The Lord Rhys," as he is usually termed, did homage to Henry II. at Pembroke in 1171, and was appointed the royal justiciar of all South Wales. At the castle of Cardigan in 1176, Prince Rhys held a historic bardic entertainment, or eisteddfod, wherein the poets and harpists of Gwynedd and Deheubarth contended in amicable rivalry. This enlightened prince died in rro6, and as at his death the house of Dynevor ceased to be of any further political importance, the overlordship of all Wales became vested indisputably in the house of Gwynedd, which from this point onwards may be considered as representing in itself alone the independent principality of Wales. The prince of Gwynedd henceforth considered himself as a sovereign, independent, but owing a personal allegiance to the king of England, and it was to obtain a recognition of his rights as such that Llewelyn ap Iorwerth, " the Great," consistently strove under three English kings, and though his resources were small, it seemed for a time as

though he might be able by uniting his countrymen to place the recognized autonomy of Gwynedd on a firm and enduring basis. By first connecting himself with John through his marriage with the English king's daughter Joan, by straining every nerve to repress dissensions and enforce obedience amongst the Welsh chieftains, and later by allying himself with the English barons against his suzerain, this prince during a

reign of 44 years was enabled to give a considerable amount of peace and prosperity to his country, which he persistently sought to rule as an independent sovereign, although acknowledging a personal vassalage to the king of England.

The close of the 12th century saw the final and complete subjection of the ancient C am bro- British Church to the supre- macy of Canterbury. As part of the Roman Upper Province of Britain, Wales would naturally have fallen under the primacy of York, but the Welsh sees had continued practically inde- pendent of outside control during Saxon times. The bishops of St Davids had from time to time claimed metropolitan rights over the remaining sees, but in 1115 St Anselme's appointment of the monk Bernard (d. 1147) to St Davids, in spite of the opposition of the native clergy, definitely marked the end of former Welsh ecclesiastical independence. In 11 88 Archbishop Baldwin with a distinguished train, whilst preaching the Third Crusade, made an itinerary of the Welsh sees and visited the four cathedral churches, thereby formally asserting the supremacy of Canterbury throughout all Wales. But in 1190 the celebrated Gerald de Barri (Giraldus Cambrensis), archdeacon of Brecon and a member of the famous Norman baronial house of de Barri, and also through his grandmother Nesta a great-grandson of Prince Rhys ap Tudor of Deheubarth, was elected bishop by the chapter of St Davids. This enthusiastic priest at once began to re-assert Lhe ancient metropolitan claims of the historic Welsh see, and between the years 1 109-1203 paid three visits to Rome in order to obtain the support of Pope Innocent III. against John and Archbishop Hubert, who firmly refused to recognize Gerald's late election. Innocent was inclined to temporize, whilst the Welsh chieftains, and especially Gwenwynwyn of Powys, loudly applauded Gerald's action, but Llewelyn ap lorwerth himself prudently held aloof from the controversy. Finally, in 1203, Gerald was compelled to make complete submission to the king and archbishop at Westminster, and henceforth Canterbury remained in undisputed possession of the Welsh sees, a circum- stance that undoubtedly tended towards the later union of the two countries.

In 1238 Llewelyn, growing aged and infirm, summoned all his vassals to a conference at the famous Cistercian abbey of Strata Florida, whereat David, his son by the Princess Joan of England, was acknowledged his heir by all present. Two years later Llewelyn, the ablest and most successful of all the Welsh princes, expired and was buried in the monastery of his own foundation at Aberconway. He was succeeded by David II., at whose death without children in 1246 the sovereignty of Gwynedd, and con- sequently of Wales, reverted to his three nephews, sons of his half-brother Griffith, who had perished in 1244 whilst trying to escape from the Tower of London, where Henry III. was holding him as hostage for the good behaviour of Prince David. Of Griffith's three sons, Owen, Llewelyn and David, the most popular and influential was undoubtedly Llewelyn, whose deeds and qualities were celebrated in extravagant terms by the bards of his own day, and whose evil fate has ever been a favourite theme of Welsh poets. Though to this, the last prince of Wales, political sagacity and a firm desire for peace have often been ascribed, it must be admitted that he showed himself both turbulent and rash at a time when the most cautious diplomacy on his part was essential for his country's existence. For Edward, Henry III.'s son and heir, who had been created earl of Chester by his father and put in possession of all the royal claims in Wales, was generally credited with a strong determin- ation to crush for ever Welsh independence, should a fitting oppor- tunity to do so present itself. Nevertheless, the hostile policy of Llewelyn, who had closely associated himself with the cause of Simon de Montfort and the barons, was at first successful. For after the battle of Evesham a treaty was concluded between the English king and the Welsh prince at Montgomery, whereby the latter was confirmed in his principality of Gwynedd and was permitted to receive the homage of all the Welsh barons, save that of the head of the house of Dynevor, which the king reserved to himself; whilst the four fertile cantrefs of Perfeddwlad, lying between Gwynedd and the earldom of Chester, were granted to

the prince. Llewelyn was, however, foolish enough to lose the results of this very favourable treaty by intriguing with the de Montfort family, and in 1273 he became betrothed to Eleanor de Montfort, the old Earl's only daughter, a piece of political folly which may possibly in- some degree account for Edward's harsh treatment of the Welsh prince. In 1274 Llewelyn refused to attend at Edward's coronation, although the Scottish king was present. In 1276 Edward entered Wales from Chester, and after a short campaign brought his obstinate vassal to submit to the ignominious treaty of Conway, whereby Llewelyn lost almost all the benefits conferred on him by the compact of Montgomery ten years before. Llewelyn, utterly humbled, now behaved with such prudence that Edward at last sanctioned his marriage with Eleanor de Montfort (although such an alliance must

originally have been highly distasteful to the English king), and the ceremony was performed with much pomp in Worcester Cathedral in 1278. In 1281 discontent with the king and his system of justice had again become rife in Wales, and at this point the treacherous Prince David, who had hitherto supported the king against his own brother, was the first to proclaim, a national revolt. On Palm Sunday 1282, in a time of peace, David suddenly attacked and burnt Hawarden Castle, whereupon all Wales was up in arms. Edward, greatly angered and now bent on putting an end for ever to the independence of the Principality, hastened into Wales; but whilst the king was campaigning in Gwynedd, Prince Llewelyn himself was slain in an obscure skirmish on the nth of December 1282 at Ccfn-y- bedd, near Builth on the Wye, whither he had gone to rouse the people of Brycheiniog. Llewelyn's head was brought to Edward at Conway Castle, who ordered it to be exhibited in the capital, surrounded by a wreath of ivy, in mocking allusion to an ancient Cymric prophecy concerning a Welsh prince being crowned in London. His body is said, on doubtful authority, to have been buried honourably by the monks of Abbey Cwm Hir, near Rhayader. Llewelyn's brother, now David III., designated by the English "the last survivor of that race of traitors," for a few months defied the English forces amongst the fastnesses of Snowdon, but ere long he was captured, tried as a disloyal English baron by a parliament at Shrewsbury, and finally executed under circumstances of great barbarity on the 3rd of October 1283. With David's capture practically all serious Welsh resistance to the English arms ceased,- if we except the unsuccessful attempt made to rouse the crushed nation in 1293 by Llewelyn's natural son, Madoc, who. ended his days as a prisoner in the Tower of London.

Having suppressed the independence of Wales, Edward now took steps to keep Gwynedd itself in permanent subjection by building the castles of Conway, Carnarvon, Criccieth and Harlech within the ancient patrimony of the princes of North Wales, whose legitimate race was now extinct save for Llewelyn's daughter Gwenllian, who had entered the convent of Sempring- ham. In April 1284 Queen Eleanor, who had meanwhile joined her husband in Wales, gave birth to a son in the newly built castle of Carnarvon, and this infant the victorious king, half in earnest and half in jest, presented to the Welsh people for a prince who could speak no word of English. On the 7th of February 1301, Edward of Carnarvon was formally created " prince of Wales " by his father, and henceforward the title and honours of Prince of Wales became associated with the recognized heir of the English crown.

By the Statute, or rather Ordinance of Rhuddlan, promulgated in 1284, many important changes were effected in the civil administration of Wales. Glamorgan and the county palatine of Pembroke had hitherto been the only portions of the country subject to English shire law, but now Edward

parcelled out the ancient territory of the princes of Gwynedd and of Deheubarth into six new counties, with sheriffs, coroners and bailiffs. Thus Anglesea, Carnarvon, Merioneth and Flint were erected in North Wales; whilst out of the districts of Ystrad Tywi and Ceredigion in South Wales, the old dominions of the house of Dynevor, the counties of Carmarthen and Cardigan were formed. The old Welsh land tenure by gavelkind was, however, still permitted

to remain in force amongst the natives of all Wales, whilst it was henceforth arranged to administer justice in the eight counties by special royal judges, and in the Marches by the officers appointed by the various lords-marchers according to the terms of their tenure. Another distinguishing mark of Edward's policy towards Wales is to be found in the commercial and administra- tive powers given to the fortified towns, inhabited solely by people of English birth and by Welshmen who acquiesced in English rule. Municipal charters and market privileges were now" granted to such towns as Cardiff, Carmarthen, Builth, Cardigan, Mont- gomery, Aberystwith, Newborough, &c, and this wise policy was continued under Edward II. and Edward III. Many of the turbulent Welsh warriors having now become mercenaries on the continent or else enlisted under the English king, and the whole of the land west of Severn at last enjoying internal peace, the commercial resources of Wales were developed in a manner that had hitherto not been possible. Coal, copper, timber, iron, and especially wool, were exported from the Principality, and by the Statute Staple of 1353 Carmarthen was declared the sole staple for the whole Welsh wool trade, every bale of wool having first to be sealed or " cocketed " at this important town, which during the 14th century may almost be accounted as the English capital of the Principality, so greatly was it favoured by the Plantagenet monarchs. A natural result of this partial treatment of the towns by the king and his vassals was that the English tongue and also English customs became prevalent if not universal in all the towns of Wales, whilst the rural districts remained strongly Cymric in character, language and sympathy.

After more than a century of enforced repose in the land and of prosperity in the towns, all Wales was suddenly convulsed by a wide-spread revolt against the English crown, which reads more like a tale of romance than a piece of sane history. The deposi- tion of Richard II. and the usurpation of Henry IV., combined with the jealousy of the rural inhabitants of Wales against the privileged dwellers of the towns, seem to have rendered the country ripe for rebellion. Upon this troubled scene now appeared Owen

Glendower (Owain Glyndwfrdwy : died ? I4r5), a descendant of the former princes of Powys and a favourite courtier of the late King Richard, smarting under the effect of personal wrongs received from Henry of Lancaster. With a success and speed that contemporary writers deemed miraculous, Owen stirred up his countrymen against the king, and by their aid succeeded in destroying castle after castle, and burning town after town throughout the whole length and breadth of the land between the years 1401 and 1406. In 1402 he routed the forces of the Mortimers at Bryn Glas near Knighton in Maesyfed, where he captured Sir Edmund Mortimer, the uncle and guardian of the legitimate heir to the English throne, the young earl of March. The aims of Owen were described by himself in a letter addressed to Charles VI., king of France, who had hastened to acknowledge the upstart as Prince of Wales and had sent 12,000 troops on his behalf to Milford Haven. In this letter Owen, who was holding his court in Llanbadarn near Aberystwith, demands his own acknowledgment as sovereign of Wales; the calling of a free Welsh parliament on the English model; the independence of the Welsh Church from the control of Canterbury; and the founding of national colleges in Wales itself. An assembly of Welsh nobles was actually summoned to meet in 1406 at Machyn- lleth in an ancient building still standing and known to this day as " Owen Glendower's Parliament House." In vain did Henry and his lords-marchers endeavour to suppress the rebellion, and to capture, by fair means or foul, the person of Glendower himself; the princely adventurer seemed to bear a charmed existence, and for a few years Owen was practically master of all Wales. Nevertheless, his rule and power gradually declined, and by the year 1408 Owen himself had disappeared as suddenly and mysteriously as he had arisen, and the land once more fell into undisputed possession of the king and his chosen vassals. For Owen's brilliant but brief career and ruthless treatment of English settlers and Anglophil Welshmen, his countrymen had not unnaturally to pay a heavy penalty in the severe statutes which the affrighted parliaments of Henry IV. framed for the

protection of the English dwellers in Wales and the border counties, and which were not repealed until the days of the Tudors. Of the part played by the Cymry during the wars of the Roses it is needless to speak, since the period forms a part of English rather than of Welsh history. The Yorkist faction seems to have been strongest in the eastern portion of the Principality, where the Mortimers were all-powerful, but later the close connexion of the house of Lancaster with Owen Tudor, a gentleman of Anglesea (beheaded in 1461) who had married Catherine of France, widow of Henry V., did much to invite Welsh sympathy on behalf of the claims of Henry Tudor his grandson, who claimed the English throne by right of his grand- mother. Through the instrumentality of the celebrated

Sir Rhys ap Thomas (1451-1527), the wealthiest and the most powerful personage in South Wales, Henry Tudor, earl of Rich- mond, on his landing at Milford Haven in ˆ85 found the Welsh ready to rise in his behalf against the usurper Richard III. With an army largely composed of Sir Rhys's adherents, Henry was enabled to face Richard III. at Bosworth, and consequently to obtain the crown of England. Thus did a Welshman revenge the ignominious deaths of Prince Llewelyn and Prince David by becoming two centuries later king of England and prince of Wales.

With the Tudor dynasty firmly seated on the throne, a number of constitutional changes intended to place Welsh subjects on a complete social and political equality with Englishmen have to be recorded. The all-important Act of Union 1536 (27 Henry VIII.), converted the whole of the Marches of Wales into shire ground, and created five new counties: Denbigh, Montgomery, Radnor, Brecknock, or Brecon and Monmouth. At the same time the remaining lordships were added to the English border counties of Gloucester, Shropshire and Hereford, and also to the existing Welsh shires of Cardigan, Carmarthen, Glamorgan and Pembroke, all of which found their boundaries considerably- enlarged under this statute. Clause 26 of the same act likewise enacted that the 12 Welsh counties should return 24 members to the English parliament: one for each county, one for the boroughs in each county (except Merioneth), and one for the town and county of Haverfordwest. It is probable that Welsh members attended the parliaments of 1 536 and 1 539, and certain it is that they were present at the parliament of 1541 and every parliament subse- quently held. This act of union was followed in 1542 by an " Act for certain Ordinances in the King's Majesty's Dominion and Principality of Wales " (34 & 35 Henry VIII.), which placed the court of the president and council of Wales and the Marches on a legal footing. This court, with a jurisdiction some- what similar to that of the Star Chamber, had originally been called into being under Edward IV. with the object of suppressing private feuds and other illegalities amongst the lords-marchers and their retainers. This council of Wales, the headquarters of which had been fixed at Ludlow, undoubtedly did good service on behalf of law and order under such capable presidents as Bishop Rowland Lee and William Herbert, earl of Pembroke; but it had long ceased to be of any practical use, and had in fact become an engine of oppression by the time of the Common- wealth, although it was not definitely abolished till the revolution of 1688. The act of 1 542 also enacted that courts of justice under the name of " The King's Great Sessions in Wales " should sit twice a year in every one of the counties of Wales, except Mon- mouth, which was thus formally declared an English shire. For this purpose four circuits, two for North and two for South Wales, each circuit containing a convenient group of three counties, were created; whilst justices of the peace and custodes rotulorum for each

shire were likewise appointed. At the same time all ancient Welsh laws and customs, which were at variance with the recognized law of England, were now declared illegal, and Cymric land tenure by gavelkind, which had been respected by Edward I., was expressly abolished and its place taken by the ordinary practice of primogeniture. It was also particularly stated that all legal procedure must henceforth be conducted in the English tongue, an arrangement which fell very heavily on poor monoglot Welshmen and appears an especially harsh and

ungracious enactment when coming from a sovereign who was himself a genuine Welshman by birth. Under the system of the Great Sessions justice was administered throughout the twelve counties of Wales for nearly three hundred years, and it was not until 1830 that this system of jurisdiction was abolished (not without some protest from Welsh members at Westminster), and the existing North and- South Wales circuits were brought into being.

With the peaceful absorption of the Principality into the realm of the Tudor sovereigns, the subsequent course of Welsh history assumes mainly a religious and educational character. The influence of the Renaissance seems to have been tardy in penetrating into Wales itself, nor did the numerous ecclesiastical changes during the period of the Reformation cause any marked signs either of resentment or approval amongst the mass of the Welsh people, although some of the ancient Catholic customs lingered on obstinately. As early as the reign of Henry VIII. there were, however, to be found at court and in the universities a number of ardent and talented young Welshmen, adherents mostly of the reforming party in Church and State, who were destined to bring about a brilliant literary revival in their native land during the reigns of Elizabeth and James I. Of this distinguished band the most memorable names are those of Bishop Richard Davies (c. 1501-1581) and of William Salesbury, the squire-scholar of Llanrwst (c. 1520-c. 1600) in Denbighshire, who is commonly credited with the honour of having produced the first printed book in the Welsh language, a small volume of pro- verbs published in London about the year 1545. With the acces- sion of Elizabeth a novel and vigorous ecclesiastical policy on truly national lines was now inaugurated in Wales itself, chiefly through the instrumentality of Richard Davies, nominated bishop of St Asaph in 1559 and translated thence to St Davids in 1 561, who was mainly responsible for the act of parliament of 1563, commanding the bishops of St Davids, Llandaff, Bangor, St Asaph and Hereford to prepare with all speed for public use Welsh translations of the Scriptures and the

Book of Common Prayer. Of the five prelates thus named, Davies alone was competent to undertake the task, and for assistance in the work of translation he called upon his old friend and former neigh- bour, William Salesbury, who like the bishop was an excellent Greek and Hebrew scholar. The pair laboured with such diligence that before the close of the year 1567 the required translations of the Liturgy and the New Testament were pub- lished in London; the former being the exclusive work of the bishop, whilst the latter was principally the product of Salesbury's pen, although some portions of it were contributed by Bishop Davies and by Thomas Huet, or Hewett, precentor of St Davids (d. 1591). Having accomplished so much in so small a space of time, the two friends were next engaged upon a translation of the Old Testament, but owing to a quarrel, the cause of which remains obscure, this interesting literary partnership was brought to an abrupt ending about 1570. The honour of presenting his countrymen with a complete Welsh version of the Bible was reserved for William Morgan {c. ˆ47-1604), vicar of Llanr- hayader, in Denbighshire, and afterwards bishop successively of Llandaff and of St Asaph. For eight years Morgan was busied with his self-imposed task, being greatly encouraged thereto by Archbishop Whitgift, by Bishop William Hughes (d. 1600) of St Asaph, and by other leading dignitaries of the Church both in England and in Wales. In December r588 the first complete Welsh Bible, commonly known as " Bishop Morgan's Bible," was issued from the royal press at Westminster under the patron- age of queen and primate, about 800 copies being supplied for distribution amongst the parish churches of Wales. This famous editio princeps of the Welsh Bible, first and foremost of Welsh classics, was further supplemented under James I. by the Authorized Version, produced by Richard Parry ˆ560-1623), bishop of St Asaph, with the help of Dr John Davies of Mallwyd (1570-ˆ644), the first great Welsh lexicographer. At the ter- centenary of " Bishop Morgan's Bible " in 188S a national move- ment of appreciation was set on foot amongst Welshmen of all denominations both at home and abroad, with the result that

a memorial cross was erected in the cathedral close of St Asaph in order to perpetuate the names and national services of the eight leading Welsh translators of the Scriptures: — Bishops Davies, Morgan and Parry; William Salesbury; Thomas Huet; Dr Davies of Mallwyd; Archdeacon Edmund Prys (1541-ˆ624), author of a popular Welsh metrical version of the Psalter; and Gabriel Goodman, dean of Westminster (1528-1601), a native of Ruthin, who greatly assisted Bishop Morgan in his task. Two circumstances attending the production of these Welsh transla- tions should be noted; — (1) That the leaders of this remarkable religious, literary and educational revival within the Principality were chiefly natives of North Wales, where for many years St Asaph was regarded as the chief centre of Cambro-British intellectual life; and (2) that all these important works in

the Welsh tongue were published of necessity in London, owing to the absence of an acknowledged capital, or any central city of importance in Wales itself.

It would be well-nigh impossible to exaggerate the services rendered to the ancient British tongue, and consequently to the national spirit of Wales, by these Elizabethan and Jacobean translations, issued in 1567, 1588 and 1620, which were able definitely to fix the standard of classical Welsh, and to embody the contending dialects of Gwynedd, Dyfed and Gwent for all time in one literary storehouse. But for this sudden revival of Cymric literature under the patronage of Elizabeth (for the obtaining of which Wales must ever owe a deep debt of gratitude to Bishop Richard Davies, "her second St David "), there is every reason to believe that the ancient language of the Princi- pality must either have drifted into a number of corrupt dialects, as it then showed symptoms of doing, or else have tended to ultimate extinction, much as the Cornish tongue perished in the r7th century.

The growth of Puritanism in Wales was neither strong nor speedy, although the year 15S8, which witnessed the appear- ance of Bishop Morgan's Bible, also gave birth to two fierce appeals to the parliament, urging a drastic Puritanical policy in Wales, from the pen of the celebrated John Penry, a native of Brecknockshire (1559-1593). Far more influential than Penry amongst the Welsh were Rhys Prichard (? 1570-1644), the famous vicar of Llandovery, 1 Carmarthenshire, and William Wroth (d. 1642), rector of Llanfaches, Monmouthshire. Of these two Puritan divines, Vicar Prichard, who was essentially orthodox in his behaviour, forms an interesting connecting link between the learned Elizabethan translators of the Bible and the great revivalists of the r8th century, and his moral rhymes in the vernacular, collected and printed after his death under the title of The Welshman's Candle (Canwyll y Cymry), still retain some degree of popularity amongst his countrymen. Although a strong opponent of Laud's and Charles's ecclesi- astical policy, Prichard lived unmolested, and even rose to be chancellor of St Davids; but the indiscreet Wroth, " the founder and father of nonconformity in Wales," being suspended in 1638 by Bishop Murray of Llandaff, founded a small community of Independents at Llanfaches, which is thus commonly ac- counted the first Nonconformist chapel in Wales. During the years prior to the Great Rebellion, however, in spite of the preaching and writings of Vicar Prichard, Wroth and others, the vast mass of Welshmen of all classes remained friendly to the High Church policy of Laud and staunch supporters of the king's prerogative. Nor were the effects of the great literary revival in Elizabeth's reign by any means exhausted, for at this time Wales undoubtedly possessed a large number of native divines that were at once active parish priests and excellent scholars, many of whom had been educated at Jesus College,

Oxford, the Welsh college endowed by Dr Hugh Price (d. 1574) and founded under Elizabeth's patronage in 1573. So striking was the devotion shown throughout the Principality to the king, who fought his last disastrous campaign in the friendly counties of Wales and the Marches, that on the final victory of the parliament there was passed within a month of Charles's execution

1 Sometimes known as vicar of Llandingat, his church being in that parish.

in 1649 (perhaps as a special measure of punishment) an " Act for the better Propagation and Preaching of the Gospel in Wales/ 1 by the terms of which a packed body of seventy commissioners was presented with powers that were practically unlimited to deal with all matters ecclesiastical in Wales. To assist these commissioners in their task of inquiry and eject- ment, a body of twenty-five " Approvers " was likewise con- stituted, with the object of selecting itinerant preachers to replace the dismissed incumbents; and amongst the Approvers are conspicuous the names of Walter Cradock (d. 1659), a sus- pended curate of St Mary's, Cardiff, and a follower of Wroth's; and of Vavasor Powell (1617-1670), an honest but injudicious zealot. Some 330 out of a possible total of 520 incumbents were now ejected in South Wales and Monmouthshire, and there is every reason to suppose that the beneficed clergy of North Wales suffered equally under the new system. The greed and tyranny of several of the commissioners, and the bigotry and mismanagement of well-meaning fanatics such as Cradock and Powell, soon wrought dire confusion throughout the whole Principality, so that a monster petition, signed alike by moderate Puritans and by High Churchmen, was prepared for presentation to parliament in 1652 by Colonel Edward Freeman, attorney-general for South Wales. Despite the fierce eflorts of Vavasor Powell and his brother itinerant preachers to thwart the reception of this South Wales petition at Westminster, Colonel Freeman was able to urge the claims of the petitioners, or " Anti- Propagators " as they were termed, at the bar of the House of Commons, openly declaring that by the late policy of ejectment and destruction " the light of the Gospel was almost extinguished in Wales." A new commission was now appointed to inquire into alleged abuses in Wales, and the existing evidence clearly shows how harsh and unfair was the treatment meted out to the clergy under the act of 1649, and also how utterly subversive of all ancient custom and established order were the reforms suggested by the commissioners and approvers. At the Restoration all the ejected clergy who sur- vived were reinstated in their old benefices under the Act of Uniformity of 1662, whilst certain Puritan

incumbents were in their turn dismissed for refusing to comply with various re- quirements of that act. Amongst these Stephen Hughes of Carmarthen (1623-1688), a devoted follower of Vicar Prichard and an editor of his works, was ejected from the living of Mydrim in Carmarthenshire, whereby the valuable services of this eminent divine were lost to the Church and gained by the Nonconformists, who had increased considerably in numbers since the Civil Wars. The old ecclesiastical policy of Elizabeth, which had hitherto borne such good fruit in Wales, was now gradually relaxed under the later Stuarts and definitely abandoned under Anne, during whose reign only Englishmen were appointed to the vacant Welsh sees. From 1702 to 1870, a period of nearly 170 years, no Welsh-speaking native bishop was nominated (with the solitary exception of John Wynne, consecrated to St Asaph in 1715), and it is needless to point out that this selfish and unjust policy was largely responsible for the neglect and misrule which dis- tinguished the latter half of the 18th and the early part of the 19th centuries. The Church, which had so long played a prominent and valuable part in the moral and literary education of the Welsh people, was now gradually forced out of touch with the nation through the action of alien and unsympathetic Whig prelates in Wales itself, which still remained mainly High Church and Jacobite in feeling.

All writers agree in stating that the mass of the Welsh people at the close of the 17th century were illiterate, and many divines of Cymric nationality charge their countrymen also with immorality and religious apathy. English was little spoken or understood amongst the peasant population, and there was a great dearth of Welsh educational works. Some efforts to remedy this dark condition of things had already been made by Thomas Gouge, with the assistance of Stephen Hughes, and also by the newly founded " Society for the Promotion of Christian Know- ledge "; but it was Griffith Jones (1683-1761), rector of Lland- dowror in south Carmarthenshire, who was destined to become

tbe true pioneer of Welsh education, religious and secular. Early in the reign of George I. this excellent man, whose name and memory will ever be treasured so long as the Welsh tongue survives, began a system of catechizing in the vernacular amongst the children and adults of his own parish. With the cordial help of Sir John Philipps (d. 1736) of Picton Castle, the head of an ancient family in Dyfed, and of Mrs Bridget Bevan of Laugharne (d. 1779), who is still affectionately remembered in Wales as the donor of " Madam Bevan's Charity," Griffith Jones was enabled to extend his scheme of educating the people throughout South Wales, where numerous " circulating charity schools," as they were called, were set up in many parishes with the approval of their incumbents. The results obtained by the growth of these schools were speedy and successful beyond the wildest hopes of their founder. This educational system, in- vented by

Griffith Jones and supported by the purse of Mrs Bevan, in 1760 numbered 215 schools, with a total number of 8687 contemporary scholars; and by the date of Jones's death in 1761 it has been proved that over 150,000 Welsh persons of every age and of either sex, nearly a third of the whole population of Wales at that time, were taught to read the Scriptures in their own language by means of these schools. With this newly acquired ability to read the Bible in their own tongue, the many persons so taught were not slow to express a general demand for Cymric literature, which was met by a supply from local presses in the small country towns; the marvellous success of the Welsh circulating charity schools caused in fact the birth of the Welsh vernacular press. In spite, however, of the marked improve- ment in the conditions and behaviour of the Welsh people, owing to this strictly orthodox revival within the pale of the Church, Griffith Jones and his system of education were regarded with indifference by the English prelates in Wales, who offered no preferment and gave little encouragement to the founder of the circulating schools. Meanwhile the writings and personal example of the pious rector of Llanddowror were stirring other Welshmen in the work of revival, chief amongst them being Howell Harris of Trevecca (1713-1773), a layman of brilliant abilities but erratic temperament; and Daniel Rowland (1713- 1790), curate of Llangeitho in Mid- Cardiganshire, who became in time the most eloquent and popular preacher throughout all Wales. Two other clergymen, who figure prominently in the Methodist movement, and whose influence has proved lasting, were Peter Williams of Carmarthen (1722-1796), the Welsh Bible commentator, and William Williams of Pantycelyn (1717- 1791), the celebrated Welsh hymn-writer. Incidentally, it will be noticed that this important Methodist revival had its origin and found its chief supporters and exponents in a restricted corner of South Wales, of which Carmarthen was the centre, in curious contrast with the literary movement in Elizabeth's reign, which was largely confined to the district round St Asaph.

During the lifetime of Griffith Jones the course of Welsh Methodism had run in orthodox channels and had been generally supported by the Welsh clergy and gentry; but after his death the tendency to exceed the bounds of conventional Church discipline grew so marked as to excite the alarm of the English bishops in Wales. Nevertheless, the bulk of the Methodists continued to attend the services of the Church, and to receive the sacraments from regularly ordained parish priests, although a schism was becoming inevitable. Towards the close of the r8th century the Methodist revival spread to North Wales under the influence of the celebrated Thomas Charles, commonly called Charles of Bala (1755-1814), formerly curate of Llany- mowddwy and the founder of Welsh Sunday schools. So strained had the relations between the English rulers of the Church and the Methodists themselves now grown, that in 1811 the long- expected schism

took place, much to the regret of Charles of Bala himself, who had ever been a devoted disciple of Griffith Jones.. The great bulk of the farming and labouring members of the Church now definitely abandoned their " Ancient Mother," to whom, however, the Welsh gentry still adhered. The Great Schism of 181 1 marks in fact the lowest point to which the

fortunes of the once powerful and popular Church in Wales had sunk; — in 181 1 there were only English-speaking prelates to be found, whilst the abuses of non-residence, pluralities and even nepotism were rampant everywhere. As instances of this clerical corruption then prevailing in Wales, mention may be made of the cases of Richard Watson (d. 1816}, the non-resident bishop of Llandaff, who rarely visited his diocese during an episcopate of thirty years; and of another English divine who held the deanery, the chancellorship and nine livings in a North Welsh see, his curates-in-charge being paid out of Queen Anne's Bounty, a fund expressly intended for the benefit of impoverished livings. An honourable exception to the indolent and rapacious divines of this stamp was Thomas Burgess (bishop of St Davids), to whose exertions is mainly due the foundation of St David's College at Lampeter in 1822, an institution erected to provide a better and cheaper education for intending Welsh clergymen. The foundation of Lampeter College was one of the earliest signs of a new era of revived vigour and better government within the Church, although it was not till 1870 that, by Mr Gladstone's appointment of Dr Joshua Hughes to the see of St Asaph, the special claims of the Welsh Church were officially recognized, and the old Elizabethan policy was one more reverted to after a lapse of nearly two hundred years. After 1870 Welsh ecclesi- astical appointments were made in a more truly national spirit, and this official acknowledgment of the peculiar duties and claims of the Church in Wales largely helped to win back no small amount of the strength and popularity that had been lost during Georgian times.

With the old national Church enthralled by English political prelates, and consequently hindered from ministering to the special needs of the people, the progress of dissent throughout the Principality was naturally rapid. Although primary education was largely supplied by the many Church schools in all parts of Wales, yet it was in the three most important denomina- tions — the Congregationalists, the Baptists and the Calvinistic Methodists (that new-born sect of which the Church herself was the unwilling parent) — that almost all Welsh spiritual development was to be found during the first half of the 19th century. Thus between the year 1S11 (the date of the Methodist secession) and 1S32 (the year of the great

Reform Bill), the number of dissenting chapels had risen from 945 to 1428: a truly marvellous increase even allowing for the speedy growth of population, since every chapel so built had of necessity to be well attended in order to render it self-supporting. From this religious guidance of the people by the well-organized forces of dissent, it was but a step to political ascendancy, and as the various constitutional changes from the Reform Bill onward began to lower the elective franchise, and thus to throw more and more power into the hands of the working classes, that spirit of radicalism, which is peculiarly associated with political dissent, began to assert itself powerfully throughout the country. As early as the reign of William IV, there appeared the weekly Times of Wales (Amserau Cymry), founded and edited by the able William Rees, who may be styled the father of the Welsh political press; and the success of Rees's venture was so marked that other journals, arranged to suit the special tenets of each sect, speedily sprang into existence. In the year 187c — a date that for many reasons marks the opening of an important era in modern Welsh history — the dissenting bodies of Wales were supporting two quarterly, sixteen monthly and ten weekly papers, all published in the vernacular and all read largely by peasants, colliers and artisans. With so powerful a press behind it, it is no wonder that Welsh political dissent was largely responsible for the changed attitude of the Imperial government in its treatment of the Principality — as evinced in the Sunday Closing Act of 1881, a measure which was very dear to the strong temperance party in Wales, and in the Welsh Intermediate Education Act, granted by Lord Salisbury's government in 1889. It was certainly owing to the pressure of Welsh political dissent that Lord Rosebery's cabinet issued the Welsh Land Tenure Commission in 1S93 — an inquiry which did much to exonerate the Welsh squirearchy from a number of vague*

charges of extortion and sectarian oppression; and that Sir H. Campbell-Bannerman's cabinet appointed the Welsh Church Commission (21st June 1906). This Commission was authorised to " inquire into the origin, nature, amount and application of the temporalities, endowments and other properties of the Church of England in Wales and Monmouthshire; and into the provision made and the work done by the Churches of all de-nominations in Wales and Monmouthshire for the spiritual welfare of the people, and the extent to which the people avail themselves of such provision." The Report and Memoranda of the Commission were published on the 2nd of December

1910.

Mention must be made of the Rebecca riots in 1843-1844 in South Wales, wherein many toll gates were destroyed by mobs of countrymen dressed in female garb, " as the daughters of Rebecca about to possess the gates of

their enemies "; and the Anti- Tithe agitation of 1885-1886 — largely traceable to the inflammatory language used concerning clerical tithe by certain organs of the vernacular press — which led to some disorderly scenes between distraining parties of police and crowds of excited peasants in the more remote rural districts. There have been occasional strikes accompanied by acts of lawlessness in the industrial and mining districts of Glamorganshire, and also amongst the workmen employed in the quarries of Gwynedd.

The University College of Wales was founded at Aberystwyth in 1872; that of South Wales at Cardiff in 1883; and of North Wales at Bangor in 1884. In 1889 the system of intermediate schools, arranged to formaneducational link between the primary schools and the colleges, was inaugurated. In November 1893 the University of Wales was incorporated by royal charter, with Lord Aberdare (d. 1895) as its first chancellor. All the religious bodies, including the Church, have been extremely active in educational and pastoral work; whilst the peculiar religious movement known as a revival (Diwygiad) has occurred from time to time throughout the Principality, notably in the years 1859 and 1904,

But the most remarkable phenomenon in modern Wales has been the evident growth of a strong national sentiment, the evolution of a new Welsh Renaissance, which demanded special recognition of the Principality's claims by the Imperial parlia- ment. This revived spirit of nationalism was by outsiders some- times associated, quite erroneously, with the aims and actions of the Welsh parliamentary party, the spokesmen of political dissent in Wales; yet in reality this sentiment was shared equally by the clergy of the Established Church, and by a large number of the laity within its fold. Nor is the question of the vernacular itself of necessity bound up with this new movement, for Wales is essentially a bi-lingual country, wherein every educated Cymro speaks and writes English with case, and where also large towns and whole districts— such as Cardiff, south Monmouth, the Vale of Glamorgan, Gower, south Glamorgan, south Pem- broke, east Flint, Radnorshire and Breconshire — remain practi- cally monoglot English-speaking. Nor are the Welsh landowners and gentry devoid of this new spirit of nationalism, and although some generations ago they ceased as a body to speak the native tongue, they have shown a strong disposition to study once more the ancient language and literature of their country. It is true that a Young Wales party has arisen, which seeks to narrow this movement to the exclusion of English ideas and influences; and it is also true that there is a party which is abnormally suspicious of and hostile to this Welsh Renaissance; but in the main it is correct to say that the bulk of the Welsh nation remains content to assert its views and requirements in a reasonable manner. How wide-spread and enthusiastic is this true spirit of national- ism amongst all classes and sects of Welsh society to-day may be

observed at the great meetings of the National Eisteddfod, which is held on alternate years in North and South Wales at some important centre, and at which the immense crowds col- lected and the interest displayed make a deep impression on the Anglo-Saxon or foreign visitors. The sincere, if somewhat narrow-minded religious feelings; the devotion manifested by all classes towards the land of their fathers; the extraordinary

vitality of the Cambro-British tongue — these are the main char- acteristics of modem Wales, and they seem to verify the terms of Taliesin's ancient prophecy concerning the early dwellers of Gwalia: —

" Their Lord they shall praise; Their Tongue they shall keep; Their Land they shall lose

Except Wild Wales." (H. M. V.)

Welsh Literature. — The Welsh language possesses an ex- tensive literature, ranging from the gth century to the present day. A detailed account of it will be found in the article Celt: Celtic Literature, § iv.

Welsh Language. — Welsh, the Celtic language spoken by the ancient Britons (see Celt: Language), is the domestic tongue of the majority of the inhabitants of the Principality. With the final destruction of Welsh independence under Edward I. the Cambro-British language, in spite of the disappearance of a court, continued to be spoken by Welshmen of all classes residing west of Severn, and the 14th and 15th centuries are remarkable for producing some of the finest Welsh bards and historians. With the union of Wales with England by the Act of 27 Henry VIII. (1536) the subsequent administration of all law and justice in the English tongue throughout the Principality threatened for a time the ancient language of the people with practical extinct- lion. From such a fate it was largely preserved by the various translations of the Scriptures, undertaken at the command of Queen Elizabeth and performed by a number of native scholars and divines, amongst whom appear prominent the names of Bishops Davies, Morgan and Parry, and of William Salesbury of Llanrwst. Although the assertion of the celebrated Rhys Prichard of Llandovery that in his time {c. 1630) only 1 % of the people of Wales could read the native language is probably an exaggeration, yet the number of persons who could read and write Welsh must have been extremely small outside the ranks of the clergy. During the earlier half of the 17th century the number of Welsh Bibles distributed throughout the Principality could hardly have exceeded 8000 in all, and except the Bible there was scarcely any Welsh work of importance in circulation. The system of the Welsh circulating charity schools, set up by Griffith Jones, rector of Llanddowror, in the 18th century, undoubtedly gave an immense impetus to the spread of popular education in Wales, for it has been stated on good authority that about one-third of the total population was taught to read and write Welsh by means of this system. As a result of Griffith Jones's efforts there quickly arose a vigorous demand for Welsh books of a pious and educational character, which was largely supplied by local Welsh printing-presses. The enthusiastic course of the Methodist movement under Howell Harris, Daniel Rowland and William Williams; the establishment of Welsh Sunday Schools; the founding of the Bible Society under Thomas Charles of Bala; and the revival early in the 19th century of the Eisteddfodau (the ancient bardic contests of music, poetry and learning), have all contributed to extend the use of the Welsh language and to strengthen its hold as a popular medium of education throughout the Principality. In 1841 the Welsh speaking population was computed at 67 % of the total, and in

1893 Welsh was understood or spoken by over 60% of the inhabitants in the twelve Welsh counties with the exception of the following districts, wherein English is the pre vailing or the sole language employed: — viz. nearly the whole of Radnorshire; east Flint, including the neighbouring districts of Ruabon and Wrexham in Denbighshire; east Brecknock; east Montgomery; south Pembroke, with the adjoining district of Laugharne in Carmarthenshire; and the districts of Gower, Vale of Glamorgan and Cardiff in south Glamorgan. In Mon- mouth, the eastern portion of the county is purely English- speaking, and in the western districts English also prevails (J. E. Southall, Linguistic Map of Wales).

Before tracing the history of Welsh sounds, it will be convenient to give the values of the letters in the modern alphabet: —

Tenues: p; I; c (= Eng. k).

Mediae: 6; d; g (= Eng. hard g).

Voiceless spirants: jf or ph (= Eng. /); th (= Eng. th in thick); c/t(= Scottish ch inloch).

Voiced spirants: / (= Eng. v); dd (= Eng. th in this); the guttural voiced spirant (7) disappeared early in Welsh.

Voiceless nasals: mh; nh; ngk.

Voiced nasals: m; n; ng.

Voiceless liquids: 11 (unilateral voiceless /); rh (voiceless r).

Voiced liquids: /; r.

Sibilant: s (Welsh has no z).

Aspirate: h.

*Semi-vowels: * (= Eng. y in yard); v> (= Eng. w).*

The sounds of t and d are more dental than in English, though they vary; the voiced spirants are very soft; the voiceless nasals are aspirated, thus nh is similar to Eng. nh in inhale; r is trilled as in Italian.

Vowels: a, e, i, have the same values as in Italian; w as a vowel = north Eng. 00 in book or Italian u; y has two sounds — (1) the clear sound resembling the Eng. i in bit, but pronounced farther back; (2) the obscure sound = Eng. i in fir; u in Med. Welsh had the sound of French «, but now has the clear sound of y described above, which is similar to the ear, and

has the same pitch.

*The Welsh language belongs to the Celtic branch of the Aryan or Indo-European family of languages. Primitive Celtic split up, as already shown, into two dialects, represented in modern times by two groups of languages — (1) the Goidelic group, comprising Irish, Scottish, Gaelic and Manx. (2) The Brythonic or Brittonic 1 group, comprising Welsh, Breton and Cornish. In the Goidelic group qu appears as c, thus Irish cetkir, " four "; in the Brythonic group it is changed into p, as in Welsh pedwar, " four." Gaulish, which was supplanted in France by Latin, had p, as in pelor-ritum, " four-wheeled car," and is thus allied to the Brythonic group; but it is believed that remains of a continental Celtic qu- dialect appear in such names as Sequani, and in some recently discovered inscrip- tions. The sounds of parent Aryan appeared in Primitive Celtic with the following modifications : — p disappeared, thus Aryan * peter, which gave Latin paler, Eng, father, gave in Irish athir; correspond- ing to Eng. floor, we have Irish lar, Welsh llaivr. The velar tenuis q, when labialized, became qu, without labialization became k; the velar media g became b or g. The aspirated mediae bh, dh, gh, ph were treated as unaspirated b, d, g, g; probably also the rare aspir- ated tenues fell together with the unaspirated. The other Aryan consonants seem generally to have remained. Aryan a, I, u remained. Aryan e became i, as in Irish fir, Welsh gwtr, " true," cognate with Latin versus. _ Aryan became a, as in Irish lar, cognate with Anglo- Saxon flor, Eng. floor. The short vowels remained, except that Aryan 3 became a, as in the other European branches.*

*In Brythonic, primitive Celtic qu became p, as above noted. Probably also Celtic u was advancing or had advanced to a forward position, for it appears in Welsh as 1, as in din, " stronghold," from Celtic *dun-on, cognate with Eng. town, while Latin «, borrowed in the Brythonic period, gives u with its Welsh sound above described, as in mur, " wall," from Latin mur-us.*

The Aryan system of inflexion was preserved in Celtic, as may be seen in Stokes's restoration of Celtic declension {Trans. Philol. Soc, 1885-1886, pp. 97-201); and Brythonic was probably as highly inflected as Latin. The development of Brythonic into Welsh is analogous to that of Latin into French. Unfortunately, the _ extant remains of Brythonic are scanty; but in the Roman period it borrowed a large number of Latin words, which, as we know their original forms, and as they underwent the same modi- fications as other words in the language, enable us to trace the phonetic changes by which Brythonic became Welsh.

These changes arc briefly as follows : —

*1. Loss of Syllables. — The last syllable of every word of more than one syllable was dropped; thus Latin termtn-us gives in Welsh terfyn; the name Sabrin-a 2 "Severn" became Hafren. The losa extends to the stem-ending of the first element of a compound, thus the personal name Maglo-cunos became M aelgwn ; and generally to unaccented syllables, thus e.piscopus became *epscop, whence esgob; trlnitat-em gives trindod. The accusative is often the case represented in Welsh; but we have also the nominative, and sometimes both, as in ciwed from civit-as, arid ciwdod from civitat-em, now two words, not two cases of the same word. Aryan declension naturally disappeared with the loss of final syllables.*

2. Consonant Changes. — (1) Between two vowels, or a vowel and a liquid, the seven consonants p, t, c, b, d, g, m, became re- spectively b, d, g, f, dd, , /, where "" represents the lost voiced spirant y. Examples: Latin cupidus gave cybydd; Tacitus gave

*1 The Bretons call their language Brezonek; the Welsh bards sometimes call Welsh Brythoneg: both forms imply an original *Brittonica.*

s The t was short : Sabrina would have given Hefrin in Welsh.

Tegyd; laborem gave Uafur; sagitta gave saeth; remus gave rhwyf. This change is called the " soft mutation." (2) After nasals £, t, c, b, d, g became respectively mh, nh, ngh, m, n, ng; thus tmperator gave ymherawdr, and ambactos (evidently a Brythonic as well as a Gaulish word) gave antaeth {m, though etymologicalty double, is written single). This change is called the " nasal mutation." (3) pp, tt, cc became respectively ph or/, th, ch; thus peccatum gave peckawd, later pechod; and Brittones gave Brython. This change is called the " spirant mutation." The tenuis becomes a spirant also after r or I, as in corff from corpus, and Elfin from Alpinus; but It gives lit or 11. The combinations act, ect t oct, uci gave aeth, aith, oeth, wyth, respectively; as in doeth, " wise," from Lat. doctus, ffrwyth from fructus. (4) Original s between vowels (but not Latin s) became h t and disappeared ; initially it generally appears as k, as in halen, " salt," sometimes as s, as in saith, " seven." Initial / and r became 11 and rh, as seen in examples in (1) above; but between vowels they remained. Similarly initial v became gw, as in gwin, from Latin wnutn, remaining between vowels, though now written iv, as in ciwed from cwitas.

A consonant occurring medially is, generally speaking, invariable in the present language; thus the p and d of cupidus are b and dd m cybydd; but

*with the initial consonant the case is different. In one combination the initial may remain; thus *oinos cupidus ˆave un cybydd, ” one miser ” ; in another combination it may have originally stood between vowels, and so is mutated, as in *duo cupido, which gave dau gybydd, ” two misers.” Thus arose the system of ” initial mutation “: an initial consonant may retain its original form, or may undergo any of the changes to which it is, subject. The names given above to these changes arc those by which they are known when they occur initially the unchanged form being called the ” radical.” The liquids /and r were brought into the system, the initial forms // and rh being regarded as ” radical.” The initial mutations, then, are as follows:—*

1 Radical .

P

I

c

b

d

g

m | li

rh

1 Soft . .

b

d

I

f

dd

—

f

;

r

j Nasal

mh

nh

ngh

m

n

ng

No change.

j Spirant .

ph

th

ch

No change.

No change.

The initial mutation of any word depends upon its position in the sentence, and is determined by a grammatical rule which can ordinarily be traced to a generalization of the original phonetic conditions. Thus the second element of a compound word, even though written and accented as a separate word, has a soft initial, because in Brythonic the first element of a compound generally ended in a vowel, as in the name Maglo-cunos. The more important rules for initial mutation are the following: the soft mutation occurs in a feminine singular noun after the article, thus y fam, " the mother" (radical mam); in an adjective following a feminine singular noun, as in mam dda, " a good mother " (da, ' good ") ; in a noun following a positive adjective, as in hen dd$n, " old man," because this order represents what was originally a compound; in a noun following dy, " thy," and ei, " his," thus dy ben, " thy head," ei ben, " his head " (pen, " head ") ; in the object after a verb; in a noun after a simple preposition; in a verb after the relative a. The nasal mutation occurs after fy, " my," and yn, " in "; thus fy mhen, " my head " (pen, " head "), yn Nhalgarth, " at Talgarth." The spirant mutation occurs after o, "and," "with," ei, "her";

thus a phen, " and a head," ei phen, " her head."

*3. Vowel Changes. — (1) Long d, whether from Aryan d or or from Latin d, becomes aw in monosyllables, as in brawd, " brother " from *brater; in the penult it is o, as in broder, " brothers," in the ultima aw, later 0, as in pechaivd, now pechod, from peccatum. Long, t, whether from Aryan e or i, or from Latin t, remains as i, see ex- amples above. Latin e was identified with a native diphthong ei, and becomes wy, as in rhwyf 'from remus. Latin b and w appear as u; see examples above. A long vowel when unaccented counts short, thus pecedtorem treated as *peccdtorem, gave pechadur. (2) Short a, e. remain; short t became y; and w became y (with its obscure sound) in the penult, remaining in the ultima, though now written w. But short vowels have been affected by vowels in suc- ceeding syllables. These " affections" of vowels are as follows:- (fl) I-affcction, caused by i in a lost termination: & becomes ai or ei, and e, 0, « became y, more rarely ai or ei. Thus *bardos gave bardd, but pi. *bardi gave beirdd; episcoph cave esgyb, " bishops." This change is also caused by -0, as in lleidr, " thief," from latro. (0) A-affection, caused by a in a lost ending: t becomes e (instead of y) ; u becomes o. Thus civitas gave ciwed', columna gave colofn. (7) Penultimate affection : ior y in the ultima causes several changes in the penult, as arch, " order," erchi, " to bid "; saer, " carpenter," pi. seiri; caer, " fort," pi. ceyrydd. (3) In the modern language other vowel changes occur by a change of position ; thus ai, au, aw in the ultima become ei, eu, respectively in the penult, as dail, " leaves," deilen, " leaf "; haul, " sun," heulog, " sunny "; brawd, " brother," pi. broder or brodyr. The last is an old interchange of sounds, and probably the others are older than their first appearance in writing (15th century) suggests.*

A ccidence, — Welsh has a definite article yr, ' ' the, ' ' which becomes 'r after a vowel, and y before a consonant unless already reduced to V. Thus yr oen, " the lamb," i'r ty, " into the house, yn y ty, " in the house."

The noun has two numbers, and two genders, masculine and feminine. A plural noun is formed from the singular by z-affection: thus bardd, " bard," pi. beirdd; ffon, " stick," pl.ˆyw; or by adding a termination as ffenestr, " window," pi. ffenestri, with any conse- quent vowel change, as brawd, " brother," pi. brodyr; gwlad, " country," pi. gwledydd. The terminations chiefly used are -aw, -ion, -on, -i, -ydd, -oedd. These are old stem endings left after the loss of the original -es ; thus latro gives lleidr, latrones gives lladron ; the forms having dd represent J stems, { becoming dd in certain positions.

In some cases the singular is formed from the plural by the ad- dition of -yn or -en; thus ser, " stars," seren, " star."

Feminine names of living things are formed from the masculine by the addition of -es, as brenin, ” king,” brenhines, ” queen ” ; Hew, ” lion,” llewes, ” lioness.” It is difficult to lay down rules for the determination of the gender of names of inanimate objects.

Adjectives are inflected for number and gender. Plural ad- jectives are formed from the singular by i-affection or by adding the termination -ion or -on; thus hardd, ” beautiful,” pi. heirdd; glas, ” blue,” pi. gleision.

Adjectives having y or w are made feminine by a-affection, due to the lost feminine ending -a; thus gwyn, ” white,” fern, gwen; trwm, ” heavy,” fern. trom.

The adjective has jour degrees ot comparison — positive, equative, comparative, superlative; as gldn, ” clean,” glaned, ” as clean (as),” glanach, “cleaner,” glanaf, “cleanest.” A few adjectives are compared irregularly.

The personal pronouns are: simple sing. 1. mi, 2. ti, 3. masc. ef, fern, hi; pi. 1. ni, 2, chwi, 3. hwy, hwynt; reduplicated, myfi, tyai, &c. ; conjunctive, minnau, tithau, Sec. Prefixed genitive: sing. J.fy, ” my,” 2. dy, 3. i, ei; pi. I. yn, ein, 2. ych, eich, 3. eu. Infixed genitive and accusative: sing. 1. ‘m, 2. ‘th, 3. ‘i; pi. 1. ‘«, 2. ‘ch, 3. ‘«. Affixed : sing. 1. i, 2, di, 3. ef, &c, like the simple forms.

The demonstrative pronouns are hwn, ” this,” hwnnw, ” that,” fern. hon. honno, pi. hyn, hynny.

The relative pronouns are nominative and accusative a, oblique cases ydd, yr, y. The expressions yr hwn, y neb, ” the one,” are mistaken for relatives by the old grammarians; the true relative follows: yr hwn a = il the one who.

The interrogative pronouns are substantival pwy ? = “who ? ” adjectival pa? Substantival ” what ?” is expressed by pa beth? ” what thing ? ” or shortly beth?

The verb has four tenses in the indicative, one in the subjunctive, and one in the imperative. The old passive voice has become an. impersonal active, each tense having one form only. The regular verb caraf, ” I love,” is conjugated thus: —

Indicative — Pres. (and fut.) sing. 1. caraf, 2. ceri, 3. cdr; pi. 1. carwn, 2. cerweh, 3. carant; impers. cerir. Imperfect sing. 1. carwn, 2. carit, 3. carai; pi. 1. carem, 2. carech, 3. cerynt, carent; impers. cerid. Aorist sing. 1. cerais, 2. ceraist, 3. carodd; pi.

1. carasom, 2. carasoch, 3. carasant; impers. carwyd. Pluperfect sing. I. caraswn, 2. carasit, 3. carasai; pi. 1. carasent, 2. carasech, 3. caresynt, -asent; impers. caresid.

Subjunctive — Pres. sing. I. carwyf, 2. cerych, 3. caro; pi. I. carom,

2. caroch, 3. caront; impers. carer.

Imperative — Pres. sing. 2. cdr, 3. cared; pi. 1. carwn, 2. cerweh,

3. carent; impers. carer.

Verbal noun, caru, " to love." Verbal adjectives, caredig, " loved," caradwy, " lovable."

As in other languages the verb " to be " and its compounds are irregular; the number of other irregular verbs is comparatively small.

Prepositions also are " conjugated " in Welsh, their objects, if pronominal, being expressed by endings. Thus ar, " on," arnaf, " on me," arnat, " on thee," arno, " on him," ami, " on her," arnom, " on us," arnock, "on you," arnynt, " on them." The second conjugation has for endings -of, -ot, -ddo, -ddi; -om, -ock, -ddynt; the third -yf, -yt, -ddo. -ddi; -ym, -ych, -ddynt.

The negative adverbs are ni, nid, conjunctive na, nod. Inter- rogative particles : a, ai. Affirmative particles: yr,fe.

The commoner conjunctions arc a, ac, " and " ; ond, eitkf, " but " ; 0, os, " if " ; pan, " when " ; tra, " while."

Syntax.— A qualifying adjective follows its noun, and agrees with it in gender and generally in number. It may, however, precede its noun, and a compared adjective generally does so.

In a simple sentence the usual order of words is the following : — verb, subject, object, adverb; as prynodd Dafydd lyfr yno, " David bought a book there." The verb may be preceded by an affirmative, a negative, or an interrogative particle.

When a noun comes first, it is followed by a relative pronoun, thus, Dafydd a brynodd lyfr yno, which really means " (it is) David who bought a book there," and is never used in any other sense in the spoken language, though in literary Welsh it is used rhetorically for the simple statement which is properly expressed by put- ting the verb first. In negative and interrogative sentences this rhetorical use does not occur.

In a simple interrogative sentence the introductory particle before the verb is a, and the positive answer consists in a repetition of the verb; a ddazv Dafydd ? Daw. " Will David come ? Yes." If the verb is aorist the answer is do for all verbs. In negative answers na precedes the verb. In sentences in which a noun comes first, the interrogative particle is- ai, and the answer is always, positive ie, negative nage; as ai Dafydd a ddaw ? ie. " Is it David who will come t Yes."

A relative pronoun immediately precedes its verb and can only be separated from it by an infixed pronoun, thus Dafydd a'i prynodd, " (it is) David who bought it,' yno y y m gweli, " (it is) there that thou wilt see me." If the relative is the object of a preposition, the latter is put at the end of the clause, and has a personal ending, thus y tv y bum ynddo, literally, " the house which I-was in-it."*

The verb does not agree with its subject unless the latter is a personal pronoun ; when the subject is a noun the verb is put in the third person singular; thus carant, "they love," can take a pro- nominal subject — carant kwy, " they love "; but " the men love " is car y dynion (not carant y dynion, which can only mean " they love the men "). In relative clauses the verb is sometimes made to agree; but in the oldest poetry we generally find the singular verb, as in the oft -repeated Gododin phrase Gwyr a aelh Gairaetk, " men who went (to) Catraeth " (not Gwyr a aethant).

Aiithori'i "if.s. — J. D. Rhys, Cambrobrytannicae Cymraecaeve linguae instilvtiones (1592); John Davies, Antiqae lingvae Briian- nicae . . . rvdimenta (1621); Anliquae linguae Britannicae . . . dictionarivm duplex (1632) ; Edward Lhuyd, Archaeo- logia Britannica (1707); \V. O. Pughe, Grammar and Dictionary (1832), vitiated by absurd etymological theories; J[. C. Zeuss, Grammatica Celtica (2nd ed. by H. Ebel, 187 1) — an index to the O Welsh glosses cited in this work was compiled by V. Tourneur in Archiv fur celt. Lexikographie, iii. 109-137; T. Rowland, Grammar of the Welsh Language* (1876). containing a large collection of facts about xhe modern language, badly arranged and wholly undigested; Rhys, Lectures on Welsh Philology* {1879); J. Strachan, An In- troduction to Early Welsh, with a Reader (Manchester, 1909) ; Stokes, " Urkeltischer Sprachschatz," in Fick's Vergleichend.es Worterbuch der idg. Sprachen *, ii. (1894) ; E. Anwyl, Welsh Grammar for Schools,ˆ i. (1898), ii. (1899); J. Morris Jones, Historical Welsh Grammar, i. (191 1); W. Spurrek, Welsh-English and English-Welsh Dictionary (Carmarthen 5 , 1904) ; D. Silvan Evans, Welsh Dictionary, A-E (1888-1906). The last-named*

received a subsidy from the British government. Some corrections and additions to the early volumes, by J. Loth, will be found in Arch. f. celt. Lex. vol. i. See also H, Sweet, " Spoken N. Welsh," in Trans, of the London Phil, Soc, 1882-1884; T. Darlington, " Some Dialectal Boundaries in Mid-Wales/ 1 in Trans, of the Hon. Soc. of Cymmrodorion, 1900-1901 ; and M. Nettlau, Beitrdge zur cymrischen Grammatik (Leipzig, 1887), also in Rev. celt. vol. ix. (J. M. J.)

WALEWSKI, ALEXANDRE FLORIAN JOSEPH COLONNA,

Comte (1810-1S68), French politician and diplomatist, was born at Walewicc near Warsaw on the 4th of May 1S10, the son of Napoleon I. and his mistress Marie, Countess Walewski. At fourteen Walewski refused to enter the Russian army, escaping to London and thence to Paris, where the French government refused his extradition to the Russian authorities. Louis Philippe sent him to Poland in 1830, and he "was then entrusted by the leaders of the Polish revolution with a mission to London. After the fall of Warsaw he took out letters of naturalization in France and entered the French army, seeing some service in Algeria. In 1837 he resigned his commission and began to write for the stage and for the press. He is said to have collaborated with the elder Dumas in Mademoiselle de Belle-Isle, and a comedy of his, VEcole du monde, was produced at the Theatre Francais in 1840. In that year his paper, Le Mcssager des chambres, Was taken over by Thiers, who sent him on a mission to Egypt, and under the Guizot ministry he was sent to Buenos Aires to co-operate with the British minister Lord Howden (Sir J. Caradoc) . The accession of Louis Napoleon to the supreme power in France guaranteed his career. He was sent as envoy extra- ordinary to Florence, to Naples and then to London, where he announced the coup d'etat to Palmerston {q.v.). In 1855 Walewski succeeded Drouyn de Lhuys as minister of foreign affairs, and acted as French plenipotentiary at the Congress of Paris next year. When he left the Foreign Office in t86o it was to become minister of state, an office which he held until 1863. Senator from 1855 to 1865, he entered the Corps Legislatif in 1865, and was installed, by the emperor's interest, as president of the Chamber. A revolt against his authority two years later sent him back to the Senate. He died at Strassburg on the 27th of October 1868. He had been created a duke in 1866, was a

member of the Academy of Fine Arts and a grand cross of the Legion of Honour.

WALFISH BAY, a harbour of South-West Africa with a coast-line of 20 m. terminated southward by Pelican Point in 22 54′ S., 14 27′ E. It belongs to Great Britain, together with a strip of territory extending 15 m. along the coast south of Pelican Point and with a depth inland from 10 to 15 m. The

total area is 430 sq. m. Except seaward Walfish Bay is sur- rounded by German South-West Africa. The northern boundary is the Swakop river; east and south there are no natural frontiers. The coast district, composed of sand dunes, is succeeded by a plateau covered in part with sparse vegetation. The river Kuisip, usually dry, has its mouth in the bay — which forms the finest harbour along a coast-line of over 1000 m. The harbour is provided with a pier 200 yds. long and is safe in all weathers. It was formerly frequented by whaling vessels (hence its name). The town has a small trade with the Hereros of the adjoining German protectorate. A tramway, n m. long, runs inland to Rooikop on the German frontier. Pop. (1904), 997, including 144 whites.

Walfish Bay forms a detached portion of the Cape province of the Union of South Africa. It was proclaimed British territory on. the 12th of March 1S78, and was annexed to Cape Colony on the 7th of August 1884 (see Africa, § 5). The delimitation of the southern frontier was in 1909 referred to the king of Spain as arbitrator between Great Britain and Germany.

WALKER, FRANCIS AMASA (1840-1897), American soldier and economist, was born in Boston, Massachusetts, on the 2nd of July 1840. His father, Amasa Walker (1799-1875), was also a distinguished economist, who, retiring irom commercial life in 1840, lectured on political economy in Oberlin College from 1842 to 1848, was examiner in the same subject at Harvard from 1853 to i860, and lecturer at Amherst from 1859 to 1869. He was a delegate to the first international peace congress in London 1843, and in 1849 to the peace congress in Paris. He was secretary of state of Massachusetts from 1851 to 1853 and a representative in Congress 1862-1863. His principal work, The Science of Wealth, attained great popularity as a textbook. Francis Walker graduated at Amherst College in i860, studied law, and fought in the Northern army during the whole of the Civil War of 1861-65, rising from the rank of sergeant-major to that of brevet brigadier-general of volunteers — awarded him at the request of General Winfield S. Hancock. As a soldier he excelled in analysis of the position and strength of the enemy. In 1864 he was captured and detained for a time in the famous Libby Prison, Richmond. After the war he became editorial writer on the Springfield (Massachusetts) Republican, and in 1S60 was made chief of the government bureau of statistics. He was superintendent of the ninth and tenth censuses (those of 1870 and 1880), and (1871-72) commissioner of Indian affairs. From 1873 to his death his work was educational, first as professor (1873-. 1881) of political economy in the Sheffield Scientific School at Yale, and then as president of the Massachusetts Institute of Technology, Boston. While superintendent of the census he increased the scope and accuracy of the records; and at the Institute of Technology he enlarged the resources and numbers of the institution, which had 302 students when he assumed

the presidency and 11 98 at his death. In. other fields .he promoted common-school education (especially in manual training), the Boston park system, and the work of the public library, and took an active part in the discussion of monetary, economic, statistical and other public questions, holding many offices of honour and responsibility. As an author he wrote on governmental treatment of the Indians, The Wages Question (1876), Money (1878), Land and its Rent (1883) and general political economy (1883 and 1884), besides producing monographs on the life of General Hancock (1884) and the history of his own Second Army Corps (1886). As an economist, from the time of the appearance of his book on the subject, he so effectively combated the old theory -of the " wage-fund " as to lead to its abandonment or material modifica- tion by American students; while in his writings on finance, from 1878 to the end of his life, he advocated international

bimetallism, without, however, seeking to justify any one nation in the attempt to maintain parity between gold and silver. A collection of posthumously published Discussions in Education (1899) was made up of essays and addresses prepared after his taking the presidency of the Institute of Technology: their most noteworthy argument is that chemistry, physics and the other sciences promote a more exact and more serviceable mental training than metaphysics or rhetoric. Walker's general tendency was towards a rational conservatism. On the question of rent he called himself a " Ricardian ot the Ricardians." To his Wages Question is due in great part the conception formed by English students of the place and functions of the employer in modern industrial economics. A remarkable feature of his writings is his treatment of economic tendencies not as mere abstractions, but as facts making for the happiness or misery of living men. General Walker died in Boston on the 5th of January 1897.

WALKER, FREDERICK (1840-1875), English subject painter, the son of a designer of jewelry, was born in Marylebone, London, on the 24th of May 1840. When very young he began to draw from the antique in the British Museum, and at the age of sixteen he was placed in the office of an architect named Baker. The occupation proved uncongenial; at the end of eighteen months he resumed his work from the Elgin marbles at the British Museum, and attended Leigh's life school in Newman Street. In March 1858 he was admitted a student of the Royal Academy. But his study in the academy schools was disconnected, and ceased before he reached the life class, as he was anxious to begin earning his own living. As a means to this end, he turned his attention to designing for the wood-engravers, and

worked three days a week for about two years in the studio of J. \V. Whymper, under whose tuition he quickly mastered the tech- nicalities of drawing on wood. His earliest book illustrations appeared in i860 in Once a Week, a periodical to which he was a prolific contributor, as also to the Cornhill Magazine, where his admirable designs appeared to the works of Thackeray and those of his daughter. These woodcuts, especially his illustra- tions to Thackeray's Adventures of Philip and Denis Duval, are among the most spirited and artistic works of their class, and entitle Walker to rank with Millais at the very head of the draughtsmen who have dealt with scenes of contemporary life. Indeed, by his contributions to Once a Week alone he made an immediate reputation as an artist of rare accomplishment, and although he was associated on that periodical with such men as Millais, Holman Hunt, Leech, Sandys, Charles Keene, Tenniel, and Du Maurier, he more than held his own against all com- petitors. In the intervals of work as a book illustrator he practised painting in water-colours, his subjects being frequently more considered and refined repetitions in colour of his black- and-white designs. Among the more notable of his productions in water-colour are " Spring," " A Fishmonger's Shop," " The Ferry," and " Philip in Church," which gained a medal in the Paris International Exhibition of 1867. He was elected an associate of the Society of Painters in Water Colours in 1864 and a full member in 1866; and in 1871 he became an associate of the Royal Academy. In this same year he was made an honorary member of the Belgian Society of Painters in Water Colours. His first oil picture, " The Lost Path," was exhibited in the Royal Academy in 1863, where it was followed in 1867 by " The Bathers," one of the artist's finest works, in 1868 by " The Vagrants," now in the National Gallery of British Art, in 1869 by ((The Old Gate," and in 18ˆ0 by "The Plough," a powerful and impressive rendering of ruddy evening light, of which the landscape was studied in Somerset. In 187 1 he ex- hibited his tragic life-sized figure of " A Female Prisoner at the Bar," a subject which now exists only in a finished oil study, for the painter afterwards effaced the head, with which he was dissatisfied, but was prevented by death from again completing the picture. The last of his fully successful works was " A Harbour of Refuge," shown in 1872 (also in the National Gallery of British Art); for " The Right of Way/' exhibited in 1875, bears evident signs of the artist's failing strength. He

had suffered indeed for some years from a consumptive tendency; in 1868 he made a sea voyage, for his health's sake, to Venice, where he stayed with Orchardson and Birkct Foster, and at the end of 1873 he went for a while to Algiers with J. W. North, in the hope that he might derive benefit from a change of climate. But, returning in the bitter English spring, he was again pros- trated; and on the 5th of June 1875 he died of consumption at St Fillan's, Perthshire.

The works of Frederick Walker are thoroughly original and individual, both in the quality of their colour and handling and in their view of nature and humanity. His colour, especially in his water-colours, is distinctive, powerful and full of delicate gradations. He had an admirable sense of design, and the figures of his peasants at their daily toil show a grace and sweep- ing largeness of line in which can be plainly traced the effect produced upon his taste by his early study of the antique; at the same time the sentiment of his subjects is unfailingly refined and poetic. His vigour of design may be seen in his poster for Wilkie Collins's The Woman in While, now in the National Gallery of British Art.

See Life and Letters of Frederick Walker, A.R.A., by John George Marks (1S96), a full biography of a personal rather than a critical kind. Frederick Walker and his Works, by Claude Phillips (1897), should be consulted as an excellent critical supplement to the larger volume. See also Essays on Art, by J. Comyns Carr, which includes a judicious essay on Walker.

WALKER, GEORGE {c. 1618-1690), hero of the siege of Londonderry, was the son of George Walker, rector of Kilmore and chancellor of Armagh (d. 1677), and of Ursula, daughter of Sir John Stanhope of Melwood, and is said to have been born in 1618 in Tyrone. He was educated at Glasgow University, and appointed to the livings of Lessan and Desertlyn, in the diocese of Armagh, near Londonderry, in 1669. In 1674 he obtained that of Donaghmore, which he held with Lessan. At the outbreak of the Civil War in Ireland towards the close of 1688, Walker, though in Holy Orders and advanced in years, raised a regiment and endeavoured to concert measures with Robert Lundy, the acting governor of Londonderry, for the defence of Dungannon. But Lundy, after having sent some troops to his support, ordered their withdrawal and the abandon- ment of the place on the 14th of March 1689. On the 17th of March Walker marched with his men to Strabane, and subse- quently was ordered by Lundy to move to Rash and then to. St Johnstown, 5 m. from Londonderry. On the approach of the enemy (April 13th) Walker rode hastily to Londonderry to inform Lundy, but was unable to convince him of his danger. He returned to his men at Lifford, where, on the 14th, he took, part in a brush with the enemy, afterwards following the retreat of the army to Londonderry. The town was in great confusion, and W T alker found the gates shut against him and his regiment. He was forced to pass the night outside, and only entered the next day " with much difficulty and some violence upon the Centry." Immediately on his arrival he urged Lundy to take the field and refused the demand to disband his own soldiers. On the 17th of April Lundy determined to give up the town to James, and called a council from which Walker and others were especially excluded; but the next day the king and his troops, who had advanced to receive the surrender, were fired upon from the walls contrary to Lundy's orders, and the arrival of Captain

Adam Murray with a troop of horse saved the situation. Lundy was deprived of ail power, and was allowed to escape in disguise from the town. On the 19th of April Walker and Baker were chosen joint-governors. Walker commanded fifteen com- panies, amounting to 900 men, and to him was also entrusted the supervision of the commissariat. He showed great energy, courage and resource throughout the siege, and led several successful sallies. Meanwhile his duties as a clergyman were not neglected. The Nonconformists were allowed the use of the cathedral on Sunday afternoons, but in the morning Walker preached. Those few of his sermons which remain, though simple in their language, are eloquent and inspiring. Meanwhile he had to contend with jealousies and suspicions within the town; but he succeeded in dispelling all misgivings and in reaffirming his

credit with the garrison. At the close of the siege, which lasted 150 days, the town was at the last extremity; but at length, on the 30th of July, Walker preached the last of the sermons by which he had helped to inspire its defence. An hour afterwards the ships were seen approaching, and the town was relieved.

As regards the general course of the war the importance of the successful resistance at Londonderry can hardly be exaggerated. It was the first open act of hostility in Ireland against James, and the disaster to his arms not only embarrassed his campaign in Ireland but prevented the expeditions to Scotland and England, and Walker's share in it was abundantly recognized. He sailed for Scotland and England on the 9th of August, and was everywhere welcomed with immense public enthusiasm. On the 29th of August he was graciously received at Hampton Court by William and Mary, before whom he had with good sense refused to appear in his military costume, and delivered to them the petition from Londonderry. William presented him with £5000, part of which he appears to have given to the widow of Baker, his fellow-governor, who died during the siege. Shortly afterwards he was nominated bishop of Londonderry, but as Bishop Hopkins, whom it was determined to remove, only died three weeks before Walker, the latter was never consecrated. Walker succeeded in obtaining a grant of £1 200 for Londonderry from the city companies, and on the iSth of November his petition to the House of Commons for relief for the widows, orphans, clergy and dissenting ministers was read, and the king was asked to distribute £10,000 among them (House of Commons Journals, vol. x. p. 288). On the following day Walker was called in, received the thanks of the House, and made a short and dignified reply. On the 8th of October he had been granted the degree of D.D. at Cambridge in

his absence, and on his return journey to Ireland he received the same diploma at Oxford (Feb. 1690). Walker met William on his arrival in Ireland on the 14th of June 1690 at Belfast, and followed his army. He was present at the battle of the Boyne on the 1st of July, but in what capacity, whether as spectator, as combatant or as minister to tend the wounded, is uncertain. 1 He was shot through the body at the passage of the river, according to one account, while he was going to the aid of the wounded Schomberg (G. Story, A True . . . History of Ike Affairs in Ireland, p. 82), and died almost immediately. His remains, or what were supposed to be such, were afterwards transferred from the battlefield and buried in his own church at Donaghmore, where a monument and inscription were placed to his memory. A more conspicuous memorial was erected in Londonderry itself.

Walker married Isabella Maxwell of Finnebrogue, and left several sons, four of whom during his lifetime were in the king's service, and from one of whom at least there are descendants at the present day.

While in London Walker had published A True Account of the Siege of Londonderry (1689), dedicated to the king, which went through several editions and was translated for perusal abroad. This pamphlet, and the ovations received by Walker in London, excited fierce jealousies, which had been subdued in the hour of peril, but which were now formulated in the Narrative (1698) of John Mackenzie, a dissenting minister who had been present during the siege. Walker was charged with having taken too much credit to himself, and of having passed over the services and names of the nonconformists. Base insinuations were added and it was declared that Walker had never even held the post cf governor. These accusations fall by the weight of their own exaggeration. On the other hand, Walker's Account, though doubtless incomplete, is written with candour and simplicity and is free from any touch of egotistical self consciousness; and both this tract and his subse quent Vindication (1689) arc greatly superior, in their dignity and restraint, to the pamphlets of his opponents. His character was proof against the perils which attend a sudden rise to fame and popularity, and his " modesty " is especially observed by several

1 Luttrell writes in his diary, vol. 2, p. 17 (Feb. 20, 1689-1690), " Mr Walker of Londonderry has taken his leave of the king to go to Ireland on some special command," and again, vol. 2, p. 44 (May 19, 1690), " Letters from Ireland say that Dr Walker, late governor of Londonderry, had a regiment of foot given him," but there appears to be no official record of his having received a commission at this time.

of his contemporaries. There exists also too much positive and independent evidence to permit any doubt whatever as to the greatness of Walker's

services. Burnet, in a passage which was not included in his published history perhaps because of the con- troversy, says: "There was a minister in the place, Dr Walker, who acted a very noble part in the government and defence of the town; he was but a man of ordinary parts, but they were suited to his work, for he did wonders in this siege " (Harleian MSS., 6584/, 292 b, printed by H. C. Foxcroft. Supplement to Burnet's Hist, of His Own Times, 1902, p. 321).

In the Siege of Derry (1893) the Rev. Philip Dwyer has collected the most essential facts and materials relating to Walker and the siege, and has reprinted in his volume Walker's True Account and Vindication, together with Walker's sermons, various other docu- ments and valuable notes.

WALKER, HENRY OLIVER (1843-), American artist, was born at Boston, Massachusetts, on the 14th of May 1843. He was a pupil of Leon Bonnat, Paris, and painted the figure and occasional portraits, but later devoted himself almost exclusively to mural decoration. His paintings symbolizing lyric poetry, for the Congressional Library, Washington; and his decorations for the Appellate Court House, New York; Bowdoin College, Maine; the enlarged State House, Boston; the Court House, Newark, New Jersey, and the Capitol at Saint Paul, Minnesota, are among his most important works. He became a member of the National Academy of Design, New York, in 1002.

WALKER, HORATIO (1858-), American artist, was born at Listowel, Ontario, Canada, on the 12th of May r858. When he was a child his family settled at Rochester, New York. Although entirely self-taught, he became a distinguished painter of animals, the figure and landscape. His pictures, principally of Canadian peasant life and scenes, show the influence of Trbyon and Millet, mainly in their feeling for largeness of com- position, in solidity of painting and in the choice of theme. He became a member of the National Academy of Design, New York, in 1891; of the American Water Color Society and of the Royal Institute of Painters in Water Colours, London. He received a medal and a diploma at Chicago, 1893; and medals at Buffalo, i9or; Charleston, 1902; and St Louis, r904. In 1888 he won the Evans prize of the American Water Color Society, New York.

WALKER, JOHN (1732-1807), English actor, philologist and lexicographer, was born at Colney Hatch, Middlesex, on the 18th of March 1732. Early in life he became an actor, his theatrical engagements including one with Garrick at Drury Lane, and a long season in Dublin. In 1768 he left the stage. After some experience in conducting a school at Kensington he com- menced to teach elocution, and in this found his principal employment for the rest of his life. In 1775 he published his

Rhyming Dictionary, which achieved a great success and has been repeatedly reprinted, and in 1791 his Critical Pronouncing Dictionary, which achieved an even greater reputation, and has run into some forty editions. He was the friend of the leading literary men of his time, including Johnson and Burke. He died in London on the 1st of August 1807.

WALKER, OBADIAH (1616-1699), master of University College, Oxford, was born at Darfield near Barnsley, Yorkshire, and was educated at University College, Oxford, becoming a fellow and tutor of this society and a prominent figure in uni- versity circles. In July 1648 the action of parliament deprived him of his academic appointments, and he passed some years in teaching, studying and travelling, returning to Oxford at the restoration of 1O60, and beginning a few years later to take a leading part in the work of University College. In June 1676 he was elected to the headship of this foundation, and in this capacity he collected money for some rebuilding, and forwarded the preparation of a Latin edition of Sir John Spelman's Life of Alfred the Great, published by the college. This was the time of Titus Oates and the popish plots, and some of Walker's writings made him suspect; however, no serious steps were taken against him, although Oxford booksellers were forbidden to sell his book, The benefits of our Saviour Jesus Christ to man- kind, and he remained a Protestant, in name at least, until the accession of James II. Soon after this event he came forward as

a Roman Catholic, and he advised the new king with regard to affairs in Oxiord, being partly responsible for the tactless conduct of James in forcing a quarrel with the fellows of Magdalen College. Mass was said in his residence, and later a chapel was opened in the college for the worship of the Roman Church; he and others received a royal licence to absent themselves from the services of the English Church, and he obtained another to super- vise the printing of Roman Catholic books. In spite of growing unpopularity he remained loyal to James, and when the king fled from England Walker left Oxford, doubtless intending to join his master abroad. But in December 1688 he was arrested at Sittingbourne and was imprisoned; then, having lost his mastership, he was charged at the bar of the House of Commons with changing his religion and with other offences. Earlyin 1690 he was released from his confinement, and after subsisting for some years largely on the charity of his friend and former pupil, Dr John Radcliffe, he died on the 21st of January 1699.

Walker's principal writings are: Of education, especially of young

gentlemen (Oxford, 1673, and six other editions); Ars rationis ad mentem nominalium libri tres (Oxford, 1673) ; and Greek and Roman History illustrated by Coins and. Medals (London, 1692).

WALKER, ROBERT (d. c. 1658), British painter, was a contemporary and to a slight extent a follower of Van Dyck. The date of his birth is uncertain, and no details are known of his early life. Although influenced by Van Dyck's art, he had still a considerable degree of individuality and developed a sound style of his own which was more severe and restrained than that of the greater master. His greatest vogue was at the time of the Commonwealth, for in addition to several portraits of Cromwell he painted other portraits of Lambert, Ireton, Fleetwood, and many more members of the Parliamentarian party. In 1652 he was given rooms in Arundel House in the Strand, London, where he resided for the rest of his life. He died either in 1658 or in 1660, the authority for the earlier date being an inscription on an engraved portrait by Lombart. Kis work had much merit ; it was vigorous and showed sound study of character. Several of his paintings, among them the portrait of William Faithorne the elder, are in the National Portrait Gallery, and there are others of notable importance at Hampton Court and in the University Galleries at Oxford. One of his portraits of Cromwell is in the Pitti Palace, where it is ascribed to Lely; it was bought in the artist's lifetime, but after the Protector's death, by the grand duke Ferdinand II. of Tuscany. Another is at Warwick Castle.

Walker painted also Robert Cromwell and his wife Elizabeth Steward, parents of the Protector. The portrait of the latter, attended by a page who is fastening his sash at the waist (now in the National Portrait Gallery, transferred from the British Museum, to which it was bequeathed by Sir Robert Rich, Bart., descendant of Cromwell's friend, Nathaniel Rich) was called by Walpole" Crom- well and Lambert "; but it is now r certain that the page represents Cromwell's son Richard. Elizabeth Cromwell, afterwards Mrs Claypole, the Protector's daughter, also sat to him. As no complete account of Walker's work is in existence (that of Walpole being very incomplete, while Cunningham passes him over entirely), it may be added that the artist twice painted John Evelyn, in different sizes, as well as Bradshaw, John Hampden, Colonel Thomas Sanders, Cornet Joyce, and Speaker Lenthall, as well as Sir William and Lady Waller, Mrs Thomas Knight, and General George Monk, duke of Albemarle, and Sir Thomas Fairfax (engraved by Faithorne). A portrait of Secretary Thurlow, which was in the Lord Northwick Collection, was attributed to him. As Walker was in the camp of the Parliamentarians and Dobson was the court painter at Oxford, few aristocratic persons sat to the former. Exceptions are Mary Capcl, duchess of Beaufort (engraved by J. Nutting), Aubrey, last earl of Oxford, and James Graham, marquess of Montrose; even a portrait of Charles I. in armour, with his hand on his helmet, is credited to Walker.

Two versions, of a like size, of his own portrait exist, one at the National Portrait Gallery and the other at Oxford, engraved by Peter' Lombart, and again, later, by T. Chambars. The Cromwell in the Scottish National Portrait Gallery is a copy. Walker's copy of Titian's famous " Venus at her Toilet," highly esteemed by Charles I., is considered a work of great merit.

WALKER, ROBERT JAMES (1801-1869), American political leader and economist, was bom in Northumberland, Pennsylvania, on the 23rd of July 1801. He graduated from the University of Pennsylvania in 1819 and practised law in Pittsburg from 1822 to 1826, when he removed to Mississippi. Though living in a

slave state he was consistently opposed to slavery, but he favoured gradual rather than immediate emancipation, and in 1838 he freed his own slaves. He became prominent, politically, during the nullification excitement of 1832-1833, as a vigorous opponent of nullification, and from 1836 to 1845 he sat in the United States Senate as a Unionist Democrat. Being an ardent expansionist, he voted for the recognition of the independence of Texas in 1837 and for the joint annexation resolution of 1845, and advocated the nomination and election of James K. Polk in

1844. He was secretary of the treasury throughout the Polk administration (1845-1849) and was generally recognized as the most influential member of the cabinet. He financed the war with Mexico and drafted the bill (1849) for the establishment of the department of the interior, but his greatest work was the preparation of the famous treasury report of the 3rd of December

1845. Although inferior in intellectual quality to Alexander Hamilton's Report on Manufactures, presenting the case against free trade, it is regarded as the most powerful attack upon the protection system which has ever been made in an American state paper. The " Walker Tariff " of 1846 was based upon its principles and was in fact largely the secretary's own work. Walker at first opposed the Compromise of 1850, but was won over later by the arguments of Stephen A. Douglas. He was appointed territorial governor of Kansas in the spring of 1857 by President Buchanan, but in November of the same year resigned in disgust, owing to his opposition to the Lecompton Constitution. He did. not, however, break with his party immediately, and favoured the so-called English Bill (see Kansas) ; in fact it was partly due to his influence that a sufficient number of anti-Lecompton Democrats were induced to vote for that measure to secure its passage. He adhered to the Union cause during the Civil War and in 1S63-1864 as financial agent of the United States did much to create confidence in Europe in the financial resources of the United States, and was instrumental in securing a loan of $250,000,000 in Germany. He

practised law in Washington, D.C., from 1864 until his death there on the nth of November 1869. Both during and after the Civil War he was a contributor to the Continental Monthly, which for a short time he also, with James R. Gilmore, conducted.

For the tariff report see F. W. Taussig, State Papers and Speeches an the Tariff (Cambridge, Mass., 1892).

WALKER, SEARS COOK (1805-1853), American astronomer, was born at Wilmington, Massachusetts, on the 28th of March 1805. Graduating at Harvard in 1825, he was a teacher till 1835, was an actuary in 1835-1845, and then became assistant at the Washington observatory. In 1847 he took charge of the longi- tude department of the United States Coast Survey, where he was among the first to make use of the electric telegraph for the purpose of determining the difference of longitude between two stations, and he introduced the method of registering transit observations electrically by means of a chronograph. He also investigated the orbit of the newly discovered planet Neptune. He died near Cincinnati on the 30th of January 1853. His brother Timothy (1802-1856) was a leader of the Ohio bar.

See Memoirs of the Roy. Aslr. Soc. vol. xxiii.

WALKER, THOMAS (1784-1836), English police magistrate, best known as author of The Original, was born on the 10th of October 1784 at Charlton-cum-Hardy, near Manchester, where his father was a prosperous cotton merchant and an active Whig politician. He was educated at Cambridge and called to the bar, and after devoting some years mainly to the study of the Poor Law was made police magistrate in Lambeth in 1829. In 1835 he started his weekly publication The Original, containing hi3 reflections on various social subjects and especially on eating and drinking; and it is in the history of gastronomy, and the art of dining, that this curious and amusing work is famous. The weekly numbers continued for six months, and subsequently were republished, after Walker's death on the 20th of January 1836, in an American selection (1837), in editions by W. B. Jerrold (with memoir) (1874), W. A. Guy (1875), and Henry Morley (1887), and in another selection of Sir Henry Cole (" Felix Summerley "), called Aristology (18S1).

WALKER, WILLIAM (1824-1860), American adventurer, was born in Nashville, Tennessee, on the 8th of May 1824. After graduating from the

univer- sity of Nashville in 1838, he studied law, was admitted to the bar, and subsequently spent a year in the study of medicine at Edinburgh and Heidelberg. He prac- tised medicine for a few months in Philadelphia and then removed to New Orleans, where he engaged in journalism. In 1850 he migrated to California and engaged in newspaper work at San Francisco and later at Marysville, where he also practised law. On the 15th of October 1S53 he sailed from San Francisco with a filibustering force for the conquest of Mexican territory. He landed in Lower California, and on the 18th of January 1854 he proclaimed this and the neighbouring State of Sonora an independent republic. Starvation and Mexican attacks led to the abandon- ment of this enterprise, and Walker resumed his journalistic work in California. On the 4th of May 1855, with fifty- six followers, Walker again sailed from San Francisco, this time for Nicaragua, where he had been invited by one of the belligerent factions to come to its aid. In October Walker seized a steamer on Lake Nicaragua belonging to the Accessory Transit Company, a corporation of Americans engaged in transporting freight and passengers across the isthmus, and was thus enabled to surprise and capture Granada, the capital and the stronghold of his opponents, and to make himself master of Nicaragua. Peace was then made; Patricio Rivas, who had been neutral, was made provisional president, and Walker secured the real power as commander of the troops. At this time two officials of the Transit Company determined to use Walker as their tool to get control of that corporation, then dominated by Cornelius Vanderbilt, and they advanced him funds and transported his recruits from the United States free of charge. In return for these favours, Walker seized the property of the company, on the pretext of a violation of its charter, and turned over its equipment to the men who had befriended him. On the 20th of May 1856 the new government was formally recognized at Washington by President Pierce, and on the 3rd of June the Democratic national convention expressed its sympathy with the efforts being made to " re- generate " Nicaragua. In June Walker was chosen president of Nicaragua, and on the 22nd of September, from alleged economic necessity, and also to gain the sympathy and support of the slave states in America, he repealed the laws prohibiting slavery.

Walker managed to maintain himself against a coalition of Central American states, led by Costa Rica, which was aided and abetted by agents of Cornelius Vanderbilt, until the 1st of May 1857, when, to avoid capture by the natives, he surrendered to Commander Charles Henry Davis, of the United States navy, and returned to the United States. In November 1857 he sailed from Mobile with another expedition, but soon after landing at Punta Arenas he was arrested by Commodore Hiram Paulding of the American navy, and was compelled to return to the United States as a paroled prisoner. On his arrival he was released by order of President

Buchanan. After several un- successful attempts to return to Central America, Walker finally sailed from Mobile in August i860 and landed in Honduras. Here he was taken prisoner by Captain Salmon, of the British navy, and was surrendered to the Honduran authorities, by whom he was tried and condemned to be shot. He was executed on the 12th of September i860.

See Walker's own narrative, accurate as to details, The War in Nicaragua (Mobile, i860); William V. Wells, Walker's Expedition lo Nicaragua (New Yo.'k, 1856) ; Charles William Doubleday, Reminis- cences of the " Filibuster " War in Nicaragua (New York, 1886), and James Jeffrey Roche, The Story of the Filibusters (London, 1 8g I) , revised and reprinted as Byways of War (Boston, 1901). (W. 0. S.)

WALKING RACES, a form of athletic sports, either on road or track. Road walking is the older form of the sport. The records for the chief walking distances were as follows in 1010: —

Distance.

Name.

Time.

Date.

Place.

lir. min.

sec.

1 mile

A. T. Yeomans.

6

198

1906

Bath

2 miles

A. T. Yeomans .

12

53i

1906

Swansea

3 „

J. W. Raby (profe

s-

sional)

20

21 4

1883

Lillie Bridge

4 „

G. E. Larner .

27

‘4

■9”5

Brighton

5 „

J. W. Raby . J. W. Raby .

35

10

1883

Lillie Bridge

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1883

Lillie Bridge

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J. W. Raby .

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1883

Lillie Bridge

20 „

W. Perkins

2 39

57

1877

Lillie Bridge

30 „

J. Butler . .

4 29

52

1905.

Putney

40 „

J. Butler . .

6 11

17

1905

Putney

50 „

J. Butler . .

7 52

27

1905

Putney

100 ,,

T. E. Hammond

17 25

22

1907

London to Brighton and back

The record distance walked in I hour was 8 m. 339 yds. by the English amateur G. E. Larner in 1905; in 8 hours, 50 m. 1190 yds. by another English amateur, J. Butler, in 1905; in 24 hours, 131 m. 580ˆ yds. by T. E. Hammond in 1908.

About the year 1875 there was a revival of interest in pro- fessional walking, which took the form of ” go-as-you-please ” competitions, extending over several days, usually six. These may be classed as walking contests, for, although running was allowed, it was seldom practised, excepting for a few moments at a time, for the purpose of relief from cramped muscles. The great difficulty in competitive walking is to keep within the rules. A ” fair gait ” is one in which one foot touches the ground before the other leaves it, only one leg being bent in stepping, namely, that

which is being put forward.

WALL, RICHARD (1694-1778), diplomatist and minister in the Spanish service, belonged to a family settled in Waterford. As he was a Roman Catholic he was debarred from public service at home, and like many of his countrymen he sought his fortune in Spain. He served, probably as a soldier in one of the Irish regiments of the Spanish army, during the expedition to Sicily in 1718, and was present at the sea fight off Cape Passaro. During the following years he continued to be em- ployed as an officer, but in 1727 he was appointed secretary to the duke of Liria, son of the duke of Berwick, and Spanish ambassador at St Petersburg. Wall's knowledge of languages, his adaptability, his quick Irish wit and ready self-confidence made him a great favourite, not only with the duke of Liria, but with other Spanish authorities. Spain was at that time much dependent on the ability of foreigners, and for a man of Wall's parts and character there were ample openings for an important and interesting career. The climate of St Petersburg seems to have been too much for him, and he soon returned to military service in Italy. It is said that when he was presented to the duke of Montemar, the Spanish general, and was asked who he was, he replied, " The most important person in the army after your excellency, for you are the head of the serpent, and I am the tail." He became known to Don Jose Patiiio, the most capable minister of King Philip V., and was sent by him on a mission to Spanish America — a very rare proof of confidence towards a man of foreign origin. He is also said to have laid a plan for retaking Jamaica from the English. In 1747 he was employed in the negotiations for the peace of Aix- la-Chapelle, and in 1748 was named minister in London. In England he made himself very popular. Though an exile through the operation of the Penal Laws, and though he proved loyal to his adopted country, he was a constant partisan of an English alliance. His views recommended him to the favour of King Ferdinand VI. (1746-1759), whose policy was resolutely peaceful. In 1752 Wall was recalled from London to assist in completing a treaty of commerce with England, which was then being negotiated in Madrid. Wall now became the candidate of the English party in the Spanish court for the post of Minister of Foreign Affairs, in opposition to the leader of the French party, the marquis de la Ensenada. He obtained the place in 1752, and in 1754 he had a large share in driving Ensenada from office. He retained his position till 1764. The despatches of the English minister, Sir Benjamin Keene, and of his

successor, Lord Bristol, contain many references to Wall. They are

creditable to him. Though a constant partisan of peace and good relations with England, Wall was firm in asserting the rights of the government he served. During the early stages of the Seven Years' War (i 756-1 763) he insisted on claiming compensation for the excesses of English privateers in Spanish waters. He frequently complained to the English ministers of the difficulties which the violence of these adventurers put in his way. As a foreigner he was suspected of undue favour to England, and was the object of incessant attacks by the French party. The new king, Charles III. (1759-1788), continued Wall in office. When war was declared by Spain in 1761 the minister carried out the policy of the king, but he confessed to the English ambassador, Lord Bristol, that he saw the failure of his efforts to preserve peace with grief. The close relations of Charles III. with the French branch of the House of Bourbon made Wall's position as foreign minister very trying. Yet the king, who detested changing his ministers, refused all his re- quests to be allowed to retire, till Wall extorted leave in 1764 by elaborately affecting a disease of the eyes which was in fact imaginary. The king gave him handsome allowances, and a grant for life of the crown land known as the Soto de Roma, near Granada, which was afterwards conferred on Godoy, and finally given to the duke of Wellington. Wall lived almost wholly at or near Granada, exercising a plentiful hospitality to all visitors, and particularly to English travellers, till his death in 1778. He left the reputation of an able minister and a very witty talker.

A full account will be found in volume iv. of Coxe's Memoirs of the Kings of Spain of the House of Bourbon (London, 1815). Further details of his early career can be gathered from the Diario del viaje a Moscovia, IJ2J-1730, of the duke of Liria (vol. xciii. of the Docu- mentor intditos paralakisloriade Espana), (Madrid, 1842, et seq.).

WALL (O. Eng. weal, weall, Mid. Eng. wal, walle, adapted from Lat. vallum, rampart; the original 0. Eng. word for a wall was wdg or wdh), a solid structure of stone, brick or other material, used as a defensive, protecting, enclosing or dividing fence, or as the enclosing and supporting sides of a building, house or room. The Roman vallum was an earth rampart with stakes or palisades {vallus, stake; Gr. tjXos, nail) and the Old English word was particularly applied to such earth walls; for the remains of the Roman walls in Britain see Britain. The word, however, was also applied to stone defensive walls, for which the Latin word was murus. The history of the wall as a means of defence will be found in the article Fortification and Siegecraft, the architectural and constructional side under the headings Architecture, Masonry and Brickwork. In anatomy and zoology the term " wall," and also the Latin term paries, is used for an investing or enclosing structure, as in " cell-walls," walls of the abdomen, &c. In the days when footpaths were narrow and ill-paved or non-existent

in the streets of towns and when the gutters were often overflowing with water and filth, the side nearest to the wall of the bordering houses was safest and cleanest, and hence to walk on that side was a privilege, hence the expressions " to take " or " to give the wall." The term " wall-rib " is given in architecture to a half-rib bedded in the wall, to carry the web or shell of the vault. In Roman and in early Romanesque work the web was laid on the top of the stone courses of the wall, which had been cut to the arched form, but as this was often irregularly done, and as sometimes the courses had sunk owing to the drying of the mortar, it was found better to provide an independent rib to carry the web; half of this rib was sunk in the wall and the other half moulded like the transverse and diagonal ribs, so that if the wall sank, or if it had to be taken down from any cause, the vault would still retain its position.

The word " wall eye " or " waJLeyed " is applied to a con- dition of the eye, particularly of a horse, in which there is a large amount of white showing or there is absence of colour in the iris, or there is leucoma of the cornea. It is also applied to the white staring eyes of certain fishes. The word has no con- nexion with " wall " as above, but is from the Icelandic vagl- eygr, vagi, a beam, sty in the eye, and eygr, eyed.

WALLABY, a native name, used in literature for any member of a section of the zoological genus Macropus, with naked muffle, frequenting forests and dense scrubs. With respect to their size they are distinguished as large wallabies and small wallabies, some of the latter being no bigger than a rabbit. From the localities in which they are found they are also called brush kangaroos. See Kangaroo.

WALLACE, ALFRED RUSSEL (1823-), British natural- ist, was born at Usk, in Monmouthshire, on the 8th of January 1823. After leaving school he assisted an elder brother in his work as a land surveyor and architect, visiting various parts of England and Wales. Living in South Wales, about 1840 he began to take an interest in botany, and began the formation of a herbarium. In 1847 he took his first journey out of England, spending a week in Paris with his brother and sister. In 1844- 1845, while an English master in the Collegiate School at Leicester, he made the acquaintance of H. W. Bates, through whose in- fluence he became a beetle collector, and with whom he started in 1848 on an expedition to the Amazon. In about a year the two naturalists separated, and each wrote an account of his travels and observations. Wallace's Travels on the Amazon and Rio Negro was published in 1853, a year in which he went for a fortnight's walking tour in Switzerland with an old school-fellow. On his voyage home from South America the ship was burnt and all his collections lost, except those which he had despatched beforehand. After spending a year and a half in England, during which time, besides his book on the Amazon, he published

a small volume on the Palm Trees of the Amazon, he started for the Malay Archipelago, exploring, observing and collecting from 1854 to 1862. He visited Sumatra, Java, Borneo, Celebes, the Moluccas, Timor, New Guinea and the Aru and Ke Islands. His' deeply interesting narrative, The Malay Archipelago, appeared in 1869, and he also published many important papers through the London scientific societies. The chief parts of his vast insect collections became the property of the late W. W. Saunders, but subsequently some of the most important groups passed into the Hope Collection of the university of Oxford and the British Museum. He discovered that the Malay Archipelago was divided into a western group of islands, which in their zoological affinities are Oriental, and an eastern, which are Australian. The Oriental Borneo and Bali are respectively divided from Celebes and Lombok by a narrow belt of sea known as " Wallace's Line," on the opposite sides of which the indigenous mammalia are as widely divergent as in any two parts of the world. Wallace became convinced of the truth of evolution, and originated the theory of natural selection during these travels. In February 1855, staying at Sarawak, in Borneo, he wrote an essay " On the Law which has regulated the Introduction of New Species " {Ann. and Mag. Nat. Hist, 1855, p. 184). He states the law as follows: " Every species has come into existence coincident both in time and space with a pre-existing closely allied species.". He justly claims that such a law connected and explained a vast number of independent facts. It was, in fact, a cautious statement of a belief in evolution, and for three years from the time that he wrote the essay he tells us that " the question of how changes of species could have been brought about was rarely out of my mind." Finally, in February 1858, when he was lying muffled in blankets in the cold fit of a severe attack of intermittent fever at Ternate, in the Moluccas, he began to think of Malthus's Essay on Population, and, to use his own words, " there suddenly flashed upon me the idea of the survival of the fittest." The theory was thought out during the rest of the ague fit, drafted the same evening, written out in full in the two succeeding evenings, and sent to Darwin by the next post. Dar- win in England at once recognized his own theory in the manu- script essay sent by the young and almost unknown naturalist in the tropics, then a stranger to him. " I never saw a more striking coincidence," he wrote to Lyell on the very day, on the 18th of June, when he received the paper: "if Wallace had my MS. sketch written out in 1842, he could not have made a better short abstract I Even his terms now stand as heads of my chapters." Under the advice of Sir Charles Lyell

and Sir Joseph Hooker, the essay was read, together with an abstract of

Darwin's own views, as a joint paper at the Linnean Society on the 1st of July 1858. The title of Wallace's section was " On the Tendency of Varieties to depart indefinitely from the Original Type." The " struggle for existence," the rate of multiplication of animals, and the dependence of their average numbers upon food supply are very clearly demonstrated, and the following conclusion was reached: " Those that prolong their existence can only be the most perfect in health and vigour; . . . the weakest and least perfectly organized must always succumb." The difference between Lamarck's theory and natural selection is very clearly pointed out. " The powerful retractile talons of the falcon and the cat tribes have not been produced or increased by the volition of those animals; but among the different varieties which occurred in the earlier and less highly organized forms of these groups, those always survived longest which had the greatest facilities for seizing their prey. Neither did the giraffe acquire its long neck by desiring to reach the foliage of more lofty shrubs, and constantly stretching its neck for the purpose, but because any varieties which occurred among its antitypes with a longer neck than usual at once secured a fresh range of pasture over the same ground as their shorter -necked companions, and on the first scarcity of food were thereby enabled to outlive them" With such clear statements as these in the paper of the 1st of July 1858, it is remarkable that even well-known naturalists should have failed to comprehend the difference between Lamarck's and the Darwin-Wallace theory. Wallace also alluded to the resemblance of animais, and more especially of insects, to their surroundings, and points out that " those races having colours best adapted to concealment from their enemies would inevitably survive the longest." In 187 1 Wallace's two essays, written at Sarawak and Ternate, were published with others as a volume, Contributions to the Theory of Natural Selection. Probably, next to the Origin of Species, no single work has done so much to promote clear understanding of natural selection and confidence in its truth; for in addition to these two historic essays, there are others in which the new theory is applied to the interpretation of certain classes of facts. Thus one treats of " Mimicry " in animals, another on " Instinct," another on " Birds' Nests." Each of these served as an example of what might be achieved in the light of the new doctrine, which, taught in this way and in an admirably lucid style, was easily absorbed by many who lound the more complete exposition in the Origin very hard to absorb. In this work, and in many of his subsequent publications, Wallace differs from Darwin on certain points. Thus the two concluding essays contend that man has not, like the other animals, been produced by the unaided operation of natural selection, but that other forces have also been in operation. We here see the in- fluence of his convictions on the subject of " spiritualism." More recently he expressed his dissatisfaction with the hypothesis of " sexual selection " by which Darwin sought to explain the conspicuous characters which are displayed during

the courtship of animals. The expression of his opinion on both these points of divergence from Darwin will be found in Darwinism (1889), a most valuable and lucid exposition of natural selection, as suited to the later period at which it appeared as the Essays were to the ealier. Darwin died some years before the controversy upon the possibility of the hereditary transmission of acquired characters arose over the writings of Weismann, but Wallace has freely accepted the general results of the German zoologist's teaching, and in Darwinism has presented a complete theory of the causes of evolution unmixed with any trace of Lamarck's use or disuse of inheritance, or Button's hereditary effect of the direct influence of surroundings. Tropical Nature and other Essays appeared in 1878, since republished combined with the 1873 Essays, of which it formed the natural continuation. One of the greatest of his publications was the Geographical Distribution of Animals (1876), a monumental work, which every student will main- tain fully justifies its author's hope that it may bear " a similar relation to the eleventh and twelfth chapters of the Origin of Species as Mr Darwin's Animals and Plants under Domesti- cation bears to the first." Island Life, which may be regarded

as a valuable supplement to the last-named work, appeared in

1880.

Turning to his other writings, Wallace published Miracles and Modern Spiritualism in 1881. Here is given an account of the reasons which induced him to accept beliefs which are shared by so small a proportion of scientific men. These reasons are purely experimental, and in no way connected with Christi- anity, for he had long before given up all belief in revealed religion. In 1882 he published Land Nationalization, in which he argued the necessity of state ownership of land, a principle which he had originated long before the appearance of Henry George's work. In Forty-five Years of Registration Statistics (1885) he maintained that vaccination is useless and dangerous. Wallace also published an account of what he held to be the greatest discoveries as well as the failures of the 19th century, The Wonderful Century (1899). His later works include Studies, Scientific and Social (1900), Man's Place in the Universe (1903) and his Autobiography (1905) . Possessed of a bold and intensely original mind, his activities radiated in many directions, ap- parently rather attracted than repelled by the unpopularity of a subject. A non-theological Athanasius contra mundum, he has the truest missionary spirit, an intense faith which would seek to move the mountains of apathy and active opposition. Whatever may be the future history of his other views, he will always be remembered as an originator of a principle more illuminating than any which has appeared since the days of Newton, as one of its two discoverers whose scientific rivalry was only the beginning of a warm and unbroken

friendship.

Wallace was married in 1866 to the eldest daughter of the botanist, Mr William Mitten, of Hurstpierpoint, Sussex. In 1871 he built a house at Grays, Essex, in an old chalk-pit, and after living there four years, moved successively to Dorking (two years) and Croydon (three years). In 1880 he built a cottage at Godalming near the Charterhouse school, and grew nearly 1000 species of plants in the garden which he made. In r88g he moved to Dorsetshire. After his return to England in 1862 Wallace visited the continent, especially Switzerland, for rest and change (1866, 1896) and the study of botany and glacial phenomena (August 1895). He also visited Spa, in Belgium, about 1870, and in October 1887 went for a lecturing tour in the United States. He delivered a course of six Lowell lectures in Boston, and visited New York, New Haven, Balti- more, &c., spending the winter at Washington. The following March he went to Canada and Niagara, and then made his way westwards. He saw the Yosemite Valley, the Big Trees, and botanized in the Sierra Nevada and at Gray's Peak. In July he returned to Liverpool by way of Chicago and the St Lawrence.

The first Darwin medal of the Royal Society was awarded to A. R. Wallace in 1890, and he had received the Royal medal in 1868. A pension was awarded him by Mr Gladstone at the beginning of 1881. He received the degree of D.C.L. from Oxford in 1889, and of LL.D. from the university of Dublin in 1882. He was president of the Entomological Society of London in 1870-1871.

Apart from Wallace's own Autobiography, a good deal of useful information is given in the biographical introduction to Wallace's Narrative of Travels on the Amazon and Rio Negro by the editor, Mr G. T. Bettany.

WALLACE, LEWIS [Lew] (1827-1905), American soldier and author, was born at Brookville, Indiana, on the 10th of April 1827, and received an academic education. He abandoned temporarily the study of law in Indianapolis to recruit a com- 1 pany of volunteers (of which he was made second lieutenant)] for the Mexican War, and served in 1846-1847 in the First Indiana Battery. He returned to the law, but at the begin- ning of the Civil War became colonel of the Eleventh Indiana Infantry, served in the West Virginia campaign, and on the 3rd of September 1861 was appointed brigadier-general. After the capture of Fort Donelson (February 16, 1862) he was promoted to major-general (March 21, 1862), was engaged at Shiloh (April 7, 1862), and afterwards commanded the Eighth Corps

with headquarters at Baltimore. By delaying the Confederate general j. A. Early at Monocacy (July 9, 1864) he saved Washing- ton from almost certain capture. General Wallace served as president of the court of inquiry (November 1S02) which in- vestigated the conduct of General D. C. Buell, and of the court which in 1865 tried and condemned Henry Wirz, commander of the Confederate prison at Andersonville, Ga. He was also a member of the court which tried the alleged conspirators against President Lincoln. He resigned from the army in 1865 to return to the bar. He served as governor of New Mexico Terri- tory (1878-1881) and as minister to Turkey (1881-1885). Though exceedingly popular as a lecturer, his literary reputation rests upon three historical romances: The Fair God (1873), a story of the conquest of Mexico; Ben Hur (1880), a tale of the coming of Christ, which was translated into several languages and dramatized; and The Prince of India (1893), dealing with the Wandering Jew and the Byzantine empire.

WALLACE, SIR RICHARD, Bart. (1818-1800), English art collector and philanthropist, was born in London on the ‘ 26th of July 1818. According to Sir Walter Armstrong (see Diet, of National Biography, art. ” Wallace “), he was a natural son of Maria, marchioness of Hertford (wife of the third marquess) , under whose auspices the boy was educated, mainly at Paris; but it was generally supposed in his lifetime that he was a son of the fourth marquess (his elder by only eighteen years), and therefore her grandson. At Paris he was well known in society, and became an assiduous collector of all sorts of valuable objets d’art, but in 1857 these were sold and Wallace devoted himself to assisting the fourth marquess, who left London to reside entirely in Paris, to acquire a magnificent collection of the finest examples of painting, armour, furniture and bric-a-brac. In 1870 the marquess of Hertford died unmarried, bequeathing to Wallace an enormous property, including Hertford House and its contents, the house in Paris, and large Irish estates. Pending the reopening of Hertford House, which had been shut up since the marquess had gone to live in Paris, Wallace sent some of the finest of his pictures and other treasures to the Bethnal Green Museum for exhibition; they were then transferred to Hertford House, wJiich had been largely transformed in order to receive them. In 187 1 he was created a baronet for his services during the siege of Paris, when he equipped several ambulances, founded the Hertford British hospital, and spent money lavishly in relief. This munificence endeared Sir Richard Wallace to the French people. From 1873 to 1885 he had a seat in parlia- ment for Lisburn, but he lived mostly in Paris, where, in the Rue LaffHte and in his villa in the Bois de Boulogne, he dwelt among art treasures not inferior to those at Hertford House. In 1878 he was made one of the British commissioners at the Paris Exhibition, and he was also a

trustee of the National Gallery and a governor of the National Gallery of Ireland. He died in Paris on the 20th of July 1890. He had married in 187 1 the daughter of a French officer, by whom he had a son, who, however, died in 1887; and Lady Wallace, who died in 1897, bequeathed his great art collection to the British nation. It is now housed in Hertford House, Manchester Square, which was acquired and adapted by the government for the purpose.

WALLACE, SIR WILLIAM (c. 1270-1305), the popular national hero of Scotland, is believed to have been the second son of Sir Malcolm Wallace of Eldcrslic and Auchinbothie, in Ren- frewshire. The date of his birth is not certainly ascertained, but is usually given as 1270. The only authority for the events of his early life is the metrical history of Blind Harry. That authority cannot be implicitly relied on, though we need not conclude that the minstrel invented the stories he relates. He lived about two centuries later than Wallace, during which a considerable body of legend had probably gathered round the name, and these popular " gestis " he incorporates in his narra- tive. At the same time he professes to follow as his " autour " an account that had been written in Latin by John Blair, the personal friend and chaplain of Wallace himself. As Blair's account has perished, we cannot tell how far the minstrel has faithfully followed his authority, but some comparatively recent

discoveries have confirmed the truth of portions of the narrative which had previously been doubted. At best, however, his authority must be regarded with suspicion, except when it is confirmed by other and more trustworthy evidence.

Only for a period of less than two years in his life — from the beginning of the insurrection in 1297 to the battle of Falkirk — does Wallace come before us in the clearest historical light. With the exception of one or two glimpses of him that we obtain from authentic historical documents, the recorded events of his later as of his earlier life rest on no more certain authority than that of Blind Harry.

In his boyhood, according to the usual accounts, he resided for some time at Dunipace, in Stirlingshire, with an uncle, who is styled " parson " of the place. By this uncle he was partially educated, and from him he imbibed an enthusiastic love of liberty. His education was continued at Dundee, where he made the acquaintance of John Blair. On a,ccount of an incident that happened at Dundee — his slaughter of a young Englishman named Selby, for an insult offered to him — he is said to have been outlawed, and so driven into rebellion against the English. Betaking himself to the wilds of the country, he gradually gathered round him a body of desperate men whom he led in various attacks upon the English. In consequence of the

success of these early enterprises his following largely increased, several of the more patriotic nobles — including the steward of Scotland, Sir Andrew Moray, Sir John de Graham, Douglas the Hardy; Wishart, bishop of Glasgow, and others — having joined him. His insurrection now became more open and pronounced, and his enterprises of greater importance. An attack was made upon the English justiciar, Ormsby, who was holding his court at Scone. The justiciar himself escaped, but many of his followers were captured or slain. The burning of the Barns of Ayr, the quarters of English soldiers, in revenge for the treacherous slaughter of his uncle, Sir Ronald Crawford, and other Scottish noblemen, followed. The success of these exploits induced the English king to take measures for staying the insurrection. A large army, under the command of Sir Henry Percy and Sir Robert Clifford, was sent against the insurgents, and came up with them at Irvine. Dissensions broke out among the Scottish leaders, and all Wallace's titled friends left him and made sub- mission to Edward, except the ever faithful Sir Andrew Moray. The treaty of Irvine, by which these Scottish nobles agreed to acknowledge Edward as their sovereign lord, is printed in Rymer's Foedera. It is dated the 9th of July 1297, and is the first public document in which the name of Sir William Wallace occurs. Wallace retired to the north, and although deserted by the barons was soon at the head of a large army. The vigour and success of his operations was such that in a short time he succeeded in recovering almost all the fortresses held by the English to the north of the Forth. • He had begun the siege of Dundee when he received information that an English army, led by the earl of Surrey and Cressingham the treasurer, was on its march northward. Leaving the citizens of Dundee to continue the siege of the castle, he made a rapid march to Stirling. En- camping in the neighbourhood of the Abbey Craig — on which now stands the national monument to his memory — he watched the passage of the Forth. After an unsuccessful attempt to bring Wallace to terms, the English commander, on the morning of the nth of September 1297, began to cross the bridge. When about one half of his army had crossed, and while they were still in disorder, they were attacked with such fury by Wallace, that almost all — Cressingham among the number — were slain, or driven into the river and drowned. Those on the south side of the river were seized with panic and fled tumultuously, having first set fire to the bridge. The Scots, however, crossed by a ford, and continued the pursuit of the enemy as far as Berwick. Sir Andrew Moray fell in this battle. The results of it were im- portant. The English were everywhere driven from Scotland. To increase the alarm of the English, as well as to relieve the famine which then prevailed, Wallace organized a great raid into the north of England, in Lhe course of which he devastated the country to the gates of Newcastle. On his return he was elected

guardian of the kingdom. In this office he set himself to re- organize the army and to regulate the affairs of the country. His measures were marked by much wisdom and vigour, and for a short time succeeded in securing order, even in the face of the jealousy and opposition of the nobles. Edward was in Flanders when the news of this successful revolt reached him . He hastened home, and at the head of a great army entered Scotland in July 1298. Wallace was obliged to adopt the only plan of campaign which could give any hope of success. He slowly retired before the English monarch, driving oS all supplies and wasting the country. The nobles as usual for the most part deserted his standard. Those that remained thwarted his councils by their jealousies. His plan, however, came very near being successful. Edward, compelled by famine, had already given orders for a retreat when he received information of Wallace's position and intentions. The army, then at Kirkliston, was immediately set in motion, and next morning (July 22, 1298) Wallace was brought to battle in the vicinity of Falkirk. After an obstinate fight the Scots were overpowered and defeated with great loss. Among the slain was Sir John de Graham, the bosom friend of Wallace, whose death, as Blind Harry tells, threw the hero into a frenzy of rage and grief. The account of his distress is one of the finest and most touching passages in the poem. With the remains of his army Wallace found refuge for the night in the Torwood — known to him from his boyish life at Dunipace. He then retreated to the north, burning the town and castle of Stirling on his way. He resigned the office of guardian, and betook himself again to a wandering life and a desultory and predatory warfare against the English. At this point his history again becomes obscure. He is known to have paid a visit to France, with the purpose of obtaining aid for his country from the French king. This visit is narrated with many untrustworthy details by Blind Harry; but the fact is established by other and indisputable evidence. When in the winter of 1303-1304 Edward received the submission of the Scottish nobles, Wallace was expressly excepted from all terms. And after the capture of Stirling Castle and Sir William Oliphant, and the submission Of Sir Simon Fraser, he was left alone, but resolute as ever in refusing allegiance to the English king. A price was set upon his head, and the English governors and captains in Scotland had orders to use every means for his capture. On the 5th of August 1305 he was taken— as is generally alleged, through treachery — at Robroyston, near Glasgow, by Sir John Menteith, carried to the castle of Dumbarton, and thence conveyed in fetters and strongly guarded to London. He reached London on the 22nd of August, and next day was taken to Westminster Hall, where he was impeached as a traitor by Sir Peter Mallorie, the king's justice. To the accusation W'allace made the simple reply that he could not be a traitor to the king of England, for he never was his subject, and never

swore fealty to him. He was found guilty and condemned to death. The sentence was executed the same day with circumstances of unusual cruelty.

The cause Gf national independence was not lost with the life of Wallace. Notwithstanding the cruelty and indignity amid which it terminated, that life was not a failure. It has been an inspira- tion to his countrymen ever since. The popular ideas regarding his stature, strength, bodily prowess and undaunted courage are confirmed by the writers nearest his own time — Wyntoun and Fordun. And indeed no man could in that age have secured the personal ascendancy which he did without the possession of thqse qualities. The little we know of his statesmanship during the short period he was in power gives proof of political wisdom. His patriotism was conspicuous and disinterested. He was well skilled in the modes of warfare that suited the country and the times. That he failed in freeing his country from the yoke of England was due chiefly to the jealousy with which he was regarded by the men of rank and power. But he had a nobler success in inspiring his countrymen with a spirit which made their ultimate conquest impossible.

For bibliography see the article in the Diet. Nat. Biog. The principal modern lives are James Moir's (1886), and A. F. Murison's (1898). (A. F. H.)

WALLACE, WILLIAM (1768-1843), Scottish mathematician, was born on the 23rd of September 1768 at Dysart in Fifeshire, where he received his school education. In 1784 his family removed to Edinburgh, where he himself was set to learn the trade of a bookbinder; but his taste for mathematics had already developed itself, and he made such use of his leisure hours that before the completion of his apprenticeship he had made considerable acquirements in geometry, algebra and astronomy. He was further assisted in his studies by John Robison (1 739-1805) and John Playfair, to whom his abilities had become known. After various changes of situation, dictated mainly by a desire to gain time for study, he became assistant teacher of mathematics in the academy of Perth in 1794, and this post he exchanged in 1803 for a mathematical mastership in the Royal Military College at Great Marlow (afterwards at Sandhurst). In 1819 he was chosen to succeed John Leslie in the chair of mathematics at Edinburgh, and in 1838, when compelled by ill-health to retire, he received a government pension for life. He died in Edinburgh on the 28th of April 1843.

In his earlier years Wallace was an occasional contributor to Leybourne's Mathematical Repository and the Gentleman's Mathe- matical Companion. Between 1801 and 1810 he contributed articles on " Algebra," " Conic Sections," " Trigonometry," and several others in mathematical and physical science to the fourth edition of the Encyclopaedia Briiannica, and

some of these were retained in subsequent editions from the fifth to the eighth inclusive. He was also the author of the principal mathematical articles in the Edin- burgh Encyclopaedia, edited by David Brewster (1808-1830). He also contributed many important papers to the Transactions of the Royal Society of Edinburgh.

See Transactions of the Roy. Ast. Sac, 1844.

WALLACE, WILLIAM (1844-1897), Scottish philosopher, was bora at Cupar-Fife on the nth of May 1844, the son of a house- builder. Between the ages of sixteen and twenty- two he was educated at St Andrews, whence he proceeded as an exhibitioner in 1864 to Balliol College, Oxford. He took a first class in Moderations, and in Lit. Hum. (1867), was Gaisford prizeman in 1867 (Greek prose) and Craven Scholar in 1869. Three years later he was appointed fellow, and in 1871 librarian, of Merton College. In 1882 he was elected Whyte's professor of moral philosophy in succession to T. II. Green, and retained the position until his death. He died on the 18th of February 1897 from the effects of a bicycle accident near Oxford. His manner was some- what brusque and sarcastic, and on this account, in his under- graduate days at Balliol, he was known as " The Dorian." But he was greatly respected both as a man and as a lecturer. His philosophical works are almost entirely devoted to German, and especially to Hegelian, doctrines, which he expounded and criticized with great clearness and literary skill. In dealing with Hegel he was, unlike many other writers, successful in express- ing himself in a lucid literary manner, without artificial and incomprehensible terminology.

His principal works were The Logic of Hegel (1873), which contains a translation of the Encyklop&die with an introduction, a second edition of which, with a volume entitled Prolegomena, appeared in 1892 ; Epicureanism (1880) ; Kant (Blackwood's Philosophical Classics, 1882); Life of Arthur Schopenhauer (1890); Hegel's Philo- sophy of Mind (translated from the Encyklopadie, with five intro- ductory essays) ; Lectures and Essays on Natural Theology and Ethics, being a selection from his papers edited with a biographical introduction by Edward Caird. He wrote several important articles for the 9th edition of the Ency. Brit., which, with some re- vision, have been repeated in the present work.

WALLACE, WILLIAM VINCENT (1814-1865), British com- poser, was born at Waterford, Ireland, his father, of Scottish family, being a regimental bandmaster. Vincent Wallace learnt as a boy to play several instruments, and became a leading violinist in Dublin. But in 1835 he married and went off to Australia, sheep farming. A concert in Sydney revived his musical passion; and having separated from his wife, he began a roving career, which had many romantic episodes, in Australia, the South

Seas, India and South America. He returned to London in 1845 and made various appearances as a pianist'; and in November of that year his opera Maritana was per- formed at'Drury Lane with great success. This was followed by Matilda of Hungary (1847), Lurline (i860), The Amber Witch

(1861), Love's Triumph (1862) and The Desert Flower (1863). He also published a number of compositions for the piano, &c. Vincent Wallace was a cultivated man and an accomplished musician, whose Maritana still holds ".he stage, and whose work as an English operatic composer, at a period by no means encouraging to English music, has a distinct historical value. Like Balfe, he was born an Irishman, and his reputation as one of the few composers known beyond the British Is",, at that time is naturally coupled with Balfe's. But he was a finer artist and a more original musician. In later years he became almost blind ; and he died in poor circumstances on the 1 2th of October 1865, leaving a widow and two children.

WALLACK, JAMES WILLIAM (c. 1704-1864), Anglo- American actor and manager, was born in London, his parents being actors. He made his firsˆ stage appearance at Drury Lane in 1807. After three years in Dublin he was again at Drury Lane until he went to America in i8t8. He settled in New York permanently in 1S52, the first Wallack's theatre being an old one renamed at the corner of Broome Street and Broad- way. The second, at 13th Street and Broadway, he built him- self. Wallack was an actor of the old school. Thackeray praises his Shylock, Joseph Jefferson his Don Caesar de Bazan. He married the daughter (d. 1851) of John Henry Johnstone (1749- 1828), a popular tenor and stage Irishman. Their son, John Lester Wallack (1820-1888), was born in New York on the 1st of January 1820. At one time in the English army, then on the Dublin and London stage, he made his first stage appearance in New York in 1847 under the name of John Lester as Sir Charles Coldstream, in Boucicault's adaptation of Used Up. He was manager, using the name Wallack, of the second Wallack's theatre from 1861, and in 1882 he opened the third at 30th Street and Broadway. His greatest successes were as Charles Surface, as Benedick, and especially as Elliot Grey in his own play Rosedale, and similar light comedy and romantic parts, for which his fascinating manners and handsome person well fitted him. He married a sister (d. 1909) of Sir John Millais. He wrote his own Memories of Fifty Years.

WALLAROO, a seaport of Daly county, South Australia, situated in Wallaroo Bay, on the Spencer Gulf, 123 m. by rail N.W. by N. of

Adelaide. It is connected by rail with the cele- brated Wallaroo copper mines (near Kadina, at a distance of 6 m. from the port). At Wallaroo Bay are the largest smelting works in the state, ranking among the largest in the world. Gold, silver and concentrated ores are received from other parts of the continent and from Tasmania for smelting at these works, which have ample facilities for shipment. Population of town (1901) 2920; of town and mines, 4866.

WALLASEY, an urban district in the Wirral parliamentary division of Cheshire, England, 2 m. N.W. of Birkenhead, of which it forms a suburb. Pop. (1901) 53,579- The former marshy estuary called Wallasey Pool is occupied by the Great Float, forming an immense dock (see Birkeniiead). The church of St Hilary, to which is assigned a foundation in the 10th century, was rebuilt in the 18th century, with the exception of the tower bearing the date r536. It was gutted by fire in 1857, and the whole was again rebuilt in the Early English style. On the shore of the Irish Sea is Leasowe Castle, once known as Mock-Beggar Hall, and supposed to have been erected by the earls of Derby in the reign of Elizabeth, in order to witness the horse-races held here. Under Wallasey Pool are remains of a submerged forest, in which various animal skeletons have been found.

At the Conquest Wallasey formed part of the possessions of Robert de Rhuddlan, and on his decease became part of the fee of Halton. In the reign of Elizabeth it had a small port, to which there belonged three barques and fourteen men. In 1668 the manor was possessed by the earl of Derby, but various parts after- wards became alienated. For a considerable time the horse-races held on what was then a common had considerable reputation, but they were discontinued in 1 760. At these races the duke of Monmouth, son of Charles II., once rode his own horse and won the plate.

WALLA WALLA, a city and the county-seat of Walla Walla county, Washington, U.S.A., in the S.E. part of the state, on Mill Creek, about 200 m. S. by W. of Spokane. Pop. (1880) 3588; (1890) 4709; (1900) 10,049, of whom 1522 were foreign- born; (1910 census) 19,364. Walla Walla is served by the Northern Pacific and the Oregon Railroad & Navigation Co.'s (Union Pacific) railways, and by an interurban electric line. In the city are a state penitentiary, Fort Walla Walla (a U.S. cavalry post), a Federal Land Office, a Young Men's Christian Association building, a Carnegie library, the State Odd Fellows' Home, and the Stubblefield Home for Widows and Orphans. Sessions of Federal District and Circuit courts are held here. Walla Walla is the seat of Whitman College (chartered, 1859; opened, 1866; rechartered, 1883), originally Congregational, but now non-sectarian, which was founded by the Rev. Cushing Eells and was named in honour of Marcus Whitman, and includes a college, a conservatory of music and a preparatory academy, and

occupies a campus of 30 acres; and of Walla Walla College (Adventist). Here are also 3t Paul's School (Protestant Episco- pal) for girls, and St Vincent's Academy for girls and De La Salle Academy for boys (both Roman Catholic). The city is situated in a farming (especially wheat-growing), stock-raising and fruit- growing region, is a distributing centre for the adjacent territory in Washington, Oregon and Idaho, and has a large wholesale business. Among its manufactures are flour and grist-mill products, agricultural implements, lumber, foundry and machine- shop products, leather and malted liquors. The value of the factory product in 1905 was $1,485,791, 54-1% more than in 1900. The municipality owns its waterworks. In r836 the famous missionary, Marcus Whitman, established at Waiilatpu, about 5 m. W. of the present Walla Walla, a mission of the American Board (Congregational), which in 1847 was broken up by an Indian attack, Whitman, his wife and twelve others being massacred, and the other residents being carried off as prisoners. In 1857 Fort Walla Walla was built by the United States government on the site of the present city, and about it a settlement grew up in 1857-1858. Walla Walla was laid out and organized as a town, and became the county seat in 1859; in 1862 it was chartered as a city. The name " Walla Walla " is said to be a Nez Perce Indian term meaning "a rapid stream." See W. D. Lyman, An Illustrated History of Walla Walla County, State of Washington (1901).

WALL-COVERINGS. The present article deals with this subject (see Mural Decoration for art and archaeology) from the practical point of view in connexion with house-furnishing. In selecting a wall-covering, the chief factors to be borne in mind are the conditions of the room, viz. the use to which it is to be put, and its lighting, aspect and outlook.

Marble is one of the most beautiful materials that can be chosen for covering a wall. _ The variety of its natural markings and colour gives a wide choice that enables it to be employed in practically any scheme oi colouring and For rooms of any aspect and of any description. The working up of the marble is done Marble mostly by machinery ; the saws used are flat strips of steel !™" set in the frame of a machine and worked to and fro, sand tiatag t and water being constantly supplied to assist in the work of cutting. Mouldings are worked to the desired profile by rapidly revolving carborundum wheels, and are afterwards polished by hand. Marble wall-slabbing needs very careful fixing, and should be well supported by a sufficient number of cramps at a little distance from the wail, leaving a space of about half an inch at the back of the slab. Non- rusting cramps should be used, such as those made of copper or bronze. A cement made of plaster of Paris and marble dust mixed in the proportion of two parts to one should be used for fixing, as pure plaster, especially if new, is liable to swell and cause the marble to crack. Marezzo and Scagliola are imitation

marbles and are described in Pi.astekwork.

Well-designed and properly executed mosaic is a very beautiful decorative medium, and ranks among the most permanent as well as most pleasing wall-coverings. With glass mosaic great M k ranges both of colour and of texture of surface can be mosaic obtained, different methods of preparing the glassgiving a brilliant granular or quite dull surface as desired to suit the particular position of the work. Marble mosaic is used more for floors and pavings than for vertical surfaces. Most mosaic is now put together in the studio and pasted upon sheets of tough paper to which the design has previously been transferred. The whole section can thus be bedded on the prepared wall-surface with the least amount of

trouble and without any danger of its sagging. When the cement has properly set, the paper is washed off from the face of the work.

Much improvement has been effected in the design and manu- facture of wall-tiles. Especially has the design of tiles reached a very TJ/ high level of excellence, and as a material w r hich combines

‘ the qualities of being hard in wear, durable, damp-resist-

ing and easily washable, with beauty of design, colouring and surface, tiling may perhaps be placed next in order of merit as a wall-covering to mosaic. A thin, opaque glass material, manufactured under various trade names, is now much used, especially for tiling existing walls. It has all the sanitary qualities of tiles, but is perhaps somewhat more fragile and liable to be damaged under hard wear. It is made in opal and other colours and is usually fixed with a special cement or mastic which allows for slight movements of expansion and contraction. The thickness of the material varies with different makers from g to f in.

*Metal sheeting, though somewhat inartistic in appearance, is useful where a durable, waterproof and sanitary wall protection is needed, jm tal a * s tnere f° re often used for sculleries, wash-houses and*

sheeiinv lavatories. Thin sheets of zinc with slightly emhossed patterns and enamelled in colours can be hung upon the wall with a composition of w r hite lead (one part) and whiting (two parts) mixed to a thick paste with varnish or gold size. Sheets of iron or steel can be more elaborately embossed and fixed to the wall with nails or screws; they are either previously enamelled or are painted after being fixed. They are used more

for ceilings than for wall-coverings, but are adapted for use in either position.

Tapestry of good design and workmanship is a really beautiful wall-covering. It is usually hung upon frames fitted to the wall, and may either cover the entire wall surface or be fixed apes /y. j n ˆ e { orm of panels, friezes, dados or fillings. It is not at all a sanitary covering, for it harbours a very large quantity of dust and dirt. The same remark applies, but perhaps in a less degree, to brocades of silk and damask. These materials are of a delicate nature and become easily soiled by the fumes of gas or oil lamps. Substitutes for these materials on stout paper and on cotton are made with a prepared back to facilitate pasting and hanging, and are a very good imitation of the better material.

*A coarse canvas, specially prepared with a smooth back forpasting, and stained in several plain colours, can now be purchased. Having a rough surface it naturally holds the dust, but this can easily be brushed off without damaging the material. *_ It is a pleasing wall- covering, which will stand hard wear, and it forms a good back- ground for pictures and furniture.*

The term ” wall-paper ” embraces a very large variety of materials of many kinds, designs and qualities, ranging from the cheapest w „ machine-printed papers of the most flimsy description and

Batters often hideous design, to the Japanese and similar leather ” papers, skilfully modelled in relief and richly decorated in gold and colours. The design of the paper, of whatever description it may be, should preferably be of a conventional pattern, unob- trusive and restful to the eye, and presenting no strong contrasts of colour. The wall must be treated as a background, consisting of a plane surface, and no attempt made to introduce a pictorial element into the decoration. The wall surface, regarded from the paper- hanger’s point of view, is often divided into three sections, the dado or base, the field or filling, and the frieze at the top immediately beneath the cornice. This subdivision is not always adhered to, and a wall may be papered uniformly all over its surface, or may consist of dado and filling without the frieze, or frieze and filling without the dado. The division between the sections is usually formed, in the case of the frieze and filling, with a wood picture rail, and between the filling and dado with a moulded dado or chair rail.

Wall-papers may be printed either in distemper colours or oil colours, and the patterns upon them are printed either by hand or by machine. There are also self-coloured papers which have different kinds of surface finish, and with some of these a pattern is formed by contrasting a smooth with a

rough or granulated surface or vice versa. Typical of such papers are the ingrain papers, which have the colour penetrating through their substance. Plain filling papers are often used t in conjunction with a boldly designed and strongly coloured frieze of considerable depth. The dado is either of similar plain paper or of an unobtrusive pattern. Often the filling is taken down to the skirting without the intervention of a dado rail. Papers printed in oil colours can be sized and varnished, and when treated in this way can be washed repeatedly and are' very durable. This treatment gives an unpleasant glazed surface to the wall, but in spite of this it is often adopted for bathrooms, kitchens and in similar positions, because it is economical.

The best papers are printed from blocks manipulated by hand. The pattern, or as much of it as is to be printed in one colour, is carved upon a pear-wood board, small and delicate members being represented by strips and dots of copper inserted in the block. With large blocks a treadle and pulley arrangement gives the work- man assistance in applying and removing the pattern, which is first fed with colour by being pressed on a felt blanket soaked in pigment and then applied to the surface of the paper to be decorated. One tint is applied at a time, and this when dry is followed by others necessary to complete the design. This drying of the previous colour ensures sharoness of outline and accuracy of colour. Designs are

sometimes worked on the paper with stencil patterns cut out of zinc sheets. These are laid upon the paper and thick colour applied through the perforations with a stiff brush.

The cheaper wall-papers are printed by machinery. The paper is made to travel round a large drum around which are grouped the print : ng cylinders, each with its separate inking roller to supply the specia colour for its use. On each of the wooden printing rollers is set cop >er " type," representing as much of the pattern as is to be printed n one colour. It is a difficult and tedious matter to get all the rollei to work together to form one perfect pattern, and when printing iu several colours it may take a skilled workman a week or more to " set " his machine, a very "large quantity of paper being spoilt during the process.

The colours used for hand-printed work, whether applied with blocks or stencil plates, are much thicker in consistency thanthose for machine work. One advantage of hand-worked paper is the comparative ease with which a paper can be matched even after it has gone out of stock. At a slight extra cost the manufacturer will print a few pieces for his customer from the blocks he has retained. With machine-printed paper this, from a practical point of view, is impossible, for it would necessitate the printer's going through the long and costly process of " setting " the machine.

Wall-papers are sold in rolls called " pieces." In England the standard size for a piece of paper is 12 yds. long and 21 in. wide. The printed surface is only 20 in. in width, as a margin of half an inch is left on each edge. One or both of these plain margins must be removed prior to hanging. French wall-papers are 9 yds. long and 18 in. wide and only contain 4O5 sq. ft. compared with 63 ft. in a

fiiece of English paper. To ascertain the number of pieces required or a room take the superficies in feet of the surface to be covered (deduction being made for the doors, windows, &c.) and divide by 60. This gives the net amount required; an allowance of about one- seventh must be added to allow for wastr in matching patterns and of odd lengths. If French papers are to be used the division should be 38 instead of 60, these figures representing in feet the area of the printed surface in each roll. The surface of the wall should before papering be carefully prepared so as to be quite smooth and regular. If the wall has been previously papered it should be stripped, and any irregularities filled in with stopping. To remove varnished paper use hot water to which borax has been added in the proportions of 2 oz. to each pint of water. Inselectingapaperfora newly plastered wall the colour chosen should be capable 01 withstanding the bleaching action of the lime in the plaster. Greens, blues and pinks especially are affected in this manner. For heavy papers glue paste should be used. Papering which has become dirty may be effectually cleaned with new bread or stiff dough; when gently rubbed over the surface in one direction this speedily removes the dirt. When the wall is damp, tinfoil, pitch-coated paper or Willesden waterproofed paper is used behind the paper to prevent the paper from becoming damaged by the wet. (J. Bt.j

WALLENSTEIN (properly Waldstein), ALBRECHT WENZEL EUSEBIUS VON, duke of Friedland, Sagan and Mecklenburg (1583-16.34). German soldier and statesman, was born of a noble but by no means wealthy or influential family at Herrmanic, Bohemia, on the 15th of September 1583. His parents were Lutherans, and in early youth he attended the school of the Brothers of the Common Life at Koschumberg. After the death of his parents he was sent by his uncle, Slawata, to the Jesuit college of nobles at Olmiitz, after which he pro- fessed, but hardly accepted, the Roman Catholic faith. In 1590 he went to the university of Altdorf, which he had to leave in consequence of some boyish follies. Afterwards he studied at Bologna and Padua, and visited many places in southern and western Europe. While in Padua he gave much attention to astrology, and during the rest of his life he never wavered in the conviction that he might trust to the stars for indications as to his destiny. For some time Wallenstein served in the army of the emperor Rudolph II. in Hungary, which was commanded by a methodical professional soldier, Giorgio Basta. His personal gallantry at the siege of Gran won for him a company without purchase. In 1606 he

returned to Bohemia, and soon afterwards he married an elderly widow, Lucretia Nikossie von Landeck, whose great estates in Moravia he inherited after her death in 1614. His new wealth enabled him to offer two hundred horse, splendidly equipped, to the archduke Ferdinand for his war with Venice in 1617. Wallenstein commanded them in person, and from that time he enjoyed both favour at court and popularity in the army. His wealth and influence were further increased by his marriage with Isabella Katharina, daughter of Count Harrach, a confidential adviser of the emperor Matthias.

In the disturbances which broke out in Bohemia in 161S and proved to be the beginning of the Thirty Years' War, advances

were made to Wallenstein by the revolutionary party; but he preferred to associate himself with the imperial cause, and he carried off the treasure-chest of the Moravian estates- to Vienna, part of its contents being given him for the equipment of a regi- ment of cuirassiers. At the head of this regiment Wallenstein won great distinction under Buquoy in the war against Mansfeld. He was not present at the battle of the Weisser Berg, but he did brilliant service as second-in-command of the army which opposed Gabriel Bethlen in Moravia, and recovered his estates which the nationalists had seized. The battle of the Weisser Berg placed Bohemia at the mercy of the emperor Ferdinand, and Wallenstein turned the prevailing confusion to his own advantage. He secured the great estates belonging to his mother's family, and the emperor sold to him on easy terms vast tracts of confiscated lands. His possessions he was allowed to form into a territory called Friedland, and he was raised in 1622 to the rank of an imperial count palatine, in 1623 to that of a prince. In 1625 he was made duke of Friedland. Meantime he fought with skill and success against Gabriel Bethlen, and so enhanced his reputation at the dark moment when Vienna was in peril and the emperor's general Buquoy dead on the field of battle. At this stage in his life the enigma of his personality is complicated by the fact that he was not only the cold, detached visionary with vast ambitions and dreams, but also the model ruler of his principality. In everyday matters of administration he displayed vigour and foresight. He not only placed the administration of justice on a firm basis and founded schools, but by many wise measures developed agriculture and mining and manufacturing industries. At the same time he enlisted in the service of his ambition and his authority a pomp and refinement in his court which contrasted forcibly with the way of life of the smaller established rulers.

When the war against the Bohemians had become a wide- spread conflagration, Ferdinand found he had no forces to oppose to the Danes and the Northern Protestants other than the Army of the League, which was not his, but the powerful and inde- pendent Maximilian's, instrument. Wallenstein saw his oppor- tunity and early in 1626 he offered to raise not a regiment or two, but a whole army for the imperial service. After some negotia- tions the offer was accepted, the understanding being that the troops were to be maintained at the cost of the countries they might occupy. Wallenstein's popularity soon brought great numbers of recruits to his standard. He soon found himself at the head of 30,000 (not long afterwards of 50,000) men. The campaigns of this army in 1625, 1626 and 1627, against Mansfeld, the Northern Protestants and Gabriel Bethlen, are described under Thirty Years' War.

Having established peace in Hungary, Wallenstein proceeded, in 1627, to clear Silesia of some remnants of Mansfeld's army; and at this time he bought from the emperor the duchy of Sagan, his outlay in the conduct of the war being taken into account in the conclusion of the bargain. He then joined Tilly in the struggle with Christian IV., and afterwards took possession of the duchy of Mecklenburg, which was granted to him in reward for his services, the hereditary dukes being displaced on the ground that they had helped the Danish king. He failed to capture Stralsund, which he besieged for several months in 1628. This important reverse caused him bitter disappointment, for he had hoped that by obtaining free access to the Baltic he might be able to make the emperor as supreme at sea as he seemed to be on land. It was a part of Wallenstein's scheme of German unity that he should obtain possession of the Hanseatic towns, and through them destroy or at least defy the naval power of the Scandinavian kingdom, the Netherlands and England. This plan was com- pletely frustrated by the resistance of Stralsund, and even more by the emperor's " Edict of Restitution " that not only rallied against him all the Protestants but brought in a great soldier and a model army, Gustavus and the Swedes.

At the same time the victory of the principles of the League involved the fall of Wallenstein's influence. By his ambitions, his high dreams of unity and the incessant exactions of his army, he had made for himself a host of enemies. He was reported to have

spoken of the arrogance of the princes, and it appeared probable that he would try to bring them, Catholics and Protestants alike, into rigid subjection to the crown. Again and again the emperor was advised to dismiss him. Ferdinand was very unwilling to part with one who had served him so well; but the demand was pressed so urgently in 1630 that he had no alter- native, and in September of that year envoys were sent to Wallenstein to announce his removal. Had the emperor declined to take this course, the princes would probably have combined against him; and the result would have been a civil war even more serious than that which had already brought so many disasters upon the country. Wallenstein perfectly understood this, and he therefore accepted the emperor's decision calmly, gave over his army to Tilly, and retired to Gitschin, the capital of his duchy of Friedland. There, and at his palace in Prague, he lived in an atmosphere of mysterious magnificence, the rumours of which penetrated all Germany. The enigma of his projects was intensified, and the princes who had secured his disgrace became more suspicious than ever. But ere long the emperor was forced by events to call him into the field again.

Shortly before the dismissal of Wallenstein, Gustavus Adolphus had landed in Germany, and it soon became obvious that he was far more formidable than the enemies with whom the emperor had yet had to contend. Tilly was defeated at Breitenfeld and on the Lech, where he received a mortal wound, and Gustavus advanced to Munich, while Bohemia was occupied by his allies the Saxons. The emperor entreated Wallenstein to come once more to his aid. Wallenstein at first declined; he had, indeed, been secretly negotiating with Gustavus Adolphus, in the hope of destroying the League and its projects and of building his new Germany without French assistance. However, he accepted Ferdinand's offers, and in the spring of 1632 he raised a fresh army as strong as the first within a few weeks and took the field. This army was placed absolutely under his control, so that, he assumed the position of an independent prince rather than of a subject. His first aim was to drive the Saxons from Bohemia — – an object which he accomplished without serious difficulty. Then he advanced against Gustavus Adolphus, whom he opposed near Nuremberg and after the battle of the Alte Veste dislodged. In November came the great battle of Liitzen (?.».), in which the imperialists were defeated, but Gustavus Adolphus was killed.

To the dismay of Ferdinand, Wallenstein made no use of the opportunity provided for him by the death of the Swedish king, but withdrew to winter quarters in Bohemia. In the campaign of 1633 much astonishment was caused by his apparent unwilling- ness to attack the enemy. He was in fact preparing to desert the emperor. In the war against the Saxons he had offered them as terms of peace the revocation of the Edict. Religious

toleration and the destruction of the separatist regime, as well as not inconsiderable aggrandisements for his own power, formed his programme, so far as historians have been able to reconstruct it, and becoming convinced from Ferdinand's obstinacy that the Edict would never be rescinded, he began to prepare to " force a just peace on the emperor in the interests of united Germany." With this object he entered into negotiations with Saxony, Brandenburg, Sweden and France. He had vast and vague schemes for the reorganization of the entire constitutional system of the empire, and he himself was to have supreme authority in determining the political destinies of his country. But as the mere commander of mercenaries he was trusted by no one, and could only play the part of Cassandra to the end.

Irritated by the distrust excited by his proposals, and anxious to make his power felt, he at last assumed the offensive against the Swedes and Saxons, winning his last victory at Steinau on the Oder in October. He then resumed the negotiations. In December he retired with his army to Bohemia, fixing his head- quarters at Pilsen. It had soon been suspected in Vienna that Wallenstein was playing a double part, and the emperor, en- couraged by the Spaniards at his court, anxiously sought for means of getting rid of him. Wallenstein was well aware of the designs formed against him, but displayed little energy in his

attempts to thwart them. This was due in part, no doubt, to ill- health, in part to the fact that he trusted to the assurances of his astrologer, Battista Seni. He also felt confident that when the time came for his army to decide between him and the emperor the decision would be in his own favour.

His principal officers assembled around him at a banquet on the 1 2th January 1634, when he submitted to them a declaration to the effect that they would remain true to him. This declara- tion they signed. More than a month later a second paper was signed; but on this occasion the officers' expression of loyalty to their general was associated with an equally emphatic expression of loyalty to their emperor. By this time Wallenstein had learned that he must act warily. On the 24th of January the emperor had signed a secret patent removing him from his command, and imperial agents had been labouring to undermine Wallen- stein 's influence. On the 7th two of his officers, Piccolomini and Aldringer, had intended to seize him at Pilsen; but finding the troops there loyal to their general, they had kept quiet. But a patent charging Wallenstein and two of his officers with high treason, and naming the gcncralnwho were to assume the supreme

command of the army, was signed on the iSth of February, and published in Prague.

When Wallenstein heard of the publication of this patent and of the refusal of the garrison of Prague to take his orders, he realized the full extent of his danger, and on the 23rd of February, accompanied by his most intimate friends, and guarded by about 1000 men, he went from Pilsen to Kger, hoping to meet the Swedes under Duke Bernhard, who, at last convinced of his sincerity, were marching to join him. After the arrival of the party at Eger, Colonel Gordon, the commandant, and Colonels Butler and Leslie agreed to rid the emperor of his enemy. On the evening of the 25th of February Wallenstein's supporters Illo, Kinsky, Terzky and Neumann were received at a banquet by the three colonels, and then murdered. Butler, Captain Devereux and a number of soldiers hurried to the house where Wallenstein was staying, and broke into his room. He was instantly killed by a thrust of Devereux's partisan. Wallenstein was buried at Gitschin, but in 1732 the remains were removed to the castle chapel of Miinchengratz.

No direct orders for the murder had been issued, but it was well understood that tidings of his death would be welcome at court. The murderers were handsomely rewarded, and their deed was commended as an act of justice.

Wallenstein was tall, thin and pale, with reddish hair, and eyes of remarkable brilliancy. He was of a proud and imperious temper, and was seldom seen to laugh. He worked hard and silently. I it times of supreme difficulty he listened carefully to the advice of his counsellors, but the final decision was always his own, and he rarely revealed his thoughts until the moment for action arrived. Few generals have surpassed him in the power of quickly organizing great masses of men and of inspiring them with confidence and enthusiasm. But it is as a statesman that Wallenstein is immortal. However much or little motives of personal aggrandisement influenced his schemes and his conduct, " Germany turns ever to Wallenstein as she turns to no other amongst the leaders of the Thirty Years' War. . . . Such faithfulness is not without reason. . . . Wallenstein's wildest schemes, impossible of execution by military violence, were always built upon the foundation of German unity. In the way in which he walked that unity was doubtless unobtain- able. . . . But during the long dreary years of confusion which were to follow it was something to think of the last supremely able man whose life had been spent in battling against the great evils of the land, against the spirit of religious intolerance and the spirit of division."

See Forster, Albrecht von Wallenstein (1834); ArCtin, Wallenstein (1846) ; Helbig, Wallenstein und Arnitn, 1632-1634 (1850), and Kaiser Ferdinand -und der Herzog von Friedland, 1633-1634 (1853); Hurter, Zur Geschichte Wallensteins (1855); Fiedler, Zur Geschichte Wallensteins

(i860); L. von Ranke, Geschichte Wallensteins (3rd ed., 1872); Gindelv. Geschichte des dreissigidhrigen Kriegs {1869); J. Mitchell, Wallenstein (1840); S. R. Gardiner, Thirty Years' War.

WALLER, EDMUND (1606-1687), English poet, was the eldest son of Robert Waller of Coleshill (then in Herts, now in Buckinghamshire) and Anne Hampden, his wife. He was first cousin to the celebrated patriot John Hampden. He was born on the gth of March 1606, and baptized in the parish church of Amersham. Early in his childhood his father sold his house

at Coleshill and migrated to Beaconsfield. Of Waller's early education all we know is his own account that he " was bred under several ill, dull and ignorant schoolmasters, till he went to Mr Dobson at Wickham, who was a good schoolmaster and had been an Eton scholar." His father died in 1616, and the future poet's mother, a lady of rare force of character, sent him to Eton and to Cambridge. He was admitted a fellow-commoner of King's College on the 22nd of March 1620. He left without a degree, and it is believed that in 1621, at the age of only sixteen, he sat as member for Agmondesham (Amersham) in the last parliament of James I. Clarendon says that Waller was " nursed in parliaments." In that of 1624 he represented Ilchester, and in the first of Charles I. Chipping Wycombe. The first act by which Waller distinguished himself, however, was his surreptitious marriage with a wealthy ward of the Court of Aldermen, in 1631. He was brought before the Star Chamber for this offence, and heavily fined. But his own fortune was large, and all his life Waller was a wealthy man. After bearing him a son and a daughter at Beaconsfield, Mrs Waller died in 1634. It was about this time that the poet was elected into Falkland's " Club."

It is supposed that about 1635 he met Lady Dorothy Sidney, eldest daughter of the earl of Leicester, who was then eighteen years of age. He formed a romantic passion for this girl, whom he celebrated under the name of Sacharissa. She rejected him, and married Lord Spencer in 1639. Disappointment, it is said, rendered Waller for a time insane, but this may well be doubted. He wrote, at all events, a long, graceful and eminently sober letter on the occasion of the wedding to the bride's sister. In 1640 Waller was once more M.P. for Amersham, and marie certain speeches which attracted wide attention; later, in the Long Parliament, he represented St Ives. Waller had hitherto supported the party of Pym, but he now left him for the group of Falkland and Hyde. His speeches were much admired, and were separately printed; they are academic ■ exercises very carefully prepared. Clarendon says that Waller spoke " upon all occasions with great sharpness and freedom." An extraordinary and obscure conspiracy against Parliament, in favour of the king, which is known as "

Waller's Plot," occupied the spring of 1643, but on the 30th of May he and his friends were arrested. In the terror of discovery, Waller was accused of displaying a very mean poltroonery, and of confessing " whatever he had said, heard, thought or seen, and all that he knew . . or suspected of others." He certainly cut a poor figure by the side of those of his companions who died for their opinions. Waller was called before the bar of the House in July, and made an abject speech of recantation. His life was spared and he was committed to the Tower, whence, on paying a fine of £10,000, he was released and banished the realm in November 1643. He married a second wife, Mary Bracey of Thame, and went over to Calais; afterwards taking up his residence at Rouen. In 1645 the Poems of Waller were first published in London, in three different editions; there has been much discussion of the order and respective authority of these issues, but nothing is decidedly known. Many of the lyrics were already set to music by Henry Lawes. In 1646 Waller travelled with Evelyn in Switzerland and Italy. During the worst period of the exile Waller managed to " keep a table " for the Royalists in Paris, although in order to do so he was obliged to sell his wife's jewels. At the close of 1651 the House of Commons revoked Waller's sentence of banishment, and he was allowed to return to Beaconsfield, where he lived very quietly until the Restoration.

In 1655 he published A Panegyric to my Lord Protector, and was made a Commissioner for Trade a month or two later. He followed this up, in 1660, by a poem To the King, upon his Majesty's Happy Return. Being challenged by Charles II. to explain why this latter piece was inferior to the eulogy of Crom- well, the poet smartly replied, " Sir, we poets never succeed so well in writing truth as in fiction." He entered the House of Commons again in 1661, as M.P. for Hastings, and Burnet has recorded that for the next quarter of a century " it was no House if Waller was not there." His sympathies were tolerant and kindly, and he constantly defended the Nonconformists. One

famous speech of Waller's was: " Let us look to our Govern- ment, fleet and trade, 'tis the best advice the oldest Parliament man among you can give you, and so God bless you." After the death of his second wife, in 1677, Waller retired to his house called Hall Barn at Beaconsfield, and though he returned to London, he became more and more attached to the retirement of his woods, " where, " he said, " he found the trees as bare and withered as himself." In 1661 he had published his poem, St James' Park; in 1664 he had collected his poetical works; in 1666 appeared his Instructions to a Painter; and in 1685 his Divine Poems. The final

collection of his works is dated 16S6, but there were further posthumous additions made in 1690. Waller bought a cottage at Coleshill, where he was born, meaning to die there; " a stag," he said, " when he is hunted, and near spent, always returns home." He actually died, however, at Hall Barn, with his children and his grandchildren about him, on the 21st of October 1687, and was buried in woollen (in spite of his expressed wish), in the churchyard of Beaconsfield.

Waller's lyrics were at one time admired to excess, but with the exception of " Go, lovely Rose " and one or two others, they have greatly lost their charm. He was almost destitute of imaginative invention, and his fancy was plain and trite. But he resolutely placed himself in the forefront of reaction against the violence and " conceit " into which the baser kind of English poetry was descending. A great deal of discussion, some of it absurdly violent in tone, has been expended on the question how far Waller was or was not the pioneer in introducing the classical couplet into English verse. It is, of course, obvious that Waller could not " introduce " what had been invented, and admirably exemplified, by Chancer. But those who have pointed to smooth distiebs employed by poets earlier than Waller have not given sufficient attention to the fact (exaggerated, doubtless, by critics arguing in the opposite camp) that it was he who earliest made writing in the serried couplet the habit and the fashion. Waller was writing in the regular heroic measure, afterwards carried to so high a perfection by Dryden and Pope, as early as 1623 (if not, as has been supposed, even in 1621).

The only critical edition of Waller's Poetical Works is that edited, with acareful biography, by G. Thorn-Drury, in 1893. (E. G.)

WALLER, LEWIS (i860-), English actor, was born in Spain, his father being a civil engineer. He first appeared on the London stage in 1S83, at Toole's, and for some years added to his reputation as a capable actor in London and the provinces. He came more particularly to the front by a fine performance as Buckingham in The Three Musketeers under Mr Beerbohm Tree's management at His Majesty's in 1895, and soon afterwards organized a company of his own, first at the Haymarket and afterwards at the Shaftesbury, Imperial, Apollo and other theatres. His fine voice and vigorous acting were well suited in his memorable production of Henry V., and he had a great success with Monsieur Beaucaire and similar plays. His wife, Mrs Lewis Waller (Florence West), also became well known as a powerful and accomplished actress.

WALLER, SIR WILLIAM (c. 1597-1668), English soldier, was the son of Sir Thomas Waller, lieutenant of Dover, and was born about 1597. He was educated at Magdalen Hall, Oxford, and served in the Venetian army and

in the Thirty Years' War. He was knighted in 1622 after taking part in Vere's expedition to the Palatinate. Little is known of his life up to 1640, when he became member of parliament for Andover. Being a strict Presbyterian hy religion, and a member of the opposition in politics, he naturally threw himself with the greatest ardour into the cause of the parliament when the Civil War broke out in 1642. He was at once made a colonel, and conducted to a speedy and successful issue the siege of Portsmouth in September; and later in the year captured Farnham, Winchester and other places in the south-west. At the beginning of 1643 Waller was made a major-general and placed in charge of operations in the region of Gloucester and Bristol (see Great Rebellion), and he concluded his first campaign with a victory at Highnam and the capture of Hereford. He was then called upon to oppose the

advance of Sir Ralph Hopton and the Royalist western army, and though more or less defeated in the hard-fought battle of Lansdown (near Bath) he shut up the enemy in Devizes. How- ever, Hopton and a relieving force from Oxford inflicted a crush- ing defeat upon Waller's army at Roundway Down. Hopton was Waller's intimate personal friend, and some correspondence passed between the opposing generals, a quotation from which (Gardiner, Civil War, i. 168) is given as illustrative of " the temper in which the nobler spirits on either side had entered on the war." " That great God," wrote Waller, " who is the searcher of my heart knows with what a sad sense I go upon this service, and with what a perfect hatred I detest this war without an enemy; but I look upon it as sent from God . . . God. . . in his good time send us the blessing of peace and in the meantime assist us to receive it! W r e are both upon the stage and must act such parts as are assigned us in this tragedy, let us do it in a way of honour and without personal animosities."

The destruction of his army at Roundway scarcely affected Waller's military reputation, many reproaching Essex, the commander-in-chief, for allowing the Oxford royalists to turn against Waller. The Londoners, who had called him " William the Conqueror," recognized his skill and energy so far as willingly to raise a new army for him in London and the south-eastern counties. But from this point Waller's career is one of gradual disillusionment. His new forces were distinctively local, and, like other local troops on both sides, resented long marches and hard work far from, their own counties. Only at moments of imminent danger could they be trusted to do their duty. At ordinary times, e.g. at the first siege of Basing House, they mutinied in face of the enemy, deserted and even marched home in formed bodies under their own officers, and their gallantry at critical moments, such as the surprise of Alton in December 1643 and the recapture of Arundel in January 1644, but partially redeemed their general bad conduct. Waller himself, a general of the highest skill, — " the best

shifter and chooser of ground " on either side, — was, like Turenne, at Ms best at the head of a small and highly-disciplined regular army. Only a Condc or a Cromwell could have enforced discipline and soldierly spirit in such men, ill-clad and unpaid as they were, and the only military quality lacking to Waller was precisely this supreme personal magnetism. In these circumstances affairs went from bad to worse. Though successful in stopping Hopton's second advance atCheriton (March i644),hewasdefeatedby Charlesl.inthewar of manoeuvre which ended with the action of Cropredy Bridge (June), and in the second battle of Newbury in October his tactical success at the village of Specn led to nothing. His last expeditions were made into the west for the relief of Taunton, and in these he had Cromwell as his lieutenant-general. By this time the confusion in all the armed forces of the parliament had reached such a height that reforms were at last taken in hand. The original suggestion of the celebrated " New Model " army came from Waller, who wrote to the Committee of Both King- doms (July 2, 1644) to the effect that " an army compounded of these men will never go through with your service, and till you have an army merely your own that you may command, it is in a manner impossible to do anything of importance." Simultaneously with the New Model came the Self-Denying Ordinance, which required all members of parliament to lay down their military commands. Waller did so gladly— the more as he had already requested to be relieved — and his active military career came to an end. But the events of 1 643-1 644 had done more than embitter him. They had combined with his Pres- byterianism to make him intolerant of all that he conceived to be licence in church, state or army, and after he ceased to exercise command himself he was constantly engaged, in and out of parliament, in opposing the Independents and the army politicians, and supporting the cause of his own religious system, and later that of the Presbyterian -Royalist opposition to the Commonwealth and Protectorate regime. He was several times imprisoned between 1648 and 1659. In the latter year he was active in promoting the final negotiations for the restoration of Charles II. and reappeared in the House of Commons. He sat

in the Convention Parliament, but soon retired from political life, and he died on the 19th of September 1668.

See Wood's Athenae Oxonienses, ed. Bliss, iii. 812 ; and two partial autobiographies, " Recollections by General Sir William Waller " (printed in The Poetry of Anna Matilda, 1788), and Vindication of the Character, &c. (1797).

Sir William Waller's cousin, Sir Hardress Waller {c. 1604- 1666) was also a parliamentarian of note. Knighted by Charles I. in 1629, he gained military experience in serving against the rebels in Ireland; then from 1645 to the conclusion of the Civil War he was in England commanding a regiment in the new model army. He was Colonel Pride's chief assistant when the latter " purged " the House of Commons in 1648, and he was one of the king's judges and one of those who signed the death warrant. During the next few years Waller served in Ireland, finally returning to England in 1660. After the restoration he fled to France, but soon surrendered himself to the authorities as a regicide, his life being spared owing to the efforts of his friends. He was, however, kept in prison and was still a captive when he died.

See M. Noble, Lives of the Regicides (1798). WALLINGFORD, a township of New Haven county, Con- necticut, U.S.A., S.W. of the centre of the state, in the valley of the Quinnipiac river. It contains the villages of East Walling- ford, Tracy and Yalesville, and the borough of Wallingford. Pop. of the township (1900) 9001, (iqro) 11,155; of the borough (1900) 6737, of whom 1 796 were foreign-born and 2 1 were negroes, (tgio) 8690. Area of the township, about 38 sq. m. The borough is 12 m. N.E. of New Haven, on a hill about 1 J m. long, and is served by the New York, New Haven & Hartford railway (which has stations also at East Wallingford and Yalesville) and by an interurban electric line connecting with Meriden and New Haven. The borough has a public library (1881), a Masonic Home, the Gaylord Farm Sanatorium of the New Haven County Anti-Tuberculosis Association, the Phelps School (for girls) and the Choate School (1896, for boys). Among the manufactures of the borough are sterling silver articles, plated and britannia ware, brass ware, rubber goods, cutlery and edge tools. The township of Wallingford was settled in 1670. At a meeting held in January 1766, in protest against the Stamp Act, it was declared, that " Whereas it appears from ancient Records and other Memorials of Incontestable Validity that our Ancestors with a great Sum Purchased said township, with great Peril possessed and Defended the Same, we are Born free (having never been in bondage to any), an inheritance of Inestimable Value," and a penalty of 20s. was imposed upon any one who should introduce or use stamped paper or parchment. During the War of Independence patriotic sentiment here was strong and Loyalists were sometimes exiled to Wallingford, where they could have no effective influence. The borough of Wallingford was incorporated in 1853 and re-incorporated in 1868. From 1851 to 1880 there was a communistic settlement, a branch of the Oneida Community, here; its property was bought by the Masonic Order and made into the Masonic Home.

See C. H. S. Davis's History of Wallingford (Meriden, 1870). WALLINGFORD, a market town and municipal borough in the Abingdon

parliamentary division of Berkshire, England, 51 m. W. by N. of London by the Great Western railway. Pop. (1901) 2808. It is pleasantly situated in the flat valley of the Thames, on the west (right) bank. The railway station is the terminus of a branch line from Cholsey . Of the churches only St Leonard's, retaining some Norman work and rebuilt approximately on its original plan, with an eastern apse, is of interest. The ancient castle has left only its mound and earthworks, and other works may be traced surrounding the tosvn on the landward side. The town hall, raised on arches, dates from 1670. The large grammar school was founded in 1659. The trade of the town is principally agricultural; and malting is carried on. The borough is under a mayor, 4 aldermen and r 2 councillors. Area, 380 acres.

The site of Wallingford (Warengcford. Walynford, Walyngfortk) was occupied by a Romano-British settlement, though the im- posing earthworks are of uncertain date — they may be of post- Roman British origin. Wallingford was a fortified town before

the Conquest, and, though burned by Sweyn in 1006, was much the largest and most important borough in Berkshire at the time of the Domesday Survey. The new castle was so extensive that eight houses had been demolished to make room for it; the market was already in existence, and perhaps also the gild merchant, which in a charter of Henry II. is said to date back to the reign of the Confessor. In the reign of Henry I. the be- ginning of decay is marked by the inability of the town " through poverty " to pay its aid. It is said to have suffered greatly from the Black Death, and its decline was accelerated by the building, in the early 15th century, of two bridges near Abingdon, which diverted the main road between London and Gloucester from Wallingford. Periodical reductions in the fee farm show the gradual impoverishment of the town, and in 1636 its assessment for ship-money was only £20, while that of Reading was £220. Wallingford was a royal borough held in the reign of Henry III. by Richard, king of the Romans. Edward III. granted the fee farm to the Black Prince and his successors in the duchy of Cornwall. The earliest charters were given by Henry I. and Henry II., the latter confirming the ancient privileges of the borough, which were to be held as the citizens of Winchester held theirs, and granting to the burgesses freedom from toll through- out his dominions. These charters were confirmed and enlarged by Henry III. in 1267 and by Philip and Mary in 1557-1558. In 1648 the corporation consisted of a mayor, three aldermen, a chamberlain and sixteen burgesses. This constitution was remodelled in 1650 by a charter from Cromwell, but the governing charter until the passing of the Municipal Corporations Act of r835 was that given by Charles II. in 1663, incorporating the town under the style of a mayor, recorder, town clerk, six aldermen, two burgesses, a chamberlain and eighteen assistants of the better sort of the inhabitants. In

1571 Elizabeth issued letters patent empowering the burgesses of Wallingford to take toll of all carts passing over their bridge, in order to provide for its repair and maintenance. Wallingford sent two members to parliament from 1295 to 1832, and one from 1832 to 1885, when its representation was merged in that of the county: before 1832 the franchise was vested in the inhabitants paying scot and lot. The empress Maud took refuge at Wallingford after her escape from Oxford Castle (1142), and here peace was made between her and Stephen (1 r 53) . Wallingford Castle was one of the last fort- resses to hold out for Charles I., and during the Commonwealth it was demolished by order of the government. In 1 205 the king commanded the sheriff of Oxford to cause a fair to be held at Wallingford at Whitsun for four days, to be continued for three years. In 1227 Swyncombe fair was transferred from theieastof St Botolph to the feast of St Mark in order not to interfere with Wallingford fair. Fairs on the days of St Nicholas and of St John the Baptist were granted by Henry VII. in 1500, and the charter of 1663 provided for two markets and four annual fairs. All the latter have fallen into disuse except the Michaelmas fair, which is principally for hiring servants. Duringthei8thcenturythe town was fairly prosperous and had a good trade in grain and malt.

See Victoria County History, Berks; T. K. Hedges, The History of Wallingford (London, 1881).

WALLIS, JOHN (1616-1703), English mathematician, logician and grammarian, was born on the 23rd of November 1616 at Ashford, in Kent, of which parish his father, Rev. John Wallis (1567-1622), was incumbent. After being at school at Ashford, Tenterden and Felsted, and being instructed in Latin, Greek and Hebrew, he was in 1632 sent to Emmanuel College, Cambridge, and afterwards was chosen fellow of Queens' College. Having been admitted to holy orders, he left the university in 1641 to act as chaplain to Sir William Darley, and in the following year accepted a similar appointment from the widow of Sir Horatio Vere. It was about this period that he displayed surprising talents in deciphering the intercepted letters and papers of the Royalists. His adherence to the parliamentary party was in 1643 rewarded by the living of St Gabriel, Fen- church Street, London. In 1644 he was appointed one of the scribes or secretaries of the Assembly of Divines at Westminster. During the same year he married Susanna Glyde, and thus

vacated his fellowship; but the death of his mother had left bim in possession of a handsome fortune. In 1645 he attended those scientific

meetings which led to the establishment of the Royal Society. When the Independents obtained the superiority Wallis adhered to the Solemn League and Covenant. The living of St. Gabriel he exchanged for that of St Martin, Iron- monger Lane; and, as rector of that parish, he in 1648 sub- scribed the Remonstrance against putting Charles I. to death. Notwithstanding this act of opposition, he was in June 1649 appointed Savilian professor of geometry at Oxford. In 1654 he there took the degree of D.D., and four years later succeeded Gerard Langbaine (1609-1658) as keeper of the archives. After the restoration he was named one of the king's chaplains in ordinary. While complying with the terms of the Act of Uni- formity, Wallis seems always 'to have retained moderate and rational notions of ecclesiastical polity. He died at Oxford on the 28th of October 1703.

The works of Wallis are numerous, and relate to a multiplicity of subjects. His hutitutio logicae, published in 1687, was very popular, and in his Grammaiica linguae Anglicanae we find indica- tions of an acute and philosophic intellect. The mathematical works are published, some of them in a small 4to volume (Oxford, 1657) and a complete collection in three thick folio volumes (Oxford, 1693-1699). The third volume includes, however, some theo- logical treatises, and the first part of it is occupied with editions of treatises on harmonics and other works of Greek geometers, some of them first editions from the MSS M and in general with Latin versions and notes (Ptolemy, Porphyrius, Briennius, Archimedes, Eutocius, Aristarchus and Pappus). The second and third volumes include also his correspondence with his contemporaries; and there is a tract on trigonometry by Caswell. Excluding all these, the mathe- matical works contained in the first and second volumes occupy ahout 1S00 pages. The titles in the order adopted, but with date of publication, are as follows: " Oratio inauguralis," on his appointment (1649) as Savilian professor (1657); " Ma thesis uni- versalis, seu opus arithmeticum philologice et mathematice tradi- tum, arithmeticam numerosam et speciosam aliaque continent " (1657); " Adversus Meibomium, de proportionibus dialogus " (1657); " De sectionibus conicis nova methodo cxpositis " (1655): " Arithmetica infmitorum, sive nova methodus inquirendi in curvilineoruin quadraturam aliaque difficiliora matheseos pro- blemata " (1655); " Eclipsis Solaris observatio Gxonii habita 2 Aug. 1654" (1655); " Traetatus duo, prior de cycloide, posterior de cissoide et de curvarum turn linearum eWvvoti turn super- ficicrum ir\c.Tvcrn& " (1659); " Mcchanica, sive de motu traetatus geometric us " (three parts, 1669-1670-1671) ; " De algebra traetatus historieus et practicus, ejusdem originem et progressus varios ostendens " (English, 1685); " De combinationibus alterna- tionibus et partibus aliquotis traetatus " (English, 1685) " De sectionibus angularibus traetatus" (English, 1685); " De angulo contactus et semicirculi traetatus" (1656); "Ejusdem traetatus defensio " (1685); " De

postulato quinto. et quinta definitione, lib. VI. Euclidis, disccptatio geometric " (? 1663); " cuno- cuneus, seu corpus partim conum partim cuneum representans geometrice consideratum " (English, 1685); " De gravitate et gravitatione disquisitio geometrica " (1662; English, 1674); " De aestu maris hypothesis nova " (1666-1669).

The Aritknietica inftnitorum relates chiefly to the quadrature of curves by the so-called method of indivisibles established by Bona- ventura Cavalieri in 1629 (see Infinitesimal Calculus). He extended the " law of continuity " as stated by Johannes Kepler; regarded the denominators of fractions as powers with negative exponents; and deduced from the quadrature of the parabola $y = x m$ *, where m is a positive integer, the area of the curves when m is negative or fractional. He attempted the quadrature of the circle by inter- polation, and arrived at the remarkable expression known as Wallis* s Theorem (see Circle, Squaring of). In the same work Wallis obtained an expression for the length of the element of a curve, which reduced the problem of rectification to that of quadrature.*

The Malhesis universalis, a more elementary work, contains copious dissertations on fundamental points of algebra, arithmetic and geometry, and critical remarks.

The De algebra traetatus contains (chapters lxvi.-lxix.) the idea of the interpretation of imaginary quantities in geometry. This is given somewhat as follows: the distance represented by the square root of a negative quantity cannot be measured in the line backwards or forwards, but can be measured in the same plane above the line, or (as appears elsewhere) at right angles to the line either in the plane, or in the plane at right angles thereto. Con sidered as a history of algebra, this work is strongly objected to by Jean Etienne Montucla on the ground of its unfairness as against the early Italian algebraists and also Franciscus Vista and Ren6 Descartes and in favour of Harriot; but Augustus De Morgan, while admitting this, attributes to it considerable merit. The symbol for infinity, 00, was invented by him.

The two treatises on the cycloid and on the cissoid, &c., and the Mechanica contain many results which were then new and valuable. The latter work contains elaborate investigations in regard to the centre of gravity, and it is remarkable also for the employment of the principle of virtual velocities.

Among the letters in volume Hi., we have one to the editor of the Acta heipsica, giving the decipherment of two letters in secret characters. The ciphers are different, but on the same principle: the characters in each are either single digits or combinations of two or three digits, standing some of them for letters, others for syllables or words, — the number of distinct,

characters which had to be deciphered being thus very considerable.

For the prolonged conflict between Hobbes and Wallis, see Hobbes, Thomas.

"WALLIS ARCHIPELAGO, Uvea, or Uea, a gioup of islands in the Pacific Ocean, N.E. of Fiji, about 13 S., 176° W., with a land area of 40 sq. in., belonging to France. It was placed under the French protectorate on the 5th of April 1887, and connected for administrative purposes with New Caledonia by decree of the 27th of November 1S88, There is a French Resident in the islands, which are connected by a regular service with Noumea, New Caledonia. The principal islands are Uvea, of volcanic formation and surrounded with coral, and Nukuatea. The islands were discovered by Samuel Wallis in 1767, and it was a missionary, Father Bataillon. who in 1837 first brought the influence of France to bear on the natives. These, about 4500 in number, are of Polynesian race, gentle and industrious. The trade of the islands is mainly with Samoa, whence cottons and iron goods are imported, and to which copra and roots are exported. The Home Islands (Fotuna and Alofa), S.W. of the Wallis Islands, were discovered by Jacob Lemaire and Willem Cornells Schouten in 1616, and placed under the French pro- tectorate by decree of the 16th of February 1888. They have 1 500 inhabitants.

WALLCN, HENRI ALEXANDRE (181 2-1904), French historian and statesman, was born at Valenciennes on the 23rd of December 1812. Devoting himself to a literary career, he became in 1840 professor at the £cote Normale Superieure under the patronage of Guizot, whom he succeeded as professor at the Faculte des Lettres in 1846. His works on slavery in the French colonies (1847) and on slavery in antiquity (1848; new edition in 3 vols., 1S79) led to his being placed, after the Revolution of 1848; on a commission for the regulation of labour in the French colonial possessions, and in November 1849 he was elected to the Legislative Assembly by the department of the Nord. He resigned in 1850, disapproving of the measure for the restriction of the suffrage adopted by the majority. In the same year he was elected a member of the Academie des In- scriptions, of which he became perpetual secretary in 1873. Under the empire he withdrew altogether from political life, and occupied himself entirely with his duties as a professor of history and with historical writings, the most original of which is a biography, Richard II, episode de la rivaliti de la France et de I Angleterre (2 vols., 1864). Although remaining a re- publican, he exhibited decided clerical leanings in his Jeanne d'Arc (2 vols., i860; 2nd ed,, 1875); La Vie de Notre Seigneur J6sus (1865) — a reply to the Vie de Jesus oilL. Renan; and Sa int Louis et son temps (1871; 4th ed., 1892), which still ranks among haglographical works. Returning to politics after the Franco- German War,

Wallon was re-elected by the department of the Nord in 1871, took an active part in the proceedings of the Assembly, and finally immortalized himself by carrying his proposition for the establishment of the Republic with a presi- dent elected for seven years, and then eligible for re-election, which, after violent debates, was adopted by the Assembly on the 30th of January 1875. " Ma proposition, 5 ' he declared, " ne prodame pas la Republique, ellc la fait." Upon the defini- tive establishment of the Republic, Wallon became Minister of Public Instruction, and effected many useful reforms, but his views were too conservative for the majority of the Assembly, and he retired in May 1876. He had been chosen a life senator in December 1875. Returning to his historical studies, Wallon produced four works of great importance, though less from his part in them as author than from the documents which accompanied them: La Terr cut (1873); Histoire du tribunal

rivolulionnaire de Paris avec le journal de ses actes (6 vols., 1880-1882); La Revolution du 31 mai et le fediralisme en 17Q3 (2 vols., 1886); Les Ripresentants du peuple en mission et la justice rivolulionnaire dans les dtpartements (5 vols., 1880-1890). Besides these he published a number of articles in the Journal des savants; for many years he wrote the history of the Aca- demie des Inscriptions in the collection of Memoirs of this Academy, and he composed obituary notices of his colleagues, which were inserted in the Bulletin. He died at Paris on the 13th of November 1904.

WALLOONS (Wallons, from a common Teut. word meaning "foreign/' cf. Ger. welsch, Du. waalsch, Eng. Welsh), a people akin to the French, but forming a separate branch of the Romance race, inhabiting the Belgian provinces of Hainaut, Namur, Liege, parts of Luxemburg and southern Brabant, parts ol the French departments of Nord and Ardennes, and a few villages in the neighbourhood of Malmedy in Rhenish Prussia. The Walloons are descended from the ancient Gallic Belgi, with an admixture of Roman elements. They are in general charac- terized by greater vivacity and adaptability than their Flemish neighbours, while they excel their French neighbours in en- durance and industry. Their numbers are reckoned in Belgium at between 2,000,000 and 3,000,000. The Walloon dialect is a distinct branch of the Romance languages, with some ad- mixture of Flemish and Low German. It was used as a literary language until the 15th century, when it began to be assimilated to French, by which it was ultimately superseded.

Grandgagnage, De Vorigine des Wallons (Liege, 1852), Vocabulaire des

noms wallons, &c. (2nd ed., 1857), and Diet, etymol. de la langue •wallonne (t. i. and h\, 1845ˆ1851 ; t. iii., byScheler, 1880); J. Dejardin, Diet, des "spots" on proverbes wallons (18G3); Van der Kindere, Recherckes surf eiknologie de la Belgzque (Brussels, 1872) ; Demarteau, Le Flamand, le Walton, &c. (Liege, 1889); M. Wilmotte, Le Walton, Histoire et litterature (Brussels, 1893); Monseur, Le Folklore wallon (Brussels, 1892J. [X.]

Walloon Literature. — In medieval times various local documents in prose and verse were written by inhabitants of Liege and its diocese in a dialect of French which contained many Walloon words and phrases. It is supposed that as early as the 12th century the idiom of the people may have been used in songs which are now lost, unless echoes of them are preserved in the curious Noels, partly in French, partly in patois, which were orally collected by M. Doutrepont and published in 1888. Several Flemish works in old French, containing Walloon expressions, and in particular the so-called Palme moral of the 13th century, have been claimed as precursors of a local literature, but they are really to be considered as composed in French with a certain admixture of Liegeois phrases. The earliest existing specimen of pure Walloon literature is the Ode in praise of Liege, dated 1620, and attributed to Mathias Navaeus; this was first printed in 1857 in the transactions of the Societe Liegeoise. Except a few very flat popular songs, there is nothing more until the end of the 1 7th century, when we find Lis Aiwes di Tongue (The Waters of Tongres), an amusing lyrical satire on the pretensions of that town to be considered a Roman spa. Fifty years later the opening of a popular theatre at Liege led to the creation of a class of farces, written in Walloon; of these Li Voege di Chaiid- fontaine (The Journey to Chaudfontaine) (1757), by Jean Noel Hamal, has considerable humour and vigour in its rhymed dialogue. Other successful comedies were Li Fiesse di Houte sH plou, Li Ligcois igagi, and, above all, Lis Hypocondes, the liveliest specimen of old Walloon literature which has survived. This diverting farce describes the adventures of a party of mock- invalids, who pursue a series of intrigues at a spa. This class of dramatic literature closed with Li Malignant in 1789. In these early songs and plays the Walloon humour is displayed with great crudity; anything like sentiment or elevated feeling is unknown.

The Revolution of 1789 inspired numerous Liegeois patriots with popular songs; of these pasqueyes, as they are styled, Albin Body collected more than 250, but they are almost entirely devoid of literary merit. Under their new government, Liege and Namur allowed the national patois to withdraw into the

background, and it was not until the middle of the 19th century that Walloon literature began seriously to be cultivated. Its only expression, for

a long time, was in lyrical poetry in the form of satires and the humorous songs, called pasqueyes and crdmignons. The earliest of the modern Walloon writers was Charles Nicolas Simonon (1774-1847), who celebrated in Li Cdparey.ihe ancient clock-tower of the cathedral of St Lambert, an object of reverence to the inhabitants of Liege. His poems were collected in 1845. Henri Joseph Forir (1784-1862) was the first president of the Societe Liegeoise, and one of the protagonists of Walloon litera- ture. He published a valuable dictionary of the patois. The Cure C. E. E. Du Vivier de Streel (1799-1863) was the author of Li Panialon trawi (The Torn Trowsers), a pasqueye which still enjoys an enormous popularity among the Walloon population. The first Walloon writer of high merit, however, was Nicolas Defrecheux (1825-1874), who is the most distinguished poet whom the patois has hitherto produced. His Leytz-m' plorer (Let me cry), when it appeared in 1854, made a wide sensation, and was the earliest expression of what is serious and tender in the Walloon nature. His Chansons wallonnes appeared in i860. Defrecheux stands almost alone among the Walloon poets as an artist and not merely an improvisatore. His poetical works were posthumously collected in 1877.

For many years, in spite of the efforts of such scholars as MM. Alphonse Le Roy and H. Gaidoz, a taste for Walloon literature remained strictly circumscribed, and was limited to a small circle of enthusiasts in Li6ge and Namur. In 1872 a literary club was formed, entitled the Caveau Liegeois, and this gave a very great stimulus to the cultivation of the Walloon letters. The national drama, which had been entirely neglected for more than a century, once more was called into existence through the exertions of the theatrical club, called Les Wallons. The comedies of A. M, J. Delchef (b. 1835) were acted with success, and led the way for the most important patois dramatist that Liege has produced, fidouard Remouchamps (b. 1836), who is the author of Tdti VPerriqui (1884), perhaps the most enter- taining farce in Walloon, and certainly the most popular. Remou- champs was for thirty years a prolific writer of short pieces fcr the stage, sentimental and farcical. After the success of this play, according to an enthusiastic chronicler, " the writers of Wallonia became legion." Their style, however, was not greatly varied, and they have mainly confined themselves to songs, satirical lampoons and farces. The founder of the Societe Liegeoise was J. F. E. Bailleux (1817-1860), to whom the revival of an interest in early Walloon literature is mainly due; in con- junction with J. V. F. J. Dehin (1809-1871) he published a translation of Lafontaine into patois. Among writers of the younger generation, special credit must be given to Henri Simon (b. 1856), for his humoristic tales and sketches; to Julien Delaite (b. 1868), for his amusing lyrics; and to Zephir Henin (b. 1866), for his prose, prose being much rarer than verse in Walloon. It would be possible to add very largely to this list, but the most

notable names have been mentioned. A certain monotonous fluency is the fault of Walloon literature, which repeats its effects too constantly, and is confined within too narrow limits. A few writers, among whom Isidore Dory (b. 1833) is prominent, have endeavoured to enlarge the scope of the patois writers, but their suggestions have met with little response. When the Walloon writer desires to impart serious information or deep feeling, he resorts to the use of French. The pasqueye, which is the char- acteristic form of Walloon verse, is a kind of semi-comic and extremely familiar lyric, humorous and extravagant, a survival of the influence of Beranger on taste three-quarters of a century ago; the facility with which these songs are composed is betrayed by the enormous number of them which exist in Liege and Namur. The difficulties of Walloon literature are increased by the unfixed character of its phonetic and often extravagant orthography.

Authorities. — H. Gaidoz, La Societe lUgeoisedelitteraturewallonne (Liege, 1890); Alphonse Le Roy, LittSrature wallonne (Brussels, 1875); Charles Defrecheux, Joseph Defrecheux et Charles Gothier, ArJkologie des poetes wallons (Liege, 1895); Maurice Wilmotte, Le Wallon (Brussels, 1894). (E.G.)

WALLOP, SIR HENRY (c. 1540-1599), English statesman, was the eldest son of Sir Oliver Wallop (d. 1566), of Farleigh Wallop, Hampshire. Having inherited the estates of his father and of his uncle. Sir John Wallop (g.v.), he was knighted in 1569 and was chosen member of parliament for Southampton in 1572. His connexion with Ireland, where the quarter part of his public life was passed, began in 1579, when he was appointed vice-treasurer of that country; this position was a very thankless and difficult one, and Wallop appears to have undertaken it very unwillingly. However, he reached Dublin and was soon immersed in the troubles caused by the rebellion of Gerald Fitzgerald, earl of Desmond, finding, in his own words, it was " easier to talk at home of Irish wars than to be in them." In July 1582 he and Adam Loftus, archbishop of Dublin, were appointed lords justices, and they were responsible for the government of Ireland for just two years, after which they were succeeded by Sir John Perrot. Sir Henry continued to fill the office of vice-treasurer, and at Enniscorthy, where he had secured a lease of lands, he set up a colony of Englishmen and opened up a trade with Madeira. As a member of the Irish council he quarrelled with Perrot, and then from 1589 to 1595 he was in England, entertaining the queen at Farleigh Wallop in 1591. Having returned to Ireland he was sent to Dundalk to attempt to make peace with Hugh O'Neill, earl of Tyrone, but this proved a vain errand. At length, after many entreaties, he

was allowed to resign the treasurership, but before he could arrange to leave Ireland he died on the 14th of April r599.

Wallop's eldest son, Sir Henry Wallop (1 568-1642), who acted as his father's deputy inlreland, left an only son, Robert Wallop (1601-1667). A member of parliament for nearly forty years, and a supporter of the parliamentary party, Robert was one of the judges of Charles I., although he did not sign the death warrant. He was active under the Commonwealth, being a member of nearly all the councils of state. At the restoration he was deprived of his estates and was imprisoned, and he died in the Tower of London on the 19th of November r667. Robert's son Henry (d. 1673) was the grandfather of John Wallop, rst earl of Portsmouth.

WALLOP, SIR JOHN (c. r490-i55r), English soldier and diplomatist, belonged to an old Hampshire family. Adopting the profession of arms, he commanded ships which took part in the war between England and France in r5i3 and 1514; later he served the king of Portugal against the Moors, and then he fought for his own sovereign in Ireland and in France. In 1526 Wallop began his diplomatic career, being sent on an errand to Germany by Henry VIII., and from 1532 to r54r he passed much of his time in Paris and elsewhere in France as the repre- sentative of the English king. He filled several other public positions, including that of lieutenant of Calais, before January 1 541, when he was suddenly arrested on a charge of treason; his offence, however, was not serious and in the same year he was made captain of Guines. In 1 543 he led a small force to help the emperor Charles V. in his invasion of France, and he remained at his post at Guines until his death there on the 13th of July

1551.

WALLQVIST, OLAF (1755-1800), Swedish statesman and ecclesiastic, was ordained in 1776, became doctor of philosophy in 1779, court preacher to Queen Louisa Ulrica in r78o, and bishop of Vexio in 1787. He attracted the attention of Gustavus III. by his eloquent preaching at the fashionable St Clara church at Stockholm. Gustavus at once took the young priest by the hand, appointed him, at twenty-five, one of his chaplains; made him a canon before he was thirty and a bishop at thirty-two,, and finally placed him at the head of the newly appointed com- mission for reforming the ecclesiastical administration of the country. Thus at thirty-four Wallqvist had nothing more to hope for but the primacy, which would infallibly have been his also had the archbishop died during the king's lifetime. Wall- qvist was, however, much more of a politician than a churchman. His knowledge of human nature, inexhaustible energy, dauntless self-confidence and diplomatic finesse made him indispensable to Gustavus III. His seductive manners too often won over

those whom his commanding eloquence failed to convince. His political career began during the mutinous riksdag of 1786, when he came boldly forward as one of the royalist leaders. But it was at the stormy riksdag of 1789 that Wallqvist put forth all his powers. The retirement of the timid primate left him without an equal in the Estate of Clergy, and it was very largely due to his co-operation that the king was able to carry through the famous " Act of Unity and Security " which converted Sweden from a constitutional into a semi-absolute monarchy. Nevertheless, even the combative Wallqvist was appalled when on the 16th of February 1789 the king privately informed him that he meant on the following day soundly to trounce the Estate of Nobles in the presence of the three other estates and bend them to his royal will. A friend of compromise, like most of the men of his cloth, Wallqvist dissuaded all revolutionary expedients at the outset, though when the king proved immovable the bishop materially smoothed the way before him. At this memorable riksdag Wallqvist exhibited, moreover, financial ability of the highest order, and, as president of the ecclesiastical commission, assisted to equilibrate the budget and find the funds necessary for resuming the war with Russia. During the brief riksdag of 1792, as a member of the secret committee, Wallqvist was at the very centre of affairs and rendered the king essential services. Indeed it may be safely said that Gustavus III., during the last six years of his reign, mainly depended upon Wallqvist and his clerical colleague, Carl Gustaf Nordin (?.».), who were patriotic enough to subordinate even their private enmity to the royal service. During the Reuterholm (q.v.) administration, Wallqvist, like the rest of the Gustavians, was kept remote from court. In r8oo he was recalled to the political arena. But his old rivalry with Nordin was resumed at the same time, and when the latter defeated a motion of the bishop's in the Estate of Clergy, at the diet of Norrkiiping, Wallqvist from sheer vexation had a stroke of apoplexy and died the same day (30th of April 1800).

As bishop of Vexio, Wallqvist was remarkable for his extra- ordinary administrative ability. He did much for education and for the poorer clergy, and endowed the library of the gymnasium with 6000 volumes. As an author also he was more than dis- tinguished. His Ecclesiastica Samlingar testify to his skill and diligence as a collector of MSS., while his Minnen och Bref, ed. E. V. Montan (Stockholm, 1878), is one of the most trustworthy and circumstantial documents relating to the Gustavian era of Swedish history.

See R. N Bain, Gustavus III. and his Contemporaries (London, 1895, vol. ii.) ; O. Wallqvists Sjdlfiografiska anteckningar (Upsala, 1850); and J. Rosengren, Om O. Wallqvist sasom Biskop och Eforus (Vexio, 1901). (R.N.B.)

WALLSEND, a municipal borough in the Tyneside parlia- mentary division of Northumberland, England, on the north bank of the Tyne, 3! m. E.N.E. of Newcastle by a branch of the North-Eastern railway. Pop. (i8gr) 11,257; (1901) 20,918. The church of St Peter dates from 1809. There are remains of the church of the Holy Cross in transitional Norman style. At an early period Wallsend was famous for its coal, but the name has now a general application to coal that does not go through a sieve with meshes five-eighths of an inch in size. The colliery, which was opened in 1807, has frequently been the scene of dreadful accidents, notably on the 23rd of October 1821, when 52 lives were lost. There are ship and boat building yards, engineering works, lead and copper smelting works, cement works and brick and tile works. In the river are two pontoon docks and an immense dry dock. Wallsend was incorporated in rgor, and the corporation consists of a mayor, 6 aldermen and r8 councillors. Area, 1202 acres.

Wallsend derives its modern name from its position at the eastern extremity of the Roman Hadrian's Wall; and there was a Roman fort here. It had a quay, of which remains have been discovered, and possessed a magazine of corn and other pro- visions for the supply of the stations in the interior.

WALMER, a watering-place, and member of the Cinque Port of Sandwich, in the St Augustine's parliamentary division of

Kent, England, 2 m. S. of Deal, on the South-Eastern & Chatham railway. Pop. of urban district (1901) 5248. Lower Walmer, the portion most frequented by visitors, extends northward along the coast, so as to be contiguous with Deal. Upper Walmer is a short distance inland, and below it Walmer Castle lies close to the sea. This was a blockhouse built for coast defence by Henry VIII. , but became the official residence of the Lords Warden, of the Cinque Ports, and was in consequence much altered from its original condition. It ceased to be the official residence in 1905, when the prince of Wales (afterwards George V.) was appointed Lord Warden, and the public was given access to those rooms which possess historical associations with former holders of the office, such as the duke of Wellington, who died here in 1852, William Pitt and others. Kingsdown, 1 m. south, is a decayed member of the Cinque Port of Dover.

WALMISLEY, THOMAS ATTWOOD (1814-1856), English musician, was born in London, his father Thomas Forbes Wal- misley (1783-1866) being a well-known organist and composer of church music and glees. Thomas Attwood {g.v.) was his god- father, and the boy was educated in music

under their tuition. He became organist at Trinity College,. Cambridge, in 18.33, and there he soon became prominent by his anthems and other compositions. He not only took the degrees of Mus.Bac. and Mus.Doc., but also graduated at Jesus College as B.A. and M.A. In 1836 he was made professor of music. His Cathedral Music was edited after his death by his father.

WALNUT (Juglans), a botanical genus of about ten species (nat. ord. Juglandaceae) , natives of the temperate regions of the northern hemisphere, extending into Mexico, the West Indies and tropical South America. They are all trees, usually of large size, with alternate stalked, unequally pinnate leaves, and abounding in an aromatic resinous juice. The scars left by the fallen leaves are unusually large and prominent. The buds are not unlike those of the ash; and it frequently happens that in the axils of the leaves, instead of one, several buds may be formed. The utility of this is seen in seasons when the shoot produced from the first bud is killed by frost; then one of the supplementary buds starts into growth, and thus replaces the injured shoot. The flowers are unisexual and monoecious, the numerous males borne in thick catkins proceeding from the side of last year's shoot. The female flowers are solitary or few in number, and borne on short terminal spikes of the present season's growth. In the male flower the receptacle is " con- crescent " or inseparate from the bract in whose axil it originates. The receptacle is, in consequence, extended more or less horizon- tally so that the flowers appear to be placed on the upper surface of horizontally spreading stalks. The perianth consists of five or six oblong greenish lobes, within which is found a tuft, con- sisting of a large number of stamens, each of which has a very short filament and an oblong two-lobed anther bursting longi- tudinally, and surmounted by an oblong lobe, which is the pro- jecting end of the connective. There is usually no trace of ovary in the male flowers, though by exception one may occasionally be formed.

The female flower consists of a cup-like receptacle, inseparate from the ovary, and bearing at its upper part a bract and two hracteoles. From the margin springs a perianth of four short lobes. The one-celled ovary is immersed within the recep- tacular tube, and is surmounted by a short style with two short ribbon-like stigmatic branches. The solitary ovule springs erect from the base of the ovarian cavity. The fruit is a kind of drupe, the fleshy husk of which is the dilated receptacular tube, while the two-valved stone represents the two carpels. The solitary seed has no perisperm or albumen, but has two large and curiously crumpled cotyledons concealing the plumule, the leaves of which, even at this early stage, show traces of pinnae.

The species best known is J. regia, the common walnut, a native of the

mountains of Greece, of Armenia, of Afghanistan and the north-west Himalayas. Traces of the former existence of this or of a very closely allied species are found in the Post- Tertiary deposits of Provence and elsewhere, proving tbe former

much wider extension of the species. At the present day the tree is largely cultivated in most temperate countries for the sake of its timber or for its edible nuts. The timber is specially valued for furniture and cabinet work and for gunstocks, the beauty of its markings rendering it desirable for the first-named purpose, while its strength and elasticity fit it for the second. The leaves and husk of the fruit are resinous and astringent, and are sometimes used medicinally as well as for dyeing pur- poses. A Spiritus Nucis Juglandis is given as an antispasmodic. It doubtless owes its properties to the alcohol which it contains. Sugar is also prepared from the sap in a similar manner to that obtained from the maple. The young fruits are used for pick- ling. When ripe the seeds are much esteemed as a delicacy, while in France much oil of fine quality is extracted from them by pressure. There are several varieties in cultivation, varying in the degree of hardihood, time of ripening, thickness of shell, size and other particulars. In the climate of Great Britain a late variety is preferable, as securing the young shoots against injury from frost, to which otherwise they are very subject. The kernel of the large-fruited variety is of very indifferent quality, but its large shells are made use of by the French as trinket cases.

The walnut is mentioned in the earliest British botanical writings, and is supposed to have been introduced by the Romans. It grows well, and ripens its fruit in the southern and midland counties of England ; but large trees may be seen as far north as Ross-shire in sheltered places. The tree succeeds in deep, sandy or calcareous loams, and in stiff loams resting on a gravelly bottom. It requires free exposure to air and light. It is propagated by seeds, and oc- casionally by budding, grafting or inarching for the perpetuation of special varieties. Seedlings should be protected from frost during the first winter. The trees form their heads naturally, and therefore little pruning is required, it being merely necessary to cut off strag- gling growths, and to prevent the branches from interlacing. The best time for performing this is in the autumn, just after the fall of the leaf. Plants raised from the seed seldom become productive till they are twenty years old. The fruit is produced at the extremities of the shoots of the preceding year; and therefore, in gathering the crop, care should be taken not to injure the young wood. In some parts of England the trees are thrashed with rods or poles to obtain the nuts, but this is not a commendable mode of collecting them.

Among the American species J. nigra, the black walnut, is especi- ally noteworthy as a very handsome tree, whose timber is of great value for

furniture purposes, but which is now becoming scarce. In Britain it forms a magnificent tree. The white walnut or butternut, /. cinerea, is a smaller tree, though it sometimes reaches 100 ft. in height; its inner bark yields an extractive, juglandin, given as an hepatic stimulant and cathartic in doses of 2-5 grains.

Closely allied to the walnuts, and sometimes confounded with them, are the hickories.

WALPOLE, HORATIO or Horace (1717-1797), English politician and man of letters, 4th carl of Orford — a title to which he only succeeded at the end of his life, and by which he is little known — was born in Arlington Street, London, on the 24th of September 1717. He was the youngest of the five children of the 1st earl of Orford (Sir Robert Walpole) by Catherine Shorter, but by some of the scandal- mongers of a later age, Carr, Lord Hervey, half-brother of John, Lord Hervey, afterwards second earl of Bristol, has been caDed his father. If this rumour be correct, no such suspicion ever entered into the mind of Horace Walpole. To his mother he erected a monument, with an inscription couched in terms of sincere affection, in the chapel of Henry VII. in Westminster Abbey, and from the beginning to the end of his public life his sarcasms never spared the Newcastles and the Hardwickes, who had shown, as he thought, lukewarmness in support of his father's ministry. On the 26th of April 1727 he was sent to Eton, where he formed what was known as the " Quadruple Alliance " with Thomas Gray, Richard West and Thomas Ashton, and became very intimate with Henry Seymour Conway, George Augustus Selwyn and the two Montagus, and in 1735 matriculated at King's College, Cambridge. Two years (1 739-1 741) were spent in Gray's company in the recognized grand tour of France and Italy. They stopped a few weeks in Paris, and lingered for three months at Rheims, on the pretence of learning the French language. Henry Seymour Conway, whose mother was a sister of Lady Walpole, shared their society in the French city. The

other two members of this little circle next proceeded to Florence, where Walpole rested for more than a year in the villa of Horace Mann, the British envoy-extraordinary for forty-six years to the court of Tuscany. Mann's family had long been on terms of the closest intimacy with his guests, and they continued correspondents until 1786. As they never met again, their friendship, unlike most of Walpole's attachments, remained unbroken. After a short visit to Rome (March- June 1740), and after a

further sojourn at Florence, Walpole and Gray parted in resentment at Reggio. Walpole in after years took the blame of this quarrel on himself, and it is generally believed that it arose from his laying too much stress on his superiority in position. In 1744 the two friends were nominally reconciled, but the breach was not cemented.

Walpole came back to England on the 12th of September 1741. He had been returned to parliament on the 14th of May 1 741 for the Cornish borough of Callington, over which his elder brother, through his marriage with the heiress of the Rolles, exercised supreme influence. He represented three constituencies in succession, Callington 1741-1754, the family borough of Castle Rising from 1754 to 1757, and the more important constituency of King's Lynn, for which his father had long sat in parliament, from the latter date until 1768. In that year he retired, probably because his success in political life had not equalled his expectations, but he continued until the end of hi? days to follow and to chronicle the acts and the speeches of both houses of parliament. Through his father's influence he had obtained three lucrative sinecures in the ex-chequer, and for many years (1 745-1 784) he enjoyed a share, estimated at about £1500 a year, of a second family perquisite, the collectorship of customs. These resources, with a house in Arlington Street, which was left to him by his father, enabled him, a bachelor all his days, to gratify his tastes. He acquired in 1747 the lease and in the next year purchased the reversion of the charmingly situated villa of Strawberry Hill, near Twickenham, on the banks of the Thames. Six years later he began a series of alterations in the Gothic style, not completed for nearly a quarter of a century later, under which the original cottage became transformed into a building without parallel in Europe. On the 25th of June 1757 he established a printing-press there, which he called " Ofhcina Arbuteana," and many of the first editions of his own works were struck off within its walls. Through Walpole's influence Dodsley published in 1753 the clever, if eccentric, designs of Richard Bentley (the youngest child of the great scholar, and for some time a protege" of Horace Walpole) for the poems of Gray. The first work printed at Strawberry Hill was two odes of Gray (8th of August 1757), and among the reprints were the Life of Lord Herbert ofCherbury, Memoirs of Grammont, Hentzner's Journey into England, and Lord Whitworth's Account of Russia. The rooms of this whimsi- cal edifice were crowded with curiosities of every description, and the house and its contents were shown, by tickets to admit four persons, between 12 and 3 from May to October, but only one party was admitted on each day, and the owner, although enamoured of notoriety, simulated discontent at this limited intrusion into his privacy. Walpole paid several visits to Paris, where he made the acquaintance of Madame du Deffand (q.v.) in 1765, and they corresponded until her death in 1780. His nephew, the reckless

3rd earl, died on the 5th of December 1701, and Horace succeeded to the peerage, but he never took his place in the House of Lords, and sometimes signed his name as " the uncle of the late earl of Orford." All his life long he was a victim of the gout, but he lived to extreme old age, and died unmarried, in Berkeley Square, London, to which he had re- moved in October 1779, on the 2nd of March 1797. He was buried privately at Houghton. The family estate descended to the earl of Cholmondeley, whose ancestor had married Horace Walpole's younger sister. All Walpole's printed books and manuscripts were left to Robert Berry (d. 19th of May 18×7) and his two daughters, Mary (1763-1852) and Agnes (1764-1852), and Mary Berry edited the five volumes of Walpole's works which were published in 1798. Their friendship had been

very dear to the declining days of Walpole, who, it has even been said, wished to marry Mary Berry. By his will each of the ladies obtained a pecuniary legacy of £4000, and for their lives the house and garden, formerly the abode of his friend Kitty Clive, which adjoined Strawberry Hill. Strawberry Hill went to Mrs Anne Darner, daughter of his lifelong friend General Conway, for her life, but it was entailed on his niece the countess dowager of Waldegrave and her heirs. The collections of Straw- berry Hill, which he had spent nearly fifty years in amassing, were dispersed under the hammer of George Robins in 1842. They are described in a catalogue of that date, and in a series of articles in the Gentleman's Magazine for that year.

The pen was ever in Horace Walpole's hands, and his entire compositions would fill many volumes. His two works of imagination, the romance of the Castle of Otranto (1764) and the tragedy of the Mysterious Mother (1768), are now all but for- gotten. The Castle of Otranto, purporting to be a story translated by William Marshal, gent., from the original Italian of Onuphrio Muralto, canon of the church of St Nicholas at Otranto, was often reprinted in England, and was translated into both French and Italian. By Sir Walter Scott it was lauded to the skies for its power in raising the passions of fear and pity, but from Hazlitt it met with intense condemnation; its real importance, however, lies in the fact that it started the romantic revival. The Mysterious Mother, a tragedy too horrible for representation on any stage, was never intended for performance in public, and only fifty copies of it were printed at Strawberry Hill, By Byron, who, like Horace Walpole, affected extreme liberalism, and like him never forgot that he was born within the purple, this tragedy was pronounced " of the highest order." Several of Walpole's antiquarian works merit high praise. The volume of Historic Doubts on the Life and Reign of King Richard the Third (T760), one of the earliest attempts to rehabilitate a character previously stamped with infamy, showed acuteness and research. These doubts provoked several answers, which are criticized in a supplement

edited by Dr E. C. Hawtrey for the Philobiblon Society (1854). A work of more lasting reputation, which has retained its vitality for more than a century, is entitled Anecdotes of Painting in England, with some Account of the Principal Artists; collected by George Vertue, and now digested and published from his original manuscripts by Horace Walpole (4 vols., 1762-1771). Its value to art students and to admirers of biographical literature demanded its frequent reproduction, and it was re- edited with additions by the Rev. James Dallaway in five volumes (1826-1828), and then again was revised and edited by R. N. Wornum in 1849. A cognate volume, also based on the materials of Vertue, is entitled the Catalogue of Engravers Born and Resident in England (1763), which, like its more famous predecessor, often passed through the press. On the Catalogue of Royal and Noble Authors of England ˆ758) Walpole spent many hours of toilsome research. The best edition is that which appeared in five volumes, in 1806, under the competent editorship of Thomas Park, who carefully verified and diligently augmented the labours of the original author. As a senator himself, or as a private person following at a distance the combats of St Stephen's, Walpole recorded in a diary the chief incidents in English politics. For twenty-seven years he studied, a silent spectator for the most part, the characters of the chief personages who trod the stage of politics, and when he quitted the scene he retained the acquaintance of many of the chief actors. If he was sometimes prejudiced, he rarely distorted the acts of those whom he disliked; and his prejudices, which lie on the surface, were mainly against those whom he considered traitors to his father. These diaries extend from 1750 to 1783, and cover a period of momentous importance in the annals of the national history. The Memoirs of the Last Ten Years of the Reign of George IL. was edited by Lord Holland (1846); its successor. Memoirs of the Reign of King George IIL., was published under the editorial care of Sir Denis Le Marchant (4 vols., 1845), and re-edited in 1894 by Mr G. F. Russell Barker; the last volumes of the series, Journal of the Reign of George III. from i/yi to 1783, .were edited and illustrated by John Doran (2 vols., 1859), and were

edited with an introduction by A. F. Steuart (London, ioog). To these works should be added the Reminiscences (2 vols., 1S19), which WalpoLe wrote in 1788 for the gratification of the Misses Berry. These labours would in themselves have rendered the name of Horace Walpole famous for all time, but his de- lightful Letters are the crowning glory of his life. His corre- spondents were numerous and widespread, but the chief of them were William Cole (1714-1 782), the clerical antiquary of Milton; Robert Jephson, the dramatist; William Mason, the poet; Lord Hertford during his

embassy in Paris; the countess of Ossory; Lord Harcourt; George Montagu, his friend at Eton; Henry Seymour Conway (1721-1795) and Sir Horace Mann. With most of these friends he quarrelled, but the friendship of the last two, in the former case through genuine liking, and in the latter through his fortunate absence from England, was never interrupted. The Letters were published at different dates, but the standard collection is that by Mrs Paget Toynbee (1903- 1905), and to it should be added the volumes of the letters addressed to Walpole by his old friend Madame du Deffand (4 vols., 1810). Dr Doran's publication, Mann and Manners at the Court of Florence (1876), is founded on the epistles sent in return to Walpole by the envoy-extraordinary. Other works relating to him are Horace Walpole and his World, by L. B. Seeley (1884); Horace Walpole, a memoir by Austin Dobson (1S90 and 1893); Horace Walpole and the Strawberry Hill Press, by M. A. Havens (1901). Walpole has been called " the best letter-writer in the English language "; and few indeed are the names which can compare with his. In these compositions his very foibles are penned for our amusement, and his love of trifles — for, in the words of another Horace, he was ever " nescio quid meditans nugarum et totus in illis "—ministers to our instruction. To these friends he communicated every fashionable scandal, every social event, and the details of every political struggle in English life. The politicians and the courtiers of his day were more akin to his character than were the chief authors of his age, and the weakness of his intellectual perceptions stands out most prominently in his estimates of such writers as Johnson and Goldsmith, Gibbon and Hume. On many occasions he displayed great liberality of disposition, and he bitterly deplored for the rest of his days his neglect of the unhappy Chatterton. Chatter- ton wrote to Walpole in 1769, sending some prose and verse fragments and offering to place information on English art in Walpole's hands. Encouraged by a kindly reply, Chatterton appealed for help. Walpole made inquiries and came to the conclusion that he was an imposter. He finally returned the manuscripts in his possession, and took no notice of subsequent letters from Chatterton.

Abundant information about Horace Walpole will be found in the Memoirs of him and of his contemporaries edited by Eliot Warburton (1851), J. H. Jesse's George Seltuyn and his Contemporaries (4 vols., 1843-1844) and the extracts from the journals and correspondence of Miss Berry (3 vols., 1866) ; and it would be unpardonable to omit mention of Macaulav's sketch of Walpole's life and character.

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WALPOLE, SIR SPENCER (1839-1907), English historian and civil servant, was born on the 6th of February 1839. He came of the younger branch of the family of the famous Whig prime minister, being descended

from his brother, the 1st lord Walpole of Wolterton. He was the son of the latter's great-grandson, the Right Hon. Spencer Horatio Walpole (1807-1898), thrice home secretary under Lord Derby, and through his mother was grandson of Spencer Perceval, the Tory prime minister who was murdered in the House of Commons. He was educated at Eton, and from 1858 to 1867 was a clerk in the War Office, then be- coming an inspector of fisheries. In 1882 he was made lieutenant- governor of the Isle of Man, and from 1893 to 1899 he was secretary to the Post Office. In 1898 he was created K.C.B. Although well known as a most efficient public servant, and in private life as the most amiable of men, Sir Spencer Walpole's real title to remembrance is as an historian. His family con- nexions gave him a natural bent to the study of public affairs, and their mingling of Whig and Tory in politics contributed, no doubt, to that quality of judicious balance — inclining, however,

to the Whig or moderate Liberal side — which, together with his sanity and accuracy, is so characteristic of his writings. His principal work, the History of England from 181$ (1878-1886), in six volumes, was carried down to 1858, and was continued in his History of Twenty-Five Years (1904). Among his other publications come his lives of Spencer Perceval (1894) and Lord John Russell (1889), and a volume of valuable Studies in Bio- graphy (1906); and he wrote the section of the article English History, dealing in detail with the reign of Queen Victoria, for the Encyclopaedia Britannica. He died on the 7th of July 1907.

WALPOLE OF WOLTERTON, HORATIO, ist Baron (1678- 1757), English diplomatist, was a son of Robert Walpole of Houghton, Norfolk, and a younger brother of the great Sir Robert Walpole. The Walpoles owned land in Norfolk in the 12th century and took their name from Walpole, a village in the county. An early member of the family was Ralph de Walpole, bishop of Norwich from 1288 to 1299, and bishop of Ely from 1299 until his death on the 20th of March 1302. Among its later members were three brothers, Edward (1 560-1637), Richard (1564-1607) and Michael (1570-e. 1624), all members of the Society of Jesus. Another Jesuit in the family was Henry Walpole (1558-1595), who wrote An Epitaph of the life and death of the most famous clerk and virtuous priest Edmund Campion. After an adventurous and courageous career in the service of the order, he was arrested on landing in England, was tortured and then put to death on the 17th of April 1595- 1

Born at Houghton on the 8th of December 1678 and educated at Eton and King's College, Cambridge, Horatio Walpole became a fellow of King's and entered parliament in 1702, remaining a member for fifty-four years. In 1715, when his brother, Sir Robert, became first lord of the treasury, he was made secretary to the treasury, and in 1716, having already had some

experience of the kind, he went on a diplomatic miss-ion to The Hague. He left office with his brother in 1717, but he was soon in harness again, becoming secretary to the lord-lieutenant of Ireland in 1720 and secretary to the treasury a second time in 1721. In 1722 he was again at The Hague, and in 1723 he went to Paris, where in the following year he was appointed envoy extraordinary and minister plenipotentiary. He got on intimate terms with Fleury and seconded his brother in his efforts to maintain friendly relations with France; he represented Great Britain, at the congress of Soissons and helped to conclude the treaty of Seville (November 1729). He left Paris in 1730 and in 1734 went to represent his country at The Hague, where he remained until 1740, using all his influence in the cause of European peace. After the fall of Sir Robert Walpole in 1742 Horatio defended his conduct in the House of Commons and also in a pamphlet, The Interest of Great Britain steadily pursued. Later he wrote an Apology, dealing with his own conduct from 1715 to 1739, and an Answer to the latter part of Lord Bolingbroke's letters on the study of history (printed 1763). In 1756 he was created Baron Walpole of Wolterton, this being his Norfolk seat, and he died on the 5th of February 1757. His eldest son, Horatio, the 2nd baron (1723- 1809), was created earl of Orford in 1806, and one of his sons was Major-General George Walpole (1758-1835), under-sccretary for foreign affairs in 1800.

See W. Coxe, Memoirs of Horatio, Lord Walpole (2nd ed., 1808); the same writer, Memoirs of Sir Robert Walpole (1816); and Charles, cpmte de Batllon, Lord Walpole A la cour de France (1867).

WALPURGIS (Walpurga or Walburga), ST (d. c. 780), English missionary to Germany, was born in Sussex at the beginning of the 8th century. She was the sister of Willibald, the first bishop of Eichstatt in Bavaria, and Wunnibald, first abbot of Heidenheim. Her father, Richard, is thought to have been a son of Hlothere, 9th king of Kent; her mother, Winna or Wuna, a sister of St Boniface. At the instance of Boniface and Willibald she went about 750 with some other nuns to found*

1 The Letters of Henry Walpole, S.J., from the original manuscripts at Stonyhurst College, were edited by the Rev. Augustus Jessopp for private circulation (1873). See the Rev. A. Jessopp, One Generation of a Norfolk House (1878).

2 French forms of the name are Gualbourg, Falbourg, Vaubourg and Avougourg.

religious houses in Germany. Her first settlement -was at : Bischofsheim in the diocese of Mainz, and two years later (754) she became abbess of the Benedictine nunnery at Heidenheim in the diocese of Eichstatt. On the death of Wunnibald in 760 she succeeded him in his charge also, retaining the superintendence of both houses until her death. Her relics were translated to Eichstatt, where she was laid in a hollow rock, rrcm which exuded a kind of bituminous oil afterwards known as Walpurgis oil, and regarded as of miraculous efficacy against disease. It is still said to exude from the saint's bones (especially from October to February) and was chosen by Cardinal Newman as an example of a credible miracle. The cave became a place of pilgrimage, and a fine church was built over the spot. Walpurgis is commemorated at various times^ but principally on the 1st of May. her day taking the place of an earlier heathen festival which was characterized by various rites marking the beginning of summer. She is regarded as the protectress against magic arts (cL the Walpurgis-Nacht dance in Goethe's Faust). In art she is represented with a crozier, and bearing in her hand a flask of balsam.

Her life was written by the presbyter Wolfhard and dedicated to Erkenbald, bishop of Eichstatt (884-916). See the Bollandist Acta sanctorum, vol. iii. February 25. On Walpurgis, Willibald and Wunnibald see G. F. Browne, Boniface of Crediton and his Com- panions (London, 1910), vii.

WALRAS, MARIE ESPRIT LfcON (1834-1910), French economist, was born at Evreux in 1834. From 1866 to 1868 he edited a journal called Le Travail, to which he contributed many valuable sociological articles. In 1S70 he was appointed professor of political economy at Lausanne, a post which he retained until his retirement in 1892. He died on the 4th of January ioro. Walras is best known for his mathematical treatment of economics, and the extreme care he has shown in his works in distinguishing theory and practice. His most important works are Elements d'economie politique pure (1874- 1877) and Thtoric mathematique de la richesse sociale (1883).

Of his many valuable papers contributed to various periodicals a good bibliography will be found in the Diet. Pol. Econ. iii. 654. See biographical notice in Economic Journal (March, 1910) by Vilfredo Pareto, his successor in the chair of political economy at Lausanne.

WALRUS, or Morse (Odobaenus rosmarus), a large marine mammal allied to the seals, representing a family by itself. The former word is a modification of the Scandinavian vallross or hvalros (" whale-horse ")» the latter an adaptation of the Russian name for the animal. A full-grown male w^alrus measures from 10 to 1 1 ft. from the nose to the end of the short tail, and is a heavy, bulky animal, especially thick about the shoulders. The

head is rounded, the eyes are rather small, and there are no external ears. The muzzle is short and broad, with, on each side, a group of stiff, bristly whiskers, which become stouter and shorter in old animals. The tail scarcely projects beyond the skin. The fore-limbs are free only from the elbow; the fore- flipper is broad, flat and webbed, the five digits being of nearly equal length, but the first slightly the longest. Each digit has a small flattened nail, situated on the inner surface at a con- siderable distance from the end. The hind-limbs are enclosed in the skin of the body, almost to the heel. The free portion when expanded is fan-shaped, the two outer toes (first and fifth) being the longest, especially the latter. Flaps of skin project considerably beyond the bones of the toes. The nails of the first and fifth toes are minute and flattened; those of the second, third and fourth elongated, sub-compressed and pointed. The soles of both fore and hind feet are bare, rough and warty. The surface of the skin generally is covered with short, adpressed hair of a light yellowish-brown colour, which, on the under parts of the body and base of 'he flippers, passes into dark reddish-brown or chestnut. In old animals the hair becomes more scanty, sometimes almost disappearing, and the skin shows evidence of the rough life and pugnacious habits of the animal in the scars with which it is usually covered. It is everywhere more or less wrinkled, especially over the shoulders, where it is thrown into deep and heavy folds.

One of the most striking characteristics of the walrus is the

pair of tusks which descend almost directly downwards from the upper jaw, sometimes attaining a length of 20 in. or more. . In the female they are as long or sometimes longer than in the male, but less massive. In the young of the first year they are not visible. These tusks correspond to the canine teeth of other mammals. All the other teeth, including the lower canines, are much alike— small, simple and one-rooted, and with crowns, rounded at first, but wearing to a flat or concave surface. Many of the teeth are lost early, or remain through life in a rudimentary state concealed beneath the gum. The tusks are formidable weapons of defence, but their principal use seems to be scraping and digging among sand and shingle for the molluscs and crus- taceans on which the walrus feeds. They are said also to aid in climbing up the slippery rocks and ledges of ice on which so much of the animal s Hie is passed.

Walruses are more or less gregarious in their habits, being met with generally in companies or herds of various sizes. They are only found near the coast or on large masses of floating ice, and rarely far out in the open sea; and, though often moving from one part of their feeding-ground to another, have no regular migrations. Their young are born between April and June,

The Atlantic Walrus {Odobaenus rosmarus).

usually but one at a time, never more than two. Their strong affection for their young, and their sympathy for each other in danger, have been noticed by all who have had the opportunity of observing them in their haunts. When one is wounded the whole herd usually join in defence. Although harmless and in- offensive when not molested, they exhibit considerable fierceness when attacked, using their tusks with tremendous effect either on human enemies who come into too close quarters or on polar bears, the only other adversary they can meet with in their own natural territory. The voice, a loud roaring, which can be heard at a great distance, is described by Dr Kane as " something between the mooing of a cow and the deepest baying of a mastiff, very round and full, with its bark or detached notes repeated rather quickly seven or nine times in succession."

The principal food of the walrus consists of bivalve molluscs, especially Mya truncata and Saxicava rugosa, two species very abundant in the Arctic regions, which it digs up from the mud and sand in which they lie buried at the bottom of the sea by means of its tusks. It crushes and removes the shells by the aid of its grinding teeth and tongue, and swallows only the soft parts of the animal. It abo feeds on other molluscs, sand-worms, star- fishes and shrimps. Portions of various kinds of seaweed have been found in its stomach, but whether swallowed intentionally or not is doubtful.

The commercial products of the walrus are its oil, hide (used to manufacture harness and sole-leather and twisted into tiller- ropes) and tusks. The ivory of the latter is, however, inferior in quality to that of the elephant. Its flesh forms an important article of food to the Eskimo and Chukchi. Of the coast tribes of the last-named people the walrus formed the chief means of support.

Walruses are confined to the northern circumpolar regions, extending apparently as far north as explorers have penetrated. On the Atlantic coast of America the Atlantic species was met with in the 16th century as low as the southern coast of Nova Scotia, and in the last century was common in the Gulf of St Lawrence and on the shores of Labrador. It still inhabits the coast round Hudson's Bay, Davis Strait and Greenland, where, however, its numbers are decreasing. It is not found on the Arctic coast of America between the 97th and 1 58th meridians. In Europe, occasional stragglers

have reached the British Isles; and it was formerly abundant on the coasts of Finmark. It is rare in Iceland, but Spitzbergen, Novaia Zemblia and the western part of the north coast of Siberia are constant places of resort. The North Pacific, including both sides of Bering Strait, northern Kamchatka, Alaska and the PribylofI Islands are also the haunts of numerous walruses, which are isolated from those of the North Atlantic by long stretches of coast in Siberia and North America where they do not occur. The Pacific walrus appears to be as large as, if not larger than, that of the Atlantic; its tusks are longer and more slender, and curved inwards; and the whiskers are smaller, and the muzzle relatively deeper and broader. These and certain other differences have led to its being considered specifically distinct, under the name of Odo- baenus obesus. Its habits appear to be similar to those of the Atlantic form. Though formerly found in immense herds, it is becoming scarce, as the methods of destruction used by American whalers are more certain than those of the Chukchi, to whom the walrus long afforded the principal means of subsistence.

Fossil remains of walruses and closely allied animals have been found in the United States, and in England, Belgium and France, in deposits of late Tertiary age. (W. H. F.; R. L.)*

WALSALL, a market town and municipal, county and parlia- mentary borough of Staffordshire, England, on the northern edge of the Black Country, and on a tributary stream of the Tame. Pop. (1891) 71,789; (1901) 86,430. It is i2o§ m.'N.W. from London by the London & North-Western railway, on which system it is a centre of several branches, and is served by the Birmingham- Wolverhampton branch of the Midland railway and. by canals. The town, though of ancient foundation, is modern in appearance. The central part stands high on a ridge at the northward termination of which is the church of St Matthew, dating in part from the 15th century, but almost wholly rebuilt. The council house and town hall was completed in 1905; there are two theatres, a free library and museum, and an institute of science and art. Recreation grounds include a pict uresque arboretum , Reed's Wood and Palpey Park . Queen Mary's Schools are a foundation of 1554; here are be- lieved to have been educated John Hough (1651-1743), the presi- dent of Magdalen College, Oxford, whom James II. sought to eject from office, afterwards bishop of Oxford, Lichfield, and Worce- ster; and John, Lord Somers (1651-1716), Lord Keeper and Lord Chancellor of England. There are large charities, and Walsall was the scene of the charitable work of Sister Dora (Miss Pattison) whom a statue commemorates. Coal, limestone and ironstone are mined in the neighbourhood. The most important products are saddlery and leather-work, horses' bits and all metal harness fittings; there are iron and brass foundries, and locks, keys, bolts and other hardware are made, both in Walsall and at Bioxwich, a large industrial suburb. Three annual fairs are

held. The parliamentary borough returns one member. The town is governed by a mayor, 8 aldermen and 24 councillors. Area, 7480 acres.

Walsall (Waleshales, Walshatt, Walsaler) is included in the list of lands given in 996 to the church of Wolverhampton, which, however, did not retain it long. It was granted by Henry II. to Herbert Ruffus, and Henry III. confirmed it to his grandson (1227). Later the manor passed to the Bassets and the Beau- champs, and Warwick the King-maker held it in right of his wife. Henry VIII. granted it (1538) to Dudley, afterwards duke of Northumberland. William Ruffus in the reign of John granted to the burgesses, in consideration of a fine of 12 marks silver and of a rent of i2d. for every burgage, all services, customs and

secular demands belonging to him and his heirs, except tallage. Henry IV. confirmed to the burgesses a grant of freedom from toll on the ground that Walsall was ancient demesne of the Crown. A mayor and twenty-four brethren who formed the council of the borough arc mentioned in 1440, but the earliest charter of incorporation is that of Charles I. (1627), confirmed in 1661, incorporating it under the title of " the Mayor and Commonalty of the Borough and Foreign of Walsall": under the act of 1835 the town was governed by a mayor, six aldermen and eighteen town councillors. It was not represented in parlia- ment till 1832. Walsall had a merchant gild in 1390; in the 17th century it was already known for its manufacture of iron goods and nail-making. In the 18th century the staple industry was the making of chapes and shoe-buckles, and the town suffered when the latter went out of fashion. Two fairs, on Michaelmas day and September 21, were granted in 1399. The Tuesday market, which is still held, and two fairs on October 28 and May 6, were granted in 141 7 to Richard Beauchamp, earl of Warwick.

See Victoria County History, Stafford ; E. L. Glew, History of the Borough and Foreign of Walsall (1856).

WALSH, JOHN HENRY (1810-1888), English writer on sport under the pseudonym of " Stonehenge," was born at Hackney, London, on the 21st of October 1810. He was educated at private schools, and became a fellow of the Royal College of Surgeons in 1844. For several years he followed his profession of surgeon, but gradually abandoned it on account of the success of his works on the subject of sport. He removed from the country to London in 1852, and the following year brought out his first important book, The Greyhound (3rd ed. 1875), a collec- tion of papers originally contributed to " Bell's Life." In 1856 appeared his Manual of British Rural Sports, which enjoyed many editions. During the same year he joined the staff of The Field, and became its editor at the close of 1857. Among his numerous books published under the name of " Stonehenge " are The Shot-

Gun and Sporting Rifle (1859), The Dog in Health and Disease (1859; 4th ed. 1887), The Horse in the Stable and in the Field (1861; 13th ed. 1890), Dogs of the British Isles (1S67; 3rd ed. 1885), The Modem Sportsman's Gun and Rifle (1882- 1884). While editor of The Field Walsh instituted a series of trials of guns, rifles and sporting powders extending over a period of many years, which greatly tended to the development of sporting firearms; and his influence upon all branches of sport was stimulating and beneficial. He died at Putney on the 12th of February 1888.

WALSH, PETER [Valesitjs] (c. 1618-1688), Irish politician and controversialist, was born at Mocretown, co. Kildare, and studied at Louvain, where he joined the Franciscans and acquired Jansenist sympathies. In 1646. he went to Kilkenny, then in the hands of the rebel " confederate Catholics," and, in opposition to the papal nuncio Rinuccini, urged, and in 1649 helped to secure, peace with the viceroy Ormonde. Persecuted from this time by the irreconcilable supporters of the papal claims, and even in danger of death, after Cromwell's conquest of Ireland he lived obscurely in London and abroad. On the restoration he urged his patron Ormonde to support the Irish Roman Catholics as the natural friends of royalty against the sectaries, and endeavoured to mitigate their lot and efface the impression made by their successive rebellions by a loyal remonstrance to Charles II., boldly repudiating papal infallibility and interference in public affairs, and affirming undivided allegiance to the crown. For eight years he canvassed for signatures to this address, but in spite of considerable support the strenuous opposition of the Jesuits and Dominicans deterred the clergy and nearly wrecked the scheme. From 1669 until his death he lived in London, much respected for his honesty, loyalty and learning. Ex- communicated by the Franciscan chapter-general in 1670,. he remained a devout adherent of his church, although he maintained friendly relations with the Anglicans, accepting their orders and attending their churches. He made a full submission to Rome before his death, though the fact has been questioned. He wrote (1672-1684) a series of controversial letters against Pope Gregory VII. 's doctrine of papal supremacy over princes;

a voluminous History of the Remonstrance (1674); Hihernica (1682), a worthless history of Ireland; in 1686 a reply to the Popery of Thomas Barlow (1607-1691), bishop of Lincoln; and other works. In these writings he consistently upheld the doctrine of civil liberty against the pretensions of the papacy.

See S. R. Gardiner, History of the Great Civil War; G. Burnet, History of

his own Times, i. 195 ; T. Carte, Life of Ormonde (new ed. 1851); Diet. Nat. Biog. lix.

WALSH, WILLIAM (1663-1708), English poet and critic, son of Joseph Walsh of Abberley, Worcestershire, was born in 1663. He entered Wadham College, Oxford, as a gentleman commoner in 1678. Leaving the university without a degree, he settled in his native county, and was returned M.P. for Worcester in 1698, 1701 and 1702. In 1705 he sat for Richmond, Yorkshire. On the accession of Queen Anne he was made "gentleman of the horse/' a post which he held till his death, noted by Narcissus Luttrell on the 18th of March 1708. He wrote a Dialogue concerning Women, being a Defence of the Sex (1691), addressed to " Eugenia "; and Letters and Poems, Amorous and Gallant (preface dated 1692, printed in Jonson's Miscellany, 1716, and separately, 1736) ; love lyrics designed, says the author, to impart to the world " the faithful image of an amorous heart." It is not as a poet, however, but as the friend and correspondent of Pope that Walsh is remembered. Pope's Pastorals were sub- mitted for his criticism by Wycherley in 1705, and Walsh then entered on a direct correspondence with the young poet. The letters are printed in Pope's Works (ed. Elwin and Courthope, vi. 49-60). Pope, who visited him at Abberley in 1707, set great value upon his opinion. " Mr Walsh used to tell me," he says, " that there was one way left of excelling; for though we had several great poets, we never had anyone great poet that was correct, and he desired me to make that my study and my aim." The excessive eulogy accorded both by Dryden and Pope to Walsh must be accounted for partly on the ground of personal friendship. The life of Virgil prefixed to Dryden's translation, and a " Preface to the Pastorals with a short defence of Virgil, against some of the reflections of Monsieur Fontenella," both ascribed at one time to Walsh, were the work of Dr Knightly Chetwood (1650-1720). In 1704 Walsh collaborated with Sir John Vanbrugh and William Congreve in Monsieur de Ponr- ceaugnac, or Squire Trelooby, an adaptation of Moliere's farce.

Walsh's Poems are included in Anderson's and other collections of the British poets. See The Lives of the Poets, vol. iii. pp. 151 et seq., published 1753 as by Theophilus Cibber.

WALSINGHAM, SIR FRANCIS (c. 1 530-1 590), English statesman, was the only son of William Walsingham, common sergeant of London (d. March 1534), by his wife Joyce, daughter of Sir Edmund Denny of Cheshunt. The family is assumed to have sprung from Walsingham in Norfolk, but the earliest authentic traces of it are found in London in the first half of the 15th century; and it was one of the numerous families which, having accumulated wealth in the city, planted themselves out as landed gentry and provided the Tudor monarchy with its justices of the

peace and main support. To this connexion may also be attributed much of the influence which London exerted over English policy in the 16th century. Sir Francis's great -great -great-grand father, Alan, was a cordwainer of Grace- church Street; Alan's son Thomas, a vintner, purchased Scad- bury in Chislehurst, and Thomas's great-grandson William bought Foot's Cray, where Francis may have been born. His uncle Sir Edmund was lieutenant of the Tower, and his mother was related to Sir Anthony Denny, a member of Henry VIII. 's privy council who attended him on his death-bed.

Francis matriculated as a fellow-commoner of King's College, Cambridge, of which Sir John Cheke was provost, in November 1548; and he continued studying there amid strongly Protest- ant influences until Michaelmas 1550, when he appears, after the fashion of the time, to have gone abroad to complete his education (Stahlin, p. 79), Returning in 1552 he was admitted at Gray's Inn on January 28, 1553, but Edward VI. 's death six months later induced him to resume his foreign travels. In I555 – 1 SS6 he was at Padua, where he was admitted a " con- siliarius " in the faculty of laws. Returning to England after

Elizabeth's accession he was elected M.P. for Banbury to her first parliament, which sat from January to May 1559. He married in January 1562 Anne, daughter of George Barnes, Lord Mayor of London and widow of Alexander Carleill, whose son-in-law Christopher Hoddesdon was closely associated with maritime and commercial enterprise. He was elected to repre- sent Lyme Regis in Elizabeth's second parliament of 1563 as well as for Banbury, and preferred to sit for the former borough. He may have owed his election to Cecil's influence, for to Cecil he subsequently attributed his rise to power; but his brother- in-law Sir Walter Mildmay was well known at court and in 1566 became chancellor of the exchequer. In that year Walsingham married a second time, his first wife having died in 1564; his second was also a widow, Ursula, daughter of Henry St Barbe and widow of Sir Richard Worsley of Appuldurcombe, captain of the Isle of Wight. Her sister Edith married Robert Beale, afterwards the chief of Walsingham's henchmen. By his second wife Walsingham had a daughter who married firstly Sir Philip Sidney, secondly Robert Devereux, second earl of Essex, and thirdly Richard de Burgh, earl of Clanricarde.

Walsingham's earliest extant communications with the government date from 1567; and in that and the following two years he was supplying Cecil with information about the move- ments of foreign spies in London. The Spanish ambassador in Paris declared in 1570 that he had been for two years engaged in collecting contributions from English churches for the assist- ance of the Huguenots in France; and he drew up a memorial depicting the dangers .of Mary Stuart's presence in England and of the project for her marriage with Norfolk. Ridoln, the conspirator, was

committed to his custody in October 1569, and seems to have deluded Walsingham as to his intentions; but there is inadequate evidence for the statement {Did. Nat. Biog.) that Walsingham was already organizing the secret police of London. In the summer of 1570 he was, in spite of his protestations, designated to succeed Norris as ambassador at Paris. La Mothe Fenelon, the French ambassador in England, wrote that he was thought a very able man, devoted to the new religion, and very much in Cecil's secrets. Cecil had in 1569 triumphed over the conservative and aristocratic party in the council; and Walsingham wds the ablest of the new men whom he brought to the front to give play to the new forces which were to carve out England's career.

An essential element in the new policy was the substitution of an alliance with France for the old Burgundian friendship. The affair of San Juan de Ulua and the seizure of the Spanish treasure-ships in 1568 had been omens of the inevitable conflict with Spain; Ridolfi's plot and Philip II.'s approaches to Mary Stuart indicated the lines upon which the struggle would be fought; and it was Walsingham's business to reconcile the Huguenots with the French government, and upon this reconcilia- tion to base an Anglo-French alliance which might lead to a grand attack on Spain, to the liberation of the Netherlands, to the destruction of Spain's monopoly in the New World, and to making Protestantism the dominant force in Europe. Walsing- ham threw himself heart and soul into the movement. He was the anxious fanatic of Elizabeth's advisers ; he lacked the patience of Burghley and the cynical coolness of Elizabeth. His devotion to Protestantism made him feverishly alive to the perils which threatened the Reformation; and he took an alarmist view of every situation. Ever dreading a blow, he was always eager to strike the first; and alive to the perils of peace, he was blind to the dangers of war. He supplied the momentum which was necessary to counteract the caution of Burghley and Elizabeth ; but it was probably fortunate that his headstrong counsels were generally overruled by the circumspection of his sovereign. He would have plunged England into war with Spain in 1572, when the risks would have been infinitely greater than in 1588, and when the Huguenot influence over the French government, on which he relied for support, would probably have broken in his hands. His clear-cut, strenuous policy of open hostilities has always had its admirers; but it is difficult to see how England could have secured from it more than she

actually did from Elizabeth's more Fabian tactics. War, declared before England had gained the naval experience and wealth of the next fifteen

years, and before Spain had been weakened by the struggle in the Netherlands and the depreda- tions of the sea-rovers, would have been a desperate expedient; and the ideas that any action on Elizabeth's part could have made France Huguenot, or prevented the disruption of the Netherlands, may be dismissed as the idle dreams of Protestant enthusiasts.

Walsingham, however, was an accomplished diplomatist, and he reserved these truculent opinions for the cars of his' own government, incurring frequent rebukes from Elizabeth. In his professional capacity, his attitude was correct enough; and, indeed, his anxiety for the French alliance and for the marriage between Elizabeth and Anjou led him to suggest concessions to Anjou's Catholic susceptibilities which came strangely from so staunch a Puritan. Elizabeth did not mean to marry, and although a defensive alliance was concluded between England and France in April 1572, the French government perceived that public opinion in France would not tolerate an open breach with Spain in Protestant interests. CoJigny's success in captivat- ing the mind of Charles IX. infuriated Catherine de Medicis, and the prospect of France being dragged at the heels of the Huguenots infuriated the Catholics. The result was Catherine's attempt on Coligny's life and then the massacre of St Bartholo- mew, which placed Walsingham 's person in jeopardy and ruined for the time all hopes of the realization of his policy of active French and English co-operation. .

He was recalled in April 1573, but the queen recognized that the failure had been due to no fault of his, and eight months later he was admitted to the privy council and made joint secretary of state with Sir Thomas Smith. He held this office jointly or solely until his death; in 1577 when Smith died, Dr Thomas Wilson was associated with Walsingham; after Wilson's death in 1581 Walsingham was sole secretary until July 1586, when Davison began his brief and ill-fated seven months' tenure of the office. After Davison's disgrace in February 1587 Walsingham remained sole secretary, though Wolley as- sisted him as Latin secretary from 1588 to 1590. He was also returned to parliament at a by-election in 1576 as knight of the shire for Surrey in succession to Charles Howard, who had become Lord Howard of Effingham, and he was re-elected for Surrey in 1584, 1586 and 1588. He was knighted on December 1, 1577, and made chancellor of the order of the Garter on April 22, 1578.

As secretary, Walsingham could pursue no independent policy; he was rather in the position of permanent under-secret ary of the combined home and foreign departments, and he had to work under the direction of the council, and particularly of Burghley and the queen. He continued to urge the necessity of more vigorous intervention on behalf of the Protestants abroad, though now his clients were the Dutch rather than the Huguenots. In June 1578 he was sent with Lord Cobham to the Netherlands, mainly to

glean reliable information on the complicated situation. He had interviews with the prince of Orange, with Casimir who was there in the interests of Protestant Germany, with Anjou who came in his own interests or in those of France, and with Don John, who nominally governed the country in Philip's name; the story that he instigated a plot to kidnap or murder Don John is without foundation. His letters betray discontent with Eliza- beth's reluctance to assist the States; he could not understand her antipathy to rebellious subjects, and he returned in October, having accomplished little.

In August 1 581 he was sent on a second and briefer mission to Paris. Its object was to secure a solid Anglo-French alliance against Spain without the condition upon which Henry III. insisted, namely a marriage between Elizabeth and Anjou. The French government would not yield, and Walsingham came back, to be followed by Anjou who sought in personal interviews to overcome Elizabeth's objections to matrimony. He, too, was unsuccessful; and a few months later he was dismissed with some English money and ostensible assurances of support. But secretly Elizabeth countermined his plans; unlike Walsing-

ham, she would sooner have seen Philip remain master of the Netherlands than see them fall into the hands of France. His final embassy was to the court of James VL in 1583, and here his vehement and suspicious Protestantism led him astray and provoked him into counterworking the designs of his own government. He was convinced that James was as hostile to Elizabeth as Mary herself, and failed to perceive that he was as inimical to popery as he was to presbyterianism. Elizabeth and Burghley were inclined to try an alliance with the Scottish king, and the event justified their policy, which Walsingham did his best to frustrate, although deserted on this occasion by his chief regular supporter, Leicester.

For the rest of his life Walsingham was mainly occupied in detecting and frustrating the various plots formed against Elizabeth's life; and herein he achieved a success denied him in his foreign policy. He raised the English system of secret intelligence to a high degree of efficiency. At one time he is said to have had in his pay fifty-three agents at foreign courts, besides eighteen persons whose functions were even more obscure. Some of Ihem were double spies, sold to both parties, whose real sentiments are still conjectural; but Walsingham was more successful in seducing Catholic spies than his antagonists were in seducing Protestant spies, and most of his information came from Catholics who betrayed one another. In his office in London men were trained in the arts of deciphering correspondence, feigning handwriting, and of breaking and repairing seals in such a way as to avoid detection. His spies were naturally doubtful characters, because the profession docs not attract honest men; morality of methods can no more be expected from counter- plotters than from plotters; and the

prevalence of political or religious assassination made counterplot a necessity in the interests of the state.

The most famous of the plots frustrated by Walsingham was Anthony Babington's, which he detected in 1586. Of the guilt of the main conspirators there is no doubt, but the complicity of Mary Stuart has been hotly disputed. Walsingham had long been convinced, like parliament and the majority of Englishmen, of the necessity of removing Mary; but it was only the discovery of Babington's plot that, enabled him to bring pressure enough to bear upon Elizabeth to ensure Mary's execution. This circumstance has naturally led to the theory that he concocted, if not the plot, at least the proofs of Mary's connivance. Un- doubtedly he facilitated her se'i-incrimination,butof her active encouragement of the plot there can be little doubt after the publication of her letters to Mendoza, in which she excuses her complicity on the plea that no other means were left to secure her liberation. Considering the part he played in this transaction, Walsingham was fortunate to escape the fate which the queen with calculated indignation inflicted upon Davison.

Walsingham died deeply in debt on April 6, 1590. Since 1579 he had lived mainly at Barn Elms, Barnes, maintaining an adequate establishment; but his salary did not cover his expenses, he was burdened with his son-in-law Sir Philip Sidney's debts, and he obtained few of those perquisites which Elizabeth lavished on her favourites. He had little of the courtier about him; his sombre temperament and directness of speech irritated the queen, and it says something for both of them that he retained her confidence and his office until the end of his life.

Dr Karl Stahlin's elaborate and scholarly Sir Francis Walsingham und seine Zeit (Heidelberg, vol. i., 1908) supersedes all previous accounts of Walsingham so far as it goes (1573) ; Dr Stahlin has also dealt with the early history of the family in his Die Walsingham bis zur Mille des 16. Jahrhunderts (Heidelberg, 1905). Vast masses of Walsmgham's correspondence are preserved in the Record Office and the British Museum; some have been epitomized in the Foreign Calendar (as far as 1582); and his correspondence during his two embassies to PVance was published in extenso by Sir Dudley Digges in 1655 under the title The Compleat Ambassador, possibly, as has been suggested by Dr Stahlin, to give a fillip to the similar policy then being pursued by Oliver Cromwell. The ascription to Sir Francis of Arcana Aulica: or Walsingham' 's Manual of Prudential Maxims for the Statesman and the Courtier is erroneous; the book is really the translation of a French treatise by one Edward Walsingham who flourished c. 1 643-1659. See also Webb, Miller and Beckwith's History of Chislehurst (1899) and Diet. Nat. Biog. lix. 231-240.

Mr Conyers Read, who edited the Bardon Papers (" Camden " ser. 1909), relating to Mary's trial, was in 1910 engaged on an elaborate life of Walsingham, part of which the present writer was able to see in MS. (A. F. P.)

WALSINGHAM, THOMAS (d. c. 1422), English chronicler, was probably educated at Ihc abbey of St Albans and at Oxford. He became a monk at St Albans, where lie appears to have passed the whole of his monastic life except the six years between 1394 and 1400 during which he was prior of another Benedictine house at Wymondham, Norfolk. At St Albans he was in charge of the scriptorium, or writing room, and he died about 1422. Walsingham's most important work is his Historia Anglicana, a valuable piece of work covering the period between 1272 and 1422. Some authorities hold that Walsingham himself only wrote the section between 1377 and 1392, but this view is con- troverted by James Gairdner in his Early chroniclers of Europe

(1879).

The Historia, which from the beginning to 1377 is largely a com- pilation from earlier chroniclers, was published by Matthew Parker in 1574 as Historia Angliae brevis. For the " Rolls " series it has been edited in two volumes by H. T. Riley (1863-1864). Covering some of the same ground Walsingham wrote a Chronicon Angiitis; this deals with English history from 1328 to 1388 and has been edited by Sir E. M. Thompson for the " Rolls " series (1874). His other writings in- clude the Gesta abbatum monasterii S. Albani and the Ypodigma Neustriae. The Gesta is a history of the abbots of St Albans irom the foundation of the abbey to 1,181. The original work of Walsingham is the period between 1308 and 1381, the earlier part being merely a compilation ; it has been edited for the " Rolls " series by H. T. Riley (1867-1869). The Ypodigma purports to be a history of the dukes of Normandv, but it also contains some English history and its value is not great. Compiled about 1419, it was dedicated to Henry V. and was written to justify this king's invasion of France. It was first published by Matthew Parker in 1574, and has been edited for the " Rolls " series by H. T. Riley (1876). Another history of England by Walsingham dealing with the period between 1272 and 1393 is in manuscript in the British Museum. This agrees in many particulars with the Chronicon Angliae, but it is much less hostile to John of Gaunt, duke of Lancaster. Walsingham is the main authority for the history of England during the reigns of Richard II., Henry IV. and Henry V., including the rising under Wat Tyler in 1381. He shows considerable animus against John Wycliffe and the Lollards.

WALTER, HUBERT (d. 1205), chief justiciar of England and archbishop of Canterbury, was a relative of Ranulf de Glanvill, the great justiciar of Henry II., and rose under the eye of his kinsman to an important position in the Curia Regis. In 1184 and in 1185 he appears as a baj-on of the exchequer. He was employed, sometimes as a negotiator, sometimes as a justice, sometimes as a royal secretary. He received no clerical pro- motion from Henry II., but Richard I. appointed him bishop of Salisbury, and by Richard's command he went with the third crusade to the Holy Land. He gained the respect of all the crusaders, and acted as Richard's principal agent in all negotia- tions with Saladin, being given a place in the first band of pilgrims that entered Jerusalem. He led the English army back to England after Richard's departure from Palestine; but in Sicily he heard of the king's captivity, and hurried to join him in Germany. In 1193 he returned to England to raise the king's ransom. Soon afterwards he was elected archbishop of Canter- bury and made justiciar. He was very successful in the govern- ment of the kingdom, and after Richard's last visit he was practic- ally the ruler of England. He had no light task to keep pace with the king's constant demand ior money. He was compelled to work the administrative machinery to its utmost, and indeed to invent new methods of extortion. To pay for Richard's ransom, he had already been compelled to tax personal property, the first instance of such taxation for secular purposes. The main feature of all his measures was the novel and extended use of representation and election for all the purposes of government. His chief measures are contained in his instruction to the itinerant justices of 1194 and 1198, in his ordinance of 1195 for the con- servation of the peace, and in his scheme of 1198 for the assess- ment of the carucage. The justices of 1194 were to order the election of four coroners by the suitors of each county court. These new officers were to " keep." i.e. to register, the pleas of the crown, an important duty hitherto left to the sheriff. The juries, both for answering the questions asked by the judges and

for trying cases under the grand assize, were to be chosen by a committee of four knights, also elected by the suitors of each county court for that purpose. In 1195 Hubert issued an ordinance by which four knights were to be appointed in every hundred to act as guardians of the peace, and from this humble beginning eventually was evolved the office of justice of the peace. His reliance upon the knights, or middle-class land- owners, who now for the first time appear in the political fore- ground, is all the more interesting because it is this class who, either as members of parliament or justices of the peace, were to have the effective rule of England in their hands for so many centuries. In 1198, to satisfy the king's demand for money, Hubert demanded a carucage or plough-tax of five shillings on every plough-land (carucate) under cultivation. This was the old tax, the

Danegeld, in a new and heavier form and there was great difficulty in levying it. To make it easier, the justiciar ordered the assessment to be made by a swom jury in every hundred, and one may reasonably conjecture that these jurors were also elected. Besides these important constitutional changes Hubert negotiated a peace with Scotland in 1195, and in 1197 another with the Welsh. But Richard had grown dissatisfied with him, for the carucage had not been a success, and Hubert had failed to overcome the resistance of the Great Council when its members refused to equip a force of knights to serve abroad. In 1198 Hubert, who had inherited from his predecessors in the primacy a fierce quarrel with the Canterbury monks, gave these enemies an opportunity of complaining to the pope, for in arresting the London demagogue, William Fitz Osbert, he had committed an act of sacrilege in Bow Church, which belonged to the monks. The pope asked Richard to free Hubert from all secular duties, and he did so, thus making the demand an excuse for dismissing Hubert from the justiciarship. On the 27th of May 1 199 Hubert crowned John, making a speech in which the old theory of election by the people was enunciated for the last time. He also took the office of chancellor and cheerfully worked under Geoffrey Fitz Peter, one of his former subordinates. In 1201 he went on a diplomatic mission to Philip Augustus of France, and in 1 202 he returned to England to keep the kingdom in peace while John was losing his continental possessions. In 1205 he died. Hubert was an ingenious, original and industrious public servant, but he was grasping and perhaps dishonest.

See W. Stubbs, Constitutional History, vol. i. (1897); Miss K. Norgate's England under the Angevin Kings, vol. ii. (1887); W. Stubbs, preface to vol. iv. of Roger of Hoveden's Chronicle (" Rolls" series, 1868-1871).

WALTER, JOHN (1738/9-1812), founder of The Times newspaper, London, was born in 1738/9, probably in London, and from the death of his father, Richard Walter (about 1755/6), until 1781 was engaged in a prosperous business as a coal merchant. He played a leading part in establishing a Coal Exchange in London; but shortly after 1781, when he began to occupy himself solely as an underwriter and became a member of Lloyd's, be over-speculated and failed. In 1782 he bought from one Henry Johnson a patent for a new method of printing from " logotypes " (i.e. founts of words or portions of words, instead of letters), and made some improvements in it. In 1784 he acquired an old printing office in Blackfriars, which formed the nucleus of the Printing-house Square of a later date, and established there his " Logographic Office." At first he only undertook the printing of books, but on 1st January 1785 he started a small newspaper called The Daily Universal Register, which on reaching its 940th number on 1st January 1788 was renamed The Times. The printing business developed and prospered, but the newspaper at first had a

somewhat chequered career. In 1789 Mr Walter was tried for a libel in it on the duke of York, and was sentenced to a fine of £50, a year's imprisonment in Newgate, to stand in the pillory for an hour and to give surety for good behaviour for seven years; and for further libels the fine was increased by £100, and the imprison- ment by a second year. On 9th March 1791, however, he was . liberated and pardoned. In 1799 he was again convicted for a technical libel, this time on Lord Cowper. He had then given

up the management of the business to his eldest son, William, and had (1795) retired to Teddington, where he died, 16th November 1812. In 1759 he had married Frances Landen (died 1798), by whom he had six children. William Walter very soon gave up the duties he undertook in 1795, and in 1803 transferred the sole management of the business to his younger brother, John.

John Walter (2) (1776-1847), who really established the great newspaper of which his father had sown the seed, was born on the 23rd of February 1776, and was educated at Merchant Taylors' School and Trinity College, Oxford. About 1798 he was associated with his elder brother in the management of his father's business, and in 1803 became not only sole manager but also editor of The Times. The second John Walter was a very remarkable man, the details of whose practice would be extremely interesting if we could recover them. But the conditions of newspaper work at that time, together with the natural reticence of one born to do, not to talk about doing, drew over his opera- tions a veil of secrecy which there are now no means of penetrat- ing. His greatness must be measured by the work he did. He found The Times one of a number of unconsidered journals whose opinions counted for little, and whose intelligence lagged far behind official reports, the accuracy of which they had no independent means of checking. He found it unregarded by the great except when a stringent law of libel enabled them to inflict vindictive punishment in the pillory and in prison for what in our days is ordinary political criticism. He left it in 1847 a great organ of public opinion, deferred to and even feared throughout Europe, consulted and courted by cabinet ministers at home, and in intimate relations with the best sources of inde- pendent information in every European capital. The man who, alone among contemporaries of older standing and with better opportunities, raised a struggling newspaper to a position such as no other journal has ever attained or is likely to attain in future, needs no further attestation of his exceptional ability and character. The secret of an achievement of that unique kind is

incommunicable. Yet we may note some at least of the elements of John Walter's monumental success. From his father he inherited a fearless and perhaps slightly aggressive independence, to which he joined a steady and tireless energy and a concentration of purpose which are less conspicuous in his father's career. He had been associated with his brother in the management of the paper for five years before he took entire control and became his own editor in 1803. In the same year he signalized the new spirit of the direction by his opposition to Pitt, which cost him the withdrawal of government advertise- ments and the loss of his appointment as printer to the Customs, besides exposing him to the not too scrupulous hostility of the official world. These were undoubtedly serious discouragements in the circumstances of that day. In John Walter's way of meeting them we rind a principle upon which he consistently acted through life, and which goes far to explain his success. He never allowed himself to be diverted from the pursuit of a great though distant object by any petty calculation of immediate gain or loss. He had set himself to build up a journal which all the world should recognize as independent of government favour, and which governments themselves should be compelled to respect and reckon with. He was not going to barter that splendid inheritance for to-day's mess of pottage, so he let the government do its worst and held on his way. At times the way must have been hard and the anxiety great, but great also was the reward. For the public in ever-widening circles received assurance, in an pgeof considerable literary and political servility, of a man who could not be bought, and a newspaper that could be neither hoodwinked nor terrorized. His determination to avoid even the appearance of being amenable to influence was forcibly illustrated when the king of Portugal sent him, through the Portuguese ambassador, a service of gold plate. It was a princely gift, and a flattering testimony to the European reputa- tion and authority of his newspaper. Mr Walter promptly returned it, courteously recognizing the honourable motives of the giver, but stating that to accept the gift would place him under

a sense of obligation incompatible with the perfect independence of thought and action which he desired to maintain. It was the same jealous regard for the complete independence of The Times that led him to insist, as he did with remarkable success, upon the strict anonymity of the able men whom he selected with the eye of a general to act as his coadjutors. From about 1810 he delegated to others editorial supervision (first to Sir John Stoddart, then to Thomas Barnes, and in 1841 to J. T. Delane), though never the supreme direction of policy. Their influence was essentially due to the fact that they had a great newspaper behind them, and behind the great newspaper was the remarkable man who made it, and never ceased from giving it inspiration and direction. To unassailable independence, inflexible integrity and sure sagacity he added complete business knowledge of

details, a sound judgment of men and things, and untiring energy in the pursuit of excellence in literary quality, in typography (see Printing), in mechanical appliances, and in the organization for the collection of news. These arc the things that went to the making of The Times, and the measure of the greatness of the second John Walter is that he supplied them all. In 1832 Mr Walter, who had purchased an estate called Bear Wood, in Berkshire (where his son afterwards built the present house), was elected to Parliament for that county, and retained his seat till 1837. In 1841 he was returned to Parliament for Notting- ham, but was unseated next year on petition. He was twice married, and by his second wife, Mary Smythe, had a family. He died in London on the 28th of July 1847.

John Walter (3) (1818-1894), his eldest son, was born at Printing-house Square in 1818, and was educated at Eton and Exeter College, Oxford, being called to the bar in 1847. On leaving Oxford he took part in the business management of The Times, and on his father's death became sole manager, though he devolved part of the work on Mr Mowbray Morris. He was a man of scholarly tastes and serious religious views, and his conscientious character had a marked influence on the tone of the paper. It was under him that the successive improvements in the printing machinery, begun by his father in i8r4, at last reached the stage of the " Walter Press " in 1869, the pioneer of modern newspaper printing-presses. In 1847 he was elected to Parliament for Nottingham as a moderate Liberal, and was re-elected in 1852 and in 1857. In 1859 he was returned for Berkshire, and though defeated in 1865, was again elected in 1868, and held the seat till he retired in 1885. He died on the 3rd of November 1894. He was twice married, first in 1842 to Emily Frances Court (d. 1858), and secondly in 1861 to Flora Macnabb. His eldest son by the first marriage, John, was accidentally drowned at Bear Wood in 1870; and he was succeeded by Mr Arthur Fraser Walter (1846-1910), his second son by the first marriage. Mr A. F. Walter remained chief proprietor of The Times till 1908, when it-was converged into a company. He then became chairman of the board of directors, and on his death was succeeded in this position by his son John.

See Newspapers: Modern London Newspapers {The Times), for the history of the paper. (H. Ch.)

WALTER, LUCY (c. 1630-1658), mistress of the English king Charles II. and reputed mother of the duke of Monmouth (q.v.), is believed to have been born in 1630, or a little later, at Roch Castle, near Haverfordwest. The Walters were a Welsh family of good standing, who declared for the king during the Civil War. Roch Castle having been captured and burned by the parlia- mentary forces in 1644, Lucy Walter found shelter first in London and then at the Hague. There, in 1648, she met the future king, possibly renewing an earlier acquaintance. There is little reason for

believing the story that she was his first mistress; it is certain that he was not her first lover. The intimacy between him and this " brown, beautiful, bold but insipid creature/' as John Evelyn calls her, who chose to be known as Mrs Barlow (Barlo) lasted with intervals till the autumn of 1651, and Charles claimed the paternity of a child born in 1649, whom he subsequently created duke of Monmouth. A daughter, Mary (b. 1651), of whom the reputed father was Henry Bennet, earl of Arlington, married William Sarsfield,

brother of Patrick Sarsfield, earl of Lucan. On the termination of her connexion with Charles II., Lucy Walter abandoned herself to a life of promiscuous immorality, which resulted in her premature death, at Paris, in 1658. Her name is often wrongly written Walters or Waters.

See Steinmann, Althorp Memoirs (1869), pp. 77 seq. and Addenda (1880); J. S. Clarke, Life of James II. (2 vols., 1816); Clarendon Slate Papers, vol. iii. (Oxford, 1869-1876); and John Evelyn, Diary, edited by W. Bray (1890).

WALTER OF COVENTRY (fl. 1290), English monk and chronicler, who was apparently connected with a religious house in the province of York, is known to us only through the historical compilation which bears his name, the Memoriale fratris Walteri de Coventria. The word Memoriale is usually taken to mean " commonplace book." Some critics interpret it in the sense of " a souvenir," and argue that Walter was not the author but merely the donor of the book; but the weight of authority is against this view. The author of the Memoriale lived in the reign of Edward I., and mentions the homage done to Edward as overlord of Scotland (1291). Since the main narrative extends only to 1225, the Memoriale is emphatically a second-hand production. But for the years 1201-1225 it is a faithful transcript of a contemporary chronicle, the work of a Barnwell canon. A complete text of the Barnwell work is preserved in the College of Arms (Heralds' College, MS. 10) but has never yet been printed, though it was collated by Bishop Stubbs for his edition of the Memoriale. The Barnwell annalist, living in Cambridgeshire, was well situated to observe the events of the barons' war, and is our most valuable authority for that import- ant crisis. He is less hostile to John than are Ralph of Coggeshall, Roger of Wendover and Matthew Paris. He praises the king's management of the Welsh and Scotch wars ; he is critical in his attitude towards the pope and the English opposition; he regards the submission of John to Rome as a skilful stroke of policy, although he notes the fact that some men called it a humiliation.

The constitutional agitation of 1215 does not arouse his enthusiasm; he passes curtly over the Runnymede conference, barely mentions Magna Carta, and blames the barons for the resumption of war. It may be from timidity that the annalist avoids attacking John, but it is more probable that the middle classes, whom he represents, regarded the designs of the feudal baronage with suspicion.

See W. Stubbs's edition of Walter of Coventry (" Rolls " series, 2 vols., 1872-1873); R. Pauli, in Geschichte von England (Hamburg, 1853), iii. 872. (H. W. C. D.)

WALTERSHAUSEN, WOLFGANG SARTORIUS, Baron von (1809-1876), German geologist, was born at Gottingen, on the 17th of December 1809, and educated at the university in that city. There he devoted his attention to physical and natural science, and in particular to mineralogy. During a tour in 1834- 1835 he carried out a series of magnetic observations in various parts of Europe. He then gave his attention to an exhaustive investigation of Etna, and carried on the work with some inter- ruptions until 1843. The chief result of this undertaking was his great Alias des Atna(i&s8-i&6i) , in which he distinguished the lava streams formed during the later centuries. After his return from Etna he visited Iceland, and subsequently published Physisch- geographische Skizze von Island (1847), Vber die vulkanischen Gesteine in Sicilien und Island (1853), and Geologischer Adas von Island (1853). Meanwhile he was appointed professor of miner- alogy and geology at Gottingen, and held this post for about thirty years, until his death. In 1866 he published an important essay entitled Recherches sur les climals de I'lpoque achielle el des Ipoques anciennes; in this he expressed his belief that the Glacial period was due to changes in the configuration of the earth's surface. He died at Gottingen on the 16th of October 1876.

WALTHAM, a city of Middlesex county, Massachusetts, U.S.A., on both banks of the Charles river, about 10 m. W. of Boston. Pop. (1890) 18,707; (1900) 23,481, of whom 6695 were fo«eign-born ; (1910 census) 27,834. Waltham is served by the Boston & Maine railway, and by electric interurban lines connecting with Boston, Lowell. Lexineton. Watertown and Newton. It is situated on a series of rugged hills rising from the

river. Prospect Hill (482 ft.) commands a magnificent view. A tract of 100 acres, comprising this hill and an adjoining elevation, has been set aside as a public park by the city; and there are four playgrounds (total area, 6sf acres) and, in the centre of the city, a large common. In Waltham are some 43 acres of the Beaver Brook Reservation and 40 acres of the Charles River Reservation of the Metropolitan park system; in the former are the famous " Waverley Oaks." The Gore Mansion, erected towards the close of

the 18th century by Christopher Gore (1758-1829), a prominent lawyer and Federalist leader, governor of Massachusetts in 1809-1810, and a member of the United States Senate in 1814-1817, is a stately country house surrounded by extensive grounds in which are fine old oaks and elms. Above the city the Charles river is famous as a canoeing ground, and there is an annual canoe carnival between Waltham and Riverside, one of the most popular resorts in the neighbourhood of Boston. The city has a good public library (about 35,000 volumes in 1910). Its principal buildings are a state armoury, and the First Parish (Unitarian), Christ (Protestant Episcopal), the Swedenborgian, the First Baptist and Beth Eden (Baptist) churches. Waltham is the seat of the Massachusetts School for the Feeble-minded (established in Boston in 1848), the first institution of its sort in the country, and of the Waltham Train- ing School for Nurses (1885), the first school to undertake the training of nurses for " day nursing " (outside of hospital wards) on the present plan, of the Convent of Notre Dame and the Notre Dame Normal Training School (Roman Catholic), of the New Church School (New Jerusalem Church), of two business schools, and the Waltham Horological School (1870), a school for practical watchmaking and repairing; here also are the Waltham Hospital (1885), the Baby Hospital (1902) and the Leland Home (1879) for aged women. In 1905 the city's factory product was valued at $7,149,697 (21-4% more than in 1900). The largest single establishment was that of the American Waltham Watch Company, which has here the largest watch factory in the world, with an annual production of about a million watches. Watch and clock materials were valued at $123,885 in 1905. In 1905 cotton goods were second in value to watches; and third were foundry and machine-shop products ($516,067). Other products are automobiles, wagons and carriages, bicycles, canoes, organs and enamelled work.

The first white settlement was made about 1640 and in 1691 became the Middle Precinct of Watertown. In 1 738 the township of Waltham was separately organized. At various times it was increased in area, part of Cambridge being added in 1755 and part of Newton in 1849. In 1859 one of its precincts was set off to form part of the new township of Belmont. In 1884 Waltham was chartered as a city. The first power mill for the manufacture of cotton cloth in the United States was established here in 1814 as an experiment by the company which built the mills and the city of Lowell. Waltham became an important manufacturing city in the decade before the American Civil War, when the company which in 1853 made the first American machine- made watches moved hither from Roxbury and established the Waltham watch industry. This watch company, before the establishment of the U.S. Observatory at Washington and the transmission thence of true time throughout the country by electric telegraph, had an elaborate observatory for testing and setting its watches.

WaLTHAM ABBEY, or Waltham Holy Cross, a market town in the Epping parliamentary division of Essex, England, on the Lea, and on the Cambridge branch of the Great Eastern railway, 13 m. N. by E. from London. Pop. of urban district of Waltham Holy Cross (1901) 6549. The neighbouring county of the Lea valley is flat and unlovely, but to the E. and N.E. low hills rise in the direction of Hainault and Epping Forests. Of the former magnificent cruciform abbey church the only portion of importance now remaining is the nave, forming the present parish church, the two easternmost bays being converted into the chancel. It is a very fine specimen of ornate Norman. Onlv the western suDDorts of the ancient tower now remain. A tower corresponding with the present size of the ciiurch was

erected in 1556 and, restored in 1798. On the south side of the church is a lady chapel dating from the end of the reign of Edward II. or the beginning of that of Edward III., containing some good Decorated work, with a crypt below. Of the monastic buildings there remain only a bridge and gateway and ether slight fragments. Bishop Hall became curate of Waltham in 161 2, and Thomas Fuller was curate from 1648 to 1658. At Waltham Cross, about 1 m. W. of Waltham in Hertfordshire, is the beautiful cross erected (1291-1294) by Edward I. at one of the resting-places of the corpse of Queen Eleanor on its way to burial in Westminster Abbey. It is of Caen stone and is supposed to have been designed by Retro Cavallmi, a Roman sculptor. It is hexagonal in plan and consists of three stages, decreasing towards the top, which is finished by a crocketed spirelet and cross. The lower stage is divided into compartments enclosing the arms of England, Castile and Leon, and Ponthieu. Its restoration has not been wholly satisfactory. The royal gun- powder factory is in the immediate vicinity; government works were built in 1890 at Quinton Hill, ˆ m. W. of the town, for the manufacture of cordite; and the town possesses gun-cotton and percussion-cap factories, flour-mills, malt kilns and breweries. Watercresses are largely grown in the neighbourhood, and there are extensive market gardens and nurseries.

The town probably grew up round the church, "which was built early in the nth century to contain a portion of the true cross. The manor was held by the abbot and convent of the Holy Cross from the reign of Henry I. to that of Henry VIII. The town was never more than a market town until 1894. In 1845 a local board of twelve members was formed to govern it; in 1894, under the Local Government Act, it was brought under an urban district council. The market of Waltham was granted to the abbey by Richard I.

and confirmed in 1227 by Henry III., who also conceded two fairs in 1251: one for ten days following the Invention of the Holy Cross, the other on the vigil of the Exalta- tion of the Cross and for seven days after. The charter from which the present market appears to be derived was granted by Queen Elizabeth in 1 560, and gave a Tuesday market for miscel- laneous stock. The fairs have died out, although as late as 1792 they were held on the 14th of May and the 25th and 26th of September. The fisheries in the river Lea appear in records from 1086 onwards. At the end of the 17th century a fulling mill is mentioned, and by the year 1721 three powder mills were in existence.

WALTHAMSTOW, a suburb of London in the Walthamstow parliamentary division of Essex, England, a short distance E. of the river Lea, with several stations on a branch of the Great Eastern railway, 6 m. N. of Liverpool Street station. Pop. of urban district (1&91) 46,346; (1901) 95,131. It is sheltered on the north and east by low hills formerly included in Epping Forest. The church of St Mary existed at a very early period, but the present building, chiefly of brick, was erected in 1535 by Robert Thorne, a merchant, and Sir George Monoux, lore- mayor of London, and has undergone frequent alteration. Besides other old brasses it contains in the north aisle the effigies in brass of Sir George Monoux (d. 1 543) and Anne his wife. There are a number of educational institutions, including a school of art; Forest School, founded in 1834 in connexion with King's College, now ranks as one of the well-known English public schools. Brewing is extensively carried on.

In the reign of Edward the Confessor Walthamstow belonged to Waltheof , son of Siward, eari of Northumberland, who married Judith, niece of William the Conqueror, who betrayed him to his death in 1075. The estate subsequently passed in 1309 to Guy de Beauchamp, earl of Warwick, and on the attainder of Earl Thomas in 1396 reverted to the crown. Afterwards it came into the possession of Edmund Beaufort, duke of Somerset; from the Somersets it passed to Sir George Rodney, and in 1639 came to the Maynard family. It is supposed to have been the birthplace of George Gascoigne the poet (d. 1577). Sir William Batten, commissioner of the navy (d. 1667), the friend of Pepys, had his seat at Walthamstow, and was frequently visited here by Pepys.

WALTHARIUS, a Latin poem founded on German popular tradition, relates the exploits of the west Gothic hero Walter of Aquitaine. Our knowledge of the author, Ekkehard, a monk of St Gall, is due to a later Ekkehard, known as Ekkehard IV. (d. 1060), who gives some account of him in the Casus Sancti Galli (cap. 80). The poem was written by Ekkehard, generally distinguished as Ekkehard I., for his master Geraldus in his schooldays, probably therefore not later than 920, since he was

probably no longer young when he became deacon (in charge of ten monks) in 957. He died in 973. Waltkarius was dedicated by Geraldus to Erchanbald, bishop of Strassburg (fl. 965-991), but MSS. of it were in circulation before that time. Ekkehard IV. stated that he corrected the Latin of the poem, the Germanisms of which offended his patron Aribo, archbishop of Mainz. The poem was probably based on epic songs now lost, so that if the author was still in his teens when he wrote it he must have possessed considerable and precocious powers.

Walter was the son of Alphcrc, ruler of Aquitaine, which in the 5th century, when the legend developed, was a province of the west Gothic Spanish kingdom. When Attila invaded the west the western princes are represented as making no resistance. They purchased peace by offering tribute and hostages. King Gibfch, here described as a Frankish king, gave Hagen as a hostage (of Trojan race, but not, as in the Nibelungenlied, a kinsman of the royal house) in place of his infant son Gunther; the Burgundian king Heririh, his daughter Hiltegund; and Alphere, his son Walter. Hagcn and Walter became brotheis in arms, fighting at the head of Attila's armies, while Hiltegund was put in charge of the queen's treasure. Presently Gunther succeeded his father and refused to pay tribute to the Huns, whereupon Hagen fled from Attila's court. Walter and Hiltegund, who had been betrothed in childhood, also made good their escape during a drunken feast of the Huns, taking with them a great treasure. The story of their flight forms one of the most charming pictures of old German story. They were recognized at Worms, however, where the treasure excited the cupidity of Gunther. Taking with him twelve knights, among them the reluctant Hagen, he pursued them, and overtook them at the Wasgenstein in the Vosges mountains. Walter engaged the Nibelungen knights one at a time, until all were slain but Hagen, who held aloof from the battle, and was only persuaded by Gunther to attack his comrade in arms on the second day. He lured Walter from the strong position of the day before, and both Gunther and Hagen attacked at once. All three were incapacitated, but their wounds were bound up by Hiltegund and they separated friends,

The essential part of this story is the series of single combats. The occasional incoherences of the tale make it probable that many changes have been introduced in the legend. The Thidreks Saga (chaps. 241-244) makes the story more probable by repre- senting the pursuers as Huns. There is reason to believe that Hagen was originally the father of Hiltegund, and that the tale was a variant of the saga of Hild as told in the Skalds kaparmdl. Hild, daughter of King Hogni, was carried off by Hedinn, son of Hjarrandi (A.S. Heorrenda). The fight between the forces of father and lover only ceased at sundown, to be renewed on the morrow, since each evening Hild raised the dead by her incanta- tions. This is obviously a

form of the old myth of the daily recurring struggle between light and darkness. The songs sung by Hiltegund in Waltkarius during her night watches were probably incantations, a view strengthened by the fact that in a Polish version the glance of Helgunda is said to have inspired the combatants with new strength. Hiltegund has retained nothing of Hild' s fierceness, but the fragment of the Anglo-Saxon Waldere shows more of the original spirit. In Waltkarius Hiltegund advises Walter to fly; in Waldere she urges him to the combat.

Bibliography.— Waltkarius was first edited by Fischer (Leipzig, 1780). Later and more critical editions are by Jacob Grimm {Lai. Gedichte des Mittelalters (Gottingen, 1838J; R. Peiper (Berlin, 1873); V. Scheffel and A. Holder (Stuttgart, 1874); there are German translations by F. Linnig (Paderborn, 1885), and II. Althof (Leipzig, 1896). See also SchefteT's novel of Eckehard (Stuttgart, 1887). The A.S. fragments of Waldere were first edited by G. Stephens (1860), afterwards by R. Wtilker in Bibl. der angel-sacks. Poesie (vol. L r

Cassel, 1881); by F. Holthausen in Goteborgs Hogskolas Arsshrift (vol. v., 1899), with autotype reproductions of the two leaves which have been preserved. See also A. Ebert, Allg. Gesch. der Lit. des Mitlelalters im Abendlande (Leipzig, 1874-1S87); R. Koegel, Gesch. der deutschen Literatur bis sum Ausgange des Miltelalters (vol. i., pt. ii., Strasbourg, 1897); M. D. Lamed, The Saga of Walter of Aquitaine (Baltimore, 1892); B. Symons, Deutsche lleldensage (Strasshurg, I905)- With Wallharius compare the Scottish ballads of " Earl Brand " and " Erlinton " (F. J. Child's English and Scottish Popular Ballads, i. 88 seq.).

WALTHEOF (d. 1076), earl of Northurnbria, was a son cf Earl Siward of Northurnbria, and, although he was probably educated for a monastic life, became earl of Huntingdon and Northampton about 1065, After the battle of Hastings he submitted to William the Conqueror; but when the Danes invaded the north of England in 1069 he joined them and took part in the attack on York, only, however, to make a fresh submission after their departure in 1070. Then, restored to his earldom, he married William's niece, Judith, and in 1072 was appointed earl of Northurnbria. In 1075 Waltheof joined the conspiracy against the king arranged by the earls of Norfolk and Hereford; but soon repenting of his action he confessed his guilt to Archbishop Lanfranc, and then to William, who was in Normandy. Re- turning to England with William he was arrested, and after being brought twice before the king's court was sentenced to death. On the 31st

of May 1076 he was beheaded on St Giles's Hill, near Winchester. Weak and unreliable in character, Waltheof, like his father, is said to have been a man of immense bodily strength. Devout and charitable, he was regarded by the English as a martyr, and miracles were said to have been worked at his tomb at Crowland. The earl left three daughters, the eldest of whom, Matilda, brought the earldom of Huntingdon to her second husband, David L, king of Scotland. One of Waltheof's grandsons was Waltheof (d. 1150), abbot of Melrose.

See E. A. Freeman, The Norman Conquest, vols, ii., iii. and iv. (J870-1876).

WALTHER, BERNHARD (1430-1504), German astronomer, was born at Nuremberg in 1430. lie was a man of large means, which he devoted to scientific pursuits. When Regiomontanus (q.v.) settled at Nuremberg in 1471, Walther built for their common use an observatory at which in 1484 clocks driven by weights were first used in astronomical determinations. He further brought into prominence the effects of refraction in alter- ing the apparent places of the heavenly bodies, and substituted Venus for the moon as a connecting-link between observations of the sun and stars. Walther established a printing-press, from which some of the earliest editions of astronomical works were issued. His observations, begun in 1475 and continued until his death in May 1504, were published by J. Schemer in 1544, and by W. Snell in 161S, as an appendix to his Observationes Hassiaceae.

See J. Ci. Doppelmayr, Hist. Nachricht von den number gisc ken Mathcmaticis, p. 23 (1730); G. A. Will, Number gisc he s Gelehrten-Lexikon, vii. 381 (1806); J. F. Montucla., Hist, des mathematiquts, i. 546; j. S. Bailly, Hist, de I'astr, moderne, i. 319; E. F. Apelt, Die Reformation der Stemkunde, p. 54; J. P. von Wurzelbaur, Uranies Noricae basis astronomica {1719); J. F. Weidler, Hist.astmnomiae, p. 322; A. G. Kastner, Geschichte der Mathematik, ii. 324; Mit- teilungen des Vereins fur Gesch. der Siadt Niirnberg, vii. 2×7 (1888) (H. Petz) ; R. Wolf, Gesch. der Astr. p. 92, &c.

WALTHER VON DER VOGELWEIDE (c. 1170-c. 1230), the most celebrated of medieval German lyric poets. For all his fame, Walthers name is not found in contemporary records,

with the exception of a solitary mention in the travelling ac- counts of Bishop Wolfger of Passau — " Walthero cantori de Vogelweide pro pellicio V. solidos longos " — " To Walther the singer of the Vogelweide five shillings to buy a fur coat," and the main sources of information about him are his own poems and occasional references by contemporary

Minnesingers. Jt is clear from the title her (Herr, Sir) these give him, that he was of noble birth; but it is equally clear from his name Vogelweide (Lat. avlarium, a gathering place or preserve of birds) that he belonged not to the higher nobility, who took their titles from castles or villages, but to the nobility of service (Dienstadcl), humble retainers of the great lords, who in wealth and position were little removed from non-noble free cultivators. For a

long time the place of his birth was a matter of dispute, until Professor Franz Pfeiffer established beyond reasonable doubt that he was born in the Wipthal in Tirol, where, not far from the little town of Sterzing on the Eisak, a wood — called the Vorder- und Hintervogelweide — preserves at least the name of his vanished home. This origin would account for what is known of Walther's early life. Tirol was at this time the home of several noted Minnesingers; and the court of 'Vienna, under the enlightened duke Frederick I. of the house of Babenberg, had become a centre of poetry and art. Here it was that the young poet learned his craft under the renowned master Reinmar the Old, whose death he afterwards lamented in two of his most beautiful lyrics; and in the open handed duke he found his first patron. This happy period of his life, during which he pro- duced the most charming and spontaneous of his love-lyrics, came to an end with the death of Duke Frederick in 1108. Henceforward Walther was a wanderer from court to court, singing for his lodging and his bread s and ever hoping that some patron would arise to save him from this " juggler's life " {gougel-fuore) and the shame of ever playing the guest. For material success in this profession he was hardly calculated. His criti- cism of men and manners was scathing; and even when this did not touch his princely patrons, their underlings often took measures to rid themselves of so uncomfortable a censor. Thus he was forced to leave the court of the generous duke Bernhard of Carinthia (1202-1256); after an experience of the tumultuous household of the landgrave of Thuringia he warns those who have weak ears to give it a wide berth; and after three years at the court of Dietrich I. of Meissen (reigned 1195-1221) he complains that he had received for his services neither money nor praise. Walther was, in fact, a man of strong views; and it is this which gives him his main significance in history, as distinguished from his place in literature. . From the moment when the death of the emperor Henry VI. (1197) opened the fateful struggle between empire and papacy, Walther threw himself ardently into the fray on the side of German independ- ence and unity. Though his religious poems sufficiently prove the sincerity of his Catholicism, he remained to the end of his days opposed to the extreme claims of the popes, whom he attacks with a bitterness which can only be justified by the strength of his patriotic feelings. His political poems begin with an appeal to Germany, written in 1198 at Vienna, against the disruptive ambitions of the princes: —

" Crown Philip with the Kaiser's crown And bid them vex thy peace no more." He was present, on the 8th of September, at Philip's coronation at Mainz, and supported him till his victory was assured. After Philip's murder in 1209, he "said and sang" in support of Otto of Brunswick against the papal candidate Frederick of Staufen; and only when Otto's usefulness to Germany had been shattered by the battle of Bouvines (1212) did he turn to the rising star of Frederick II., now the sole representative of German majesty against pope and princes. From the new emperor his genius and his zeal for the empire at last received recognition; and a small fief in Franconia was bestowed upon him, which, though he complained that its value was little, gave him the home and the fixed position he had so Jong desired. That Frederick gave him an even more signal mark of his favour by making him the tutor of his son Henry VII., is more than doubtful. The fact, in itself highly improbable, rests only upon the evidence of a single poem, which is capable of another interpretation. Walther's restless spirit did not suffer him to remain long on his new property. In 121 7 we find him once more at Vienna, and again in 1219 after the return of Duke Leopold VT. from the crusade. About 1224 he seems to have settled on his fief near Wurzburg. He was active in urging the German princes to take patt in the crusade of 1228, and may have accompanied the crusading army at least as far as his native Tirol. In a beautiful and pathetic poem he paints the change that had come over the scenes of his childhood and made his life seem a thing dreamed. He died about 1230, and was buried at Wurzburg, after leaving directions, according to the

story, that the birds' were to be fed at his tomb daily. The original gravestone with its Latin inscription has disappeared; but in 1843 a new monument was erected over the spot. There is also a fine statue of the poet at Bozen, unveiled in 1877.

Historically interesting as Walther's political verses are, their merit has been not a little exaggerated by modern German critics, who saw their own imperial aspirations and anti-papal prejudices reflected in this patriotic poet of the middle ages. Of more lasting value are the beautiful lyrics, mainly dealing with love, which led his contemporaries to hail him as their master in song (unsers sanges meisler). He is of course unequal. At his worst he does not rise above the tiresome conventionalities of his school. At his best he shows a spontaneity, a charm and a facility which his rivals sought in vain to emulate. His earlier lyrics are full of the joy of life, of feeling for nature and of the glory of love. Greatly daring, he even rescues love from the convention which had made it the prerogative of the nobly

born, contrasts the titles ” woman ” (wip) and ” lady ” (fro&we) to the disadvantage of the latter, and puts the most beautiful of his lyrics— Unter der linden — into the mouth of a simple girl. A certain seriousness, which is apparent under the joyous- ness of his earlier work, grew on him with years. Religious and didactic poems become more frequent; and his verses in praise of love turn at times to a protest against the laxer standards of an age demoralized by political unrest. Throughout his attitude is healthy and sane. He preaches the crusade; but at the same time he suggests the virtue of toleration, pointing out that in the worship of God

” Christians, Jews and heathen all agree.” He fulminates against ” false love “; but pours scorn on those who maintain that ” love is sin.” In an age of monastic ideals and loose morality there was nothing commonplace in the simple lines in which he sums up the inspiring principle of chivalry at its best. —*

*” Swer guotes wibes liebe hat Der schamt sich iedcr missetat.” **

Altogether Walther’s poems give us the picturt not only of a great artistic genius, but of a strenuous, passionate, very human and very lovable character.

The Gedichle were edited by Karl Lachmann (1827). This edition of the great scholar was re-edited by M. Haupt (3rd ed., 1853). Walther v. d. Vogelweide, edited by Franz PfeifTer, with introduction and notes {4th edition, by Karl Bartsch, Leipzig, 1873). Gtossarium zu d. Gedichten Walther’s, nebst e. Reimverzeichnis, by C. A. Hornig (Quedlinburg, 1844). There are translations into modern German by B. Obermann (1886), and into English verse Selected poems of Waller von der Vogelweide by W. Alison Phillips, with introduction and notes (London, 1896). The poem Unter der Linden, not included in the latter, was freely translated by T. L. Beddoes (Works, 1890), more closely by W- A. Phillips in the Nineteenth Century for July 1896 (cexxxiii. p. 70). Leben u. Dichten Walther’s ton der Vogelweide, by Wilhelm Wilmanns (Bonn, 1882), is a valuable critical study of the poet’s life and works. (W. A. P.)

WALTON, BRIAN (1600-1661), English divine and scholar, was born at Seymour, in the district of Cleveland, Yorkshire, in 1600. He went to Cambridge as a sizar of Magdalene College in 1616, migrated to Peterhouse in 1618, was bachelor in 1619 and master of arts in 1623. After holding a school mastership and two curacies, he was made rector of St Martin’s Orgar in London in 1628, where he took a leading part in the contest between the London clergy and the citizens about the city tithes, and compiled a treatise on the subject, which is printed in Brewster’s Collectanea (1752). His conduct in this matter displayed his ability, but his

zeal for the exaction of ecclesiastical dues was remembered in 1641 in the articles brought against him in parliament, which appear to have led to the sequestration of his very considerable preferments. 2 He was also charged with Popish practices, but on frivolous grounds, and with aspersing the members of parliament for the city. 1 " He who has the love of a good woman Is ashamed of every misdeed. "

3 He was from January 1635-1636 rector of Sandon, in Essex, where his first wife, Anne Claxton, is buried. He appears to have also been a prebendary of St Paul's, and for a very short time be had held the rectory of St Giles in the Fields.

In 1642 he was ordered into custody as a delinquent; thereafter he took refuge in Oxford, and ultimately returned to London to the house of William Fuller (is8o?i659), dean of Ely, whose daughter Jane was his second wife. In this retirement he gave himself to Oriental studies and carried through his great work, a Polyglot Bible which should be completer, cheaper and provided with a better critical apparatus than any previous work of the kind (see Polyglot) . The proposals for the Polyglot appeared in 1652, and the book itself came out in six great folios in 1657, having been printing for five years. Nine lan guages are used: Hebrew, Chaldce, Samaritan, Syria c, Arabic, Persian, Ethiopic, Greek and Latin. Among his collaborators were James Ussher, John Lightfoot and Edward Pococke, Edmund Cast ell, Abraham Wheelocke and Patrick Young. Thomas Hyde and Thomas Greaves. The great undertaking was supported by liberal subscriptions, and Walton's political opinions did not deprive him of the help of the Commonwealth; the paper used was freed from duty, and the interest of Crom' well in the work was acknowledged in the original preface, part of which was afterwards cancelled to make way for more loyal expressions towards that restored monarchy under which Oriental studies in England immediately began to languish. To Walton himself, however, the Reformation brought no dis- appointment. He was consecrated bishop of Chester in December 1660. In the following spring he was one of the commissioners at the Savoy Conference, but took little part in the business. In the autumn of 1661 he paid a short visit to his diocese, and returning to London he died on the 29th of November.

However much Walton was indebted to his helpers s the Polyglot Bible is a great monument of industry and of capacity for directing a vast undertaking, and the Prolegomena (separately reprinted by Dathe, 1777, and by Francis Wranghan, 1825) show judgment as well as learning. The same qualities appear in Walton's Considerator Considered (1659), a reply to the Considerations of John Owen, who thought that the accumulation of material for the revision of the received text tended to atheism. Among Walton's works must also be mentioned an Jntroductio ad lectionem

linguarum orientalium (1654; 2nd ed., 1655), meant to prepare the way for the Polyglot.

See Henry J. Todd, Memoirs of the Life and Writings of Walton (London, 1821), in 2 vols., of which the second contains a reprint of Walton's answer to Owen.

WALTON, IZAAK (1593-1683), English writer, author of The Compleat Angler, was born at Stafford on the 9th of August 1503; the register of his baptism gives his father's name as Jervis, and nothing more is known of his parentage. He settled in London as an ironmonger, and at first had one of the small shops, 7ˆ ft. by 5 ft., in the upper storey of Gresham's Royal Burse or Exchange in Cornhill. In 1614 he had a shop in Fleet Street, two doors west of Chancery Lane. Here, in the parish of St Dunstan's, he gained the friendship of Dr John Donne, then vicar of that church. His first wife, married in December 1626, was Rachel Floud, a great-great- niece of Archbishop Cranmer. She died in 1640. He married again soon after, his second wife being Anne Ken — the pastoral " Kenna " of The Angler's Wish — step-sister of Thomas Ken, afterwards bishop of Bath and Wells. After the Royalist defeat at Marston Moor, he retired from business. He had bought some land near his birthplace, Stafford, and he went to live there; but, according to Wood, spent most of his time " in the families of the eminent clergymen of England, of whom he was much beloved"; and in 1650 he was again living in Clerkenwell. In 1653 came out the first edition of his famous book, The Compleat Angler. His second wife died in 1662, and was buried in Worcester cathedral church, where there is a monument to her memory. One of his daughters married Dr Hawkins, a prebendary of Winchester. The last forty years of his long life seem to have been spent in ideal leisure and occupation, the old man travelling here and there, visiting his " eminent clergymen " and other brethren of the angle, compiling the biographies of congenial spirits, and collecting here a little and there a little for the enlargement of his famous treatise. After 1662 he found a home at Farnham Castle with George Morley, bishop of Winchester, to whom he dedicated his Life of George Herbert and also that of Richard Hooker; and from time to time he visited Charles Cotton in

his fishing house on the Dove. He died in his daughter's house at Winchester on, the 15th of December 1683, and was buried in the cathedral. It.is characteristic of his kindly nature that he left his property at Shalford for the benefit of the poor of his native town.

Walton hooked a much bigger fish than he angled for when he offered his quaint treatise, The Compleat Angler, to the public. There is hardly a name in English literature, even of the first rank, whose immortality is more secure, or whose personality is the subject of a more devoted cult. Not only is he ths sacer vales of a considerable sect in the religion of recreation, but multitudes who have never put a worm on a hcok — even on a fly-hook — have been caught and securely held by his picture of the delights of the gentle craft and his easy leisurely transcript of his own simple, peaceable, lovable and amusing character. The Compleat Angler was published in 1653, but Walton con- tinued to add to its completeness in his leisurely way for a quarter of a century. It was dedicated to John Ofncy, his most honoured friend. There was a second edition in 1655, a third in 1661 (identical with that of 1664), a fourth in 1668 and a fifth in 1676. In this last edition the thirteen chapters of the original have grown to twenty-one, and a second part was added by his loving friend and brother angler Charles Cotton, who took up " Venator " where Walton had left him and completed his instruction in fly-fishing and the making of flies. Walton did not profess to be an expert with the fly; the fly-fishing in his first edition was contributed by Thomas Barker, a retired cook and humorist, who produced a treatise of his own in 1659; but in the use of the live worm, the grasshopper and the frog " Pis- cator " himself could speak as a master. The famous passage about the frog — often misquoted about the worm — " use him as though you loved him, that is, harm him as little as you may possibly, that he may live the longer " — appears in the original edition. The additions made as the work grew were not merely to the technical part; happy quotations, new turns of phrase, songs, poems and anecdotes were introduced as if the leisurely author, who wrote it as a recreation, had kept it constantly in his mind and talked it over point by point with his numerous brethren. There were originally only two interlocutors in the opening scene, " Piscator " and " Viator "; but in the second edition, as if in answer to an objection that " Piscator " had it too much in his own way in praise of angling, he introduced the falconer, " Auceps," changed " Viator " into " Venator " and made the new companions each dilate on the joys of his favourite sport.

Although The Compleat Angler was not Walton's first literary work, his leisurely labours as a biographer seem to have grown out of his devotion to angling. It was probably as an angler that he made the acquaintance of Sir Henry Wotton, but it is clear that Walton had more than a love of fishing and a humorous temper to recommend him to the friendship of the accomplished ambassador. At any rate, Wotton, who had intended to write the life of John Donne, and had already corresponded with Walton on the subject, left the task to him. Walton had already contributed an Elegy to the 1633 edition of Donne's poems, and he completed and published the

life, much to the satis- faction of the most learned critics, in 1640. Sir Henry Wotton dying in 1639, Walton undertook his life also; it was finished in 1642 and published in 1651. His life of Hooker was published in 1662, that of George Herbert in 1670 and that of Bishop Sanderson in 1678. All these subjects were endeared to the biographer by a certain gentleness of disposition and cheerful piety; three of them at least — Donne, Wotton and Herbert — were anglers. Their lives were evidently written with loving pains, in the same leisurely fashion as his Angler, and like it are of value less as exact knowledge than as harmonious and complete pictures of character. Walton also rendered affection- ate service to the memory of his friends Sir John Skeffington and John Chalkhill, editing with prefatory notices SkefEngton's Hero of Lorenzo in 1652 and Chalkhill's Thealma and Clearckus a few months before his own death in 1683. His poems and prose fragments were collected in 1878 under the title of Waltoniana.

The best-known old edition of the Angler is J. Major's (2nd ed., 1824). The book was edited by Andrew Lang in 1896, and various modern editions have appeared. The standard biography is that by Sir Harris Nicolas, prefixed to an edition of the Angler (1836). There are notices also, with adGitional scraps of fact, annexed to two American editions, Bethune's (1847) and Dowling's (1857). An edition of Walton's Lives, by G. Sampson, appeared in 1903. See also Izaak Walton and Ms Friends, by S. Martin (1903).

WALTON-LE-DALE, an urban district in the Darwen parlia- mentary division of Lancashire, England, on the S. bank of the Ribble, immediately above Preston. Pop. (1901) 11,271. The church of St Leonard, situated on an eminence to the east of the town, was originally erected in the nth century. The earliest portions of the present building are the Perpendicular chancel and tower, the nave having been rebuilt in 1798, while the transepts were erected in 1816. There are a number of interest- ing old brasses and monuments. Cotton-spinning is carried on, and there are market-gardens in the vicinity. Roman remains have been found here, and there was perhaps a roadside post on the site. The manor of Walton w T as granted by Henry de Lacy about 1130 to Robert Banastre. It afterwards passed by marriage to the Langtons, and about 1592 to the Hoghtons of Hoghton. Walton was the principal scene of the great battle of Preston, fought on the 17th of August 1648 between Crom- well and the duke of Hamilton. In 1701 the duke of Norfolk, the earl of Derwentwater and other Jacobites incorporated the town by the style of the " mayor and corporation of the ancient borough of Walton." In 1715 the passage of the Ribble was bravely defended against the Jacobites by Parson Woods and his parishioners of Atherton {q.v.).

WALTON-OH-THAMES, an urban district in the Epsom parliamentary division of Surrey, England, pleasantly situated on the right bank of the Thames, 17 m. W.S.W. from London by the London & South-Western railway. Pop. (1901) 10,329. The church of St Mary has late Norman portions, and contains numerous memorials, including examples of the work of Chantrey and Roubiliac. A verse inscribed upon a pillar is reputed to be Queen Elizabeth's profession of faith as regards transubstantia- tion. The queen was a frequent resident at Henry VIII. 's palace of Oatlands Park, which was destroyed during the civil wars of the 17th century. The property subsequently passed through various hands, and the park is reduced in extent by the modern growth of villas surrounding it. It contains, however, a remark- able grotto built of mineral and stalactitic rock, shells and other similar materials, by one of the earls of Lincoln when owner. Ashley Park, a Tudor mansion (in the main modernized), attributed to Cardinal Wolsey, was at times the residence of Cromwell; while John Bradshaw, who, as lord president of the court, sentenced Charles I. to death, occupied the old manor house of Walton. Walton is a favourite resort of anglers and boating parties.

WALTON-ON-THE-NAZE (or Walton-le-Soken), a watering- place in the Harwich parliamentary division of Essex, England, the terminus of a branch of the Great Eastern railway from Colchester, 71! m. E.N.E. from London. Pop. of urban district (1901) 2014. This portion of the coast has suffered from en- croachment of the sea, and a part of the old village of Walton, with the church, was engulfed towards the end of the 18th century. A prebendary stall at St Paul's Cathedral, London, was endowed with the lands thus consumed (praebenda consumpta per mare). On the E. side of the town is the open North Sea, with a fine stretch of sand and shingle, affording good bathing. To the west is an irregular inlet studded with low islands, known as Hanford Water. The Naze is a promontory 2 m. N. by E. of the town, and in the vicinity of Walton are low cliffs exhibiting the fossiliferous red crag formation. The church of All Saints is a brick building dating mainly from 1804. Walton has a public hall, several hotels and a small theatre; and iron foundries and brick works. Services of passenger steamers in connexion with Harwich, Clacton-on- Sea, and London are maintained in the summer.

WALTZING HOUSE (or Japanese Waltzing Mouse), a pied race of the house mouse (Mus musculus), or one of its allies,

originally bred in China, and known in Japan as the Nankin mouse. The

habit of these mice of spinning round and round after their tails is highly developed, and continually exercised. In Japan, where there were originally two breeds, a grey and a white, these mice are kept in cages on account of their dancing propensities. The dancing was at one time supposed to be due to a disease of the labyrinth of the ear; but Dr K. Kishi, in a paper in the Zeitsckrift fiir mssenschaftliche Zoologie (vol. xxi. pt. 3), concludes that it is the effect of confinement for untold centuries in small cages.

WALWORTH, SIR WILLIAM (d. 1385), lord mayor of London, belonged to a good Durham family. He was apprenticed to John Lovekyn, a member of the Fishmongers' Gild, and succeeded his master as alderman of Bridge ward in 1368, becom- ing sheriff in 1370 and lord mayor in 1374. He is said to have suppressed usury in the city during his term of office as mayor. His name frequently figures as advancing loans to the king, and he supported John of Gaunt, duke of Lancaster, in the city, where there was a strong opposition to the king's uncle. His most famous exploit was his encounter with Wat Tyler in 1381, during his second term of office as lord mayor. In June of that year, when Tyler and his followers entered south Loudon, Walworth defended London Bridge against them; he was with Richard II. when he met the insurgents at Smithfield, and assisted in slaying their leader (see Tyler, Wat), after- wards raising the city bodyguard in the king's defence; for which service he was rewarded by knighthood and a pension. He subsequently served on two commissions to restore the peace in the county of Kent. He died in 1385, and was buried in the church of St Michael, Crooked Lane, of which he was a considerable benefactor. Sir William Walworth was the most distinguished member of the Fishmongers' Gild, and he invariably figured in the pageants prepared by them when one of their members attained the mayoralty. He became a favourite hero in popular tales, and appeared in Richard Johnson's Nine Worthies of London in 1592.

See William Herbert, The History . . . of St Michael, Crooked Lane, London . . . (1831); W. and R. Woodcock, Lives of Illustrious Lord Mayors (1846); an account of Wat Tyler's rebellion in a frag- mentary chronicle printed by G. H. Trevelyan in the English Historical Review (July 1898).

WAMPUM, or Wampum-Peage (Amer. Ind. wampam, "white"; peag, "bead"), the shell-money of the North American Indians. It consisted of beads made from shells, and, unlike the cowry-money of India and Africa (which was the shell in its natural state), required a considerable measure of skill in its manufacture. Wampum was of two colours, dark purple and white, of cylindrical form, averaging a quarter of an inch in length, and about half that in diameter. Its colour determined its value. The term wampum or wampum-peage was apparently applied to the beads only when strung or woven together. They were ground as smooth as glass and

were strung together by a hole drilled through the centre. Dark wampum, which was made from a " hard shell " clam {Venus mercenaria), popularly called quahang or quahog, a corruption of the Indian name, was the most valuable. White wampum was made from the shell of whelks, either from the common vihe\k(Buccinumundalum), or from that of Pyrula canaliculata and Pyrula carica. Wampum was employed most in New England, but it was common elsewhere. By the Dutch settlers of New York it was called seawan or zeewand, and roenoke in Virginia, and perhaps farther south, for shell-money was also known in the Carolinas, but whether the roenoke of the Virginian Indians was made from the same species of shell as wampum is not clear. Cylindrical shell-beads similar to the wampum of the Atlantic coast Indians were made to some extent by the Indians of the west coast. This was manufactured from the Mytilus caiifornianus, a mussel which abounds there.

In the trading between whites and Indians, wampum so com- pletely took the place of ordinary coin that its value was fixed by legal enactment, three to a penny and five shillings a fathom. The fathom was the name for a count, and the number of shells varied according to the accepted standard of exchange. Thus

where six wampum went to the penny, the fathom consisted of 360 beads; but where four made a penny, as under the Massa- chusetts standard of 1640, then the fathom counted 240. The beads were at first worth more than five shillings per fathom, the price at which they passed current in 1643. A few years before the fathom had been worth nine or ten shillings. Connecticut received wampum for taxes in 1637 at four a penny. In 1640 Massachusetts adopted the Connecticut standard, "white to pass at four and bleuse at two a penny." There was no restric- tion on the manufacture of wampum, and it was made by the whites as well as the Indians. The market was soon flooded with carelessly made and inferior wampum, but it continued to be circulated in the remote districts of New England through the 17th century, and even into the beginning of the 18th. It was current with silver in Connecticut in 1704.

Wampum was also used for personal adornment, and belts were made by embroidering wampum upon strips of deerskin. These belts or scarves were symbols of authority and power and were surrendered on defeat in battle. Wampum also served a mnemonic use as a tribal history or record. " The belts that pass from one nation to another in all treaties, declarations and important transactions, are very carefully preserved in the chiefs' cabins, and serve not only as a kind of record or history but as a public treasury. According to the Indian conception, these belts could tell by means of an interpreter the exact rule, pro- vision or transaction talked into them at the time and of which they were the exclusive record. A strand of wampum,

consisting of purple and white shell-beads or a belt woven with figures formed by beads of different colours, operated on the principle of associating a particular fact with a particular string or figure, thus giving a serial arrangement to the facts as well as fidelity to the memory. These strands and belts were the only visible records of the Iroquois, but they required the trained interpreters who could draw from their strings and figures the acts and intentions locked up in their remembrance" (Major Rogers, Account of North America, London, 1765).

See Holmes, " Art in Shell of the Ancient Americans " in Annual Report of Bureau of Ethnology, Washington, for 1880-1881; W. B. Weeden, Indian Money as a Factor in New England Civilization (Baltimore, 1884); E. Ingersoll, "Wampum and its History," in American Naturalist, vol. xvii. (1883); Horatio Hale, "On the Origin and Nature of Wampum," in American Naturalist, vol. xviii. (1884); C. L. Norton, "The Last Wampum Coinage," in American Magazine for March 1888.

WANA, a valley and frontier outpost of Waziristan in the North-West Frontier Province of India. It lies to the west of the Mahsud country, and to the north of the Gomal river, and is in- habited by the Waziri tribe. Lying on the border of Afghanistan, it is conveniently placed for dominating Waziristan on the north and the Gomal Pass on the south, and occupies very much the same strategic position as the Zhob valley holds in Baluchistan. It forms the end of the chain of outposts extending from Quetta to Waziristan, and can be supported either from India by the Gomal Pass or from Quetta by the Zhob valley. In 1894, when the Indo-Afghan boundary commission was delimiting the Waziri border, the Mahsud Waziris, thinking their independence to be threatened, made a night attack on the camp of the com- mission at Wana. The result was the Waziristan Expedition of the same year, and the occupation of Wana by British troops. On the formation of the North-West Frontier Province in 1901 it was decided to replace the troops by militia, and Wana was handed over to them in 1904. It is now the headquarters of the political agency of Southern Waziristan.

WANAMAKER, JOHN (1838-), American merchant, was born, of Palatine-Huguenot stock, in Philadelphia, Penn- sylvania, on the nth of July 1838. He attended a public school in that city until he was fourteen, then became an errand boy for a book store, and was a retail clothing salesman from 1856 until i86r, when he established with Nathan Brown (who afterward became his brother-in-law) the clothing house of Wanamaker & Brown, in Philadelphia, the partnership continuing until the death of Brown in 1868. In 1869 Wanamaker founded the house of John Wanamaker & Company; and in 1875 bought the

Pennsylvania Railroad Company's freight depot at Thirteenth and Market streets, and in the following year opened it as a dry goods and clothing store, subsequently much enlarged. In September 1896 he acquired from Hilton, Hughes & Company the former New York store of A. T. Stewart, and thereafter greatly enlarged it and added a new building; this, and the Philadelphia store, are among the largest department stores in the United States. Mr Wanamaker was postmaster-general in President Benjamin Harrison's cabinet in 1889-1893, and brought about the establishment of post-offices on ocean-going vessels. He early identified himself with religious work in Phila- delphia; was the first paid secretary, in 1857-1861, of that city's Young Men's Christian Association, of which he was president in 1870-1883, and in 1858 founded, and thereafter served as superintendent of, the Bethany (Presbyterian) Sunday School, one of the largest in the world. He took an active part in the movement which resulted in the formation of the United States Christian Commission in 1861.

WANDERU (Wandeeoo), the native name for the species of langur monkeys (Semnopithecus) inhabiting the island of Ceylon; but in India commonly misapplied to the lion-tailed macaque, Macacus silenus (see Primates).

WANDESFORD, CHRISTOPHER (1592-1640), lord deputy of Ireland, was the son of Sir George Wandesford (1573-1612) of Kirklington, Yorkshire, and was born on the 24th of September 1592. Educated at Clare College, Cambridge, he entered parlia- ment in 1621, and his rise to importance was due primarily to his friendship with Sir Thomas Wentworth, afterwards earl of Strafford. Although at first hostile to Charles I., this being evidenced by the active part he took in trie impeachment of Buckingham, Wandesford soon became a royalist partisan, and in 1633 he accompanied Wentworth to Ireland, where he was already master of the rolls. His services to his chief were fully recognized by the latter, whom in 1640 he succeeded as lord deputy, but he had only just begun to struggle with the diffi- culties of his new position when he died on the 3rd of December

1640.

His son Christopher (1628-1687), created a baronet in 1662, was the father of Sir Christopher Wandesford (d. 1707), who was created an Irish peer as Viscount Castlecomer in 1 707 , Castlecomer in Kilkenny having been acquired by his grandfather when in Ireland. Christopher, the 2nd

viscount (d. 17 19), was secretary- at-war in 1717-1718. In 1758 John, 5th viscount, was created Earl Wandesford, but his titles became extinct when he died in January 17 84,

For Wandesford's life see Thomas Comber, Memoirs of the Life and Death of the Lord Deputy Wandesford (Cambridge, 1778) ; T. D. Whitaker, History of Richmondskire, vol. ii. (1823) ; and the Auto- biography of his daughter, Alice Thornton, edited by Charles Jackson for the Surtces Society (Durham, 1875).

WANDIWASH, a town in the North Arcot district of Madras, India. Pop. (1901) 5971. It is notable as the scene of the victory of Sir Eyre Coote in 1760, the most important ever won by the British over the French in India.

WANDSBEK, a town of Germany, in the Prussian province of Schleswig-Holstein, practically forming a populous suburb of Hamburg, with which it is connected by a railway and an electric tramway. Pop. (1905) 31,563. It is best known as the place of residence of the poet Johann Heinrich Voss and of Matthias Claudius, who here issued (1771-1775) the Wandslecker Boten. There is a monument to Claudius in the town. Its leading manufactures are spirits, tobacco, beer, leather and confectionery; other industries arc machine building and gardening.

WANDSWORTH, a south-western metropolitan borough of London, England, bounded N. by the river Thames and Batter- sea, and E. by Lambeth, and extending S. and W. to the boundary of the county of London. Pop. (1901) 232,034. The name, which occurs in Domesday, indicates the position of the village on the river Wandle, a small tributary of the Thames. Wands- worth is the largest in area of the metropolitan boroughs, in- cluding the districts of Putney by the river, part of Clapham in the north-east, Streatham in the south-east, Balham and Upper and Lower Tooting in the centre and south. These are

mainly residential districts, and the borough is not thickly populated. Towards the west, along the Upper Richmond and Kingston roads, there is considerable open country, undulating and well wooded. It is to a great extent preserved in the public grounds of Putney Heath, which adjoins Wimbledon Common, outside the borough, on the north; and Richmond Park and Barnes Common, parts of which are in the borough. Other public grounds are parts of Wandsworth Common (193 acres) and Clapham Common, both extending into Battersea, Tooting Bee (147 acres) and Streatham Common (66 acres), and Wands- worth Park bordering the Thames. The borough is connected with Fulham across the Thames by Wandsworth and Putney bridges. The annual Oxford and Cambridge boat-race starts from above Putney Bridge, finishing at Mortlake; and the club-

houses of the principal rowing clubs of London are situated on the Putney shore. Putney Heath was formerly notorious as a resort of highwaymen and duellists. Among the institu- tions of Wandsworth are the Royal Hospital for Incurables, Putney; the Fountain and the Grove fever hospitals, Lower Tooting; the Clapham School of Art, Wandsworth Technical Institute; the Roman Catholic Training College for Women, West Hill; and Wandsworth Prison, Heathfield Road. The parliamentary borough of Wandsworth returns one member, but the municipal borough also includes part of the Clapham division of the parliamentary borough of Battersea and Clap- ham, and part of the Wimbledon division of Surrey. The borough council consists of a mayor, 10 aldermen and 60 council- lors. Area, 9129-7 acres.

WANGANUI, the principal port on the west coast of North Island, New Zealand, in the Waitotara county, at the mouth of the Wanganui river, 134 m. by rail N. of Wellington. Pop. (1906)8175. The town is laid out in rectangular blocks at the foot of low hills, from the summit of which (as in Queen's Gardens) a splendid panorama is seen, including the snow-clad Mount Ruapehu to the north-east. The river bar obstructs navigation, the depth not exceeding 14 ft., so that large vessels must lie outside. The district is agricultural and pastoral, and wool and grain. are exported, as well as meat and dairy produce, for which there are large refrigerating works. The Wanganui Collegiate School (Church of England) is one of the largest boarding schools in Australasia. The district was the scene of conflicts with the natives in 1847, 1864 and 1868, and in the beautiful Moutoa gardens a monument commemorates the battle of that name (May 14th, 1864). The settlement was founded in 1842.

WANGARA, the Hausa name for the Mandingo (?.».), a people of West Africa; used also as the name of districts in the western and central Sudan. The Wangara are also known as Wan- garawa, Wongara, Ungara, Wankore and Wakore. According to Idrisi (writing in the 12th century), the Wangara country was renowned for the quantity and the quality of the gold which it produces. The country formed an island about 300 m. long by 150 in breadth, which the Nile {i.e. Niger) sur- rounded on all sides and at all seasons. This description corre- sponds fairly accurately with the tract of country between the Niger and its tributary the Bani. Idrisi's account of the annual inundation of the land by the rising of the Niger agrees with the facts. He states that on the fail of the waters natives from all parts of the Sudan assembled to gather the gold which the subsiding waters left behind. In the closing years of the 18th and the opening years of the 19th century the discoveries of Hornemann, Mungo Park and others revived the stories of Wangara and its richness in gold. Geographers of that period (e.g. Major Rennell) shifted the Wangara country far to the east and confused Idrisi's description with accounts which probably referred to

Lake Chad. Gradually, however, as knowledge increased, the Wangara territory was again moved westward, and was located within the Niger bend. The name has now practically disappeared from the maps save that a town in the hinterland of Dahomey is named Wangara (French spelling Ouangara). Idrisi's account as to the richness in gold of the upper Niger regions has basis in fact ; though the gold brought

in considerable quantities to the European trading stations on the Gambia and Senegal in the 16th, 17th and 18th centuries appears to have come largely from Bambuk.

WANGARATTA, a town of Victoria, Australia, in the counties of Moira, Delatite and Bogong, at the junction of the Ovens and King rivers, 1455 m. by rail N.E. of Melbourne. Pop. (1901) 2621. It is a prosperous little town in an agricultural district and is the sec of an Anglican bishop. It has numerous industries, including flour-milling, tanning, fellmongery, brewing, coach-building, bacon-curing, and bicycle and butter making. Important stock sales are held fortnightly, and there is an annual agricultural exhibition.

WANSTEAD, an urban district in the Romford parliamentary division of Essex, England, forming a residential suburb of London, on a branch of the Great Eastern railway, 8 m. N.E. of Liverpool Street station. Pop. (1901) 9179. Wanstead Park, 184 acres in extent, was opened in 1882. Northward extend the broken fragments of Epping Forest. Wanstead Flats, adjoining the Park, form another open ground. At Lake House Thomas Hood wrote the novel Tylney Hall. At Snaresbrook in the parish of Wanstead are the Infant Orphan Asylum, founded in 1827, and the Royal Merchant Seamen's Orphan Asylum, established in London in 181 7 and refounded here in 1861. In Snaresbrook is Eagle Pond or Lake, io| acres in extent.

Wanstead is mentioned in Domesday, and the name is con- sidered by some to be derived from Woden's stead or place, indicating a spot dedicated to the worship of Woden. It be- longed before the time of Edward the Confessor to the monks of St Peter's, Westminster, and afterwards to the bishop of London, of whom it was held at the time of the Domesday Survey by Ralph Fitz Brien. In the reign of Henry VIII. it came into the possession of the crown, and in 1549 it was bestowed by Edward VI. on Lord Rich, whose son sold it in 1577 to Robert Dudley, earl o[Leicester. The original manor house was rebuilt by Lord Chancellor Rich, who was

here visited by Queen Elizabeth in 1561, and for her entertainment Sir Philip Sidney wrote a dramatic interlude which was played before the queen at Wanstead garden, and is printed at the end of the Arcadia. Sir Richard Child, afterwards earl of Tylney, built the splendid mansion of Wanstead House in 1715 (demolished in 1822), in which the prince of Conde and others of the Bourbon family resided during the reign of the first Napoleon.

WANTAGE, a market town in the Abingdon parliamentary division of Berkshire, England. Pop. of urban district (1901), 3766. It lies in the richly wooded Vale of White Horse, in a hollow at the foot of the steep hills which border the Vale on the south, 2 m. S. of Wantage Road station on the Great Western railway, with which a steam tramway connects it. The church of St Peter and St Paul is cruciform, and as a whole Perpendicular in appearance, but retains a nave arcade and ornate tower-arches of the Early English period. The font is a fine specimen of the same style; and there is beautiful woodwork in the chancel. An altar-tomb in alabaster of 1361, and a fine brass of 1414, commemorate members of the family of Fitzwarren. There are other brasses of the 15th and 16th centuries. The neighbouring building of the grammar school preserves a Norman door from another church, which formerly stood in the same churchyard with St Peter's. In the broad market-place is a great statue of King Alfred, executed by Count Gleichen and unveiled in 1877 ; for Wantage is famous as the birthplace of the king in 849. The town has a large agricultural trade and ironworks.

The title of Baron Wantage of Lockinge was taken in 1885 by Sir Robert Loyd-Lindsay (b. 1832) on his elevation to the peerage. He was the son of General James Lindsay of Balcarres, but took the additional surname of Loyd in 1858 on marrying the heiress of Lord Overstone, the banker; he fought with his regiment the Scots Fusilier Guards in the Crimea and won the V.C., retiring as lieutenant-colonel. He was M.P. for Berks from 1S65 to 1885, and was financial secretary to the War Office in 1877-1880. The title became extinct at his death in 1900.

WAPENSHAW (M.E. for " weapon-show "), a periodical muster or review of troops formerly held in every district in Scotland, the object having been to satisfy the military chiefs that the arms of their retainers were in good condition. Scott's Old Mortality gives a description of one. The name is still given to rifle meetings held annually at Aberdeen and other places in Scotland.

WAPENTAKE, anciently the principal administrative division of the counties of York, Lincoln, Leicester, Nottingham, Derby and Rutland, corresponding to the hundred in the southern counties of England. In many

cases, however, ancient wapen- takes are now called hundreds. North of the Tees, Sadberg in Durham is the only district which was called a wapentake, and the rest of the ancient administrative divisions of the three northern counties were called wards. The word wapentake seems to have been first applied to the periodical meetings of the magnates of a district; and, if we may believe the 12th century compilation known as the Leges Edwardi, it took its name from the custom in accordance with which they touched the spear of their newly-appointed magistrate with their own spears and so confirmed his appointment. Probably it was also usual for them to signify their approval of a proposal by the clash of their arms, as was the practice among the Scandinavian peoples. Wapentakes are not found outside the parts of England which were settled by the Danes. They varied in size in different counties ; those of Yorkshire, for instance, being very much larger than those of Lincolnshire. As a general rule each wapen-take had its own court, which had the same jurisdiction as the hundred courts of the southern counties. In some cases, however, a group of wapentakes had a single court. It should be noticed that the court was styled wapentagium simply, and not curia wapentagii.

See Sir Henry Ellis, General Introduction to Domesday Book; W. W. Skeat, Etymological English Dictionary; W. Stubbs, Constitu- tional History; and H. M. Chadwick, Studies on Anglo-Saxon Institutions (1905). (G. J. T.)

WAPPERS, EGIDE CHARLES GUSTAVE, Baron (1803- r874), Belgian painter, was born at Antwerp on the 23rd of August 1803. After studying at the Antwerp Academy he went to Paris in 1826. The Romantic movement was then astir in France, and in that vehement struggle towards a new ideal artists and political men were thrown together. Wappers was the first Belgian artist to take advantage of this state of affairs, and his first exhibited picture, " The Devotion of the Burgomaster of Leiden," appearing at the appropriate moment, had a mar- vellous success in the Brussels Salon of 1830, The picture, although political, was in fact a remarkable work, which revolu- tionized the taste of Flemish painters. Wappers was invited to the court of Brussels, and was favoured with commissions. In 1832 the city of Antwerp appointed him professor of painting, and his triumph was complete when he exhibited at the Antwerp Salon of 1834 his masterpiece, " An Episode of the Belgian Revolution of 1830" (Brussels Gallery). He was subsequently appointed painter to the king of the Belgians, and at the death of Matthieu van Bree he was made director of the Antwerp Academy. Of his very numerous works we may name " Christ Entombed," " Charles I. taking leave of his Children," " Charles IX.," " Camoens," " Peter the Great at Saardam," and " Boc- caccio at the Court of Joanna of Naples." Louis Philippe gave him a commission to paint a large picture for the gallery at Versailles, " The Defence of Rhodes by the Knights of St John of Jerusalem," a work finished in 1844, when he

received from the king of the Belgians the title of baron. After retiring from the post of director of the Antwerp Academy, he settled in 1853 in Paris, where he died on the 6th of December 1874.

See J. du Jardin, V Art flamand; Camille Lemonnier, Histoire des beaux arts en lielgique; E. Fetis, " Notice sur Gustave Wappers," Annuaire de Vacademie royale de Belgiaue (1884).

WAQIDl [Abvl 'Abdallah Mahommed ibn "Umar ul-Waqidi] (747-823), Arabian historian, was born at Medina, where he became a corn-dealer but was compelled tc flee from his creditors (owing largely to his generosity) to Bagdad. Here the Barmecide vizier Yahya b. Khalid (see Barmecides) gave him means and

made him cadi in the western district of the city. In 819 he was transferred to Rosafa (Rusafa) on the east side. His greatest work is the Kitab ul-Maghazi, or history of Mahomet's campaigns.

The first third of the Kltab ul-Ma%hazi (one leaf missing) was published by A. von Kremer from a Damascus MS. (Calcutta, 1856). Sprenger in his Leben Muhammad's used a British Museum MS. containing the first half, all but one leaf. J. Wellhausen published an abridged German translation from another British Museum MS. under the title Muhammad in Medina (Berlin, 1882).

Ascribed to Waqidi, but probably written at the time of the Crusades to incite the Moslems against the Christians, are several works on the conquests of Islam. One of the best known is the Futuh ush-Shdm, edited by W. Nassau Lees (Calcutta, 1854-1862; Cairo, 1865). M. J. de Goeje, in his Memoires sur la conquete de la Syrie (Leiden, 1900), holds that this work is founded on that of Abu Hudhaifa ul-Bukhari, which in turn is an edition of the real Waqidi.

See Arabia, Literature, section " History." (G. W. T.)

WAR (0. Eng. werre, Fr. guerre, of Teutonic origin; cf. O.H.G. werran, to confound), the armed conflict of states, in which each seeks to impose its will upon the other by force. War is the opposite of Peace (q.v.), and is the subject of the military art. In separate sections below the general principles of the art of war are discussed, and the laws which have gradually become accepted among civilized peoples for the regulation of its con- ditions. The details concerning the history of individual wars, and the various weapons

and instruments of war, are given in separate articles.

See Army, Navy, Conscription, Strategy, Tactics, Infantry, Cavalry, Artillery, Engineers, Fortification, Coast De- fence, Officers, Staff, Guards, Supply and Transport, Uni- forms, Arms and Armour, Gun, Rifle, Pistol, Sword, Lance, Ordnance, Machine Guns, Submarine Mines, Torpedo, &c. The important wars are dealt with under the names commonly given to them ; e.g. American Civil War, American War of Inde- pendence, American War of 1S12, Crimean War, Dutch Wars, Franco-German War, French Revolutionary Wars, Great Rebellion, Greek War of Independence, Italian Wars, Napoleonic Camfaigns, Peloponnesian War, Peninsular War, Punic Wars, Russo-Japanese War, Russo-Turktsh Wars, Servo-Bulgarian War, Seven Weeks' War, Seven Years' War, Spanish-American War, Spanish Succession War, Thirty Years' War. Important campaigns and battles are also separately treated (e.g. Waterloo, Trafalgar, Shenandoah Valley, Wil- derness, Met/, &c).

I. General Principles

*It is not easy to determine whether industrial progress, improved organization, the spread of education or mechanical inventions have wrought the greater change in the military art. conditions. ˆ ar * s nrst an(l foremost a matter of movement; and as such it has been considerably affected by the multi- plication of good roads, the introduction of steam transport, and by the ease with which draught animals can be collected. In the second place, war is a matter of supply; and the large area of cultivation, the increase of live-stock, the vast trade in pro- visions, pouring the food-stuffs of one continent into another, have done much to lighten the inevitable difficulties of a cam- paign. In the third place, war is a matter of destruction; and while the weapons of armies have become more perfect and more durable, the modern substitutes for gunpowder have added largely to their destructive capacity. Fourthly, war is not merely a blind struggle between mobs of individuals, without guidance or coherence, but a conflict of well-organized masses, moving with a view to intelligent co-operation, acting under the impulse of a single will and directed against a definite objective. These masses, however, are seldom so closely concentrated that the impulse which sets them in motion can be promptly and easily communicated to each, nor can the right objective be selected without some knowledge of the enemy's strength and dispositions. Means of intercommunication, therefore, as well as methods of observation, are of great importance; and with the telegraph, the telephone, visual signalling, balloons, airships and improved field-glasses, the armies of to-day, so far as regards the mainten- ance of connexion between different bodies of troops, and the diffusion, if not the acquiring, of information, are at a great advantage compared with those of the middle of the 10th century.*

War, then, in some respects has been made much simpler. Armies are easier to move, to feed and to manoeuvre. But in

other respects this very simplicity has made the conduct of a campaign more difficult. Not only is the weapon wielded by the general less clumsy and more deadly than heretofore, less fragile and better balanced, but it acts with greater rapidity and has a far wider scope. In a strong and skilful hand it may be irresistible; in the grasp of a novice it is worse than useless. In former times, when war was a much slower process, and armies were less highly trained, mistakes at the outset were not neces- sarily fatal. Under modern conditions, the inexperienced com- mander will not be granted time in which to correct his deficiencies and give himself and his troops the needful practice. The idea of forging generals and soldiers under the hammer of war dis- appeared with the advent of " the nation in arms." Military organization has become a science, studied both by statesmen and soldiers. The lessons of history have not been neglected. Previous to 1870, in one kingdom only was it recognized that intellect and education play a. more prominent part in war than stamina and courage. Taught by the disasters of 1806, Prussia set herself to discover the surest means of escaping humiliation for the future. The shrewdest of her sons undertook the task. The nature of war was analysed until the secrets of success and failure were laid bare; and on these investigations a system of organization and of training was built up which, not only from a military, but from a political, and even an economical point of view, is the most striking product of the 19th century. The keynote of this system is that the best brains in the state shall be at the service of the war lord. None, therefore, but thoroughly competent soldiers are entrusted with the responsi- bility of command; and the education of the officer is as thorough, as systematic and as uniform as the education of the lawyer, the diplomatist and the doctor. In all ages the power of intellect has asserted itself in war. It was not courage and experience only that made Hannibal, Alexander and Caesar the greatest names of antiquity. Napoleon, Wellington and the Archduke Charles were certainly the best-educated soldiers of their time; while Lee, Jackson and Sherman probably knew more of war, before they made it, than any one else in the United States. But it was not until 1866 and 1870 that the preponderat- ing influence of the trained mind was made manifest. Other wars had shown the value of an educated general; these showed the value of an educated army. It is true that Moltke, in mental power and in knowledge, was in no wise inferior to the great captains who preceded him; but the remarkable point of his campaigns is that so many capable generals had never before been gathered together under one flag. No campaigns have been submitted to such searching criticism. Never have mistakes been more sedulously sought for or more frankly exposed. And yet, compared with the mistakes of other campaigns, even with that of 1815, where

hardly a superior officer on cither side had not seen more battles than Moltke and his comrades had seen field-days, they were astonishingly few. It is not to be denied that the foes of Prussia were hardly worthy of her steel. Yet it may be doubted whether either Austria or France ever put two finer armies into the field than the army of Bohemia in 1866 and the army of the Rhine in 1870. Even their generals of divisions and brigades had more actual experience than those who led the German army corps. Compared with the German rank and file, a great part of their non-commissioned officers and men were veterans, and veterans who had seen much service. Their chief officers were practically familiar with the methods of moving, supplying and manoeuvring large masses of troops; their marshals were valiant and successful soldiers. And yet the history of modern warfare records no defeats so swift and so complete as those of Koniggratz and Sedan. The great host of Austria was shattered to fragments in seven weeks; the French Imperial army was destroyed in seven weeks and three days; and to all intent and purpose the resistance they had offered was not much more effective than that of a respectable militia. But both the Austrian and the French armies were organized and trained under the old system. Courage, experience and professional pride they possessed in abundance. Man for man, in all virile qualities, neither officers nor men were inferior to

their foes. But one thing their generals lacked, and that was education for war. Strategy was almost a sealed book to them; organization a matter of secondary importance. It was no part of their duty, they declared, to train the judgment of their subordinates; they were soldiers, and not pedagogues. Know- ledge of foreign armies and their methods they considered useless; and of war prepared and conducted on " business principles " they had never even dreamt.

*The popular idea that war is .a mere matter of brute force, redeemed only by vaiour and discipline, is responsible for a greater evil than the complacency of the amateur. and'war." *' blinds both the people and its representatives to their bounden duties. War is something more than a mere outgrowth of politics. It is a political act, initiated and controlled by the government, and it is an act of which the issues are far more momentous than any other. No branch of political science requires more careful study. It is not pretended that if military history were thoroughly studied all statesmen would become Moltkes, or that every citizen would be competent*

to set squadrons in the field. War is above all a practical art, and the application of theory to practice is not to be taught at a university or to be learned by those who have never rubbed shoulders with the men in the ranks. But if war were more generally and more thoroughly studied, the importance of organization, of training, of education and of readiness would be more generally appreciated; abuses would no longer be regarded with lazy tolerance; efficiency would be something more than a political catchword, and soldiers would be given ample oppor- tunities of becoming masters of every detail of their profession. Nor is this all. A nation that understood something about war would hardly suffer the fantastic tricks which have been played so often by the best-meaning statesmen. And statesmen them- selves would realize that when war is afoot their interference is worse than useless; that preparation for defence, whether by the multiplication of roads, the construction of railways, of arsenals, dockyards, fortresses, is not the smallest of their duties; and lastly, that so far as possible diplomacy and strategy should keep step. Each one of these is of far greater importance than in the past. In the wars of the 18th century, English cabinets and Dutch deputies could direct strategical operations without bringing ruin on their respective countries. The armies of Austria in 1792-1795, controlled as they were by the Aulic Councils, were more formidable in the field than those of the French Republic. In the campaigns of 1854 and r8so the plans of Newcastle and Napoleon III. worked out to a successful issue; and if Lincoln and Stanton, his Secretary of War, im- perilled the Union in 1862, they saw the downfall of the Southern Confederacy in 1865. But in every case amateur was pitted against amateur. The Dutch deputies were hardly less incapable of planning or approving a sound plan of campaign than Louis XIV. The Aulic Council was not more of a marplot than the Committee of Public Safety. Newcastle was not a worse strategist than the tsar Nicholas I. Napoleon III. and his advisers were quite a match for the courtier generals at Vienna; while Lincoln and Stanton were not much more ignorant than Jefferson Davis. The amateur, however, can no longer expect the good fortune to be pitted against foes of a capacity no higher than his own. The operations of Continental armies will be directed by soldiers of experience whose training for war has been incessant, and who will have at their command troops in the highest state of efficiency and preparation. It is not difficult to imagine, under such conditions, with what condign punishment mistakes will be visited. Napoleon III. in 1859 committed as many blunders as he did in 1870. But the Austrians had no Moltke to direct them; their army corps were commanded by men who knew less of generalship than a Prussian major, and their armament was inferior. Had they been the Austrians of to-day, it is probable that the French and the allies would have been utterly defeated. And to come to more recent campaigns, while American officers have not hesitated to declare that if the Spaniards at Santiago had been

Germans or French, the invasion would have ended in disastrous failure, it is impossible to doubt

that had the Boers of 1899 possessed a staff of trained strategists, they would have shaken the British Empire to its foundations. The true test of direction of war is the number of mistakes. If they were numerous, although the enemy may not have been skilful enough to take advantage of them, the outlook for the future under the same direction, but against a more practised enemy, is anything but bright.

As regards preparation for defence, history supplies us with numerous illustrations. The most conspicuous, perhaps, is the elaborate series of fortifications which were constructed by Vauban for the defence of France; i,™ p ff a ”

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and there can be no question that Louis XIV., in defence. erecting this mighty barrier against invasion, gave proof of statesmanlike foresight of no mean order. An instance less familiar, perhaps, but even more creditable to the brain which conceived it, was Wellington’s preparation of Portugal in 1809-1811. Not only did the impregnable stronghold of Torres Vedras, covering Lisbon, and securing for the sea-power an open door to the continent of Europe, rise as if by magic from the earth, but the whole theatre of war was so dealt with that the defending army could operate wherever opportunity might offer. No less than twenty supply depots were established on different lines of the advance. Fortifications protected the principal magazines. Bridges were restored and roads improved. Waterways were opened up, and flotillas organized; and three auxiliary bases were formed on the shores of the Atlantic. Again, the famous ” quadrilaterals ” of Lombardy and Rumelia have more than fulfilled the purpose for which they were con- structed; and both Austria and Turkey owe much to the fortresses which so long protected their vulnerable points. Nor has the neglect of preparation failed to exert’ a powerful effect. Moltke has told us that the railway system qf Germany before 1870 had been developed without regard to strategical considerations. Yet the fact remains that it was far better adapted both for offence and defence than those of Austria and France; and, at the same time, it can hardly be denied that the unprovided state of the great French fortresses exercised an evil influence on French strategy. Both Metz and Strassburg were so far from forming strong pivots of manoeuvres, and thus aiding the operations of the field armies, that they required those armies for their protection; and the retreat on Metz, which removed Bazaine’s army from the direct road to Paris and placed it out of touch with its supports, was mainly due to the unfinished outworks and deficient armament of the virgin city. Since 1870 it has been

recognized that preparation of the theatre of war is one of the first duties of a government. Every frontier of continental Europe is covered by a chain of entrenched camps. The great arsenals are amply fortified and strongly garrisoned. Strategy has as much to say to new railways as trade; and the lines of communication, whether by water or by land, are adequately protected from all hostile enterprises.

We now come to the importance of close concert between strategy and diplomacy. On the continent of Europe they can easily keep pace, for the theatre of war is always aaKxrt . within easy reach. But when the ocean intervenes between between two hostile states it is undoubtedly difficult diplomacy to time an ultimatum so that a sufficient armed force ""^ shall be at hand to enforce it, and it has been said in high places that it is practically impossible. The expedition to Copenhagen in 1807, when the British ultimatum was pre- sented by an army of 27,000 men carried on 300 transports, would appear to traverse this statement. But at the beginning of the 20th century an army and a fleet of such magnitude could neither be assembled nor despatched without the whole world being cognizant. It is thus perfectly true that an appreciable period of time must elapse between the breaking off of negotia- tions and the appearance on the scene of an invading army. Events may march so fast that the statesman's hand may be forced before the army has embarked. But because a powerful blow cannot at once be struck, it by no means follows that the delivery or the receipt of an ultimatum should at once produce a daDgerous situation. Dewey's brilliant victory at Manila lost

the greater part of its effect because the United States Govern- ment was unable to follow up the blow by landing a sufficient force. Exactly the same thing occurred in Egypt in 1882. The only results of the bombardment of Alexandria were the destruc- tion of the city, the massacre of the Christian inhabitants, the encouragement of the rebels, who, when the ships drew off, came to the natural conclusion that Great Britain was powerless on land. Again, in 1899 the invading Boers found the frontiers unfortified and their march opposed by an inadequate force. It is essential, then, that when hostilities across the sea are to be apprehended, the most careful precautions should be taken to ward off the chance of an initial disaster. And such pre- cautions are always possible. It is hardly conceivable, for instance, that a great maritime power, with Cyprus as a place d'armes, could not have placed enough transports behind the fleet to hold a

sufficient garrison for Alexandria, and thus have saved the city from destruction. Nor in the case of a distant province being threatened is there the smallest reason that the garrison of the province should be exposed to the risk of a reverse before it is reinforced. It may even be necessary to abandon territory. It will certainly be necessary to construct strong places, to secure the lines of communication, to establish ample magazines, to organize local forces, to assemble a fleet of transports, and to keep a large body of troops ready to embark at a moment's notice. But there is no reason, except expense, that all this should not be done directly it becomes clear that war is probable, and that it should not be done without attracting public attention. In this way strategy may easily keep pace with diplomacy; and all that is wanted is the exercise of ordinary foresight, a careful study of the theatre of war, a knowledge of the enemy's resources and a resolute determination, despite some teniDorary inconvenience and the outcry of a thoughtless public, to give the enemy no chance of claiming first blood. The Franco-German War supplies a striking example. Moltke's original intention was to assemble the German armies on the western frontier. The French, he thought, inferior in numbers and but half prepared, would probably assemble as far back as the Moselle. But, as so often happens in war, the enemy did what he was least expected to do. Hastily leaving their garri- sons, the French regiments rushed forward to the Saar. The excitement in Germany was great; and even soldiers of repute, although the mobilization of the army was still unfinished, demanded that such troops as were available should be hurried forward to protect the rich provinces which lie between the Saar and Rhine. But the chief of the staff became as deaf as he was silent. Not a single company was despatched to reinforce the slender garrisons of the frontier towns; and those garrisons were ordered to retire, destroying railways and removing rolling- stock, directly the enemy should cross the boundary. Moltke's foresight had embraced every possible contingency. The action of the French, improbable as it was deemed, had still been provided against; and, in accordance with time-tables drawn up long beforehand, the German army was disentrained on the Rhine instead of on the Saar. Ninety miles of German territory were thus laid open to the enemy; but the temporary surrender of the border provinces, in the opinion of the great strategist, was a very minor evil compared with the disasters, military and political, that would have resulted from an attempt to hold them.

It is hardly necessary to observe that no civilian minister, however deeply he might have studied the art of war, could

be expected to solve for himself the strategic problems Dut/esof which come before him. In default of practical Minister. knowledge, it would be as impossible for him to

decide where garrisons should be stationed, what fortifications were necessary, what roads should be constructed, or how the lines of communication should be protected, as to frame a plan of campaign for the invasion of a hostile state. His foresight, his prevision of the accidents inevitable in war, would necessarily be far inferior to those of men who had spent their lives in applying strategical principles to concrete cases; and it is exceedingly unlikely that he would be as prolific of

strategical expedients as those familiar with their employment. Nevertheless, a minister of war cannot divest himself of his responsibility for the conduct of military operations. In the first place, he is directly responsible that plans of campaign to meet every possible contingency are worked out in time of peace. In the second place, he is directly responsible that the advice on which he acts should be the best procurable. It is essential, therefore, that he should be capable of forming an independent opinion on the merits of the military projects which may be submitted to him, and also on the merits of those who have to execute them. Pitt knew enough of war and men to select Wolfe for the command in Canada. Canning and Castlereagh, in spite of the opposition of the king, sent Wellington, one of the youngest of the lieutenant-generals, to hold Portugal against the French. The French Directory had sufficient sense to accept Napoleon's project for the campaign of Italy in 1796. In the third place, strategy cannot move altogether untrammelled by politics and finance. But political and financial considerations may not present themselves in quite the same light to the soldier as to the statesman, and the latter is bound to make certain that they have received due attention. If, however, modifications are necessary, they should be made before the plan of campaign is finally approved; and in any case the purely military considerations should be most carefully weighed. It should be remembered that an unfavourable political situation is best redeemed by a decisive victory, while a reverse will do more to shake confidence in the Government than even the temporary surrender of some portion of the national domains. " Be sure before striking " and Reader pour mieux sauter are both admirable maxims; but their practical application requires a thorough appreciation of the true principles of war, and a very large degree of moral courage, both in the soldier who suggests and in the statesman who approves. If, however, the soldier and the statesman are supported by an enlightened public, sufficiently acquainted with war to realize that patience is to be preferred to precipitation, that retreat, though inglorious, is not necessarily humiliating, their task is very considerably lightened. Nothing is more significant than a comparison between the Paris press in 1870 and the American Confederate press in 1864. In the one case, even after the disastrous results of the first encounters had proved the superior strength and readiness of the enemy, the French people, with all

the heat of presumptuous ignorance, cried out for more battles, for an immediate offensive, for a desperate defence of the frontier provinces. So fierce was their clamour that both the generals and the government hesitated, until it was too late, to advise the retreat of Bazaine's army; and when that army had been cut off at Metz, the pressure of public opinion was so great that the last reserve of France was despatched to Sedan on one of the maddest enterprises ever undertaken by a civilized state. In 1864, on the other hand, while Lee in Virginia and Johnston in the west were retreating from position to position, and the huge hosts of the Union were gradually converging on the very heart of the Confederacy, the Southern press, aware that every backward step made the Federal task more difficult, had nothing but praise for the caution which controlled the movements of their armies. But the Southern press, in three crowded years of conflict, had learned something of war. In r866 and 1870 the German press was so carefully muzzled that even had there been occasion it could have done nothing to prejudice pubjic opinion. Thus both the sovereign and the generals were backed by the popular support that they so richly merited; but it may be remarked that the relations between the army and the government were char- acterized by a harmony which has been seldom seen. The old king, in his dual capacity as head of the state and commander- in-chief, had the last word to say, not only in the selection of the superior officers, but in approving every important operation. With an adviser like Moltke at his elbow, it might appear that these were mere matters of form. Moltke, however, assures us that the king was by no means a figurehead. Although most careful not to assert his authority in a way that would embarrass his chief of staff, and always ready to yield his own judgment

to sound reasons, he expressed, nevertheless, a perfectly inde- pendent opinion on every proposal placed before him, and on very many occasions made most useful suggestions. And at the same time, while systematically refraining from all inter- ference after military operations had once begun, he never permitted military considerations to override the demands of policy. In 1&66, when it was manifestly of the first importance, from a military point of view, that the Prussian army should be concentrated in a position which would enable it to cross the border immediately war was declared, the political situation was so strained that it was even more important to prevent the enemy from setting foot at any single point on Prussian territory. The army, in consequence, was dispersed instead of

being con- centrated, and the ultimate offensive became a difficult and hazardous operation. It is true that the king was an able and 'experienced soldier. Nevertheless, the wise restraint he displayed in the course of two great campaigns, as well as the skill with which he adjusted conflicting factors, are an admirable example of judicious statesmanship.

*The duration of a campaign is largely affected by the deadly properties of modern firearms. It is true that the losses in battle are relatively less that in the days of Brown *J5"J' , Bess and the smooth-bore cannon, and almost in- ert, significant when compared with the fearful carnage wrought by sword and spear. The reason is simple. A battlefield in the old days, except at close quarters, was a comparatively safe locality, and the greater part of the troops engaged were seldom exposed for a long time together to a hot and continuous fire. To-day death has a far wider range, and the strain on the nerves is consequently far more severe. De- moralization, therefore, sets in at an earlier period, and it is more complete. When troops once realize their inferiority, they can no longer be depended on. It is not the losses they have actually suffered, but those that they expect to suffer, that affect them. Unless discipline and national spirit are of superior quality, unless the scldier is animated by something higher than the mere habit of mechanical obedience, panic, shirking and wholesale surrender will be the ordinary features of a campaign. These phenomena made themselves apparent, though in a less degree, as long ago as the American Civil War, when the weapon of the infantry was the muzzle-loading rifle, firing at most two rounds a minute, and when the projectiles of the artillery were hardly more destructive than the stone shot of Mons Meg. With the magazine rifle, machine guns, shrapnel and high- explosives they have become more pronounced than even at Vionvilie or Plevna. "The retreat of the 38th (Prussian) Brigade,' 1 writes Captain Hoenig, an eye-witness of the former battle, " forms the most awful drama of the great war. It had lost 53 % of its strength, and the proportion of killed to wounded was as 3 to 4. Strong men collapsed inanimate. ... I saw men cry like children, others fell prone without a sound; in most the need of water thrust forth all other instincts; the body demanded its rights. ' Water, water,' was the only intelligible cry that broke from those moving phantoms. The enemy's lead poured like hail upon the wretched remnant of the brigade; yet they moved only slowly to the rear, their heads bent in utter weariness; their features distorted under the thick dust that had gathered on faces dripping with sweat. The strain was beyond endurance. The soldier was no longer a receptive being; he was oblivious of everything, great or small. His comrades or his superiors he no longer recognized; and yet he was the same man who but a short time before had marched across the battlefield shouting his marching chorus. A few active squadrons, and not a man would have escaped ! Only he who had seen men in such circumstances,*

and observed their bearing, knows the dreadful imprint that their features leave upon the memory. Madness is there, the madness that arises from bodily exhaustion combined with the most abject terror. . . . I do not shrink," he adds, "from confessing that the fire of Mars-labour affected my nerves for months."

If such are the results of ill-success, a whole army might he reduced to the condition of the 38th Brigade in the first

month of the campaign, and it is thus perfectly clear that some small mistake in conduct, some trifling deficiency in preparation, an ill conceived order or a few hours' delay in bringing up a reinforcement may have the most terrible consequences.

The importance, nay the necessity, that the people, as a governing body, should keep as watchful an eye on its armed forces and the national defences as on diplomacy or legislation is fully realized naturally enough, only by those nations whose instincts of self-preservation, by reason of the configuration of their frontiers or their political situation, are strongly developed. Yet even to maritime empires, to Great Britain or indeed to the United States, an efficient army is of the first necessity. Their land frontiers are vulnerable. They may have " a ™ 1 "" 1 to deal with rebellion, and a navy is not all-powerful, force. even for the defence of coasts and commerce. It can protect, but it cannot destroy. Without the help of an army, it can neither complete the ruin of the enemy's fleet nor prevent its resuscitation. Without the help of an army it can hardly force a hostile power to ask for terms. Exhaustion is the object of its warfare; but exhaustion, unless accelerated by crushing blows, is an exceedingly slow process. In the spring of 1861 the blockade was established in American waters along the coasts of the Southern Confederacy, and maintained with increasing stringency from month to month. Yet it was not till the spring of 1865 that the colours of the Union floated from the capitol of Richmond, and it was the army which placed them there. A state, then, which should rely on naval strength alone, could look forward to no other than a protracted war, and a protracted war between two great powers is antagonistic to the interests of the civilized world. With the nations armed to the teeth, and dominated to a greater or smaller extent by a militant spirit; with commerce and finance dependent for health and security on universal peace, foreign intervention is a mere question of time. Nor would public opinion, either in Great Britain or America, be content with a purely defensive policy, even if such policy were practic- able. Putting aside the tedium and the dangers of an intermin- able campaign, the national pride would never be brought to confess that it was incapable of the same resolute effort as much smaller communities. " An army, and a strong army," would be the general cry. Nor would such an army be difficult to

create. Enormous numbers would not be needed. An army supported by an invincible navy possesses a strength which is out of all proportion to its size. Even to those who rely on the big bat- talions and huge fortresses, the amphibious power of a great maritime state, if intelligently directed, may be a most formidable menace; while to the state itself it is an extraordinary security. The history of Great Britain is one long illustration. Captain Mahan points out that there are always dominant positions, outside the frontiers of a maritime state, which, in the interests of commerce, as well as of supremacy at sea, should never be allowed to pass into the possession of a powerful neighbour. Great Britain, always dependent for her prosperity on narrow seas, has long been familiar with the importance of the positions that command these waterways. In one respect at least her policy has been consistent. She has spared no effort to secure such positions for herself, or, if that has been impracticable, at least to draw their teeth. Gibraltar, Malta, St Lucia, Aden, Egypt, Cyprus are conspicuous instances; but above all stands Antwerp. In perhaps the most original passage of Alison's monumental work the constant influence of Antwerp on the destinies of the United Kingdom is vividly portrayed. " Nature has framed the Scheldt to be the rival of the Thames. Flowing through a country excelling even the midland counties of England, in wealth and resources, adjoining cities equal to any in Europe in arts and commerce; the artery at once of Flanders and Holland, of Brabant and Luxemburg, it is fitted to be the great organ of communication between the fertile fields and rich manufacturing towns of the Low Countries and other maritime states of the world." Antwerp, moreover, the key of the great estuary, is eminently adapted for the establishment of a vast naval arsenal, such as it became under Philip II. of

Spain and again under the first Napoleon. ” It is the point,” continues the historian, ” from which in every age the independ- ence of these kingdoms has been seriously menaced. Sensible of her danger, it had been the fixed policy of Great Britain for centuries to prevent this formidable outwork from falling into the hands of her enemies, and the best days of her history are chiefly occupied with the struggle to ward off such a disaster.” In ascribing, however, every great war in which Great Britain has been engaged to this cause alone he has gone too far. The security of India has been a motive of equal strength. Never- theless, it was to protect Antwerp from the French that Charles II. sided with the Dutch in 1670; that Anne declared war on Louis XIV. in 1704; that Chatham supported Prussia in 1742; that Pitt, fifty years later, took up arms against the Revolution.

The trophies of the British army in the great war with France were characteristic of the amphibious power. The troops took later- more battleships than colours, and almost as many

actions ot naval arsenals as land fortresses. Many were the oavaland blows they struck at the maritime strength of France military an(j ner a vj£ es . Dut nac ; the expedition which landed ” on the Isle of Walcheren in 1809 been as vigorously conducted as it was wisely conceived, it would have hit Napoleon far harder than even the seizure of the Danish fleet at Copen- hagen. The great dockyard that the emperor had constructed on the Scheldt held the nucleus of a powerful fleet. Eight line- of-battle ships and ten frigates lay in mid-channel. Twenty vessels of different classes were on the slips, and in the magazines and storehouses had been accumulated sufficient material to equip all these and twenty more. The destruction of Antwerp — and for a full week it was at Lord Chatham’s mercy — would have freed scores of British frigates to protect British commerce; Wellington, in his great campaign of 1813, could not have had to complain that, for the first time, the communication by sea of a British army was insecure; the Americans, in the war which broke out in 181 2, would have been more vigorously opposed; and Napoleon, who, while Antwerp was his, never altogether abandoned hope of overmastering Great Britain on her own element, might, on his own confession, have relinquished the useless struggle with the great sea power. The expedition failed, and failed disastrously. But for all that, fulfilling as it did the great maxim that the naval strength of the enemy should be the first objective of the forces of the maritime power, both by land and sea, it was a strategical stroke of the highest order.

The predominant part played by the army under Wellington in Spain and Belgium has tended to obscure the principle that governed its employment in the war of 1793-1815. The army, in the opinion of the country, was first and foremost the auxiliary of the fleet; and only when the naval strength of the enemy had been destroyed was it used in the ordinary manner, i.e. in the invasion of the hostile territory and in lending aid to the forces of confederate powers. Events proved that these principles were absolutely sound. It was not in the narrow seas alone that the army rendered good service to the navy. Depriving France of her colonies, occupying her ports in foreign waters, ousting her from commanding posts along the trade routes, it contributed not only to her exhaustion, but to the protection of British commerce and to the permanent establishment of maritime supremacy. Few of these operations are of sufficient magnitude to attract much notice from the ordinary historian, yet it is impossible to overrate their effect. To the possession of the dominant positions that were captured by the army, Great Britain, in no small degree, is indebted for the present security of her vast dominions. The keynote of the fierce struggle with the French Empire was the possession of India. Before he became First Consul, Napoleon had realized that India was the throne of Asia; that whoever should sit on that throne, master of the commerce of the East, of the richest and most natural market for the products of the West, and of the hardiest and most en- lightened nations of the golden hemisphere, would be master of more than half the globe. But his prescience was not surer than the instinct of the British people. Vague and shadowy

indeed were their dreams of empire, yet the presentiment of future greatness, based on the foothold they had already gained in Hindustan, seems always to have controlled the national policy. They knew as well as Napoleon that Malta and Egypt, to use his own phrase, were merely the outworks of their strong- hold in the East; and that if those outworks fell into the hands of France, a great army of warlike Mahommedans, led by French generals, stiffened by a French army corps, and gathering impetus from the accession of every tribe it passed through, might march unopposed across the Indus. So, from first to last, the least threat against Egypt and Malta sufficed to awaken their apprehensions; and in their knowledge that India was the ultimate objective of all his schemes is to be found the explanation of the stubbornness with which they fought Napoleon. It is not to be denied that in thwarting the ambition of their mighty rival, or perhaps in furthering their own, the navy was the chief instrument; but in thrusting the French from Egypt, in adding Ceylon, Mauritius and Cape Colony to the outworks, the army, small as it was then, compared with the great hosts of the Continent, did much both for the making and the security of the British Empire.

But the scope of the military operations of a maritime state is by no means

limited to the capture of colonies, naval arsenals and coaling-stations. Timely diversions, by attracting a large portion of the enemy's fighting strength on the mainland, may give valuable aid to the armies of an ally. The Peninsular War is a conspicuous example. According to Napoleon, the necessity of maintaining his grip on Spain deprived him of r8o,ooo good soldiers during the disastrous campaign of 1813; and those soldiers, who would have made Dresden a decisive instead of a barren victory, were held fast by Wellington. Again, it was the news of Vittoria that made.it useless for the emperor to propose terms of peace, and so escape from the coils that strangled him at Leipzig.

Nor is the reinforcement supplied by a small army based upon the, sea to be despised. In 1793 a British contingent under the duke of York formed part of the allied forces which, had the British government forborne to interfere, would in all probability have captured Paris. Twenty-two years later, under wiser auspices, another contingent, although numbering no more than 30,000 men, took a decisive part in the war of nations, and the blunders of the older generation were more than repaired at Waterloo. Nevertheless, the strength of the amphibious power has been more effectively displayed than in the campaign of 1815. Intervention at the most critical period of a war has produced greater results than the provision of a contingent at the outset. In 1781 the disembarkation of a French army at Yorktown, Virginia, rendered certain the independence of the United States; and in 1878, when the Russian invaders were already in sight of Constantinople, the arrival of the British fleet in the Dardanelles, following the mobilization of an ex- peditionary force, at once arrested their further progress. Had the British Cabinet of 1807 realized the preponderating strength which even a small army, if rightly used, draws from the com- mand of the sea, the campaign of Eylau would in all probability have been as disastrous to Napoleon as that of Leipzig. The presence of 20,000 men at the great battle would have surely turned the scale in favour of the allies. Yet, although the men were available, although a few months later 27,000 were assembled in the Baltic for the coercion of Denmark, his Majesty's ministers, forgetful of Marlborough's glories, were so imbued with the idea that the British army was too insignificant to take part in a Continental war, that the opportunity was let slip. It is a sufficiently remarkable fact that the successive governments of that era, although they realized very clearly that the first duty of the army was to support the operations and complete the triumph of the navy, never seemed to have grasped the principles which should have controlled its use when the com- mand of the sea had been attained. The march of the Allies on Paris in r?93 was brought to a standstill because the British Cabinet considered that the contingent would be better em- ployed in besieging Dunkirk. After the failure of the expedition

under Sir John Moore to achieve the impossible, and in con- junction with the Spaniards drive the French from the Peninsula, the ministry abandoned all idea of intervention on the main theatre, although, as wc have seen, had such intervention been well timed, it might easily have changed the current of events. It is true that when the main theatre is occupied by huge armies, as was the case during the whole of the Napoleonic conflict, the value of a comparatively small force, however sudden its appear- ance, is by no means easily realized. For instance, it would seem at first sight that a British contingent of 100,000 men would be almost lost amid the millions that would take part in the decisive conflicts of a European war. It is remembered, however, that with enormous masses of men the difficulties of supply are very great. Steam has done much to lighten them, and the numbers at the point of collision will be far greater than it was possible to assemble in the days of Napoleon. Nevertheless, the lines of communication, especially railways, will require more men to guard them than heretofore, for they are far more vulnerable. The longer, therefore, the lines of communication, the smaller the numbers on the field of battle. Moreover, the great hosts of the Continent, not only for convenience of supply, but for con- venience of manoeuvre, will deploy several armies on a broad front. At some one point, then, a reinforcement of even one or two army corps might turn the scale.

The objections, however, to intervention of this character are numerous. Between allied armies, especially if one is far larger than the other, there is certain to be friction, Weakness as was t ˆ e case – m tne Crimea; and the question of armies. supply is not easily settled. If, however, the decisive point is near the coast, as in the campaign of Eylau, the army of the maritime power, possessing its own base, can render effective aid without embarrassment either to itself or its ally. But, under all other conditions, independent opera- tions of a secondary nature are distinctly to be preferred. Such was clearly the opinion of the British ministries during the war with France. They recognized that by giving vitality and backbone to popular risings even a small army might create useful diversions. But their idea of a diversion was a series of isolated efforts, made at far-distant points; and even so late as r8r3 they were oblivious of the self-evident facts that for a diversion to be really effective it must be made in such strength as to constitute a serious threat, and that it should be directed against some vital point. Fortunately for Europe, Wellington foresaw that the permanent occupation of Portugal, and the presence of a British army in close

proximity to the southern frontier of France, would be a menace which it would be im- possible for Napoleon to disregard. Yet with what difficulty he induced the government to adopt his views, and how luke- warm was their support, is exposed in the many volumes of his despatches. In all history there are few more glaring instances of incompetent statesmanship than the proposal of the cabinet of 18 13, at the moment Wellington was contemplating the campaign that was to expel the French from Spain, and was asking for more men, more money and more material, to detach a large Force in the vague hope of exciting a revolution in southern Italy. Whether the improvement in communications, as well as the increase in the size of armies, have not greatly weakened the value of diversions on the mainland, it is difficult to say. Railways may enable the defender to concentrate his forces so rapidly that even the landing may be opposed, and with the enormous numbers at his command he may well be able to spare a considerable force from the main theatre. It is possible to conceive that a small army, even if it completed its embarka- tion, might find itself shut up in an entrenched position by a force little larger than itself. If, however, the diversion were made at a crisis of the campaign, the sudden appearance of a new army might be decisive of the war. Otherwise, the army would probably do more good if it refrained from landing and confined itself to threats. So long as it was hidden by the horizon, it would be invested with the terrors of the unknown. The enemy's knowledge that at any moment a well-equipped force, supported by a powerful fleet, might suddenly descend

upon some prosperous port or important arsenal, would compel him to maintain large garrisons along the whole seaboard. The strength of these garrisons, in all probability, would be much larger in the aggregate than the force which menaced them, and the latter would thus exercise a far greater disintegrat- ing effect on the enemy's armed strength than by adding a few thousand men to the hosts of its ally. On theatres of war which are only thinly populated or half civilized, a descent from the sea might easily produce a complete change in the situation. The occupation of Plevna, in close proximity to the Russian line of communications and to the single bridge across the Danube, brought the Russian advance through Bulgaria to a sudden stopj and relieved all pressure on Turkey proper. The deadlock which ensued is suggestive. Let us suppose that the invaders' line of communications had been a railway, and Plevna situated near the coast. Supplied from the sea, with unlimited facilities for reinforcement, Osman's ring of earthworks would have been absolutely impregnable; and had the ring been pushed so far inland as to secure scope for offensive action, the Russians. in all human probability, would never have crossed the Balkans. It is perfectly possible, then, that if an army lands within reach of a precarious line of communications it may compel the enemy, although far

superior in numbers, to renounce all enterprises against distant points.

*Railways in war are good servants, but bad masters. In some respects they are far superior to a network of highroads. Two trains will supply the daily needs of 100,000 men several hundred miles distant from their base. But the road-bed is easily destroyed; the convoy system is impractic- able, and the regular course of traffic is susceptible to the slightest threat. So, when railways become the principal factors, as when an army finds itself dependent on a long and exposed line, a powerful aggressive combination becomes a matter of the utmost difficulty. The whole attention of the commander will be given to the security of his supplies, and even if he is not thrown on the defensive by the enemy's activity, his liberty of action will be exceedingly circumscribed. The relative values of the different kinds of communications have a most important bearing on the art of war. A great waterway, such as the Nile, the Mississippi, the Danube or the Ganges, is safer and surer than a railway. But railways are far more numerous than navigable rivers, and a series of parallel lines is thus a better meansof supplying a large army. But neither railways nor waterways as lines of supply or of operation arc ******* to be compared with the sea. Before the war of 1870, operation. for instance, a study of the French railway system enabled Moltke to forecast, with absolute accuracy, the direction of Napoleon's advance, the distribution of his forces, and the extent of front that they would occupy. In a war, therefore, between two Continental powers, the staff on either side would have no difficulty in determining the line of attack; the locality for concentration would be at once made clear; and as the carrying capacity of all railways is well known, the numbers that would be encountered at any one point along the front might be easily calculated. But if the enemy's army, supported by a powerful fleet, were to advance across blue water, the case would be very different. Its movements would be veiled in the most complete secrecy. It would be impossible to do more than guess at its objective. It might strike at any point along hundreds of miles of coast, or it might shift from one point to another, perhaps far distant, in absolute security; it could bewilder the enemy with feints, and cause him to disperse his forces over the whole seaboard. Surprise and freedom of movement are pre-eminently the weapons of the power that commands the sea. Witness the War of Secession. McClellan, in 1862, by the adroit transfer of 120,000 men down the reaches of Chesapeake to the Virginia Peninsula, had Richmond at his mercy. Grant in 1864, by ■ continually changing his line of communication from one river t& another, made more progress in a month than his predecessors had done in two years. Sher man's great march across Georgia would have been impossible had not a Federal fleet been ready to receive him when he reached*

the Atlantic; and, throughout the war, the knowledge that at any moment a vast fleet of transports might appear off any one of the ports on their enormous seaboard prevented the Con- federates, notwithstanding that the garrisons were reduced to a most dangerous extent, from massing their full strength for a decisive effort.

The power of striking like ” a bolt from the blue ” is Gf the very greatest value in war. Surprise was the foundation of almost all the grand strategical combinations of the past, as it will be of those to come. The first thought and the last of the

great general is to outwit his adversary, and to strike phtbious wnere ne * s l east expected. And the measures he adopts power. to accomplish his purpose are not easily divined.

What soldier in Europe anticipated Marlborough’s march to the Danube and Blenheim field? What other brain besides Napoleon’s dreamt of the passage of the Alps before Marengo? Was there a single general of Prussia before Jena who foresaw that the French would march north from the Bavarian frontier, uncovering the roads to the Rhine, and risking utter destruction in case of defeat? Who believed, in the early June of 1S15, that an army 130,000 strong would dare to invade a country defended by two armies that mustered together over 200,000 unbeaten soldiers? To what Federal soldier did it occur, on the morning of Chancellorsville, that Lee, confronted by 90,000 Northerners, would detach the half of his own small force of 50,000 to attack his enemy in flank and rear? The very course which appeared to ordinary minds so beset by difficulties and dangers as to be outside the pale of practical strategy has, over and over again, been that which led to decisive victory; and if there is one lesson more valuable than another as regards national defence, it is that preparation cannot be too careful or precautions overdone. Overwhelming numbers, adequately trained, commanded and equipped, are the only means of ensuring absolute security. But a numerical preponder- ance, either by land or sea. over all possible hostile combina- tions, is unattainable, and in default the only sound policy is to take timely and ample precautions against all enterprises which are even remotely possible. There is nothing more to be dreaded in war than the combined labours of a thoroughly well-trained general staff, except the intellect and audacity of a

great strategist. The ordinary mind, even if it does nT £° ” not shrink from great danger, sees no way of surmount- strategy, ing great difficulties; and

any operation which

involves both vast dangers and vast difficulties it scoffs at as chimerical. The heaven-born strategist, on the other hand, " takes no counsel of his fears." Knowing that success is seldom to be won without incurring risks, he is always greatly daring; and by the skill with which he overcomes all obstacles, and even uses them, as Hannibal and Napoleon did the Alps, and as some great captain of the future may use the sea, to further his purpose and surprise his adversary, he shows his superiority to the common herd. It is repeated ad nauseam that in consequence of the vastly improved means of transmitting information, surprise on a large scale is no longer to be feared. It is to be remembered, however, that the means of concentrating troops and ships are far speedier than of old; that false informa- tion can be far more readily distributed; and also, that if there is one thing more certain than another, it is that the great strategist, surprise being still the most deadly of all weapons, will devote the whole force of his intellect to the problem of bringing it about.

Nor is it to be disguised that amphibious power is a far more terrible weapon than even in the days when it crushed Napoleon. Commerce has increased by leaps and bounds, and it is no longer confined within territorial limits. The arteries vital to the existence of civilized communities stretch over every ocean. States which "in 1800 rated their maritime traffic at a few hundred thousand pounds sterling, value it now at many millions. Others, whose flags, fifty years ago, were almost unknown on the high seas, possess to-day great fleets of merchantmen; and those who fifty years ago were self-dependent, rely in great part, for the maintenance of their prosperity, on their intercourse

with distant continents. There is no great power, and few small ones, to whom the loss of its sea-borne trade would be other than a most deadly blow; and there is no great power that is not far more vulnerable than when Great Britain, single-handed, held her own against a European coalition. Colonies, commercial ports, dockyards, coaling-stations are so many hostages to fortune. Year by year they become more numerous. Year by year, as commercial rivalry grows more acute, they become more intimately bound up with the prosperity and prestige of their mother-countries. And to what end? To exist as pledges of peace, auspicia melioris aevi, or to fall an easy prey to the power that is supreme at sea and can strike hard on land?

Even the baldest and briefest discussion of the vast subject of war would be incomplete without some reference to the relative merits of professional and unprofessional value of soldiers. Voluntary service still holds its ground in the twprofes- Anglo-Saxon states; and both the United Kingdom stomal and

America will have to a great extent to rely, in troopSt case of conflicts which tax all their resources, on troops who have neither the practice nor the discipline of their standing armies. What will be the value of these amateurs when pitted against regulars? Putting the question of moral aside, as leading us too far afield, it is clear that the individual amateur must depend upon his training. If, like the majority of the Boers, he is a good shot, a good scout, a good skirmisher and, if mounted, a good horseman and horsemaster, he is undeniably a most useful soldier. But whether amateurs en masse, that is, when organized into battalions and brigades, are thoroughly trustworthy, depends on the quality of their officers. With good officers, and a certain amount of previous training, there is no reason why bodies of infantry, artillery or mounted infantry, composed entirely -of unprofessional soldiers, should not do excellent service in the field. Where they are likely to fail is in discipline; and it would appear that at the beginning of a campaign they are more liable to panic, less resolute in attack, less enduring under heavy losses and great hardships, and much slower in manoeuvre than the professionals. To a certain extent this is inevitable; and it has a most important bearing on the value of the citizen soldier, for the beginning of a campaign is a most critical phase. In short, troops who are only half-trained or have been hastily raised may be a positive danger to the army to which they belong; and the shelter of stout earthworks is the only place for them. Yet the presence of a certain number of experienced fighting men in the ranks may make all the difference; and, in any case, it is probable that battalions com- posed of unprofessional soldiers, the free citizens of a free and prosperous state, are little if at all inferior, as fighting units, to battalions composed of conscripts. But it is to be understood ihat the men possess the qualifications referred to above, that the officers are accustomed to command and have a good practical knowledge of their duties in the field. A mob, however patriotic, carrying small-bore rifles is no more likely to hold its own to-day against well-led regulars than did the mob carrying pikes and Hint-locks in the past. A small body of resolute civilians, well- armed and skilful marksmen, might easily on their own ground defeat the same number of trained soldiers, especially if the latter were badly led. But in a war of masses, the power of combination, of rapid and orderly movement, and of tactical manoeuvring is bound to tell. (G.F.R.H.)

Literature.— On the general principles of War, see C. v. Clause- witz, Vom Kriege (Eng. trans. On War, newed. 1906) ; C. v. B(inder)- K(rieglstein), GeAsi und Staff im Kriege (1895); Ardant du Picq, Etudes sur le combat; W. Bagehot, Physics and Politics; G. le Bon, Psychologic des foides and Psychologic ae I'Sducation; F. N. Maude, War and the World's Life (1907) ; Berndt, Zahl im Kriege (statistical tables); Biottot, Les Grands Inspires — Jeanne d'Arc; C. W. C. Oman, Art of War; M. Jahns, Gesch. der

Kriegswissenschaften; v. der Goltz, Volk in Waffen (Eng. trans., Nation in Arms); A. T. Mahan, Influence of Sea Power on History; C. E. Callwell, Military Opera- tions and Maritime Preponderance; P.H. Colomb, Natal warfare; Stewart Murray, Future Peace of the Anglo-Saxons; H. Spenser Wilkinson, The Brain of an Army, War and Policy, &c. ; and works mentioned in the bibliography to the article Army.

II. Laws of War

The law of war, in strict usage, does not apply to all armed conflicts, but only to such conflicts as, by the usage of states, civil war constitute war. War exists when the organized armed as disttB- forces of one state are opposed to the organized armed gulshed forces of another state. War also exists within the fro ".. bounds of a single state when organized armed forces, " "' of sufficient power to make the issue doubtful, place themselves in opposition to the armed forces of the existing government. If the disaffected forces are in a state of flagrant inferiority in comparison with those of the existing govern- ment there is not a state of war but of rebellion. The combatants in civil war are entitled to treatment in accordance with the law of war. Rebels, as outlaws, have no rights. In the South African campaign (1800-1002) the question arose whether the manifest inferiority of the Boer forces, the possession by the British forces of the seats of government, and their practical occupation of the whole country, did not put an end to the state of war and con- stitute the Boer fighting forces rebels against a new existing government which had proclaimed annexation of the conquered states. The action of the British commanders is a precedent in favour of the view that the fighting forces of an invaded state are entitled to belligerent rights, though in a state of hopeless in- feriority, so long as they remain in the field in organized bands. In this, as in many cases which have formed international usage, the danger of reprisals more than the logic of principles has dictated a different line of conduct from that which the strict principles of law suggested. A somewhat similar, but more complicated situation, arose out of the cession by Spain to the United States of the Philippine Islands. The insurgents being in possession of them at the time, Spain ceded what she did not in fact possess. Thus it has been contended that the position of the insurgents became that of belligerents defending their country against conquest by invading forces.

Wars have been classed in different ways — wars of intervention,

wars of conquest, wars of defence, wars of independence, just

wars, unjust wars, and so on; but the law of war

, Of!?. applies to them all without distinction. States do*

Interest. ... 111 i_ –

not sit as judges over each other, but treat war, subject to their own interest, as a fact. Interest, however, with the increasing development of international relations is becoming a more important factor in the determination of the attitude of the neutral onlooker (see Neutrality).

In the Chino-Japanese War (1894-05) the Japanese had to decide whether the Chinese were entitled to treatment under

the European law of war. Japan had acceded to the War will, Q eneva Convention (see below) in 1886, and to the peoples. Declaration of Paris (see below) in 1887. China was a

party to neither, and observed the provisions of neither. Japan, nevertheless, as related by her learned judicial advisers, Professors Ariga and Tafcahashi, observed towards the Chinese forces, combatant and non-combatant, all the rules of European International Law without resorting to the reprisals to which Chinese barbarities provoked her.

The position of neutral governments towards insurgent forces is always a delicate one. If they are not recognized as Neutral belligerents by the state against which they are position arrayed, the state in question theoretically accepts towards responsibility for the consequences of their acts in ‘ respect of neutral states. A neutral state may be satisfied with this responsibility, or it may recognize the bel- ligerent character of the insurgents. If, however, it does not, the insurgent forces cannot exercise rights of war against neutral property without exposing themselves to treatment as outlaws and pirates. A case of such treatment occurred in September 1902 in connexion with a then pending revolution in Hayti. A German cruiser, the ” Panther,” treated an insurgent gunboat, the ” Crete-a-Pierrot,” as a pirate vessel, 1 and sank her for having stopped and confiscated arms and ammunition found among the cargo of the German steamer 1 The Times (9th September 1902).

” Markomannia ” on the ground that they were contraband destined for the armed forces of the existing Haytian govern- ment. The ” Cr6te-a-Pierrot ” had for some years formed part of the Haytian navy, and was commanded by Admiral Killick, who had been an admiral of that navy.

There had been no recognition of the belligerency of the insurgents. No state seems to have made any observations on the incident, which may be taken to be in accordance with current international usage.

A well-known instance of a neutral government recognizing insurgent forces as belligerent, in spite of the denial of that character to them by the state against which they British re- are carrying on hostilities, occurred in the North cogaition American Civil War. The right asserted by Great "ttiieCan-

federates

Britain to recognize the belligerency of the Con- federate forces was based on the contention that British com- mercial interests were very largely affected by the blockade of the Southern ports. It is agreed, however, among jurists that, where the interests of neighbouring states are not affected, the recognition of an insurgent's belligerency is needless interference. 2

*The recognition of belligerency does not entail recognition of the belligerent as a sovereign state. It goes no farther than its immediate purpose. The belligerent armies p f e ect * are lawful combatants, not bandits. Supplies taken recogni- from invaded territory are requisitions, not robbery. t.'on of The belligerent ships of war are lawful cruisers, not beillger- pirates; and their captures, made in accordance with maritime law, are good prize; and their blockades, if effectual, must be respected by neutrals. But this does not suffice to invest the belligerent with the attributes of independent sovereignty for such objects as negotiation of treaties, and the accrediting of diplomatic and consular agents. This was the attitude of Great Britain and France towards the Confederates in the American Civil War.*

The position, of a vassal state or a colony carrying on foreign war without the consent of the suzerain or parent state might involve still more complicated issues. 3

Civilized warfare, the textbooks tell us, is confined, as far

as possible, to disablement of the armed forces of the enemy;

otherwise war would continue till one of the parties

was exterminated. " It is with good reason," observes -_?" ar , ,, . ° ' forces ana*

X attel, that this practice has grown into a custom civilians.

with the nations of Europe, at least with those that

keep up regular standing armies or bodies of militia. The troops.

alone carry on war, while the rest of the nation remain in peace ”

(Law of Nations, iii. 226). Modern notions of patriotism do not,

however, view this total and unconditional abstention of the

2 It is also agreed that, as the existence of belligerency imposes burdens and liabilities upon neutral subjects, a state engaged in civil war has no right, in endeavouring to effect its warlike objects, to em- ploy measures against foreign vessels, which, though sanctioned in time of peace, are not recognized in time of war. In other words, it cannot enjoy at one and the same moment the rights of both peace and war. Thus, in 1861, when the government of New Granada, during a civil war, announced that certain ports would be closed, not by blockade, but by order, Lord John Russell said that ” it was perfectly competent to the government of a country in a state of tranquillity to say which ports should be open to trade, and which should be closed; but in the event of insurrection, or civil war in that country, it was not competent for its government to close ports which were de facto in the hands of the insurgents; and that such a proceeding would be an invasion of international law relating to blockade ” (Hansard, clxh'i., 1846). Subsequently the government of the United States proposed to adopt the same measure against the ports of the Southern States, upon which Lord John Russell wrote to Lord Lyons that ” Her Majesty's government entirely concur with the French government in the opinion that a decree closing the Southern ports would be entirely illegal, and would be an evasion of that recognized maxim of the law of nations that the ports of a belligerent can only be closed by an effective blockade ” (State Papers, North America, No. 1, 1862). Tn neither case was the order carried out. When in 1885 the President of Colombia, during the existence of civil war, declared several ports to be closed without instituting a blockade, Mr T. F. Bayard, Secretary of State of the United States, in a despatch of 24th April of that year, fully acknowledged the principle of this contention by refusing to acknowledge the closure.

3 In the Servo- Bulgarian War of 1885 the Sultan, though suzerain of Bulgaria, was unmoved by the invasion of his vassal's dominions.

civilian population as any longer possible. They have found, to some

extent, expression in the following Articles of the Hague War-Regulations: —

" Art. 1. The laws, rights and duties of war apply not only to an army, but also to militia and volunteer corps fulfilling the follow- ing conditions: (a) To be commanded by a person responsible for his subordinates; (6) to have a fixed distinctive emblem recog- nizable at a distance; (c) to carry arms openly; and (d) to conduct their operations in accordance with the laws and customs of war. In countries where militia or volunteer corps constitute the army, or form part of it, they are included under the denomination ' army.'

" Art. 2. The population of a territory not under occupation, who, on the enemy's approach, spontaneously take up arms to resist the invading troops without having had tfme to organize themselves in accordance with Article I, shall be regarded as belligerent if they carry arms openly, and if they respect the laws and customs of war." 1

The only alteration made by the revised Convention of Nov. 27th, 1907, as compared with that of 1899 is the insertion in Art. 2 of the words in italics.

By these provisions, irregular combatants whom both the government of the United States in the American Civil War and the German government in the Franco-German War refused to regard as legitimate belligerents, are now made legally so. 2

1 The preamble of the Convention refers specially to Articles 1 and 2 in the following terms: " In the view of the High Contracting Parties, these provisions, the drafting of which has been inspired by the desire to diminish the evils of war so far as military necessities permit, are destined to serve as general rules of conduct for bel- ligerents in their relations with each other and with populations;

" It has not, however, been possible to agree forthwith on provi- sions embracing all the circumstances which occur in practice ;

" On the other hand, it could not be intended by the High Con- tracting Parties that the cases not provided for should, for want of a written provision, be left to the arbitrary judgment of the military commanders;

" Until a more complete code of the laws of war is issued, the High Contracting Parties think it expedient to declare that in cases not included in the Regulations adopted by them, populations and belligerents remain under the protection and empire of the principles of international law, as they result from the usages established among civilized nations, from the

laws of humanity, and the requirements of the public conscience;

" They declare that it is in this sense especially that Articles 1 and 2 of the regulations adopted must be understood."

9 The instructions for the government of armies of the United States in the field, issued in 1863, provided:—

" Men or squads of men who commit hostilities, whether by fighting or inroads for destruction or plunder, or by raids of any kind, without commission, without being part and portion of the organized hostile army, and without sharing continuously in the war, but who do so with intermitting returns to their homes and avocation, or with the occasional assumption of the semblance of peaceful pursuits, divesting themselves of the character or appearance of soldiers — such men or squads of men are not public enemies, and therefore, if captured, are not entitled to the privilege of prisoners of war, but shall be treated summarily as highway robbers or pirates." Germany seven years later declined to recognize the regular bands of francs tireurs unless each individual member of them had been personally called out by legal authority, and wore a uniform or badge, irremovable and sufficient to distinguish him at a distance. The older publicists were, on the whole, strongly opposed to the legaliza tion of irregular troops. Hallock settles the question in a summary way by calling those who engage in partisan warfare, robbers and murderers, and declaring that when captured they are to be treated as criminals {I nier national Law, chap, xviii. s. 8). It Is easy to understand the unfavourable opinion of partisan bands usually ex- pressed by the military authorities when the enormous power for damage of modern arms is considered. At the Brussels Conference of 1874 the representatives of the great military Powers of the Continent naturally desired to keep spontaneous movements within the narrowest possible bounds, while the delegates from the secondary states, who have to rely for their defence chiefly upon the patriotism of their people, endeavoured to widen the right of resistance to an invader. Finally the Conference adopted the provisions which were later formally recognized at the Hague Conference (sec British State Papers Miscellaneous, No. 1, 1875, PP- 252—257). It is noteworthy that both at the Brussels and the Hague Conferences the British delegate ranged himself on the side of the smaller states in favour of the recognition of guerrilla bands. At the Hague Conference Sir John Ardagh gave notice of his intention to propose an additional Article, to the effect that nothing in the Regulations should " be considered as tending to diminish or suppress the right which belongs to the population of an invaded country patriotically to oppose the most energetic resistance by every legitimate means." The upshot of this notice was to cause the insertion of a proviso in the preamble of the

*Connected with the position of private persons in time of war is that of their property in invaded territory, a subject which has often been misunderstood. Assertions Enewy as to its immunity from capture in warfare on land property have been made which are historically inaccurate ontevaded and are not borne out by contemporary usage. No * crrfl' doubt contemporary usage is an improvement on older usage. An invading army, before the practice of war became more refined, lived by foraging and pillage in the invaded country; pillage, in fact, being one of the inducements held out to the adventurers who formed part of the fighting forces either as officers or as common soldiers, and this continued down to comparatively recent times. Attenuations followed from the rise of standing and regular armies, and the consequent more marked distinction between soldier and civilian. They have now taken the form of systematic requisitions and contributions, the confining of the right of levying these to generals and com mander s-in- chief, the institution of quittances or bills drawn by the belligerent invader on the invaded power and handed in payment to the private persons whose movable belongings have been appropriated or used, and of war indemnities. These are methods of lessening the hardships of war as regards the private property on land of the subjects of belligerent states. Their object and effect have by no means been to arrive at immunity, but to develop an organized system by which damage and losses to individuals, whom the fortune of war has brought into immediate contact with the enemy, are spread over the whole community. There is thus no immunity of private property in warfare on land, and the Hague War-Regulations, far from declaring the contrary, have ratified the right of ap- propriation of private property in the following Article: —*

" Neither requisitions in kind nor services can be demanded from communes or inhabitants except for the necessities of the army of occupation. They must be in proportion to the resources of the country, and of such a nature as not to involve the population in the obligation of taking part in military operations against their country.

" These requisitions and services shall only be demanded on the authority of the Commander in the locality occupied.

" The contributions in kind shall, as far as possible, be paid for in ready money; if not, their receipt shall be acknowledged and the payment of the amounts due shall be made as soon as possible " (Article 52).

In another Article provision, moreover, is made for the utiliza- tion of property in kind belonging to private persons: —

" An army of occupation can only take possession of the cash, funds and property liable to requisition belonging strictly to the state, depots of arms,

means of transport, stores and supplies, and, generally, all movable property of the state which may be used for military operations.

" All appliances, whether on land, at sea, or in the air adapted for the transmission of news, or for the transport of persons or things, exclusive of cases governed by naval law, depots of arms, and gener- ally, all kinds of ammunition of war, may be seized, even if they belong to private individuals, but must be restored and compensation fixed when peace is made."

Utilizable neutral rolling-stock is not excepted, Article 19 of the Convention on the rights and duties of neutral powers and persons in war on land only providing that—

" The plant of railways coming from neutral states, whether the property of those states, or of companies, or of private persons, and recognizable as such, shall be sent back as soon as possible to the country of origin."

Enemy property at sea is subject to different rules from those which govern it on land. It is liable to capture and confiscation wherever found on the high seas or in enemy waters. The United States has made strenuous C ff iI rf efforts to get this rule of maritime warfare altered, atsea. and immunity from capture accepted as the law of the sea. It has even made this a condition of its accession to the Declaration of Paris (see Neutrality). But thus far other powers have shown no disposition to agree to any alteration. At the Hague Conferences the United States raised the question again, but thus lar all that has been done has been to ratify Convcntion'denying the right of military commanders to act accord- ing to their own arbitrary judgment (Parliamentary Papers, No. 1, 1899, c. 9534).*

existing exemptions. The considerations ■which have led man- kind to systematize the practice of war in regard to private property on land do not arise in the same form in connexion with private property at sea. Here there is no question of seizing the live stock, or the bedding, or the food, or the utensils of the private citizen. If ship and cargo arc captured, it may be hard upon the merchant, but such captures do not directly deprive him of the necessaries of life. Yet, as in the case of war on. land, its hardships have been attenuated, and progress has been made by developing a more systematic procedure of capture of private property at sea. Thus exemption from capture is now allowed by belligerents to enemy merchant ships

which, at the outbreak of war, are on the way to one of their ports, and they also allow enemy merchantmen in their ports at its outbreak a certain time to leave them. This is confirmed by the Hague Convention of 1907 on the status of enemy ships on the outbreak of hostilities. A somewhat similar practice exists as regards pursuit of merchant ships which happen to be in a neutral port at the same time with an enemy cruiser. Under the Hague Convention of 1907 respecting the rights and duties of neutral powers in naval war (Art. 16), this, too, is confirmed. Lastly, there has grown up. on grounds similar to those which have led to the indulgence shown to private property on land, a now generally recognized immunity from capture of small vessels engaged in the coast fisheries, provided they are in no wise made to serve the purposes of war, which also has been duly confirmed in the Hague Conventions of 1907 by Art. 3 of the convention relative to certain restrictions on the exercise of the right of capture in maritime war. This has all been done with the object of making the operations of war systematic, and enabling the private citizen to estimate his risks and take the necessary precautions to avoid capture, and of restricting acts of war to the purpose of bringing it to a speedy conclusion.

We have seen that the only immunity of private property yet known to the laws of war is a limited one at sea. War, by its very nature, seems to prevent the growth of any such immunity. The tendency in war on land has been to spread its effects over the whole community, to keep a faithful record on both sides of all confiscations, appropriations and services enforced against private citizens; beyond this, protection has not yet been extended. There is good reason for this. The object of each belligerent being to break the enemy's power and force him to sue for peace, it may not be enough to defeat him in the open field; it may be necessary to prevent him from repairing his loss both in men and in the munitions of war. This may imply crippling his material resources, trade and manufactures. It has been contended that " to capture at sea raw materials used in the manufacturing industry of a belligerent state, or products on the saie of which its prosperity, and therefore its taxable sources depend, is necessarily one of the objects, and one of the least cruel, which the belligerents pursue. To capture the merchant vessels which carry these goods, and even to keep the seamen navigating them prisoners, is to prevent the employment of the ships by the enemy as transports or cruisers, arid the repairing from among the seamen of the mercantile marine of losses of men in the official navy." 1

The question of reform of the existing practice would naturally be viewed in different countries according to their respective interests. The United States has obviously an interest in the exemption of its merchant vessels and cargoes from capture, a small official navy being sufficient for the assertion of its ascend- ancy on the American continent. It may also be presumed to be in the interest of Italy, who, in a treaty with the "United

States in 1871, provided for mutual recognition of the exemption.

In the Austro-Prussian war of 1866 the principle of inviolability was adhered to by both parties. Germany proclaimed the same principle in 1870, but afterwards abandoned it.

There is a strong movement in Great Britain in favour of the general adoption of immunity. Whether it may now be expedient for her to agree to such immunity is an open question. It is

1 Barclay, " Proposed Immunity of Private Property at Sea from Capture by Enemy," Law Quarterly Review (January 1900).

quite conceivable, however, that different considerations would weigh with hei in, a war with the United States from those which would arise in a war with France or Germany. In the case of the United States it might be in the interest of both parties to localize the operations of war, and to interfere as little as possible, perhaps for the joint exclusion of neutral vessels, with the traffic across the Atlantic. In the case of a war with France or Germany, Great Britain might consider that the closing of the high sea to all traffic by the merchantmen of the enemy would be very much in her own interest.

The converse subject of the treatment of subjects of the one belligerent who remain in the country of the other belligerent also was not dealt with at the Hague. British practice in this matter has always been indulgent, the protection su biects- to the persons and property of non-combatant enemies tneir pro- on British soil dating back to Magna Carta (s. 48), and t [ert ˆ, aa this is still the law of England. The practice on the

hostile territory.

continent of Europe varies according to circumstances,

to which no doubt, in the event of the invasion of Great Britain,

British practice would also have to adapt itself.

The Hague War-Regulations deal fully with the treatment of prisoners, and though they add nothing to existing practice, such treatment is no longer in the discretion / JJJf of the signatory Powers, but is binding on them. They provide as follows: —

Prisoners of war are in the power of the hostile government, but not in that of the individuals or corps who captured them. They must be humanely treated. All their personal belongings, except arms, horses and military papers, remain their property (Article 4). Prisoners of war may be interned

in a town, fortress, camp or any other locality, and bound not to go beyond certain fixed limits; but they can only be confined as an indispensable measure of safety, and only so long as circumstances necessitating this measure shall endure (Article 5). The state may utilize the labour of prisoners of war according to their rank and aptitude, with the ex- ception of officers. Their tasks shall not be excessive, and shall have nothing to do with the military operations. Prisoners may be authorized to work for the public service, for private persons, or on their own account. Work done for the state shall be paid for ac- cording to the tariffs in force for soldiers of the national army em- ployed on similar tasks, or if there are none in force, then according to a tariff suitable to the work executed. When the work is for other branches of the public service or for private persons, the conditions shall be settled in agreement with the military authorities. The wages of the prisoners shall go towards improving their position, and the balance shall be paid them at the time of their release, after de- ducting the cost of tneir maintenance (Article 6). The government into whose hands prisoners of war have fallen is bound to maintain them. Failing a special agreement between the belligerents, prisoners of war shall be treated, as regards food, quarters and clothing, on the same footing as the troops of the government which has captured them (Article 7). Prisoners of war shall be subject to the laws, regula- tions and orders in force in the army of the state into whose hands they have fallen. Any act of insubordination warrants the adoption, as regards them, of such measures of severity as may be necessary. Escaped prisoners, recaptured before they have succeeded in re-' joining their army, or before quitting the territory occupied by the army that captured them, are liable to disciplinary punishment. Prisoners who, after succeeding in escaping, are again taken prisoners, are not liable to any punishment for the previous flight (Article 8). Every prisoner of war, if questioned, is bound to declare his true name and rank, and if he disregards this rule, he is liable to a curtail- ment of the advantages accorded to the prisoners of war of his class (Article 9). Prisoners of war may be set at liberty on parole if the laws of their country' authorize it, and, in such a case, they are bound, on their personal honour, scrupulously to fulfil, both as regards their own government and the government by whom they were made prisoners, the engagements they have contracted. In such cases, their own government shall not require of nor accept from them any service incompatible with the parole given (Article 10). A prisoner of war cannot be forced to accept his liberty on parole; similarly the hostile government is not obliged to assent to the prisoner's request to be set at liberty on parole (Article n). Any prisoner of war who is liberated on parole and recaptured, bearing arms against the govern- ment to whom he had pledged his honour or against the allies of that government, forfeits his right to be treated as a prisoner of war, and can be brought before the courts (Article 12).

An interesting provision in the Regulations assimilates individuals who, following an army without directly belonging to it, such as newspaper correspondents Jsts I and reporters, sutlers, contractors, fall into the enemy's I hands, to prisoners of war, provided they can produce a

Relief societies.

certificate from the military authorities of the army they were accompanying.

*A new departure is made by clauses providing for the institution of a bureau for information relative to prisoners of inform a- war – -This * s to be created at the commencement of tion office hostilities, in each of the belligerent states and, when ** '» necessary, in the neutral countries on whose territory*

prisoners, belligerents have been received. It is intended to answer all inquiries about prisoners of war, and is to be furnished by the various services concerned with all the necessary informa- tion to enable it to keep an individual return for each prisoner of war. It is to be kept informed of internments and changes, liberations on parole, evasions, admissions into hospital, deaths, &c. It is also the duty of the bureau to receive and collect all objects of personal use, valuables, letters, &c, found on the battlefields or left by prisoners who have died in hospital or ambulance, and to transmit them to those interested. Letters, money orders and valuables, as well as postal parcels destined for the prisoners of war or despatched by them, are to be free of all postal duties both in the countries of origin and destination, as well as in those they pass through. Gifts and relief in kind for prisoners of war are to be admitted free of all duties of entry, as well as of payments for carriage by the government railways.

Furthermore, relief societies for prisoners of war, regularly con- stituted with the object of charity, are to receive every facility, within the bounds of military requirements and administrative regulations, for the effective accom- plishment of their task. Delegates of these societies are to be admitted to the places of internment for the distribution of relief, as also to the halting-places of repatriated prisoners, " if furnished with a personal permit by the military authorities, and on giving an engagement in writing to comply with all their regulations for order and police."

The obligations of belligerents with regard to sick and wounded in war on land are now governed by the Geneva Convention of July 6th, 1006. By this Convention ambulances and wounded notary hospitals, their medical and administrative staff and chaplains are " respected and protected under all circumstances," and the use of a uniform flag and arm-badge bearing a red cross are required as a distinguishing mark of their character. A Convention, accepted at the Peace Conferences, has now adapted the principles of the Geneva Convention to maritime warfare. This new Convention provides that —

Military hospital-ships, that is to say, ships constructed or assigned by states specially and solely for the purpose of assist- ing the wounded, sick or shipwrecked, and the names of which have been communicated to the belligerent powers at the com- mencement or during the course of hostilities, and in any case before they are employed, are to be respected and cannot be captured while hostilities last.

As regards hospital-ships equipped wholly or in part at the cost of private individuals or officially recognized relief societies, they likewise are to be respected and exempt from capture, provided the belligerent or neutral power to which they belong shall have given them an official commission and notified their names to the hostile power at the commencement of or during hostilities, and in any case before they are employed.

The belligerents have the right to control and visit them; they can refuse to help them, order them off, make them take a certain course, and put a commissioner on board; they can even detain them, if important circumstances require it.

The religious, medical or hospital staff of any captured ship is inviolable, and its memhers cannot be made prisoners of war.

Lastly, neutral merchantmen, yachts or vessels, having, or taking on board, sick, wounded or shipwrecked of the belligerents, cannot be captured for so doing.

The following prohibitions are also placed by the Hague Regulations on the means of injuring the enemy: —

To employ poison or poisoned arms. , .. To kill or wound treacherously individuals belonging to

its/unag the hostile nation or army.

*sieve bom- * ° ^ m or wound an enemy who, having laid down arms bZrdniciits °r h avm g no longer means of defence, has surrendered at '*

discretion.

To declare that no quarter will be given.

To employ arms, projectiles or material of a nature to cause superfluous injury.

To make improper use of a flag of truce, the national flag or military ensigns and the enemy's uniform, as well as the distinctive badges of the Geneva Convention.

To destroy or seize the enemy's property, unless such destruction or seizure be imperatively demanded by the necessities of war; to attack or bombard towns, villages, habitations or buildings which are not defended. Rases of

To pillage a town or place, even when taken by assault. w 1 ***

Ruses of war and the employment of methods necessary' to obtain information about the enemy and the country, on the contrary, are considered allowable.

A spy is one who, acting clandestinely, or on false pretences, obtains, or seeks to obtain, information in the zone of operations of a belligerent, with the intention of communicating it to the hostile party (the Hague War-Regulations, Art. 29}. Spies.

Thus, soldiers not in disguise who have penetrated into the zone of operations of a hostile army to obtain information are not considered spies. Similarly, the following are not considered spies: soldiers or civilians, carrying out their mission openly, charged with the delivery of despatches destined either for their own army or for that of the enemy. To this class belong likewise individuals sent in balloons to deliver despatches, and generally to maintain communication be- tween the various parts of an army or a territory (ib.). A spy taken in the act cannot be punished without previous trial, and a spy who, after rejoining the army to which he belongs, is subsequently captured by the enemy, is a prisoner of war, and not punishable for his previous acts of espionage. 1

In sieges and bombardments all necessary steps are to be taken to spare as far as possible buildings devoted to religion, art, science and charity, hospitals and places where the sick and wounded are collected, provided they are not used at the same time for military purposes; but the besieged arc to indicate these buildings or places by some particular and visible signs and notify them to the assailants.

A new Convention respecting bombardments by naval forces was adopted

by the Hague Conference of 1907, forbidding the bombardment of undefended " ports, towns, villages, dwellings or buildings," unless after a formal summons the local authorities decline to comply with requisitions for provisions or supplies necessary for the immediate use of the naval force before the place in question- But they may not be bombarded on account of failure to pay money contributions. On the other hand, the prohibition does not apply to military works, depots of arms, &c, or ships of war in a harbour.

Another new Convention adopted at the Hague in 1907 dealt with the laying of automatic submarine contact mines. Its main provisions are as follows: —

It is forbidden :

1. To lay unanchored automatic contact mines, except when they are so constructed as to become harmless one hour at most after the person who laid them ceases to control them;

2. To lay anchored automatic contact mines which do not become harmless as soon as they have broken loose from their moorings;

3. To use torpedoes which do not become harmless when they have missed their mark (Art. I).

It is forbidden to lay automatic contact mines off the coast and ports of the enemy, with the sole object of intercepting commercial shipping (Art. 2).

When anchored automatic contact mines are employed, every possible precaution must be taken for the security of peaceful shipping.

The belligerents undertake to do their utmost to render these mines harmless within a limited time, and, should they cease to be under surveillance, to notify the danger zones as soon as military exigencies permit, by a notice addressed to shipowners, which must also be communicated to the Governments through the diplomatic channel. (Art. 3.)

Neutral Powers which lay automatic contact mines off their coasts must observe the same rules and take the same precautions as are imposed on belligerents.

The neutral Power must inform shipowners, by a notice issued in advance, where automatic contact mines have been laid. This notice must be communicated at once to the Governments through the diplomatic channel. (Art, 4.)

At the close of the war the Contracting Powers undertake to do their utmost to remove the mines which they have laid, each Power removing its own mines.

As regards anchored automatic contact mines laid by one of the belligerents off the coast of the other, their position must be notified to the other party by the Power which laid them, and each Power must proceed with the least possible delay to remove the mines in its own waters. (Art. 5.)

1 See, as to Flags of Truce, Art. 32 of the Hague Regulations.

Modern practice.

The Contracting Powers which do not at present own perfected mines cf the pattern contemplated in the present Convention, and which, consequently, could not fit present carry out the rules laid down in Articles I and 3, undertake to convert the materiel of their mines as soon as possible so as to bring it into conformity with the foregoing requirements. (Art. 6.)

Territory is considered as occupied when it is actually under the authority of the hostile army. The authority having passed Occupa- ‘ nt0 tne hands of the occupant, the latter takes all Won at possible steps to re-establish public order and safety. hostile Compulsion of the population of occupied territory to err ory. ta k e p art j n miliary operations against their own country, or even give information respecting the army of the other belligerent and pressure to take the oath to the hostile power are prohibited. Private property must be respected, save in case of military necessity (Arts. 46 and 52). The property of religious, charitable and educational institutions, and of art and science, even when state property, are assimilated to private property, and all seizure of, and destruction or intentional damage done to such institutions, to historical monuments, works of art or science is prohibited (Art. 56).

Practice as regards declarations of war has hitherto varied. The Franco-Prussian War of 1870 was preceded by a deliberate declaration. In the war between Japan and China 1/000™’ taere was no declaration. (See Ariga, La Guerre war. sino-japonaise, Paris, 1896). The delivery of an

ultimatum specifying those terms, the compliance with which is demanded within a specified time, is practically a conditional declaration of war which becomes absolute in case of non-compliance. Thus the note communicated by the United States to Spain on 20th April 1898 demanded

the " immediate withdrawal of all the land and sea forces from Cuba," and gave Spain three days to accept these terms. On the evening of 22nd April the United States seized several Spanish vessels, and hostilities were thus opened. In the case of the Transvaal War, the declaration also took the form of an ultimatum. A special Hague convention adopted at the Conference of 1907 now provides that hostilities " must not commence without previous and explicit warning in the form of a reasoned declaration of war or of an ultimatum with conditional declaration of war." It also provides that the existence of a state of war must be notified to the neutral powers and shall not take effect in regard to them until after the receipt of the notification which may be given by telegraph. Most of the good effect of the provision, however, is negatived by the qualification that neutral powers cannot rely on the absence of notification if it is clearly established that they were in fact aware of the existence of a state of war.

Too much confidence must not be placed in regulations con- cerning the conduct of war. Military necessity, the heat of action, the violence of the feelings which come into imwof wmr.Vˆy w ' u a-l wa ys at times defeat the most skilfully- combined rules diplomacy can devise. Still, such rules are a sign of conditions of public opinion which serve as a restraint upon the commission of barbarities among civilized peoples. The European operations in China consequent on the " Boxer " rising showed how distance from European criticism tends to loosen that restraint. On the other hand, it was signifi- cant that both the United States and Spain, who were not parties to the Declaration of Paris, found themselves, in a war confined to them, under the necessity of observing provisions which the majority of civilized states have agreed to respect. (T. Ba.)

WARANGAL, an ancient town of India, in the Nizam's Dominions or Hyderabad state, 86 m. N.E. of Hyderabad city. It was the capital of a Hindu kingdom in the 12th century, but little remains to denote its former grandeur except a fort and four gateways of a temple of Siva. Warangal has given its name to a district and a division of the state.

WARASDIN (Hungarian, Varasd; Croatian, Varazdin), a royal free town of Hungary, and capital of the county of Warasdin, in Croatia-Slavonia ; on the right bank of the Drave, 62 m. by rail N.N.E. of Agram. Pop. (1900) 12,930. Warasdin is the seat of a district court, and possesses an old castle, a cathedral

and several churches, monasteries and schools. It carries on a brisk trade in timber, wine, fruit, tobacco, spirits, stoneware and silk. Coal is also mined in the Warasdin Mountains. The celebrated sulphur baths of Constantins-Bad or Toplitz, known to the Romans as Thermae Conslanlianae, lie about 10 m. S.

WARBECK, PERKIN (c. 1474-1499), pretender to the throne of England, was the son of Jehan de Werbecque, a poor burgess of Tournay in Flanders and of his wife Katherine de Faro. The exact date of his birth is unknown, but as he represented himself as having been nine years old in 1483, it must have taken place in, or close on, 1474. His confession made at the end of his life was an account of his early years which is to some extent supported by other testimony. The names of his father and other relations whom he mentions have been found in the municipal records of Tournay, and the official description of them agrees with his statements. According to this version, which may be accepted as substantially true, he was brought up at Antwerp by a cousin Jcha.n Sticnbccks, and served a succession of em- ployers as a boy servant. He was for a time with an Englishman John Strewe at Middleburg, and then accompanied Lady Brampton, the wife of an exiled partisan of the house of York, to Portugal. He was for a year employed by a Portuguese knight whom he described as having only one eye, and whom he names Vacz de Cogna (Vaz da Cunha ?). In 1491 he was at Cork as the servant of a Breton silk merchant Pregent (Pierre Jean) Meno. Ireland was strongly attached to the house of York, and was full of intrigue against King Henry VII. Perkin says that the people seeing him dressed in the silks of his master took him for a person of distinction, and insisted that he musl be either the son of George, duke of Clarence, or a bastard of Richard III. He was more or less encouraged by the earls of Desmond and Kildare. The facts are ill recorded, but it is safe to presume that intriguers who wished to disturb the government of Henry VII. took advantage of a popular delusion, and made use of the lad as a tool. At this time he spoke English badly. By 1 492 he had become sufficiently notorious to attract the attention of King Henry's government and of foreign sovereigns. He was in that year summoned to Flanders by Margaret, the widowed duchess of Burgundy, and sister of Edward IV., who was the main support of the Yorkist exiles, and who was the enemy of Henry VII. for family reasons and for personal reasons also, for she wished to extort from him the payment of the balance of her dowry. She found the impostor useful as a means of injuring the king of England. Several European sovereigns were moved to help him by the same kind of reason. The suppositions that he was the son of Clarence or of Richard III. were discarded in favour of the more useful hypothesis that he was Richard, duke of York, the younger of the two sons of Edward IV., murdered in the Tower. Charles VIII., king of France, the counsellois of the youthful duke of Burgundy, the duke's father Maximilian, king of the Romans, and James IV. of Scotland, none of whom can have been really deceived, took up his cause more or less actively. He was entertained in France, and was taken by Maximilian to attend the funeral of the emperor Frederick III. in 1493. At Vienna he was treated as the lawful king of England. He was naturally the cause of considerable anxiety to the English govern- ment, which was

well acquainted with his real history, and made attempts to get him seized. His protectors entered into negotia- tions which in fact turned on the question whether more was to be gained by supporting him, or by giving him up. An appeal to Isabella, queen of Castile, met with no response. In July 149S he was provided with a few ships and men by Maximilian, now emperor, and he appeared on the coast of Kent. No move- ment in his favour took place. A few of his followers who landed were cut off, and he went on to Ireland to join the earl of Desmond in Munster. After an unsuccessful attack on Waterford in August, he fled to Scotland. Here King James IV. showed him favour, and arranged a marriage for him with Catherine Gordon, daughter of the earl of Huntly. He was helped to make a short inroad into Northumberland, but the intervention of the Spanish government brought about, a peace between England and Scotland. In 1497 Perkin was sent on his travels again with

two or three small vessels, and accompanied by his wife, who had borne him one or two children. After some obscure adven- tures in Ireland, he landed at Whitesand Bay, near the Land's End, on the 7th of September, and was joined by a crowd of the country people, who had been recently in revolt against excessive taxation. He advanced to Exeter, but was unable to master the town. On the approach of the royal troops he deserted his followers, and ran for refuge to the sanctuary of Beaulieu in Hampshire. He then surrendered. His wife was kindly treated and placed in the household of Henry's queen Elizabeth. Perkin was compelled to make two ignominious public confessions at Westminster, and in Cheapside on the 15th and 19th of June 1498. On the 23rd of November 1499 he was hanged on a charge of endeavouring to escape from the Tower with the imprisoned earl of Warwick.

See James Gairdner, Richard the Third, and the Story of Perkin Warbexk (Cambridge, 1898).

WARBLER, in ornithology, the name bestowed in 1773 by T. Pennant {Genera of Birds, p. 35) on the birds removed, in 1769, by J. A. Scopoli from the Linnaean genus Molacilla (cf. Wagtail) to one founded and called by him Sylvia — the last being a word employed by several of the older writers in an indefinite way — that is to say, on all the species of Motacitta which were not wagtails. " Warbler " has long been used by English technical writers as the equivalent of Sylvia, and is now applied to all members of the sub-family Sylviinae of the thrushes (g.v.), and in the combination " American warblers " to the distinct passerine family

Mniotiltidae. The true warblers {Sylviinae) are generally smaller than the true thrushes Turdinae (see Thrushes), with, for the most part, a weak and slender bill. They seldom fly far, except when migrating, but frequent undergrowth and herbage, living on insects, larvae and fruit. The song is unusually clear and very sweet, with frequently a metallic sound, as in the grasshopper warbler. The nest is usually cup-shaped and well lined, and from three to six eggs (twelve in Regains), usually spotted, are laid.

The true warblers are chiefly Old World, visiting the southern Old World in winter, but members of the sub-family occur in New Zealand, Polynesia and Panama. Amongst the commonest in England is the well-known sedge-bird or sedge- warbler, Acrocephalus sckoenobaenus , whose chattering song resounds in summer-time from almost every wet ditch in most parts of Britain. As is the case with so many of its allies, the skulking habits of the bird cause it to be far more often heard than seen; but, with a little patience, it may be generally observed flitting about the uppermost twigs of the bushes it frequents, and its mottled back and the yellowish-white streak over its eye serve to distinguish it from its ally the reed-wren or reed-warbler. A. streperus, which is clad in a wholly mouse-coloured suit. But this last can also be recognized by its different song, and com- paratively seldom does it stray from the reed-beds which are its favourite haunts. In them generally it builds one of the most beautiful of nests, made of the seed-branches of the reed and long grass, wound horizontally round and round so as to include in its substance the living stems of three or four reeds, between which it is suspended at a convenient height above the water, and the structure is so deep that the eggs clo not roll out when its props are shaken by the wind. Of very similar habits is the reed-thrush or great reed- warbler, A. arundinaeeus, a loud-voiced species, abundant on the Continent but very rarely straying to England.ˆ Much interest also attaches to the species known as Savi's warbler, Locustdla luscini- oides, which was only recognized as a constant inhabitant of the Fen district of England a few years before its haunts were destroyed by drainage. The last example known to have been obtained in this country was killed in 1856. The nest of this species is peculiar, placed on the ground and formed of the blades of a species of Glyceria so skilfully entwined as to be a very permanent structure, and it is a curious fact that its nests were well known to the sedge-cutters of the district which it most frequented, as those of a bird with which they were unacquainted, long before the builder was recognized by naturalists. In coloration the bird somewhat resembles a nightingale (whence its specific name), and its song differs from that of any of those before mentioned, being a long smooth trill, pitched higher but possessing more tone than that of the grasshopper- warbler Locuslella naevius — which isa widely-distributed species throughout the British Isles, not only limited to marshy sites, but affecting also dry soils, inhabiting

indifferently many kinds of places where there is tangled and thick herbage, heather or brushwood. In those parts of England where it was formerly most abundant it was known as the reefer or reel-bird, from its song resembling the whirring noise of the reel at one time used by the spinners of wool. The precise determination of this bird — the grasshopper lark, as it was long called in books, though

its notes if once heard can never be mistaken for those of a grass- hopper or cricket, and it has no affinity to the larks — as an English species is due to the discernment of Gilbert White in 1768. In its habits it is one of the most retiring of birds, keeping in the closest shelter, so that it may be within a very short distance of an eager naturalist without his being able to see it — the olive-colour, streaked with dark brown, of its upper plumage helping to make it invisible. The nest is very artfully concealed in the thickest herbage. The foreign forms of aquatic warblers are far too numerous to be here mentioned.

The members of the typical genus Sylvia, which includes some of the sweetest singers, are treated of under Whitethroat; and the willow- and wood-wrens under Wren. The Australian genus Malurus, to which belong the birds known as " superb warblers," not inaptly so named, since in beauty they surpass any others of their presumed allies, is now placed in with the Old World fly- catchers in the family Musicapidae. Part of the plumage of the cocks in breeding-dress is generally some shade of intense blue, and is so glossy as to resemble enamel, while black, white, chestnut or scarlet, as well as green and lilac, are also present in one species or another, so as to heighten the effect. But, as already stated, there are system- atists who would raise this genus, which contains some 15 species, to the rank of a distinct family, though on what grounds it is hard to say.

The birds known as " American warblers," forming what is now recognized as a distinct family, Mniotiltidae, remain for considera- tion. They possess but nine instead of ten primaries, and are peculiar to the New World. More than 130 species have been described, and these have been grouped in 20 genera or more, of which members of all but three are at least summer-visitants to North America. As a whole they are much more brightly coloured than the Sylviinae, for, though the particular genus Mniotilta (from which the family takes its name) is one of the most abnormal — its colours being plain black and white, and its habits rather resembling those of a Tree-creeper (q.v.) — in other groups chestnut, bluish-grey and green appear, the last varying from an olive to a saffron tint, and in some groups the yellow predominates to an extent that has gained for its wearers, belonging to the genus Dendroeca, the name of 11 golden " warblers. In the genus Setophaga, the members of which deserve to be called " fly-catching " warblers, the plumage of the males at least presents yellow, orange,

scarlet or crimson.

The Mniotiltidae contain forms exhibiting quite as many diverse modes of life as do the Sylviinae. Some are exclusively aquatic in their predilections, others affect dry soils, brushwood, forests and so on. Almost all the genera are essentially migratory, but a large proportion of the species of Dendroeca, Setophaga, and especially Basileuterus, seem never to leave their Neotropical home ; while the genera Leucopesa, Teretristis and Microligia, comprising in all but 5 species, are peculiar to the Antilles. The rest are for the most part natives of North America, where a few attain a very high latitude, 1 penetrating in summer even beyond the Arctic Circle, and thence migrate southward at the end of summer or in the fall of the year, some reaching Peru and Brazil, but a few, as, for instance, Parula pitiayumi and Ceothlypis velaia, seem to be resident in the country last named. (A. N.)

WARBURTON, BARTHOLOMEW ELLIOTT GEORGE (1810- 1852), usually known as Eliot Warburton, British traveller and novelist, was born in 1810 near Tullamore, Ireland. He was educated at Trinity College, Cambridge, and was called to the Irish bar in 1S37. He contracted lasting friendships with Monckton Milnes (Lord Houghton) and A. W. ICinglake, and gave up his practice as a barrister for travel and literature. He made a hit with his first book, The Crescent and the Cross. It was an account of his travels in 1843 in Turkey, Syria, Palestine and Egypt, and fairly divided public attention with Kinglake's Eothen, which appeared in the same year, 1844. Interest was centred in the East at the time, and Warburton had popular sympathy with him in his eloquent advocacy of the annexation of Egypt; but, apart from this consideration, the spirited narrative of his adventures and the picturesque sketches of Eastern life and character were more than sufficient to justify the success of the book. His most substantial work was a Memoir of Prince Rupert and the Cavaliers (1849), enriched with original documents, and written with eloquent partiality for the subject. This was followed in 1850 by Reginald Hastings, a novel, the scenes of which were laid in the same period of civil war, and, in 1851, by another historical novel, Darien, or The Merchant Prince. He was sent by the Atlantic and Pacific Junction Company to explore the isthmus of Darien and to negotiate a treaty with the Indian tribes. He sailed on this 1 Seven species have been recorded as wandering to Greenland, and one, Dendroeca virens, is said to have occurred in Europe (Nau- mannia, 1858, p. 425).

mission in the " Amazon," which perished by fire with nearly all on board on the 4th of January 1852.

His brother, Major George Warburton (1816-1857), wrote Hochelaga, or England in the New World (1846), and The Conquest of Canada (1849).

WARBURTON, COLONEL SIR ROBERT (1842-1899), Anglo- Indian soldier and administrator, was the son of an artillery officer who had been taken prisoner at Kabul in 1842, and escaped through the good offices of an Afghan princess. He married this lady, and she transmitted to their son that power of exercising influence over the tribes of the north-west frontier which stood him in good stead during his long service in India. Warburton entered the Royal Artillery in i86t, took part in the Abyssinian War of 1867-68, and then joined the Bengal Staff Corps. He served with distinction in the expedition against the Utman Khel in 1878 and in the Afghan War of 1878-80. Very soon after the British government had made permanent arrange- ments for keeping open the Khyber Pass, Warburton was appointed to take charge of it as political officer. This post he held, discharging its duties with conspicuous ability, between 1879 and 1882 with intervals of other duty, and continuously from 1882 until 1890. He turned the rude levies which formed the Khyber Rifles into a fine corps, ready to serve the Indian government wherever they might be required. He made the road safe, kept the Afridis friendly, and won the thanks of the Punjab government, expressed in a special order upon his retire- ment, for his good work. When the Afridis began to cause anxiety in 1897, Colonel Warburton was asked by the govern- ment of India if he would assist in quieting the excitement amongst them. He declared himself ready to do 50, but in the meantime the trouble had come to a head. Colonel Warburton took part in the campaign which followed; at its close his active career ended. He occupied his leisure in retirement by writing his memoirs, Eighteen Years in the Khyber (1900). He died at Kensington on the 22nd of April 1899.

WARBURTON, WILLIAM (1698-1779), English critic and divine, bishop of Gloucester, was born at Newark on the 24th of December 1698. His father belonged to an old Cheshire family and was town clerk of Newark. William was educated at Oakham and Newark grammar schools, and in 17 14 he was articled to Mr Kirke, attorney at East Markham, in Nottingham- shire. After serving his time he returned to Newark with the intention of practising as a solicitor; but, having given some time to the study of Latin and Greek, he left the law and was ordained deacon by the archbishop of York in 1723, and in 1727 received priest's orders from the bishop of London. He had occupied the interval in various literary labours, the most important being the notes he contributed to Theobald's edition of Shakespeare, and an anonymous share in a pamphlet on the jurisdiction of the Court of Chancery, The Legal Judicature in Chancery staled (1727). This was an answer to another anony- mous pamphlet, written by Philip Yorkc, afterwards Lord Chan- cellor Hardwicke, who replied in an

enlarged edition (1728) of his original Discourse of the Judicial Authority . . . of Master of the Rolls. Warburton now received from Sir Robert Sutton the small living of Greasley, in Nottinghamshire, exchanged next year for that of Brant Broughton, Lincolnshire. He held in addition, from 1730, the living of Frisby in Lincolnshire. In 1728 he was made an honorary M.A. of Cambridge. At Brant Broughton for eighteen years he spent his time in study, the first result of which was his treatise on the Alliance between Church and State (1736). The book brought Warburton into favour at court, and he probably only missed immediate preferment by the death of Queen Caroline. His next and best-known work, Divine Legation of Moses demonstrated on the Principles of a Religious Deist (2 vols., 1 737-1 741), preserves his name as the author of the most daring and ingenious of theological paradoxes. The deists had made the absence of any inculcation of the doctrine of a future life an objection to the divine authority of the Mosaic writings. Warburton boldly ad mitted the fact and turned it against the adversary by maintaining that no merely human legislator would have omitted such a sanction of morality. The

author's extraordinary power, learning and originality were acknowledged on all hands, though he excited censure and suspicion by his tenderness to the alleged heresies of Conyers Middleton. The book aroused much controversy. In a pamphlet of " Remarks " (1742), he replied to John Tillard, and Remarks on Several Occasional Reflections (1 744-1 745) was an answer to Akenside, Conyers Middleton (who had up to this time been his friend), Richard Pococke, Nicholas Mann, Richard Grey, Henry Stebbing and other of his critics. As he characterized his opponents in general as the " pestilent herd of libertine scribblers with which the island is overrun," it is no matter of surprise that the book made him many bitter enemies.

Either in quest of paradox, or actually unable to recognize the real tendencies of Pope's Essay on Man, he entered upon its defence against the Examcn of Jean Pierre de Crousaz, in a series of articles (1738-1739) contributed to The Works of the Learned. Whether Pope had really understood the tendency of his own work has always been doubtful, but there is no question that he was glad of an apologist, and that Warburton's feu d'esprit in the long run did more for his fortunes than all his erudition. It occasioned a sincere friendship between him and Pope, whom he persuaded to add a fourth book to the Dunciad, and en- couraged to substitute Cibber for Theobald as the hero of the poem in the edition of 1743 published under the editorship of Warburton. Pope bequeathed him the copyright and the editorship of his works, and contributed even more to his advance- ment by introducing him to Murray, afterwards Lord Mansfield, who obtained for him in 1746 the preachership of Lincoln's Inn, and to Ralph Allen, who, says Johnson, " gave him his niece and his estate,

and, by consequence, a bishopric." The marriage took place in 1745, and from that time Warburton resided principally at his father-in-law's estate at Prior Park, in Gloucestershire, which he inherited on Allen's death in 1764. In 1747 appeared his edition of Sha.kespearc, into which, as he expressed it, Pope's earlier edition was melted down. He had previously entrusted notes and emendations on Shakespeare to Sir Thomas Hanmer, whose unauthorized use of them led to a heated controversy. As early as 1727 Warburton had corre- sponded with Theobald on Shakespearean subjects. He now accused him of stealing his ideas and denied his critical ability. Theobald's superiority to Warburton as a Shakespearean critic has long since been acknowledged. Warburton was further kept busy by the attacks on his Divine Legation from all quarters, by a dispute with Bolingbrokc respecting Pope's behaviour in the affair of Bolingbroke's Patriot King, by his edition of Pope's works (17 51) and by a vindication in 1750 of the alleged miracu- lous interruption of the rebuilding of the temple of Jerusalem undertaken by Julian, in answer to Conyers Middleton. War- burton's manner of dealing with opponents was both insolent and rancorous, but it did him no disservice. He became pre- bendary of Gloucester in 1753, chaplain to the king in 1734, prebendary of Durham in 1755, dean of Bristol in 1757, and in j 759 bishop of Gloucester. He continued to write so long as the infirmities of age allowed, collecting and publishing his sermons, and toiling to complete the Divine Legation, further fragments of which w r ere published with his posthumous Works. He wrote a defence of revealed religion in his View of Lord Bolingbroke's Philosophy (1754), and Hume's Natural History of Religion called forth some Remarks …" by a gentleman of Cambridge " from Warburton, in which his friend and biographer, Richard Hurd, had a share (1757). He made in 1762 a vigorous attack on Methodism under the title of The Doctrine of Grace. He also engaged in a keen controversy with Robert Lowth, afterwards bishop of London, on the book of Job, in which Lowth brought home charges of lack of scholarship and of insolence that admitted of no denial. His last important act was to found in 1768 the Warburtonian lecture at Lincoln's Inn, " to prove the truth of revealed religion . . . from the completion of the prophecies of the Old and New Testament which relate to the Christian Church, especially to the apostacy of Papal Rome." He died at Gloucester on the 7th of June 1779. Warburton was undoubtedly a great man, but his intellect, marred by wilfulness and the passion fdr

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paradox, effected no result in any degree adequate to its power. He was a warm and constant friend, and gave many proofs of gratitude to his benefactors.

Warburton's works were edited (7 vols., 1788) by Bishop Hurd with a biographical preface, and the correspondence between the two friends — an important contribution to the literary history of the period — was edited by Dr Parr in 1808. Warburton's life was also written by John Selby Watson in 1863, and Mark Pattison made him the subject of an essay in 1889. See also I. D'Israeli, Quarrels of Authors (1814); and especially John Nichols, Literary Anecdotes (1812-1815), vol. v., and Illustrations (1817-1858), vol. ii., for his correspondence with William Stukeley, Peter des Maizeaux, Thomas Birch, John Jortin and Lewis Theobald.

WARD, ADOLPHUS WILLIAM (1837-), English historian and man of letters, was born at Hampstead, London, on the 2nd of December 1837, and was educated in Germany and at the university of Cambridge. In 1866 he was appointed pro- fessor of history and English literature in Owens College, Man- chester, and was principal from 1890 to 1897, when he retired. He took an active part in the foundation of Victoria University, of which he was vice-chancellor from 1886 to 1890 and from 1894 to 1896. In 1897 the freedom of the city of Manchester was conferred upon him, and in 1900 he was elected master of Peter- house, Cambridge. His most important work is his standard History of English Dramatic Literature to the Age of Queen Anne (1875), re-edited after a thorough revision in three volumes in 1899. He also wrote The House of Austria in the Thirty Years' War (1869), Great Britain and Hanover (1899), The Electress Sophia and the Hanoverian Succession (1903) ; he edited Crabbe's Poems (2 vols., 1905-1906) and Pope's Poetical Works (1869); he wrote the volumes on Chaucer and Dickens in the " English Men of Letters " series, translated Cur this 's History of Greece (5 vols., 1868— 1S73); he was one of the editors of the Cambridge Modern History, and with A. R. Waller edited the Cambridge History of English Literature (1907, &c). For the 9th edition of the Ency. Brit, he wrote the article Dkama, and biographies of Ben Jonson and other dramatists; and he became animportant contributor to the present work.

WARD, ARTEMUS, the pen-name of Charles Farrar Browne (1834-1867), American humorous writer, was born in Waterford, Maine. He began life as a compositor and became an occasional contributor to the daily and weekly journals. In 1858 he published in the Cleveland Plain Dealer the first of the "Artemus Ward " series, which attained great popularity both in America and England. His separate publications were: Artemus Ward: his Book (New York, 1862); Artemus Ward: his Travels (New York, T865); Artemus Ward among the Fenians (1865); Betsey Jane Ward: hur Book of Goaks (New York, 1866), generally attributed to him; Artemus Ward in London, and oilier Papers (New York, 1867). Artemus Ward's Lecture at the Egyptian Hall . . . and other Relics of ike Humourist (London, 1869), edited by T. W. Robertson and J. C. Rotten, was published posthumously

(New York, 1869). His wit largely relied on the drollery of strange spelling. In i860 he became editor of Vanity Fair, a humorous New York weekly, which proved a failure. About the same time he began to appear as a lecturer, and his eccentric humour attracted large audiences. In 1866 he visited England, where he became exceedingly popular both as a lecturer and as a contributor to Punch. In the spring of the following year his health gave way, and he died of consump- tion at Southampton on the 6th of March 1867.

His Complete Works, with memoir by E. P. Hingston, were published in London in the same year, and Sandwiches at New York in 1870.

WARD, EDWARD MATTHEW (1816-1879), English historical and genre painter, was born at Pimlico, London, in 1S16. Among his early boyish efforts in art was a series of clever illustrations to the Rejected Addresses of his uncles Horace and James Smith, which was followed soon afterwards by designs to some of the papers of Washington Irving. In 1830 he gained the silver palette of the Society of Arts; and in 1835, aided by Wilkie and Chantrey, he entered the schools of the Royal Academy, having in the previous year contributed to its exhibition his portrait of Mr 0. Smith, the comedian, in his character of Don Quixote. In 1836 he went to Rome, where in 183S he gained a

silver medal from the Academy of St Luke for his " Cimabue and Giotto," which in the following year was exhibited at the Royal Academy. .The young artist now turned his thoughts to fresco- painting, which he studied under Cornelius at Munich. In 1843 he forwarded his " Boadicea Animating the Britons previous to the Last Battle against the Romans " to the competition for the decoration of the Houses of Parliament — a work upon which be was afterwards engaged, having in 1853 been directed by the fine art commissioners to execute eight subjects in the corridor of the House of Commons. The success of his " Dr Johnson in Lord Chesterfield's Ante-Room " — now in the National Gallery, along with the " Disgrace of Lord Clarendon " (the smaller picture) (1846), the " South Sea Bubble " (1847), and " James II. Receiving the News of the Landing of the Prince of Orange " (1850) — secured his election as an associate of the Royal Academy in 1847, and in 1855 he gained full academic honours. Among the more important of his other works may be named " Charlotte Corday Led to Execution " (1852), the " Last Sleep of Argyll " (1854), the " Emperor of the French Receiving the Order of the Garter " (1859), painted for the queen, the " Ante- Chamber at Whitehall during the Dying Moments of Charles II." (1861), " Dr Johnson's First Interview with John Wilkes " (1865), and the " Royal Family of France in the Temple," painted in

1851, and usually considered the artist's masterpiece. He died at Windsor, on the 15th of January 1S70. In 1848 he had married Henrietta Ward (b. 1832), who, herself an admirable artist, was a granddaughter of James Ward, R.A. (1 769-1859), the distinguished animal painter. Their son, Leslie Ward (b. i8sr), became well known as " Spy " of Vanity Fair (from 1873 to 1909), and later of the World, with his character portraits of contemporary celebrities.

WARD, ELIZABETH STUART PHELPS (1844-1911), American author and philanthropist, was bom in Boston, Massachusetts, on the 31st of August 1S44. She was the granddaughter of the Rev. Moses Stuart, and the daughter of the Rev. Austin Phelps (1820-1890) who became a professor in the Andover Theological Seminary in 1848, and Elizabeth Stuart Phelps (1815-1852), who wrote Sunnyside (1851), a popular book in its day, and other works. In 1848 she removed with her parents to Andover, where she attended private schools. When she was in her teens she wrote short stories for the Youth's Companion, The Atlantic Monthly and Harper's Magazine. She wrote many juveniles, especially Sunday-School books, such as the Tiny and the Gypsy series. In 1868 appeared in The Atlantic Monthly her short story, The Tenth of January, a narrative of the falling and burning of a cotton-mill at Lawrence, Mass., in i860. In the same year appeared The Gales Ajar (1S68), her first novel, a realistic study of life after death, which was widely read and was translated into several European languages. Her Beyond the Gates (1883), The Gates Between (1887) and Within the Gates (1901) are in the same vein. She was actively interested in charitable work, in the advancement of women and in temperance reform. In 1888 she married Herbert Dickinson Ward (b. 1861), son of the Rev. William Hayes Ward.

Among Mrs Ward's books, in addition to those already mentioned, are: Men, Women and Ghosts (1869): The Trolly Book (1869), juvenile; Hedged in (1870); The Silent Partner (1871); Trolly's Wedding Tour and Story Book (1873), juvenile ; What to Wear (1873), essays; Poetic Studies (1875), poems; The Story of Avis (1877), Sealed Orders, and Other Stories (1879); Friends: a Duet (1881); Doctor Zay (1882); Songs of the Silent World, and Other Poems

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Fourteen to One, and Other Stones (1891); Austin Phelps: 'a Memoir (1891); Donald Many (1893); A Singular Life (1894), one of her best-known novels; The Supply at Saint Agatha's (1896); Chapters from a Life (1896); The Story of Jesus Christ: an Interpretation (1897); The

Successors of Mary the First (1901); Avery (1902), first issued serially in Harper's Magazine as His Wife; Trixy (1904); The Man in the Case (1906); Walled In (1907); and Though Life Do Us Part (1908). In collaboration with her husband, she wrote two novels founded on Biblical scenes and characters, The Master of the Magicians (r8go), and Come Forth (1890). Among Mr Ward's books are The New Senior at Andover (1890); The Republic without a President, and Other Short Stories (1891) ; The Captain of the Kittturink

(1892); A Dash to the Pole (1893); The White Crown, and Other Stories (1894); The Burglar ivho moved Paradise (1S97): and The Light of the World (1901).

WARD, JAMES (1769-1859), English animal painter and engraver, was born in Thames Street, London, on the 23rd of October 1769. At the age of twelve he was bound apprentice with J. Raphael Smith, but he received little attention and learnt nothing from this engraver. He was afterwards instructed for over seven years by his elder brother, William Ward, and he engraved many admirable plates, among which his " Mrs Billington," after Reynolds, occupies a very high place. He presented a complete set of his engravings, in their various states, numbering three hundred impressions, to the British Museum. While still a youth he made the acquaintance of George Morland, who afterwards married his sister; and the example of this artist's works induced him to attempt painting. His early productions were rustic subjects in the manner of Morland, which were frequently sold as the work of the more celebrated painter. His " Bull-Bait," an animated composition, introducing many figures, attracted much attention in the Royal Academy of 1797. A commission from Sir John Sinclair, president of the new agricultural society, to paint an Alderney cow, led to much similar work, and turned Ward's attention to animal-painting, a department in which he achieved his highest artistic successes. His " Landscape with Cattle," acquired for the National Gallery at a cost of £1500, was painted in 1820- 1822 at the suggestion of West, in emulation of the "Bull of Paul Potter " at the Hague. His " Boa Serpent Seizing a Horse " was executed in 1822, and his admirable " Grey Horse, ,; shown in the Old Masters' Exhibition of 1879, dates from 1828. Ward also produced portraits, and many landscapes like the <: Gordale Scar" and the "Harlech Castle" in the National Gallery. Sometimes he turned aside into the less fruitful paths of allegory, as in his unsuccessful " Pool of Bethesda " (1818), and " Triumph of the Duke of Wellington " (1818). He was a frequent contributor to the Royal Academy and the British

Institution, and in 184.1 he collected one hundred and forty examples of his art, and exhibited them in his house in Newman Street. He was elected an associate of the Royal Academy in 1S07, and a full member in 181 1, and died at Cheshunt on the 23rd of November 1859.

Ward compiled an autobiography, of which an abstract was published in the Art Journal in .'849.

WARD, JAMES (1843-), English psychologist and meta- physician, was born at Hull on the 27th of January 1843. He was educated at the Liverpool Institute, at Berlin and Gottingen, and at Trinity College, Cambridge; he also worked in the physio- logical laboratory at Leipzig. He studied originally for the Congregational ministry, and for a year was minister of Emmanuel Church, Cambridge. Subsequently he devoted himself to psychological research, became fellow of his college in 1875 and university professor of mental philosophy in 1897. He was Gifford lecturer at Aberdeen in 1895-1897, and at St Andrews in 1 908-19 10. His work shows the influence of Leibnitz and Lotze, as well as of the biological theory of evolution. His psychology marks the definite break with the sensationalism of the English school; experience is interpreted as a continuum into which distinctions arc gradually introduced by the action of selective attention; the implication of the subject in experience is emphasized; and the operation in development of subjective, as well as natural, selection is maintained. In his metaphysical work the analysis of scientific concepts leads to a criticism of naturalism and of dualism, and to a view of reality as a unity which implies both subjective and objective factors. This view is further worked out, through criticism of pluralism and as a theistic interpretation of the world, in his St Andrews Gifford Lectures (the Realm of Ends) .

Beside the article " Psychology " in the Ency. Brit. (9th, 10th and ,11th ed.) he has published Naturalism and Agnosticism (1899, 3rd ed. 1907), besides numerous articles in the Journal of Physiology, Mind, and the British Journal of Psychology.

WARD, JOHN QUINCY ADAMS (1830-1910), American sculptor, was born in Urbana, Ohio, on the 29th of June 1S30.

His education was received in the village schools. He studied under Henry K. Brown, of New York, in 1850-1857, and by 1861, when he opened a studio in New York, he had executed busts of Joshua R. Giddings, Alexander II. Stephens, and Hannibal Hamlin, prepared the first sketch for the " Indian Hunter," and made studies among the Indians themselves for the work. In 1863 he became a member of the National Academy of Design (New York), and he was its president in 1872-3873. Among his

best-known statues are the " Indian Hunter," finished in 1864 (Central Park, New York); Washington, heroic size (on the steps of the U.S. Sub-Treasury, Wall Street, New York); Henry Ward Beecher (Brooklyn); an equestrian statue of General George H. Thomas (Washington); Israel Putnam (Hartford); and the seated statue of Horace Greeley, the founder of the New York Tribune, in front of the office of that newspaper. In 1896 he was elected president of the newly organized National Sculp- ture Society (New York). Unlike his fellow-countryman, W. W. Story, he acquired his training, his inspiration and his themes from his own country. He died in New York on the 1st of May 1 910.

WARD, LESTER FRANK (1841-), American geologist and sociologist, was born in Joliet, Illinois, on the 18th of June 1841. He graduated at Columbian (now George Washington) University in 1869 and from the law school of the same university in 1871, his education having been delayed by his service in the Union army during the Civil War. In 1865-1872 he was employed in the United States Treasury Department, and became assistant geologist in 1881 and geologist in 18S8 to the U.S. Geological Survey. In 1884-1886 he was professor of botany in Columbian University. He wrote much on paleo- botany, including A Sketch of Paleobotany (1885), The Geographi- cal Distribution of Fossil Plants (18SS) and The Status of the. Mesozoic Floras of the United States (1905). He is better known, however, for his work in sociology, in which, modifying Herbert Spencer and refuting the Spencerian individualism, he paralleled social with psychological and physical phenomena. His more important works are: Dynamic Sociology (1883, 2nd ed. 1897), Psychic Factors of Civilization (1897), Outlines of Sociology (189S), Sociology and Economics (1899), Pure Sociology (1903), and, with J, Q. Dealy, Text-Book of Sociology (1905).

See an appreciation by L. Gurnplowicz, in Die Zeit (Vienna, 20th Aug. 1904) ; reprinted in English in vol. x. of The American Journal of Sociology.

WARD, MARY AUGUSTA [Mrs Humphry Ward] (1851-), British novelist, was born on the nth of June 185 1 at Hobart, Tasmania, where her father, Thomas Arnold (1824- 1900), was then an inspector of schools. Thomas Arnold was a son of Arnold of Rugby, and a brother of the poet Matthew Arnold. As a scholar of University College, Oxford, at the crisis of the Oxford Movement, he had begun life as a Liberal of the school of Jowett, Stanley and Clough. In 1856 he became a Roman Catholic, relinquished his inspectorship of schools in Tasmania, and was appointed professor of English literature at Dublin, thence following Newman to Birmingham, where he published his Manual of English Literature. After a brief period of unrest he reverted to the English Church,

and went to Oxford, where he lived twenty years, editing The Select Works of Wyclif &nd Beowulf for the Clarendon Press, Henry of Hunting- don and Symeon of Durham for the " Rolls " series, and, with W. E. Addis, the Catholic Dictionary, In 1877 he reverted once more to the Roman Catholic Church, and was appointed fellow of the new Royal University of Ireland, dying in Dublin on the 12th of November 1900. His daughter was brought up mainly at Oxford, and her early associations with a life of scholarship and religious conflict are deeply marked in her own later literary career. She was brought into close connexion during this period with Edward Hartopp Cradock, who was principal of Brasenose College from 1853 till his death in 1886, and some of whose characteristics went to the portrait of the " Squire " in Robert Elsmere. In 1872 she married Thomas Humphry Ward (b. 1845), then fellow and tutor of Brasenose, and one of the authors of the Oxford Spectator, Mr Humphry Ward, a son of the

Rev. Henry Ward, Vicar of St Barnabas, King's Square, London, E.C., remained at Oxford till 1-880, and then went to London to take up literary work; with the help of the chief critics of the day he brought out the important selections of English verse called The English Poets (4 vols., 1880-1881). He joined the staff of The Times and wrote much for that paper, becoming its principal art critic. He also published Humphry Sandwith, a Memoir (1884); and he edited Men of the Reign (18S5), English Art in the Public Galleries of London (1886), Men of the Time (1887), and, with the help of Matthew Arnold, Huxley, Lord Wolseley, H. S. Maine and others, The Reign of Queen Victoria: a Survey of Fifty Years of Progress (1887).

Mrs Humphry Ward at first devoted herself to Spanish litera- ture, and contributed articles on Spanish subjects to the Diction- ary of Christian Biography, edited by Dr William Smith and Dr Henry Wace. She wrote also for Macmillan's Magazine. In 1881 she published her first book, Milly and Oily, a child's story illustrated by Lady (then Mrs) Alma-Tadema. This was followed in 1S84 by a more ambitious, though slight, study of modern life, Miss Bretherton, the story of an actress. In 1885 Mrs Ward published an admirable translation of the Journal of the Swiss philosopher Amiel, with a critical introduction, which showed her delicate appreciation of the subtleties of speculative thought. It was no bad preparation for her next book, which was to make her famous. In February 18S8 appeared Robert Elsmere, a powerful novel, tracing the mental evolution of an English clergyman, of high character and conscience and of intellectual leanings, constrained to surrender his own orthodoxy to the influence of the " higher

criticism." The character of Elsmere owed much to reminiscences both of T. H. Green, the philosopher, and of J. R. Green, the historian. Largely in consequence of a review by W. E. Gladstone in the Nineteenth Century (May 1888, " Robert Elsmere and the Battle of Belief"), the book became the talk of the civilized world. It ran in five months through seven editions in three-volume form, and the cheap American editions had an enormous sale. It was translated into several European languages, and was the subject of articles in learned foreign reviews. Robert Elsmere is in itself a fine story, notably in its picture of the emotional conflict between Elsmere and his wife, whose over-narrow orthodoxy brings her religious faith and their mutual love to a terrible impasse) but it was the detailed discussion of the " higher criticism " of the day, and its influence on Christian belief, rather than its power as a piece of dramatic fiction, that gave the book its exceptional vogue. It started, as no academic work could have done, a popular discussion on historic and essential Christianity. In i8qo Mrs Ward took a prominent part in founding Univer- sity Hall, an " Elsmerian " settlement for working and teaching among the poor. Her next novel, David Grieve, was published in 1802. In Marcdla (1894), and its sequel Sir George Tressady (i8q6), she broke new ground in the novel of modern politics and socialism, the fruit of observation and reflection at Univer- sity Hall. In 1895 had appeared the short tragedy, the Story of Bessie Costrell. Mrs Ward's next long novel, Ilelbeck of Bannisdale (1808), treated of the clash between the ascetic ideal of Roman Catholicism and modern life. The clement of Catholic and humanistic ideals entered also into Eleanor (1900), in which, however, the author relied less on the interest of a Ihesis and more on the ordinary arts of the novelist. Eleanor was dramatized and played at the Court Theatre in 1902. In Lady Rose's Daughter (1903) — dramatized as Agatha in 1905 — and The Marriage of William Ashe (1905), modern tales founded on the stories respectively of Mile de Lespinasse and Lady Caroline Lamb, she relied entirely and with success upon social portraiture. Later novels were Eenwick's Career (1906), Diana Mallory (igoS), Daphne (1909) and Canadian Born

(IQIO).

Mrs Ward's eminence among latter-day women-novelists arises from her high conception of the art of fiction and her strong grasp of intellectual and social problems, her descriptive power (finely shown in the first part of Robert Elsmere) and her command of a broad and vigorous prose style. But her

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activities were not confined to literature. She was the originator in England of the Vacation Schools, which have done much to educate the poorest

children of the community upon rational lines. She also took a leading part in the movement for op- posing the grant of the parliamentary suffrage to women, whilst encouraging their active participation in the work of local government. She was one of the founders of the Women's National Anti-Suffrage League in 1908, and both spoke and wrote repeatedly in support of its tenets.

See for bibliography up to June 1904, English Illustrated Magazine, vol. xxxi. (N.S.) pp. 294 and 299. (H. Ch.)

WARD, SETH (1617-1689), English bishop, was born in Hert- fordshire, and educated at Sidney Sussex College, Cambridge, where he became fellow in 1640. In 1643 he was chosen univer- sity mathematical lecturer, but he was deprived of his fellowship next year for opposing the Solemn League and Covenant. In 1649 he became Savilian professor of astronomy at Oxford, and gained a high reputation by his theory of planetary motion, propounded in the works entitled In Ismaelis Bullialdi astro- nomiae philolaicae fundamenta inquisitio brevis (Oxford, 165.3), and Astronomia geometrica (London, 1656). About this time he was engaged in a philosophical controversy with Thomas Hobbes. He was one of the original members of the Royal Society. In 1659 he was appointed master of Trinity College, Oxford, but not having the statutory qualifications he resigned in 1660. Charles II. appointed him to the livings of St Lawrence Jewry in London, and Uplowman, Devonshire, in 1661. He also became dean of Exeter (1661) and rector of Breock, Corn- wall (1662). In the latter year he was consecrated bishop of Exeter, and in 1667 he was translated to the see of Salisbury. The office of chancellor of the Order of the Garter was conferred on him in 167 1. In his diocese he showed great severity to nonconformists, and rigidly enforced the act prohibiting con- venticles. He spent a great deal of money on the restoration of the cathedrals of Worcester and Salisbury. He died at Knights- bridge on the 6th of January 1688/1689.

WARD, WILLIAM (1766-1826), English mezzotint-engraver, an elder brother of James Ward (q.v.), was born in London in 1766. He was the most distinguished pupil of J. Raphael Smith, and executed a great part of many of the plates which bear the name of that excellent engraver. In 1795 he began to exhibit in the Royal Academy, of which in 1814 he was elected an associate engraver. He also held the appointment of mezzotint-engraver to the prince regent and the duke of York. He executed six plates after Reynolds, engra.ved many of the works of his brother- in-law, George Morland, and his mezzotints after Andrew Geddes, which include the full-lengths of Sir David Wilkie and of Patrick Brydone, are of great merit. His engravings are full of artistic spirit, and show fine feeling for colour; and they are excellently tender and expressive in their rendering of flesh. He

died in London on the 1st of December 1826.

WARD, WILLIAM GEORGE (1812-1882), English Roman Catholic theologian, was born on the 21st of March 1812. His career is extremely interesting as illustrating the development of religious opinion at a remarkable crisis in the history of English religious thought. Ward is described by his son and biographer as somewhat unequally gifted by nature. For pure mathematics he had a special gift- — almost a passion. For history, applied mathematics — for anything, in fact, outside the exact sciences — he felt something approaching to contempt. He was endowed with a strong sense of humour and a love of paradox carried to an extreme. He went up to Christ Church, Oxford, in 1830, but his father's subsequent pecuniary embarrassments compelled him in 1833 to try for a scholarship at Lincoln College, which he succeeded in obtaining. His examination for mathematical honours exhibited some of the peculiarities of his character and mental powers. Four out of his five papers on applied mathe- matics were sent up absolutely blank. Honours, however, were not refused him, and in 1834 he obtained an open fellowship at Balliol. In the previous year the Tractarian movement had commenced, and Ward's relations with that movement were as original as the rest of his life. He was attracted to it by his

hatred of moderation and what he called " respectability " in any shape — a characteristic of which some amusing instances have been handed down. He was repelled from it by the conception he had formed of the character of Newman, whom he regarded as a mere antiquary. When, however, he was at length persuaded by a friend to go and hear Newman preach, he at once became a disciple. But he had, as Newman afterwards said of him, "struck into the movement at an angle." He had no taste for historical investigations. He treated the question at issue as one of pure logic, and disliking the Reformers, the right of private judgment which Protestants claimed, and the somewhat prosaic uniformity of the English Church, he flung himself into a general campaign against Protestantism in general and the Anglican form of it in particular. He nevertheless took deacon's orders in 1838 and priest's orders in 1840.

In 1839 Ward became the editor of the British Critic, the organ of the Tractarian party, and he excited suspicion among the adherents of the Tractarians themselves by his violent denuncia- tions of the Church to which he still belonged. In 1841 he urged the publication of the celebrated "Tract XC.," and wrote in defence of it. From that period Ward and his

associates worked undisguisedly for union with the Church of Rome, and in 1844 he published his Ideal of a Christian Church, in which he openly contended that the only hope for the Church of England lay in submission to the Church of Rome. This publication brought to a height the storm which had long been gathering. The university of Oxford was invited, on the 13th of February 1S45, to condemn " Tract XC," to censure the Ideal, and to degrade Ward from his degrees. The two latter propositions were carried and " Tract XC." only escaped censure by the 11011 placet of the proctors, Guillemard and Church. The condemnation precipitated an exodus to Rome. Ward left the Church of England in September 1845, and was followed by many others, including Newman himself. After his reception into the Church of Rome, Ward gave himself up to ethics, metaphysics and moral philosophy. He wrote articles on free will, the philosophy of theism, on science, prayer and miracles for the Dublin Review. He also dealt with the condemnation of Pope Honorius, carried on a controversial correspondence with John Stuart Mill, and took a leading part in the discussions of the Metaphysical Society, founded by Mr James Knowles, of which Tennyson, Huxley and Martineau were also prominent members. He was a vehement opponent of Liberal Catholicism. In 1851 he was made professor of moral philosophy at St Edmund's College, Ware, and was advanced to the chair of dogmatic theology in 1852. In 1868 he became editor of the Dublin Review. He gave a vigorous support to the promulgation of the dogma of Papal Infallibility in 1870. After his admission into the Roman Catholic Church he had, rather to the dismay of his friends, entered the married state, and for a time had to struggle with poverty. But his circum- stances afterwards improved. He died on the 6th of July 1882. (J J.L.)*

Seˆ William George Ward and ike Oxford Movement (1889); and William George Ward and the Catholic Revival (1893), by his son, Wilfrid Philip Ward (b. 1856), who has also written the Life and Times of Cardinal Wiseman; and Ten Personal Studies (190S).

WARD, that which guards or watches and that which is guarded or watched. The word is a doublet of " guard," which was adapted from the French comparatively late into English. Both are to be referred to the Teutonic root war-, to protect, defend, cf. " wary," " warn," " beware," O. Eng. iveard, Ger. warten, &c, and the English " guardian," " garrison," &c. The principal applications of the term are, in architecture, to the inner courts of a fortified place; at Windsor Castle they are called the upper and lower wards (see Batt.ey, Castle); to a ridge of metal inside a lock blocking the passage of any key which has not a corresponding slot into which the ridge fits, the slot in the key being also called " ward " (see Locks). Another branch of meaning is to be found in the use of the word for a division into which a borough is divided for the purpose of election of

councillors, or a parish for election of guardians. It was also the term used as equivalent to " hundred " in

Northumberland and Cumberland. To this branch belongs the use for the various large or small separate rooms in a hospital, asylum, &c, where patients are received and treated. The most general meaning of the word is for a minor or person who is under a guardianship (see Infant, Marriage and Roman Law).

WARDEN, a custodian, defender, guardian (see Guardian, a word with which it is etymologically identical). The word is frequently employed in the ordinary sense of a watchman or guardian, but more usually in England in the sense of a chief or head official. The lords wardens of the marches, for example, were powerful nobles appointed to guard the borders of Scotland and of Wales; they held their lands per baroniam, the king's writ not running against them, and they had extensive rights of administrating justice. The chief officer of the ancient stan- naries of Cornwall has the title of lord warden (see Stannaries), as has also the governor of Dover Castle (see Cinque Ports). Warden was until 1870 the alternative title of the master of the mint, and " warden of the standards " the title of the head of the Standards office (see Standards). The principal or head of several of the colleges of Oxford University is also termed warden.

WARDHA, a town and district of British India, in the Nagpur division of the Central Provinces, which take their name from the Wardha river. The town is situated 49 m. S.W. of Nagpur by rail. Pop. (1901) 9872, It was laid out in 1866, shortly after the district was first constituted. It is an important centre of the cotton trade.

The District of Wardha has an area of 2428 sq. m. It is hilly in the north, and intersected by spurs from the Satpura range. The central portion includes the three peaks of Malegaon (1726 ft.), Nandgaon (1874 ft.), and Jaitgarh (2086 ft.). From this cluster of hills numerous small streams lead to the Wardha river on the one side, while on the other the Dham, Bor, and Asoda flow down the length of the district in a south-easterly direction. The Wardha, and its affluent the Wanna, are the only rivers of any importance. To the south the country spreads out in an undulating plain, intersected by watercourses, and broken here and there by isolated hills rising abruptly from the surface. In general the lowlands are well wooded. Leopards, hyenas, wolves, jackals and wild hog abound in the district; other animals found are the spotted deer, nilgai and antelope. The district is subject to great variations of climate, and the rainfall at Wardha town averages 41 in. In 1901 the population was 385,103, showing a decrease of 4% in the decade. The principal crops are cotton, millet, wheat

and oil-seeds. This region supplies the cotton known in the market as Hinganghat. There are cotton-mills at Hinganghat and Palgaon, and many factories for ginning and pressing cotton. The district is traversed by the Nagpur line of the Great Indian Peninsula railway. A branch runs from Wardha town past Hinganghat to the Warora coal-field in the district of Chanda. The history of Wardha forms part of that of Nagpur district, from which it was separated in 1862 for administrative purposes.

See Wardha District Gazetteer (Allahabad, 1906).

WARDLAW, ELIZABETH, Lady (1677-1727), reputed author of Hardyknute, second daughter of Sir Charles Halket, was born in April 1677. She married in 1696 Sir Henry Wardlaw, Bart., of Pitreavie. The ballad of Hardyknute, published in 1719 as an old poem, was supposed to have been discovered by her in a vault at Dunfermline, but no MS. was ever produced; and in the 1767 edition of Percy's Reliques the poem was ascribed to her. The beautiful ballad of Sir Patrick Spent (F. J. Child, English and Scottish Popular Ballads, ii. 17) has been also asserted to be her work, one of the supporters of the theory being Robert Chambers {Remarks on Scottish Ballads, 1859). The level of accomplishment in Hardyknute, however, gives no reason for supposing that Lady Wardlaw was capable of producing Sir Patrick Spens.

See Norval Clyne, The Romantic Scottish Ballads and the Lady Wardlaw Heresy (1859), and J. H. Watkins, Early Scottish Ballads (Glasgow, 1867).

WARDLAW, HENRY (d. 1440), Scottish prelate, was a son of Sir Andrew Wardlaw and a nephew of Walter Wardlaw (d. 1390), bishop of Glasgow, who is said to have been made a cardinal by the anti-pope Clement VII. in 1381. Educated at the universities of Oxford and of Paris, Henry Wardlaw returned to Scotland about 1385, and owing to his influential connexions received many benefices in the Church. He passed some time at Avignon, and it was whilst he was residing at the papal court that he was chosen bishop of St Andrews, being consecrated in 1403. Returning to Scotland he acted as tutor to the future king, James I., and finished the work of restoring his cathedral. Then having helped to bring about the release of James from his captivity in England, he crowned this king in May 1424, and afterwards acted as one of his principal ad- visers. He appears to have been an excellent bishop, although he tried to suppress the teaching of John Wy cliff e by burning its advocates. He died on the 6th of April 1440.

Wardlaw's chief title to fame is the fact that he was the founder of the university of St Andrews, the first Scottish university. He issued the charter of foundation in February 141 1, and the privileges of the new seat of learning were confirmed by a bull of Pope Benedict XIII., dated the 28th of August 1413. The university was to be " an impregnable rampart of doctors and masters to resist heresy."

WARDROBE, a portable upright cupboard for storing clothes. The earliest wardrobe was a chest, and it was not until some degree of luxury was attained in regal palaces and the castles of powerful nobles that separate accommodation was provided for the sumptuous apparel of the great. The name of wardrobe was then given to a room in which the wall-space was filled with cupboards and lockers — the drawer is a comparatively modern invention. From these cupboards and lockers the modern wardrobe, with its hanging spaces, sliding shelves and drawers, was slowly evolved. In its movable form as an oak " hanging cupboard " it dates back to the early 17th century. For probably a hundred years such pieces, massive and cumbrous in form, but often with well-carved fronts, were made in fair numbers; then the gradual diminution in the use of oak for cabinet-making produced a change of fashion. Walnut succeeded oak as the favouriLe material for furniture, but hanging wardrobes in walnut appear to have been made very rarely, although clothes presses ; with drawers and sliding trays, were frequent. During a large portion of the 18th century the tallboy (g.v.) was much used for storing clothes. Towards its end, however, the wardrobe began to develop into its modern form, with a hanging cup-board at each side, a press in the upper part of the central portion and drawers below. As a- rule it was of mahogany, but so soon as satinwood and other hitherto scarce finely grained foreign woods began to be obtainable in considerable quantities, many elaborately and even magnificently inlaid wardrobes were made. Where Chippendale and his school had carved, Sheraton and Hepplewhite and their contemporaries obtained their effects by the artistic employment of deftly contrasted and highly polished woods. The first step in the evolution of the wardrobe was taken when the central doors, which had hitherto enclosed merely the upper part, were carried to the floor, covering the drawers as well as the sliding shelves, and were fitted with mirrors.

WARD-ROOM (i.e. the room of the guard), the cabin occupied by the commissioned officers, except the captain, in a man-of- war. In the wooden line-of battle ships it was above the gun room.

WARE, a market town in the Hertford parliamentary division of Hertfordshire, England, on the river Lea, 22 m. N. of London by a branch of the Great Eastern railway. Pop. of urban district (1001) 5573. The church of St Mary is a cruciform Decorated and Perpendicular building of

flint and stone, con- sisting of chancel (built, it is supposed, by Lady Margaret Beaufort, countess of Richmond, and mother of Henry VII.), lady chapel to the south (c. 1380), nave of five bays of the time of Richard II., transepts, aisles, south porch and embattled tower of the time of Edward III. There is an elaborate

Perpendicular font. The modern mansion of The Priory, to the west of the town, occupies the site of a priory of the order of St Francis, founded, according to Dugdale, by Hugh de Grant- maisnil, lord of Ware. A portion of the original building is incorporated in the modern one. Among public buildings are the corn exchange and the town-hall, which includes a literary institute and library. The famous " Great Bed of Ware," referred to in Shakespeare's Twelfth Night, which formerly was at the Saracen's Head in Ware, has been removed to Rye House, 2 m. distant, the scene of the Rye House plot of 1683 against Charles II. The town possesses breweries and brick-fields, and there is a large trade in malt, assisted by the navigation of the Lea to London. Near the village of Great Amwell (i-m. S.E.) are the sources of the New river, formed in 1606-1612 to supply London with water; and on a small island in the stream stands a monument to Sir Hugh Myddleton, through whose exertions this work was carried out.

WARE, a township of Hampshire county, Massachusetts, U.S.A., traversed by the Ware river, and about 25 m. E.N.E. of Springfield. Pop. (1880) 4817, (1890) 7329, (1900) 8263, of whom 3263 were foreign-born, (.1910 census) S774. Area 29-3 sq. m. The township is served by the Boston & Albany and Boston & Maine railways, and by two interurban electric lines. Its average elevation is about 550 ft. above sea-level. There is a public library (14,225 volumes in 1910). In 1905 the value of the factory products was $3,783,696, 23-2% more than in 1900. Among the manufactures are cotton and woollen goods, and boots and shoes. The township owns and operates its waterworks. Because of its hard and rough soil, Ware was not settled as early as the surrounding townships,' the first per- manent settlement being made in 1730. It was incorporated in 1742 as a precinct, in 1761 as a district (formed from parts of Brookfield, Palmer and Western, now "Warren, and certain common lands), and in 1775 as a separate township. In 1823 additions were made from Brookfield and Western.

WAREHAM, a market town and municipal borough in the eastern parliamentary division of Dorsetshire, England, i2if m. S.W. by W. from London by the London & South-Western railway. Pop. (1901:) 2003. It lies between the rivers Frome and Piddle, if m. above their outflow into Poole harbour. The town is of high antiquity, and is partially surrounded by earth- works probably of British construction. The church of St Mary

contains a chapel dedicated to St Edward, commemorating that Edward who was murdered at Corfe Castle in this neigh- bourhood, whose body lay here before its removal to Shaftes- bury. It also possesses a remarkable Norman font of lead. Two other ancient churches remain, but are not used for worship. There are ruins of a priory dedicated to SS. Mary, Peter and Ethelwold, and the site of the old castle may be traced. The town and neighbourhood have been long noted for their lime and cement, and large quantities of potters', pipe, fire and other kinds of clay are sent to Staffordshire and to foreign countries. The borough is under a mayor, 4 aldermen, and 12 councillors. Area 251 acres.

Owing to its situation as a key of Purbeck, the site of Ware- ham {Werham, Warham) has been occupied from early times. The earthworks, of British origin, were modified in almost every successive age. That Wareham was a pre-Saxon town is evident from Assers statement that its British name was Dumguetr. The early chroniclers declare that St Aldhelm founded a church near Wareham about 701, and perhaps the pricry, which is mentioned as existing in 876, when the Danes retired from Cambridge to a strong position in this fort. Their occupation was not lengthy. Having made terms with Alfred, they broke the conditions and returned to Cambridge. In the following year they were again at Wareham, which they made their headquarters. Beorhtric, the immediate predecessor of Ecgbert, was buried here. Further incursions made by the Danes in 998 and in 1015 under Canute probably resulted in the destruction of the priory, on the site of which a later house was founded in the 12th century as a cell of the Norman abbey of Lysa, and in the decayed condition of Wareham in 1086, when 203 houses

were ruined or waste, the result of misfortune, poverty and fire. The early castle, which existed before 1086, was important during the civil wars of Stephen's reign; in 1142 Robert, earl of Gloucester, on his departure for France, committed it to his son's charge. Stephen, however, surprised and took it, but it surrendered to the earl in the same year on the king's refusal to send it aid. John fortified it against Louis of France in 1216, and during the civil wars it was the scene of much fighting, being stormed by the parliamentary forces in 1644. Wareham was accounted a borough in Domesday Book, and the burgesses in 1 1 76 paid 20 marks for a default. In 1180-1181 they rendered account of 5 marks for erecting a gild without licence. The fee-farm of the borough was obtained in 1211, on a fine of 100 marks. The constitution of Wareham underwent a change during the years 1326-1338, when the governing body of the bailiffs and commonalty

were replaced by the mayor and bailiffs. In 1587 Elizabeth granted certain privileges to Wareham, but it was not incorporated until 1703, when the existing fairs for April 6 and August 23 were granted. The port was important throughout the middle ages, and was required to furnish four ships for the French w r ar in 1334. Considerable trade was carried on with France and Spain, cloth, Purbeck stone and, later, clay being largely exported.

WARENNE, EARLS. The Warennes derived their surname from the river of Guarenne or Varenne and the little town of the same name near Arques in Normandy. William de Warenne, who crossed with William I. in 1066, was a distant cousin of the Conqueror, his grandmother having been the sister of Gunnora, wife of Richard I. of Normandy. De Warenne received as his share of English spoil some 300 manors in Yorkshire, Norfolk, Surrey and Sussex, including Lew r es Castle. He was wounded at the siege of Pevensey and died in 1080, a year after he had received the title of earl of Surrey. Both he and his successors were more commonly styled Earl Warenne than earl of Surrey. His wife Gundrada, described on her monument as stirps ducum, 1 appears to have been a sister of Gharbod, earl of Chester.

Their son William, 2nd earl (c. 1071-1138), was a suitor for the hand of Matilda of Scotland, afterwards queen of Henry I. He was temporarily deprived of his earldom in 1101 for his support of Robert, duke of Normandy, but he commanded at the battle of Tenchebrai (1106), and was governor of Rouen in 1 135. He carried off Elizabeth of Vcrmandois, granddaughter of Henry I. of France, and wife of Robert, count of Meulan, and married her in 1 1 iS after her husband's death.

William de Warenne, 3rd earl (d. 1148J, was, with his half- brother, Robert de Beaumont, early of Leicester, present at the battle of Lincoln, where his flight early in the day contributed to Stephen's defeat. He remained faithful to the queen during Stephen's imprisonment, and in 1146 he took the cross, and was killed near Laodicea in January 1148.

His daughter and heiress, Isabel, married in 1153 William de Blois, second son of King Stephen and Matilda of Boulogne, and in 1163 Hamelin Plantagenet, natural son of Geoffrey, count of Anjou. Both Isabel's husbands appear to have borne the title of Earl Warenne. Earl Hamelin was one of those who at the council of Northampton denounced Becket as a traitor; he remained faith fid to his half-brother, Henry II., during the trouble with the king's sons, and in Richard I.'s absence on the crusade he supported the government against the intrigues of Prince John. William de Warenne (d. 1240), son of Isabel and Hamelin, who succeeded to the earldom in 1202, enjoyed the special confidence of King John. In 1212,

when a general rebellion was appre- hended, John committed to him the custody of the northern shires; and he remained faithful to his master throughout the troubles which preceded the signing of the Charter. In 1216, as the king's situation became desperate, the earl repented of his loyalty, and, shortly before the death of John, made terms with Prince Louis. He returned, however, to his lawful allegiance im- mediately upon the accession of Henry III., and was, during his minority, a loyal supporter of the crown. He disliked, however,

1 See R. E. Chester Watsoh, " Gundrada," in the Jul. of the Arch. Inst., xU. p. 108.

the royal favourites who came into power after 1227, and used his influence to protect Hubert de Burgh when the latter had been removed from office by their elTorts (1232). Warenne's relations with the king became strained in course of time. In 1238 he w r as evidently regarded as a leader of the baronial opposition, for the great council appointed him as one of the treasurers who were to prevent the king from squandering the subsidy voted in that year. His son John de Warenne (c. 1231-1304) succeeded in 1240, and at a later date bore the style of earl of Surrey and Sussex. In the battle of Lewes (1264) he fought under Prince Edward, and on the defeat of the royal army fled with the queen to France. His estates were confiscated but were subsequently restored. He served in Edward I.'s Welsh campaigns, and took a still more prominent part in Scottish affairs, being the king's lieutenant in Scotland in 1296-1297. In September 1297 he advanced to Stirling, and, giving way to the clamour of his soldiers, was defeated by William Wallace on the nth. He invaded Scotland early the next year with a fresh army, and, joining Edward in the second expedition oi that year, commanded the rear at Falkirk

By his first wife, Alice of Lusignan, half-sister of Henry III., Eari W'arenne had three children — Alice, who married Henry Percy, father of the 1st baron Percy; Isabella, who married John Baliol, afterwards king of Scots; and William, who pre- deceased his father, leaving a son John.

John de Warenne (1 286-1347) succeeded his grandfather in 1304, and was knighted along with the prince of Wales in 1306, two days after his marriage with the prince's niece, Joanna, daughter of Eleanor of England, countess of Bar. From that time onwards he was much engaged in the Scottish wars, in which he had a personal interest, since John Baliol was his cousin and at one time his ward. As there were no children of his marriage, his nephew, Richard Fitzalan II., earl of Arundel (c. 1307-1376), became heir to his estates and the earldom of Surrey. His northern estates reverted to the crown, and the southern estates held by Joanna of Bar during her lifetime passed to Fitzalan. The Warrens of

Poynton, barons of Stock- port, descended from one of Earl Warenne's illegitimate sons by Isabella de Holland. Earl Warenne had received from Edward Baliol the Scottish earldom of Strathearn, but seems never to have established effective possession.

See G. E. C(okayne), Complete Peerage, vol. vii. (1896); and John Watson, Memoirs of the Ancient Earls of Warren or Surrey (2 vols., "Warrington, 1782).

WAR GAME, or (in its German form) Kriegspiel, a scientific game, played by representing the positions and movements of troops on a map. Kriegspiel is, as the name indicates, of German origin. A form of it, invented by Marshal Keith, and called Kriegs-schachsspiel (War Chess), was in vogue in the 1 8th century. In its present form it was invented by von Reisswitz (1794-1827), a Prussian officer, in 1824. As a game it quickly became fashionable at the German courts, and as a means of instruction it was promptly introduced into the Prussian army, whence it has spread to all the armies of the world. The idea of it has been applied also to naval warfare in recent times, the most usual form of naval war game being that designed by F. T. Jane about 1898.

In the military game the positions of troops are marked on maps, movements are made under regulations and the whole or portions of past campaigns can be reproduced in outline of fair accuracy, or more usually hypothetical manoeuvres may be formulated for study and instruction. The materials required are at least three copies of the same map, drawn to such scale as may be suitable to the magnitude of the operations to be represented. If the scheme is one for small numbers of troops, maps of large scale are essential, as small features of the ground largely influence the action of small bodies, and it is only on large-scale maps that the real influence of small features can readily be appreciated. Conversely, with large bodies, maps on a diminished scale are convenient. A great amount of detail is necessary in all maps drawn for military purposes; heights, roads, buildings, water-courses, fences and the nature of the

ground, all enter into the question of the feasibility or the reverse of military operations; and where the map is the actual field of manoeuvre, the features of the natural field must be adequately supplied. Blocks, cut or moulded to scale, represent the different units of the combatants; and are coloured (generally red and blue) to distinguish the opposing forces. Some pairs of dividers and a few measures of the same scale as the maps

employed complete the material outfit. Printed regulations for the conduct of kriegspiel are of small value; and although rules have been drafted at various times and in many languages, they have generally been allowed to lapse, practice having proved that the decision of a competent umpire is of more value, as to the sound- ness or unsoundness of a military manoeuvre, than a code of regulations which inevitably lack elasticity.

The usual course of procedure varies hut little in the different countries in which the system has been employed. The central map screened from the view of the combatants is used by the umpire, who places on it the forces of both sides; copies arc on either hand behind screens or in adjoining rooms, and on them representative blocks are placed in positions which agree with the information possessed by each respective commander. A scheme is formulated such as may occur in war, and a " General Idea " or "Narrative" is the common property of both sides. This contains those items of common knowledge which would be in the possession of either commander in the field. The General Idea is supplemented by " special ideas," issued one to each ot the combatants, supplying the information which a commander might reasonably be expected to haye of the details of his own force. A third series of instruc- tions is issued, entitled " Orders," which define to each commander the object to be attained; and on receipt of these he is required to draft specific orders, such as, in manoeuvre or in war, would be considered necessary for issue to field units in the assumed circum- stances. Then the game begins. The units of artillery, cavalry, infantry or train-wagons advance or retreat at a rate approxi- mately regulated to their normal pace. Information gained by advancing patrols is brought at realistic speed to its destination; and no alteration in the ordered movements of a unit is allowed, till ex- piration of the calculated time for the transmission of the intelligence and for the issue of fresh orders. So the exercise progresses, each movement is marked, and periodically the blocks on the three maps are placed as they would be at a simultaneous moment. Smaller units yield to largerones of the enemy; equal forces, if unassisted by superiority of position," contain " one another, and are practically neutralized till reinforcements arrive and equilibrium is overthrown.

The decisions of the umpire are all-important, and it is he who makes or mars the value of the instruction. Some axioms must be universally accepted for the guidance both of himself and of the players. A force arrayed within effective range on the flank of an equal and hostile force has the better position of the two. Artillery in position with an unimpeded glacis is a terrible task for a frontal attack. Cavalry, as such, is ineffective in woodlands, marshes or a country broken up by cross hedges or wire fencing. Infantry in masses is an ideal target for efficient artillery, and in scattered bodies affords opportunities for attack by well-handled cavalry. The just application of the ideas contained in these few sentences to the

varying stages of a combat is no mean task for a cultured soldier.

One of many difficulties encountered in war is the lack of accurate information. Any one man's view of details spread over large areas of country is extremely limited; and even with the greatest pre- cautions against unreality, a commander's information is vastly more accurate over the extended units of his mimic force at kriegspiel than when the forces so represented are men, horses and machines, wrapped in dust or in smoke, and partially obscured by accidents of the ground too insignificant for reproduction on the map. Yet whilst accepting a certain unreality in kriegspiel, and to a less degree in field manoeuvres, both by one and the other military training and education are furthered. The framing of orders follows identical lines at kriegspiel, at manceuvres or in war. The movement of troops in mimic warfare should be brought to harmonize as far as possible with reality. Up to a point this is relatively easy, and depends chiefly on the quality of the umpiring. But directly the cloˆe contact of important bodies of troops is represented on paper, imagination, not realism, governs the results. Even this, however, can be tempered, as regards the larger problems of the tactical grouping of forces, by the wisdom and experience of the umpire. It is true that military history teems with tactical events that no map can reproduce and no seer could have prophesied. But the greater an officer's familiarity with military history, the more likely he is to provide the margin of safety against such incidents in his dispositions, and thus kriegspiel, even in the domain of general tactics, is of invaluable assistance as a means of applying sound principles, learned in other ways, to concrete cases.

WARGLA, a town in the Algerian Sahara, 175 m. S.W. of Biskra on the caravan route to the Niger countries, and a starting-

point for the exploration of the southern part of the Sahara. Pop. (1906) 3579, the majority of mixed Berber and negro blood. The town is walled and is entered by six gateways, which are fortified. The French fort, barracks, hospital and other buildings are south of the native town. Wargla lies in an oasis containing many palm trees. It claims to be the oldest town in the Sahara, and was for a long time self-governing, but eventually placed itself under the protection of the sultan of Morocco, The sultan, however, had ceased to have any power in the town some time previous to the French occupation. Wargla was first occupied for the French in 1853 by native allies, but it was not until 1872 that the authority, of France was definitely established. The importance of the town as a trans-Saharan trade centre has greatly declined since the suppression of slave-trading by the French. The oasis in which Wargla is situated contains two or three other small fortified ksurs or villages, the largest and most picturesque being Ruissat. The total population of the oasis is about 12,000.

WARHAM, WILLIAM (c. 1450-1532), archbishop of Canter- bury, belonged to a Hampshire family, and was educated at Winchester and New College, Oxford, afterwards practising and teaching law both in London and Oxford. Later he took holy orders, held two livings, and became master of the rolls in 1494, while Henry VII. found him a useful and clever diplomatist. He helped to arrange the marriage between Henry's son, Arthur, and Catherine of Aragon; he went to Scotland with Richard Foxe, then bishop of Durham, in 1497; and he was partly responsible for several commercial and other treaties with Flanders, Burgundy and the German king, Maximilian I. In 1502 Warham was consecrated bishop of London and became keeper of the great seal, but his tenure of both these offices was short, as in 1504 he became lord chancellor and archbishop of Canterbury. In 1 509 the archbishop married and then crowned Henry VIII. and Catherine of Aragon, but gradually withdrawing into the background he resigned the office of lord chancellor in 1515, and was succeeded by Wolsey, whom he had consecrated as bishop of Lincoln in the previous year. This resignation was possibly due to his dislike of Henry's foreign policy. He was present at the Field of the Cloth of Gold in 1520, and assisted Wolsey as assessor during the secret inquiry into the validity of Henry's marriage with Catherine in 1527. Throughout the divorce proceedings Warham's position was essentially that of an old and weary man. He was named as one of the counsellors to assist the queen, but, fearing to incur the king's displeasure and using his favourite phrase it a principis mors est, he gave her very little help; and he signed the letter to Clement VII. which urged the pope to assent to Henry's wish. Afterwards it was proposed that the archbishop himself should try the case, but this suggestion came to nothing. He presided over the Convocation of 1 53 1 when the clergy of the province of Canterbury voted £100,000 to the king in order to avoid the penalties of praemunire, and accepted Henry as supreme head of the church with the saving clause " so far as the law of Christ allows." In his con- cluding years, however, the archbishop showed rather more independence. In February 1532 he protested against all acts concerning the church passed by the parliament which met in 1529, but this did not prevent the important proceedings which secured the complete submission of the church to the state later in the same year. Against this further compliance with Henry's wishes Warham drew up a protest ; he likened the action of Henry VIII. to that of Henry II., and urged Magna Carta in defence of the liberties of the church. He died on the 22nd of August 1532 and was buried in Canterbury cathedral. Warham, who was chancellor of Oxford University from 1506 until his death, was munificent in his public, and moderate in his private life. As archbishop he seems to have been somewhat arbitrary, and his action led to a serious quarrel with Bishop Foxe of Winchester and others in 151 2.

See W. F. Hook, Lives of the Archbishops of Canterbury (1860-1876) ; J. Gairdner in Diet. Nat. Biog., vol. lix. (T899), and The English Church in the 16th Century (1902); J. S. Brewer, Reign of Henry VIII. (1884); and A. F. Pollard, Henry VIII. (1905).

WARKWORTH, a small town in the Wansbeck parliamentary division of Northumberland, England, 32 m. N. of Newcastle- upon-Tyne by the North-Eastern railway. Pop. (1001) 712. It is beautifully situated in a hollow of the river Coquet, 1ˆ m. above its mouth, where on the S. bank is Amblf., an urban district (pop. 4428), with a harbour. An ancient bridge of two arches crosses the river, with a fortified gateway on the road mounting to the castle, the site of which is surrounded on three sides by the river. Of this Norman stronghold there are fine remains, including walls, a gateway and hall; while the re- mainder, including the Lion tower and the keep, is of the 13th and 14th centuries. Roger Fitz-Richard held the manor and probably built the earliest parts of the castle in the reign of Henry II. The lordship came to the Percies in Edward III.'s reign and is still held by their descendants the .dukes of North- umberland, though it passed from them temporarily after the capture of the castle by Henry IV. in 1405, and again on the fall of the house of Lancaster. The foundation of Warkworth church is attributed to Ceolwulf, king of Northumbria (c. 736), who subsequently became a monk. It was the scene of a massacre by a Scottish force sent by William the Lion in r 1 74. The church is principally of Norman and Perpendicular work, but remains of the Saxon building have been discovered. In the vicinity are remains of a Benedictine priory of the r3th century. By the side of the Coquet above the castle is the Hermitage of Wark- worth. This remarkable relic consists of an outer portion built of stone, and an inner portion hewn from the steep rock above the river. This inner part comprises a chapel and a smaller chamber, both having altars. There is an altar-tomb with a female effigy in the chapel. From the window between the inner chamber and the chapel, and from other details, the date of the work may be placed in the latter part of the 14th century, the characteristics being late Decorated. The traditional story of the origin of the hermitage, attributing it to one of the Bertrams of Bothal Castle in this county, is told in Bishop Percy's ballad The Hermit of Warkworth (r77i). At Amble are ruins of a monastic toll-house, where a tax was levied on shipping; and Coquet Island, 1 m. off the mouth of the river, was a monastic resort from the earliest times, like the Fame and Holy Islands farther north. The harbour at Amble has an export trade in coal and bricks, coal and fireclay being extensively worked in the neighbourhood, and an import trade in timber.

WARLOCK, a wizard, sorcerer or magician (see Magic). The word in O. Eng. is warloga, literally "a liar against the truth," from wtfcr, truth, cognate with Lat. verum (cf. Ger. wahr), and loga, liar, from Uogan, to lie (cf. Ger. liigen). It was thus used with the meaning of a traitor, deceiver, a breaker of a truce. In M. Eng. it is found as a name for the devil {warloghe), the arch liar and deceiver. The use of the word for a sorcerer or wizard, one whose magic powers are gained by his league with the devil, seems to be a northern English or Scottish use.*

WARMINSTER, a market town in the Westbury parlia- mentary division of Wiltshire, England, 100ˆ m. W. by S. of Lon- don by the Great Western railway. Pop. of urban district (1901) 5547. Its white stone houses form a long curve between the uplands of Salisbury Plain.which sweep away towards the north and east, and the tract of park and meadow land lying south and west. The cruciform church of St Denys has a 14th-century south porch and tower. St Lawrence's chapel, a chantry built under Edward I., was bought by the townsfolk at the Reforma- tion. Warminster has also a free school established in 1707, a missionary college, a training home for lady missionaries and a reformatory for boys. Besides a silk mill, malthouses and engineering and agricultural implement works, there is a brisk trade in farm produce.

Warminster appears in Domesday, and was a royal manor whose tenant was bound to provide, when required, a night's lodging for the king and his retinue. This privilege was enforced by George III. when he visited Longleat. The meeting of roads from Bath, Frome, Shaftesbury and Salisbury made Warminster a busy coaching centre. Eastward, within 2 m., there are two' great British camps: Battlesbury, almost impregnable save

on the north, where its entrenchments are double; and Scratch- bury, a line of outworks encircling an area of some 40 acres, with three entrances and a citadel in the midst. Barrows are numerous. Longleat, a seat of the marquesses of Bath, lies 5 m. S.E., surrounded by its deer park, crossed from N. to S. by a long and narrow mere. The house is one of the largest and most beautiful examples in the county, dating from the close of the r6th century. Its name is derived from the " leat "or conduit which conveyed water from Horningsham, about 1 m. south, to supply the mill and Austin priory founded here late in the 13th century. The monastic estates passed at the Dissolution to the Thynne family, who built Longleat. Sir Christopher Wren added certain staircases and a doorway. In 1670 the owner was the celebrated Thomas Thynne satirized in Dryden's Absalom and Achitophel, and Bishop Ken found a home at Longleat for twenty years after the loss of his bishopric.

WARNER, CHARLES DUDLEY (1829- 1900), American essayist and

novelist, was born of Puritan ancestry, in Plainfield, Massachusetts, on the 12th of September 1829. From his sixth to his fourteenth year he lived in Charlemont, Mass., the scene of the experiences pictured in his delightful study of childhood, Being a Boy (1877). He removed thence to Cazenovia, New York, and in r85i graduated from Hamilton College, Clinton, N.Y. He worked with a surveying party in Missouri; studied law at the university of Pennsylvania; practised in Chicago (1856-1860); was assistant editor (i860) and editor (1861- 1867) of The Hartford Press, and after The Press was merged into The Hartford Courant, was co-editor with Joseph R. Hawley; in 1884 he joined the editorial staff of Harper's Magazine, for which he conducted " The Editor's Drawer " until 1892, when he took charge of " The Editor's Study." He died in Hartford on the 20th of October 1900. He travelled widely, lectured frequently, and was actively interested in prison reform, city park supervision and other movements for the public good. He was the first president of the National Institute of Arts and Letters, and, at the time of his death, was president of the American Social Science Association. He first attracted atten- tion by the reflective sketches entitled My Summer in a Garden (1870; first published in The Hartford Courant), popular for their abounding and refined humour and mellow personal charm, their wholesome love of out-door things, their suggestive comment on life and affairs, and their delicately finished style, qualities that suggest the work of Washington Irving. Among his other works are Saunterings (descriptions of travel in eastern Europe, 1872) and Back-Log Studies (1872); Baddeck, and That Sort of Thing (1874), travels in Nova Scotia and elsewhere; My Winter on the Nile (1876); In the Levant (1876); In the Wilderness (1878); A Roundabout Journey, in Europe (1883); On Horseback, in the Southern States (1888); Studies in the South and West, with Comments on Canada (1889); Our Italy, southern California (1891); The Relation of Literature to Life (1896); The People for Whom Shakespeare Wrote (1897); and Fashions in Literature (1902). He also edited " The American Men of Letters " series, to which he contributed an excellent biography of Washington Irving (1881), and edited a large "Library of the World's Best Literature." His other works include his graceful essays, As We Were Saying (1891) and -4s We Go (1893); and his novels, The Gilded Age (in collaboration with Mark Twain, 1873); Their Pilgrimage (1886); A Little Journey in the World (1889); The Golden House (1894); and That Fortune (1889).

See the biographical sketch by T. R. Lounsbury in the Complete Writings (15 vols., Hartford, 1904) of Warner.

WARNER, OLIN LEVI (1844-1896), American sculptor, was born at West Suffield, Connecticut, on the 9th of April 1844. In turn an artisan and a telegraph operator, by 1869 he had earned enough money to support him through a course of study in Paris under Jouffroy and Carpeaux. He was

in France when the Republic was proclaimed in 1870 and enlisted in the Foreign Legion, resuming his studies at the termination of the siege. In 1872 he removed to New York, where, however, he met with little success; he then went to his father's farm in Vermont, and worked for manufacturers of silver and plated ware as well

*as makers of mantel ornaments. He attracted the attention of Daniel Cottier, of the Cottier Art Galleries of New York, where Warner's work was exhibited, and some commissions gradually secured for him recognition. They were followed by busts of Aldcn Weir, the artist, and of Maud Morgan, the musician; some decorations for the Long Island Historical Society; statues of Governor Buckingham at the State Capitol, Hartford, Conn.; William Lloyd Garrison and General Charles Devens, at Boston; reliefs of several striking North American Indian types; a fountain for Portland, Oregon, and the designs for the bronze doors, " Tradition " and (* Writing," of the Congressional Library at Washington, of which he lived to complete only the former, which contains the beautiful figures of " Imagination " and " Memory." Warner died in New York City on the 14th of August 1896. He was one of the five charter members of the Society of American Artists (1877), and in 1889 became an academician, National Academy of Design, New York. One of his best-known works is a " Diana." He designed the souvenir silver half-dollar piece for the Columbia Fair at Chicago, in 1893, making also some colossal heads of great artists for the art palace, and busts of Governors Clinton and Flower, of New York State.*

WARNER, SETH (1743-1784), American Revolutionary soldier, was born in Roxbury, Connecticut, on the 17th of May 1743. He removed with his father to the "New Hampshire Grants" in 1763, and became prominent among the young men who forcibly resisted New York's claim to the territory (see Vermont). At the outbreak of the War of Independence, he led the detachment of " Green Mountain Boys " which captured Crown Point (q.v.) on the nth of May 1775, and took part in the unsuccessful expedition against Quebec later in the year. In July 1776 he became colonel in the Continental Army, and served throughout the war. He retired in 1782, and returned to Roxbury, where he died in 1784.

See Daniel Chipman, Life (Burlington, Vt., 1858).

WARNER, WILLIAM (i558?-i6oq), English poet, was born in London about 155S. He was educated at Magdalen Hall, Oxford, but left the university without taking a degree. He practised in London as an attorney,

and gained a great reputation among his contemporaries as a poet. His chief work is a long poem in four teen-syllabled verse, entitled Albion's England (1586), and dedicated to Henry Carey, 1st Baron Hunsdon. His history of his country begins with Noah, and is brought down to Warner's own time. The chronicle is by no means continuous, and is varied by fictitious episodes, the best known of which is the idyll in the fourth book of the loves of Argentine, the daughter of the king of Deira, and the Danish prince, Curan. Here Warner's simple art shows itself at its best. His book, perhaps on account of its patriotic subject, was very popular, but it is difficult to understand how Francis Meres came to rank him with Spenser as the chief heroical poets of the day, and to institute a comparison between him and Euripides. Warner died suddenly at Am well in Hertfordshire on the 9th of March j6oo.

His other works are Pan his Syrinx, or Pipe, Compact of Seven Keedes (1585), a collection of prose tales; and a translation of the Menaeckmi of Plautus (1595). Albion's England consisted originally of four " books," but the number was increased in successive issues, and a posthumous edition (1612) contains sixteen books. It was reprinted (18 10) in Alexander Chalmers's English Poets.

WARNSDORF, a town of Bohemia, Austria, 124 m. N.E. of Prague by rail. Pop. (1900) 21,150. Warnsdorf was formed in 1870 by uniting seven separate village communities, and is now one of the largest towns in Bohemia. It is a great industrial centre, especially for textiles.

WARORA, a town of British India, in Chanda district of the Central Provinces, on a branch of the Great Indian Peninsula railway. Pop. (1901) 10,626. Warora gives its name to a coalfield, which was worked by the government from 1871 to iqo6; a fire-clay industry under the same management also raised fire-clay for bricks and tiles. The ginning and pressing of cotton is an important industry.

WARRANT (Med. Lat. war an turn-, O. Fr. garant, war ant, derived from O.H.G. root represented in modern German by

gewahren), in English law, an authority in writing empowering a person to do an act or to execute an office. The procedure known as quo warranto (q.v.) is used to determine the right to hold certain kinds of public office. The term " warrant " occurs very early in constitutional documents: it is found in the Assize of Clarendon and the Assize of the Forest, both in the reign of Henry II., but in neither case in its modern meaning. The original meaning seems to have been more akin to guarantee (q.v.), warranty or security; and to some extent the term implies something in the nature of a guarantee or representation by the person issuing the warrant that the

person who acts on it can do so without incurring any legal penalty. The term is applied to a great variety of documents of very different kinds, which may be classified as ® executive or administrative, (2) judicial or quasi-judicial and (3) financial or commercial.

1. Executive and Administrative. — While the royal prerogative was insufficiently defined and limited, a great many executive acts were authorized by royal warrant {per speciale mandatum regis), which now either depend on statute or are dealt with by departments of state without the need of recourse to the personal authority of the sovereign. Under present constitutional practice royal warrants are as a general rule countersigned by a member of the cabinet or other responsible officer of state. By an act of 1435 (18 Hen. VI. c. 1) letters patent under the great seal must bear the date of the royal warrant delivered to the chancellor for their issue. This act still applies to all patents, except for inventions. The form and countersignature of warrants for affixing the great seal is regulated by the Great Seal Act 1884. Pardon, which was granted for centuries only by letters patent under the great seal, has since 1827 in England and 1828 in Ireland been granted in case of felony by warrant under the royal sign manual countersigned by a secretary of state (/ &. 8 Geo. IV. c. 28, s. 13; 9 Geo. IV. c. 54, s. 33). The prerogative of the crown with reference to the control of the navy and army is largely exercised by the issue of warrants. In 1871 the purchase of commissions in the army was abolished by royal warrant, said to have been authorized by statute (49 Geo. III. c. 126), but afterwards confirmed by parliament (34 & 35 Vict. c. 86). Under existing legis- lation for the government of the military forces of the crown royal warrants are used to form army corps, to deal with certain details as to pay and regimental debts, and with the militia and reserve forces. The convocation of naval courts- martial and the appoint- ment of judge-advocate and provost-marshal at such court is by warrant of the Admiralty or of the officer on foreign or detachea service who by his commission is entitled to convene such a court (see Naval Discipline Act 1866, s.58; Army Act 1881, s. 179). A general court-martial for the army is constituted by royal warrant or convened by an officer authorized to convene such court, or his lawful delegate (Army Act 1881, s. 48). Appointments to certain offices under the crown are made by warrant of the king or of the appropriate department of state. In the navy and army the officers called warrant officers are so styled because they are appointed by warrant and do not hold commissions. In 1602 the censorship of the stage was committed to the poet Daniel by royal warrant (see .Theatke), and certain tradesmen to the court are described as " warrant holders." because of the mode of their appointment. Abuses of claims to this distinction are punishable (Merchandise Marks Act 1887, s. 20; Patents Act 1883, s. 107). Warrants under the royal sign manual are

subject to a ten-shilling stamp duty (Stamp Act 1891). The issue of warrants under the hand of a secretary of state, so far as they affect personal liberty, depends in every case on statute, e.g. as to the surrender of fugitive criminals (Extradition), or the deportation of undesirable aliens (see Alien), or the bringing up prisoners as witnesses in courts of justice. The right of a secretary of state or the lord-lieutenant in Ireland by express warrant in writing to detain or open letters in the post office was recognized by orders in council and proclamations in the 17th century and by various post office acts, and is retained in the Post Office Act 1836 (s. 25). The right was challenged, but was finally established by the reports of committees of both Houses appointed in 1841 on a complaint by Mazzini and others that Sir James Graham, then home secretary, had opened their letters. It was exercised as recently as 1881 over the letters of persons suspected of treasonable correspondence in Ireland. The warrant of a law officer of the crown for sealing letters patent forinventions (necessary under the old patent law) has been superseded by other procedure since the Patents Act 1883.

2. Judicial and Quasi- Judicial Warrants. — Unless a statute otherwise provides a judicial warrant must be in writing under the seal, if any, of the court, or under the hand and (or) seal of the functionary who grants it. Committal for breach of privilege of the House of Commons is by warrant of the Speaker. During the Tudor and Stuart reigns frequent attempts were made by the crown and great officers of state to interfere with personal liberty, especially as to offences of state. The legality of these proceedings was challenged by the judge? in Elisabeth's reign. On the abolition of the Star Chamber it was enacted (16 Car. I. c. 10) that if any person

be imprisoned by warrant of the king in person, of the council board, or any of the privy council, he is entitled to a writ of habeas corpus, and the courts may examine into the legality of the cause of detention. This enactment, and the Habeas Corpus Act 1679, put an end to the interference of the executive with matters belonging to the judicature; but unt'l 1763 there survived a practice by which a secretary of state issued warrants to arrest individuals for state offences, and to search or seize the books and papers of the accused. The latter practice was examined and declared illegal in the famous case of Entick v. Carrington (19 How. St. Tr. 1030). All privy councillors are included in the commission of the peace for every county. The council itself is said to have power to issue warrants of arrest for high treason, but the power, if it exists, is in abeyance in England. The special powers given to the lofd- iieutenant of Ireland in 1881

(4ˆ & 45 Vict. c. 5) expired in 1906. As a result of the gradual restriction of the royal prerogative, the term warrant has come in modern times oftenest to be used of documents issuing from courts of justice. Few documents issuing from the superior courts are called warrants. In these courts writs and orders are more generally used. In courts of record which try indictments a " bench warrant " is sometimes used for the arrest of an absent defendant, but the word warrant has for judicial purposes become most closely associated with the jurisdiction of justices of the peace. As a general rule no one can be arrested without wamnt. To this rule there are certain exceptions either at common law or by statute. At common law a justice of the peace, a sheriff, a coroner, a constable and even a private person, may arrest any one without warrant for a treason, felony or breach of the peace com- mitted, or attempted to be committed, in his presence. A constable .(whether a constable at common law or a police constable appointed under the Police Acts) may arrest a person indicted for felony; a constable or a private person may arrest on reasonable suspicion that he who is arrested has committed a felony. But in the latter case he does so at his peril, for he most prove (what the constable need not) that there has been an actual commission of the crime by some one, as well as a reasonable ground for suspecting the particular person. What is a reasonable ground it is of course im- possible to define, but : in the case of a constable, a charge by a person not manifestly unworthy of credit is generally regarded as sufficient. An accused person who has been bailed may be arrested by his bail, and the police may assist in the arrest. In neither case is a warrant necessary. Nor is it necessary for the apprehension of one against whom the hue and cry is raised. The king cannot arrest in person or by verbal command, as no action would lie against him for wrong- ful arrest. Statutory powers of arrest without warrant are given to both constables and private persons by many statutes, e.g. the Night Poaching Act 182S, certain of the Criminal Law Consolidation Acts of 1861, the Prevention of Crime Act 1871 and Police Acts. In those cases in which arrest without warrant is illegal or is found inexpedient, information in writing or on oath is laid before a justice of the peace setting forth the nature of the offence charged and to stfmc extent the nature of the evidence implicating the accused; and upon this information, if sufficient in the opinion of the justice applied to, he issues his warrant for the arrest of the person in- criminated. The warrant, if issued by a competent court as to a matter over which it has jurisdiction, becomes a judicial authority to the person who executes it, and resistance to such a warrant is a criminal offence. The possession of a legal warrant by a peace officer on arrest is of great importance in determining whether a person resisting apprehension is justified or not ir his resistance Should the officer attempt to apprehend him on a warrant manifestly illegal on its face, or without a warrant in a case where a warrant is necessarv, and be killed in

the attempt, the killing would probably be held to be manslaughter and not murder. Before bringing an action against constables for alleged illegal arrest under a justice's warrant the complainant must apply for theperusaland a copy of the warrant (24 Geo. II. c. 44, s. 6; Pollock, Torts, 6th ed., 1 17). Entry upon the land or seizure of property cannot as a rule be justified except under judicial warrant. The only common law warrant of this kind is the search warrant, which may be granted for the purpose of searching for stolen goods. Special powers for issuing such warrants are given by the Army, Merchant Shipping, Customs, Pawnbrokers and Stamp Acts, and for the discovery of explosives or appliances for coining and forgery. The Criminal Law Amendment Act 1885 allows the issue of search warrants where it is suspected that a female is unlawfully detained for immoral purposes. Execution of the decisions of a court of summary jurisdiction is secured by warrants, part of the process of the court, such as warrants of distress or commitment. A warrant may also issue for the apprehension of a witness whose attendance cannot be otherwise assured. The forms of warrants used by justices in indictable casesare scheduled to the Indictable Offences Act 1848. Those used for summary jurisdiction are contained in the Summary Jurisdiction Rules of 1886.

As a general rule, warrants must be executed within the local jurisdiction of the officer who issued them. Warrants, &c, issued by a judge of the High Court run through England, in criminal as well as in civil cases: and the same rule applies as to courts having bankruptcy jurisdiction. The warrants of justices of the peace can be executed on freph pursuit within. 7 m, of ihe boundary of the jurisdiction, and ii properly backed by a local justice or officer in

any other part of the British islands (see Summary Jurisdiction). There is also a special provision as to executing warrants in the bprdet counties of England and Scotland. Under the Extradition Acts and Fugitive Offenders Act 1881 provision is made for the issue of warrants in aid of foreign and colonial justice; but the foreign and colonial warrants have no force in the United Kingdom.

The word " warrant " is used as to a few judicial or quasi- judicial matters of civil concern, e.g. warrant to arrest a ship in an admiralty action in rem ; and in the county courts warrants to the bailiffs of the court are used where in the High Court a writ to the sheriff would be issued, e.g. for attachment, execution, possession and de- livery (see County Court Rules, 1903, scheduled forms). A warrant of distress for rent issued by a landlord to a bailiff is sometimes described as a private warrant, but it is in reality a peculiar quasi- judicial remedy derived from feudal relations between lord arid vassal. Arrest in civil or quasi-civil proceedings is in certain cases

effected under warrant, e.g. where a bankrupt fails to obey orders of the court for his attendance (Bankruptcy Act 1883, s. 25), and in certain cases where justices have summary jurisdiction.

Financial and Commercial. — Payment out of the treasury is generally made upon warrant. Treasury' warrants are regulated by many of the acts dealing with the national debt.

Payment of dividends by trading corporations and companies is generally made by means of dividend warrants. Mercantile warrants are instruments giving a right to the delivery of goods, generally those deposited at a dock or warehouse, and by mercantile custom regarded as documents of title to the goods to which they relate. They have been recognized by the legislature, especially in the Factors Acts. Thus the interpretation clause of the Factors Act 1889 includes under the head cf documents of title, dock warrants and warrants for the delivery of goods, and a fuller definition is given by s. in of the Stamp Act 1891, which imposes on such documents a stamp duty of 3d. Warrants of attorney are instruments authoriz- ing an attorney to appear for the principal in an action and to consent to judgment. They must now be attested by a solicitor and registered in the Bill of Sale Office under the Debtors Act 1869. They are now little used. The forgery of any warrant of this kind or of any endorsement or assignment thereof is punishable under the Forgerv Act 1 861.

Scotland. — By art. xxiv. of the Articles of Union royal warrants were to continue to be kept as before the union. The Secretary for Scotland Act 1885 enabled the crown by royal warrant to appoint the secretary to be vice-president of the Scotch Education Depart- ment. The lord advocate's warrant runs throughout the whole of Scotland. Warrants issued by courts of summary jurisdiction agree in the main with those in use in England, though their names are not the same (see Summary Jurisdiction). There are numerous statutory piuvisions as to warrants of other kinds. By the Debtors (Scotland) Act 1838 (1 & 2 Vict. c. 114) warrants for diligence, and to charge the debtor under pain of imprisonment, may be inserted in an extract of decree; and in a summons concluding for payment of money a warrant to arrest the movables, debts and money of the defender may be included. By the Court of Session Act 1868 (31 £32 Vict. c. 100) a warrant of inhibition may be inserted in the will of a summons. A crown writ is a warrant for infeftment (31 & 32 Vict. c. 101). The same act gives forms of warrants of registration. The procedure of the sheriff court in its civil jurisdiction as to warrants of citation is regulated by the Sheriff Courts (Scotland) Act 1907 (7 Edw. VII. c. 51). The practice as to warrants of citation and commitment in the High Court of Justiciary and the sheriff court in its criminal jurisdiction now depends chiefly on the Criminal Procedure Act 1887 (50 & 51 Vict. c. 35). The weditatio fvgae warrant is

a judicial warrant on which imprisonment jrr.ay follow until the debtor give eautio judicio sisti. It corresponds to some extent to the writ ne exeat regno of English practice, but it may he issued by a sheriff (1 & 2 Vict. c. 119, s. 25). Another kind of judicial warrant is a border warrant for arresting a debtor on the English side of the border. The warrant of attorney is not known in Scotland, its place being taken by the clause of registration, which is not avoided by the death of the person giving it.

United States. — By the constitutions of the United States and of almost all the states, warrants are not to issue but upon probable cause, supported by oath or affirmation, and particularly describing the place to be searched and the persons or thing to be seized. These provisions have been held not to mean that there shall he no arrest without warrant, but to confine the right of arrest to circumstances similar to those which justify it in English law. The constitutions of some states forbid general warrants. A warrant is generally necessary for the payment of money out of the United States cr a state treasury. (W. F. C.)

WARRANT OF ATTORNEY. A warrant of attorney to confess judgment is a security for money (now practically obsclete) in the form of an authority to a solicitor named by a creditor, empowering him to sign judgment in an action against .the debtor for the sum due, with a defeasance, or clause that the warrant shall not be put into force in case of due payment of the money secured. II. was often used as a collateral security, either for the payment of an annuity or with mortgages, in

order that the mortgagee, by entering up judgment, might obtain priority in the administration of the assets of the mortgagor. The Debtors Act 1869 contained various provisions for making known to the debtor the extent of the liability incurred by him, among others that the warrant must be executed in the presence of a solicitor named by the debtor, and that it and the defeasance must be written on the same paper. A warrant of attorney must be duly stamped, generally as a mortgage (q.v.) } and must be registered as a judgment in the central office of the Supreme Court.

WARRANT-OFFICER, in the British navy, the name given to officers who rank next to those who hold commissions, being appointed by warrant. They include the master, purser, surgeon, gunner, boatswain and carpenter, the first three being of " ward- room rank," i.e. messing with the lieutenants. In the military forces a warrant-officer is appointed by a secretary of state's warrant, and ranks below the commissioned officers

and above the non-commissioned officers. A warrant-officer often holds an honorary commission.

WARRANTY, etymologieally, another form of Guarantee (q.v.). It is used, however, in a rather different sense. The sense common to both words is that of a collateral contract, under which responsibility for an act is incurred, and for the breach of which an action for damages lies. Warranty generally expresses the responsibility of the person doing the act, guarantee the responsibility of some other person on his behalf. A warranty may be defined, in the words of Lord Abinger, as " an express or implied statement of something which the party undertakes shall be part of the contract, and, though part of the contract, collateral to the express object of it " (Chanter v. Hopkins, 1S38, 4 M. & W. 404). It differs from a condition in that a condition forms the basis of the contract and a breach of it discharges from the contract, and from a representation in that the latter does not affect the contract unless made a part of it expressly, or by implication as in contracts of insurance and other contracts uberrimae jidei, or unless it be fraudulent. These distinctions are not always accurately maintained. Thus in the Real Property Act 1845, § 4, condition seems to be used for warranty.

Warranty as it affected the law of real property was, before the passing of the Real Property Limitation Act 1833 and the Fines and Recoveries Act 1833, a matter of the highest importance. A warranty in a conveyance was a covenant real annexed to an estate of freehold, and either expressed in a clause of warranty or implied in cases where a feudal relation might exist between feoffor and feoffee. The warranty, as described by Littleton, § 697, was an outgrowth of feudalism, and something very like it is to be found in the Liber Feudorum. At the time of Glanvill the heir was bound to warrant the reasonable donations of his ancestor. Warranty was one of the elements in Bracton's definition of homage, 786, ' juris vinculum quo quis astringitur ad w r arrantizandum defendendum et acquietandum tcnentem suum in seisina versus omnes." For an express warranty the word warranlizo or warrant was necessary. The word " give " implied a warranty, as did an exchange and certain kinds of partition. In order to bind heirs a clause of warranty was required. This was either lineal, collateral or commencing by disseisin. The differences between the three kinds were very technical, and depended on abstruse and obsolete learning. They are treated at great length in old works on real propertv, especially Coke upon Littleton hy Butler, 3646. The feoffor or his heirs were bound by voucher to warranty or judgment in a writ of warrantia chartae to yield other lands to the feoffee in case of the eviction of the latter. Vouching to warranty was a part of the old fictitious pro- ceedings in a common recovery in use for the purpose of barring an entail before the Fines and Recoveries Act. Warranty of this nature, as far as it relates to the

conveyance of real estate, though not actually abolished in all possible cases, is now superseded by cove- nants for title. The more usual of these are now by the Conveyanc- ing Act 1 881 deemed to be implied in conveyances. For the implied warranties of title and quality see Sale of Goods. Vouching to warranty was at one time important in the law of personality as well as of reality. The procedure is fully described in Glanvill. The right of calling on the holder of lost or stolen goods to vouch to warranty (interciare) , i.e. to give up the name of the person from whom he received them, under pain of forfeiture, was often granted under the name of theam as a local franchise. Warranty, as it exists at present in the law of personality, is cither express or implied. There is no general rule as to what constitutes a warranty. It is not necessary' that an express warranty should be in writing, the law being that every affirmation at the time of sale of personal chattels is a warranty, provided that it appears to have been so

intended. The principal cases of implied warranty occur in the contracts of sale and insurance. There is also an implied warranty in other kinds of contract, e.g. of seaworthiness by the shipowner in a contract between him and a charterer for the hire of a ship. In all cases of implied warranty the warranty may be excluded by the special terms of the contract. For breach of warranty an action may be brought directly, or the breach may be used as ground for a counter claim or for reduction of damages, but the breach will not in the case of a warranty proper entitle the person suffering: by it to a rescission of the contract. Thus in a sale the property passe-, although the warranty be broken. In some cases warranties on sale arc the subject of statutory enactments, as the Merchandise Marks Acts and the Sale of Food and Drugs Acts. In some other acts, such as the Bills of Exchange Act 1882, the term warranty docs not occur, but the practical effect is the same.

Scotland. — The term corresponding to warranty in the law of heritable property is " warrandice." Warranty, strictly speaking, seems confined to movables. Warrandice appears early in Scots law, the heir by Regiam Majestatem being bound to warrant the reasonable donations of his ancestor. Warrandice in the existing law is either real or personal. Real warrandice is that whereby warrandice lands are made over, as indemnity for those conveyed, to assure the person to whom they were conveyed from loss by the appearance of a superior title. Real warrandice is implied in ex-cambion. Its effect is that the excamber, in case of eviction, may recover possession of his original lands. This is not in accordance with the English law in exchange. Personal warrandice is either express or implied. There is an implied warrandice in every onerous deed, and an absolute warrandice presumes an onerous consideration. Express warrandice is either simple, against the future acts of the vendor, from fact and deed, against acts whether past or future, or absolute, or against all deadly, that is, on any ground existing before the sale. A clause of warrandice is the Scottish equivalent of the English covenants for title. By the Titles to Land Consolidation (Scotland) Amendment Act 1869 a clause of warrandice in the form given in the schedule to the act imports absolute warrandice as regards the lands and the title-deeds thereof, and warrandice from fact and deed as regards the rents.

United States. — Warranty in conveyances of real estate is expressly abolished by statute in many states. In . some states warranty is implied on the transfer and indorsement of negotiable instru- ments. (J. W.)

WARREN, GOUVERNEUR KEMBLE (1830-1882), American soldier, was born at Coldspring, New York, on the 8th of January' 1830, and entered West Point in 1S46, graduating in 1850. He was assigned to the engineers, and for several years was employed in survey work in the West, where he took part in some expedi- tions against the Indians. In 1859 he was made assistant instructor in mathematics at West Point. But two years later, at the outbreak of the Civil War, the scientific subaltern was made lieutenant-colonel of volunteers and posted to the newly raised 5th New York Volunteer Infantry. He was fully equal to the task, for his regiment was very soon brought into a state of marked efficiency. In August he was promoted colonel. He commanded a brigade of the V- corps at Gaines's Mill, Second Bull Run and Antietam, and was shortly afterwards promoted brigadier-general of Volunteers. During the Fredericksburg campaign he was on the engineer staff of the Army of the Potomac, but after Chancellorsville he was appointed chief of engineers in that army, and in that capacity rendered brilliant services at Gettysburg {q.v.), his reward being promotion to major- general U.S.V. and the brevet of colonel in the regular army. When the Army of the Potomac was reorganized in the

spring of 1864 Warren returned to the V. corps as its commander.

*His services in th**- Wilderness (q.v.) and Petersburg (q.v.) campaigns proved his fitness for this large and responsible command, but his naturally lively imagination and the engineer's inbred habit of caution combined to make him a brilliant but somewhat unsafe subordinate. He would have become one of the great chiefs of staff of history, or even a successful army commander, but he sometimes failed where a less highly gifted man would have succeeded. He was at his best when the military situation depended on his exercising his initiative, as on the first day in the Wilderness, in which his action saved the army, at his worst when, as on the 10th of May before Spottsylvania, he was ordered to attempt the impossible. On the latter occasion both Grant and Meade threatened to relieve him of his command, and Humphreys, the chief of staff of the army, was actually sent to control the movements of the V. corps. Similar incidents took place in the later stages of*

the campaign, and at last, at the critical moment preceding the battle of Five Forks, Sheridan, who was in charge of the opera- tions, was authorized by Grant to relieve Warren of his command if he thought fit. The thoughtful Warren and the. eager, violent Sheridan were ill-matched. At the outset the V. corps, being no longer composed of the solid troops of 1862 and 1863, fell into confusion, which Warren exerted himself to remedy, and in the event the battle was an important Union victory. But after it had ended Sheridan sent for Warren and, with no attempt to soften the blow, relieved him of his command. A court of inquiry was subsequently held, which entirely exonerated Warren from the reckless charges of apathy, almost of cowardice, which Sheridan brought against him. – Shortly after Five Forks Warren resigned his volunteer commission, and received the brevet of brigadier-general in the regular army. After the war he was employed, in the substantive rank of major (1879 lieutenant-colonel) of engineers, in survey work and harbour improvements. General Warren died on the 8th of August 1882 at Newport, R.I. A statue to his memory was erected at Round Top, on the field of Gettysburg, on the sixth anniversary of his death.

WARREN, SIR JOHN BORLASE, Bakt. (1753-1822), English admiral, was born at Stapleford, Nottinghamshire, on the 2nd of September 1753, being the son and heir of John Boriase Warren (d. 1775) of Stapleford and Little Marlow. He was educated at Emmanuel College, Cambridge, and in 1771 entered the navy as an able seaman; in 1774 he became member of

parliament for Marlow; and in 1775 he was created a baronet, the baronetcy held by his ancestors, the Borlases, having become extinct in 1680. His career as a seaman really began in 1777, and two years later he obtained command of a ship. In April 1794, in charge of a squadron of frigates, Warren captured three French frigates, and in similar ways he did excellent service for some time in protecting British trade. In 1796 he is said to have captured or destroyed 220 vessels. Perhaps his best deed in the service was the defeat in October 1 798 of a French fleet, carrying sooo men, which it was intended to land in Ireland, a plan which he completely frustrated. In 1802 he was sent to St Petersburg as ambassador extraordinary, but he did not forsake the sea, and in 1806 he captured a large French war- ship, the " Marengo." He became an admiral in 1810, and was commander-in-chief on the North American station in 1813-1814. He died on the 27th of February r822. His two sons predeceased their father, and his daughter and heiress, Frances Maria (1784-1837), married George Charles Venables-Vernon, 4th Lord Vernon (1770-1835). Their son was George John Warren Vernon, 5th Lord Vernon (1803-1866).

WARREN, JOSEPH (1 741-1775), American politician, was born at Roxbury, Massachusetts, on the nth of June 1741. He graduated from Harvard College in 1759, taught in a school at Roxbury in 1760-1761, studied medicine, and began to practise in Boston in 1764. The Stamp Act agitation aroused his interest in public questions. He soon became associated with Samuel Adams, John Adams and Josiah Quincy, Jr., as a leader of the popular party, and contributed articles and letters to the Boston Gazette over the signature " True Patriot." The efforts of Samuel Adams to secure the appointment of committees of correspondence met with his hearty support, and he and Adams were the two leading members of the first Boston com- mittee of correspondence, chosen in 1772. As chairman of a committee appointed for the purpose, he drafted the famous " Suffolk Resolves," which were unanimously adopted by a convention at Milton (q.v.) on the 9th of September 1 774. These " resolves " urgediorcible opposition to Great Britain if it should prove to be necessary, pledged submission to such measures as I he Continental Congress might recommend, and favoured the calling of a provincial congress. Warren was a member of the first three provincial congresses (1774-1775), president of the third, and an active member of the committee of public safety. He took an active part in the fighting on the 19th of April, was appointed major-general of the Massachusetts troops, next in rank to Artemas Ward, on the 14th of June

1775; and three days later, before his commission was made out, he took part as a volunteer, under the orders of Putnam and Prescott, in the battle of Bunker Hill (Breed's Hill), where he was killed. Next to the Adamses,

Warren was the most in- fluential leader of the extreme Whig faction in Massachusetts. His tragic death strengthened their zeal for the popular cause and helped to prepare the way for the acceptance of the Declaration of Independence. Warren's speeches are typical examples of the old style of American political eloquence. His best- known orations were those delivered in Old South Church on the second and fifth anniversaries (1772 and 1775) of the " Boston Massacre."

The standard biography is Richard Frothingham's Life and Times of Joseph Warren (Boston, 1865).

WARREN, MERCY (1728-1814), American writer, sister of James Otis (q.v.) } was born at Barnstable, Mass., and in 1754 married James Warren (1726-1808) of Plymouth Mass., a college friend of her brother. Her literary inclinations were fostered by both these men, and she began early to write poems and prose essays. As member of the Massachusetts House of Rep- resentatives (1766-1774) and its speaker (1776-1777 and 1787-1788), member (1774 and 1775) and president (1775) of the Provincial Congress, and paymaster-general in 1775, James Warren took a leading part in the events of the American revolutionary period, and his wife followed its progress with keen interest. Her gifts of satire were utilized in her political dramas, The Adulator (1773) and The Croup (1775); and John Adams, whose wife Abigail was Mercy Warren's close friend, encouraged her to further efforts. Her tragedies, " The Sack of Rome " and " The Ladies of Castile," were included in her Poems, Dramatic and Miscellaneous (1790), dedicated to General Washing- ton. Apart from their historical interest among the beginnings of American literature, Mercy Warren's poems have no permanent value. In 1805 she published a History of the American Revolu- tion, which was coloured by somewhat outspoken personal criticism and was bitterly resented by John Adams (see his correspondence, published by the Massachusetts Historical Society, 1878). James Warren died in 1808, and his wife followed him on the 19th of October 1814.

See Elizabeth F. Ellet, Women of the Revolution (1856; new ed., 1900) ; an article by Annie Russell Marble in the New England Mag- azine (April 1903): Alice Brown, Mercy Warren (New York, 1896).

WARREN, MINTON (1850-1907), American classical scholar, was born at Pawtucket, Rhode Island, on the 29th of January 1850, a descendant of Richard Warren, who sailed in the " May- flower " in 1620. He was educated at Tufts College and sub- sequently at Yale. After three years as a schoolmaster, he went to Germany to complete his studies in comparative philology and especially in Latin language and literature. Having taken the degree of doctor of philosophy at Strassburg in 1879, he returned to the

United States as Latin professor at Johns Hopkins University. In 1899 he was appointed Latin professor at Harvard. His life-work was a new edition of Terence, which, however, he left unfinished at his death. He was director of the American School of Classical Studies in Rome (1897-1899), and president of the American Philological Association (1898). Among his publications are: " Enclitic Ne in Early Latin " (Strassburg dissert., reprinted in Amer. Journ. of Philol., 1881); On Latin Glossaries, with especial reference to the Codex Sangal- lensis (St Gall Glossary) (Cambridge, U.S.A., 1885); The Stele Inscription in the Roman Forum {Amer. Journ. of Philol., vol. xxviii. No. 3, and separately in 1908). He died on the 26th of November 1907.

See Harvard Magazine (Jan. 1908) and W. M. Lindsay in Classical Review (Feb. 1908).

WARREN, SAMUEL (1807-1877), English lawyer and author, son of Dr Samuel Warren, rector of All Souls', Ancoats, Man- chester, was born near Wrexham in Denbighshire on the 23rd of May 1807. The elder Samuel Warren (1781-1862) became a Wesleyan minister, but was expelled by Conference in 1835 on account of his attitude towards proposals for the establishment of a theological training college at Manchester. He formed a

new association, the members of which were nicknamed Warren- ites, and this developed into the United Methodist Free Churches. Warren himself took orders in the Church cf England. His son, the younger Samuel Warren, studied medicine at the University of Edinburgh, but abandoned this to study for the English bar. He entered the Inner Temple in 1828, and was successful in his profession. He took silk in r.851, was made recorder of Hull in 1852, represented Midhurst in parliament for three years (1856-1859) and was rewarded in 1859 with a mastership in lunacy. He had already written a good deal on the subject of insanity in its legal aspects, and he was always a determined opponent of the rising school of medical alienists who were more and more in favour of reducing certain forms of crime to a state of mental aberration which should not be punished outside of asylums. Meantime he had made much more brilliant success in fiction. Very early in his career he had begun to write for Blackwood. His Passages from the Diary of a Late Physician were published in that magazine between August 1830 and August 1837, and appeared in collected form in 1838. These realistic short stories, with a somewhat morbid interest shielded under a moral purpose, were extremely popular. Warren's brief experience as a medical student thus stood him in good stead. But his great success was Ten Thousand a Year, which ran in Blackwood from October 1839 to August 1841, and was published

separately immediately on its conclusion. Critics complained of the coarse workmanship, the banality of the moralizing, the crudeness of the pathos, the farcical extravagance of the humour; but meantime the work proved one of the most popular novels of the century. Of the higher qualities of imagina- tion and passion Warren was destitute, but his sketches of character, especially farcical character — Tittlebat Titmouse, Oily Gammon, Mr Quicksilver (an open caricature of Lord Brougham) — are bold and strong, forcibly imprinted on the memory, and the interest of the story is made to run with a powerful current. For several years Warren was known as the author of Ten Thousand a Year, and many tales were told of his open pride in the achievement. In 1847 he made another venture, but Now and Then was not a success. The Lily and the Bee, a squib on the Crystal Palace, published in 1851, though it had the honour of translation into Italian, was a signal failure. A pessimistic dissertation on The Intellectual and Moral Develop- ment of the Age, published in 1853, also fell flat, and thenceforth Warren, after publishing his Works: Critical and Imaginative., in four volumes in 1854, retired on his laurels. He died in London on the 29th of July 1877.

Warren also wrote several legal works of repute — Introduction to Imw Studies (1835), Extracts from Blackstone (1837), Manual of Parliamentary Law (1852).

WARREN, WILLIAM (1812-1888), American actor, was born in Philadelphia on the 17th of November 1812, the son of an English actor (1767-1832) of the same name. His first stage appearance was made there as Young Norval in Home's Douglas in 1832. A dozen years of wandering theatrical life followed, giving him a wide experience in every kind of part, the last few in comedy in a company headed by his brother-in-law, J. B. Rice. In 1846 he made his first appearance in Boston as Sir Lucius O'Trigger in The Rivals at the Howard Athenaeum, and in the next season he became a member of the Boston Museum, in which stock company he remained for thirty-five years. Here he held his " Golden Jubilee " on the 28th of October 1882. He died on the 21st of September 1888.

WARREN, a city and the county-seat of Trumbull county, Ohio, U.S.A., in the N.E. part of the state, on the Mahoning river, about 50 m. S.E. of Cleveland, and 14 m. N.W. of Youngstown. Pop. (1890)5973, (1900)8529(1161 foreign-born); (.1910) 11,081. Warren is served by the Erie, the Pennsylvania, and the Balti- more & Ohio railways. The city has a public library and a hospital. The surrounding country is devoted to farming, dairying and coal and iron mining. The total value of the factory products in 1905 was $2,4ˆ,379. The first permanent white settlement on the site of Warren (then owned by Connecti- cut) was made in 1799 by settlers from Washington county,

Pennsylvania. Warren was named in honour of a surveyor — Moses Warren, of New Lyme, Connecticut — employed by the Connecticut Land Company, which sold the land to the first settlers. The county was named in honour of Governor Jonathan Trumbull of Connecticut. Warren was chartered as a city in 1834. For several years before September 1909 Warren was the national headquarters of the National American Woman's Suffrage Association.

See History of Trumbull and Mahoning Counties (2 vols., Cleveland, Ohio, 1882), and II. T. Upton, History of Trumbull County (Chicago,

1909).

WARREN, a borough and the county-seat of Warren county, Pennsylvania, U.S.A., on the N. side of the Allegheny river at the mouth of the Conewango river, about 35 m. N.E. of Titus- ville. Pop. (1880) 2810; (1S90) 4332; (1900) 8043, of whom 1529 were foreign-born; (1910 census) 11,080. The foreign element is largely Swedish, Danish and Slavish. Warren is served by the Pennsylvania and the Dunkirk, Allegheny Valley & Pittsburg railways, and by electric railway to Jamestown, New York. Among the public buildings and institutions are the county court house, a state hospital for the insane (established 1873), a Y.M.C.A. building and a state armoury. Warren is situated at the southern foot of a high sheer ridge, in a region rich in oil and natural gas; the borough ships and refines oil, and has various manufactures. The total value of its factory product in 1905 was $5,976,905 (62-4% more than in 1900), of which $3,038,894 was the value of refined oil and $1,220,165 the value of foundry and machine-shop products. The borough owns and operates the water-works and the electric lighting plant. The town site of Warren was laid out by commissioners appointed by Governor Thomas Mifflin in 1795, and Warren was incorpor- ated as a borough in 1832; it was named in honour of Joseph Warren, the American patriot. In 1895 part of Glade township was annexed.

See J. S. Schenck and W. S. Rann, History of Warren County, Pennsylvania (Syracuse, N.Y., 1S87).

WARREN, properly an old term of the English forest law, derived from the O. Fr. warenne, varenne, garenne (med. Lat. warenna, warir, to guard, cf. " ward "), and applied to one of the three lesser franchises, together with " chase " and " park," included under the highest franchise, the " forest," and ranking last in order of importance. The " beasts of warren " were the hare, the coney {i.e. rabbit), the pheasant and the partridge. The word thus

became used of a piece of ground preserved for these beasts of warren. It is now applied loosely to any piece of ground, whether preserved or not, where rabbits breed (see Forest Laws).

WARRENPOINT, a seaport and watering-place of county Down, Ireland, the terminus of a branch of the Great Northern railway, by which it is 50! m. S.S.W. of Belfast. Pop. (1901) 1817. It lies on the northern shore of the beautiful Carlingford Lough; behind it rise the Mourne Mountains, while across the lough are the Carlingford Hills, with Slieve Gullion. These hills afford shelter from inclement winds, and give Warrenpoint and other neighbouring watering-places on the lough a climate which renders them as popular in winter as in summer. There is a quay here where large vessels can discharge, and agricultural produce is exported. The shores of the lough are studded with country seats lying picturesquely on the well-wooded hill slopes; and nearly 3 m. E. of Warrenpoint (connected by tramway) is Rosstrevor, one of the most noted watering-places in Ireland, charmingly situated in a position open to the sea, but enclosed on the north and east.

WARRENSBURG, a city and the county-seat of Johnson county, Missouri, U.S.A., on a hilly site near the Blackwater Fork of the La Mine river, in the west central part of the state, about 65 m. S.E. of Kansas City. Pop. (1890) 4706; (1900) 4724, including 556 negroes and 127 foreign-born; (iQi°) 4689. It is served by the Missouri Pacific railway. The city is the seat of a state normal school (opened in 1872), and among the pro- minent buildings are the court house and the railway station, both built of local sandstone. Pertle Springs, about ijm. S.,

is a summer resort. Warrensburg is a shipping and supply point for a rich farming region. In the immediate vicinity there are extensive quarries of a blue sandstone, one of the best building stones of the state. Warrensburg was made the county- seat in 1836. Its settlement dates from a little earlier. The present city is not on the site of the original settlement, but is near it; the old town was abandoned in 1857, when the railway passed by it. During the Civil War Warrensburg was a Union post.

WARRINGTON, a market town and municipal, county and parliamentary borough of Lancashire, England, on the river Mersey, midway between Manchester and Liverpool, and 1S2 m. N.W. by N. from London by the London & North-Western railway. Pop. (1891) 52,2,88; (1901) 64,242. It has extensive local connexions by way of the Cheshire lines. The church

of St Elphin is a fine cruciform building with lofty central tower and spire. The style is Decorated, but restoration has been heavy. A much earlier church formerly occupied the site, and of this the crypt remains beneath the existing chancel. The town hall, a classical building of the 18th century, was formerly a residence, and was purchased by the corporation in 1872, while the park in which it stands was devoted to public use. The other chief buildings are the museum and free library, with technical institute and the market hall. The educational institutions include a free grammar school, founded by one of the Boteler family in 1526, and a blue-coat school (1665). A few halt-timbered houses of the 17th century remain in the streets. A wide system of electric tramways and district light railways is maintained by the borough. Warrington and the neighbourhood are an important centre of the tanning industry. There are also iron bar, hoop and wire works, tool, soap, glass and chemical works, foundries and cotton mills. Considerable agricultural markets and fairs are held. The parliamentary borough (1832), returning one member, extends into Cheshire. The town was incorporated in 1847, and the corporation consists of a mayor, 9 aldermen and 27 councillors. Area 305S acres.

Warrington (otherwise Walintune, Werinton, Werington) is supposed to be of British origin, and the great Roman road from Chester to the north passed through it. There was a Romano-British village — perhaps also a military post — at Wilderspool. It is mentioned in Domesday Book as the head of a hundred. After the Conquest it became one of the possessions of Roger de Poictou. In Henry I.'s reign a barony was formed for Pain de Vilars, of which Warrington was the head and to which it gave the name, and from that family both manor and barony passed to the Botelers or Butlers, who first established their residence on the mote hill and before 1280 built Bewsey m Burton wood. The Butlers held both barony and manor till 15ˆ6, when the barony lapsed and the manor passed after some vicissitudes to the Irelands of Bewsey, then to the Booths and in 1769 to the Blackburns. In 1255 William le Boteler obtained a charter from Henry III. for an annual fair to last three days from ihe eve of St Thomas the Martyr (18th July). In 1277 Edward I. granted a charter for a weekly market on Friday and an annual fair of eight days beginning on the eve of St Andrew (30th Nov.), and in 1285 another charter changing the market day from Friday to Wednesday and extending the summer Tair to eight days. The market and fairs had, however, existed before the granting of these charters. Blome in 1673 speaks of Warrington market as an important one " for linen cloth, corn, cattle, provisions and fish, being much resorted to by the Welshmen." and in 1730 Defoe says the market was especially famous for " a sort of table linen called Huk-a-back or Huk-a- buk." The fairs are still held, as well as the Wednesday chartered market, besides a Saturday market which is probably customary. In the 1

8th and early 19th centuries the chief industries were huckabacks and coarse cloths, canvas, fustians, pins, glass, sugar-refining and copper. During the Civil War the inhabitants embraced the royalist cause and the earl of Derby occupied the town and made it for some time nis headquarters in order to secure the passage of the Mersey. In April 1643 the parliamentary forces attacked it, but had to raise the siege, as Lord Derby

began to set the town on fire. Lord Derby left Colonel Edward Norris in command and in May the parliamentarians again attacked the town, which was forced to surrender after a six days' siege owing to lack of provisions. In 1648, after the royalist defeat at Winwick by Cromwell, part of the royal forces under General Baillie rallied at Warrington, hoping to effect the passage of the bridge, but failed, and the general with 4000 men capitu- lated. In August 1659 Sir George Booth, lord of the manor, was defeated at Winnington, and part of his forces surrendered at Warrington to the parliamentary garrison. During the Rebellion of 1745, on the approach of Prince Charles Edward from Manchester, the bridge was cut down and the few stragglers who ventured that way seized. A borough was created by William le Boteler about 1230 by a charter which has not been preserved; but its growing strength alarmed the lord who contrived to repress it before 1300, and for over 500 years Warrington was governed by the lord's manor court. A charter of incorporation was granted in 1847. By the Reform Act of 1832 the town returns one member to parliament. The church dedicated to St Elphin is mentioned in Domesday Book, and was in early times head of the ancient deaneiy of Warrington. There was a friary of Augustine or Hermit Friars here founded apparently about 1280.

WARRISTON, ARCHIBALD JOHNSTON, Lord (1611-1663), Scottish judge and statesman, son of James Johnstone (d. 1617), a merchant burgess of Edinburgh, was baptized on the 28th of March 161 1, educated at Glasgow, and passed advocate at the Scottish bar in 1633. He first came into public notice in 1637, during the attempt of Charles I. to force the English liturgy upon Scotland, when as the chief adviser of the Covenanting leaders he drew up their remonstrances. On the 28th of February 1638, in reply to a royal proclamation, he read to an enormous multitude assembled in Greyfriars churchyard at Edinburgh and in presence of the heralds, a strong protestation, and together with Alexander Henderson was a principal author of the National Covenant of 1638, drawing up himself the second part, which consisted in a recapitulation of all the acts of parliament con- demning " popery " and asserting the liberties of the Scottish church. He was appointed clerk to the tables, and also clerk and afterwards procurator or counsel to the general assembly held at Glasgow the same year, when he was the means of restor- ing several missing volumes of records. In June 1639 he took part in the negotiations leading

to the treaty of Berwick, when his firm attitude was extremely displeasing to the king. He urged Charles to refrain from annulling the acts of the assembly since this would restrict all future assemblies, to which Charles replied Ci that the devil himself could not make a more uncharit- able construction or give a more bitter expression," and on Johnston's continuing his speech ordered him to be silent and declared he would speak to more reasonable men. 1 In August he read a paper before the Scottish parliament, strongly condemning its prorogation. In the following year he was appointed to attend the general of the army and the committee, and on the 23rd of June, when the Scottish forces were preparing to invade England, he wrote to Lord Savile asking for definite support from the leading opposition peers in England and their acceptance of the National Covenant, which drew from the other side at first nothing but vague assurances and subsequently the engagement forged by Lord Savile with the signatures of the peers. In October he was a commissioner for negotiating the treaty of Ripon and went to London. He continued after the peace to urge the pumshment of the incendiaries, and especially of Traquair, and in a private interview with the king strongly opposed the proposed act of general oblivion. On the king's arrival in Scotland in :64r he led the opposition on the important constitutional point of the control of state appointments, supporting the claims of the parliament by an appeal to the state records, which he had succeeded in recovering.

Tn September Johnston received public thanks for his services from the Scottish parliament, and, in accordance with the policy of conciliation then pursued for a short time by the king, was 1 Johnston's " Diary " in Scottish Hist. Soc. Publ., xxvi. 84.

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appointed on the 13th of November 1641 a lord of session, with the title of Lord Warriston (a name derived from an estate purchased by him near Edinburgh in 1636), was knighted, and was given a pension of £200 a year. The same month he was appointed a commissioner at Westminster by the parliament for settling the affairs of Scotland. He was a chief agent in concluding the treaty with the English parliament in the autumn of 1643, and was appointed a member of the committee of both kingdoms in London which directed the military operations, and in this capacity went on several missions to the parliamentary generals. He took his seat early in 1644 in the Assembly of Divines, to which he had been nominated, and vehemently opposed measures tolerating independency or giving powers to laymen in ecclesiastical affairs. The articles of the unsuccessful treaty of Uxbridge were, for the most part, drawn up by him the same year. Besides his public

duties in England he sat in the Scottish parliament for the county of Edinburgh from 1643 tilL 1647, was speaker of the barons, and served on various committees. After the final defeat of Charles, when he had surrendered himself to the Scots, Johnston was made in October 1646 king's advocate, and the same year was voted £3000 by the estates for his services. He continued to oppose unwise concessions to Charles, and strongly disapproved of the " engage- ment " concluded in 1648 by the predominant party with Charles at Carisbrooke, which, while securing little for Presbyterianism, committed the Scots to hostilities with the followers of Cromwell. He now became the leader of the " remonstrants/' the party opposed to the "engagement," and during the ascendancy of the engagers retired to Cantyre as the guest of Argyll. He returned again after the Whiggamore Raid, 1 met Cromwell at Edinburgh in October after the defeat of the engagers at Preston, and in conjunction with Argyll promoted the act of Classes, passed on the 23rd of January 1649, disqualifying the royalists. The good relations now formed with Cromwell, however, were soon broken off by the king's execution, and Johnston was present officially at the proclamation of Charles II. as king at Edinburgh, on the 5th of February 1649. On the 10th of March he was appointed lord clerk register. In May he pronounced the vindictive sentence on Montrose, and he is said to have witnessed with Argyll the victim being drawn to the place of execution. He was present at the battle of Dunbar (3rd of September 1650) as a member of the committee of estates, to which body is ascribed the responsibility for Leslie's fatal abandonment of his position on Doon Hill. After the defeat he urged the removal of David Leslie, afterwards Lord Newark, from the command, and on the 21st of September delivered a violent speech in Charles's presence, attributing all the late misfortunes to the Stuarts and to their opposition to the Reformation.

His first object in life being the defence of Presbyterianism, Johnston could join neither of the two great parties, and now committed himself to the faction of the remonstrants who desired to exclude the king, in opposition to the resolutioners who accepted Charles. The latter for some time maintained their superiority in the kingdom, Johnston being reduced to poverty and neglect. In the autumn of 1656 Johnston went to London as representative of the remonstrants; and soon afterwards, on the oth of July 1657, he was restored by Cromwell to his office of lord clerk register, and on the 3rd of November was appointed a commissioner for the administration of justice in Scotland, henceforth remaining a member of the government till the Restoration. In January 1658 he was included by Cromwell in his new House of Lords, and sat also in the upper chamber in Richard Cromwell's parliament. On the latter's abdication and the restoration of the Rump, he was chosen a member of the council of state, and continued in the administra-

1 This was the name given to a successful raid on Edinburgh by a band of Argyll's partisans gathered mainly from the west of Scotland. It took place in September 1648, just after the defeat of Hamilton at Preston. The term Whiggamore is said to be derived from Wkiggam, a word used by the ploughmen in the west of Scotland to encourage their horses. See S. R. Gardiner, Great Civil War, vol. iii. (1891).

tion as a member of the committee of public safety, maintaining consistently his attitude against religious toleration. At the Restoration he was singled out for punishment. He avoided capture, escaping to Holland and thence to Germany, and was condemned to death in his absence on the 13th of May 1661. In 1663, having ventured into France, he was discovered at Rouen, and with the consent of Louis XIV. was brought over and imprisoned in the Tower of London. In June he was taken to Edinburgh and confined in the Tolbooth. He was hanged on the 22nd of July at the Market Cross, Edinburgh, the scene of many of his triumphs, and a few yards from his own house in High Street, which stood on the east side of what is now known as Warriston's Close. His head was exposed on the Netherbow and afterwards buried with his body in Greyfriars churchyard.

Johnston was a man of great energy, industry and ability, and the successful defence of their religion by the Scots was probably owing to him more than to any other man. He is described by his contemporary Robert Baillie as " one of the most faithful and diligent and able servants that our church and kingdom has had all the tymes of our troubles/' 2 He was learned in the Scottish law, eloquent and deeply religious. His passionate devotion to the cause of the Scottish church amounted almost to fanaticism. According to the History by his nephew Bishop Burnet, "he looked on the Covenant as the setting Christ on his throne." Hehad by nature no republican leanings; " all the Royalists in Scotland," writes Baillie as late as 1646, " could not have pleaded so much for the crown and the king's just power as the chancellor and Warriston did for many days together." When, however, Presbyterianism was attacked and menaced by the sovereign, he desired, like Pym, to restrict the royal prerogative by a parliamentary constitution, and endeavoured to found his arguments on law and ancient pre- cedents. His acceptance of office under Cromwell hardly deserves the severe censure it has received. He stood nearer both in politics and religion to Cromwell than to the royalists, and was able in office to serve usefully the state and the church, but his own scrupulous conscience caused him to condemn in his dying speech, as a betrayal of the cause of Presbyterianism, an act which he regarded as a moral fault committed in order to provide for his numerous family, and the remembrance of which disturbed his last hours. Johnston was wanting in tact and in consideration for his opponents, confessing himself that his "

natural temper (or rather distemper) hath been hasty and passionate." He was hated by Charles I., whose statecraft was vanquished by his inflexible purpose, and by Charles II., whom he rebuked for his dissolute conduct; but he was beloved by Baillie, associated in private friendship and public life with Argyll, and lamented by the nation whose cause he had championed.

He had a large family, the most famous of his sons being James Johnston (1655-1737), called "secretary Johnston." Having taken refuge in Holland after his father's execution, Johnston crossed over to England in the interests of William of Orange just before the revolution of 16S8. In 1692 he was appointed one of the secretaries for Scotland, but he was dismissed from office in 1696. Under Anne, however, he began again to take part in public affairs, and was made lord clerk register. Johnston's later years were passed mainly at his residence, Orleans House, Twickenham, and he died at Bath in May 1737.

See W. Morison, Johnston of Warriston (1901).

WARRNAMBOOL, a seaport of Villiers county, Victoria, Aus- tralia, 166 m. by rail W.S.W. of Melbourne. Pop. (1901) 6410. The town lies on an eminence, on the shores of Warrnambool Bay, in a rich pastoral and agricultural district. Race meetings are held here, and the steeplechase course is considered the finest in the colony. Warrnambool has a fine port with a viaduct and breakwater pier 2400 ft. in length, and a jetty 860 ft. in length, on to which the railway runs. Large quantities of dairy produce, wool and live stock are exported; and there are a number of flourishing industries in the town, including brewing, flour- milling, tanning and boot and biscuit manufacturing. Sandstone 15 Baillie, Letters and Journals (Bannatync Club, 1841).

abounds in the district and is extensively quarried. The summer climate is the coolest in the Australian states.

WARSAW, a government of Russian Poland, occupying a narrow strip of land west of the lower Bug and west of the Vistula from its confluence with the Bug to the Prussian frontier. It is bounded by the Polish governments of Plock and Lomza on the N., Siedlce on the E., and Radom, Piotrkow and Kalisz ontheS. Area 5605 sq. m.; estimated pop. (1906) 2,269,000. It occupies the great plain of central Poland, and is low and flat, with only a few hills in the south, and along the course of the Vistula in the north-west, where the terraces on the left bank descend by steep slopes to the river.

Terrible inundations often devastate the region adjacent to the confluence of the Vistula with the Narew and Bug, and marshes gather in the low-lying grounds. The soil, which consists chiefly of boulder clay, lacustrine clays, and sandy fluviatile deposits, is not particularly fertile. The government is divided into thirteen districts, the chief towns of which are Warsaw, Blonie, Gostynin, Grojec, Kutno, LowicZj Neszawa, Novo-Minsk, Plonsk, Radzymin, Skierniewice, Sochaczew and Wloclawek. In spite of the un-fertile soil, agriculture is prosecuted with considerable success. Manufacturing industries have also greatly developed.

WARSAW (Polish Warszawa, Ger. Warschau, Fr. Varsovie), the capital of Poland and chief town of the government of Warsaw. It is beautifully situated on the left bank of the Vistula, 387 m. by rail E. of Berlin, and 605 m. S.W. of St Petersburg. It stands on a terrace 120 to 130 ft. above the river, to which it descends by steep slopes, leaving a broad bench at its base. The suburb of Praga on the right bank of the Vistula, here 450 to 660 yds. broad, is connected with Warsaw by two bridges— the railway bridge which passes close under the guns of the Alexander citadel to the north, and the Alexander bridge (1666 ft. long; built in 1S65 at a cost of £634,000) in the centre of the town. With its large population, its beautiful river, its ample communications and its commerce, its university and scientific societies, its palaces and numerous places of amuse- ment, Warsaw is one of the most pleasant as well as one of the most animated cities of eastern Europe. From a military point of view Warsaw is the chief stronghold for the defence of Poland; the Alexander citadel has been much improved, and the bridge across the Vistula is defended by a strong fort, Sliwicki.

Situated in a fertile plain, on a great navigable river, below its confluence with the Pilica and Wieprz, which drain southern Poland, and above its confluence with the Narew and Bug, which tap a wide region in the east, Warsaw became in medieval times the chief entrepdt for the trade of those fertile and populous valleys with western Europe. Owing to its position in the territory of Mazovia, which was neither Polish nor Lithuanian, and, so to say, remained neutral between the two rival powers which constituted the united kingdom, it became the capital of both, and secured advantages over the purely Polish Cracow and the Lithuanian Vilna. And now, connected as it is by six trunk lines with Vienna, Kiev andsouth-western Russia, Moscow, St Petersburg, Danzig and Berlin, it is one of the most important commercial cities of eastern Europe. The south-western railway connects it with Lodz, the Manchester of Poland, and with the productive mineral region of Piotrkow and Kielce, which supply its steadily growing manufactures with coal and iron, so that Warsaw and its neighbourhood have become a centre for all kinds of manufactures. The iron and steel industry has greatly de- veloped, and produces large quantities of rails. The

machinery works have suffered to some extent from competition with those of southern Russia, and find the high price of land a great obstacle in the way of extension. But the manufactures of plated silver, carriages, boots and shoes (annual turnover £8,457,000), millinery, hosiery, gloves, tobacco, sugar, and all sorts of small artistic house decorations, are of considerable importance, chiefly owing to the skill of the workers. Trade is principally in the goods enumerated above, but the city is also a centre for trade in corn, leather and coal, and its two fairs (wool and hops) have a great reputation throughout western Russia. The wholesale deportations of Warsaw artisans after the Polish

insurrections of 1794, 1831 and 1863 considerably checked, but by no means stopped, the industrial progress of the town. The barrier of custom-houses all round Poland, and the Russian rule, which militates against the progress of Polish science, technology and art, are so many obstacles to the development of its natural resources. The population has nevertheless grown rapidly, from 161,008 in i860, 276,000 in 1872 and 436,750 in 1887, to 756,426 in 10.01; of these more than 25,000 are Germans, and one-third are Jews. The Russian garrison numbers over 30,000 men. Warsaw is an archiepiscopal see of the Greek Orthodox and Roman Catholic churches, and the headquarters of the V., VI. and XV. Army Corps.

The streets of Warsaw are adorned with many fine buildings, partly palaces exhibiting the Polish nobility's love of display, partly churches and cathedrals, and partly public buildings erected by the municipality or by private bodies. Fine public gardens and several monuments further embellish the city. The university (with 1500 students), founded in 1816 but closed in 1832, was again opened in 1869 as a Russian institution, the teaching being in Russian; it has a remarkable library of more than 500,000 volumes, rich natural history collections, a fine botanic garden and an astronomical observatory. The medical school enjoys high repute in the scientific world. The school of arts, the academy of agriculture and forestry, and the conservatory of music are all high-class institutions. The association of the friends of science and the historical and agricultural societies of Warsaw were once well known, but were suppressed after the insurrections, though they were subsequently revived.

The theatre for Polish drama and the ballet is a fine building, which includes two theatres under the same roof; but the pride of Warsaw is its theatre in the Lazienki gardens, which were laid out (1767-1788) in an old bed of the Vistula by King Stanislaus Ponia- towski, and have beautiful shady alleys, artificial ponds, an elegant little palace with ceilings painted by Bacciarelli, several imperial villas and a monument (1788) to John Sobieski, king of Poland, who delivered Vienna from the Turks in 1683.

Here an artificial ruin on an island makes an open-air theatre. Two other public gardens, with alleys of old chestnut trees, are situated in the centre of the city. One of these, the Saski Ogrod, or Saxon garden (17 acres), which hasa summer theatre and fine old trees, is one of the most beautiful in Europe; it is the resort of the Warsaw aristocracy. The Krasinski garden is the favourite promenade of the Jews.

The central point of the life of Warsaw is the former royal castle (Zamek Krolewski) on Sigismund Square. It was built by the dukes of Mazovia, enlarged by Sigismund III. (whose memorial stands opposite) and Ladislaus IV., and embellished by John Sobieski and Stanislaus Poniatowski. At present it is inhabited by the " governor- general of the provinces on the Vistula " {i.e. Poland), and by the military authorities. Most of its pictures and other art treasures have been removed to St Petersburg and Moscow. Four main thoroughfares radiate from it; one, the Krakowskie Przedmiescie, the best street in Warsaw, runs southward; It is continued by the Nowy Swiat and the Ujazdowska Aleja avenue, which leads to the Lazienki gardens. Many fine buildings arc found in and near these two streets: the church of St Anne (1454), which belonged formerly to a Bernardine monastery; the agricultural and industrial museum, with an ethnographical collection; the monument (1898) to the national poet Adam Mickiewicz (1798-1855) ; the Alexander Nevski cathedral of the Orthodox Greek Church, built in 1894 and following years on the Saxon Square in the Byzantine style, with five gilded cupolas and a detached campanile, 238 ft. high; close beside it the former Saxon palace, once the residence of the Polish kings but now used as military administrative offices; the Lutheran church,, finished in 1799, one of the most conspicuous in Warsaw; a monu- ment (1841) to the Polish generals who held with Russia in 1830 and were therefore shot by their compatriots, removed to the Zielony Square in 1898 ; the buildings of the Art Association, erected in 1898-1900; the university (sec above); the church of the Holy Ghost (1682-1696), with the heart and monument of the musician F. F. Chopin; a monument (1830) to the astronomer N. Kopernicus (1473-1543); the palaces of the families Zamoyski and Ordynacki (now the conservatory of music);- the building of the Philharmonic Society (1899-1901); and the church of St Alex- ander, built in 1826 and splendidly restored in 1891. The Ujaz- dowska Aleja avenue, planted with lime-trees and bordered with cafes and places of amusement, is the Champs Elysees of Warsaw It leads to the Lazienki park and to the Belvedere palace (1822) now the summer residence of the governor-general, and farther wes to the Mokotowski parade ground, which is surrounded on the south and west by the manufacturing district. Another principal street, the Marszalkowska, runs parallel to the Ujazdowska from the Saxon garden to this parade ground, on the south-east of which are the Russian barracks. The above-mentioned

streets are crossed by another series running west and east, the chief of them being the Senators, which begins at Sigismund Square and contains the best shops. The palace of the archbishop of Warsaw, the Imperial (Russian) Bank, formerly the Bank of Poland; the town hall (1725),

burned in 1863, but rebuilt in 1870; the small Pod Blacha palace, now occupied by a chancery; the theatre (1833); the old mint; the beautiful Reformed church (1882) ; the Orthodox Greek cathedral of the Trinity, rebuilt in 1837; the Krasinski palace (1692), burned in 1782 but rebuilt; the place of meeting of the Polish diets, now the Supreme Court; the church of the Transfiguration, a thank- offering by John Sobieski for his victory of 1G83, and containing his heart and that of Stanislaus Poniatowski; and several palaces are grouped in or near Senators' Street and Miodowa Street.

To the west Senators' Street is continued by Electors' Street, where is the very elegant church (1849) of St Charles Borromeo, and the Chlodna Street leading to the suburb of Wola, with a large field where the kings of Poland used to be elected. In Leshno Street, which branches of? from Senators' Street, are the Zelazna Brama, or Iron Gate; in the market-place the bazaar, the arsenal and the Wielopolski barracks.

To the north of Sigismund Square is the old town — Stare Miasto — the Jewish quarter, and farther north still the Alexander citadel. The old town very much recalls old Germany by its narrow streets and antique buildings, the cathedral of St John, the most ancient church in Warsaw, having been built in the 13th century and restored in the 17th. The citadel, erected in 1832-1835 as a punishment for the insurrection of 1831, is of the old type, with six forts too close to the walls of the fortress to be useful in modern warfare.

The suburb of Praga, on the right bank of the Vistula, is pocrly built and often flooded; but the bloody assaults which led to its capture in 1794 by the Russians under Suvarov, and in 1831 by Paskevich, give it a name in history.

In the outskirts of Warsaw are various more or less noteworthy villas, palaces and battlefields. Willanow, the palace of John Sobieski, afterwards belonging to Count X. Branicki, was partly built in 1678-1694 by Turkish prisoners in a fine Italian style, and is now renowned for its historical relics, portraits and pictures. It is situated to the south of Warsaw, together

with the pretty pilgrim- age church of Czerniakow, built by Prince Stanislaus Lubomirski in 1691, and many other fine villas (Morysinck, Natolin, Krolikarnia, which also has a picture gallery, Wierzbno and Mokotow). Mary- mont, an old country residence of the wife of John Sobieski, and the Kaskada, much visited by the inhabitants of Warsaw, in the north, the Saska Kempa on the right bank of the Vistula, and the castle of Jablona down the Vistula are among others that deserve mention. The castle and forest of Bielany (4! m. N.), on the bank of the Vistula, are a popular holiday resort in the spring.

Among the battlefields In the neighbourhood is that of Gr6chow where the Polish troops were defeated in 1831, and Wawer in the same quarter (E. of Praga), where Prince Joseph Poniatowski defeated the Austrians in the war of 1809; at Maciejowice, 50 m. up the Vistula, Kosciuszko was wounded and taken by the Russians in 1794; and 20 m. down the river stands the fortress of Modlin, now Novogeorgicvsk.

History. — The history of Warsaw from the 16th century onwards is intimately connected with that of Poland. The precise date of the foundation of the town is not known; but it is supposed that Conrad, duke of Mazovia, erected a castle on the present site of Warsaw as early as the 9th century. Casimir the Just is supposed to have fortified it in the nth century, but Warsaw is not mentioned in annals before 1224. Until 1526 it was the residence of the dukes of Mazovia, but when their dynasty became extinct it was annexed to Poland. When Poland and Lithuania were united, Warsaw was chosen as the royal residence. Sigismund Augustus (Wasa) made it (1550) the real capital of Poland, and from 1572 onwards the election of the kings of Poland took place on the field of Wola, on the W. outskirts of the city. From the 17th century possession of it was continually disputed between the Swedes, the Russians, the Brandenburgers and the Austrians. Charles Gustavus of Sweden took it in 1655 and kept it for a year; the Poles retook it in July 1656, but lost it again almost immediately. Augustus II. and Augustus III. did much for its embellishment, but it had much to suffer during the war with Charles XII. of Sweden, who captured it in 1702; buL in the following year peace was made, and it became free again. The disorders which followed upon the death of Augustus III. in 1763 opened a field for Russian intrigue, and in 1764 the Russians took possession of the town and secured the election of Stanislaus Poniatowski, which led in 1773 to the first partition of Poland. In November 1794 the Russians took it again, after the bloody assault on Praga, but next year, in the third partition of Poland, Warsaw was given to Prussia. In November 1806 the town was occupied by the troops of Napoleon, and after the peace of Tilsit (1807) was made the capital of the independent duchy of Warsaw;

but the Austrians seized it on the 21st of April 1809, and kept possession of it till the 2nd of June, when it once more became independent. The Russians finally took it on the 8th of February 1813. On the 29th of November 1830, Warsaw gave the signal for the unsuccessful insurrection which lasted nearly one year; the city was captured after great bloodshed by Paskevich, on the 7th of September 183 1. Deportations on a large scale, executions, and confiscation of the domains of the hobilit) 7 followed, and until 1856 Warsaw remained under severe military rule. In 1862 a series of demonstrations began to be made in Warsaw in favour of the independence of Poland, and after a bloody repression a general insurrection followed in January 1863, the Russians remaining, however, masters of the situation. Executions, banishment to the convict prisons of Siberia, and confiscation of estates followed. Deportation to Siberia and the interior of Russia was carried out on an unheard-of scale. Scientific societies and high schools were closed; monasteries and nunneries were emptied. Hundreds of Russian officials were called in to fill the administrative posts, and to teach in the schools and the university; the Russian language was made obligatory in all official acts, in all legal proceedings, and even, to a great extent, in trade. The very name of Poland was expunged from official writings, and, while the old institu- tions were abolished, the Russian tribunals and administra- tive institutions were introduced. The serfs were liberated. Much rioting and lawless bloodshed took place in the city in 1905-1906. (P. A. K.; J. T. Be.)

WARSAW, a city and the county-seat of Kosciusko county, Indiana, U.S.A., on the Tippecanoe river, about no m. E.of Chi- cago. Pop. (1890)3547; (1900) 3987, including 102 foreign-born; (1910) 4430. Warsaw is served by the Pittsburg, Fort Wayne & Chicago (Pennsylvania system) and the Cleveland, Cincinnati, Chicago & St Louis railways, and by interurban electric lines. It is picturesquely situated in the lake country of Indiana on Center, Pike and Winona lakes. Immediately E. of the city, on Winona (formerly Eagle) Lake, which is about 2 by 3 m. and has an a- erage depth of 30 ft., is Winona (formerly Spring Fountain) Park (incorporated 1895 largely by Presbyterians), which primarily aims to combine the advantages of Northfield, Massachusetts, and Chautauqua, New York. There is excellent boating and bathing here, and there are mineral springs in the Park, where in the summer there are a Chautauqua course lasting for six weeks, a normal school, a Bible school, a Bible conference, a school of missions, an International Training School for Sunday School Workers, a conference of temperance workers and nature study and other regular summer school courses; and in other months of the year courses are given here by the Winona Normal School and Agricultural Institute, Winona Academy (for boys) and Winona Conservatory of Music, and the Winona Park School for Young Women. The control of the Park is

inter-denomi- national — the Winona Federated Church was organized in 1905. Under practically the same control is the Winona Technical Institute in Indianapolis. The surrounding country is devoted to farming and stock raising. Warsaw was first platted in 1836, and became a city in 1875.

WART (Lat. verruca), a papillary excrescence of the skin, or mucous membrane. The ordinary flat warts of the skin occur mostly upon the hands of children and young persons; a long pendulous variety occurs about the chin or neck of delicate children, and on the scalp in adults. Warts are apt to come out in numbers at a time; a crop of them suddenly appears, to disappear after a time with equal suddenness. Hence the sup- posed efficacy of charms. A single wart will sometimes remain when the general eruption has vanished. The liability of crops of warts runs in families. In after life a wart on the hands or fingers is usually brought on by some irritation, often repeated, even if it be slight. Warts often occur on the wrists and knuckles of slaughter-house men and of those much occupied with ana- tomical dissection; they are often of tuberculous origin (butchers' warts). Chimney-sweeps and workers in coal-tar, petroleum, &c, are subject to warts, which often become cancerous. Warts occur singly in later life on the nose or lips or other parts of the

face, sometimes on the tongue; they are very apt to become malignant. Towards old age broad and flattened patches of warts of a greasy consistence and brownish colour often occur on the back and shoulders. They also are apt to become malignant. Indeed, warts occurring on the lip or tongue, or on any part of the body of a person advanced in life, should be suspected of malignant associations and dealt with accordingly. Venereal warts occur as the result of gonorrhoeal irritation or syphilitic infection.

A wart consists of a delicate framework of blood-vessels sup- ported by fibrous tissue, with a covering of epidermic scales. When the wart is young, the surface is rounded; as it gets rubbed it is cleft into projecting points. The blood-vessels, whose outgrowth from the surface really makes the wart, may be in a cluster of parallel loops, as in the common sessile wart, or the vessels may branch from a single stem, making the long, pendulous warts of the chin and neck. The same kinds of warts also occur on mucous surfaces. It is owing to its vascularity that a wart is liable to come back after being shaved off; the vessels are cut down to the level of the skin, but the blood is still forced into the stem, and the branches are thrown out beyond the surface as before. This fact has a bearing on the treatment of warts, if they

are snipped off, the blood-vessels of the stem should be destroyed at the same time by a hot wire or some other caustic, or made to shrivel by an astringent. The same end is served by a gradually tightening ligature (such as a thread of elastic) round the base of the wart. Glacial acetic or carbolic acid may be applied on the end of a glass rod, or by a camel-hair brush, care being taken not to touch the adjoining skin. A solution of perchloride of iron is also effective in the same way. Nitrate cf silver is objectionable, owing to the black stains left by it. A simple domestic remedy, often effectual, is the astringent and acrid juice of the common stonecrop {Scdum acre) rubbed into the wart, time after time, from the freshly gathered herb. The result of these various applications is that the wart loses its firmness, shrivels up, and falls off. Malignant and tuberculous warts should be removed by the scalpel or sharp spoon, their bases, if thought advisable, being treated by pure carbolic acid.

A peculiar form of wart, known as verrugas, occurs endemically in the Andes. Jt is believed to have been one of the causes of the excessive mortality from haemorrhages of the skin among the troops of Pizarro. Attention was called to it by Dr Archibald Smith in 1842; in 1874, during the making of the Trans-Andean railway, it caused considerable loss of life among English navvies and engineers. (E. O.)*

WARTBURG, THE, a castle near Eisenach in the grand-duchy of Saxe-Weimar. It is magnificently situated on the tcp of a precipitous hill, and is remarkable not only for its historical associations but as containing one of the few well-preserved Romanesque palaces in existence. The original castle, of which some parts— including a portion of the above-mentioned palace (Landgrafenhaus) — still exist, was built by the landgrave Louis " the Springer " (d. 1123), and from his time until 1440 it re- mained the seat of the Thuringian landgraves. Under the landgrave Hermann I., the Wartburg was the home of a boister- ous court to which minstrels and " wandering folk " of all descriptions streamed; 1 and it was here that in 1207 took place the minstrels' contest {Sdngcrkrieg) immortalized in Wagner's Tannkduser. Some years later it became the home of the saintly Elizabeth of Hungary (q.v.) on her marriage to Louis the Saint (d. 1227), to whom she was betrothed in 1211 at the age of four. 2 It was to the Wartburg, too, that on the 4th of May 1521, Luther was brought for safety at the instance of Frederick the Wise, elector of Saxony, and it ws.s during his ten months' residence here (under the incognito of Junker Jorg) that he completed his translation of the New Testament.

From this time the castle was allowed gradually to decay. It was restored in the 18th century in the questionable taste of

1 Walther von der Vogelweide (ed. F. Pfeiffer 1880, No. 99) and Wolfram

von Eschenbach (Parzival vi. 526 and Wiilthalm 417, 26) both refer to the noise and constant crush of crowds passing in and out at the Wartburg " night and day."

1 Wagner, with a poet's licence, has placed the S&ngerkrieg during Elizabeth's residence at the Wartburg.

the period; but its present magnificence it owes to the grand- duke Charles Alexander of Saxe-Weimar, with whom at certain seasons of the year it was a favourite residence.

The most interesting part of the castle is the Romanesque Land-grafenhaus. This, besides a chapel, contains two magnificent halls known as the Sangersaal (hall of the minstrels)— in which Wagner lays one act of his opera — and the Festsaal (festival hall). The Sangersaal is decorated with a fine fresco, representing the minstrels' contest, by Moritz von Schwind, who also executed the frescoes in other parts of the building illustrating the legends of St Elizabeth and of the founding of the castle by Louis the Springer. The Festsaal has frescoes illustrating the triumphs of Christianity, by Welter. In the buildings of the outer court of the castle is the room once occupied by Luther, containing a much mutilated four-post bed and other relics of the reformer. The famous biot caused by Luther's hurling his ink-pot at the devil has long since become a mere hole in the wall, owing — it is said — to the passion of American tourists for 11 souvenirs."

The armoury (Riistkatntner) contains a fine collection of armour, including suits formerly belonging to Henry II. of France, the elector Frederick the Wise and Pope Julius II. The great watch-tower of the castle commands a magnificent view of the Thuringian forest on the one side and the plain on the other.

WARTHE (Polish, Warta), a river of Poland and Germany, and the chief affluent of the Oder. It rises on the north slope of the Carpathian Mountains N.W. of Cracow, flows north as far as Radomsk, then west, then north again past Sieradz, until it reaches Kola, where it again turns west, crosses the frontier into the Prussian province of Posen, where it takes a northerly direction past the town of Posen. Then once more bending west, it flows past Schwerin and Landsbcrg and enters the Oder from the right at Ciistrin. Its total length is 445 m. of which 215 are in Poland and 230 in Prussia; it is navigable up to Konin in West Poland, a distance of 265 m. Its. banks are mostly low and flat, its lower course especially running through drained and cultivated marshes. It is connected with the Vistula through its tributary the Netze and the Bromberg canal. The area of its drainage basin is 17,400 sq. m.

WART-HOG, the designation of certain hideous African wild swine (see Swine), characterized by the presence of large warty protuberances on the face, the large size of the tusks in both sexes, especially the upper pair, which are larger and stouter than the lower ones and are not worn at their summits, and the complexity and great size of the last pair of molar teeth in each jaw. The adults have frequently no teeth except those just mentioned, and nearly bare skins; and the young are uniformly coloured. Two nearly allied species are recognized, namely, the southern Phacochoerus aethiopicus, which formerly ranged as far south as the Cape, and the northern P. africanus, which extends to the mountains of Abyssinia, where It has been found at a high elevation. In South and East Africa wart-hogs frequent more or less open country, near water, and dwell in holes, generally those of the aard-vark. In Abyssinia, on the other hand, they spend the day among bushes, or in ravines, feeding at night.

WARTON, JOSEPH (1722-1800), English critic and poet, eldest son of Thomas Warton (see below), was baptized at Duns- fold, Surrey, on the 22nd of April 1722, and entered Winchester school on the foundation in 1735. William Collins was already there, and the two formed a friendship which was maintained through their Oxford career. They read Milton and Spenser together, and wrote verses, which, published in the Gentleman's Magazine, attracted the attention of Dr Johnson. Warton went to Oriel College, Oxford, in 1740, and took his. E.A. degree in 1744. He took holy orders, and during his father's lifetime acted as his curate at Basingstoke. He then went to Chelsea, London; but eventually returned to Basingstoke. He married, became rector of Winslade (1748), of Tun worth (1754); in 1755 he was appointed a master in Winchester school, and headmaster in 1766. He was not a successful schoolmaster, and when the boys mutinied against him for the third time he wisely resigned his position (1793).

His leisure was devoted to literature. W T arton was far from having the genius of Collins, but they were at one in their im- patience under the prevailing taste for moral and ethical poetry. Whoever wishes to understand how early the reaction against Pope's style began should read Warton's The Enthusiast,

or The Lover of Nature, and remember that it was printed in 1744, the year of Pope's death. " As he is convinced," he wrote in the preface (1746) to his Odes on Several Subjects, " that the fashion uf moralizing in verse has been carried too far, and as he looks upon invention and imagination to be the chief faculties of a poet, so he will be happy if the following odes

may be looked upon as an attempt to bring back poetry into its right channel." He published an edition (1753) in Latin and English of Virgil. This contained Christopher Pitt's version of the Acnevd, his own rendering of the Eclogues and Georgia in the heroic measure, and essays by Warburton and others. Warton himself appended essays on epic and didactic poetry, a life of Virgil and notes. He made the acquaintance of Dr Johnson, and wrote papers on Shakespeare and Homer in The Adventurer; and in 1757 he published the first part of an Essay on the Genius and Writings of Pope, an essay regarded at the time as revolu- tionary, by Johnson at least, because it put Pope in the second rank to Shakespeare. Spenser and Milton, on the ground that moral and ethical poetry, however excellent, is an inferior species. He held his own against Johnson in the Literary Club; and after enduring many jests about the promised second part of the essay and the delay in its appearance, published it at last, retracting nothing, in 1782. Warton's edition of Pope was published in 1797. An edition of Dryden, for which he had collected materials, was completed and published by his son in 1811. Warton was a prebendary of St Paul's and of Winchester Cathedrals, and held the livings of Upham and of Wickham, Hampshire, where he died on the 23rd of February i8co.

Sec Biographical Memoirs of the Late Rev. Joseph Warton, by John Wooll (vol. i., 1806, no more published).

WARTON, THOMAS (c. 1688-1745), English author, professor of poetry at Oxford, son of Anthony Warton, v/as born at Godal- ming about 16S8. He was educated at Hart Hall and Magdalen College, Oxford. He was satirized for his incompetence as professor of poetry by Nicholas Amhurst in. Terrae filius as " squinting Tom of Maudlin." He was vicar of Basingstoke, Hampshire, and master of the grammar-school of the town, where he had among his pupils Gilbert White, the naturalist. He received further preferments in the church, and died at Basingstoke on the 10th of September 1745. He published nothing during his lifetime, but after his death his son Joseph published some of his poetry under the title of Poems on Several Occasions ("1748).

WARTON, THOMAS (1728-1700), English poet-laureate and historian of poetry, younger son of Thomas Warton (see above), was born at Basingstoke on the oth of January 1728. He was still more precocious as a poet than his brother — translated one of Martial's epigrams at nine, and wrote The Pleasures of Melan- choly at seventeen— and he showed exactly the same bent, Milton and Spenser being his favourite poets, though he " did not fail to cultivate his mind with the soft thrillings of the tragic muse " of Shakespeare.

In a poem written in 1745 he shows the delight in Gothic churches and

ruined castles which inspired so much of his subse- quent work in romantic revival. Most of Warton's poetry, Humorous and serious — and the humorous mock-heroic was better within his powers than serious verse — was written before the age of twenty-three, when he took his M.A. degree and became a fellow of his college (Trinity, Oxford). He did not altogether abandon verse; his sonnets, especially, which are the best of his poems, were written later. But his main energies were given to omnivorous poetical reading and criticism. He was the first to turn to literary account the medieval treasures of the Bodleian Library. It was through him, in fact, that the medieval spirit which always lingered in Oxford first began to stir after its long inaction, and to claim an influence in the modern world. Warton, like his brother, entered the church, and held one after another, various livings, but he did not marry. He gave little attention to his clerical duties-, and Oxford always remained his home. In 1749 he published an heroic poem in praise of Oxford, The Triumph of Isis. He was a very easy and convivial as well as a very learned don. with a taste for

pothouses and crowds as well as dim aisles and romances in manuscript and black letter. The first proof that he gave of his extraordinarily wide scholarship was in his Observations on the Poetry of Spenser (1754). Three years later he was appointed professor of poetry, and held the office for ten years, sending round, according to the story, at the beginning of term to inquire whether anybody wished him to lecture. The first volume of his monumental work, The History of English Poetry, appeared . twenty years later, in 1774, the second volume in 1778, and the third in 1 78 1. A work of such enormous labour and research could proceed but slowly, and it was no wonder that Warton flagged in the execution of it, and stopped to refresh himself with annotating (1785) the minor poems of Milton, pouring out in this delightful work the accumulated suggestions of forty years.

In 1785 he became Camden professor of history, and was made poet-Iaureatc in the same year. Among his minor works were an edition of Theocritus, a selection of Latin and Greek inscriptions, the humorous Oxford Companion to the Guide and Guide to the Companion (1762); The Oxford Sausage (1764); an edition of Theocritus (1770); lives of Sir Thomas Pope and Ralph Bathurst, college benefactors; a History of the Antiquities of Kiddington Parish, of which he held the living (1781); and an Inquiry into the Authenticity of the Poems attributed to Thomas Rowley (1782). His busy and convivial life was ended by a paralytic stroke in May 1790.

Warton's poems were first collected in 1777, and he was engaged at the time of his death on a corrected edition, which appeared in 1791, with a memoir by his friend and admirer, Richard Mant. They were edited in 1822 for the British Poets, by S. W. Singer.

The History of English Poetry from the close of the nth to the Commencement of the 18th Century, to which are prefixed two Dissertations: I. On the Origin of Romantic Fiction in Europe; II. On the Introduc- tion of Learning into England (1774-1781) was only brought down to the close of the 16th century. It was criticized b;y J. Ritson in 1782 in A Familiar Letter to the Author. A new edition came out in 1824, with an elaborate introduction by the editor, Richard Price, who added to the text comments and emendations from Joseph Ritson, Francis Douce, George Ashby, Thomas Park and himself. Another edition of this, stated to be " further improved by the corrections and additions of several eminent antiquaries," appeared in 1840. In 1871 the book was subjected to a radical revision by Mr W. C. Hazlitt. He cut out passages in which Warton had been led into gross errors by misreading his authorities or relying on false information, and supplied within brackets information on authors or works omitted. Warton's matter, which was somewhat scattered, although he worked on a chronological plan, was in some cases re- arranged and the mass of profuse and often contradictory notes was cut down, although new information was added by the editor and his associates, Sir Frederick Madden, Thomas Wright, W. Aldis Wright, W. W. Skeat, Richard Morris and F. J. Furnivall. When all criticism has been allowed for the inaccuracies of Warton's work, and the unsatisfactory nature of his general plan, the fact remains that his book is still indispensable to the student of English poetry. Moreover, much that may seem commonplace in his criticism was entirely fresh and even revolutionary in his own day. Warton directed the attention of readers to early English literature, and, in view of the want of texts, rendered inestimable service by transcrib- ing large extracts from early writers. Of the poets cf the 16th century he was an extremely sympathetic critic and has not been superseded.

See " T. Warton and Machyn's Diary," by H. E. D. Blakiston in the English Historical Review (April 1896) for illustrations of his inaccurate methods.

WARWICK, EARLS OF. John Rous (c. 1411-1491% the historian of the earls of Warwick, gives an account of them from Brutus their founder through many mythical ancestors, among whom is the Guy of romance. The 1st earl of Warwick was Henry dc Ncwburgh (d. n 23), lord of Newbourg in Normandy and son of Roger de Beaumont. He became constable of Warwick Castle in 1068, and, though there is no proof that he actually came over with the Conqueror, his elder brother Robert de Beaumont, comte de Meulan, fought at Hastings. He apparently spent most of his time in Normandy, and was a baron of the Norman exchequer. He was created earl of Warwick early in the reign of William II. receiving a grant of the great estates of the Saxon, Thurkill of Aiden, in Warwickshire. Hi was attached throughout his life to Henry 1., and both the Beaumont brothers were faithful to the king at the time of the

conspiracy of the Norman nobles in nor. By hie wife Margaret, daughter of Geoffrey II., count of Perche, he had five sons and two daughters. He died on the 20th of June 1123, and was buried in the Norman abbey of Preaux, near Pont-Audemer, a family foundation of which he and his brother were patrons. At Warwick he founded the priory of the Austin Canons, and endowed the church of St Mary.*

Of his sons Roger de Newburgh became 2nd earl of Warwick and died in 1153; Rotrou (d. 1 139) became archbishop of Rouen; and Robert, seneschal and justiciar of Normandy, died in 1185 in the abbey of Bee, of which he was a benefactor. The 2nd earl was followed by his two sons in succession, William (d. 1 1 84) and Waleran (d. 1204). Henry de Newburgh, 5th earl of Warwick (1192-1229), took the royal side in the civil wars of the reigns of John and Henry III. The 6th earl, Thomas de Newburgh (c. 1213-1297), left no heirs, and was succeeded by his sister Margaret, countess of Warwick in her own right, who was twice married, but left no heirs. Her second husband, John du Plessis, assumed the title of earl of Warwick in 1245, and in 1250 received a grant of his wife's lands for life. He was succeeded in 1263 by Countess Margaret's cousin and heir, Sir William Mauduit (1 220-1 268), 8th carl of Warwick. Mauduit's sister and heiress, Isabel de Beauchamp, had apparently adopted the religious life at the time of her brother's death, and her son William de Beauchamp became 9th earl of Warwick.

His son Guy de Beauchamp, 10th earl of Warwick (1278- 1315), received grants of land in Scotland for his services at Falkirk, and in 1301 was one of the signatories of the letter to the pope denying the papal right to interfere in Scottish affairs. He was with Edward I. at the time of his death, and is said to have been warned by him against Piers Gaveston. He was one of the lords ordainers of 1310, and was concerned in the capture of Gaveston, though he declined to countenance his execution. He died on the 10th of August 1315. His son, Thomas de Beauchamp, nth earl (1313-1369), was marshal of England in 1344, and of the English army in France in 1346. He fought at Crecy and Poitiers, and w r as one of the original knights of the Garter.

Thomas de Beauchamp, 12th earl (c. 1345-1401), was about twenty-four years old when he succeeded his father. He served on the lords' committee of reform in the Good Parliament in 1376, and again in 1377, and was a member of the commission of inquiry in 1379. Appointed governor to Richard II. in February 1381, he joined the nobles who sought to impose

their authority on the king, and was one of the lords appellant in 1388. After the overthrow of his party in 1389 Warwick lived in retirement, but although he had for the moment escaped Richard'svengeance he was not forgiven. Being invited with Gloucester and Arundel to a banquet at court on the 10th of July 1397 he alone of the three was imprudent enough to obey the summons. He was immediately arrested and imprisoned in the Tower of London, in that part of the fortress since known as the Beauchamp Tower. Warwick made a full confession in parliament; his honours were forfeited and he himself banished. He was again in. the Tower in 1398, but was liberated and restored to his honours on the accession of Henry IV. His son Richard Beauchamp, 13th earl of Warwick, is separately noticed.

Henry, rˆh earl of Warwick (1423-1445), Earl Richard's son, a descendant, through his mother Constance le Despenser, of Edmund, duke of York, fifth son of Edward III., received a patent making him premier earl in 1444. A year later he was created duke of Warwick with precedence next after the duke of Norfolk, a rank disputed by the duke of Buckingham. The assertion that he was crowned king of the Isle of Wight seems to have no foundation in fact. The 14th earl, whose honours were pro- bably due to his lather's services, died in his twenty-second year, leaving a daughter Anne, who died in 1449. On her death the earldom lapsed to the crown. The estates passed to Sir Richard Neville (see Warwick, Richard Neville, earl of), in right of his wife Anne, sister of Henry Beauchamp, duke of Warwick. He and his wife were created earl and countess of Warwick each for life in 14ˆ0. with remainder to Anne's heirs, and> these

failing, to Margaret, countess of Shrewsbury, half-sister of the countess Anne. After the death of her husband, the Kingmaker, at Barnet in 1471, the rights of the countess, heiress of the Beauchamp estates, were set aside " as if the seid countes were nowe naturally dede " (act of 13 Edward IV. 1473) in favour of her daughters, Isabel, wife of George, duke of Clarence, and Anne, who, after the murder of her first husband Edward prince of Wales in 1471, married Richard, duke of Gloucester, afterwards Richard III. Their mother was allowed to resume her estates in 1487, but only to settle them on the crown. She was succeeded in 1493 in the earldom by her grandson Edward Plantagenct, 18th earl of Warwick (1475-1499), son of the duke of Clarence, and therefore the Yorkist heir to the crown. He was imprisoned in 1484, his sole offence being his birth, and was executed in 1499 on a charge of conspiracy with his fellow, prisoner, Perkin Warbeck. He was the last representative of the male line of the Plantagenets. His honours were forfeited, and his estates passed to his sister Margaret, countess of Salisbury in her own right, the unfortunate lady who was executed in i54i.

The next bearer of the title was John Dudley, Viscount Lisle, afterwards duke of Northumberland {q.v.)> who was created earl of Warwick in 1547, on account of his descent from Margaret, countess of Shrewsbury, daughter of Richard Beauchamp, earl of Warwick. The earldom became extinct with his son John Dudley, 20th earl of Warwick (c. 1528-1554), who was condemned to death for having signed the letters patent making his sister-in-law, Lady Jane Grey, heir apparent. He was released from prison in October 1554, but died in the same month. His brother, Ambrose Dudley (c. 1528-1590),' who fought at St Quentin in 1557, secured the reversal of the attainder of himself and his brother consequent on the attempt to place Lady Jane Grey on the throne, and in 1561 was created Baron Lisle and earl of Warwick. He was in high favour with Elizabeth, as was his third wife Anne, daughter of Francis Russell, 2nd earl of Bedford. His brother Robert, earl of Leicester, having predeceased him his honours became extinct on his death in 1590.

The earldom was revived in 161S in favour of Robert Rich, 3rd Baron Rich [c. 1560-1619), grandson of Lord Chancellor Rich, who died shortly after his elevation. His wife Penelope, Lady Rich, is separately noticed. He was succeeded in 1619 by his eldest son Robert Rich, 2nd or 23rd earl of Warwick (q.v.), whose twe sons Robert (1611-1659) and Charles (1610-1673) succeeded him in the earldom and died leaving no male issue. The 5th or 26th earl »f Warwick was their cousin Robert Rich (1620-1675), eldest son of Henry, rst earl of Holland. His grandson, the 7th or 28th earl, left no issue, and the title became extinct on the death, on the 15th of September 1759, of his kinsman Edward Rich, 8th or 29th earl. It was revived two months later, when Francis Greville, Baron Brooke oT Beauchamps Court (1719- 1773), who had in 1746 been created Earl Brooke of Warwick Castle, became earl of Warwick. Greville was descended from Robert Greville, the 2nd baron, who was killed at Lichfield during the civil war and he represented a cadet branch of the Beauchamp family. His son George (1746-1816) became the 2nd earl of this line, and the earldom has remained with his descendants, Francis Richard (b. 1853) becoming the 5th earl in 1893. His wife, Frances Evelyn, countess of Warwick, daughter of Colonel the Hon. C. H. Maynard (d. 1S65), inherited the estates of her grandfather, Henry Maynard, 5th and last Viscount Maynard (1788-1865). She became well known in society, and later for her interest in social questions.

WARWICK, SIR PHILIP (1609-1683), English writer and politician, was the son of Thomas Warwick, or Warrick, a musician, and was born in Westminster on the 24th of December 1609. Educated at Eton, he travelled abroad for some time and in 1636 became secretary to the lord high treasurer, William Juxon; later he was a member of the Long Parliament, being one of those who voted against the attainder of Strafford and who

followed Charles I. to Oxford. He fought at Edgehill and was one of the king's secretaries during the negotiations with the

parliament at Hampton Court, and also during those at Newport, Charles speaking very highly of his services just before his execution. Remaining in England, Warwick was passively loyal to Charles II. during the Commonwealth and enjoyed the con- fidence 'of the royalist leaders. In 1660 the king made him a knight, and in 1661 he became a member of parliament and secretary to another lord treasurer, Thomas Wriothesley, earl of Southampton, retaining this post until the treasury was put into commission on Southampton's death in May 1667. He died on the 15th of January 1683. Warwick's only son, the younger Philip Warwick (d. 1683), was envoy to Sweden in 16S0.

Warwick is chiefly known for his Memoirs of the reigne of King Charles I., with a continuation to the happy restauration of King Charles II., written between 1675 and 1677 and published in London in 1701.

WARWICK, RICHARD BEAUCHAMP, Earl of (1382-1439), son of Thomas Beauchamp, was born at Salwarp in Worcester- shire on the 28th of January 1382, and succeeded his father in 1401. He had some service in the Welsh War, fought on the king's side at the battle of Shrewsbury on the 22nd of July 1403, and at the siege of Aberystwith in 1407. In 1408 he started on a pilgrimage to the Holy Land, visiting on his way Paris and Rome, and fighting victoriously in a tournament with Pandolfo Malatesta at Verona. From Venice he took ship to Jaffa, whence he went to Jerusalem, and set up his arms in the temple. On his return he travelled through Lithuania, Prussia and Germany, and reached England in 1410. Two years later he was fighting in command at Calais. Up to this time Warwick's career had been that of the typical knight errant. During the reign of Henry V. his chief employment was as a trusted counsellor and diplomatist. He was an ambassador to France in September 1413, and the chief English envoy to the coronation of Sigi'smund at Aix-la-Chapelle, and to the council of Constance in the autumn of 1414. During the campaign of Agincourt he was captain of Calais, where in April 1416 he received Sigismund with such courtly magnificence as to earn from him the title of the " Father of Courtesy." In the campaigns of 1417-18 Warwick took a prominent part, reducing Domfront and Caudebec. Then he joined the king before Rouen, and in October 1418 had charge of the negotiations with the dauphin and with Burgundy. Next year he was again the chief English spokesman in the conference at Meulan, and afterwards was Henry's

representative in arrange- ing the treaty of Troyes. At the sieges of Melun in 1420, and of Mantes in 1421-22 he held high command. Warwick's sage experience made it natural that Henry V. should on his death-bed appoint him to be his son's governor. For some years to come he was engaged chiefly as a member of the council in England. In 1428 he received formal charge of the little king's education. He took Henry to France in 1430, and whilst at Rouen had the superintendence of the trial of Joan of Arc. In 1431 he defeated Tothon de Xaintrailles at Savignies. Next year he returned to England. The king's minority came nominally to an end in 1437. Warwick was then not unnaturally chosen to succeed Richard of York in the government of Normandy. He accepted loyally a service " full far from the ease of my years," and went down to Portsmouth in August, but was long detained by bad weather, " seven times shipped or ever he might pass the sea/' and only reached Honfleur on the 8th of November. In Nor- mandy he ruled with vigour for eighteen months, and died at his post on the 30th of April 1439. His body was brought home and buried at Warwick. His tomb in St Mary's church is one of the most splendid specimens of English art in the 15th century. Warwick married (1) Elizabeth Berkeley, (2) Isabella Despenser. By his second wife he left an only son Henry, afterwards duke of Warwick, who died in 1445, and a daughter Anne, who as her brother's sister of the whole blood brought the title and chief share of the estates to her husband Richard Neville, the king-maker. By his first wife he had three daughters, of whom the eldest, Margaret, married John Talbot, earl of Shrewsbury.

Bibliography. — John Rous (d. 1491) wrote a life of Warwick, illustrated with over fifty drawings, now at the British Museum (Cotton MS. Juliua E. iv.). They have been reproduced in Strutt's

Manners and Customs; new edition by Mr Emery Walker, with notes by Lord Dillon and Mr W. St John Hope. More authoritative material must be sought in strictly contemporary chronicles, and especially in the Vila Henrici Qi«'«Ji ascribed to Elmham, Monstrelet ; Chronicles of London (ed. C. L. Kingsford) and j. Stevenson, Letters, &c. illustrative of the English Wars in France (" Rolls " series). For modern accounts consult J. II. Wylie, Henry IV. \ C. L. Kingsford, Henry V. ; and Sir James Ramsay, Lancaster and York. (C. L. K.)

WARWICK, RICHARD NEVILLE, Earl of (1428-1471),

called " the king-maker," was eldest son of Richard Neville, earl of Salisbury, by Alice, only daughter and heiress of Thomas, the last Montacute earl of Salisbury. He was born on the 22nd of November 1428, and whilst still a boy betrothed to Anne, daughter of Richard Beauchamp, earl of Warwick. W r hen her brother's daughter died in 1449, Anne, as

only sister of the whole blood, brought her husband the title and chief share of the Warwick estates. Richard Neville thus became the premier earl, and both in power and position excelled his father. Richard, duke of York, was his uncle, so when York became protector in 1453, and Salisbury was made chancellor, it was natural that Warwick should be one of the council. After the king's recovery in 1455 Warwick and his father took up arms in York's support. Their victory at St Albans on the 22nd of May was due to the fierce energy with which Warwick assaulted and broke the Lancastrian centre. He was rewarded with the important office of captain of Calais; to his position there he owed his strength during the next five years. Even when York was displaced at home, Warwick retained his post, and in 1457 was also made admiral. He was present in February 1458 at the professed reconciliation of the two parties in a loveday at St Paul's, London. During the previous year he had done some good fighting on the march of Calais by land, and kept the sea with vigour; now on his return he distinguished himself in a great fight with Spanish ships off Calais on the 28th of May, and in the autumn by captur- ing a German salt-fleet on its way to Lubcck. These exploits brought him a prestige and popularity that were distasteful to the home government. Moreover, England was at war neither with Castile nor with the Hanse. Warwick's action may possibly have formed part of some Yorkist design for frustrating the foreign policy of their rivals. At all events there was pretext enough for recalling him to make his defence. Whilst he was at the court at Westminster a brawl occurred between his re- tainers and some of the royal household. Warwick himself escaped with difficulty, and went back to Calais, alleging that his life had been deliberately attempted. When in the following year a renewal of the war was imminent, Warwick crossed over to England with his trained soldiers from Calais under Sir Andrew Trollope. But at Ludlow on the 12th of October Trollope and his men deserted, and left the Yorkists helpless. Warwick, with his father, his cousin the young Edward of York, and only three followers, made his way to Barnstaple. There they hired a little fishing vessel. The master pleaded that he did not know the Channel, but Warwick resourcefully took command and himself steered a successful course to Calais. He arrived just in time to anticipate the duke of Somerset, whom the Lancastrians had sent to supersede him. During the winter Warwick held Calais against Somerset, and sent out a fleet which seized Sandwich and captured Lord Rivers. In the spring he went to Ireland to concert plans with Richard of York. On his return voyage he encountered a superior Lancastrian fleet in the Channel. But Exeter, the rival commander, could not trust his crews and dared not fight.

From Calais Warwick, Salisbury and Edward of York crossed to Sandwich on the 26th of June. A few days later they entered London, whence Warwick at once marched north. On the 10th of July he routed the

Lancastrians at , Northampton, and took the king prisoner. For the order to spare the commons and slay the lords Warwick was responsible, as also for some later execu- tions at London. Yet when Richard of York was disposed to claim the crown, it was, according to Waurin, Warwick who decided the discussion in favour of a compromise, perhaps from loyalty to Henry, or perhaps from the wish not to change a weak sovereign for a strong. Warwick was in charge of London at the

time when Richard and Salisbury were defeated and slain at Wakefield. The Lancastrians won a second victory at St Albans on the i-th of February 1461, possibly through lack of general- ship on Warwick's part. But in his plans to retrieve the disaster Warwick showed skill and decision. He met Edward of York in Oxfordshire, brought him in triumph to London, had him proclaimed king, and within a month of his defeat at St Albans was marching north in pursuit of the Lancastrians. The good generalship which won the victory of Towton may have been due to Edward rather than to Warwick, but the new king was of the creation of the powerful earl, who now had his reward. For four years the government was centred undisputedly in the hands of Warwick and his friends. The energy of his brother John, Lord Montagu, frustrated the various attempts of the Lancastrians in the north. In another sphere Warwick himself was determining the lines of English policy on the basis of an alliance with France. The power of the Nevilles seemed to be completed by the promotion of George, the third brother, to be archbishop of York. The first check came with the announce- ment in September 1464 of the king's secret marriage to Elizabeth Woodville. This was particularly distasteful to Warwick, who had but just pledged Edward to a French match. For the time, however, there was no open breach. The trouble began in 1466, when Edward first made Rivers, the queen's father, treasurer, and afterwards threw obstacles in the way of an intended marriage between Warwick's daughter Isabel and George of Clarence, his own next brother. Still in May 1467 Warwick went again with the king's assent to conclude a treaty with France. He returned to find that in his absence Edward, under Woodville's influence, had committed himself definitely to the Burgundian alliance. Warwick retired in dudgeon to his estates, and began to plot in secret for his revenge. In the summer of 1469 he went over to Calais, where Isabel and Clarence were married without the king's knowledge. Meantime he had stirred up the rebellion of Robin of Redesdale in Yorkshire; and when Edward was drawn north Warwick invaded England in arms. The king, outmarched and outnumbered, had to yield himself prisoner, whilst Rivers and his son John were executed. Warwick was apparently content with the overthrow of the

Woodvilles, and believed that he had secured Edward's submission. In March 1470 a rebellion in Lincolnshire gave Edward an oppor- tunity to gather an army of his own. When the king alleged that he had found proof of Warwick's complicity, the earl, taken by surprise, fled with Clarence to France. There, through the instrumentality of Louis XL, he w'as with some difficulty reconciled to Margaret of Anjou, and agreed to marry his second daughter to her son. In September Warwick and Clarence, with the Lancastrian lords, landed at Dartmouth. Edward in his turn had to fly oversea, and for six months Warwick ruled England as lieutenant for Henry VI. , who was restored from his prison in the Tower to a nominal throne. But the Lancastrian restoration was unwelcome to Clarence, w r ho began to intrigue with his brother. When in March 147 1 Edward landed at Ravenspur, Clarence found an opportunity to join him. Warwick was completely outgenerailed, and at Barnet on the 14th of April was defeated and slain.

Warwick has been made famous by Lytton as " The Last of the Barons." The title suits him as a great feudal lord, who was a good fighter but a poor general, who had more sympathy with the old order than with the new culture. But he was more than this. He had some of the qualities of a strong ruler, and the power to command popularity. He was a skilled diplomatist and an adroit politician. These qualities, with his position as the head of a great family, the chief representative of Beauchamp, Despenser, Montacute and Neville, made him during ten years " the king-maker."

Warwick's only children were his two daughters. Anne, the younger, was married after his death to Richard of Gloucester, the future Richard III. Their husbands shared his inheritance and quarrelled over its division.

Bibliography. — Warwick of course fills a great place in con- temporary authorities; for a note on the chief of them see

under Edward IV. For modern authorities see especially C. W. Oman's brilliant but enthusiastic Warwick the King-Maker, Sir James Ramsay's Lancaster and York, and Stubbs's Constitutional History. (C. L. K.)

WARWICK, SIR ROBERT RICH, 2ND Earl o? (15S7-1658), colonial administrator and admiral, was the eldest son of Robert Rich, earl of Warwick (see above) and his wife Penelope Rich (q-v.), and succeeded to the title in 1619. Early interested in colonial ventures, he joined the Bermudas, Guinea, New England and Virginia companies. His enterprises involved him in disputes with the East India Company (1617) and with the Virginia Company, which in 1624 was suppressed through his action. In 1627 he commanded an unsuccessful privateering expedition against the

Spaniards. His Puritan connexions and sympathies, while gradually estranging him from the court, pro- moted his association with the New England colonies. In 1628 he indirectly procured the patent for the Massachusetts colony, and in 1631 he granted the " Saybrook " patent in Connecticut. Compelled the same year to resign the presidency of the New England Company, he continued to manage the Bermudas and Providence Companies, the latter of which, founded in 1630, administered Old Providence on the Mosquito coast. Mean- while in England Warwick opposed the forced loan of 1626, the payment of ship-money and Laud's church policy, and with his brother the first lord Holland {q.v.) came to be recognized as one of the heads of the Puritans. In March 1642 the Commons, in spite of the king's veto, appointed him admiral of the fleet, and in July he gained the whole navy for the parliament. He raised forces in Norfolk and Essex on the outbreak of the war, and as lord high admiral (1643-1645) he did good service in intercepting the king's ships and relieving threatened ports. In 1643 he was appointed head of a commission for the government of the colonies, which the next year incorporated Providence Planta- tions, afterwards Rhode Island, and in this capacity he exerted himself to secure religious liberty. Reappointed lord high admiral in May 1648, in the vain hope that his influence with the sailors would win back the nine ships which had revolted to the king, he collected a new fleet and blockaded them at Helvoetsluys. Dismissed from office on the abolition of the House of Lords in 1649, he retired from public life, but was intimately associated with Cromwell, whose daughter Frances married his grandson and heir Robert Rich in 1657. He died on the 19th of April 1658. The suspicions cast by his enemies on his religious sincerity and political fidelity appear to be baseless.

WARWICK, a town of Merivale county, Queensland, Australia, 169 m. by rail S.W. of Brisbane. Pop. (1901) 3836. It lies on the bank of the river Contadamine, in the heart of one of the best agricultural districts in Queensland, and is perhaps the most attractive inland town in the colony. It is well laid out with many substantial public and private buildings, and has two large parks, besides smaller recreation grounds. The district is famous for its vineyards, and quantities of excellent w r ine are made; wheat and maize are the principal crops, but tobacco, oats and lucerne are largely grown. Coal is found near the town, as are also marble, good building stone and brick clay.

WARWICK, a municipal and parliamentary borough, and the county town of Warwickshire, England; finely situated on the river Avon, the Warwick & Napton and Birmingham canals, 98 m. N.W. from London. Pop. (1901) 11,889. It is served by the Great Western and the London & North-western railways. The parliamentary borough was united with that of Leamington in 1885, and returns one member. Leaming- ton lies 2 m. E.,

and the towns are united by the suburb of New Milverton.

The magnificent castle of the earls of Warwick stands in a commanding and picturesque position on a rocky eminence above the river. Its walls, enclosing a lovely lawn and gardens, are flanked by towers, of which Caesar's tower, 147 ft. high, the Gateway tower and Guy's tower are the chief, dating from the 14th century. The residential portion lies on the river side. Excepting a few traces of earlier work, its appearance is that of a Drincely mansion of the 17th century. There is

a famous collection of pictures. The Great Hall and other apartments suffered from fire in 1871, but were restored. A vase of marble attributed to the 4th century B.C. is preserved here; it was discovered near Hadrian's Villa at Tivoli in Italy. Below the castle the Avon, with thickly wooded banks, affords one of the most exquisite reaches of river scenery in England. The church of St Mary is principally, as it stands, a rebuilding of the time of Queen Anne, after a fire in 1694. It appears from Domesday that a church existed before the Conquest. It was made collegiate by Roger dc Ncwburgh, the second Norman earl, in 1123. At the Dissolution Henry VIII. granted the foundation to the burgesses of the town. The Eeauchamp Chapel survived the fire; it is a beautiful example of Perpendicular work, founded by the will of Earl Richard Beauchamp, and built between 1443 and 1464. The fine tomb of the earl stands in the centre. There are only scanty traces of the old town walls, but the east and west gates remain, rendered picturesque by chapels built above them . The priory of St Sepulchre was founded by Henry de Ncwburgh and completed in the reign of Henry I., on the site of an ancient church, for a society of canons regular. It is now a private residence. Leicester Hospital, established by Robert Dudiey, earl of Leicester, is a picturesque example of half-timber building. It was originally used as the hall of the united gilds of the Holy Trinity, the Blessed Virgin and St George the Martyr. The earl of Leicester, by an act of incorporation ob- tained in 1 57 1, founded the hospital for the reception of twelve poor men possessing not more than £5 a year, and a master. The first master, appointed by the earl himself, was the famous Puritan, Thomas Cartwright. St John's Hospital, a foundation of the time of Henry II., is represented by a beautiful Jacobean mansion. There are numerous charities in the town, the principal being those of Henry VIII., Sir Thomas White and Thomas Oken. The first is devoted to ecclesiastical and municipal stipends and to the King's School. By the charity of Sir Thomas White, the sum of £100 is lent, without interest, to young trades- men for a period of nine years. The King's School, an important foundation for boys,

dates from the reign of Edward the Con- fessor. It occupies modern buildings. Upon the same foundation are the high school for girls and the King's middle school. Among public buildings are a shire hall, free library and museum. Industries include gelatine- and brick-making, and there are ironworks. The parliamentary borough returns one member. Area, 5613 acres.

A famous site in the vicinity of Warwick is Guy's Cliffe, where a modern mansion, embodying ancient remains, crowns the precipitous rocky bank of the Avon. Here was the hermitage of the first Guy, earl of Warwick. Blacklow Hill in the vicinity was the scene of the execution of Piers Gaveston, the favourite courtier of Edward II., in 131 2.

Warwick (Warwic, Warrewici, Warrewyk) is said to have been a Roman station, and was later fortified by ˆthclflced, the lady of Mercia, against the Danes. At the time of the Domesday Survey, Warwick was a royal borough, containing 261 houses, of which 130 were in the king's hands, while 19 belonged to burgesses who enjoyed all the privileges they had had in the time of Edward the Confessor. The Conqueror granted the borough to Henry of Newburgh, who was created earl of Warwick, and in all probability built the castle on the site of ˆthelflaed's fortification. The Bcauchamps, successors of Henry of Newburgh as earls of Warwick, held the borough of the king in chief. Although the borough owed its early importance to the castle of the earls of Warwick as well as to its position, and received a grant of a fair from John, earl of Warwick, in 1261, it seems to have developed independently of them, and received no charter until it was incorporated under the title of the burgesses of Warwick in 1546 after it had come into the king's hands by the attainder of Edward, earl of Warwick, in 1499. Other charters were granted in 1553, 1665, 1684 and 1694, of which that of 1553 allowed the appointment of assistant burgesses, though this was discontinued in 1698 because through their means a candidate for the borough was elected who was not supported by the recorder and aldermen. The charter of 1694

conferred the title of " Mayor, Aldermen and Burgesses " on the corporation, and appointed the offices of the borough. The mayor, aldermen and assistant burgesses were to assemble yearly at Michaelmas, and in the presence of all the burgesses nominate two aldermen, who should elect the new mayor and other officers. A mayor refusing office was to be fined £20, an alderman £to and an assistant burgess £5. In T882 the borough was divided into three wards, and the corporation consists of a mayor, 6 aldermen and 18 town councillors. Warwick returned two members to parliament from 1295, but in 1885 the number was reduced to one. In addition to the fair granted by the earl to the burgesses in ra6r, he himself held by prescriptive right a yearly fair in August and a market

every Wednesday. Another fair was granted in 1 290, and in t4i3 the fair held at Michaelmas was changed to the feast of St Bartholomew. Fairs are now held on the 1 2th of October and on the Monday before St Thomas's day. A market is held every Saturday, the first charter for this being granted in r545. A gaol is mentioned here as early as 1 200 in a pipe roll of that year.

WARWICK, a township of Kent county, Rhode Island, U.S.A., about s m. S. of Providence, on the W. side of Narragansett Bay (here called Providence river) and crossed by the Pawtuxet river, which is in its lower course a part of the township's northern boundary. Pop. (1890) 17,761; (1900) 21,316, of whom 7792 were foreign-born; (J910 census) 26,629. The township is crossed by the New York, New Haven & Hartford railway, and electric lines serve most of its twenty-seven rather scattered villages. The larger villages are: on the river, Pontiac, Natick, River Point (at the junction of the two upper branches of the Pawtuxet), Phoenix, Centreville and Crompton; on Greenwich Bay, Apponaug and Warwick; and on Providence river, Shawomet, Warwick Neck, Oakland Beach, Buttonwoods, Conimicut and Long Meadow, which are summer resorts. Water power is provided by the Pawtuxet river, and much cotton and some woollen and print goods are manufactured. The value of the factory product in r905 was $7,051,971 (17-1% more than in 1900); of the total, nine-tenths was the value of textile products. Warwick, originally called Shawomet (Shawmut), its Indian name, was settled in 1643 by Samuel Gorton (q.v.) and a few followers. Gorton quarrelled with the Indians, was carried off to Boston, was tried there for heresy, was convicted, and was imprisoned; was released with orders to leave the colony in March 1644, went to England, and under the patronage of the earl of Warwick returned to his settlement in 1648 and renamed it in honour of the earl. In 1647 the settlement entered into a union with Providence, Newport and Portsmouth under the Warwick (or Williams) charter of r644, but during 1651- 1654 Warwick and Providence were temporarily separated from the other two towns. Warwick was the birthplace of General Nathanael Greene.

WARWICKSHIRE, a midland county of England, bounded N. by Staffordshire, E. by Leicestershire and Northamptonshire, S. by Oxfordshire and Gloucestershire, and W. by Worcestershire.. The area is 902-3 sq. m. The river Avon, watering a rich valley on a line from N.E. to S.W., divides the county into two unequal parts. The greater, lying to the N.W., drains principally to the Trent through the rivers Cole, Blythe, Rea, Anker and minor streams. Between these valleys, and dividing the system from that of the Avon, the land rises in gentle undulations, and is of plateau-like character, generally between 400 and 600 ft. in eleva- tion. There are considerable tracts of this nature on the western boundary, both north and south of Birmingham, on the eastern boundary north of Rugby, and in the

centre between the Blythe, the Anker and the Avon. From this side the Avon receives the Swift, the Sowe and the Alne. The northern district was distinguished by Camden as the Woodland, as opposed to the southern or Feldon, " a plain champain." The northern wood- land embraced the ancient forest of Arden (q.v.) and it is this district which gave to the county the common epithets of " woody " or " leafy." The Feldon or south-eastern district is almost wholly in the Avon valley. From this side the Avon receives the Leam, the Itchen and the Stour. Along the

south-eastern boundary runs the highest line of hills in the county, reaching some 800 ft., and including Edge Hill (which gives name to the battle of 1642), and the Brailes, Dassett, Napton and Shuckburgh hills. The county boundary here extends across the highest line of hills, to include the headwaters of some of the feeders of the Cher well, and thus a small part of the drainage area of the Thames. These hills rise abruptly, and command wide views over the champaign. The finest silvan scenery is found on the banks of the Avon; the position of Guy's Cliffe and of Warwick Castle are well-known examples. It is not difficult to trace the influence of the scenic characteristics of the county in the writings of its most famous son, William Shake- speare.

Geology. — The Archean rocks are represented by _ some volcanic ashes and intrusive dykes (the Caldecote Series), which are exposed north-west of Nuneaton. They dip south-westward under the Cambrian beds— Hartshill Quartzite and Stockingford Shales— which give rise to higher ground; the quartzite, which is opened up in numerous large roadstone quarries, contains towards its summit a fauna suggesting that of the Olenellu-s zone, one of the oldest faunas known. The quartzite as well as the overlying shales is seamed with intrusive dykes of diorite. A small inher of the same shales occurs at Dosthill, south of Tamworth. The Coal Measures of the Warwickshire coalfield crop out in the north of the county between Nuneaton and Tamworth and contain valuable coal-seams; they pass conformably under the so-called Permian red sandstones and marls which are apparently the equivalents of the Keele Beds of Staffordshire, and like them should be grouped with the Coal Measures; they occupy a considerable area north and west of Coventry, and at Corley form high ground (625 ft.) ; in several places shafts have been sunk through them to the productive Coal Measures below. The rest of the county is occupied in the northern half by the Triassic red rocks, and in the south-east by the Lias. Of the Trias the Bunter (soft red sandstones with pebble-beds) is repre- sented only between Birmingham and Sutton Coldfield, where it is

succeeded by the Keuper Sandstone, which is occasionally exposed also around the edge of the coalfield (Tamworth, Coventry, Warwick; Maxstoke) ; the Keuper Marls occupy a large area in the centre of the county, while some sandstones in them form picturesque scarps near Henley- in -Ard en. The highly fnssiliferous Rhaetic beds which introduce the Lias are seldom exposed. The Lower Lias limestones are worked for cement (as near Rugby) and abound in ammonites. The Middle Lias sands and limestones follow, and form escarpments (as at Edge Hill, 710 ft.); but these and the lowest members of the Oolite series scarcely cross the county boundary from Oxfordshire. Glacial drifts — boulder-clay, sand and gravel — overspread large areas of the older rocks; their composition shows them to have been deposited from glaciers or ice-sheets which entered the district from the Irish Sea, from North Wales and from the North Sea. Later fluvio-glacial gravels of the Avon valley have yielded mammalian remains (hippopotamus, mammoth, &c), while palaeolithic imple- ments of quartzite have been found in the old gravels uf the Rca near Birmingham. Coal, ironstone, lime and cement are the chief mineral products; manganese ore was formerly got from the Cambrian rocks.

Climate and Agriculture. — The climate is generally mild and healthy. The soil is on the whole good, and consists of various loams,' marls, gravels and clays, well suited for most of the usual crops. It is rich in pasture-land, and dairy-farming is increasing. It has excellent orchards and market-gardens, and possesses some of the finest woodlands in England. About five-sixths of the total area, a high proportion, is under cultivation, and of this abouttwo-thirds is in permanent pasture. Oats and wheat occupy the greater part of the area under grain crops. In connexion with the cattle- rearing and dairy-farming, over half the acreage under green crops is occupied by turnips, swedes and mangolds.

Industries. — The industrial part of the county is the northern. Warwickshire includes the greatest manufacturing centre of the Midlands — Birmingham, though the suburbs of that city extend into Staffordshire and Worcestershire. Metal -working in all branches is prosecuted here, besides other industries. Coventry is noted for cycle-making, and, with Bedworth and Nuneaton and the intervening villages, is a seat of the ribbon- and tape -makers. A small rich coalfield occurs in the north-east, extending outside the county northward from Coventry. Clay, limestone and other stone are quarried at various points, and an appreciable amount of iron ore is raised.

Communications, — The main line of the London & North-Western railway runs within the county near the N.E. boundary, by Rugby, Nuneaton and Tamworth, with branches to Leamington and War- wick, Coventry and Birmingham, and cross-branches. The northern line of the Great Western

railway runs through Leamington and Warwick to Birmingham, with branches to Stratford-on-Avon and Henley-in-Arden. The Leicester and Birmingham branch of the Midland railway crosses the north of the county by Nuneaton, and the Birmingham- Evesham line of this company serves Alcester.

The East and West Junction railway, from Blisworth in North-amptonshire, serves Stratford-on-Avon and terminates at Broom Junction on the Evesham line of the Midland. Water communica- tion through the east of the county is afforded by the Oxford and Coventry canals. The Warwick & Napton canal joins the Oxford at Napton; the Warwick & Birmingham joins these towns, and the Stratford on Avon is a branch from it. The Fazeley canal runs N.E. from Birmingham. None of the rivers is of commercial value for navigation.

Population and Administration. — The area of the ancient county is 577,462 acres, with a population in 1891 of 805,072, and in 1901 of 897,835, the chief centres of increase lying natur- ally in the parts about Birmingham and Coventry. The area of the administrative county is 579,885 acres. The municipal boroughs are: Aston Manor (pop. 77,326), Birmingham (522,204), Coventry (69,978), Leamington, officially Royal Leamington Spa (26,888), Nuneaton (24,996), Stratford-on-Avon (8310), Sutton Coldfield (14,264) and Warwick (11,889), the county town. The urban districts are: Bulkington (1548), Erdington ■ (16,368), Ken il worth (4544) and Rugby (16,830). Among the tpwns not appearing in these lists there should be mentioned: Alcester (2303), Atherstone (5248), Bedworth (7169), Coleshill (2593), Foleshill (5514) and Solihull (7517). Warwickshire is in the midland circuit, and assizes are held at Warwick. It has one court of quarter sessions, and is divided into 14 petty sessional divisions. The boroughs of Birmingham, Coventry, Royal Leamington Spa, Stratford-on-Avon, Sutton Coldfield and Warwick have separate commissions of the peace, and the boroughs of Birmingham and Warwick have., in addition, separate courts of quarter sessions. The total number of civil parishes is 267. The county, which is mostly in the diocese of Worcester, but also extends into those of Lichfield, Gloucester, Peterborough and Oxford, contains 297 ecclesiastical parishes or districts, wholly or in part. Warwickshire has four parlia- mentary divisions — Northern or Tamworth, North-eastern or Nuneaton, South-eastern or Rugby, and South-western or Strat- ford-on-Avon, each returning one member. The parliamentary boroughs of Aston Manor, Coventry and Warwick return one member each, and that of Birmingham has seven divisions, each returning one member.

Birmingham is the seat of a university, of the large grammar school of King Edward VI., and of other important educational institutions. At Rugby is

one of the most famous of English public schools. The King's School, Warwick, is a large boys' school, and the Leamington High School is for girls. There is a day training college for schoolmasters and schoolmistresses in connexion with Mason University College, Birmingham. Among other institutions there may be mentioned the Lady Warwick College for the instruction of women in the higher branches of agriculture, &c, founded by Frances, countess of Warwick, at Reading in 1898, and subsequently removed to Studley Castle in western Warwickshire, where there is accommodation for 50 students.

History. — The earliest English settlers in the district now known as Warwickshire were a tribe of Hwiccas who, pushing up the Severn valley in the 6th century, made their way along the passages afforded by the Avon valley and the Roman Fosse Way, the extent of their settlement being indicated by the ancient limits of the diocese of Worcester. The vast forest of Arden, stretching from the Avon to the site of the modern Birmingham, barred any progress northwards, at the same time affording protection from the Anglian tribes who were already settled about Atherstone, and it was only after the battle of Cirencester in 628 that the whole of the Hwiccan territory was comprised in Mercia. In 675 Cosford was included in the endowment of Peterborough, and in 757 iEthelbald was slain at Seckington in a battle with the West Saxons. The shire of Warwick origin ated in the 10th century about ˆEthelflasd's new burgh at Warwick, and is mentioned by name in the Saxon Chronicle in 1016, when it was harried by Canute. The Danes made frequent incursions in the district in the 10th and nth centuries, but no I traces of their settlements occur south of Rugby. I The shire offered little resistance to the Conqueror, who was

WASH, THE

at Warwick in 1068, and Thurkill the sheriff was one of the few Englishmen to retain large estates which he had held before the conquest, his family long continuing in the county under the name of Arden. The fortification which he had raised at Warwick William entrusted to Henry, son of Roger de Beaumont, after- wards earl of Warwick, and Robert, count of Meulan, Henry's elder brother, had an important fief. Coventry Minster was richly endowed, and in 1285 the prior claimed among other privileges to have an independent coroner and to. hold two courts a year. The earldom and castle of Warwick subsequently passed to the Beauchamps, and in the reign of Henry VI. to the Nevilles. The Clintons, founders of the castles and priories at Maxstoke and Kenilworth, enjoyed large estates in tie county during the Norman period.

The ten Domesday hundreds of Warwickshire are now reduced to four, all of which are mentioned in the 12th century. Hemling- ford represents the Domesday hundred of Coleshill; Rnightlow, the Domesday hundreds of Bomelau, Meretone and Stanlei; Kineton, the Domesday hundreds of Tremelau, Honesberie, Fexhole and Berricestone; Barlichway, the Domesday hundreds of Femecumbe and Patelau. Coleshill took its name from Coles- hill, a town near the junction of the Cole and the Blythe; Hemlingford from a ford over the Tame near Kingsbury; Knightlow from a hill on Dunsmore Heath; Meretone and Stanlei from the villages of Marton and Stoneleigh; Berrice- stone from Barcheston on the Stour; Barlichway from a plot of ground on a hill between Haselor and Burton. Patelau hundred, which derived its name from a tumulus between Wootton Wawen and Stratford-on-Avon, was a liberty of the bishops of Worcester, and in the 17th century, though reckoned part of Barlichway hundred, possessed a court leet and court baron. The boundaries of Warwickshire have remained prac- tically unchanged since the Domesday Survey, but Spilsbury, now in Oxfordshire, Romsley, Shipley, Quat and Rudge, now in Shropshire, and Chillington, now in Staffordshire, were assessed under this county, while Sawbridge, Berkswell, Whitacre, Over and Whichford, now in this county, were assessed under Northamptonshire. Warwickshire was united with Leicester- shire under one sheriff until 1566, the shire court for the former being held at Warwick.

In the 13th century Warwickshire included the deaneries of Warwick and Kineton within the archdeaconry and diocese of Worcester; the rest of the county constituting the archdeaconry of Coventry within the Lichfield diocese, with the deaneries of Coventry, Stoneley, Merton and Arden. In 1836 the arch- deaconry of Coventry was annexed to the diocese of Worcester, and in 1854 its deaneries were entirely reconstituted and made thirteen in number. In i86r the deanery of Alcester was formed within the archdeaconry of Worcester, and Kineton was divided into North Kineton

and South Kineton. In 1894 the deaneries of Aston, Birmingham, Coleshill, Northfield, Polesworth, Solihull and Sutton Coldfield were formed into the archdeaconry of Birmingham, the archdeaconry of Coventry now including the deaneries of Atherstone, Baginton, Coventry, Dassett Magna,- Dunchurch, Leamington, Monks Kirby, Rugby and Southam.

In the wars of the reign of Henry III. Simon de Montfort placed Kenilworth Castle in charge of Sir John Giffard, who in 1264 attacked Warwick Castle and took prisoner the earl and countess of Warwick, who had supported the king. During the Wars of the Roses the Nevilles, represented by the earl of Warwick, supported the Yorkist cause, while Coventry was a Lancastrian stronghold. On the outbreak of the Civil War of the 17th century Warwickshire and Staffordshire were associated for the parliament under Lord Brooke. The battle of Edgehill was fought in 1642, and in 1643 Birmingham, then a small town noted for its Puritanism, was sacked by Prince Rupert. Coventry endured a siege in 1642, and skirmishes took place at Southam and Warwick.

At the time of the Domesday Survey the industries of Warwick- shire were almost exclusively agricultural, the extensive wood- lands north of the Avon affording pasturage for sheep, while

meadows and water-mills were numerous in the river valleys. The woollen industry flourished in Norman times, and Coventry was famed for its wool and broadcloths in the reign of Edward III. Coal was probably dug at Griff in the 12th century, but the Warwickshire collieries only came into prominence in the 17th century, when John Briggs of Bedworth made an attempt to monopolize the coal trade. Birmingham was already famous for its smiths and cutlers in the 16th century. In the early 17th century the depopulation and distress caused by the enclosures of land for pasture led to frequent riots. The silk, industry at Coventry and the needle industry about Alcester both flourished in the 18th century.

Warwickshire returned two members to the parliament of 1290, and in. 1295 Coventry and Warwick were each represented by two members. Tamworth returned two members in 1584. Under the Reform Act of 1832 the county returned four members in two divisions; Birmingham was represented by two members, and Tamworth was disfranchised. Under the act of 1868 the representation of Birmingham was increased to three members.

Antiquities, — Of pre-Norman architecture some traces appear in the fine church of Wootton Wawen in the Arclcn (western) district. Otherwise the

type is scarce, but Saxon remains, such as burial urns and jewelrv, have been found in several places, as near Bcnsford Bridge on Watling Street. For ecclesiastical architecture Coventry with its three spires is famous, and among village churches there are many fine examples. Of those retaining Norman portions may be mentioned: Wolston and Berkswell in the Coventry district; Polesworth, formerly conventual, and Curdworth in the north; and in the south, in the neighbourhood of Edgehill, Burton Dassett, a very noteworthy building, and Warmington, where there is a remarkable specimen of domus indusi or anchorite's chamber. There are also fine examples of Decorated work, such as Knowle, Solihull and Temple Balsall in Arden, and Brailes under the southern hills. Among the numerous religious houses in the county several have left remains. Such are the Cistercian foundations of Coombe Abbey near Coventry, of the 12th century, adjoining the mansion of that name in a beautiful park; of Merevalc near Atherstone; and of Stoneleigh near Kenilworth, also adjoining a famous mansion. This abbey was a 12th-century foundation, but a majestic gatehouse of the 14th century also stands. Maxstoke Priory, in Arden, was a foundation for Augustinian canons of the 14th century. Wroxall Abbey was a Benedictine nunnery of the 12th century; but the name is given to a modern mansion. In view of the large share the county has had in war, it is not surprising to find many examples of great fortified houses or castles. Warwick Castle and Kenilworth Castle, the one still a splendid residence, the other a no less splendf.d ruin, arc described under those towns. At Hartshill (the birthplace of Michael Drayton the poet) there is a fragment of a Norman castle. Among fortified mansions Maxstoke Castle is of the 14th century; Baddesley Clinton Hall is of the 15th as it stands, but is an earner foundation; Astley Castle is another good specimen of the period. Cpmpton Wyniates, once fortified, is a beautiful Elizabethan house of brick, so remarkably hidden in a hollow of the southern hills as to. be visible only from the closest proximity on all sides; Charles I. lodged here during the Civil Wars. Charlecote Park is a modernized Elizabethan hall in an exquisite situation on the Avon above Strat- ford. Of more modern mansions Arbury Hall, Astley Castle, Newnham Paddox, Ragley Hall and Walton Hall may be mentioned.

See Victoria County History, Warwickshire; Sir William Dugdale, The Antiquities of Warwickshire (London, 1656; 2nd ed., 2 vols., London, 1730); W. Smith, A History of the County of Warwick (Birmingham, 1830); J, T. Burgess, Historic Warwickshire (London, 1876); Early Earthworks in Warwickshire (Birmingham, 1884); S. Timmins, History of Warwickshire (" Popular County History " series) (London, 1889); J. Hannet, The Forest of Arden (London,

1863).

WASH, THE, a shallow bay of the North Sea, on the Lincoln, shire and Norfolk coast of England. It is roughly square in shape, penetrating the land for 22 m., and being 20 m. wide at the head and 1 2 at the mouth . Through the sandbanks which form its bed there are two main channels into deep water; one, Boston Deeps, is kept open by the waters of the Witham and Welland; the other, Lynn Deeps, gives passage to those of the Nene and the Great Ouse. The Wash is the remnant of a much larger bay, which covered a large part of the Fens which now border it; it is gradually filling with the deposits of the rivers, and from time to time small portions are reclaimed (see Fens). The flat bordering lands are protected by sea-walls. The formerly dangerous passage of the marsh-lands, which were liable to irruptions of the tide, is illustrated by the accident to

King John in 1216 shortly before his death. Passing over the Cross Keys Wash, near Sutton Bridge, his baggage and treasure wagons were engulfed and he himself barely escaped with life.

WASHBURN, CADWALLADER COLDEN (1818-1882), American soldier and politician, was born at Livermore, Maine, on the 22nd of April 1818. He was admitted to the bar in 1842, and removed to Mineral Point, Wisconsin, where he practised law, speculated in land and engaged in banking. He became prominent in the Republican party, and was a member (1855- 1861) of the U.S. House of Representatives, of which his brother Israel (181ˆ-1883) was a member from Maine in 1851-1861; his brother Liihu Benjamin (see below) changed the spelling of the family surname to Washburne. At the beginning of the Civil War he became colonel of the Second Wisconsin Cavalry, was promoted to brigadier-general on the 16th of July 1862 and to major-general on the 29th of November 1862, and assisted in the capture of Vicksburg (4th July 1863), after which he served in Texas and West Tennessee. Resigning from the army in 1S65, he became extensively interested in flour-milling and lumbering in Wisconsin. From 1867 to 1S71 he was again a member of the U.S. House of Representatives, and subsequently served one term (1872-1874) as governor of Wisconsin.

WASHBURN, a city and the county-seat of Bayfield county, Wisconsin, U.S.A., about 52 m. E. of Superior, Wis., and about 6 m. N. of Ashland, on Chequamegon Bay, an arm of Lake Superior. Pop. (1910) 3830. Washburn is served by the Northern Pacific and the Chicago & North-

Western railways, and by several lines of lake steamships. The city is finely situated on high land above the bay, and is a popular summer resort, being especially well known for its boating and fishing. It has a Carnegie library. Among its manufactures are staves, shingles, lumber, wooden ware and bricks. There is a powder and dynamite plant in the vicinity. In the city there are also grain elevators and large coal docks, and in the neighbourhood are valuable stone quarries. In 1659 Radisson and Groseilliers touched here on their trip alongthc south shoreof Lake Superior. In 1665 Father Claude Allouez, the Jesuit, established on the shore of the bay, a short distance south of the present city, the first French mission in Wisconsin, which he named " La Pointe rlu Saint Esprit," and which in 1660 was placed in charge of Father Jacques Marquette. The place was visited by Du Luth in 1681-1682, and here in 1693 Le Sueur, a fur trader, built a stockaded post. In 1718 a fort was erected and a French garrison placed in it. About 1820-1821 a trading post of the American Fur Company was established in the neighbourhood. The present city, named in honour of Governor C. C. Washburn, dates from about 1S79, but its growth was slow until after 1888. It was chartered as a city in 1904.

WASHBURNE, ELIHU BENJAMIN (1816-1887), American statesman, born in Livermore, Maine, on the 23rd of September i S 1 6. He was one of seven brothers, of whom four sat in Congress from as many different states. He received a common school education, graduated at the Harvard Law School in 1839, and was soon afterwards admitted to the bar. In 1840 he removed to Galena, Illinois. He was elected to Congress in 1852, where, first as a Whig and afterwards as a Republican, he represented his district continuously until 1869, taking a prominent part in debate, and earning the name " watch-dog of the Treasury " by his consistent and vigorous opposition to extravagant and unwise appropriations. He contributed much to aid General Grant during the Civil War, and the latter on becoming President made Washburne secretary of state. On account of ill-health, however, he served only twelve days, and was then appointed minister to France, where during the Franco- Prussian War and the Commune he won much distinction as protector of German and other foreign citizens in Paris. He was the only foreign minister who remained at his post during the Commune. In 1877 he retired from public life, and died in Chicago, Hi., on the 22nd of October 18S7. He published Recollections of a Minister to France (2 vols., 1887), and edited The Edwards Papers (1884).

WASHINGTON, BOOKER TALIAFERRO (c. r8so-),

American negro teacher and reformer, was born on a plantation near Hale's Ford, Franklin county, Virginia. Soon after the Civil War he went to Maiden, West Virginia, where he worked in a salt furnace and then in a coal mine. He obtained an elementary education at night school, and

worked as a house servant in a family where his ambition for knowledge was encouraged. In 1872 " by walking, begging rides both in wagons and in thecars " he travelled 500 m. to the Hampton (Virginia) Normal and Agricultural Institute, where he remained three years, working as janitor for his board and education, and graduated in 1875. For two years he taught at Maiden, West Virginia, and studied for eight months (187S-1879) at the Way- land Seminary in Washington, B.C. In 1879 he became in- structor at the Hampton Institute, where he trained about seventy-five American Indians with whom General S. C. Armstrong was carrying on an educational experiment, and he developed the night school, which became one of the most important features of the institution. In 1881 he was appointed organizer and principal of a negro normal school at Tuskegee, Alabama (q.v.), for which the state legislature had made an annual appropriation of $2000. Opened in July 1881 in a little shanty and church, the Tuskegee Normal and Industrial Institute became, under Washington's presidency, the foremost exponent of industrial education for the negro. To promote its interests and . to establish better understanding between whites and blacks, Washington delivered many addresses throughout the United States, notably a speech in 1895 at the opening of the Atlanta Cotton States and International Exposition. In 1900 at Boston. Massachusetts, he organized the National Negro Business League. Harvard conferred upon him the honorary degree of A.M. in 1896, and Dartmouth that of LL.D. in 1901.

Among his publications are a remarkable autobiography, Up from Slavery (1901), The Future of the American Negro {1899), Sowing and Reaping (1900), Character Building (1902), Working with the Hands (1904), Tuskegee and its People (1905) , Putting the most into Life (1906), Life of Frederick Douglass (1907), The Negro in Business (1907) and The Story of the Negro (1909).

WASHINGTON, BUSHEOD (1762-1829), American jurist, nephew of George Washington, was born in Westmoreland county, Virginia, on the 15th of June 1762. He graduated in 1778 at the College of William and Mary, where he was an original member of the Phi Beta Kappa Society; was a member of a volunteer cavalry troop in 1780; studied law in Philadelphia in 1781, and began practice in his native county. He served in the House of Delegates in 1787, and in the following year sat in the convention which ratified for Virginia the Federal Con- stitution. After living in Alexandria for a short time he removed to Richmond and in 1798 was appointed an associate justice of the United States Supreme Court by President John Adams. He was George Washington's literary executor, and supervised the preparation of John Marshall's Life of Washington (5 vols., 1804-1807) ; and on Mrs Washington's death in 1802 he inherited Mount Vernon and a part of the estate. He died in Philadelphia on the 26th of

November 1829.

WASHINGTON, GEORGE (1732-1799), the first president of the United States, was born at Bridges Creek, Westmoreland county, Virginia, on the 22nd (Old Style nth) of February 1732. The genealogical researches of Mr Henry E. Waters seem to have established the connexion of the family with the Washingtons of Sulgrave, Northamptonshire, England. The brothers John and Lawrence Washington appear in Virginia in 1658. John took up land at Bridges Creek, became a member of the House of Burgesses in 1666, and died in 1676. His eldest son, Lawrence, married Mildred Warner, by whom he had three children — John, Augustine (1694-1 743) and Mildred. Augustine Washington married twice. By the first marriage, with Jane Butler, there were four children, two of whom, Lawrence and Augustine, grew to manhood. By the second marriage, in 1730, with Mary Ball, descendant of a family which migrated to Virginia, in 1657, there were six children— George, Betty, Samuel, John, Charles and Mildred. Upon the death of the father, Lawrence inherited the estate at Hunting Creek, on the Potomac,

later known as Mount Vernon, and George the estate on the Rappahannock, nearly opposite Fredericksburg, where his father usually lived.

Of Washington's early life little is known, probably because there was little unusual to tell. The story of the hatchet and the cherry-tree, and similar tales, are undoubtedly apocryphal, having been coined by Washington's most popular biographer, Mason Weems (d. 1825). l There is nothing to show that the boy's life was markedly different from that common to Virginia families in easy circumstances; plantation affairs, hunting, fishing, and a little reading making up its substance. From 1735 to 1739 he lived at what is now called Mount Vernon, and after- wards at the estate on the Rappahannock. His education was only elementary and very defective, except in mathematics, in which he was largely self-taught; and although at his death he left a considerable library, he was never an assiduous reader. Although he had throughout his life a good deal of official contact with the French, he never mastered their language. Some careful reading of good books there must have been, however, for in spite of pervading illiteracy, common in that age, in matters of grammar and spelling, he acquired a dignified and effective English style. The texts of his writings, as published by Jared Sparks, have been so " edited " in these respects as to destroy their value as evidence; but the edition of Mr Worthington C. Ford restores

the original texLs. Washington left school in the autumn of 1747, and from this time wc begin to know something of his life. He was then at Mount Vernon with his half-brother Lawrence, who was also his guardian. Lawrence was a son-in-law of William Fairfax, proprietor of the neighbouring plantation of Bel voir, and agent for the extensive Fairfax lands in the colony. Lawrence had served with Fairfax at Cartagena, and had made the acquaintance of Admiral Edward Vernon, from whom Mount Vernon was named. The story that a commission as midshipman was obtained for George through the good offices of the admiral, but that the opposition of the boy's mother put an end to the scheme, seems to lack proof. In 1748, however, through the influence of Thomas. Lord Fairfax, the head of the family, who had come to America to live, Washington, then only sixteen years of age, was appointed surveyor of the Fairfax property; and an appointment as public surveyor soon followed. The next three years were spent in this service, most of the time on the frontier. He always retained a disposition to speculate in western lands, the ultimate value of which he early appreciated; many of his later investments of this character are treated in C. W. Butter- field's Washington-Crawford Letters (1877). He seems, too, to have impressed others already with his force of mind and char- acter. In 1 751 he accompanied his half-brother Lawrence, who was stricken with consumption, to the West Indies, where he had an attack of small-pox which left him marked for life. Lawrence died in the following year, making George executor under the will and residuary heir of Mount Vernon; and the latter estate became his in 1761.

In October 1753, on the eve of the last French and Indian war, Washington was chosen by Governor Robert Dinwiddle as the agent to warn the French away from their new posts on the Ohio, in western Pennsylvania. He accomplished the winter journey safely, though with considerable danger and hardship; and shortly after his return was appointed lieutenant-colonel of a Virginia regiment, under Colonel Joshua Fry. In April 1754 he set out with two companies for the Ohio, defeated (28th May) a force of French and Indians at Great Meadows (in the present Fayette county, Pennsylvania), but at Fort Necessity in this viciniiy was forced to capitulate (3rd July), though only after a vigorous defence. For his services he received the thanks of the House of Burgesses. When General Edward Braddock arrived in Virginia in February 1755, Washington wrote him a diplomatically worded letter, and was presently made a member

1 Weems was a Protestant Episcopal clergyman, who first published a brief biography of Washington in iSoo, and later (1806) consider- ably expanded it and introduced various apocryphal anecdotes. The biography, though worthless, had an immense circulation, and is to a considerable degree responsible for the traditional conception of Washington.

of the staff, with the rank of colonel. His personal relations with Braddock were friendly throughout, and in the calamitous defeat he showed for the first time that fiery energy which always lay hidden beneath his calm and unruffled exterior. He ranged the whole field on horseback, making himself the most conspicuous target for Indian bullets, and, in spite of what he called the " dastardly behaviour " of the regular troops, saved the expedition from annihilation, and brought the remnant of his Virginians out of action in fair order. In spite of his reckless exposure, he was one of the few unwounded officers. In August, after his return, he was commissioned commander of the Virginia forces, being then twenty-three years old. For about two years his task was that of " defending a frontier of more than 350 m. with 700 men/' a task rendered the more difficult by the insubordination and irregular service of his soldiers, and by irritating controversies over official precedence. To settle the latter question he made a journey to Boston, in 1756, to confer with Governor William Shirley. In the winter of 1757 his health broke down, but in the next year he had the pleasure of com- manding the advance guard of the expedition under General John Forbes which occupied Fort Duquesne and renamed it Fort Pitt. (See Pittsburg: History.) At the end of the year he resigned his commission, the war in Virginia being at an end, and in January i75g married Martha Dandridge (1732-1802), widow of Daniel Parke Custis.

*For the next fifteen years Washington's life at Mount Vernon, where he made his home after his marriage, was that of a typical Virginia planter of the more prosperous sort, a consistent member and vestryman of the Established (Episcopal) Church, a large slave-holder, a strict but considerate master, and a widely trusted man of affairs. His extraordinary escape in Braddock's defeat had led a colonial preacher to declare in a sermon his belief that the young man had been preserved to be " the saviour of his country "; but if there was any- such impression it soon died away, and Washington gave his associates no reason to consider him a man of uncommon endowments. His marriage brought him an increase of about $100,000 in his property, mak- ing him one of the richest men in the colonies; and he was able to develop his plantation and enlarge its extent. His attitude towards slavery has been much discussed, but it does not seem to have been different from that of many other planters of that day; he did not think highly of the system, but had no invincible repugnance to it, and saw no way of getting rid of it. In his treatment of slaves he was exacting, but not harsh, and was averse to selling them save in case of necessity. His diaries show a minutely methodical conduct of business, generous indulgence in hunting, comparatively little reading and a wide acquaintance with the leading men of the colonies, but no marked indications of what is usually considered to be " greatness." As in the *:ase of Lincoln, he was educated into greatness by the increasing weight of his*

responsibilities and the manner in which he met them. Like others of the dominant planter class in Virginia, he was repeatedly elected to the House of Burgesses, but the business which carne before the colonial assembly was for some years of only local importance, and he is not known to have made any set speeches in the House, or to have said anything beyond a .statement of his opinion and the reasons for it. He was present on the 29th of May 1 765, when Patrick Henry introduced his famous resolutions against the Stamp Act. That he thought a great deal on public questions, and took full advantage of his legislative experience as a means of political education, is shown by his letter of the 5th of April 1769 to his neighbour, George Mason, communicating the Philadelphia non-importation resolutions, which had just reached him. In this he considers briefly the best means of peaceable resistance to the policy of the ministry., but even at that early date faces frankly and fully the probable final necessity of resisting by force, and endorses it, though only as a last resort. In May following, when the House of Burgesses was dissolved, he was among the members who met at the Raleigh tavern and adopted a non-importation agreement; and he himself kept the agreement when others did not. Though on friendly terms with Governor Norborne Berkeley, Baron

Botetourt and his successor, John Murray, earl of Dunmore, he nevertheless took a prominent part, though without speech- making, in the struggles of the Assembly against Dunmore, and his position was always a radical one. As the breach widened, he even opposed petitions to the king and parliament, on the ground that the claims to taxation and control had been put forward by the ministry on the basis of right, not of ex- pediency, that the ministry could not abandon the claim of right and the colonies could not admit it, and that petitions must be, as they already had been, rejected. " Shall we," he writes in a letter, " after this whine and cry for relief? "

On the 5th of August 1774 the Virginia convention appointed Washington as one of seven delegates to the first Continental Congress, which met at Philadelphia on the 5th of September, and with this appointment his national career, which was to continue with but two brief intervals until his death, begins. His letters during his service in Congress show that he had fully grasped the questions at issue, that he was under no delusions as to the outcome of the struggle over taxation, and that he expected war. " More blood will be spilled on this occasion," he wrote, " if the ministry are determined to push matters to extremity, than history has ever yet furnished instances of in the annals of North America." His associates in

Congress at once recognized his military ability, and although he was not a member of any of the committees of the Congress, he seems to have aided materially in securing the endorsement by Congress of the Suffolk county, Massachusetts, resolves (see Mtlton, Mass.) looking towards organized resistance. On the adjourn- ment of the Congress he returned to Virginia, where he con- tinued to be active, as a member of the House of Burgesses, in urging on the organization, equipment and training of troops, and even undertook in person to drill volunteers. His attitude towards the mother country at this time, however, must not be misunderstood. Much as he expected war, he was not yet ready to declare in favour of independence, and he did not ally himself with the party of independence until the course of events made the adoption of any other course impossible. In March 1775 he was appointed a delegate from Virginia to the second Continental Congress, where he served on committees for fortifying New York, collecting ammunition, raising money and formulating army rules. It seems to have been generally understood that, in case of war, Virginia would expect him to act as her commander-in-chief, and it was noticed that, in the second Congress, he was the only member who habitually appeared in uniform. History, however, was to settle the matter on broader lines. The two most powerful colonics were Virginia and Massachusetts. The war began in Massachusetts, troops from New England flocking to the neighbourhooc} of Boston almost spontaneously; but the resistance, if it was to be effective, must have the support of the colonies to the southward, and the Virginia colonel who was serving on all the military com- mittees of Congress, and whose experience in the Braddock campaign had made his name favourably known in England, was the obvious as well as the politic choice. When Congress, after the fights at Lexington and Concord, resolved that the colonies ought to be put in a position of defence, the first practical step was the unanimous selection (June 15), on motion of John Adams of Massachusetts, of Washington as commander-in-chief of the armed forces of the United Colonies. Refusing any salary and asking only the reimbursement of his expenses, he accepted the position, asking " every gentleman in the room,' however, to remember his declaration that he did not believe himself to be equal to the command, and that he accepted it only as a duty made imperative by the unanimity of the call. He reiterated this belief in private letters even to his wife; and there seems to be no doubt that, to the day of his death, he was the most determined sceptic as to his fitness for the positions to which he was successively called. He was commissioned on the 17th of June 1775, set out at once for Cambridge, Mass., and on the 3rd of July took command of the levies there assembled for action against the British garrison in Boston. The battle of Bunker Hill had already taken place, news of it reaching him on the way*

north. Until the following March, Washington's work was to bring about

some semblance of military organization and discipline, to collect ammunition and military stores, to corre- spond with Congress and the colonial authorities, to guide military operations in widely separate parts of the country, to create a military system for a people entirely unaccustomed to such a thing and impatient and suspicious under it, and to bend the course of events steadily towards driving the British out of Boston. He planned the expeditions against Canada under Richard Montgomery and Benedict Arnold, and sent out privateers to harass British commerce. It is not easy to see how Washington survived the year 1775; the colonial poverty, the exasperating annoyances, the outspoken criticism of those who demanded active operations, the personal and party dis- sensions in Congress, the selfishness or stupidity which cropped out again and again among some of the most patriotic of his coadjutors were enough to have broken down most men. They completed his training. The change in this one winter is very evident. If he was not a great man when he went to Cambridge, he was both a general and a statesman in the fullest sense when he drove the British out of Boston in March 1776. From that time until his death he was admittedly the foremost man of the continent.

The military operations of the remainder of the War of Inde- pendence are described elsewhere (see American War of Independence). Washington's retreat through New Jersey; the manner in which he turned and struck his pursuers at Trenton and Princeton, and then established himself at Morristown, so as to make the way to Philadelphia impassable; the vigour with which he handled his army at the Brandywine and Germantown; the persistence with which he held the strategic position of Valley Forge through the dreadful winter of 1777-1778, in spite of the misery of his men, the clamours of the people and the impotence and meddling of the fugitive Congress — all went to show that the fibre of his public character had been hardened to its permanent quality. " These are the times that try men's souls," wrote Thomas Paine at the beginning of 1776, and the words had added meaning in each year that followed; but Washington had no need to fear the test. The spirit which culminated in the treason of Benedict Arnold was a serious addition to his burdens; for what Arnold did others were almost ready to do. Many of the American officers, too, had taken offence at the close personal friendship which had sprung up between the marquis dc La Fayette and Washington, and at the diplomatic deference which the commander-in-chief felt compelled to show to other foreign officers. Some of the foreign volunteers were eventually dis- missed politely by Congress, on the ground that suitable employ- ment could not be found for them. The name of one of them, Thomas Conway, an Irish soldier of fortune from the French service, is attached to what is called " Conway's Cabal," a scheme for superseding Washington by General Horatio Gates, who in October 1777 succeeded in forcing Burgoyne to capitulate at

Saratoga, and who had been persistent in his depreciation of the commander-in-chief and in intrigues with members of Congress. A number of officers, as well as of men in civil life, were mixed up in the plot, while the methods employed were the lowest forms of anonymous slander; but at the first breath of exposure every one concerned hurried to cover up his part in it, leaving Conway to shoulder both the responsibility and the disgrace. The treaty of alliance of 1778 with France, following the surrender of Burgoyne, put an end to all such plans. It was absurd to expect foreign nations to deal with a second-rate man as commander-in-chief while Washington was in the field, and he seems to have had no further trouble of this kind. The prompt and vigorous pursuit of Sir Henry Clinton across New Jersey towards New York, and the battle of Monmouth, in which the plan of battle was thwarted by Charles Lee, another foreign recruit of popular reputation, closed the military record of Washington, so far as active campaigning was concerned, until the end of the war. The British confined their operations to other parts of the continent, 'and Washington, alive as ever to the importance of keeping up connexion with New England,

devoted himself to watching the British in and about New York City. It was in every way fitting, however, that he who had been the mainspring of the war from the beginning, and had borne far more than his share of its burdens and discouragements, should end it with the campaign of Yorktown, conceived by himself, and the surrender of Comwallis (October 1 781). Although peace was not concluded until September 1783, there was no more important fighting. Washington retained his commission until the 23rd of December 1783, when, in a memorable scene, he returned it to Congress, then in session at Annapolis, Md., and retired to Mount Vernon. His expenses during the war, including secret service money, aggregated about $64,000; in addition he expended a considerable amount from his private fortune, for which he made no claim to reimbursement.

By this time the popular canonization of Washington had fairly begun. He occupied a position in American public life and in the American political system which no man could possibly hold again. He may be said to have Become a political element quite apart from the Union, or the states, or the people of either. In a country in which newspapers had at best only a local circulation, and where communication was still slow and difficult, the knowledge that Washington favoured anything superseded, with very many men, both argument and the necessity of information. His constant correspondence with the governors of the states gave him a quasi-paternal

attitude towards govern- ment in general. On relinquishing his command, for example, he was able to do what no other man could have done with either propriety or safety: he addressed a circular letter to the governors, pointing out changes in the existing form of govern- ment which he believed to be necessary, and urging " an in- dissoluble union of the states under one federal head," " a regard to public justice," the adoption of a suitable military establishment for a time of peace, and the making of " those mutual concessions which are requisite to the general prosperity." His refusal to accept a salary, either as commander-in-chief or as president, might have been taken as affectation or im- pertinence in any one else; it seemed natural and proper enough in the case of Washington, but it was his peculiar privilege. It is even possible that he might have had a crown, had he been willing to accept it. The army, at the end of the war, was justly dissatisfied with its treatment. The officers were called to meet at Newburgh, and it was the avowed purpose of the leaders of the movement to march the army westward, appropriate vacant public lands as part compensation for arrears of pay, leave Congress to negotiate for peace without an army, and " mock at their calamity and laugh when their fear cometh." Less publicly avowed was the purpose to make their commander-in-chief king, if he could be persuaded to aid in establishing a monarchy. Washington put a summary stop to the whole pro- ceeding. A letter written to him by Colonel Lewis Nicola, on be- half of this coterie, detailed the weakness of a republican form of government as they had experienced it, their desire for " mixed government." with him at its head, and their belief that " the title of king " would be objectionable to but few and of material advantage to the country. His reply was peremptory and indignant. In plain terms he stated his abhorrence of the proposal; he was at a loss to conceive what part of his conduct could have encouraged their address; they could not have found " a person to whom their schemes were more disagree- able " ; and he charged them, " if you have any regard for your- self or posterity, or respect for me, to banish these thoughts from your mind, and never communicate, as from yourself or any one else, a sentiment of the like nature." His influence, and his alone, secured the quiet disbanding of the discontented army. That influence was as powerful after he had retired to Mount Vernon as before the resignation of his command. The Society of the Cincinnati, an organization composed of officers of the late war, chose him as its first president; but he insisted that the Society should abandon its plan of hereditary member- ship, and change other features of the organization against which there had been public clamour. When the legislature of Virginia gave him 150 shares of stock in companies formed for the

improvement of the Potomac and James rivers, and he was unable to refuse them lest his action should be misinterpreted, he extricated himself by

giving them to educational institutions. His voluminous correspondence shows his continued concern for a standing army and the immediate possession of the western military posts, and his interest in the development of the western territory. From public men in all parts of the country he received such a store of suggestions as came to no other man, digested it, and was enabled by means of it to speak with what seemed infallible wisdom. In the midst of a burden of letter- writing, the minute details in his diaries of tree-planting and rotation of crops, and his increasing reading on the political side of history, he found time to entertain a stream of visitors from all parts of the United States and from abroad. Among these, in March 1785, were the commissioners from Virginia and Maryland, who met at Alexandria (q.v.) to form a commercial code for Chesapeake Bay and the Potomac, and made an oppor- tunity to visit Mount Vernon. From that moment the current of events, leading into the Annapolis Convention (see Anna- polis, Md.) of 1786 and the Federal Convention of the following year, shows Washington's close supervision at every point.

When the Federal Convention met at Philadelphia in May 1787 to frame the present constitution, Washington was present as a delegate from Virginia, though much against his will; and a unanimous vote at once made him the p-residing officer. Natur- ally, therefore, he did not participate in debate; and he seems to have spoken but once, and then to favour an amendment reducing from 40,000 to 30,000 the minimum population required as a basis of representation in the House. The mere suggestion, coming from him, was sufficient, and the change was at once agreed to. He approved the constitution which was decided upon, believing, as he said, " that it was the best constitution which could be obtained at that epoch, and' that this or a dissolu- tion awaits our choice, and is the only alternative." As president of the convention he signed the constitution, and kept the papers of the convention until the adoption of the new government, when they were deposited in the Department of State. All' his vast influence was given to secure the ratification of the new instrument, and his influence was probably decisive. When enough states had ratified to assure the success of thenew government, and the time came to elect a president, there was no hesitation. The office of president had been " cut to fit the measure of George Washington," and no one thought of any other person in connexion with it. The unanimous vote of the electors made him the first president of the United States; their unanimous vote elected him for a second time in 1702— 1703; and even after he had positively refused to serve for a third term, two electors voted for him in 1796-1797. The public events of his presidency are given elsewhere (see United States, § History). While the success of the new government was the work of many men and many causes, one cannot resist the conviction that the factor of chief importance was the existence, at the head of the executive department, of

such a character as Washington. It was he who gave to official intercourse formal dignity and distinction. It was he who secured for the president the power of removal from office without the intervention of the Senate. His support of Hamilton's financial plans not only insured a speedy restoration of public credit, but also, and even more important, gave the new government constitutional ground on which to stand; while his firmness in dealing with the " Whisky Insurrection " taught a much-needed and wholesome lesson of respect for the Federal power. His official visits to New England in 1789, to Rhode Island in 1790 and to the South in 1791 enabled him to test public opinion at the same time that they increased popular interest in the national government. Himself not a political partisan, he held the two natural parties apart, and prevented party contest, until the government had become too firmly established to be shaken by them. Perhaps the final result would not in any case have failed, even had " blood and iron " been necessary to bring it about; but the quiet attainment of the result was due to the personality of Washington, as well as to the political sense of the American people.

It would be a. great mistake to suppose, however, that the influence of the president was fairly appreciated during his term of office, or that he himself was uniformly respected. Washington seems never to have understood fully either the nature, the significance, or the inevitable necessity of party government in a republic. Instead, he attempted to balance party against party, selected representatives of opposing political views to serve in his first cabinet, and sought in that way to neutralize the effects of parties. The consequence was that the two leading members of the cabinet, Alexander Hamilton and Thomas Jefferson, exponents for the most part of diametrically opposite political doctrines, soon occupied the position, to use the words of one of them, of " two game-cocks in a pit." The unconscious drift of Washington's mind was toward the Federalist party; his letters to La Fayette and to Patrick Henry, in December 1798 and January 1799, make that evident even without the record of his earlier career as president. It is in- conceivable that, to a man with his type of mind and his extraordinary experience, the practical sagacity, farsightedness and aggressive courage of the Federalists should not have seemed to embody the best political wisdom, however h'ttle he may have been disposed to ally himself with any party group or subscribe to any comprehensive creed. Accordingly, when the Democratic- Republican party came to be formed, about 1793, it was not to be expected that its leaders would long submit with patience to the continual interposition of Washington's name and influence between themselves and their opponents; but they maintained a

calm exterior. Some of their followers were less discreet. The president's proclamation of neutrality, in the war between England and France, excited them to anger; his support of Jay's treaty with Great Britain roused them to fury. His firmness in thwarting the activities of Edmond Charles Edouard Genet, minister from France, alienated the partisans of France; his suppression of the " Whisky Insurrection " aroused in some the fear of a military despotism. Forged letters, purporting to show his desire to abandon the revolutionary struggle, were published; he was accused of drawing more than his salary; his manners were ridiculed as "aping monarchy"; hints of the propriety of a guillotine for his benefit began to appear; he was spoken of 'as the " stepfather of his country." The brutal attacks, exceeding in virulence anything that would be tolerated to-day, embittered his presidency, especially during his second term: in 1793 he is reported to have declared, in a cabinet meeting, that " he would rather be in his grave than in his present situation," and that " he had never repented but once the having slipped the moment of resigning his office, and that was every moment since." The most unpleasant portions of Jefferson's A nas are those in which, with an air of psychological dissection, he details the storms of passion into which the president was driven by the newspaper attacks upon him. There is no reason to believe, however, that these attacks represented the feeling of any save a small minority of the politicians; the people never wavered in their devotion to the president, and his election would have been unanimous in 1796, as in 1792 and 1789, had he been willing to serve.

He retired from the presidency in 1797,' and returned to Mount Vernon, his journey thither being marked by popular demon- strations of affection and esteem. At Mount Vernon, which had suffered from neglect during his absence, he resumed the planta- tion life which he loved, the society of his family, and the care of his slaves. He had resolved some time before never to obtain another slave, and " wished from his soul " that Virginia could be persuaded to abolish slavery; " it might prevent much future mischief"; but the unprecedented profitableness of the cotton industry, under the impetus of the recently invented cotton gin, had already begun to change public sentiment regarding slavery, and Washington was too old to attempt further innova- tions. Visitors continued to flock to him, and his correspondence, as always, took a wide range. In 1798 he was made commander- in-chief of the provisional army raised in anticipation of war with

1 He had previously, under date of the 17th of September 1796, issued a notable " Farewell Address " to the American people.

France, and was fretted almost beyond endurance by the quarrels of Federalist politicians over the distribution of commissions. In the midst of these military preparations he was struck down by sudden Ulness, which

lasted but for a day, and died at Mount Vernon on the 14th of December 1799. His disorder was an oedematous affection of the wind-pipe, contracted by exposure during a long ride in a snowstorm, and aggravated by neglect and by such contemporary remedies as bleeding, gargles of " molasses, vinegar and butter " and " vinegar and sage tea," which " almost suffocated him," and a blister of cantharides on the throat. He died as simply as he had lived ; his last words were only business directions, affectionate remembrances to relatives, and repeated apologies to the physicians and attendants for the trouble he was giving them. Just before he died, says his secretary, Tobias Lear, he felt his own pulse; his countenance changed; the attending physician placed his hands over the eyes of the dying man, " and he expired without a struggle or a sigh." The third of the series of resolutions introduced in the House of Representatives five days after his death, by John Marshall of Virginia, later chief-justice of the Supreme Court, states exactly, if somewhat rhetorically, the position of Washing- tion in American history: " first in war, first in peace, and first in the hearts of his countrymen." 2 His will contained a pro- vision freeing his slaves, and a request that no oration be pro- nounced at his funeral. His remains rest in the family vault at Mount Vernon (q.v.), which since i860 has been held by an association, practically as national property.

All contemporary accounts agree that Washington was of imposing presence. He measured just 6 ft. when prepared for burial; but his height in his prime, as given in his orders for clothes from London, was 3 in. more. La Fayette says that his hands were " the largest he ever saw on a man." Custis says that his complexion was " fair, but considerably florid." His weight was about 220 lb. Evidently it was his extraordinary dignity and poise, forbidding even the suggestion of familiarity, quite as much as his stature, that impressed those who knew him. The various and widely-differing portraits of him find exhaustive treatment in the seventh volume of Justin Winsor's Narrative and Critical History of America. Winsor thinks that " the favourite profile has been unquestionably Houdon's, with Gilbert Stuart's canvas for the full face, and probably John Trumbull's for the figure." Stuart's face, however, with its calm and benign expression, has fixed the populai notion of Washington.

Washington was childless: the people of his time said he was the father only of his country. Collateral branches of the family have given the Lees, the Custises, and other families a claim to an infusion of the blood.

Bibliography. — A complete bibliography of books relating to Washington would be very voluminous. The best edition ot his Writings is that of W. C. Ford (14 vols., New York, 1889-1893). Sparks's edition (12 vols., Boston, 1837) has in the main been super- seded, though it contains some papers not included by Ford, and the Life, which comprises vol. i., still has value.

J. D. Richardson‘9 Messages and Papers of the Presidents (vol. i., Washington, 1896) collects the presidential^ messages and proclamations, with a few omissions. A descriptive list of biographies and biographical sketches is given in W. S. Baker’s Bibliotheca Washingtoniana. (Philadelphia, 1889). The most important lives are those of John Marshall (Philadelphia, 1804-1807), David Ramsay (New York, 1807), Washington Irving (New York, 1855-1859), E. E. Hale (New York, 1888), H. C. Lodge (Boston, 1889; rev. ed., 1898), B. T. Thayer (New York, 1894) and Woodrow Wilson (New York, 1897). Valuable for their presentation of differing aspects of Washington’s career are: W. S. Baker’s Itinerary of Washington (Philadelphia, 1892), II. B. Carrington’s Washington the Soldier (New York, 1899), G. W. P. Custis’s Recollections and Private Memoirs of Washington (New^ York, i860), P. L. Ford’s True George Washington (Phila- delphia, 1896) and R. Rush’s Washington in Domestic Life (Phila- delphia 1857). The larger comprehensive histories of the United States by Bancroft, Hildreth, Winsor, McMaster, Von Hoist, Schouler and Avery, the biographies in the ” American Statesmen ” series, and Hart’s ” American Nation ” series, are indispensable. There is an interesting attempt to make a composite, portrait of Washington in Science (December 11, 1885). (W.MacD.)*

2 This characterization originated with Henry Lee.

WASHINGTON

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WASHINGTON, a city and the capital of the United States of America, coterminous with the District of Columbia, on the north-east bank of the Potomac river at the head of tide and navigation, 40 m. S.W. of Baltimore, 135 m. S.W. of Philadelphia, and 225 m. S.W. of New York. Area, 60 sq. m. (exclusive of 10 sq. m. of water surface). Pop. (1800) 230,302; (1900) 278,718, of whom 20,119 were foreign-born and 87,186 were negroes; (1910) 331,069. The city proper covers only about 10 sq. m. lying between the Anacostia river and Rock Creek, and rising from the low bank of the Potomac, which is here nearly 1 m. wide; above are encircling hills and a broken plateau, which rise to a maximum height of 420 ft. and contain the former city of Georgetown, the villages of Anacostia, Brightwood, Tennallytown, and other suburban districts.

Streets and Parks. — The original plan of the city, which was prepared by Major Pierre Charles L’Enfant (1755-1825), under the supervision of President Washington and Thomas Jefferson, 1 was a masterpiece in landscape architecture and in the main it has been preserved. Besides streets running east and west, which are named by the letters of the

alphabet, and streets running north and south, which are numbered, there are avenues named for various states, which radiate from two foci — the Capitol and the White House — or traverse the city without any fixed plan. North and south of the Capitol they are numbered; east and west from it streets are lettered, but streets are dis- tinguished by annexing to the name or letter the name of the quarter: N.W., S.W., N.E. or S.E. — the city is divided into these four parts by North Capitol, East Capitol and South Capitol streets, which intersect at the Capitol. The width of the avenues is from 120 to 160 ft. and the width of the streets from 80 to 1 20 ft. More than one-half the area of the city is comprised in its streets, avenues and public parks. Among the principal residence streets are Massachusetts, especially between Dupont and Sheridan circles, New Hampshire, Connecticut and Vermont Avenues and 16th Street, all in the N.W. quarter of the city. The principal business streets are Pennsylvania Avenue (especi- ally between the Capitol and the White House) and 7th, 9th, 14th and F streets. Streets and avenues for the most part are paved with a smooth asphalt pavement, and many of them have two and occasionally four rows of overarching shade trees and private lawns on either side. At nearly every intersection of two avenues is a circle or square in which is the statue of some notable American whose name the square bears. At the intersection of a street with an avenue there is usually the reservation of a small triangular grass plot at least. In L'Enfant's plan a park or mall was to extend from the Capitol to the White House. Instead of this the mall extends from the Capitol to Washington Monument, which stands near the intersection of lines west from the Capitol and south from the White House. In 1901, however, a commission (Daniel Hudson Burnham, C. F. McKim, Augustus St Gaudens and F. L. Olmsted, Jr.) was appointed by authority of the United States Senate to prepare plans for the beautifi.- cation of the city and this body, seeking in the main to return to L'Enfant's plan, has submitted a design for a park-like treatment of the entire district between Pennsylvania and Maryland avenues from the Capitol to the White House and between lower New York Avenue and the Potomac, with an elm-shaded mall 300 ft. wide bisecting the park from the Capitol to the Monument, with a group of official and scientific buildings fronting the mall on either side, with a group of municipal buildings between the mall and Pennsylvania Avenue, and with a Lincoln memorial on the bank of the Potomac. Potomac Park (740 acres), a portion of which is embraced in this design, has already been reclaimed from the Potomac river. On Rock Creek, above Georgetown, is the National Zoological Park (under the control of the Smithsonian Institution), embracing 170 acres in a pictu- resque site. North of this and extending to the boundary of the

1 The actual surveying and laying out of the city was done by Andrew ElHcott (1 754-1 820), a civil engineer, who had been employed in many

boundary disputes, who became surveyor-general of the United States in 1792, and from 1812 until his death was professor of mathematics at the United States Military Academy at West Point.

District, and including both banks of Rock Creek, with its wild and picturesque beauty, is a tract of 1600 acres, known as Rock Creek Park.

Climate- — The climate of Washington is characterized by great humidity, long-continued and somewhat oppressive heat in summer, and mild winters. During a period of thirty-three years ending December 1903 the mean winter temperature (December, January and February) was 35 F. and themean summer temperature (June, July and August) 75°; the mean of the winter minima was 27°, and the mean of the summer maxima 85°. Extremes ranged, how- ever, from an absolute maximum of 104° to an absolute minimum of -15°. There is an average annual precipitation of 43-1 in., which is quite evenly distributed throughout the year. Although snowstorms are infrequent and snow never lies long on the ground, the average fall of snow for the year amounts to 22-5 in.

Buildings. — In a dignified landscape setting on the brow of a hill that is itself nearly 100 ft. above the Potomac stands the Capitol s (built 1793-1827; architect, William Thornton (d. 1827), super- intendent of the Patent Office, whose designs were modified by B. H. Latrobe and Charles Bulfinch; wings and dome added 1851- 1865). It consists of a central building of Virginia sandstone, painted white, and two wings of white Massachusetts marble. Its length is 751 ft., and its breadth ranges in different parts from 121 to 324 ft. The main building is surmounted with an iron dome, designed by Thomas Ustic Walter, which rises to a height of 268ˆ ft., and on the dome is a statue of Liberty (1863; 19$ ft. high) by Thomas Crawford. The Capitol faces east, and on this side is a richly sculptured 3 portico with Corinthian columns leading to the rotunda under the dome, a sculptured Corinthian portico leading to the Senate Chamber in the north wing, and a plain Corinthian portico leading to the Hall of Representatives in the south wing; there is also a portico at each end and on the west side of each wing. The rotunda, 96 ft. in diameter and 180 ft. high, is decorated with eight historical paintings: "Landing of Columbus" (1492), by John Vanderlyn; " De Soto discovering the Mississippi " (1541), by William Henry Powell; " Baptism of Pocahontas " (1613), by John Gadsby Chapman; " Embarkation of the Pilgrims from Delft- Haven " (1620), by Robert Walter Weir; " Signing the Declaration of Independence" (1776), by John Trumbull; "Surrender of Burgoyne at Saratoga " (1777), by Trumbull; " Surrender of Corn- wallis_ at Yorktown " (1781), by Trumbull; and "Washington resigning his Commission at Annapolis " (1783), by Trumbull. Between the rotunda and the Hall of Representatives is the National Hall of Statuary (formerly the Hall of

Representatives), in which each state in the Union may erect statues of two " of her chosen sons "; and between the rotunda and the Senate Chamber is the room of the Supreme Court, which until 1859 was the Senate Chamber. 4

The Executive Mansion, more commonly called the White House, the official residence of the president, is a two-storey building of Virginia freestone, painted white since 1814 to hide the marks of fire — only the walls were left standing after the capture of the city by the British in that year. It is 170 ft. long and 86 ft. deep. It is simple but dignified ; the principal exterior ornaments are an Ionic portico and a balustrade. The White House was built in 1792-1799 from designs by James Hoban, who closely followed the plans of the seats of the dukes of Leinster, near Dublin, and in 1902-1903, when new executive offices and a cabinet room were built and were, con- nected with the White House by an esplanade, many of the original features of Hoban's plan were restored. East of the White House and obstructing the view from it to the Capitol stands the oldest of the departmental buildings, the Treasury Building (architect, Robert Mills (1781-1855), then U.S. architect), an imposing edifice mainly of granite, 510 ft. long and 280 ft. wide; on tne east front is a colonnade of thirty-eight Ionic columns, and on each of the other three sides is an Ionic portico. On the opposite side of the White House is a massive granite building of the State, War and Navy Departments, 567 ft. long and 342 fL wide. The Library of Congress (1889-1897; cost, exclusive of site, over $6,000,000), south-east of the Capitol, was designed by Smithmeyer <& Pelz, and the designs were modified by Edward Pearce Casey (b. 1864), the architect; it is in the Italian Renaissance style, is 340 by 470 ft., and encloses four courts and a central rotunda surmounted by a flat black copper dome, with gilded panels and a lantern. The exterior walls are of white New Hampshire granite, and the walls of the

2 See Glenn Brown, The History of the United States Capitol (2 vols.,

1900-1903).

3 The allegorical decorations here arc by Persico and Horatio Greenough ; those on the Senate portico are by Thomas Crawford, who designed the bronze doors at the entrances to the Senate and House wings. At the east door of the rotunda is the bronze door (1858; modelled by Randolph Rogers). At the west entrance are elaborate bronze doors (1910) by Louis Amateis (b. 1855).

- *Connected with the Capitol by subways, immediately S.E. and N.E. of the Capitol respectively, are the marble office buildings (1908) of the House of Representatives and of the Senate. The Capitol is*

connected by subways with the Library of Congress also.

interior courts are of Maryland granite and white enamelled bricks. There are numerous sculptural adornments without, and there is elaborate interior decoration with paintings, sculpture, coloured marbles and gilding. 1 Two squares north of the Senate office- building is the Union Railway Station (1908; 343 by 760 ft.; cost, $4,000,000), designed by Daniel Hudson Burnham, consisting of a main building of white granite (from Bethel, Vermont) and two wings, and facing a beautiful plaza. On Pennsylvania Avenue, nearly midway between the Capitol and the White House, is the nine-storey Post Office (1899; with a tower 300 ft. high), housing the United States Post Office Department and the City Post Office. A few squares north-west of it are the General Land Office, the headquarters of the Department of the Interior (commonly called the Patent Office), with Doric portico; the Pension Office, in which the Inauguration Ball is held on the evening o! each president's taking office; the Government Printing Office (twelve storevs — one of the few tall office-buildings in the city) ; the City Hall, or District Court House; and the District Building (roflS), another building of the local government. On the heights north of Georgetown is the United States Naval Observatory, one of the best-equipped institu- tions of the kind; from it Washington time is telegraphed daily to all parts of the United States. Near Rock Creek, west of George- town, is the Signal Office and headquarters of the United States Weather Bureau. In the Mall are the building of the Department of Agriculture, the Smithsonian Institution (q.v,), the National Museum (1910), the Army Medical Museum and the Bureau of Fisheries, and here a building for the Department of Justice is to be erected. Facing the Mall on the south is the home of the Bureau of Engraving and Printing, in which the United States paper money and postage stamps are made. Not far from the White House is the Corcoran Gallery of Art (1894-1897; architect, Ernest Flagg), of white Georgia marble in a Neo-Grecian style, housing a collection of paintings (especially American portraits) and statuary; the gallery was founded and endowed in 1869 by William Wilson Cor- coran (1798-1888) " for the perpetual establishment and encourage- ment of the Fine Arts." The Public Library, a gift of Andrew Carnegie, is a white marble building in the Mount Vernon Square, at the intersection of Massachusetts and New York avenues. A prominent building, erected with money given mainly by Mr Carnegie, is that of the Pan-American Union (formerly Bureau of American Republics). The old Ford's Theatre, in which President Lincoln was assassinated, is on Tenth Street N.W. between E and F\ The house in which Lincoln died is on the opposite side of the street, and

contains relics of Lincoln collected by O. H. Oldroyd.

Monuments. — Foremost among the city's many monuments is that erected to the memory of George Washington. It is a plain obelisk of white Maryland marble, 55 ft. square at the base and 555 ft- in height; it was begun in 1848, but the work was abandoned in 1855-1877, but was completed in 1884 at a cost of $i,30O,ooo. a Among statues of Washington are the half-nude seated figure (1843) by Greenough in the Smithsonian Institution, and an equestrian statue (i860) of Washington at the Battle of Princeton by Clark Mills in Washington Circle. Among the other prominent statues are: the equestrian statue (1908) of General Philip Sheridan in Sheridan Circle, by Gutzon Borglum ; an equestrian statue of General Sherman near the Treasury Building, by Carl Rohl-Smith; a statue of Frederick the Great (by T. Uphues; presented to the United States by Emperor William II. of Germany) in front of the Army War College at the mouth of the Anacostia river; a statue of General Nathanael Greene (by H. K. Brown) in Stanton Square; statues of General Winfield Scott in Scott Square (by H. K. Brown) and in the grounds of the Soldiers' Home (by Launt Thompson); a statue of Rear-Admiral S. F. Du Pont in Dupont Circle (by Launt Thomp- son); of Rear-Admiral D. G. Farragut (by Vinnie Ream Hoxie); an equestrian statue of General George H. Thomas (by J. Q. A. Ward), erected by the Society of the Army of the Cumberland;

1 A bronze fountain, " The Court of Neptune," in front of the Library, is by Hinton Perry. Granite portrait busts of great authors occupy niches in windows near the entrance; these are by J. S. Hartley, Herbert Adams and F. W. Ruckstuhl. The allegorical figures over the entrance are by Bela L. Pratt. There are fine bronze doors by Olin Warner and Frederick Macmonnies. Among the mural paintings are series by John W. Alexander, Kenyon Cox, E. H. Blashfield, Henry Oliver Walker (b. 1843), W r alter McEwen, Elihu Vedder, Charles Sprague Pearcc (b. 1851), Edward Simmons (b. 1852), George Willoughby Maynard (b. 1843), Robert Reid (b. 1862), George R. Barse, Jr. (b. 1861), W. A. Mackay, F. W. Benson (b. 1862), Walter Shirlaw (b. 1838), Gari Melchers (b. 1860), W. De L. Dodge (b. 1867) and others.

2 The site is said to have been chosen by Washington himself — Congress had planned a marble monument in 1783. In 1833 the Washington National Monument Society was formed and a popular subscription was taken. The obelisk was designed by Robert Mills, whose original plan included a " Pantheon " 100 ft. high with a colonnade and a colossal statue of Washington. After 1877 the work was carried on by an appropriation made by Congress. See Frederick L. Harvey, History of the Washington Monument and the National Monument Society (Washington, 1903).

one of General George B. McClellan, by Frederick Macmohnies; and statues of Lincoln, 3 by Scott Flannery and (in Lincoln Park) by Thomas Ball, of Joseph Henry (by W. W Story) in the grounds of the Smithsonian Institution, of John Marshall (by Story) on the west terrace of the Capitol, of General Andrew Jackson (by Clark Mills) and, in Lafayette Square, of the Marquis de Lafayette (by Falguiereand Mercie),of the Comte de Rochambeau (by F. Hamar) and of Baron von Steuben (1910). In Pennsylvania Avenue, at the foot of Capitol Hill, is a Monument of Peace (by Franklin Simmons) in memory of officers, seamen and marines of the U.S. Navy killed in the Civil War.

Cemeteries. — On the opposite side of the Potomac, in Virginia, and adjoining Fort Myer, a military post (named in honour of General Albert James Myer (1827— 1880), who introduced in 1870 a system of meteorological observations at army posts) with reservation of 186 acres, is Arlington, a National Cemetery (of 408-33 acres), in which lie buried 21,106 soldiers killed in the Civil War and in the war with Spain ; among the distinguished officers buried here are General Philip Henry Sheridan, Admiral David Dixon Porter, General Joseph Wheeler and General Henry W. Lawton; there is a Spanish War Monument; the grounds are noted for their natural beauty, and on the brow of a hill commanding a magnificent view of the city is Arlington House (1802), the residence of George Washington Parke Custis (1781-1857), grandson of Martha Washington, and afterwards of General Robert E. Lee, Custis's son-in-law; the estate was seized by Federal troops early in the Civil War, and was bought by the United States in 1864; there was a military hospital here throughout the Civil War. Adjoining the grounds of the Soldiers' Home (3 m. N.of theCapitol) isa National Military Cemetery containing the graves of 7220 soldiers. On the bank of the Anacostia river, east of the Capitol, is the Congressional Cemetery containing the graves of many members of Congress. North of Georgetown is Oak Hill Cemetery, and in the vicinity of the Soldiers' Home are Rock Creek, Glenwood, Harmony, Prospect Hill and St Mary's Ceme- teries. A crematorium was completed in 1909, and cremation instead of interment has since been urged by the District commissioners.

Charities, cVe. — The National Soldiers' Home (i8£i), founded by General Winfield Scott, comprises five buildings, with accommoda- tions for 800 retired or disabled soldiers, and 512 acres of beautiful grounds. The charitab'e and correctional institutions of the District of Columbia are the following government institutions, under the control of the United States or of the District of Columbia: Freedmen's Hospital (1862), United States Naval Hospital (1866), an Insane Asylum on the S. side of the Anacostia river, the District of Columbia Industrial Home School (1872), a Municipal Lodging House (1892), a Soldiers' and Sailors' Temporary Home (1888),

Workhouse, Reform School for Boys, Reform School for Girls and Industrial Home School (1872). Among many private institutions are the Washington City Orphan Asylum (1815); Lutheran Eye, Ear and Throat Infirmary (1889); Episcopal Eye, Ear and Throat Hospital (1897); Providence Hospital {1861; Sistars of Charity); George YVashington University Hospital (189S) ; Georgetown University Hospital (1898); Columbia Hospital for Women (1866); Children's Hospital (1871); Washington Hospital for Foundlings (1887); Children's Temporary Home (1899; for negroes); a German Orphan Asylum (1879); Washington Home for Incurables (1889); Home for the Aged (1871); the National Lutheran Home (1890); the Methodist Home (1890) and Baptist Home (1880). A " non-support law," which went into effect in 1906, enacts that a man who refuses to provide for his family when able to do so shall be committed to the workhouse for hard labour, and that fifty cents a day shall be paid to his family. A Juvenile Court and a Board of Children's Guardians have extensive jurisdiction over dependent and delinquent children,, and a general supervision of all charities and corrections is vested in a Board of Charities, consisting of five members appointed by the president of the United States.

Education. — Washington is one of the leading educational centres of the United States. The public school system, under the control of a Board of Education of six men and three women appointed by the supreme court judges of the District of Columbia, embraces kindergartens, primary schools, grammar schools, high schools, a business high school, manual training schools, normal schools and night schools. The schools are open nine months in the year, and all children between eight and fourteen years of age are required to attend 3ome public, private or parochial school during these months unless excused because of some physical or mental disability. George Washington University, in the vicinity of the White House, isa non- sectarian institution (opened in 1821 under the auspices of the Baptist General Convention as " The Columbian College in the District of Columbia"; endowed by W. W. Corcoran in 1872, organized as the Columbian University in 1873, organized under its present name 4 in 1904), and comprises Columbian College of Arts

3 A Lincoln memorial is to be erected on the Mall W. of the Washington monument.

4 The name was changed when the offer of the George Washington Memorial Association to build a $500,000 memorial building was accepted.

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and Sciences with a graduate department (1893), a College of the Political Sciences (1907), Washington College of Engineering, divisions of architecture and education (1907), a Department of Law (first organized in 1826; closed in 1827; reorganized in 1865), a Department of Medicine (1821; since 1866 in a building given by W. W. Corcoran), with several affiliated hospitals, a Department of Dentistry (1887), the National College of Pharmacy (united with the university in 1906), and a College of Veterinary Medicine (1908). In 1909 this University had 185 instructors and 1520 students. Georgetown University is in Georgetown (q.v.). The Catholic University of America (incorporated 1887; opened 1889), with buildings near the Soldiers' Home, stands at the head of Roman Catholic schools in America. Although designed especially for advanced theological studies, it comprises a School of the Sacred Sciences, a School of Philosophy, a School of Letters, a School of Physical Sciences, a School of Biological Sciences, a School of Social Sciences, a School of Jurisprudence, a School of Law and a School of Technological Sciences. In 1909 its faculty numbered 42 and its students 225. A Franciscan convent, Dominican, Paulist and Marist houses, and Trinity College for girls are affiliated with the Catholic University. The American University (chartered 1893), under Methodist Episcopal control, designed to bear a relation to the Protestant churches similar to that of the Catholic University to the Catholic Church, with a campus of 94 acres at the north-west end of the city, in 1910 had not been opened to students. Howard University (1867), for the higher education of negroes, is situated south-west of the Soldiers' Home; it was named in honour of General Oliver Otis Howard, one of its founders and (in 1869-1873) its president; it has a small endowment, and is supported by Congressional appropriations which are administered by the Secretary of the Interior; it comprises an academy, a college of arts and sciences, a teachers' college, a school of theology, a school of law, a school of medicine, a pharmaceutic college, a dental college, a school of manual arts and applied sciences, and a commercial college; in 1909 it had 121 instructors and 1253 students.

The Columbia Institution for the Deaf and Dumb (see Deaf and Dumb), on Kendall Green, in the north-eastern part of the city, is composed of Kendall school (a secondary school] and of Gallaudet College (called in 1864-1893 the National Deaf Mute College; the present name is in honour of Dr T. H. Gallaudet); it was the first institution to give collegiate courses to the deaf, and it has received Congressional appropriations, though it is a private foundation. Washington has also several academies, seminaries and small colleges; among the latter arc St John's College (Roman Catholic, 1870) and Washington Christian College (n on- sectarian, 1902). The Washington College of Law (1896) is an evening school especially for

women. A School of Art is maintained in the Corcoran Gallery of Art.

The Carnegie Institution of Washington, founded by Andrew Carnegie in 1902 and endowed by him with $22,000,000 ($10,000,000 in 1902 ; §12,000,000 later), is designed " to encourage in the broadest and most liberal manner, investigation, research and discovery, and the application of knowledge to the improvement of mankind; and in particular to conduct, endow and assist investiga- tion in any department of science, literature or art, and to this end to co-operate with governments, universities, colleges, technical schools, learned societies and individuals; to appoint committees of experts to direct special lines of research ; to publish and distribute documents; and to conduct lectures, hold meetings and acquire and maintain a library. " It is under the control of a board of twenty-four trustees, vacancies in which are filled by the remaining members. In 1908 ten departments had been organized: Botanical Research, with a " desert laboratory " (1903) at Tucson, Arizona; Economics and Sociology (1904); Experimental Evolution, with a station (1904) at Cold Spring Harbor, New York (see Huntington, N.Y.); Geophysical Research, with a laboratory (1906-1907) at Washington — investigations have been carried on by the U.S. Geological Survey and at McGill University, Toronto; Historical Research (1903); Marine Biology, with a laboratory (1904) at Tortugas, Florida; Meridian Astrometry (1906; work is carried on especially at Dudley Observatory, Albany, New York); Research in Nutrition, with a laboratory (1906) at Boston, Massachusetts — investigations (since 1904) had been carried on at Yale and Wesleyan universities; Solar Physics, with observatory (1905) on Mount Wilson, California, and workshops at Pasadena, California, and Terrestrial Magnetism (1903; headquarters in Washington); the institution had assisted Luther Burbank in his horticultural experi- ments since 1905, and had published the Index Medicus since 1903; and it makes occasional grants for minor research and tentative investigations,

The learned societies of Washington are to a large degree more national than local in their character; among them are: the Washington Academy of Sciences (189SJ, a " federal head " of most of the societies mentioned below; the Anthropological Society (founded 1879 ; incorporated 1887), which has published Transactions (1879 sqq., with the co-operation of the Smithsonian Institution) and The American Anthropologist (1888-1898; since 1898 published by the American Anthropological Association) ; 1 he National Geographic Society (1888), which since 1903 has occupied the Hubbard Memorial Building, which sent scientific expeditions to

Alaska, Mont Pelee and La Souffricrc, and which publishes the AV tional Geographic Magazine (1888 sqq.), National Geo&apkic Monographs (1895) an d various special maps; the Philosophical Society of Washington

(1871; incorporated 1901), devoted especially to mathematical and physical sciences; the Biological Society (1880), which publishes Proceedings (1880 sqq.); the Botanical Society of Washington (1901); the Geological Society of Washington (1893); the Entomological Society of Washington (1884), which publishes Proceedings (1884 sqq.); the Chemical Society (1884); the Records of the Past Exploration Society (1901), which publishes Records of the Past (1902 sqq.); the Southern History Association (1896), which issues Publications (1897 sqq.); the Society for Philosophical Inquiry (1893), which publishes Memoirs (1893 sqq.); the Society of American Foresters (1900), which publishes Proceedings (1905 sqq.); and the Cosmos Club. The libraries and scientific collections of the Federal government and its various bureaus and institutions afford exceptional opportunities for students and investigators (see Libraries: § United States). The Library of Congress contains more than 1,800.000 volumes and 100,000 manuscripts, and large collections of maps and pieces of music. In the library of the State Department are 70,000 volumes of documents. The library of the Surgeon-General's Office contains 200, ooo volumes, and is the largest medical library in the world. Besides these there is a vast amount of material in the collections of the Bureau of Education, the Bureau of Ethnology, the Smithsonian Institution, the National Museum, the House of Representatives, the Patent Office, the Department of Agriculture, the Botanic Gardens, the Bureau of Fisheries, the Naval Observatory, the Geological Survey and the Coast and Geodetic Survey. The Public Library, containing about 1 10,000 volumes, is a circulating library.

Communications,— Seven railways enter the city : the Philadelphia, Baltimore & Washington division of the Pennsylvania System, the Baltimore & Ohio, the Southern, the Chesapeake & Ohio, the Wash- ington, Baltimore & Annapolis, the Washington Southern and the Washington, Alexandria & Mt Vernon. Steamboats ply daily from the foot of Seventh Street to Alexandria, Mt Vernon, Old Point Comfort and Norfolk, and at Old Point Comfort there is connexion with boats for New York. There is also an hourly ferry service to Alexandria, and at irregular intervals there are boats direct to Balti- more, Philadelphia, New York and Boston. The street railways, underground trolley in the urban district and overhead trolley in the suburbs, connect at several points with intcrurban railways in Maryland and Virginia.

Industries. -ˆ—Tha city's manufactures and commerce are of little importance in proportion to its population. Only government manufactures and manufactures for local consumption arc at all large. In 1905 the government's printing and publishing cost $5,999,996; its ordnance and ordnance stores (in the Navy Yard on the bank of the Anacostia river), $5,331,459; and its engraving and plate printing, $3,499,5:7. The total

value of the products of all the factories in the District which were operated under private ownership amounted to $18,359,159, and 89,575,971, or 52% of this was the value of printing and publishing, bread and other bakery products, gas and malt liquors.

Government. — Washington is the seat of the Federal govern- ment of the United States and as such, is not self-ruled, but governed by the Federal Congress. The city was chartered in 1802, with a mayor appointed 'annually by the president of the United States and an elective council of two chambers. The mayor was elected by the council from 1812 to 1820, and by the people (biennially) from 1820 to 1871. In 1871 the Federal Congress repealed the charters of Washington and Georgetown and established a new government for the entire District, con- sisting of a governor, a secretary, a board of public works, a board of health and a council appointed by the president with the concurrence of the Senate, and a House of Delegates and a delegate to the National House of Representatives elected by the people. In 1874 Congress substituted a government by three commissioners appointed by the president with the concurrence of the Senate, and in 1878 the government by commissioners was made permanent. Two of the commissioners must be residents of the District, and the third commissioner must be an officer of the Corps of Engineers of the United States Army. The people of the District have no voice in its government, have no repre- sentation in Congress and do not vote for the president of the United States. The District commissioners are the chief execu- tive officers. Congress and the commissioners legislate for the District; the president, the commissioners and the supreme court of the District appoint the administrative officers and boards; and the president appoints the judges of the District courts, viz. a court of appeals,, a supreme court, a municipal court, a police court, a probate court and a juvenile court. One-half the expenses of the government of Washington is paid

by the District of Columbia and one-half by the United States. The revenue of the District, which is derived from a property tax and from various licences, is paid into the United States Treasury; appropriations, always specific and based on estimates prepared by the commissioners, are made only by Congress; and all accounts are audited by the Treasury Department. The government owns the waterworks, by which an abundant supply of water is taken from the Potomac at the Great Falls, conducted for 12 m. through an aqueduct 9 ft. in diameter and filtered through a sand filtration plant.

*The government of the District has been uniformly excellent, and the laws therefor have been modern in their tendency. The Employment of children under fourteen years of age in any factory, workshop, mercantile establishment, store, business office, telegraph *.r telephone office, restaurant, hotel, apartment house, club, theatre, Aootblack stand, or in the distribution or transmission of merchandise or messages is forbidden, except that a child between twelve and fourteen years of age may with the permission of the judge of the juvenile court be employed at an occupation not dangerous or injurious to his health or morals if necessary for his support or for the assistance of a disabled, ill or invalid parent, a younger brother or sister, or a widowed mother. No child under fourteen years of age may be employed in any work whatever before six o'clock in the morning, after seven o'clock in the evening, or during the hours when the public schools are in session.*

History. — During the War of Independence Philadelphia was the principal seat of the Continental Congress, but it was driven thence in 1783 by mutinous soldiers, and for the succeeding seven years the discussion of a permanent site for the national capital was characterized by sectional jealousy, and there was a strong sentiment against choosing a state capital or a large city lest it should interfere with the Federal government. The Constitution, drafted in 1787, authorized Congress " to exercise exclusive legislation in all cases whatsoever, over such district (not exceeding 10 sq. m.) as may, by cession of particular states, and the acceptance of Congress, become the seat of govern- ment of the United States," Virginia and Maryland promised such a cession; President Washington was known to be in favour of a site on the Potomac, and. in July 1790 Alexander Hamilton, in return for Thomas Jefferson's assistance in passing the bill for the assumption of the state war debts by the Federal govern- ment, helped Jefferson to pass a bill for establishing the capital on the Potomac, by which the president was authorized to select a site anywhere along the Potomac between the Eastern Branch (Anacostia) and the Conococheague river, a distance of about 80 m., and to appoint three commissioners who under his direc- tion should make the necessary surveys and provide accom- modations for the reception of Congress in 1800. The com- missioners — Thomas Johnson (1732-1819) and Daniel Carroll (1756-1829) of Maryland and Dr David Stuart of Virginia — ■ gave the city its name; Major L'Enfant drew its plan, and Andrew Ellicott laid it out. When, in 1800, the government was removed to Washington it was " a backwoods settlement in the wilderness"; as a city it existed principally on paper, and the magnificence of the design only served to emphasize the poverty of the execution. One wing of the Capitol and the President's House were nearly completed, but much of the land surrounding the Capitol was a marsh; there were no streets worthy of the name, the roads were very bad,

and the members of Congress were obliged to lodge in Georgetown. For many years such characterizations as " Wilderness City," " Capital of Miserable Huts," " City of Streets without Houses," " City of Magnificent Distances " and (; A Mudhole almost Equal to the Great Serbonian Bog " were common. Resolutions were frequently offered by some disgusted member of Congress for the removal of the capital. In 1814, during the second war with Great Britain, the British, after defeating on the 24th of August an American force at Bladensburg, Prince George county, Maryland, about 6 m. N.E. of Washington, occupied the city and burned the Capitol, the President's House, some of the public offices, and the Navy Yard. In the following year when a bill appropriating $500,000 for rebuilding was before Congress it met with formidable opposition from the il capital movers." The question of removal was again to the front when, in 1846, the Virginia portion of the District was retroceded to that state

in response to the appeal of Alexandria, which had suffered from the neglect cf Congress. The lethargy of the nation toward its capital suddenly vanished at the outbreak of the Civil War. At the close of the first day's bombardment of Fort Sumter (April 1 2th, 1861) Leroy P. Walker (1817-1884), the Confederate Secretary of War, boasted that before the 1st of May the Con- federate flag would float over the Capitol. The North, alarmed at the threat, speedily transformed Washington into a great military post and protected it on all sides with strong earthworks. Throughout the war it was the centre of the military operations of the North: here the armies were officered and marshalled, from here they marched on their campaigns against the South, here was the largest depot of military supplies, and here were great hospitals for the care of the wounded. Although several times threatened by the South, Washington was never really in danger except in July 1S64 when General Jubal A. Early advanced " against it with 12,000 veterans, defeated General Lew Wallace with about 3500 men at Monocacy Bridge on the 6th, and on the nth appeared before the fortifications, which were at the time defended by only a few thousand raw troops; the city was saved by the timely arrival of some of Grant's veterans. In the city, on the 23rd and 24th of May 1865, President Andrew Johnson reviewed the returning soldiers of the Union Army.

The population of Washington increased from 61,122 to 109,199 or 78-6% in the decade from i860 to 1870, and the stirring effects of the Civil War were far-reaching. The city had been founded on too elaborate and extensive a plan to be left to the initiative and unaided resources of its citizens. But under the new form of government which was instituted in 1871 a wonderful transformation was begun under the direction of Alexander R. Shepherd (1835-1902), the governor of the District and president of the board of public works. Temporary financial embarrassment

followed, but when the Federal government had taken upon itself half the burden and established the economic administration of the commissioners, the problem of beautifying the nation's capital was solved.

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WASHINGTON, a city and county-seat of Daviess county,. Indiana, U.S.A., about 50 m. N.E. of Evansville. Pop. (1890) 6064, (1900) 8551, of whom 391 were foreign born and 255 negroes, (1910 census) 11,404. It is served by the Baltimore & Ohio South Western (which has repair shops here) and the Evansville & Indianapolis railways. The city has a public library and a city park of 45 acres. It is the shipping point of the surrounding farming, stock-raising and coal-mining region, and there are deposits of kaolin and fireclay in the vicinity. The total value of the factory product in 1905 was $1,166,749 (48-6% more than in 1900). The municipality owns and operates the electric lighting plant. Washington was settled in 18 1 6 and chartered as a city in 1870.

WASHINGTON (or Washington Court House), a city and the county-seat of Fayette county, Ohio, U.S.A., on Paint Creek, 35 m. S.E. of Springfield. Pop. (1880) 3798, (1890) 5742, (1900) 5751 (708 negroes); (1910) 7277. It is served by the Baltimore & Ohio, the Cincinnati & Muskingum Valley (Penn- sylvania Lines), the Detroit, Toledo & Ironton, and the Cincin- nati, Hamilton & Dayton railways. It is in a rich fanning and stock and poultry-raising region, has a large poultry-pa eking house and various manufactures. Washington, or Washington Court House as it is often called to distinguish it from the

village of Washington in Guernsey county, Ohio, was laid out in 1810 and was chartered as a city in 1888.

WASHINGTON, a borough and the county-seat of Washington county, Pennsylvania, U.S.A., about 25 m. S.W. of Pittsburg and about 30 m. N.E. of Wheeling, West Virginia, on Chartiers Creek. Pop. (1900) 7670, of whom 465 were foreign born and 984 were negroes; (1910) 18,778. Washington is served by the main line of the Baltimore & Ohio, the Chartiers Valley branch of the Pittsburgj Cincinnati, Chicago & St Louis (Pennsylvania system) and the Waynesburg & Washington railways and a connecting line for freight service, and by electric railway to Pittsburg. Among its public buildings and institutions are the county court-house (in which are the rooms of the Washington County Historical Society), the Federal building, two hospitals, a Y.M.C.A. building and a public library. It is the seat of Washington and Jefferson College, of Washington Seminary (1836) for girls and of a school of business. Washington and Jefferson College was incorporated, in 1865, by the consolidation of two rival institutions, Washington Academy and Jefferson College. Washington Academy (incorporated in 1787 and en- dowed by the legislature of Pennsylvania), which was opened in 1789, was incorporated as Washington College in 1806, and in 1852 became a synodical college of the Presbyterian Church, under the direction of the synod of Wheeling. Jefferson College, which was an outgrowth of Canonsburg Academy at Canonsburg, 7 m. from Washington, was chartered in 1794, and incorporated as Jefferson College in 1802; from 1826 until 1838 the Jefferson Medical College of Philadelphia was its medical department. In 1 869, by an act of the legislature, all departments were located at Washington. In 1872 a chair of engineering and applied mathematics and one of biology were established with an endow- ment of $40,000, the gift of Dr Francis J. LeMoyne, and the chairs of Greek and of Latin were endowed by the Rev. C. C. Beatty with $60,000. In 1909-1910 Washington and Jefferson College (including Washington and Jefferson Academy) had 29 instructors, 413 students, about 20.000 volumes in its library and an endowment of $630,000. Washington is in a bituminous coal and natural gas region, and there are manufactories of glass, iron tubing and pipe, tin plate, steel, &c. The site was part of a tract bought in 177 1 by David Hoge and was known at first as Catfish camp after an Indian chief, Tingooqua or Catfish. It was platted in October 1781 and called Bassettown in honour of Richard Bassett (d. 1815), a member of the Federal constitu- tional convention of 1787 and of the United States Senate in 1789-1793, and governor of Delaware in 1 798-1801. The village was replatted in November 1784 and renamed in honour of General Washington, to whom a large part of the site had belonged. The early settlers were chiefly Scotch-Irish. At first a part of Strabane township, one

of the original thirteen townships of Washington county, in February 1786 Washington was made a separate election district; it was incorporated as a town in 1810; was chartered as a borough and enlarged in 1852, and its limits were extended in 1854 and 1855, Since 1900 there have been added to the borough North and South Washington and the industrial suburb of Tylerdale, East and West Washington, although practically one with the borough, remaining under separate administration. The location of Washington on the old " National Road " gave it importance before the advent of railways. At the LeMoyne crematory established here by Dr Francis Julius LeMoyne,' on the 6th of December 1876, took place the first public cremation in the United States; the body burned was that of Baron Joseph Henry Louis de Palm (1809-1876), a Bavarian nobleman who had emigrated to the United States in 1862 and had been active in the Theosophical Society in New York.

1 LeMoyne (1798-1879) was the son of a French refugee, and was an ardent abolitionist. In 1840 he was the Liberty party's candidate for the vice-presidency. He built a. normal school for negroes near Memphis, Tennessee, and gave money to Washing- ton College, at which he had graduated in 1 8 15. Largely through LeMoyne's influence Washington, became an important point on the " underground railway " for assisting runaway slaves to Canada.

See Boyd Crumrine (ed.), The History of Washington County, Pennsylvania (Philadelphia, 1882); and Alfred Creigh, The History of Washington County from Us First Settlement to the Present Time (Harrishurg, 1871).

WASHINGTON, the most north-westerly state of the United States of America. It lies between latitudes 45° 32′ and 49 N. and between longitudes 116 57′ and 124° 48′ W. On the N. it is bounded by British Columbia, along the 49th parallel as far W. as the middle of the Strait of Georgia and then down the middle of this strait and Haro Strait, and along the middle of the channel the Strait of Juan de Fuca, which separate it from Vancouver Island; on the E. the south portion of its boundary is the Snake river, which separates it from Idaho, but from the confluence of the Snake and Clearwater rivers (a little W. of 117) the E. boundary line between Washington and Idaho runs directly N.; on the S. the Columbia river separates it from Oregon from the mouth of that river to the point of the upper intersection with the 46th parallel of N. latitude, but from thence eastward the S. boundary line between Washington and Oregon is the 46th parallel; on the W. the state is bounded by the Pacific Ocean. The state has a maximum length, from E. to W., of 360 m. and a maximum width of 240 m.; area, 69,127 sq. m., of which 2291 sq. m. are water surface.

Physical Features. — The western half of Washington lies in the Pacific Mountains province, consisting of the Coast range and the Cascade range, separated by a broad basin known as the Sound Valley The eastern half of the state is occupied in the north by a westward extension of the Rocky Mountains, and in the centre and south by the north-western portion of the Columbia Plateau province. The most prominent physical feature of the state is the Cascade mountain range, which with a N.N.E. and S.S.W. trend crosses the state 30 to 40 m. W. of the middle. On the S. border this mountain range occupies a tract about 50 m. in width, and to the northward it widens to 100 m. or more. The general height of the ridges and peaks is about 8000 ft. above the sea, but there are five ancient snow-capped volcanoes which equal or exceed 10,000 ft. These are Mount Rainier or Tacoma (14,363 ft.), Mount Adams (12,470 ft.), Mount Baker (10,827 ft.), Glacier Peak (10,436 ft.) and Mount St Helens (10,000 ft.). Glaciers are common both in the N\ and in the S. region, even on the higher elevations. Both slopes of the Cascades are cut deep by valleys. Along the Pacific Coast the ridges of the Coast range are only about 1500 ft. in height in the S. part of the state, but they rise northward in the Olympic Moun- tains and reach a maximum of elevation on Mount Olympus of 8150 ft. The Olympics meet the ocean along a rather straight line, but farther S. the coast line is broken by Gray's Harbour and Willapa Bay, the drowned lower portions of river valleys. The upheaval of the Cascade Mountains on the E. and the Olympic Mountains and Coast range on the W. left between them the Puget Sound Basin, the gently sloping sides of which descend in the central portion to less than 100 ft. from sea-level. A still greater subsidence farther north produced Puget Sound. East of the Cascade Mountains the Columbia and Spokane rivers mark the boundary between the Okanogan Highlands to the northward and the Columbia plateau to the southward. The Okanogan Highlands, an outlier of the Rocky Mountains extending westward from the Cceur d'Alene Mountains in Idaho, reach heights of 5000 to 6000 ft. above the sea, but are characterized by long gentle slopes, rounded divides and wide stream basins. In some of the larger valleys there are glacial terraces. The Columbia plateau consists of horizontal beds of lava having a total thickness of several thousand feet, and its surface has a general elevation of 1000 to 2000 ft. above sea-level. West of the Columbia river the plain is broken by several monoclinal ridges rising 2000 to 3000 ft. above it and extending eastward 50 to 75 m. from the foothills of the Cascades. In some parts, especially (in Douglas and Grant counties) within the Big Bend of the Columbia, the plain is frequently cut by coulees, or abandoned river channels., some of them 500 to 600 ft. deep and with very precipitous walls. The Grand Coulee represents the course of the Columbia river during the glacial period, when its regular channel was blocked with ice. There are also deep canyons which have been cut by the rivers in their present

courses, especially by the Snake river and its tribu- taries. The S.W. corner of the state is occupied by the Blue Moun- tains, which rise about 7000 ft. above the sea and arc cut deep by canyons. About 11,000 sq. m. in Washington have a minimum elevation exceeding 3000 ft. ; an approximately equal area has a maximum elevation less than 500 ft., and the mean elevation of the entire state is 1700 ft.

The Okanogan Highlands, the Columbia plain, the E. slope of the Cascade Mountains and the S. portion of the Puget Sound Basin are drained by the Columbia and its tributaries. This large river enters the N.E. corner of the state from the N\, traverses it in a winding course from N. to S., forms the greater portion of its S. boundary, and discharges into the Pacific. Ocean. The Snake (in

the S.E., a little W. of the 119th parallel), the Spokane (in the east central part) and the Pend Oreille (on the N. boundary) are its principal tributaries from the E.; the Yakima (a little above the mouth of the Snake) from the VV. ; and the Okanogan (in the north central part of the state), from the N. A portion of the Puget Sound Basin and a portion of the Coast range are drained by the Chehalis river, which has cut a channel through the Coast range and discharges into Gray's Harbour. The W. slope of the Cascades, most of the E. slope of the Olympics and the N. portion of the Puget Sound Basin are drained by a great number of small rivers into the Puget Sound; and the W- slope of the Olympics and Coast range is drained by several other small rivers into the Pacific. On the Cascade Mountains, at the beads of streams, are a number of lakes of glacial origin, the largest of which is Lake Chelan on the E. slope in Chelan county. This is nearly 60 m. in length, and from 1 to 4 m. wide. At the upper end it is about 1400 ft. deep, but it is shallow at the lower end where the water is held back by a morainal dam, and where only 3ˆ m. from the Columbia river it is about 400 ft. above the level of the river. There arc also several alkali lakes or chains of alkali lakes in the coulees on the Columbia plateau.

Fauna. — Many species of wild animals still inhabit the state, but the number of each species has been much reduced. The caribou, moose, antelope, mountain sheep, beaver, otter and mink are scarce. Few eik are found except in the inaccessible districts on the Olympic Mountains. White- and black-tailed deer and black bear inhabit the densest forests. Mountain goats are quite numerous on the Cascades. The destruction of cougars, lynx (" wildcats "), coyotes and wolves is encouraged by bounties. Coyotes and jack-rabbits are the most numerous denizens of the Columbia plain. Musk-

rats and skunks are numerous west of the Cascades. The blue grouse and partridge are the principal game birds. The sage-hen is common on the Columbia plain. The Japanese pheasant and the California quail have increased in numbers under the protection of the state. Among other game birds are prairie : chickens, ducks, geese, swan, brant, sandhill crane and snipe. The speckled trout, which abounds in nearly all of the mountain streams and lakes, is the principal game fish. Other freshwater fish are the perch, black bass, pike, pickerel and white fish. There are large quantities of salmon in the lower Columbia river, in Gray's and Willapa harbours, and in Puget Sound; oyster fisheries in Gray's and Willapa harbours and in Puget Sound; cod, perch, flounders, smelt, herring and sardines in these and other salt waters. For all the more desirable game a close season has been established by the state.

Flora. — The Puget Sound Basin and the neighbouring slopes of the Cascade and Olympic Mountains are noted for their forests, consisting mainly of giant Douglas fir or Oregon pine (Pseudotstiga Douglasii), but containing also some cedar, spruce and hemlock, a smaller representation of a few other species and a dense under- growth. Near the Pacific Coast the forests consist principally of hemlock, cedar and Sitka spruce. At an elevation of about 3000 ft. on the \V. slope of the Cascades the red fir ceases to be the dominant tree, and between this elevation and the region of perpetual snow, on a few of the highest peaks, rise a succession of forest zones con- taining principally: (1) yellow pine, red and yellow fir, white fir and cedar; (2) lodgepole pine, white pine, Engelmann spruce and yew; (3) subalpine fir, lovely fir, noble fir, Mertens hemlock, Alaska cedar and tamarack; (4) white-bark pine, Patton' hemlock, alpine larch and creceping juniper. Deciduous trees and shrubs are repre- sented in western Washington by comparatively small numbers of maple, alder, oak, cottonwood, willow, ash. aspen, birch, dogwood, sumach, thornapple, wild cherry, chokecherry, elder, huckleberry, blueberry ,(blackberry, raspberry, gooseberry and grape. The E. slope of the Cascades and most of the Okanogan Highlands are clothed with light forests consisting chiefly of yellow pine, but containing also Douglas hr, cedar, larch, tamarack and a very small amount of oak. In the eastern part of the Okanogan High- lands there is some western white^ pine, and here, too, larch is most abundant. The Columbia plain is for the most part treeless and, except where irrigated, grows principally bunch-grass or, in its lower and more arid parts, sagebrush. In the forest regions of eastern Washington the underbrush is light, but grasses and a great variety of flowering plants abound.

Climate. — In western Washington, where the ocean greatly influences the temperature and the mountains condense the moisture of vapour- bearing winds, the climate is equable and moist. Eastern Washington, too, usually

has a mild temperature, but occasionally seme regions in this part of the state are visited by a continental extreme, and as the winds from the ocean lose most of their moisture in passing over the Cascades, the climate is either dry or arid accord- ing to elevation. Along the coast the temperature is rarely above 92 ° F. or below io° F. ; the mean temperature for July is about 6o°, for January 40 , and for the entire year 50. In the Puget Sound Barin an occasional cold east wind during a dry period in winter causes the temperature to fall below zero. At Centralia, in the Chehalis Valley, the temperature has risen as high as 102 . But the mean temperature for January is 34 in the N. portion of the basin and 40 in the S. portion; for July it is 60 ° in the north and 65 in the south; and for the entire year it is 46 in the north and 52* in the south. During April and October the temperatures in eastern Washington are nearly the same as those in western*

Washington, but during July the temperatures in eastern Washington are subject to a range from 40 ˆ to 110 , and during January from 65 to – 30 . However, the climate is so dry in eastern Washington that the "sensible" variations are much less than those recorded by the thermometer. In the south-eastern counties the winters are mild, with the exception of an occasional cold period, and the summers are hot. The rainfall on the W. slope of the Olympic, Coast range and Cascade Mountains is from 60 to 120 in. annually, and in the Puget Sound Basin it is from 25 to 60 in., it being least on the N.E. or leeward side of the Olympics. About three-fourths of the rain in western Washington falls during the wet season from November to April inclusive. On the Okanogan High- lands, on the eastern foothills of the Cascade Mountains, on the Blue Mountains and on the elevated portion of the Columbia Plain which comprises the E. border counties, the annual rainfall and melted snow amount to from 12 to 24 in., but in the southern half of eastern Washington the Columbia river flows through a wide district of low elevation, where the rainfall and melted snow amount to only 6 to 12 in. a year, and where there is scarcely any precipitation during the summer months. There is a heavy snowfall in winter oh the moun- tains, and in a large portion of eastern Washington the average annual snowfall is 40 in. or more. Along the coast the prevailing winds blow from the west or south; in the Puget Sound Basin from the south, and in eastern Washington from the south-west, except in the Yakima and Wenatchee valleys, where they are north-west. During summer the winds are very moderate in western Washington, but during winter they occasionally blow with great violence. In eastern Washington hot winds from the north or east are occasionally injurious to the growing wheat in June or July.ˆ Light hailstorms are not uncommon, but tornadoes are unknown in the state.

Soils. — The soils of western Washington are chiefly glacial, those of

eastern Washington chiefly volcanic. In the low tidewater district of the Puget Sound Basin an exceptionally productive soil has been made by the mixture of river silt and sea sand. In numerous depressions, some of which may have been the beds of lakes formed by beaver dams, the soil is deep and largely of vegetable formation. In the valleys of rivers which have overflowed their banks and on level bench lands there is considerable silt and vegetable loam mixed with glacial clay; but en the hills and ridges of western Washington the soil is almost wholly a. glacial deposit consisting principally of clay but usually containing some sand and gravel. On the Columbia plateau the soil is principally volcanic ash and decomposed lava; it is almost wholly volcanic ash in the more arid sections, but elsewhere more decomposed lava or other igneous rocks, and some vegetable loam is mixed with the ash. On the E. slope of the Cascades and on the Okanogan Highlands glacial deposits of clay, gravel or sand, as well as vegetable loam, are mixed with the volcanic substances.

Fisheries. — Washington's many waterways, both fresh and salt, and especially those which indent or are near the coast, make the fisheries resources of great value. The catch and canning of salmon are particularly important. In 1905 the value of canned salmon was $2,431,605 (26,601,429 ft>).

Forests.— \n 1907 the estimated area of standing timber in Wash ington was 11,720 sq. m. besides that included in national forest reserves. The forest reserves are included in ten national parks, named the Chelan, Columbia, Colville, Kaniksu, Olympic, Ranier, Snoqualmie, Washington, Wanaha and Wenatchee, the Chelan beine the largest, with an area of 2,492,500 acres. The aggregate area of these parks (all of which were opened in 1907 and 1908) is 18,850-7 sq. m., or about three-elevenths of the total area of the state.

Irrigation. — The principal Federal irrigation undertakings in 191& were known as the " Okanogan project " and the " Yakima project." The former (authorized in 1905) provided for the irrigation of about 10,000 acres in Okanogan county by means of two reservoirs of an aggregate area of 650 acres, main canals and main laterals 20 m. long and small laterals 30 m. long, the water being taken from the Salmon river. In 1909 about 3000 acres in this project were watered and under cultivation. The Yakima project involved the irrigation of about 600,000 acres by means of five reservoirs of an aggregate area of 804,000 acre-feet, and was undertaken by the United States government in 1905.

Agriculture. — The development of the agricultural resources of Washington was exceedingly rapid after 1880. The wheat crop in 1909 was 35,780,000 bushels, valued at $33,275,000; oats, 9,898,000 bushels,

valued at $4,751,000; barley, 7,189,000 bushels, valued at $4,601,000; rye, 84,000 bushels, valued at $79,000; Indian corn, 417,000 bushels, valued at $359,000. The principal wheat -producing region is the south-eastern part of the state. Western Washington has large hay crops; in the E. part of the state much alfalfa is grown, especially in Yakima county. In W. Washington peas are raised for forage.

Vegetable crops are successfully grown in low alluvial lands of the W. part of the state, and on the irrigated volcanic ash lands E. of the mountains. Apple-growing and the raising of other fruits have increased rapidly. Small fruits are more successful in the W. part of the state. Grapes are grown on the mountain sides, cranberries on the bog lands near the coast, and nuts in the S.E. parts.

Live-stock and dairy products are important factors in the

agricultural wealth of Washington, but the raising of live-stock on ranges is less common than when large herds grazed free on govern- ment lands. Dairying, as distinct from grazing, has much increased In importance in recent years.

Minerals. — The mineral wealth of Washington is large, but its resources have been only slightly developed, and had hardly begun before the first decade of the 20th century: in 1902 the total value of all mineral products was $5,393,659; in 1907 it was $11,617,706 and in 1908 $11,610,224.

The coal deposits of Washington are the only important ones in the Pacific states, and in Washington only, of the Pacific states, is there any coking coal. In the Cowlitz Valley an inferior coal was found in 1848. The first important coal-mining was near Bellingham Bay, in Whatcom county, where coal was discovered in 1852 and where 5374 tons were mined in i860. Between 1850 and i860 coal was found on the Stilaguamish river (Snohomish county) and on the Black river (near Seattle) and in 1863 at Gilman (King county); but it was not until between 1880 and 1885, when the Green river field in King county and the Roslyn mines in Kittitas county were opened, that commercial production became important: the output was 3,024,943 tons (valued at $6,690,412) in 1908, when nearly one-half (1,414,621 tons) of the total was from Kittitas county and most of the remainder from the counties of King (931,643 tons) and Pierce (551,678 tons). There are large deposits of glacial and residual clays and clay shales throughout the state.

Serpentine marble with seamed markings has been found in Adams and Stevens counties. Granite is found about Puget Sound and in the extreme eastern part of the state; it is largely used in riprap or rough foundations. Sandstone is found especially in the N.W. In Whatcom and San Juan counties; it is used for paving blocks. Limestone also is found most plentifully in the north and north-wesrern parts of the state.

Gold, silver, copper, lead and a little iron (almost entirely brown ore) are the principal ores of commercial importance found in Washington. The total value of gold, silver, copper and lead in 1908 was $378,816 (gold $242,234, silver $47,076, copper $41,188, lead $48,318). The largest output of each of these ores in 1908 was in Stevens county; Ferry, King and Okanogan counties ranked next in the output of gold; Okanogan and Ferry counties in the output of silver; Okanogan in the output of copper; and King in the output of lead. About nine-tenths of the gold was got from dry or siliceous ores and about 8 % from placer mines; about two- thirds of the silver from dry or siliceous ores, about two-ninths from copper ores, and most of the other ninth from lead ores. The only lead ore is galena. The copper is mostly a copper glance passing into chalcopyrite ; it is found in fissure veins with granite, A small quantity of zinc (7 tons in 1906) is occasionally produced. Tungsten is found as wolframite in Stevens county near Deer Trail and Bissell, in Okanogan county near Loomis, in Whatcom county near the inter- national boundary, and (with some scheelite) at Silver Hill, near Spokane. Nickel has been found near Keller in Ferry county, and molybdenum near Davenport, Lincoln county. There is chromite in the black sands of the sea-coast and the banks of the larger rivers. .Antimony deposits were first worked in 1906. Arsenic is found.

Manufactures. — There was remarkable growth in the manufactur- ing industries of Washington between 1880 and 1905, due primarily to the extraordinary development of its lumber industry. In 1870 the value of lumber products was $1,307,585, and the Territory ranked thirty-first among the states and territories in this industry, and in 1880 the value of the product was $1,734,742; by 1905 the value had increased to $49,572,512, and Washington now ranked first. The manufacture of planing mill products, including sashes, doors and blinds, was an important industry, the products being valued in 1905 at $5,173,422.

Next in commercial importance to lumber and timber products are flour and grist mill products, valued in 1905 at $14,663,612. Other important manufactures are: slaughtering and meat packing (wholesale), $6,251,705 in 1905; malt liquors, $4,471,777; and foundry and machine shop products, $3,862,279.

Transportation and Commerce. — Puget Sound has formed a natural

terminus for several transcontinental railways, the cities of Seattle and Tacoma on its shores affording outlets to the commerce of the Pacific for the Northern Pacific, the Great Northern and the Chicago, Milwaukee & Puget Sound transcontinental lines, which enter these cities with their own tracks. The Union Pacific and the Canadian Pacific reach Seattle over the tracks of other roads. The Northern Pacific and the Great Northern enter the state near the middle of its eastern boundary at Spokane, which is a centre for practically all the railway lines in the eastern part of the state. The Northern Pacific, the first of the transcontinental roads to touch the Pacific north of San Francisco, reaches Seattle with a wide sweep to the south, crossing the Columbia river about where it is entered by the Yakima and ascending the valley of the latter to the Cascade Mountains. The Great Northern, running west from Spokane, crosses the state in nearly a straight line, and between this road and the Northern Pacific, and paralleling the Great Northern, runs the recently constructed Chicago, Milwaukee & Puget Sound, the westward extension of the Chicago, Milwaukee & St Paul. The Northern Pacific sends a branch line south from Tacoma parallel

with the coast to Portland on the Columbia river, where it meets the Southern Pacific and the Oregon Railroad & Navigation Company's line (a subsidiary of the Union Pacific), thus affording communica- tion southwards, and up the valley of the Columbia to the east. Entering the south-east corner of the state, the Oregon Railroad & Navigation Company extends a line northwards to Spokane, and a branch of the Great Northern, leaving the main line at this city, runs north-westward into British Columbia. The Spokane, Portland & Seattle railway connects the three cities named by way of the Columbia Valley; and the Spokane & Inland Empire sends a line eastward into Idaho to the Cceur d'Alene country and another through the south-eastern part of the state into Nevada. In 1880 the railway mileage was 289 m.; in 1890, 2012-05 m «; ' n r 9°°, 2888-44 m – ! an< i on tne Ist °f January 1909, 4180-32 m.

Seattle and Tacoma are among the four leading ports of the United States on the Pacific. Other harbours on Puget Sound of commercial importance are Olympia, Everett and Bellingham. Port Townsend is the port of entry for Puget Sound. Gray's Harbour, on the western coast, is of importance in lumber traffic.

Population.— The population in 1S60 was 11,594; in 1S70, 2 3>955; i n 1880, 75,116; in 1890, 349,390, an increase within the decade of 365-1%; in 1900, 518,103, an increase of about 45%. In 1910, according to the U.S. census returns, the total population of the state reached 1,141,990. Of the total popula- tion in 1900, 394,179 were native whites, 111,364 or 21-5% were foreign-born, io,i39(of whom 2531 were not taxed) were Indians, 5617 were Japanese, 3629 were Chinese, and 2514

were negroes. The Indians on reservations in 1909 were chiefly those on Colville Reservation (1,297,000 acres unallotted), in the N.E. part of the state, and the Yakima Reservation (837,753 acres unallotted), in the S. part; they belonged to many small tribes chiefly of the Salishan, Athapascan, Chinookan and Shahaptian stocks. Of the foreign-born, 18,385 were English- Canadians, 16,686 Germans, 12,737 Swedes, 10,481 natives of England, 9891 Norwegians and 7262 Irish. Of the total population 241,388 were of foreign parentage (i.e. either one or both parents were foreign-born), and of those having both parents of a given nationality 34,490 were of German, 19,359 of Swedish, 17,456 of Irish, 16,959 ˚f Norwegian and 16,835 ˚f English parentage; The Roman Catholic Church in 1906 had more members than any other religious denomination, 74,981 out of the total of 191,976 in all denominations; there were 31,700 Methodists, 13,464 Lutherans, 11,316 Baptists, 10,628 Disciples of Christ, 10,025 Congregational ists and 6780 Protestant Episcopalians.

Government. — Washington is governed under its original constitution, which was adopted on the ist of October 18S9. An amendment may be proposed by either branch of the legislature; if approved by two-thirds of the members elected to each branch and subsequently, at the next general election, by a majority of the people who vote on the question it becomes a part of the constitution. Five amendments have been adopted: one in 1894, one in 1896, one in 1900, one in 1904, and one in 1910. Suffrage is conferred upon ail adult citizens of the United States (including women, 1910) who have lived in the state one year, in the county ninety days, and in the city, town, ward or precinct thirty days immediately preceding the election, and are able to read and speak the English language; Indians who are not taxed, idiots, insane persons and convicts are debarred. General elections are held biennially, in even- numbered years, on the first Tuesday after the first Monday in November, and candidates, except those for the supreme court bench and a few local offices, are nominated at a direct primary election, held the second Tuesday in September.

The governor, lieutenant-governor, secretary of state, treasurer, auditor, attorney-general, superintendent of public instruction and commissioner of public lands are elected for a term of four years; and each new administration begins on the second Monday in January. The governor's salary is $6000 a year, which is the maximum allowed by the constitution.

The legislature consists of a Senate and a House of Representatives, and the constitution provides that the number of representatives shall not be less than sixty-three nor more than ninety-nine, and the number of senators not more than one-half nor less than one- third the number of representatives. Senators are elected by single districts for a term of four years, a portion

retiring every two years; representatives are elected, one, two or three from a district, for a term of two years. Regular sessions of the legislature are held biennially, in odd-numbered years, and begin on the second Monday

in January. Any bill or any item or items of any bill which has passed both houses may be vetoed by the governor, and to override a veto a two-thirds vote of the members present in each house is required. No law other than appropriation bills can go into effect until ninety days after the adjournment of the legislature, except in case of an emergency, by a vote in each house of two-thirds of all its members. The members of the legislature arc paid $5 for each day's attendance during the session, besides an allowance for travelling expenses.

Justice is administered principally by a supreme court, superior courts and justices of the peace. The supreme court consists of nine judges elected for a term of six years, one of those whose term next expires being chosen chief justice, and is divided into two departments. The presence of at least three judges in each department is required, and the concurrence of at least three judges is necessary to a decision. In case of a disagreement the case may be heard again in the same department, transferred to the other department, or to the court en banc. The chief justice or any four of his associates may at any time convene the court en banc, and if so convened at least five of the judges must be present, and the concurrence of at least five is necessary to a decision. The supreme court hˆs original jurisdiction in habeas corpus, quo warranto and mandamus proceedings against all state officers; and it has appellate jurisdiction except in civil actions for the recovery of money or personal property, in which the original amount in controversy does not exceed $200, and which at the same time do not involve the legality of a tax, impost, assessment, toll or municipal fine, or the validity of a statute. Judges of the superior courts (one or more for each county, or one for two or more counties jointly) are elected for a term of four years. They have original jurisdiction in all cases in equity, in all cases at law which involve the title or possession of real property, or the legality of a tax, impost, assessment, toll or municipal fine, and in all other cases at law in which the amount in controversy is $100 or more, in nearly all criminal cases, in matters of probate, in proceedings for divorce, and in various other cases; and they have appellate jurisdiction of cases originally tried before a justice of the peace or other inferior courts where the amount in controversy is more than $20. Justices of the peace, one or more in each election precinct, are elected for a term of two years. They have jurisdiction of various civil actions in which the amount in controversy is less than $100, and

concurrent jurisdiction with the superior courts in all cases of misdemeanours, but punishment by a justice of the peace is limited in cities of the first class to a fine of $500, or imprisonment for six months, and elsewhere to a fine of $100 or imprisonment for thirty days.

Local Government. — The government of each county is vested principally in a board of three commissioners elected by a county at large, some for two and some for tour years. The other county officers are a clerk, a treasurer, an auditor, an assessor, an attorney, an engineer, a sheriff, a coroner and a superintendent of public schools, each elected for a term of two years. Township organization is in force only when adopted by a particular county at a county election ; in 19TO only one county (Spokane) had the town- ship organization. Each township is governed by the electors assembled annually (the first Tuesday in March) in town meeting and by three supervisors, a clerk, a treasurer, an assessor, a justice of the peace and a constable, and an overseer of highways for each road district, all elected at the town meeting, justice of the peace and a constable for a term of two years, the other officers for a term of one year; each overseer of highways is chosen by the electors of his district. Municipalities are incorporated under general laws, and cities are divided into three classes, the first class including those having a population of 20,000 or more, the second class those having a population between 10, ooo and 20,000, the third class tho-,e having a population between 1500 and 10,000. When a community has a population between 300 and 1500 within an area of 1 sq. m.. it may be incorporated as a town. A city of the first class is per- mitted to frame its own charter, but its general powers are prescribed by statute. A city of the second class must elect a mayor and twelve councilmen, and its mayor must appoint a police judge, an attorney, a street commissioner and a chief of police. A city of the third class trust elect a mayor, seven councilmen, a treasurer, a health officer, a clerk and an attorney, and its mayor must apoint a marshal, a police justice and as many policemen as the council provides lor. An incorporated town must elect a mayor, five councilmen and a treasurer, and its mayor must appoint a marshal and a clerk.

Miscellaneous Laws. — Either husband or wife may hold, manage and dispose of his or her separate property independent of the other, but property which they hold in common is under the management and control of the husband except that he cannot devise by will more than one-half "of the community real or personal property, or convey, mortgage or encumber any of the community real estate unless his wife joins him. When either husband or wife dies intestate one-third of the separate real estate of the deceased goes to the sur- vivor if there are two or more children, one-half of it if there is only one child, the whole of it if there are no children, no issue of children, and no father, mother, brother or sister. One-half of the

community property goes to the survivor in any case, and the whole of it if there is no will and neither children nor the issue of children. Where there

is no will one-half of the residue of the separate personal estate goes to the survivor if there are issue, and the whole of it if there are no issue. A law enacted in 1909 forbids a marriage in which either of the parties is a common drunkard, habitual criminal, epileptic, imbecile, feeble-minded person, idiot or insane person, a person who has been afflicted with hereditary insanity, a person who is afflicted with pulmonary tuberculosis in its advanced stages, or a person who is afflicted with any contagious venereal disease, unless the woman is at least forty-five years of age. A plaintiff must reside in the state one year before filing an application for a divorce. Neither party is permitted to marry a third party until six months after the divorce has been obtained. Washington has a state board consisting of three members appointed by the governor to confer with commissioners from other states upon such matters as marriage and divorce, insolvency, descent and distribution of property, the execution and probate of wills, for the purpose of promoting uniformity of legislation respecting them. A homestead to the value of $1000 which is owned and occupied by the head of a family is exempt from attachment or forced sale except for debts secured by mechanics', labourers', materialmen's or vendors' liens upon the premises. If the owner is a married man the homestead may he selected from the community property but not the wife's separate property without her consent, and when it has been selected, even if from the husband's separate property, h cannot be encumbered or conveyed without the wife's consent. Personal property is exempt from execution or attachment as follows: all wearing apparel of every person and family; private libraries to the value of $500; all family pictures; household goods to the value of $500; certain domestic animals or $250 worth of other property chosen instead; firearms kept for the use of a person or family; certain articles (within specified values) necessary to the occupations of farmers, physicians, and other professional men. teamsters, lightermen, &c, and the jjroceeds of all life and accident insurance. By a law enacted in 1909 the licensing of the sale of intoxicating liquors, other than for medical purposes by druggists and pharmacists, is left to the option of counties and cities.

Charities, &c. — The state charitable and penal institutions consist of the Western Washington Hospital for the Insane at Fort Steila- coom, the Eastern Washington Hospital for the Insane at Medical Lake, the State School for the Deaf and the State School for the Blind at Vancouver, the State Institution for Feeble-minded near Medical Lake, the Washington Soldiers' Home and Soldiers' Colony at Orting, the Veterans' Home at Port Orchard, the State Ftnitcntiary at Walla Walla, the State Reformatory at Monroe and the State Training School at Chehalis. All of these institutions

arc under the management of a bi-partisan State Board of Control which consists of three members appointed by the governor fur a term of six years, one every two years, and also removable by the governor in his discretion. Each member receives a salary of $3000 a year. The same board together with the superintendent of the penitentiary constitute a prison board. The State Training School is for the reformatory training of children between eight and eighteen years of age who have been found guilty of any crime other than murder, manslaughter or highway robbery, or who for some other cause have been committed to it by a court of competent jurisdiction.

Education. — The public school system is administered by a state superintendent of public instruction, a state board of education, regents or trustees of higher institutions of learning, a superintendent of the common schools and a board of education in each county, and a board of directors in each school district. The state super- intendent is elected for a term of four years. The state board of education consists of the state superintendent, the president of the University of Washington, the president of the State College of Washington, the principal of one of the state normal schools chosen biennially by the principals of the state normal schools, and three other members appointed biennially by the governor, one of whom must be a superintendent of a district of the first class, one a county superintendent and one a principal of a high school. This body very largely determines the course of study in the elementary schools, high schools, normal school and the normal departments of the University and the State College, approves then quirements for entrance to the University and the State College, and prepares the questions for the examination of teachers. Each county superintendent is elected for a term of two years. The county board of education consists of the county superintendent and four other members appointed by him for a term of two years; one of its principal duties is to adopt the text-books for schools in districts in which there is no four-year accredited high school. In a school district which maintains a four-year accredited high school there is a text-book commission consisting of the city superintendent or the principal of the high school, two members of the board of directors designated by the board, and tw T o teachers appointed by the board. All children between eight and fifteen years of age, and all between fifteen and sixteen years of age who are not regularly employed in some useful or remunerative occupation, must attend the public school all the time it is in session or a private school for the same time unless excused by the city or the county superintendent because of mental or physical disability or because of proficiency in the branches taught in the first eight

grades. Washington has three state normal schools: one at Cheney, one at Beilingham, and one at Ellensburg, and each of them is under the management of a board of three trustees appointed by the governor with the concurrence of the Senate for a term of six years, one every two years. The State College of Washington {1890) at Pullman, for instruction in agriculture, mechanical arts and natural sciences, includes an agricultural college, an experiment station and a school of science. The University of Washington (1862) at Seattle embraces a college of liberal arts, a college of engineering and schools of law, pharmacy, mines and forestry. Whitman College (Congrega- tional, 1866) at Walla Walla, Gonzaga College (Roman Catholic, 1887) at Spokane, Whitworth College (Presbyterian, 1 890) at Tacoma and the University of Puget Sound (Methodist Episcopal, 1905) at Tacoma are institutions of higher learning maintained and controlled by their respective denominations.

Finance. — The revenue for state, county and municipal purposes is derived principally from a general property tax, a privilege tax levied on the gross receipts of express companies and private car companies, an inheritance tax and licence fees for the sale of intoxicating liquors. Real property is assessed biennially; personal property, annually. For the two years ending the 1st of October 1908 the total receipts into the state treasury amounted to $10,854,281-42 and the total disbursements amounted to $11,053,375-13. The net state debt on the 1st of October 1908 amounted to $967,576-38.

History. — The early exploration of the western coast of North America grew out of the search for a supposed passage, some- times called the " Strait of Anian " between the Pacific and the Atlantic. In Purchas his PUgrimm.es (1625) was published the story of Juan de Fuca, a Greek mariner whose real name was Apostolos Valerianos, who claimed to have discovered the passage and to have sailed in it more than twenty days. Though the story was a fabrication, the strait south of Vancouver Island was given his name. An account of the various Spanish and English explorers has already been given under Oregon and need not be repeated at length here.

In 1787 a company of Boston merchants sent two vessels, the " Columbia " and the " Washington " under John Kendrick and Robert Gray (i755-r8o6) to investigate the possibility of establishing trading posts. They reached Nootka Sound in September 1788, and in July 1789 Captain Gray in the " Columbia " began the homeward voyage by way of China. Captain Kendrick remained, erected a fort on Nootka Sound, demonstrated that Vancouver was an island andini79i purchased from the Indians large tracts of land between 47° and 51 N. lat. for his employers. On the homeward voyage he was accidentally killed and his vessel was lost. Meanwhile Captain Gray in September 1790 sailed from Boston on a second voyage. During the winter of 179ˆ1792 he built another fort on Nootka Sound and mounted four cannon from the ship. With the coming of spring he sailed southward, determined to settle definitely the existence of the great river, which he had vainly attempted to enter the previous summer. Captain George Vancouver (1758-1798), in charge of a British exploring expedition then engaged in mapping the coast (1792-1794), was sceptical of the existence of the river, but Captain Gray, undiscouraged, persisted in the search and on the nth of May 1792 anchored in the river which he named Columbia in honour of his ship. The later claim of the United States to all the territory drained by the river was based chiefly upon this discovery by Captain Gray, who had succeeded where Spanish and British had failed. The territory became known as Oregon (q.v.).

The first white man certainly known to have approached the region from the cast was Alexander Mackenzie of the North- west Fur Company, who reached the coast at about lat. 52° in July 1793. With the purchase of Louisiana (30th April 1803) the United States gained a clear title to the land between the Mississippi and the Rocky Mountains as far north as 49 and, because of contiguity, a shadowy claim to the region west of the mountains. In 1819 Spain specifically renounced any claim she might have to the coast north of 42°, strengthening thereby the position of the United States. Just before the purchase of Louisiana, President Jefferson had recommended to Congress (18th January 1803) the sending of an

expedition to explore the headwaters of the Missouri, cross the "Rockies and follow the streams to the. Pacific. In accordance with the recommendation

Meriwether Lewis (q.v.) and William Clark, both officers of the United States Army, with a considerable party left St Louis on the 14th of May 1804, ascended the Missouri to the head- waters, crossed the Rockies and, following the Columbia river, reached the ocean in November 1805. The return journey over nearly the same route was begun on the 23rd of March 1806, and on the 23rd of September they reached St Louis.

The story of the struggle of the rival British and American companies to control the fur trade, with the final dominance of the Hudson's Bay Company has been told under Oregon and need not be repeated. Since the country was considered to be of little value the question of boundaries was not pressed either by Great Britain or the United States after the War of 1812, and by a treaty concluded on the 20th of October 1818 it was agreed that " any country that may be claimed by either party on the north-west coast of North America, westward of the Stony (Rocky) Mountains shall be free and open for the term of ten years from the date of the signature of the present convention to the vessels, citizens and subjects of the two powers." On the 6th of August 1827 the convention was continued in force indefinitely with the proviso that either party might abrogate the agreement on twelve months' notice. Meanwhile Russia (17th April 1824) agreed to make no settlement south of 54 40′ and the United States agreed to make none north of that line. In February 1825 Great Britain and Russia made a similar agreement. This left only Great Britain and the United States as the contestants for that territory west of the Rocky Mountains between 42 and 54 40', which by this time was commonly known as the Oregon country. American settlers in considerable numbers soon began to enter the region south of the Columbia river, and in 1841, and again in 1843, these settlers attempted to form a provisional government. A fundamental code was adopted in 1845 and a provisional government was established, to endure until " the United States of America extend their jurisdiction over us." North of the river, the Hudson's Bay, Company discouraged settlement, believing that the final deter- mination of the boundary controversy would make that stream the dividing line. Though there were a few mission stations in the eastern part of the present state of Washington (see Whitman, Marcus), the first permanent American settlement north of the Columbia was made in 1845 on the Des Chutes river, at the head of Puget Sound at the present Tumwater. Others soon followed in spite of the efforts of the chief factor of the Hudson's Bay Company , Dr John M'Loughlin, and these permanent settlers finally carried the day.

Interest iii the Oregon country developed with the increase of settlers and of knowledge and a demand for the settlement of the boundary dispute arose. The report of Captain Charles Wilkes, who visited the coast in 1841-1842 in charge of the United States exploring expedition helped to excite this interest. In the presidential campaign of 1844 one of the Democratic demandswas " Fifty-fourfortyorfight." By a treaty negotiated by James Buchanan, on the part of the United States, and Richard Pakenham, on the part of Great Britain, and ratified on the 17th of July 1846, the boundary was fixed at 49 to the middle of the channel separating the continent from Vancouver Island and thence " southerly through the middle of the said channel and of Fuca's Straits to the Pacific Ocean." A dispute later arose over this water-line. The act establishing a territorial government for Oregon was approved on the 14th of August 1848, and the first, governor, Joseph Lane (1801-1881), assumed the government on the 3rd of March 1849. Following the in- crease of population north of the Columbia, the territory was divided, and Washington Territory was established on the 2nd of March 1853, with the river as the southern boundary to the point where it is intersected by the forty-sixth parallel, and thence along that parallel to the summit of the Rocky Mountains, thereby including portions of the present states of Idaho and Montana. The first governor, Major Isaac I. Stevens, of the United States Army, took charge on the 29th of September 1853, and a census indicated a population of 3965, of whom 1682 were voters. Olympia was chosen as the temporary seat of

government, and Governor Stevens at once set to work to ex- tinguish the Indian, titles to land and to survey a route for a railway, which, was later to become the Northern Pacific. The Indians, alarmed by the rapid growth of the white population, attempted to destroy the scattered settlements and the wandering prospectors for gold, which had been discovered in eastern Washington in 1855. Between 1855 and 1859, after many sharp contests, the Indians were partially subdued.

Shortly after 1846, the British began to assert that the Rosario Strait and not Haro Strait (as the Americans held) was the channel separating the mainland and Vancouver Island, thus claiming the Haro Archipelago of which San Juan was the principal island. Conflict of authority arose, and in 1859 San Juan was occupied by U.S. troops commanded by Captain George E. Pickett (1825-1875), and for a time hostilities seemed imminent. By agreement joint occupation followed until, by the Treaty of Washington (May 8, 187 1), the question was left to the German emperor, who decided (October 21, 1S72) in favour of the United States. Meanwhile Oregon was

admitted as a state (February 14, 1859) with the present boundaries, and the remnant of the territory, including portions of what are now Idaho and Wyoming, was added to Washington. The discovery of gold in this region, however, brought such a rush of population that the Territory of Idaho was set off (March 3, 1863) and Washington was reduced to its present limits. Rapid growth in population and wealth led to agitation for statehood, and a constitution was adopted in 1878, but Congress declined to pass an enabling act. The development of Alaska and the completion of the Northern Pacilic Railroad to the coast (1883) brought a great increase in population. A large number of Chinese coolies who had been introduced to construct the railway congregated in the towns on the completion of the work, and in 1885 serious anti-Chinese riots led to the declaration of martial law by the governor and to the use of United States troops. Finally the long-desired admission to statehood was granted by Con- gress (February 22, 1889) and President Benjamin Harrison (November 11, 1889) formally announced the admission complete.

Since admission the progress of the state has continued with increasing rapidity. The Alaska-Yukon Exposition, designed to exhibit the resources of western America, held at Seattle June-October 1909, was a complete success. In politics the state has been Republican in national elections, except in 1896, when it was carried by a fusion of Democrats and Populists. A Populist was elected governor and was re-elected in 1900.

Governors of Washington Territorial.

Isaac I. Stevens 1853-1857

C. H. Mason (acting) 1857

Fayette McMullcn 1857-1858

C, H. Mason (acting) 1858-1859

Richard D. Gholson 1 859-1 860

Henrv M. McGill (acting) 1860-1861

Wm.'H. Wallace 1861

!,. J. S. Turney (acting) 1861-1862

Win. Pickering l 1862-1866

George E. Cole 1866-1867

E. L. Smith (acting) 1867

Marshall F. Moore 1867-1869

Alvin Flanders 1869-1870

Edward S. Salmon 1870-1872

Elisha P. Ferry 1872-1880

W. A. Newell 1880-1884

Watson C. Squire 1884-1887

Eugene Semple 1887-1889

Miles C. Moore 1889

State.

Elisha P. Ferry Republican 1889-1893

JohnH.McGraw . ,, 1893-1897

J. R. Rogers -. Populist 1897-1901

Henry C. McBride 2 Republican (acting) 1901-1905

Albert E. Mead Republican I9 5~i900,

Samuel G. Coagrove 3 ,, 1909

M. E. Hay Republican (acting) 1909-

1 Absent from the Territory during the greater part of 1865, during which time Ehvood Evans acted as governor.

- *In place of j. R. Rogers, deceased.*
- *Died 28th March 1909.*

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*WASHSTAND, a tabic or stand containing conveniences for personal ablutions. In its 18th-century form it was called a " basin stand "or " basin frame," and is still sometimes described as a " washhand stand." Its direct, but remote, ancestor was the monastic lavabo, ranges of basins of stone, lead or marble fed from a cistern. They were usually of primitive conception, and a trough common to all was probably more frequent than separate basins. Very occasionally they were of bronze adorned with enamels and blazoned with heraldry. Very similar usages obtained in castles and palaces, fixed lavatories being con- structed in the thickness of the walls for the use of their more important residents. These arrangements were obviously intended only for the summary ablutions which, until a very late date, sufficed to even the high-born. By degrees the lavabo became portable, and a "basin frame" is mentioned as early as the middle of the 17th century. Examples of earlier date than the third or fourth decade of the 18th century are, however, virtually unknown. Thenceforward, until about the end of that century, this piece of furniture was usually literally a " stand." It was supported upon a tripod; a circular orifice in the top received the basin, and smaller ones were provided for a soap dish and a water-bottle. Sometimes a stand for the water-jug when the basin was in use was provided below, and very com- monly there was a drawer, sometimes even two drawers, below the basin. Great numbers of these stands were made to fit into corners, and a " corner wash-stand " is still one of the commonest objects in an old furniture shop. Chippendale designed such stands in an elaborate rococo fashion, as well as in simpler form. As the 18th century drew to its close the custom of using the same apartment as reception room by day and sleeping room by night produced a demand for what was called " harlequin furniture "— *■ pieces which were contrived a double or triple debt to pay. Thus a variety of complicated combination washstands and dressing tables were made, and fitted with mirrors and sometimes with writing conveniences and drawers for clothes. Sheraton developed astonishing ingenuity in devising a type of furniture which, if we may judge by the large number of examples still existing, must have become highly popular. With the beginning of the 19th century and the expansion of ideals of personal cleanliness, the washstand grew in size*

and importance. It acquired the form of an oblong wooden table provided, like its smaller predecessors, with orifices for basins and fitted with a br«ad shelf-like stretcher upon which the jugs were placed when they were removed from the basins. Ample space was provided for soap-dishes and water-bottles. These tables were single or double, for the use of one or two persons. The washstand, as we know it in the 20th century, look its final form when the wooden top was replaced by marble, unpierced, the basins being placed upon the slab, which, in the beginning almost invariably white, is now often of red or other warm-tinted marble.

WASP (Lat. vespa), the common name for a well-known sort of stinging insect. The order Hymenoptera is divided into two sub-orders, the Symphyta and the Apocrita. The latter is subdivided into several sections, one of which, the Vespoidea, includes all the true wasps; in addition to the ruby wasps and many of the " Fossores " or digging wasps.

The true wasps (forming the old section Diploptera) are in their turn divided into three families — (1) the Vespidae, (2) the

Eumenidae, and (3) the Masaridae, which together comprise some 1500 different species. They arc characterized by their wings, which are present in both sexes and also in the modified females or workers, being longitudinally folded when at rest, except in the Masaridae. The antennae are usually elbowed, and contain twelve or thirteen joints; in some cases they are clavate. A pair of notched faceted eyes are present, and three ocelli in the top of the head. The mouth-parts are arranged for sucking, but have not reached that degree of perfection found amongst the bees. Hence wasps cannot obtain the sugary secretion from deeply-seated nectaries, and their visits to flowers are confined to such as are shallow or widely opened; they particularly frequent the UmbelHferae. The maxillae are elongated, and compressed, the maxillary palp six-jointed. The labium is prolonged centrally into a " tongue," which is glandular at the tip; the paraglossae are linear. The labial palp has three or four joints. The pro-thorax is ova!, and its sides are prolonged backward to the base of the wings. The fore wing has two or three submarginal cells. The legs are not provided with any adaptations for collecting pollen. The abdomen is sometimes pedunculate, its second (apparently first) segment being drawn out into a long stalk, which connects it with the aiitrunk, made up of the thorax and the first abdominal segment. The queens and the workers are armed with a powerful sting. The usual colour of these insects is black, relieved to a greater or less degree by spots and patches of yellow or buff.

The Diploptera may be subdivided into two groups in accord- ance with the habits of life of the insects comprising the section. One of the groups includes the family Vespidae, which is com- posed of social wasps, and includes the hornet (Vespa crabro) and the common wasp (V. vulgaris). The other group contains two smaller families, the Eumenidae and the Masaridae, the members of which are solitary in their mode of life.

Family 1. Vespidae. — In addition to their social habits the members of this family are characterized by certain structural features. The anterior wings have three submarginal cells. The antennae have thirteen joints in the males and twelve in the females; the claws of ; the tarsi are simple; the anterior four tibiae have two spines at the tip; the abdomen is but rarely pedunculated, and the posterior segments are often very contractile.

*The members of this family approximate very closely to bees in their social manner of life. The communities are composed of males, fertile females and workers. The latter are females in which the ovary remains undeveloped; they resemble the perfect female in external appearance, but are slightly smaller. It has been shown by P. Marchal that a clear line of distinction between queen and worker cannot always be drawn. Unlike the hive bees', the wasps' com- munity is annual, existing for one summer only. Most of the members die at the approach of autumn, but a few females which have been fertilized hibernate through the winter, sheltered under stones or in hollow trees. In the spring and with the returning warm weather the female regains her activity and emerges from her hiding- place. She then seta about finding a convenient place for building a nest and establishing a new colony. The common wasp (V. vulgaris) usually selects some burrow or hole in the ground, which, if too small, she may enlarge into a chamber suitable for her purpose. She then begins to build the nest. This is constructed of small nbrcs of old wood, which the wasp gnaws, and kneads, when mixed with the secretion fro*m the salivary glands, into a sort of papier-mache pulp. Some of this is formed into a hanging pillar attached to the rocf of the cavity, and in the lower free end of this three shallow cup-like cells are hung. In each of these an egg is laid. The foundress of the society then continues to add cells to the comb, and as soon as the grubs appear from the first-laid eg^s she has in addition to tend and feed them. The development within the egg takes eight days.*

The grubs are apodal, thicker in the middle than at either end; the mandibles bear three teeth; the maxillae and labium are repre- sented by fleshy tubercles. The body, exclusive of the head, consists of thirteen segments, which bear lateral tubercles and spiracles. The larva has no anus. The larvae arc suspended with the head downwards in the cells, and require a good deal of attention, being fed by their mother upon insects which arc well chewed before they are given to the larvae, or upon honey.

At the same time the mother is enlarging and deepening the cells in which they live, building new cells, and laying more eggs, which are usually suspended in the same angle of each cell.

After about a fortnight the grubs cease to feed, and, forming a silky cover to their cells, become pupae. This quiescent stage lasts about ten days, at the end of which period they emerge as the imago or perfect insect. The silky covering of the cell is round or convex outwards; and to leave the cell the insect either pushes it out, when

it opens like a box lid, or gnaws a round hole through it. As soon as the cell is vacated it is cleaned out and another egg deposited. In this way two or three larvae occupy successively the same cell during the summer. The first wasps that appear in a nest are workers, and these at once set to work to enlarge the comb, and feed the larvae, &c. The material of the nest, as before stated, is usually dried wood, worked by the mandibles of the wasp, with the addition of its salivary secretion, into a pulp, which can easily be moulded whilst moist; it dries into a substance of a papery appearance, but possessing considerable tenacity. Sometimes paper itself, such as old cartridge cases, is used. The combs areˆrranged horizontally; each contains a single layer of cells opening downwards. The second comb is suspended from the first by a number of hanging pillars which are built from the point of union of three cells. The space between two combs is just sufficient to allow the wasps to cross each other. The combs are roughly circular in outline, and increase in size for the first four or five layers, after which they begin to decrease; the whole is covered by a roughly made coatmg consisting of several layers of the .same papery substance which composes the combs. This is continued down until it forms a roughly spherical covering for the whole, but not giving any support to the combs, which are inde- pendent of it. As the nest increases in size, the covering needs to be repeatedly pulled to pieces and reconstructed, its inner layer being cut away as the combs are enlarged. The covering is pierced by apertures for the passage of the wasps. The cells are hexagonal at their mouths, but above become more rounded in their cross section. During the first half of the summer workers only are produced, but, as fruit ripens and food becomes more abundant, fully developed females and males appear, the latter often from parthenogenettcally developed eggs of the later broods of workers. The males ana females are larger than the workers, and require larger cells for their development; these are usually kept apart from one another and from those of the workers. The malts may be distinguished by their longer antennae, by the more elongated outline of their body, and by the absence of a sting.

In a favourable season, when the weather is warm and food plentiful, a nest may contain many thousands of cells full of wasps in various stages of

development; and, as each cell is occupied two or three times in the course of a summer, those authorities who put the number of the members of the community as high as 30,000 are probably not far wrong.

At the approach of autumn the society begins to break up; the males fertilize the females whilst flying high in the air. They then die, often within a few hours. The workers leave the nest, carrying with them any grubs that remain in the cells, and both soon perish. The nest is entirely deserted. The fertilized females, it has been seen, creep into crevices under stones or trees, or hide amongst moss, and hibernate until the warmth of the following spring induces them to leave their hiding-places and set about founding a new community. There are altogether seven species of Vespa met with in Britain. V. vulgaris, the common or ground wasp, V. rufa, the red wasp, distinguished by its reddish-yellow abdomen, and V, germanica, the German ‘ wasp, with three black spots upon its first abdominal seg- ment, are classed together a£ ground wasps. They build their nests in burrows in the ground, but this is not an invariable rule; they may be distinguished from the tree wasps by their shorter cheeks and usually by the first joint in the antennae or the female being black. Vespa austriaca (arborea) is a race of V. Fig. 1.— Vespa rufa.

rufa, in whose nest it sometimes

lives as an inquiline. The tree wasps build stouter nests upon branches of trees; the first joint of the antennae of the females is yellow in front. The tree wasps are V. sylvestris, norvegica and crabro.

The hornet, V. crabro, is the largest species occurring in Great Britain. They have a more distinctly red colour than the common wasp, and a row of red spots upon each side of the abdomen. They occur much more rarely than the common wasp, and appear to he almost confined to the southern half of England. Their nests resemble those described above, but are larger; t’hcy t are found in hollow trees or deserted out-houses. Their communities are smaller in number than those of the other wasps.

The hornet, where it occurs in any number, does a considerable amount of damage to forest trees, by gnawing the bark off the younger branches to obtain material for constructing its nest. It usually selects the ash or alder, but sometimes attacks the lime, birch and willow. Like the wasp, it does much damage to fruit, upon the juices of which it lives. On the other hand, the wasp is useful by keeping down the numbers of flies and other insects. It catches these in large numbers, killing them with its jaws and not with its sting. It then tears off the legs and wings, and bears the body back to its nest as food for the larvae. Wasps also act to some extent as flower fertilizers, but in this respect they cannot compare with bees; they visit

fewer flowers, and have no adaptations on their limbs for carrying off the pollen.

The genus Vespa is very widely spread; it contains over forty species, distributed all over the world. Some of the largest and handsomest come from eastern Asia. V. mandarina of China and Japan, and V. magnified of the East Indies and Nepal, measure

2 in. across the wings; V. orientaiis, found in Greece, Egypt and the East, builds its nest of clay.

The only other genus of Vespidae which is found in Europe is Polistes, which occurs in the countries bordering the Mediterranean. The colonics of this genus are much smaller than those of Vespa. Each nest consists of a single tier of cells in the form of a round plate, sup- ported in the middle by a single stalk. This comb is sometimes vertical, the cells then being horizontal or slightly oblique. Some of the members of this genus store up honey, which in the case of a South American species is poisonous, from the nature of the flowers from which it is gathered. The members of this genus have a slender body; the thorax is more oblong than in the genus Vespa, the palps are stouter and the abdomen Is more distinctly pedunculate.

The genus Ischnogaster, from the East Indies, has many structural features in common with the Eumenidae, but the character of its communities, and its nest, which is very small, justify its position amongst the social wasps.

The genus /carta, common in Australia and the East Indies, builds very small nests, of two or three rows of cells, hanging on one side from a stalk.

Synacca is a South American genus, which builds large nests, sometimes 3 ft. in length, closely applied to the branch of a tree; they never contain more than one layer of cells, which are hori- zontally placed. The whole nest is built of coarse material, chiefly small pieces of bark; and there is only one opening, at the lower end. Another South American genus, Chartergus, makes a tough nest, pendent from boughs of trees, and opening to the exterior below by a median aperture. The combs are arranged, somewhat like funnels, inside one another, but with spaces between. The apex of each comb is pierced by a hole for the wasps to pass from one gallery to another.

The nest, of Tatua, which occurs in

Fig. 2. — Nest of Vespa sylvestris.

FlG. ˆ.ˆ—Polistes tepidus and nest.

*Mexico and * South America, is also pendent, but the combs are horizontal; the opening from the exterior is at the side, and the passage from one gallery to another is also lateral.*

The external appearance of the nest of Nectarina, found in Brazil and other parts of South America, resembles that of the common wasp, but is rougher. Internally the combs are arranged concentri- cally, more or less parallel with the external covering which affords them support.

The members of the two remaining families, the Eumenidae and the Masaridae, resemble one another in their solitary mode of life; only males and normal females exist — no workers being found.

Family 2. Eumenidae. — Solitary species, with three submarginal cells in the fore wing; antennae with thirteen joints in the male, twelve in the female; abdomen sometimes pedunculate, posterior segments contractile. In the foregoing structural features the Eumenidae resemble the Vespidae, but they differ in having bifid

Fig. 4. Eumenes smithii.

claws on their tarsi, and the t two anterior tibiae have but one spine at the tip. The mandibles are elongated, and form a kind of rostrum, in this respect approaching the Fossores.

Eumenes coarctata is the only British species of this genus. The female is ˆ in. long, the male somewhat shorter. The abdomen is connected with the thorax by a long peduncle. The colour is black, relieved by spots of yellow. It constructs small spherical cells of mud, which are found attached to stems of plants, very generally to the heath. At first the cell opens to the exterior by means of a round pore; one egg is deposited in each cell, and a store of honey as food for the larva when hatched; the cell is then closed with mud. The larvae of some species are carnivorous, and then the food-supply stored up in the cell con- sists of caterpillars and other insect larvae which have been paralysed by the parent wasp stinging thcrn through the cerebral ganglion ; when the larva of the Eumenes emerges from the egg it sets upon these and devours them.

The genus Odynerus contains a 'ery large number of species, found in all parts of the world. The members of this genus are about the size of a fly, and they differ from Eumenes in having a sessile abdomen. Some of the species construct their cells in sand- heaps, lining them with agglutinated

grains of sand; others live in cavities of trees lined with, the same material, whilst others build their nests of mud. Like some of the species of Eumenes, they store up paralysed Lepidopterous and Chrysomeleous larvae as food for their carnivorous grubs.

Family 3. Masaridae.— The membei's of the third family, the Masaridae, are sharply distinguished by the possession of only two submarginal cells in the fore wing, which folds imperfectly or not at all when at rest. Their antennae are frequently clavate, particularly so in the genus Celonites; they are twelve-jointed, but as the terminal joints are almost fused they appear to be composed of only eight joints. The wings are not so completely folded as in the other two families, and the abdomen is but slightly contractile. The maxillae are short and their palps very small, with but three or four joints.

The number of genera comprised in this family is small; none occur in Britain, but in southern Europe some species are found. They make their nest in cavities in the earth, generally in a bank, and construct an irregular gallery leading down to it.

During hot fine summers wasps cause a good deal of less to market gardeners and fruit growers. During this time of year they live almost exclusively upon the sweet juices of ripe fruit, occasionally carrying off small particles of the flesh. At the same time they have not entirely lost their carnivorous tastes, for they frequently attack the meat in butcher's shops, but render compensation by killing and carrying off to feed their grubs considerable numbers of blow-flies. Wasps also perform an important service in keeping down the numbers of cater- pillars. The larvae are almost exclusively carnivorous, living upon insects captured by their parents and reduced by them to a pulp before being given to the young. During the spring the first broods that appear live largely upon honey; and this forms the staple food of the genus Polistes throughout their whole life.

In attempting to rid a district of wasps, unless the nest can be taken, there is little good in killing stray members of the community. On the other hand, thekilling of queen-wasps in early

spring probably means that the formation of a nest and the production of a society whose members are counted by thousands is in each case prevented.

The number of wasps is kept down by numerous enemies. The most effective of these live in the nests and devour the larvae; among them are two species of beetle, Rhipiphorus paradoxus and Lebia linearis. Two species of Ichneumon, and a species of Anthomyia, also infest the nests of wasps and prey upon the grubs. The larvae of the syrphid flies Volucella,

found in the nests of both wasps and bees, are now believed to be scavengers rather than parasites. In the tropics some species are attacked by fungi, the hyphae of which protrude between

Masaris vespiformis.

the segments of the abdomen, and give the wasp a very extra- ordinary appearance.

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(A. E. S.;G. H. C.)

WASSAIL (O. Eng, wees hdl, " be whole," " be well "), primarily the ancient form of " toasting," the term being applied later to the Christmas feasting and revelries and particularly to the bowl of spiced ale or wine which was a feature of the medieval Christmas. One of the earliest references to the wassail-bowl in English history is in the description of the reception of King Vor tiger n by Hengist, when Rowena " came into the king's presence, with a cup of gold rilled with wine in her hand, and making a low reverence unto the king said, ' Waes hael hlaford Cyning,' which is ' Be of health, Lord King.' " In a collection of ordinances for the regulations of the royal household in Henry VII. 's reign, the steward on Twelfth Night was to cry " wassail " three times on entering with the bowl, the royal chaplain respond- ing with a song. Wassailing was as much a custom in the monasteries as in laymen's houses, the bowl being known as poculum Caritatis. What was popularly known as wassailing was the custom of trimming with ribbons and sprigs of rosemary a bowl which was carried round the streets by young girls singing caroLs at Christmas and the New Year. This ancient custom still survives here and there, especially in Yorkshire, where the bowl is known as " the vessel cup," and is made of holly and evergreens, inside which are placed one cr two dolls trimmed with ribbons. This cup is borne on a stick by children who go from house to house singing Christmas carols. In Devonshire and elsewhere it was the custom to wassail the orchards on Christmas and New Year's eve. Pitchers of ale or cider were poured over the roots of the trees to the accompani-

ment of a rhyming toast to their healths.

WASTE (O. Fr. wast, guast, gast, gaste; Lat. vasttis, vast, desolate), a term used in English law in several senses, of which four are the most important. (1) " Waste of a manor " is that part of a manor subject to rights of common, as distinguished from the lord's demesne (see Commons, Manor). (2) " Year, day, and waste " was a part of the royal prerogative, acknowledged by a statute of Edward II. > De Fraerogativa Regis. The king had the profits of freehold lands of those attainted of felony and petit treason, and of fugitives for a year and a day with a right of committing waste in sense (3) thereon. After the expiration of a year and a day the lands returned to the lord of the fee. This species of waste was abolished by the Corruption of Blood Act 1814 (see Felony, Treason). (3) The most usual significa- tion of the word is " any unauthorii^d act of a tena..t, ior a freehold estate not of inheritance, or for any lesser interest, which substantially alters the permanent character of the thing demised (i.) by diminishing its value, (ii.) by increasing the burden on it, (iii.) by impairing the evidence of title and thereby injuring the " inheritance " (West Ham Charity Board v. East London W.W., 1900, 1 Ch. 624, 637; cf. Pollock, Law of Torts, 7th ed., 345).

Waste in sense (3) is either voluntary or permissive. Voluntary waste is by act of commission, as by pulling down a house, wrongfully removing fixtures (q.v.), cutting down timber trees, i.e. oak, ash, elm, twenty years old, and such other trees, e.g. beech, as by special custom arc counted timber, in the district, opening new quarries or mines (but not continuing the working of existing ones), or doing anything which may— for this is the modern test — alter the nature of the thing demised, such as conversion of arable into meadow land. Although an act may technically be waste, it will not as a rule constitute actionable waste, or be restrained by injunction, in the absence of some prohibitive stipulation if it is " ameliorating," i.e. if it improves the value of the land demised (see Mmx v. Cobley, 1892, 2 Ch. 253, 263). In the case of " timber estates " upon which trees of various kinds are cultivated solely for their produce and the profit gained from their periodical felling and cutting, the timber is not considered as part of the inheritance but as the annual fruits cf the estate, and an exception arises in favour of the tenant for life (see Dashwood v. Mogniac, 1891. 3 Ch. 306). Under the Settled Land Act 1882 a tenant for life may grant building, mining and other

leases for the prescribed terms " for any purpose whatever, whether involving waste or not." Permissive waste is by act of omission, such as allowing buildings to fall out of repair. A " termor " — a term which here includes " all who held by lease for life or lives, or for years by deed or without deed " by the statute of Marlborough (1267) — may not commit

waste without licence in writing from the reversioner. In case a tenant for life or for any smaller interest holds (as is often the case by the terms of a will or settlement) " without impeachment of waste " (sauns impeachment de wast, i.e. without liability to have his waste challenged or impeached), his rights are considerably greater, and he may use the profits salva return substantia (to use the language of Roman law, from which the English law of waste is in great measure derived). For instance, he may cut timber in a husband-like manner and open mines; but he may not commit what is called equitable waste, that is, pull down "or deface the mansion or destroy timber planted or left for ornament or shelter (Weld-Blundell v. Wolseley, 1903, 2 Ch. 664). Acts of equitable waste were, before 1875, not cognizable in courts of common law, but by the judicature Act 1873, s. 25 (3), in the absence of special provisions to that effect an estate for life without impeachment of waste does not confer upon the tenant for life any legal light to commit equitable waste. A copy-holder mav not commit waste unless allowed to do so by the custom of the manor. The penalty for waste is forfeiture of the copyhold ; Galbraith v. Foynton, 1905, 2 K.B. 258 (see Copy- hold). The Agricultural Holdings Acts 1900 and 1906, by reason of their provisions giving compensation for improvement, as regards the holdings to which they apply, override some of the old common law doctrines as to waste. The act of 1900 provides (s. 2 [3]) that where a tenant, who claims compensation for improvements, has wrongfully been guilty of waste, either voluntary or permissive, the landlord shall be entitled to set off the sums due to him in respect of such waste, and to have them assessed by arbitration in manner provided by the acts of 1900 and 1906. Under the act of 1906 the tenant is permitted to disregard the terms of his tenancy as to the mode of cropping on arable land, but if he exercises his statutorv freedom of cropping in such a manner as to injure or deteriorate his holding, the landlord is entitled to recover damages for such iniurv, &c. (s.3).

Remedies for Waste. — Various remedies for waste have been given to the reversioner at different periods in the history of English law. At common law only single damages seem to have been recoverable. This was altered by the legislature, and for some centuries waste was a criminal or quasi-criminal offence. Magna Carta enacted that a guardian committing waste of the lands in his custody should make amends and lose his office. The statute of Marlborough (1267) made a " fernjor " (as above defined) committing waste liable to grievous amercement as well as to damages, and followed Magna Carta in forbidding waste by a guardian. The statute of Gloucester (1278) enacted that a writ of waste might be granted against a tenant for life or years or in courtesy or dower, and on being attainted of waste the tenant was to forfeit the land wasted and to pay thrice the amount of the waste. This statute was repealed by the Civil Procedure Acts

Repeal Act 1879. In addition to the writ of waste the writ of estrepement (said to be a corruption of exstirpamentum, and to be connected with the French estropier, to lame) lay to prevent injury to an estate to which the title was disputed. This writ has long been obsolete. Numerous other statutes dealt with remedies for waste. The writ of waste was superseded at common law by the " mixed action " of waste (itself abolished by the Real Property Limitation Act 1833), and by the action of trespass on the case (see Tort, Trespass). The court of chancery also intervened by in- junction to restrain equitable waste. At present proceedings may be taken either by action for damages, or by application for an injunction, or by both combined, and either in the king's bench or in the chancery divisions. P»y the Judicature Act 1873, s. 25 (8), the old jurisdiction to grant injunctions to prevent threatened waste is considerably enlarged. The Rules of the Supreme Court, Orel. xvi. r. 37, enable a representative action to be brought for the prevention of waste. In order to obtain damages or an injunction, substantial injury or danger of it must be proved. In England only the high court (unless by agreement of the parties) has jurisdiction in questions of waste, but hi Ireland, where the law of waste is similar to English law, county courts and courts of summary jurisdiction have co-ordinate authority to a limited extent (cf. Land Act i860, ss- 35-39)-

The law of waste as it affects ecclesiastical benefices will be found under Dilapidations.

(4) " Waste of assets " or " devastavit " is a squandering and mis-application of the estate and effects of a deceased person by his executors or administrators, for which they are answerable out of their own pockets as far as they have or might have had assets of the deceased (see Executors and Administrators). Executors and administrators may now be sued in the county court for waste of assets (County Courts Act 1888, s. 95).

Scotland. — In Scots law " waste " is not used as a technical term, but the respective rights of fiar and life-renter are much the same as in England. As a general rule, a life-renter has no right to cut timber, even though planted by himself. An exception is admitted in the case of coppice wood, which is cut at regular intervals and allowed to grow again from the rocts. Grown timber is also available

to the life-renter for the purpose of keeping up the estate or repairing buildings. Before making use of mature timber for estate purposes, the life-renter should give notice to the fiar. He is also entitled to the benefit of

ordinary windfalls. Extraordinary windfalls are treated as grown timber. Life-renters by " constitution " {i.e.. by grant from the proprietor) as opposed to life-renters by " reserva- tion " (where the proprietor has reserved the life-rent to himself in conveying the fee to another) have, as a rule, no right to coals or minerals underground if they are not expressed in the grant or appear to have been intended by a testator to pass by his settlement, for they are partes scli. Where coals or minerals are expressed in, the grant, and also in cases of life-rent by " reservation," the life- renter may work any mine which had been opened before the be- ginning of his right, provided he does not employ a greater number of miners, or bring up a greater quantity cf minerals, than the un- burdened proprietor did. All life-renters are entitled to such minerals as are required for domestic use and estate purposes.

British Possessions. — French law is in force in Mauritius, and has been followed in substance in the civil codes of Quebec (art. 455) and St Lucia (art. 406). In most of the other colonies the rules of English law are followed, and in many of them there has been legisla- tion on the lines of the English Settled Land Acts. In India the law as to waste is included to some extent in the Transfer of Property Act (No. IV. of 1882) and its amendments. Section 108 deals with the liabilities of lessees for waste, which may be varied by the terms of the lease or by local usage. The liabilities for waste of persons having under Hindu or Mahommedan law limited interests in reality depend in the main upon those laws and not on Indian statute law.

United States. — " In the United States, especially in the Western states, many acts are held to be only in a natural and reasonable way of using and improving the land — clearing wild woods, for example — which in England, or even in the Eastern states, would be manifest waste " (Pollock, Torts, 7th ed., 345). Thus Virginia, North Carolina, Vermont and Tennessee have deviated in favour of the tenant from English rules, while Massachusetts has adhered to them {Ruling Cases, tit. " Waste," xxv. 380, American notes). In certain states, e.g. Minnesota, Oregon and Washington (ibid., p. 381), the action of waste is regulated by statute.

Europe. — The French Civil Code provides (art. 591) that the usufructuary may cut timber in plantations that are laid out for cutting, and are cut at regular intervals, although he is bound to follow the example of former proprietors as to quantity and times. This provision is in force in Belgium (Civil Code, art. 59 1) . Analogous provisions are to be found in the civil codes of Holland (art. 814), Spain (art. 485), Italy (art. 486), and cf. the German Civil Code, art. 1036.

Authorities. — English law: Bewes, Law of Waste; Fawcett, Law of

Landlord and Tenant; Foa, Law of Landlord and Tenant; Woodfall, Law of Landlord and Tenant. Scots law : Erskine, Principles (Edinburgh). Irish law: Nolan and Kane, Statutes relating to the Law of Landlord and Tenant in Ireland (Dublin) ; Wylie, Judicature Acts (Dublin). American law: Bouvier, Law Diet. (Boston and London). Indian law: Shepherd and Brown, Indian Transfer of Property Act 1882. (A. W. R.)

WATCH (in 0. Eng. wacce, a keeping guard or watching, from wacian, to guard, watch, wacan, to wake), a portable time- piece. This is the most common meaning of the word in its substantival form, and is the subject of the present article. The word, by derivation, means that which keeps watchful or wakeful observation or attention over anything, and hence is used of a person or number of persons whose duty it is to protect anything by vigilance, a guard or sentry; it is thus the term for the body of persons who patrolled the streets, called the hours, and performed the duties of the modern police. The application of the term to a period of time is due to the military division of the night by the Greeks and Romans into " watches " (4>uXa/cai, vigiliae), marked by the change of sentries; similarly, on ship- board, time is also reckoned by " watches/' and the crew is divided into two portions, the starboard and port watches, taking duty alternately. 1 The transference of the word to that which marks the changing hours is easy.

1 In the British navy the twelve hours of the night are divided into three watches of four hours — from eight to twelve the first watch, from twelve to four the middle watch, and from four to eight the morning watch. The twelve hours of the day are divided into four watches, two of four hours — eight to midday, midday to four P.M. — and two of two hours, from four to six and six to eight. These are the " dog watches," and their purpose is to change the turn of the watches every twenty-four hours, "so that the men who watch from eight to midnight on one night, shall watch from midnight till 4 A.M. on the next. The " watch bill " is the list of the men appointed to the watch, who are mustered by the officers. Time was originally kept by an hour-glass, every half-hour; the number of the half-hour

Fig. 1.

The invention of portable timepieces dates from the end of the 15th century, and the earliest manufacture of them was in Germany. They were originally small clocks with mainsprings enclosed in boxes; sometimes they were of a globular form and were often called " Nuremberg eggs." Being too large for the pocket they were frequently hung from the girdle. The difficulty with these early watches was the inequality of action of the mainspring. An attempt to remedy this was provided by a contrivance called the stack-freed, which was little more than a sort of rude auxiliary

spring. The problem was solved about the years 1525- 1540 by the invention of the fusee. By this contrivance the main- spring is made to turn a barrel on which is wound a piece of catgut, which in the latter part of the 16th century was replaced by a chain. The other end of the catgut band is wound upon a spiral drum, so contrived that as the spring runs down and becomes weaker the leverage on the axis of the spiral increases, and thus gives a stronger impulse to the works (fig. 1).

In early watches the escapement was the same as in early clocks, namely, a crown wheel and pallets with a balance ending in small weights. Such an escapement was, of course, very imperfect, for since the angular force acting on the balance does not vary with the displacement, the time of oscillation varies with the arc, and this again varies with every variation of the driving force. An immense improvement was therefore effected when the hair-spring was added to the balance, which was replaced by a wheel. This was done about the end of the 17th century. During the 18th century a series of escapements were invented to replace the old crown wheel, ending in the chrono- meter escapement, and though great improvements in detail have since been made, yet the watch, even as it is to-day, may be called an 18th-century invention.

The watches of the 16th century were usually enclosed in cases ornamented with the beautiful art of that period. Some- times the case was fashioned like a skull, and the watches were made in the form of octagonal jewels, crosses, purses, little books, dogs, sca-sheLs, &c, in almost every instance being finely en- graved. Queen Elizabeth was very fond of receiving presents, and, as she was also fond of clocks, a number of the gifts pre- sented to her took the form of jewelled watches.

The man to whom watch-making owes perhaps most was Thomas Tompion (1630-1713), who invented the first dead-beat escapement for watches (fig. 2). It consisted of a balance-wheel mounted on an axis of semi-cylindrical form with a notch in it, and a projecting stud. When the teeth of the scape-wheel came against the cylindrical part of the axis they were held from going forward, but when the motion of the axis was reversed, the teeth slipped past the notch and struck the projection, thus giving an impulse. This escapement was afterwards developed by George Graham (1673-1751) into the horizontal cylindrical escapement and into the well-known dead-beat escapement for clocks.

The development of escapements in the 18th century greatly

is shown by striking the watch bell, hanging on a beam of the fore- castle, or by the mainmast, with the clapper. One stroke is given for each half-hour. Thus 12.30 A.M. is one bell in the middle watch, and 3 a.m. is six

bells. The bell was also used to indicate the course of a ship in a fog. A vessel on the starboard tack tolled the bell, a vessel on the port tack beat a drum. The watch guns were fired when setting the watch in the evening and relieving it in the morning. The gun is now only fired at sundown.

V\V>

Fig. 2.

improved watches. But a defect still remained, namely, the influence of temperature upon the hair-spring of the balance- wheel. Many attempts were made to provide a remedy. John Harrison proposed a curb, so arranged that alterations of tempera- ture caused unequal expansion in two pieces of metal, and thus actuated an arm which moved and mechanically altered the length of the hair-spring, thus compensating the effect of its altered elasticity. But the best solution of the problem was ultimately proposed by Pierre le Roy (1717-1785) and perfected by Thomas Earnshaw (1749-1829). This was to diminish the inertia of the balancc-whecl in proportion to the increase of temperature, by means of the unequal expansion of the metals composing the rim. Invention in watches was greatly stimulated by the need of a good timepiece for finding longitudes at sea, and many successive rewards were offered by the government for watches which would keep accurate time and yet be able to bear the rocking motion of a ship. The difficulty ended by the invention of the chronometer, which was so perfected towards the early part of the 19th century as to have even now undergone but little change of form. In fact the only great triumph of later years has been the invention of watch-making machinery, whereby the price is so lowered that an excellent watch (in a brass case) can now be purchased for about £2 and a really accurate time-keeper for about £18.

A modern watch consists of a case and framework containing the four essential parts of every timepiece, namely, a mainspring and apparatus for winding it up, a train of wheels with hands and a face, an escapement and a balance-wheel and hair-spring. We shall describe these in order.

The Mainspring.— As has been said, the mainspring of an old- fashioned watch was provided with a drum and fusee so as to equalize its action on the train. An arrangement was provided to prevent overwinding, consisting of a hook which when the chain was nearly wound up was pushed aside so as to engage a pin, and thus prevent further winding (see fig. l). Another

arrangement for watches without a fusee, called a Geneva stop, consists of a wheel with one tooth affixed to the barrel arbour, working into another with only four or five teeth. This allows the barrel arbour only to be turned round four or five times.

The " going-barrel, " which is fitted to most modern watdhes, con- tains no fusee, but the spring is delicately made to diminish in si/e from one end to the other, and it is wound up for only a few turns, so that the force derived from it does not vary very substantially. The unevenness of drive is in modern watches sought to be counter- acted by the construction of the escapement and balance-wheel.

Watches used formerly to be wound with a separate key. They are now wound by a key permanently fixed to the case. The de- pression of a small knob gears the winding key with the hands so as to enable them to be set. With this contrivance watches are well protected against the entry of dust and damp.

Watch Escapements. — The escapements that have come into practical use are — (1) the old vertical escapement, now disused; (2) the lever, very much the most common in English watches; (3) the horizontal or cylinder, which is equally common in foreign watches, though it was of English invention; (4) the duplex, which used to be more in fashion for first-rate watches than it is now; and (5) the detached or chronometer escapement, so called because it is always used in marine chronometers.

The vertical escapement is simply the original clock escapement adapted to the position of the wheels in a watch and the balance, in the manner exhibited in fig. 3. As it req uires considerable thickness in the watch, is inferior in going to all the others and is no cheaper than the level escape- ment can now be made, it has gone out of use.

The lever escapement, as it is now univer- sally made, was brought into use late in the 18th century by Thomas Mudge. Fig. 4 shows its action. The position of the lever with referencetothepallets is immaterial in principle, and is only a question of convenience in the arrangement ; but it is generally such as we have given it. The principle is the same as in the dead- beat clock escapement, with the advantage that there is no friction on the dead faces of the pallets beyond what is necessary for locking. The reason why this friction cannot be avoided with a pendulum is that its arc of vibration is so small that the requisite depth of intersection cannot be got between the two circles described by the end S of the lever and any D?n in the pendulum which would work into it; whereas, in a watch, :ne pin P, which is set in a cylinder on the verge of the balance, does not generally slip out of the nick in the end of the lever until the balance has got 15 past

its middle position. The pallets are under- cut a little, as it is called, i.e. the dead faces are so sloped as to

Fig. 3-

Fig. 4.

Fig. 5.

give a little recoil the wrong way, or slightly to resist the unlocking, because otherwise there would be a risk that a shake of the watch would let a tooth escape while the pin is dis- engaged from the lever. There is also a further provision added for safety. In the cylinder which carries the impulse pin P there is a notch just in front of P, into which the other pin S on the lever fits as they pass; but when the notch has got past the cylinder it would prevent the lever from returning, because the safety-pin S cannot pass except through the notch, which is only in the position for letting it pass at the same time that the impulse-pin is engaged in the lever. The pallets in a lever escapement (except bad and cheap ones) are always jewelled, and the scape-wheel is of braes. The staff of the lever also has jewelled pivot- holes in expensive watches, and the scape-wheel has in all good ones. The holes for the balance- pivots are now always jewelled. The scape-wheel in this and most of the watch escapements generally beats five times in a second, in large chronometers four times; and the wheel next to the scape-wheel carries the seconds-hand.

Fig, 5 is a plan of the horizontal or cylinder escapement, cutting through the cylinder, which is on the verge of the balance, at the level of the tops of the teeth of the escape-wheel ; for the triangular pieces A, B are not flat projections in the same plane as the teeth, but are raised on short stems above the plane of the wheel ; and "still more of the cylinder than the portion shown at ACD is cut away where the wheel itself has to pass. The author of this escapement was G. Graham, and it resembles his dead escapements in clocks in principle more than the lever escape- ment does, though much less in appear- ance, because in this escapement there is the dead friction of the teeth against the cylinder, first on the outside, as here repre- sented, and then on the inside, as shown by the dotted lines, during the whole vibration of the balance, except that portion which belongs to the impulse. The impulse is given by the oblique outside edges Aa, Bt of the teeth against the edˆes A, D of the cylinder alternately. The portion of the cylinder which is cut away at the point of action is about 30 less than the semicircle. The cylinder itself is made either of steel or ruby, and, from the small quantity of it which is left at the level of the wheel, it is very delicate; and probably this has been the main reason why, although it is an English invention, it has been most entirely abandoned by the English watchmakers

in favour of the lever, which was originally a French invention, though very much improved by Mudge, for before his invention the lever hada rack or portion of a toothed wheel on its end, working into a pinion on the balance verge, and consequently it was affected by the dead friction, and that of this wheel and pinion besides. This used to be called the rack lever, and Mudge's the detached lever; but, the rack lever being now quite obsolete, the word " detached " has become confined to the chronometer, to which it is more appropriate, as will be seen presently. The Swiss watches have almost universally the horizontal escapement. It is found that— for some reason which is apparently unknown, as the rule certainly does not hold in cases seemingly analogous — a steel scape-wheel acts better in this escapement than a brass one, although in some other cases steel upon steel, or even upon a ruby, very soon throws off a film of rust, unless they are kept well oiled, while brass and steel, or stone, will act with scarcely any oil at ail, and in some cases with none.

The duplex escapement (fig. 6) is probably so called because there is a double set of teeth in the scape-wheel — the long ones (like those of the lever escapement in shape) for locking only, and short ones (or rather r.-.

upright pins on the rim of the wheel) for giving the impulse to the pallet Pon the verge of the balance. It is a single-beat escapement; i.e. the balance only receives the impulse one way, or at every alter- nate beat, as in the chronometer escape- ment. When the balance is turning in the direction marked by the arrow, and arrives at the position in which the dotted tooth b has its point against the triangular notch V, the tooth end slips into the notch, and, as the verge turns farther round, the tooth goes on with it till at last it escapes when the tooth has got into the position A; and by that time the long tooth or pallet which projects from the verge has

moved from p to P, and just come in front of the pin T, which stands on the rim of the scape-wheel, and which now begins to push against P, and so gives the impulse until it also escapes when it has arrived at t\ and the wheel is then stopped by the next tooth B having got into the position b, with its point resting against the verge, and there is dead friction between them, and this friction is lessened by the

distance of the points of the long teeth from the centre of the scape- wheel. As the balance turns back, the nick V goes past the end of the tooth 6, and in consequence of its smallness it passes without visibly affecting the motion of the scape-wheel, though of course it does produce a very slight shake in

passing. It is evident that, if it did not pass, the tooth could not get into the nick for the next escape. The objection to this escapement is that it requires very great delicacy of adjustment, and the watch also requires to be worn care- fully; for, if by accident the halance is once stopped from swinging back far enough to carry the nick V past the tooth end, it will stop altogether, as it will lose still more of its vibration the next time from receiving no impulse. The performance of this escapement, when well made, and its independence of oil, are nearly equal to those of the detached escapement ; but, as lever watches are now made sufficiently good for all but astronomical purposes, for which chrono- meters are used, and they are cheaper both to make and to mend than duplex ones, the manufacture of duplex watches has almost disappeared.

The chronometer or detached escapement is shown at fig. 7 in the form to which it was brought by Earnshaw, and in which it has remained ever since, with the very slight difference that the pallet P, on which the impulse is given (corresponding exactly to the pallet P in the duplex escapement), is now generally set in a radial direction from the verge, whereas Earnshaw made it sloped backward, or undercut, like the scape-wheel teeth. The early history of escape- ments on this principle does not seem to be very clear. They appear to have originated in France; but there is no doubt that they were considerably improved by the first Arnold (John), who died in 1799. Earnshaw's watches, however, generally beat his in trials.

In fig. 7 the small tooth or cam V, on the verge of the balance, is just on the point of unlocking the detent DT from the tooth T of the scape-wheel ; and the tooth A will immediately begin to give the impulse on the pallet P, which, in good chronometers, is always a jewel set in the cylinder; the tooth V is also a jewel. This part of the action is so evident as to require no further notice. When the balance returns, the tooth V has to get past the end of the detent, without disturbing it; for, as soon as it has been unlocked, it falls against the banking-pin E, and is ready to receive the next tooth B, and must stay there until it is again unlocked. It ends, or rather begins, in a stiffish spring, which is screwed to the block D on the watch frame, so that it moves without any friction of pivots, like a pendulum. The passing is done by means of another spring VT, called the passing spring, which can be pushed away from the body of the detent towards the left, but cannot be pushed the other way without carrying the detent with it. In the back vibration, there- fore, as in the duplex escapement, the balance receives no impulse, and it has to overcome the slight resistance of the passing spring besides; but it has no other friction, and is entirely detached from the scape-wheel the whole time, except when receiving the impulse. That is also the case in the lever escapement ; but the impulse in that escapement is givenobliquely, and consequently with a good deal of friction; and, besides, the scape-wheel only acts on the balance through the

intervention of the lever, which has the friction of its own pivots and of the impulse pin. The locking-pallet T is undercut a little for safety, and is also a jewel in the best chronometers; and the passing spring is usually of gold. In the duplex and detached escapements, the timing of the action of the different parts requires great care, i.e. the adjusting them so that each may be ready to act exactly at the right time; and it is curious that the arrangement which would be geometrically correct, or suitable for a very slow- motion of the balance, will not do for the real motion. If the pallet P were really set so as just to point to the tooth A in both escapements at the moment of unlocking (as it has been drawn, because otherwise it would look as if it could not act at all), it would run av,'ay some distance before the tooth could catch it, because in the duplex escapement the scape-wheel is then only moving slowly, and in the detached it is not moving at all, and has to start from rest. The pallet P is therefore, in fact, set a little farther back, so that it may arrive at the tooth A just at the time when A is ready for it, without wasting time and force in running after it. The detached escapement has also been made on the duplex plan of having long teeth for the locking and short ones or pins nearer the centre for the impulse; but the advantages do not appear to be worth the addi- tional trouble, and the force required for unlocking is not sensibly diminished by the arrangement, as the spring D must in any case be fairly stiff, to provide against the watch being carried in the position in which the weight of the detent helps to unlock it.

An escapement called the lever chronometer has been several times reinvented, which implies that it has never come into general use. It is acombination of the lever as to the lockingandthechronometer as to the impulse. It involves a little drop and therefore waste of force as a tooth of the wheel just escapes at the " passing " beat where no impulse is given. But it should be understood that a single-beat escapement involves no more loss of force and the escape of no more teeth than a double one, except the slight

Fig. 7.

drop in the duplex and this lever chronometer or others on the same principle.

There have been several contrivances for remonloire escapements; but there are defects in all of them; and there is not the same advantage to be obtained by giving the impulse to a watch-balance by means of some other spring instead of the mainspring as there is in turret-clocks, where the force of the train is liable to very much greater variations than in chronometers or small clocks.

The balance-wheel and hairspring consist of a small wheel, usually of brass, to which is affixed a spiral, or in chronometers a helical, spring. This wheel swings through an angle of from 180 to 270 and its motions are approximately isochronous. The time of the watch can be regulated by an arm to which is attached a pair of pins which embrace the hair-spring at a point near its outer end, and by the movement of which the spring can be lengthened or shortened. The first essential in a balance-wheel is that its centre of gravity should be exactly in the axis, and that the centre of gravity of the hair-spring should also be in the axis of the balance-wheel. True isochronism is disturbed by variations in the driving force of the train or by variations in temperature, and also by variations in barometric pressure. Isochronism is produced in the first place by a proper shape of the spring and its overcoil It is usual to time the watch's going when the mainspring is partly wound up, as well as when it is fully wound up, and then by removing parts of the hair-spring to get such an adjustment that the rate is not influenced by the lesser or greater extent to which the watch has been wound. The variations in length and still more in elasticity caused in a hair- spring by changes of temperature were for long not only a trouble to watchmakers but a bar to the progress of the art. A pendulum requires scarcely any compensation except for its own elongation by heat; but a balance requires compensation, not only for its own expansion, which increases its moment of inertia just like the pendulum, but far more on account of the decrease in the strength of the spring under increased heat. E. G. Dent, in a pamphlet on compensation balances, gave the following results of some experi- ments with a glass balance, which he used for the purposeon account of its less expansibility than a metal one: at 32° F., 3606 vibrations in an hour; at 66°, 3598-5; and at ioo°, 3599. If therefore it had been adjusted to go right (or 3600 times in an hour) at 32 °. it would have lost ~\ and 8£ seconds an hour, or more than three minutes a day, for each successive increase of 34 , which is about fifteen times as much as a common wire pendulum would lose under the same increase of heat ; and if a metal balance had been used instead of a glass one the difference would have been still greater.

The necessity for. this large amount of compensation having arisen from the variation of the elasticity of the spring, the first attempts at correcting it were by acting on the spring itself in the manner of a common regulator. Harrison's compensation consisted of a compound bar of brass and steel soldered together, having one end fixed to the watch-frame and the other carrying two curb pins which embraced the spring. As the brass expands more than the steel, any increase of heat made the bar bend; and so, if it was set the right way, it carried the pins along the spring, so as to shorten it. This contrivance is called a compensation curb; and it has often been. reinvented, or applied in a modified form. But there are two objections to

it: the motion of the curb pins does not correspond accurately enough to the variations 111 the force of the spring, and it disturbs the isochronism, which only subsists at certain definite lengths of the spring.

The compensation which was next invented left the spring un- touched, and provided for the variations of temperature by the construction of the balance itself. Fig. 8 shows the plan of the ordinary compensation balance. Each portion of the rim of the balance is composed of an inner bar of steel with an outer one of brass soldered, or rather melted, upon it, and carrying the weights b, b, which are screwed to it. As the temperature increases, the brass expanding must bend the steel inwards, and so carries the weights farther in, and diminishes the moment of inertia of the balance, the decrease of rate being inversely as the diameter of the balance-wheel. The metals are generally soldered together by pouring melted brass round a solid steel disk, and the whole is afterwards turned and filed away till it leaves only the crossbar in the middle lying flat and the two portions of the rim standing edgeways. The first person to practise this method of uniting them appears to have been either Thomas Earnshaw or Pierre le Roy.

The adjustment of a balance for compensation can only be done by trial, and requires a good deal of time. It must be done in- dependently of that for time— the former by shifting the weights, because the nearer they arc to the crossbar the less distance they will move over as the rim bends with them. The timing is done by screws with heavy heads {t, t, fig. 8), which are just opposite to the ends of the crossbar, and consequently not affected by the bending of the rim; other screws are also provided round the rim for adjusting the moment of inertia and centre of gravity of the balance-wheel. The compensation may be done approximately by

the known results of previous experience with similar balances; and many watches are sold with compensation balances winch have never been tried or adjusted, and sometimes with a mere sham compensation balance, not even cut through.

Secondary Compensation. — When chronometers had been brought to great perfection it was perceived that there was a residuary error, which was due to changes of temperature, but which no adjustment of the compensation would correct. The cause of the secondary error is that as the temperature rises the elasticity of the spring decreases, and therefore its accelerating force upon the balance- wheel diminishes. Hence the watch tends to go slower.

In order to compensate this the split rim of the balance-wheel is made with the more expansible metal on the outside, and therefore tends to curl inwards with increase of temperature, thus diminishing the moment of inertia of the wheel. Now the rate of error caused by the increase of temperature of the spring varies approximately with the temperature according to a certain law, but the rate of correction due to the diminution of the moment of inertia caused by the change of form of the rim of the wheel does not alter proportionally, but according to a more complex law of its own, varying more rapidly with cold than with heat, so that if the rate of the chronometer is correct, say, at30°F. and also at 90 ° F., it will gain at all intermediate temperatures, the spring being thus under-corrected for high tempera- tures and over-corrected for low. Attempts have been made by alterations of shape of the balance-wheel to harmonize the progress of the error with the progress of the correction, but not with very conspicuous success.

We shall give a short description of the principal classes of in- ventions for this purpose. The first disclosed was that of J. S. Eiffe (sometimes attributed to Robert Molyneux), which was com- municated to the astronomer-royal in 1835. In one of several methods proposed by him a compensation curb was used; and though, for the reasons given before, this will not answer for the primary compensation, it may for the secondary, where the motion required is very much smaller. In another the primary compensation bar, or a screw in it, was made to reach a spring set within it with a small weight attached at some mean temperature, and, as it bent farther in, it carried this secondary compensation weight along with it. The obvious objection to this is that it is discontinuous; but the whole motion is so small, not more than the thickness of a piece of paper, that this and other compensations on the same principle appear to have been on some occasions quite successful.

Another large class of balances, all more or less alike, may be represented by E. J. Dent's, which came next in order of time. He described several forms of his invention; the following descrip- tion applies to the one he thought the best. In fig. 9 the flat cross- bar rr is itself a compensation bar which bends n « upwards under increased heat; so that, if

(*) > J the weights v, v were merely set upon up-

right stems rising from the ends of the cross- bar, they would approach the axis when that bar bends upwards. But, instead of the stems rising from the crossbar, they rise from the two secondary compensation pieces stu, in the form of staples, which are set on the crossbar ; and, as these secondary' pieces themselves also bend upwards, they make the weights approach the axis more rapidly as the heat increases ; and by a proper adjustment of the

height of the weights on the stems the moment of inertia of the balance can be made to vary in the proper ratio to the variation of the intensity of the spring. The cylindrical spring stands above the crossbar and between the staples.

Fig. 10 represents E. T. Loseby's mercurial compensation balance. Besides the weights D, D, set near the end of the primary compen- sation bars B, B, there are small bent tubes FE, FE with mercury in them, like a thermometer, the bulbs being at F, F. As the heat increases, not only do the primary weights D, D and the bulbs F, F approach the centre of the balance, but some of the mercury is driven along the tube, thus carrying some more of the weight towards the centre, at a ratio increasing more rapidly than the temperature. The tubes arc scaled at the thin end, with a little air included. The action is here equally continuous with Dent's, and the adjustments for primary and secondary com- pensation are apparently more in- dependent of each other; and this modification of Le Roy's use of mercury for compensated balances (which does not appear to have answered) is certainly very elegant and ingenious. Nevertheless an analysis of the Greenwich lists for seven years of Loseby's trials proved that the advantage of this method over the others was more theoretical than practical; Dent's compensation was the most suc- cessful of all in three years out of the seven, and Loseby's in only one.

Fig. 10.

Loseby's method has never been adopted by any other chronometer- maker, whereas the principles both of Eiffe's and of Dent's methods have been adopted by several other makers.

A few chronometers have been made with glass balance-springs, which have the advantage of requiring very little primary and no secondary compensation, on account of the very small variation in their elasticity, compared with springs of steel or any other metal.

One of the most important and interesting attempts to correct the temperature errors of a hair-spring by a series of corresponding temperature changes in the moment of inertia of the balance-wheel has been made by means of the use of the nickel-steel compound called invar, which, on account of its very small coefficient of ex- pansion, has been of great use for pendulum rods. In a memoir published in 1904 at Geneva, Dr Charles Guillaume, the inventor of invar, shows that in order to get a true secondary compensation what is wanted is a material having the property of causing the curve of the rim of the wheel to change at an increasing rate as compared with changes in the temperature. This is found in those specimens of invar in which the second coefficient of expansion is negative,

i.e. which are less dilatable at higher temperatures than at lower ones. It is satisfactory to add that such balance-wheels have been tried successfully on chronometers, and notably in a deck watch by Paul Ditisheim of Neuchatel, who has made a chronometer with a tourbillon escapement and an invar balance-wheel, which holds the highest record ever obtained by a watch of its class.

It is obvious that in order that a watch may keep good time the centre of gravity of the balance-wheel and hair-spring must be exactly in the axis; for if this were not the case, then the wheel would act partly like a pendulum, so that the time would vary according as the watch was placed in different positions. It is exceedingly difficult to adjust a watch so that these " position errors " are eliminated. Accordingly it has been proposed to neutralize their effect by mounting the balance-wheel and hair- spring upon a revolving carriage which shall slowly rotate, so that in succession every possible position of the balance-wheel and spring is assumed, and thus errors are averaged and mutually destroy one another. This is called the tourbillon escapement. There are several forms of it, and watches fitted with it often keep excellent time.

Stop watches or chronographs are of several kinds. In the usual and simplest form there is a centre seconds hand which normally remains at rest, but which, when the winding handle is pressed in, is linked on to the train of the watch and begins to count seconds, usually by fifths. A second pressure arrests its path, enabling the time to be taken since the start. A third pressure almost instantaneously brings the seconds hand back to zero, this result being effected by means of a heart-shaped cam which, when a lever presses on it instantaneously, flies round to zero position. The number of complete revolutions of the seconds hand, i.e. minutes, is recorded on a separate dial.

Calendar work on watches is, of course, fatal to great accuracy of time-keeping, and is very complicated. A watch is made to record days of the week and month, and to take account of leap years usually by the aid of star-wheels with suitable pauls and stops. The type of this mechanism is to be found in the calendar motion of an ordinary' grandfather's clock.

Watches have also been made containing small musical boxes and arranged with performing figures on the dials. Repeaters are striking watches which can be made at will to strike the hours and either the quarters or the minutes, by pressing a handle which winds up a striking mechanism. They were much in vogue as a means of dis- covering the time in the dark before the invention of lucifer matches, when to obtain a light by means of flint and steel was a troublesome affair.

From what has been said it will be seen that for many years the form of escapements and balance-wheels has not greatly altered. The great improvements which modern science has been able to effect in watches are chiefly in the use of new metals and in the employment of machinery, which, though they have altered the form but little, have effected an enormous revolution in the price. The cases of modern watches are made sometimes of steel, artificially blackened, sometimes of compounds of aluminium and copper, known as aluminium gold. Silver is at present being less employed than formerly. The hair-springs are often of palladium in order to render the watch no n- magnetizable. An ordinary watch, if the wearer goes near a dynamo, will probably become magnetized and quite useless for time-keeping. One of the simplest cures for this accident is to twirl it rapidly round while retreating from the dynamo and to continue the motion till at a considerable distance. The use of invar has been already noticed. '

It would be impossible to enumerate, still more to describe, the vast number of modern machines that have been invented for making watches. It may be said briefly that every part, including the toothed wheels, is stamped out of metal. The stamped pieces are then finished by cutters and with milling machinery. Each machine as a rule only does one operation, so that a factory will contain many hundreds of different sorts of machines. The modern watchmaker therefore is not so much of a craftsman as an engineer. The effect of making all the parts of a watch by machinery is that each is interchangeable, so that one part will fit any watch. It is

not an easy thing to secure this result, for as the machines are used the cutting edges wear down and require regrinding and resetting. Hence a tool is not allowed to make more than a given quantity of parts without being examined and readjusted, and from time to time the pieces being put out are tested with callipers. The parts thus made are put in groups and sorted into boxes, which are then given over to the watch-adjusters, who put the parts together and make the watch go. The work of adjustment for common watches is a simple matter. But expert adjusters select their pieces, measure them and correct errors with their tools. The finest watches are thus largely machine-made, but hand-finished. The prejudice against machine-made watches has been very strong in England, but is dying out — not, unfortunately, before much of the trade has been lost. A flourishing watch industry exists in Switzerland in the neighbourhood of Neuchatel. A watch in a stamped steel case can now be made for about five shillings. There is no reason why in such a neighbourhood as Birmingham the English watch

industry should not revive.

The use of jewelled bearings for watch pivots was introduced by Nicholas Facio about the beginning of the 18th century. Diamonds and sapphires are usually employed and pierced either by diamond drills or by drills covered with diamond dust. Rubies are not a very favourite stone for jewels, but as they and sapphires can now be made artificially for about two shillings a carat the difficulty of obtaining material for watch jewelling has nearly disappeared.

Watches have also been fitted with machinery whereby electric contacts are made by them at intervals, so that if wires are led to and away from them, they can be made to give electric signals and thus mark dots at regular intervals on a moving strip of paper.

As in the case of clocks, the accuracy of going of a watch is esti- mated by observation of the variations of its mean daily rate. This is officially done at Kew Observatory, near Richmond, and also for admiralty purposes at Greenwich. At Richmond watches are divided into two classes, A and B. For an A certificate the trials last for forty-five days, and include tests in temperatures varying from 40 to 90 F. f going in every position with dial vertical, face up and face down. The average daily departure from the mean daily rate, that is the average error due to irregular departures from the average going rate, must not exceed 2 seconds a day except where due to position, when it may amount to 5 seconds. The errors should not increase more than 0-3 seconds a day for each i° F. The trial for the B certificate is somewhat similar but less severe. Chronometers are put through trials lasting 55 days, and their average error from mean rate is expected not to exceed 0-5 seconds per diem. The fees for these tests are various sums from two guineas down- wards. In estimating the time-keeping qualities of a watch or clock, the error of rate is of no consequence. It is simply due to the time- keeper going too fast or too slow, and this can easily be corrected. What is wanted for a good watch is that the rate, whatever it is, shall be constant. The daily error is of no account provided it is a uniform daily error and not an irregular one. Hence the object of the trials is to determine not merely the daily rate but the variations of the daily rate, and on the smallness of these the value of the watch as a time-keeper depends. (G.; H.H.C.)

WATER. Strictly speaking, water is the oxide of hydrogen which is usually stated to have the formula H 2 (see below), but in popular use the term is applied to a great variety of different substances, all of which agree, however, in being the water of the chemist modified differently in the several varieties by the nature or proportion of impurities. In all ordinary waters, such as are used for primary purposes, the impurities amount to

very little by weight — as a rule to less than fVth of 1 %.

Of all natural stores of water the ocean is by far the most abundant, and from it all other water may be said to be derived. From the surface of the ocean a continuous stream of vapour is rising up into the atmosphere to be recondensed in colder regions and precipitated as rain, snow or sleet, &c. Someˆths of these precipitates of course return directly to the ocean; the rest, falling on land, collects into pools, lakes, rivers, &c, or else penetrates into the earth, perhaps to reappear as springs or wells- As all the saline components of the ocean are non- volatile, rain water, in its natural state, can be contaminated only with the ordinary atmospheric gases — oxygen, nitrogen and carbon dioxide. Rain water also contains perceptible traces of ammonia, combined as a rule, at least partly, with the nitric acid, which is produced wherever an electric discharge pervades the atmosphere.

Lake waters, as a "class, are relatively pure, especially if the mountain slopes over which the rain collects into a lake are relatively free of soluble components. For example, the water of Loch Katrine (Scotland) is almost chemically pure, apart from small, but perceptible, traces of richly carboniferous matter

taken up from the peat of the surrounding hills, and which impart to it a faint brownish hue, while really pure water is blue when viewed through a considerable thickness.

River water varies very much in composition even in the same bed, as a river in the course of its journey towards the ocean passes from one kind of earth to others; while, compared with spring waters, relatively poor in dissolved salts, rivers are liable to be contaminated with more or less of suspended matter.

Spring waters, having been filtered through more or less considerable strata of earth, are, as a class, clear of suspended, but rich in dissolved, mineral and organic matter, and may also contain gases in solution. Of ordinarily occurring minerals only a few are perceptibly soluble in water, and of these calcium carbonate and sulphate and common salt arc most widely diffused. Common salt, however, in its natural occurrence, is very much localized; and so it comes that spring and well waters are contaminated chiefly with calcium carbonate and sulphate. Of these two salts, however, the former is held in solution only by the carbonic acid of the water, as calcium bicarbonate. But a carbonate-of-limc water, if exposed to the atmosphere, even at ordinary temperatures, loses its carbonic acid, and the calcium carbonate is precipitated. The stalactites (q.v.) which adorn the roofs and sides of certain caverns are produced in this manner. Many waters are Valuable medicinal agents owing to their contained gases and salts (see

Mineral Wateks).

In addition to its natural components, water is liable to be con- taminated through accidental influxes of foreign matter. Thus, for instance, all the Scottish Highland lochs are brown tjirough the presence in them of dissolved peaty matter. Rivers flowing through, or wells sunk in, populous districts may be contaminated with excrementitious matter, discharges from industrial establish- ments, &c. The presence of especially nitrogenous organic matter is a serious source of danger, inasmuch as such matter forms the natural food or soil for the development of micro-organisms, includ- ing those kinds of bacteria which are now supposed to propagate infectious diseases. Happily nature has provided a remedy. The nitrogenous organic matter dissolved in (say) a river speedily suffers disintegration by the action of certain kinds of bacteria, with forma- tion of ammonia and other (harmless) products; and the ammonia, again, is no sooner formed than, by the conjoint action of other bacteria and atmospheric oxygen, it passes first into (salts of) nitrous and then nitric acid. A water which contains combined nitrogen in the form of nitrates only is, as a rule, safe organically; if nitrites are present it becomes liable to suspicion; the presence of ammonia is a worse symptom; and if actual nitrogenous organic matter is found in more than microscopic traces the water is possibly (not necessarily) a dangerous water to drink.

All waters, unless very impure, become safe by boiling, which process kills any bacteria or germs that may be present.

Of the ordinary saline components of waters, soluble magnesium and calcium salts are the only ones which are objectionable sanitarily if present in relatively large proportion. Calcium carbonate is harmless; but, on the other hand, the notion that the presence of this component adds to the value of a water as a drinking water is a mistake. The farinaceous part of food alone is sufficient to supply all the lime the body needs; besides, it is questionable whether lime introduced in any other form than that of phosphate is available for the formation of, for instance, bone tissue.

The fitness of a water for washing is determined by its degree of softness. A water which contains lime or magnesia salts decom- poses soap with formation of insoluble lime or magnesia salts of the fatty acids of the soap used. So much of the soap is simply wasted ; only the surplus can effect any detergent action. Several methods for determining the hardness of a water have been devised. The most exact method is to determine the lime and magnesia gravi- metrically or by alkalimetry; or by Clark's soap test, but this process frequently gives inaccurate results. In this method, which, however, is largely used, a measured volume of the water is placed in a stoppered bottle, and a standard solution of soap is then dropped in from a

graduated vessel, until the mixture, by addition of the last drop of soap, has acquired the property of throwing up a peculiar kind of creamy froth when violently shaken, which shows that all the soap-destroying components have been precipitated. The volume of soap required measures the hardness of the water. The soap-solution is referred to a standard by means of a water of a known degree of hardness prepared from a known weight of carbonate of lime by converting it into neutral chloride of calcium, dissolving this in water and diluting to a certain volume. The hardness is variously ex- pressed. On Clark's scale it is the grains of calcium carbonate per gallon of 70,000 grains; in Germany the parts of lime per 100,000 of water, and in France the parts of calcium carbonate per 100,000.

On the English scale, a water of 15 and over is hard, between 5 and 15 moderately hard, and of less than 5 soft.

*That part of the hardness of a water which is actually owing to carbonate of lime (or magnesia) can easily be removed in two ways, (1) By boiling, the free carbonic acid goes off with the steam, and the carbonate of lime, being bereft of its solvent, comes down as a precipitate which can be removed by filtration, or by allowing it to settle, and decanting off the clear supernatant liquor. (2) A method of Clark's is to mix the water with just enough of milk of lime to convert the free carbonic acid into carbonate. Both this **nd the original carbonate of lime are precipitated, and can be removed as in the first case.*

From any uncontaminated natural water pure water is easily

Erepared. The dissolved salts are removed by distillation; if care e taken that the steam to be condensed is dry, and if its condensation be effected within a tube made of a suitable metal (platinum or silver are best, but copper or block tin work well enough for ordinary purposes) , the distillate can contain no impurities except atmospheric gases, which latter, if necessary, must be removed by boiling the distilled water in a narrow-necked flask until it begins to " bump," and then allowing it to cool in the absence of air. This latter opera- tion ought, strictly speaking, to be performed in a silver or platinum flask, as glass is appreciably attacked by hot water. For most purposes distilled water, taken as it comes from the condenser, is sufficiently pure. The preparation of absolutely pure water is a matter of great difficulty. Stas, in his stoichiometric researches, mixed water with potassium manganate, and distilled after twenty- four hours; the

product being redistilled and condensed in a platinum tube just before it was required.

Pure water, being so easily procured in any quantity, is used largely as a standard of reference in metrology and in the quantita- tive definition of physical properties. Thus a " gallon " is defined as the volume at 62 F. of a quantity of water whose uncorrected mass, as determined by weighing in air of 30-in. pressure and 62 F. of temperature, is equal to 10 lb avoirdupois. The kilogramme in like manner is defined as the mass of 1 cubic decimetre of water, measured at the temperature corresponding to its maximum density (4 C). The two fixed points of the thermometer correspond — the lower (o° O, or 32 F.) to the temperature at which ice melts, the upper (ioo° C, o»- 212 F.) to that at which the maximum tension of steam, as it rises from boiling water, is equal to 760 mm. or 30-in. mercury pressure. 30 in. being a little more than 760 mm., 212 F. is, strictly speaking, a higher tcmocrature than ioo D C, but the difference is very trifling. Specific heats are customarily measured by that of water, which is taken as =1. All other specific heats of liquids or solids (with one exception, formed by a certain strength of aqueous methyl alcohol) are less than 1. The temperate character 01 insular climates is greatly owing to. this property of water. Another physiographically important peculiarity of water is that it expands on freezing (into ice), while most other liquids do the reverse. 11 volumes of ice fuse into only 10 volumes or water at o° C; and the ice-water produced; when brought up gradually to higher and higher temperatures, again exhibits the very exceptional property that it contracts between o and 4 C. (by about Toloo °f its volume) and then expands again by more and more per degree of increase of temperature, so that the volume at ioo° C. is 1-043 times that at 4 C. In former times water was viewed as an " element," and the notion remained in force after this term (about the time of Boyle) had assumed its present meaning, although cases of decomposition of water were familiar to chemists. In Boyle's time it was already well known that iron, tin and zinc dissolve in aqueous hydrochloric or sulphuric acid with evolution of a stinking inflammable gas. Even Boyle, however, took this gas to be ordinary air contaminated with inflammable stinking oils. This view was held by all chemists until Cavendish, before 17^4, showed that the gas referred to, if properly purified, is free of smell and constant in its properties, which are widely different from those of air — the most important point of difference being that the gas when kindled in air burns with evolution of much heat and formation of water. Cavendish, however, did not satisfy himself with merely proving this fact qualitatively; he determined the quantitative relations, and found that it takes very nearly 1000 volumes of air to burn 423 volumes of " hydrogen " gas; but tooo volumes of air, again, according to Cavendish, contain 210 volumes of oxygen; hence, very nearly, 2*

volumes of hydrogen take up I volume of oxygen to become water. This important discovery was only confirmed by the sub- sequent experiments of Humboldt and Gay-Lussac, which were no more competent than Cavendish's to prove that the surplus of 3 units (423 volumes instead of 420) of hydrogen was an observational error. More recent work, e.g. of Morley, Leduc and Scott, has shown that the ratio is not exactly 2-1. The gravimetric composition was determined by Bcrzelius and Dulong, and later by Dumas by passing pure hydrogen over red-hot copper oxide. It has also been determined by several other variations and methods (sec Hydrogen). The molecular weight of liquid water has attracted much attention, for it was perceived long ago that its high boiling point, refractive index and other properties were not consistent with the simple formula H 2 0. Cryoscopic measurements led to rhe probable formula (HaO)2. whilst the surface tension leads to (H 2 0)4. The question has been considered by H. E. Armstrong, who suggests that the

simple molecule, H 2 0, which he calls hydrone, condenses in liquid water to form cyclic or chained compounds, containing tetravalent oxygen, resembling in structure the polymethylenes or paraffins.

WATER-BOATMAN, an aquatic hemipterous insect of the family Notonectidae, of which the best known species {Notonecta glauca) is a prominent feature in the pond-life of Great Britain. The technical name, Notonecta, meaning " back-swimmer " alludes to the habit of the insect of swimming upside down, the body being propelled through the water by powerful strokes of the hind legs, which are fringed with hair and, when at rest, are extended laterally like a pair of sculls in a boat. As is the case with other water-bugs, this insect is predaceous and feeds upon aquatic grubs or worms. The body is richly supplied with long hairs, which serve to entangle bubbles of air for purposes of respiration. The eggs are laid in the stems of water plants.

WATERBUCK (Wasserbok), the name of a large South African antelope {Cobus ellipsiprymnus) belonging to the subfamily Cervicaprinae, characterized by the white elliptical ring on the buttocks, and the general reddish grey colour of the long and coarse hair. They have heavily fringed necks and tufted tails; the bucks carry long sub- lyrate and heavily ringed horns, but the does are horn- ■ less. They seek refuge from pur- suit in the water. The name is ex- tended to include the sing-sing or defassa waterbuck (C. dejassa), a wides p read species, without the white ring on the buttocks, and represented by several local races, one of which is foxy red while a second is greyish. Both species equal in si2e the red deer. The smaller members of the genus Cobus (which is exclusively African) are generally called kobs. (See Antelope.)

WATERBURY, a city and one of the county-seats of New Haven county, Connecticut, U.S.A., since 1900 coextensive with the township of Waterbury, on the Naugatuck river, in the west central part of the state, about 32 m. S.W. of Hartford. Pop. (1900) 51,139, of whom 15,368 were foreign-born (5866 being Irish, 2007 Italian, 1777 French Canadian, 1265 Russian, 1195 French, and 938 English); (1910 census) 73,141. Area 29 sq. m. Waterbury is served by the New York, New Haven & Hartford railway, and is connected by electric lines with New Haven, Bridgeport, Thomaston, Woodbury and Watertown. It has four public parks (the Green, Chase, Hamilton and Forest), with a total acreage of 80 acres, and a Soldiers' and Sailors' Monument, designed by George E. Bissell. The most im- portant public buildings are the Federal building, the county court house, a state armoury, (he Silas Bronson Public Library (1870; with an endowment of $200,000 and with 81,500 volumes in i9io),the Odd Fellows Temple, a Y.M.C.A. building and the Buckingham Music Hall (1907); and among the charitable in- stitutions are the Southmayd Home (1898) for aged women, the Waterbury hospital (1890) and the St Mary's hospital (1908). In the city are the St Margaret's Diocesan School for Girls (Protestant Episcopal, 1875), the Waterbury Industrial School and the Academy of Notre Dame (1868). There is good water power here from the Naugatuck river and its tributaries Mad river and Great Brook. In 1005 Waterbury ranked third among the manufacturing cities of Connecticut (being surpassed only by

Bridgeport and New Haven), with a factory product valued at $3 2 >3°7 ,3 59 (6 ■ 7 % more than in 1 900) . The most important manu- factures are rolled brass and copper (value in 1905, $12,599,736, or 24-3 % of the total for the United States), brass-ware (value in 1905, $7,387,228, or 42-2% of the total for the United States), clocks and watches — over a million watches are made here each year — and stamped ware (value in 1905, $1,037,666). The manufacture of brass- ware originated here in 1802 with the making of brass buttons; iron buttons covered with silver were first made here about T760, block tin and pewter buttons about 1S00, bone and ivory buttons about 1812, sheet brass in r83o, and pins and plated metals for daguerreotypes in 1842. Old-fashioned tall wooden clocks were made in Waterbury in the latter part of the 18th century, and cheap watches were first made here in 1879; these were long distinctive of Waterbury, and were often called " Waterbury watches." The manufacture of cloth dates from 1814, and broadcloth was first made here in 1833. The city has a large wholesale trade and is a shipping point for dairy products. The municipality owns and operates the water- works.

The township of Waterbury was incorporated in 1686, having been since its settlement in 1677 a part of Farmington township known as Mattatuck. The city of Waterbury was first chartered in 1853. The city and the township were consolidated in rgor. City elections are held biennially and the mayor, city clerk, treasurer, comptroller, city sheriff and aldermen hold office for two years. With the consent of the Board of Aldermen the mayor appoints five electors who with the mayor constitute a department of public works; appoints three electors who with the mayor, comptroller, and president of the Board of Aldermen constitute a department of finance; appoints five electors who with the mayor constitute a department of public safety; and appoints five electors who constitute a department of public health. In 1002 there was a destructive fire in the business district of the city, and during a strike of street railway employees in 1903 state troops were called out to maintain order.

WATER-DEER, a small member of the deer-tribe from northern China differing from all other Cervidae except the musk- deer (with which it has no affinity) by the absence of antlers in both sexes. To compensate for this deficiency, the bucks are armed with long sabre-like upper tusks (see Deer). The species typifies a genus, and is known as Hydrclapkus (or Hydro- pses) inermis; but a second form has been described from Hankow under the name of H. kreyenbergi, although further evidence as to its claim to distinction is required. Water-deer frequent the neighbourhood of t'ne large Chinese rivers where they crouch amid the reeds and grass in such a manner as to be invisible, even when not completely concealed by the covert. When running, they arch their backs and scurry away in a series of short leaps. In captivity as many as three have been produced at a birth.

This is one of the few deer in which there are glands neither on the hock nor on the skin covering the cannon-bone. These glands probably enable deer to ascertain the whereabouts of their fellows by the scent they leave on the ground and herbage. The sub-aquatic habits of the present species probably render such a function impossible, hence the absence of the glands. The tail is represented by a mere stump. (R. L.)*

WATERFALL, a point in the course of a stream or river where the water descends perpendicularly or nearly so. Even a very small stream of water falling from any considerable height is a striking object in scenery. Such falls, of small volume though often of immense depth, are common, for a small stream has not the power to erode a steady slope, and thus at any con- siderable irregularity of level in its course it forms a fall. In many mountainous districts a stream may descend into the valley of the larger river to which it is tributary by way of a fall, its own valley having been eroded more slowly and less deeply than the main valley. Mechanical considerations apart, the usual cause of the occurrence of a waterfall is a

sudden change in geological structure. For example, if there be three horizontal strata, so laid down that a hard stratum occurs between two

soft ones, a river will be able to grade its course through the upper or lower soft strata, but not at the same rate through the intermediate hard stratum, over a ledge of which it will con- sequently fall. The same will occur if the course of the river has been interrupted by a hard barrier, such as an intrusive dyke of basalt, or by glacial or other deposits. Where a river falls over an escarpment of hard rock overlying softer strata, it powerfully erodes the soft rock at the base of the fall and may undermine the hard rock above so that this is broken away. In this way the river gradually cuts back the point of fall, and a gorge is left below the fall. The classic example of this process is provided by the most famous falls in the world — Niagara.

WATER-FLEA, a name given by the earlier microscopists (Swammerdam, 1669) to certain minute aquatic Crustacea of the order Cladocera, but often applied also to other members of the division Entomostraca (q.v.). The Cladocera are abundant everywhere in fresh water. One of the commonest species, Daphnia pidex, found in ponds and ditches, is less than one- tenth of an inch in length and has the body enclosed in a trans- parent bivalved shell. The head, projecting in front of the shell, bears a pair of branched feathery antennae which are the chief swim- ming organs and propel the animal, in a succession of rapid bounds, through the water. There is a single large black eye. In the living animal five pairs of leaf-like limbs acting as gills can be observed in constant motion between the valves of the shell, and the pulsating heart may be seen near the dorsal surface, a little way behind head. The body ends behind in a kind of tail ani ; \ with a double curved claw j ‘ ‘ which can be protruded br.p. from the siiell. The female carries tho eggs in a brood- ■ˆ• chamber between the back

of the body and the shell until hatching takes place. Through- out the greater part of the year only females occur and the eggs develop ” parthenogenetically,” without fertiliza- tion. When the small males appear, generally in the autumn, fertilized ” winter ” or ” resting eggs ” are produced which are cast adrift in a case of ” ephippium ” formed by a specially modified part of the shell. These resting eggs enable the race to survive the cold of winter or the drying up of the water.

For a fuller account of the Cladocera and of other organisms which sometimes share with them the name of ” water-fleas,” see the article Entomostraca. (W. T. Ca.)

WATERFORD, a county of Ireland in the province of Minister, bounded E. by Waterford Harbour, separating it from Wexford, N. by Kilkenny and by

Tipperary, W. by Cork, and S. by the Atlantic. The area is 458,108 acres, or about 716 sq. m. The coast line is in some parts bold and rocky, and is indented by numerous bays and inlets, the principal being Waterford Harbour; Tramore Bay, with picturesque cliffs and some extensive caves, and noted for its shipwrecks, on account of the rocky character of its bed; Dungarvan Harbour, much fre- quented for refuge in stormy weather; and Youghal Harbour, partly separating county Waterford from county Cork. The surface of the county is to a large extent mountainous, providing beautiful inland scenery, especially towards the west and north- west. The Knockmealdown Mountains, which attain a height of 2609 ft., form the northern boundary with Tipperary. A wide extent of country between Clonmel and Dungarvan is occupied by the two ranges of the Comeragh and Monavallagh

Parker and Harwell's Text-Booh of Zoology, the k y permission of - Macmillan & Co.

Daphnia (after Clays). . antennule. d.gl. Digestive

Antenna,

gland.

Brain.

/. Swimming-

Brood –

feet.

pouch.

ht. Heart.

Eye.

sh.gl. Shell-gland

Mountains, reaching a height of 2504 ft. To the south of Dun- garvan there is a lower but very rugged range, called the Drum Hills. The south-eastern division of the county is for the most part level. Though Waterford benefits in its communications by the important rivers in its vicinity, the only large

river it can properly claim as belonging to it is the Blackwater. This river is famous for salmon fishing, and, particularly in the stretch between Cappoquin and Lismore, flows between high, well- wooded banks, contrasting beautifully with the background of mountains. It enters the county east of Fermoy, and flows eastward to Cappoquin, the head of navigation, where it turns abruptly southward, to fall into the sea at Youghal Harbour. Waterford Harbour may be called the estuary of three important rivers, the Suir, the Nore and the Barrow, but neither of the two last touches the county. The Suir reaches it about 8 m. from Clonmel, and thence forms its northern boundary with Tipperary and Kilkenny. It is navigable to Clonmel, but the traffic lies mainly on the left bank, outside the county.

Geology. — The Knockmealdown Mountains are an anticline of Old Red Sandstone, cut away at the eastern end to expose Silurian strata, which are associated with an extensive series of volcanic and intrusive rocks, often crushed by earth-movement. The impressive scarp formed by the Old Red Sandstone conglomerate above this lower ground is called the Comeragh Mountains. The moraine- dammed cirque of Lough Coumshingaun lies in these, with a precipice 1000 ft. in height. The unconformity of the Old Red Sandstone on the greenish and yellowish Silurian shales is excellently seen on the north bank of the Suir at Waterford. Carboniferous Limestone is iound in the floor rjf the synclinals on either side of the great anticline, that is, in the Suir valley on the north, and in the green and richly- wooded hollow of the Blackwater on the south. Rapidly repeated anticlinal and synclinal folds continue this structure across the country between Dungarvan and Youghal. Rich copper-mines were worked, mainly in the 19th century, in the Silurian area near Bon- mahon, and the region remains full of mineral promise.

Industries. — The land is generally better adapted for pasturage than for tillage, although there are considerable tracts of rich soil in the south-eastern districts. The proportion of tillage to pasture is, however, roughly as I to 3 J, though the acreage under the principal crops of oats, potatoes and turnips is on the whole fairly maintained. The numbers of cattle, sheep and poultry increase steadily, and pigs are extensively reared. The woollen manufacture, except for home use, is practically extinct, but the cotton manufacture is still of some importance. There are also breweries, distilleries and a large number of flour-mills. The valuable deep sea and coast fisheries have distinct headquarters at Waterford, and the noted salmon fisheries of the Suir and Blackwater have theirs at Waterford and Lismore respectively. Railway communication is provided by the Waterford, Dungarvan, Lismore and Co. Cork branch of the Great Southern and^ Western railway, traversing the county from E. to W. ; and by the Waterford and Tramore railway, while the city of Water- ford is

approached by lines of the first-named company from the N. (from Dublin) and W. (from Limerick).

Population and Administration. — The population (95,702 in 1891; 87,187 in 1901) decreases at a rate about equal to the average of the Irish counties, and emigration is considerable. Nearly 05% of the total are Roman Catholics, and about 74% constitute the rural population. The chief towns are the city of Waterford (pop. 26,769), Dungarvan (4850), and Lismore (1583); Portlaw and Tramore, and Cappoquin are lesser towns. The county is divided into eight baronies. Down to the Union in 1800 the county returned two members, and the boroughs of Dungarvan, Lismore and Tallow two each. Thereafter, and before the Redistribution Act of 1885, the county returned two members, the borough of Waterford two, and Dungarvan one. The county now returns two members, for the east and west divisions respectively, while the county of the city of Waterford returns one member. Assizes are held at Waterford, and quarter sessions at Lismore, Dungarvan, and Waterford. The county is mainly in the Protestant diocese of Ossory, and the Roman Catholic diocese of Waterford and Lismore.

History and A iniquities. — In the 9th century the Danes landed in the district, and afterwards made a permanent settlement. Waterford was one of the twelve counties into which King John is ctated to have divided that part of Ireland which he nominally annexed to the English crown. On account of the convenience of the city as a landing place, many subsequent expeditions passed through the county, directed against disaffected or rebellious

tribes. In 1444 the greater part of it was granted to James, earl of Desmond, and in 1447 it was bestowed on John Talbot, earl of Shrewsbury, who was created earl of Waterford. The county suffered severely during the Desmond rebellion, in the reign of Elizabeth, as well as in the rebellion of r64i and during the Cromwellian period. There are in the county a considerable number of banows, duns, cromlechs and similar relics of the ancient inhabitants. At Ardmore, overlooking the sea from Ram Head, there is a round tower 95 ft. in height, and near it a huge rath and a large number of circular entrenchments. Among the old castles special mention may be made of Lismore, originally erected in 1185, but now in great part comparatively modern. The chief ecclesiastical remains are those of the chancel and nave of the cathedral of Ardmore, where a monastery and oratory were founded by St Declan in the 7th century. The see of Ardmore was abolished in the 12th century. Here are also remains of a church and oratory, and a holy well. Mention should be made of the existing monastery of Mount Melleray, a convent of Trappists founded near Cappoquin in 1830, on the expulsion of the foreign members of this order

from France. Schools, both free and boarding, are maintained; and there is a branch of the order at Roscrea (Co. Tipperary) .

WATERFORD, a city, county of a city, parliamentary borough, . seaport, and the chief town of Co. Waterford, Ireland. Pop. (1901) 26,769. It is finely situated on the south bank of the Suir 4 m. above its junction with the Barrow, at the head of the tidal estuary called Waterford Harbour, in m. S.S.W. from Dublin by the Great Southern and Western railway. This is the principal railway serving the city, having lines from Dublin and from the north-west, besides the trunk line between Rosslare, Waterford and Cork. Waterford is also, however, the terminus of the Dublin and South-Eastern line from Dublin via New Ross, and for the Waterford and Tramore line, serving the seaside resort of Tramore, 7 m. S. The Suir is crossed by a wooden bridge of thirty-nine arches, and 832 ft. long, connecting Waterford with the suburb of Ferrybank. The city is built chiefly along the banks of the river, occupying for the most part low and level gruund except at its western extremity, and excepting the quay and the Mall, which connects with the southern end of the quay, its internal appearance is hardly of a piece with the beauty of its environs. The modern Protestant cathedral of the Holy Trinity, generally called Christ Church, a plain structure with a lofty spire, occupies the site of the church built by the Danes in 1096, in the Mall. Near it are the episcopal palace and deanery. There is a handsome Roman Catholic cathedral, and the training seminary for priests called St John's College deserves notice. The principal secular buildings are the town-hall, the county and city courts and prisons, the custom-house and the barracks. At the extremity of the quay is a large circular tower, called Reginald's Tower, forming at one time a portion of the city walls, and occupying the site of the tower built by Reginald the Dane in 1003. Near the summit one of the balls shot from the cannon of Cromwell while besieging the city is still embedded in the wall. Other remains of the fortifications, consisting of towers and bastions, are to be seen as in the Tramore railway sidings and in Castle Street. There are a number of hospitals and similar benevolent institutions, including the leper house founded in the reign of King John, now used practically as an infirmary. The town possesses breweries, salt-houses, foundries and flour mills; and there is a large export trade in cattle, sheep and pigs, and in agricultural produce. It is the headquarters of extensive salmon and sea fisheries. Waterford is second in importance to Cork among the ports of the south coast of Ireland. There is regular com- munication by steamer with Cork, with Dublin and Belfast, with Fishguard, Glasgow, Liverpool, Bristol, Plymouth, South- ampton, London and other ports. Local steamers ply to Dun- cannon, New Ross and other places on the neighbouring estuaries. Waterford Harbour is a winding and well-sheltered bay formed by the estuary of the river Suir, and afterwards by the joint estuary of the Nore

and Barrow. Its length to the sea is about i 15 m. Its entrance is 3 m. wide, and is lighted by a fixed light

on the ancient donjon of Hook Tower (139 ft. in height) and others. The quay, at which there is a depth of 22 ft. of water at low tide, was enlarged in 1705 by the removal of the city walls, and is about ij m. in length. At Ferrybank, on the Kilkenny side of the river, there is a shipbuilding yard with patent slip and graving dock. By the Suir there is navigation for barges to Clonmel, and for sailing vessels to Carrick-on-Suir; by the Barrow for sailing vessels to New Ross and thence for barges to Athy, and so to Dublin by a branch of the Grand Canal ; and by the Nore for barges to Inistioge. The shores of the harbour are picturesque and well- wooded, studded with country residences and waterside villages, of which Passage and Duncannon are popular Tesorts of the citizens of Waterford.

Anciently Waterford was called Cuan~na-groith, the haven of the sun. By early writers it was named Menapia. It is supposed to have existed in very early times, but first acquired importance under the Danes, of whom it remained one of the principal strongholds until its capture by Strongbow in ii7r. On the 18th of October 1172 Henry II. landed near Waterford, and he here received the hostages of the people of Munster. It became a cathedral city in 1096. The Protestant dioceses of Cashel, Emly, Waterford and Lismore were united in 1833. Prince John, afterwards king of England, who had been declared lord of Ireland in 1177, landed at Waterford in 1185. After ascending the English throne he granted it a fair in r204, and in 1206 a charter of incorporation. He landed at Waterford in T210, in order to establish within his nominal territories in Ireland a more distinct form of government. The city received a new charter from Henry III. in 1232. Richard II. landed at Waterford in October 1394 and again in 1399. In r447 it was granted by Henry VI. to John Talbot, earl of Shrewsbury, who was created earl of Waterford. In 1497 it successfully resisted an attempt of Perkin Warbeck to capture it, in recognition of which it received various privileges from Henry VII., who gave it the title of urbs intacta. In 1603, after the accession of James I. to the English crown, the city, along with Cork, took a prominent part in opposition to the government and to the Protestant religion, but on the approach of Mour.tjoy it formally submitted. From this time, however, the magistrates whom it elected refused to take the oath of supremacy, and, as by its charter it possessed the right to refuse admission to the king's judges, and therefore to dispense with the right of holding assizes, a rule was obtained in the Irish chancery for the seizure of its charter, which was carried into

effect in 1618. In 1619 an attempt was made to induce Bristol merchants to settle in the city and undertake its government, but no one would respond to the invitation, and in 1 626 the charter was restored. The city was unsuccessfully attacked by Cromwell in 1649, but surrendered to Ireton on the 10th of August 1650. After the battle of the Boyne James II. embarked at it for France (July 1690). Shortly afterwards it surrendered to William, who sailed from it to England. It sent two members to parliament from 1374 to 1885, when the number was reduced to one. In 1898 it was constituted one of the six county boroughs having separate county councils.

WATERFORD, a village of Saratoga county, New York, U.S.A., on the W. bank of the Hudson river, near the mouth of the Mohawk river, and about 10 m. N. of Albany. Pop. (1900) 3146, of whom 474 were foreign-born; (1005) 3134; (1910) 3245. Waterford is served by the Delaware & Hudson rail- way, and is at the junction of the Erie and the Champlain divisions of the great barge canal connecting Lake Erie and Lake Champlain. There was a settlement here probably as early as 1630, and Waterford was laid out in 1784, and was incorporated as a village in 1794.

WATERHOUSE, ALFRED (1830-ˆ05), English architect, was born at Liverpool on the 19th of July 1830, and passed his professional pupilage under Richard Lane in Manchester. His earliest commissions were of a domestic nature, but his position as a designer of public buildings was assured as early as r859 by success in the open competition for the Manchester assize courts. This work marked him not only as an adept in the planning of a complicated building on a large scale, but also as a champion of

the Gothic cause. Nine yearslater, in 1868, another competition secured for Waterhouse the execution of the Manchester town- hall, where he was able to show a firmer and perhaps more original handling of the Gothic manner. The same year brought him the rebuilding of part of Caius College, Cambridge, not his first uni- versity work, for Balliol, Oxford, had been put into his hands in 1867. At Caius, out of deference to the Renaissance treat- ment of the older parts of the college, the Gothic element was intentionally mingled with classic detail, while Balliol and Pembroke, Cambridge, which followed in 1871, may be looked upon as typical specimens of the style of his mid career — Gothic tradition (European rather than British) tempered by individual taste and by adaptation to modern needs. Girton College, Cambridge, a building of simpler type, dates originally from the same period (1870), but has been periodically enlarged by further buildings. Two important domestic works were undertaken in r87o and 1871 respectively— Eaton Hall for the duke, then marquis, of Westminster, and

Heythrop Hall, Oxfordshire, the latter, a restoration, being of a fairly strict classic type. Iwerne Minster for Lord Wolverton was begun in 1877. In 1865 Water- house had removed his practice from Manchester to London, and he was one of the a-rchitccts selected to compete for the Royal Courts of Justice. He received from the government, without competition, the commission to build the Natural History Museum, South Kensington, a design which marks an epoch in the modern use of terra-cotta. The new University Club — a Gothic design — was undertaken in 1866, to be followed nearly twenty years later by the National Liberal Club, a study in Renaissance composition. Waterhouse's series of works for Victoria University, of which he was made LL.D. in 1895, date from 1870, when he was first engaged on Owens College, Man chester. Yorkshire College, Leeds, was begun in 1878; and Liverpool University College in 18R5. St Paul's School, Hammer- smith, was begun in 1881, and in the same year the Central Technical College in Exhibition Road, London. Waterhouse's chief remaining works in London are the new Prudential Assur- ance Company's offices in Holborn; the new University College Hospital; the National Provincial Bank, Piccadilly, 1892; the Surveyors' Institution, Great George Street, 1896; and the Jenner Institute of Preventive Medicine, Chelsea, 1895. For the Prudential Company he designed many provincial branch offices, while for the National Provincial Bank he also designed premises at Manchester. The Liverpool Infirmary is Water- house's largest hospital; and St. Mary's Hospital, Manchester, the Alexandra Hospital, Rhyl, and extensive additions at the general hospital, Nottingham, also engaged him. Among works not already mentioned are the Salford gaol; St Margaret's School, Bushey; the Metropole Hotel, Brighton; Hove town- hall; Alloa town-hall; St Elizabeth's church, Reddish; the Weigh House chapel, Mayfair; and Hutton Hall, Yorks. He died on the 22nd of August, 1905.

Waterhouse became a fellow of the Royal Institute of British Architects in 1861, and president from 1888 to 1891. He obtained a grand prix for architecture at the Paris Exposition of 1867, and a " Rappel " in 1878. In the same year he received the Royal gold medal of the Royal Institute of British Architects, and was made an associate cf the Royal Academy, of which body he became a full member in 1885 and treasurer in 1898. He became a member of the academies of Vienna (1869), Brussels (1886), Antwerp (1887), Milan (1888) and Berlin (1889), and a corresponding member of the Institut de France (1893). After 1886 he was constantly called upon to act as assessor in architectural competitions, and was a member of the international jury appointed to adjudicate on the designs for the west front of Milan Cathedral in 1887. In 1890 he served as architectural member of the Royal Commission on the proposed enlargement of Westminster Abbey as a place of burial. From 1891 to 1902, when he retired, his work was conducted in partnership with his son,

Paul Waterhouse.

WATERHOUSE, JOHN WILLIAM (1847-), English painter, was the son of an artist, by whom he was mainly trained. As a figure-painter he shows in his work much imaginative power and a very personal style, and his pictures are for the most part illustrations of classic myths treated with attractive fantasy. An able draughtsman and a fine colourist, he must be ranked among the best artists of the British school. He was

ejected an associate of the Royal Academy in 1885 and acade- mician in 1895. Four of his paintings, " Consulting the Oracle," " St Eulalia," " The Lady of Shalott " and " The Magic Circle," are in the National Gallery of British Art.

See " J. VV. Waterhouse and his Work," by A. L. Baldly, Studio, vol. iv.

WATER-LILY, a name somewhat vaguely given to almost any floating plant with conspicuous flowers, but applying more especially to the species of Nymphaea, Nuphar, and other members of the order Nymphaeaceae. These are aquatic plants with thick fleshy rootstocks or tubers embedded in the mud, and throwing up to the surface circular shield-like leaves, and leafless flower-stalks, each terminated by a single flower, often of great beauty, and consisting of four or five sepals, and numer- ous petals gradually passing into the very numerous stamens without any definite line of demarcation between them. The ovary consists of numerous carpels united together and free, or more or less embedded in the top of the flower-stalk. The ovary has many cavities with a large number of ovules attached to its walls, and is surmounted by a flat stigma of many radiating rows as in a poppy. The fruit is berry-like, and the seeds are remarkable for having their embryo surrounded by an endosperm- as well as by a perispcrm. The anatomical construction of these plants presents many peculiarities which have given rise to discussion as to the allocation of the order among the dicotyledons or among the monocotyledons, the general balance of opinion being in favour of the former view. The leaf-stalks and flower- stalks are traversed by longitudinal air-passages, whose dis- position varies in different species. The species of Nymphaea are found in every quarter of the globe. Their flowers range from white to rose-coloured, yellow and blue. Some expand in the evening only, others close soon after noon. Nymphaea alba (Castalia alba) is common in some parts of Britain, as is also the yellow Nuphar luteum (Nymphaea luted): The seeds and the rhizomes contain an abundance of starch, which renders them serviceable in some places for

food.

Of recent years great strides have been made in the culture of new varieties of water-lilies in the open air. Many beautiful Nymphaea hybrids have been raised between the tender and hardy varieties of different colours, and there are now in com- merce lovely forms having not only white, but also yellow, rose, pink and carmine flowers. In many gardens open-air tanks have been fitted up with hot-water pipes running through them to keep the water sufficiently warm in severe weather. The open-air water-lily tank in the Royal gardens, Kew, is one of the latest and most up-to-date in construction. These coloured hybrids were originated by M. Latour Marliac, of Temple-sur-Lot, France, some of the most favoured varieties being carnea, chroma- tella, flammea, ignea, rosea, Robinsoni, Aurora, blanda, &c.

Amongst hardy species of Nymphaea now much grown are Candida, nilida, odorata, pygmaea and tuberosa, all with white, more or less sweet-scented flowers ; fiava, yehow, and sphaerocarpa, rose-carmine. Amongst the tender or hothouse Nymphaeas the following are most noted: blanda, white; devoniensis, scarlet (a hybrid between N. Lotus and N. rubra); edulis, white; elegans, yellowish white and purple; gigantea, blue; kcwensis, rose-carmine (a hybrid between A', devoniensis and N. Lotus) ; Lotus, red, white ; pubescens, white ; scutijulia, bright blue; stdlata, bli'e, with several varieties; and Sturtevanti, a pale-rose hybrid.

Under the general head of water-lily are included the lotus of F-gypt, Nymphaea Lotus, and the sacred lotus of India and China, Ndumbium speciosum, formerly a native of the Nile, as shown by Egyptian sculptures and other evidence, but no longer found in that river. The gigantic Victoria regia, with leaves 6 to 7 ft. in diameter and flowers 8 to 16 in. across, also belongs to this group. It grows in the backwaters of the Amazon, often covering the surface for miles; the seeds are eaten under the name water maize.

WATERLOO, a city and the county-seat of Black Hawk county, Iowa, U.S.A., on the Cedar river, about 90 m. W. of Dubuque and about 275 m. W. of Chicago. Pop. (1890) 6674; (1900) 12,580, of whom 1334 were foreign-born; (1910 census) 26,693. It is served by the Illinois Central (which has large construction and repair shops here), the Chicago, Rock Island & Pacific, the Chicago Great Western, and the Waterloo, Cedar Falls & Northern (from Cedar Falls to Sumner) railways. The city has several public parks, a public library (1S79) witli two

buildings, a Y.M.C.A. building, and a good public school system, including a manual training school. There is a Chautauqua park. The river here is

700 to 900 ft. wide; its clear water flows over a limestone bed through a rather evenly sloping valley in the middle of the city with enough fall to furnish valuable water power. The value of the factory product in 1905 was $4,693,888. The city is situated in a rich agricultural, dairying and poultry-raising region, and is an important shipping point. Waterloo was first settled about 1846, was laid out in 1854, first chartered as a city in 1868, and became a city of the first class in 1005.

WATERLOO CAMPAIGN, 1815. On February 27, 1815, Napoleon set sail from Elba with his force of 1000 men and 4 guns, determined to reconquer the throne of France. On March 1 he landed near Cannes, and proceeded at once to march on Paris. He deliberately chose the difficult route over the French Alps because he recognized that his opponents would neither expect him by this route nor be able to concert combined operations in time to thwart him. Events proved the wisdom of his choice. His advance to Paris was a series of triumphs, his power waxing with every league he covered, and when he reached Paris the Bourbons had fled. But he had soon to turn his attention to war. His sudden return, far from widening the breaches between the allies, had fused them indissolubly together, and the four powers bound themselves to put 1 50,000 men apiece under arms and to maintain them in the field until Napoleon had been utterly crushed. So, from the first, France was faced with another war against an affrighted and infuriated Europe, a war in which the big battalions would be on the side of the Seventh Coalition; and to oppose their vast armies Napoleon only had in March the 150,000 men he had taken over from Louis XVIII. when the Bourbon hurriedly quitted the throne. Of this force the emperor could have drawn together some 50,000 men within ten days and struck straight at the small allied forces that were in Belgium at the moment. But he wisely refrained from taking the immediate offensive. Such an act would have proved that he desired, nay provoked a war; and further, the engagement of such small forces could lead to no decisive results. Napoleon therefore stayed his hand and proceeded to hasten forward the organization, almost the creation of an army, with which he could confront the coalition. Mean- while he sought to detach Great Britain and Austria from the alliance. But he did not permit his political enterprise to stay his military preparations; and, by constant attention to the minutest details, by June 1 he had got together JVs <" >feoa ' an army of 360,000 for the defence of France, one half tlans. of which was available for field service. In this army was comprised his whole means of defence; for he had no allies. On his return from Elba it is true that Murat, the king of Naples, took his side; but recklessly opening an offensive campaign, Murat was beaten at Tolentino (May 2-3) , and he found himself compelled to fly in disguise to France, where the emperor refused him an audience or employment. Herein Napoleon wronged France, for he deprived her of the*

most brilliant cavalry soldier of the period. Shorn thus of his single ally, the emperor realized that the whole eastern land-frontier of France was open to invasion, from the North Sea to the Mediterranean. By the end of May he had placed his forces as follows to protect his empire.

D'Erlon's I. Corps cantoned between Lille and Valenciennes.

Reille's II. Corps cantoned between Valenciennes and Avesnes.

Vandamme's III. Corps cantoned around Rocroi.

Gerard's IV. Corps cantoned at Metz.

Lobau's VI. Corps cantoned at Laon.

Grouchy's Cavalry Reserve at Guise.

Marshal Mortier with the Imperial Guard at Paris.

Rapp with the V. Corps (20,000) near Strassburg.

18,500 more troops under Suchet, Brune and Lecourbe guarded the S.E. frontier from Basel to Nice, and covered Lyons; 8000 men under Clausel and Decaen guarded the Pyrenean frontiei ; whilst Lamarque led 10,000 men into La Vendue to quell the insurrection in that quarter. In 181 5 Napoleon was not supported by a united and unanimous France; the country

was weakened by internal dissensions at the very moment when it was needful to put every man in line to meet the rising tide of invasion surging against the long curving eastern frontier.

Napoleon now pondered over his plan of campaign. In Belgium, across an almost open frontier, lay an ever-increasing force of Anglo-Dutch and Prussian troops under Wellington and Bliicher. The Rhine frontier was threatened by Schwarzen- berg's Austrians (210,000); Barclay de Tolly's Russians (150,000) were slowly coming up; and another Austrian force menaced the S.E. frontier of France. The allies determined that they would wage a war without risks, and they were particularly anxious to avoid the risk of defeat in detail. It was accordingly arranged that Wellington and Bliicher should await in Belgium the arrival of the Austrian and Russian masses on the Rhine, about July 1, before the general invasion of France

was begun. Thereafter, whatever befell, the allied armies would resolutely press forward towards Taris, affording each other mutual support, and with the tremendous weight of troops at their disposal thrust back Napoleon upon his capital, force him to fight in front of it, and drive him when defeated within its works. The end would then be in sight. Thus they had planned the campaign, but Napoleon forestalled them.. In fact, the threatening danger forced his hand and compelled him to strike before he had collected a sufficient army for his defensive needs. Consequently he determined to advance swiftly and secretly against Wellington and Bliicher, whose forces, as Napoleon knew, were dispersed over the country of their unenthusiastic ally. Thus he designed to crush a part of the coalition before the Russians and Austrians poured over the eastern frontier. Once Wellington and Bliicher were destroyed he would move southwards and meet the other allies on the Rhine. He might thus compensate for his numerical inferiority by superior mobility and superior leadership.

His information showed that Wellington held the western half of Belgium from the Brussels-Charleroi road to the Scheldt, that his base of operations was Ostend, and that his ,

headquarters were at Brussels. Bliicher, based on p iˆ s " 0a " the Rhine at Coblcntz, held the eastern half from the Brussels-Charleroi road to the Meuse, and had his headquarters at Namur. The emperor was convinced that nothing could be gained by invading Belgium from the S.E. or W.; such a stroke would surely drive the allies together, and that was never Napoleon's custom. On the other hand, if he struck straight at Charleroi — the allied junction point — he would drive the " Armee du Nord " like an armoured wedge between the allies, if only he caught them unsuspicious and unready. Forced asunder at the outset, each would (in all probability) fall back along his own line of communication, and the gap thus made between the allies would enable the emperor to manoeuvre between them and defeat them in turn. To gain the best chance of success he would have to concentrate his whole army almost within gunshot of the centre of the enemies' outposts without attracting their attention; otherwise he would find the allies concentrated and waiting for him.

Wellington and Bliicher were disposed as follows in the early days of June (Map I.). The Anglo-Dutch army of 93,000 with headquarters at Brussels were cantoned: I. Corps (Prince of Orange), 30,200, headquarters Braine-le-Comte, disposed in the area Enghicn-Genappe-Mons; II. Corps (Lord Hill), 27,300, headquarters Ath, distributed in the area Ath – Oudcnarde-Ghent; reserve cavalry (Lord Uxbridge) 9900, in the valley of the Dendre river, between Grammont and Ninovc; the reserve (under Wellington himself) 25,500, lay around Brussels. The frontier in front of Leuze and Binche was watched by the Dutch- Belgian light cavalry.

Map 1.

Bliicher's Prussian army of 116,000 men, with headquarters at Namur, was distributed as follows: —

I. Corps (Zieten), 30,800, cantoned along Jhe Sambre, headquarters Charleroi, and covering the area Fontaine 1 Eveque-Fleurus-Moustier.

II. Corps (Pirch I.), 31,000, headquarters at Namur, lay in the area Namur- Hannut-Huy.

III. Corps (Thielemann), 23,900, in the bend of the river Meuse, headquarters Ciney, and disposed in the area Dinant-Huy-Ciney.

IV. Corps (Billow), 30,300, with headquarters at Liege, around that place.

The frontier in front of Binche, Charleroi and Dinant was watched by the Prussian outposts.

Thus the allied front extended for nearly 90 m. across Belgium, and the mean depth of their cantonments was 30 m. To con- centrate the whole army on either flank would take six days, and on the common centre, about Charleroi, three days.

The allies had foreseen the very manoeuvre that Napoleon designed to put into execution, and had decided that if an attempt were made to break their centre they would concentrate forwards and on their inner flanks, the Anglo-Dutch army forming up at Gosselies and the Prussians at Fleurus. Here they would be in contact, and ready to act united against Napoleon with a numerical superiority of two to one. The necessary three days' warning of the French concentration they felt certain they would obtain, for Napoleon's troops were at this juncture distributed over an area (Lille-Metz- Paris) of 175 m. by 100 m,; and to concentrate the F'rench army unknown to, and unobserved by, the allies, within striking distance and before they had moved a man to meet the onrush of the foe, was unthinkable. But, as in 1800, it was the unthinkable that happened.

It will be seen that Bliicher covered Fleurus, his concentration point, by Zieten's corps, in the hope of being able to collect his army round Fleurus in the time that Zieten would secure for him by a yielding fight. Wellington on the other hand was far less satisfactorily placed ; for in advance of Gosselies he had placed only a cavalry screen, which would naturally be

too weak to gain him the requisite time to mass there. Hence his ability to concentrate hung on the mere good luck of obtaining timely information of Napoleon's plans, which in fact he failed to obtain. But the two tracts of country covered by the allies differed vastly in configuration. Bliicher's left was protected by the difficult country of the Ardennes. On the other hand, the duke's whole section lay close to an open frontier across which ran no fewer than four great roads, and the duke considered that his position " required, for its protection, a system of occupation quite different from that adopted by the Prussian army." He naturally relied on his secret service to warn him in such time as would enable him to mass and meet the foe. His reserve was well placed to move rapidly and promptly in any direction and give support wherever required.

The emperor made his final preparations with the utmost secrecy. The Army of the North was to concentrate in three fractions — around Solre, Beaumont and Philippeville — as close to Charleroi as was practicable; and he arranged to screen the initial movements of the troops as much as possible, so as to prevent the allies from discovering in time that their centre was aimed at. He directed that the movements of the troops when they drew near the allied outposts should be covered as far as possible by accidents of ground, for there was no great natural screen to cover his strategical concentration.

Gerard and the IV. Corps from Metz, having the longestdistance to go, started first (on June 6), and soon the whole army was j bc in motion for the selected points of concentration,

Preach every effort being made to hide the movements of the coacen' troops. On June 11 Napoleon himself left Paris for ra on. ˆ f Ton i t an(j D y j un e 14 he had achieved almost the impossible itself; for there, at Solre, Beaumont and Philippe- ville, lay his mass of men, 124,000 strong, concentrated under his hand without rousing the enemy's suspicions, and ready to march across the frontier at dawn. Far different were things on the other side of the Sambre. The allies were still resting in fancied security, dispersed throughout widely distant canton- ments; for nothing but vague rumours had reached them, and they had not moved a man to meet the enemy.

The opposing armies were of very different quality. Welling- ton's was a collection of many nationalities; the kernel being composed of his trusty and tenacious British and King's German Legion troops, numbering only 42,000 men. Of the remainder many were far from enthusiastic in the cause for which they had perforce to take up arms, and might prove a source of weakness should victory incline to the French eagles. Bliicher's army was undoubtedly more homogeneous, and though it is doubtful if he

possessed any troops of the same quality as Wellington's best, on the other hand he had no specially weak elements.

Napoleon was at the head of a veteran army of Frenchmen, who worshipped their leader and were willing to die for France if necessity demanded. But there were lines of weakness, too, in his army. He had left Marshal Davout behind in Paris, and Murat in disgrace; Suchet was far off on the eastern frontier, and Clausel was in the south of France. The political reasons for these arrangements may have been cogent, but they injured France at the very outset. Marshal Soult was appointed chief of the staff, a post for which he possessed very few qualifications; and, when the campaign began, command of the left and right wings had perforce to be given to the only two marshals available, Ney and Grouchy, who did not possess the ability or strategic skill necessary for such positions. Again, the army was morally weakened by a haunting dread of treason, and some of the chiefs, Ney for example, took the field with disturbing visions of the consequences of their late betrayal of the Bourbon cause, in case of Napoleon's defeat. Finally, the army was too small for its object. Herein Napoleon showed that he was no longer the Napoleon of Austerlitz: for he left locked up in far-distant secondary theatres no less than 56,500 men, of whom he could have collected some 30,000 to 36,000 for the decisive campaign in Belgium. Had he made in 181 5 the wise distribution of his soldiers in the theatre of war which he made in his former immortal campaigns, he would have concentrated 155,000 to 160,000 of his available force opposite to Charleroi on June 14, and the issue of the campaign would hardly have been in doubt. But he failed to do so, and by taking the field with such inferior numbers he left too much to Fortune.

For his advance into Belgium in 1815 Napoleon divided his army into two wings and a reserve. As the foe would lie away to his right and left front after he had passed the Sambre, one wing would be pushed up towards Wellington and another towards Bliicher; whilst the mass of the reserve would be centrally placed so as to strike on either side, as soon as a force of the enemy worth destroying was encountered and gripped. To this end he had, on the 14th, massed his left wing (Reille and D'Erlon) around Solre, and his right wing (Gerard) at Philippe- ville; whilst the central mass (Vandamme, Lobau, the Guard and the Cavalry Reserve) lay around Beaumont.

The orders for the French advance next day, among the finest ever issued, directed that the army should march at dawn and move to the Sambre at Marchicnne and Charleroi. By evening it was expected that the whole would have crossed the Sambre, and would bivouac between the sundered allies.

*But at the very outset delays occurred. Owing to an accident that befell the single orderly despatched with orders for Van- damme, the III. Corps remained without other definite y fte orders than those issued on June 13, warning them to passage be ready to move at 3 a.m. The corps therefore of the stood last on the morning of June 15, awaiting further Satabte * instructions. This was the more unfortunate as Van- damme was destined to lead the advance on Charleroi by the centre road. But the emperor regarded it merely as " an unfortunate accident," nothing more, and the advance in two wings and a reserve continued, undisturbed by such occurrences.*

Gerard, too, was late in starting, for his corps had not been fully concentrated over-night. Zieten's outposts on the right bank of the Sambre gained still further time, for they fought stubbornly to retard the French advance on Marchienne and Charleroi. But Zieten declined, and very wisely, to fight on the right bank, and he made the most of the screen afforded by the Utile river. He had to delay the French advance for 24 hours

and give time for Bliicher's concentration, at the same time retaining his own freedom o£ manoeuvre, and this in spite of the great length of the summer day, the short distance that he lay in front of Fleurus, the tremendous numerical superiority of the French and Napoleon's personal presence at their head.

When the French left wing and centre reached the Sambre bridges, at Marchienne and Charleroi, they found them held and strongly barricaded, and the cavalry were powerless to force the passage. It was nearing noon when the emperor reached the front with the Young Guard, whom he had personally hurried forward. He immediately took action, and under his direction the bridge at Charleroi was stormed shortly after noon. Almost at the same time Reille forced the passage at Marchienne. Instead cf drawing his corps together and retreating en masse up the Fleurus road, Zieten wisely withdrew on two roads, using those to Quatre Bra3 and Fleurus. The defenders of Marchienne used the former, while the brigade which had held Charleroi fell back by the latter. The emperor at once began the advance along both the roads. The left wing was directed to push up the Gosseiies-Quatre Bras road, and Pajol's cavalry followed the Prussians who retired along the Giily-Fleurus road. The emperor took post at Charleroi. About 3 p.m. Marshal Ney joined the army, was given the command of the left wing, and ordered to drive the Prussians out of Gosselies, and clear the

road northward of that place. Ney took over his command just when the attack on Gosselies was impending. The Prussians were driven from the town, but they managed to effect a roundabout retreat to Ligny, where they rallied. Ney pushed on his advance up the Brussels road. When he had left for the front, the emperor proceeded with Grouchy to reconnoitre the Prussian position at Gilly; and handing over the command of the right wing to the marshal, whom he ordered to capture Gilly, Napoleon returned to Charleroi, to hasten the passage of the French army across the Sambre and mass it in the gap between the allies. But the head of Vandamme's corps had by this time crossed the river, and the emperor ordered it to assist Grouchy.

What meanwhile were the allies doing? There is no doubt that, surprised by the suddenness of the French advance, they were caught unprepared. But on the 15th the critical nature of the situation dawned on them, and naturally on Blucher first, as his headquarters were nearer to the frontier than Wellington's, and Blucher had had previous experience of Napoleon's powers. As soon as the Prussian marshal got the first real warning of imminent danger, he ordered (in accordance with the pre- arranged plan) an immediate concentration of his army on his inner flank at Sombreffe. Unfortunately for him the first orders sent to Biilow by Gneisenau, chief of the staff, at midnight June 14-15, were written in so stilted and hazy a style that Biilow did not consider any especial display of energy was required. Hence the IV. Corps was neutralized until after the 16th. The other two corps commanders (Pirch I. and Thielemann) received clearer orders, and acted promptly enough. They concentrated their scattered men and hastened to march to the appointed rendezvous. By nightfall Pirch I. had bivouacked the II. Corps at Mazy, only 4 m. short of Sombreffe, and Thielemann and the III. Corps had reached Namur, within easy distance of the Ligny battlefield. Blucher wisely shifted his own headquarters to Sombreffe on the afternoon of the 1 5th.

Wellington's position at nightfall was very different, and can hardly be termed safe or even satisfactory. Definite news of the French advance only reached Brussels about 3 p.m. on the 15th; and even then the duke was by no means certain of the direction of Napoleon's main stroke. Hence the first orders he issued were for his divisions to concentrate at their respective alarm-posts, intending later to send them further orders when the situation had somewhat cleared up. For whatever reasons, Wellington thought Napoleon would attempt to turn his right and cut his line of communications. Had Napoleon attempted this he would (if successful) have driven the Anglo-Dutch army back upon the Prussians, instead of separating the allies, as he actually tried to do and very nearly succeeded in doing. Failing to appreciate this fully, Wellington omitted to order an immediate

concentration on his inner (left) flank as Blucher had done, and the danger of Bliicher's position was thus enormously increased. Curiously enough, the allies do not appear to have decided upon the course to be taken in case they were surprised, as they virtually were, and their system of intercommunication — if system it can be called — was most imperfect. They ought to have arranged loyally and promptly to let each other know every move it was proposed to make and the reasons for moving, for thus only could concerted action be ensured when confronted with Napoleon, " in whose presence it was so little safe to make . . . a false movement."

Wellington's subordinates at the critical point, however, acted with admirable boldness. Prince Bernard, in command of a brigade at Quatre Bras and Frasnes, recognizing the pressing danger that threatened on the Brussels road, retained his position there to check the French advance, instead of drawing off westwards and massing with the rest of his division at Nivelles; and in this action he was firmly supported by his immediate superiors. It was due to their presence of mind that Wellington maintained his hold on the important strategical point cf Quatre Bras on June 15 and 16. Consequently, as Ney's wing advanced northward from Gosselies along the Brussels road, it came upon an advanced detachment of this force at Frasnes. The detachment was quickly forced to retire on its supports at the cross-roads, but here Prince Bernard firmly held his position; and by his skilful use of cover and the high standing corn he prevented the French gauging the weakness of the small force that barred their way. The day was now drawing to a close, and Ney decided wisely not to push his advance any farther. He was in front of a force of unknown strength which appeared resolved to stand its ground, his men were tired, and the cannon-thunder to his right rear proclaimed clearly that Grouchy had not made much headway on the Fleurus road. To push on farther might isolate the left wing among a host of allies. He therefore halted his command, and, later, made a report to the emperor.

Meanwhile two long hours had been wasted on the right whilst Grouchy and Vandamme deliberated over their plan of action in front of the Prussian brigade at Gilly; and it was not until the emperor himself again reached the front, about 5.30 p.m., that vigour replaced indecision. There was a brief bombardment, and then Vandamme's corps was sent forward with the bayonet to drive out the foe. The shock was too great ; the Prussians gave way immediately and were chased back into the woods by cavalry. Grouchy now pushed on towards Fleurus, which was still held by Bliicher's troops, and there the advance came to a halt, as the light was failing and the troops exhausted.

Thus, thanks to Zieten's fine delaying action, Blucher by nightfall on June 15 had secured most of the ground requisite for his pre-arranged

concentration; for one corps was in position, and two others were at hand. Billow's corps was unavailable, for the reason already given, but of this fact Blucher was still necessarily ignorant. Wellington, owing to his original disposi- tions and the slowness of his concentration, had only retained a grip on Quatre Bras thanks to the boldness of his subordinates on the spot. His other troops were assembling: I. Corps, Nivelles, Braine-le-Comte and F-nghien; II. Corps, Ath, Gram- mont and Sotteghem; heavy cavalry at Ninove; Reserve at Brussels. During the night of the 15th orders were sent for the divisions to move eastwards towards Nivelles, and at dawn the Reserve marched for Mt. S. Jean. Thus Wellington did not even yet realize the full significance of the emperor's opening moves.

But if the intelligence which the duke rightly relied on had come to hand on the 15th, it cannot be doubted that he would have effected a more expeditious concentration on his inner flank. His trusted intelligence officer, Colonel Colquhoun Grant, was at this time in France, and it had been arranged that his reports shouid be received at the duke's outposts by General DBrnberg, for transmission to the duke. On June 15 Grant wrote to Wellington stating that the French were advancing, and that French officers spoke freely about a decisive action being fought within three days. But Dornberg, arrogating to himself the right

of selecting the reports which were worth forwarding, sent it back, saying that, so far from convincing him that the emperor was advancing to give battle, it assured him of the contrary. Owing to this officer's presumptuous folly Grant's information only reached the duke on June 18, too late to be of use.

The Army of the North on this night was disposed as follows: — The left wing stretched from Frasnes back to the Sambre at Marchienne and Thuin. Reille's corps was to the front and was covered by the light cavalry of the Guard and Pire's lancers. Ncy's headquarters were at Gosselies; one division (Girard's) was at Wangenies and acted as a link between the two wings. The right wing, under Grouchy, had come to a halt in front of Fleurus. It was covered by Pajoi's and Exelmans' cavalry corps. Vandamme's was the leading infantry corps, and it bivouacked with its head at VVinage. Gerard's corps (with which was Kellermann's cuirassier corps) halted astride the Sambre at Chatelet. Gerard's advance had been delayed owing to the commander of his leading division deserting with his staff to the Prussians. Consequently the IV. Corps had not assisted at all in the passage of the river; though had it only been present, it would have

been magnificently placed to co-operate with Grouchy in the action of Gilly. Thus each of these strategical covering forces was itself protected by an adequate tactical advanced guard, to perform the service of local protection. The centre (or reserve) was meanwhile disposed as follows: The Guard was halted between Gilly and Charleroi; the emperor's headquarters being at the latter place. Milhaud's Cuirassier corps and Lobau's(VL) corps were south of the Sambre, between Charleroi and Jamioulx. In this particular the execu- tion on June 15 fell short of the original conception, for at night- fall about one-third of the French army was still on the right bank of the river. This, however, signified little, for the emperor still occupied a dominant strategical position.

Napoleon had now perfected his arrangements for the invasion of Belgium, and his army was organized definitely in two wings and a reserve; the latter being so placed that it could be brought " into action on either wing as circumstances dictated." As circumstances dictated, either wing would fasten upon one of the allied armies and detain it until the reserve had time to come up and complete its destruction; the other wing meantime detaining the other allied army and preventing its commander from coming to his colleague's assistance. The emperor was not in possession of the Namur-Nivelles road. The allies were thus afforded an opportunity of committing the very blunder which Napoleon longed for, namely to attempt a risky forward con- centration. His dispositions on the night of the i«;th-i6th were skilfully calculated to encourage the allies to mass at Quatre Bras and Sombreffe, and his covering force were pushed suffi- ciently forward— to Frasnes and Fleuras— to grip whichever ally adventured his army first. At nightfall the Army of the North lay concentrated " in a square whose sides measured 12 m. each; and it could with equal facility swing against the Prussians or the Anglo-Dutch, and was already placed between them."

Early on the morning of June 16 Prince Bernard was reinforced at Quatre Bras by the rest of his division (Perponcher's) ; and Wellington's other troops were now all on the march eastward except the reserve, who were heading southwards and halted at the cross-road of Mt. S. Jean until the duke had resolved that their objective should be Quatre Bras. They then marched in that direction. Bliicher meanwhile was making his arrangements to hold a position to the south of the Namur-Nivelles road and thus maintain uninterrupted communication with Wellington at Quatre Bras. In this way he would keep open the Namur road, and also that from Gembloux for Billow's arrival.

Napoleon spent the early morning in closing up his army, and writing what proved to be the most important letter of the campaign to Ney (Charleroi, about 8 a.m.) : u I have adopted as the general principle for this campaign to divide my army into two wings and a reserve. . . . The Guard will form the reserve, and I shall bring it into action on either wing just as circumstances dictate. . . . According to circumstances I shall weaken one wing to strengthen my reserve. ...” Here, in its simplest

form, is the principle that underlies Napoleon’s strategy in 1815. Only on the wing on which the reserve is brought into action will a decisive result be aimed at. The other is to. be used ex- clusively to neutralize the other enemy, by holding him at bay.

Napoleon’s original plan for the 16th was based on the assump- tion that the allies, who had been caught napping, would not attempt a risky forward concentration; and he intended therefore to push an advanced guard as far as Gembloux, for the purpose of feeling for and warding off Bliicher. To assist this operation the reserve would move at first to Fleurus to reinforce Grouchy, should he need assistance in driving back Bliicher’s troops; but, once in possession of Sombreffe, the emperor would swing the reserve westwards and join Ney, who, it was supposed, would have in the meantime mastered Quatre Bras. In pursuance of this object Ney, to whom Kellermann was now attached, was to mass at Quatre Bras and push an advanced guard 6 m. northward of that place, with a connecting division at Marbais to link him with Grouchy. The centre and left wing together would then make a night-march to Brussels. The allies would thus be irremediably sundered, and all that remained would be to destroy them in detail. Napoleon now awaited further information from his wing commanders at Charleroi, where he massed the VI. Corps (Lcbau), to save it, if possible, from a harassing countermarch, as it appeared likely that it would only be wanted for the march to Brussels. Ney spent the morning in massing his two corps, and in reconnoitring the enemy at Quatre Bras, who, as he was informed, had been rein- forced. But up till noon he took no serious step to capture the cross-roads, which then lay at his mercy. Grouchy meantime reported from Fleurus that Prussian masses were coming up from Namur, but Napoleon does not appear to have attached much importance to this report. He was still at Charleroi when, between 9 and 10 a.m., further news reached him from the left that considerable hostile forces were visible at Quatre Bras. He at once wrote to Ney saying that these could only be some of Wellington’s troops, and that Ney was to concentrate his force and crush what was in front of him, adding that he was to send all reports to Fleurus. Then, keeping Lobau pro- visionally at Charleroi, Napoleon hastened to Fleurus, arriving about 11. He found that Grouchy had made little progress beyond the town. As he surveyed the field

from the windmill north of Fleurus it struck him as significant that Bliicher's troops were disposed parallel to the Namur road, as if to cover a forward concentration, and not at right angles to it, as they would be had they been covering a retreat. Still, at the moment, only one corps was showing. Possibly, how- ever, the decisive day of the campaign had come. By the emperor's arrangements Vandamme, Gerard Pajol and Exel- mans would be available after 2 p.m. to attack whatever force Bliicher might command, and the Guard and Milhaud would be at hand to act as reserve. The wonder is that he did not now order Lobau to move to some intermediate position, such as Wangenies, where he would be available for either wing as circumstances dictated. At 2 p.m. Napoleon ordered Ney to master Quatre Bras, and added that the emperor would attack the corps which he saw in front of him. Whichever wing succeeded first would then wheel inwards and help the other. Not yet had Napoleon grasped the full significance of the allied movements, for the decisive flank had not yet become clear.*

Bliicher had already determined to fight. Meanwhile, Welling- ton, having reached Quatre Bras in the morning, wrote to him to concert the day's operations; then, as all was quiet in his front, he rode over to meet Bliicher at Brye. The two chiefs, surveying the French army in their front, considered that no serious force was in front of Quatre Bras, and Wellington termin- ated the interview with the conditional promise that he would bring his army to Bliicher's assistance at Ligny, if he was not attacked himself. This promise, of course, was never fulfilled, for Ney employed the duke all day at Quatre Bras; and, further- more, the duke's tardy concentration made it quite impossible for him to help Bliicherdirectly on theLigny battlefield. Onhisreturn to Quatre Bras he found that a crisis had already been reached.

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WATERLOO CAMPAIGN

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Map II.

Quatre Bras,

Ney had allowed the valuable hours to slip away when he j could have stormed Quatre Bras with ease and ensured co- i operation with his master. Remembering the surprises | that the battles in Spain had provided for the marshals | opposed to the duke, he massed nearly the whole j of Reille's corps before he advanced. The prince of Orange, in j command at Quatre Bras, had only 7500 troops. But by j boldly scattering his force and by making use of the Bossu wood t and the farms, he covered the cross-roads and showed a firm front to the very superior force which Ney commanded. It was then 2 p.m. The Dutch-Belgian troops to the east of the Brussels highway were at once forced back by the mass of men moved against them, and it looked as if the whole defence would crumple up. But about 3 p.m. timely succour reached the field — Van Merlen's cavalry from Nivelles, Picton and the 5th division from Brussels — and Wellington returned and took over the command. Picton at once stopped the victorious French advance to the cast of the road, but the remaining division (Jerome) of Reille's corps now reached the front and Ney flung it into the Bossu wood to clear that place and keep his left flank free. A fierce fight now broke out all along the line, in which Jerome steadily made ground in the Bossu wood, while Picton showing a dauntless front maintained his position. The Bruns- wick contingent now reached the field, but their duke whilst leading a charge received a mortal wound and the attack failed. It was nearly. 4. 1 5 p.m. when Ney received Napoleon's 2 p.m. order, and in obedience to it he made another attack, in which the Bossu wood was virtually cleared of its defenders. However, about 5 p.m. further reinforcements reached Wellington, Alten's (3rd) division coming in from Nivellcs. Ney now realized that he could only capture Quatre Bras with D'Erlon's help.

But shortly afterwards (about 5.15) he heard that the I. Corps, without his direct order or knowledge, had moved east- wards to assist in the battle of Ligny. Immediately afterwards

(about 5.30) he received an order from Napoleon to seize Quatre Bras and then turn eastwards to crush Bliicher, who was caught at Ligny. Napoleon added, " The fate of France is in your hands." Ney's duty was merely to hold Wellington for certain at Quatre Bras and allow D'Erlon to carry out the movement which must ensure a decisive result at Ligny, in accordance with Napoleon's plan of campaign. In any case D'Erlon could not come back in time to give him effectual help. But incap- able of grasping the situation, and beside himself with rage, Ney sent imperative orders to D'Erlon to return at once, and immediately afterwards he ordered Kellermann to lead his one available cuirassier brigade and break through

Wellington's line. The charge was admirably executed; it overthrew one British regiment which it caught in line, but being unsup- ported it achieved nothing further of importance, and was beaten back. When this attempt to master the cross-roads had ended in failure, Ney received a verbal message from the emperor, enjoining him that, whatever happened at Quatre Bras, D'Erlon must be allowed to carry out the movement ordered by the emperor. The bearer, Major Baudus, knowing the im- portance of the manoeuvre which the I. Corps was carrying out, strove to induce Ney to reconsider D'Erlon's recall; but the marshal refused and ended the discussion by plunging into the fight. Shortly afterwards (about 7 p.al) Wellington received further reinforcements (Cooke's division of the British Guards), which brought his force up to 33,000 against Ney's 22,000 men. The duke then attacked strenuously all along the line, and before darkness stopped the fight he drove back the French to their morning position at Frasnes. The losses were as follows : Anglo-Dutch 4700, and French 4300. At 9 p.m., when the battle was lost and won, D'Erlon's corps arrived. It had already reached the edge of the Ligny battlefield when the counter-order arrived, and conceiving that he was still under Marshal Ney (for the officer who bore the pencil-note directing Ney to detach

D'Erlon, had on his own initiative ordered the I. Corps to the eastward) the general considered he ought to return to the left wing, and leaving one division at Wagnelee he withdrew his force. The incident was immeasurably unfortunate for the French. Had the I. Corps been thrown into the doubtful struggle at Quatre Bras, it must have crushed Wellington; had it been used at Ligny it would have entailed Bliicher's annihilation. But oscillating between the two fields, it took part in neither. When the fighting was over, at 10 p.m., Ney wrote a short and some- what one-sided account of the action to Soult.

On the other flank there had meanwhile been waged the bitterly fought battle of Ligny. As Bliicher's dispositions gradually Lbtny became clearer the emperor realized that the first decisive day of the campaign had actually come, and he promptly made arrangements for defeating the Prussian army in his front. Blucher, to cover the Namur road, held with the I. Corps the villages' of Brye, St Amand and Ligny, whilst behind his centre was massed the II. Corps, and on his left was placed the III. Corps. Wellington and Biilow on arrival would act as general reserve. Bliicher's army, as he finally disposed it, was quite visible to Napoleon on the bare open slopes which it occupied above St Amand and Ligny, the II. Corps being especially exposed. The emperor decided to bear down Bliicher's

centre and right with the corps of Vandamme and Gerard and with Girard's division which he had drawn into his operations, containing the Prussian left meanwhile with the squadrons of Pajol and Exelmans, assisted by a few infantry. . The Guard and Milhaud were in hand at Fleurus. Further, he could order up Lobau, and direct Ney to move his rearward corps across and form it up behind Bliicher's right. When the battle was ripe, he would crush the Prussian centre and right between the Guard and D'Erlon's corps. It was a somewhat complicated manoeuvre; for he was attempting to outflank his enemy with a corps that he had subordinated to Marshal Ney. Much depended on whether Ney would grasp the full purport of his orders; in a similar case at Bautzen he had failed to do so, and he failed as badly now. The usual Napoleonic simplicity was wanting at Ligny, and he paid in full for the want.

It was just after 2-30 p.m. when Napoleon, hearing the sound of Ney's cannon to the westward and realizing that Wellington was attacked and neutralized, commenced; the battle at Ligny. Bliicher's force was numerically very superior. The Prussians numbered about 83,000 men to Napoleon's 71,000 (including Lobau, who only came up at the end of the day). A fierce fight was soon raging for the villages. Vandamme and Girard attacked S. Amand, whilst Gerard attempted to storm Ligny; on the right Grouchy held Thielemann in play, and in the centre near Fleurus were the Guard and Milhaud in reserve, close to the emperor's headquarters on the mill. At 3.15 P.M., when the battle was in full swing, Napoleon wrote in duplicate to iNey, saying, " The fate of France is in your hands," and ordering the marshal to master Quatre Bras and move eastwards to assist at Ligny. Immediately afterwards, hearing that Ney had 20,000 men in front of him, he sent the " pencil-note " by General La Bedoyere which directed Ney to detach D'Erlon's corps to Ligny. This, as we know, the A.D.C. in a fit of mistaken zeal took upon himself to- do. Hence the corps appeared too soon, and in the wrong direction. But neither order made it sufficiently clear to Ney that co-operation at Ligny was the essential, provided that Wellington was held fast at Quatre Bras. In other words, Ney had merely to hold Wellington with part of the French left wing all day, and detach the remainder of his force to co-operate in the deathblow at Ligny. This is clear when the first letter to Ney is studied with the orders, as it was meant to be; but Ney in the heat of action misread the later instructions. Meanwhile the emperor ordered Lobau to bring up his corps at once to Fleurus where he could hardly be of great service, whereas had he been directed to move on Wagnelee he might have co-operated in the last struggle far more efficiently. The fight for the villages continued to rage fiercely and incessantly, each side behaving as if its mortal foe was in front. The villages were captured and re- captured, but generally the French had the better of the fighting,

for they compelled Blucher to use up more and more of his reserves, and prevented the Prussians from breaking through to the southward of S. Amand. Eventually the fighting became so furious that the troops engaged literally melted away, particu- larly at Ligny, and the emperor was finally compelled to call on his reserve to replenish the troops first engaged. But hardly had the Young and Middle Guard marched off to reinforce Vandamme and Gerard, when Vandamme sent word that a hostile column, over 30,000 strong, was threatening the French left (in reality this was D'Erlon's corps). Vandamme's exhausted troops were unnerved at the sight of this fresh foe, and an incipient panic was only quelled by turning guns on the fugitives. It was now between 5.30 and 6. The emperor concluded that this could not be D'Erlon, because he had arrived too soon and was marching in an evidently wrong direction. He at once sent an officer to reconnoitre. Meanwhile the reinforcements which he had despatched were most opportune. The Prussians had seized the opportunity offered by the slackening of the French attacks to rally and deliver a counterstroke, which was parried, after achieving a small measure of success, by the bayonets of the Young Guard. It' was about 6.30 before Napoleon learned that the unknown force was actually D 'Ellon's, and somewhat later he heard that it had counter-marched and withdrawn westwards. Repeated orders sent to the commander of the division left by D'Erlon failed to induce him to engage his command decisively, and thus Napoleon obtained no direct co-operation from his left wing on this, the first decisive day of the campaign. Thus relieved about his left, but realizing that D'Erlon had returned to Ney, the emperor had perforce to finish the battle single- handed. Blucher now delivered a general counterstroke against Vandamme. Massing every available man he led the attack in person; but he vainly attempted to make ground to the south of S. Amand; the exhausted Prussians were overpowered by the chasseurs of the Guard and forced to retire in disorder. Napoleon's opportunity to finish the battle had come at last. He could at least beat Bliicher and render the Prussians unfit for any serious operation except retreat on June 17, although he could no longer expect to destroy the Prussian army. Lobau's corps, too, was now arriving and forming up on the heights east of Fleurus. The artillery of the Guard, therefore, came into action above Ligny to prepare Bliicher's centre for assault. Some delay was occasioned by a thunderstorm; but, as this passed over, the guns opened and the Old Guard and Milhaud's cuiras- siers proceeded to form up opposite to Ligny. About 7.45 p.m. a crashing salvo of 60 guns gave the signal for a combined assault to be delivered by Gerard and the Guard, with Milhaud moving on their right flank. Bliicher's worn-out soldiers could not withstand the tremendous impact of Napoleon's choicest troops, and the Prussian centre was pierced and broken. But the gallant old marshal, still had some fresh squadrons in hand, and he promptly launched them to si em the French advance. While leading one of the charges in person his

horse was shot and fell under him, but he was rescued and borne in a semi-conscious condition from the field. Without doubt, the personal risk 10 which Blucher exposed himself at this crisis was far too great; for it was essential that the command of the Prussian army should remain vested in a chief who would loyally keep in touch and act entirely in concert with his colleague. In this way only could the allies hope to obtain a decisive success against Napoleon. By 9 p.m. the main battle was over, and everywhere the French pushed resistlessly forward. Napoleon was master of Bliicher's battlefield, and the beaten Prussians had retired to the north of the Namur-Nivclles road. Under the circumstances, the late hour, the failing light and the lack of information as to events on the left wing, immediate pursuit was out of the question.

The execution had again fallen short of the conception; Bliicher though beaten was not destroyed, nor was his line with Wellington cut. If the Prussians now retired northwards, parallel to the direction which Wellington would follow perforce on the morrow, the chance of co-operating in a decisive battle would still remain to the allies; and Gneisenau's order issued by moonlight, directing the retreat on Tilly and Wavre, went

far to ensuring the possibility of such combined action. However, Gneisenau was very remiss in not immediately reporting this vital move and the necessity for it to trie duke, as it left the Anglo-Dutch inner flank quite exposed. Gneisenau apparently selected Wavre, not with the intention of assisting his ally, but rather to re-establish his own line of communication, and the presence of the Prussians on the field of battle of Waterloo must be put down to the immortal credit of Blucher and Grolmann, his quartermaster-general. Gneisenau at this crisis in the affairs of the allies does not appear to have subordinated everything to co-operation at all cost with Wellington, and he allowed supply considerations and the re-establishment of his communications to overweigh the paramount necessity of ar- ranging concerted action with his ally. Probably Wellington's failure to co-operate at Ligny had heightened the Prussian chief-of-staff 's unworthy suspicions of the good faith and soldierly qualifications of the British marshal; and it was well for the allies that Blucher was able to resume command before Napoleon had time to profit from the dissensions that would probably have arisen had Gneisenau remained in control. The casualties in the hard-fought battle of Ligny "were very heavy. The Prussians lost about 12,000 men and 21 guns, and the French 8500; in Ligny more than 4000 dead lay on an area of about 400 sq. yds., and in

one of the hamlets of S. Amand thete lay, almost to a man, the gallant 82nd of the line (Girard's division). So dose was the fighting that most of the 20,000 casualties lay on about 2 sq. m. of ground. It was a really Napoleonic battle.

Despite D'Erlon's misadventure the emperor had the game still in his hands, for Ney's failure had actually placed the Anglo- Dutch army in a precarious position. So true is it that a tactical failure encountered in carrying out a sound strategical plan matters but little. Again Napoleon's plan of campaign had succeeded. The emperor having beaten Blucher, the latter must fall back to rally and re-form, and call in Biilow, who had only reached the neighbourhood of Gembloux on June 16; whilst on the other flank Ney, reinforced by D'Erlon's fresh corps, lay in front of Wellington, and the marshal could fasten upon the Anglo-Dutch army and hold it fast during the early morning of June 17, sufficiently long to allow the emperor to close round his foe's open left flank and deal him a deathblow. But it was clearly essential to deal with Wellington on the morrow, ere Blucher could again appear on the scene. Welling- ton was by no means so well acquainted with the details of the Prussian defeat at Ligny as he ought to have been. It is true that, before leading the final charge, Blucher despatched an aide-de-camp to his colleague, to tell him that he was forced to retire; but this officer was shot and the message remained undelivered. To send a message of such vital importance by a singie orderly was a piece of bad staff work. It should have been sent in triplicate at least, and it was Gneisenau's duty to repeat the message directly he assumed temporary command. Opposed as they were to Napoleon, Gneisenau's neglect involved them in an unnecessary and very grave risk.

Napoleon was unwell, and consequently was not in the saddle on the 17th as early as he would otherwise have been. In his , j absence neither Ney nor Soult appears to have made any serious arrangements for an advance, although every minute was now golden. During the night more reinforce- ments arrived for Wellington, and on the morning of June 17 the duke had most of his army about Quatre Bras. But it was 24 hours too late, for Blucher's defeat had rendered the Anglo- Dutch position untenable. Early in the morning Wellington (still ignorant of the exact position of his ally) sent out an officer, with an adequate escort, to establish touch with the Prussians. This staff officer discovered and reported that the Prussians were drawing off northwards to rally at Wavre; and about o a.m. a Prussian orderly officer arrived from Gneisenau to explain the situation and learn Wellington's plans. The duke replied that he should fall back on Mt S. Jean, and would accept battle there, in a selected position to the south of the Forest of Soignes, provided he was assured of the support of one of Blucher's corps. Like the good soldier and loyal ally that he was, he now

subordinated everything to the one essential of manoeuvring so as to remain in communication with Blucher, It was 2 a.m. on June 18 before he received the answer to his suggestion.

Early on the 1 7th the Prussians drew off northwards on three roads, Thielemann covering the withdrawal and moving via Ge-nbloux to join hands with Biilow. The French cavalry on the right, hearing troops in motion on the Namur road, dashed in pursuit down the turnpike road shortly after dawn, caught up the fugitives and captured them-. They turned out to be stragglers; but their capture for a time helped to confirm the idea, prevalent in the French army, that Blucher was drawing off towards his base. Some delay too was necessary before Napoleon could finally settle on his plan for this day. The situation was still obscure, details as to what had happened on the French left were wanting, and the direction of Blticner's retreat was by no means certain. Orders, however, were sent to Ney, about 8 a.m., to take up his position at Quatre Bras, and if that was impossible he was to report at once and the emperor would co-operate. Napoleon clearly meant that Ney should attack whatever happened to be in his front. If confronted by a rear-guaTd he would drive it off and occupy Quatre Bras; and if Wellington was still there the marshal would promptly engage and hold fast the Anglo-Dutch army, and report to the emperor. Napoleon would in this case hasten up with the reserve and crush Welling- ton. Wellington in fact was there ; but Ney did nothing what- ever to retain him, and the duke began his withdrawal to Mt. S. Jean about 10 a.m. The last chance of bringing about a decisive French success was thus allowed to slip away.

Meanwhile Napoleon paid a personal visit about 10 a.m. to the Ligny battlefield, and about n a.m. he came to a decision. He determined to send the two cavalry corps of Pajol • ■ ■ ■ F and Exelmans, and the corps of Vandamme and Bper Ztions. Gerard, with Teste's division (VI. Corps), a force of 33,000 men and no guns, to follow the Prussians, penetrate their intentions and discover if they meditated uniting with Wellington in front of Brussels. As Exelmans' dragoons had already gained touch of the III. Prussian corps at Gembloux, the emperor directed Marshal Grouchy, to whom he handed over the command of this force, to " proceed to Gembloux." This order the marshal only too literally obeyed. After an inconceivably slow and wearisome march, in one badly arranged column moving on one road, he only reached Gembloux on June 17, and halted there for the night. His cavalry gained contact before noon with Thielemann's corps, which was resting at Gembloux, but the enemy was allowed to slip away and contact was lost for want of a serious effort to keep it. Grouchy did not proceed to the front, and entirely failed to appreciate the situation at this critical juncture. Pressing danger could only exist if Blucher had gone northwards, and northwards, therefore, in the

Dyle valley, he should have diligently sought for traces of the Prussian retreat. 1 Had Blucher gone eastwards, Grouchy, holding the Dyle, could easily have held back any future Prussian advance towards Wellington. Grouchy, however, went to Gembloux as ordered. By nightfall the situation was all in favour of the allies; for Grouchy was now actually outside the four Prussian corps, who were by this time concentrated astride the Dyle at Wavre. Their retreat having been unmolested, the Prussians were ready once more to take the field, quite twenty-four hours before Napoleon deemed it possible for the foe defeated at Ligny.

On the other flank; too, things had gone all in favour of Welling- ton. Although the emperor wrote to Ney again at noon, from Ligny, that troops had now been placed in position at Marbais to second the marshal's attack on Quatre Bras, yet Ney remained quiescent, and Wellington effected so rapid and skilful a retreat that, on Napoleon's arrival at the head of his supporting corps,

1 There appears to be no reason to believe that Grouchy pushed any reconnaissances to the northward and westward of Gentinnes on June 17; had he done so. touch with Blucher's retiring columns must have been established, and the direction of the Prussian retreat made clear. The right of Milhaud's cuirassier corps, whilst marching from Marbais to Quatre Bras, saw a column of Prussian infantry retiring towards Wavre, and Milhaud reported this fact about 9 P.M. to the emperor, who, however, attached little weight to it.

he found only the duke's cavalry screen and some horse artillery still in position. Can we wonder that he gave vent to his anger Napoleon's an d declared that Ney had ruined France? This was pursuit of the fatal mistake of the campaign, and Fortune turned Welting- now against her former favourite. Although the """ smouldering fires of his old energy flamed out once

more and Napoleon began a rapid pursuit of the cavalry screen, which crumpled up and decamped as he advanced, yet all his efforts were powerless to entangle the Anglo-Dutch rearguard to such an extent that Wellington must turn back to its assist- ance. The pursuit, too, was carried out in the midst of a tropical thunderstorm which broke at the roar of the opening cannonade, and very considerably retarded the French pursuit. It

was not until the light was failing that Napoleon reached the heights of Rossomme opposite to Wellington's position and, by a masterly reconnaissance in force, compelled the duke to disclose the pres- ence of practically the whole Anglo-Dutch army. The French halted, somewhat loosened by pursuit, between Rossomme and Genappe and spent a wretched night in the sodden fields.

During the night Wellington received the reassuring news that Blucher would bring two corps certainly, and possibly four, to Waterloo, and determined to accept battle. Napoleon's plan being to penetrate between the allies and then defeat, them successively, the left was really the threatened flank of the Anglo-Dutch army. Yet so far was Wellington from divining Napoleon's object that he stationed 17,000 men (iricluding Colville's British division) at Hal and Tubize, 8 m. away to his right, to repel the turning movement that he ground- lessly anticipated and to form a rallying point for his right in- case his centre was broken. By deliberately depriving himself of this detachment, on June 18, the duke ran a very grave risk. With the 67,600 men whom he< had in hand, however, he took up a truly admirable " Wellingtonian " position astride the Nivelles-Brussels and Charleroi-Brussels roads which meet at Mt S. Jean. He used a low ridge to screen his main defensive position/exposing comparatively few troops in front of the crest. Of his 156 guns, 78 belonged to the British artillery; but of his 67,660 men only 29,800 were British or King's German Legion troops, whereas all Napoleon's were Frenchmen and veterans. Wellington Oofiipied Hougoumont in strength, chiefly with detachments of the British Guards; and he also placed a garrison of the K.G.L. in La Haye Sainte, the tactical key of the allied position. Both these farms were strengthened; but, still nervous about his right flank, the duke occupied Hougoumont in much greater force than La Haye Sainte, and massed the bulk of his troops on his right. The main position was very skilfully taken up, and care was taken to distribute the troops so that the indifferent and immature were closely supported by those who were " better disciplined and more accustomed to war." Owing to a misconception, one Dutch-Belgian brigade formed up in front of the ridge. Full arrangements were made for Blucher's co-operation through General Muffling, the Prussian attaché on the duke's staff. The duke was to stand fast to receive the attack, whilst the Prussians should close round Napoleon's exposed right and support Wellington's left. The Prussians were thus the real general reserve, and it was Wellington's task to receive Napoleon's attack and prepare him for the decisive counter-stroke.

Blucher loyally kept his promise to his ally ; but the execution left much to be desired. He did not start his corps on their westward march until a considerable time after dawn, and then, owing to bad staff work, the rear corps of all (Billow) was selected to lead the march. This unnecessary delay was aggravated further by a fire that broke out in Wavre and

delayed the march. In spite of his hurts the old marshal was in the saddle.

Meanwhile Napoleon formed his army for the attack on Wellington's position. The wet state of the ground (largely composed of corn-fields) and the scattered bivouacs of the French army prevented the attack from being made at 6 a.m. as Napoleon had desired. It was therefore put off first of all until 9 a.m., and later until 11.30, to permit the sodden ground to dry sufficiently for the mounted arms to manoeuvre freely and

give time to the French army to close up. During the night the emperor had received a report from Marshal Grouchy, dated Gembloux, 10 p.m., 17th, which stated that the Prussians were: retiring in two columns towards Wavre and Perwez. Grouchy added that if he found that the bulk of the Prussians were moving on Wavre he would follow them and separate them from } Wellington. But a glance at the map shows that this wast impossible. By following the Prussians Grouchy, who had taken up a position outside the Prussian left flank, would inevitably drive the allies together. It was 10 a.m. when the emperor: answered this letter, and he directed the marshal to march for. Wavre, thus approaching the French army and entering the zone of the main operations. The underlying idea of manoeuvring in two wings and a reserve should be kept in mind when considering this letter. Its meaning will then clearly be, that Grouchy was to endeavour to place his force on the inner Prussian flank and hold ' them back from Waterloo. But this is just what the despatch ■ does not state verbally and precisely, and accordingly Grouchy, ' like Ney on the 16th and 17th, misread it.

*The French army proceeded to form up in an imposing array some 1300 yards from Wellington's position, and if sofne mis-' givings as to the result filled the minds of men like Soult, Reille and Foy, who had had previous experience of Wellington in, the' field, none at any rate dwelt in Napoleon's mind. The lateness" of the hour at which the attack was delivered, and the emperor's determination to break Wellington's centre instead of outflanking the Anglo-Dutch left and further separating the allies, deprived hini of whatever chance he still possessed of beating Wellington "before Blucher coiild intervene. Napoleon drew up his army of 74,06*1 men and 246 guns in three lines,: fully in view of the allies. In the, first line were the corps of; Reille and D'Efferiywho were destined to attack the allied line: and prepare it for the final assault. In the second line were Kellermann's cuirassiers, the incomplete corps of Lobau, the squadrons of Domon and Subervie, and Milhaud's cuirassiers. In the third line was the Guard. It was an imposing array of : veteran troops, and when their emperor rode along the lines they received him with extraordinary enthusiasm.*

The battle of Waterloo may be divided into five phasesˆ About 1 1 .30 the

first phase opened with an attack by one of Reille's divisions on Hougoumont. This- was a mere . . side-issue, destined to draw Wellington's attention Waterloo: to his right, and in this it failed. About noon, how- phase. ever, a battery of 80 French guns unlimbered on the long spur to the S.E.of La Haye Sainte, to prepare the duke's centre for the main attack. Here the form of the ground so skilfully chosen sheltered the defence in some degree from the tempest of iron that now beat against the position. After 1 P.M., and just before he gave orders for Ney to lead the main attack, the emperor scanned the battlefield, and on his right front he saw a dense dark cloud emerging from the woods at Chapelle Saint Lambert. It was soon discovered that this was Biilow's corps marching to Wellington's assistance. A letter was now awaiting despatch to Grouchy, and to it was added a postscript that the battle was raging with Wellington, that Billow's corps had been sighted by the emperor, and that the marshal was to hasten to the field and crush Biilow. This order at least was precise and clear, but it was sent 12 hours too late, and when Grouchy received it he was unable to carry it out. To neutralize Biilow when necessity arose, the emperor now detached Lobau together with the squadrons of Domon and Subervie. The French general, however, hardly drew out far enough from the French right; otherwise the magnificent resolution he displayed and the admirable obstinacy with which his troops fought against ever-increasing odds are worthy of all praise. Thus as early as r.30 p.m. the Prussian interven- tion deranged the symmetry of Napoleon's battle-array.

It did not occur to the emperor that it would be wise to break off the fight now and seek a more favourable opportunity of beating the allies in detail. He was still determined to play the game out to the bitter end, and involve Wellington and Biilow's corps in a common ruin.

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Map III.

Ney was therefore ordered to attack Wellington's centre with D'Erlon's corps. Owing to a misconception the columns used ˆˆ for advance were over-heavy and unwieldy, and the

pAne. corps failed to achieve anything of importance. As

D'Erlon's troops advanced the Dutch-Belgian brigade in front of the ridge, which had been subjected to an overwhelm- ing fire from the 80 French guns at close range, turned about and retired in disorder through the main

position. This, however, was the solitary success secured by the I. corps; for the left division failed to storm La Haye Sainte, which was most gallantly defended, and Picton's division met the remainder of D'Erlon's corps face to face, engaging them in a murderous infantry duel in which Picton fell. It was during this struggle that Lord Uxbridge launched two of his cavalry brigades on the enemy; and the " Union brigade " catching the French infantry unawares rode over them, broke them up, and drove them to the bottom of the slope with the loss of two eagles. The charge, however, over-reached itself, and the British cavalry, crushed by fresh French horsemen hurled on them by the emperor, were driven back with great loss. So far no success against Wellington had been achieved, and Biilow was still an onlooker.

Ney was now ordered to attack La Haye Sainte again, but the attack failed. A furious cannonade raged, and the Anglo-Dutch

line withdrew slightly to gain more cover from the ˆ ftM ,_ ridge. Ney misinterpreted this manoeuvre and led

out, about 4 P.M., Milhaud's and Lefebvre-Desnouettes' horsemen (43 squadrons) to charge the allied centre between the two farms. For several reasons, the cavalry could only advance at a trot. As the horsemen closed they were received with

volleys of case from the guns, and the infantry formed into squares. Against the squares the horsemen were powerless, and failing to break a single square, they were finally swept off the plateau by fresh allied horsemen. KellermannVdbirassier and the heavy horse of the Guard (37 fresh squadrons) now advanced to support the baffled cavalry, the latter falling in as supports. The whole 80 squadrons resumed the attack, but with no better result. The cavalry gradually became hopelessly entangled among the squares they were unable to break, and at last they were driven down the face of the ridge and the most dramatic part of the battle came to an end. Had these great cavalry attacks been closely supported by infantry, there can be little doubt that they must, have achieved their object. But they were not. In his handling of the three arms together, Napoleon on this day failed to do justice to his reputation.*

About 4.30 p.m. Biilow at last engaged. Lobau's men were gradually overpowered and forced back into Plancenoit, the village was stormed, and the Prussian round shot reached the main road. To set his right flank free the emperor called further on his reserve, and sent Duhesme with the Young Guard to Lobau's support. Together, these troops drove Biilow out of Plancenoit, and forced him back towards the Paris wood. But the Prussians had not yet changed the fate of the day.

Napoleon now ordered Ney to carry La Haye Sainte at what- ever cost, and this the marshal accomplished with the wrecks of D'Erlon's corps soon after 6 P.M. The .garrison ,

(King's German Legion) had run out of rifle ammuni- phase tion and the French bursting in seized the post. This was the first decided advantage that Napoleon had gained during*

the day. The key of the duke's position was now in Napoleon's hands, Wellington's centre was dangerously shaken, the troops were exhausted, and the reserves inadequate. But the Iron Duke faced the situation unmoved. Calmly he readjusted his line and strengthened the torn centre. Happily for him, Pirch I.'s and Zieten's corps were now at hand. Pirch I. moved to support Billow; together they regained possession of Plancenoit, and once more the Charleroi road was swept by Prussian round shot. Napoleon, therefore, had to free his right flank before he could make use of Ney's capture. To this end he sent two battalions of the Old Guard to'storm Plancenoit. The veterans did the work magnificently with the bayonet, ousted the Prussians from the place, and drove them back 600 yards beyond it. But Napoleon could not turn now on Wellington. Zieten was fast coming up on the duke's left, and the crisis was past. Zieten's advent permitted the two fresh cavalry brigades of Vivian and Vandeleur on the duke's extreme left to be moved and posted behind the depleted centre. The value of this reinforcement at this particular moment can hardly be overestimated.

The French army now fiercely attacked Wellington all along the line; and the culminating point of this phase was reached when

Napoleon sent forward the Guard, less 5 battalions, phase ˆ0 attack Wellington's centre. Delivered in three

Echelons, these final attacks were repulsed, the first echelon by Colin Halkett's British Brigade, a Dutch-Belgian battery, and a brigade of Chasse's Dutch-Belgian division; the second and third echelons by the Guards, the 52nd, and the Royal Artillery. Thus ended the fifth phase.

As the Guard recoiled (about 8 p.m.) Zieten pierced the north- east corner of the French front, and their whole line gave way

as the allies rusher! forward on their now defenceless French & P re y Three battalions of tKe Guard indeed stood their*

ground for some time, but they were finally over- whelmed. Afterwards, amidst the ruins of their army, two battalions of the 1st Grenadiers of the Guard defied all efforts to break them But, with the exception of these two battalions, the French army was quickly transformed into a flying rabble. Biilow and Pirch I. now finally overpowered Lobau, once more recaptured Plancenoit, and sealed the doom of the French army. But Lobau 's heroic efforts had not been in vain; they had given his master time to make his last effort against Wellington; and when the Guard was beaten back the French troops holding Plancenoit kept free the Charleroi road, and prevented the Prussians from seizing Napoleon's line of retreat.

When Wellington and Blucher met about 9.15 p.m. at " La Belle Alliance, " the victorious chiefs arranged that the Prussians should take up the pursuit, and they faithfully carried out the agreement. Pushing on through the night, they drove the French out of seven successive bivouacs and at length drove them over the Sambre. The campaign was virtually at an end, and the price paid was great. The French had lost over 40,000 men and almost all their artillery on June 18; the Prussians lost 7000, and Wellington over 15,000 men. So desperate was the fighting that some 45,000 killed and wounded lay on an area of roughly 3 sq. m. At one point on the plateau " the 27th (Inniskillings) were lying literally dead in square "; and the position that the British infantry held was plainly marked by the red line of dead and wounded they left behind them.

A few words may now be bestowed on Marshal Grouchy, commanding the right wing. The marshal wrongly determined Grouchy's on tne I ˆ t ˆ 1 to continue his march to Wavre in a single operations column, and he determined, still more wrongly, to June move by the right bank of the Dyle. Breaking up

from bivouac long after dawn, he marched forward, via Walhain. Here he stopped to report to the emperor some intelligence which turned out to be false, and he remained for breakfast. Hardly had he finished when the opening roar of the cannonade at Waterloo was heard. Grouchy was now urged by his generals, especially by Gerard, to march to the sound of the firing, but he refused to take their advice, and pushed on to Wavre, where he found the Prussians (Thielemann's corps of 16.000 men) holding the passages across the Dyle. A fierce fight

(called the Action of Wavre) began about 4 P.M., in which the Prussians were for long victorious. Instead of concentrating his force upon one bridge over the swampy and unfordable Dyle, Grouchy scattered it in attacks upon several; and when the emperor's despatch arrived, saying Biilow was in sight, the marshal was powerless to move westward. Towards the end of the day Colonel Vallin's Hussars stormed the Limale bridge, and a large

part of Grouchy's force then promptly gained the left bank. The action continued till about n p.m., when it died out, to recommence shortly after dawn. Thielemann was at length overborne by sheer weight of numbers, and towards n A.M. he was forced to retire towards Louvain. The losses were con- siderable, about 2400 men on each side.

Grouchy's victory was barren. In the far higher duty of co- operation he had failed miserably. His tactical achievement could avail the emperor nothing, and it exposed his own force to considerable danger. Whilst pondering on the course he should follow, the marshal received the news of the awful disaster that had overtaken the emperor at Waterloo. In a flash he realized his danger and made prompt arrangements to begin his retreat on Namur, the only line to France that was then available. This retreat he carried out resolutely, skilfully and rapidly, slipping past Blucher and finally bringing his force to Paris. But the rapid advance of the allies gave France no time to rally. Napoleon was forced to abdicate, and finding escape was impos- sible, he surrendered (on July 14) to the British — " the most powerful, the most unwavering and the most generous of his foes."

The causes of Napoleon's failure in the Waterloo campaign were as follows: — The French army was numerically. too weak for the gigantic task it undertook. Napoleon himself was no longer the Napoleon of Marengo or Austerlitz, and though he was not broken down, his physical strength was certainly impaired. Ney failed to grasp and hold Wellington on the critical 17th June; and on the 17th and iSth Grouchy's feeble and false manoeuvres enabled Blucher to march and join Wellington at Waterloo. Napoleon'3 chance of success was dangerously diminished, if not utterly de- stroyed, by the incompetence of the two marshals whom in an evil hour he selected for high commands. Another dominant influence in shaping the course of events was the loyalty of Blucher to his ally, and the consequent appearance of the Prussian army at Waterloo. Nor must we overlook Wellington's unswerving determination to co-operate with Blucher at all costs, and his firmness on June 18; or the invincible steadiness shown by the British troops and those of the King's German Legion.

Bibliography. — Some of the principal books on the campaign are: Colonel Grouard, Critique de 181$; H. Houssaye, Waterloo; General PolHo, Waterloo {18 1 5) ; Shaw-Kennedy, Battle of Waterloo ; Captain W. Siborne, 9th Foot, History of the Waterloo Campaign ; Clausewitz, Campagne de 181$; Colonel Charras, Histoire de la Campagne de 181$, Waterloo; L. Navcz, Les Quatre Bras, Ligny, Waterloo et Wavre; General H. T. Siborne, R.E., Waterloo Letters; Colonel Chesney, Waterloo Lectures; Wellington, Despatches and Memorandum on the Battle of Waterloo; Correspondanee and Com- mentates of Napoleon.

In this article the writer has been greatly assisted by the advice and suggestions of Lieut.-Col. H. W. L. Hime, R.A. (A.'F. B.)*

WATERLOO-WITH-SEAFORTH, an urban district in the Bootle and Ormskirk parliamentary divisions of Lancashire, England, at the mouth of the Mersey, 4 m. N. by W. of Liverpool- Pop. (1801) 17,225; (1901) 23,102. On account of its facilities for bathing, firm sands, pleasant scenery and nearness to Liver- pool, of which it is a suburb, it is much frequented both by visitors and by residents.

WATERLOW, SIR ERNEST ALBERT (1850-), English painter, was born in London, and received the main part of his art education in the Royal Academy schools, where, in 1873, he gained the Turner medal for landscape-painting. He was elected associateof the Royal Society of Painters in Water-Colours in 2880, member in 1894, and president in 1897; associate of the Royal Academy in 1890, and academician in 1903; and he was knighted in 1902. He began to exhibit in 1872 and has produced a considerable number of admirable landscapes, in oil and water-colour, handled with grace and distinction. One of his pictures, " Galway Gossips, " is in the National Gallery of British Art.

See Sir E. A. Waterlow, R.A., P.R.W.S., by C. Collins Bake/ (Art Journal Office, 1906).

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WATER MOTORS

WATER MOTORS. The subject of hydraulic transmission of power is treated generally under Power Transmission {Hydraulic) , and the present article is confined to water motors.

Hydraulic Lifts. — The direct-acting lift is perhaps the simplest of all machines using pressure-water, but as the height of the lift increases, certain problems in construction become exceedingly difficult to cope with, notably those due to the great increase in the weight and displacement of the ram. In fact, with a simple ram it is not possible to lift beyond a certain height with a given pressure and load. It becomes, therefore, necessary to balance in some way the varying displacement of the ram if economy is to be secured in the working: this is often done by the use of counter-weights attached to chains travelling over head sheaves, but this largely destroys the simplicity and safety of the direct-acting lift, and hence some form of hydraulic balancing is more satisfactory and more certain.

In one form, shown in fig. I, the lift cylinder is in hydraulic connexion with a pair of short cylinders placed one above the other, the pistons working in

them being connected together by a common rod. Below the piston of the upper cylinder is an annular space E (surrounding the common piston rod) with a capacity equal to the maximum displacement of the lift- ram, while the corresponding annular area C of the piston of the lower cylinder is just large enough when subjected to the working water pressure to enable the work of lifting the net load to be done and any friction to be overcome. The area B of the top side of the upper piston is proportioned in such a way that when under the full water pressure the dead weight of the ram and cage is just balanced when the former is at the bottom of its stroke. With this arrange- ment the lift – ram and the two balance pistons are always in equi- librium, or, in _ other words, the ever -changing displacement of the lift-ram is automatically in balance. To work the lift, pressure-water is admitted to the annular space C above the lower of the two balance pistons (the space B above the upper one is always in communication with the pressure- water), and the combined pressure on the two pis- tons is sufficient to lift the cage, ram and load. _ As the ram ascends it apparently increases in weight, but this is balanced by the greater pressure on the two balance pistons as they descend, owing to the in- crease of the head of water acting on them. To allow the lift-ram to descend, the pressure- water in C above the lower balance piston is discharged through the exhaust into the drain, while that above the upper piston is simply pushed back into the pressure main. As an illustration of the economy of this system, it may be. mentioned that in one lift having a 6-in. ram with a lift of 90 ft., the working load being 1 ton and the maximum working speed 180ft. a minute, the quantity of pressure-water used per journey of Fig. 1. — Hydraulic 9° ft. was reduced from 109 to 24ˆ

‘ Balancing. gallons by the use of this method of

balancing. In another system of hydraulic balance (fig;. 2) the ram A has an annular area so proportioned that when it is connected with the water in an elevated tank (usually placed somewhere in the roof of the building), the hydraulic pressure upon it just balances the weight of the ram and cage. Here again, since the intensity of the pressure on A becomes greater as it descends owing to the increased head, the apparent increase of weight of the lift-ram as it rises is automatically balanced; water from the high-pressure system is admitted down the hollow ram B and does the work of lifting the live load.

Since the introduction of deep-level electric railways’ in London

and elsewhere, hydraulic passenger lifts on a large scale have beer brought into use for conveying passengers up and down from the street level to the underground stations.

Direct-acting Water Motors. — Owing to the difficulty of securing a durable motor with a simple and trustworthy means of auto- matically regulating the quantity of water used to the power needed at various times from the motor, not much advance has been recently made in the use of water motors with reciprocating rams or pistons. Prob- ably the most successful one has been a rotary engine invented by Mr Arthur Rigg. 1

In this engine the stroke, and therefore the amount of water used, can be varied either by hand or by a governor while it is running; the speed can also be varied, very high rates, as much as 600 revolutions a minute, being attain- able without the question of shock or vibration becoming troublesome. The cylinders are cast in one piece with a circular valve, and rotate about a main stud S (fig. 3), while their plungers are connected to a disk crank which rotates above the point O, which is the centre of the main crank; O S being the crank length or half stroke of the engine, any variation in its length will vary the power of the engine and at the same time the quantity of water used- The movement of S is obtained by means of a relay engine, in which there are two rams of different diameters; a constant pressure is always acting on the smaller of these when the motor is at work, while the governor (or hand- power if desired) admits or exhausts pressure- water from the face of the other, and the move- ments to and fro thus given to the two rams alter the position of the stud S, and thus change the stroke of the plungers of the main engine. Fig. 4 gives an outside view of a 30-H.P. engine capable of using water at a pressure of 700 lb per sq. in.; the governor is carried within the driving pulley shown at the right-hand end, while the working revolving cylinders are carried insir'e the boxed-in flywheel at the left-hand end, the relay cylinder and its attachments being fixed to the bed-plate in front of the flywheel. On a test one of these engines gave an efficiency or duty of 80%.

Water Wheels. — The Pelton water wheel (fig. 5) has proved a most successful motor when very high heads are available, heads of 2000 feet having been used occasionally. Such machines have been extensively em- ployed in America, and have also lately been used in Great Britain, worked by the FlG B a ˆ[n high-pressure water supplied in large towns.

The wheel carries a series of cups placed at equal distances around the circumference. A jet or jets of water impinge on the cups, the interiors of which are shaped in such a way that the jet is discharged parallel to its original direction. If the linear velocity of the cups in feet a second is Vi, and the linear velocity of the jet is V2, then the velocity of the jet relative to the cup is V 2 — Vi feet a second, and if the whole energy of the water is to be given up to the cups, the water must leave the cup with zero absolute velocity. But its velocity relative to the cup, as it passes back- wards, is — (V2r~Vi), and since the forward velocity of the cup is Vi, the abso- lute

velocity of the water is -(V,-V 1) + Vior2Vi-V2. This will become zero if Vi is \V 2 , that is, if the linear velocity of the cup- centres is one-half that of the jet of water impinging upon them. The theoretical efficiency of the wheel would then be 100%. The actual efficiency of these wheels when used with high falls is from 80 to 86%; when used in connexion with high-pressure water in London an efficiency

J This engine was fully described in Engineering, vol. xlv, n. 61.

Fig. 3.

Section of Rigg's Water Engine.

of 70% has been obtained, and when a dynamo is driven directly by them about 66 % of the hydraulic energy has been converted into electric energy.

Pelton wheels are very sensitive to variation of load, and con- siderable trouble was experienced at first in securing adequate

Fig. 4. — External View of Rigg's Water-Engine. >

governing when they were used to generate electric energy; but this difficulty has been overcome, and they have been rendered most efficient machines for use with high falls, where ordinary turbines would be difficult to manage owing to the excessive speed at which they would run. In a small installation in the United States water is brought in a 36-in. pipe a distance of 1800 ft., and supplies six

Pelton wheels each 28 in. in diameter, running at 135 revolutions a minute under a head of 130 ft. The total power developed is 600 H.P., and though the load factor varies very greatly in this case, the differential type of governor used secures perfect control of the running of the wheels.

Turbines. — The turbine has now become one of the most efficient of the prime movers employed by man, and in the United States of America and on the continent of Europe 1 its use has enormously increased of recent years. Though no radical changes have been made in the design of tur- bines for some years, an immense amount of skill and ingenuity has been shown in perfecting and improving details, and such machines of great size and power are now constantly being made, and give every satisfaction when in use.

In the " Hercules " turbine, shown in fig. 6, the flow is what is called mixed, that is, it is partly a radial inward and partly an axial flow machine. On entering, the water flows at first in a radial direction, and then gradually, as it passes through the wheel, it receives a downward component which becomes more and more important. Professor Thurston has published the results of a test

Fig. 5.— Pelton Wheel

1 This and some of the other drawings have been taken from Blaine's Hydraulic Machinery.

2 The following statistics of turbine construction in Switzerland are taken from Sckweizerischcke Bauzeitung (1901), p. 128, which, in rhe same volume at p. 53, contains a valuable article on the most important improvements in turbines and their regulation shown

n the Paris Exhibition of 1901 : —

Period.

Number

of Turbines.

Total H.P.

Average H.P.

1844-1869 1869-1879 1879-1889 1889-1899

Totals .

767 1006 1840 2231

36,894 66,688

133,579 400,474

48

66J

72J

I79i

of one of these, which gave an efficiency of 87 % at full load and 70% at about three-fifths full load.

Another turbine of the mixed flow type is the " Victor," which consists of three parts* — the outer guide case, and, inside this, the register gate, and the wheel. The gate regulates the speed of the wheel by varying the quantity of water; when fully open it merely forms, a continuation of the guide passages, and thus offers no obstruction to the flow of the water, but by giving it a movement through a part of a revolution the passages are partly blocked and the flow of the water is checked. This form of regulation is fairly efficient down to three-quarter opening. Turbines of this type may also be used on horizontal shafts, and are very useful in the case of low falls where there is a large amount of water and the head is fairly constant. At Massena, in New York State, 75,000 H.P. is to be developed from fifteen sets of these turbines working under a head of 40 ft. Each generator can develop 5000 H.P. at a potential of 2200 volts, and is driven by three horizontal double turbines on the same shaft; when working under a minimum head of 32 ft. at 150 revolutions, each turbine will have a nominal horse- power of 1000.

Probably the most important application of turbines to the generation of power on a great scale is that at Niagara Falls. The water is tapped off from the river Niagara about 1 m. above the falls and brought by a canal to the power- house. The wheel-pit is '1 80 ft. in depth, and is connected with the river below the falls by a tail-race, consisting of a tunnel 21 ft. high and 18 ft. 10 in. wide at its largest section. The original turbines were of the " Fourneyron " type, and a pan* were mounted on each vertical shaft, the two being capable of giving out 5000 H.P. with a fall of 136 ft. Each pair of wheels is built in three storeys, and the outflow of the water is controlled by a cylindrical gate or sluice, which is moved up and down by the action of the governor. As the pair of wheels and the big vertical shaft (which is of hollow steel 38 in. in diameter) with the revolving part of the dynamo mounted on the upper end, of the shaft weigh about 152,000 ft>, a special device, since adopted in other similar power plants, was designed to balance in part this

Fig. 6.—" Hercules " Turbine.

dead weight. The water passes from the penstock through the guide blades of the upper wheel, and in doing so acts in an upward direction on a cover of the upper wheel, which thus becomes, as it were, a balance- piston. The

total upward pressure on this piston, is cal- culated to be equal to 150,000 lb; hence the shaft-bearings are practically relieved from pressure when the wheels are running. Another turbine which has come into extensive use is the " Francis, ' an exceedingly efficient turbine on a low fall with large quantities of water. At Schaffhausen two of them with a fall of 12J ft. de- veloped 430 H.P., when the older turbines only gave 260 H.P., the

efficiency of the Francis turbine being in this case 86 % at full load and 77 % at half load.

A recent form of the Jonval turbine is shown in fig. 7- This turbine was designed to give 1250 H.P. with a fall of 25 ft. and an efficiency of 77 %. It is fitted with a suction pipe and a circular balanced sluice for admitting and cutting off the water-supply. The wheel is 12 ft. 3ˆ in. in diameter, and has a speed of fifty revolu- tions per minute, and the power generated is transmitted through bevel-gearing to a horizontal shaft from which the power is taken

Fig. 7, — Jonval Turbine.

off for various purposes. When complete the turbine weighed about 140 tons. There is a regulating arrangement, by which one- half of the guide-passages can be shut off in pairs from the water, and at the same time air is freely admitted into these unused passages by pipes which pass through the hinges of the controlling shutter. Tests of a turbine of this slow-moving type showed an efficiency of 82 % at full gate, and one of 75 % when half of the passages in the guide-blades were closed by the shutters, as described above.

As an illustration of the use of water-power, even at a considerable distance from a town, the case of Lausanne may be described. The town has secured the right of using a waterfall of 113 to 118 ft. high, by impounding the Rh&nenear Saint Maurice. In dry seasons this will supply 6000 H.P., and for quite ten months in an ordinary year 14,000 H.P. The plant in 1902 consisted of five turbines, having horizontal axles, and each developing iooo_ H.P. when running at 300 revolutions a minute. They drive electric generators, and the current so produced is taken at a pressure of 22,000 volts on overhead wires a distance of 35 m. to Lausanne, the loss being estimated not to exceed 10% in the long transmission. Near the town is a station for reducing the voltage, and current is distributed at 125 volts for lighting purposes and at 500 volts for use on the tramways and for

other power purposes.

Authorities. — For further information concerning the construc- tion and employment of water motors, the reader is referred to the following papers and textbooks : — Proc. Inst. Mech. Eng. (1882), p.i 19 (1889J, p. 350; (1895), p. 353. (These papers contain full accounts of recent forms of lifts.) — Engineering, vol. lxvii. pp. 91, 128, 160, " Power Station at Niagara ; vol. Ixxii. pp. 391-767, " Govern- ing of Water Wheels." — Proc, Inst. Civil Eng., vol. lxxxvi. p. 60, "Mersey Railway Lifts"; vol. xciii. p. 596, "Experiments on Jonval and Girard Turbines at Alching"; vol. xcvi. p. 182, "Hy- draulic Canal Lifts"; vol. cii. p. 154, " Keswick Water-Power Electric Station"; vol. cxii. p. 410, " Hydraulic Works at Niagara "; vol. cxviii. p. 537, " A 12-Mile Transmission of Power Generated by Pelton Wheels''; vol. exxiii. p. 530, " The Pelton Water Wheel "; vol. exxiv. p. 223, "The Niagara Power Works"; vol. exxvi. p. 494, "The Rheinfelden Power Transmission Plant "; vol. cxii. p. 269, " Electric Transmission Plants in Transvaal," p. 307, " Tur- bines"; vol. cxlii. p. 451, " Electrical Installations at Lausanne "; vol. cxlv. p. 423, " Water Power at Massena " ; vol. cxlvii. p. 467, " Some Large Turbine Installations." — Wood, Theory of Turbines) Bovey, Hvdraulics; Bjflrling, Hydraulic Motors; Blaine, Hydraulic Machinery; Bodmer, Hydraulic Motors; Unwin, "Water Motors" (Lectures on Hydro-Mechanics, Inst. Civil Eng., 1885). (T. H. B.)*

WATER-OPOSSUM, or Yapock (Ckironectes minimus), the single representative of the genus. This animal is distinguished from other opossums by its webbed hind-feet, non-tuberculated soles, and peculiar coloration. Its ground colour is light grey, with four or five sharply contrasted brown bands passing across its head and back, giving it a very peculiar mottled appearance; the head and body together are about 14 in. long, and the tail measures a little more. It is almost wholly aquatic in its habits,

living on small fish, crustaceans and other water animals; its range extends from Guatemala to southern Brazil.

WATER POLO, a game which has done much to ' advance swimming in popular favour and to improve the stamina of swimmers. It is played either in a bath or open water, the teams consisting of seven a side. The field of play must not exceed 30 yds. or be less than 19 yds. in length, and the width must not be more than 20 yds. The ball used must be round and fully inflated, and must not measure less than 26-3-, nor more than 28 in. in circumference. It must be waterproof, with no strapped seams outside, and no grease or other objectionable substance placed on it. The goals must be 10 ft. in width, with a cross-bar 3 ft. above the surface when the water is 5 ft. or over in depth, and 8 ft. from the bottom when the water is less

than 5 ft. in depth; in no case must the water in which a game is played be less than 3 ft. Goal nets are used in all important matches. The duration of a match is supposed to be 14 minutes, seven minutes each way. The officials consist of a referee, a time- keeper and two goal scorers, the first-named official starting the game by thrbwing the ball into the centre of the bath. A goal is scored by the entire ball passing between the goal posts and under the cross-bar.

The players have to place themselves in a line with their respective goals, and are not allowed to start swimming to the centre of the bath until the word " Go " is given. They are usually divided into 3 forwards, I half-back, 2 backs and a goalkeeper. To the fastest swimmer is usually assigned the place of centre-forward, and it is his duty to make all headway possible so as to reach the ball before the opposing forward of the other side, then pass rapidly back to the half or one of the backs and swim on to within close proximity of the opponent's goal and wait for a pass. The other forwards should rapidly follow him up and each man carefully shadow one of the opposing side. In handling the ball only one hand may be used, for to touch the ball with both hands at the same time constitutes a foul, as also does the holding of the rail or the side, during any part of the game, the standing on or touching of, the bottom of the bath except for the purpose of resting, interfering or impeding an opponent in any way, unless he be holding the ball, holding the ball under water when tackled, jumping from the bottom or pushing off from the side (except at starting or restarting) in order to play the ball or duck an opponent, holding, pulling back or pushing off from an opponent, turning on the back to kick at an opponent, assisting a player at the start or restart to get a good push off, throwing the ball at the goalkeeper from a free throw or refusing to play the ball at the command of the referee after a foul or the ball has been out of the field of play. Dribbling or striking the ball is held to be not holding, but lifting, carrying, pressing under water or placing the hand under or over the ball when actually touching, is holding; dribbling up the bath and through the posts is permissible. There is a penalty area, 4 yds. from each goal-post, and the imaginary line across the bath is not allowed to be passed by the respective goal- keepers, otherwise they commit a foul. They may stand to defend thetr goal, touch the ball with both hands or jump from the bottom to play the ball, but in all other respects the same rules as to fouls apply to them as to other players. In any case they are not allowed to throw the ball beyond half-di stance. If they do so the opposing side is awarded a free throw. For fouls which the referee considers to have been committed wilfully there are very severe penalties, and those guilty of them are ordered out of the water until a goal has been scored, thus for the time being crippling the side. Deliberately wasting time, starting before the word " Go," taking up a position within 2 yds. of the opponent's goal, changing position after the

whistle has blown for a free throw or other similar stoppage of play, or deliberately splashing an opponent in the face, arc all held to be wilful fouls. Whenever the whistle blows for fouls the players have to remain in their respective places until the ball has left the hand of the player to whom the free throw was awarded. A player who has been wilfully fouled within 4 yds. of his opponent's goal line is given a penalty throw, and the consequence is that a. close match is often won by reason of a player deliberately breaking the rules when his goal is hotly assailed. In ordinary fouls the ball must touch another player before a goal can be scored, but in penalty throws it need not. Any player throwing the ball over his own goal line concedes a corner throw to the other side, but if an opposing player sends it over it is a free throw for the goalkeeper. After each goal is scored the players return to their respective ends, waiting for the word " Go, and at half-time they are allowed a rest of three minutes, during which they leave the water. Fouls, half-time and time are declared by whistle, and goals by bell.

The game requires careful practice of smart and scientific passing, side and back-handed throws, and accurate shooting. For this purpose " throwing the water-polo ball " contests are commonly held by the leading clubs, who also engineer competitions on points for shooting at goal.

It was not until the formation of the London Water Polo League in 1889 that the game was specially catered for, but a form of it had previously been known and played in several parts of England and Scotland. In 1870 the old London Swim- ming Association, the forerunner of the present Amateur Swimming Association, appointed a committee to draw up rules for a game of " Football in the water," but no report of that committee appears to have been presented. In 1876 aquatic handball matches were played in the sea of! Bournemouth by members of the Bournemouth Premier Rowing Club, and in 1877 there were similar matches at the annual competition for the Bon Accord Club in the river Dee, and a year prior tc that some rules had been drawn up for the Aberdeen Club. The game at length found its way to the Midlands, and led to the foundation of the Midland Aquatic Football Association, whose rules were somewhat similar to those in vogue in America, where goals are scored by placing the ball in a marked-out space called I " goal." In 1883 Birmingham Leander played All England at Portsmouth; in 1885 the Amateur Swimming Association took official recognition of the game, and in 188S started the English championship, this being won the first year by Burton-on-Trent. Then came the foundation of the London Water Polo League, through

whose agency county associations came into being, inter-county matches were played, and international games arranged. The first county matches were played in 1890, and the first international the same year, the game being between England and Scotland at Kensington Baths on 28th July. England was beaten by four gjpals to none, but the outcome of the match was the cementing of friendly relations between the English and Scottish associations, and the gradual spread of the game, until the English, Irish, Scottish and Welsh associa- tions joined together and formed an international board, without whose sanctionnoneof the rules of the game can now be altered. Oxford and Cambridge met for the first time in 1891, and since then the Blues' committee of each university have given swimming and water polo a " half blue." The game has become popular in many European countries, and friendly matches between English and continental clubs are frequently played. It has also extended to Egypt, India and Australia, in which countries the British rules have been adopted.

See the Amateur Swimming Association's Handbook for rules of the game and instructions to referees. (W. Hy.)

WATER RIGHTS. By the law of England the property in the bed and water of a tidal river, as high as the tide ebbs and flows at a medium spring tide, is presumed to be in the crown or as a franchise in a grantee of the crown, such as the lord of a manor, or a district council, and to be extra-parochial. The bed and water of a non-tidal river are presumed to belong to the person through whose land it flows, or, if it divide two properties, to the riparian proprietors, the rights of each extend- ing to midstream (ad medium JUum aquae). In order to give riparian rights, the river must now in a defined channel, or at least above ground. The diminution of underground water collected by percolation, even though malicious, does not give a cause of action to the owner of the land in which it collects, it being merely damnum sine injuria, though he is entitled to have it unpolluted unless a right of pollution be gained against him by prescription. The right to draw water from another's well is an easement, not a profit a prendre, and is therefore claimable by custom. As a general rule a riparian proprietor, whether on a tidal or a non-tidal river, has full rights of user of his property. Most of the statute law will be found in the Sea Fisheries Acts 1843 to 1891, and the Salmon and Freshwater Fisheries Acts 1861 to 1886. In certain cases the rights of the riparian proprietors are subject to the intervening rights of other persons. These rights vary according as the river is navigable or not, or tidal or not. For instance, all the riparian proprietors might combine to divert a non-navigable river, though one alone could not do so as against the others, but no combination of riparian proprietors could defeat the right of the public to have a navigable river maintained undiverted. We shall here

imposed upon, riparian proprietors, in addition to those falling under the head of fishery or navigation. In these matters English law is in substantial accordance with the law of other countries, most of the rules being deduced from Roman law. Perhaps the main difference is that running water is in Roman law a res communis, like the air and the sea. In England, owing to the greater value of river water for manufacturing and other purposes, it cannot be said to be common property, even though it may be used for navigation. The effect of this difference is that certain rights, public in Roman law, such as mooring and unloading cargo, bathing, drying nets, fishing for oysters, digging for sand, towing, &c, are only acquirable by prescription or custom in England, By Roman law, a hut might lawfully be built on the shore of the sea or of a tidal river; in England such a building would be a mere trespass. Preaching on the foreshore is not legal unless by custom or prescription {Llandudno Urban Council v. Woods, 1899, 2 Ch. 705). Nor may a fisherman who dredges for oysters appropriate a part of the foreshore for storing them (Truro Corporation v. Rowe, 1902, 2 K.B. 709).

The right of use of the water of a natural stream cannot be better described than in the words of Lord Kingsdown in 1858: " By the general law applicable to running streams, every riparian proprietor has a right to what may be called the ordinary use of water flowing past his land — for instance, to the reasonable use of the water for domestic purposes and for his cattle, and this without regard to the effect which such use may have in case of a deficiency upon pro- prietors lower down the stream. But, further, he has a right to the use of it for any purpose, or what may be deemed the extraordinary use of it, provided he does not thereby interfere with the rights of other proprietors, either above or below him. Subject to this con- dition, he may dam up a stream for the purposes of a mill, or divert the water for the purpose of irrigation. But he has no right to inter- cept the regular flow of the stream, if he thereby interferes with the lawful use of the water by other proprietors, and inflicts upon them a sensible injury " (Miner v. Gilmour, 12 Moore's P.C. Cases, 156). The rights of riparian proprietors where the flow of water is artificial rest on a different principle. As the artificial stream is made by a person for bis own benefit, any right of another person as a riparian proprietor does not arise, at common law, as in the case of a natural stream, but must be established by grant or prescription. If its origin be unknown the inference appears to be that riparian pro- prietors have the same rights as if the stream had been a natural one (Baity v. Clark, 1902, 1 Ch. 649). The rights of a person not a riparian proprietor who uses land abutting on a river or stream by the licence or grant of the riparian proprietor are not as full as thougt he were a riparian proprietor, for he cannot be imposed as a riparian proprietor upon the other proprietors without their consent. The effect of this appears

to be that he is not entitled to sensibly affect their rights, even by the ordinary as distinguished from the extra- ordinary use of the water. Even a riparian proprietor cannot divert the stream to a place outside his tenement and there use it for pur- poses unconnected with the tenement (McCartney v. Londonderry & Lough Stvilly My. Co., 1904, A.C. 301).

The limitations to which the right of the riparian proprietor is subject may be divided into those existing by common right, those imposed for public purposes, and those established against him by crown grant or by custom or prescription. Under the first head comes the public right of navigation, of anchorage and fishery from boats (in tidal -waters), and of taking shell-fish (and probably other fish except royal fish) on the shore of tidal waters as far as any right of several fishery does not intervene. Under the second head would fall the right of eminent domain by which the state takes riparian rights for public purposes, compensating the proprietor, the restrictions upon the sporting rights of the proprietor, as by acts forbidding the taking of fish in close time, and the Wild Birds Protection Acts, and the restrictions on the ground of public health, as by the Rivers Pollution Act 1876 and the regulations of port sanitary authorities. The jurisdiction of the state over rivers in England may be exercised by officers of the crown, as by commis- sioners of sewers or by the Board of Trade, under the Crown Lands Act 1866. A bridge is erected and maintained by the county authorities, and the riparian proprietor must bear any inconvenience resulting from it. An example of an adverse right by crown grant is a ferry or a port. The crown, moreover, as the guardian of the realm, has jurisdiction to restrain the removal of the foreshore, the natural barrier of the sea, by its owner in case of apprehended danger to the coast. The rights established against a riparian proprietor by private persons must as a rule be based on prescription or custom, only on prescription where they are in the nature of profits h prendre. The public cannot claim such rights by prescription, still less by custom. Among such rights are the right to land, to discharge cargo, to tow, to dry nets, to beach boats, to take sand, shingle or water, to have a sea-wall maintained, to pollute the water (subject to the Rivers

Pollution Act), to water cattle, &c. In some cases the validity of local riparian customs has been recognized by the legislature. The right to enter on lands adjoining tidal waters for the purpose of watch- ing for and landing herrings, pilchards and other sea-fish was con- firmed to the fishermen of Somerset, Devon and Cornwall by I Jac. I. c, 23. Digging sand on the shore of tidal waters for use as manure on the land was granted to

the inhabitants of Devon and Cornwall by 7 Jac. I. c. 18. The public right of taking or killing rabbits in the day- time on any sea bank or river bank in the county of Lincoln, so far as the tide extends, or within one furlong of such bank, was preserved by the Larceny Act 1 88 1. It should be noticed that rights of the public may be subject to private rights. Where the river is navi- gable, although the right of navigation is common to the subjects of the realm, it may be connected with a right to exclusive access to riparian land, the invasion of which may form the ground for legal proceedings by the riparian proprietor (see Lyon v. The Fishmongers' Company, 1876, I A.C. 662). There is no common-law right of support by subterranean water. A grant of land passes all water- courses, unless reserved to the grantor.

A freshwater lake appears to be governed by the same law as a non-tidal river, surface water being pars soli. The preponderance of authority is in favour of the right ofthe riparian proprietors as against the crown. Most of the law will be found in Bristow v. Cormican, 1878, 3 A.C. 648.

Unlawful and malicious injury to sea and river banks, towing paths, sluices, flood-gates, mill-dams, &c, or poisoning fish, is a crime under the Malicious Damage Act 1861.

Ferry is a franchise created by grant or prescription. When created it is a highway of a special description, a monopoly to be used only for the public advantage, so that the toll levied must be reasonable. The grantee may have an action or an injunction for infringement of his rights by competition unless the infringement

be by act of parliament. In Hopkins v. G.N. Ry. Co., 1877, 2 Q.B.D. 224 (followed in Dibden v. Skirrow, 1907, 1 Ch. 437), it was held that the owner of a ferry cannot maintain an action for loss of

traffic caused by a new bridge or ferry made to provide for new traffic, Many ferries are now regulated by local acts.

Weir, the gurges of Domesday, the kidellus of Magna Carta, as appurtenant to a fishery, is a nuisance at common law unless granted by the crown before 1272. From the etymology of kidellus the weir was probably at first of wicker, later of timber or stone. The owner of a several fishery in tidal waters cannot maintain his claim to a weir unless he can show a title going back to Magna Carta. In private waters he must claim by grant or prescription. Numerous fishery acts from 25 Edw. HI. st. 4, c. 4 deal with weirs, especially with regard to salmon fishery. An interesting case is Hanbury v. Jenkins, 1901, 2 Ch. 401 , where it was held that a grant of " wears " in the Usk by Henry VIII. in 1516 passed the bed of the river as

well as the right of fishing.

Mill may be erected by any one, subject to local regulations and to his detaining the water no longer than is reasonably necessary for the working of the wheel. But if a dam be put across running water, the erection of it can only be justified by grant or prescriptipn, or (in a manor) by manorial custom. On navigable rivers it must have existed before 1272. The owner of it cannot pen up the water permanently so as to make a pond of it.

Bathing. — The reported cases affect only sea-bathing, but Hall (p. 160) is of opinion that a right to bathe in private waters may exist by prescription or custom. There is no common-law right to bathe_ in the sea or to place bathing-machines on the shore. Pre- scription or custom is necessary to support a claim, whether the fore- shore is the property of the crown or of a private owner (Brinckman v. Matley, 1904, 2 Ch. 313). Bathing in the sea or in rivers is now often regulated by the by-laws of a local authority.

Scotland. — The law of Scotland is in general accordance with that of England. One of the principal differences is that in Scotland, if a charter state that the sea is the boundary of a grant, the foreshore is included in the grant, subject to the burden of crown rights for public purposes. Persons engaged in the herring fishery on the coast of Scotland have, by 11 Geo. III. c. 31, the right to use the shore for 100 yds. from high-water mark for landing and drying nets, erecting huts and curing fish. By the Army Act 1881, s. 143, soldiers on the march in Scotland pay only half toll at ferries. The right of ferry is one of the regalia minora acquirable by prescriptive possession on a charter of barony, Sea-greens are private property. The right to take seaweed from another's foreshore may be prescribed as a servitude. Interference with the free passage of salmon by abstraction of water to artificial channels is restrainable by interdict (Pirie v. Earl of Kintore, 1906, A.C. 478). See the Salmon Fisheries (Scotland) Acts 3828 to 1868.

In Ireland the law is in general accordance with that of England. In R. v. Clinton, I.R. 4 C.L. 6, the Irish court went perhaps beyond any English precedent in holding that to carry away drift seaweed from the foreshore is not larceny. The Rivers Pollution Act 1876 was re-enacted for Ireland by the similar act of 1893.

In the United States the common law of England was originally the law, the state succeeding to the right of the crown. This was no doubt sufficient In the thirteen original states, which are not traversed by rivers of the largest size, but was not generally followed when it 'became obvious that new conditions, unknown in England,

had arisen. Accordingly the soil cf navigable rivers, fresh or salt, and of lakes, is vested in the state, which has power to regulate navigation and impose tolls. The admiralty jurisdiction of the United States extends to all public navigable rivers and lakes where commerce is carried on between different states or with foreign nations (Genesee Chief v. Fitzhugh, 12 Howard's Rep. 443). And in a case decided in 1893 it was held that the open waters of the great lakes are " high seas " within the meaning of § 5346 of the Revised Statutes (U.S. v. ' Rodger s, 150 U.S. Rep, 249). A state may establish ferries and authorize dams. But if water from a dam overflow a public highway, an indictable nuisance is caused. The right of eminent domain is exercised to a greater extent than in England in the compulsory acquisition of sites for mills and the construction of levees or embankments, especially on the Mississippi. In the drier country of the west and in the mining districts, the common law as to irrigation has had to be altered, and what was called the " Arid Region Doctrine " was gradually established. By it the first user of water has a right by priority of occupation if he give notice to the public of an intention to appropriate, provided that he be competent to hold land.

Authorities. — Hall's Essay on the Rights of the Crown on the Sea- Shore (1830) has been re-edited in 1875 and 1888. Sec also S. A. and H. S. Moore, History and Law of Fisheries (1903). Among American authorities are the works of Angell, Gould and Pomeroy, on Waters and Watercourses, Washburn on Easements, Angell on the Right of Property in Tide Waters, Kirney on Irrigation and the Report to the Senate on Irrigation (1900).. (J, W.)

WATER-SCORPION, an aquatic hemipterous insect of the family Nepidae, so called from its superficial resemblance to a scorpion., which is due to the modification of the legs of the anterior pair for prehension, and to the presence of a long slender process, simulating a tail, at the posterior end of the abdomen. The common British; species (Nepa cinerea) lives in ponds and stagnant water, and feeds upon aquatic animal organisms principally of the insect kind. Respiration in the adult is effected by means of the caudal process, which consists of a pair of half-tubes capable of being locked together to form a siphon by means of which air is conducted to the tracheae at the apex of the abdomen when the tip of the tube is thrust above the surface of the water. In immature forms the siphon is undeveloped and breathing takes place through six pairs of abdominal spiracles. The eggs, laid in the stems of plants, are supplied with seven filamentous processes which float freely in the water.

In Nepa the body is broad and flat;' but in an allied water-bug, Ranatra, which contains a single British species (R. linearis), it is long and narrow, while the legs are very slender and elongate. Certain exotic members of this

group,, sometimes erroneously referred to the Nepidae, but really forming a special family, Belo- stomidae, are of large size, a South American species, Belostoma grande, reaching a length of between 4 and 5 in.

WATERSHED, in physical geography, the line separating the headstreams tribtitary to two different river-systems or basins. Alternative terms . are " water-parting " and " divide." The crest of a mountain ridge forms the most clearly marked water- shed; in a plain country of gentle slope (e.g. the central plain of Ireland) the watershed is often difficult to trace, as the head- waters of two different river systems may merge in marshes or lakes at the highest levels. In a mountainous country, where two streams, flowing in opposite directions but having their sources adjacent, are both gradually eroding or cutting back the land at their heads, a pass is formed. In such cases, where one stream erodes faster than the other, the stronger may ultimately " behead " the weaker, and " capture " some of its waters, whose flow is diverted from one basin to another.

WATERSPOUT, a local vorticular storm occurring over a water-surface, and in origin and form similar to a tornado (q.v.) oyer the land. A whirling, funnel-shaped cloud, first observed as a pendant from the mass of storm-cloud above, seems to grow downwards, tapering, towards the water-surface, which is violently agitated, and finally (when the spout is fully developed) appears to be drawn up to meet the cloud from above. This appearance is deceptive, as the bulk of the water carried along by the whirling spout is condensed from the atmosphere, and, even when the spout is formed over a salt-water surface, is found to be fresh. . Waterspouts occur most frequently over the warm seas of the tropics, but they are not confined to the warmer tropical seasons, or even to low latitudes.

COLLECTING AREAS]

WATER SUPPLY

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WATER SUPPLY. This article is confined to the collection and storage of water for domestic and industrial uses and irrigation, and its purification on a large scale. The conveyance of vater is dealt with in the article Aqueduct.

Collecting Areas

Surface Waters. — Any area, large or small, of the earth's surface from any part of which, if the ground were impermeable, water would flow by gravitation past any point in a natural watercourse is commonly known in Europe as the " hydro- graphic basin " above that point. In English it has

been called indifferently the " catchment basin/' the " gathering ground," the " drainage area " and the " watershed." The latter term, though originally equivalent to the German Wasserscheide— "water-parting" — is perhaps least open to objection. The water-parting is the line bounding such an area and separating it from other watersheds. The banks of a watercourse or sides of a valley are distinguished as the right and left bank respectively, the spectator being understood to be looking down the valley.

The surface of the earth is rarely impermeable, and the structure of the rocks largely determines the direction of flow of so much of the rainfall as sinks into the ground and is not evaporated. Thus the figure and area of a surface watershed may not be coincident with that of the corresponding under- ground watershed; and the flow in any watercourse, especially from a small watershed, may, by reason of underground flow from or into other watersheds, be dispropor- tionate to the area apparently drained by that watercourse.

When no reservoir exists, the volume of continuous supply from any watershed area Dj y is evidently limited to the minimum,

weather or, so-called, extreme dry weather /Jaw of ji ow j the stream draining it. This stream. cann ot be determined from the rain- fall; it entirely depends upon the power of the soil and rock to store water in the particular area under consideration, and to yield it con- tinuously to the stream by means of concen- trated springs or diffused seepage. Mountain areas of 10,000 acres and upwards, largely covered with moorland, upon nearly imper- meable rocks with few water-bearing fissures, yield in tem- perate climates, towards the end of the driest seasons, and therefore solely from underground, between a fifth and a quarter of a cubic foot per second per 1000 acres. Through- out the course of the river Severn, the head- waters of which are chiefly supplied from such formations, this rate does not materially change, even down to the city of Worcester, past which the discharge flows from 1,256,000 acres. But in smaller areas, which on the average arc necessarily nearer to the water- parling, the limits are much wider, and the rate of minimum discharge is generally smaller.

Thus, for example, on 1000 acres or less, it commonly falls to one- tenth of a cubic foot, and upon an upland Silurian area of 940 acres, giving no visible sign of any peculiarity, the discharge fell, on the 21st of September 1893, to one-thirty-fifth of a cubic foot per second per 1000 acres. In this case, however, some of the water probably passed through the beds and joints of rocks to an adjoining valley lying at a lower level, and had both streams been gauged the average would probably have been considerably greater. The Thames at Teddington, fed largely from cretaceous areas, fell during ten days in September 1898 (the artificial abstractions for the

supply of London being added) to about one-sixth of a cubic foot, and since 1880 the discharge has occasionally fallen, in each of six other cases, to about one-fifth of a cubic foot per second per 1000 acres. Owing, however, to the very variable permeability of the strata, the tributaries of the Thames, when separately gauged in dry seasons, yield the most divergent results. It may be taken as an axiom that the variation of minimum discharges from their mean values increases as the separate areas diminish. In the eastern and south-eastern counties of England even greater variety of dry weather flow prevails than in the west, and upon the chalk formations there are generally no surface streams, except such as burst out after wet weather and form the so-called " bournes." On the other hand, some rocks in mountain districts, notably the granites, owing to the great quantity of water

Rainfall

stored in their numerous fissures or joints, commonly yield a much higher proportion of so-called dry weather flow.

When, however, a reservoir is employed to equalize the flow during and before the period of dry weather, the minimum flow continuously available may be increased to a much higher figure, depending upon the capacity of that reservoir in relation to the mean flow of the stream supplying it. In such a case the first essential in determining the yield is to ascertain the rainfall. For this purpose, if there are no rain-gauges on the drainage area in question, an estimate may be formed from numerous gaugings throughout the country, most of which are published in British Rainfall, initiated by the late Mr G. J. Symons, F.R.S., and now carried on by Dr H. R. Mill. 1 But except in the hands of those who have spent years in such investigations, this method may lead to most incorrect conclusions. If any observations exist upon the drainage area itself they are commonly only from a single gauge, and this gauge, unless the area is very level, may give results widely different from the mean fall on the whole area. Unqualified reliance upon Single gauges in the past has been the cause of serious errors in the estimated relation between rainfall and flow off the ground.

The uncertainties are illustrated by the following actual example : A battery of fourteen rain-gauges, in the same vertical plane, on ground having the natural profile shown by the section (fig. 1), gave during three consecutive years the respective falls shown by

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Fig. 1.

the height of the dotted lines above the datum line. Thus on the average, gauge C recorded 20% more than gauge D only 70 ft. distant; white at C, in 1897, the rainfall was actually 30% greater than at J only 560 ft. away. The greatly varying distribution of rainfall over that length of 1600 ft. is shown by the dotted lines measured upwards from the datum to have been remarkably con- sistent in the three years; and its causes — the path necessarily taken in a vertical plane ny the prevailing winds blowing from A towards N — after passing the steep bank at C D — may be readily understood. Such examples show the importance of placing any rain-gauge, so far as possible, upon a plane surface of the earth — horizontal, or so inclined that, if produced, especially in the direction of prevailing winds, it will cut the mean levels of the area whose mean rainfall is intended to be represented by that gauge. It has been commonly stated that rainfall increases with the altitude. This is broadly true. A rain-cloud raised vertically upwards expands, cools and tends to precipitate; but In the actual passage of rain-clouds over the surface of the earth other influences are at work. In fig. 2 the thick line

Fig. 2.

represents the profile of a vertical section crossing two ranges of hills and one valley. The arrows indicate the directions of the prevailing winds. At the extreme left the rain-clouds are thrown up, and if this were all, they would precipitate a larger proportion of the moisture

1 Since the above was written, this work has been taken over by the " British Rainfall Organization."

they contained as the altitude increased. But until the clouds rise above the hill there is an obvious countervailing tendency to com- pression, and in steep slopes this may reduce or entirely prevent pre- cipitation until the summit is reached, when a fall of pressure with commotion must occur.

Very high mountain ranges usually consist of many ridges, among which rain-clouds arc entangled in their ascent, and in such cases precipitation towards the windward side of the main range, though on the leeward sides of the minor ridges of which it is formed, may occur to so large an extent that before the summit is reached the clouds are exhausted or nearly so, and in this case the total precipitation is less on the leeward than on the wind- ward side of the main range; but in the moderate heights of the United Kingdom it more commonly happens from the causes ex- plained that precipitation is prevented or greatly retarded until the summit of the ridge is reached. The following cause also contributes to the latter effect. Imagine eleven raindrops A to K to fall simul- taneously and equi-distantly from the horizontal plane A M. A strong wind is urging the drops from left to right. The drops A and K may be readily conceived to be equally diverted by the wind, and to fall near the tops of the two hills respectively. Not so drop C, for directly the summit is passed the wind necessarily widens out vertically and, having a greater space to fill, loses forward velocity, ft may even eddy backwards, as indicated by the curved arrows, and it is no uncommon thing, in walking up a steep hill in the contrary direction to the flight of the clouds, to find that the rain is coming from behind. Much the same tendency exists with respect to all drops between B and E, but at F the wind has begun to accommodate itself to the new regime and to assume more regular forward motion, and as J is approached, where vertical contraction of the passage through which the wind must pass takes place, there is an increasing tendency to lift the raindrops beyond their proper limits. The general effect is that the rain falling from between G and K is spread over a greater area of the earth G'K' than that falling from the equal space between B and F, which reaches the ground within the smaller area B'F'. From this cause also, therefore, the leeward side of the valley re- ceives more rain than the windward side. In the United Kingdom the prevailing winds are from the south-west, and some misapprehen- sion has been caused by the bare, but perfectly correct, statement that the general slope towards the western coast is wetter than that towards the eastern. Over the whole width of the country from coast to coast, or of the Welsh mountain ranges only, this is so; but it is nevertheless true that the leeward side ofan individual valley or range of hills generally receives more rain than the windward side. Successive abstraction of raindrops as the iain-clouds pass over ridge after ridge causes a gradually diminishing precipitation, but this is generally insufficient to reverse the local conditions, which tend to the contrary effect in individual ranges. The neglect of these facts has led to many errors in estimating the mean rainfall on watershed areas from the fall observed at gauges in particular parts of those areas.

In the simplest case of a single mountain valley to be used for the supply of

an impounding reservoir, the rainfall should be known at fiVe points, three being in the axis of the valley, of which one is near the point of intersection of that axis with the boundary of the watershed. Then, in order to connect with these the effect of the right- and left-hand slopes, there should be at least one gauge on each side about the middle height, and approximately in a line perpendicu- lar to the axis of the valley passing through the central. gauge. The relative depths recorded in the several gauges depend mainly upon the direction of the valley and steepness of the bounding hills. The gauge in the bottom of the valley farthest from the soufrce will in a wide valley generally record the least rainfall, and one of those on the south-west side, the highest. Much will depend upon the judicious placing of the gauges. Each gauge should have for 10 or 15 yds. around it an uninterrupted plane fairly representing the general level or inclination, as the case may be, of the ground for a much larger distance around it. The earliest records of such gauges should be carefully examined, and if any apparently anomalous result is obtained, the cause should be traced, and when not found in the gauge itself, or in its treatment, other gauges should be used to check it. The central gauge is useful for correcting and checking the others, but in such a perfectly simple case as the straight valley above assumed it may be omitted in calculatingthe results, and if the other four gauges are properly placed, the arithmetical mean of their results will probably not differ widely from the true mean for the valley. But such records carried on tor a year or many years would afford no knowledge of the worst conditions that could arise in longer periods, were it not for the existence of much older gauges not far distant and subject to somewhat similar conditions. The nearer such long-period gauges are to the local gauges the more likely are their records to rise and tall in the same proportion. The work of the late Mr James Glaisher,F.R.S., of the late Mr G.J . Sy mons, F.R.S., of the Meteorological Office and of the Royal Meteorological Society, has resulted in the establishment of a vast number of rain- gauges in different parts of the United Kingdom, and it is generally, though not always, found that the mean rainfall over a long period can be determined, for an area upon which the. actual fall is known only for a short period, by assigning to the missing years cf the short- period gauges, rainfalls bearing the same proportion to those of corresponding years in the long-period gauges that the rainfalls of

the known years in the short-period gauges bear to those of corre- sponding years in the long-period gauges. In making such compari- sons, it is always desirable, if possible, to select as standards long- Seriod gauges which are so situated that the short-period district lies etween them. Where suitably placed long-period gauges exist, and where care has been exercised in ascertaining the authenticity of their records and in making the comparisons, the short records of the local gauges may be thus carried back

into the long periods with nearly correct results.

Rainfall is proverbially uncertain; but it would appear from the most trustworthy records that at any given place the total rainfall during any period of 50 years will be within 1 or 2 % of the total rainfall at the same place during any other period of 50 years, while the records of any period of 25 years will geneiallv be found to fall within 35 % of the mean of 50 years. It is equally satisfactory to know that there is a nearly constant ratio on any given area (ex- ceeding perhaps 1000 acres) between the true mean annual rainfall, the rainfall of the driest year, the two driest consecutive years and any other groups of driest consecutive years. Thus in any period of 50 years the driest year (not at an individual gauge but upon such an area) will be about 63% of the mean for the 50 years.

That in the two driest consecutive years will be about 75 % of the mean for the 50 years.

That in the three driest consecutive years will be about 80 % of the mean for the 50 years.

That in the four driest consecutive years will be about 83 % of the mean for the 50 years.

That in the five driest consecutive years will be about 85 % of the mean for the 50 years.

That in the six driest consecutive years will be about 865 % of the mean for the 50 years.

Apart altogether from the variations of actual rainfall produced by irregular surface levels, the very small area of a single rain-gauge is subject to much greater variations in short periods than can possibly occur over larger areas. If, therefore, instead of regarding only the mean rainfall of several gauges over a series of years, we compare the relative falls in short intervals of time among gauges yielding the same general averages, the discrepancies prove to be very great, and it follows that the maximum possible intensity of discharge from different areas rapidly increases as the size of the watershed decreases. Extreme cases of local discharge are due to the phenomena known in America as " cloud-bursts,' which occasionally occur in Great Britain and result in discharges, the intensities of which have rarely been recorded by rain-gauges. The periods of such discharges are so short, their positions so isolated and the areas affected so small, that we have little or no exact knowledge concerning them, though. their disastrous results are well known. They do not directly affect the question of supply, but may very seriously affect the works from which, that supply

is given.

Where in this article the term " evaporation " is used alone, it is to be understood to include absorption by vegetation. Of the total quantity of rainfall a very variable pro- Ev aaora- portion is rapidly absorbed or re-evaporated. Thus u oa and in the western mountain districts of Great Britain, absorp largely composed of nearly impermeable rocks more tlon ' or less covered with pasture and moorland, the water evaporated and absorbed by vegetation is from 13 to 15 in. out of a rainfall of 80 in., or from 16 to 19%, and is nearly constant down to about 60 in., where the proportion of loss is therefore from 22 to 25%. The Severn down to Worcester, draining 1,256,000 acres of generally flatter land largely of the same lithological character, gave in the dry season from the 1st of July 1887 to the 30th of June 1888 a loss of 17-93 hi. upon a rainfall of 27-34 in. or about 66%; while in the wet season, 1st of July 1882 to the 30th of Jurie 1883, the loss was 21-09 in. upon a rainfall of 43-26 in., or only 49%- Upon the Thames basin down to Teddington, having an. area of 2,353,000 acres, the loss in the dry season from the 1st of July 1890 to the 30th of June 1891 was 17*22 in. out of a rainfall of 21*62 in., or 79%; while in the wet season, 1st of July 1888 to the 30th of June 1889, it was 18-96 out of 29-22 in., or only 65%. In the eastern counties the rainfall is lower and the evaporation approximately the same as upon the Thames area, so that the percentage of loss is greater. But these are merely broad examples and averages of many still greater variations over smaller areas. They show generally that, as the rainfall increases on any given area evapora- tion increases, but not in the same proportion. Again, the loss from a given rainfall depends greatly upon the previous season. An inch falling in a single day on a saturated mountain area will nearly all reach the rivers, but if it falls during a drought seven-eighths may be lost so far as the period of the drought*

is concerned. In such a case most of the water is absorbed by the few upper inches of soil, only to be re-evaporated during the next few days, and the small proportion which sinks into the ground probably issues in springs many months later. Thus the actual yield of rainfall to the streams depends largely upon the mode of its time-distribution, and without a knowledge of this it is impossible to anticipate the yield of a particular rainfall. In estimating the evaporation to be deducted from the rainfall for the purpose of determining the flow into a reservoir, it is important to bear in mind that

the loss from a constant water surface is nearly one and a half times as great as from the intermittently saturated land surface. Even neglecting the isolated and local discharges due to excessive and generally unrecorded rainfall, the variation in the discharge of all streams, and especially of mountain streams, is very great. We have seen that the average flow from mountain areas in Great Britain towards the end of a dry season does not exceed one-fifth of a cubic foot per second per 1000 acres. Adopting this general minimum as the unit, we find that the flow from such areas up to about 5000 acres, whose mean annual rainfall exceeds 50 in., may be expected occasionally to reach 300 cub. ft., or 1500 such units; while from similar areas of 20,000 or 30,000 acres with the same mean rainfall the discharge sometimes reaches 1 200 or 1300 such units. It is well to compare these results with those obtained from much larger areas but with lower mean rainfall. The Thames at Teddington has been continuously gauged by the Thames Conservators since 18S3, and the Severn at Worcester by the writer, on behalf of the corporation of Liverpool, during the 10 years 1881 to 1890 inclusive. The highest flood, common to the two periods, was that which occurred in the middle of February 1883. On that occasion the Thames records gave a discharge of 7-6 cub. ft. per second per 1000 acres, and the Severn records a discharge of 8-6 cub. ft. per second per 1000 acres, or 38 and 43 respectively of the above units; while in February 1881, before the Thames gaugings were commenced, the Severn had risen to 47 of such units, and subsequently in May 1886 rose to 50 such units, though the Thames about the same time only rose to 13. But in November 1894 the Thames rose to about 80 such units, and old records on the Severn bridges show that that river must on many occasions have risen to considerably over 100 units. In both these cases the natural maximum discharge is somewhat diminished by the storage produced by artificial canalization of the rivers.

These illustrations of the enormous variability of discharge serve to explain what is popularly so little understood, namely,

the advantage which riparian owners, or other persons MUorf”” mter ssted in a given stream, may derive from works water. constructed primarily for the purpose of diverting

the water of that stream — it may be to a totally different watershed — for the purposes of a town supply. Under modern legislation no such abstraction of water is usually allowed, even if limited to times of flood, except on condition of an augmentation of the natural dry-weather flow, and this condition at once involves the construction of a reservoir. The water supplied to the stream from such a reservoir is known as ” compensation water,” and is generally a first charge upon the works. This water is usually given as a continuous and uniform flow, but in special

cases, for the convenience of mill- owners, as an intermittent one. 1 In the manufacturing districts of Lancashire and Yorkshire it generally amounts to one-third of the whole so-called " available supply." In Wales it is usually about one-fourth, and elsewhere still less; but in any case it amounts to many times the above unit of one-fifth of a cubic foot per second per 1000 acres. Thus the benefit to the fisheries and to the riparian owners generally is beyond all question; but the cost to the water authority of conferring that benefit is also very great — commonly (according to the proportion of the natural flow intended to be rendered uniform) 20 to 35% of

1 The volume of compensation water is usually fixed as a given fraction of the so-called " available supply " (which by a convention that has served its purpose well, is understood to be the average flow o(the stream during the three consecutive driest vears).

*the whole expenditure upon the reservoir works. Down to the middle of the 19th century, the proportioning of the size of a reservoir to its work was a very rough operation. YhUot There were few rainfall statistics, little was known stream of the total loss by evaporation, and still less of its w** distribution over the different periods of dry and r " xrya,r – wet weather. Certain general principles have since been laid down, and within the proper limits of their application have proved excellent guides. In conformity with the above-men- tioned convention (by which compensation water is determined as a certain fraction of the average flow during the three driest consecutive years) the available supply or flow from a given area is still understood to be the average annual rainfall during those years, less the corresponding evaporation and absorption by vegetation. But this is evidently only the case when the reservoir impounding the water from such an area is of just sufficient capacity to equalize that flow without possible exhaus- tion in any one of the three summers. If the reservoir were larger it might equalize the flow of the four or more driest consecutive years, which would be somewhat greater than that of the three; if smaller, we might only be able to count upon the average of the flow of the two driest consecutive years, and there are many reservoirs which will not yield continuously the average flow of the stream even in the single driest year. With further experience it has become obvious that very few reservoirs are capable of equalizing the full flow of the three consecutive driest years, and each engineer, in estimating the yield of such reservoirs, has deducted from the quantity ascer- tained on the assumption that they do so, a certain quantity representing, according to his judgment, the overflow which in one or more of such years might be lost from the reservoir. The actual size of the reservoir which would certainly yield the assumed supply throughout the driest periods has therefore been largely a matter of judgment. Empirical rules have grown up assigning to each district, according to its average*

rainfall, a particular number of days' supply, independently of any inflow, as the contents of the reservoir necessary to secure a given yield throughout the driest seasons. But any such generalizations are dangerous and have frequently led to disappointment and sometimes to needless expenditure. The exercise of sound judgment in such matters will always be necessary, but it is nevertheless important to formulate, so far as possible, the conditions upon which that judgment should be based. Thus in order to determine truly the continuously available discharge of any stream, it is necessary to know not only the mean flow of the stream, as represented by the rainfall less the evaporation, but also the least favourable distribution of that flow throughout any year.

The most trying time-distribution of which the author has had experience in the United Kingdom, or which he has been able to discover from a comparison of rainfalls upon nearly impermeable, areas exceeding 1000 acres, is graphically represented by the thick irregular line in the left-hand half of fig. 3, where the total flow for the driest year measures 100 on the vertical percentage scale; the horizontal time scale_ being divided into calendar months.

The diagram applies to ordinary areas suitable for reservoir con- struction and in which the minimum flow of the stream reaches about one-fifth of a cubic foot per second per 1000 acres. Correspondingly, the straight line a a represents uniformly distributed supply, also cumulatively recorded, of the same quantity of water over the same period. But, apart from the diurnal fluctuations of consumption which may be equalized by local " service reservoirs," unSorm distribution of supply throughout twelve months is rarely what we require; and to represent the demand in most towns correctly, we should increase the angle of this line to the horizontal during the summer and t diminish it during the winter months, as indicated by the dotted lines b b. The most notable features of this particular diagram are as follows : Up to the end of 59 days (to the 28th Febru- ary) the rate of flow is shown, by the greater steepness of the thick line, to be greater than the mean for the year, and the surplus water — about 11% of the flow during the year — must be stored; but during the 184 days between this and the end of the 243rd day (31st August) the rate of flow isgenerally below the mean, while from that day to the end of the year it 16 again for the most part above the mean. Now, in order that a reservoir may enable the varying flow, represented cumulatively by the irregular line, to be discharged in a continuous and uniform flow to satisfy a demand represented

cumulatively by the straight line a a, its capacity must be such that it will hold not only the n % surplus of the same year, but that, on June 10th, when this surplus has been used to satisfy the demand, it will still contain the water c d — 19% — stored from a previous year; otherwise between June 10th and August 31st the reservoir will be empty and only the dry weather flow of the stream will be available for supply. In short, if the reservoir is to equalize the whole flow of this year, it must have a capacity equal to the greatest deficiency c d of the cumulative flow below the cumulative demand, plus the greatest excess efoi the cumulative flow over the cumulative demand. This capacity is represented by the height of the line a'a' (drawn parallel to a a from the point of maximum surplus /) vertically above the point of greatest deficiency e, and equal, on the vertical scale, to the difference between the height £=48% and gf78% or 30% of the stream-flow during the driest year. A reservoir so proportioned to the stream-flow with a proper addition to avoid drawing off the bottom water, would probably be safe in Great Britain in any year

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Fig. 3.

for a uniform demand equal to the cumulative stream-flow; or, if it failed, that failure would be of very short duration, and would probably only occur once in 5° years.

It may be at first sight objected that a case is assumed In which there is no overflow before the reservoir begins to fall, and therefore no such loss as generally occurs from that cause. This is true, but it is only so because we have made our reservoir large enough to contain in addition to its stock of 19%, at the beginning of the year, all the surplus water that passes during the earlier months in this driest year with its least favourable time-distribution of flow. Experience shows, in fact, that if a different distribution of the assumed rainfall occurs, that distribution will not try the reservoir more severely while the hitherto assumed uniform rate of demand is maintained. But, as above stated, the time-distribution of demand is never quite uniform. The particular drought shown on the diagram is the result of an exceptionally early deficiency of rainfall which, in conjunction with the variation of demand shown by the dotted line b b, is the most trying condition. The reservoir begins to fall at the end of February, and continues to do so with few and short exceptions until the end of August, and it so happens that about the end of August this dotted line, b b representing actual cumulative demand, crosses the straight line a a of uniform demand, so that the excess of demand, represented by. the slope from June to September, is balanced by the deficiency of demand, represented by the flatter slope in the first five months, except as regards the small quantity b e near the end of February, which, not having been drawn off duringjanuary and February, must overflow before the end .of February. To avoid this loss the II % is in this case to be increased by the small quantity be determined by examination of the variation of the actual from a constant demand.

After the reservoir begins to fall — in this case at the end of February — no ordinary change in the variation of demand can affect the question, subject of course to the cumulative demand not exceeding the reservoir yield for the; assumed year of minimum rainfall. In assuming a demand at the beginning of the year below the mean, resulting in an overflow equal in this case to b e at the end of February and increasing our reservoir to meet it, we assume also that some additional supply to that reservoir beyond the Ii % of the stream- flow from the driest year can be obtained from the previous year. In relation to this supply from the previous year the most trying assumption is that the rainfall of that year, together with that of the driest year, will be the rainfall of the two driest consecutive years. We have already seen that while the rainfall of the driest of 50 years is about 63% of the mean, that of the driest two consecutive years is about 75% of the mean. It follows, therefore, that the year immediately preceding the driest cannot have a rainfall less than about 87% of the mean., As the loss by evaporation is a deduction ■ lying between a constant figure and a direct proportional to the rainfall, we should err on the safe side in assuming the flow in the second driest year to be increased proportionally to the rainfall, or by the difference between 63 and 87 equal to 24% of the mean of 50 years. This 24 % of the 50 years' mean flow is 38% of the driest year's flow in fig. 3, and is therefore much more than sufficient to ensure the reservoir begin- ning the driest year with a stock equal to the greatest deficiency— ˆ19%— of the cumulative flow of that year beyond , the cumulative demand.

But in determining the capacity of reservoirs intended to yield a supply of water equal to the mean flow of two, three or more years, the error, though on the safe side, caused by assuming the evaporation to be pro- portional to" the rainfall, is too great to be neglected. The evaporation slightly increases as the rainfall in- creases, but at nothing like so high a rate. Having determined this evaporation for the second driest con- secutive year and deducted it from the rainfall — which, as above stated, cannot be less than 87% of the mean of 50 years — we may, as shown on fig. 3, extend our cumulative diagram of demand and flow into the reservoir from one to two years. .,

The whole diagram shows, by the greater gradient of the unbroken straight lines, the greater demand which can be satisfied by the enlarge- ment of the reservoir to the extent necessary to equalize the flow of the two driest consecutive years. The new capacity is either c hot c' h', whichever, in the particular case under investigation, is the greater. In the illustration the c' k' is a little greater, measuring 47!% of the flow of the driest year. In the same way we may group in a single diagram any number of consecutive driest years, and either ascertain the reservoir capacity necessary for a given uniform yield (represented cumulatively by a straight line

corresponding with a'a! , but drawn over all the years instead of one), or conversely, having set up a vertical from the most trying point in the line of cumulative flow (c or c' in fig. 3 — – representing, in percentage of the total annual flow of the driest year, the capacity of reservoir which it may be convenient to provide) we may draw a straight line a'" a'" of uniform yield from the head of that vertical to the previous point of maximum excess of cumulative flow. The line a" a" drawn from zero parallel to the first line, produced to the boundaries of the diagram, will cut the vertical at the end of the first year at the percentage of the driest year's flow which may be safely drawn continuously from the reservoir throughout the two years. It is to be observed that any irregularity in the rate of supply from the reservoir may occur between the critical periods of maximum excess of cumulative flow and maximum deficiency

COLLECTING AREAS]

WATER SUPPLY

39]

JMA6RAM OF RESERVOIR CAPACITY AND YIEl\D :~in furi at/on to flow or stream expressed in terms or ramall

Note. — The figures in the right-hand column at the ends of the curved lines are inches of mean annual rainfall over a period of 50 years.

The co-ordinates to any point upon any curved line give respec- tively the required reservoir capacity and daily yield in gallons per acre of drainage area, corresponding with the mean annual rainfall represented by that curved line.

The curves have been drawn for a, mean annual evaporation of 14 in. For any increased rate of evaporation 1 yi in. are to be sub- tracted from the rainfall for each inch of evaporation above 14 in. For any decreased rate of evaporation i>i in. are to be added to the rainfall for each inch of evaporation below 14 in.

Any excess of evaporation from the water surface and allowance for bottom water are to be added to the storage so found.

The period over which the reservoir equalizes th« flow is shown by the number of years marked on the straight radial lines.

Where the absolute minimum stream flow is known to be greater than the minimum of J cubic footper second per 1000 acres fioSgallona per acre per day) assumed in fchediagram, the capacity of the reservoir as taken from

the diagram may be reduced by the amount correspond- ing to that minimum flow for the particularrainfaU and evaporation.

foupoo 200,000 .roqooo 400.000 soopoo eoo&oo

CAPACITY Or RESERVOIR IN GALLONS PER AORE OF DRAINAGE AREA.

Fig. 4.

of cumulative flow (/ and c respectively, in the one year diagram) which does not increase the aggregate cumulative supply between those points, or cause the line of cumulative supply from the reservoir to cut the line of cumulative flow into it.

From diagrams constructed upon these principles, the general diagram (fig. 4) has been produced. To illustrate its use, assume the case of a mean rainfall of 50 in., figured in the tight-hand column -at the end of a curved line, and of 14 in. of evaporation and absorption by vegetation as stated in the note on the diagram. The ordinate to any point upon this curved line then represents on the left-hand scale the maximum continuous yield per day for each acre of drainage area, from a reservoir whose capacity is equal to the corresponding abscissa. As an example, assume that we can conveniently construct a reservoir to contain, in addition to bottom water not to be used, 200,000 gallons for each acre of the watershed above the point of interception by the proposed dam. We find on the left-hand scale of yield that the height of the ordinate drawn to the 50-inch mean rain- fall curve from 200,000 on the capacity scale, is 1457 gallons per day per acre; and the straight radial line, which cuts the point of inter- section of the curved line and the co-ordinates, tells us that this reservoir will equalize the flow of the two driest consecutive years. Similarly, if we wish to equalize the flow of the three driest con r secutive years we change the co-ordinates to the radial line figured 3, and thus find that the available capacity of the reservoir must be 276,000 gallons per acre, and that in consideration of the additional expense of such a reservoir we shall increase the daily yield to 161 2 gallons per acre. In the same manner it will be found that by means of a reservoir having an available capacity of only 118,000 gallons per aˆre of the watershed, we may with the same rainfall and evapora- tion secure a daily supply of 1085 gallons per acre. In this case the left-hand radial line passes through the point at which the

co- ordinates meet, showing that the reservoir will just equalize the flow of the driest year. Similarly, the yield from any given reservoir, or the capacity required for any yield, corresponding with any mean rainfall from 30 to 100 in., and with the flow over any period, from the driest year to the six or more consecutive driest years, may be determined from the diagram.

It Is instructive to note the ratio of increaseof reservoir capacity and yield respectively for any given rainfall. Thus, assuming a mean rainfall of 60 in. during 50 years, subject to evaporation and absorption equal to 14 in. throughout the dry period under considera- tion, we find from the diagram the following quantities (in gallons per acre of drainage area) and corresponding ratios : —

Net Capacity of Reservoir.

Yield of Reservoir.

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466,000

287-7

12-0

2294

155-5

3-3

6

504,000

3111

8-1

2350

159-3

2-4

On comparing columns 3 and 6 or 4 and 7 it appears that so great is the increase required in the size of a reservoir in relation to its in- creased yield, that only in the most favourable places for reservoir construction, or under the most pressing need, can it be worth while to go beyond the capacity necessary to render uniform the flow of the two or three driest consecutive years.

It must be clearly understood that the diagram 6g. 4 does not relieve the reader from any exercise of judgment, except as regards the net capacity of reservoirs when the necessary data haye been obtained. It is merely a

geometrical determination of the conditions necessarily consequent in England, Scotland and Wales, upon a given mean rainfall over many years, upon evaporation and absorption in

Particular years (both of which he must judge or determine for imself), and upon certain limiting variations of the rainfall, already stated to be the result of numerous records maintained in Great Britain for more than 50 years. It must also be remembered that the total capacity of a reservoir must be greater than its net available capacity, in order that in the driest seasons fish life may be main- tained and no foul water may be drawn off.

Applied to most parts of Ireland and some parts of Great Britain, the diagram will give results rather unduly on the safe side, as the extreme annual variations of rainfall are less than in most parts of Great Britain. Throughout Europe the annual variations follow nearly the same law as in Great Britain, but in some parts the distribution of rainfall in a single year ts often more trving. The droughts are longer, and the ram, when it falls, especially along the

Springs

Mediterranean coast, is often concentrated into shorter periods. .Moreover, it often falls upon sun-heated rocks, thus increasing the evaporation for the time; but gaugings made by the writer in the northern Apennines indicate that this loss is more than compensated by the greater rapidity of the fall and of the consequent now. In such regions, therefore, for reservoirs equalizing the flow of 2 or more years, the capacity necessary does not materially differ from that required in Great Britain. As the tropics are approached, even in mountain districts, the irregularities become greater, and occasion- ally the rainy season is entirely absent for a single year, though the mean rainfall is considerable.

We have hitherto dealt only with the collection and storage of that portion of the rainfall which flows over the surface of nearly impermeable areas. Upon such areas the loss by percolation into the ground, not retrieved in and the form of springs above the point of interception shallow may be neglected, and the only loss to the stream we s ‘ is that already considered of re-evaporation into the air and of absorption by vegetation. But the crust of the earth varies from almost complete impermeability to almost complete permeability. Among the sedimentary rocks we have, for example, in the clay slates of the Silurian formations, rocks no less cracked and fissured than others, but generally quite impermeable by reason of the joints being packed with the very fine clay resulting from the rubbing of slate upon slate in the earth movements to which the cracks arc due. In the New &ed Sandstone, the Greensand and the upper Chalk, we find the opposite

extremes; while the igneous rocks are for the most part only permeable in virtue of the open fissures they contain. Wherever, below the surface, there are pores or open fissures, water derived from rainfall is (except in the rare cases of displace- ment by gas) found at levels above tfce sea determined by the resistance of solids to its passage towards some neighbouring sea, lake or watercourse. Any such level is commonly known as the level of saturation. The positions of springs are deter- mined by permeable depressions in the surface of the ground below the general' level of saturation, and frequently also by the holding up of that level locally by comparatively impermeable strata, sometimes combined with a fault or a synclinal fold of the strata, forming the more permeable portion into an under- ground basin or channel lying within comparatively impermeable boundaries. At the lower lips or at the most permeable parts of these basins or channels such rainfall as does not flow over the surface, or is not evaporated or absorbed by vegetation, and does not, while still below ground reach the level of the sea, issues as springs, and is the cause «>f the continued flow of rivers and streams during prolonged droughts. The average volume in dry weather, of such flow, generally reduced to terms of the fraction of a cubic foot per second, per thousand acres of the contributing area, is commonly known in water engineering as the " dry weather flow " and its volume at the end of the dry season as the " extreme dry weather flow."

Perennial springs of large volume rarely occur in Great Britain at a sufficient height to afford supplies by gravitation; but from the limestones of Italy and many : other parts of the world very considerable volumes issue far above the sea-level, and are thus available, without pumping, for the supply of distant towns. On a small scale, however, springs are fairly distributed over the United Kingdom, for there are no formations, except perhaps blown sand, which do not vary greatly in their resistance to the percolation of water, and therefore tend to produce overflow from underground at some points above the valley levels. But even the rural popula- tions have generally found surface springs insufficiently constant for their use and have adopted the obvious remedy of sinking wells. Hence, throughout the world we find the shallow well still very common in rural districts. The shallow well, however, rarely supplies enough water for more than a few houses, and being commonly situated near to those houses the water is often seriously polluted. Deep wells owe their comparative immunity from pollution to the circumstances that the larger quantity of water yielded renders it worth while to pump that water and convey it by pipes from comparatively unpolluted areas; and that any impurities in the water must have passed through a

Deep Wells.

considerable depth, and by far the larger part of them through a great length of filtering material, and must have taken so long a time to reach the well that their organic character has disappeared. The principal water-bearing formations, utilized in Great Britain by means of deep wells, are the Chalk and the New Red Sandstone. The Upper and Middle Chalk are perme- able almost through their mass. They hold water like a sponge, but part with it under pressure to fissures by which they are intersected, and, in the case of the Upper Chalk, to ducts following beds of flints. A well sunk in these formations without striking any fissure or water-bearing flint bed, receives water only at a very slow rate; but if, on the other hand, it strikes one or more of the natural water-ways, the quantity of water capable of being drawn from it will be greatly increased.

It is a notable peculiarity of the Upper and Middle Chalk formations that below their present valleys the underground water passes more freely than elsewhere. This is explained by the fact that the Chalk fissures are almost invariably rounded and enlarged by the erosion of carbonic acid carried from the surface by the water passing through them. These fissures take the place of the streams in an impermeable area, and those beneath the valleys must obviously be called upon to discharge more water from the surface, and thus be brought in contact with more carbonic acid, than similar fissures elsewhere. Hence the best position for a well in the Chalk is generally that over which, if the strata were impermeable, the largest quantity of surface water would flow. The Lower Chalk formation is for the most part impermeable, though it contains many ruptures and dislocations or smashes, in the interstices of which large bodies of water, received from the Upper and Middle Chalk, may be naturally stored, or which may merely form passages for water derived from the Upper Chalk. Thus despite the impermeability of its mass large springs are occasionally found to issue from the Lower Chalk. A striking example is that known as Lydden Spout, under Abbot's Cliff, near Dover. In practice it is usual in chalk formations to imitate artificially the action of such underground watercourses, by driving from the well small tunnels, or " adits " as they are called, below the water-level, to intercept fissures and water-bearing beds, and thus to extend the collecting area.

Next in importance to the Chalk formations as a source of underground water supply comes the Trias or New Red Sand- stone, consisting in Great Britain of two main divisions, the Keuper above and the Bunter below.

With the exception of the Red Marls forming the upper part of the Keuper, most of the New Red Sandstone is permeable, and some parts contain, when saturated, even more water than solid chalk; but, just as in the case of the chalk, a well or borehole in the sandstone yields very little water unless it strikes a fissure; hence, in New Red Sandstone, also, it is a common thing to form underground chambers or adits in search of additional fissures, and sometimes to sink many vertical boreholes with the same object in view.

As the formation approaches the condition of pure sand, the water-bearing property of any given mass increases, but the difficulty of drawing water from it without admixture sand ”” ° san< * a ' so mcreascs ' I" sa nd below water there are, of course, no open fissures, and even if adits could be usefully employed, the cost of constructing and lining them through the loose sand would be prohibitive. The well itself must be lined; and its yield is therefore confined to such water as can be drawn through the sides or the bottom of the lining without setting up a sufficient velocity to cause any sand to flow with the water. Hence it arises that, in sand formations, only shallow wells or small boreholes are commonly found. Imagine for a moment that the sand grains were by any means rendered immobile without change in the permeability of their interspaces; we could then dispense with the iron or brickwork lining of the well ; but as there would still be no cracks or fissures to extend the area of percolating water expospd to the open well, the yield would be very small. Obviously, it must be very much smaller when the lining necessary to hold up loose sand is used. Uncemented brickwork, or perforated ironwork, are*

the usual materials employed for lining the well and holding up the sand, and the quantity of water drawn is kept , below the comparatively small quantity necessary to produce a velocity, through the joints or orifices, capable of disturbing the sand. The rate of increase of velocity towards any isolated aperture through which water passes into the side of a well sunk in a deep bed of sand is, in the neighbourhood of that aperture, inversely proportional to the square of the distance therefrom. Thus, the velocity across a little hemisphere of sand only J in. radius covering a i-in. orifice in the lining is more than iooo times the mean velocity of the same water approaching the orifice radially when 16 in. therefrom. This illustration gives some idea of the enormous increase of yield of such a well, if, by any means, we can get rid of the frictional sand, even from “‘a’ within the 16 in. radius. We cannot do this, but y/e/rf, happily the grains in a sand formation differ very widely in diameter, and if, from the interstices between the larger grains in the neighbourhood of an orifice, we can remove the finer grains, the resistance to flow of water is at once enormously reduced. This was for the first time successfully done in a well, constructed by the Biggleswade Water Board in 1902, and now supplying

water over a large area of North Bedfordshire. This well, 10 ft. diameter, was sunk through about no ft. of surface soil, glacial drift and impermeable gault clay and thence passed for a further depth of 70 ft. into the Lower Greensand formation, the outcrop of which, emerging on the south-eastern shore of the Wash, passes south-westwards, and in Bedfordshire attains a thickness exceeding 250 ft. The formation is probably more or less permeable throughout; it consists largely of loose sand and takes the general south-easterly dip of British strata. The Biggleswade well was sunk by processes better known in connexion with the sinking of mine shafts and foundations of bridges across the deep sands or gravels of bays, estuaries and great rivers. Its full capacity has not been ascertained; it much exceeds the present pumping power, and is probably greater than that of any other single well unassisted by adits or boreholes. This result is mainly due to the reduction of frictional resistance to the passage of water through the sand in the immediate neighbourhood of the well, by washing out the finer particles of sand and leaving only the coarser particles. For this purpose the lower 45 ft. of the cast-iron cylinders forming the well was provided with about 660 small orifices lined with gun-metal tubes or rings, each armed with numerous thicknesses of copper wire gauze, and temporarily closed with screwed plugs. On the removal of any plug, this wire gauze prevented the sand from flowing with the water into the well; but while the finer particles of sand remained in the neighbourhood of the orifice, the flow of water -through the contracted area was very small. To remove this obstruction the water was pumped out while the plugs kept the orifices closed. A flexible pipe, brought down from a steam boiler above, was then connected with any opened orifice. This pipe was provided, close to the orifice, with a three-way cock, by means of which the steam might be first discharged into the sand, and the current between the cock and the well then suddenly reversed and diverted into the well. The effect of thus alternately forcing high-pressure steam among the sand, and of discharging high-pressure water contained in the sand into the well, is to break up any cohesion of the sand, and to allow all the finer particles in the neighbourhood of the orifice to rush out with the water through the wire gauze into the well. This process, in effect, leaves each orifice surrounded by a hemisphere of coarse sand across which the water flows with comparative freedom from a larger hemisphere where the corresponding velocity is very slow, and where the presence of finer and more obstructive particles is therefore unimportant. Many orifices through which water at first only dribbled were thus caused to discharge water with great force, and entirely free frem sand, against the opposite side of the well, while the general result was to increase the inflow of water many times, and to entirely prevent the intrusion of sand. Where, however, a firm rock of any kind is encountered, the yield of a well (under a given head of water) can only be increased by enlargement*

of the main well in depth or diameter, or by boreholes or adits. No rule as-to the adoption of any one of these courses can be laid down, nor is it possible, without examination of each particular case, to decide whether it is better to. attempt to increase the yield of the well or to construct an additional well some distance away. By lowering the head of water in any well which draws its supply from porous rock, the yield is always temporarily increased. Every well has its own particular level of water while steady pumping at a given rate is going on, and if that level is lowered by harder pumping, it may take months, or even years, for the water in the interstices of the rock to accommodate itself to the new conditions; but the permanent yield after such lowering will always be less than the quantity capable of being pumped shortly after the change. We have hitherto supposed the pumps for drawing the water to have been placed in the well at such a level as to be accessible, while the

suction pipe only is below water. Pumps, however, A°reh S / fl ma ˆ ˆ e (an d have been) placed deep down in boreholes,

so that water may be pumped from much greater depths. By this means the head of pressure in the boreholes tending to hold the water back in the rock is reduced, and the supply consequently increased; but when the cost of main- tenance is included, the increased supply from the adoption of this method rarely justifies expectations. When the water has been drawn down by pumping to a lower level its passage through the sandstone or chalk in the neighbourhood of the borehole is further resisted by the smaller length of borehole below the water; and there are many instances in which repeated lowering and increased pumping, both from wells and boreholes, have had the result of reducing the water available, after a few years, nearly to the original quantity. One other method — the

use of the so-called ” air-lift ” — should be mentioned.

This ingenious device originated in America. The object attained by the air-lift is precisely the same as that attained by putting a pump some distance down a borehole; but instead of the head being reduced by means of the pump, it is reduced by mixing the water with air. A pipe is passed down the borehole to the desired depth, and connected with air-compressors at the surface. The compressors being set to work, the air is caused to issue from the lower end of the pipe and to mix in fine bubbles with the rising column

of water, sometimes several hundred feet in height. The weight of the column of water, or rather of water and air mixed, is thus greatly reduced. The method will therefore always increase the yield for the time, and it may do so permanently, though to a very much smaller extent than at first; but its economy must always be less than that of direct pumping.

In considering the principles of well supplies it is important to bear the following facts in mind. The crust of the earth, so far as it is permeable and above the sea-level, receives from rainfall its supply of fresh water. That supply, so far as it is not evaporated or absorbed by vegetation, passes away by the streams or rivers, or sinks into the ground. If the strata were uniformly porous the water would lie in the rock at different depths below the surface according to the previous quantity and distribution of the rainfall. It would slowly, but constantly, percolate downwards and towards the sea, and would ooze out at or below the sea-level, rarely regaining the earth's surface earlier except in deep valleys. Precisely the same thing happens in the actual crust of the earth, except that, in the formations usually met with, the strata are so irregularly permeable that no such uniform percolation occurs, and most of the water, instead of oozing out near the sea-level, meets with obstructions which cause it to issue, sometimes below the sea-level and sometimes above it, in the form of concentrated springs. After prolonged and heavy rainfall the upper boundary of the sub-soil water is, except in high ground, nearly coincident with the surface. After prolonged droughts it still retains more or less the same figure as the surface, but at lower depths and always with less pronounced differences of level.

Sedimentary rocks, formed below the sea or salt lagoons, must originally have contained salt water in their interstices.

*On the upheaval of such rocks above the sea-level, fresh water from rainfall began to flow over their exposed surfaces, and, so far as the strata were permeable, to lie in their saline interstices upon the salt water. The weight of the water original salt water above the sea-level f and of the fresh below water so superimposed upon it, caused an overflow * nw " 1 towards the sea. A hill, as it were, of fresh water rested in the interstices of the rock upon the salt water, and continuing to press downwards, forced out the salt water even below the level of the sea. Subject to the rock being porous this process would be continued until the greater column of the lighter fresh water balanced the smaller head of sea water. It would conceivably take but a small fraction of the period that has in most cases elapsed since such upheavals occurred for the salt water to be thus displaced by fresh water, and for the condition to be attained as regards saturation with fresh water, in which with few exceptions we now find the porous portions of the earth's crust wherever the rainfall exceeds the evaporation. There are cases,*

however, as in the valley of the Jordan, where the ground is actually below the sea-level, and where, as the total evaporation is equal to or exceeds the rainfall, the lake surfaces also are below the sea-level. Thus, if there is any percolation between the Mediterranean and the Dead Sea, it must be towards the latter. There are cases also where sedimentary rocks, formed below the sea or salt lagoons, are almost impermeable: thus the salt deposited in parts of the Upper Keuper of the New Red Sandstone, is protected by the red marls of the formation, and has never been washed out. It is now worked as an im- portant industry in Cheshire.

Perhaps the most instructive cases of nearly uniform percola- tion in nature are those which occur in some islands or peninsulas formed wholly of sea sand. Here water is maintained above the sea-level by the annual rainfall, and may be drawn off by wells or borings. Cm such an island, in the centre of which a borehole is put down, brackish water may be reached far below the sea-level; the salt wafer forming a saucer, as it were, in which the fresh water lies. Such a salt- water saucer of fresh water is maintained full to overflowing by the rainfall, and owing to the frictional resistance of the sand and to capillary action and the fact that a given column of fresh water is balanced by a shorter column of sea water, the fresh water never sinks to the mean sea-level unless artificially abstracted.

Although such uniformly permeable sand is rarely met with in great masses, it is useful to consider in greater detail so simple a case. Let the irregular thick line in fig, 5 be the section of a circular island a mile and a quarter in diameter, of uniformly permeable sand-

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Girted cfGn*ai&*

Wells in sand.

*{Xdtr mtd> 1**rj>ermeafl*Vftrtdu*-*

Fig. 5.

The mean sea-level is shown by the horizontal line aa, dotted where it passes through the land, and the natural mean level of saturation bb, above the sea-level, by a curved dot and dash line. The water, contained in the interstices of the sand above the mean sea-level, would (except in so far as a film, coating the sand particles, is held up by capillary attraction) gradually sink to the sea-level if there were no rainfall. The resistance to its passage through the sand is, how- ever, sufficiently great to prevent this from occurring while percola- tion of annual rainfall takes place.

Hence we may suppose that a condition has been attained in which the denser salt water below and around the saucer CC (greatly exaggerated in vertical scale) balances the less dense, but deeper

fresh water within it. Next suppose a well to be sunk in the middle of the island, and a certain quantity of water to be drawn therefrom daily. For small supplies such a well may be perfectly successful; but however small the quantity drawn, it must obviously have the effect of diminishing the volume of fresh water, which contributes to the maintenance of the level of saturation above the sea-level; and with further pumping the fresh water would be so far drawn upon that the mean level of saturation would sink, first to a curved figure — a cone of depression — such as that represented by the new level of saturation dd, and later to the figure represented by the lines ee, in which the level of saturation has everywhere been drawn below the mean sea-level. Before this stage the converse process begins, the reduced column of fresh water is no longer capable of balancing the sea water in the sand, inflow occurs at c and e, resulting finally in the well water becoming saline. The figure, in this case of uniform percolation, assumed by the water in the neighbourhood of a deep well is a surface of revolution, and, however irregular the percolation and the consequent shape of the figure, it is commonly, but somewhat incorrectly, called the" cone of depression. " It cannot have straight, or approximately straight, sides in any vertical plane, but in nature is an exceedingly irregular figure drawn about curves — not unlike those in fig. 5. In this case, as in that of a level plane of uniformly porous sand, the vertical section of the figure is tangential to the vertical well and to the natural level of the subsoil water.

The importance of this illustration is to be found elsewhere than in islands, or peninsulas, or in uniformly porous sand. Where the strata are not uniformly porous, they may resist the passage of water from the direction of the sea or they may assist it; and round the whole coast of England, in the Magnesian limestone to the north- east, in the Chalk and Greensand to the east and south, and in the New Red Sandstone to the west, the number of wells which have been abandoned as sources of potable supply, owing to the percola- tion of sea water, is very great. Perhaps the first important cases occurred in the earlier part of the igth century on the Lancashire shore of the Mersey estuary, where, one after another, deep wells in the New Red Sandstone had to be abandoned for most purposes. On the opposite side, in the Cheshire peninsula, the total quantity of water drawn

has been much less, but even here serious warnings have been received. In 1895 the single well then supplying Eastbourne was almost suddenly rendered unfit for use, and few years pass without some similar occurrence of a more or less serious kind. The remarkable suddenness with which such changes are brought about is not to be wondered at when the true cause is considered. The action of sandstone in filtering salt waters was investigated in 1878 by Dr Isaac Roberts, F.R.S., who showed that when salt water was allowed to percolate blocks of sandstone, the effluent was at first nearly fresh, the salt being filtered out and crystallized for the most part near the surface of ingress to the sandstone. As the process continued the salt-saturated layer, incapable of further effective filtration, grew in thickness downwards, until in the process of time it filled the whole mass of sandstone. But before this was accom- plished the filtration of the effluent became defective, and brackish water was received, which rapidly increased nearly to the saltness of the inflow. Into such blocks, charged with salt crystals and thoroughly dried, fresh water was then passed, and precisely the converse process took place. A thickness of only 12 in. of Bunter sandstone proved at first to be capable of removing more than 80% of the chlorides from sea water; but, after the slow passage of only o-6 gallon through 1 cub. ft. of stone, the proportion removed fell to 851 . The general lesson to be learned from these facts is, that if the purity of the water of any well not far removed from the sea is to be maintained, that water must not be pumped down much below the sea-level. In short, the quantity of water drawn must in no case be allowed to exceed the quantity capable of being supplied to the well through the medium of the surrounding soil and rock, by rain falling upon the surface of the land. If it exceeds this, the stock of fresh water held in the inter- stices of the rock, and capable of flowing towards the well, must disappear and the deficit between the supply and – , , u “: demand can only be made up by water filtering from the sea %ˆ£:>iˆ-;;v:*

and reaching the well at first quite free from salt, but sooner ” ”

or later in a condition unfit for use.

Dams Any well-made earthen embankment of moderate

height, and of such thickness and uniformity of con- struction as to ensure freedom from excessive dims” percolation at any point, will in the course of time become almost impermeable to surface water standing against it; and when permeable locks are covered with many feet of soil, the leakage through such soil from standing water newly placed above it generally diminishes rapidly, and in process of time often ceases entirely. Even the beds of sluggish rivers flowing over porous strata generally become so impermeable that excavations made in their neighbour- hood, though freely*

collecting the subsoil water, receive no

river water whatever. Thus natural or artificial surfaces which are completely permeable to rainfall may become almost impermeable when protected by surface water from drought and frost, and from earth-worms, vegetation and artificial disturbance. The cause of this choking of the pores is precisely the same as that described below in the case of sand filters. But in order that the action may be complete the initial resistance to percolation of water at every part of the soil must be such that the motion of the water through it shall be insufficient to disturb the water-borne mineral and organic particles lodged on the surface or in the interstices of the soil. If, therefore, a reservoir so formed survives the first few years without serious leakage, it is not likely, in the absence of artificial disturbance, to succumb owing to leakage at a later period. Hence, as the survival of the fittest, there are many artificial waters, with low dams consisting exclusively of earth— and sometimes very sandy earth — satisfactorily performing their functions with no visible leakage. But it is never advisable to rely upon this action, where, as in the case of a reservoir for water supply, large portions of naturally permeable bottom are liable to be uncovered and exposed to the weather.

The most important dams are those which close the outlets of existing valleys, but a dam may be wholly below ground, and according to the commoner method of construction In Great Britain, wherever sufficiently impermeable t ^^ rising ground is not met with at the intended boundary of a reservoir, a trench is cut along such portion, and carried down to rock, or such other formation as, in the engineer's opinion, forms a sufficiently impermeable sheet beneath the whole surface: to be covered with water. Into this trench so- called " puddled clay," that is, clay rendered plastic by kneading with water, is filled and thoroughly worked with special tools, and trodden in layers. In this manner an underground compartment is formed, the bottom of which is natural, and the sides partly natural and partly artificial, both offering high resistance to the passage of water. Above ground, if the water level is to be higher than the natural boundary, the same puddle walls or cores are carried up to the required level, and are supported as they rise by embankments of earth on either side.

Fig. 6 is a typical section of a low dam of this class, impounding water upon gravel overlying impermeable clay. In such a structure the whole attention as regards water-tightness should be concen- trated upon the puddle wall or core. When, as may happen in dry seasons, the puddle wall remains long above the water level, it parts with moisture and contracts. It is essential that this contraction shall not proceed to such an extent as may possibly produce cracking. Drying is retarded, and the contraction due to a given degree of drying is greatly reduced, by the presence of sand and small

stones among the clay. Nearly all clays, notably those from the Glacial deposits, naturally contain sand and stones, 40 to 50% by weight of which is not too much if uniformly distributed and if the clay is otherwise good. But in the lower parts of the trench, where the Orerftotr let-el

Fig. 6. — Section of Typical Low Earth Embankment in Flat Plain.

clay can never become dry, plasticity and ductility are, for reasons to be explained below, the first consideration, and there the pro- portion of grit should be lower. The resistance of clay to percolation by water depends chiefly upon the density of the clay, while that density is rapidly reduced if the clay is permitted to absorb water. Thus, if dry clay is prevented from expanding, and one side be sub- jected to water pressure while the other side is held up by a com- pletely porous medium, the percolation will be exceedingly small; but if the pressure preventing the expansion is reduced the clay will swell, and the percolation will increase. On the restoration of the pressure, the density will be again increased by the reduction of the

water-filled interstices, and the percolation will be correspondingly checked. Hence the extreme importance in high dams with clay cores of loading the clay well for some time before water pressure is brought against it. If this is done, the largest possible quantity of clay will be slowly but surely forced into any space, and, being pre- vented from expanding, it will be unable subsequently to absorb more water. The percolation will then be very small, and the risk of disintegration will be reduced to a minimum. The embankments on either side of the puddle wall are merely to support the puddle and to keep it moist above the ground level when the reservoir is low. They may be quite per- meable, but to prevent undue settlement and distortion they must, like the puddle, be well consolidated. In order to prevent a tendency to slip, due to sudden and partial changes of satura- tion, the outer embankment should always be permeable, and well drained at the base except close to the puddle. The less permeable materials should be confined to the inner parts of the embankments; this is especially important in the case of the inner embankment in order that, when the water level falls, they may remain moist without becoming liable to slip. The inner slope should be protected from the action of waves by so-called " hand-pitching," consisting of roughly- squared stonework, bedded upon a layer of broken stone to prevent local disturbance of the embankment by action of the water between the joints of the larger stones.

In mountain valleys, rock or shale, commonly the most impermeable materials met with in such positions, are sometimes not reached till considerable depths are attained. There are several cases in Great Britain where it has been neces- sary to carry down the puddle trench to about 200 ft. below the surface of the ground vertically above those parts. The highest dams of this class in the British islands impound water to a level of about no ft. above the bottom of the valley. Such great works have generally been well con- structed, and there are many which after fifty years of use are perfectly sound and water-tight, and afford no evidence of deterioration. On the other hand, the partial or total failure of smaller dams of this description, to retain the reservoir water, has been much more common in the past than is generally supposed. Throughout Great Britain there are still many reservoirs, with earthen dams, which cannot safely be filled ; and others which, after remaining for years in this condition, have been repaired. From such cases and their successful repair valuable experience of the causes of failure may be derived.

Most of these causes are perfectly well under- stood by experienced engineers, but instances of

the sand. Thus the permeable vein grows vertically rather than horizontally, and ultimately assumes the form of a thin vertical sheet traversing the puddle wall, often diagonally in plan, and having a thickness which has varied in different cases from a few inches to a couple of feet or more, of almost clean sand rising to an observed height of 30 or 40 ft,, and only arrested in its upward growth by the necessary lowering of the reservoir water to avoid serious danger. The settlement of the plastic clay above the eroded portion soon produces a surface depression at the top of the embankment over or

TOP BANK LEVEL

PUP PLED

Fig. 8.-

Brosioa by leakage.

malconstruction of recent date are still met with., A few such cases will now be mentioned. The base of a puddle trench is often found to have been placed upon rock, perfectly sound in itself, but having joints which are not impermeable. The loss of water by leakage through such joints or fissures below the puddle wall may or may not be a serious matter in itself; but if at any point there is sufficient movement of water across the base of the trench to produce the slightest erosion of the clay above it, that movement

almost in- variably increases. The finer particles of clay in the line of the joint are washed away, while the sandy particles, which nearly all natural clays contain, remain behind and form a constantly ˆdeepening porous vein of sand crossing the base of the puddle. Percolation

Earth Embankment, with stone toe and concrete trench.

through this sand is thus added to the original leakage. Having passed through the puddle core the leaking water sometimes rises to the surface of the ground, producing a visibly turbid spring. As erosion proceeds, the contraction of the space from which the clay is washed continues, chiefly by the sinking down of the clay above

■*Leakage due to improperly formed discharge culvert through puddle wall of reservoir.*

nearly over the leakage, and thus sometimes gives the first warning of impending danger. It is not always possible to prevent any leakage whatever through the strata below the bottom or beyond the ends of the trench, but it is always possible to render such leakage entirely harmless to the work above it, and to carry the water by relief-pipes to visible points at the lower toe of the dam. Wherever the base of a puddle wall cannot be worked into a continuous bed of clay or shale, or tied into a groove cut in sound rock free from water-bearing fissures, the safest course is to base it on an artificial material at once impermeable and incapable of erosion, interposed between the rock and the puddled clay. Water-tight concrete is a suitable material for the purpose; it need not be made so thick as the puddle core, and is therefore sometimes used with considerable advantage in lieu of the puddle for the whole depth below ground. In fig. 7 a case is shown to be so treated. Obviously, the junction between the puddle and the concrete might

nave been made at any lower level.

However well the work may be done, the lower part of a mass of puddled clay invariably settles into a denser mass when weighted with the clay u aetfum i above. If, therelore, one part is held up, se tfj emeot „ by unyielding rock for example, while an adjoining part has no support but the clay beneath it, a fracture — not unlike a geological fault — must result. Fig. 8 is a part longitudinal section through the puddle wall of an earthen embankment. The puddle wall is crossed by a pedestal of concrete carrying the brick discharge culvert. The puddle at a was originally held up by the flat head of this pedestal; not so the puddle at b, which under the superin- weight settled down and produced the fault be.

cumbent t ..„_ ……. _ ,

accompanied with a shearing or tangential strain or, less probably, with actual fracture in the direction bd. Serious leakage at once began between c and b and washed out the clay, particle by particle, but did not wash out the sand associated with it, which remained

behind in the crevice. The clay roof, rather than the walls of this crevice of sand, gave way and pressed down to fill the vacancy, and the leakage worked up along the weakened plane of tangential strain bd. On the appearance of serious leakage the overflow level of the water originally at ef was lowered for safety to gh; and for many years the reservoir was worked with its general level much below gh. The sand-filled vein, several inches in width, was found, on taking out the puddle, to have terminated near the highest level to which the water was allowed to rise, but not to have worked downwards. There can be little doubt that the puddle at the right-hand angle j was also strained, but not to the point of rupture, as owing to the rise of the sandstone base there was comparatively little room for settlement on that side. In repairing this work the perfectly safe

form shown by the dotted lines ka, kj was substituted for the flat surface aj, and this alone, if originally adopted, would have pre- vented dangerous shearing strains. As an additional precaution, however, deep tongues of concrete like those in fig, 7 were built in the rock throughout the length of the trench, and carried up the sides and over the top of the ped- estal. The

puddle was ,, – , • t, , . 1 then replaced, and remains

fciG. 9.— Overhanging Rock Leakage. se nsibly watertight. The lesson taught by fig. 8 applies also to the ends of puddle walls where they abut against steep faces of rock. Unless such faces are bo far below the surface of the puddle, and so related to the lower parts of the trench, that no tension, and consequent tendency to separation of the puddle from the rock, can possibly take place, and unless abundant time is given, before the reservoir is charged, for the settlement and compression of the puddle to be completed, leakage with disastrous results may occur. In other cases leakage and failure have arisen from allowing a part of the rock bottom or end of a puddle trench to overhang, as m fig. 9. Here the straining of the original horizontal puddle in settling down is indicated in a purposely exaggerated way by the curved lines. There is considerable distortion of the clay, resulting from combined shearing and tensile stress, above each of the steps of rock, and reaching its maximum at and above the highest rise ab, where it has proved sufficient to produce a dangerous line of weakness ac, the tension at a either causing actual rupture, or such increased porosity as to permit of percolation capable of keeping open the wound. In such cases as arc shown in figs. 8 and 9 the growth of the sand vein is not vertical, but inclined towards the plane of maximum shearing strain. Fig. 9 also illustrates a weak place at b where the clay either never pressed hard against the overhanging rock or has actually drawn away therefrom in the process of settling towards the lower part to the left. When it is considered that a parting of the clay, sufficient to allow the thinnest film of water to pass, may start the formation of a vein of porous sand in the manner above explained, it will be readily seen how great must be the attention to details, in unpleasant places below ground, and below the water level of the surrounding area, if safety is to be secured. In cases like fig. 9 the rock should always be cut away to a slope, such as that shown in fig. 10.

If no considerable difference of water-pressure had been allowed between the two sides of the puddle trench in figs. S or 9 until the clay

ˆ had ceased to settle down,

it is probable that the interstices, at first formed between the puddle and the concrete or rock, would have been suffici- ently filled to prevent in- jurious percolation at any future time. Hence it is always a safe precaution to afford plenty of time for such settlement before Proper Figure for Rock Slope. a reservoir is charged with water. But to all such precautions should be added the use of concrete or brickwork tongues running longitudinally at the bottom of the trench, such as those shown at a higher level in fig. 7.

In addition to

ˆ rmJL the progress of the work a stream of water is allowed to

flow across it, fine clay is sometimes washed away, and the gravel or sand associated with it left to a sufficient extent to permit of future percolation. Unless such places are carefully dug out or re-puddled before the work of filling is resumed, the percolation may increase along the vertical plane where it is greatest, by the erosion

Fig.

and falling in of the clay roof, as in the other cases cited. Two instances probably originating in some such cause are shown in fig. 1 1 in the relative positions in which they were found, and carefully measured, as the puddle was removed from a crippled reservoir dam. These fissures are in vertical planes stretching entirely across the puddle trench, and reaching in one case, aa, nearly to the highest level at which the reservoir had been worked for seventeen years after the leakage had been discovered. The larger and older of these veins was 44ˆ ft. high, of which 14 ft. was above the original ground level, and it is interesting to note that this portion, owing probably to easier access for the water from the reservoir and reduced com- pression of the puddle, was much wider than below. The little vein to the left marked bb, about 3! ft. deep, is curious. It looks like the beginning of success of an effort made by a slight percolation during the whole life of the reservoir to increase itself materially by erosion.

*Camay * *\>ay aton a ˆ n ˆˆTˆ}ˆ*

///Y/jW//Qrigin&Uy intended top water level •y//7/

Fig. 1 1 .—Vertical Vein of Leakage.

There is no reason to believe that the initial cause of such a leakage could be developed except during construction, and it is certain that once begun it must increase. Only a knowledge of the great loss of capital that has resulted from abortive reservoir construction justifies this notice of defects which can always be avoided, and are too often the direct result, not of design, but of parsimony in pro- viding during the execution of such works, and especially below ground, a sufficiency of intelligent, experienced and conscientious supervision.

In some cases, as, for example, when a high earthen embankment crosses a gorge, and there is plenty of stone to be had, it is desirable to place the outer bank upon a toe or platform of rubble stonework, as in fig. 7, by which means the height of the earthen portion is reduced and complete drainage secured. But here agaiii great care must be exercised in the packing and consolidation of the stones, which will otherwise crack and

settle.

_ As with many other engineering works, the tendency to slipping either of the sides of the valley or of the reservoir embankment "itself has often given trouole, and has sometimes led to serious disaster.

This, however, is a kind of failure not always attributable to want of proper supervision during construction, but rather to improper choice of the site, or treatment of the case, by those primarily responsible.

In countries where good clay or retentive earth cannot be obtained, numerous alternative expedients have been adopted with more or less success. In the mining districts wHh'dln- °f America, for example, where timber is cheap, rough phragma stone embankments have been lined on the water face at wood, w ith timber to form the water-tight septum. In such ^^,' Sc ' a position, even if the timber can be made sufficiently water-tight to begin with, the alternate immersion and exposure to air and sunshine promotes expansion and con- traction, and induces rapid disintegration, leakage and decay. Such an expedient may be justified by the doubtful future of mining centres, but would be out oi the question for permanent water supply. Riveted sheets of steel have been occasionally used, and, where bedded in a sufficient thickness of concrete, with success. At the East Canon Creek dam, Utah, the height of which is about 61 ft. above the stream, the trench below ground was filled with concrete much in the usual way, while above ground the water-tight diaphragm consists of a riveted steel plate varying in thickness from tV in. to A in. This steel septum was protected on either side by a thin wall of asphaltic concrete supported by rubble stone embankments, and owing to irregular settling of the embankments became greatly distorted, apparently, however, without causing leakage. Asphalt, whether a natural product or artificially obtained, as, for example, in some chemical manufactures, is a most useful material if properly employed in connexion with reservoir dams. Under sudden impact it is brittle, and has a concboidal fracture like glass; but under continued pressure it has the properties of a viscous fluid. The rate of flow is largely dependent upon the proportion of bitumen it contains, and is of course retarded by mixing it with sand and stone to form what is commonly called asphalt concrete. But given time, all such compounds, if they contain enough bitumen to render them water-tight, appear to settle down even at ordinary temperatures as heavy viscous fluids, retaining their

fluidity permanently if not exposed to the air. Thus they not only penetrate all cavities in an exceed- ingly intrusive manner, but exert pressures in all directions, which, owing to the density of the asphalt, are more than 40 % greater than would be produced by a corresponding depth of water. From the neglect of these considerations numerous failures have occurred.

Elsewhere, a simple concrete or masonry wall or core has been used above as well as below ground, being carried up between embankments either of earth or rubble stone. This construction has received its highest development in America. On the Titicus, a tributary of the Croton river, an earthen dam was completed in 1895, with a concrete core wall 100 ft. high — almost wholly above the original ground level, which is said to be impermeable; but other dams of the same system, with core walls of less than 100 ft. in height, are apparently in their present condition not impermeable. Reservoir No. 4 of the Boston waterworks, completed in 1885, has a concrete core wall. The embankment is 1800 ft. long and 60 ft. high. The core wall is about 8 ft. thick at the bottom and 4 ft. thick at the top, and in the middle of the valley nearly 100 ft. in height. At irregular intervals of 1 50 f t. or more buttresses 3 ft. wide and 1 ft. thick break the continuity on the water side. That this work has been regarded as successful is shown by the fact that Reservoir No. 6 of the same waterworks was subsequently constructed and completed in 1804 with a similar core wall. There is no serious difficulty in so constructing walls of this kind as to be practically water-tight while they remain unbroken; but owing to the settlement of the earthen embankments and the changing level of saturation they are undoubtedly subject to irregular stresses which cannot be calculated, and under which, speaking generally, plastic materials are much safer. In Great Britain masonry or concrete core walls have been generally confined to positions below ground. Thus placed, no serious strains are caused either

by changes of temperature or of moisture or by movements of the lateral supports, and with proper ingredients and care a very thin wall wholly below ground may be made water- tight.

The next class of dam to be considered is that in which the structure as a whole is so bound together that, with certain reservations, it may be considered as a monolith subject chiefly to the overturning tendency of water- Masonry pressure resisted, by the weight of the structure itself and the supporting pressure of the foundation. Masonry dams are, for the most part, merely retaining walls of exceptional size, in which the overturning pressure is water. If such a dam is sufficiently strong, and is built upon sound and moderately rough rock, it will always be incapable of sliding. Assuming also that it is incapable of crushing under its own weight and the pressure of the water, it must, in order to fail entirely, turn over on its

outer toe, or upon the outer face at some higher level. It may do this in virtue of horizontal water-pressure alone, or of such pressure combined with upward pressure from intrusive water at its base or in any higher horizontal plane. Assume first, however, that there is no uplift from intrusive water. As the pressure of water is nil at the surface and increases in direct proportion to the depth, the overturning moment is as the cube of the depth; and the only figure which has a moment ot resistance due to gravity, varying also as the cube of its depth, is a triangle. The form of stability having the least sectional area is therefore a triangle. It is obvious that the angles at the base of such a hypothetical dam must depend upon the relation between its density and that of the water. It can be shown, for example, that for masonry having a density of 3, water being 1 , the figure of minimum section is a right-angled triangle, with the water against its vertical face; while for a greater density the water face must lean towards the water, and for a less density away from the water, so that the water may lie upon it. For the sections of masonry dams actually used in practice, if designed on the condition that the centre of all vertical pressures when the reservoir is full shall be, as hereafter provided,-at two-thirds the width of the base from the inner toe, the least sectional area for a density of 2 aleo has a vertical water face. As the density of the heaviest rocks is only 3, that of a masonry dam must be below 3, and in practice such works if well constructed vary from 2-2 to 2-6. For these densities, the deviation of the water face from the vertical in the figure of least sectional area is, however, so trifling that, so far as this consideration is concerned, it may be neglected.

If the right-angled triangle abc, fig. 12, be a profile I ft. thick of a monolithic dam, subject to the pressure of water against its vertical side to the full depth a& =

*d in feet, the horizontal _J&£r TeveU P**

pressure of water against the section of the dam, in- creasing uniformly with the

depth, is properly repre- /

sented by the isosceles right-angled triangle_ abe, /

in which be is the maximum ^ / r^p

water-pressure due to the Qrifratfwaalr pressure tr~ full depth d, while the area

oie

is the total hori-

Fig.

zontal pressure against the dam, generally stated in cubic feet of water, acting at one-third its depth above

the base. Then — is the resultant horizontal pressure with an over- turning moment of

-Diagram of Right-Angled Triangle Dam.

6 ‘

(■)

If x be the width of the base, and p the density of the masonry, the weight of the masonry in terms of a cubic foot of water will be j acting at its centre of gravity g, situated at fi from the outer toe, and the moment of resistance to overturning on the outer toe, px’d

3

(3)

DAMS)

WATER SUPPLY

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Equating the moment of resistance (2) to the overturning moment (1), we have

p?d &

3 6

and

m ■ ■ • • • < >

That is to say, for such a monolith to be on the point of overturning under the horizontal pressure due to the full depth of water, its base must be equal to that depth divided by the square root of twice the density of the monolith. For a density of 2-5 the base would there- fore be 44-7 % of the height.

We have now to consider what are the necessary factors of safety, and the modes of their application. In the first place, it is out of Factors of the q uestion to allow the water to rise to the vertex a safetv of such a mas < >nry triangle. A minimum thickness must

be adopted to give substance to the upper part ; and where thˆ dam is not used as a weir it must necessarily rise several feet above the water, and may in either event have to carry a roadway. Moreover, considerable mass is required to reduce the internal strains caused by changes of temperature. In the next place, it is necessary to confine the pressure, at every point of the masonry, to an intensity which will give a sufficient factor of safety against crushing. The upper part of the dam having been designed in the light of these conditions, the whole process of completing the design is simple enough when certain hypotheses have been adopted, though somewhat laborious in its more obvious form. It is clear that the greatest crushing pressure must occur, either, with the reservoir empty, near the lower part of the water face aft,. or with the reservoir full, near the lower part of the outer face oc. The principles hitherto adopted in designing masonry dams, in which'the moment of re- sistance depends upon the figure and weight of the masonry, involve certain assumptions, which, although not quite true, have proved useful and harmless, and are so convenient that they may be con- tinued with due regard to the modifications which recent investiga- tions have suggested. One such assumption is that, if the dam is well built, the intensity of vertical pressure will (neglecting local irregularities) vary nearly uniformly from face to face along any horizontal plane. Thus, to take the simplest case, if dbce (fig. 13) represents a rectangular mass already designed for the superstructure

.j£fe£e£.jflte&.

Centre' of nf&far 'pressure '—4- ˆ*

K<

Fig. 13. — Factor of Safety Diagram.

of the dam, and g its centre of gravity, the centre of pressure upon the base will be vertically under g, that is, at the centre of the base, and the load will be properly represented by the rectangle bfgc, of which the area represents the total load and the uniform depth of its uniform intensity.ˆ At this high part of the structure the intensity of pressure will of course be much less than its permissible intensity. If now we assume the water to have a depth d above the base, the total water pressure represented by the triangle kbh will have its centre at rf/3 from the base, and by the parallelogram of forces, assuming the density of the masonry to be 2-5, we

find that the centre of pressure upon the base be is shifted from the centre of the base to a point i nearer to the outer toe c, and adopting our assumption of uniformly varying intensity of stress, the rectangular diagram of pressures will thus be distorted from the figure bfgc to the figure of equal area bjlc, having its centre vertically under the point at which

. 14. — Diagram showing lines of pressure in Masonry Dam.

the resultant of all the forces cuts the base be. For any lower leve! the same treatment may, step by step, be adopted, until the maxi- mum intensity of pressure cl exceeds the assumed permissible maximum, or the centre of pressure reaches an assigned distance from the outer toe c, when the base must be widened until the maximum intensity of pressure or the centre of pressure, as the case may be, is brought within the prescribed limit. The resultant profile is of the kind shown in fig. 14.

Having thus determined the outer profile under the cpnditions hitherto assumed, it must be similarly ascertained that the water face is everywhere cap- (faffa, able or resisting the ZeveZ vertical pressure of the masonry when the reser- voir is empty, and the base of each compart- ment must be widened if_ necessary in that direction also. Hence in dams above 100 ft. in height, further adjust- ment of the outer profile may be required by reason of the deviation of the inner profile from the vertical. The effect ot this process is to give a series of points in the horizontal planes at which the resultants of all forces above those planes respectively cut the planes. Curved lines, as dotted in fig. 14, drawn through these points give the centre of pressure, for the reservoir full and empty respectively, at any horizontal plane. These general principles were recognized by Messrs Graefr and Delocre of the Ponts et Chaussees, and about the year 1866 were put into practice in the Furens dam near St Etienne. In 1871 the late Professor Rankine, F.R.S., whose remarkable perception of the practical fitness or unfitness of purely theoretical deductions gives his writings exceptional value, received from Major Tulloch, R.E., on behalf of the municipality of Bombay, a request to consider the subject generally, and with special reference to very high dams, such as have since been constructed in India. Rankine pointed out that before the vertical pressure reached the maximum pressure per- missible, the pressure tangential to the slope might do so. Thus conditions of stress are conceivable in which the maximum would be tangential to the slope or nearly so, and would therefore increase the vertical stress in proportion to the cosecant squared of the slope. It is very doubtful whether this pressure is ever reached, but such a limit rather than that of the vertical stress must be considered when the height of a dam demands it. Next, Rankine pointed out that, in a structure exposed to the overturning action of forces which fluctu- ate in amount and direction, there should be no appreciable tension at any point

of the masonry. But there is a still more important reason why this condition should be strictly adhered to as regards the inner face. We have hitherto considered only the horizontal overturning pressure of the water; but if from originally defective construction, or from the absence of vertical pressure due to— weight of masonry towards the water edge of any horizontal bed, as at ab in fig. I4_, water intrudes beneath that part of the masonry more readily than it can obtain egress along be, or in any other direction towards the outer face, we shall have the uplifting and overturning pressure due to the full depth of water in the reservoir over the width ab added to the horizontal pressure, in which case all our previous calculations would be futile. The condition, therefore, that there shall be no tension is important as an element of design; but when we come to construction, we must be careful also that no part of the wall shall be less permeable than the water face. In fig. 13 we have seen that the varying depth of the area bjlc approximately represents the varying distribution of the vertical stress. If, therefore, the centre of that became so far removed to the right as to make.; coincident with b, the diagram of stresses would become the triangle j l'c', and the vertical pressure at the inner face would be nil. This will evidently happen when the centre ef pressure i' is two-thirds from the inner toe b' and one-third from the outer toe c' ; and if we displace the centre of pressure still further to the right, the condition that the centre of figure of the diagram shall be vertically under that centre of pressure can only be fulfilled by allowing the point j' to cross the base toj thus giving a negative pressure or tension at the inner toe. Hence it follows that on the assumption of uniformly varying stress the line of pressures, when the rerervoir is full, should not at any horizontal plane fall outside the middle third of the width of that plane.*

Rankine In his report adopted the prudent course of taking as the safe limits certain pressures to which, at that time, such structures were known to be subject. Thus for the inner face he took, as the limiting vertical pressure, 320 ft. of water, or nearly 9 tons per sq. ft., and for the outer face 250 ft. of water, or about 7 tons per sq. ft.

For simplicity of calculation Rankine chose logarithmic curves for both the inner and outer faces, and they fit very well with the con- ditions. With one exception, however — the Beetaloo dam in Australia 1 10 ft. high — there are no practical examples of dams with logarithmically curved faces.

After Rankine, a French engineer, Bouvier, gave the ratio of the maximum stress in a dam to the maximum vertical stress as I to the cosine squared of the angle between the vertical and the resultant which, in dams of the usual form, is about as 13 is to 9.

During the last few years attention has been directed to the stresses — including shearing stresses — on planes other than hori- zontal. M. Levy contributed various papers on the subject which will be found in the Comptes rendus de I Academic des Sciences (1895 and 1898) and in the Annates des Fonts et Chaussees (1897). He in- vestigated the problem by means of the general differential equations of static equilibrium for dams of triangular and rectangular form considered as isotropic elastic solids. In one of these papers Levy formulated the requirement

now generally adopted in France that the vertical ■■ .CMH ft fiT fck

pressure at the upstream end of any joint, calcu- "ZZ. ■ated by the law of uniformly varying stress, should not be less than that of the water pressure r~ it the level of that joint in order to prevent in- trusive water getting into the structure. —

These researches were followed by those of Messrs L. W. Atcherley and Karl Pearson, F.R.S., 1

and by an approximate graphical treatment by

Dr W. C. Unwin, F.R.S. 2 Dr Unwin took two horizontal planes, one close above the other, and calculated the vertical stresses on each bv the law of uniformly varying stresses. Then the differ- ence between the normal pressure on a rectangular element in the lower plane and that on the upper — plane is the weight of the element and the differ- ence between the shears on the vertical faces of that element. The weights being known, the principal stresses may be determined. These researches led to a wide discussion of the sufficiency of the law of uniformly varying stress when applied to horizontal joints as a test of the — stability of dams. Professor Karl Pearson showed that the results are dependent upon the assump- tion that the distribution of the vertical stresses on the base of the structure also followed the law of uniformly varying stress. In view of the irregular forms and the uncertainties of the nature of the materials at the foundation, the law of uni- formly varying stress was not applicable to the base of the dam. He stated that it was practic- ally impossible to determine the stresses by purely mathematical means. The late Sir Benjamin Baker, F.R.S., suggested that the stresses might be measured by experiments with elastic models, and among others, experiments were carried out by Messrs Wilson and Gore s with indiarubber models of plane sections of dams (including the foundations) who applied forces to represent the gravity and water pressures in such a manner that the virtual density of the rubber was increased many times without interfering with the proper ratio between gravity and water pressure, and by this means the strains produced were of sufficient magnitude to be easily measured.

The more important of their results are shown graphically in figs. 15 and 16, and prove that the law of uniformly varying stress is generally applicable to the upper two-thirds of a dam, but that at parts in or near the foundations that law is departed from in a way which will be best understood from the diagrams.

Fig. 1 5 shows a section of the model dam. The maximum principal stresses are represented by the directions and thicknesses of the two systems of intersecting lines mutually at right angles.

Tensile stresses (indicated by broken lines on the diagram) are shown at the_ upstream toe notwithstanding that the line of resist- ance is well within the middle third of the section. It is important to notice that the maximum value of the tension at the toe lies in a direction approximately at 45 to the vertical, but at points lower down in the foundation this tension, while less in magnitude, becomes much more horizontal. This feature indicates that in the event of a crack occurring at the upstream toe, its extension would tend to turn downwards and follow a direction nearly parallel with the maximum pressure lines, in which direction it would not materially affect

the stability of the structure.

As a matter of fact, the foundations of most dams are carried down in vertical trenches, the lower part only being in sound materials so that actual separation almost corresponding with the hypothetical

crack is allowed in the first instance with no harmful effects. Similar experiments upon models with rounded toes but otherwise uf the same form showed a considerable reduction in tne magnitude of the tensile stresses.

On examining the diagram it will be observed that the maximum compressive stresses are parallel to and near to the down stream face of the section, which values are approximately equal to the maxi- mum value of the vertical stress determined by the law of uniformly varying stress divided by the cosine squared of the angle between the vertical and the resultant.

The distributions of stress on the base line of the model for " reser- voir empty " and " reservoir full " are shown in fig. 16 by ellipses of stress and by diagrams of stress on vertical and horizontal sections.

Arrow heads at the ends of an axis of an ellipse indicate tension as distinct from compression, and the semi-axes in magnitude and direction represent the principal stresses.

FlG. 15. — Diagrams illustrating results 0} Wilson and Gore's experiments with an India- rubber model dam. Reservoir full.

The two systems of lines mutually at right angles show the directions of the maximum and minimum stiesses respectively. Such stresses are termed principal stresses. Tension is indi- cated by broken lines and compression by full lines.

The shearing stresses are zero along the lines of principal stress and reach a maximum on lines at 45 thereto. The magnitudes of the maximum shearing stresses are indicated hy the algebraic differences of the thicknesses of the lines of principal stress.

Line ab is in 3uch a position that the stresses along and above it are not, materially affected by the more irregular suesses below that line produced by the sudden change in section at the base of the dam. The vertical distance above the line ab of any pobt in the dotted line dc is proportional to the vertical com- ponent of the compressive stress on the line ab assumed to vary uniformly from face to face, and similarly the vertical distance of any point in the 3-dot-and-dish line ae above the line aft is proportional to the vertical component of the stress determined ex- perimentally. The vertical component diagrams abed and abea are drawn to a larger scale

*than *z zZˆTf the lines indicating the principal ! stresses.*

1 On Some Disregarded Points in the Stability of Masonry Dams, DraperV Company Research Memoir (London, 1904.). 3 Engineering (May 12th, 1905). 3 Proceedings of the Institution of Civil Engineers, vol. 172, p.

It is obvious that experiments of the kind referred to cannot take into account all the conditions of the problem met with in actual practice, such as the effect of the rock at the sides of the valley and variations of temperature, &c, but deviations in practice from the conditions which mathematical analyses or experiments assume are nearly always present. Such analyses and experiments are not on that account the less important and useful.

So tar we have only considered water-pressure against the reser- voir side of the dam; but it sometimes happens that the water and earth pressure against the outer face is considerable enough to modify the lower part of the section. In dams of moderate height above ground and considerable depth below ground there is, moreover, no reason why advantage should not be taken of the earth resistance due either to the downstream face of the trench against which the foundations are built, or to the materials excavated and properly embanked against that face above the ground level or to both. We do not always know the least resistance which it is safe to give to a retaining wall subject to the pressure of earth, or conversely, the maximum resistance to side-thrust which natural or embanked earth will afford, because we wisely neglect the important but very variable element of adhesion between the particles. It is notorious among engineers that retaining waits designed in accordance with the well-known theory of conjugate pressures in earth are un- necessarilystrong, and this arises mainly from the assumption that the earth is merely a loose granular mass without any such ad- hesion. As a result of this theory, in the case of a retaining wall supporting a vertical face of earth beneath an extended horizontal plane level with the top of the wall, we get

p_ wx-

-sin tf>

2 l-J-sin tj>'

DAMS]

WATER SUPPLY

RESERVOIR EMPTY RESERVOIR FULL

HORIZONTAL PRESSURE* ON VERTICAL JOINTS

KEEUVSI*

TTTTiiiiiiiiiininmii iniiiiiiiMiiiMiiiimiiinlrnr

SHEARING

• TRE 9ICI

KCCEHvgm

Iiiiinimiiiiii

9MVMVMMHHH

Fig. 16. — Showing Stresses at base of model dam determined experimentally.

where P is the horizontal pressure of the earth against the wall exerted at one-third its height, w the weight of unit volume of the material, x the height of the wall, and 4, the angle of repose of the material. That the pressure so given exceeds the maximum possible pressure we do not doubt ; and, conversely, if we put

p, _ ««£ . ! +sin j> 21— sin we may have equal confidence that P' will be less than the maximum pressure which, if exerted by the wall against the earth, will be borne without disturbance. But like every pure theory the principles of conjugate pressures in earth may lead to danger if not applied with due consideration for the angle of repose of the material, the modi- fications brought about by the limited width of artificial embank- ments, the possible contraction away from the masonry, of clayey materials during dry weather for some feet in depth and the tendency of surface waters to produce scour between the wall and the em- bankment. Both the Neuadd and the Fisher Tarn damsarelargely dependent upon the support of earthen embankments with much economy and with perfectly satisfactory results.

In the construction of the Vyrnwy masonry dam Portland cement concrete was used in the joints. When more than six months old, o in. cubes of this material never failed under compression below in tons per sq. ft. with an average of 167 tons: and the mean resistance of all the blocks tested between two and three years after moulding exceeded 215 tons per sq. ft., while blocks cut from the concrete of the dam gave from 181 to 320 tons per sq. ft. It has been shown that the best hydraulic lime, or volcanic

puzzuolana and lime, if properly ground while slaking, and otherwise treated in the best-known manner, as well as some of the so-called natural (calcareous) cements, will yield results certainly not inferior to those obtained from Portland cement. The only objection that can in any case be urged against most of the natural products is that a longer time is required for induration; but in the case of masonry dams sufficient time necessarily passes before any load, beyond that of the very gradually increasing masonry, is brought upon the structure. The result of using properly treated natural limes is not to be judged from the careless manner in which such

limes have often been used in the past. Any stone cf which it is desirable to build a masonry dam would certainly possess an average strength at least as great as the above figures fcr concrete; the clay slate of the Lower Silurian formation, used in the case of the Vyrnwy dam, had an ultimate crushing strength of from 700 to 1000 tons per sq. ft. If, therefore, with such materials the work is well done, and is not subsequently liable to be wasted or disintegrated by expansion or contraction or other actions which in the process of time affect all exposed surfaces, it is clear that 1 5 to 20 tons per sq. ft, must be a perfectly safe load. There are many structures at present in existence bearing considerably greater loads than this, and the granite ashlar masonry of at least one, the Bear Valley dam in California, is subject to compressive stresses, reaching, when the reservoir is full, at least 40 to 50 tons per sq. ft., while certain brickwork linings in mining shafts are subject to very high circumferential stresses, due to known water-pressures. In one case which has been investigated this circumferential pressure exceeds 26 tons per sq. ft., and the brickwork, which is 18 in. thick and 20 ft. internal diameter, is perfectly sound and water-tight. In portions of the structure liable to important changes of pressure from the rise and-fall of the water and subject to the additional stresses which expansion and contraction by charges of temperature and of moisture induce, and in view of the great difficulty of securing that the average modulus of elasticity in all parts of the structure shall be approximately the same, it is probably desirable to limit the calculated load upon any external work, even of the best kind, to 15 or 20 tons per sq. ft. It is clear that the material upon which any high masonry dam is founded must also have a large factor of safety against crushing under the greatest load that the dam can impose upon it, and this consideration unfits any site for the construction of a masonry dam where sound rock, or at least a material equal in strength to the strongest shale, cannot be had; even in the case of such a material as shale the foundation must be well below the ground.

The actual construction of successful masonry dams has varied from the roughest rubble masonry to ashlar work. It Materials 1S P r0Da °le, however, that, all things considered, random rubble in which the flattest sideˆ of each block of stone is dressed to a fairly uniform surface 3 so that it may be bedded as it were in a tray of mortar, secures the nearest approach to uniform elasticity. Such stones may be of any size subject to each of them covering only a small proportion of the width of the structure (in the Vyrnwy dam they reached 8 or 10 tons each), and the spaces between them, where large enough, must be similarly built in with smaller, but always the largest possible, stones; spaces too small for this treatment must be filled and rammed with concrete. AH stones must be beaten down into their beds until the mortar squeezes up into the joints around them. The faces of the work may be of squared masonry, thoroughly tied into the hearting; but, in view of the expansion and contraction mentioned below, it is better that the face masonry should not be coursed. Generally speaking, in the excavations for the foundations springs are met with; these may be only sufficient to indicate a continuous dampness at certain beds or joints of the rock, but all such places should be connected by relief drains carried to visible points at the back of the dam. It should be impossible, in short, for any part of the rock beneath the dam to become charged with water under pressure, either directly from the water in the reservoir or from higher places in the mdUntain sides. For similar reasons care must be taken to ensure that the structure of the water face of the dam shall be the least permeable of any part. In the best examples this has been secured by bedding the stones near to the water face in somewhat finer mortar than the rest, and sometimes also by placing pads to fill the joints for several inches from the water face, so that the mortar was kept away from the face and was well held up to its work. On the removal of the pads, or the cutting out of the face of the mortar where pads were not used, the vacant joint was gradually filled with almost dry mortar, a hammer and caulking tool being used to consolidate it. By these means practical impermeability was obtained. If the pores of the water face are thus rendered extremely fine, the surface water, carrying more or less fine detritus and organic matter, will soon close them entirely and assist in making that face the least permeable portion of the structure.

But no care in construction can prevent the compression of the mass as the superincumbent weight comes upon it. Any given yard of height measured during construction, or at any time after construction, will be less than a yard when additional weight has been placed upon it; hence the ends of such dams placed against rock surfaces must move with respect to those surfaces when the superincumbent load comes upon them. This acti6n is obviously much reduced where the rock sides of the valley rise slowly; but

in cases where the rock is very steep, the safest course is to face the facts, and not to depend for water-tightness upon the cementing of the masonry to the rock, but rather to provide a vertical key, or dowel joint, of some material like asphalt, which will always remain water-tight. So far as the writer has been able to observe or ascertain, there are very few masonry dams in Europe or America which have not been cracked transversely in their higher parts. They generally leak a little near the junction with the rock, and at some other joints in intermediate positions. In the case of the Neuadd dam this difficulty was met by deliberately omitting the mortar in transverse joints at regular intervals near the top of the dam, except just at their faces, where it of course cracks harmlessly, and by filling the rest with asphalt. Serious move- ment from expansion and contraction does not usually extend to levels which are kept moderately damp, or to the greater mass of the dam, many feet below high- water level.

The first masonry dam of importance constructed in Great Britain was that upon the river Vyrnwy, a tributary of the Severn, in con- nexion with the Liverpool water-supply (Plate I.)- Its height, subject to water- pressure, is about 134 ft., and a carriage-way is carried on arches at an elevation of about 18 ft. higher. As this dam is about 1 180 ft. in length from rockf to rock, it receives practic-

ally no support from the sides of the valley. Its construction drew much attention to the subject of masonry dams in England — where the earthwork dam, with a wall of puddled clay, had hitherto been almost universal— and since its completion nine more masonry dams of smaller size have been completed. In connexion with the Elan and Claerwen works, in Mid-Wales, for the supply of Birmingham, six masonry dams were projected, three of which are completed, in- cluding the Caban Goch dam, 590 ft. long at the water level, and subject to a water-pressure of 152 ft. above the rock foundations and of 122 ft. above the river bed, and the Craig-yr-allt Goch dam, subject to a head of 133 ft. The latter dam is curved in plan, the radius being 740 ft. and the chord of the arc 515 ft. In the Dcrwent Valley scheme, in connexion with the water supplies of Derby, Leicester, Nottingham and Sheffield, six more masonry dams have received parliamentary sanction. Of these the highest is the Hag- glee, on the Ashop, a tributary of the Derwent, which will impound water to about 136 ft. above the river bed, the length from rock to rock being 980 ft. , Two of these dams are now in course of construc- tion, one of which, the Howden, will be 1080 ft. in length and will impound water to a depth of 114 ft. abovethe river bed. In 1892 the excavation was begun for the foundations of a masonry dam across the Croton river, in connexion with the supply of New York. The length of this dam from rock to rock at the overflow level is about 1500 ft. The water face, over the maximum depth at which that face cuts the rock foundations, is subject to a water-pressure of about 260 ft.,

while the height of the dam above the river bed is 163 ft. The section, shown in fig. 17, has been well considered. The hearting is of rubble masonry, and the faces are coursed ashlar.

Fici. 17.— Section of Croton Dam.

So-called "natural cement" has been used, except during frosty weather, when Portland cement was substituted on account of its more rapid setting. An important feature in connexion with this dam is the nature of the foundation upon which it stands. _ Part of the rock is schist, but the greater portion limestone, similar in physical qualities to the Carboniferous limestone of Great Britain. The lowest part of the surface of this rock was reached after excavat- ing through alluvial deposits to a depth of about 70 ft., but owing to its fissured and cavernous nature it became necessary to ex- cavate to much greater depths, reaching in places more than 120 ft. below the original bottom of the valley. Great pains appear to have been taken to ascertain that the cavernous portions of the rock had been cut out and built up before the building was begun.

The Furens dam, already referred to as the earliest type of a scientifically designed structure of the kind, is subject to a pressure of about 166 ft. of water; the valley it crosses is only about 300 ft. wide at the water level, and the dam is curved in plan to a radius of 828 ft. Much discussion has taken place as to the utility of such curvature. The recent investigations already referred to indicate the desirability of curving dams in plan in order to reduce the possi- bility of tension and infiltration of water at the upstream face. In narrow rock gorges extremely interesting and complex problems re- lating to the combined action of horizontal and vertical stresses arise, and in some such cases it is evident that much may be done by means of horizontal curvature to reduce the quantity of masonry without reduction of strength. The Bear Valley dam, California, is the most

from Pkotosrofhs by J- Madardy. XX.MH. 40-'.

LAKE VYRNWY, December 1

RESERVOIRS)

daring example in existence of the employment of the arch principle. Its height from the rock bed is 64 ft., and it is subject during floods to a head

of water not much less. The length of the chord of the arc across the valley is about 250 ft. and the radius 335 ft. The dam was begun in 1883, with abase 20 ft. thick, narrowing to 13 ft. at a height of 16 ft. The cost of this thickness being regarded as too great, it was abruptly reduced to 8 ft. 6 in., and for the remaining 48 ft. it was tapered up to a final width of about 3 ft. The masonry is de- scribed by Mr Schuyler as " a rough uncut granite ashlar, with a hearting of rough rubble all laid in cement mortar and gravel." This dam has been in satisfactory use since 1885, and the slight filtration through the masonry which occurred at first is said to have almost entirely ceased.

In New South Wales thirteen thin concrete dams, dependent upon horizontal curvature for their resistance to water pressure, have been constructed in narrow gorges at comparatively small cost to impound water for the use of villages. The depth of water varies from 18 ft. to 76 ft. and five of them have cracked vertically, owing apparently to the impossibility of the base of the dam partaking of the changes of curvature induced by changes of temperature and of moisture in the upper parts. It is stated, however, that these cracks close up and become practically water-tight as the water rises.

Something has been said of the failures of earthen dams. Many masonry dams have also failed, but, speaking generally, we know less of the causes which have led to such failures. The Failures, examination of one case, however, namely, the bursting in 1895 of the Bouzey dam, near fipinal, in France, by which many lives were lost, has brought out several points of great interest. It is probably the only instance in which a masonry dam has slipped upon its foundations, and also the only case in which a masonry dam has actually overturned, while curiously enough there is every probability that the two circumstances had no connexion with each other. A short time after the occurrence of the catastrophe the dam was visited by Dr W. C Unwin, F.R.S., and the writer, and a very careful examination of the work was made by them. Someof the blocks of rubble masonry carried down the stream weighed several hundred tons. The original section of the dam is shown by the continuous thick line in fig. 18, from which it appears that the work was subject to a pressure of only about 65 ft. of water. In the year 1884 a length

ELEVATION

Water Face. -Elevation and Plan of Bouzey Dam.

Fig. 18. — Section of Bouzey Dam.

of 450 ft. of the dam, out of a total length of 1706 ft., slipped upon its

foundation of soft- sandstone, and became slightly curved in plan as shownat a, b, fig. 19, the maximum movement from the original straight line being about 1 ft. Further sliding on the base was pre- vented by the construction of the cross-lined portions in the section (fig. 18). These precautions were perfectly effective in securing the safety of the dam up to the height to which the counterfort was carried. As a consequence of this horizontal bending of the dam the vertical cracks shown in fig. 19 appeared and were repaired. Eleven

1 See Proc. Inst. C.E. vol. exxvi. pp. 91-95.

*years after this, and about fifteen years after the dam was first brought into use, it overturned on its outer edge, at about the level indicated by the dotted line just above the counterfort ; and there is no good reason to attribute to the movement of 1884ˆ, or to the vertical cracks it caused, any influence in the overturning of 1895. Someof the worst cracks were, in- deed, entirely be- yond the portion overturned, which consisted of the mass 570 ft. long by 37 ft. in depth, and weighing about 20,000 tons, shown in eleva- tion in fig. 19. The line of pres- sures as generally fiven for this am with the reservoir full, on the hypothesis that the density of the masonry was a little over 2, is shown by long and short dots in fig. 18. Fig. 19.- Materials actu- ally collected from the dam indicate that the mean density did not exceed 1-85 when dry and 2*07 when saturated, which would bring the line of pressures even closer to the outer face at the top of the counterfort. In any event it must have approached well within 3! ft. of the outer face, and was more nearly five-sixths than two-thirds of the width of the dam distant from the water face; there must, therefore, have been considerable vertical tension at the water face, variously com- puted according to the density assumed at from ij to if ton per square foot. This, if the dam had been thoroughly well constructed, either with hydraulic lime or Portland cement mortar, would have been easily borne. , The materials, however, were poor, and it is probable that ■ rupture by tension in a roughly horizontal plane took place. Directly this occurred, the front part of the wall was sub- ject to an additional overturning pressure of about 35 ft. of water acting upwards, equivalent to about a ton per square foot, which would certainly, if it occurred through- out any considerable length of the dam, have immediately overturned it. But, as a matter of fact, the dam actually stood for about fifteen years. Of this circumstance there are two possible explanations. It is known that more or less leakage took place through the dam, and to moderate this the water face was from time to time coated and repaired with cement. Any cracks were thus, no doubt, temporarily closed; and as the structure of the rest of the dam was porous, no opportunity was given for the per- colating water to accumulate in the horizontal fissures to anything like the head in the reservoir. But in reservoir work such coatings are not to be trusted, and a single horizontal*

crack might admit sufficient water to cause an uplift. Then, again, it must be remembered that although the full consequences of the facts described might arise in a section of the dam 1 ft. thick (if that section were entirely isolated), they could not arise throughout the length unless the adjoining sections were subject to like conditions. Any horizontal fissure in a weak place would, in the nature of things, strike somewhere a stronger place, and the final failure would be deferred. Time would then become an element. By reason of the constantly changing temperatures and the frequent filling and emptying of the reservoir, expansion and contraction, which are always at work tending to produce relative movements wherever one portion of a structure is weaker than another, must have assisted the water-pressure in the extension of the horizontal cracks, which, growing slowly during the fifteen years, provided at last the area required to enable the intrusive water to overbalance the little remaining stability of the dam.

Reservoirs From very ancient times in India, Ceylon and elsewhere, reservoirs of great area, but generally of small depth, have been built and used for the purposes of irrigation; and in modern times, especially in India and America, comparatively shallow reservoirs have been constructed of much greater area, and in some cases of greater capacity, than any in the United Kingdom.

Yet the hilly parts of the last-named country are rich in magni- ficent sites at sufficient altitudes for the supply of any parts by gravitation, and capable, if properly laid out, of affording a volume of water, throughout the driest seasons, far in excess of the probable demand for a long future. Many of the great towns had already secured such sites within moderate distances, and had constructed reservoirs of considerable size, when, in 1S70, 1SS0 and 1892 respectively, Manchester, Liverpool and Birmingham obtained statutory powers to draw water from relatively great distances, viz. from Thirlmere in Cumberland, in the case of Manchester; from the river Vyrnwy, Montgomery- shire, a tributary of the Severn, in the case of Liverpool; and from the rivers Elan and Claerwen in Radnorshire, tributaries of the Wye, in the case of Birmingham. Lake Vyrnwy, com- pleted in 18S9, includes a reservoir which is still by far the largest in Europe.

Thin reservoir is situated in a true Glacial lake-basin, and having therefore all the appearance of a natural lake, is commonly known as Lake Vyrnwy-

It is 825 ft. above the sea, has an ~ , area of 1 121 acres, an available capacity exceeding 12,000*

Vyrmwy. m ii|j on gallons, and a length of nearly 5 m. Its position in North Wales is shown in black in fig. 20, and the two views on Plate I. show respectively the portion of the valley visible from the dam before impounding began, and the same portion as a lake on the completion of the work. Before the valves in the dam were closed, the village of Llanwddyn, the parish church, and many farmsteads were demolished. The church was rebuilt outside the watershed, and the remains from the old churchyard were removed to a new cemetery adjoining it. The fact that this valley is a post-Glacial lake-basin was attested by the borings and excavations made for the founda- tions of the dam. The trench in which the masonry was founded covered an area 120 ft. wide at the bottom, and extending for 1172 ft. across the valley. Its site had been determined by about 190 borings, probings and shafts, which, following upon the indications afforded by the rocks above ground, proved that the rock bed crossing the valley was higher at this point than elsewhere. Here then, buried in alluvium at a depth of 50 to 60 ft. from the surface, was found the rock bar of the post-Glacial lake; at points farther up the valley, borings nearly 100 ft. deep had failed to reach the rock. The Glacial striae, and the dislocated rocks — moved a few inches or feet from their places, and others, at greater distances, turned over, and beginning to assume the sub-angular form of Glacial boulders — were found precisely as the glacier, receding from the bar, and giving place totheancientlake.hadleft them, covered and preserved by sand and gravel washed from the terminal morain. Later came the alluvial si I ting-up. Slowly, but surely, the deltas of the tributary streams advanced into the lake, floods deposited their burdens of detritus in the deeper places, the lake shallowed and shrank and in its turn yielded to the winding river of an alluvial strath, covered with peat, reeds and alders, and still liable to floods. It is interesting to record that during the construction of the works the implements of Neolithic man were found, near the margin of the modern lake, below the peat, and above the alluvial clay on which it rested. Several of the reser voir sites in Wales, shown by shaded tines in fig. 20, are in all prob- ability similar post-Glacial lake-basins, and in the course of time some of them may contain still greater reservoirs. They are pro- vided with well-proportioned watersheds and rainfall, and being nearly all more than 500 ft. above the sea, may be made available for the supply of pure water by gravitation to any part of England. In 1892 the Corporation of Birmingham obtained powers for the construction of six reservoirs on the rivers Elan and Claerwen, also shown in fig. 20, but the sites of these reservoirs are long narrow valleys, not lake-basins. The three reservoirs on the Elan were completed in 1904. Their joint capacity is 11,320 million gallons, and this

will be increased to about 18,000 millions when the remain- ing three are built.

Of natural lakes in Great Britain raised above their ordinary levels that the upper portions may be utilized as reservoirs, Loch Katrine supplying Glasgow is well known. Whitehaven is similarly supplied from Ennerdale, and in the year 1894 Thirlmere in Cumberland was brought into use, as already mentioned, for the supply of Manchester. The corporation have statutory power to raise the lake 50 ft., at which level it will have an available capacity of about 8000 million gallons; to secure this a masonry dam has been constructed, though the lake is at present worked at a lower level.

It is obvious that the water of a reservoir must never be allowed to rise above a certain prescribed height at which the works will be ^^ perfectly safe. In all reservoirs impounding the natural Overflow. fi OVf f a gtream, this involves the use of an overflow. Where the dam ts of masonry it may be used as a weir; but where earthwork is employed, the overflow, commonly known in such a case as the " bye-wash," should be an entirely independent work, consisting of a low weir of sufficient length to prevent an unsafe ri?e of the water level, and of a narrow channel capable of easily carrying away any water that passes over the weir. Theabsenceof oneor both of these conditions has led to the failure of many dams.

Reservoirs unsafe from this cause still exist in the United Kingdom. Where the contributory drainage area exceeds 5000 acres, the dis- charge, even allowing for so-called " cloud-bursts," rarely or never exceeds the rate of about 300 cub. ft. per second per 1000 acres, or 1500 times the minimum dry weather flow, taken as one-fifth of a cubic foot; and if we provide against such an occasional discharge, with a possible maximum of 400 cub. ft. at much more distant intervals, a proper factor of safety will be allowed. But when a reservoir is placed upon a smaller area the conditions are materially changed. The rainfall which produces, as the average of all the tributaries in the larger area, 300 cub. ft. per second per 1 000 acres, is made up of groups of rainfall of very varying intensity, falling upon different portions of that area, so that upon any section of it the intensity of discharge may be much greater.

The height to which the water is permitted to rise above the sill of the overflow depends upon the height of the embankment above that level (in the United Kingdom commonly 6 or 7 ft.), and this again should be governed by the height of possible waves. In open places that height is seldom more than about one and a half times the square root of the " fetch " or greatest distance in nautical miles from which the wave'has travelled to the point in question; but in narrow reaches or lakes it is relatively

higher. In lengths not ex- ceeding about 2 m., twice this height may be reached, giving for a 2-mile " fetch " about 3f ft., or il ft. above the mean level. Above this again, the height of the wave should be allowed for " wash," making the embankment in such a case not less than 5J ft. above the highest water-level. If, then, we determine that the depth of over- flow shall- not exceed 1ˆ ft., we arrive at 6f ft. as sufficient for the height of the embankment above the sill of the overflow. Obviously we may shorten the sill at the cost of extra height of embankment, but it is rarely wise to do so.

The overflow sill or weir should be a masonry structure of rounded vertical section raised a foot or more above the waste-water course, in which case for a depth of ij ft. it will discharge, over every foot of length, about 6 cub. ft. per second. Thus, if the drainage area exceeds 5000 acres, and we provide for the passage of 300 cub. ft. per second per 1000 acres, such a weir will be 50 ft. long for every 1000 acres. But, as smaller areas are approached, the excessive local rainfalls of short duration must be provided for, and beyond these there are extraordinarily heavy discharges generally over and gone before any exact records can be made; hence we know very little of them beyond the bare fact that from 1000 acres the discharge may rise to two or three times 300 cub. ft. per second per 1000 acres. In the writer's experience at least one case has occurred where, from a mountain area of 1300 acres, the rate per 1000 was for a short time certainly not less than 1000 cub. ft. per second. Nothing but long observation and experience can help the hydraulic engineer to judge of the configuration of the ground favourable to such phenomena. It is only necessary, however, to provide for these exceptional dis- charges during very short periods, so that the rise in the water-level of the reservoir may be taken into consideration; but subject to this, provision must be made at the bye-wash for preventing such a flood, however rare, from filling the reservoir to a dangerous height.

From the overflow sill the bye-wash channel may be gradually narrowed as the crest of the embankment is passed, the water being prevented from attaining undue velocity by steps of heavy masonry, or, where the gradient is not very steep, by irregularly set masonry.

Purification

When surface waters began to be used for potable purposes,

sortie mode of arresting suspended matter, whether living

or dead, became necessary. In many cases gauze

strainers were at first employed, and, as an improve- ?£, „

*,,.,. . \, *l * j titration.*

ment upon or addition to these, the water was caused

to pass through a bed of gravel or sand, which, like the gauze, was regarded merely as a strainer. As such strainers were further improved, by sorting the sand and gravel, and using the fine sand only at the surface, better clarification of the water was obtained; but chemical analysis indicated, or was at the time thought to indicate, that that improvement was practically confined to clarification, as the dissolved impurities in the water were certainly very little changed. Hence such filter beds, as they were even then called, were regarded as a luxury rather than as a necessity, and it was never suspected that, notwith- standing the absence of chemical improvement in the water, changes did take place of a most important kind. Following upon Dr Koch's discovery of a method of isolating bacteria, and of making approximate determinations of their number in any volume of water, a most remarkable diminution in the number of microbes contained in sand-filtered water was observed; and it is now well known that when a properly constructed sand-filter bed is in its best condition, and is worked in the best-known manner, nearly the whole of the microbes

existing in the crude water will be arrested. The sand, which is nominally the filter, has interstices about thirty times as wide as the largest dimensions of the larger microbes; and the reason why these, and, still more, why organisms which were individually invisible under any magnifying power, and could only be detected as colonies, were arrested, was not understood. In process of time it became clear, however : that the worse the condition of a filter bed, in the then general acceptation of the term, the better it was as a microbe filter; that is to say, it was not until a fine film of mud and microbes had formed upon the surface of the sand that the best results were obtained.

Even yet medical science has not determined the effect upon the human system of water highly charged with bacteria which are not known to be individually pathogenic. In the case of the bacilli of typhoid and cholera, we know the direct effect; but apart altogether from the presence of such specific poisons, polluted water is undoubtedly injurious. Where, therefore, there is animal pollution of any kind, more especially where there is human pollution, generally indicated by the presence of bacillus coli communis, purification is of supreme importance, and no process has yet been devised

which, except at extravagant cost, supersedes for public supplies that of properly-conducted sand filtration. Yet it cannot be too constantly urged that such filtration depends for its comparative perfection upon the surface film; that this surface film is not present when the filter is new, or when its materials have been recently washed; that it may be, and very often is, punctured by the actual working of the filters, or for the purpose of increasing their discharge; and that at the best it must be regarded as an exceedingly thin line of defence, not to be depended upon as a safeguard against highly polluted waters, if a purer source of supply can possibly be found. Such filters are not, and in the nature of things cannot be, worked with the precision and continuity of a laboratory experiment.

In fig. 21 a section is shown of an efficient sand-filter bed. The thick- ness of sand is 3 ft. 6 in. In the older filters it was usual to support

this sand upon small gravel resting upon larger gravel, and so on until the material was sufficiently open to pass the water laterally to under- drains. But a much shal- lower and certainly not less efficient filter can be con- structed by making the under-drains cover the whole bottom. In fig. 21 the sand rests on small gravel of such degree of coarseness that the whole of the grains would be retained on a sieve of |-in. mesh and rejected by a sieve of £-in. mesh in the clear, supported upon a 3-in. thickness of bricks laid close together, and consti- tuting the roof of the under- drains, which are formed by \ Conchetie. other bricks laid on thin asphalt, upon a concrete [. — Section of Sand-Filter Bed. floor. In this arrangement the whole of the materials may be readily removed for cleansing. In the best filters an automatic arrangement for the measurement of the supply to each separate filter, and for the regulation of the quantity within certain limits, is adopted, and the resistance at outflow is so arranged that not more than a certain head of pressure, about 2\ ft., can under any circumstances come upon the surface film, while a depth of several feet of water is maintained over the sand. It is essential that during the working of the filter the water should be so supplied that it will not disturb the surface of the sand. When a filter has been emptied, and is being re-charged, the water should be introduced from a neighbouring filter, and should pass upwards in the filter to be charged, until the surface of the sand has been covered. The unfiltered water may then be allowed to flow quietly and to fill the space above the sand to a depth of 2 or 3 ft. It would appear to be impossible with any water that requires filtra- tion to secure that the first filtrate shall be satisfactory if filtration begins immediately after a filter is charged; and if the highest results are to be obtained, either the unfiltered water must be per- mitted to pass extremely slowly over the surface of the sand without

—•- FINE

:,A SAND.

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Fig.

passing through it, or to stand_upon the sand until the surface film has formed. With waters giving little or no sediment, which are often the most dangerous, some change, as by the first method, is necessary. It has been proposed, on the other hand, to allow the filter to act slowly until the surface film is formed, and to discard the first effluent. This course can scarcely fail to introduce into the sand many bacteria, which may be washed through when the full working of the filters is begun; and it should not, therefore, be adopted when the source of the supply is known to be subject to human pollution. The time for the formation of an efficient surface films varies, according to the quality of the raw water, from a few hours to a few days. ludg- ing from the best observations that have been made on a large scale, the highest rate of efficient filtration when the surface film is in good condition is about 4 in. downwards per hour of the water contained above the sand, equivalent to about 50 gallons per day from each square foot of sand. When the surface film has once been formed, and the filter has begun its work, it should continue without interrup- tion until the resistance of that film becomes too great to permit of the necessary quantity of water being passed. That period will vary, according to the condition of the water, from eight or ten days to four weeks. The surface film, together with half an inch to an inch of sand, is then carefully scraped off and stored for subsequent washing and use. This process may be repeated many times until the thick- ness of the fine sand is reduced to about 18 in., when the filter bed should be restored to its full thickness.

A lately discovered effect of sand filtration is a matter of great importance in connexion with the subject of aqueducts. A brown slimy sediment, having the appearance of coffee grounds when placed in clear water, has been long observed in pipes conveying surface waters from mountain moorlands. The deposit grows on the sides of the pipes and accumulates at the bottom, and causes most serious obstruction to the flow of water. The chemists and bacteriologists do not -appear to have finally determined the true nature and origin of this growth, but it is found in the impounded waters, and passes into the pipes, where it rapidly increases. It is checked even by fine copper wire-gauze strainers, and where the water passes through sand-filter beds in the course of an aqueduct, the growth, though very great between the reservoir and the filter beds,, is almost absent

between the filter beds and the town. Even the growth of the well-known nodular incrustations in iron pipes is much reduced by sand filtration. From these facts it is clear that, other things being the same, the best position for the strainers and filter beds is as close as possible to the reservoir.

Some surface waters dissolve lead when bright, but cease to do so when the lead becomes tarnished. More rarely the action is con- tinuous, and the water after being passed through lead cisterns and Eipes produces lead poisoning — so called " plumbism." The lia- ility t to this appears to be entirely removed by efficient sand filtration.

Sand filtration, even when working in the best possible manner, falls short of the perfection necessary to prevent the passage of bacteria which may multiply after the filter is passed. Small, however, as the micro-organisms are, they are larger than the capillary passages in some materials through which water under pressure may be caused to percolate. It is therefore natural that attempts should have been made to construct filters which, while permitting the slow percolation of water, should preclude the passage of bacteria or their spores. In the laboratory of Pasteur probably the first filter which successfully accomplished this object was produced. In this apparatus, known as the Pasteur-Chamber- land filter, the filtering medium is biscuit porcelain. It was followed by the Berkefield filter, constructed of baked infusorial earth. Both these filters arrest the organisms by purely mechanical action, and if the joints are water-tight and they receive proper attention and frequent sterilization, they both give satisfactory results on a small scale for domestic purposes. The cost, however — to say nothing of the uncertainty — where large volumes of water are concerned, much exceeds the cost of obtaining initially safe water. Moreover, if a natural water is so liable to pathogenic pollution as to demand filtra- tion of this kind, it ought at once to be discarded for an initially pure supply; not necessarily pure in an apparent or even in a chemical sense, for water may be visibly coloured, or may contain considerable proportions both of organic and inorganic impurity, and yet be taste- less and free from pathogenic pollution.

There are several materials now in use possessing remarkable power to decolourize clarify, chemically purify and oxidize water; but they are too costly for use in connexion with public water supplies unless a rate of filtration is adopted quite inconsistent with the formation of a surface film capable of arresting micro-organisms. This fact does not render them less useful when applied to the arts in which they are successfully employed.

Attempts have been made, by adding certain coagulants to the water to be filtered, to increase the power of sand and other granu- lar materials to

arrest bacteria when passing through them at much higher velocities than are possible for successful filtration by means of the surface film upon sand. The effect is to produce between the sand or other grains a glutinous substance which does the work per- formed by the mud and microbes upon the surface of the sand filter. Elsewhere centrifugal force, acting somewhat after its manner in the cream separator, has been called in aid.

[PURIFICATION

The sedimentation tank forms a very important

■• *help to filtration. In the case of river waters liable*

■ **" to turbidity the water should always be passed through such tanks before being placed in the filters.*

They form, moreover, additional safeguards against organic impurity. Sedimentation tanks on a sufficient scale may effect the purification of the water to almost any desired extent. This is shown to be the case by the purity of some lake

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waters; but the first cost of the works and the subsequent removal of the sediment are in some cases a serious matter, and any approach to the comparatively perfect action of lakes is out of the question. By the use of such tanks, however, when

the condition of the water demands it, and by passing the effluent water through sand filters when in good condition, the number of microbes is found to be reduced by as much as 97 or even 99%. This, when attained, is undoubtedly a most

important reduction in the chance of pathogenic bacteria passing into the filtered water; but much mere must be done than has hitherto in most places been done to ensure the constancy of such a condition before it can be assumed to represent the degree of safety attained. No public supply should be open to any such doubt as ought to, or may, deter people from drinking the water without previous domestic filtration or boiling.

Distribution

The earliest water supplies in Great Britain were generally distributed at low pressure by wooden pipes or stone or brick

conduits. For special purposes the Romans introduced

tT" * cast-lead pipes, but they were regarded as luxuries,

supply. not as necessaries, and gave way to cheaper conduits

made, as pump barrels had long been made, by boring out tree trunks, which are occasionally dug up in a good state of preservation. This use of tree-trunks as pipes is still common in the wooded mountain districts of Europe. Within the 19th century, however, cast iron became general in the case of large towns; but following the precedent inseparable from the use of weaker conduits, the water was still delivered under very low pressure, rarely more than sufficient to supply taps or tanks near the level of the ground, and generally for only a short period out of each twenty-four hours. On the introduction of the Waterworks Clauses Act 1847, an impetus was given to high-pressure supplies, and the same systems of distributing mains were frequently employed for the purpose; but with few exceptions the water continued to be supplied intermittently, and cisterns or tanks were necessary to store it for use during the periods of intermission. Thus it happened that pipes and joints intended for a low-pressure supply were subjected, not only to high pressure, but to the trying ordeal of suddenly varying pressures. As a rule such pipes were not renewed: the leakage was enormous, and the difficulty was met by the very inefficient method of reducing the period of supply still farther. But even in entirely new distributing systems the network is so extensive, and the number of joints so great, that the aggregate leakage is always considerable; the greatest loss being at the so-called " ferrules " connecting the mains with the house " communication " or " service " pipes, in the lead pipes, and in the household fittings. But a far greater evil than mere loss of water and inconvenience soon proved to be inseparable from intermittent supply. Imagine a hilly town with a high-pressure water supply, the water issuing at

numerous points, sometimes only in exceedingly smalt veins, from the pipes into the sub-soil. In the ordinary course of intermittent supply or for the purpose of repairs, the water is cut off at some point in the main above the leakages; but this does not prevent the continuance of the discharge in the lower part of the town. In the upper part there is consequently a tendency to the formation of a vacuum, and some of the impure sub-soil water near the higher leakages is sucked into the mains, to be mixed with the supply when next turned on. We are indebted to the Local Government Board for having traced to such causes certain epidemics of typhoid, and there can be no manner of doubt that the evil has been very general. It is therefore of supreme importance that the pressure should be constantly maintained, and to that end, in the best-managed waterworks the supply is not now cut off even for the purpose of connecting house-service pipes, an apparatus being employed by which this is done under pressure. Constant pressure being granted, constant leakage is inevitable, and being constant it is not surprising that its total amount often exceeds the aggregate of the much greater', but shorter, draughts of water taken for various household purposes. There is therefore, even in the best cases, a wide field for the conservation and utilization of water hitherto entirely wasted.

Following upon the passing of the Waterworks Clauses Act 1847, a constant supply was attempted in many towns, with the result in some cases that, owing to the enormous loss arising from the prolongation of the period of leakage from

a fraction of an hour to twenty-four hours, it was impossible to

maintain the supply. Accordingly, in some places large sections

of the mains and service pipes were entirely renewed, _

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and the water consumers were put to great expense in supply.

changing their fittings to new and no doubt better types, though the old fittings were only in a fraction of the cases actually causing leakage. But whether or not such stringent methods were adopted, it was found necessary to organize a system of house-to-house visitation and constantly recurring inspection. In Manchester this was combined with a most careful examination, at a depdt of the Corporation, of all fittings intended to be used. Searching tests were applied to these fittings, and only those which complied in every respect with the prescribed regulations were stamped f Was te. and permitted to be fixed within the limits of the water supply. But this did not obviate the necessity for house- to-house inspection, and

although the number of different points at which leakage occurred was still great, it was always small in relation to the number of houses which were necessarily entered by the inspector; moreover, when the best had been done that possibly could be done to suppress leakage due to domestic fittings, the leakage below ground in the mains, ferrules and service pipes still remained, and was often very great. It was clear, therefore, tha- in its very nature, house-to-house visitation was both wasteful and insufficient, and it remained for Liverpool to correct the difficulty by the application, in 1873, of the " Differentiating waste water meter," which has since been extensively used for the same purpose in various countries. One such instrument was placed below the roadway upon each main supplying a population of generally between 1000 and 2000 persons.

Its action is based ' upon the following considerations: When water is passing through a main and supplying nothing but leakage the Mow of that water is necessarily uniform, and any instrument which graphically represents that flow as a horizontal line conveys to the mind a full conception of the nature of the flow, and if by the position of that line between the bottom and the top of a diagram the quantity of water (in gallons per hour, for example) is recorded, we have a full statement, not only of the rate of flow, but of its nature. We know, in short, that the water is not being usefully employe!. In the actual instrument, the paper diagram is mounted upon«a drum caused by clockwork to revolve uniformly, and is ruled with vertical hour lines, and horizontal quantity lines representing gallons per hour. Thus, while nothing but leakage occurs the uniform horizontal line is continued. If now a tap is opened in any house connected with the main, the change of flow in the main will be represented by a vertical change of position of the horizontal line, and when the tap is turned off the pencil will resume its original vertical position, but the paper will have moved like the hands of a clock over the interval during which the tap was left open. If, on the other hand, water is suddenly drawn off from a cistern supplied through a ball-cock, the flow through the ball-cock will be recorded, and will be represented by a sudden rise to a maximum, followed by a gradual decrease as the ball rises and the cistern fills; the result being a Curve having its asymptote in the original horizontal line. Now, all the uses of water, of whatever kind they may be, produce some such irregular diagrams as these, which can never be confused with the uniform horizontal line of leakage, but are always super- imposed upon it. It is this leakage line that the waterworks engineer uses to ascertain the truth as to the leakage and to assist him in its suppression. In. well-equipped waterworks each house service pipe is controlled by a stop-cock accessible from the footpath to the officials -of the water authority, and the process of waste detection by this method depends upon the manipulation of such stop-cocks in conjunction with the differentiating meter. As an*

example of one mode of applying the system, suppose that a night inspector begins work at 1 1.30 p.m. in a certain district of 2000 persons, the meter of which records at the time a uniform flow of 2000 gallons an hour, showing the not uncommon rate of leakage of 24 gallons per head per day. The inspector proceeds along the footpath from house to house, and outside each house he closes the stop-cock, recording, opposite the number of each house the exact time of each such operation. Having arrived at the end of the district he retraces his steps, reopens the whole of the stop-cocks, removes the meter diagram, takes it to the night complaint office, and enters in the " night inspection book " the records he has made. The next morning the diagram and the " night inspection book " are in the hands of the day inspector, who compares them. He finds, for example, from the diagram that the initial leakage of 2000 gallons an hour has in the course of a 45 hours' night inspection fallen to 400 gallons an hour, and that the 1600 gallons an hour is accounted for by

fifteen distinct drops of different amounts and at different times. Each of these drops is located by the time and place records in the book and the time records on the diagram as belonging to a particular service pipe; so that out of possibly 300 premises the bulk of the leakage has been localized in or just outside fifteen. To each of these premises he goes with the knowledge that a portion of the total leakage of 2000 gallons an hour is almost certainly there, and that it must be found, which is a very different thing from visiting three or four hundred houses, in not one of which he has any particular reason to expect to 6nd leakage. Even when he enters a house with previous knowledge that there is leakage, its discovery may be difficult. It is often hidden, sometimes underground, and may only be brought to light by excavation. In these cases, without some such system of localization, the leakage might go on for years or for ever. There are many and obvious variations of the system. That described requires a diagram revolving once in a few hours, otherwise the time scale will be too close; but the ordinary diagram revolving once in 24 hours is often used quite effectively in night inspections by only closing those stop-cocks which are actually passing water. This method was also first introduced in Liverpool. The night inspector carries with him a stethoscope, often consisting merely of his steel turning-rod, with which he sounds the whole of the outside stop-cocks, but only closes those through which the sound of water is heard. An experienced man, or even a boy, if selected as possessing the necessary faculty (which is sometimes very strongly marked), can detect the smallest dribble when the stop- cock is so far closed as to restrict the orifice. Similar examinations by means of the stop-valves on the mains are also made, and

it often happens that the residual leakage (400 gallons an hour in the last case) recorded on the diagram, but not shut off by the house stop- cocks, is mentioned by the inspector as an " outside waste," and localized as having been heard at a stop-cock and traced by sounding the pavement to a particular position under a particular street. All leakages found on private property are duly notified to the water tenant in the usual way, and subsequent examinations are made to ascertain if such notices have been attended to. If this work is properly organized, nearly the whole of the leakage so detected is suppressed within a month. A record of the constantly fluctuating so-called " night readings " in a large town is most interesting and instructive. If, for example, in the case of a hundred such districts we watch the result of leaving them alone, a gradual growth of leakage common to most of the districts, but not to all, is observed, while here and there a sudden increase occurs, often doubling or trebling the total supply to the district. Upon the original installa- tion of the system in any town, the rate of leakage and consequent total supply to the different districts is found [to vary greatly, and in some districts it is usually many times as great per head as in others. An obvious and fruitful extension of the method is to employ the inspectors only in those districts which, for the time being, promise the most useful results.

In many European cities the supply of water, even for domestic purposes, is given through ordinary water meters, and paid for, s . . according to the meter record, much in the same manner meter ˆ aa a SU PP V °f 8 as or electricity. By the adoption of this method great reductions in the quantity of water used and wasted are in some cases effected, and the water tenant ays for the leakage or waste he permits to take place, as well as jr the water he uses. The system, however, does not assist in the detection of the leakage which inevitably occurs between the reservoir and the consumer's meter; thus the whole of the mains, joints and ferrules connecting the service pipes with the mains, and the greater parts of the service pipes, are still exposed to leakage without any compensating return to the water authority. But the worst evil of the system, and one which must always prevent its introduction into the United Kingdom, is the circumstance that it treats water as an article of commerce, to be paid for according to the quantity taken. In the organization of the best municipal water undertakings in the United Kingdom the free use of water is encouraged, and it is only the leakage or occasional improper employment of the water that the water authority seeks, and that successfully, to suppress. The objection to the insanitary effect of the meter-payment system has, in some places, been sought to be removed by providing a fixed quantity of water, assumed to be sufficient, as the supply for a fixed minimum payment, and by using the* meter records simply for the purpose of determining what additional payment, if any, becomes due from the water tenant. Clearly, if*

the excesses are frequent, the limit must be too low; if infrequent, all the physical and administrative complication involved in the system is employed to very little purpose.

The question of the distribution of water, rightly considered, resolves itself into a question of delivering water to the water tenant, without leakage on the way, and of securing that the fittings employed by the water tenant shall be such as to afford an ample and ready supply at all times of the day and night without leakage and without any unnecessary facilities for v/ aste. If these conditions are complied with, it is probable that the total rate of supply will not exceed, even if it reaches, the rate

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necessary in any system, not being an oppressive and insanitary system, by which the water is paid for according to the quantity used. (G. F. D.)

WATERS, TERRITORIAL. In international law " territorial waters " are the belt of sea adjacent to their shores which states respect as being under their immediate territorial jurisdic- tion, subject only to a right of " inoffensive " passage through them by vessels of all nations. As to the breadth of the belt and the exact nature of this inoffensive right of passage, however, there is still much controversy. The 3-miles' limit recognized and practised by Great Britain, France and the United States seems to have been derived from the cannon range of the period, when it was adopted as between Great Britain and the United States, i.e. towards the close of the 18th century. Bynkershoek, a famous Dutch jurist, whose authority at one time was almost as great in England as in his own country, in a dissertation on the Dominion of the Sea (1702), had devised a plausible juridical theory to support a homogeneous jurisdiction over environing waters in the place of the quite arbitrary claims made at that time, to any distance seawards, from whole seas to range of vision. Starting from the fact that fortresses can give effective protection within range of their cannon, and that in practice this effective protection was respected, he argued that the respect was not due to the reality of the presence of cannon, but to the fact that the state was in a position to enforce respect. This it could do from any point along its shore. Hence his well-known doctrine: terras dominium jinilur, ubi fmitur armorum vis. The doctrine satisfied a requirement of the age and became a maxim of inter- national law throughout northern Europe, both for the protection of shore fisheries and for the assertion of the immunity of adjacent waters of neutral states from acts of war between belligerent states. Germany still holds in principle to this varying limit of cannon range. Norway has never agreed to the 3 m., maintaining that the special configuration of her coast necessitates the exercise of jurisdiction over a belt of 4 m. Spain lays claim to jurisdiction over 6 m. from her shores. The

writers and specialists on the subject are quite as much divided. A British Fishery Commission in 1893 reported that " the present territorial limit of 3 m. is insufficient, and that, for fishery purposes alone, this limit should be extended, provided such extension can be effected upon an international basis and with due regard to the rights and interests of all nations." The committee recommended that " a proposition on these lines should be submitted to an international conference of the powers who border on the North Sea/' There is already an international convention, dated 6th May 1882, between Great Britain, France, Belgium, Holland, Germany and Denmark, relating to the regulation of the fisheries in the North Sea, which has fixed the limit of territorial waters as between the contracting parties at 3 m. measured from low-water mark and from a straight line drawn from headland to headland at the points where they are 10 m. across. In the British Act of 29th June 1893, giving effect to a subsequent convention (16th November 1887) between the same parties for the regulation of the liquor traffic in the North Sea, " territorial waters " are declared to be as defined in the Territorial Waters Jurisdiction Act 1878. In this Act the definition is as follows: —

The territorial waters of Her Majesty's dominions in reference to the sea means such part of the sea adjacent to the coast of the United Kingdom, or the coast of some other part of Her Majesty's dominions, as is deemed by international law to be within the territorial sovereignty of Her Majesty; and for the purpose of any offence declared by this act to be within the jurisdiction of the admiral, any part of the open sea within one marine league of the coast measured from low-water mark shall be deemed to be open sea Within the territorial waters of Her Majesty's dominions.

This definition only restricts the operation of the 3 m. limit to offences dealt with in the act, and does not deal with bays. The act of 1893 declares that the articles of the convention " shall be of the same force as if they were enacted in the body of the act," but this convention gives no definition of territorial waters.

The jurisdiction exercised in British territorial waters under

the Territorial Waters Jurisdiction Act of 1878 l is asserted without distinction between them and inland waters. " All offences " committed by any person, whether a British subject or not, and whether or not committed " on board or by means of a foreign ship," " within the territorial waters of Her Majesty's dominions/' are made punishable under it. No exception is

made for offences committed on merely passing foreign vessels, except that there is this attenuation in their case, that no prosecution can take place without a special authorization given by certain high officers of state. 2 It is doubtful whether any Continental state would recognize so complete a jurisdiction. The subject has been exhaustively dealt with by both the Institute of International Law and the International Law Association, which, at the suggestion of the rapporteur of the two committees, decided that the subjects of fisheries and neutrality should be dealt with separately. The following considerations and rules were adopted in 1894 by the institute and afterwards by the association: —

Whereas there is no reason to confound in a single zone 'the distance necessary for the exercise of sovereignty and protection of coast fisheries and the distance necessary to guarantee the neutrality of non-belligerents in time of war; And whereas the distance most commonly adopted of 3 m. from low-water mark has been recognized as insufficient for the protection of coast fisheries ; And whereas, moreover, this distance does not correspond to the real range of cannon placed on the coast ; The following dispositions are adopted : —

Art. I. The state has the right of sovereignty over a belt of sea along its coast subject to the right of inoffensive passage reserved in article 5. This belt is called territorial waters (mer territoriale).

Art. II. Territorial waters extend tor 6 sea m. (60 to 1 degree of latitude) from low-water mark along the whole extent of its coasts.

Art. III. For bays, territorial waters follow the trend of the coast except that it 13 measured from a straight line drawn across the bay from the two points nearest the sea where the opening of the bay is of 12 marine m. in width, unless a greater width shall have become recognized by an immemorial usage.

Art. IV. In case of war the adjacent neutral state shall have the right to extend by its declaration of neutrality or by special notification its neutral zone from 6 m. to cannon range from the coast.

Art. V. All ships, without distinction, have the right of inoffen- sive passage through territorial waters, subject to the belligerent right to regulate, and for purposes of defence to bar, the passage through the said waters for every ship, and subject to the right of neutrals to regulate the passage through the said waters for ships of war of all nationalities.

Art. VI. Crimes and offences committed on board foreign ships passing through territorial waters by persons on board such ships, upon persons or

things on board the same ships, are, as such, beyond the jurisdiction of the adjacent state, unless they involve a violation of the rights or interests of the adjacent state, or of its subjects or citizens not forming part of its crew or its passengers.

Art. VII. Ships passing through territorial waters must conform to the special rules laid down by the adjacent state, in the interest and for the security of navigation and for the police of the sea.

Art. VIII. Ships of all nationalities, by the simple fact, of being in territorial waters, unless merely passing through them, are sub- ject to the jurisdiction of the adjacent state.

The adjacent state has the right to continue upon the high seas the pursuit of a ship commenced within territorial waters, and to arrest and try it for an offence committed within the limits of its waters. In case of capture on the high seas the fact shall, however, he notified without delay to the state to which the ship belongs. The pursuit is interrupted from the moment the ship enters the territorial waters of its own state or of a third power. The right of pursuit ceases from the moment the ship enters a port either of its own country or of a third power.

1 This act was passed to meet what was thought to be a defect in British law, the decision in the well-known " Franconia " case having been that territorial waters were " out of the realm," and that criminal jurisdiction within them over a foreign ship could be exer- cised only in virtue of an act of parliament.

2 Proceedings, says § 3 of the act, for the trial and punishment of a person who is not a British subject, andwho is charged with any offence as is declared by this act to be within the jurisdiction of the admiral, shall not be instituted in any Court of the United Kingdom, except with the consent of one of the principal Secretaries of State, and on his certificate that the institution ol such proceedings is in his opinion expedient, and shall not be instituted in any British dominions outside of the United Kingdom except with the leave of the governor of the part of the dominions in which such proceedings are proposed to be instituted, and on his certificate that it is expedient that such proceedings should be instituted.

Art. IX. The special position of ships of war and of ships assimilated to them is reserved

Art. X. The provisions of the preceding articles are applicable to straits not exceeding 12 m. in width, with the following modifica- tions and exceptions:—

(r) Straits, the coast of which belong to different powers, form part of the territorial waters of the adjacent states, their jurisdiction respectively extending to the middle line of the straits;

(2) Straits whose coasts belong to the same state, and which are indispensable for maritime communication between two or more states other than the state in question, form part of the territorial waters of the said state whatever the proximity of the two coasts may be;

(3) Straits serving as a passage between one open sea and another can never be closed.

Art. XL The position of straits already regulated by conventions or special usage is reserved.

The Dutch, government in 1896 brought these rules to the notice of the leading European governments, and suggested the desirability of concluding an international convention on the subject. The only government which was unfavourable to the proposal was that of Great Britain. (See as to the Moray Firth Fisheries controversy, North Sea Fisheries Cokvektiok.)

In the Hague Convention of 1907 respecting the rights and duties of neutral powers in naval war, the existing practice in regard to territorial waters is confirmed (see arts. 2, 3, 9, 10, 12, 13 and 18), but no definition of what constitutes the distance of these waters seawards is given, This question is among those which the next Hague Conference may deal with, inasmuch as for purposes of neutrality the difficulties connected w'ith fishery questions do not arise. 3

Authorities. — Sir Thomas Barclay, Question de la mer territoriale (published by the Association Internationale de la Marine, Paris, 1902); Idem, as rapporteur on the subject in the Annuaires de rinstilut de droit international for 1893 and 1894; Idem, Special Re- port of the International Law Association (replies to Questionnaire, 1893), and Report and Discussion (1895); Idem, Problems of Inter- national Practice and Diplomacy (London, 1907), pp. 109 et seq. See also Coulson and Forbes, Law relating to Waters (London, 1910), 3rd ed., pp. 5 et seq. (T. Ba.)

WATER-THYME, known botanically as Elodea canadensis, a small submerged water-weed, native of North America. It was introduced into Co. Down, Ireland, about 1836, and appeared in England in 1841, spreading through the country in ponds, ditches and streams, which were often choked with its rank growth. Elodea is a member of the monocotyledonous natural order Hydro charideae (q.v.).

WATERTON, CHARLES (1782-1865), English naturalist and traveller,

was bcrn at Walton Hall, near Pontefract, Yorkshire, on the 3rd of June 1782. After being educated at the Roman Catholic college of Storiyhurst, and travelling a short time in Spain, he went to Demerara to manage some estates belonging to his family. He continued in this occupation for about eight years, when he began those wanderings upon the results of which his fame as a naturalist principally rests. In his first jcurney, which began in 181 2, and the principal object of which was to collect the poison known as curare, he travelled through British Guiana by the Demerara and Essequibo rivers to the frontiers of Brazil, making many natural history collections and observa- tions by the way. After spending some time in England he returned to South America in i8r6, going by Pernambuco and Cayenne to British Guiana, where again he devoted his time to the most varied observations in natural history.. For the third time, in 1820, he sailed from England for Demerara, and agˆiin he spent his time in similar pursuits. Another sojourn in England of about three years' was followed by a visit to the United States in 1824; and, having touched at several of the "West India islands, he again went on to Demerara, returning to England at the end of the year. In 1828 he published the results of his four journeys, under the title of Wanderings in South America — consisting largely of a collection of observations on the

3 The question of revising the limits fixed for Territorial Waters in the Convention of 1882 (see above) was the subject of an animated discussion at the conference at Hull of the National Sea Fisheries Protection Association in 1906, when a resolution was adopted in favour of maintaining the present 3-miles limit on grounds of expediency, which deserve serious consideration.

appearance, character and habits of many of the animals to he found in British Guiana. Waterton Was a keen and accurate observer, and his descriptions are of a graphic and humorous character, rarely to be found in works on natural history. He married in 1829, and from that time lived mostly at Walton Hall, devoting himself to the improvement of his estate, to country pursuits, and to natural history observations. .He also pub- lished three series of Essays in Natural History (1838, 1844, 1857). He died at Walton Hall on the 27th of May 1865, from the result of an accident. His only son, Edmund Waterton (1830-1887), was an antiquary, who paid special attention to rings; some of those he collected are in the Victoria and Albert Museum.

WATERTOWN, a township of Middlesex county, Massachu- setts, U.S.A.,

on the Charles river, about 6 m. W. of Boston. Pop. (1890) 7073; (1900) 9706, of whom 2885 were foreign- born and 53 were negroes; (1910 census) 12,875. Area, 4-1 sq. m. Watertown is served by the Fitchburg division of the Boston & Maine railway, and is connected with Boston, Cambridge, Newton (immediately adjacent and served by the New York, New Haven & Hartford railway) and neighbouring towns by electric railways. It is a residential and manufacturing suburb of Boston. The township is at the head of navigation on the Charles, and occupies the fertile undulating plains along the river running back to a range of hills, the highest of which are Whitney Hill (200 ft.) and Meeting House Hill (250 ft.). Within the township are several noteworthy examples of colonial architecture. There are several small parks and squares, including Central Square, Beacon Square, about which the business portion of the township is centred, and Saltonstall Park, in which is a monument to the memory of Watertown's soldiers who died in the Civil War, and near which are the Town House and the Free Public Library, containing a valuable collection of 60,000 books and pamphlets and historical memorials. There are two interesting old burying-grounds: one on Grove Street, near the Cambridge line, first used in 1642, contains a monument to John Coolidge, killed during the British retreat from Concord and Lexington on the r9th of April 1775; the other is near the centre of the village about the former site of the First Parish Church. In Coolidge's Tavern (still standing) Washington was entertained on his New England tour in 1789; and in a house recently moved from Mt Auburn Street to Marshall Street the Committee of Safety met in 1775. Within the town- ship are mounds and earthworks which Professor E. N. Horsford thought were the remains of a Norse settlement in the nth century, and which include a semicircular amphitheatre of six tiers or terraces which he thought was an assembly place, and a portion of a stone wall or dam. The Federal government maintains at Watertown one of its principal arsenals, occupying grounds of about 100 acres along the river. Several of the original low brick buildings, built between 1816 and 1820, still stand. In 1905 the value of Watertown's factory products was $15,524,675.

Watertown was one of the earliest of the Massachusetts Bay settlements, having been begun early in 1630 by a group of settlers led by Sir Richard Saltonstall and the Rev. George Phillips. The first buildings were upon land now included within the limits of Cambridge. For the first quarter century Watertown ranked next to Boston in population and area. Since then its limits have been greatly reduced. Thrice portions have been added to Cambridge, and it has contributed territory to form the new townships of Weston (17 12), Waltharn (1738), and Belmont (1859). In 1632 the residents of Watertown protested against being compelled to pay a tax for the erection of a stockade fort at Cambridge; this was the first protest in

America against taxation without representation and led to the establishment of representative government in the colony. As early as the close of the 17th century Watertown was the chief horse and cattle market in New England and was known for its fertile gardens and fine estates. Here about 1632 was erected the first grist mill in the colony, and in 1662 one of the first woollen mills in America was built here. In the First Parish Church, the site of which is marked by a monument.

the Provincial Congress, after adjournment from Concord, met from April to July 1775; the Massachusetts General Court held its sessions here from 1775 to 1778, and the Boston town meetings were held here during the siege of Boston, when many of the well-known Boston families made their homes in the neighbourhood. For several months early in the War of Independence the Committees of Safety and Correspondence made Watertown their headquarters and it was from here that General Joseph Warren set out for Bunker Hill. In 1832-1834 Theodore Parker conducted a private school here and his name is still preserved in the Parker School.

See S. A. Drake, History of Middlesex County (2 vols., Boston, 1880); Convers Francis, A Historical Sketch of Watertown to the close of its Second Century (Cambridge, 1830); S. F. Whitney, Historical Sketch of Watertown (Boston, 1906); and " Watertown," by S. F. Whitney, in vol. iil. of D. Hamilton Hurd's History of Middlesex County (Philadelphia, 1890). The Watertown Records (4 vols., Watertown and Boston, 1894—1906) have been published by the Historical Society of Watertown (organized in 1888 and incor- porated in 1891).

WATERTOWN, a city and the county-seat of Jefferson county, New York, U.S.A., 73 m. (by rail) N. of Syracuse, on the Black river. Pop. (1890) 14,725; (1900) 21,696, of whom 5119 were foreign-born and 75 were negroes; (1910 census) 26,730. Water- town is served by the New York Central & Hudson River railway. The city has several squares and public parks, one of them, City Park, having an area of about 300 acres. Among the public buildings and institutions are the city hall, the Federal building, the county court house, a state armoury, the Flower Memorial Library (erected as a memorial to Roswell P. Flower, governor of New York in 1892-1895, by his daughter, Mrs J. B. Taylor) with 25,514 vols, in 1910, the Immaculate Heart Academy (Roman Catholic), the Jefferson County Orphan Asylum (1859), the St Patrick's Orphanage (1897; under the Sisters of St Joseph), the Henry Keep Home (1879), for aged men and women, St Joachim's Hospital (1896; under the Sisters of Mercy), and the House of the Good Samaritan (1882). Watertown is situated in a fertile agricultural and dairying region, of which it is a distributing centre, and it ships large quantities of farm produce and dairy products (especially cheese). The Black river furnishes water-power which is utilized by

manufacturing establishments of diversified character. In 1905 the city's factory product was valued at $8,371,618. Watertown was settled during the late years of the 18th century. It became the county-seat in 1805, was incorporated as a village in 1816 and was first chartered as a city in 1869.

WATERTOWN, a city of Dodge and Jefferson counties, Wisconsin, U.S.A., on both banks of the Rock river, about 45 m. W.N.W. of Milwaukee. Pop. (1890) 8755; (1900) 8437, including 2447 foreign-born; (1905'state census) 8623; (1910) 8829. Water- town is served by the Chicago & North- Western and the Chicago, Milwaukee & St Paul railways, and by an interurban electric line, connecting with Milwaukee. It is the seat of North-western University (1865; Lutheran), which includes collegiate, pre-paratory and academic departments, and had in 1908-1009 n instructors and 283 students, and of the Sacred Heart College (Roman Catholic, opened in 1872 and chartered in 1874), under the Congregation of the Holy Cross. There are also a Carnegie library, a Lutheran Home for the Feeble-Minded, and a City Hospital. The Rock river furnishes water-power which is utilized for manufacturing. The value of the factory product in 1005 was $2,065,487. The city is situated in a dairying and farming region. The municipality owns and operates its water- works. Watertown was founded about 1836 by settlers who gave it the name of their former home, Watertown, New York. Afterwards there was a great influx of Germans, particularly after the Revolution of 1848, among them being Carl Schurz, who began the practice of law here. Germans by birth or descent still constitute a majority of the population. Watertown was incorporated as a village in 1849, and was chartered as a city in 1853.

WATERVILLE, a city of Kennebec county, Maine, U.S.A., on the Kennebec river, ig m. above Augusta. Pop. (1900)

9477, of whom 2087 were foreign-born; (1910 census) 11,458. It is served by the Wiscasset, Waterville & Farmington railway, and two lines of the Maine Central railroad. The Ticonic Falls in the river afford excellent water-power, which is used in the manufacture of cotton and woollen goods. &c. In Winslow (pop. in igio, 2709), on the opposite side of the river and connected by bridges with Waterville, are large paper and pulp mills. Waterville has a Carnegie library and is the seat of Colby College (Baptist), which was incorporated as the Maine Literary and Theological Institution in 18 13, was renamed Waterville College in 1S21, was named Colby University in 1867, in honour of Gardner Colby (1810-1879), a liberal benefactor, and received its present name in 1899. Since 1S71

women have been admitted en the same terms as men. In 1910 the college library contained 51,000 volumes. Waterville was settled about the middle of the 18th century. It was a part of the township of Winslow from 1771 to 1S02, when it was incorporated as a separate town- ship. It was first chartered as a city in 1883.

WATERVLIET, a city of Albany county, New York, U.S.A., on the W. bank of the Hudson river opposite Troy and about 5 m. N. of Albany. Pop. (r89o) 12,967; (1900) 14,321, of whom 2754 were foreign-born and 59 were negroes; (1910 census) 15,074. Watervliet is served by the Delaware & Hudson railway and by steamboat lines on the Hudson river, and is connected with Troy by bridges and ferries, and with Albany, Troy, Cohoes and Schenectady by electric lines. The Erie and Champlain canals have their terminals a short distance above the city. The city has a city hall and a public library. Watervliet is situated in a good farming country, but is chiefly a manufacturing place; in 1905 its factory products were valued at $1,884,802 (25% more than in 1900), not including the product of the United States Arsenal (1807), on the river, an important manu- factory of heavy ordnance. The place was originally called West Troy and was incorporated as a village in r836; in 1897 it was chartered as a city under its present name; at the same time the township of Watervliet in which it was situated was divided into the townships cf Colonie and Green Island. In 1776 the first settlement of Shakers (q.v.) in America was made in the township by " Mother Ann " Lee and her followers, who named it Niskayuna. Here " Mother Ann " died and is buried.

WATFORD, a market town in the Watford parliamentary division of Hertfordshire, England, 17J m. N.W. of London by the London & North-Western railway. Pop. of urban district (1891) 17,063; (i9or) 29,327. It lies on the small river Colne in a pleasant undulating and well wooded district. The church of St Mary, with embattled tower and spire, is of various dates, and contains good examples of monumental work of the early 17th century; and in the churchyard is buried Robert Clutterbuck (d. 1831), author of the- History and Antiquities of the County of Hertford. There are several modern churches and chapels. The chief building within the town is the Watford Public Library and School of Art. There are large breweries, also corn-mills, malt-kilns and an iron foundry. Bushey, on the south side of the Colne, lying for the most part high above it, is a suburb, chiefly residential, with a station on the North- Western line. The church of St James, extensively restored by Sir Gilbert Scott, is Early English in its oldest part, the chancel. Here a school of art was founded by Sir Hubert von Herkomer, R.A., but it was closed in 1904, and subsequently revived in other hands. Other institutions are the Royal Caledonian Asylum and the London Orphan Asylum. At Aldenham, 2 m. N.E., the grammar school founded in 1599 now ranks as one of the minor English public schools.

WATKIN, SIR EDWARD WILLIAM, 1st Bart. (1819-1901), English railway manager, was born in Manchester on the 26th of September 1819. He was the son of Absalom Watkin, a merchant in Manchester, and was employed in his father's counting-house, ultimately becoming a partner; but in 1845 he was appointed secretary of the Trent Valley railway, which was soon afterwards absorbed by the London & North-Western Company. He next joined the Manchester & Sheffield Com- pany, of which he became general manager and then chairman,

subsequently combining with the duties thus entailed the chairmanship of the South-Eastern (1867) and of the Metropolitan (1872). His connexion with these three railways was maintained to within a short time of bis death, and they formed the material of one of his most ambitious schemes — the establishment of a through route under one management from Dover to Man- chester and the north. This was the end he had in view in his successful fight for the extension of the Manchester, Sheffield & Lincolnshire railway (now the Great Central) to London; and his persistent advocacy of the Channel tunnel (q.v.) between Dover and Calais was really a further development of the same idea, for its construction would have enabled through trains to be run from Paris to Lancashire and Scotland, via the East London (of which also he was for a time chairman) and the Metropolitan. The latter scheme, however, failed to obtain the necessary public and political support. Other projects had even less success. His plans for a tunnel between Scotland and Ireland under the North Channel, and for a ship canal across Ireland from Galway to Dublin, did not come to anything; while the great tower at Wembley Park (near Harrow), intended to surpass the Eiffel Tower at Paris, stopped at an early stage. It was in the realms of railway politics that Watkin showed to best advantage; for the routine work of administration pure and simple he had no aptitude. He entered parliament as a Liberal, and after representing Stockport from 1864 to 1868, sat as member for Hythe for twenty-one years from 1874, becoming a Liberal-Unionist at the time of the Home Rule split, and subsequently acting as a " free lance." In 1868 he received a knighthood, and in 1880 he was created a baronet. His death occurred at Northende"n, Cheshire, on the 13th of April 1901.

WATKINS, a village and the county-seat of Schuyler county, New York, U.S.A., at the head (south end) of SenecaLake, about 22 m. N.N.W. of Elmira. Pop. (1890) 2604; (1900) 2943; (1905) 2957; (1910)2817. Watkins is served by the New York Central & Hudson River, the Northern Central (Pennsylvania) and the Lehigh Valley railways, by an electric line to Elmira and by a steamer line on the lake. There are mineral springs, whose waters, notably those of an iodo-bromated brine spring, are used in bath treatment for rheumatism, gout, heart, kidney and liver diseases, &c. Partly within the village limits is Watkins Glen, a narrow winding gorge

about 2 m. long, with walls and precipices from 100 to 300 ft. high, through which flows a small stream, forming many falls, cascades and pools. The Glen property, about 103 acres, was opened as an excursion resort in 1863, and in 1906 was made a free state reservation or park and was placed in the custody of the American Scenic and Historic Preservation Society. About 3 m. S.E. is Havana Glen, about ij m. long. The first settlement here was made in 1788, and Watkins was incorporated as a village in 1842.

WATLING STREET, the Early English name for the great road made by the Romans from London past St Albans (Roman Vemlamium) to Wroxeter (Roman Viroconium) near Shrewsbury and used by the Anglo-Saxons, just as a great part of it is used to-day. According to early documents the name was at first Waeclinga (or Waetlinga) strset; its derivation is unknown, but an English personal name may lie behind it. After the Conquest the road was included in the list of four Royal Roads which the Norman lawyers recorded or invented (see Ermine Street). Later still, in the Elizabethan period and after it, the name Watling Street seems to have been applied by anti- quaries to many Roman or reputed Roman roads in various parts of Britain, and English map-makers and inferior writers on Roman roads still perpetuate the fictions. In particular, the Roman " North Road " which ran from York through Corbridge and over Cheviot to Newstead near Melrose, and thence to the Wall of Pius, and which has largely been in use ever since Roman times, is now not unfrequently called Watling Street, though there is no old authority for it and throughout the middle ages the section of the road between the Tyne and the Forth was called Dere Street. (F. J. H.)

WATSON, RICHARD ˆ737-1816), English divine, was bom in August 1737 at Heversham in Westmorland. His father, a

schoolmaster, sent him to Trinity College, Cambridge, where he was elected a fellow in 1760. About the same time he had the offer of the post of chaplain to the factory at Bencoolen, in the Straits Settlements. " You are too good," said the master of Trinity, " to die of drinking punch in the torrid zone "; and Watson, instead of becoming, as he had nattered himself, a great orientalist, remained at home to be elected professor of chemistry, a science of which he did not at the time possess the simplest rudiments. " I buried myself," he says, " in my laboratory, and in fourteen months read a course of chemical lectures to a very full audience." One of his discoveries led to the black-bulb thermometer. Not the least of his

services was to procure an endowment for the chair, which served as a precedent in similar instances. In 177 1 he was appointed regius professor of divinity, but did not entirely renounce the study of chemistry. In 1768 he had published Institutions metallurgical, intended to give a scientific form to chemistry by digesting facts established by experiment into a connected series of propositions. In 1781 he followed this up with an introductory manual of Chemical Essays. In 1776 he answered Gibbon's chapters on Christianity, and had the honour of being one of the only two opponents whom Gibbon treated with respect. The same year he offended the court by a Whig sermon, but in 1779 became archdeacon of Ely. He had always opposed the American War, and on the accession of Lord Shelburne to power in 1782 was made bishop of Llandaff, being permitted to retain his other preferments on account of the poverty of the see. Shelburne expected great service from him as a pamphleteer, but Watson proved from the ministerial point of view a most impracticable prelate. He immediately brought forward a scheme for improving the condi- tion of the poorer clergy by equalizing the incomes of the bishops, the reception of which at the time may be imagined, though it was substantially the same as that carried into effect by Lord Melbourne's government fifty years later. Watson now found that he possessed no influence with the minister, and that he had destroyed his chance of the great object of his ambition, promo- tion to a better diocese. Neglecting both his see and his professor- ship, to which latter he appointed a deputy described as highly incompetent, he withdrew to Calgarth Park, in his native county, where he occupied himself in forming plantations and in the improvement of agriculture. He also frequently came forward as a preacher and as a speaker in the House of Lords. His advice to the government in 1787 is said to have saved the country £100,000 a year in gunpowder. In 1796 he published, in answer to Thomas Paine, an Apology for Ike Bible, perhaps the best known of his numerous writings. Watson continued to exert his pen with vigour, and in general to good purpose, denouncing the slave trade, advocating the union with Ireland, and offering financial suggestions to Pitt, who seems to have frequently consulted him. In 1798 his Address to the People of Great Britain, enforcing resistance to French arms and French principles, ran through fourteen editions, but estranged him from many old friends, who accused him, probably with injustice, of aiming to make his peace with the government. Though querulous because of his non- preferment, De Quincey tells us that " his lordship was a joyous, jovial, and cordial host." He died on the 2nd of July 1816, having occupied his latter years in the composition and revision of an autobiography (published in 1817), which, with all its egotism and partiality, is a valuable work, and the chief authority for his life.

WATSON, THOMAS (c. 1557-1592), English lyrical poet, was born in

London, probably in 1557. He proceeded to Oxford, and while quite a young man enjoyed a certain reputation, even abroad, as a Latin poet. His De remedio amoris, which was perhaps his earliest important composition, is lost, and so is his " piece of work written in the commendation of women-kind," which was also in Latin verse. He came back to London and became a law-student. The earliest publication by Watson which has survived is a Latin version of the Antigone of Sophocles, issued in 1581. It is dedicated to Philip Howard, earl of Arundel, who was perhaps the patron of the poet, who seems to have spent some part of this year in Paris. Next year Watson appears for

the first time as an English poet in some verses prefixed to Whet- stone's Heptameron, and also in a far more important guise, as the author of the 'ExarojuTraflia or Passionate Centurie of Ijjve. This is a collection or cycle of 100 pieces, in the manner of Petrarch, celebrating the sufferings of a lover and his long farewell to love. The technical peculiarity of these interesting poems is that, although they appear and profess to be sonnets, they are really written in triple sets of common six-line stanza, and therefore have eighteen lines each. It seems likely that Watson, who courted comparison with Petrarch, seriously desired to recommend this form to future sonneteers; but in this he had no imitators. 1 Among those who were at this time the friends of Watson we note Matthew Royden and George Peele. In 1585 he published a Latin translation ofTasso's pastoral play of Aminla, and his version was afterwards trans- lated into English by Abraham Fraunce (1587). Watson was now, as the testimony of Nashe and others prove, regarded as the best Latin poet of England. In 1590 he published, in English and Latin verse, his Meliboeus, an elegy on the death of Sir Francis Walsingham, and a collection of Italian Madrigals, put into English by Watson and set to music by Byrd. Of the remainder of Watson's career nothing is known, save that on the 26th of September 1592 he was buried in the church of St Bartholomew the Less, and that in the following year his latest and best book, The Tears of Fancie, or Love Disdained (1593), was posthumously published. This is a collection of sixty sonnets, regular in form, so far at least as to have fourteen lines each. Spenser is supposed to have alluded to the untimely death of Watson in Colin Clout's Come Home Again, when he says: — " Amyntas quite is gone and lies full low, Having his Amaryllis left to moan." He is mentioned by Meres in company with Shakespeare, Peele and Marlowe among " the best for tragedie," but no dramatic work of his except the translations above mentioned has come down to us. It is certain that this poet enjoyed a great reputa- tion in his lifetime, and that he was not without a direct influence upon the youth of Shakespeare. He was the first, after the original experiment made by Wyat and Surrey, to introduce the pure imitation of Petrarch into English poetry. He was well read in Italian, French and Greek

literature. Watson died young, and he had not escaped from a certain languor and insipidity which prevent his graceful verses from producing their full effect. This demerit is less obvious in his later than in his earlier pieces, and with the development of the age, Watson, whose con- temporaries regarded him as a poet of true excellence, would prob- ably have gained power and music. As it is, he has the honour of being one of the direct forerunners of Shakespeare (in Venus and Adonis and in the Sonnets), and of being the leader in the long procession of Elizabethan sonnet-cycle writers. (E. G.)

The English works of Watson, excepting the madrigals, were first collected by Edward Arber in 1870. Thomas Watson's " Italian Madrigals Englished" (1590) were reprinted (ed. F. J. Carpenter) from the Journal of Germanic Philology (vol. ii., No. 3, p. 337} with the original Italian, in 1899. See also Mr Sidney Lee's Introduction (pp. xxxii.-xli.) to Elizabethan Sonnets in the new edition (1904) of An English Garner.

1 Speaking of the Hecatompathia, Mr Sidney Lee says : " Watson deprecates all claim to originality. To each poem he prefixes a prose introduction in which he frankly indicates, usually vith ample quotations, the French, Italian or classical poem whicl) was the source of his inspiration " {Elizabethan Sonnets, p. xxviii.). In a footnote (p. xxxix.) he adds: " Eight of Watson's sonnets oie, according to his own account, renderings from Petrarch ; twelve are from Serafmo dell' Aquila (1466-1500); four each come from Strozza, the Ferrarese poet, and from Ronsard; three from the Italian poet, Agnolo Firenzuola (1493-1548) ; two each from the French poet, Etienne Forcadel, known as Forcatulus (I5I4? I573), the Italian Girolamo Parabosco (fl. 1548), and Aeneas Sylvius; while many arc based on passages from such authors as (among the Greeks) Sophocles.Theocritus, Apollonius of Rhodes (author of the epic Argonautka); or (among the Latins), Virgil, Tibullus, Ovid, Horace, Propertius, Seneca, Pliny, Lucan, Martial and Valerius Flaccus; or (among the modern Italians) Angelo Poliziano (1454 1494) and Baptista Mantuanus (1448-1516); or (among other modern Frenchmen) Gervasius Sepinus of Saumur, writer of eclogues after the manner of Virgil and Mantuanus."

WATSON, WILLIAM (c. 1559-1603), English conspirator, was a native of the north of England, and was born probably on the 23rd of April 1559. In 1586 he became a Roman Catholic priest in France, and during the concluding years of Elizabeth's reign he paid several visits to England; he

was imprisoned and tortured more than once. He became prominent as a champion of the secular priests in their dispute with the Jesuits, and in 1601 some writings by him on this question appeared which were answered by Robert Parsons. When Elizabeth died, Watson hastened to Scotland to assure James I. of the loyalty of his party, and to forestall the Jesuits, who were suspected of intrigu- ing with Spain. The new king did not, however as was hoped, cease to exact the necessary fines; and the general dissatisfaction felt by the Roman Catholics gave rise to the " Bye plot," or " Watson's plot," in which connexion this priest's name is best known, and to its sequel the Main or Cobham's, plot; Watson discussed the grievances of his cc-religionists with another priest, William Clark, with Sir Griffin Markham and Anthony Copley, and with a disappointed Protestant courtier, George Brooke; they took another Protestant, Thomas, 1 5th Lord Grey de Wilton, into their confidence, and following many Scottish precedents it was arranged that James should be surprised and seized, while they talked loudly about capturing the Tower of London, con- verting the king to Romanism, and making Watson lord keeper. One or two of the conspirators drew back; but Watson and his remaining colleagues arranged to assemble at Greenwich on the 24th of June 1603, and under the pretence of presenting a petition to carry out their object. The plot was a complete failure; Henry Garnet and other Jesuits betrayed it to the authorities, and its principal authors were seized, Watson being captured in August at Hay on the Welsh border. They were tried at Winchester and found guilty; Watson and Clark were executed on the oth of December 1603, and Brooke suffered the same fate a week later. Grey and Markham were reprieved. Before the executions took place, however,, the failure of the Bye plot had led to the discovery of the Main plot. Brooke's share in the earlier scheme caused suspicion to fall upon his brother Henry Brooke, Lord Cobham, the ally and brother-in-law of Sir Robert Cecil, afterwards earl of Salisbury. Cobham appears to have been in communication with Spain about the possibility of killing " the king and his cubs " and of placing Lady Arabella Stuart on the throne. He was seized, tried and condemned to death, but although led out to the scaffold he was not executed. It was on suspicion of being associated with Cobham in this matter that Sir Walter Raleigh was arrested and tried.*

See the documents printed by T. G. Law in The Archpriest contro- versy (1896-1898); the same writer's Jesuits and Seculars (1889), and S. R. Gardiner, History of England, vol. i. (1905).

WATSON. WILLIAM (1858-), English poet, was born on the 2nd of August 1858 at Burley-in- Wharf edale, Yorkshire, and was brought up at Liverpool, whither his father moved for business. In 1880 he published his first book The Prince's Quest, a poem showing the influence of Keats and Tennyson, but giving little indication of the author's mature style. It

attracted no attention until it was republished in 1893 after Mr Watson had made a name by other work. In 1884 appeared Epigrams of Art, Life and Nature, a remarkable little-volume, which already showed the change to Mt Watson's characteristic restraint and concision of manner. But it passed unnoted. Recognition came with the publication of Wordsworth's Grate in 1890; and fame with the publication of the second edition in 1891, and the appearance in the Fortnightly Review, August 1 891, of an article by Grant Allen entitled " A New Poet." Wordsworth's Grave, which marked a reversion from the current Tennysonian and Swinburnian fashion to the meditative note of Matthew Arnold, exhibited in full maturity Mr Watson's poetical qualities; his stately diction, his fastidious taste, his epigrammatic turn, his restrained yet eloquent utterance, his remarkable gift of literary criticism in poetic form. Besides Wordsworth's Grave the volume contained Ver tenebrosum (originally published in the National Review for June 1885), a series of political sonnets

indicating a fervour of political conviction which was later to find still more impassioned expression; also a selection with additions from the Epigrams of 1884, and among other miscellane- ous pieces his tribute to Arnold, " In Laleham Churchyard." During the years 1890-1892 he contributed articles to the National Review, Spectator, Illustrated London News, Academy, Bookman and Atalanta, which were collected and republished in 1893 as Excursions in Criticism. In 1893 he also published Lacrymae Musaram, the poem which gave the title to the volume being a fine elegy on the death of Tennyson; and it included the poem on " Shelley's Centenary " (both of these printed privately in 1892), and " The Dream of Man," the earliest of his philo- sophical poems. The same year, too, saw the publication of The Eloping Angels, a serio-comic trifle of small merit, dedicated to Grant Allen. During this year Mr Gladstone bestowed on him the Civil List pension of £200 available on the death of Tennyson. In 1894 followed Odes and Other Poems, and in 1895 The Father of lite Forest, which contained also the fine " Hymn to the Sea " in English elegiacs (originally contributed to the Yellow Book), " The Tomb of Burns," and " Apologia," a piece of candid and just self-criticism. The volume contained also a sonnet " To the Turk in Armenia," a prelude to the series of sonnets about Armenia contributed to the Westminster Gazette and republished in a brochure called The Purple East in 1896. These sonnets were republished with revision and con- siderable additions, and a preface by the bishop of Hereford, in The Year of Shame in 1897. Whatever view was taken of the poet's incursion into politics, no one doubted his passionate sincerity, or the excellence of the poetical rhetoric it inspired. In 1898 were published his Collected Poems and a volume of new poetry The Hope of the World, which opened' with his three chief philosophical poems, the title piece, " The Unknown God," and " Ode in May." In 1902 he printed privately' 50

copies of New Poems, and published his " Ode on the Coronation of King Edward VII.," a favourable specimen of its class; and in 1903 besides a volume of Selected Poems a collection of poems contri- buted to various periodicals and called For England: Poems Written During Estrangement, a. poetical defence of his impugned patriotism during the Boer War. In 1909 appeared an important volume of New Poems.

Mr Watson's poetry falls chiefly into the classes above in- dicated — critical, philosophical and political —to which may be added a further class of Horatian epistles to his friends. This classification indicates the high character and also the limitations of his poetry. It is contemplative, not dramatic, and only occasionally lyrical in impulse. In spite of the poet's plea in his " Apologia " that there is an ardour and a fire other than that of Eros or Aphrodite, ardour and fire are not conspicuous qualities of his verse. Except in his political verse there is more thought than passion. Bearing trace enough of the influence of the romantic epoch, his poetry recalls the earlier classical period in its epigrammatic phrasing and Latinized diction. By the distinction and clarity of his style and the dignity of his move- ment William Watson stands in the true classical traditionof great English verse, in a generation rather given over to lawlessness and experiment.

See also section on William Watson in Poets of the Younger Genera- tion, by William Archer (1902) ; and for bibliography up to Aug. 1903, English Illustrated Magazine, vol. xxix. (N.S.), pp. 542 and 548- (W.P.J.)

WATT, JAMES (1736-1819), Scottish engineer, the inventor of the modern condensing steam-engine, was born at Greenock on the 19th of January 1736. His father was a small merchant there, who lost his trade and fortune by unsuccessful speculation, and James was early thrown on his own resources. Having a taste for mechanics he made his way to London, at the age of nineteen, to learn the business of a philosophical-instrument maker, and became apprenticed to one John Morgan, in whose service he remained for twelve months. From a child he had been extremely delicate, and the hard work and frugal living of his London pupilage taxed his strength so severely that he was forced at the end of a year to seek rest at home, not, however,

until he had gained a fair knowledge of the trade and become handy in the use of tools. Before going to London he had made the acquaintance of some of the professors in Glasgow college, and on his return to Scotland in

1756 he sought them out and obtained work in repairing astronomical instruments. He next tried to establish himself as an instrument maker in Glasgow, but the city gilds would not recognize a craftsman who had not served the full term of common apprenticeship, and Watt was forbidden to open shop in the burgh. The college, however, took him under its protection, and in 1757 he was established in its precincts with the title of mathematical-instrument maker to the university.

Before many months Joseph Black, the discoverer of latent heat, then lecturer on chemistry, and John Robison, then a student, afterwards professor of natural philosophy at Edinburgh, became his intimate friends, and with them he often discussed the possibility of improving the steam-engine, of which at that time Thomas Newcomen's was the most advanced type. The engine was then applied only to pumping water — chiefly in the drainage of mines; and it was so clumsy and wasteful of fuel as to be but little used. Some early experiments of Watt in 1761 or 1762 led to no positive result, but in 1764 his attention was seriously drawn to the matter by having a model of Newcomen's engine, which formed part of the college collection of scientific apparatus, given him to repair. Having put the model in order, he was at once struck with its enormous consumption of steam, and set himself to examine the cause of this and to find a remedy.

In Newcomen's engine the cylinder stood vertically under one end of the main lever or " beam " and was open at the top. Steam, at a pressure scarcely greater than that of the atmosphere, was admitted to the under side; this allowed the piston to be pulled up by a counterpoise at the other end of the beam. Communication with the boiler was then shut off, and the steam in the cylinder was condensed by injecting a jet of cold water from a cistern above. The pressure of the air on the top of the piston then drove it down, raising the counterpoise and doing work. The injection water and condensed steam which had gathered in the cylinder were drained out by a pipe leading down into a well.

Watt at once noticed that the alternate heating and cooling of the cylinder in Newcomen's engine made it work with tedious slowness and excessive consumption of steam. When steam was admitted at the beginning of each stroke, it found the metal of the cylinder and piston chilled by contact with the condensed steam and cold injection water of the previous stroke, and it was not until much steam had been condensed in heating the chilled surfaces that the cylinder was able to fill and the piston to rise. His first attempt at a remedy was to use for the material of the cylinder a substance that would take in and give out heat slowly. Wood was tried, but it made matters only a little better, and did not promise to be durable. Watt observed that the evil was intensified whenever, for the sake of making a good vacuum under the piston, a specially large quantity of injection water

was supplied.

He then entered on a scientific examination of the properties of steam, studying by experiment the relation of its density and pressure to the temperature, and concluded that two conditions were essential to the economic use of steam in a condensing steam-engine. One was that the temperature of the condensed steam should be as low as possible, ioo° F. or lower, otherwise the vacuum would not be good; the other was, to quote his own words, " that the cylinder should be always as hot as the steam which entered it." In Newcomen's engine these two conditions were incompatible, and it was not for some months that Watt saw a means of reconciling them. Early in 1765, while walking on a Sunday afternoon in Glasgow Green, the idea flashed upon him that, if the steam were condensed in a vessel distinct from the cylinder, it would be practicable to make the temperature of condensation low, and still keep the cylinder hot. Let this separate vessel be kept cold, either by injecting cold water or by letting it stream over the outside, and let a vacuum be maintained in the vessel. Then, whenever

communication was made between it and the cylinder, steam would pass over from the cylinder and be condensed; the pressure in the cylinder would be as low as the pressure in the condenser, but the temperature of the metal of the cylinder would remain high, since no injection water need touch it. Without delay Watt put this idea to the test, and found that the separate con- denser did act as he had anticipated. To maintain the vacuum in it he added another new oigan, namely, the air-pump, the function of which is to remove the condensed steam and water of injection along with any air that gathers in the condenser.

To further his object of keeping the cylindet as hot as the steam that entered it, Watt supplemented his great invention of the separate condenser by several less notable but still import- ant improvements. In Newcomen's engine a layer of water over the piston had been used to keep it steam-tight; Watt substituted a tighter packing lubricated by oil. In Newcomen's engine the upper end of the cylinder was open to the air; Watt covered it in, leading the piston-rod through a steam-tight stuffing box in the cover, and allowed steam instead of air to press on the top of the piston. In Newcomen's engine the cylinder had no clothing to reduce loss of heat by radiation and conduction from its outer surface; Watt not only cased it in non-conducting material, such as wood, but introduced a steam- jacket, or layer of steam, between the cylinder proper and an outer shell.

All these features were specified in his first patent (see Steam- Engine), which, however, was not obtained till January 1769, nearly four years after the inventions it covers had been made. In the interval Watt had been

striving to demonstrate the merits of his engine by trial on a large scale. His earliest experiments left him in debt, and, finding that his own means were quite insufficient to allow him to continue them, he agreed that Dr John Roebuck, founder of the Carron ironworks, should take two-thirds of the profits of the invention in consideration of his bearing the cost. An engine was then erected at Kinneil, near Linlithgow, where Roebuck lived, and this gave Watt the opportunity of facing many difficulties in details of construction. But the experiments made slow progress, for Roebuck's affairs became embarrassed, and Watt's attention was engaged by other work. He had taken to surveying, and was fast gaining reputa- tion as a civil engineer. In 1767 he was employed to make a survey for a Forth and Clyde canal — a scheme which failed to secure parliamentary sanction. This was followed during the next six years by surveys for a canal at Monkland, for another through the valley of Strathmore from Perth to Forfar, and for others along the lines afterwards followed by the Crinan and Caledonian canals. He prepared plans for the harbours of Ayr, Port-Glasgow and Greenock, for deepening the Clyde, and for building a bridge over it at Hamilton. In the course of this work he invented a simple micrometer for measuring distances, consisting of a pair of horizontal hairs placed in the focus of a telescope, through which sights were taken to a fixed arid movable target on a rod held upright at the place whose distance from the observer was to be determined. The micrometer was varied in a number of ways; and another fruit of his ingenuity about the same time was a machine to facilitate drawing in perspective.

Meanwhile the engine had not been wholly neglected. Watt had secured his patent; the Kinneil trials had given him a store of valuable experience; Roebuck had failed, but another partner was ready to take his place. In 1768 Watt had made the acquaintance of Matthew Boulton, a man of energy and capital, who owned the Soho engineering works at Birmingham. Boulton agreed to take Roebuck's share in the invention, and to join Watt in applying to parliament for an act to prolong the term of the patent. The application was successful. In 1775 an act was passed continuing the patent for twenty-five years. By this time the inventor had abandoned his civil engineering work and had settled in Birmingham, where the manufacture of steam-engines was begun by the firm of Boulton & Watt. The partnership was a singularly happy one. Boulton had the good sense to leave the work of inventing to Watt, in whose

genius he had the fullest faith; on the other hand, his substantial means, his enterprise, resolution, and business capacity supplied what was wanting to

bring the invention to commercial success. During the next ten years we find Watt assiduously engaged in developing and introducing the engine. Its first and for a time its only application was in pumping; it was at once put to this use in the mines of Cornwall, where Watt was now frequently engaged in superintending the erection of engines. Further inventions were required to fit it for other uses, and these followed in quick succession. W T att's second steam-engine patent is dated 1781. It describes five different methods of converting the reciprocating motion of the piston into motion of rotation, so as to adapt the engine for driving ordinary machinery. The simplest way of doing this, and the means now universally followed, is by a crank and fly-wheel; this had occurred to Watt, but had meanwhile been patented by another, and hence he devised the " sun and planet wheels " and other equivalent contrivances. A third patent, in 1782, contained two new inventions of the first importance. Up to this time the engine had been single-acting; Watt now made it double-acting; that is to say, both ends of the cylinder, instead of only one, were alternately put in communication with the boiler and the condenser. Up to this time also the steam had been admitted from the boiler throughout the whole stroke of the piston; Watt now introduced the system of expansive working, in which the admission valve is closed after a portion only of the stroke is performed, and the steam enclosed in the cylinder is then allowed to expand during the remainder of the stroke, doing additional work upon the piston without making any further demand upon the boiler until the next stroke requires a fresh admission of steam. He calculated that, as the piston advanced after admission had ceased, the pressure of the steam in the cylinder would fall in the same proportion as its volume increased —a law which, although not strictly true, does accord very closely with the actual behaviour of steam expanding in the cylinder of an engine. Recognizing that this would cause a gradual reduction of the force with which the piston pulled or pushed against the beam, Watt devised a number of contrivances for equalizing the effort throughout the stroke. He found, however, that the inertia of the pump-rods in his mine engines, and the fly-wheel in his rotative engines, served to compensate for the inequality of thrust sufficiently to make these con trivances unnecessary. His fourth patent, taken out in 1784, describes the well-known " parallel motion," an arrangement of links by which the top of the piston-rod is connected to the beam so that it may cither pull or push, and is at the same time guided to move in a sensibly straight line. " I have started a new hare," he writes to Boulton in June of that year; " I have got a glimpse of a method of causing a piston-rod to move up and down perpendicularly by only fixing it to a piece of iron upon the beam, without chains or perpendicular guides or untowardly frictions, arch-heads, or other pieces of clumsiness. I think it a very probable thing to succeed, and one of the most ingenious simple pieces of mechanism I have contrived."*

A still later invention was the throttle-valve and centrifugal governor, by which the speed of rotative engines was automatic- ally controlled. One more item in the list of Watt's contributions to the development of the steam-engine is too important to be passed without mention: the indicator, which draws a diagram of the relation of the steam's pressure to its volume as the stroke proceeds, was first used by Boulton & Watt to measure the work done by their engines, and so to give a basis on which the charges levied from their customers were adjusted. It would be difficult to exaggerate the part which this simple little instru- ment has played in the evolution of the steam-engine. The eminently philosophic notion of an indicator diagram is funda- mental in the theory of thermodynamics; the instrument itself is to the steam engineer what the stethoscope is to the physician, and more, for with it he not only diagnoses the ailments -if a faulty machine, whether in one or another of its organs, but gauges its power in health.

The commercial success of the engine was not long in being

established. By 1783 all but one of the Newcomen pumping- engines in Cornwall had been displaced by Watt's. The mines were then far from thriving; many were even on the point of being abandoned through the difficulty of dealing with large volumes of water; and Watt's invention, which allowed this to be done at a moderate cost, meant for many of them a new lease of life. His engine used no more than a fourth of the fuel that had formerly been needed to do the same work, and the Soho firm usually claimed by way of royalty a sum equivalent to one-third of the saving — a sum which must have been nearly equal to the cost of the fuel actually consumed. Rival manu- facturers came forward, amongst whom Edward Bull and Jonathan Carter Hornblower are the most conspicuous names. They varied the form of the engine, but they could not avoid infringing Watt's patent by the use of a separate condenser. When action was taken against them on that ground, they retaliated by disputing the validity of the fundamental patent of 1769. In the case of Boulton & Watt v. Bull the court was divided on this point, but in an action against Hornblower the patent was definitely affirmed to be valid by a unanimous finding of the Court of King's Bench. This was in 1799, only a year before the monopoly expired, but the decision enabled the firm to claim a large sum as arrears of patent dues. In connexion with these trials Watt himself, as well as his early friends Black and Robison, drew up narratives of the invention of the steam-engine, which are of much interest to the student of its history. 1

Before Watt's time the steam-engine was exclusively a steam- pump, slow-working, cumbrous and excessively wasteful of fuel. His first patent made it quick in working, powerful and efficient, but still only as a steam-pump. His later inventions adapted it to drive machinery of all kinds, and left it

virtually what it is to-day, save in three respects. In respect of mechanical arrangement the modern engine differs from Watt's chiefly- in this,- that the beam, ah indispensable feature in the early pumping-engines, and one which held its place long after the need for it had vanished, has gradually given way to more direct modes of connecting the piston with the crank. Another difference is in the modern use of high-pressure steam. It is remarkable that Watt, notwithstanding the fact that his own invention of expansive working must have opened his eyes to the advantage of high-pressure steam, declined to admit it into his practice. He persisted in the use of pressures that were little if at all above that of the atmosphere. His rivals in Cornwall were not so squeamish. Richard Trevithick ventured as far as 120 lb on the square" inch, and a curious episode in the history of the steam-engine is an attempt which Boulton & Watt made to have an act of parliament passed forbidding the use of high pressure on the ground that the lives of the public were endangered. The third and pnly other respect in which a great improvement has been effected is in the introduction of compound expansion. Here, too, one cannot but regret to find the Soho firm hostile," though the necessity of defending their monopoly makes their action natural enough. Hotfiriblower had in fact stumbled on the invention of the compound engine, but as his machine employed Watt's condenser it was suppressed, to be revived after some years by Arthur Woolf (l 766-1837). In one of his patents (1784) Watt describes a steam locomotive, but he never prosecuted this, and when William Mur- doch, his chief assistant (famous as the inventor of gas-lighting), made experiments on the same lines, Watt gave him little encourage- ment. The notion then was to use a steam carriage on ordinary roads; its use on railways had not yet been thought of. When that idea took form later in the last years of Watt's life, the old man refused to smile upon his offspring; it is even said that he put a clause in the lease of his house that no steam carriage should on any pretext be allowed to approach it.

On the expiry in 1800 of the act by which the patent of 1769 liad been extended, Watt gave up his share in the business of engine-building to his sons, James, who carried it on along with a son of Boulton for many years, and Gregory, who died in 1804. The remainder of his life was quietly spent at Heathfield Hall, his house near Birmingham, where he devoted his time, with scarcely an interruption, to mechanical pursuits. His last work was the invention of machines for copying sculpture

1 Another narrative of the utmost interest was written by Watt in 1814 in the form of a footnote to Robison's article " Steam-Engine, " from the fourth edition of the Encyclopaedia Britannica, which Watt revised before it was reprinted in the collected edition of Robison's works. See Robison's Mechanical Philosophy, vol. it.

— one for making reduced copies, another for talcing facsimiles by means of a light stiff frame, which carried a pointer over the surface of the work while a revolving tool fixed to the frame alongside of the pointer cut a corresponding surface on a suit- able block. We find him in correspondence with Sir Francis Chantrey about this machine nut many months before his death, and presenting copies of busts to his friends as the work " of a young artist just entering on his eighty-third year." His life drew to a tranquil close, and the end came at Heathfield on the 19th of August 1810. His remains were interred in the neighbouring parish church of Handsworth.

Watt was twice married — first in 1763 to his cousin Margaret Miller, who died ten years later. Of four children born of the marriage, two died in infancy; another was James (1769-1848), who succeeded his father in business; the fourth was a daughter who lived to maturity, but died early, leaving two children. His second wife, Anne Macgregor, whom he married before settling in Birmingham in 1775, survived him; but her two children, Gregory and a daughter, died young.

Some of Watt's minor inventions have been already noticed. Another, which has proved of great practical value, was the letter- copying press, for copying manuscript by using a glutinous ink and pressing the written page against a moistened sheet of thin paper. He patented this in 1780, describing both a roller press, the use of which he seems to have preferred in copying his own correspond- ence, and also the form of screw press now found in every merchant's office.

In the domain of pure science Watt claims recognition not only as having had ideas greatly in advance of his age regarding what is now called energy, but as a discoverer of the composition of water. Writing to Joseph Priestley in April 1783, with reference to some of Priestley's experiments, he suggests the theory that " water is composed of dephlogisticated air and phlogir.ton deprived of part of their latent or elementary heat." It is difficult to determine the exact meaning attached to these antiquated terms, and to say how far Watt's suggestion anticipated the fuller discovery of Cavendish. Watt's views were communicated to the Royal Society in 1783, Cavendish's experiments in 1784, and both are printed in the same volume of the Philosophical Transactions.

The early and middle part of Watt's life was a long struggle with poor health: severe headache prostrated him for days at a time; but as he grew old his constitution seems to have become more robust. His disposition was

despondent and shrinking; he speaks of himself, but evidently with unfair severity, as ‘ indolent to excess.” ” I am not enterprising,” he writes; ” I would rather face a loaded cannon than settle an account or make a bargain; in short, I find myself out of my sphere when I have anything to do with mankind.” He was a man of warm friendships, and has left a personal memorial of the greatest interest in his numerous letters. They are full of sagacity and insight : his own achievements are told with a shrewd but extremely modest estimate of their value, and in a style of remarkable terseness and lucidity, lightened here and there by a touch of dry humour. In his old age Watt is described by his contemporaries as a man richly stored with the most various knowledge, full of anecdote, familiar with most modern languages and their literature, a great talker. Scott speaks of ” the alert, kind, benevolent old man, his talents and fancy overflowing on every subject, with his attention alive to every one’s question, his information at every one’s command.”

See J. P. Muirhead, Origin and Progress of the Mechanical In- ventions of James Watt (3 vols., 1854; vols. i. and ii. contain a memoir and Watt’s letters; vol. iii. gives a reprint of his patent specifications and other papers); Muirhead, Life of Watt (1858); Smiles, Lives of Boulton and Watt; Williamson”, Memorials of the Lineage, &c, of James Watt, published by the Watt Club (Greenock, 1856) ; Correspondence of the late James Watt on his Discovery of the Theory of the Composition of Water, edited by Muirhead (1846); Cowper, ” On the Inventions of James Watt and his Models preserved at Handsworth and South Kensington,” Proc. Inst. Mech. Eng. (1883); article ” Watt ” in the Encyclopaedia Britannica (6th edition, 1823), by James Watt, junior; Robison, Mechanical Philosophy, vol. ii. (1822) (letters and notes by Watt on the History of the Steam- Engine). Q. A. E.)

WATTEAU, ANTOINE (1684-1721), French painter, was born in Valenciennes, of humble Flemish origin. Comte de Caylus, his staunch friend of later years, and his first biographer, refers to Watteau’s father as a hard man, strongly disinclined lo accede to his son’s wish to become a painter; but other accounts show him in a kinder light — as a poor, struggling man, a tiler by trade, who secured for his son the best possible education. Certain it is that at the age of fourteen Watteau was placed with Gerin, a mediocre Valenciennes painter, with

*whom he remained until 1702. It *s to be assumed that he learnt far more from the study of Ostade’s and Teniers’s paintings in his native town than from his first master’s teaching. Not only in subject-matter, but in their general tonality, his earliest works, like ” La Vraie Gaiete,” which was in the collection of Sir Charles Tennant, suggest this influence. Gerin died in 1702, and Watteau, almost penniless, went to Paris, where he found*

employment with the scene-painter Metayer. Things, however, went badly with his new master, and Watteau, broken down in health and on the verge of starvation, was forced to work in a kind of factory where devotional pictures were turned out in wholesale fashion. Three francs a week and meagre food were his reward; but his talent soon enabled him to paint the St Nicolas, the copying of which was allotted to him, without hav- ing to refer to the original. Meanwhile he spent his rare leisure hours and the evenings in serious study, sketching and drawing his impressions of types and .scenes. His drawings attracted the attention of Claude Gillot, an artist imbued with the spirit of the Renaissance, who after having successfully tried himself in the mythological and historical genre, was just at that time devoting himself to the characters and incidents of the Italian comedy. Gillot took Watteau as pupil and assistant, but the young man made such rapid progress that he soon equalled and excelled his master, whose jealousy led to a quarrel, as a result of which Watteau, and with him his fellow-student and later pupil, Lancret, severed his connexion with Gillot and entered about 1708 the studio of Claude Audran, a famous decorative painter who was at that time keeper of the collections at the Luxembourg Palace. From him Watteau acquired his knowledge of decorative art and ornamental design, the garland-like composition which he applied to the designing of screens, fans and wall panels. At the same time he became deeply imbued with the spirit of Rubens and Paolo Veronese, whose works he had daily before him at the palace; and he continued to work from nature and to collect material for his formal garden backgrounds among the fountains and statues and stately avenues of the Luxembourg gardens. His chinoiseries and singeries date probably from the years during which he worked with Audran,

Perhaps as a recreation from the routine of ornamental design, Watteau painted at this time " The Departing Regiment," the first picture in his second and more personal manner, in which the touch reveals the influence of Rubens's technique, and the first of a long series of camp pictures. He showed the painting to Audran, who, probably afraid of losing so talented and useful an assistant, made light of it, and advised him not to waste his time and gifts on such subjects. Watteau, suspicious of his master's motives, determined to leave him, advancing as excuse his desire to return to Valenciennes. He found a purchaser, at the modest price of 60 livres, in Sirois, the father- in-law of his later friend and patron Gersaint, and was thus enabled to return to the home of his childhood. In Valenciennes he painted a number of the small camp-pieces, notably the " Camp-Fire," which was again bought by Sirois, the price this time being raised to 200 livres; this is now in the collection of Mr W. A. Coats in Glasgow. Two small pictures of the same type are at the Hermitage in St Petersburg.

Returning to Paris after a comparatively short sojourn at Valenciennes, he

took up his abode with Sirois, and competed in i7og for the Prix de Rome. He only obtained the second prize, and, determined to go to Rome, he applied for a crown pension and exhibited the two military pictures which he had sold to Sirois, in a place where they were bound to be seen by the academicians. There they attracted the attention of de la Fosse, who, struck by the rare gifts displayed in these works, sent for Watteau and dissuaded him from going to Italy, where he had nothing to learn. It was to a great extent due to de la Fosse and to Rigaud that Watteau was made an associate of the Academy in 1712, and a full member in 1717, on the completion of his diploma picture, " The Embarkment for Cythera," now at the Louvre. A later, and even more perfect, version of the same subject is in the possession of the German emperor. It is quite possible that the superb portrait of' Rigaud by Watteau

belonging to Mr Hodgkins, was painted in acknowledgment of Rigaud's friendly action.

Watteau now went to live with Crozat, the greatest private art collector of his time, for whom he painted a set of four decorative panels of " The Seasons," one of which, " Summer," is now in the collection of Mr Lionel Phillips. Crozat left at his death some 400 paintings and 19,000 drawings by the masters. It is easy to imagine how Watteau roamed among these treasures, and became more and more familiar with Rubens and the great Venetians. In 1719 or 1720 the state of his health had become so alarming that he went to London to consult the famous doctor Richard Mead. But far from benefiting by the journey, he became worse, the London fog and smoke proving particularly pernicious to a sufferer from consumption. On his return to Paris he lived for six months with his friend Gersaint, for whom he painted in eight mornings the wonderful signboard depicting the interior of an art dealer's shop, which is now — cut into two parts — in the collection of the German emperor. His health made it imperative for him to live in the country, and in 1721 he took up his abode with M. le Fevre at Nogent. During all this time, as though he knew the near approach of the end and wished to make the best of his time, he worked with feverish haste. Among his last paintings were a " Crucifixion " for the cure of Nogent, and a portrait of the famous Venetian pastellist Rosalba Camera, who at the same time painted her portrait of Watteau. His restlessness increased with the progress of his disease; he wished to return to Valenciennes, but the long journey was too danger- ous; he sent for his pupil Pater, whom he had dismissed in a fit of ill-temper, and whom he now kept by his side for a month to give him the benefit of his experience;

and on the 18th of July 1 721 he died in Gersaint's arms.

Watteau's position in French art is one of unique importance, for, though Flemish by descent, he was more French in his art than any of his French contemporaries. He became the founder — and at the same time the culmination — of a new school which marked a revolt against the pompous decaying classicism of the Louis XIV. period. The vitality of his art was due to the rare combination of a poet's imagination with a power of seizing reality. In his treatment of the landscape background and of the atmospheric surroundings of the figures can be found the germs of impressionism. All the later theories of light and its effect upon the objects in nature are foreshadowed by Watteau's fetes champtlres, which give at the same time a characteristic, though highly idealized, picture of the artificiality of the life of his time. He is the initiator of the Louis XV. period, but, except in a few rare cases, his paintings are entirely free from the licentiousness of his followers Lancret and Pater, and even more of Boucher and Fragonard. During the last years of his life Watteau's art was highly esteemed by such fine judges as Sirois, Gersaint, the comte de Caylus, and M. de Julienne, the last of whom had a whole collection of the master's paintings and sketches, and published in 1735 the Abrlgl de la vie de Watteau, an introduction to the four volumes of engravings after Watteau by Cochin, Thomassin, Le Bas, Liotard and others. From the middle of the 18th century to about 1875, when Edmond de Goncourt published his Catalogue raisonnt of Watteau's works and Caylus's discourse on Watteau delivered at the Academy in 1748, the discovery of which is also due to the brothers de Goncourt, Watteau was held in such slight esteem that the prices realized by his paintings at public auction rarely exceeded £100. Then the reaction set in, and in 1891 the " Occupation according to Age " realized 5200 guineas at Christie's, and " Perfect Harmony " 3500 guineas. At the Bourgeois sale at Cologne in 1904 " The Village Bride " fetched £5000.

The finest collection of Watteau's works is in the possession of the German emperor, who owns as many as thirteen, all of the best period, and mostly from M. de Julienne's collection. At the Kaiser Friedrich museum in Berlin are two scenes from the Italian and French comedy and a fete champetre. In the Wallace Collection are nine of his paintings, among them " Rustic Amusements," " The Return from the Chase," " Gilles and his Family," " The Music Party," " A Lady at her Toilet " and

" Harlequin and Columbine." The Louvre owns, besides the diploma picture, the " Antiope," " The Assemblage in the Park," "Autumn," "Indifference," "La Finette," "Gilles," "A Re- union " and " The False Step," as well as thirty-one original drawings. Other paintings of importance are at the Dresden, Glasgow, Edinburgh, St Petersburg and

Vienna galleries; and a number of drawings are to be found at the British Museum and the Albertina in Vienna. Of the few portraits known to have been painted by Watteau, one is in the collection of the late M. Groult in Paris.

Authorities. — Since the resuscitation of Watteau's fame by the de Goncourts, an extensive literature has grown around his life and work. The basis for all later research is furnished by Caylus's somewhat academic Life, Gersaint's Catalogue raisonne (Paris, 1744), and Julienne's Abrege. For Watteau's childhood, the most trustworthy information will be found in Cellier's Watteau, son enfance, ses comtemporains (Valenciennes, 1867). Of the greatest importance is the Catalogue raisonne de I'ozuvre de Watteau, by E. de Goncourt (1875), and the essay on Watteau by the brothers de Goncourt in V Art du XVIII" siecle. See also Watteau by Paul Mantz (Paris, 1892); " Antoine Watteau," by G. Dargenty (Les Artistes celebres, Paris, 1891); Watteau, by Gabriel SeaiTles (Paris, 1892); Antoine Watteau by Claude Phillips (London, 1895; reprinted without alterations or corrections by the author, 1905) ; and Camille Mauclair's brilliant monograph Antoine Watteau (London, 1905), which is of exceptional interest as a physiological study, since the author establishes the connexion between Watteau's art and character and the illness to which he succumbed in the prime of his life. (P.G.K.)

WATTENBACH, WILHELM (1810-1897), German historian, was born at Ranzau in Holstein on the 22nd of September 1819. He studied philology at the universities of Bonn, Gottingen and Berlin, and in 1843 he began to work upon the Monumenta Germaniae kistorica. In 1855 he was appointed archivist at Breslau; in 1862 he became professor of history at Heidelberg, and ten years later professor at Berlin, where he was a member of the directing body of the Monumenta and a member of the Academy. He died at Frankfort on the 21st of September 1897. Wattenbach was distinguished by his thorough knowledge of the chronicles and other original documents of the middle ages, and his most valuable work was done in this field.

His principal book, Deulschlands Geschichtsquellen im Miitelalter bis zur Mitte des jj, Jahrhunderts, is unrivalled as a guide to the sources of the history of Germany in the middle ages; this was first published in 1858, and has passed through several editions. Cognate works are his Anleilungzur lateinischen Paldographie (Leipzig, 1869, and again 1886) ; and Das Schriftwesen im Mittelalter (Leipzig, 1871, and again 1896). Wattenbacn also wrote Beitrdge zur Geschichte der christlicken Kirche in Bohnten und Mahren (Vienna, 1849); Geschichte des rbmischen Papsttums (Berlin, 1876); and Anleitung zur griechischen Paldographie (Leipzig, 1867, and again 1895).

WATTERSON, HENRY (1840-), American journalist, was born in Washington, D.C., on the 16th of February 1840. His father, Harvey McGee Watterson (1811-1891), was a jour- nalist and lawyer, and was a Democratic representative in Con- gress in 1839-1843. The son was educated by private tutors, and between 1858 and 1861 was editor of the Washington States and of the Democratic Review. During the Civil War he served in the Confederate army as aide-de-camp to General Nathan B. Forrest and to General Leonidas Polk in 1861-1862; he was editor of the Chattanooga Rebel in 1862-1863, and was chief of scouts in General Joseph E. Johnston's army in 1864. In 1865-ˆ67 he was an editor of the Republican Banner, at Nash- ville, Tennessee, and in 1867-1868 was editor of the Journal at Louisville, Kentucky. In 1868, with W. N. Haldeman, he founded and became editor of the Louisville Courier-Journal, a consolidation of the Courier (1843), the Democrat (1844), and the Journal (1830); and it soon became one of the most influential of Southern newspapers. He was a Democratic representative in Congress from August r8?6 to March 1877, and was delegate at large to the National Democratic Conventions of 1876, 1880, 1884, 1888 and 1892, serving as temporary chairman in 1876, and as chairman of the platform committee in 1880 and 1888. He became widely known as a lecturer and orator. His publications include History of the Spanish-American War (1899) and The Compromises of Life (1902).

WATTIGNIES, a village of France s$ m. S.S.E. of Maubeuge, the scene of a battle in the French Revolutionary Wars (q.v.), fought on the i5th-i6th October 1793. The Allied army, chiefly Austrians, under Coburg, was besieging Maubeuge, and the Revolutionary army, preparing to relieve it, gathered behind Avesnes. Coburg disposed a covering force of 21,000 astride the A vcsnes- Maubeuge road, 5000 on the right with their flank on the Sambre, 9000 in the centre, on a ridge in an amphitheatre of woods, and 6000 on the left, chiefly on the plateau of Wattignies. \ long line of woods enabled the Republican commander, Jourdan, to deploy unseen; 14,000 men were to attack the right, 16,000 were sent towards Wattignies, and 13,000 were to demonstrate in the centre till the others had succeeded and then to attack. Meantime (though this part of the programme miscarried) the Maubeuge garrison, which was almost as strong as its besiegers, was to sally out. Even without the Maubeuge garrison Jourdan had a two-to-one superiority. But the French were still the undisciplined enthusiasts of Hondschoote. Their left attack progressed so long as it, could use " dead ground " in the valleys, but when the Republicans reached the gentler slopes above, the volleys of the Austrian regulars crushed their

swarms, and the Austrian cavalry, striking them in flank, rode over them. The centre attack, ordered by Carnot on the assumption that all was well on the flanks, was premature; like the left, it pro- gressed while the slopes were sharp, but when the Republicans arrived on the crest they found a gentle reverse slope before them, at the foot of which were Coburg's best troops. Again the dis- ciplined volleys and a well-timed cavalry charge swept back the assailants. The French right reached, but could not hold, Wattignies. But these reverses were, in the eyes of Carnot and Jourdan, mere mishaps. Jourdan wished to renew the left attack, but Carnot, the engineer, considered the Wattignies plateau the key of the position and his opinion prevailed. In the night the nearly equal partition of force, which was largely responsible for the failure, was modified, and the strength of the attack massed opposite Wattignies. Coburg meanwhile strengthened his wings. He heard that Jourdan had been re- inforced up to 100,000. But he called up few fresh battalions, and put into line only 23,000 men. In reality Jourdan had not received reinforcements, and the effects of the first failure almost neutralized the superiority of numbers and enthusiasm over discipline and confidence. But at last, after a long fight had eliminated the faint-hearted, enough brave men remained in the excited crowds held together by Carnot and Jourdan to win the plateau. Coburg then drew off. His losses were 2500 out of 23,000, Jourdan's 3000 out of 43,000.

WATTLE AND DAB, a term in architecture (Lat. cratittus) applied to a wall made with upright stakes with withes twisted between them and then plastered over. It is probably one of the oldest systems of construction; the Egyptians employed the stems of maize for the upright stakes; these were secured together with withes and covered over with mud, the upper portions of the maize stems being left uncut at the top, to in- crease the height of the enclosure; and these are thought by Professor Petrie to have given the origin for the cavetto cornice of the temples, the torus moulding representing the heavier coi! of withes at the top of the fence wall. Vitruvius (ii. 8) refers to it as being employed in Rome. In the middle ages in England it was employed as a framework for clay chimneys.

WATTMETER, an instrument for the measurement of electric power, or the rate of supply of electric energy to any circuit. The term is generally applied to describe a particular form of electrodynamometer, consisting of a fixed coil of wire and an embracing or neighbouring coil of wire suspended so as to be movable. In general construction the instrument resembles a Siemens electrodynamometer (see Amperemeter). The fixed coil is called the current coil, and the movable coil is called the potential coil, and each of these coils has its ends brought to separate terminals on the base of the instrument. The principle on which the instrument works is as follows: Suppose any circuit, such as an electric motor, lamp or transformer, is receiving electric current; then the power given to that circuit reckoned

in watts is measured by the product of the current flowing through the circuit in amperes and the potential difference of the ends of that circuit in volts, multiplied by a certain factor called the power factor in those cases in which the circuit is inductive and the current alternating.

Take first the simplest case of a non-inductive power-absorbing circuit. If an electro-dynamometer, made as above described, has its fixed circuit connected in series with the power-absorbing- circuit and its movable coil (wound with fine wire) connected across the terminals of the power-absorbing circuit, then a current will flow through the fixed coil which is' the same or nearly the same as that through the power-absorbing circuit, and a current will flow through the high resistance coil of the wattmeter proportional to the potential difference at the terminals of the power-absorbing circuit. The movable coil of the wattmeter is normally suspended so that its axis is at right angles to that of the fixed coil and is constrained by the torsion of a spiral spring. Whenthe currents flow through the two coils, forces are brought into action compelling the coils to set their axes in the same direction, and these forces can be opposed by another torque due to the control of a spiral spring regulated by moving a torsion head on the instrument. The torque required to hold the coils in their normal position is proportional to the mean value of the product of the currents flowing through two coils respectively, or to the mean value of the product of the current in the power-absorbing circuit and the potential difference at its ends, that is, to the power taken up by the circuit. Hence this power can be measured by the torsion which must be applied to the movable Coil of the wattmeter to hold it in the_ normal position against the action of the forces tending to displace it. The wattmeter can therefore be calibrated so as to give direct readings of the power reckoned in watts, taken up in the circuit; hence its name, wattmeter. In those cases in which the power- absorbing circuit is inductive, the coil of the wattmeter connected across the terminals of the power-absorbing circuit must have an exceedingly small inductance, else a considerable correction may become necessary. This correcting factor has the follow- ing value: If Ts stands for. the time-constant of the movable circuit of the wattmeter, commonly called the potential coil, the time constant being defined as the ratio of the inductance to the resistance of that circuit, and if T H is the time-constant similarly defined of the power-absorbing circuit, and if F is the correcting factor, and p =2ir times the frequency n, then, 1

F = –

i+ˆTV

i+p 2 T s T R –

Hence an electrodynamic wattmeter, applied to measure the electrical power taken up in a circuit when employing alternating currents, gives absolutely correct readings only in two cases — (i.) when the potential circuit of the wattmeter and the power-absorbing circuit have negligible inductances, and (ii.) when the same two circuits have equal time-constants. If these conditions are not fulfilled, the wattmeter readings, assuming the wattmeter to have been calibrated with continuous currents, may be either too high or too low when alternating currents are being used.

In order that a wattmeter shall be suitable for the measurement of power taken up in an inductive circuit certain conditions of construction must be fulfilled. The framework and case of the instrument must be completely non-metallic, else eddy currents induced in the supports will cause disturbing forces to act upon the movable coil. Again the shunt circuit must have piactically zero inductance and the series or current coil must be wound or constructed with stranded copper wire, each strand being silk covered, to prevent the production of eddy currents in the mass of the conductor. Wattmeters of this kind have been devised by J. A. Fleming, Lord Kelvin and W. Duddell and Mather. W- E. Sumpner, however, has devised forms of wattmeter of the dyna- mometer type in which iron cores are employed, and has defined the conditions under which these instruments are available for accurate measurements. See " New Alternate Current Instruments," Jour. Inst. Elec. Eng., 41, 227 (1908).

There are methods of measuring electrical power by means of electrostatic voltmeters, or of quadrant electrometers adapted for the purpose, which when so employed may be called electrostatic wattmeters. If the quadrants of an electrometer {q.v.} are con' nected to the ends of a non-inductive circuit in series with the power-absorbing circuit, and if the needle is connected to the end of this last circuit opposite to that at which the inductionless re- sistance is connected, then the deflexion of the electrometer will be proportional to the power taken up in the circuit, since it is pro- portional to the mean value of (A — B) {C — i (A + B)j, where A and B are the potentials of the quadrants and C is that of the needle. This expression, however, measures the power taken up in the power-absorbing circuit. In the case of the voltmeter method of measuring power devised by W. E. Ayrton and W. E. Sumpner in 1891, an electrostatic voltmeter is employed to measure the fall of potential Vi down any inductive circuit in which it is desired to

1 For the proof of this formula see J. A. Fleming, The Alternate Current Transformer in Theory and Practice, i. 16S.

measure the power absorption, and also the volt-drop V 2 down an inductionless resistance R in series with it, and also the volt-drop V3 down the two together. The power absorption is then given by the expression (W — Vi ! — 'WO/2R. For methods of employing the heating power of a current to construct a wattmeter see a paper by J. T. Irwin on " Hot-wire Wattmeters," Jour. Inst. Elec. Eng.

(1907), 39,617.

For the details of these and many other methods of employing wattmeters to measure the power absorption in single and polyphase circuits the reader is referred to the following works: J. A. Fleming, Handbook for the Electrical Laboratory and Testing Room (1903); Id., The Alternate Current Transformer in Theory and Practice (1905) ; G. Aspinall Parr, Electrical Engineering Measuring Instru- ments (1903); A. Gray, Absolute Measurements in Electricity and Magnetism (1900); E. Wilson, " The Kelvin Quadrant Electrometer as a Wattmeter," Proc. Roy. Soc. (1898), 62, 356; J. Swinburne, "The Electrometer as a Wattmeter," Phil. Mag. (June 1891); W. E. Ayrton and W. E. Sumpner, " The Measurement of the Power given by an Electric Current to any Circuit," Proc. Roy. Soc. (1891), 49, 424; Id., " Alternate Current and Potential Difference Analogies in the Method of Measuring Power," Phil. Mag. (August 1891); W. E. Ayrton, " Electrometer Methods of Measuring Alternating Current Power," Journ. Inst. Elec. Eng. (1888), 17, 164; T. H. Blakesley, " Further Contributions to Dynamometry or the Measure- ment of Power," Phil. Mag. (April 1891); G. L. Addenbrooke, "The Electrostatic Wattmeter and its Calibration and Adaptation for Polyphase Measurements," Electrician (1903), 51, 8jl; W. E. Sumpner, " New Iron-cored Instruments for Alternate Current Working," Jour. Inst. Elec. Eng. t 36, 421 (1906). (J. A. F.)

WATTS, ALARIC ALEXANDER (1797-1864), English journalist and poet, was the son of John Mosley Watts and grandson of William Watts, a Leicester physician of repute. After leaving school he made his living for a short time by teach- ing, and in 1818 joined the staff of the New Monthly Magazine in London, becoming about the same time a contributor to the Literary Gazette. In 1822 he was made editor of the Leeds Intelligencer, in the columns of which he was one of the first to advocate measures for protecting workers in factories against accidents from machinery. In 1823 he published his first volume of verse, Poetical Sketches, and in 1824 he became the editor of the Literary Souvenir, of which he also became the proprietor two years later, and in the conduct of which he secured the co-operation of some of the most famous men of letters of the period. In 1825

he went to Manchester as editor of the Man- chester Courier, a position which he resigned a year later; in 1827 he assisted in founding the Standard, of which the first editor was Stanley Lees Giffard; and in 1833 he started the United Service Gazette, which he edited for several years. Watts was also interested in a number of provincial Conservative newspapers which were not financially successful, and he became bankrupt in 1850, but was awarded a civil service pension by Lord Aberdeen in 1854. In 1856 he edited the first edition of Men of the Time. Watts died in London on the 5th of April 1864. In 1867 a collection of his poems was published in a volume entitled The Laurel and the Lyre.

See A. A. Watts, Alaric Watts (2 vols., London, 1884). WATTS, GEORGE FREDERICK (1817-1904), English painter and sculptor, was born in London on the 23rd of February 1817. While hardly more than a boy he was permitted to enter the schools of the Royal Academy; but his attendance was short- lived, and his further art education was confined to personal experiment and endeavour, guided and corrected by a constant appeal to the standard of ancient Greek sculpture. There are portraits of himself, painted in 1834; of Mr James Weale, about 1835; of his father, " Little Miss Hopkins," and Mr Richard Jarvis, painted in 1836; and in 1837 he was already far enough advanced to be an exhibitor at the Academy with a picture of " The Wounded Heron " and two portraits. His first exhibited figure-subject, " Cavaliers," appeared on the Academy walls in 1839, and was followed in 1840 by " Isabella e Lorenzo," in 1841 by " How should I your true love know? " and in 1842 by a scene from Cymbeline and a portrait of Mrs Ionides. The Royal Commission appointed for the decoration of the new Houses of Parliament offered prizes in 1842 to those artists whose cartoons for frescoes should be adjudged best adapted to its object, and at the exhibition in Westminster Hall next year Watts secured a prize of £300 for a design of " Caractacus led

in triumph through the streets of Rome." This enabled him to visit Italy in 1844, and he remained there during the greater portion of the three following years, for the most part in Florence, where he enjoyed the patronage and personal friendship of Lord Holland, the British ambassador. For him he painted a portrait of Lady Holland, exhibited in 1848, and in his Villa Careggi, near the city, a fresco, after making some experimental studies in that medium, fragments of which are now in the Victoria and Albert Museum. To Lord Holland's encouragement, also, it was chiefly due that in 1846 the artist took part in another competition, the third organized by the Royal Commissioners, who on this occasion announced a further list of prizes for works in oil. Watts sent in a cartoon depicting " Alfred inciting his subjects to prevent the landing of the Danes, or the first naval victory of the English," which, after obtaining a first-class prize of £500 at the exhibition in Westminster Hall, was purchased by the

government, and hangs in one of the committee rooms of the House of Commons. It led, moreover, to a commission foi the fresco of " St George overcomes the Dragon," which, begun, in 1848 and finished in 1853, forms part of the decorations of the Hall of the Poets in the Houses of Parliament. He next proposed to adorn gratuitously the interior of the Great Hall of Euston railway station with a series of frescoes illustrating " The Progress of the Cosmos," but the offer was refused. A similar proposition made shortly afterwards to the Benchers of Lincoln's Inn was received in a less commercial spirit, and was followed by the execution of the fresco, " Justice: a Hemicycle of Lawgivers," on the north side of their hall.

While this large undertaking was still in progress, Watts was working steadily at pictures and portraits. In 1849 the first two of the great allegorical compositions which form the most characteristic of the artist's productions were exhibited — " Life's Illusions," an elaborate presentment of the vanity of human desires, and " The people that sat in darkness," turning eagerly towards the growing dawn. In 1850 he first gave public expression to his intense longing to improve the condition of humanity in the picture of " The Good Samaritan " bending over the wounded traveller; this, as recorded in the catalogue of the Royal Academy, was " painted as an expression of the artist's admiration and respect for the noble philanthropy of Thomas Wright, of Manchester," and to that city he presented the work. In 1S56 Watts paid a visit to Lord Holland at Paris, where he was then ambassador, and through him made the acquaintance and painted the portraits of Thiers, Prince Jerome Bonaparte and other famous Frenchmen; while other celebrities who sat to him during these years were Guizot (1848), Colonel Rawlinson, C.B., Sir Henry Taylor and Thomas Wright (1851), Lord John Russell (1852), Tennyson (1836, and again in 1859)-, John Lothrop Motley the historian (1859), the duke of Argyll (i860), Lord Lawrence and Lord Lyndhurst (1862), Lord Wensleydale (1864), Mr Gladstone (1858 and 1865), Sir William Bowman and Swinburne (1865), Panizzi (1866) and Dean Stanley and Dr Joachim in 1867. Notable pictures of the same period are " Sir Galahad " (1862), " Ariadne in Naxos " (1863), " Time and Oblivion " (1864), originally designed for sculpture to be carried out " in divers materials after the manner of Pheidias," and " Thetis " (1866).

In spite of these and many other evidences of his importance, it was not until 1867 that Watts was elected an Associate of the Royal Academy, but the council then conferred upon him the rare distinction of promoting him, in the course of the same year, to full Academicianship. Thenceforward he continued to exhibit each year, with a few exceptions, at the Academy, even after his retirement in 1896, and he was also a frequent con- tributor to the Grosvenor Gallery, and subsequently to the New Gallery, at which

last a special exhibition of his works was held ir. the winter of 1896-1897. Though he travelled abroad to some extent, going to Asia Minor in 1857 with the expedition sent to investigate the ruins of Halicarnassus, and visiting in later years Italy, Greece and Egypt, the greater part of his life was passed in the laborious seclusion of his studio either at Little Holland House, Melbury Road, Kensington, where he settled in 1859, or in the

country at Limnerslease, Compton, Surrey. Apart from his art, his life was happily uneventful, the sole facts necessary to record being his marriage in 1886 with Miss Mary Fraser-Tytler, an early union with Miss Ellen Terry having been dissolved many years before; his twice receiving (1885 and 1894), but respectfully declining, the offer of a baronetcy; and his inclusion in June 1902 in the newly founded Order of Merit. He died on the 1st of July 1904.

The world is exceptionally well provided with opportunities of judging of the qualities of G. F. Watts's art, for with a noble gene- rosity he presented to his country a representative selection of the best work of his long life. A prominent element in it, and ore which must prove of the greatest value to posterity, is the inesti- mable series of portraits of his distinguished contemporaries, a series no less remarkable for its artistic than for its historical interest. A glance through the list of his subjects shows the breadth of his sym- pathies and his superiority to creed or party. Among politicians are the duke of Devonshire (1883), Lords Salisbury (1884), Sherbrooke (1882), Campbell (1882), Cowper (1877), Ripon (1896), Dufferin (1897) and Shaftesbury (1882), Mr Gerald Balfour (1899) and Mr John Burns (1897); poets — Tennyson, Swinburne (1884), Browning ("875), Matthew Arnold (1881), Rossetti (1865, and subsequent replica) and William Morris (1870); artists — himself (1864, 1880, and eleven others), Lord Leighton (1871 and 1881), Calderon (1872), Prinsep (1872), Burne-Jones (1870), Millais (1871), Walter Crane (1891)- and Alfred Gilbert (1896); literature is represented by John Stuart Mill (exhibited 1874), Carlyle (1869), George Meredith (1893), Max_ Muiler (1895) and Mr Lecky (1878); music, by Sir Charles Halle; while among others who have won fame in diverse paths are Lords Napier (1886) and Roberts (1899), General Baden-Powell (1902), Garibaldi, Sir Richard Burton (1882), Cardinal Manning (1882), Dr Martineau (1874), Sir Andrew Clark (1894), George Pea- body, Mr Passmore Edwards, Claude Montefiore (1894). Even more significant from an artistic point of view is the great collection of symbolical pictures in the Tate Gallery which forms the artist's message to mankind. Believing devoutly in the high mission of

didactic art, he strove ever to carry out his part of it faithfully. To quote his own words: " My intention has not been so much to paint pictures that charm the eye, as to suggest great thoughts that will appeal to the imagination and the heart, and kindle all that is best and nohlest in humanity "; and his tenet is that the main ob- ject of the painter should be " demanding noble aspirations, con- demning in the most trenchant manner prevalent vices, and warning in deep tones against lapses from morals and duties."

There are not wanting critics who radically dissent from this view of the proper functions of art. It must be admitted that there is force in their objection when the inner meaning of a picture is found to be exceedingly obscure, if not incomprehensible, without a verbal explanation. In the female figure, for instance, bending blindfolded on the globe suspended in space and sounding the sole remaining string upon her lyre, while a single star shines in the blue heavens, it is not obvious to every one that the idea of " Hope " (1885) is suggested. There can be few, nevertheless, who will maintain that his aim is not a lofty one; and the strongest evidence of the artist's greatness, to those who accept his doctrine, is the fact that he has not only striven untiringly for his own ideals, but has very often gloriously attained them. Moreover, in so doing he has not failed on occasion to impart to his work much of that very charm which is to him a secondary consideration, or to exhibit an assured and accomplished mastery of the technical achievement which is to some the pnmary object and essential triumph of painting. It was, in short, the rare combination of supreme handicraft with a great imaginative intellect which secured to Watts his undisputed place in the public estimation of his day. The grandeur and dignity of his style, the ease and purposefulness of his brushwork, the richness and harmoniousness of his colouring — qualities partly his own, partly derived from his study of Italian masters at an early and impression- able age — are acknowledged even by those to whom his elevated educational intentions are a matter of indifference, if not of absolute disapprobation; while many, to whom his exceptional artistic attainment is a sealed book, have gathered courage or consolation from the grave moral purpose and deep human sympathy of his teaching. He expresses his ideas for the most part in terms of beauty, an idealized, classical beauty of form, a glowing, Venetian beauty of colour, though his conviction of the deadly danger of heaped-up riches, which he vindicated in his life as well as in his work, has, in such cases as " The Minotaur " (exhibited in 1896), " Mammon " (1885) and " Jonah " (1895), where the unveiled vileness of Cruelty and Greed is fearlessly depicted, driven him to the presentment of sheer ugliness or brutality. Far oftener a vast, all-embracing tenderness inspires his work; it is the sorrow, not the sin, that stirs him. When he would rebuke the thoughtless inhumanity which sacrifices its annual

hecatombs of innocent birds to fashionable vanity and grasping commerce, it is not upon the blood and cruelty that he dwells, but the pity of it that he typifies in " Dedication " or " The Shuddering Angel " (1892) weeping over the altar spread with Woman's spoils.

Yet it is as a teacher that the artist is seen at his highest: he

would sooner point out the true way to those who seek it than admonish those who have wandered. He never wearies of em- phasizing the reality of the power of Love, the fallacy underlying the fear of Death. To the early masters Death was a bare and ghastly skeleton, above all things to be shunned; to Watts it is a grand, impressive figure, awful indeed but not horrible, irre- sistible but not ruthless, a bringer of rest and peace, not to be rashly sought but to be welcomed when the inevitable hour shall strike. "Sic transit" (1892) conveys most completely, perhaps, Watts's lesson on the theme of death. Stretched on a bier and reverently sheeted lies a corpse; strewn neglected on the ground lie the ermine robe of worldly rank, the weapons of the warrior, the lute of the musician, the book of human learning, the palmer's robe of late repentance and the roses of fleeting pleasures; the laurel crown remains as the one thing worth the winning, and the inscription " What I spent I had; w'hat I saved I lost; what I gave I have," points the moral. Such is the significance of the still more masterly " Court of Death " (finally completed 1902 and now in the Tate Gallery). To the same early masters Love was usually a mere distributor of sensual pleasures, a tricksy spirit instinct with malice and bringing more harm than happiness to humanity, though neither was of much moment. W T atts has not altogether ignored this view, and in " Mischief " (1878) has portrayed Man, love-led, entangled among the thorns of the world; but, in the main, Love to him is the chief guide and helper of mankind along the barren, rock- strewn path of life, through whom alone he can attain the higher levels, and who triumphs in the end over Death itself. To these views on the all-importance of love a trilogy of pictures in the Tate Gallery gives full expression. In the first, " Love and Life," ex- hibited in 1885, a replica of an earlier picture in the Metro- politan Museum, New York, and of another version presented by him to the Luxembourg, Paris, Love, a figure in the prime of manhood, leads and supports the slender, clinging girl who symbolizes Life up to the craggy mountain-top, while he partly shields her from the blast under a broad Wing. Of this he himself said, " Probably ' Love and Life ' best portrays my message to the age. Life, re- presented by the female figure, never could have reached such heights unless protected and guided by Love " ;- and in the prefatory- note to the exhibition of his works in 1896 he wrote, " The slight female figure is an emblem of the fragile quality in humanity, at once its weakness and its strength ; senstbility, aided by Love, sympathy, tenderness, self-sacrifice, and all that the range of the term implies, humanity ascends the rugged path from*

brutality to spirituality." The limitations of earthly love are shown in the second " Love and Death," one version of which was exhibited in 1877 and others in 1896, &c. In this, Love, a beautiful boy, striving vainly to bar the door to the mighty figure of Death, is thrust back with crushed wings powerless to stay the advance; but that the defeat is merely apparent and temporary is suggested rather than asserted by the third " Love Triumphant " (1898), where Time, with broken scythe, and Death lie prostrate, while the same youth, with widespread wings and face and arms upraised to heaven, stands between them on tiptoe as if preparing to soar aloft. Though the purely symbolical is the most distinctive side of Watts's art, it is by no means the only one. He has drawn inspiration largely from both the Old and New Testaments, more rarely from the poets and classical myths; still more rarely he has treated subjects of modern life, though even in these he has not abandoned his moral purpose, but has sought out such incidents, whether fictitious or historical, as will serve him in conveying some lesson or monition. The three pictures of the story of Eve in. the Tate Gallery, " She shall be called woman " (1892), " Eve Tempted " and " Eve Repentant " (both exhibited in 1896), and " The Curse of Cain " (1872) in the Diploma Gallery, may be cited as examples of the first; " For he had great possessions" (1894) of the second; "Sir Galahad" (1862;, "Orpheus and Eurydice " and "Psyche" (1880), of the third; and " The Irish Famine " (about 1847) and " A Patient Life of Unrewarded Toil " (1890), of the last of these. Never has he treated religion from a sectarian point of view.

Watts is before all things a painter with a grave and earnest purpose, painting because that form of expression was easier to him than writing, though he has published some few articles and pam- phlets, chiefly on art matters ; but he, too, has his lighter side, and has daintily treated the humorously fanciful in " Good luck to your fishing " (1889) ; " The habit does not make the monk " (1889), in which Cupid, haif-hidden under the frock, taps maliciously at a closed door; and " TriflesLight as Air " (exhibited 1901), a swarm of little amorint drifting in the summer air like a cloud of gnats ; while in " Experientia docet B.C." (1890), a primeval woman watching with admiration, not unmixed with anxiety, the man who has first swallowed an oyster, he condescends, not very successfully, to the frankly comic. These must be regarded, however, as merely the relaxations of the serious mind that has left its impress even on the relatively few, but very admirable, landscapes he produced, in which, as for instance " The Carrara Mountains from Pisa " (1881), a sober dignity of treatment is conspicuous.

Watts's technique is as individual as his point of view. It is chiefly remarkable for its straightforwardness and simplicity, and

l G. F. Walts, R.A., by Charles T. Bateman.

its lack of any straining after purely technical effects. The idea to be expressed is of far higher importance to him than the manner of expressing it. The statement of it should be a matter of good, sound workmanship, not of artistic agility or manual dexterity. To say what he has to say as clearly and briefly as may be is his aim, and when he ha3 achieved the effect he desires, the method of his doing so is of no further moment. In the use of paint as paint, in the intrinsic beauties of surface and handling, he would seem in his later years to take no delight. Thus in parts of the picture the rough, coarse canvas he prefers may be so thinly covered that every fibre of the material can be seen, while in others a richly modelled impasto loads the surface. He employs, as far as possible, pure colours laid on in direct juxtaposition or broken into and across each other, not blended and commingled on the palette. He eschews all elaboration of detail and, except in portraiture, works rarely from the living model, neglecting minor delicacies of form or passages of local colour, conventionalizing to a standard of his own rather than idealizing — a process not always unproductive of faults of drawing and proportion, as in the figure of " Faith " (1896), or of singularities of tint, as in the curious leaden face and prismatic background in " The Dweller in the Innermost " (1886). He avoids, as a rule, the use of definite outline, leaving the limits of his forms to melt imperceptibly into the background ; nor does texture interest him greatly, and a uniform fresco-like surface is apt to represent flesh and foliage, distance and foreground alike. He intends deliberately that the things he depicts, be they what they may, shall be symbols, useful for their meaning alone, and he makes no attempt at conferring on them an accurate actuality, which might distract the attention from the paramount idea. That this reticence is intentional may be learned from an examination of his earliest works, in which the accessories are rendered with a precise, if some- times a dry, truthfulness of observation; that it is not due to carelessness or indifference is shown by the inexhaustible patience with which each picture has been executed. His earlier pictures are unsurpassed in the art of England for fine technical qualities of colour and delicacy of handling. Though working unceasingly, Watts never hurried the completion of any canvas. Of two slightly differing versions of " Fata Morgana," both begun in 1847, the first was not finished before 1870, the second not until ten years later. Even after finishing a picture sufficiently for exhibition, he often subse- quently worked further upon it. The portrait of Lord Leighton, exhibited in 1881, was repainted in 1888; the version of " Love and Death," exhibited in 1877, and 1883, and all the pictures presented to the Tate Gallery in 1897, were more or less retouched when hung there. Furthermore, he painted more than one version of several of his favourite

subjects, a circumstance which, combined with the fact that he rarely added the year to his signature and kept no record of his annual production, makes the task of precisely dating his pictures for the most part impossible, while it renders any attempt to dispose his works in periods untrustworthy and artificial, since even the growth and inevitable decay of artistic power are to a considerable extent obscured.

Founded admittedly on the Grecian monuments, there is a sculp- turesque rather than pictorial quality in most of his compositions, a regulated disposition which, though imparting often a certain air of unreality and detachment, inspires them nevertheless with that noble impressiveness which forms their most conspicuous character- istic. It is natural, therefore, that in sculpture itself he should also take a high place. A taste for this he acquired as a boy; he was a constant visitor to the studio of Behnes, where he not infrequently made drawings from the casts, though he was never in any sense his pupil. Among his works in this branch of art are a bust of " Clytie " (1868), monuments to the marquis of Lothian, Bishop Lonsdale and Lord Tennyson, a large bronze equestrian statue of " Hugo Lupus " at Eaton Hall (1884), and a colossal one of a man on horseback, emblematical of " Physical Energy," originally in- tended for a place on the Embankment, but destined to stand among the Matoppo Hills as an enduring evidence of the artist's admiration for Cecil Rhodes; a replica has been placed in Kensington Gardens. It was the practical idealism of Rhodes that appealed to him, and in this quality Watts himself was by no means lacking. Much of his time and attentionˆ was given to the promotion of the Home Arts and Industries Association; he assisted Mrs Watts with both money and advice in the founding of an art pottery at Compton, and in the building at the same place of a highly decorated mortuary chapel, carried out almost entirely by local labour; and it was entirely due to his initiative that the erection in Postmen's Park, Aldersgate Street, London, of memorial tablets to the unsung heroes of everyday life was begun.

Authorities. — M. H. Spielmann, " The Works of Mr G. F. Watts, R.A., with a Catalogue of his Pictures," Pall Mall Gazette "Extra" (1886); Julia Cartwright (MrsAdy), " G. F. Watts, Royal Academician, His Life and Work," Art Journal, Extra Number (1896); W. E. T. Britten, "The Work of George Frederick Watts, R.A., LL.D.," Architectural Review (1888 and 1889); Cosmo Monkhouse, British Contemporary Artists (1889) ; Charles T. Bate- man, G. F. Watts, R.A., Bell's Miniature Scries of Painters (1901); " Mr G. F. Watts, R.A., Character Sketch," The Review of Reviews Oune 1902). (M. Be.)

WATTS, ISAAC (1674-1748), English theologian and hymn writer, son of a clothier, was born at Southampton on the 17th of July 1674. The father, who afterwards had a boarding- school at Southampton, also wrote poetry,

and a number of his pieces were included by mistake in. vol. i. of the son's Posthumous Works. Isaac Watts is stated to have begun to learn Latin when only in his fifth year, and at the age of seven or eight to have composed some devotional pieces to please his mother. His nonconformity precluded him from entering either of the universities, but in his sixteenth year he went to study at the nonconformist academy at Stoke Newington, of which the Rev. Thomas Rowe, minister of the Independent meeting at Girdlers' Hall, was then president. On leaving the academy he spent more than two years at home, and began to write his hymns, but in the autumn of 1696 he became tutor in the family of Sir John Hartopp at Stoke Newington, where he probably prepared the materials of his two educational works — Logick, or the Right Use of Reason in the Enquiry after Truth (1725), and The Know^ ledge of the Heavens and the Earth made easy, or the First Principles of Geography and Astronomy Explained (1726). In his twenty- fourth year Watts was chosen assistant to Dr Isaac Chauncy (1632-1712), pastor of the Independent congregation in Mark Lane, London, and two years later he succeeded as sole pastor. The state of his health, which he had injured by overwork, led to the appointment of an assistant in 1703. In 1704 the con- gregation removed to Pinner's Hall, and in 1708 they built a new meeting-house in Bury Street. In 171 2 W^atts was attacked by fever, which incapacitated him for four years from the per- formance of his duties. In 1712 he went to live with Sir Thomas Abney of Abney Park, where he spent the remainder of his life, the arrangement being continued by Lady .Abney after her husband's death. Watts preached only occasionally, devoting his leisure chiefly to the writing of hymns (see Hymns), the preparation of his sermons for publication, and the composition of theological work. In 1 706 appeared his Home Lyricae, of which an edition with memoir by .Robert Southey forms vol. ix. of Sacred Classics (1834); in 1707 a volume of Hymns; in 1719 The Psalms of David; and in 1720 Divine and Moral Songs for Children. His Psalms are free paraphrases, rather than metrical versions, and some of them (" God, our help in ages past," for instance) are amongst the most famous hymns in the language. His religious opinions were more liberal in tone than was at that time common in the community to which he belonged; his views regarding Sunday recreation and labour were scarcely of puritanical strictness; and his Calvinism was modified by his rejection of the doctrine of reprobation. He did not hold the doctrine of the Trinity as necessary to salvation, and he wrote several works on the subject in which he developed views not far removed from Arianism. He died on the 25th of November 1748, and was buried at Bunhill Fields, where a tombstone was erected to his memory by Sir John Harlopp and Lady Abney. A memorial was also erected to him in Westminster Abbey,, and a memorial hall, erected in his honour at Southampton, was opened

in l8 75-

Among the theological treatises of Watts, in addition to volumes of sermons, are Doctrine of the Trinity (1722); Discourses on the Love of God and its Influence on all the Passions (1729); Catechisms for Children and Youth (1730) ; Essays towards a Proof of a Separate State for Souls (1732); Essay on the Freedom of the Will (1732); Essay on the Strength and Weakness of Human Reason (1737); Essay on the Ruin and Recovery of Mankind (1740); Glory of Christ as God-Man Unveiled (1746); and Useful and Important Questions concerning Jesus, the Son of God (1746J. He was also the author of a variety of miscellaneous treatises. His Posthumous Works appeared in 1773, and a further instalment of them in 1779. The Works of % , . Issac Watts (6 vols.), edited by Dr Jennings and Dr Doddridge, with a memoir compiled by G. Burder, appeared in 1810-1811. His poetical works were included in Johnson's English Poets, where they were accompanied by a Life, and they appear in subsequent similar collections. See also The Life, Times and Correspondence of Isaac Watts (1834) by Thomas Milner.

WATTS-DUNTON, WALTER THEODORE (1832-), English man of letters, was born at St Ives r Huntingdon, on the 12th of October 1832, his family surname being Watts, to which he added in 1897 his mother's name of Dunton. He was

originally educated as a nahn-alist, and saw much of the East Anglian gypsies, of whose superstitions and folk-lore he made careful study. Abandoning natural history for the law, he qualified as a solicitor and went to London, where he practised for some years, giving his spare time to his chosen pursuit of literature. He contributed regularly to the Examiner from 1874 and to the Athenaeum from 1875 until 1898, being for more than twenty years the principal critic of poetry in the latter journal. His article on " Poetry " in the ninth edition of the Ency. Brit. (vol. xix., r885) was the principal expression of his views on the first principles of the subject, and did much to increase his reputation, which was maintained by other articles he wrote for the Encyclopaedia Britannica and for the chief periodicals and reviews. Mr Watts-Dunton had considerable influence as the friend of many of the leading men of letters of his time; he enjoyed the confidence of Tennyson, and contributed an appre- ciation of him to the authorized biography. He was in later years Rossetti's most intimate friend. He was the bosom friend of Swinburne (?.«.), who shared his home for nearly thirty years before he died in 1009. The obituary notices and

apprecia- tions of the poets of the time, which he contributed to the Athenaeum and other periodicals, bore testimony to his sympathy, insight and critical acumen. It was not, however, until 1897 that he published a volume under his own name, this being his collection of poems called The Coming of Love, portions of Which he had printed in periodicals from time to time. In the following year his prose romance Aylwin attained immediate success, and ran through many editions in the course of a few months. Both The Coming of Love and Aylwin set forth, the one in poetry, the other in prose, the romantic and passionate associations of Romany life, and maintain the traditions of Borrow, whom Mr Watts-Dunton had known well in his own early days. Imagina- tive glamour and mysticism are their prominent characteristics, and the novel in particular has had its share in restoring the charms of pure romance to the favour of the general public. He edited George Borrow's Lavengro (1893) and Romany Rye (rpoo); in 1903 he published The Renascence of Wonder, a treatise on the romantic movement; and his Studies of Shake- speare appeared in 1910. But it was not only in his published work that Mr Watts-Dunton's influence on the literary life of his time was potent. His long and intimate association with Rossetti and Swinburne made him, no doubt, a unique figure in the world of letters; but his own grasp of metrical principle and of the historic perspective of the glories of English poetry made him, among the younger generation, the embodiment of a great tradition of literary criticism which could never cease to command respect. In 1905 he married. His life has been essentially one of devotion to letters, faithfully and disinter- estedly followed.

WAUGH, BENJAMIN (1830-1908), English social reformer, was born at Settle, Yorkshire, on the 20th of February 1839. He passed the early years of his life in business, but in 1865 entered the congregational ministry. Settling at Greenwich he threw himself with ardour into the work of social reform, devoting himself especially to the cause of the children.. He served on the London School Board from 1870 to 1876. In 1884. he was responsible for the establishment of the London society for the prevention of cruelty to children, which four years later was established on a national basis. He was elected its honorary secretary, and it was largely owing to information obtained by him that the Criminal Law Amendment Act of 1885 was passed, while by his personal effort he secured the insertion of a clause giving magistrates power to take the evidence of children too young to understand the nature of an oath. In 1889 he saw the work accomplished by his society (of which he had been made director the same year) recognized by the passing of an act for the pre- vention of cruelty to children, the first stepping-stone to the act of 1908 (see Children, Law Relating to). In 1895 a charter of incorporation was conferred on the society, but in 1897 it was the object of a serious attack on its

administration. An inquiry was demanded by Waugh, and the commission of inquiry, which included Lord Herschell and others, completely vindicated the

society and its director. Waugh had given up pastoral work in 1887 to devote his whole time to the society, and he retained his post as director until 1905, when the state of his health com- pelled his retirement. He remained consulting director until his death at Weslcliff, near Southend, Essex, on the nth of March 1908. Waugh edited the Sunday Magazine from 1874 to 1896, but he had otherwise little leisure for literary work. His The Gaol Cradle, who rocks it? (1873) was a plea for the abolition of juvenile imprisonment.

WAUGH, EDWIN (1817-1890), known as " The Lancashire Poet," was born at Rochdale, on the 29th of January 1817, the son of a shoemaker. For several years he earned his living as a journeyman printer in various parts of the country. In 1855 he published his first book, Sketches of Lancashire Life and Localities, following this up with reprinted Poems and Songs (1859). His rendering of the Lancashire dialect was most happy, and his rude lyrics, full of humour and pathos, were great favourites with his countrymen. He died on the 30th of April

1890.

See Milner's Memoir in an edition of Waugh's selected works

(1892-1893).

WAUKEGAN, a city and the county-seat of Lake county, Illinois, U.S.A., on the W. shore of Lake Michigan, about 36 m. N. of Chicago. Pop. (1890) 4915; (1900) 9426, of whom 2506 were foreign-born; (1910 census) 16,069. It is served by the Elgin, Joliet & Eastern (of which it is a terminus) and the Chicago & North Western railways, by an interurban electric line, and by lake steamers. In r88o the United' States government under- took the formation of an artificial harbour with a channel 13 ft. deep, and in 1902-1904 the depth was increased to 20 ft. The main portion of the city is situated about 100 ft. above the level of thelake. There are a number of parks and mineral springs, and along the lake front a fine driveway, Sheridan Road. The city is a residential suburb of Chicago. The principal buildings are the Federal building, the Court House, a Carnegie library, the Masonic Temple and McAlister Hospital. At the village of North Chicago (pop. in 1910, 3306), about 3 m. S. of Waukegan, there is a United States Naval Training Station. Waukegan is the commercial centre of an agricultural and dairying region, and has various manufactures. The total value of the factory product in 1905 was $3,961,313. Waukegan was

settled about 1835, and until 1849 was known as Little Fort, which is supposed to be the English equivalent of the Indian name Waukegan. It became the county-seat of Lake county in 1841, was in- corporated as a town in 1849, and first chartered as a city in 1859.

WAUKESHA, a city and the county-seat of Waukesha county, Wisconsin, U.S.A., about 19 m. W. of Milwaukee on the Little Fox river. Pop. (1890) 6321; (1900) 7419, including 1408 foreign-born; (1905 state census) 6049; (1910) 8740. Waukesha is served by the Minneapolis, St Paul & Sault Ste Marie, the Chicago & North-Western and the Chicago, Milwaukee & St Paul railways, and by interurban electric railways connecting it with Milwaukee, Oconomowoc and Madison. The medicinal mineral springs (Bethesda, White Rock, &c.) are widely known. Among the public buildings are the county court house and the public library. Waukesha is the seat of the State Industrial School for Boys (established as a house of refuge in i860) and of Carroll College (Presbyterian, co-educational, 1846). Waukesha was first settled in 1834, was named Prairieville in 1839, was incorporated as a village under its present name (said to be a Pottawatomi word meaning " fox") in 1852, and chartered as a city in 1896. In 1851 the first railway in the state was com- pleted between Milwaukee and Waukesha, but the village re- mained only a farming community until the exploitation of the mineral springs was begun about 1868. About 15 m. S. of Waukesha, near Mukwonago (pop. in 1910,615), in 1844-1845, there was an unsuccessful communistic agricultural settle- ment, the Utilitarian Association, composed largely of London mechanics led by Campbell Smith, a London bookbinder.

WAURIN (or Wavrin), JEHAN (or Jean de) (d. c. r 4 74), French chronicler, belonged to a noble family of Artois, and was present at the battle of Agincourt. Afterwards he fought for

the Burgundians at Verneuil and elsewhere, and then occupying a high position at the court of Philip the Good, duke of Burgundy, was sent as ambassador to Rome in 1463. Jehan wrote, or rather compiled, the Recueil des croniques et anckiennes istories de la Grant Bretaigne, a collection of the sources of English history from the earliest times to 1471. For this work he borrowed from Froissart, Monstrelet and others; but for the period between 1444 and 1471 the Recueil is original and valuable, although somewhat untrustworthy with regard to affairs in England itself.

From the beginning to 688 and again from 1399 to 1471 the text has been edited for the Rolls Series (5 vols., London, 1864-1891), by W. and E. L. C. P. Hardy, who have also translated the greater part of it into English. The section from 1325 to I471 has been edited by L. M. E. Dupont (Paris, 1858-1863).

WAUSAU, a city and the county-seat of Marathon county, Wisconsin, U.S.A., on both banks of the Wisconsin river, about 185 m. N.W. of Milwaukee. Pop. (1890) 9253; (1900) 12,354, of whom 3747 were foreign-born; (1910 census) 16,560. There is a large German element in the population, and two German semi-weekly newspapers are published here. Wausau is served by the Chicago, Milwaukee & St Paul and the Chicago & North-Western railways. The city is built for the most part on a level plateau above the river and extends to the top of high bluffs on either side. It has a fine city hall, a Carnegie library, the Marathon County Court House, a hospital, built by the Sisters of the Divine Saviour, and a Federal Building. In Wausau are a U.S. land office, the Marathon County Training School for Teachers, the Marathon County School of Agriculture and Domestic Science, and a County Asylum for the Chronic Insane. Valuable water-power furnished by the Big Bull Falls of the Wisconsin (in the city) is utilized for manufacturing, and in 1910 water-power sites were being developed on the Wisconsin river immediately above and below the city. In 1905 the factory products were valued at $45644,457. Wausau had its origin in a logging-camp, established about 1838. In 1840 a saw-mill was built here, and in 1858 the village was incorporated under its present name. After 1880, when Wausau was chartered as a city, its growth was rapid.

WAUTERS, EMILE (1848-), Belgian painter, was born in Brussels, 1848. Successively the pupil of Portaels and Gerome, he produced in 1868 " The Battle of Hastings: the Finding of the body of Harold by Edith," a work of striking, precocious talent. A journey was made to Italy, but that the study of the old masters in no wise affected his individuality was proved by " The Great Nave of St Mark's " (purchased by the king of the Belgians). As his youth disqualified him for the medal of the Brussels Salon, which otherwise would have been his, he was sent, by way of compensation, by the minister of fine arts, as artist -delegate to Suez for the opening of the canal — a visit that was fruitful later on. In 1870, when he was yet only twenty-two years of age, Wauters exhibited his great historical picture of " Mary of Burgundy entreating the Sheriffs of Ghent to pardon the Councillors Hugonet and Humbercourt " (Liege Museum) which created a veritable furore, an impression which was confirmed the following year at the London International Exhibition. It was eclipsed by the celebrated "Madness of Hugo van der Goes " (1872, Brussels Museum), a picture which led to the commission for the two large works decorating the Lions' staircase of the Hotel de Ville — " Mary of Burgundy swearing to respect the Communal Rights of Brussels, 1477 " and " The Armed Citizens of Brussels demanding the Charta from Duke John IV. of Brabant." His other large compositions comprise " Sobieski and his Staff before Besieged Vienna " (Brussels Museum) and the harvest of a journey to Spain and

Tangiers, " The Great Mosque," and " Serpent Charmers of Sokko," and a souvenir of his Egyptian travel, " Cairo, from the Bridge of Kasr-el-Nil " (Antwerp Museum). His vast panorama — probably the noblest and most artistic work of this class ever produced — " Cairo and the Banks of the Nile " (1881), 380 ft. by 49 ft., executed in six months, was exhibited with extra- ordinary success in Brussels, Munich, and the Hague. Wauters is equally eminent as a portraitist, in his earliest period exhibiting, as in his pictures, sober qualities and subtle grip, but later on

developing into the whole range of a brilliant, forceful palette, and then into brighter and more delicate colours, encouraged thereto, in his more recent work, by his adoption of pastel as a medium even for life-size portraits, mainly of ladies. His portraits, numbering over two hundred, include many of the greatest names in Belgium, France, and America (Wauters having for some years made Paris his chief home). Among these may be named the Baron Gofnnet, the Baroness Gofionet, Madame Somzee (standing at a piano) , Master Somzee (on horseback by the sea-shore), the Princess Clementine of Belgium (Brussels Museum), Lady Edward Sassoon, Baron de Bleichroder, Princess de Ligne, Miss Lorillard, a likeness of the artist in the Dresden Museum, and M.Schollaert (president of the Chamber of Deputies) — the last named an amazing example of portraiture, instinct with character and vitality. The vigour of his male, and the grace and elegance of his female, portraits are unsurpassable, the resemblance perfect and the technical execution such as to place the artist in the front rank. Between 1889 and 1900 the painter contributed to the Royal Academy of London. Few artists have received such a succession of noteworthy distinctions and recognitions. His " Hugo van der Goes," the work of a youth of twenty-four, secured the grand medal of the Salon. He has been awarded no fewer than six " medals of honour " — at Paris in 1878 and 1889; Munich, 1879; Antwerp, 1885; Vienna, 1888; and Berlin, 1883. He is a member of the academy of Belgium, and honorary member of the Vienna, Berlin, and Munich academies, and corresponding member of the Institut de France and of that of Madrid. He has received the order of merit of Prussia, and is Commander of the order of Leopold, and of that of St Michael of Bavaria, officer of the Legion of Honour, &c.

See M. H. Spielmann, Magazine of Art (1887); A. J. Wauters, Magazine of Art (1894); Joseph Anderson, Pall Mall Magazine (1896) ; G. Sera.6 (" Wauters as a Painter of Architecture ") Archi- tectural Record (1901). (M. H. S.)

WAVE. 1 It is not altogether easy to frame a definition which shall be precise and at the same time cover the various physical phenomena to which the term " wave " is commonly applied. Speaking, generally, we may say that it denotes a process in which a particular state is continually

handed on without change, or with only gradual change, from one part of a medium to another. The most familiar instance is that of the waves which are observed to travel over the surface of water in consequence of a local disturbance; but, although this has suggested the name l since applied to all analogous phenomena, it so happens that water-waves are far from affording the simplest instance of the process in question. In the present article the principal types of wave-motion which present themselves in physics are reviewed in the order of their complexity. Only the leading features are as a rule touched upon, the reader being referred to other articles for such developments as are of interest mainly from the point of view of special subjects. The theory of water- waves, on the other hand, will be treated in some detail. § 1. Wave-Propagation in One Dimension.

The simplest and most easily apprehended case of wave-motion is that of the transverse vibrations of a uniform tense string. The axis of x being taken along the length of the string in its undisturbed position, we denote by y the transverse displacement at any point. This is assumed to be infinitely small; the resultant lateral force on any portion of the string is then equal to the tension (P, say) multiplied by the total curvature of that portion,, and therefore in the case of an element Sx to Py ff S;c, where the accents denote dif- ferentiations with respect to x. Equating this to pSx.jf, where p is the line-density : we have

*y=&y w * (0*

where e = V(P//>) (2)

1 The word " wave," as a substantive, is late in English, not occurring till the Bible of 1ˆ51 (Skeat, Etym. Diet., 1910). The proper O. Eng. word was Wffijj, which became waive in M. Eng. ; it is cognate with Ger. Woge, and is allied to " wag," to move from side to side, and is to be referred to the root wegh, to carry, Lat. vehere, Eng. " weigh," &c. TheO.Eng.iyajfa«,M.Eng, wave»,tofluctuate,towaver in mind, cf. waefre, restless, is cognate with M.H.G. wabelen, to move to and fro, cf. Eng. " wabble " of which the ultimate root is seen in " whip," and in " quaver."

The general solution of (1) was given by J. Ie-R. d'Alembert in 1747 ; it is

y=f(ct-x)+F(cl+x) (3)

where the functions/, F are arbitrary. The first terra is unaltered in value when x and ct are increased by equal amounts; hence this term, taken by

itself, represents a wave-form which is propagated without change in the direction of x-positive with the constant velocity c. The second term represents in like manner a wave-form travelling with the same velocity in the direction of x-negative; and the most general free motion of the string consists of two such wave-forms superposed. In the case of an initial disturbance con- fined to a finite portion of an unlimited string, the motion finally resolves itself into two waves travelling unchanged in opposite directions. In these separate waves we have

y=—?cy\ (4)

as appears from (3), or from simple geometrical considerations. It is to be noticed, in this as in all analogous cases, that the wave- velocity appears as the square root of the ratio of two quantities, one of which represents (in a generalized sense) the elasticity of the medium, and the other its inertia.

The expressions for the kinetic and potential energies of any portion of the string are

T = lpjyˆdx, V-lPJ/y. . . . (5) where the integrations extend over the portion considered. The relation (4) shows that in a single progressive wave the total energy is half kinetic and half potential.*

When a point of the string (say the origin O) is fixed, the solution takes the form

y=f{ct-x)-f{ct+x) (6)

As applied (for instance) to the portion of the string to the left of O, this indicates the superposition of a reflected wave represented by the second term on the direct wave represented by the first. The reflected wave has the same amplitudes at corresponding points as the incident wave, as is indeed required by the principle of energy, but its sign is reversed.

The reflection of a wave at the junction of two strings of unequal densities p, p is of interest on account of the optical analogy. If A, B be the ratios of the amplitudes in the reflected and transmitted waves, respectively, to the corresponding amplitudes in the incident wave, it is found that

A=-Cm-i)/0»+O, B-2M/&H-0. ... (7) where n, = V (p'fp), is the ratio of the wave-velocities. This is on the hypothesis of an abrupt change of density; if the transition be gradual there may be little or no reflection.

The theory of waves of longitudinal vibration in a uniform straight rod follows exactly the same lines. If £ denote the displacement of a particle whose undisturbed position is x, the length of an element of the central line

is altered from 8x to Sx--6£, ana the elongation is therefore measured by £' '. The tension across any section ia accordingly E«£', where w is the sectional area, and E denotes Young's modulus for the material of the rod (see Elasticity). The rate of change, of momentum of the portion included between two consecutive cross-sections is pto&x.i-, where p now stands for the volume-density. Equating this to the difference of the tensions on these sections we obtain

?=c 2 r (8>

where

c = V(E/,,) (9)

The solution and the interpretation are the same as in the case of (1). It may be noted that in an iron or steel rod the wave-velocity given by (9) amounts roughly to about five kilometres per second.

The theory of plane elastic waves in an unlimited medium, whether fluid or solid, leads to differential equations of exactly the same type. Thus in the case of a fluid medium, if the displacement £ normal to the wave-fronts be a function of / and x, only, the equation of motion of a thin stratum initially bounded by the planes x and

x+fct is

"5T—a? (lo)*

where p is the pressure, and po the undisturbed density. If p de- pends only on the density, we may write, tor small disturbances,

p=po+ks, (11)

where 5, = (p-pu)po, is the " condensation," and k is the coefficient of cubic elasticity. Since s = -d£/dx t this leads to

*BP 3x**

with

c=V (//»). • • • . • – (13) I he latter formula gives for the velocity of sound in water a value (about 1490 metres per second at 1,5° C.) which is in good agreement with direct observation. In the case of a gas, if we neglect variations of temperature, we have k = £o by Boyle's Law, and therefore t = V(/>u/pu). This result, which is due substantially to Sir I. Newton, gives, however, a value considerably below the true velocity of*

sound. The discrepancy was explained by P. S. Laplace (about

(12)

1806?). The temperature is not really constant, but rises and falls as the gas is alternately compressed and rarefied. When this is allowed for we have k=ypo, where 7 is the ratio of the two specific heats of the gas, and therefore c = V(v£o/po). For air, 7 = 1-41, and the consequent value of c agrees well with the best direct de- terminations (332 metres per second at o° C).

The potential energy of a system of sound waves is ˆks 2 per unit volume. As in all cases of propagation in one dimension, the energy of a single progressive system is half kinetic and half potential.

In the case of an unlimited isotropic elastic solid medium two types of plane waves are possible, viz. the displacement may be normal or tangential to the wave-fronts. The axis of x being taken in the direction of propagation, then in the case of a normal displacement £ the traction normal to the wave-front is (X-f-2ju)3£/tto:, where X, p. are the elastic constants of the medium, viz. n is the "rigidity," and \ = k~lft t where k is the cubic elasticity. This leads to the equation

£ = a ! «" (14)

where

a=V{(X+2/0/p)«V{(A+i/0/p}. –• (15) The wave-velocity is greater than in the case of the longitudinal vibrations of a rod, owing to the lateral yielding which takes place in the latter case. In the case of a displacement 77 parallel to the axis of y, and therefore tangential to the wave-fronts, we have a shearing strain dy/dx, and a corresponding shearing stress ndji/dx. This leads to

$ = ftV (16)

with

&=V(Wp) (17)

In the case of steel (A = 1-841 . io 12 , ˆ = 8-19. io 11 , = 7-849 C.G.S.) the wave-velocities a, b come out to be 6-1 and 3-2 kilometres per second, respectively.

If the medium be crystalline the velocity of propagation of plane waves will depend also on the aspect of the wave-front. For any given direction of the

wave-normal there are in the most general case three distinct velocities of wave-propagation, each with its own direction of particle-vibration. These latter directions are perpendicular to 4 each other, but in general oblique to the wave- front. For certain types of crystalline structure the results simplify, but it is unnecessary to enter into further details, as the matter is chiefly of interest in relation to the now abandoned elastic-solid theories of double-refraction. For the modern electric theory of light see Light, and Ei.tec.TRic Waves.

Finally, it may be noticed that the conditions of wave-propagation without change of type may be investigated in another manner. If we impress on the whole medium a velocity equal and opposite to that of the wave we obtain a " steady " or " stationary " state in which the circumstances at any particular point of space are constant. Thus in the case of the vibrations of an inextensible string we may, in the first instance, imagine the string to run through a fixed smooth tube having the form of the wave. The velocity c being constant there ia no tangential acceleration, and the tension P is accordingly uniform. The resultant of the tensions on the two ends of an element Bs is P&s/R, in the direction of the normal, where R denotes the radius of curvature. This will be exactly sufficient to produce the normal acceleration e 2 /K m the mass pSs, provided c 2 = P/p. Under this condition the tube, which now exerts no pressure on the string, may be abolished, and we have a free stationary wave on a moving string. This argument is due to P. G. Tait.

The method was applied to the case of air-waves by W. J. M. Rankine in 1870. When a gas flows steadily through a straight tube of unit section, the mass m which crosses any section in unit time must be the same; hence if u be the velocity we have

pu = m . (18)

Again, the mass which at time / occupies the space between two fixed sections (which we will distinguish by suffixes) has its momen- tum increased in the time 5/ by (mui-muˆ) U, whence

pY-p2=m{ur-ut) (19)

Combined with (18) this gives

pi--m-lp l =p 2 --m' 1 /p2 (20)

Hence for absolutely steady motion it is essential that the ex- pression p--m 2 jp should have the same value throughout the wave. This condition is not accurately fulfilled by any known substance, whether subject to the " isothermal " or " adiabatic " condition; but in the case of small variations

of pressure and density the relation is equivalent to

m 2 =p 2 dp/dp, (21)

and therefore by (18), if c denote the general velocity of the current,

c z — dpl'dp = k/p t .... (22) in agreement with (13). The fact that the condition (20) can only be satisfied approximately shows that some progressive change of type must inevitably take place in sound-waves of finite amplitude. This question has been examined by S. D. Poisson (1807), Sir G, G. Stokes (1848), B. Riemann (1858), S. Earnshaw (1858), W. J. M. Rankine (1870), Lord Rayleigh (1878) and others. It appears that

the more condensed portions of the wave gain continually on the less condensed, the tendency being apparently towards the pro- duction of a discontinuity, somewhat analogous to a " bore ' in water-waves. Before this stage can be reached, however, dissipative forces (so far ignored), such as viscosity and thermal conduction, come into play. In practical acoustics the results are also modified by the diminution of amplitude due to spherical divergence. §2. Wave-Propagation in General. We have next to consider the processes of wave-propagation in two or three dimensions. The simplest case is that of air-waves. When terms of the second order in the velocities are neglected, the dynamical equations are

du dp §v_3p §J£_dj>.

v dt ■

a f n ar*

and the '

"ay m at~ a%

' equation of continuity " (see Hydromechanics) is

*Tt+ < *\al:+-ay+a£) ~°- ■ ■ ■ If we write p = pa(i+s), p = po+ks, these may be written*

at ~ c 'ax' at ~

where c is given by § 1 (13), and as

s 3£

‘ c ay at ~ ‘

/du , dv . &IV

at \a ay az*

‘)’■

W

(2)

(3)

(+)

the latter equation expressing that the condensation s is diminishing at a rate equal to the ” divergence ” of the vector (w, v, w) (see Vector Analysis). Eliminating u, v, w, we obtain

*If-***

where V 2 stands for Laplace’s operator Platf+aPiaf +a’laz. This, the general equation of sound-waves, appears to be due to L. Euler (1759). In the particular case where the disturbance is symmetrical with respect to a centre 0, it takes the simpler form*

3Krs) .3»(«)

ae

at 1

(6)

where r denotes distance from O. It is easily deduced from (i) that in the case of a medium initially at rest the velocity (», v, w) is now wholly radial. The solution of (6) is

t _ /(rf-r) , F(rf+r)

(7)

This represents two spherical waves travelling outwards and in- wards, respectively, with the velocity c, but there is now a progressive change of

amplitude. Thus in the case of the diverging wave re- presented by the first term, the condensation in any particular part of the wave continually diminishes as i/r as the wave spreads. The potential energy per unit volume [§ i (5)! varies as-ˆVand s o diminishes in inverse proportion to the square of the distance from O. It may be shown that as in the case of plane waves the total energy of a diverging (or a converging) wave is half potential and half kinetic. '

The solution of the general equation (5), first given by S. D. Poisson in 1819, expresses the value of 5 at any given point P at time /, in terms of the mean values of s and $ at the instant t = o over a spherical surface of radius ct described with P as centre, viz.

*±ff*W»+3i\j i ff &»>•]. ■ ■ (8)*

where the integrations extend over the surface of the aforesaid sphere, dw is the solid angle subtended at P by an element of its surface, and f(ct), F(c/) respectively denote the original values of s and s at the position of the element. Hence, if the disturbance be originally confined to a limited region, the agitation at any point P external to this region will begin after a time t\c and will cease after a time rj/c, where fi, rˆ are the least and greatest distances of P from the boundary of the region in question. The region occupied by the disturbance at any instant t is therefore delimited by the.envelope of a family of spheres of radius ct described with the points of the original boundary as centres.

One remarkable point about waves diverging in three dimensions remains to be noticed. It easily appears from (3) that the value of 'the integral Jsdt at any point P, taken over the whole time of transit of a wave, is independent of the position of P, and therefore equal to zero, as is seen by taking P at an infinite distance from the original seat of disturbance. This shows that a diverging wave necessarily contains both condensed and rarefied portions. If initially we have zero velocity everywhere, but a uniform condensation s throughout a spherical space of radius a, it is found that we have ultimately a diverging wave in the form of a spherical shell of thickness 2a, and that the value of s within this shell varies from \stftjr at the anterior face to — \st&lr at the interior face, r denoting the mean radius of the shell.

The process of wave-propagation in two dimensions offers some peculiarities which are exemplified in cylindrical waves of sound, in waves on a uniform tense plane membrane, and in annular waves

on a horizontal sheet of water of (relatively) small depth.

equation of motion is in all these cases of the form d 2 s

*at**

*= c*Ws,*

The

(9)

where Viˆ dVdˆ-frˆ/dy 2 . I" tne case of the membrane 5 denotes the displacement normal to its plane; in the application to water-waves it represents the elevation of the surface above the undisturbed level. The solution of (9), even in the case of sym- metry about the origin, is analytically much less simple than that of (6). It appears that the wave due to a transient local disturbance, even of the simplest type, is now not sharply defined in the rear, as it is in the front, but has an indefinitely prolonged "tail." This is illus- trated by the annexed figures which represent graphically the time-variations in the condensation 5 at a particular point, as a wave originating in a local condensation passes over this point. The curve A represents (in a typical case) the effect of a plane wave, B that of a cylindrical wave, and C that of a spherical wave. The changes of type from A to B and from B to C are accounted for by the increasing degree of mobility of the medium.

The equations governing the displacements w, 0, w of a uniform isotropic elastic solid medium are

ahi

FlG.

'(+p)aˆ+' 1 v 4 ».*

where

du , dv .aw

(10)

3x~ay' dz From these we derive by differentiation

where

and

at 1

gt Z -PV i, gf,

= uVA,

=iVf,

dw_d£ du_dw dv _du

dy

ay

as in tions

! =(X+2,u)/p. P=»ip,

It appears then that the ” dilatation ‘

(II)

(12) (13)

(14)

. (15)

A and the ” rota-

£, i), f are propagated with the velocities a, b, respectively.

By formulae analogous to (8) we can calculate the values of A, £, tj, £* at any instant in terms of the initial conditions. The subsequent determination of w, v, w is a merely analytical problem into which we do not enter; it is clear, however, that if the original disturbance be confined to a limited region we have ultimately two concentric spherical diverging waves. In the outer one of these, which travels with the velocity a, the rotations £, 17, t vanish, and the wave is accordingly described as . ■” irrotational,” or “condensational.” In the inner wave, which travels with the smaller velocity b, the dilatation A vanishes, and the wave is therefore characterized as ” equivoluminal ” or ” distortional.” In the former wave the directions of vibration of the particles tend to become normal, and in the latter tangential, to the wave-front, as in the case of plane elastic waves (§ i).

The problems of reflection and transmission which arise when a wave encounters the boundary of an elastic-solid _ medium, or the interface of two such media, are of interest chiefly in relation to the older theories of optics. It mav, however, be worth while to remark that an irrotational or

an equivoluminal wave does not in general give rise to a reflected (or transmitted) wave of single character; thus an equivoluminal wave gives rise to an irrotational as well as an equivoluminal reflected wave, and so on.

*Finally, in a limited elastic solid" we may also have systems of waves of a different type. These travel over the surface with a definite velocity somewhat less than that of the equivoluminal waves above referred tc; thus in an incompressible solid the velocity is -95546; in a solid such that A = a« it is *9I94&._ The agitation due to these waves is confined to the immediate neighbourhood of the surface, diminishing exponentially with increasing depth. The theory of these surface waves was given by Lord Rayleigh in 1885. In the modern theory of earthquakes three phases of the disturbance*

1 Figures 1, 2, 4, 6, 7 and 8 are from Professor Hprace Lamb's Hydrodynamics, by permission of the Cambridge University Press.

at a station distant from the origin are recognized; the first corre- sponds to the arrival of condensational waves, the second to that of distortional waves, and the third to that of the Rayleigh waves (see Elasticity).

The theory of waves diverging from a centre in an unlimited crystalline medium has been investigated with a view to optical theory by G. Green (1839), A. L. Cauchy (1830), E. B. Christoffel (1877J and others. The surface which represents the wave-front consists of three sheets, each of which is propagated with its own special velocity. It is hardly worth while to attempt an account here of the singularities of this surface, or of the simplifications which occur for various types of crystalline symmetry, as the subject has loBt much of its physical interest now that the elastic-solid theory of light is practically abandoned.

§ 3. Water-Waves. Theory of " Long " Waves.

The simplest type of water-waves is that in which the motion of the particles is mainly horizontal, and therefore (as will appear) sensibly the same for all particles in a vertical line. The most conspicuous example is that of the forced oscillations produced by the action of the sun and moon on the waters of the ocean, and it has therefore been proposed to designate by the term " tidal " all cases of wave-motion, whatever their scale, which have the above characteristic property.

Beginning with motion in two dimensions, let us suppose that the axis of x

is drawn horizontally, and that of y vertically upwards. If we neglect the vertical acceleration, the pressure at any point will have the statical value due to the depth below the instantaneous position of the free surface, and the horizontal pressure- gradient dp/dx will therefore be independent of y. It follows that all particles which at any instant lie in a plane perpendicular to Ox will retain this relative configuration throughout the motion. The equation of horizontal motion, on the hypothesis that the velocity («) is infinitely small, will be

*du dp d-n . **

p ai = -aZ = z p dx W

where 17 denotes the surface-elevation at the point x. Again, the equation of continuity, viz.,

ai + ay~° (2)

gives

if the origin be taken at the bottom, the depth being assumed to be uniform. At the surface we have y = k--iji and v — dnjdt, subject to an error of the second order in the disturbance. To this degree of approximation we have then

*«—*3i- •-■-■■ (4) If we eliminate « between (1) and (4) we obtain*

a? ˆdx 2 ‘ • – W

with

t? = gh (6)

The solution is as in § 1, and represents two wave-systems travelling with the constant velocity V (kˆ), which is that which would be acquired by a particle falling freely through a space equal to half the depth.

Two distinct assumptions have been made in the foregoing investigation. The meaning of these is most easily understood if we consider the case of a simple-harmonic train of waves in which

1| = 0COSife(C — x), U = %~CQS k(ct — x), ... (7)*

where k is a constant such that 2rjk is the wave-length X. The first assumption, viz. that the vertical acceleration may be neglected in comparison with the horizontal, is fulfilled if kh be small, i.e. if the wave-length be large compared with the depth. It is in this sense that the theory is

regarded as applicable only to "long" waves. The second assumption, which neglects terms of the second order in forming the equation (1), implies that the ratio WA of the surface- elevation to the depth of the fluid must be small. The formulae (7) indicate also that in a progressive wave a particle moves forwards or backwards according as the water-surface above it is elevated or depressed relatively to the mean level. It may also be proved that the expressions

T = yhfu t dx,V = lgpfn l dx, . . . (8)

for the kinetic and potential energies per unit breadth are equal in the case of a progressive wave.

It will be noticed that there is a very close correspondence between the theory of "long" water-waves and that of plane waves of sound, e.g. the ratio ij/A corresponds exactly to the " condensation " in the case of air-waves. The theory can be adapted, with very Blight adjustment, to the case of waves propagated along a canal of any uniform section, provided the breadth, as well as the depth,

be small compared with the wave-length. The principal change is that in (6) h must be understood to denote the mean depth. The theory was further extended by G. Green (1837) and by Lord Rayleigh to the case where the dimensions of the cross-section are variable. If the variation be sufficiently gradual there is no sensible reflection, a progressive wave travelling always with the velocity appropriate to the local mean depth. There is, however, a variation of amplitude; the constancy of the energy, combined with the equation of continuity, require that the elevation q in any particular , part of the wave should vary as &""?fc?, where & is the breadth of the water surface and k is the mean depth.

Owing to its mathematical simplicity the theory of long waves in canals has been largely used to illustrate the dynamical theory of the tides. In the case of forced waves in a uniform canal, the equation (1) is replaced by

*du Brt , v f *

ot = -ial+ x <9)

where X represents the extraneous force. In the case of an equatorial canal surrounding the earth, the disturbing action of the moon, supposed (for simplicity) to revolve in a circular orbit in the plane of the equator, is represented by

X—ˆain2(ri+£+ e),

(10)

where a is the earth's radius, H is the total range of the tide on the " equilibrium theory," and

, gHo-a , , , x , :

(11)

The coefficient in the former of these equations U negative unless the ratio ft/a exceed

When the ratio ijfh of the elevation to the depth is no longer treated as infinitely small, it is found that a progressive wave- system must undergo a continual change of type as it proceeds, even in a uniform canal. It was shown by Sir G. B. Airy (1845) that the more elevated portions of the wave travel with the greater velocities, the expression for the velocity of propagation being

approximately. Hence the slopes will become continually steeper in front and more gradual behind, until a stage is reached at which the vertical acceleration is no longer negligible, and the theory ceases to apply. The process is exemplified uy sea-waves running inwards in shallow water near the shore. The theory of forced periodic waves of finite (as distinguished from infinitely small) ■ amplitude was also discussed by Airy. It has an application in tidal theory, in the explanation of " overrides " and 'compound tides " (see Tide).

§ 4. Surface- Waves. This is the most familiar type of water-waves, but the theory is not altogether elementary. We will suppose in the first instance that the motion is in two dimensions x, y, horizontal and vertical respectively. The velocity-potential (see Hydromechanics) must satisfy the equation

&4> . 3V

dx + dy*~ 0t*

(0

and must make d/dy— b at the bottom, which is supposed to be plane and horizontal. The pressure-equation is, if we neglect the square of the velocity,

j = ˆi~gy+ const < 2)

Hence, if the origin be taken in the undisturbed surface, we may write, for the surface-elevation,

“KfrL

(3>

with the same approximation. We have also the geometrical condition

e V t = ~Ldy-\y-o. . • • ■ • (4) The general solution of these equations is somewhat complicated,

and it is therefore usual to fix attention in the first place on the case of an infinitely extended wave-system of simple- harmonic profile, say

tj=0 sin k(x — ct) (5)

The corresponding value of <$> is

, sS cos h k{y+h) , , ,. ,,,

where h denotes the depth; it is in fact easily verified that this satisfies (1), and makes dtp/dy = a t (or y=— h, and that it fulfils the pressure-condition (3) at the free surface. The kinematic condition (4) will also be satisfied, provided

(7)

= X tan hkh = ~^tan h-r-.

X denoting the wave-length 2jt/&- It appears, on calculating the component velocities from (6), that the motion of each particle is elliptic-harmonic, the semi-axes of the orbit, horizontal and vertical, being

a co s h k(y-- h) „ sin h k(y--h) , fl>

P sin h hh ‘ P Bin h kh W

where y refers to the mean level of the particle. The dimensions of the orbits diminish from the surface downwards. The direction of motion of a surface-particle is forwards when it coincides with a crest, and backwards when it coincides with a trough, of the waves. When the wave-length is anything less than double the depth we have tan h kh~i, practically, and

the formula (6) reduces to

ˆ = ˆ“cos k(x-

■ct)

(9)

(10)

(11)

with

*C ~k 2**

*the same as if the depth were infinite. The orbits of the particles are now circles of radii /?«**. When, on the other hand, X is moderately large compared with h, we have tan h kh = kh, and c = -*I(gh), in agreement with the preceding theory of ” long ” waves. These results date from G. Green (1839) and Sir G. B. Airy (1845).*

The energy of our simple-harmonic wave-train is, as usual, half kinetic and half potential, the total amount per unit area of the free surface being \gp(P. This is equal to the work which would be required to raise a stratum of fluid, of thickness equal to the surface- amplitude 8, through a height \B.

It has been assumed so far that the upper surface Js free, the pressure there being uniform. We might also consider the case of waves on the common surface of two liquids of different densities. For wave-lengths which are less than double the depth of either liquid the formula (10) is replaced by

2t p+p

where p, p’ are the densities of the lower and upper fluids respec- tively. The diminution in the wave-velocity c has, as the formula indicates, a twnfold cause; the potential energy of a given deforma- tion of the common surface is diminished by the presence of the upper fluid in the ratio {p — p’)lp, whilst the inertia is increased in the ratio {p+p’)Ip : When the two densities are very nearly equal the waves have little energy, and the oscillations of the common surface are very slow. This is easily observed in the case of paraffin oil over water.

To examine the progress, over the surface of deep water, of a disturbance whose initial character is given quite arbitrarily it would be necessary to

resolve it by Fourier's theorem into systems of simple-harmonic trains. Since each of these is propagated with the velocity proper to its own wave-length, as given by (10), the resulting wave-profile will continually alter its shape. The case of an initial local impulse has been studied in detail by S. D. Poisson (1816), A. Cauchy (1815) and others. At any subsequent instant the surface is occupied on either side by_ a train of waves of varying height and length, the wave-length increasing, and the height diminishing, with increasing distance (x) from the origin o£ the disturbance. The longer waves travel faster than the shorter, so that each wave is continually being drawn out in length, and its velocity of propagation therefore continually increases as it ad- vances. If we fix our attention on a particular point of the surface, the level there will rise and fall with increasing rapidity and in-creasing amplitude. These statements are all involved in Poisson's approximate formula

. . (12)

CI tf ■ RP

which, however, is only valid under the condition that x is large compared with \g^. This shows moreover that the occurrence of a particular wave-length X is conditioned by the relation

.... (13)

I 3 V :

>X

The foregoing description applies in the first instance only to the case of an initial impulse concentrated upon an infinitely narrow

band of the surface. The corresponding results for the more practical case of a band of finite breadth are to be inferred by superposition. The initial stages of the disturbance at a distance x, which is large compared with the breadth b of the band, will have the same char- acter as before, but when, owing to the continual diminution of the length of the waves emitted, X becomes comparable with or smaller than b, the parts of the disturbance which are due to the various parts of the band will no longer be approximately in the same phase, and we have a case of ' interference M in the optical sense. The result is in general that in the final stages the surface will be marked by a series of groups of waves of diminishing amplitude separated by bands of comparatively smooth water.

The fact that the wave-velocity of a simple- harmonic train varies with the wave-length has an analogy in optics, in the propagation of light in a

dispersive medium. In both cases we have a contrast with the simpler phenomena of waves on a tense string or of light- waves in vacuo, and the notion of " group-velocity," as distinguished from wave-velocity, comes to be important. If in the above analysis of the disturbance due to a local impulse we denote by U the velocity with which the locus of any particular wave-lengths X travels, we see from (13) that U=ie. The actual fact that when a limited group of waves of approximately equal wave-length travels over relatively deep water the velocity of advance of the group as a whole is less than that 'of the individual waves composing it seems to have been first explicitly remarked by J. Scott Russell (1R44). If attention is concentrated on a particular wave, this is seen to progress through the group, gradually dying out as it approaches the front, whilst its former place in the group is occupied in suc- cession by other waves which have come forward from the rear. General explanations, not restricted to the case of water-waves, have been given by Stokes, Rayleigh, and others. If the wave- length X be regarded as a funrtion of x and t, we have

ar+Ua;=o, ... (i 4)

since X does not vary in the neighbourhood of a geometrical point

travelling with velocity U, this being in fact the definition of U.

Again, if we imagine a second geometrical point to move with the

waves, we have

d\ . d_dc _y.dc d\ , ■,

M^ C te-~dx K ~ K d-Tx U5J

the second member expressing the rate at which two consecutive

wave-crests are separating from one another. Comparing (14) and

(15), we have

v=c ~ x d\ • • (l6)

If a curve be constructed with X as abscissa and c as ordinate, the group-velocity U will be represented by the intercept made by the tangent on the axis of c. This is illustrated by the annexed figure, which refers to the case of deep-water waves; the curve is a parabola, and the intercept is half the ordinate, in accordance with the relation U = 4c already remarked. The physical importance of the motion of group-velocity was pointed out by 0. Reynolds (1877), who showed that the rate at which energy is pro-

pagated is only half that which would be required for the transport of the group as a whole with the velocity c.

The preceding investigations enable us to infer the effect of a pressure-disturb- ance travelling over the surface of still water with, say, a constant velocity c in the direction of ˆ-negative. The . ab- normal pressure being supposed concentrated on an infinitely narrow band of the surface, the elevation t\ at any point P may be regarded as due to a succession of infinitely small impulses de- livered over bandis of the surface at equal infinitely short intervals of time on equidistant lines parallel to the (horizontal) axis of s. Of the wave-systems thus successively generated, those only will combine to produce a sensible effect at P which had their origin in the neighbourhood of a line Q whose position is determined by the consideration that the ˆ phase at P is " stationary " for variations in the position of Q. Now if t be the time which the source of disturbance has taken to travel from Q to its actual position O, it appears from (12) that the phase of the waves at P, originated at Q, is gPfˆx-i- Jjt, where X=QF. The condition for station- ary phase is therefore

x = 2x/t. . . (17) Fig. 3.

In this differentiation, O and P are .

to be regarded as fixed; hence ***£, and therefore OQ~c*** *— 2PQ. We have already seen that the wave-length at P is such that PQ = U/, where U is the corresponding group-velocity. H*nce the*

Fig. 2.

WAVE

4-9

Fig. 4.

wave-length X at points to the right of O is uniform, being that proper to a wave-velocity c, viz. X = 2xc 2 /g. The disturbance is therefore followed by a train of waves of approximately simple- harmonic profile, of the length indicated. An approximate calcula- tion shows that, except in the immediate neighbourhood of the source of disturbance, the surface-elevation is given by

**~f£*»£. • • • • (.8)*

where x is now measured from O, and To(=fpdx) represents the integral of the disturbing surface pressure over the (infinitely small)

breadth of the band on which it acts. The case of a diffused pressure can be in- ferred by integration. The annexed figure gives a representation of a particular case, obtained by a more exact process. The pressure is here sup- posed uniformly distributed over a band of breadth AB.

A similar argument can be applied to the case of finite depth (fe), but since the wave-velocity cannot exceed V(2gA) the results are modified if the velocity c of the travelling pressure exceeds this limit. There is then no train of waves generated, the disturbance of level being purely local. It hardly needs stating that the in- vestigation applies also to the case of a stationary surface disturbance on a running stream, and that similar results follow when the disturbance consists in an equality of the bottom. In both cases we have a train of standing waves on the down-stream side, of length corresponding to a wave-velocity equal to that of the stream.

The effect of a disturbance confined to the neighbourhood of a point of the surface (of deep water) was also included in the in- vestigations of Cauchy and Poisson already referred to. The formula analogous to (12), in the case of a local impulse, is

*,. ** ■ g' 2 f «— – 4 sm2-, s r 4 4r'*

ivhere r denotes distance from the source. The interpretation is similar to that of the two-dimensional case, except that the amplitude of the annular waves diminishes outwards, as was to be expected, in a higher ratio.

The effect of a pressure-point travelling in a straight line over the surface of deep water is interesting, as helping us to account in some degree for the peculiar system of waves which is seen to accompany a ship. The configuration of the wave-system is shown by means of the lines of equal phase in the annexed diagram, due to V. W. Ekman (1906), which differs from the drawing origin- ally given by Lord Kelvin (1887) in that it indicates the differ- ence of phase between the transverse and diverging waves at the common boundary of the two series. The two systems of waves are due to the fact that at any given instant there are two previous positions of the moving pressure-point which have transmitted vibrations of Aft°r V. Walfrid Ekman, On Stationary stationary phase to any given

(■9)

point P within the range of the figure. When the depth is finite

Wavtsin Running Water.

Fig. 5. the configuration is modified, and if it be less than c % jg, where c is the velocity of the disturbance, the transversal waves disappear.

The investigations referred to have a bearing on the wave- resistance of ships. This is accounted for by the energy of the new wave- groups which are continually being started and left behind. Some experiments on torpedo boats moving in shallow water have indi- cated a falling off in resistance due to the absence of transversal waves just referred to. For the effect of surface-tension and the theory of " ripples " see Capillary Action.

§ 5. Surface-Waves of Finite Height.

The foregoing results are based on the assumption that the amplitude may be treated as infinitely small. Various interesting investigations have been made in which this restriction is, more or less, abandoned, but we are far from possessing a complete theory.

A system of exact equations giving a possible type of wave- motion on deep water was obtained by F. J. v. Gerstner in 1802, and rediscovered by W. J. M. Rankine in 1863. The orbits of the particles, in this type, are accurately circular, being defined by the equations

***»*

where (a, b) is the mean position of the particle, k = 2vj\; and the wave-velocity is

**~v\>/fe) = V(gV2T) (2)*

The lines of equal pressure, among which is included of course the surface-profile, are trochoidal curves. The extreme form of wave- profile is the cycloid, with the cusps turned upwards. The mathe-

Fig. 6.

matical elegance and simplicity of the formulae (1) are unfortunately counterbalanced by the fact that the consequent motion of the fluid elements proves to be " rotational " (see Hydromechanics), and therefore not such as could be generated in a previously quiescent liquid by any system of forces applied to the surface.

Sir G. Stokes, in a, series of papers, applied himself to the deter- mination of the possible " irrotational " wave-forms of finite height which satisfy the conditions of uniform propagation without change of type. The equation of the profile, in the case of infinite depth, is obtained in the form of a Fourier series, thus

y = acoskx J r%ka 2 cos2kx--%k 2 a 3 casT) kx-- . , the corresponding wave-velocity being approximately

(3)

vmˆ-mi w

where A = 2:r/£. The equation (3), so far as we have given the development, agrees with that of a trochoid (fig. 7). As in the case of Gerstner's waves the outline is sharper near the crests and flatter ; in the troughs than in " the caseof the simple- FlG. 7.

harmonic curve, and

these features become accentuated as the ratio of the amplitude to the wave-length increases. It has been shown by Stokes that the extreme form of irrotational waves differs from that of the rotational Gerstner waves in that the crests form a blunt angle of 120 . Ac- cording to the calculations of J. H. Michel) (1893), the height is then about one-seventh of the wave-length, and the wave-velocity exceeds that of very low waves of the same length in the ratio 6:5. It is to be noticed further that in these waves of permanent type the motion of the water- particles is not purely oscillatory, there being on the whole a gradual drift at the surface in the direction of propagation. These various conclusions appear to agree in a general way with what is observed in the case of sea-waves.

In the case of finite depth the calculations are n ore difficult, and we can only here notice the limiting type which is obtained when the wave-length is supposed very great compared with the depth (h). We have' then practically the " solitary wave " to : which attention was ' first directed by J. Scott Russell (1844) from observation. The theory has been worked out by J. Boussinesq (1871) and Lord Rayleigh. The surface-elevation is given by

1} = a sec h 2 £(x/6) , (5)

provided

6«-A(A + o)/3a (6)*

and the velocity of propagation is

C = V{fi(& + a)j (7)

*In the extreme form a = h and the crest forms an angle of 120 . It appears that a solitary w*ave of depression, of permanent type, is impossible.*

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(1844). Theoretical works : S. D. Poisson, " Memoire sur la theorie du son," J. de V Scale polyt. 7 (1807); " Mem. eur la theorie des ondes," Mem. de Vacad. roy. des sc. I (1816) ; A. Cauchy, " Mem. sur la theorie des ondes," Mem. de Vacad. roy. des sc. 1 (1827) ; Sir G. B. Airy, "Tides and Waves," Encycl. Metrop. (1845). Many classical investigations are now most conveniently accessible

Fig. 8.

in the following collections: G. Green, Math. Papers (Cambridge, 1871); H. v. Helmholtz, Gesammelte Abhandlungen (Leipzig, 1882- 1895) ; Lord Rayleigh, Scientific Papers (Cambridge, 1899-1903) ; W. J. M. Rankine, Misc. Scientific Papers (London, 1881) ; Sir G. G. Stokes, Math, and Phys. Papers (Cambridge, 1880-1905). Numerous references to other writers will be found in the articles by P. Forch- heimer (" Hydraulik "), H. Lamb (" Schwingungen elastischer Korper, insb. Akustik "), and A. E. H. Love (" Hydrodynamik ") in various divisions of the fourth volume of the Kncykl. d. math. Wiss.; and in H. Lamb's Hydrodynamics (3rd ed., Cambridge, 1906). (H. Lb.)

WAVELLITE, a mineral consisting of hydrated aluminium phosphate, AWOHMPOˆ + 45H2O, crystallizing in the ortho- rhombic system. Distinct crystals are of rare occurrence, the mineral usually taking the form of hemispherical or globular aggregates with an internal radiated structure. It is translucent and varies in colour from grey or white to greenish, yellowish, &c. The hardness is 3ˆ, and the specific gravity 2-32. It was first found, at the end of the 18th century, by Dr W. Wavell near Barnstaple in Devonshire, where it lines crevices in a black slaty rock. It has also been found in Ireland (Tipperary and Cork), Arkansas, &c. (L. J. S.)

WAVERLY, a village of Tioga county, New York, U.S.A., about 18 m. S.E. of Elmira, on the Cayuta Creek, near the Chemung and the Susquehanna rivers, which unite several miles S. of the village. Pop. (1890) 4123; (1900) 4465, of whom 295 were foreign-born; (1905) 4915; (rgio) 4855. It is served by the Delaware, Lackawanna & Western, the Erie and the Lehigh Valley railways. With South Waverly (pop. in 1910 1084) — separated from Waverly only by the state line and really a part of the village — Sayre, and Athens, Pennsylvania, it is connected by electric railway and the three form practically an industrial unit. Waverly is also connected by electric line with Elmira. The village is a railway centre of some importance, distributes coal from the Wyoming Valley mines, and

ships the dairy products of a large farming district and small fruits and garden products. Waverly was settled about 1804 by settlers from Connecticut and the Hudson River Valley, and was incorporated as a village in 1854.

WAVRE, a town of Belgium, in the province of Brabant, 14 m. S.E. of Brussels. Pop. (1904) 8517. It. was on this place that Grouchy advanced on the day of Waterloo, gaining a useless success here over a Prussian corps while the fate of the campaign was being decided elsewhere. The Prussians erected here a fine monument by Van Oemberg in 1859.

WAX, a solid fatty substance of animal and vegetable origin, allied to the fixed oils and fats. From these it is distinguished by the fact that while oils and fats are glycerides, a true wax contains no glycerin, but is a combination of fatty acids with certain solid monatomic alcohols (see Oils).

WAX FIGURES. Beeswax is possessed of properties which render it a most convenient medium for preparing figures and models, cither by modelling or by casting in moulds. At ordinary temperatures it can be cut and shaped with facility; it melts to a limpid fluid at a low heat; it mixes with any colouring matter, and takes surface tints well; and its texture and consistency may be modified by the addition of earthy matters and oils or fats. When molten, it takes the minutest impressions of a mould, and it sets and hardens at such a temperature that no ordinary climatic influences affect the form it assumes, even when it is cast in thin laminae. The facilities which wax offers for modelling have been taken advantage of from the remotest times. Figures in wax of their deities were used in the funeral rites of the ancient Egyptians, and deposited among other offerings in their graves; many of these are now preserved in museums. That the Egyptians also modelled fruits can be learned from numerous allusions in early literature. Among the Greeks during their best art period, wax figures were largely used as dolls for children; statuettes of deities were modelled for votive offerings and for religious ceremonies, and wax images to which magical properties were attributed w r ere treasured by the people. Wax figures and models held a still more important place among the ancient Romans. The masks {effigies or imagines) of ancestors, modelled in wax, were preserved by

patrician families, this, jus imaginum being one of the privileges of the nobles, and these masks were exposed to view on ceremonial occasions, and carried in their funeral processions. Tie closing days of the Saturnalia were known as Sigittaria, on account of the custom of making, towards the end of the festival, presents of wax models of fruits and waxen statuettes which were fashioned by the Sigillarii or manufacturers of small figures in

wax and other media. The practice of wax modelling can be traced through the middle ages, when votive offerings of wax figures were made to churches, and the memory and lineaments of monarchs and great personages were preserved by means of wax masks as in the days of Roman patricians. In these ages malice and supersti- tion found expression in the formation of wax images of hated persons, into the bodies of which long pins were thrust, in the confident expectation that thereby deadly injury would be induced to the person represented; and this belief and practice continued till the r7th century. Indeed the superstition still survives in the Highlands of Scotland, where as recently as 1885 a clay model of an enemy was found in a stream, having been placed there in the belief that, as the clay was washed away, so would the health of the hated one decline. With the renaissance of art in Italy, modelling in wax took a position of high im- portance, and it was practised by some of the greatest of the early masters. The bronze medallions of Pisano and the other famous medallists owe their value to the art qualities of wax models from which they w r cre cast by the cire perdue process; and indeed all early bronzes and metal work were cast from wax models. The tile de cire in the Wicar collection at Lille is one of the most lovely examples of artistic work in this medium in existence. Wicar, one of Napoleon's commissaries, brought this figure from Italy. It represents the head and shoulders of a young girl. It has been claimed as a work of Greek or Roman art, and has been assigned to Leonardo da Vinci and to Raphael, but all that can be said is that it probably dates from the Italian Renaissance. In 1909 Dr Bode, the director of the Kaiser Friedrich Museum at Berlin, purchased in England, for (it was stated) £8000, a life-sized half-length female figure in wax, which he attributed to Leonardo da Vinci or his school. The figure was shown to have once been in the possession of Richard Cockle Lucas (1800— 1883), a sculptor and worker in ivory, wax, &c. It was claimed that the figure was really Lucas's work and was a reproduction in wax of a picture of " Flora" attributed to Leonardo da Vinci, now in the possession of the Morrison family at Basildon Park, near Pang- bourne; this view was repudiated by Dr Bode, but was generally accepted in England (see The Times, Oct.-Dec. 1909; and particularly the Burlington Magazine, May, June, August, igio). Till towards the close of the 18th century modelling of medallion portraits and of relief groups, the latter frequently polychromatic, was in considerable vogue throughout Europe. About the end of the r8th century Flaxman executed in wax many portraits and other relief figures which Josiah Wedgwood translated into pottery for his jasper ware. The modelling of the soft parts of dissections, &c, for teaching illustrations of anatomy was first practised at Florence, and is now very common. Such preparations formed part of a show at Hamburg in 1 7 2 1 , and from that time wax-works, on a plane lower than art, have been popular attractions, These exhibitions consist principally of images of historical or notorious

personages, made up of waxen masks on lay figures in which sometimes mechanism is fitted to give motion to the figure. Such an exhibition of wax-works with mechanical motions was shown in Germany early in the 18th century, and is described by Steele in the Tatler. The most famous modern wax-work exhibition is that of Madame Tussaud (q.v.) in London.

WAX-TREE, Wax Myrtle, Candleberry, popular names of species of Myrica, especially M. cerijera, a North American plant, the fruits of which have a waxy covering and are used as a source of vegetable wax. M. Gale is the native British gale (q.v.) or sweet-gale.

WAXWING, a bird first so called apparently by P. JVSelby in 1825 (Illustr. Brit. Ornithology, p. 87), having been before known

as the " silk-tail " (Pkilos. Transactions, 1685, p. 1161) — a literal rendering of the German Seidenschwanz — or "chatterer" — the prefix " German," " Bohemian " or " waxen " being often also applied. Selby's convenient name has now been generally adopted, since the bird is readily distinguished from almost all others by the curious expansion of the shaft of some of its wing- feathers at the tip into a flake that looks like scarlet sealing-wax, while its exceedingly silent habit makes the name " chatterer" wholly inappropriate, and indeed this last arose from a mis- interpretation of the specific term garrulus, meaning a jay (from the general resemblance in colour of the two birds), and not referring to any garrulous quality. It is the Ampelis garrulus of Linnaeus and of more recent ornithologists, and is the type of the Passerine family Ampelidae.

The waxwing is a bird that for many years excited vast interest. An irregular winter-visitant, sometimes in countless hordes, to the whole of the central and some parts of southern Europe, it was of old time looked upon as the harbinger of war, plague or death, and, while its harmonious coloration and the grace of its form were attractive, the curiosity with which its irregular appearances were regarded was enhanced by the mystery which enshrouded its birthplace, and until the summer of 1856 defied the searching of any explorer. In that year, however, all doubt was dispelled through the successful search in Lapland, organized by John Wolley, as briefly described by him to the Zoological Society {Proceedings, 1857, pp. 55, 56, pi. cxxii.). 1 In 1858 H. E. Dresser found a small settlement of the species on an island in the Baltic near Uleaborg, and with his own hands took a nest. It is now pretty evident that the wax- wing, though doubtless breeding yearly in some parts of northern Europe, is as

irregular in the choice of its summer-quarters as in that of its winter-retreats. Moreover, the species exhibits the same irregular habits in America. It has been found in Nebraska in " millions," as well as breeding on the Yukon and on the Anderson river.

Beautiful as is the bird with its full erectile crest, its cinnamon- brown plumage passing in parts into grey or chestnut, and relieved by black, white and yellow — -all of the purest tint — the external feature which has invited most attention is the " sealing-wax " (already mentioned) which tips some of the secondary or radial quills, and occasionally those of the tail. This is nearly as much exhibited by the kindred species, A. cedrorum —the^ well-known cedar-bird of the English in North America — which is easily dis- tinguished by its smaller size, less black chin-spot, the yellower tinge of the lower parts and the want of white on the wings. In the A. phoenicopterus of southern-eastern Siberia and Japan, the remiges and rectrices are tipped with red in the ordinary way without dilatation of the shaft of the feathers.

Both the waxwing and cedar-bird seem to Jive chiefly on ingects in summer, but are marvellously addicted to berries during the rest of the year, and will gorge themselves if opportunity allow. They are pleasant cage-birds, quickly becoming tame. The erratic habits of the waxwing are probably due chiefly to the supplies of food it may require, prompted also by the number of mouths to be fed, for there is some reason to think that this varies greatly from one year to another, according to season. The flocks which \isit Britain and other countries outs ; de the breeding range of the species naturally contain a very large proportion o' young birds. (A. N.)

WAYCROSS, a city and the county-seat of Ware county, Georgia, U.S.A., about 96 m. S.W. of Savannah and about 60 m. VV. of Brunswick. Pop. (1880) 62S; (1S90) 3364; (1900) 5919 (2899 negroes); (1910)14,485. Waycross is served by the Atlanta, Birmingham & Atlantic, and the Atlantic Coast Line railways, several branches of the latter intersecting here. In the city is the Bunn-Bcll Institute (Baptist, opened in 1909). There are large railway car construction and repair shops here, and Way- cross is a commercial centre for the forest products (naval stores and lumber) and the cotton, sugar cane, sweet potatoes, melons and pears of the surrounding country. The municipality owns the water-works, the water-supply being obtained from artesian wells. Before the passage of the state prohibition law Waycross secured virtual prohibition of the sale of intoxicating liquors by requiring a large liquor license fee ($20,000 in 1883, increased to $30,000 in 1892). Waycross was settled in 1870, was first in- corporated in 1874 and became a city in 1909.

1 A fuller account of his discovery, illustrated by Hewitson, is given in The Ibis (r86i, pp. 92-106, pi. iv).

WAYLAND, FRANCIS (1796-1865), American educationist, was born in New York City on the nth of March 1796. His father was an Englishman of the same name, who was a Baptist pastor. The son graduated at Union College in 1813 and studied medicine in Troy and in New York City, but in 1816 entered Andover Theological Seminary, where he was greatly influenced by Moses Stuart. He was too poor to conclude his course in theology, and in 1817-1821 was a tutor at Union College, to which after five years as pastor of the First Baptist Church of Boston he returned in 1826 as professor of natural philosophy. In 1827 he became president of Brown University. In the twenty-eight years of his administration he gradually built up the college, improving academic discipline, formed a library and gave scientific studies a more prominent place. He also worked for higher educational ideals outside'the college, writing text-books on ethics and economics, and promoting the free school system of Rhode Island and especially (1828) of Pro- vidence. His Thoughts on the Present Collegiate System in the United States (1842) and his Report to the Corporation of Brown University of 1850 pointed the way to educational reforms, particularly the introduction of industrial courses, which were only partially adopted in his lifetime. He resigned the presidency of Brown in r85S, and in 1857-1858 was pastor of the First Baptist Church of Providence. He died on the 30th of September 1865. He was an early advocate of the temperance and anti- slavery causes, for many years was " inspector of the state prison and Providence county jail," president of the Prison Discipline Society, and active in prison reform and local charities. He was one of the " law and order " leaders during the " Dorr Rebellion " of, 1842, and was called " the first citizen of Rhode Island." His son Francis (1826-1904) graduated at Brown in 1846, and studied law at Harvard; he became probate judge in Connecticut in 1864, was lieutenant-governor in 1869-1870, and in 1872 became a professor in the Yale Law School, of which he was dean from 1873 to 1903..

Besides several volumes of sermons and addresses and the volumes already mentioned, he published Elements of Moral Science (1835, repeatedly revised and translated into foreign languages); Elements of Political Economy (1837), in which he advocated. free-trade; The Limitations of Human Responsibility (1838) ; Domestic Slavery Considered as a Scriptural Institution (1845); Memoirs of Harriet Ware (1850); Memoirs of Adoniram Judson (1853); Elements of Intellectual Philosophy (1854); Notes on the Principles and Practices of Baptist Churches (1857); Letters on the Ministry of the Gospel (1863); and a brief Memoir of Thomas Chalmers (1864).

See The Life and Labors of Francis Wa^la-nd (2 vols., New York, 1867) by his sons Francis and Heman Lincoln ; '.the shorter sketch (Boston, 1891) by James O. Murray in the "American Religious Leaders " series; and an article by G. C. Verplanck in vol. xiv. of the American Journal of Education.

WAYLAND THE SMITH (Scand. Volundr, Ger. Wieland), hero of romance. The legend of Wayland probably had its home in the north, where he and his brother Egill 2 were the types of the skilled workman, but there are abundant local traditions of the wonderful smith in Westphalia and in southern England. His story is told in one of the oldest songs of the Edda, the V olundarkiSa, and, with considerable variations, in the prose piSrekssaga (Thidrek's sage), while the Anglo-Saxon Beowulf and Dear's Lament contain allusions to it. The tale of Wayland falls naturally into two parts, the former of which contains obviously mythical features. He was the son of the giant sailor Wate and of a mermaiden. His grandfather was that Vilkinus, king of Norway, who lent his name to the Vilkina- or pibrekssaga. Three brothers Volundr, Egill and Slagfihr seized the swan-maidens Hlajjgubr, Olrun and Hervor, who, divested of their feather dresses, stayed with them seven or eight years as their wives. The second part of the story concerns Volundr, lord of the elves, the cunning smith, who, after learning his art from Mime, then from the dwarfs, came to the court of King Ni]>ohr, and there defeated in fight the smith Amilias. Volundr's sword, Mimung, with which he won this victory, was one of the famous weapons in German epic poetry. In the Dietrich cycle it descended to

2 Egill was compelled to prove his skill as an archer by shooting an apple off the head of his three-year-old son; he is thus the prototype of William Tell.

Wayland's son Wittich, and was cunningly exchanged by Hilde- brand for a commoner blade before Wittich'5 fight with Dietrich. Ni]>o)t, in order to secure Volundr's services, lamed him by cutting the sinews of his knees, and then established him in a smithy on a neighbouring island. The smith avenged himself by the slaughter of NiJ'oJ'r's two sons and the rape of his daughter Bodvildr. He then soared away on wings he had prepared. The story in its main outlines bears a striking resemblance to the myth of Daedalus. For the vengeance of Volundr there is a very close counterpart in the medieval versions of the vengeance- of the Moorish slave on his master. The denouement of this tale, which made its first appearance in European literature in the De obedientia (Opera, Venice, 3 vols., 1518-1519) of

Jovianus Pontanus (d. 1503), is different, for the Moorish slave casts himself down from a high tower. The Aaron of the Shakespearian play of Titus Andronicus was eventually derived from this source.

Swords fashioned by Wayland are regular properties of medieval romance. King Rhydderich gave one to Merlin, and Rimcnhild made a similar gift to Child Horn. English local tradition placed Wayland Smith's forge in a cave close to the White Horse in Berkshire. If a horse to be shod, or any broken tool were left with a sixpenny piece at the entrance of the cave the repairs would presently be executed.

The earliest extant record of the Wayland legend is the repre- sentation in carved ivory on a casket of Northumbrian workman- ship of a date not later than the beginning of the 8th century. The fragments of this casket, known as the Franks casket, came

The Franks Casket.

into the possession of a professor at Clermont in Auvergne about the middle of the last century, and was presented to the British Museum by Sir A. W. Franks, who had bought it in Paris for a dealer. One fragment is in Florence. The left-hand compartment of the front of the casket shows Vblundr holding with a pair of tongs the skull of one of Nipo]?r's children, which he is fashioning into a goblet. The boy's body lies at his feet. Bodvildr and her attendant also appear, and Egill, who in one version made Volundr's wings, is depicted in the act of catching birds.

See also Vigfiisson and Powell, Corpus poet. bor. (i. pp. 168-174, Oxford, 1883); A. S. Napier, The Franks Casket (Oxford, rooij; G. Sarrazin, Germanische Heldensage in Shakespere's Titus Androni- cus (Herrig's Archiv, xcvii., Brunswick, 1896); P. Maurus, Die Witlandsage in der Literatur (Erlangen and Leipzig, 1902) ; C. B. Depping and F. Michel, Veland le Forgeron (Paris, 1833). Sir Walter Scott handled the Wayland legend in Kenilworth ; there are dramas on the subject by Borsch (Bonn, 1895), English version by A. Comyn (London, 1898), August Demmin (Leipzig, 1880), H. Drachmann (Copenhagen, 1898), and one founded on K. Simrock's heroic poe on wieland is printed in Richard Wagner's Gesammdte SchrifU (vol. iii. 2nd ed., Leipzig, 1887).

WAYNE, ANTHONY (1745-1796), American soldier, was born in the township of Easttown, Chester county, Pennsylvania, on the 1st of January 1745, of a Yorkshire family. As a boy he exhibited a marked bent toward a military life. He was educated in Philadelphia, and was a surveyor in Pennsylvania

and (1765) in Nova Scotia, where he was agent for a proposed colony. He married in 1766 and passed the next few years on the Chester county farm inherited from his father, holding some minor offices and after 1774 taking an active part upon various patriotic committees. Having recruited and organized the Fourth Pennsylvania battalion of Continental troops, he first saw active service at its head in Canada during the retreat of Benedict Arnold after the Quebec campaign. His excellent behaviour at the skirmish of Three Rivers led Philip Schuyler to place him for some months in command of Ticonderoga. While at this post, on the 21st of February 1777, he was com- missioned brigadier-general. In April Washington ordered him to take command of the " Pennsylvania Line " at Morristown, and he rendered distinguished service at Brandywine and Germantown, and by his coolness and courage at Monmouth, after the retreat of General Charles Lee, did much to save the day for the Americans. Later in 1778 political necessity led to his being superseded by St Clair, his ranking officer, in the command of the regular Pennsylvania troops, but upon Washington's recommendation he organized a new Light Infantry corps, with, which he performed the most daring exploit of the War of Independence — the recapture of Stony Point by a midnight attack (15-16 July 1779) at the point of the bayonet. This well-planned enterprise aroused the greatest enthusiasm throughout the country and won for Wayne the popular soubriquet " Mad Anthony." Upon the disbanding of the Light Infantry corps, Wayne, again in command of the Pennsylvania line, rendered effective service in counteracting the effect of Benedict Arnold's treason and of the mutiny of the Pennsylvania troops. In 1781 he was sent south to join General Nathanael Greene, but in Virginia was deflected to aid Lafayette against Lord Coruwallis. After the American success at Yorktown, Wayne served with such marked success in Georgia, that the state rewarded him with a large rice planta- tion (which proved a financial failure) and Congress breveted him major-general. In 1792 Washington offered him the command of the regular army with the rank of major-general to fight the hostile Indians north-west of the Ohio, who had been rendered insolent by their successes over General Josiah Harmar in 1790 and General Arthur St Clair in 1791, and indirectly to compel the British to yield the posts they held on the American side of the lakes. Wayne spent the winter of 1792-1793 in recruiting his troops near Pittsburg and in drilling them for effective service in the reorganized army. The government continued its efforts to induce the Indians to allow white settlements beyond the Ohio, but a mission in 1793 ended in a failure. Meanwhile Wayne had transferred his troops toFort Washington(Cincinnati) , and upon learning of the failure of the negotiations, advanced the greater part of his forces to Greenville, a post on

a branch of the Great Miami, about 80 m. north of Cincinnati. During the winter he also established an outpost at the scene of St Clair's defeat. The Indians attacked this post, Fort Recovery, in June 1794, but were repulsed with considerable slaughter. Late in July Wayne's legion of regulars, numbering about 2000, was reinforced by about 1600 Kentucky militia under General Charles Scott, and the combined forces advanced to the junction of the Auglaize and Maumee rivers, where Fort Defiance was constructed. Here Wayne made a final effort to treat with the Indians, and upon being rebuffed, moved forward and encountered them on the 20th of August in the battle of Fallen Timbers, fought near the falls of the Maumee, and almost under the walls of the British post Fort Miami. This decisive defeat, supple- mented by the Treaty of Greenville, which he negotiated with the Indians on the 3rd of August 1795, resulted in opening the North-west to civilization. Wayne retained his position as com- mander of the army after its reorganization, and he rendered service in quelling the proposed filibustering expeditions from Kentucky against the Spanish dominions, and also took the lead in occupying the lake posts delivered up by the British. While engaged in this service he died at Erie, Pennsylvania, on the 15th of December 1796, and was interred there. In 1809 his remains were removed to St David's Churchyard, Radnor, Pennsylvania.

See Charles J. Stilld, Major-General Anthony Wayne and the Pennsylvania Line (Philadelphia, 1893); J. Munsell, (cd.), Wayne's Orderly Book of the Northern Army at Fort Ticonderoga and Mount Independence (Albany, 1859); Boyer, A Journal of Wayne's Cam- paign (Cincinnati, 1866); William Clark, A Journal of Major- Ceneral Anthony Wayne's Campaign against the Shawnee Indians (MSS. owned by R. C. Ballard Thruston) ; H. P. Johnston, The Storming of Stony Point (New York, 1900) ; J. R. Spears, Anthony Wayne (New York, 1903).

WAYNESBORO, a borough of Franklin county, Pennsylvania, U.S.A., near Antietam Creek, about 14 m. S.E. of Chambers- burg, and about 65 m. S.W.of Harrisburg. Pop. (1890) 381 1; (1900)3396; (1910)7199. Waynesboro is served by the Cumber- land Valley and the Western Maryland railways. It lies at the foot of the South Mountain, and under the borough are many caves and caverns. A settlement was made here about 1734; it was called Mount Vernon for twenty years, and then Wallace-town (in honour of an early settler) until the close of the War of Independence, when it was named Waynesborough in honour of General Anthony Wayne; a village was platted in 1797; its charter as a borough, granted in 1818, was repealed in 1824 but was revived in 1830, the

spelling being changed to " Waynesboro." See Benjamin M. Nead, Waynesboro (Harrisburg, Pa., 1900). WAYNFLETE, WILLIAM (1395-1486), English lord chancellor and bishop of Winchester, was the son of Richard Pattene or Patyn, alias Barbour, of Wainfleet, Lincolnshire (Magd. Coll. Oxo'n. Reg. f. 84b), whose monumental effigy, formerly in the church of Wainfleet, now in Magdalen College Chapel at Oxford, seems to be in the dress of a merchant. His mother was Margery, (laughter of SirWilliam Brereton of that ilk in Cheshire(Ormerod's Cheshire, iii. 81). Of Waynflete's education it is only possible to assert that he was at Oxford University. It has been alleged that he was a Wykehamist, a scholar at Winchester College and New College, Oxford. But unless he was, as is improbable, the " Willelmus Pattney, de eadem, Sar. Dioc," admitted in 1403, he was not a scholar of Winchester, and in any case was not a scholar of New College. Nor was he a commoner in college at Winchester or at New College, as his name does not appear in the Hall books, or lists of those dining in hall, at either college. That he was a day-boy commoner at Winchester is possible, but seems unlikely. He was never claimed in his lifetime by either college as one of its alumni. That he was at Oxford, and probably a scholar at one of the grammar schools there, before passing on to the higher faculties, is shown by a letter of the chancellor addressed to him when provost of Eton (Ep. Acad. Oxf. Hist. Soc. i. 158) which speaks of the university as his " mother who brought him forth into the light of knowledge and nourished him with the alimony of all the sciences." He is probably the William Barbour who was ordained acolyte by Bishop Fleming of Lincoln on the 21st of April 1420 and sub- deacon on the 21st of January 1421; and as " William Barbour," otherwise Waynflete of Spalding, was ordained deacon on the 18th of March 1421, and priest on the 21st of January 1426, with title from Spalding Priory. He may have been the William Waynflete who was admitted a scholar of the King's Hall, Cambridge, on the 6th of March 1428 (Exch. Q. R. Bdle. 346, no. 31), and was described as LL.B. when receiving letters of protection on the 15th of July 1429 (Proc. P.C. iii. 347) to enable him to accompany Robert FitzHugh, D.D., warden of the hall, on an embassy to Rome. For the scholars of the King's Hall were what we should call fellows, as may be seen by the appoint- ment to the hall on the 3rd of April 1360 of Nicholas of Drayton, B.C.L.,and John Kent.B.A., instead of two scholars who had gone off to the French wars without the warden's leave (Cal. Close Rolls). William Waynflete, presented to the vicarage of Skendleby, Lines, by the Priory of Bardney (Lincoln, Ep. Reg. f. 34, Chandler, 16), on the 14th of June 1430, may also have been our Waynflete. There was, however, arother William Waynflete, who was instituted rector of Wroxhall, Somerset, on the 17th of May 1433 (Wells, Ep. Reg. Stafford), and was dead when his successor was appointed on the 18th of November 1436 (Wells, Ep. Reg. Stillington). A successor to the William Waynflete at the

King's Hall was admitted on the 3rd of April 1434.

Meanwhile, our Waynflete had become headmaster of Winchester ; Mr William Wanneflete being paid 50s. as Informator scolarium, teacher of the scholars of the college, for the quarter beginning on the 24th of June 1430 (Win. Coll. Bursars' Roll 8-9 Hen. VI.) and so continuously, under many variants of spelling, at the rate of £10 a year until Michaelmas 1441 (V.C.H., Bucks, ii. 154). He was collated by Bishop Beaufort at some date unascertainable (through the loss of the 2nd volume of Beaufort's Episcopal Register) to the mastership of St Mary Magdalen's Hospital, a leper hospital on St Giles' Hill, just outside the city of Win- chester (Vet. Mon. iii. 5). The first recorded headmaster after the foundation of the college, John Melton, had been presented by Wykeham to the mastership of this hospital in 1393 shortly before his retirement. Its emoluments, amounting to £9, 12s. a year, nearly doubled the headmaster's income.

Under the influence of Archbishop Chicheley, who had himself founded two colleges in imitation of Wykeham, and Thomas Bekynton, king's secretary and privy seal, and other Wyke- hamists, Henry VI., on the nth of October 1440, founded, in imitation of Winchester College, " a college in the parish church of Eton by Windsor not far from our birthplace," called the King's College of the Blessed Mary of Eton by Windsor, as " a sort of first-fruits of his taking the government on himself." The college was to consist of a provost, 10 priests, 6 choristers, 25 poor and needy scholars, 25 almsmen and a magistcr infor- mator " to teach gratis the scholars and all others coming from any part of England to learn grammar." Only two fellows, 4 choristers, 2 scholars and 2 almsmen were named in the charier and probably were only colourably members. Waynflete was not, as alleged (Diet. Nat. Biog.), named a fellow. On the 5th of March 1440-1441, the king endowed the college out of alien priories with some £500 a year, almost exactly the amount of the original endowment of Winchester. On the 31st of July

1441 Henry VI. went for a week-end visit to Winchester College to see the school for himself. Here he seems tq have been so much impressed with Waynflete, that at Michaelmas, 1441, Waynflete ceased to be headmaster of Winchester. In October he appears dining in the hall there as a guest, and at Christmas

1442 he received a royal livery, five yards of violet cloth, as provost of Eton. Though reckoned first headmaster of Eton, there is no definite evidence that he was. The school building was not begun till May 1442 (V.C.H., Bucks, ii. 154). William Westbury, who left New College, " transferring himself to the king's service," in May 1442, and appears in the first extant Eton Audit Roll 1444-1445 as headmaster, was probably such

from May 1442. If Waynflete was headmaster from October 1441 to May 1442, his duties must have been little more than nominal. As provost, Waynflete procured the exemption of the college from archidiaconal authority on the 2nd of May, and made the contract for completion of the carpenter's work of the eastern side of the quadrangle on the 30th of November 1443. On the 21st of December 1443 he was sworn to the statutes by Bishop Bekynton and the earl of Suffolk, the king's commissioners, and himself administered the oath to the other members of the foundation, then only five fellows and eleven scholars over fifteen years of age. He is credited with having taken half the scholars and fellows of Winchester to Eton to start the school there. In fact, five scholars and perhaps one commoner left Winchester for Eton in 1443, probably in July, just before the election. For three of them were admitted scholars of King's College, Cambridge, on the 19th of July, that college, by its second charter of the 10th of July 1443 having been placed in the same relation to Eton that New College bore to Winchester; i.e. it was to be recruited entirely from Eton. The chief part of Waynflete's duties as provost was the financing and completion of the buildings and establishment. The number of scholars was largely increased by an election of 25 new ones on the 26th of September 1444, the income being, then £946, of which the king contributed £120 and Waynflete £18, or more than half his stipend of £30 a year. The full number of 70 scholars was not filled up till Waynflete's last year as provost, 1446-1447 (Eton Audit Roll). So greatly did Waynflete ingratiate himself

with Henry that when Beaufort, bishop of Winchester, Henry's uncle, died on the nth of April 1447, the same day Henry wrote to the chapter of Winchester, the prior and monks of St Swithin's cathedral, to elect Waynflete as his successor. On the 12th of April he was given the custody of the temporalities, on the 15th of April he was elected, and on the 10th of May provided to the see by a papal bull. On the 13th of July 1447 he was consecrated in Eton church, when the warden and fellows and others of his old college gave him a horse at a cost of £6, 13s. 4d., and 13s. 4d. to the boys. Subsequent visits to Winchester inspired Henry with the idea of rebuilding Eton church on cathedral dimensions. Waynflete was assigned as the principal executor of his " will " for that purpose, and if there was any variance between the executors, he was to determine it. From T448 to 1450 £3336 or some £100,000 of our money was spent on the church, of which Waynflete with the marquis of Suffolk and the bishop of Salisbury contributed £700 or £21,000. The troubles which began in 1450 put a stop to the work.

Waynflete, as bishop, lost no time in following the example of Wykeham and his royal patron in becoming a college founder. On the 6th of May 1448 he obtained licence in mortmain and on the 20th of August founded at Oxford " for the extirpation of heresies and errors, the increase of the clerical order and the adornment of holy mother church, a perpetual hall, called Seint Marie Maudeleyn Halle, for study in the sciences of sacred theology and philosophy," to consist of a president and 50 scholars. Its site was not that of the present college, but of two earlier halls called Boston and Hare, where the new schools now are. Thirteen M.A.'s and seven bachelors, besides the president, John Hornley, B.D., were named in the charter. The dedication to Mary Magdalen was no doubt derived from the hospital at Winchester of which the founder had been master. On St Wolstan's Day, the 19th of January 1448-1440, Waynflete was enthroned in Winchester cathedral in the presence of the king; and, probably partly for his sake, parliament was held there in June and July 1449, when the king frequently attended the college chapel, Waynflete officiating (Win. Coll. Reg. Vet.). When Jack Cade's rebellion occurred in 1450 Waynflete was employed with Archbishop Stafford, the chancellor, to negotiate with the rebels at St Margaret's church, Southwark, close to Winchester House. A full pardon was promised, but on the 1st of August Waynflete was one of the special commissioners to try the rebels. On the 7th of May 1451 Waynflete, from " le peynted chambre " in his manor house at Southwark, asserting that his bishopric was canonically obtained and that he laboured under no disqualification, but feared some grievous attempt against himself and his see, appealed to the protection of the pope. It is suggested (Diet. Nat. Biog.) that this was due to some disturbances at Winchester {Proc. P.C. vi. 108), where one of Cade's quarters was sent after his execution. But it is more likely, as suggested by Richard Chandler (Life of Waynflete, 181 1), that it was some Yorkist attack on him in progress in the papal court, to meet which he appointed next day 19 proctors to act for him. In the result nothing disturbed his peaceable possession of the see. With the archbishop of Canterbury he received Henry VI. on a pilgrimage to St Thomas a Becket on the 2nd of August 1451. When in November the duke of York encamped near Dartford, Waynflete with three others was sent from the king's camp at Blackheath to propose terms, which were accepted. Edward, prince of Wales, was born on the 13th of October 1453 and baptized by Waynflete the next day. This year Waynflete acquired the reversion of the manor of Stanswick, Berks, from Lady Danvers (Chandler, p. 87) for Magdalen Hall. The king became insane in 1454. On the death of the chancellor, John Kemp, archbishop of Canterbury, during the sitting of parliament, presided over by the duke of York, commissioners, headed by Waynflete, were sent to Henry, to ask him to name a new chancellor, apparently intending that Waynflete should be named. But no answer could be extracted from the king, and after some delay Lord Salisbury took the

seals. During York's regency, both before and after the battle of St Albans, Waynflete took an active part in the proceedings of the privy

council. With a view to an ampler site for his college, Waynflete obtained on the 5th of July 1456 a grant of the Hospital of St John the Baptist outside the east gate at Oxford and on the 15th of July licence to found a college there. Having obtained a papal bull, he founded it by deed of the 12th of June 1458, converting the hospital into a college with a president and six fellows, to which college two days later Magdalen Hall surrendered itself and its possessions, its members being incorporated into " the New College of St Mary Magdalen."

Meanwhile Waynflete himself had been advanced to the highest office in the state, the chancellorship, the seals being delivered to him by the king in the priory of Coventry, in the presence of the duke of York, apparently as a person acceptable to both parties. On the 27th of October 1457 he took part in the trial and condemnation for heresy of Reginald Pecock, bishop of Chichester, who had been ordained subdeacon and deacon on the same day and by the same bishop as Waynflete ̂himself. Only Pecock's books and not the heretic were burnt. As the heresy consisted chiefly in defending the clergy on grounds of reason instead of authority, the proceeding docs not show any great enlightenment on Waynflete's part. It must have been at this time that an addition was made by Waynflete to the Eton college statutes, compelling the fellows to forswear the heresies of John Wycliffe and Pecock. Waynflete presided as chancellor at the parliament at Coventry in November 1459, which, after the Yorkist catastrophe at Ludlow, attainted the Yorkist leaders. It was no doubt because of this that, three days before the Yorkist attack at Northampton, he delivered the great seal to the king in his tent near Delapre abbey, a nunnery by Northampton, on the 7th of July 1460 (Rot. Claus. 38 Hen. VI. m. 5 d). It was taken with Henry and handed to the Yorkist, George Neville, bishop of Exeter, brother of the kingmaker, earl of Warwick, in London on 25th July following. Whether, as alleged by some, Waynflete fled and hid himself during the period covered by the battle of Wakefield and Edward's first parliament in i46r, is very doubtful. A testimonial to his fidelity written by Henry to the pope on the 8th of November 1460 (Chandler, 346) was written while Henry was in Yorkist hands. The fact too that complaints laid before Edward IV. himself in August 1461 of wrongful exaction of manorial rights from the tenants of the episcopal manor of East Meon, Hants, were decided in the bishop's favour in parliament in the December following (Rot. Pari. v. 475) also suggests that he was not regarded as an enemy to the Yorkists, though a personal favourite of Henry's. A general charter of confirmation to him and his successors of the property and rights of the bishopric of Winchester on the 1st of July 1462 (Pat. 2 Ed. IV.) points in the same direction. It is certain that he took an active part in the

restoration of Eton College, "which Edward annexed to St George's, Windsor, in 1463, depriving it of a large part of its possessions. In the earliest Audit Rolls after the restoration of the college in 1467 there are many entries of visits of Provost Westbury to "the lord of Winchester," which in January 1468-1469 were for " beginning the work of the church " " and providing money for them." Why a pardon was granted to Waynflete on the 1st of February 1469 (Pat. 8 Ed. IV. pt. iii. ta. 16) does not appear. On the restoration of Henry VI. on the 28th of September 1470 Waynflete welcomed him on his release from the Tower, which necessitated a new pardon, granted a month after Edward's reinstatement on the 30th of May 147 r (Pat. 11. Ed. IV. pat. i. m. 24), and a loan to the king of 2000 marks (£1333, 6s. 8d.), or some £40,000 of our money. In the years 1471-1472 to 1474 Waynflete was largely engaged in completing the church, now called chapel, at Eton, his glazier supplying the windows, and he contracted on the 1 jth of August 1475 for the rood-loft to be made on one side "like to the rode lofte in Bishop Wykeham's college at Winchester," and on the other like that " of the college of St Thomas of Acres in London." In 1479 he built the ante-chapel at the west-end, as it now stands, of stone from Headington, Oxford.

In 1474 Waynflete, being the principal executor of Sir John Fastolf, who died in 1459, leaving a much-contested will, pro- cured the conversion of his bequest for a collegiate church of

seven priests and seven almsmen at Caistor, Norfolk, into one for seven fellows and seven poor scholars at Magdalen. In the same year that college took possession of the alien priory of Sele, Sussex, the proceedings for the suppression of which had been going on since 1469. The new, now the old, buildings at Magdalen were begun the same year, the foundation-stone being laid in the middle of the high altar on the 5th of May 1474 (Wood, 207). Licences on the 1st of July, the 22nd of July 1477 and the 12th of February 1479, authorized additions to the endowment. On the 23rd of August 1480, the college being completed, the great west window being contracted to be made after the fashion of that at All Souls' College, a new president, Richard Mayhew, fellow of New College, was installed on the 23rd of August 1480, and statutes were promulgated. The foundation is commonly dated from this year and not from 1448, when Magdalen Hall was founded, though if not dated from 1448 it surely dates from 1458, when that hall and St John's Hospital were converted into Magdalen College. The statutes were for the most part a replica of those of New College, members of which were, equally with members of Magdalen,

declared to be eligible for the presidency. They provided for a head and 70 scholars, but the latter were divided into 40 fellows and 30 scholars called demies, because their commons were half those of the fellows. Magdalen College School was established at the gates and as a part of the college, to be, like Eton, a free grammar school, free of tuition fees for all comers, under a master and usher, the first master being John Ankywyll, a married man, with a salary of £10 a year, the same as at Winchester and Eton. The renewal of interest in classical literature was shown in the prohibition of the study of sophistry by any scholar under the age of eighteen, unless he had been pronounced proficient in grammaticals. On the 22nd of September 1481 Waynflete received Edward IV. in state at the college, where he passed the night, and in July 1483 he received Richard III. there in even greater state, when Master William Grocyn, " the Grecian," a fellow of New College, " responded," in divinity. In 1484 Waynflete gave the college the endowment for a free grammar school at his name-place, Wainfleet, sufficient to produce for the chantry-priest-schoolmaster £10 a year, the same salary as the headmaster of Magdalen School, and built the school which still exists almost untouched, a fine brick build- ing with two towers, 76 ft. long by 26 ft. broad. The next year saw the appropriation to the college of the Augustinian Priory of Sclborne, Hants.

On the 27th of April i486, Waynflete, like Wykeham, made his will at their favourite manor, South or Bishop's Waltham. It is remarkable that he gives the same pecuniary bequests to Winchester and New Colleges as to his own college of Magdalen, but the latter he made residuary devisee of all his lands. He died on the nth of May i486, and was buried in the chantry chapel of St Mary Magdalen behind the high altar in Winchester cathedral, which he had erected in his lifetime. The effigy on it may betaken to be an authentic portrait. (A. F. L.)

WAYZGOOSE, a term for the annual dinner and outing' of printers and their employes. The derivation of the term is doubtful. It may be a misspelling for " wasegoose," from wase, Mid. Eng. for " sheaf," thus meaning sheaf or harvest goose, the bird that was fit to eat at harvest-time, the "stubble- goose " mentioned by Chaucer in "The Cook's Prologue." It is more probable that the merry-making which has become particularly associated with the printers' trade was once general, and an imitation of the grand goose-feast annually held at Waes, in Brabant, at Martinmas. The relations of England and Holland were formerly very close, and it is not difficult to believe that any outing or yearly banquet might have grown to be called colloquially a " Waes-Goose." It is difficult to explain why the term should have only survived in the printing trade, though the English printers owed much to their Dutch fellow-workers. Certainly the goose has long ago parted company with the printers' wayzgoose, which is usually held in July, though it has no fixed season. An unlikely suggestion is that

the original wayzgoose was a feast given by an apprentice to his comrades at which the bird formed the staple eatable.

WAZIR, or Vizier (Arabic wazir) , a minister, usually the principal minister under a Mahommedan ruler. In India the nawab of Oudh was long known as the nawab wazir, the title of minister to the Mogul emperor having become hereditary in the family.

WAZIRABAD, a town of British India, in Gujranwala district of the Punjab, near the right bank of the river Chenab, 62 m. N. of Lahore. Pop. (1901) 18,069. It is an important railway junction. The main line of the North-Western railway here crosses the Chenab by the Alexandra bridge, opened by the prince of Wales in 1876. The branch to Sialkot has been extended to Jammu (51 m.); another branch follows the line of the Chenab canal towards Multan. Boat-building and manufactures of steel and iron are carried on.

WAZIRISTAN, a section of the mountain tract in the North- west Frontier Province of India, lying between the Tochi river on the north and the Gomal river on the south. The whole of Waziristan lies within the British sphere of influence, the boundary with Afghanistan having been demarcated in 1894. It forms two political agencies, but only a portion, consisting of the Tochi valley, with an area of about 700 sq. m. and a population (1903) of 24,670, is directly administered. Northern Waziristan has an area of about 2310 sq. m., and southern Waziristan an area of about 2734 sq. m.

The Tochi and the Gomal rivers enclose Waziristan, their affluents rising to the west of that country in the upland valleys of Shawal and Birmal, and flowing north and south to a junction with the main streams. Between the two rivers stretches the central dominating range of Waziristan from north-east to south- west, geologically connected with the great limestone ranges of the Suliman hills to the south, and dominated by the great peaks of Shuidar (Sheikh Haidar) and Pirghal, both of them between 11,000 and 12,000 ft. above the sea, and hardly inferior to the Khaisargarh peak of the Takht-i-Suliman; From these peaks westwards a view is obtained across the grass slopes and cedar woods of Birmal and Shawal (lying thousands of feet below) to the long, serrated ridges of the central watershed which shuts off the plains of Ghazni. To the eastward several lines of drainage strike away for the Indus, breaking through parallel folds and flexures of the mountains, of which the conformation is here distinctly observable, although not so marked as it is south of the Gomal. These lines of drainage are, as usual, the main avenues of approach to the interior of the country. They are the Khaisora and the Shakdu on the north, which, uniting, join the Tochi south of Bannu, and the Tank Zam (which is also called Khaisor

near its head) on the south. The two former lead from the frontier to Rasmak and Makin, villages of some local importance, situated on the slopes of Shuidar; and the latter leads to Kaniguram, the Waziri capital, and the centre of a con- siderable iron trade. Kaniguram lies at the foot of the Pirghal mountain.

Amongst the mountains of Waziristan there is much fine scenery and a delightful climate. Thick forests of ilex clothe many of the spurs, which reach down to the grassy deodar- covered uplands of Birmal on the west; and the spreading poplar attains magnificent dimensions amongst the flats and plateaus of the eastern slopes. The indigenous trade of the country is inconsiderable, although Waziri iron is much esteemed. The agricultural products are poor, and the general appearance of the priest-ridden people is significant of the endurance of many hardships, even of chronic starvation. The most notable product of the country is the Waziri breed of horses and donkeys. The latter especially deserve to rank as the best of their kind on the Indian frontier, if not in all India.

The geological formation of Waziristan is the same as that of the contiguous frontier. Recent subaqueous deposits have been disturbed by a central upheaval of limestone; the lower hills are soft in composition and easily weather-worn, the slopes are rounded, and large masses of detritus have collected in the nullah beds and raised their level. Through these deposits heavy rain-floods have forced their way with many bends and curves to the plains, enclosing within each curve a " warn " or " raghza," which slopes gradually to the hills and affords the only available space for irrigation and agriculture. A " warn " is a gently sloping open space, generally

raised but slightly above the river level. A " raghza " differs from a " warn " in being on a higher level and often beyond the reach of irrigation. Pasture is found abundantly in the hills, but cultivation only on the borders of the main streams. Passing up and down these main water-courses, there is an appearance of great fertility and wealth, which is entirely due to these thriving strips of verdure, their restricted and narrow iimits being hardly visible from the river beds. From above, when viewed from the flanking ridges, the vast extent of hill country, neither high, nor imposing, nor difficult of access, but invariably stony and rough, compares strongly with the narrow bands of enclosed cultivation winding about like green ribbons, and marking the course of the main streams from the snow- covered peaks to the plains. The physiography of Waziristan is that of the Ku.ram to the

north rather than that of the Suliman hills to the south.

The Waziris are the largest tribe on the frontier, but their state of civilization is very low. They are a race of robbers and murderers, and the Waziri name is execrated even by the neighbouring Mahommedan tribes. Mahommedans from a settled district often regard Waziris as utter barbarians, and seem inclined to deny their title to belong to the faith. They have been described as being " free-born and murderous, hot- headed and light-hearted, self-respecting but vain." The poverty of their country and the effort required to gain a subsistence in it have made the Waziris a hardy and enduring race. Their physique is uncommonly good, and though on the average short of stature, some extremely tall and large men are to be found amongst them. They are generally deep-chested and compact of build, with a powerful muscular development common to the whole body, and not confined to the lower limbs as is the case with some hill tribes of the Himalayas. As mountaineers the Waziris would probably hold their own with any other Pathan tribe of the frontier.

Except in a few of the highest hills, which are well-wooded, the Waziri country is a mass of rock and stones, bearing a poor growth of grass and thinly sprinkled with dark evergreen bushes; progress in every direction except on devious paths known to the natives is obstructed by precipices or by toilsome stony ascents; and knowledge of the topography, a mere labyrinth of intricate ranges and valleys, comes only as the result of long acquaintance. Broken ground and tortuous ravines, by making crime easy and precaution against attack difficult, have fostered violence among the people and developed in them an extraordinary faculty of prudence and alertness. In con- sequence of his isolation the Waziri has become independent, self-reliant and democratic in sentiment. Through the in-accessibility of his own country to lowlanders, combined with the proximity of open and fertile tracts inhabited by races of inferior stamina, he has developed into a confirmed raider; and the passage through his country of mountain footpaths, connecting India with Afghanistan, has made him by frequent opportunity a hereditary highwayman as well. The women enjoy more freedom than amongst most Pathan tribes, and are frequently unfaithful. The ordinary punishment of adultery is to put the woman to death, and to cut off half the right foot of the man. Amongst Waziris also, as amongst other Pathans, the blood-feud is a national institution.

The Waziris, who number some 40,000 fighting men altogether, are divided into two main sections, the Darwesh Khel (30,000) and the Mahsuds (8000) , with two smaller sections. The Darwesh Khel, the more settled and civilized of the two, inhabit the lower hills bordering on Kohat and Bannu districts, and the ground lying on both sides of the Kurram river, between Thai on the north and the Tochi Valley on the south. The

Mahsuds, who inhabit the tract of country lying between the Tochi Valley on the north and the Gomal river on the south, have earned for themselves an evil name as the most confirmed raiders on the border; but they are a plucky race, as active over the hills as the Afridis, and next to them the best-armed large tribe on the frontier. The Mahsud country, especially that part within reach of British posts, is more difficult even than Tirah. To the south and east it is girt by an intricate belt of uninhabited, generally waterless hills and ravines. To the north a zone of Darwesh Khel territory, not less than 20 m. in width, hilly

and difficult, separates the Mahsuds from the Tochi. The Tochi Valley is inhabited by a degraded Pathan tribe, known as Dauris, who have voluntarily placed themselves under British protection since 1895. In dealing with the Mahsuds it must be remembered that from Wana to Tank, from Tank to Bannu, and from Bannu to Datta Khel, or for a distance of over 200 m., British territory is open to Mahsud depredations. This length of frontier is equal to the whole Thal-Kohat-Pesha- war-Malakand line, covering the eight or ten tribes that took part in the frontier risings of 1897. So that the Mahsuds should really be compared with the whole of those ten tribes, and not with any single one.

British expeditions were needed against various sections of the Waziris in 1852, 1859, i860, 1880, 1881, 1894, 1897 and

1902.

The success of Sir Robert Sandeman in subduing the wild tribes of Baluchistan had led to a similar attempt to open up Waziristan to British civilization; but the Pathan is much more democratic and much less subject to the influence of his maliks than is the Baluchi to the authority of his chiefs; and the policy finally broke down in 1894, when the Waziris made a night attack upon the camp of the British Delimitation Com- mission at Wana. The Commission had been appointed to settle the boundary with the Afghans, and the Waziris regarded it as the final threat to their independence. The attack was delivered with such determination that the tribesmen penetrated into the centre of the camp, and it was only with the greatest difficulty that friend could be distinguished from foe. A large force of 11,000 British troops subsequently traversed the tribal country, destroyed their towers and dictated terms, one of which was that the Tochi Valley should be occupied by British garrisons. But still there was trouble, which led to the Tochi expedition of 1897; and, in spite of the further lessons taught the Waziris in two expeditions in 1902, the attempt to " Sandemanise " Waziristan was given up by Lord Curzon. The British garrisons in the Tochi and Gomal valleys were withdrawn, and two corps of tribal militia, from 1300 to 1500 strong, were gradually formed to

replace the British troops.

See Grammar and Vocabulary of Waziri Pashto, by J. G. Lorimer (Calcutta, 1902); Paget and Mason's Frontier Expeditions (1884); Mahsud Waziri Operations (1902), Blue-book.

WAZZAN, a small hillside town, 60 m. N.W. by N. of Fez, Morocco. It has a considerable trade with the country round, and manufactures a coarse white woollen cloth with rough surface from which the hooded cloaks (called jdlabs) are made. Its proudest name is Dar D'manah — House of Safety — as it is sanctuary for any who gain its limits, on account of the tomb of a sainted Idrisi Sharif, who lived there in 1727. It is the head-quarters of his descendants.

WEALD, THE, a district in the south-east of England. It includes the portions of Sussex, Kent and Surrey which are enclosed between the North and South Downs — a district of Lower Cretaceous rocks encircled by Upper Cretaceous hills. It extends from Frensham and Petersfield on the Hampshire borders to the English Channel between Folkestone and East-bourne. With the exception of the easternmost part, it drains by rivers running northward and southward through gaps in the Downs, the origin of which is considered under that heading. The Weald was formerly covered by the forest of Andrcdesleah or Andredsweald (" the wood or forest without habitations "), which was 120 m. in length and about 30 in greatest breadth. About 1660 the total area under forest was estimated at over 200,000 acres. The chief remains of the ancient forests are Ashdown, St Leonards and Tilgate, and the nomenclature often indicates the former extent of woodland, as in the case of Hurst- pierpoint (hurst meaning wood), Midhurst, Fernhurst, Billings- hurst, Ashurst and many others. The forests were interspersed with, lagoons; and the rainfall being very great caused marshes, but it abated in consequence of the cutting down of the Wealden forests for fuel in the extensive ironworks that formerly existed in the district. The locality best preserving the ancient char- acter of the Weald is the hilly district in the centre, forming a

picturesque broken range running east and west under the name of the Forest Ridges. This forms the main water-parting of the Weald, dividing the Vale of Sussex from the Vale of Kent; and was also the seat of the iron industry which was prosecuted by the Romans and probably earlier, reached its highest importance in the 16th and 17th centuries, and was maintained even till the early years of the 19th century. The Andredesleah

had an early historical interest as forming a physical barrier which kept the South Saxons isolated from other Saxon kingdoms. Descending from over sea upon the coastal district of Sussex, to which they gave name, towards the close of the 5th century, they populated it thickly, and maintained independence, in face of the accretions of the West Saxon kingdom, for upwards of a hundred years.

WEALDEN, in geology, a thick series of estuarine and fresh- water deposits of Lower Cretaceous age, which derives its name from its development in the Weald of Kent and Sussex. In the type area it is exposed by the denudation of a broad anticlinal fold from which the higher Cretaceous beds have been removed. The Wealdcn rocks lie in the central part of this anticline between the escarpments of the North and South Downs; they extend eastwards from the neighbourhood of Haslemere and Elland Chapel to the west between Pevensey and Hythe. This forma- tion is divisible into two portions, the Weald Clay above and the Hastings Sands below. The Weald Clay which occupies the central, upland part of the area from Horsham to the sea coast consists of dark brown and blue clays and shales, occasionally mottled in the neighbourhood of sandy lenticles, which together with calcareous sandstones, shelly limestones and nodular iron- stones take a subordinate place in the series. About Horsham the Weald Clay is 1000 ft. thick, but it decreases in an eastward direction; at Tunbridge it is only 600 ft. Certain subordinate beds within the Weald Clay have received distinctive names. " Horsham stone " is a calcareous flaggy sandstone, often ripple marked, usually less than 5 ft. thick, which occurs at about 120 ft. above the base of the Clay. " Sussex marble " is the name given to more than one of the high limestone beds which are mainly composed of a large form of Paludina (P. fluviorum) ; some of the lower limestone layers contain a small species (P. sussexiensis) . The Sussex marble (proper) occurs about 100 ft. below the top of the clays; it is the most important of the limestone bands, and its thickness varies from 6 ft. to 2 in.; it js known also as Bethersden marble, Petworth marble, Laughton stone, &c. It has been widely used in the Weald district in church architec- ture and fcr polished mantelpieces. The ironstones were formerly smelted in the western part of the area.

The Hastings Sands are divisible into three main subdivisions: the Tunbridge Wells Sand, the Wadhurst Clay and the Ashdown Sand. Like the overlying Weald Clay this series thickens as a whole towards the west. In the west, the Tunbridge Wells Sand is sepa- rated into an upper and lower division by the thickening of a bed of clay — the Grinstead Clay — which in the cast, about Rye, &c, is quite thin; at Cuckfietd a second clay bed 15 ft. thick divides the upper division. The upper beds of the lower Tunbridge Wells Sand cause good landscapes around West Hoathly and near East Grinstead. The Wadhurst Clay is very constant in character; near the base

it frequently contains clay-ironstone, which in former times was the main source of supply for the Wealden iron industry. Much of the higher portion of the Hastings Sand country is made of the Ashdown Sands, consisting of sand, soft sandstones and subordinate clay bends; in the east, however, clay is strongly developed at the base of this group, and at Fairlight is more than 360 ft. thick, while the sandy portion is only 150 ft. These clays with sandy layers are known as the Fairlight Clays. Beds of r-'gnite are found in these beds, and a calcareous sandstone, called T'lgate stone, occurs near the top of the Ashdown Sands and in the Wadhurst Clay. The old town of Hastings is built on Ashdown Sand, but St Leonards is mainly on Tunbridge Wells Sand.

Wealden beds occur on the southern side of the Isle of Wight and in the Isle of Purbeck in Dorsetshire. The Wealden anticline can be traced across the Channel into the Bas Boulonnais. A separate Wealden area exists in north Germany between Brunswick and Bentheim, in the Ostervald and Teutoberger Wald, where the Deister Sandstone (150 ft.) corresponds to the Hastings Sands and the Waldcrthon (70-100 ft.) to the Weald Clay. The former contains valuable coal beds, worked in the neighbourhood of Obernkirchen, &c, and a good building stone.

The fossils of the Wealden beds comprise freshwater shellfish, Unto, Paludina, Melanopsis, Cyrena; and estuarine and marine

forms such as Ostrea, Exogyra and Mytilus. An interesting series of dinosaurs and pterodactyles has been obtained from the Wealden of England and the continent of Europe, of which Iguanodon is the best known — a large number of almost entire skeletons of this genus were discovered in some buried Cretaceous valleys at Bernissart in Belgium; other forms are Heterosuchus, Qrnithocheirus, Ornithopsis, Cimoliosaurus and Titanosaurus. Among the plant remains are Chara, Bennettites, Equisitiles, Fittonia, Sagenopteris and Thujites. The fishes, plants and reptiles of these formations possess a decidedly Jurassic aspect, and for this reason several authorities are in favour of retaining the Wealden rocks in that system, and the close re- lationship between this formation and the underlying Purbcckian, both in England and in Germany, tends to support this view.

See Cretaceous, Neocomian, Pureeckian; also W. Toplcy, " Geology of the Weald," Mem. Geol. Survey (I.ondon, 1875).

(J. A. H.)

WEALTH, etymologically the condition of well-being, pros- perity in its widest sense. The word does not appear in Old English, but is a Middle

English formation, welthe, on the 0. Eng. wela, well-being, from wet, well, cognate with Dan. vel, Ger. wohl. The original meaning survives in the Prayer for the King's Majesty of the English Book of Common Prayer, " Grant him in health and wealth long to live," and in "commonwealth," i.e. good of the body politic, hence applied to the body politic itself.

In economics, wealth is most commonly defined as consisting of all useful and agreeable things which possess exchange value, and this again is generally regarded as coextensive with all desirable things except those which do not involve labour or sacrifice for their acquisition in the quantity desired. On analysis it will be evident that this definition implies, directly, preliminary conceptions of utility and value, and, indirectly, of sacrifice and labour, and these terms, familiar though they may appear, are by no means simple and obvious in their meaning. Utility, for the purposes of economic reasoning, is usually held to mean the capacity. to satisfy a desire or serve a purpose (J. S. Mill), and in this sense is clearly a much wider term than wealth. Sunshine and fresh air, good temper and pleasant manners, and all the infinite variety of means of gratification, material and immaterial, are covered by utility as thus denned. Wealth is thus a species of utility, and in order to separate it from other species some differentia must be found. This, according to the general definition, is exchange value, but a little reflection will show that in some cases it is necessary rather to contrast value with wealth. " Value," says Ricardo, expanding a thought of Adam Smith, "essentially differs from riches, for value depends not on abundance but on the difficulty or facility of production." According to the well-known tables ascribed to Gregory King (1648-1712), a deficiency of a small amount in the annual supply of corn will raise its value far more than in pro- portion; but it would be paradoxical to argue that this rise in value indicated an increase in an important item of national wealth. Again, as the mines of a country are exhausted and its natural resources otherwise impaired, a rise in the value of the remainder may take place, and as the free gifLs of nature arc appropriated they become valuable for exchange; but the country can hardly be said to be so much the wealthier in con- sequence. And these difficulties are rather increased than diminished if we substitute for value the more familiar concrete term " money-price " — for the contrast between the quantity of wealth and its nominal value becomes more sharply marked. Suppose, for example, that in the total money value of the national inventory a decline were observed to be in progress, whilst at the fame time, as is quite possible, an increase was noticed in the quantity of all the important items and an improvement in their quality, it would be in accordance with common sense to say that the wealth of the country was in- creasing and not decreasing.

So great are these difficulties that some economists (e.g. Ricardo) have proposed to take utility as the direct measure of wealth, and, as H.

Sidgwick has pointed out, if double the quantity meant double the utility this would be an easy and natural procedure. But even to the same individual the increase in utility is by no means simply proportioned to the increase in quantity, and the utility of different commodities to different

individuals, and a fortiori of different amounts, is proverbial. The very same things may to the same individual be productive of more utility simply owing to a change in his tastes or habits, and a different distribution of the very same things, which make up the wealth of a nation, might indefinitely change the quantity of utility; but it would be paradoxical to say that the wealth had increased because it was put to better uses.

We thus seem thrown back on value as the essential characteristic, allowance being made for any change in the standard of value; but there are still difficulties to be overcome. Some things that undoubtedly possess value or that can command a price are immaterial, e.g. the advice of a lawyer or physician or the song of a prima donna, and, although perhaps the skill of a workman (in any grade of the social scale) might be considered as attached to the man, as a coal mine is attached to a place, it is more in accordance with popular usage to consider skill as immaterial, whilst at the same time it seems equally natural prima facie to confine the term wealth to material things in the common sense. Again, the credit system of a country is a product of great labour and sacrifice, it is most closely connected with the production of its material wealth in the narrowest sense, and it certainly commands a pecuniary value, and yet credit is more generally held to be a representative rather than a part of wealth, owing apparently to its insubstantial character. Apart from the question of materiality some writers have insisted on relative permanence and possibility of accumulation as essential attributes of wealth, and have thus still further narrowed the scope of the definition.

There can be no doubt that it is on many grounds desirable in economics to use terms as far as possible in their popular acceptations; but this rule must always be subordinate to the primary object in view. In nearly every department of know- ledge in which popular terms have been retained it has been found necessary either constantly to use qualifying adjectives where the context is not a sufficient guide, and in some cases, when analysis discloses very different elements, to make a selection. Sometimes it has been found convenient to use a term with some variation in the definition according to the branch of the subject in hand. 1 Applying these rules to the definition of wealth, perhaps the best solution is that which is

generally connected with German economists {e.g. Adolf von Held). Wealth consists of utilities, and in the first great department of economics — the consumption of wealth — it is utility with which we are principally concerned — the idea of value, for example, being overshadowed. The most general law of the consumption of wealth is that successive portions of any stock give a diminishing amount of utility when consumed. Then in the department of the production of wealth the most important characteristics are the labour and sacrifice necessary to put the utilities desired into the things and to place the things where they are wanted. The idea of value is again secondary and subordinate. We can readily see the part played by nature, labour arid capital re- spectively in the production of any commodity without con- sidering the eflects on its value of the various factors; we can understand the principles of division of labour and of the relative productiveness of large and small industries without entering into questions of value except in the most general manner. In the department of the distribution of wealth the fundamental conception is the right of appropriation; and accordingly J. S. Mill very properly commences this part of his subject by an account of the relative advantages of the socialistic and individual systems of property. It is quite possible under the former to conceive of all the distribution being made without any exchange and with reference simply to the wants or the deserts of the members of the society. Thus it is not until we arrive at the department of the exchange of wealth that'the characteristic of value becomes predominant, although of course value is closely connected with utility and labour and sacrifice.

1 On the uses and difficulties of definitions in political economy compare H. Sidgwick's Principles of Political Economy, bk. i. ch. ii., and J. N. Keynes's Scope and Method of Political Economy,

Usually, however, it will be found that in most cases anything which can fairly be classed as wealth in one department is also wealth in the others, and thus the definition is reached that wealth in general consists of all " consumable utilities which require labour for their production and can be appropriated and exchanged." It only remains to add that " utilities " may be divided into " inner " and " outer " (to translate the German literally) — the " inner " being such as are simply sources of personal gratification to their possessor, e.g. a good ear for music; the " outer " utilities again may be divided into " free " and " economic," the former, as a rule, e.g. sunlight, not being the result of labour and not capable of appropriation or exchange, and the latter as a rule possessing each of these marks. It is these " economic utilities " which constitute wealth in the specific sense of the term, although its use may be extended by analogy to include almost all utilities.

See A. Marshall, Principles of Economics (1907) ; J. B. Clark, Philosophy

of Wealth (1886) and Distribution of Wealth (1899); W. E. Hearn, Pluiology (186+) ; F. A. Walker, Political Economy (1888); and J. S. Nicholson, Principles of Political Economy

(1903). as. n.)

WEAPON (O. Eng. w&pen, cf. Du. wapen, Ger. Wappe, also Wappen, a coat of arms, heraldic shield), any instrument of Offence or defence, more usually a term confined to offensive or attacking instruments. The general sketch of the history and development of weapons of offence and defence is given under Arms and Armour; particular weapons are treated under such heads as Halberd, Lance, Spear, Sword, Gun, Pistol, Rifle, Ordnance and Machine-guns.

WEAR, a river of Durham, England, rising in the Pennine chain near the Cumberland border, and traversing a valley about 60 m. in length to the North Sea, with a drainage area of 458 sq. m. A series of streams draining from the hills between Killhope Law and Burnhopc Seat (2452 ft.) are collected at Wearhead, up to which point the valley is traversed by a branch of the North-Eastem railway. Hence eastward, past the small towns of St John's Chapel and Stanhope, and as far as that of Wolsingham, Weardale is narrow and picturesque, sharply aligned by high-lying moorland. Below, it takes a south-easterly bend as far.as Bishop Auckland, then turns northward and north- eastward, the course of the river becoming extremely sinuous. The scenery is particularly fine where the river sweeps round the bold peninsula which bears the cathedral and castle of the city of Durham. The valley line continues northerly until Chester- le-Street is passed, then it turns north-east; and soon the river becomes navigable, carrying a great traffic in coal, and having its banks lined with factories. At the mouth is the large seaport of Sunderland.

WEASEL (Pulorius nivalis), the smallest European species of the group of mammals of which the polecat and stoat are well-known members (see Carntvora). The weasel is an elegant little animal, with elongated slender body, back much arched, head small and flattened, ears short and rounded, neck long and flexible, limbs short, five toes on each foot, all with sharp, com- pressed, curved claws, tail rather short, slender, cylindrical, and pointed at the tip, and fur short and close. The upper-parts, out- side of limbs and tail, are uniform reddish brown, the under-parts white. In cold regions the weasel turns white in winter, but less regularly and only at a lower temperature than the stoat or ermine, from which it is distinguished by its smaller size and the absence of the black tail-tip. The length of the head and body of the male is usually about 8 in., that of the tail 2j in.; the female is smaller. The weasel is generally distributed through- out Europe and Northern and Central Asia; and is represented by a closely allied

animal in North America. It possesses all the active, courageous and bloodthirsty disposition of the rest of the genus, but its diminutive size prevents it attacking and destroying any but the smaller mammals and birds. Mice, rats, water-rats and moles, as well as frogs, constitute its principal food. It is generally found on or near the surface of the ground, but it can not only pursue its prey through holes and crevices of rocks and under dense tangled herbage, but follow it up the

stems and branches of trees, or even into the water, swimming with perfect ease. It constructs a nest of dried leaves and herbage, placed in a hole in the ground or a bank or hollow tree,

The Weasel (Putorius nivalis).

in which it brings up its litter of four to six (usually five) young ones. The mother will defend her young with the utmost despera- tion against any assailant, and has been known to sacrifice her own life rather than desert them. (R. L.)*

WEATHER (O. Eng. weder; the word is common to Teutonic languages; cf. Du. weder, Dan. veir, Icel. vc&r, and Ger. Wetter and Gerwiller, storm; the root is wa- to blow, from which is derived " wind "), the condition of the atmosphere in regard to its temperature, presence or absence of wind or cloud, its dry- ness or humidity, and all the various meteorological phenomena (see Meteorology). The term " weathering " is used in geology of the gradual action of the weather upon rocks, and is also applied, in architecture, to the inclination or slope outwards given to cornices, string courses and window sills, to throw off the rain.

WEAVER, JAMES' BAIRD (1833-), American lawyer and political leader, was born at Dayton, Ohio, on the 12th of June 1833. He studied law at Cincinnati, Ohio, and served on the Federal side in the Civil War, becoming colonel in November 1862; he was mustered out in May 1864, and in March 1865 was breveted brigadier-general of volunteers. He was district-attorney for the second Judicial District of Iowa in 1866-1870 and an assessor of internal revenue in Iowa in 1863-1873; and was a representative in Congress in 1870-1881 and in 1885-1880, being elected by a Greenback-Democratic fusion. In 1880 he was the candidate of the Greenback party for president and received a popular vote of 308,578; and in 1802 he was the candidate of the People's party, and received 22 electoral votes and a popular vote of 1,041,021.

WEAVER-BIRD, the name 1 by which a group of between 200 and 300 species are now usually called, from the elaborately interwoven nests that many of them build, some of the structures being of the most marvellous kind. By the older systematists such of these birds as were then known were distributed among the genera Oriolus, Loxia, Emberiza and Fringilla; and it. was G. L. Cuvier who in 1817 first brought together these dissevered forms, comprising them in a genus Ploceus. Since his time others have been referred to its neighbourhood, and especially

*1 First bestowed in this form apparently by J. F. Stephens in 1826 (G. Shaw's Gen. Zoology, xiv. pt. i. p. 34); but in 1782 J. Latham (Synopsis, i, p, 435) had called the ' Troupiale du Senegal " of Button the " weever oriole," from its habit of entwining the wires of the cage in which it was kept with such vegetable fibres as it could ;et, and hence in 1788 Gmelin named it Oriolus texlor. In 1800 *". M. Daudin used the term " Tisserin " for several species of the Linnaean genus Loxia, and this was adopted some years later by Cuvier as the equivalent of his Ploceus, as mentioned in the text.*

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the genus Vidua with, its allies, so as to make of them a sub- family Ploceijiae, which in 1847 was raised by J. Cabanis to the rank of a family Ploceidae — a step the propriety of which has since been generally admitted, though the grounds for taking it are such as could not be held valid in any other order' than that of Passeres. The Ploceidae are closely related to the Frwgillidae (see Finch) , and are now divided into two sub-families, the Ploceinae and Viduinae, the former chiefly found in Africa and its islands, the latter in the Ethiopian, Australian and Indian regions.

Perhaps the most typical liloceine weaver-bird is Hyphant- ornis cucullata, an African species, and it is to the Ethiopian Region that by far the greatest number of these birds belong, and in it they seem to attain their maximum of development. They are all small, with, generally speaking, a sparrow-like build; but in richness of colouring the males of some are very conspicuous — glowing in crimson, scarlet or golden yellow, set off by jet black, while the females are usually dull in hue. Some species build nests that are not very remarkable, except in being almost invariably domed — others (such as the most typical Indian weaver-bird, Ploceus baya) fabricate singular structures 2 of closely and uniformly interwoven tendrils or fine roots, that often hang from the bough of a tree over water, and, starting with a solidly wrought rope, open, out into a globular chamber, and then contract into a tube several inches in length, through which the birds effect their exit and entrance. But the most wonderful nests of all, and indeed the most wonderful built by birds, are those of the so-called sociable grosbeak,

Philhetaerus socius, of Africa. These are composed wholly of grass, and are joined together to the number of 100 or 200 — indeed 320 are said to have been found in one of these aggregated masses, which usually take the form of a gigantic mushroom, 3 affording a home and nursery to many pairs of the birds which have been at the trouble of building it. These nests, however, have been so often described and figured by South African travellers that there is no need here to dilate longer on their marvels. It may be added that this species of weaver-bird, known to French writers as the R&puUicain, is of exceptionally dull plumage.

The group of widow-birds, 4 Viduinae, is remarkable for the extraordinary growth of the tail-feathers in the males at the breeding-season. In the largest species, Vidua (sometimes called Ckera) progne, the cock-bird, which, with the exception of a scarlet and buff bar on the upper wing-coverts, is wholly black, there is simply a great elongation of the rectrices; but in V. paradisea the form of the tail is quite unique. The middle pair of feathers have the webs greatly widened, and through the twisting of the shafts their inferior surfaces are vertically opposed. These feathers are comparatively short, and end in a hair-like filament. The next pair are produced to the length of about a foot — the bird not being so big as a sparrow— and droop gracefully in the form of a sickle. But this is not all: each has attached to its base a hair-like filament of the same length as the feather, and this filament originally adhered to and ran along the margin of the outer web, only becoming detached when the feather is full grown. 5 In another species, V, principalis, the middle two pairs of rectrices are equally elongated, but their webs are convex, and the outer pair contains the inner, so that when the margins of the two pairs are applied

2 These differ from those built by some of the Orioles (q.v.) and other birds, whose nests may be compared to pensile pockets, while those of these weaver-birds can beat be likened to a stocking hung up by the " toe," with the " heel " enlarged to receive the eggs, while access and exit are obtained through the " leg."

3 But at a distance they may often be mistaken for a native hut, with its grass-roof.

- *It has been ingeniously suggested that this name should be more correctly written Whydah bird — from the place on the West Coast of Africa so named; but Edwards, who in 1745 figured one of the species, states that he was informed that " the Portuguese call this bird the widow, from its colour and long train" (Nat. Hist. Birds, i. p. 86).*

•This curious structure was long ago described by Brisson (Orni- thologie,

iii. p. 123), and more recently by Strickland (Contr. Orni- thology (1850), pp. 88 and 149, pi. 59).

a sort of cylinder is formed. 1 The females of all the widow-birds differ greatly in appearance from the males, and are generally clothed in a plumage of mottled brown.

Usually classed with the weaver-birds is a vast group of small seed-eating forms, often called Spermestinae, but for which Estreldinae would seem to be a more fitting name. These comprehend the numerous species so commonly seen in cages, and known as ama- davats, Estrelda amandava, nutmeg-birds, Munia punctularia, wax- bills, Pytelia melba and pkoenicoptem, cutthroats, Amadina fasciata, the Java sparrow, Munia ory&ivora and many others. Many of these genera are common to Africa and India, and some also to Australia. (A. N.)

WEAVING. The process of leaving consists in interlacing, at right angles, two or more series of flexible materials, of which the longitudinal are called warp and the transverse weft. Weaving, therefore, only embraces one section of the textile industry, for felted, plaited, netted, hosiery and lace fabrics lie outside this definition. Felting consists in bringing masses of loose fibres, such as wool and hair, under the combined influences of heat, moisture and friction, when they become firmly inter- locked in every direction. Plaited fabrics have only one series of threads interlaced, and those at other than right angles. In nets all threads are held in their appointed places by knots, which are tied wherever one thread intersects another. Hosiery fabrics, whether made from one or many threads, are held together by intersecting a series of loops; while lace fabrics are formed by passing one set of threads between and round small groups of a second set of threads, instead of moving them from side to side. Notwithstanding the foregoing limitations, woven fabrics are varied in texture and have an enormous range of application. The demands made by prehistoric man for fabrics designed for clothing and shelter were few and simple, and these were fashioned by interlacing strips of fibrous material and grasses, which in their natural condition were long enough for the purpose in hand. But, as he passed from a state of savagery into a civilized being, his needs developed with his culture, and those needs are still extending. It no longer suffices to minister to individual necessities; luxury, commerce and numerous industries must also be considered.

The invention of spinning {q.v.) gave a great impetus to the introduction of

varied effects; previously the use of multicoloured threads provided ornament for simple structures, but the demand for variety extended far beyond the limits of colour, and different materials were employed either separately or conjointly, together with different schemes of interlacing. Eventually the weaver was called upon to furnish articles possessing lustre, softness and delicacy; or those that combine strength and durability with diverse colourings, with a snowy whiteness, or with elaborate ornamentation. In cold countries a demand arose for warm clothing, and in hot ones for cooler materials; while commerce and industry have requisitioned fabrics that vary from normal characteristics to those that exceed an inch in thickness. In order to meet these and other requirements the world has been searched for suitable raw materials. From the animal kingdom, wool, hair, fur, feathers, silk and the pinna fibre have long been procured. From the vegetable kingdom, cotton, flax, hemp, jute, ramie and a host of other less known but almost equally valuable materials are derived. Amongst minerals there are gold, silver, copper, brass, iron, glass and asbestos. In addition, strips of paper, or skin, in the plain, gilt, silvered and painted con- ditions are available as well as artificial fibres. All of the fore- going may be used alone or in combination.

*From such variec *aw materials it is not surprising that woven fabrics should present an almost endless variety of effects; yet these differences are only in part due to the method of weaving. The processes of bleaching (q.v.), mercerizing (q.v.), dyeing {q.v.), printing (see Textile Printing) and finishing (q.v.) contribute almost as much to the character and effect of the resultant product as do the incorporation in one fabric of threads spun in different ways and from fibres of different origin, with paper, metal, beads or even precious stones.*

1 Both these species seem to have been first described and figured in 1600 by Aldrovandus (lib. xv. cap. 22, 23) from pictures sent to him by Ferdinando de' Medici, duke of Tuscany.

Industrial Technicologv All weaving schemes are reducible to a few elementary principles, but no attempted classification has been quite successful, for fabrics are constantly met with that possess characteristics supposed to be peculiar to one class, but lack others which are deemed equally typical. Nevertheless, since some classification is essential, the following will be adopted, namely: Group i, to include all fabrics made from one warp and one weft, provided both sets of threads remain parallel in the finished article and are intersected to give the requisite feel and appearance: Group 2, to include (a) fabrics constructed from two warps and one weft, or two wefts and one warp, as in those that are backed, reversible and figured with extra material; (b) two or more distinct fabrics built simultaneously from two or more warps and wefts, as in two, three

and other ply cloths; (c) fabrics built by so intersecting two or more warps and wefts that only one texture results, as in loom-made tapestries and figured repps. Group 3, to include fabrics in which a portion of the weft or warp rises vertically from the ground- work of a finished piece, as in velveteens, velvets, plushes and piled carpets. Groups 4, to embrace all fabrics in which one portion of the warp is twisted partially, or wholly, round another portion, as in gauzes and lappet cloths. Although some fabrics do not appear to fall into any of the above divisions, and in others the essential features of two or more groups are combined, yet the grouping enumerated above is sufficiently inclusive for most purposes.

The fabrics included in Group 1 are affected by the nature and closeness of the yarns employed in their construction, by colour, or by the scheme of intersecting the threads. The most important section of this group is Plain Cloth, in which the warp and weft threads are approximately equal in thickness and closeness, and pass over and under each other alternately, as in fig. 1, which shows a design, plan and two sections of plain cloth. Such a fabric would, therefore, appear to admit of but slight ornamentation, \et this is by no means the Case, for if thick and thin threads of warp and weft alternate, the resultant fabric may be made to assume a corrugated appearance on the face, while beneath it remains flat, as in poplins, repps and cords. A plan and a longitudinal section of a repp cloth is shown at fig. 2. Colour may also be employed to ornament plain fabrics, and its simplest application produces stripes ahd checks. But colour may convert these fabrics into the most artistic and costly productions of the loom, as is the case with tapestries, which

Fig. 1. — Plain Cloth.

Fig. 2.— Repp Cloth.

are at once the oldest and most widely diffused of ornamented textiles. Tapestries only differ from simple plain cloth in having each horizontal line of weft made up of numerous short lengths of parti-coloured thread. Many fine specimens of this art have been recovered from ancient Egyptian and Peruvian tombs, and many are still produced in the Gobelins and other celebrated manufactories of Europe.

Twills are next in importance to plain cloth on, account of their wide range of application and great variety of effects; in elabor- ately figured goods their use is as extensive as where they provide the only ornament. Twills invariably form diagonal ribs in fabrics, and these are due to the intervals at which the warp and weft are intersected; thus two or more warp threads are passed over or under one or more than one weft thread in regular succession. Twills are said to be equal when similar quantities of warp and

weft are upon the face of a fabric, unequal when one set of threads greatly pre- ponderates over the other set, as in figs. 3, 4, which require four warp and weft threads to complete the scheme of intersections. If the ribs form angles of 45 degrees, the warp and weft threads per inch are about equal in number, but for an unequal twill the material most in evidence should be closest and finest. The angle formed may be greater or less than 45 degrees, as in figs. 5, 6; if greater, the warp preponderates, if less, the weft preponderates. Twills are simple and fancy; both terms refer to the schemes of intersecting. In the

former the same number of warp threads are placed successively above or below each weft thread, and the ribs are of uniform width, as in figs. 3, 4. In the latter more warp threads may be above one

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Fic- 3. — Four-thread | Twill. Fig. 4. — Four-thread $ Twill.

pick than another, the ribs may vary in width and small ornament may be introduced between the ribs, as in figs. 5, 6 and 7, where the dark squares represent warp upon the surface. Twills raay_ be broken up into zigzags, lozenges, squares and other geometrical designs; all of which may be produced by reversings in the diagonal lines, or by reversing the weave of an unequal twill. Fig. 8 is a zigzag, namely, a twill reversed in one direction. Fig. 9 is a diamond,

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Fig. 5. — ‘Upright Twill.

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Fig. 6.

-Reclining Twill.

or a twill reversed in two directions, and fig. 10 is a diaper, or an unequal twill which gives a warp face in one place and a weft face in another. Satins and satteens form another important section of Group r. In a satin the bulk of the warp, and in a satteen the bulk of the weft, is on the face of a fabric. If perfect in construction both present a smooth, patternless appearance, which is due in part to the scheme of intersections, in part to using fine material for the

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Fig. 7. — Fancy Twill.

Frc 8. — Zigzag.

surface threads and placing it close enough together to render tne points of intersection invisible; the threads of the other set being coarser and lewer in number. Satins differ from twills in having each warp thread lifted, or depressed, separately, but not successively. From five to upwards of thirty threads of warp and weft are required to complete the various schemes of intersecting. If the intervals between the intersections are equal the weave is said to be perfect,

Fig. 9. — Diamond.

FiG. 10.

taper.

as in fig. 11, but if the intervals are irregular it is said to be imperfect, as in fig. 12. In Dantajks a satin is combined with a satteen weave, and since any desired size and shape of either weave may be pro- duced, great facilities are offered for the development of all kinds of ornamentation. But in combination neither the satin nor the satteen can be perfect in construction, for one requires a preponder- ance of warp, the other a preponderance of weft; as a sequence every point of intersection is distinctly visible on both surfaces. Brocades arc fabrics in which both sets of threads may be floated irregularly upon the surface to produce ornamental effects, and they may be taken as typical of all one warp and one weft fabrics

that are figured by irregularly floated material, wnether the threads are uniformly or irregularly distributed, and whether one weave or several

weaves be employed.

*Group 2 includes all backed and reversible fabrics, as well as those ornamented with extra material and compounded. Cloths intended for men's wear are often backed, th< * object of which is to give weight and bulk to a thin texture without interfering with the*

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Fig. 11.— Five-thread

Satteen.

Fig. 12. — Six-thread Satteen.

face effects. Either warp or weft may be used as backing; if the former there are two series of warp to one series of weft threads, while in the latter therˆ are two series of weft to one series of warp threads. The face material is superposed upon that of the back, but the ratio of face threads may be one or two to one of back. In order to avoid disturbing the face weave, only those threads are used to bind the backing that are hidden on the face, as in fig. 13, which gives the design and a transverse section of a backed fabric; A is face weft; B back weft, and the circles are warp threads; of the latter C, D ; are beneath both B and A. This diagram will serve equally as a longitudinal section of a warp-hacked fabric, if A represents a thread of face warp, B a thread of back warp and the circles are weft threads. Weft backing is capable of giving a more spongy feel to a fabric than warp, because softer materials may be used, but in these fabrics the length output of loom is reduced by reason of the wefts being superposed. Warp-backcd fabrics, whether uniformly coloured or striped, do not materially reduce the output of a loom, for every weft thread adds to the cloth length. Reversible fabrics may have either two scries of differently coloured wefts or warps to one of the other series, in which r smtM

event they may be similarly figured on raSH

both sides by causing the threads of the RiERia

double series to change places, as in the fPsTpS

design and transverse section, fig. 14; or, irnrB

by allowing one scries to remain con- S rwT^H

stantly above the other, as in backed cloths, both sides may be similar or dis- similar in colour and pattern. Fabrics figured with extra material may have two series of warp or weft threads to one series of the other set, and they may yield reversible or one-sided cloths. A ground texture may have extra material placed above or below it, as in fig. 15, where a design and transverse section of the cloth are given; the waved lines and circles represent a cross-section of plain cloth and A is a thread of extra material ; or ordinary and extra material may be used con- jointly for figuring. _ Compound cloths must have at least two textures, and be as distinct in character as if woven in separate looms ; they have many advantages over backed cloths, thus: the same design and colouring may be produced on both sides; where bulk and weight are required a fine surface texture may be formed over a ground of inferior material, and soft weft be passed between the upper and lower textures. The fabric is more perfect and admits of cither simple or elaborate patterns being wrought upon the surface, with simple ones beneath, as in piques and matelasstfs. One texture may be constantly above the other and connected at the selvages only, as in hose pipes and pillow slips; or at intervals a thread may pass from one texture into the other, in which event both are united, as in many styles of bed-covers and vestings. If differently coloured

Fig, 13

— Weft -backed Fabric.

Fig.

14. — Weft Reversible Fabric.

Fig.

15. — Figuring with Extra Weft.

the textures may change places at pleasure, as in Kidderminster carpets; or, from three to twelve textures may be woven simultane- ously, and united, as in belting cloth. There may be from one to ttjree threads of face warp to one of back, and the wefting may or may not correspond with the warping. Fig. 16 shows the face and

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Fig.

16. — Compound Fabric.

back weaves, the design, and a transverse section of a compound cloth with two threads of face warp and weft to one of back, and both are stitched together. The circles in the upper and lower Hncs represent face and back warps respectively, and A, B, C are weft threads placed in the upper and lower textures. Loom-made tapestries and figured repps form another section of Group 2. As compared with true tapestries, the loom-made articles have more limited colour schemes, and their figured effects may be obtained from warp as well as weft, whether interlaced to form a plain face, or left floating more or less loosely. Every weft thread, in passing from selvage to selvage, is taken to the surface where required, the other portions being bound at the back. Some specimens are reversible, others are one- sided, but, however numerous the warps and wefts, only one texture is produced. When an extra warp of fine material is used to bind the wefts firmly together a plain or twill weave shows on both sides. If a single warp is employed, two or more wefts form the figure, and the warp seldom floats upon the surface. Where warps do assist to form figure it rarely happens that more than three can be used without overcrowding the reed. Fig. 17 gives the design, and a transverse section of a reversible tapestry in four colours, two of which arc warps and two wefts. If either warp or weft is on the ! surface, corresponding threads are be- ; neath. The bent lines represent weft and Fig. 1 7.— Tapestry with the circles warp. Figured repps differ Two Warps and Two from plain ones in having threads of one, Wefts. or more than one, thick warp floated over

thick and thin weft alike; or, in having several differently coloured warps from which a fixed number of threads are lifted over each thick weft thread; the face of the texture is then uniform, and the figure is due to colour.

Group 3. Piled Fabrics. — In all methods of weaving hitherto dealt with the

warp and weft threads have been laid in longitudinal and transverse parallel lines. In piled fabrics, however, portions of the weft or warp assume a vertical position. If the former there are two series of weft threads, one being intersected with the warp to form a firm ground texture, the other being bound into the ground at regular intervals, as in the design and transverse section of a velveteen, fig. 18; the circles and waved lines form plain cloth, and the loose thread A is a pile pick. After leaving n w y i 1 the loom all threads A are cut by push-

ffyQl H ing a knife lengthwise between the plain

B8 ~5"B8 "S i cloth and the pile. As each pick is

severed both pieces rise vertically and the fibres open out as at B. Since the pile threads are from two to six times as numerous as those of the ground, and rise Fig. 18. — Velveteen. from an immense number of places, a uniform brush-like surface is formed. Raised figures are produced by carrying the threads A beneath the ground cloth, where no figure is required, so that the knife shall only cut those portions of the pile weft that remain on the surface. The effect upon the face varies with the distribution of the binding points, and the length of pile is determined by the distance separating one point from another.

Chenille. — When chenille is used in the construction of figured weft-pile fabrics, it is necessary to employ two weaving operations, namely, one to furnish the chenille, the other to place it in the final fabric. Chenille is made from groups of warp threads that are separated from each other by considerable intervals; then, multi- coloured wefts are passed from side to side in accordance with a predetermined scheme. This fabric is next cut midway between the groups of warp into longitudinal strips, and, if reversible fabrics such as table-covers and curtains are required, each strip is twisted axially until the protruding ends of weft radiate from the core of warp, and form a cylinder of pile. In the second weaving this chenille is folded backward and forward in a second warp to lay the Colours in their appointed places and pile projects on both sides of the fabric. If chenille is intended for carpets, the ends of pile weft are bent in one direction, and then woven into the upper surface of a strong ground texture.

Warp-piled Fabrics have at least two series of warp threads to one of weft, and are more varied in structure than weft-piled fabrics, because they may be either plain or figured, and have their surfaces cut, looped or both.

Velvets and Plushes are woven single and double. In the former case both ground and pile warps are intersected with the weft, but at intervals of two or three picks the pile threads are lifted over a wire, which is subsequently

withdrawn; if the wire is furnished with a knife at its outer extremity, in withdrawing it the pile threads are cut, but if the wire is pointed a line of loops remains, as in terry velvet. Fig. 19 is the design, and two longitudinal sections of a Utrecht velvet. The circles at A are weft threads, and the bent line is a pile thread, part of which is shown cut, another part being

looped over a wire. At B the circles are repeated to show how the ground warp intersects the weft.

Double Plushes consist of two distinct ground textures which are kept far enough apart to ensure the requisite length of pile. As weaving proceeds the pile threads are interlaced with each series of weft threads, and passed from one to the other. The uniting pile material is next severed midway between the upper and Tower textures, and two equal fabrics result. Fig. 20 gives three longi-

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Fig. 19. — Utrecht Velvet.

Fig. 20. — Double Plush.

tudinal sections of a double pile fabric. The circles A, B are weft threads in the upper and lower fabrics respectively; the lines that interlace with these wefts are pile warp threads which pass vertically from one fabric to the other. At C, D the circles are repeated to show how the ground warps intersect the wefts, and at E the arrows indicate the cutting point.

*Figured Warp-pile Fabrics are made with regular and irregular cut and looped surfaces. If regular, the effect is due to colour, and this again *may be accomplished in various ways, such as (a) by knotting tufts of coloured threads upon a warp, as in Eastern carpets; (b) by printing a fabric after it leaves the loom; (c) by printing each pile thread before placing it in a loom, so that a pattern shall be formed simultaneously with a pile surface, as in tapestry carpets; (d) by providing several sets of pile threads, no two of which are similar in colour; then, if five sets are available, one-fifth of all the pile warp must be lifted over each wire, but any one of five colours may be selected at any place, as in Brussels and W r ilton carpets. Fig. 21 is the design, and a longitudinal section of a Brussels carpet. The circles represent two tiers of weft, and the lines of pile threads, when not lifted over a wire to form loops, are laid between the wefts; the ground warp interlaces with the weft to bind the whole together. When the surface of a piled fabric is irregular, also when cut and looped pile are used in combination, design is no longer dependent upon colour, for in the FlG. 21. — Brussels Carpet. former case pile threads are only lifted*

over wires where required, at other places a. fiat texture is formed. In the latter case the entire surface of a fabric is covered with pile, but if the figure is cut and the ground looped the pattern will be distinct.

Group 4. Crossed Weaving. — This group includes all fabrics in which the warp threads intertwist amongst _ themselves to give intermediate effects between ordinary weaving and lace, as in gauzes. Also those in which some warp threads are laid trans- versely in a piece to imitate embroidery, as in lappets.

Plain Gauze embodies the principles that underlie the construction of all crossed woven textiles. In these fabrics the twisting of two warp threads together leaves large interstices between both warp and weft. But although light and open in texture, gauze fabrics are the firmest that can be made from a given quantity and quality of material. _ One warp thread from each pair is made to cross the other at every pick, to the right and to the left alternately, therefore the same threads are above every pick, but since in crossing from side to side they pass below the remaining threads, all are bound securely together, as in fig. 22> where A is a longitudinal section and B a plan of gauze. , _

Leno is a muslin composed of an odd number of picks of a plain weave followed by one pick of gauze. In texture it is heavier than gauze, and the cracks are farther apart transversely.

Fancy Gauze may be made in many ways, such as (a) by using crossing threads that differ in colour or count from the remaining threads, provided they arc subjected to slight tensile strain; (6) by causing some to twist to the right, others to the left simultane- ously; (c) by combining gauze with another weave, as plain, twill, satin, brocade or pile; (d) by varying the number of threads that cross, and by causing those threads to entwine several^ ordinary threads ; (e) by passing two or more weft threads into each crossing, and operating any assortment of crossing threads at pleasure.

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-Plain Gauze.

MACHINERY]

WEAVING

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Fig. 23. — Lappet Fabric.

Lappet weaving consists in diapering the surface of a plain or gauze fabric with simple figures. This is done by drawing certain warp threads into a transverse position and then lifting them over a thread of weft to hx them in the texture; after which they are moved in the opposite direc- tion and lifted over the following pick. The material between one binding point and another must float loosely, and this limits the usefulness of lappet figuring. In fig. 23, the thick lines show a lappet spot upon a plain texture. Notwithstanding diverse struc- ture, intricate mechanisms are not essential to the production of either simple or complex textures ; the most elaborate and beautiful specimens of the weaver's art have been manufactured upon simple machinery.

Weaving Machinery.

The longitudinal threads of a fabric are called warp, caine, twist and organzine, and the transverse threads are weft, shoot, woof, filling and tram. A loom for intersecting these several threads must provide for: (1) Shedding; namely, raising and lowering the warp threads in a predetermined sequence so as to form two lines between which the weft may be passed. (2) Picking, or ˆplacing lines of weft between the divided warp. (3) Beating-up, or striking each weft thread, into its appointed position in the fabric. (4) Letting-off, or holding the warp tense and delivering it as weaving proceeds. (5) Taking-up, or drawing away the cloth as manufactured. (6) Temples, for stictching the fabric widthwise in order to prevent the edge threads of a warp from injuring the reed, and from breaking. Power looms require the above-named contrivances to act automatically, and in addition: (7) A weft-fork, to stop a loom when the weft becomes exhausted or breaks. (8) Mechanism for stopping a loom when the shuttle fails to reach its appointed box. (9) For weaving cross stripes, multiple shuttle boxes are needed to bring different colours, or counts of weft, into use at the proper time. (10) In some looms a device for automatically ejecting a spent cop, pirn or shuttle, and inserting a full one, is requisite, (n) If a weaver has to attend to a greater number of looms than usual, a device for stopping a loom when a warp thread fails is essential.

The Hand-Loom. — During the 17th and the first half of the 18th centuries it was observed that wherever any branch of the textile industry had been carried to a high state of excellence the looms

Fig. 24. — Diagram of Hand-Loom.

used to manufacture a given fabric were similar in essentials, although in structural details they differed greatly. Prior to the invention of the fly shuttle by John Kay, in 1733, no far-reaching invention had for

generations been applied to the hand-loom, and subsequently the Jacquard machine and multiple shuttle boxes represent the jnief changes. A hand-loom as used in Europe at the present time (see fig. 24) has the warp coiled evenly upon a beam whose gudgeons

are laid in open steps formed in the loom framing. Two ropes are coiled round this beam, and weighted to prevent the warp from being given off too freely. From the beam the threads pass alter- nately over and under two lease rods, then separately through the eyes of the shedding harness, in pairs between the dents of a reed, and finally they are attached to a cloth roller. For small patterns healds are used to form sheds, but for large ones a jacquard machine is required. Healds may be made of twine, of wire or of twine loops into which metal eyes, called mails, are threaded. But they usually consist of a number of strings which are secured above and below upon wooden laths called shafts, and each string is knotted near the middle to form a small eye. From two to twenty-four pairs of shafts may be employed, but the healds they carry must collectively equal the number of threads in the warp. These healds will be equally or unequally distributed upon the shafts according to the nature of the pattern to be woven, and the threads will be drawn through the eyes in a predetermined order. The upper shafts are suspended from pulleys or levers, and the lower ones arc attached directly or indirectly to treadles placed near the floor. The weaver depresses these treadles with his feet in a -sequence suited to the pattern, and the scheme of drawing the warp through the healds. When a treadle is pressed down, at least one pair of shafts will be lifted above the others, and the warp threads will ascend or descend with the healds to form a shed for a shuttle, containing weft, to be passed through (see Shuttle). The reed (fig. 25) is the instrument

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Fig. 25. — Weaver's Reed.

by which weft is beaten into position in the cloth ; it also determines the closeness of the warp threads, and guides a moving shuttle from side to side. It is made by placing strips of flattened wire between two half round ribs of wood, and binding the whole together by passing tarred twine between the wires and round the ribs. Such a reed is placed in the lower portion of a batten, which is suspended from the upper framework of the loom. In front of the reed, and immediately below the warp, the projecting batten forms a race for the shuttle to travel upon from side to side. Before Kay's invention a shuttle was thrown between the divided warp and caught at the opposite selvage, but Kay continued the projecting batten on both

sides of the warp space, and constructed boxes at each end. Over each box he mounted a spindle, and upon it a driver, or picker. Bands connected both pickers to a stick which the weaver held in his right hand, while with the left hand he controlled the batten. Thus: a treadle is pressed down by one foot to form a shed; the batten is pushed back till a sufficient portion of the shed is brought in front of the reed, and the depressed threads He upon the shuttle race; a clear way is thus provided for the shuttle. A quick movement of the stick tightens the cord attached to a picker and projects the shuttle from one box to the other. The batten is now drawn forward, and the reed beats up the weft left by the shuttle. As the next treadle is depressed to form another division of the warp for the return movement of the shuttle, the last length of weft is en- wrapped between intersecting warp threads, and the remaining movements follow in regular succession (sec fig. 26).

In cases where the weft forms parti-coloured stripes across a fabric, also where different counts of weft are used, shuttles, equal in number

Fig. 26. — Section of Plain Web in Process of Weaving on the Loom.

a, The warp beam. d, The reed in position for pick-

b, The lease rods by which the ing, and also for beating-up.

warp is divided and crossed, e. Woven cloth. c,c, Two pairs of shafts containing /, The cloth beam.

healds. to the colours, counts or materials, must be provided. By Robert Kay's invention of multiple shuttle boxes, in 1760, much of the rime lost through changing shuttles by hand was prevented. His drop boxes consist of trays formed in tiers and fitted into the ordinary shuttle boxes. Each tray is capable of holding a shuttle, and by operating a lever and plug with the forefinger and thumb of the left hand, the trays may be raised and lowered at pleasure to bring that shuttle containing the colour next needed into line with the picker.

The Draw /.oom.— Large figured effects were formerly produced in draw looms, where the warp threads were so controlled by separate strings that any assortment could be lifted when required. Thus: to the lower end of each string a dead weight, called alingoe, was attached, and a few inches above the lingoe a mail was fixed for the

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Fig. 27. — Diagram of Jacquard Machine and Harness.

control of a warp thread. The strings passed through a drilled board which held the mails and warp threads facing the proper reed dents. Still higher up, groups of strings were cunnected to neck cords ; each group consisted of all strings required to rise and fall together constantly. If, for example, in the breadth of a fabric there were twelve repeats of a design, twelve strings would be tied to the same neck cord, but taken to their respective places in the comber board. The foregoing parts of a draw loom harness are clearly shown in fig. 27 : A are lingoes, and the dots represent mails.

_ B is the comber board; between

B and C are mounting strings and nock cords, two strings beiii-g attached to each cord; and C is the bottom board. Each neck cord, after being led through a per- forated bottom board C, and over a grooved pulley, was threaded through a ring on the top of a vertical cord called the simple, and passed horizontally to, and tied upon a bar rigidly fixed near the ceiling of the weaving room. The simple cords were similarly at- tached to a bar placed near the floor. From one hundred to several thousands of neck and simple cords could be used in one harness. The design to be reproduced in cloth was read into the parallel lines of the simple by looping a piece of string round each cord that governed warp threads to be lifted for a given shed; after which all the loops were bunched together. By pulling at a bunch of loops the simple cords were deflected and they caused all warp threads con- trolled by them to be lifted above the level of those undisturbed. Similar bunches of loops were formed for every shed required for one repeat of a design, and they were pulled in succession by the draw-boy, while the weaver attended to the batten and picking.

The Jacquard machine is the most important invention ever applied to the hand-loom, but it is not the work of one man; it represents the efforts of several inventors whose labours extended over three-quarters of a century. This apparatus has taken the places of the simple, the loops, the pulleys and the draw-boy of the older shedding motion, but other parts of the harness remain un- changed. In 1725 Basile Bouchon substituted for the bunches of looped string an endless band of perforated paper by which the simples for any shed could be selected. In 1728 M. Falcon con- structed the machine since known as the Jacquard and operated it through the medium of perforated cards, but it was attached to the simple cords and required a draw-boy to manipulate it. In 1745 Jacques de Vaucanson united in one

machine Bouchon's band of paper and the mechanism of Falcon. He placed this machine where the pulley box previously stood, and invented mechanism fur operating it from one centre.

It is said that about the year 1801 J. M. Jacquard was called upon to correct the defects of a certain loom belonging to the state, in ˆ.oing which he asserted that he could produce the desired effects by simpler means, and this he undoubtedly accomplished. In or about 1804 he discarded the simple and all but a few inches of the vertical neck cords ; he placed Falcon's apparatus immediately over the centre of the loom and severally attached the upper portions of the neck cords to the hooks; all of which Vaucanson had previ- ously done. He then perforated each face of a quadrangular frame— 1 used by Falcon to guide the cards to the draw-boy, and since known as the cylinder — and invented means whereby the cylinder could be made to slide horizontally to and fro, and at each outward journey make one-quarter of a revolution. Cards were so held upon this cylinder by pegs that at each rotatory movement one was brought into action and another moved away. By means of two treadles placed beneath the warp one weaver could operate the entire loom. The cylinder was controlled with one foot, the selecting parts with the other, and both hands were free to attend to picking and beating- up- •

In a Jacquard machine the warp threads are raised by rows of upright wires called hooks. See D, fig. 27. These are bent at both extremities and are normally supported upon a bottom board C, which is perforated to permit the neck cords from the harness beneath to be attached to the hooks. Each of a series of horizontal needles E — one of which is shown enlarged and detached at the foot of the drawing — is provided with a loop and a coiled eye; the former to permit of a to-and-fro movement, the latter to receive a hook. The straight ends of the needles protrude about one-quarter of an inch through a perforated needle board G, but the looped ends rest upon bars placed in tiers. A wire passed through all the loops of the needles which form one vertical line limits the extent of their

lateral movement, and small helical springs, a, enclosed in a box F, impinge upon the loops of the needles with sufficient force to press them and their hooks forward. A frame H, called a griffe, is made to rise and fall vertically by a treadle which the weaver actuates with one foot. This frame contains a blade for each line of hooks, and when the blades are in their lowest position the hooks are free and vertical with their heads immediately over the blades, hence, an upward movement given to the griffe would lift all the hooks and thereby all the warp threads. Only certain hooks, however, must be lifted with the griffe, and the selection is made by a quadrangular block of wood, I, called a cylinder, and cards which are placed upon it. Thus, each face of the cylinder has a perforation opposite

each needle, so that if the cylinder be pressed close to the needle board the needle points will enter the holes in the cylinder and remain undisturbed. But if a card, which is not perforated in every possible place, is interposed between the cylinder and the needles, the un- punctured parts cf the card close up some of the holes in the cylinder, and prevent corresponding needles from entering them. Each needle so arrested is thrust back by the advancing card; its spiral spring a is contracted and its hook D is tilted as shown in the figure. If at this instant the griffe H ascends, its blades will engage the heads oi all vertical hooks and lift them, but those dislocated by being tilted will remain unlifted So soon as the pressing force of a card is removed from the needles the elasticity of the springs restores both needles and hooks to their normal positions. Cards are perforated by special machinery from a painted design, after which they are laced into a chain and passed over conical pegs upon the cylinder; the number required to weave any pattern equals the number of weft threads in that pattern. The cylinder is generally drawn out and turned by each upward movement of the griffe, and restored to the needles by each downward movement, so that each face in succession is presented to the needles, and each rotatory movement brings forward a fresh card. As the griffe rises with vertical hooks a shed is formed, and a thread of weft is passed across the w r arp. The griffe then descends and the operation is repeated but with a new combination of lifted threads for each card. A Jacquard may contain from 100 to 1200 hooks and needles, and two or more machines may be mounted upon the same loom.

Since Jacquard's time attempts have been made to dispense with hooks, needles, springs, cards, the cylinder and several other parts ; machines have also been specially designed for effecting economies in the manufacture of certain fabrics; but although some of these devices are used in different sections of the industry, the single lift Jacquard remains unchanged, except in its details, which have been modified to give greater certainty of action to the moving parts. The most far-reaching changes are directly due to efforts made to adapt the Jacquard to fast running power looms. Alfred Barlow, John and William Crossley, and others, devised means whereby two hooks could control the same warp thread, and they provided the machine with two grilles, each capable of actuating alternate rows of hooks. One griffe was caused to ascend as the other descended, therefore, if one of the two hooks that operate a warp thread is lifted for the first shed, the other hook can begin to rise for a second shed immediately the first begins to fall. About half the time originally needed for shedding is thus saved, and as a result Jacquards can now be run at 210 to 220 picks per minute.

Preparing Warp and Weft for Weaving. — The power loom is only one of a scries of machines which revolutionized weaving. Although early inventors

of the power loom did much to perfect its various movements, the commercial results were disappointing, chiefly because means had not been devised for preparing warp and weft in a suitable manner for such a machine. William Radcliffe, of Stockport, perceived these shortcomings, and concluded that, by- division of labour, weaving could be brought into line with, the then recently invented, spinning machinery. He, therefore, set himself the task of solving the problems involved, and by inventing the beam warper, the dressing sizing machine, the shuttle tongue, and the pin cop, he enabled the power loom to become a factor in the textile industry. The term preparation embraces winding, warping, sizing, Yorkshire dressing, drawing-in, twisting and occasionally- other operations.

Weft Winding.— Weft yarns invariably receive simpler treatment than warp yarns ; in many cases none at all. Cops and ring spools pass direct to the loom unless their dimensions are unsuited to the shuttles, in which case they, together with wefts bleached or dyed in hanks or used in a saturated condition, require winding upon pirns, or into cops of suitable sizes. Pirn winders differ greatly in construction, but the majority are furnished with conical shapers, consisting either of slip cups, or of cone rollers mounted upon studs. A pirn, whose head is coned to fit inside a shaper, is slipped over a spindle, and both are passed, either vertically or horizontally, through a shaper; the basal end of the spindle being flattened to enter a rectangular hole in a wharve which is driven from a central tin drum. A thread is attached to a rotating pirn, and a vibrating guider leads it to and fro inside the shaper. Both spindle and pirn recede from the shaper until the pirn is full, when they become stationary. Hanks are carried by ryces, and cops and ring spools by skewers. Cop winders are chiefly used for coarse yarns, which they coil upon bare spindles. By this means a greater length of weft can be placed in a shuttle than when pirns are used.

Warp winding consists in transferring yarn from cops, ring spools or hanks, cither to warpers, bobbins or cheeses (see Cotton-Spinning Machinery). Machines for this purpose are of two kinds, which are known respectively as spindle and drum. In the former each bobbin is placed upon a vertical spindle and rotated by frictional contact; a yarn guider meanwhile rises and falls far enough to lay the threads in even coils between the bobbin flanges. In the latter each bobbin, or tube, is laid upon a rotating drum and a thread guide moves laterally to and fro; slowly for a bobbin, but quickly for a tube.

Warping, — The number of longitudinal threads in a web vary according to their closeness and its breadth. It is the function of a warper to provide a sufficient number of parallel threads for a web, all of ei-ual length, and to retain their parallelism. Warpers are of three types, viz. mill, beam and sectional.

Mill -warping is the oldest type now in extensive use. A mill warper has a creel in which from 50 to upwards of 300 bobbins or cheeses, are supported horizontally upon pegs, and the mill has a vertical axis which carries three wheels, upon whose rims vertical staves are fixed about I ft. apart to form a reel, from 5 to upwards of 20 yds. in circumference. The threads from the creel are threaded in succession through leasing needles, then passed in groups of four to twenty threads between runners, and, finally, fastened by a peg to the mill staves. The needles are mounted alternately in two frames which may be moved up inclined planes; one to elevate odd threads, the other even ones, and both separations thus formed are retained upon separate pegs; this is the lease which enables a weaver to readily fix the position of a broken thread. As the mill rotates the threads form a tape about 1 in. wide, and the leasing apparatus slides down a post to coil the threads spirally upon the reel. When the full length of warp has been made the mill is stopped, a half beer leaˆe is picked by hand from the divisions formed by the runners, and also retained upon pegs. The mill next reverses its direction of rotation, and as the leasing apparatus ascends the threads are folded back upon themselves. Hence, if a reel is 20 yds. in circumference, and 200 threads are in use to make a warp 600 yds. long, and containing 2000 threads, the reel will make 30 revolutions (600-5-20 —30) also 10 reversals, for at each reversal 200 additional threads will be added (2000 -=-200 = 10). When a warp is complete, strings are passed through the leases, and it is coiled into a ball, loosely linked into a chain, or dropped into a sheet. If a mill has its axis horizontal the leasing apparatus must slide horizontally.

Winding on Frame. — After a ball warp has been bleached, dyed or sized, the half beers are laid amongst the teeth of a coarse comb to open out the threads to the necessary breadth, in which condition thev are coiled upon a loom beam.

Beam warping is the system most extensively used in the cotton trade. The creels for these machines have an average capacity of about Goo bobbins, and are often V-shaped in plan. In each leg of the V the bobbins are arranged in tiers of 16 to 20, and row behind row. The threads are drawn separately between the dents of an adjustable reed, then under and over a series of rollers; from here they are dropped amongst the teeth of an adjustable comb and led down to a warpers beam, which rests upon the surface of a drum. As the drum rotates the threads are drawn from the

bobbins and wrapped in even coils upon the beam. On most of these machines mechanism is attached for arresting motion on the fracture of a thread, and also for accurately measuring and recording the lengths of warp made. When full, a warpers beam holds threads of much greater length than are needed for any warp, but they are insufficient in number. Thus: If 500 threads are in use, and warps of the above-named particulars are required, four similar beams must be filled (2000 -=-500 = 4) and the threads from all are subsequently united. The chief parts of a beam warper may be used as a substitute for a mill warper, provided that mechanism be employed to contract the threads to the form of a loose rope and coil them into a cylindrical ball, which will be subsequently treated as a mul warp. Or, one of these warpers may be furnished with parts which, when the threads are roped, links them loosely into a chain.

Sectional warping is chiefly employed for coloured threads and its outstanding features consist in contracting the threads to form a ribbon of from 3 in. to 12 in. wide. This ribbon is coiled upon a block placed between flanges, and when completed is set aside until a sufficient number of similar sections have been made ; after which they are slipped upon a shaft and by endlong pressure con- verted into a compact mass. All the threads are then collected and transferred in the form of a sheet to a loom beam; each section contributing its own width to that of the warp. Sectional warps are also made upon horizontal mills by superposing the coils of a ribbon of yarn upon a portion of the staves. When the first section is formed a second is wound against it, and the operation continued until all the sections have been made; after which the yarn is run upon a loom beam.

Yorkshire dressing is used to make striped warps from balled warps which have been dyed in different colours. The operation is as follows: The requisite number of threads of any colour is split from a uniformly dyed ball and set aside until warps of the remaining colours have bc-n similarly treated. The split sections from the several balls collectively contain as many threads as are needed for a warp, but those threads have still to be placed in their proper

*sequence. This is done by drawing them in groups of two or four between the dents of a reed to a predetermined colour scheme, then all are attached to a loom bc*vm which is supported in a frame. The beam is rotated by stepped cones and gearing, and winds the threads upon itself. But in order to hold the threads taut they are passed between weighted rollers and deflected by bars arranged ladder- wise; in passing from one part of the machine to another they are gradually opened out to the width of the beam.*

Sizing.— In cases where single yarns are made from short fibrous materials, smooth surfaces are obtained by laying the outstanding ends of fibres upon the thread, and fastening the fibres together to impart sufficient strength to resist the strains of weaving. This is accomplished either by coating a thread or by saturating it with an adhesive paste. In hand-loom days the paste was applied by brushes to successive stretches of warp w r hile in a loom. But with the advent of mechanical weaving it was found necessary to size a warp before placing it in a loom. Two systems were evolved, the one invented by William Radcliffe sizes, dries and beams a warp in one operation, the yarn is made to pass in the form of a sheet between a pair of rollers, the lower one being partly immersed in warm size. In rotating this roller carries upon its surface a film of size which it deposits upon the threads, while, by pressure, the upper roller distributes the size evenly. Brushes acting automatically smooth down the loose fibres and complete the distribution of size. As the yarn advances it is separated by reeds and lease rods, so that in – passing over steam chests and fans the moisture contained in the threads may be quickly evaporated. This machine is a duplex one, for the warpers beams are divided into two sets and placed at opposite ends of the machine. Both halves receive similar treatment as they move to the centre, where the loom beam is placed.

The Ball Warp Sizer. — While efforts were being made to perfect Radcliffe's dressing machine a system of sizing ball warps was being gradually evolved and this system is still largely employed. The machine consists of a long trough, inside which a series of rollers are fitted, either in one horizontal plane or alternately in two horizontal planes; but over the front end of the trough a pair of squeezing rollers are mounted. The trough contains size, which is maintained at a boiling temperature and in sufficient quantity to submerge the rollers. Two warps, in the form of loose tapes, may be simultaneously led over, under and between the rollers. As the warps advance the threads become saturated with size, and the squeezing rollers press out all but a predetermined percentage, the latter being regulated by varying the pressure of the upper roller upon the lower one. If more size be required than can be put into the threads during one passage through the machine, they may be similarly treated a second time. This process does not lay all the loose fibres, but the threads remain elastic. After sizing, the warps are passed backward and forward, and over and under, a set of steam-heated cylinders by which the moisture contained in the threads is evaporated; they are next either reballed, or wound upon a loom beam.

Slasher Sizing. — For sizing cotton yarns Radcliffe's dressing machine has to a large extent been displaced by the slasher, but in some branches of the textile industry it is still retained under various modifications. In a slasher the threads from a number of warping beams are first combined into one

sheet, then plunged into a trough filled with size which is kept at a boiling temperature by perforated steam pipes; and next squeezed between two pairs of rollers mounted in the trough. The under surfaces of the sizing rollers are. in the size, but the upper squeezing rollers are covered with flannel, and rest by gravitation upon the lower ones. On leaving the size trough the sheet of yarn almost encircles two steam-heated cylinders whose diameters are respectively about 6 ft. and 4 ft. ; these quickly expel moisture from the yarn, but so much heat is generated that fans have to be employed to throw cool air amongst the threads. The yarn is next measured, passed above and below rods which separate threads that have been fastened together by size, smeared with piece marks, and coiled upon a loom beam by means of a slipping friction gear. The last-named is employed so that the surface speed of winding shall not be affected by the increasing diameter of the loom beam. By means of mechanism which greatly reduces the velocities of the moving parts, much necessary labour may be performed without actually stopping the machine; this relieves the yarn of strain, and gives better sizing, yet slashed warps arc less elastic than dressed, or balled sized ones, and they lack the smoothness of dressed warps.

Hank sizing is chiefly, but not exclusively, employed for bleached and coloured yarns. Machines for doing this work consist of a tank which contains size, flanged revolving rollers and two hooks. One hook is made to rotate a definite number of times in one direction, tLˆn an equal number the reverse way; the other has a weight suspended from its outer end and can be made to slide in and out. Size in the tank is kept at the required temperature by steam pipes, and " doles " of hanks are suspended from the rollers with about one-third their length immersed in size. As the hanks rotate all parts of the yarn enter the size, and when sufficiently treated they are removed from the rollers to the hooks where they are twisted to wring out excess, and force in required size. If sufficient size has not been added by one treatment, when untwisted, the wrung-out hanks are passed to a similar machine containing paste of greater density than the first there to be again treated ; if necessary this may

be followed by a third passage. On the completion of sizing the hanks are removed either to a drying stove or a drying machine. If to the former, they are suspended from fixed, horizontal poles in a specially heated and ventilated chamber. If to the latter, loose poles containing hanks are

dropped into recesses in endless chains, and slowly carried through a large, heated and ventilated box, being partially rotated the while. On reaching the front of the box they are removed, brushed and made up into bundles. After which the yarn is wound, warped and transferred to a loom beam.

Drawing-in, or altering, is the operation of passing warp threads through the eyes of a shedding harness, in a sequence determined by the nature of the pattern to be produced, and the order of lifting the several parts. It is effected by passing a hook through each harness eye in succession, and each time a thread is placed in the hook by an attendant, it is drawn into an eye by the withdrawal of the hook.

Twisting or looming consists in twisting, between the finger and thumb, the ends of a new warp separately upon those of an old one, the remains of which are still in the eyes of the shedding harness. The twisted portions adhere sufficiently to permit of all being drawn through the eyes simultaneously.

The Power Loom. — Little is known of the attempts made before the beginning of the 17th century to control all parts of a loom from one centre, but it is certain the practical outcome was inconsiderable. In the year 1G61. a loom was set up in Danzig, for which a claim was made that tt could weave four or six webs at a time without human aid, and be worked night and day; this was probably a ribbon loom. In order to prevent such a machine from injuring the poor people, the authorities in Poland suppressed it, and privately strangled or drowned the inventor. M. de Gennes, a French naval officer, in 1678 invented a machine whose chief features consisted in controlling the healds by cams, the batten by cams and springs and the shuttle by a carrier. From 1678 to 1745 little of importance appears to have been done for the mechanical weaving of broadcloth. But in the last-named year M. Vaucanson constructed a very ingenious, self- acting loom, on which the forerunner of the Jacquard machine was mounted; he also adopted de Gennes's shuttle carrier. All early attempts to employ mechanical motive power for weaving failed, largely because inventors did not realize that success could only be reached through revolution. Mechanical preparing and spinning machinery had first to be invented, steam was needed for motive power, and the industry required reorganization, which included the abolition of home labour and the introduction of the factory system.

During the last quarter of the 18th century it was generally believed that, on the expiry of Arkwright's patents, so many spinning mills would be erected as to render it impossible to consume at home the yarns thus produced, and to export them would destroy the weaving industry. Many manufacturers also maintained it to be impossible to devise machinery

which would bring the production of cloth up to that of yarn. It was as a protest against the last-named assertions that Dr Edmund Cartwright, a clergyman of the church of England, turned his attention to mechanical weaving. More fortunate than his predecessors, he attacked the problem after much initial work had been done, especially that relating to mechanical spinning and the factory system, for without these no power loom could succeed. In 1785 Dr Cartwright patented his first power loom, but it proved to be valueless. In the following year, however, he patented another loom which has served as the model for later in- ventors to work upon. He was conscious that for a mechanically driven loom to become a commercial success, either one person would have to attend several machines, or each machine must have a greater productive capacity than one manually controlled. The thought and ingenuity bestowed by Dr Cartwright upon the realiza- tion of his ideal were remarkable. He added parts w r hich no loom, whether worked manually or mechanically, had previously been provided with, namely, a positive let-off motion, warp and weft stop motions, and sizing the warp while the loom was in action. With this machine he commenced, at Doncaster, to manufacture fabrics, and by so doing discovered many of its shortcomings, and these he attempted to remedy: by introducing a crank and eccentrical wheels to actuate the batten differentially; by improving the picking mechanism; by a device for stopping the loom when a shuttle failed to enter a shuttle box; by preventing a shuttle from rebounding when in a box; and by stretching the cloih with temples that acted automatically. In 1792 Dr Cartwright obtained his last patent for weaving machinery; this provided the loom with multiple shuttle boxes for weaving checks and cross stripes. Rut all his efforts were unavailing; it became apparent that no mechanism, however perfect, could succeed so long as warps continued to be sized while a loom was stationary. His plans lor sizing them while a loom was in operation, and also before being placed in a loom, both failed. Still, provided continuity of action could be attained, the position of the power loom was assuied, and means for the attainment of this end were supplied in 1803, by William Radcliffe, and his assistant Thomas Johnson, by their inventions of the beam warper, and the dressing sizing machine.

For upwards of thirty years the power loom was worked under numerous difficulties; the mechanism was imperfect, as were also organization, and the preparatory processes. Textile workers w f ere unused to automatic machinery, and many who had been accustomed

to labour in their own homes refused employment in mills, owing to dislike of the factory system and the long hours of toil which it entailed, that spinners and manufacturers were compelled to procure assistants from workhouses; this rendered mill life more distasteful than it otherwise would have been to hand spinners and weavers. Their resentment led them to

destroy machinery, to burn dow r n mills, to ill-use mill workers and to blame the power loom for the distress occasioned by war and political disturbances. Yet improvements in every branch of the textile industry followed each other in quick successions, and the loom slowly assumed its present shape. By using iron instead of wood in its construction, and centring the batten, or slay, below instead of above the warp line, the powder loom became more compact than the hand-loom.

Motion is communicated to all the working parts from amain shaft A (fig. 28), upon which two cranks are bent to cause the slay B to oscillate; by toothed wheels this shaft, drives a second shaft, C, at half its own speed. For plain weaving four tappets are fixed upon the second shaft, two, D, for moving the shuttle to and fro, and two others, E, for moving the healds, L, up and down through the medium of treadles M, M. For other schemes of weaving shedding tappets are more numerous, and are either loosely mounted upon the second shaft, or fixed upon a separate one. In either event

Fig. 28. — Vertical Section of a Power Loom.

they are driven by additional gearing, for the revolutions of the tappets to those of the crank shaft must be as one is to the number of picks in the repeat of the pattern to be woven. Also, when tw'o or more shuttles are driven successively from the same side of a loom, if the picking tappets rotate with the second shaft, those tappets must be free to slide axial 3y in order to keep one out of action so long as the other is required to act. The warp beam F is often put under the control of chains instead of ropes, as used in hand looms, and the chains are attached to adjustably weighted levers, G, whereby the effectiveness of the weights may be varied at pleasure. In the manufacture of heavy fabrics, however, it may be necessary to deliver the warp by positive gearing, which is either connected, or otherwise, to the taking-up motion. The cloth is drawn forward regularly as it is manufactured by passing it over the rough surface of. a roller, I, and imparting to the roller an inter- mittent motion each time a pick of weft is beaten home. This motion is derived from the oscillating slay, and is communicated through a train of wheels. The loom is stopped when the weft fails by a fork-and-grid stop motion, which depends for its action on the lightly balanced prongs of a fork, N. These prongs come in contact with the weft, between the selvage of the web and the shuttle box each time the shuttle is shot to the side at which the apparatus is fixed. If the prongs meet no thread they are not depressed, and being unmoved a connexion is formed with a vibrating lever, J; the latter draws the fork forward, and with it a second lever O, by which the loom is stopped. On the other hand, if the prongs are tilted, the loom continues in action. If more than one shuttle is used it may be necessary to feel for each, instead of alternate

threads of weft. In such cases a fork is placed beneath the centre of the cloth and lifted above a moving shuttle ; if in falling it meets with weft it is arrested, and the loom continues in motion, but if the weft is absent the prongs fall far enough beneath the

shuttle rare for a stop to act upon a lever and bring the loom to a stand. To prevent a complete wreck of the warp it is essential to arrest the loom when a shuttle fails to reach its appointed box. For this purpose there are two devices, which are known respectively as fast and loose reed stop motions. The first was invented in 179,6 by Robert Miller, and its action depends upon the shuttle, as it enters a box, raising two blades, K, which if left down would strike against stops, and so disengage the driving gear. The second was invented in 1834 by W. H. Hornby and William Kenworthy; it is an appliance for liberating the lower part of a reed when a shuttle remains in the warp, thus relieving it, for the time being, of its function of beating up the weft. On the release of a reed from the motion of the slay, a dagger stops the loom. Temples must keep a fabric distended to the breadth of the warp in the reed, and be self- adjusting. This is usually accomplished by small rollers whose surfaces arc covered with tine, closely set points. The rollers are placed near the selvages of a web which is prevented from contracting width wise by being drawn tightly over the points.

Looms are varied in details to suit different kinds of work, but as a rule fabrics figured with small patterns are provided with healds for shedding as at L, while those with large patterns are provided with the Jacquard and its harness. Healds may be operated either by tappets or dobbies, but the range of usefulness in tappets is generally reached with twelve shafts of healds and with patterns having sixteen picks to a repeat; where they are unsuitable for heald shedding a dobby is used. A dobby may resemble, in con- struction and action, a small Jacquard; if so the selection of healds that rise and fall for any_pick is made by cards. In other types of dobbies the selection is frequently made by lags, into which pegs are inserted to pattern in the same manner that cards are perforated. By acting upon levers the pegs bring corresponding hooks into contact with oscillating griffe bars, and these lift the required heald shafts. Such machines are made single and double acting, and some have rollers in place of pegs to form a pattern. When multiple shuttles are required for power looms one of two types is selected, namely, drop or rotating boxes; the former are applicable to either light or heavy looms, but the latter are chiefly confined to light

looms. As previously stated, Robert Kay invented drop boxes in 1760, but they were not successfully applied to the power loom until 1845, when Squire Diggle patented a simple device for operating them automatically. Since his time many other methods have been introduced, the most successful of these being operated indirectly from the shedding motion. Revolving boxes were patented in 1843 by Luke Smith. They consist in mounting a scries of shuttles in chambers formed in the periphery of a cylinder, and in moving the cylinder far enough, in each direction, to bring the required shuttle in line with the picker.

Automatic Weft Supply. — Many devices have been added to power looms with a view to reduce stoppages, amongst which those for the automatic supply of weft are probably the most important. These efforts originated with Charles Parker, who, in 1840, obtained the hrst patent, but no marked success was achieved until 1894, when J. H. Northrop patented a cop changer. By his plan a cylindrical hopper, placed over one shuttle box, is charged with cops or pirns. At the instant fresh weft becomes necessary the lowest cop in the hopper is pressed into a shuttle from above, the spent one is pressed out from beneath, and the new weft is led into the shuttle eye, while the loom is moving at its normal speed. The mechanism is controlled by the weft fork, or by a feeler which acts when only a predetermined quantity of weft remains inside a shuttle. Many inventions are designed to eject an empty shuttle and intro- duce a full one; others change a cop, but differ in construction and action from the Northrop, yet, at the time of writing, they have not been so successful as the last-named. By relieving a weaver of the labour of withdrawing, filling, threading and inserting shuttles it was seen that a large increase might be made in the number of looms allotted to one weaver, provided suitable mechanism could be devised for stopping a loom on the failure of a warp thread.

Warp Stopping Motions date from 1786, when Dr Cartwright suspended an independent detector from each warp thread until a fracture occurred, at which time a detector fell into the path, of a vibrator and the loom was arrested. The demand for warp stop motions was, however, small until automatic w r eft supply mechanisms were adopted. The majority of those devices now in use are con- structed upon Dr CartwrighYs lines, but some are so attached to wire healds that, at one position in every shed, an unbroken thread supports both heald and detector until a thread fails, when a de- tector is engaged by a vibrator, and the driving mechanism is dis- located. In other warp stop motions pairs of threads are crossed between the lease rods, and a wire passed between them is held forward by the crossed threads until one breaks; the wire then springs back, makes contact with a metal bar, and electro-mechanical connexions stop the loom.

Smallware Looms. — A loom, which was for a long period operated manually, but to which mechanical power could be applied, was brought into use more than a century before Dr Cartwright's in- vention. It was known as the Dutch engine loom, and was designed to weave from eight to upwards of forty tapes or ribbons simultane- ously. This machine may be regarded as a series of looms mounted in one frame, each having a complete set of parts, and as the first

practical effort to connect and control all the motions of weaving from one centre. The place and date of its invention are uncertain ; but it is known that in some districts its use was entirely prohibited, in others it was strictly limited, and that it was worked in Holland about 1620. In England the first patent was obtained by John Kay and John Snell, in 1745, for additions which enabled it to be worked by hand, by water, or other force, and in 1760 John Snell appears to have added the draw harness for weaving flowered ribbons. In 1765 a factory in Manchester was filled with ribbon looms which were cither invented by M. Vaucanson, or Kay and Snell, but one weaver could only attend to one machine. When worked by hand it was known as the bar loom, because the weaver oscillated by hand a horizontal bar that set in motion all parts of the machine. The shuttles and reeds are actuated from the batten, the former originally by pegs, but later by a rack and pinion arrangement, which in action shoot the shuttles simultaneously across a web, to the right and left alternately, each into the place vacated by its next neighbour. One small warp beam is required for each web, but tappets, dobbies, or Jacquards are available for dividing the threads. Where differ- ently coloured wefts are needed in one w r cb the shuttles are mounted in tiers and all raised or lowered at once to bring the proper colour in line with the shed.

In Swivel Weaving similar shuttles are added to the battens of broad looms in order to diaper small figure effects, in different colours or materials, over the surface of broad webs.

Pile Weaving. — Looms for weaving piled fabrics differ in certain important respects from those employed for ordinary weaving; they are also made to differ from each other to suit the type of fabric to be manufactured, as, for example, double and single, plain and figured, textures.

In Double Pile Looms the special features are those that control the pile threads, and those that sever the vertical lines of pile. Two ground warps arc requisite, and unices they arc kept a uniform distance apart the piled effects will be irregular. For plain goods the pile threads are wound upon two or more beams, and, as they move from web to web, doth-covered rollers deliver them in fixed lengths. Meanwhile, a shuttle passes twice in

succession through each ground warp, and the pile threads in moving above or beneath the wefts are bound securely. Both fabrics arc furnished with taking-up rollers which draw the pieces apart and so stretch the uniting pile in front of a knife, which severs it, thus forming two pieces at once. A knife may consist of a short blade that merely moves to and fro across the webs, or of a disk mounted upon a spindle, which, in moving from side to side, revolves; in either case it is automatically sharpened. But if a knife is longer than the breadth of a fabric it receives only a slight lateral movement, and must be periodically removed for sharpening. In plain and printed goods healds control all the warps; but in figured goods, other than those made from printed warps, a Jacquard is needed to lift, and a creel to hold, the pile threads.

Single Pile Looms. — The chief feature which renders most single pile looms dissimilar from others is the mechanism by which wires are woven upon, and withdrawn automatically from, a ground texture. Wires are of two kinds, namely, without and with knives; the former, being flattened and somewhat pointed, are woven above the weft of a ground texture, but beneath the pile, hence, by with drawing them, looped pile is formed. A wire terminating in a knife with a sloping blade, on being withdrawn, cuts the pile and produces a brush-tike surface. The mechanism for operating the wires is placed at one end of a loom and consists of an arm wdiich moves in and out; at each inward movement a wire is inserted, and at each outward movement one is withdrawn. In weaving tapestry carpets, and certain other fabrics, a wire and a shuttle move simultaneously, but a shuttle passes through the ground warp, while a wire passes beneath the pile.' After several wires have been woven upon the ground texture the one first inserted is withdrawn by the vibrating arm, and at the next inward movement the same wire enters the warp near the reed, where it is beaten up with the weft, and, from this point, the operation is continuous. Tapestry carpets require three warps, one for the ground texture, a second, or stuffing warp, to give bulk and elasticity to the tread, and a third to form the pile. The last named is printed upon a large drum, thread by thread to the colour scheme of the design, then, when the colours have been fixed, and the threads accurately placed, they are wound upon a beam, and all the warps are operated by healds. For figured velvets, and Brussels and Wilton carpets, the pile warp beam is replaced by a creel, in order that each thread of pile may be wound upon a bobbin and separately tensioned. This is essential, because, in the weaving of a design, it is probable that no two threads of pile will be required in equal lengths. Creels are made in sections called frames, each of which usually carries as many bobbins as there are loops of pile across a web, and the number of sections equal the number of colours. In weaving these fabrics healds are used to govern the ground w r arp, but a Jacquard is needed for the pile. It must form two

sheds, the lower one to receive a shuttle, the upper one to make a selection of threads beneath which the wire is to pass.

Terry Looms. — Looms for weaving piled textures, of the Turkish towel type, have the reed placed under the control of parts that prevent it from advancing its full distance for two picks out of every

series that separate one line of loops from another. At such times the weft is not beaten home, but a broad crack is formed. So soon as the reed again moves through its normal space three picks of weft are simultaneously driven home, thus closing the gap, and causing part of the pile to loop upward, the remainder downward. The system is available for plain and figured effects.

Gauze Textures are woven in looms having a modified shedding harness, which, at predetermined intervals, draws certain warp threads crosswise beneath others, and lifts them while crossed. Also, a tensioning device to slacken the crossed threads and thus prevent breakages due to excessive strain. At other times the shedding is normal.

Lappet Looms have a series of needles fixed upright in laths, and placed in a groove cut in the slay, in front of the reed. Each needle carries a thread which does not pass through the reed, hence, by giving the laths an endlong movement of varying extent, and lifting the needles for each pick, their threads are laid crosswise in the web to pattern. (T. W. F.)

Archaeology and Art

The archaeology of shuttle- weaving shows that for ages the use of a loom for weaving plain, as distinct from ornamental

or figured textiles, whether of fibres or of spun threads, has been practically universal, whilst the essential points of its construction have been almost uniform in charac- ter. An early stage in its development, anterior probably to that when the spinning of threads had been invented, is represented by the loom or frame (see fig. 29) used by a native of Sarawak to make a textile with shreds of grass. As will be seen, the shreds of grass for the warp are divided into groups by a flat sword-shaped implement which serves as the batten (Latin spaiha). The shuttle is passed above it, leaving a weft of grass in between the warp; the batten is then

moved upwards and compresses the weft into the warp; this method of pressing the weft upwards was usually employed by Egyptian and Greek weavers for their linen textiles of beautiful quality. Fig. 30 gives us an. Indian

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From Roth's Natives of Sarawak, by permission of Truslove and Hanson.

Fig. 29. — Loom from Sarawak.

Fig, 30. — Indian Hill Tribesman's Loom.

Hill tribesman weaving with spun threads; but here we find the loom fitted with rudely constructed headles, by which the weaver lifts and lowers alternate ranks of warp threads so that he may throw his shuttle-carried weft across and between them. Besides the headles there is a hanging reed or comb, and between

*the reeds of it the warp threads are passed and fastened to a roller or cylinder. After throwing his shuttle once or twice backwards and forwards, the weaver pulls the. comb towards himself, thereby pressing his weft and warp together, thus making the textile which he fiEj^ LTU^ ^ g-j-l^g^^p -^ ^ ^^*

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time to time on to the rT^C^^^^^^^^^^^^^^^m, roller. This advance in the construction of the loom is also virtually of undateable age; and except for more sub- stantial construction, there is little difference in main principles be- tween it and the medieval loom of fig. 31. With such looms, and by arranging coloured warp threads in a given order and then weaving info them coloured shuttle or weft threads, simple textiles with stripes

and chequer patterns Fig. 31.— Medieval Loom, from j could be, and were, by Jost Amman; middle of the produced; but textiles CClltur y-

of complex patterns and textures necessitated the more complicated apparatus that belongs to a later stage in the evolution of the loom. Fig. 32 is from a Chinese drawing, illustrating the description given in a Chinese book published in 1210 on the art of weaving intricate designs. The traditions and records of such figured" weavings are far older than the date of this book. As spun silken threads were brought into use, so the development of looms with increasing numbers of headles and other mechanical facilities for this sort of weaving seems to have started. But as far back as 2690 B.C. the Chinese were the only cultivators of silk, 1 the delicacy and fineness of which must have postulated possibilities in

Cut 1 6th

FlG. 32.— Chinese Loom for Figured Weaving (Photo).

weaving far beyond those of looms in which grasses, wools and flax were used. It therefore is probably correct. to credit the Chinese with being the earlier inventors of looms for weaving figured silks, which in course of time other nations (acquainted only with wool and flax textiles) saw with wonder. At the comparatively modern period of 300 e.c. Chinese dexterity in fine-figured weaving had become matured and was apparently in advance of anyotherelsewhere. Designswere being woven by the Chinese of the earlier Han Dynasty 206 b.c. as elaborate almost 1 E. Pariset, Ilistoire de la sole (Paris, 1862).

as those of the present day, with dragons, phoenixes, mystical bird forms, flowers and fruits. 1 At that time even Egypt, Assyria or Babylonia, Greece and Rome, seem to have been only learning of the fact that there was such a material as silk.. 2 Their shuttle-weaving had been, and was then concerned with spun wool and flax and possibly some cotton, whilst the orna- mentation of their textiles, although sparkling on occasion with golden threads, was done apparently not by shut tie- weaving but by either embroidery or a sort of compromise between darning and weaving from which tapestry weaving descended (see Tapestry). The range of their colours was limited, reds, purples and yellows being the chief; and their shuttle-weaving was principally concerned with plain stuffs, and in a much smaller degree with striped, spotted and chequered fabrics. Remains of these, whether made by Egyptians thousands of years B.C., by Scandinavians of the early Bronze Age, by lake dwellers, by Aztecs or Peruvians long before the Spanish Conquest, display little if any technical difference when compared with those woven by nomads in Asia, hill tribes in India and natives in Central Africa and islands of the Pacific. Such ornamental effect as is seen in them depends upon the repetition of stripes or very simple crossing forms, still this principle of repetition is a prominent factor in more intricate designs which are shuttle- woven in broad looms and lengths of stuff.

The world's apparent indebtedness to the Chinese for knowledge of figured shuttle-weaving leads to some consideration of their early overland commerce westwards. About 200 B.C. during the Han Dynasty Chinese

trade had extended beyond inner Asia to the confines of the Graeco-Parthian empire, then at its zenith, and the protection of the route by which the Seres (Chinese) sent their merchandise was fully recognized as a matter of importance. Seventy years later the emperor of China sent a certain Chang Kien on a mission to the Indo-Scythians; and according to his records the people as far west as Bactria (adjacent to the Graeco-Parthian territory) were knowing traders, and amongst other things under- stood the preparation of silk. Chinese weavings had for some time been coming into Persia, and doubtless instigated the more skilled weavers there to adapt their shuttle looms in course of time to the weaving of stuffs with greater variety of effects than had been hitherto obtained by them; and into Persian designs were intro- duced details taken not only from Chinese textiles, but also from sculptured, embroidered and other ornament of Graeco-Parthian and earlier Babylonian styles. In A.D, 97 Chinese enterprise in still furthering their trade relations with the Far West is at least sug- gested by the fact that envoys from the emperor of China to Rome actually reached the eastern shores of the Mediterranean, but turned back frightened by the Parthian accounts of the terrors of the sea voyage.

Early in the 3rd century A.D. Heliogabalus is reputed to have been amongst the first of the Roman emperors to wear garments entirely of silk (holosericum), which, if figured (as is not unlikely), were probably of Syrian or Persian manufacture. Sidonius ApolHnaris (5th century) writes of Persian patterned stuffs, — " Bring forth brilliant cushions and stuffs on which, produced by a miracle of art, we behold the fierce Parthian with his head turned back on a prancing steed; now escaping, now returning to hurl his spear, by turns fleeing from and putting to flight wild animals whom he pursues " — a description quite appropriate to such silk weaving as that in fig. 33. A number of kindred pieces have been recovered of late years from Egyptian burial-places of the Roman period. The Persians of the Sassanian dynasty (3rd to 7th century) traded in silks with Romans and Byzantines; King Chosroes (about 570) encouraged the trade, and ornamental weaving seems to have been an industry of some standing at Bagdad and other towns north, east and south, e.g. Hamadan, Kazvin Kashan, Yezd Pcrscpolis, &c. To the north- west of Persia and north of Syria lay the Byzantine region of Anatolia (now Asia Minor), some towns in which became noted for their fine weavings: the mass of the population there was well off in the 6th century, the country highly cultivated and prosperous, and justice fairly administered, 3 thus affording favourable conditions for an industry like ornamental weaving, which had been and was prosper- ing in neighbouring Syrian districts.

1 See Chinese Art, by Stephen W. Bushell, C.M.G., B.Sc, M.D. (London, 1906), vol. ii. p. 95.

2 Aristotle describes the silk-worm and its cocoon. Virgil-Martial and late Roman writers (including Pliny) throw scarcely more light upon the use of silken stuffs than that they were of rarity and greatly prized by opulent Romans. Propcrtius (19 B.C.) writes of " silken garments of varied tissue," and of Cynthia that " perchance she glistens in Arabian Silk."

3 \V. M. Ramsay, Studies in the History and Art of the Roman Empire (University of Aberdeen, 1906).

XXVITI. 15

Between the 1st and 6th centuries A.D., then, knowledge of silk

and its value in fine weaving was spreading itself, not only in the further western regions of Southern Asia, but also in Egypt, where Greek and Roman taste influenced the works of Copts or those

Fig. 33. — Syrian or Persian Silk Weaving of the 5th Century. natives who maintained old Egyptian traditions in technical handi- crafts. Of peculiar interest in this connexion are fragments of flax (yellow and brown) woven with a comparatively elaborate texture, as well as in patterns (see fig. 34) which suggest an ordinary type of Roman pavement designs (3rd century and earlier), the basis of which is roundels Jinked together. Stuffs in which the style of

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Fig. 34. — Syrian and Coptic Flax Weaving of the 5th or 6th Century, patterns, though comparatively simple, is rather more Oriental, are of flax and wool, and the official robes of Roman consuls seem to have been of this character, and amongst other goods may have been made with small technical difference at Rome 4 or at Fostat (Cairo)

4 In 369 by order of the emperors Valens and Valentinian the making of textiles in which gold and silken threads were introduced ■was limited to women’s workrooms or gynecia (see Codex of Theo- dosius, lib. x, tit. 21, lex 1). In the 5th century the weaving of silken tunics and mantles was prohibited (Codex Theodosius, lib x. th. 21, lex 3).

or Alexandria or other towns in Lower Egypt as well as in Syria. Contemporaneously the development of similar weaving appears to

Fig. 35.-

-Syrian or Anatolian Silk Weaving of the 5th Century.

with Samson and the Lion (repeated).

have been proceeding in Byzantine provinces, though perhaps not in so marked a way as when Justinian systematized sericulture 1 and still further stimulated shuttle-weaving in the town of Byzantium

(Constantinople) itself I in a.d. 552.

*For examples of the ! elaborate figure weav- ings at that time we have to rely upon [such as have been rescued in the service of I archaeology from the J oblivion of tombs and burial – places. The dates of some speci- I mens can be fixed with I almost certainty by 1 means of nearly con- temporary records, e.g. those of Sidonius Apollinaris and later Anastasius the Libra- i rian; comparison and classification lead to almost conclusive in- ferences as to the dates of other examples. Broadly speaking, the earlier of these remains (i.e. from about the 4th to the 7th century) seem to be cither of r, — n ” ■ rt j c*n j r+ u Persian (Sassanian)*

T . Fig. 36 -Byzantine Red Silk and Gold mailufacture and dc _ Thread Weaving of the I ith Century. Fairs a ; or o£ Svrian and of hons and pairs of small birds. possibly Alexandrian

make. Christian sub- jects were occasionally introduced into the designs. Between the 7th and the 13th centuries Byzantine manufactures come to the fore, and it is difficult if not impossible now to draw a clear line between those of Roman-Byzantine, Perso-Byzantine and Moslem-

Byzantine styles, though one may do so in respect of certain Moslem (Moorish and Saracenic) weavings, which have distinctive features

Fig. 37. —Part of Silk Wrapping of the Emperor Charlemagne, possibly of Bagdad manufacture, 9U1 CenLury, with Fanciful Elephant and Sacred Tree device in a Roundel.

of design, and were produced in the south of Spain and in Sicily about a period from the 10th century to the 13th.

Fig. 35, from a piece of sarcenet with repeated parallel series of Samsons and lions (or gladiators?), is probably 5th-century Syrian or

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1 This virtually was the starting of sericulture in Europe.

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Fig. 38. — Fragment of Byzantine Silk, 12th Century, with Ogival Framing about pairs of Birds, &c.

Anatolian ; of the same date are pieces with scenes of the Annuncia- tion repeated in roundels, and with artistic birds and lions, in the treasury of the Sancta Sanctorum of the Chapel of St Lawrence m

the old Lateran Palace, Rome. Scriptural subjects 1 seem to be typical of those which were condemned by Anatolian and Syrian, fathers of the Christian church as early as in the late 4th century, and Asterius, bishop of Amasus, in denouncing the luxury of the rich in flaunting themselves in such inappropriately decorated silks, has left a most useful description of the subjects decorating them. A scheme long maintained in Syrian and Byzantine patterns was that of repeated roundels, within which other than scriptural subjects were wrought, e.g. hunters on horseback (as in fig. 33), fantastic animals and birds, singly or in pairs, confronting one another or back

B.

framing, composed of animals, birds and the like, formally treated and repeated vertically and horizontally, as in fig. 36, which is from a silk and gold thread shuttle- weaving classified as Byzantine of the nth century manufacture. But this style of composition also occurs in a Sassanian or Syrian silk of the 5th century at Lc Mans, 3 and again in the Cope of St Maxim at ChJnon, which is powdered with panthers. Conventional eagles (reminiscent perhaps of the Roman Eagle), with scale patterns on their breasts and wings, are woven in the wrappings reputed to have been given by the Empress Placidia for the corpse of St Germain (448) preserved at the church of St Euscbius at Auxcrre. Some likeness in style may be detected between these latter and a fragment of one of the wrappings of St Cuthbert (d. 688) at Durham, though in this case the elaborate

ornamentation is set within a roundel. Prior to the discovery of woven silks in the Akhmin cemeteries, the periods to which tradition and association had ascribed the Auxerre and Durham specimens were con- sidered too early ; but there now seems to be far less reason to question that ascription. Fig. 37 is from part of a silken wrapping of Charlemagne (early 9th century) now at Aix-la- Chapelle. It bears a Greek inscrip- tion of the names of Peter, governor of Negropont, and Michael, chamberlain of the Imperial Chambers, and this is taken by some authorities as evidence that the weaving was made at Byzan- tium. On the other hand, Eginhard, Charlemagne's secretary, has written of gifts, including rich textiles pre- sented in his day by Haroun al Rasr.hid to the emperor, 4 and a fabric like that in question might have been made quite possibly even at Baghdad in the 9th century or earlier. In the nth century amongst the handicrafts- men in the city of Byzantium were many skilled native and foreign weavers; and their designs generally appear to reflect the style of earlier Persianesque and Syrian taste.

About the 12th century the well- used pattern scheme of roundels became more or less superseded by one of continuous ovals, of ogival framings (see fig. 38), contemporary with which are Saracenic patterns based on hexagonal and star-shape frames. Within these new varieties of pattern framings recur the Byzan- tine and Persianesque pairs of birds, animals, &c. But distinct from these is the more restricted style which has been mentioned. It had arisen under the influence for the most part of the Fatimy Khalifs, not onlv in Syria and FlG. 39. — Specimens of various Small Loom Wcavings between the 7th and 15th centuries. Alexandria but also in Sicily and Part of a narrow band or orphrey woven in gold and silk threads with a Latin inscription southern Spam. Patterns of this along the edges. German work of the 13th century. Moslem or Saracenic type are usually

Part of a broad band or orphrey woven in gold and silk threads with figures of the Crucifixion composed of a succession of parallel and the Annunciation (?). It bears an inscription, Oditia me fecit. It is probably German bands— narrow and wide—containing work of the 13th century. Kufic inscriptions.

13th century

C and D. Specimens of Cologne orphreys woven in silk and gold threads; C bears a Latin inscrip- tion, and the faces of the Virgin and Child are embroidered.

, groups of small intricate geometrical devices, and occasionally conventional animals

E. Part of a narrow band woven in gold and silk threads with chevron spaces filled with delicate an “, P ir ds. A 12th-century example

scroll ornament, among which are occasional animal and bird devices. French work of the 13th century. F. Part of a narrow band or clavus from a Coptic tunic of the 9th or 10th century.

to back, frequently with a sacred tree device 2 between them. A piece of Sassanian silk, probably of the 6th century, shows a gryphon practically identical with that sculptured on the patterned saddle- cloth of a king (Chosroes II.?) in the archway to the garden of the king’s palace at Kermchah.

Less common perhaps are patterns, without roundel or other

Possibly English or ‘

1 The silken wrappings of St WUibald (700-786), a founder of the church at Eichstatt, where they are still preserved, are woven with repeated roundels, each enclosing a Daniel between two lions, and are perhaps Byzantine of the 8tb century.

2 See Sir George Birdwood’s chapter on Knop and Flower pattern in his Industrial Arts of India, in which this device of ancient Assyrian art is discussed as well as its relation and that of the horn, a fanlike symbol, to cognate ornament in Greek, Roman and even Renaissance art.

of this class of pattern has been given elsewhere (see Brocade, fig. 1).

Almeria, Malaga, Grenada and Seville were notable Moorish weav- ing places m Spain for such patterned silks and stuffs as these; and even after the Christian conquest of Grenada at the end of the 15th century this city retained its celebrity for silks woven ” a la Moresque.”

In Sicily no similar survival of Saracenic influence seems to have been as strongly maintained, notwithstanding the numerous Saracen weavers at work in the island for years before the Royal factory for silk weaving came to be organized at Palermo under Norman supremacy. According to the usual story, Roger of Sicily, or Roger Guiscard, who in 1 147 made a successful raid on the shores of Attica, and took Athens, Thebes and Corinth, carried off as prisoners 3. number of Greek (Byzantine) weavers and settled them at Palermo in the factory known as the H&tel des Tiraz. A mixture of Byzantine

3 See Abecedaire d arcMolngie (June 1854). * Recherckes, &c, by Francisquc Michel, i. 40.*

and Saracenic styles of textile patterns ensued; and ‘this peculiarity is demonstrated in many of the rich fabrics attributed to south and north Italian weavers from the 12th century onwards. From Palermo

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portant part, and possibly was applicable to early brocades. Carmoca or Carmuk (Arab Kamkla, from the Chinese Kimka—nteo brocade; was another handsome stuff corresponding in a way with Indian

Apparel of a Dalmatic woven in Venice late m the 15th century, with the Virgin in glory.

Fiu.

the art of ornamental weaving in this style soon extended into the mainland, and from Apulia a bishop of St Evroul in Normandy is mentioned as having obtained a number of silken goods in the 12th century. From the 13th century onwards Lucca, Florence, Milan, Genoa and Venice became important centres, using not only im- ported silk, but also such as was being then cultivated in Italy, for sericulture had become an Italian industry early in the 13th century. Wandering Saracenic and Byzantine weavers even before that time had strayed or been taken to work at places in Germany, France and Britain, but the output of their productions in northern countries was almost infinitesimal as compared with that of the far greater Italian output, nevertheless they were sowing the seeds of a harvest to be reaped centuries later by these more northerly European countries.

To the influence of these early sporadic weavings we seem to trace a distinctive class of work, which was done by inmates of monasteries and convents as well as by devout ladies, in little looms, for use as stoles, maniples, orphreys and similar narrow bands. A rhyming chronicler of the 13th century paraphrases the older record by Egin- hard of the skill of Charlemagne’s daughters in silk weaving, ” ouvrer en soie en taulieles ” or small looms. 1 The illustrations in fig. 39 give varieties of this class of work between the 7th and 15th centuries, for which Cologne especially seems to have become famous in the 15th century. Venice also made work of corresponding character: and the designs were evidently furnished by or directly adapted from the compositions of sue 1 : artists as those who

produced the notable German and Venetian woodcuts of the 15th century (fig. 40).

Whilst the bulk of the Italian patterned stuffs issuing in great lengths from large looms were of silk, a good many also were woven in wools, or wools intermixed with silks. The earlier of the silk textiles — Persian, Syrian and Byzantine — were of the nature of sarcenet and taffetas; later in development are satins, damask satins, brocades, and still later (i.e. about the end of the 14th century) come Italian velvets and cloths of gold, which quite transcended the ancient and less substantial attalic cloths of the early Roman period. Medieval inventories and records contain many names of textiles, but the exact technical meaning of several of them is un- certain. Cendal, Sandal, Syndonus seem to relate to such materials as sarcenet or taffeta: zetani, from low Latin, is held by some writers to be of the same class as samit or examite, so called because the weft threads were only caught at every sixth thread of the warp; damask, now regarded as a special class of textile, the ornamentation of which depends upon contrasting sheens in the surface of the stuff, whether of silk or linen, got its name from Damascus, much in the same way as Baudekin comes from Baldak, or Baghdad. Baudekin, and an apparently somewhat earlier word cidatoun, seem to have been general terms for rich-looking textiles, in which gold thread played an im-

1 See Recherches, &c, by Francisque Michel, i. 93-94-

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Part of Orphrey with the Virgin and Child (Siena weaving, 1425-1450).

c

Part of Orphrey, with the Annunciation (Florentine weav- ing, late 15th century)

40.

Kincobs. Velvet (Italian velluto — shaggy) isvehiiau in French docu- ments of the 14th century, and is a finely piled material of silk, and on that account may have been called Samit, as the German word

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Fig. 41. — Piece of North Italian Silk Weaving of the 14th century, with pattern planned on an ogival basis with fantastic birds, some of which are of a Chinese type, and Persianesque cone forms containing sham Arabic inscriptions.

Sammel implies velvet, as does the Russian Axamitt. Diaper (Italian diaspro, meaning patterned) was used not only to denote a regular and geometric patterning but in some cases a special sort of linen or silk. Muslin from Mosul, and gauze from Gaza, are two

well-known and kindred textiles. Frequently one meets with odd phrases such as " silk of Brydges " (Bruges), " silk dornex " (from Dorneck), " sheets of raynes " (RheimsJ, and " fuschan in Appules ' (Naples fustian).

Many of the foregoing stuffs are identifiable by textures peculiar to them ; this is, however, not so as regards their ornamental patterns, for these are frequently interchanged, the same class of patterns appearing in satin damasks, velvets and brocades. This is particu- larly the case with 13th- and 14th-century Italian stuffs. In the patterns of these, as previously suggested, are strong traces of Sara- cenic and Byzantine motives, intermingled with badges, heraldic devices, human figures, eagles, falcons, hounds, lions, harts, boards, leopards, rays of light, Persianesque pine cone and cloud forms, and even Chinese mystical birds, symmetrically distributed, without framings, as a rule, though elaborations of the ogival frame or scheme are also met with, but less frequently (see fig. 41)- Such fabrics, iiMde in the main by Lucchese weavers, appear to have been traded in with other European countries. But besides trade records, there are others relating to Lucchese weavers who left their own town under stress of circumstances, civil wars and the like, to settle and work elsewhere, as in France and Flanders, during the 15th century. Nevertheless

the northern parts of Italy were the fertile places for producing fine types of patterned textiles used by Italian and other

Fig. 42. — Damask and Brocade Silk Fabric, facture of the 15th century.

Italian manu-

European courts and nobles: and if the art seriously dwindled in the town of Lucca, it flourished conspicuously, from the end of the 14th century and up to the beginning of the 16th century, in Venice, Bologna, Genoa, Florence and Milan. There was nothing similar to compete with it in France, Germany or England. The identifica- tion of its splendid varieties is made possible upon referring to contemporary paintings by Orcagna, Crivelli, Spinello Aretino and later Italian masters, as well as to those of the Flemish School, Gheraet David, Mabuse, &c.

Of a specially distinct class, very dignified in effect, are patterns of the 15th century based upon the repetition of conventional pentagonally constructed leaf panels, clearly defined in outline, each encircling a pomegranate or cone form around which radiate small leaves or blossoms; though they were more richly developed in superb velvets and cloths of gold, for which Florence, Venice and Genoa were famed, this type of design is also woven in less costly materials. A composite unusual and beautiful design of another kind is given in fig. 42. Repeated large leaf shapes can just be detected in it, but more remarkable are the bunches of radiating stalks of wheat-ears and cornflowers within them; whilst about them, arranged in hexagonal trellising, are leafy bars, small birds, crowns, pomegranates and other daintily depicted plant forms. This piece of damask combined with brocade weaving is of late 15th century manufacture: and after the opening of the next century the freedom towards realistic treatment, which we find here, enters into many of the Italian patterns. In some of them, however, an Ottoman or Anatolian feeling is apparent, as hi fig. 43 from a figured silk which is considered to have been made in Venice. The chained dogs and birds in this design recall the rather more formal ones in Lucchese patterns of a hundred and fifty years earlier, whereas the lengthy serrated leaves and elongated flower devices charged with i

carnations and hyacinths depicted on a smaller scale are unmis- takably Ottoman. Persian fabrics of rather thin silk material or taffetas like that of the original of this were also being woven with varieties of floral designs, as well as others portraying Persian stories. At this period there was considerable activity in weaving sumptuous stuffs at Broussa and Constantinople (fig. 44). Arabic and Turkish weavers often came over to be employed in Venice, blending Italian and Oriental characteristics into

their designs.

In Spain during the early 16th century we have traces of Hispano-Moresque influence in the overlapping and interlocking nondescript forms; but Spanish wcavings are hardly comparable in quality with the Italian of the same time. In the middle of this century cloths of gold or of silver, with the pattern details raised in velvet and brocatelles of similar formal design were made (in greater quantities Italy for costumes of I men and women. The frequent basis of most of the designs is the ogival framework already r ferred to, but it is much elaborated with detail and combined with the cone device of a previous century. The ornamenta- tion of this style is purely conventional throughout, the various devices hav- ing little of the appear- ance of actual objects like fruit, leaves, &c.

The time, however, was close at hand when a more general reaction was to set in, in the direction of designs re- presenting forms very nearly as they actually look,' an example of which occurs in fig. 45, with its leaf forms and j crowns. This from a class of silk damask or lampas, which is kindred to brncatelle; a feature in lampas is that its ground is different colour from that of the ornament on it. and as in the case of portions of ■ brocatelles its texture is of taffeta or sarcenet quality. 1 At the end of the 16th century a pe- culiar type of pattern consists of repetitions in different positions of the same detail treated real- istically or purely orna- mentally, little if any- thing of quite the same j character having been previously designed. Of i such fig. 46, with its repeated^ realistic leafy Fig. 43.— Piece of Venetian Silk Weav- logs variously placed, is ing showing Ottoman influence in the an example. The prin- design (16th century), ciple in the composition

of these patterns, but with a greater variety of conventional detail, is followed in French 17th century examples. However, as soon as figured weaving became well organized in France at this time, a school of designers arose in that country who adopted a realism that predominated in French patterns during the succeeding i50 years, that is, from Louis XIV. to the end of the 18th century. Throughout this period French figured stuffs seem to surpass those of other countries. " If, " writes Monsieur Pariset, "any account is to be taken of the weavers during the 14th and 15th centuries who made cloths and velvets of silk at Paris, Rouen, Lyons, Nimes and Avignon, it must be remembered that they were almost solely Italian emigrants from Lucca and Florence, who had fled their towns during troublous times. " By a charter granted by Francis I. to Lyons, foreign and native workmen were encouraged to promote the city's interests in trade and manufacture; still, it is not until the 17th century that Lyons really asserts herself in producing fabrics possessing French taste and ornamentation. The more important designs were supplied by trained artists of whom Reval,a pupil of Le Brim, the first principal of the Academic des

Beaux Arts founded by Colbert in Paris (1648), Pillement and Philippe de la Salle in the iSl h century, may be

1 See Ornament in European Silks (London, 1899), p. 15,

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named. Their influence in the domain of fanciful, and at times extravagant realistic, floral patterns was widespread. Soon after the revocation of the Edict of Nantes, in consequence of which thousands of Protestant weavers left France, factories for weaving ^^^^ silksand mixed materials ||||pf; with patterns imitating d§l?>$ the successive French became organized i t a 1 fi e 1 d s, in re, Yorkshire, Norfolk and elsewhere in England, as well as in Germany at Crefeld, Elberfcld, Barmen and VVeissen.

Entirely distinct from what has already been discussed is a branch of WWF0$s££i$$IF l W »jff^Vy^/ cerned with the decora- Wk*j&*&>gMgM^XM tion of linens, that flourished notably in Italy towards the end of the 15th century and in the 16th century. From early times long and narrew Italian table- cloths were enriched with ornament of linen or cotton threads of a single colour, and Signora Isabella Ercra has written at some Fie. 44.— Ottoman (Anatolian) Silk and length _ about them* Gold Thread Weaving of the 16th century, illustrating the result of with ogival framed ornament. The original h,;r investigations with is stated to have come from a sultana's several examples culled tomb at Broussa or Constantinople. from paintings by Pietro*

Lorenzetto of Siena (1340), by Ghirlandaja (1447-1490), &c. In Leonardo da Vinci's painting of the Last Supper, now in the Louvre, the border of the tablecloth is very like many examples of this sort of textile in the Victoria and Albert Museum, South Kensington. Their char- acteristic ornament, in rather heavy blue thread, consists of quaint animals and birds in pairs, which are evident derivations of those so often seen in Italo-Byzantine and Lucchese silks and brocades. Be-

larly with Perugia. In the 16th century, work of similar style was produced, but it was lighter and flatter in texture and often done

.46.

-Italian. Silk Damask or Lampas of late 16th century, with pattern of repeated leafy logs.

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Fig. 45. — Italian Silk Damask or Lampas, with purple ground and pattern of late 16th century.

sides animals and birds, reversed names and words were sometimes introduced, e.g. " Amor " for " Roma," " Asoizarg " for " Graziosa " and " Eroma " for " Amore," &c. The simpler of these table-cloth patterns probably date from before the 14th century, whilst the fuller ones were certainly made in considerable quantities in the 15th century. An inventory dated 1842 has an entry of two napkins or cloths woven in cotton with bands of dragons and lions a la Perugina, which is suggestive that this type of weaving was associated particu-

1 See the Italian monthly art review, Emporium, vol. xxiii. (1906).

with red or yellow silk, and embroidery was sometimes added to the weaving.

The most important and probably the best known class of later ornamental linen weaving is that of damask household napery, which, as a reflection of satin damask, was developed in the flax-growing regions of Saxony, Flanders and North Franceˆ during the late 15th or early 16th century; it was then rare and acquired for use by wealthy persons only. 2 The style of design in the better of the old linen damasks has some kinship with that of bold 15th- and 16th- century woodcuts of the Flemish or German schools. To some extent these damask figure subjects recall those of the coloured Cologne and Venetian orphreys for copes and apparels for dal- matics. The early history of linen damask is obscure, but a great many of its results are preserved in England. A napkin with the royal shield of Henry VII., the supporters within the garter surmounted by the crown, is in the Victoria and Albert Museum where it is called Flemish. On the other hand it is possibly the work of Flemings in England, since from the time of Edward I. and for a hundred years " a constant stream of emigrants passed from Flanders to England." 3 The Victoria and Albert Museum contains an early 16th-century tablecloth t in damask linen of German or Flemish manufacture with various subjects, chiefly religious and moral: Gideon being shown as a kneeling knight, the fleece of wool on the ground being

near him, while from above the dew falls on it; below Gideon is the Virgin Mary and the unicorn, and lower down an ange! with seven dogs' heads typifying different virtues as shown in the lettering — -fides, spes, charitas, &c. In another which was probably made in England (at Norwich?) by Flemings during the second half of the 16th century, we find St George and the Dragon, the royal arms of Queen Anne Boleyn, the badges of Queen Anne Boleyn and Queen Elizabeth, the crowned Tudor Rose, and repeated portraits of Queen Elizabeth, with the legend below, " God save the Queene." This specimen is also in the Victoria and Albert Museum. A hundred years later in date is a tablecloth on which is a view of old St Paul's (burnt in 1666), while above and below occurs the wreathed shield of the City of London. A different class of linen, with the design done in blue, was evidently, from the inscriptions on it, the work of a German or Fleming, and probably woven in Germany about 1730. Here we find the wreathed arms of the City of London, a view of " London," and " George der II. Konig in Engelland " mounted on horseback. In this specimen the design is repeated, and

2 The earl of Northumberland (1512) is said to have had but eight linen cloths for his personal use, while his large retinue of servants had but one, which was washed once a month. (See notes by Rev. C. H. Evelyn White on damask linen. Proceedings of Society of Antiquaries, second series, vol. xx. p. 132.)

3 See Rev. C. H. Evelyn White's paper on damask linen, Pro- ceedings of Society of Antiquaries, second series, vol. xx. pp. 130-140.

not reversed, as is the case with the earlier pieces. A large collection of this German damask weaving with coloured thread was formed under the auspices of the Royal Kunstgewerbe Museum at Dresden. 1 The north-eastern Irish industry of damask weaving owes much to French Protestant refugees, who settled there towards the close of the 17th century, though linen manu- facture had been established in the district by a colony of Scots in 1634. Dunfermline in Scotland is said to produce as much damask as the rest of Europe, but there are important manufactories of it at Courtrai and Liege in Belgium, in Silesia, Austria and else- where.

LITERATURE. — The following are titles of a few works on weaving, from which much important information on the subject may be derived: — J. Bezon, Dictionnaire des tissus (8 vols., Paris, 1859- 1863), more or less technical only, Dictionnaire des sciences (Paris, 1751-1780), technical ;

Michel Francisque, Recherckes sur le commerce, la fabrication et V usage des etoffes de soie,d'or et d' argent (2 vols., Paris, 1852— 1854), a well-known work full of erudition in respect of the archaeology of woven fabrics, their technical characteristics, &c. ; James Yates, Textrinum antiquorum : an Account of the Art of Weaving among the Ancients (London, 1843), a very valuable and learned work of reference; Very Rev. Daniel Rock, D.D., Textile Fabrics (London, 1870), with snmc few good illustrations; Pariset, Histoire de la soie (Paris. 1862) ; Raymond Cax, VArt de decor er Us tissus, &c. (Paris, iqoo); Alan Cole, Ornament in European Silks (London, 1899), well illustrated; J. Lessmg, Berlin koniglicke Museen, Die Gewebe-Sammlung des k. Kunstgewerbe- Museums (Berlin. 1900), a very fine scries of phototype facsimiles of all kinds of textiles; A. Riegl, Die dgyptischen Textil-Funde (Wien, 1889); R. Forrer, Romische und byzantinische Seiden-Textilien (Strassburg, 1891); A. Dupont Auberville, J.' Ornament des tissus (Paris, 1877), admirable illustrations; F. Fischbach, Die wichtigsten Webe-Orna- mente (3 vols., Wiesbaden, 1901), admirable illustrations; Raymond Cax, Le A fusee historique des tissus . . . de Lyon (Lyon, 1902) ; Nuremberg: Germanisches Museum, Katalog der Gewebesammlung des germanischen National-Museums (Nuremberg, 1896).

(A.S.C.)

WEB (a word common to Teutonic languages, cf. Du. webbe, Dan. vaev, Ger. Geivebe, all from the Teutonic wabk — to weave), that which is woven (see Weaving). The word is thus applied to anything resembling a web of cloth, to the vexillum of the feather of a bird, to the membrane which connects the toes of many aquatic birds and some aquatic mammals; it is particu- larly used of the " cobweb," the net spun by the spider, the Old English name for which was dtor-coppe, i.e. poison-head (dtor, poison, and coppc, tuft or head). In architecture the term " web " is sometimes given, in preference to " panel," to the stone shell of a vault resting on the ribs and taking its winding surface from the same; see Vault.

WEBB, MATTHEW (1S48-1S83), English swimmer, generally known as " Captain Webb," was born at Dawley in Shropshire on the 18th of January 1848, the son of a doctor. While still a boy he saved one of his brothers from drowning in the Severn, and, while serving on board the training ship in the Mersey, he again distinguished himself by saving a drowning comrade. He served his apprenticeship in the East India and China trade, shipped as second mate for several owners, and in 1874, was awarded the first Stanhope gold medal by the Royal Humane Society for an attempt to save a seaman who had fallen over- board from the Cunard steamship " Russia." In 1875 Captain Webb abandoned a sea-faring life and became a professional swimmer. On the 3rd of July he swam from Blackwall Pier to

Gravesend, a distance of 20 ni., in 4! hours, a record which remained unbeaten until 1899. In the same year, after one unsuccessful attempt, he swam the English Channel, on the 24th of August, from Dover to Calais in 2 if hours. For the next few years Webb gave performances of diving and swimming at the Royal Aquarium in London and elsewhere. Crossing to America, he attempted, on the 24th' of July 1883, to swim the rapids and whirlpool below Niagara Falls. In this attempt he lost his life.

WEBB, SIDNEY (1859-), English socialist and author, was born in London on the 13th of July 1859. He was educated at private schools in London and Switzerland, at the Birkbeck Institute and the City of London College. From 1875 to 1878 he was employed in a city office, but he entered the civil service by open competition as a clerk in the War Office in 1878, became

1 See Leinendamastmuster des XVTT. und XVIII. Jahrkunderts, Emil Kumsch (Dresden, 1891).

surveyor of taxes in. 1879, and in 1881 entered the colonial office, where he remained until 1891. In 1885 he was called to the bar at Gray's Inn. Mr Webb was one of the early members of the Fabian Society, contributing to Fabian Essays (1889); and he became well-known as a socialist, both by his speeches and his writings. He entered the London County Council in 1892 as member for Deptford, and was returned at the head of the poll in the successive elections of 1895, 1898, 1901 and 1904. He resigned from the civil service in 1891 to give his whole time to the work of the Council (where he was chairman of the Technical Education Board) and to the study of economics. He served from 1903 to 1906 on the Royal Commission on Trade Union Law and on other important commissions. He married in 1892 Miss Beatrice Potter, herself a writer on economics and sociology, the author of The Co-operative Movement in Great Britain (1891) and a contributor to Charles Booth's Life and Labour of the People (1891-1903). His most important works are: a number of Fabian tracts; London Education (1904); The Eight Hours Day (1891), in conjunction with Harold Cox; and, with Mrs Sidney Webb, The Histpry of Trade Unionism (1894, new ed. 1902), Industrial Democracy (1897, new ed. 1902), Problems of Modern Industry (1898), History of Liquor Licensing (1903), English Local Government (1906), &c. Mrs Webb was a member of the Royal Commission on the Poor Law, and she and her husband were responsible for the Minority Report (see Poor Law) and for starting the widespread movement in its favour.

WEBB CITY, a city of Jasper county, Missouri, U.S.A., in the S.W. part of the state, about 160 m. S. of Kansas City. Pop. (1890) 5043; (1900) 9201, of whom 24S were foreign-born; (1910 U.S. census) 11,817. It is

served by the Missouri Pacific and the St Louis & San Francisco railway systems, and is the headquarters of the electric inter urban railway connecting with Carthage and Joplin, Missouri, Galena, Kansas and other cities. With Carterville (pop. 1910, 4539), which adjoins it on the E., it forms practically one city; they are among the most famous and productive " camps " in the rich lead and zinc region of south-western Missouri, and Webb City owes its industrial importance primarily to the mining and shipping of those metals. The value of the factory product increased from $353,566 in 1900 to $637,965 in 1905. Webb City was laid out and incorporated as a town in 1875, and first chartered as a city in 1876. White lead was discovered here in 1873, on the farm of John C. Webb, in whose honour the city is named; and systematic mining began in 1877.

WEBBE, WILLIAM (fl. 1586), English literary critic, was educated at St John's College, Cambridge, where he took his degree in 1572-1573, He was tutor to the two sons of Edward Sulyard of Flemyngs, Essex, and later to the children of Henry Grey of Pirgo in the same county. A letter from him is prefixed to the 1592 edition of Tancred and Gismunda? written by his friend, Robert Wilmot. In 1586 he published A Discourse of English Poelrie, dedicated to his patron, Edward Sulyard. Webbe argued that the dearth of good English poetry since Chaucer's day was not due to lack of poetic ability, or to the poverty of the language, but to the want of a proper system of prosody. He abuses " this tinkerly verse w r hich we call ryme," as of barbarous origin, and comments on the works of his con- temporaries, displaying enthusiasm for Spenser's Shepheardes Calendar, and admiration for Phaer's translation of Virgil. He urged the adoption of hexameters and sapphics for English verse, and gives some lamentable examples of his own com- position.

The Discourse was reprinted in J. Haslcwood's Ancient Critical Essays (1811-1815), by E. Arber in 1869, and in Gregory Smith's Elizabethan Critical Essays (1904).

WEBER, CARL MARIA FRIEDRICH ERNEST VON (1786- 1826), German composer, was born at Eutin, near Lubeck, on thei8thof December 1786, of a family that had long been devoted to art. His father, Baron Franz Anton von Weber, a military

2 The original play, Gismonde of Salerne, w r as by five authors, and was produced in the Queen's presence at the Inner Temple in 1568.

officer in the service of the palgrave Karl Theodor, was an excellent violinist, and his mother once sang on the stage. His cousins, Josepha, Aloysia, Constanze and Sophie, daughters of Franz Anton's brother Fridolin, attained a high reputation as vocalists. The great composer, Mozart, after having been rejected by Aloysia, married Constamzc, and thus became Franz Anion's nephew by marriage. Fridolin played the violin nearly as well as his brother; and the whole family displayed exceptional talent for music. Franz Anton von Weber was a man of thriftless habits and culpable eccentricity. Having been wounded at Rosbach, he quitted the army, and in 1758 he was appointed financial councillor to Clement August, elector of Cologne, who for nine years overlooked his incorrigible neglect of duty. But the elector's successor dismissed him in 1768; and for many years after this he lived in idleness at Hildesheim, squandering the property of his wife, Anna de' Fumetti, and doing nothing for the support of his children until 1778, when he was appointed director of the opera at Liibeck. In 1779 the prince bishop of Eutin made him his kapellmeister, and not long afterwards his wife died of a broken heart. Five years later he went to Vienna, placed two of his sons under Michael Haydn, and in 1 7S5 married the young Viennese singer Genovefa von Brenner. In the following year Carl Maria von Weber was born — a delicate child, afflicted with congenital disease of the hip-joint.

On his return from Vienna, Franz Anton, finding that a new kapellmeister had been chosen in his place, .accepted the humbler position of " Stadt Musikant." This, however, he soon relin- quished; and for some years he wandered from town to town, giving dramatic performances, in conjunction with the children of his first wife, wherever he could collect an audience. The effect of this restless life upon the little Cari Maria's health and education was deplorable; but, as he accompanied his father everywhere, he became familiarized with the stage from his earliest infancy, and thus gained an amount of dramatic experience that laid the foundation of his future greatness. Franz Anton hoped to see him develop into an infant prodigy, like his cousin Mozart, whose marvellous career was then rapidly approaching its close. In furtherance of this scheme, the child was taught to sing and place his fingers upon the pianoforte almost as soon as he could speak, though he was unable to walk until he was four years old. Happily his power of observation and aptitude for general learning were so precocious that he seems, in spite of all these disadvantages, to have instinctively educated him- self as became a gentleman. In 1798 Michael Haydn taught him gratuitously at Salzburg. In the March of that year his mother died. In April the family visited Vienna, removing in the autumn to Munich. Here the child's first composition — a set of "Six Fughetlas" — was published, with a pompous dedication to his half-brother Edmund; and here also he took lessons in singing and in composition. Soon afterwards he

began to play successfully in public, and his father compelled him to write incessantly. Among the compositions of this period were a mass and an opera — Die Macht der Liebe und des Weins — now destroyed. A set of " Variations for the Pianoforte," composed a little later, was lithographed by Carl Maria himself, under the guidance of Alois Senefelder, the inventor of the process, in which both the father and the child took great interest.

In 1800 the family removed to Freiberg, where the Ratter von Sleinsberg gave Carl Maria the libretto of an opera called Das Waldmadcken, which the boy, though not yet fourteen years old, at once set to music, and produced in November at the Freiburg theatre. The performance was by no means successful, and the composer himself was accustomed to .speak of the work as " a very immature production " ; yet it was afterwards reproduced at Chemnitz, and even at Vienna.

Carl Maria returned with his father to Salzburg in 1801, resuming his studies under Michael Haydn. Here he composed his second opera, Peter Sckmoll und seine Nachbarn, which was unsuccessfully produced at Nuremberg in 1803. In that year he again visited Vienna, where, though Joseph Haydn and Albrechtsberger were both receiving pupils, his father preferred

placing him under Abt Vogler. Through Vogler's instrument- ality Carl Maria was appointed conductor of the opera at Breslau, before he had completed his eighteenth year. In this capacity he greatly enlarged his experience of the stage, so that he ranks among the greatest masters of stage-craft in musical history; but he lived a sadly irregular life, contracted debts, and lost his beautiful voice through accidentally drinking an acid used in lithography— a mishap which nearly cost him his life. These hindrances, however, did not prevent him from beginning a new opera called Rilbezahl, the libretto of which was "romantic" to the last degree, and Weber worked at it enthusiastically, but it was never completed, and little of it has been preserved beyond a quintet and the masterly overture, which, re-written in 1811 under the title of Der Bekerrscher der Geister, now ranks among its author's finest instrumental compositions.

Quitting Breslau in 1806, Weber removed in the following year to Stuttgart, where he had been offered the post of private secretary to Duke Ludwig, brother of Frederick, king of Wurtemberg. The appointment was a disastrous one. The stipend attached to it was insufficient to meet the twofold demands of the young man's new social position and the thrift- lessness of his father, who was entirely dependent upon him for support. Court life at Stuttgart was uncongenial to him, though he yielded to its temptations. The king hated him and his practical jokes. He fell hopelessly into debt, and, worse than all, became involved in a fatal intimacy with

Margarethc Lang, a singer at the opera. Notwithstanding these distractions he worked hard, and in 1809 re-modelled Das Waldmadcken, under the title of Sylvana, 1 and prepared to produce it at the court theatre. But a dreadful calamity prevented its performance. Franz Anton had misappropriated a large sum of money placed in the young secretary's hands for the purpose of clearing a. mortgage upon one of the duke's estates.- Both father and son were charged with embezzlement, and, on the 9th of February 1810, they were arrested at the theatre, during a rehearsal of Sylvana, and thrown by the king's order into prison. No one doubted Weber's innocence, but after a summary trial he and his father were ordered to quit the country, and on the 27th of February they began a new life at Mannheim.

Having provided a comfortable home for his father, and begun a new comic opera, in one act, called Abu Hassan, Weber re- moved to Darmstadt in order to be near his old master Abt Vogler, and his fellow-pupils Meyerbeer and Gansbacher. On the 16th of September 1810, he reproduced Sylvana at Frankfort, but with very doubtful success. A bu Hassan was com- pleted at Darmstadt in January 1811, after many interruptions, one of which (his attraction to the story of Der Freischiitz—see below) exercised a memorable influence upon his later career.

Weber started in February 1811 on an extended artistic tour, during which he made many influential friends, and on the 4th of June brought out A bu Hassan with marked success at Munich. His father died at Mannheim in 1812, and after this he had no settled home, until in 1813 his wanderings were brought to an end by the unexpected offer of an appointment as kapellmeister at Prague, coupled with the duty of entirely remodelling the performances at the opera-house. The terms were so liberal that he accepted at once, engaged a new company of performers, and directed them with uninterrupted success until the autumn of 1816. During this period he composed no new operas, but he had already written much of his best pianoforte music, and played it with never-failing success, while the disturbed state of Europe inspired him with some of the finest patriotic melodies in exist- ence. First among these stand ten songs from Korner's Leyer, und Schwerdt, including " Vater, ich rufe dich," and " Lutzow's wilde Jagd " ; and in no respect inferior to these are the splendid choruses in his cantata Kampf und Sieg, which was first per- formed at Prague, on the 22nd of December 181 5.

Weber resigned his office at Prague on the 30th of September

1 As the MS. of Das Waldmadcken has been lost, it is impossible now to determine its exact relation to the later work.

5 Spitta gives a different account of the occurrence, and attributes the robbery to a servant.

WEBER, C. VON

1816, and on the 21st of December, Frederick Augustus, king of Saxony, appointed him kapellmeister at the German opera at Dresden. The Italian operas performed at the court theatre were superintended by Morlacchi, whose jealous and intriguing disposition gave endless trouble. The king, however, placed the two kapellmeisters on an exact equality both of title and salary, and Weber found ample opportunity for the exercise of his remarkable power of organization and control. He now gave his close attention to the story of Der Freischutz, which he had previously meditated turning into an opera, and, with the assist- ance of.Friedrich Kind, he produced an admirable libretto, under the title of Des Jiigers Braut. No subject could have been better fitted than this to serve as a vehicle for the new art-form which, under Weber's skilful management, developed into the type of "romantic opera." He had dealt with the supernatural in Riibczahl, and in Sylvana with the pomp and circumstance of chivalry; but the shadowy impersonations in Rubesahl are scarcely less human than the heroine who invokes them; and the music of Sylvana might easily have been adapted to a story of the 19th century. But Weber now knew better than to let the fiend in Der Freischutz sing; with three soft strokes of a drum below an unchanging dismal chord he brings him straight to us from the nether world. Every note in Euryanthe breathes the spirit of medieval romance; and the fairies in Oberon have an actuality quite distinct from the tinsel of the stage. This un- compromising reality, even in face of the unreal, forms the strongest characteristic of the pure " romantic school," as Weber understood and created it. It treats its wildest subjects in earnest, and without a doubt as to the reality of the scenes it ventures to depict, or the truthfulness of their dramatic interpretation.

Weber wrote the first note of the music of Der Freischutz on the 2nd of July — beginning with the duet which opens the second act. But so numerous were the interruptions caused by Morlacchi's intrigues, the insolence of unfriendly courtiers, and the attacks of jealous critics that nearly three years elapsed before the piece was completed. In the meantime the per- formances at the opera-house were no less successfully remodelled at Dresden than they had already been at Prague, though the work of reformation was far more difficult; for the new kapellmeister was surrounded by enemies who openly subjected him to every possible annoyance, and even the king himself was at one time strongly prejudiced against him. Happily, he no longer stood alone in the world. Having, after much difficulty, broken off his liaison with Margarethe Land, he married the singer Carolina Brandt, a noble-minded woman and con- summate

artist, who was well able to repay him for the part he had long played in her mental development. The new opera was completed on the 13th of May 1S20, on which day Weber wrote the last note of the overture — which it was his custom to postpone until the rest of the music was finished. There is abundant evidence to prove that he was well satisfied with the result of his labours; but he gave himself no rest. Hehad engaged to compose the music to Wolff's Gipsy drama, Preciosa. Two months later this also was finished, and both pieces ready for the stage.

In consequence of the unsatisfactory state of affairs at Dresden, it had been arranged that both Preciosa and Der Freischutz — no longer known by its original title, Des Jiigers Braut — should be produced at Berlin. In February 1S21 Sir Julius Benedict was accepted by Weber as a pupil; and to his pen we owe a delightful account of the rehearsals and first performance of his master's chef-d'eeuvre. Preciosa was produced with great success at the old Berlin opera-house on the 14th of June 1821. On the 18th of June, the anniversary of the battle of Waterloo, the opening of the new " Schauspielhaus " was celebrated by the production of Der Freischutz. Much anxiety was caused by unforeseen difficulties at the rehearsals; yet, so calm was Weber's mind that he devoted his leisure time to the composition of his Concertstuck in F minor — one of his finest pianoforte pieces. Until the last moment his friends were anxious; the author was not; and the result justified his confidence in his own powers.

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The success of the piece was triumphant. The work was received with equal enthusiasm at Vienna on the 3rd of October, and at Dresden on the 26th of January 1822. Yet Weber's position as kapellmeister was not much improved by his success, though, in order to remain faithful to his engagements, he had refused tempting offers at Berlin and Cassel, and, at the last-named place, had installed Ludwig Spohr in a position much more advantageous than his own.

For his next opera Weber accepted a libretto based, by Frau Wilhelmine von Chezy, on the story of Euryanthe, as originally told in the 13th century, in Gilbert de Montreuil's Roman de la Violetle, and repeated with alterations in the Decamcrone, in Shakespeare's Cymbeline, and in several later forms. In place of the ghostly horrors of Der Freischutz, the romantic element was here supplied by the chivalric pomp of the middle ages. The libretto is in one respect superior to that of Der Freischutz, inasmuch as it substitutes elaborate recitative for the spoken dialogue peculiar to the German " Schauspiel " and French " opera comique. " It is, in fact, a " grand opera " in every sense of the words, — the prototype of the "music drama" perfected fifty years later by Wagner. The overture — as usual,

written last — presents a feature that has never been imitated. During its performance the curtain temporarily rises, to exhibit, in a tableau vivant, the scene in the sepulchral vault upon which the whole story turns. This direction is now rarely carried out; but Weber himself well knew how much the interest of the piece depended on it. The work was produced at the Karntnerthor theatre in Vienna, on the 25th of October 1823, and received with enthusiasm.

Weber's third and last dramatic masterpiece was an English opera, written for Covent Garden theatre, upon a libretto adapted by Handle from Wieland's Oberon. It was disfigured by the spoken dialogue abandoned in Euryanthe; but in musical beauty it is quite equal to it, while its fairies and mermaids are as vividly real as the spectres in Der Freischutz. Though already far gone in consumption, Weber began to compose the music on the 23rd of January 1825. Charles Kemble had offered him £1000 for the work, and he could not afford to rest. He finished the overture in London, at the house of Sir George Smart, soon after his arrival, in March 1826; and on the 12th of April the work was produced with triumphant success. But it cost the composer his life. Wearied out with rehearsals and performances of the opera, and concerts at which he was received with rapturous applause, he grew daily perceptibly weaker; and, notwithstanding the care of his kind host, Sir George Smart, and his family, he was found dead in his bed on the morning of the 5th of June 1826. For eighteen years his remains rested in a temporary grave in Moorfields chapel; but in 1844 they were removed and placed in the family vault at Dresden, Wagner making an eloquent speech.

Besides his three great dramatic, masterpieces and the other works already mentioned, Weber wrote two masses, two symphonies, eight cantatas, and a large number of songs, orchestral and pianoforte pieces, and music of other kinds, amounting altogether to more than 250 compositions. (W. S. R.)

Weber's style rises, in his three greatest works, to heights which show his kinship with the great classics and the great moderns. His intellect was quick and clear; but yet finer was the force of character with which he overcame the disadvantages of his feeble health, desultory education and the mistakes of his youth. With such gifts of intellect and character, every moment of his short life was precious to the world; and it is impossible not to regret the placing of his training in the hands of Abt Vogler. Weber's master was an amiable charlatan, whose weakness as a teacher was thoroughly exposed, in perfect innocence, by his two illustrious pupils. Meyerbeer wished to be famous as the maker of a new epoch in opera. Weber could not help being so in reality. But he was sadly hampered by his master's inability to teach realities instead of appearances; and to this

impediment alone must we assign the fact that his masterpieces do not begin earlier in his career. With extra- ordinary rapidity and thoroughness he learnt English a year before his death in order to compose Oberon, with the result

that there is only one obvious mistake in the whole work, and the general correctness of declamation is higher than in most of his German works. This is typical of Weber's general culture, mental energy and determination; points in which, as in many traits in his music, he strikingly resembles Wagner. But all his determination could not quite repair the defects of his purely musical training, and though his weaknesses are not of glaring effect in opera, still there are moments when even the stage cannot explain them away. Thus the finale of Der Freischiitz breaks down so obviously that no one thinks of it as anything but a perfunctory winding-up of the story, though it really might have made quite a fine subject for musical treatment. In Euryanthe Weber attained his full power, and his inspiration did not leave him in the lurch where this work needed large musical designs. But the libretto was full of absurdities; especially in the last act, which not even nine remodellings under Weber's direction could redeem. Yet it is easy to see why it fascinated him, for, whatever may be said against it from the standpoints of probability and literary merit, its emotional contrasts are highly musical. Indeed it is through them that the defects invite criticism.

Oberon is spoilt by the old local tradition of English opera according to which its libretto admitted of no music during the action of the drama. Thus Weber had in it no opportunity for his musical stage-craft; apart from the fact that the action itself is entirely without dramatic motive and passion, since the characters are simply shifted from Bordeaux to Bagdad whenever Oberon waves his wand.

Many attempts have been made to improve the libretti of Euryanthe and Oberon, but none are quite successful, for Weber has taken a great artist's pains in making the best of bad material. All that can be said against Weber's achievements only reveals the more emphatically how noble and how complete in essentials was his success and his claim to immortality. His pianoforte works, while showing his helplessness in purely musical form, more than bear out his contemporary reputation as a very great pianoforte player. They have a pronounced theatrical tendency which, in the case of such pieces of gay romanticism as the Invitation a. la danse and the Concertstiick, is amusing and by no means inartistic. In orchestration

Weber is one of the greatest masters. His treatment of the voice is bold and interesting, but very rash; and his declamation of words is often incorrect. His influence on the music of his own day is comparable to his influence on posterity; for he was not only a most efficient director but a very persuasive journalist; and (in spite of the inexperience that made him disapprove of Beethoven) for all good music other than his own he showed a growing enthusiasm that was infectious. (D. F. T.)

WEBER, WILHELM EDUARD (1804-1891), German physicist, was born at Wittenberg on the 24th of October 1804, and was a younger brother of Ernst Heinrich Weber, the author of Weber's Law (see below). He studied at the university of Halle, where he took his doctor's degree in 1826 and became extraordinary professor of physics in 1828. Three years later he removed to Gottingen as professor of physics, and remained there till 1837, when he was one of the seven professors who were expelled from their chairs for protesting against the action of the king of Hanover (duke of Cumberland) in suspending the constitution. A period of retirement followed this episode, but in 1843 he accepted the chair of physics at Leipzig, and six years later returned to Gottingen, where he died on the 23rd of June 1891. Weber's name is especially known for his work on electrical measurement. Until his time there was no established system either of stating or measuring electrical quantities ; but he showed, as his colleague K. F. Gauss did for magnetic quantities, that it is both theoretically and practically possible to define them, not merely by reference to other arbitrary quantities of the same kind, but absolutely in terms in which the units of length, time, and mass are alone involved. He also carried on extensive sesearches in the theory of magnetism; and it is interesting that in connexion with his observations in terrestrial magnetism he not only employed an early form of mirror galvanometer, but

also, about 1833, devised a system of electromagnetic telegraphy, by which a distance of some 9000 ft. was worked over. In conjunction with his elder brother he published in 1825 a well- known treatise on waves, Die Welknlehre auf Experiments gegriindet; and in 1833 he collaborated with his younger brother, the physiologist Eduard Friedrich Weber (1806-1871), in an investigation into the mechanism of walking.

WEBER'S LAW, in psychology, the name given to a principle first enunciated by the German scientist, Ernst Heinrich Weber (1795-1878), who became professor at Leipzig (of anatomy, t8i8, of physiology, 1S40). He was specially famous for his researches into aural and cutaneous sensations. His law, the purport of which is that the increase of stimulus necessary to produce an increase of sensation in any sense is not a fixed quantity but depends on the proportion which the increase bears to the immediately preceding stimulus, is the principal generalization of that

branch of scientific investigation which has come to be known as psycho-physics (?.».).

According to Gustav Fcchner {q.v .) , who has done most to prosecute these inquiries and to consolidate them under a separate name, ” psycho-physics is an exact doctrine of the relation of function or dependence between body and soul.” In other words, it is through- out an attempt to submit to definite measurement the relation of physical stimuli to the resulting psychical or mental facts, and forms an important department of experimental psychology. It deals with the quantitative aspects of mental facts — their intensity or quantity proper and their duration. Physical science enables us, at least in the case of some of the senses, to measure with accuracy the objective amount of the stimulus, and introspection enables us to state the nature of the subjective result. Thus we are able to say whether a stimulus produces any psychical result, and can fix in that way the minimum sensibile or ” threshold of consciousness ” for each of the senses. In like manner (though with less accuracy, owing to the dis- turbing nature of the conditions) we can fix the sensational maxi- mum, or upper limit of sensibility, in the different senses, that is to say, the point beyond which no increase of stimulus produces any appreciable increase of sensation. We thus determine, as Wundt puts it, the limit-values between which changes of intensity in the stimulus are accompanied by changes in sensation. But the central inquiry of psycho-physics remains behind. Between the quantitative mini- mum and the quantitative maximum thus fixed can we discover any definite relation between changes in the objective intensity of the stimuli and changes in the intensity of the sensations as estimated by consciousness. The answer of psycho-physics to this inquiry is given in the generalization variously known as “Weber’s law,” ” Fechner’s law,” or the ” psycho-physical law,” which professes to formulate with exactitude the relations which exist between change of stimulus and change of sensation.

As we have no means of subjectively measuring the absolute intensity of our sensations, it is necessary to depend upon the mental estimate or comparison of two or more sensations. Comparison enables us to say whether they arc equal in intensity, or if unequal which is the greater and which is the less. But as they approach equality in this respect it becomes more and more difficult to detect the difference. By a series of experiments, therefore, it will be possible, in the case of any particular individual, to determine the least observable difference in intensity between two sensations of any particular sense. This least observable difference is called by Fechner the UntcrschiedsscJnvelle or ” difference-threshold,” that is to say, the limit of the discriminative sensibility of the sense in question. That such a “threshold,” or least observable difference, exists is plain from very simple examples. Very small increases may be made in the objective

amount of light, sound or pressure — that is, in the physical stimuli applied to these senses — without the subject on whom the experiment is made detecting any change. _ It is further evident that, by means of this Untersckiedsschwelle, it is possible to compare the discriminative sensibility of different individuals, or of different senses, or (as in the case of the skin) of different parts of the same sense organ: the smaller the difference observable the finer the discriminative sensibility. Thus the discrimination of the muscular sense is much more delicate than that of the sense of touch or pressure, and the discriminative sensibility of the skin and the retina varies very much according to the parts of the surface affected. Various methods have been adopted with a view to determine these minima of discriminative sensibility with an approach to scientific precision. The first is that employed by Weber himself, and has been named the method of just observable differences. It consists either in gradually adding to a given stimulus small amounts which at first cause no' perceptible difference in sensation but at a certain point do cause a difference to emerge in consciousness, or, vice versa, in gradu- ally decreasing the amount of additional stimulus, till the difference originally perceived becomes imperceptible. By taking the average of a number of such results, the minimum may be determined with tolerable accuracy. The second method is called by Fechner the method of correct and incorrect instances. When two stimuli arc

very nearly equal the subject will often fail to recognize which Is the greater, saying sometimes that A is greater, sometimes that B is greater. When in a large number of trials the right and wrong guesses exactly balance one another we may conclude that the difference between the two stimuli is not appreciable by the sense. On the other hand, as soon as the number of correct guesses definitely exceeds half of the total number of cases, it may be inferred that there is a certain subjective appreciation of difference. This method was first employed by Vierordt. The third method, that of average errors, is very similar to the one just explained. Here a certain weight (to take a concrete example) is laid upon the hand of the person experimented upon, and he is asked, by the aid of sub- jective impression alone, to fix upon a second weight, exactly equal to the first. It is found that the second weight sometimes slightly exceeds the first, sometimes slightly falls below it. Whether above or below is of no consequence to the method, which depends solely on the amount of the error. After a number of experiments, the different errors are added together, and the result being divided by the number of experiments gives us the average error which the subject may be calculated upon to make. This

marks the amount of stimulus which is just below the difference-threshold for him. This method was first employed by Fechner and Volkmann. The different methods were first named, and the theory of their applica- tion developed by Fechner in his Elements der Psyckophysik (i860). A number of experimental variations have since been devised by Wundt and others, but they are all reducible to the two types of the " gradation " and " error " methods. These methods have been chiefly applied to determine the relation of the difference-threshold to the absolute magnitude of the stimuli employed. For a very little reflection tells us that the smallest perceivable difference is not an amount whose absolute intensity; is constant even within the same sense. It varies with the intensity of the stimuli employed. We are unable, for example, to recognize slight differences in weight when the weights compared are heavy, though we should be perfectly able to make the distinction if the weights compared were both light. Ordinary observation would lead us, therefore, to the conclusion that the greater the intensity of the original stimulus at work the greater must be the increase of stimulus in order that there may bo a perceptible difference in the resulting sensation. Weber was the first (after a prolonged series of experiments) to clothe this generality with scientific precision by formulating the law which has since gone by his name. He showed that the smallest perceptible difference is not absolutely the same, but remains relatively the same, that is, it remains the same fraction of the preceding stimulus. For example, if we can distinguish 16 oz. and 17 oz., we shall be able to distinguish 32 oz. and 34 oz., but not 32 oz. and 33 oz., the addition being in each case A of the preceding stimulus. This fraction (supposing it to be the difference-threshold of the muscular sense) remains a constant, however light or however heavy the weights compared. The law may be formulated thus : — The difference between any two stimuli is experienced as of equal magnitude, in case the mathematical relation of these stimuli remains unaltered. Or, otherwise expressed, in order that the intensity of a sensation may increase in arithmetical progression the stimulus must increase in geometrical progression. It is also expressed by Fechner in. the form — The sensation increases as the logarithm of the stimulus.

The law has been variously interpreted. Fechner himself designated it the psycho-physical law, and treated it as the fundamental formula of the relation between body and mind, thus assigning to it an ontological dignity and significance. But in this " psycho-physical " interpretation of his results he has not had a numerous following. Wundt interprets the law in a purely " psychological " sense, making it a special instance of the general law of relativity which governs our mental states. Introspection can give us no information as to the absolute intensity of the stimulus; for a stimulus is known in consciousness only through its sensational resultant. Hence, he argues, we can only compare one psychical state with another, and our

standard of measurement is therefore necessarily a relative one; it depends directly upon the preceding state with which we compare the present. Others (e.g. G. E. Miiller) have attempted to give the law a purely physical or " physiological " explanation. Instead^ of holding with Fechner that the law expresses a recondite relation between the. material and the spiritual world, they prefer to regard the quantitative relation between the last physical antecedent in the brain and the resultant mental change as prima facie one of simple proportion, and to treat Weber's law as holding between the initial physical stimulus and the final action of the nerve-centres. According to this interpretation, the law would be altogether due to the nature of nervous action. As a nerve, says Sully, after a tpvnporary degree of stimulation temporarily loses its sensibility, so the greater the previous stimulation of a nerve the greater is the additional stimulus required to produce an appreciable amount of sensation.

Weber's law, it must be added, holds only within certain limits. In the " chemical " senses of taste and smell experiments are almost impossible. It is not practicable to limit the amount of the stimulus with the necessary exactitude, and the results are further vitiated by the long continuance of the physiological effects. The same con- siderations apply with still more force to the organic sensations, and

the results in the case of temperature sensations are completely uncertain. The law is approximately true in the case of sight, hearing pressure, and the muscular sense — most exactly in the case of sound. As this is the sense which affords the greatest facilities for measuring the precise amount of the stimulus, it may perhaps be inferred that, if we could attain the same exactitude in the other senses, with the elimination of the numerous disturbing extraneous influences at work, the law would vindicate itself with the same exactitude and certainty. It is further to be noted, how r ever, that even in those senses in which it has been approximately verified, the law holds with stringency only within certain limits. The results are most exact in the middle regions of the sensory scale; when we approach the upper or lower limit of sensibility they become quite uncertain.

Literature. — Weber's investigations were published as " Der Tastsinn und das Gemeingeftihl," in Wagner's Handw drier buck der Pkysiologie, iii. (1846). Fechner's Elemente der Psyckophysik (i860) contains an elaborate exposition of the whole subject. He replied to his critics in tw6 later works, In Sachen der Psyckophysik (1877) and Revision der Hauptpunkte der Psyckophysik (1882). Delbceuf s Etude psyckophysique (1873), Examen critique de la lot psyckophysique (1883), and Elements de psyckophysique generate et speciale (1883), and G. E. Midler's Zur Grundlegung der Psyckophysik (1878) are also important documents; and the subject is fully treated in Wundt's Grundzuge der physiologiscken Psychologie (ed.

1902-1903), and " (Jber die Methode d. Minimalandcrungen," in Pkilos. Stud, (Leipzig, 1883), or, more popularly, in his Human and Animal Psychology (2nd ed., 1892), Lectures 2, 3, 4. See also Ladd's Physiological Psychology (1887), which is based upon Wundt; Meinong, in Zeitschr. fur Psychologie, xi. (1896); Ziehen, Leitfaden der physiologiscken Psychologic (7th ed., Jena, 1906); E. B. Titchener, Experimental Psychology (ii., 1905); Professor James Ward's " Attempt to Interpret Fechner's Law," in Mind, i. 452 sqq. ; and generally text- books of psychology, e.g. G. F. Stout's Manual of Psychology, bk. ii. ch. 7 (following Meinong) ; James's Principles of Psychology, ch. 13 ; Kulpe's Outlines of Psychology, part i. chap. I and 3. (A. S. P.-P.)

WEBSTER, ALEXANDER (1707-1784), Scottish writer and minister, son of James Webster, a covenanting minister, was born in Edinburgh in 1707. Having become a minister in the church of Scotland, he propounded a scheme in 1742 for provid- ing pensions for the widows of ministers. The tables which he drew up from information obtained from all the presbyteries of Scotland were based on a system of actuarial calculation that supplied a precedent followed by insurance companies in modern times for reckoning averages of longevity. In 1755 the govern- ment commissioned Webster to obtain data for the first census of Scotland, which he carried out in the same year. In 1753 he was elected moderator of the General Assembly; In 1771 he was appointed a dean of the Chapel Royal and chaplain to George III. in Scotland; and he died on the 25th of January

1784.

Webster published in 1748 his Calculations, setting forth the principles on which his scheme for widows' pensions was based; he also wrote a defence of the Methodist movement in 1742, and Zeal for the Civil and Religious Interests of Mankind Commended (1754).

WEBSTER, BENJAMIN NOTTINGHAM (1797-1882), Knglish actor, manager and dramatic writer, was born in Bath on the 3rd of September 1797, the son of a dancing master. First appearing as Harlequin, and then in small parts at Drury Lane, he went to the Haymarkct in 1829, and was given leading comedy character business. He was the lessee of the Haymarket from 1837; he built the new Adelphi theatre (1859); later the Olympic, Princess's and St James's came under his control; and he was the patron of all the contemporary playwrights and many of the best actors, who owed their opportunity of success to him. As a character actor he was unequalled in his day, especially in such parts as Triplet in Masks and Faces, Joey Ladle in No Thoroughfare, and John Peerybmgle in his own dramatization of The Cricket on the Hearth. He wrote, trans- lated or

adapted nearly a hundred plays. Webster took his formal farewell of the stage in 1874, and he died on the 3rd of July 1882. His daughter, Harriette Georgiana (d. 1897), was the first wife of Edward Levy-Lawson, 1st baron Burnham; and his son, W. S. Webster, had three children — Benjamin Webster (b. 1864; married to Miss May Whitby), Annie (Mrs A. E. George^ and Lizzie (Mrs Sydney Brough) — all well known on the London stage, and further connected with it in each case by marriage.

WEBSTER, DANIEL (1 782-1852), American statesman, was born in Salisbury (now Franklin), New Hampshire, on the

1 8th of January 1782, He was a descendant of Thomas Webster, of Scottish ancestry, who settled in New Hampshire about 1636. His father, Ebcnczcr Webster (1739-1806), was a sturdy frontiers- man; when, in 1763, he built his log cabin in the town of Salis- bury there was no habitation between him and Canada. He was a member of Rogers' Rangers in the Seven Years' War, served in the War of Independence, was for several years a member of the New Hampshire legislature, was a delegate to the New Hampshire convention which ratified the Federal constitution, and was a justice of the court of common pleas for his county. Daniel was a frail but clever child, and his family made great sacrifices to give him and his elder brother Ezekiel a good education. He attended Phillips Exeter Academy about nine months in 1794, was further prepared for college by Dr Samuel Wood, the minister at Boscawen, and graduated at Dartmouth College in 1801. He was chosen Fourth of July orator in Hanover, the college town, in 1800, and in his speech appears the substance of the political principles for the develop- ment of which he is chiefly famous. After graduation he began the study of law in his native town. When in the following winter money had to be earned to enable Ezekiel to remain in college, Daniel accepted the principalship of the academy at Fryeburg, Maine; but he resumed his lav; studies in the 'follow- ing year, and in 1804, with Ezekiel's assistance, he was enabled to go to Boston and conclude his studies under Christopher Gore (175S-1827), later governor of Massachusetts (1800-1810) and a U.S. senator (1813-1816). Admitted to the bar in Boston in 1805, Webster began the practice of law at Boscawen, but his father died a year later, and Webster removed in the autumn of 1807 to Portsmouth, then one of the leading commercial cities of New England. Here he rose rapidly to eminence both at the bar and in politics.

His political career began in earnest at the opening of the War of 181 2.

He led the opposition in his state to the policy of Madison's administration, was elected by the Federalists a member of the National House of Representatives, and took his seat in May 1813. Henry Clay, the speaker, appointed him a member of the Committee on Foreign Relations, of which John C. Calhoun was chairman, and for some forty years these three constituted a great triumvirate in American politics. Webster had been in the House less than three weeks when he greatly embarrassed the administration by introducing a set of resolutions asking for information relating to the immediate cause of the war. In January 1814, when a bill to encourage enlistments was before the House, he attacked the conduct of the war in his first great speech. An even more forcible speech, delivered later in the same session, in support of a bill for repeal- ing the embargo and non-importation acts, marked him as one of the foremost men in Congress. He successfully opposed a bill providing for what would have been practically an irredeem- able currency, and he voted against the bill for chartering the second United States bank, although it provided for the redemp- tion of bank notes in specie, because he objected to permitting the government to have so large a share in its management. Webster removed to Boston in June 1816. This cost him his seat in Congress after the 4th of March 1817, and for the next six years he was engaged chieily in the practice of law in the courts of Massachusetts and before the U.S. Supreme Court.

His first leading case before the Supreme Court was the Dartmouth College Case. In 1815, when the Dartmouth board of trustees was rent by factions, the majority, who were Federal- ists and Congregationalists, removed the president, John Wheelock, who was a Presbyterian, and appointed Francis Brown in his place. Whcelock appealed to the legislature in the following year, when it was strongly Republican, and that body responded by passing acts which virtually repealed the charter received from George III., created a state university, placed Wheelock at its head, and transferred to it, the property of the college. The case came before the Supreme Court of New Hampshire in May 1817. Jeremiah Mason (1768-1848), a lawyer of the first rank, Jeremiah Smith and Webster appeared for the college, and argued that these, acts were invalid because

they were not within the general scope of the legislature's power, because they violated provisions of the state constitution and because they violated the clause of the Federal Constitution which prohibits a state from impairing the obligation of contracts but the court decided against them. On the last point, however, the case was carried to the Supreme Court of the United States, and there Webster, presenting principally arguments of his colleagues at the state trial' and making a powerful appeal to the emotions of the court, won the case for the college and for himself the front rank at the American bar. The result, too, vindicating as it did the

supremacy of the Constitution of the United States, was a substantial gain for that nationalism which Webster advocated in his first Fourth of July oration at Hanover, and the promotion of which was for the remainder of his career his principal service to his country. His next great case was that of M'Culloch v. Maryland Maryland had imposed a tax upon the Baltimore branch of the Bank of the United States. The Maryland Court of Appeals sustained the validity of this act. Webster, supported 'by William Pinkney and William Wirt, argued in February 1819, (1) that the power to establish a bank was to be implied from the general power given to Congress to administer the financial affairs of the nation, and was a means of administering the finances which was appropriate and within the discretion of Congress; (2) that " the power to tax is the power to destroy," and that a state had not the constitutional power to impose a tax upon any instrumentality of the government of the United States. The Supreme Court sustained these argu- ments and the act of Maryland was held to be void, Four years later (1823) Webster argued the case of Gibbons v. Ogden. The state of New York, in order to reward the enterprise of Robert R. Livingston and the inventive genius of Robert Fulton in the application of the steam engine to traffic on the water, had given to them a monopoly of all transportation by steam within the waters of New York. The highest court of that state sustained the validity of the monopoly. Gibbons, who had begun to run a steamboat from New Jersey, appealed to the Supreme Court. Webster argued that the Federal Constitution gave to Congress control over interstate commerce, and that any interference by the legislature of a state with this commerce was unconstitu- tional and void. The Supreme Court so held; its opinion, written by Chief Justice Marshall, being little else than a recital of Webster's argument. In the case of Ogden v. Saunders, heard in 1824 and reheard in 1827, in which the question was the validity or invalidity of the insolvent laws of the several states, Webster argued that the clause prohibiting a state from impairing the obligation of contracts applied to future as well as to past contracts, but the court decided against him.

Meanwhile Webster had come to be recognized as the first American orator. His oration at Plymouth, on the J2nd of December 1820, on the second centennial anniversary of the landing of the Pilgrims, placed him in this rank. No man mastered more thoroughly the fundamental principles of govern- ment and the currents of feeling which influence the destiny of nations. His oration in 1825 at the laying of the corner stone of the Bunker Hill monument contained perhaps the clearest statement to be found anywhere of the principles underlying the American War of Independence. In the following year Webster delivered his oration in commemoration of the second and third presidents of the United States — John Adams and Thomas Jefferson — who died on the 4th of July 1826; it is particularly

remarkable for Adams's imaginary reply in the Continental Congress to the arguments against a Declaration of Independence, beginning with the familiar quotation: " Sink or swim, live or die, survive or perish, I gave my hand and my heart to this vote." Webster's physical endowments as an orator were extraordinary. Thomas Carlyle thus describes him as he appeared in London in 1839.

" Not many days ago I saw at breakfast the notablest of your notabilities, Daniel Webster. He is a magnificent specimen. You might say to all the world, ' This is our Yankee Englishman; such limbs we make in Yankee land! ' As a logic fencer, or parliamentary Hercules, one would be inclined to back him at first sight against all the extant world. The tanned complexion, that amorphous crag- like

face; the dull black eyes tinder the precipice of brows, like dull anthracite furnaces, needing only to be blown; the mastiff mouth accurately closed; I have not traced so much of silent Berserkir rage that I remember in any man."

In 1820 Webster took an important part in the convention called to revise the constitution of Massachusetts, his arguments in favour of removing the religious test, in favour of retaining property representation in the Senate, and in favour of increasing the independence of the judiciary, being especially notable. He was a member of the National House of Representatives from 1S23 to 1827 and of the Senate from 1827 to 184T. Soon after returning to the House he supported in a notable speech a resolution to send a commissioner to Greece, then in insurrection.

The tariff was to him a distasteful subject, and he was governed in his attitude toward it largely by the wishes of the majority of his constituents. He opposed the tariff bill of 1816 and in 1824, and he repudiated the name of " American system/' claimed by Clay for his system of protection. When, however, the tariff bill of 1828, which was still more protective, came up for discussion, Webster had ceased to oppose protection; but he did not attempt to argue in favour of it. He stated that his people, after giving warning in 1824 that they would consider protection the policy of the Government, had gone into protected manufactures, and he now asked that that policy be not reversed to the injury of his constituents. In later speeches, too, he defended protection rather as a policy under which industries had been called into being than as advisable if the stage had been clear for the adoption of a new policy.

The tariff of 1828 aroused bitter opposition in South Carolina, and called from Vice-President Caihoun the statement of the doctrine of nullification which was adopted by the South Carolina legislature at the close of the year and is known as the South Carolina Exposition. Senator Robert Y. Hayne, from the same state, voiced this doctrine in the Senateˆ and Webster's reply was his most powerful exposition of the national conception of the Union. The occasion of this famous Webster-Hayne debate was the introduction by Senator Samuel A. Foote (1780- 1840) of Connecticut of arcsolution of inquiry into the expediency of restricting the sales of the Western lands. This was on the 29th of December 1829, and after Senator Benton of Missouri had denounced the resolution as one inspired by hatred of the East for the West. Hayne, on the 19th of January 1830, made a vigorous attack on New England, and declared his opposition to a permanent revenue from the public lands or any other source on the ground that it would promote corruption and the consolidation of the government and " be fatal to the sovereignty and independence of the states." Webster's brief reply drew from Hayne a second speech, in which he entered into a full exposition of the doctrine of nullification, and the important part of Webster's second reply to Hayne on the 26th and 27th of January is a masterly exposition of the Constitution as in his opinion it had come to be after a development of more than forty years. He showed the revolutionary and unpractical character of any doctrine such as nullification (g.v.) based on the assumption that the general government was the agent of the state legislatures. It placed the general government, he said, in the absurd position of a " servant of four-and-twenty masters, of different wills and different purposes, and yet bound to obey all." He then argued at length that the correct assumption was that both the general government and the state government were " all agents of the same supreme power, the people," that the people had established the Constitution of the United States and that in the Supreme Court, established under that Constitution, was vested the final decision on all constitutional questions. Whatever may be said of the original creation of the Constitution, whether by the states or by the people, its development under the influences of a growing nationalism was a strong support to Webster's argument, and no other speech so strengthened Union sentiment throughout the North; its keynote was " Liberty and Union, now and forever, one and inseparable." South Carolina, however, insisted that its doctrine

was sound, and in November 1832 passed an ordinance declaring the revenue laws of the United States null and void. President Jackson responded with a proclamation denying the right oi nullification, and asked Congress for authority to collect the revenue in South Carolina by force if necessary. A bill, known as the Force Bill, was introduced in the Senate, and in the debate upon it Webster had an encounter with Calhoun. His

reply to Calhoun, printed as " The Constitution not a compact between sovereign States," is one of his closest legal arguments, but somewhat overmatched by the keen logic of his adversary.

Webster's support of President Jackson in the South Carolina trouble helped to drive Calhoun into an alliance with Clay; and Clay, whose plan of preserving the Union was by compromise, came forward with a bill for greatly reducing the tariff. Webster, strongly opposed to yielding in this way, made a vigorous speech against the bill, but it passed and South Carolina claimed a victory. In the same year (1833) the Whig party began to take definite form under the leadership of Clay, in opposition, chiefly, to President Jackson's bank policy, and Webster joined the ranks behind Clay with an aspiration for the presidency. He was formally nominated for that office by the Massachusetts legislature in 1835, and received the electoral vote of that state, but of that state only. Four years later his party passed him by for William Henry Harrison, the hero of Tippecanoe, and Webster refused the proffered nomination for vice-president.

President Harrison appointed Webster secretary of state but died one month after taking office. John Tyler, who succeeded to the presidency, was soon " read out of his party," and all his cabinet except Webster resigned. Webster hesitated, but after consultation with a delegation of Massachusetts Whigs decided to remain. Although he was severely criticized there were good reasons for his decision. When he entered office the relations between the United States and Great Britain were critical. The M'Leod case 1 in which the state of New York insisted on trying a British subject, with whose trial the Federal government had no power to interfere, while the British govern- ment had declared that it would consider conviction and execu- tion a casus belli; the exercise of the hateful right of search by British vessels on the coast of Africa; the Maine boundary, as to which the action of a state might at any time bring the Federal government into armed collision with Great Britain- all these at once met the new secretary, and he felt that he had no right to abandon his work for party reasons. With the special commissioner from Great Britain, Lord Ashburton, he concluded the treaty of 1842 known as the Webster-Ashburton Treaty. Differences arising out of theM'Leod case were adjusted by extend- ing the principle of extradition. The question of the suppression of the African slave trade, with which was connected the right of search, was settled by an agreement that each nation should keep in service off the coast of Africa a squadron carrying not fewer than eighty guns, and that the two squadrons should act in concert when necessary. The North-east boundary dispute was settled by a compromise which allowed Maine about 5500 sq. m. less than she had claimed, and allowed Great Britain about as much less on her claim, and by an agreement on the part of the government of the United States to pay to Maine and Massachusetts " in equal moieties

" the sum of $300,000 for their assent (see Maine).

Immediately after the treaty had been concluded the Whigs insisted that Webster should leave the cabinet. He refused, for a time, to be driven, but because of their continued attacks, together with his ambition to become president, and because Tyler favoured the annexation of Texas while he was opposed to it, he resigned in May 1843. He was forgiven by his party in the following year, but not until the opposition, provoked by the retention of his position under Tyler, had ruined whatever

1 This case grew out of the Canadian rebellion of 1837. Alexander M'Leod boasted in November 1840 that he was one of a Canadian party who, on the 29th of December 1837, had captured and burned a small American steamboat, the " Caroline," and in the course of the attack had shot Amos Durfee. The Canadian commander had regarded the " Caroline " as being in the service of the insurgents and had asked for volunteers to destroy her (see Seward, W. H.).

chance he might have had in that year of receiving the presidential nomination. In June 1843, on the occasion of the completion of the Bunker Hill monument, Webster delivered another classic oration. In February 1S44 he argued the Girard Will Case before the United States Supreme Court. Stephen Girard {q.v.) had devised and bequeathed the residue of his estate for the establishment and maintenance of Girard College, in which no minister of the Gospel of any sect or denomination whatever should be admitted. The suit was brought to break the will, and Webster, for the plaintiffs, after stating that the devise could stand only on condition that it was a charity, argued that it was not a charity because no teaching was such except Christian teaching. He made an eloquent plea for Christianity, but his case was weak in law, and the court sustained the will.

Webster was returned to the Senate in 1845. He opposed the annexation of Texas and the Mexican War, and was, as before, the recognized spokesman of his party. At the beginning of the quarrel of the North and the South over the organization of the territory acquired from Mexico, Calhoun contended that the Constitution of the United States extended over this territory and carried slavery with it, but Webster denied this on the ground that the territory was the property of, not part of, the United States, and Webster's view prevailed- The whole matter had, therefoie, to be adjusted by Congress, and as the growing intensity of the quarrel revealed the depth of the chasm between the sections, Clay came forward with the

famous compromise of 1850, and Webster's last great speech— " The Constitution and the Union," or as it is more commonly known " The Seventh of March Speech " — was in support of this Compromise. It was a noble effort to secure a lasting settlement of the slavery question, but he was bitterly denounced throughout the north as a renegade. In July 1850 Webster again became secretary of state, in the cabinet of President Fillmore. Perhaps the most important act of his second term was obtaining the release of Kossuth and other Hun- garian refugees who had fled to Turkey, and whose surrender had been demanded by the Austrian government. He died at his home in M;irshfield, Massachusetts, on the 24th of October 1852. Webster was twice married— first in 1808 to Grace, daughter of Rev. Elijah Fletcher, a New Hampshire clergyman. She died in 1828, leaving two sons, Daniel Fletcher, killed in the second battle of Bull Run, and Edward, a major in the United States army, who died while serving in the Mexican War, and a daughter Julia, who married Samuel Appleton. Webster's second wife was Caroline Le Roy, daughter of Jacob Le Roy, a New York merchant. He was married to her in 1829 and she survived him.

The universal expression of respect and admiration at the time of Webster's death showed that he had retained the confidence of his people. Never, since the death of Washington, had there been in the United States such a universal expression of public sorrow and bereavement. It is not too much to say that the conviction of the justice of their cause that carried the northern states successfully through the Civil War was largely due to the arguments of Webster. He had convinced the majority of the people that the government created by the Constitution was not a league or confederacy, but a Union, and had all the powers necessary to its maintenance and preservation. He had con- vinced the Supreme Court, and established the principle in American jurisprudence, that whenever a power is granted by a Constitution, everything that is fairly and reasonably involved in the exercise of that power is granted also. He established the freedom of the instrumentalities of the national government from adverse legislation by the states; freedom of commerce between the different states; the right of Congress to regulate the entire passenger traffic through and from the United States, and the sacredness of public franchises from legislative assault. The establishment of these principles was essential to the integrity and permanence of the American Union.

Bibliography. — The Works of Daniel Webster (6 vols., Boston, 1 851) contain a biographical memoir by Edward Everett; G. T. Curtis, Life of Daniel Webster (2 vols., New York, 1870) is the most complete biography, but it is written wholly from an admirer's point of view. See also J. W. Mclntyre (ed.), Writings and Speeches of Daniel Webster (iS vols., Boston, 1903); Fletcher Webster (ed.),

*Daniel Webster's Private Correspondence (2 vols., Boston, 1857) * H. C. Lodge, Daniel Webster (Boston, 1899) ; J. B. Mr.Master, Daniel Webster (New York, 1902); E. P. Wheeler, Daniel Webster, the Expounder of the Constitution (New York, 1905); S. W. McCall, Daniel Webster (Boston, 1902J; and Norman Hapgood, Daniel Webster (Boston, 1899). (E. P. W.; X.)*

WEBSTER, JOHN (fl. 1602-1624), English dramatist, was a writer for the stage in the year 1602, when he had a share in three plays noted by Philip Henslow, and he published in 1624 the city pageant for that year, " invented and written by John Webster, merchant-tailor." In the same year a tragedy by Ford and Webster, A late Murther of the Sonn upon the Mother, was licensed for the stage; it is one of the numberless treasures now lost to us through the carelessness of genius or the malignity of chance. Beyond the period included between these two dates there are no traces to be found of his existence; nor is anything known of it with any certainty during that period, except that seven plays appeared with his name on the title page, three of them only the work of his unassisted hand. He was the author of certain additions to Marston's tragi-comedy of The Malcontent (1604); these probably do not extend beyond the induction, a curious and vivacious prelude to a powerful and irregular work of somewhat morbid and sardonic genius. Three years later, in i6o7j two comedies and a tragedy, " written by Thomas Dekker and John Webster," were given to the press. The comedies are lively and humorous, full of movement and incident; but the beautiful interlude of poetry which distinguishes the second scene of the fourth act of Westward Ho! is unmistakably and unquestionably the work of Dekker; while the companion comedy of Northward Ho! is composed throughout of homespun and coarse-grained prose. The Famous History of Sir Thomas Wyalt is apparently a most awkward and injurious abridgment of an historical play in two parts on a pathetic but undramatic subject, the fate of Lady Jane Grey. In this lost play of Lady Jane (noted by Henslow in 1602) Heywood, Dekker, Chettle and Smith had also taken part; so that even in its original form it can hardly have been other than a rough piece of patchwork. There are some touches of simple eloquence and rude dramatic ability in the mangled and corrupt residue which is all that survives of it; but on the whole this " history " is crude, meagre, and unimpressive. In 1612 John Webster stood revealed to the then somewhat narrow world of readers as a tragic poet and dramatist of the very foremost rank in the very highest class. The White Devil, also known as Vittoria Corombona, 1 is a tragedy based on events then comparatively recent — on a chronicle of crime and retribution in which the leading circumstances weie altered and adapted with the most delicate art and the most consummate judgment from the incompleteness of incomposite reality to the requisites of the stage of Shakespeare. By him

alone among English poets have the finest scenes and passages of this tragedy been ever surpassed or equalled in the crowning qualities of tragic or dramatic poetry — in pathos and passion, in subtlety and strength, in harmonious variety of art and infallible fidelity to nature. Eleven years had elapsed when the twin masterpiece of its author — if not indeed a still greater or more absolute masterpiece — was published by the poet who had given it to the stage seven years before. The Duchess of Malfy 2 (an Anglicized version of Amalli, corresponding to such designa- tions as Florence, Venice and Naples) was probably brought on the stage about the time of the death of Shakespeare; it was first printed in the memorable year which witnessed the first publication of his collected plays. This tragedy stands out among its compeers as one of the imperishable and ineradicable land- marks of literature. All the great qualities apparent in The White Devil reappear in The Duchess of Malfy, combined with a yet more perfect execution, and utilized with a yet more consummate

1 The White Divel; or, The Tragedy of Paulo Giordano Vrsini, Duke of Brachiano, 'with the Life and Death of Vittoria Corombona, the famous Venetian Curtisan (1612). Other editions, with varying title-pages, 1631, 1665, 1672.

2 The Dutchess of Malfey, A Tragedy. As it was approvedly well acted at Blackfriers . . . (1623). The plot is taken from a novel by Bandello, and is also the subject of a tragedy by Lope de Vega, El Mayor Domo de la duquessa d Amalfi.

skill. No poet has ever so long and so successfully sustained at their utmost height and intensity the expressed emotions and the united effects of terror and pity. The transcendent imagina- tion and the impassioned sympathy which inspire this most tragic of all tragedies save King Lear are fused together in the fourth act into a creation which has hardly been excelled for unflagging energy of impression and of pathos in all the dramatic or poetic literature of the world. Its wild and fearful sublimity of invention is not more exceptional than the exquisite justice and tenderness and subtlety of its expression. Some of these executive merits may be found in an ill-constructed and ill-con- ditioned tragi-comedy which was printed in the same year; but few readers will care to remember much more of The Devil's Law Case than the admirable scenes and passages which found favour in the unerring and untiring sight of Webster's first and final interpreter or commentator, Charles Lamb. Thirty-one ycarslater (1654) the noble tragedy of Appius and Virginia was given to the world — a work which

would alone have sufficed to perpetuate the memory of its author among all competent lovers of English poetry at its best. Seven years afterwards an unprincipled and ignorant bookseller published, under the title of Two New Playes: viz. A Cure for a Cuckold: a Comedy. The Thracian Wonder, A Comical History. As it hath been several times acted with great A pplause, two plays of which he assigned the authorship to John Webster and William Rowley. This attribution may or may not be accurate; the former play is a mixture of coarsely realistic farce and gracefully romantic comedy. An elegy on Henry, prince of Wales, and a few slight occasional verses, com- pose the rest of Webster's remaining extant works.

[Edward Phillips, in his Theatrum poetarum, wrongly attri- buted to him a share in The Weakest goes to the Wall. The play of Guise, mentioned by Webster himself in the introduction to The, DeviVs Law Case, is lost.]

Webster's claims to a place among the chief writers of his country were ignored for upwards of two centuries. In 1S30 the Rev. Alexander Dyce first collected and edited the works of a poet who had found his first adequate recognition twenty- two years earlier at the pious and fortunate hands of Lamb. But we cannot imagine that a presentiment or even a fore-knowledge of this long delay in the payment of a debt so long due from his countrymen to the memory of so great a poet would seriously have disturbed or distressed the mind of the man who has given us the clue to his nature in a single and an imperishable sentence — " I rest silent in my own work." (A. C. S.)

See The Works of John Webster; with some Account of the Author and Notes, by Alexander Dyce (new ed., 1857) ; The Dramatic Works of John Webster, edited by William Hazlitt the younger (1857); Hie Best Plays of Webster and Tourneur, edited by J. A. Symonds for the" Mermaid " series (1888-1903) \ Love's Graduate . . . (Oxford, 1885), in which Webster's supposed share in A Cure for a Cuckold is presented separately by S. Spring-Rice, with an introduction by Edmund Gosse. See also E. Gosse, Seventeenth- Century Studies (1883); and especially an exhaustive treatise by E. E. Stoll, John Webster, The Periods of his Work as determined by his Relations to the Drama of his Day (Boston, Massachusetts, 1905). Mr Stoll 's account (see p. 42) shows that the additional biographical suggestions made by Mr Sidney Lee in his article in the Diet. Nat. Biog. are not supported.

WEBSTER, NOAH (1758-1843), American lexicographer and journalist, was born at West Hartford, Connecticut, on the 1 6th of October 1758. He was descended from John Webster of Hartford, governor of Connecticut in 1656-1657, and on his mother's side from Governor William Bradford of Plymouth. He entered Yale in 1774, graduating in 1778. He studied law,

and was admitted to the bar at Hartford in 1781. In 1782-1783 he taught in a classical school at Goshen, New York, and became convinced of the need of better textbooks of English. In 1783- 1785 he published at Hartford A Grammatical Institute of the English Language, in three parts, a spelling-book, a grammar and a reader. This was the pioneer American work in its field, and it soon found a place in most of the schools of the United States. During the twenty years in which Webster was preparing his dictionary, his income from the spelling-book, though the royalty was less than a cent a copy, was enough to support his family; and before 1861 the sale reached more than a million copies a

year. The wide use of this book contributed greatly to uni- formity of pronunciation in the United States, and, with his dictionary, secured the general adoption in the United States of a simpler system of spelling than that current in England. In 1 785 he published Sketches of American Policy, in which he argued for a constitutional government whose authority should be vested in Congress. This he regarded as the first distinct proposal for a United States Constitution, and when in 1787 the work of the commissioners was completed at Philadelphia, where Webster was then living as superintendent of an academy, he wrote in behalf of the constitution an Examination of the Leading Principles of the Federal Constitution. In 1788 he started in New York the American Magazine, but it failed at the end of a year, and he resumed the practice of law at Hartford. In 1793, in order to support Washington's administration, he removed to New York and established a daily paper, the Minerva (afterwards the Commercial Advertiser) , and later a semi-weekly paper, the Herald (afterwards the New York Spectator). In 1798 he removed to New Haven. He served in the Connecticut House of Represen- tatives in 1 800 and 1802-07, and as a county judge in 1 807-1 1. In 1807 he published A Philosophical and Practical Grammar of the English Language. In 1806 he had brought out A Compendious Dictionary of the English Language, and in 1807 he began work on his dictionary. While engaged on it he removed in 1812 to Amherst, Massachusetts, where he was president of the Board of Trustees of the Academy and assisted in founding Amherst Col- lege. He was also a member of the General Court of Massa- chusetts. In 1822 he returned to New Haven, and the next year he received the degree of LL.D. from Yale. He spent a year (1824-1825) abroad, working on his dictionary, in Paris and at the university of Cambridge, where he finished his manuscript. The work came out in 182S in two volumes. It contained 12,000 words and from 30,000 to 40,000 definitions that had not appeared in any earlier dictionary. An English edition soon followed. In 1840 the second edition, corrected and enlarged, came out, in two volumes. He completed the revision of an appendix a few days before his death, which occurred in New Haven on the 28th of May 1843.

The dictionary was revised in 1847 under the editorship of Professor Chauncey A. Goodrich and published in one volume. In 1859 a pictorial edition was issued. In 1864 it was revised mainly under the direction of Professor Noah Porter, and again in 1890 under the same direction, the latter revision appearing with the title of the International Dictionary of the English Language. The latter was again issued in 1900, with a supplement of 25,000 words and phrases, under the supervision of William Torrey Harris, who edited another revision, in 1909, under the title of the New International Dictionary of the English Language. It has frequently been abridged.

Among Webster's other works are Dissertations on the English Language (1789), a course of lectures that he had given three years before in some of the chief American cities; Essays (1790); The Revolution in France (1794); A Brief History of Epidemics and Pestilential Diseases (1799), in two vols.; The Rights of Neutral Nations in Time of War (1802) ; Historical Notices of the Origin and State of Banking Institutions and Insurance Offices (1802); and A Collection of Papers on Political, Literary, and Moral Subjects (1843), which included " On the Supposed Change in the Temperature of Winter," a treatise showing long and careful "research. He also published Governor John Winthrop's Journal in 1790, aim wrote a History of the United States, of which a revised edition ap- peared in 1839.

See Memoir of Noah Webster by his son-in-law, Professor Chauncey A. Goodrich, in the quarto editions of the Dictionary, also Noah Webster (1882), by Horace E. Scudder, in " American Men of Letters."

WEBSTER, THOMAS (1773-1844), British geologist, was born in the Orkney Isles in 1773, and was educated at Aberdeen. He subsequently went to London and studied architecture, the Royal Institution in Albemarle Street being built from his design. In 1826 he was appointed house-secretary and curator to the Geological Society of London, and for many years he rendered important services in editing and illustrating the Transactions of the Society. In 1841-1842 he was professor of geology in Univer- sity College, London. He was distinguished for his researches on the Tertiary formations of the Isle of Wight, where he recog- nized the occurrence of both fresh-water and marine strata; h« continued his observations on the mainland of Hampshire, and

subsequently in Dorsetshire, where he described the Purbeck and Portland rocks. To him Sir Henry C. Englefield (1752-1822) was indebted for the

geological descriptions and the effective geological views and sections of the Isle of Wight and Dorset that enriched his Description of the Principal Picturesque Beauties, Antiquities and Geological Phenomena of the Isle of Wight (1816). The mineral Websterite was named after him. He died in London on the 26th of December 1844.

WEBSTER, THOMAS (1800-1886), English figure painter, was born at Ranelagh Street, Pimlico, London, on the 20th of March 1800. His father was a member of the household of George III.; and the son, having shown an aptitude for music, became a chorister in the Chapel Royal, St James's. He, however, developed a still stronger love for painting, and in 1821 he was admitted student of the Royal Academy, to whose exhibition he contributed, in 1824, portraits of " Mrs Robinson and Family." In the following year he gained the first medal in the school of painting. Till 1879 he continued to exhibit in the Royal Academy work of a genial and gently humorous character, dealing com- monly with subjects of familiar incident, and especially of child life. Many of these were exceedingly popular, particularly his " Punch " (1840)5 which procured in 1841 his election as A.R.A., followed five years later by full membership. He became an honorary retired academician in 1877, and died at Cranbrook, Kent, on the 23rd of September 1886. His " Going into School, or the Truant" (1836), and his "Dame's School" (1S45) are in the National Gallery, and five of his works are in the South Kensington Museum.

WEBSTER, a township of Worcester county, Massachusetts, U.S.A., on the French river, about 16 m. S.S.W. of Worcester. Pop. (1890) 7031; (1900) 8804, of whom 3562 were foreign- born; (1910 census), 11,509. Land area (1906), 12-19 sc l- m – Webster is served by the New York, New Haven & Hartford, and the Boston & Albany railways, and by intcrurban electric lines. In the township is Lake Chaubunagungamaug, a beautiful sheet of water about 2 sq. m. in area. The manufacture of textiles and of boots and shoes is the principal industry; the total value of the factory product in 1905 was $5,867,769. Webster was founded by Samuel Slater (1768-1835), who in 1812 built cotton-mills and in 1815-1816 began the manufacture of woollen cloth. The township, named in honour of Daniel Webster, was erected in 1832 from common lands and from parts of Dudley and Oxford townships, which before the cotton-mills were built here were almost uninhabited.

See Holmes Ammidown, Historical Collections (New York, 1874), vol. i. pp. 461-524.

WECKHERLIN, GEORG RUDOLF (1584-1653), German poet, was born at Stuttgart on the 15th of September 1584. After studying law he settled at Stuttgart, and, as secretary to the Duke Johann Friedrich of Wiirttcmberg,

was employed on diplomatic missions to France and England. Between 1620 and 1624 he lived in England in the service of the Palatinate, and seems also to have been employed by the English govern- ment. In 1644 he was appointed " Secretary for Foreign Tongues " in England, a position in which, on the establishment of the Commonwealth, he was followed byMilton. He died in London on the 13th of February 1653. Weckherlin was the most distinguished of the circle of South German poets who prepared the way for the Renaissance movement associated in Germany with "Martin Opitz. Two volumes of his Oden und Gescinge appeared in 1618 and 1619; his collected Geistliche und weltliche Gedichte in 1641. His models were the poets of the French PUiade, and with his psalms, odes and sonnets he broke new ground for the German lyric. An epic poem on the death of Gustavus Adolphus, in alexandrines, seems to have won most favour with his contemporaries.

Weckherlin's Gedichte have been edited by H. Fischer for the Stuttgarter LiterarisckerVerein(vo\s. cxcix.-cc., 1894 1895). Selections were published by W. Miiller (1823) and K. Goedeke (1873). See also C. P. Conz, Nachrickten von dem Leben und den Schriften Weckher lin s (1803) ; E. Hopfner, G. R. Weckherlins Oden und Gesange (1865) ; H. Fischer, Beitrdge zur Literaturgeschichte Sckwabens (1891), and the same author's article in the AUgemeine deutsche Biographic (1896).

WEDDERBURN, JAMES (i495?-i533), JOHN (1500-1556) and ROBERT (i5io??i556), Scottish poets and religious re formers, were natives of Dundee, where their father James Weddcrburn was a prosperous merchant. All three .brothers studied at St Andrews University. James Wedderburn, who had gone to St Andrews in 1514, was for a time in Fran.ce prepar- ing for a mercantile career. On his return to Dundee in 1514 he received instruction in the Reformed faith from Friar Hewat, a Dominican monk. He composed a play on the beheading of St John the Baptist, and another, a morality satirizing church abuses, in the setting of episodes from the story of Dionysius the Tyrant, both of which were performed in 1540 in the play-field of Dundee. Neither of these nor a third ascribed to him by Calderwood, the historian, are extant. A charge cf heresy was brought against him, but he escaped to France, and established himself as a merchant at Rouen or Dieppe, where he lived un- molested until his death in 1553, although attempts were made by the Scottish community there to bring further charges against him.

John Wedderburn graduated M.A. at St Andrews in 1528, He took priests' orders and appears to have held the chaplaincy of St Matthews, Dundee, but in March 1539 he was accused of heresy, apparently for having, in conjunction with his brothers, written some anti-Catholic ballads. He escaped to Wittenberg, where with other of his compatriots he received the

teaching of the German reformers. There he gained an acquaintance with the Lutheran hymns, which he turned to account on his return to Scotland. The death of James V. and the known leanings of the regent, the earl of Arran, to reform, encouraged many exiles, Wedderburn among them, to revisit Scotland. It is probable that he was the author of the greater portion of the Compendious Book of Psalms and Spiritual Songs which contains a large number of hymns from the German. The enormous influence of the collection, with its added Gude and Godlie Ballatis, on Scottish reform, is attested by the penalties enacted against the authors and printers of these books. John Wedder- burn was in Dundee as late as 1546, when he was obliged to flee to England. John Johnston, in his Coronis martyrum says he died in exile in 1556.

Robert Wedderburn, who graduated M.A. in 1530, was ordained priest, and succeeded his uncle John Barry as vicar of Dundee; but before he came into actual possession he also was suspected of heresy, and was compelled to flee to France and Germany. He returned to Scotland in 1546. He appears to have been actual vicar of Dundee in 1552. His sons were legitimized in January 1553.

The earliest known edition of the Compendious Book of Psalms and Spiritual Songs (of which an unique copy is extant) dates back to ˆ567, though the contents were probably published in broad sheets during John Wedderburn 's lifetime. It consists of a calendar and almanac, a catechism, hymns, many of them translations from the German, metrical versions of the Psalms, and a collection of ballads and satirical poems against the Catholic church and clergy. The separate shares of the brothers in this compilation cannot be settled, but Robert is said to have edited the whole and added the section of " gude and godlie ballatis." Many of these ballads are adapted from secular songs. Editions of the book appeared in 1578 (printed by John" Ros), in 1600 (by Robert Smith), in 1621 (by Andro Hart); selections were published by Lord Hailes (1765) and by Sibbald (1802) ; a reprint of the 1621 volume was edited by Sir J. G. Dalyell in Scotish Poems of the Sixteenth Century (1801); and of the 1578 volume by David Laing in 1868. In 1897 Professor A. F. Mitchell reprinted the 1567 volume (expurgated) for the Scottish Text Society.

" Vedderburn's " Complainte of Scoilande (1549) hasbeen variously assigned to Robert Wedderburn, to Sir David Lyndsay and to Sir James Inglis, who was chaplain of the Abbey of Cambuskenneth from about 1508 to 1550. It is a prose treatise pleading for the maintenance of the Scottish alliance with France, written by a determined enemy of England and of the English party in Scotland. It is dedicated to Mary of Guise, and consists of the " Dreme " of Dame Scotia and her complaint against her three sons. These two sections are connected by a " Monologue Recreatif," in which

the author displays his general knowledge of popular songs, dances and tales, of astronomy, natural history and naval matters. Four copies of this work are extant, but in none is the title-page preserved. Tn the Harleian catalogue the book is entered as Vedderburn's Complainte of Scotlande, wyth ane Kxortatione to the thre Estaits to be vigilante in the Deffens of their Public Veil (1549) {Catalogus Bibliothecae

Harleianae, vol. i. no. 8371). This title, which is repeated with varia- tions in spelling in vol. iv. no. 12070, bears every mark of authenticity. The book appears to have been printed in France, and the idea of Dame Scotia's exhortations to her sons, the Three Estates, is borrowed from Alain Chartier's Quadrilogue invectif, some passages of which are appropriated outright. Other passages are borrowings from Octavien de Saint Gelais and Sir David Lyndsay. There are strong arguments against Robert Wedderburn's authorship, as maintained by Laing and others. It is not likely that he would write in support of Cardinal Beaton's policy, and the dialect is an ex- aggerated form of Latinized Middle Scots, differing materially from the language of the Compendious Book. Some of the orthographical and typographical peculiarities are due to the fact that the book was set. up by Parisian printers. Sir J. A. H. Murray inclines to assign it to Sir James Inglis, or an unknown priest of the name of Wetlderburn.

The text of the Complaynt was first edited by Leyden in 1801. Murray's edition for the E.E.T.S. appeared in 1872. The intro- duction to the latter requires revision in the light of later discoveries as to the plagiarisms in the text. See the paper by W. A. Neilson in The Journal of Germanic Philology (iv.), the note by W. A. Craigie in The Modern Quarterly of Language and Literature (i. 267), Gregory Smith's Specimens of Middle Scots (1902), p. 135 et seq., and the article bv J. T. T. Brown in the Scottish Historical Review (January

WEDDING, the common term for the mairiage ceremony. The verb " to wed " is properly to engage by a pledge (O. Eng. -wed, a pledge, wager; cf. Lat. vas, vadis; M. Dutch wedde, pledge, pawn; Swed. vad, bet, &c). The term "wedlock" (O. Eng. wedldc: from lac, a gift), used of the stale of marriage, or the vows and sacrament of marriage, properly means a gift given as a pledge; cf. Ger. Morgengabe, the gift to the bride on the morning after the marriage.

See Marriage and Family.

WEDGE (0. Eng. weeg, a mass of metal, cognate with Dutch wig, wigge, Dan. vaegge. &c; in Lilh. the cognate form outside Teut. is found in wagis, a peg, spigot; there is no connexion with '"' weigh/' " weight," which must be referred to the root wcgh. to lift, carry, draw, cf. Lat. vehere, whence " vehicle/' &c), a piece of wood or metal, broad and thick at one end, and inclined to a thin edge or point at the other, used as a means for splitting wood, rocks, &c, of keeping two closely pressing surfaces apart, or generally for exerting pressure in a confined space. The " wedge " has sometimes been classed as one of the simple mechanical powers, but it is properly only an application of the inclined plane.

In meteorology, the term " wedge " is used of a narrow area of high pressure between two adjacent cyclonic systems, which takes the form of a wedge or tongue, as do the isobars represent- ing it on a weather-chart. A wedge moves along between the rear of a retreating cyclone and the front of one advancing, and may be regarded as a projection from an an ticy clonic system lying to one side of the course of the cyclones. As the crest of the wedge {i.e. the line of highest pressure) passes over any point the wind there changes suddenly from one direction almost to the opposite, while the clearing weather of the retreating cyclone and the temporary fine weather after its passing are quickly succeeded by a break indicating the approach of the following cyclone. Conditions exactly opposite to those accompanying a wedge are provided by a " V-shaped depression."

WEDGWOOD, JOSIAH (1730-1795), the most distinguished of English manufacturers of pottery, came of a family many members of which had been established as potters in Stafford- shire throughout the 17th century and had played a notable part in the development of the infant industry. Dr Thomas Wedgwood of Burslem was one of the best of the early salt- glaze potters. Josiah, born in 1730, was the youngest child of another Thomas Wedgwood, who owned a small but thriving pottery in Burslem. At a very early age he distinguished himself by keen powers of observation and interest in all that was curious and beautiful. Soon after the death of his father in 1739, Josiah, then scarcely ten years of age, was taken away from school and set to learn the art of " throwing " clay, i.e. shaping pottery vessels on the thrower's wheel, at which he soon became extraordinarily skilful.

In 1744 he was apprenticed to his eldest brother, who had succeeded to the management of his father's pottery; and in

1752, shortly after the term of his apprenticeship had expired, he became manager of a small pottery at Stoke-upon-Trent, known as Alders pottery, at a very moderate salary. Within a year or two he became junior partner with Thomas Whicldon of Fen-ton, then the cleverest master-potter in

Staffordshire. Many of Whieldon's apprentices afterwards became noted potters, and there can be little doubt that Wedgwood gained greatly at this period of his life by his association with Wh'ieldon. But he was too original to remain long content with a subordinate position, and the pottery business was developing so rapidly that he had every inducement to commence work on his own account.

In 1759 he leased the ivy House pottery in Burslem from some relatives, and like a sensible man he continued to make only such pottery as was being made at the period by his feJlow- manufacturers. Salt-glaze and green and yellow glaze seem to have been his first staples. In 1762 he also leased the Brick- House, alias " Bell " works, at Burslem. The fine white English earthenware was just reaching perfection, and Wedgwood was soon one of its best-known makers. He was most active and energetic in his efforts, not only for the improvement of Stafford- shire pottery, but almost equally so for the improvement of turnpike roads, the construction of a canal (the Trent & Mersey) and the founding of schools and chapels. Almost the first step in his public career outside his native district was the presenta- tion of a service of his improved cream-coloured earthenware to Queen Charlotte in 1762. The new ware was greatly appreciated, and Wedgwood was appointed potter to the queen and afterwards to the king. He gave the name of Queen's Ware to his productions of this class, and this judicious royal patronage awarded to a most deserving manufacturer un- doubtedly helped Wedgwood greatly. Having laid the founda- tions of a successful business in his admirable domestic pottery — the best the world had ever seen up to that time — he turned his attention to artistic pottery, and the European renaissance of classic art — fostered by the discovery of Pompeii and the recovery of Greek painted vases from the ancient graves in Campania and other parts of Italy — being at its height it was natural that Wedgwood should turn to such a source of inspiration. Although every European country was affected by this neo-classical revival it may be claimed that England absorbed it more com- pletely than any other country, for the brothers Adam (the architects) and Josiah Wedgwood brought it into absolute correspondence with modern tastes and ideas. W r edgwood was particularly successful in this direction, for his " dry " bodies — some of which, like the black and cane bodies, had long been known in the district, others, such as the famous Jasper bodies, which he invented after years of laborious effort — lent themselves particularly well to the reproduction of designs based on the later phases of Greek art. If our increased appreciation and knowledge of Greek and Roman art makes us at times impatient with the mechanical perfection of the works of Wedgwood and his contemporaries, the fault is even more the fault of a nation and a period than that of any individual, however com- manding. It will always remain to Wedgwood's credit that he was the most successful

and original potter the world has ever seen — the only one, through all the centuries, of whom it can be truthfully said that the whole subsequent course of pottery manufacture has been influenced by his skill. –

Of the externals of his life a few facts will suffice. He married his cousin, Sarah Wedgwood, in 1764, and they had a numerous family of sons and daughters. One of these daughters was the mother of the famous naturalist Charles Darwin. Some time after his marriage (viz. 1768) he entered into a partnership with Thomas Bentley of Liverpool, a man of considerable taste and culture. Bentley, who was a handsome, courtly man, attended largely to the London sales. In 1769 they opened splendid new works, near Hanley, that with their classic leanings they christened "Etruria." They continued a practiceof Wedgwood's in employing able artists to produce designs, and the most famous of these was John Flaxman, whose name will for ever be associated with the firm's productions. Bentley diedin 1780 and Wedgwood

remained sole owner of the Etruria works until 1790, when he took some of his sons and a nephew, named Byerley, into partner- ship. He died on the 3rd of January 179s, rich in honours and in friends, for besides being a great potter he was a man of high moral worth, and was associated with many noted men of his time, amongst whom should be mentioned Sir Joseph Banks, Joseph Priestley and Erasmus Darwin. His descendants have carried on the business at Etruria to this day, and have lately established at the works a Wedgwood irruseum of great interest.

See Ceramics. For detailed accounts of his life see Eliza Metyeard t Lift of Wedgwood (1865-1S66); Jewitt, Life of Wedgwood (1865); Rathbone, Old Wedgwood (1893); Church, Josiak Wedgwood: Master-Potter (1894; new ed., 1903); Burton, History and Descrip- tion of English- Earthenware and Stoneware (1904) ; J. C. Wedgwood, A History of the Wedgwood Family (1909). (W. B.)*

' WEDMORE, FREDERICK (1844-), English art critic and man of letters, was born at Richmond Hill, Clifton, on the oth of July 1844, the eldest son of Thomas Wedmore of Druids Stoke, Stoke Bishop. His family were Quakers, and he was educated at a Quaker private school and then in Lausanne and Paris. After a short experience of journalism in Bristol he came to London in 1868, and began to write for the Spectator. His early works included two novels, but the best examples of his careful and artistic prose are perhaps to be found in his volumes of short stories. Pastorals of

France (1877), Renunciations (1893), Orgeas and Miradou (1896), reprinted in 1905 as A Dream of Provence. In 1900 he published another novel, The Collapse of the Penitent. As early as 1878 he had begun a long connexion with the London Standard as art critic. He began his studies on etching with a noteworthy paper in the Nineteenth Century (1877-1878) on the etchings of Charles Meryon. This was followed by The Four Masters of Etching (1883), with original etchings by Sir F. S. Haden, Jules Ferdinand Jacque- mart, J. M. Whistler, and Alphonse Legros; Etching in England (1895); an English edition (1S94) of E. Michel's Rembrandt; and a study and a catalogue of Whistler's Etchings (1899). His other works include Studies in English Art (2 vols., 1876-1880), The Masters of Genre Painting (18S0), English Water Colour (1902), Turner and Ruskin (2 vols., 1900).

WEDNESBURY, a market town and municipal and parlia- mentary borough of Staffordshire, England, in the Black Country, i2i m. N.W. from London by the London & North- Western railway, and on the northern line of the Great Western. Pop. (1901) 26,554. An overhead electric tramway connects with Walsall, 3! m. N. The town is ancient, but of modern growth and appearance as an industrial centre. The church of St Bartholomew, however, is a fine Perpendicular building, standing high. It is traditionally supposed to occupy the site of a place of the worship of Woden or Odin, and the name of the town to be derived from this god through the form Wodensborough. A church was built, probably in the nth century, and from 1301 to 1535 the advowson, tithes, &c, belonged to the abbot of Halesowen. The present church was several times restored in the 18th and 19th centuries. The chief public buildings are the town hall (1872), art gallery (1891), and free library (1878). Coal, limestone and ironstone are mined. A special kind of coal, giving an intense heat, is largely used in forges. There are great iron and steel works, producing every kind of heavy goods used by railway and engineering works, such as boiler plates, rails, axles, tubes, bolts and nuts. Stoneware potteries are also important. Similar industries, with brick-making, are practised at Darlaston, an urban district (pop. 15,395), within the parliamentary borough. Wednesbury returns one member to parliament. The town is governed by a mayor, 4 aldermen, and 12 councillors. Area, 2287 acres.

HereEthelfleda,widowof iEthelredof Mercia, in 916 constructed a castle. The place is not mentioned in Domesday, but appears to have belonged to the barony of Dudley. After the Conquest it became a demesne of the crown, and it was bestowed by Henry II. on the Heronvilles. It received parliamentary representation in 1867, and became a municipal borough in 1886.

WEED, THURLOW (1797-1882), American journalist and politician, was

born in Cairo, Greene county, New York, on the

15th of November 1797. He began to earn his own living at the age of eight. From 1811 to 1818 he worked as an apprentice and journeyman printer in Onondaga Hollow, Utica, Auburn, Cooperstown, Albany and New York City, His first independent enterprises, the Republican Agriculturist, established at Norwich, N.Y., in 1818, and the Onondaga County Republican, established at Manlius, N.Y., in 1821, proving unsuccessful, he became editor of the Rochester Telegraph in 1822. Entering politics as an opponent of the Democratic machine, which he termed the Albany Regency, Weed was in 1824 elected to the Assembly on the John Quincy Adams ticket, serving for a single session (1825). Two years later, during the excitement over the disappearance of William Morgan (see Anti-Masonic Party), he retired from the Telegraph and threw himself with enthusiasm into the attack on the Masonic order, editing for a time the Anti-Masonic Enquirer. In 1830 he established and became editor of the Albany Evening Journal, which he controlled for thirty-five years. Supporting the WHgs and later the Republicans, it was one of the most influential anti-slavery papers in the north- east; and Thurlow Weed himself became a considerable force in politics. In 1863 he retired from the Journal and settled in New York City. In 1867 he assumed editorial control of the Commercial Advertiser, but was soon compelled to resign on account of ill-health. He died in New York City on the 22nd of November 1882,

See The Life of Thurlow Weed (vol. i. f Autobiography, edited by his daughter, Harriet A. Weed; vol. ii., Memoir, by his grandson, Thurlow Weed Barnes, Boston and New York, 1 884). The Memoir is especially full for the period 1 850-1 867.

WEEHAWKEN, a township of Hudson county, New Jersey, U.S.A., in the N.E. part of the state, on the Hudson river, adjoining Hoboken and opposite the city of New York. Pop. (1890) 1943; (1900) 5325; (1910 census), 11,228. It is served by the New York, Ontario & Western, and the West Shore railways (being a terminus of the latter), and by suburban electric lines, and is connected with New York City by steam ferries. The township consists of a narrow strip of land along the western bank of the Hudson, and at the southern extremity of the Palisades. The extensive water-front is lined with wharves, some of which can accommodate the largest ocean steamers. On a ledge below the crest of the Palisades is the famous duelling ground, where New York citizens and others once settled ,their quarrels. Originally a part of Hoboken and North Bergen, the township of Weehawken was separately incorporated in 1859. Its name is an Indian word said to mean ” maize land.”

*WEEK (from A.S. wicu, Germanic *wikon } probably = change, turn), the name given to periods of time, varying in length in different parts of the world, but shorter than a " month." The month may be divided in two ways: a fractional part may be taken (decad or pentad), as in East Africa or Ancient Egypt (moon-week), or the week may be settled without regard to the length of the month (market-week, &c). The seven-day week (see Calendar) originated in West Asia, spread to Europe and later to North Africa (Mahommedan). In other parts of Africa three, four (especially in the Congo), five, six and eight (double four) day weeks are found, and always in association with the market; the same applies to the three-day week of the Muyscas (S. America), the four-day week of the Chibchas, the five-day week of Persia, Malaysia, Java, Celebes, New Guinea and Mexico; in ancient Scandinavia a five-day period was in use, but markets were probably unknown. That the recurrence of the market determined the length of the week seems clear from the Wajagga custom of naming the days after the markets they visit, as well as from the fact that on the Congo the word for week is the same as the word for market. Among agricultural tribes in Africa one day of the week, which varies from place to place, is often a rest-day, visiting the market being the only work allowed.*

Lasch in Zts.fur Sodalwissenschaft, ix. 619 seq., and N.W. Thomas in Journ. Comparative Legislation, xix. 90 seq., refer to the week in connexion with the market. (N. W. T.)

WEEKS, EDWIN LORD (1849-1903), American artist, was born at Boston, Massachusetts, in 1849. He was a pupil of Leon Bounat and of J. L. Gerome, at Paris. He made many

voyages to the East, and was distinguished as a painter of oriental scenes. In 1895 he wrote and illustrated a book of travels, From the Black Sea through Persia and India, and two years later he published Episodes of Mountaineering. He died on the 17 th of November 1903. He was a member of the Legion of Honour, France, an officer of the Order of St Michael, Germany, and a member of the Secession, Munich.

WEENIX, JAN BAPTIST (1621-1660), Dutch painter, the son of an architect, was born in Amsterdam, and studied first under Jan Mieker, then at Utrecht under A. Blocmaert, and at Amsterdam under Moijaert, and finally, between 1643 and 1647, in Rome. In that city he acquired a great name and worked for Pope Innocent and Cardinal Pamphili. He returned to his native country in 1649, in which year he became master of the gild

of St Luke at Utrecht, where he died in 1660. He was a very productive and versatile pointer, his favourite subjects being landscapes with ruins and large figures, seaports, and, later in life, large sLill-Hfe pictures of dead game. Now and then he attempted religious genre, one of the rare pieces of this kind being the " Jacob and Esau " at the Dresden Gallery. At the National Gallery, London, is a " Hunt- ing Scene " by the master, and the Glasgow Gallery has a char- acteristic painting of ruins. Weenix is represented at most of the important continental galleries, notably at Munich, Vienna, Berlin, Amsterdam, and St Petersburg. His chief pupils were his son Jan, Berchem, and Hondecoeter.

His son, Jan Weenix (1640-1719), was born at Amsterdam and was a member of the Utrecht gild of painters in 1664 and 1668. Like his father he devoted himself to a variety of sub- jects, but his fame is chiefly due to his paintings of dead game and of hunting scenes. Indeed, many of the pictures of this genre, which were formerly ascribed to the elder Weenix, are now generally considered to be the works of his son, who even at the early age of twenty rivalled, and subsequently surpassed, his father in breadth of handling and richness of colour. At Amsterdam he was frequently employed to decorate private houses with wall-paintings on canvas; and between 1702 and 1712 he was occupied with an important series of large hunting pictures for the Prince Palatine Johann Wilhelm's castle of Bensberg, near Cologne. Some of these pictures are now at Munich Gallery. He died at Amsterdam in 1719. Many of his best works are to be found in English private collections, though the National Gallery has but a single example, a painting of dead game and a dog. Jan Weenix is well represented at the galleries of Amsterdam, The Hague, Haarlem, Rotterdam, Berlin, and Paris.

WEEVER, JOHN (1576-1632), English poet and antiquary, a native of Lancashire, was born in 1576. He was educated at Queens' College, Cambridge; where he resided for about four years from 1594, but he took no degree. In 1599 he published Kpigrammes in ike Oldest Cut and Newest Fashionˆ containing a sonnet on Shakespeare, and epigrams on Samuel Daniel, Michael Drayton, Ben Jonson, William Warner and Christopher Middleton, all of which are valuable to the literary historian. In 1601 he published The Mirror of Martyrs or The Life and Death of . . . Sir John Oldcastie, which he calls in his preface the " first trew Oldcastie," perhaps on account of the fact that Shakespeare's Falstaff first appeared as Sir John Oldcastie. In the fourth stanza of this long poem, in which Sir John is his own panegyrist, occurs a reminiscence of Shakespeare's Julius Caesar which serves to fix the date of the play. After travelling in France, the Low Countries and Italy, Weever settled in Clerken- well, and made friends among the chief antiquaries of his time. The result of extensive travels in his own country appeared in Ancient Funerall Monuments (1631), now

valuable on account of the later obliteration of the inscriptions.

The Huth Library contains a unique copy of a thumb-book Agnus Dei (1606), containing a history of Christ. The Mirror of Martyrs has been reprinted for the Ruxburghe Club (1872).

WEEVER. The weevcrs {Trachinus) are small marine fishes which are common on the coasts of Europe, and which have attained notoriety from the painful and sometimes dangerous

wounds they are able to inflict upon those who incautiously handle them. They belong to a family of spiny-rayed fishes (Tra- chinidae), and are distinguished by a long low body with two dorsal fins, the anterior of which is composed of six or seven spines only, the posterior being 'long and many-rayed; their anal resembles in form and composition the second dorsal fin. The ventral fins are placed in advance of the pectorals, and consist of a spine and five rays. The caudal fin has the hind margin not excised. The body is covered with very small scales, sunk in and firmly adherent to the skin, but the upper surface of the head is bony, without integument. The head, like the body, is com- pressed, with the eyes of moderate size and placed on the side of the head; the mouth is wide, oblique, and armed with bands of very small teeth.

Several species of weevers are known, but two only occur on the British coasts, viz., the Greater Weever {Trachinus draco) and the Lesser Weever {T. viper a) \ the former is frequently found of a length of 12 in., and possesses some thirty rays in the second dorsal fin, whilst the latter grows only to about half that length, and has about ten rays less in the dorsal. The coloration of both is plain, but the short first dorsal fin is always of a deep black colour. The weevers are bottom fish, burying and hiding themselves in the sand or between shingle — the lesser species living close inshore and the greater preferring deeper water, and being found sometimes floating on the surface at a distance of several miles from the shore. Al- though weevers, especially the lesser, are in the habit of burying themselves in the sand, and are abundant in some localities much resorted to by bathers, accidents from stepping upon them are much more rare than from incautiously handling them after capture. They probably make their escape on perceiving the approach of a person. The wounds are inflicted by the dorsal and opercular spines, are very painful, and sometimes cause violent local inflammation. The spines are deeply grooved, and the poisonous fluid which is lodged in the grooves is secreted by small glands at their base. The flesh is not bad eating, and great numbers of the larger species (7". draco) are brought to the Paris market. On the poisonous properties, cf. G. J. Allman, Ann. and Mag. N.H., vl. (1841), p, 161 ; L. Gressin, Contribution A I'Stude de I'appareil a venin che.z les poissons du genre Vive (Paris,

1884); W. N. Parker, Froc. Zool. Soc. (1888), p. 359; C. Phisalix, Bull. Mus. Paris (1899), p. 256; A. Briot, C,R. Soc. Biol., Iiv. (1902), pp. 1169 and 1197, and lv. (1903), p. 623.

WEEVIL, Anglo-Saxon wifel, a term now commonly applied to the members of a group of Coleoptera termed the Rhyncophora. This group is characterized by the prolongation of the head into a rostrum or proboscis, at the end of which the mouth, with its appendages, is placed. The antennae are usually elbowed, and often end in a club-shaped swelling. The basal portion of the antennae frequently lies in a depression at the side of the rostrum, and this gives the antennae the appearance of emerging half-way along the rostrum. The mouth appendages are small; the mandibles, however, are stout. The palps are very short and conical as a rule. The body is usually small; in shape it varies very much. The elytra arc very hard, and in some cases fused with one another, rendering flight impossible. The larvae are white, fleshy, apodal grubs, with a series of tubercles along each side of the body; the head is round, and bears strong jaws, and sometimes rudimentary ocelli. They are exclusively phytophagous. The Rhyncophora embrace four families, — (1) the Curculionidae, or true weevils, (2) the Scolytidae, or bark- beetles, (3) the Brenthidae, (4) the Anthribidae.

The Curculionidae form one of the largest families amongst the Coleoptera, the number of species described exceeding 20,ooo ; arranged in '1 150 genera. The antennae are elbowed, ana clavate, with the basal portion inserted in a groove. The third tarsal joint is generally bilobed. Over 400 species exist in Great Britain, few of which exceed half an inch in length. The genera Phyllobius and Polydrosus include some of the most beautiful insects found in Britain — their brilliancy, like that of the Lepidoptera, being due to the presence of microscopic scales. The diamond beetle of South America, Entimus imperialism is another singularly beautiful weevil; its colour is black, studded with spangles of golden green. The immense family of the Curculionidae includes members which differ greatly from one another in size, colour, and appearance; even the rostrum, the most striking common characteristic, varies greatly. The form of the body is very various : some are rounded or oval, others elongated, almost linear; some are covered with warty protuberances, whilst others are smooth and shining, often with a metallic lustre.

One of the commonest members of this family in Great Britain is the nut weevil, Balaninus nucutn. It is of a brownish colour,

varied with yellow, the legs reddish. Its rostrum is unusually long, being five-sixths of the body length in the female, and slightly shorter in the male. The antennae are 7-jointed. The first three joints are much longer than thick; the four following are shorter, and the seventh not longer than thick. The larva is very common in hazel nuts and filberts. When the nuts are' about half-grown, the female bores, with its rostrum, a minute hole in the stilt comparatively soft

nut-shell, and deposits an. egg within the nut. The egg is said to be pushed in by means of the long ros- trum. As the nut grows the slight puncture becomes almost obliterated, so that it is unnoticed by all but the most observant eye. The larva is a thick white grub with a brownish head, bearing fleshy tubercles along its side. It feeds upon the substance of the nut. The nuts which are infested by this insect are usually the first to fall to the ground; the larva then bores a round hole through the nut shell, by means of its jaws, and creeps out. It hides itself in the ground during the winter, and in

1. Balaninus glandium, magnified. the spring it passes into the

2. The same, natural size. pupa stage, from which it

3. The larva, magnified. emerges about August as

4. The same, natural si2e. the full-grown insect. A

5. Head and snout of the female, nearly allied form, Balan-

magnified. inns glandium, attacks both

6. The same parts of the male, magni- hazel nuts and acorns.

fied, to show arrangement of In an unobtrusive way antennae. weevils do immense harm

to vegetation. This is effected not so much by their numbers and their powers of con- sumption, as amongst caterpillars, but by their habits of attack- ing the essential parts of a plant, and causing by their injuries the death of the plant affected. They destroy the young buds, shoots and fruits, and attack the young plants in their most delicate organs. Many of them devour seed, as the corn weevils, Calandra granaria and C. oryzae, and in this way vegetation is severely injured, and its spread seriously checked. Others cause much damage in forests, by boring under the bark and through the wood of trees, whilst some even burrow in the tissue of the leaves.

The Brenthidae, Anthribidae and Scolytidae are described in the article Coleoptera.

The Bruchidae are often called " weevils," but they have no close affinity with the Rhynchophora, being nearly allied to the Chryso- melidae or leaf beetles. The antennae are straight, and inserted upon the head just in front of the eyes; they are Il-jointed, and serrated or toothed in the inside. Bruchus pisi causes considerable damage to pease ; during the spring the beetle lays its eggs in the young pea, which is devoured by the larva which hatches out in it.

(A. E. S.;G. H. C.)

WEGSCHEIDER, JULIUS AUGUST LUDWIG (1771-1849), German theologian, was born at Kiibelingen, Brunswick, on the 17th of September 1771, studied theology at Helmstadt, was tutor in a Hamburg family 1795-1805, Repetcnt at Gottingen, professor of theology at Rinteln in Hesse (1806-181 5), and at Halle from 181 5. In 1830 he (with, his colleague Wilhelm Gesenius) was threatened with deposition for teaching rationalism, and though he retained his office he lost his influence, which passed to F. A. Tholuck and Julius Muller. He died on the 27th of January

1849.

His chief works were Xjber die von der neuesten Philosophic geforderle Trennung de.r Moral von der Religion (1804); Einleitung in das Evangelium Johannis (1 806) ; and Institutiones theologicae dog maiicae (1815), to which W. Steiger's Kritik des Rationalismus in Wegscheider' s Dogmatik (1830) was a reply.

WEIGHING MACHINES. Mechanical devices for determining weights or comparing the masses of bodies may be classi- fied as (a) equal-armed balances, (&) unequal-armed balances, (c) spring balances and (d) automatic machines. Equal-armed balances may be divided into (1) scale-beams or balances in which the scale-pans are below the beam; (2) counter machines and balances on the same principle, in which the scale-pans are above the beam. Unequal-armed balances may be divided into (1) balances consisting of a single steelyard; (2) balances formed

by combinations of unequal-armed levers and steelyards, such as platform machines, weighbridges, &c.

Equal-armed Balances.

Scale-beams are the most accurate balances, and the most generally used. When constructed for purposes of extreme accuracy they will turn with the

one-millionth part of the load weighed, though to ensure such a result the knife-edges and their bearings must be extremely hard (either hardened steel or agate) and worked up with great care. The beam must be provided with a small ball of metal which can be screwed up and down a stem on the top of the beam for the purpose of accurately adjusting the position of the centre of gravity, and there should be a small adjustable weight on a fine screw projecting horizon- tally from one end of the beam for the purpose of accurately balancing the arms.

*The theory of the scale-beam is stated by Weisbach in his Mechanics of Machinery and Engineering, as follows: — In fig, 1 D is the fulcrum of the balance, S the centre of gravity of the beam a'one without the scales, chains or weights; A and B the points of suspension of the chains. If the length of the arms AC = BC=/,CD=a,SD = s, the angle of deviation of p *®*

Fig. 1.

the balance from the horizontal = , the weight of the beam alone = G, the weight on one side = P, that on the other^F-|-Z, and lastly the weight of each scale with its appurtenances = Q then

. , Zl

*ten * ~ [2 (P+Q)-hZ]a+G *;*

From this it is inferred that the deviation, and therefore the sensitive- ness, of the balance increases with the length of the beam, and de- creases as the distances, a and s, increase ; also, that a heavy balance is, ceteris paribus, less sensitive than a light one, and that the sensitive- ness decreases continually the greater the weight put upon the scales. In order to increase the sensitiveness of a balance, the line AB joining the points of suspension and the centre of gravity of the balance must be brpught nearer to each other. Finally, if a is made extremely small, so that practically ta.n = Zl/ Gs, the sensitiveness is inde- pendent of the amount weighed by the balance. Weisbach also shows that if Gy 2 is the moment of inertia of the beam, the time, t t of a vibration of the balance is

,_ MP+Q)(P+«') + Gy » \ g{2 (f+Q) a+Gs\ '

This shows that the time of a vibration increases as P, Q and / increase, and as a and x diminish. Therefore with equal weights a balance vibrates more slowly the more sensitive it is, and therefore weighing by a sensitive balance is a slower process than with a less sensitive one.

The conditions which must be fulfilled by a scale-beam in proper

adjustment are: — £1) The beam must take up a horizontal position when the weights in the two scale-pans are equal, from nothing to the full weighing capacity of the machine. (2) The beam must take up a definite position of equilibrium for a given, small difference of weight in the scale-pans. The sensitiveness, i.e. the angle of devia- tion of the beam from the horizontal after it has come to rest, due to a given small difference of weight in the scale-pans, should be such as is suited to the purposes for which the balance is intended. Bearing in mind that with ordinary trade balances there is always a possi- bility of the scale-pans and chains getting interchanged, these conditions require; (a) That the beam without the scale-pans and chains must be equally balanced and horizontal; (b) that the two scale-pans with their chains must be of equal weight; (c) that the arms of the beam must be exactly equal in length; i.e.. the line joining the end knife edges must be exactly bisected by a line drawn perpendicular to it from the fulcrum knife-edge. By testing the beam with the scale-pans attached and equal weights in the pans, and noting carefully the position which it takes up; and then inter- changing the scale-pans, &c, and again noting the position which the beam takes up, a correct inference can be drawn as to the causes of error; and if after slightly altering or adjusting the knife-edges and scale-pans in the direction indicated by the experiment, the operation is repeated, any required degree of accuracy may be ob- tained by successive approximations. The chief reason for testing balances with weights in the scale-pans rather than with the scale- pans empty, is that the balance might be unstable with the weights though stable without them. This is not an infrequent occurrence, and arises from the tendency on the part of manufacturers to make balances so extremely sensitive that they are on the verge of in- stability. In fig. 2 let ABCD be the beam of a scale-beam, Z the

Fig. 2.

fulcrum knife-edge, and X, Y the knife-edges on which the scales are hung In order to ensure a high degree of sensitiveness, balances are sometimes constructed so that Z is slightly below the line joining X

and Y, and is only slightly above H, the centre of gravity of the beam with the scale- pans and chains attached. The addition of weights in the scales will have the effect of raising the point H till it gets above Z, and the balance, becoming unstable, will turn till it is brought up by a stop of some

kind.

Fig. 3 represents a precision balance constructed to weigh with great accuracy. The beam is of bronze in a single deep casting, cored out in the middle so as to allow the saddle at the top of the stand to pass through the beam and afford a continuous bearing for the fulcrum knife-edge. The knife-edge and its bearing are both of steel or agate, and the bearing surface is flat. The end knife-edges also are of steel or agate, and have continuous bearing on flat steel or agate surfaces at the upper part of the suspension links. To relieve the knife-edges from wear when the balance is not being used a triangular frame is provided, which is lifted and lowered by a cam action at the bottom, and moves vertically in guides fixed on the stand. By its upward movement the tops of the screw studs near its ends are first received by the projecting studs on each side of the suspension links, and the suspension links are lifted off the "end knife-edges; and next, as the sliding frame continues its upward motion, the horizontal studs at the two ends of the beam are received in the forks at the ends of the sliding frame, and by them the fulcrum of the beam is lifted off its bearing. To keep the beam truly in its place, which is very necessary, as all the bearings arejlat.jthe re~

From Airy, " On Weighing Machines," Institution of Civil Engineers, 1802,

Fig. 3. — Precision Balance.

cesses for the ends of the studs are formed so as to draw the beam without strain into its true position every time that it is thrown out of gear by the sliding frame. The end knife-edges are adjusted and tightlv" jammed into exact position by means of wedge pieces and set screws, and the beam is furnished with delicate adjusting weights at its top. The position of the beam with respect to .the horizontal is shown by a horizontal pointer (not shown) projecting from one end of it, which plays past a scale, each division of which corresponds to the fV.th or t ˆth of a grain according to the size and delicacy of the machine. A first-class chemical balance would be made in this manner, but in all places where there are acids and gases the knife-edges and bearings must be made of agate, as the fumes attack and corrode steel.

For the weighing of very small quantities with balances of great delicacy, the following method is adopted: — If the balance be in perfect adjustment, and / be the length of each arm, and w a. very minute difference of the weights in the two scale-pans, by which the beam is deflected from the horizontal by a very small angle tf>, it can easily be shown that tan <>, or t£, varies as wXl. Therefore the angle of deflection which would be produced by grain weight hung at the distance l/io (for example) from*

the centre is the same as would be produced by rV n °f a grain in the scale-pan at the distance /. Therefore by graduating the top of the beam and shifting a rider grain weight till the beam is horizontal, it is easy to ascertain the small difference of weight in the scale-pans which caused the de- flection to the T Aijtli or TTi Wth part of a grain without using a weight smaller than a grain.

The fitting of the knife-edges is of great importance. In ordinary trade halancesa triangular piece of hard steel, with a finely-ground edge, is driven through a triangular hole in the beam and jammed tight. This forms the knife-edge, and the scale-pans are hung from the two projecting ends of the piece of steel. Similarly the two

projecting ends of the central piece of steel which forms the fulcrum take bearing on two cheeks of the stand, between which the beam sways. It is clear that errors will arise if the pieces of steel are not truly perpendicular to the plane of the beam, and the adjust- ment of great accuracy would be very tedious. Therefore for balances of precision the end knife-edges are fixed on the top of the beam so as to present a continuous unbroken knife-edge, and the fulcrum knife-edge is aiso made continuous, the beam being cored out or cut away to admit ol the introduction of the stand bearing. With this arrangement the knife-edges can be easily adjusted and examined, and the system is now rapidly extending to the better class of trade balances.

The knife-edges of weighing machines are the parts that w'ear out soonest, but very little is known about them experimentally, and the knife-edges made by different makers vary extremely in their angles. Those made by some of the best makers for the most delicate machines are formed to an angle of about 8o° between the sides, with the finished edge ground to an angle varying from no to 120 . The following may be taken as the maximum loads per in, of acting or efficient knife-edge allowed by the best makers; —

1. For scale-beams of the highest accuracy — From ˆ lb per in for a machine of 2 lb capacity, to 25 lb per in. for a machine of 80 lb capacity.

2. For ordinary trade scale-beams, counter machines, and dead- weight machines — From 20 lb per in. for a machine of 7 lb capacity to 600 lb per in, for a machine of 3 ton capacity.

3. For platform machines and weighbridges — From 120 lb per in- for a machine of 4 cwt. capacity, to I ton per in. for a machine oi 25 tons capacity.

The sensitiveness of scale-beams depends entirely upon the skill and care used in their construction. With balances of the highest precision it may be as high as ro7i&

In Emery's testing machine there are no knife-edges, but their function is performed by thin steel plates, which are forced under a very heavy pressure into slots formed in the parts that are to be connected, so that the parts are united by the plate. In this case there is no friction and no sensible w r ear, so that very great perman- ency of condition and constancy of action might be expected But the resistance to bending of the steel plates would render this arrange- ment unsuitable for scale-beams, in which the movement is large. In some respects it would appear to be very suitable for weighbridges, in which the movement of the lever is very small, but for general convenience of adjustment the knife-edges appear preferable. .

In the comparison of standard weights, or in any weighing opera- tions where great accuracy is required, it is necessary to use many precautions. The comparison of standard weights has to be con- ducted at the standard temperature, and the room must be brought to that temperature and maintained at it. The balance must be enclosed in a glass case to protect it from draughts of air or from the heat of the body of the operator. And the operations of placing and shifting the weights must be effected by mechanism which will enable this to be done without opening the case or exposing the machine.

When the weights which are to be compared are of different metals further complications arise, for the volumes of equal weights of different metals will be different, and therefore the quantity of air displaced by them will be different, and the difference of the weights of air displaced by the two 'weights must be allowed for. And the weight of air displaced depends upon the density of the air at the time of weighing, and therefore the barometer reading must be taken. For this correction an exact knowledge of the specific gravities of the metals under comparison is required. In this way an exact comparison of the weights in vacuo can be computed, but of course the simplest way of arriving at the result would be by the construction of a strong air-tight case which can be completely exhausted of air by an air-pump, and in which the weighing can then be effected in vacuo. The difficulty about weighing in vacuo is that it is found almost impossible to exhaust the case entirely, or even to maintain a constant degree of exhaustion, by reason of the leakage connected with the weighing operations, and in consequence weighing in vacuo is not much in favour. Whatever method is adopted, very exact weighing is a difficult and troublesome work.

Counter machines have an advantage over scale-beams in not being encumbered with suspension chains and the beam above. They are usually made with two beams, each with its three knife- edges, rigidly tied together or cast in one piece and some distance apart, so that the scale-pans being carried on two knife-edges, each is prevented from tipping over sideways. To prevent them from tipping over in the direction of the beams a vertical leg is rigidly fastened to the under side of each pan, the lower end of which is loosely secured by a horizontal stay to a pin in the middle of the frame. In using these machines there is seldom any question of determining the weight to any great nicety, and rapid action is generally of high importance. Hence they are very commonly made unstable, or " accelerating, " i.e. they are constructed with the fulcrum knife-edges lower than the line joining the end knife-edges, and they are arranged so that the beam is horizontal when the stop of the reights-pan is hard down on its bearings. This arrangement

is well adapted for weighing out parcels of goods of a definite weight, though not for ascertaining the correct weight of a given article. For the latter purpose machines are used of which the beams are made stable, or " vibrating," by constructing them with the fulcrum knife-edges above the line joining the end knife-edges.

" Accelerating " machines can be used to the advantage of the vendor in two ways. Firstly, in using them to determine the weight

Fig. 4.

of a given article. For with unstable balances, although the smallest excess of weight in the goods-pan will cause it to descend till it is brought up by its stop, yet being in this position, a very much greater weight than the difference which brought it there will be required in the weights-pan to enable it to mount again. If W be the weight in each pan when the goods-pan commenced to sink, I the length of each arm, m the distance of the fulcrum below the line joining the end knife-edges, and the angle at the fulcrum which defines the range of sway of the beam, it can easily be shown that w, the ad- ditional weight required in the weights-pan to enable the goods-pan to rise from its stop, is given by the equation w = W 2m tan 0/L — nt tan /3. So that it, for example, a fishmonger uses such a machine to ascertain the weight of a piece of fish which he places in the

goods- pan, and thereby depresses it down upon its stop, and then places weights in the weights-pan till the goods-pan rises, the customer is charged for more than the real weight of the fish. Secondly, in using them out of level, with the goods end of the machine lower than the weights end. If 6 be the angle of tilt of the machine, and the other eymbols be as before, it may be shown that the additional weight, w

Fig. 5.

which is needed in the weights-pan to enable the goods-pan to rise off its stop, is given by the equation w= W 2m tan (0—0) /L — m tan (0—0). When & is negative, as it is when the goods end of the machine is lower than the weights end, the value of w may be very appreciable. With " vibrating " machines the value of m is in general so extremely small that w is of no practical importance in either of the above cases.

If a counter machine be made with a large flat goods-pan, as in fig. 4, an error may be caused by placing the goods eccentrically

on the pan, as at D or E. Using the symbols of the diagram,. it can be shown that the effect of placing the weight W at E instead of F is to cause the end of the beam to descend, as if under the action of an additional weight, w, at F such that

w = Wa(m/~ 1 +tan 0),'h. The condition that must exist in order that the balance may weigh correctly for all positions of the weight \V is w~a, or tan = —ml~ l ; that is, the stay KG must be adjusted parallel to the line joining the points A and C. From the equation for w, it is seen that the larger h is the smaller w will be. Therefore for the larger counter machines, where it is not convenient to have the scale-pans raised high above the counter, and for " dead-weight " machines on the same principle, where it is not convenient to have the scale-pans raised high above the floor, there is an advantage in adopting the "inverted counter machine" arrangement (fig. 5), because the vertical leg can be produced upwards as high as is required. This arrangement is very common. As will be readily understood from the construction of the machines, there is more friction in counter machines than in scale-beams. The "sensitiveness " error allowed by the Board of Trade for counter machines is five times as great as that allowed for scale-beams.

The torsion balance made by the United States Torsion Balance and Scale Company of New York is a counter machine made with- out knife-edges, and is very sensitive. It is constructed with two similar beams, one above the other, which are coupled together at the ends to form a parallel motion for carrying the pans up- right. The coupling is effected by firmly clamping

the ends of the beams upon the top and bottom respectively of a loop of watch- spring, which is tightly stretched round the casting carrying the pan, as is shown in the end view in fig. 6. At their middles the beams are similarly clamped upon the top and bottomˆ of_ a loop of watch-spring ‘ which is tightly stretched round casting which is bolted upon the bed-plate. When the case which holds the machine is adjusted hori- zontally by means of its foot- screws, and the weights in the pans are equal, the beams remain perfectly horizontal; but with the slightest difference of weight in the pans the beams are tilted, and the elastic resistance of the springs to torsion allows the beams to take up a definite position of equi- librium. The lower beam carries on a saddle a scale which is raised nearly to the top of the glass case

in which the machine is enclosed, and as the beams sway this scale plays past a scratch on the glass, which is so placed that when the zero point on the scale coincides with the scratch the beams are horizontal. With proper care this machine should be very per- manent in its action.

Unequal-armed Balances.

Steelyards are simple, trustworthy and durable, but unless special contrivances are introduced for ascertaining the position of the travelling poise with very great accuracy, there will be a little uncertainty as to the reading, and therefore steelyards are not in general so accurate as scale-beams. When carefully nicked they are well-adapted for weighing out definite quantities of goods, such as 1 lb, 2 lb, &c, as in such cases there is no question of estimation. The ordinary way of using a steelyard is to bring it into a horizontal position by means of movable weights, and to infer the amount of the load from the positions of these. But it is sometimes convenient to use a fixed weight on the long arm, and to infer the amount of the load from the position of the steelyard. The rule for graduation is very simple. The simplest form is that which has a single travelling poise. The more, elaborate ones are made cither with a heavy travelling poise to measure the bulk of the load with a light travelling poise for the remainder, or else with a knife-edge at the end of the steel- yard, on which loose weights are hung to measure the bulk of the load, the remainder being measured with a light travelling poise. The advantage of the first arrangement is that the weights on the steelyard are always the same, and inconsistencies of indication are avoided, while in the second arrangement the loose weights are lighter and handier, though they must be very accurate and consistent among themselves, or the error will be considerable, by reason of the great leverage they exert.

Steelyards, like other weighing machines, will be “accelerating,” or ” vibrating ” according to the arrangement of the knife-edges.

In fig. 7 let Z be the fulcrum knife-edge, X the knife-edge on which the load R is hung, and H the centre of gravity of the weights to the right of Z, viz. the weight, W, of the steelyard acting at its centre of gravity ; G, the travelling poise ; P, acting at M ; and the weights, Q, hung on the knife-edge at Y. Then if Z be below the line joining X and H, the steelyard will be " accelerating " ; i.e. with the smallest excess of moment on the left-hand side of the fulcrum, the end C of the steelyard will rise with accelerating velocity till it is brought up by a stop of some sort; and with the smallest excess of moment on the right-hand side of the fulcrum, the end C of the steelyard will drop, and will descend with accelerating velocity till it is brought up by a similar stop. If Z be above the line XH, the steelyard is " vibrating "; i.e. it will sway or vibrate up and down, ultimately coming to rest in its position of equilibrium. Steelyards, again, are frequently arranged as counter machines, having a scoop or pan resting on a pair of knife-edges at the short end, which is prevented

1_

—T\

i«~—

53

ft w p q

Fig. 7.

from tipping over by a stay arrangement similar to that of other counter machines.

Steelyards are largely used in machines for the automatic weighing out of granular substances. The principle is as follows: The weighing is effected by a steelyard with a sliding poise which is set to weigh a definite weight of the material, say i tb. A pan is carried on the knife-edges at the short end, and is kept from tipping over by stays. A packet is placed on the pan to receive the material from the shoot of a hopper. A rod, connected at its lower end with the steelyard, carries at its upper end a horizontal dividing knife, which cuts off the flow from the shoot when the steelyard kicks. When the filled packet is removed, the steelyard resumes its original position, and the

filling goes on automatically.

The automatic personal weighing machine found at most railway stations operates by means of a steelyard carrying a fixed weight on its long arm, the load on the platform being inferred from the position of the steelyard. In fig. 8 the weight on the platform is transferred

by levers to the vertical steel band, A,, which is wrapped round an arbor on the axle of the disk- wheel, B , to which is rigidly attached the toothed segment, C. The weight, D, is rigidly attached to the axle of the wheel, B, and the counter- balance, E, is hung from the wheel, B, by means of a cord wrapped round it. When the pull of the band,

A, comes upon the wheel,

B, it revolves through a certain angle in the direc- tion of the arrow until the three forces, viz. the pull of A, the weight, D, and the counterbalance, E, are in equilibrium. The toothed segment, C, actuates the pinion, F, which carries the finger, G, and this finger remains fixed in position so long as the person is standing on the platform. If now a small weight, as a penny, be passed through the slot, H, it falls into the small box, I, and causes the lever, J, to

turn; the lever, J, which turns in friction wheels at K, and is counterbalanced at O, carries a toothed segment, L, which actuates a small pinion on the same axle as F, and is free to turn on that axle by a sleeve. This small pinion carries a finger, M, which is arranged to catch against the finger, G, when moved up to St. Consequently as the lever, J, turns, the finger, M, revolves, and Is stopped when it reaches G. The sleeve of the pinion which carries M also carries the dial finger, and if the dial is properly graduated its finger will indicate the weight. The box, I, has a hinged bottom with a projecting click finger which, as the box de- scends, plays idly over the staves of a ladder arc. When the weight is removed from the platform, the counterbalance, E, causes the

finger, G, to run back to its zero position, carrying with it the finger M, and causing the click finger of the box, I, to trip open the bottom of the box and let the penny fall out. The lever, J, regains its zero position, and all is ready for another weighing. Since so small a weight as a penny has to move the lever, J, together with the dial finger, &c., it is evident that the workmanship must be good and the friction kept very low by means of friction wheels.

Some of the largest and most accurate steelyards are those made for testing machines for tearing and crushing samples of metals and other materials.

They are sometimes made with a sliding poise weighing I ton, which hasa run of 200 in., and the steelyard can exert a pull ofioo tons.

Balances are frequently used as counting machines, when the articles to be counted are all of the same weight or nearly so, and this method is both quick and accurate. They are also used as trade computing machines, as in, the case of the machine made by the Computing Scale Company, Dayton, Ohio, U.S.A. In this machine the goods to be priced are placed on the platform of a small platform machine whose steelyard is adjusted to balance exactly the weight of the platform, levers and connexions. The rod which transmits the pull of the long body lever of the platform machine to the knife- edge at the end of the short arm of the steelyard is continued upwards, and by a simple mechanical arrangement transmits to an upper steelyard any additional pull of the long body lever due to the weight of goods placed on the platform. This upper steelyard is arranged as in fig 9, where A is the point where the pull of the long body lever due to the weight of the goods on the platform comes upon the steelyard; C is the fulcrum of the steelyard, which with the steelyard can be slid to and fro on the frame of the machine; and Q

*f) * $9 7 a O m to*

- *Fig. 9. .*

is a poise which can be slid along the upper bar of the steelyard. The steelyard is exactly in balance when there is no weight on the platform and Q is at the zero end of its run, at O. Suppose that

the weight of the goods on the platform is (p) lb, and that -th

of this weight is transmitted by the long body lever to the point

A, so that — lb is the pull at A.”” Let the lower bar of the steel-

yard be graduated in equal divisions of length, d, each of which represents one penny, so tha t the distance CA =

given by the equation &Xq.d~QXOQ, or OQˆpXqXˆQ’ K

therefore the upper bar be graduated in divisions, each of which

is -7ˆ1 the indication of the poise Q, viz. pXq graduations, gives

correctly the value of the goods. Thus to ascertain the value of goods on the platform of unknow r n weight at a given price per lb, it is only necessary

to slide the steelyard till the weight acts at the division which represents the price per lb, and then to move the poise Q till the steelyard is in balance; the number of the division which defines the position of the poise Q will indicate the sum to be paid for the goods. When the load on the platform is large, so that the value of the goods may be considerable, it is convenient to measure the larger part of the value by loose weights which, when hung at the end of the steelyard, represent each a certain money value, and the balance of the value is determined by the sliding poise Q.

In the machines commonly used to weigh loads exceeding 2 cwt. the power is applied at the end of the long arm of the steelyard and multiplied by levers from 100 to 500 times, so that the weights used are small and handy. The load is received upon four knife-edges, so that on the average each knife-edge receives only one-fourth of the load, and, as will be seen, it is immaterial whether the load is received equally by the four knife-edges or not, which is essential to the useful application of these machines.

In fig. 10 AB is the steelyard. The platform and the load upon it are carried on four knife-edges, two of which, Xi and #2, are shown, and the load is transferred to the steelyard by thetwoleversshown, the upper one CD being known as the " long body," and the lower one EF as the " short body." If ZiXiˆz-iOh, and Zit=z»y2, then the leverage of any portion of the load applied at x% will be the same as the leverage of any part of the load applied at x u and the pressure produced at y\ will be the same for equal portions of the load, whethev they were originally applied at Xi or x 2 . Platform machines, like steelyards, may be arranged either on the " accelerating " principle or on the " vibrating " principle. If in fig. 10 gi be the centre of

gravity of the long body CD, and hi be the centre of gravity of the three vertical forces acting downwards at the points x u t and gi, considered as weights collected at those points; then if h\ be above the line Ziyi it can be shown that this arrangement of the knife-edges of CD favours the " acceleration " principle, and is suited to act with and assist an " accelerating " steelyard, and similarly if the point h 2 be above the line z 2 y2 in the case of the short body EF. If the knife- edges be placed so that hi and h-i are below the lines X\ji and x 2 y 2 respectively, the arrangement will favour the " vibration " principle, and is suited to act with and assist a " vibrating " steelyard.

It is very important that platform machines should be truly level. With accelerating machines a small amount of tilt in any direction considerably affects the accuracy of the weighing, and when the amount of tilt is considerable the action may be changed, so that a machine which was intended to act as an accelerating machine acts like a vibrating one. Vibrating machines are only slightly affected by being out of level in comparison with accelerating machines, and in this matter they have a distinct advantage. When a platform machine is in true adjustment, and the loose w r eights w r hlch are intended to be hung at the end of the steelyard are correct and consistent among themselves, a good and new machine, w r hose capacity is 4 cwt., should not show a greater error than 4 oz. when fully loaded. Platform machines are slightly affected by changes of temperature. In some cases they are made " self-recording " by the following arrangement: The steelyard is provided with a large and a small travelling poise. Each of these poises carries a horizontal strip of metal, which is graduated and marked with raised figures corresponding to those on the steelyard itself. These strips pass

Fig. 10.

under a strong punching lever arranged on the frame of the machine. A card prepared for the purpose is introduced through a slit in the frame between the punch and the strips. When the poises have been adjusted to weigh a load on the platform the punch is operated by a strong pull, and the impression of the raised figures is left on the card. Thus the weight is recorded without reading the positions of the poises. In another arrangement the self-recording parts are entirely enclosed in the travelling poise itself.

Fig. 11 shows the ordinary arrangement of the parts of a plat- form machine, but there are many types which differ greatly in detail though not in jirinciple.

When the goods to be weighed are very heavy, portable weigh- bridges or platform machines are inapplicable and it is necessary to erect the weighbridge on a solid foundation. Some weigh- bridges are arranged in a manner similar to that of the platform machines already described, but having the long body lever turned askew, so that the end of it projects considerably beyond the side of the weighbridge casing, and the pillar and steelyard which receive its pull are clear of the wagon on the platform. In another arrange- ment two similar triangular levers take bearing on opposite sides of an intermediate lever which communicates their pressures to the steelyard; this is a very sound and simple arrangement for ordinary long weighbridges. Lastly, when the weighbridge is very long — and they are sometimes made 40 ft. long, and are arranged to weigh up to 100 tons

or more — it is practically composed of two platform machines end to end, each having its four knife-edges to rcccivethe load, and the two long bodies take bearing on the opposite sides of an intermediate horizontal lever, the end of w r hlch is connected with the steelyard. When skilfully made they are very accurate and durable.

A useful application of weighbridges is to ascertain the exact weights on the separate wheels of locomotive engines, so that they may be properly adjusted. For this purpose a number of separate weighbridges of simple construction arc erected, one for each wheel of the engine, with their running surfaces in exactly the same horizontal plane. The engine is moved on to them, and the pressures of all the wheels are taken simultaneously, each by its own weighbridge.

There are many kinds of weighing machines depending for their action on combinations of levers, and arranged to meet special requirements. Such are coal platform machines for weighing out

coal in sacks, the levers of which are arranged as in the ordinary platform machines, but for the sake of compactness the steelyard is returned back over the long body, and when loaded with the proper weight indicates the correct weight of the coal in the sack by its end

Section on AB

Section on CD.

Fig. 11.

kicking up. Crane machines are used to weigh goods as they are hoisted by a crane; the lever arrangement is shown in fig. 12.

A crane machine of peculiar construction, well adapted for weigh- ing heavy loads, and extremely simple and compact,„which does not properly come under any of the heads under which the machines have been classified, is the hydrostatic weighing machine. This machine is constructed with an open top cylinder, a stirrup strap being provided by which it may be suspended from a crane. The

cylinder, which is filled with oil or other liquid, is fitted with a piston having a piston-rod passing downwards and terminating in an attachment for the goods to be weighed. As the goods are lifted by the crane the whole of their weight is taken by the liquid in the

FlC. 12.

cylinder, and the pressure on the liquid, as indicated by a pressure gauge, gives the weight. The gauge has a plain dial, marked off to indications given by the application of standard tons and cwts. ; it couid probably be read to about 2% of the load weighed.

Spring Balances. For many purposes spring balances are the most convenient of all weighing machines. They arc rapid in action, the indication is in general clear, and there is no need of loose weights except for testing the machine occasionally. Their action depends upon the extension of one or more spiral springs, and as the extension is proportionate to the weight which causes it the graduation is very simple. The accuracy of spring machines depends upon the accuracy of the springs and the workmanship of the machines. The springs in general are very accurate and uniform in their extension, and are very permanent when fairly well used; but their indications are apt to vary from fatigue of the springs if they are kept extended by a weight for a long time. Their in- dications also vary with the temperature, so that for good work it is advisable that spring balances should be frequently checked with standard weights. For the sake of compactness and con- venience of reading the extension of the springs, and conse- quently the load, is frequently indicated on a dial, by means of a small rack and pinion, which give motion to a finger on the dial-plate, but the regularity and correctness of the indications of the finger will depend upon the condition of the rackwork and upon the friction, and these will vary with the wear of the machine. For the above reasons spring balances arc not in general so accurate as knife-edge machines. It is found that when a spiral spring is extended by a weight it has a tendency to turn a little round its axis. Therefore an index pointer attached to the bottom of the spring, and moving past a scale would rub slightly against the case. To correct this tendency the spring is usually made half with right-hand spiral and half with left- hand spiial.

The extension of a spiral spring is given by the formula: — Extension = \Y‘4#R ii /Er*, in which W= weight causing extension, in lbs; n = number of coils; R = radius of spring, from centre of coil to centre of wire, in inches; r = radius of wire of which the spring is made, in inches ; E = coefficient of elasticity of wire, in lbs per square inch. The value of E depends upon the tempering of the wire and will vary accordingly: for the springs of trade balances E will usually be about 10,500,000. For the application of the above formula it is necessary to measure ® and ® very

accurately, by reason of the high powers involved, but when this has been carefully done the formula may be relied upon. Thus in the case of a spring for which the values of the quantities were W = 7 lb,K = 5i, R = -3oin., r = -038 in., E = 10,500,000, the formula gives' extension = 1-764 in., while direct experiment gave extension = 1-75 in. And with a very long and weak spring for which the values of the quantities were W = |oz., 1=233, R = -35 in., f = -oo85 in., E = 10,500,000, the formula gives extension = 22-78 in., while direct experiment with the spring gave 23-5 in.

Automatic Weighing Machines.

During the last few years great efforts have been made to expedite the operation of weighing machines by the introduction of machinery, more or less complicated, which renders the machines to a great extent self-acting. The object aimed at varies very much with different machines. Sometimes the object is to weigh out parcels of goods in great numbers of the same definite weight. Sometimes the object is to weigh out parcels of goods, of unknown weight, as in ordinary retail dealing, and to give the exact value of each parcel at different rates per tb. Sometimes the object is to weigh many loads in succes- sion, the loads being of varying weight, and to present the total weight at the end of a day's work ; this is the case with machines for weighing coal and other minerals. Of course the introduction of automatic mechanism introduces friction and other complica- tions, and it is difficult to construct automatic machines that shall be as accurate in their weighing as the simpler weighing machines, but in many weighing operations a moderate degree of accuracy will suffice, and speed is of great importance. It is to meet such cases that the greater number of automatic weigh- ing machines have been invented. Some examples of these machines will now be given.

Automatic Computing Spring Weighing Machine, for Retail Purposes (fig. 13). — A light and carefully balanced drum with its axis horizontal is enclosed within a cylindrical casing, and rotates freely in bearings formed in the ends of the casing. The casing is fixed in supports on the top_ of a strong frame, which also carries a small platform machine of ordinary construction on which the goods to be weighed are placed. The pull of the load is transmitted to a hook which hangs freely from the middle of a horizontal bar below the drum casing. At each end of the drum casing is attached a vertical spiral spring, and by the extension of these springs the weighing of the goods is effected. There are also two vertical racks, one at each end of the casing, in connexion with ~ the two springs, and these actuate pinions on the axle of the drum and cause it to revolve as the springs extend. The horizontal bar which receives the pull of the load is connected at its ends with the two spiral springs and pulls verti- cally upon

them. Above the horizontal bar, and parallel with it, is a rod which is connected ar its ends with the lower ends of the vertical racks, and at its middle with the horizontal bar. The con- nexion with the hori- zontal bar is through the medium of an adjustable cam. This cam can be turned fyy hand in a vertical plane by means of a worm and wheel movement, and by turn- ing the worm the vertical distance between the bar which is attached to the springs and the rod which is attached to the racks can be increased or diminished, and thus the racks can be moved rela- tively to the springs. By this means the zero of the scale on the drum can be

adjusted to the fixed m ; D V" f '{he" B™rd"cf Tra'de7by"permission ol the index on the casing when Controller of H.M. Stationery Office.

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Fig. 13. — Price-computing Spring Weighing Machine.

there are no goods on the platform. There is also a compensation arrange- ment for effecting automatically the same adjustment for changes of temperature. To deaden the vibration of the springs after a load has been placed on the platform, and thus to enable the weights and values of the goods to be read rapidly, the piston of a glycerin cylinder is attached to the end' of the lever which pulls upon the hook of the horizontal bar and is worked by it in the glycerin.

On the outer surface of the drum are printed the weight of the goods in lb and oz., and the money value of the goods corresponding to the different rates per lb. The side of the casing which is next to the seller is pierced centrally by two slots, one a vertical slot through which the weight is read on the drum, and the other a horizontal slot, half of it on each side of the vertical slot, through which the money values of the goods, corresponding to the different rates per lb, are read. The weight of the goods is recorded by means of an index pointer fixed to the casing on one side of the vertical slot, and the money values are opposite the figuresdefiningtherat.es per lb, which are marked on the edge of the casing below the hori-

values are indicated on the chart by the toothed edge of the index

arm. On the customer's side of the machine the weight of the goods is indicated on a pair of arcs by a separate index arm precisely in the same

manner as on the seller's side.

In weighing, the goods are placed in the pan of an ordinary lever machine (see fig. 14}, and the end of the lever rests on the stirrup end of a short vertical rod. The upper end of this rod is formed into a loop, and this loop_ pulls upon a knife-edge which is fixed to a short lateral arm rigidly attached to a vertical disk, and this disk turns in bearings formed in the frame of the machine. The same disk carries the index arm, which is rigidly fixed to it and indicates the weight and value of the goods, and also carries the pendulum, which is rigidly attached to it, and regulates the position of the index arm according to the position which it takes up and the leverage which it exerts when swayed out of the vertical position by the action of the lever of the lever machine. This lever is so counterbalanced that when there is no weight in the pan the pendulum is vertical, and the index arm should then stand at zero. The zero adjust- ment is effected by means of levelling screws in the base of the frame. In order to deaden the vibrations of the index arm when weighing goods a vertical rod is attached to the lever from the lever machine near its left-hand end, and this rod carries on its lower end a plunger which works in a closed cylindrical dash-pot containing oil or glycerin.

Automatic Computing Weighing Machine {even balance and pendulum) for Retail Fur poses (rig. 15). — This is an equal-armed inverted counter machine (see fig. 5) arranged to weigh up to 14 lb with great accuracy. Up to 2 lb the weight of the load is registered automatically on the chart in much the same manner as in the case of the automatic computing weighing machine already described. When the load exceeds 2 m one or more 2- lb weights are placed in the weights-pan, and the value of the portion of the goods corresponding to these 2-lb weights is computed, at the rate per lb, in the ordinary manner; and the value of the balance of the weight of the goods is read off the chart, and the two are added together. The advantage of this is that a very open scale is obtained for reading the value of the balance of the load. Thus, for weighing up to the full load of 14 lb, six 2-lb weights are, required and no others.

The manner in which the balance of the load is weighed is as follows ; Near the bottom of the vertical leg from the goods-pan, a projecting piece is rigidly attached to it, and as the pan descends with the balance of the load this piece pulls by a hook on a thin band of steel, which

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Fig. 14. — Price- computing Weighing Machine.

zontal slot. On the side of the casing which is next to the buyer there is a vertical slot through which the weight of the goods can be read on the drum.

A utomatic Computing Weighing Machine for Retail Purposes (fig. 14). — The action oi the machine shown in fig. 14 depends upon the displacement of a loaded pendulum. And the machine is arranged to weigh goods up to 8 lb' with the fixed weight only on the pendulum, and up to 16 lb with an additional weight which can be readily slipped on to the pendulum rod. The weights and money values are arranged on a vertical chart, the sides of which converge towards the pivoting centre of an index arm which is actuated by the weighing mechanism. The two outer arcs of the chart are occupied by the scales for the weight of the goods in lb and oz., and the rest of the chart is occupied by a series of 25 concentric arcs which show the money values of the goods for 25 rates per lb. The rates per lb are inscribed on the index arm at points corre- sponding to the values on the concentric arcs of the chart, and the

is led upwards and wraps round the surface of a disk to which it is firmly secured. This disk rotates by rocking on a pair of knife-edges whose bearings are rigidly attached to the frame. The disk carries a weighted brass cylinder rigidly attached to it, which is pulled into an oblique position by the steel band until equilibrium is established. And the disk also carries the index arm which plays past the vertical face of the chart, and indicates the weight and price up to 2-lb weight. The disk also carries a second and corresponding index arm which indicates the weight on the purchaser's side of the machine. At the bottom of the vertical leg from the goods-pan there is also a projecting piece which is attached to the top of a vertical piston rod, the piston of which plays in a dash-pot of glycerin as the beam sways, and deadens the vibrations of the index arm.

Automatic 1'ea Weighing Machine (fig. 16). — This machine is designed to weigh out tea in quantities of { lb each, which are done up in separate packets by hand. A large number of movements

have to be provided for, and the machinery is complicated, so that a general description of the action of the machine is all that will be here given.

The tea is fed into a hopper, which has a large opening at the bottom, and

this opening is entirely closed, by two cylindrical brushes, which are mounted end to end on a horizontal shaft. As they revolve these brushes engage the tea in the hopper, draw it out by degrees, and drop it into a compartment of t a circular drum which hangs on one end of a scale-beam. The brushes have the same diameter, but one is much longer than the other, and they move independently of one another. For the bulk of the filling both brushes are in operation, but when the load is nearly complete the longer brush is stopped and the filling is completed by the shorter brush only. When the load is complete the shorter brush also is stopped while the compartment uf the drum is emptied. And the action is then renewed. All these operations are effected automatically.

The circular drum is divided into four equal compartments by radial diaphragms. And in a pan ac the other end of the beam (which is counter-balanced for the weight of the drum) is a {-\b weight to weigh the lea. As the uppermost compartment fills, the weights end of the beam rises, and by means of a vertical rod suc- cessively operates on detents connected with the rotation of the two brushes, and stops them in turn. And when the short brush is stopped a rod from the shaft trees a spring detent which keeps rhe drum in position and tips it over. The tea is shot out and falls into a receptacle below, and the drum makes a quarter of a revolution, and is agmn held in position by the detent with an empty compartment at top ready for rhe next filling.

The power is applied by a belt round a pulley, which is mounted on the end of the horizontal shaft which carries the brushes. The brushes are carried by sleeves which run loosely on the shaft, and to each sleeve is rigidly fixed a ratchet wheel. Next the ratchet wheel is a disk which is keyed on to the shaft. The ratchet wheel and the disk are automatically connected by clutch mechanism in order to effect the rotation of the brushes. The clutch mechanism is freed at the proper time by the action of the vertical rod at the end of the beam, and the brushes then

is placed in the weights-pan of the balance, and is the only loose weight used with the machine. The pair of beams are hung centrally by rods and hooks from knife-edges in the forked end of a strong beam, which is carried at its fulcrum by the top plate- of the frame of the machine. This beam is heavily counterbalanced at its further extremity- Underneath the top plate of the machine, and strongly framed to it, is a box, which contains the horizontal rods to the ends of which 'are attached the slides which regu-late the flow of sugar from the bottom of the hopper. These rods pass through holes in the front and back plates of the box. and are furnished with spiral springs, which (when the rods are forced back by hand) are in compression between the back plate of the box and shoulders on the rods. The rods are held in this position by detents which take hold of the

shoulders of the rods ; and are acted upon from the front end of the upper beam and the weights-pan end of the lower beam respectively, in order to release the rods at the proper times and reduceorcutofftheflow of sugar from the hopper. The upper slide has the shape of a truncated cone, and it red uces the orifice of flow so as to render the flow of the sugar more manage- able. The lower slide is simply a cut-off slide. When it is desired to use the machine, a 4-lb bag is placed under the orifice of the hopper upon the goods-pan of the balance, and the slide rods are thrust back by hand till they are held by their detents, and the sugar flows rapidly into the bag. When the bag is nearly charged to the weight of 4 Jfa, the weight of the bag of sugar over- comes the resistance of the counterbalance of the upper beam, and its front end drops a certain distance. In dropping it dislodges the detent of the reducing slide, and the slide springs forward and reduces the flow of the sugar. The dim- inished stream of sugar con- tinues to flow till the 4-lb weight in the weights-pan is lifted (the end of the upper beam being for the time brought up against the frame and unable to descend further), and in lifting it dis-

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Fig. 15. — Price-computing Weighing Machine — even Balance and Pendulum.

lodges the detent of the cut-off slide/ The slide springs forward and cuts off the flow. The filled bag is then removed and replaced by an empty bag and the action is renewed.*

In order to ensure the correct weight of the bag it is necessary to consider that when the cut-off slide acts, a certain quantity of sugar is in transitu and has not at that moment taken its place in the bag. This is allowed for by means of a rider weight, which is arranged so as automatically to add its weight to that of the sugar in the bag while

stand still while the load is discharged. The beam then recovers its original position and the action of the machine is renewed.

Automatic Sugar Weighing Machine (fig. 17). — This machine is adapted for weighing out granulated white sugar in parcels of i-lb, 2-lb and 4-tb weight. The sugar is run into a conical hopper and is delivered into the open mouth of a bag which is placed on the goods- pan of a balance. The balance consists of a pair of equal-armed beams rigidly connected together and acting as a single beam. A 4-lb weight

the4-ib weight is being lifted. But at the same instant that the cut- off takes place the rider weight is lifted off the end of the balance by a

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Fig. 16. — Automatic Tea Weighing Machine.

self-acting arrangement, and the sugar in transitu takes its place in the bag. And, if the rider weight has been correctly adjusted, the

bag of sugar will be shown to weigh exactly 4 lb by the beam vibra- ting in equipoise.

A utomatic Coat Weighing Machine (fig. 18). — This machine weighs the coal de- livered into factories, &c, by charges up to 20 cwt. at a time, and records and sums up the weights of the charges so as to ex- hibit the total weight delivered. The whole of this work is effected automatically.

The coal is dropped into a hopper by a grab. The hopper is carried on two knife- edges, one on each side, and is prevented from tipping over fore and aft by a pair of parallel motion bars on each side. The knife-edges on which the hopper rests are on two hori- zontal levers, one on each side of the hop-

_ ,. .. ,. . , , (, _, , . _ , t per. These levers are

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of the Bo.-.rd of Trade, by permiˆion of the Controller Carried _ by knite-edge

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Fig. 17.— Automatic Sugar Weighing the frame of the ma-

Machine, chine, and transmit the

weight of the hopper by means of an intermediate lever and a vertical rod to the indicator lever. And the long arm of the indicator lever pulls

vertically upon the spring of an ordinary spring balance, which registers the load, and with the addition of suitable counting mechanism sums up the weights of any number of successive loads.

The charges of coal fall into the hopper with a heavy shock, and in order to save the knife-edges there is a strong pin in each side of the hopper below the knife-edge, which, before the charge of coal is dropped into the hopper, is acted on by a strong horizontal flitch- plate, which heaves the hopper off the knife-edges and relieves them from the shock. The heaving-up of the flitch-plate and hopper is effected by a cam on the end of a horizontal shaft which runs along the back of the machine behind the hopper. The flitch-platc rests at one end on the top of this cam, and at the other end is shackled to the horizontal arm of a bell-crank lever which is pivoted on the frame. When a charge of coal is dropped into the hopper, the bell-crank lever receives a violent jerk from the shackle of the flitch-plate, and this jerk by means of suitable mechanical arrangements throws a pinion on the cam shaft into gear with a wheel on a counter shaft

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Fig. 18. — Automatic Coal Weighing Machine.

which is kept constantly running by means of a belt and pulley driven by an engine. The cam shaft and the cam then begin to revolve, and the flitch-plate is gradually lowered till the knife-edge bearings of the hopper are received on the knife-edges of the main measuring levers, and the load is then weighed by the levers and the spring- balance. Shortly after this is done the mechanism at the back of the hopper automatically opens the doors at the bottom of the hopper, and the coal drops out. The rotation of the cam shaft continues till the cam has again heaved up the flitch-plate, when the pinion on the cam shaft is thrown out of gear with the wheel on the counter shaft, and the cam remains steady till another charge of coal is dropped into the hopper and the action is renewed. The coal when dropped out of the hopper runs down a shoot into a receptacle, from whence it is lifted by a Jacob's Ladder and distributed to the boilers, &c, of the factory.

Automatic Coal Weighing Machine (fig. 19). — This machine is designed to weigh and total up the weight of materials passed over it during a considerable course of operations. The trucks or other receptacles containing the coal, &c, are drawn upon the platform of the machine, and the pull of the load is transferred by a vertical rod at the left-hand end of the machine to the knife-edge on the short arm of the steelyard, whose fulcrum is carried on bearings in the frame. Behind the pulley at the top of the machine and on the same shaft is a spur wheel, which drives both of

the spur wheels shown in the diagram. The small spur wheel is mounted on the steelyard, and this wheel and the one that drives it are so arranged that their line of

pressure shall exactly coincide with the line of the fulcrum knife- edge; the object of this is that the pressure may not influence the sway of the steelyard, which must depend entirely upon the poise. By means of a pair of mitre wheels the small spur wheel causes a screwed shaft, which runs along the middle of the steelyard, to

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Fig. 19. — Automatic Coal Weighing Machine.

revolve, and as it revolves it carries the large poise along the steel- yard. Thus, if the poise be at the zero end of the steelyard at the left-hand side of the machine, when the load comes upon the platform the screwed shaft carries the poise along the steelyard till equilibrium is established, and the end of the steelyard drops. By the first part of this drop the movement of the poise is suddenly stopped, as will be explained below, and the travel of the poise along the steelyard, which measures the load on the platform, is recorded by the amount of rotation of the large spur wheel, and this is suitably shown on a dial in connexion with the wheel. By the second part of the drop the motion of the poise is reversed and the poise is run back to the zero

clutch with a shaft in the same line, on which are keyed a sprocket wheel and a ratchet wheel. The sprocket wheel is connected by a chain with a similar sprocket wheel which is keyed on the same shaft as that of the left-hand pulley. The ratchet wheel is acted upon by a pawl which is shown on the diagram. When the poise is at the zero end, and there is no load on the platform, the end of the steelyard is down, and has locked the ratchet wheel by means of the pawl ; the shaft being thus locked, the sprocket wheels are stopped, the drum-shait runs free by the friction clutch, and the two pulleys which arc connected by the crossed band are running idle. When the load to be weighed comes upon the platform, the end of the steelyard rises and unlocks the ratchet wheel through the pawl ; the sprocket gearing is driven by the friction clutch, and drives the axle of the left-hand small pulley. The mitre wheels come Into operation and the poise is carried along till the end of the steelyard drops, and locks the ratchet by

permission of the Controller of wheel. By means of a horizontal rod the same drop of the steelyard also locks together by clutch gearing the left-hand

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Fiu. 20. — Automatic Luggage Weighing Machine.

end in readiness for the next load. All of this is effected auto- matically as follows:—

The machine.is driven continuously by a belt from a motor which wraps round the large drum at the right-hand side of the machine. On the same axle as the drum and behind it is a small pulley which is keyed upon the axle and is connected with the small pulley (which runs idle on its shaft) at the left-hand side of the machine by a crossed belt. Thus these two small pulleys are always running, but in opposite directions. The drum-shaft is connected by a friction

pulley and the adjacent sprocket wheel, and the pulley drives the sprocket wheel in the opposite direction to that which it had before. Consequently the motion of the mitre wheels is reversed and the poise is run back to zero. When the poise arrives at zero it frees the clutch which connects the pulley and the sprocket wheel, and the machine is then ready for the next load. The poise having arrived at the end of its run and unable to go further, the mitre wheels and the sprocket gearing are stopped, and the two pulleys and the cross belt run idle till the next load comes upon the platform.

Automatic Luggage Weighing Machine (fig 20). — This machine is intended for the weighing of personal luggage at railway stations. It consists ot a platform which is carried by levers arranged in the manner of an ordinary platform machine, which are connected with the registration mechanism by a vertical rod. This rod is continued upwards by a pair of thin nickel bands which are led right and left over two horizontal cylinders, round which they partly wrap, and to which they are firmly attached. The diameter of the middle part of the cylinders is greater than that of the ends, and the bands from the vertical rod are led over the middle part. To each cylinder a pair of similar nickel bands are ted downwards from the top of a casting which is bolted to the frame. The lower ends of these bands pass round the under side of the end portions of the cylinders, wrapping close round them, and are firmly attached to them. To the bottom of each cylinder is rigidly attached a heavy solid cylinder of lead, and these are the regulators of the position of equilibrium of the cylinders when they rotate under the action of the lead. When the load comes upon the platform the

pull of the vertical rod is transmitted by the nickel bands to the cylinders around which they are wrapped, and causes them to revolve. As they rotate they roll themselves up the pairs of bands which are attached to the top of the casting, and at the same time cause the leaden weights attached to the bottoms of the cylinders to take up a lateral position, where they exercise a. leverage opposing the motion of the cylinders, and bringing them up in a definite position corre- sponding to the pull of the vertical rod. By the rolling 01 the cylinders up the vertical bands from the casting the cylinders are raised vertically through a space defined by the position of the leaden regulators. By means of suitable and simple mechanism this vertical movement of the cylinders works plunger pistons in a pair of cylinders which contain glycerin, and these deaden the vibrations of the machinery while weighing is going on. The same vertical movement also actuates the index finger of a large dial, on which the weight oi their luggage can be easily read by passengers standing near while their luggage is being weighed.

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WEIGHTS AND MEASURES. This subject may be most conveniently considered under three aspects — I. Scientific; II. Historical; and III. Commercial.

I. Scientific

1. Units.— In the United Kingdom two systems of weights and measures are now recognized— the imperial and the metric. Th'e fundamental units of these systems are— of length, the yard and metre; and of mass, the pound and kilogram.

The legal theory of the British system of weights and measures is— (a) the standard yard, with all lineal measures and theii

squares and cubes based upon that; (b) the standard pound of 7000 grains, with all weights based upon that, with the troy- pound of 5760 grains for trade purposes; (c) the standard gallon (and multiples and

fractions of it), declared to contain 10 lb of water at 62 F., being in volume 277-274 cub. in., which contain each 252-724 grains of water in a vacuum at 62 , or 252-458 grains of water weighed with brass weights in air of 62 with the barometer at 30 in. Of the metric units international definitions have been stated as follows: — ■

(a) The unit of volume for determinations of a high degree of accuracy is the volume occupied by the mass of 1 kilogram of pure water at its maximum density and under the normal atmospheric pressure; this volume is called litre.

(b) In determinations of volume which do not admit of a high degree of accuracy the cubic decimetre can be taken as equivalent to the litre; and in these determinations expressions of volumes based on the cube of the unit of linear measure can be substituted for expressions based on the litre as denned above.

(c) The kilogram is the unit of mass; it is equal to the mass of the international prototype of the kilogram. 1

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2. Standards. — The metre (mctre-a-traits) is represented by the distance marked by two fine lines on an iridio-platinum bar 0 = o° C.) deposited with the Standards Department. This metre (m.) is the only unit of metric extension by which all other metric measures of extension — whether linear, superficial or solid- — axe ascertained.

The kilogram (kg.) is represented by an iridio-platinum standard weight, of cylindrical form, by which all other metric weights, and all measures having reference to metric weight, are ascertained in the United Kingdom.

From the above four units are derived all other weights and measures (W. and M.) of the two systems.

The gallon is the standard measure of capacity in the imperial System as well for liquids as for dry goods.

In the United Kingdom the metric standard of capacity is the litre, represented (Order in Council, 19th May 1890) by the capacity of a hollow cylindrical brass measure whose internal diameter is equal to one-half its height, and which at o° C, when filled to the brim, contains one kg. of distilled water of the temperature of 4 C, under an atmospheric pressure equal to 760 millimetres at o° C. at sea-level and latitude 45 ; the weighing being made in air, but reduced by calculation to a vacuum. In such definition an attempt has been made to avoid former confusion of

expression as to capacity, cubic measure, and volume; the litre being recognized as a measure of capacity holding a given weight of water.

For the equivalent of the litre in terms of the gallon, seebelow III. Commercial.

In the measurement of the cubic inch it has been found that 2 the specific mass of the cubic inch of distilled water freed from air, and weighed in air against brass weights (A = 8-i3), at the temperature of 62 F., and under an atmospheric pressure equal to 30 in. (at 32 F.), is equal to 252-297 grains weight of water at its maximum density (4 C). Hence a cubic foot of water would weigh 62-281 lb avoir., and not 62-321 lb as at present legally taken.

For the specific mass of the cubic decimetre of water at 4 C, under an atmospheric pressure equal to 760 mm., Guillaume and Chappuis of the Comite International des Poids et Mesures at Paris (C.I. P.M.) have obtained 0-9999707 kg., 3 which has been accepted by the committee.

The two standards, the cubic inch and the cubic decimetre, may not be strictly comparable owing to a difference in the normal temperature (Centigrade and Fahrenheit scales) of the two units of extension, the metre and the yard.

1 Troisie.me Conference Gen&rale des Poids et Mesures (Paris, 1901). Metric Units Com. Roy. Soc. (1898).

2 Phil. .Trans. (1892); and Proc. Roy. Soc. (1895), p, 143.

3 Proc. Verb. Com. Intern, des Poids et Mesures (rooo), p. 84. Congres International de Physique reuni a Paris en 1900.

For the weight of the cubic decimetre of water, as deduced from the experiments made in London in 1896 as to the weight of the cubic inch of water, D. Mendeleeff {Proc. Roy. Soc, 1895) has obtained the following results, which have been adopted in legislative enact- ments in the United Kingdom : —

Temperature on

the Hydrogen

Thermometer

Scale.

o

4

i6|

20

32-0 39-2

59 -o

62-0

68-o

Weight of Water in vacuo.

Of a Cubic

Decimetre in

Grammes.

999.716 999-847 998-979 998-715 998-082

Of a Cubic Inch in Grams.

252-821 252-854 252-635

252-5ˆ8

252-407

Of a Cubic

Inch in

Russian Dolis.

368-686 3 68 -734 368-414 368-316 368-083

In this no account is taken of the compressibility of water — that is to say, it is supposed that the water is under a pressure of one atmosphere. The weight of a cubic decimetre of water reaches 1000 grammes under a pressure of four atmospheres; but in vacuo, at all temperatures, the weight of water is less than a kilogram.

3. National Stattdards. — National standards of length are not legally now referred to natural standards or to physical con-

n_n

Section of bar.

Section at a a'.

O

and

appears

FlG. I. — Present Imperial Standard Yard, 1844.

Total length of bronze bar, 38 in.; distance a a', 36 in., or the imperial yard; a a', w r ells sunk to the mid-depth of the bar, at the bottom of each of which is inserted a gold stud, having the defining line of the yard engraved on it.

stants, but it has been shown by A. A. Michelson that a standard of length might be restored, if necessary, by reference to the measurement of wave-lengths of light. Preliminary experiments have given results correct to ˆ=0-5 probable that by further experi- ments, results correct to ˆi-o/j. may be obtained. That is to say, the metre might be redetermined or restored as to its length within one ten-millionth part, by reference to, e.g., 1553163-5 wave-lengths of the red ray of the spectrum of cad- mium, in air at 15 C. and 760 mm.*

In all countries the national standards of weights and measures are in the custody of the state, or of some authority administering the government of the country. The standards of the British Empire, so far as they relate to the imperial and metric systems, are in the custody of the Board of Trade. Scientific research is not, of course, bound by official standards.

For the care of these national standards the Standards Department was developed, under the direction of

Royal Commission ® (of which the

Fig.

—Imperial Standard Pound, 1844.

Platinum pound avoirdu- late Henry Williams Chisholm was a pois, of

cylindrical form, with leading member), to conduct all com- groove at a for lifting the parisons and other operations with weight, reference to weights and measures in

aid of scientific research or otherwise, which it may be the duty of the state to undertake. Similar standardizing offices are established

A Valeur du Metre, A. A. Michelson (Paris, 1894); Units, Everett, Illustrations of C.G.S. System; Unites et Etalons, Guillaume (Paris, – 1890); Lupton's Numerical Tables, 1892; Metric Equivalent Cards, 1901; Dictionary of Metric Measures, L. Clark (1891); Glazebrook and Shaw's Physics (1901).

6 Report Standards Commission, 1870.

in other countries (see Standards). Verified " Parliamentary Copies " of the imperial standard are placed at the Royal Mint, with the Royal Society, at the Royal Observatory, and in the Westminster Palace.

The forms of the four primary standards representing the four units of extension and mass are shown in figs, i to 4.

A secondary standard measure for dry goods is the bushel of 1824, containing 8 imperial gallons, represented by a hollow bronze cylinder having a plane base, its internal diameter being double its depth.

The imperial standard measure of capacity is a hollow cylinder (fig. 5) made of brass, with a plane base, of equal height and diameter; which when filled to the brim, as determined by a plane glass disk, contains 10 lb weight of water at £ = 62° F.B. = 30 in., weighed in air against brass weights.

4. Atmospheric Pressure, and Materials.— In the verification of a precise standard of length there may be taken into account the influence of the variation of atmospheric pressure. Taking the range of the barometer in Great Britain from 28 to 31 in., giving a difference of 3 in. (76 millimetres), which denotes a variation of 103 grammes per square centimetre in the pressure of the atmosphere, the change caused thereby in the length of a standard of linear measurement would appear to be as follows: —

For the yard measure of the form shown in fig. 1 a difference

*Mof length equal to 0-000002 in. is caused by the variation of atmo- spheric pressure from 28 to 31 in. For the metre of the form shown in fig. 3 the difference in length for a variation of 76 mm. in the barometer would be 0-000048 mm. on the metre. With reference to the materials of which standards of length are made, it appears that the Mat they alloy iridio- platinum (90% platinum, 10% iridium) is probably of all substances the least affected by time or circum- stance, and of this costly alloy, therefore, a new copy of the im- perial yard has been made. There appears, however, to be some Iridio-platinum bar of Tresca objection to the use of iridio- section as shown at A. The two platinum for weights, as, owing microscopic lines are engraved to its great density (A = 2i-57), on the measuring axis of the bar the slightest abrasion will make an at b, one near to each end of the appreciable difference in a weight ; bar. The standard metre (tnhtre- sometimes, therefore, quartz or (i-traits) was supplemented by rock-crystal is used; but to this the delivery to Great Britain, also there is some objection, as in 1898, of an end standard owing to its low density (A = 2-65) metre (m'etre-a-bouts) also made there is a large exposed surface of iridio-platinum, and also of the mass. For small standard verified by the C.I. P.M. Acorn- weights platinum (A =21-45) and parison of the yard with the aluminium (A = 2 -67) are used, and metre was made by the C.I. P.M. also an alloy of palladium (60%) in 1896, and of the pound and and silver (40%) (A= 11*00). kilogram in 1 883-1 885 (see III. For ordinary standards of Commercial). length Guillaume's alloy (invar) of*

nickel (35'7%) and steel (64-3%) is used, as it is a metal that can be highly polished, and is capable of receiving fine graduations. Its coefficient of linear expansion is only 0-0000008 for i° C. 1

5. Electrical Standards. — Authoritative standards and instru- ments for the measurement of electricity, based on the funda- mental units of the metric system, have been placed in the Electrical Laboratory of the Board of Trade. 2 These include Current measuring \ The standard ampere, and sub-standards

instruments. \ from I to 2500 amperes.

Potential measuring C The standard volt, and sub-standards instruments. ■] for the measurement of pressure from

(25 to 3000 volts. Resistance measuring (The standard ohm, sub- standards up instruments. < to 100,000 ohms, and below I ohm to

(7ZZZ ohm.

Rapport du Yard, Dr Benoit (1896). 2 Orders in Council (1894).

Fig. 3. — National Standard Metre, 1897.

Fig.

4. — National Standard Kilogram, 1897.

*6. Temperature. — In the measurement of temperature the Fahrenheit scale is still followed for imperial standards, and the Centigrade scale for metric standards. At the time of the con- struction of the imperial standards in 1844, Shccpshanks's Fahrenheit thermometers were used; but it is difficult to say now what the true temperature then, of 62 F., may have been as compared with 62 F., or 16-667° C., of the present normal hydrogen scale. For metrological purposes the C.I. P.M. have adopted as a normal thcrmometric scale the Centigrade scale of the hydrogen thermometer, having for fixed points the tempera- ture of pure melting ice (o°) and that of the vapour of boiling dis- tilled water (ioo°), under a normal 1 atmospheric pressure; hydrogen being taken under an initial mano- metric pressure of 1 metre, that is to say, at hfj 1 ˆ = 1*3158 times the normal atmospheric pressure. This latter is represented by the weight of a column of mercury 760 mm. in height; the specific gravity of mercury being now taken as 13*5950. after Volkmann and Marek, and at the normal in- ' tensity followed under this pres- sure. The value of this intensity is equal to that of the force of gravity at the Bureau International, Paris (at the level of the Bureau), divided by 1-000332; a co-efficient which allows for theoretical reduction to the latitude 45 and to the level of tho. sea. The length of the metre is independent of the thermometer so far that it has its length at a definite physical point, the temperature of melting ice (o° C), but there is the practical difficulty that for ordinary purposes measurements cannot be always carried out at o° C.*

The International Geodetic Committee have adopted the metre as their unit of measurement. In geodetic measurements the dimensions of the triangles vary with the temperature of the earth, but these variations in the same region of the earth are smaller than the variations of the temperature of the air : less than io° C. Adopting as a co-efficient of dilatation of the earth's crust 0-000002, the variations of the distances are smaller than the errors of measurement (see Geodesy).

7. Standardizing Institutions. — Besides the State departments dealing with weights and measures, there are other standardizing institutions of recent date. In Germany, e.g. there is at Charlottenburg (Berlin)

a technical institute

(Physikalisch – technische-

Reichsanstalt) established

under Dr W. Forster in

1887, which undertakes

researches with reference

to physics and mechanics,

particularly as applied to

technical industries. 3 In

England a National

Physical Laboratory

(N,P.L.) has been established, based on the German institute,

and has its principal laboratory at Bushey House, near

Hampton, Middlesex. Here is carried out the work of

standardizing measuring instruments of various sorts in use

3 Wissenschaftliche Abkandlungen der pkysikalischen Reichsan- stalt, Band ii. (Berlin, 1900); Denksckrift betreffend die Tdtigkeit der K. Norm.-Aichungs Kommn. (1869-1900).

Fig. 5 — Present Imperial Standard Gallon, 1824

by manufacturers, the determination of physical constants and the testing of materials. The work of the Kew Observa- tory, at the Old Deer Park, Richmond, has also been placed under the direction of the N.P.L. (see III. Commercial). 1 The C.I. P.M. at Paris, the first metrological institution, also undertakes verifications for purely scientific purposes. A descriptive list of the verifying instruments of the Standards Department, London, has been published. 2 In the measurement of woollen and other textile fabrics,

as to quality, strength, number of threads, &c, there exists at Bradford a voluntary standardizing institution known as ,the Conditioning House (Bradford Corporation Act 1887), the work of which has been extended to a chemical analysis of fabrics.

8. Ancient Standards of England and Scotland. — A "troy pound " and a new standard yard, as well as secondary standards, were constructed by direction of parliament in 1758-1760, and were deposited with the Clerk of the House of Commons. When the Houses of Parliament were burned down in 1834, the pound was lost and the yard was injured. It may here be mentioned that the expression " imperial " first occurs in the Weights and Measures Act of 1824. The injured standard was then lost sight of, but it was in 1891 brought to light by the Clerk of the Journals, and has now been placed in the lobby of the residence of the Clerk of the House, together with a standard " stone " of 14 lb. 3

*In the measurement of liquids the old " wine gallon " (231 cub. in.) was in use in England until 1824, when the present imperial gallon (fig. 5) was legalized; and the wine gallon of 1707 is still referred to as a standard in the United States. Together with the more ancient standard of Henry VII. and of Queen Elizabeth, this standard is deposited in the Jewel Tower at Westminster. They are probably of the Norman period, and were kept in the Pyx Chapel at Westminster, now in the custody of the Commissioners of Works. A sketch of these measures is given in fig. 6.**

Besides these ancient standards of England (1495, 1588, 1601) there are at the council chambers of Edinburgh and

chant's pound of 7200 grains, from France and Germany, also superseded. (" Avoirdepois " occurs in 1336, and has been thence con- tinued: the Elizabethan standard was probably 7002 grains.) Ale gallon of 1601 =282 cub. in., and wine gallon of 1707=231 cub. in., both abolished in 1824. Winchester corn bushel of 8X268.8 cub. in. and gallon of 274ˆ are the oldest examples known (Henry

m

UK

Fig. 7. — The Scots Choppin or Half-Pint, 1555.

Fig. 8. — Lanark Stone Troy Weight, 1618.

VII.), gradually modified until fixed in 1826 at 277.274, or 10 pounds of water.

French Weights and Measures Abolished. — Often needed in reading older works.

ligne,

12 = ponce,

i2 = pied,

6 = tobe,

2cxx> = lieue dc postc.

3S883 in.

1-0658

i2-7Sg2

„ 76-735

2-42219 miles.

grain,

72 = gros,

8 = once,

o = marc.

2 = poids de marc

•8197 gr.

5Q-OJI

472-17

3777-33

I07g2 lb.

Fig. 6. — A, Winchester Bushel of Henry VII.; B, Standard weight (112 lb) of Elizabeth; C, Ale Gallon at Henry VII.; D, the Gallon.

Linlithgow some of the interesting standards of Scotland, as the Stirling jug or Scots pint, 1618; the choppin or half-pint, 1555 (fig. 7); the Lanark troy and tron weights of the same periods (fig. 8). 5

English Weights and Measures Abolished. — The yard and handful, or 40 in. ell, abolished in 1439. The yard and inch, or 37 in. ell (cloth measure), abolished after 1553; known later as the Scotch ell = 37-06. Cloth ell of 45 in., used till 1600. The yard of Henry VII. = 3.V963 in. Saxon

moneyers. pound, or Tower pound, 5400 grains, abolished in 1527. Mark, § pound = 3&00 grains. Troy pound in use in 1415, established as monetary pound 1527, Troy weight was abolished, from the 1st of January 1879, by the Weights and Measures Act 1878, with the exception only of the Troy ounce, its decimal parts and multiples, legalized in 1853, 16 Vict. c. 29, to be used for the sale of gold and silver articles, platinum and precious stones. Merchant's pound, in 1270 established for all except gold, silver and medicines = 6750 grains, generally superseded by avoirdupois in 1303. Mer-

1 Treasury Committee on National Physical Laboratory, Parlia- mentary Paper, 1898.

3 Descriptive List of Standards and Instruments, Parliamentary Paper, 1892.

3 Report on Standards deposited in House of Commons, 1 st November 1891.

*4 S. Fisher, The Art Journal, August 1900. * Buchanan, Ancient Scotch Standards.*

*Rhineland foot, much used in Germany, = 12-357 m – = *he foot of the Scotch or English cloth ell of 37-06 in., or 3X12-353. (H. J. C.)*

II. Ancient Historical

Though no line can be drawn between ancient and modern metrology, yet, owing to neglect, and partly to the scarcity of materials, there is a gap of more than a thousand years over which the connexion of units 6 of measure is mostly guess-work. Hence, except in a few cases, we shall not here consider any units of the middle ages. A constant difficulty in studying works on metrology is the need of distin- guishing the absolute facts of the case from the web of theory into which each writer has woven them — often the names used, and sometimes the very existence of the units in question, being entirely an assumption of the writer. Again, each writer has his own leaning: A. Bockh, to the study of water-volumes and weights, even deriving linear measures therefrom; V. Queipo, Hundred- ^° the connexion with Arabic and Spanish measures; old Wine J. Brandis, to the basis of Assyrian standards; Mommscn, to coin weights; and P. Bortolotti to Egyptian units; but F. Hultsch is more general, arjd appears to give a more equal representation of all sides than do other authors. In this article the tendency will be to trust far more to actual measures and weights than to the statements of ancient writers; and this position seems to be justified by the great in- crease in materials, and their more accurate means of study.

The usual arrangement by countries has been mainly abandoned in favour of folio whig out each unit as a whole, without recurring to it separately for every locality.

The materials for study are cf three kinds. (1) Literary, both in direct statements in works on measures {e.g. EUasof Kisibis), medicine (Galen) and cosmetics (Cleopatra), in ready-reckoners (Didymus), clerk's (katib's) guides, and like handbooks, and in indirect explanations of the equivalents of measures, mentioned by authors (e.g. Josephus). But all such sources are liable to the most confounding errors, and some passages relied on have in any case to submit to conjectural emendation. These authors are of great value for connecting the monumental information,

fi In the absence of the actual standards of ancient times the units of measure and of weight have. to be Inferred from the other remains; hence unit in this division is used for any more or less closely defined amount of length or weight in terms of which matter was measured.

but must yield more and more to the increasing evidence of actual weights and measures. Besides this, all their evidence is but approximate, often only stating quantities to a half or quarter of the amount, and seldom nearer than 5 or 10%; hence they are entirely worthless for all the closer questions of the approximation or original identity of standards in different countries; and it is just in this line that the imagination of writers has led them into the greatest speculations, unchecked by accurate evidence of the original standards. (2) Weights and measures actually remaining. These are the prime sources, and as they increase and are more fully studied, so the subject will be cleared and obtain a fixed basis. A difficulty has been in the paucity of examples, more due to the neglect of collectors than the rarity of specimens. The number of published weights did not exceed 600 of all standards in 1S80; but the collections from Naucratis (28) / Defenneh (29) and Memphis (44) have supplied over six times this quantity, and of an earlier age than most other examples, while existing collections have been more thoroughly examined. It is above all desirable to make allowances for the changes which weights have undergone; and, as this has only been done for the above Egyptian collections and that of the British Museum, conclusions as to the accurate values of different standards will here be drawn from these rather than continental sources. (3) Objects which have been made by measure or weight, and from which the unit of

construc- tion can be deduced. Buildings will generally yield up their builder's foot or cubit when examined {Inductive Metrology, p. 9). Vases may also be found bearing such relations to one another as to show their unit of volume. And coins have long been recognized as one of the great sources of metrology — valu- able for their wide and detailed range of information, though most unsatisfactory on account of the constant temptation to diminish their weight, a weakness which seldom allows us to reckon them as of the full standard. Another defect in the evidence of coins is that, when one variety of the unit of weight was once fixed on for the coinage, there was (barring the deprecia- tion) no departure from it, because of the need of a fixed value, and hence coins do not show the range and character of the real variations of units as do buildings, or vases, or the actual commercial weights.

Principle of Study. — 1. Limits of Variation in Different Copies, Places and Times. — Unfortunately, so very little is known of the ages of weights and measures that this datum — ■ most essential in considering their history — has been scarcely considered. In measure, Egyptians of Dynasty IV. at Gizeh on an average varied 1 in 350 between different buildings (27). Buildings at Persepolis, all of nearly the same age, vary in unit 1 in 450 (25). Including a greater range of time and place, the Roman foot in Italy varied during two or three centuries on an average ˆotf from the mean. Covering a longer time, we find an average variation of 5ˆ0 in the Attic foot (25), j\$ in the English foot (25), y-l-Q- in the English itinerary foot (25). Se we may say that an average variation of tˆtt by toleration, extending to double thai by change of place and time, is usual in ancient measures. In weights of the same place and age there is a far wider range; at Defenneh (29), within a century probably, the average variation of different units is g-g, g 1 , and g 1 *.-, the range being just the same as in all times and places taken together. Even in a set of weights all found together, the average variation is only reduced to – , in place of ˆ (29). Taking a wider range of place and time, the Roman libra has an average variation of b 1 ,) in the examples of better period (43), and in those of Byzantine age 3*5 (44). Altogether, we see that weights have descended from original varieties with so little intercomparison that no rectification of their values has been made, and hence there is as much variety in any one place and time as in all together. Average variation may be said to range from ˆ to ˆ in different units, doubtless greatly due to defective balances.*

2. Rate of Variation. — Though large differences may exist, the rate of general variation is but slow — excluding, of course, all monetary standards. In Egypt the cubit lengthened yiˆ in

1 These figures refer to the authorities at the end of this section.

some thousands of years (25, 44) . The Italian mile has lengthened T -o cr since Roman times (2) ; the English mile lengthened about 3~|nf m f° ur centuries (31). The English foot has not appreciably varied in several centuries (25) . Of weights there arc scarce any dated, excepting coins, which nearly all decrease; the Attic tetradrachm, however, increased'^ in three centuries (28), owing probably to its being below the average trade weight to begin with. Roughly dividing the Roman weights, there appears a decrease of -^V from imperial to Byzantine times

(43).

3. Tendency of Variation.- This is, in the above cases of lengths, to an increase in course of time. The Roman foot is also probably 30 larger than the earlier form of it, and the later form in Britain and Africa perhaps another g^- larger (25). Prob- ably measures tend to increase and weights to decrease in trans- mission from time to time or place to place.

4. Details of Variation. — Having noticed variation in the gross, we must next observe its details. The only way of examining these is by drawing curves (28, 29) , representing the frequency of occur- rence of all the variations of a unit; for instance, in the Egyptian unit — the kat — counting in a large number how many occur between 140 and 141 grains, 141 and 142, and so on; such numbers represented by curves show at once where any particular varieties of the unit he (see Naukratis, i. 83). This method is only applicable where there is a large number of examples; but there is no other way of studying the details. The results from such a study — of the Egyptian kat, for example — show that there are several distinct families or types of a unit, which originated in early times, have been perpetuated by copying, and reappear alike in each locality (see Tanis, ii. pi. 1.). Hence w t c see that if one unit is derived from another it may be possible, by the similarity or difference of the forms of the curves, to discern whether it was derived by general consent and recognition from a standard in the same condition of distribution as 1 that in which we know it, or whether it was derived from it in earlier times before it became so varied, or by some one action forming it from an individual example of the other standard without any varia- tion being transmitted. As our knowledge of the age and locality of weights increases these criteria in curves will prove of greater value; but even now no consideration of the connexion of different units should be made without a graphic representation to compare their relative extent and nature of variation.

5. Transfer of Units.— The transfer of units from one people to another takes place almost always by trade. Hence the value of such evidence in pointing out the ancient course of trade and commercial connexions (17). The great spread of the Phoenician weight on the Mediterranean, of the

Persian in Asia Minor and of the Assyrian in Egypt are evident cases; and that the decimal weights of the laws of Manu (43) are decidedly not Assyrian or Persian, but on exactly the Phoenician standard, is a curious evidence of trade by water and not overland. If, as seems probable, units of length may be traced in prehistoric remains, they are of great value; at Stonehenge, for instance, the earlier parts are laid out by the Phoenician foot, and the later by the Pelasgo- Roman foot (26). The earlier foot is continually to be traced in other megalithic remains, whereas the later very seldom occurs (25). This bears strongly on the Phoenician origin of our prehistoric civilization. Again, the Belgic foot of the Tungri is the basis of the present English land measures, which we thus see are neither Roman nor British in origin, but Belgic. Generally a unit is transferred from a higher to a less civilized people; but the near resemblance of measures in different countries should always be corroborated by historical considera- tions of a probable connexion by commerce or origin (Head, Hisloria Numorum, xxxvii.). It should be borne in mind that in early times the larger values, such as minac, would be trans- mitted by commerce, while after the introduction of coinage the lesser values of shekels and drachmae would be the units; and this needs notice, because usually a borrowed unit was multiplied or divided according to the ideas of the borrowers, and strange modifications thus arose.

6. Connexions of Lengths, Volumes and Weights. — This is the most difficult branch of metrology, owing to the variety of con- nexions which can be suggested, to the vague information we have, especially on volumes, and to the liability of writers to ration- alize connexions which were never intended. To illustrate how easy it is to go astray in this line, observe the continual reference in modern handbooks to the cubic foot as 1000 oz. of water; also the cubic inch is very nearly 250 grains, while the gallon has actu- ally been fixed at 10 lb of water; the first two are certainly mere coincidences, as may very probably be the last also, and yet they ofTer quite as tempting a base for theorizing as any connexions in ancient metrology. No such theories can be counted as more than coincidences which have been adopted, unless we rind a very exact connexion, or some positive state- ment of origination. The idea of connecting volume and weight has received an immense impetus through the metric system, but it is not very prominent in ancient times. The Egyptians report the weight of a

measure of various articles, amongst others water (6), but lay no special stress on it; and the fact that there is no measure of water equal to a direct decimal multiple of the weight-unit, except very high in the scale, does not seem as if the volume was directly based upon weight. Again, there are many theories of the equivalence of different cubic cubits of water with various multiples of talents (2, 3, 18, 24, 33); but connexion by lesser units would be far more probable, as the primary use of weights is not to weigh large cubical vessels of liquid, but rather small portions of precious metals. The Roman amphora being equal to the cubic foot, and containing 80 librae of water, is one of the strongest cases of such relations, being often men- tioned by ancient writers. Yet it appears to be only an approximate relation, and therefore probably accidental, as the volume by the examples is too large to agree to the cube of the length or to the weight, differing ^\r, or sometimes even -fa. 1

Another idea which has haunted the older metrologists, but is still less likely, is the connexion of various measures with degrees on the earth's surface. The lameness of the Greeks in angular measurement would alone show that they could not derive itinerary measures from long and accurately determined distances on the earth.

7. Connexions with Coinage. — From the 7th century B.C. onward, the relations of units of weight have been complicated by the need of the interrelations of gold, silver and copper coinage; and various standards have been derived theoretically from others through the weight of one metal equal in value to a unit of another. That this mode of originating standards was greatly promoted, if not started, by the use of coinage we may see by the rarity of the Persian silver weight (derived

1 Relative to the uncertain connexion of length, capacity and weight In the ancient metrological systems of the East, Sir Charles Warren, R.E., has obtained by deductive analysis a new equivalent of the original cubit (Palestine Exploration Funr, Quarterly, April, July, October 1899). He shows that the length of the cubit arose through the weights; that is to say, the original cubit of Egypt was based on the cubic double — cubit of water — and from this the several nations branched off with their measures and weights. For the length of the building cubit Sir C. Warren has deduced a length equivalent to 20-6169 English inches, which compares with a mean Pyramid cubit of 20-6015 ' n – as hitherto found. By taking all the ancient cubits, there appears to be a remarkable coincidence through- out with 20-6109 in.*

Sir C. Warren has derived a primitive unit from a proportion of the human body, by ascertaining the probable mean height of the ancient people in Egypt, and so thereby has derived a standard from the stature of man. The

human body has furnished the earliest measure for many races (H. O. Arnold-Forster, The Coming of the Kilogram, 1898), as the foot, palm, hand, digit, nail, pace, ell (ulna), &c. It seems probable, therefore, that a royal cubit may have been derived from some kingly stature, and its length perpetuated in the ancient buildings of Egypt, as the Great Pyramid, &c.

So far this later research appears to confirm the opinion of Bockh (2) that fundamental units of measure were at one time derived from weights and capacities. It is curious, however, to find that an ancient nation of the East, so wise in geometrical proportions, should have followed what by modern experience may be regarded as an inverse method, that of obtaining a unit of length by deducing it through weights and cubic measure, rather than by deriving cubic measure through the unit of length.

from the Assyrian standard), soon after the introduction 'of coinage, as shown in the weights of Defenneh (29), The relative value of gold and silver (17, 21) in Asia is agreed generally to have been 13J to 1 in the early ages of coinage; at Athens in 434 B.C. it was 14:1; in Macedon, 350 B.C., i2|:i; in Sicily, 400 B.C., 15:1, and 300 B.C., 12:1; in Italy in 1st century, it was 12:1, in the later empire 13-9:1, and under Justinian 14-4:1. Silver stood to copper in Egypt as 80:1 (Brugsch), or 120:1 (Revillout); in early Italy and Sicily as 250:1 (Mommsen), or 120:1 (Soutzo), under the empire 120:1, and under Justinian 100:1. The distinction of the use of standards for trade in general, or for silver or gold in particular, should be noted. The early observance of the relative values may be inferred from Num. vii. 13, 14, where silver offerings are 13 and 7 times the weight of the gold, or of equal value and one -half value.

S. Legal Regulations of Measures. — Most states have preserved official standards, usually in temples under priestly custody. The Hebrew "shekel of the sanctuary" is familiar; the standard volume of the apet was secured in the dromus of Anubis at Memphis (35); in Athens, besides the standard weight, twelve copies for public comparison were kept in the city; also standard volume measures in several places (2); at Pompeii the block with standard volumes cut in it was found in the portico of the forum (33); other such standards are known in Greek cities (Gythium, Panidum and Trajanopolis) (11, 33); at Rome the standards were kept in the Capitol, and weights also in the temple of Hercules (2); the standard cubit of the Nilometer was before Constantine in the Serapaeum, but was removed by him to the church (2). In England the Saxon standards were kept at Winchester before a.d. 950 and copies were legally compared and stamped; the Normans removed them to West- minster to the custody of the king's chamberlains at the ex- chequer; and they were preserved in the crypt of Edward the Confessor, while remaining royal property (9). The oldest English standards remaining are those of Henry VII. Many weights have

been found in the temenos of Demeter at Cnidus, the temple of Artemis at Ephesus, and in a temple of Aphrodite at Byblus (44); and the making or sale of weights may have been a business of the custodians of the temple standards.

9. Names of Units. — It is needful to observe that most names of measures are generic and not specific, and cover a great variety of units. Thus foot, digit, palm, cubit, stadium, mile, talent, mina, stater, drachm, obol, pound, ounce, grain, metretes, medimnus, modius, hin and many others mean nothing exact unless qualified by the name of their country or city. Also, it should be noted that some ethnic qualifications have been applied to different systems, and such names as Babylonian and Euboic are ambiguous; the normal value of a standard will therefore be used here rather than its name, in order to avoid confusion, unless specific names exist, such as kat and uten.

All quantities stated in this article without distinguishing names are in British units of inch, cubic inch or grain.

Standards of Length. — Most ancient measures have been derived from one of two great systems, that of the cubit of 20-63 in., or the digit of -729 in.; and both these systems are found in the earliest remains.

20-63 in. — First known in Dynasty IV. in Egypt, most accurately 20-620 in the Great Pyramid, varying 20-51 to 20-71 in Dyn. IV. to VI. (27). Divided decimally in iocths; but usually marked in Egypt into 7 palms of 28 digits, approximately ; a mere juxtaposition (for convenience) of two incommensurate systems (25, 27). The average of several cubit rods remaining is 20-65, a ge in general about 1000 B.C. (33). At Philae, &c, in Roman times 20-76 on the Nilometers (44) . This unit is also recorded by cubit lengths scratched on a tomb at Beni Hasan (44), and by dimensions of the tomb of Ramessu IV. and of Edfu temple (5) in papyri. From this cubit, mahi, was formed the xylon of 3 cubits, the usual length of a walking- staff ; fathom, nent, of 4 cubits, and the khet of 40 cubits (18) ; also the schoenus of I2,ooocubits,actually found marked on the Memphis-Faium road (44).

Babylonia had this unit nearly as early as Egypt. The divided plotting scales lying on the drawing boards of the statues of Gudea (Nature^ xxviii. 341) are of £ 20-89, or a span of 10-44, which is divided in 16 digits of -653, a fraction of the cubit also found in Egypt.

Buildings in Assyria and Babylonia show 20-5 to 20-6. The Baby- lonian system was sexagesimal, thus (18)—

*uban, 5 = qat, 6 = ammat , 6 = qanu, 60= sos, 30 = parasang, a = kaspu. "60 inch 3"44 20*6 124 7430 22ˆ000 446,000*

Asia Minor had this unit in early times— in the temples of Ephesus 20-55, Samos 20-62 ; Hultsch also claims Priene 20-90, and the stadia of Aphrodisias 20-67 and Laodicea 20-94. Ten buildings in ai! give 20-63 mean (18, 25) ; but in Armenia it arose to 20-76 in late Roman times, like the late rise in Egypt (25). It was specially divided into Jth, the foot of j-ths being as important as the cubit. 12"45 in This was especially the Greek derivative of the 20-63 , y ' cubit. It originated in Babylonia as the foot of that 5 a /O' system (24), in accordance with the sexary system applied to the early decimal division of the cubit. In Greece it is the most usual unit, occurring in the Propylaea at Athens 12-44, temple at Aegina 12-40, Miletus 12-51, the Olympic course 12-02, &c. (18); thirteen buildings giving an average of 12-45, mean variation -06 (25), = 1 of 20-75, m – var – ' IO – The digit = i palaeste, = | foot of 12-4; then the system is —

foot, i i3 = eubit, 4-orguia . 100= \ t&]

' (10 =acaena, io=plethron, 6= J

I2\jin. 1S7 747 i24'5 1245 7470

*In Etruria it probably appears in tombs as 12-45 (25); perhaps in Roman Britain; and in medieval England as 12-47 (25). 13*8 in This foot is scarcely known monumentally. On three 2 v . * Egyptian cubits there is a prominent mark at the 19th 3X207. digit or 1ˆ j n>) which shows the existence of such a measure (33). It became prominent when adopted by Philetaerus about 280 B.C. as the standard of Pergamum (42), and probably it had been shortly before adopted by the Ptolemies for Egypt. From that time it is one of the principal units in the literature (Didymus, &c), and is said to occur in the temple of Augustus at Pergamum as 13-8 (18). Fixed by the Romans at 16 digits (133 = Roman foot), or its cubit at if Roman feet, it was legally =13-94 at I2 3 B – c * (42); and 77 Philetaereau stadia were = Roman mile (18). The multiples of the 20-63 cubit are in late times generally reckoned in. theˆe feet of f cubit. The name " Babylonian foot " used by Bockh (2) is only a theory of his, from which to derive volumes and weights; and no evidence for this name, or connexion with Babylon, is to be found. Much has been written (2, 3, 33) on supposed cubits of about 17-18 in. derived from 20*63 — mainly in*

*endeavouring to ger a basis for the Greek and Roman feet ; but these are really con- nected with the digit system, and the monumental or literary evidence for such a division of 20-63 w ˆl not bear examination. 17*30 There is, however, fair evidence for units of 17-30 and s , 1-730 or 3*3 of 20-76 in Persian buildings (25); and the*

■*jX2o*7b. game i s f ounc i i n Asia Minor as 17-25 or f of 20-70. On the Egyptian cubits a small cubit is marked as about 17 in., which may well be this unit, as I of 20-6 is 17-2; and, as these marks are placed before the 23rd digit or 17-0, they cannot refer to 6 palms, or 17-7, which is the 24th digit, though they are usually attributed to that*

*We now turn to the second great family based on the digit. This has been so usually confounded with the 20-63 family, owing to the juxtaposition of 28 digits with that cubit in Egypt, that it should be observed how the difficulty of their incommensurability has been felt. For instance, Lepsius (3) supposed two primitive cubits of 13-2 and 20-63, to account for 28 digits being only 20-4 when free from the cubit of 20-63 — * ne first 24 digits being in some cases made shorter on the cubits to agree with the true digit standard, while the remaining 4 are lengthened to fill up to 20-6. In the •727 in dynasties IV. and V. in Egypt the digit is found in tomb sculptures as -727 (27) ; while from a dozen examples in the later remains we find the mean -728 (25). A length of 10 digits is marked on all the inscribed Egyptian cubits as the ‘ ! lesser span ” (33). In Assyria the same digit appears as -730, particularly at Nimrud (25) ; and in Persia buildings show the 10-digit length of 7-34 (25). In Syria it was about -728, but variable; in eastern Asia Minor mere like the Persian, being -732 (25). In these cases the digit itself, or decimal multiples, seem to have been used.*

*18*23 “ˆ e pre-Greek examples of this cubit in Egypt, men- ˆ tioned by Bockh (2), give 18-23 as a mean, which is 25X 7 2 9- 25 digits of -729. and has no relation to the 20-63 cubit. This cubit, or one nearly equal, was used in Judaea in the times of the kings, as the Siloam inscription names a distance of 1758 ft. as roundly 1200 cubits, showing a cubit of about 17-6 in. This is also evidently the Olympic cubit; and, in pursuance of the decimal multiple of the digit found in Egypt and Persia, the cubit of 25 digits was \ of the orguia of 100 digits, the series being —*

*old digit, i 2 jˆ > Cu! ‘ llt ‘ *=\ orguia, io = amma, io = stadion. ‘7ˆgincli iS”2 72’g J2g 7296.*

Then, taking f of tht cubit, or | of the orguia as a foot, the Greeks arrived at their foot of 12-14; this, though very well known in literature, is but rarely found, and then generally in the form of the cubit, in monumental measures. The Parthenon step, cele- brated as 100 ft. wide, and apparently

225 ft. long, gives by Stuart 12-137, by Penrose 12-165, by Paccard 12-148, differences due to scale and not to slips in measuring. Probably 12-16 is the nearest

value. There are but few buildings wrought on this foot in Asia Minor, Greece or Roman remains. The Greek system, however, adopted this foot as a basis for decimal multiplication, forming

foot, I2'i6 inches

lo^pletliron,

which stand as |th of the other decimal series based on the digit. This is the agrarian system, in contrast to the orguia system, which was the itinerary series (33).

Then a further modification took place, to avoid the inconveni- ence of dividing the foot in i6| digits, and a new digit was formed — longer than any value of the old digit — of j^ of the foot, or -760, so that the series ran

disrit 1 io = lichas

*f * (gO s = orguia, io = amma, io = stadion.*

*76 inch 7*6 72'9 729 7296.*

This formation of the Greek system (25) is only an inference from the facts yet known, for we have not sufficient information to prove it, though it seems much the simplest and most likely history.

*11*62 Seeing the good reasons for this digit having been ex- , y , ported to the West from Egypt— from the presence of the ioX'720. I g. 2 3 cubit in Egypt, and from the 729 digit being the decimal base of the Greek long measures — it is not surprising to find it in use in Italy as a digit, and multiplied by 16 as a foot. The more so as the half of this foot, or 8 digits, is marked off as a measure on the Egyptian cubit rods (33). Though Queipo has opposed this con nexion (not noticing the Greek link of the digit), he agrees that it is supported by the Egyptian square measure of the plethron, being equal to the Roman actus (33). The foot of n-6 appears probably first in the prehistoric and early Greek remains, and is certainly found in Etrurian tomb dimensions as 11-59 (2). Dorpfeld con- siders this as the Attic foot, and states the foot of the Greek metro- logical relief at Oxford as 11-65 (or n-6i, Hultsch). Hence we see that it probably passed from the East through Greece to Etruria, and thence became the standard foot of Rome; there, though divided by the Italian duodecimal system into 12 unciae, it always maintained its original 16 digits, which are found marked on some of the foot- measures. The well-known ratio of 25:24 between the 12- 16 foot and this we see to have arisen through one being -g of 100 and the other 16 digits — 16| : 16 being as 25 : 24, the legal ratio. The*

mean of a dozen foot-measures (1) gives 1 1 -616 = -008, and of long lengths and buildings ii-6o7 ± -oi. In Britain and Africa, however, the Romans used a rather longer form (25) of about 11 -68, or a digit of -730. Their series of measures was —

digitus, 4 = palmus, 4 = pes, 5 = passus, I25 = stadium, 8 = milliare; •72G inch 2-90 11-62 58-1 7262 58,100

*uncia *g68 = 1 , 2 pes, palralpes*

*cubitus 17*43 = 6 palmi.*

Either from its Pelasgic or Etrurian use or from Romans, this foot appears to have come into prehistoric remains, as the circle of Stonehenge (26) is 100 ft. of 11 -68 across, and the same is found in one or two other cases. 11-60 also appears as the foot of some medieval English buildings (25).

We now pass to units between which we cannot state any con- nexion.

25"1. — The earliest sign of this cubit is in a chamber at Abydos (44) about 1400 B.C.; there, below the sculptures, the plain wall is marked out by red designing lines in spaces of 25- 13 ± -03 in., which have no relation to the size of the chamber or to the sculpture. They must therefore have been marked by a workman using a cubit of 25-13. Apart from medieval and other very uncertain data, such as the Sabbath day's journey being 2000 middling paces for 2000 cubits, it appears that Joscphus, using the Greek or Roman cuhit, gives half as many more to each dimension of the temple than does the Talmud; this shows the cubit used in the Talmud for temple measures to be certainly not under 25 in. Evidence of the early period is given, moreover, by the statement in j Kings (vii. 26) that the brazen sea held 2000 baths; the bath being about 2300 cub. in., this would show a cubic of 25 in. The corrupt text in Chronicles of 3000 baths would need a still longer cubit; and, if a lesser cubit of 21-6 or 18 in be taken, the result for the size of the bath would be impossibly small. For other Jewish cubits see 18-2 and 21-6. Oppert (24) concludes from inscriptions that there was in Assyria a royal cubit of |- the U cubit, or 25-20; and four monu- ments show (25) a cubit averaging 25-28. For Persia Qneipo (33) relies on, and develops, an Arab statement that the Arab hashama cubit was the royal Persian, thus fixing it at about 25 in.; and the Persian guerze at present is 25, the royal guerze being i| times this, or 37J2 in. As a unit of 1-013, decimally multiplied, is most com- monly to be deduced from the ancient Persian buildings, we may take 25-34 as t ne nearest approach to the ancient Persian unit.

216.— The circuit of the city wall of Khorsabad (24) is minutely stated on

a tablet as 24,740 ft. (U), and from the actual size the tJ it therefore 10-806 in. Hence the recorded series of measures on the Senkereh tablet are valued (Oppert) as —

e,-=; {2o=(palm), 3 = TT, 6 = qanu, 2 = sa, $=(n), i2 = us, 30=kasbu.

sus -‘ \6o =U.6o =r«),

**iS inch 3‘6 io’So < >4‘8 i2g‘6 648 7776 223,280*

Other units are the suklum or 311 = 5-4, and cubit of 211 = 21-9.

which are not named in this tablet. In Persia (24) the series on the same base was —

vitasti, 10-7 inches

= arasni, 36o=asparasa, 3o=paratbafiha, 2=g3p-

2I‘4 7704 231,120 462,240

probably

yava, 6=angu.sta io=vitasti; andgama^g arasni; also b5zu-=2 arasni.
■18 inch 107 107 128 21-4 428 21-4

The values here given are from some Persian buildings (25), which indicate 21-4, or slightly less; Oppert’s value, on less certain data, is 21-52. The Egyptian cubits have an arm at 15 digits or about 10-9 marked on them, which seems like this same unit (33).

*This cubit was also much used by the Jews (33), and is so often referred to that it has eclipsed the 25-1 cubit in most writers. The Gemara names 3 Jewish cubits (2) of 5, 6 and 7 palms; and, as Oppert (24) shows that 25-2 was reckoned 7 palms, 21-6 being 6 palms, we may reasonably apply this scale to the Gemara list, and read it as 18, 21-6 and 25-2 in. There is also a great amount of medieval and other data showing this cubit of 21*6 to have been familiar to the Jews after their captivity; but there is no evidence for its earlier date, as there is for the 25-in. cubit (from the brazen sea) and for the iS-in. cubit from the Siloam inscription.*

*From Assyria also it passed into Asia Minor, being found on the city standard of Ushak in Phrygia (33), engraved as 21*8, divided into the Assyrian foot of 108, and half and quarter, 5-4 and 2-7. Apparently the same unit is found (18) at Heraclea in Lucania, 21-86; and, as the general foot of the South Italians, or Oscan foot (18), best defined by the 100 feet square being -& of the jugerum, and therefore = io-So or half of 21-60. A cubit of 21-5 seems certainly to be indicated in prehistoric remains in Britain, and also in early Christian buildings in Ireland (25).*

22-2. — Another unit not far different, but yet distinct, is found apparently in Punic remains at Carthage (25), about 11-16 (22-32), and probably also in Sardinia as 11-07 (22-14), where it would naturally be of Punic origin. In the Hauran 22-16 is shown by a basalt door (British Museum), and perhaps elsewhere in Syria (25). It is of some value to trace this measure, since it is indicated by some prehistoric English remains as 22-4.

*200. — This unit may be that of the pre-Semitic Mesopotamia ns, as it is found at the early temple of Mujjayyir (Ur) ; and, with a few other cases (25), it averages 19-97. It is described by Oppert (24), from literary sources, as the great U of 222 susi or 39*96, double of 19-98; from which was formed a reed of 4 great U or 159-8. The same measure decimally divided is also indicated by buildings in Asia Minor and Syria (25).*

19-2, — In Persia some buildings at Pcrscpolis and other places (25) are constructed on a foot of 9-6, or cubit of 19-2; while the modern Persian arish is 38-27 or 2X19-13. The same is found very clearly in Asia Minor (25), averaging 19-3; and it is known in literature as the Pythic foot (18, 33) of 9-75, or 2 of 19-5, if Cen- sorinus is rightly understood. It may be shown by a mark (33) on the 26th digit of Sharpe's Egyptian cubit = 19-2 in.

13-3. — This measure does not seem to belong to very early times, and it may probably have originated in Asia Minor. It is found there as 13-35 in buildings. Hultsch gives it rather less, at 13-1, as the " small Asiatic foot." Thence it passed to Greece, where it is found (25) as 13-36. In Romano-African remains it is often found, rather higher, or 13-45 average (25). It lasted in Asia apparently till the building of the palace at Mashita (a.d. 620), where it is 13-22, according to the rough measures we have (25). And it may well be the origin of the dira' Stambuli of 26-6, twice T 3'3- Found in Asia Minor and northern Greece, it does not appear unreasonable to connect it, as Hultsch does, with the Belgic foot of the Tungri, which was legalized (or perhaps introduced) by Drusus when governor, as £ longer than the Roman foot, or 13-07; this statement was evidently an approximation by an increase of 2 digits, so that the small difference from 13-3 is not worth notice. Further, the pcrtica was 12 ft. of 18 digits, i.e.

Drusian feet.

Turning now to England, we find (25) the commonest building foot up to the 15th century averaged 13-22. Here we see the Belgic foot passed over to England, and we can fill the gap to a considerable extent from the itinerary measures. It has been shown (31) that the old English mile, at least as far back as the 13th century, was of 10 and not 8 furlongs. It was therefore equal to 79,200 in., and divided decimally into 10 furlongs 100 chains, or 1000 fathoms. For the existence of this fathom (half the Belgic perrica) we have the proof of its half, or yard, needing to be suppressed by statute (9) in 1439, as " the yard and full hand," or about 40 in., — evidently the yard of the most usual old English foot of 13-22, which would be 39-66. We can restore then the old English system of long measure from the buildings, the statute-prohibition, the surviving chain and furlong, and the old English mile shown by map? and itineraries, thus: —

foot, 3 = yarJ, 2 = fathom, io = chain, io=furlong, io=milc-

13-22 3966 79-32 793 7932 70,320

Such a regular and extensive system could not have been put into use throughout the whole country suddenly "in 1250, especially as tt must have had to resist the legal foot now in use, which was enforced (9) as early as 950. We cannot suppose that such a system would be invented and become general in face of the laws enforcing

pes, 100— decempeda, •94 sq. it. 94

*jugerum, 2 =heredium, ■6205 acre 1*241*

the 12-in. foot. Therefore it must be dated some time before the roth century, and this brings it as near as we can now hope to the Belgic foot, which lasted certainly to the 3rd or 4th century, and is exactly in the line of migration of the Belgic tribes into Britain. It is remarkable how near this early decimal system of Germany and Britain is the double of the modern decimal metric system. Had it not been unhappily driven out by the 12-in. foot, and repressed by statutes both against its yard and mile, we should need but a small change to place our measures in accord with the metre.

The Gallic leuga, or league, is a different unit, being 1-59 British miles by the very concordant itinerary of the Bordeaux pilgrim. This appears to be the great Celtic measure, as opposed to the old English, or Germanic, mile. In the north-west of England and in Wales this mile lasted as 1-56 British miles till 1500; and the perch of those parts was correspondingly longer till this century (31). The " old London mile " was 5000 ft., and probably this was the mile which was modified to 5280 ft., or 8 furlongs, and so became

the British statute mile.

Standards of Area. — We cannot here describe these in detail. Usually they were formed in each country on the squares of the long measures. The Greek system was —

foot , 36 =hexapodes

100= acaena, 2S = aroura, 4=pIethron.

1,027 sq- Et. 3696 102. 68 2567 10,268

The Roman system was —

36=clima, 4.— actus, 2 = jugerum, 33ˆ4 13,536 27,073

100= cent una, 4=saltus. 124-1 4q6‘4

Standards of Volume. — There is great uncertainty as to the exact values of all ancient standards of volume — the only precise data being those resulting from the theories of volumes derived from the cubes of feet and cubits. Such theories, as we have noticed, are extremely likely to be only approximations in ancient times, even if recognized then; and our data are quite inadequate for clearing the subject. If certain equivalences between volumes in different countries are stated here, it must be plainly understood that they are only known to be approximate results, and not to give a certain basis for any theories of derivation. All the actual monumental data that we have are alluded to here, with their amounts. The impossibility of safe correlation of units necessitates a division by countries.

Egypt. — The hon was the usual small standard; by 8 vases which have contents stated in hons (8, 12, 20, 22, 33, 40) the mean is 29-2 cub. in. ± -6; by 9 unmarked pottery measures (30) 29-1 =fc-i6, and divided by 20; by 18 vases, supposed multiples of hon (1), 32-1 ±-2. These last are probably only rough, and we may take 29-2 cub. in. == 5. This was reckoned (6) to hold 5 utens of water (uten.. 1470 grains), which agrees well to the weight; but this was probably an approximation, and not derivative, as there is (14) a weight called shet of 4-70 or 4-95 uten, and this was perhaps the actual weight of a hon. The variations of hon and uten, however, cover one another completely. From ratios stated before Greek times (35) the series of multiples was —*

ro, 8=lion, 4 = honnii, io=apet { ro=(Thcban), 10= sa.

or besha (4=tama 365 cub. m. 29‘2 n6”8 nfiS 4672 11,680 116,800

(Theban) is the " great Thehan measure."

In Ptolemaic times the artaba (2336), modified from the Persian, was general in Egypt, a working equivalent to the Attic metretes — value 2 apet or £ tama ; medimnus = tama or 2 artabas, and fractions down to j£g artaba (35). In Roman times the artaba remained (Didymus), but § was the usual unit (name unknown), and this was divided down to £% or T ˆj artaba (35) — thus producing by ˆ artaba a working equivalent to the xestes and sextarius (35). Also a new Roman artaba (Didymus) of 1540- was brought in. Beside the equivalence of the hon to 5 utens weight of water, the mathe- matical papyrus (35) gives 5 besha = f cubic cubit (Revillout's interpretation of this as I cubit 3 is impossible geometrically; see Rev. Eg., 1 881, for data); this is very concordant, but it is very unlikely for 3 to be introduced in an Egyptian derivation, and probably therefore only a working equivalent. The other ratio of Revillout and Hultsch, 320 hons = cubit 3 , is certainly approximate.*

Syria, Palestine and Babylonia. — Here there are no monumental data known; and the literary information does not distinguish the closely connected, perhaps identical, units of these lands. More- over, none of the writers are before the Roman period, and many relied on are medieval rabbis. A large number of their statements are rough (2, 18, 33), being based on the working equivalence of the bath or epha with the Attic metretes, from which are sometimes drawn fractional statements which seem more accurate than they are. This, however, shows the bath to be about 2500 cub. in. There are two better data (2) of Epiphanius and Theodoret — Attic medimnus = 1 -j baths, and saton (ˆbath) = ifmodii; these give about 2240 and 2260 cub. in. The best datum is in Josephus (Ant. iii. 15, 3), where 10 baths = 4i Attic or 31 Sicilian medimni, for which it is agreed we must read modii (33); hence the bath =2300 cub. in. Thus these three different reckonings agree closely, but all equally depend on the Greek and Roman standards, which are not well fixed. The Sicilian modius here is %$, or slightly under £, of the bath, and so probably a

Punic variant of the 5 bath or saton of Phoenicia. One close datum, if trustworthy, would be log of waters Assyrian mina .-. bath about 2200 cub. in. The rabbinical statement of cub. cubit of 21-5 holding 320 logs puts the bath at about 2250 cub. in.; their log-measure, holding six hen's

eggs, shows it to he over rather than under this amount ; but their reckoning of bath = j cubit cubed is but approxi- mate; by 21-5 it is 1240, by 25-1 it is 1990 cubic in. The earliest Hebrew system was —

(log, 4 = kab) 3 = hin, 6 \ _ \ bath, or) , (homer— wet.

'issaron ro J ' \ eph3 J" (or kor — d f y-

32 cub. in. 128 230 283 2300 23,000

'lssaron (" tenth-deal ") is also called gomer. The log and kab are not found till the later writings; but the ratio of hin to 'issaron is practically fixed in early tiroes by the proportions in Num. xv. 4-9. Epiphanius stating great hin = 18 xestes, and holy hin = 9, must refer to Syrian xestes, equal to 24 and 12 Roman; this makes holy hin as above, and great hin a double hin, i.e. seah or saton. His other statements of saton = 56 or 50 sextaria remain unexplained, unless this be an error for bath =56 or 50 Syr. sext. and .. =2290 or 2560 cub. in. The wholesale theory of Revillout (35) that all Hebrew and Syrian measures were doubled by the Ptolemaic revision, while retaining the same names, rests entirely on the resemblance of the names apet and epha, and of log to the Coptic and late measure lok. But there are other reasons against accepting this, besides the im probability of such a change.

The Phoenician and old Carthaginian system was (18) —

log , 4 ˆkab, 6 =saton , 30 — corus,

31 cub. in. 123 740 22,200

valuing them by 31 Sicilian =41 Attic modii (Josephus, above). The old Syrian system was (18) —

cotyte, 2 = Syr. xestes, i8=sabith;i or satoc ' 1 { =collatlion, 2 =bath-artaba ; 21 cub. in. 41 740 mo 2220

also

Syr. xestes, 45 = ma.ris, 2=metretes or artaba.

41 1850 3700

The later or Seleucidan system was (18) —

cotyle, 2 = Syr. xestes, 90= Syr. metretes,

22 44 4000

the Syrian being 1 \ Roman sextarii.

The Babylonian system was very similar (IS) —

*(\), 4 = capitba. j ;|~™^ 1 * e ph a< IO =homer, 6 =achane. 33 cub. in. 132 1080 2380 23,800 142,800*

The approximate value from capitha=2 Attic choenices (Xenophon) warrants us in taking the achane as fixed in the following system, which places it closely in accord with the preceding. In Persia Hultsch states —

capetis. J4'4 cub. ia.

10.83 3570 142.800

the absolute values being fixed by artaba =51 Attic choenices (Herod, i. 192). The maris of the Pontic system is £ of the above, and the Macedonian and Naxian maris j of the Pontic (18). By the theory of maris = £ of 20-6 3 it is 1755-; by maris = Assyrian talent, 1850, in place of 1850 or 1980 stated above; hence the more likely theory of weight, rather than cubit, connexion is nearer to the facts.*

Aeginetan System. — This is so called from according with the Aeginetan weight. The absolute data are all dependent on the Attic and Roman systems, as there are no monumental data. The series of names is the same as in the Att 1 'c system (18). The values are iˆXthe Attic (Athenaeus, Theophrastus, &c.) (2, 18), or more closely 11 to 12 times | of Attic. Hence, the Attic cotyle being 17-5 cub. in., the Aeginetan is about 25-7. The Boeotian system (18) included the achane; if this = Persian, then cotyle = 24'7. Or, separately through the Roman system, the mnasis of Cyprus (18)ˆ=170 sextarii; then the cotyle = 24-8. By the theory of the metretes being i| talents Aeginetan, the cotyle would be 23-3 to 24-7 cub. in. by the actual weights, which have tended to decrease. Probably then 25-0 is the best approximation. By the theory (18) of 2 metretes =cube of the 18-67 cubit from the 12-45 f°°t> the cotyle would be about 25-4. within -4; but then such a cubit is unknown among measures, and not likely to be formed, as 12-4 is % of 20-6. The Aeginetan system then was —

cotyle, 4~ch,, m «. { l = ^^ teus ; ' '^^ete. 1i }=™^™- 25 cub. in. 100 300 800 3200 4800

This was the system of Sparta, of Boeotia (where the aporryma = 4 choenices, the cophinus = 6 choenices, and saites or saton or hecteus=2 aporrymae, while 30 medimni = achane, evidently Asiatic connexions throughout), and of Cyprus (where 2 choes = Cyprian medimnus, of

which 5 = medimnus of Salarms, of which 2 = mnasis (18)

Aiti-c or Usual Greek System. — The absolute value of this system is far from certain. The best data are three stone slabs, each with several standard volumes cut in them (11, 18), and two named vases. The value of the cotyle from the Naxian slab is 15-4 (best, others I4-6—I9-6); from a vase about (6 6; from the Panidum slab 17-1 (var. 16-2-18-2); from a Capuan vase 17-8; from the Ganus slab 17-8 (var. I7—I8-). From these we may take 17-5 as a fair approxi-

*mation. It is supposed that the Panathenaic vases were intended as metretes; this would show a cotyle of 14-4-17-1. The theories of connexion give, for the value of the cotyle, metretes = Aeginetan talent, .-. i54-i6-6; metres f of 12-16 cubed, .-.I6-6; _ metretes = §£ of 12-16 cubed, .-. 16-8; medimnus = 2 Attic talents, hecteus = 20 minae, choenix = 2| minae, .-. i6*75; metretes = 3 cub. spithami (4 cubit = 9-i2), .■. 17-5; 6 metretes — 2 ft. of 12-45 cubed, .*. 17-8 cub. in. for cotyle. But probably as good theories could be found for any other amount ; and certainly the facts should not be set aside, as almost every author has done, in favour of some one of half a dozen. theories. The system of multiples was for liquids —*

cyathus, il = oxybaphon, 4 = cotyIe, i2 = chous, I2 = metretes,

a'p cub. in. 4'4 i?"5 210 2520

with the tetarton (8-8), 2 = coty!e, 2 = xestes (35-) introduced from the Roman system. For dry measure —*

cyatluis, 6 — cotyle, 4 = choenix, 8 = becteus, 6 ~ niedimoiis,

2'ocub. in. I7 – S 70 56° 3360

with the xestes, and amphoreus (1680) =\ medimnus, from the Roman system. The various late provincial systems of division are beyond our present scope (18).

System- of Gythium. — A system differing widely both in units and names from the preceding is found on the standard slab of Gythium in the southern Peloponnesus {Rev. Arch., 1872). Writers have unified it with the Attic, but it is decidedly larger in its ur.it, giving 19-4 (var. I9-I-I9-8) for the supposed cotyle. Its system is —

cotyle,

4 = hemihecton,

4 = chous,

3-f»).

58 cub. in.

232

932

2796

And with this agrees a pottery cylindrical vessel, with official stamp on it (AHM02I0N, &c), and having a fine black line traced round the inside, near the top, to show its limit; this seems to be probably very accurate, and contains 58-5 cub. in., closely agreeing with the cotyle of Gythium. It has been described {Rev. Arch., 1872) as an Attic choenix. Gythium being the southern port of Greece, it seems not too far to connect this 58 cub. in. with the double of the Egyptian hon = 58-4, as it is different from every other Greek system.

Roman System. — The celebrated Farnesian standard congius of bronze of Vespasian, " mensurae exactae in Capitolio P. X., " con- tains 206-7 cur> – m – (2)i and hence the amphora 1654, By the sextarius of Dresden (2) the amphora is 1695; by the congius of Ste Genevieve (2) 1700 cub. in.; and by the ponderarium measures at Pompeii (33) 1540 to 1840, or about 1620 for a mean. So the Farnesian congius, or about 1650, may best be 1 adopted. The system for liquid was —

quartarius,

4 = sextarius,

6 = congius,

4 = urna

? = amphora

8‘6 cub. in.

344

206

825

£650

for dry measure 16 sextarii =modius, 550 cub. in.; and to both systems were added from the Attic the cyathus (2-87), acetabulum (4-3) and hemina (17-2 cub. in.). The Roman theory of the amphora being the cubic foot makes it 1569 cub. in., or decidedly less than the actual measures; the other theory of its containing 80 librae of water would make it 1575 by the commercial or 1605 by the monetary libra — again too low for the measures. Both of these theories there- fore are rather working equivalents than original derivations; or at least the interrelation was allowed to become far from exact.

Indian and Chinese Systems. — On the ancient Indian system see Numismata Orientalia, new ed., i. 24 ; an the ancient Chinese, Nature, xxx. 565, and xxxv. 318.

Standards of Weight.— For these we have far more complete data than for volumes or even lengths, and can ascertain in many cases the nature of the variations, and their type in each place. The main series on which we shall rely here are those — (1) from Assyria (38) about 800 B.C.; (2) from the eastern Delta of Egypt (29) (Defenneh); (3) from western Delta (28) (Naucratis) ; (4) from Memphis (44)— -all these about the 6th century B.C., and therefore before much interference from the decreasing coin standards; (5) from Cnidus; (6) from Athens; (7) from Corfu; and (8) from Italy (British Museum) (44). As other collections are but a fraction of the whole of these, and are much less completely examined, little if any good would be done by including them in the combined results, though for special types or inscriptions they will be mentioned.

*146 grains. — The Egyptian unit w r as the kat, which varied between 138 and 155 grains (28,29). There were several families or varieties within this range, at least in the Delta, probably five or six in all (29). The original places and dates of these cannot yet be fixed, except for the lowest type of 138-140 grains; this belonged to Heliopolis (7), as two weights (35) inscribed of " the treasury of An " show 139-9 ar *d 140-4, while a plain one from there gives 138-8; the variety 147-149 may belong to Hermopolis (35), according to an inscribed weight. The names of the kat and tema are fixed by being found on weights, the utcn by inscriptions ; the series was —*

(«}, io=kat, 140 grs. 146

,io = uten,

1460

10 = tema.

14 ,600.

The tema is the same name as the large wheat measure (35), which was worth 30,000 to 19,000 grains of copper, according to Ptolemaic receipts and accounts {Rev. Eg., 1881, 150), and therefore very likely worth 10 uteris of copper in earlier times when metals were scarcer. The kat was regularly divided into 10; but another division, for the sake of interrelation with another system, was in 3 and \,

scarcely found except in the eastern Delta, where it is common (29) ; and it is known from a papyrus (38) to be a Syrian weight. The uten is found -4-6 = 245, in Upper Egypt (rare) (44). Another division (in a papyrus) (38) is a silver weight of T ˆ kat = about 88— perhaps the Babylonian siglus of 86. The uten was also binarily divided into 12S peks of gold iu Ethiopia; this may refer to another standard (see 129) (33). The Ptolemaic copper coinage is on two bases — the uten, binarily divided; and the Ptolemaic five shekels (1050), also binarily divided. (This result is from a larger number than other students have used, and study by diagrams.) The theory (3) of the derivation of the uten from isVn cubic cubit of water would fix it at 1472, which is accordant; but there seems no authority either in volumes or weights for taking 1500 utens. Another theory (3) derives the uten from joVii of the cubic cubit of 24 digits, or better S of 20-63 ; that, however, will only fit the very lowest variety of the uten, while there is no evidence of the existence of such a cubit. The kat is not unusual in Syria (44), and among the haematite weights of Troy (44) are nine examples, average 144, but not of ex- treme varieties. 129 pt; ■ 258 ?r = ˆ e gˆˆt standard of Babylonia became the -..Jl .”””” – . “”” parent of several other systems; and itself //0 J •j”ˆ ‘ and its derivatives became more widely spread ** ˆ’ ‘ than any other standard. It was known in two*

forms — one system (24) of—

um, 6o = sikhir, 6 = shekel, io = sloae, 6 — inaneh, $0 = talent; •36 gnu 21-5 lag iago 7750 465,000

and the other system double of this in each stage except the talent. These two systems are distinctly named on the weights, and are known now as the light and heavy Assyrian systems (19, 24). (It is better to avoid the name Babylonian, as it has other meanings also.) There are no weights dated before the Assyrian bronze lion weights (9, 17, 19, 38) of the nth to

8th centuries B.C. Thirteen of this class average 127-2 for the shekel; 9 haematite barrel-shaped weights (38) give 128-2; 16 stone duck-weights (38), 126-5. A heavier value is shown by the precious metals — the gold plates from Khorsabad (18) giving 129, and the gold daric coinage (21, 35) of Persia 129-2. Nine weights from Syria (44) average 128-8. This is the system of the " Babylonian " talent, by IIerodotus = 70 minae Euboic, by Pollux = 70 minae Attic, by Aelian=72 minae Attic, and, therefore; about 470,000 grains. In Egypt this is found largely at Naucratls (28, 29), and less commonly at Defenneh (29). In both places the distribution, a high type of 129 and a lower of 127, is like the monetary and trade varieties above noticed; while a smaller number of examples are found, fewer and fewer, down to 118 grains. At Memphis (44) the shekel is scarcely known, and a \ mina weight was there converted into another standard (of 200). A few barrel weights are found at Karnak, and several egg-shaped shekel weights at Gebelcn (44) ; also two cuboid weights front there (44) of I and 10 utens are marked as 6 and rk>, which can hardly refer to any unit but the heavy shekel, giving 245. Hultsch refers to Egyptian gold rings of Dynasty XVIII. of 125 grains. That this unit penetrated far to the south in early times is shown by the tribute of Kush (34) in Dynasty XVIII. ; this is of 801, 1443 and 23,741 kats, or 15 and 27 manehs and 72 talents when reduced to this system. And the later Ethiopic gold unit of the pek (7),or T i 5 of the uten, was 10-8 or more, and may therefore be the \ sikhir or obolos of 2 1-5. But the fraction ˆ, or a continued binary division repeated seven times, is such a likely mode of rude subdivision that little stress can be laid on this. In later times in Egypt a class of large glass scarabs for funerary purposes seem to be adjusted to the shekel (30). Whether this system or the Phoenician of 224 grains was that of the Hebrews is uncertain. There is no doubt but that in the Maccabean times and onward 218 was the shekel ; but the use of the word darkemftn by Ezra and Nehemiah, and the probabilities of their case, point to the darag- maneh, ˆ maneh or shekel of Assyria; and the mention of -5 shekel by Nehemiah as poll tax nearly pro vets that the 129 and not 218 grains is intended, as 218 is not divisible by 3. But the Maccabean use of 2i8 may have been a reversion to the older shekel; and this is strongly shown by the fraction £ shekel (i Sam. ix. 8), the continual mention of large decimal numbers of shekels in the earlier books, and the certain fact of 100 shekels being = mina. This would all be against the 129 or 258 shekel, and for the 218 or 224. There is, however, one good datum if it can be trusted: 300 talents of silver (2 Kings xviii. [4) are 800 talents on Sennacherib's cylinder (34), while the 30 talents of gold is the same in both accounts. Eight hundred talents on the Assyrian silver standard would be 267 — or roundly 300 — -talents on the heavy trade or gold system, which is therefore probably the Hebrew. Probably the 129 and 224 systems coexisted in the country; but on the whole it seems more likely that 129 or

rather 258 grains was the Hebrew shekel before the Ptolemaic times — especially as the 100 shekels to the mina is paralleled by the following Persian system (Hultsch) —

, . , (=;a = mina 60 — talent of gold

shekel, – ((in ˆ m ; na 6o=taIent of trade,

TZQl-'J?,. fi-liO 7750 387,000 465,000

the Hebrew system being

gerah, 20 — shekel, ioo^=maneh, 30— talent,

12-9 grs. 258? 25,800 774, goo

and, considering that the two Hebrew cubits are the Babylonian and Persian units, and the volumes are also Babylonian, it is the more

*likely that the weights should have come with these. From the east this unit passed to Asia Minor; and six multiples of 2 to 20 shekels (av. 127) are found among the haematite weights of Troy (44), including the oldest of them. On the Aegean coast it often occurs in early coinage (17) — at Lampsacus 131-129, Phocaea 256- 254, Cyzicus 252—247, Methymna 124-6, &c. In later times it was a main unit of North Syria, and also on the Euxine, leaden weights of Antioch (M), Callatia and Tom is being known (38). The mean of these eastern weights is 7700 for the mina, or 128. But the leaden weights of the west (44) from Corfu, &c, average 7580, or 126-3; this standard was kept up at Cyzicus in trade long after it was lost in coinage. At Corinth the unit was evidently the Assyrian and not the Attic, being 129-6 at the earliest (17) (though modified to double Attic, or 133, later) and being -f-3, and not into 2 drachms. And this agrees with the mina being repeatedly found at Corcyra, and with the same standard passing to the Italian coinage (17) similar in weight, and in division into i — the heaviest coinages (17) down to 400 B.C. (Terina, Velia, Sybaris, Posidonia, Metapontum, Tarentum, &c.) being none over 126, while later on many were adjusted to the Attic, and rose to 134. Six disk weights from Carthage (44) show- 126. It is usually the case that a unit lasts later in trade than in coinage; and the promin- ence of this standard in Italy may show how it is that this mina (18 unciae = 7400) was known as the " Italic " in the days of Galen and Dioscorides (2). 126 pt- "ˆ var i at -ion on the main system was made by forming a (200 *" m ˆ na °f 5° shekels. This is one of the Persian series (gold) , ** ' and the \ of the Hebrew series noted above. But it is most striking when it is found in the mina form which distinguishes it. Eleven weights from Syria and Cnidus (44) (of the curious type with two breasts on a rectangular block) show a mina of 6250*

(125-0); and it is singular that this class is exactly like weights of the 224 system found with it, but yet quite distinct in standard. The same passed into Italy and Corfu (44), averaging 6ooo^divided in Italy into unciae (rS), and scripulae Gj^-g), and called litra (in Corfu?). It is known in the coinage of Hatria (18) as 6320. And a strange division of the shekel in 10 (probably therefore connected with this decimal mina) is shown by a series of bronze weights (44) with four curved sides and marked with circles (British Museum, place unknown), which may be Romano-Gallic, averaging 125 -Mo. This whole class seems to cling to sites of Phoenician trade, and to keep clear of Greece and the north — perhaps a Phoenician form of the 129 system, avoiding the sexagesimal multiples.

If this unit have any connexion with the kat, it is that a kat of gold is worth 15 shekels or j mina of silver; this agrees well with the range of both units, only it must be remembered that 129 was used as gold unit, and another silver unit deduced from it. More likely then the 147 and 129 units originated independently in Egypt and Babylonia.

From 129 grains of gold was adopted an equal value of silver = 1720, on the proportion of 1:13-3, and this

86 grs.

8600:

516,000.

was divided in 10 = 1 72 — which was. used either in

this form, or its half, 86, best known as the siglus (17). Such a proportion is indicated in Num. vii., where the gold spoon of ro shekels iscqual in value to the bowl of 130 shekels, or double that of 70, i.e. the silver vessels w r ere 200 and 100 sigli. The silver plates at Khorsabad (18) we find to be 80 sigli of 84-6. The Persian silver coinage shows about 86-o; the danak was | of this or 28-7, Xeno- phon and others state it at about 84._ As a monetary weight it seems to have spread, perhaps entirely, in consequence of the Persian dominion; it varies from 174- downwards, usually 167, in Aradus, Cilicia and on to the Aegean coast, in Lydia and in Macedonia (17). The silver bars found at Troy averaging 2744, or | mina of 8232, have been attributed to this unit (17) ; but no division of the mina in J is to be expected, and the average is rather low. Two haematite weights from Troy (44) show 86 and 87-2. The mean from leaden weights of Chios, Tenedos (44), &c, is 8430. A duck-weight of Camirus, probably early, gives 8480; the same passed on to Greece and Italy (17), averaging 8610; but in Italy it was divided, like all, other units, into unciae and scripulae

(44). It is perhaps found in Etrurian coin- ageasi/5— 172 (17). By the Romans it was used on the Danube (18), two weights of the first legion there showing 8610; and this is the mina of 20 unciae (8400) named by Roman writers. The system was—

obol, 6— = sigIus, ioo— mina. 60— talent.

14-3 grs. 86 86co 516,000

A derivation from this was the ■§ of 172, or 57-3, the so-called

Phocaean drachma, equal in silver value to the ˆ of the gold 258

grains. It was used at Phocaea as 58-5. and passed to the colonies

of Posidonia and Velia as 59 or 118. The colony of Massilia brought

it into Gaul as 58-2-54-9.

« That this unit (commonly called Phoenician) is derived*

**. s m ‘ from the 129 system can hardly be doubted, both being*

l” 2 ˆ so intimately associated in Syria and Asia Minor. The*

072,000. R ,] at j on j 3 258 ;229 ::9:8; but the exact form in which

the descent took place is not settled: fa or 129 of gold is worth

57 of silver or a drachm, \ of 230 (or by trade weights 127 and 226) ;

otherwise, deriving it from the silver weight of 86 already formed,

the drachm is 3 of the stater, 172, or double of the Persian danak of

28-7, and the sacred unit of Didyma in Ionia was this half-drachm,

27; or thirdly, what is indicated by the Lydian coinage (17), 86 of

ANCIENT HISTORICAL]

gold was equal to 1 150 of silver, 5 shekels or ˆ mina. Other pro- posed derivations from the kat or pek are not satisfactory. In actual use this unit varied greatly: at Naucrat.is (29) there are groups of it at 231, 223 and others down to 208; this is the earliest form in which we can study it, and the corresponding values to these are 130 and 1 26, or the gold and trade varieties of the Babylonian, while the lower tall down to 20S corresponds

to the shekel down to 1 18, which is just what is found. Hence the 224 unit seems to have been formed from the 129, after the main families or types of that had arisen. It is scarcer at Defenneh (29) and rare at Memphis (44). Under the Ptolemies, however, it became the great unit of Egypt, and is very prominent in the later literature in consequence (18, 35). The average of coins (21) of Ptolemy I. gives 219-6, and thence they gradually diminish to 210, the average (33) of the whole series of Ptolemies being 218. The "argenteus" (as Reviltout transcribes a sign in the papyri) (35) was of 5 shekels, or 1090; it arose about 440 B.C., and became after 160 B.C. a weight unit for copper. In Syria, as early as the 15th century B.C., the tribute of the Rutennu, of Naha- raina, Megiddo, Anaukasa, &c. (34), is on a basis of 454-484 kats, or 300 shekels (^ talent) of 226 grains. The commonest weight at Troy (44) is the shekel, averaging 224. In coinage it is one of the commonest units in early times; from Phoenicia, round the coast to Macedonia, it is predominant (17) ; at a maximum of 230 (Ialysus), it is in Macedonia 224, but seldom exceeds 220 elsewhere, the earliest Lydian of the 7th century being 219, and the general average of coins 218. The svstem was —

WEIGHTS AND MEASURES

487

S = drnchtn,

56

4 = shekel,

I20 = talcnt.

672,000

From the Phoenician coinage it was adopted for the Maccabean. It is needless to give the continual evidences of this being the later Jewish shekel, both from coins (max. 223) and writers (2, 18, 33); the question of the early shekel we have noticed already under 129. In Phoenicia and Asia Minor the mina was specially made in the form with two breasts (44), 19 such weights averaging 5600 (= 224) ; and thence it passed into Greece, more in a double value of 11,200 (= 224). From Phoenicia this naturally became the main Punic unit; a bronze weight from lot (18), marked 100, gives a drachma of 56 or 57 (224-228) ;anda Punic inscription (18) names 28 drachmae = 25 Attic, and .-. 57 to 59 grains (228-236); while a probably later series of 8 marble disks from Carthage (44) show 208,but vary from 197 to 234. In Spain it was 236 to 216 in different series (17), and it is a question whether the Massiliote drachmae

of 58-55 are not Phoenician rather than Phocaic. In Italy this mina became naturalized, and formed the " Italic mina " of Hero, Priscian, &c; also its double, the mina of 26 unciae or io,8oo, = 5o shekels of 216; the average of 42 weights gives 5390 (= 215-6), and it was divided both into 100 drachmae, and also in the Italic mode of 12 unciae and 288 scripulae (44). The talent was of 120 minae of 5400, or 3OOO shekels, shown by the talent from Herculaneum, ta, 660,000 and by the weight inscribed pondo ckxv. (i.e. 125 librae) talentum siclorvm. hi., -i.e. talent of 3000 shekels (2) (the M being omitted; just as Epiphanius describes this talent as 125 librae, or 6 (= 9) nomibinata, for 9000). This gives the same approximate ratio 96: 100 to the libra as the usual drachma reckoning. The Alexandrian talent of Festus, 12,000 denarii, is the same talent again. It is believed that this mina -M 2 unciae by the Romans is the origin of the Arabic rati of r2 ukiyas, or 550O grains (33), which is said to have been sent by Harurt al-Rashid to Charlemagne, and so to have originated the French monetary pound of 5666 grains. But, as this is probably the same as the English monetary pound, or tower pound of 5400, which was in use earlier (see Saxon coins), it seems more likely that this pound (which is common in Roman weights) was directly inherited from the Roman civilization. on , Another unit, which has scarcely been recognized in aocxv" mctr °l°gy hitherto, Is prominent in the weights from Anc oon Egypt — some 50 weights from Naucratis and 15 from 4 ' ' Defenneh plainly agreeing on this and on no other basis. Its value varies between 76-5 and 81-5 — mean 79 at Naucratis (29) or 81 at Defenneh (29). It has been connected theoretically with a binary division of the 10 shekels or " stone " of the Assyrian systems (28), 1290-:- 16 being 80-6; this is suggested by the most usual multiples being 40 and 80 = 25 an d 5° shekels of 129; it is thus akin to the mina of 50 shekels previously noticed. The tribute of the Asi, Rutennu, Khita, Assam, &c, to Thothmes III. (34), though in un- even numbers of kats, comes out in round thousands of units when reduced to this standard. That this unit is quite distinct from the Persian 86 grains is clear in the Egyptian weights, which maintain a wide gap between the two systems. Next, in Syria three inscribed weights of Antioch and Bcrytus (18) show a mina of about 16,400, or 200X82. Then at Abydus, or more probably from Babylonia, there is the large bronze lion-weight, stated to have been originally 400,500 grains; this has been continually J 60 by different writers, regardless of the faet (Rev. arch., 1862, 30) that it bears the numeral 100; this therefore is certainly a talent of 100 minae of 4005; and as the mina is generally 50 shekels in Greek systems it points to a weight of 8o-i. Farther west the same unit occurs in several Greek weights (44) which show a mina of 7800 to 8310, mean 8050 -r 1 00 = 80-5. Turning to coinage, we find this often, but usually overlooked as a degraded form of the Persian 86 grains siglos. But the earliest

coinage in Cilicia, before the general Persian coinage (17) about 380 B.C., is Tarsus, 164 grains; Soli, 169, 163, 158; Nagidus, 158, 161-153 later; Issus, 166; Mallus, 163-154 — all of which can only by straining be classed as Persian; but they agree to this standard, which, as we have seen, was used in Syria in earlier times by the Khita, &c. The Milesian or " native " system of Asia Minor (18) is fixed by Hultsch at 163 and 81-6 grains — the coins of Miletus (17) showing 160, 80 and 39. Coming down to literary evidence, this is abundant. Bockh decides that the "Alexandrian drachma" was I of the Solonic 67, or= 80-5, and shows that it was not Ptolemaic, or Rhodian, or Aeginetan, being distinguished from these in in-scriptions (2). Then the " Alexandrian mina " of Dioscorides and Galen (2) is 20 unciae =8250; in the " Analecta " (2) it is 150 or 158 drachmae =8100. Then Attic: Euboic. or Aeginetan:: 18:25 in the mctrologisls (2), and the Euboic talent = 7000 " Alexandrian " drachmae; the drachma therefore is 8o-o. The " Alexandrian " wood talent: Attic talent: :6:5 (Hero, Didymus), and. -.480, 000, ■which is 60 minae of 8000. Pliny states the Egyptian talent at 80 librae — 396,000; evidently =the Abydus lion talent, which is-j-100, and the mina is. -.3960, or 50X79-2. The largest weight is the "wood" talent of Syria (18) =6 Roman talents, or 1,860.000, evidently 120 Antioch minae of 15,500 or 2X7750. This evidence is too distinct to be set aside; and, exactly confirming as it does the Egyptian weights and coin weights, and agreeing with the early Asiatic tribute, it cannot be overlooked in future. The system was

(50 = talent,

(6o = Grcek talent

drachm,

2 = stater.

50 = mina,

80 grs.

160

8000

400,000 480,000

?C\7 – ion This system, the Aeginetan, one of the most im- oS'o • portant to the Greek world, has been thought to

579,000.

*be a degradation of the Phoenician (17, 21), sup- posing 220 grains to have been reduced in primitive Greek usage to 194. But we are now able to prove that it was an independent system — (1) by its not ranging usually oyer 200 grains in Egypt before it passed to Greece; (2) by its earliest example, perhaps before the 224 unit existed, not being over 208; and (3) by there being no intermediate linking on of this to the Phoenician unit in the large number of Egyptian weights, nor in the Ptolemaic coinage, in which both standards are used. The first example (30) is one with the name of Amenhotep I. (17th century B.C.) marked as " gold 5," which is 5X207*6. Two other marked weights are from Memphis (44), snowing 201 -8 and 196-4, and another Egyptian 191-4. The range of the (34) Naucratis weights is 186 to 199, divided in two groups averaging 190 and 196, equal to the Greek monetary and trade varieties. Ptolemy I. and II. also struck a scries of coins (32) averaging 199. In Syria haematite weights arc found (30) averaging 198-5, divided into 99-2, 49-6 and 24-8; and the same division is shown by gold rings from Egypt (38) of 24-9. In the medical papyrus (38) a weight of f kat is used, which is thought to beSyrian; now § kat— 92 to 101 grains, or just this weight which we have found in Syria; and the weights of § and $ kat are very rare in Egypt except at Defenneh (29), on the Syrian road, where they abound. So we have thus a weight of 207-191 in Egypt on marked weights, joining therefore completely with the Aeginetan unit in Egypt of 199 to 186, and coinage of 199, and strongly connected with Syria, where a double mina of Sidon (18) is 10,460 or 50X 209-2. Probably before any Greek coinage we find this among the haematite weights of Troy (44), ranging from 208 to 193-2 (or 104- 96*6), i.e. just covering the range from the earliest Egyptian down to the earlv Aeginetan coinage. Turning now to the early coinage, we see the fuller weight kept up (17) at Samos (202), Miletus (201), Calymna (100, 50), Methymna and Scepsis (99, 49), 1 Ionia (197); while the coinage of Aegina, (17, 12), which by its wide diffusion made this unit best known, though a few of its earliest staters go up even to 207, yet is characteristically on the lower of the two groups which we recognize in Egypt, and thus started what has heen considered the standard value of 194, or usually 190, decreasing afterwards to 184. In later times, in Asia, however, the fuller weight, or higher Egyptian group, which we have just noticed in the coinage, was kept up (17) into the series of cistophori (196-191), as in the Ptolemaic series of 199. At Athens the old mina was fixed by Solon at 150 of his drachmae (18) or 9800 grains, according to the earliest drachmae, showing a stater of 196; and this continued to be the trade mina in Athens, at least until 160 n.c, but in a reduced form, in which it equalled only 138 Attic drachmae, or 9200. The Greek mina weights show (44), on an average of 37,9650 (= stater of 193), varying from 1S6 to 199. In the Hellenic coinage it varies (18) from a maximum of 200 at Pharae to 192, usual full weight; this unit occupied*

(17) all central Greece, Peloponnesus and most of the islands. The system was —

6 = drachm,

2 = stater,

50 = mina,

60 = talent.

6 grs.

96

192

9600

576,000

1 That this unit was used for gold in Egypt, one thousand years before becoming a silver coin weight in Asia Minor, need not be dwelt on, when we see in the coinage of Lydia (17) gold pieces and silver on the same standard, which was expressly formed for silver alone, i.e. 84 grains. The Attic and Assyrian standards were used indifferently for either gold or silver.

It also passed into Italy, but in a smaller multiple of 35 drachmae, or { of the Greek mina; 12 Italian weights (44) bearing value marks (which cannot therefore be differently attributed) show a libra of 2400 or 5 of 9600, which was divided in unciae and sextulae, and the full-sized mina is known as the 24 uncia mina, or talent of 120 librae of Vitruvius and Isidore (18) = 9900. Hultsch states this to be the old Etruscan pound.

412 With the trade mina of 9650 in Greece, and recognized in Italy, we can hardly doubt that the Roman libra is 495° £ rs – t he half of this mina. At Athens it was 2X4900, and on the average of all the Greek weights it is 2X4825, so that 4950 —the libra —is as close as we need expect. The division by 12 does not affect the question, as every standard that came into Italy was similarly divided. In the libra, as in most other standards, the*

value which happened to be first at hand for the coinage was not the mean of the whole of the weights in the country ; the Phoenician coin weight is below the trade average, the Assyrian is above, the Aeginetan is below, but the Roman coinage is above the average of trade weights, or the mean standard. Rejecting all weights ot the lower empire, the average (44) of about 100 is 4956; while 42 later Greek weight? (nomisma, &c.) average 4857, and 16 later Latin ones (solidus, etc.) show 4819. The coinage standard, however, was always higher (18); the oldest gold shows 5056, the Campanian Roman 5054, the consular gold 5037, the aurei 5037, the Constantine solidi 5053 and the Justinian gold 4996. Thus, though it fell in the later empire, like the trade weight, yet it was always above that. Though it has no exact relation to the congius or amphora, yet it is closely =4977 grains, the £ of the cubic foot of water. If, however, the weight in a degraded form, and the foot in an undegraded form, come from the East, it is needless to look for an exact relation be- tween them, but rather for a mere working equivalent, like the 1000 ounces to the cubit foot in England. Bockh has remarked the great diversity between weights of the same age — those marked " Ad August! Temp " ranging 4971 to 5535, those tested by the fussy

graefect Q. Junius Rusticus vary 4362 to 5625, and a set in the ritish Museum (44) belonging together vary 4700 to 5168. The series was —

siliqua, 6 = scripulum , 4= >sextula, 6 = uncia, I2 = [ibra, 287 grs. 17-2 687 412 4950

the greater weight being the centumpondium of 495,000. Other weights were added to these from the Greek system —

obolus, 6=drachma, 2— sirilicu3, 4= uncia;

8-6 grs. 515 103 412

and the sextula after Constantine had the name of solidus as a coin weight, or nomisma in Greek, marked N on' the weights. A beautiful set of multiples of the scripulum was found near Lyons (38), from 1 to 10X17-28 grains, showing a libra of 4976. In Bryzantine times in Egypt glass was used for coin-weights (30), averaging 68-0 for the solidus =4896 for the libra. The Saxon and Norman ounce is said to average 416-5 (Num. Ckron., 1871, 42), apparently the Roman uncia inherited.

,- , ' The system which is perhaps the best known, through i:„ """ its adoption by Solon in Athens, and is thence called 0700 t ˆttic or Solonic, is nevertheless far older than its intro- 402,000. ˆLˆj-jon mto Greece, being found in full vigour in Egypt in the 6th century B.C. It has been usually*

reckoned as a rather heavier form of the 129 shekel, increased to 134 on its adoption by Solon. But the Egyptian weights render this view impossible. Among them (29) the two contiguous groups can be discriminated by the 129 being multiplied by 30 and 6o (while the 67 or 134 is differently X25, 40, 50 and 100. Hence, although the two groups overlap owing to their nearness, it is impossible to regard them as all one unit. The 129 range is up to 131-8, while the Attic range is 130 to 138 (65-69). Hultsch reckons on a ratio of 24:25 between them, and this is very near the true values; the full Attic being 67-3, the Assyrian should be 129-2, and this is just the full gold coinage weight. We may perhaps see the sense of this ratio through another system. The 80-grain system, as we have seen, was probably formed by binarily dividing the 10 shekels, or " stone "; and it had a talent (Abydus lion) of 5000 drachmae; this is practically identical with the talent of 6000 Attic drachmae. So the talent of the 80-grain system was sexagesimally divided for the mina which was afterwards adopted by Solon. Such seems the most likely history of it, and this is in exact accord with the full original weight of each system. In Egypt the mean value at Naucratis (29) was 66-7, while at Defenneh (29) and Memphis (44) — probably rather earlier— it was 67-0. The type of the grouping is not alike in different places, showing that no distinct families had arisen before the diffusion of this unit in Egypt; but the usual range is 65-5 to 69-O. Next it is found at' Troy (44) in three cases, all high examples of 68-2 to 68-7; and these are very important, since they cannot be dissociated from the Greek Attic unit, and yet they are cf a variety as far removed as may be from the half of the Assyrian, which ranges there from 123-5 to 131 ; thus the difference of unit between Assyrian and Attic in these earliest of all Greek weights is very strongly marked. At Athens a low variety of the unit was adopted for the coinage, true to the object of Solon in depreciating debts; and the first coinage is of only 65-2, or scarcely within the range of the trade weights (28) ; this seems to have been felt, as, contrary to all other

*states, Athens slowly increased its coin weight up to 66-6, or but little under the trade average. It gradually supplanted the Aeginetan standard in Greece and Italy as the power of Athens rose ; and it was adopted by Philip and Alexander (17) for their great gold coinageof I33and66*5. This system is often known as the" Euboic," owing to Its early use in Euboea, and its diffusion by trade from thence. The series was —*

chalcous, S = obolus, 6 = - = drachma, ioo = mina, 6o = talantort. 1-4 grs. 11-17 67 6700 402,000

Turning now to its usual trade values in Greece (44), the mean of 113 gives 67-15; but they vary more than the Egyptian examples, having a sub-variety both above and below the main body, which itself exactly coincides

with the Egyptian weights. The greater part of those weights which bear names indicate a mina of double the usual reckoning, so that there was a light and a heavy system, a mina of the drachma and a mina of the stater, as in the Phoenician and Assyrian weights. In trade both the rninae were divided in \, 4, h 3, and £, regardless of the drachmae. This unit passed also into Italy, the libra of Picenum and the double of the Etrurian and Sicilian libra (17); it was there divided in unciae and scripulae (44), the mean of 6 from Italy and Sicily being 6600; one weight (bought in Smyrna) has the name " Leitra " on it. In literature it is constantly referred to: but we may notice the " general mina " (Cleopatra), in Egypt, 16 unciae— 6600; the Ftolemaic talent, equal to the Attic in weight and divisions (Hero, Didymus) ; the Antiochian talent, equal to the Attic (Hero); the treaty of the Romans with Antiochus, naming talents of 80 lihrae, i.e. mina of 16 unciae; the Roman mina in Egypt, of 15 unciae, probably the same diminished; and the Italic mina of 16 unciae. It seems even to have lasted in Egypt till the middle ages, as Jabarti and the " katib's guide " both name the rati misri (of Cairo) as 144 dirhems = 676o.

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III. Commercial

t. Denominations. — The denominations of trade weights and measures at present used in the United Kingdom are represented by "Board of Trade standards," by which are regulated the accuracy of the common weights and measures handled in shops, &C.: 1

Imperial Measures of Length. — 100 feet, 66 feet or a chain of 100 links, rod, pole, or perch, measures from 10 feet to 1 foot;

1 Board of Trade Model Regulations, 1892 ; Weights and Measures Acts, 1878 1889, 1892, 1893.

18 inches; yard of 36 inches, $, £, £, ˆ yard, nail, inch, and duodeci- mal, decimal and binary parts of the inch.

Imperial Measures of Capacity. — Liquid measures from 32 gallons to 1 gallon, quart, pint, \ pint, gill, \ gilt, | gill. Dry measures of bushel, \ bushel, peck, gallon, quart, pint, 5 pint.

Apothecaries' Measures. — 40 fluid ounces to \ fl. oz., 16 fluid drachms to \ fl. dr., 60 minims to I minim.

Avoirdupois Weights.— Cental (100 lb), 56 tb (£ cwt.), 28 lb, 14 lb (stone), 7, 4, 2, 1 ft; S, 4. 2, 1, £ ounce (8 drams); 4, 2, 1, 5 drams.

Troy Weights. — The ounce (480 gr.) and multiples and decimal parts of the ounce troy from 500 ounces to o-ooi oz.

Apothecaries' Weights. — 10 oz. to 1 oz. (480 gr.) ; 4 drachms to 2 oz. ; 2, 1 drachms; 2 scruples to \ scruple; and 6 grains to h grain.

Fenny-weights. — 20 dwt. (480 grains), 10, 5, 3, 2, I dwts.

Grain Weights. — 4000, 2000, 1000 gr. (making 7000 gr. or r lb), 500 to oor gr.

2. The international trade metric weights and measures (1897) handled in shops, &c, of which there are also Board of Trade standards, are set out as follows: — •

Imperial to Metric 1 yard =

1 square yard =

I cubic inch =

1 gallon 2 =

I pound (7000 grains) = 1 ounce troy (480 gr.) = 1 fluid drach:

4′ =

1 fluid ounce

1 metre (m.) at o° C. 1 square metre (m 2 .) 1 cubic decimetre (c.d.)

1000 cubic centimetres (c.c.)

1 litre (1.)

1 kilogram (kg.)

■914399 m. ■836126 m 2 . •387 c.c. ■5459&3I 1-

•45359243 Kg.

■1035 grammes. ■552 millilitres (ml.). ■84123 centilitres (cl.). Metric

to Imperial

- 39-3701 i3inchcsat62°F. 10-7639 square feet.

= 3-1

1 gramme (g.)

61-024 cubic inches.

*i*7598 pints.*

*2-2046223 lb avoir. [15*43 2 35 6 4 grains*

or ˆ 0-7716 scruple.

METRE divided i nto Decimetres, Centimetres, and Millimetres.

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FIG. 9. — International Metric Trade Weights and Measures, 1897. A, linear; B, capacity; C, and D, weights.

Length. — Decametre or 10 metres; double metre; metre or 1000 millimetres; decimetre or o-i metre; centimetre or o-oi metre; millimetre.

Capacity. — 20 litres; 10 litres or decalitre; 5, 2, 1, 0-5. 0-2, o-i (decilitre) ; 005, 0-02, o-oi (centilitre) ; 0-005, 0-002, o-oOl (miliilitrc) litres.

Cubic Measures. — 1000 (litre), 500, 200, 100, 50, 20, 10, 5, 2 cubic centimetres, 1 c.c. or rooo cubic millimetres.

Weights. — 20, 10, 5, 2, 1 kilograms; 500 to 1 gramme; 5 to I decigram; 5 to I cefitigram ; 5 to l milligram. (Series 5, 2, 2, 1 i, i.e. with a duplicate weight of " 2.")

3. Equivalents. — The metric equivalents of the units of the metric system in terms of the imperial system, as recalculated in i8q7 ; are as follows:— 1

1 Metric Equivalents, King's Printers (1898).

2 The equivalent of the litre in gallons may also be derived as follows: —

Let P(i-^/fZ) = P I (i— pfd'), where P is the weight of the water contained in the gallon when weighed in London — g. London = g. Paris (45°)Xi;ooo577.

The correction for temperature, 62 F., is — 0-0906 in.; hence 29-9094 inches. One inch = 25-4 mm.; also 29-9094X25-4 = 759"9876; and 759-698761- Xi-ooo577 = 76o'i37 mm. P is the weight of the brass weights (10 lb) A = 8-143.*

P, the density (0-001218738) of dry air, containing 4 vols, of carbonic acid in 10,000 vols.; £ = 16-667° C; 6 = 760-137 mm. of mercury at 0°, lat. 45 , and at sea-level. Coefficient of expansion of air = 0-00367; A mercury at o C. = 13-595. d is the density of water at 62 F. (16-667° C.) = 0-9988611. d l , the density of the brass as above. 10 lb = 4-5359243 kg.*

From the above it follows that P = 4'5407857 kg. Therefore — 1 gallon = P/o-99886i 1 = 4-5459631 litres.

[COMMERCIAL

I veclro

I tchetverte

The equivalents of the Russian weights and measures, in terms also of the imperial and metric weights and measures, were re- calculated in 1897. : The following are the leading equivalents: f 0-025 pood. 1 Russian pound —s 96 zolotniks. L 9216 dolis. = -0-40951240 kg. = 0-90282018 lt> avoir. ro-ooo66 verst.

larchinne H °'?;^ g Tl

16 vercnoks.

L 280 liniias.

= 0-711200 metre.

= 777778 yard.

_ f 10 schtoffs

_ \ = ioo tcharkas

= 12-299 litres

= 2-7056 gallons.

= 8 tchetveriks

= 2-0991 hectolitres

*= 577*9 bushels.*

4. Local Control. — The necessary local inspection and verifica- tion of weights and measures in use for trade (as distinct from the verbal and written use of weights and measures) is in the United Kingdom undertaken by inspectors of weights and measures, who are appointed by the local authorities, as the county and borough councils. An inspector is required to hold a certificate of qualification, and for his guidance general regula- tions are made by his local authority as to modes of testing weights, measures and weighing instruments. 2 In Europe the local inspection is generally carried out through the Stale, and a uniform system of local verification is thereby maintained.

5. Errors. — In the verification of weights and measures a margin of error is permitted to manufacturers and scale-makers, as it is found to be impossible to make tws weights, or two measures, so identical that between them some difference may not be found either by the balance or the microscope. For common weights and measures this margin (tolerance, remedy or allowance, as it is_ also called) has been set out by the Board of Trade for all the various kinds of weights and measures in use for commercial purposes in the United Kingdom, and similar margins of error are recognized in other countries. For instance, on I lb avoir, weight made of brass, 2 grains in excess are allowed; on I oz. troy or apothecaries' weight, +0-2 grain is allowed; on 1 pint pot, 4 fluid drachms is permitted;

on 1 brass yard, 0-05 inch in excess or 0-02 inch in deficiency in length is allowed for ordinary trade purposes.

6. Foreign Weights and Measures. — Throughout the British Empire the imperial system of weights and measures is legal.

In Russia, as in the United Kingdom and the United States, the national weights and , measures are followed (§ 3 above), although the use of metric weights and measures is permissive.

In India the native weights, &c, ancient and arbitrary, arc still followed. In i88q the British yard was adopted for the whole of India (Measures of Length Act) at a normal tempera- ture of S5 F. as standardized to the imperial yard at 62 F. The metric system was also introduced, mainly for railway purposes, in 1870 and 1S71 (Indian Acts). Certified measures of the yard, foot and inch are kept by the Commissioners of Police at Calcutta, Madras and Bombay.

In standardizing a weight for use in India, correction has to be made for the weight of air displaced by the material standard, and for such purpose the normal temperature of 85 , atmospheric pressure

29ˆ inches, latitude 22 35′ 6-5″ (Calcutta), g = < |. 0-9982515 V

are taken. The ” tola” (180 grains) is properly the Government unit of weight for currency; and 80 tolas make the ” Government seer.”

7. Customary Weights and Measures. — In some districts of the United Kingdom, as well as in provincial districts of other countries, old local and customary denominations of weights and measures are still found to be in use, although their use may have been prohibited by law. So powerful is custom with the people. 3

8. Legislation. — In everyday transactions with reference to weights and measures, the British legislature also exercises

1 C.I.P.M. Froces-verbaux (.1897), p. 155.

2 Regulations, Birmingham, Glasgow, London, Manchester, &c.

3 Report Select Committee (1892); Merchant’s Handbook, W._A. Browne (1892); Reports H.M. Representatives Abroad, Foreign Office, 1900-1901.

control in industrial pursuits. ‘For instance, in weighing live cattle, owners of markets are now required to provide adequate accommodation. 4 Useful statutes have also been passed to pro- tect the working class, as in checking

the weighing instruments used in mines in Great Britain, over which instruments wages are paid, and in the inspection of similar instruments used in factories and workshops. The Merchandise Marks Act 1887 makes it. an offence also to apply in trade a false description, as to the number, quantity, measure, gauge or weight of goods sold; and this Act appears to reach offences that the Weights and Measures Acts may perhaps not reach.

9. Pharmaceutical Weights and Measures. — By the Medical Act of 1858, and the Act of 1S62. the General Council of Medical Education and Registration of the United Kingdom are authorized to issue a " Pharmacopoeia " with reference to the weights and measures used in the preparation and dispensing of drugs, &c. The British Pharmacopoeia issued by the Council in 1898 makes no alteration in the imperial weights and measures required to be used by the Pharmacopoeia of 1864. For all pharmaceutical purposes, however, the use of the metric system alone is employed in all paragraphs relating to analysis, whether gravimetric or volumetric. For measures of capacity the Pharmacopoeia continues to use imperial measuring vessels graduated at the legal temperature of 62 F. The official names of the metric capacity units arc defined at 4 C, as generally on the Continent. The new Pharmacopoeia also follows foreign practice, and employs metric measures of capacity and volumetric vessels graduated at 15-5 C, or 6o° F. Specific gravity bottles are also adjusted at 6o° F., the figures indicating specific gravities being quotients obtained by dividing in each instance the weight of the solid or liquid by the weight of an equal bulk of water, both taken at 6o° F. 5

10. Gauges. — " Gauges," as understood at one time, included only those used in the measurement of barrels, casks, &c, and hence the term " gauger." For engineering and manufacturing purposes the more important linear gauges are, however, now used, adjusted to some fundamental unit of measure as the inch; although in certain trades, as for wires and flat metals, gauges continue to be used of arbitrary scales and of merely numerical sizes, having no reference to a legal unit of measure ; and such are rarely accurate. A-standard gauge, however, exists (Order in Council, August 1883), based on the inch, but having numbered sizes from 7/0 (0-5 inch) to No. 50 (o-ooi inch) to meet the convenience of certain trades. 6

11. Screws. — The screw is an important productive measuring instrument, whether used as a micrometer-screw of less than an inch in length, or as a master-screw of 20 feet in length. The probable errors and eccentricities of small micrometer- screws have been care- fully investigated to ±o-oooi inch; but the accuracy of leading screws used in workshops has not been sufficiently verified. For some engineering purposes it would appear to be desirable to produce master-screws to an accuracy of 2 oVo of an inch to the foot of screw, so as to serve indirectly for the verification of " guiding

screws " for general use in workshops. 7 Attempts in this direction were originally made by Whitworth, Clement, Donkin, Rogers, Bond and others, but we still need a higher accuracy in screw-threads.

12. Educational. — Ordinary arithmetic books often contain refer- ences to local and customary weights and measures and to obsolete terms of no practical use to children. It appears to be desirable, as the Committee of Council on Education have done, to recognize only the legal systems of weights and measures — the imperialand metric. The Education Code of Regulations for 1900 prescribes that the tables of weights and measures to be learned^ include those only which are in ordinary use, viz. in all classes or forms above the third the tables of

(Weight — ton, cwt, stone, H), oz. and dr., -j Length — mile, furlong, rod or pole, chain, yd., ft. and inch, [Capacity — quarter, bushel, pk., gall., qt. and pt. In Code standards above the fifth, in addition to the foregoing, the tables of

/Area — sq. mile, acre, rood, pole, yd., ft. and inch, \ Volume — cubic yard, foot and inch. Instruction in the principles of the metric system, and in the ad vantages to be gained from uniformity in the method of forming multiples and sub-multiples of the unit, are, under this Code, to be

4 Markets and Fairs (Cattle) Acts 1887, 1891 ; Coal Mines Regula- tion Act 1887; Factory and Workshop Act 1878.

5 Pharmacopoeia (1901) ; Calendar Pharmaceutical Society, 1902.

6 Order in Council, 26th August 1881.

7 Systematique des vis horlogeres, Thury (Geneva, 1878). Bulletin Soc. d 'Encouragement pour l'Industrie Nationale, Paris, 1894. Report of British Association on Screw-threads, 1900.

given to the scholars in Standards IV., V., VI. and VII. As a prepara- tion for this it is stated in the Code that it will be useful to give in Standard III. (arithmetic) elementary lessons on the notation of decimal fractions. (See Arithmetic.)

Table of the Principal Foreign Weights and Measures now in use, and

of their Equivalents in Imperial or in Metric Weights and Measures.

Almude . . . Portugal Anoman (Ammo- Ceylon

mam, Amomam) Ara …. Italy . Archin, or Ar- Turkey ,

shin

Archin .

Bulgaria .

Archine, or Ar-

Russia

ch in nc

Ardeb

Egypt . .

Are … .

Area .

Spain

Arpent .

France

Canada . .-;

Arroba .

Portugal .

Spain

Art aba .

Persia

Aunc

Belgium .

France

Jersey Rome

Barilo

Bat, or Tical

Siam .

Batman .

Persia

Turkey .

Behar . .

Arabia

Berri . .

Turkey .

Boisseau .

Belgium .

Boutylka

Russia

Braca

Portugal .

Braccio .

Spain

Rome

Brassc

France

Braza

Argentina

Bu, or tsubo

Japan . .

Bushel . .

U. States

Canada .

Bunder .

Netherlands.

Cabot

Jersey

Candy .

Bombay .

Madras .

Cantar .

Turkey .

Cantara piccolo

Italy . . .

Capicha .

Persia

Catty . .

China

N. Borneo .

Siam .

Cawnie .

Madras .

Cental .

U. States

Canada .

Centigramme

Centilitre

Centimetre .

Centimetre, cub

ic (c.c.) .

Centimetre, squ

are .

Centner .

Austria .

Denmark

Switzerland .

Chain

Canada .

Cyprus .

Chang .

China

Siam .

Chapah .

N. Borneo

Chec. See Takil

Chek . .

Hong Kong .

Chenica .

Persia

Ch'ien .

China

Ch'ih . .

. China

i6-8 litres.

0-699 quarter (dry measure), 5-60 bushels.

1 metric are, II9.6 sq. yds.

I new archin (Law 1881) = 1 metre (39-37 inches) = 10 par- maks (decimetres) = 100 khats (centimetres), I mill = 1000 ar- chies (kilometre). Pharoagh = 10 mills. Another pharoagh = 2 hours' -journey.

0-758 metre (masons).

o-68o metre (tailors).

28 inches, or 0-7112 metre. .

5-447 bushels (Customs). 5

bushels (old measure). = 100 sq. metres = 1 196 sq. yds. 1 metric are. Legal arpent was equal to 100 sq.

*perches = 51*07 metric ares.*

in Quebec = 180 French feet. 14-68 to 15 kilogrammes. Mayor = 3-55 gallons, or 1 cantara. 1-809 bushel.

Menor = 2-76 gallons (liquids).

I metre. Formerly 1-312 yard. 1-885 metre (1812).

4 feet.

12-834 gallons.

234 grains.

6| th av. ; varies locally.

= 10 ocks.

439-45 Ih av., nearly.

1-084 mile (old measure).

15 litres.

1-353 pi nt (wine bottle).

2-22 metres.

0-670 metre (commercial).

Braccio-d'ara = 29-528 inches.

5-328 feet.

5-682 feet.

3-0306 square metres.

2150-42 cubic inches, about

0-96944 imperial bushel. 1

bushel = 8 gallons = 32 quarts =

64 pints. 2-471 acres (old hectare). 10 pots, or 4 gallons, 1 quart 3

gills imperial measure. 560 lb av. 4<)3-7 lb av.

124-7 ft) av – (°id weight). 74-771 lb av. 0-58 gallon.

I I lb av. Sec Tad. 1 \ lb av.

2-675 ft av -i or fc 1 o hap. 1-322 acre.

100 lb av. (As in Great Britain.)

= T fa grm. =0-154 grain.

= xU litre = 0-07 gill-

= =0394 inch = tU m.

= 0-061 cubic inch, or 1 c.c.

= 0'i55 square inch.

50 kilogrammesˆ 110-231 lb. av.

50 kilogrammes =110-231 lb. av.

50 kilogrammes = 1 10-231 lb.

66 feet.

0-33 pic.

10 ch ih = 1 1 ft. 9 inches (Treaty).

*2*675 ft-*

1 ft av.*

14! inches.

*0*289 gallon.*

583 grains (silver weight).

Varies throughout China from 11 to 15-8 inches. For Customs purposes the Treaty ch'ih = 14- 1 inches, and 5 ch'ih = 1 pu.

Ch'ih

Peking

Shanghai

491

*= 12 "5 (P u ˆ c wor ˆ s **

*= 12*4 statistics.*

= 12-6 architects.

*= 12*7 common.*

= 13-1 tribunal of mathematics.

= 13-2 Board of Revenue.

= 14-1 Customs.

Chilogramrne .

Italy . .

1 kilogramme.

Chin or Catty .

China

1 1 lb av. (Treaty) .

Ching

China

121 sq. feet (Treaty).

Ch'ing .

China

72,600 sq. feet (Treaty).

Chittack. . .

Bengal

5 tolas, or 900 grains.

Ch'ok . . .

Corea

7! in. (linear); 12 1 in. (bulki-

Chiio

China

ng)- 181 5 sq. feet (Treaty).

Chupah

Singapore

1-66 lb av. of water at 62°F.,asa ■measure of capacity.

Malacca .

144 oz. av. of water.

Chupak .

Straits Settle ments

- I quart.

Collothun .

Persia

*1*809 gallon.*

Coss ….

Bengal

*1*136 metre.*

Covad .

Portugal .

o-66 metre.

Covid, or Cubit

Madras .

18 to 21 inches.

Bombay .

18 inches.

Siam .

18 inches.

Covido .

Arabia

18 inches approximately.

Covido (Great)

27 inches.

Cuartillo

Spain

1-16 litre (dry); 0-504 litre liquid.

Daktylon (Royal

Greece

1 centimetre.

Daribah

Egypt .

43-5S bushels (Customs).

= 10 grms. =5-64 drams av.

Decalitre .

= 10 litres = 2-2 gallons.

— 10-936 yards.

De = c/iatina .

Russia

*= 2400 square sagenes = 2*7*

acres.

*• = 10 g rm * = 1-54 grain.*

— j^ litre — 0-176 pint.

Decimetre .

= 3-937 inches = o-i metre.

Decimetre, cubic

= 1000 c.c. = 61 -024 cub. in.

Decimetre, square

= 100 sq. centm. = ■ 15-5 sq. in.

Denaro .

Rome

18-17 grains (old weight).

Deunam

Turkey .

1 metric are.

Diraa, or Draa,

[Egypt .

t 27 inches usually. ” I 21-3 inches Nile measure.

or Pic

Turkey .

27 inches (old measure of pike).

Dirriem .

Egypt .

*1-761 dram av. (Customs). 3*0884 grammes (Cairo).*

Djerib .

Turkey .

1 hectare.

Dol'ia, or Dola .

Russia

(0-686 grain. ' l 96 doli = 1 zolotnick.

Drachma

Netherlands

3-906 grammes.

Turkey .

. 154-324 grains.

Drachme (Royal

C recce

1 gramme (gold weight).

Constantino

)le =57-871 grains. See Ock.

Dram. See Ohe.

Ducat . . . Vienna .

Duim . . . Netherlands.

Eimer

El . . . Ell . . . Ella . . . Elle . . . Endaseh, or Hindazi

Faltche . Fanega .

Fass . Fcddan

Fen .

Fjerdingkar. Fod . . .

Foglietto Foot .

Austria .

Netherlands .

Jersey

N. Borneo .

Switzerland .

Egypt . .

Moldavia Argentina

Portugal . Spain Peru .

Germany Egypt .

China Denmark Denmark Norway . Rome U. States Canada . Amsterdam South Africa Old Rhenish

53′ 8 73 grains. I centimetre.

12-448 gallons.

1 metre. (Old ell =27-08 inches).

4 feet.

1 yard.

0-6561 yard.

Usually 25 inches.

1 hectare, 43 ares, 22 centiares.

*3*773 bushels.*

55-364 litres.

1-526 bushel.

1 \ bushel.

1-615 acre, but varies locally.

1 hectolitre.

1-038 acre (Masri). Also 1-127

*acre locally. 1.266 acre (old). 5-83 grains (silver weight). 0-9564 bushel. 1-0297 foot. 0-3137 metre. o-8 pint. 12 inches. French foot =12*8 inches.*

|n-i 4 7m.i ld 12-356 in. J

measure.

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Fot . . . .

Founte, or Funt

or Livrc Foute, or Pied . Frasco . Fuss ….

Gallon Gantang

Garnetz .

Gin. See Kati.

Gisla

Go . . .

Grain

Gramme (gr.)

GrammA (Royal)

Gramo .

Grano

Grao

Grein

Guz, or Gudge

WEIGHTS AND MEASURES

Sweden .

Russia

Russia Argentina Vienna Switzerland

U. States Canada .

Straits Settle- ments N. Borneo

Russia

Zanzibar .

Japan

Russia

Greece

Spain

Rome

Portugal .

Netherlands

India: Bengal „ Bombay „ Madras .

Persia

Hat'h, or Moo- lum, or Cubit Hectare Hectogramme Hectolitre . Hectometre Hiyaka-me Hiyak-kin . Hoon. See Takil. Hu . . , .

Immi

Joch ….

Kaima .

Kan . . .

Kanne or Karma

Kantar, or Can- taro

Arabia

i Bengal \ Bombay

Japan Japan

China

Switzerland

Austria-Hun- gary

Sweden Netherlands Hong Kong Germany Sweden Egypt . .

Karwar Kassabah Kati, Catty or

Gin Keila, or Pishi Ken . . . Kerat . . .

Kette, or Chain Keu . .

Khat (New) Kile , . . Killow . . Kilogramme Kilometre . Kin . . . Klafter . .

Koddi . . Koilon (Royal)

Koku . .

Kon . . Korn-tondt .

Persia

Egypt \ China, Straits } Settlements

Zanzibar .

Japan

Turkey .

Germany Siam . Turkey . Cyprus Turkey

Japan, China

Austria

Switzerland

Arabia

Greece

Japan Corea

Norway .

11-689111, iofot = 1 stong. 1 ref = 10 stanger. 1 mil = 360 ref. 0-90282 lb av.

1 English foot.

2 1 litres.

12 zolls = 1-037 foot.

31 fuss = 1 metre. See Stab.

231 cubic inches = 8-3389 lb av. of water at t. 39-8° Fahr. At 62 ° Fahr. =08325 imp. gallon.

32 gallons.

144 oz. av. weight of water as

measure of capacity. 0-3607 peck.

Measure of 360 lb av. of rice. 180-39 cubic centimetres. 0-960 grain (apothecaries). = 15-4323564 grains av. troy. = 0-2572 drachm, or 0-7716

scruple. = 0-03215 oz. troy. I millimetre. 1 gramme. 0-757 grain.

0-768 grain; also measureo-i8in. = 0-065 gramme. 36 inches. 27 inches.

33 inches, Government Survey. The guz, gueza or zer varies from

24 to 44 inches. A guz of 40-95 inches (Guz, Azerba.ijan)iscom- mon. Government standard guz = 36 2 inches. There is a guz for retail trade of 25 inches. 25 inches to 37 inches (Bassorah).

18 inches.

1 8- inches, or cu v >it.

= 100 ares, or 2-471 acres.

100 grm. =3-53 oz, av.

*1 00 litres =2*7; bushels,*

= 109-36 yards.

5797-198 grains

132J lb av.

125 gallons, noarly. 1-5 litre. I-422 acre.

0-576 gallon.

1 litre.

1 3 tb av.

1 litre, or fo merly 1-762 pint.

0-576 pint.

99-0492 lb av. = 100 rotls (Cus- toms) . 45 kilogrammes of cotton. 44-5 kilogrammes other produce.

100 batman.

3-8824 yards (Customs).

J 1^ lb av.

Measure of 6 lb av. of rice. 5-965 ft., i-8i metre. l£ inch measure (old). 3-09 grains weight (old) 14-994 ellen, or 10-936 yards. 40 inches. 1 centimetre. 8 gallons. 0-97 bushel.

= 1000 grm. ^2-2046223 lb av. = 0-6214 mile.

0-601 kilogramme = 1-325 lb. = 2-0740 yards. 1-9685 yard. 1-67 gallon. 1 hectolitre. Old koilon =33-16

litra. = 39‘7033 galls. =4-9629 bushels. i\ K> av. 138-97 litres.

Korn-tonde .

Korn-top Maal

Korrel

Kotyle (Royal)

Kouza

Koyan

Krina

Kung

Kup .

Kwan or

Kyat

Lak't Last . Leang Lekha Li .

Kuwan

Sweden .

Norway . Netherlands Greece Cyprus . Straits Setts Bulgaria . China Siam . Japan Burma

Bulgaria . Netherlands China Bulgaria . China

Livre-poids . Loth . . .

Maatze . Mace . . .

Mahud . . . Maik . . . Marc, or Mark .

Marco . Maund .

Megametre (as- tronomy) Metre (m.) . .

Metre, cubic Metre, square

Metro .

Metz. . Micron (p.) Miglio . Mi ile Mil, or Mill

Mile . . .

Mite (postal) Milha . . Mjlle

Milligramme Millilitre. Millimetre Miscal . Mkono Mna . Mom me . M or gen .

Liang

Libbra .

Libra

Libra (Castilian)

Libra, or Arratel

Line or Ligne .

Linita

Litra (Royal) .

Litre

Litre (metric) .

Litro.

Livre (lb)

China Italy . Argentina Spain, Mexico Portugal . Paris . Russia Greece Cyprus .

Spain Italy . . Russia

Belgium

France

Germany

Switzerland Vienna

Austria .

Switzerland

Netherlands

China

N. Borneo

Arabia

Burmah

France

Sweden

Vienna

Portugal

Spain

India

U. States Great Britain

Spain Italy .

Austria .

Rome

Netherlands Turkey . Denmark France 1 . Germany Austria . Portugal . France

Persia East Africa Greece Japan Denmark. Norway . Prussia .

[COMMERCIAL

3-821 bushels, 160 litres. 1 decigramme. 1 decilitre.

9 quarts.

• 53333 lb av. 12-8 litres. 78-96 inches (Treaty).

10 inches.

8-281 ib = 3-75652 kilogrammes. 100 kyats = 3-652 lb av.

0-650 metre.

30 hectolitres.

5ˆ33 grains (silver weight).

229-83 sq. metres.

about J mile =360 pu. Varies

with length of ch'ih. A small weight 0-583 grain, I £ oz. 16 liang = 1 chin = 1 1 lb av. 0-7477 ft> av. 1-0127 ft> av. i -014 lb. 1 -012 lb av.

fs point, or 0-089 inch. 01 inch. 1 archine = 28o liniias. 1 litre = 100 mystra. 2 -J quarts. = 1-7598 pint

j 1 litre.

0-90282 lb av. Apoth. livre =

1 1 -5204 oz. troy. Kilogramme. 0-4895 kilogramme. New loth = 1 decagramme. Old

loth, nearly \ oz. av. 1 5-625 grammes. 270-1 grains. Postal loth, 257-2

grains. 1-245 quart. 2-64 gallons. I decilitre. 58 £ grains. 93 \ ft) av. 2-04 lb av.

3 maik = cubit = i9ˆ inches. 0-2448 kilogramme (old weight). 0-4645 lb av.

4331-37 grains=24 karato. = 8 oncas=229-5 grammes. 355°' 54 grains. 82-286 lb av., Government. 72 £ lb (old bazaar). 74-67 lb av., factory. 28 lb nearly, Bombay. 25 lb nearly, Madras. 37 to 44 lb, Juggerat. Local maunds vary on either side

of 80 lb.

i,ooo,oco metres.

39-37 inches.

39-370II3 inches ˆ t m.

= 1000 c.d. =35.315 oubic r eet.

= 100 square decimetres = 10-764

square feet.

f 1 metre. 1-691 bushel. = i oV, n millimetre. 0-925 mile. I kilometre.

1000 archins (new mil). 4-680 miles.

f Nautical mile— 1852 metres.

4-714 miles.

1-296 mile.

1-949 kilometre.

-tuVs gramme = o-oi5 grain.

*= : r^o * litre.*

= 0-03937 inch=i rj im, m.

71 grains.

45-72 centimetres.

il kilogramme = 1-172 oka

T ^oo kwan.

[0-631 acre.

COMMERCIAL]

WEIGHTS AND MEASURES

Mo

China

Commonly 866-65 sq. yds. Varies locally. Shanghai = 6600 sq. ft. (Municipal Council). By Cus- toms Treaty =920-417 sq. yds., based on en 'in of 14-1 inches. 1 hectolitre. Myriagramrae = 10 kilogrammes— 22-046 lb av.

Mud …. Netherlands

Ngoma

Nin .

Obolos Ock .

Octavillo Oitavo . Oke . .

Onca Once Oncia Onze

Ounce

Packen . Palamc (Royal) Palm Palnio

Para . .

Parah .

Parasang. See Fersak'h.

Parmak. See At chin.

East Africa Siam .

Greece Turkey .

Portugal Bulgaria

Cyprus

Egypt

Greece

Turkey

Portugal France Rome

Netherlands 1 7. States

Russia

Greece

Holland

Portugal

Spain

N. Borneo

Cevlon

Passeree Pe . . . . Pecheus (Roval) Pecul . . . Perche .

Persakh, or Para- sang Pfund . . .

Bengal

Portugal

Greece

China

France

Canada

Persia

Germany

Prussia . Switzerland .

Vienna .

Pharoagh. See Archln. Pic … . Cyprus . Picul . . . Japan . . Straits Settle merits, Hong Kong . Korth Borneo

“]\ keilas. U inch.’

1 decigramme.

Legal ock (1SS1) ˆ= 100 drachmas.

New batman = 10 ocks, and

kantar = 10 batmans ock = I

kilogramme. 0-29 litre. 1-730 litre.

1 -28 litre (for liquids). 1-282 kilogramme (old). 2>> lb. av. =400 drains (Cyprus). 2-751 ib av. (Customs). 2-805

lb (Alexandria). 2-8o lb = 1-282 kilogramme. 1-33 litre. 1-1518 pint. 2-834 ft) av – (old

weight). 28-688 grammes. 30-59 grammes (old). 436-165 grains.

*1 hectogramme. 10 or.zen=pond. Av. ounce = 437*5 grains.*

1083-382 lb av. 1 decimetre. 1 decimetre. 0-22 metre. 8-346 inches. 90 fb

av. 5-59 pinLs.

5 seers.

I metre (old).

1 metre = 1-543 °ld pecheuse. i33i ft av.

22 square pieds de roi. In Quebec

18 French feet. Probably 3-88 miles = 6000 guz.

= 16 unzen=32 loth) • 1 , ■ ,.

i-oitow 3 !bav.r 2 ht –

Zoll. pfund (1872) =500 grammes. Old zoll lb = 1-1023 lb av. 500 grammes =16 unzc. Apoth. pf. —375 grammes. Pfund = 560-06 grammes. Zoll. pfund (1871) =500 grammes.

2 feet.

Picki , .

Greece

China

Pie . . .

Rome

Pie de Burgos

Spain

Pied . .

Belgium .

Canada .

Pied dc Roi .

Paris .

Pike . . .

Turkey .

Pint . .

L T . States

Vintc

France

Pipa . . –

Portugal .

Pipe …. Gibraltar. Pishi. See Keila. Poide de Marc . France Polegada . . Portugal . Pond . . . Netherlands .

Pot

Denmark Switzerland Belgium . Norway .

I33s tt> av.

A measure of 180 lb weight of

water.

0-648 metre.

25 gallons (dry measure).

11-73 inches.

11-13 inches.

11-81 inches = 10 pounces.

12-79 inches.

0-3248 metre.

See Dir'aa.

0-8325 imperial pint.

0-931 litre.

534 litres (Oporto).

420 litres (Lisbon).

500 litres (officially).

105 to 126 gallons.

0-2448 kilo = 8 onces.

27-77 millimetres.

1 kilogramme. Apothecaries

pond =375 grammes. 1-7 pint=4 paeglc. 2-64 pints or 1-5 litre. 1ˆ litre (dry). £ litre (liquid). 0-965 litre.

Pouce

Poud, or Pcod , Pound .

Pu . . Puddee .

Pulgada . Pund . .

Quart Quarto

Quintal

Quintal (metric) Quintale

Ratel . . . Rattel, or Rottle

Rode . . .

Roede

Rod, or Rottolo

Rottol .

Rubbio .

Sagene .

SchefTel .

Schepel . Schoppen'

Se . .

Seer . .

Netherlands Germany Switzerland Japan . India

493

i -066 inch (old measure).

1 inch.

0-016122 ton = 36 lb.

Standard troy lb =5760 grains.

Avoir. lb = 7000 grains. 0-90282 lb av. (0-4095 kilogramme). 7561 grains = 16 oz. Jersey = I

Hvre. 70-5 inches = 5 ch'ih. 2-89 pints. 100 cubic inches =

Government puddee. 0-927 inch.

1-1023 ˆ av -> or 5°° grammes. 04981 kilogramme. 6560 grains. Varies locally. 55oo-5 grains (apoth.).

See Bushel.

2-024 bushels.

3-46 litres.

100 libras (Castilian) =101-4 ft)-

58-752 kilogrammes, or 1292 ft>av.

loo libras, or 101-27 m av –

— 100 kilogrammes = 1-968 cwt.

1 metric quintal.

1-014 ft) av.

1-02 lb av., nearly (dry measure).

17-219 lb av. weight.

2-440 miles (itinerary). 2-1 18

miles (natural). 3-762 metres. 1 dekamctrc. 0-9905 lb av. (Customs). 0-9805

lb av. (Govt.). 2-206 lb great rottolo. 0-715 lb less rottolo. 2-124 ft g rea t rottolo. Rottolo*

mina = | oka. 2-513 pints (old measure). i-oi2 quarter (dry measure).

Ceylon

Persia

Note. — In Inc

Seidel . . .

consiucrabl

Austria .

Sen ….

Siam .

Ser . . . .

India

Shaku

Japan

Sheng

China

Shih ….

China

Shoo

Japan

Skaal-pund .

Sweden .

Norway .

Skeppe .

Denmark

Skjeppe .

Norway .

Stab ….

Germany

Stadron (Royal)

Greece

Stcrc (metric) .

Stero

Italy . . .

Strecpc .

Holland . .

Stremma

Greece

Strich . . .

Germany

Striche .

Switzerland .

Stunde . .

Germany

France Russia Russia

U. States

Russia Jersey

China Madras

Spain Denmark Norway Sweden

U. States Rome Portugal Spain

Portugal

Argentina

France

Italy .

Persia Arabia

Japan

Denmark

Netherlands Egypt .

Cairo .

Alexandria

Turkey . Spain

Russia . . 7 feet.

Germany . 50 litres, formerly 14-56 metzen

(Prussia). 1 decalitre.

\ litre, formerly o-ii gallon. 0-375 litre.

1 18-615 square yards (9918 are). Government seer = 2 8 ˆ lb av. Bengal, 80 tolas weight of rice

(heaped measure), about 60

cubic inches (struck measure). Southern India = weight of 24

current rupees. Madras, 25 ft > nearly. Juggerat, weight of 40 local

rupees. Bombay, old seer, about 28 lb. Measure of 1-86 pint. 16 miscals,

or 1136 grains weight

(Sihr). In India the seer, like the maund, varies ; usually 40 seers go to a maund. 0-6224 pint. 44-4 miles, nearly. 1 litre (Indian Law, 1871). 0-30 metre, also 9-18273 square

decimetres; also 18-039 cubic

centimetres. 1813 pint. 160 lb. 1 804 litre.

435-076 grammes, or 0-959 lb av. 0-4981 kilogramme, or officially

I kilogramme. 17-39 litres. 17-37 litres.

1 metre, or 3- 1 old fuss, but varied, 1 kilometre. 1 cubic metre. 1 metric stere. 1 millimetre. I metric are. 238-1 square

pecheus (Constantinople). I millimetre. 3s strich = 1 millimetre. Old itinerary measure, 2-3 to 3-4

miles.

494

Stunde Sullchek Sung Tael . .

Tahil .

Tam .

Tan .

Tang

Tang-sun

Tank

Tcharka

Tchetverte

Teng

WEIGHT-THROWING— WEI-HAI-WEI

Switzerland .

Turkey ,

Corea

Siam .

Hong Kong . China Japan

(No current Straits Settle- ments Hong Kong China Burma China Bombay Russia Russia

Burma

4-8 kilometres. Stunder = 5 stun-

den, or 24 kilometres. Cubic measure (1881) whose sides

equal a parmak (decimetre). 4 lb av., nearly.

936i grains. 1 5 oz. av.

Silver weight, 1 { oz. av. 10 momme. coin of the tacl.)

1 § oz. av. = 10 chee = 100 hoon.

1333 Ibav.

= 25 gallons. Also 1332 lb weight.

2 miles, nearly. About 3I miles = 10 li.

1 7i\ grains, or 72 tanks ˆ30 pice.

0-866 gill = o-2i8 pint.

5-772 bushels ˆ8 tchetveriks, or

2-099 hectolitres. Burmese measures of capacity de- pend on the teng or basket. Officially a basket is 2218-2 cubic inches, but the teng varies locally : —

Akyab = 23 It) of rice. Bassein = 5i lb of rice. Moulmein = 48 lb of rice. Rangoon = 48 to 50 lb of rice.

Thanan .

Siam .

1-5 pint.

Thangsat

Siam .

4-688 gallons.

To . . .

Japan

18-0391 litres = 3-9703 galls. = 1-98 pecks.

Toise

France

2-1315 yards.

Tola . . .

India

1 80 grains. Legal weight of rupee.

Tomand

Arabia

187-17 Ibav. of rice.

Ton .

U. States

2240 Ibav., also a net ton of 2000 lb.

Tonde

Denmark

I 3 I “392 litres (liquid measure). 139-121 litres, (dry measure).

Tonne, or Millie

r France Germany

> 1000 kilogrammes.

Tonne (metric)

1000 kilogrammes = 0‘9842 ton.

Tonnelada .

Portugal .

*793″ * 5 kilogrammes.*

Tonos

Greece

29-526 cwt.

Toli .

China

18 pints approximately.

Tovar

Bulgaria .

128-2 kilogrammes.

T’sun

China

1-41 inch (Treaty measure).

Tu . . .

China

100-142 miles = 25 H, based on the ch’ih of 14-1 inches.

Vara . .

Peru . .

33 inches.

Spain

2-782 feet.

Argentina

2-841 feet.

Portugal .

i-ii metre.

Vat . . .

Holland .

I hectolitre..

Vedro

Russia

2 ‘7°56 gallons = 10 schtoffs, or 12-3 litres.

Bulgaria .

12-8 litres.

Verchok .

Russia

1-75 inch.

Versta, or Verst

Russia

0-66288 mile.

Vierkanteroede

Holland .

1 melric are.

Viertel .

Denmark

1-7 gallon.

Switzerland

15 litres.

Viss .

Rangoon

3/& lb av.

Wa . . .

Siam .

80 inches.

Wigtje .

Netherlands

1 gramme.

Wisse

Netherlands

1 metric stere.

Yard . .

U. States

36 inches.

Mexico .

838 centimetres.

Zac .

Netherlands

. 1 hectolitre.

Zer (Persia). S

ee G-uz.

Zoll . . .

35 zoll = 1 decimetre. Old zoll nearl v ne inch. (See also Pfun'd.)

Zolotnik

Russia

65-8306 grains, or 96 doli.

(H.J.C.)

WEIGHT-THROWING, the athletic sport of hurling heavy weights either for distance or height. Lifting and throwing weights of different kinds have always been popular in Great Britain, especially Scotland and Ireland, and on the continent of Europe, particularly in Germany, Switzerland and Austria- Huofary. No form of throwing weights is included in the

British athletic championship programme, although " putting the shot " (q.v.) and " hammer-throwing " (q.v.) are recognized championship events. In America throwing the 56-Ib weight for distance belongs to the championship programme. It was once a common event in Great Britain at all important athletic meetings, the ordinary slightly conical half-hundredweight being used and thrown by the ring attached to the top; the ring, however, was awkward to grip, and a triangular handle was afterwards substituted. In America the 56-lb weight is a ball of iron or lead with a triangular or pear-shaped handle. The weight used to be thrown standing, but since 188S it has been thrown from a 7-ft. circle with a raised edge, like that used for the hammer and shot in America.

In throwing the athlete stands slightly stooping, with his feet about 18 in. apart and grasping the handle with both hands opposite his thighs. The weight is swung round and back past the right leg as far as possible, then up, over and round the head, as in. the hammer-throw. One complete swing round the head ' is usually enough, as too much momentum is apt to throw the athlete off his balance. The weight is then swung round together with the whole body as rapidly as possible, as in hammer-throwing. The athlete works himself to the front of the circle just before the moment of delivery and begins the final heave with his back towards the direction in which he wishes to throw the weight. This heave is accomplished by completing the final spin of the body, giving the legs, back and arms a vigorous upward movement at the same time, and following the weight through with the uplifted arms as it leaves the hands, but taking care not to overstep the circle. With one hand a smoother swing can be made but much less power

applied. In throwing for height the athlete stands beside the high-jump uprights and casts the weight over the cross-piece, making the swing and spin in a more vertical direction with a heave upward at the moment of delivery. Throwing for height and with one hand were formerly events in the American championship programme, but have been discontinued. The record for throwing the 56-lb weight for height is 15 ft. 6f in., made by the American- Irishman J. S. Mitchell. The record for distance, 38 ft. 8 in., was made in 1907 by the American- Irishman John Flanagan. In throwing weights large and heavy men have an advantage over small, brute strength being the chief requisite, while a heavy body makes a better fulcrum while revolving than a light one.

WEI-HAI-WEI, a British naval and coaling station, on the N.E. coast of the Shan-tung peninsula, China, about 40 m. E. of the treaty port of Chi-fu and 115 m. from Port Arthur. It was formerly a Chinese naval station strongly fortified, but was captured by the Japanese in February 1895, and occupied by their troops until May 1898, pending the payment of the indemnity. Port Arthur having in the spring of that year been acquired by the Russian government under a lease from China, a similar lease was granted of Wei-hai-wci to the British government, and on the withdrawal of the Japanese troops the British fleet took possession, the flag being hoisted on the 24th of May 1898. No period was fixed for the termination of the lease, but it was stipulated that it should continue so long as Russia continued to hold Port Arthur. The lease of Port Arthur having been ceded to Japan in September 1905, the British lease of Wei-hai- wci was made to run for as long as Japan held Port Arthur.

The harbour is formed by an island named Liu-kung-tao running east and west across the mouth of a small bay, leaving an entrance at each end. Towards the mainland the water shoals, and the best anchorage is under the lee of the island. The native city is walled, and has a population of about 2000. The chief port is named Port Edward; it has good anchorage with a depth of 45 ft. of water. The leased area comprises, besides the harbour and island, a belt of the mainland, 10 English miles wide, skirting the whole length of the bay. The coast line of the bay is some 10 m., and the area thus leased extends to 285 sq. m. Within this area Great Britain has exclu- sive jurisdiction, and is represented by a commissioner under the colonial office; and has, besides, the right to erect fortifica- tions, station troops and take any other measures necessary for defensive purposes at any points on or near the coast in that part of the peninsula east of 121 40′ E. Within that zone, which covers 1505 sq. m., Chinese administration is not interfered with, but no troops other than Chinese and British are allowed there. The territory consists of rugged hills rising to 1600 ft. and well -cultivated valleys. The hills also, as far as possible,

are terraced for cultivation and in some instances are planted with dwarf pine and scrub oak. It contains some 310 villages and a population of about 150,000. Chinese war- vessels are at liberty to use the anchorage, notwithstanding the lease; and Chinese jurisdiction may continue to be exercised within the walled city of Wei-hai-wei. so far as not inconsistent with military requirements. Wei-hai-wei was made the headquarters of a native Chinese regiment in the pay of Great Britain, and organized and led by British officers; but this regiment was disbanded in 1902. Wei-hai-wei is used by the China squadron as a sana- torium and exercising ground. Its excellent climate attracts many visitors. Wei-hai-wei being a free port no duties of any kind are collected there. The import trade consists of timber, maize, paper, crockery, sugar, tobacco, kerosene oil, &c. Gold has been found in the territory, and silver, tin, lead and iron are said to exist. In each of the years 1903-1909 theexpenditure exceeded the revenue (about $70,000 in 1909-1910), deficits being made good by grants from the British parliament.

WEILBURG, a town of Germany, in the Prussian province of Hesse-Nassau, picturesquely situated on the Lahn, just above the confluence of the Weil, $0 m. N.E. from Coblenz by the rail- way to Gicsscn. Pop. (1905) 3828. The old town, built on and around a rocky hill almost encircled by the river, contains a castle of the 16th century, formerly the residence of the dukes of Nassau-Weilburg, and later of the grand-dukes of Luxemburg. It has an Evangelical and a Roman Catholic church,' the former, the Stadtkirche, containing the burial vaults of the princes of Nassau, a gymnasium and an agricultural college. Its industries include wool-spinning, mining, tanning and dyeing. In the neighbourhood are the ruins of the castles of Merenberg and Freienfels. Weilburg was in the nthcentury the property of the bishops of Worms, from whom it passed to the house of Nassau. From 1355 to 1816 it was the residence of the princes of Nassau- Weilburg, a branch of this house.

See C. C. Spielmann, Fuhrer dutch Weilburg und Umgebung (Weilburg, 1894) ; and Geschichte der Sladt und Herrschaft Weilburg (Weilburg, 1896).

WEIMAR, a city of Germany, the capital of the grand-duchy of Saxe-Weimar-Eisenach. It is situated in a fertile valley on the Ilm, a small tributary of the Saale, 50 m. S.W. of Leipzig and 141 m. S.W. of Berlin, on the main line of railway to Bcbra and Frankfort-on-Main, and at the junction of three lines to Jena, Gera and Berka and Rastenberg. Pop.

*(1885) 21,565, (1905) 31,121. Weimar owes its importance not to any industrial development, which the grand-dukes discourage within the limits of their Residenz, but to its intimate association with the classical period of German literature, which earned for it the title of the " poets' city " and u the German Athens." The golden age of Weimar, covered by the reign of Charles Augustus (q.v.) from 1775 to 1828, has left an indelible impress on the character of the town. * *<.*

In spite of its classical associations and of modern improve- ments, Weimar still retains much of its medieval character. The walls survive, indeed, only in isolated fragments, but the narrow winding streets of the older part of the town, and the market-place surrounded by houses with high-pitched gables and roofs are very picturesque. Of the churches the Stadtkirche {parish church), of which Herder became pastor in 1776, is a Gothic building dating from about 1400, but much altered in detail under " classical " influences. It contains the tombs of the princes of the house of Saxe- Weimar, including those of the elector John Frederick the Magnanimous and his wife, and of Duke Bernhard of Weimar, a hero of the Thirty Years' War. The altar-piece is a triptych, the centre-piece representing the Crucifixion; beside the cross Luther is represented, with the open Bible in his hand, while the blood from the pierced side of the Saviour pours on to his head. The picture is regarded as the masterpiece of Lucas Cranach (q.v.), who lived for a time at Weimar, in the Briick'sches Haus on the market-place. In front of the church is a statue of Herder, whose house still serves as the parsonage. The other church, the Jakobs- or Hofkirche (court church^is also ancient; its disused churchyard contains

the graves of Lucas Cranach and Musaeus. The most important building in Weimar, is the palace, a huge structure forming three sides of a quadrangle, erected (1789-1803) under the super- intendence of Goethe, on the site of one burned down in 1774. A remnant of the old palace, with a tower, survives. The interior is very fine, and in one of the wings is a series of rooms dedicated to the poets Goethe, Schiller, Herder and Wieland, with appro- priate mural paintings. Of more interest, however, is the house in which Goethe himself lived from 1782 to 1832. It was built by the duke as a surprise present for the poet on his return from his Italian tour, and was regarded at the time as a palace of art and luxury. It has therefore a double interest, as the home of the poet, and as a complete example of a German nobleman's house at the beginning of the 19th century, the furniture and fittings (in Goethe's study and bedroom down to the smallest details) remaining as they were when the poet died. 1 The house is built round a quadrangle, in which is the coach-house with Goethe's coach, and has a beautiful, old-fashioned garden. The interior, apart from the scientific and art collections made by Goethe, is mainly remarkable for the extreme simplicity of its furnishing. The Goethe- Schiller

Museum, as it is now called, stands isolated, the adjoining houses having been pulled down to avoid risk of fire.

Of more pathetic interest is the Schiller haus, in the Schiller' slrasse, containing the humble rooms in which Schiller lived and died. The atmosphere of the whole town is, indeed, dominated by the memory of Goethe and Schiller, whose bronze statues, by Rietschel, grouped on one pedestal (unveiled in 1857) stand in front of the theatre. The theatre, built under Goethe's super- intendence in 1825, memorable in the history of art not only for its associations with the golden age of German drama, but as having witnessed the first performances of many of Wagner's operas and other notable stage pieces, was pulled down and replaced by a new building in 1907. The most beautiful monu- ment of Goethe's genius in the town is, however, the park, laid out in the informal " English " style, without enclosure of any kind. Of Goethe's classic " conceits " which it contains, the stone altar round which a serpent climbs to eat the votive bread upon it, inscribed to the " genius hujus loci," is the most famous. Just outside the borders of the park, beyond the Ilm, is the " garden house," a simple wooden cottage with a high-pitched roof, in which Goethe used to pass the greater part of the summer. Finally, in the cemetery is the grand ducal family vault, in which Goethe and Schiller also lie, side by side.

Wieland, who came to Weimar in 1772 as the duke's tutor, is also commemorated by a statue (1857), and his house is indicated by a tablet. The town has been embellished by several other statues, including those of Charles Augustus (1875); Lucas Cranach (i8£6); Marie Seibach (1889) ; the composer Hummel (1895) and Franz Liszt (1904). Among the other prominent buildings in Weimar are the Griines Schloss (18th century), containing a library of 200,000 volumes and a valuable collection of portraits, busts and literary and other curiosities; the old ducal dower-house (Wittumspalais) ; the museum, built in 1863-1868 in the Renaissance style with some old masters and Prcllcr's famous mural paintings illustrating the Odyssey, In 1896 the Goethe-Schiller Arcniv, an imposing building on the wooded height above the Ilm, containing MSS. by Goethe, Schiller, Herder, Wiel nd, Immermann, Fritz Renter, Morike, Otto Ludwig and others, vs opened. Weimar possesses also archaeo- logical, ethnographic. .1 and natural science collections and the Liszt Museum (in the gardener's house in the park, for many years the musician's home). Among the educational establishments are a gymnasium, and Reahchule, the Sophienstift (a large school for girls of the better ckss, founded by the grand-duchess Sophia), the grand-ducal school of art, geographical institutes, a technical school, commercial school, music schoolteachers' seminaries, and deaf and dumb and blind asylums. An English church was opened in 1899. There are a few industries, printing, tanning and cloth-weaving.

Various points in the environs of Weimar arealsointerestingfrom their associations. A broad avenue of chestnuts, about 2 m. in length, leads southwards from the town to the grand-ducal ch&teau

1 To be strictly accurate, they thus remained until the death of Goethe's last descendant in 1884. The house, which had been left to the grand-duke for the nation, was then found to be so structurally rotten that the interior had to be largely reconstructed. Everything was, however, replaced in the exact position it had previously occupied.

of Belvedere, in the gardens of which the open-air theatre, used in Goethe's day, still exists. To the north-east, at about the same distance from the town, are the tiny chateau and park of Tiefurt, on the banks of the Ilm, the scene of many pastoral court revels in. the past. To the north-west is the Ettersberg, with the Ettersburg, a chateau which was another favourite resort of Charles Augustus and his friends.

The history of Weimar, apart from its association with Charles Augustus and his court, is of little general interest. The town is said to have existed so early as the oth century. Till 1140 it belonged to the counts of Orlamunde; it then fell to Albert the Bear and the descendants of his second son. In 1247 Otto III. founded a separate Weimar line of counts. In 1345 it became a fief of the landgraves of Thuringia, to whom it escheated in 1385 with the extinction of the line of Otto III. At the partition of Saxony in 1485 Weimar, with Thuringia, fell to the elder, Ernestine, branch of the Saxon house of Wettin, and has been the continuous residence of the senior branch of the dukes of this line since 1572. Under Charles Augustus Weimar became a centre of Liberalism as well as of art. It had previously narrowly escaped absorption by Napoleon, who passed through the town during the pursuit of the Prussians after the battle of Jena in 1806, and was only dissuaded from abolishing the duchy by the tact and courage of the duchess Louisa.

The traditions of Charles Augustus were well maintained by his grandson, the grand-duke Charles Alexander (1818-1901), whose statue now stands in the Karlsplatz. The grand-duke's connexion with the courts of Russia and Holland — his mother was a Russian grand-duchess and his wife, Sophia Louisa (1824- 1897), a princess of the Netherlands— tended to give the Weimar society a cosmopolitan character, and the grand-duke devoted himself largely to encouraging men of intellect, whether Germans or foreigners, who came to visit or to settle in the town. The art school,

founded by him in 1848, has had a notable series of eminent painters among its professors, including Preller,B6cklin, Kalckreuth, Max Schmidt, Pauwels, Ileumann, Verlat and Thedy. Under the patronage of Charles Alexander, also, Weimar became a famous musical centre, principally owing to the presence of Franz Liszt, who from 1848 to 1886 made Weimar his principal place of residence. Other notable con- ductors of the Weimar theatre orchestra were Eduard Lassen and Richard Strauss.

See Scholl, Weimar's Merkiviirdigkeiten einst und jetzt (Weimar, I 85/) ; Springer, Weimar's klassiscke Statten (Berlin, 1868) ; Ruland, Die Schdtze des Goethe National- Museums in Weimar (Weimar and Leipzig, 1887); Francke, Weimar und Umgebungen (3rd ed., Weimar, 1900); Kuhn, Weimar in Wort und Bild (4th ed., Jena, 1905).

WEINHEIM, a town of Germany, in the grand-duchy of Baden, pleasantly situated on the Bergstrasse at the foot of the Odenwald, 11 m. N. of Heidelberg by the railway to Frankfort on Main. Pop. (1Q05) 12,560. It is still in part surrounded by the ruins of its ancient walls. The Gothic town hall; the ruins of the castle of Windeck and the modern castle of the counts of Berck- heim; the house of the Teutonic Order; and three churches are the principal buildings. The town has various manufactures, notably leather, machinery and soap, and cultivates fruit and wine. It is a favourite climatic health resort and a great tourist centre for excursions in the Odenwald range. Weinheim is mentioned in chronicles as early as the 8th century, when it was a fief of the abbey of Lorsch, and it was fortified in the 14th century. In the Thirty Years' War it was several times taken and plundered, and its fortifications dismantled.

See Hegewald, Der Luftkurort Weinheim an der Bergstrasse (Wein- heim, 1895); Ackcrmann, Fuhrer durch Weinheim und Umgebung (Weinheim, 1895); and Zinkgraf, Bilder aus der Geschichte der Stadt Weinheim (Weinheim, 1904).

WEINSBERG, a small town of Germany, in the kingdom of Wiirttemberg, pleasantly situated on the Sulm, 5 m. E. from Heiibronn by the railway to Crailsheim. Pop. (1905) 3097. It has an ancient Romanesque church, a monument to the re- former Oecolampadius {q.v.), and a school of viticulture, which is the chief occupation of the inhabitants. On the Schlossberg above the town He the ruins of the castle of Weibertreu, and at

its foot is the house once inhabited by Justinus Kerner (q.v.), with a public garden and a monument to the poet.

The German king Conrad III. defeated Count Welf VI. of Bavaria near Weinsberg in December 1140, and took the town, which later became a

free imperial city. In 1331 it joined the league of the Swabian cities, but was taken by the nobles in 1440 and sold to the elector palatine, thus losing its liberties. It was burnt in 1525 as a punishment for the atrocities com- mitted by the revolted peasants. The famous legend of Weiber- treu (" women's faithfulness "), immortalized in a ballad by Chamisso, is connected with the siege of 1140, although the story is told of other places. It is said that Conrad III. allowed the women to leave the town with whatever they could carry, where- upon they came out with their husbands on their backs.

See Bernheim, " Die Sage von den treuen Weibern zu Weinsberg " (in the Forsehungen zur deutschen Geschichte, vol. xv. (Gottingen, 1875); Merk, Geschichte der Stadt Weinsberg und ihrer Burg Weiber- treu (Heiibronn, 1880).

WEIR, ROBERT WALTER (1803-1889), American portrait and historical painter, was born at New Rochelle, New York, on the 18th of June 1803. He was a pupil of Jarvis, was elected to the National Academy of Design in 1829, and was teacher of drawing at the United States Military Academy at West Point in 1834-1846, and professor of drawing there in 1846-1876. He died in New York City on the 1st of May 1889. Among his better-known works are: " The Embarkation of the Pilgrims " (in the rotunda of the United States Capitol at Washington, D.C.) ; " Landing of Hendrik Hudson "; " Evening of the Crucifixion"; " Columbus before the Council of Salamanca "; " Our Lord on the Mount of Olives "; " Virgil and Dante crossing the Styx," and several portraits, now at West Point, and " Peace and War " in the Chapel there.

His son, John Ferguson Weir (b. 1841), painter and sculptor, became a Member of the National Academy of Design in 1866, and was made director of the Yale University Art School in 1868. Another son, Julian Alden Weir (b. 1852), studied under his father, and under J. L. GeVome, and became a distinguished portrait, figure and landscape painter. He was one of the founders of the Society of American Artists in 1877, and became a member of the National Academy of Design (1886) and of the Ten American Painters, New York.

WEIR (from O. Eng. wer, a dam; cognate with werian, to defend, guard; cf. Ger. Wehr, defence), a barrier placed across rivers to raise the water-level for catching fish, for mills, for navigation or for irrigation, the discharge of the river taking place over the crest or through openings made for the purpose. Rough weirs, formed of stakes and twigs, were erected across English rivers in Saxon times for holding up the water and catching fish, and fish-traps, with iron-wire meshes and eel baskets, are still used sometimes at weirs. Weirs are essential for raising the head of water for

water-wheels at mills, and for diverting some of the flow of a river into irrigation canals; but they have received their greatest and most varied extension in the canalization of rivers for navigation. There are three distinct classes of weirs, namely, solid weirs, draw-door weirs, including regulating sluices for irrigation, and movable weirs, which retain the water above them for navigation during the low stage of the river, and can be lowered or removed so as to leave the channel quite open in flood-time.

Solid Weirs. — The simplest form of weir is a solid, watertight dam of firm earthwork or rubble stone, faced with, stone pitching, with r.riba filled with rubble, with fascine mattresses weighted with stone, or with masonry, and protected from undermining by sheet piling or one or more rows of well foundations. These weirs, if solidly constructed, possess the advantages of simplicity, strength and durability, and require no superintendence. They, however, block up the river channel to the extent of their height, and consequently raise the flood-level above them. This serious defect of solid weirs, where the riparian lands are liable to be injured by inundations, can be slightly mitigated by keeping down the crest of the weir some- what below the required level, and then raising the water-level at the low stage of the river by placing a row of planks along the top of the weir.

Waste weirs resemble ordinary solid weirs in providing for the surplus discharge from a reservoir of an impounded river or mountain stream over their crest ; but in reality they form part of a masonry

reservoir dam for storing up water for water-supply or irrigation, kept purposely lower than the rest of the dam to allow the excess of water to escape down the valley (see Water-Supply).

Draw-door Weirs. — The discharge of a river at a weir can be .egulated as required and considerably increased In flood-time by introducing a series of openings in the centre of a solid weir, with sl::ice-gates or panels which slide in grooves at the sides of upright frames or masonry piers erected at convenient intervals apart,

Fig, i. — Lifting-gate Weir and Foot-bridge at Richmond, Surrey.

and which can be raised or lowered as desired from a foot-bridge. Tliis arrangement has been provided at several weirs on the Thames, to afford control of the flood discharge, and reduce the extent of the inundations; the largest of these composite weirs on that river is at the tidal limit at Teddington, where the two central bays, with a total length of 242ˆ ft., are

closed by thirty-five draw-doors sliding between iron frames supporting a foot-bridge, from which the doors are raised by a winch. 1 Ordinaiy draw-doors, sliding in grooves of

*moderate size and raised against a small head of water, can be readily worked i n spite of the friction of the sides of the doors against their supports; but with large draw-doors and a con- siderable head, the friction of the surfaces in contact offers a serious impediment * in raising them. This fric- tion has been greatly re- duced by making the draw- doors, or sluice-gates, slide on each side against a verti- cal row of free-rollers sus- pended by an encircling . chain; and the working HIP is much facilitated by -Mechanism of Lifting-gate, counterpoising the doors.*

Fig. 2.

Richmond.

By these arrangements the large draw-door weir across the Thames at Richmond, with three spans of 66 ft. closed by lifting doors, each 12 ft. high and weighing 32 tons, can be fully opened in seven minutes by two men raising each door from the arched double foot-bridge (figs. I, 2 and 3). This weir retains the river above it at half-tide level, in order to cover the mud-banks which had been bared at low tide between Richmond and Teddington by the lowering of the low-water level, owing to the removal of various obstructions in the river below. The weir is raised

Fig. 3. — Plan of Works at Richmond.

out of the river as soon as the flood-tide on its lower side has risen to half-tide level, so as not to impede the flow and ebb of the tide up to Teddington above that level, and is not lowered rill the tide has fallen again to the same level. In order that the doors when raised may not impede the view under the arches,

1 L. F. Vernon-Harcourt, Rivers and Canals, 2nd edition, p. 114, and plate iii. figs. 15 and 16.

Frame we/r.

the doors are rotated automatically at the top by grooves at the sides of the piers, so as to assume a horizontal position and pass out of sight in the central space between the two foot-ways (fig. 2). The barrage at the head of the Nile delta, and the regulating sluices across the Kile at Assiut and Esna in Upper Egypt below Assuan, are examples of draw-door weirs, wuh their numerous openings closed by sluice-gates sliding on free rollers, which control the discharge of water from the river for irrigation.

Movable Weirs. — There are three main types of movable weirs, namely frame weirs, shutter weirs and drum weirs, which, however, present several variations in their arrangements.

The ordinary form of frame weir consists of a series of iron frames placed across a river end on to the current, between 3 and 4 ft. apart, hinged to a masonry apron on the bed of the river and carrying a foot-bridge along the top, from which the actual barrier, resting against the frames and cross-bars at the top and a sill at the bottom, is put into place or removed for closing or opening the weir. The barrier was originally formed of a number of long

square wooden spars ” ■”■ˆ – = = j rrjj yii\ v »-

*which could be readily : — „ , ‘_~ Hf \ \ *

handled by one man, ^^_ MU V\ \ -i

being inclined slightly ^^L from the vertical and — placed close together for shutting the weir; but panels of wood or sheet- iron closing the space between adjacent frames and sliding in grooves at the sides, and rolling-up curtains composed of a series of horizontal wooden laths connected by leathern hinges, have also been

*wˆiˆtw^^^w^^*

Fig.

Scale 200. 4. — Needle Weir, River Moldau.

employed. The needle weir, so called from the long, slender spars being termed aiguilles in France, had the merit of simplicity in its earliest form ; and by means of some ingenious contrivances, comprising a hook, winch, lever and rotating bar, for assisting the weir-keepers in placing and releasing the needles, the system has been applied successfully to the weirs of greater height required on the Meuse, the Main and the Moldau (fig. 4). The needle weir has, however, attained its greatest development in the United States across the Big Sandy river at Louisa, where, instead of needles 3 to 4 in. square, beams 12 in. square and 185 ft. long have been resorted to, provided with a steel eye at the top and a ring near the centre of gravity to enable them to be worked (fig. 5). The needles are put in place one by one against the raised frames, or trestles, by a derrick on a barge lifting them by their ring T whilst a man on the foot-bridge, taking hold of the eye at the top, arranges them in position close together. The weir is opened by joining the needles of each bay by a chain passed through the eyes at the top and a line of wire through

*the central rings, so . r ˆ poow n * i*

that when released at the top by the tilting of the escape bar by the derrick, they float sS

*down as a raft, and are *!*

caught by a man in a boat, or, when the cur- rent is strong, they are £ftOMfi6o drawn to the bank by™ a rope attached to – them previously to their release. The trestles of this _ weir are, as usual, hinged to the apron, so that in flood-time they can be completely lowered into a. recess across the z pron by means of

Scale 200.

Fig. 5. — Spar Weir, Louisa, Big Sandy River, U.S.A.

chains actuated by a winch, leaving the channel perfectly open for the discharge of floods and for the passage of vessels when the lock is submerged. Whereas, however, ordinary frames placed nearer together than their height overlap one another when lowered on to the apron, the trestles of the Louisa weir He clear of each other quite flat on the apron.

The frame weir closed by sliding panels or rolling-up curtains (fig. 6) possesses the advantage that the panels or laths can be diminished in thickness towards the top in proportion to the reduced water-pressure; whereas the needles, being of uniform cross-section, have to be made stout enough to sustain the maximum bottom pressure.

An objection has occasionally been urged against frames lowered on to the bed of a river that they, are liable to be covered over by detritus or drift brought down by floods, and consequently are subject to injury or impediments in being raised. In order to

obviate this, the frames have, in a few instances, been suspended from an overhead foot-bridge. The system was first proposed in _ . . view of the canalization of the Rhone, which brings

frame down large quantities of shingle and gravel ; but it was

*weir ˆ rst an * P te d f° r two weirs on the lower Seine under quite*

different conditions (fig. 7). The frames hang vertically from the bottom of

the overhead bridge, and rest against a sill at the bottom when the weir is in operation, the openings between the frames being closed below the water-level by rolling-up curtains or sliding panels, which arc lowered or raised by a travelling winch carried by a small foot-bridge formed by hinged brackets at the Dack of the frames, and situated a little above the highest flood- level. The weir is opened by removing the sliding panels or rolling

SCALE £00.

Fig. 6. — Frame Weir with RolHng-up Curtain, Port Villez, Lower Seine,

up the curtains, and then lifting the hinged frames to a horizontal position under the overhead bridge by means of chains worked by a winch on the bridge. This system, which has been employed for the lowest weir on the Moldau, and for a weir at the upper end of the Danube canal near Vienna to shut out floods and floating ice, as well as on the Seine, possesses the merits of raising all the movable parts of the weir out of water m flood-time, and rendering the working of the weir very safe and easy. On the other hand, it involves the expense of a wide foot-bridge for raising the frames, and wide and high river piers, especially for the navigable passes where the bridge has to be raised high enough to afford the regulation headway for vessels at the highest navigable flood-level (fig. 7), so that its adoption should be restricted to positions where the con- ditions are quite exceptional,

section or wem,

ELEVATION.

Shutler weir.

Fig. 7.— Suspended Frame Weir, Poses, River Seine.

The earliest form of shutter weir, known as a bear-trap, intro- duced in the United States in 1S18, and subsequently erected across the Marne in France, consists of two wooden gates, each turning on a horizontal axis laid across the apron, inclined towards one another and abutting together at an angle in the centre when the weir is closed ; the up-stream one serves as the weir, and the down-stream one forms its support, and both fall flat upon the apron for opening the weir. 1 – This weir is raised by admitting water under pressure beneath the gates through culverts in connexion with the upper pool; and is lowered by unfastening the raised gates and letting the water under them escape into the lower pool. This old form of bear-trap has been used for closing an opening 52 ft. wide to provide for the escape of drift at the Davis

1 Rivers and Canals, p. 132 and plate iv. fig. 15.

Island weir across the Ohio. Improvements, however, in the bear- trap have been introduced in the United States, one of the best novel forms being shown in fig. 8, whereby the pass of a weir 80 ft. in width can be readily closed, opened or partially opened under a maximum head of 16 ft. by means of chains worked by a winch. 2 The shutter weir, introduced on the upper Seine about the middle of the 19th century and subsequently adopted for weirs across several rivers in France, Belgium and the United States, consists of a row of wooden or iron shutters turning on a horizontal axis a little above their centre of pressure, borne by an iron trestle at the back of each shutter, which is hinged to the apron of the weir, and supported when raised by an iron prop resting against an iron shoe fastened on the apron (fig. 9). The weir is opened by releasing the iron props from their shoes, either by a sideways pull of a tripping bar with' projecting teeth laid on the apron and worked from the bank,

Scale £qo <

Fig. 8.— Bear-trap Weir. U.S.A.

or by pulling the props clear of their shoes by chains fastened to the bottom of the shutters; the unsupported trestles and shutters fall flat on the apron on the top of the props, as shown by dotted lines in fig. 9. The weir is raised again by pulling up the shutters to a horizontal position by their bottom chains from a special boat, or from a foot-bridge on movable frames, together with their trestles and the props which are replaced in their shoes. The discharge at the weir whilst it is raised is effected either by partially tipping some of the shutters by chains from a foot-bridge, or by opening butterfly valves resembling small shutters in the upper panels of the shutters. The addition of a foot-bridge greatly facilitates the raising and lowering of these shutter weirs, and also aids the re- gulation of the discharge ; but it renders this form of weir much more costly than the ordinary frame weir, and where large quantities of drift come down with sudden floods, the frames of the bridge arc liable to be carried away, and therefore boats must be relied on for working the weir.

The drum weirs erected across shallow, regulating passes on the river Marne in 1857-1867 comprise a scries of upper and under wrought-iron paddles, which can make a quarter of a revolution round a central axis laid along the sill of the weir. The straight, upper paddles form the weir, and can be raised against the stream by making the water from the upper pool press upon the upper faces of the slightly larger lower paddles,

Dram weir.

Scale aoo.

Fig. 9. — Shutter Weir with Foot-bridge, Port a 1'Anglais, Upper Seine, crooked for the purpose, causing them to revolve In a quadrant of a cylinder under the sill, known as the drum; and they can be readily lowered by cutting off the flow from the upper pool and putting the drum in communication with the lower pool, which connexions can be adjusted by see-saw sluice-gates, so as to put the upper paddles in any intermediate position between vertical and horizontal (fig. 10). The merits of this weir in being easily raised against a strong current and in allowing of the perfect regulation of the discharge, are unfortunately, under ordinary conditions, more than counterbalanced by the necessity of carrying the drum and its foundations to a greater depth below the sill of the weir than the height of the weir above it. Accordingly, for several years its use was restricted to the Marne; but in 1883-1886 drum weirs were

2 Proc. Inst. C.E., vol. exxix., p. 258 and plate vL, fig. 2.

adopted for closing the timber passes alongside the needle weirs placed across the Main, with a single upper paddle 393 ft. long and 5 ft. 7 in. high in each case; and a still larger drum weir was erected about the same time for closing the navigable pass of a weir across the Spree at Charlottenburg, with an upper paddle 32§ ft. long and 9i ft. high (fig. 10).

A peculiar and cheaper form of drum weir has been constructed across ten bays each 75 ft. wide on the Osage river near its confluence with the Missouri, where a hollow, wooden, cylindrical sector, stiffened inside by iron framing and revolving on an axis laid along the crest of the solid part of the weir, fits into a drum at the back

Fig. 10, — Drum Weir, Charlotte nburg, River Spree.

lined with planking, having a radius of 9 ft. The weir is raised by-admitting water from the upper pool into a wedge-shaped space left below the sector when it is lowered in the drum, which by its pressure lifts the sector out of the drum, forming a barrier, 7 ft. high, closing each bay of the weir. Provision has also been made for rendering the sector buoyant by forcing air into it, so that it can he raised when the head of water is insufficient to lift it by the pressure of the water from the upper pool. In spite of its high cost, the drum weir furnishes a valuable hydraulic contrivance for situations where it is very important to be able to close a weir of moderate height against a strong current and to regulate with ease and precision the discharge past a weir. (L. F. V.-H.)

WEISMANN, AUGUST (1S34-), German biologist, was born at Frankiort-on-Main, on the 17th of January 1834, and studied medicine in Gottingen. After spending three years in Rostock, he visited successively Vienna (1858), Italy (1859) and Paris (i860), and from 1861 to 1862 he acted as private physician to the archduke Stephen of Austria at Schaumburg Palace. In 1863 he went to Giesscn to devote himself to biological study under Leuckart, and in 1866 he was appointed extra- ordinary professor of zoology at Freiburg, becoming ordinary professor a few years later. His earlier work was largely con- cerned with purely zoological investigations, one of his earliest works dealing with the development of the Diptera. Micro- scopical work, however, became impossible to him owing to impaired eyesight, and he turned his attention to wider problems of biological inquiry. Between 1868 and 1876 he published a series of papers in which he attacked the question of the vari- ability of organisms; these were published in an English trans- lation by R. Meldola in 1882, under the title Studies in the Theories of Descent, Darwin himself contributing a preface in which the importance of the nature and cause of variability in individuals was emphasized. Weismann's name, however, is best known as the author of the germ-plasm theory of heredity, with its accompanying denial of the transmission of acquired characters — a theory which on its publication met with consider- able opposition, especially in England, from orthodox Darwinism. A series of essays in which this theory is expressed was collected and published in an English translation (Essays upon Heredity and Kindred Biological Problems, vol. i. 1880, vol. ii. 1892). Weismann published many other works devoted to the exposition of his biological views, among them being Die Dauer des Lebens; Vererbung', EwigkeU des Lebens; Die Kontinuitdt des Keim- plasmas als Grundlage einer Theorie der Vererbung; Das Keim-

plasma; Die AHtnacht der Naturzucktung; Aussers Einfiiisse als Entwicklungsrcize; Neue Gedanken zur Vererbungsfrage, and Germinal-Selekiion.

For an account of his doctrines the reader is referred to the articles on Heredity, Regeneration and Reproduction.

WEISS, BERNHARD (1827ˆ.) German Protestant New Testament scholar, was born at Konigsberg on the 20th of June 1S27. After studying theology at Konigsberg, Halle and Berlin, he became professor extraordinarius at Konigsberg in 1852, and afterwards professor ordinarius at Berlin. In 1880 he was made superior consistorial councillor. An opponent of the Tubingen School, he published a number of important works, which are well known to students in Great Britain and America.

He edited and revised Matthew (the 9th ed., 1897), Mark and Luke (the

9th ed., 1901), John (the 9th ed., 1902), Romans (the 9th cd. (1899), the Epistles to Timothy and Titus (the 7th ed., 1902J, Hebrews (the 6th ed.,1897), the Epistles of John (the 6th ed., 1900). _ Hia other works include : Lehrbuch der biblischen Theologie des Neuen Testaments (1868, 9th ed., 1903; Eng. trans., 1883), Das Leben Jesu (1882, 4th ed., 1902; Eng. trans., 1883), Lehrbuch der Ein- leitung in das Neue Testament (1886; 3rd ed., 1897; Eng. trans. T888), Das Neue Testament: Berichtigter Text (3 vols., 1902), and Die Quellen des Lukasevangeliums (1907). He was also the reviser of commentaries on the New Testament in the series of H. A. W. Mever.

WEISSE, CHRISTIAN HERMANN (1S01-1866), German Protestant religious philosopher, was born at Leipzig on the 10th of August 1 801. He studied at Leipzig, and at first belonged to the Hegelian school of philosophy. In course of time, how- ever, his ideas approximating to those of Schelling in his later years, he elaborated with I. H. v. Fichte a new speculative theism, and became an opponent of Hegel's pantheistic idealism. In his addresses on the future of the Protestant Church (Reden ■Uber die Zukunft der evangelischen Kirche, 1849), he finds the essence of Christianity in Jesus's conceptions of the heavenly Father, the Son of Man and the kingdom of Heaven. In his work on philosophical dogmatics {Philosophische Dogmatik oder Philosophie des Christentums, 3 vols. 1855-1862) he seeks, by idealizing all the Christian dogmas, to reduce them to natural postulates of reason or conscience. He died on the 19th of September 1866. '

His other works include: Die Idee der Gottheit (1833), Die philo- sophische Geheimlehre von der Unsterblichkeit des menscmichen Tndividuums (1834), Bucklein von der Auferstehung (1836), Die evangelische Geschichte, kritisch und philosophisch bearbeitet (2 vols,, 1838), and Psychologie und Unsterblickkeitslehre (edited by R. Seydel, 1869). See O. Pfleiderer, Development of Theology (1890); and cf. R. Seydel, Christ. Herm. Weisse (1866), and Religion und Wissenschaft (1887).

WEISSENBURG, a town of Germany, in the imperial province of Alsace-Lorraine, district of Lower Alsace, on the Lauter, at the foot of the eastern slope of the Vosges Mountains, 42 m. N.E. of Strassburg by the railway BaseJ-Strassburg-Mannheim. Pop. (1900) 6946. The beautiful Roman Catholic abbey church of SS. Peter and Paul, dating from the 13th century, contains some fine early stained glass. The industries include the manu- facture of paper, matches, stockings and beer, and hops and wine are also extensively cultivated. Weissenburg grew up round a Benedictine abbey which was founded in the 7th century by Dagobert II. and became the seat of a famous school. Here Otfrid, w r ho was a native of the district, completed (c. 868) his Old High German Gospel book (see German

Literature). The town became a free imperial city in 1305. It has been the scene of two memorable battles. The famous " Weissenburg lines," consisting of entrenched works erected by Villars in 1706 along the Lauter, and having a length of 12 m., were stormed in October 1793 by the Prussians and Saxons under the Austrian general Wurmser. The Allies were in their turn dispossessed by Pichegru in December and forced to retreat behind the Rhine. These lines, as well as the fortifications of Weissenburg, are now dismantled. On the 4th of August 1870 the Germans under the crown prince of Prussia, afterwards the emperor Frederick, gained the first victory of the war over a French corps (part of the army commanded by MacMahon) under General Douay, who was killed early in the engagement.

The name Weissenburg occurs in three other places; the town of Weissenburg-am-Sand in Bavaria (q.v.)\ a Swiss invalid resort in the Niedersimmental, above Lake Thun, with sulphate of lime springs, beneficial for bronchial affections; also a Hungarian comitat (Magyar Fejervar), with Stuhlweissenburg as capital.

WEISSENBURG-AM-SAND, a town of Germany, in the Bavarian district of Middle Franconia, situated in a pleasant and fertile country at the western foot of the Franconian Jura, 1300 ft, above the sea, and 33 m. by rail S.W. of Nuremberg by the railway to Munich. Pop. (1905) 6709. It is still sur- rounded by old walls and towers, and has two Gothic churches and a Gothic town-hall. The town has a mineral spring, connected with which is a bathing establishment. A Roman castle has recently been discovered, and there is a collection of antiquities in the modern school. The old fortalice of Wtilzburg (2060 ft.) overlooks the town. Gold and silver fringe, bricks, cement wares, beer and cloth are manufactured. Weissenburg dates from the 8th century', and in the 14th was made a free imperial town. It passed to Bavaria in 1806.

See C. Meyer, Chronik der Stadt Weissenburg in Bayern (Munich, 1904.) ; and Fabricius, Das Kastell Weissenburg (Heidelberg, 1906).

WEISSENFELS, a town of Germany, in the Prussian province of Saxony, situated on the Saale 20 m. S.W. of Leipzig and 19 m. S. of Halle by the main line to Bebra and Frankfort-on-Main. Pop. (1905) 30,894. It contains three churches, a spacious market-place and various educational and benevolent institu- tions. The former palace, called the Augustusburg, built in 1G64-1690, lies on an eminence near the town; this spacious

edifice is now used as a military school. Weissenfels manu- factures machinery, ironware, paper and other goods, and has an electrical power-house. In the neighbourhood are large deposits of sandstone and lignite, Weissenfels is a place of considerable antiquity, and from 1656 till 1746 it was the capital of the small duchy of Saxe- Weissenfels, a branch of the electoral house of Saxony, founded by Augustus, second son of the elector John George I. The body of Gustavus Adolphus was embalmed at Weissenfels after the battle of Lutzen.

See Sturm, Chronik der Stadt Weissenfels (Weissenfels, 1846) ; and Gerhardt, Geschichte der Stadt Weissenfels (Weissenfels, 1907).

WEIZSACKER, KARL (1822-1899), German Protestant theologian, was born at Oehringen near Heilbronn in Wtirttem- berg, on the nth of December 1822. After studying at Tubingen and Berlin, he became Privatdozent at Tubingen in 1847 and eventually (1861) professor of ecclesiastical and dogmatic history. From 1856 to 1878 he helped to edit the Jahrbucher fur deutsche Theologies and his elaborate studies Untersuchungen ilber die evangelische Geschichte, ihrc Quellen und den Gang ihrer Enlwicklung (1S64) and Das apostolische Zeilalter der christl. Kirche (1886, 2nd ed. 1893; Engl, trans. 1894-1895) made him widely known and respected. He died on the 13th of August 1899. His son, Karl von Weizsacker (b. 1853), was appointed in 1900 Kultusminister for Wiirttemberg.

Weizsacker's other works include Zur Kritik des Barnabas- briefs (1863) and Ferdinand Christian Baur (1892). Cf. Hcgler, Zur Erinnerung an. Karl Weizsacker (1900).

WEKERLE, SANTOR [Alexander] (1848-), Hungarian statesman, was born on the 14th of November 1848 at Moor, in the comitat of Stuhlweissenburg. After studying law at the university of Budapest he graduated doctor juris. He then entered the government service, and after a period of probation was appointed to a post in the ministry of finance. He still, however, continued an academic career by lecturing on political economy at the university. In 1886 Wekerle was elected to the House of Deputies, became in the same year financial secretary of state, and in 1889 succeeded Tisza as minister of finance. He immediately addressed himself to the task of improving the financial position of the country, carried out the conversion of the State loans, and succeeded, for the first time in the history of the Hungarian budget, in avoiding a deficit. In November 1892 Wekerle succeeded Count Szapary as premier, though still retaining the portfolio of finance. At the head of a strong government he was enabled, in spite of a powerful opposition of Catholics and Magnates, to carry in 1894 the Civil Marriage Bill. The continued opposition of the clerical party,

however, brought about his resignation on the 22nd of December 1894, when he was succeeded by Banffy. On the 1st of January 1897 he was appointed president of the newly created judicial commission at Budapest, and for the next few years held aloof from politics, even under the ex-lex government of Fejervary. On the reconciliation of the king-emperor with the coalition he was therefore selected as the most suitable man to lead the new government, and on the 8th of April 1906 was appointed prime minister, taking at the same time the portfolio of finance. He resigned the premiership on the 27th of April 1909, but was not finally relieved of his office until the formation of the Khuen- Hedervary cabinet on the 17th of January 1910.

WELCKER, FRIEDRICH GOTTLIEB (1784-1868), German philologist and archaeologist, was born at Grunberg in the grand duchy of Hesse. Having studied classical philology at the university of Giessen, he was appointed (1803) master in the high school, an office which he combined with that of lecturer at the university. In 1806 he journeyed to Italy, and was for more than a year private tutor at Rome in the family of Wilhclm von Humboldt, who became his friend and correspondent. Welcker returned to Giessen in 1808, and resuming his school- teaching and university lectures was in the following year appointed the first professor of Greek literature and archaeology at that or any German university. After serving as a volunteer in the campaign of 18 14 he went to Copenhagen to edit the posthumous papers of the Danish archaeologist Georg Zoega (1755-1809), and published his biography, Zoegas Leben (Stutt. 1819). His liberalism in politics having brought him into conflict with the university authorities of Giessen, he exchanged that university for Gottingen in 1816, and three years later received a chair at the new university of Bonn, where he established the art museum and the library, of which he became the first librarian. In 1841-ˆ43 he travelled in Greece and Italy (cf. his Tagebuch, Berlin, 1865), retired from the librarianship in 1854, and in 1S61 from his professorship, but continued to reside at Bonn until his death. Welcker was a pioneer in the field of archaeology, and was one of the first to insist, in opposition to the narrow methods of the older Hellenists, on the necessity of co-ordinating the study of Greek art and religion with philology.

Besides early work on Aristophanes, Pindar, and Sappho, whose character he vindicated, he edited Alcman (1815), Hipponax (1817), Theognis (r826) and the Theogony of Hcsiod (1865), and published a Sylloge epigrammalum Graecorum (Bonn, 1828). His Griechische Gotterlehre (3 vols., Gottingen, 1S57-1862) may be regarded as the first scientific treatise on Greek religion. Among his works on Greek literature the chief are Die Aschy- leische Trilogie (1824, 6), Der epische Zyklus oder die Homerischen Gedichte (2 vols. 1835, 49), Die griechischen Tragodien mit Riicksickt auf den epischen Zyklus geordnet (3 vols., 1839-1S41). His editions and

biography of Zoega, his Zeitschrift fur Geschichte und Auslegung der alien Kunsl (Gottingen, 1817, 8) and his Alie Denkmaler (5 vols., 1849-1864) contain his views on ancient art.

See Kekule\ Das Leben F. G. Welckers (Leipzig, 1880); W. von Humboldts Briefe an Welcker (ed. R.Haym, Berlin, 1859); J. E. Sandys, History of Classical Scholarship (vol. iii., pp. 216, 7, Cam- bridge, 1908).

WELDING (i.e. the action of the verb " to weld," the same word as " to well," to boil or spring up, the history of the word being to boil, to heat to a high degree, to beat heated iron; according to Skeat, who points out that in Swedish the compound verb uppvalla means to boil, the simple valla is only used in the sense of welding), the process of uniting metallic surfaces by pressure exercised when they are in a semi-fused condition. It differs therefore from brazing and soldering, in which cold surfaces are united by the interposition of a fused metallic cementing material. The conditions in which welding is a suitable process to adopt are stated in the article Forging. The technique of the work will be considered here.

The conditions for successful welding may be summed up as clean metallic surfaces in contact, a suitable temperature and rapid closing of the joint. All the variations in the forms of welds are either due to differences in shapes of material, or to

the practice of different craftsmen. The typical weld is the scarf. If, for instance, a bar has to be united to another bar or to an eye, the joint is made diagonally (scarfed) because that gives a longer surface in contact than a weld at right angles (a butt weld), and because the hammer can be brought into play better. Abutting faces for a scarfed joint are made slightly convex; the object is to force out any scale or dirt which might otherwise become entangled in the joint at the moment of closing and which would impair its union. The ends are upset (enlarged) previous to welding, in order to give an excess of metal that will permit of slight corrections being effected around the joint (" swaging ") without reducing the diameter below that of the remainder of the bar. These principles are seen in other joints of diverse types, in the butt, the vee and their modifications. Joint faces must be clean, both chemically, i.e. free from oxides, and mechanically, i.e. free from dust and dirt, else they will not unite. The first condition is fulfilled by the use of a fluxing agent, the second by ordinary precautions. The flux produces with the oxide a fluid slag which is squeezed out at the instant of making the weld. The commonest fluxes are

sand, used chiefly with wrought iron, and borax, used with steel; they are dusted over the joint faces both while in the fire and on the anvil. Mechanical cleanliness is ensured by heating the ends in a clean hollow hre previously prepared, and in brushing off any adherent particles of fuel before closing the weld. The scarf, the butt and the vee occur in various modifications in all kinds of forgings, but the principles and precautions to be observed are identical in all. But in work involving the use of rolled sections, as angles, tees, channels and joists, important differences occur, because the awkwardness of the shapes to be welded involves cutting and bending and the insertion of separate welding pieces (" gluts ")• Welds are seldom made lengthwise in rolled sections, nor at right angles, because union is effected in such cases by means of riveted joints. But welding is essential in all bending of sections done at sharp angles or to curves of small radius. It is necessary, because a broad flange cannot be bent sharply; if the attempt be made when it is on an outer curve it is either ruptured or much attenuated, while on an inner curve it is crumpled up. The plater's smith therefore cuts the flanges in both cases, and then bends and welds them. If it is on an inner curve, the joint is a lap weld; if it is on an outer one, a fresh piece or glut is welded in. Gluts of rectangular section are used for cylindrical objects and rings of various sections. The edges to be united may or may not be scarfed, and the gluts, which are plain bars, are welded against the edges, all being brought to a welding heat in separate furnaces. The furnace tubes of boilers and the cross tubes are welded in this way, sometimes by hand, but often with a power hammer, as also are all rings of angle and other sections on the vertical web.

The temperature for welding is very important. It must be high enough to render the surfaces in contact pasty, but must not be in excess, else the metal will become badly oxidized (burnt) and will not adhere. Iron can be raised to a temperature at which minute globules melt and fall off, but steel must not be heated nearly so much, and a moderate white heat must not be exceeded. Welds in steel are not so trustworthy nor so readily mˆdc as those in iron.

Thermit Welding. — The affinity of finely powdered aluminium for metallic oxides, sulphides, chlorides, &c, may be utilized to effect a reduction of metals with which oxygen, sulphur or chlorine combine. C. Vautin in 1894 found that when aluminium in a finely divided state was mixed with such compounds and ignited, an exceedingly high temperature, about 3000 C, was developed by the rapid oxidation of the aluminium. He found that metals which are ordinarily regarded as infusible were readily reduced, and in a very high degree of purity. These facts were turned to practical account by Dr H. Goldschmidt, who first welded two iron bars by means of molten iron produced by the process, to which the name of " thermit " is now commonly applied. The method has also been applied to

the production of pure metals for alloying purposes, as of chromium free from

Am welding.

carbon, used in the manufacture of chrome steel, of pure man- ganese for manganese steel, of molybdenum, ferro-vanadium, ferro-titanium and others used in the manufacture of high speed steels.

Thermit as a welding agent is produced by mixing iron oxides with finely granulated aluminium, in a special crucible lined with mag- nesia. On ignition, the chemical reactions proceed so rapidly that the contents would be lost over the edges unless the crucible were closed with a coven The result of the reaction is that two layers are produced, the bottom one of pure iron, the top one of oxide of alumina or corundum. If the contents are poured over the edge, the slag follows first, and is followed by the metal. But in welding the metal is poured first through the bottom upon the joint. It is practically pure wrought iron in a molten state, at 3000 ° C, or 5400° F. The heat is so intense that it is possible thus to burn a clean hole through a I in. wrought iron plate. The joints are pre- pared by abutting them, and provision is made with clamps to grip and retain them in correct positions. Often, but not always, the part to be welded is enclosed in a mould, into which the thermit is tapped from the crucible. The applications of thermit welding are numerous. A wide field is that of tramway rails, of which Targe numbers have been successfully welded. Steel girders have been welded, as also have broken and faulty steel and iron castings, broken shafts, broken sternposts (for which crucibles 6 ft. in height with a capacity of 7 cwt. have been constructed) , and wrought iron pipes. Another application is to render steel ingots sound, by introducing thermit in a block on an iron rod into the mould, which prevents or greatly lessens the amount of piping in the head, due to shrinkage and occlusion of gases. (J. G. H.)

Electric Welding. — In electric welding and metal working the heat may be communicated to the metal by an electric arc, or by means of the electric resistance of the metal, as in the Thomson process. Arc welding is the older procedure, and it appears to have been first made use of by de Meritens in 1881 for uniting the parts of storage-battery plates. The work-piece was placed upon a support or table, and connected with the positive pole of a source of current capable of maintaining an electric arc. The other pole was a carbon rod directed by the hand of the operator so as first td make contact with the work-piece, and then to effect the proper separation to maintain the arc. The heat of the arc was partly communi- cated to the work and partly dissipated in the hot gases escaping into the surrounding air. The result was a fusion of the metallic lead of the storage-battery plate

which united various parts of the plate. The process was somewhat similar to the operation of lead-burning by the hydrogen and air blowpipe, as used in the formation of joints in chemical tanks made of sheet-lead. The method of de Meritens has been modified by Bernardos and Olszewski, Slavienoff, Coffin and others.

In the Bernardos and Olszewski process the work is made the negative pole of a direct current circuit, and an arc is drawn between this and a carbon rod, to which a handle is attached for manipulating. As this rod is the positive terminal, particles of carbon may be introduced as a constituent of the metal taking part in the operation, making it hard and brittle, and causing cracks in the joint or filling; the metal may, in fact, become very hard and unworkable. The Slavienoff modification of the arc-welding process consists in the employment of a metal electrode in place of the carbon rod. The metal electrode gradually melts, and furnishes fused drops of metal for the filling of vacant spaces in castings, or for forming a joint between two parts or pieces.

In arc welding, with a current source at practically constant potential, a choking resistance in series with the heating arc is needed to secure stability in the arc current, as in electric arc lighting from constant potential lines. Little effective work can be done by the Bernardos and Olszewski method with currents much below 150 amperes in the arc, and the value in some cases ranges above 500 amperes. The potential must be such that an arc of 2 to 3 in. in length is steadily maintained. This may demand a total of about 150 volts for the arc and the choking resistance together. In the Slavienoff arc the potential required will be naturally somewhat lower than when a carbon electrode is used, and the current strength will be, on the other hand, considerably greater, reaching, it appears, in certain cases, more than 4000 amperes. In some recent applica- tions of the arc process the polarity of the work-piece and the arc- controlling clectrode_ has, it is understood, been reversed, the work being made the positive pole and the movable electrode the negative. More heat energy is thus delivered to the work for a given total of electric energy expended.

The arc method is essentially a fusing process, though with due care it is used for heating to plasticity the edges of iron sheets to be welded by pressure and hammering. It has been found applicable in special cases to the filling of defective spots in iron castings, by fusing into blow-holes or other spaces small masses of similar metal, added gradually, and melted into union with the body of the piece by the heat of the arc. Similarly, a

more or less complete union between separate pieces of iron plate J to \ in. in thickness has been effected by fusing additional metal between them. The range of operations to which the arc process is applicable is naturally somewhat limited, and depends Lo a large extent upon the skill acquired by the operator, who necessarily works with his eyes well screened from the glare of the large arc. Unless the space in which the work is carried on is large, the irritating vapours which rise from the arc stream add to the difficulty. Strong draughts of air which would disturb the arc must also be avoided. These factors, added to the relative slowness of the work and the uncertainty as to its result, have tended to restrict the application of arc welding in practice. Moreover, much heat-energy is dissipated in the arc flame and passes into the air, while, owing to the time required for the work, the metal undergoing treatment loses much heat by radiation. Yet the method requires little special machinery. The current may be taken from existing electric lighting and power circuits of moderate potential without transformation, and may be utilized with simple appliances, consisting chiefly of heavy wire leads, a carbon or metal electrode with a suitable handle for its manipulation, a choking or steadying resistance, and screen of dark glass for the operator's eyes.

In 1874 Werdermann proposed to use, as a sort of electric blow- pipe, the flame gases ol an electric arc blown or deflected by an air jet or the like — a suggestion subsequently revived by Zerener for arc welding. The arc in this instance is deflected from the space between the usual carbon electrodes by a magnetic field. The metal to be heated takes no part in the conduction of current, the heat is communicated by the gases of the arc, and, to a small extent, by the radiation from the hot carbon electrodes between which the arc is formed. The process is scarcely to be called electric in any true sense. Another curious operation, resembling in some respects the arc methods, has been proposed for the heating of metal pieces before they are brought under the hammer for forging or welding. The end of a metal bar is plunged into an electrolytic bath while connected with the negative pole of a lighting or other electric circuit having a potential of 100 to 150 volts. The positive pole is connected with a metal plate as an anode immersed in the electrolyte, or forming the side of the containing vat or tank. A solution of sodium or potassium carbonate is a suitable electrolyte. That part of the bar which is immersed acts as a cathode of limited surface, and is at once seen to be surrounded by a luminous glow, with gas bubbles arising from it. The immersed end of the bar rapidly heats, and may even melt under the liquid of the bath. It is probable that an arc forms between the surface of the metal and the adjacent liquid layer, the intense heat of which is in part communicated to the metal and in part lost in the solution, causing thereby a rapid heating of the bath. This singular action appears to have been hrst made known by Hoho and Lagrange. It is distinctly a form

of electric heating, having no necessary relation to such subsequent operations as welding, and is, moreover, wasteful of energy, as the heat is largely carried off in the liquid bath.

The process of Elihu Thomson first brought to public notice in 1886, has since that time been applied commercially on a large scale to various me Lai— welding operations. The pt l a metal pieces to be united are held in massive clamps and pressed together in firm contact; and a current is made to traverse the proposed joint, bringing it to the welding temperature. The union is effected by forcing the pieces together mechanically. The characteristic feature of the process is the fact that the heat is given out in the body of the metal.

The voltage does not usually exceed two or three, though it may reach four or five volts; but as the resistance of the metal pieces to be joined is low, the currents are of very large values, sometimes reaching between 50,000 and 100,000 amperes. Even for the joining of small wires the current is rarely less than 100 amperes. Such currents cannot, of course, be carried more than a few feet without excessive loss, unless the conductors are given very large section. With alternating currents, also, the effectiveness of the work speedily diminishes, on account of the inductive drop in the leads, if they are of any considerable length. The carrying of the welding currents over a distance of several feet may, in fact, lead to serious losses. These difficulties are overcome in the Thomson we'ding transformer, which resembles the step-down transformers used in electric lighting distribution by alternating currents, with the exception that the secondary coil or conductor, which forms part of the welding circuit, usually consists of only one turn of great section, S S (fig. 1). This is often made in the form of a copper casing, which surrounds or encloses the primary coil P P in whole or in part. The primary coil is of copper wire of many turns. The secondary casing, with the primary enclosed, is provided with the

usual laminated iron- transformer core, I, constituting a closed iron magnetic circuit threading both primary and secondary electric circuits. The terminals of the single-turn secondary serve as con- nexions and supports for the welding clamps C D,. which hold the work. The clamps are variously modified to suit the size, shape and character of the metal pieces, MN, to be welded, and the proportions of the transformer itself are made proper for the conditions existing in each case. The potential of the primary circuit may be selected at any convenient value, provided the winding of the coil P P is adapted thereto, but usually 300 volts is employed, and the periodicity is about 60 cycles. Inasmuch as only the proposed joint and a small amount of metal on each side of it are concerned in the opera- tion, the delivery of energy is closely localized. The chief electrical resistance in the welding circuit is in the projections between the clamps, where the

electric energy is delivered and appears as heat. A portion of the energy is, as usual, lost in the transformation and in the resistance of the circuits elsewhere, but, by proper proportion-

FiG. 1.— Thomson Welding Transformer.

ing, the loss may be kept down to a moderate percentage of the total, as in other electric work.

The pieces are set firmly in the welding clamps, with the ends to be joined in abutment and in electric contact. The projecticn of each piece from the clamp varies with the section of the pieces, their form and the nature of the metal, and the time in which a joint is to be made; but it rarely exceeds the thickness or diameter of the pieces, except with metals of high heat conductivity such as copper. When the pieces are in place the current is turned into the primary coil of the transformer, sometimes suddenly and in full force, but more often gradually. Switches and regulating devices in the primary circuit permit complete and delicate control. At least one of the clamps, D (fig. I), is movable through a limited range towards and from the other, and is thus the means of exerting pressure for forcing the softened metal into complete union. In large work the motion is given by a hydraulic cylinder and piston, under suitable control by valves. At about the time the current is cut off, it is usual to apply i ncreased pressure. The softened metal is upset or pressed outwards at the joint and forms a characteristic burr, which may be removed by filing or grinding, or be hammered down while the

metal is still hot. Sometimes the burr is not objectionable, and is allowed to remain. Lap welds may be made, but butt welds are found to be satisfactory for most purposes. The appearance of round bars in abutment before welding is shown in fig. 2 at A; and at B they are represented as having been joined by an electric butt weld, with tl\e slight upset or burr at the joint. Before the intro- duction of the Thomson process a few only of the metals, such as platinum, gold and iron, were regarded as weldable; now nearly all metals and alloys may be readily joined. Such combinations as tin and lead, copper and brass, brass and iron, iron and nickel, brass and German silver, silver and copper, copper and platinum ˆ iron and German silver, tin and zinc, zinc and cadmium, &c, are easily made; even brittle crystalline metals like bismuth and antimony may be welded, as well as different metals and alloys whose fusing or softening temperatures do not differ too widely.

If the meeting ends conduct sufficiently to start the heating, it is not necessary that they should fit closely together, nor is it necessary that they should be quite clean, the effect of the incipient heating being to confer

conductivity upon the scale and oxide at the joint.

Fig.

WELDING

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In some cases the application of a flux, such as borax, enables the welding to be accomplished at a lower temperature, thus avoiding risk of injury by excessive heating. While the pieces are heating, the increase of temperature may raise the specific resistance of the metal so that the current required will be lessened per unit of area, while on the other hand the growing perfection of contact during welding, by increasing the conducting area at the joint, compensates for this in that it tends to the increase of current. With some alloys like brass and German silver, which have a low temperature coefficient, this compensating effect is nearly absent. The increase of specific resistance of the metals with increase of temperature

mm

Automatic Welder.

has another valuable effect in properly distributing the heating over the whole section of the joint. Any portion which may be for the moment at a lower temperature than other portions will neces- sarily have a lower relative resistance, and more current will be diverted to it. This action rapidly brings any cooler portion into equality of temperature with the rest. Tt also prevents the over- heating of the interior portions which are not losing heat by radiation and convection. The success of the electric process in welding metals which were not formerly regarded as weldablc is probably due in a measure to this cause, and also to the ease of control of the operation, for the operator may work within, far narrower limits of plasticity and fusibility than with the forge fire or blowpipe. The mechanical pressure may be automatically applied and the current automatically cut off after the completion of the weld. In some more recent types of welders the clamping and releasing of the pieces are also accomplished automatically, and nothing is left for the operator to do but to feed the pieces into the clamps. Repetition- work is thus rapidly and accurately done. The automatic welder represented in fig. 3 has a capacity of nearly 1000 welds per day. The pressure required is subject to considerable -ariation : the more rigid the material at the welding temperature, the greater is the necessary pressure. With copper the force may be about 600 pounds per square inch of section; with wrought iron, 1200 pounds; and with steel, 1800 pounds. It is customary to begin the

operation with a much lighter pressure than that used when all parts of the pieces at the joint have come into contact. The pressure exerted in completing the weld has the effect of extruding from the joint all dross and slag, together with most of the metal which is rendered plastic by the heat. The strongest electric welds arc those effected by this " extrusion from the joint, in consequence of heavy pressure quickly applied at the time of completion of the weld. The unhammered weld, as ordinarily made by the electric process, has substantially the same strength as the annealed metal of the bar, the break under tensile strain, when the burr at the weld is left on, usually occurring a little to one side of the joint proper, where the metal has been annealed by heating. Hammering or forging the joint while the metal cools, in the case of malleable metals such as iron or copper, will usually greatly toughen the metal, and it should be resorted to where a maximum of strength is desired. The same object is partially effected by placing the weld, while still hot, between dies pressed forcibly together so as to give to the weld some desired form, as in drop-forging.

The amount of electric energy necessary for welding by the Thomson process varies with the different metals, their electric conductivity, their heat conductivity, fusibility, the shape of the pieces, section at the joint, &c. In the following table are given some results obtained in the working of iron, brass and copper. The figures are of course only approximate, and refer to one condition alone of time-consumption in the making of each weld. The more rapidly the work is done, the less, as a rule, is the total energy required ; but the rate of output of the plant must be increased with increase of speed, and this involves a larger plant, the consequent expense of which is often disadvantageous. If in the following

table the watts for a given section be multiplied by the time, the relation between the total energy required for different sections of the same metal, or for the same section of the different metals, is obtained. These products are given under the head of watt-seconds. It will be seen that the energy increases more rapidly than the sections of the pieces — doubtless because the larger pieces take a longer time in welding, with the result of an increased loss by con- duction of heat along the bars back from the joint. If the time of welding could be made the same for various sections, it is probable that the energy required would be more nearly in direct proportion to the area ot section for any given metal. This relation would however, only hold approximately, as there is a greater relative loss of heat by radiation and convection into the air from the pieces of smaller section. The total energy in watt-seconds for any given section of copper will be found to be about half as much again as that for the same section of iron, while the amounts of energy- required for equal sections of brass and iron do not greatly differ.

Energy used in Electric Welding

Iron and Steel.

Section, Sq. In.

Watts in Prim- ary of Welder.

Time in Sees.

Watt-seconds.

0-5.

8,500

33

280,500

I'O .

16,700

45

751,500

1-5 .

23,500

55

1,292,500

2'0 .

29,000

05

1,885.000

2'5 ■

34,000

70

2,380,000

3-0 .

39,000

78

3,042,000

3-5 ■

44,000

85′

3,740,000

4-0 .

50,000

90

4,500,000

Brass.

•25 .

7.5oa

17

127,500

•5 • ■ ■

13,500

22

297,000

75 •

19,000

29

551,000

I-O .

25,000

33

825,000

1-25 •

31,000

38

1,178,000

1-5 .

36,000

42

1,512,000

i-75 •

40,000

45

1,800,000

20 .

44,000

48

2,112,000 .

Copper.

•125-

6,000

8

48,000

■25 .

14,000

IT

154,000

•375-

19,000

13

247,000

■5 ■ ■ ■

25,000

l6

400,000

•625. . .

3 1 ,000

18

558,000

■75 •

36.500

21

766,500

•875. • ■

43,000

22

946,000

1-0

49,000

23

1,127,000

111 practice, joints in solid bars or in wires are the most common, but the process is applicable to pieces of quite varied form. Joints in iron, brass, or lead pipe arc readily made; strips of sheet metal are joined, as in band saws; bars or tubes are joined at various angles; sheet metal is johied to bars, ike. One of the more interesting of the recent applications of electric welding is the longitudinal seaming of thin steel pipe. The metal or skelp is in long strips, bent to form a hollow cylinder or pipe, and the longitudinal seam moves through a special welder, which passes a current across it. The work is completed by drawing the pipe through dies. The welding of a ring formed by bending a short bar into a circle affords an excellent illustration of the character of the currents employed in the Thomson process. Notwithstanding the comparatively free path around the ring through the full section of the bent bar, the current heats the abutted ends to the welding temperature. In this way waggon and carriage wheel tyres, harness rings, pail and barrel hoops, and similar objects are extensively produced. The process is also largely applied to the welding of iron and copper wires used for electric lines and conductors, of steel axles, tyres and metal frames used in carriage work, and of such parts of bicycles as pedals, crank hangers, scat posts, forks, and steel tubing for the frames. The heat, whether it be utilized in welding or brazing, is so sharply localized that no damage is done to the finish of surfaces a short distance from the weld or joint. Parts can be accurately formed and finished before being joined, as in the welding of taper shanks to drills, the lengthening of drills, screw taps, or augers, and the like. Electric welding is applicable to forms of pieces, or

to conditions of work which would be impracticable with the ordinary forge fire or gas blowpipe. A characteristic instance is the wire bands which hold m place the solid rubber tyres of vehicles. The proximity of the rubber forbids the application of the heat of a fire or blowpipe, but by springing the rubber back from the proposed joint and seizing the ends of wire by the electric welding damps, the union is rapidly and easily made. When the rubber of the tyre is released, it covers

the joint, regaining its complete form. Special manufactures have in some cases arisen based upon the use of electric welding.

The welding clamps, and the mechanical devices connected with them, vary widely in accordance with the work they have to do. A machine for forming metal wheels is so constructed that the hubs are made in two sections, which when brought together in the welder are caused to embrace the radiating iron or steel spokes of the wheel. The two sections are then welded, and hold the spokes in solid union with themselves. Another machine, designed lor the manufacture of wire fences, makes several welds automatically and simultaneously Galvanized iron wires are fed into the machine from reels in several parallel lines about a foot apart, and at intervals are crossed at right angles by wire sections cut automatically from another reel of wire. As the wire passes, electric welds are tormed between the transverse and the parallel lines. The machine delivers a continuous web of wire fencing, which is wound upon a drum and removed from time to time in large rolls. In the United States, street railway rails are welded into a continuous metal structure. A. huge welding transformer is suspended upon a crane, which is borne upon a car arranged to run upon the track as it is laid. The joint between the ends of two contiguous rails is made by welding lateral strap pieces, covering the joint at each side and taking the place of the ordinary fish-plates and bolts. The exertion of a greatly increased pressure at the finish of the welding seems to be decidedly favourable to the permanence and strength of the joints. When properly made, the joint is strong enough to resist the strains of extension and compression during temperature changes. For electric railways the welded joint obviates all necessity for " bonding " the rails together with copper wires to convert them into continuous lines of return conductors for the railway current. In railway welding the source of energy is usually a current delivered from the trolley line itself to a rotary converter mounted on the welding car, w r hereby an alter- nating current is obtained for feeding the primary circuit of the weld- ing transformer. Power from a distant station is thus made to produce the heat required for track welding, and at exactly

the place where it is to be utilized. In this instance the work is stationary while the welding apparatus is moved from one joint to the next. Welding transformers are sometimes used to heat metal for annealing, for forging, bending, or shaping, for tempering, or for hard soldering. Under special conditions they are well adapted to these purposes, on account of the perfect control of the heating or energy delivery, and the rapidity and cleanliness of the operation.

Divested of its welding clamps, the welding transformer has

found a unique application in the armour-annealing process of

Lemp, by means of which spots or lines are locally annealed

*" mn "** in hard-faced ship's armour, so that it can be drilled or*

cut as desired. Before the introduction of this process,

plate annealing.

it was practically impossible to render any portion of the hardened face of such armour workable by cutting tools without detriment to the hardness of the rest. A very heavy electric current is passed through the spot or area which it is desired to soften, so that, notwithstanding the rapid conduction of heat into the body of the plate, the metal is brought to a low red heat. In order that the spot shall not reharden, it is requisite that the rate of cooling shall be slower than when the heating current is cut off suddenly, the current therefore undergoes gradual diminution, under control of the operator. The welding transformer has for its secondary terminals simply two copper blocks fixed in position, and mounted at a distance of an inch or more apart. These are placed firmly against the face of the armour plate, with the spot to be annealed bridging the contacts, or situated between them. As in track welding, the transformer is made movable, so that it can be brought into any position desired. When the annealing is to be done along a line, the secondary terminals, with the transformer, are slowly and steadily slid over the face of the plate, new portions of the plate being thus continually brought between the terminals, wdiile those which had reached the proper heat are slowly removed from the terminals and cool gradually. (E. T.)

WELDON, WALTER (1832-1885), English technical chemist, was born at Loughborough on the 31st of October 1832. In 1854 he began to work as a journalist in London in connexion with the Dial, which was afLerwards incorporated in the Morning Star, and in i860 he started a monthly magazine, Weldon 7 s Register of Facts and Occurrences relating to Literature , ike Sciences and the Arts, which was discontinued after about

three years' existence. Though he was without practical knowledge of the science, Weldon turned to industrial chemistry, and in the course of a few years took out the patents which led to his "manganese-regeneration" process (see Chlorine). This was put into operation about 1869, and by 1875 it was being used by almost every chlorine manufacturer of imparlance throughout Europe. He continued to work at the production of chlorine in connexion with the processes of alkali-manufacture (q.v.), and became a leading authority on the subject, but none of his later oroposals — not even the Weldon-Pechiney magnesia process.

which was established on a commercial scale only a year or two before his death— met with equal success. He died at Burstow, Surrey, on the 20th of September 1885. He professed Sweden- borgian principles and was a believer in spiritualism.

His son, Walter Frank Raphael Weldon (1860-1006), was appointed in 1899 Linacre professor of comparative anatomy at Oxford.

WELF or GUELPH, a princely family of Germany, descended from Count Warin of Altorf (8th century), whose son Isenbrand is said to have named his family Weljen, i.e. whelps. From his son Welf I. (d. 824) were descended the kings of Upper Burgundy and the elder German line of Welf. Welf III. (d. 1055) obtained the duchy of Carinthia and the March of Verona. With him the elder line became extinct, but his grandson in the female line, Welf IV. (as duke, Welf I.), founded the younger line, and became duke of Bavaria in 1070. Henry the Black (d. 1126), by his marriage with a daughter of Magnus, duke of Saxony, ob- tained half of the latter's hereditary possessions, including Liineburg, and his son Henry the Proud (q.v.) inherited by marriage the emperor Lothair's lands in Brunswick, &c, and received the duchy of Saxony. The power which the family thus acquired, and the consequent rivalry with the house of Hohenstaufen, occasioned the strife of Guelphs and Ghibellines {q.v.) in Italy. Henry the Lion lost the duchies of Bavaria and Saxony by his rebellion in 1180, and Welf VI. (d. 1191) left his hereditary lands in Swabia and his Italian possessions to the emperor Henry VI. Thus, although one of the Welfs reigned as the emperor Otto IV., there remained to the family nothing but the lands inherited from the emperor Lothair, which were made into the duchy of Brunswick in 1235. Of the many branches of the house of Brunswick that of Wolfenbiittel became extinct in 18S4, and that of Liineburg received the electoral dignity of Hanover in 1692, and founded the Hanoverian dynasty of Great Britain and Ireland in 1714. For its further history see Hanover. The Hanoverian legitimists in the German Reichs- tag are known as Welfen.

See Sir A. Halliday, History of the House of Guelph (1821) ; R. D. Lloyd,

Origin of the Guelphs; F. Schmidt, Die Anfdnge des welfischen Geschlechts (Hanover, 1900).

WELHAVEN, JOHANN SEBASTIAN CAMMERMEYER (1807- 1873), Norwegian poet and critic, was born at Bergen, the son of a pastor, in 1807. He first studied theology, but from 1828 onwards devoted himself to literature. In 1840 he became reader and subsequently professor of philosophy at Christiama, and delivered a series of impressive lectures on literary subjects. In 1836 he visited France and Germany; and in 1858 he went to Italy to study archaeology. His influence was extended by his appointment as director of the Society of Arts. He died at Christiania on the 21st of October 1873. Welhaven made his name as the representative of conservatism in Norwegian litera- ture. In a violent attack on W'ergeland's poetry he opposed the theories of the extreme nationalists. He desired to see Norwegian culture brought into line with that of other European countries, and he himself followed the romantic tradition, being most closely influenced by J. L. Heiberg. He represented clear- ness and moderation against the extravagances of Wergeland. He gave an admirable practical exposition of his aesthetic creed in the sonnet cycle Norges Daemring (1834). He published a volume of Digte in 1839; and in 1845 Nyere Digte. The collec- tions of old Norse poetry made by Asbjbrnsen and Moe influenced his talent, and he first showed his full powers as a poet in Nyere Digte. His descriptive poetry is admirable, but his best work was inspired by his poems on old Norse subjects, in which he gives himself unreservedly to patriotic enthusiasm. Other poems followed in 1848, 1851 and 1859.

His critical work includes Ewald og de norske Digiere (1863), 0? Ludwig Holberg (1854). Welhaven's Satnlede Skrifter were publishec in 8 vols, at Copenhagen (1867-1869).

WELL, the name given to an artificial boring in the eartl through which water can be obtained. Two classes may b< distinguished: shallow or ordinary wells, sunk through a per meable stratum until an impermeable stratum is reached; a,r>/ deep and Artesian wells {q.v.), the latter named from Artoi

WELL

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e;

in France, which are sunk through an impermeable stratum down into a waLer-bearing stratum which overlies an impermeable stratum. Obviously

ordinary wells can supply water very cheaply, but, since impurities readily reach them, there is great risk of contamination. The same does not apply to deep wells, such water being usually free from organic impurities. In ordinary wells, and in deep wells, the water requires pumping to the surface; in artesian wells, on the other hand, the water usually spouts up to a greater or less height above it.

The Secondary and Tertiary geological formations, such as those underneath London and Paris, often present the_ appearance of immense basins, the boundary or rim of the basin having been formed by an upheaval of the subjacent strata. In these formations it often happens that a porous stratum is included between two impermeable layers of clay, so as to form a flat porous U tube, continuous from side to side of the valley, the outcrop on the surrounding hills forming the mouth of the tube. The rain filtering down through the porous layer to the bottom of the basin forms there a subterranean pool, which with the liquid or semi-liquid column pressing upon it constitutes a sort of huge natural hydrostatic bellows. It is obvious then, that when a hole is bored down through the upper impermeable layer to the surface of the lake, the water will be forced up by this pressure to a height above the surface of the valley greater or less according to the elevation of the level in the feeding column, thus forming a natural fountain.

In the Tertiary formations, the porous layers are not so thick as in the Secondary, and consequently the occurrence of underground lakes is not on so grand a scale; but there being a more frequent alternation of these sandy beds, we find a greater number of them, and often a series of natural fountains may be obtained in the same valley, proceeding from water-bearing strata at different depths, and rising to different heights.

It does not follow that all the essentials for an artesian well are present, though two impermeable strata with a porous one between may crop out round a basin. There must also be continuity of the lermeable bed for the uninterrupted passage of the water, and no reach in cither of the confining layers by which the water might escape. It has occasionally happened that oir deepening the bore, with the hope of increasing the flow of water, it has ceased alto- gether, doubtless from the lower confining layer being pierced, and the water allowed to escape by another outlet. The subterranean pool is frequently of small extent, and of the nature of a channel rather than of a broad sheet of water; and the existence of one spring is no guarantee that another will be found by merely boring to the same depth in its neighbourhood. Faults also have an effect on the supply, which in many cases has been found to increase by cutting headings or adits. The most suitable strata in England are the Chalk, Oolite, New Red Sandstone and Lower Greensand; London is in part supplied by the Chalk, whilst Liverpool

utilizes the New Red. The theoretical determination of the existence of artesian conditions can be arrived at only by a thorough acquaint- ance with the geology of the district. Although water from deep wells is free from organic matter, it usually contains salts such as calcium bicarbonate, &c, which make the water unsuitable for wash- ing and certain manufacturing purposes although it is fit for drinking.

The mechanical appliances employed in boring for water are practically the same as in boring for petroleum (q.v.). The upper part of a deep well may be of brick, the continuation being lined with steel pipes, or, better, it may be lined with metal for its entire length.

One of the most remarkable artesian wells is at Crenelle, near Paris. The operation of boring extended from 1834 to 1841 ; after a depth of 1254 ft. had been reached (May 1837), a length of 270 ft. of the boring rods broke and fell to the bottom of the hole, and nearly fifteen months' constant labour was required to pick it up again. Discouraged by the delay, the French government was to have abandoned the project after a depth of 1500 ft. had been reached without any satisfactory result; but Arago prevailed on them, to prosecute the work, and an additional depth of about 300 ft. proved the correctness of Arago's theory. On the 26th February 1 841, at a depth of 1798 ft,, the boring rods suddenly sank a few yards, and within a few hours a vast column of water spouted up at the rate of 6x> gallons per minute, and at a temperature of nearly 82 F. Prior to this no artesian boring had reached even 1000 ft. ; and that of Crenelle was the deepest executed till the completion (12th August 1850) of the salt-spring at Kissingen, in Bavaria, which throws up a column of water to the height of 58 ft. from a depth of 18785 ft. The most remarkable feature of this spring is that the projecting force is due, not to hydrostatic pressure, but to that of carbonic acid gas generated at the junction of the gypsum with the magnesian limestone, about 1680 ft. down. Modern mechanical improvements have enabled engineers to exceed these Artesian dimensions con- siderably, and at a greatly diminished cost. The well at Passy, near Paris, which is supplied from the same water-bearing stratum as that of Crenelle, was bored by Kind in a very short time, having been begun on 15th September 1855, and carried to a depth of 1732

ft. by March 1857. Its total depth is now about 1923 ft. with the diameter of 2 ft. 4 in. at the bottom; and it throws up a con- tinuous stream of water at the rate of five and a half million gallons per day to a height of 54 ft. above the ground.

Among other deep wells sunk in the Paris basin subsequently to those of Grenelle and Passy, the following may be mentioned. A gigantic bore, 5 ft. 7 in. in diameter, was begun in January 1866 at La Chapelle, and by

November 1869 had reached a depth of 181 1 ft., the intention being to extend it to a depth of 2950 ft. A bore of 19 in. diameter was carried down to a depth of 1570 ft. in about two and a half years (1864-1867), for the purpose of obtaining a water-supply for the sugar refinery of Say in Paris; and the same engineer who executed this work (Dru) began in 1866 an artesian boring of the huge diameter of 6| ft. at the part of Paris named Butle aux Cailles, to be carried down to a depth of 2600 to 2900 ft. In the Paris basin there are a great many other wells, varying from 300 to 400 ft, in depth, and from 2 to 8 in. in the diameter of the bore-hole.

The Tertiary chalk strata over which London stands have been riddled with artesian borings for the sake of pure water supply. Many of the large London, factories, railways, institutions are supplied by artesian wells over 300 ft. deep. At Merton in Surrey, at Brighton, at Southampton, all along the east coast of Lincolnshire, and in the low district between the chalk wolds near Louth and the Wash, artesian borings have long been known, and go by the name of blow-wells among the people of the district. The general level to which the water rises in the London district has been very sensibly lowered by the immense number of perforations that have been made; and in several wells where the water formerly rose to the surface, it now requires to be pumped up.

None of the artesian borings in England approach the depths frequent on the Continent and in America. The average depth of the water-bearing stratum around Paris is six times that of the London chalk beds; and in some parts of Germany and of America, wells have been sunk to even double the depth of the Parisian wells of Crenelle and Passy. In Chicago there are several wells more than 2000 ft. deep; and at West Chicago in Dupage county, Illinois, there is one 3081 ft. deep. In the city of St Louis, Missouri, there is an artesian well 3843-j ft. deep, yielding a few gallons of salty water (temperature, 105 F.),a minute; boring was stopped in September 1868. Among the deepest borings in the world are: a well in Putnam Pleights, Windham county, Connecticut, 6004 ft. deep and 6 in. in diameter, yielding 2 gallons per minute with water rising to 4 ft. from the surface; one at Schladenbach (5735 ft.), near Leipzig; one 12 m. south-east of Pittsburg, which is 5575 ft. deep and 6j in. in diameter; one in Lawrence county, Alabama, 5120 ft. deep and 6 in. in diameter, yielding gas, oil and salt water; and one (about 4200 ft.) at Sperenberg 20 m. from Berlin, sunk for the purpose of obtaining a supply of rock salt,— -the salt deposit here is 3907 ft. thick.

The following are some of the other most important artesian sinkings that have been made. At Louisville, Kentucky, a bore of 3 in. was carried to a depth of 2086 ft. between April 1857 and the summer of 1858; it yields 264 gallons a minute and its fountain rises 170 ft. high. At Charleston,

South Carolina, there are: one well 2050 ft. deep and 4 in. in diameter, yielding 450 gallons a minute; another 1945 ft. deep and 5 in. in diameter, yielding 695

fallons a minute; and three more each exceeding 1900 ft. in depth, n 1858 a well at Neusalwerk,near Minden, had reached the depth of 2288 ft. At Bourne, Lincolnshire, there is a well 95 ft. deep, which yields over half a million gallons of water per day, the pressurebeing sufficient to supply the town and force the water to the tops of the highest houses. There is one in Philadelphia (Mount Vernon and 13th sts.), 3031 ft, deep and 8 in. in diameter, yielding 2600 gallons a minute. There are several deep wells in South Dakota : in Aberdeen City there are two 1300 ft. deep with flows of 1350 and 1000 gallons, respectively, per minute. Two artesian wells at Croydon supply a million gallons of water per day; and Brighton draws over a million

fallons from artesian sinkings. There is a well at Bages, near 'erpignan, which gives 330 gallons per minute; and one at Tours, which jets about 6 ft. above ground, and gives 237 gallons per minute. The boring of wells in the great desert of Sahara is a very ancient industry; and some oases are supplied with water wholly from artesian wells. The average depth of these is from 160 to 200 ft., and the upper strata have only to be pierced to give a constant stream. With their primitive methods of boring, the Arabs often labour for years before they reach the wished-for pool ; and with only palm wood as a casing, they have great difficulty in keeping the bore-hole from closing up by the drifting of the sand, and they require to scour them out periodically. Since 1858 an immense number of perforations have been made by French engineers, and the fertilising effect upon the sandy desert plains has already made

1 itself apparent. The importance of deep wells in such cases cannot be over-estimated.

Artesian wells have been made to supply warm water, for keeping hospitals, &c, at a constant temperature. Invariably the tempera- ture of water from great depths is higher than that at the surface. The temperature of the water in the well at Grenelle is 82 F., and

: that of Passy the same, showing that they have a common source. Kissingen well has a temperature of 66° F-, that of St Louis

one of 73°-4 F. that of Louisville 76J F., and that of Charleston 87° F. The

average rate of increase of temperature is i° for a descent of from 40 to 55 ft. In WiirUeiiibcrg the water of artesian wells is employed to maintain in large manufactories a constant temperature of 47 when it is freezing outside. Artesian waters have also been employed to reduce the extreme variations of temperature in fish-ponds.

WELLES, GIDEON (1802-1878), American political leader, was born at Glastonbury, Connecticut, on the 1st of July 1802. He studied for a time at Norwich University, Vermont, but did not graduate. From 1826 to 1837 he edited the Hartford Times, making it the official organ of the Jacksonian Democracy in south- ern New England. He served in the state House of Representatives in 1827, 1829-30, 1S32 and 1834-35, was state comptroller in 1835 and 1842-43, was postmaster at Hartford in 1835-42, and was chief of the bureau of provisions and clothing in the Navy Depart- ment at Washington in 1846-1849. Leaving the Democratic party on the Kansas-Nebraska issue, he assisted in the formation of the Republican party in Connecticut, and was its candidate for governor in 1856; he was a delegate to the Republican national conventions of 1856 and i860. On the inauguration of President Lincoln in 1861 he was appointed secretary of the navy, a' position which he held until the close of President Andrew Johnson's administration in 1869. Although deficient in technical training, he handled with great skill the difficult problems which were presented by the Civil War. The number of naval ships was increased between 1861 and 1865 from 90 to 670, the officers from 1300 to 6700, the seamen from 7500 to 51,500, and the annual expenditure from $12,000,000 to $123,000,000; important changes were made in the art of naval construction, and the blockade of the Confederate ports was effectively maintained. Welles supported President Johnson in his quarrel with Congress, took part in the Liberal Republican movement of 1872, and returning to the Democratic party, warmly advocated the election of Samuel J. Tilden in 1876. He died at Hartford, Connecticut, on the nth of February 1878.

In 1874 Welles published Lincoln and Seward, in which he refutes the charge that Reward dominated the Administration during the Civil War. His Diary, which appeared in the Atlantic Monthly (1909-1911), is extremely valuable for the study of the Civil War and Reconstruction. See also Albert Welles, History of the Welles Family (New York, 1876).

WELLESLEY, RICHARD COLLEY WESLEY (or Wellesley), Marquf,ss (1760-1842), eldest son of the 1st earl of Mornington, an Irish peer, and brother of the famous duke of Wellington, was born on the 20th of June 1760. He was sent to Eton, where he was distinguished as a classical scholar, and to Christ Church, Oxford. By his father's death in 1781 he became earl of Mornington, taking his seat in the Irish House of Peers. In

1784 he entered the English House of Commons as member for Beeralston. Soon afterwards he was appointed a lord of the treasury by Pitt. In 1703 he became a member of the board of control over Indian affairs; and, although he was best known by his speeches in defence of Pitt's foreign policy, he was gaining the acquaintance with Oriental affairs which made his rule over India so effective from the moment when, in 1797, he accepted the office of governor-general, Wellesley seems to have caught Pitt's large political spirit during his intercourse with him from 1793 to 1797. That both had consciously formed the design of acquiring a great empire in India to compensate for the loss of the American colonies is not proved; but the rivalry with France, which in Europe placed England at the head of coalition after coalition against the French republic and empire, made Wellesley 's rule in India an epoch of enormous and rapid extension of English power. Clive won and Warren Hastings consolidated the British ascendancy in India, but Wellesley extended it into an empire. On. the voyage outwards he formed the design of annihilating French influence in the Dcccan. Soon after his landing, in April 1798, he learnt that an alliance was being negotiated between Tippoo Sultan and the French republic. Wellesley resolved to anticipate the action of the enemy, and ordered preparations for war. The first step was to effect the disbandment of the French troops entertained by the Nizam of Hyderabad. The invasion of Mysore followed in February

1799, and the campaign was brought to a rapid close by the capture of Seringapatam. In 1803 the restoration of the peshwa proved the prelude to the Mahratta war against Sindhia and the raja of Berar. The result of these wars and of the treaties which followed them was that French influence in India was extinguished, that forty millions of population and ten millions of revenue were added to the British dominions, and that the powers of the Mahratta and all other princes were so reduced that England became the really dominant authority over all India. He found the East India Company a trading body, he left it an imperial power. He was an excellent administrator, and sought to provide, by the foundation of the college of Fort William, for the training of a class of men adequate to the great work of governing India. In connexion with this college he established the governor-general's office, to which civilians who had shown talent at the college were transferred, in order that they might learn something of the highest statesmanship in the immediate service of their chief. A free-trader, like Pitt, he endeavoured to remove some of the restrictions on the trade between England and India. Both the commercial policy of Wellesley and his educational projects brought him into hostility with the court of directors, and he more than once tendered his resignation, which, however, public necessities led him to post- pone till the autumn of 1805. He reached England just in time to see Pitt before his death. He had been created an

English peer in 1797, and in 1799 an Irish marquess.

On the fall of the coalition ministry in 1807 Wellesley was invited by George III. to join the duke of Portland's cabinet, but he declined, pending the discussion in parliament of certain charges brought against him in respect of his Indian administra- tion. Resolutions condemning him for the abuse of power were moved in both the Lords and Commons, but defeated by large majorities. In 1809 Wellesley was appointed ambassador to Spain. He landed at Cadiz just after the battle of Talavera, and endeavoured, but without success, to bring the Spanish government into effective co-operation with his brother, who, through the failure of his allies, had been compelled to retreat into Portugal. A few months later, after the duel between Canning and Castlereagh and the resignation, of both, Wellesley accepted the post of foreign secretary in Perceval's cabinet. He held this office until February 1812, when he retired, partly from dissatisfaction at the inadequate support given to Wellington by the ministry, but also because he had become convinced that the question of Catholic emancipation could no longer be kept in the background. From early life Wellesley had, unlike his brother, been an advocate of Catholic emancipation, and with the claim of the Irish Catholics to justice he henceforward identified himself. On Perceval's assassination he refused to join Lord Liverpool's administration, and he remained out of office till 1821, criticizing with severity the proceedings of the congress of Vienna and the European settlement of 1814, which, while it reduced France to its ancient limits, left to the other great powers the territory that they had acquired by the partition of Poland and the destruction of Venice. He was one of the peers who signed the protest against the enactment of the Corn Laws in 181 5. In 1821 he was appointed lord-lieutenant of Ireland. Catholic emancipation had now become an open question in the cabinet, and Wellesley 's acceptance of the vice- royalty was believed in Ireland to herald the immediate settle- ment of the Catholic claims. The Orange faction was incensed by the firmness with which their excesses were now repressed, and Wellesley was on one occasion mobbed and insulted. But the hope of the Catholics still remained unfulfilled. Lord Liverpool died without having grappled with the problem. Canning in turn passed away; and on the assumption of office by Wellington, who was opposed to Catholic emancipation, his brother resigned the lord-lieutenancy. He had, however, the satisfaction of seeing the Catholic claims settled in the next year by the very statesmen who had declared against them. In 1833 he resumed the office of lord-lieutenant under Earl Grey, but the ministry soon fell, and, with one short exception, Wellesley did not further take part in official life. Pie died on the

a6thof September 1842. He had no successor in the marquisate, but the earldom of Mornington and minor honours devolved on his brother William, Lord Maryborough, on the failure of whose issue in 1863 they fell to the 2nd duke of Wellington.

See Montgomery Martin, Despatches of the Marquess Wellesley (1840); VV. M. Torrens, The, Marquess Wellesley (1880); W. H. Hutton, Lord Wellesley (" Rulers of India " series, 1893) ; and G. B. Mallcson, Wellesley (" Statesmen " series, 1895).

WELLESLEY, a township of Norfolk county, Massachusetts, U.S.A., 14 m. S.W. of Boston. Pop. (1890) 3600, (1000) 5072, of whom 1306 were foreign-born and 17 were negroes, (1910 census) 5413. Area, 10-4 sq. m. Wellesley is served by the Boston & Albany railway, and is connected with Natick (3 m. W.), Newton, Needham, Boston and Worcester by electric lines. The north-eastern boundary of the township is the Charles river, which divides it from the city of Newton. The surface of the township is hilly and abundantly wooded, with many small streams and lakes; the two principal villages are Wellesley Hills and Wellesley, and smaller villages are Wellesley Falls, Wellesley Farms and Wellesley Fells. The highest point is MaugusHill (416 ft.), near Wellesley Hills village. In the northern part of Wellesley and extending into Weston is a large forest tract known as " The Hundreds." Within the township are parts of two of the reservations of the Metropolitan Park system, 6607 acres of the Charles river reservation, and 4-58 acres of Hemlock Gorge. Hunnewell Park is the former home of Dr W. T. G. Morton, who discovered the anaesthetic properties of sulphuric ether. West of Wellesley village, among the hills, lie Morses Pond and Lake Waban, on which are beautiful Italian gardens and (on the north side) the buildings and extensive grounds (350 acres) of Wellesley College (undenominational, 1875) for women, which was established by Henry Towle Durant (i822-i88r), a prominent Boston lawyer. In 1910 the college had 130 instructors and t3i9 students. The library (65,200 volumes in 1910) was endowed by Eben N. Horsford, the chemist and ethnologist; it contains a library of American linguistics collected by Major J. W. Powell and Mr Horsford, and the Frances Pearson Plimpton library of early Italian literature. There are about 30 buildings, of which twelve are residential halls or cottages. Instruction is in classical, literary and scientific branches, and the degrees of A.B. and A.M. are awarded.

Wellesley was settled about 1640, being then within the limits of Dedham. When the township of Needham was set off from Dedhamini7ii, Wellesley was included within the new territory, and in 1774 was organized as the west parish of Needham or West Needham. In 1881 it was incorporated

under its present name.

See J. E. Fiskc in D. H. Hurd's History of Norfolk County (Boston,

1884).

WELLHAUSEN, JULIUS (1844-), German biblical scholar and Orientalist, was born at Hameln on the Weser, Westphalia, on the 17th of May 1844. Having studied theology at the university of Gottingen under Heinrich Ewald, he established himself there in 1870 as privat-docent for Old Testament history. In 1872 he was appointed professor ordinarius of theology in Greifswald. Resigning in 1882 owing to conscientious scruples, he became professor extraordinarius of oriental languages in the faculty of philology at Halle, was elected professor ordinarius at Marburg in 1883, and was transferred to Gottingen in 1892. Wellhausen made his name famous by his critical investigations into Old Testament history and the composition of the Hexateuch, the uncompromising scientific attitude he adopted in testing its problems bringing him into antagonism with the older school of biblical interpreters. The best known of his works are De gentibus et fatmliis Judaeis (Gottingen, T870) ; Der Text tier Bucher Samuelis untersucht (Gottingen, r87i); Die Pkarisaer und Sadducaer (Greifswald, r874); Prolegomena zur Geschickte Israels (Berlin, 1882; Eng. trans., 188;; 5th German edition, 1899; first published in 1878 as Geschichte Israels); Mukammed in Medina (Berlin, 1882) ; Die Komposition des Hexateuchs und der historischen Bucher des Allen Testaments (1889, 3rd ed. 1899); Israeliiische und jildische Geschichte (1894, 4th ed. 1901); Resle arabischen Heidentums (1897); Das arabische Reich und

sein Sturz (1902); Skizzen und Vorarbeiten (1884-1899); and new and revised editions of F. Bleek's Einleitung in das Alte Testament (4-6, 1878-1893). In 1906 appeared Die christliche Religion, mit Einschluss der israelitisch-jiidischen Religion, in col- laboration with A. Julichcr, A. Harnack and others. He also did useful and interesting work as a New Testament commentator. He published Das Evangelium Marci, iibersetzl und erklart in 1903, Das Evangelium Matthai and Das Evangelium Lucae in r904, and Einleitung in die drci erslen Evangeiien in 1905.

WELLINGBOROUGH, a market town in the eastern parlia- mentary division of Northamptonshire, England, 635 m. N.N.W. from London by the Midland railway; served also by the London & North- Western railway. Pop. of urban district (r90i), 18,412. It lies on the declivity of a hill near the junction of the Ise with the Nene, in a pleasant well-wooded district. The church of St Luke is a beautiful building with Norman and Early English portions, but is mainly Decorated, with a western tower and spire. The grammar-schools, founded in 1594 and endowed with the revenues of

a suppressed gild, include a' school of the second and a school of the third grade, the former a building of red brick in the Renaissance style erected in 1880, and the latter an old Elizabethan structure. Another educational endowment is Freeman's school, founded by John Freeman in 17 n. There are also several charities. The principal public building is the corn exchange. The town is o[some importance as a centre of agricultural trade; but the staple industry is in leather. A great impulse to the prosperity of the town was given by the introduction of the boot and shoe trade, especially the manu- facture of uppers. Smelting, brewing and iron-founding are also carried on, as well as the manufacture of portable steam-engines, and iron ore is raised in the vicinity.

In 948 Edred gave the church at Wellingborough to Crowland Abbey, and the grant was confirmed by King Edgar in 966. In the reign of Edward II. the abbot was lord in full. The town received the grant of a market in 1201. It was formerly famed for the chalybeate springs to which it owes its name, and in r62r was visited by Charles I. and his queen, who resided in tents during a whole season while taking the waters. It was after its almost total destruction by fire in 1738 that the town was built on its present site on the hill.

WELLINGTON, ARTHUR WELLESLEY, 1ST Duke 01? (1769- 1852), was the fourth son of Garrett (1735-1781) Wellesley or Wesley, 2nd baron and ist carl of Mornington, now remem- bered only as a musician. He was descended from the family of Colley or Cowley, w : hich had been settled in Ireland for two centuries. The duke's grandfather, Richard Colley, ist Baron Mornington (d. 1758), assumed the name of Wesley on succeeding to the estates of Garrett Wesley, a distant relative of the famous divine. In Wellington's early letters the family name is spelt Wesley; the change to Wellesley seems to have been made about 1790. Arthur (born in Ireland in 1769 :) was sent to Eton, and subsequently to a military college at Angers. He entered the army as ensign in the 73rd Highlanders in 1787, passed rapidly through the lower ranks (in five different regi- ments), became major of the 33rd (now duke of Wellington's West Riding), and purchased the lieutenant-colonelcy of that regiment in 1793 with money advanced to him by his eldest brother. But in all these changes he did little regimental duty, for he was aide-de-camp to the lord-lieutenant, of Ireland for practically the whole of these years. Before reaching full age he was returned to the Irish parliament by the family borough of Trim. Little is known of his history during these yˆars; but neither in boyhood nor in youth does he appear to have made any mark among his contemporaries.

His first experience of active service was in the campaign of 1 794-1 795, when the British force under the duke of York was driven out of Holland by Pichegru. In 1 796 he was sent with his regiment to India, being

promoted colonel by brevet about the same time. It was thus as a commanding officer that he learnt

1 At 24 Upper Merrion Street, Dublin, or at Dungan Castle, Meath, on the 29th of April or on ist May ; but both place and date are uncertain.

for the first time the details of regimental duty. He mastered them thoroughly, gained a minute acquaintance with every detail of the soldier's life, learned the precise amount of food required for every mouth, the exact weight that could be carried, the distances that could be traversed without exhaustion, the whole body of conditions in short which govern the military activity of man and beast. It was to the completeness of his practical knowledge that Wellington ascribed in great part his later success. It is probable, moreover, that he at this time made a serious study of the science and history of war. His formal training at Angers was altogether too slight to account for his great technical knowledge; no record, however, exists of the stages by which this was acquired except that as soon as he landed in India he began to devote fixed hours to study, giving up cards and the violin. This study was directed chiefly to the political situation of India, and when on his advice his eldest brother, Lord Mornington, afterwards Marquess Wellesley, accepted the governor-generalship of India, he became his trusted though unofficial adviser. In the war with Tippoo Saib the 33rd was attached to the Nizam's contingent, and Colonel Wellesley commanded this division in the army of General (Lord) Harris. Though his military services in this short campaign were not of a striking character, he was appointed by his brother to the supreme military and political command in Mysore, in spite of the claims of his senior, Sir David Baird.

His great faculties now for the first time found opportunity for their exercise. In the settlement and administration of the conquered territory he rapidly acquired the habits and experience of a statesman, while his military operations against Doondiah, a robber chief, were conducted with extraordinary energy and success, Doondiah being killed and his army scattered. More important, however, than the military side of these operations was their political character. When pressed in Mysore, Doondiah moved into Mahratta territory, whither Wellesley followed him. Here, negotiating and bargaining with the Mahratta chiefs, Wellesley acquired a knowledge of their affairs and an influence over them such asno other Englishman possessed. Simple and honourable himself, he was shrewd and penetrating in his judgment of Orientals; and, unlike his great predecessor Clive, he rigidly adhered to the rule of good faith in his own actions,

however depraved and however exasperating the conduct of those with whom he had to deal. The result of Wellesley's singular personal ascendancy among the Mahrattas came into full view when the Mahratta War broke out. In the meantime, however, his Indian career seemed likely to be sacrificed to the calls of warfare in another quarter. Wellesley was ordered in December 1800 to take command of a body of troops collected for foreign service at Trincomalee, in Ceylon. It was at first intended that these troops should act against Java or Mauritius; their destination was, however, altered to Egypt, with a view to co-operation with Sir Ralph Abercromby's expedition, and Baird was placed in command. Though deeply mortified at the loss of the command, Wellesley in his devotion to duty moved the troops on his own responsibility from Trinco- malee to Bombay, from the conviction that, if they were to be of any use in Egypt, it was absolutely necessary that they should provision at Bombay without delay. But at Bombay Wellesley was attacked by fever, and prevented from going on. The troop-ship in which he was to have sailed went down with all on board.

He returned in May 1801 to Mysore, where he remained until the Mahratta War broke out. The power of the Peshwa, nomin- ally supreme in the Mahratta territory, had been overthrown by his rivals Holkar and others, and he had himself fled. The Indian government undertook to restore his authority. Welles- ley, now a major-general, was placed in command of a division of the army charged with this task. Starting from Seringapatam, he crossed the frontier on March 12, 1803, and moved through the southern Mahratta territory on Poona. The march was one unbroken success, thanks to Wellesley's forethought and sagacity in dealing with the physical conditions and his personal and diplomatic ascendancy among the chieftains of the district.

No hand was raised against him, and a march of 600 m. was conducted without even a skirmish. Wellesley had intended to reach Poona on the 23rd of April. On the night of the 18th he heard that a rival of the Peshwa intended to burn the city. At once Wellesley pressed on with the cavalry and an infantry battalion in light order, and after a forced march of 32 hours entered Poona on the afternoon of the 20th, in time to save the city. The Peshwa was now restored, and entered into various military obligations with Wellesley, which he very imperfectly fulfilled.

In the meantime Sindhia and Holkar, with the raja of Berai, maintained a doubtful but threatening aspect farther north. It was uncertain whether or not a confederacy of the northern Mahrattas had been formed against the British government. In these critical circumstances Wellesley was charged with " the general direction and control of military and political affairs in the territories of the Nizam, the Peshwa and the Mahratta states and

chiefs." Armed with these powers, he required Sindhia, as a proof of good faith, to withdraw to the north of the Nerbudda. Sindhia not doing so, war was declared on the 6th of August 1803. Wellesley marched northwards, captured Ahmadnagar on the nth, crossed the Godavery ten days later, and moved against the combined forces of Sindhia and the raja of Berar. Colonel Stevenson was meanwhile approaching with a second division from the east, and it was intended that the two should unite. On the 23rd of September Wellesley supposed himself to be still some miles from the enemy; he suddenly found that the entire forces of Sindhia and the raja of Berar were close in front of him at Assaye. Weighing the dangers of delay, of retreat, and of an attack with his single division of 4500 men, supported only by 5000 native levies of doubtful quality, Welles- ley convinced himself that an immediate attack, though against greatly superior forces (30,000 horse, 10,000 European-drilled infantry and 100 well-served guns) in a strong position, was the wisest course. He threw himself upon the Mahratta host, and, carrying out a bold manoeuvre under an intense fire, ultimately gained a complete victory, though with the loss of 2500 men out of a total probably not much exceeding 7000. In comparison with the battle of Assaye, all fighting that had hitherto taken place in India was child's play. Wellesley himself had two horses killed under him. Uniting with Stevenson's division, the conqueror followed up the pursuit, and brought the war to a close by a second victory at Argaum on the 29th of November, and the storming of Gawilghur on the 1 5th of December. The treaties with Sindhia and the raja of Berar, which marked the downfall of the Mahratta power, were negotiated and signed by Wellesley (who was made K.B. in Sept. r8o4) in the course of the following month. Not yet thirty-five years old, he had proved himself a master in the sphere of Indian statesmanship and diplomacy as on the field of battle. Had his career ended at this time, his Indian despatches alone would have proved him to have been one of the wisest and strongest heads that have ever served England in the East.

His ambitions now led him back to Europe, and in the spring of 1805 he quitted India. On his return home he was immediately sent on the abortive expedition to Hanover. In 1806 he was elected M.P. for Rye, in order to defend his brother, the governor- general, in the House, and in the fallowing year he was Irish secretary for a few months. He was then employed in the expedition against Copenhagen, in which he defeated the Danes in the action of Kjoge (29th Oct.). In 1808, however, began the war (see Peninsular War) in which his military renown was fully established. In April he was promoted lieutenant-general and placed in command of a division of the troops destined to operate against the French in Spain or Portugal. The conduct of events is narrated in a separate article, and need only be summarized here. Finding that the junta of Corunna wished for no

foreign soldiery, he followed his alternative instructions to act against Junot at Lisbon. He landed at Mondego Bay in the first week of August, and moved southwards, driving in the enemy at Rolica on the 17th of August. On the 21st the battle of Vimeiro was fought and won. In the midst of this

engagement, however, Sir Harry Burrard landed, and took over the command. Burrard was in turn superseded by Sir Hew Dalrymple, and the campaign ended with the convention of Cintra, which provided for the evacuation of Portugal by the French, but gave Junot's troops a free return to France. So great was the public displeasure in England at the escape of the enemy that a court of inquiry was held. After the battle of Corunna, Wellesley, who had in the meantime resumed his duties as Irish secretary, returned to the Peninsula as chief in command. He drove the French out of Oporto by a singularly bold and fortunate attack, and then prepared to march against Madrid by the valley of the Tagus. He had the support of a Spanish army under General Cucsta; but his movements were delayed by the neglect of the Spanish government, and Soult was able to collect a large force for the purpose of falling upon the English line of communication. Wellesley, unconscious of Soult's presence in force on his flank, advanced against Madrid, and defeated his immediate opponent, King Joseph, at Talavera de la Reina (q.v.) on the 27th-28th of July. The victory of Tala- vera, however, brought prestige but nothing else. Within the next few days Soutt's approach on the line of communication was discovered, and Wellesley, disgusted with his Spanish allies, had no choice but to withdraw into Portugal and there stand upon the defensive.

A peerage, with the title of Viscount Wellington and Baron Douro, was conferred upon him for Talavera. He was also made marshal-general of the Portuguese army and a Spanish captain- general. But his conduct after the battle was sharply criticized in England, and its negative results were used as a wenpon against the ministry. Even on the defensive, Wellington's task was exceedingly difficult. Austria having made peace, Napoleon was at liberty to throw heavy forces into the Peninsula. Welling- ton, foreseeing that Portugal would now be invaded by a very powerful army, began the fortification of the celebrated lines of Torres Vedras (see Fortification). The English army wintered about Almeida. As summer approached Wellington's anticipa- tions were realized. Massena moved against Portugal with an army of 70,000 men. Wellington, unable to save Ciudad Rodrigo, retreated down the valley of the Mondego, devastating the country, and at length halted at Busaco and gave battle. The F'rench attack was repelled, but

other roads were open to the invader, and Wellington continued his retreat. Massena followed, but was checked completely in front of the lines. He sought in vain for an unprotected point. It was with the utmost difficulty that he could keep his army from starving. At length, when the country was exhausted, he fell back to Santarem, where, Welling- ton being still too weak to attack, he maintained himself during the winter. But in the spring of 181 1 Wellington received reinforcements and moved forward. Massena retreated, de- vastating the country to check the pursuit, but on several occasions his rearguard was deeply engaged, and such were the sufferings of his army, both in the invasion and in the retreat, that the French, when they re-entered Spain, had lost 30,000 men. Public opinion in England, lately so hostile, now became con- fident, and Wellington, whose rewards for Talavera had been opposed in both Houses, began to gain extraordinary popularity. In the meantime Soult, who was besieging Cadiz, had moved to support Massena. But after capturing Badajoz, Soult learnt that Massena was in retreat, and also that his own forces at Cadiz had been beaten. He in consequence returned to the south. Wellington, freed from pressure on this side, and believing Massena to be thoroughly disabled, considered that the time had come for an advance into Spain. The fortresses of Almeida, Ciudad Rodrigo and jladajoz barred the roads. Almeida was besieged, and Wellington was preparing to attack Badajoz when Massena again took the field, and marched to the relief of Almeida. The battle of Fuentes d'Onoro followed, in which Wellington was only able to extricate the army from a dangerous predicament which " if Boney had been there " would have been a disaster. The garrison of Almeida too escaped, after blowing up part of the fortress. In the south, in spite of the hard-won victory of Albuera, the English attack on Badajoz had to be

given up. The same misfortune attended a fresh stroke against Ciudad Rodrigo, and at the end of a campaign in which he had used all his skill and care to compensate for inferior numbers, he withdrew behind the Coa. He had meanwhile been given the local rank of general and had also received the Portuguese title of Conde de Vimeiro.

Wellington had from the first seen that, whatever number of men Napoleon might send against him, it was impossible, owing to the poverty of the country, that any great mass of troops could long be held together, and that the French, used to " making war support war," would fare worse in such conditions than his own troops with their organized supply service. It was so at the end of 181 r. Soult had to move southwards to live, and the English were again more than a match for the enemy in front of them. Wellington resumed the offensive, and on the 19th of January 181 2 Ciudad Rodrigo was taken by storm. Again, suddenly altering the centre of gravity, Wellington invested Badajoz in the middle of March. It was necessary at whatever cost to anticipate the arrival of Soult with a relieving

army, and on the 6th of April Wellington ordered the assault. The fearful slaughter which took place before the British were masters of the defences caused Wellington to be charged with indifference to loss, but a postponement of the attack would merely have resulted in more battles against Soult. Of all generals Wellington was the last to waste a single trained man, and the sight of the breaches of Badajoz after the storm for a moment unnerved even his iron sternness.

The advance from Ciudad Rodrigo into Spain was now begun. Marmont, who had succeeded Massena, fell back to the Douro, but there turned upon his assailant, and, by superior swiftness, threatened to cut the English off from Portugal. Wellington retreated as far as Salamanca (q.v.), and there extricated himself from his peril by a most brilliant victory (July 22). The French fell back on Burgos. Instead of immediately following them, Wellington thought it wise to advance upon the Spanish capital. King Joseph retired, and the English entered Madrid in triumph. The political effect was great, but the delay gave the French northern army time to rally. " The vigorous following of a beaten enemy was not a prominent characteristic of Lord Wellington's warfare," as Napier says. Burgos offered an obstinate defence. Moreover, Soult, raising the siege of Cadiz, and gathering other forces to his own, pressed on towards Madrid. Wellington was compelled once more to retire into Portugal. The effect of the campaign was, however, that the southern provinces were finally cleared of the invader. During this retreat he announced in general orders that the demoralization and misconduct of the British army surpassed anything that he had ever witnessed. Such wholesale criticism was bitterly resented, but indeed throughout his career Wellington, cold and punctilious, never secured to himself the affections of officers and men as Marlborough or Napoleon did. He subjugated his army and gave it brilliant victories, but he inspired few disciples except the members of his own staff. To the end of his life his relations with the principal generals who served under him were by no means intimate.

Wellington had been made an earl after the fall of Ciudad Rodrigo, and the Spanish government created him duke of Ciudad Rodrigo about the same time. For Salamanca his reward was a marquessate, and a grant of £100,000 for the purchase of an estate. He was also made Duque da Victoria by the Portuguese regency, and before the opening of the campaign of 1813, which was to crown his work, he was given both the Garter and the Golden Fleece.

He was now invested with the supreme command of the Spanish armies. He visited Cadiz in December 181 2, and offered counsels of moderation to the democratic assembly, which were not followed. During the succeeding months he was occupied with plans and preparations, and at length, in

May 1813, the hour for his final and victorious advance arrived. The Russian dis- asters had compelled Napoleon to withdraw some of his best troops from the Peninsula. Against a weakened and discouraged adversary Wellington took the field with greatly increased

numbers and with the utmost confidence. The advance of the allied army was irresistible. Position after position was evacu- ated by the French, until Wellington, driving everything before him, came up with the retreating enemy at Vittoria (q.v.), and won an overwhelming victory (June 2isl). Soult's combats in the Pyrenees, and the desperate resistance of St Sebastian, prolonged the struggle through the autumn, and cost the English thousands of men. But at length the frontier was passed, and Soult forced back into his entrenched camp at Bayonne. Both armies now rested for some weeks, during which interval Welling- ton gained the confidence of the inhabitants by his unsparing repression of marauding, his business-like payment for supplies, and the excellent discipline which he maintained. In February 1814 the advance was renewed. The Adour was crossed, and Soult was defeated at Orthcs. At Toulouse, after the allies had entered Paris, but before the abdication of Napoleon had become known, the last battle of the war was fought. Peace being proclaimed, Wellington took leave of his army at Bordeaux, and returned to England, where he was received with extra- ordinary honours, created duke of Wellington, and awarded a fresh grant of £400,000.

After the treaty of Paris (May 30) Wellington was appointed British ambassador at the French capital. During the autumn and winter o-f 1814 he witnessed and reported the mistakes of the restored Bourbon dynasty, and warned his government of the growing danger from conspiracies and from the army, which was visibly hostile to the Bourbons. His insight, however, did not extend beyond the circumstances immediately before and around him, and he failed to realize that the great mass of the French nation was still with Napoleon at heart. He remained in France until February 1815, when he took Lord Castlereagh's place at the congress of Vienna. All the great questions of the congress had already been settled, and Wellington's diplomatic work here was not of importance. His imperfect acquaintance with French feeling was strikingly proved in the despatch which he sent home on learning of Napoleon's escape from Elba. " He has acted," he wrote, " upon false or nc information, and the king (Louis XVIII.) will destroy him without difficulty and in a short time." Almost before Wellington's unfortunate prediction could reach London, Louis had fled, and France was at Napoleon's feet. The ban of the

congress, however, went out against the common enemy, and the presence of Wellington at Vienna enabled the allies at once to decide upon their plans for the campaign. To Wellington and Blucher were committed the invasion of France from the north, while the Russians and Austrians entered it from the east. Wellington, with the English troops and their Dutch, German and Belgian allies, took his post in the Netherlands, guarding the country west of the Charleroi road. Blucher, with the Prussians, lay between Charleroi, Namur and Liege. In the meantime Napoleon had outstripped the preparations of his adversaries. By the 13th of June he had concentrated his main army on the" northern frontier, and on the 14th crossed the Sambre. The four days' campaign that followed, and the crown- ing victory of the 18th of June, are described in the article Waterloo Campaign. Wellington's reward was a fresh grant of £200,000 from parliament, the title of prince of Waterloo and great estates from the king of Holland, and the order of the Saint-Esprit from Louis XVIII.

Not only the prestige of his victories, but the chance circum- stances of the moment, now made Wellington the most influential personality in Europe. The emperors of Russia and Austria were still far away at the time of Napoleon's second abdication, and it was with Wellington that the commissioners of the provisional government opened negotiations preliminary to the surrender of Paris. The duke well knew the peril of delaying the decision as to the government of France. The emperor Alexander was hostile to Louis XVIII. and the Bourbons generally; the emperor Francis might have been tempted to support the cause of Napoleon's son and his own grandson, who had been proclaimed in Paris as Napoleon II.; and if the restoration of Louis — which Wellington believed would alone restore permanent peace to France and to Europe — was to be

effected, the allies must be confronted on their arrival in Paris with the accomplished fact. He settled the affair in his usual downright manner, telling the commissioners bluntly that they must take back their legitimate king, and refusing — perhaps with more questionable wisdom — to allow the retention of the tricolour flag, which to him was a :t symbol of rebellion." At the same time the opposition of the most influential member of the commission and the most powerful man in France, Fouche, was overcome by his appointment, on Wellington's suggestion, as minister of police. The result was that when the emperor Alexander arrived in Paris he found Louis XVIII. already in possession, and the problem before the allies was merely how to keep him there.

In the solution of this problem the common sense of Wellington and of Castlereagh, with whom the duke worked throughout in complete harmony, played a determining part; it was mainly owing to their influence that

France escaped the dismemberment for which the German powers clamoured, and which was ad- vocated for a while by Lord Liverpool and the majority of the British cabinet. Wellington realized the supreme necessity, in the interests not only of France but of Europe, of confirming and maintaining the prestige of the restored monarchy, which such a dismemberment would have irretrievably damaged. It was this conviction that inspired his whole attitude towards French affairs. If he unwillingly refused to intervene in favour of Marshal Ney, it was because he believed that so conspicuous an example of treason could not safely be allowed to go un- punished. If he bore in silence the odium that fell upon him owing to the break-up of the collection of the Louvre, it was because he knew that it would be fatal to allow it to be known that the first initiative in the matter had come from the king. In the same spirit he carried out the immense and unique trust imposed upon him by the allies when they placed him in com- mand of the international army by which France was to be occupied, undes the terms of the second peace of Paris, for five years. By the terms of his commission he was empowered to act, in case of emergency, without waiting for orders; he was, moreover, to be kept informed by the French cabinet of the whole course of business. His power was immense, and it was well and wisely used. If he had no sympathy with revolutionary disturbers of the peace, he had even less with the fatuous extra- vagances of the comte d'Artois and his reactionary entourage t and his influence was thrown into the scale of the moderate constitutional policy of which Richelieu and Decazes were the most conspicuous exponents. The administrative duties con- nected with the army of occupation would alone have taxed to the uttermost- the powers of an ordinary man. 1 Besides this, his work included the reconstruction of the military frontier of the Netherlands, and the conduct of the financial negotiations with Messrs Baring, by which the French government was able to pay off the indemnities due from it, and thus render it possible for the powers to reduce the period of armed occupation from five years to three. He was consulted, moreover, in all matters of international importance, notably the affairs of the Spanish colonies, in which he associated himself with Castlereagh in pressing those views which were afterwards carried into effect by George Canning.

The length of time during which France was to be occupied by the allies practically depended upon Wellington's judgment. On the 10th of December 1816 Pozzo di Borgo wrote to the duke enclosing a memorandum in which the emperor Alexander of Russia suggested a reduction in the army of occupation: " no mere question of finance, but one of general policy, based on reason, equity and a severe morality "; at the same time he left the question of its postponement entirely to Wellington. To

1 Isolated fortresses were still holding out for Napoleon in September 3815,

e.g. Longwy, which surrendered on the 20th. Much trouble was caused by the behaviour of some of the allied troops, notably the Prussians. Detailed reports of the condition of the country for the first months of the occupation are contained in the Bulletins de la correspondance de I'Interieur, copies of which are preserved in the Foreign Office records (F.O. Congress. Paris. Castlereagh, August, &c, 1815).

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Wellington the proposal seemed premature; he would prefer to wait till " the assembly had published its conduct by its acts "; for if the new chambers were to prove as intractable as the dissolved Chombre introuvable, the monarchy would not be able to dispense with its foreign tutors. To Castlereagh he wrote (December n, 1S16) that although he believed that the common people of the departments occupied," particularly those occupied by us/' were delighted to have the troops and the money spent among them, among the official and middle classes the feeling was very different. In view of the weakness of the king's government, to reduce the army would be to expose the excitable elements of the population to the temptation of attacking it. " Suppose I or my officers were forced to take military action. Suppose this were to happen in the Prussian cantonments. The whole Prussian army would be put in motion, and all Europe would resound with the alarm of the danger to be apprehended from the Jacobins in France." l

The events of the next few months considerably modified his opinions in this matter. The new chambers proved their trust- worthy quality by passing the budget, and the army of occupa- tion was reduced by 30,000 men. Wellington now pressed for the total evacuation of France, pointing out that popular irritation had grown to such a pitch that, if the occupation were to be prolonged, he must concentrate the army between the Scheldt and the Meuse, as the forces, stretched in a thin line across France, were no longer safe in the event of a popular rising. But such a concentration would in itself be attended with great risk, as the detachments might be destroyed piecemeal before they could combine. These representations determined the allies to make the immediate evacuation of France the principal subject of discussion at the congress which it was arranged to hold at Aix- la-Chapelle in the autumn of 1818. Here Wellington supported the proposal for the immediate evacuation of France, and it was owing to his common-sense criticism that the proposal of Prussia, supported by the emperor Alexander and Metternich, to establish an " army of observation " at Brussels, was nipped in the bud. The conduct of the final arrangements with Messrs Raring and Hope, which made a definitive financial settlement

between France and the allies possible, was left entirely to him.

On Wellington's first entry into Paris he had been received with popular enthusiasm, 2 but he had 'soon become intensely unpopular. He was held responsible not only for the occupation itself, but for every untoward incident to which it gave rise- even Blucher's attempt to blow up the Pont de Jena, which he had prevented, was laid to his charge. His characteristically British temperament was wholly unsympathetic to the French, whose sensibility was irritated by his cold and slightly contemptuous justice. Two attempts were made to assassinate him. 3 After the second the prince regent commanded him to leave Paris and proceed to the headquarters at Cambrai. 4 For the first time the duke disobeyed orders; the case, he wrote, was one in which he was " principally and personally concerned," and he alone was in' a position to judge what line of action he ought to pursue. 5 His work in Paris, however, was now finished, and on the 30th of October, in a final " order of the day," he took leave of the international troops under his command. On the 23rd of October, while still at Aix, he had received an offer from Lord Liverpool of the office of master-general of the ordnance, with a seat in the cabinet. He accepted, though with some reluctance, and only on condition that he should be at liberty, in the event of the Tories going into opposition, to take any line he might think proper.

For the next three years " the Duke " was little before the world. He supported the repressive policy of Liverpool's cabinet, and organized the military forces held ready in case of a Radical rising. It was his influence with George IV. that led to the

1 F. O. Continent; Paris; Wellington (No. 32).

a See the interesting letter of Lord Castlereagh to Lord Liverpool preserved in the Foreign Office Records (Congress; Paris; Viscount Castlereagh, July 7-20, 1815), dated July 8, 1815.

3 Maxwell, Life, ii, 114 ff.

- *Suppl. Despatches, xii. 326.*

5 Suppl. Despatches, ii. 335.

readmittance of Canning to the cabinet after the affair of the royal divorce had been settled. It was only in 1822, however, that the tragic death of his friend Londonderry (Castlereagh) brought him once more into international prominence. Londonderry had been on the eve of starting for the conference at Vienna, and the instructions which he had drawn up for his own guidance were handed over by Canning, the new foreign secretary, to

Wellington, who proceeded in September to Vienna, and thence in October to Verona, whither the conference had been adjourned. Welling- ton's official part at the congress is outlined elsewhere (see Verona, Congress of). Unofficially, he pointed out to the French plenipotentiaries, arguing from Napoleon's experience, the extreme danger of an invasion of Spain, but at the same time explained, for the benefit of the duke of Angoul£me, the best way to conduct a campaign in the Peninsula.

Wellington's intimate association for several years with the sovereigns and statesmen of the Grand Alliance, and his ex- perience of the evils which the Alliance existed to hold in check, naturally led him to dislike Canning's aggressive attitude towards the autocratic powers, and to view with some apprehension his determination to break with the European concert. He realized, however, that in the matter of Spain and the Spanish colonies the British government had no choice, and in this question he was in complete harmonywith Canning. This was also at first the case in respect to the policy to be pursued in the Eastern Question raised by the war of Greek independence. Both Canning and Wellington were anxious to preserve the integrity of Turkey, and therefore to prevent any isolated intervention of Russia; and Wellington seemed to Canning the most suitable instrument for the purpose of securing an arrangement between Great Britain and Russia on the Greek question, through which it was hoped to assure peace in the East. In February 1826, accordingly, the duke was sent to St Petersburg, ostensibly to congratulate the emperor Nicholas I. on his accession, but more especially — to use Wellington's own words — " to induce the emperor of Russia to put himself in our hands." G In this object he signally failed. He was, indeed, received in St Petersburg with all honour; but as a diplomatist the " Iron Duke " — whom Nicholas, writing to his brother Constantine, described as " old and broken (cassi)" — was no match for the " Iron Tsar." As for the Greeks, the emperor said bluntly that he took no interest in " ces messieurs" whom he regarded as "rebels"; his own particular quarrel with Turkey, arising out of the non-fulfilment of the treaty of Bucharest, was the concern of Russia alone; the ultimatum to Turkey had, kidccd, been prepared before Wellington's arrival, and was despatched during his visit. Under stress of the imminence of the peril, which Nicholas was at no pains to conceal, the duke was driven from concession to con- cession, until at last the tsar, having gained all he wanted, condescended to come to an arrangement with Great Britain in the Greek question. On the 4th of April was signed the Protocol of St Petersburg, an instrument which — as events were to prove — fettered the free initiative not of Russia, but of Great Britain (sec Turkey: History; Greece: History). 1

After the death of the duke of York on the 5th of December 1826 the post of commander-in-chief was conferred upon Welling- ton. His relations with

Canning had, however, become increas- ingly strained, and when, in consequence of Lord Liverpool's illness, Canning in April 1827 was called to the head of the administration, the duke refused to serve under him. On the day after the resignation of his seat in the cabinet he also resigned his offices of master of the ordnance and commander-in-chief, giving as his reason " the tone and temper of Mr Canning's letters," though it is difficult to see in these letters any adequate reason for such a course (see Maxwell's Life, ii. igp). The effect of his withdrawal was momentous in its bearing upon Eastern affairs. Canning, freed from Wellington's restraint, carried his intervention on behalf of Greece a step further, and

G Memorandum to Canning of January 26, 1826 (Well. Desp. iii.)

7 An interesting account of Wellington s negotiations in St Peters- burg, based on unpublished documents in the Russian archives, is given in T.Schiemann's Geschickte Rttsslands unter Nikolaus J. (Berlin, 1908), ii. 126-138.

concluded, on the 27th of July, the treaty of London, whereby France, England and Russia bound themselves to put an end to the conflict in the East and to enforce the conditions of the St Petersburg protocol upon the belligerents. Against this treaty Wellington protested, on the ground that it " specified means of compulsion which were neither more nor less than measures of war." His apprehensions were fulfilled by the battle of Navarino.

Canning died on the Sth of August 1827, and was succeeded as premier by Lord Goderich. The duke was at once again offered the post of commander-in-chief, which he accepted on the 17th of August. On the fall of Lord Goderich J s cabinet five months later Wellington became prime minister. lie had declared some time before that it would be an act of madness for him to take this post; but the sense of public duty led him to accept it when it was pressed upon him by the king. His cabinet included at the first Huskisson, Palmerston and other followers of Canning. The repeal of the Test and Corporation Acts having been carried in the House of Commons in the session of 1828, Wellington, to the great disappointment of Tories like Lord Eldon, recommended the House of Lords not to offer further resistance, and the measure was accordingly carried through. Soon afterwards a quarrel between the duke and Huskisson led to the retirement from the ministry of all its more liberal members. It was now hoped by the so-called Protestant party that Welling- ton, at the head of a more united

cabinet, would offer a steady resistance to Catholic emancipation. Never were men more bitterly disappointed. The Clare election and the progress of the Catholic Association convinced both Wellington and Peel that the time had come when Catholic emancipation must be granted; and, submitting when further resistance would have led to civil war, the ministry itself brought in at the beginning of the session of 1829 a bill for the relief of the Catholics. Well- ington, who had hitherto always opposed Catholic emancipation, explained and justified his change of front in simple and impressive language. His undoubted seriousness and his immense personal reputation did not, however, save him from the excesses of calumny and misinterpretation; and in order to impose some moderation upon his aspersers the duke thought it necessary to send a challenge to one of the most violent of these, the earl of Winchelsea. No mischief resulted from the encounter.

Catholic emancipation was the great act of Wellington's ministry; in other respects his tenure of office was net marked by much success. The imagination and the breadth of view necessary to a statesman of the highest order were not part of his endowment, nor had he the power of working harmoniously with his subordinates. His Eastern policy was singularly short-sighted. There might have been good reason, from Wellington's point of view, for condemning Canning's treaty of London; but when, in consequence of this treaty, the battle of Navarino had been fought, the Turkish fleet sunk, and the independence of Greece practically established, it was the weakest of all possible courses to withdraw England from its active intervention, and to leave to Russia the gains of a private and isolated war. This, however, was Wellington's policy; and, having permitted Russia to go to war alone in 1828, nothing remained for him but to treat Greece as a pawn in Russia's hands, and to cut down the territory of the Greek kingdom to the narrowest possible limits, as if the restoration to the sultan of an inaccessible mountain-tract, inhabited by the bitterest of his enemies, could permanently add to the strength of the Ottoman empire. The result was the renunciation of the Greek crown by Prince Leopold; and, although, after the fall of Wellington's ministry, a somewhat better frontier was given to Greece, it was then too late to establish this kingdom in adequate strength, and to make it, as it might have been made, a counterpoise to Russia's influence in the Levant. Nor was the indulgence shown by the cabinet towards Dom Miguel and the absolutists of Portugal quite worthy of England. That Wellington actively assisted despotic governments against the constitutional move ments of the time is not true. He had indeed none of the sym- pathy w>th national causes which began to influence British policy under Canning, and which became so powerful under

Palmerston; but the rule which he followed in foreign affairs, so far as he

considered it possible, was that of non-intervention.

As soon as Catholic emancipation was carried, the demand for parliamentary reform and extension of the franchise agitated Great Britain from end to end. The duke was ill informed as to the real spirit of the nation. He conceived the agitation for reform to be a purely fictitious one, worked up by partisans and men of disorder in their own interest, and expressing no real want on the part of the public at large. Met with a firm lesistance, it would, he believed, vanish away, with no worse result than the possible plunder of a few houses by the city mobs. Wholly unaware of the strength of the forces which he was provoking, the duke, at the opening of the parliament which met after the death of George IV., declared against any parliamentary reform whatever. This declaration led to the immediate fall of his government. Lord Grey, the chief of the new ministry, brought in the Reform Bill, which was resisted by Wellington as long as anything was to be gained by resistance. When the creation of new peers was known to be imminent, however, Wellington was among those who counselled the abandonment of a hopeless struggle. His opposition to reform made him for a while un- popular. He was hooted by the mob on the anniversary of Waterloo, and considered it necessary to protect the windows of Apsley House with iron shutters.

For the next two years the duke was in opposition. On the removal of Lord Althorp to the House of Lords in 1834, William IV. unexpectedly dismissed the Whig ministry and requested Wellington to form a cabinet. The duke, however, recommended that Peel should be at the head of the government, and served under him, during the few months that his ministry lasted, as foreign secretary. On Peel's later return to power in 184 1 Wellington was again in the cabinet, but without departmental office beyond that of commander-in-chief. He supported Peel in his Corn-Law legislation, and throughout all this later period of his life, whether in office or in opposition, gained the admira- tion of discerning men, and excited the wonder of zealots, by his habitual subordination of party spirit and party connexion to whatever appeared to him the real interest of the nation. On Peel's defeat in 1846 the duke retired from active public life. He was now nearly eighty. His organization of the military force in London against the Chartists in April 1848, and his letter to Sir John Burgoyne on the defences of the country, proved that the old man had still something of his youth about him. But the general character of Wellington's last years was rather that of the old age of a great man idealized. To the unbroken splendours of his military career, to his honourable and con- scientious labours as a parliamentary statesman, life unusually prolonged added an evening of impressive beauty and calm. The passions excited during the stormy epoch of the Reform Bill had long passed away. Venerated and beloved by the greatest and the lowliest, the old hero entered, as it were, into the

immortality of his fame while still among his countrymen. Death came to him at last in its gentlest form. He passed away on the 14th of September 1852, and was buried under the dome of St Paul's, in a manner worthy both of the nation and of the man. His monument, by Alfred Stevens (q.v.) , stands in the nave of the cathedral.

Authorities. — The Wellington Despatches, edited by Gurwood; Supplementary Despatches ; and Wellington Despatches, New Series, edited by the second duke of Wellington. Unlike Napoleon's despatches and correspondence, everything from Wellington's pen is absolutely trustworthy: not a word is written for effect, and no fact is misrepresented. Almost all the political memoirs of the period 1 830-1 850 contain more or less about Wellington in his later life. Those of Greviile and Croker have perhaps most of interest. A good deal of information, from the unpublished Russian archives, is given in F. F. de Martens' Recueil des traites conclus par la Russie. See also Sir Herbert Maxwell, Life of Wellington (2 vols., London, 1900), and the literature of the Peninsular War (q.v.), Waterloo Campaign (q.v.).

WELLINGTON, a town of Wellington county, New South Wales, Australia, 248 m. by rail N.W. of Sydney. Pop. (1901) 2988. The river Macquarie is here spanned by a fine railway bridge. There arc rich gold-bearing reefs in the vicinity of the

town and gold dredging is a growing industry; wheat growing is the most considerable agricultural pursuit; but fruit trees and vines are cultivated with success. Stock-rearing also is exten- sively followed on account of the fine pasturage in the district. In the vicinity are the beautiful Wellington caves.

WELLINGTON, a market town in the Wellington (Mid) parliamentary division of Shropshire, England, io| m. by rail E. of Shrewsbury. Pop. of urban district (rooi), 6283. It is an important junction on the London & North-Western and Great Western railways, being 152 m. N.W. from London by the former line. The Shropshire Union canal connects it with the Severn. The neighbourhood is picturesque, the Wrekin, about i% m. from the town, rising to a height of r335 ft. The church of AU Saints dates from 1790. The manufacture of agricultural implements and nails, iron and brass founding and malting are carried on. The Roman Watling Street, running near the town, gives its name to a suburb of Wellington.

Before the Conquest Wellington (Weliton, Welintun) beloneed to Earl Edwin of Mercia, and after his forfeiture in 1071 was granted to Roger,

earl of Shrewsbury. It came into the king's hands in 1102 through the attainder of Robert de Belesme. King John in 1212 granted Wellington to Thomas de Erdington " as a reward for services rendered in Rome at the time of the Interdict." Among the numerous subsequent lords of the manor were the families of Burnell and Lovell, the present owner being Colonel Sir Thomas Mayrick, Bart. Like many other towns in Shropshire, Wellington appears to have grown into importance as a border town, and possibly had some manner of corporate community in 1177, when it paid three marks to an aid, but its privileges seem to have disappeared after the annexation of Wales, and it was never incorporated. Markets are held on Thursday and Saturday under a charter of 1691-1692 to William Forester, but the Thursday market was first granted in 1 244 to Giles de Erdington. Wellington has never been represented in parliament.

WELLINGTON, a market town in the Wellington parlia- mentary division of Somersetshire, England, at the foot of the Blackdown hills, and near the river Tone, T70J m. W. by S. of London by the Great Western railway. Pop. of urban district (1901), 7283. The 15th-century church of St John has a fine Perpendicular tower and chancel; while the clerestoried nave is Early English. There is a magnificent altar-tomb to Sir J. Popham, Lord Chief Justice under Elizabeth and James I. The chief buildings include the West Somerset County School and a 17th-century hospital for the aged poor, founded by Sir J. Popham. A tower, which stands on the highest peak of the Blackdowns, 25 m. S., was erected in honour of the duke of Wellington. The town has woollen manufactures, iron foundries and brick and tile works.

WELLINGTON, the capital of New Zealand, the seat of government and of a bishop. Pop. (1001) 43,638; (1906) 58,ˆ63, and including suburbs, 63,807. It lies on the south- western shore of North Island, on the inner shore of Port Nichol- son, an inlet of Cook's Strait, the site affording a splendid harbour, walled in by abrupt hills. The original flat shore is occupied by massive walls constructed for the reclaiming of land, as the hills prevent an inland extension of the city. Wood was originally in favour as a building material, owing to the prevalence of earthquakes, but brick and stone subse- quently took its place in the construction of the principal build- ings. The main street is a winding thoroughfare named in different parts Thorndon Quay, Lambton Quay, Willis Street and Manners Street. It runs parallel to the shore, but the quays properly so called are separated from it by blocks of buildings. It is traversed by an electric tramway. There are two railway stations in the town and one in the southern suburb of Te Are. Two main lines leave the town, one following the west coast, the other an inland route to Napier. The principal buildings are governmental; the houses of parliament, formerly a wooden erection, are rebuilt in brick and stone; there are also the residence of the governor and court house. The

fine town hall was founded by the prince of Wales in 1901. There

are several fine churches, and among educational institutions the chief is the Victoria University. An excellent school of art and several public libraries are provided, the latter including that in the house of parliament. The museum contains a beautiful Maori house of carved woodwork, and biological collections. There are several public parks and gardens on well-chosen elevated sites, the principal being the Botanical Garden, from which the city and port are well seen. Shipping is controlled by a harbour board (1880). The extensive wharves are amply served by hydraulic machinery and railways. Welling- ton was founded in 1840, being the first settlement of New Zealand colonists, and the seat of government was transferred here from Auckland in 1865. The town is under municipal government.

WELLS, CHARLES JEREMIAH (i7g8?-i87o), English poet, was born in London, probably in the year 1798. He was educated at Cowden Clarke's school at Edmonton, with Tom Keats, the younger brother of the poet, and with R. H. Home. He became acquainted with John Keats, and was the friend " who sent me some roses," to whom Keats wrote a sonnet on the 29th of June 1816: —

" When, O Wells! thy roses came to me,

My sense with their deliciousness was spelled ;

Soft voices had they, that, with tender plea,

Whisper'd of peace and truth and friendliness unquelled."

Unfortunately, Wells soon afterwards played a cruel practical joke on the dying Tom Keats, and reappears in the elder poet's correspondence as " that degraded Wells." Both with Keats and Reynolds, Wells was in direct literary emulation, and his early writings were the result of this. In 1822 he published Stories after Nature — or rather, in the manner of Boccaccio, tempered by that of Leigh Hunt — a curious little volume of brocaded prose. At the close of 1823, under the pseudonym of H. L. Howard, appeared the Biblical drama of Joseph and his Brethren (dated 1824). For the next three years Wells saw Hazlitt, as he said, "every night," but in 1827 the two men were estranged. When Hazlitt died, in September 1S30, Wells took Home to see his dead friend, and afterwards raised a monu-ment to the memory of Hazlitt in the church of St Anne's, Soho. His two books passed almost unnoticed, and although Hazlitt said that Joseph and his Brethren was " more than original, aboriginal, and a mere experiment in comparison with the vast things " Wells could do, he forbore to review it,

and even dissuaded the young poet from writing any more. Wells was now practising as a solicitor in London, but he fancied that his health was failing and proceeded to South Wales, where he occupied himself with shooting, fishing and writing poetry until 1835, when he removed to Broxbourne, in Hertfordshire. In 1840 he left England, never to set foot in it again. He settled at Quimper, in Brittany, where he lived for some years. A story called Claribel appeared in 1843, and one or two slight sketches later, but several important tragedies and a great deal of miscellaneous verse belonging to these years are lost. Wells stated in a letter to Home (November 1877) that he had com- posed eight or ten volumes of poetry during his life, but that, having in vain attempted to find a publisher for any of them, he burned the whole mass of MSS. at his wife's death. The only work he had retained was a revised form of Joseph and his Brethren, which was praised in 1838 by Wade, and again, with great warmth, by Home, in his New Spirit of the Age, in 1844. The drama was then once more forgotten, until in 1863 it was read and vehemently praised by D. G. Rossetti. The tide turned at last; Jffseph and his Brethren became a kind of shibboleth — a rite of initiation into the true poetic culture — but still the world at large remained indifferent. Finally, however, Swinburne wrote an eloquent study of it in the Fort- nightly Review in 1875, and the drama itself was reprinted in 1876. The old man found it impossible at first to take his revival seriously, but he woke up at length to take a great interest in the matter, and between 1876 and 1878 he added various scenes, which are in the possession of Mr Buxton Forman, who published one of them in 1895. After leaving Quimper,

Wells went to reside at Marseilles, where he held a professorial chair. He died on the 17th of February 1879.

From R. H. Home, the author of Orion, the present writer received the following account of the personal appearance of Wells in youth. He was short and sturdy, with dark red hair, a sanguine complexion, and bright blue eyes; he used to call himself " the cub," in reference to the habitual roughness of his manners, which he was able to resolve at will into the most taking sweetness and good-humour. Wells's wife who had been a Miss Emily Jane Hill, died in 1874. Their son, after his father's death, achieved a notoriety which was unpoetical, although recorded in popular song, for he was the once-famous " man who broke the bank at Monte Carlo."

The famous Joseph and his Brethren, concerning which criticism has recovered its self-possession, is an overgrown specimen of the pseudo-Jacobean drama in verse which was popular in ultra-poetical circles between 1820 and 1830. Its merits are those of rich versification, a rather florid and voluble eloquence and a subtle trick of reserve, akin to that displayed by Webster and Cyril Tourneur in moments of impassioned dialogue. Swin- burne has said that there are lines in Wells " which might more naturally be mistaken, even by an expert, for the work of the young Shakespeare, than any to be gathered elsewhere in the fields of English poetry." This may be the case, but even the youngest Shakespeare would have avoided the dulness of subject-matter and the slowness of evolution which impede the reader's progress through this wholly undramatic play. Joseph and his Brethren, in fact, although it has been covered with eulogy by the most illustrious enthusiasts, is less a poem than an odd poetical curiosity.

In 1909 a reprint was published of Joseph and his Brethren, with Swinburne's essay, and reminiscences by T. Watts-Dunton. (E. G.)

WELLS, DAVID AMES (1828-1898), American economist, was born in Springfield, Massachusetts, on the 17th of June 1828. He graduated at Williams College in 1847, was on the editorial start of the Springfield Republican in 1848, and at that time invented a machine for folding newspapers and book-sheets. He then removed to Cambridge, graduated at the Lawrence Scientific School in 1851, and published in 1850-1865 with George Bliss (1793-1873) an Annual of Scientific Discovery. In 1866 he patented a process for preparing textile fabrics. His essay on the national debt, Our Burden and Our Strength (1864), secured him the appointment in 1865 as chairman of the national revenue commission, which laid the basis of scientific taxation in the United States. In 1866-1870 he was special commissioner of revenue and published important annual reports; during these years he became an advocate of free trade, and he argued that the natural resources of the United States must lead to industrial supremacy without the artificial assistance of a protective tariff which must produce an uneven development industrially. The creation of a Federal Bureau of Statistics in the Department of the Treasury was largely due to Wells's influence. In 187 1 he was chairman of the New York State Commission on local taxation which urged the abolition of personal taxes, except of moneyed corporations, and the levy of a tax on the rental value of dwellings to be paid by the occupant; and in 1878 he reported on New York canal tolls. In 1877 he was president of the American Social Science Association. He died in Norwich, Connecticut, on the 5th of November 1898.

He edited many scientific text -books, and wrote The Creed of the Free

Trader (1875), Robinson Crusoe's Money (1878), Our Merchant Marine (18S2), The Primer of Tariff Reform(iSS4), Practical Economics (1885), Principles of Taxation^ 1886) , Recent Economic Changes (18B9).

WELLS, HERBERT GEORGE (1866- J, English novelist was bom at Bromley, Kent, on the 21st of September 1866, the son of Joseph Wells, a professional cricketer. He was educated at Midhurst grammar school and at the Royal College of Science, where he was trained in physics, chemistry, astronomy, geology and biology. He graduated B.Sc. of London University in t888 with first-class honours, taught science in a private school, and subsequently did private coaching. In 1893 he began to write for the Pail Mall Gazette, of which he was dramatic critic in 1895. He also wrote for Nature and the Saturday Review. After the

success of his fantastic story The Time Machine (1895) he gave his time chiefly to the writing of romances, in which the newest scientific and technical discoveries were used to advance his views on politics and sociology. But he did not confine himself to fiction. His Anticipations (1902) showed his real gift for sociological speculation. Beginning with a chapter on the means of locomotion in the 20th century, it went on to discuss war, the conflict of languages, faith, morals, the elimination of the unfit, and other general topics, with remarkable acuteness and constructive ability. In The Discovery of the Future (1902) , Mankind in the Making (1903), A Modern Utopia (1905) and New Worlds for Old (1908) his socialistic theories were further developed. As a novelist, meanwhile, he had taken a very high place. Some earlier stories, such as The Wheels of Chance (1896) and Love and Mr Lewisham (1900), had proved his talent for drawing character, and pure phantasies like The War of the Worlds (1898) his abundant invention; but Kipps (1905) and Tono-Btmgay (1909) showed a great advance in artistic power. The list of his works of fiction includes The Stolen Bacillus and other Stories (1895), The Wonderful Visit (1895), The Island of Doctor Moreau (1896), The Platlner Story and Others (1897), When the Sleeper Wakes (1899), The First Men in the Moon (1901), The Food of the Gods (1904), In the Days of the Comet (1906), The War in the Air (1908), Anne Veronica (1909), The History of Mr Polly (1910).

WELLS, SIR THOMAS SPENCER, ist Bart. (1818-1897), English surgeon, was born at St Albans on the 3rd of February 1818, and received his medical education in Leeds, Dublin and St Thomas's Hospital, London (M.R.C.S. 1841). From 1841 to 1848 he served as a surgeon in the navy, and in 1848 he went to Paris to study pathology. In 1853 he settled in London, and took up ophthalmic surgery, interrupting his work to go out to the East in the Crimean War. In 1854 he became surgeon to the Samaritan Free Hospital for Women and Children, London. His reputation in surgery

had obtained for him in 1844 the fellow- ship of the Royal College of Surgeons, and he subsequently be- came a member of council, Hunterian professor of surgery and pathology (1878), President (1882) and Hunterian Orator (1883). In 1883 he was made a baronet. His name is best known in con- nexion with his successful revival of the operation of ovariotomy, which had fallen into disrepute owing to the excessive mortality attending it; and in his skilful hands, assisted by modern surgical methods, the operation lost almost all its danger. His book on Diseases of the Ovaries was published in 1865. Sir Spencer Wells married in 1853 Miss Elizabeth Wright, and had a son and daughters. lie died on the 31st of January 1897. His estate at Golder's Hill, Hampstead, was sold after his death to the London County Council and converted into a public park.

WELLS, a city, municipal borough and market town in the Wells parliamentary division of Somerset, England, 20 m. S. of Bristol, on the Great Western and Somerset & Dorset railways. Pop. (1901) 4849. It is a quiet, old-fashioned place, lying in a hollow under the Mendip Hills, whose spurs rise on all sides like islands. The city is said to have derived its name from some springs called St Andrew's Wells, which during the middle ages were thought to have valuable curative properties. During Saxon times Wells was one of the most important towns of Wcssex, and in 905 it was made the seat of a bishopric by King Edward the Elder. About the year 1091-1092 Bishop John de Villula removed the see to Bath; and for some years Wells ceased to be an episcopal city. After many struggles between the secular clergy of Wells and the regulars of Bath, it was finally arranged in 1139 that the bishop should take the title of " bishop of Bath and Wells," and should for the future be elected by delegates appointed partly by the monks of Bath and partly by the canons of Wells. The foundation attached to the cathedral church of Wells consisted of a college of secular canons of St Augustine, governed by a dean, sub-dean, chancellor and other officials. The diocese covers the greater part of Somerset. The importance of the city is almost wholly ecclesiastical; and the theological college is one of the most important in England,

Wells is governed by a mayor, 4 aldermen and 12 councillors. Area 720 acres.

The cathedral, one of the most magnificent of all the secular churches of England, was executed principally by Bishops Reginald Fitz-Jocelyn (1171-1191), Savaricus (1192-1205) and Jocelyn (1 206-1 242). According to the usual medieval practice, the eastern part of the church

was begun first, and the choir was consecrated for use long before the completion of the nave, the western part of which, with the magnificent series of statues on the facade, is commonly attributed to Bishop Jocelyn. With him was associated a famous architect in Elias de Derham, who was his steward in 1 236, and died in 1 245. The upper half of the two western towers has never been built. The noble central tower, r6o ft. high, was built early in the r4th century; the beautiful octagonal chapter-house on the north side, and the lady chapel at the extreme east, were the next important additions in the same century. The whole church is covered with stone groining of various dates, from the Early English of the choir to the fan vaulting of the central tower. Its plan consists of a nave (161 ft. in length and 82 in breadth) and aisles, with two short transepts, each with a western aisle and two eastern chapels. The choir and its aisles are of unusual length (ro3 ft.), and behind the high altar are two smaller transepts, beyond which is the very rich Decorated lady chapel, with an eastern semi-octagonal apse. On the north of the choir is the octagonal chapter-house, the vaulting of which springs from a slender central shaft; as the church belonged to secular clergy, it was not necessary to place it in its usual position by the cloister. The cloister, 160 by 150 ft., extends along the whole southern wall of the nave. The extreme length of the church from east to west is $&$ ft. The oak stalls and bishop's throne in the choir are magnificent examples of 15th- century woodwork, still well preserved.

The glory of the church, and that which makes it unique among the many splendid buildings of medieval England, is the wonderful series of sculptured figures which decorate the exterior of the west front. The whole of the facade, 150 ft. wide, including the two western towers, is completely covered with this magnificent series ; there are nine tiers of single figures under canopies, over 600 in number, mostly large life size, with some as much as 8 ft. in height, and other smaller statues; these represent angels, saints, prophets, kings and queens of the Saxon, Norman and Plantagenet dynasties, and bishops and others who had been benefactors to the see. There are also forty-eight reliefs with subjects from Bible history, and immense representations of the Last Judgment and the Resurrection, the latter alone containing about 150 figures. The whole com- position is devised so as to present a comprehensive scheme of theology and history, evidently thought out with much care and ingenuity. As works of art, these statues and reliefs are of high merit; the faces are noble in type, the folds of the drapery very gracefully treated with true sculpturesque simplicity, and the pose of the figures remarkable for dignity. A great variety of hands and much diversity of workmanship can be traced in this mass of sculpture, but in very few cases does the work fall conspicuously below the general level of excellence.

The interior of the central tower presents an interesting example of the

skilful way in which the medieval builders could turn an unexpected constructional necessity into a beautiful architectural feature. While it was being built the four piers of the great tower arches showed signs of failure, and, therefore, in order to strengthen them, a second lower arch was built below each main arch of the tower; and on this a third inverted arch was added. Thus the piers received a steady support along their whole height from top to bottom, and yet the opening of each archway was blocked up in the smallest possible degree. The contrasting lines of these three adjacent arches on each side of the tower have a very striking and graceful effect ; nothing similar exists elsewhere.

On the south side of the cathedral stands the bishop's palace, a moated building, originally built in the form of a quadrangle by Bishop Jocelyn, and surrounded by a lofty circuit wall. The hall and chapel are beautiful structures, mostly of the 14th century.

The vicars' college was a secular foundation for two principals and twelve vicars; fine remains of this, dating from the 15th century, and other residences of the clergy stand within and near the cathedral close; some of these are among the most beautiful examples of medieval domestic architecture in England.

The church of St_ Cuthbert is one of the finest of the many fine parochial churches in Somersetshire, with a noble tower and spire at the west end. It was originally an Early English cruciform building, but the central tower fell in during the 16th century, and the whole building was much altered during the Perpendicular period. Though much damaged, a very interesting reredos exists behind the

high altar; it consists of a " Jesse tree " sculptured in relief, erected in 1470. Another beautiful reredos was discovered in 1848, hidden in the plaster on the east wall of the lady chapel, which is on the north side.

There was a Roman settlement at Wells (Theorodunum, Fonticuli, Tidington, Welliae, Welle), this site being chosen on account of the springs from which the town takes its' name, and the Roman road to Cheddar passed through Wells. King Ine founded a religious house there in 704, and it became an episcopal see in 910. To this latter event the subsequent growth of Wells is due. There is evidence that Wells had become a borough owned by the bishops of Wells before 1 160, and in that year Bishop Robert granted the first charter, which exempted his burgesses from certain tolls. Other charters granted by Bishop Reginald before 1180 and by Bishop Savaric about 1201 gave the burgesses of Wells the right to jurisdiction in their own disputes. These charters were confirmed by John in 1201, by Edward I. in 1 290, by Edward III. with the grant of new

privileges in 1334, T341, 1343 and 1345, by Richard II. in 1377, by Henry IV. in 1399 and by Henry VI. in 1424. Wells obtained charters of incorporation in 1589, 1683, 1688 and 1835. It was represented in parliament from 1295 to 1868. Fairs on March 3, October 14 and November 30 were granted before 1160, and in 1201 fairs on May 9, November 25 and June 25 were added. They were important in the middle ages for the sale of cloth made in the town, but the fairs which are now held on the first Tuesdays in January, May, July, November and December are noted for the sale of cheese. The market days for the sale of cattle and provi- sions are Wednesdays and Saturdays. Silk-making, stocking- making and gloving replaced the cloth trade in Wells, but have now given place to brush-making, corn and paper milling, which began early in the 19th century.

See Victoria County History, Somerset; Thomas Serel, Lectures on Wells (1880).

WELLSTON, a city of Jackson county, Ohio, U.S.A., about 30 m. S.E. of Chillicothe. Pop. (1880) 952; (1890) 4377; (1900) 8045, of whom 311 were foreign-born; (1910 census) 6875. Land area (1906), 6-62 sq. m. Wellston is served by the Baltimore & Ohio South-western, the Hocking Valley, the Cincinnati, Hamilton & Dayton, and the Detroit, Toledo & Iron- ton railways, and is connected by an electric line with Jackson (pop. in 1910, 5468), the county-seat, about 10 m. S.W. Immedi- ately N. of the city is Lake Alma Park. Wellston is situated in a coal and iron mining country; among the city's manufactures arc iron and cement, and in 1905 the value of the factory product was 81,384,295, 41-4% more -than in 1900. The municipality owns and operates its water-works and its electric lighting plant. Wellston (named in honour of Harvey Wells, its founder) was settled in 1871, and was chartered as a city in 1876.

WELLSVILLE, a city of Columbiana county, Ohio, U.S.A., about 35 m. S. of Youngstown, on the Ohio river. Pop. (1890) 5247; (1900) 6146 (475 being foreign-born and 113 negroes); (1910) 7769. Wellsville is served by the Pennsylvania railway, and by an interurban electric line connecting with Rochester, Pa., and Steubenville, Ohio. It is in a, region which has rich deposits of coal, natural gas, oil and clay; and there are various manufactures. The neighbourhood was first settled in 1795 by one James Clark of Washington county, Pennsylvania, who bought a tract of 304 acres here and who transferred it a year afterwards to his son-in-law, William W T ells, in whose honour the settlement was named in 1820 when it was platted. From 1832 to 1852 W r ellsville was an important shipping point on the Ohio, with daily steamboats to Pittsburg; it was incorporated as a village in 1848, and was chartered as a city in 1890.

WELS, a town of Austria, in Upper Austria, 17 m. S.S.W. of Linz by rail. Pop. (1900) 12,187. It is situated on the river Traun and possesses an interesting parish church, in Gothic style, rebuilt in the 15th century, but the oldest part supposed to date from the 9th century. The town draws a supply of natural gas, used for lighting, heat and motive power, from deep artesian borings first made in r89r. It has an important trade in corn, timber, horned cattle, pigs and horses, fowls, dairy produce and lard; and considerable manufactures, including machinery,

cast-iron, copper and brass goods, calico, gunpowder, oil, paper, articles in felt, flour, leather and biscuits. Wels stands on the site of the Roman Ovilaba, and was in the 8th century the residence of the dukes of Lambach-Wels. The actual town dates from the nth century. i

WELSER, the name of a famous family of German merchants, members of which held official positions in the city of Augsburg during the 13th century. The family first became important during the 15th century, when the brothers Bartholomew and Lucas Welser carried on an extensive trade with the Levant and elsewhere, and had branches in the principal trading centres of south Germany and Italy, and also in Antwerp, London and Lisbon. The business was continued by Antony (d. 1518), a son of Lucas Welser, who was one of the first among the Germans to use the sea route to the East, which had been discovered by Vasco da Gama. The Welsers were also interested in mining ven- tures; and, having amassed great wealth, Antony's son Bar- tholomew (1488-1561) lent large sums of money to Charles V., receiving in return several marks of the imperial favour. Bartholomew and his brother Antony, however, are chiefly known as the promoters of an expedition under Ambrose Dalfinger (d. 1532), which in 1528 seized the province of Caracas in Venezuela. With the consent of Charles V., this district was governed and exploited by the Welsers; but trouble soon arose with the Spanish government, and the undertaking was abandoned in 1555. After Bartholomew's death the business was carried on by three of his sons and two of his nephews; but the firm became bankrupt in 1614. Bartholomew's niece Philippine (1527-1580), the daughter of his brother Francis (1497-1572), married the Archduke Ferdinand, son of the emperor Ferdinand I.

Perhaps the most famous member of the Welser family was Antony's grandson, Marcus (1558-1614). Educated in Italy, Marcus became burgomaster of Augsburg, but was more dis- tinguished for his scholarship and his writings. The most im- portant of his many works is his Rerum

Boicarum libri quinque, dealing with the early history of the Bavarians, which was translated into German by the author's brother Paul (d. 1620). His works, Marci Velseri opera historica et philologica, were collected and published with a biography of Marcus by C. Arnold (Nuremberg, 1682). The Augsburg branch of Welsers became extinct in 1797, and a branch which settled at Nuremberg in 1878; but the TJlm branch of the family is still nourishing.

See K. Habler, Die uberseeischen Unternehmungen der Welser (Leipzig, 1903); W. Boheim, Philippine Welser (Berlin, 1894); and A. Kleinschmidt, Augsburg, Nilrnberg und ihre Handelsfiirsten (Cassel, 1881).

WELSH LAWS, or Leges Waixiae. There is, comparatively speaking, no great distance of time between the leges barbarorum and the Laws of Wales, while the contents of the latter show a similar, nay almost the same, idea of law as the former; and, apart from the fact that Wales became permanently connected at the end of the 13th century with a Teutonic people, the English, it has been noticed that in Wales Roman and Germanic, but no traces of a specific Welsh, law are found. King Howel Dda {i.e. the Good), who died in 950, is the originator of the Welsh code. 1 In the preface it is stated that Howel, " seeing the laws and customs of the country violated with impunity, summoned the archbishop of Menevia, other bishops and the chief of the clergy, the nobles of Wales, and six persons (four laymen and two clerks) from each comot, to meet at a place called Y Ty Gwyn ar Dav, or the white house on the river Tav, repaired thither in person, selected from the whole assembly twelve of the most experienced persons, added to their number a clerk or doctor of laws, named Bllgywryd, and to these thirteen confided the task of examining, retaining, expounding and abrogating. Their compilation was, when completed, read to

1 There is no historical foundation for the legendary laws of_ a prince Dymal (or Dyvnwal) Moel Mud, nor for the Laws of Marsia, which are said to belong to a period before the Roman invasion, even so early as 400 years before Christ. An English translation by the side of the Welsh text of the so-called triads of Dyvnwal Moel Mud is given by Owen, in The Ancient Laws of Wales.

the assembly, and, after having been confirmed, proclaimed. Howel caused three copies to be written, one of which was to accompany the court for daily use, another was deposited in the court at Aberfraw, and a third at Dinevwr. The bishops denounced sentence of excommunication against all transgressors, and soon after Howel himself went to Rome attended by the archbishop of St David's, the bishops of Bangor and St Asaph and thirteen other personages. The laws were recited before the pope and confirmed by

his authority, upon which Howel and his companions returned home." All this could not have been effected before Howel had subjected Wales to his own rule, therefore not before 943. We have three different recensions of the code, one for Venedotia or North Wales, another for Dimetia or South Wales, a third for Gwent or North-east Wales. We do not know how far these recensions were uniform in the begin- ning; but a variance must have occurred shortly after, for the manuscripts in which the codes are preserved differ greatly from each other. The code was originally compiled in Welsh, but we have no older MSS. than the 12th century, and even the earliest ones (especially those of the Venedotia recension) contain many interpolations. The Latin translations of the code would seem to be very old, though even here we have no earlier MSS. (belong- ing to the Dimetia recension) than the 13th century. The Latin text is much shorter than the Welsh, but we do not know whether this abridgment was made on purpose, or whether the translation is an imitation of an earlier text. The texts present only a few traces of Roman law, which, however, are evidently additions of a later period.

The whole body of Welsh laws was published in one volume by Aneurin Owen under the direction of the commissioners on the public records as Ancient Laws and Institutes of Wales (London, 1841). The text of Howel's laws has been edited by A. W. Wade- Evans as Welsh Medieval Law (London, 1909).

WELSHPOOL (or Welchpool, so called because Pool, its old name, led to confusion with Poole, in Dorsetshire; Welsh Trallwm), a market town and municipal and contributary parliamentary borough of Montgomeryshire, N. Wales, in the upper Severn valley, on the Montgomeryshire canal and the Cambrian railway, 8 m. N. of Montgomery, and 182 m. from' London. Pop. (1901) 6121. Its buildings and institutions include the old Gothic church of St Mary, the Powysland Museum, with local fossils and antiquities, and a library, vested (with its science and art school) in the corporation in 1887. Powis Castle (about a mile S.W. of the town) is the seat of Earl Powis, and has been in the possession of the Herberts for many genera- tions. The flannel manufacture has been transferred toNewtown, but Welshpool has tweeds and woollen shawls, besides a fair trade in agricultural produce, malting and tanning. The town returned a member to parliament from 1536 to 1728, was again enfranchised in 1832, and now (with Llanfyllin, Llanidloes, Montgomery, Machynlleth and Newtown) forms the Montgomery district of parliamentary boroughs. A charter was granted to the town by the lords of Powis, confirmed by James I. (161 5), and enlarged by Charles II. The castle was begun, in or about 1109, by Cadwgan ab Bleddyn ab Cynfyn (Cynvyn), and finished by Gwenwynwyn; in 1196 it was besieged, undermined and taken by Hubert, archbishop of Canterbury. Retaken by Gwenwynwyn in 1197, it was dismantled by

Llewelyn, prince of N. Wales, in 1233. It then remained for several years in the hands of the lords of Powis. During the Civil War, the then lord Powis, a royalist, was imprisoned, and the castle was later demolished. Powis Castle, being of red sandstone, is usually called in Welsh Castell Coch (red castle). In the park is Llyn du (black pool), whence Welshpool is said to be named.

WEM, a market town in the northern parliamentary division of Shropshire, England, n m. N. of Shrewsbury on the London & North Western railway. Pop. (1901), 3796. It is a pleasantly situated town with a considerable agricultural trade. The church of St Peter and St Paul retains a Norman tower. Flour-milling and tanning are the chief industries. In the neighbourhood is the splendid domain of Hawkstone.

In the reign of Edward the Confessor Wem was held as four manors, but at the time of the Domesday Survey William

Pantulf was holding the whole as one manor of Roger, earl of Shrewsbury, from whom it passed to the Botelers, barons of Wcm. The famous Judge Jeffreys was among the subsequent lords of the manor and was created Baron Jeffreys of Wem in 1685, but upon the death of his only son and heir in 1720 the title became extinct. The town was a borough by prescription, but there appears to be no mention of burgesses before the 15th century. In 1459 Ralph, Lord Greystock, is said to have granted a charter, no longer extant, to his tenants in the manor, and in 1674 the freeholders, " borough-holders " and copy- holders, of Wem brought an action against Daniel Wicherley, then lord of the manor, for the establishment of customs and privileges chiefly connected with the tenure of their lands and tenements, which was decided ifl their favour. The borough was governed by two bailiffs, both elected at the court leet of the lord of the manor, one by his steward, the other by a borough jury, but in the beginning of the 19th century there were only seventy-two burgesses and their rights seem to have gradually disappeared. An urban district council was formed in 1900. Wem has never been represented in parliament. The market was originally held on Sunday under grant from John to Warin Fitz Gerald in 1205, but in 1351, in consequence of a protest from the archbishop of Canterbury, it was changed to Thursday, on which day it is still held. The grant of 1205 also included a fair at the feast of SS. Peter and Paul, which was maintained until within recent years, when fairs were also held at the feast of St Mark, chiefly for linen cloth, under grant from Charles I. to Thomas HowaTd in 1636, and at the feast of St Martin,

bishop of Tours, for the sale of hops. A great fire w r hich broke out at Wem on the 3rd of March 1677 caused damage to the extent of £23,677.

Sec Victoria County History, Shropshire; Samuel Garbet, The History of Wem (1818).

WEMBLEY, an urban district in the Harrow parliamentary division of Middlesex, England, 10 m. W.N.W. of St Paul's Cathedral, on the Metropolitan and London & North Western railways. Pop. (1901) 4519. Wembley adjoins Sudbury on the east; the district is residential, but lacks natural attractions except in the case of Wembley Park, a pleasant wooded recrea- tion ground, owned by a company. Here a tower was begun on the lines of the Eiffel Tower in Paris, and projected to exceed it in height, reaching 1200 ft., but only a short stage was com- pleted. The manor of Wembley belonged to the priory of Kilburn until that foundation was dissolved by Henry VIII.

WEMYSS, EARLS OF, the title held by a Scottish family who had possessed the lands of Wemyss in Fifeshire since the 12th century, and of which various members had attained distinction. In 1628 Sir John Wemyss, who had been created a baronet in 1625, was raised to the peerage as Baron Wemyss of Elcho ; and in 1633 he became earl of Wemyss, and Baron Elcho and Methcl, in the peerage of Scotland. He took part with the Scottish parliament against Charles I., and died in 1649. On the death of "David, 2nd earl of Wemyss (1610-1679), the estates and titles passed to his daughter Margaret, countess of Wemyss, whose son David, 3rd earl of Wemyss, succeeded on her death in 1705. His son James, 4th earl (1699-1756), married a great heiress, Janet, daughter of Colonel Francis Charteris, who had made a large fortune by gambling. His son David, Lord Elcho (1721-1787), was implicated in the Jacobite rising of 1745, and was consequently attainted, the estates passing to his younger brother James, while the title remained dormant after his father's death, though it was assumed by Elcho's brother Francis, who took the name of Charteris on inheriting his maternal grand- father's estate. A reversal of the attainder was granted in 1826 to his descendant Francis Charteris Wemyss Douglas (1772-1853), who had been created Baron Wemyss of Wemyss in the peerage of the United Kingdom in 1821, and had assumed the name of Charteris Wemyss Douglas on inheriting some of the Douglas estates through a female ancestor. Thenceforward the title descended in the direct line.

WEMYSS, a parish of Fifeshire, Scotland, embracing the villages of East and West Wemyss and the police burgh of

Buckhavcn, a fishing port lying on the northern shore of the Firth of Forth,

2j m. S.W. of Leven, on the North British Railway Company's branch line from Thornton Junction to Methil. Coal mining is the principal industry of the district, the coal being exported from the port of Methil, of which the harbour was constructed by David, 2nd earl of Wemyss (d. 1679), the town being made a burgh of barony in 1662. Population of Buckhaven, including Methil and Innerleven (1901), 8828; of East Wemyss, 2522; of West Wemyss, 1253; of Wemyss parish, 15,031. The district is of much archaeological and historic interest. On the shore to the north-east are two square towers which are supposed to have formed part of Macduff's castle; and near them are the remarkable caves (weems, from the Gaelic, tiamha) from which the district derives its name. Several of them contain archaic sculptures, held by some to be the work of the Christian missionaries who found shelter here; by others ascribed to the same prehistoric agency as the inscribed stones of northern Scotland. Near East Wemyss is Wemyss Castle, the ancient seat of the family of the same name which has played a conspicuous part in Scottish history. It was at Wemyss castle that Mary, queen of Scots, first met the earl of Darnley, in 1565, and her room is still known as " the Presence Chamber."

WENCESLAUS (1361-1419), German king, and, as Wenceslaus IV., king of Bohemia, was the son of the emperor Charles IV. and Anna, daughter of Henry II., duke of Schweidnitz. Born at Nuremberg on the 26th of February 1361, he was crowned king of Bohemia in June 1363, and invested with the margraviate of Brandenburg in 1373. In September 1370 he married Joanna (d. 1386) daughterof Albert I., duke of Bavaria, and was elected king of the Romans or German king at Frankfort on the 10th of June 1376, and crowned at Aix-la-Chapelle on the 6th of July following. He took some part in the government of the empire during his father's lifetime, and when Charles died in November 1378 became sole ruler of Germany and Bohemia, but handed over Brandenburg to his half-brother Sigismund. His reign was a period of confusion both in church and state, and although he appears to have begun to rule with excellent intentions, he was totally unfit to cope with the forces of disorder. Germany was torn with feuds, the various orders for the establishment of peace were disregarded, and after 1389 the king paid very little attention to German affairs. In 1383 he inherited the duchy of Luxemburg from his uncle Wenceslaus and in 1387 assisted his half-brother Sigismund to obtain the Hungarian throne.

For some time Wenceslaus ruled Bohemia successfully, but he fell under the influence of favourites and aroused the irritation of the nobles. A quarrel with John II., archbishop of Prague, which led to the murder of John's vicar-general, John of Pomuk, at the instigation of the king, provoked a rising led by Jobst, margrave of Moravia, a cousin of Wenceslaus; and in 1394 the king was taken prisoner and only released under pressure of

threats from the German princes. Having consented to limita- tions on his power in Bohemia, he made a further but spasmodic effort to restore peace in Germany. He then met Charles VI., king of France at Reims, where the monarchs decided to persuade the rival popes Benedict XIII. and Boniface IX. to resign, and to end the papal schisms by the election of a new pontiff. Many of the princes were angry at this abandonment of Boniface by Wenceslaus, who had also aroused much indignation by his long absence from Germany and by selling the title of duke of Milan to Gian Galleazzo Visconti. The consequence was that in August 1400 the four Rhenish electors met at Oberlahnstein and declared Wenceslaus deposed. He was charged with attempting to dismember the empire to his own advantage, with neglecting to end the schism in the church, with allowing favourites to enrich themselves, and was further accused of murder. Though he remained in Bohemia he took no steps against Rupert III. count palatine of the Rhine, who had been elected as his successor. He soon quarrelled with Sigismund, who took him prisoner in 1402 and sent him to Vienna, where he remained in captivity for nineteen months after abdicating in Bohemia. In 1404, when Sigismund was recalled to Hungary, Wenceslaus regained his

freedom and with it his authority in Bohemia; and after the death of the German king Rupert in 1410 appears to have entertained hopes of recovering his former throne. Abandoning this idea, however, he voted for the election of Sigismund in 1411, but stipulated that he should retain the title of king of the Romans. His concluding years were disturbed by the troubles which arose in Bohemia over the death of John Huss, and which the vacillat- ing king did nothing to check until compelled by Sigismund. In the midst of these disturbances he died at Prague on the 16th of August 1419. His second wife was Sophia, daughter of John, duke of Bavaria-Munich, but he left no children. Wenceslaus was a capable and educated man, but was lacking in perseverance and industry. He neglected business for pleasure and was much addicted to drunkenness. He favoured the teaching of Huss, probably on political grounds, but exercised very little influence during the Hussite struggle.

See Th. Lindner, Geschichte des deutschen Reiches vom Ende des I4ten Jakrkiinderls bis zur Reformation, part i. (Brunswick, 1875- 1880), and " Die Wahl Wenzels," in the Forschungen zur deutschen Ge- schichte, Band xiv. (Gottingen, 1862-1886); F. M. Pelzel, Lebens- geschichte des romischen und bokmischen Konigs Wenceslaus (Prague, 1788-1790); F. Palacky, Geschichte von B ohm en, Bande iii. and iv. (Prague, 1864-1874)

; H. Mau, Konig Wenzel und die rheinischen Kurfiirsten (Rostock, 1887). The article by Th, Lindner in the Allgemeine deutsche Biographie, Band xli., should also be consulted for a bibliography, and also the same writer's work, Das Urkunden- wesen Karls IV. und seiner Nachfotger (Stuttgart, J882).

WfiN-CHOW-FU, a prefectural city in the province of Cheh- kiang, China, and one of the five ports opened by the Chifu convention to foreign trade, situated (28 1′ N., 120 31′ E.) on the south bank of the river Gow, about 20 m. from the sea. The population is estimated at 80,000. The site is said to have been chosen by Kwo P'oh (a.d. 276-324), a celebrated antiquary who recognized in the adjacent mountain peaks a correspondence with the stars in the constellation of the Great Bear, from which circumstance the town was first known as the Tow or Great Bear city. Subsequently the appearance in its vicinity of a white deer carrying a flower in its mouth was deemed so favourable an omen as to more than justify the change of its name to Luh or Deer city. Its present name, which signifies the " mild district," and is correctly descriptive of the climate, though not of the inhabitants, was given to it during the Ming dynasty (1368- 1644) . The walls, which were built in the 10th century, arc about 4 m. in circumference, 35 ft. in height, and 12 ft. broad at the top. The streets are paved with brick and are wide, straight and clean. The gates, seven in number, were erected in 1598. Wen-chow is about 1560 m. S.S.E. by road from Peking and 600 m. E.S.E. of Hankow. The British consul and the customs outdoor staff occupy foreign-built houses on Conquest Island, which lies abreast of the city. The neighbourhood is hilly and pretty, while opposite the north-west gate Conquest Island forms a picturesque object. The island is, however, more beautiful than healthy. The port, which was opened to foreign trade in 1876, has not justified the expectations which were formed of it as a commercial centre, and in 1908 the direct foreign trade was valued at £19,000 only.*

There is no foreign settlement at Wen-chow, and the foreign residents are mainly officials and missionaries. The tea trade of Wen-chow-Fu, formerly important, has declined owing to care- less cultivation. A considerable native export trade in wood, charcoal, bamboo, medicines, paper umbrellas, oranges, otter skins and tobacco leaf is carried on. The imports are chiefly cotton yarn and piece goods, kerosene oil, palm-leaf fans, aniline dyes, sugar and matches.

WENDEN (Lettish Tseziz), a town of western Russia, in the government of Livonia, 60 m. by rail N.E. of Riga. ˆop. (1897) 6327. Here are the well preserved nuns of a former castle of the Brethren of the Sword, afterwards (from 1237) of the grand- master of the Teutonic Knights. In 1577 the garrison blew it up to prevent it from falling into the hands of Ivan the

Terrible of Russia. It was rebuilt, but has been in ruins since a fire in

1743.

WENDOVER, a market town in the Aylesbury parliamentary division of Buckinghamshire, England, 33 m. N.W. of London

by the Metropolitan and the Great Central joint railway. Pop. (1901) 2036. It is picturesquely situated in a shallow defile of the Chiltern Hills, towards their western face. Wendover is a quiet town of no great activity. Its church of St Mary is mainly Decorated, and a few old houses remain.

Wendover (Wendovre, Wandovre, Wendoura) is on the Upper Icknield Way, which was probably an ancient British road, and various traces of a British settlement have been found in the town and neighbourhood. In 1087 the king held the manor of Wendover, and therefore it belonged to the ancient demesne of the crown. There is no trace of any incorporation of the town. Two burgesses were summoned to the parliaments of 1300, 1307 and 1309, but no further returns were made until 1625. In 1832 Wendover lest its right of separate representation. It is note- worthy that John Hampden and Edmund Burke both repre- sented the borough. In 1464 Edward IV. confirmed to his tenants and the residents within the borough the market that they had always held every Thursday. For a short period the day was changed to Tuesday, but the market was given up before 1888. Hugh de Gurnay held a fair in Wendover on the eve, feast and morrow of St John the Baptist, granted him in 1214. Another fair was granted to John de Molyns in 1 347-1348 on the eve, feast and morrow of St Barnabas, but in 1464 Edward IV. granted two fairs to his tenants and residents in the borough, to be held on the vigils, feasts and morrows of St Matthew and of SS. Philip and James. These fairs have been held without interruption till the present day, their dates being October 2 and May 13.

WENDS, the name applied by the Germans to the Slavs (q.v.) wherever they came in contact with them. It is now used for the Slovenes (q.v.), for the Germanized Polabs (q.v.) in eastern Hanover, and especially for the Lusatian Wends or Sorbs (q.v.). It is first found in Pliny (Venedae) and in English is used by Alfred.

WENDT, HANS HINRICH (1853-), German Protestant theologian, was born in Hamburg on the 18th of June 1853. After studying theology at Leipzig, Gottingen and Tubingen, he became in 1885 professor ordinarius of systematic theology at Heidelberg, and in 1893 was called to Jena. His work on the teaching of Jesus (Die Lehre Jesu, 1886-1890; Eng. trans, of second part, 1892) made him widely known. He also edited several editions (5th to 8th, 1880-1898) of the Commentary on ike Acts of the

Apostles inH. A. W. Meyer's series. In May 1904 he delivered two addresses in London on " The Idea and Reality of Revelation, and Typical Forms of Christianity," as the Essex Hall Lectures (published, 1904).

His works include: Die christliche Lehre von der menschlichen Vollkommenkeit (1882), Der Erfahrungsbeweis für die Wahrheit des Christentums (1897), and Das Johannesevangelium (1900; Eng. trans., 1902).

WENLOCK, a municipal borough in the Ludlow and Wellington parliamentary divisions of Shropshire, England, extending on both sides of the river Severn. Pop. (1901) 15,866. It includes the market towns of Broseley, Madeley and Much Wenlock (q.v.). The parish of Madeley includes the small towns of Iron- bridge and Coalport, with part of Coalbrookedale (q.v.) The district is in part agricultural, but contains limestone quarries, some coal-mines and iron-works. The borough is under a mayor, 8 aldermen and 24 councillors. Area, 22,657 acres.*

Wenlock (Weneloche) is said to be of pre-Roman origin, but owed its early importance to the nunnery founded c. 680 by St Milburg, daughter of Merewald, king of Mercia. This was destroyed by the Danes but refounded as a priory by Earl Leofric in 1017. It was again deserted after the Conquest until Roger de Montgomery founded a house of the Cluniac order on its site. The town was a borough by prescription, and its privileges began with the grants made to the priory and its tenants. It was incorporated under the name of " Bailiff, Burgesses and Commonalty " by Edward IV. in 1468 at the request of Sir John Wenlock, Kt., and " in consideration of the laudable services which the men of the town performed in assisting the king to gain possession of the crown," and the charter was confirmed in

1547 by Henry VIII. and in 1631 by Charles I. The bailiff was to be chosen annually by the burgesses, but his election seems to have depended entirely upon the lord of the manor, and, after a contest in 1821 between Lord Forester and Sir W. W. Wynne, the lord of the manor at that date, was nominated by each of them alternately.- In the report of 1835 the borough is said to consist of seventeen parishes and to be unfit for corporate government. By the charter of Edward IV. the town obtained the right of sending two members to parliament, but was disfranchised in 1885. The first grant of a market and fair is dated 1227, when the prior of Wenlock obtained licence to hold a fair on the vigil, day and morrow of the Nativity of St John the Baptist, and a market every Monday. The incorporation charter

of 1468 granted these to the burgesses, who continue to hold them.

See Victoria County History: Shropshire; John Randall, Randall's Tourists' Guide to Wenlock (1875); "Borough of Wenlock," The Salopian and West Midland Monthly Illustrated Journal, March, April, November, December, 1877, April and October, 1878, March, 1879

(1877-1879).

WENLOCK GROUP (Wenlockian), in geology, the middle series of strata in the Silurian (Upper Silurian) of Great Britain. This group in the typical area in the Welsh border counties contains the following formations: Wenlock or Dudley lime- stone, 90-300 ft.; Wenlock shale, up to 1900 ft.; Woolhope or Barr limestone and shale, 150 ft.

The Woolhope beds consist mainly of shales which are generally calcareous and pass frequently into irregular noduiarand lenticular limestone. In the Malvern Hills there is much shale at the base, and in places the limestone may be absent. These beds are best developed in Herefordshire ; they appear also at May H ill in Gloucestershire and in Radnorshire. Common fossils are Phacops caudatus, Encrinurus punctatus, Orihis calligramma, Atrypa reti- cularis, Orthoceras annulatum.

The Wenlock Shales are pale or dark-grey shales which extend through Coalbrookdale in Shropshire, through Radnorshire into Carmarthenshire. They appear again southward in the Silurian patches in Gloucestershire, Herefordshire and Monmouthshire. They thicken from the south northward. The fossils are on the whole closely similar to those in the limestones above with the natural difference that corals are comparatively rare in the shales, while graptolites are abundant. Six graptolite zones have been recognized by Miss G. L. Elles in this formation.

The Wenlock limestone occurs either as a series of thin limestones with thin shales or as thick massive beds ; it is sometimes hard and crystalline and sometimes soft, earthy or concretionary. It is typically developed in Wenlock Edge, where it forms_ a striking feature for some 20 m. It appears very well exposed in a sharp anticline at Dudley, whence it is sometimes called the " Dudley limestone"; it occurs also at Aymestry, Ludlow, Woolhope, May Hill, Usk and Malvern. The fossils include corals in great variety (Halysites catenularis, Favosites aspera, Heliolites inter stinctus), crinoids (Crotalocrinus, Marsupiocrinus, Periechocrinus), often very beautiful specimens, and trilobites (Calymene Blumenbachii, the " Dudley locust," PhacoPs caudatus, lllaenus (Bumbastes)barriensis, Homolonotus delphinocephalus) . Merostomatous crustaceans make their first appearance here(Eurypterus punctatus, Hemiaspis horridus). Brachiopods

are abundant (Atrypa reticularis, Spirifer plicatilis, Rhynchonella cuneata, Orthis, Leptaena, Pentamerus) ; lamellibranchs include the genera Avicula, Cardiola, Grammysia; Murckisonia, Bellerophon, Ompkalotrochus are common gasteropod genera. Conu- laria Soweroyi is by no means rare, and there are several common cephalopod genera (Orthoceras, Phragmoceras, Trochoceras) . _

The greater part of the known Silurian fauna of Britain comes from Wenlock rocks; J. Davidson and G. Maw obtained no fewer than 25,000 specimens of brachiopods from 7 tons of the shale. Not only are there many different genera and species but individually certain forms are very numerous. The three principal zonal graptolites are, from above downwards: Monograptus testis, Cyrto- graptus Linnarssoni, Cyrtograptus Murchisoni.

When traced northward into Denbighshire and Merionethshire the rocks change their character and become more slaty or arenace- ous; they are represented in this area by the " Moel Ferna Slates," the " Pen-y-glog Grit," and " Pen-y-glog Slates," all of which belong to the lower part of a great series (3000 ft.) of slates and grits known as the " Denbighshire Grits." Similar deposits occur on this horizon still farther north, in the Lake district, where the Wenlock rocks are represented by the " Brathay Flags " (lower part of the Coniston Flags series), and in southern Scotland, where their place is taken by the variable " Riccarton beds " of Kirkcudbright Shore, Dumfries- shire, Riccarton and the Cheviots; by greywackes and shales in Lanarkshire; by mudstones, shales and grits in the Pentland Hills, and in the Girvan area by the " Blair " and " Straiton beds." In Ireland the " Ferriters Cove beds," a thick series of shales, slates and sandstones with lavas and tuffs in the Dingle promontory; the

" Mweelrea beds " and others in Tipperary and Mayo are of Wenlock age. Lime and flagstones are the most important economic products of the British Wenlock rocks.

See the article Silurian, and for recent papers, Geological Litera- ture, Geol. Soc, London, annual, and the Q.J. Geol. Soc, London.

(J. A. II.)

WENNERBERG, GUNNAR (1817-1901), Swedish poet, musician and politician, was born at Lidkoping, of which place his father was parish priest, on the 2nd of October 1817. He passed through the public school of Skara, and in his twentieth year became a student at Upsala. He was remarkable from the first, handsome in face and tall in figure, with a finely trained singing voice, and brilliant in wit and conversation. From the outset

of his career he was accepted in the inner circle of men of light and leading for which the university was at that time famous. In 1843 he became a member of the musical club who called themselves " The Juvenals," and for their meetings were written the trios and duets, music and words, which Wennerberg began to publish in 1846. In the following year appeared the earliest numbers of Gluntarne (or " The Boys "), thirty duets for baritone and bass, which continued to be issued from r847 to 1850. The success of these remarkable productions, master- pieces in two arts, was overwhelming: they presented an epitome of all that was most unique and most attractive in the curious university life of Sweden. In the second volume of his collected works Wennerberg gave, long afterwards, a very interesting account of the inception and history of these cele- brated duets. His great personal popularity, as the representa- tive Sw r edish student, did not prevent him, however, from pursuing his studies, and he became an authority on Spinoza. In 1850 he first travelled through Sweden, singing and reciting in public, and his tour was a long popular triumph. In i860 he published his collected trios, as The Three. In 1865, at the particular wish of the king, Charles XV., Wennerberg entered official fife in the department of elementary education. He succeeded Fahlcrantz in 1866 as one of the eighteen of the Swedish Academy, and in 1870 became minister for education (Ekklesiaslikminister) in the Adlercreutz government, upon the fall of which in 1875 he retired for a time into private life. He was, however, made lord-lieutenant in the province of Kronoberg, and shortly afterwards was elected to represent it in the Diet. His active parliamentary life continued until he was nearly eighty years of age. In 1S81 and 1885 he issued his collected works, mainly in verse. In 1893 he was elected to the upper house. He preserved his superb appearance in advanced old age, and he died, after a very short illness, on the 24th of August 1901, at the royal castle of Lecko, where he was visiting his brother-in-law, Count Axel Rudenschold. His wife, the Countess Hedvig Cronstedt, whom he married in 1852, died in 1900. Wennerberg was a most remarkable type of the lyrical, ardent Swedish aristocrat, full of the joy of life and the beauty of it. In the long roll of his eighty-four years there was scarcely a crumpled rose-leaf. His poems, to which their musical accom- paniment is almost essential, have not ceased, in half a century, to be universally pleasing to Swedish ears; outside Sweden it would be difficult to make their peculiarly local charm intelligible. (E. G.)

WENSLEYDALE, JAMES PARKE, Baeon (1782-1868), English judge, was born near Liverpool on the 22nd of March 1782. He was educated at Macclesfield grammar school and Trinity College, Cambridge. He had a brilliant career at the university, winning the Craven scholarship, Sir William Browne's gold medal, and being fifth wrangler and senior chancellor's medallist in classics. Called to the bar at the Inner Temple he

rapidly acquired an excellent common law practice and in 1828 was raised to the king's bench, while still of the junior bar. In 1834 he was transferred from the king's bench to the court of exchequer, where for some twenty years be exercised considerable influence. Tlie changes introduced by the Common Law Procedure Acts of 1854, 1855 proved too much for his legal conservatism and he resigned in December of the latter year. The government, anxious to have his services as a law lord in the House of Lords, proposed to confer on him a life peerage, but this

was opposed by the House of Lords (see Peerage), and he was eventually created a peer with the usual remainder (1856). He died at his residence, Ampthili Park, Bedfordshire, on the 25th of February 1868, and having outlived his three sons, the title became extinct.

WENSLEYDALE, the name given to the upper part of the valley of the river Ure in the North Riding, Yorkshire, England. It is celebrated equally for its picturesque scenery and for the numerous points of historical and other interest within it. The Ure rises near the border of Yorkshire and Westmorland, in the uplands of the Pennine Chain. Its course is generally easterly as long as it is confined by these uplands, but on de- bouching upon the central plain of Yorkshire it takes a south- easterly turn and flows past Ripon and Boroughbridgc to form, by its union with the Swale, the river Ouse, which drains to the Humber. The name Wensleydale is derived from the village of Wensley, some 25 m. from the source of the river, and is primarily applied to a section of the valley extending 10 m. upstream from that point, but is generally taken to embrace the whole valley from its source to a point near Jervaulx abbey, a distance of nearly 40 m., below which the valley widens out upon the plain. The dale is traversed by a branch of the North- Eastem railway from Northallerton.

As far up as Hawes, the dale presents a series of landscapes in which the broken limestone crags of the valley-walls and the high-lying moors beyond them contrast finely with the rich land at the foot of the hills. Beyond Hawes, towards the source, the valley soon becomes wide, bare and shallow, less rich in contrast, but wilder. On both sides throughout the dale numer- ous narrow tributary vales open out. Small waterfalls are numerous. The chief are Aysgarth Force, on the main stream, Mill Gill Force on a tributary near Askrigg, and Hardraw Scaur beyond Hawes, the finest of all, which shoots forth over a projecting ledge of limestone so as to leave a clear passage behind it. The surrounding cliffs complete a fine picture. The small river Bain, joining the Ure near Askrigg, forms a pretty

lake called Semerer or Semmer Water, | m. in length.

Following the valley upward, the points of chief interest apart from the scenery are these. Jervaulx Abbey was founded in 1 156 by Cistercians from Byland, who had previously settled near Askrigg. The remains are mainly transitional Norman and Early English, and are not extensive. Of the great church hardly any fragments rise above ground-level, but the chapter- ho use, refectory and cloisters remain in part, and the ivy-clad ruins stand in a beautiful setting of woodland. Above the small town of Middleham, where there are large training stables, rises the Norman keep of Robert Fitz-Ranulph, which passed to the Nevills, being held by the " King-maker," Warwick. The subsidiary buildings date down to the 14th century. In Cover Dale near Middleham is the ruined Premonstratensian abbey of Coveriiam, founded here in the 13th century and retaining a gatehouse and other portions of Decorated date. Farther up Wensleydale Bolton Castle siands high on the north side. This was the stronghold of the Scropes, founded by Richard I.'s chan- cellor of that name. Its walls, four corner-towers and fine position still give it an appearance of great strength.

WENTWORTH-, the name of an English family distinguished in the parliamentary history of the 16th and 17th centuries. The Wentworths traced descent from William Wentworth (d. 1308) of Wentworth Woodhouse, in Yorkshire, who was the ancestor of no fewer than eight distinct lines of the family, two main branches of which were settled in the 14th century at Wentworth Woodhouse and North Elmshall respectively. From the elder, or Wentworth Woodhouse branch, were descended Thomas Wentworth the celebrated earl of Strafford (q.v.), and through him the Watson-Wentworths, marquesses of Rockingham in the 18th century, and the earls FitzWilliam of the present day. To the younger branch belonged Roger Wentworth (d. 1452), great-great-grandson of the above- mentioned William. Roger, who was a son of John Wentworth (n. 1413) of North Elmshall, Yorkshire, acquired the manor of Nettlestead in Suffolk in right of his wife, a grand-daughter of Robert, Baron Tibetot, in whose lands this manor had been included, and who died leaving an only daughter in 1372. Roger's son Henry (d. 1482) was twice married; by his first wife he was the ancestor of the Wentworths of Gosfield, Essex;

by his second of the Wentworths of Lillingstone Lovell, Bucking- hamshire. 1 Another of Roger Wentworth's sons, Sir Philip Wentworth, was the grandfather of Margery, wife of Sir John Seymour, mother of the Protector Somerset and of Henry VIII.'s wife Jane Seymour, and grandmother of King Edward VI. Margery's brother Sir Robert Wentworth (d. 1528) married a daughter of Sir James Tyrrell, the reputed murderer of Edward V. and his brother in the Tower; and Sir Robert's son by this marriage, Thomas Wentworth (1501-1551), was summoned to parliament by writ in

1529 as Baron Wentworth of Nettlestead. He was one of the peers who signed the letter to the pope in favour of Henry VIII.'s divorce from Catherine of Aragon, and was one of the judges of Anne Boleyn. He was lord chamber- lain to Edward VI., and died in 1551 leaving sixteen children.

*Thomas Wentworth, 2nd Baron Wentworth of Nettlestead (1525-1584), was the eldest son of the above-mentioned 1st baron. He served with distinction under his relative the Pro- tector Somerset at the battle of Pinkie in 1547; but in 1551 he was one of the peers who condemned Somerset to death on a charge of felony. He was a trusted counsellor of Queen Mary, who appointed him deputy of Calais. Wentworth was the last Englishman to hold this post, for on the 7th of January 1558 he was compelled to surrender Calais to the French, his representations as to the defenceless condition of the fortress having been disregarded by the English Council some years earlier. Wentworth himself remained in France as a prisoner of war for more than a year, and on his return to England in *559 he was sent to the Tower for having surrendered Calais; but he was acquitted of treason. He died on the 13th of January 1584. His eldest son William married a daughter of Lord Burghley, but predeceased his father, whose peerage consequently passed to his second son Henry (1558-1593), who was one of the judges of Mary, queen of Scots, at Fotheringay in 1586.*

Thomas Wentworth, 1st earl of Cleveland (1591-1667), was the eldest son of Henry, whom he succeeded as 4th Baron Wentworth of Nettlestead in 1593. In 1614 he inherited from an aunt the estate of Toddington in Bedfordshire, till then the property of the Cheyney family, and here he made his principal residence. In 1626 he was created carl of Cleveland, and in the following year he served under Buckingham in the expedi- tion to La Rochelle. Adhering to the king's cause in the parlia- mentary troubles, he attended his kinsman StrafTord at his execution, and afterwards was a general on the royalist side in the Civil War until he was taken prisoner at the second battle of Newbury. Cleveland commanded a cavalry regiment at Worcester in 1651, when he was again taken prisoner, and he remained in the Tower till 1656. He died on the 25th of March 1667. His early extravagance and the fortunes of war had greatly reduced his estates, and Nettlestead was sold in 1643. Cleveland was described by Clarendon as " a man of signal courage and an excellent officer"; his cavalry charge at Cropredy Bridge was one of the most brilliant incidents in the Civil War, and it was by his bravery and presence of mind that Charles II. was enabled to escape from Worcester. At his death the earldom of Cleveland became extinct. He outlived his son Thomas (1613-1645), who was called up to the House of Lords in his father's lifetime as Baron Wentworth, and whose daughter Henrietta Maria became Baroness Wentworth in her own right on her grandfather's death. This lady, who was the duke of

Monmouth's mistress, died unmarried in 1686. The barony of Wentworth then reverted to Cleveland's daughter Anne, who married the 2nd Lord Lcvelace, from whom it passed to her grand-daughter Martha (d. 1745), wife of Sir Henry Johnson, and afterwards to a descendant of Anne's daughter Margaret, Edward Noel, who was created Viscount Wentworth of Wellesborough in 1762. The viscountcy became extinct at his death, and the barony again passed through the female line in the person of Noel's daughter Judith to the latter's daughter Anne Isabella, who married Lord Byron the

1 In the 16th century Lillingstone Lovell was in Oxfordshire, that portion of the county being surrounded by Buckinghamshire, with which it was afterwards incorporated.

poet; and from her to Byron's daughter Augusta Ada, whose husband was in 1838 created earl of Lovelace. The barony of Wentworth was thereafter held by the descendants of this nobleman in conjunction with the earldom of Lovelace.

Paul Wentworth (1533-1593), a prominent member of parliament in the reign of Elizabeth, was a member of the Lillingstone Lovell branch of the family (see above). His father Sir Nicholas Wentworth (d. 1557) was chief porter of Calais. Paul Wentworth was of puritan sympathies, and he first came into notice by the freedom with which in 1566 he criticized Elizabeth's prohibition of discussion in parliament on the question of her successor. Paul, who was probably the author of the famous puritan devotional book The Miscellanie, or Regestrie and Methodical! Directorie of Orizons (London, 1615), died in 1503. He became possessed of Burnham Abbey through his wife, to whose first husband, William Tyldesley, it had been granted at the dissolution of the monasteries by Henry VIII.

Peter Wentworth (i 530-1 596) was the elder brother of the above-mentioned Paul, and like his brother was a prominent puritan leader in parliament, which he first entered as member for Barnstaple in 1571. He took a firm attitude in support of the liberties of parliament against encroachments of the royal prerogative, on which subject he delivered a memorable speech on the 8th of February 1576, for which after examination by the Star Chamber he was committed to the Tower. In February 1587 Sir Anthony Cope (1548-1614) presented to the Speaker a bill abrogating the existing ecclesiastical law, together with a puritan revision of the Prayer Book, and Wentworth supported him by bringing

forward certain articles touching the liberties of the House of Commons; Cope and Wentworth were both committed to the Tower for interference with the queen's ecclesi- astical prerogative. In 1593 Wentworth again suffered imprison- ment for presenting a petition on the subject of the succession to the Crown; and it is probable that he did not regain his freedom, for he died in the Tower on the 10th of November 1596. While in the Tower he wrote A Pilhie Exhortation to her Majesty for establishing her Successor to the Crown, a famous treatise preserved in the British Museum. Peter Wentworth was twice married; his first wife, by whom he had no children, was a cousin of Catherine Parr, and his second a sister of Sir Francis Walsingham, Elizabeth's secretary of state. His third son, Thomas Wentworth (c. 1 568-1623), was an ardent and some- times a violent opponent of royal prerogative in parliament, of which he became a member in 1604, continuing to represent the city of Oxford from that year until his death. He was called to the bar in 1594 and became recorder of Oxford in 1607. Another son, Walter Wentworth, was also a member of parlia- ment.

Sir Peter Wentworth (1592-1675) was a grandson of Peter Wentworth, being the son of Peter's eldest son Nicholas, from whom he inherited the manor of Lillingstone Lovell. As sheriff of Oxfordshire in 1634 he was charged with the duty of collecting the levy of ship-money, in which he encountered popular opposition. He was member for Tamworth in the Long Parliament, but refused to act as a commissioner for the trial of Charles I. He was a member of the council of state during the Commonwealth; but was denounced for immorality by Cromwell in April 1653, and his speech in reply was interrupted by Cromwell's forcible expulsion of the Commons. Sir Peter, who was a friend of Milton, died on the 1st of December 1675, having never been married. By his will he left a legacy to Milton, and considerable estates to his grand-nephew Fisher Dilke, who took the name of Wentworth; and this name was borne by his descendants until dropped in the 18th century by Wentworth Dilke Wentworth, great-grandfather of Sir Charles Wentworth Dilke {q.v.).

See W. L. Rutton, Three Branches of the Family of Wentworth of Nettlestead (London, 1891); Joseph Foster, Pedigrees of the County Families of Yorkshire (2 vols., London, 1874); Charles Wriothesley, Chronicle of England during the Reigns of the Tudors, edited by W. D. Hamilton (2 vols., London, 1875-1877); Bulstrodc Whitelocke, Memorials of the English Affairs: Charles I. to the Restoration (London, 1732); John Strype, Annals of the Reformation (7 vols.,

Oxford, 1824) ; Mark Noble, Lives of the English Regicides (2 vols., London, 1798) containing a memoir of Sir Peter Wentworth; Lord Clarendon, History of the Rebellion (7 vols., Oxford, 1839), and Calendar of the Clarendon State Papers; S. R. Gardiner, History of England from the

Accession of James I. to the Outbreak of the Civil War (10 vols., London, 1883-1884), and History of the Great Civil War, 1642-1649 (3 vols., London, 1886-1891); I. A. Froude, History of England (12 vols., London, 1856-1870); G. E. C, Com- plete Peerage, vol. viii. (London, 1898). See also articles " Went- worth " bv A. F. Pollard, C. H. Firth and Sir C. W. Dilke, in Diet. Nat. Biog. (London, 1899). (R. J. M.)

WENTWORTH, WILLIAM CHARLES (1793-1872), the " Australian patriot," who claimed descent from the great Strafford, but apparently without sufficient reason, was born in 1793 in Norfolk Island, the penal settlement of New South Wales, where his father D'Arcy Wentworth, an Irish gentleman of Roscommon family, who had emigrated in 1790 and later became a prominent official, was then government surgeon. The son w T as educated in England, but he spent the interval between his schooling at Greenwich and his matriculation (1816) at Peterhouse, Cambridge, in Australia, and early attracted the attention of Governor Macquarie by some adventurous exploration in the Blue Mountains. In 1819 he published in London a work on Australasia in two volumes, and in 1823 he only just missed the chancellor's medal at Cambridge (won by W. M. Praed) with a stirring poem on the same subject. Having been called to the bar, he returned to Sydney, and soon obtained a fine practice. With a fellow barrister, Wardell, he started a newspaper, the Australian, in 1824, to advocate the cause of self-government and to champion the " emancipists " — the incoming class of ex-convicts, now freed and prospering — against the " exclusivists " — the officials and the more aristo- cratic settlers. With Wardell, Dr William Bland and others, he formed the " Patriotic Association," and carried on a deter- mined agitation both in Australia and in England, where they found able supporters. The earlier object of their attack was the governor, Sir Ralph Darling, who was recalled in 1831 in consequence, though he was acquitted by a select committee of the House of Commons of the charges brought against him by Wentworth in connexion with his severe punishment of two soldiers, Sudds and Thompson, who had perpetrated a robbery in order to obtain their discharge (a favourite dodge at the time), and one of whom, Sudds, had died. Wentworth continued, under the succeeding governor, Sir Richard Bourke, who was guided by him, and Sir George Gipps, with whom he had constant differences, to exercise a powerful influence; and in 1842, when the Constitution Act was passed, it was generally recognized as mainly his work. He became a member of the first legislative council and led the " squatter party." He was the founder of the university of Sydney (1852), where his son afterwards founded bursaries in his honour; and he led the movement resulting in the new constitution for the colony (1854), subsequently (1861) becoming president of the new legislative council. But things had meanwhile moved fast in the colony, and Wentworth's old

supremacy had waned, since Robert Lowe (afterwards Lord Sherbrooke) and others had come into prominence in the political arena. He had done his work for colonial autonomy, and was becoming an old man, somewhat out of touch with the new generation. For some years before 1861 he stayed chiefly in England, where in 1857 he founded the " General Association for the Australian Colonies," with the object of obtaining from the government a federal assembly for the whole of Australia; and in 1862 he definitely settled in England, dying on the 20th of March r872. His body was taken to Sydney and accorded a public funeral by the unanimous vote of the New South Wales legislature.

WENZEL, KARL FRIEDRICH (1740-1793), German metal- lurgist, was born at Dresden in 1740. Disliking his father's trade of bookbinding, for which he was intended, he left home in 1755, and after taking lessons in surgery and chemistry at Amsterdam, became a ship's surgeon in the Dutch service. In 1766, tired of sea-life, he went to study chemistry at Leipzig, and afterwards devoted himself to metallurgy and assaying at his native place with such success that in 1780 he wasappointed

chemist to the Freiberg foundries by the elector of Saxony. In 1785 he became assessor to the superintending board of the foundries, and in 1786 chemist to the porcelain works at Meissen. He died at Freiberg on the 26th of February 1793.

In consequence of the quantitative analyses he performed of a large number of salts, he has been credited with the discovery of the law of neutralization (Vorlesuirgen iiber die chemische Verwandtschajt der Korper, 1777). But this attribution rests on a mistake first made by J. J. Berzelius and copied by subsequent writers, and Wenzel's published work (as pointed out by G. H. Hess in 1840) does not warrant the conclusion that he realized the existence of any law of invariable and reciprocal proportions in the combinations of acids and bases.

WEPENER, a town of the Orange Free State, 82 m. by rail S.E. of Bloemfontein, and 2 m. W. of the Basuto border. Pop, (1904) 1366, of whom 822 were whites. It lies in a rich grain district, and 3 m. north by the Caledon river are large flour mills. The town, named after the leader of the Boers in their war with the Basuto chief Moshesh in 1865, was founded in 18S8. In April 1900 it was successfully defended against the Boers under Christiaan de Wet by a Cape force of Irregulars commanded by Colonel E. H. Dalgcty.

WERDAU, a town of Germany, in the kingdom of Saxony, on the Pleisse, in the industrial district of Zwickau, and 40 m. S. of Leipzig. Pop. (1905) 19,473. Its chief industries are cotton and wool-spinning and the weaving of cloth, but machinery of various kinds, paper and a few other articles are also manu- factured. In addition to the usual schools, Werdau contains a weaving-school. The town is mentioned as early as 1304 and in 1398 it was purchased by the margrave of Meissen, who afterwards became elector of Saxony.

See Stichard, Chronik der Fabrikstadt Werdau (2nd ed., Werdau,

1865).

WERDEN, a town of Germany, in the Prussian Rhine province, on the river Ruhr, 6 m. by rail S. of Essen. Pop. (1905) 11,029. It has an interesting Roman Catholic church which belonged to the Benedictine abbey founded about 800 by St Ludger, whose stone coffin is preserved in the crypt. The abbey buildings are used as a prison. The manufacture of cloth, woollens, shoes and paper, dyeing, tanning, brewing and distilling are the principal industries. In the neighbourhood are stone quarries and coal mines. Werden grew up around the Benedictine abbey, which was dissolved in 1802. The Codex Argenteus of Ulfilas, now in the university library at Upsala, was discovered here in the 16th century.

See Fliigge, Chronik der Stadt Werden (Diisseldorf, 1887); and Fiikrer durch Werden (Werden, 1887).

WERDER, KARL WILHELM FRIEDRICH AUGUST LEO- POLD, Count von (1808-1887), Prussian general, entered the Prussian Gardes du Corps in 1825, transferring the following year into the Guard Infantry, with which he served for many years as a subaltern. In 1839 he was appointed an instructor in the Cadet Corps, and later he was employed in the topographical bureau of the Great General Staff. In 1842-1843 he took part in the Russian operations in the Caucasus, and on his return to Germany in 1846, was placed, as a captain, on the staff. In 1 848 he married. Regimental and staff duty alternately occupied him until 1863, when he was made major-general, and given the command of a brigade of Guard Infantry. In the Austrian War of 1866 von Werder greatly distinguished himself at Gitschin (Jicm) and Koniggratz at the head of the 3rd division. He returned home with the rank of lieutenant-general and the order pour le mirite. In 1870, at first employed with the 3rd Army Headquarters and in command of the Wurttemberg and Baden forces he was after the battle of Worth entrusted with the operations against Strassburg, which he captured after a long and famous siege. Promoted general of infantry, and assigned to command the new XI Vth Army Corps, he defeated the French at Dijon and at Nuits, and, when Bourbaki's army moved forward to relieve Belfort, turned upon him and fought the desperate action of Villersexel, which enabled him to cover the Germans besieging Belfort. On the 15th, 16th and 17th of January 1871, von Werder with greatly inferior forces succeeded in holding his

own on the Lisaine against all Bourbaki's efforts to reach Belfort, a victory which aroused great enthusiasm in southern Germany. After the war von Werder commanded the Baden forces, now called the XlVth Army Corps, until he retired in 1879. On his retirement he was raised to the dignity of count. He died in 1887 at Griissow in Pomerania. The 30th (4th Rhenish) Infantry regiment bears his name, and there is a statue of von Werder at Freiburg in the Breisgau.

See von Conrady, Leben des Grafen A. von Werder (Berlin, 1889).

WERGELAND, HENRIK ARNOLD (1808-1845), Norwegian poet and prose writer, was born at Christiansand on the 17th of June 1808. He was the eldest son of Professor Nikolai Wergeland (1 780-1848), who had been a member of the constitutional assembly which proclaimed the independence of Norway in 1814 at Eidsvold. Nikolai was himself pastor of Eidsvold, and the poet was thus brought up in the very holy of holies of Nor- wegian patriotism. He entered the university of Christiania in 1825 to study for the church, and was soon the leader of a band of enthusiastic young men who desired to revive in Norway the spirit and independence of the old vikings. His earliest efforts in literature were wild and formless. He

was full of imagination, but without taste or knowledge. He published poetical farces under the pseudonym of " Siful Sifadda"; these were followed in 1828 by an unsuccessful tragedy; and in 1829 by a volume of lyrical and patriotic poems, Digte,forste Ring, which attracted the liveliest attention to his name. At the age of twenty-one he became a power in literature, and his enthusiastic preaching of the doctrines of the revolution of July made him a force in politics also. Meanwhile he was tireless in his efforts to advance the national cause. He established popular libraries, and tried to alleviate the widespread poverty of the Norwegian peasantry. He preached the simple life, denounced foreign luxuries, and set an example by wearing Norwegian homespun. But his numerous and varied writings were coldly received by the critics, and a monster epic, Skabelsen, Mennesket og Messias (Creation, Man and Messiah), 1830, showed no improvement in style. It was remodelled in 1845 as Mennesket. From 1831 to 1835 Wergeland was submitted to severe satirical attacks from J. S. le Welhaven and others, and his style improved in every respect. His nationalist political propaganda lacked knowledge and system. His partisans were alienated by his inconsistent admiration for King Carl Johan, by his unpopular advocacy of the Jewish cause, and by the extravagance of his methods generally. His popularity waned as his poetry improved, and in 1840 he found himself a really great lyric poet, but an exile from political influence. In that year he became keeper of the royal archives. He died on the 12th of July 1845. In 1908 a statue was erected to his memory by his compatriots at Fargo, North Dakota. His Jan van Huysums Blomsterstykke (1840), Svalen (1841), Joden (1842), Jodinden (1S44) and Den Engelske Lods (1844), form a series of narrative poems in short lyrical metres which remain the most interesting and important of their kind in Norwegian literature. He was less successful in other branches of letters; in the drama neither his Campbellerne (1837), Venetianerne (1843), nor Soka- detterne (1848), achieved any lasting success; while his elaborate contribution to political history, Norges KonstituUons Historic (1841-1843), is forgotten. The poems of his later years include many lyrics of great beauty, which are among the permanent treasures of Norwegian poetry.

Wergeland's Samlede Skrifter (9 vols., Christiania, 1852-1857) were edited by H. Lassen, the author of Henrik Wergeland og Jtans Samtid (1866), and the editor of his Breve (1867). Sec also H. Schwanenfliigel, Henrik Wergeland (Copenhagen, 1877); and J. G. Kraft, Norsk Formatter ~Lexikon (Christiania, 1857), for a detailed bibliography.

WERGILD, Wergeld or Wee, the Anglo-Saxon terms for the fine paid by, e.g. a murderer to the relatives of the deceased in proportion to the rank of the latter. The wer was part of the early Teutonic and Celtic customary law, and represented the substitution of compensation for personal

retaliation, resulting from the rise in authority of the power of the community as such. (See Criminal Law; Homicide; and Teutonic Peoples.)

WERMELSKIRCHEN, a town of Germany, in the Prussian Rhine province, situated 4 m. S.W. from Lenncp by rail and at the junction of a line to Remscheid. Pop. (1900) 15,469. It contains an Evangelical and a Roman Catholic church and a Latin school. Wermelskirchen is the centre of many thriving industries, chief among which are the manufacture of silks, cotton and silk ribbons, plush, tobacco and steel goods.

WERMUND, an ancestor of the Mercian royal family, a son of Wihtlajg and father of Ofla. He appears to have reigned in Angel, and his story is preserved by certain Danish historians, especially Saxo Grammaticus. According to these traditions, his reign was long and happy, though its prosperity was eventually marred by the raids of a warlike king named Athislus, who slew Frowinus, the governor of Schleswig, in battle. Frowinus's death was avenged by his two sons, Keto and Wigo, but their conduct in fighting together against a single man was thought to form a national disgrace, which was only obliterated by the subsequent single combat of Offa. It has been suggested that Athislus, though called king of the Swedes by Saxo, was really identical with the Eadgils, lord of the Myrgingas, men- tioned in Widsith. As Eadgils was a contemporary of Ermanaric (Eormenric), who died about 370, his date would agree with the indication given by the genealogies which place Wermund nine generations above Penda. Frowinus and Wigo are doubtless to be identified with the Freawine and Wig who figure among the ancestors of the kings of Wesscx.

For the story of the aggression against Wermund in his later years, told by the Danish historians and also by the Vitae duorum Of arum, sec Offa; also Saxo Grammaticus, Gesta Danorum, edited by A. Holder, pp. 105 fr. (Strassburg, 1S86) ; Vitae duorum Offarum {in Wats's edition of Matthew Paris, London, 1640). See also H. M. Chadwick, Origin of the English Nation (Cambridge, 1907).

WERNER, ANTON ALEXANDER VON (1843-), German painter, was born at Frankfort -on-the-Oder, on the 9th of May 1843. He first studied painting at the Berlin Academy, pursued his studies at Carlsruhe, and, having won a travelling scholarship upon the exhibition of his early works, he visited Paris in 1867, and afterwards Italy, where he remained for some time. On his return he received several state commissions, and on the out-break of the Franco-Prussian War in 1870 he was sent with the staff of the

third corps d'armee, and stayed in France- till the close of the campaign. In 1873 he was appointed professor at the Berlin Academy, of which he afterwards became director. Among his more important works must be named " The Capitula- tion of Sedan," " Proclamation of the German Empire at Versailles," " Moltke before Paris," " Moltke at Versailles," " The Meeting of Bismarck and Napoleon III.," " Christ and the Tribute Money," " William I. visiting the Tombs," " The Congress of Berlin," and some decorations executed in mosaic for the Triumphal Arch at Berlin. Von Werner's work is chiefly interesting for the historic value of his pictures of the events of the Franco-German War.

See Kunst fur Alle, vol. i. ; Knackfuss, Kiinstler-Monographieen, No. 9.

WERNER, ABRAHAM GOTTLOB (1750-1817), father of Ger- man geology, was born in Upper Lusatia, Saxony, on the 25th of September 1750. The family to which he belonged had been engaged for several hundred years in mining pursuits. His father was inspector of Count Solm's iron-works at Wehrau and Lorzendorf, and from young Werner's infancy cultivated in him a taste for minerals and rocks. The boy showed early promise of distinction. He began to collect specimens of stones, and one cf his favourite employments was to pore over the pages of a dictionary of mining. At the age of nine he was sent to school at Bunzlau in Silesia, where he remained until 1764, when he joined his father at Wehrau with the idea of ultimately succeeding him in the post of inspector. When nineteen years of age (1769) he journeyed to Freiberg, where he attracted the notice of the officials, who invited him to attend the mining school established two years previously. This was the turning point in Werner's career. He soon distinguished himself by his industry and by the large amount of practical knowledge of mineralogy which he acquired. In 177 1 he repaired to the

university of Leipzig and went through the usual curriculum of study, paying attention at first chiefly to the subject of law, but continuing to devote himself with great ardour to minera- logical pursuits. While still a student he wrote his first work on the external characters of minerals, Von den ausserlicken Kennzcichen der Fossilien (1774), which at once gave him a name among the mineralogists of the day. In 1775 he was appointed inspector in the mining school and teacher of mineralogy at Freiberg. To the development of that school and to the cultivation of mineralogy and geognosy he thence- forth, for about forty years, devoted the whole of his active and indefatigable industry. From a mere provincial institution the Freiberg academy under his care rose to be one of the great centres of scientific light in Europe, to which students from all parts of the world flocked to listen to his eloquent teaching. He wrote but little, and though he elaborated a complete system of geognosy and mineralogy he never could

be induced to publish it. From the notes of his pupils, however, the general purport of his teaching was well known, and it widely influenced the science of his time. He died at Freiberg on the 30th of June

1817.

One of the distinguishing features of Werner's teaching was the care with which he taught fithology and the succession of geological formation; a subject to which he applied the name geognosy. His views on a definite geological succession were inspired by the works of J. G. Lehmann and G. C. Fuchsel (1722-1773). He showed that the rocks of the earth are not disposed at random, but follow each other in a certain definite order. Unfortunately he had never enlarged his experience by travel, and the sequence of rock-masses which he had recognized in Saxony was believed by him to be of universal application (see his Kurze Klassifikalion und Beschreibung der verschiedenen Gebirgsarten, 1787). He taught that the rocks were the precipitates of a primeval ocean, and followed each other in successive deposits of world-wide extent. Volcanoes were regarded by him as abnormal phenomena, probably due to the combustion of subterranean beds of coal. Basalt and similar rocks, which even then were recognized by other observers as of igneous origin, were believed by him to be water-formed accumulations of the same ancient ocean. Hence arose one of the great historical controversies of geology. Werner's followers preached the doctrine of the aqueous origin of rocks, and were known as Neptunists; their opponents, who recognized the important part taken in the construction of the earth's crust by subterranean heat, were styled Vulcanists. R. Jameson, the most distinguished of his British pupils, was for many years an ardent teacher of the Wernerian doctrines. Though much of Werner's theoretical work was erroneous, science is indebted to him for so clearly demonstrating the chronological succession of rocks, for the enthusiastic zeal which he infused into his pupils, and for the impulse which he thereby gave to the study of geology.

See S. G. Frisch, Lebensbeschreibung A. G. Werners (Leipzig, 1825} ; Cuvier, Moge de Werner; Lycll, Principles of Geology; ana Sir A. Geikie, Founders of Geology (1897; 2nd ed., 1906).

WERNER, FRIEDRICH LUDWIG ZACHARIAS (1768- 1823), German poet, dramatist and preacher, was born on the 18th of November 1768 at Konigsberg in Prussia. From his mother, who died a religious maniac, Werner inherited a weak and unbalanced nature, which his education did nothing to correct. At the university of his native place he studied law; but Rousseau and Rousseau's German disciples were the in- fluences that shaped his view of life. For years he oscillated violently between aspirations towards the state of nature, which betrayed him into a series of rash and

unhappy marriages, and a sentimental admiration — in common with so many of the Romanticists — for the Roman Catholic Church, which ended in 1811 in his conversion. Werner's talent was early recognized and obtained for him, in spite of his character, a small government post at Warsaw, which he exchanged after- wards for one at Berlin. In the course of his travels, and by correspondence, he got into touch with many of the men most eminent in literature at the time; and succeeded in having his plays put on the stage, where they met with much success. In 1814 he was ordained priest, and, exchanging the pen for the pulpit, became a popular preacher at Vienna, where, during the famous congress of 181 4, his eloquent but fanatical sermons were listened to by crowded congregations. He died at Vienna on the 17th of January 1823.

Werner was the only dramatist of the Romantic movement

who — thanks to the influence of Schiller — was able to sub- ordinate his exuberant imagination to the practical needs of the stage. His first tragedy, Die Sbhne des Tals (1803-1804), is in two parts, and it was followed by Das Kreuz an der Ostsee (1806). More important is the Reformation drama Martin Luther, oier die Weihe der Krcft (1807), which, after his con- version to Catholicism, Werner recanted in a poem Weihe der Unkrajt (1813). His powerful one-act tragedy, Der vierund- zwanzigste Februar (1815, but performed 1810), was the first of the so-called " fate tragedies." Attila (1808), Wanda (1810) and Die Mutter der Makkabaer (1820) show a falling-off in Werner's powers.

Z. Werner's Theater was first collected (without the author's consent) in 6 vols." (1816-1818) ; Ausgewdhlle Schriflen (15 vols., 1840-1841), with a biography by K. J. Schiitz. Sec also J. E. Hitzig, Lebensabriss F. L. Z. Werners (1823); H. DUntzer, Zwei Bekehrte (1873); J. Minor, Die Schicksalstragodie in ihren Haupl- vertretern (1883) and the same author's volume, Das Schicksalsdrama (in Kiirschner's Deutsche Nationalliteratur, vol. 151, 1884); F. Poppenberg, Zackarias Werner (1893).

WERNIGERODE, a town of Germany, in the province of Prussian Saxony, 13 m. by rail S.W. of Halberstadt, picturesquely situated on the Holzemme, on the north -slopes of the Harz Mountains. Pop. (1905) 13,137. It contains several interesting Gothic buildings, including a fine town hall with a timber facade of 1498. Some of the quaint old houses which have escaped the numerous fires that have visited the town are elaborately adorned with wood-carving. The gymnasium, occupying a modern Gothic

building, is the successor of an ancient grammar- school, which existed until 1825. Brandy, cigars and dye- stuffs are among the 1 manufactures of the place. Above the town rises the chateau of the prince of Stolberg-Wernigerode. A pavilion in the park contains the library of 117,000 volumes, the chief feature in which is the collection of over 3000 Bibles and over 5000 volumes of hymnology. Wernigerode is the chief town of the county (Grafschaft) of Stolberg-Wernigerode, which has an extent of to7 sq. m., and includes the Brocken within its limits.

The counts of Wernigerode, who can be traced back to the early 12th century, were successively vassals of the margraves of Brandenburg (1268), and the archbishops of Magdeburg (1381). On the extinction of the family in 1429 the county fell to the counts of Stolberg, who founded the Stolberg- Wernigerode branch in 1645. The latter surrendered its military and fiscal independence to Prussia in 17 14, but retained some of its sovereign rights till 1876. The counts were raised to princely rank in 1890.

See Forstemann, Die Grdfiich-Stolbergische Bibliothek in Wernige- rode (Nordhauscn, 1866), and G. Sommer, Die Grafschaft Werni- gerode (Halle, 1883).

WERTH [Weekt], JOHANN, Count von (c. 1395-1652), German general of cavalry in the Thirty Years' War, was born between 1590 and 1600 at Biittgen in the duchy of Jvllich. His parents belonged .to the numerous class of the lesser nobility, and at an early age he left home to follow the career of a soldier of fortune in the Walloon cavalry of the Spanish service. In 1622, at the taking of Jiilich, he won promotion to the rank of lieutenant. He served as a colonel of cavalry in the Bavarian army in 1630. He obtained the command of a regiment, both titular and effective, in 1632, and in 1633 and 1634 laid the foundations of his reputation as a swift and terrible leader of cavalry forays. His services were even more conspicuous in the great pitched battle of Nordlingen (1634), afterwhich the emperor made him a Freiherr of the Empire, and the elector of Bavaria gave him the rank of lieutenant field-marshal. About this time he armed his regiment with the musket as well as the sword. In 1635 and 1636 his forays extended into Lorraine and Luxemburg, after which he projected an expedition into the heart of France. Starting in July 1636, from the country of the lower Meuse, he raided far and wide, and even urged the cardinal infante, who commanded in chief, to " plant the double eagle on the Louvre." Though this was not attempted, Werth's horsemen appeared at St Denis before the uprising of the French national spirit in the shape of an army of fifty thousand men at Compiegne forced

the invaders to retire whence they had come. The memory of this raid

lasted long, and the name of " Jean de Wert " figures in folk-songs and serves as a bogey to quiet unruly children. In 1637 Werth was once more in the Rhine valley, destroying convoys, relieving besieged towns and surprising the enemy's camps. In February 1638 he defeated the Weimar troops in an engagement at Rheinfelden, but shortly afterwards was made prisoner by Bernhard of Saxe-Weimar. His hopes of being exchanged for the Swedish marshal Horn were disappointed, for Bernhard had to deliver up his captive to the French. The terrible Jean de Wert was brought to Paris, amidst great rejoic- ings from the country people. He was lionized by the society of the capital, visited in prison by high ladies, who marvelled at his powers of drinking and his devotion to tobacco. So light was his captivity that he said that nothing bound him but his word of honour. However, he looked forward with anxiety for his release, which was delayed until March 1642 because the imperial government feared to see Horn at the head of the Swedish army and would not allow an exchange.

When at last he reappeared in the field it was as general of cavalry in the imperial and Bavarian and Cologne services. His first campaign against the French marshal Guebriant was uneventful, but his second (1643) in which Count Mercy was his commander-in-chief, ended with the victory of Tiittlingen, a surprise on a large scale, in which Werth naturally played the leading part. In 1644 he was in the lower Rhine country, but he returned to Mercy's headquarters in time to take a brilliant share in the battle of Freiburg. In the following year his resolution and bravery, and also his uncontrolled rashness, played the most conspicuous part in deciding the day at the second battle of Nordlingen. Mercy was killed in this action, and Werth succeeded to the command of the defeated army, but he was soon superseded by Field-marshal Geleen. Johann von Werth was disappointed, but remained thoroughly loyal to his soldierly code of honour, and found an outlet for his anger in renewed military activity. In 1647 differences arose between the elector and the emperor as to the allegiance due from the Bavarian troops, in which, after long hesitation, Werth, fearing that the cause of the Empire and of the Catholic religion would be ruined if the elector resumed control of the troops, attempted to take his men over the Austrian border. But they refused to follow, and escaping with great difficulty from the elector's vengeance Werth found a refuge in Austria. The emperor was grateful for his conduct in this affair, ordered the elector to rescind his ban, and made Werth a count. The last campaign of the war (1648) was uneventful, and shortly after its close he retired to live on the estates which he had bought in the course of his career, and on one of these, Benatek near Koniggratz, he died on the 16th of January 1652.

See Lives by F. W. Rarthold (Berlin, 1826) , W. von Janko (Vienna, 1874), F. Tcichcr (Augsburg, 1877).

WERWOLF (from A.S. wer; cf. Lat. vir, man; and wolf; or, according to a later suggestion, from O.H.G. weri, wear, i.e. wearer of the wolf skin), a man transformed temporarily or permanently into a wolf. The belief in the possibility of such a change is a special phase of the general doctrine of lycan thropy (?.».). In the European history of this singular belief, wolf transformations appear as by far the most prominent and most frequently recurring instances of alleged metamorphosis, and consequently in most European languages the terms expres- sive of the belief have a special reference to the wolf. Ex- amples of this are found in the Gr. \vKa.vdpanros, Russian volkodldk, Eng. " werwolf," Ger. wahrwolf, Fr. loup-garou. More general terms {e.g. Lat., versipellis; Russ., oboroten', O. Norse, hamrammr; Eng. "turnskin," "turncoat") are sufficiently numerous to furnish some evidence that the class of animals into which metamorphosis was possible was not viewed as a restricted one. But throughout the greater part of Europe the werwolf is preferred; there are old traditions of his existence in England, in Wales and in Ireland ; in southern France, Germany, Lithuania, Bulgaria, Servia, Bohemia, Poland and Russia he can hardly be pronounced extinct now; in Denmark, Sweden,

Norway and Iceland the bear competes with the wolf for pre- eminence.

In Greek mythology the story of Lycaon supplies the most familiar instance of the werwolf. According to one form of it Lycaon was transformed into a wolf as a result of eating human flesh; one of those who were present at periodical sacrifice on Mount Lycaon was said to suffer a similar fate. Pliny, quoting Euanthes, tells us (Hist. Nat. viii. 22) that a man of the family of Antaeus was selected by lot and brought to a lake in Arcadia, where he hung his clothing on an ash and swam across. This resulted in his being transformed into a wolf, and he wandered in this shape nine years. Then, if he had attacked no human being, he was at liberty to swim back and resume his former shape. Probably the two stories are identical, though we hear nothing of participation in the Lycaean sacrifice by the descend- ant of Antaeus. Herodotus (iv. 105) tells us that the Neuri, a tribe of eastern Europe, were annually transformed for a few days, and Virgil (Ed. viii. 98) is familiar with transformation of human beings into wolves.

There are women, so the Armenian belief runs, who in con- sequence of deadly sins are condemned to pass seven years in the form of a wolf. A spirit comes to such a woman and brings her a wolf's skin. He orders her to put it on, and no sooner has she done this than the most frightful wolfish

cravings make their appearance and soon get the upper hand. Her better nature conquered, she makes a meal of her own children, one by one, then of her relatives' children according to the degree of relation- ship, and finally the children of strangers begin to fall a prey to her. She wanders forth only at night, and doors and locks spring open at her approach. When morning draws near she returns to human form and removes her wolf skin. In these cases the transformation was involuntary or virtually so. But side by side with this belief in involuntary metamorphosis, we find the belief that human beings caa change themselves into animals at will and then resume their own form.

The expedients supposed to be adopted for effecting change of shape may here be noticed. One of the simplest apparently was the removal of clothing, and in particular of a girdle of human skin, or the putting on of such a girdle — more commonly the putting on of a girdle of the skin of the animal whose form was to be assumed. This last device is doubtless a substitute for the assumption of an entire animal skin, which also is frequently found. In other cases the body is rubbed with a magic salve. To drink water out of the footprint of the animal in question, to partake of its brains, to drink of certain enchanted streams, were also con- sidered effectual modes of accomplishing metamorphosis. Olaus Magnus says that the Livonian werwolves were initiated by draining a cup of beer specially prepared, and repeating a set formula. Ralston in his Songs of the Russian People gives the form of incantation still familiar in Russia. Various expedients also existed for removing the beast-shape. The simplest was the act of the enchanter (operating either on himself or on a victim); another was the removal of the animal girdle. To kneel in one spot for a hundred years, to be reproached with being a werwolf, to be saluted with the sign of the cross, or addressed thrice by baptismal name, to be struck three blows on the forehead with a knife, or to have at least three drops of blood drawn were also effectual cures. In other cases the transformation was supposed to be accomplished by Satanic agency voluntarily submitted to, and that for the most loathsome ends, in particular for the gratification of a craving for human flesh. " The werwolves," writes Richard Verstegan (Restitution of Decayed Intelligence, 1628) , " are certayne sorcerers, who having annoynted their bodies with an oyntment which they make by the instinct of the devill, and putting on a certayne inchaunted girdle, doe not onely unto the view of others seeme as wolves, but to their owne thinking have both the shape and nature of wolves, so long as they weare the said girdle. And they do dispose themselves as very wolves, in wourrying and killing, and most of humane creatures." Such were the views about lycan- thropy current throughout the continent of Europe when Verstegan wrote. France in particular seems to have been

infested with werwolves during the 16th century, and the consequent trials

were very numerous. In some of the cases — e.g. those of the Gandillon family in the Jura, the tailor of Chalons and Roulet in Angers, all occurring in the year 1598, — there was clear evidence against the accused of murder and cannibalism, but none of association with wolves; in other cases, as that of Gilles Garnier in D61ein 1573, there was clear evidence against some wolf, but none against the accused; in all the cases, with hardly an exception, there was that extra- ordinary readiness in the accused to confess and even to give circumstantial details of the metamorphosis, which is one of the most inexplicable concomitants of medieval witchcraft. Yet, while this lycanthropy fever, both of suspectors and of suspected, was at its height, it was decided in the case of Jean Grenier at Bordeaux, in 1603, that lycanthropy was nothing more than an insane delusion, from this time the loup-garou gradually ceased to be regarded as a dangerous heretic, and fell back into his pre-Christianic position of being simply a " man -wolf-fiend," as which he still survives among the French peasantry. In Prussia, Livonia and Lithuania, according to the bishops Claus Magnus and Majolus, the werwolves were in the 16th century far more destructive than " true and natural wolves," and their heterodoxy appears from the assertion that they formed " an accursed college " of those " desirous of innovations contrary to the divine law." In England, however, where at the beginning of the 17th century the punishment of witchcraft was still zealously prosecuted by James I., the wolf had been so long extinct that that pious monarch was himself able (Demonologie, lib. hi.) to regard " warwoolfes " as victims of delusion induced by "a naturall superabundance of melancholic" Only small creatures, such as the cat, the hare and the weasel, remained for the malignant sorcerer to transform himself into; but he was firmly believed to avail himself of these agencies. Belief in witch-animals still survives among the uneducated classes in parts of the United Kingdom.

The werwolves of the Christian dispensation were not, however, all heretics, all viciously disposed towards mankind. " According to Baronius, in the year 617, a number of wolves presented themselves at a monastery, and tore in pieces several friars who entertained heretical opinions. The wolves sent by God tore the sacrilegious thieves of the army of Francesco Maria, duke of Urbino, who had come to sack the treasure of the holy house of Loreto. A wolf guarded and defended from the wild beasts the head of St Edmund the martyr, king of England. St Oddo, abbot of Cluny, assailed in a pilgrimage by foxes, was delivered and escorted by a wolf " (A. de Gubernatis, Zoological Mythology, 1872, vol. ii. p. 145). Many of the wer-wolves were most innocent and God-fearing persons, who suffered through the witchcraft of others, or simply from an unhappy fate, and who as wolves behaved in a truly touching fashion, fawning upon and protecting their benefactors. Of this sort were the " Bisclaveret " in Marie de France's

poem (c. 1200), the hero of " William and the Were-wolf " (translated from French into English about 1350), and the numerous princes and princesses, knights and ladies, who appear temporarily in beast form in the M&rchen of the Aryan nations generally. Nay, the power of transforming others into wild beasts was attributed not only to malignant sorcerers, but also to Christian saints. " Omnes angeli, boni ct mali, ex virtute naturali habent potestatem transmutandi corpora nostra," was the dictum of St Thomas Aquinas. St Patrick transformed Vereticus, king of Wales, into a wolf; and St Natalis cursed an illustrious Irish family, with the result that each member of it was doomed to be a wolf for seven years. In other tales the divine agency is still more direct, while in Russia, again, men are supposed to become werwolves through incurring the wrath of the devil.

Literature. — In the numerous medieval works directed to the study of sorcery and witchcraft, the contemporaneous phases of lycanthropy occupy a prominent place. In addition to the authors who have been already mentioned, the following may be named as giving special attention to this subject: Wier, De praestisiis daemonum (Amsterdam, 1563); Bodin, Demonomanie des sorcters (Paris, 1580); Boguet, Discours des sorciers (Lyons, 2nd ed. 1608);

Lancre, Tableau de Vinconstanxe de mauvais anges (Paris, 1613); Psellus, De operatione daemonum (Paris, 1615); see also Glanvil, Sadducismus triumphatus, for the English equivalents of lycan- thropy. Treatises solely confined to lycanthropy are rare both in medieval and in modern times; but a few are well known, as, for instance, those of Bourquelot and Nynauld, De la lycanthropie (Paris, 1615). See also Leubuscher, jjber die Wehrwblfe (1850); Grimm, Deutsche Mythologie, 4, ii. and iii. ; Hertz, Der Werwolf (Stuttgart, 1862); Baring Gould, The Book of Were-wolves (London, 1865J. Also the bibliography to Lycanthropy, and Andree, Ethno-

fraphische Paralleien, 1st series, 62-80; Tylor, Primitive Culture, i. ; '. Sebillot, Traditions de la Haute-Bretagne, i. 289.

(N. W. T.; J. F. M'L.)

WESEL, JOHANN RUCHRAT VON (d. 1481), German theologian, was born at Oberwesel early in the 15th century. He appears to have been one of the leaders of the humanist move- ment in Germany, and to have had some intercourse and sym- pathy with the leaders of the Hussites in Bohemia. Erfurt was in his day the headquarters of a humanism which was

both devout and opposed to the realist metaphysic and the Thomist theology which prevailed in the universities of Cologne and Heidelberg. Wesel was one of the professors at Erfurt between 1445 and 1456, and was vice-rector in 1458. In 1460 he was appointed preacher at Mainz, in 1462 at Worms, and in 1479, when an old and worn-out man, he was brought before the Dominican inquisitor Gerhard Elten of Cologne. The charges brought against him took a theological turn, though they were probably prompted by dislike of his philosophical views. They were chiefly based on a treatise, De indulgentiis, which he had composed while at Erfurt twenty-five years before. He had also written De potestate ecclesiastica. He died under sentence of imprisonment for life in the Augustinian convent in Mainz in 1481.

It is somewhat difficult to determine the exact theological position of Wesel. LTlmann claims him as a " reformer before the Reformation," but, while he mastered the formal principle of Protestantism, that scripture is the sole rule of faith, it is more than doubtful that he had that experimental view of the doctrines of grace which lay at the basis of Reformation theology. He held that Christ is men's righteousness in so far as they are guided by the Holy Ghost, and the love towards God is shed abroad in their hearts, which clearly shows that he held the medieval idea that justification is an habitual grace implanted in men by the gracious act of God. He seems, however, to have protested against certain medieval ecclesiastical ideas which he held to be excrescences erroneously grafted on Christian faith and practice. He objected to the whole system of indulg- ences; he denied the infallibility of the church, on the ground that the church contains within it sinners as well as saints; he insisted that papal authority could be upheld only when the pope remained true to the evangel; and he held that a sharp distinction ought to be drawn between ecclesiastical sentences and punishments, and the judgments of God.

The best account of Wesel is to be found in K. Ullmann's Reformers before the Reformation. His tract on Indulgences is published in Walch's Monutnenta Medii Aevi, vol. L, while a report of his trial is given in Ortuin Gratius's Fasciculus return expetendarum el fugiendarum (ed. by Browne, London, 1690), and d'Argentre's Collextio judiciorum de tiovis erroribus (Paris, 1728). See also Otto Clemen's art. in Herzog-Hauck's Realencyklopddie fur prot. Tkeologie und Ktrche (3rd ed., Leipzig, 1908), xxi. 127.

WESEL, a fortress town of Germany, in the Prussian province of Westphalia at the confluence of the Rhine and the Lippe, 46 m. S W. of Miinster and 35 m. N.W. of Duisburg. Pop. (1005) 23,237 (43% Protestants), including a considerable garrison. There is a junction of five railway lines, and the Rhine is crossed by a large railway bridge and by a

bridge of boats. The inner line of fortifications was razed in 1890, and the defensive works now consist only of the citadel and three detached forts, one of which, Fort Blucher_ serves as a tele-de-pont on the left bank of the Rhine. Wesel contains some quaint old houses, and a town hall, dating from 1396, with an elaborate facade, and containing a valuable collection of old silver plate. The large Protestant church of St Willibrord has a choir, built 1424-1526, which is one of the noblest Gothic structures on the Lower Rhine, and a modern nave (1882-96). The Mathena church dates from

1429-1477. The two Roman Catholic churches, the castle, now the commandant's house (built in 1417), the Berliner Tor — Berlin gate— (built in 1722 and recently restored), the Lower- Rhenish museum of antiquities and the modern gymnasium and military hospital, are among the other chief buildings. Wesel carries on a considerable trade in grain, timber, colonial goods, tobacco, &c, facilitated by new harbour accommodation and wharves at the mouth of the Lippe. It has manufactures of wire, leaden pipes and other metal goods, cement, sugar, &c.

Wesel, formerly known as Lippemiinde, was one of the points from which Charlemagne directed his operations against the heathen Saxons. Incorporated in 1241, it became a flourishing commercial town, and though repeatedly subject to the counts of Cleves, was a member of the Hanseatic League, and as late as 1 521 a free imperial city. It was occupied by the Spaniards in 1614, by the Dutch in 1629, by the French in 1672, also during the Seven Years' War, and in 1805, and was ceded to Prussia in 1814. A monument outside the town commemorates eleven of Ferdinand von S chill's officers who were shot here on the 16th of September 1809 after their unsuccessful attempt at Stralsund. Wesel is occasionally spoken of as Unterwesel, to distinguish it from Oberwesel, a small town on the Rhine, above St Goar.

See Gantesweiler, Chronik der Sladt Wesel (Wesel, 1881), and Reinhold, Verfassungsgeschichle Wesels (Breslau. 1888).

WESER (O. Ger. Visuracha, Wisura, Lat. Visurgis), one of the chief rivers of Germany, formed by the union of the Werra and the Fulda at Miinden, in the Prussian province of Hanover, flowing generally north and entering the North Sea below Bremerhaven, between Jade Bay and the estuary of the Elbe. The mouth is 170 m. from Miinden, but the winding course of the river is 270 m. long; if the measurement be made from the source of the Werra, in the Thiiringer Wald, the total length of the stream is 440 m. At Miinden the river surface is 3S0 ft. above sea-level; the most rapid fall in its course is be- tween Karlshafcn and Minden in Westphalia. Nearly the

entire course of the Weser lies in Prussia, but it also touches part of Brunswick and Lippe, and after flowing through Bremen expands into an estuary separating the duchy of Oldenburg from the Prussian province of Hanover. Between Miinden and Minden its course lies through a picturesque valley flanked by irregular and disjointed ranges of hills (Reinhardswald, Sollinger Wald, Weser Hills, &c); but after it emerges from these mountains by the narrow pass called the " Porta Westfalica," near Minden, its banks become flat and uninteresting. The breadth of the river varies from no yds. at Miinden to 220 yds. at Minden, 250 yds. at Bremen, ij- m. at Elsilcth and 7-^- m. at its entrance into the sea.

The Weser on the whole is shallow, and navigation above Bremen is sometimes interrupted by drought. Until 1894 the fairway up to Bremen had a minimum depth of little over 8 ft.; thereafter im- portant works were undertaken, the minimum depth was made 18 ft., and the importance of Bremen as a port was greatly enhanced. Boats of 350 tons can ascend generally as far as Miinden. A system of waterways (the Geeste and Hadelner canals, meeting one another at Eederkesa) connects the estuary of the Weser with that of the Elbe; a canal between the Hunte and the Leda gives connexion with the Ems. On the upper Weser (above Bremen) the navigation, which is interrupted by occasional rapids, is assisted by locks and weirs. The principal tributaries on the right are the Aller, Wumme, Drepte, Lunc and Geeste, and on the left the Dtemel, Nethe, Emmer, Werra, Aue and Hunte. The Werra and Fulda are both navigable when they unite to form the Weser, the Fulda being canalized between Cassel and the town of Fulda for a distance of 173 m.; the Aller, Wumme, Geeste and Hunte are also navigable. Below the junction of the Hunte the Weser, hitherto a single stream, is divided into several channels by islands. The Weser drains a basin estimated at 18,530 sq. m..

The navigation of the Weser was long hampered by the various and vexatious claims and rights of the different states through whose territories it ran. Before 1866 the joint stream, including the Werra and the Fulda, changed its ruler no less than thirty-five times on its way to the sea. In 1823, however, a treaty was made establishing a fixed toll and a uniform system of management; this was further improved in 1856 and 1865; and when Prussia took possession of Hanover and Hesse-Nassau in 1866 the chief difficulties m the way of organizing the river-trade disappeared. The principal town on the Weser is Bremen. Other towns past which it flows

between Miinden and the sea are Karlshafen, H oxter, Holzminden, Bodenwerder, Hameln, Rinteln.Vlotho, Minden,Stolzenau,Nienburg, Vegesack, Elsfleth, Brake, Geestemunde and Bremerhayen. The Weser gave

name to a department in the short-lived kingdom of Westphalia : the chief town was Osnabruck.

WESLEY (FAMILY). The Wesley family sprang from Welswe, near Wells in Somerset. Their pedigree has been traced back to Guy, whom Athelslan made a thane about 938. One branch of the family settled in Ireland. Sir Herbert Westley of West- leigh, Devon, married Elizabeth Wellesley of Dangan in Ireland. Their third son, Bartholomew, studied both medicine and theo- logy at Oxford, and, in 1619, married the daughter of Sir Henry Colley of Kildare. In 1660 he held the rectories of Catherston and Charmouth in Dorset valued at £.35, 10s. per annum. He was ejected in 1662 and gained his living as a doctor. He was buried at Lyme Regis on February 15th, 1670.

His son, John Westley, grandfather of the founder of Methodism, was born in 1636 and studied at New Inn Hall, Oxford, where he became proficient in Oriental languages and won the special regard of John Owen, then vice-chancellor. Cromwell's Triers approved him as minister of Winterborn-Whitchurch, Dorset, in 1658. The following year he married the daughter of John White, the patriarch of Dorchester. In 1 661 he was committed to prison for refusing to use the Book of Common Prayer. His candour and zeal made a deep im- pression on Gilbert Ironside the elder, Bishop of Bristol, with whom he had an interview. He was ejected in 1662 and became a Nonconformist pastor at Poole. He died in 1678; his widow survived him for 32 years. One of his sons, Matthew, became a surgeon in London, where he died in 1737.

Another son, Samuel, was trained in London for the Noncon- formist ministry, but changed his views, and, in August 1683, entered Exeter College, Oxford, as a sizar. He dropped the " t " in his name and returned to what he said was the original spelling, Wesley. In 1689 he was ordained and married Susanna, youngest daughter of Dr Samuel Annesley, vicar of St Giles, Cripplegate, and nephew of the 1st earl of Anglcsea. Annesley gave up his living in 1662 and formed a congregation in Little St Helen's, Bishopsgate, where he was honoured as the St Paul of the Nonconformists. Samuel Wesley was appointed rector of South Ormsby in 1691, and moved to Epworth in 1697. He had nineteen children, of whom eight died in infancy. His lawless parishioners could not endure his faithful preaching, and in 1705 he was confined in Lincoln Castle for a small debt. Two-thirds of his parsonage was destroyed by fire in 1702 and in 1709 it was burnt to the ground. He managed to rebuild the rectory, but his resources were so heavily strained that thirteen years later it was only half furnished. Samuel Wesley was a busy author. At Oxford in 1685 he wrote a volume of poems bearing the strange title Maggots. He wrote a Life of Christ in verse (1693), The History of the Old and New Testament in Verse (1701?), a noble

Letter to a Curate, full of strong sense and ripe experience, and Dissertations on the Book of Job (1735). He died at Epworth in 1735. Susanna Wesley died at the Foundery, London, in 1742 and was buried in Bunhill Fields.

Their eldest son, Samuel Wesley (1690-1739), was born in London, entered Westminster School in 1704, became a Queen's scholar in 1707 and in 1711 went up to Christ Church, Oxford. He returned to Westminster as head usher, took orders and enjoyed the intimate friendship of Bishop Atterbury, Harley earl of Oxford, Addison, Swift and Prior. He became head- master of Blundeli's School at Tiverton in 1732 and died there on the 6th of November 1739. He was a finished, classical scholar, a poet and a devout man, but he was never reconciled to the Methodism of his brothers. His poems, published in 1736, reached a second edition in 1743, and were reprinted with new poems, notes and a Life by W. Nichols, in 1862.

Charles Wesley (1 707-1 788) was the eighteenth child of the Rector of Epworth, and was saved from the fire of 1709 by his nurse. He entered Westminster School in 1716, became a King's Scholar and was captain of the school in 1725. He was a plucky boy, and won the life-long friendship of the future earl of Mansfield by fighting battles on his behalf. Garret

W r esley of Ireland wished to adopt his young kinsman, but this offer was declined and the estates were left to Richard Colley on condition that he assumed the name Wesley. The duke of Wellington was Colley's grandson, and appears in the Army List for 1800 as the Hon. Arthur Wesley. Charles Wesley was elected to Christ Church in 1726. John had become fellow of Lincoln the previous March. Charles lost his first twelve months at Oxford in " diversions," but whilst John was acting as their father's curate, his brother " awoke out of his lethargy." He persuaded two or three other students to go with him to the weekly sacrament. This led a young gentleman of Christ Church to exclaim: " Here is a new set of Methodists sprung up." The name quickly spread through the university and Oxford Methodism began its course. In 1735 Charles Wesley was ordained and went with his brother to Georgia as secretary to Colonel, afterwards General, Oglethorpe, the Governor. The work proved uncongenial, and after enduring many hardships his health failed and he left Frederica for England on July the 26th, 1736. He hoped to return, but in February 1738 John Wesley came home, and Charles found that his state of health made it necessary to resign his secretaryship. After his evan- gelical conversion on Whit Sunday (May 21st, 1738), he became the poet of the Evangelical Revival. lie wrote about 6500 hymns. They vary greatly in merit, but

Canon Overton held him, taking quantity and quality into consideration, to be " the great hymn-writer of all ages." Their early volumes of poetry bear the names of both brothers, but it is generally assumed that the original hymns were -by Charles and the translations by John Wesley. Poetry was like another sense to Charles, and he was busy writing verse from his conversion up to his death-bed when he dictated to his wife his last lines, " In age and feebleness extreme." For some years he took a full share in the hardships and perils of the Methodist itiner- ancy, and was often a remarkably powerful preacher. After his marriage in 1749 his work was chiefly confined to Bristol, where he then lived, and London. He moved to London in 1771 and died in Marylebone on March the 29th, 17S8. He was strongly opposed to his brother's ordinations, and refused to be buried at City Road, because the ground there was uncon- secrated. He was buried in the graveyard of Marylebone Old Church, but this appears to have been unconsecrated also.

Charles Wesley married Sarah Gwynne, daughter of a Welsh magistrate living at Garth, on April 8th, 1749. She died in 1822 at the age of ninety-six. Five of their children died as infants and are buried in St James's Churchyard, Bristol. Their surviving daughter Sarah, who was engaged in literary work, died unmarried in 1828. Charles Wesley, Junr. (1759-1834) was organist of St George's, Hanover Square. He published Six Concertos for the Organ and Harp in 1778. He also died unmarried. Samuel, the younger brother (1766-1837), was even more gifted than Charles as an organist and composer; he was also a lecturer on musical subjects. Two of his sens were Dr Wesley, sub-dean of the Chapel Royal, and Dr Samuel Sebastian Wesley (1810-1876), the famous composer and organist of Gloucester Cathedral.

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WESLEY, JOHN (1703-1791), English divine, was born at Epworth Rectory on the 17th of June (O.S.) 1703. He was the fifteenth child of Samuel and Susanna Wesley (see Wesley Family). His mother's training laid the foundation of his character, and under her instruction the children made remark- able progress. On February 9, 1709, the rectory was burnt down, and the children had a narrow escape. On the duke of Buckingham's

nomination, Wesley was for six years a pupil at Charterhouse. In June 1720 he went up to Christ Church,

Oxford, with an annual allowance of £40 as a Charterhouse scholar. His health was poor and he found it hard to keep out of debt, but he made good use of his opportunities. A scheme of study which he drew up for 1722 with a time-table for each day of the week is still to be seen in his earliest diary, which became the property of Mr George Stampe of Great Grimsby. The diary runs from April 5, 1725, to February 19, 1727. A friend describes Wesley at this time as "a young fellow of the finest classical taste, and the most liberal and manly sentiments." He was " gay and sprightly, with a turn for wit and humour."

The standard edition of Wesley 9 s Journal (1909) has furnished much new material for this period of Wesley's life, the Rev. N. Curnock having unravelled the difficult cipher and shorthand in which Wesley's early diaries were kept. He reached the conclusion that the religious friend who directed Wesley's attention to the writings of Thomas a Kempis and Jeremy Taylor, in 1725, was Miss Betty Kirkham, whose father was rector of Stanton in Gloucestershire. Up to this time Wesley says he had no notion of inward holiness, but went on " habitu- ally and for the most part very contentedly in some or other known sin, indeed with some intermission and short struggles especially before and after Holy Communion," which he was obliged to attend three times a year. On the 25th of September 1725 he was ordained deacon, and on the 17th of March 1726 was elected fellow of Lincoln. His private diaries, seven of which are in the hands of Mr Russell J. Colman of Norwich, contain monthly reviews of Wesley's reading. It covered a wide range, and he made careful notes and abstracts of it. He generally took breakfast or tea with some congenial friend and delighted to discuss the deepest subjects. At the coffee house he saw the Spectator and other periodicals. He loved riding and walking, was an expert swimmer and enjoyed a game at tennis.

He preached frequently in the churches near Oxford in the months succeeding his ordination, and in April 1726 he obtained leave from his college to act as his father's curate. The new material in the Journal describes the simple matter of his life. He read plays, attended the village fairs, shot plovers in the fenland, and enjoyed a dance with his sisters. In October he returned to Oxford, where he was appointed Greek lecturer and moderator of the classes. He gained considerable reputa- tion in the disputation for his master's degree in February 1727. He was now free to

follow his own course of studies and began to lose his love for company, unless it were with those who were drawn like himself to religion. In August he returned to Lincolnshire, where he assisted his father till November 1729. During those two years he paid three visits to the university. In the summer of 1729 he was up for two months. Almost every evening found him with the little society which had gathered round Charles.

When he came, into residence in November he was recognized as the father of the Holy Club. It met at first on Sunday evenings, then every evening was passed in Wesley's room or that of some other member. They read the Greek Testament and the classics; fasted on Wednesday and Friday; received the Lord's Supper e\ f ery week; and brought all their life under review. In 1730 William Morgan, an Irish student, visited the gaol and reported that there was a great opening for work among the prisoners. The friends agreed to visit the Castle twice a week and to look after the sick in any parish where the clergyman was willing to accept their help. Wesley s spirit at this time is seen from his sermon on " The Circum- cision of the Heart," preached before the university on the 1st of January 1733- l 1 l 7&5 he said it " contains all that I now teach concerning salvation from all sin, and loving God with an undivided heart." Wesley rose at four, lived on £28 a year and gave away the remainder of his income. He already displayed those gifts for leadership which were to find so conspicuous a field in the evangelical revival. John Gambold, a member of the Holy Club, who after wards became a Moravian bishop, says " he was blest with such activity as to be always gaining ground, and such steadiness that he lost none. What proposals he made to any were sure to charm them, because they saw him always the same." He wore an air of authority yet never lacked address, or " assumed anything to himself above his contemporaries." William Law's books pro- duced a great impression on Wesley, and on his advice the young tutor began to read mystic authors, but he saw that their*

tendency was to make good works appear mean and insipid, and he soon laid them aside.

Wesley had not yet found the key to the heart and conscience of his hearers. He says, " From the year 1725 to 1729, I preached much, but saw no fruit to my labour. Indeed it could not be that I should ; for I neither laid the foundation of repentance nor of preaching the Gospel, taking it for granted that all to whom I preached were believers, and that many of them needed no re- pentance. From the year 1729 to 1734, laying a deeper foundation of repentance, I saw a little fruit. But it was only a little; and no wonder: for I did not preach faith in the blood cf the covenant. From 1734 to 1738, speaking more of faith in Christ, I saw more fruit of my preaching." Looking back on these days in 1777, Wesley felt " the

Methodists at Oxford were all one body, and, as it were, one soul; zealous for the religion of the Bible, of the Primitive Church, and, in consequence, of the Church of England; as they believed it to come nearer the scriptural and primitive plan than any other national church upon earth." The number of Oxford Metho- dists was small and probably never exceeding twenty-five. John Clayton, afterwards chaplain of the Collegiate Church of Manchester, who remained a strong High Churchman; James Hervcy, author of Meditations among the Tombs, and Theron and Aspasio; Benjamin Ingham, who became the Yorkshire evangelist ; and Thomas Brough- ton, afterwards secretary of the S.P.C.K., were members of the Holy Club, and George Whitefield joined it on the eve of the Wesleys' departure for Georgia.

Wesley's father died on April 25, 1735, and in the following October John and Charles took ship for Georgia, with Benjamin Ingham and Charles Delamotte. John was sent out by the Society for the Propagation of the Gospel, and hoped to labour as a missionary among the Indians, but though he had many interesting conversations with them the mission was found to be impracticable. The cabin of the " Simmonds" became a study for the four Methodists. The calm confidence of their Moravian fellow-passengers amid the Atlantic storms con- vinced Wesley that he did not possess the faith which casts out fear. Closer acquaintance with these German friends in Savannah deepened the impression. Wesley needed help, for he was beset by difficulties. Mrs Hawkins and Mrs Welch poisoned the mind of Colonel Oglethorpe against the brothers for a time. Wesley's attachment to Miss Hopkey also led to much pain and disappointment. All this is now seen more clearly in the standard edition of the Journal. Wesley was a stiff High Churchman, who scrupulously followed every detail of the rubrics. He insisted on baptizing children by trine immersion, and refused the Communion to a pious German, because he had not been baptized by a minister who had been episcopally ordained. At the same time he was accused of " introducing into the church and service at the altar com- positions of psalms and hymns not inspected or authorized by any proper judicature." The list of grievances presented by Wesley's enemies to. the Grand Jury at Savannah gives abundant evidence of his unwearying labours for his flock. The foundation of his future work as the father of Methodist lrvmnody was laid in Georgia. His first Collection of Psalms and Hymns (Charlestown, 1737) contains five of his incomparable transla- tions from the German, and on his return to England he pub- lished another Collection in 1738, with five more translations from the German and one from the Spanish. In April 1736 Wesley formed a little society of thirty or forty of the serious members of his congregation. He calls this the second rise of Methodism, the first being at Oxford in November 1729. The company in Savannah met every Wednesday evening " in order to a free

conversation, begun and ended with singing and prayer." A select company of these met at the parsonage on Sunday afternoons. In 1781 he writes, " I cannot but observe that these were the first rudiments of the Methodist societies."

In the presence of such facts we can understand the significance of the mission to Georgia. Wesley put down many severe things against himself on the return voyage, and he saw after- wards that even then he had the faith of a servant though not that of a son. In London he met Peter Bohler who had been ordained by Zinzendorf for work in Carolina. By Bohler Wesley was convinced that he lacked " that faith whereby alone we are saved." On Wednesday, May 24, 1738, he went to a society meeting in Aldersgate Street where Luther's Preface to the Epistle to the Romans was being read. " About a quarter

before nine, while he was describing the change which God works in the heart through faith in Christ, I felt my heart strangely warmed. I felt I did trust in Christ, Christ alone, for salvation; and an assurance was given me that he had taken away my sins, even mine, and saved me from the law of sin and death." Mr Lecky points out the significance of that event. " It is scarcely an exaggeration to say that the scene which took place at that humble meeting in Aldersgate Street forms an epoch in English history. The conviction which then flashed upon one of the most powerful and most active intellects in England is the true source of English Methodism " (History of England in Eighteenth Century, ii. 558).

Wesley spent some time during the summer of 1738 in visiting the Moravian settlement at Hcrrnhuth and returned to London on September 16, 1738, with his faith greatly strengthened. He preached in all the churches that were open to him, spoke in many religious societies, visited Newgate and the Oxford prisons. On New Year's Day, 1739, the Wesleys, Whitefield and other friends had a Love Feast at Fetter Lane. In February White- field went to Bristol, where his popularity was unbounded. When the churches were closed against him he spoke to the Kingswood colliers in the open air, and after six memorable weeks wrote urging Wesley to come and take up the work. Wesley was in his friend's congregation on April 1, but says, " I could scarcely reconcile myself to this strange way of preach- ing in the fields . . . having been all my life (till very lately) so tenacious of every point relating to decency and order, that I should have thought the saving of souls almost a sin, if it had not been done in a church." Next day Wesley followed White- field's example. His fears and prejudices melted away as he discerned that this was the very method needed for reaching the multitudes living in almost heathen darkness. He already had the means of

shepherding those who were impressed by the preaching. On the ist of May 1738 he wrote in his journal: " This evening our little society began, which afterwards met in Fetter Lane." Among its " fundamental rules " we find a provision for dividing the society into bands of five or ten persons who spoke freely and plainly to each other as to the u real state " of their hearts. The bands united in a conference every Wednesday evening. The society first met at James Hutton's shop, " The Bible and Sun," Wild Street, west of Temple Bar. About the 25th of September it moved to Fetter Lane. Wesley describes this as the third beginning of Methodism. After the fiefd preaching began converts multiplied. They found all the world against them, and Wesley advised them to strengthen one another and talk together as often as they could. When he tried to visit them at their homes he found the task beyond him, and therefore invited them to meet him on Thursday evenings. This meeting was held in the end of 1739 at the Foundery in Moorfields which Wesley had just secured as a preaching place. Grave disorders had arisen in the society at Fetter Lane, and on the 25th of July 1740 Wesley withdrew from it. About 25 men and 48 women also left and cast in their lot with the society at the Foundery. The centenary of Methodism was kept in 1839, a hundred years after the society first met at the Foundery.

Wesley's headquarters at Bristol were in the Horse Fair, where a room was built in May 1739 for two religious societies which had been accustomed to meet in Nicholas Street and Baldwin Street. To meet the cost of this Captain Fox suggested that each member should give a penny per week. W r hen it was urged that some were too poor to do this, he replied, " Then put eleven of the poorest with me; and if they can give anything, well: I will call on them weekly, and if they can give nothing I will give for them as well as for myself." Others followed his example and were called leaders, a name given as early as the 5th of November 1738 to those who had charge of the bands in London. Wesley saw that here was the very means he needed to watch over Ins flock. The leaders thus became a body of lay pastors. Those under their care formed a class. It proved more convenient to meet together and this gave opportunity for religious conversation and prayer. As the

society increased Wesley found it needed " still greater care to separate the precious from the vile." He therefore arranged to meet the classes himself every quarter and gave a ticket " under his own hand " to every one " whose seriousness and good conversation "he found no reason to doubt. The ticket furnished an easy means for guarding the meetings of the society against intrusion. " Bands " were formed for those who wished for closer communion. Love-feasts for fellowship and testimony were also introduced,

according to the custom of the primitive church. Watchnights were due to the suggestion of a Kingswood collier in 1740. Wesley issued the rules of the united societies in February 1743. Those who wished to enter the society must have " a desire to flee from the wrath to come, to be saved from their sins." When admitted they were to give evidence of their desire for salvation " by doing no harm; by doing good of every possible sort; by attending upon all the means of grace." It was expected that all who could do so would contribute the penny a week suggested in Bristol, and give a shilling at the renewal of their quarterly ticket. Wesley had at first to take charge of the contributions, but as they grew larger he appointed stewards to receive the money, to pay debts, and to relieve the needy. The memorable arrangement in Bristol was made a few weeks before Wesley's field of labour was extended to the north of England in May 1742. He found Newcastle ripe for his message. English Christianity seemed to have no power to uplift the people. Dram-drinking was spreading like an epidemic. Freethinkers' clubs flourished. " The old religion," Lecky says, " seemed everywhere loosening round the minds of men, and indeed it had often no great influence even on its defenders." Some of the clergy in country parishes were devoted workers, but special zeal was resented or discouraged.

The doctrine of election had led to a separation between Whitefield and the Wesleys in 1741. Wesley believed that the grace of God could transform every life that received it. He preached the doctrine of conscious acceptance with God and daily growth, in holiness. Victory over sin was the goal which he set before all his people. He made his appeal to the conscience in the clearest language, with the most cogent argument, and with all the weight of personal conviction. Hearers like John Nelson felt as though every word was aimed at themselves. No preacher of the century had this mastery over his audience. His teaching may be described as Evangelical Arminianism and its standards are his own four volumes of sermons and his Notes on ike New Testament.

Up till 1742 Wesley's work was chiefly confined to London and Bristol, with the adjacent towns and villages or the places which lay between them. On his way to Newcastle that year Wesley visited Birstal, where John Nelson, the stone-mason, had already been working. On his return he held memorable services in the churchyard at Epworth. Methodism this year spread out from Birstal into the West Riding. Societies were also formed in Somerset, Wilts, Gloucestershire, Leicester, Warwickshire, Nottinghamshire and the south of Yorkshire. In the summer Charles Wesley visited Wednesbury, Leeds and Newcastle. Next year he took Cornwall by storm. The work in London was prospering. In 1743 Wesley secured a west-end centre at W r est Street, Seven Dials, which for fifty years had a wonderful history. In August 1747 Wesley paid his first visit to Ireland, where he had

such success that he gave more than six years of his life to the country and crossed the. Irish Channel forty-two times. Ireland has its own conference presided over by a delegate from the British conference. Wesley's first visit to Scotland was in 1751. He paid twenty-two visits, which stirred up all the Scottish churches.

Such extension of his field would have been impossible had not Wesley been helped by a heroic band of preachers. Wesley says: " Joseph Humphreys was the first lay preacher that assisted me in England, in the year 1738." That was probably help in the Fetter Lane Society, for Wesley then had no preaching place of his own. John Cennick, the hymn-writer and schoolmaster at Kingswood, began to preach there in 1739. Thomas Maxwell, who was left to meet and pray with the members at the Foundery during the absence of the Wesleys, began to preach. Wesley hurried to London to check this irregularity, but his mother urged him to hear Maxwell

for himself, and he soon saw that such assistance was of the highesl value. The autobiographies of these early Methodist preachers are among the classics of the Evangelical Revival. As the work ad- vanced Wesley held a conference at the Foundcry in 1744. Besides himself and his brother, four other clergymen were present and four " lay brethren." It was agreed that " lay assistants " were allow- able, but only in cases of necessity. This necessity grew more urgent every year as Methodism extended. One of the preachers in each circuit was the " assistant," who had general oversight of the work, the others were " helpers." The conference became an annual gathering of Wesley's preachers. In the early conversations doctrine took a prominent place, but as Methodism spread the oversight of its growing organization occupied more time and more attention. In February 1784 Wesley's deed of declaration gave the conference a legal constitution, lie named one hundred preachers who after his Heath were to meet once a year, fill up vacancies in their number, appoint a president and secretary, station the preachers, admit proper persons into the ministry, and take general oversight of the societies. In October 1768, a Methodist chapel was opened in New York. At the conference of 1 769 two preachers, Richard Boardman and Joseph Filmoor, volunteered to go out to take charge of the work. In 1771, Francis Asbury, the Wesley of America, crossed the Atlantic. Methodism grew rapidly, and it became essential to pro- vide its people with the sacraments. In September 1784 Wesley ordained his clerical helper, Ur Coke, superintendent (or bishop), and instructed him to ordain Asbury as his colleague. Richard Whatcoat and Thomas Vasey were

ordained by Wesley, Coke and Creighton to administer the sacraments in America. Wesley had reached the conclusion in 174G that bishops and presbyters were essentially of one order (see Methodism, sect. " United States ").

He told his brother in 1785: "I firmly believe that I am a scriptural kirlaKOTros as much as any man in England or in Europe; for the uninterrupted succession I know to be a fable, which no man ever did or can prove." Other ordinations for the admini- stration of the sacraments in Scotland, the colonies and England followed. The interests of his work stood first with Wesley. He did everything that strong words against separation could do to bind his societies to the Church of England; he also did everything that legal documents and ordinations could do to secure the permanence of that great work for which God had raised him up. In the words of Canon Overton and Rev. F. H. Relton (Hist, of Eng. Ch. x-fiˆ-i&oo); "It is purely a modern notion that the Wesleyan movement ever was, or ever was in- tended to be, except by Wesley, a church movement." Despite his strong sayings, it was Wesley who broke the links to the church, for, as Lord Mansfield put it, " ordination is separation."

Wesley's account of his itinerancy is given in his famous Journal, of which the first part appeared about 1739. Mr Birrell has called it " the most amazing record of human exertion ever penned by man." It is certainly Wesley's most picturesque biography and the most vivid account of the evangelical revival that we possess. The rapid development of his work made a tremendous strain upon Wesley's powers. He generally travelled about 5000 m. a year and preached fifteen sermons a week. He had constant encounters with the mob, but his tact and courage never failed. His rule was always to look a mob in the face. Many delicious stories are told of his presence of mind and the skilful appeals which he made to the better feeling of the crowd.

Wesley's writings did much to open the eyes of candid men to his motives and his methods. Besides the incomparable Journal, his Appeals to Men of Reason and Religion also pro- duced an extraordinary effect in allaying prejudice and winning respect. He constantly sought to educate his own people. No man in the 18th century did so much to create a taste for good reading and to supply it with books at the lowest prices. Sir Leslie Stephen pays high praise to Wesley's writings, which went " straight to the mark without one superfluous flourish." As a social reformer Wesley was far in advance of his time. He provided work for the deserving poor, supplied them with clothes and food in seasons of special distress. The profits on his cheap books enabled him to give away as much as £1400 a year. He established a lending stock to help struggling business men and did much to relieve debtors who had been thrown into prison. He opened dispensaries in

London and Bristol and was keenly interested in medicine.

Wesley's supreme gift was his genius for organization. He was

by no means ignorant of this. " I know this is the peculiar talent which God has given me." Wesley's special power lay in his quickness to avail himself of circumstances and of the suggestions made by those about him. The class-meeting, the love-feast, the watch-night, the covenant service, leaders, stewards, lay preachers, all were the fruit of this readiness to avail himself of suggestions made by men or events. Wesley skilfully wove these into his system, and kept the whole machinery moving harmoniously. He inspired his preachers and his people with his own spirit and made everything subordinate to his over- mastering purpose, the spread of scriptural holiness throughout the land.

In 1751 W'esley married Mary Vazeille, a widow, but the union was unfortunate and she finally left him. John Fletcher, the vicar of Madeley, to whom Wesley had turned as a possible successor, died in 1785. He had gone to Wesley's help at West Street after his ordination at Whitehall in 1757 and had been one of his chief allies ever since. He was beloved by all the preachers, and his Checks to Antinomianism show that he was a courteous controversialist. Charles Wesley died three years after Fletcher. During the last three years of his life John Wesley reaped the harvest he had sown. Honours were lavished upon him. His people hailed every appearance among them with delight, and his visits to various parts of the country were public holidays. His interest in everything about him continued unabated. He had a wealth of happy stories which made him the most delightful of companions in the homes of his people. Robert Southey never forgot how Wesley kissed his little sister and put his hand on his head and blessed him. Alexander Knox says, ." So fine an old man I never saw! The happiness of his mind beamed forth in his countenance. Every look showed how fully he enjoyed ' The gay remembrance of a life well spent.' Wherever Wesley went, he diffused a portion of his own felicity." He preached his last sermon in Mr Belson's house at Leatherhead on Wednesday, the 23rd of February 1791; wrote next day his last letter to Wilber- force, urging him to carry on his crusade against the slave trade; and died in his house at City Road on the 2nd of March 1791, in his eighty-eighth year. He was buried on the oth of March in the graveyard behind City Road chapel. His long life enabled him to perfect the organization of Methodism and to inspire his preachers and people with his own ideals, while he had con- quered opposition by unwearying patience and by close adherence to the principles which he sought to teach.

See also Methodism, and the articles on the separate Methodist bodies; see also Wesley Family. (J. T.)*

WESLEY, SAMUEL (1766-1837), English musical composer, son of Charles Wesley (sec above), was born at Bristol on the 24th of February 1766, and developed so precocious a talent for music that at three years old he played the organ and at eight composed an oratorio entitled Ruth — a fact which is duly chronicled on a curious portrait, painted in 1774, and afterwards engraved, wherein he is represented in the childish costume of the period. Though suffering for many years from an acci- dental injury to the brain, Wesley was long regarded as the most brilliant organist and the most accomplished extempore fugue- player in England. He may indeed be regarded as the father of modern organ-playing, for he it was who, aided by his friends Benjamin Jacob and C. F. Horn, first introduced the works of Sebastian Bach to English organists, not only by his superb playing, but by editing with Horn, in 1S10, the first copy of Das wohltemperirte Clavier ever printed in England. Wesley's last performance took place on the 12th of September 1837 at Christ Church, Newgate Street. London, where, after hearing the wonderful performances of Mendelssohn, he was himself induced to play an extempore fugue. He died on the nth of October 1837, leaving a vast number of MS. and printed compositions.

His brother Charles (1757-1815) was also an accom- plished organist, and still more famous was his son, Samuel Sebastian (q. v.).

WESLEY, SAMUEL SEBASTIAN (1810-1876), English com- poser and organist, natural son of Samuel Wesley, the eminent composer, was born in London on the 14th of August 1810. He

V^as one of the Children of the Chapel Royal from 1810, held various unimportant posts as organist from the age of fifteen, and in 1832 was appointed to Hereford Cathedral. His career as a composer began with his splendid anthem, " The Wilderness," which was probably written for the opening of the Hereford organ in that year. In 1834 it fell to him to conduct the Festival of the Three Choirs, and in the following year he resigned Hereford for Exeter Cathedral; and during the next six years his name became gradually more and more widely known. In 1842 Dr Hook, afterwards dean of Chichester, offered him a large salary to become organist of Leeds parish church, and at Leeds much of his finest work as a composer was done. In 1849 he quitted this post for Winchester, in order to secure educational advantages for his sons. He was at Winchester until 1865, when he offered himself as a candidate for Gloucester Cathedral, the last of his many posts. He again conducted the Three Choirs Festivals of 1865, 1868, 1871 and 1874. A civil list pension of £100 a year was

conferred on him in 1873; he died at Gloucester on the 19th of April 1876, and was buried at Exeter.

Like his father he was a very eccentric man, but his compositions show powers that are found in very few Englishmen of his date. If the list of his compositions is smaller than that of his father's, it must be remembered that his anthems, in which is contained his best work, are far more important and more extensive than most compositions so called : in many of them the whole anthem is no longer sung, but even die selections from them make up anthems of ordinary length. The> ire masterly in design, fine in inspiration and expression, and nolle in character. His " Blessed be the God and Father, " " The Wilderness, " already mentioned, " Ascribe unto the Lord, " " O Lord, Thou art my God, " and many others, are masterpieces in their way, and in all of these, as in the service in E, published with a rather trenchant preface in 1845, there is a happy combination of the modern resources of harmony with the dignified cathedral style, a combination which naturally alarmed the orthodox party of his time.

WESLEYAN METHODIST CHURCH, one of the chief branches of Methodism (q.v.). On the day of John Wesley's death the preachers in London sent a brief note to those stationed in the country: " Dear Brother, The melancholy period we have so long dreaded is now arrived. Our aged and honoured Father, Mr Wesley, is no morel He was taken to Paradise this morning, in a glorious manner, after a sickness of five days. We have not time to say more at present relative to his Demise. Only what respects out future Oeconomy. This injunction he laid upon us, and all our Brethren on his death-bed, That we each continue in our respective Station till the time appointed for the next Conference at Manchester. We have, therefore, no doubt but you will, with us, readily comply with his Dying Request. The more so, as this is consonant with the determination of the Conference held at Bristol when he was supposed to be near death there, and confirmed in succeeding Conferences."

In 1790 there were 294 preachers and 71,668 members in Great Britain, 19 missionaries and 5300 members on the mission stations; 198 preachers and 43,265 members in the United States. The 6th of April was kept as a day of fasting and prayer, and the 1st of July was thus set apart in order to seek divine guidance for the approaching conference. The crisis was serious. The large proportion of Wesley's members had been gathered by the labours of himself and his helpers. They had been taught to observe the sacraments and naturally desired that provision should be made for their administration in their own chapels. Some felt that they could not go to the Lord's Table where the clergyman was a worldly man; others went, but with much fear and doubt. The Church party was in- fluential and resolute

to maintain close relations with the Church of England. Their object was to prevent Methodism becoming independent. There was also a small but determined party that leaned to dissent. The struggle between these conflicting tendencies soon began. On the 30th of March 1791 nine preachers, sent out the famous Halifax circular making suggestions as to the choice of president and other matters that must come before the conference. The first signature to this circular was that of William Thompson who was afterwards elected as the first president. On the 4th of May eighteen laymen met at Hull and expressed their conviction that the useful-

ness of Methodism would be promoted by its continued con- nexion with the Church of England. They would not consent to the administration of the sacraments by the preachers in Hull, nor to Methodist preaching at the time when services were held in church. A trenchant reply to this circular was prepared by Alexander Kilham (q.v.), one of the younger Methodist preachers.

The conference met in Manchester on the 26th of July 1791. A letter from Wesley (dated Chester, April 7, 1785) was read, beseeching the members of the Legal Conference not to use their powers for selfish ends but to be absolutely impartial in station- ing the preachers, selecting boys for education at Kingswood School, and disposing of connexional funds. The conference at once resolved that all privileges conferred by Wesley's Poll Deed should be accorded to every preacher in full connexion. To supply the lack of Wesley's supervision the circuits were now grouped together in districts. At first the preachers of the district elected their own chairman, but they were after- wards appointed by the conference. Regulations as to its business were issued in 1812. As to the sacraments and the relations of Methodism to the Church of England the decision was: " We engage to follow strictly the plan which Mr Wesley left us." This was ambiguous and was interpreted variously. Some held that it forbade the administration of the sacraments except where they were already permitted; others maintained that it left Methodism free to follow the leadings of Providence as Wesley had always done. During the year the difficulties of the situation became more apparent. Wesley had given the sacrament to the societies when he visited them and this privilege was greatly missed. The conference of 1792 was so much perplexed that it resorted to the casting of lots. The decision was thus reached that the sacraments should not be administered that year. This was really shelving the question, but it gave time for opinion to ripen, and in T793 it was resolved by a large majority that " the societies should have the privilege of the Lord's Supper where they unanimously desired it." In 1794, this privilege was definitely granted to ninety-three societies. The feeling in Bristol was very strong. The trustees of Broadmead, who were opposed to the administration of the sacrament by the preachers, forbade Henry Moore to occupy that pulpit. Nearly the

whole society thereupon withdrew to Portland Chapel. The conference of 1795 had to deal with this controversy. It prepared a " Plan of Pacification " which was approved by the conference and by an assembly of trustees, and was welcomed by the societies. The Lord's Supper, baptism, the burial of the dead and service in church hours were not to be conducted by the preachers unless a majority of the trustees, stewards and leaders of any chapel approved, and assured the conference that no separation was likely to ensue. The consent of conference had to be given before any change was made.

In 1796, Alexander Kilham, who refused to abstain from agitation for further reform, and accused his brethren of priest- craft, was expelled from their ranks and the New Connexion was formed with 5000 members (see Methodist New CoNr nexion). The conference of 1797 set itself to remove any ground for distrust among the societies and to enlist their hearty support in all branches of the work. Annual accounts were to be published of various funds. The Circuit Quarterly Meeting had to approve the arrangements for the support of the preachers. The preachers had long been accustomed to consult the leader's meetings of their societies, but it was now clearly decided that stewards and leaders should be appointed in connexion with the leaders' meeting, and certain rights were granted to that meeting as to the admission and expulsion of members. Local preachers had to be accepted by the local preachers' meeting, and the powers of trustees of chapels were considerably extended. The constitution of Methodism thus practically took the shape which it retained till the admission of lay representatives to conference in r878. No period in the history of Methodism was more critical than this, and in none was the prudence and good sense of its leaders more conspicuous. Advance was quietly made along the lines now laid down. The preachers had agreed in 1793 that all distinction between those

whom Wesley had ordained and their brethren should cease. In the minutes of conference for 1818 " Rev." appears before the names of preachers who were members of the Missionary Committee. Jabez Bunting (q.v.), who had become the ac- knowledged leader of the conference, wished to have its young ministers set apart by the imposition of hands, but this scriptural custom was not introduced till 1836.

Meanwhile, Methodism was growing into a great missionary church. Its work in the West Indies was firmly established in Wesley's lifetime. In 1786 eleven hundred negroes were members of the society in Antigua. The

burden of superin- tending these missions and providing funds for their support rested on Dr Coke, who took his place as the missionary bishop of Methodism. In 1813 he prevailed on the conference to sanction a mission to Ceylon. He sailed with six missionaries on the 30th of December, but died in the following May in the Indian Ocean. To meet these new responsibilities a branch Missionary Society had been formed in Leeds in October 1813, and others soor sprang up in various parts of the country. The Centenary of the Missionary Society falls in 1913, but Methodist Missions really date from 1786 when Dr Coke landed at Antigua. The area of operations gradually extended. Missions were begun in Madras, at the Cape of Good Hope, in Australia, and on the west coast of Africa. Two missionaries were sent to the Friendly Islands in 1826, and in 1835 a mission was undertaken among the cannibals of Fiji, which spread and deepened till the whole group of islands was transformed. The work in China began in 1851; the Burma mission was estab- lished in 1887. The rapid progress of the Transvaal and Swazi- land missions has been almost embarrassing. The Missionary Jubilee in 1863-1868 yielded £179,000 for the work abroad. As the growth of the missions permitted conferences have been formed in various countries. Upper Canada, had its conference in 1834, France in 1852, Australia in 1855, South Africa in 1882. The missionary revival which marked the Nottingham Con- ference of 1906 quickened the interest at home and abroad and the Foreign Field (monthly) is prominent among missionary periodicals. The Women's Auxiliary, founded in 1858, kept its jubilee in 1908. It supports schools and medical missions, homes and orphanages. In 1828 the erection of an organ in Brunswick Chapel, Leeds, led to a violent agitation and a small body of " Protestant Methodists " was formed. A more formid- able division was led by Dr Warren, a preacher of ability and influence, who was disappointed because no place was found for him in the newly-formed Theological Institution. He tried to awaken general opposition to the Institution scheme, and being suspended from his office as superintendent by a special district meeting, appealed to the law courts, which sustained the action of the district meeting. He was expelled from the conference and joined the Wesleyan Methodist Association in 1836, but shortly afterwards became a clergyman in Manchester. In his first cpnference in 1744 Wesley asked, " Can we have a seminary for labourers?" The answer was: "If God spare us to another Conference." Next year the subject was broached with the reply: " Not till God give us a proper tutor." The idea was not realized in his lifetime, but Wesley did everything in his power to train his preachers. He gathered them together and read with them as he had done with his pupils at Oxford; he urged them to spend at least five hours a day in reading the best books. He made this challenge, " I will give each of you, as fast as you will read them, books to the value of £5." In 1834 Hoxton Academy was taken as a training place for ministers; and in 1839 the students moved to

Abney House, Stoke Newing- ton. Didsbury College was opened in 1842, Richmond in 1843. Headingley was added in 1868, Handsworth in 1881.

The Centenary of Methodism was celebrated in 1839 and £221,939 was raised as a thank-offering: £71,609 was devoted to the colleges at Didsbury and Richmond; £70,000 was given to the missionary society, which spent £30,000 on the site and building of a mission- house in Bishopsgate Within; £38,000 was set apart for the removal of chapel debts, &c.

Methodism was now recognized as one of the great moral and spiritual forces of the world. Its progress was rapid, but in 1849 there came a disastrous check. 'There was much jealousy of Dr

Bunting, the master mind 'of Methodism, to whose foresight and wisdom large part of its success was due. Fly-sheets were issued attacking him and other eminent ministers. James Everett, Samuel Dunn and William Griffith were expelled from the ministry, and an agitation began which robbed Wesleyan Methodism of 100,000 members. Those who now left the Connexion joined the reformers of 1828 and 1836 and formed the Methodist Free Churches. In 1852 the constitution of the Quarterly Meeting was clearly defined, and the June Quarterly Meeting obtained the right to approach con- ference with memorials. Various other provisions were made which increased confidence. It was not till 1856 that the Connexion began to recover from the loss caused by this agitation.

Methodism began its work for popular education in a very modest way. In 1837 it had nine infant schools and twenty-two schools for elder children. A grant of £5000 was made from the Centenary Fund for the provision of Wesleyan day-schools. The conference of 1843 directed that greater attention must be given to this de- partment, and a committee met in the following October which resolved that 700 schools should be established if possible within the next seven years, and an Education Fund raised of £5000 a year. In 1849 the Normal Training College for the education of day- school teachers was opened in Westminster, and in 1872 a second college was opened in Battersea for school- mistresses. Westminster provides for 120 and Southlands for no students. They supply teachers not only for Wesleyan, but for council schools all over the country, and no colleges have a higher reputation. Besides its day- schools, Methodism possesses the Leys School at Cambridge, Rydal Mount at Colwyn Bay and prosperous boarding-schools for boys and girls in many parts of the country.

Methodism has from the beginning done much work in the army. Dr William Harris Rule (1802-1890), who was appointed chaplain at

Gibraltar in 1832, won for it fuller recognition from the authorities. Charles H. Kelly, his colleague at Aldershot, and R. W. Allen had a large share in the struggle by which Methodist work both in the army and the navy was developed. Capitation grants have made it possible to organize the work at every station at home and abroad. No homes for soldiers and sailors are more efficient or better liked by the men. The service done by Methodist chaplains in war time, and especially in the Boer War, won the warmest recognition from the authorities.

In 1878, laymen were Introduced into the Wesleyan conference. They had been members of the committee appointed in 1803 to " guard our privileges in these perilous times, " and had gradually taken their place on the missionary and other committees. Circuit steward? had attended the district meetings before 1817 but in that year their right to attend was established. The Financial District Meeting of which they were members was created in 1819 and the financial business of each district soon came under its control. Out of the Annual Home Missionary gathering sprang a system of committees of review which, in 1852, James H. Rigg suggested might be enlarged and combined into a kind of diet composed of ministers and laymen who should consider reports from the various departments. The time was not ripe for such a scheme, but in 1861 the principle of direct representation was introduced into the com- mittees of review. The Representative Session which met in 1878 consisted of 240 ministers and 240 laymen. The Pastoral Session of ministers met first to deal with pastoral affairs. In 1891 the Repre- sentative Session was sandwiched between the two parts of the Pastoral Session. In 1898 it met first and its numbers were enlarged to 300 ministers and 300 laymen. In 1892 the district meeting became known as the District Synod, and in 1893 the circuits began to choose representatives to the Synod in addition to the circuit stewards. The great advance in organization made with such peace and goodwill was commemorated in 1878 by the Thanksgiving Fund which reached £297,500. Dr Rigg, the president of that year, put all his strength into the movement, and every department of Methodist work at home and abroad shared in the benefits of the fund.

The Forward Movement in Methodism dates from that period. A bolder policy won favour. Methodism realized its strength and its obligations. In 1885 the Rev. S. F. Collier was appointed to Manchester and the Rev. Peter Thompson was sent to work in the East End. Next year the Revs. Hugh Price Hughes and Mark Guy Pearse began the West London Mission. Every succeeding year has witnessed development and growth. Large mission-halls have been built in the principal towns of England, Scotland and Ireland. Great congregations have been gathered, and the work done for up- lifting the fallen and outcast has, earned the gratitude of all good men. The Manchester mission is regarded as one of the glories of that city.

The Forward Movement will always be associated with the name of Hugh Price Hughes (q.v.). Village Methodism shared in the quickening which the Forward Movement brought to the large towns. Chapels which had been closed were reopened; an entrance was found into many new villages. Weak circuits were grouped together and gained fresh energy and hope by the union.

No work has been dearer to Methodists" than that of the National Children's Home and Orphanage founded by Dr Bowman Stephenson in 1869. Its headquarters are in Bethnal Green, but it has branches in various parts of the country and an emigration dep&t in Canada. It cares not only for waifs and strays, but for cripples and delicate children. Orphans of respectable parents have a home at Birmingham,

and the reformatory school has done splendid service for lads who have committed a first offence. Dr A. E. Gregory – , who in 1900 succeeded Dr Stephenson, has seen remarkable progress in all de-

Partments of the great institution under his care. ' Sisters of the eople " and deaconesses, for whom there is a training home at llkley, founded by Dr Stephenson in 1902, have also done much to help in these modern developments of Methodism.

The Chapel Committee, which has its headquarters in Manchester, has general oversight of 9070 trusts with property valued at about twenty-five millions. The number of Methodist chapels in 1818 was 2000; in 1839, 3500; in 1910, 8606. The sitting increased from a million in 1851 to about 2,375,000 in 1910. The outlay on trust property in that period was more than fifteen millions. Debts amounting to £3,266,013 have been paid off since 1854, More than half a million has been advanced in loans and of this nothing has been lost. In 1907 and 1908 £1,292,282 was spent on trust property, and of this £892,114 was contributed. London Methodism owes more than can be told to the Metropolitan Chapel Building Fund which was founded in 1861. The names of the Rev. William Arthur, Sir Francis Lycett, Sir W. McArthur, will always be associated with this fund which has promoted the erection of some hundred new chapels. The Extension Fund, established in 1874, largely by the help of Sir Francis Lycett and Mr Mewburn, has done similar work for country towns and villages. About two thousand chapels have been assisted with grants and loans. Similar work has been done in Scotland by a fund established in 1878. North and South Wales also have their Chapel Funds. A secretary

and committee were appointed in 1910 to carry out various developments of work in London. The work of the Metropolitan Chapel Building Fund and the London Mission is taken over by this new committee.

John Wesley felt a lively interest in the Sunday schools which began to spring up all over England in the last years of his life. The first rules for the management of Methodist Sunday schools were issued by the Conference in 1827. In 1837 there were 3339 Methodist Sunday schools with 59,297 teachers and 341,443 scholars. A quarter of the preaching places, however, had no schools. The Education Committee was formed in 1838 to take oversight of the work in day and Sunday schools. The Methodist Sunday School Union, founded in 1873, was formed into a department in 1907 and is doing much to guide and develop the work. The Temperance Com- mittee was formed in 1875; a temperance secretary was set apart in 1890. The department has its monthly organ and has its offices in Westminster. The Wesley Guild Movement, established in 1901, has its headquarters in Leeds and is doing a great work for the young people of Methodism.

The centenary of Wesley's death was kept in 1891. Memorable services were held in City Road Chapel, which was restored and rendered more worthy of its historic position. Wesley's statue was placed in the forecourt. In 1898 the rooms in Wesley's house, where he studied and where he died, were set apart as a Methodist Museum. The first Methodist Oecumenical Conference was held in London in 1 88 1, the second in Washington in 1891, the third in London in 1901, the fourth being fixed for Toronto in 191 1. The Methodist Assembly which met. in Wesley's Chapel, London, in 1909 brought the branches of British Methodism together with good results. A considerable extension of the three years' term has been secured in certain cases by a legal device for escaping the provisions of the eleventh clause ot Wesley's Deed Poll, but some more satisfactory method of dealing with the subject is under consideration.

The great event of recent Methodist history was the Twentieth Century Fund inaugurated by Sir Robert W. Perks in 1898. To his unwearying zeal and business ability the triumph secured was chiefly due. The Rev. Albert Clayton, the secretary of the fund, lavished his strength on his vast task and the total income exceeded £1.073,782. The grants were: General Chapel Committee, £290,617; Missionary Society, £102,656; Education Committee, £193.705; Home Missions, £96,872; Children's Home, £48,436. The Royal Aquarium at Westminster was purchased and a central hall and church house as the headquarters of Methodism erected. For this object £242,206 was set apart.

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WESSEL, JOHAN 1 (c. 1420-1489), Dutch theologian, was born at Groningen. He was educated at the famous school at De venter, which was under the supervision of the Brothers of Common Life, and in close connexion with the convent of Mount St Agnes at Zwolle, where Thomas a Kempis was then living. At Deventer, where the best traditions of the 14th-century mysticism were still cultivated, Wessel imbibed that earnest devotional mysticism which was the basis of his theology and which drew him irresistibly, after a busy life, to spend his last days among the Friends of God in the Low Countries. From Deventer he went to the Dominican school at Cologne to be taught the Thomist theology, and came in contact with human- ism. He learnt Greek from monks who had been driven out of Greece, and Hebrew from some Jews. The Thomist theology sent him to study Augustine, and his Greek reading led him to Plato, sources which largely enriched his own theological system. Interest in the disputes between the realists and the nominalists in Paris induced him to go to that city, where he remained for sixteen years as scholar and teacher. There he eventually took the nominalist side, prompted as much by his mystical anti-ecclesiastical tendencies as by any metaphysical insight; for the nominalists were then the anti-papal party. A desire to know more about humanism sent him to Rome, where in 1470 he was the intimate friend of Italian scholars and under the protection of Cardinals Bessarion and Francis Delia Rovere (general of the Franciscan order and afterwards Pope Sixtus IV.). It is said that Sixtus would have gladly made Wessel a bishop, but that he had no desire for any ecclesiastical preferment. From Rome he returned to Paris, and speedily became a famous teacher, gathering round him a band of en- thusiastic young students, among whom was Reuchlin. In 1475 he

was at Basel and in 1476 at Heidelberg teaching philosophy in the university. As old age approached he came to have a growing dislike to the wordy theological strife which surrounded him, and turned away from that university discipline, " non studia sacrarum litcrarum sed studiorum commixtae cor- ruptiones." After thirty years of academic life he went back to his native Groningen, and spent the rest of his life partly as director in a nuns' cloister there and partly in the convent of St Agnes at Zwolle. He was welcomed as the most renowned scholar of his time, and it was fabled that he had travelled through all lands, Egypt as well as Greece, gathering every where the fruits of all sciences—" a man of rare erudition," says the title-page of the first edition of his collected works, " who in the shadow of papal darkness was called the light of the world." His remaining years were spent amid a circle of warm admirers, friends and disciples, to whom he imparted the mystical theology, the zeal for higher learning and the deep devotional spirit which characterized his own life. He died on the 4th of October 1489, with the confession on his lips, " I know only Jesus the crucified." He is buried in the middle of the choir of the church of the " Geestlichen Maegden," whose director he had been.

Wessel has been called one of the " reformers before the Refor- mation," and the title is justifiable if by it is meant a man of deeply spiritual life, who protested against the growing paganizing of the papacy, the superstitious and magical uses of the sacraments, the authority of ecclesiastical tradition, and that tendency in later scholastic theology to lay greater stress, in a doctrine of justification, upon the instrumentality of the human will than on the objective work of Christ for man's salvation. Ills own theology was, however, essentially medieval in type, and he never grasped that experimental thought of justification on which Reformation theology rests.

Martin Luther in 1521 published a collection of Weasel's writings which had been preserved as relics by his friends, and said that if he (Luther) had written nothing before he read them, people might well have thought that he had stolen all his ideas from them. The books are of an aphoristical character, the ideas being rather mechanically*

1 His correct name was Wessel Harmens Gansfort (or Ganzevort), the Christian name Wessel being a corruption of Basilius, and the surname Gansfort being that of a W'estphalian village from which his family came.

2 The collection included De providentia, De causis et effectibus incarnationis et passionis, De dignitate et potestate ecclesiastica, De sacramente, poenitentiae, Quae sit vera communio sanctorum, V6 purgatorio and a number of letters.

arranged, so that it is not possible to single out any one as the centre of the whole system. The authority of the Bible Wessel would support when necessary, not by the priest but by the divinity pro- fessor. His views on the sacraments anticipated those of Zwingli rather than of Luther.

See Vila Wesseli Groningensis, by Albert Hardenberg, published in an incomplete form in the preface to Wessel's collected works (Amsterdam, 1614; this preface also contains extracts from the works of several writers who have given facts about the life of Wessel); W. Muurling, Com. Hist. TheoL. de Wesseli Gansforlii vita, &c. (1831); K. Ullmann, Reformers before the Reformation (the second volume of the German edition is a second and enlarged edition of a previous work entitled Johann Wessel, ein Vorganger Luthers (1834) ; J. Friedrich, Johann Wessel, ein Bild aus der Kirchengeschichte des i$ten Jahrhunderts (1862); A. Ritschl, History of the Christian Doctrine of Justification and Reconciliation (Edinburgh, 1872) ; J. J. Doedes, " Hist.-litterarisches zur Biographie J. Wessels " in Theol. Studien und Kritiken (1870).

WESSELENYI, MIKLfiS, Baron (1706-1850), Hungarian statesman, son of Baron Miklos Wesselenyi and Ilona Cserei, was born at Zsibo, and was educated at his father's castle by Mozes Pataky in the most liberal and patriotic direction. In 1823 he permanently entered public life and made the ac- quaintance of Count Stephen Szechenyi whose companion he was on a long educative foreign tour, on his return from which he became one of the leaders of the liberal movement in the Upper House. In 1833 appeared his Baliteletek (Prejudices), which was for long a prohibited book. He was the foremost leader or the Opposition at the diet of 1834, and his freely expressed opinions on land-redemption, together with his efforts to give greater publicity to the debates of the diet by printing them, involved him in two expensive crown prosecu- tions. He was imprisoned at Grafenberg, whither he had gone to be cured of an eye trouble, and two years later became quite blind. Subsequently he did much for agriculture, children's homes and the introduction and extension of the silk industry in Hungary. The events of 1848 brought him home from a long residence abroad, but he was no longer the man he had been, and soon withdrew again to Grafenberg. He died on the 21st of April 1850, on his way back to Hungary.

See Ferencz Szilagyi, Life and Career of Baron Nicholas Wesselenyi the Younger (Hung. Budapest, 1876). (R. N. B.)

WESSEX, one of the kingdoms of Anglo-Saxon Britain. The story of its origin is given in the Saxon Chronicle. According to this the kingdom was founded by two princes, Cerdic, and Cynric his son, who landed in 494 or 495 and were followed by other settlers in 501 and 5r4. After several successful battles against the Welsh they became kings in 519. Very few of the localities connected with the story of these princes have been identified with certainty, but such identifications as there are point to the southern part of Hampshire. In 530 Cerdic and Cynric are said to have conquered the Isle of Wight, which they gave to two of their relatives, Stuf and Wihtgar. Cerdic died in 534. Cynric defeated the Britons at Salisbury in 552 and again in conjunction with his son Ceawlin at Beranburh, probably Barbury Hill, in 556. At his death in 560 he was succeeded by Ceawlin, who is mentioned by Bede as the second of the English kings to hold an imperium in Britain. With him we enter upon a period not perhaps of history, but at least of more or less reliable tradition. How far the earlier part of the story deserves credence has been and still is much debated. At all events no value can be attached to the dates given in the Chronicle. The preface to this work places Cerdic's assumption of the sovereignty six years after his landing, that is, in the year 500, and assigns him a reign of sixteen years, which makes his death fall eighteen years before 534, the date recorded in the annals. Again, while the annals record Ceawlin's accession in 560 and his expulsion in 592, the preface with other early authorities assigns him a reign of only seventeen years. Further a number of genealogies, both in the Chronicle and elsewhere, represent Cynric as grandson of Cerdic and son of a certain Creoda. Suspicion likewise attaches to the name Cerdic, which seems to be Welsh, while we learn from Bede that the Isle of Wight, together with part at least of the Hampshire coast, was colonized by Jutes, who apparently had a kingdom distinct from that of Wessex. For these reasons the story of the foundation of Wessex, though it appears to possess

considerable antiquity, must be regarded as open to grave suspicion. It is worthy of note that the dynasty claimed to be of the same origin as the royal house of Bernicia and that two of Cerdic's ancestors, Freawine and Wig, figure in the story of Wermund, king of Angel.

Whatever may be the truth about the origin of the kingdom, and it is by no means impossible that the invasion really proceeded from a different quarter, we need not doubt that its dimensions were largely increased under Ceawlin. In his reign the Chronicle mentions two great victories over the Welsh, one at a place called Bedcanford in 571, by which Aylesbury and the upper part of the Thames valley fell into the hands of the West Saxons, and another at Deorham in 577, which led to the capture of Cirencester, Bath and Gloucester. Ceawlin is also said to have defeated ˆithelberht at a place called Wibbandun (possibly Wimbledon) in 568. In

592 he was expelled and died in the following year. Of his successors Ceol and Ceolwulf wc know little though the latter is said to have been engaged in constant warfare. Ceolwulf was succeeded in 61 r by Cynegils, whose son Cwichelm provoked a Northumbrian invasion by the attempted murder of Edwin in 626. These kings are also said to have come into collision with the Mercian king Penda, and it is possible that the province of the Hwicce (q.v.) was lost in their time. After the accession of Oswald, who married Cynegils's daughter, to the throne of Northumbria, both Cynegils and Cwichelm were baptized. Cynegils was succeeded in 642 by his son Cenwalh, who married and subsequently divorced Penda's sister and was on that account expelled by that king. After his return he gained a victory over the Welsh near Pen-Selwood,by which a large part of Somerset came into his hands. In 661 he was again attacked by the Mercians under Wulfhere. At his death, probably in 673, the throne is said to have been held for a year by his widow Sexburh, who was succeeded by Aescwine, 674-676, and Centwine, 676-685. According to Bede, however, the kingdom was in a state of disunion from the death of Cenwalh to the accession of Ceadwalla in 685, who greatly increased its prestige and conquered the Isle of Wight, the inhabitants of which he treated with great barbarity. After a brief reign Cead- walla went to Rome, where he was baptized, and died shortly afterwards, leaving the kingdom to Ine. By the end of the 7th century a considerable part at least of Devonshire as well as the whole of Somerset and Dorset seems to have come into the hands of the West Saxons. On the resignation of Ine, in 726, the throne was obtained by jEthelheard, apparently his brother- in-law, who had to submit to the Mercian king /Ethelbald, by whom he seems to have been attacked in 733. Cuthred, who succeeded in 740, at first acted in concert with ˆEthelbald, but revolted in 752. At his death in 7 56 Sigeberht succeeded. The latter, however, on account of his misgovernment was deserted by most of the leading nobles, and with the exception of Hampshire the whole kingdom came into the hands cf Cynewulf. Sigeberht, after putting to death the last of the princes who remained faithful to him, was driven into exile and subsequently murdered; but vengeance was afterwards taken on Cynewulf by his brother Cyneheard. Cynewulf was succeeded in 786 by Berhtric, who married Eadburg, daughter of the Mercian king Offa. Her violent and murderous conduct led to the king's death in 802; and, it is said, caused the title of queen to be denied to the wives of later kings. Berhtric was succeeded by Ecgberht (?.».), the chief event of whose reign was the overthrow of the Mercian king Beornwulf in 825, which led to the establishment of West Saxon supremacy and to the annexation by Wessex of Sussex, Surrey, Kent and Essex.

ˆEthelwulf (q.v.), son of Ecgberht, succeeded to the throne of Wessex at his father's death in 839, while the eastern provinces went to his son or

brother ˆEthelstan. A similar division took place on ˆEthelwulf's death between his two sons ˆEthelbald and /95thelberht, but on the death of the former in 858 ˆEthel- berht united the whole in his own hands, his younger brothers jEthelred and Alfred renouncing their claims. ˆEthelberht was succeeded in 865 by ˆthelred, and the latter by Alfred in 871. This was the period of the great Danish invasion which culminated

in the submission of Guthrum in 878. Shortly afterwards the kingdom of the Mercians came to an end and their leading earl ˆthelred accepted Alfred's overlordship. By 886 Alfred's authority was admitted in all the provinces of England which were not under Danish rule. From this time onwards the history of Wessex is the history of England. Kings of Wessex.

Cerdic

• 519

yEthelheard

. 728(726)

Cynric

• 534

Cuthrcd .

■ *741 (740)*

Ceawlin .

. 560 (c. 571)

Sigeberht

• 754(756)

Ccol . . .

• 592 if. 588)

Cynewull

■ *755(757)*

Ceolwulf.

• *597 (<:• 59+)*

Berhtric .

. 784(786)

Cynegils .

. 611

Ecgbert .

. 800 (802)

Cenwalh .

. 643 (c. 642)

/Ethelwulf

• *836(839)*

Sexburh .

. 672

/Ethelbald

. 855(858)

ˆscwine

. 674

iEthelberht

. 860

Ccntwine

. 676

/Ethelred

. 866

Ceadwalla

. 685

Alfred .

. 871 .

Ine

. 688

The dates are those of the annals m the Chronicle, with approximate corrections in brackets.

See Anglo-Saxon Chronicle, edited by Earle and Plummcr (Oxford, 1892-1899) ; Bede, Hist. Eccl. and Continmtio, edited by C. Plummer (Oxford, 1896) ; " Annales Lindisfarnenses," in the Monumenta Germ. hist. xix. 502-508 (Hanover, 1866); Asser, Life of King Alfred, edited by W. H. Stevenson (Oxford, 1904); W. de G. Birch, Cartularium Saxonicum (London, 1885-1893). (F. G. M. B.)

WEST, BENJAMIN (1738-1820), English historical and portrait-painter, was born on the 10th of October 1738, at Springfield, Pennsylvania, of an old Quaker family from Buckinghamshire. When a boy of seven he began to show his inclinations to art. According to a well-known story, he was sitting by the cradle of his sister's child, watching its sleep, when the infant happened to smile in its dreams, and, struck with its beauty, young Benjamin got some paper, and drew its portrait. The career thus begun was prosecuted amid many difficulties; but his perseverance overcame every obstacle, and at the age of eighteen he settled in Philadelphia as a portrait-painter. After two years he removed to New York, where he practised his profession with considerable success. In 1760, through the assistance of some friends, he was enabled to com- plete his artistic education by a visit to Italy, where he remained nearly three years. Here he acquired reputation, and was elected a member of the principal academies of Italy. On the expiry of his Italian visit he settled in London as an historical painter. His success was not long doubtful. George III. took him under his special patronage; and commissions flowed in upon him from all quarters. In 1768 he was one of the four artists who submitted to the king the plan for a royal academy, of which he was one of the earliest members; and in 1772 he was appointed historical painter to the king. He devoted his attention mainly to the painting of large pictures on historical and religious subjects, conceived, as he believed, in the style of the old masters, and

executed with great care and much taste. So high did he stand in public favour that on the death of Sir Joshua Reynolds, in 1792, he was elected his successor as president of the Royal Academy, an office which he held for twenty-eight years. In 1802 he took advantage of the opportunity afforded by the peace of Amiens to visit Paris, and inspect the magnificent collection of the masterpieces of art, pillaged from the gallery of almost every capital in Europe, which then adorned the Louvre. On his return to London he devoted himself anew to the labours of his profession, which were, however, somewhat broken in upon by quarrels with some of the members of the Royal Academy. In 1804 he resigned his office, but an all but unanimous request that he should return to the chair induced him to recall his resignation. Time did not at all weaken the energy with which he laboured at his easel. When sixty-five he painted one of his largest works, " Christ healing the Sick." This was originally designed to be presented to the Quakers in Philadelphia, to assist in erecting a hospital. On its completion it was exhibited in London to immense crowds, and was purchased by the British Institution for 3000 guineas, West sending a replica to Philadelphia. His subsequent works were nearly all on the same grand scale as the picture which had been so successful, but

they did not meet with very ready sale. He died in London on the nth of March 1820, and was buried in St Paul's.

West's works, which fond criticism ranked during his life with the great productions of the old masters, are now considered as in general formal, tame, wanting that freedom of nature and that life which genius alone can breathe into the canvas. His " Death of Wolfe ' is interesting as introducing modern costume instead of the classical draperies which had been previously universal in similar subjects by English artists; and his " Battle of La Hogue " is entitled to an honourable place among Bqjish historical paintings.

An account of West's life was published by Gait (The Progress of Genius, 1S16). See also H. T. Tuckerman, Book of the Artists (N.Y.,1868).

WEST, NICHOLAS (1461-1533), English bishop and diplo- matist, was born at Putney, and educated at Eton and at King's College, Cambridge, of which he became a fellow in 1483. He was soon ordained and appointed rector of Egglescliffe, Durham, receiving a little later two other livings and becoming chaplain to King Henry VII. In 1509 Henry VIII. appointed him dean of St George's chapel, Windsor, and in 151 5 he was elected bishop of Ely. West's long and successful career as a diplo- matist began in 1502 through his friendship with Richard Fox, bishop of Durham. In the interests of Henry VII. he visited the German king Maximilian I. and George, duke of Saxony; in 1506 he negotiated an important commercial treaty with

Flanders, and he attempted to arrange marriages between the king's daughter Mary and the future emperor Charles V., and between the king himself and Charles's sister Margaret. By Henry VIII. West was sent many times to Scotland and to France. Occupied mainly during the years 1513 and 1514 with journeys to and from Scotland, he visited Louis XII. of France in the autumn of 1514 and his successor Francis I. in 1515. In 151 5 also he arranged a defensive treaty between England and France, and he was principally responsible for treaties concluded between the two countries in 1518 and 1525, and at other times. He was trusted and employed on personal matters by Cardinal Wolsey. He died on the "28th of April 1533. The bishop built two beautiful chapels, one in Putney church and the other in Ely cathedral, where he is buried.

WESTALL, RICHARD (1 765-1836), English subject painter, was born in Hertford in 1765, of a Norwich family. In 1779 he went to London, and was apprenticed to an engraver on silver, and in 1785 he began to study in the schools of the Royal Academy. He painted " Esau seeking Jacob's Blessing," " Mary Queen of Scots going to Execution " and other historical subjects in water-colour, and some good portraits in the same medium, but he is mainly known as a book-illustrator. He produced five subjects for the Shakespeare Gallery, illustrated an edition of Milton, executed a very popular series of illustra- tions to the Bible and the prayer-book, and designed plaies for numerous other works. In 1808 he published a poem, A Day in Spring, illustrated by his own pencil. His designs are rather tame, mannered and effeminate. He became an associate of the Royal Academy in 1792, and a full member in 1794; and during his later years he was a pensioner of the Academy. He died on the 4th of December 1836. His brother, William Westall, A.R.A. (1781-1850), landscape painter, is mainly known by his illustrations to works of travel.

WESTBORO, a township of Worcester county, Massachusetts, U.S.A., about 12 m. E. of Worcester. Pop. (1890) 5195; (1900) 5400 (1127 being foreign-born); (1905, state census) 5378; (1910) 5446. Westboro is served by the Boston & Albany railway and by inteiurban electric lines. Area, about 22 sq. m. It has a public library, which has belonged to the township since 1857; and here are the Lyman School for Boys, a state industrial institution (opened in 1886 and succeeding a state reform school opened in 1846), and the W'estboro Insane Hospital (homoeopathic, 1884), which is under the general supervision of the State Board of Insanity. There are manufactures of boots and shoes, straw and leather goods, carpets, &c. Westboro was the birthplace of Eli Whitney, inventor of the cotton gin. The first settlement here was made about 1659 in a part of Marlboro called Chauncy (because of a grant of 500 acres here to Charles Chauncy, president

of Harvard College, made in 1659 and revoked in 1660 by the General Court of Massachusetts). In 1717 this part of Marlboro, with other lands, was erected into the township of Westboro, to which parts of Sutton (1728), Shrewsbury (1762 and 1793) and Upton (1763) were subsequently annexed, and from which Northboro was separated in 1766.

WEST BROMWICH, a market town and municipal, county &nd parliamentary borough of Staffordshire, England, 6 m. N.W. of Birmingham, on the northern line of the Great Western railway. Pop. (1891) 59,538, (1901) 65,175. The appearance of the town, like its growth as an industrial centre of the Black Country, is modern. It is, however, of ancient origin; thus the church of All Saints, formerly St Clement, was given by Henry I. to the convent of Worcester, from which it passed to the priors of Sand well, who rebuilt it in the Decorated period, the present structure (1872) following their plan. The chief public buildings are the town hall (1875), the Institute (1886), providing instruc- tion in science and art, under the corporation since 1894, the free library (1874) and law-courts (1891). The picturesque Oak House, of the 16th century, was opened as a museum and art gallery in 1898. Among schools is one for pauper children in which engineering, baking, spade-husbandry, &c, are taught. San dwell Hall, formerly a seat of the earls of Dartmouth, con- tains a school for daughters of clergymen, &c. The house, standing in pleasant wooded grounds, is on the site of the Bene- dictine priory of Sandwell, founded in the time of Henry II. There are charities founded by the families of Stanley and Whorwood (1613 and 1614). Dartmouth Park is a recreation ground of about 60 acres; others are Farley, Kenwick and Hill Top Park. Numerous mines work the extensive coalfields, which include a thirty-foot seam. There are large iron and brass foundries and smelting furnaces, and malting and brickmaking are carried on. The parliamentary borough returns one member. The town is governed by a mayor 6 aldermen and 18 councillors. Area, 5860 acres.

WESTBROOK, a city of Cumberland county, Maine, U.S.A., on the Presumpscot river, 5 m. N.W. of Portland. Pop. (1890) 6632, (1900) 7283 (1673 foreign-born), (1910) 8281. It is served by the Maine Centra! and the Boston & Maine railways. In Westbrook are the Walker Memorial Library (1894) and the Warren Library (1879). The river provides water- power, and among the manufactures are paper, silks, cotton goods, &c. In 1814 Westbrook was separated from Falmouth and incorporated as a township under the name of Stroudwater, and in 1815 the present name was adopted in honour of Colonel Thomas West- brook, who had

distinguished himself in wars with the Indians. In 1871 Deering, now a part of Portland, was taken from the township. A city charter was granted to Westbrook in 1889 and adopted in 1891.

WESTBURY, RICHARD BETHELL, ist Baron (1800-T873), lord chancellor of Great Britain, was the son of Dr Richard Bethell, and was born at Bradford, Wilts. Taking a high degree at Oxford in 1818", he was elected a fellow of Wadham College. In 1823 he was called to the bar at the Middle Temple. On attaining the dignity of queen's counsel in 1840 he rapidly took the foremost place at the Chancery bar and was appointed vice- chancellor of the county palatine of Lancaster in 1851. His most important public service was the reform of the then existing mode of legal education, a reform which ensured that students before call to the bar should have at least some acquaintance with the elements of the subject which they were to profess. In 1851 he obtained a seat in the House of Commons, where he continued to sit, first as member for Aylesbury, then as member for Wolver- hampton, until he was raised to the peerage. Attaching himself to the liberals, he became solicitor-general in 1852 and attorney- general in 1856 and again in 1859. On June 26, 1861, on the death of Lord Campbell, be was created lord high chancellor of Great Britain, with the title of Baron Westbury of Westbury, county Wilts. The ambition of his life was to set on foot the compilation of a digest of the whole law, but for various reasons this became impracticable. The conclusion of his tenure of the chancellorship was unfortunately marked by events which,

although they did not render pergonal corruption imputable to him, made it evident that he had acted with some laxity and want of caution. Owing to the reception by parliament of reports of committees nominated to consider the circumstances of certain appointments in the Leeds Bankruptcy Court, as well as the granting a pension to a Mr Leonard Edmunds, a clerk in the patent office, and a clerk of the parliaments, the lord chancellor felt it incumbent upon him to resign his office, which he accordingly did on the 5th of July 1865, and was succeeded by Lord Cranworth. After his resignation he continued to take part in the judicial sittings of the House of Lords and the privy council until his death. In 1872 he was appointed arbitrator under the European Assurance Society Act 1872, and his judg- ments in that capacity have been collected and published by Mr F. S. Reilly. As a writer on law he made no mark, and few of his decisions take the highest judicial rank. Perhaps the best known is the judgment delivering the opinion of the judicial committee of the privy council in 1863 against the heretical character of certain extracts from the well-known publication Essays mid Reviews. His principal legislative achievements were the passing of the Divorce Act 1857, and of the Land Registry Act 1862 (generally known as Lord Westbury's Act), the latter of which in practice proved a

failure. What chiefly distinguished Lord Westbury was the possession of a certain sarcastic humour; and numerous are the stories, authentic and apocryphal, of its exercise. In fact, he and Mr Justice Maule fill a position analo- gous to that of Sydney Smith, convenient names to whom " good things " may be attributed. Lord Westbury died on the 20th of July 1873, within a day of the death of Bishop Wilberforce, his special antagonist in debate.

See Life of Lord Westbury by T. A. Nash.

WESTBURY, an urban district in the Westbury parliamentary division of Wiltshire, England, on the river Biss, a small tributary of the Lower Avon. Pop. (1901) 3305. It is 95! m. W. by S. of London by the Great Western railway, and lies within 3 m. of the Somerset border, sheltered on the east by the high tableland of Salisbury Plain. All Saints' church is Norman and later, with a magnificent nave. In the south transept stands a monument to Sir James Ley, earl of Marlborough and president of the council in 1629; the "good earl" addressed in a sonnet by Milton. A chained black-letter copy of Erasmus' " Para- phrase of the New Testament " is preserved in the south chapel. In the suburb of Westbury Leigh is the " Palace Garden," a moated site said to have been a royal residence in Saxon times.

Westbury (Westberie, Westburi) figures in Domesday as a manor held by the king. The manor was granted by Henry II. to Reginald de Pavely in 1172-1173, and from then onwards passed through various families until in 1810 it was purchased by Sir M. M. Lopez from the earl of Abingdon. A post mote was held for Westbury in 1361-1362, but the earliest mention of the town as a borough occurs in 1442-1443. The charter of incorpora- tion is lost (tradition says it was burnt), and the town possesses no other charter. The title of the corporation was " Mayor and Burgesses of Westbury," and it consisted of a mayor, recorder and 13 capital burgesses. The borough returned two members to parliament from 1448. In 1832 the number was reduced to one, and in 1885 the representation was merged in that of the county. In 1252 Henry III. granted to Walter de Pavely a yearly fair for three days from October 31, and a weekly market on Friday. Henry VI. in 1460 granted three fairs yearly for three days from April 22, Whit Monday and September 13 respectively, and a market on Thursdays. In 1835 the mayor's fair was held at Whitsuntide, and the lord of the manor's at Easter. In 1875 a yearly sheep fair took place on the first Tuesday in September and a pleasure fair on Easter and Whit Monday; in 1888 on the first Tuesday in September and on the 24th of that month; the former still exists. In 1673 there was a market on Friday, in 1835 a nominal one on Tuesday and after 1875 it ceased. During the 18th and 19th centuries there was a considerable trade in malt, bricks, tiles and cloth. The last, once the most extensive, has now sunk into insignifi- cance,

while the others exist also only on a small scale.

WEST CHESTER, a borough and the county-seat of Chester county, Pennsylvania, U.S.A., about 20 m. W. of Philadelphia. Pop. (1890) 8028; (1900) 9524, of whom 566 were foreign-born and 1777 were negroes; (1910 census) 11,767. West Chester is served directly by the Pennsylvania and the Philadelphia, Baltimore & Washington railways and by an interurban electric line to Philadelphia; electric lines connect with the Philadelphia & Reading at Lenape, 4 m. to the south-west, and at Coatesville, 10 m. to the west. The borough lies about 450 ft. above sea-level in an undulating country. At West Chester are the West Chester State Normal School (1871), the Darlington Seminary (non- sectarian; for girls), founded in 1851 by Smedley Darlington (1827-1899; principal of the school in 1851-1861 and a repre- sentative in Congress in 1887-1891), the Friends' Graded School and the Friends' (Orthodox) Select School. There are fine botanical gardens in Marshall Square. Among the public build- ings are a county court house (1847-1848), a county jail and a county hospital (1892-1893), the public library and a large Y.M.C.A. building. The colonial Turk's Head Hotel here has been so called since 1768 and was probably first opened in 1762. West Chester is in a farming country with important market- gardens and dairy farms; among its manufactures are dairy implements, foundry and machine-shop products and carriage and wagon materials. The factory product in 1905 was valued at $2,121,185. There are several large nursery farms here. West Chester was first settled in 1713, succeeded Chester as the county-seat in 1784-1786, and was incorporated as a town in 17S8 and as a borough in 1799. During the War of Independence the battle of Brandywine was fought about 7 m. S. of West Chester on the nth of September 1777, and on the 20th General Anthony Wayne, with a small force, was surprised and routed by the British at Paoli, about 8 m. N.E.

WESTCOTT, BROOKE FOSS (1825-1901), English divine and bishop of Durham, was born on the 12th of January 1825 in the neighbourhood of Birmingham. His father, Frederick Brooke Westcott, was a botanist of some distinction. Westcott was educated at King Edward VI. school, Birmingham, under James Prince Lee, where he formed his friendship with Joseph Barber Lightfoot (g.v.). In 1844 Westcott obtained a scholarship at Trinity College, Cambridge. He took Sir William Browne's medal for a Greek ode in 1846 and 1847, the Members' Prize for a Latin essay in 1847 as an undergraduate and in 1849 as a bachelor. He took his degree in January 1848, obtaining double-first honours. In mathematics he was

twenty-fourth wrangler, Isaac Todhunter being senior. In classics he was senior, being bracketed with C. B. Scott, afterwards headmaster of Westminster. After obtaining his degree, Westcott remained for four years in residence at Trinity. In 1849 he obtained his fellowship; and in the same year he was ordained deacon and priest by his old headmaster, Prince Lee, now bishop of Manchester. The time spent at Cambridge was devoted to most strenuous study. He took pupils; and among his pupils there were reading with him, almost at the same time, his school friend Lightfoot and two other men who became his attached and lifelong friends, E. W. Benson and F. J. A. Hort (qq.v.). The inspiring influence of Westcott 1 5 intense enthusiasm left its mark upon these three distinguished men; they regarded him not only as their friend and counsellor, but as in an especial degree their teacher and oracle. He devoted much attention to philosophical, patristic and historical studies, but it soon became evident that he would throw his strength into New Testament work. In 1851 he published his Norrisian prize essay with the title Elements of the Gospel Harmony.

In 1852 he became an assistant master at Harrow, and soon afterwards he married Miss Whithard. He prosecuted his school work with characteristic vigour, and succeeded in combining with his school duties an enormous amount both of theological research and of literary activity. He worked at Harrow for nearly twenty years under Dr C. J. Vaughan and Dr Montagu Butler, but while he was always conspicuously successful in inspiring a few senior boys with something of his own intellectual and moral enthusiasm, he was never in the same measure capable

*of maintaining discipline among large numbers. The writings which he produced at this period created a new epoch in the history of modern English theological scholarship. In 1855 he published the first edition of his History of the New Testament Canon, which, frequently revised and expanded, became the standard English work upon the subject. In 1859 there appeared his Characteristics of the Gospel Miracles. In i860 he expanded his Norrisian essay into an Introduction to the Study of the Gos*pels, a work remarkable for insight and minuteness of study, as well as for reverential treatment combined with considerable freedom from traditional lines. Westcott's work for Smith's Dictionary of the Bible, notably his articles on " Canon," " Maccabees," 11 Vulgate," entailed most careful and thorough preparation, and led to the composition of his subsequent valuable popular books, The Bible in the Church (1864) and a History of the English Bible (1869). To the same period belongs The Gospel of the Resurrection (1866). As a piece of consecutive reasoning upon a fundamental Christian doctrine it deservedly attracted great attention. Its width of view and its recognition of the claims of historical science and pure reason were thoroughly character- istic of Westcott's mode of discussing a theological question. At the time when the book appeared his*

method of apologetic showed both courage and originality, but the excellence of the work is impaired by the difficulty of the style.

In r865 he took his B.D., and in 1870 his D.D. He receivecl in later years the honorary degrees of D.C.L. from Oxford (1881) and of D.D. from Edinburgh (1883). In 1S68 Westcott wˆas appointed examining chaplain by Bishop Connor Magee (of Peterborough) ; and in the following year he accepted a canonry at Peterborough, which necessitated his leaving Harrow. For a time he contemplated with eagerness the idea of a renovated cathedral life, devoted to the pursuit of learning and to the development of opportunities for the religious and intellectual benefit of the diocese. But the regius professorship of divinity at Cambridge fell vacant, and Lightfoot, who was then Hulsean professor, declining to become a candidate himself, insisted upon Westcott's standing for the post. It was due to Lightfoot's support almost as much as to his own great merits that Westcott was elected to the chair on the 1st of November 1870. This was the turning-point of his life. He now occupied a great position for which he was supremely fitted, and at a juncture in the reform of university studies when a theologian of liberal views, but universally respected for his massive learning and his devout and single-minded character, would enjoy a unique opportunity for usefulness. Supported by his friends Lightfoot and Hort, he threw himself into the new work with extraordinary energy. He deliberately sacrificed many of the social privileges of a university career in order that his studies might be more con- tinuous and that he might see more of the younger men. His lectures were generally on Biblical subjects. His Commentaries on St John's Gospel (1881), on the Epistle to the Hebrews (1889) and the Epistles of St John (1883) resulted from his public lectures. One of his most valuable works, The Gospel of Life (1892), a study of Christian doctrine, incorporated the materials upon which he was engaged in a series of more private and esoteric lectures delivered on week-day evenings. The work of lecturing was an intense strain to him, but its influence was immense: to attend one of Westcott's lectures — even to watch him lecturing — -was an experience which lifted and solemnized many a man to whom the references to Origen or Rupert of Deutz were almost ludicrously unintelligible. Between the years 1870 and 1881 Westcott was also continually engaged in work for the revision of the New Testament, and, simultaneously, in the preparation of a new text in conjunction with Hort. The years in which Westcott, Lightfoot and Hort could thus meet frequently and naturally for the discussion of the work in which they were all three so deeply engrossed formed a happy and privileged period in their lives. In the year 1881 there appeared the famous Westcott and Hort text of the New Testament, upon which had been expended nearly thirty years of incessant labour. The reforms in the regulations for degrees in divinity, the formation and first revision of the

new theological tripos,

the inauguration of the Cambridge mission to Delhi, the institu- tion of the Church Society (for the discussion of theological and ecclesiastical questions by the younger men), the meetings for the divinity faculty, the organization of the new Divinity School and Library and, later, the institution of the Cambridge Clergy Training School, were all, in a very real degree, the result of Westcott's energy and influence as regius professor. To this list should also be added the Oxford and Cambridge preliminary examination for candidates for holy orders, with which he was from the first most closely identified. The success of this very useful scheme was due chiefly to his sedulous interest and help.

The departure of Lightfoot to the see of Durham in 1S79 was a great blow to West cot t. Nevertheless it resulted in bring- ing him into still greater prominence. He was compelled to take the lead in matters where Lightfoot's more practical nature had previously been predominant. In 1883 Westcott was elected to a professorial fellowship at King's. Shortly afterwards, having previously resigned his canonry at Peterborough, he was appointed by the crown to a canonry at Westminster, and accepted the position of examining chaplain to Archbishop Benson. His little edition of the Paragraph Psalter (1879), arranged for the use of choirs, and his admirable lectures on the Apostles' Creed, entitled Historic Faith (1883), are reminiscences of his vacations spent at Peterborough. He held his canonry ai. Westminster in conjunction with the regius professorship. The strain of the joint work was very heavy, and the intensity of the interest and study which he brought to bear upon his share in the labours of the Ecclesiastical Courts Commission, of which he had been appointed a member, added to his burden.

Preaching at the Abbey gave him a valued opportunity of deal- ing with social questions. His sermons were generally portions of a series; and to this period belong the volumes Christus Consummator (1886) and Social Aspects of Christianity (1887).

In March 1890 he was nominated to the see of Durham, there to follow in the steps of his beloved friend Lightfoot, who had died in December 1889. He was consecrated on the 1st of May at Westminster Abbey by Archbishop Thompson (of York), Hort being the preacher, and enthroned at Durham cathedral on the 15th of May. The change of work and surroundings could hardly have been greater. But the sudden immersion in

the practical administration of a northern diocese gave him new strength. He surprised the world, which had supposed him to be a recluse and a mystic, by the practical interest he took in the mining population of Durham and in the great shipping and artisan industries of Sunderland and Gateshead. Upon one famous occasion in 1892 he succeeded in bringing to a peaceful solution a long and bitter strike which had divided the masters and men in the Durham collieries; and his success was due to the confidence which he inspired by the extraordinary moral energy of his strangely " prophetic " personality, at once thoughtful, vehement and affectionate. His constant endeavour to call the attention of the Church to the religious aspect of social questions was a special note in his public utterances. He was a staunch supporter of the co-operative movement. He was practically the founder of the Christian Social Union. He continually insisted upon the necessity of promoting the cause of foreign missions, and he gladly gave four of his sons for the work of the Church in India. His energy was remarkable to the very end. But during the last two or three years of his life he aged considerably. His wife, who had been for some years an invalid, died rather suddenly on the 28th of May 1901, and he dedicated to her memory his last book, Lessons from Work (1901). He preached a farewell sermon to the miners in Durham cathedral at their annual festival on the 20th of July. Then came a short, sudden illness, and he passed away on the 27th of July.

Westcott was no narrow specialist. He had the keenest love of poetry, music and art. He was himself no mean draughtsman, and used often to say that if he had not taken orders he would have become an architect. His literary sympathies were wide. He would never tire of praising Euripides, while few men had given such minute study to the writings of Robert Browning. He followed with delight the development of natural science

studies at Cambridge. He spared no pains to be accurate, or to widen the basis of his thought. Thus he devoted one summer vacation to the careful analysis of Comte's Politique positive. He studied assiduously The Sacred Books of the East, and earnestly contended that, no systematic view of Christianity could afford to ignore the philosophy of other religions. The outside world was wont to regard him as a mystic; and the mystical, or sacramental, view of life enters, it is true, very largely into his teaching. He had in this respect many points of similarity with the Cambridge Platonists of the 17 th century, and with F. D. Maurice, for whom he had profound regard. But in other respects he was very practical; and his strength of will, his learning and his force of character made him really masterful in influence wherever the subject under discussion was of serious moment. He was a strong supporter of Church reform, especially in the direction of obtaining larger powers for the laity.

He kept himself aloof from all party strife. He describes him- self when he says, " The student of Christian doctrine, because he strives after exactness of phrase, because he is conscious of the inadequacy of any one human formula to exhaust the truth, will be filled with sympathy for every genuine endeavour towards the embodiment of right opinion. Partial views attract and exist in virtue of the fragment of truth — be it great or small — which they include; and it is the work of the theologian to seize this no less than to detect the first spring of error. It is easier and, in one sense, it is more impressive to make a per- emptory and exclusive statement, and to refuse to allow any place beside it to divergent expositions; but this show of clear- ness and power is dearly purchased at the cost of the ennobling conviction that the whole truth is far greater than our individual minds. He who believes that every judgment on the highest matters different from his own is simply a heresy must have a mean idea of the faith; and while the qualifications, the reserve, the lingering sympathies of the real student make him in many cases a poor controversialist, it: may be said that a mere con- troversialist cannot be a real theologian " {Lessons from Work, pp. 84-85). His theological work was always distinguished by the place which he assigned to Divine Revelation in Holy Scripture and in the teaching of history. His own studies have largely contributed in England to the better understanding of the doctrines of the Resurrection and the Incarnation. His work in conjunction with Hort upon the Greek text of the New Testa- ment will endure as one of the greatest achievements of English Biblical criticism. The principles which are explained in Hort's introduction to the text had been arrived at after years of elabor- ate investigation and continual correspondence and discussion between the two friends. The place which it almost at once took among scientific scholars in Great Britain and throughout Europe was a recognition of the great advance which it repre- sented in the use and classification of ancient authorities. His commentaries rank with Lightfoot's as the best type of Biblical exegesis produced by the English Church in the 19th century.

The following is a bibliography of Westcott's more important writings, giving the date of the first editions : — Elements of the Gospel Harmony (1851); History of the Canon of First Four Centuries (1853); Characteristics of Gospel Miracles (1859); Introduction to the Study of the Gospels (i860); The Bible in the Church (1864); The Gospel of the Resurrection (1 866) ; Christian Life Manifold and One (1869); Some Points in the Religious Life of the Universities (1873); Paragraph Psalter for the Use of Choirs (1879); Commentary on the Gospel of St John (1881); Commentary on the Epistles of St John (1883); Revelation of the Risen Lord (1882); Revelation of the Father (1884); Some Thoughts from the Ordinal (1884); Christus Consummator (1886); Social Aspects of Christianity (1887); The Victory of the Cross: Sermons in Holy Week

(1888); Commentary on the Epistle to the Hebrews (1889) ; From Strength to Strength (1890) ; Gospel of Life (1892); The Incarnation and Common Life (1893); Some Lessons of the Revised Version of the New Testament (1897); Christian Aspects of Life (1897); Lessons from Work (1901).

Lives by his son B. F. Westcott (1903), and bv J. Clavton (1906). (H. E. R.")*

WESTERLY, a township of Washington county, Rhode Island, U.S.A., in the extreme S.W. part of the state, about 44 m. S.S.W. of Providence, separated from Connecticut on the W. by the Pawcatuck river, which forms the northern boundary

of the township also. Pop. (1890) 6813, (1000) 7541, (1788 being foreign-born and 185 negroes), (1905, state census) 8381, (1910) 8696. Area, about 31 sq. m. Westerly is served by the New York, New Haven & Hartford railway, and by interurban electric lines connecting with Norwich and New London, Conn. The township includes several small villages, connected by electric railways, the best known being Watch Hill, which has fine sea-bathing. Larger villages are Westerly, in the western part of the township and at the head of navigation (for small vessels) on the Pawcatuck river, and Niantic, in the north- eastern part of the township. In Westerly there is a public library (1894), with 23,323 volumes in 1909. Beyond Watch Hill Point on the S.W. point of an L-shaped peninsula, running first W. and then N., is Napatree Point, on which is Fort Mans-field, commanding the N.E. entrance to Loug Island Sound. The township is the centre of the granite industry of the state; the quarries are near the villages of Westerly and Niantic. The granite is of three kinds: white statuary granite, a quartz monzonite, with a fine even-grained texture, used extensively for monuments; blue granite, also a quartz monzonite and also much used for monuments; and red granite, a biotite granite, reddish grey in colour and rather coarse in texture, used for buildings. 1 Among the manufactures are cotton and woollen goods, thread and printing presses. The water supply is from artesian wells. The first settlement here was made in 1661, and the township was organized in 1669, when the present name was adopted instead of the Indian Misquamicut (meaning " salmon ") by which it had been called. In 1686 the name was changed to Haversham, but in 1689 the present name was restored.

See Frederic Dcnison, Westerly and its Witnesses, for Two Hundred and Fifty Years, 1626-1876 (Providence, R.I., 1878).

WESTERMANN, FRANCOIS JOSEPH (d. 1794), French general, was born at Molsheim in Alsace. At an early age he entered a cavalry regiment, but soon left the service and went to Paris. He embraced enthusiastically the ideas of the Revolution , and in 1790 became greffier of the municipality of Haguenau. After a short imprisonment on a charge of inciting emeutes at Haguenau, he returned to Paris, where he joined Danton and played an important part in the attack on the Tuileries on the 10th of August 1792. He accompanied Dumouricz on his cam- paigns and assisted him in his negotiations with the Austrians, being arrested as an accomplice after the general's defection. He succeeded, however, in proving his innocence, and was sent with the rank of general of brigade into La Vendee, where he distinguished himself by his extraordinary courage, by the audacity of his manoeuvres, and by his severe treatment of the insurgents. After suffering a defeat at Chatillon, he vanquished the Vendeans at Beaupreau, Laval, Granville and Baug6, and in December r793 annihilated their army at Le Mans and Savenay. He was then summoned to Paris, where he was pro- scribed with the Dantonist party and executed on the 5th of April 1794.

See P. I loll, Nos- ge'ne'raux alsaciens . . . Weslermann (Strassburg, 1900J.

WESTERN AUSTRALIA, a British colonial state, forming part of the Commonwealth of Australia. (For Map, see Aus- tralia.) This portion of Australia lies to the west of t29° E. long., forming considerably more than one- third of the whole; it has an area of 1,060,000 sq. m., is 1400 m. in length and 850 in breadth, and has a coast-line of 3500 m. It is divided into five districts — Central, Central Eastern, South-Eastcrn, North and Kimberley. The Central or settled district, in the south- west, is divided into twenty-six counties. Apart from the coast lands, the map presents almost a blank, as the major portion is practically a dry waste of stone and sand, relieved by a few shallow salt lakes. The rivers of the south are small — the Black- wood being the most considerable. To the north of this are the Murray, the well-known Swan, the Moore, the Greenough and the Murchison. The last is 400 m. long. Shark's Bay receives the Gascoyne (200 m. long), with its tributary the Lyons.

1 See T. N. Dale, The Chief Commercial Granites of Massachusetts, New Hampshire and Rhode Island (Washington, 1908), Bulletin 354 of the United States Geolocical Survey.

Still farther north, where the coast trends eastward, the principal rivers are the Ashburton, the Fortescue and the De Grey. Kimberley district to the north-east has some fine streams — the Fitzroy and Ord and their tributaries, on some of which (the Mary, Elvira, &c.) are the goldlicld s, 250 m. south of Cambridge Gulf. The Darling mountain range is in the

south-west, Mount William reaching 3000 ft. ; in the same quarter are Toolbrunup (3341 ft.), Ellen's Peak (3420), and the Stirling and Victoria ranges. Gardner and Moresby are flat-topped ranges. Mount Elizabeth rises behind Perth. Hampton tableland overlooks the Bight. In the north-west are Mount Bruce (4000 ft.), Augustus (3580), Dalgaranger (2100), Barlee, Pyrton and the Capricorn range. Kimberley has the King Leopold, M'Clintock, Albert Edward, Hardman, Gcikic, Napier, Lubbock, Oscar, Mueller and St George ranges. The lake district of the interior is in the Gibson and Victoria deserts from 24° to 32″ S. The lakes receive the trifling drainage of that low region. Almost all of them are salt from the presence of saline marl.

Geology. — The main mass of Westralia consists of a vast block of Archean rocks, which forms the whole of the western half of the Australian continent. The rocks form a plateau, which faces the coast, in a series of scarps, usually a short distance inland. The edge of this plateau is separated from the Southern Ocean by the Nullarbor limestones, at the head of the Great Australian Bight; but they gradually become narrower to the west; and the Archean rocks reach the coast at Port Dempster and to the east of Esperance Bay. Thence the southern boundary of the Archean rocks extends due west, while the coast trends southward, and is separated by a belt of Lower Palaeozoic and Mesozoic deposits; but the reappearance of the granitic rocks at King George Sound and Albany may be due to an outlier of the Archean tableland. Along the western coast, the scarp of the Archean plateau forms the Darling Range behind Perth. Further north, behind Shark's Bay, the plateau recedes from the coast, and trends north-westward through the Hammersley Mountains and the highlands of Pilbarra. The Archean rocks underlie the Kimberley Goldfield; but they are separated from the main Archean plateau to the south by the Lower Palaeozoic rocks, which extend up the basin of the Fitzroy river and form the King Leopold and Oscar Ranges.

The Archean rocks arc of most interest from the auriferous lodes which occur in them. The Archean rocks of the area between the Darling Range and the goldfield of Coolgardie were classified by II. P. Woodward into six parallel belts, running northward and southward, but with a slight trend to the west. The westernmost belt consists of clay slates, quartzites and schists, and is traversed by dykes of diorite and fclstone; the belt forms the western foot of the Archean plateau, along the edge of the coastal plain. The second belt consists of gneisses and schists, and forms the western part of the Archean plateau. Its chief mineral deposit is tin, in the Green-bushes tin-field, and various _ other minerals, such as graphite and asbestos. Then follows a wide belt of granitic rocks; it has no permanent surface water and is bare of minerals, and, therefore, formed for a long time an effective barrier to the settle- ment or prospecting of the country to the east. _ This

granitic band ends to the east in the first auriferous belt, which extends from the Phillips river, on the southern coast, to Southern Cross, on the Perth to Kalgoorlie railway; thence it goes through Mount Magnet, Lake Austin and the Murchison Goldfield at Nannine, and through the Peak Goldfield to the heads of the Gascoyne and Ashburton rivers. To the east of this belt is a barren band of granites and gneisses, succeeded again eastward by the second auriferous belt, including the chief goldfields of Westralia. They begin on the south with the Dundas Goldfield, and the mining centre of Norseman; then to the north follow the goldfields of Kalgoorlie, with its Golden Mile at Boulder, and the now less important field of Coolgardie. This line continues thence through the goldfields of Leonora and Mount Margaret, and reappears behind the western coast in the Pilbarra Goldfield. The rocks of the goldfields consist of amphobolite-schists and other basic schists, traversed by dykes of granite, diorite and porphyrite, with some peridotites. Some of^ the ainphibolites have been crushed and then silicified into jasperoids, so that they much resemble altered sedimentary slates.

The Palaeozoic group is represented by the Cambrian rocks of the Kimberley Goldfield, which have yielded Oknettus forresti. There appear to be no certain representatives of the Ordovician system; while the Silurian is represented in the King Leopold Range of Kimberley, and, according to II. P. Woodward, in the contorted, unfossilliferous quartzites and shales of the Stirling Range, north of Albany. The Upper Palaeozoic is well represented by an area of some 2000 sq. m. of Devonian sedimentary and volcanic rocks in the Kimberley district, and by the Carboniferous system, including both a lower, marine type, and an upper, terrestrial type. The Lower Carboniferous limestones occur in the Napier, ■ Oscar and Geikie Ranges ol Kimberley, and in the basin of the Gascoyne river, where they contain the glacial deposits discovered by Gibb-MaitlancL

between the Wooramel and Minilya rivers. The upper and terrestrial type of the Carboniferous include sandstones with Stigmaria and Lepidodendron in the" Kimberley district, and the coals of the Irwin coalfield, the age of which is proved by the interstratification of the coal seams with beds containing Productus subquadratus, Cyrtina carbonaria and Aviculopecten subquinquelineatus. The Mesozoic rocks were discovered in 1861, and their chief outcrop is along the western coast plains of Wcstralia between Geraldton and Perth. They have been pierced by many bores put down for artesian wells. The fossils indicate a Lower Jurassic age ; and r according to Etheridge, some of the fossils are Lower Cretaceous. The Collie coalfield,

to the east of Eunbury, is generally regarded as Mesozoic. Its coal is inferior in quality to that of Eastern Australia, and contains on an average of 34 analyses 11-77% Q1 nioistu re, and 8 ■ 62 % of ash. According to Etheridge its age is Permo-Carboniferous. The Kainozoic rocks include the marine limestones in the Nullarbor Plains at the head of the Great Australian Bight, whence they extend inland for 150 m. They have no surface water, but the rain- fall in this district nourishes artesian wells. The occurrence of marine Kainozoic beds under the western coastal plain is proved by the bores, as at Carnarvon, where they appear to be over 1000 ft. in thickness. The coastal region also includes sheets of clay and sandstone, with deposits of brown coal as on the Fitzgerald river on the southern coast, and in the basin of the Gascoyne. The Archean plateau of the interior is covered by wide sheets of sub- aerial and lacustrine deposits, which have accumulated in the basins and river valleys. They include mottled clays, lateritic ironstones and conglomerates. In places the materials have been roughly assorted by river action, as in the deep lead of Kanowna. The clays contain the bones of the Diprotodon, so that they are probably of Upper Pliocene or Pleistocene age. The Kainozoic volcanic period of Australia is represented by the basalts of Bunbury and Black Point, east of Flinders Bay.

A bibliography of Westralian geology has been issued by Maitland, Bulletin Geol. Survey, No. 1, 1898. An excellent summary of the mineral wealth of the state has been given by Maitland, Bulletin 8, No. 4, 1900, pp. 7-23, also issued in the Year-book of Western Australia. The main literature of the geology of Westralia is in the Bulletins of the Geol. Survey, and in the reports of the Mines De-

Eartment. A general account of the gold-mining has been given y A. G. Charleton, 1902; and also by Donald Clark, Australian Mining and Metallurgy (1904). (J. W. G.)

Flora. — Judged by its vegetable forms, Western Australia would seem to be older than eastern Australia, South Australia being of intermediate age. Indian relations appear on the northern side, and South African on the western. There are fewer Antarctic and Polynesian representatives than in the eastern colonies. European forms are extremely scarce. Compared with the other side of Australia, a third of'the genera on the south-west is almost wanting in the south-east. In the latter, 55, having more than ten species each, have 1260 species; but the former has as many in 55 of its 80 genera. Of those 55, 36 are wanting in the south-east, and 17 arc absolutely peculiar. There are fewer natural orders and genera westward, but more species. Baron von Miiller declared that " nearly half of the whole vegetation of the Australian continent has been traced to within the boundaries of the Western Australian territory." He includes 9 Malvaceae,

6Euphorbiaceae,2 Rubiaceae, 9 Proteaceae, 47 Leguminosae, 10 Myrtaceae, 12 Compositae, 5 Labiatae, 6 Cyperaceae, 13 Convolvulaceae, 16 Gramineae, 3 Filices, 10 Amaranthaceae. Yet over 500 of its tropical species arc identified with those of India or Indian islands. While seven-tenths of the orders reach their maximum south-west, three-tenths do so south-east. Cypress pines abound in the north, and ordinary pines in Rottnest Island. Sandalwood {Santalttm _ cygnorum) _ is exported. The gouty stem baobab (Adansonia) is in the tropics. Xanthorrkoea,the grass tree, abounds in sandy districts. Mangrove bark yields a purple tan. Palms and zamias begin in the north- west. The Melaleuca Leucadendron is the paperbark tree of settlers. The rigid-leafed Banksia is known as the honeysuckle. Casuarinae are the he and she oaks of colonists, and the Exocarpus is their cherry tree. Beautiful flowering shrubs distinguish the south-west; and the deserts are all ablaze with flowers after a fall of rain. Poison plants are generally showy Leguminosae, Sida and the Gastrolohium.

The timber trees of the south-west are almost unequalled. Of the Eucalypts, the jarrah or mahogany, E. marginata, is first for value. It runs over five degrees of latitude, and its wood resists the teredo and the ant. Sir Malcolm Eraser assigns 14,000 sq. m. to the jarrah, 10,000 to E. viminalis, 2300 to the karri (E. colossea or E. diver sicolor) , 2400 to York gum (E. loxophleba), 800 to the red gum (£. calophylla) and 500 to tuart or native pear (E. gompho- cephala). Not much good wood is got within 20 m. of the coast. The coachbuilder's coorup rises over 300 ft. Morrel furnishes good timber and rich oil. An ever- increasing trade is done in the timber of the south-western forests.

Fauna. — Among the mammals are the Macropus giganteus, M. irma, M. datna, M. brachyurus, Lagorchesles fasciatus, Bettongia penicillata, Phaldngista vulpecula, Pseudochirus cooki, Dasyurus geoffroyi, Tarsipes rostratus, Antechinus apicalis, Perameles obesula, Perameles myosurus, Myrmecobius fasciatus. Fossil forms partake

of the existing marsupial character, Diprotodon being allied to the wombat and kangaroo. ■ Nail-bearing kangaroos are in the north- west ; the banded one, size of a rabbit, is on Shark's Bay. Nocturnal phalangers live in holes of trees or in the ground. Carnivorous Phascogalae are found in south-west. There are three kinds of wombat. The rock-loving marsupial Ospkranter is only in the north-east, and Perameles bougainvillei at Shark's Bay. The dalgytc or Petrogale lagotis is at Swan river and Hypsiprymnus w the south. The colony has only two species of wallabies to five in New South Wales. The Halmaturus of the Abrolhos is a sort of wallaby; a very elegant species is 18 in. long. The pretty Vromicia, 6 in. long, lives on stamens and nectar, like the Tarsipes, having a brush at the tip of its

tongue; its tail is prehensile. The hare-like Lagorckestes fasciatus is a great leaper. The Hapalotis of the interior has nests in trees. Beaver rats and other small rodents are trouble- some, and bats are numerous. The dingo is the wild dog. The platypus {Ornithorhynchus) and the Echidna are the only forms of the Monotremata. The seal, whale and dugong occur in the adjacent seas.

The west is not so rich as the east of Australia in birds. Many forms are absent and others but poorly represented, though some are peculiar to the west. The timbered south-west has the greatest variety of birds, which are scarce enough in the dry and treeless interior. Of lizards the west has 12 genera not found in eastern Australia. Of snakes there are but 15 species to 3 in Tasmania and 31 in New South Wales. While the poisonous sorts are 2 to 1 in the east, they arc 3 to 1 in the west. The turtle is obtained as an article of food. The freshwater fishes are not all like those 01 the cast. They include the mullet, snapper, ring fish, guard fish, bonita, rock cod, shark, saw fish, parrot fish and cobbler. Under the head of fisheries may be mentioned the pearl oyster, which is dived for by natives at Shark's Bay; the trepang or beche-de-mer is also met with in the north. Insects are well represented, especially Coleoptera, Lepidoptera, Hymenoptera, Hemiptera and Diptera.

Climate, — With little ˆov no cold anywhere, the heat of _ summer over the whole area is considerable. Western Australia differs from the country to the east in having no extensive ranges to collect vapour, while the trade winds blow off the dry land instead of from the ocean; for these two reasons the climate is very dry. Thunder- storms often supply almost the only rainfall in the interior. The south-western corner, the seat of settlements, is the only portion where rains can be depended on for cultivation ; but even there few places have a rainfall of 40 in. As one goes northward the moisture lessens. The north-west and all the coast along to Kimberley, with most of that district, suffer much from dryness. The north-cast comes in summer within the sphere of the north-west monsoons, though just over the low coast-range few showers are known. The south coast, exposed to polar breezes, with uninterrupted sea, has to endure lengthened droughts. In the Swan river quarter the rainfall is in winter, being brought by north-west winds, and summer days have little moisture. While the south wind cools the settled region, it comes over the parched interior to the northern lands. The hot wind of Swan river is from the east and north-east; but it is from the south in summer to Kimberley and the north-west. In one season the land breeze is hot, in another cool, but always dry.

The climate of Perth is typical of the south-western districts. There are two distinct seasons, the winter and the summer. The winter commences

somewhat abruptly, being ushered in by heavy rains; it begins usually not earlier than the middle of April or later than the middle of May, and continues until towards the end of October. The winters are, as a rule, very mild, but there is some cold weather in July and August, and though there is little at the coast, frost is not uncommon inland. The summer is heralded by an occasional hot day in October, in November the weather becomes settled and continues warm until the end of March. In the four montha, December to March, the maximum temperature in the shade exceeds 90° on an average on 37 days, but as a rule the heat does not last long, the evenings and nights being tempered by a cool breeze.

*In the interior the climate resembles that of the south-west in regard to the occurrence of two seasons only. The winter, however, has much less rain than on the coast, and is cold, clear and bracing. The summer is, as a rule, hot, but is tempered in the south by occasional cool changes, though unrelieved as the tropic is ap- proached. Within the tropics there are two seasons, the wet and the dry. The wet season is most unpleasant, the temperature rarely falling below ioo°; the dry season, which lasts from April to November, is usually fine, clear and calm. The average rainfall at Perth is 33 in. falling on 1 10 days; the mean maximum tempera- ture is 74-9 and the minimum 54-8°; at Coolgardie the mean maximum is 77-8° and the mean minimum 52-4 ; at Wyndham, on the north-west coast, the mean maximum is 93-9° and the mini- mum 75*4°**

Population. — Population made very slow increase tinder the old conditions of settlement, and even when gold was discovered in X882 at Kimberley, and five years later at Yilgarn, no great impetus was given to the colony, and at the census of 1891 the population was still under 50,000. The sensational gold finds

at Coolgardie in 1892, however, had a most important influence in drawing population, and in three and a half years the population was doubled: during a portion of this time the rush of miners to the gold-fields was so great as to be reminiscent of the ex- perience of the eastern colonies during the 'fifties. At the end of 1905 the population was 254,779, comprising 150,495 males and 104,284 females. The slowness of the early growth and the more rapid strides of later years will be gathered from the follow- ing figures: pop. (i860) 15,227, (1870) 25,084, (1880) 29,019, (1890) 46,290, (1895) 101,238, (1901) 194,889. The chief towns of Western Australia are: Perth — the capital — 56,000, Fremantle 23,008, Kalgoorlie 6780, Boulder 5658. The number of people in all gold-field

towns fluctuates very greatly. Cool- gardie, for example, was returned in July 1894 as having within its municipal boundaries 12,000 people; in 1905 it had only 3830.

The births during 1905 numbered 7582 and the deaths 2709, the rates per thousand of population being respectively 30-30 and 10-83, showing a net increment of 19-47 P er 1000. In the period 1861- 1865 the birth-rate was 39-07 per 1000. Between 1S86 and 1890 it stood at 36-88; then came a rapid decline, and in 1896 was reached the low level of 22-67 P er 1000. In 1904 the rate was 30-34 per 1000. The decline in the birth-rates has been a common experience of all the Australian states; in Western Australia it was due in a large degree to the decline in the proportion of females to males. In 1870 the females numbered 62% of the males, and in 1880 75%, while in 1895 the proportion was only 45%. The illegitimate births during 1905 were 4-19% of the total births. The death-rate, which in 1897 was 16-99 per 1000, has steadily declined in recent years. The large influx of young unmarried men in the years 1894-1898 was followed by the arrival of a large number of single women, and the marriage-rates increased from 7 per 1000 in the five years 1891-1895 to 10-7 per 1000 in 1897. In 1905 the rate stood at the more normal level of 8-48. Except for a slight influx of population in the three years 1 885-1 887, due to the gold dis- coveries at Kimberley, there was very little immigration to Western Australia prior to 1891 ; in that year, however, there was a consider- able inpouring of population from the eastern colonies, notably from Victoria and South Australia, and in the seven years which closed with 1897 the population of the colony gained nearly 110,000 by immigration alone. In 1898 there was still a large inflow of population, but the outflow was also great, and in 1898 and the following year the two streams balanced one another; but 1900 showed an excess of 6000, and 1905 of 7617 gained by immigration.

Western Australia is the most sparsely populated of all the states; only the coastal fringe and the gold-fields show any evidences of settlement, and if the area were divided amongst the population there would be but ten persons to 52 . sq. m. The population is almost exclusively of British origin, and only differs from that of the other states in that there is a larger body of Australian-born, who are not natives of the colony itself. About 45% of the population are members of ‘ the Church of England; one-fourth belong to other Protestant denominations, and one-fourth are Roman Catholics.

Administration.— In 1890 Western Australia, up to that time a crown colony administered by a governor, was granted responsible government. The legislative authority is vested in a parliament composed of two Houses — a Legislative Council, whose thirty members are elected for six years, and a Legislative Assembly of fifty members, elected by adult suffrage (men

and women). As a portion of the Commonwealth, Western Australia sends six senators and five representatives to the federal parlia- ment. In a country so sparsely settled municipal government has little scope for operation.

So far forty-four municipalities have been gazetted. Besides the municipalities there are district roads boards, elected by the ratepayers of their respective districts to take charge of the formation, construction and maintenance of the public roads throughout their districts. There were in 1905 ninety-four such boards in existence. Some of the districts are of enormous size: Pilbarra, for example, has an area of 14,356 sq. m.; Cool- gardie North has 75,968 sq. m.; Nullagine has 90,438 sq. m., and the Upper Gascoyne has 136,000 sq. m. Over areas so vast little effective work can be accomplished, but where the districts are small the administration is much the same as in the munici- ipalitics. The receipts from rates of all local districts in 1905 was £104,760, and the grants by the government £80,938, making a total of £185,698.

Education. — Attendance at school is compulsory upon all children over six years and under fourteen years of age. Instruction is imparted only in secular subjects, but the law allows special religious teaching to be given during half an hour each day by clergymen to children of their own denomination. Children can claim free educa- tion on account of inability to pay fees, of living more than a mile from school, or of having attended school for more than 400 half-days during the preceding year. The state expended in 1905 £131,585 on public instruction, the great bulk of which was devoted to primary schools. The number of schools supported by the state in that year was 335, the teachers numbered 888, the net enrolment of scholars was 27,978, and the average attendance 23,703. There were in 1905 99 private schools with 350 teachers and 7353 scholars, the average attendance being 6128.

Judged by the number of persons arrested, crime is more prevalent than in any other part of Australia. The gold-fields have attracted some of the best and most enterprising of the Australian population; at the same time many undesirable persons flocked to the state expecting to reap a harvest in the movement and confusion of the gold diggings. These latter form a large part of the criminal population of the state. The arrests in 1905 numbered 14,646, of which 2104 were for serious offences; so that for every thousand of the population 49 were arrested for trivial and 8 for serious crimes.

Finance. — The discovery of gold and the settlement on the gold- fields of a large population, for the most part consumers of dutiable goods, has entirely revolutionized the public finances of the state. In 1891 the revenue

was £497,670, that is, £10, 15s. per inhabitant; in 1895 it rose to £1,125,941, or £12, 10s. per inhabitant; and in 1897 to £2,842,751, or £20, 12s. 2d. per inhabitant. Fori9o5the figures were £3,615,340, or £14, 18s. 5d. per inhabitant. The chief sources of revenue in 1905 were: customs and excise, £1,027,898; other taxation, £22 1 ,738 ; railways, £1 ,629,956 ; public lands (including mining), £207,905; all other sources, £527,843. The expenditure has risen with the revenue, the figures for 1905 being £3,745,224, equal to £15, 9s. 2d. per head of population. The chief items of expenditure in 1905 were: railway working expenses, £i 1 297,499; public works, £337,927; interest and charges upon debt, £578,704; mines, £248,496; education, £149,552. The public debt is of comparatively recent creation. In August 1872 an act was passed authorizing the raising, of certain sums for the construction of public works; in 1881 the amount owing was not more than £511,000, and in 189 1 only £1,613,000 or £30, 5s. 8d. per inhabitant; from the year last named the indebtedness has in- creased by leaps and bounds, and in 1905 had mounted up to £16,642,773, a sum equal to £66, 10s. 4d. per inhabitant, involving an interest charge of £574,406 or £2, 5s. id. per inhabitant. The proceeds of the loans were used largely for the purpose of railway extension — the expenditure on this service at the middle of 1906 was £9,618,970; on w r ater supply and sewerage works, £2,892,390; on telegraphs and telephones, £269,308; on harbour and river improvements, £2,182,529; on development of gold-fields, £973,082; on development of agriculture, £597 ,189.

Defence.— The local defence force of Western Australia in 1905 comprised 57 permanent artillerymen, 772 rnilitia, 580 volunteers, and 2534 riflemen — a total of 3943. The defence of the state is undertaken by the federal government.

Minerals. — Gold-mining is the main industry, and in 1905 16,832 miners w r ere directly engaged in it; as large a number is indirectly engaged in the industry. Gold, silver, coal, tin and copper are the chief minerals mined; the mineral production of the state in 1905 was valued at £8,555,841. The value of the gold produced was £8.305,654, a falling off of £118,572 as compared with 1904. The dividends paid by the gold-mining companies for that year amounted to £2,167,639 as' against £2,050,547 in 1904. Up to 1905 the total recorded mineral production of Western Australia amounted in value to £65,012,499 — gold representing £63,170,911 of that sum; while £13,739.842 had been paid in dividends.

Western Australia ranks as the largest gold producer of the Australian group. Coal is worked at Collie, 25 in. E. of Bunbury; boring operations which had been going on between Greenough and Mullewa on the Gerald ton-Cue railway line were discontinued in 1905, the bore hole, carried to a

depth of 1418 ft. having failed to disclose any coal seams. The export of copper in 1905 was valued at £16,266; of tin, £86,840; of silver, £44,278. The value of the coal produced in that year was £55,312.

Industries. — The agricultural possibilities of the state are more restricted than those of the eastern states, as the rainfall in the southern and temperate portion does not extend far from the coast, and the land where the fall is satisfactory is only good over small areas. The area cultivated in 1871 was 52,000 acres; in 1881 it was 53,000 acres; in 1891, 64,000 acres; and in 1905, 467,122 acres. The principal crops grown in the year last named were : wheat, 195,071 acres; oats, 15,713 acres; hay, 124,906 acres. The wheat yield was 11-83 bushels per acre, and the hay crop 112 tons per acre. In 1905 the number of sheep depastured was 3,120,703 ; cattle, 631,825; horses, 97,397. These figures show an increase for all classes of stock. There are in the state about 2000 camels. The number of sheep has increased considerably in late years. In 1871, 2,000,000 lb of wool were exported; in 1881, 4,100,000 lb; in

i8gi, 8,800,000 ft; in 1900, 9,514,000 ft); and in 1905, 17,489,402 lb; the value of the latter being £594,872.

Western Australia has very extensive forests of timber, and it has been estimated that the forest surfaces cover more than 20 million acres, of which 8 million acres are jarrah; 1,200,000 acres, karri; 200,000ˆ acres, tuart; 7 million acres, wandoo; and 4 million acres, York gum, yate, sandalwood and jam. The principal timber exported is jarrah, karri, and sandalwood, the value of the exports being about £656,000 annually. There are 30 saw-mills in operation, employing altogether 2750 hands.

Fisheries are taking an important position; they comprise pearl shell fishing beehe-de-mer, and preserved or tinned fish. The pearl shell fisheries in the north-west and in Shark's Bay have been a considerable source of wealth, the export of pearls and pearl shell being valued at £110,667 hi 1899, £106,607 in 1900 and £171,237 in 1903. In 1892 the export was valued at £119,519.

Mandurah, at the mouth of the Murray, and Fremantle ha% r e preserving sheds for mullet and snapper. Guano beds arc worked to much advantage at the Laccpede Isles. Salt is produced largely at Rottnest Island. Raisins are dried, and the oil of castor trees is expressed. The mulberry tree succeeds well, and sericulture is making progress. Dugong oil is got from

Shark's Bay. Honey and wax are becoming valuable exports; from the abundance of flowers the hives can be emptied twice a year. Manna and gums of various kinds are among the resources of the country. Among the wines made are the Riesling, Burgundy, Sweetwater, Hock and Fontaine-bleau.

Commerce. — All the great lines of steamers trading between Australia and Europe make one of the ports a place of call both on the inward and outward voyage; this makes the shipping tonnage very large compared with the population. In 1891 the tonnage entered and cleared equalled 21 tons per head, and in 1905 14-3 tons. The increase of tonnage is shown by the following figures: 1881, tonnage entered, 145,048; 1891, 533,433; 1905, 1,839,227. In 1905 the tonnage entering Fremantle was 1,176,982, and the im- ports were valued at £6,030,415. The shipping entering Albany had a tonnage of 519,377, and the imports were valued at £160,305. The trade of Bunbury was: shipping 92,281 tons, imports £59,197; Broome, shipping 32,191 tons, imports £48,653; other ports, shipping 18,396 tons, imports £182,739.

The trade has increased very rapidly under the influence of the gold discoveries, as the following figures show:—

Year.

Imports.

Exports.

Total.

Per Head.

Total.

Per Head.

£ s. d.

£ s. d.

1861

H7,9I3

998

95.789

6 2 10

1871

226,000

9 ro

209,196

8 6 11

1881

404,831

13 14 3

502.770

17 8

1891

1,280,093

25 2 5

799,466

15 13 9

1901

6.454. 171

34 4 5

8,515.623

45 3

1905

6,481,309

25 18 1

9,871,219

39 9 1

About 54% of the trade is with Great Britain and 21% with the other Commonwealth states.

Railways. — Western Australia is the only state of Australia in which there is any considerable length of railway lines not owned by the state. The total railway mileage in 1905 was 2260, of which 655 m. were privately owned. The divergence of the policy of Western Australia from that pursued by other states was caused by the inability of the government to construct lines at a time when the extension of the railway was most urgently required in the interests of settlement. Private enterprise was therefore encouraged by liberal grants of land to undertake the work' of

construction. Changed conditions have modified the state policy in respect of landgrants, and in 1897 the government acquired the Great Southern railway, 243 m. in length, one of the two trunk lines in private hands. The cost of constructing and equipping the state lines open for traffic in 1905 was £9,808,458; the earnings for that year amounted to £1,610,129, the working expenses were £1,256,003, and the net receipts £354.126; this represents a return of 3-61% upon the capital cost.

Posts and Telegraphs. — The postal business has grown enormously since the gold discoveries. In 1905 there were 295 post offices as compared with 86 in 1891. In the latter year the letters despatched and received numbered 3,200,000, and the newspapers 1,665,000; in 1905 the letters and postcards totalled 22,107,000, and the news- papers and packets 14,800,000, being respectively 88 and 59 per head of population. There were in the same year 188 telegraph stations, 6389 m. of line, and 9637 m. of telegraph wire in use, while the number of telegrams sent and received was 1,634,597. There were sixteen public telephone exchanges and 4857 telephones in use at the end of that year.

Banking. — -There are six banks of issue, with 109 branches in various parts of the country. The liabilities of these banks in 1904 averaged £5,206,170, and the assets £6,399,305; the note circulation was £354,810; the deposits bearing interest £1,475,616; deposits

not bearing interest £3,258,294, making the total deposits £4,733,910. The gold and silver held by the banks, including bullion, was £2,129,304. The savings banks are directly controlled by the government and are attached to the post offices; in 1904 there were 54,873 depositors in these banks with £2,079,764 to their credit — an average of £37ˆ 18s. per depositor. In 1891 there weie only 3564 depositors and £46,181 at credit.

Authorities. — James Bonwick, Western Australia, its Past and Future, 8vo (London, 1885); Very Rev. J. Brady, Descriptive Vocabulary of the Native Language of Western Australia (Rome, 1845); Hon. D. VV. Carnegie, Spinifex and Sand (London, 1898); Ernest Favenc, The Great Australian Plain, 8vo (Sydney, 1881J, Western Australia, its Past History, Present Trade and Resources, &c. (Sydney, 1887); Sir John Forrest, Explorations in Australia, 8vo (London, 1875); M. A. C. Frazer, Western Australia Year-Book, annually (Perth). (T. A. C.)

History. — Both the western and northern coasts of the colony are pretty accurately laid down on maps said to date from 1540 to 1550, where the western side of the continent terminates at Cape Leeuwen. The discovery of the coast may be attributed to Portuguese and Spanish navigators, who were in the seas northward of Australia as early as 1520. The Dext

visitors, nearly a century later, were the Dutch. John Edel explored northward in 1619, and De Witt in 1628. The " Guide Zee- paard " in 1627 sailed along the south coast for 1000 m., the territory being named Nuyt's Land. Tasman made a survey of the north shore in 1644, but did not advance far on the western border. Dampier was off the north-west in 1688 and 1696, naming Shark's Bay. Vancouver entered King George Sound in 1791. The French, under D'Entrccasteaux, were off Western Australia in 1792; and their commodore Baudin, of the " Geographe " and " Naturalistc," in 1801 and 1802 made important discoveries along the western and north-western shores. Captain Flinders about the same time paid a visit to the Sound, and traced Nuyt's Land to beyond the South Australian boundary. Freycinet went thither in 1818. Captain King surveyed the northern waters between 1818 and 1822.

The earliest settlement was made from Port Jackson, at the end of 1825. Owing to a fear that the French might occupy King George Sound, Major Lockyer carried thither a party of convicts and soldiers, seventy-five in all, and took formal British possession, though Vancouver had previously done so. Yet the Dutch had long before declared New Holland, which then meant only the western portion of Australia, to be Dutch property. This convict establishment returned to Sydney in 1829. In 1827 Captain Stirling was sent to report upon the Swan river, and his narrative excited such interest in England as to lead to an actual free settlement at the Swan river. Captain Fremantle, R.N., in 1827 took official possession of the whole country. Stirling's account stimulated the emigration ardour of Sir F. Vincent, and Messrs Peel, Macqueen, &c, who formed an association, securing from the British government permission to occupy land in Western Australia proportionate to the capital invested, and the number of emigrants they despatched thither. In this way Mr Peel had a grant of 250,000 acres, and Colonel Latour of 103,000. Captain (afterwards Sir James) Stirling was appointed lieutenant-governor, arriving June 1, 1829. The people were scattered on large grants. The land was poor, and the forests heavy; provisions were at famine prices; and many left for Sydney or Hobart Town . The others struggled on, finding a healthful climate, and a soil favouring fruits and vegetables, whilst their stock grazed in the more open but distant quarters. The overland journey of Eyre from Adelaide to King George Sound in 1839-1840, through a water- less waste, discouraged settlers; but Grey's overland walk in 1838 from Shark's Bay to Perth revealed fine rivers and good land in Victoria district, subsequently occupied by farmers, graziers and miners. The difficulties of the settlers had com- pelled them to seek help from the British treasury, in the offer to accept convicts. These came in 1850; but transportation ceased in 1868, in consequence of loud protests from the other colonies.

The progressive history of Western Australia may be said to commence in

1870, when its energetic and capable governor, Sir Frederick Weld, began to inaugurate public works on a

large scale. It was still the day of small things, for the colony, though of the enormous extent of 1,000,000 sq. m., "was prac- tically unknown, its resources were restricted, and its population scanty. However, a beginning was then made, and the first Loan Bill to raise money for pushing on telegraphs, for surveying lines of projected railways, and above all for starting exploring expeditions, passed the Legislative Council. The colony was fortunate in possessing two brothers of the best practical type of explorer, John and Alexander Forrest. The object of their earliest expeditions was to find more land available for pastoral or agricultural settlement. Vast distances in various directions were covered, and severe hardships, chiefly from want of water, undergone by these intrepid pioneers. Perhaps the most famous of these journeys was that accomplished by Mr (after- wards Sir) John Forrest between Eucla and Adelaide in 1870. Other dauntless explorers— notably Mr Ernest Giles, the Gregorys and Mr Austin — had also contributed to the growing knowledge of the resources of the vast territory, and the state owes and gratefully acknowledges its debt to these stalwart and splendid pioneers. Although, in consequence of the vast amount of gold which had been found in the eastern colonies, principally in Victoria, all these explorers had carefully ex- amined any likely country for traces of gold, it was not until 1882 that the government geologist reported indications of auriferous country in the Kimberley district, and the first payable gold-field was shortly afterwards " proclaimed " there. Exploring expeditions in every direction were then started both privately and publicly, and prosecuted with great vigour. Within five years gold-fields were proclaimed at Yilgarn, about 200 m. to the east of Perth, and the discovery of patches of rich alluvial gold in the Pilbarra district quickly followed, but the rush for the Coolgardie and Kalgoorlie gold-fields did not begin until 1S93.

The year 1889 found the colony on the eve of responsible government. Two years before, a practically unanimous vote of the Legislature had affirmed the principle of autonomy, and the general election in the following year showed still more plainly the desire of the people of Western Australia for the self-govern- ment which had enabled the eastern colonies to control their own affairs successfully for thirty years. The new Legislative Council of i88g therefore drafted a Constitution Bill, which after some discussion was forwarded to Lord Knutsford, the Secretary of State for the Colonies. This Bill was duly laid before the Imperial Parliament; but the measure was

then rejected by that assembly, chiefly owing to the misunderstanding of vital questions, such as the control of crown lands, the scantiness of the scattered population, and other less important details. However, the governor of that day, Sir Frederick Napier Broome, K.C.M.G., having satisfied himself that the constitutional change was necessary not only for the immediate needs of the rapidly growing colony, but in view of the larger question of Imperial Federation, supported the demands of the Legislature in every possible way. A clear and able statement of the colonists' case, which appeared above his signature in The Times in the summer of that year, helped to bring about a better understanding of the subject; and a slightly modified Constitution Bill having been passed by the new Legislative Council, the governor and two members of the Legislature (Sir T. C. Campbell and Mr S. H. Parker, Q.C.) were selected to proceed to England as delegates to explain and urge the wishes of the colonists upon the Imperial Parliament. A select committee, with Baron de Worms as chairman, was appointed, and the matter was carefully considered; with the satisfactory result that the Bill enabling the Queen to grant a constitution to Western Australia passed its third reading in the House of Commons on 4th July, and received the royal assent on 15th August 1890.

Since then the colony has made great progress. Sir John Forrest, who was for ten years its Premier, brought to his arduous task not only administrative ability of a very high order, but a thorough and intimate knowledge of the needs and resources of the vast colony over so much of which he had travelled.

For a long time the advantages of Federation were not so apparent

to the people of Western Australia as to those of the eastern colonies, and although Sir John Forrest consistently and patiently laboured at every opportunity to explain the principles of the BUI framed by the Federal Convention which had held its sittings since 1886 in Adelaide, Sydney and Melbourne, the desire to federate was of slow growth. Among the objections was the feeling that so far as Western Australia was concerned the step was premature, and that the colony had more to lose than gain by Federation. This applied chiefly to the questions of tariff and free trade, and to the loss of the individual control" of such sources of revenue as customs, postal and telegraph services. On the subject of defence there could be but one opinion, in favour of Federation, but that was hardly enough to counterbalance the fears of the local producer, who had become accustomed to a protective tariff. Then the gold-fields expressed a desire to be made into a separate colony, and although a numerously signed petition to that effect was forwarded to the Queen, it was regarded in the light of a party move, and did not prove successful. Still there was great hesitation on the part of many of the colonists of Western Australia to join the Commonwealth

without receiving a pledge for the retention of their own customs dues for five years, and early in 1900 Sir John Forrest made a personal attempt to obtain this concession from the sister governments. He was, however, unsuccessful, as was Mr S. H. Parker, Q.C, who in the same year accompanied the delegates from the eastern colonics to London, and endeavoured to obtain the insertion in the Enabling Bill of certain recommendations of the select committee in Perth. Yet as a whole the people of Western Australia were loyal to the Federal cause, and therefore it was considered best to submit the Bill to a referendum of the electors, when a majority of over 25,000 votes decided in favour of Federation, as the Constitution Act provided that this state should have the right to enact her own tariff as against the sister states for the desired five years, decreasing annually at the rate of one-fifth of the amount of the original duty until the whole disappeared. (M. A. B.)

WESTFIELD, a township of Hampden county, Massachusetts, U.S. A., on the Westfield river, about 10 m. W. of Springfield. Pop. (1890) 9805; (1900) 12,310 (2441 being foreign-born) ; (1905, state census) 13,611; (1910) 16,044. It is served by the New York, New Haven & Hartford and the Boston. & Albany railways, and is connected with Springfield, Holyoke and Huntington by electric lines. The township lies in and on cither side of a deep alluvial valley, 6-7 m. long from east to west and 2-3 m. wide, and includes the large village of Westfield and the small villages of East Farms, Mundale, Middle Farms, Little River, W T est Farms and Wyben. In the township are the Westfield State Normal School (1844), the Westfield Atheneum (incorporated in 1864), which in 1910 had a library of 25,000 volumes, and the Noble hospital (1893). Westfield Academy, a famous secondary school, chartered in 1793 and opened in iSoo, was closed in 1S66 and its building and grounds were sold in 1877 t° the township for a public high school. Woronoco Park (200 acres), in the western part of the township, is a tract of great natural beauty. West- field manufactures more whips than any other place in the United States, the factory of the United States Whip Company being one of the largest in the world; this industry was begun here early in the 19th century. Other important manufactures are foundry and machine-shop products, paper, thread and bicycles. In 1905 the value of the factory product was $5,818,130, an increase of 31% since 1900. A trading post, known by the Indian name Woronoco (or Woronoko), was established here about 1640. In 1669 the township, which had previously been part of Springfield, was erected under its present name — it was then the westernmost township in Massachusetts. Land was added to it in 1713, and parts were taken from it to add to Southwick (1770 and 1779), to Montgomery (1780), to Russell (1792), and to West Springfield (1802).

See James C. Greenough, " The Town of Westfield, "in vol. ii. (pp.

317-456) of -ˆ History of Hampden County, Massachusetts (3 vols., 1902), edited by Alfred M. Copeland; and John Alden, History of Westfield (Springfield, 1851).

WESTGATE-ON-SEA, a watering-place in the Isle of Thanet parliamentary division of Kent, England, 2 m. W. by S. of Margate on the South-Eastern & Chatham railway. Pop. (1901) 2738. It is of modern growth and noted for its healthy Climate. Facing the sea there are gardens and promenades over 1 m. in length, and there is a marine drive along the top of the cliffs. There are also golf links and other appointments of a popular resort. Birchington, immediately to the west (pop. 2128), is also a growing resort. The church of All Saints is

Perpendicular, with an Early English tower, and contains some interesting monuments.

WEST HAM, a municipal, county, and parliamentary borough of Essex, England, forming an eastward suburb of London. Pop. (1891) 204,903, (tooi) 267,358. The parish stretches north and south from Wanstead and Leyton to the Thames, and east and west from East Ham to the river Lea. It is divided into four wards — Church Street, Stratford-Langthorne, Plaistow and Upton. The church of All Saints has a good Perpendicular tower, but the remainder is extensively restored. .There are a number of old monuments. In the restoration of 1866 some early mural painting was discovered, and a transition Norman clerestory was discovered, remaining above the later nave. There are several modern churches, and a Franciscan monastery and school (St Bonaventure's). West Ham Park (80 acres) occupies the site of Ham House and park, for many years the residence of Samuel Gurney, the banker and philanthropist. The place was purchased for £25,000, and vested in the corpora- tion of London for the use of the public. Of this amount the Gurney family contributed £10,000 and the corporation the same sum, the remaining £5000 being collected from the inhabitants of West Ham. The house was taken down, and the park was opened in 1874. Mrs Elizabeth Fry lived in a house in Upton Lane, on the confines of her brother's park. In 1762 the number of houses in West Ham parish was stated to be 700, of which " 455 are mansions and 245 cottages." Now few large houses remain, but the smaller houses have greatly increased. There are numerous chemical and other manufactures which have been removed from London itself; and the large population can also be traced in part to the foundation of the Victoria and Albert docks at Plaistow. Included within the borough are the extensive railway works of

the Great Eastern railway at Stratford. This industrial centre is continued eastward in the urban district of East Ham (pop. 96,018), where the old village church of St Mary Magdalene retains Norman portions. West Ham is governed by a mayor, 12 aldermen and 36 councillors. Area 4683 acres.

At the time of the Conquest West Ham belonged to Alestan and Leured, two freemen, and at Domesday to Ralph Gernon and Ralph Peverel. West Ham village was included in the part which descended to the Gernons, who took the name of Montfichet. The manor of West Ham was settled upon Strat- ford-Langthorne Abbey, founded by William de Montfichet in 1 13 5 for monks of the Cistercian order. The abbey stood in the marshes, on a branch of the Lea known as the Abbey Creek, about I m. south of Stratford Broadway. West Ham received the grant of a market and annual fair in 1253. The lordship was given to the abbey of Stratford, and, passing to the crown at the dissolution, formed part of the dowry of Catherine of Portugal, and was therefore called the Queen's Manor. In 1885 the urban sanitary district was erected into a parliamentary borough, returning two members for the northern and southern divisions respectiyely. It was incorporated in 1886.

WEST HAVEN, a borough of Orange township, New Haven county, Connecticut, U.S.A., on New Haven Harbor and separ- ated from New Haven by the West river. Pop. (1900) 5247 (893 foreign-born); (1910) 8543. West Haven is served by the New York, New Haven, & Hartford railway. It is mainly a residential suburb of New Haven. There is a public park, and Savin Rock, rising from Long Island Sound, is a summer resort. West Haven was set apart from New Haven in 1822 and was united with North Milford to form the township of Orange; it was incorporated as a borough in 1873.

WEST HOBOKEN, a town of Hudson county, New Jersey, U.S.A., in the NJS. part of the state, adjoining Hoboken and Jersey City. Pop. (1890) 11,665; (1900) 23,094, of whom 9119 were foreign-born; (1910, census) 35,403. For transportation facilities the town depends upon the railways serving Hoboken and Jersey City. West Hoboken lies about \ m. W. of the Hudson river, occupies a pleasant site somewhat higher than that of its neighbouring municipalities, and commands a fine view of the surrounding country. Among the prominent build- ings are a Carnegie library, St Michael's Monastery (containing

a theological school), a Dominican Convent, and several fine churches; and there are two Roman Catholic orphanages. The town is an important centre for the manufacture of silk and silk goods; in 1905 the value of these products was $4,211,018. West Hoboken was created a separate township in 1861, from a part of the township of North Bergen, and in 1884 was

incorporated as a town.

WESTHOUGHTON, an urban district in the Westhoughton parliamentary division of Lancashire, England, 5 m. W.S.W. of Bolton on the Lancashire and Yorkshire railway. Pop. (1901) 14,377. There are coal mines in the neighbourhood, and the town possesses silk factories, print-works and cotton mills. Westhoughton before the time of Richard II. was a manor belonging to the abbey of Cockcrsand. It was confiscated ' at the Reformation, and since then has been vested in the crown. The army of Prince Rupert assembled on Westhoughton moor before the attack on Bolton.

WEST INDIES, THE, sometimes called the Antilles (q.v.), an archipelago stretching in the shape of a rude arc or parabola from Florida in North America and Yucatan in Central America to Venezuela in South America, and enclosing the Caribbean Sea (615,000 sq. m.) and the Gulf of Mexico (750,000 sq. m. in area). The land area of all the islands is nearly 100,000 sq. m., with an estimated population of about 6\ millions; that of the British islands about 12,000 sq. m. The islands differ widely one from another in area, population, geographical position, and physical characteristics. They are divided into the Bahamas, the Greater Antilles (Cuba, Jamaica, Haiti and Porto Rico), and the Lesser Antilles (comprising the remainder). The Lesser Antilles are again divided into the Windward Islands and Leeward Islands. Geographically, the Leeward Islands are those to the north of St Lucia, and the Windward, St Lucia and those to the south of it; but for administrative purposes the British islands in the Lesser Antilles are grouped as is shown in the table given later.

Geology. — The West Indies are the summits of a submerged mountain chain, the continuation of which towards the west must be sought in the mountains of Honduras. In Haiti the chain divides, one branch passing through Jamaica and the other through Cuba, the Cayman Islands and the Misteriosa Bank. In Das Anthtz der Erde, E. Suess divides the Antilles into three zones: (1) The first or interior zone, which is confined to the Lesser Antilles, is entirely of volcanic origin and contains many recent volcanic cones. It forms the inner string of islands which extends from Saba and St Kitts to Grenada and the Grenadines. The western part of the deep-cleft island Guadeloupe belongs to this zone. (2) The second zone consists chiefly of Cretaceous and early Tertiary rocks. In the west it is broad, including the whole of the Greater Antilles, but in the east it is restricted to a narrow belt which comprises the Virgin Islands (except Anegada), Anguilla, St Bartholomew, Antigua, the eastern part of Guadeloupe and part of Barbados. (3) The third and outermost zone is formed of Miocene and later beds, and the islands which compose it are flat and low. Like the second zone it is broad in the west and narrow in the east. It includes the

Bahamas, Anegada, Sombrero, Barbuda and part of Barbados. Geologically, Florida and the plain of Yucatan may be looked upon as belonging to this zone. Neither Trinidad nor the islands off the Venezuelan coast can be said to belong to any of these three zones. Geologically they are a part of the mainland itself. They consist of gneisses and schists, supposed to be Archaean, eruptive rocks, Cretaceous, Tertiary and Quaternary deposits; and the strike of the older rocks varies from about W.S.W. to S.W. Geologically, in fact, these islands are much more nearly allied to the Greater Antilles and to Central America than they are to the Lesser Antilles; and there is accord- ingly some reason to believe that the arc formed by the West Indian Islands is really composite in origin. Although the three zones recognized by Suess are fairly clearly defined, the geological history of the Greater Antilles, with which must be included the Virgin Islands, differs considerably from that of the Lesser. In Cuba and Haiti there are schists which are probably of pre-Cretaceous age, and have, indeed, been referred to the Archaean ; but the oldest rocks which have yet been certainly identified in the West Indies belong to the Cretaceous period. Throughout the Greater Antilles the geological succession begins as a rule with volcanic tuffs and conglomerates of hornblende-andesite, &c, in the midst of which are intercalated occasional beds of limestone with Rudistes and other Cretaceous fossils. These are overlaid by sediments of terrigenous origin, and the whole series was folded before the deposition of the next succeeding strata. The nature of these Cretaceous deposits clearly indicates the neighbourhood of an extensive area of land;

but during the succeeding Eocene period and the early part of the Oligocene, a profound subsidence led to the deposition of the Globi- germa chalks and white Radiolarian earths of Jamaica, Cuba and Haiti. The Greater Antilles must at this time have been almost completely submerged, and the similar deposits of Barbados and Trinidad point to a similar submergence beyond the Windward Islands. In the middle of the Oligocene period a mighty upheaval, accompanied by mountain folding and the intrusion of plutonic rocks, raised the Greater Antilles far above their present level, and united the islands with one another, and perhaps with Florida. A subsequent depression and a serieb of minor oscillations finally resulted in the production of the present topography.

The geology of the Lesser Antilles is somewhat different. In some of the islands there are old volcanic tuffs which may possibly be the equivalents of the Cretaceous beds of Jamaica, but volcanic activity here continued throughout the Tertiary period and even down to the present day. Another

important difference is that except in Trinidad and Barbados, which do not properly belong to the Carib- bean chain, no deep-sea deposits have yet been found in the Lesser Antilles and there is no evidence that the area ever sank to abysmal depths.

In the foregoing account the chronology of R. T. Hill has been followed ; but there is still considerable difference of opinion as to the ages and correlation of the various Tertiary deposits and con- sequently as to the dates of the great depression and elevation. J. W. Spencer, for example, places the greatest elevation of the Antilles m the Pliocene and Pleistocene periods. Moreover, chiefly on the evidence of submerged valleys, he concludes that practically the whole of the Caribbean Sea was land and that a complete con- nexion existed, by way of the West Indian bridge, between North and South America. 1

The mineral wealth of the islands is not remarkable. Gold, silver, iron, copper, tin, platinum, lead, coal of a poor quality, cobalt, mercury, arsenic, antimony, manganese, and rock salt either have been or are worked. Asphalt is worked to considerable advantage among the pitch lakes of Trinidad. Opal and chalcedony are the principal precious stones.

Climate. — As in most tropical countries where considerable heights are met with — and here over 15,500 sq. m. He at an elevation of more than 1500 ft. above sea-level — the climate of the West Indies (in so far at least as heat and cold arc concerned) varies at different altitudes, and on the higher parts of many of the islands a marked degree of coolness may generally be found. With the exception of part of the Bahamas, all the islands He between the isotherms of 77° and S2 F. The extreme heat, however, is greatly tempered by the sea breezes, and by long, cool, refreshing nights. Frost is occasionally formed in the cold season when hail falls, but snow is unknown. The seasons may be divided as follows. The short wet season, or spring, begins in April and lasts from two to six weeks, and is succeeded by the short dry season, when the thermometer remains almost stationary at about 8o° F. In July the heat increases to an extent well nigh unbearable. No change occurs till after a period varying from the end of July to the beginning of October, when the great rainfall of the year begins, accompanied by tremendous and destructive hurricanes. This season is locally known as the " hurricane months." The annual rainfall averages 63 in. These storms arise in the Atlantic and towards the east. For a day or two they follow a westerly course, inclining, at the same time, one or two points towards the north, the polar tendency becoming gradually more marked as the distance from the equator increases. When the hurricanes reach latitude 25 N., they curve to the north-east, and almost invariably wheel round on arriving at the northern portion of the Culf of Mexico, after which they follow the coast line of North America. Their rate

of speed varies considerably, but may be said to average 300 m. per day among the islands. The usual signs of the approach of the cyclones are an ugly and threatening appearance of the weather, sharp and frequent puffs of wind, increasing in force with each blast, accompanied with a long heavy swell and confused choppy sea, coming from the direction of the approaching storm. December marks the beginning of the long dry reason, which, accompanied by fresh winds and occasional hail showers, lasts till April. The average temperature of the air at Barbados, which may be taken as a favourable average, is, throughout the year, 8o° F. in the forenoon, and about 82 in the afternoon. The maximum is 87°, and the minimum 75°.

Flora. — The flora of the islands is of great variety and richness, as plants have been introduced from most parts of the globe, and flourish either in a wild state or under cultivation ; grain, vegetables, and fruits, generally common in cool climates, may be seen growing in luxuriance within a short distance of like plants which only attain perfection under the influence of extreme heat, nothing being here required for the successful propagation of both but a difference in the height: of the lands upo n which they grow. The forests, which

are numerous and wide-spreading, produce the most valuable woodf and delicious fruits. Palms are in great variety, and there are several species of gum-producing trees. Some locust trees have been estimated to have attained an age of 4000 years, and are of immense height and bulk. Piptadenia, on account of its almost imperishable character when in the ground, is used as a material for house- building. Xanthoxylon, the admired and valuable satin-wood of commerce, is common; Sapindus finds a ready market on account of its toughness; crab-wood yields a useful oil and affords reliable timber ; and tree ferns of various species are common. Pimento is peculiar to Jamaica. But it is to the agricultural resources of the islands that the greatest importance attaches. For centuries almost the whole care of the planters was bestowed upon the culti- vation of the sugar-cane and tobacco plant, but in modern times, as will be seen later, attention has been turned to the production of other and more varying crops. Crops of tobacco, beans, peas, maize, and Guinea corn are popular, and a species of rice, which requires no flooding for its successful propagation, is largely pro- duced. Hymenachne striatum covers many of the plains, and affords food for cattle.

Fauna. — The fauna of the region is Neotropical, belonging to that region which includes South and part of Central America, although great numbers of birds from the North- American portion of the Holarctic realm migrate to the islands. The resident birds, however, eighteen genera of which are certainly Neotropical, show beyond doubt to which faunal region the

islands properly belong. Mammals are, as in most island groups, rare. The agouti abounds, and wild pigs and dogs are sufficiently numerous to afford good sport to the hunter, as well as smaller game, in the shape of armadillos, opossums, musk-rats and raccoons. The non-migrating birds include txogons, sugar-birds, chatterers, and many parrots and humming birds. Waterfowl and various kinds of pigeons are in abundance. Reptiles are numerous: snakes — both the boa and adder — are innumerable, while lizards, scorpions, tarantulas and centipedes are everywhere. Insects are in great numbers, and are often annoying. Among domestic animals mules are largely reared, and where the country affords suitable pasture and forage cattle-breeding is practised. Goats ahound, and large flocks of sheep are kept for the sake of their flesh alone, as the climate is not adapted for wool-growing.

Area and Population. — The following list of the West Indian islands gives their area and population. Notwithstanding the

1 See E. Suess, Das A ntlitz der Erde (Wien, 1885; Eng. trans. , Oxford, 1904) ; J. W. Spencer, " Reconstruction of the Antillean Continent," Bull. Geol. Soc. Amer., vol. vi. (1895), p. 103 (Abstract in Geol. Mag., 1894, pp. 448-451): see also a series of papers by J. W. Spencer in Quart. Journ. Geol. Soc, vols, lxvii., lxviii. (1901, 1902); R. T. Hill, "The Geology and Physical Geography of Jamaica," Bull. Mus. Comp. Zool. Harvard, vol. xxxiv. (1899).

xxvin. 18

Name.

Area,

Population.

1901

sq. m.

1881.

(unless stated).

British —

5.450

43.521

53,735

Jamaica . . . . . .

4,207

584.170

806,690 ‘

Turks Island . .

169

4.73 2

5,287

Leeward Islands:

Virgin Islands St Kitts .

58 ,

5.287

4,908

63

5

41,001

\ 29,782

(12,774

Antigua ….

108

34.964

34,178

Montserrat ….

32 £

10,083

12,215

Dominica ….

291

28,211

28,894

Barbados ….

166

171,860

195,588

Windward Islands :

*St Lucia . . . * .*

233

38,551

49,833

St Vincent ….

140

40,548

44,000 2

Grenada ….

133

42,430

63,438

Trinidad

1.754 l

114)

171,179

J 233,397

(18,751

French —

Guadeloupe ….

688

182,110

Martinique ….

380

182,024 a

St Martin (part)

17

3,000 6

Dutch —

St Martin (part)

21

3,i87 <

Curacao

212

30,883

Buen Ayre ….

95

6,233

Aruba

69

8,555

St Eustatius

8

1,283

Saba . . .

5

2,294

Danish —

St Thomas ….

33

11,012

St John

21

925

St Croix

84

18,590

U.S.A.—

Porto Rico ….

3,606

1,118,012 5

Republics —

Santo Domingo

18,045

500,000?

Haiti

10,240

Boo.ooo 6

Cuba (and adjacent islands) .

45,000

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1 Estimate, 1905. s Ks

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WEST INDIES

operations of educational institutions and of large numbers of missionaries of various religious denominations, the percentage of illegitimate births among the population of the British West Indian islands remains very high — in Barbados about 54; in Jamaica, 63; in Trinidad, 59% of the general births; and 79 % of the East Indian.

The population of the West Indies represents many original stocks, the descendants of which have developed variations of habits and customs in their New World environment. They may be divided into six main classes: (1) Eurofieans — immi- grants (British, French, Spanish and in a lesser degree Dutch, Danish and German) and West Indian born; (2) African negroes — immigrants (a fast vanishing quantity) and West Indian born; (3) a mixture of Europeans and Africans; (4) coolies from India — imported and West Indian born; (5) Chinese; (6) aboriginal Indians of more or less pure descent. Of these, the people of pure African blood are in a large majority, the " coloured " race of mixed European and African blocd being next in numerical importance. Under British influence the negroes of the West Indies have become British in thought and habit; and it would seem that the stimulating influence of European direction and encouragement is absolutely necessary for the future development and progress of these islands. In the republics of Santo Domingo and Haiti the negroes are left to drift along, while the French and Danish islands show no great sign of progress.

British Colonies, Government, &c. — The British West India colonies ' are either crown colonies — that is to say, their govern- ment is absolutely under the control of the British Colonial Office, the official members of their councils predominating, and the unofficial members being nominated by the crown, as in the Windward and Leeward Islands — or they have a measure of representative government, as in the Bahamas, Barbados and Jamaica, in which all or part of the legislatures are elected and are more or less independent of crown control. The laws of the various colonies are English, with local statutes to meet local needs. The governors and high officials are appointed by the crown; other officials are appointed by the governor. Each governor acts under the advice of a privy council. In matters of detail the colonies present a variety of forms of government (for which see the separate articles). Federation has been widely discussed and is held desirable by many, but in view of the insular character of the colonies, the considerable distances separating some of them, and in many instances the lack of common interests (apart from certain broad issues), the project appears to be far from realization.

The only fortified places in the British West Indies are Jamaica, Barbados and St Lucia — all of importance as coaling stations. In many of the islands there are local volunteer forces. The police forces of the colonies are in the main modelled on the Irish constabulary, supplemented by rural constabulary. The force is usually officered by Europeans.

Economic Conditions. — The West Indian colonies have suffered from periods of severe economic depression, though from the early years of the 20th century there has been good evidence of recovery and development.

An obvious reason for temporary depression is the liability of the islands to earthquakes and hurricanes, in addition to eruptions in the volcanic islands, such as those in St Vincent and Martinique in 1902. For example, the great earthquake of January 1907 in Jamaica may be recalled, and hurricanes caused serious damage in Jamaica in August 1903 and November 1909, and in the Bahamas in September and October 190S. A treasury fund has been estab lished in Jamaica as a provision against the effects of such disasters. It has been stated that the excessive rainfall which accompanies these storms is of great ultimate benefit to the soil.

The British West Indian colonies do not offer opportunities for ordinary' labouring immigrants. Barbados is the only island where the land is entirely settled. But the settlement, planting and development of lands elsewhere involve a considerable amount of capital, and manual labour is provided by the natives

1 It is a common practice to include British Guiana with these, but the present article is confined to the insular colonies.

or East Indian coolies. Attempts to settle European labourers have been unsuccessful. The West Indian negro, as a labouring class, has frequently been condemned as averse from regular work, apathetic in regard to both his own and his colony's affairs, immoral and dishonest. In so far as these shortcomings exist, they are due to the tendencies inherited from the period of slavery, to the ease with which a bare livelihood may be obtained, and to other such causes. But for the most part the negroes appreciate their advantages under British government and are quick to assimilate British customs and ideas. Advances in the system of peasant proprietorship have brought beneficial results. The drafting of large numbers of labourers from the West Indies to the Panama canal works early in the 20th century, though causing a shortage of labour and involving legislation in some of the islands, exercised a moral effect on the natives by enlarging their horizon.

The growth of general prosperity in the British West Indies is assigned 2 "to the revival of the sugar industry, to the develop- ment of the fruit trade; to the increase in the cultivation of cocoa and cotton; to the volume of tourist travel, which swells year by year; and to such local developments as the 'boom' in Trinidad oil." It was pointed out in the Report of the Royal Commission on Trade Relations between Canada and the West Indies (Cd. 5369, London, 1910) that " the geographical position of the West Indian Colonies must always tend to throw them under the influence of the fiscal system either of the United States or of the Dominion of Canada. Attempts have been made from time to time to obtain for these Colonics special advantages in the markets of the United States. . . . The Colonial policy of the United States has now finally stopped advance in that direction," and

the connexion with the Dominion has therefore become of paramount importance. The Dominion government admitted the West Indies to the British preferential tariff (25% under existing duties) in 1898. The percentage was raised to 33ˆ in 1900. In 1903 the duties imposed on bounty-fed beet sugar in the United States, which had opened the market there to West Indian sugar, were abolished, and a surtax (since removed) was placed on German imports into Canada, Both acts enhanced the value of the Canadian market to the West Indies, while that of the American sugar market was further reduced when in 1901 sugar from Porto Rico began to be admitted thereto free of duty, and when special terms were extended to sugar from the Philippine Islands and Cuba in 1902 and 1903 respectively. The Canadian connexion was thus largely instrumental in saving the sugar indusLry in the West Indies from severe depression, if not from the actual extinction foreseen by a Royal Commission in 1897. This commission pointed out, in particular, the danger which threatened those colonies where sugar provided practically the sole industrial and commercial interest. On a recommendation of this commission the Imperial Department of Agriculture was established in 1898, its cost being met from imperial funds. It is under a commissioner with headquarters at Barbados. Its functions arc to maintain and supervise botanical and experimental stations, to establish agricultural schools, arrange agricultural teaching in other schools, create scholarships, and issue publications. The depart- ment has been largely instrumental in establishing new industries and thus relieving many islands from dependence on the sugar industry alone.

The negotiations for commercial relations between the West Indies and Canada began in 1866; in 1872 proposals for steam- ship subsidies were accepted. The Commission of 1909 recom- mended that the governments should continue to subsidize a service, for which they suggested various improvements. In 1901 a line of subsidized steamers had been started between Jamaica and England, but this contract expired, and the mail contract was determined in 1910, and recommendations were put forward for a steamship service between Canadian and West Indian ports with improvements additional to those recommended by the Commission. It may be added that the

2 In The Times of May 24, 1910, where, in an imperial supplement, a number of articles on the West Indian colonics appear.

Commission also made recommendations for the reduction of the high cable rates between the West Indies and the United Kingdom.

Besides sugar, the principal products of the islands are cocoa, fruits and cotton. Cotton-growing reached importance in a very short time owing largely to the efforts of the Imperial Department of Agriculture, Sea Island seed having been planted in St Vincent only in 1903, and in that island and elsewhere (Antigua, St Kitts, Montserrat) good crops are now obtained. Grenada is almost entirely, and Trinidad, Dominica and St Lucia are largely, dependent upon cocoa. The fruit and spice trade is of growing importance, and there is a demand for bottled fruit in Canada and elsewhere. The variety of fruits grown is great; the bananas and oranges of Jamaica, the limes of Montserrat, Dominica and St Lucia, and the pine-apples of the Bahamas may be mentioned as characteristic. It must be borne in mind, however, that the islands as a whole cannot be said to possess a community of commercial interests. Even the industries already indicated are by no means equally distributed throughout the islands; moreover there are certain local industries of high importance, such as the manufacture of rum in Jamaica, the production of asphalte and the working of the oilfields (the development of which was first seriously under- taken about 1905) in Trinidad, and the production of arrow- root in St Vincent. Sponges are an important product of the Bahamas, and salt of the Turks Islands. Rubber plantation has been successfully exploited in several islands, such as Trinidad, Dominica and St Lucia. (See further articles on the various islands.)

Religion. — In all the British colonies there is full religious tolera- tion. The Church of England Province of the West Indies is divided into the following bishoprics: Jamaica, Nassau (i.e. Bahamas), Trinidad, (British) Honduras, Antigua {i.e. Leeward Islands), Barbados, Windward Islands, (British) Guiana. With the exception of Barbados and British Guiana, the Church of England is dis- established, disendowment taking place gradually, the churches thus becoming self supporting. In Barbados the Church is both established and endowed. In the Bahamas and Jamaica disen dowment is gradually taking place; in Trinidad and British Guiana the Church of England receives endowment concurrently with other religious bodies. The Windward Islands, Leeward Islands and British Honduras are totally disendowed. In all the islands, except Trinidad, St Lucia, Grenada and Dominica, the Church of England, though in all cases in a minority when compared with the aggregate of other bodies, is the most numerous of any denomination. There are Roman Catholic bishops at Port-of-Spain (Trinidad), Roseau (Dominica — for the Leeward Islands), Jamaica, British Guiana and Barbados (resident at Georgetown), British Honduras, Guadeloupe, Martinique, Haiti (archbishop and four bishops), Santo Domingo (archbishop), Cuba (archbishop and bishop), Porto Rico and Curacao. Other religious denominations working actively in the West Indies are the Baptists, Wesleyans, Presbyterians, Congre- gationalists and

Moravians.

History. — The archipelago received the name of the West Indies from Columbus, who hoped that, through the islands, he had found a new route to India. The name of Antilles was derived from the fact that Columbus, on his arrival here, was supposed to have reached the fabled land of Antilia. Columbus first landed on San Salvador, generally identified with Watling Island of the Bahamas, and several voyages to this new land were made in rapid succession by the great discoverer, resulting in the rinding of most of the larger islands, and a more intimate knowledge of those already known. The importance of its latest possession was at once recognized by the court of Spain, and, as a first move towards turning the West Indies to profitable account, numbers of the natives, for the most part a harmless and gentle people, were shipped overseas and sold into slavery, others being employed in forced labour in the mines which the Spaniards had opened throughout the archipelago, and from which large returns were expected. Thus early in its history began that traffic in humanity with which the West India plantations are so widely associated, and which endured for so long a time. Goaded to madness by the wrongs inflicted upon them, the aborigines at last took arms against their masters, but with the result which might have been expected — their almost utter ex- tirpation. Many of the survivors sought release from their sufferings in suicide, and numbers of others perished in the mines, so that the native race soon almost ceased to exist. Spain was not long allowed to retain an undisputed hold upon the islands: British and Dutch seamen soon sought the new region, accounts concerning the fabulous wealth and treasure of which stirred all Europe, and a desultory warfare began to be waged

amongst the various voyagers who flocked to this El Dorado, in consequence of which the Spaniards found themselves gradually but surely forced from many of their vantage grounds, and compelled very materially to reduce the area over which they had held unchecked sway. The first care of the English settlers was to find out the real agricultural capabilities of the islands, and they diligently set about planting tobacco, cotton and indigo. A French West India Company was incorporated in 1625, and a settlement established on the island of St Christopher, where a small English colony was already engaged in clearing and cultivating the ground; these were driven out by the Spaniards in 1630, but only to return and again assume posses- sion. About this time, also, the celebrated buccaneers, Dutch smugglers, and British and French pirates began to infest the neighbouring seas, doing much damage to legitimate traders., and causing commerce to be earned on only under force of arms, and with much difficulty and danger. Indeed, it was not till the beginning of the 18th century — some time after Spain had, in 1670, given up her claim to the exclusive possession of the archi- pelago — that these rovers were rendered

comparatively harm- less; and piracy yet lingered off the coasts down to the early years of the 19th century. In 1640 sugar-cane began to be systematic- ally planted, and the marvellous prosperity of the West Indies began; it was not from the gold and precious stones, to which the Spaniards had looked for wealth and power, but from the cane that the fortunes of the West Indies were to spring. The success- ful propagation of this plant drew to the islands crowds of adventurers, many of them men of considerable wealth. The West Indies were for many years used by the English govern- ment as penal settlements, the prisoners working on the planta- tions as slaves. In 1655 a British force made an unsuccessful attack on Haiti, but a sudden descent on Jamaica was more fortunate in its result, and that rich and beautiful island has since remained in the possession of Great Britain. The Portuguese were the first to import negroes as slaves, and their example was followed by other nations having West-Indian colonies, the traffic existing for about 300 years. In 1660 a division of the islands was arranged between England and France, the remaining aborigines being driven to specified localities, but this treaty did not produce the benefits expected from it, and as wars raged in Europe the islands (see separate articles) frequently changed hands.

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WESTMACOTT, SIR RICHARD (1 775-1856), British sculptor, was born in London, and while yet a boy learned the rudiments of the plastic art in the studio of his father, who was then a sculptor of some reputation. In 1793, at the age of eighteen, he went to Rome and became a pupil of Canova, then at the height of his fame. Under the prevailing influences of Italy at that time, Westmacott devoted all his energies to the study of classical sculpture, and throughout his life his real sym- pathies were with pagan rather than with Christian art. Within a year of his arrival in Rome he won the first prize for sculpture offered by the Florentine academy of arts, and in the following year (3795) he gained the papal gold medal

awarded by the Roman Academy of St Luke with his bas-relief of Joseph and his brethren. In 1798, on the 20th of February, he married Dorothy Margaret, daughter of Dr Wilkinson of Jamaica. On his return to London Westmacott began to exhibit his works yearly at the Royal Academy, the first work so exhibited being

his bust of Sir William Chambers. In 1805 he was elected an associate, and in 1S11 a full member of the Royal Academy, his diploma work being a " Ganymede " in high relief; in 1827 he was appointed to succeed Flaxman as Royal Academy professor of sculpture, and in 1837 he was knighted. A very large number of important public monuments were executed by him, including many portrait statues; but little can be said in praise of such works as the statue on the duke of York's column (1833), the portrait of Fox in Bloomsbury Square, or that of the duke of Bedford in Russell Square. Much ad- miration was expressed at the time for Westmacott's monu- ments to Collingwood and Sir Ralph Abercromby in St Paul's Cathedral, and that of Mrs Warren in Westminster Abbey; but subjects like these were far less congenial to him than sculpture of a more classical type, such as the pedimental figures representing the progress of civilization over the portico of the British Museum, completed in 1847, and his colossal nude statue of Achilles in bronze, copied from the original on Monte Cavallo in Rome, and reared in 1822 by the ladies of England in Hyde Park as a compliment to the duke of Wellington. He died on the 1st of September 1856.

WESTMEATH, EARL OF, a title held in the Irish family of Nugent since 1621. During the reign of Henry II. Sir Gilbert Nugent received the lordship or barony of Delvin in Meath, which soon passed by marriage from the Nugents to the family of Fitzjohn. About two hundred years later the barony returned to the Nugent family, Sir William Nugent (d. c. 141 5) marrying Catherine, daughter of John Fitzjohn. The barony, however, is considered to date from the time of Sir William Nugent and not from that of Sir Gilbert, 1389 being generally regarded as the date of its creation.

Sir William Nugent, who is generally called the 1st, but sometimes the 9th, baron Delvin, was succeeded by his son Sir Richard (d. c. 1460) as 2nd baron. In 1444 and 1440 Sir Richard was lord deputy of Ireland. His grandson, Richard, the 4th baron (d. c. 1538), was summoned to the Irish parlia- ment in i486. During his whole life he was loyal to the English king, and both before and after the years 1527 and 1528 when he was lord deputy, he took a vigorous part in the warfare against the Irish rebels.

Among his descendants was Robert Nugent, Earl Nugent (q.v.). Richard's grandson, Christopher, the 6th baron (c. 1544-1602), also served England well, but about 1576 he fell under the displeasure of Queen Elizabeth and he was several times imprisoned, being in the intervals employed in Ireland. He was a prisoner in Dublin Castle when he died. Delvin wrote A Primer of the Irish Language, compiled at the request and for the use of Queen Elizabeth.

His son, Richard, the 7th baron (1583-1642), took part in 1606 in a plot against the English government and was imprisoned, but he soon escaped from captivity and secured a pardon from James I. In 1621 he was created earl of West- meath. Having refused in 1641 to join the Irish rebellion, he was attacked by A party of rebels and was so seriously injured that he died shortly afterwards. His grandson, Richard, the 2nd earl (d. 1684), served Charles II. against Cromwell in Ireland and afterwards raised some troops for service in Spain. His grandson Thomas, the 4th earl (1656-1752), served James II. in Ireland. Thomas's brother, John, the 5th earl (1672-1754), left Ireland after the final defeat of James II. and took service in France. He fought against England at the battles of Ramil- lies, Oudenardc and Malplaquet and remained on active service until 1748. He died in Brabant on the 3rd of July 1754. His son Thomas, the 6th earl (d. 1792), also served in the French army; later he conformed to the established religion, being the first Protestant' of his house, and took his seat in the Irish House of Lords in 1755. His son George Frederick, the 7th earl (1760-1814), a member of the Irish House of Commons before 1792, was succeeded by his son George Thomas John (1 785-1871), who was created marquess of Westmeath in 1822 and who was an Irish representative peer from 1831 to 1871. He died without legitimate sons on the 5th of May 1871, when the marquessate became extinct.

The earldom of Westmeath now passed to a distant cousin, Anthony Francis Nugent (1805-1879), a descendant of Thomas Nugent (d. 1715) of Pallas, Galway, who was a son of the 2nd earl. Thomas was chief justice of Ireland from 1687 until he was outlawed by the government of William III. In 1689 he was created by James II. baron ot Riverston, but the validity of this title has never been admitted. In 1S83 his descendant, Anthony Francis (b. 1S70), became the nth earl.

Cadets of the Nugent family were Nicholas Nugent (d. 1582), chief justice of the common bench in Ireland, who was hanged for treason on the 6th of April 1582; William Nugent (d. 1625) an Irish rebel during the reign of Elizabeth; Sir George Nugent, Bart. (1757-1S49), who, after seeing service in America and in the Netherlands, was commander-in-chief in India from 181 1 to 1813 and became a field-marshal in 1846; and Sir Charles Edmund Nugent {c. 1759-1844), an admiral of the fleet. More famous

perhaps was Lavall, Count Nugent (1777-1862), who rose to the rank of field-marshal in the Austrian army and was made a prince of the empire. His long and honourable military career began in 1793 and sixty-six years later he was present at the battle of Solferino. His most distinguished services to Austria were during the war with France in 1813 and 1814, and he was also useful during the revolution in Hungary in 1849.

See D' Alton, Pedigree of the Nugent Family; and Historical Sketch of the Nugent Family, printed by J. C. Lyons (1853).

WESTMEATH, a county of Ireland in the province of Leinster, bounded N.W. by Longford, N. by Cavan, N.E. and E. by Meath, S. by King's county, and W. by Roscommon. The area is 454,104 acres, or about 709 sq. m. The Shannon forms the western boundary. The average height of the surface of the county is over 250 ft. above sea-level. The highest summits are Knocklayde (795 ft.), Hill of Ben (710 ft.) and Knockayon (707 ft.). A large surface is occupied by bog. A special feature of Westmeath is the number of large loughs, which have a combined area of nearly 17,000 acres. In the north, on the borders of Cavan, is Lough Sheelin, with a length of 5 m., and an average breadth of between 2 and 3 m., and adjoining it is the smaller Lough Kinale. In the centre of the county there is a group of large loughs, of which Lough Dereveragh is 6 m. long by 3 broad at its widest part. To the north of it are Loughs Lcnc, Glore, Bawn and others, and to the south Loughs Iron and Owel. Farther south is Lough Ennell or Belvidere, and in the south-west Lough Ree, a great expansion of the river Shan- non, forming part of the boundary with Roscommon. The river Inny, which rises in Co. Cavan, enters Westmeath from Lough Sheelin, and, forming for parts of its course the boundary with Longford, falls into Lough Ree. The Inny has as one of its tributaries the Glore, flowing from Lough Lene through Lough Glore, a considerable part of its course being under- ground. From Lough Lene the Dale also flows southwards to the Boyne and so to the Irish Sea, and thus this lake sends its waters to the opposite shores of the island. The Brosna flows from Lough Ennell southwards by King's county into the Shannon. The Westmeath loughs have a peculiar fame among anglers for the excellence of their trout-fishing.

Westmeath is essentially a county of the great Carboniferous Limestone plain, with numerous lakes occupying the hollows. Two or three little inliers of Old Red Sandstone, as at Killucan and Moate, form distinctive hills, about 500 ft. in height. At Sron Hill near Killucan, a core of Silurian strata appears within the sandstone dome. A considerable system of eskers, notably north of Tullamore, diversifies the surface of the limestone plain.

The soil is generally a rich loam of great depth resting on limestone, and is

well adapted both for tillage and pasturage. The occupations are almost wholly agricultural, dairy farming predominating. Flour and meal are largely produced. The only textile manufactures are those of friezes, flannels, and coarse linens for home use. The only mineral of any value is limestone.

The main line of the Midland Great Western railway enters the county from E. and passes W. by Mullingar and Athlone. From Mullingar a branch runs N.W. to Inny Junction, where lines diverge N. to Cavan (county Cavan), and W.N.W. to Longford (county Longford) and Sligo. A branch of the Great Southern & Western railway runs from Portarlington (Queen's county) to Athlone, and this and the Midland Great Western main line are connected by a short line between Clare and Streamstown, worked

by the latter company. Water communication with Dublin is furnished hv the Royal Canal, traversing the centre of the county. A branch of the Grand Canal reaches Kilbeggan in the south.

The population (68,611 in 1891; 61,629 in 1901) decreases in excess of the average shown by the Irish counties, and emi- gration is considerable. About 92% of the total are Roman Catholics, and about 86% constitute the rural population. The principal towns are Athlone (pop. 6617), of which the part formerly in Roscommon was added to Westmeath by the Local Government (Ireland) Act of 1898, and Mullingar (4500), the county town. Castlepollard and Moate are lesser market towns. By the Redistribution Act of 1885 Westmeath was formed into two parliamentary divisions, North and South, each returning one member, Athlone being included in the county representation. The county is divided into twelve baronies. Assizes are held at Mullingar and quarter sessions at Mullingar and Moatc. The county is in the Protestant dioceses of Dublin, Killaloe and Ossory, and in the Roman Catholic dioceses of Kildare and Leighlin, Killaloe and Ossory.

Westmeath was severed from Meath {g.v.) m 1543. The plan for the insurrection of 1641 was concerted in the abbey of Multifarnham, and both in the wars of this period and those of 1688 the gentry of the county were so deeply implicated that the majority of the estates were confiscated. There are a considerable number of raths or encampments: one at Rath-conrath is of great extent; another at Bally more was fortified during the wars of the Cromweflian period and those of 1688, and was afterwards the headquarters of General Ginkell, when preparing to besiege Athlone; and there is a third of con- siderable size near Lough Lene. The ruins of the Franciscan abbey of Multifarnham, founded in 1236 by William Delaware,

picturesquely situated near Lough Dereveragh, include a tower 93 ft. in height.

WESTMINSTER, MARQUESSES AND DUKES OF. The title of marquess of Westminster was bestowed in 1831 upon Robert Grosvenor, 2nd Earl Grosvenor (1767-1845), whose grandson, Hugh Lupus Grosvenor (1825-1899), was created duke of Westminster in 1874. The family of Grosvenor is of great antiquity in Cheshire, the existence of a knightly house of this name (Le Grosvenur) in the palatine county being proved by deeds as early as the 12th century (see The Ancestor, vi. 19). The legend of its descent from a nephew of Hugh Lupus, earl of Chester, perpetuated in the name of the first duke, and the still more extravagant story, repeated by the old genealogists and modern " peerages," of its ancestors, the " grand hunts- men " {gros veneurs) of the dukes of Normandy, have been exploded by the researches of Mr W. H. B. Bird (see " The Grosvenor Myth " in The Ancestor, vol. i. April 1902), The ancestors of the dukes of Westminster, the Grosvenors of Eaton, near Chester, were cadets of the knightly house mentioned above, and rose to wealth and eminence through a series of fortunate marriages. Their baronetcy dates from 1622.

Sir Thomas Grosvenor, the 3rd baronet (1656-1700), in 1676 married Mary (d. 1730), heiress of Alexander Davies (d. 1665), a scrivener. This union brought to the Grosvenor family certain lands, then on the outskirts of London, but new covered by some of the most fashionable quarters of the West End. Sir Thomas's sons, Richard (1689-1732), Thomas (1603-1733) and Robert (d. 1755), succeeded in turn to the baronetcy, Robert being the father of Sir Richard Grosvenor (1731-1802), created Baron Grosvenor in 1761 and Viscount Belgrave and Earl Grosvenor in 1784. The 1st earl, a great breeder of racehorses, was succeeded by his only surviving son Robert (1767-1845), who rebuilt Eaton Hall and developed his London property, which was rapidly increasing in value. In the House of Commons, where he sat from 1788 to 1802, he was a follower of Pitt, who made him a lord of the admiralty and later a commissioner of the board of control, but after 1806 he left the Tories and joined the Whigs. He was created a marquess at the coronation of William IV. in 1831. His son, Richard, the 2nd marquess, (1795-1869), was a member of parliament from 1818 to 1835 and lord steward of the royal household from 1850 to 1852.

The latter's son, Hugh Lupus (1825-1899), created a duke in 1874, was from 1847 to 1869 member of parliament for Chester and from 1880 to 1885 master of the horse under Gladstone, but he left the Liberal party when the split came over Home Rule for Ireland. His great wealth made him specially con- spicuous; but he was a patron of many progressive movements. His eldest son, Victor Alexander, Earl Grosvenor

(1853-1884), predeceased him, and he was succeeded as 2nd duke by his grandson, Hugh Richard Arthur Grosvenor (b. 1879), who in 1901 married Miss Cornwallis-West. Earl Grosvenor's widow, Countess Grosvenor, a daughter of the 9th earl of Scarborough, had in 1887 married Mr George Wyndham (b. 1863), a grandson of the 1st baron Leconneld, who subsequently became well- known both as a litterateur and as a Unionist cabinet minister.

Two other peerages are held by the Grosvenor family. In 1857 Lord Robert Grosvenor (1801-1893), a younger son of the 1st marquess, after having sat in the House of Commons since 1822, was created Baron Ebury. He was an energetic opponent of ritualism in the Church of England; and he was associated in philanthropic work with the earl of Shaftesbury. On his death his son, Robert Wellesley Grosvenor (b. 1834), became the 2nd baron. In 1886, Lord Richard Grosvenor (b, 1837), a son of the 2nd marquess, was created Baron Stal- bridge; from 1880 to 1885 he had been "chief whip" of the Liberal party. In 1891 he became chairman of the London & North Western railway.

WESTMINSTER, a part of . London, England; strictly a city in the administrative county of London, bounded E. by " the City," S. by the river Thames, W by the boroughs of Chelsea and Kensington, and N. by Paddington, St Marylebone and Holborn. Westminster was formed into a borough by the London Government Act of 1899, and by a royal charter of the 29th of October 1900 it was created a city. The council consists of a mayor, 10 aldermen and 60 councillors. The city comprises the parliamentary boroughs of the Strand, West- minster and St George's, Hanover Square, each returning one member.- Area, 2502-7 acres. The City of Westminster, as thus depicted, extends from the western end of Fleet Street to Kensington Gardens, and from Oxford Street to the Thames, which it borders over a distance of 3 m., between Victoria (Chelsea) Bridge and a point lx:low Waterloo Bridge. It thus includes a large number of the finest buildings in London, from the Law Courts in the east to the Imperial Institute in the west, Buckingham and St James's palaces, the National Gallery, and most of the greatest residences of the wealthy classes. But the name of Westminster is more generally associated with a more confined area, namely, the quarter which includes the Abbey, the Houses of Parliament, the government and other buildings in Whitehall, the Roman Catholic Cathedral, and the parts immediately adjacent to these.

Westminster Abbey.— The Abbey of St Peter is the most widely celebrated church in the British empire. The Thames, bordered in early times by a great expanse of fen on either hand from Chelsea and Battersea downward, Tradition washed, at the point where the Abbey stands, one Mstory. shore of a low island perhaps three-quarters of a mile in circumference, known as

Thorney or Bramble islet. Tributary streams from the north formed channels through the marsh, flanking the island north and south, and were once connected by a dyke on the west. These channels belonged to the Tyburn, which flowed from the high ground of Hampstead. Relics of the Roman occupation have been excavated in the former island, and it is supposed that traffic on the Watling Street, from Dover to Chester, crossed the Thames and the marshes by way of Thorney before the construction of London Bridge; the road continuing north-west in the line -of the modern Park Lane (partly) and Edgware Road. Tradition places on the island a temple of Apollo, which was destroyed by an earthquake in the reign of the emperor Antoninus Pius. On the site King Lucius is said to have founded a church (c. a.d. 170). The irruption of the Saxons left Thorney desolate. Traditional still, but supported by greater probability, a story states that Scbert,

king of the East Saxons, having taken part in the foundation of St Paul's Cathedral, restored or refounded the church at Thorncy " to the honour of God and St Peter, on the west side of the City of London " (Stow). A splendid legend relates the coming of St Peter in person to hallow his new church. The sons of Sebert relapsed into idolatry and left the church to the mercy of the Danes. A charter of Offa, king of Mercia (785), deals with the conveyance of certain land to the monastery of St Peter; and King Edgar restored the church, clearly defining by a charter dated 951 (not certainly genuine) the boundary of Westminster, which may be indicated in modern terms as extending from the Marble Arch south to the Thames and east to the City boundary, the former river Fleet. Westminster was a Benedictine founda- tion. In 1050 Edward the Confessor took up the erection of a magnificent new church, cruciform, with a central and two western towers. Its building continued after his death, but it was consecrated on Childermas Day, 28th December 1065; and on the following " twelfth mass eve " the king died, being buried next day in the church. In 1245 Henry III. set about the rebuilding of the church east of the nave, and at this point it becomes necessary to describe the building as it now appears.

Westminster Abbey is a cruciform structure consisting of nave with aisles, transepts with aisles (but in the south transept the place of the western aisle is occupied by the eastern cloister walk), and choir of polygonal apsidal form, with six chapels (four polygonal) opening north and south of it, and

an eastern Lady Chapel, known as Henry VII. 's chapel. There are two western towers, but in the centre a low square tower hardly rises above the pitch of the roof. The main entrance in common use is that in the north transept. The chapter-house, cloisters and other conventual buildings and remains lie to the south. The total length of the church (exterior) is 531 ft. and of the transepts 203 ft. in all. The breadth of the na T ,e without the aisles is 38 ft. 7 in. and its height close upon 102 ft. These dimensions are very slightly lessened in the choir. Without, viewed from the open Parliament Square to the north, the beautiful proportions of the building are readily realized, but it is somewhat dwarfed by the absence of a central tower and by the vast adjacent pile of the Houses of Parliament. From this point (considered as a building merely) it appears only as a secondary unit in a magnificent group. Seen from the west, however, it is the dominant unit, but here it is impossible to overlook the imperfect conception of the " Gothic humour " (as he himself termed it) manifested by Wren, from whose designs the western towers were completed in r 740. The north front, called Solomon's Porch from a former porch over the main entrance, is from the designs of Sir G. G. Scott, considerably altered by J. L. Pearson.

Within, the Abbey is a superb example of the pointed style. The body of the church has a remarkable appearance of uniformity, because, although the building of the new nave was continued with intermissions from the 14th century until Tudor times, the broad design of the Early English work In the eastern part of the church was carried on throughout. The choir, with its unusual form and radiating chapels, plainly follows French models, but the name of the architect is lost. Exquisite ornament is seen in the trjforium arcade, and between some of the arches in the transept are figures, especially finely carved, though much mutilated, known as the censing angels. Henry VI I. 's Chapel replaces an earlier Lady Chapel, and is the most remarkable building of its period. It comprises a nave with aisles, and an apsidal eastward end formed of five small radiating chapels. Roth within and without it is ornamented with an extraordinary wealth and minuteness of detail. A splendid series of carved oak stalls lines each side of the nave, and above them hang the banners of the Knights uf the Bath, of whom this was the place of installation when the Order was re-constituted in 1725. The fan-traceried roof, with its carved stone pendants, is the most exquisite architectural feature of the chapel.

The choir stalls in the body of the church" are modern, as is the organ, a fine instrument with an " echo " attachment, electrically connected, in the triforium of the south transept. The reredos is by Sir G. G. Scott, with mosaic by Salviati. In Abbot Islip's chapel there is a series of effigies in wax, representing monarchs and others. The earliest, which is well preserveci, is of Charles II., but remnants of older figures survive. Some of the effigies were carried in funeral processions according to custom, but this

was not done later than 1735. There are, however, figures of Lord Chatham and Nelson,

monies and tttoau ments.*

set up by the officials who received the fees formerly paid by visitors to the exhibition.

But the peculiar fame of the Abbey lies not in its architecture, nor in its connexion with the metropolis alone, but in the fact that it has long been the place of the coronation of sovereigns and the burial-place of many of them and of their greatest Cere ~ subjects. The original reason for this was the reverence attaching to the memory of the Confessor, whose shrine stands in the central chapel behind the high altar. The Norman kings were ready to do honour to his name. From William the Conqueror onward every sovereign has been crowned here except- ing Edward V. The coronation chairs stand in the Confessor's chapel. That used by the sovereign dates from the time of Edward I., and contains beneath its seat the stone of Scone, or stone of destiny, on which the Celtic kings were crowned. It is of Scottish origin, but tradition identifies it with Jacob's pillow at Bethel. Here also are kept the sword and shield of Edward HI., still used in the coronation ceremony. The second chair was made for Mary, consort of William III. Subsequent to the Conquest many kings and queens were buried here, from Henry III. to George II. Not all the graves are marked, but of those which are the tomb of Henry VII. and his queen, Elizabeth of York, the central object in his own chapel, is the finest. The splendid recumbent effigies in bronze, of Italian workmanship, rest upon a tomb of black marble, and the whole is enclosed in a magnificent shrine of wrought brass. Monu- ments, tombs, busts and memorials crowd the choir, its chapels and the transepts, nor is the nave wholly free of them. All but the minority of the Gothic period (among which the canopied tombs of Edmund Crouchback and Aymer de Valence, in the sanctuary, are notable) appear incongruous in a Gothic setting. Many of the memorials are not worthy of their position as works of art, nor are the subjects they commemorate always worthy to lie here, for the high honour of burial in the Abbey was not always so conscientiously guarded as now. Eliminating these considerations, however, a wonderful range of sculptural art is found. A part of the south transept is famed under the name of the Poet's Corner. The north transept contains many monuments to statesmen.

The monastery was dissolved in 1539, and Westminster was then erected into a bishopric, but only one prelate, Thomas Thurleby, held the office of bishop. In 1553 Mary again appointed an abbot, but Elizabeth reinstated the dean, with twelve pre

bendaries. Of the conventual buildings, the cloisters are of jk £l » d . aps the 13th and 14th centuries. On the south side of the ^^'

southern walk remains of a wall of the refectory are seen from without. From the eastern walk a porch gives entry to the chapter house and the chapel of the Pyx. The first is of the time of Henry III., a fine octagonal building, its vaulted roof supported by a slender clustered column of marble. It was largely restored by Sir Gilbert Scott. There are mural paintings of the 14th and 15th centuries. The chapel or chamber of the Pyx is part of the under- croft of the original dormitory, and is early Norman work of the Confessor's time. It was used as a treasury for the regalia and other articles of value in early times, and here were kept the standard coins of the realm used in the trial of the pyx now carried out at the Mint. The undercroft is divided into compartments by walls, and part of it appears in the gymnasium of Westminster School. Above it is now the chapter library. To the south-east lies the picturesque Little Cloister, with its court and fountain, surrounded by residences of canons and officials. Near it are slight ruins of the monastic infirmary chapel of St Catherine. West of the main cloisters are the Deanery, Jerusalem chamber and College Hall, the building surrounding a small court and dating in fabric mainly from the 14th century". This was the Abbot's house. Its most famous portion is the Jerusalem chamber, believed to be named from the former tapestries on its walls, representing the holy city. Here died Henry IV.in 1413, as set forth in Shakespeare's Henry IV. (Pt. ii., Act iv. Sc. 4). It is a beautiful room, with open timber roof, windows partly of stained glass, and walls tapestried and panelled The College Hall, adjoining it, is of similar construction, but plainly fitted in the common manner of a refectory, with a dais for the high table at the north and a gallery at the south. It is now the dining-hall of Westminster School.

Westminster School. — St Peter's College, commonly called Westminster School, is one of the most ancient and eminent public schools in England, and the only school of such standing still occupying its original site in London. A school was main- tained by the monks from very early times. Henry VIII. took steps to raise it in importance, but the school owes its present eminence to Queen Elizabeth, who is commemorated as the foundress at a Latin commemoration service held periodically in the Abbey, where, moreover, the daily school service is held. The school buildings lie east of the conventual buildings, sur- rounding Little Dean's Yard, which, like the cloisters, communi- cates with Dean's Yard, in which arc the picturesque houses of the headmaster, canons of the Abbey, and others. The build- ings are modern or large modernized. The Great Schoolroom

is a fine panelled hall, bearing on its walls the arms and names of many eminent alumni; it is entered by a gateway attributed to Inigo Jones, also covered with names. Ash- burnham House, now containing one of the school houses, the library and class-rooms, is named from the family for whom it was built, traditionally but not certainly, by Inigo Jones. The finest part remaining is the grand staircase. The number of scholars, called King's Scholars, on the foundation is 60, of which 40, who are boarders, represent the original number. The great proportion of the boys are home boarders (Town Boys). In the College dormitory a Latin play is annually presented, in accordance with ancient custom. It is preceded by a prologue, and followed by a humorous epilogue, in Latin adapted to subjects of the moment. Other customs for which the school is noted are the acclamation of the sovereign at coronation in the Abbey, in accordance with a privilege jealously held by the boys; and the " Pancake Greaze," a struggle in the Great Schoolroom on Shrove Tuesday to obtain possession of a pancake carrying with it a reward from the Dean. The number of boys is about 250. Valuable close scholarships and exhibitions at Christ Church, Oxford, and Trinity College, Cambridge, are awarded annually.

57 Margaret's. — On the north side of the Abbey, close beside it, is the parish church of St Margaret. It was founded in or soon after the time of the Confessor, but the present building is Perpendicular, of greater beauty within than without. St Margaret's is officially the church of the House of Commons. It is frequently the scene of fashionable weddings, which arc rarely held in the Abbey. On the south side of Dean's Yard is the Church House, a memorial of Queen Victoria's Jubilee (1887), consisting of a spacious hall of brick and stone, with offices for numerous Church societies.

Westminster Palace : Houses of Parliament. — A royal palace existed at Westminster at least as early as the reign of Canute, but the building spoken of by Fitzstephen as an " incomparable structure furnished with a breastwork and a bastion " is supposed to have been founded by Edward the Confessor and enlarged by William the Conqueror. The Hall, called Westminster Hall, was built by William Rufus and altered by Richard II. In 151 2 the palace suSered greatly from fire, and thereafter ceased to be used as a royal residence. St Stephen's chapel, originally built by King Stephen, was used from 1547 for the meetings of the House of Commons, which had been held previously in the chapter house of the Abbey. The Lords used another apartment of the palace, but on the 16th of October 1834 the whole of the buildings, except the hall, was burnt down. In 1840

the building of the New Palace, or Houses of Parliament, began, and it was completed in 1867, at a cost of about three millions sterling. (For plan, &c, see Architecture: Modern.) It covers an area of about 8 acres, and has a frontage of about 300 yds. to the Thames. The architect was Sir Charles Barry, and the style is late Perpendicular.

Towards the river it presents a rich fagade with a terrace rising directly from the water. At the south-west corner rises the vast Victoria tower, above the royal entrance, 340 ft. high, and 75 ft. square. At the north is the clock tower, 320 ft. high, bearing the great clock which chimes the quarters on four bells, and strikes the hours on a bell weighing over 13 tons, named Big Ben after Sir Ben>amin Hall, First Commissioner of Works at the time when the clock was erected. The building incorporates Westminster Hall, which measures 290 ft. in length, 68 in width, and 90 in height. It has a magnificent open roof of carved oak, and is used as the vestibule of the Houses of Parliament. Of the modern rooms, the House of Peers is a splendidly ornate chamber, 97 ft. in length ; that of the Commons is 70 ft. long, and less lavishly adorned. The sitting of parliament is signified by a flag on Victoria Tower in daytime and by a light at the summit of the clock tower at night.

Whitehall. — Northward from Parliament Square a broad, slightly curving thoroughfare leads to Trafalgar Square. This is Whitehall, which replaced the narrow King Street. Here, between the Thames and St James's Park, formerly stood York House, a residence of the archbishops of York from 1248. Wolsey beautified the mansion ajid kept high state there, but on his disgrace Henry VIII. acquired and reconstructed it, employed

Holbein in its decoration, and made it his principal residence. Inigo Jones designed a magnificent new palace for James I., but only the banqueting hall was completed (1622), and this survived several fixes, by one of which (1697) nearly the whole of the rest of the palace was destroyed. The hall, converted into a royal chapel by George I., and now housing the museum of the Royal United Service Institution, the buildings of which adjoin it, is a fine specimen of Palladian architecture, and its ceiling is adorned with allegorical paintings by Rubens, restored and rehung in 1907. The museum contains military and naval relics, models and other exhibits. Through this hall Charles I. passed on his way to execution beneath its windows; and the palace was the scene of the death of Henry VIII., Cromwell and Charles II.

The principal government offices are situated in Whitehall. On the left, following the northerly direction, are buildings completed in 1908, from the designs of J. M. Brydon, for the Boards of Educa- tion, Trade, Local Government, &c. The Home, Foreign, Colonial and India Offices occupy the next block, a heavy building, adorned with allegorical figures, by Sir G.

G. Scott (1873). Downing Street, separating these from the Treasury, contains the official residences of the First Lord of the Treasury and the Chancellor of the Ex- chequer. The Treasury itself dates from 1737, but the fagade is by Sir Charles Barry. The Horse Guards, containing the offices of various military departments, is a low but not unpicturesque building surrounding a court-yard, built in 1753 on the site of a

guard-house for the security of Whitehall palace, dating from 1631. (n the parade ground between it and St James's Park the ceremony of trooping the colour is held at the celebration of the sovereign's birthday. The portion of the Admiralty facing Whitehall dates from 1726 and is plain and sombre; but there are handsome new buildings on the Park side. On the right of Whitehall, besides the banquet hall, are the fine War Office, completed in 1906, from the designs of W. Young, and Montagu House, the residence of the duke of Buccleuch. In front of the War Office an equestrian statue of the duke of Cambridge (d. 1904) was unveiled in 1907.

Trafalgar Square is an open space sloping sharply to the north. On the south side, facing the entry of Whitehall, , is the Nelson column (1843) by W. Railton, 145 ft. in height, a copy in granite from the temple of Mars Ultor in Rome, crowned with a statue of Nelson by E. H. Baily, and having at its base four colossal lions in bronze modelled by Sir Edwin Landscer. The centre of the square is levelled and paved with asphalte, and contains two fountains. There are statues of George IV., Napier, Havelock and Gordon. Behind the terrace on the north rises the National Gallery (1838), a Grecian building by William Wilkins, subsequently much enlarged, with its splendid collection of paintings. The L National Portrait Gallery is contained in a building (1895) on the north-east side of the National Gallery.

Westminster Cathedral. — A short distance from Victoria Street, towards its western end, stands Westminster Cathedral (Roman Catholic). Its foundation was laid in 1896, and its consecration took place at the close of 1903. Its site is somewhat circum- scribed, and this and its great bulk renders impossible any- general appreciation of its complex outline; but its stately domed campanile, 2S3 ft. in height, forms a landmark from far over London. The style was described by the architect, J. F. Bentlcy, as early Christian Byzantine, and the material is mainly red brick. The extreme length is 360 ft., the breadth 156 ft., the breadth of the nave 60 ft., and its height (domes within) 112 ft.

WESTMINSTER, STATUTES OF, two English statutes passed during the reign of Edward I, Parliament having met at Westminster on the 22nd of April 1275, its main work was the consideration of the statute of

Westminster I. This was drawn up, not in Latin, but in Norman French, and was passed " par le assentement des erceveskes, eveskes, abbes, priurs, contes, barons, ct la communaute de la tere ileokes somons." Its provisions can be best summarized in the words of Stubbs (Const. Hist. cap. xiv.) : —

" This act is almost a code by itself; it. contains fifty-one clauses, and covers the whole ground of legislation. Its language now recalls that of Canute or Alfred, now anticipates that of our own day; on the one hand common right is to be done to all, as well poor as rich, without respect of persons; on the other, elections are to be free, and no man is by force, malice or menace, to disturb them. The spirit of the Great Charter is not less discernible: ex- cessive amercements, abuses of wardship, irregular demands for feudal aids, are forbidden in the same words or by amending enact- ments. The inquest system of Henry II., the law of wreck, and

the institution of coroners, measures of Richard and his ministers, come under review as well as the Provisions of Oxford and the Statute of Marlborough."

The second statute of Westminster was passed in the parlia- ment of 1285. Like the first statute it is a code in itself, and contains the famous clause De donis conditionalibus (q.v.), " one of the fundamental institutes of the medieval land law of England." Stubbs says of it: "The law of dower, of ad- vowson, of appeal for felonies, is largely amended; the in- stitution of justices of assize is remodelled, and the abuses of manorial jurisdiction repressed; the statute De religiosis, the statutes of Merton and Gloucester, are amended and re-enacted. Every clause has a bearing on the growth of the later law."

The statute Quia Emptores of 1290 is sometimes called the statute of Westminster III.

WESTMINSTER, SYNODS OF. Under this heading are included certain of the more important ecclesiastical councils held within the present bounds of London. Though the precise locality is occasionally uncertain, the majority of the medieval synods assembled in the chapter-house of old St Paul's, or the former chapel of St Catherine within the precincts of West- minster Abbey or at Lambeth. The councils were of various types, each with a constitutional history of its own. Before the reign of Edward I., when convocation assumed substantially its present form (see Convocation), there were convened in London various diocesan, provincial, national and legatine synods; during the past six centuries, however, the chief

ecclesiastical assemblies held there have been convocations of the province of Canterbury.

The first really notable council at St Paul's was that of 1075 under the presidency of Lanfranc; it renewed ancient regula- tions, forbade simony and permitted three bishops to remove from country places to Salisbury, Chichester and Chester re- spectively. In 1 102 a national synod at Westminster under Anselm adopted canons against simony, clerical marriages and slavery. The councils of 1126, 1127 and 1138 were legatine, that of 1175 provincial; their canons, chiefly re-enactments, throw light on the condition of the clergy at that time. The canons of 1200 are based in large measure on recommendations of the Lateran Council of 1179. At St Paul's the legatine con- stitutions of Otto were published in a synod of 1237, those of Ottobon in 1268: these were the most important national councils held after the independence of York had been estab- lished. A synod at Lambeth in 12S1 put forth canons none too welcome to Edward I.; they included a detailed scheme for the religious instruction of the faithful. During the next two centuries the councils devoted much attention to heresy: eight propositions concerning the body of Christ after his death were rejected at St Mary-le-Bowin 1286; the expulsion of the Jews from England was sanctioned by a legadne synod of Westminster in 1291; ten theses of Wiclif's were condemned at the Dominican friary in 1382, and eighteen articles drawn from his Trialogy,s met the same fate at St Paul's in 1396; and the doom of Sir John Oldcastle was scaled at the latter place in 1413. The 14th-century synods at St Paul's concerned them- selves largely with the financial and moral status of the clergy, and made many quaint regulations regarding their dress and behaviour (1328, 1342, 1343; cf. 1463). From the time of Edward VI. on, many of the most vital changes in ecclesiastical discipline were adopted in convocations at St Paul's and in the Abbey. To enumerate them would be to give a running com- mentary on the development of the Church of England; among the most important were those of 1547, 1552, 1554, 1562, 1571, 1604, 1605, 1640 and 1661. In 1852 there was held the first of a series of synods of the newly organized Roman Catholic archdiocese of Westminster. For the " Pan-Anglican Synods " see Lambeth Conferences.*

Bibliography.— For acts of synods prior to the Reformation see Spelman, Hardouin, W. Lynwood, Provinciate (Oxford, 1679), and hest of all Wilkins ; for the canons and proceedings of convocations from 1547 to 1717 consult E. Cardwell, Synodalia (2 vols., Oxford, 1842); for translations and summaries, Guerin, Landon and Hefele, Conciliengesckichte, vol. iv. ff. ; see also T. Lathbury, A History of the Convocation of the Church of England (2nd enlarged edition,

London, 1853); A. P. Stanley, Historical Memorials of Westminster Abbey

(4th and revised ed., London, 1876), 411-413, 495-504; H. H. Milman, Annals of 5. Paul's Cathedral (2nd ed., London, 1869). Full titles under Councils. (W. W. R.)*

WESTMORLAND, EARLS OP. Ralph Neville, 4th Baron Neville of Raby, and 1st earl of Westmorland (1364-1425), eldest son of John, 3rd Baron Neville, and his wife Maud Percy (see Neville, Family), was knighted by Thomas of Wood- stock, afterwards duke of Gloucester, during the French expedi- tion of 1380, and succeeded to his father's barony in 13S8. He had been joint warden of the west march in 13S6, and was reappointed for a new term in 1390. In 1391 he was put on the commission which undertook the duties of constable in place of the duke of Gloucester, and he was repeatedly engaged in negotiations with the Scots. His support of the court party against the lords appellant was rewarded in 1397 by the earldom of Westmorland. He married as his second wife Joan Beaufort, half-sister of Henry of Lancaster, afterwards Henry IV., whom he joined on his landing in Yorkshire in 1399. He already held the castles of Brancepeth, Raby, Middleham and Sheriff Hutton when he received from Henry IV, the honour and lordship of Richmond for life. The only rivals of the Nevilles in the north were the Percies, whose power was broken at Shrewsbury in 1403. Both marches had been in their hands, but the warden- ship of the west marches was now assigned to Westmorland, whose influence was also paramount in the east, which was under the nominal wardenship of the young Prince John, after- wards duke of Bedford. Westmorland had prevented North- umberland from marching to reinforce Hotspur in 1403, and before embarking on a new revolt he sought to secure his enemy, surrounding, but too late, one of Sir Ralph Eure's castles where the earl had been staying. In May the Percies were in revolt, with Thomas Mowbray, earl marshal, and Archbishop Scrope. Westmorland met them on Shipton Moor, near York, on the 29th of May 1405, and suggested a parley between the leaders. By pretending accord with the archbishop, the earl induced him to allow his followers to disperse. Scrope and Mowbray were then seized and handed over to Henry at Pontefract on the 3rd of January. The improbabilities of this narrative have led some writers to think, in face of contemporary authorities, that Scrope and Mowbray must have surrendered voluntarily. If Westmorland betrayed them he at least had no share in their execution. Thenceforward he was busily engaged in negotiating with the Scots and keeping the peace on the borders. He did not play the part assigned to him by Shakespeare in Henry V. t for during Henry's absence he remained in charge of the north, and was a member of Bedford's council. He consolidated the strength of his family by marriage alliances. His daughter Catherine married in 141 2 John Mowbray, second duke of Norfolk, brother and heir of the earl marshal, who had been executed after Shipton Moor; Anne married Humphrey, first duke of

Buckingham; Eleanor married, after the death of her first husband Richard Ie Despenser, Henry Percy, 2nd earl of Northumberland; Cicely married Richard, duke of York, and was the mother of Edward IV. and Richard III. The sons by his second marriage were Richard Neville, earl of Salisbury, William, Baron Fauconberg, George, Baron Latimer, Robert, bishop of Salisbury and then of Durham, and Edward, Baron Abergavenny. The earl died on the 21st of October 1425, and a fine alabaster tomb was erected to his memory in Staindrop church close by Raby Castle.

See J. H. Wylie, History of England under Henry IV. (4 vols.,

1884-1898).

Ralph, 2nd earl of Westmorland (c. 1404-1484), the son of John, Lord Neville (d. 1423), succeeded his grandfather in 1425, and married as his first wife Elizabeth Clifford, daughter of Sir Henry Percy (Hotspur), thus forming further bonds with the Percies. The 3rd earl, Ralph Neville (1456-1499), was his nephew, and the son of John Neville, Lord Neville, who was slain at Towton. His grandson Ralph, 4th earl of Westmorland (1499-1550), was an energetic border warrior, who remained faithful to the royal cause when the other great northern lords

joined the Pilgrimage of Grace. He was succeeded by his son Henry, 5th earl (c. 1525-1563).

Charles, 6th earl (1543-1601), eldest son of the 5th earl by his first wife Jane, daughter of Thomas Manners, 1st earl of Rutland, was brought up a Roman Catholic, and was further attached to the Catholic party by his marriage with Jane, daughter of Henry Howard, earl of Surrey. He was a member of the council of the north in 1569 when he joined Thomas Percy, 7th earl of Northumberland, and his uncle Christopher Neville, in the Catholic rising of the north, which had as its object the' liberation of Mary, queen of Scots. On the collapse of the ill- organized insurrection Westmorland fled with his brother earl over the borders, and eventually to the Spanish Netherlands, where he lived in receipt of a pension from Philip II. of Spain, until his death on the 16th of November 1601, He left no sons, and his honours were forfeited by his formal attainder in 1571. Raby Castle remained in the hands of the crown until 1645.

The title was revived in 1624 in favour of Sir Francis Fane (c. 1574-1629), whose mother, Mary Neville, was a descendant of a younger sun of the first earl. He was created baron of Burghersh and earl of

Westmorland in 1624, and became Lord le Despenser on his mother's death in 1626. His son Mildmay Fane, 2nd or 8th earl of Westmorland (c. 1602-1666), at first sided with the king's party, but was afterwards reconciled with the parliament. John Fane, 7th or 13th earl of Westmorland (i682?-i'762), served under Marlborough, and was made in 1739 He a tenant -general of the British armies.

John Fane, nth or 17th earl (1784-1859), only son of John, 10th earl, was known as Lord Burghersh until he succeeded to the earldom in 1841. He entered the army in 1803, and in 1805 took part in the Hanoverian campaign as aide-de-camp to General Sir George Don. He was assistant adjutant-general in Sicily and Egypt (1806-1807), served in the Peninsular War from 1S08 to 1813, was British military commissioner to the allied armies under Schwarzenberg, and marched with the allies to Paris in 1814. He was subsequently promoted major- general (1825), lieutenant-general (1838) and general -(1854), although the latter half of his life was given to the diplomatic service. He was British resident at Florence from 1814 to 1830, and British ambassador at Berlin from 1841 to 1851, when he was transferred to Vienna. In Berlin he had mediated in the Schleswig-Holstein question, and in Vienna he was one of the British plenipotentiaries at the congress of 1855. He retired in 1855, and died at Apthorpe House, Northamptonshire, on the i6lh of October 1859. Himself a musician of considerable reputation and the composer of several operas, he took a keen interest in the cause of music in England, and in 1822 made proposals which led to the foundation in the next year of the Royal Academy of Music. His wife Priscilla Anne (1793-1870), daughter of William Wellesley-Pole, 3rd earl of Mornington, was a distinguished artist.

His published works include Memoirs of the Early Campaigns of the Duke of Wellington in Portugal and Spain (1820J, and Memoir of the Operations of the Allied Armies under Prince Schwarzenberg and Marshal Bliicher (1822).

Francis William Henry, 12th or 18th earl (1825-1891), fourth son of the preceding, was also a distinguished soldier. He entered the army in 18.13 and served through the Punjab cam- paign of 1846; was made aide-de-camp to the governor-general in 184S, and distinguished himself at Gujrat on the 21st of February 1849. He went to the Crimea as aide-de-camp to Lord Raglan, and was promoted lieutenant-colonel in 1855. On his return to England he became aide-de-camp to the duke of Cambridge, and received the Crimean medal. The death of his elder brother in 1851 gave him the style of Lord Burghersh, and after his accession to the earldom in 1859 he retired from the service with the rank of colonel. He died m August 1891 and was succeeded by his son, Anthony Mildmay Julian Fane (b. 1S59), as 13th carl.

WESTMORLAND, a north-western county of England, bounded N.W. by Cumberland, N.E. for a short distance by Durham, E. by Yorkshire, S. and S.W. by Lancashire. It

reaches the sea in the Kent estuary in Morecambe Bay. The area is 786-2 sq. m. Physically the county may be roughly divided into four areas. (1) The great upland tract in the north- eastern part, bordering on the western margin of Yorkshire and part of Durham, consists mainly of a wild moorland area, rising to elevations of 2780 ft. in Milburn Forest, 2403 in Dufton Fell, 2446 in Hilton Fell, 2024 in Bast if ell, 2328 in High Seat, 2323 in Wild Boar Fell and 2235 in Swarth Fell. (2) The second area comprises about a third of the Lake District (q.v.), westward from Shap Fells. This area includes High Street (2663 ft.), Helv.ellyn (31 18) and Fairfield (2863), Langdale Pikes (2401) and on the boundary Bow Fell (2960), Crinkle Crags (2816) and Pikeo'Blisco (2304). It must also be taken to cover the elevated area on the Yorkshire border which includes the Ravenstonedale and Langdale Fells to the N. and the Middleton and Barbon Fells to the S., of an intrusive angle of Yorkshire. This area, however, which reaches in some points over 2200 ft. of altitude, is marked off from the Lake District mountains by the Lune valley. All but the lower parts of the valleys within these two areas lie at or above 1000 ft. above Ordnance datum; and more than half the remainder lies between that elevation and 1750 ft., the main mass of high land lying in the area first mentioned. (3) The third area includes the comparatively low country between the northern slopes of that just described and the edge of the uplands to the north-east thereof. This covers the Vale of Eden. About three-fifths of this area lies between the 500 arfd the 1000 ft. contour. (4) The Kendal area consists mainly of undulating lowlands, varied by hills ranging in only a few cases up to 1000 ft. More than half this area lies below the 500 ft. contour. Westmorland may thus be said to be divided in the middle by uplands ranging in a general south-easterly direction, and to be bordered all along its eastern side by the elevated moorlands of the Pennine chain. The principal rivers are — in the northern area the higher part of the Tees, the Eden with its main tributaries, the Lowther and the Eamont, and in the southern area the Lune and the Kent, with their numerous tributary becks and gills. The lakes include Windermere, part of Ullswatcr, Grasmere, Hawes Water and numerous smaller lakes and tarns, which are chiefly confined to the north- western parts of the county. Amongst the other physical features of more or less interest are numerous crags and scars, chiefly in the neighbourhood of the lakes; others are Mallerstang Edge, Helbeck, above Brough; Ilaikable or High Cup Gill, near Appleby; Orton Scars; and the limestone crags west of Kirkby Lonsdale. Among the waterfalls are Caldron Snout, on the northern confines of the county, flowing over the Whin Sill, and Stock Gill Force, Rydal Falls,

Skelwith Force, and Dungeon Gill Force, all situated amongst the volcanic rocks in the west. Hell Gill, near the head of the Eden, and Stenkrith, near Kirkby Stephen, are conspicuous examples of natural arches eroded by the streams flowing through them.

Geology. — The diversity of scenery and physical features in this county are directly traceable to the influence of geological structure. In the mountainous north-western portion, which includes the heights of Helvellyn, Langdale Pikes, and Bow Fell, and the lakes Ullswater, Hawes Water, Grasmere and Elterwater, we find the great mass of igneous rocks known as the Borrowdale volcanic series — andesites, basalts and tuffs — of Ordovician age. On the northern and north-western sides these volcanic rocks pass into the neighbouring county of Cumberland; their southern boundary runs north-easterly from the upper end of Windermere by Kentmere and past the granitic mass of Shap Fell; thence the boundary turns north-westward through Rasgill to the east end of Ullswater. Narrow strips of Ordovician Skiddaw slate occur on the south banks of Ullswater and fringe the Borrowdale rocks for some distance east of Windermere. A large area of Silurian rocks occupies most of the south-western part of the county from Windermere to near Raven- stonedale and southward to Sedbcrgh, Kendal and Kirkby Lonsdale. The Ordovician and Silurian rocks are bordered on the east and south by Carboniferous limestone from the river Eamont southward through Clifton, Shap, Crosby Garrett and Ravenstonedale; and again south of Kendal, down the Kent valley and eastward to Kirkby Lonsdale. Outlying patches of limestone rest on the Silurian at Grayrigg, Mealbank and elsewhere. The Carboniferous lime— , stone is found again on the east side of the Eden valley in Milburn Forest, Dufton Fell, Stainmorc and Winstar Fell. Here and there in the south-east corner Millstone Grit and Shales cap the limestone

and some little distance east of Brough under Stainmore a small patch of Coal Measures remains. At the base of the Carboniferous rocks in this county is a red conglomeratic deposit, the lower part of which may be regarded as of Old Red Sandstone age ; it may be traced from Ullswater through Butterwick, Rasgill and Tebay, and it appears again at Sedbergh, Barton and around Kendal. In the limestones on the east side of the Eden the Great Whin Sill, a diabase dike, may be followed for a considerable distance. In the Eden valley two sets of red sandstones occur, that on the western side is of Permian age and includes the conglomerate beds known as " brockram." The Permian extends as a belt from 4 to 2 m. wide between Penrith, Appleby and Kirkby Stephen. The sandstone on the

eastern side of the valley is of Bunter age. The eastern side of the valley is strongly faulted so that small patches of Ordovician and Silurian rocks appear all along the margin of the Carboniferous limestone. Evidences of glaciation are abundant in the form of morainic accumulations and transported or striated blocks.

*Climate and Agriculture. — The rainfall is very heavy, especially in the western part (see Lake District), whence it diminishes eastward. Thus at Kendal, on the eastern flank of the Lake District, the mean annual rainfall is still as high as 48-71 in., whereas at Appleby in the Eden valley it is only 32 -45 in. The greater part of the county may, however, be considered to lie within an area having 40 to 60 in. mean annual fall. The average temperature in January at Appleby is 35-8° F., but at Windermere it is 37*4°. The summer temperature js mild; thus at the same two points 58*4° and 58-7° are recorded. The principal characteristic of the climate is the pre- ponderance of cloudy, wet and cold days, especially in the spring and autumn, — combining to retard the growth of vegetation. The late stay of cold winds in the spring has much to do with the same, especially in the lowlands extending along the foot of the Cross Fell escarpment from Brough north-westwards. The helm-wind (q.v.) is characteristic of this district. Scarcely one-half of the total area of the county is under cultivation, and of this acreage about five- sixths is in permanent pasture, both cattle and sheep being largely kept. Large portions of the valleys are well wooded. Nearly the whole of the acreage under corn crops is occupied by oats; a little barley is grown, but the wheat crop is insignificant. About three- fourths of the acreage under green crops is occupied by turnips. The meadow-land yields excellent grass. Grass of inferior value char- acterizes the pasture-lauds; while on the fell (or unenclosed) land, except in limestone areas, the herbage consists chiefly of the coarser kinds of grass, bents and heather. These, however, furnish nourish- ment for the hardier breeds of sheep, which are pastured there in large numbers. It is from the sale of these, of their stock cattle, horses and pigs, and of their dairy produce that the staple of the farmers' income is derived. A large part of Westmorland was formerly in the hands of "statesmen" (see Cumbkkland) whose holdings were usually of small extent, but were sufficient, with careful management, for the respectable maintenance of themselves and their families. The proportion of landowners of this class has greatly decreased.*

Manufactures. — The manufacturing industries, owing to the absence of any large supplies of native fuel, are not numerous. The principal is woollen manufacture in one form or another, and this is chiefly confined to the low country in and near Kendal. Bobbin-making, the manufacture of explosives, fulling, snuff- grinding and several small industries are carried on, and use the water-power available at so many points. Paper-making is

also carried on. The quarries occupy a considerable number of hands at various points, as in the case of the green slate quarries which are detrimental to the scenery in the lower part of Langdale.

Communications. — The main line of the London and North- Western railway from the south serves Oxenholmc (branch to Kendal and Windermere), Low Gill (branch to lngleton in York- shire), and Tebay, leaving the county after surmounting the heavy gradient at Shap. The Midland main line, with a parallel course, serves Appleby. A branch of the North Eastern system from Darlington serves Kirkby Stephen and Tebay, and another branch connects Kirkby Stephen with Appleby and Penrith.

Population and Administration. — The area of the ancient county is 503,160 acres, with a population in 1891 of 66,098 and in 1901 of 64,303. The natives are prevalently tall, wiry, long-armed, big-handed, dark-grey-eyed and fresh-coloured. In disposition they arc cautious, reserved and unemotional and thrifty beyond measure. • The general character of the dialects of Westmorland is that of a basis of Anglian speech, influenced to a certain extent by the speech current amongst the non-Anglian peoples of Strathclyde. This is overlaid to a much greater though variable extent by the more decidedly Scandinavian forms of speech introduced at various periods between the 10th and the 12th centuries. Three well-marked dialects can be made out.

The area of the administrative county is 505,330 acres. The county contains four wards (corresponding to hundreds). The municipal boroughs are Appleby, the county town (pop.

1764) and Kendal (14,183). The urban districts are Ambleside (2536), Bowness and Windermere (5061), Grasmere (781), Kirkby Lonsdale (1638) and Shap (1226). The county is in the northern circuit, and assizes are held at Appleby. It has one court of quarter sessions, and is divided into five petty sessional divisions. The borough of Kendal has a separate commission of the peace. There are 115 civil parishes. Westmorland is in the diocese of Carlisle, and contains 86 ecclesiastical parishes or districts, wholly or in part. There are two parliamentary divisions, Northern or Appleby and Southern or Kendal, each returning one member.

History. — The earliest English settlements in the district which is now Westmorland were effected by the Anglian tribes who entered Yorkshire by the Humber in the 6th century and laid the foundations of the kingdom of Deira, which included within its bounds that portion of Westmorland afterwards known as the barony of Kendal. The northern district; corre- sponding to the later barony of Appleby, meanwhile remained unconquered, and it was not until the close of the 7th century that Ecgfrith

drove out the native Britons and established the Northumbrian supremacy over the whole district. With the Danish invasions of the 9th century the Kendal district was included in the Danelaw, while the barony of Appleby formed a portion of the land of Carlisle. The first mention of Westmorland in the Saxon Chronicle occurs under 966, when it was harried by Thored son of Gunnar, the term here applying only to the barony of Appleby, which at this period was being exten- sively colonized by Norwegian settlers, traces of whose occupation arc especially noticeable in the place-names of the Lake District.

The Domesday Survey describes only the barony of Kendal which appears as part of Amounderness in Yorkshire. Before the Conquest it had formed part of the earldom of Tostig of Northumbria, and had been bestowed by William I. on Roger of Poitou, but, owing to the forfeiture of his estates by the latter, at the time of the survey it was in the hands of the crown. The annexation of the northern portion of Westmorland to the crown of England was accomplished by William Rufus, who in 1092 drove out Dolfin from the land of Carlisle, and fortified Brough-under-Stainmorc, Brougham, Appleby and Pendragon. In the reign of Henry I. the barony of Appleby was included in the grant to Ranulph Meschin of the earldom of Carlisle, but on the accession of Ranulph to the earldom of Chester in 11 20 it was surrendered to the crown, and its inclusion in the pipe roll of 1 131 shows that Westmorland was now definitely estab- lished on the administrative basis of an English county.

The barony of Kendal was held in the 12th century by the Mowbrays, and from them passed to the family of Lancaster, who held it as of the honour of Westmorland. In the 13th century it was separated into two moieties; the Lindsay moiety which passed from the Lindsays to the Copelands and Coucys and in the reign of Henry VI. to the Beauforts and Richmonds, whence was derived its later name of Richmond Fee; the Brus moiety, which became subdivided into the Marquis Fee held by the Parr family, ancestors of Katherine Parr, and the Lumley Fee which passed from the Th wengs to the Lumleys and Hothams. The barony of Appleby, with the hereditary shrievalty, was bestowed by King John on the family of Veteripont, from whom it passed by female descent to the Cliffords in the 13th century, and in the 16th century to the Tuftons, afterwards earls of Thanet, who retained the dignity until their descendant, Mr Barham of Trecwn, yielded his rights to the crown.

*The division of Westmorland into wards originated with the system of defence against the inroads of the Scots, each barony being divided into two wards, and each ward placed unuer a * high constable, who presided over the wards to be maintained at certain fords and other appointed places. The barony of Kendal was divided into Kendal and Lonsdale wards,*

and the barony of Appleby, called the Bottom, into east and west wards, there being anciently a middle ward between these last two. The shire court and assizes for the county were held at Appleby. The barony of Appleby was included in the diocese of York from the 7th century, and in 1291 formed the deaneries of

Lonsdale and Kendal within the archdeaconry of Richmond. The barony of Appleby, which had been bestowed by Henry I. in the see of Carlisle, formed in 1291 the deanery of Westmorland within the archdeaconry and diocese of Carlisle. The barony of Kendal was placed by Henry VIII. in his new diocese of Chester, of which it remained a part until in 1856 it was constituted the archdeaconry of Westmorland within the diocese of Carlisle. In iSsg the Westmorland portion of the archdeaconry of Carlisle was subdivided into the deaneries of Appleby, Kirkby Stephen and Lowther; and the additional deanery of Ambleside was formed within the archdeaconry of Westmorland. The only religious foundation of any importance in Westmorland was the Premonstratensian house at Shap founded by Thomas, son of Gospatric, in the 1 2th century.

The early political history of Westmorland after the Conquest is a record of continuous inroads and devastations from the Scots. In the Scottish invasion of the northern counties which followed the battle of Bannockburn Brough and Appleby were burnt, and the county was twice harried by Robert Bruce in the ensuing years. In 1385 a battle was fought at Hoff near Appleby against the Scots under Earl Douglas, and in 1388, after Otter- burn, the Scots sacked Appleby with such effect that nine- tenths of it lay in ruins and was never rebuilt. In the Wars of the Roses, Westmorland, under the Clifford influence, inclined to favour the Lancastrian cause, but was not actively concerned in the struggle. In the Civil War of the 17th century the chief families of the county were royalist, and in 1641 Anne, countess of Pembroke, hereditary high sheriff of the county, garrisoned Appleby Castle for the king, placing it in charge of Sir Philip Musgrave, the colonel of the train-bands of Westmorland and Cumberland. In 1642 a memorial was presented to Charles signed by nearly 5000 of the inhabitants of Westmorland and Cumberland protesting their loyalty and readiness to sacrifice their lives and fortunes in his service. Appleby Castle surrendered in 1648, but the strength of the royalist feeling was shown in the joy which greeted the news of the Restoration, the mayor of Appleby publicly destroying the charter which the town had received from Cromwell. The Jacobite rising of 1745 found many adherents in Westmorland, and a skirmish took place on Clifton Moor between the

forces of Lord George Murray and the duke of Cumberland.

The economic development of Westmorland, both on account of natural disadvantages and of the ravages of border strife, has been slow and unimportant; the rugged and barren nature of the ground being unfavourable to agricultural prosperity, while the lack of fuel hindered the growth of manufactures. Sheep-farming was carried on in the moorland districts, however, and the Premonstratensian house at Shap supplied wool to the Florentine and Flemish markets in the 13th and 14th centuries. The clothing industry, which spread from Kendal to the sur- rounding districts, is said to have been introduced by one John Kempe of Flanders, who settled there in the reign of Edward III., and a statute of 1465 alludes to cloths of a distinct make being manufactured at Kendal. In 1589 the county suffered severely from the ravages of the plague, 2500 deaths being recorded in the deanery of Kendal alone. Speed, writing in the 17th century, says of Westmorland that li it is not commended either for plenty of corn or cattle, being neither stored with arable grounds to bring forth the one, nor pasturage to lead up the other; the principal profit, that the people of this province raise unto themselves is by clothing." The comb manufacture was estab- lished at Kendal in 1700, and about the same time the develop- ment of the boot and shoe trade to some extent supplemented the loss consequent on the decline of the clothing industry. There were two paper-mills at Milnthorpe in 1777, one of which existed eighty years before.*

Westmorland returned two knights for the county to the parlia- ment of 1290, and in 1295 two burgesses for the borough of Appleby. Under the Reform Act of 1832 Appleby was dis- franchised and Kendal returned one member.

Antiquities. — Notable ecclesiastical buildings are almost entirely wanting in Westmorland, though mention jnay be

made of the ruins of Shap Abbey, which lies near the small market town of that name in the bleak upper valley of the Lowther. The Perpendicular western tower and other fragments remain. Late Norman work is preserved in some of the churches, as at Kirkby Lonsdale, and in a few castles. Among the castles, those at Appleby, Brough, Brougham and Kendal are notable, but examples are numerous. Among old houses, Levens Hall dates from the 16th century, and Sizergh Hall embodies part of an ancient castle; both are in the Kendal district. The formal gardens at Levens Hall are remarkable. Lowther Castle, near Penrith, the seat of the earl of Lonsdale, is a fine modern mansion, in a Gothic style more satisfactory in broad effect than in detail.

See Joseph Nicholson and Richard Burn, The History and Anti- quities of the Counties of Westmorland and Cumberland (2 vols., London, 1777); William Whellan, The History and Topography of the Counties of Cumberland and Westmorland (Pontcfract, i860); Transactions of the Cumberland and Westmorland Antiquarian and Archaeological Society (Kendal, 1870, &c.); R. S. Ferguson, History of Westmorland (Popular County Histories, 1894); Sir D. Fleming, Description of Westmorland (1671); T. Gibson, Legends and Notes on Places of North Westmorland (London, 1887); M. W. Taylor, Manorial Halls of Westmorland (Kendal, 1892); T. Ellwood, Land- nama Book of Iceland as it illustrates the Dialect and Antiquities of Westmorland (Kendal, 1894); Victoria County History, Westmorland.

WESTON, THOMAS (1737-1776), English actor, was the son of a cook. Plis first London appearance was about 1759, and from 1763 until his death he was admitted to be the most amusing comedian on the English stage. Foote wrote for him the part of Jerry Sneak in the Mayor of Garratt. Abel Drugger in the Alchemist was one of his famous performances; and Garrick, who also played this part, praised him highly for it.

WESTON-SUPER-MARE, a seaside resort in the Wells parlia- mentary division of Somersetshire, England, on the Bristol Channel, 1375 m. W. by S. of London by the Great Western rail- way. Pop. of urban district (igoi), 10,048. It is built partly on level ground near the shore, and partly on the

slopes of Worlebury Hill, which aids in giving shelter from the north and east. Among the fir-clad slopes of the neighbourhood, which command a fine view of the Welsh hills across the Channel, there are many beautiful walks and drives. An esplanade extends for about 3 m., and public gardens have been laid out on Worlebury Hill, from the far end of which a long pier projects, linking the rocky islet of Birnbeck to the town. Grove Park, once the manor- house, is owned by the council, and is used as a free library, its grounds being open. Other institutions include a museum opened in honour of Queen Victoria's Diamond Jubilee, and the West of England Sanatorium, to which two large conservatories are at! ached, as a winter-garden for invalids. The town has long been famous for its potteries, and there are mineral water-works and fisheries. Large quantities of sprats are caught. Intermittent springs exist in Weston, which are affected by the ebb and flow of the tide.

WEST ORANGE, a town of Essex county, New Jersey, U.S.A., in the N.E. part of the state, about 13 m. W. of New York City. Pop. (1890) 4358, (1000) 6889 (1772 foreign-born); (1905, state census) 7872; (igio) 10.980. It is served by the Orange branch of the Erie railroad, and is connected with neighbouring towns and cities by electric lines. The town has an area of about 7 sq. m. It is crossed in a N.E. and S.W. direction by two ridges — the I'irst (also called the Orange or Watchung) Mountain and the Second Mountain. Eagle Rock (about 650 ft.), on the summit of First Mountain, commands a splendid view. On the eastern slope of First Mountain are Hutton Park, containing the grounds of the Essex County Country Club, and Llewellyn Park, a beauti- ful residential tract of 750 acres, named in honour of its originator, Llewellyn S. Haskell (1815-1872). West Orange has various manufactures, including phonographs, lawn mowers and felt hats. In 1862 parts of the townships oT Orange, Caldwell and Livingston were united into a new township named Fairmount. In 1863 another part of Orange was added and the name of the new township was changed to West Orange. In 1900 West Orange was chartered as a town.

See H. Whittemore, The Founders and Builders of the Oranges (Newark, 1896).

WESTPHAL, RUDOLF (1826-1892), German classical scholar, was born at Obernkirchen in Schaumburg on the 3rd of July 1S26. He studied at Marburg and Tubingen, and was professor at Breslau (1858-1862) and Moscow (1875-1879). He subse- quently lived at Biickeburg, and died at

Stadthagen in Schaum- burg-Lippe on the 10th of July 1892. Westphal was a man of varied attainments, but his chief claim to remembrance rests upon his contributions on Greek music and metre. His chief works are: Griechische Meirik (3rd ed., 1885-1889); System der antiken Rhythmik (1865); Hephaestion's De metris enchiridion (1866); Aristoxenus of Tarentum (translation and commentary, 1883-1893, vol. ii. being edited after his death by F. Saran); Die Musik des griechischen A Itertums (1883); A llgemeine Metrik der indogermanischen und semitischen Volker (1892). He made translations of Catullus (1870) and of Aristophanes' Acharnians (1889), in which he successfully reproduced the Dorisms in Plattdcutsch.

WESTPHALIA (Ger. Westfalen), a province of the kingdom of Prussia. The ancient duchy and the Napoleonic kingdom of the same name, neither of which was conterminous with the modern province, are dealt with in the historical part of this article. The area of the province is 7801 sq. m., its length both from N. to S. and from E. to W. is about 130 m., and it is bounded N. by Hanover, E. by Schaumburg-Lippe, Hanover, Lippe-Detmold, Brunswick, Hesse-Nassau and Waldeck, S. and S.W. by Hesse-Nassau and the Rhine Province, and N.W. by the kingdom of the Netherlands.

Nearly half of Westphalia is an extension of the great North- German plain, which here stretches S.E. into an acute angle enclosed on the N.E. by the long low range of the Teutoburger Wald ar.d its southern prolongation the Eggegebirge, and on the S. by the line of hills called the Haar or Haarstrang, which divides the basins of the Lippe and Ruhr. The Westphalian plain is broken by extensive outcrops of the underlying cretaceous beds, and is not very fertile, except in the Hellweg, a zone between the Haarstrang and the Lippe. There are extensive fens in the N. and W., and N. of Pader- born is a sandy waste called the Senne. The plain is drained in the N. by the Ems and in the S. by the Lippe, which rise close together in the Teutoburger Wald. Between their basins are the Vechte and other small rivers flowing into the Zuider Zee. The triangular southern portion of Westphalia, most of which is included in Sauer- land (" south land "), is a rugged region of slate hills and wooded valleys drained chiefly by the Ruhr with its affluents the Lenne, Mohne, &c, and in the S. by the Sieg and Eder. The hills rise in the S.E. to the Rotlager or Rothaargebirge, culminating in the Winterberg plateau with the Kahler Asten (2713 ft.), the highest summit in the province. The Rotlagergebirge, Eggegebirge and Teutoburger Wald form with some intermediate ranges the water- shed between the basin of the Weser and those of the Rhine and Ems. In the N.E. corner of the province the Weser divides the Wiehengebirge from the Wesergebirge by the narrow pass called Porta Westfalica.

The climate is temperate except in the south, which is cold in winter and has a heavy rainfall. Of the total area 43 % is occupied by arable land and gardens, 18% by meadows and pastures and 28 % by forests. The best agricultural land is in the Hellweg and the Weser basin. The number of peasant proprietors is propor- tionately greater than in any other part of Prussia, and as a class they are well-to-do. The crops include grain of all kinds (not sufficient, however, for the needs of the province), peas and beans, buckwheat, potatoes, fruit and hemp. The cultivation of flax is very extensive, especially in the N.E. Swine, which are reared in great numbers in the plains, yield the famous Westphalian hams; and the rearing of cattle and goats is important. The breeding of horses is fostered by the government.

The mineral wealth is very great, especially in coal and iron. The production of coal is greater than that of any other province of Prussia, and amounted in 1906 to 53,000,000 tons. The great Ruhr coal-field extends from the Rhineland into the province as far as Unna, the centre being Dortmund, and there is a smaller coal-field in the N. at Ibbenbiiren. The production of iron ore, chiefly S. of the Ruhr (1,360,000 tons in 1905) is exceeded in Prussia only by that of the Rhine province. After coal and iron the most valuable minerals are zinc, lead, pyrites and copper. Antimony, quicksilver, stone, marble, slate and potter's clay are also worked, and there are brine springs in the Hellweg and mineral springs at Lippspringe, Oynhausen, &c.

The manufacturing industry of the province, which chiefly depends upon its mineral wealth, is very extensive. Iron and steel goods are produced in the so-called " Enneper Strasse," the valley of the Ennepe, a small tributary of the Ruhr with the town of Hagen, and in the neighbouring towns of Bochum, Dortmund, Iserlohn and Altena, and also in the Siegen district. The brass and bronze

industries are carried on at Iserlohn and Altena, those of tin and Britannia metal at Ludenscheid; needles are made at Iserlohn and wire at Altena. The very important linen industry of Bielefeld. Herford, Minden and Warendorf has flourished in this region since the 14th century. Jute is manufactured at Bielt-feld and cotton goods in the W. Paper is extensively made on the lower Lenne, and leather around Siegen. Other manufactures are glass, chemicals, sugar, sausages and cigars. An active trade is promoted by several trunk lines of railway which cross the province (total mileage in 1906, 1889 m., exclusive of light railways) and by the navigation of the Weser (on which Minden has a port), Ems, Ruhr and Lippe. Beverungen is the chief market for corn and Paderborn for wool.

The population in 1905 was 3,618,090, or 464 per sq. m. It is very

unevenly distributed, and in the industrial districts is increasing very rapidly. In recent years there has been a great influx of Poles into these parts, attracted by the higher wages. In 1900 they already numbered more than 100,000. Between 1895 and 1900 the mean annual increase of the population was 3-3%, the highest recorded in the German empire, but between 1900 and 1905 it fell to 2-5%. The percentage of illegitimate births (2-6) is the lowest in Germany. 51-0% of the inhabitants are Roman Catholics, 47-9% Protestants. The distribution of the two communions still closely follows the lines of the settle- ment at the peace of W v estphalia. Thus the former duchy of W r estphaiia and the bishoprics of Minister and Paderborn which remained in ecclesiastical hands are almost entirely Roman Catholic, while the secularized bishopric of Minden and the former counties of Ravensberg and Mark, which fell or had fallen to Brandenburg, and the Siegen district, which belonged to Nassau, are predominantly Protestant.

The province is divided into the three governmental departments {Regierungsbezirke) of Minden, Munster and Arnsberg. Miinster is the seat of government and of the provincial university. Wvest- phalia returns thirty-one members to the Prussian Lower House and seventeen to the Reichstag. ,

The inhabitants are mainly of the Saxon stock and speak Low German dialects, except in the Upper Frankish district around Siegen, where the Hessian dialect is spoken.

Westphalia, " the western plain" (in early records Westfalaki), was originally the name of the western province of the early duchy of Saxony, including the western portion of the modern province and extending north to the borders of Friesland. When Duke Henry the Lion of Saxony fell under the ban of the empire in 1 80, and his duchy was divided, the bishops of Munster and Paderborn became princes of the empire, and the archbishop of Cologne, Philip of Heinsberg, received from the emperor Frederick I. the Sauerland and some other districts which became the duchy of Westphalia. Within the duchy were some in- dependent secular territories, notably the county of Mark, while other districts were held as fiefs from the archbishops, afterwards electors. From 1368 the electors themselves held the county of Arnsberg as an imperial fief. The duchy received a constitution of its own, and was governed for the elector by a marshal (Land- marschall, after 1480 Landdrost) who was also stadtholder, and presided over the Westphalian chancellery. This system lasted till 1803. By Maximilian's administrative organization of the empire in 1500 the duchy of Westphalia was included as an appanage of Cologne in the scattered circle of the Lower Rhine. The Westphalian circle which was formed at the same time com- prised nearly all the rest of the modern

province (including Mark) and the lands north of it between the Weser and the frontier of the Netherlands, also Verden, Schaumburg, Nassau, Wied, Lippe, Berg, Cleves, Jiilich, Liege, Bouillon and Cambrai.

Brandenburg laid the foundations of her dominion in West- phalia by obtaining the counties of Mark and Ravensberg in 1614 (confirmed 1666), to which the bishopric of Minden was added by the peace of Westphalia in 1648 and Tecklenburg in 1707. By the settlement of 1803 the church lands were secular- ized, and Prussia received the bishopric of Paderborn and the eastern part of Miinster, while the electoral duchy of Westphalia was given to Hesse-Darmstadt.

After the peace of Tilsit the kingdom of Westphalia was created by Napoleon I. on the 18th of August 1807, and given to his brother Jerome (see Bonaparte). It included the present governmental department of Minden, but by far the larger part of the kingdom lay outside and chiefly to the east of the modern

province, and comprised the Hanoverian department of Hildes- heim and in part that of Arensberg, Brunswick, the northern part 'of the province of Saxony as far as the Elbe, Halle, and most of Hesse-Cassel. The area was 14,627 sq. m., and the population nearly two millions. Cassel was the capital. A constitution on the French imperial pattern granted by the king remained practically inoperative, an arbitrary bureaucratic regime was instituted, the finances were from the beginning in a hopeless condition, and the country was drained of men and money for Napoleon's wars. In January 1S10 most of Hanover was added, but at the end of the same year half the latter, together with the city of Minden, was annexed to the French empire. There had already been serious revolts and raids, and after the battle of Leipzig the Russians drove the king from Cassel (October 1813), the kingdom of Westphalia was dissolved and the old order was for a time re-established. At the congress of Vienna (1815) Hesse-Darmstadt surrendered her share of Westphalia to Prussia, and the present province was constituted.

See Weddigen, Westfalen, Land und Leute (Paderborn, 1896); G. Schulze, Heimatskunde der Provinz Westfalen (Minden, IQ00); Lemberg, Die Hiitten- und Metallindustrie Rheinlands und West- falen! (4th ed., Dortmund, 1905) ; J. S. Seibertz, Landes- und Rechtsgesckichte dcs Herzogtums Westfalen (4 vols., Arnsberg, 1839- 1875) ; R. Wilmans, Die Kaiser urkunden der Provinz Westfalen (2 vols., Miinster, 1867-1881); M.

Jansen, Die Ilerzogsgewalt der Erzbischofe van Koln in Westfalen (Munich, 1895); Holzapfel, Das Konigreich Westfalen (Magdeburg, 1895); G. Servieres, L'Allemagne frangaise sous Napoleon I™" (Paris, 1904) ; HaseMioff , Die Eniwickelung der Landeskultur in der Provinz Westfalen im igten Jakrhundert (Miinster, 1900).

WESTPHALIA, TREATY OF, a collective name given to the two treaties concluded on the 24th of October 1648 by the empire with France at Minister and with Sweden and the Pro- testant estates of the empire at Osnabruck, by which the Thirty Years' War (q.v.) was brought to an end.

As early as 1636 negotiations had been opened at Cologne at the instance of Pope Urban VIII. , supported by the seigniory of Venice, but failed owing to the disinclination of Richelieu to stop the progress of the French arms, and to the refusal of Sweden to treat with the papal legate. In 1637 the agents of the emperor began to negotiate at Hamburg with Sweden, though the mediation of Christian IV., king of Denmark, was rejected by Sweden, and the discussions dragged on for years without result. In the meantime the new emperor Ferdinand III. proposed at the diet of Regensburg in 1640 to extend the peace of Prague to the whole empire, on the basis of an amnesty, from which, however, those Protestant estates who were still leagued with foreign powers were to be excluded. His aim was by settling the internal affairs of the empire to exclude the German princes from participation in negotiations with foreign powers; but these efforts had no result.

A more practical suggestion was made by the Comte d'Avaux, the French envoy at Hamburg, who proposed in 1641 that the negotiations at Cologne and Hamburg should be transferred to Miinster and Osnabruck, two cities in the Westphalian circle not more than 30 m. apart. A preliminary treaty embodying this proposal was concluded between the representatives of the emperor, France and Sweden at Hamburg on the 2 5th of December 1641. A dispute as to precedence between France and Sweden, and the refusal of the latter power to meet the papal nuncio, made the choice of a single meeting-place impossible. It was arranged, however, that the two assemblies should be regarded as a single congress, and that neither should conclude peace without the other.

The date fixed for the meeting of the two conventions was the nth of July 1.643, but many months elapsed before all the representatives arrived, and the settlement of many questions of precedence and etiquette caused further delays. England, Poland, Muscovy and Turkey were the only European powers unrepresented. The war continued during the deliberations, which were influenced by its fortunes.

The chief representative of the emperor was Count Maximilian von Trautmansdorff, to whose sagacity the conclusion of peace ■vas largely due, The French envoys were nominally under

Henry of Orleans, duke of Longueville, but the marquis de Sable and the comte d'Avaux were the real agents of France. Sweden was represented by John Oxenstierna, son of the chan- cellor, and by John Adler Salvius, who had previously acted for Sweden at Hamburg. The papal nuncio was Fabio Chigi, afterwards Pope Alexander VII. Brandenburg, represented by Count Johann von Sayn- Wittgenstein, played the foremost part among the Protestant states of the empire. On the 1st of June 1645 France and Sweden brought forward propositions of peace, which were discussed by the estates of the empire from October 1645 to April 1646. The settlement of religious matters was effected between February 1646 and March 1648. The treaty was signed at Miinster by the members of both conventions on the 24th of October 1648, and ratifications were exchanged on the 8th of February 1649. The papal protest of January 3, 165 1, was disregarded.

The results were determined in the first place by the support given to each other by France and Sweden in their demands for indemnification, the concession of which necessitated compensa- tion to the German states affected, and secondly by the deter- mination of France to weaken the power of the emperor while strengthening the Roman Catholic states, especially Bavaria.

Sweden received western Pomerania with Riigen and the mouths of the Oder, Wismar and Poel, in Mecklenburg, and the lands of the archbishopric of Bremen and the bishopric of Verden, together with an indemnity of 5,000,000 thaler?. The privileges of the Free Towns were preserved. Sweden thus obtained control of the Baltic and a footing on the North Sea, and became an estate of the empire with three deliberative voices in the diet.

The elector of Brandenburg received the greater part of eastern Pomerania, and, as he had a claim on the whole duchy since the death of the last duke in 1635, he was indemnified by the bishoprics of Halbcrstadt, Minden and Kammin, and the reversion of the archbishopric of Magdeburg, which came to him on the death of the administrator, Prince Augustus of Saxony, in 1680. The elector of Saxony was allowed to retain Lusatia. As compensation for Wismar, Mecklenburg-Schwerin obtained the bishoprics of Schwerin and Ratzeburg and some lands of the Knights of St John. Brunswick-Liineburg restored Hildesheim to the elector of Cologne, and gave Minden to Branden-burg, but obtained the alternate succession to the bishopric of Osnabruck and the church lands of Walkchried and Groningen. Hesse-Cassel received the prince-abbacy of Hersfeld, the county

of Schaum- burg, &c. The elector of Bavaria was confirmed in his possession of the Upper Palatinate, and in his position as an elector which he had obtained in 1623. Charles Louis, the son and heir of Frederick V., the count palatine of the Rhine, who had been placed under the ban of the empire, received back the Lower Palatinate, and a new electorate, the eighth, was created for him.

France obtained the recognition of the sovereignty (which she had enjoyed de facto since 1552) over the bishoprics and cities of Metz, Toul and Verdun, Pinerolo in Piedmont, the town of Breisach, the landgraviate of Upper and Lower Alsace, the Sundgau, the advocacy (Landvogtei) of the ten imperial cities in Alsace, and the right to garrison Philippsburg. During the Thirty Years' War France had professed to be fighting against the house of Austria, and not against the empire. It was stipulated that the immediate possessions of the empire in Alsace should remain in enjoyment of their liberties (in ea libertate et possessions immedietatis erga imperium Romanum, qua hactenus gavisae sunt), but it was added as a condition, that the sovereignty of France in the territories ceded to her should not be impaired (ita tamen, ut praesenti hac declarations nihil detractatum intelligatur de eo omni supremi dominii iure, quod supra concessum est). The intention of France was to acquire the full rights of Austria in Alsace, but as Austria had never owned the landgraviate of Lower Alsace, and the Landvogtei of the ten free cities did not in itself imply possession, the door was left open for disputes. Louis XIV. afterwards availed himself of this ambiguous clause in support of his aggressive policy on the Rhine. The independence of Switzerland was at last formally

recognized, as was that of the United Netherlands in a separate treaty signed by Spain at MUnster.

Apart from these territorial changes, a universal and uncon- ditional amnesty to all those who had been deprived of their possessions was declared, and it was decreed that all secular lands should be restored to those who had held them in 1618, Some exceptions were made in the case of the hereditary dominions of the emperor.

Even more important than the territorial redistribution was the ecclesiastical settlement. By the confirmation of the treaty of Passau of r552 and the religious peace of Augsburg of 1555, and the extension of their provisions to the Reformed (Calvinist) Church, toleration was secured for the three great religious communities of the empire. Within these limits

the governments were bound to allow at least private worship, liberty of conscience and the right of emigration, but these measures of toleration were not extended to the hereditary lands of the house of Habsburg. The Protestant minority in the imperial diet was not to be coerced by the majority, but religious questions were to be decided by amicable agreement. Protestant adminis- trators of church lands obtained seats in the diet. Religious parity was established in the imperial chamber {Reichskam?ner-gericht), and in the imperial deputations and commissions.

The difficult question of the ownership of spiritual lands was decided by a compromise. The edict of restitution of 1629 was annulled. In Wiirttemberg, Baden and the Palatinate these lands were restored to the persons who had held them in 1618 or their successors, but for the rest of the empire possession was determined by the fact of occupation on the 1st of January 1624 {annus decretorius or normal year). By the provision that a prince should forfeit his lands if he changed his religion an obstacle was placed in the way of a further spread of the Reforma- tion. The declaration that all protests or vetoes by whomsoever pronounced should be null and void dealt a blow at the inter- vention of the Roman curia in German affairs.

The constitutional changes made by the treaty had far-reaching effects. The territorial sovereignty of the states of the empire was recognized. They were empowered to contract treaties with one another and with foreign powers, provided that the emperor and the empire suffered no prejudice. By this and other changes the princes of the empire became absolute sovereigns in their own dominions. The emperor and the diet were left with a mere shadow of their former power. The emperor could not pronounce the ban of the empire without the consent of the diet. The diet, in which the 61 imperial cities gained the right of voting on all imperial business, and thus were put on an equality with the princes, retained its legislative and fiscal powers in name, but practically lost them by the requirement of unanimity among the three colleges, which, moreover, were not to give their several decisions by majorities of their members, but by agreement between them.

Not only was the central authority replaced almost entirely by the sovereignty of about 300 princes, but the power of the empire was materially weakened in other ways. It lost about 40,000 sq. m. of territory, and obtained a frontier against France which was incapable of defence. Sweden and France as guarantors of the peace acquired the right of interference in the affairs of the empire, and the former gained a voice in its councils. For many years Germany thus became the principal theatre of European diplomacy and war. But if the treaty of Westphalia pronounced the dissolution of the old order in the empire, it facilitated the growth of new powers in its component parts, especially Austria, Bavaria and

Brandenburg.

The treaty was recognised as a fundamental law of the German constitution, and formed the basis of all subsequent treaties until the dissolution of the empire.

See the text in Dumont, Corps universel diplomatique (The Hague, 1726-1731), vi. 429 ff. ; J. G. von Meiern, Acta pads Westphalicae publico- (6 vols., Hanover and Gottingen, 1734-1736), Instrumenta pacis Caesareo-Suecicae el Caesareo-Gallicae (Gottingen, 1738); " A. A. " [Bishop Adam Adami], Arcana pacis Westphalicae (Frank- fort, 1698), edited by J. G. von Meiern (Leipzig, 1737) ; K. T. Heigel, " Das Westfalische Friedenswerk von 1643-1648 " in the Zeitschrift

fur Geschickte und Politik (1888); F. Philippi and others, Def Westfalische Frieden, ein Gedenkbuch (Munster, 1898); Journal du Congrks de Munster par F. Ogier, aumdnier du comte d' Avaux, edited by A. Boppe (Paris, 1893); Cambridge Modern History, iv. p. 395 ff.' and bibliography, p. 866 ff. ; J. Bryce, The Holy Roman Empire, ch. xix. (A. B. Go.)

WEST POINT, a village and military post, in Orange county, New York, U.S.A., on the west bank of the Hudson river, 50 m. above New York City. It is served by the West Shore railway, and is connected by ferry with the New York Central railway at Garrison. The United States Military Academy occupies a plateau 180 ft. above the river, reached by a roadway cut into the cliff and commanding a view up and down the river for many miles. Between 1902 and 1908 Congress appropriated about $7,500,000 for the reconstruction of the academy, but most of the old buildings of historic interest have been incor- porated. The Headquarters Building and Grant Hall (the mess hall) contain portraits of famous American soldiers. The military library is one of the finest in existence (80,000 volumes in 1910), and its building contains interesting memorials, by Saint Gaudens, to J. McNeill Whistler and Edgar Allan Poe, both former cadets in the academy. Cullum Memorial Hall (1899) was the gift of Major-General George Washington Cullum (1809-1892), superintendent of the academy in 1864-1866. Opposite it is a monument (1845) to Major F. L. Dade's command of no men who were ambushed and killed by the Seminole Indians in Florida in December 1835. In the S.E. corner of the parade ground (60 acres) is a granite statue to Colonel Sylvanus Thayer (1785-1872), who was superintendent of the academy from 1817 to 1833. In the N.W. angle is the bronze statue (186S) of Major-Gencral John Sedgwick, U.S. Volunteers, who was killed by a sharpshooter, on the 9th of May 1864, while making a personal reconnaissance at Spottsylvania. Between Trophy Point and the hotel is the Battle Monument (1874, 78 ft. high, surmounted by a statue of Victory by MacMonnies), a

memorial to the soldiers of the regular army who died in the Civil War. Above the cliff towards the N. and E. of the plain is Fort Clinton; in its E. front stands a monument erected in 1828 by the Corps of Cadets to Kosciuszko, who planned the original fortifications here in 177S. About 1 m. N. of the academy is " West Point Cemetery" (about 14 acres) on the E. angle of an elevated plain overlooking the river, formerly known as " German Flats," in which rest the remains of Thayer, Winfield Scott, Robert Anderson and other distinguished soldiers. The Cadet Monument (1817) stands on the E. angle overlooking the river. High above the academy on Mount Independence (490 ft.) still stands old Fort Putnam, commanding a fine view for miles up and down the Hudson. In 1908, as the gift of Mrs Russell Sage and Miss Anna B. Warner, there was added to the military reservation Con- stitution Island (about 280 acres), lying directly opposite West Point, with the remains of two forts built during the War of Independence.

West Point, " the Gibraltar of the Hudson," was first occupied as a military post in January 1778, when a chain of redoubts was erected at various strategic points along the Hudson. At West Point were built a half-dozen earthwork fortifications, of which Fort Putnam on Mt. Independence, Fort Clinton on the extremity of the point (not to be confused with the Fort Clinton captured by the British in 1777 farther down the river) and Battery Knox, just above the river landing, were the largest. These were the fortifications that Benedict Arnold, their com- mander, in 1780 agreed to deliver into British hands. After the discovery of his treason, Washington made his headquarters for some time at West Point before removing to Newburgh. Later Washington recommended West Point as a site for a military school. Such an establishment had been suggested by Henry Knox in May 1776; and in October of that year the Continental Congress passed a resolution appointing a committee to draw plans for " a military academy of the army." A Corps of Invalids was established in June 1777, was organized in Philadelphia in July 1777, and was transferred to West Point in 1 781; this corps was " to serve as a military school for young gentlemen previously to, their being appointed to marching

regiments." Three buildings had been erected here to house a library, an engineers' school and a laboratory, and practical experiments in. gunnery had been begun here in February 1780. In 1783, at Newburgh, Washington laid before his officers the matter of a military academy such as Knox had suggested. A school for artillerists, engineers and cadets of the corps was established here on the president's recommendation in 1794, and

continued until the buildings were destroyed by fire in 1796. In July 1801, Henry Dearborn, Jefferson's secretary of war, directed that all cadets of the corps of artillerists, a subordinate rank which had been established in 17945 should report at West Point for in- struction, and in September of that year a school was opened with five instructors, four of them army officers. On the 16th of March 1802, President Jefferson approved an act establishing a military academy at West Point, and on the 4th of July it was formally opened with ten cadets present. Acts of 1802 and 1808 authorized 40 cadets from the artillery, 100 from the infantry, 16 from the dragoons and 20 from the riflemen. But few of these were actually appointed, and for several years instruction was disorganized and desultory. In 1811-1812 instruction was practically abandoned, and in March 1812 the "academy" was without a single instructor. Up to this time 88 cadets had been graduated, but they had been admitted without any sort of examination, and at any age between 12 and 34. An act of Congress of the 29th of April 181 2 reorganized the academy, and laid down the general principles and plan on which it has since been conducted. A maximum of 250 cadets was then authorized. Under the able superin tendency of Major Sylvanus Thayer this plan was perfected and put into successful operation. Up to 1843 no territorial requirement was necessary for appoint- ment, but in that year a custom that had grown up of providing for one cadet from each Congressional district, each Territory and the District of Columbia, was embodied in the law.

By acts of 1900, 1902, 1903 and 1908 the Corps of Cadets as now constituted consists of one cadet from each congressional district (appointed on, recommendation by members of Congress), one from each Territory, one from the District of Columbia, one from Porto Rico, two from each state at large (on recommendation of the senators), and 40 from the United States at large, all to be appointed by the president. Four Filipinos may also receive instruction and become eligible on graduation for commissions in the Philippine scouts. The maximum number of cadets under the apportionment of the twelfth census was 533. Candidates for admission must be between 17 and 22 years, unmarried, and at least 5 ft. 4 in. high. For entrance there are physical examinations, and examinations in algebra, plane geometry, English grammar, composition and litera- ture, geography and general history. In 1902 the entrance require- ments were raised and the actual amount of work done in the academy was thus decreased. The principal courses are: tactics for all classes; civil and military engineering (first class); practical military engineering (fourth, third, second and first classes) ; mechanics and astronomy (third and second classes); mathematics (new cadets, fourth and third classes); chemistry, mineralogy and geology (third and second classes) ; drawing (third and second classes); modern languages, i.e. French and Spanish

(fourth, third, second and first classes) ; law (first class) ; ordnance and gunnery (first class); military hygiene (second class); and English and history (new cadets and fourth class). The course is four years, and academic instruction continues from the 1st of September to the 5th of June. The summer months are devoted to field work and encampments. Each cadet while in attendance receives pay at the rate of $ 600 a year and one ration per day, or commutation thereof at thirty cents per day, amounting to $709-50. The number of graduates from 1802 to 1909 inclusive was 4852. The superin- tendents of the academy have been: in 1802-1803 an d in 1805-1812, Jonathan Williams; in 1812-1814, Joseph Gardner Swift (1783- 1865); in 1 815—1817, Alden Partridge (1785—1854) ; in 1817-1833, Sylvanus Thayer; in 1833-1838 Ren6 E. De Russy (1796-1864); in i838-i845andin 1856-1861, Richard Delafield (1 798-1 873) ; in 1845- 1852, Henry Brewerton (1801-1879); in 1852-1855, Robert E. Lee; in 1855-1856, John Gross Barnard (1815-1882); in January 1861, P. G. T. Beauregard; in 1861-1864, Alexander Hamilton Bowman (1803-1865); in 1864, Zealous Bates Tower (1819-1900); in 1864- 1866, G. W. Cullum; in 1866-1871, Thomas Gamble Pitcher (1824- 1895); in 1871-1876, Thomas Howard Ruger (1833-1907); in 1876-1881, J. M. Schofield; in 1881-1882, O. 0. Howard; in 1882- 1887, Wesley Merritt; in 1887-1889, John Grubb Park (1827- 1900); in 1880-1893, John Moulden Wilson (b. 1837); in 1893- 1898, Oswald Herbert Ernst (b. 1842) ; m 1898-1906, Albert I^opold Mills (b. 1854); in 1906-1910, H. L. Scott (b. 1853); and, 1910, T. H. Barry (b. 1855).

SeeG. W. Cullum, Biographical Register of the Officers and Graduates of the United States Military Academy (4 vols., New York, 1891- 1904); E. C. Boynton, History of West Point (ibid. 1863); J. P. Farley, West Point in the Early Sixties (Troy, 1902) ; Morris Schaff, The Spirit of Old West Point (Boston, 1907) ; and the annual reports of the superintendent.

WESTPORT, a market-town, seaport and seaside resort of County Mayo, Ireland, near the mouth of a small river in Clew Bay. Pop. (1901) 3892. The town is 160 m. W. from Dublin by the Midland Great Western railway, Wcstport Quay at the river mouth being served by a branch line. There is a small export trade in grain. The beautiful demesne of the marquess of Sligo enriches the neighbourhood. Clew Bay, thickly studded with islands and surrounded with mountains, is one of the most magnificent of the great inlets on the W. coast. Near the S. shore is Croagh Patrick (2510 ft.), an isolated conical hill of singularly perfect form, in wide repute as a place of pilgrimage.

WEST PRUSSIA (Ger. Westpreussen), a province of Prussia, bounded on the N. by the Baltic, on the E, by East Prussia, on the S. by Russian Poland and the province of Posen, and on the W. by Brandenburg and Pomerania.

The area is 9862 sq. m. The greater part is occupied by the low Baltic plateau, intersected by a network of streams and lakes, and rising to the Turmberg (1086 ft.) near Danzig, East of Konitz is an extensive moorland, 70 m. long, called the Tucheler Heide. The lakes, though very numerous, are not large. The Vistula, here of great width, and subject to destructive floods, enters the province near Thorn, and flowing north in a valley which divides the plateau, enters Danzig Bay by a large delta, the Werder. The other rivers are chiefly tributaries of the Vistula, as the Drewenz on its right bank and the Brahe on its left.

In general physical characteristics the province resembles East Prussia, but the climate is less harsh and the fertility of the soil greater. Arable land and gardens occupy 55-6% of the area, meadows and pastures 12-9%, forests 21-7%, and the rest is mostly waste. The valley and delta of the Vistula are very fertile, and produce good crops of wheat and pasturage for horses, cattle and sheep. Besides cereals, the chief crops are potatoes, hay, tobacco, garden produce, fruit and sugar-beet. Poultry, fish and timber are important sources of wealth. Cavalry horses (especially at the government stud farm of Maricnwerdcr) and merino sheep are reared. The minerals are unimportant, except amber, peat: and clay. Shipbuilding is carried on at Danzig and Elbing, and in various places there are iron and glass works, saw-mills, sugar factories and distilleries. Much of the trade passes through the ports of Danzig and Elbing.

The population in 1905 was 1,641,746, showing a mean density of 166 to the sq. m. Of these 567,318 or 34-5 % were Poles, a larger proportion than in any other Prussian province except Posen. They are increasing somewhat faster than the Germans, and the efforts of the colonization commission have done little to promote the immigration of German farmers. The Kashi'bes (q.v.), nearly all of whom (less than 200,000) live in W. Prussia, chiefly in the west, from Putzig to Konitz, are here reckoned with the Poles. The Poles proper chiefly inhabit the centre of the province, and the borders of Russian Poland. Among the Germans, who are most numerous in the north-east, Low German dialects are spoken, except in a Swabian colony round Kulmsee. Roman Catholics number 51-4% and Protestants 46-6% of the population, and there are 16,000 Jews. The Poles are almost all Roman Catholics.

The province is divided into the governmental departments of Danzig and Marienwerder. It returns twenty-two members to the Prussian Lower House and thirteen to the Reichstag. Danzig is the capital, and the only large town.

West Prussia, with the exception of southern Pomerania (around Marienwerder) which belonged to Prussia, was a pos- session of Poland

from 1466 till the first partition of Poland in 1772, when it was given to Prussia with the exception of Danzig and Thorn, which Poland retained till 1793, The present province was formed in 1808, but from 1824 to 1878 was united with East Prussia. For its history see also Prussia and Poland.

See K. Lohmeyer, Geschichte von Ost- und Westpreussen (part i., 3rd ed., Gotha, 1908) ; Vallentin, Westpreussen seit den ersten Jahrzehnten dieses Jahrhunderts (Tubingen, 1893); Ambrassat, Westpreussen, ein Handbuch der Heimatkunde (Danzig, 1906).

WEST SPRINGFIELDˆ a township of Hampden county, Massachusetts, U.S.A., on the Connecticut river, opposite Springfield. Pop. (1890) 5077; (iqoo) 7105 (1501 foreign- born); (1910) 9224. Area, about 18 sq. m. The township is served by the Boston & Albany railway, and by interurban

electric railways to Holyoke and Hartford. The principal villages are Merrick and West Springfield on the Connecticut river and Mittineaguc on the Wcstricld river. West Springfield was originally a part of Springfield. The first settlement was not made, however, until about 1653, and there were few settlers until after King Philip's War (1676). In 1696 West Springfield was organized as a separate parish, and in 1774 was made a separate township. Holyoke was set ofi from it in i860, and Agawam in 1855.

WEST VIRGINIA, the north-westernmost of the so-called Southern states of the United States of America, lying between latitudes 37 10′ and 40° 40′ N., and longitudes 77 40′ and 8 2 40′ W. It is bounded on the north-west by Ohio, from which it is separated by the Ohio river, on the north by Penn- sylvania and Maryland, the Potomac river dividing it from the latter stale; on the east and south-east by Pennsylvania, Maryland and Virginia, the boundary fines in the first two cases being meridians, in the last case a very irregular line following the crest of mountain ridges in places; and on the south-west by Virginia and Kentucky, the Big Sandy river separating it from the latter state. The extreme length of the state from north to south is about 240 m., the extreme breadth from east to west about 265 m. Area, 24,170 sq. m., of which 148 sq. m. is water surface.

Physical Features. — The state is divided into two distinct physio- graphic provinces; the Alleghany Plateau on the west, comprising perhaps two-thirds of the area of the state, and forming a part of the great Appalachian Plateau Province which extends from New York to Alabama ; and the

Newer Appalachians or Great Valley Region on the east, being a part of the large province of the same name which extends from Canada to Central Alabama. The Alleghany Plateau consists of nearly horizontal beds of limestone, sandstone and shales, including important seams of coal ; inclines slightly toward the north-west, and is intricately dissected by extensively branching streams into a maze of narrow canyons and steep-sided hills. Along the Ohio river, these hills rise to an elevation of 800 to 1000 ft. above sea-level, while toward the south-cast the elevation increases until 3500 and 4000 ft. are reached along the south-east margin of the plateau, which is known as the Alleghany Front. The entire plateau area is drained by the Ohio river and its tributaries. Along the flood-plains of the larger rivers are fertile " bottomlands," but the ruggedness of the plateau country as a whole has retarded the development of the state, much of which is still sparsely populated. The coal beds are of enormous extent, and constitute an important element in the wealth of the state. Petroleum and natural gas also occur in the plateau rocks in great quantities.

In the Newer Appalachian region, the beds which still lie hori- zontal in the plateau province were long ago thrown into folds and planed off by erosion, alternate belts of hard and soft rock being left exposed. Uplift permitted renewed erosion to wear away the soft belts, leaving mountain ridges of hard rock separated by parallel valleys. Hence the region is variously known as the Ridge and Valley Belt, the Great Valley Region, or the Folded Appa- lachians. The mountain ridges vary in height up to 4000 ft. and more, the highest point in the state being Spruce Knob (4860 ft.). The parallel valleys are drained by north-east and south-west flowing streams, those in the north-east being tributary to the Potomac, those farther south tributary to the Great Kanawha. Although the valleys between the ridges are not always easy of access, they give broad areas of nearly level agricultural land.

Flora. — The plateau portion of West Virginia is largely covered by hardwood forests, but along the Ohio river and its principal tributaries the valuable timber has been removed and considerable areas have been wholly cleared for farming and pasture lands. Among the most important trees of this area are the white and chestnut oaks, the black walnut, the yellow poplar, and the cherry, the southern portion of the state containing the largest reserve supply. In the area of the Newer Appalachian Mountains, the eastern Panhandle region has a forest similar to that of the plateau district; but between these two areas of hardwood there is a long belt where spruce and white pine cover the mountain ridges. Other trees common in the state are the persimmon, sassafras, and, in the Ohio Valley region, the sycamore. Hickory, chestnut, locust, maple, beech, dogwood, and pawpaw are widely distributed. Among the shrubs and vines are the blackberry,

black and red raspberry, gooseberry, huckleberry, hazel and grape. Ginseng is an important medicinal plant. Wild ginger, elder and sumach are common, and in the mountain areas, rhododendrons, mountain laurel and azaleas.

Climate. — Inasmuch as the state has a range of over 4000 ft. in altitude, the climate varies greatly in different districts. The mean annual temperatures for typical sections are as follows; Ohio Valley

north of the thirty-ninth parallel, 53 F.; south-western part of state, 56 ; central plateau district, 52 ; mountainous belt along south-eastern boundary of state, 48 to 50 . Wellsburg, in the northern Panhandle, has-a mean winter temperature of 27 , a summer mean of 70 . Parkersburg, farther down the Ohio Valley, has a winter mean of 34 ° and a summer mean of 74° Martinsburg, in the eastern Panhandle, has nearly the same means, 32 and 74 . Terra Alta, in the north-eastern mountains, has a winter mean of 26 , a summer mean of only 67 . The first killing frosts generally occur about the middle of October in the Ohio Valley region, and about the first of October in the higher plateau and mountain region; the average dates for the last killing frosts in the same localities are the middle and last of April respectively. In the Ohio Valley and eastern Panhandle the summer mean temperature is 74°, the winter mean 31 ° to 34 . The highest recorded temperature for the state is 107 , the lowest-35 . Temperatures above ioo° and below-15 are rare. Precipitation is greatest in the mountains, over 50 in.; and least over the Ohio Valley, the eastern Panhandle and the extreme south-east, 35 to 40 in. Snows are frequent during the winter, and sometimes deep in the higher plateau and mountain districts. The prevailing winds are from south to west.

Agriculture. — The state is primarily agricultural. In general the richer western part is devoted to crops, and the eastern part to raising live-stock. The crop of Indian corn in 1909 was 27,632,000 bushels, and the acreage 880,000. The wheat crop was 4,810,000 bushels, and the acreage 370,000. The crop of buckwheat was 499,000 bushels (grown on 22,000 acres). The rye crop was 148,000 bushels, and the acreage 11,000. The production of oats was 2,156,000 bushels (grown on 98,000 acres). In 1909 the acreage of hay alone was 675,000 acres, and the crop was 844,000 tons, valued at $11,225,000. Tobacco is grown throughout the state; in 1909 on 12,000 acres was grown a crop of 12,000,000 lb, valued at

$1,663,200.

Stock-raising is an important industry, especially in the eastern part of the state.

Mines and Quarries. — The state's great mineral wealth is in coals of various kinds, petroleum, and natural gas.

The coal deposits underlie about 1ˆ,000 sq. m. (more than 70 % of the total) of the state's area, and bituminous coal has been found in 51 of the 55 counties; this is one of the largest continuous coal fields in the world. The principal districts are the Fairmont (or Upper Monongahela) and the Elk Garden (or Upper Potomac) in the northern, and the Pocahontas (or Flat Top) and the New and Kanawha rivers districts in the southern part of the state. The total output of the state was 44,648 tons in 1863, when the first ship- ments outside the state were made; and 41,897,843 tons (valued at $40,009,054) in 1908, when the output of West Virginia was third in quantity and in value among the states of the Union, being exceeded only by that of Pennsylvania and of Illinois. The seams are principally above water levels and in many cases have been laid bare by erosion; and the supply is varied — besides a " fat coking, gassy bituminous," there are an excellent grade of splint coal Jfirst mined in 1864 at Coalburg, Kanawha county) and (except that in Kentucky) the only important supply of cannel coal in the United States. Most of the mines are operated under " non-union " rules. The bituminous coal of West Virginia is a particularly good coking coal, and in 1905, 1906, 1907 and 1908 West Virginia ranked second (to Pennsylvania) among the states of the Union in the amount of coke manufactured; the Flat Top district is the principal coke- making region.

Petroleum ranks second to coal among the state's mineral re- sources. In 1 771 Thomas Jefferson described a " burning spring " in the Kanawha Valley, and when wells were drilled for salt brine near Charleston petroleum and natural gas were found here before there was any drilling for oil in Pennsylvania. Immediately before the Civil War, petroleum was discovered in shallow wells near Parkersburg, and there was a great rush of prospectors and specu- lators to the Little Kanawha Valley. But the Civil War interrupted development. After the war, wells were drilled at Burning Springs, Oil Rock, California House, Volcano, Sandhill and Horseneck, and in the years 1865-1876 3,000,000 bbls. of oil, valued at $20,000,000, were taken put of these districts. A successful well in Marion county, near Mannington, far from the region of the earlier wells, was drilled in 1889, and the output of the state increased from 119,448 bbls. in 1888 to 544,113 in 1889, and to 2,406,218 in 1891; in 1893 it was first more than 8,000,000 bbls.; and in 1900 it was 16,195,675. After 1900 it gradually decreased — although new pools in Wetzel county were found in 1902— and in 1908 it was 9,523,176 bbls. (valued at $16,911,865).

Natural gas, like petroleum, was first heard of in West Virginia in connexion with a burning spring on the Kanawha, and there were gas

springs on the Big Sandy and the Little Kanawha. In 1841 natural gas was found with salt brine in a well on the Kanawha, and was used as a fuel to evaporate the salt water. The production was not large until after 1895; it was valued at $1,334,023 in 1898, at $3,954,472 in 1901, at $10,075,804 in 1905, at $16,670,962 in 1907, and at $14,837,130 in 1908, when (as since 1904, when it first was greater than that of Indiana) it was second only in value to that, of Pennsylvania. The principal field is in Wetzel county, but there are important supplies in Lewis, Harrison, Marion, Monongahela,

Lincoln and Wayne counties. Much of the natural gas is piped out of the state into Ohio (even into the northern parts), Kentucky, Pennsylvania and Maryland; within the state gas has been utilized as a fuel in carbon black and glass factories.

Brine wells have been mentioned above; the salt industry is still carried on in Mason county, and in 1908 145,157 bbls. were pro- duced with a value of $10,481; and there is a small output of bromine. Iron ore is found in the state in the coal hills (especially Laurel Hills and Beaver Lick Mountain), but the deposits have not been worked on a large scale. Pig iron is manufactured cheaply because of the low price of fuel; in 1907 the value of pig iron manu- factured in the state was $6,454,000. There are deposits of ex- cellent clay, especially for pottery, and in 1907 ($2,159,132) and 1908 ($2,083,821) the state ranked after Ohio and New Jersey in the value of pottery. The total value of all clay products in West Virginia was $3,261,736 in 1908. An excellent glass sand is pro- cured from crushed sandstone near Berkeley Springs, Morgan county. Grindstones have been quarried in Wood and Jackson counties. There are black slate deposits near Martinsburg. There are mineral springs, mostly medicinal waters, in Greenbrier, Summers, Webster, Ohio and Preston counties. Among the more noted medicinal springs are: classed as calcareous and earthy, Sweet Springs, 74° F., in Monroe county, diuretic and diaphoretic; and Berkeley Springs, 74 F., in Morgan county, reputed restorative in neuralgic cases, and as containing sulphur; Salt Sulphur Springs, in Monroe county, of value in scrofula and skin diseases.

Manufactures. — Manufacturing is largely localized in the north- western part of the state along the Ohio river. The value of the factory product in 1905 was $99,040,676. The principal manu- facture is iron and steel: in

1905 the product of steel works and rolling mills was $13,454,802. The iron mills are almost all in the vicinity of Wheeling. The first rolling mill west of the Alleghanies was probably one near Morgantown. Next in importance among the state's manufactures are lumber and timber, and flour and grist mills. The tanning, currying- and finishing of leather, an industry largely dependent on the plentiful supply of oak and hemlock bark for tanning, is tentralized in the northern and eastern parts of the state, near the forests. The glass industry began in Wheeling in 182 1, and there a process was discovered by which in 1864 for soda ash bicarbonate of lime was substituted, and a lime glass was made which was as fine as lead glass; other factors contributing to the localization of the manufacture of glass here are the fine glass sand obtained in the state and the plentiful supply of natural gas for fuel.

Transportation and Commerce. — Railway development in West Virginia has been due largely to the exploitation of the coal and lumber resources of the state. The Baltimore & Ohio railway leads in trackage: it enters the state with several lines at its northern end; its main line crosses this portion of the state from east to west, striking the Ohio at Parkersburg, and one of its lines (Ohio River railway) extends nearly the length of the state from Wheeling in the north through Parkersburg to Kenova in the south. This road serves as a carrier for the northern coal producing districts. The Chesapeake & Ohio traverses the southern part of the state, from White Sulphur Springs in the east, through Charleston to the Ohio, serving the New and Kanawha rivers coal district as a freight carrier; the Norfolk & Western runs just within the south-western boundary along the valley of the Big Sandy, carrying coal both east and west from the Pocahontas coal-field; and the new Virginian railway entering at the south-east taps the coal -producing region (the Kanawha and Pocahontas districts) at Deepwater, serving in addition to the Norfolk & Western as a carrier of coal to Norfolk on the Virginia coast. The railway mileage of the state grew with great rapidity in the decade 1880-1890; it was 691 m. in 1880, 1,433-30 in 1890, 2,473-34 in 1900 and 3,215-32 in January 1909. Natural facilities for transportation, afforded by the Ohio river and its branches, the Monongahela, at the northern end of the state, and the Little Kanawha and the Great Kanawha, are of special value for the shipment of lumber and coal. The Monongahela has been improved by locks and dams to Fairmont. It is the carrier of a heavy tonnage of coal to Pittsburg, Pennsylvania. The Little Kanawha, which has also been improved, serves chiefly for the transportation of logs which are floated down to the Ohio.

Population. — The population of West Virginia at the various censuses since its organization as a state has been as follows:

1870, 442,014; 1880, 618,457; 1890, 762,794; 1900, 958,800;

1910, 1,221,119. I n 1890-1900 and 1900-1910 the increase in population was more than one fourth. Of the total population in 1900, 97-7% was native-born, 892,854 were native whites, 43,499 were negroes, 56 were Chinese and 12 were Indians. Of the inhabitants born in the United States 61,508 were natives of Virginia, 40,301 of Ohio, 28,927 of Pennsylvania and 10,867 of Kentucky; and of the foreign-born there were 6537 Germans, 3342 Irish, 2921 Italians and 2622 English. Of the total population 71,388 were of foreign parentage— i.e. either one or both parents were foreign-born, and 18,232

were of German and 10,534 of Irish parentage, on both the father's and the mother's side.

*In 1906 there were in the state 301,565 members of religious denominations, of whom 86-2% were Protestants. The Methodist bodies with 115,825 communicants (38-4% of the total communicants or members) were the strongest. There were 67,044 Baptists (2226 United Baptists, 2019 Primitive Baptists and 1513 Free Baptists); 40,011 Roman Catholics; *9;993 United Brethren, all of the " New Constitution "; 19,668 Presbyterians; 13,323 Disciples of Christ; 6506 Lutherans, and 5230 Protestant Episcopalians. The principal cities of the state are Wheeling, Huntington, Parkersburg, Charleston (the capital), Martinsburg, Fairmont and Grafton.*

Administration. — The first constitution of 1863 was super- seded by the present instrument which was adopted August 1872 and was amended in 1880, 1883 and 1902. The constitution may be amended by either of two methods. A majority of the members elected to each house may submit the question of calling a convention to the people; and if a majority of the votes cast approve, an election for members cf a convention shall be held, and all acts of the convention must be submitted to the people for ratification or rejection. On the other hand, a two-thirds majority of each house of the legislature may submit an amendment or amendments to popular vote at the next general election, when the approval of a majority of the qualified voters is necessary for ratification. All male citizens above twenty-one years of age have the right of suffrage, subject to a residence of one year in the state and sixty days in the county in which they offer to vote. Paupers, insane, and those convicted of treason, felony or bribery in an election are barred, " while the disability continues," and no person in the military, naval or marine service of the United States is deemed a resident of the state by reason of being stationed therein. An official blanket ballot containing the names of the candidates arranged in columns according to party is provided at public expense.

Executive. — The executive department consists of the governor, secretary

of state, superintendent of free schools, auditor, treasurer and attorney-general, all elected by the people at the time of the presidential election and serving for four years from the fourth of March following. _ The governor must have been a citizen for five years preceding this election, must have attained the age of thirty and is ineligible for re-election during the four years succeeding the expira- tion of his term. In case of the death, resignation or other dis- ability of the governor, the president of the Senate acts as governor, and in case of his incapability the Speaker of the House of Dele- gates; and these two failing;, the legislature on joint ballot elects an acting governor. A new election must be called to fill the vacancy unless the unexpired term is less than one year. The governor appoints, subject to the consent of a majority of the members elected to the Senate, all officers whose appointment or election is not otherwise provided for. In case of a vacancy in the court of appeals or in the circuit court the governor appoints until the next general election, or if the unexpired term is less than two years, until the end of the term. The governor sends a message at the beginning of each session of the legislature, and may convene the houses in extraordinary session when he deems it necessary. He may veto a bill, or in case of an appropriation bill, the separate items, but this veto may be overridden by a simple majority of the total membership of each house. Any bill not returnee! with objec- tions within five days after presentation becomes a law. An appro- priation bill cannot be vetoed after the legislature adjourns.

Legislative. — The legislature, consisting of the Senate and the House of Delegates, meets at the capital on the first Wednesday in January of the odd years. The Senate is composed (1910) of thirty members, chosen from fifteen districts for a term of four years, but one half the membership retires biennially. A senator must be twenty-five years of age, and must have been a citizen of the state for five years and a resident of the district for one year preceding his election. The Senate elects a president, confirms or rejects the nominations of the governor, and acts as a court of impeachment for the trial of public officers, besides sharing in legislative functions. The House of Delegates is composed (1910) of eighty-six members, of whom each county chooses at least one. A delegate must be a citizen and have resided one year in the county from which he is chosen. No person holding a lucrative office under the state or the United States, no salaried officer of a railroad company, and no officer of any court of record is eligible for membership in either house. Besides its legislative functions the House prepares articles of impeachment and prosecutes the proceedings before the Senate. The length of the legislative session is forty-five days,

but it may be extended by a vote of two-thirds of the members elected to each house. No act takes effect until ninety days after its passage unless two-thirds of the members of each house specifically order otherwise.

Judiciary. — The judicial power is vested in the Supreme Court of Appeals, the Circuit courts, such inferior courts as may be established, county courts, the powers and duties of which are, however, chieflv police and fiscal, and in justices of the peace. The Supreme Court of Appeals, consisting of five judges, elected for terms of twelve years, holds three terms annually, one at Wheeling, one at Charleston and one at Charles Town. It has original juris- diction in cases of habeas corpus, mandamus and prohibition, and appellate jurisdiction in cases involving a greater amount than one hundred dollars; concerning title or boundary of lands, probate of wills; the appointment or qualification of personal representatives, guardians, curators, committees, &c. ; concerning a mill, roadway, ferry or landing; the right of a corporation or county to levy tolls or taxes; in cases of quo warranto, habeas corpus, mandamus, certio- rari and prohibition, and all others involving freedom or the con- stitutionality of a law; in criminal cases where there has been a conviction for felony or misdemeanour in a circuit, criminal or intermediate court; and in cases relating to the public revenues. The court designates one of its members as president. Nineteen judges elected for terms of eight years in eighteen circuits compose the circuit court, the judges of which have original jurisdiction of matters involving more than $50; of all cases of habeas corpus, mandamus, quo warranto and prohibition; of all cases in equity; and of all crimes and misdemeanours. The judges have appellate jurisdiction of cases civil and criminal coming up from the lower courts. In order to relieve the circuit judges the legislature has established by special acts inferior courts, generally with criminal jurisdiction only, in nine counties of the state. The judicial powers of the county court are confined to probate, the appointment of executors, administrators and other personal representatives, and the settlement of their accounts, matters relating to apprentices and to contested elections for county and district officers. (See below under Local Government.) One or two justices of the peace (de- pending on population) are elected from each magisterial district; there must be not less than three, nor more than ten, districts in each county.

Local Government. — As in Virginia, the county is the unit of govern- ment, though an unsuccessful attempt to introduce the township sys- tem was made in the first constitution. The county court, consisting of three commissioners elected for six years but with terms so a rranged that one retires every two years, is the police and fiscal authority. Other officers are

the' clerk of the county court, elected for six years, the sheriff, who also acts as tax-collector and treasurer, the prosecuting attorney, one or two assessors, the surveyor of lands and the super- intendent of free schools, all elected for the term of four years; the sheriff may not serve two consecutive full terms. In addition there are boards appointed or elected by various authorities and charged with specific duties. They include the local board of health and the board of jurv commissioners. Each of the magisterial districts (of which, as has been said, there must be at least three and not more than ten in each county) elects one or two magistrates and con- stables, and a board of education of three members. The constitu- tion provides that the legislature, on the request of any county, may establish a special form of county government, and several of the larger and more populous counties have special acts.

Miscellaneous Laws. A woman's right to hold, manage and acquire property is not affected by marriage, except that unless she lives apart from her husband, she may not mortgage or convey real estate without his consent. A woman becomes of age at twenty-one. Rights of dower and courtesy both exist. When a husband dies intestate leaving a widow and issue, the widow is entitled to the life use of one-third of the real estate and to one-third of the personal estate absolutely. If there is no issue she takes the whole of the personal estate, while the real estate, subject to her dower, goes first to her husband's father and then to his mother, brothers and sisters. If the wife dies intestate the husband has a right to the use of her real estate for life, and to one-third of the personal estate if there is issue; otherwise to the whole. Neither can by will deprive the other of the right of dower or courtesy in the real estate and of the right to one-third of the personal estate. Childrenmay be disinherited with or without cause. Any parent or infant children of deceased parents may set apart personal estate not exceeding $200 in value which shall be exempt from execution. A homestead not exceeding $1000 in value may be set apart, provided that it is recorded before the debt against which it was claimed was contracted. Marriages between whites and negroes, or where either party had a wife or husband living, or within the prohibited degrees of consanguinity, or where either was insane or physically incapable of marriage, or where the male was under eighteen or the female under sixteen may be annulled. No female or male under twelve may be employed in mines, and no child under twelve may be employed in a factory, and when school is in session none under fourteen.*

Charities, &c. — -The state charitable and penal institutions consist of the West Virginia Hospital for the Insane at Weston, the Second Hospital for the Insane at Spencer, three miners' hospitals — one at Welch, one at McKendree and one at Fairmont; the West Virginia

Asylum for Incurables at Huntington, Schools for the Deaf and Blind at Romney, the West Virginia Penitentiary at Moundsville, the West Virginia Reform School at Grafton and the West Virginia Industrial Home for Girls near Salem. These are all under the supervision of a state board of control of three members, appointed by the governor, which was created in 1909, and also has control of the finances of the state educational system. There is also a state humane society, which was organized in 1899 for the protection of children and of the helpless aged, and for the prevention of cruelty to animals. The West Virginia Colored Orphans' Home near Huntington is not under state control, but has received appropria- tions from the legislature. In 1908 a law was enacted for establishing the West Virginia Children's Home to bt under the control of the Humane Society.

Education.— Each magisterial district constitutes a school district and there are also a few independent school districts. For each school district there is a board of education consisting of a president and two commissioners, each elected for a term of four years, one commissioner every two years. This board is authorized to establish and alter sub- districts. A law" enacted in 1908 requires that children between eight and fifteen years of age shall attend school twenty-four weeks each year, provided the public school in their district is in session that length of time. The county supervision of public schools is vested in a county superintendent, who is elected for a term of four years. The state supervision is vested in a state superintendent, who iselected for a term of four years. A state board of education, consisting of the state superintendent and five other persons appointed by him, constitutes a state board of examiners (for special primary, high school and professional certificates) and prescribes the course of study. There is also a state school book commission, consisting of the state superintendent and eight other members appointed by the governor. The state maintains six normal schools for whites (at Huntington, Fairmont, West Liberty, Glenville, Shepherdstown, Athens) and two for negroes (at Institute and at Blucfield). They are governed by a board of regents consisting of the state super- intendent and six other members appointed by the governor. At the head of the educational system is the West Virginia University (1867) at Morgantown {g_.v.). The principal institutions of higher learning not under state control are Bethany College (Christian, 1841), at Bethany; Morris Harvey College (Methodist Episcopal, Southern, 1888), at Barboursville; West Virginia Wesleyan College (Methodist Episcopal, 1890), at Buckhannou; and Davis and Elkins College (Presbyterian, 1904), at Elkins.

Finance. — The state revenue is derived mainly from a general pro- perty tax, licence taxes levied on various businesses and occupations, a collateral inheritance tax and a capitation tax. For the year ending on the 30th of September 1908 the receipts were $3,382,131-66 and the disbursements

$3,482,317-03. West Virginia's share of the Virginia debt which existed when West Virginia was set off from Virginia has not yet been determined (see below, § History), but other than this the state has no debt, and the contraction of a state debt other than " to meet casual deficits in the revenue, to redeem a previous liability of the state, to suppress insurrection, repel invasion or defend the state in time of war " is forbidden by the constitution. The indebtedness of a county, municipality or school district is limited to 5 % ol the value of its taxable property.

History. — That part of Virginia beyond the Alleghany moun- tains was a favourite haunt of the Indians before the first coming of the whites, and there are many Indian mounds, in- dicative of an early and high cultural development, within the present limits of the state, and especially in the neighbourhood of Moundsville (?.«•)• The western part of Virginia was not explored until long after considerable settlements had been made in the east. In 167 1 General Abram Wood, at the direction of Governor William Berkeley (c. 1610-1677), sent a party which discovered Kanawha Falls, and in 1716, Governor Alexander Spottswood with about thirty horsemen made an excursion into what is now Pendleton county. John Van Metre, an Indian trader, penetrated into the northern portion in 1725, and Morgan ap Morgan, a Welshman, built a cabin in the present Berkeley county in 1727. The same year German settlers from Penn- sylvania founded New Mecklenburg, the present SKepherdstown, on the Potomac, and others soon followed. Charles II. of England, in 1661, granted to a company of gentlemen the land between the Potomac and Rappahannock rivers, commonly known as the " Northern Neck." The grant finally came into the possession of Thomas, Lord Fairfax, and in 1746 a stone was erected at the source of the north branch of the Potomac to mark the western limit of the grant. A considerable part of this land was surveyed by George Washington between 1748 and 1751. The diary kept by the young surveyor indicates that there were already many squatters, largely of German origin, along the South Branch of

the Potomac. Christopher Gist, a surveyor in the employ of the first Ohio Company (see Ohio Company), which was composed chiefly of Virginians, in 1751-1752 explored the country along the Ohio river north of the mouth of the Kanawha, and the company sought to have a fourteenth colony established with the name " Vandalia." Many settlers crossed the mountains after 1750, though they were somewhat hindered by Indian depredations. Probably no Indians lived within the present limits of the state, but the region was a common hunting ground, crossed also by many

war trails, and during the French and Indian war (1754-63) the scattered settlements were almost destroyed. In 1774 the governor of Virginia, Lord Dunmore, himself led a force over the mountains, and a body of militia under General Andrew Lewis dealt the Shawnee Indians under Cornstalk a crushing blow at Point Pleasant (q.v.) at the junction of the Kanawha and the Ohio riversj but Indian attacks continued until after the War of Independence. During the war the settlers in Western Virginia were generally active Whigs and many served in the Continental army.

Social conditions in western Virginia were entirely unlike those existing in the eastern portion of the state. The population was not homogeneous, as a considerable part of the immigra- tion came by way of Pennsylvania and included Germans, the Protestant Scotch-Irish and settlers from the states farther north. During the War of Independence the movement to create another state beyond the Alleghanies was revived, and a petition (1776) for the establishment of " Westsylvania" was presented to Congress, on the ground that the mountains made an almost impassable barrier on the east. The rugged nature of the country made slavery unprofitable, and time only increased the social, political and economic differences between the two sections of the state. The convention which met in i82g to form a new con- stitution for Virginia, against the protest of the counties beyond the mountains, required a property qualification for suffrage, and gave the slave-holding counties the benefit of three-fifths of their slave population in apportioning the state's representation in the lower Federal house. As a result every county beyond the Alleghanies except one voted to reject the constitution, which was nevertheless carried by eastern votes. Though the Virginia constitution of 1850 provided for white manhood suffrage, yet the distribution of representation among the counties was such as to give control to the section east of the Blue Ridge Mountains. Another grievance of the West was the large expenditure for internal improvements at state expense in the East compared with the scanty proportion allotted to the West. For an account of the Virginia convention of 1861, which adopted the Ordinance of Secession, see Virginia. Here it is sufficient to say that only nine of the forty-six delegates from the present state of West Virginia voted to secede. Almost immediately after the adoption of the ordinance a mass meeting at Clarksburg recommended that each county in north- western Virginia send delegates to a conven- tion to meet in' Wheeling on the 13th of May 1861. When this "' First Wheeling Convention" met, four hundred and twenty-five delegates from twenty-five counties were present, but soon there was a division of sentiment. Some delegates favoured the immediate formation of a new state, but the more far-sighted members argued that as the ordinance had not yet been voted upon by the people, and Virginia was still in the Union, such action would be revolutionary, since the United States Constitu- tion provides that no state may be divided

without its consent. Therefore it was voted that in case the ordinance should be adopted (of which there was little doubt) another convention including the members-elect of the legislature should meet at Wheeling on the nth of June. At the election (23rd May 1861) the ordinance was ratified by a large majority in the state as a whole, but in the western counties 40,000 votes out of 44,000 were cast against it. The " Second Wheeling Convention" met according to agreement (nth June), and declared that, since the Secession Convention had been called without the consent of the people, all its acts were void, and that all who adhered to it had vacated their offices. An act for the " reorganization " of the government was passed on the igth of June. The next day

Francis H. Pierpont was chosen governor of Virginia, other officers were elected and the convention adjourned. The legislature, composed of the members from the western counties who had been elected on the 23rd of May and some of the hold- over senators who had been elected in 1859, met at Wheeling on the 1st of July, filled the remainder of the state offices, organized a state government and elected two United States senators who were recognized at Washington. There were, therefore, two state governments in Virginia, one owning allegiance to the United States and one to the Confederacy. The Convention, which had taken a recess until the 6th of August, then re- assembled and (August 20) adopted an ordinance providing for a popular vote on the formation of a new state, and for a con- vention to frame a constitution if the vote should be favourable. At the election (October 24, 1861) 18,480. votes were cast for the new state and only 781 against. The convention met on the 26th of November 1861, and finished its work on the 18th of February 1862, and the instrument was ratified by the people (18,162 for and 514 against) on the nth of April 1862. Next the legislature of the " Reorganized " government on the 13th of May gave its consent to the formation of the new state. Application for admission to the Union was now made to Congress, and on the 31st of December 1S62 an enabling act was approved by President Lincoln admitting the state on the condition that a provision for the gradual abolition of slavery be inserted in the Constitution. The Convention was reconvened on the 12th of February 1863, and the demand of Congress was met. The revised instrument was adopted by the people on the 26th of March 1863, and on the 20th of April 1863 President Lincoln issued a proclamation admitting the state at the end of sixty days (June 20, 1863). Meanwhile officers for the new state were chosen, and Governor Pierpont removed his capital to Alexandria where he asserted jurisdiction over the counties of Virginia within the Federal lines. The question of the constitutionality of the formation of the new state was brought before the Supreme Court of the United States in the following manner. Berkeley and Jefferson counties lying on the Potomac east of the mountains, in 1863,

with the consent of the " Reorganized " government of Virginia voted in favour of annexation to West Virginia. Many voters absent in the. Confederate army when the vote was taken refused to acknowledge the transfer on their return. The Virginia legislature repealed the act of cession and in 1866 brought suit against West Virginia asking the court to declare the counties a part of Virginia. Meanwhile Congress on the 10th of March 1866 passed a joint resolution recognizing the transfer. The Supreme Court in 1871 decided in favour of West Virginia, and there has been no further question. During the Civil War West Virginia suffered comparatively little. McClcllan's forces gained possession of the greater part of the territory in the summer of 1861, and Union control was never seriously threatened, in spite of Lee's attempt in the same year. In 1863 General John D. Imboden, with 5000 Confederates, overran a considerable portion of the state. Bands of guerrillas burned and plundered in some sections, and were not entirely suppressed until after the war was ended. The state furnished about 36,000 soldiers to the Federal armies and somewhat less than 10,000 to the Confederate. The absence in the army of the Confederate sympathizers helps to explain the small vote against the formation of the new state. During the war and for years afterwards partisan feeling ran high. The property of Confederates might be confiscated, and in 1866 a constitutional amendment disfranchising all who had given aid and comfort to the Confederacy was adopted. The addition of the Fourteenth and Fifteenth Amendments to the U.S. Constitution caused a reaction, the Democratic party secured control in 1870, and in 1871 the constitutional amendment of 1866 was abrogated. The first steps toward this change had been taken, however, by the Republicans in 1870. In 1872 an entirely new constitution was adopted (August 22).*

Though the first constitution provided for the assumption of a part of the Virginia debt, negotiations opened by Virginia in 1S70 were fruitless, and in 1871 that state funded two-thirds of the debt and arbitrarily assigned the remainder to West Virginia.

The legislature of the latter state in 1S73 adopted a report declaring that between 1822 and 1861, during which period the debt had been incurred, the western counties had paid an excess of taxes, more than equal to the amount which had been ex- pended in the west for the purposes for which the debt had been incurred, and concluded with the statement: " West Virginia owes no debt, has no bonds for sale and asks no credit." In 1006 Virginia entered suit in the U.S. Supreme Court to compel West Virginia to assume a portion of the debt. West Virginia demurred, but was overruled,

and on the 4th of May 1908 a master was appointed to take testimony. The state rejected decisively the overtures made by Virginia in 1866, looking towards a reunion of the commonwealths.

Governors of West Virginia. Arthur I. Boreman . . . Republican 1863-1869

D. D. T. Farnsworth (acting) . „ 1869 Wm. E. Stevenson … „ 1869-1871 John J. Jacobs …. Democrat 1871-1877 Henry M. Mathews … „ 1877-1881 Jacob D. Jackson … „ 1881-1885

E. Willis Wilson …. „ 1885-1890 A. Brooks Fleming > ... ,, 1890-1893 Wm. A. MacCorkle … „ 1893-1897 George W. Atkinson . . . Republican 1897-1901 Albert B. White …. „ 1901-1905 Wm. M. O. Dawson … ,, 1905-1909 Wm. E. Glasscock … „ 1909-

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WESTWARD HO, a small seaside village in the Barnstaple parliamentary division of Devonshire, England, on the east of Barnstaple Bay, 2J m. N.W. of Bideford, on the Bideford, Appledorc & Westward Ho railway. Of modern growth, it takes its name from a famous novel by Charles Kingsley. Many visitors are attracted in summer by its pure and bracing air, its quiet, and, above all, by its golf club, with links laid out on the sandhills known

as Braunton Burrows. Westward Ho forms part of the urban district of Northam, which had a population in 1901 of 5355.

WETHERSFIELD, a township of Hartford county, Connecticut, U.S.A., on the Connecticut river, adjoining on the N. the city of Hartford, of which it is a residential suburb. Pop. (1890) 2271; (1900) 2637 (489 foreign-born); (1910) 3148. Area, about 12 sq. m. It is served by the New York, New Haven & Hartford railway and by electric lines to Hartford. Among its old buildings are the house in which in 1781 George Washington and Count Rochambeau met to plan the Yorktown campaign; the First Church of Christ (Congregational), erected in 1761 and re- modelled in 1838 and 1882; and the old academy building, which was built in 1802, is now used as a town hall, and houses a public library. There is a giant elm here, 262 ft. in girth. The Connecti- cut state prison is in Wethersfield. In the township tobacco, vegetables and garden seeds are raised and dairy interests are of considerable importance; the principal manufactures are small tools and mattresses. Wethersfield is the oldest permanently

1 Title contested by Nathan Goff. Contest settled by legislature Feb. 4, 1890, until which time Governor Wilson held over.

inhabited township in the state; it was first settled in the winter of 1634-1635 by colonists f rom Watertown, Massachusetts, and received its present name in 1637. With Hartford and Windsor in 1639 it framed the Fundamental Orders of the Colony of Connecticut. Before 1660 its inhabitants aided in the founding of Stamford and Milford, Connecticut, and of Hadley, Massachusetts.

See H. R. Stiles, History of Ancient Wethersfield (New York,

1900).

WETSTEIN (also Wettsiein), JOHANN JAKOB (1693-1754), New Testament critic, was born at Basel on the 5th of March 1693. Among his tutors in theology was Samuel Werenfels (1657-1740), an influential anticipator of modern scientific exegesis. While still a student he began to direct his attention to the special pursuit of his life — the text of the Greek New Testa- ment. A relative, Johann Wetstein, who was the university librarian, gave him permission to examine and collate the principal MSS. of the New Testament in the library, and he copied the various readings which they contained into his copy of Gerard of Maestricht's edition of the Greek text. In 1713 in his public examination he defended a dissertation entitled De variis Novi Testamenti lectionibus, and sought to show that variety of readings did not detract from the authority of the Bible. Wetstein paid great attention also to Aramaic and Talmudic Hebrew. In the spring of 1714 he

undertook a learned tour, which led him to Paris and England, the great object of his inquiry everywhere being manuscripts of the New Testament. In 1716 he made the acquaintance of Richard Bentley at Cambridge, who took great interest in his work. The great scholar induced him to return to Paris to collate carefully the Codex Ephraemi, Bentley having then in view a critical edition of the New Testament. In July 1717 Wetstein returned to take the office of a curate at large (diaconus communis) at Basel, a post which he held for three years, at the expiration of which he exchanged it to "become his father's colleague and successor in the parish of St Leonard's. At the same time he pursued his favourite study, and gave private lectures on New Testament exegesis. It was then that he decided to prepare a critical edition of the Greek New Testament. He had in the meantime broken with Bentley, whose famous Proposals appeared in 1720. His earlier teachers, however, J. C. Iselin and J. L. Frey, who were engaged upon work similar to his own, became so unfriendly towards him that after a time he was forbidden any further use of the manuscripts in the library. Then a rumour got abroad that his projected text would take the Socinian side in the case of such passages as 1 Timothy iii. 16; and in othei ways (e.g. by regarding Jesus's temptation as a subjective experience, by explaining some of the miracles in a natural Way) he gave occasion for the suspicion of heresy. At length in 1729 the charge of projecting an edition of the Greek Testament savouring of Arian and Socinian views was formally laid against him. The end of the long and unedifying trial was his dismissal, on the 13th of May 1730, from his office of curate of St Leonard's. He then removed from Basel to Amsterdam, where a relative, Johann Heinrich Wetstein, had an important printing and publishing business, from whose office excellent editions of the classics were issued, and also Gerard of Maestricht's edition of the Greek Testament. Wetstein had begun to print in this office an edition of the Greek Testament, which was suddenly stopped for some unknown reason. As soon as he reached Amsterdam he published anonymously the Prolegomena ad Novi Testamenti Graeci editionem, which he had proposed should accompany his Greek Testament, and which was republished by him, ■ with additions, as part of his great work, 1751. The next year (1731) the Remonstrants offered him the chair of philosophy in their college at Amsterdam, vacated by the illness of Jean le Clerc, on condition that he should clear himself of the suspicion of heresy. He thereupon returned to Basel, and procured a reversal (March 22, 1732) of. the previous decision, and re- admission to all his clerical offices. But, on his becoming a candidate for the Hebrew chair at Basel, his orthodox opponents procured his defeat ?.nd his retirement to Amsterdam. At

length, after much painful contention, he was allowed to instruct the Remonstrant students in philosophy and Hebrew on certain somewhat humiliating conditions. For the rest of his life he continued professor in the Remonstrant college, declining in 1745 the Greek chair at Basel. In 1746 he once more visited England, and collated Syriac MSS. for his great work. At last this appeared in 1751-1752, in two folio volumes, under the title Novum Testamentum Graecum editionis receptae cum lectionibus varianlibus codicum MSS., &c. He did not venture to put new readings in the body of his page, but consigned those of them which he recommended to a place between the textus receptus and the full list of various readings. Beneath the latter he gave a commentary, consisting principally of a mass of valuable illustrations and parallels drawn from classical and rabbinical literature, which has formed a storehouse for all later commentators. In his Prolegomena he gave an admirable methodical account of the MSS., the versions and the readings of the fathers, as well as the troubled story of the difficulties with which he had had to contend in the prosecution of the work of his life. He was the first to designate uncial manuscripts by Roman capitals, and cursive manuscripts by Arabic figures. He did not long survive the completion of this work. He died at Amsterdam on the 23rd of March 1754.

Wetstein's New Testament has never been republished entire. The London printer, William Bowyer, published, in 1763, a text in which he introduced the readings recommended by Wetstein; J. G. Semler republished the Prolegomena and appendix (1764); A. Lotze commenced a new edition of the work, btrt the Prolegomena only appeared (Rotterdam, 1831), and this "castigated." It is generally allowed that Wetstein rendered invaluable service to textual criticism by his collection of various readings and his methodical account of the MSS. and other sources, and that his work was rendered less valuable through his prejudice against the Latin version and the principle of grouping MSS. in families which had been recommended by Richard Bentiey and J. A. Bengel.

Sec Wetstein's account of his labours and trials in his Nov. Test. i.; articles in C. F. Illgen's Ztschr.fiir histor. Theol. by C. R. Hagen- bach (1839), by L. J. Van Rhyn in 1843 and again by Hcinrich Bottger in 1870; S. P. Tregelles, Account of the Printed Text of the New Testament; F. H. A. Scrivener's Introduction to the Criticism of the New Testament ; W. Gass, Protestantische Dogmatik, vol. iii. ; the art. in Hcrzog's Realencyklopddie and in the AUgemeine deutsche Biographic

WETTIN, the name of a family from which several of the royal houses of Europe have sprung, derived from a castle which stood near the small town of that name on the Saale. Attempts to trace the descent to the Saxon chief Widukind or Wittekind, who died about 807, or to Burchard, margrave of

Thuringia (d. 90S), have failed, and the earliest known ancestor is one Dietrich, who was count of Hassegau or Hosgau, a district on the left bank of the Saale. Dietrich w r as killed in 982 fighting the Hungarians, and his sons Dedo I. (d. 1009) and Frederick (d. roi7) received lands taken from the Wends, including the county or Gau of Wettin on the right bank of the Saale. Dedo's son Dietrich II. inherited these lands, distinguished himself in warfare against the Poles, and married Matilda, daughter of Ekkard I., margrave of Meissen. Their son Dedo II. obtained the Saxon east mark and lower Lusatia on the death of his uncle Ekkard II., margrave of Meissen, in 1046, but in 1069 he quarrelled with the emperor Henry IV. and was compelled to surrender his possessions. He died in 1075, and his lands were granted to his son Henry I., who in 1089 was invested with the mark of Meissen. In 1103 Henry was succeeded by his cousin Thimo (d. 1104), who built a castle at Wettin, and was called by this name. Henry II., son of Henry I., followed, but died childless in it23; his cousin, Conrad I., son of Thimo, claimed Meissen, of which he secured possession in 1130, and in 1135 the emperor Lothair II. added lower Lusatia to his possessions. Abdicating in ri56, Conrad's lands were divided between his five sons, when the county of Wettin fell to his fourth son Henry, whose family died out in 1217. Wettin then passed to the descendants of Conrad's youngest son Frederick, and in 1288 the county, town and castle of Wettin were sold to the arch- bishop of Magdeburg. They were retained by the archbishop until the peace of Westphalia in 1648, when they passed to the

elector of Brandenburg, and afterwards became incorporated in the kingdom of Prussia.

Conrad I. and his successors had added largely to their pos- sessions, until under Henry I., the Illustrious, margrave of Meissen, the lands of the Wettins stretched from the Oder to the Werra, and from the Erzgebirge to the Harz mountains. The subsequent history of the family is merged in that of Meissen, Saxony and the four Saxon dukedoms. In June 1889 the 800th anniversary of the rule of the Wettins in Meissen and Saxony was celebrated with great splendour at Dresden.

See G. E. Hofmeister, Das Haus Wettin (Leipzig, 1889) ; C. W. Bottiger, Geschichte des Kurstaates und Kbnigreichs Sachsen (Gotha, 1867-1873); O. Posse, Die Markgrafen von Meissen und das Haus Wettin (Leipzig, 1881) ; K. Wenck, Die Wettiner im lqten Jahrhundert (Leipzig, 1877); Kammel, Festschrift zur 800 jdhrigen Jubelfeier des Hauses Wettin (Leipzig, 1889); and H. B. Meyer, Hof- und Zenlral- venoallung der Wettiner (Leipzig, 1902).

WETZLAR, a town of Germany, in the Prussian Rhine province, pleasantly situated at the confluence of the Dill and Lahn, 64 m. N.E. of Coblenz by

the railway to Giessen. Pop. (1905) 12,276. The most conspicuous building is the cathedral, dating in part from the 1 1 th, in part from the I4th-i6th centuries. The municipal archives contain interesting documents of the whilom imperial chamber (see infra). The town preserves associations of Goethe, who wrote Die Leiden desjungen Werthers after living here in 1772 as a legal official, and of Charlotte Buff, the Lotte of Werther. Overlooking the town are the ruins of the medieval castle of Kalsmunt. There are iron mines and foundries and optical instrument factories. Wetzlar was originally a royal demesne, and in the 12th century became a free imperial town. It had grown in importance when, in 1693, the imperial chamber {Reichskammergericht) was removed hither from Spires, The town lost its independence in 1803, and passed to the prince-primate Dalberg. Three years later (1806), on the dissolution of the empire, the imperial chamber ceased to exist. The French were defeated here by the Austrians and Saxons under the archduke Charles, 15th June 1796.

WEXFORD, a county of Ireland in the province of Leinster, bounded N. by Wicklow, E. and S. by St George's Channel, and W. by Waterford, Kilkenny and Carlow. The area is 576,757 acres or about 902 sq. m. The coast-line dees not present any striking features, and owing to the number of sandbanks navigation is dangerous near the shore. The only inlet of importance on the east coast and the only safe harbour is Wexford Harbour, which, owing to a bar, is not accessible to large vessels at ebb-tide. The artificial harbour of Rosslare, outside Wexford Harbour to the south, was therefore opened in 1906. On the south coast the great inlet of Waterford Harbour separates the county from Waterford and Kilkenny, and among several inlets Bannow Bay is the largest. Several islets adjoin the coast. South from Crossfarnogue Point are the Saltee Islands, and Coningmore and Coningbeg, beyond the latter of which is the Saltee lightship. South-east from Greenore Point is the Tuskar Rock.

The surface of the county is chiefly a series of verdant low hills, except towards the northern and western boundaries. An elevated ridge on the north-western boundary forms the termina- tion of the granitic range in Wicklow, and in Croghan Kinshela, on the borders of Wicklow, rises to a height of 1985 ft. On the western border, another range, situated chiefly in Carlow, extends from the valley of the Slaney at Newtownbarry to the confluence of the Barrow with the Nore at New Ross, and reaches 2409 ft. in Blackstairs Mountain, and 2610 ft. in Mount Leinster on the border of Co. Carlow. In the southern district, a hilly region, reaching in Forth Mountain a height of 725 ft., forms with Wexford Harbour the northern boundaries of the baronies of Forth and Bargy, a peninsula of flat and fertile land. The river Slaney enters the county at its north-western ex-tremity, and flows south-east to Wexford Harbour. Its chief tributary is the

Bann, which flows south-westwards from the borders of Wicklow. The Barrow forms the western boundary of the county from the Blackstairs range of mountains till its confluence with the Suir at Waterford Harbour.

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WEXFORD

Geology. — The Leinster Chain, with its granite core and margin of mica-schist, bounds the county on the west. From this, Silurian ground stretches to the sea, like a platform with a hummocky surface, numerous intrusive and contemporaneous felsitic lavas, and some diorites occurring along the strike in continuation of the Waterford series. A granite outlier rises south-east of Enniscorthy; and granite, in part gneissic, forms Carnsorc Pt. From near Cour- town to Bannow Bay, greenish slates like the Oldhamian series of Wicklow form a broad band, with Old Red Sandstone and Carboni-ferous Limestone above them near Wexford. Silurian beds appear again towards Carnsore. The surface of the county is much modified by glacial drift, and by the presence of sands and gravels of pre- G'lacial and possibly late Pliocene age. These interesting bedsare used for liming the fields, under the name of " manure gravels, on account of the fossil shells that they contain.

Industries. — The soil for the most part is a cold stiff clay resting on clay-slate. The interior and western districts are much inferior to those round the coasts. In the south-eastern peninsula of Forth and Bargy the soil is a rich alluvial mould mixed with coralline sandstone and limestone. The peninsula of Hookhead, owing to the limestone formation, is specially fruitful. In the western districts of the county there are large tracts of turf and peat-moss. The acreage under pasture is a little over twice that of tillage, and figures show a fair maintenance of the principal crops, barley, of which the county produces more than any other Irish county, oats, potatoes and turnips. The numbers also of (cattle, sheep, pigs and poultry are large and increasing, or well maintained. Except in the town of Wexford the manufactures and trade are of small importance. The town of Wexford is the headquarters of sea and salmon fishing districts, and there are a few fishing villages on the inlets of the south coast.

The main line of the Dublin & South-Eastern railway enters the county from N.E., and runs to Wexford by way of Enniscorthy, with a branch W. to New Ross, from Macmine Junction. Con- necting with this line at Palace East, a branch of the Great Southern & Western joins the Kilkenny & Kildare line at Bagenalstown, county Carlow. This company also owns the lines from Rosslare harbour to Wexford and across the southern part of the county to Waterford. There is water communication for barges by the

Slaney to Enniscorthy ; by the Barrow for larger vessels to New Ross, and by this river and the Grand Canal for barges to Dublin.

Population and Administration. — The population decreases (112,063 in 1891; 104,104 in iooi), but this decrease and the emigration returns are less serious than the average of Irish counties. Of the total about 91% are Roman Catholics, and about 83% form the rural population. The principal towns are Wexford (pop. 11,168), New Ross (5847), Enniscorthy (5458) and Gorey (2178). Newtownbarry, finely situated on the Slaney below the outliers of Mount Leinster, is a lesser market town. To the Irish parliament, until the Union of 1800, the county returned two members, and the boroughs of Bannow, Clomnines, Enniscorthy, Fcthard, Gorey, New Ross, Taghmon and Wexford two each. By the Redistribution Act of 18S5 Wexford, which had returned two members since 1800, was divided into two parliamentary divisions, North and South, each returning one member, the borough of Wexford, which formerly returned one member, and the portion of the borough of New Ross within the county, being merged in the South Division. The county is divided into ttn baronies. It is in the Protestant diocese of Dublin, and the Roman Catholic dioceses of Dublin, Ferns, and Kildare and Leighlin. Assizes are held at Wexford, and quarter sessions at Enniscorthy, Gorey, New Ross and Wexford.

History and Antiquities. — The northern portion of Wexford was included in Hy Kinselagh, the peculiar territory of the Macmorroughs, overlords of Leinster, who had their chief residence at Ferns. Dermod Macmorrough, having been de- posed from the kingdom of Leinster, asked help of Henry II., king of England, who authorized him to raise forces in England for the assertion of his claim. He secured the aid of Strongbow by promising him the hand of Eva, and in addition obtained assistance from Robert Fitzstephcn and Maurice Fitzgerald of Wales. Ontherstof May ri69 Fitzstcphen landed at Bagenbon on the south side of Fethard, and after four days' siege captured the town of Wexford from its Danish inhabitants. After this Dermod granted the territory of Wexford to Fitzstephen and Fitzgerald and their heirs for ever. Macmorrough having died in 1172, Strongbow became lord of Leinster. At first Henry II. retained Wexford in his own possession, but in 11 74 he com- mitted it to Strongbow. The barony of Forth is almost entirely peopled by the descendants of those who accompanied these

English expeditions. Wexford was one of the twelve counties into which the conquered territory in Ireland is generally stated to have been divided by King John, and formed part of the possessions of William Marshal, earl of Pembroke, who had married Strongbow's daughter. Through the female line it ultimately passed to John Talbot, carl of Shrewsbury, who in 1446 was made earl of Waterford and baron of Dungarvan. In 1474 George

Talbot was seneschal of the liberty of Wexford. The district was actively concerned in the rebellion of 1641; and during the Cromwellian campaign the town of Wexford was carried by storm on the 9th of October 1649, and a week later the garrison at New Ross surrendered — a " seasonable mercy," according to Cromwell, as giving him an " opportunity towards Munster." Wexford was the chief seat of the rebellion of 1 798, the leaders there being the priests.

Evidences of the Danish occupation are seen in the numerous raths, or encampments, especially at Dunbrody, Enniscorthy and New Ross. Among the monastic ruins special mention may be made of Dunbrody abbey, of great extent, founded about. 1 1 78 for Cistercian monks by Hervey de Montmorency, marshal of Henry II.; Tintern abbey, founded in 1200 by William Marshal, earl of Pembroke, and peopled by monks from Tintern abbey in Monmouthshire ; the abbey of St Sepulchre, Wexford, founded shortly after the invasion by the Roches, lords of Fermoy ; Fcras abbey, founded by Dermod Macmorrough (with other remains including the modernized cathe- dral of a former see, and ruins of a church) ; and the abbey of New Ross, founded by St Alban in the 6th century. There are a con- siderable number of old castles, including Ferns, dismantled by the parliamentary forces under Sir Charles Coote in 1641, and occupying the site of the old palace of the Macmorroughs ; the massive pile of Enniscorthy, founfled by Raymond le Gros; Carrick Castle, near Wexford, the first built by the English ; and the fort of Duncannon.

WEXFORD, a seaport, market town and municipal borough, and the county town of Co. Wexford, Ireland, finely situated on the south side of the Slaney, where it discharges into Wexford Harbour, on the Dublin & South-Eastern railway, 921 m. S. of Dublin. Pop. (1901) 11,168. Wexford Harbour, formed by the estuary of the Slaney, is about 5 m. from N. to S. and about 4 from E. to W. There are quays extending nearly 900 yds., and the harbour affords good accommodation for shipping, but its advantages are in great part lost by a bar at its mouth pre- venting the entrance of vessels drawing more than 12 ft. An artificial harbour was therefore opened at Rosslare in 1906, outside the southern part of the promontory closing in the harbour, and this is connected with Wexford by a railway (8J m.) owned by the Great Southern & Western Company, and is served by the passenger steamers of the Great Western railway of England from F'ishguard. The town of Wexford consists, for the most part, of extremely narrow streets, of picturesque appearance, but inconvenient to traffic. Some remains exist of the old walls and flanking towers. The Pro- testant church, near the ruins of the ancient abbey of St Sepulchre or Selsker, is said to occupy the spot where the treaty was signed between the Irish and the English invaders in 1169. The principal modem buildings are the town-hall, court-house, barracks, occupying the site of the ancient castle, St

Peter's College for the education of Catholic clergy, with a striking chapel by A. W. Pugin, and a number of convents. At Carrick, 2 m. W., the Anglo-Normans erected their first castle, and opposite this, across the river, is a modern round tower com- memorating the men of Wexford who died in the Crimean War. The principal exports are agricultural produce, live stock and whisky. Shipbuilding is carried on, and also tanning, malting, brewing, iron-founding, distilling and the manufacture of artificial manure, flour, agricultural implements, and rope and twine. Wexford is the headquarters of salmon and sea fishery districts. Under the Local Government (Ireland) Act 1898 it retains its mayor and corporation.

Wexford was one of the earliest colonies of the English, having been taken by Fitzstephen. It was the second town that Crom- well besieged in r649. It was garrisoned for William III. in 1690. In 1798 it was made the headquarters of the rebels, who, however, surrendered it on the 2rst of June. In 1318 the town received a charter from Aymer de Valence, which was extended by Henry IV. in 1411, and confirmed by Elizabeth in 1558.

By James I. it was in 1608 made a free borough corporate, by the title of " the town and free borough corporate of Wexford." It returned two members to parliament from 1374 till the Union, when they were reduced to one. In 1885 it was included in the south division of the county.

WEYBRIDGE, an urban district in the Chertsey parliamentary division of Surrey, England; 19 m. W.S.W. from London by the London & South-Westcrn railway. Pop. (1901) 5329. It lies in the flat valley of the river Wcy, 1 m. above its junction with the Thames. The river is locked up to Godalming, and navigation is assisted by cuts. Weybridge has grown in modern times out of a village into a residential town. The church of St James is modern but contains numerous ancient memorials, and one by Sir F. Chantrey for the duchess of York (d. 1820), daughter of Frederick William II. of Prussia, to whose memory there is also a column on Weybridge Green. The summit of this column is that which formerly stood at Seven Dials, London. The Roman Catholic chapel of St Charles Borromeo was the burial-place of Louis Philippe, ex-king of the French (d. 1850), who resided at Claremont in the neighbouring parish of Esher ; his. queen and other members of his family; but their bodies were subsequently, removed to Dreux in Normandy. To the east of Weybridge lies Henry VIII. 's park of Oatlands (see Walton- on-Thames). In 1907 the Brooklands racing track for motor- cars was opened near Weybridge. It has a circuit of 2^-£ m. round the inner edge, and including the straight finishing track is

34 m. in total length; its maximum width is 100 ft., and at the curves it is banked up to a maximum height of 28 ft. 8 in.

WEYDEN, ROGIER VAN DER [originally Roger de la Pasture] 1 (c. 1400-1464), Flemish painter, was born in Tournai, and there apprenticed in 1427 to Robert Campin. He became a gild master in 1432 and in 1435 removed to Brussels, where he was shortly after appointed town painter. His four historical works in the Hotel de Ville have perished, but three tapestries in the Bern museum are traditionally based on their designs. In 1449 Rogier went to Italy, visiting Rome, Ferrara (where he painted two pictures for Lionel d'Este), Milan and probably Florence. On returning (1450) he executed for Pierre Bladelin the " Magi " triptych, now in the Berlin Gallery, and (1435) an altarpiece for the abbot of Cambrai, which has been identified with a triptych in the Prado Gallery representing the " Crucifixion," " Expulsion from Paradise " and " Last Judgment." Van der Weyden's style, which was in no way modified by his Italian journey, is somewhat dry and severe as compared with the painting of the Van Eycks, whose pupil Vasari erroneously supposed him to be; his colour is less rich than theirs, his brush-work more laboured, and he entirely lacks their sense of atmosphere. On the other hand, he cared more for dramatic expression, particularly of a tragic kind, and his pictures have a deeply religious intention. Comparatively few works are attributed with certainty to this painter; chief among such are two altarpieces at Berlin, besides that mentioned above, " The Joys and Sorrows of Mary," and "Life' of St John the Baptist," a "Deposition" and " Crucifixion " in the Escorial, the Prado triptych, another (" Annunciation," " Adoration " and " Presentation ") at Munich; a " Madonna" and a "St John the Baptist" at Frankfort. The " Seven Sacraments " altarpiece at Antwerp is almost certainly his, likewise the " Deposition " in the Uffizi, the triptych of the Beaune hospital, and the "Seven Sorrows" at Brussels. Two pictures of St Luke painting the Virgin, al Brussels and St Petersburg respectively, are attributed to him. None of these is signed or dated. Van der Weyden attracted many foreigners, notably Martin Schongauer, to his studio, and he became one of the main influences in the northern art of the 15th century. He died at Brussels in 1464. His descendant, Rogier van der Weyden the younger, is known to have entered the Antwerp gild in 1528, but no work of his has yet been satisfactorily authenticated.

See Hasse, Roger van der Weyden und Roger van Brugge (Strass- burg, 1905).

1 He has sometimes been wrongly identified with a painter called Roger of Bruges or Ruggiero da Bruggia.

WEYLER Y NICOLAU, VALERIANO, Marquess of Tenerife (1839-),

Spanish soldier, was born at Palma de Majorca. His family were originally Prussians, and served in the Spanish army for several generations. He entered at sixteen the military college of infantry at Toledo, and, when he attained the rank of lieutenant, passed into the staff college, from which he came out as the head of his class. Two years afterwards he became captain, and was sent to Cuba at his own request. He distin- guished himself in the expedition to Santo Domingo in many fights, and especially in a daring reconnaissance with few men into the heart of the enemy's fines, for which he got the cross with laurels of San Fernando. From 1868 to 1872 he served also brilliantly against the Cuban rebels, and commanded a corps of volunteers specially raised for him in Havana. He returned to Spain in 1873 as brigadier-general, and took an active part against the Carlists in the eastern provinces of the Peninsula in 1875 and 1876, for which he was raised to the rank of general of division. Then he was elected senator and given the title of marquess of Tenerife. He held the post of captain- general in the Canary Isles from 1878 to 1883, and in the Balearic Isles afterwards. In 1888 he was sent out as captain-general to the Philippines, where he dealt very sternly with the native rebels of the Carolines, of Mindanao and other provinces. On his return to Spain in 1892 he was appointed to the command first of the 6th Army Corps in the Basque Provinces and Navarre, where he soon quelled agitations, and then as captain-general at Barcelona, where he remained until January 1896. In Catalonia, with a state of siege, he made himself the terror of the anarchists and socialists. After Marshal Campos had failed to pacify Cuba, the Conservative government of Canovas del Castillo sent out Weyler, and this selection met the approval of most Spaniards, who thought him the proper man to crush the rebellion. Weyler attempted to do this by a policy of inexorable repression, which raised a storm of indignation, and led to a demand from America for his recall. This recall was granted by the Liberal government of Sagasta, but Weyler afterwards asserted that, had he been left alone, he would have stamped out the rebellion in six months. After his return to Spain his reputation as a strong and ambitious soldier made him one of those who in case of any constitutional disturbance might be expected to play an important r61e, and his political position was nationally affected by this consideration; his appointment in 1900 as captain-general of Madrid resulted indeed in more than one ministerial crisis. He was minister of war for a short time at the end of 1901, and again in 1905. At the end of October 1909 he was appointed captain-general at Barcelona, where the disturbances connected with the execution of Francisco Ferrer were quelled by him without bloodshed.

WEYMAN, STANLEY JOHN (1855-), English novelist, was born at Ludlow, Shropshire, on the 7th of August 1855, the son of a solicitor. He was educated at Shrewsbury School, and at Christ Church, Oxford. He

took his degree in modern history in 1877, and was called to the bar at the Inner Temple in 1881, joining the Oxford circuit. He had been practising as a barrister for eight years when he made his reputation as a novelist by a series of romances dealing with French history: The House of the Wolf (1889), A Gentleman of France (1893), Under the Red Robe (1894), Memoirs of a Minister of France (1895), &c. Among his later novels were: Shrewsbury (1897), The Castle Inn (1898), Sophia (1900), Count Hannibal (1901), In King's Byways (1902), The Long Night (1903), The Abbess of Vlaye (1904), Starvecrow Farm (1905), Chippinge (1906).

WEYMOUTH, a township of Norfolk county, Massachusetts, U.S.A., on Weymouth harbour, a part of Boston Bay, 9 m. S.E. of Boston, between Quincy and Brain tree (to the W.) and Hingham to the E. Pop. (1890) 10,866; (1900) 11,324 (1845 foreign-born); (1905, state census) 11,585; (1910) 12,895. Area, 19 sq. m. Weymouth is served by the New York, New Haven & Hartford railway, and is connected with Boston, Quincy, Braintree, Hingham, Nantasket and Rockland by electric lines. In the township there are several villages, including Weymouth, North Weymouth, East Weymouth and South

Weymouth, and the smaller villages of Weymouth Centre, Weymouth Heights, Lovell's Corner, Nash's Corner and Old Spain, and there are also four islands, Round, Grape, Slate and Sheep. The mainland itself is largely a peninsula lying between the Weymouth Fore river and the Weymouth Back river, to the west and east respectively. The surface of the country is rough: Great Hill (at one of the narrowest parts of the peninsula) is about 140 ft. above the rivers. In the township are the Fogg Library (1898, in South Weymouth) founded by a bequest of John S. Fogg; and the Tufts Library (1879, in Weymouth village), endowed by Quincy Tufts and his sister Susan Tufts. In 1905 the township's factory products were valued at $4,921,955, of which $2,588,213, or 52-6% of the total, was the value of boots and shoes. The township owns and operates its water works; the water supply is obtained from Weymouth Great Pond in the village of South Weymouth, Weymouth was first settled in 1623 by Robert Gorges. It was known first as the Plantation of Wessaguscus or W r essagusset; was incorpo- rated as a township in 1635, and its boundaries have been prac- tically unchanged since 1637, when Round and Grape islands were granted to Weymouth.

See C. F Adams, Jr-, " Wcssagusset and Weymouth " in No. 3 (1905) of the Publications ot the Weymouth Historical Society (organized in 1879

and incorporated in 1886), and D. H. Hum, History of Norfolk County (Boston, 1884).

WEYMOUTH and MELCOMBE REGIS, a seaport, watering- place, market town and municipal borough in the Southern parlia- mentary division of Dorsetshire, England, 142 m. S.W. by W. from London, on the London & South-Western and Great Western railways. Pop. (1891) 16,100; (1901) 19,843. It is formed of Weymouth, a fishing town and seaport on the south- west of the Wey, and Melcombe Regis on the north-east of the river, the two towns being contiguous. The situation on Wey- mouth Bay, which is enclosed to the south by the Isle of Portland, and north by the eastward trend of the coast, is picturesque. An esplanade about 1 m. in length fronts the sea. To the south of the esplanade is a pier of stone on wooden piles, and the Alexandra and other public gardens are attractive. The harbour lies between the pier on the north and the spur of land called the Nothe on the south, and is protected by a concrete wall extending 500 ft. northward from the Nothe. The principal buildings are the old town-hall, the market house, the guildhall, the Royal Dorset Yacht Clubhouse, the theatre, the Royal Victoria Jubilee Hall, the Weymouth and Dorset eye infirmary, the Weymouth royal hospital and dispensary and the barracks. Of the numerous churches none dates from before the 19th century. Opposite the Royal Terrace is an equestrian statue of George III., erected in 1809 in commemoration of his jubilee. A mile S.W. of W r eymouth is Sandsfoot Castle, a fort erected by Henry VIII. for the protection of the shipping. The principal exports are Portland stone, bricks and tiles and provisions, and the imports are coal, timber, garden and dairy produce and wine; Ship and boat building, rope and sail making, and brewing are carried on. The Great Western railway company maintains a regular service of passenger steamers to Guernsey and Jersey. The municipal borough is under a mayor, 8 aldermen and 24 councillors. Area, 1299 acres.

Although its convenient harbour was probably used before Saxon times, and bronze weapons and Roman interments have been found, there is no evidence that Weymouth (Waimue, Waymuth) was a place of early settlement. The first mention of "that place called Weymouth" occurs in a charter of King ˆEthelred (866-871), while it is again spoken of in a charter of King ˆLthelstan (895-940). Edward the Confessor gave the manor to the church of Winchester in 1042, and it remained with the prior and convent of St Swithin until the 13th century, when it passed by exchange to Gilbert de Clare, earl of Gloucester, though the vassals of the prior and convent remained exempt from dues and tronage in the port. Coming by marriage into the hands of the earls of March and Plantagenets, the manor was finally vested in the crown. The first charter was that granted by the prior and convent in 1252, by which Weymouth

was made a free borough and port for all merchants, the burgesses holding their burgages by the same customs as those of Ports- mouth and Southampton. The demand of six ships from the town by the king in 1324 shows its importance in the 14th century, but there is no mention of a mayor until 1467. It is probable that the town suffered considerably at the hands of the French at the beginning of the 15th century, though in 1404 the men of Weymouth were victorious over a party which landed in the Isle of Portland. Early in the 16th century the commercial rivalry between Weymouth and the neighbouring borough of Melcombe came to a height. Melcombe had received a charter from Edward I, in 1280 granting to its burgesses half the port and privileges similar to those enjoyed by the citizens of London; Edward II. in 1307- 130S granted that its men might elect for themselves two bailiffs. The date of the grant of the town at an annual fee-farm of S marks is uncertain, but in the reign of Henry VI. a commission was appointed to inspect the destruction wrought by the king's enemies on the town, with the result that the fee-farm was reduced to 20s. The continual disputes between the two boroughs led to the passing of an act of union in 1571, the new borough being incorporated under the tille of the " Mayor, Bailiffs and Burgesses" by James I. in 1616; further charters were granted by Charles II. and George II. Melcombe Regis first returned two members to parliament in 1307, and Weymouth in 1319, four members being returned by the united boroughs until 1832, when the representation was reduced to two and ceased in 1885. The medieval fairs are no longer held. As early as 1293 trade was carried on with Bayonne, and six years later a receiver of customs on wool and wool-fells is mentioned at Weymouth, while wine was imported from Aquitaine. In 1586 sugar is mentioned as an import, and in 1646 deal boards were brought here from Hamburg. The town suffered severely during the Civil War, being garrisoned by the parliamentary troops in 1642, taken by the earl of Carnarvon in 1643, and surrendered in the following year. The town is described as "but little" in 1733, but a few years afterwards it gained a reputation as a watering-place, and the duke of Gloucester built a house here; George III. and the royal family in 1789 paid Weymouth the first of a series of visits which further ensured its popularity.

See H. J. Moule, Descriptive Catalogue of the Charters, Minute Books, and other Documents of the Borough of Weymouth and Melcome Regis, A.D, 1250 to i860 (Weymouth, 1883); John Hutchlns, History and Antiquities of the County of Dorset (3rd ed., Westminster, i860).

WHALE, the English name applied to all the larger and some of the smaller representatives of the order Cetacea {q.v.). Although by their mode of life far removed from close observa- tion, whales are in many respects the most interesting and wonderful of all creatures; and there is much in their structure and habits worthy of study. One of the first lessons a study of

these animals affords is that, in the endeavour to discover what a creature really is, from what others it is descended, and to which it is related, the outward appearance affords little clue, and we must go deep below the surface to find the essential characteristics of its nature. There was once, and may be still, an idea that a whale is a fish. To realize the fallacy of this notion we have only to consider what a fish really is, what under all the diversities of form, size and eclour there is common to all fishes, and we see that in everything which, characterizes a true fish and separates if from other classes, as reptiles, birds and mammals, the whale resembles the last and differs from the fish. It is as essentially a mammal as a cow or a horse, and simply resembles a fish externally because it is adapted to inhabit the same element; but it is no more on that account a fish than is a bat (because adapted to paˆs a great part, of its existence on the wing) nearly related to a bird. In every part of the structure of a whale we see the result of two principles acting and reacting upon each other — on the one hand, adherence to type, or rather to fundamental inherited structural conditions, and, en the other, adaptation to the peculiar circumstances under which it lives, and to which it has become gradually fitted. The external fish-like form is perfectly suited for

swimming through the water; the tail, however, is not placed vertically as in fishes, but horizontally, a position which accords better with the constant necessity for rising to the surface for ihe purpose of breathing. The hairy covering characteristic of all mammals, which if present might interfere with rapidity of movement through the water, is reduced to the merest rudiments — a few short bristles about the chin or upper lip — which are often only present in young animals. The function of keeping the body warm is performed by a thick layer of non-conducting

remains in perfect action, filling the whole of the interval. The mechanical perfection of the arrangement is completed by the great development of the lower lip, which rises stiffly above the jaw-bone and prevents the long, slender, flexible ends of the whalebone from being carried outwards by the rush of water from the mouth, when its cavity is being diminished by the closure of the jaws and raising of the tongue.

If, as appears highly probable, the " bowhead " of the Okhotsk Sea and Bering Strait belongs to this species, its range is ctrcum- polar. Though found in the seas on both sides of Greenland, and passing freely from one to the other, it is never seen so far south as Cape Farewell; but on the Labrador coast, where a cold stream sets down from the north, its range is

somewhat farther. In the Bering Sea, according to Scam- mon, " it is seldom seen south of the fifty-fifth parallel, which is about the farthest southern extent of the winter ice, while in the Sea of Okhotsk its southern limit is about the latitude of 54°." " Everything tends to prove, T> Scammon says, " that Balaena mysticetus is truly an ' ice whale,' for among the scattered floes, or about the borders of the ice-fields or barriers, is its home and feeding-ground. It is true that these animals are pursued in the open water during the summer months, but in no instance have we learned Fig. i.— The Greenland or Arctic Right Whale {Balaena mysticetus). Q { their being captured south of where winter ice-fields are

occasionally met with." The occurrence of this species, therefore, on the British or any European coast is unlikely, as when alive and in health the southern limit of its range in the North Sea is from the east coast of Greenland at 64° N. lat. along the north of Iceland towards Spitzbergen, and a glance at a physical chart will show that there are no currents setting southwards which could bear a disabled animal or a floating carcase to the British shores. To this improb- ability may be added the fact that no authentic instance has been recorded of the capture or stranding of this species upon any European coast. Still, as two other Arctic cetaceans, the narwhal and the beluga, have in a few instances found their way to British shores, it would be rash to deny the possibility of the Greenland right whale doing the same.

The black whale or southern right whale (B. australis) re- sembles the preceding in the absence of a dofsal fin and of longitudinal furrows in the skin of the throat and chest, but differs in that it possesses a smaller head in proportion to its body, shorter whalebone, a different-shaped contour of the upper margin of the lower lip, and a greater number of vertebrae. This type inhabits the temperate seas of both southern and northern hemispheres and is divided into several species accord- ing to their geographical distribution: B. biscayensis of the North Atlantic, B. japonica of the North Pacific, B. australis of the South Atlantic, and B. antipodarum and B. novae-zelandiae of the South Pacific. But. the differential characters by which they are separated are slight, and the number of specimens available for comparison is not sufficient to afford the necessary data to determine whether these characters can be regarded as specific or not.

The Biscay right whale was formerly abundant in the North Atlantic, but is now verging on extinction. This was the whale the pursuit of which gave occupation to a numerous population oa the

material, the " blubber," a dense kind of fat placed immediately beneath the skin. The fore-limbs, though functionally reduced to mere paddles, with no power of motion except at the shoulder- joint, have beneath their

smooth and continuous external covering all the bones, joints and even most of the muscles, nerves and arteries of the human arm and hand; and rudiments even of hind-legs are found buried deep in the interior of the animal, serving no useful purpose, but pointing a lesson to those able to read it.

In the present article attention is directed only to what may be regarded as the typical whales. Of these the Greenland or Arctic right whale (Balaena mysticetus) attains, when full grown, a length of from 45 to 50 ft. In this species (fig. 1) all the peculiarities which distinguish the head and mouth of the whales from those of other mammals have attained their greatest development. The head is of enormous size, exceeding one-third the whole length of the creature. The cavity of the mouth is actually larger than that of the body, thorax and abdomen together. The upper jaw is very narrow, but greatly arched from before backwards, to increase the height of the cavity and allow for the great length ot the whalebone-blades; the enormous lateral halves of the lower jaw are widely separated posteriorly, and have a further outward sweep before they meet at the symphysis in front, giving the floor of the mouth the shape of an immense spoon. The whalebone-blades attain the number of 380 or more on each side, and those in the middle of the series have a length of 10 or sometimes 12 ft. They are black in colour, fine and highly elastic in texture, and fray out at the inner edge and ends into long, delicate, soft, almost silky, but tough hairs. The remarkable development of the mcuth and of the structures in connexion with it, which dis- tinguishes the right whale from all its allies, is entirely in relation to the nature of its food. By this apparatus the creature is enabled to avail itself of the minute hut highly nutritious crustaceans and pteropods which swarm in immense shoals in the seas it frequents. The large mouth enables it to take in at one time a sufficient quantity of water filled with these small organisms, and the length and delicate structure of the whale- bone provide an efficient strainer or hair-sieve by which the water can be drained off. If the whalebone were rigid, and only as long as is the aperture between the upper and lower jaws when the mouth is shut, a space would be left beneath it when the jaws were separated, through which the water and the minute particles of food would escape. But instead of this the long, slender, brush-like, clastic ends of the whalebone blades fold back when the mouth is closed, the front ones passing below the binder ones in a channel lying between the tongue and the lower jaw. When the mouth is opened, their elasticity causes them to straighten out like a bow unbent, so that at whatever distance the jaws are separated the strainer

Fig. 2.— The Black Whale or Southern Right Whale (B. australis).

shores of the Basque provinces of France and Spain in the middle ages. From the 10th to the 16th centuries Bayoune, Biarritz, St Jean de Luz and

San Sebastian, as well as numerous other towns on the north coast of Spain, were the centres of an active whale " fishery," which supplied Europe with oil and whalebone. In later times the whales were pursued as far as the coast of Newfoundland. They were, however, already getting scarce when the voyages under- taken towards the close of the 16th century for the discovery of the north-eastern route to China and India opened the seas round Spitzbergen ; then for the first time the existence of the Greenland whale became known, and henceforth the energies of the European whale-fishers became concentrated upon that animal. Among instances of the occurrence of this whale in Europe in modern times

may be mentioned three, namely, in the harbour of San Sebastian in January 1854, in the Gulf of Taranto, in the Mediterranean, in February 1877, and on the Spanish coast between Guetaria and Zarauz (Guipuzcoa) in February 1878. The skeletons of these three whales are preserved in the museums of Copenhagen, Naples and San Sebastian respectively. On the coast of the United States several specimens have been taken; and a cargo of whalebone belonging to this species was received at New Bedford in 1906. During the latter year six examples were killed by whalers from Buneveneader, in the island of Harris (see R- C. Haldane, Ann. Scot. : Nat. Hist., 1907, p. 13). In the North Pacific a similar if not identical whale is regularly hunted by the Japanese, who tow the carcases ashore for the purpose of flensing and extracting the whalebone. In the tropical seas, however, right whales arc never or rarely seen; but the southern temperate ocean, especially in the neighbourhood of the Cape of Good Hope, Kerguelen's Island, Australia and New Zealand, is inhabited by " black whales," once abundant, but now nearly exterminated through the wanton destruction of the females as they visit the bays and inlets round the coast, their constant habit in the breeding time. The range of these whales southward has not been accurately determined; but no species corresponding with the Arctic right whale has been met with in the Antarctic seas.

See also H limp-back Wh ale, Rorqual, Spekm-Wh ale, Beluga, &c. (W. H. F.;R. L.)*

WHALEBONE, the inaccurate name under which the baleen plates of the right whale are popularly known; the trade-name of whale-fin, which the substance receives in commerce, is equally misleading. Whalebone is formed in the palate on the roof of the mouth and is an exaggeration of the ridges, often homy in character, which are found on the roof of the mouth

of all mammals. Three kinds are recognized by traders — the Green- land, yielded by the Greenland whale, Balaena myslicelus; the South Sea, the produce of the Antarctic black whale, B. australis; and the Pacific or American, which is obtained from B. japonica. Very many different names have been given to whales of the B. australis group, and it is possible that local races exist, whilst some writers arc inclined to regard B. japonica as not specifically distinct from B. australis. Of these the Greenland whalebone is the most valuable. It formed the only staple known in earlier times, when the northern whale fishery was a great and productive industry. This whalebone usually comes into the market trimmed and clean, with the hairy fringe which edges the plates removed. To prepare whalebone for its economic applications, the blades or plates are boiled for about twelve hours, till the substance is quite soft, in which state it is cut either into narrow strips or into small bristle-like fila- ments, according to the use to which it is to be devoted.

Whalebone possesses a unique combination of properties which render it peculiarly and almost exclusively suitable for several purposes. It is light, flexible, tough and fibrous, and its fibres run parallel to each other without intertwisting. One of its earliest uses, referred to by William le Breton in the 13th century, was to form the plumes on helmets. It has been found practicable to employ flexible steel for several purposes to which whalebone was formerly applied, especially in the umbrella and corset industries, in which steel is now almost exclusively used. Whalebone, is, however, still in large demand among dressmakers and milliners; but it is princi- pally used in the brush trade. In cases where bristles are too soft and weak, and where the available vegetable fibres .possess insufficient elasticity and durability, whalebone offers the great advantage of being procurable in strips or filaments, long or short, thick or thin, according to requirement. Hence it is principally used for making brushes for mechanical purposes. The use of whalebone in brush- making was originally patented by Samuel Crackles in 1808, and various special machines have been adapted for cutting the material into filaments. When whalebone came into the English market in. the 17th century it cost at first about £700 per ton. In the 1 8th century its price ranged from £350 to £500 per ton, but early in the 19th century it fell as low as £25. Later it varied from £200 to £250; but with the decrease in whaling the article has become very scarce, and upwards of £2000 per ton is now paid for Greenland whalebone.

WHALE-FISHERY, or Whaling, the pursuit and capture of the larger species of cetaceans (see Cetacea and Whale). Man, in all probability, first became acquainted with the value of the products yielded by whales from stranded individuals; but at what time he first ventured to hunt and kill these monsters in the open ocean it is now impossible to ascertain. Wc know, however, from King Alfred's account of Ohthere's voyage to the

White Sea that the Norwegians were expert whalers at least a thousand years ago; and we also know that from the 10th to the 16th centuries the Basques of Bayonne, Biarritz,

St Jean-de-Luz, San Sebastian and certain other French and Spanish ports were sarrying on a lucrative trade in the products of a whale-fishery conducted by themselves, which supplied Europe with whalebone and oil. In the latter, and not im- probably also in the former case, the species hunted was the Atlantic right-whale, or black whale {Balaena biscayensis) , which the Basques seem to have well-nigh exterminated in their own waters; and it was not till a later epoch that the pursuit of its larger-headed cousin, the Greenland right-whale {B. mysticetus), was initiated. Hunting the sperm-whale, or cacha- lot, in the South Sea was a still later development, while rorqual- hunting is quite a modern industry.

Of whaling vessels of the old type, a brief notice will suffice. Those engaged in the British South Sea fishery, which was in its prime about the year 1700, were from 300 to 400 tons burden, and equipped for at least a three-years' voyage. They carried from 28 to 33 officers and men, and six whale-boats. Built sharp at both ends, these boats were about 27 ft. long, and were furnished, in addition to masts and sails, with a couple of 200-fathom whale-lines. When a whale was sighted from the " crow's-nest " at the masthead of the vessel, four boats, each carrying a crew of six men, were lowered and despatched in pursuit. The crew consisted cf a boat-steerer in the bow, four rowers and a headsman in the stern. The boat-steerer carried the harpoons with which the whale was first attacked, and when the boat was once " fast " to a whale by means of the harpoon and line, the attack was carried on by the headsman, who was armed with long slender lances. When several whales were seen, two or more of the boats might make separate attacks; but in other instances they kept together, so that their united lines were available when the whale descended or " sounded." After the first blow of the harpoon, or at all events after the first effective lancing, the "sounding" was deep and prolonged; but loss of blood eventually caused the victim to keep near the surface, when, if all went well, it was finally despatched by lance- thrusts behind one of the flippers into the vital parts.

When a sperm-whale was killed, the carcase was made fast to the side of the vessel, and the process of flensing, or " cutting- in," commenced. On being made fast to the vessel, the whale was enveloped in a framework, and a strip of the blubber cut in a spiral direction. By raising this strip with the aid of proper apparatus, the whale could be turned round and round on its axis, and nearly the whole of the blubber removed in a con- tinuous piece, to be cut, as required, into convenient lengths. Meanwhile the liquid spermaceti, or " head-matter," was ladled out in buckets from the great

cavity in the skull and put in casks, where it solidified, to be carried to port and there refined. The blubber was, however, reduced to oil by " try- works " with which the vessel was provided, and stored in barrels. A large male sperm-whale will yield as much as eighty barrels, or about 3 tons of oil; while the yield of a small female does not exceed 1 or 2 tons. In the old days the cargo of a successful vessel might include the products of a hundred whales, yielding from 150 to 200 tons of boiled sperm-oil in addition to the spermaceti.

In the old days of the Greenland whale-fishery vessels of about 350 tons burden were deemed the most eligible, these ■being constructed in such a manner as to resist so far as possible the pressure of the ice. The crew was about fifty in number, and the vessel carried six or seven whale-boats of the same length as those used in the South. Sea fishery. The vessels left Peterhead and Dundee (the ports for the Greenland fishery, as was London for the South Sea fishery) about the beginning of April, and, after touching at the Shetlands, reached the whaling-grounds before the end of that month. In approaching a whale, which was effected from behind, silence was essential, and the harpoon had to be delivered within a distance of a few yards. The moment the wounded whale disappeared a flag was hoisted in the boat to give notice that assistance was re- quired from the ship. Attention to the line was a matter of the utmost importance, as if it became entangled the boat would be drawn under water by the whale. Sometimes its motion

was retarded by one or more turns round the il bollard," a post fixed for this purpose in the boat; when this was done the friction was so great as to produce quantities of smoke, fire being prevented by sluicing the bollard with water. Even with the assistance offered by the bollard, the whale-line might be run out within ten minutes, when the lines of a second or even a third boat would be attached. In this manner some 600 or 700 fathoms of line would be taken out; the whale commonly remaining under water when first wounded for about 40 minutes, although a period of an hour is said to be not unfrequent. On rising after its second descent the whale was attacked with lances thrust deep into the body and aimed at the vital parts. The old-fashioned lance was a 6-ft. rod and §-in. iron, flattened at one end into the form of a lance-head with cutting edges, and at the other expanding into a socket for the reception, of a short wooden handle. Torrents of blood spouted from the blow-hole of the whale denoted the approaching end of the struggle. So soon as the whale was dead, no time was lost in piercing the tail or " flukes," and thus making the carcase fast

to the boats by means of a cable, and then towing it in the direction of the ship. From fifteen minutes to as much as fifty hours might be occupied in a whale-hunt.

The following account of the operation of " flensing," or securing the blubber and whalebone of the Greenland whale, is taken from Sir William Jardine's Naturalists' Library: —

" The huge carcase is somewhat extended by strong tackles placed at the snout and tail. A band of blubber, two or three feet in width, encircling the whale's body at what is the neck in other animals, is called the kent, because by means of it the whale is turned over or kented. To this band is fixed the lower extremity of a com- bination of powerful blocks, called the kent-purchase, by means of which the whole circumference of the animal is, section by section, brought to the surface. The harpooners, having spikes on their feet to prevent their falling from the carcase, then begin with a kind of spade, and with huge knives, to make long parallel cuts from end to end, which are divided by cross-cuts into pieces of about half a ton. These are conveyed on deck, and, after being reduced to smaller portions, are stowed in the hold. Finally, being by other operations still further divided, the blubber is put into casks, which is called ' making-ofiV and packed down completely by a suitable instrument.

" While this flensing is proceeding, and when it reaches the lips, which contain much oil, the baleen (whalebone) is exposed. This is detached by means of bone hand-spikes, bone knives and bone spades. The whole whalebone is hoisted on deck in one mass, when it is split by bone wedges into junks, containing five or ten blades each, and stowed away. When the whole whalebone and blubber are thus secured, the two jaw-bones, from the quantity of oil which they contain, arc usually hoisted on deck, and then only the kreng re- mains — the huge carcase of flesh and bone, which is abandoned either to sink or to be devoured by the birds, sharks and bears, which duly attend on such occasions for their share of the prey."

The largest cargo ever secured by a Scotch whaler was that of the " Revolution " of Peterhead in 1S14, which comprised the products of no less than forty-four whales. The oil, which amounted to 299 tons, realized £9568, while the price obtained for the whalebone., added to the government bounty then given to Greenland whalers, brought up the total sum to £11,000. Allowing a ton to each whale, the whalebone alone at present prices would have yielded about £110,000 1

At a later period, say about 1880, the Greenland whaler had grown to a vessel of from 400 to 500 tons gross register, rigged either as a ship or a bark, and provided with auxiliary engines of about 75 horse-power. She

would be manned by from fifty to sixty hands, and would carry eight boats of the type men- tioned above. Below the hold-beams were fitted about fifty iron tanks capable of containing from 200 to 250 tons of oil. Such a vessel would cost about £17,500 to build, and her working expenses, exclusive of interest and insurance, would be about £500 a month. At the period mentioned each whale-boat was armed with a harpoon-gun measuring 4 ft. 6 in. in length and weighing 75 lb; the barrel being 3 ft. long, with iˆ-m. bore, and mounted in a wooden stock, tapering behind into a pistol-handle. The gun-harpoon is used solely for first getting on to the whales; hand-harpoons being employed for getting a hold with other lines.

Without referring to further improvements in the weapons

and vessels employed, it will suffice to state that in the Greenland whale-fishery the whales are still killed from whale-boats. In the rorqual-fishery, as at Newfoundland, on the other hand, the actual attack is made from a steam-vessel of considerable size, as is described in the following quotation from a paper by Mr G. M. Allen in the American Naturalist for 1904, refer- ring to the fishery at Rose au-Rue, Placentia Bay, New- foundland: —

‘”’ The fishery itself, ” observes the author, ” is carried on by means of small and staunchly built iron steamers of something over one hundred tons. A cannon-like gun is mounted on a pivot at the bow, and discharges a 5-ft. harpoon of over 100 lb weight, which at short range is nearly buried in the body of the whale- A hollow iron cap filled with blasting powder is screwed to the tip of the harpoon, forming its point. A timed fuse discharges the bomb inside the body of the whale. The harpoon carries a stout cable which is handled by a powerful 5-sheet winch on the steamer’s deck.”

Explosive harpoons of the type referred to were invented by Svend Foyn, a Norwegian, and used by him about the year 1865 or 1866 in the manner described above, as they still are in various Norwegian rorqual-fisheries.

In fisheries of this type the carcases of the whales are towed into harbour for flensing; and in place of the “kreng” being wasted, the flesh is worked up to form an excellent manure, while the bones are ground up and also used as fertilisers.

A somewhat similar mode of proceeding characterizes the sperm-whale fishery now carried on in the Azores, so far at least as the towing of the carcases to shore for the purpose of flensing is concerned. According to an account given by Professor E. L. Bouvier in the Bulletin de I’Institut Occanograpkique for 1907, American whalers have observation stations on most of the islands of the Azores group; Horta, in Fayal, being the favourite

station. The carcases of the cachalots are towed for flensing into a small creek adjacent to the port, where, after the removal of the spermaceti and blubber, they are left to rot. Even the teeth have a commercial value, being either sold as curiosities in Horta, or utilized for ivory. Whenever practicable, the whales caught by the vessels belonging to the great sperm-whaling station at New Bedford are towed into the harbour for flensing.

Passing on to a review of some of the more important whale- fisheries of the world, the Atlantic fishery by the Basques in the 10th and six succeeding centuries claims first mention. Readers desirous of obtaining further insight into the little that is known about it are referred to an interesting paper by Sir Clements Markham published in the Proceedings of the Zoo- logical Society of London for 1881. Although, as already mentioned, the black whale {Balaena Mscayensis) was well-nigh exterminated in the north Atlantic by the Basques, and for many years afterwards was excessively rare, yet quite recently several examples have been taken by Scottish whalers off the Hebrides, while the whalebone of others has been received at New Bedford.

The discovery in 1596 by the Dutch navigator Barents of Spitzbergen. followed by the voyage of Hudson in the " Hope- well " in 1607, may be said to have inaugurated the second phase in the whaling industry; these adventurous voyages bringing to light for the first time the existence of the Greenland whale (B. mysticetus); a species of much greater value than any that had been previously hunted.

Here it may be well to refer to two common misconceptions regarding this whale. In the first place, it does not appear to be, as commonly supposed, a circumpolar species. There is, for instance, no evidence of its occurrence eastward of Spits- bergen along the Siberian coast between io° and 170 E.; and it is not till the latter parallel is reached, at Cape Schelagskoi, that the domain of the so-called bowhead of the American whales is entered.

" On the other side of Bering Strait," writes Mr T. Southwell in the Annals of Scottish Natural History for April 1904, " these whales do not appear to penetrate much farther east than Cape Bathurst, and it seems highly improbable that there is any inter- communication between those at that point and the whales in Baffin Bay. On the other hand, the whales on the east side of

Davis Strait do not descend so far south as Cape Farewell, nor are those in.

the Greenland Sea known to pass westward round that cape. It seems therefore that, although their range as a species is undoubtedly extensive longitudinally, the localities they inhabit are greatly restricted, each being inhabited by a local race differing from the other in some slight degree."

The second misconception is that the Greenland whale has gradually been driven northward by the whalers. A sufficient proof of the falsity of this idea is afforded by the fact that the minute organisms constituting the food of the species arc re- stricted to the icy seas of the far north. The Greenland whale is, in fact, essentially an ice-whale.

To revert to the history of the fishery, no sooner was the accessibility of the Spitzbergen seas made known than vessels were fitted out for whaling there, at first by the British, and soon after by the Dutch. The seas absolutely swarmed with whales, which showed little fear of vessels and could thus be captured with ease. The first whaling expedition was despatched by the Muscovy Company, under the command of Jonas Poole; and the success of four voyages (1609-1612) soon attracted the atten- tion of other nations. Some indication of the abundance of the whales may be gathered from the fact that in the year 1697 no less than 1959 of these monsters were killed off Spitzbergen by 188 vessels.

The fishery in Davis Strait was begun in 17 19 by the Dutch, who at first killed large numbers of whales and were subse- quently followed by the British. Although many whales have been seen in recent years, few are taken; and it is the opinion of many that in Greenland waters, at any rate, steam has been fatal to the industry.

The following summary of the rise and fall of the British Greenland whale-fishery is given by Mr Southwell in the article already cited: —

" For the first quarter of the 19th century scarcely a seaport of any importance on the east coast of England was unrepresented in the Arctic seas: from Scotland, Berwick, Leith, Kirkcaldy, Dundee, Montrose, Aberdeen, Peterhead, Kirkwall, Greenock and for a time Banff and Bo'ness, all took part in the whale-fishery. Gradually, one by one, they fell off, till only Peterhead, which sent out her first whaler in 1788, and Dundee (which started in 1790) were left. In 1893 Peterhead, which in 1857 sent out 34 vessels, ceased to be repre- sented in the industry, leaving Dundee in possession of the field. Dundee sent out its largest fleet in 1885, — 16 vessels; in 1903 she was represented by 5 vessels only, one of which was wrecked."

According to Mr Southwell's account of the Arctic fishery (Zoologist, 1906), a Dundee vessel, the " Scotia," visited the east Greenland seas in

the summer of 1906, where she took four small right-whales; this visit being the first made to those seas by a British vessel since 1899.

As already mentioned, the British whalers were accustomed to sail for the Arctic Ocean early in April; and if their destina- tion was the east Greenland sea, off the west coast of Spitzbergen, they generally arrived on the grounds about a month later. The whales make their appearance amongst the ice near the sea edge about the 15th of May, but only remain until the opening of the barrier-ice permits them to resume their northward journey; for about the middle of June they suddenly disappear from these grounds, and are last seen going north-west, when the north Greenland whale-fishing is over for the season. If un- successful in obtaining a cargo at the northern grounds, the whale- ships were accustomed to proceed southwards as far as lat. 75 ; where, if the sea were sufficiently open, they penetrated west- wards until the coast of Greenland became visible. There they cniised amongst the ice until August, when the darkness of the nights put an end to the season's fishing. If the south-west fishery, in Davis Strait, were the first object of the voyage, the vessels arrived at the edge of the ice near Resolution Island in April. If unsuccessful here they proceeded direct to Disco Island, where they usually arrived early in May. The whales appear about the middle of May at South East Bay, where a great fishing was once carried on. The dangerous passage of Melville Bay was next performed; the whales entering the north water in June, and pushing on towards the sounds. If there were a J ' land-floe across," i.e. if the land-ice of the west side were con- tinuous across the entrance of Ponds Bay and Lancaster Sound,

whales would be seen in considerable numbers and good cargoes might be obtained; but immediately the land-floe broke up they departed to the westward. When there was no land-floe across, the whales proceeded at once to the secluded waters of Eclipse Sound and Prince Regent Inlet for the summer months. At this season most of the vessels cruised in the sounds, but a few searched the middle ice, until the darkness of the August nights compelled them to seek anchorage in some of the harbours of the west side, to await the return of the whales south. This migration takes place on the formation of young ice in the sounds, usually in the latter part of September. Only the larger whales, most of which are males, come, however, close down along the land of the west side. These the ships sent their boats to inter- cept; this forming the inshore-fishing, or " rock-nosing," which continued till the formation of young ice drove the vessels out of harbour, usually early in October.

A few vessels, American as well as British, occasionally entered Hudson Bay and prosecuted the fishing in the neighbourhood of Southampton Island, even entering Fox Channel. There were whaling-stations in

Cumberland Inlet, and a few vessels usually remained throughout the winter, ready to take advantage of the opening of the ice in the following spring. Here both young and old whales make their appearance in May; and the fishing continued till the whales migrated northwards in June.

Of the other nationalities which took part in the Spitzbergen- Grecnland fisheries, it may be mentioned that the Dutch had fisheries both at Jan Mayen till 1640 and at Spitzbergen. In the Spitzbergen fishery 10,019 whales were taken by them in the ten years from 1679 to 1688. About 1680, when the fishing was probably most prosperous, they had 260 vessels and 14,000 seamen employed. The fishery continued to flourish on an extensive scale till 1770, when it began to decline, and it finally came to a close before the end of the century. At the same time the Germans prosecuted the fishing to a very considerable extent ; 79 vessels from Hamburg and Bremen being employed in 1721, while during the fifty years from 1670 to 1719 an average of 45 vessels sailed yearly from Hamburg alone. German vessels continued to engage in the fishery until 1873. The Spaniards, although they at first supplied the harpooners to the crews of the English and Dutch vessels, never seem to have engaged largely in the northern fishery. The Danes, although likewise early appearing on the Spitzbergen fishing-grounds, never pursued the industry on a large scale until after the commence- ment of the Davis Strait fishing in 1721, in which year they had 90 vessels engaged; but by 1803 the number had fallen to 35.

The continually increasing rarity of the Greenland whale has caused an enormous appreciation in the value of whalebone of recent years, as compared to the prices obtaining the first half of the last century. For about twenty years preceding the year 1840 the average price of this commodity was about £163 per ton; while in the year 1835 whalebone of the Greenland whale sold at £250 per ton, and that of the south Atlantic black whale (Balaena australis) at £145 per ton. At the present date the price is about £2500 per ton, but a few years ago it touched £2800, although soon after it fell for a short time to £1400. The reason of the fall from £2800 to £2500 (at about which figure the price has stood for some time) is believed to be owing to the use of strips of horn for many purposes where whale-bone was formerly employed. Owing to its much greater length, the whalebone of the Greenland whale is, as indicated above, far more valuable than that yielded by the northern and southern Atlantic black whales, of which comparatively little generally comes Into the market. The best quality of whalebone is known in the trade as " size-bone," and consists of plates not less than 6 ft. in length.

In the twenty years preceding 1840 the average price of whale- oil from the northern fisheries was £30 per ton; the actual price in 1835 being £40 per

ton. At the present day the price is only £23 per ton. It may be added that in 1835 South Sea oil sold at £43 and sperm-oil at £75 per ton.

A few words will suffice for the American fishery of the so- called bowhead, the western race of the Greenland whale, in Bering Strait. Here the whales are mostly sought for and killed in open water, and the vessels are consequently less adapted for ice-work. For the most part the vessels sail from San Francisco in March, and arrive at the ice-edge off Cape Navarin, where the fishing is begun, in May. The whales

disappear during summer, but return in the autumn, when the "fall-fishing" is carried on in the neighbourhood of Point Barrow; and between the seasons it was customary for the vessels to go south for sperm-whaling. The Bering Strait fishery was begun in 1848, and in the three following years 250 ships obtained cargoes. In 1871 no less than 34 vessels were abandoned in the ice off Cape Belcher, the crews making good their escape to other vessels; while again in 1876 a dozen vessels experienced a similar fate.

The sperm-whale fishery, of which the products are sper- maceti, sperm-oil, ambergris (mostly found floating in masses in the sea) and teeth, appears to have been initiated by the Americans in 1690, who for a considerable period found sufficient occupation in the neighbourhood of their own coasts. The British are, however, stated to have opened up the great whaling- grounds of the Pacific and Indian Oceans, although they did not embark on sperm-whaling till 1775. Within less than twenty years from that date their trade had, however, attained its maximum; no less than 75 British vessels, all from the port of London, being engaged in this industry in the year 1791. After this there was a steady decline till 1830, when only 31 vessels were thus employed; and since 1853 sperm-whaling has ceased to be a British indusLry.

As regards the American fishery, the island of Nantucket embarked in this trade about the year 1712, and by 1774 there were 360 American ships engaged in sperm-whaling, while in 1846, when the fishery was about at its zenith, the number was 735, mostly from New Bedford. Between 1877 and 1886 the average number of vessels had sunk to 159. New Bedford, on the Atlantic, and San Francisco, on the Pacific side, are the two great whaling centres; and during the period last mentioned the average imports of whaling products into the United States totalled 5304 tons of sperm-oil, together with 4863 tons of whale-oil and 145 tons of whalebone.

During the first half of the last century the colony of New South Wales was busily engaged in this trade, and in 1835 exported 2989 tons of sperm-oil.

Since the year 1882, when no less than 203 head were taken by the Peterhead whaler " Eclipse," the Norwegians have carried on a fishery for the bottle-nosed whale (Hyperobdon rostratus), a species which although greatly inferior in point of size, yields an oil closely akin to sperm-oil, but possessed of even greater lubricating power. An average male bottle-nose will yield about 22 cwts. of oil, containing 5% of pure spermaceti. Bottle-nose fishing is chiefly carried on in the neighbourhood of Jan Mayen and Iceland during the months of May, June and July, the whales usually disappearing quite suddenly about the middle of the last-mentioned month. In 1903 about 1600 tons of this oil came on the market, which would imply the destruction of nearly 2000 whales.

The invention by Svend Foyn of the explosive harpoon, already referred to, inaugurated about the year i860 the Nor- wegian fin-whale fishery, an industry which has since been taken up by other nationalities. The rorquals or fin-whales (Balaenoptera), which include the largest of all cetaceans, are built for speed, and are much fiercer animals than either the Greenland or the Atlantic right whale; their rush when wounded being of enormous velocity, while their vitality is such that attacking them in the old-fashioned way with the hand-harpoon is practically useless, and at the same time fraught with great danger to the pursuers. To a considerable extent the same may be affirmed of the humpbacked whale (Megaptera). Under these circumstances, previous to the invention of the bomb- jarpoon, these whales were left entirely alone by the whalers.

By the year 1885 the Norwegians had a fleet of over 30 vessels engaged in this fishery off the coast of Finrnark, the amount of whose catch comprised 1398 whales in 1885, and 954 in the following year. Gradually the Norwegians have developed and extended the rorqual-fishery, and they now possess stations in Iceland, the Faroes and Shetlands, and also at Buneveneader in Harris in the Hebrides. In the Shetlands there are two stations at the head of Ronas Voe on the north-west side of the

mainland where operations are carried on from May and June till September, when the whales leave the shore. During the first season (1903) the Norrona Whaling Company's vessels killed 64 whales, while 62 were accounted for by the Shetland Whaling Company.

In 1898 a successful rorqual- fishery was established by the Newfoundland Steam Whaling Company at Rose-au-Rue, Placentia Bay, Newfoundland. Four species of rorquals as well as humpbacks are hunted; and during a portion of the season in 1903 the catch included 174 of the former and 14

of the latter.

In addition to the above-mentioned fisheries for the larger whales, there are considerable local captures of the smaller kinds, commonly known as grampuses or killers, porpoises, and dolphins. Of these, however, very brief mention must suffice. The most important captures are generally made in northern seas. The black pilot-whale, or grindhval {Globicephalus melas), is, for in- stance, not infrequently taken in large shoals by the Faroe islanders; these whales being driven by boats into the shallows, where they are sometimes slaughtered by hundreds. Much the same may be stated with regard to the grampus or killer (Orca gladiator), of which no less than 47 head were killed at once in January 1904 at Bildostrommen, Norway. Of even more importance is the white-whale or beluga (Delphinapterus leucas), which is hunted for its blubber, hide and flesh; the average yield per head being about 100 gallons of oil. In 1871 the Tromsoe whalers captured no less than 2167 individuals; while in 1898 300 out of a school of some 900 were captured on a single occasion at Point Barrow, Alaska. These whales, which are worth about £3 a head, yield the leather known commercially as " porpoise- hide." The narwhal (Monodon monoceros), yielding both blubber and the valuable ivory tusks, is usually captured singly by the Grecnlanders in their " kayaks." Local porpoise and dolphin fisheries arc carried on by the fishermen in many parts of the world, the natives of the Travancore coast being noted for their success in this respect; while even the fresh-water susu or Ganges dolphin (Platanista gangetica) and the Rio de la Plata dolphin (Pontoporia Mainvittei) ate also caught in considerable numbers for the sake of their blubber.

Literature. — The following books and papers may be con- sulted: T. Beale, The Natural History of the Sperm-Whale (London, I 837); W. S. Tower, A History of the American Whale Fishery (Philadelphia, 1907) ; J. R. Spears, Story of New England Whaling (New York, 1908) ; C. R. Markham, " On the Whale-Fishery of the Basque Provinces of Spain," Proc. tool. Soc. London (1S81), p. 969; T. Southwell, " Notes on the Seal and Whale Fishery," Zoologist (London, 1884-1907), and "On the Whalc-Fisheryfrom Scotland, with some account of the changes in that industry and of the species hunted," Ann. Scot. Nat. Hist. (1904), p. 77; G. M. Allen, " Some Observations on Rorquals off Southern Newfoundland," American Naturalist, xxxvhi. 613 (1904) ; R. C. Haldane, " Whaling in Shetland, 1904," Ann. Scott. Nat. Hist. (1905), p. 65, and " Whaling in Scotland," I.e. (1907), p. 10; E. L,. Bouvier, " Quelques im- pressions d'un naturaliste au cours d'une campagne scientifique de S.A.S. le Prince de Monaco, 1905," Bulletin de I'Institut Octano- graphique (Monaco, 1907), No. 93. (R. L.)*

WHALE-OIL, the oil obtained from the blubber of various species of the

genus Balaena, as B. mysticetus, Greenland or " right " whale (northern whale-oil), B. auslralis (southern whale-oil), Balaenoptera longimana, Balaenoptera borealis (Finback oil, Finner whale-oil, Humpback oil). The " orca " or " killer " whale, and the " beluga " or white whale, also yield " whale-oils." " Train-oil " proper is the northern whale-oil, but this term has been applied to ail blubber oils, and in Germany, to all marine animal oils — fish-oils, liver oils, and blubber oils. The most important whale-oil is sperm or spermaceti oil, yielded by the sperm-whales.

Whale-oil varies in colour from a bright honey yellow to a dark brown, according to the condition of the blubber from which it has been extracted. At best it has a rank fishy odour, and the darker the colour the more disagreeable the smell. With lowering of the temperature stearin, accompanied with a small proportion of spermaceti, separates from the oil, and a little under the freezing- point nearly the whole of these constituents may be crystallized out. When separated and pressed, this deposit is known as whale tallow, and the oil from which it is removed is distinguished as pressed whale-oil; this, owing to its limpidity, is sometimes passed as sperm-oil. Whale-oil is principally used in oiling wools for combing,

in batching flax and other vegetable fibres, in currying and chamois leather-making, and as a lubricant for machinery. Sperm-oil is obtained from the cavity in the head of the sperm-whale, and from several smaller receptacles throughout the body of the animal. During the life of the whale the contents of these cavities are in a fluid condition, but no sooner is the " head matter " removed than the solid wax spermaceti separates in white crystalline flakes, leaving the oil a clear yellow fluid having a fishy odour. Refined sperm-oil is a most valuable lubricant for small and delicate machinery (see Oils).

WHALLEY, EDWARD (c. 1615-c. 1675), English regicide, the exact dates of whose birth and death are unknown, was the second son of Richard Whalley, who had been sheriff of Notting- hamshire in 1505, by his second wife Frances Cromwell, aunt of Oliver Cromw r ell. His great-grandfather was Richard Whalley (1499-1583), a prominent adherent of the protector Somerset and member of parliament. He is said to have started in' the trade of a woollen-draper, but on the outbreak of the great rebellion he took up arms for the parliament, became major of Cromwell's regiment of horse, and greatly distinguished himself in the field. His conduct at Gainsborough fight in 1643 was especially praised by Cromwell; he fought at Marston Moor, commanded one of Cromwell's two regiments of cavalry

at Naseby and at the capture of Bristol, was then sent into Oxford- shire, took Banbury, and w 7 as besieging Worcester when he was superseded, according to Richard Baxter, the chaplain of his regiment, on account of his religious orthodoxy. He, however, supported his regiment in their grievances against the parlia- ment in 1647. When the king was seized by the army, he was entrusted to the keeping of Whalley and his regiment at Hampton Court. Whalley refused to remove Charles's chaplains at the bidding of the parliamentary commissioners, and treated his captive with due courtesy, receiving from Charles after his flight a friendly letter of thanks. In the second Civil War, Whalley again distinguished himself as a soldier, and when the king was brought to trial he was chosen to be one of the tribunal and signed his death-warrant. He took part in Cromwell's Scottish expedition, was wounded at Dunbar, and in the autumn of 1650 was active in dealing with the situation in north Britain. Next year he took part in Cromwell's pursuit of Charles II. and was in the fight at Worcester. He followed and supported his great kinsman in his political career, presented the army petition to parliament (August 1652), approved of the protectorate, and represented Nottinghamshire in the parliaments of 1654 and 1636, taking an active part in the prosecution of the Quaker James Naylor. He was one of the administrative major-generals, and was responsible for Lincoln, Nottingham, Derby, Warwick and Leicester. He supported the " Petition and Advice," except as regards the proposed assumption of the royal title by Cromwell, and became a member of the newly constituted House of Lords in December 1657. On the protector's death, at which he was present, he in vain gave his support to Richard; his regiment refused to obey his orders, and the Long Parliament dismissed him from his. command as a representative of the army. In November 1659 he undertook an unsuccessful mission to Scotland to arrange terms with Monk. At the Restoration, Whalley, with his son-in-law, General William Goffe, escaped to America, and landed at Boston on the 27th of July 1660, living successively at New Haven and at Hadley, Massachusetts, every attempt on the part of the government at home to procure his arrest meeting with failure. He was alive, but failing in health, in 1674, and probably did not long survive. Whalley was twice married; first to Judith Duffell, by whom, besides other children, he had a son John and a daughter Frances (who married Major-General William Goffe, the regicide); and secondly to Mary Middleton, sister of Sir George Middleton, by whom he had two sons, Henry and Edward.

Authorities. — An account of Whalley's life is in Noble's Lives of the Regicides, and of his family in Noble's Memoirs of the Pro- lectoral House of Cromwell, vol. ii.; see also Gardiner's and Claren- don's histories of the period, Peck's Desiderata curiosa (1775; Whalley's account of the king's flight); Ezra Stiles' s History of three of the Judges of Charles I. (1794,

&c.). The article by C. H. Firth in the Dict.ˆ Nat. Biog. is an admirable summary. Whalley's sojourn in America is dealt with in numerous papers published by the Massachusetts Historical Society, and in the Hutchinson Papers

published (1865) by the Prince Society; see also Atlantic Monthly, vi. 89-93; Pennsylvania Mag.A. 55-66, 230, 359; F. B. Dexter's Memoranda concerning Whalley and Goffe, New Haven Col. Hist. Soc. Papers, ii. (1877); Poem commemorative of Goffe, Whalley and Dixwcll, with abstract of their history, by Philagathos (Boston, 1793); Palfrey's Hist, of New England, ii. (1866); Notes and Queries, 5th series, viii. 359 (bibliography of American works on the regicides).

WHARF, a place for loading or unloading ships or vessels, particularly a platform of timber, stone or other material along the shore of a harbour or along the bank of a navigable river against which vessels may lie and discharge their cargo or be loaded. The O. Eng. word kmerj meant literally a turning or turning-place (hiveorfan, to turn, cf. Goth, hwairban, Gr. Kap-jros, wrist), and was thus used particularly of a bank of earth, a dam which turns, the flow of a stream; the cognate word in Dutch, werf, meant a wharf or a shipbuilder's yard, cf. Dan. vaerft k dockyard, and the current meaning of the word is probably borrowed from Dutch or Scandinavian languages.

In English law all water-borne goods must be landed at specified places, in particular hours and under supervision; wharves, which by the Merchant Shipping Act 1895, § 492, include quays, docks and other premises on which goods may be lawfully landed, are either " sufferance wharves," authorized by the commissioners of customs under bond, or " legal wharves " specially appointed hy treasury warrant and exempt from bond. There are also wharves authorized by statute or by prescriptive right. The owner or occupier of a wharf, is styled a " wharfinger, ' properly " wharfager," with an intrusive n, as in " messenger " and " passenger."

WHARNCLIFFE, JAMES ARCHIBALD STTJART-WORTLEY-MACKENZIE, 1ST Baron (1776-1845), English statesman, was the son or Colonel Stuart, son of the 3rd earl of Bute and ol his wife Mary Wortley-Montagu(Baroness Mountstuart in her own right), as whose heir Colonel Stuart added the name of Wortley, taking later also that of Mackenzie (which his son in later life discarded) as heir to his uncle J. S. Mackenzie of Rosehaugh. He entered the army, becoming colonel in 1797, but retired in 1 801 and devoted himself to politics, sitting in parliament as a Tory for Bossiney in Cornwall till 1818, when he was returned for Yorkshire. His attitude on various questions became gradually more Liberal, and his support of Catholic emancipation lost him his seat in 1826. He was then

raised to the peerage as Baron Wharncliffe of Wortley, a recognition both of his previous parliamentary activity and of his high position among the country gentlemen. At first opposing the Reform Bill, he gradually came to see the undesirability of a popular conflict, and he separ- ated himself from the Tories and took an important part in modifying the attitude of the peers and helping to pass the bill, though his attempts at amendment only resulted in his pleasing neither party. He became lord privy seal in Peel's short ministry at the end of 1834, and again joined him in 1841 as lord president of the council. In 1837 he brought out an edition of the writings of his ancestress, Lady Mary Wortley-Montagu (new ed. 1893). On his death in 1845 he was succeeded as 2nd baron by his eldest son, John Stuart-Wortley (1801-1855), whose son Edward, 3rd baron (1827-1899), best known as chairman of the Manchester, Lincoln & Sheffield railway, converted under him into the Great Central, was created 1st earl of Wharncliffe and Viscount Carlton in 1876; his name was prominently identified with railway enterprise, and became attached to certain features of its nomen- clature. He was succeeded as 2nd earl by his nephew Francis (b. 1856).

Among other members of the family, several of whom dis- tinguished themselves in law, politics, art and the army, may be mentioned the 1st baron's third son, James Archibald Stuart- Wortley (1805-1881), recorder of London and solicitor-general; his son, C. B. Stuart-Wortley, K.C. (b. 1S51), became well known in parliament as under-secret ary for the home office (1885, and 1886-1892) and deputy-chairman of committees.

WHARTON (Family). The Whartons of Wharton were an old north of England family, and in 1543 Thomas Wiiarton (1495- 1568) was created a baron for his services in border warfare. From him descended the 2nd, 3rd and 4th barons; and the latter, Philip Wharton (1613-1696), was the father of Thomas Wharton (1648-1715), who in 1706 was created earl and in

1714 marquess of Wharton. The 1st marquess was one of the chief Whig politicians after the Revolution. He is famous in literary history as the author of the famous political ballad, Lilliburlero, which " sang James II. out of three kingdoms." Wharton was lord-lieutenant of Ireland in Anne's reign, and in- curred the wrath of Swift, who attacked him as Verres in the Examiner (No. 14), and drew a separate " character " of him, which is one of Swift's masterpieces. He was a man of great wit and versatile cleverness, and cynically ostentatious in his immorality, having the reputation of being the greatest rake and the truest Whig of his time. Addison dedicated to him the fifth volume of the Spectator, giving him a

very different " character " from Swift's. His first wife, Anna Wharton (1632-1685), was an authoress, whose poems, including an Elegy on Lord Rochester, were celebrated by W'alter and Dryden. His son, Philip Wharton (169S-1731), duke of Wharton, succeeded to his father's marquessate and fortune, and in 1718 was created a duke. But he quickly earned for himself, by his wild and profligate frolics and reckless playing at politics, Pope's satire of him as " the scorn and wonder of our days "(Moral Essays, i. 179). He spent his large estates in a few years, then went abroad and gave eccentric support to the Old Pretender. There is a lively picture of his appearance at Madrid in 1726 in a letter from the British consul, quoted in Stanhope's History of England (ii. 140). He was outlawed in 1729, and at his death the titles became extinct. In 1S43 a claim was made before the House of Lords for a revival of the barony in favour of Mr Kemys-Tynte, a descendant of the 1st baron in the female line.

For the history of the family see E. "R. Wharton's Whartons of Wharton Hall (189S).

WHARTON, FRANCIS (1820-1889), American legal writer and educationalist, was born in Philadelphia, Pennsylvania, on the 7th of March 1820. He graduated at Yale in 1830, was admitted to the bar in 1843, became prominent in Pennsylvania politics as a Democrat, and in Philadelphia edited the North A merican and United Stales Gazette. He was professor of English history and literature at Kenyon College, Gambier, Ohio, in 1856-1863. He took orders in the Protestant Episcopal church in 1862 and in 1863-1869 was rector of St Paul's Church, Brook- line, Massachusetts. In 1871-1881 he taught ecclesiastical polity and canon law in the Protestant Episcopal Theological School at Cambridge, Massachusetts, and at this time he lectured on the conflict of laws at Boston University. For two years he travelled in Europe, and after two years in Philadelphia he went to Washington, D.C., where he was lecturer on criminal law (1885- 1886) and t hen professor of criminal law (1 886-1 888) at Columbian (now George Washington) University; in 1885-1888 he was solicitor (or examiner of claims) of the Department of State, and from 1888 to his death on the 21st of February 1889 was employed on an edition (authorized by Congress) of the Revolu- tionary Diplomatic Correspondence of the United States (6 vols., 1889, ed. by J. B. Moore), which superseded Sparks's compilation. Wharton was a " broad churchman " and was deeply interested in the hymnology of his church. He received the degree of LL.D. from the university of Edinburgh in 1883, and was the foremost American authority on international law.

He published: A Treatise on the Criminal Law of the United States (1846; many times reprinted); State Trials of the United States during the Administrations of Washington and Adams (1849); A Treatise on the Law

of Homicide in the United Slates (1855); with Moreton Stille, A Treatise on Medical Jurisprudence (1855); Modern Theism (1859), in which he applied rules of legal evidence to modern sceptical theories; A Treatise on the Conflict of Laws (1872; 3rd ed. 1905); A Treatise on the Law of Negligence (1874); A Commentary on the Law of Agency and Agents (1876), A Commentary on the Law of Evidence in Civil Issues (1877; 3rd ed. 1888) ; a companion work on Criminal Evidence; Commentary on the Law of Contracts (1882); Commentaries on Law (1884) ; and a Digest of the International Law of the United States (3 vols. 1886).

See the Memoir (Philadelphia, 1891) by his daughter, Mrs Viele, and several friends; and J. B. Moore's " Brief Sketch of the Life of Francis Wharton," prefaced to the first volume of the Revolu- tionary Diplomatic Correspondence.

WHARTON, HENRY (1664-1695), English writer, was descended from Thomas, 2nd Baron Wharton (1520-1572),

*being a son of the Rev. Edmund Wharton, vicar of Worsie*d, Norfolk. Born at Worstcad on the 9th of November 1664, Wharton was educated by his father, and then at Gonville and Caius College, Cambridge. Both his industry and his taients were exceptional, and his university career was brilliant. In 1686 he entered the service of the ecclesiastical historian, the Rev. William Cave (1637-1713), whom he helped in his literary work; but considering that his assistance was not sufficiently appreciated he soon forsook this employment. In 1687 be was ordained deacon, and in 1688 he made the acquaintance of the archbishop of Canterbury, William Sancroft, under whose generous patronage some of his literary work was done. The arch- bishop, who had a very high opinion of Wharton's character and talents, made him one of his chaplains, and presented him to the Kentish living of Sundridge, and afterwards to that of Chartham in the same county. In 1689 he took the oath of allegiance to William and Mary, but he wrote a severe criticism of Bishcp Burnet's History of the Reformation, and it was partly owing to the bishop's hostility that he did not obtain further preferment in the English church. He died on the 5th of March 1695, and was buried in Westminster Abbey.*

Wharton's most valuable work is his Anglia sacra, a collection of the lives of English archbishops and bishops, which was published in two volumes in 1691. Some of these were written by Wharton himself; others were borrowed from early writers. His other writings include, in addition to his

criticism of the History of the Reformation, A treatise of the celibacy of the clergy (1688); The enthusiasm of the Church of Rome demonstrated in some observations upon the life of Ignatius Loyola (1688) ; and A defence of pluralities (1692, new eel. 1763). In the Lambeth Library there are sixteen volumes of Wharton's manuscripts. Describing him as " this wonderful man," Stubbs says that Wharton did for the elucidation of English Church history " more than any one before or since." A life of Wharton is included in George D'Oyly's Life of W. Sancroft

(1821).

WHATELY, RICHARD (1787-1863), English logician and theological writer, archbishop of Dublin, was born in London on the 1st of February 1787. He was educated at a private school near Bristol, and at Oriel College, Oxford. He obtained double seccnd-class honours and the prize for the English essay; in 1811 he was elected fellow of Oriel, and in 1814 took orders. During his residence at Oxford he wrote his celebrated tract, Historic Doubts relative to Napoleon Bonaparte, a very clever feu d'esprit directed against excessive scepticism as applied to the Gospel history. After his marriage in i82r he settled in Oxford, and in 1S22 was appointed Bampton lecturer. The lectures, On the Use and Abuse of Party Spirit in Matters of Religion, were published in the same year. In August 1823 he re- moved to Halesworth in Suffolk, but in 1825, having been ap- pointed principal of St Alban Hall, he returned to Oxford. At St Alban Hall Whately found much to reform, and he left it a different place. In 1825 he published a series of Essays on Some of the Peculiarities of the Christian Religion, followed in 1828 by a second series On some of the Difficulties in the Writings of St Paul, and in 1830 by a third On the Errors of Romanism traced to their Origin in Human Nature. While he was at St Alban Hall (1826) the work appeared which is perhaps most closely associated with his name — his treatise on Logic, originally contributed to the Encyclopaedia Metropolitana, in which he raised the study of the subject to a new level. It gave a great impetus to the study of logic throughout Great Britain. A similar treatise on Rhetoric, also contributed to the Encyclopaedia, appeared in 1828. In 1829 Whately was elected to the pro- fessorship of political economy at Oxford in succession to Nassau William Senior. This was a subject admirably suited to his lucid, practical intellect; but his tenure of office was cut short by his appointment to the archbishopric of Dublin in 1831. He published only one course of Introductory Lectures (1831), but one of his first acts on going to Dublin was to endow a chair of political economy in Trinity College out of his private purse.

Whately 's appointment by Lord Grey to the see of Dublin came as a great surprise to everybody, for though a decided Liberal Whately had from the

beginning stood aloof from all political parties, and ecclesiastically his position was that of

an Ishmaelitc fighting for his own hand. The Evangelicals regarded him as a dangerous latitudinarian on the ground of his views on Catholic emancipation, the Sabbath question, the doctrine of election, and certain quasi-Sabellian opinions he was supposed to hold about the character and attributes of Christ, while his view of the church was diametrically opposed to that of the High Church party, and from the beginning he was the determined opponent of what was afterwards called the Trac- tarian movement. The appointment was challenged in the House of Lords, but without success. In Ireland it was im- mensely unpopular among the Protestants, both for the reasons just mentioned and as being the appointment of an Englishman and a Whig. Whately's blunt outspokenness and his " want of conciliating manners," which even his friends admit, prevented him from ever completely eradicating these prejudices, while at the same time he met with determined opposition from his own clergy. He ran counter to their most cherished prejudices from the first by connecting himself prominently with the attempt to establish a national and unsectarian system of education. He enforced strict discipline in his diocese, where it had been long unknown; and he published an unanswerable statement of his views on the Sabbath (Thoughts on the Sabbath, 1832). He took a small country place at Redesdale, 4 m. out of Dublin, where he could enjoy his favourite relaxation of gardening. Here his life was one of indefatigable industry. Questions of tithes, reform of the Irish church and of the Irish Poor Laws, and, in particular, the organization of national education occupied much of his time. But he found leisure for the discussion of other public questions, for example, the subject of transportation and the general question of secondary punishments. In 1837 he wrote his well-known handbook of Christian Evidences, which was translated during his lifetime into more than a dozen languages. At a later period he also wrote, in a similar form, Easy Lessons on Reasoning, on Morals, on Mind and on the British Constitution. Among his other works may be mentioned Charges and Tracts (1836), Essays on Some of the Dangers to Christian Faith (1839), The Kingdom of Christ (1841). He also edited Bacon's Essays, Paley's Evi- dences and Paley's Moral Philosophy. His cherished scheme of unsectarian religious instruction for Protestants and Catholics alike was carried out for a number of years with a measure of success, but in 1852 the scheme broke down owing to the op- position of the new Catholic archbishop of Dublin, and Whately felt himself constrained to withdraw from the Education Board. From the

beginning Whately was a keen-sighted observer of the condition of Ireland question, and gave much offence by openly supporting the state endowment of the Catholic clergy as a measure of justice. During the terrible years of 1846 and 1847 the archbishop and his family were unwearied in their efforts to alleviate the miseries of the people. From 1856 onwards symptoms of decline began to manifest themselves in a paralytic affection of the left side. Still he continued the active discharge of his public duties till the summer of 1863, when he was prostrated by an ulcer in the leg, and after several months of acute suffering he died on the 8th of October 1863.

Whately was a great talker, much addicted in early life to argument, in which he used others as instruments on which to hammer out his own views, and as he advanced in life much given to didactic monologue. He had a keen wit, whose sharp edge often inflicted wounds never deliberately intended by the speaker, and a wholly uncontrollable love of punning. Whately often offended people by the extreme, unconventionality of his manners. When at Oxford his white hat, rough white coat, and huge white dog earned for him the sobriquet of the White Bear, and he outraged the conventions of the place by exhibiting the exploits of his climbing dog in Christchurch Meadow. With a remarkably fair and lucid mind, his sympathies were narrow, and by his blunt outspokenness on points of difference he alienated many. With no mystical fibre in his own constitution, the Tractarian movement was incomprehensible to him, and was the object of his bitter dislike and contempt. The doctrines of the Low Church party seemed to him to be almost equally tinged

with superstition. He took a practical, almost business-like view of Christianity, which seemed to High Churchmen and Evangelicals alike little better than Rationalism, In this they did Whately less than justice, for his religion was very real and genuine. But he may be said to have continued the typical Christianity of the 18th century— that of the theologians who went out to fight the Rationalists with their own weapons. It was to Whately essentially a belief in certain matters of fact, to be accepted or rejected after an examination of " evidences." Hence his endeavour always is to convince the logical faculty, and his Christianity inevitably appears as a thing of the intellect rather than of the heart. Whately's qualities are exhibited at their best in his Logic, which is, as it w r ere, the quintessence of the views which he afterwards applied to different subjects. He wrote nothing better than the luminous Appendix to this work on Ambiguous Terms.

In 1864 his daughter published Miscellaneous Remains from his commonplace book and in 1866 his Life and Correspondence in two volumes. The Anecdotal Memoirs of Archbishop Whately, by W. J Fitzpatrick (i864_), enliven the picture.

‘ WHAT-NOT, a piece of furniture, derived from the French Giaghre, which was exceedingly popular in England in the first three-quarters of the 19th century. It usually consists of slender uprights or pillars, supporting a series of shelves for holding china, ornaments or trifles of any kind — hence the allusive name. In its English form, although a convenient drawing-room receptacle, it was rarely beautiful. The early mahogany examples are, however, sometimes graceful in their simplicity.

WHEAT (Triticum), the most important and the most gener- ally diffused of cereal grasses. It is an annual plant, with hollow, erect, knotted stems, and pro- duces, in addition to the direct developments from the seed- ling plant, secondary roots and secondary shoots- (tillers) from the base. Its leaves have each a long sheath encircling the stem, and at the junction of the blade or ” flag ” with the sheath a small whitish out- growth or ” ligula.” The in- florescence or ear consists of a central stalk bent zigzag, forming a series of notches (see fig. 1), and bearing a number of flattened spikelets, one of which grows out of each notch and has its inner or upper face pressed up against it. At the base of each spikelet are two empty boat-shaped glumes or “chaff-scales,” one to the right, the other to the left, and then a series of flowers, 2 to 8 in number, closely crowded to- gether; the uppermost are abortive or sterile,— indeed, in some varieties only one or two of the flowers are fertile. Each flower consists of an outer or lower glume, called the flower- ing glume, of the same shape as the empty glume and terminat- ing in a long, or it may be in a short, awn or ” beard.” On the other side of the flower and at a slightly higher level is the ” palea,” of thinner texture than the other glumes, with infolded margins and with two ribs or veins. These several glumes are closely applied one to the other so as to conceal and protect the ovary,

-Spikelet and Flowers oE

Fig. 1.- Wheat.

A, Spikelet magnified.

B, Glumes, from side.

C, Glumes, from back.

D, Flowering glume or lower palea.

E, Palea.

F, Lodicuies at base of j, the

ovary, surmounted by styles. G and H, Seed from front and back

respectively. /, Rachis, or central stalk of ear,

spikelets removed.

and they only separate for a short time when flowering takes place; after fertilization they close again. Within the pale are two minute, ovate, pointed, white membranous scales called "lodicules." These contain three slamens with thread-like filaments and oblong, two-lobed anthers. The stamens are placed round the base of the ovary, which is rounded or oblong, much smaller than the glumes, covered with down, and sur- mounted by two short styles, extending into feathery brush-like stigmas. The ripe fruit or grain, sometimes called the " berry," the matured state of the ovary and its contents, is oblong or ovoid, with a longitudinal furrow on one side. The ovary adheres firmly to the seed in the interior, so that on examining a longi- tudinal section of the grain by the microscope the outer layer is seen to consist of epiderma.l cells, of which the uppermost are prolonged into short hairs to cover the apex of the grain.

Two or three layers of cells inside the epidermis constitute the tissue of the ovary, and overlie somewhat similar layers which form the coats of the seed. Within these is the albumen or endo- sperm, constituting the flowery part of the seed. The outermost layer of the endosperm consists of square cells larger and more regular in form than thoseon each side; these contain aleuron grains- small particles of gluten or nitrogenous matter. The remaining central mass of the seed is com- posed of numerous cells of irregular form and size containing many starch grains as well as gluten granules. The several layers of cells above re- ferred to become more

*Trrˆ'c **f** cr * ess ˆ ry anc * , ' nse P ar ~ III. Spelt able one £ rom anotner)*

forming the substance known as " bran." At the lower end of the albumen, and placed obliquely, is the minute embryo-plant, which derives its nourishment in the first instance from the albumen; this is destined to form the future plant.

*The wheat plant is nowhere found in a wild condition. Some of the species of the genus Aegilops (now generally referred to Trlticum by Bentham and Hooker and by Haeckel) species.** ma y possibly have been the sources of our cultivated forms, as they cross freely with wheats. Haeckel considers that there are three species, (i) Trlticum mono- coccum, which undoubtedly grows wild in Greece and Meso- potamia, is cultivated in Spain and elsewhere, and was also cultivated by the aboriginal Swiss lake-dwellers, as*

well as at Hissarlik, as is shown by the grain 1 found in those localities. (2) T. sativum is the ordinary cultivated wheat, of which Haeckel recognizes three principal races, spelta, dicoccum and tenax. Spelt wheats (see fig. 2) were cultivated by the aboriginal Swiss, by the ancient Egyptians, and throughout the Roman empire. The variety dicoccum was also cultivated in prehistoric times, and is still grown in Southern Europe as a summer wheat and one suitable for starch-making. The variety tenax includes four sub-races, vulgare (common wheat), compaclum, turgkium and durum (see below). (3) The third species, T. polonicum, or Polish wheat, is a very distinct-looking form, with long leafy glumes; its origin is not known. As these varieties intercross with each

1 See drawings made to scale by Mr Worthington Smith in. the Gardener's Chronicle (25th December 1886).

x xvin. ig

Fig. 2, — /. Beardless Polish wheat, with seed, •vheat. All much reduced

other, the presumption is that they, like the species of Aegilops, which also intercross with wheat, may have all originated from one common stock.

Basing his conclusions upon philological data, such as the names of wheat in the oldest known languages, the writings of the most ancient historians, and the observations of botanical travellers, De Candolle infers that the 2wJ£J? rf original home of the wheat plant was in Mesopotamia, a on , and that from there its cultivation extended in very early times to the Canaries on the west and to China on the east. In the western hemisphere wheat was not known tilt the 16th century. Humboldt mentions that it was accidentally intro- duced into Mexico with rice brought from Spain by a negro slave belonging to Cortes, and the same writer saw at Quito the earthen vase in which a Flemish monk had introduced from Ghent the first wheat grown in South America.

As might be anticipated from the cultivation of the plant from time immemorial and from its wide diffusion throughout the eastern hemisphere, the varieties of wheat — that is, of I" 1 . sativum — _. . . are very numerous and of every grade of intensity. Those v / a ˆf cases in which the variation is most extreme some botanists would prefer to consider as forming distinct species; but others, as De Vilmorin, having regard to the general facts of the case and to the numerous intermediate gradations, look upon all the forms as derivatives from one. In illustration of this latter point it may be mentioned that not only do the several varieties run one into the other, but their chemical composition varies likewise according to climate and season. According to Professor Church, 2 even in the produce

of a single ear there may be 3 to 4 % more of albuminoid matters in some grains than in others; but on the average the proportion of gluten to starch is as 9-11 to 100. From the point of view of agriculture it is generally of no great moment what rank be assigned to the various forms. It is only important to take cognizance of them for purposes of cultivation under varying circumstances. Hence we only allude to some of the principal variations and to those characteristics which are found to be unstable. (1) Setting aside differences of constitution, such as hardihood, size, and the like, there is relatively little variation in the form of the organs of vegetation. This indicates that less attention has been paid to the straw than to the grain, for it is certain that, were it desirable, a great range of variation might be induced in the foliage and straw. As it is, some varieties are hardier and taller than others, and the straw more solid, varying in colour and having less liability to be "laid"; but in the matter of "tillering," or the production of side-shoots from the base of the stem, there is much difference. Spring wheats procured from northern latitudes mature more rapidly than those from temperate or hot climates, whilst the reverse is the case with autumn wheats from the same source. The difference is accounted for by the greater amount of light which the plants obtain in northern regions, and, especially, by its comparatively uninterrupted continuance during the growing period, when there are more working hours for the plants in the day than in more southern climes. Autumn wheats, on the other hand, are subjected to an enforced rest for a period of several months, and even when grown in milder climates remain quiescent for a longer period, and start into growth later in spring — much later than varieties of southern origin. These latter, accustomed to the mild winters of those latitudes, begin to grow early in spring, and are in consequence liable to injury from spring frosts. Wheats of dry countries and of those exposed to severe winds have, says De Vilmorin, narrow leaves, pliant straw, bearded ears, and velvety chaff — characteristics which enable them to resist wind and drought. Wheats of moist climates, on the other hand, have broader leaves, to admit of more rapid transpiration. No doubt careful microscopic scrutiny of the minute anatomy of the leaves of plants grown under various conditions would reveal further adaptations of structure to external conditions of climate. At any rate, it is certain that, as a general rule, the hard wheats' are almost exclusively cultivated in hot, dry countries, the spelt wheats in mountainous districts and on poor soil, turgid (durum forms) and common wheats in plains or in valleys — the best races of wheat being found on rich alluvial plains and in fertile valleys. The wheat used in the neighbourhood of Florence for straw- plaiting is a variety with very slender stalks. The seed is sown very thickly at the beginning of winter and pulled, not cut, about the end of May, before the ear is ripe. In the United Kingdom ordinary wheat, such as old red Lammas and Chiddam white, is used for straw-plaiting, the straw being cut some time

before the berry ripens. The propensity to " tiller " is of the greatest importance, as it multiplies the resources of the farmer. An instance of this is given in the Philosophical Transactions (1768), where it is stated that one seedling plant in the Cambridge botanic garden was divided into eighteen parts, each of which was replanted and subsequently again divided, till it produced sixty-seven plants in one season. In March and April of the following year these were again divided

2 Food Grains of India, p. 94.

and produced 500 plants, which in due time yielded 21,109 ears.

(2) The variations in root-development have not been much attended to, although it would be well to study them in order to ascertain the degree of adaptability to various depths and conditions of soil.

(3) A most important difference is observable in the liability to attacks of rust {Puccinia), some varieties being almost invariably free from it, while others are in particular localities so subject to it as to be not worth cultivating. (4) The ears vary, not only in size, but also in form, this latter characteristic being dependent on the degree ot closeness with which the spikelets are set on. In such varieties as Talavcra the spikelcts are loose, while in the club and square-headed varieties they are closely packed. The form of the ear depends on the relative width of the anterior and posterior surfaces as compared with that of the lateral surfaces. In the square-headed varieties the lateral surfaces are nearly as wide as the median ones, owing to the form and arrangement of the spikelets. The number of abortive or sterile spikelcts at the top of the ear also varies-: in some cases nearly all the spikelets are fertile, while in others several of the uppermost ones are barren.

The classification of the different varieties of cultivated wheat

has occupied the attention of many botanists and agriculturists.

_ The classification adopted by Henry de Vilmorin in his

uassmca- ˆgs B ˆs mei u eurs (p ar i Si 18S1) is based, in the first

../ , instance, on the nature of the ear: when mature its axis*

. , or stem remains unbroken, as hi the true wheats, or it

breaks into a number of joints, as in the spelt wheats.

In the first class the ripe grain readily detaches itself from

the chaff-scales, while in the spelts it is more or less adherent to

them, or not readily separable from them. The true wheats are

, further subdivided into common wheats (T. vul- gare), turgid wheats (7\ turgidum), hard wheats (7\ durum) and Polish wheats {T. polonicum). In the common wheats the chaff- scales are boat-shaped, ovoid, of the consistence of parchment, and shorter than the spikelet; the seed is usually floury, opaque, white, and easily broken. In the turgid wheats the glumes have long awns, and the seed is turgid and floury, as in the common wheats. In the hard wheats the outer glumes are keeled, sharply pointed, awned, and the seed is elongated and of hard glassy texture, somewhat translucent, and difficult to break owing to its tough- ness. These seeds are richer in nitrogen than the corn- turgid wheats, so

-Longitudinal Section of a highly magnified.

Fig. 3

Grain of Wheat

A, Epidermal celli

B, Cells containing ateuron or gluten irion am

grains. that an approximate notion

C, Cells of endosperm or albumen, of^ the richness in albu-

filled with starch. minoids may be gained

D, Embrvo cut through the middle, by simply inspecting the

root-end pointing downwards. cut surface of the seed. The

Polish wheat, rarely if ever cultivated in the United Kingdom, has very large lanceolate glumes, longer than the spikelet, and elongated glassy seeds. Further sub- divisions are made, according to the presence or absence of awns (bearded and beardless wheats), the colour of the ears (white, fawn- coloured or red), the texture of the ears (glabrous — i.e. smooth — or downy) and the colour of the seed, or " berry." In the jointed or spelt wheats the distinctions lie in the presence of awns, the direction of the points of the glumes (straight, bent outwards, or turned inwards}, the form of the ear as revealed on a cross-section, and the entire or cleft palea. As illustrating the fact of the occasional instability of these variations, Professor Church mentions that a single grain will be sometimes horny and partly opaque and floury, in which case its composition will correspond with its aspect. The division into spring wheat and winter wheat is an agricultural one solely. Any variety may be a spring or a winter wheat according to the time at which it is sown. In the summer wheats it may often be observed that the median florets do not fill out so fully as in the autumn wheats. Among the turgid wheats there is a frequent tendency in the spike to branch or become compound — a tendency which is manifested to a less degree in other forms. The Egyptian, or so-called " mummy " wheat is of this character, the lower part of the spike branching out into several subdivisions. This multiplica- tion of the seed-bearing branches might at first sight be considered advantageous; but in practice the quality of the grain is found to be inferior, as if the force that should have been devoted to the maturation of the grain were, in a measure, diverted and expended in the production of additional branches to the spike.

With regard to the chemical composition of the ripe grain, the Rothamsted experiments reveal a singular uniformity, even under very varied conditions of manuring, and even where much diversity was apparent in the constitution of the straw. A high or low per- centage of nitrogen in the grain was also shown to depend more directly on the degree of ripening, as influenced by the character of the season, than on difference in manure; but it depends more upon the variety than upon soil or nutrition.

Apart from the botanical interest of these diversities, as indica- tions of the faculty of variation in' plants, and possibly as clues to the genealogy and origin of the cultivated plant, their , rf . practical importance is very great. Some varieties are jftrtti suited to hot, others to cold countries; some will flourish sottand on one description of soil, others on another. Hence the i oca m y . paramount importance of ascertaining by experiment, not only what are the best varieties, but which are the best adapted for particular localities and particular climatic conditions. Poiion and Deherain have shown L the " infinite superiority " in yield over the ordinary- wheats of a particular square-headed variety grown on rich soil in the north of France. A good selection of seed, accord- ing to the nature of the soil, demands, says De Vilmorin, intelligence and accurate knowledge on the part of the farmer. If a good variety be grown in poor soil, the result will be unprofitable, while, if bad wheatbe grown on good soil, the result may be nil. In botanical collections there exist, it is stated, herbarium specimens or other evidences of plants grown in Norway as far north as lat. 65 (Schu- beler), in Switzerland at an elevation of 1200 ft. above the valley of Zermatt (or 6500 ft. above the sea), near the straits of Magellan, as well as in Teneriffe, the Cape of Good Hope, Abyssinia, Rodriguez, the Philippine Islands and the Malay Archipelago. These widely separated localities show the great area over which the culture is possible, and illustrate the powers of adaptation of the plant. The requirements of the consumer have also to be considered : for some purposes the soft floury wheats, with their large relative proportion of starch, are the best, for others the harder wheats, with their larger quantity of gluten. With the modern processes of milling, the harder wheats are preferred, for they make the best flour for bakers' use; and in North America the spring wheats are, as a rule, harder than the winter wheats. The bearded varieties are supposed to be hardier; at any rate they defy the ravages of predatory birds more completely than the unarmed varieties, and they are preferable in countries liable to storms of wind, as less likely to have their seeds detached. The durum wheats are specially employed in Italy for the fabrication of macaroni. Polish wheat is used for similar pur- poses. Spelt wheats are grown in the colder mountainous districts of Europe; their flour is very fine, and is used especially for pastry- making; but, owing to the construction of the grain, it requires special machinery for grinding (see

Flour).

Wheat begins to grow at a temperature of 5 C. (41 F.) ; and, when the aggregate temperature, as represented by the sum of the daily means, has mounted up to 185 F., the germ begins to escape from the husk, if the seed be not deeply buried; but if it is deeply buried, an amount of heat is required greater in proportion to the depth. If the seed lies at a depth lower than a foot from the surface, it rarely germinates. The seedling plant ceases to grow if the mean temperature of the day remains below 42 ° F. When the young plants have been influenced by an aggregate temperature amounting to 1896° F. from the period when sown, or 1715° from the period of germination, branching or " tillering " goes on freely, and the young ears are formed. Under the influence of a mean temperature of 55 , or a little above, the flowers are produced. A still higher daily mean is required, for the full development and ripening of the grain. The figures here cited are given by Risler and are calculated for the climate of Paris; but, of course, the same principles apply in the case of other countries. The amount of light and of moisture has also to be taken into account. The fact that the wheat plant requires less water than other cereals, and therefore does not suffer so much from drought, is one of great importance to the cultivator, and furnishes one reason for the greater proportionate culture of wheat in the eastern than in the western counties of England.

The following figures, cited by De Vilmorin from Joufie, will give an idea of the nature and amount of the demands made upon the soil by a wheat crop : in order to yield a crop of 44! bushels of wheat to the acre, the soil must supply to the crop during its growth in round numbers — 202 lb of nitrogen, 81 lb of phosphoric acid, 55 Vb of lime, 26 lb of magnesia, and 255 lb of potash.

The numerous varieties of wheat now in cultivation have been obtained either by selection or by cross-breeding. In any wheat- field there may be observed on close inspection plants _ . differing in character from the majority. If seeds of 'y 10 ""^"

these " sporting '

ants be taken and grown in another

season, they may (or may not) reproduce the particular variation. If they do, and the same process of selection be continued, the variation becomes in time " fixed," though it is always more or less liable to revert to its original condition. By continuously and systematically selecting the best grains from the best ears, Major Ilallett succeeded in introducing " pedigree wheats " of fine quality. But even greater results may be expected from

cross-breeding, or

1 Ann. agronom. (January 18SS), p. 33.

the fertilization of the flowers of one description of wheat by the pollen of another. This has been attempted by Shireff, Le Couteur T Maund and others in the past, and more recently by H. de Vilmorin and Messrs Carter. Under natural circumstances wheat is self- fertilized: that is to say, the pollen of any given flower impregnates the stigma and ovule of the same flower; the glumes and coverings of the flower being tightly pressed round the stamens and stigmas in such a way as to prevent the access of insects and to ensure the deposit of the pollen upon the stigmas of the same flower. This process of self-fertilization is the usual method, and no doubt keeps the variety true or unmixed ; but the occasional presence of varieties in a wheat-field shows that cross-fertilization is sometimes secured. The stamens of the wheat plant may frequently be seen protruding beyond the glumes, and their position might lead to the inference that cross-fertilization was the rule; but on closer examination it will be found that the anthers are empty or nearly so, and that they are not protruded till after they have deposited the pollen upon the stigma. The separation of the glumes, which occurs at the time of fertilization, and which permits the egress of the useless stamens after that operation, occurs only under certain conditions of tempera- ture, when the heat, in fact, is sufficient to cause the lodicules of the flower to become turgid and thus to press apart the glumes. A temperature of about 75 c F. is found by Messrs Carter to be the most favourable. From what has been said it will be evident that the artificial fertilization of wheat is a very delicate operation. The glumes have to be separated and the anthers cut away before the pollen is fully formed, care being taken at the same time not to injure the stigma, and specially not to introduce, on the scissors or other- wise, any pollen except that of the variety desired. De Vilmorin 's experiments have shown that all the varieties will intercross, and that even such a distinct form as the Polish is no exception. From this he concludes that all the forms have originated from one stock and are to be comprised within one species. In the progeny of these crossed wheats, especially in the second generation, much variation and difference of character is observable — a phenomenon commonly noticed in the descendants from cresses and hybrids, and styled by Naudin " irregular variation." Sometimes characteristics appear in the crossed wheats which are not found in the parent varieties, although they occur in other wheats. Thus, De Vilmorin records the presence of turgid wheats among seedlings raised from a common wheat fertilized with the pollen of a

hard variety, and spelt wheats among the descendants of a common crossed with a turgid wheat. The production of wheat, with the use of wheat bread, has in- creased enormously since the extension of railways has made possible the transportation of grain for great distances (see Grain Trade). Of late years the increase of production has been most notable in southern Russia, Argentina, Australia, India and North America.

A merican Wheat-Farming. 1 — That wonderful agricultural region, extending from the in tenia Lion a 1 line on the north to the 37th parallel, and from the Atlantic Ocean to the 100th meridian, and comprising 26 states, produces 76% of the American wheat crop. This region, which contains only 30% of the land surface of the country, but embraces 60% of its total farm area and 70% of its improved farm acreage, is the greatest cereal-producing region of the world. Besides wheat, it produces 82% of the total corn crop, 91% of the total oat crop and 8$% of the total hay crop of the United States. The methods pursued in the eastern portion of this region are similar to those used in other parts of the world; but in the north-western portion wheat-growing is carried on on a gigantic scale, and by methods almost unknown anywhere else. The best illustration of the great or " bonanza " wheat farms, as they are called, are found along the Red river (of the North), where it flows between the states of North Dakota and Minnesota.

The wheat grown in the United States is of two distinct kinds. One is the large-kernel winter wheat of the Eastern states; the other is the hard spring wheat. The " blue stem " or the " Scotch-Fife " arc native varieties of the latter kind grown in Minnesota and the two Dakotas. For flour-making this wheat is considered the best in the world. During the season of 1S99 the product of hard spring wheat amounted to nearly 250,000,000 bushels, or two-fifths of the entire wheat product of the United States. Of this, Minnesota and the two Dakotas alone produced 200,000,000 bushels. M'iMesota is the greatest wheat-producing state in the Union, IIe> fields in 1899 covered 5,000,000 acres, and she produced nearly 80,000,000 bushels, which is twice the entire production of all Australia, and more than that of Great Britain and Ireland put together. In Minnesota and the Dakotas the farms are devoted almost exclusively to wheat- growing. Many of them contain from 3000 to 10,000 acres. 'For Canadian Wheat see Canada § Agriculture.

The country is a very level one, making it possible to use all kinds of machinery with great success. As there are no moun- tains or swamps, there is here very little waste land, and every square foot of the vast wheat fields can be made productive.

The first characteristic of a " bonanza " wheat farm is the machinery. The

smallest agricultural implement used upon them is a plough, and the largest is the elevator. A hoe or a spade is almost unknown. Between these / a ^ two there are machines of all sizes adapted to the needs of the particular work. Let us assume the conditions prevailing upon a bonanza farm of 5000 acres, and briefly describe the process of wheat production from the ploughing of the land to the delivery of the grain in the final market. These great wheat farms were established upon new lands sold directly to capitalists by the railroads. The lands became the property of the railroads largely through government grants, and they attracted capitalists, who bought them in large bodies and at low prices. The improvements made upon them consist of the cheap wooden dwellings for the managers, dormitories and dining-halls for the men, stables for the horses, and sheds and workshops for repairing machinery. Very little of the land is under fence. Since the desirable lands cf the country have been occupied, the prices of these lands have advanced slowly, with the result that the big farms are being divided up into small holdings. After a generation or two, if land continues to rise in the market as it has recently, the bonanza farms will become a thing of the past. At present the best of these lands in the valley of the Red river (of the North) are worth from $25 to $30 an acre. The improvements upon them add about $5 an acre more. A farm is not considered a big one unless it contains from 2000 to 10,000 acres at least. There are, of course, many small farmers owning from two to five sections (640 acres in each section), but their methods are more like those of the small farmers in the eastern United States or on the continent of Europe. It is necessary to own a large body of land in order to be able to use the machinery and methods here described. It is hard to convey a just notion of the size of these farms. They stretch away as far as the eye can reach in every direction, making it difficult even for the visitor to conceive their size. The distances across wheat fields are so great that even horse- back communication is too slow. The farms are separated into divisions, and lodging-houses and dining-halls and barns are scattered over them, so as to keep the workmen and teams near the scene of their labour. The men living at one end of the farm may not see those at the other for months at a time. Even then it is necessary to take the meals to the men in the fields rather than allow them to walk or ride to the dining-halls. It is not an unusual thing for a working crew to find themselves at the dinner hour 2 m. from their hall.*

First, after burning the old straw of the previous year — which is real labour in itself, so enormous is its bulk— conies the ploughing. This begins in October, The plough used has a 16-in. _. . . share, turns two furrows, and is drawn by five horses. ^ ou Xi m X* Each plough covers about 250 acres in a season, travelling an average of 20 m. a day. The ploughing begins in October, and continues a month or six weeks, according to the*

season. The ploughs are driven in " gangs " under the eye of a superintendent, who rides with them. From eight to ten of these ploughs follow each other around the vast section. If one stands a few rods ahead of them they seem to be following one another in a line; but, if one stands to the right of the " gang," one sees that the line is broken, and that the second plough is a width farther in the field than the leader, and so on for the entire number. Experience shows that it costs about 70 cents an acre to plough the land in this way. About forty men are employed upon a farm of 5000 acres during the ploughing season. The men are paid by the month, and receive about $25, including their board. They breakfast at five o'clock, take an hour for their dinner at noon— usually in the field — and have their supper at seven. At the end of the ploughing season these particular men are usually discharged. Only eight or ten are kept on a farm of this size throughout the year. The other men go back to their homes or to the factories in the cities, where they await the harvesting and threshing season. The eight or ten who remain upon the farm are employed in doing odd jobs, sueh as overhauling machinery, or helping the carpenter and blacksmith, or looking after the horses. The wheat region is a country of heavy snows, and of severe, dry cold; but when March comes the snows begin to melt away, and by April the ploughed land is dry enough for

The harvest.

the harrow. The harrowing is done with 25-ft. harrows, drawn by four horses, and operated by a single man. One man can harrow 60 to 73 acres a day.

The seeding follows immediately with four-horse press drills that cover 12 ft. The harrows and drills are worked in " gangs " as the .-.. ploughs were. Each drill will go from 20 to 25 m. a day.

beeatag. When the weather is good the seeding upon a 5000-acre farm will be done in twenty or twenty-five days. It is usual to seed a bushel and a peck of wheat to the acre. The wheat used for this purpose is carefully selected after the harvest of the previous year, and is thoroughly cleaned of foreign seeds. Through years of culti- vation, varieties of wheat have been produced which arc particu- larly well adapted to the soil and climate of this region. It has been found more profitable to use the native " blue stem " or " Scotch- Fife " wheat than the seed from any other country, or even from the neighbouring states. Counting the seed, wheat and the labour, it costs about $1 an acre to harrow the ground and plant the wheat.

When the planting is done the extra labourers are discharged again, and the regular ones are put to work on the corn, oats and millet, Labour which are grown to feed the horses. The men who do the most important work are all temporary labourers. They come from the cities of the east or the farms of the south. They begin with the early harvest in Oklahoma, and work northwards up the Missouri and the Red river until the season closes in Manitoba. They are not tramps, but steady, industrious men, with few bad habits and few ambitions. On well-managed farms drinking and gambling are strictly forbidden. The work is hard, and, as there are few amusements on the farm, the men spend their resting periods in sleep. Their dormitories are usually comfortably furnished, their dining- balls clean. The bonanza farmers find it good policy to feed their men well. Many a strike has occurred in the midst of the harvest because the quality or quantity of the food served was not what it ought to have been. The largest part of this food is brought from the eastern states. Some potatoes, turnips and beans are grown upon the farms; but the ccrned beef, bacon and groceries come from the cities. It is estimated that it costs 35 cents a day to feed each labourer. Farmers say that a good name in these respects enables them to get the choice of workmen, and that no money brings such sure returns as that expended in the bedrooms and upon the food.

The harvest labourers begin to arrive from the south about the middle of July, and by the end of this month the harvest is at its height. A farm of 5000 acres will use 75 or 100 extra men. With the men comes the new machinery in train loads. It is estimated that at least $5,000,000 worth of agri- cultural machines is annually sold in this region. The wheat farmers say that it does not pay to take undue care of old machinery, that more money is lost in repairing and tinkering an old machine than would pay for a new one. The result is that new machinery is bought in very large quantities, used until it is worn out or cannot be re- paired without considerable work, and then left in the fields to rust. Heaps of cast-iron can be seen already upon many of the large farms. Of course a great many extra parts are bought to take the place of those which break most frequently, and some men are always kept at work repairing machines in the field. One of the big 10,000-acre farms will use up two car-loads of twine in a single harvest, enough to lay a line around the whole coast of England, Ireland and Scotland. The harvesters vary in size according to the character of the land. Upon the rougher ground and small farms the ordinary binders are used; upon the great plains, like those of California, a great harvester is used, which has a cutting line 52 ft. wide. These machines cut, thresh and stack the grain at the rate of 1600 sacks a day, and. cover an area in that time of 100 acres. These machines can only be used where the wheat ripens thoroughly standing in the field. The harvest labourer earns $10 a week everywhere in America. The bonanza farmer

expects one machine to cut at least 250 acres, and three men are required for each of them. The harvest lasts from ten days to three weeks, according to the weather. Including the labour and the wear and tear, it costs about 60 cents an acre to harvest wheat.

*The wheat is not stacked as in the Eastern states and in England, but stands upright in shocks in the field. The grain cures very Tbresblor ra P"^y m the dry climate, so that by the time the wheat * is all cut and shocked on one end of the division, it is ready for the thresher at the other. The shocks of wheat are hauled directly to the thresher and fed into the self-feeder. It usually takes a day and a quarter to thresh the wheat which it took a day to cut. The farmer estimates that a threshing-machine can thresh all the wheat ordinarily grown upon 2500 acres, so that a 5000-acre farmer would have at least two machines running at the same time. Time is a very important thing in threshing, since a rainfall might spoil enough grain in one night to buy several machines. The threshing season is tnus a time of great pressure and of extensively active work. The wheat straw is worse than a waste product — it is a great nuisance upon the bonanza farm. A little ot it is used for fuel for the engines and for bedding the stock; but the bulk of it is dragged away from the threshing machine by machinery, and left lying in great heaps until an opportunity is afforded for burning it up. This is usually done immediately before the ploughing in the autumn. The grain falls from the spout of the thresher into the box-wagon, which carries*

The returns.

it to the elevator. The elevator is placed at the railway station, and is usually owned by the bonanza farmer.

From the time the sheaves of wheat are tumbled into the wagon until the flour reaches the hands of the cook, no hand touches the wheat that passes through the great Minneapolis mills. When the box-wagons reach the elevator the loosing of a bolt dumps the grain into the bin, where it remains until the pulling of a lever lets it into the cars. Every pound of it is weighed and accounted for, and entered upon the books, so as to show the exact product of each division of the farm. After the rush of the threshing is over the farmer studies these books carefully to see what his land is doing, and makes Ms plans for the next year, so as to rest or strengthen those divisions w r hich are failing. It costs about $1.50 an acre to thresh the grain and put it into the elevator. This sum, added to the estimated cost of the other processes men- tioned above, makes the total cost of growing an acre of grain about $3.80. This includes the cost of labour, seed and wear and tear of machinery, but does not include the interest on land or plant. The taxes on land will average 25 cents an acre. The farmers estimate that the other improvements, the waterworks, elevators, insurance, horse feed, &c, will

make this up to $6 an acre. The best of these farms will yield 20 bushels to the acre. This makes the wheat cost 30 cents a bushel. During the last five years the average farm-selling price of wheat in the North-West has been 58 cents. An acre thus produces $11.60, making a gross profit of $5.60. Still to be provided for is the interest on the operating expenses for eighteen months, which will, at 8%, be 48 cents per acre. Interest on the capital in land, improvements and machinery, at $30 per acre, make $1.80 more, or a total interest charge of $2.28. When this is deducted from the gross profits of $5.60 prices found above, we have a net profit of $3.32 an acre, not an exorbitant one by any means. This is about 8 % on the capital invested in the land, plant and operating expenses. But we have described the conditions on one of the best bonanza farms. The average yield per acre in this region is not over 18 bushels, and the average expenses would be higher than those given.

Every bonanza farmer's office is connected by wire with the markets at Minneapolis, Chicago and Buffalo. Quotations arrive hourly in the selling season, and the superintendent keeps in close touch with his agents in the wheat-pits of these and other cities. When the instrument tells him of a good price, his agent is instructed to sell immediately. The farmer on the upper waters of the Red river (of the North) is kept fully informed as to the drought in India, the hot winds in the Argentine and the floods of the Danube. Any occurrences in these distant parts of the world are known to him in a surprisingly short time. The world's great wheat fields almost lie within his sight, so well does he know the conditions that prevailin them. Ten days are allowed for delivery, so that he can usually ship the wheat after it is sold. In the early days of wheat-farming the bonanza farmer often speculated, but experience has taught him that he had better leave this to the men in the cities, and content himself with the profit from the business under his eye. The great elevator centres are in Duluth, St Paul, Minneapolis, Chicago and Buffalo. These elevators have a storage capacity of from 100,000 to 2,500,000 bushels. The new ones are built of steel, operated by steam or electricity, protected from fire by pneu- matic water-pipes, and have complete machinery for drying and scouring the wheat whenever it is necessary. The elevators are provided with long spouts containing movable buckets, which can be lowered into the hold of a grain-laden vessel. The wheat is shovelled into the pathway of the huge steam shovels, which draw it up to the ends of these spouts, where the buckets seize it, and carry it upwards into the elevator, and distribute it among the various bins according to grade. A cargo of 200,000 bushels can thus be unloaded in two hours, while spouts on the other side of the elevator reload it into cars, five to ten at a time, filling a car in from five to ten minutes, or the largest canal boat in an hour. The entire work of unloading, storing and reloading adds only one cent to the price of a bushel of wheat.

1 The great wheat-growing states like Minnesota have estab- lished systems of inspecting and grading wheat under state super- vision. In Minnesota the system is carried out by the Railroad and Warehouse Commission(i885), which fixes /na P« / 'W and defines the different grades of wheat and directs the grading. work. At present there are 1 8 grades recognized in this state. The first is described as "No. i,hard spring wheat, sound, bright and well cleaned, composed mainly of hard * Scotch-Fife,' weighing not less than 58ft) to the measured*

bushel." The second grade is known as " No. x, northern spring wheat, sound, and well cleaned, composed of the hard and soft varieties of spring wheat." So the varieties run — " No. 2, northern "; " No. 3, northern," &c.-—down to the 18th, which is "no grade." The official inspectors examine, grade and sample the wheat in the cars in which it is received at the great markets or elevators. The cars are sealed at the point of original shipment. The first thing, therefore, is to examine the seals to see that they are unbroken. The inspector then samples and examines the wheat, and enters the grade upon a blank opposite the number and letters of the car. His tag and sample go to the wheat exchange or chamber of commerce, where they are exposed in small tin pans, and form the basis of the trading. A few years ago the wheat received from the north-west was very clean indeed, but since the new land has all been cultivated the fields are growing more weedy, with the result that the wheat brought in is becoming mixed with oats and seeds of weeds, requiring more careful separating and inspection. After the inspector has finished his work the cars are resealed with the state seal, and await orders of the purchaser. The delay will not ordinarily be more than one day. The commission keeps complete records and samples of each car until the wheat has passed entirely out of the market. When disputes occur as to the grade they can thus be instantly settled. If the grade is changed after a second examination the state pays the expense of the inspection; if not, it is paid by the agent who raises the objection. Only about 5% of the samples are ever reinspected, and in less than 2% of these is the grade changed. The com- mission collects the small fee of 20 cents a car for its services as inspector, and later weighs all the wheat as it is distributed into the elevators. This small charge pays all the expenses.

The transportation of the wheat from the fields of the north- west to the seaport is a business of tremendous magnitude.

Most of this wheat goes by way of the lakes through the oortaiioa Sault

Sainte Marie canal to Buffalo, where it is shipped

by rail or inland canal to New York. Philadelphia or Baltimore. Duluth, on Lake Superior, is, surprising to say, the second port in the United States in point of tonnage. The Sault Sainte Marie canal passes two and a half times as much tonnage during the eight months it is open as the Suez canal passes in the entire year. The cheapest transportation in the world is found upon these lakes, the rate being only three-fourths of a mill per ton of wheat per mile. The greater lake vessels, called " Whalebacks," cairy cargoes up to 250,000 bushels, a bulk difficult to conceive. 700 bushels is a car-load. At that rate the cargo of 250,000 bushels will fill 360 American cars, or 9 trains of 40 cars each. At 20 bushels to the acre, this single cargo would represent the yield of two and a half farms of 5000 acres each, like that described above, with every acre in cultiva- tion. The railways of the north-west have a monopoly of the business of hauling wheat, with the result that it costs 20 cents to ship a bushel of wheat from the Dakota field to Duluth, which is as much as it costs to forward it from Duluth to Liverpool. The bushel of wheat, or an equivalent amount of flour, can be shipped from Minneapolis or Duluth to almost any point in western Europe for from 20 to 25 cents.

What are the prospects of wheat production in the United States? In his presidential address before the British Association for the ^^ Advancement of Science (1900), Sir William Crookes

*fJUfff** painted a rather dark picture of the future of the world's *" " wheat production. Among other things he said, " It is*

almost certain that within a generation the ever-increasing population of the United States will consume all the wheat grown within its borders, and will be driven to import like ourselves. " Americans think that this statement is altogether too pessimistic. Not sufficient account had been taken of the unculti- vated land in farms, and of the possibilities of improving the yield, and still further cheapening the product. It is probable that the United States will by 1933 have a population of 133,000,000. This population would require a wheat crop of 700,000,000 bushels for its own use alone. Limiting attention to the great cereal-producing region described above, let us see what the prospects are for increasing the acreage and the yield. The fact that these States contain, ac- cording to the last census, over 100,000,000 acres of unimproved land, already enclosed in farms, suggests at once the great possi- bilities in wheat. But all this land is not immediately available for

wheat

produc

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cultivation. The availableness of the unimproved land in these states is chiefly a question of population and physical features. In states like New York and Pennsylvania, which are much broken up by hills and mountains, and have already a large population, it is probable that the land available for wheat cultivation is now nearly all taken up, although they still have 30% of unimproved land in farms. In the great states of Michigan, Missouri, Wisconsin, Minnesota and the Dakotas there is still 40 to 50% of unimproved . land in farms. There are few mountains and hills in these States, and there is still room in them for a large population. It is evident that in states like these wheat culture is destined to increase greatly. Twelve states, in this vast cereal-growing region — Ohio, Indiana, Illinois, Missouri, Kansas, Nebraska, Michigan, Iowa, Wisconsin, Minnesota, North and South Dakota — still have from 20 to 40% of unimproved land in farms. The total area of these states is nearly four times that of France. Their soil is primarily as fertile as hers. If we put the population of France at 40,000,000, the states in question could, at the same ratio, support a population of 140,000,000. France produced during the five years ending 3897 eight bushelsof wheat per caput. At eight bushels per caput, the people in these twelve states alone could produce 1,120,000,000 bushels, or 420,000,000 bushels more than will be required by the population of 133,000,000 expected by 1933. This is a great manufacturing as well as a great agricultural region, and it is here, therefore, that a large part of this increase in population will be found.

It is evident that there is great room for improvement also in the matter of yield per acre. The average yield of wheat per acre has increased slowly in recent years. So long as there was so much virgin land to be brought under cultivation, it is surprising that it has increased at all, since the tendency everywhere is to " skin " the rich, new lands first. Mr B. W. Snow, formerly one of the statis- ticians of the United States Department of Agriculture, has shown (The Forum, vol. xxviii. p. 94) that the producing capacity of the wheat lands, under favourable weather, increased steadily during the period 1880-1899. He distinguishes between the actual yield and the producing capacity, and bases his comparison upon the latter. He takes the average for each year of five years between 1880 and 1899s an d shows that the producing capacity per acre increased 0.5 bushel between the first and the second period, 1.3 bushels between the second and the third, and 1.4 bushels between the third and the fourth. In the period 1880-1884, inclusive, the maximum capacity was a little less than 14 bushels, while in the period 1895-1899 the maximum capacity exceeded slightly 17 bushels — an increase of 3.2 bushels per acre, or 23%, in less than twenty years.

He says, " To account for this increase in the potential yield in our wheat-fields many factors must be taken into considera- tion. Among these may be mentioned improved methods of plough- ing, tile drainage, use of the press drill, which results in greater immunity against winter killing, crop rotation, and, to a very small extent, fertilization. An important factor to be mentioned in this connexion is the change in the distribution of the acreage under wheat, consequent upon falling prices. A decline in the price of wheat rendered its production unprofitable where the rate of yield was small. Gradually these lands were passed over to crops better suited to them; while at the same time the wheat acreage was increased in districts having a better rate of yield." He predicts that " the increase in the acre yields in this country has only begun. All that has been accomplished during the period under review may be attributed to improvements in implements for preparing the soil and planting the seed. Wheat is grown year after year without rotation — except in a few cases — on a' lhird_ or more of our wheat acreage; not one acre in fifty is directly fertilized for the crop, and only a minimum amount of attention is given to the betterment of seed stock. If, in the face of what cannot be considered less than careless and inefficient agricultural practice, we have increased the wheat capacity of our land by 3.2 bushels per acre in so short a time, what may we not expect in the way of large acre yields before we experience the hardships of a true wheat famine? "

Diseases.— Wheat, like other cereals, is liable to epidemic diseases caused by parasitic organisms which prey on the plant tissues. Of these the rust, smut and bunt fungi are by far the most common and the most destructive. Rust alone is said to cause an annual loss of wheat in India amounting to from 4,000,000 to 20,000,000 rupees. We have no similar calculation of loss for Great Britain, where wheat is not so much grown, but it is well known that there is a continual, serious depreciation of value in the crops due to parasitic fungi.

The rust fungus, Puccinia graminis, is a Uredine belonging to the hctcroecious group, that is, one that passes from one host to another at different stages of ils life-history. In spring, while the wheat plants are still green and immature, the rust makes its appearance as orange-red spots or streaks on the stalks and leaves. These coloured spots are due to the presence of a sorus or layer of countless numbers of minute brown spores, the uredospores of the summer fruitingform. The fine thread-like filaments composing the mycelium of the fungus are embedded in the tissue underneath and aroundthe urcdo-sorus, and draw from the host the nourishment required. The spores, when mature, are easily detached, and are carried by insects or by the wind to other wheat-piants. If infection takes place, other sori are formed in ten days or a fortnight under favourable conditions of moisture and warmth.

Towards the end of the summer the uredospores are replaced by the winter resting-sporcs, called teleutospores, which are larger, thicker- walled and darker in colour. These teleutospores remain inactive on the straw until spring, when they germinate in manure heaps or on moist ground and produce minute sporidia, which are conveyed by air currents to the alternate host, in this case a barberry. In due time the fungus, known as Aecidium Berberidis, appears on the barberry leaves in the form of small cluster-cups on aecidia, each of which is filled with chains of orange-coloured aecidios pores. Infection of the leaves of the young wheat plants follows on the scattering of the aecidiospores : a sorus of the rusty uredospores is produced, and the life-cycle is complete.

Though this is the normal and complete development of Puccinia graminis, it is not invariably followed. In Australia, for instance, the berberry is an imported plant and of rare occurrence, yet rust is very abundant. Teleutospores of hcteroecious rusts never reinfect the host on which they are produced, so that in many cases the

Fig. ˆ.—Puccinia graminis.

A, Mass of teleutospores (/) on a vulgaris, with a, aecidium

leaf of couch-grass. fruits, p, peridium, and sp,

e, Epidermis ruptured. spermogonia. (After Sachs.)

b, Sub-epidermal fibres. (After C, Mass of uredospores iur)

De Bary.) with one teleutospore (t).

B, Part of vertical section sh, Sub-hy menial hyphae. (After

through leaf of Berheris De Bary.)

uredospores probably survive the winter in Europe as well as in Australia and give rise to the rust of the following year. Wind dispersal of the spores would account for mysterious appearances of the disease, in some years almost every straw in a wheat-field being affected, while in other years scarcely one is attacked. Rust disease does not directly affect the grains, but both quantity and quality are impaired by the exhausted condition of the wheat plants. No cure is possible, but as winter wheat suffers less than spring wheat, early sowing is recommended. Fungus spores will not

germinate without moisture, and attention to drainage helps to keep down this and other fungus pests. It has also been observed that too heavy nitrogenous manuring stimulates and prolongs the growing period of the wheat; flowering is retarded, and thus there is a greater opportunity for infection to take place. Wheat growing on an old manure heap is nearly always badly diseased. Much attention has been paid recently to the cultivation of varieties of wheat that are immune to rust attacks, and care should be taken to select strains that have been proved able to resist the disease.

The other two parasites, smut and bunt, affect principally the grain. Smut of wheat, Uslilago Tritici, infects the host at the time of flowering. The fungus-spores, from some diseased plant, alight on the stigma of the flower, and germinate there along with the ollen grains. The developing seed thus encloses fungal hyphae, which remain dormant within the seed and in spring develop sym- bolically with the growth of the wheat plant, doing no apparent injury until the time of fruiting is reached, when the fungus takes complete possession and fills the new seed with a mass of dark- coloured spores. These are scattered over the field and alight on

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Fig. 5. — Germinating Rest-

other flowering wheat plants. It is impossible to detect the first

infection or to cleanse the seed ;

the only remedy is to procure seed

from a smut-free source, and to

prevent further spread of the

disease by gathering all smutted

heads before the spores have

matured or dispersed.

Tilletia Tritici, bunt or stinking smut of wheat, is so-called because the bunted grain has a disagreeable odour of stale herrings. Bread made from bunted flour is dark in colour, and both unpalatable and unwholesome. The spores of the fungus remain in the soil or in manure-heaps until spring, when they germinate and attack the first green leaves of the host plant. The

after development is similar to that of smut, and the seed grain be- comes a mere mass of fungus spores. Much can be done in this case to clean the seed before sowing

by immersing it in hot water or m g-Gonidia: A of 'VsUlago in some solution that will kill the receptaculorum; B of Tilletia spores without injuring the grain Caries.

Other parasitic fungi of less s p t The gonidium. economic importance occasionally p m) The proinycc-lium. do considerable damage. Erysiple ˆ ' The sporidia: in B the graminis, a mildew of grasses, has sporidia have coalesced in

caused great loss in various coun- pairs at v.

tries; Dilophia graminis sometimes

causes deformities of the leaves and inflorescence; another some- what similar fungus, Ophiobolus graminis, attacks the leaves and stalks near the ground, completely destroying the plants.

Helminthosporium gramineum, a disease of barley, has also been recorded as growing on wheat; it forms long narrow dark-brown streaks on the leaves, which wither and die. The lower leaves are usually the only ones attacked, and the yield of grain has not been seriously affected.

WHEATEAR, a bird's name, perhaps of doubtful meaning, 1 though J. Taylor, the " water poet " (d. 1654), in whose writings it seems first to occur, and F. Willughby, explain it (in the word:; of J. Ray, the latter's translator) as given " because [in] the time of wheat harvest they wax very fat." The wheatear, Saxicola osnanthe, is one of the earliest migrants of its kind to return to its home, often reaching England at the end of February and almost always by the middle of March. The cock bird, with his bluish grey back and light buff breast, set off by black ear- coverts, wings, and part of the tail, is rendered still more con- spicuous by his white rump as he takes short flights in front of those who disturb him, while his sprightly actions and gay song harmonize so well with his delicately-tinted plumage as to render him a welcome object to all who delight in free and open country. When alarmed both sexes have a sharp monosyllabic note that sounds like chat; and this has not only entered into some of the local names of this species and of its allies, but ha3 caused all to be frequently spoken of as " chats." The nest is constantly placed under ground; the bird takes advantage of the hole of some other animal, or the shelter of a clod in a fallow-field or a recess beneath a rock. A large amount of soft material is therein collected, and on them from 5 to 8 pale blue eggs are

laid.

The wheatear has a very wide range throughout the Old World, extending in summer far within the Arctic Circle, from Norway to the Lena and Yana valleys, while it winters in Africa beyond the Equator and in India. But it also breeds regularly in Greenland and some parts of North America. Its reaching the former and the eastern coast of the latter, as well as the Bermudas, may possibly be explained by the drifting of individuals from Iceland; but far more interesting is the fact of its continued seasonal appearance in Alaska without ever showing itself in British Columbia or California, and

1 The vulgar supposition of its being an euphemism of an Anglo- Saxon name (cf. Bennett's ed. of White's Nat. Hist. Selborne, p. 69, note) must be rejected until evidence that such a name ever existed be adduced. It is true that " whittaile " (cf. Dutch Witstaart and French Culblanc) is given by Cotgravc in 1611 ; but the older names, according to Turner, in 1544, of "clotburd" (= clod-bird) and smatch (= chat) do not favour the usual derivation. " Fallow-chat ' is another old name still locally in use, as is " coney-chuck."*

without ever having been observed in Kamchatka, Japan or China, though it is a summer resident in the Tchuktchi peninsula. . Hence it would seem as though its annual flights across Bering's Strait must be in connexion with a migratory movement that passes to the north and west of the Slanovoi range of mountains.

Many species more or less allied to the wheatear have been de- scribed. Some eight are included in the European fauna; but the majority are inhabitants of Africa. Several of them are birds of the desert ; and here it may be remarked that, while most of these exhibit the sand-coloured tints so commonly found in animals of like habitat, a few assume a black plumage, which, as explained by H. B. Tristram, is equally protective, since it assimilates them to the deep shadows cast by projecting stones and other inequalities of the surface.

Amongst genera closely allied to Saxicola are Pratincola, which comprises among others two well-known British birds, the stonechat and whinchat, P. rubicola and P. rubetra, the latter a summer- migrant, while the former is resident as a species, and the black head, ruddy breast, and white collar and wing-spot of the cock render him a conspicuous object on almost every

furze-grown com- mon or heath in the British Islands, as he sits on a projecting twig or flits from bush to bush. This bird has a wide range in Europe, and several other species, more or less resembling it, inhabit South Africa, Madagascar, Reunion and Asia, from some of the islands of the Indian Archipelago to Japan. The whinchat, on the otherhand, much more affects enclosed lands, and with a wide range has no very near ally. The wheatear and its allies belong to the sub-family Turdinae of the thrushes {q.v.). (A. N.)

WHEATLEY, FRANCIS (1 747-1801), English portrait and landscape painter, was born in 1747 at Wild Court, Covent Garden, London. He studied at Shipley's drawing- school and the Royal Academy, and won several prizes from the Society of Arts. He assisted in the decoration of Vauxhall, and aided Mortimer in painting a ceiling for Lord Melbourne at Brocket Hall (Hertfordshire). In youth his life was irregular and dis- sipated. He eloped to Ireland with the wife of Gresse, a brother artist, and established himself in Dublin as a portrait-painter, executing, among other works, an interior of the Irish House of Commons. His scene from the London Riots of 17S0 was admir- ably engraved by Heath. He painted several subjects for Boydell's Shakespeare Gallery, designed illustrations to Bell's edition of the poets, and practised to some small extent as an etcher and mezzotint-engraver. It is, however, as a painter, in both oil and water-colour, of landscapes and rustic subjects that Wheatley is best remembered. He was elected an associate of the Royal Academy in 1790, and an academician in the following year. He died on the 28th of June 1801. His wife, afterwards Mrs Pope, was known as a painter of flowers and portraits.

WHEATON, HENRY (1785-1848), American lawyer and diplomatist, was born at Providence, Rhode Island, on the 27th of November 1785. He graduated at Brown University in 1802, was admitted to the bar in 1805, and, after two years' study abroad, practised law at Providence (1807-1812) and at New York City (1812-1827). He was a justice of the Marine Court of the city of New York from 1815 to 1810, and reporter of the United States Supreme Court from 1816 to 1827, aiding in 1825 in the revision of the laws of New York. His diplomatic career began in 1827. with an appointment to Denmark as charge d'affaires, followed by that of minister to Prussia, 1837 to 1846. During this period he had published a Digest of the Law of Maritime Captures (1815); twelve volumes of Supreme Court Reports, and a Digest; a great number of historical articles, and some collected works; Elements of International Law (1836), his most im- portant work, of which a 6th edition with memoir was prepared by W. B. Lawrence and an eighth by R. H. Dana (q.v.); Histoire du Pr ogres du Droit des Gens en Europe, written in 1838 for a prize offered by the French Academy of Moral and Political Science, and translated in 1845 by

William B. Lawrence as A History of the Law' of Nations in Europe and America: and the Right of Visitation and Search (1842). The History took rank at once as one of the leading works on the subject of which it treats. Wheaton's general theory is that international law consists of " those rules of conduct which reason deduces, as consonant to justice, from the nature of the society existing among independent nations, with such definitions and modifica- tions as may be established by general consent." In 1846 Whcaton

was requested to resign by the new president, Polk, who needed his place for another appointment. The request provoked general condemnation; but Wheaton resigned and returned to the United States. He was called at once to the Harvard Law School as lecturer on international law; but he died at Dor- chester, Massachusetts, on the nth of March 1848.

WHEATSTONE, SIR CHARLES (I8G2-X875), English physicist and the practical founder of modern telegraphy, was born at Gloucester in February 1802, his father being a music seller in that city. In 1806 the family removed to London. Wheatstone's education was carried on in several private schools, at which he appears to have displayed no remarkable attainments, being mainly characterized by a morbid shyness and sensitiveness that prevented him from making friends. About 1816 he was sent to his uncle, a musical instrument maker in the Strand, to learn the trade; but with his father's countenance he spent more time in reading books of all kinds than at work. For some years he continued making experiments in acoustics, following out his own ideas and devising many beautiful and ingenious arrangements. Of these the " acoucryptophone " was one of the most elegant — a light box, shaped like an ancient lyre and suspended by a metallic wire from a piano in the room above. When the in strument was played, the vibrations were transmitted silently, and became audible in the lyre, which thus appeared to play of itself. On the death of his uncle in 1823 Wheatstone and his brother succeeded to the business; but he never seems to have taken a very active part in it, and he virtually retired after six years, devoting himself to experimental research, at first chiefly with regard to sound. Although he occasionally read a paper to scientific societies when a young man, he never could become a lecturer on account of his shyness. Hence many of his in- vestigations were first described by Faraday in his Friday evening discourses at the Royal Institution. By 1834 his originality and resource in experiment were fully recognized, and he was appointed professor of experimental philosophy at King's College, London, in that year. This appointment was inaugurated by two events, — a course of eight lectures on sound, which proved no success and was not repeated, and the deter- mination by means of a revolving mirror of the speed of electric discharge in conductors, a piece of work leading to enormously important results. The great velocity of electrical

transmission suggested the possibility of utilizing it for sending messages; and, after many experiments and the practical advice and business-like co-operation of William Fothergill Cooke (1806- 1879), a patent for an electric telegraph was taken out in their joint names in 1837. Wheatstone's early training in making musical instruments now bore rich fruit in the continuous designing of new instruments and pieces of mechanism. His life was uneventful except in so far as the variety of his work lent it colour. He became a fellow of the Royal Society in 1837; in 1847 he married; and in 1868, after the completion of his master- piece, the automatic telegraph, he was krtighted. While in Paris perfecting a receiving instrument for submarine cables, Sir Charles Wheatstone caught cold, and died on the 19th of October

1S75.

Wheatstone's physical investigations are described in more than thirty-six papers in various scientific journals, the more important being in the Philosophical Transactions, the Proceedings of the Royal Society, the Comptes rendus and the British Association Reports. They naturally divide themselves into researches on sound, light and electricity, but extend into other branches of physics as well. But his best work by far was in the invention of complicated and delicate mechanism for various purposes, in the construction of which he employed a staff of workmen trained to the highest degree of excellence. For his insight into mechanism and his power over it he was unequalled, except perhaps by Charles Babbage. A crypto-graphic machine, which changed the cipher automatically and printed a message, entirely unintelligible until translated by a duplicate instrument, was one of the most perfect examples of this. Crypto- graphy had a great fascination for Wheatstone ; he studied it deeply at one time, and deciphered many of the MSS. in the British Museum which had defied all other interpreters. In acoustics his principal work was a research on the transmission of sound through solids, the explanation of Chladni's figures of vibrating solids, various investiga- tions of the principles of acoustics and the mechanism of hearing, and the invention of netf Musical instruments, e.g. the concertina (q.v.).

The kaleidophone, intended to present visibly the movements of a sonorous body, consisted of a vibrating wire or rod carrying a silvered bead reflecting a point of light, the motions of which, by persistence of the successive images on the retina, were thus repre- sented in curves of light. In light there are a series of papers on the eye, on the physiology of vision,

on binocular vision, including the invention of one of the popular scientific instruments, the stereoscope (q.v.), and on colour. The polar clock, devisedfor use in place of a sun-dial, applies the fact that the plane of polarization of sky light is always 90 from the position of the sun; hence by measuring the azimuthal angle of the plane, even when the sun is below the horizon, correct apparent solar time may be obtained. In 1835, in a paper on " The Prismatic Decomposition of Electrical Light," he proved that sparks from different metals give distinctive spectra, which afforded a ready means of discriminating between them. But it is by his electrical work that Wheatstone is best remembered. He not only- guided the growth of scientific telegraphy on land wires, but made the earliest experiments with submarine cables, foreseeing the practica- bility of this means of communication as early as 1840. He devised the " A, B, C " telegraph instrument, the automatic transmitter, by which messages may be sent at the rate of 500 words a minute, printing telegraph receivers of various forms, electrical chronoscopes, and many forms of electrical recording apparatus, — amongst others two sets of registering meteorological instruments, of which the earlier, described in 1842, was afterwards developed by Father A. Secchi and F. van Rysselberghe, but the later, put forward in 1867, included metallic thermometers and was less successful.

Wheatstone's Scientific Papers were collected and published by the Physical Society of London in 1879. Biographical notices of him will he found in his Proc. Inst. C.E., xlvii. 283, and Proc. Roy. Soc. , xxiv. xvi. For his connexion with the growth of tele- graphy, see Nature, xi. 510, and xii. 30 sq.

WHEATSTONE'S BRIDGE, an electrical instrument which consists of six conductors, joining four points, of such a character that when an electromotive force is applied in one branch the absence of a current in another branch (called the conjugate branch) establishes a relation between the resistance of the four others by which we can determine the value of the resistance in one of these, that of the others being assumed to be known. This arrangement was not invented by Sir Charles Wheatstone — although it bears his name and is commonly attributed to him, and was employed by him in some of his electrical researches — but by S. H. Christie, in 1S33. 1

The arrangement of the six conductors is diagram matically repre- sented in fig. 1. In one of these branches is placed a battery B and in another a galvanometer G; the four other resistances are denoted by the letters P, Q, R, S. The circuits in which the battery and galvanometer are placed are called conjugate circuits, ˆand the circuits P, Q, R, and S are I called the arms of the bridge, the /branches P and Q being called the ratio arms and S the measuring arm. The circuit in which the galvanometer is placed is the

bridge circuit. Keys are inserted in the battery and galvanometer circuits to open or close them at pleasure. The resistance forming the four arms of the bridge can be so adjusted that if these resistances have values denoted by P,Q, R, and S, then when P: Q :: R: S, the current in the galvano- meter circuit will be zero when an electromotive force is applied in the battery circuit.

To prove this statement, let the conductors P, Q. R, S., be arranged in a lozenge shape, as in fig. 1. Let E be the electromotive force in the battery circuit, and let (x--y) be the current through the re- sistance P, y the current through the resistance Q and 2 that through B. Then by G. R. Kirch hoff' s laws (see Electrokinetics) we have the current equations,

(P+G + R) (x+y)-Gy-Rz = (Q+G+S)>— G(+ y)-Ss-0 CR+S +B)s-RU + 3-)-Sj = F Rearranging the terms and solving for x (the current through the galvanometer), we obtain*

x=(PS-RQ)E/A. where A is a complex expression, involving the resistances P, Q- R> S, G, and B, which does not concern us. Hence when x = o, P : Q = R : S and the value of R can be determined in terms of P, Q and S.

In the practical instrument the fhree arms of the bridge P, Q, and S are generally composed of coils of wire contained in a box, whilst R is the resistance the value of which is to be determined. This last resistance is connected to the other three with the addition

Fig.

1 See Wheatstone's Scientific Papers, p. 129.

of a galvanometer and a battery connected up as shown in the diagram. The operation of determining the value of the resistance R therefore consists in altering the ratio of the three resistances P, Q, and S, until the galvanometer indicates no current through it when the battery circuit is completed or closed by the key. In one form of Wheatstone's Bridge, known as the series pattern plug-resistance bridge, or Post Office pattern, the two ratio arms, P and Q, each consist of a series of coils of wire, viz. two i-ohm coils, two 10-ohm coils, two 100-ohm coils and two 1000-ohni coils, which are joined up

Fig. 2. — Standard Wheatstone's Bridge. in scries in the order, 1000, 100, 10, 1 ; 1, 10, 100, 1000, the junctions between each pair being connected to brass blocks, a series of which are mounted upon an ebonite slab that forms the lid of the box. The blocks are bored out with a hole partly in one block and partly in the other (sec fig. 2) so that they can be connected by

accurately fitting conical plugs. When the blocks are interconnected by the plugs all the coils are short-circuited ; but if the plug or plugs are taken out, then a current flowing from one end of the series to the other is compelled to pass through the corresponding coils. In series with this set of coils is another set, S, which forms a measuring arm, the resistances of which are generally 1 , 2, 3, 4/10, 20, 30, 40, iqo, 200, 300, 400, 1000, 2000, 3000, 4000 ohms. The junction between each pair of coils is connected as above described to a block, the blocks being interconnected by plugs all of which are made interchangeable. Another form of Wheatstone's Bridge, shown in fig. 2, is known as the dial pattern. Ten brass blocks are arranged parallel to or around another brass block, and by means of a plug which fits into holes bored partly out of the common block and partly out of the surrounding blocks, any one of the latter can be connected with the common one. A series of nine equal resistances, say I -ohm coils, or nine 100-ohm coils, are joined in between these circumferential blocks (fig. 3). It will be seen that if a plug is placed so as to connect

Fig. 3. — Diagram showing Connexions of a Dial and Plug pattern, Wheatstone's Bridge.

any outside block with the central block, the current can only pass from the zero outer block to the central block by passing through a certain number of the resistance coils. Hence according to the magnitude of each coil the total resistance may be made anything from 1 to 9, 10 to 90, or 100 to 900 ohms, &c. Three or four of the " dials " thus composed are arranged side by side, the brass blocks being mounted on a slab of ebonite and the coils contained in the box underneath, and they are so joined up that the central block of one dial is connected to the outside block of the next marked O. This arrangement forms the measuring arm of the bridge, the ratio arms being constructed on the series plug pattern just described. A bridge of this pattern has the advantage that the insertion or removal of a

plug in the measuring arm does not tend to tighten or loosen all the rest of the plugs; moreover, there are fewer plugs to manipulate, and each plug is occupied. The resistance coiis themselves are generally wound on brass or copper bobbins, with silk-covered manganin wire, which should first be aged by heating for about ten hours to a temperature of 140 C, to remove the slight tendency to change in resistivity which would otherwise present itself.

For the accurate comparison of resistance coils it is usual to make use of

the Matthiessen and Hockin bridge, and to employ the method of differential comparison due to G. Carey Foster. 1 On a board is stretched a uniform metallic wire a b, generally of platinum silver. The ends of this wire are connected to copper blocks, which them- selves are connected to a series of four resistance coils, A, B, and P, Q (fig. 4). A and B are the coils to be compared, P and Q are two other

-iiiiii n

A P Q \ B

coils of convenient value. Over the stretched wire moves a contact maker S, which makes contact with it at any desired point, the position of which can be ascertained by means of an underlying scale. A battery C of two or three cells is connected to the ex- tremities of the slide wire, and the sensitive galvanometer G is con- nected in between the contact-maker and the junction between the coils P and Q. The observer begins by moving the slider until the galvanometer shows no current. The position of the coils A and B is then interchanged, and a fresh balance in position on the bridge is obtained. It is then easily shown that the difference between the resistance of the coils A and B is equal to the resistance of the length of the slide wire intercepted between the two places at which the balance was found in the two observations.

Let the balance be supposed to be attained, and let x be the position of the slider on the wire, so that x and l — x are th&two sections of the slide wire, then the relation between the resistance is

*(A + *)/(B + J-*)*P/Q. Next, let the position of A and B be interchanged, and the slide-wire reading be x' ; then*

*(B + *')/ (A +/-*') = P/Q.*

Hence it follows that A — B = x'— x, or the difference of the resist- ances of the coils A and B is equal to the resistance of that length of the slide wire between the two points where balance is obtained.

Various plans have been suggested for effecting the rapid inter- change of the two coils A and B; one of the most conveni :nt was designed by J. A. Fleming in 1880, and has been since used by the British Association Committee on Electrical Units for "making com- parison between standard coils with great accuracy (see Phil. Mag., 1880, and Proc. Pkys. Soc, 1879). In all very exact resistance

Fig. 5.

measurements the chief difficulty, however, is not to determine the resistance of a coil, but to determine the temperature of the coil at the time when the resistance measurement is made. The difficulty is

1 " On a Modified Form of Wheatstone's Bridge, and Methods of Measuring Small Resistances," by Professor G. Carey Foster. Proc. Soc. Tel. Eng. (1872), I.

caused by the fact that the coil is heated by the current used to measure its resistance, which thus alters in value. In accurate comparisons, therefore, it is necessary that the coils to be compared should be immersed in melting ice, and that sufficient time should be allowed to elapse between the measurements for the heat generated in the coil to be removed.

The standard resistance coil employed as a means of comparison by which to regulate and check other coils consists of a wire, generally of manganin or platinum silver, insulated with silk and wound on a brass cylinder (fig. 5). This is soldered to two thick terminal rods of copper, and the coil is enclosed in a water-tight brass cylinder so that it can be placed in water, or preferably in paraffin oil, and brought to any required temperature. In the form of standard coil recom- mended by the Berlin Reichsanstalt the coil is immersed in an insulating oil which is kept stirred by means of a small electric motor during the time of making the measurement. The tempera- ture of the oil can best be ascertained by means of a platinum resistance thermometer.

For the measurement of low resistances a .modification of the Wlteatstone's bridge devised by Lord Kelvin is employed. The Kelvin bridge consists of nine conductors joining six points, and in one practical form is known as a Kelvin and Varley slide. Modifications of the ordinary Wheatstone's bridge for very accurate measurements have been devised by H. L. Callendar and by Callendar and E. H. Griffiths (see G. M. Clark, the Electrician, 38, p. 747). A useful bridge method for measurement of low resistances has been given by R. T. Housman (the Electrician, 40, p. 300, 1897). These and numerous modifications of the Wheatstone's bridge will be found described in J. A. Fleming's Handbook for the Electrical Laboratory and Testing-' Room, vol. i. (1903).

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WHEEL (0. Eng. hweol, hiveohl, &c, cognate with Icel. kjdl, Dan. hiul, cVc; the Indo-European root is seen in Sanskrit chakrd, Gr. ki'kXos, circle, whence "cycle"), a circular frame or solid disk revolving on an axis, of which the function is to transmit or to modify motion. For the mechanical attributes and power of the wheel and for the modification of the lever, known as the " wheel and axis," and of the mechanical powers, see Mechanics. The most familiar type of the wheel is of course that used in every type of vehicle, but it-forms an essential part of nearly every kind of mechanism or machinery. Vehicular wheels in the earliest times were circular disks either cut out of solid pieces of wood, or formed of separate planks of wood fastened together and then cut into a circular shape. Such may be still seen in use among primitive peoples to-day, especially where the tracks, if any exist, are of the roughest description, and travelling is heavy. The ordinary wheel consists of the nave (O. Eng. nafu, cf. Ger. Nabe, allied with "navel"), the central portion or hub, through which the axle passes, the spokes, the radial bars inserted in the nave and reaching to the peripheral rim, the felloe or felly (0. Eng. felge, Ger. Felge, properly that which fitted together, Teut. felhan, to fit together). From the monuments we see that the ancient Egyptian and Assyrian chariots had usually six spokes; the Greek and Roman wheels from four to eight. (See further Carriage and Chariot; also Tire; and articles on Bicycle; Tricycle; and Motor Vehicles.)

WHEEL, BREAKING ON THE, a form of torture and execution formerly in use, especially in France and Germany. It is said to have been first used in the latter country, where the victim was placed on a cart-wheel and his limbs stretched out along the spokes. The wheel was made to slowly revolve, and the man's bones broken with blows of an iron bar. Sometimes it was mercifully ordered that the executioner should strike the criminal on chest and stomach, blows known as coups de grdce, which at once ended the torture, and in France he was usually strangled after the second or third blow. A wheel was not always used

In some countries it was upon a frame shaped like St Andrew's Cross that the sufferer was stretched. The punishment was abolished in France at the Revolution. It was employed in Germany as late as 1827. A murderer was broken on the row or wheel at Edinburgh in 1604, and two of the assassins of the regent Lennox thus suffered death.

WHEELER, JOSEPH (1836-1906), American soldier, was born at Augusta, Georgia, in 1836, and entered the United States cavalry from West Point in 1850. Within two years the Civil War broke out, and Wheeler, as a Southerner, resigned to enter the Confederate service. In a short time he became colonel of the 10th Alabama Infantry, with which he took part in the desultory operations of 1861 in Kentucky and Tennessee. He commanded a brigade at the battle of Shiloh, but soon afterwards he returned to the cavalry arm in which he won a reputation second only to Stuart's. After the action of Perryville he was promoted brigadier-general, and in January 1863 major-general. Thence- forward throughout the campaigns of Chickamauga, Chattanooga and Atlanta he commanded the cavalry of the Confederate army in the West, and when Hood embarked upon the Tennessee expedition, he left Wheeler's cavalry to harass Sherman's army during the " March to the Sea." In the closing operations of ■the war, having now the rank of lieutenant-general, he com- manded the cavalry of Joseph Johnston's weak army in North Carolina, and was included in its surrender. After this he became a lawyer and a cotton placer and in 1882ˆ83 and i88s-iooo«was a representative in Congress. At the outbreak of the Spanish- American War in 1898, President M'Kinley, in pursuance of the policy of welding the North and the South, commissioned two ex-Confederate generals — Wheeler and Fitzhugh Lee — as'major-generals of United States volunteers, and in this capacity Wheeler was placed in command of the cavalry division of Shatter's army in Cuba. He commanded in the actions of Guasimas and San Juan, was afterwards sent to the Philippines in command of a brigade, and in 1900 was commissioned a brigadier-general in the regular army. Shortly afterwards he retired. General Wheeler died on the 23th of January 1906.

WHEELER, WILLIAM ALMON (1819-1887), vice-president of the United States from 1877 to 1881, was born at Malone, New York, on the 30th of June 1819. He studied at the university of Vermont for two years (1833-1835), and in 1845 was admitted to the bar. First as a Whig, and then, after 1856, as a Republican, he was prominent for many years in state and national politics. He was a member of the state Assembly in 1849-ˆ50, a member and president pro tempore of the state Senate in 1858-1859, and a member of the national House of Representatives in 1861-1863, and again from 1869 until 1877. He was the author of the so-called " Wheeler Compromise," by which the difficulties between contending political factions in Louisiana were adjusted in 1875.

Nominated for vice-president by the Republicans in 1876 on the ticket with President Hayes, he was installed in office through the decision of the Electoral Commission, and at the end of his term he retired from public life. He died at Malone on the 4th of June 1887.

WHEELING, a city and the county-seat of Ohio county, West Virginia, U.S.A., on the east bank of the Ohio river, at the mouth of Wheeling Creek, 66 m. (by rail) S.W. of Pittsburg. Pop. (1890) 34,522; (1900) 38,878, of whom 1066 were negroes, and 5461 were foreign-born, including 3106 Germans and 876 Irish; (1910, census) 41,641. Area, 3-2 sq. m. Wheeling is served by the Baltimore & Ohio, the Pennsylvania and the Wheeling & Lake Erie railways, by the belt line of the Wheeling Terminal Company and by interurban electric lines. Wheeling is the largest city in West Virginia, and commercially the most important place on the Ohio river between Pittsburg and Cincinnati. It is built on a narrow strip of bottom land, between the river and steep hills, at an elevation of about 640 ft. above tidewater. Between the mainland and Wheeling (formerly Zane's) Island, which forms a part of the city, there are a suspen- sion-bridge, which has a span of 1010 ft., and a steel bridge, and from the island across the back river channel there are two bridges to the Ohio shore, one from the middle of the island to

Bridgeport on which the Old National Road crosses the river, and the other from the northern end of the island to Martin's Ferry, Ohio. A fifth bridge connects Wheeling with Bellaire, Ohio. Wheeling has a public library, containing 23,261 volumes in 1909. Near the city is the Mount de Chantal Academy (Roman Catholic) for girls, and in Wheeling is Linsly Institute, a secondary school for boys. The principal public buildings are the Custom-House and Post-Office, the City Hall, a High School, a Y.M.C.A. building and a Scottish Rite Cathedral. In the city are a City Hospital (private, 1890) and the Wheeling Hospital (under the Sisters of St Joseph, 1853). On the National Road there is a monument to Henry Clay; and in the City Hall Square is a Soldiers' Monument. By reason of its situation on the Ohio river Wheeling is an important shipping and distributing centre, and it has various important manufacturing interests. Its factory products were valued in r905 at $23,297,475. The chief industry is the manufacture of iron and steel, which in 1905 gave employ- ment to more than 34% of the city's wage-earners, and yielded more than 46 % of the total value of its products. The manu- facture of nails, begun here in 1849, was for many years of great importance. Other products in r905 were slaughtering and meat products, $1,812,348; malt liquors, $1,541,185; tobacco and cigars (especially stogies), $1,16ˆ594; foundry and machine- shop products, $709,376; lumber and planing mill products, $685,861; pickles, preserves and sauces, $676,437; glass, $508,145; and pottery. Glass was first manufactured here in 1821. Coal is found in abundance in the surrounding

region, and also natural gas, which is much used as fuel in the manufacture of iron, steel and glass.

The first settlement here was made in 1770 by Colonel Ebenezer Zane (r747-i8n), and his brothers, Jonathan (one of the founders of Zanesville, Ohio) and Silas, who in the autumn of that year made their way to this point from their home in Virginia, and took possession of claims at the mouth of Wheeling Creek. Other settlers came soon afterward, and in 1774 a strong stockade fort was erected within the present limits of Wheeling — at the top of Main Street hill. Until 1776 this fort was called Fort Fincastle in honour of Lord Dunmore, Viscount Fincastle, governor of Virginia from 1771 to t776. After 1776 it was called Fort Henry, in honour of Patrick Henry. During this period the Indians were hostile, and the settlers were frequently forced to take refuge in the stockade. On the 1st of September 1777 the fort was attacked by a large force of Indians and 15 of the whites were killed; during this attack, when the ammunition of the defenders had failed, Elizabeth Zane {c. 1759-1847), a sister of Ebenezer, brought under fire a keg of powder from a house sixty yards from the fort. In September 1782 the fort was unsuccessfully besieged for two days by a force of about 40 British regular soldiers and about 250 Indians. The town was laid out by Colonel Zane in r793, was incorporated in 1806, and was chartered as a city in 1836. It was designated as the capital of the " restored government of Virginia " in 1861, after the secession of Virginia at the beginning of the Civil War, and was the capital of West Virginia from 1863 to 1869, and again from 1875 until May 1885. The name " Wheeling " is a corrup- tion of an Indian word, of uncertain meaning, sometimes translated as " the place of the head."

WHETHAMSTEDE, JOHN (d. 1465), English abbot, was a son of Hugh Bostock, and was born at Wheathampstead in Hertfordshire, owing his name, the Latin form of which is Frumenlarius, to this circumstance. In early life he entered St Albans Abbey and in 1420 he was chosen abbot of this house. In 1423 he attended a council at Pavia, but in England his time was mainly occupied with lawsuits, several of which he carried on to defend the property and enforce the rights of the abbey. In 1440 he resigned his post, but in I45r, on the death of his suc- cessor, John Stoke, he became abbot for the second time. He died on the 20th of January 1465, and his tomb may still be seen in the abbey church. Whethamstede was an energetic and successful abbot. He greatly improved the buildings at St Albans, which suffered somewhat during his later years owing to the wars of the roses; he also did some building at Gloucester

College, Oxford, with which he was connected. He was a friend of Duke Humphrey of Gloucester, whom he helped to gather to- gether his famous collection of books, and was himself a writer, his works including Granarium de viris illustrious; Pal-earium poetarum; and Super Valerium in Augustinum de Anchona.

Whethamstede's Chronicle, or the fegistrum abbatiae Johannis Whethamstede, is a register compiled soon after the abbot's death, which tells the events of his second abbacy. It has been edited by H. T. Riley, and is in vol. i. of the Registra quorundam, abbatum monasterii S. Albani (London, 1872). The events of his first abbacy are narrated in the Annates monasterii S. Albani of John Amundes- ham, also edited by H. T. Riley (London, 1870-1871).

WHETSTONE, GEORGE (i544?is87?), English dramatist and author, was the third son of Robert Whetstone (d, 1557). A member of a wealthy family that owned the manor of Walcot at Bernack, near Stamford, he appears to have inherited a small patrimony which he speedily dissipated, and he com plains bitterly of the failure of a lawsuit to recover an inheritance of which he had been unjustly deprived. In 1572 he joined an English regiment on active service in the Low Countries, where he met George Gascoigne and Thomas Churchyard. Gascoigne was his guest near Stamford when he died in 1577, and Whetstone commemorated his friend in a long elegy. His first volume, the Rocke of Regarde (1576), consisted of tales in prose and verse adapted from the Italian, and in 1578 he published The right excellent and famous Historye of Promos and Cassandra, a play in two parts, drawn from the eighty-fifth novel of Giraldi Cinthio's Hecatomithi. To this he wrote an interesting preface addressed to William Fleetwood, recorder of London, with whom he claimed kinship, in which he criticizes the contemporary drama. In 1582 he published his Heptameron of Civill Discourses, a collection of tales which includes The Rare Historic- of Promos and Cassandra. From this prose version apparently Shakespeare drew the plot of Measure for Measure, though he was doubtless familiar with the story in its earlier dramatic form. Whetstone accompanied Sir Humphrey Gilbert on his expedition in 1578- 1579, and the next year found him in Italy. The Puritan spirit was now abroad in England, and Whetstone followed its dictates in his prose tract A Mir our for Magestrates (15S4), which in a second edition was called A Touchstone for the Time. Whetstone did not abuse the stage as some Puritan writers did, but he objected to the performance of plays on Sundays. In 1585 he returned to the army in Holland, and he was present at the battle of Zutphen. His other works are a collection of military anecdotes entitled The Honourable Reputation of a Souldier (1585); a political tract, the English Myrror (1586), numerous elegies on distinguished persons, and The Censure of a Loyall Subject (1587). No information about Whetstone is available after

the publication of this last book, and it is conjectured that he died shortly afterwards.

WHEWELL, WILLIAM (1794-1866), British philosopher and historian of science, was born on the 24th of May 1794 at Lan- caster. His father, a carpenter, wished him to follow his trade, but his success in mathematics at Lancaster and Heversham grammar-schools enabled him to proceed with an exhibition to Trinity, Cambridge (1812). He was second wrangler in 1816, became fellow and tutor of his college, and, in 1841, succeeded Dr Wordsworth as master. He was professor of mineralogy from 1S28 to 1832, and of moral philosophy (then called " moral theology and casuistical divinity") from 1838 to 1855. He died on the 6th of March 1866 from the effects of a fall from his horse.

Whewell was prominent not only in scientific research and philosophy, but also in university and college administration. His first work, An Elementary Treatise on Mechanics (1819), co-operated with those of Peacock and Herschel in reforming the Cambridge method of mathematical teaching; to him in large measure was due the recognition of the moral and natural sciences as an integral part of the Cambridge curriculum (1850). In general, however, especially in later years, he opposed reform: he defended the tutorial system, and in a controversy with Thirlwall (1834) opposed the admission of Dissenters; he upheld the clerical fellowship system, the privileged class of

In 1826 and 1828, Whewell was engaged with Airy in con- ducting experiments in Dolcoath mine, Cornwall, in order to determine the density of the earth. Their united labours were unsuccessful, and Whewell did little more in the way of ex- perimental science. He was the author, however, of an Essay on Mineralogical Classification, published in 1828, and contributed various memoirs on the tides to the Philosophical Transactions of the Royal Society between 1833 and 1850. But it is on his History and Philosophy of the Sciences that his claim to an enduring reputation mainly rests. The History of ike Inductive Sciences, from the Earliest to the Present Time appeared originally in 1837. Whewell's wide, if superficial, acquaintance with various branches of science enabled him to write a comprehensive account of their development, which is still of the greatest value. In his own opinion, the History was to be regarded as an intro- duction to the Philosophy of the Inductive Sciences (1840). The latter treatise ' analyses the method exemplified in the formation of ideas, in the new inductions of science, and in the applications and system a tization of these inductions all exhibited by the History in the process of development

In the Philosophy, Whewell endeavours to follow Bacon's plan for

discovery of an effectual art of discovery. He examines ideas (" explication of conceptions ") and by the " colligation of facts endeavours to unite these ideas to the facts and so construct science. But no art of discovery, such as Bacon anticipated, follows, for " invention, sagacity, genius " are needed at each step. He analyses induction into three steps: — (1) the selection of the (fundamental) idea, such as space, number, cause or likeness; (2) the formation of the conception, or more special modification of those ideas, as a circle, a uniform force, &c. ; and (3) the determination of magni- tudes. Upon these follow special methods of induction applicable to quantity, viz., the method of curves, the method of means, the method of least squares and the method of residues, and special methods depending on resemblance (to which the transition is made through the law of continuity), viz. the method of gradation and the method of natural classification.

Here, as in his ethical doctrine (see Ethics), Whewell was moved by opposition to contemporary English empiricism. Following Kant, he asserted against J. S. Mill the a priori nature of necessary truth, and by his rules for the construction of conceptions he dispensed with the inductive methods of Mill.

*Between 1835 and 1861 Whewell was the author of various works on the philosophy of morals and politics, the chief of which, Elements of Morality, including Polity, was published in 1845. The peculiarity of this work — written, of course, from what is known as the in- tuitional point of view — is its fivefold division of the springs of action and of their objects, of the primary and universal rights of man (personal security, property, contract, family rights and govern- ment), and of the cardinal virtues (benevolence, justice, truth, purity and order). Among Whewell's other works — too numerous to mention — reference must be made to writings popular in their day, such as the Bridgewater Treatise on Astronomy (1833), and- the essay. Of the Plurality of Worlds (1854), * n which he argued against the pro- bability of planetary life, and also to the' Platonic Dialogues for English Readers (1859-1861) , to the Lectures on the History of Moral Philosophy in England (1852), to the essay, Of a Liberal Education in General, with particular reference to the Leading Studies of the University of Cambridge {1845), to the important edition and abridged translation of Grctius, De jure belli et pads (1853), and to the edition of the Mathematical Works of Isaac Barrow (i860).*

Full bibliographical details are given by Isaac Todhunter, W. Whewell: an Account of his Writings (2 vols., 1876). See also Life of W. Whewell, by Mrs Stair Douglas (1881).

WHICHCOTE (or Whitciicote), BENJAMIN (1600-1683)-, English divine and philosopher, was born at Whichcote Hall, Stoke, Shropshire, and

educated at Emmanuel College, Cam- bridge, where he became fellow in 1633. He was ordained in 1636, and appointed shortly afterwards to be Sunday afternoon

1 Afterwards broken up into three parts published separately: (1) the History of Scientific Ideas (1858), substantially a reproduction erf the first part of the Philosophy; (2) the Novum organum renovatum (1858), containing the second part of the same>u;ork, but without the historical review of opinions, which was issued with large additions as (3) the Philosophy of Discovery .(i860).

lecturer at Trinity Church, Cambridge. In 1643 he received the rectory of North Cadbury, Somerset, and in the following year he was appointed provost of King's College, Cambridge, in place of Samuel Collins who was ejected. On resigning North Cadbury in 1649 he became rector of Milton, Cambridgeshire. In 1650 he was vice-chancellor of Cambridge University. Cromwell in 16$$ consulted him upon the question of extending tolerance to the Jews. His Puritan views lost him the provostship of King's College at the Restoration of 1660, but on complying with the Act of Uniformity he was appointed to the living of St Anne's, Blackfriars, London. In 1668 he became vicar of St Lawrence Jewry, London. He is regarded as the founder of the important school of Cambridge Platonists. His works, chiefly theological treatises and sermons, were all published posthum- ously. He died in May 1683.

See John Tulloch, Rational Theology, ii. 59-84 (1874) ; and Masters in English Theology, edited by A. Barry (1877).

WHICKHAM, an urban district in the Chester-le- Street parliamentary division of Durham, England, 4 m. S.W. of Newcastle-upon-Tyne, near the river Derwent. Pop. (1901) 12,852. There is a station (Swalwcll) on a branch of the North- Eastern railway. The church cf St Mary has Norman and Transitional portions, and in the neighbourhood is the mansion of Gibside, of the 17th century. The demesne borders the Der- went, and is of great beauty, part being laid out in formal gardens and straight avenues. It contains a lofty Doric column and a detached chapel and banqueting hall, and in the vicinity are picturesque fragments of the monastic chapel of Friarside, and of the manor house of Hollinside. Whickham is one of the centres of a coal-mining district, the mines employing the majority of the industrial population; but there are also iron, steel, and chemical works.

WHIG AND TORY, the names associated with two opposing political parties in England. The origin of :(Whig " has been much controverted; it has been associated with the Scots for " whey," as implying a taunt against the " sour-milk " faces of the western Lowlanders; another theory is that it represented the initials of the Scots Covenanters' motto, " We hope in God " ; another derives it from the Scots word " whiggam," used by peasants in driving their horses. It was, however, a form of the Scots Gaelic term used to describe cattle and horse thieves, and transferred to the adherents of the Presbyterian cause in Scot- land. " Tory " is derived from the Irish Tar a Ri, " Come, oh king! " associated with the creed of the Irish native levies enlisted in the civil wars on behalf of the loyalist cause; the outlaws who fought for James in Ireland after the revolution were similarly nicknamed Rapparees or Tories.

Parliamentary parties, as such, came into existence in England as soon as parliament achieved or aimed at predominance in the state. In 1641 , shortly after the meeting of the Long Parliament, they were divided on the question of church reform, passing, as soon as political questions were involved, into Cavaliers and Roundheads. After the expulsion of the Cavaliers in 1642 and 1643 the Houses were divided into a peace party and a war party, and these in 1643 took the shape of Presbyterians and Independents. After the Restoration there was a country party and a court party, and to these the names of Whig and Tory were applied in r679, in the heat of the struggle which preceded the meeting of the first short parliament of Charles II. The words were nicknames given by the opponents of each party. To call a man a Whig was to compare him with the Presbyterian rebels of the west of Scotland. To call a man a Tory was to compare him with the Papist outlaws of Ireland. In fact, at this time the Whigs were maintainers of parliamentary power over the crown and of toleration for Dissenters, the Tories maintainers of the hereditary indefeasible rights of the wearer of the crown and of the refusal of toleration to Dissenters. The relation between the parties was further qualified by the fact that the heir to the crown was a Roman Catholic, whose claim to succeed was defended by the Tories and assailed by the Whigs.

The persistency of the names of the two parties is mainly owing to their essential unmeaningness. As new questions

arose, the names of the old parties were retained, though the objects of contention were no longer the same. The Revolution of 1688-89 made it impossible for the Tories to retain their old attitude of attachment to the hereditary right of the occupant of the throne, with the exception of the extreme wing of the party, which remained Jacobite. They still, however, continued, though accepting the Toleration Act, to oppose the offering of

further favours to Dissenters. In Anne's reign, after the war with France had gone on for some time, they supported a peace policy, whilst the Whigs advocated a continuance of the war. On the whole, during the last years of the 17th and the first years of the 18th century the Whigs may be regarded as the party of the great landowners, and of the merchants and tradesmen, the Tories as the party of the smaller landowners and the country clergy. The Whigs established, through their hold upon the boroughs under the influence of the great landowners, a firm government, which could keep in check, and at last practically set aside, the power of the crown. The Tories, distrusting the authority of the ministerial government, and fearing a new despotism based on parliamentary corruption, became, especially after Bolingbroke's return from exile, almost democratic in their views and in their demands for the purification of the existing system.

With the accession of George III. Toryism took a new form. The struggle about the Dissenters was now a thing of the past, and the king was accepted as a leader in carrying on the attack against the power of the great Whig families. The attack was the easier because the Whig families had split into factions. For some time the dividing line between Whigs and Tories was this: the Tories asserted that the king had a right to choose his ministers and control their policy, subject to the necessity of securing a majority of the House of Commons, whilst the Whigs thought that the-choice should lie with leading members of parliament, and that the king should have no controlling power. The Whig view appears to resemble that subsequently adopted; but in the middle of the 18th century the corruption which prevailed rendered the analogy worthless, and the real conflict was between the corrupt influence of the crown and the influence of a clique of great landowners resting on their possession of electoral power through the rotten boroughs. In 1770 the king had his way and established Lord North at the treasury as his nominee. The Whigs, deprived of power, improved their position by the loss of one great instrument of corruption; but they were weakened by the establishment of two distinct currents of opinion in their own ranks. The main body under Rocking- ham was influenced by Burke to demand practical reforms, but set its face against any popular changes in the constitution. The Whigs who followed Chatham wished to place parliament on a more popular basis by the reform of the House of Commons. When in 1783 Chatham's son Pitt became prime minister, the Tory party took; a new start. It retained the Tory principle of reliance on the crown, and joined to it Chatham's principle of reliance on the people as opposed to the great Whig families. It also supported Pitt in practical reforms.

All this was changed by the French Revolution. In opposition to the new democracy, the Tories coalesced with a section of the Whig families, the representatives of which entered the ministry in 1794. From this time till

1822, in spite of men like Pitt, and the personal influence of Tory leaders who supported moderate reform, Toryism came to be popularly identified with a desire to retain the existing state of things, however full of abuses it might be. When Canning and Peel entered the ministry in 1822, a gradual change took place, and a tendency to practical reform manifested itself. The refusal of Wellington to listen to any proposal for altering the constitution of the House of Com- mons threw power once more into the hands of the Whigs in 1830. Shortly afterwards the name Tory gave place to that of Conserva- tive (q.v.), though it was cherished by those Conservatives who wished to assert their power of originating a definite policy, and who disliked to be branded with a purely negative appellation, and it was also retained as a terra of opprobrium by the Liberals for those whom they regarded as old-fashioned opponents of

reform. The name of Whig was replaced by that of Liberal, being frequently, however, assigned to the less progressive por- tion of the party, the " moderate Liberals," or even to half-and- half Conservatives, as a term more or less of reproach. It ceased to be a name accepted by any definite English political section. WHIG PARTY, in America, a political party prominent from about 1824 to 1854. 1 The first national party system of the United States came to an end during the second war with Great Britain. The destruction of the Federalist party (q.v.) through a series of suicidal acts which began with the Alien and Sedition laws of 1798, and closed with the Hartford Convention of 1814- 1815, left the Jeffersonian Republican (Democratic) party in undisputed control. When, after Waterloo, Napoleon ceased to disturb the relations of the new world with the old, the American people, freed for the first time from all trace of political depend- ence on Europe, were at liberty to shape their public policy in their own way. During the period of rapid internal develop- ment which followed after 1815, the all-inclusive Republican party began gradually to disintegrate and a new party system was evolved, each member of which was the representative of such groups of ideas and interests, class and local, as required the support of a separate party. This work of disintegration and rebuilding proceeded so slowly that for more than a decade after the Peace of Ghent each new party, disguised during the early stages of organization as the personal following of a parti- cular leader or group of leaders, kept on calling itself Republican. Even during the sharply contested election of 1824 the rival partisans were known as Jackson, Crawford and Calhoun, or as Clay and Adams Republicans. (See Democratic Pasty.) It was not until late in the administration of John Quincy Adams, 1825 to 1829, that the supporters of the president and

Henry Clay, the secretary of state, were first recognized as a distinct party and began to be called by the accurately descriptive term National Republicans. But after the party had become con- solidated, in the passionate campaign of 1828, and later in oppos- ing the measures of President Jackson, it adopted in 1834 the name Whig, which, through memorable associations both British and American, served as a protest against executive encroach- ments, and thus facilitated union with other parties and factions, such as the Anti-Masonic party (q.v.), that had been alienated by the high-handed measures of President Jackson. The new name announced not the birth but the maturity of the party, and the definite establishment of its principles and general lines of policy. The ends for which the Whigs laboured were: first, to maintain the integrity of the Union; second, to make the Union thoroughly national; third, to maintain the republican character of the Union; fourth, while utilizing to the full the inheritance from and through Europe, to develop a distinctly American type of civilization; fifth, to propagate abroad by peaceful means American ideas and institutions. Among the policies or means which the Whigs used in order to realize their principles were the broad construction of those provisions of the Federal Constitution which confer powers on the national government; protective tariffs; comprehensive schemes of internal improvements under the direction and at the cost of the national government; support of the Bank of the United States; resistance to many acts of President Jackson as encroachments by the executive on the legislative branch of the government and therefore hostile to republicanism; coalition with other parties in order to promote national as opposed to partisan ends; resort to compromise in order to allay sectional irritation and compose sectional differ- ences; and cordial and yet prudent expression of sympathy with the liberal movement in other lands.

The activity of the Whig party, reckoned from the election of 1824, when its organization began, to the repeal of the Missouri Compromise in 1854, covers thirty years. In two respects, namely, the rise of the new radical democracy under Andrew Jackson, and the growth of sectionalism over the slavery issue, this period was highly critical. In view of these events the most

1 Immediately before the War of Independence and during the war those who favoured the colonial cause and independence were called " Whigs."

difficult task of the Whigs, clearly discerned and heartily accepted by them, under the patriotic and conservative leadership of Henry Clay and Daniel Webster, was to moderate and enlighten, rather than antagonize, the new democracy; and — what proved to be beyond their powers — to overcome the disrupting influence of the slavery issue.

The inaugural address and the messages to Congress of Presi- dent J. Q. Adams set forth clearly the nationalizing, broad- construction programme of the new party. But his supporters in Congress, imperfectly organized and facing a powerful opposi- tion, accomplished very little in the way of legislation. The election of 1828 gave to Andrew Jackson the presidency, and to the people, in a higher degree than ever before, the control of the government. The president's attack upon the Bank, the intro- duction of the modern " spoils system " into the Federal civil service, the unprecedented use of the veto power, Jackson's assumption of powers which his opponents deemed unconstitu- tional, and his personal hostility towards Clay, who had succeeded Adams in the leadership of the party, brought about, under Whig leadership, a coalition of opposition parties which influenced deeply and permanently the character, policy and fortunes of the Whig party. It became the champion of the Bank, of the right of Congress, and of the older and purer form of the civil service. Moreover, as a means of strengthening the bond with their new allies, the Whigs learned to practise a tolerance towards the opinions and even the principles of their associates which is exceptional in the history of American political parties. In strict accord with their own principles, however, the Whigs supported the president during the Nullification Controversy (see Nullifica- tion). The renown of Webster as the foremost expositor of the national theory of the Union rests largely on his speeches during this controversy, in particular on his celebrated reply to Senator R. Y. Haync of South Carolina. Nevertheless, after vindicating the rights of the Union, most of the Whigs supported Clay in arranging the compromise tariff of 1832 which enabled the Nullifiers to retreat without acknowledging discomfiture. The majority of the Northern Whigs, with the entire Southern membership of the party, disapproved the propaganda of the Abolitionists on the ground of its tendency to endanger the Union, and many from a like motive voted for the " Gag Rules " of 1835-1844 (see Adams, J. Q.), which in spirit, if not in letter, violated the constitutional right of petition. In the election of 1832 Clay was the nominee of the party for the presidency, but in 1836 and 1840, purely on grounds of expediency, the Whig conventions nominated General W. H. Harrison. During the administration of Martin Van Buren the Whigs tried with success to make party capital out of the panic of 1837, which they ascribed to Jackson, and out of the long depression that followed, for which they held Van Buren responsible. The election of General Harrison in the "log cabin and hard cider" campaign of 1840 proved a fruitless victory: the early death of the presi- dent and the anti-Whig politics of his successor, John Tyler (q.v.), whom the Whigs had imprudently chosen as vice-president, shattered their legislative programme.

In 1844 Clay was again the Whig candidate, and the annexa- tion of Texas, involving the risk of a war with Mexico, was the leading issue. The

Whigs opposed annexation; and the prospect of success seemed bright, until Clay, in the effort to remove Southern misapprehensions, wrote that he " would he glad " at some future time to see Texas annexed if it could be done " without dishonour, without war, with the common consent of the tlnion, and upon just and fair terms." It is widely held that this letter turned against Clay the anti-slavery element and lost him the prefidency. The triumph of Polk in 1844 was followed by the annexation of Texas and by war with Mexico. The Whigs opposed the war, but on patriotic grounds voted supplies for its prosecution. The acquisition of Texas, and the assured prospect of a great territorial enlargement, at the cost of Mexico, brought to the front the question of slavery in the new domain. The agitation that followed continued through the presidential election of 1848 (in which the Whigs elected General Zachary Taylor), and did not subside until the passage of" the

" Compromise Measures of 1850 " (q.v:). To its authors this compromise seemed essential to the preservation of the Union; but it led directly to the destruction of the Whig party. In the North, where the inhumane Fugitive Slave Law grew daily more odious, the adherence to the Compromise on which Clay and Webster insisted weakened the party fatally. The alternative, namely, a committal of the party to the repeal of the obnoxious law, would have driven the Southern Whigs into the camp of the Democrats, leaving the Northern Whigs a sectional party powerless to resist the disruption of the Union. The only weapons that the Whigs knew how to use in defence of the Fugitive Slave Law were appeals to patriotism and sectional bar- gaining, and these could be employed only so long as the party remained intact.

The National Whig Convention of r852, the last that repre- sented the party in its entirety, gave to the Northern Whigs the naming of the candidate— General Winfield Scott — who was defeated in the ensuing election, and to the Southern the framing of the platform with its " finality " plank, which, as revised by Webster, read as follows: " That the series of acts of the Thirty- second Congress, the act known as the Fugitive Slave Law in- cluded, are received and acquiesced in by the Whig party of the United States as a settlement in principle and substance of the dangerous and exciting questions which they embrace . . . and we will maintain this system as essential to the nationality of the Whig party and the integrity of the Union."

Two years later the Repeal of the Missouri Compromise by the Kansas-

Nebraska Act demonstrated that " this system " could not be maintained, and that in committing the Whig party to the policy of its maintenance the Convention of 1852 had signed the death-warrant of the party.

Among the services of the Whigs the first in importance are these: During the thirty critical years in which under the leadership of Clay and Webster they maintained the national view of the nature of the Union, the Whigs contributed more than all their rivals to impress this view upon the hearts and minds of the people. During this same extended period as peace-makers between the sections they kept North and South together until the North had become strong enough to uphold by force the integrity of the Union. And lastly they bequeathed to the Re- publican party the principles on which, and the leader, Abraham Lincoln, through whom the endangered Union was finally saved.

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WHIP, in general, an instrument for striking, usually consisting of a handle of a flexible nature with a lash attached (see Whip- ping, below). In English parliamentary usage, a " whip " is a member (or members) chosen by the leader or leaders of a political party for the special duty of securing the attendance of the other members of that party on all necessary

occasions, the term being abbreviated from the whipper-in of a hunt. The name is also given to the summons urging members of the party to attend. Whips are, of course, always members of

parliament, and for the party in power {i.e. the government) their services are very essential, seeing that the fate of an im- portant measure, or even the existence of the government itself, may depend upon the result of a division in the House. Where the majority of the party in power is not large it is very necessary that there should always be at hand a sufficient number of its supporters to make up a majority, and without the assistance of the whips it would be impossible to secure this. The chief whip of the government holds the office of patronage secretary to the treasury, so called because when offices were freely dis- tributed to secure the support of members, it was his chief duty to dispose of the patronage to the best advantage of his party. He is still the channel through which such patronage as is left to the prime minister is dispensed. He is assisted by three junior whips, who are officially appointed as junior lords of the treasury; their salaries are £1000 a year each, while the patronage secretary has a salary of £2000. The parties not in office have whips who are unpaid. Attendance of members is primarily secured by lithographed notices sent by the whips to their following, the urgency or importance of the notice being indicated by the number of lines underscoring the notice, a four-line whip usually signifying the extremest urgency. The whips also arrange for the " pairing " of such of the members of their party who desire to' be absent with those members of the opposition party who also desire to be absent. The chief whips of either party arrange in consultation with each other the leading speakers in an important debate, and also its length, and give the list of speakers to the speaker or chairman, who usually falls in with the arrange- ment. They take no part in debate themselves, but are con- stantly present in the House during its sittings, keeping a finger, as it were, upon the pulse of the House, and constantly informing their leader as to the state of the House. When any division is regarded as a strictly party one, the whips act as tellers in the division.

An interesting account of the office of whip is given in A. L. Lowell's Government of England (1908), vol. i. c. xxv.

WHIPPING, or Flogging, a method of corporal punishment which in one form or another has beer, used in all ages and all lands (see Bastinado, Knout, Cat-o'-Nine-Tails). . In ancient Rome a citizen could not be scourged, it being considered an infamous punishment. Slaves were beaten with rods. Similarly in early medieval England the whip could not be used on the freeman, but wa.s reserved for the villein. The Anglo-Saxons whipped prisoners with a three-corded knotted lash. It was not uncommon for mistresses to whip or have their servants whipped to death. William of

Malmesbury relates that as a child King Jithelred was flogged with candles by his mother, who had no handier weapon, until he was insensible with pain. During the Saxon period whipping was the ordinary punishment for offences, great or small. Payments for whipping figure largely in. municipal and parish accounts from an early date. The aboli- tion of the monasteries, where the poor had been sure of free meals, led during the 16th century to an increase of vagrancy, at which the Statute of Labourers (1350) and its provisions as to whipping had been early aimed. In the reign of Henry VIII. was passed (1530) the famous Whipping Act, directing vagrants to be carried to some market town or other place " and there tied to the end of a cart naked and beaten with whips throughout such market town till the body shall be bloody." In the 39th year of Elizabeth a new act was passed by which the offender was to be stripped to the waist, not quite naked. It was under this statute that whipping-posts were substituted for the cart. Many of these posts were combined with stocks, as that at Waltham Abbey, which bears date " 1598." It is of oak, 5 ft. g in. high, with iron clasps for the hands when used for whipping, and for the feet when used as stocks. Fourpence was the old charge for whipping male and female rogues. At quarter sessions in Devonshire at Easter 1598 it was ordered that the mothers of bastard children should be whipped; the reputed fathers suffering a like punishment. In the west of England in 1684, " certain Scotch pedlars and petty chapmen being in the habit of selling their goods to the greate damage and hindrance

of shoppe-keepers," the court ordered them to be stripped naked and whipped. The flogging of women was common. Judge Jeffreys, in so sentencing a female prisoner, is reported to have exclaimed, " Hangman, I charge you to pay particular attention to this lady. Scourge her soundly, man: scourge her till her blood runs down! It is Christmas: a cold time for madam to strip. See that you warm her shoulders." Lunaticsˆ too, were whipped, for in the Constable's Accounts of Great Staughton, Hunts, occurs the entry, " 1690-1, Paid in charges taking up a distracted woman, watching her and whipping her next day — 8/6d." A still more remarkable entry is " 1710-1, Pd. Thomas Hawkins tor whipping two people yt had smallpox — 8d." In 1764 the Public Ledger states that a woman who is described as " an old offender " was taken from the Clerkenwell Bridewell to Enfield and there publicly whipped at the cart's tail by the common hangman for cutting wood in Enfield Chase. A statute of 1 791 abolished the whipping of females.

WHISKER, a word chiefly used in the plural in the sense of the hair worn

by a man on the cheeks as opposed to the beard on the chin and the moustache on the upper lip (see Beard). It is also applied to the bristly feelers growing round the mouth of a cat or other animal. The word by derivation means that which " whisks " or " brushes."

WHISKY, or Whiskey, a potable spirit distilled from cereal grains. The name is probably derived from the Celtic uisge- beatha (water of life), which was subsequently contracted to usquebaugh, and still later to whisky (cf. Skeat, Etym. Diet, s.v.). The liquor known as "usquebaugh" in the 17th and 18th centuries was not, however, of the same character as the whisky of modern limes, but was a compound of plain spirit with saffron, nutmegs, sugar and other spices and flavouring matters. Whether the term whisky to denote a plain type of spirit was used concurrently with usquebaugh, or whether the latter name covered both varieties, is not clear. It is certain, however, that an alcoholic liquor, derived mainly from grain, has been prepared for very many centuries in both Ireland and Scotland (see Spirits). There are three main types of whisky, namely, Scotch, Irish and American.

Scotch whiskies may be broadly divided into two main groups, namely (a) pot-still or malt whiskies, and (b) patent-still or grain whiskies; the former are made practically without exception from malted barley only, the latter from a mixture of malted barley and other un malted cereals, chiefly rye, oats and maize (see Spirits), (a) There are four main varieties of Scotch malt whiskies, namely, Highland Malts, Lowland Malts, Campbeltowns and Islays. The Highland Malts are produced (if we except a few distilleries on the islands in the west and north) in the district on the mainland lying north of an imaginary line drawn through Dundee on the east and Greenock on the west. The largest group of distilleries is in the famous Speyside or Glenlivet district.

The Lowland Malts are made south of the imaginary line alluded to. The Campbeltowns are distilled in or near the town of that name at the southern end of the Kin tyre peninsula. The Islays are produced in the island of that name. These different varieties of whisky, although made in much the same way, yet possess distinctive characteristics of flavour. The type of barley employed, the quantity of peat employed in curing the malt, the quality of the water, the manner of carrying out the various distillery processes — particularly that of distillation — the shape and size of the stills, &c, all these are factors which affect the flavour of the final product. The Islays, which, as a rule, are considered to be among the most valuable of Scotch whiskies, possess a very full and peaty flavour together with a strong ethereal bouquet. For this reason they are much used for blending with whiskies of a lighter type. The Highland Malts proper (Speyside type) are less peaty than the Islays, yet possess a full flavour, although many of

them are inclined to be ” elegant ” rather than ” big.” The Lowland Malts, again, are, as a class, less peated than the Highland Malts, and indeed, nowadays, in view of the growing taste for a more neutral class of beverage, there are some Lowland Malt distilleries which dis- pense with the use of peat altogether. Many of the Lowland Malts possess considerable body and flavour, but, on the whole, they are lighter and not so fine as those of the Highland variety. Lowland distillers are now running their spirit at much the same strength as their Highland colleagues, whereas formerly it was the custom to work at a far higher strength. The result is that the difference between the two classes of spirit is not so marked as it was. The Campbeltowns, although in some respects similar to the Islays on the one hand, and the Highland Malts on the other, are somewhat rougher and less elegant than these. They usually possess a full peaty flavour, (b) Patent-still or grain whiskies are, as a class, lighter in flavour and ” body “than the pot-still types. This is due to the fact thai the rectification of these whiskies is carried a good deal further than, is the case with the ” malts.” They are made from a mixture of malted and unmalted cereals, and, as no peat is employed in the curing of the malt, they lack the ” smoky ” flavour of the other varieties. Some controversy has arisen as to whether these patent-still spirits have a right to the name of ” whisky ” or ” Scotch whisky,” but although, no doubt, this controversy is largely due to conflicting trade interests, it has also, in the author’s opinion, been caused by a very general popular misconception as to the true character of these whiskies. The idea that they are true ” silent ” or ” neutral ” spirits — i.e. alcohol and water pure and simple — is quite incorrect. They possess a distinct flavour, which varies at different distilleries, and analysis discloses the fact that they contain very appreciable quantities of the ” secondary ” products which distinguish potable spirits from plain alcohol. Indeed, as a result of an extensive investigation of the question

Composition of Scotch Whiskies.

Note.— The figures below are based on a large number of analyses of typical samples. Cf. Schidrowitz and Kaye, Journal Soc.

Ckem. Ind. (June 1905). Where two figures are given in the same column, they do not indicate extremes, but merely normal variation.

Description.

(Results expressed in grams per 100 litres of absolute alcohol.)

Alcohol.

Total Acid.

Non-volatile Acid.

Esters.

Higher Alcohols.

Aldehydes.

Furfurol.

Highland Malts- New light type . New heavy type Mature light type . Mature heavy type .

Lowland Malts —

Mature …. Campbeltown —

New . .

Mature ….

Islay l

Grain Whiskies —

New

Mature ….

Practically all Scotch whiskies are distilled at about 25 O.P. (about 72 % of alcohol by volume). Prior to stor- age they are reduced to 11 O.P. with water. Mature whiskies con- tain 45 to 60 % of alco- hol according to age, humidity of store, &c. For retail sale, whiskies are reduced to a strength of roughly 17 to 24 U.P.

15 20

j 20-80

15

20-60

20-30 30-80

Trace to 5

25-50

Nil Nil

5-35

Nil

5-20

Nil

5-25

Nil

5-25

50 75

50-100 j

25-50 50-75

50-70 60-120

20-40 25~5″

140 200 150 220

110-180 120-200

180-220 230-250

50-60 60-70

10 20-40

*j .5-50 *

*\ 15-50 *

20-40 30-70

2-10 > 5-15 i

2-5-3

3-5

2-3 2-5-4-5

2-5-4-5 2-3-5

3-8 2-5-7

Trace to 0-75

1 The Islays give similar figures to the Highland Malts except that the Higher Alcohols and Furfurol are slightly higher.

by the author, it has been shown that the relative proportion of " secondary " products in Highland Malt, Lowland Malt and " grain " whiskies respectively, is roughly as 3:2:1. The figures in the foregoing table illustrate, as far as we are at present able to determine them, the general composition of the various types of Scotch whiskies referred to.

The character of Scotch whisky is much influenced by the manner in which it is matured. Chief among the factors in this connexion is the nature of the cask employed. The main varieties are plain wood, sherry and refill casks. Technically the term " plain " wood is applied to a cask made from seasoned oak which has contained no other liquor than whisky. Similarly the term " sherry " wood is as a rule only applied to a cask the wood of which has become impregnated with sherry by con- tact with that wine, and which has not been used in any other manner. A sherry cask which has been filled with whisky, then emptied and " refilled ". with whisky, is known as a " refill." Brandy and Madeira "wood" are also occasionally employed. The nature of the atmospheric conditions of the cellar is also of importance in determining character and quality (see Spirits).

Blending. — Scotch whiskies are, as a general rule, " blended " prior to sale to the public. By " blending " is understood the art of putting together different types and varieties of whisky to form a harmonious combination. The general run of " self " whiskies — i.e. whiskies from a single distillery — do not appear to be to the public taste, but by combining different kinds of whisky blenders have

with that employed for Scotch " grain," but as a class they are somewhat lighter as regards flavour and body than the latter. Irish whiskies arc not classified territorially, although occasionally the distinction of " Dublin " or " Country makes " is recognized in the trade. Broadly speaking, however, the differences between Irish whiskies are not due to class, but to individual

variation.

American Whisky. — There are two main varieties of American whisky, namely, Rye whisky, the predominant raw material in the manufacture of which is rye, and Bourbon or corn whisky, made mainly from Indian corn (maize). Both varieties possess a much higher flavour and greater body than do the Scotch or Irish whiskies, due partly to the class of raw material employed, and partly to the method of distillation. Broadly speaking, the American self (so-called ” straight “) whiskies contain double the quantity of secondary or ” by ” products present in Scotch or Irish whiskies.

American whiskies are almost invariably stored in very heavily charred barrels, which, while it very appreciably affects the flavour, is necessary, inasmuch as it is doubtful whether it would be possible to mature these exceedingly heavy whiskies within a commercially reasonable time without the cleansing and purifying effect of the charcoal formed by the burning of the cask. Even with the aid of the charred cask, the average maturation time of the American pot-still whiskies is certainly two or three years longer than that of Scotch and Irish whiskies. (P. S.)

succeeded in pro- ducing an article Composition of Irish Whiskies (Analyses by Schidrowitz and Kaye). the demand for – — which has in- creased enor- mously during the past quarter of a century, and which may now be regarded as a staple beverage in all English- speaking coun- tries. The great expansion of the Scotch whisky trade of late years is undoubtedly due in the main to the introduc- tion of blending on scientific lines. There are different types of blends, ethers again

Description.

(Results expressed in grams per ioo litres of absolute alcohol.)

Alcohol per cent by vol. l

Total Acid.

Non- volatile Acid.

Esters.

Higher Alcohols.

Aldehydes.

Furfurol.

Dublin Whiskies —

I. ! Pot-still (new) . .

ia. Pot-still. From same distillery, 14 years old (plain wood)

2. Pot-still (new) . 2a. Pot-still. From same

distillery, 14 years old

3. Pot-still, 14 years old

4. Patent-still (new)

7172

57-08

74-n

60-47 63-42 70-76

7

29 6

32 87 17

Trace

8

Nil

8

45

Trace

34

38 28

47 87 25

145

185 233

264

226

38

12

68 8

21

32

5-5

3‘3

4-1

4.4 4-5

1 Irish whisky is generally distilled at about 50 O.P. and reduced with water to 25 O.P. prior to storage. 2 Nos. 1, 2, 3 and 4 represent different distilleries.

In some a Highland Malt, in others an Islay, in grain ” flavour may predominate, but, generally ipeaking, the aim of the blender is to produce an article in which no single constituent ” comes through ” — i.e. is markedly apparent. The best blends are produced by blending a number of ” vatted ” whiskies. A ” vat ” is produced by blending a number of whiskies of the same style or type, for instance, ten or fifteen Highland Malts from different distilleries. The ” vat ” is allowed to mature before being blended with other types to form the final blend. The better- class blends contain, as a general rule, 50 to 60% of Highland and Lowland Malts, ioto20%of Islays, and about 20 to 40% of ” grain ” whisky.

A typical high-class blend would, on analysis, show figures much as follows: Alcohol, 45 to 48% by vol.; total acid, 30 to 50; non- volatile acid, 20 to 30; esters, 30 to 60; higher alcohols, 120 to 1 70; aldehydes, 15 to 25 ; furfurol, 2-5 to 3-5.

Irish Whisky. — Irish pot-still whisky is sharply differentiated from the Scotch variety in that (a) the raw materials employed are generally composed largely of unmalted grain, (b) the malt is not peat-cured, (c) the process of distillation is entirely different both as regards method and apparatus (see Spirits). The result is that whereas Scotch whisky possesses a characteristic dry, clean flavour, Irish whisky is round and sweet, with a full ethereal bouquet. The general run of Irish pot-still whiskies are made with 30 to 50% of malted barley, the balance being rye, oats, un- malted barley and wheat. A few distilleries employ malted barley only, but the product so obtained— owing to the different methods employed and the absence of peat curing — is quite different from Scotch malt whisky. The Irish ” grain ” or ” patent still ” whiskies are made in a manner practically identical

WHISKY INSURRECTION, THE, an uprising in Western Pennsylvania in 1 794 against the Federal Government, occasioned by the attempted enforcement of the excise law (enacted by Congress March 1791) on domestic spirits. The common prejudice in America against excise in any form was felt with especial strength in Western Pennsylvania, Virginia and North Carolina, where many small whisky stills existed; and protests were made almost immediately by the Pennsylvania ns. Albert Gallatin (q.v.) took a leading part in expressing their resentment in a constitutional manner, but under the agitator David Bradford the movement soon developed into excesses. The attempt to enforce the law led to stormy scenes and riotous violence, the Federal revenue officers in some cases

being tarred and feathered; but in September 1794 President Washington, using the new powers bestowed by Congress in May 1792, despatched a con- siderable force of militia against the rebellious Pennsylvanians, who thereupon submitted without bloodshed, the influence of Gallatin being used to that end. Bradford fled to New Orleans; some of his more prominent supporters were tried for treason and convicted, but promptly pardoned. In American history this so-called " rebellion " is important chiefly on account of the emphasis it gave to the employment by the Federal Executive of the new powers bestowed by Congress for interfering to enforce Federal laws within the states. It is indeed inferred from one of Hamilton's own letters that his object in proposing this excise law was less to obtain revenue than to provoke just such a local resistance as would enable the central government to demonstrate its strength.

WHIST

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WHIST, a game at cards. The etymology of the name is disputed. Possibly it is of imitative origin, from " whist " (Hist! Hush! Silence!). "It is called Whist from the silence that must be observed in the play " (Cotton, Compleat Gamester). In the 16th century a card game called triumph or trump was commonly played in England. A game called trionfi is men- tioned as early as 1526, and triumphus Hispanicus in 1541. La triomphe occurs in the list of games played by Gargantua (Rabelais, first half of 16th century). In Giovanni Florio's Worldc of Wordss (1398) trionfo is defined as " the play called trump or ruff." It is probable that the game referred to by the writers quoted is la triomphe of the early editions of the Academic des jeux. It is important to note that this game, called by Charles Cotton " French ruff," is similar to ecarte. " English ruff-and-honours," also described by Cotton, is similar to whist. If we admit that ruff and trump are convertible terms, of which there is scarcely a doubt, the game of trump was the precursor of whist. A purely English origin may, therefore, be claimed for trump (not la triomphe). No recoid is known to exist of the invention of this game, nor of the mode of its growth into ruff- and- honours, and finally into whist. The earliest reference to trump in English is believed to occur in a sermon by Latimer, " On the Card," preached at Cambridge, in Advent, about the year 1529. He says, " The game that we play at shall be the triumph. . . . Now turn up your trump, . . . and cast your trump, your heart, on this card." In Gammer Gurlon's Needle (1575) Dame Chat says, "We be fast set at trumpe." Eliot (Fruits for the French, 1593) calls trump ■" a verie common ale- house game." Richard Price or Rice (Invective, against Vices, 1579) observes that "renouncing the trompe and comming in againe " (i.e. revoking intentionally) is a common sharper's trick. Cotton in his Compleat Gamester says, " He that can by

craft overlook his adversary's game hath a great advantage." Thomas Dekker (Belman of London, 1608) speaks of the deceits practised at " tromp and such like games." Trump also occurs in Antony and Cleopatra (written about 1607), with other punning allusions to card-playing —

" She, Eros, has

Packed cards with Caesar, and false-played my glory

Unto an enemy's triumph." — Act iv.

Ruff-and-honours, if not the same game as trump, was probably the same with the addition of a score for the four highest cards of the trump suit. A description of the game is first met with in The Compleat Gamester (1674) by Cotton. He states that ruff-and- honours (alias slamm) and whist are games very commonly known in England. It was played by four players, paired as partners, and it was compulsory to follow suit when able. The cards ranked as at whist, and honours were scored as now. Twelve cards were dealt to each player, four being left in the stock. The top card of the stock was turned up for trumps. The holder of the ace of trumps was allowed to ruff, i.e. to take in the stock and to put out four cards from his hand. The game was played nine up; and at the point of eight honours could be called, as at long whist. Cotton adds that at whist there was no stock. The deuces were put out and the bottom card was turned up for trumps.

It is believed that the earliest mention of whist is by Taylor, the Water Poet (Motto, 1621). He spells the word "whisk." The earliest known use of the present spelling is in Hudibras, the Second Part (spurious), 1663. The word is afterwards spelt indifferently whisk or whist for about half a century. Cotton (1674) spells it both ways. Richard Seymour (Court Gamester, 1734) has "whist, vulgarly called whisk." While whist was undergoing this change of name, there was associated with it the additional title of swabbers (probably allied to sweep, or sweep- stakes). Fielding (History of Mr Jonathan Wild) says that whisk-and-swabbers was " the game then [1682] in chief vogue." Francis Grose (Classical Dictionary of the Vulgar Tongue, 1785) states that swabbers are " the ace of hearts, knave of clubs, ace and duce of trumps at whist." The true function of the swabbers is not positively known; it is probable that the holders of these cards were entitled to receive a certain stake from the other

players. Swabbers dropped out of general use during the 18th century. The points of the game rose from nine to ten (" nine in all," Cotton, 1725; "ten in all," Seymour, 1734, "rectified according to the present standard of play "). Simultaneously with this alteration, or closely following it, the entire

pack of fifty-two cards was used, the deuces being nc longer discarded. This improvement introduces the odd trick, an element of great importance in modern whist. Early in the 18th century whist was not a fashionable game. The Hon. Dames Barrington (Archaeologia, vol. viii.) says it was the game of the servants' hall. Contemporary writers refer to it in a disparaging way, as being only fit for hunting men and country squires, and not for fine ladies or people of quality. According to Barrington, whist was first, played on scientific principles by a party of gentlemen who frequented the Crown Coffee House in Bedford Row, London, about 1728. They laid down the following rules: " Lead from the strong suit; study your partner's hand; and attend to the score." Shortly afterwards the celebrated Edmond Hoyle (q.v.) published his Short Treatise (1742). It has been surmised by some that Hoyle belonged to the Crown Coffee House party. This, however, is only a conjecture. There is abundant evidence to show that, in the middle of the iSth century, whist was regularly played at the coffee houses of London and in fashionable society. From the time of Hoyle the game continued to increase in public estimation, until the introduction of bridge, which has to a large extent replaced it, but which has much in common with it.

It will be of interest to mark the successive stages through which whist passed from the time of Cotton. The only suggestions as to play in Cotton are that, " though you have but mean cards in your own hand, yet you may play them so suitable to those in your partner's hand that he may either trump them or play the best of that suit " ; also that " you ought to have a special eye to what cards are play'd out, that you may know by that means either what to play if you lead or how to trump securely and advantagiously." It appears'from this that the main ideas were to make trumps by ruffing, to make winning cards, and to watch the fall of the cards with these objects. In the rules laid down by the Crown Coffee House school a distinct advance is to be noticed. Their first rule, " Lead from the strong suit," shows a sound knowledge of the game. Their second rule, "Study your partner's hand," though sound, is rather vague. Their third rule, " Attend to the score," if amended into " Play to the score," is most valuable. From the Crown Coffee House school to Hoyle is rather a wide jump; but there is no intervening record. Hoyle in his Short Treatise endorses and illustrates the " Crown " rules. He also brought the doctrine of probabilities to bear on the game, and gave a number of cases which show a remarkable insight into the play.

About 1770 was published William Payne's Maxims for Playing tile Game of Whist. The advance in this book is decided, as it in- culcates the rules of leading invariably from five trumps and the return of the highest card from three held originally. Matthews' s Advice to the Young Whist-Player (anon., 1804) repeats the " maxims of the old school," with "observations

on those he thinks erroneous " and " with several new ones," but some of the maxims which he thinks erroneous are now generally allowed to be correct.

Soon after Matthews wrote the points ol the game were cut down from ten (long whist) to five (short, whist). Clay's account of this change is that, about the beginning of the 19th century, Lord Peterborough having lost a large sum of money, the players pro- posed to make the game live up, in order to give the loser a chance of recovering his loss. The new game, short whist, was found to be so lively that it soon became general, and eventually superseded the long game. " Coelebs " (Laws and Practice of Whist, 1851), who mainly repeats former writers, only calls for mention because he first printed in his second edition (1856) an explanation of the call for trumps. Calling for trumps was first recognized as part of the game by the players at Graham's Club about 1840. Long whist may be said to have died about 1835. The new game necessarily caused a change in the style of play, as recorded by James Clay in The Laws of Short Whist, and a Treatise on the Game (1864).

Whist then travelled, and about 1830 some of the best French whist-players, with Deschapelles at their head, modified and im- proved the old-fashioned system. They were but little influenced by the traditions of long whist, and were not content merely to imi- tate the English. The French game was the scorn and horror of the old school, who vehemently condemned its rash trump leads; those who adopted the practice of the new school were found to be winning plavers.

Dr William Pole (Philosophy of Whist, 1883) remarks that the long experience of adepts had led to the introduction of many improve- ments in detail since the time of Hoyle, but that nothing had been

done to reduce the various rules of the game to a systematic form until between 1850 and i860, when a knot of young men proceeded to a thorough investigation of whist, and in 1862 Henry Jones, one of the members of this " little whist school," brought out a work, under the pseudonym of " Cavendish," which " gave for the first time the rules which constitute the art of whist-playing according to the most' modern form of the game." The little school was first brought prominently into notice by an article on whist in the Quarterly Review of January. Whist had previously been treated as though the " art " of the game depended on the practice of a number of arbitrary conventions. But it was now shown that all rules of

whist- play depend upon and are referable to general principles. Hence, as soon as these general principles were stated, and the reasons for their adoption were argued, players began to discuss and to propose innovations on the previously established rules of play.

A further development was the introduction of the system of dis- carding from the best protected suit instead of from the weakest, when the adversaries have the command in trumps. Soon after this (1872) followed the " echo " of the call for trumps, and contempo- raneously with the echo the lead of the penultimate card from suits of five cards or more, not including the ace, a lead that was so vigorously opposed by some players that " the grand battle of the penultimate " ensued. The old players indeed regarded the new system with the same horror as they had formerly displayed with respect to the French school, stigmatizing it not only as an innovation, but as a private understanding, and even as cheating! Even Clay, the greatest

f)layer of his day, was at first an opponent of the penultimate ead, but after consideration adopted it. General Drayson {Art of Practical Whist, 1879) was the first to propose an analogous system, namely, that six cards in a suit, not including the ace, could be shown by leading the antepenultimate card, but his proposal, logical though it was, did not at first find favour. Before this (1 874-1 87ˆ) leads from high cards, having regard to the number held in the suit, had not escaped attention, several innovations being introduced, but it yet remained for some one to propound a constant method of treating all leads, and to classify isolated rules so as to render it possible to lay down general principles. This was done in 1883-1884 by Nicholas Browse Trist of New Orleans, who introduced the system of " American Leads." American leads propose a systematic course of play when opening and continuing the lead from the strong suit. First, with regard to a low card led. When you open a strong suit with a low card, lead your fourth best. When opening a four- card suit with a low card, the lowest, which is the fourth best, is the card selected. When opening a five-card suit with a low card, the penultimate card is selected. Instead of calling it the penultimate, call it the fourth best. So with a six-card suit; but, instead of antepenultimate, sav fourth best. And so on with suits of more than six cards: disregard all the small cards and lead the fourth best. Secondly, with regard to a high card led, followed by a low card. When you open a strong suit with a high card and next lead a low card, lead your original fourth best. The former rule w r as to proceed with the lowest. Thus, from ace, knave, nine, eight, seven, two, the leader was expected to open with the ace, and then to lead the two. An American leader would lead ace, then eight. Thirdly, with regard to a high card led, followed by a highcard. When you remain with two high indifferent cards, lead the higher if you opened a suit of four, the lower if you opened a suit of five or more.

A player who adopts this system notifies by it to his partner that, when he originally leads a low card, he holds exactly three cards higher than the one led; when he originally leads a high card, and next a low one, he still holds exactly two cards higher than the second card led; and when he originally leads a high card, and follows it with a high card, he indicates in many cases, to those who know the analysis of leads (as laid down in whist books), whether the strong suit consisted originally of four Qr of more than four cards. (See Whist Develop- ments, by " Cavendish," 1885.)

These leads led to an overhauling of the play of the second and third hands, whist becoming apparently so complicated as to deter players of moderate ability from plunging into its intricacies. This fact, combined with the introduction of the fascinating and simpler game of bridge, caused a distinct decadence in the popularity of whist during the last decade of the 19th century.

Whist (i.e. modern " short " whist) is played with a full pack of 52 cards. The ace is Ihe highest, except in cutting, when it is the lowest. After the ace rank king, queen, &c, in order, down to the two. Four persons play, but with only three or two players the game can still be played with certain modifications (see Dummy below). The rjlayers each draw a card, the one who gets the lowest deals, and has choice of cards and seats. The player who draws the next lowest is his partner ; if two or more players draw cards of equal value, they cut again, the lowest playing with the original lowest. The cards are then cut and dealt one by one from left to right. The last card is turned up to show the trump suit. In America the trump suit is sometimes cut for, the card then being replaced in the pack before shuffling

(blind trump). A misdeal passes the deal, and at the end of each hand it passes in any case to the player on the left. At the end of the first, trick the dealer takes the turned trump card into his. hand. If he fails to do so, the card may be called to any subsequent trick. The player on the dealer's left leads, and it is compulsory for the others to follow suit if possible, under penalty for " revoke " (by which the adversaries may either add three to their score, deduct three from the defaulting side, or take three tricks of theirs and add them to their own). A player who cannot follow suit may play any card he chooses to the trick unless he has exposed a card and the adversaries call it. The highest card, or trump (if one is played), wins the trick, the winner leading to the next trick. When all the cards have been played the tricks gained by each side are counted, each trick over six counting one. Six tricks are called "a book." Trump honours — ace, king, queen, knave — also count to the score, but a side which has a score of four at the beginning of a hand cannot score for honours. Tricks count before honours; thus if one side has a score of one and holds four honours, while the other has a score of four and makes the odd trick, the latter wins

a double, the honours not counting, as the game has already been won by tricks. The scores for honours are as follows, but some players halve these scores, or, particularly in America, do not count honours at all. This is a matter of arrangement. If one side holds all four honours, four points; if three, two points; if both sides hold two there is no score, honours being "divided," or " easy." A rubber consists of the best of three games, unless one side wins the first two games. A game consists of five points. Thus if one side makes nine tricks and holds three honours it scores a game—three points by tricks (or " by cards ") and two by honours — but if a revoke has been made, i.e. if a player, holding a card of the suit led, has played- a card of another suit, the revoking side cannot score more than four, whatever its score in points may be. The side that wins the rubber scores two points in addition to the game points, which are reckoned thus: three points for a " treble," a game in which the adversaries have no score; two points for a " double," i.e. when the adversaries have made one or two; one point for a "single," i.e. when they have made three or four. Thus two trebles and the rubber (or " rub ") count eight points; treble, single and the rub count six points. If the losers have won a game, its value is deducted. Sometimes, by arrangement, the rubber points are raised to four. At the end of a rubber, or, by arrangement, of two rubbers, the players cut again for partners. If others wish to join the tabic the original players cut, the highest going out. It is not customary for more than two to join — technically, to"cut in"; hence, if -two players vacate at the end of the next rubber, they now take the place of the other original pair, who leave without cutting. When only one player " cuts in," the other three retire by rotation, decided by cutting, and come back in their turn. If more than four players wish to form a table, they cut first to see w r ho shall stand out, the highest retiring; they then cut afresh for partners.

Dummy Whist is played by three players, two being partners and the other playing with dummy, whose cards, which must be dealt face downwards, are exposed on the table before the play begins. Dummy has the first deal in every rubber. His cards being exposed he is not considered able to revoke; if he does, there is no penalty, nor is his partner liable for any mistake of his own whereby he cannot profit, e.g. by exposing a card; but if he leads from the wrong hand, a suit can be called. At Double Dummy each player has a dummy partner, and there is no misdeal, as the deal is a disadvantage.

The leads and the play of the different hands have been so minutely systematized that some of the various text-books should be studied carefully by any one who wishes to become proficient, but some broad general rules may be useful to the beginner. The original leader should lead from his strongest, which is almost always hlslongest suit, but if his longest suit contains only four cards and is also the trump suit, opinions differ,

though most players would observe the general rule. The same rule applies to subsequent first leads of a suit, unless they have to be modified owing to information derived from cards already played. Thus a player who has to lead after, say, the third or fourth trick may have to sacrifice his lead of his strongest suit in response to a " call for trumps " by his partner. Such a lead is

called a " forced" lead, and from three cards the highest should invariably be led, and, if the opportunity occurs, the second best at the second lead, but from four the lowest should be led. This lead of the highest from three applies to all forced leads, whether they are due to a " call," or to the fall of the cards already played. As a broad rule an ace is led always when five or more are held in the suit, but if you have the king also, lead it first; from a five suit without the ace lead the worst but one. With ace and two or three small ones, lead a small one; with ace and one small one, the ace. The second hand generally plays his worst card, but if an honour is led and he holds. the acei he should play the ace; also holding queen and king he should play the queen, or with knave, queen and king, the knave. If queen is led it is usually unwise to put on the king, but it is generally sound play to put the knave on the ten. With king and one other, or queen and one other, most players advocate the play of the small card; some would play the king under these conditions, but not the queen; many play the queen and not the king; but the state of the score may affect the play. If it is important to get the lead, so as to lead trumps, the honour should be played, but as a rule the second hand reserves his strength. The third hand should win the trick if he can, unless he knows that his partner's card is a winning one; consequently he generally plays his highest card. The fourth hand should win the trick if he can, as a player is justified in passing a trick only if by so doing he is absolutely sure of winning two.

Returned Leads. — A partner's lead should be returned at once, unless one has a strong suit of one's own, in which event it is ad- visable to lead a card of it, to guide one's partner as to his future lead, but a lead of trumps must be returned as soon as possible. If a player holds three cards originally in his partner's suit he should invariably return the higher of the two left in his hand after the first round. Thus holding ace, three, two only, he should win with the ace and return the three; when the two falls afterwards, his partner will know that he holds no more. So, with ace, knave, ten only, win with the ace and return the knave, though from a scoring point of view the knave and ten are of equal value. With lour originally, return the lowest, but a winning card should always be led or

played in the second round, unless there is any special reason for retaining it. If your partner has called for trumps and you get the lead, with four trumps lead the smallest, with three lead the highest, and, if it wins, go in with the next highest. This law r is universal in trumps (and also applies to forced leads from three-card suits) even if ace, king and another be held, from which the ordinary lead would be the king. If, however, one adversary has obviously played his last trump, a third round is not always advisable, as two trumps will fall from the leader and his partner, and only one from the adversaries. On the other hand it is generally good play to draw two opposing trumps for one, so that they may not make separately.

In the play of a hand never play an unnecessarily high card — unless you are " calling." Thus, holding ten and knave, play the ten; your partner will infer that you do not hold the nine, but may hold the knave, and even the queen as well, though all the cards are of equal value for making tricks. Similar inferences should be drawn from all cards played, and should be drawn at the moment. Never play false cards unless you see your partner is so weak that it can do no harm to deceive him; in such a case, with knave and ten, the knave may be played. It is a maxim that information given by play is more valuable to the partner than it is to the two adversaries.

Trutnpingor" Ruffing " and Discarding. The second player should not trump a doubtful card (i.e. a card that his partner might be able to beat), if he is strong in trumps; if weak, he should trump. A winning card from an adversary should be trumped in any case. With weak trumps, it is bad play to " force " one's partner, i.e. invite him to trump; but with strong trumps force him. If your partner refuse to trump an adverse winning card, lead a trump at the first opportunity. If you have a " cross-ruff " ^ (i.e. if you and your partner can trump different suits), those suits should be led alternately, and not trumps. Force an adversary who is known to be strong in trumps. A weak suit in trumps (three only) should be led if the adversaries have a cross-ruff, or if the game is hopeless unless partner is strong, or if winning cards arc held in all plain suits, which might be trumped.

It is usual to discard originally from the weakest suit, but if the adversaries are shown to have strength in trumps, from the strongest, i.e. the longest, so as to guard the weak suits. With absolute com- mand of a suit, if you are compelled to discard from it, discard the winning card to inform your partner that you have command ; e.g. with king, knave, ten — ace and queen being out— discard the king. The call "for trumps, an artifice, which is also known as to " ask," to " signal, to " hang out blue-Peter" or to "peter," for trumps, consists in playing an unnecessarily high card, followed later by a lower one, e.g. by playing the three before the two, or the ten before the nine. As the " call " is an imperious command, equivalent to " sacrifice everything, partner, for the sake of leading

trumps," it is only justified by great strength in the trump suit. The echo: To your partner's call you should " echo," if you holdfour or more, by calling yourself , however low your trumps are. Similarly four trumps may be shown in partner's lead of trumps by playing a high card followed by a lower one.

General Maxims. Play to the score. If winning the odd trick 'suves or wins the game, do not try risky combinations for the sake

of getting two or three tricks. Count your cards before playing. If your partner " renounces," i.e. discards or tramps, always ask him if he has a card of the suit led, to save the revoke. Announce the score when you mark it. Watch the fall of every card. Study the rules, especially those about penalties and consultation with partner. If the winning of one more trick wins or saves the game, and you hold the winning card, play it, unless it be the winning trump, which is good at any time. Retain the trump-card if you can play others of equal trick-making value; your partner then knows the position of one trump ; e.g. with nine and ten in addition to the eight, the turn-up, play them before parting with the eight. Keep command of adversaries' suits as long as is judicious ; get rid of the command of partner's strong suit. Do not finesse (i.e. play a lower card than your highest in the third hand) in partner's suit, unless he leads a high card in an obviously forced lead. Lead through a known strong suit on your left, and (especially) up to a known weak suit on your right. If you have to lead from a suit of two lead the highest. Leading from a " singleton " (your only card in one suit), in order to be able to trump— sometimes disparagingly called " Whitecha pel ling "—is not generally good play, and results badly unless the side is strong in trumps, but m some circumstances it is useful. Do not lead from a " tenace " (i.e. best and third best of a suit) if you have another equally good suit. Remember that whist is a game of combination, and that tricks made by your partner are just as valuable to you as tricks made by yourself. Sort your hand so as to keep the suits separate, red and black alternately, keeping the cards each in order of their value.

For Long Whist the play of the hands and the laws of the game are practically the same as at ordinary or " short " whist, but a more venturesome style of play may be adopted in view of the number of points required, i.e. a certain amount of risk may be taken when the odd trick is a certainty in the hope of getting two or three tricks instead. With the score at nine, honours cannot be secured, but at eight a player who holds two honours may ask his partner before playing if he too holds an honour, the formula being ' Can you one, partner? " If the answer is " Yes," the honours are scored and the game ends. There is no " treble " at long whist. A double is scored when the losers are less than five, a single if they have made five or more. The game, however, is almost obsolete.

Progressive Whist. — This form of the game is social rather than scientific, but is a pleasant variety on the' ordinary round game. The host provides prizes, as a rule — first, second and " booby " prizes for both ladies and gentlemen, the " booby " prizes going to the players who make the fewest points. Any number of tables may be formed. Partners are selected by lot, two ladies and two gentlemen never being partners. This can be done by means of two sets of tickets of different colours, numbered identically, No. I pairing with No. I and so on. After the first round there is no drawing for partners, as will be seen. The holders of all tickets numbered I and 2 form the first table, of 3 and 4 the second table. Only one pack of cards is needed at each table, but every player should be provided with a scoring card and pencil. The players at all the tables cut for deal, but no dealing is begun before a signal given by the master of the ceremonies. At each table one hand only is played. Honours are not counted. The score Is marked by the number of tricks made, or the winner may mark all tricks above six. The winners remain at their original tables. The losers move on, from No. 1 table to No. 2, from No. 2 to No. 3 and from the last table to No. I. Partners are formed afresh, the gentleman who has just won playing with the lady who has just lost, and vice versa. Play may last for one or more complete rounds, or for a given time, indicated by a signal, after which no fresh hand is begun. The scores are then added up and the prizes awarded. In playing the ordinary rules of whist are observed.

A printed existence was first given to the laws of whist by Hoyle in 1743. The fourteen laws then issued were subsequently increased to twenty-four. These laws were the authority until 1760, when the members of White's and Saunders's Chocolate Houses revised them. The revised laws (nearly all Hoyle) were accepted by whist players for over a century, notwithstanding that they were very incomplete. The laws of short whist, a more comprehensive code approved by the Portland and Arlington clubs, were brought out in 1864, and became the accepted standard, small modifications only having been introduced since. The latest edition of the rules should be consulted for what is not indicated in the text.

See Principles of Whist, Stated and Explained, by "Cavendish " (London, 1902), the most authoritative work.

WHISTLE, the shrill warbling sound made by forcing the breath through the lips, contracted to form a small orifice, or pro- duced by means of an instrument of the whistle type; also, gener- ally, any similar shrill, hissing or Warbling sound, as of a bird's note, of wind through trees, ropes, &c. The 0. Eng. hwistlian, to whistle, and hwistlerc, whistler, piper, are closely allied to hwisprian or hw&strian, to whisper, to speak softly or under one's breath; and both are imitative words, representing a shrill hissing sound, cf. Ger. wispeln, to whisper, Dan. hvisle, to whistle. The instrument known as

a " whistle " takes many forms, from

the straight flute and flageolet type made of wood or metal and pierced with holes, to the metal signalling pipe used for signalling on board ship or by policemen. Similarly the term is used of the instruments sounded by the escape of steam on a locomotive or other engine and on steamships, &c, as a means of giving signals. WHISTLER, JAMES ABBOTT MeNEILL (1834-1903), American artist, was born at Lowell, Massachusetts, on the 10th of July 1834. His father was Major G. W. Whistler, and his mother one of the Baltimore family of Winans. He was first heard of in Europe in 1857, when he had already been an art student, in Paris, in the studio of Gleyre. His first etchings, those known as " The French Set," were the means of bringing him under the notice of certain people interested in art, but the circulation of these first, like that of his later etchings, has always, of necessity, been more limited than their fame. The impressions from each plate are generally few. It was still in etching that Whistler continued his labours, and, coming to London in 1859, it appears, he almost at once addressed himself to the chronicle of the quaint riverside buildings and the craft of the great stream — the Thames " below Bridge." The " French Set " had included De Hooch-like or Nicholas Maes-like genre pieces, such as " La Vieille aux loques," the " Marchande de moutarde," and " The Kitchen," this last incomparably improved and perfected by the retouching that was accomplished a quarter of a century after the first performance. The Thames series of sixteen etchings, wrought chiefly in 1859, disclosed a new vision of the river, in which there was expressed, with perfect draughts- manship, with a hitherto unparalleled command of vivacious line, the form of barge and clipper, of warehouse, wharf and waterside tavern. " The Pool," " Thames Police " and " Black Lion Wharf " are perhaps the finest of this series. Before it was begun, Whistler, ere he left Paris, had proceeded far with a plate, existing only in the state of trial proof, and, in that, of extreme rarity. It is called " Paris, lie dc la CiteV' and has distinct and curious manifestations of a style to be more generally adopted at a later period. For several years after the completion of the " Sixteen Etchings," Whistler etched comparatively little; but about 1870 we find him entering what has been described as his " Leyland period," on account of his connexion with the wealthy shipowner and art patron, Mr Frederick R. Leyland, of Prince's Gate, whose house became famous for Whistler's Peacock Room, 1 painted in 1877. In that period he worked greatly in dry-point. The " Model Resting," one of the most graceful of his figure pieces, and " Fanny Leyland "—an exquisite instance of girl portraiture — are notable performances of this time. To it also belong the

largely conceived dry-points, so economical of means and endowed with so singular a unity of effect, the " London Bridge " and " Price's Candle-works." A little later came the splendid visions of the then disappearing wooden bridges of Battersea and Putney, and the plate " The Adam and Eve," which records the river-front of old Chelsea. This, however, is only seen in perfection in the most rare proofs taken before the publication by the firm of Hogarth. From these plates we pass almost imperceptibly to the period of the Venetian etchings, for in 1879, a t tne instance of the Fine Art Society, Whistler made a sojourn in Venice, and here he wrought, or, to speak accurately, commenced, not only the set of prints known as the " Venice Set," but also the " Twenty-six Etchings " — likewise chiefly, though not wholly, of Venice — issued later by the firm of Dowdeswell. One or two of the minor English subjects of the " Twenty-six Etchings " — those done after the artist's return from Venice — give indications of the phase reached more clearly in certain little prints executed a few years later, and, with perhaps one exception, never formally published. " Fruit Shop," " Old Clothes Shop," and " Fish Shop, busy Chelsea," belong to this time. Later, and bent upon doing justice to quite different themes, which demand different methods, the ever flexible artist again changes his way, and — not to speak of the dainty little records of the places about the Loire, which in method have affinity with the pieces last named — we have

1 Whistler quarrelled with Leyland, and eventually painted his life-size portrait as a devil with horns and hoofs.

" Steps, Amsterdam," " Nocturne, Dance House," with its magical suggestion of movement and light, and the admirable landscape " Zaandam." With the mention of these things may fitly close a sketch of Whistler's periods in etching; but before proceeding to other branches of his work, the main characteristics of the whole series of etchings (of which, in Wedmore's Whistler's Etchings, nearly 300 examples are described) should be briefly indicated. These main characteristics are precision and vivacity; freedom, flexibility, infinite technical resource, at the service always of the most alert and comprehensive observation; an eye that no picturesqueness of light and shade, no interesting grouping of line, can ever escape — an eye, that is, that is emanci- pated from conventionality, and sees these things therefore with equal willingness in a cathedral and a mass of scaffolding, in a Chelsea shop and in a suave nude figure, in the facade of a Flemish palace and in a " great wheel " at West Kensington. Mr Whistler's pictures have as a chief source of their attractive- ness those mental qualities of alertness and emancipation. Charm of colour and of handling enhance the hold which they obtain upon such people of taste as may be ready to receive them. There are but very few of them, however, at least very few oil pictures, when one considers the number of years since the artist began to labour; and one notable fact must be at once understood

— the admitted masterpieces in painting belong almost entirely to the earlier time. " Sarasate " is an exception, and " Lady Archibald Campbell," and in its smaller, but still charming, way " The Little Rose of Lyme Regis "; but even these — save the " Little Rose " — are of r88s or thereabouts. A few years earlier than they are the " Connie Gilchrist," the " Miss Alexander," and the " Rosa Corder," and the Thames " Nocturnes "; but we go farther back to reach the " Portrait of the Painter's Mother," which is now in the Luxembourg; the " Portrait of Carlyle," now at Glasgow; the " Cremorne Gardens," the " Nocturne, Valparaiso Harbour," the " Music Room," with little Miss Annie Haden standing by the piano while her mother plays, and the " White Girl," or " Little White Girl," in which Whistler shows the influence, but never the domination, of the Japanese. Of the slight but always exquisitely harmonious studies in water colour, undertaken by Whistler in his middle period, none call for special notice. To the middle time, too, belong, not perhaps all of his slight but delicately modelled pastels of the figure, but at least his more universally accepted pastels of Venetian scenes, in which he caught the sleepy beauty of the Venetian by-way. In pastel, as in painting, in water colour and in etching, Whistler has never been unmind- ful of the particular qualities of the medium in which he has worked, nor of the applicability of a given medium to a given subject. The result, accordingly, is not now a victory and now a failure, now a " hit " and now a " miss," but rather a succession of triumphs great and small. One other medium taken up by Whistler must now be mentioned. His lithographs — his drawings on the stone in many instances, and in others his drawings on that " lithographie paper " which with some people is the easy substitute for the stone to-day — are perhaps half as numerous as his etchings. Mr T. R. Way has catalogued about a hundred. Some of the lithographs are of figures slightly draped; two or three of the very finest are of Thames subjects- — including a " nocturne " at Limehouse, of unimaginable and poetic mystery; others are bright and dainty indications of quaint prettiness in the old Faubourg St Germain, and of the sober lines of certain Georgian churches in Soho and Bloomsbury. An initiator in his own generation, and ever tastefully experimental, Whistler no doubt has found enjoyment in the variety of the mediums he has worked in, and in the variety of subjects he has brilliantly tackled. The absence of concentration in the Whistlerian temperament, the lack of great continuity of effort, may probably prove a drawback to his taking exactly the place as a painter of oil pictures, which, in other circumstances, his genius and his taste would most certainly have secured for him. In the future Whistler must be accounted, in oil painting, a master exquisite; but rare. But the number and the range of his etched subjects and the extraordinary variety of perception and of skill which

he has brought to bear upon the execution of his nearly three hundred coppers, ensure, and have indeed already compassed, the acceptance of him as a master ameng masters in that art of etching. Rembrandt's, Van Dyck's, Meryon's, Claude's, are, in fact, the only names which there is full warranty for pronouncing beside his own.

No account of Whistler's career would be complete without a reference to his supremely controversial personality. In 1878 he brought a libel action against Ruskin for his criticisms in Fors Clavigera (1877). Ruskin had denounced one of his nocturnes at the Grosvenor Gallery as " a pot of paint flung in the public face." After a long trial, Whistler was awarded a farthing damages. His examination caused much interest, especially in artistic circles, on account of his attitude in vindication of the purely artistic side of art; and it was in the course of it that he answered the question as to how long a certain " impression " had taken him to execute by saying, " All my life." His eccen- tricity of pose and dress, combined with his artistic arrogance, sharp tongue, and bitter humour, made him one of the most talked-about men in London, and his mots were quoted every-where. He followed up his quarrel with Ruskin by publishing a satirical pamphlet. Whistler v. Ruskin: Art v. Art Critics. In 1885 he gave his Ten o 1 Clock Lecture in London, afterwards embodied in The Gentle Art of Making Enemies (1890). The substance of this flippantly written and amusing outburst was an insistence on the liberty of the artist to do what was right in his artistic eyes, and the inability of the public or the critics to have any ideas about art worth considering at all. In 1895 another quarrel, with Sir William Eden, whose wife's portrait Whistler had painted, but refused to hand over, came into the courts in Paris; and Whistler, though allowed to keep his picture, was condemned in damages. In later years he lived mainly in Paris, but he returned to l'/e in London in 1902; and he died on the 17th of July 1903 at 74 Cheyne Walk, Chelsea. In 1S88 he had married Mrs Goodwin, widow of E. W. Goodwin, the architect, and daughter of J. B. Philip, the sculptor; she died in 1S96, leaving no children. In 1886 he became president of the Royal Society of British Artists (a title at which afterwards he scoffed); and he took a leading part later in founding the International Art Society, of which he was the first president. His " Nocturne in blue and silver " was presented to the National Gallery after his death by the National Art Collection Fund.

See also T. R. Way and G. R. Dennis, The Art of J. McN. Whistler (190 1) ; F. Wcdmore, Mr Whistler's Etchings-, Theodore Duret, Histoire de J, McN. Whistler et de son ceuvre (1904); Mortimer Menpes, Whistler as I knew him; W. G. Bowdoin, Whistler, the Man and his Work (1902); Catalogue of Memorial Exhibition (Inter- national Society, 1905); and E.

R. and J. Pennell, The Life of James McNeill Whistler (1908) . (F. We.)

WHISTON, WILLIAM (1667-1752), English divine and mathematician, was born on the 9th of December 1667 at Norton in Leicestershire, of which village his father was rector. He w r as educated privately, partly on account of the delicacy of his health, and partly that he might act as amanuensis to his father, who had lost his sight. He afterwards entered at Clare College, Cambridge, where he applied himself to mathematical study, and obtained a fellowship in 1693. He next became chaplain to John Moore (1646-1714), the learned bishop of Nor- wich, from whom he received the living of Lowestoft in 169S. He had already given several proofs of his noble but over- scrupulous conscientiousness, and at the same time of a pro- pensity to parados. His New Theory of the Earth (1696), although destitute of sound scientific foundation, obtained the praise of both Newton and Locke, the latter of whom justly classed the author among those who, if not adding much to our knowledge, " ft least bring some new things to our thoughts." In 1701 he resigned his living to become deputy at Cambridge to Sir Isaac Newton, whom two years later he succeeded as Lucasian professor of mathematics. In 1707 he was Boyle lecturer. For several years Whiston continued to write and preach both on mathematical and theological subjects with con- siderable success; but his study of the Apostolical Constitutions

had convinced him that Arianism was the creed of the primi- tive church; and with him to form an opinion and to pub- lish it were things almost simultaneous. His heterodoxy soon became notorious, and in 1710 he was deprived of his pro- fessorship and expelled from the university. The rest of his life was spent in incessant controversy — theological, mathematical, chronological and miscellaneous. He vindicated his estimate of the Apostolical Constitutions and the Arian views he had derived from them in his Primitive Christianity Revived (5 vols., 1711-1712). In 1713 he produced a reformed liturgy, and soon afterwards founded a society forpromoting primitive Christianity, lecturing in support of his theories at London, Bath and Tun- bridge Wells. One of the most valuable of his books, the Life of Samuel Clarke, appeared in 1 730. While heretical on so many points, he was a firm believer in supernatural Christianity, and frequently took the field in defence of prophecy and miracle, including anointing the sick and touching for the king's evil. His dislike to rationalism in religion also made him one of the numerous opponents of Benjamin Hoadly's Plain Account of the Nature and End of the Sacrament. He proved to his own satisfaction that Canticles was apocryphal and that Baruch was not. He was ever pressing his views of ecclesiastical govern- ment and discipline, derived from the Apostolical Constitutions, on i the ecclesiastical authorities, and marvelled that they could not see the matter in the same light as himself. He assailed the memory of Athanasius with a

virulence at least equal to that with which orthodox divines had treated Arius. He attacked Sir Isaac Newton's chronological system with success; but he himself lost not only time but money in an endeavour to discover the longitude. Of all his singular opinions the best known is his advocacy of clerical monogamy, immortalized in the Vicar of Wakefield. Of all his labours the most useful is his translation of Josephus (1737), with valuable notes and dissertations, often reprinted. His last " famous discovery, or rather revival of Dr Giles Fletcher's," which he mentions in his autobiography with infinite complacency, was the identification of the Tatars with the lost tribes of Israel. In 1745 he published his Primitive New Testament. About the same time (1747) he finally left the Anglican communion for the Baptist, leaving the church literally as well as figuratively by quitting it as the clergyman began to read the Athanasian creed. He died in London, at the house of his son-in-law, on the 22nd of August 1752, leaving a memoir (3 vols., 1749-1750) which deserves more attention than it has received, both for its characteristic individuality and as a store- house of curious anecdotes and illustrations of the religious and moral tendencies of the age. It does not, however, contain any account of the proceedings taken against him at Cambridge, these having been published separately at the time.

Whiston is a striking example of the association of an entirely paradoxical bent of mind with proficiency in the exact sciences. He also illustrates the possibility of arriving at rationalistic conclu- sions in theology without the slightest tincture of the rationalistic temper. He was not only paradoxical to the verge of craziness, but intolerant to the verge of bigotry. " 1 had a mind," he says, " to hear Dr (John) Gill preach. But, being informed that he had written a folio book on the Canticles, 1 declined to go to hear him." When not engaged in controversy he was not devoid of good sense. He often saw men and things very clearly, and some of his bon mots are admirable.

WHITAKER, JOSEPH (1820-1895). English publisher, was born in London on the 4th of May 1820, and apprenticed to a bookseller at the age of fourteen. After a long experience with various bookselling firms, he began business on his own account as a theological publisher. In January 1858 he started the Book- seller, and for 1869 published the first issue of Whitaker's Almanack, the annual work of reference, which also met with immediate success. In 1874 he published the first edition of the Reference Catalogue of Current Literature, of which several editions have since appeared. Whitaker died at Enfield on the 15th of May 1895. He had been the father of fifteen children.

WHITBREAD, SAMUEL (175S-1815), English politician, came of a Bedfordshire Nonconformist family; his father had made a considerable

fortune as owner of the well-known brewery asso- ciated with his name. Educated at Eton and St John's College,

Cambridge (after originally going to Christ Church, Oxford), he began by entering the brewing business; but after his marriage with the daughter of the ist Earl Grey in 1789 he took to politics, and in 1790 was elected for Bedfordshire as a Whig, attaching himself to Fox. He became known as a social and financial reformer and a constant assailant in parliament of all sorts of abuses. It was on his motion in 1805 that Lord Melville was impeached for financial maladministration of the navy, and he conducted the case for the prosecution. His Poor Law bill in 1807, an elaborate Radical scheme, came to nothing. Whitbread continued to be a constant speaker in parliament, and the principal representative of Liberal criticism, a monument of opposition tactics. He opposed the regency, championed the princess of Wales, and led the peace party; and the caricaturists were busy with his personality. In 1809 he became chairman of the committee for rebuilding Drury Lane theatre, and for some time he was immersed in controversies connected with it, which eventually seem to have unstrung his mind, for he committed suicide on the 6th of July 1815. The Whitbread influence in Liberal politics continued to be very strong in Bedfordshire in later generations, his son William Henry (from 1818 to 1837) and grandson Samuel (from 1852 to 1895) representing Bedford for many years.

WHITBY, a seaport, watering-place and market town in the Whitby parliamentary division of the North Riding of Yorkshire, England, 245 m. N. from London, on the North-Eastern railway. Pop. of urban district (1901) 11,755. There are a terminal station in the town and a station at West Cliff on the Saltburn branch. Whitby is beautifully situated at the mouth and on both banks of the River Esk; the old town of narrow streets and picturesque houses standing on the steep slopes above the river, while the modem residential quarter is mainly on the summit of West Cliff. A long flight of steps leads up the eastern height to the abbey, the ruins of which gain a wonderful dignity from their commanding position. This was a foundationof Oswy, king of Northumbria, in 658, in fulfilment of a vow for a victory over Penda, king of Mercia. It embraced an establishment for monks and (until the Conquest) for nuns of the Benedictine order, and under Hilda, a grand-niece of Edwin, a former king of North- umbria, acquired high celebrity. The existing ruins comprise parts of the Early English choir, the north transept, also Early English but of later date, and the rich Decorated nave. The west side of the nave fell in 1763 and the

tower in 1830. On the south side are foundations of cloisters and domestic buildings. Adjoin- ing the abbey is Whitby Hall, built by Sir Francis Cholmley about 1580 from the materials of the monastic buildings, and enlarged and fortified by Sir Hugh Cholmley about 1635. A little below the abbey is the parish church of St Mary, originally Norman, and retaining traces of the first building; owing to a variety of alterations at different periods, and the erection of high wooden pews and galleries, its appearance is more remarkable than beautiful. A modern cross in the churchyard commemorates St Caedmon, the Northumbrian poet (c. 670), who was a monk at the abbey and there died. Other features of the town are the pleasant promenades and gardens on West Cliff, the anti- quarian and geological museum, and an excellent golf course. The coast is cliff-bound and very beautiful both to the north and to the south, while inland the Esk traverses a lovely wooded vale, surrounded by open, high-lying moors. Whitby is a quiet resort, possessing none of the brilliance of Scarborough on the same coast. A large fishing industry is carried on from the harbour, which is formed by the mouth of the river and protected by two piers. The manufacture of ornaments from the jet found in the vicinity forms a considerable industry. The jet is a species of petrified wood found towards the bottom of the Upper Lias, and its use for the purpose of ornament dates from very early times. A former activity in shipbuilding is of interest through the recollection that here were constructed the ships for Captain Cook's voyages. Wooden ships and boats are still built, and rope-making and sail-making are carried on.

Whitby {Streanaeshakh c. 657-857; Prestebi c. 857~ro8o; Witeby, &c. c. 857 onwards) is first mentioned by Bede, who

states that a religious house was established here about A.r>. 657. In the 9th century it was destroyed by the Danes, but being refounded became the centre of a Danish colony, and until laid waste by the Conqueror was the most prosperous town in the district. Henry I. made a grant to the abbot and convent of Whitby of a burgage in the vill of Whitby, and Richard de Waterville, abbot 1175-1190, granted the town in free burgage to the burgesses. In 1 200 King John, bribed by the burgesses, confirmed this charter, but in 1201, bribed by the successor of Richard de Waterville, quashed it as injurious to the dignity of the church of Whitby. A bitter struggle went on, however, till the 14th century, when a trial resulted in a judgment against the burgesses. In 1629 Whitby petitioned for incorporation on the ground that the town was in decay through want of good govern- ment and received letters patent giving them self-government. However, in 1674-1675 the crown, probably in gratitude for the part played by the Cholmleys in the Civil War, restored to the lords of the manor all the liberties ever enjoyed by the abbots of Whitby in Whitby and Whitby Strand. Whitby became a parliamentary borough under the Reform

Act of r832, returning one member until it was disfranchised under the Redistribution of Seats Act 1885. At the beginning of the 14th century Sir Alexander Percy claimed the hereditary right of buying and selling in Whitby without payment of toll. The market was held time out of mind on Sunday until the reign of Henry VI., who changed the day to Saturday, still the market day. A fortnightly cattle market was granted by Charles I. Henry I. granted to the abbot of Whitby a fair at the feast of St Hilda and the king's firm peace to all coming to the fair; A second fair was used later, but neither of them is any longer held. There was a port at Whitby in the 12th century and probably before, and though never important there have always since been traces of Whitby shipping and merchandise. In medieval times the salting and sale of herrings and the sale of cod, fish and other products of the North Sea fishery were the only industries. Whale-fishing began in 1753.

See J. C. Atkinson, Memorials of Old Whitby (London, 1894); Lionel Charlton, History of Whitby (York, 1779); George Young, History of Whitby (Whitby, 1817); Victoria County History, York- shire, North Riding.

WHITCHURCH, a market town in the Newport parliamentary division of Shropshire, England, 171 m. N.W. from London on a joint line of the London & North-Western and Great Western railways, and the terminus of the Cambrian railway. Pop. of urban district (1901) 5221. Malting and cheese-making are the principal industries. The church of St Alkmund, rebuilt in the 18th century, retains the fine tomb of John Talbot, first earl of Shrewsbury, who fell at the battle of Bordeaux (1453). The town hall and other public buildings are modern. The grammar school was founded in 1550, and here (c. 1791) Reginald Heber, Bishop of Calcutta, was educated. The parish of Whitchurch extends into Cheshire.

Whitchurch was at first known as Westun and belonged before the Conquest to King Harold, but was afterwards granted to Earl Roger, of whom William de Warenne was holding it at the time of the Domesday Survey. The name is said to have been altered to Whitchurch or Album Monasterium on account of a stone church built there soon after 1086. The manor appears to have been held by a younger branch ot the Warenne family, from whom it passed by marriage to the families of- Lestrange and Talbot. It was sold by the Talbots to Thomas Egerton, from whom it passed to the earls of Bridgwater and eventually to the present owner, Earl Brownlow. Whitchurch is mentioned as a borough in the 14th century, and was governed by a bailiff, but its privileges, which sprang up with the castle, appear to have disappea red after its decay. The town has never been represented in parliament nor noted for any trade except agriculture. In 1228 John Fitz-Alan received the right of changing the day of the

market he held at Whitchurch from Thursday to Monday, and in t362 a fair lasting three days from the feast of SS. Simon and Jude was granted to John Lestrange. Lord Brownlow granted the market rights to the local authority.

WHITE, ANDREW DICKSON (1832-), American educa- tionist, was born in Homer, New York, on the 7th of November 1832. He graduated at Yale (A.B.) in 1853, studied at the Sorbonne in 1854, and at the University of Berlin in 1855-1856, meanwhile serving as attache at the United States Legation at St Petersburg in 1854-1855. He was professor of history and English literature in 1857-1863, and lecturer on history in 1863- 1867 at the University of Michigan. In 1864-1867 he was a member of the New York state Senate, and as chairman of the Committee on Education took an active part in formulating the educational features of the bill under which Cornell University (q.v.) was incorporated (1865). At Mr Cornell's suggestion Mr White drew up a plan of organization for the institution, and in 1867 became its first president, which post he held continuously until 1S85, serving thereafter as a member of the board of trustees and of its executive committee. During his administration he greatly strengthened the curriculum of the university, to which he gave his architectural library, and, upon his retirement, his historical and general library of about 20,000 volumes (in- cluding bound collections of pamphlets) and about 3000 unbound pamphlets, which was installed in a special room in the main library building of the university. In recognition of this gift the departments of history and polilical science of the university have been named the President White School of History and Political Science. In 1870 President Grant appointed Benjamin F. Wade, Mr White and Samuel G. Howe a commission to visit Santo Domingo and report on the advisability of the president's project for annexing it to the United States, and in 1895 he was appointed by President Cleveland a member of the commission established to determine the boundary between Venezuela and British Guiana. Dr White was United States minister to Germany in 1879-1881, and to Russia in 1892-1894, and was United States ambassador to Germany in 1897-1903. In 1899 he was president of the American delegation at the Hague Peace Conference. He received the degree of LL.D, from the Univer- sity of Michigan (1867), from Cornell (1886), from Yale (1887), from St Andrews, Scotland (1902), from Johns Hopkins, (1902), and from Dartmouth (1906); L.H.D. from Columbia (1887) and D.C.L. from Oxford (1902). He was also made an officer of the Legion of Honour, was awarded the royal gold medal of Prussia for arts and sciences in 1902, was president of the American Historical Association, of which he was a

founder, in 1S84, and was actively identified with various other learned bodies.

His publications include The Greater States of Continental Europe (1874) ; A History of the Warfare of Science with Theology in Christen- dom (2 vols., 1896), his most important work, his Autobiography (2 vols., New York, 1905) and Seven Great Statesmen (1910).

WHITE, SIR GEORGE STUART (1835-), British field marshal, the son of an Irish country gentleman, was born in County Antrim on the 6th of July 1835. He was educated at Sandhurst, and in 1853 joined the Inniskillings, with which regiment he served in India during the Mutiny in 1857. In the second Afghan War (1878-80) he was second in command of the Gordon Highlanders, whom he led in their charge at the battle of Charasiah. For conspicuous gallantry in this action, and again shortly afterwards at Kandahar, he received the Victoria Cross. In 1881 he assumed command of the Gordon Highlanders, and look part in the Nile Expedition of 1884-85. As brigadier in the Burmese War (1885-87) he rendered distinguished service, for which he was promoted major-general; and when Sir Frederick (afterwards Lord) Roberts returned to India from Burma in 1887, White was left in command of the force charged with the duty of suppressing the dacoits and pacifying the country. This he accomplished with a thoroughness which earned the thanks of the government of India. He was in command of the Zhob expedition in 1890, and in 1S93 he suc- ceeded Lord Roberts as commander-in-chief in India; and during his tenure of this office directed the conduct of the Chitral expedition in 1895 and the Tirah campaign in 1897. In the latter year he was made G.C.B. and in 1898 G.C.S.I. Returning to England in 1898 he became quartermaster-general

to the forces; and on the outbreak of the Boer War in 1899 he was given command of the forces in Natal. He defeated the Boers at Elandslaagte on the 21st of October 1S99 and at Reitfontein on the 24th; but the superior numbers of the Boers enabled them to invest Ladysmith,- which Sir George White defended in a siege lasting 119 days, from the 2nd of November 1899 to the rst of March 1900, in the course of which he refused to entertain Sir Redvers Butter's suggestion that he should arrange terms of capitulation with the enemy (see Ladysmith, Siege and Relief of). After the relief of Ladysmith, White, whose health had been impaired by the siege, returned to England, and was appointed governor of Gibraltar (1900-1904). King Edward VII., who visited the fortress in 1903, personally gave him the baton of a field maishal. In 1905 Sir George White was ap- pointed governor of Chelsea Hospital, and in the same year was decorated with the Order of Merit.

See T, F. G, Coates, Sir George White (1900).

WHITE, GILBERT (1720-1793), English writer on natural history, was born on the 18th of July 1720 in the little Hampshire village of Selborne, which his writings have rendered so familiar, to all lovers of either books or nature. He was educated at Basingstoke under Thomas Warton, father of the poet, and subsequently at Oriel College, Oxford, where in 1744 he was elected to a fellowship. Ordained in 1747. he became curate at Swarraton the same year and at Selborne in 1751. In 1752 he was nominated junior proctor at Oxford and became dean of his college. In 1753 he accepted the curacy of Durley, and in 1757 he was a candidate for the provost ship of Oriel, but failed to secure election. Soon afterwards he received the college living of Moreton Pinkney, though he did not reside there, and in 1761 he became curate at Faringdon, near Selborne, a position which he held until in 1784 he again became curate in his native parish. He died in his home, The Wakes, Selborne, on the 26th of June 1793-

Gilbert White's daily life was practically unbroken by any great changes or incidents; for nearly half a century his pastoral duties, his watchful country walks, the assiduous care of his garden, and the scrupulous posting of his calendar of observations made up the essentials of a full and delightful life, but hardly of a biography. At most we can only fill up the portrait by reference to the tinge of simple old-fashioned scholarship, which on its historic side made him an eager searcher for antiquities and among old records, and on its poetic occasionally stirred him to an excursion as far as that gentlest slope of Parnassus in- habited by the descriptive muse. Hence we are thrown back upon that correspondence with brother naturalists which has raised his life and its influence so far beyond the commonplace. His strong naturalist tendencies are not, however, properly to be realized without a glance at the history of his younger brothers. The eldest, Thomas, retired from trade to devote himself to natural and physical science, and contributed many papers to the Royal Society, of which he was a fellow. The next, Benjamin, became the publisher of most of the leading works of natural history which appeared during his lifetime, including that of his brother. The third, John, became chaplain at Gibraltar, where he accumulated much material for a work en the natural history of the rock and its neighbourhood, and carried on a scientific correspondence, not only with his eldest biother, but with Linnaeus. The youngest, Henry, was vicar of Fyfield, hear Andover. The sister's son, Samuel Barker, also became in time one of White's most valued correspondents. With other natural- ists, too, he had intimate relations: with Thomas Pennant and Daines Barrington he was in constant correspondence, often too with the botanist John Lightfoot, and sometimes with Sir Joseph Banks and others, w r hile Richard Chandler and other antiquaries kept alive his historic zeal. At first he was content to furnish information from which the works of Pennant

and Barrington largely profited ; but gradually the ambition of separate authorship developed from a suggestion thrown out by thelatterof these writers in 1770. The next year White sketched to Pennant the project of " a natural history of my native parish, an annus historico-naluralis, comprising a journal for a whole

year, and illustrated with large notes and observations. Such a beginning might induce rrjore able naturalists to write the history of various districts and might in time occasion the pro- duction of a work so much to be wished for — a full and complete natural history of these kingdoms." Yet the famous Natural History and Antiquities of Selborne did not appear until 1789. It was well received from the beginning, and has been reprinted time after time.

To be a typical parish natural history so far as completeness or order is concerned, it has of course no pretensions; batches of letters, an essay on antiquities, a naturalist's calendar and miscel- laneous jottings of all kinds are but the unsystematized material of the work proper, which was never written. Yet it is largely to this very piecemeal character that its popularity has been due. The style has the simple, yet fresh and graphic, directness of all good letter- writing, and there is no lack of passages of keen observation, and even shrewd interpretation. White not only notes the homes and ways, the times and seasons, of plants and animals — comparing, for instance, the different ways in which the squirrel, the field-mouse and the nuthatch eat their hazel-nuts — or watches the migrations of birds, which were then only beginning to be properly recorded or understood, but he knows more than any other observer until Charles Darwin about the habits and the usefulness of the earthworms, and is certain that plants distil dew and do not merely condense it. The book is also interesting as having appeared on the borderland between the medieval and the modern school of natural history, avoiding the uncritical blundering of the old Encyclopaedists, without entering on the technical and analytic character of the opening age of separate monographs. Moreover, as the first book which raised natural history into the region of literature, much as the Compleat Angler did for that gentle art, we must affiliate to it the more finished products of later writers like Thoreau or Richard Jefferies. Yet, while these are essential merits of the book, its en-dearing charm lies deeper, in the sweet and kindly personality of the author, who on his rambles gathers no spoil, but watches the birds and field-mice without disturbing them from their nests, and quietly plants an acorn where he thinks an oak is wanted, or sows beech-nuts in what is now

a stately row. lie overflows with anecdotes, seldom indeed gets beyond the anecdotal stage, yet from this all study of nature must begin; and he sees everywhere intelligence and beauty, love and sociality, where a later view of nature insists primarily on mere adaptation of interests or purely competitive struggles. The encyclopaedic interest in nature, although in White's day culminat- ing in the monumental synthesis of Buffon, was also disappearing before the analytic specialism inaugurated by Linnaeus; yet the catholic interests of tne simple naturalist of Selborne fully reappear a century later in the greater naturalist of Down, Charles Darwin.

The Life and Letters of Gilbert White of Selborne, by his great grand-nephew, Rashleigh Holt-White, appeared in 1901.

WHITE, HENRY KIRKE (1785-1806), English poet, was born at Nottingham, the son of a butcher, on the 21st of March 1785. He was destined at first for his father's trade, but after a short apprenticeship to a stocking- weaver, was eventually articled to a lawyer. Meanwhile he studied hard, and his master offered to release him from his contract if he had sufficient means to go to college. He received encouragement from Cap el Lofft, the friend of Robert Bloomfield, and published in 1803 Clifton Grove, a Sketch in Verse, with other Poems, dedicated to Georgiana, duchess of Devonshire. The book was violently attacked in the Monthly Review (February 1804), but White was in some degree compensated by a kind letter from Robert Southey. Through the efforts of his friends, he was entered as a sizar at St John's College, Cambridge, spending a year beforehand with a private tutor. Close application to study induced a serious illness, and fears were entertained for his sanity, but he went into residence at Cambridge, with a view to taking holy orders, in the autumn of 1805. The strain of continuous study proved fatal, and he died on the 19th of October 1806. He was buried in the church of All Saints, Cambridge. The genuine piety of his religious verses secured a place in popular hymnology for some of his hymns. Much of his fame was due to sympathy inspired by his early death, but it is noteworthy that Byron agreed wiLh Southey in forming a high estimate of the young man's promise.

His Remains, with his letters and an account of his life, were edited (3 vols., 1807-1822) by Robert Southey. See prefatory notices by Sir Harris Nicolas to his Poetical Works (new ed., 1866) in the " Aiding Edition " of the British poets; by H. K. Swann in the volume of selections £1897) in the Canterbury Poets; and by John Drinkwater to the edition in the " Muses' Library." See also J. T. Godfrey and I. Ward, The Homes and Haunts of Henry Kirke White (1908).

WHITE, HUGH LAWSON (1773-1840), American statesman, was born in Iredell county, North Carolina, on the 30th of October 1773. In 1787 he

crossed the mountains into East Tennessee (then a part of North Carolina) with his father James White (1737-1815), who was subsequently prominent in the early history of Tennessee. Hugh became in 1790 secretary to Governor William Blount, and in 1792-1793 served under John Sevier against the Creek and Cherokee Indians, and in the battle of Etowah (December 1793), according to the accepted tradition, killed with his own hand the Cherokee chief Kingfisher. He studied in Philadelphia and in 1796 he was admitted to the bar at Knoxville. He was a judge of the Superior Court of Tennessee in 1801-1807, a state senator in 1807-1809, and in 1809-1815 was judge of the newly organized Supreme Court of Errors and Appeals of the state. From 1812 to 1827 he was president of the State Bank of Tennessee at Knoxville, and managed it so well that for several years during this period it was the only western bank that in the trying period during and after the War of "1812 did not suspend specie payments. In 1821-1824 he was a member of the Spanish Claims Commission, and in 1S25 succeeded Andrew Jackson in the United States Senate, serving until 1840 and being president pro' tent, in 1832- 1834. In the Senate he opposed internal improvements by the Federal government and the recharter of the United States Bank, favoured a protective tariff and Jackson's coercive policy in regard to nullification, and in general supported the measures of President Jackson, though his opposition to the latter's indis- criminate appointments caused a coolness between himself and Jackson, which was increased by White's refusal to vote to ex- punge the resolutions of a former Senate censuring the president. In 1830, as chairman of the Committee on Indian Affairs, he secured the passage of a bill looking to the removal of the Indians to lands west of the Mississippi. He was opposed to Van Buren, Jackson's candidate for the presidency in 1836, was himself nominated in several states as an independent candidate, and received the twenty-six electoral votes of Tennessee and Georgia, though President Jackson made strong efforts to defeat him in the former state. About 1838 he became a Whig in politics, and when the Democratic legislature of Tennessee instructed him to vote for Van Burcn's sub-treasury scheme he objected and resigned (Jan. 1840). His strict principles and his conservatism won for him the sobriquet of ;< The Cato of the United States Senate." He died at Knoxville on the 10th of April 1840.

See Nancy N. Scott (ed.), A Memoir of Hugh Laws on White (Philadelphia, 1856).

WHITE, JOSEPH BLANCO (1775-1841), British theologian and poet, was born at Seville on the nth of July 1775. He was educated for the Roman Catholic priesthood; but after his ordination (1800) religious doubts led him to escape from Spain to England (1810), where he ultimately entered the Anglican Church, having studied theology at Oxford and made the

friendship of Arnold, Newman and Whately. He became tutor in the family of the last-named when he was made archbishop of Dublin (1831). While an this position he embraced Unitarian views; and he found an asylum amongst the Unitarians of Liverpool, where he died on the 20th of May 1841.

White edited El Espafwl, a monthly Spanish magazine in London, from 1810 to 1814, and afterwards received a civil list pension of £250. His principal writings are Doblado's Letters from Spain (1822) ; .Evidence against Catholicism (1825) ; Second Travels of an Irish Gentleman in Search of a Religion (2 vols., 1834); Observations on Heresy and Orthodoxy (1835). They all show literary ability, and were extensively read in their day. He also translated Paley's Evidences and the Book of Common Prayer into Spanish. He is best remembered, however, by his sonnet "Night and Death" ("Mysterious Night! when our first parent knew "), which was dedicated to S. T. Coleridge on its appearance in the Bijou for 1828 and has since found its way into several anthologies. Three versions are given in the Academy of the 12th of September 1891.

See Life of the Rev. Joseph Blanco White, written by himself, il-IQi portions of his Correspondence, edited by John Hamilton Thorn (London, 3 vols., 1845).

WHITE, RICHARD GRANT (1822-1885), American Shake- spearean scholar, philologist and essayist, was born in New York city, on the 23rd of May 1822. He graduated at the university of the City of New York in 1839, studied medicine and then law, and was admitted to the bar in 1845, but made no serious attempts to practise. He contributed (anonymously) musical criticisms to the New York Ccttrier and Enquirer, of which he was co-editor in 1851-1858, and became a member cf the staff of the New York World, when that paper was established in i860. In 1861-1878 he was chief of the United States Revenue Marine Bureau, for the district of New York. When he was 21 years old he wrote his sonnet, " Washington: Pater Patriae," which, published anonymously, was frequently ascribed to Wordsworth, and by William Cullen Bryant was ascribed to Landor ; White did not admit his authorship until 1852. In 1853 he contributed anonymously to Putnam's Magazine (October and November), an acute and destructive criticism of Collier's folio manuscript emendations of Shakespeare; 1 and in the following year this criticism was republished (with other matter) in his Shakespeare's Scholar: being Historical and Critical Siudies of his Text, Characters, and Commentators; with an

Examination of Mr Collier's Folio of 1623. During the Civil War he contributed to the Spectator, under the pseudonym, " A Yankee," a series of articles which greatly influenced English public opinion in favour of the North, while his clever and pungent satire, The New Gospel of Peace; according to St Ben jamin, in four books (1863-1866) — also published anonymously — was an effective attack upon " copper-headism " and the advocates of " peace at any price." He died in New York on the 8th of April 1885.

In addition to those mentioned above, his Shakespearean publica- tions include, Essay on the Authorship of the Three Parts of King Henry VI. (1859), Memoirs of the Life of William Shakespeare; with an Essay towards the Expression of his Genius, and an account of the Rise and Progress of the English Drama to the Time of Shakespeare (1865) ; an annotated edition of Shakespeare's works in 3 vols, (1883), and Studies in Shakespeare (1885), pleading for a rational treatment of the plays without over-annotation, textual or aesthetic. On linguistic subjects he wrote Words and their Uses, Past and Present (1870), and a sequel, Every Day English (1880), which without lingu- istic thoroughness, stimulated interest in the general subject of good use in language. His other publications include National Hymns: How they are Written and How they are not Written (18G1), containing some of the best and worst of 1 200 hymns submitted to a committee (of which White was a member) in a competition for a prize offered for a national hymn; Poetry, Lyrical, Narrative and Satirical, of the Civil War (1866) ; The Pall of Man; or, The Loves of the Gorillas, By a Learned Gorilla (1871); Chronicles of Gotham. By XI. Donough Ouiis (1871); The American View of the Copyright Question (1880), England Without and Within (1881), and The Fate of Mansftild Humphreys (1884), a novel. For estimates of White's critical writing see the review of Shakespeare's Scholar in the Eclectic Magazine, vol. xxxiv. (1855); and the articles in the Atlantic Monthly, vol. xlix. (1882) by E. P. Whipple, and vol. lvii. (1886).

His son, Stanfokd White (1853-1906), the famous architect, studied under Henry H. Richardson, whom he assisted in the designing of Trinity Church, Boston, and became a member of the New York firm of McKim, Mead & White in 1881. He designed the Madison Square Garden, the Century and Metro- politan Clubs in New York City, the buildings of the New York University and the University of Virginia, and the pedestals for several of the statues by Augustus St Gaudens. He was murdered by Harry Thaw in 1906.

WHITE, ROBERT (1645-1704), English engraver and draughtsman, was born in London in 1645. He studied en- graving under David Loggan, for whom he executed many architectural subjects; his early works also include

landscapes and engraved title-pages for books. He acquired great skill in portraiture, his works of this class being commonly drawn with black-lead pencil upon vellum, and afterwards excellently en- graved in line. Portraits executed in this manner he marked ad vivum, and they are prized by collectors for their artistic merit and their authenticity. Virtue catalogued 275 portrait

1 J. Paine Collier, Notes and Emendations to the Text of Shake- speare's Plays from Early MS. Corrections in a Copy of the Folio, 1632 (London. 1853).

engravings by White, including the likenesses of many of the most celebrated personages of his day; and nine portraits engraved in mezzotint are assigned to him by J. Chaloner Smith. White died at Bloomsbury , London, in 1 704. His son, George White, who was bom about 1671 and died about 1734, is also known as an engraver and portrait -painter.

WHITE, SIR THOMAS (1492-1567), founder of St John's College, Oxford, was a son of William White, a clothier, and was bora at Reading. At an early age he became a merchant in London and was soon a member, and then master of the Merchant Taylors Company; growing wealthier he became an alderman and sheriff of the city of London. One of the promoters of the Muscovy Company, he was knighted in 1553, and in October of the same year he was chosen lord mayor. His term of office fell in a strenuous time. He had to defend the city against Sir Thomas Wyat and his followers, and he took part in the trial of the rebels, as just previously he had done in the case of Lady Jane Grey. In 1555 White received a licence to found a college at Oxford, which he endowed with lands in the neighbourhood of the city and which, dedicated to the Virgin Mary and St John Baptist, was opened in 1560. Soon after this event Sir Thomas began to lose money, and he was comparatively poor when he died at Oxford on the 12th of February 1567. His later years were mainly spent in Oxford, and he was buried in the chapel of St John's College. White had some share in founding the Merchant Taylors' School in London. He was twice married, but left no children. A portrait of him hangs in the hall of St John's College and one on glass, painted in the 16th century, is in the old library. Several early lives of him are among the college manu- scripts. Sir Thomas must be distinguished from another Sir Thomas White of South Warnborough, Hampshire, some of whose properly, by a curious coincidence, passed also into the possession of St John's College.

WHITE, THOMAS (c. 1550-1624), English divine, was born at Bristol about 1550, the son of a clothier. He graduated from Magdalen Hall (now Hertford College), Oxford., in 1570; took holy orders, and, coming to London, became rector of St Gregory by St Paul's and shortly after vicar of

St Dunstan's in the West. Several of his sermons, attacking play-going and the vices of the metropolis, were printed. He was made a prebendary of St Paul's, treasurer of Salisbury, canon of Christ Church, Oxford, and canon of Windsor. In 1613 he built and endowed an almshouse, called the Temple Hospital, in Bristol. In 1621 he founded what is now known as White's chair of moral philosophy at Oxford, with a salary of £100 per annum for the reader, and several small exhibitions for scholars of Magdalen Hall. He died on the 1st of March 1624, bequeathing £3000 for the estab- lishment of a college of " all the ministers, parsons, vicars, lecturers and curates in London and its suburbs " (afterwards Sion College (q.v.)), and an almshouse, now abolished, and leaving bequests for lectureships at St Paul's, St Dunstan's and at Newgate.

WHITE, THOMAS (1628-1698), bishop of Peterborough, was born at Aldington in Kent, and educated at St John's College, Cambridge. Having taken hoiy orders, he became vicar of Newark-on-Trent in 1660, vicar of Allhallows the Great, London, in 1666, and vicar of Bottesford, Leicestershire, in 1679. In 1683 he was'" appointed chaplain to the princess Anne, and in 1685 he was chosen bishop of Peterborough. In 168S he joined the archbishop of Canterbury, William Sancroft, and five of his suffragan bishops in petitioning against the declaration of indulgence issued by James II., sharing the trial and the triumph- ant acquittal of his colleagues. In 1689 he refused to take the oath of allegiance to William and Mary and was deprived of his see, but he did not become very active among the nonjurors. White died on the 30th of May 1698.

The bishop must be distinguished not only from the founder of Sion College, but also from Thomas White (1593-1676), philo- sopher and controversialist. Educated at St Omer, Valladolid and Douai, the latter was ordained priest in 161 7, and taught for some years in the college at Douai. Later he was president of the English college at Lisbon. He died in London on the 6th

of July 1676. White was a voluminous writer; not only did he engage in controversy with Protestants, but he attacked the personal infallibility of the pope.

WHITE, SIR WILLIAM ARTHUR (1824-1891), British diplomatist, was born at Pulawy, in Poland, on the 13th of February 1824. He was descended on his father's side from an Irish Roman Catholic family. His mother's family, though not of Polish extraction, owned considerable

estates in Poland, where White, though educated at King William's College, Isle of Man, and Trinity College, Cambridge, spent a great part of his early days, and thus gained an intimate knowledge of the Slavonic tongues. From 1843 to 1857 he lived in Poland as a country gentleman, but in the latter year he accepted a post in the British consulate at Warsaw, and had almost at once to perform the duties of acting consul-general. The insurrection of 1863 gave him an opportunity of showing his immense knowledge of Eastern politics and his combination of diplomatic tact with resolute determination. He was promoted in 1864 to the post of consul at Danzig. The Eastern Question was, however, the great passion of his life, and in 1875 he succeeded in getting transferred to Belgrade as consul-general for Servia. In 1879 he was made British Agent at Bucharest. In 1884 he was offered by Lord Granville the choice of the legation at Rio or Buenos Aires, and in 1885 Lord Salisbury, who was then at the Foreign Office, urged him to go to Peking, pointing out the increasing import- ance of that post. White's devoted friend, Sir Robert Morier, wrote in the same sense. But White, who was already acting as ambassador ad interim at Constantinople, decided to wait; and during this year he rendered one of his most conspicuous services. It was largely owing to his efforts that the war between Servia and Bulgaria was prevented from spreading into a universal conflagration, and that the union of Bulgaria and eastern Rumelia was accepted by the powers. In the following year he was rewarded with the embassy at Constantinople. He was the first Roman Catholic appointed to a British embassy since the Reformation. He pursued consistently the policy of counteracting Russian influence in the Balkans by erecting a barrier of independent states animated with a healthy spirit of national life, and by supporting Austrian interests in the East. To the furtherance of this policy he brought an unrivalled knowledge of all the under-currents of Oriental intrigue, which his mastery of languages enabled him to derive not only from the newspapers, of which he was an assiduous reader, but from the obscurest sources. His bluff and straightforward manner, and the knowledge that with him the deed was ready to follow the word, enabled him at once to inspire confidence and to overawe less masterful rivals. The official honours bestowed on him culminated in 1888 with the G.C.B. and a seat on the Privy Council. He was still ambassador at Constantinople when he was attacked by influenza during a visit to Berlin, where he died on the 28th of December 1891.

WHITE, SIR WILLIAM HENRY (1845-), English naval architect, was born at Devonport on the 2nd of February 1845, and at the age of fourteen became an apprentice in the dockyard there. In 1864 he took the first place in the scholarship com- petition at the Royal School of Naval Architecture, which had then just been established by the Admiralty at South Kensington, and in 1867 he gained his diploma as fellow of the school with first-class

honours. At once joining the constructive staff of the Admiralty, he acted as confidential assistant to the chief con- structor, Sir Edward Reed, until the latter's retirement in 1870. The loss of the " Captain " in that year was followed by an inquiry into designs for ships of war, and in connexion with this White, together with his old fellow-student, William John, worked out a long series of calculations as to the stability and strength of vessels, the results of which were published in an important paper read in 1871 before the Institution of Naval Architects. In 1872 White was appointed secretary to the Council of Construction at the Admiralty, in 1875 assistant con- structor, and in i88t chief constructor. In April 1883 he left the service of the Admiralty, at the invitation of Lord (then Sir W. G.) Armstrong, in order to undertake the difficult task of

organizing a department for the construction of warships of the largest size at the Elswick works; but he only remained there for two and a half years, for in October 1885 he returned to the Admiralty in succession to Sir Nathaniel Barnaby as director of naval construction, retaining that post until the beginning of 1902, when ill-health obliged him to relinquish the arduous labours it entailed. During that period, which in Great Britain was one of unprecedented activity in naval shipbuilding as a result of the awakening of public opinion to the vital importance of sea-power, more than 200 vessels of various types were added to the British navy, at a total cost of something like 100 millions sterling, and for the design of all of these, as well as for the work of their construction, Sir William White was ultimately respon- sible. In addition, he did much to further the knowledge of scientific shipbuilding. He was professor of naval architecture at the Royal School from 1870 to 1873, and when in the latter year it was moved to Greenwich to be merged in the Royal Naval College, he reorganized the course of instruction and acted as professor for eight years more. The lectures he gave in that capacity were the foundation of his Manual of Naval Architecture, which has been translated into several foreign languages and is recognized as a standard text-book all over the world. Sir William White, who was chosen a fellow of the Royal Society in 1888, also read many professional papers before various learned and engineering societies. He was created K.C.B. in

1895.

WHITEAVES, JOSEPH FREDERICK (1835-), British palaeontologist, was born at Oxford, on the 26th of December 1835. He was educated at private schools, and afterwards worked under John Phillips at Oxford (i8s8-i86r); he was led to study the Oolitic rocks, and added largely to our knowledge of the fossils of the Great Oolite series, Cornbrash and Corallian {Rep. Brit. Assoc. r86o, and Ann., Nat. Hist. 1861). In 1861 he visited Canada and made acquaintance with the geology of Quebec and Montreal,

and in 1863 he was appointed curator of the museum and secretary of the Natural History Society of Montreal, posts which he occupied until 1875. He studied the land and freshwater mollusca of Lower Canada, and the marine invertebrata of the coasts; and also carried on researches among the older Silurian (or Ordovician) fossils of the neighbourhood of Montreal. In 1875 he joined the palaeontological branch of the Geological Survey of Canada at Montreal; in the following year he became palaeontologist, and in 1877 he was further appointed zoologist and assistant director of the survey. In 1881 the offices of the survey were removed to Ottawa. His publica- tions on Canadian zoology and palaeontology are numerous and important. Dr Whiteaves was one of the original fellows of the Royal Society of Canada, and contributed to its Transactions, as well as to the Canadian Naturalist and other journals. He received the hon. degree of LL. D. in 1900 from McGill University, Montreal.

WHITEBAIT, the vernacular name of the small fish which appears in large shoals in the estuary of the Thames during the summer months, arid is held in great esteem as a delicacy for the table. Formerly whitebait was supposed to be a distinct species of fish. T. Pennant and G. Shaw believed it to be some kind of Cyprinoid fish, similar to the bleak, whilst E. Donovan, in his Natural History of British Fishes (1802-1808), misled by speci- mens sent to him as whitebait, declared it to be the young of the shad. In r82o W. Yarreli proved conclusively that Donovan's opinion was founded upon an error; unfortunately he contented himself with comparing whitebait with the shad only, and in the end adopted the opinion of the Thames fishermen, whose interest it was to represent it as a distinct adult form; thus the whitebait is introduced into Yarrell's History of British Fishes (1836) as Clupea alba. The French ichthyologist Valenciennes went a step farther, declaring it to be not only specifically but also generically distinct from all other Clupeoids. It is now known to consist of the young fry of herrings and sprats in varying proportions mixed with a few shrimps, gobies, stickle- backs, pope-fishes and young flounders: but these impurities are as far as possible picked out from the whitebait before it is

marketed. The fishing is carried on from February to August, and samples taken in the successive months were found to contain the following percentages of herrings, the remainder being young sprats: 7, 5, 14, 30, 87, 75, 52. Hence it will be seen that sprats predominated in February, March, April and May, herrings in June and July. There is reason to believe that these young herrings are derived from a local " winter " race spawning

about February and March, and having nothing to do with the great shoals of the more open sea spawning in the North Sea in November. The Thames being unequal to the supply of the large demand for this delicacy, large quantities of whitebait are now brought to London and other markets from many parts of the coast. In times past whitebait were considered to be peculiar to the estuary of the Thames; and, even after the specific identification of Thames whitebait with the young of the herring and sprat, it was still thought that there was a dis- tinctive superiority in its condition and flavour. It is possible that the young fish find in the estuary of the Thames a larger amount of suitable food than on other parts of the coast, where the water may be of greater purity, but possesses less abundance of the minute animal life on which whitebait thrive. Indeed, Thames whitebait which have been compared with that from the mouth of the Exe, the Cornish coast, Menai Strait, and the Firth of Forth seemed to be better fed; but, of course, the specific characteristics of the herring and sprat — into which we need not enter here— were nowise modified.

The fry of fishes is used as an article of diet in almost every country: in Germany the young of various species of Cyprinoids, in Italy and Japan the young of nearly every fish capable of being readily captured in sufficient numbers, in the South Sea Islands the fry of Teutkis, in New Zealand young Galaxias are consumed at certain seasons in large quantities; and, like whitebait, these fry bear distinct names, different from those of the adult fish.

Whitebait are caught on the flood-tide from boats moored in from 3 to 5 fathoms of water. The net used is a bag some 20 ft. long, narrow and small-meshed towards the tail end, the mouth being kept open in the direction of the advancing tide by a framework 3 or 4 ft. square. It is placed alongside the boat and sunk to a depth of 4 ft. below the surface ; Irom time to time the end of the bag is lifted into the boat, to empty it of its contents. The " schools' of whitebait advancing and retiring with the tide for days, and probably for weeks, have to run the gauntlet of a dozen of these nets, and therefore get very much thinned in number by the end of the season. When the view commenced to gain ground that whitebait were largely young herring, the question arose whether or not the immense destruction of the young brood caused by this mode of fishing in- juriously affected the fishery of the mature herring. This perhaps it does; but, since it has been ascertained that the herring is much more restricted in its migrations than was formerly believed, and that the shoals are to a great extent local, the injury, such as it is, must be local and limited to the particular district in which the fishing for whitebait is methodically practised. Similar reasoning applies to sprats. (J. T. C.)

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WHITEFIELD, . GEORGE (1 7 r4-i 770) , English religious leader, was born on the 16th of December 1714 at the Bell Inn, Gloucester, of which his father was landlord. At about twelve years of age he was sent to the school of St Mary de Crypt, Gloucester, where he developed some skill in elocution and a taste for reading plays, a circumstance which probably had considerable influence on his subsequent career. At the age of fifteen he was taken from school to assist his mother in the public-house, and for a year and a half was a common drawer. He then again returned to school to prepare for the university, and in 1733 entered as a servitor at Pembroke College, Oxford, graduating in 1736. There he came under the influence of the Methodists (see Wesley), and entered so enthusiastically into their practices and habits that he was attacked by a severe illness, which compelled him to return to his native town. His enthusiastic piety attracted the notice of Martin Benson, bishop of Gloucester, who ordained him deacon on the 20th of June 1736. He then began an evangelizing tour in Bath, Bristol and other towns, his eloquence at once attracting immense multitudes.

In 1736 he was invited by Wesley to go out as missionary to

Georgia, and went to London to wait on the trustees. Before setting sail he preached in some of the principal London churches, and in order to hear him, crowds assembled at the church doors long before daybreak. On the 28th of December 1737 he em- barked for Georgia, which he reached on the 7th of May 1738. After three months' residence there he returned to England to receive priest's orders, and to raise contributions for the estab- lishment of an orphanage. As the clergy did not welcome him to their pulpits, he began to preach in the open air. At Kings- wood Hill, Bristol, his addresses to the colliers soon attracted crowds, and his voice was so clear and powerful that it could reach 20,000 folk. His fervour and dramatic action. held them spell-bound, and his homely pathos soon broke down all barriers of resistance. " The first discovery of their being affected," he says, " was by seeing the white gutters made by their tears, which plentifully fell down their black cheeks." In 1738 an account of Whitefield's voyage from London to Georgia was published with- out his knowledge. In 1739 he published his Journal from his arrival in Savannah to his return to London, and also his Journal from his arrival in London to his departure thence on his way to Georgia. As Ms embarkation was further delayedfor ten weeks he published A Continuation of the Rev. Mr Whitefield' s Journal during the Time he was delayed in England by the Embargo. His unfavourable reception in England by the clergy led him to make reprisals. To Joseph Trapp's attack on the Methodists he published in 1739 A Preservative against Unsettled Notions, in which the clergy of the Church of England were denounced with some bitterness; he also published shortly afterwards The Spirit and Doctrine and Lives of our Modern Clergy, and a reply to a

pastoral letter of the bishop of London in which he had been attacked. In the same year appeared Sermons on Various Subjects (2 vols.), the Church Companion, or Sermons on Several Subjects, and a recommendatory epistle to the Life of Thomas Halyburton. He again embarked for America in August 1739, and remained there two years, preaching in all the principal towns. He left his incumbency of Savannah to a lay delegate and the commissary's court at Charleston suspended him for ceremonial irregularities. While there he published Three Letters from Mr Whitefield, in which he referred to the "mystery of iniquity " in Tillotson, and asserted that that divine knew no more of Christ than Mahomet did.

During his absence from England Whitefield found that a divergence of doctrine from Calvinism had been introduced by Wesley; and notwithstanding Wesley's exhortations to brotherly kindness and forbearance he withdrew from the Wesleyan connexion. Thereupon his friends built for him near Wesley's church a wooden structure, which was named the Moorfields Tabernacle. A reconciliation between the two great evangelists was soon effected, but each thenceforth went his own way. In 1741, on the invitation of Ralph and Ebenezer Erskine, he paid a visit to Scotland, commencing his labours in the Secession meeting-house, Dunfermline. But, as he refused to limit his ministrations to one sect, the Seceders and he parted company, and without their countenance he made a tour through the prin- cipal towns of Scotland, the authorities of which in most instances presented him with the freedom of the burgh, in token of their estimate of the benefits to the community resulting from his preaching. From Scotland he went to Wales, where on the 14th of November he married a widow named James. The marriage was not a happy one. On his return to London in 1742 he preached to the crowds in Moorfields during the WTiitsun holidays with such effect as to attract nearly all the people from the shows. After a second visit to Scotland, June- October 1742 (where at Cambuslang in particular he wielded a great spiritual influence), and a tour through England and Wales, 1742-1744, he embarked in August 1744 for America, where he remained till June 1748. On returning to London he found his congregation at the Tabernacle dispersed; and his circumstances were so depressed that he was obliged to sell his household furniture to pay his orphan-house debts. Relief soon came through his acquaintance with Selina, countess of Huntingdon (q.v.), who appointed him one of her chaplains.

The remainder of Whitefield's life was spent chiefly in evangel- izing tours in Great Britain, Ireland and America. It has been stated that " in the

compass of a single week, and that for years, he spoke in general forty hours, and in very many sixty, and that to thousands." In 1748 the synods of Glasgow, Perth and Lothian passed vain resolutions intended to exclude him from churches; in 1753 he compiled his hymn-book, and in 17 56 opened the chapel which still bears his name in Tottenham Court Road. On his return from America to England for the last time the change in his appearance forcibly impressed Wesley, who wrote in his Journal: " He seemed to be an old man, being fairly worn out in his Master's service, though he had hardly seen fifty years." When health was failing him he placed himself on what he called " short allowance," preaching only once every week-day and thrice on Sunday. In 1769 he returned to America for the seventh and last time, and arranged for the conversion of his orphanage into Bethesda College, which was burned down in 1773. He was now affected by a severe asthmatic complaint; but to those who advised him to take some rest, he answered, " I had rather wear out than rust out." He died on the 30th of September 1770 at Newburyport, Massachusetts, where he had arrived on the previous evening with the intention of preaching next day. In accordance with his own desire he was buried before the pulpit in the Presbyterian church of the town where he died.

Whitefield's printed works convey a totally inadequate idea of his oratorical powers, and are all in fact below mediocrity. They ap- peared in a collected form in 1771-1772 in seven volumes, the last containing Memoirs of his Life, by Dr John Gillies. _ His Letters (1734-1770) were comprised in vols, i., ii. and in. of his Works and were also published separately. His Select Works, with a memoir by J. Smith, appeared in 1850. See Lives by Robert Philip (1837), L.Tyerman (2 vols., 1876-1877),]. P. Gledstone (1871, new ed. 1900), and VV. H. Lecky's History of England, vol. ii.

WHITEFISH, a collective name applied in different countries to very different kinds of freshwater fishes. The numerous European species of the Cyprinoid genus Leuciscus are frequently comprised under the name of " Whitefish," but the term is employed here for the various species of the Salmonoid genus Coregonus. The Coregonus group arc somewhat herring-shaped, silvery salmonids with small, toothless or feebly toothed mouth, and rather large scales. They are distributed over Europe, Asia and North America, some species living in the sea, but most inhabiting clear lakes. The highly esteemed " lavaret " of Savoy, the " felchen," " kilch," " gangfisch," " palee," " gravenche," " fera " or Switzerland and southern Germany, the " sik " of Sweden, belong to this genus, which is represented in British and Irish waters by the houting (C. oxyrhynchus), occasionally found in the North Sea, the gwyniad or pawan (C. clupeoides) of Loch Lomond, Haweswater, Ullswater and Bala, the vendace (C. vandesius) of Lochmaben, and its newly described ally (C. gracilior) from Derwentwater

and Bassenthwaite lakes -in Cumberland. About eight species are distinguished from the northern parts of North America. The Coregonus are mostly of small size, few of them attaining a length of 18 in. Secondary nuptial sexual characters are by no means so well marked as in Salmo, but pearl-like excrescences may appear on the scales during the breeding season, and are more prominent in males than in females.

WHITEHALL, a village of Washington county, New York, U.S.A., in a township of the same name on the Poultney river and the Champlain Canal, at the head of Lake Champlain, and 78 m. by rail N. by E. of Albany. Pop. (1890) 4434; (1900) 4377, of whom 547 were foreign-born; (1905) 4148; (191°) 4° I 7- Whitehall is served by the Delaware & Hudson railway, and is the N. terminus of the new barge-canal system of New York state. It is situated in a narrow valley between two hills called West Mountain and Skene's Mountain, and Wood Creek flows through the village and empties into the lake with a fall, from which valuable water-power is derived; there are various manufactures, and the village owns and operates the water works. In 1759, to strengthen the British hold on Canada, a iarge tract of land at the S. end of Lake Champlain was granted to Colonel

Philip Skene (1725-1810), who fought at Ticonderoga in 1758 and in 1759, and who established here in 1761 a settlement of about thirty families which he called Skenesborough and which was patented in 1765. Skene was a Loyalist, and in May 1775 Skenesborough was seized by a party of American volunteers. In Burgoyne's expedition (1777) Skene and his son, Andrew Philip Skene (1753-1826), served as guides, and Skenesborough was recovered by the British after most of it had been burned by the Americans. At the close of the war Skene's estate was confiscated and in 1786 the place was named Whitehall. In the War of 181 2 Whitehall was fortified and was a base of supplies for American operations against Canada. It was incorporated as a village in 1806.

WHITEHAVEN, a municipal and parliamentary borough, seaport and market town of Cumberland, England, 41 m. S.W. of Carlisle. Pop. (1901) 19,324. It lies mainly in a valley opening upon the Irish Sea, with high ground to north and south, and is served by the London & North- Western, the Cockermouth, Keswick & Penrith and the Furness railways. The harbour is protected by two main piers, of which the western is a fine structure by Sir John Rennie, and divided into four parts by others; it has a wet dock and extensive quayage. Regular passenger communications are maintained with the Isle of Man. The exports are principally coal, pig iron and ore, steel and stone. The port was made subordinate to that of Maryport in 1892. There are collieries near the town, the workings extending beneath the sea; there are also iron mines and works, engineering

works, shipbuilding yards, breweries, tanneries, stone quarries, brick and earthenware works, and other industrial establish- ments in and near the town. The parliamentary borough returns one member. The municipal borough is under a mayor, 6 aldermen and 18 councillors. Area 1810 acres.

Whitehaven (Wilofthaven) was an insignificant possession of the priory of St Bee which became crown property at the dis- solution of the religious houses. It was acquired before 1644 by relatives of the earl of Lonsdale, who secured the prosperity of the town by working the coal-mines. From 1 708 the harbour was governed by twenty-one trustees, whose power was extended and municipalized by frequent legislation, until, in 1885, they w T ere incorporated. In 1894 this government by incorporated trustees gave place to that of a municipal corporation created by charter in that year. The harbour was entrusted to fifteen commissioners. Since the Reform Act of 1832 Whitehaven has returned one representative to parliament. A weekly market and yearly fairs were granted to Sir John Lowther in 1660; two fairs were held in 1888; and the market days are now Tuesday, Thursday and Saturday. Whitehaven coal was sent chiefly to Ireland in the 18th century. In the first half of the 19th century other exports were lime, freestone, and grain; West Indian, American and Baltic produce, Irish flax and Welsh pig iron were imported, and shipbuilding was a growing industry. Paul Jones, the notorious buccaneer, served his apprenticeship at the port, which in 1778 he successfully raided, burning three vessels.

WHITEHEAD, WILLIAM (1715-1785), English poet-laureate, son of a baker, was born at Cambridge, and baptized on the 1 2th of February 1715. His father had extravagant tastes, and spent large sums in ornamenting a piece of land near Grant – chester, afterwards known as " Whitehead's Folly." William was his second son, and through the patronage of Henry Bromley, afterwards Lord Montfort, was admitted to Winchester College. In 1735 he entered Clare Hall, Cambridge, as a sizar, and became a fellow in 1742. At Cambridge Whitehead published an epistle "On the Danger of writing Verse" 1 and some other poems, notably an heroic epistle, Ann Boleyn to Henry the Eighth (1743), and a didactic Essay an Ridicule (1743). In 1745 he became tutor to Viscount Villiers, son of the earl of Jersey, and took up his residence in London. He produced two tragedies: The Roman Father (Drury Lane, 24th of February 1750), and Creusa, Queen of Athens (Drury Lane, 20th of April 1754). The plots are based respectively on the Horace of Corneille, and the Ion of Euripides. In June 1754 he went abroad with Lord Villiers,

1 Printed in A Collection of Poems by several Hands (vol. ii., 1748).

and his companion Viscount Nuneham, son of Earl Harcourt, only returning to England in the autumn of 1756. In 1757 he was appointed poet-laureate in succession to Cibber, and proceeded to write annual effusions in the royal honour. That he was not altogether happy in his position, which was dis- credited by the fierce attacks made on his predecessor, Colley Cibber, appears from " A Pathetic Apology for all Laureates, past, present and to come." Charles Churchill attacked him in 1762, in the third book of The Gkosl, as the heir of Dullness and Method. In the same year Whitehead produced his most successful work in the comedy of the School for Lovers, produced at Drury Lane on the 10th of February. This success encouraged David Garrick to make him his reader of plays. Whitehead's farce, The Trip to Scotland, was performed on the 6th of January 1770. He collected his Plays and Poems in 1774. He had for some time, after his return from the Continent, resided in the houses of his patrons, but from 1760 he lived in London, where he died on the 14th of April 1785. Beside the works already mentioned, Whitehead wrote a burlesque poem, The Sweepers, a number of verse contes, of which " Variety " and " The Goat's Beard " are good examples, and much occasional and official verse.

See memoirs by his friend William Mason, prefixed to a complete edition of

his poems (York, 1788). His plays are printed in Bell's British Theatre (vols. 3, 7, 20) and other collections, and his poems appear in Chalmers's Works of the English Poets (vol. 17) and similar compilations.

WHITE HORSE, VALE OF, the name of the valley of the Ock, a stream which joins the Thames from the west at Abingdon in Berkshire, England. The vale is flat and well wooded, its green meadows and foliage contrasting richly with the bald summits of the White Horse Hills, which flank it on the south. On the north a lower ridge separates it from the upper Thames valley; but local usage sometimes extends the vale to cover all the ground between the Cotteswolds (on the north) and the White Horse Hills. According to the geographical definition, however, the vale is from 2 to 5 m. wide, and the distance by road from Abingdon to Shrivenham at its head is 18 m. Wantage is the only town in the heart of the vale, lying in a sheltered hollow at the foot of the hilis, along which, moreover, villages are more numerous than elsewhere in the vale. Towards the west, above Uffington, the hills reach a culminating point of 856 ft. in White Horse Hill. In its northern flank, just below the summit, a gigantic figure of a horse is cut, the turf being removed to show the white chalky soil beneath. This figure gives name to the hill, the range and the vale. It is 374 ft. long and of the rudest outline, the neck, body and tail varying little in width. Its origin is unknown. Tradition asserted it to be the monument of a victory over the Danes by King Alfred, who was born at Wantage; but the site of the battle, that of Ashdown (871), has been variously located. Moreover, the figure, with others of a similar character elsewhere in England, is considered to be of a far higher antiquity, dating even from before the Roman occupation. Many ancient remains occur in the vicinity of the Horse. Oh the summit of the hill there is an extensive and well- preserved circular camp, apparently used by the Romans, but of earlier origin. It is named Uffington Castle from the village in the vale below. Within a short distance are Hardwell Castle, a square work, and, on the southern slope of the hills near Ash- down Park, a small camp traditionally called Alfred's. A smooth, steep gully on the north flank of White Horse Hill is called the Manger, and to the west of it rises a bald mound named Dragon's Hill, the traditional scene of St George's victory over the dragon, the blood of which made the ground bare of grass for ever. But the name, properly Pendragon, is a Celtic form signifiying " chief of kings," and may point to an early place of burial. To the west of White Horse Hill lies a cromlech called Wayland Smith's Cave, said to be the home of a smith who was never seen, but shod the horses of travellers if they were left at the place with payment. The legend is elaborated, and the smith appears as a character, in Sir Walter Scott's novel Kenilworlh. The White Horse itself has been carefully cleared of vegetation from time to time, and the process, known as the " Scouring of the White Horse,"

was formerly made the occasion of a festival. Sportsof all kinds were held, and keen rivalry was maintained, not only between the inhabitants of the local villages, but between local champions and those from distant parts of England. The first of such festivals known took place in 1755, and they died out only subsequently to 1857. A grassy track represents the ancient road or Ridge Way along the crest of the hills continuing Icknield Street, from the Chiltern Hills to the north-east, across the Thames; and other earthworks in addition to those near the White Horse overlook the vale, such as Letcombe Castle above Wantage. At the foot of the hills not far east of the Horse is preserved the so-called Blowing Stone, a mass of sandstone pierced with holes in such a way that when blown like a trumpet a loud note is produced. It is believed that in the earliest times the stone served the purpose of a bugle. Several of the village churches in the vale are of interest, notably the fine Early English cruciform building at Uffington. The length of the vale is traversed by the main line of the Great Western railway, between Didcot and Swindon.

See Thomas Hughes, The Scouring of the White Horse (1859).

WHITEING, RICHARD (1840-), English author and journalist, was born in London on the 27th of July 1840, the son of a civil servant. He was a pupil of Benjamin Wyon, medallist and seal-engraver, and made his journalistic debut by a series of papers in the Evening Star in 1866, printed separately in the next year as Mr Sprouts, His Opinions. He became leader-writer and correspondent on the Morning Star, and was subse- quently on the staff of the Manchester Guardian, the New York World, and for many years the Daily News, resigning from th« last-named paper in r8oo. His novel The Democracy (3 vols., 1876) was published under the pseudonym of Whyte Thorne. His remarkable story The Island (1888) attracted little attention until, years afterwards, its successor, No. 5 John Street ˆ899), made him famous; the earlier novel was then republished. Later works were The Yellow Van (1903), Ring in the New (1906), All Moonshine (1907).

WHITELEY, WILLIAM ˆ831-1907), English "Universal Provider," was born at Agbrigg, near Wakefield, Yorkshire, on the 29th of September 1831, the son of a corn-factor. At the age of sixteen he was apprenticed to a firm of drapers at Wakefield. In 1851 he made his first visit to London to see the Great Exhibi- tion, and was so impressed with the size and activity of the metropolis that he determined to settle there as soon as his apprenticeship was over. A year later he obtained a subordinate position in a draper's establishment in the city, and after studying the drapery trade in this and other London establishments for ten years, in 1863 himself opened a small shop for the sale of fancy drapery in Westbourne Grove, Bayswater. His capital amounted to about £700, which he had saved from his salaries and commissions, and he at first employed two young girls and

an errand boy. Friends in the trade had assured him that Westbourne Grove was one of the two worst streets in London for his business, but Whiteley had noted the number and quality of the people who passed the premises every afternoon, and relied on his own judgment. Events justified his confidence, and within a year he was employing fifteen hands. He made a con- sistent practice of marking all goods in plain figures and of "dressing " his shop-window attractively, both unusual features in the retail trading of the time, and to this, coupled with the fact that he was satisfied with small profits, he largely attributed a success in which his own genius for organization and energy played a conspicuous part. In 1866 Whiteley added general drapery to his other business, opening by degrees shop after shop and department after department, till he was finally enabled to call himself the " Universal Provider," and boast that there was nothing which his stores could not supply. " Whiteley's was, in fact, the first great instance of a large general goods store in London, held under one man's control. In 1899 the business, of which the profits then averaged over £roo,ooo per annum, was turned into a limited liability company, Whiteley retaining the bulk of the shares. On the 23rd of January 1907 he was shot dead, after an interview in his private

office, by Horace George Rayncr, who claimed (but, as was proved, wrongly) to be his illegitimate son and who had been refused pecuniary assistance. Rayner was found guilty of murder, and sentenced to be hanged; but the home secretary (Mr Herbert Gladstone), in response to an agitation for his reprieve, commuted the sentence to penal servitude for life.

WHITELOCKE, SIH JAMES (1570-1632), English judge, son of Richard Whitelocke, a London merchant, was born on the 28th of November 1570. Educated at Merchant Taylors' School, London, and at St John's College, Oxford, he became a fellow of his college and a barrister. He was then engaged in managing the estates belonging to St John's College, Eton College and Westminster College, before he became recorder of Woodstock and member of parliament for the borough in 1610. In 1620 Whitelocke was made chief justice of the court of session of the county palatine of Chester, and was knighted; in 1624 he was appointed justice of the court of king's bench. He died at Fawley Court, near Reading, an estate which he had bought in 1616, on the 22nd of June 1632. His wife, Elizabeth, was a daughter of Edward Bulstrode of Hedgerley Bulstrode, Bucking- hamshire, and his son was Bulstrode Whitelocke.

Sir James was greatly interested in antiquarian studies, and was the author

of several papers which are printed in T. Hearne's Collec- tion of Discourses (1771} ; his journal, or Liber Jamelicus, was edited by John Bruce and published by the Camden Society in 1858.

Whitelocke's elder brother, Edmund Whitelocke (1565-1608), was a soldier in France and later a courtier in England. He was imprisoned because he was suspected of being concerned in the Gunpowder Plot, and although he was most probably innocent, he remained for some time in the Tower of London.

The soldier John Whitelocke (1757-1833) was doubtless a descendant of Sir James Whitelocke. He entered the army in iyyS and served in Jamaica and in San Domingo. In 1805 he was made a lieutenant-general and inspector-general of recruit- ing, and in 1807 he was appointed to command an expedition sent to recover Buenos Aires from the Spaniards. An attack on the city was stubbornly resisted, and then Whitelocke concluded an arrangement with the opposing general by which he aban- doned the undertaking. This proceeding was regarded with great disfavour both by the soldiers and others in South America and in England, and its author was brought before a court- martial in 1808. On all the charges except one he was found guilty and he was dismissed from the service. He lived in retire- ment until his death on the 23rd of October 1833.

WHITELOCKE, BULSTRODE (1605-1675), English lawyer and parliamentarian, eldest son of Sir James Whitelocke, was baptized on the 19th of August 1605, and educated at Merchant Taylors' School and at St John's College, Oxford, where he matriculated on the 8lh of December 1620. He left Oxford, without a degree, for the Middle Temple, and was called to the bar in 1626 and chosen treasurer in 1628. He was fond of field sports and of music, and in 1633 he had charge of the music in the great masque performed by the inns of court before the king and queen. Meanwhile he had been elected for Stafford in the parliament of 1626 and had been appointed recorder of Abingdon and Henley. In 1640 he was chosen member for Great Marlow in the Long Parliament. He took a prominent part in the proceedings against Strafford, was chairman of the committee of management, and had charge of articles XIX.XXIV. of the impeachment. He drew up the bill for making parliaments indissoluble except by their own consent, and supported the Grand Remonstrance and the aclion taken in the Commons against the illegal canons; on the militia question, however, he advocated a joint control by king and parliament.. On the out break of the Great Rebellion he took the side of the parliament, using his influence in the country as deputy-lieutenant to prevent the king's raising troops in Buckinghamshire and Oxfordshire. He was sent to the king at Oxford both in 1643 and 1644 to negotiate terms, and the secret communications with Charles on the latter occasion were the foundation of

a charge of treason brought against Whitelocke and Denzil Holies (?..) later. He was again one of the commissioners at Uxbridge in 1645.*

Nevertheless he opposed the policy of Holies and the peace party and the proposed disbanding of the army in J 647, and though one of the lay members of the assembly of divines, repudiated the claims of divine authority put forward by the Presbyterians for their church, and approved of religious toler- ance. He thus gravitated more towards Cromwell and the army party, but he took no part either in the disputes between the army and the parliament or in the trial of the king. On the establishment of the Commonwealth, though out of sympathy with the government, he was nominated to the council of state and a commissioner of the new Great Seal. He urged Cromwell afterthe battle of Worcester and again in 1652 to recall the royal family, while in 1653 he disapproved of the expulsion of the Long Parliament and was especially marked out for attack by Cromwell in his speech on that occasion. Later in the autumn, and perhaps in consequence, Whitelocke was despatched on a mission to Christina, queen of Sweden, to conclude a treaty of alliance and assure the freedom of the Sound. On his return he resumed his office as commissioner of the Great Seal, was appointed a com- missioner of the treasury with a salary of £1000, and was returned to the parliament of 1654 for each of the four constituencies of Bedford, Exeter, Oxford and Buckinghamshire, electing to sit for the latter constituency.

Whitelocke was a learned and a sound lawyer. He had hitherto shown himself not unfavourable to reform, having supported the bill introducing the use of English into legal proceedings, having drafted a new treason law, and set on foot some altera- tions in chancery procedure. A tract advocating the registering of title-deeds is attributed to him. But he opposed the revolu- tionary innovations dictated by ignorant and popular prejudices. He defeated the strange bill which sought to exclude lawyers from parliament; and to the sweeping and ill-considered changes in the court of chancery proposed by Cromwell and the council he offered an unbending and honourable resistance, being dis- missed in consequence, together with his colleague Widdrington, on the 6th of June 165ˆ from his commissionership of the Great Seal (see Lenthall, William). He still, however, remained on good terms with Cromwell, by whom he was respected; he took part in public business, acted as Cromwell's adviser on foreign affairs, negotiated the treaty with Sweden of 1656, and, elected again to the parliament of the same year as member for Bucking- hamshire, was chairman of the committee which conferred with Cromwell on the subject of the Petition and Advice and urged the protector to assume the title of king. In December 1657 he became a member of the new House of Lords. On Richard Cromwell's accession he was reappointed a commissioner of the Great Seal, and had considerable influence during the

former's short tenure of power. He returned to his place in the Long Parliament on its recall, was appointed a member of the council of state on the 14th of May 1659, and became president in August; and subsequently, on the fresh expulsion of the Long Parliament, he was included in the committee of safety which superseded the council. He again received the Great Seal into his keeping on the 1st of November. During the period which immediately preceded the Restoration he endeavoured to oppose Monk's schemes, and desired Fleetwood to forestall him and make terms with Charles, but in vain.

On the failure of his plans he retired to the country and awaited events. Whitelocke's career, however, had been marked by moderation and good sense throughout. The necessity of carrying on the government of the country somehow or other had been the chief motive of his adherence to Cromwell rather than any sympathy for a republic or a military dictatorship, and his advice to Cromwell to accept the title of king wasdoubt- less tendered with the object of giving the administration greater stability and of protecting its adherents under the Statute of Henry VII. Nor had he shown himself unduly ambitious or self- seeking in the pursuit of office, and he had proved himself ready to sacrifice high place to the claims of professional honour and duty. These considerations were not without weight with his contemporaries at the Restoration. Accordingly Whitelocke was not excepted from the Act of Indemnity, and after the

payment of various sums to the king and others he was allowed to retain the bulk of his property. He lived henceforth in seclusion at Chilton in Wiltshire, dying on the 28th of July 1675.

Whitelocke married (1) Rebecca, daughter of Thomas Bennet, (2) Frances, daughter of Lord Willoughby of Parham, and (3) Mary Carleton, widow of Rowland Wilson, and left children by each of his wives. He was the author of Memorials of the English affairs from the beginning of the reign of Charles /...., published 1682 and reprinted, a work which has obtained greater authority than it deserves, being largely a compilation from various sources, composed after the events and abounding in errors. His work of greatest value, his Annals, still remains in MS. in Lord Bute's and Lord de la Warr's collections {Hist. Brit. Coram . III. Rsp.-pp. 202, 217; also Egerton MSS. Brit. Mus. 997 , add. MSS. 4992, 4994); his Journal of the Swedish Embassy . . . was published 1772 and re-edited by Henry Reeve in 1885 (add. MSS. 4902, 4991 and 4995 and Hist. MSS. Comm. III. Rep. 190, 217); Notes on the King's Writ for choosing Members of Parliament .

. . were published 1766 (see also add. MSS. 4993); Memorials of English Affairs from the supposed expedition of Brace to this Island to the end of the Reign of James I., were published 1709; Essays Ecclesiastical and Civil (1706) ; Quench not the Spirit . . . (171 1) ; some theological treatises remain in MS., and several others are attributed to him.

See the article by C. H. Firth in the Diet Nat. Biog. with authorities there quoted; Memoirs of B. Whitelocke by R. H. Whitelocke (i860); II. Reeve's edition of the Swedish Embassy; Foss's Judges of England; Eng. Hist. Rev. xvi. 737; Wood's Ath. Oxon. Hi. 1042.

WHITE MOUNTAINS, the portion of the Appalachian Moun- tain system which traverses New Hampshire, U.S.A., between the Androscoggin and Upper Ammonoosuc rivers on the north and the lake country on the south. They cover an area of about 1300 sq. m., are composed of somewhat homogeneous granite rocks, and represent the remnants of long-continued erosion of a region formerly greatly elevated. From a plateau which has been cut deep by rivers and streams they rise to rounded, summits often noble in outline and of greater elevation than elsewhere in the Appalachian system, except in North Carolina, and culminate in Mount Washington, 6293 ft. above the sea. Thirteen other summits have an elevation exceeding 5000 ft. The scenery is so beautiful and varied that the region has long been popular as a summer resort. It is traversed by railways, one of which ascends Mount Washington, and contains numerous villages and fine hotels.

See the article New Hampshire; the Guidebook (Part i. r Boston, 1907) published by the Appalachian Mountain Club; and Appa- lachia fibid., 1876 seq.), a periodical published by the same club.

WHITE PLAINS, a village and the county-seat of Westchester county, New York, U.S.A., about 12 m. N. of New York City on the Bronx river, about midway between the Hudson river and Long Island Sound. Pop. (1890) 4508; (1900) 7899, of whom 1679 were foreign-born and 269 were negroes; (1910 census) 26,425. The village is served by the New York Central & Hudson River railway, and is connected by electric lines with New York City, and with Yonkers, Mount Vernon, New Rochelle, Tarrytown and Mamaroneck. White Plains is a beautiful residential suburb stretching over a considerable area of rolling tree-clad hills and picturesque stretches of meadow lands in the valley of the Bronx and Mamaroneck rivers. Near the village are Silver, Kensico and Rye lakes. Among the public buildings and the institutions here are a fine Public Library building, a town hall, an armoury, the Westchester county court house and county jail, several private schools, the White Plains Hospital, St Agnes Hospital, the Presbyterian Convalescents' Sanitarium, the New York Orthopaedic

Hospital, Muldoon's Hygienic In- stitute and Bloomingdale Hospital for the Insane (1821). In White Plains are the grounds of the Century. Country Club, the Knollwood Golf and Country Club and the Westchester County Fair Association. There are some prosperous farms and market gardens.

When the Dutch first settled Manhattan, the central portion of what is now W T estchester county was the granary for part of the Mahican tribe; it was called Quarropas by the Indians. To the early traders here the region was known as " the White Plains " from the groves of white balsam which covered it. The first organized settlement (November 1683) was by a party of Connecticut Puritans, who had settled at Rye in what was then

disputed territory between New York and Connecticut; they moved westward in a body and took up lands the title to which they bought from the Indians. The heirs of John Richbell claimed that White Plains was comprised in a tract extending N. from the Mamaroneck river granted to him by the Dutch and con- firmed by the English, and the controversy between these heirs and the settlers from Rye was only settled in 1722 by the grant to Joseph Budd and sixteen other settlers of a royal patent under which the freeholders chose their local officers and managed their own affairs. In 1759 White Plains succeeded Westchester as the county-seat of Westchester county. In the early summer of 1776 the Third Provincial Congress, having adjourned from New York City, met here in the old court house on South Broad- way — the site is now occupied by an armoury and is marked by a monument (1910). From the steps of this building the Declara- tion of Independence, brought from Philadelphia, was officially read for the first time in New York on the nth of July 1776. Here Congress adopted formally the name "Convention of Representatives of the State of New Y r ork," and from this dates the existence of New York as a state. After the British under Lord Howe had effected a landing at Throg's Neck on Long Island Sound, Washington withdrew (October) all his forces from the North end of Manhattan Island except the garrison of Fort Washington, and (21st October) concentrated his army near White Plains. His right rested on the Bronx river here, and there was a small force in rude earthworks on Chatterton's Hill on the W. bank. This point Howe attacked (October 28th), his troops advancing in. two columns 4000 strong, the British under General Alexander Leslie, the Hessians under Colonel Johann Gottlieb Rail. General Alexander McDougall, in com- mand of the American right wing, reinforced the troops on the hill, making the number of the defenders about 1600. The attack was stubbornly resisted for some time, after which the Americans retreated in good order across the river. The British had sustained such a severe loss (about 250) that no attempt was made to follow the Americans, who carried their dead and wounded, some 125 in number, away with them. Washington's forces retired three days later to North Castle township, where they occupied a stronger

position. The old Miller House, which still stands in North White Plains, was occupied at intervals by Washington as his headquarters before the battle and again in the summer of 1778. In 1779 a Continental force under Aaron Burr was stationed here for some months, and in 1781 (July) White Plains was occupied by parts of Lauzun's and Rocham- beau's French force. In 1866 White Plains received a village charter, which it still retains in spite of its large population.

See F. Shonnard and W. W. Spooner, History of Westchester County (N-Y., 1900), and J. T. Scharf, History of Westchester County (2 vols., ibid., 1886).

WHITESIDE, JAMES (1804-1876), Irish judge, son of William Whiteside, a clergyman of the Church of Ireland, was born on the 12th of August 1804, and was educated at Trinity College, Dublin, being called to the Irish bar in 1830. He very rapidly acquired a large practice, and after taking silk in 1S42 he gained a reputation for forensic oratory surpassing that of all his con- temporaries, and rivalling that of his most famous predecessors of the 1 8th century. He defended Daniel O'Connell in the state trial of 1843, and William Smith O'Brien in 1848; and his greatest triumph was in the Yelverton case in 1861. He was elected member for Enniskillen in 1851, and in 1859 became member for Dublin University. In parliament he was no less successful as a speaker than at the bar, and in 1852 was appointed solicitor-general for Ireland in the first administration of the earl of Derby ; becoming attorney-general in 1858, and again in 1866. In the same year he was appointed chief justice of the Queen's Bench; and he died on the 25th of November 1876. Whiteside was a man of handsome presence, attractive personality and cultivated tastes. In 1848, after a visit to Italy, he published Italy in the Nineteenth Century; and in 1870 he collected and republished some papers contributed many years before to periodicals, under the title Early Sketches of Eminent Persons. In 1833 Whiteside married Rosetta, daughter of

William Napier, and sister of Sir Joseph Napier (1804-1882), lord chancellor of Ireland.

See J. R. O'Flanagan, The Irish Bar (London, 1879).

WHITETHROAT, a name commonly given to two species of little birds, one of which, the Motacilla sylvia of Linnaeus and Sylvia rufa or S. cinerea of recent authors, is regarded as the type, not only of the genus Sylvia, but of

the sub-family of thrushes known as Sylviinae (cf. Warbler). Very widely spread over Great Britain, in some places tolerably common, and by its gesticulations and song rather conspicuous, it is one of those birds which have gained a familiar nickname, and " peggy whitethroat " is the anthropomorphic appellation of schoolboys and milkmaids, though it snares " nettle-creeper " and other homely names with perhaps more than one congener, while to the writers and readers of books it is by way of distinction the greater white- throat. The lesser whitethroat, Sylvia curtuca, is both in habits and plumage a much less sightly bird.: the predominant reddish brown of the upper surface, and especially the rufous edging of the wing-feathers, that are so distinctive of its larger congener, are wanting, and the whole plumage above is of a smoky-grey, while the bird in its movements is never obtrusive, and it rather shuns than courts observation. The nests of each of these species are very pretty works of art, firmly built of bents or other plant-stalks, and usually lined with horsehair; but the sides and bottom are often so finely woven as to be like open basket- work, and the eggs, splashed, spotted or streaked with olive- brown, are frequently visible from beneath through the interstices of the fabric. This style of nest-building seems to be common to all the species of the genus Sylvia, as now restricted, and in many districts has obtained for the builders the name of " hay- jack," quite without reference to the kind of bird which puts the nests together, and thus is also applied to the blackcap, S. atricapilla, and the garden- warbler — this last being merely a book-name— S. salicaria (S. hortensis of some writers). The former of these deserves mention as one of the sweetest songsters of Great Britain. The name blackcap is applicable only to the cock bird, who further differs from his brown-capped mate by the purity of his ashy-grey upper plumage; but, notwithstanding the marked sexual difference in appearance, he takes on himself a considerable share of the duties of incubation. All these four birds, as a rule, leave Great Britain at the end of summer to winter in the south. Two other species, one certainly belonging to the same genus, S. orphea, and the other, S. nisoria, a some- what aberrant form, have occurred two or three times in Great Britain. The curious Dartford warbler of English writers, Sylvia undata, is on many accounts a very interesting bird, for it is one of the few of its family that winter in England— a fact the more remarkable when it is known to be migratory in most parts of the continent of Europe. Its distribution in, England is very local, and chiefly confined to the southern counties. It is 8 pretty little dark-coloured bird, which here and there may be seen on furze-grown heaths from Kent to Cornwall. For a species with wings so feebly formed it has a wide range, inhabiting nearly all the countries of the Mediterranean seaboard, from Palestine to the Strait of Gibraltar, and thence along the west coast of Europe to the English Channel; but everywhere else it seems to be very local.

This may be the most convenient place for noticing the small group of warblers belonging to the well-marked genus Hypolais, which, though in general appearance and certain habits resembling the Phylloscopi (cf. [willow] Wren), would seem usually to have little to do with those birds, and to be rather allied to the Sylviinae. They have a remarkably loud song, and in consequence are highly valued on the continent of Europe, where two species at least spend the summer. One of them, H. icterina, has occurred more than once in the British Islands, and their absence as regular visitors is to be regretted. Among the minor characteristics of this little group is one afforded by their eggs, which are of a deeper or paler brownish pink, spotted with purplish black. Their nests are beautiful structures, combining warmth with lightness in a way that cannot be fully appreciated by any description. (A. N.)

WHITFIELD, JOHN CLARKE (1770-1836), English organist and composer, was born at Gloucester on the 13th of December 1770, and educated at Oxford under Dr Philip Hayes. In 1789

he was appointed organist of the parish church at Ludlow. Four years later he took the degree of Mus. Bac. at Cambridge, and in 1795 he was chosen organist of Armagh cathedral, whence he removed in the same year to Dublin, with the appointments of organist and master of the children at. St Patrick's cathedral and Christchurch. Driven from Ireland by the rebellion of 1798, he accepted the post of organist at Trinity and St John's Colleges, Cambridge, and about the same time assumed the surname of Whitfield, in addition to that of Clarke, by which he had been previously known. He took the degree of Mus. Doc. at Cambridge in 1799, and in 1810 proceeded to the same grade at Oxford. In 1820 he was elected organist and master of the choristers at Hereford cathedral; and on the death of Dr Haig he was appointed professor of music at Cambridge. Three years afterwards he resigned these appointments in consequence of an attack of paralysis. He died at Hereford, on the 22nd of February 1836.

Whitfield's compositions were very numerous. Among the best of them are four volumes of anthems, published in 1805. He also composed a great number of songs, one of which — " Bird of the Wilderness," written to some well-known verses by James Hogg, the " Ettrick Shepherd " — attained a high degree of popularity. But the great work of his life was the publication, in a popular and eminently useful form, of the oratorios of Handel, which he was the first to present to the public with a complete pianoforte accompaniment.

WHITGIFT, JOHN {c. 1530-1604), English archbishop, was the eldest son of Henry Whitgift, merchant of Great Grimsby, Lincolnshire, where he was born, according to one account in 1533, but according to a calculation

founded on a statement of his own in 1530. At an early age his education was entrusted to his uncle, Robert Whitgift, abbot of the neighbouring monas- tery of Wellow, by whose advice he was afterwards sent to St Anthony's school, London. In 1549 he matriculated at Queens' College, Cambridge, and in May 1550 he migrated to Pembroke Hall, where he had the martyr John Bradford for a tutor. In May 1555 he became a fellow of Petcrhouse. Having taken orders in 1560, he became in the same year chaplain to Richard Cox, bishop of Ely, who collated him to the rectory of Teversham, Cambridgeshire. In 1563 he was appointed Lady Margaret professor of divinity at Cambridge, and his lectures gave such satisfaction to the authorities that on the 5th of July 1566 they considerably augmented his stipend. The following year he was appointed regius professor of divinity, and also became master first of Pembroke Hall and then of Trinity. He had a principal share in compiling the statutes of the university, which passed the great seal on the 25th of September 1570, and in November following he was chosen vice-chancellor. Macaulay's description of Whitgift as " a narrow, mean, tyrannical priest, who gained power by servility and adulation," is tinged with rhetorical exaggeration; but undoubtedly Whitgift's extreme High Church notions led him to treat the Puritans with exceptional intoler- ance. In a pulpit controversy with Thomas Cartwright, regard- ing the constitutions and customs of the Church cf England, he showed himself Cartwright's inferior in oratorical effectiveness, but the balance was redressed by the exercise of arbitrary authority. Whitgift, with other heads of the university, deprived Cartwright in 1570 of his professorship, and in September 1571 exercised his prerogative as master of Trinity to deprive him of his fellowship. In June of the same year Whitgift was nominated dean of Lincoln. In the following year he published An Answere to a Certain Libel intituled an Admonition to the Parliament, which led to further controversy between the two divines. On the 24th of March 1577, Whitgift was appointed bishop of Worcester, and during the absence of Sir Henry Sidney in Ireland (1577) he acted as vice-president of Wales. In August 1583 he was appointed archbishop of Canterbury, and thus was largely instrumental in giving its special complexion to the church of the Reformation. Although he wrote a letter to Queeo Elizabeth remonstrating against the alienation of church pro- perty, Whitgift always retained her special confidence. In his policy against the Puritans, and in his vigorous enforcement of the subscription test, he thoroughly carried out the queen's policy. of religious uniformity. He drew up articles aimed at

nonconforming ministers, and obtained increased powers for the Court of

High Commission. In 1 586 he became a privy councillor. His action gave rise to the Marprelate tracts, in which the bishops and clergy were bitterly attacked. Through Whitgift 's vigilance the printers of the tracts were, however, discovered and punished; and in order more effectually to check the publication, of such opinions he got a law passed in 15Q3 making Puritanism an offence against the statute law. In the controversy between Walter Travers and Richard Hooker he interposed by prohibiting the preaching of the former; and he moreover presented Hooker with the rectory of Boscombe in Wiltshire, in order to afford him more leisure to complete his Ecclesiastical Polity, a work which, however, cannot be said to represent either W r hitgift's theological or his ecclesiastical standpoint. In 1595 he, in conjunction with the bishop of London and other prelates, drew up the Calvinistic instrument known as the Lambeth Articles, which were not accepted by the church. Whitgift attended Elizabeth on her deathbed, and crowned James I. He was present at the Hampton Court Conference in January 1604, and died at Lambeth on the 2Qth of the following February. He was buried in the church of Croydon, and his monument there with his recumbent effigy was in great part destroyed in the fire by which the church was burnt down in 1867.

Whitgift is described by his biographer, Sir G. Paule, as of " midd'ie stature, strong and well shaped, of a grave countenance and brown complexion, black hair and eyes, his beard neither long nor thick." lie was noted for his hospitality, and was somewhat ostentatious in his habits, sometimes visiting Canterbury and other towns attended by a retinue of 800 horsemen. He left several unpublished works, which are included among the MSS. Angliae. Many of his letters, articles, injunctions, &c. are calendared in the published volumes of the " State Paper " series of the reign of Elizabeth. His Collected Works, edited for the Parker Society byJohnAyre (3 vols. .Cambridge, 1851-1853), include, besides the controversial tracts already alluded to, two sermons published during his lifetime, a selection from his letters to Cecil and others, and some portions of his unpublished MSS.

A Life of Whitgift by Sir G. Paule appeared in 1612, 2nd ed. 1649. It was embodied by John Strype in hisLtfe and Acts of Whitgift (1718). There is also a life in C. Wordsworth's Ecclesiastical Biography (1810), W. F. Hook's Archbishops of Canterbury (1875), and vol. i. of Whit- gift's Collected Works. See also C.H.Cooper's A thenae CantabrigUnses.

WHITHORN, a royal burgh of Wigtownshire, Scotland. Pop. (1901) 1118. It is situated near the southern extremity of the peninsula of Machers, i2\ m. S. of Wigtown by railway. The town consists of one long street running north and south, in which the town-hall is situated. It is famous for its associa- tions with St Ninian or Rmgan, the first Christian missionary to

Scotland. He landed at the Isle of Whithorn, a small pro- montory about 3! m. to the S.E. where he built (397) a church of stone and lime, which, out of contrast with the dark mud and wattle huts of the natives, was called Candida Casa, the White House (Anglo-Saxon, Hwit am, W r hitheme or Whithorn). This he dedicated to his master St Martin of Tours. Ninian died probably in 432 and was buried in the church. A hundred years later the Magnum Monasterium, or monastery cf Rosnat, was founded at Whithorn, and became a noted home of learning and, in the 8th century, the seat of the bishopric of Galloway. It was succeeded in the 12th century by St Ninian's Priory, built for Premonstratensian monks by Fergus i(King " of Galloway, of which only the chancel (used as the parish church till 1822) with a richly decorated late Norman doorway, and fragments of the lady chapel, vaults, cellars, buttresses and tombs remain. The priory church was the cathedral church of the see till the Reformation, when it fell into gradual decay. In Roman times Whithorn belonged to the Novantac, and William Camden, the antiquary, identified it with the Lcukopibia of Ptolemy. It was made a royal burgh by Robert Bruce.

WHITING, a city of Lake county, Indiana, U.S.A., on the SAV. shore of Lake Michigan, about 10 m. S.E. of Chicago. Pop. (1S90) 1408; (1900) 3983 (i5Q7 foreign-born); (1910) 6587, It is served by the Baltimore & Ohio, the Lake Shore & Michigan Southern, the Pennsylvania, the Chicago, Indiana & Southern and (for freight only) the Elgin, Joliet & Eastern, the Chicago Terminal Transfer, and the Indiana Harbour Belt rail- ways; and is connected with Chicago and with the surrounding

towns by an electric line. The city has a Carnegie library and a public park. Manual training, from the fourth to the twelfth grades, is a feature cf the public school system. Whiting adjoins the cities of Hammond and East Chicago, and is practically a part of industrial Chicago, from which it is separated only by a state line. It is a shipping point; the Standard Oil Company has a large refinery here, and among its manufactures are asphaltum for street paving, linoleum and men's garments. Whiting was first settled about 1870, was incorporated as a town in 1895, and chartered as a city in 1903.

WHITING (Gadus mcrlangus), a fish of the family Gadidae, which is abundant on the shores of the German Ocean and all round the coasts of the British Islands; it is distinguished from the other species of the genus by having from 33 to 35 rays in the first anal fin, and by lacking the barbel on the chin. The snout is long, and the upper jaw longer than the lower. A black spot at the root of the pectoral fin is also very characteristic of this species, and but rarely absent. The whiting is one of the most valuable

f©od fishes of northern Europe, and is caught throughout the year by hook and line and by the trawl. It is in better condition at the beginning of winter than after the spawning season, which falls in the months of February and March. Its usual size is from 1 to \ lb, but it may attain to twice that weight.

WHITLOW, a name applied loosely to any inflammation involving the pulp of the finger, attended by swelling and throbbing pain. In the simplest form, which is apt to occur in sickly children, the inflammation results in a whitish vesicle of the skin, containing watery or bloody fluid. In all such cases, where the deeper structures are not implicated, no radical local treatment is needed, although the illness is an indication for constitutional treatment. The inflammation is not usually spoken of as whitlow unless it involves the deeper structures of the last joint of the finger, in which case it is associated with intense pain. As the result of a scratch or prick of the finger septic germs enter the skin and give rise to an acute inflammation, with throbbing and bursting pain. If the germs do not spread from that spot, they set up an acute localized attack of erysipelas which may end in a superficial abscess. More often, however, they make their way to the periosteum of the last bone of the finger, and involve it in a devastating inflammation which may end in death (necrosis) of that bone. Sometimes the germs find their way into the tendon-sheath, and, spreading into the palm of the hand, cause a deep abscess with, perhaps, sloughing of the tendon, and leaving a permanently stiffened finger. In some cases amputation of the finger is eventually called for. W^hitlow is especially apt to occur in people who are out of health, as in them the micro-organisms of the disease meet with less resistance. So soon, therefore, as the acute stage of the disease is over, conic treatment, with quinine and iron, is needed. The local treatment of whitlow demands a free incision into the area in which the germs are undergoing cultivation, and the sooner that this is done the better. It is wrong to wait for an abscess to be formed. A prompt incision may actually prevent the formation of abscess, and the easing of the tension of the inflamed tissue by the incision gives immediate relief. Perhaps, even in the early stage of the disease, a bead or two of pus may find exit, but whether there is abscess or not, the depths of the wound should be swabbed out with some strong carbolic or mercuric lotion in order to destroy the germs. The hand should then be placed upon a splint with antiseptic fomentations around the finger. It should, moreover, be kept well raised, or worn in a sling, (E. O.)*

WHITMAN, MARCUS (1802-1847), American missionary and pioneer, was born at Rushville, New York, on the 4th of September v8o3. He studied medicine at Pittsfield, Massachu- setts, and practised in Canada and in Wheeler, Steuben county, New York. In 1834 he was accepted by the American Board of Commissioners for Foreign Missions for missionary

work among the American Indians, and was assigned to the Oregon territory, then under the joint occupation of Great Britain and the United States. He set out early in 1835, but returned almost immediately

to secure other workers. In February 1836 he married and in March again crossed the continent, accompanied by his wife, Rev. and Mrs H. H. Spalding and W. H. Gray, and settled at Waiilatpu, near the present Walla Walla, Washington. Dis- sensions which arose among the missionaries and their apparent lack of success led to a resolution (February 1842) of the Pru- dential Committee of the Board to abandon the southern station. With the consent of his associates, Dr Whitman started from the station (3rd October 1842) on the perilous winter journey over the Rocky Mountains and across the plains for the missionary headquarters at Boston, to urge the revocation of the order. He visited New York and Washington also to enlist help and sympathy. On his return journey he joined a considerable body of emigrants on their way to Oregon and piloted them across the mountains. The mission, however, gained the ill-will of the Indians, and, on the 29th of October 1847 Dr and Mrs Whitman and twelve others were killed, and the station was broken up.

On the 16th of November 1 864 the statement was published, on the authority of Mr Spalding, that the purpose of Dr Whitman s ride, twenty-two years before, was to prevent the cession of the territory to Great Britain. The story was amplified by Spalding and Gray in 1865, 1866 and 1870, and in its final form declared that Whitman learned at the British fort Walla Walla in September 1842 that a large number of British settlers were expected, and that it was hoped that the treaty then supposed to l>e in process of negotiation between Lord Ashburton and Daniel Webster, Secretary of State, would give the tenitory to the British. Thereupon Whitman made his way to Washington, and with much difficulty convinced Webster and President Tyler of the value of the country and prevented its ex- change for fishing privileges off Newfoundland. This story has been widely disseminated, but Professor E. G. Bourne and Mr W, I. Marshall independently investigated the whole question, and showed that there is no evidence that Dr Whitman influenced or attempted to influence the State Department. For the pro-Whitman side, see W. H. Gray, Oregon (Portland, 1870); William Barrows, Oregon (Boston, 1883); O. W. Nixon, How Marcus Whitman saved Oregon (Chicago. 1895) ; W. A. Mowry, Marcus Whitman (New York, 1901); Myron Eells, Marcus Whitman (Seattle, 1909). On the other side see H. H. Bancroft, Oregon (San Francisco, 1886-1888); E. G. Bourne, Essays in Historical Criticism (New York, I

901); W. I. Marshall, History v. The Whitman-saved-Oregon Story (Chicago, 1904).

WHITMAN, WALT (1819-1892), American poet, was born at West Hills, on Long Island, New York, on the 31st of May 1819. His ancestry was mingled English and Holland Dutch, and had flourished upon Long Island more than 150 years — long enough to have taken deep root in the soil and to have developed, in its farmers and seafaring men, many strong family traits. His father, Walter Whitman, was a farmer and carpenter; his mother, Louisa Van Velsor, was the granddaughter of a sea captain. There do not appear to be any men in his line of descent given to scholarly or intellectual pursuits till we get back to the 17th century, when we come to Abijah Whitman, a clergyman, settled in Connecticut. Later this Abijah moved to Long Island, and from him all the Whitmans on the island descended. Walt was the second of a family of nine children. The parents early moved to Brooklyn, where Whitman spent his youth. His career was a chequered one, like that of so many other self-made American men. First he was an errand boy in a lawyer's office; then he was employed in a printing office; next he became a country school teacher; he founded (1836) and till 1839 edited the Long Islander at Huntington, and later edited a daily paper in Brooklyn (the Eagle, 1846-1847) ; then he was found in New Orleans, on the editorial staff of the Crescent (1848-1849) ; afterwards he passed his time carpentering, building and selling small houses in Brooklyn (1851-1854), in the meanwhile writing for the magazines and reviews and turning out several novels, and finally revolving in his mind the scheme of his Leaves of Grass. This scheme was probably gestating in his mind during the years 1853, 1854 and 1855. He frequently stopped his carpentering to work at his poems. He left voluminous manuscript notes, showing the preparatory studies and reflections that preceded the Leaves; many of them, under the title of Notes and Fragments, were privately printed by his literary executor, Dr Richard Maurice Bucke, in 1899. Finally, in the summer of 1855 the first edition of Leaves of

Grass appeared — a small quarto of ninety-four pages. The book did not attract the attention of the critics and the reading public till a letter from Emerson to the poet, in which the volume was characterized as " the most extraordinary piece of wit and wisdom that America has yet contributed," was published in the New York Tribune. This created a demand for the book, and started it upon a career that has probably had more vicissitudes and called forth more adverse as well as more eulogistic criticism than any other contemporary literary work. In 1856 a second and much enlarged edition of Leaves of Grass appeared. In i860 a third edition, with much new matter, was published in Boston. In 1862 Whitman went to Washington to look after his brother, Lieutenant-Colonel George W.

Whitman, who was wounded at the battle of Fredericksburg. Henceforth, for more than ten years he remained in and about Washington, acting as a volunteer nurse in the army hospitals as long as the war lasted, and longer, and then finding employment as a clerk in the government departments, in the meantime adding to and revising his Leaves and publishing two or three editions of them, himself his own publisher and bookseller. Out of his war experiences came in 1866 his Drum Taps, subsequently incorporated into the main volume. Early in 1873 he suffered a paralytic stroke which partially disabled him. He then went to Camden, New Jersey, to live and continued to reside in that city till his death on the 27th of March 1892. In 1871 appeared his prose volume called Democratic Vistas. In 1876 he published a thin volume, called Two Rivulets, made up of prose and verse. Specimen Days and Collect, also prose, appeared in 1882. New editions of his Leaves continued to appear at intervals as long as he lived. A final and complete edition of his works, including both prose and verse, was published in Philadelphia in 1889.

Whitman never married, never left America, never laid up, or aimed to lay up, riches: he gave his time and his substance freely to others, belonged to no club nor coterie, associated habitually with the common people — mechanics, coach-drivers, working men of all kinds — was always cheerful and optimistic. He was large and picturesque of figure, slow of movement, tolerant, receptive, democratic and full of charity and goodwill towards all. His life was a poet's life from first to last^-free, unworldly, unhurried, unconventional, unselfish, and was con- tentedly and joyously lived. He left many notes that throw light upon his aims and methods in composing Leaves of Grass. " Make no quotations," he charged himself, " and no reference to any other writers. Lumber the writing with nothing — let it go as lightly as the bird flies in the air or a fish swims in the sea. Avoid all poetical similes; be faithful to the perfect likelihoods of nature — healthy, exact, simple, disdaining ornaments. Do not go into criticisms or arguments at all; make full-blooded, rich, flush, natural works. Insert natural things, indestructibles, idioms, characteristics, – rivers, states, persons, &c. Be full of strong sensual germs. . . . Poet! beware lest your poems are made in the spirit that comes from the study of pictures of things — and not from the spirit that comes from the contact with real things themselves." The mother-idea of his poems, he says, is democracy, and democracy " carried far beyond politics into the region of taste, the standards of manners and beauty, and even into philosophy and theology." His Leaves certainly radiates democracy as no other modern literary work does, and brings the reader into intimate and enlarged relations with fundamental human qualities — with sex, manly love, charity, faith, self-esteem, candour, purity of body, sanity of mind. He was democratic because he was not in any way separated nor detached from the common people by his quality,

his culture, or his aspirations. He was bone of their bone and flesh of their flesh. Tried by current standards his poems lack form and structure, but they undoubtedly have in full measure the qualities and merits that the poet sought to give them. (J- Bu.)

See his Complete Writings (10 vols., New York, 1902), with bibliographical and critical matter by O. L. Triggs. His Poems (1902) has a biographical introduction by John Burroughs, whose Whitman: A Study (Boston, 1896) forms the tenth volume of the " New River. side " edition of the poet's works. See also Walt Whitman's Diwry in Canada, with Extracts from other of his Diaries and Literary Notebooks

(Boston, 1904) edited by W. S. Kenned)'; In re Walt Whitman (Philadelphia, 1893) edited by his literary executors, H. L. Traubel, R. M. Bucke, T. B. llarned; Horace Traubel, With Walt Whitman in Camden (Boston, T77j a record of talks in 1888, full of material; Bliss Perry, Walt Whitman: His Life and Work (Boston, 1907), with new material and unpublished letters; Calamus, a. series or letters (1868-1880} written by Whitman to a " young friend " (Peter Doyle), edited by R. M. Bucke (1897), who also wrote an authorized biography — Wall Whitman (Philadelphia, 1883) — which contains contemporary criticisms of Whitman and W D. O'Connor's "Good Gray Poci " (1866); Walt Whitman (London, 1893), a study by J. Addington Symonds; Reminiscences of Walt Whitman with Extracts from his Letters (London, 1896) by W. S. Kennedy; H. B. Binns, Life of Walt Whitman (New York, 1906); and critical estimates in R. L. Stevenson's Familiar Studies of Men and Books (1882) ; E. Dowden's Studies in Literature (1892J, and in E. C. Stedman's Poets of America, &c. A bibliography of writings on Whitman is appended to Selections (Boston, 1898), edited by O. L. Triggs.

WHITNEY, ELI (1 765-1825), American inventor, was born on a farm in Westboro, Massachusetts, on the 8th of December 1765, He exhibited unusual mechanical ability at an early age and earned a considerable part of his expenses at Yale College, where he graduated in 1792. He soon went to Savannah, Georgia, expecting to secure a position as a teacher, but was disappointed, and accepted the invitation of Mrs Nathanael Greene, the widow of the Revolutionary general, to spend some time on her planta- tion on the Savannah river, while deciding upon his future course. The construction by Whitney of several ingenious household contrivances led Mrs Greene to introduce him to some gentlemen who were discussing the desirability of a machine to separate the short staple upland cotton from its

seeds, work which was then done by hand at the rate of a pound of lint a day. In a few weeks Whitney produced a model, consisting of a wooden cylinder encircled by rows of slender spikes set half an inch apart, which extended between the bars of a grid set so closely together that the seeds could not pass, but the lint was pulled through by the revolving spikes; a revolving brush cleaned the spikes, and the seed fell into another compartment. The machine was worked by hand and could clean 50 lb of lint a day. The model seems to have been stolen, but another was constructed and a patent was granted on the 14th of March 1794. Meanwhile Wˆhitney had formed a partnership with Phineas Miller (who afterward married Mrs Greene), and they built at New Haven, Connecticut, a factory (burned in March 1795) for the manu- facture of the gins. The partners intended to establish an absolute monopoly and to charge a toll of one-third of the cotton or to buy the whole crop. They were unable to supply the demand for gins, and country blacksmiths constructed many machines. A patent, later annulled, was granted (May 12, i7g6) to Hogden Holmes for a gin which substituted circular saws for the spikes. Whitney spent much time and money prosecuting infringements of his patent, and in 1807 its validity was finally settled. The financial returns in Georgia cannot be ascertained. The legislature of South Carolina voted $50,000 for the rights for that state, w r hile North Carolina levied a license tax for five years, from which about $30,000 was realized. Tennessee paid, perhaps, Sioˆoo. 1 Meanwhile Whitney, disgusted with the struggle, began the manufacture of fire-arms near New Haven (1798) and secured profitable government contracts; he introduced in this factory division of labour and standardized parts. Although the modern gin has been much enlarged and improved, the essential features are the same as in Whitney's first model, and the inven- tion profoundly influenced American industrial, economic and social history.

See Denison Olmsted, Memoir (New Haven, 1846); D. A. Tomp- kins, Cotton and Cotton Oil (Charlotte, N.C., 1901) ; and W. P. Blake, " Sketch of Eli Whitney " in New Haven Colony Historical Society, Papers, vol. v. (New Haven, 1894).

WHITNEY, JOSIAH DWIGHT (1819-1896), American geolo- gist, was born at Northampton, Massachusetts, on the 23rd of November 1819. He graduated at Yale in 1839, and after two years' work as assistant in the geological survey of New Hamp- shire, spent some time in Europe in the study of chemistry, mineralogy and geology. Returning to the United States in 1847, he laboured successfully for a time in the copper and iron 1 D. A. Tompkins, Cotton (1901), p. 28.

lands of the Lake Superior region; in 1855 he became State chemist and professor in the Iowa University and took part in the geological survey of

the state; he subsequently worked in the lead region of the upper Missouri river, in Wisconsin, and in Illinois, publishing many reports, singly or in collaboration with others. From i860 to 1874 he was state geologist of California, and issued a comprehensive series of reports on its topography, geology and botany. In 1869, with William. H. Brewer, he determined the heights of the principal Rocky Mountain summits; and in recognition of his labours Mount Whitney (14,502, in Inyo county, California, the highest peak in the United States) received its name from him. From 1865 until his death he was professor of geology and director of the school of mining and practical geology at Harvard University, residing in Cambridge save when absent on expeditions of research. The records of his investigations are somewhat dispersed; the most homogeneous of his writings are The Metallic Wealth of the United States, described and compared with that of other Countries (1854), a work of importance at the time of its issue, and Contributions to American Geology (vol. i. only, 1S80). He died at Lake Sunapee, New Hampshire, on the 18th of August 1896.

WHITNEY, WILLIAM COLLINS (1841-1904), American political leader and financier, was born at Gonway, Massa- chusetts, on the 15th of July 1S41, of Puritan stock. He gradu- ated at Yale in 1863, studied law at Harvard, and practised with success in New York City. He was an aggressive opponent of the " Tweed Ring," and was actively allied with the anti- Tammany organizations, the " Irving Hall Democracy " of 1875-1890, and the "County Democracy " of 1880-1890, but upon the dissolution of the latter he became identified with Tammany. In 1875-1882 he was corporation counsel of New York, and as such brought about a codification of the laws relating to the city, and successfully contested a large part of certain claims, largely fraudulent, against the city, amounting to about $20,000,000, and a heritage from the Tweed regime. During President Cleveland's fir3t administration (1885-1889), Whitney was secretary of the navy department and did much to develop the navy, especially by encouraging the domestic manufacture of armour plate. In 1892 he was instrumental in bringing about the third nomination of Mr Cleveland, and took an influential part in the ensuing presidential campaign; but in 1896, disapproving of the " free-silver " agitation, he refused to support his party's candidate, Mr W. J. Bryan. Whitney took an active interest in the development of urban transit in New York, and was one of the organizers of the Metropolitan Street Railway Company. He was also interested in horse- racing, and in 1 901 won the English Derby with Volodyovski, leased by him from Lady Meux. He died in New York City on the 2nd of February 1964.

WHITNEY, WILLIAM DWIGHT (1827-1894), American philologist, was born at Northampton, Massachusetts, on the gth of February 1827. He w r as the fourth child and the second surviving son of Josiah D wight Whitney,

a banker, and Sarah Williston, daughter of the Rev. Payson Williston (1763- 1856) of Easthampton, Mass., and a sister of Samuel Williston (1795- 1874), founder of Williston Seminary at Easthampton. Through both parents he was descended from New England stock remark- able alike for physical and mental vigour; and he inherited all the social and intellectual advantages that were afforded by a community noted, in the history of New England, for the large ■ number of distinguished men whom it produced. At the age of fifteen (1842) he entered the sophomore class ox Williams College (at Williamstown,Mass.), where he graduated three years later with the highest honours. His attention was at first directed to natural science, and his interest in it always remained keen, and his knowledge of its principles and methods exerted a notice- able influence upon his philological work. In the summer of 1849 he had charge of the botany, the barometrical observations and the accounts of the United States survey of the Lake Superior region conducted by his brother, Josiah D. Whitney, and in the summer of 1873 assisted in the geographical work of the Hayden expedition in Colorado. His interest in the study of Sanskrit

was first awakened in 1848, and he at once devoted himself with enthusiasm to this at that time little-explored field of philological labour. After a brief course at Yale with Professor Edward Elbridge Salisbury (1814-1901), then the only trained Orientalist in the United States, Whitney went to Germany (1850) and studied for three years at Berlin, under Weber, Bopp and Lepsius, and at Tubingen (two summer semesters) under Roth, returning to the United States in 1853. In the following year he was appointed professor of Sanskrit in Yale, and in 1869 also of comparative philology. He also gave instruction in French and German in the college until 1867, and in the Sheffield scientific school until 1886. An urgent call to a professorship at Harvard was declined in 1869. The importance of his contribu- tions to science was early and widely recognized. He was elected to membership in numerous learned societies in all parts of the world, and received many honorary degrees, the most notable testimonial to his fame being his election on the 31st of May 1881, as foreign knight of the Prussian order pour le meritc for science and arts to fill the vacancy caused by the death of Carlyle. In 1870 he received from the Berlin Academy of Sciences the first Bopp prize for the most important contribu- tion to Sanskrit philology during the preceding three years — his edition of the Tdiitirlya-Pratiqdkhya {Journal of the American Oriental Society, vol. ix.). He died at New Haven, Connecticut, on the 7th of June 1894.

As a philologist Whitney is noted especially for his work in Sanskrit, which placed him among the first scholars of his time. He edited (1855-1856), with Professor Roth, the Atharva-Veda- Sanhita; published (1862) with a translation and notes the Athana-Vcda-Prati0khya; made important contributions to the great Petersburg lexicon; issued an index verborum to the published text of the Atharva-Veda {Journal of the American Orienttil Society, 1881); made a translation of the Atharva-Veda, books i.-xix., with a critical commentary, which he did not live to publish (edited by Lanman, 1905); and published a large number of special articles upon various points of Sanskrit philology. His most notable achievement in this field, however, is his Sanskrit Grammar (1879), a work which, as Professor Delbrtick has said, not only is " the best text-book of Sanskrit which we possess," but also places its author, as a scientific grammarian, on the same level with such writers as Madvig and Kriiger. To the general public Whitney is best known through his popular works on the science of language and his labours as a lexicographer. The former are, perhaps, the most widely read of all English books on the subject, and have merited their popularity through the soundness of the views which they present and the lucidity of their style. 1 His most important service to lexicography was his guidance, as editor-in-chief, of the work on The Century Dictionary (18S9-1891). Apart from the permanent value of his contributions to philology, Whitney is notable for the great and stimulating influence which he exerted throughout his life upon the development of American scholarship.

The chronological bibliography of Whitney's writings appended to vol. xix. (first half) of the Journal of the American Oriental Society, issued in May 1897, contains 360 numbers. Of these the most Im- portant, in addition to those mentioned above, are: Translation of the Suryasiddhdnta, a Text-book of Hindu Astronomy {Jour, Am. Oriental Soc, vol. vi., i860); Language and the Study of Language (1867) ; A Compendious German Grammar (1869) ; Oriental and . Linguistic Studies (1873; second series, 1874); The Life and Growth of Language (1875); Essentials of English Grammar {l8j?);A Compendious German and English Dictionary (1877); A Practical French Grammar (1886); Max Muller and the Science of Language (1892). (B. E. S.)

WHITSTABLE, a watering-place in the St Augustine's parlia- mentary division of Kent, England, on the north coast at the east end of the Swale, 6 m. N.N.W. of Canterbury, on the South Eastern & Chatham railway. Pop. of urban district (1901), 7086.

1 They arc particularly important in that they counteracted the popular and interestingly written books of Max Muller: for instance, Muller, like Renan and Wilhelm von Humboldt, regarded language as an innate faculty

and Whitney considered it the product of experience and outward circumstance. Sec Whitney's article Philology in the present edition of the Encyclopaedia Britannica,

The branch railway connecting Whitstable with Canterbury was one of the earliest in England, opened in 1830. The church of All Saints (Decorated and Perpendicular) possesses some old brasses; it was restored in 1875. Whitstable has been famous for its oyster beds from time immemorial. The fisheries wefe held by the Incorporated Company of Dredgers (incor- porated by Act of Parliament in 1793), the affairs being administered by a foreman, deputy foreman and jury of twelve; but in 1896 an Act of Parliament transferred the management of the fishery to a company. The less extensive Seasalter and Ham oyster fishery adjoins. There is also a considerable coasting trade in coal in conjunction with the South-Eastern & Chatham railway company, who are the owners of the harbour, which accom- modates vessels of about 400 tons alongside the quay. The urban district consists of parts of the old parishes of Whitstable and Seasalter. In modern times the manor was held by Wynne Ellis (1790-1875), who left a valuable collection of paintings to the nation.

Tankerton, adjoining Whitstable to the N.E., is a newly established seaside resort.

WHITSUNDAY, or Pentecost (Lat. Pentccoste, Gr. ■jtw'tij/cootˆ sc. rjixkpa, Fr. Pcntccdte, Ger. Pfingsten, fr. O. H. Ger. fimfchustin), one of the principal feasts of the Christian Church, celebrated on the fiftieth (irevT-qKOo-Tr]) day after Easter to commemorate the descent of the Holy Spirit on the disciples. The day became one of the three baptismal seasons, and the name Whitsunday is now generally attributed to the white garments formerly worn by the candidates for baptism on this feast, as in the case of the Dominica in albis. The festival is the third in importance of the great feasts of the Church and the last of the annual cycle commemorating the Lord. It is connected with the Jewish Pentecost (q.v.), not only in the historical date of its origin (see Acts vii.), but in idea; the Jewish festival is one of thanks for the first-fruits of the earth, the Christian for the first-fruits of the Spirit. In the early Church the name of Pentecost was given to the whole fifty days between Easter and Whitsunday, which were celebrated as a period of rejoicing (Tcrtullian, De idolatr. c. 12, De bapt. 19, Decor, milit. 3, Apost. Canons, c. 37, Canons of Antioch, 30). In the narrower sense, as the designation of the fiftieth day of this period, the word Pentecost occurs for the first time in a canon of the council of Elvira (305), which denounces as an heretical abuse the tendency to celebrate the 40th day (Ascension) instead of the 50th, and adds: " juxta auctoritatem scripturarum cuncti diem Pentecostis celebremus," There is plentiful evidence that the festival was regarded very early as one of the great feasts;

Gregory Nazianzcn {Oral. xliv. De Pentec.) calls it the " day of the Spirit " (rjpepa. too UpeOfiaros) , and in 8 the Peregrinatio Silviae (see Duchesne, Origines, App.) describes its elaborate celebration at Jerusalem. The code of Theodosius (xv. 5, De spectaculis) forbade theatrical performances and the games of the circus during the feast. The custom of hallowing the days immediately surrounding the festival is comparatively late. Thus, among others, the synod of Mainz in 813 ordered the celebration of an octave similar to that at Easter. The custom of celebrating the vigil by fasting had already been introduced. The duration of the festival was, however, ultimately fixed at three days. In the Church of England this is still the rule (there are special collects, gospels and epistles for Monday and Tuesday in Whitsun week); in the Lutheran churches two days only are observed.

In the middle ages the Whitsun services were marked by many curious customs. Among these described by Durandus {Rationale div. of. vi. 107) are the letting down of a dove from the roof into the church, the dropping of balls of fire, rose-leaves and the like. Whitsun is one of the Scottish quarter-days, and though the Church festival is movable, the legal date was fixed for the 15th of May by an act of 1693. Whitmonday, which, with the Sunday itself, was the occasion for the greatest of all the medieval church ales, was made an English Bank Holiday by an act passed on the 25th of May 1871.

See Duchesne, Origines du culte Chretien (1889); W. Smith and Cheetham, Die. of Christian Antiquities (1874-1880) ; Herzog-Hauck,

Realencyklopadie (1904), xv. 254., s.v. " Pfingsten." For the many superstitions and observances of the day see P. H, Ditch- field, Old English Customs (1897); Brand, Antiquities of Great Britain (Hazlitt's edit., 1905); B. Picart, Ceremonies et coutumes religieuses de ious ies peuples (1723).

WHITTIER, JOHN GREENLEAF (1807-1892), America's " Quaker poet " of freedom, faith and the sentiment of the common people, was born in a Merrimack Valley farmhouse, Haverhill, Massachusetts, on the 17th of December 1807. The dwelling was built in the 17th century by his ancestor, the sturdy immigrant, Thomas Whittier. notable through his efforts to secure toleration for the disciples of George Fox in New England.

Thomas's son Joseph joined the Society of Friends and bore his share of obloquy. Successive generations obeyed the monitions of the Inner Light. The poet was born in the faith, and adhered to its liberalized tenets, its garb and speech, throughout his lifetime. His father, John, was a farmer of limited means but independent spirit. His mother, Abigail Hussey, whom the poet strongly resembled, was of good stock. The Rev. Stephen Bachiler, an Oxford man and a Churchman, who became a Nonconformist and emigrated to Boston in 1632, was one of her forebears and also an ancestor of Daniel Webster. The poet and the statesman showed their kinship by the " dark, deep-set and lustrous eyes " that impressed one who met either of these uncommon men. The former's name of Greenleaf is thought to be derived from the French Feuillevert, and to be of Huguenot origin; and there was Huguenot blood as well in Thomas Whittier, the settler. The poet thus fairly inherited his con- science, religious exaltation and spirit of protest. All the Whittiers were men of stature and bodily strength, John Green- leaf being almost the first exception, a lad of delicate mould, scarcely adapted for the labour required of a Yankee farmer and his household. He bore a fair proportion of it, but through- out his life was frequently brought to a halt by pain and physical debility. In youth he was described as " a handsome young man, tall, slight, and very erect, bashful, but never awkward." His shyness was extreme, though covered by a grave and quiet exterior, which could not hide his love of fun and sense of the ludicrous. In age he retained most of these characteristics, refined by a serene expression of peace after contest. His eyes never lost their glow, and were said by a woman to be those of one " who had kept innocency all his days."

Whittier's early education was restricted to what he could gain from the primitive " district school " of the neighbourhood. His call as a poet came when a teacher lent to him the poems of Burns. He was then about fifteen, and his taste for writing, bred thus far upon the quaint Journals oj Friends, the Bible and The Pilgrim's Progress, was at once stimulated. There was little art or inspiration in his boyish verse, but in his nineteenth year an older sister thought a specimen of it good enough for submission to the Free Press, a weekly paper which William Lloyd Garrison, the future emancipationist, had started in the town of Newburyport. This initiated Whittier's literary career. The poem was printed with a eulogy, and the editor sought out his young contributor: their alliance began, and continued until the triumph of the anti-slavery cause thirty-seven years later. Garrison overcame the elder Whittier's desire for the full services of his son, and gained permission for the latter to attend the Haverhill academy. To meet expenses the youth worked in various ways, even making slippers by hand in after-hours; but when he came of age his text-book days were ended. Mean- while he had written creditable student verse, and contributed both

prose and rhyme to newspapers, thus gaining friends and obtaining a decided if provincial reputation. He soon essayed journalism, first spending a year and a half in the service of a publisher of two Boston newspapers, the Manufacturer, an organ of the Clay protectionists, and the Philanthropist, devoted to humane reform. Whittier edited the former, having a bent for politics, but wrote for the latter also. His father's last illness recalled him to the homestead, where both farm and family became his pious charge. Money had to be earned, and he now secured an editorial post at Hartford, Connecticut, which he

sustained until forced by ill-health, early in his twenty-fifth year, to re-seek the Haverhill farm. There he remained from 1832 to 1836, when the property was sold, and the Whittiers removed to Amesbury in order to be near their meeting-house and to enable the poet to be in touch with affairs. The new- home became, as it proved, that of his whole after-life; a dwelling then bought and in time remodelled was the poet's residence for fifty-six years, and from it, after his death on the 7th of September 1892ˆ his remains were borne to the Amesbury graveyard.

While in Hartford Whittier issued in prose and verse his first book, Legends of New England (1831), and edited the writings of the poet John Gardiner C. Brainard. Thenceforward he was constantly printing verse, but of the hundred or more pieces composed before his settlement at Amesbury less than fifty are retained in his final collection. Of these none has more signific- ance than the poem to Garrison, which appeared in 1831, and was read (December 1833) at the Philadelphia Convention that formed the Anti-Slavery Society. To that convention, with one-third of its membership composed of Friends, Whittier was a delegate, and was appointed one of the committee that drafted the famous Declaration of Sentiments. Although a Quaker, he had a polemical spirit; men seeing Whittier only in his saintly age knew little of the fire wherewith, setting aside ambition and even love, he maintained his warfare against the " national crime," employing action, argument and lyric scorn. A future was open ioc him among the Protectionists, who formed the Whig party, and doubtless soon would have carried him to the United States Congress. As it was, he got no farther than the legislature of his own state (1835-1836), elected by his neighbours in an anti-slavery town. But if Garrison, Phillips and Sumner and Mrs Stowe were to be the rhapsodists of the long emancipation struggle, Whittier was its foreordained poet-seer. In 1833 he had issued at his own cost a pamphlet, " Justice and Expediency," that provoked vehement discussion North and South. Later he shared with the agitators their experience of lawlessness, mob-violence and political odium. His sister Elizabeth, who became his life companion, and whose verse is preserved with his own, was president of the Woman's Anti-Slavery Society in Amesbury. It is to be noted that the first collection of Vvhitticr's lyrics was the Poems written

during the Progress of the Abolition Question in Ike United States, issued by a friend in 1837. But Mogg Megone (1836) was his first book, a crude attempt to apply the manner of Scott's romantic cantos to a native theme. Among his other lyrical volumes, of dates earlier than the Civil War, were Lays of my Home (1843), Voices of Freedom (1846), Songs of Labor (1850), The Chapel of the Hermits (1853), The Panorama (1856), Home Ballads (i860). The titles of In War Time (1863) and National Lyrics (1865) rightly designate the patriotic rather than Tyrtaean contents of these books. The poet was closely affiliated with the Atlantic Monthly from the foundation of that classic magazine in 1857. His repute became national with the welcome awarded to Snow-Bound in 1866, and brought a corresponding material reward. Of his later books of verse may be mentioned The Tent on the Beach (1867), The Penn- sylvania Pilgrim (1872), The Vision of Echard (1878), The King's Missive (1881), At Sundown, his last poems (1890). As early as 1849 an illustrated collection of his poems appeared, and his Poetical Works was issued in London in 1850. During the ensuing forty years no less than ten successive collections of his poems appeared. Meanwhile he did much editing and compiling, and produced, among other works in prose, The Stranger in Lowell (1845), Super naturalism in New England (1847), Leaves from Margaret Smith's Journal (1849), a pieasing treatment in old-style English of an early Colonial theme. When he died, in 1892, in New Hampshire, among the hills he loved and sang so well, he had been an active writer for over sixty years, leaving more than that number of publications that bore his name as author or editor. His body was brought to Amesbury for interment; the funeral services were held in the open air, and conducted after the simple rites of the Friends, in the presence of a large concourse, certain of whom "spake as they were

moved " in tribute to the bard. The Amesbury house has been acquired by the " Whittier Home Association," so that the building and erounds are guarded as he left them, and form a shrine to which there is a constant pilgrimage. The Haverhill homestead, memorized in Snow-Bound, is also held by trustees " to preserve the natural features of the landscape," and to keep the buildings and furniture somewhat as they were in their minstrel's boyhood.

It wouldbe unjust to consider Whittier's genius from an academic point of view. British lovers of poetry — except John Bright and others of like faith or spirit — have been slow to comprehend his dis- tinctive rank. As a poet he was essentially a balladist, with the faults of his qualities; and his

ballads, in their freedom, naivete, even in their undue length, are among the few modern examples of unso- phisticated verse. He returned again and again to their production, seldom labouring on sonnets and lyrics of the Victorian mould. His ear for melody was inferior to his sense of time, but that his over- facilitv and structural defects were due less to lack of taste than to early habit, Georgian models, disassociation from the schools, is indi- cated by his work as a writer of prose. In Margaret Smith's Journal an artistic, though snppositive, Colonial style is well maintained. Whittier became very sensible of his shortcomings; and when at leisure to devote himself to his art he greatly bettered it, giving much of his later verse all the polish that it required. In extended com- position, as when he followed Longfellow's Tales of a Wayside Inn with his own Tent on the Beach, he often failed to rival his graceful brother poet. In American balladry he was pre-eminent; such pieces as " The Swan Song of Parson Avery," " Marguerite," " Bar- clay of Ury," "Skipper Ireson's Ride," " In the ' Old South,' " hold their place in literature. . It is necessary above all to consider the relation of a people's years of growth and ferment to the song which represents them; for in the strains of Whittier, more than in those of any other 19th-century lyrist, the saying of Fletcher of Saltoun as, to the ballads and laws of a nation finds a historic illustration. He was the national bard of justice, humanity and reform, whose voice went up as a trumpet until the victory was won. Its lapses resembled those of Mrs Browning, who was of his own breed in her fervour and exaltation. To the last it was uncertain whether a poem by Whittier would " turn out a sang," or " perhaps turn out a sermon "; if the latter, it had deep sincerity and was as close to his soul as the other. He began as a liberator, but various causes em- ployed his pen; his heart was with the people, and he was under- standed of them ; he loved a worker, and the Songs of Labor convey the zest of the artisan and pioneer. From 1832 to 1863 no occasion escaped him for inspiring the assailants of slavery, or chanting paeans of their martyrdom or triumph. No crusade ever had a truer laureate than the author of " The Virginia Slave Mother," " The Pastoral Letter "—one of his stinging ballads against a time-serving Church — " A Sabbath Scene," and " The Slaves of Martinique." Randolph of Roanoke " is one of the most pathetic and most elevated of memorial tributes. " Ichabod " and " The Lost Occasion," both evoked by the attitude of Webster, are Roman in their condemnation and " wild with all regret."

The green rusticity of Whittle: 's farm and village life imparted a bucolic charm to such lyrics as " In School Days," " The Bare- foot Boy," " Telling the Bees," " Maud Muller," and " My School- mate." His idyllic masterpiece is the sustained transcript of winter scenery and home-life, Snow-Bound, which has had Ao equal except Longfellow's "Evangeline" in American favour, but, in fact, nothing of its class since " The Cottar's

Saturday Night " can justly be compared with it. Along with the Quaker poet's homing sense and passion for liberty of body and soul, religion and patriotism are the dominant notes of his song. His conception of a citizen's prerogative and duty, as set forth in " The Eve of Election, "certainly is not that of one whose legend is " our country, right or wrong." Faith, hope and boundlesscharity pervade the " Questions of Life," " Invocation," and " The Two Angels," and arc exquisitely blended in " The Eternal Goodness," perhaps the most enduring of his lyrical poems. " We can do without a Church," he wrote in a letter; " we cannot do without God. and of Him we are sure." The inward voice was his inspiration, and of all American poets he was the one whose song was most like a prayer. A knightly celibate, his stainless life, his ardour, caused him to be termed a Yankee Galahad; a pure and simple heart was laid bare to those who loved him in " My Psalm," " My Triumph " and " An Autograph." The spiritual habit abated no whit of his inborn sagacity, and it is said that in his later years political leaders found no shrewder sage with whom to take counsel. When the question of primacy among American poets was canvassed by a group of the public men of Lincoln's time, the vote was for Whittier; he was at least one whom they understood, and who expressed their feeling and convictions. Parkman called him " the poet of New England," but as the North and West then were charged with the spirit of the New England states, the two verdicts were much the same. The fact remains that no other poet has sounded more native notes, or covered so much of the American legendary, and that Whittier's name, among the patriotic, clean and true, was one with which to conjure. He was revered by the people

cleaving to their altars and their fires, and his birthdays were calendared as festivals, on which greetings were sent to him by young and old.

In his age the poet revised his works, classifying them for a definitive edition, in seven volumes, published at Boston, 18S8. Their metrical portion, annotated by Horace E. Scudder, can be found in the one-volume "Cambridge Edition," (Boston, 1894). Whittier's Life and Letters, prepared by his kinsman and literary executor, Samuel T. Pickard, also appeared in 189,1. _ See also G. R. Carpenter, John Greenleaf Whittier (Boston, 1903) in the "American Men of Letters" series ; a life (1907) by Bliss Perry ; and B. Wendell, Stelligeri (New York, 1893, pp. 149-201). (E.C.S.)

WHITTINGHAM, CHARLES (1767-1840), English printer, was born on the 16th of June 1767,. at Caludon or Calledon, Warwickshire, the son of a farmer, and was apprenticed to p Coventry printer and bookseller. In 1789 he set up a small printing press in a garret off Fleet Street, London, with a loan obtained from the typefounding firm of William Caslon, and by 1797 his business had so increased that he was enabled to move into larger premises. An edition of Gray's Poems, printed by him in 1799, secured him

the patronage of all the leading publishers. Whittingham inaugurated the idea of printing cheap, handy editions of standard authors, and, on the bookselling trade threatening not to sell his productions, took a room at a coffee house and sold them by auction himself. In 1809 he started a paper-pulp factory at Chiswick, near London, and in 181 1 founded the Chiswick Press. From 1810 to 1815 he devoted his chief attention to illustrated books, and is credited with having been the first to use proper overlays in printing woodcuts, as he was the first to print a fine, or " Indian Paper " edition. He was one of the first to use a steam-engine in a pulp mill, but his presses he preferred to have worked by hand. He died at Chiswick on the 5th of January 1840.

His nephew, Charles Whittingham (1795-1876), who from 1824 to 1828 had been in partnership with his uncle, in 1838 assumed control of the business. He already had printing works at Took's Court, Chancery Lane, London, and had printed various notable books, specially devoting himself to the intro- duction of ornamental initial letters, and the artistic arrange-ment of the printed page. The imprint of the Chiswick press was now placed on the productions of the Took's Court as well as of the Chiswick works, and in 1852 the whole business was removed to London. Under the management of the younger Whittingham the Chiswick Press achieved a considerable reputation. He died on the 21st of April 1876.

WHITTINGHAM, WILLIAM (c. 1524-1579), English scholar, who belonged to a Lancashire family, was born at Chester. Educated at Brasenosc College, Oxford, he became a fellow of All Souls' College and a senior student of Christ Church, and later he visited several universities in France and Germany. A strong Protestant, he returned to England in 1553, but soon found it expedient to travel again to France. In 1554 he was a leading member of the band of English Protestant exiles who were assembled at Frankfort-on-the-Main, and in the contro- versies which took place between them concerning the form of service to be adopted, Whittingham strongly supported the Calvinistic views propounded by John Knox. These opinions, however, did not prevail, and soon the Scottish reformer and his follower were found at Geneva; in 1359 Whittingham succeeded Knox as minister of the English congregation in that city, and here he did his most noteworthy work, that of making an English translation of the Bible. He was probably responsible for the English translation of the New Testament which appeared in 1 557, and he had certainly a large share in the translation of both the Old and the New Testaments which is called the Genevan or Breeclies Bible. This was printed at Geneva in 1560 and enjoyed a remarkable popularity (see Bible, English). He also made a metrical translation of some of the Psalms. Having returned to England in 1560, Whittingham went to France in the train of Francis Russell, 2nd earl of Bedford, and a little later he acted as

minister of the English garrison at Havre, being in this place during its siege by the French in 1562. In the following year he was made dean of Durham. He attended well to the duties of his office, but his liking for puritan customs made

certain prelates and others look upon him with suspicion, and in 1576 or 1577 a commission was appointed to inquire into his conduct. This had no result, and another commission was appointed in 1578, one charge against Whittingham being that he had not been duly ordained. The case was still under con- sideration when the dean died on the 10th of June 1579.

WHITTINGTON, RICHARD (d. 1423), mayor of London, described himself as son of William and Joan (Dugdale, Mon- aslicon Anglicanum, vi. 740). This enables him to be identified as the third son of Sir William Whittington of Pauntley in Gloucestershire, a knight of good family, who married after 1355 Joan, daughter of William Mansel, and widow of Thomas Berkeley of Cubberley. Consequently Richard was a very young man when he is mentioned in 1379 as subscribing five marks to a city loan. He was a mercer by trade, and clearly entered on his commercial career under favourable circumstances. He married Alice, daughter of Sir Ivo Fitzwaryn, a Dorset knight of considerable property. Whittington sat in the common council as a representative of Coleman Street Ward, was elected alderman of Broad Street in March 1393, and served as sheriff in 1393-1394. When Adam Bamme, the mayor, died in June 1397. Whittington was appointed by the king to succeed him, and in October was elected mayor for the ensuing year. He had acquired great wealth and much commercial importance, and was mayor of the staple at London and Calais. He made frequent large loans both to Henry IV. and Henry V., and accord- ing to the legend, when he gave a banquet to the latter king and his queen in 1421, completed the entertainment by burning bonds for £60,000, which he had taken up and discharged. Henry V. employed him to superintend the expenditure of money on completing Westminster Abbey. But except as a London commercial magnate Whittington took no great part in public affairs. He was mayor for a third term in 1406-1407, and for a fourth in 1419-1420. He died in March 1423. His wife had predeceased him leaving no children, and Whittington bequeathed the whole of his vast fortune to charitable and public purposes. In his lifetime he had joined in procuring Leadenhall for the city, and had borne nearly all the cost of building the Greyfriars Library. In his last year as mayor he had been shocked by the foul state of Newgate prison, and one of the first works undertaken by his executors was its rebuilding. His executors, chief

of whom was John Carpenter, the famous town clerk, also contributed to the cost of glazing and paving the new Guildhall, and paid half the expense of building the library there; they repaired St Bartholomew's hospital, and provided bosses for water at Billingsgate and Cripplegate. But the chief of Whitting- ton's foundations was his college at St Michael, Paternoster church, and the adjoining hospital. The college was dissolved at the Reformation, but the hospital or almshouses are still maintained by the Mercers' Company at Highgate. Whittington was buried at St Michael's church. Stow relates that his tomb was spoiled during the reign of Edward VI., but that under Mary the parishioners were compelled to restore it {Survey, i. 243). Whittington had a house near St Michael's church; it is doubtful whether he had any connexion with the so-called Whittington Palace in Hart Street, Mark Lane. There is no proof that he was ever knighted; Stow does not call him Sir Richard. Much of Whittington's fame was probably due to the magnificence of his charities. But a writer of the next generation bears witness to his commercial success in A Libell of English Policy by styling him " the sunne of marchaundy, that lodestarre and chief-chosen flower."

" Pen and paper may not me suffice Him to describe, so high he was of price."

The Richard Whittington of history is thus very different from the Dick Whittington of popular legend, which makes him a poor orphan employed as a scullion by the rich merchant, Sir Hugh Fitzwarren, who ventures the cat, bis only possession, on one of his master's ships. Distressed by ill-treatment he runs away, but turns back when he hears from Holloway the prophetic peal of Bow bells. He returns to find that his venture has brought him a fortune, marries his master's daughter, and

succeeds to his business. The legend is not referred to by Stow, whose love for exposing fables would assuredly have prompted him to notice it if it had been well established when he wrote. The first reference to the story comes with the licensing in 1605 of a play, now lost, The History of Richard Whittington, of his lowe byrth, his great fortune. Thomas Hey wood in 1606 makes one of the characters in If you know not me you know nobody, allude to the legend, to be rebuked by another because " they did more wrong to the gentleman." " The legend of Whittington," probably meaning the play of 1605, is also mentioned by Beaumont and Fletcher in r6n in The Knight of the Burning Pestle. The story was then no doubt popular. When a little later Robert Elstracke, the engraver, published a supposed portrait of Whittington with his hand resting on a skull, he had in deference to the public fancy to substitute a cat; copies in the first state are very rare. Attempts have been made to explain the story as possibly referring to vessels called " cats," which were employed in the North Sea

trade, or to the French achat (purchase). But Thomas Keightley traced the cat story in Persian, Danish and Italian folk-lore at least as far back as the r3th century. The assertion that a carved figure of a cat existed on Newgate gaol before the great fire is an unsupported assumption.

Bibliogra phy. — The most important early references to Whitting- ton are contained in Dr R. R. Sharpe's Calendar of Letter~book II ; II. T. Riley's Memorials of London; and Political Songs, ii. 178 (Rolls series). For his charities see Stow's Survey of London (ed. C. L. Kingsford, 1908). For documents relating to Whittington College see Dugdale, Monasticon A nglicanum, vi. 740, and the Calendar of Patent Rolls, Henry VI., ii. 214-217. Samuel Lysons collected the facts, but accepted the legend in The Model Merchant of the Middle Ages (i860). The Life by W. Besant and J. Rice does not improve on Lysons. Some useful references will be found in J. H. Wylie's History of England under Henry IV. For an examination of the legend see T. Keightley's Tales and Popular Fictions, pp. 241-286 (1834), and H. B. Whcatlcy's preface to his edition of The History of Sir Richard Whittington (first published in 1656). (C. L. K.)

WHITTINGTON, an urban district in the north-eastern parliamentary division of Derbyshire, England, 10 m. S. by E. of Sheffield and 2 m. N. of Chesterfield, on the Midland railway. Pop. (1901) 9416. The parish church of St Bartholomew was restored after its destruction by fire, excepting the tower and spire, in T895. Samuel Pegge, the antiquary (1704-1796), was vicar of Whittington and Heath for many years, and was buried here. Stone bottles and coarse earthenware are manufactured in the town, where there are also large ironworks, collieries and brickworks. A small stone cottage, known as Revolution House, was the meeting-place of John Darcy, the 1st earl of Danby, and the 4th earl of Devonshire, who there concerted the plans by which, in 1688, the Whig party brought about the fall of James II. and the succession of William III. It was then a hostelry, known as the " Cock and Pynot "; pynot being the local name for a magpie.

■ *WHITTLESEA (or Whittlesey), WILLIAM (d. 1374), arch- bishop of Canterbury, was probably born in the Cambridgeshire village of Whittlesey. He was educated at Oxford, and owing principally to the fact that he was a nephew of Simon Islip, archbishop of Canterbury, he received numerous ecclesiastical preferments; he held prebends at Lichfield, Chichester and Lincoln, and livings at Ivychurch, Croydon and Cliffe. Later he was appointed vicar-general, and then dean of the court of arches by Islip. In 1360 he became bishop of Rochester, and two years later bishop of Worcester. In 1368 Whittlesea was elected archbishop of Canterbury in succession to Simon Langham, but his term of office was very uneventful, a circumstance due partly, but not wholly, to his feeble health. He died at*

Lambeth on the 5th or 6th of June 1374.

WHITTLESEY, a market town in the Wisbech parliamentary division of Cambridgeshire, England, <\ m. E. of Peterborough, between that city and March, on the Great Eastern railway. Pop. of urban district (1901) 3909. It lies on a gentle eminence in the flat fen country, and the fine Perpendicular tower and spire of the church of St Mary are a landmark from far. A little to the north is the great artificial cut carrying the waters of the

river Nene; and the neighbourhood is intersected with many other navigable " drains." To the south-west is the tract known as Whittlesey Mere, 6 m. distant from the town, in Huntingdon- shire. It was a lake until modern times, when it was included in a scheme of drainage. The so-called Whittlesey Wash, in the neighbourhood of the town, is among several tracts in the fens which are perennially flooded. St Mary's church is principally Perpendicular, bat has Norman and Decorated portions; the church of St Andrew is also Decorated and Perpendicular. The town has manufactures of bricks and tiles, and a considerable agricultural trade.

WHITWORTH, SIR JOSEPH, Bart. (1803-1887), English engineer, was born at Stockport, near Manchester, on the 21st of December 1803. On leaving school at the age of fourteen, he was placed with an uncle who was a cotton-spinner, with the view of becoming a partner in the business; but his mechanical tastes were not satisfied with this occupation, and in about four years he gave it up. He then spent some time with various machine manufacturers in the neighbourhood of Manchester, and in 1825 moved to London, where he gained more experience in machine shops, including those of Henry Maudslay. In 1833 he returned to Manchester and started in business as a tool- maker. In 1840 he attended the meeting of the British Associa- tion at Glasgow, and read a paper on the preparation and value of true planes, describing the method which he had successfully used for making them when at Maudslay's, and which depended on the principle that if any two of three surfaces exactly fit each other, all three must be true planes. The accuracy of workman- ship thus indicated was far ahead of what was contemplated at the time as possible in mechanical engineering, but Whit worth : not only proved that it could be attained in practice, but also showed how it could be measured. He found that if two true planes were arranged parallel to each other, an exceedingly small motion towards or from each other was sufficient to determine whether an object placed between them was held firmly or allowed to drop, and by

mounting one of the planes on a screwed shaft provided with a comparatively large wheel bearing a. scale on its periphery, he was able to obtain a very exact measurement of the amount, however minute, by which the distance between the planes was altered, by observing through what angular distance the wheel had been turned. In 1841, in a paper read before the Inst itution of Civil Engineers, he urged the necessity for the adoption of a uniform system of screw threads in place of the various heterogeneous pitches then employed. His system of standard gauges was also widely adopted. The principles of exact measurement and workmanship which he advocated were strictly observed in his own manufactory, with the result that in the Exhibition of iSsr he had a show of machine tools which were far ahead of those of any competitor. It was doubt- less this superiority in machine construction that caused the government three years later to request him to design, and estimate for making, the machinery for producing rifled muskets at the new factory at Enfield. He did not see his way to agree to the proposition in this form, but it was ultimately settled that he should undertake the machinery for the barrels only. Finding that there was no established practice to guide him, he began a series of experiments to determine the best principles for the manufacture of rifle barrels and projectiles. He ultimately arrived at a weapon in which the necessary rotation of the pro- jectile was obtained, not by means of grooving, but by making the barrel polygonal in form, with gently rounded angles, the bullets also being polygonal and thus travelling on broad bearing- surfaces along the rotating polygon. The projectile he favoured was 3 to 35 calibres in length, and the bore he fixed on was 0-45 in., which was at first looked upon as too small. It is re- ported that at the trial in 1857 weapons made according to these principles excelled the Enfield weapons in accuracy of fire, penetration and range to a degree " which hardly leaves room for comparison." He also constructed heavy guns on the same lines; these were tried in competition with Armstrong's ordnance in 1864 and 1865, and in their inventor's opinion gave the better results, but they were not adopted by the government. In

constructing them Whitworth experienced difficulty in getting large steel castings of suitable soundness and ductility, and thus was led about 1870 to devise his compressed steel process, in which the metal is subjected to high pressure while still in the fluid state, and is afterwards forged in hydraulic presses, not by hammers. In 1868 he founded the Whitworth scholarships, setting aside an annual sum of £3000 to be given for " intelligence and proficiency in the theory and practice of mechanics and its cognate sciences/' and in the following year he was created a baronet. He died at Monte Carlo, whither he had gone for the sake of his health, on the 22nd of January 1887. In addition to handing over £100,000 to the Science and Art Department for the permanent endowment of the thirty

Whitworth scholarships, his residuary legatees, in pursuance of what they knew to be his intentions, expended over half a million on charitable and educa- tional objects, mainly in Manchester and the neighbourhood.

WHOOPING-COUGH, or Hooping- Cough (syn. Pertussis, Chin-cough) , a specific infective disease of the respiratory mucous membrane, of microbic origin (see Parasitic Diseases), mani- festing itself by frequently recurring paroxysms of convulsive coughing accompanied with peculiar sonorous inspirations (or whoops). Although specially a disease of childhood, whooping- cough is by no means limited to that period but may occur at any time of life. It is one of the most dangerous diseases of infancy, the yearly death-rate in England . and Wales for each of the five years 1904-1908 being greater than that from scarlet fever and typhoid added together. The majority of these deaths were in infants under one year, 97 % in children under 5 years (Tatham). It is more common in female than in male children. There is a distinct period of incubation variously estimated at from two to ten days. Three stages of the disease are recognized, viz. (1) the catarrhal stage, (2) the spasmodic or paroxysmal stage, (3) the stage of decline.

The first stage is characterized by the ordinary phenomena of a catarrh, with sneezing, watering of the eyes, irritation of the throat, feverishness and cough, but in general there is nothing in the symptoms to indicate that they are to develop into whooping-cough, but the presence of an ulcer on the fraenum linguae is said to be diagnostic. The catarrhal stage usually lasts from ten to fourteen days. The second stage is marked by the abatement of the catarrhal symptoms, but at the same time by increase in the cough, which now occurs in irregular paroxysms both by day and by night. Each paroxysm consists In a series of violent and rapid expiratory coughs, succeeded by a loud sonorous or crowing inspiration — the " whoop." During the coughing efforts the air is driven with great force out of the lungs, and as none can enter the chest the symptoms of impending asphyxia appear. The patient grows deep-red or livid in the face, the eyes appear as if they would burst from their sockets, and suffocation seems imminent till relief is brought by the " whoop " — the louder and more vigorous the better. Occasionally blood bursts from the nose, mouth and ears, or is extravasated into the conjunctiva of the eyes. A single fit rarely lasts beyond from half to three-quarters of a minute, but after the "whoop" another recurs, and of these a number may come and go for several minutes. The paroxysm ends by the coughing or vomiting up of a viscid tenacious secretion, and usually after this the patient seems comparatively well, or, it may be, somew r hat wearied and fretful. The frequency of the paroxysms varies according to the severity of the case, being in some instances only to the extent of one or two in the whole day, while in others there may be several in the course of a single hour. Slight causes serve to

bring on the fits of coughing, such as the acts of swallow- ing, talking, laughing, crying, &c, or they may occur without any apparent exciting cause. In general children come to recognize an impending attack by a feeling of tickling in the throat, and they cling with dread to their mothers or nurses, or take hold of some object near them for support during the paroxysm; but although exhausted by the severe fit of coughing they soon resume their play, apparently little the worse. The attacks are on the whole most severe at night. This stage of the disease usually continues for thirty to fifty days, but it may

be shorter or longer. It is during this time that complications are apt to arise which may become a source of danger greater even than the malady itself. The chief of these are inflamma- tory affections of the bronchi and lungs and convulsions, any of which may prove fatal. When, however, the disease progresses favourably, the third or terminal stage is announced by the less frequent paroxysms of the cough, which generally loses in great measure its "whooping" character. The patient's condition altogether undergoes amendment, and the symptoms disappear in from one to three weeks. It is to be observed, however, that for a long period afterwards in any simple catarrh from which the patient suffers the cough often assumes a spasmodic character, which may suggest the erroneous notion that a relapse of the whooping-cough has occurred.

In severe cases it occasionally happens that the disease leaves behind it such structural changes in the lungs (emphysema, &c), as entail permanent shortness of breathing or a liability to attacks of asthma. Further, whooping-cough is well known to be one of those diseases of early life which are apt to give rise to a weakened and vulnerable state of the general health, or to call into activity any inherited morbid tendency, such as that towards consumption.

As regards the treatment in mild cases, little is necessary beyond keeping the patient warm and carefully attending to the general health. The remedies applicable in the case of catarrh or the milder forms of bronchitis are of service here, while gentle counter-irritation to the chest by stimulating liniments may be employed all through the attack. In mild weather the patient may be in the open air. An abdominal binder should be worn night and day in order to prevent the occurrence of hernia. Systematic disinfection of the sputum by means of a solution of corrosive sublimate or by burning should be practised in order to check the spread of infection. In the more severe forms efforts have to be employed to modify

The severity of the paroxysms. Numerous remedies are recommended, the chief of which are the bromides of ammonium or potassium, chloral, codeine, &c. These can only be safely administered under medical advice, and with due regard to the symptoms in individual cases. During convalescence, where the cough still continues to be troublesome, a change of air will often effect its removal.

WHYMPER, EDWARD (1840-), British artist, explorer and mountaineer, was born in London on the 27th of April 1840. The son of an artist, he was at an early age trained to the profes- sion of a wood-engraver. In i860 he was commissioned to make a series of sketches of Alpine scenery, and undertook an extensive journey in the Central and Western Alps. Among the objects of this tour was the illustration of an attempt, which proved unsuccessful, made by Professor Bonncy's party, to ascend Mont Pelvoax, at that time believed to be the highest peak of the Dauphinc Alps. He successfully accomplished the ascent in 1861— the first of a series of expeditions that threw much light on the topography of a district at that time very imperfectly mapped. From the summit of Mont Pelvoux he discovered that it was overtopped by a neighbouring peak, subsequently named the Pointe des Ecrins, which, before the annexation of Savoy added Mont Blanc to the possessions of France, was the highest point in the French Alps. Its ascent by Mr Whymper's party in 1864 was perhaps the most remarkable feat of mountaineering up to that date. The years 1861 to 1865 are filled with a number of new expeditions in the Mont Blanc group and the Pennine Alps, ameng them the ascent of the Aiguille Verte and the crossing of the Morning Fass. Professor Tyndall and Mr Whymper emu- lated each other in fruitless attempts to reach the summit of the Matterhorn by the south-western or Italian ridge. Mr Whymper, six Limes repulsed, determined to try the eastern face, convinced that its precipitous appearance when viewed from Zermatt was an optical illusion, and that the dip of the strata, which on the Italian side formed a continuous series of overhangs, should make the opposite side a natural staircase. His attempt by what is now the usual route was crowned with success {14th of July 1865); but on the descent four of the party slipped and were killed, and

only the breaking of the rope saved Mr Whymper and the two remaining guides from the same fate. The account of his attempts on the Matterhorn occupies the greater part of his Scrambles among the Alps (1871), in which the illustrations are engraved by the author himself, and are very beautiful. His campaign of 1865 had been planned to exercise his judgment in the choice of routes as a preparation for an expedition to Greenland (1867). This resulted in an important collection of fossil plants, which were described by Professor Heer and deposited in the British Museum. Mr Whymper's report was published in the Report of the British Association for the year j 869. Though hampered by want of means and by the prevalence

of an epidemic among the natives, he proved that the interior could be explored by the use of suitably constructed sledges, and thus contributed an important advance to Arctic exploration. Another expedition followed in 1872, and was devoted to a survey of the coast-line. He next organized an expedition to Ecuador, designed primarily to collect data for the study of mountain- sickness and of the effect of diminished pressure on the human frame. He took as his chief guide Jean-Antoine Carrel, whose subsequent death from exhaustion on the Matterhorn after bringing his employers into safety through a snowstorm forms one of the noblest pages in the history of mountaineering. During 18S0 Mr Whymper on two occasions ascended Chimborazo, whose summit, 20,500 ft. above sea-level, had never before been reached; spent a night on the summit of Cotopaxi, and made first ascents of half-a-dozen other great peaks. In 1S92 he published the results of his journey in a volume, entitled Travels amongst the Great Andes of the Equator. His observations on mountain-sickness led him to conclude that it was caused by "diminution in atmospheric pressure, which operates in at least two ways — namely, (a) by lessening the value of the air that can be inspired in any given time, and (b) by causing the air or gas within the body to expand, and to press upon the internal organs"; and that " the effects produced by {b) may be temporary and pass away when equilibrium has been restored between the internal and external pressure." The publication of his work was recognized on the part of the Royal Geographical Society by the award of the Patron's medal. His experiences in South America having convinced him of certain serious errors in the readings of aneroid barometers at high altitudes, he published a work, entitled How to Use the Aneroid Barometer, and succeeded in introducing important improvements in their construction. He afterwards published two guide-books to Zermatt and Chamonix. In 1001-1005 he undertook an expedition in the region of the Great Divide of the Canadian Rockies.

WHYTE, ALEXANDER (1837-), Scottish divine, was born at Kirriemuir in Forfarshire on the 13th of January 1837, and was educated at the university of Aberdeen and at New College, Edinburgh. He entered the ministry of the Free Church of Scotland and after serving as colleague in Free St John's, Glasgow (1866-1870), removed to Edinburgh as colleague and successor to Dr R. S. Candlish at Free St George's. In 1909 he succeeded Dr Marcus Dcds as principal, and professor of New Testament literature, at New College, Edinburgh.

Among his publications are Characters and Characteristics of William Law (1893); Bunyan Characters (3 vols., 1894); Samuel Rutherford (1894) ; An Appreciation of Jacob Behmen (1895) ; Lancelot Andrewes and his Private Devotions (1895) ; Bible Characters (7 vols., 1897) ; Santa Teresa (1897) ; Father John of Cronstadl (1 898) ; An Appreciation of Browne's Religio Medici (1898) ; Cardinal Newman, An Appreciation (1901).

WHYTE-MELYIUE, GEORGE JOHN (1821-1878), English novelist, son of John Whyte-Melville of Strathkinness, Fifeshire, and grandson on his mother's side of the 5th duke of Leeds, was born on the 19th of June 1821. Whyte-Melville received his education at Eton, entered the army in 1839, became captain in the Coldstream Guards in 1846 and retired in 1849. After trans- lating Horace (1S50) in fluent and graccfulverse, he published his first novel, Digby Grand, in 1853. The unflagging verve and intimate technical knowledge with which he described sport;u : – scenes and sporting characters at once drew attention to him a» a novelist with a new vein. He was the laureate of fox-hunting;

all his most popular and distinctive heroes and heroines, Digby Grand, Tilbury Nogo, the Honourable Crasher, Mr Sawyer, Kate Coventry, Mrs Lascelles, are or would be mighty hunters. Tilbury Nogo was contributed to the Sporting Magazine in 1853 and published separately in 1854. He showed in the adventures of Mr Nogo — and it became more apparent in his later works — that he had a surer hand in humorous narrative than, in pathetic description; his pathos is the pathos of the preacher. His next novel, General Bounce, appeared in Fraser's Magazine (1854). When the Crimean War broke out Whyte-MelviUe went out as a volunteer major of Turkish irregular cavalry; but this was the only break in his literary career from the time that he began to write novels till his death. By a strange accident, he lost his life in the hunting-field on the 5th of December 1878, the hero of many a stiff ride meeting his fate in galloping quietly over an ordinary ploughed field in the Vale of the White Horse.

Twenty-one novels appeared from his pen after his return from the Crimea: — Kate Coventry (1856); The Interpreter (1858); Holmby House (i860); Good for Nothing (1861); Market Harborough (1861); The Queen's Maries (1862); The Gladiators (1863); Brookes of Bridlemere (1864); Cerise (1866); Bones and I (1868); The White Rose (1868); M or N (1869); Contraband (1870); Sarchedon (1871); Satanetla (1873); Uncle John (1874); Sister Louise (1875); Kater- felio (1875); Rosine (1875); Roy's Wife (1878); Black but Comely (1878). Several of these novels are historical, The Gladiators being

Serhaps the most famous of them. As an historical novelist Whyte- lelville is not equal to Harrison Ainsworth in painstaking accuracy and minuteness of detail ;_ but he makes his characters live and move with great vividness. It is on his portraiture of contemporary sport- ing society that his reputation as a novelist musr rest; and, though now and then a character

reappears, such as the supercilious stud- groom, the dark and wary steeple-chaser, or the fascinating sporting widow, his variety in the invention of incidents is amazing. Whyte- MelviUe was not merely the annalist of sporting society for his genera- tion, but may also be fairly described as the principal moralist of that society; he exerted a considerable and a wholesome influence on the manners and morals of the gilded youth of his time. His Songs and Verses (1869) and his metrical Legend of the True Cross (1873), though respectable in point of versification, are of no particular merit.

WICHITA, a tribe of North American Indians of Caddoan stock. They call themselves Kitikitish or Tawehash. Their former range was between the Red and Washita rivers, Oklahoma, and they are now on a reservation there. They were kinsmen of the Pawnee, and the French called them Pani Pique ("Tat- tooed Pawnee "). They were known to other Indians as the " Tattooed People " in allusion to the extensive tattooing customary among them. They numbered 3000 in or about 1800, but only about 300 now survive.

WICHITA, a city and the county-seat of Sedgwick county, Kansas, U.S.A., on the Arkansas river, at the mouth of the Little Arkansas, 208 m. (by rail) S.W. of Kansas City. Pop. (1880) 49n; (1890) 23,853; (1900) 24,671, of whom 1447 were foreign-born and 1380 were negroes; (1910 census), 52,450. Area, 18-75 s 1- m – Wichita is served by the Atchison, Topeka & Santa Fe, the Chicago, Rock Island & Pacific, the Missouri Pacific, the St Louis & San Francisco, and the Kansas City, Mexico & Orient railways. The site of the city is level, about 1300 ft. above the sea. The principal public buildings are the Federal building, the city hall, the county court house, a Y.M.C.A. building, an auditorium and exposition hall and a Masonic Temple. In Wichita are Fairmount College (Congregational; co-educational; organized as a preparatory school in 1892 and as a college in 1895); Friends' University (Society of Friends; co-educational; 1898); and Mount Carmel Academy and the Pro-Cathedral School (both Roman Catholic). Among the city's parks (area in 1909, 325 acres) is one (Riverside) of 146 acres. The city is supplied with natural gas. Wichita is a transporta- tion centre for the rich agricultural region surrounding it, and is an important market for broom-corn. In 1905 it ranked third among the cities of the state in value of its factory product ($7,389,844). The principal industry is slaughtering and meat- packing. The Kansas City, Mexico & Orient railway has car- shops here. Wichita, named from an Indian tribe, was settled in 1870, and was chartered as a city in 1871. In 1909 the city adopted by popular vote government by commission under a state law of 1907 providing for a mayor and four commissioners,

heads of the executive, finance, streets and public improvements, parks, public buildings and health, and water and lights depart- ments, all elected for two years and nominated by primary election or by petition signed by at least 25 voters.

WICK, a royal, municipal and police burgh, seaport and county town of Caithness, Scotland. Pop. (1901) 7911. It is situated at the head of Wick Bay, on the North Sea, 327 m. N. of Edinburgh, by the North British and Highland railways. It consists of the old, burgh and Louisburgh, its continuation, on the north bank of the river Wick, and of Pulteneytown, the chief seat of commerce and trade, on the south side. Pulteney- town, laid out in 1805 by the British Fishery Society, is built on a regular plan; and Wick proper consists chiefly of the narrow and irregular High Street, with Bridge Street, more regularly built, which contains the town hall and the county buildings. In Pulteneytown there are an academy, a chamber of commerce, a naval reserve station and a fish exchange. Among other buildings are the free libraries, the Rhind Charitable Institution and the combination hospital. The port consists of two harbours of fair size, but the entrance is dangerous in stormy weather. The chief exports are fish, cattle and agricultural produce, and the imports include coal, wood and provisions. Steamers from Leith and Aberdeen run twice a week and there is also weekly communication with Stromness, Kirkwall and Lerwick. It is to its fisheries that the town owes its prosperity. For many years it was the chief seat of the herring fishing on the east coast, but its insufficient harbour accommodation has hampered its progress, and both Peterhead and Fraserburgh surpass it as fishing ports. Women undertake the cleaning and curing, and the work attracts them from al! parts. So expert are they that on the occasion of a heavy catch they are sent as far even as Yarmouth to direct and assist the local hands. Shipbuilding has now been discontinued, but boat-building and net-making are extensively carried on. There are also cooperage, the manufacture of fish-guano and fish products, flour mills, steam saw mills, a ropery and a woollen manufactory, a brewery and a distillery. The town, with Cromarty, Dingwall, Dornoch, Kirkwall and Tain, forms the Wick group of parliamentary burghs. Wick (Vik or " bay ") is mentioned as early as 1140. It was constituted a royal burgh by James VI. in 1589, its superior being then George Sinclair, 5th earl of Caithness. By a parliamentary bounty in 1768 some impetus was given to the herring-fishery, but its real importance dates from the construction of a harbour in 1 808.

WICKLOW, a county of Ireland in the province of Leinster, bounded E. by St George's Channel, N. by the county of Dublin, S. by Wexford and W. by Carlow and detached portions of Kildare. The area is 500, 216 acres or about 782 sq. m. Wicklow is among the most famous counties of Ireland for beauty of scenery, both coastal and more especially inland. The coast is

precipitous and picturesque, but very dangerous of approach owing to sandbanks. There are no inlets that can be properly termed bays. The harbour at Wicklow has a considerable trade; but that of Arklow is suitable only for small vessels. To the north of the town of Wicklow there is a remarkable shingle beach, partly piled up by the waves and currents. The central portion of the county is occupied by a mountain range, forming one of the four principal mountain groups of Ireland. The direction of the range is from N.E. to S.W., and the highest elevations are gener- ally attained along the central line. The range consists of long sweeping moorlands, rising occasionally by precipitous escarp- ments into culminating points, the highest summits being Kippure (2473 ft.), Duff Hill (2364), Table Mountain (2416) and Lugnaquilla (3039), the last acquired by the War Office as a manoeuvring ground. The range rises from the north by a succession of ridges intersected by deep glens, and subsides towards the borders of Wexford and Carlow. To the north its foothills enter county Dublin, and add attraction to the southern residential outskirts of the capital.

In the valleys there are many instances of old river terraces, the more remarkable being those at the lower end of Glenmalure and the lower end of Glendalough. It is in its deep glens that

much of the peculiar charm of Wicklow scenery is to be found, the frequently rugged natural features contrasting finely with the rich and luxuriant foliage of the extensive woods which line their banks. Among the more famous of these glens are Glen- dalough, Dargle, Giencree, Glen of the Downs, Devil's Glen, Glenmalure and the beautiful vale of Avoca or Ovoca. The principal rivers are the Liffey, on the north-western border; the Vartry, which passes through Devil's Glen to the sea north of Wicklow Head; the Avonmore and the Avonbeg, which unite at the " meeting of the waters " to form the Avoca, which is afterwards joined by the Aughrim and falls into the sea at Arklow; and the Slaney, in the west of the county, passing south- wards into Carlo w. There are a number of small but finely situ- ated lakes in the valleys, the principal being Loughs Dan, Bray and Tay or Luggelaw, and the loughs of Glendalough. The trout- fishing is generally fair. Owing to its proximity to Dublin and its accessibility from England, the portions of the county possess- ing scenic interest have been opened up to great advantage. Bray in the north is one of the most popular seaside resorts in the country, and Greystones, 5 m. S., is a smaller one. Of the small towns and villages inland which are much frequented for the beauty of the country in which they lie, are Enniskerry, west of Bray, and

near the pass of the Scalp; Laragh, near Glendalough, from which a great military road runs S.W. across the hills below Lugnaquilla; and, on the railway south of Wicklow, Rathdrum, a beautifully situated village, Woodenbridge in the Vale of Avoca and Aughrim. Near the village of Shillelagh lies the wood which is said to have given the name of shillelagh to the oaken or blackthorn staves used by Irishmen. Ashford and Roundwood on the Vastry river, Delgany near the Glen of the Downs, and Rathnew, a centre of coach routes, especially for the Devil's Glen, must also be mentioned. The beauty of the central district of the Wicklow mountains lies in its wild solitude in contradistinction to the more gentle scenery of the populated glens. In the extreme north-west of the county Blessington is a favourite resort from Dublin, served by a steam tramway, which continues up the valley of the Liffey to the waterfalls of Pollaphuca. The climate near the sea is remarkably mild, and permits the myrtle and arbutus to grow.

Geology. — Wicklow, as regards its geology, is mainly an extension of county Wexford, the Leinster chain bounding it on the west, and Silurian foothills sloping thence down to the sea. Thehighland of muscovite- granite, with a marginal zone of mica-schist, produced by contact-action on the Silurian shales, runs from Shillelagh to the sea mirth of Bray, its highest point being Lugnaquilla. The rounded heather-clad moors give way to more broken country on either side, where the streams cut deeply into the Silurian region. The water- supply of Dublin is obtained from an artificial lake on the first plateau of the foothills at Roundwood. From Wicklow town to near Bray, red and greenish slates and yellow-brown quartzites, probably Cambrian, form a hilly country, in which rise Carrick Mt., the Great Sugarloaf and Bray Head. Oldkamia occurs in this series. Volcanic and intrusive felsites and diorites abound in the Silurian beds of the south, running along the strike of the strata. A considerable amount of gold has been extracted from the valley-gravels north of Croghan Kinshela on the Wexford border. Tinstone has also been found in small quantities. Lead-ore is raised west of Laragh, and the mines in the Avoca valley have been worked for copper, lead and sulphur, the last-named being obtained from pyrite. Paving-setts are made from the diorite at Arklow, and granite is extensively quarried at Ballyknockan on the west side of the mountain-chain.

Industries. — The land in the lower grounds is fertile; and although the greater part of the higher districts is covered with heath and turf, it affords good pasturage for sheep. There is a considerable extent of natural timber as well as artificial plantations. The acreage under pasture is nearly three times that of tillage, and„whereas the principal crops of oats and potatoes decrease considerably, the numbers of sheep, cattle, pigs and poultry are well maintained. Except in the Avoca district, where the mining industry is

of some importance, the occupations are chiefly agricultural. The port of Wicklow is the headquarters of a sea-fishery district.

The Dublin and South-Eastern railway skirts the coast by way of Bray and the town of Wicklow, touching it again at Arklow, with a branch line from Woodenbridge junction to Shillelagh. A branch of the Great Southern & Western line from Sallins skirts the west of the county by Baltinglass.

Population and Administration. — The population (64,492 in 1891, 60,824 in 1001) decreases to a less extent than the average of the Irish counties, and emigration is considerable. Of the

total about 80% are Roman Catholics, and 18% Protestant Episcopalians; about 80% forms the rural population. Bray (pop. 7424), Wicklow (the county town, 3288) and Arklow (4944) are the principal towns, all on the coast; Wicklow is the only considerable port. Wicklow returned to the Irish parliament, until the Union in 1800, two county members and two each for the boroughs of Baltinglass, Bray, Tinahely and Arklow; it is now formed into two parliamentary divisions, an eastern and a western, each returning one member. The county is divided into eight baronies. It is mainly in the Protestant diocese of Dublin and in the Roman Catholic dioceses of Dublin, Kildare and Leighlin and Ferns. Assizes are held at Wicklow, and quarter-sessions at Bray, Baltinglass, Tinahely, Arklow and Wicklow.

History and Antiquities. — Wicklow was not made a county until 1606. It was the last Irish ground shired, for in this mountainous district the Irish were long able to preserve inde- pendence. Wicklow sided with the royal cause during the Cromwellian wars, but on Cromwell's advance submitted to him without striking a blow. During the rebellion of 1798 some of the insurgents took refuge within its mountain fastnesses, and an engagement took place near Aughrim between a band of them under Joseph Holt (1756-1826) and the British troops. A second skirmish was fought at Arklow between the rebels and General Needham, the former being defeated.

Of the ancient cromlechs there are three of some interest, one near Enniskerry, another on the summit of Lugnaquilla and a third, with a druidical circle, at Donaghmore. There are comparatively un- important monastic remains at Rathdrum, Baltinglass and Wicklow. The ruins in the vale of Glendalough, known as the " seven churches," including a perfect round tower, are, perhaps excepting Clonmacnoise, the most remarkable ecclesiastical remains in Ireland. They owe their origin to St Kevin, who lived in the vale as a hermit, and is reputed to have died on the 3rd of June 618. Of the old fortalices or strongholds associated with the early wars, those of special interest are Black Castle, near Wicklow, originally founded by the Norman invaders, but taken by the Irish in 1301, and afterwards rebuilt by William Fitzwilliam ; the scattered remains of Castle Kevin, the ancient stronghold of the O'Tooles, by whom it was probably originally built in the I2th century ; and the ruins of the old castle of the Ormondes at Arklow, founded by Theobald FitzWalter (d. 1285), the scene of frequent conflicts up to the time of Cromwell, by whom it was demolished in 1649, and now containing within the interior of its ruined walls a constabulary barrack. The fine mansion of Powers- court occupies the site of an old fortalice founded by De la Poer, one of the knights who landed with Strongbow; in the reign of Henry VIII. it was taken by the O'Tooles and O'Brynes.

WICKLOW, a seaport, market town, and the county town of county Wicklow, Ireland, picturesquely situated at the mouth cf a lagoon which receives the river Vartiy and other streams, 28! m. S. of Dublin by the Dublin & South-Eastern railway. Pop. (1901) 3288. The harbour, which is governed by commis- sioners and can accommodate vessels of 1 500 tons, has two piers, with quayage. There is a considerable import trade in coal, timber, iron and slate; and some exports of grain and metallic ore, but the latter suffers by competition with the imports to Britain of sulphur ore from Spain. The town has county build- ings, a parish church embodying a good Norman door from a previous structure, some ruins of a Franciscan abbey of the 13th century, and remains of Black Castle, on a commanding situation above the sea, founded in Norman times and rebuilt by. William Fitzwilliam after capture by the Irish in 1301. The name shows the town to have been a settlement of the Norsemen. The cliff scenery to the S. towards Wicklow Head is fine, and the town has some claims as a seaside resort. It is governed by an urban district council.

WICKRAM, JORG, or Gr.ORG (d. c. 1560), German poet and novelist, was a native of Colmar in Alsace; the date of his birth is unknown. He passed the latter part of his life as town clerk of Burgheim on the Rhine, and died before 1562. Wickram was a many-sided writer. He founded a Meistersinger school in Colmar in 1540, and has left a number of

Meistersingerlieder. He edited Albrecht von Halberstadt's Middle High German version of Ovid's Metamorphoses (1545), and in 1555 he published Das Rollwagenbuchlein, one of the best of the many German collections of tales and anecdotes which appeared in the i6tb century. The title of the book implies its object, namely, to

supply reading for the traveller in the " Rollwagen " or diligences. As a dramatist, Wickram wrote Fastnachtsspiele (Das Narren- giessen, 1537; Der treue Eckart, 1538J and two dramas on biblical subjects, Der verlorene Sohn (1540) and Tobias (1551). A moralizing poem, Der irrereilende Pilger (1556), is half-satiric, half-didactic. It is, however, as a novelist that Wickram has left the deepest mark on his time, his chief romances being Ritter Galmy aus Schottland (1539), Gabriotto und Reinhard (1554), Der Knabenspiegel (1554), Von guten und bosen Nachbarn (1556) and Der Goldjaden (1557). These may be regarded as the earliest attempts in German literature to create that modern type of middle-class fiction which ultimately took the place of the decadent medieval romance of chivalry.

Wickram's works have been edited by J. Bolte and W. Scheel for the Stuttgart Litsrarischer Verein (vols., 222, 223, 229, 230, 1900- 1903); Der Ritter Galmy was republished by F. de la Molte Fouque in 1806; Der Goldfaden by K. Brentano in 1809; the Rollwagen- buchlein was edited by H. Kurz in 1865, and there is also a reprint of it in Reclam's Universalbibliothek. See A. Stober, J. Wickram (1866); \V. Scherer, Die Anfange des deutschen Prosaromans (1877).

WIDDRINGTON, BARONS. In November 1643 Sir William Widdrington (1610-1651), of Widdrington, Northumberland, son and heir of Sir Henry Widdrington (d. 1623), was created Baron Widdrington, as a reward for his loyalty to Charles I. He had been member for Northumberland in both the Short and the Long Parliaments in 1640, but in August 1642 he was expelled because he had joined the royal standard. He fought for the king chiefly in Yorkshire and Lincolnshire during 1642 and 1643; he was governor of Lincoln in 1643, but in 1644, after helping to defend York, he left England. Although in 1648 he had been condemned to death by the House of Commons, he accompanied Charles II. to Scotland in 1650, and he was mortally wounded whilst fighting for him at Wigan, dying on the 3rd of September 1651. His great-grandson, William, the 4th baron (1678-1743), took part in the Jacobite rising of 1715, and with two of his

brothers was taken prisoner after the fight at Preston. He was convicted of high treason, and his title and estates were forfeited, but he was not put to death, and he survived until the 19th of April 1743. When his son, Henry Francis Widdrington, who claimed the barony, died in September 1774, the family appears to have become extinct.

Other eminent members of this family were Sir Thomas Widdring- ton and hisbrother Ralph. Havingmarried adaughterof Ferdinando Fairfax, afterwards 2nd Lord Fairfax, Thomas Widdrington was knighted at York in 1639, and in 1640 he became member of parlia- ment for Berwick. He was already a barrister, and his legal know- ledge was very useful during the Civil War. In 1651 he was chosen a member of the council of state, although he had declined to have any share in the trial of the king. Widdrington was elected Speaker in September 1656, and in June 1658 he was appointed chief baron of the exchequer. In 1659 and again in 1660 he was a member of the council of state, and on three occasions he was one of the com- missioners of the great seal, but he lost some of his offices when Charles II. was restored. However, he remained in parliament until his death on the 13th of May 1664. lie left four daughters, but no sons. Widdrington, who founded a school at Stamfordham, Northumberland, wrote Analecta Eboracensia; some Remaynes of the city of York. This was not published until 1877, when it was edited with introduction and notes by the Rev. Caesar Caine. His younger brother, Ralph Widdrington (d. i6SS), was educated at Christ's College, Cambridge, where he made the acquaintance of Milton. In 1654 he was appointed regius professor of Greek at Cambridge/and in 1673 Lady Margaret professor of divinity.

The name of Roger Widdrington was taken by Thomas Preston (1563-1640), a Benedictine monk, who wrote several books of a controversial nature, and passed much of his time in prison, being still a captive when he died on the 3rd of April 1640. (See Rev. E. Taunton, The English Black Monks of St Benedict, 1897.)

*In 1840 the writer, Samuel Edward Cook, took the name of Widdrington, his mother being the heiress of some of the estates of this family. Having served in the British navy he lived for some years in Spain, writing Sketches in Spain during the years 1829- [832 (London, 1834) * a "d Spain and the Spaniards in 1843 (London, 1844). He died at his residence, Newton Hall, Northumberland, on the nth of January 1856 and was succeeded in the ownership of his estates by his nephew, Shalcross Fitzherbert Jacson, who took the name Widdrington. See Rev. John Hodgson, History of Northumber- land (1820-1840).*

WIDNES, a municipal borough in the Widnes parliamentary division of Lancashire, England, on the Mersey, 12 m. E.S.E.

from Liverpool, served by the London & North- Western and Lancashire & Yorkshire railways and the Cheshire lines. Pop. (1901) 28,580. It is wholly of modern growth, for in 1851 the population was under 2000. There are capacious docks on the river, which is crossed by a wrought-iren bridge, 1000 ft. long, and 95 in height, completed in 1868, and having two lines of railway and a footpath. Widnes is one of the principal seats of the alkali and soap manufacture, and has also grease-works for locomotives and waggons, copper works, iron-foundries, oil and paint works and sail-cloth manufactories. The barony of Widnes in 1554-1555 was declared to be part of the duchy of Lancaster. The town was incorporated in 1892, and the corpora- tion consists of a mayor, 6 aldermen and 18 councillors. Area, 3 1 10 acres.

WIDOR, CHARLES MARIE (1845-), French composer and organist, was born at Lyons on the 22nd of February 1845. He studied first at Lyons, then at Brussels under Lemmens for the organ and Fetis for composition. In 1870 he became organist of the church of Saint Sulpicc in Paris. He succeeded Cesar Franck as professor of the organ at the Paris Conservatoire, where he was also appointed professor of composition, counterpoint and fugue in 1896. A very prolific composer, he displayed his creative ability in a variety of different styles. His works include an opera, Maitre Ambros (Opera Comique, 1896), La Korrigane (ballet, given at the Opera, 1880), incidental music to Conle d'avril (1885), Les Jacobites (1885) and Jeanne d? Arc (a panto- mime play, 1890), three symphonies, The Walpurgis Night and other works for orchestra, a quintet for strings and piano, trio for piano and strings, a mass, psalms and other sacred composi- tions, symphonies for organ, a large number of piano pieces and many songs.

WIDUKIND, Saxon historian, was the author of Res gestae Saxonicae. Nothing is known of his life except that he was a monk at the Benedictine abbey of Corvey, and that he died about 1004, although various other conjectures have been formed by students of his work. He is also supposed to have written lives of St Paul and St Thecla, but no traces of these now remain. It is uncertain whether he was a resident at the court of the emperor Otto the Great or not, and also whether he was on intimate terms with Otto's illegitimate son William, archbishop of Mainz. His Res gestae Saxonicae, dedicated to Matilda, abbess of Quedlinburg, who was a daughter of Otto the Great, is divided into three books, and the greater part of it was undoubtedly written during the lifetime of the emperor, probably about 968. Starting with certain surmises upon the origin of the Saxons, he deals with the war between Thcudcrich L, king of Austrasia, and the Thuringians, in which the Saxons played an important part. An allusion to the conversion of the race to Christianity under Charlemagne brings him to the early Saxon dukes and the reign of Henry the Fowler, whose campaigns

are referred to in some detail. The second book opens with the election of Otto the Great as German king, treats of the risings against his authority, and concludes with the death of his wife Edith in 946. In the third book the historian deals with Otto's expedition into France, his troubles with his son Ludolf and his son-in-law, Conrad the Red, duke of Lorraine, and the various wars in Germany; but makes only casual reference to Otto's visits to Italy in g$i and 962. He gives a vivid account of the defeat of the Hungarians on the Lechfeld in August 955, and ends with the death of Otto in 973 and eulogy on his life.

Widukind formed his style upon that of Sallust; he was familiar with the De vitis Caesarum of Suetonius, the Vita Karoli magni of Einhard, and probably with Livy and Bede. Many quotations from, the Vulgate are found in his writings, and there are traces of a knowledge of Virgil, Ovid and other Roman poets. His sentences are occasionally abrupt and lacking in clearness, his Latin words are sometimes germanized (as when he writes michi for tnihi) and grammatical errors are not always absent. The earlier part of his work is taken from tradition, but he wrote the contemporary part as one familiar with court life and the events of the day. He says very little about affairs outside Germany, and although laudatory of

monastic life gives due prominence to secular affairs. He writes as a Saxon, proud of the history of his race and an admirer of Henry the Fowler and Otto the Great.

Three manuscripts exist of the Res gestae, one of which is in the British Museum, and the book was first published at Basel in 1532. The best edition is that edited by G. Waitz in the Monumenta Germaniae historica. Scriptores, Bant) iii. (Hanover and Berlin, 1826). A good edition published at Hanover and Leipzig in 1904 contains an introduction by K. A. Kehr.

See R. Kopke, Widukind von Corvey (Berlin, 1867); J. Raase, Widukind von Korvei (Rostock, 1880); and B. Simson, " Zur Kritik des Widukind " in the Neites Archiv der Gesellschafl fur altere deutsche Geschichte, Band xii. (Hanover, 1876). (A. W. II.)*

WIDUKIND, or Wittekind (d. c. 807), leader of the Saxons during the earlier part of their resistance to Charlemagne, belonged to a noble Westphalian family, and is first mentioned in 777 when his absence from an assembly of the Saxons held by the Frankish king of Paderborn was a matter for remark. It is inferred with considerable probability that he had

taken a leading part in the attacks on two Frankish garrisons in 776, and possibly had shared in earlier fights against the Franks, and so feared to meet the king. In 778 he returned from exile in Denmark to lead a fresh rising, and in 782 the Saxons at his instigation drove out the Frankish priests, and plundered the border territories. It; is uncertain whether Widukind shared in the Saxon victory at the Siintel mountains, or what part he took in the risings of 783 and 784. In 785 Charlemagne, leading an expedition towards the mouth of the Elbe, learned that Widukind was in the land of the Nordalbingians, on the right bank of the river. Negotiations were begun, and the Saxon chief, assured of his personal safety, appeared at the Frankish court at Attigny. There he was baptized, the king acting as his sponsor and loading him with gifts. The details of his later life are unknown. He probably returned to Saxony and occupied there an influential position, as in 922 the inheritance of the " old count or duke Widukind " is referred to. Many legends have gathered around his memory, and he was long regarded as a national hero by the Saxons. He is reported to have been duke of Engria, to have been a devoted Christian and a builder of churches, and to have fallen in battle in 807. Kingly and princely houses have sought to establish their descent from him, but except in the case of Matilda, wife of the German king, Henry I. the Fowler, without any success.

See W. Diekamp, Widukind der Sachsenfilhrer nock Geschichte ttnd Sage (Miinster, 1877); J. Dettmer, Der Sachsenfilhrer Widukind nach Geschichte und Sage (Wurzburg, 1879).

WIEDEMANN, GUSTAV HEINRICH (1S26-1809), German physicist, was born at Berlin on the 2nd of October 1826. After attending the Cologne gymnasium, he entered the university of Berlin in 1844, and took his doctor's degree there three years later. His thesis on that occasion was devoted to a question in organic chemistry, for he held the opinion that the study of chemistry is an indispensable preliminary to the pursuit of physics, which was his ultimate aim. In Berlin he made the acquaintance of H. von Helmholtz at the house of H. G. Magnus, and was one of the founders of the Berlin Physical Society.. In 1854 he left Berlin to become professor of physics in Basel University, removing nine years afterwards to Brunswick Polytechnic, and in 1&66 to Karlsruhe Polytechnic. In 1871 he accepted the chair of physical chemistry at Leipzig. The attention he had paid to chemistry in the earlier part of his career enabled him to hold his own in this position, but he found his work more congenial when in 1887 he was transferred to the professorship of physics. He died at Leipzig on the 24th of March 1800. His name is probably most widely known for his literary work. In 1877 he undertook Lhe editorship of the Annalen der Pkysik und Chemie in succession to J. C. Poggen- dorff, thus starting the series of that scientific periodical which is familiarly cited as Wied. Ann. Another

monumental work for which he was responsible was Die Lehre von der Elektricitat, or, as it was called in the first instance, Lehre von Galvanismus und JLlektromagnetismus , a book that is unsurpassed for accuracy and comprehensiveness. He produced the first edition in 1861, and a fourth, revised and enlarged, was only completed a

short time before his death. But his original work was also important. His data for the thermal conductivity of various metals were for long the most trustworthy at the disposal of physicists, and his determination of the ohm in terms of the specific resistance of mercury showed remarkable skill in quanti- tative research. He carried out a number of magnetic investiga- tions which resulted in the discovery of many interesting pheno- mena, some of which have been . rediscovered by others; they related among other things to the effect of mechanical strain on the magnetic properties of the magnetic metals, to the relation between the chemical composition of compound bodies and their magnetic properties, and to a curious parallelism between the laws of torsion and of magnetism. He also investigated electrical endosmosis and the electrical resistance of electrolytes. His eldest son, Eilhard Ernst Gustav, born at Berlin on the 1st of August 1852, became professor of physics at Erlangen in 1886, and his younger son, Alfred, born at Berlin on the 18th of July 1856, was appointed to the extraordinary professorship of Egyptology at Bonn in 1892.

WIELAND, CHRISTOPH MARTIN (1 733-1813), German poet and man of letters, was born at Oberhoizheim, a village near Biberach in Wurttemberg, on the 5th of September 1733. His father, who was pastor in Oberhoizheim, and subsequently in Biberach, took great pains with the child's education, and from the town school of Biberach he passed on, before he had reached his fourteenth year, to the gymnasium at Klosterberge, near Magdeburg. He was a precocious child, and when he left school in 1749 was widely read in the Latin classics and the leading contemporary French writers; amongst German poets his favourites were Brockes and Klopstock. While at home in the summer of 1750, he fell in love with a kinswoman, Sophie Guter- mann, and this love affair seems to have acted as an incentive to poetic composition; under this inspiration he planned his first ambitious work, Die Natur der Dinge (1752), a didactic poem in six books. In 1750 he went to the university of Tubingen as a student of law, but his time was mainly taken up with literary studies. The poems he wrote at the university — Hermann, an epic (published by F. Muncker, 1886), Zwolf moraliache Briefe in Versen (1752), Anti-Ovid (1752) — are pietistic in tone and dominated by the influence of Klopstock. They attracted the attention of the Swiss literary reformer, J. J. Bodmer, who invited Wicland to visit him in Zurich in the summer of 1752. After a few months, however, Bodmer felt himself as little in

sympathy with Wieland as, two years earlier, he had felt himself with Klopstock, and the friends parted; but Wieland remained in Switzerland until 1760, residing, in the last year, at Bern where he obtained a position as private tutor. Here he stood in intimate relations with Rousseau's friend Julie de Bondeli. Meanwhile a change had come over Wieland's tastes; the writings of his early Swiss years — Der gepriifte Abraham (1753), Sympathien (1756), Empfindungen eines Christen (1757) — were still in the manner of his earlier writings, but with the tragedies. Lady Johanna Gray (1758), and Clementina von Porreiia (1760)— the latter based on Richardson's Sir Charles Grandison — the epic fragment Cyrus (1759), and the "moral story in dialogues," Araspes und Panthea (1760), Wicland, as Lessing said, " forsook the ethereal spheres to wander again among the sbns of men."

Wieland's conversion was completed at Biberach, whither he had returned in 1760, as director of the chancery. The dullness and monotony of his life here was relieved by the friendship of a Count Stadion, whose library in the castle of Warthausen, not far from Biberach, was well stocked with French and English literature. Here, too, Wieland met again his early love Sophie Gutermann, who had meanwhile become the wife of Hofrat La Roche, then manager of Count Stadion's estates. The former poet of an austere pietism now became the advocate of a light-hearted philosophy, from which frivolity and sensuality were not ex- cluded. In Don Sylvip von Rosalva (1764), a romance in imita- tion of Don Quixote, he held up to ridicule his earlier faith and in the Komische Erzdhlungen (1765) he gave his extravagant imagination only too free a rein. More important is the novel Geschichte des Agatkon (1766-1767), in which, under the guise of

a Greek fiction, Wieland described his own spiritual and intel- lectual growth. This work, which Leasing recommended as " a novel of classic taste," marks an epoch in the development of the modern psychological novel. Of equal importance was Wieland's translation of twenty-two of Shakespeare's plays into prose (8 vols., 1762-1766) ; it was the first attempt to present the English poet to the German people in something approaching entirety. With the poems Musarion oder die Philosophic der Grazien (1768), Idris (1768), Combabus (1770), Der neue Amadis (1771), Wieland opened the series of light and graceful romances in verse which appealed so irresistibly to his contemporaries and acted as an antidote to the sentimental excesses of the subsequent Sturm und Drang movement. Wieland married in 1765, and between 1760 and 1772 was professor of philosophy at Erfurt. In the last-mentioned year he published

Der goldene Spiegel oder die Konige ton Scheschian, a pedagogic work in the form of oriental stories; this attracted the attention of duchess Anna Amalie of Saxc-Weimar and resulted in his appointment as tutor to her two sons, Karl August and Konstantin, at Weimar. With the exception of some years spent at Ossmannstedt, where in later life he bought an estate, Weimar remained Wieland's home until his death on the 20th of January 1813. Here, in 1773, he founded Der teulsche Merkur, which under his editorship (1773-1780) became the most influential literary review in Germany. Of the writings of his later years the most important are the admirable satire on German provinciality — the most attractive of all his prose writings — Die Abderiten, eine sehr wahrscheinliche Gesr.hit.hle (1774), and the charming poetic romances, Das Winlermdrchen (1776), Das Sommer-marchen (1777), Geron der Adelige (1777), Die Wiinsche oder Pervonte (1778), a series culminating with Wieland's poetic masterpiece, the romantic epic of Oberon (1780). Although belonging to a class of poetry in which modern readers take but little interest, Oberon has still, owing to the facile beauty of its stanzas, the power to charm. In Wieland's later novels, such as the Geheime Geschichte des Philosophen Peregrinus Proteus (1791) and Aristipp und einige seiner Zeitgcnossen (1800-1802), a didactic and philosophic tendency obscures the small literary interest they possess. He also translated Horace's Satires (1786), Lucian's Works (1788- 1789), Cicero's Letters (1808 ff.), and from 1796 to 1803 he edited the Attisches Museum which did valuable service in popularizing Greek studies.

Without creating a school in the strict sense of the term, Wieland influenced very considerably the German literature of his time. The verse-romance and the novel — more especially in Austria — benefited by his example, and even the Romanticists of a later date borrowed many a hint from him in their excursions into the literatures of the south of Europe. The qualities which distinguish his work, his fluent style and light touch, his careless frivolity rather than poetic depth, show him to have been in literary temperament more akin to Ariosto and Voltaire than to the more spiritual and serious leaders of German poetry; but these very qualities in Wieland's poetry introduced a balancing element into German classical literature and added materially to its fullness and completeness.

Editions of Wieland's Sdmtliche Werke appeared in (1794-1802, 45 vols.), (1818-1828, 53 vols.), (1839-1840, 36 vols.), and (1853-1858, 36 vols.). The latest edition (40 vols.) was edited by H. Duntzer (1879-1882); a new critical edition is at present in preparation by the Prussian Academy. There are numerous editions of selected works, notably by H Prohle in Kurschner's Deutsche National- literatur (vols. 51-56, 1883-1887); by F. Muncker (6 vols., 1889); by W. Bolsche (4 vols., 1902). Collections of Wieland's letters were edited by his son Ludwig (1815) and by H. Gessner

(1815-1816); his Letters to Sophie Larocne by F. Horn (1820). See J. G. Gruber, C. M. Wielands Leben (4 vols., 1827-1828); H. Poring, C. M. Wieland (1853); J. W. Loebell, C. M. Wieland (1858); H. Prohle, Lessing, Wieland, Heinse (1876); L. F. Ofterdinger, Wielands Leben und Wirken in Schwaben und in der Schweiz (1877) ; R. Keil, Wieland und Reinhold (1885); F. Thalmeyr, tJber Wielands Klassizitat, Sprache und Stil (1894); M. Dfill, Wieland und die Antike (1896); C. A. Behmer, Sterne und Wieland (1899); W. Lenz, Wielands Verhultnis zu Spenser, Pope und Swift (1903); L. Hirzel, Wielands BsziehungenzudendiutschenRcimantikern (1904). See also M.Koch's article in the Allgemeine deutscke Biographic (1897). 0- G. R.)

WIELICZKA, a mining town in Galicia, Austria, 220 m. by rail W. of Lemberg and 9 m. S.E. of Cracow. Pop. (1900) 6012. It is built on the slopes of a hill which half encircles the place, and over the celebrated salt-mines of the same name. These mines arc the richest in Austria, and among the most remarkable in the world. They consist of seven different levels, one above the other, and have eleven shafts, two of which are in the town. The levels are connected by flights of steps, and are composed of a labyrinth of chambers and passages, whose length aggregates over 65 m. The length of the mines from E. to W. is 2ˆ m., the breadth from N. to S. is 1050 yds. and the depth reaches 980 ft. Many of the old chambers, some of which are of enormous size, are embellished with portals, candelabra, statues, &c, all hewn in rock-salt. There are also two large chapels, containing altars, ornaments, &c, in rock-salt, a room called the dancing saloon (Tamsaal), where the objects of interest found in the mines are kept; the Kronleuchtersaal, and the chamber Michatovice are also worth mention. In the interior of the mines are sixteen ponds, of which the large lake of Przykos is 195 ft. long, no ft. broad, and 10-26 ft. deep. The mines employ over 1000 workers, and yield about 60,000 tons annually. The salt of Wieliczka is well known for its purity and solidity, but has generally a grey or blackish colour. The date of the discovery of the mines is unknown, but they were already worked in the nth century. Since 1814 they have belonged entirely to the Austrian government. The mines suffered greatly from inundations in 1868 and 1879, and the soil on which the town is built shows signs of subsidence.

See E. Windakiewicz, Das Steinsalzbergwerk in Wieliczka (Freiberg,

1896).

WIELOPOLSKI, ALEKSANDER, Marquis of Gonzaga-Mysz- kowski (1803-1877), Polish statesman, was educated in Vienna, Warsaw, Paris and Gbttingen. In 1830 he was elected a member of the Polish diet on the Conservative side. At the beginning of the Insurrection of 1831 he was sent

to London to obtain the assistance, or at least the mediation, of England; but the only result of his mission was the publication of the pamphlet Mfmoire presente a Lord Palmerston (Warsaw, 1831). On the collapse of the insurrection he emigrated, and on his return to Poland devoted himself exclusively to literature and the cultiva- tion of his estates. On the occasion of the Galician outbreak of 1845, when the Ruthenian peasantry massacred some hundreds of Polish landowners, an outbreak generally attributed to the machinations of the Austrian government, Wielopolski wrote his famous Lellre aVun genlilhomme polonais au prince de Metter- nich (Brussels, 1846), which caused a great sensation at the time, and in which he attempted to prove that the Austrian court was acting in collusion with the Russian in the affair. In 1861, when Alexander II. was benevolently disposed towards the Poles and made certain political and national concessions to them, Wielo- polski was appointed president of the commissions of public worship and justice and subsequently, president of the council of state. A visit to the Russian capital in November still further established his influence, and in 1862 he was appointed adjutant to the grand-duke Constantine. This office he held till the 12th of September 1863, when finding it impossible to resist the rising current of radicalism and revolution he resigned all his offices, and obtained at his own request unlimited leave of absence. He retired to Dresden, where he died on the 30th of December 1877.

See Henryk Lisicki, Le Marquis Wielopolski, sa vie et son temps (Vienna, 1880); Wlodzimieriz Spasowicz, The Life and Policy of the Marquis Wielopolski (Rus.) (St Petersburg, 1882). (R. N. B.)

WIENER-NEUSTADT, a town of Austria, in Lower Austria, 31 m. S. of Vienna by rail. Pop. (1900) 28,438. It is situated between the Fischa and the Leitha and is close to the Hungarian frontier. It was almost entirely rebuilt after a destructive fire in 1834, and ranks among the handsomest provincial towns in Austria. Its ancient gates, walls and towers have disappeared, but it still possesses a few medieval edifices, the most important of which is the old castle of the dukes of Babenberg, founded in the r2th century, and converted by Maria Theresa in 1752 into a military academy. The Gothic chapel contains the remains

of the emperor Maximilian I., who was born here in 1459. The parish church, with its two lofty towers, is substantially a Roman- esque building of the 13th century, but the choir and transepts are Gothic additions of a later date. The late Gothic church of the old Cistercian abbey contains a

handsome monument in memory of Leonora of Portugal (d. 1467), consort of the emperor Frederick III., and possesses a rich library and an interesting museum. The town-house is also a noteworthy building and contains large and important archives. The chief industrial establishments are a large ammunition factory and an engine factory; but manufactures of cotton, silk, velvet, pottery and paper, sugar-refining and tanning are also extensively carried on. Trade is also brisk, and is facilitated by a canal connecting the town with Vienna, and used chiefly for the transport of coal and timber.

Neustadt was founded in 1192, and was a favourite residence of numerous Austrian sovereigns, acquiring the title of the " ever- faithful town " {die alltzcit getreue Siadt) from its unfailing loyalty. In 1246 it was the scene of a victory of the Hungarians over the Austrians; and in i486 it was taken by Matthias Corvinus, king of Hungary, who, however, restored it to Maximilian I. four years later. In 1529 and 168,3 it was besieged by the Turks. It was at Neustadt that the emperor Rudolf II. granted to the Bohemian Protestants, in 1609, the " Majestats- brief," or patent of equal rights, the revocation of which helped to precipitate the Thirty Years 1 War.

See Hinner, Wandelbilder aus der Geschichte Wiener- Neustadts (Wiener-Neustadt, 1892).

WIENIAWSKI, HENRI (1835-1880), Polish violinist and composer, was born at Lublin, in Poland, on the 10th of July 1835. He was a pupil of the Paris Conservatoire from 1843 to 1846, and again in 1849-1850. Meanwhile he had given concerts in his native country and in Russia, and in 1850 entered upon the career of a travelling virtuoso, together with his brother Joseph, a distinguished pianist. He was appointed solo violinist to the tsar in i860, and taught in the Conservatoire of St Peters- burg from 1862 to 1867. He went on tour again in 1872 with Rubinstein in America, and on his return in 1874 was appointed to succeed Vieuxtemps as professor in the Brussels Conservatoire; but, like his predecessor, he was compelled through ill-health to give up the post after three years, returning to a public career in spite of his illness, until his death, which occurred in a hospital in Moscow, on the 31st of March 1880. He was a wonderfully sympathetic solo player, and a good if not a great quartet player. His Legende, the fantasias on Faust and on Russian airs, his two concertos and some other pieces, have retained their high place in the violin repertory.

WIEPRECHT, WILHELM FRIEDRICH (1802-1872), German musical conductor, composer and inventor, was born on the 10th of August 1802, at Aschersleben, where his father was town musician. According to his autobiography, Wieprecht early learned from his father to play on nearly all wind instruments. It was in violin -playing, however, that his father

particularly wished him to excel; and in 1819 he went to Dresden, where he studied composition and the violin to such good purpose that a year later he was given a position in the city orchestra of Leipzig, playing also in those of the opera and the famous Gewandhaus. At this time, besides playing the violin and clarinet in the orchestra, he also gave solo performances on the trombone. In 1824 he went to Berlin, where he became a member of the royal orchestra, and was in the same year appointed chamber musician to the king. His residence at Berlin gave Wieprecht ample opportunity for the exercise of his genius for military music, on which his fame mainly rests. Several of his marches were early adopted by the regimental bands, and a more ambitious military composition attracted the attention of Gasparo Spontini, at whose house he became an intimate guest. It was now that he began to study acoustics, in order to correct the deficiencies in military musical instruments. As the result, he improved the valves of the brass instruments, and succeeded, by constructing them on sounder acoustic principles, in greatly increasing the volume and purity of their tone. He also invented

the bass tuba or bombardon in order to give greater richness and power to the bass parts. In recognition of these inventions he was, in 1835, honoured by the Royal Academy of. Berlin. In 1838 he was appointed by the Prussian government director- general of all the guards' bands, and in recognition of the magnifi- cent performance by massed bands on the occasion of the emperor Nicholas I.'s visit the same year, was awarded a special uniform. In 1843 he became director-general of the bands of the 10th Confederate army corps, and from this time exercised a profound influence on the development of military music through- out Germany, and beyond. He was the first to arrange the symphonies and overtures of the classical masters for military instruments, and to organize those outdoor performances of concert pieces by military bands which have done so much to popularize good music in Germany and elsewhere. The perform- ance arranged by him of Beethoven's " Battle of Vittoria," in which the bugle calls were given by trumpeters stationed in various parts of the garden and the cannon shots WGre those of real guns f created immense sensation. Besides the great work he accomplished in Germany, Wieprecht, in 1847, reorganized the military music in Turkey and, in 1852, in Guatemala. He composed military songs as well as numerous marches, and con- tributed frequently on his favourite subject to the Berlin musical papers. He died on the 4th of August 1S72. Wieprecht was a man of genial, kindly and generous nature, and was associated with many charitable foundations established for the benefit of poor musicians.

WIESBADEN, a town and watering-place of Germany, in the Prussian province of Hesse-Nassau. Pop. (1905) 100,953. It is delightfully situated in a basin under the well-wooded south- western spurs of the Taunus range,

5 m. N. of Mainz, 3 m. from the right bank of the Rhine (at Biebrich), and 25 m. W. of Frankfort-on-Main by rail. The town is on the whole sumptuously built, with broad and regular streets. Villas and gardens engirdle it on the north and east sides and extend up the hills behind. Its prosperity is mainly due to its hot springs and mild climate, which have rendered it a favourite winter as well as summer resort. The general character of the place, with its numerous hotels, pensions, bathing establishments, villas and places of entertainment, is largely determined by the require- ments of visitors, who in 1907 numbered 180,000. The principal buildings are the royal palace, built in 1837-1840 as a residence for the dukes of Nassau, and now a residence of the king of Prussia; the Court Theatre (erected 1892-1894); the new Kurhaus, a large and handsome establishment, with colonnades, adjoining a beautiful and shady park; the town-hall., in the German Renaissance style (1884-1888); the government offices and the museum, with a picture gallery, a collection of antiquities, and a library of 150,000 vols. Among the churches, which are all modern, are the Protestant Marktkircke, in the Gothic style with five towers, built 1853-1862; the Ber&kirche; the Roman Catholic church of St Boniface; the Anglican church and the Russian church on the Ncroberg. There are two synagogues. Wiesbaden contains numerous scientific and educational institu- tions, including a chemical laboratory, an agricultural college and two musical conservatoria.

The alkaline thermal springs contain § % of common salt, and smaller quantities of other chlorides; and a great deal of their efficacy is due to their high temperature, which varies from 156 to 104 Fahr. The water is generally cooled to 93 F. for bathing. The principal spring is the Kochbrunnen (156 F.), the water of which is drunk by sufferers from chronic dyspepsia and obesity. There are twenty-eight other springs of nearly identical composi- tion, many of which are used for bathing, and are efficacious in cases of rheumatism, gout, nervous and female disorders and skin diseases. The season lasts from April to October, but the springs are open the whole year through and are also largely attended in winter.

Two miles north-west of the town lies the Neroberg (800 ft.), whence a fine view of the surrounding country is obtained, and which is reached by a funicular railway from Beausite, and 6 m. to the west lies the Hohe Wurz#I (2025 ft.) with an ouLlook tower.

Wiesbaden Is one of the oldest watering-places in Germany, and may be regarded as the capital of the Taunus spas. The springs mentioned by Pliny

{Hist. nal. xxi. 2) as Fontes Malthiaci were known to the Romans, who fortified the place c. 1 1 B.C. The massive wall in the centre of the town known as the Heiden- tnaucr was probably part of the fortifications built under Dio- cletian. The name Wisibada (" meadow bath ") appears in 830. Under the Carolingian monarchs it was the site of a palace, and Otto I. gave it civic rights. In the nth century the town and district passed to the counts of Nassau, fell to the Walram line in 1255, and in 1355 Wiesbaden became with Idstein capital of the county Nassau-Idstein. It suffered much from the ravages of the Thirty Years' War and was destroyed in 1644. In 1744 it became the seat of government of the principality Nassau- Uskigen, and was from 181 5 to 1866 the capital of the duchy of Nassau, when it passed with that duchy to Prussia. Though the springs were never quite forgotten, they did not attain their greatest repute until the close of the iSth century. From 1771 to 1873 Wiesbaden was a notorious gambling resort; but in the latter year public gambling was suppressed by the Prussian government.

See Roth, Gesckichte und kislorische Topographic der Stadt Wies- baden (Wiesbaden, 1883); Pagenstecher, Wiesbaden in tnedizinisch-topographischer Beziekung (Wiesbaden, 1870) ; Kranz, Wiesbaden und seine Thermen (Leipzig, 1884); Pfeifier, Wiesbaden als Kurort (5r.h ed., Wiesbaden, 1899); and Heyl, Wiesbaden und seine Umge- bungen (27th ed., Wiesbaden, 1908).

WIG (short for " periwig," an alternative form of "peruke," Fr. perruquc; cf. Span, peluca; conjccturally derived from Lat. pilus), an artificial head of hair, worn as a personal adorn- ment, disguise or symbol of office. The custom of wearing wigs is of great antiquity. If, as seems probable, the curious head- covering of a prehistoric ivory carving of a female head found by M. Piette in the cave of Brassempouy in the Landes represents a wig (sec Ray Lankester, Science from an Easy Chair, fig. 7) the fashion is certainly some 100,00c years old. In historic times, wigs were worn among the Egyptians as a royal and official head-dress, and specimens of these have been recovered from mummies. In Greece they were used by both men and women, the most common name being irrjviKr} or

At Rome wigs came into use certainly in the early days of the empire. They were also known to the Carthaginians; Polybius (iii. 78) says that Hannibal used wigs as a means of disguise, Thr fashionable ladies of Rome were much addicted to false hair, and we learn from Ovid, A.mores } i. 14. 45) and Martial (v. 68) that the golden hair imported from Germany was most favoured. Juvenal (vi. 12c) shows us Messalina assuming a yellow wig for her visits to places of ill-fame, and the scholiast on the passage ?ays that the yellow wig was characteristic of courtesans. The chief names for wigs were galerus, gaicricuhi-m, corymbium, (ˆpill-amentum, caliendrum,

or even comae emptae, &c. Galerus meant in the first place a skull-cap, or coif, fastening under the chin, and made of hide or fur, worn by peasants, athletes and Homines. The first men's wigs then would have been tight fur

caps simulating hair, which would naturally suggest wigs ot false hair. Otho wore a wig (Suetonius, Otho § 12), which could not be distinguished from real hair, while Nero (Dio Cass. Ixi. 9) wore a wig as a disguise, and Heliogabalus also wore one at times (ibid, lxxix. 13). Women continued to have wigs of different colours as part of their ordinary wardrobe, and Faustina, wife of Marcus Aurelius, is said to have had several hundred. An amusing development of this is occasionally found in portrait busts, e.g. that of Plautilla in the Louvre, in which the hair is made movable, so that by changing the wig of the statue from time to time it should never be out of fashion.

The Fathers of the Church violently attacked the custom of wearing wigs, Tertullian (De cuttu fern. C. 7) being particularly eloquent against them, but that they did not succeed in stamping out the custom was proved by the finding of an auburn wig in the grave of a Christian woman in the cemetery of St Cyriacus. In 672 a synod of Constantinople forbade the wearing of artificial hair.

Artificial hair has presumably always been worn by women when the fashion required abundant locks. Thus, with the development of elaborate coiffures in the 16th century, the wearing of false hair became prevalent among ladies in Europe: Queen Elizabeth had eighty attires of false hair, and Mary queen of Scots was also in the habit of varying the attires of hair she wore. The periwig of the 16th century, however, merely simu- lated real hair, either as an adornment or to supply the defects of nature. It was not till the 17th century that the peruke was worn as a distinctive feature of costume. The fashion started in France. In 1620 the abbe La Riviere appeared at the court of Louis XIII. in a periwig made to simulate long fair hair, and four years later the king himself, prematurely bald, also adopted one and thus set the fashion. Louis XIV., who was proud of his abundant hair, did not wear a wig till after 1670. Meanwhile, his courtiers had continued to wear wigs in imitation of the royal hair, and from Versailles the fashion spread through Europe. In England it came in with the Restoration; for though the prince of Wales (Charles I.), while in Paris on his way to Spain, had " shadowed himself the most he could under a burly pcrruque, which none in former days but bald-headed people used," he had dropped the fashion on returning to England, and he and his Cavaliers were distinguished from the " Roundheads " only by wearing their own flowing locks. Under Charles II. the wearing of the peruke became general. Pepys records that he parted with his own hair and " paid £3 for a periwigg "; L and on going to church in one he says " it did not prove so

strange as I was afraid it would." It was under Queen Anne, however, that the wig attained its maximum development, covering the back and shoulders and floating down over the chest. So far, indeed, whatever the exaggeration of its proportions, the wig had been a " counterfeit hair " intended to produce the illusion of abundant natural locks. But, to quote the inimitable author of Ploca- cosmos, " as the perukes became more common, their shape and forms altered. Hence we hear of the clerical, the physical, and the huge tie peruke for the man of law, the brigadier or major for the army and navy; as also the tremendous fox ear, or cluster of temple curls, with a pig-tail behind. The merchant, the man of business and of letters, were distinguished by the grave full bottom, or more moderate tie, neatly curled; the tradesman by the long bob, or natty scratch; the country gentleman by the natural fly and hunting peruke. All conditions of men were distinguished by the cut of the wig, and none more so than the coachman, who wore his, as there does some to this day, in imitation of the curled hair of a water-dog." 2

1 This was cheap. The author of Plocacosmos says that " when they first were wore, the price was usually one hundred guineas "; and the article in Diderot's Encyclopedic says that it sometimes cost as much as 1000 ecus.
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2 Plocacosmos, p, 203. The writer goes on to describe the fashions on the stage. " So late as King William's reign, in one of Rowe's pieces, Lady Jane Grey, the Lord Guildford Dudley is dressed in all the modern fashion of laced coat, cravat, high peruke, &c, while the heroine is simply drest, her hair parted in the middle, hanging care- lessly on her shoulders. . . . Nearer our time, in the tragedy of CaUu Mr Booth is dressed a-la-mode, with the huge peruke Mr Quin

This differentiation of wigs according to class and profession explains why, when early in the reign of George III. the general fashion of wearing wigs began to wane and die out, the practice held its own among professional men. It was by slow degrees that doctors, soldiers and clergymen gave up the custom. In the Church it survived longest among the bishops, the wig ultimately becoming a sort of ensign of the episcopal dignity. Wigs were first discarded by the bishops, by permission of the king, at the coronation banquet of William IV., the weather being hot; and Greviile comments on the odd appearance of the pre- lates with their cropped polls. At the coronation of Queen Victoria the archbishop of Canterbury, alone of the prelates, still woie a wig. Wigs are now worn as part of official costume

only in the United Kingdom and its dependencies, their use being confined, except in the case of the speaker of the house of commons and the clerks of parliament, to the lord chancellor, the judges and members of the bar (see Robes). Wigs of course continue to be worn by many to make up for natural deficiencies; and on the stage the wig is, as in all times, an indispensable adjunct. Many of the modern stage wigs are made of jute, a fibre which lends itself to marvellously perfect imitations of human hair.

See F. W. Fairholt, Costume in England, 2 vols., ed. Dillon (1885) ; C. F. Xicolai. Ober den Gebrauch der falschen Haare und Perrilcken (1S01); the articles "Coma' 1 and " Gslerus " in Darernberg and Saglio's Diciionnairedes antiquites. There is an admirable article on wigs and wig-making in Diderot's Hncyclopedie (1765), t. xii., s.v. " Perruque." James Stewart's Flocacosmos, or the Whole Art of Hair dressing (London, 1782) also contains rich material.

WIGAN, a market town, and municipal, county and parlia- mentary borough of Lancashire, England, 194 m. N.W. by N. from London by the London & North- Western railway, served also by the Lancashire & Yorkshire and the Great Central rail- ways. Fop. (1891) 55,013, (1001) 60,764. It lies on the small river Douglas, which flows into the estuary of the Ribble. There is connexion by canal with Liverpool, Manchester, &c. The older portions of the town occupy the north bank of the river, the modern additions being chiefly on the south bank. The church of All Saints, late Perpendicular, consisting of chancel with aisles and two chapels, was restored in 1630 and in modern times. There are numerous modern churches and chapels. The principal public buildings are the Royal Albert Edward Infirmary and Dispensary, the public hall, the borough courts and offices, the arcade, the market hall, the free public library and the county courts and offices (1888). The educational institutions include the free grammar school (founded by James Leigh in 1619 and rebuilt in 1876), the Wigan and District Mining and Technical College (built by public subscription and opened in 1903) and the mechanics' institution, also the convent of Notre Dame (1854), with a college for pupil teachers and a high school for girls, and several Roman Catholic schools. A public park of 27 acres was opened in 1878. The town owes much of its prosperity lo its coal mines, which employ a large proportion of the inhabitants and supply the factory furnaces. The chief manufacture is that of cotton fabrics; the town also possesses iron forges, iron and brass foundries, oil and grease works, railway waggon factories, and bolt, screw and nail works. The parliamentary borough, returning one member since 18S5, is coextensive with the municipal borough, and falls mainly within the Ince division of the county. The county borough was created in 1S88. The corporation consists of a mayor, 10 aldermen and 30 councillors. Area 5082 acres, including the former urban district of Pemberton (pop. 21,664 m 1901), which was

included with Wigan in 1904.

acted almost all his young characters, as Hamlet, Horatio, Pierre, &c. in a full-dress suit and large peruke. But Mr Garrick's genius . . . first attacked the mode of dress, and no part more than that of the head of hair. The consequence of this was, that a capital player's wardrobe " [came to include} " what they call natural heads of hair: there is the comedy head of hair, and the tragedy ditto; the silver locks, and the common gray; the carotty poll, and the yellow caxon ; the savage black, and the Italian brown, and Shylock's and FalstalT's very different heads of hair; ... with the Spanish fly, the foxes tail, &c. &c." He adds that the tendency is to replace those by " the hair, without powder, simply curled."

Roman remains have been found, and it is probable that the town covers the site of a Roman post or fort, Coccium. Wigan, otherwise Wygan and Wigham, is not mentioned in Domesday Book, but. three of the townships, Upholland, Dalton and Orrel are named. After the Conquest Wigan was part of the barony of Newton, and the church was endowed with a carucate of land, the origin of the manor. Some time before Henry III.'s reign the baron of Newton granted to the rector of Wigan the manorial privileges. In 1246 Henry III. granted a charter to the famous John Manscl, parson of the church, by which Wigan was con- stituted a free borough and the burgesses permitted to have a Gild Merchant. In 1249 John Mansel granted by charter to the burgesses that each should have five roods of land to his burgage as freehold on payment of i2d. each. Confirmations and exten- sions of Henry III.'s charter were granted by Edward II. (1314I, Edward III. (1340), Richard II. (1378), Henry IV. (1400), Henry V. (1413), Charles II. (1663), James II. (1685) and William IV. (1832 and 1836). In 1258 Henry III. granted by charter to John Mansel a weekly market on Monday and two fairs, each of three days, beginning on the eve of Ascension Day and on the eve of All Saints' Day, October 28th. Edward II. granted a three days' fair from the eve of St Wilfrid instead of the All Saints' fair, but in 1329 Edward III. by charter altered the fair again to its original date. Charles IL's charter granted, and James IL's confirmed, a three days' fair beginning on the 16th of July. Pottery and bell-founding were formerly import- ant trades here, and the manufacture of woollens, especially of blankets, was carried on in the 18th century. The cotton trade developed rapidly after the introduction of the cylindrical carding machine, which was set up here two years before Peel used it at Bolton. During the Civil War the town, from its vicinity to Lathom Flouse and the influence af Lord Derby, adhered staunchly to the king. On the 1st of April 1643 the Parliamentarians under Sir John Seaton captured Wigan after severe fighting. In the following month Lord Derby regained it for the Royalists, but Colonel Ashton soon retook it and demolished the works. In 1651 Lord Derby landed from the Isle of Man and marched through Preston to Wigan

on the way to join Charles II. At Wigan Lane on the 25th of August a fierce battle took place between the Royalist forces under Lord Derby and Sir Thomas Tyldesley and the Parliamentarians under Colonel Lilburne, in which the Royalists were defeated, Tyldesley was killed and Lord Derby wounded. During the rebellion of 1745 Prince Charles Edward spent one night (December roth) here on his return march. In 1295 Wigan returned two members to parliament and again in 1307; the right then remained in abeyance till 1547, but from that time till 1S85, except during the Commonwealth, the borough returned two members, and since 1885 one member. The church of All Saints is of Saxon, origin, and was existing in Edward the Confessor's time- The list of rectors is complete from 1199.

WIGEON, or Wtdgeon (Fr. Vigeott, from the Lat. Vipio)} also called locally " Whewer " and " Whew " (names imitative of the whistling call-note of the male), the Anas penelope of Linnaeus and Mareca penelope of modern ornithologists, one of the most abundant species of ducks throughout the greater part of Europe and northern Asia, reaching northern Africa and India in winter. A good many pairs breed in the north of Scotland; but the nurseries of the vast numbers which resort in autumn to the waters of temperate Europe are in Lapland or farther to the eastward. Comparatively few breed in Iceland.

Intermediate in size between the teal and the mallard, and less showy in plumage than either, the drake wigeon is a beautiful bird, with the greater part of his bill blue, his forehead cream-colour, his head and neck chestnut, 2 replaced by greyish-pink below and above by lavender-grey, which last, produced by the transverse undulations of fine black and white lines, extends over the back and upper surface of the wings, except some of the coverts, which are

1 So Pigeon (g.v.) from Pipio. Other French names, more or less local, are, according to Holland, Vignon, Vingeon, Wa-gne, Woinge, Wignet, Wuiot, Vioux and Digeon. In some parts of England the small teasing flies, generally called midges, are known as " wigcons."

2 Hence come the additional local names " bald-pate " and " red- head."

conspicuously white, and shows itself again on the flanks. The wings are further ornamented by a glossy green speculum between two black bars; the tail is pointed and dark; the rest of the lower parts is white. The female has the inconspicuous coloration character- istic of her sex among most of the

duck tribe. In habits the wigeon differs not a little from most of the Anatinae. It greatly affects tidal waters during the season of its southern stay, and becomes the object of slaughter to hundreds of gunners on the coasts of Britain and Holland; but, when it resorts to inland localities, as it also does to some extent, it passes much of its time in grazing, especially by day, on the pastures which surround the lakes or moors that it selects.

The wigeon occurs occasionally on the eastern coast of North America, and not uncommonly, it would seem, on the Pribyloff Islands in the Pacific. But the New World has two allied species of its own. One of them, M. americana (a freshly killed example of which was once found in a London market), inhabiting the northern part of that continent, and in winter reaching Central America and the West Indian islands as far as Trinidad, wholly resembles its Old- World congener in habits and much in appearance. But in it the chestnut of the head is replaced by a close speckling of black and buff, the white wing-coverts are wanting, and nearly all the plumage is subdued in tone. The other species, M . sibilatrixy inhabits the southern portion of South America and its islands, from Chile on the west to the Falklands on the east, and is easily recognized by its nearly white head, nape glossy with purple and green, and other differences; while the plumage hardly differs sexually at all. (A. N.)

WIGGIN, KATE DOUGLAS (1857-), American novelist, daughter of Robert N. Smith, a lawyer, was born in Philadelphia, Pennsylvania, on the 28th of September 1857. She was educated at Abbott Academy, Andover, Massachusetts, and removed in 1876 to Los Angeles, California. She taught in Santa Barbara College (1877-1878), established in San Francisco the first free kindergartens for poor children on the western coast (1878), and, with the help of her sister, Miss Nora Archibald Smith, and of Mrs Sarah B. Cooper, organized the California Kindergarten Training School (18S0). She married, in 1880, Samuel Bradley Wiggin of San Francisco, who died in 18S9. In 1805 she married George Christopher Riggs, but continued to write under the name of Wiggin. Her interest in children's education was shown in numerous books, some written in collaboration with her sister, in both prose and verse. But her literary reputation rests rather on her works of prose fiction, which show a real gift for depicting character and an original vein of humour. The best known of these are: The Birds 1 Christmas Carol (1888) ; Penelope's English Experiences (1893); Marm Lisa (tSo6); Penelope's Progress (1808), being Penelope's experiences in Scotland; Penelope's Irish Experiences (1901); The Diary of a Goose-Girl (1002); and Rebecca of Sunnyhrook Farm (1903).

WIGGLESWORTH, MICHAEL (1631-1705), American clergy- man and poet, was born in England, probably in Yorkshire, on the 18th of October 1631. His father, Edward (d. 1653), perse- cuted for his Puritan faith,

emigrated with his family to New England in 1638 and settled in New Haven. Michael studied for a time at a school kept by Ezekiel Cheever, and in 1651 graduated at Harvard, where he was a tutor (and a Fellow) in 1652-1654. Having fitted himself for the ministry, he preached at Charlestown in 1653-1654, and was pastor at Maiden from 1656 until his death, though for twenty years or more bodily infirmities prevented his regular attendance upon his duties — Cotton Mather described him as " a little feeble shadow of a man." During this interval he studied medicine and began a successful practice. He was again a Fellow of Harvard in 1697-1705. He died at Maiden on the 10th of June 1705. Wigglesworth is best known as the author of The Day of Doom; or a Poetical Description of the Great and Last Judgment (1662). At least two English and eight American editions have appeared, notable among them being that of 1867 (New York), edited by W. H. Burr and including other poems of Wigglesworth, a memoir and an autobiography. For a century this realistic and terrible expression of the prevailing Calvinistic theology was by far the most popular work written in America. His other poem; include God's Controversy with New England (written in 1662, " in the time of the great drought," and first printed in the

Proceedings of the Massachusetts Historical Society for 1781), and Meat out of the Eater; or Meditations concerning the Necessity, End and Usefulness of Affiictiotis unto God's Children (1669; revised in 1703).

His son, Samuel (i 689-1 768) , also a clergyman, was the author of several prose works and of one poem of merit, " A Funeral Song" (1709). Another son, Edward (1693-1765), was the first Hollis professor of Divinity at Harvard (1722-1765), and the author of various theological works; and a grandson, Edward (1732-1794), was the second Hollis professor of Divinity (1765-1791), in which position he was succeeded by Michael Wigglesworth } s great-grandson, Rev. David Tappan (1752-1803).

See J. W. Deane, Memoir of Rev. Michael Wigglesworth (Boston, 187O.

WIGHT, ISLE OF, an island off the south coast of England, forming part of Hampshire, separated from the mainland by the Solent and Spithead. It is of diamond shape, measuring 22§ m. from E. to W. and 13! from N. to S. (extremes). The area is 147 sq. m. The south coast is for the most part cliff-bound and grand, and there is much quietly beautiful scenery both inland and along the northern shores. Although east winds are at times prevalent in winter and spring, and summer heats may be excessive, the climate, especially in certain favoured spots, is mild and healthy. As a result numerous watering-places have grown up on the coasts.

A range of high chalk downs crosses the island from east to west, terminating seaward in the Culver cliffs and the cliffs near Freshwater respectively. It is breached eastward by the Yar stream flowing N.E., in the centre by the Medina, the principal stream in the island, flowing N., and by another Yar, flowing N., in the extreme west. These downs reach a height over 700 ft. west of the Medina, but east of it do not greatly exceed 400 ft. The slope northward is gradual. The north-west and north-cast coasts, overlooking the Solent and Spithead respectively, rise sharply, but hardly ever assume the cliff form; they are beauti- fully wooded, and broken by many picturesque estuaries, such as those of the western Yar and Newtown on the north-west, the Medina opening northward opposite Southampton Water, and Wootton Creek and the mouth of the eastern Yar on the north-east. The streams mentioned rise very near the south coast; the western Yar, indeed, so close to it that the high land west of the stream is nearly insulated. A second range of downs in the extreme south, between St Catherine's Point and Dunnose, reaches the greatest elevation in the island, exceeding 800 ft. in St Catherine's Hill. Below these heights on the seaward side occurs the remarkable tract known as the Undercliff, a kind of terrace formed by the collapse of rocks overlying soft strata (sand and clay) which have been undermined. The upper cliffs shelter this terrace from the north winds; the climate is re- markably mild, and many delicate plants flourish luxuriantly. This part of the island especially affords a winter resort for sufferers from pulmonary complaints. Along the south coast the action of small streams on the soft rocks has hollowed out steep gullies or ravines, known as chines. Many of these, though small, are of great beauty; the most famous are Shanklin and Blackgang chines. The western peninsula shows perhaps the finest development of sea-cliffs. Off the westernmost promontory rise three detached masses of chalk, about too ft. in height, known as the Needles, exposed to the full strength of the south- westerly gales driving up the Channel. During a storm in 1764 a fourth spire was undermined and fell.

Geology. — The geology of the island possesses many features of interest. Its form has been determined by the, simple monoclinal fold which has thrown up the Chalk with a high northward dip, so that it now exists as a narrow ridge running from the Needles east- ward to Culver Cliffs. Owing to a kink in the fold the ridge expands somewhat south of Carisbrooke. On the north side of the ridge the Chalk dips beneath the Tertiaries of the Hampshire Basin. Imme- diately north of the Chalk the Lower Eocene, Reading beds and London Clay form a narrow parallel strip, followed by a similar strip of Upper Eocene, Bracklesham and Bagshot beds. The remaining northern portion of the island is occupied by fluvio- marine OUgocene strata, including the Headon, Osborne, Bembridge and Hamstead beds. The various Tertiary formations are exhibited along the

coast, and may also be studied to great advantage in White Cliff and Ahim Bays. In Alum Bay the vertical disposition of the strata is well shown, and the highly-coloured Bagshot sands and clays form a conspicuous feature. From the excellent coast sections many fossils may be obtained. South of the Chalk ridge that rock has been com- pletely removed by denudation so as to expose the underlying Upper Greensand, which has slipped in many places over the underlying Gault (locally called " blue slipper "J, forming picturesque landslips. The Lower Greensand formation may best be studied in the cliff section from Atherfield Point to Rocken End, and in the chines of Shanklin and Blackgang. Beneath the Greensand the Wealden is exposed in the section from Brook to Atherfield, and also, to a much less extent, in Sandown Bay. The Wealden strata have yielded abundant fossil remains of extinct reptiles (Iguanodon), especially in the neighbourhood of Brook and Cowieaze Chines; and at Brook Point an extensive fossil forest exists, being the remains of a great raft of timber floated down and deposited in estuarine mud at the mouth of a great river. At Brook also the characteristic Wealden mollusk, I] mo valdensis, occurs abundantly.

Towns. &c— Newport at the head of the Medina estuary is the chief town; Cowes at the mouth the chief port. The principal resorts of visitors are Cowes (the headquarters of the Royal Yacht Squadron); Ryde on the north-east coast; Sandown, Shanklin and Ventnor on the south-east; Freshwater Gate on the south- west, and Yarmouth on the Solent. Others are Totland Bay near the mouth of the Solent, Gurnard near Cowes, and Seaview and Bembridge south of Ryde. The principal lines of com- munication with the mainland are between Cowes and South- ampton, Ryde and Portsmouth, and Yarmouth and Lymington. Newport is the chief railway centre, lines running N. to Cowes, \V. to Yarmouth and Freshwater, S. to Ventnor, with a branch to Sandown, and E. to Ryde. A direct line connects Ryde, Sandown, Shanklin and Ventnor, and has a branch to St Helen's and Bembridge. There are few industries in the island. The land is chiefly agricultural, a large proportion being devoted to sheep-grazing. Fishing is carried on to a considerable extent on the south coast — lobsters, crabs and prawns being plentiful. Oyster cultivation has been attempted in the Medina, in Brading Harbour and in the Newtown river. At Cowes shipbuilding is carried on, and timber is grown for the British navy in a part of the ancient forest of Parkhurst, between the Medina and the Solent. The general trade of the island centres at Newport, but in the coast towns the chief occupation of the inhabitants consists in providing for

visitors. The island shares in the defences of the Solent, Spithead and Portsmouth; there are batteries at Puckpool near Ryde, and on the eastern foreland, and along the west coast between the Needles and Yarmouth. Strong associations connect the Isle of Wight with the British royal family. Osborne House, near Cowes, was a residence and the scene of the death of Queen Victoria, and was presented to the nation by King Edward in 1902 (see Cowes). Princess Beatrice succeeded her husband Prince Henry of Battenbcrg as honorary governor of the island in 1896. The island is divided into two liberties, East and West Medina, excluding the boroughs of Newport and Ryde; and it forms one petty and special sessional division of the county. The urban districts are Cowes, East Cowes, St Helen's, Sandown, Shanklin and Ventnor. Until 1885 there was one member of parliament for the island and one for the borough of Newport; now, however, there is only one member for the whole island. Episcopally the island has for many centuries belonged to the see of Winchester. Pop. (1891) 78,672; (igor) 82,418.

History. — Among the most interesting relics of the Roman occupation of the Isle of Wight following its conquest by Ves- pasian in a.d. 43 are the villas at Brading and Carisbrooke, the cemetery at Newport, and remains of foundations at Combiy Farm, Gurnet, and between Brixton and Calbourne. Of the settlement of the island by the Jutes no authentic details are preserved, but in 661 it was annexed by Wulfhere to Wessex and subsequently bestowed on his vassal, the king of Sussex. In 998 it was the headquarters of the Danes, who levied their supplies from the opposite coasts of Hampshire and Sussex.

From the 14th to the 16th century the island was continuously under fear of invasion by the French, who in 1377 burnt Yar- mouth and Francheville (the latter being subsequently rebuilt

and known as Newtown), and so devastated Newport that it lay uninhabited for two years. In 1419, on a French force landing in the island and demanding tribute in the name of King Richard and Queen Isabella, the islanders replied that the king was dead and the queen sent home to her parents without any such condition of tribute, " but if the Frenchmen's minde were to fight, they willed them to come up, and no man should let them for the space of five hours, to refresh themselves, but when that time was expired they should have battayle given to them "; a proposition prudently declined by the Frenchmen, who returned to their ships and sailed home again. A more formidable raid was attempted in 1545 when a French fleet of 150 large ships, 25 galleys, and 50 smaller vessels drew up off Brading Harbour, and in spite of the brave defence of the islanders wrought much serious destruction. Wolverton near Brading having lain a ruined site ever since. As a result of this, the last French inva- sion, an

organized system of defence was planned for the island, and forts were constructed at Cowes, Sandown, Freshwater and Yarmouth. During the Civil War of the 17th century the island was almost unanimous in support of the parliament, and Carisbrooke Castle was the prison of Charles I. from 1647 to 1648, and in 1650 of his two children, the princess Elizabeth and the duke of Gloucester, the former dying there from the effects of a chill after only a few weeks of captivity.

The lordship of the island was granted by William the Con- queror to William Fitz-Osbern, but escheated to the crown by the treason of Roger, son of William, and was bestowed by Henry I. on Baldwin de Redvers, whose descendant Isabella de Fortibus sold it to Edward I. in 1293 for 6000 marks. Hence- forth the island was governed by wardens appointed by the crown, who in the reign of Henry VII. were styled captains, a title revived in 1889 in the person of Prince Henry of Battenberg. The ancient place of assembly for the freemen of the island was at Shide Bridge near Newport, and at Newport 1 also was held the Knighten Court, in which cases of small debt and trespasses were judged by those who held a knight's fee or part of a knight's fee of Carisbrooke Castle. The feudal tenants held their lands for the service of escorting their lords into and out cf the island, and of serving forty days at their own cost in defence of Caris- brooke Castle. In the Domesday Survey twenty-nine mills are mentioned, and salt-works at Boarhunt, Bowcombe, W'atching- well and Whitfield. The island quarries have been worked from remote times, that of Quarr supplying material for Winchester cathedral. Alum was collected at Parkhurst Forest in 1579. Alum and sand for glass-making were formerly obtained at Alum Bay. In 1295 the united boroughs of Yarmouth and Newport made an isolated return of two members to parliament. From 1584 the boroughs of Lymington, Newport, Newtown .and Yarmouth returned two members each, until under the act of 1832 the two last were disfranchised. By the act of 186S Lymington and Newport lost one member each, and by the act of 1885 were disfranchised.

Antiquities. — -Early antiquities include British pit villages near Rowborough, Celtic tumuli on several of the chalk downs, and the so-called Long Stone at Mottiston, a lofty sandstone monolith. The Roman villa near Brading contains some beauti- ful and well-preserved examples of tesselated pavements. Carisbrooke Castle is a beautiful ruin built upon the site of an ancient British stronghold. There are slight remains of Quarr Abbey near Ryde, founded for Benedictines (afterwards Cis- tercians) by Baldwin de Redvers in the first half of the 12th century. The most noteworthy ancient churches are those of Bonchurch (Norman), Brading (transitional Norman and Early English), Shahieet (Norman and Decorated), and Carisbrooke, of various styles.

See Victoria County History, Hampshire; Sir R. Worsley, The History of the Isle, of Wight (London, 3781); Richard Warner, The History of the Isle of Wight (Southampton, 1795); B. B. Woodward, History of Hampshire, including the Isle of Wight (3 vols., London, 1861-1869); Percy Stone, Architectural History of the Isle of Wight (London, 1891).

WIGTOWN, a royal burgh and the county town of Wigtown- shire, Scotland. Pop. (1901) 1329. It is situated on the western

shore of Wigtown Bay — whence the name, from the Scandinavian vik, " bay " — 7 m. S. by E. of Newton Stewart by railway. It is built on an eminence around a spacious central area laid out in walks. The town hall stands at a corner of this square, and at the opposite side are two crosses, one of 1738 and the other commemorating Waterloo. Some fishing is carried on. In the old churchyard were buried Margaret MacLachlan, a widow aged 63, and Margaret Wilson, a girl of 18, two covenanting martyrs who were tied to stakes in the sands of Wigtown Bay and drowned by the rising waters (1685), to whose memory, as well as that of three men who were hanged at the same time without trial, an obelisk surmounted by an urn was erected in 1858 on the top of Windy Hill, outside the town. Wigtown was made a royal burgh in 1469.

WIGTOWNSHIRE (sometimes called West Galloway), a south-western county of Scotland, bounded N. by Ayrshire, E. by Kirkcudbrightshire and Wigtown Bay, S. by the Irish Sea and W. and N. by the North Channel. Including the small island of St Helena, at the head of Luce Bay, it covers an area of 311,609 acres, or 487 sq. m. On the eastern boundary the estuary of the Cree expands into Wigtown Bay, between which and Luce Bay, farther west, extends the promontory of the Machers, terminating in Burrow Head. By the indentation of Luce Bay on the south and Loch Ryan on the north the hammer- headed peninsula of the Rinns is formed, of which the Mull of Galloway, the most southerly point of Scotland, is the southern, and Milleur Point the northern extremity. The more or less rugged coast has many small inlets, few of which, owing to hidden rocks, afford secure landing-places. Excepting Loch Ryan, a fine natural harbour of which Stranraer is the port, the harbours are not available for vessels of heavy burden, on account either of the great distance to which the sea retires, or of their exposure to frequent fierce gales. Much of the county has a wild, bleak appearance, the higher land being covered with heath and whins, while in the lower districts there are long stretches of bog and moss, and in the north centre, a few miles west of Newton Stewart, is a tract

known as the Moors. Only towards the Ayrshire border do the hills reach a considerable altitude, Benbrake and Craigairie Fell being each 1000 ft. in height. The chief rivers are the Cree, forming the boundary with Kirkcudbrightshire and flowing past Newton Stewart and Carty into Wigtown Bay; the Bladenoch, issuing from Loch Maberry and falling into Wigtown Bay at Wigtown after a course of 22 m., its principal affluents, all on the right, being Black Burn, the Tarff and the Malzie; and the Luce, formed by the junction at New Luce of Main Water and Cross Water of Luce, and emptying itself into Luce Bay. Most of the numerous lochs are small, several being situated in private parks, as at the earl of Stair's estate of Castle Kennedy. Among the larger lakes are Loch Maberry and Loch Dornal. both partly in Ayrshire, and Loch Ochiltree in the north of the shire, Loch Connell in the wcst ; Loch Ronald in the centre and the group of Castle Loch and four others in the parish of Mochrum, towards the south, and Loch Dowalton, at the junction of Kirkinner, Sorbie and Glasserton parishes.

Geology. — A line drawn in a north-easterly direction from the coast about 3 m. below Portpatrick, passing slightly north of the head of Luce Bay by Newton Stewart to the Cairnsmore of Fleet, divides the county so that practically all the rocks on the northern side are of Ordovician age, while those on the south are Silurian. This line coincides with the general direction of the strike of the beds through- out the county. Moat of the Ordovician rocks are black shales, in which graptolites may be found, along with greywackes and grits; they include the Glenkill and Hartfell. groups of the Moffat district. These rocks may be seen exposed on the coast south of Portpatrick and in the valley of the Cree. The slate quarries of Cairn Ryan are of Llandeilo age. Nearly the whole of the Silurian region is occupied by dark grits, greywackes and shales of 'Llandovery age. though here and there a small exposure of the underlying black Moffat shales appears on the denuded crest of one of the innumerable folds into which all these rocks have been thrown. A series of shales, flags and grey- wackes of Wenlock age is found on the shore between Burrow Head and Whithorn. On the west side of Loch Ryan is a narrow belt of Permian breccia and thin sandstones about 9 m. long and I m. wide; this rests unconformably upon a similar belt of Carboniferous sand- stones, about 8 m. long and J m. in width, which lies on the west

side of the Permian. A small patch of granite stands out on the coast at Laggantulloch Head, north of the Mull of Galloway. There are also a few patches and dikes of diorite and quartz-felsite. Glacial moraines and drumlins are found over much of the older formations, and are well seen between Glenluce and Newton Stewart and south of Wigtown. The boulder-clay is used for brick-making near Stranraer. On the coasts of Luce Bay and Loch Ryan raised beaches are found at levels of 25 ft. and 50 ft.

above the sea, and tracts of blown sand lie above the shore. There are several peat- covered areas in the county.

Climate and Agriculture. — The mean annual rainfall amounts to 36-3 in., varying from 49-19 in. at Kirkcowan, a few miles west of Newton Stewart, to 26-81 in. at the Mull of Galloway. The average temperature for the year is 48-3° F., for January 40 ° F. and for July 58-5° F. In spite ofits humidity the climate is not unfavourable for the ripening of crops, and frosts as a rule are not of long duration. Much of the shire consists of stony moors, rendering the work of reclamation difficult and in some parts impossible. The gravelly soil along the coasts requires heavy manuring to make it fruitful, and in the higher arable quarters a rocky soil prevails, better adapted for grass and green crops than for grain. A large extent of the surface is black top reclaimed from the moors, and in some districts loam and clay are found. By dint of energy, however, and constant resort to scientific agriculture, the farmers have placed half of the shire under cultivation, and the standard of farming is as high as that of any county in Scotland. Oats is the leading crop, barley and wheat occupy- ing only a small area. Turnips and swedes constitute the great bulk of the green crops, potatoes coming next. Large tracts are under clover and rotation grasses and in permanent pasture, in consequence of the increasing attention paid to dairy-farming, which is carried on in combination and on scientific principles. Several creameries have been established in the dairy country, cheese being a leading product. Though the size of the herds is surpassed in several other Scottish counties, the number of milch cattle is only exceeded in three (Ayr, Aberdeen and Lanark). Ayrshire is the favourite breed for dairy purposes, and black polled Galloways are found in the eastern districts. A cross of the two breeds is also maintained. The sheep are principally black-faced on the hill iarms, and in other parts Leicester and other long-woolled breeds. The flocks are usually heavy, and great numbers of pigs are kept. The shire has acquired some reputation for its horses, chiefly Clydesdale. The holdings are fairly large, the average being considerably over 100 acres, one- third of them running from 100 acres to 30a Most of the park land is finely wooded, and there are a few nurseries, market gardens and orchards.

Other Industries. — There arc small manufactures in several of the towns, as woollens at Kirkcowan; tweeds, leather and agricultural implements at Newton Stewart; dairy appliances, beer, flour and bricks at Stranraer; and whisky at Bladenoch. Sandstone and slates are quarried, and peat is cut in various places. Fisheries, on a minor scale, are conducted chiefly from Stranraer, certain villages on Loch Ryan and Luce Bay, and Wigtown, and the Cree, Bladenoch and Luce yield salmon. Shipping is mainly carried on from Stranraer, but also from Port William, Portpatrick, Wigtown and Garliestown.

The Glasgow & South-Western railway runs to Stranraer via Girvan, and the Portpatrick and Wigtownshire joint railway from Newton Stewart to Portpatrick via Stranraer, with a branch line at Newton Stewart to Wigtown and Whithorn. There are coach services from Stranraer to Ballantrae on the Ayrshire coast and to Drumorc, 4 m. N. of the Mull, and regular communication by mail steamer between Stranraer and Larne in Co. Antrim, Ireland.

Population and Administration. — In 1801 the population amounted to 36,062; in iqoi to 32,685 or 67 persons to the sq. m., the decrease for the decade being the third highest in Scotland. In 1901 there were 88 persons speaking Gaelic and English. The principal towns arc Stranraer (pop. 6036); Newton Stewart (2598), which, however, standing on both banks of the Cree, extends into Kirkcudbrightshire; Wigtown (1329); and Whithorn (1188). Formerly Wigtown, Stranraer and Whithorn formed with New Galloway, in Kirkcudbrightshire, a group of burghs returning one member, but in 1885 the first three were merged in the county, which returns one member to parliament. Wigtown, the county town, Stranraer and Whit- horn are royal burghs. The shire forms part of the sheriffdom of Dumfries and Galloway, and a sheriff-substitute sits at Wigtown and Stranraer. The administrative county is divided into the Lower district, comprising the shire east of the parishes of New Luce and Old Luce, and the Upper district, comprising the shire west of and including these parishes. The county is under school-board jurisdiction, and there are high schools in Newton Stewart and Stranraer. The board-schools in .Whithorn and Wigtown have secondary departments, and several of the schools in the shire earn grants for higher education. The county

council expends the ” residue ” grant in providing bursaries for science pupils, and in subsidizing agricultural classes at Kilmarnock and Edinburgh University, and the cookery classes and science department of the high schools.

History and Antiquities. — Galloway, or the country west of the Nith, belonged to a people whom Ptolemy called Novantae and Agricola subdued in a.d. 79. They were Atecott Picts, and are conjectured to have replaced a small, dark-haired aboriginal race, akin probably to the Basques of the Iberian peninsula. They held this south-western corner of Scotland for centuries, protecting themselves from the northern and southern Picts by a rampart, called the Ueil’s Dyke, which has been traced in a north- easterly direction from Reoch on the eastern side of Loch Ryan to a spot on the

Nith near the present Thornhill, a distance of 50 m. Evidences of the Pictish occupation are prevalent, in the form of hill forts, cairns, standing stones, hut circles and crannogs or lake dwellings (several of which were exposed when Dowalton Loch near Sorbie and Barhapple Loch near Glenluce were drained), besides canoes and flint, stone and bronze implements. The Romans possessed a small camp at Rispain near Whithorn and a station at Rerigonium, which has been identified with Innermessan on the eastern shore of Loch Ryan; but so few remains exist that it has been concluded they effected no per- manent settlement in West Galloway. Ninian, the first Christian missionary to Scotland, landed at Isle of Whithorn in 396 to convert the natives. His efforts were temporarily successful, but soon after his death (432) the people relapsed into paganism, excepting a faithful remnant who continued to carry on Christian work. A monastery was built at Whithorn, and, though the bishopric founded in the 8th century was shortly afterwards removed, it was established again in the 12th, when the priory erected by Fergus, " king " of Galloway, became the cathedral church of the see of Galloway and so remained till the Reforma- tion. In the 6th century the people accepted the suzerainty of the Northumbrian kings who allowed them in return autonomy under their own Pictish chiefs. On the decay of the Saxon power more than two hundred years later this overlordship was abandoned, and the Atecotts formed an alliance with the North- men then ravaging the Scottish coasts. Because of this relation- ship the other Picts styled the Atecotts, by way of reproach, Gallgaidhei, or stranger Gaels, whence is derived Galloway, the name of their territory. With the aid of the Norsemen and the men of Galloway Kenneth Macalpine defeated the northern Picts at Forteviot and was crowned king of Scotland at Scone in 844. Henceforward the general, history of Wigtownshire is scarcely distinguishable from that of Kirkcudbrightshire. A few particular points, however, must be noted. Malcolm MacHeth, who had married a sister of Somerled, lord of the Isles, headed about 1150a Celtic revolt against the intrusion of Anglo-Norman lords, but was routed at Causewayend near the estuary of the Cree. In 1190 Roland, lord of Galloway, built for Cistercians from Melrose the fine abbey of Glenluce, of which the only remains are the foundations of the nave, the gable of the south transept, the cloisters, quadrangle and the vaulted chapter-house. In the disordered state of the realm during David II. 's reign east Galloway had been surrendered to Edward III. (1333), but Wigtownshire, which had been constituted a shire in the previous century and afterwards called the Shire to distinguish it from the Stewartry of Kirkcudbright, remained Scottish territory. In 1342 Sir Malcolm Fleming, earl of Wigtown, was appointed sheriff with power to hold the county separate from the other half of Galloway, but falling into straitened circumstances he sold his earldom and estates in 1372 to Archibald the Grim, 3rd earl of Douglas, thus once more placing all

Galloway under one lord. Under Douglas's lordship the laws of Galloway, which had obtained from Pictish times and included, among other features, trial by battle (unless an accused person chose expressly to forgo the native custom and ask for a jury), were modified, and in 1426 abolished, the province then coming under the general law. Soon after the fall of the Douglases (1455) the Kennedy family, long established in the Ayrshire district of Carrick, obtained a preponderating influence in Wigtownshire, and in 1509 David

Kennedy was created earl of Cassillis. Gilbert, the 4th earl, so powerful that he was called the " king of Carrick," held the shire for Mary, queen of Scots, when she broke with the Lords of the Congregation, but could do little for her cause. He profited by the Reformation himself, however, to acquire by fraud and murder the estate of Glenluce Abbey (about 1570). In 1603 James VI. instituted a bishop in the see of Galloway — which had not been filled for twenty years — and otherwise strove to impose episcopacy upon the people, but the inhabitants stood firm for the Covenant. The acts against Nonconformity were stringently enforced and almost every incumbent in Galloway was deprived of his living. Field-preaching was a capital crime and attendance at conventicles treason. A reign of terror supervened, and numbers of persons emigrated to Ulster in order to escape persecution. John Graham of Claverhouse, Viscount Dundee, having replaced Sir Andrew Agnew, who had refused the Test, as sheriff (1682), goaded the people into rebellion, the drowning of Margaret MacLachlan and Margaret W'ilson within flood-mark in Wigtown Bay (1685) being an instance of his ruthless methods. With the Revolution of 1688 Presbyterianism was restored, and John Gordon, recently consecrated bishop of Galleway, retired to France. The Jacobite risings of 1715 and 1745 excited only languid interest, but in 1747 heritable jurisdictions were abolished and Sir Andrew Agnew ceased to be hereditary sheriff, though he was the only official able to prove continuous tenure of the post since it was granted to his family in 1451. The first sheriff appointed under the new system was Alexander Boswell, Lord Auchinleck, father of James Boswell, the biographer of Dr Johnson. In 1760 an engagement took place in Luce Bay, when the young French seaman, Francois Thurot, with three warships, attempting a diversion in Jacobite interests, was defeated and killed with the loss of three hundred men and his vessels.

*Among ancient castles in Wigtownshire may be mentioned the cliff towers, possibly of Norse origin, of Carghidown and Castle Feather near Burrow Head; the ruins of Ba*ldoon, south of Wigtown, associated with events which suggested to Sir Walter Scott the romance of The Bride of Lammermoor; Corsewall near the northern extremity of the Rinns; the Norse stronghold of Cruggleton, south of Garliestown, which belonged in*

the 13th century to de Quincy, earl of Winchester, who had married a daughter of Alan, " king " of Galloway, and to Alexander Comyn, 2nd earl of Buchan (d. 1289), his son-in-law; Dunskey, south of Portpatrick, built in the 16th century, occupying the site of an older fortress; the fragments of Long Castle at Dowalton Loch, the ancient seat of the MacDonells; Myrton, the seat of the MacCullochs, in Mochrum parish; and the ruined tower of Sorbie, the ancient keep of the Hannays.

See Sir Herbert Maxwell, History of Dumfries and Galloway (Edinburgh, 1896); Sir Andrew Agnew, The Agnews of Lochnaw (Edinburgh, 1893); The Galloway Herd-Book (Dumfries, 1880); Proceedings of the Soc. of Ant. of Scotland, passim; Gordon Eraser, Wigtown and Whithorn (Wigtown, 1877).

WIGWAM, a term loosely adopted as a general name for the houses of North American Indians. It is, however, strictly applied to a particular dome-shaped or conical hut made of poles lashed together at the tops and covered with bark. The skin tents of many of the Plains Indians are called tipis. The word " wigwam " represents the Europeanized or Anglicized form of the Algonkian wekott-om-ut, i.e. u in his (their) house."

WIHTRED, king of Kent (d. 725), son of Ecgberht, nephew of Hlothhere and brother of Eadric, came to the Kentish throne in 690 after the period of anarchy which followed the death of the latter king. Bede states that Wihtred and Swcfheard were both kings in Kent in 692, and this statement would appear to imply a period of East Saxon influence (see Kent), while there is also evidence of an attack by Wessex. Wihtred, however, seems to have become sole king in 694. At his death, which did not take place until 725, he left the kingdom to his sons Aethel- berht, Eadberht and Alric. After the annal 694 in the Chronicle there is inserted a grant of privileges to the church, which pur- ports to have been issued by Wihtred at a place called Baccan- celde. This grant, however, cannot be accepted as genuine and

has merely an illustrative value, but there is still extant a code of laws issued by him in a council held at a place called Berghamstyde (Barham?) during the fifth year of his reign (probably 695).

See Bede. Ilist. Eccl., ed. C. Plummer (Oxford, 1896); Anglo- Saxon Chronicle, ed. Earle and Plummer (Oxford, 1899).

WILBERFORCE, ROBERT ISAAC (1802-1857), English clergyman and

writer, second son of William Wilberforce, was born on the 19th of December 1802. He was educated at Oriel College, Oxford, taking a double first in 1823. In 1S26 he was chosen fellow of Oriel and was ordained, among his friends and colleagues being Newman, Pusey and Keble. For a few years he was one of the tutors at Oriel, but the provost, Edward Hawkins, disliked his religious views, and in 183 1 he resigned and left Oxford. In 1832 he obtained the living of East Farleigh, Kent, which in 1840 he exchanged for that of Burton Agnes, near Hull. In 1841 he was appointed archdeacon of the East Riding. About this time Wilberforce became very intimate with Manning, and many letters on theological and ecclesiastical questions passed between them. In 1851 Manning joined the Church of Rome, and three years later W'ilberforce took the same step. He was preparing for his ordination when he died at Albano on the 3rd of February 1857. He left two sons, the younger of whom, Edward Wilberforce (b. 1834), became one of the masters of the Supreme Court of Judicature. Edward's son, Lionel Robert Wilberforce (b. 1.861), was in 1900 appointed professor of physics in the university of Liverpool.

R. I. Wilberforce assisted his brother Samuel to write the Life and to edit the Correspondence of his father. His other writings include: Church Courts anal Church Discipline (1843); Doctrine of the Holy Eucharist (1853); Doctrine of the Incarnation in Relation to Mankind and the Church (1848 and later editions); The Five Empires i a Sketch of Ancient History (1840); A Sketch of the History of Erastianism (1851); An Enquiry into the Principles of Church Authority (1854); and a romance, Rutilius and Lucius (1842J.

WILBERFORCE, SAMUEL (1805-1873), English bishop, third son of William Wilberforce, was born at Clapham Common, London, on the 7th of September 1805. In 1823 he entered Oriel College, Oxford. In the " United Debating Society," which afterwards developed into the " Union," he distinguished himself as a zealous advocate of liberalism. The set of friends with whom he chiefly associated at Oxford were sometimes named, on account of their exceptionally decorous conduct, the " Bethel Union "; but he was by no means averse to amuse- ments, and specially delighted in hurdle jumping and hunting. He graduated in 1826, taking a first class in mathematics and a second in classics. After his marriage on the nth of June 1828 to Emily Sargent, he was in December ordained and appointed curate-in-charge at Checkenden near Henley-on-Thames. In 1830 he was presented by Bishop Sumner of Winchester to the rectory of Brightstone in the Isle of Wight. In this compara- tively retired sphere he soon found scope for that manifold activity which so prominently characterized his subsequent career. In 1831 he published a tract on tithes, " to correct the prejudices of the lower order of farmers," and in the following year a collection of hymns for use in his parish, which had a large general

circulation; a small volume of stories entitled the Note Book of a Country Clergyman; and a sermon, The Apostolical Ministry. At the close of 1837 he published the Letters and Journals of Henry Martyn. Although a High Churchman Wilberforce held aloof from the Oxford movement, and in 1838 his divergence from the " Tract " writers became so marked that J. H. Newman declined further contributions from him to the British Critic, not deeming it advisable that they should longer "co-operate very closely," In 1838 Wilberforce published, with his elder brother Robert, the Life of his father, and two years later his father's Correspondence. In 1839 he also published Eucharistica (from the old English divines), to which he wrote an introduction, Agathos and other Sunday Stories, and a volume of University Sermons, and in the following year Rocky Island and other Parables. In November 1839 he was installed archdeacon of Surrey, in August 1840 was collated canon of Winchester and in October he accepted the rectory of Alverstoke.

In 1841 he was chosen Bampton lecturer, and shortly afterwards made chaplain to Prince Albert, an appointment he owed to the impression produced by a speech at an anti-slavery meeting some months previously. In October 1843 he was appointed by the archbishop of York to be sub-almoncr to the queen. In 1844 appeared his History of the American Church. In March of the following year he accepted the deanery of Westminster, and in October the bishopric of Oxford.

The bishop in 1847 became involved in the Hampden con- troversy, and signed the remonstrance of the thirteen bishops to Lord John Russell against Hampden's appointment to the bishopric of Hereford. He also endeavoured to obtain satis- factory assurances from Hampden; but, though unsuccessful in this, he withdrew from the suit against him. The publication of a papal bull in 1850 establishing a Roman hierarchy in England brought the High Church party, of whom Wilberforce was the most prominent member, into temporary disrepute. The seces- sion to the Church of Rome of his brother-in-law, Archdeacon (afterwards Cardinal) Manning, and then of his brothers, as well as his only daughter and his son-in-law, Mr and Mrs J. H. Pye, brought him under further suspicion, and his revival of the powers of convocation lessened his influence at court; but his unfailing tact and wide sympathies, his marvellous energy in church organization, the magnetism of his personality, and his eloquence both on the platform and in the pulpit, gradually won for him recognition as without a rival on the episcopal bench. His diary reveals a tender and devout private life which has been overlooked by those who have only considered the versatile facility and persuasive expediency that marked the successful public career of the bishop, and earned] him the sobriquet of " Soapy Sam/' In the House of Lords he took a prominent part in the discussion of social and ecclesiastical questions. He has been styled the "

bishop of society "; but society occupied only a fraction of his time. The great bent of his energies was cease- lessly directed to the better organization of his diocese and to the furtherance of schemes for increasing the influence and efficiency of the church. In 1854 he opened a theological college at Cuddesdon, which was afterwards the subject of some con- troversy on account of its alleged Romanist tendencies. His attitude towards Essays and Reviews in 1861, against which he wrote an article in the Quarterly, won him the special gratitude of the Low Church party, and latterly he enjoyed the full con- fidence and esteem of all except the extreme men of either side and party. On the publication of J. W. Colenso's Commentary on the Romans in 1861, Wilberforce endeavoured to induce the author to hold a private conference with him; but after the publication of the first two parts of the Pentateuch Critically Examined he drew up the address of the bishops which called on Colenso to resign his bishopric. In 1867 he framed the first Report of the Ritualistic Commission, in which coercive measures against ritualism were discountenanced by the use of the word " restrain " instead of " abolish " or " prohibit." He also endeavoured to take the sting out of some resolutions of the second Ritualistic Commission in 1868. and was one of the four who signed the Report with qualifications. Though strongly opposed to the disestablishment of the Irish Church, yet, when the constituencies decided for it, he advised that no opposition should be made to it by the House of Lords. After twenty-four years' labour in the diocese of Oxford, he was translated by Gladstone to the bishopric of Winchester. He was killed on the 19th of July 1873, by the shock of a fall from his horse near Dorking, Surrey.

Wilberforce left three sons. The eldest, Reginald Garton Wilberforce, being the author of An Unrecorded Chapter of the Indian Mutiny (1894). His two younger sons both attained dis- tinction in the English church. Ernest Roland Wilberforce (1840- iqo8) was bishop of Newcastle- on-Tyne from 1882 to 1895, and bishop of Chichester from 1895 till his death. Albert Basil Orme Wilberforce (b. 1841) was appointed canon residentiary of West- minster in 1S94, chaplain of the House of Commons in 1896 and archdeacon of Westminster in 1900; he has published several volumes of sermons.

Besides the works already mentioned, Wilberforce wrote Heroes of Hebrew History (1870), originally contributed to Good Words, and several volumes of sermons. See Life of Samuel Wilberforce, with Selections from his Diary and Correspondence (1879-1882), vol. i., ed. by Canon A. R. Ash well, and vols. ii. and Hi., ed. by his son R. G. Wilberforce, who also wrote a

one-volume Life (1888). One of the volumes of the " English Leaders of Religion " is devoted to him, and he is included in Dean Burgon's Lives of Twelve Good Men (1888).

WILBERFORCE, WILLIAM (1759-1833), English philan- thropist whose name is chiefly associated with, the abolition of the slave trade, was descended from a Yorkshire family which possessed the manor of Wilberfoss in the East Riding from the time of Henry II. till the middle of the 18th century. He was the only son of Robert Wilberforce, member of a commercial house at Hull, by his wife Elizabeth, daughter of Thomas Bird of Barton, Oxon, and was born at Hull on the 24th of August 1759. It was from his mother that he inherited both his feeble frame and his many rich mental endowments. He was not a diligent scholar, but at the grammar school of Hull his skill in elocution attracted the attention of the master. Before he had completed his tenth year he lost his father and was transferred to the care of a paternal uncle at Wimbledon; but in his twelfth year he returned to Hull, and soon afterwards was placed under the care of the master of the endowed school of Pocklington. Here his love of social pleasures made him neglectful of his studies, but he entered St John's College, Cambridge, in October 1766. Left by the death of his grandfather and uncle the possessor of an independent fortune under his mother's sole guardianship, he was somewhat idle at the university, though he acquitted himself in the examinations with credit; but in his serious years he " could not look back without unfeigned remorse " on the opportunities he had then neglected. In 1780 he was elected to the House of Commons for his native town, his success being due to his personal popularity and his lavish expenditure. He soon found his way into the fast political society of London, and at the club at Goosctrces renewed an acquaintance begun at Cambridge with Pitt, which ripened into a friendship of the closest kind. In the autumn of 1783 he set out with Pitt on a tour in France; and after his return his eloquence proved of great assistance to Pitt in his struggle against the majority of the House of Commons. In 1784 Wilberforce was elected for both Hull and Yorkshire, and took his seat for the latter con- stituency.

A journey to Nice in the autumn of the same year with his friend Dr Isaac Miiner (1750-1820), who had been a master at Hull grammar school when Wilberforce was there as a boy, and had since made a reputation as a mathematician, and afterwards became president of Queens' College, Cambridge, and dean of Carlisle, led to his conversion to Evangelical Christianity and the adoption of more serious views of life. The change had a marked effect on his public conduct. In the beginning of 1787 he busied himself with the establishment of a society for the reformation of manners. About the same time he made the acquaintance of Thomas Clarkson, and began the agitation against the slave trade. Pitt entered heartily into their plans, and recommended Wilberforce to undertake the guidance of the

project as a subject suited to his character and talents. While Clarkson conducted the agitation throughout the country, Wilberforce took every opportunity in the House of Commons of exposing the evils and horrors of the trade. In 1788, however, a serious illness compelled him to retire for some months from public life, and the introduction of the subject in parliament therefore devolved on Pitt, whose representations were so far successful that an act was passed providing that the number of slaves carried in ships should be in proportion to the tonnage. On the 1 2th of May of the following year Wilberforce, in co-opera- tion with Pitt, brought the subject of abolition again before the House of Commons; but the friends of the planters succeeded in getting the matter deferred. On the 27th of January following Wilberforce carried a motion for referring to a special committee the further examination of witnesses, but after full inquiry the motion for abolition in April 1791 was lost by 163 votes to 88. In the following April he carried a motion for gradual abolition

by 238 to 85 votes; but in the House of Lords the discussion was finally postponed till the following session. Notwith- standing his unremitting labours in educating public opinion and annual motions in the House of Commons, it was not till 1807, the year following Pitt's death, that the first great step towards the abolition of slavery was accomplished. When the anti-slavery society was formed in 1823, Wilberforce and Clarkson became vice-presidents; but before their aim was accomplished Wilberforce had retired from public life, and the Emancipation Bill was not passed till August 1833, a month after his death.

In 1797 Wilberforce published A Pralical View of the Prevail- ing Religious System of Professed Christians in the Higher and Middle Classes of this Country Contrasted with Real Christianity, which within half a year went through five editions and was afterwards translated into French, Italian, Dutch and German. In the same year (May 1797) he married Barbara Ann Spooner and took a house at Clapham, where he became one of the leaders of what was known as the " Clapham Sect " of Evangeli- cals, including Henry Thornton, Charles Grant, E. J. Eliot, Zacchary Macaulay and James Stephen. It was in connexion with this group that he then occupied himself with a plan for a religious periodical which should admit "a moderate degree of political and common intelligence," the result being the appearance in January 1801 of the Christian Observer, He also interested himself in a variety of schemes for the advance- ment of the social and religious welfare of the community, including the establishment of the Association for the Better Observance of Sunday, the foundation, with Hannah More (q.v.), of schools at Cheddar, Somersetshire, a project for opening a school in every parish for the religious instruction of children, a plan for the education of the children of the lower classes, a bill for securing better salaries to curates, and a method for disseminating, by

government help, Christianity in India. In parliament he was a supporter of parliamentary reform and of Roman Catholic emancipation. In 18 12, on account of failing health, he exchanged the representation of Yorkshire for that of a constituency which would make less demands on his time, and was returned for Bramber, Sussex. In 1825 he retired from the House of Commons, and the following year settled at High- wood Hill, near Mill Hill, "just beyond the disk of the metropolis." He died at London on the 29th of July 1833, and was buried in Westminster Abbey close to Pitt, Fox and Canning. In Westminster Abbey a statue was erected to his memory, and in. Yorkshire a county asylum for the blind was founded in his honour. A column was also erected to him by his townsmen of Hull. Wilberforce left four sons, two of whom, Samuel and Robert Isaac, are noticed separately. The youngest, Henry William Wilberforce (1807-1873), was educated at Oriel College, Oxford, and was president of the Oxford Union. He took orders in the English Church, but in 1850 became a Roman Catholic. He was an active journalist and edited the Catholic Standard.

The chief authorities of the career of William Wilberforce are his Life (5 vols., 1838) by his sons, Robert Isaac and Samuel, and his Correspondence (1840) also published by his sons A smaller edition of the Life was published by Samuel Wilberforce in 1868. See also The private papers of William Wilberforce, edited by A. M. Wilberforce (1897); Sir James Stephen, Essays in Ecclesiastical Biography (1849); J. C. Colquhoun, Wilberforce, His Friends and Times (1866); John Stoughton, William Wilberforce (1880); J. J. Gurney, Familiar Sketch of Wilberforce (1838); and J. S. Hartford, Recollections of W. Wilberforce (1864).

WILBRANDT, ADOLF (1S37-), German novelist and dramatist, was born at Rostock on the 24th of August 1837, the son of a professor at that university. Having received his early education at the gymnasium of his native town, he entered the university and engaged in the study of law. This, however, he soon abandoned in favour of philology and history, and continued these studies in Berlin and Munich. After taking the degree of doctor of philosophy, he joined the staff of the Siiddeutsche Zeitung in Munich. He travelled abroad for a time and in 1871 settled in Vienna, where, two years later, he married the actress, August? 3audius. In 1881 Wilbrandt was appointed

director of the Hofburg theatre in succession to Franz Dingel- stedt, an office he held until 1887. In this year he returned to his native town of Rostock, and remained actively engaged in literary production. Wilbrandt

is distinguished both as a dramatist and novelist. His merits were acknowledged by the award of the Grillparzer prize on two occasions—in 1875 for the tragedy Gracchus der Volkstribun, and in 1890 for his dramatic poem Der Meisler von Palmyra, while in 1878 he received the Schiller prize for his dramatic productions.

Among his plays may be mentioned the tragedies, Arria und Messalina (1874), Nero (1876); Kriemhild (1877); the comedies Unerreichbar (1870), Die Maler (1872), Jugendliebe (1873) and Der Kampf urns Dasein (1874); and the drama Die Tackier des Herrn Fabricius (1883). Among his novels the following deserve notice: — Meister Amor (1880); Hermann Ifinger (1892); Der Dornenweg (1894); Die Osterinsei (1895); Die Rothenburger (1895); and Hildegard Mahlmann (1897). He also published translations of Sophocles and Euripides (1866), Gedichte (1874, 1889 and 1907), and a volume of Erinnerung en (1905).

See V. Klemperer, Adolf Wilbrandt. Eine Studie iiber seine Werke (1907), and A. Stern, Studien zur Literatur der Gegenwart (3rd ed., I9°5)-

WILBYE, JOHN, English 16th-century madrigal composer, was born probably at Bury St Edmunds, but the details of his life are obscure. A set of madrigals by him appeared in 1598 and a second in 1608, the two sets containing sixty-four pieces; and from a few contributions known to have been made by him to other contemporary sets, we can infer that he was alive in 1614. He is the most famous of all the English madrigalists ; his pieces have long been favourites and are included in modern collections.

WILD, JONATHAN (c. 1682-1725), English criminal, was born about 1682 at Wolverhampton, where his father was a wig-maker. After being apprenticed to a local buckle-maker, he went to London to learn his trade, and, getting into debt, was imprisoned for several years. The acquaintance of many criminals which he made in prison he turned to account after his release by setting up as a receiver of stolen goods. Wild shrewdly realized that it was safer, and in most cases more profitable, to dispose of such property by returning it to its legitimate owners than to sell it, with the attendant risks, in the open market, and he thus built up an immense business, posing as a recoverer of stolen goods, the thieves receiving a commission on the price paid for recovery. A special act of parliament was passed by which receivers of stolen property were made accessories to the theft, but Wild's professed " lost property office " had little difficulty in evading the new law, and became so prosperous that two branch offices were opened. From profiting by robberies in which he had no share, Wild naturally came to arrange robberies himself, and he devised and controlled a huge organiza- tion, which plundered London and its approaches wholesale. Such thieves as refused to work with him received short shrift.

The notorious Jack Sheppard, wearied of Wild's exactions, at last refused to deal with him, whereupon Wild secured his arrest, and himself arrested Sheppard's confederate, " Blueskin." In return for Wild's services in tracking down such thieves as he did not himself control, the authorities for some time toler- ated the offences of his numerous agents, each a specialist in a particular kind of robbery, and so themselves strengthened his position. If an arrest were made, Wild had a plentiful supply of false evidence at hand to establish his agents' alibi, and he did not hesitate to obtain the conviction, by similar means, of such thieves as refused to recognize his authority. Such stolen property as could not be returned to the owners with profit was taken abroad in a sloop purchased for this work. At last either the authorities became more strict or Wild less cautious. He was arrested, tried at the Old Bailey, and after being acquitted on a charge of stealing lace, found guilty of taking a reward for restoring it to the owner without informing the police. He was hanged at Tyburn on the 24th of May 1725.

WILDBAD, a watering-place of Germany, in the kingdom of Wurttemberg, picturesquely situated 1475 ft. above the sea, in the romantic pine-clad gorge of the Enz in the Black Forest, 28 m. W. of Stuttgart and 14 E. of Baden-Baden by rail. Pop.

(1905) 3734- It contains an Evangelical, a Roman Catholic and an English church, and has some small manufactures (cigars, paper and toys). Its thermal alkaline springs have a temperature of Qo D -too° Fahr. and are used for bathing in cases of paralysis, rheumatism, gout, neuralgia and similar ailments. The fact that the springs rine within the baths, and are thus used at the fountain-head, is considered to contribute materially to their curative value. The water is used internally for affections of the stomach and digestive organs, and of the kidneys, bladder, &c. Wildbad possesses all the usual arrangements for the comfort and amusement of the visitors (over 15,000 annually), including large and well-appointed hotels, a Kurhaus, a Trink- Halle and promenades. The neighbourhood is picturesque, the most attractive spot being the Wildsee, of which legends are told.

See W. T. v. Renz, Die Xur m Wildbad (with Guide, Wildbad, 1888), and Weizsacker, Wildbad (2nd ed., 1905).

WILDE, OSCAR O'FLAHERTIE WILLS (1856-1900), English author, son of Sir William Wilde, a famous Irish surgeon, was born in Dublin on the rsth of October 1856; his mother, Jane Francisca Elgee, was well known in Dublin as a graceful writer of verse and prose, under the pen-name of " Speranza." Having distinguished himself in classics at Trinity College, Dublin, Oscar Wilde went to Magdalen College, Oxford, in 1874, and won the Newdigate prize in 1878 with his poem " Ravenna," besides taking a

first-class in classical Moderations and in Literae Humaniores. But his career at Oxford, brilliant intellectually as he showed himself to be, was chiefly signalized by the part he played in what came to be known as the aesthetic movement. He adopted what to undergraduates appeared the effeminate pose of casting scorn on manly sports, wearing his hair long, decorating his rooms with peacock's feathers, lilies, sunflowers, blue china and other objets d'art, which he declared his desire to " live up to," affecting a lackadaisical manner, and professing intense emotions on the subject of " art for art's sake "—then a new-fangled doctrine which J. M. Whistler was bringing into prominence. Wilde made himself the apostle of this new cult. At Oxford his behaviour procured him a ducking in the Cherwell, and a wrecking of his rooms, but the cult spread among certain sections of society to such an extent that languishing attitudes, " too-too " costumes and " aestheticism " generally became a recognized pose. Its affectations were burlesqued in Gilbert and Sullivan's travesty Patience (1881), which practically killed by ridicule the absurdities to which it had grown. At the same time it cannot be denied that the " aesthetic " movement, in the aspect fundamentally represented by the school of William Morris and Rossetti, had a permanent influence on English decorative art. As the leading : ' aesthete," Oscar Wilde became one of the most prominent personalities of the day; apart from the ridicule he encountered, his affected paradoxes and his witty sayings were quoted on all sides, and in 1882 he went on a lecturing tour in the United States. In 1884 he married Constance Lloyd. He had already published in 1881 a selection of his poems, which, however, only attracted admiration in a limited circle. In 1888 appeared The Happy Prince and Other Tales, illustrated by Walter Crane and Jacomb Hood. This charming volume of fairy talcs was followed up later by a second collection, The House of Pomegranates (1892), acknowledged by the author to be " intended neither for the British child nor the British public." In much of his writings, and in his general altitude, there was to most people an undertone of rather nasty suggestion which created prejudice against him, and his novel, The Picture of Dorian Gray (1891), with all its sparkle and cleverness, impressed them more from this point of view than from its purely literary brilliance. Wilde contri- buted some characteristic articles to the reviews, all coloured by his peculiar attitude towards art and life, and in 1891 re- published three of them as a book called Intentions. His first real success with the larger public was as a dramatist with Lady Windermere's Fan at the St James's Theatre in 1892, followed by A Woman of No Importance (1893), An Ideal Husband (1895) and The Importance of Being Earnest (1895). The

dramatic and literary ability shown in these plays, all of which were published later in book form, was as undoubted as their diction and ideas were characteristically paradoxical. In 1893 the licenser of plays refused a licence to Wilde's Salome, but it was produced in French in Paris by Sarah Bernhardt in 1894. His success as a dramatist hatl by this time gone some way to disabuse hostile critics of the suspicions as regards his personal character which had been excited by the apparent looseness of morals which since his Oxford days it had always pleased him to affect; but to the consternation of his friends, who had ceased to credit the existence of any real moral obliquity, in 1895 came fata! revelations as the result of his bringing a libel action against the marquis of Oaeensherry; and at the Old Bailey, in. May, Wilde was sentenced to two years' imprisonment with hard labour for offences under the Criminal Law Amend- ment Act. It was a melancholy end to what might have been a singularly brilliant career. Even after leaving prison he was necessarily an outcast from decent circles, and he lived mainly on the Continent, under the name of " Sebastian Melmoth." He died in Paris on the 30th of November 1900. In 1898 he published his powerful Ballad of Reading Gaol. His Collected Poems, containing some beautiful verse, had been issued in 1892. While in prison he wrote an apology for his life which was placed in the hands of his executor and published in 1905. The manuscripts of A Florentine Tragedy and an essay on Shakespeare's sonnets were stolen from his house in 1895. In 1904 a five-act tragedy, The Duchess of Padua, written by Wilde about 1883 for Mary Anderson, but not acted by her, was pub- lished in a German translation (Die Hcrzogin von Padua, trans- lated by Max Meyerfeld) in Berlin. It is still impossible to take a purely objective view of Oscar Wilde's work.. The Old Bailey revelations removed all doubt as to the essential un-healthincss of his personal influence; but his literary genius was none the less remarkable, and his plays were perhaps the most original contributions to English dramatic writing during the period. (H. Ch.)

WILDENBRUCH, ERNST VON (1845-1909), German poet and dramatist, was born on the 3rd of February 1845 at Beyrout in Syria, the son of the Prussian consul-general. Having passed his early years at Athens and Constantinople, where his father was attached to the Prussian legation, he came in 1857 to Germany, received his early schooling at the Padagogium at Halle and the Franxosische Gymnasium in Berlin, and, after passing through the Cadet school, became, in 1863, an officer in the Prussian army. He abandoned the military career two years later, but was recalled to the colours in 1866 for the war with Austria. He next studied law at the university of Berlin, and again served in the army during the Franco-Prussian War, 1S70-71. In 1876 Wildenbruch was attached to the foreign office, which he finally quitted in 1900 with the title of counsellor of legation. He achieved his first literary successes with the epics Vionviile

(1874) and Sedan (1875). After publishing a volume of poems, Licder und Balladen (Berl., 1877; 7th ed., 1900), he produced, in 1882, the tragedy, Die Karolinger. Among his chief dramas may be mentioned the tragedy Harold (1S82); Die Quitzows (1888); Der Generalfddoberst (1889); Die Hauben- lerche (1891); Heinrich und Ileinrichs Geschlecht (1895); Die Tochter des Erasmus (1900) ; and Konig Laurin (1902). Wilden- bruch was twice (in 1S84 and 1896) awarded the Schiller prize, and was, in 1892, created a doctor of philosophy honoris causa by the university of Jena. He also wrote several volumes of short stories (Novellen, 1883; Neue Novetten, 1885; Tiefe Wasser, 1S97, &c.). He died on the 15th of January 1909.

Cf. B. Litzmann, Das deulsche Drama in den Bewegungen der Gegenwart (1S94; 4th ed., 1S97); H. Bulthaupt, Dramaturgic des Schauspiels, vol. iv. (1901).

WILDERNESS, a large forest in Spottsylvania county, Virginia, U.S.A., on the S, bank of the Rapidan, extending from Mine Run on the E. to Chancellorsville on the W. It is famous in military history for the battles of Chancellorsville (1863) and Wilderness (1864) during the American Civil War.

Chancellorsville. — In May 1863 a three days' battle was fought

at Chancellorsville between the Army of the Potomac, under General J. Hooker, and General Lee's Army of Northern Virginia, which had stemmed the tide of invasion in the East by taking up a defensive position along the right or south bank of the Rappahannock. General Burnside had suffered a severe repulse in front of the Confederate position at Fredericksburg in December 1862, and his successor resolved to adopt the alterna- tive plan of turning Lee's flank and so gaining the road to Richmond. General Lee had meanwhile weakened his forces by detaching Longstreet's two divisions and the cavalry brigades of Hampton, Robertson and Jones. Hooker had now at his disposal 1 2, 000 cavalry, 400 guns and 120,000 infantry and artillery, organized in seven corps (I. Reynolds, II. Couch, HI. Sickles, V. Meade, VI. Sedgwick, XI. Howard, XII. Slocum). Geneial Lee counted only 45,000 men of all arms effective. Hooker detached to.,ooo cavalry under Stoneman and Sedg- wick's corps (30,000) to demonstrate on his flanks along the Rapidan and at Fredericksburg, while with the remainder he moved up the Rappahannock and crossed that river and after- wards the Rapidan and on the 30th of April fixed his head- quarters at Chancellorsville, a farmhouse in the Wilderness. Lee's cavalry under Stuart had duly reported the Federal movements and Lee called up " Stonewall " Jackson's four divisions from below the Massaponax as soon as Sedgwick's corps crossed the river at Fredericksburg. At Chancellorsville Anderson's

division was in position, and McLaws was sent to support him, while Jackson took three divisions to the same point, leaving Early's division to observe Sedgwick. Hooker had cleared and entrenched a position in the forest, inviting attack from the E. or S. General Lee, however, discovered a route by which the Federals might be attacked from the N. and W r ., and Jackson was instructed to execute the turning movement and fall upon them. As soon as a brigade of cavalry was placed at his disposal Jackson marched westward with his corps of 22,000 men and by a detour of 15 m. gained the Federal right flank, while Anderson and McLaws with 20 guns and 12,000 men demonstrated in front of Hooker's army and so kept oo ; ooo men idle behind their earthworks. One of Stuart's cavalry brigades neutralized Stoneman's 10,000 horsemen. Sedgwick was being contained by Early. Jackson's attack surprised the Federals, who fled in panic at nightfall, but Jackson was mortally wounded. Next day the attack was resumed under the direction of Stuart, who was reinforced by Anderson, while McLaws now threatened the left flank of the Federals and Fitz Lee's cavalry brigade operated against their line of retreat. Hooker finally gained the shelter of an inner line of works covering the ford by which he must retreat. Meanwhile, Early had checked Sedgwick, but when at last the Federal corps was about to overwhelm the Confederate division Lee came to succour it. Then Sedgwick was assailed by Early, McLaws and Anderson, and driven over the Rappahannock to join the re- mainder of Hooker's beaten army, which had recrossed the Rapidan on the 5th of May and marched back to Falmouth. Phisterer's Record states that the Federal loss was 16,000 and that of the Confederates 12,000 men.

See A. C. Hamlin, Chancellorsville; G. F. R. Henderson, Stonewall

Jackson; A. Doubleday, Chancellorsville and Gettysburg, Battles and Leaders of the Civil War and Official Records of the War of Secession.

(G. W. R.)

Grant's Campaign of the Wilderness and Cold Harbor. — On the evening of the 3rd of May 1864, after dark, the Army of the Potomac, commanded by Major-Genefal G. G. Meade and consisting of the II., V. and VI., and Cavalry corps, left its winter quarters about Culpeper to manoeuvre across the Rapidan with a view to fighting a battle at or near New Hope Church and Craig's Church. The army, and the IX. corps (Burnside), which was an independent command, were directed by Lieute-n ant General Grant, the newly appointed commander of the armies of the United States, who accompanied Meade's head quarters. The opposing Army of Northern Virginia under General R. E. Lee lay in quarters around Orange Court House (A. P. Hill's corps), Verdiersville (Ewell's corps) and Gordonsville

(Longstreet's corps). The respective numbers were: Army of the Potomac, 98,000; IX. corps, 22,000; Army of Northern Virginia rather less than 70,000.

The crossing of the Rapidan was made at Germamia and Ely's Fords, out of reach of Lee's interference, and in a few hours the two ieading corps had reached their halting-places —V., Wilder- ness Tavern; and II., Chancellorsville. The VI. followed the V. and halted south of Germanna Ford. Two of the three divisions of cavalry preceded the march, and scouted to the front and flanks. Controversy has arisen as to whether the early halt of the Union army in the midst of the Wilderness was not a serious

Grant's intention of avoiding a battle until he was clear of the Wilderness was not achieved, for Confederate infantry appeared on the Orange Turnpike east of Mine Run, where on his own initiative Warren had posted a division of the V. corps overnight as ilank-guard, and some cavalry, judiciously left behind by Wilson at Parker's Store, became engaged a little later with hostile forces on the Orange Plank Road. This led to the suspension of the whole manoeuvre towards Lee's right rear. The first idea of the Union headquarters was that Lee was falling back to the North Anna, covered by a bold rear- guard, which Grant and Meade arranged to cut off and destroy

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error of judgment. The reason assigned was the necessity of protecting an enormous wagon train, carrying 15 days' supplies for the whole army, that was crossing after the II. corps at Ely's Ford. Burnside's corps was far to the rear when the advance began, but by making forced marches it was able to reach Germanna Ford during the 5t.I1 of May. On that day the manoeuvre towards Craig's Church was resumed at 5 a.m., Wilson's cavalry division moving from Parker's Store south- ward, the V. corps (Warren) moving from Wilderness Tavern towards Parker's Store, followed by the VI. under Sedgwick, the II. from Chancellorsville by way of Todd's Tavern towards Shady Grove Church. Of the other cavalry divisions, Gregg's went towards Fredericksburg (near where the Confederate cavalry corps had been reported) and Torbert's (which had acted as rearguard and watched the upper Rapidan during the first day's march) was not yet across the river.

by a convergent attack of Warren and Sedgwick. But the appearance of infantry on the Plank Road as well as the Pike had shown that Lee intended to fight in the Wilderness, and Hancock (II. corps) wa.s called in from Todd's Tavern, while one division (Getty's) of the VI. was hurried to the intersection of the Brock and Plank roads to hold that point until Hancock's arrival. Getty arrived just in time, for Confederate skirmisher! were found dead and wounded only 30 yds. from the cross toads.. The division then formed up to await Hancock's arrival up the Brock Road, practically unmolested, for Lee had only two ol his corps on the ground (Hill on the Plank Road, Ewell on thi Pike), and did not desire to force a decision .until Longstreet's distant corps should arrive.

Meanwhile Warren had been slowly forming up his attacking line with great difficulty in. the woods. Grant appears to have used bitter words to Meade on the subject of Warren's delays,

and Meade passed these on to Warren, who in turn forced his subordinates into premature action. In the end, about noon, Griffin's division of Warren's corps attacked directly along the Pike and crushed the enemy's first line, but, unsupported by the VI. corps on the right and Wadsworth's division (V. corps) on the left, both of which units were still groping their way for- ward in the woods, was forced back with heavy losses. Wadsworth took a wrong direction in the woods and presented himself as an easy victim to Ewell's right, soon after Griffin's repulse. The VI. corps advanced later in the day on Warren's right, but was only partially engaged. The result of the attack on Ewell was thus completely unsatisfactory, and for the rest of the battle the V. and VI. corps were used principally as reser- voirs to find supports for the offensive wing under Hancock, who arrived on the Plank Road about 2 p.m.

Hancock's divisions, as they came up, entrenched themselves along 1 he. Brock Road. In the afternoon he was ordered to attack whatever force of the enemy was on the Plank Road in front or! him, but was unwilling to do so until he had his forces well in hand. Finally Getty was ordered to attack " whether Hancock was ready or not." This may have been an attempt to force Hancock's hand by an appeal to his soldierly honour, and as a fact he did not leave Getty unsupported. But the dis- jointed attacks of the II. corps on Hill's entrenchments, while forcing the Confederates to the verge of ruin, were not as success- ful as the preponderance of force on the Union side ought to have ensured. For four hours the two lines of battle were fighting 50 yds. apart, until at nightfall the contest was given up through

mutual exhaustion.

The battle of the 6th was timed to begin at 5 a.m. and Grant's attack was wholly directed on Parker's Store, with the object of crushing Hill before Longstreet could assist him. If Longstreet, instead of helping Hill, were to attack the extreme Union left, so much the better; but the far more probable course for him to take was to support Hill on or north of the Plank Road, and Grant not only ordered Hancock with six of the eleven divisions of Meade's army to attack towards Parker's Store, but sent his own " mass of manoeuvre " (the IX. corps) thither in such a wa v as to strike Hill's left. The cavalry was drawn back for the protection of the trains, 1 for " every musket " was required in the ranks of the infantry. Warren and Sedgwick were to hold Ewell occupied on the Pike by vigorous attacks. At 5 o'clock Hancock advanced, drove back and broke up Hill's divisions, ;ind on his right Wadsworth attacked their left rear. But after an hour's wood fighting the Union attack came to a standstill, and at this moment, the critical moment for the action of the IX. corps, Burnside was still more than a mile away, having scarcely passed through Warren's lines into the woods. Then Longst reel's corps, pushing its way in two columns of fours ihrough Hill's retreating groups, attacked Hancock with the greatest fury, and forced him back some hundreds of yards. Rut the woods broke the force of this attack too, and by 7.30 ihe battle had become a stationary fire-fight. After an interval in which both sides rallied their confused masses, Longstreet attacked again and gained more ground. Persistent-rumours came into the Union headquarters of a Confederate advance against the Union left rear, and when Grant realized the situation he broke off one of Burnside's divisions from the IX. corps column and sent it to the cross roads as direct reserve to Hancock. At this moment the battle took a very unfavourable turn on the Plank Road. Longstreet had sent four brigades of infantry by a detour through the woods south of the Plank Road to attack Hancock's left. This was very effective, and the Union troops were hustled back to the cross-roads. But Longstreet, like Jackson a year before in these woods, was wounded by his own men at the critical moment and the battle again came to a standstill (2-2.30 P.M.).

Burnside's corps, arriving shortly before 10 A.M. near Chewn-

1 Wilson's division, in its movement on Shady Grove Church on rhe 5th, had been cut off by the enemy's advance on the Plank Road and attacked by some Confederate cavalry. Rut it extricated itself and joined Gregg, who had been sent to assist him, at Todd's Tavern.

ing's house, the position whence it was to have attacked Hill's left in the early morning, was about to attack, in ignorance of Hancock's repulse, when fortunately an order reached it to suspend the advance and to make

its way through the woods towards Hancock's right. This dangerous flank march, screened by the woods, was completed by 2 p.m., and General Burnside began an attack upon the left of Longstreet's command (R. H. Anderson's fresh division of Hill's corps). But Hancock being in no condition to support the IX. corps, the whole attack was, at 3 p.m., postponed by Grant's order until 6 p.m. Thus there was a long respite for both sides, varied only by a little skirmish- ing. But Lee was determined, as always, to have the last word, and about 4.15-4.30 a fierce assault was delivered amidst the burning woods upon Hancock's entrenchments along the Brock Road. For a moment, aided by the dense smoke, the Con- federates seized and held the first line of works, but a counter- stroke dislodged them. Burnside, though not expecting to have to attack before 6, put into the fight such of his troops as were ready, and at 5.30 or thereabouts the assaulting line receded into the woods. Grant cancelled his order to attack at 6, and at the decisive point the battle was at an end. But on the extreme right of the Union arjny a sudden attack was delivered at sunset upon the hitherto unmolested VI. corps, by Gordon, one of Ewell's brigadiers. This carried off two generals and several hundred prisoners, and a panic ensued which affected all the Union forces on the Pike, and was not quieted until after nightfall.

Lee, therefore, had the last word on both flanks, but in spite of this and of the very heavy losses, 2 Grant had already resolved to go on, instead of going back like his various predecessors. To him, indeed, the battle of the Wilderness was a victory, an indecisive victory indeed, but one that had given him a moral superiority which he did not intend to forfeit. His scheme, drafted early on the morning of the 7th, was for the army to march to Spottsylvania on the night of the 7th-8th, to assemble there on the 8th, and thence to undertake a fresh manoeuvre against Lee's right rear on the 9th. This movement required the trains with the fighting line to be cleared away from the roads needed for the troops at once, and Lee promptly discovered that a movement was in progress. He mistook its object, however, and assuming that Grant was falling back on Fredericksburg, he prepared to shift his own forces to the south of that place so as to bar the Richmond road. This led to a race for Spott- sylvania, which was decided more by accidents to cither side than by the measures of the two commanding generals. On the TJnion side Warren was to move to the line Spottsylvania Court House-Todd's Tavern, followed by Hancock; Sedgwick was to take a roundabout route and to come in between the V. and II. corps; Burnside to follow Sedgwick. The cavalry was ordered to watch the approaches towards the right of the army. The movement began promptly after nightfall on the 7th. But ere long the head of Warren's column, passing in rear of Han- cock's line of battle, was blocked by the headquarters escort of Grant and Meade. Next, the head of

the V. corps was again checked at Todd's Tavern by two cavalry divisions which had been sent by Sheridan to regain the ground at Todd's Tavern, 3 given up on the 6th, and after fighting the action of Todd's Tavern had received no further orders from him. Meade, greatly irritated, ordered Gregg's division out towards Corbin's Bridge and Merritt's (Torbert's) to Spottsylvania. On the latter road the Union cavalry found themselves opposed by Fitz Lee's cavalry, and after some hours of disheartening work in the woods, Merritt asked Warren to send forward infantry to drive the enemy. This Warren did, although he was just preparing to rest and to feed his men after their exhausting night-march. Robinson's division at the head of the corps deployed and swiftly drove in Fitz Lee. A little beyond Alsop's, however, Robinson found his path barred by entrenched infantry. This was part

" The Union losses in the battle were 18,000, the Confederates at least 11,500.

' In consequence of a mistaken order that the trains which he was protecting were to move forward to Piney Branch Church.

of Anderson's (Longstreet's) corps. That officer had been ordered to draw out of his (Wilderness) works, and to bivouac, preparatory to marching at 3 a.m. to the Court House, but, finding no good resting-place, he had moved on at once. His route took him to the Catharpin Road (Hampton's cavalry protecting him towards Todd's Tavern), and thence over Corbin's Bridge to Block House Bridge. At or near Block House Bridge the corps halted to rest, but Stuart (who was with Fitz Lee) called upon Anderson for assistance and the march was resumed at full speed. Sheridan's new orders to Gregg and Merritt did not arrive until Meade had given these officers other instruc- tions, but Wilson's cavalry division, which was out of the line of march of the infantry, acted in accordance with Sheridan's plan of occupying the bridges in front of the army's intended position at Spottsylvania Court House, and seized that place, inflicting a smart blow upon a brigade of Stuart's force that was met there.

The situation about 9 a.m. on the 8th was therefore curious. Warren, facing E., and opposed by part of Anderson's corps, was seeking to right his way to Spottsylvania Court House by the Brock Road. Wilson, facing S., was holding the Court House and driving Fitz Lee's cavalry partly westward on to the backs of the infantry opposing Warren, partly towards Block House Bridge, whence the rest of Anderson's infantry was

approaching. All the troops were weary and hungry, and Sheridan ordered Wilson to evacuate the Court House and to fall back over the Ny. Warren fruitlessly attacked the Con- federate infantry at Spindler's, General Robinson being severely wounded, and his division disorganized. The other divisions came up by degrees, and another attack was made about 11. It was pressed close up to, and in some places over, the Con- federate log-works, but it ended in failure like the first. A third attempt in the evening dwindled down to a reconnaissance in force. Anderson was no longer isolated. Early's division ob- served Hancock's corps at Todd's Tavern, but the rest of Eweli's and all Hill's corps went to Spottsylvania and prolonged Ander- son's line northward towards the Ny. Thus the re-grouping of the Union army for manoeuvre, and even the running light or strategic pursuit imagined by Grant when he found Anderson at Spottsylvania, were given up, and on the 9th both armies rested. On this day General Sedgwick was killed by a long- range shot from a Confederate rifle. His place was taken by General H. G. Wright. On this day also a violent quarrel between Meade and Sheridan led to the departure of the cavalry corps on an independent mission. This was the so-called Richmond raid, in which Sheridan defeated Stuart at Yellow Tavern (where Stuart was killed) and captured the outworks of Richmond, but, having started with empty forage wagons, 1 had then to make his way down the Chickahominy to the nearest supply depots cf the Army of the James, leaving the Confederate cavalry free to rally and to rejoin Lee.

Finding the enemy thus gathered in his front, Grant decided to fight again on. the 10th. While Hancock opposed Early, and Warren and Wright Hill and Anderson, Burnside was ordered by Grant to work his way to the Frcdericksburg-Spottsylvania road, thence to attack the enemy's right rear. The first stage of this movement of the IX. corps was to be made on the 9th, but not the attack itself, and Burnside was consequently ordered not to go beyond a place called " Gate " on the maps used by the Union staff. This, it turned out, was not the farm of a person called Gate, as headquarters supposed, but a mere gate into a field. Consequently it was missed, and the IX. corps went on to Gale's or Gayle's house, where the enemy's skirmishers were driven in, 2 The news of an enemy opposing Burnside at " Gate," which Grant still supposed to be the position of the IX. corps, at once radically altered the plan of battle. Lee was presumed

1 Owing to the circumstances of his departure, the angry army staff told him to move out at once with the forage that he had, and Sheridan, though the army reserve supplies were at hand, made no attempt to fill up from them.

• A Further source of confusion, for the historian at least, is that on the survey maps made in 1867 this " Gayle " is called " Beverly " (see map

II.).

to be moving north towards Fredericksburg, and Grant saw an opportunity of a great and decisive success. The IX. corps was ordered to hold its position at all costs, and the others were to follow up the enemy as he concentrated upon Burnside. Hancock was called in from Todd's Tavern, sent down to force the fords of the Po at and below Tinder's Mill, and directed upon Block House Bridge by an officer of Grant's own staff, while Warren and Wright were held ready. But once more a handful of cavalry in the woods delayed the effective deployment of the moving wing, and by the time that the II. corps was collected opposite Block House Bridge it was already night. Still there was, apparently, no diminution of force opposite Burnside, and Hancock was ordered to resume bis advance at early dawn on the 10th.

Meade, however, had little or no cognizance of Grant's orders to the independent IX. corps, and his orders, conflicting with those emanating from the Lieu tenant General's staff, puzzled Hancock and crippled his advance. At 10 the whole scheme was given up, and the now widely deployed Union army closed on its centre as best it could for a direct attack on the Spott sylvania position. At 4, before the new concentration was complete, and while Hancock was still engaged in the difficult operation of drawing back over the Po in the face of the enemy, Warren attacked unsupported and was repulsed. In the woods on the left Wright was more successful, and at 6 p. 11. a rush of twelve selected regiments under Colonel Emory Upton carried the right of Lee's log-works. But for want of support this attack too was fruitless, though Upton held the captured works for an hour and brought off 1000 prisoners. Burnside, receiving Grant's new orders to attack from Gayle's towards Spottsylvania, sent for further orders as to the method of attack, and his advance was thus made too late in the day to be of use. Lee had again averted disaster, this time by his magnificent handling of his only reserve, Hill's (now Early's) corps, which he used first against Hancock and then against Burnside with the greatest effect.

This was the fourth battle since the evening of the 4th of May. On the morning of the nth Grant sent his famous message to Washington, " I purpose to fight it out on this line if it takes all summer." The 12th was to be the fifth and, Grant hoped, the decisive battle. A maze of useful and useless entrench- ments had been constructed on both sides, especially on the Union side, from mere force of habit. Grant, seeing from the experience of the 10th that his corps commanders were manning these entrenchments so strongly that they had only feeble forces disposable for the attack, ordered all superfluous defences to be given up. Three corps were formed in a connected line (from right to left, V., VI., IX.) during the nth, and that

night the II. corps moved silently to a position between Wright and Burnside and formed up in the open field at Brown's in an attacking mass of Napoleonic density — three lines of divisions, in line and in battalion and brigade columns. Burnside was to attack from Gayle's (Beverly's on the map) towards McCool's. Warren and Wright were to have at least one division each clear of their entrenchments and ready to move.

Up to the nth Lee's line had extended from the woods in front of Block House Bridge, through Perry's and Spindler's fields to McCool's house, and its right was refused and formed a loop round McCool's. All these works faced N.W. In addi- tion, Burnside's advance had caused Early's corps to entrench Spottsylvania and the church to the south of it, facing E. Between these two sections were woods. The connexion made between them gave the loop around McCool's the appearance from which it derives its historic name of The Salient. Upon the northern face of this Salient Hancock's attack was delivered.

On the nth the abandonment of Burnside's threatening advance on his rear and other indices had disquieted Lee as to his left or Block House flank, and he had drawn off practically all Eweli's artillery from the McCool works to aid in that quarter. The infantry that manned the Salient was what remained oi Stonewall Jackson's " foot cavalry," veterans of Antietam Fredericksburg and Chanceilorsvilfe. But at 4.35, in the mist Hancock's mass swept over their works at the first rush anc swarmed in the interior of the Salient, gathering thousands

prisoners and seizing the field batteries that Lee had sent back just too late.

The thronging and excited Federals were completely dis- ordered by success, and the counter-attack of one or two Con- federate brigades in good order drove them back to the line of the captured works. Then, about 6, there began one of the most remarkable struggles in history. While Early, swiftly drawing back from Block House, checked Burnside's attack from the east, and Anderson, attacked again and again by parts of the V. corps, 1 was fully occupied in preserving his own front, Lee, with Ewell's corps and the few thousand men whom the other

time came, Lee succeeded so well that after twenty hours' bitter fighting the new line was ready and the Confederates gave up the barren prize to Hancock. Lee had lost 4000 prisoners as well as 4500 killed and wounded, as against 7000 in the Army of the Potomac and the IX. corps.

There were other battles in front of Spottsylvania, but that of the 12th was the climax. From the 13th to the 20th the Federals gradually worked round from west to east, delivering a few partial attacks in the vain hope of discovering a weak point. Lee's position, now semicircular, enabled him to con- centrate on interior lines on each occasion. In the end the

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generals could spare, delivered all day a series of fierce counter- strokes against Hancock. Nearly all Wright's corps and even part of Warren's (in the end 45,000 men) were drawn into the fight at the Salient, for Grant and Meade well knew that Lee was struggling to gain time for the construction of a retrench- ment across the base of it. If the counter-attacks failed to gain this respite, the Confederates would have to retreat as best they could, pressed in front and flank. But the initial superi- ority of the Federals was neutralized by their disorder, and, keeping the fight alive by successive brigade attacks, while the troops not actually employed were held out of danger till their

1 The tension was so great that, after threatening to deprive Warren of his command, Meade sent General Humphreys, his chief of staff, to direct the V. corps' attack.

Federals were entrenched facing E. between Beverly's house (Burnside's old " Gayle ") and Quisenberry's, Lee facing W, from the new works south of Harrison's through the Court House to Snell's Bridge on the Po. In the fork of the Po and the Ny, with woods and marshes to obstruct every movement, Grant knew that nothing could be done, and he prepared to execute a new manoeuvre. But here, as in the Wilderness, Lee managed to have the last word. While the Union army was resting in camp fc" the first time since leaving Culpepcr, F.well's corps suddenly attacked its baggage-train near Harris's house. The Confederates were driven off, but Grant had to defer his intended manoeuvre for two days. When the armies left Spottsylvania, little more than a fortnight after breaking up from winter quarters, the casualties had reached the totals of 35,000 out of

an original total of 120,000 for the Union army, 36,000 out of 70,000 for the Confederates.

The next manoeuvre attempted by Grant to bring Lee's army to action " outside works " was of an unusual character, though it had been

foreshadowed in the improvised plan of crushing Lee against Burnside's corps on the 9th. Hancock was now (20th) ordered to move off under cover of night to Milford; thence he was to march south-west as far as possible along the Richmond and Fredericksburg railroad, and to attack whatever

NORTH ANNA

Positions about 3a.m. on May 221

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force of the enemy he met. It was hoped that this bold stroke by an isolated corps would draw Lee's army upon it, and the rest of the Army of the Potomac would, if this hope were realized, drive down upon Lee's rear while Hancock held him up in front. Supposing, however, that Lee did not take the bait, the man- oeuvre would resolve itself into a turning movement with the object of compelling Lee to come out of his Spottsylvania lines on pain of being surrounded.

The II. corps started on the night of the 2oth-2ist. The alarm was soon given. At Milford, where he forced the passage of the Mattapony, Hancock found himself in the presence of hostile infantry from Richmond and heard that more had

arrived at Hanover Junction, both from Richmond and from the Shenandoah Valley. He therefore suspended his advance and entrenched. The main army began to move off, after giving Lee time to turn against Hancock, at 10 a.m. on the 21st, and marched to Catlett's, a place a few miles S.W. of Guinea's bridge, Warren leading, Burnside and Wright following. But no news came in from Hancock until late in the evening, and the development of the manoeuvre was consequently delayed, so that on the night of the 2ist-22nd Lee's army slipped across Warren's front en routs for Hanover Junction. The other Confederate forces that had opposed Hancock likewise fell back. Grant's manceuvre had failed. Its principal aim was to induce Lee to attack the II. corps at Milford, its secondary and alternative purpose was, by dislodging Lee from Spott- sylvania, to force on an en- counter battle in open ground. But he was only offered the bait — not compelled to take it, as he would have been if Hancock with two corps had been placed directly athwart the road between Spottsylvania and Hanover Junction — and, having unimpaired freedom of action, he chose to retreat to the Junction. The four Union corps, therefore, could only pursue him to the North Anna, at which river they arrived on the morn- ing of the 23rd, Warren on the right, Hancock ' on the left, Wright and

Burnside being well to the rear in second line. The same afternoon Warren seized Jericho Ford, brought over the V. corps to the south side, and repulsed a very sharp counter- stroke made by one of Lee's corps. Hancock at the same time stormed a Confederate re- doubt which covered the Tele- graph Road bridge over the river. Wright and Burnside closed up. It seemed as if a battle was at hand, but in the night reports came in that Lee had fallen back to the South Anna, and as these were more or less confirmed by the fact that Warren met with no further opposition, and by the enemy's retirement from the river bank on Hancock's front, the Union generals gave orders, about midday on the 24th, for what w r as practically a general pursuit. This led incidentally to an attempt to drive Lee's rearguard away from the point of passage, between Warren's and Hancock's, required for Burnside, and in the course of this it became apparent that Lee's army had not fallen back, but was posted in a semicircle to which the North Anna formed a tangent. On the morning of the 25th this position was reconnoitred, and found to he more formidable than that of Spottsylvania. Moreover, it divided the two halves of the Union army that had crossed above and below.

Grant gave up the game as drawn and planned a new move. This had as its objects, first, the seizure of a point of passage

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on the Pamunkey; secondly, the deployment of the Army of the Potomac and of a contingent expected from the Armyof the James, and thirdly, the prevention of Lee's further retire- ment, which was not desired by the Union commanders, owing to the proximity of the Richmond defences and the consequent want of room to manoeuvre. On the 27th Sheridan's cavalry and a light division of infantry passed the Pamunkey at Hanover Town, and the two divided wings of the Army of the Potomac were withdrawn over the North Anna without mishap — thanks to exactitude in arrangement and punctuality in execution. On the 28th the Army of the Potomac had arrived near Hanover Town, while at Hawes's Shop, on the road to Richmond, Sheridan

and anvil battle was again taken up, the " anvil " being Smith's XVIII. corps, which had come up from the James river to White House on the 30th; but once more the lure failed because it was not made sufficiently tempting.

The last episode of the campaign centred on Cold Harbor, a village close to the Chickahominy, which Sheridan's cavalry seized, on its own initiative, on the 31st. Here, contrary to the expectation of the Union staff, a considerable force of Confederate infantry — new arrivals from the James — was met, and in the hope of bringing on a battle before either side had time to entrench, Grant and Meade ordered Sheridan to hold the village at all costs, and directed Wright's (VI.) corps from the

TOT0P0T0MOY AND COLD HARBOR,

positions May26

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had a severe engagement with the enemy's cavalry. Lee was now approaching from Hanover Junction via Ashland, and the Army of the Potomac swung round somewhat to the right so as to face in the presumed direction of the impending attack. The Confederate general, however, instead of attacking, swerved south, and planted himself behind the Totopotomoy. Here he was discovered, entrenched as always, on the 29th, and skirmishing all along the line, varied at times by more severe righting, occupied that day and the 30th. On the morning of the 31st the Union army was arranged from right to left in the order VI., II., IX. and V. corps, Sheridan having meantime drawn off to the left rear of the infantry.

Now, for the last time in the campaign, the idea of a hammer

extreme right ving, and Smith's (XVIII.) from Old Church, to march thither with all possible speed, Wright in the night of the 31st of May and Smith on the morning of the 1st of June. Lee had actually ordered his corps commanders to attack, but was too ill to enforce his wishes, and in the evening Wright and Smith themselves assaulted the Confederate front opposite Cold Harbor. The assault, though delivered by tired men, was successful. The enemy's first or skirmish line was everywhere stormed, and parts of the VI. corps even penetrated the main line. Nearly 800 prisoners were taken, and Grant at once pre- pared to renew the attack, as at Spottsylvania, with larger forces, bringing Hancock over from the right of the line on the night of the 1st, and ordering Hancock, Wright and Smith to

a&sault on the next morning. But Lee had by now moved more forces down, and his line extended from the Totopotomoy to the Chickahominy.

*Hancock's corps, very greatly fatigued by its night march, did not form up until after midday, and meanwhile Smith, whose corps, originally but 10,000 strong, had been severely tried by its hard marching and righting on the ist, refused to consider the idea of renewing the attack. The passive resistance thus encountered dominated Grant's fighting instinct for a moment. But after reconsidering the problem he again ordered the attack to be made by Wright, Smith and Hancock at 5 p.m. A last modification was made when, during the afternoon, Lee's far distant left wing attacked Buxnside and Warren. This, showing that Lee had still a considerable force to the northward, and being, not very inaccurately, read to mean that the 6 m. of Confederate entrenchments were equally — i.e. equally thinly — guarded at all points, led to the order being given to all five Union corps to attack at 4-30 a.m. on the 3rd of June. *<.*

The resolution to make this plain, unvarnished frontal assault on entrenchments has been as severely criticized as any action of any commander in the Civil War, and Grant himself subse- quently expressed his regret at having formed it. But such criticisms derive all their force from the event, not from the conditions in which, beforehand, the resolution was made. The risks of failure were deliberately accepted, and the battle — if it can be ca!led a battle — was fought as ordered. The assault was made at the time arranged and was repulsed at all points, with a loss to the assailants of about 8000 men. Thereafter the two armies lay for ten days less than a hundred yards apart. There was more or less severe fighting at times, and an almost ceaseless bickering of skirmishers. Owing to Grant's refusal to sue for permission to remove his dead and wounded in the terms demanded, Lee turned back the Federal ambulance parties, and many wounded were left to die between the lines. It was only on the 7th that Grant pocketed his feelings and the dead were buried.

This is one of the many incidents of ("old Harbor that must always rouse painful memories -though to blame Lee or ■Grant supposes that these great generals were infinitely more inhuman here than at any other occasion in their lives, and takes no account of the consequences of admitting a defeat at this critical moment, when the causes for which the Union army and people contended were about to be put to the hazard of a presidential election.

The Federal army lost, in this month of almost incessant campaigning, about 50,000 men, the Confederates about 3?, 000. Though the aggregate of the Union losses awed both contem- poraries and historians of a later generation, proportionately the losses of the South were heavier (46% of the original strength as compared with 41% on the Union side), and whereas within a few weeks Grant was able to replace nearly every man he had lost by a new. recruit, the Confederate government was almost at the

end of its resources.

See A. A. Humphreys, The Campaign of Virginia, 1864-65 (New York, 1882); Military History Society of Massachusetts, The Wilderness Campaign ; Official Records oftke Rebellion, serial numbers 67, 68 and 69; and C. F. Atkinson, The Wilderness and Cold Harbor (London, 1908). (C. F.A.)

WILDMAN, SIR JOHN (c. 1621-1693), English agitator, was educated at the university of Cambridge, and during the Civil War served for a short time under Sir Thomas Fairfax. He became prominent, however, not as a soldier but as an agitator, being in 1647 one of the leaders of that section of the army which objected to all compromise with the king. In a pamphlet, Putney Projects, he attacked Cromwell; he was responsible for The Case of the Army stated, and he put the views of his associ- ates before the council of the army at a meeting in Putney church in October 1647. The authorities looked upon him with suspicion, and in January 1648 he and John Lilburne were imprisoned, preparations, says Clarendon, being made " for bis trial and towards his execution." However, he was released in the following August, and for a time he was associated with the

party known as the levellers, but he quickly severed his connexion with them and became an officer in the army. He was a large buyer of the land forfeited by the royalists, and in 1654 he was sent to the House of Commons as member for Scarborough. In the following year he was arrested for con- spiring against Cromwell, and after his release four months later he resumed the career of plotting, intriguing alike with royalists and republicans for the overthrow of the existing regime. In 1659 he helped to seize Windsor castle for the Long Parliament, and then in November 1661 he was again a prisoner on some suspicion of participating in republican plots. For six years he was a captive, oidy regaining his freedom after the fall of Clarendon in October 1667.

In or before 1681 Wildman became prominent among those who were discontented with the rule of Charles II., being especially intimate with Algernon Sydney. He was undoubtedly concerned in the Rye House Plot, and under James II. he was active in the interests of the duke of Monmouth, but owing to some disagreements, or perhaps to his cowardice, he took no part in the rising of 1685. He found it advisable, however, to escape to Holland, and returned to England with the army of William of Orange in 1688. In 1689 he was a member of the convention parliament.

Wildman was postmaster – general from April 1689 to February idgr, when some ugly rumours about his con- duct brought about his dismissal. Nevertheless, he was knighted by William III. in 1692, and he died on the

2nd of June 1693. Sir John, who was the author of many political pamphlets, left an only son, John, who died childless in

1710.

WILES, IRVING RAMSAY (1861-), American artist, was born at Utica, New. York, on the 8th of April 1 861. He studied under his father, the landscape painter, Lemuel Maynard Wiles (1826-1905), in the Art Students' League, New York, and under Carolus Duran, at Paris. His earlier work was as an illustrator for American magazines, and later he devoted himself with great success to portraiture. He became a full member of the National Academy of Design (1897) and a member of the American Water Color Society.

WILFRID (c. 634-709), English archbishop, was born of good parentage in Northumbria, c. 634. When serving in King Oswio's court, he attracted the notice of the queen, Eanrled, who, foster- ing his inclination for a religious life, placed him under the care of an old noble, Cudda, now a monk at LindisFarne. Later on Fanned enabled him to visit Rome in the company of Benedict Biscop. At Lyons Wilfrid's pleasing features and quick intelli- gence made Annemund, the archbishop, desire to adopt him and marry him to his niece. Resisting his offers, the youth went on to Rome, received the papal benediction, and then, in accordance with his promise, returned to Lyons, where he stayed for three years, till the murder of his patron, whose fate the executioners would not let him share. On his return home, Oswio's son Alchfrid gave him a monastery at Ripon, and, before long, Agilbert, bishop of the Gewissae, or West Saxons, ordained him priest.

He was probably already regarded as the leading exponent of the Roman discipline in England when his speech at the council of Whitby determined the overthrow of the Celtic party (664). About a year later he was consecrated to the see of York, not, however, in England, where perhaps he could not find the fitting number of orthodox prelates, but at Compiegne, Agilbert being now bishop of Paris. On his return journey he narrowly escaped the pagan wreckers of Sussex, and only reached his own country to find Ceadda (St Chad) installed in his see.

The rest of his life is largely a record of wandering and misfortune. For three years (665-668) he ruled his mon- astery at Ripon in peace, though acting as bishop in Mercia and Kent during vacancies in sees there. On Archbishop Theodore's arrival (668) he was restored to his see, and spent in it nine years of ceaseless activity, especially in building churches, only to be driven out through the anger of King Ecgfrith's queen (677).

Theodore now divided Wilfrid's large diocese into three; and the aggrieved prelate went to lay his case before the bishop of Rome. On his way a west wind drove him to Friesland, where he evangelized the natives and prepared the way for Willibrord {q.v.). Late in life he ordained Suidbcrt bishop of the Frisians. A synod held at Rome under Agatho (680) ordained his restitu- tion ; but even this decision could not prevent his being cast into prison on his return home. When released he wandered first to Mercia, then to Wessex and finally to Sussex. Here he rescued the pagan folk from an impending famine, sent preachers to the Isle of Wight and founded a monastery at Selsey. After Ecgfrith's death (20th May 685) Wilfrid was restored to York (much circumscribed), and Ripon (686-687). He was once more driven out in 691-692, and spent seven years in Mercia. A great council of the English Church held in Northurnbria excommunicated him in 702. He again appealed to Rome in person, and obtained another decision in his favour (703-704) . Despite the intercession of Brihwald, archbishop of Canterbury, Aldfrith king of North- urnbria refused to admit the aged prelate into his kingdom till his last illness (705). This year or the next a council was held near the River Nidd, the papal letters were read, and, despite the opposition of the bishops, Wilfrid once mere received the abbeys of Ripon and Hexham. Not long after he died at Oundle in Northamptonshire as he was going on a visit to Ceolrcd, king of Mercia (709). He was buried at Ripon, whence, according to Eadmer. his bones were afterwards removed to Canterbury.

Wilfrid's is a memorable name in English history, not only because of the large part he played in supplanting; the Celtic discipline and in establishing a precedent of appeal to papal authority, but also by reason of his services to architecture and learning. At York he re- newed Paulinus's old church, roofing it with lead and furnishing it with glass windows; at Pipon he built an entirely new basilica with columns and porches ; at Hexham in honour of St Andrew he reared a still nobler church, over which Eddius grows eloquent. In the early days of his bishopric he used to travel about his diocese attended by a little troop of skilled masons. He seems to have also reformed the method of conducting the divine services by the aid of his skilled chanters, /Edde and ˆEona, and to have established or renewed the rule of St Benedict in the monasteries. On each visit to Rome it was his delight to collect relics for his native land; and to his favourite basilica at Ripon he gave a bookcase wrought in gold and precious stones, besides a splendid copy of the Gospels.

Wilfrid's life was written shortly after his death by Eddius at the request of Acca, his successor at Hexham, and Tatbert, abbot of Ripon —both intimate friends of the great bishop. Other lives were written by Frithegode in the 10th, by Folcard in the nth, and by Fadmer early in the 12th century. See also Bede's Hist. Reel, v. 19, iii. 25. iv. 13, &c. All the lives

are printed in J. Raine's Historians of the Church of York, vol. i. " Rolls " series.

WILHELMINA [Wilhelmina Helena Pauline Maria of Orange-Nassau] (1880-), queen of the Nether- lands, was born at the Hague on the 31st of August 1880. Her father, William lit. (Willem Paul Alexander Frederik Lodewijk), had by his first wife, Sophia Frederika Mathilde of Wurttemberg, three sons, all of whom predeceased him. Having been left a widower on the 3rd of June 1877, he married on the 7th of January 1879 Adelheid Emma Wilhelmina Theresia, second daughter of Prince George Victor of Waldeck-Pyrmont, born on the 2nd of August 1858, and Wilhelmina was the only issue of that ifnion. She succeeded to the throne on her father's death, which look place on the 23rd of November 1800, but until her eighteenth year, when she was " inaugurated " at Amsterdam on the 6th of September 1898, the business of the state was carried on under the regency of the queen-mother, in accordance with a law made on the 2nd of August 1884. On the 7th of February 1901 Queen Wilhelmina married Henry Wladimir Albert Ernst, duke of Mecklenburg-Schwerin (born on the 19th of April 1876). To the great joy of the Dutch people, Queen Wilhelmina, on the 30th of April 1909, gave birth to an heir to the throne, the Princess Juliana (Juliana Louise Emma Maria Wilhelmina). (See Holland: History.)

WILHELMINA (Sophia Friderzka Wilhelmina) (1700- 1758), margravine of Baireuth, was born in Berlin on the 3rd of July 1709, the daughter of Frederick William I., crown prince, afterwards king of Prussia, and of Sophia Dorothea, daughter of the elector of Hanover (George 1. of England).

Wilhelmina shared the unhappy childhood of her brother, Frederick the Great, whose friend and confidante she remained, with the exception of one short interval, all her life. Sophia Dorothea wished to marry her daughter to Frederick, prince of Wales, but on the English side there was no disposition to make the offer except in exchange for substantial concessions, to which the king of Prussia was not prepared to assent. The fruitless intrigues carried on by Sophia Dorothea to bring about this match played a large part in Wilhelmina's early life. After much talk of other matches, which came to nothing, she was eventually married in 1731, to Frederick, hereditary prince of Baireuth. The marriage, only accepted by Wilhelmina under threats from her father and with a view to lightening her brother's disgrace, proved at the outset a happy one, though it was clouded at first by narrow means, and afterwards by the infidelities of the future margrave with Dorothea von Marwitz, whose ascendancy at 'the court of Baireuth was bitterly resented by Frederick the Great, and caused an estrangement of some three years between Wilhelmina and the brother she

so devotedly loved. When Wilhelmina's husband came into his inheritance in 1735 the pair set about making Baireuth a miniature Versailles. Their building operations included the rebuilding of their summer residence, the Ermitage, the great Baireuth opera-house, the building of a theatre and the reconstruction of the Baireuth palace and of the new opera house. They also founded the university of Frlangen, the undertakings bringing the court to the verge of bankruptcy.

The margravine made Baireuth one of the intellectual centres of Germany, surrounding herself with a little court of wits and artists which gained added prestige from the occasional visits of Voltaire and Frederick the Great. With the outbreak of the Seven Years' War, Wilhelmina's interests shifted from dilettant- ism to diplomacy. She acted as eyes and ears for her brother in southern Germany until her death on the .rath of October 1758, the day of Frederick's defeat by the Austrians at Hochkirch. Her only daughter Frederica had contracted in 1748 an unhappy marriage with Charles Eugene, duke of Wurttemberg.

The margravine's memoirs, Memoires de ma vie, written or revised between 1748 and her death, are preserved in the Royal Library of Berlin. They were first printed in two forms in 1810 — a German translation down to the year 1 733 from the firm of Cotta of Tubingen ; and in French published by Vieweg of Brunswick, and coming down to 1742. There have been several subsequent editions, including a German one published at Leipzig in 1908. An English translation was published in Berlin in 1904. For the discussion on the authen- ticity of these entertaining, though not very trustworthy, memoirs. see G. H. Pertz, Vber die Merkwiirdigkeiten dcr Markgrajin (1851). See also Arvcde Barine, Princesses et grandes dames (Paris, 1890); E. E. Cut tell, Wilhelmine, Mcrgravine of Baireuth (L/mdon, 2 vols., ic)0=;);"and R. Fester, Die Bayrenther Schwester Friedrichs des Grossen (Berlin, 1902).

WILHELMSHAVEN, or Wilheliisiiafen, a town of Germany, and the chief naval station and war harbour of the empire on the North Sea, situated on the north-west shore of the Jade Busen, a large shallow basin formed by inundations and united with the sea by the Jade, a channel 3 m. long. Pop. (1885), 19,422; (1905), 26,012, of whom S227 belonged to the navy or army. The ground on which it stands (4 sq. m.) was purchased by Prussia from the grand-duke of Oldenburg in 1853,. when the Prussian navy was being formed. The construction of the harbour and town was begun in 1855, and the former was opened in 1869. Though reckoned a part of the Prussian province of Hanover it is completely surrounded on the landward side by Oldenburg territory. The town is laid out on a regular plan and ample scale, and the streets are wide and shaded with trees. The main thoroughfare is the Roonstrasse, which, running E. and W., passes the

market-square, upon which stand the town hall and the post office. There are two Evangelical and two Roman Catholic churches, a gymnasium, schools for warrant officers and engineers and other naval educational institutions. The original harbour, constructed in 1855-1869, consists of an inner and outer basin. To the south-east of the inner harbour a large new harbour has been more recently constructed for war vessels in commission. This so-called new harbour (170

acres in area and 26 ft. deep) is connected by means of a lock (571 ft. long) with the new harbour entrance, which was com- pleted in 1886. On the north it is connected with the fitting-out basin (3832 ft. long, 446 ft. wide), which again is connected by a lock (158 ft. long) with the outer basin (617 ft. long, 410 ft. wide), and so with the old harbour entrance. North of this the " third entrance " has been recently constructed, with two enormous locks, one of which in an emergency coidd be used as an additional dock. On the west side of the fitting-out basin lies the shipbuild- ing basin (1237 ft. long by 742 ft. wide), with three dry-docks (of which two are each 453 ft. long, 85 ft. wide and more than 30 ft. deep, whilst the third is 394 ft. long), and also with two slips of the largest size. Further new docks (each about 617 ft. by 97 ft.), capable of containing large battle-ships, were com- pleted in 1906. A torpedo harbour lies to the south- east of the new harbour. The three entrances to the old and new harbours are sheltered by long and massive moles; and the whole complex of docks, building slips, machine shops, &c, forms the govern- ment dockyard, which is enclosed by a lofty wall with fourteen iron gates. The establishment is defended by strong fortifica- tions. The commercial harbour lies on the south side of the town at the east end of the Ems-Jade canal. The industries of the place are almost exclusively connected with the requirements of the dockyard, and embrace machine shops, iron foundries and boiler works. Wilhelmshaven is visited for its sea-bathing. It possesses depots for artillery and mines, a meteorological observatory and a signalling station. A battalion of marines is stationed here. Since 1900 the development of the naval establishment and of the town has been exceptionally rapid, coincident with the growth of the German navy, and with the shifting of political and naval activity from the Baltic to the North Sea.*

See Ebcrhard, Fukrer durck Wilhelmshaven und seine Umgebung (Wilhelmshaven, 1906) ; L. v. Krohn, Vierzig Jahre in einem deuischen KriegsJuifen (Wilhelmshaven, 1905).

WILKES, CHARLES (1708-1877), American naval officer and explorer,

was born in New York City on the 3rd of April 1708. He entered the United States Navy as a midshipman in 1818, and became a lieutenant in 1826. In 1830 he was placed in charge oF the division of instruments and charts, and in 1838 was appointed to command an exploring and surveying expedi- tion in the Southern Seas, authorized by Congress in 1836. The expedition, including naturalists, botanists, a mineralogist, taxidermists, a philologist, &c, was carried by the sloops-of-war " Vincennes " and " Peacock," the brig " Porpoise," the store- ship " Relief 3? and two tenders. Leaving Hampton Roads on the 18th of August 1838, it stopped at Madeira and "Rio de Janeiro; visited Tierra del Fuego, Chile, Peru, the Paumotu group of the Low Archipelago, the Samoan islands and New South Wales; from Sydney sailed into the Antarctic Ocean in December 1 839 and reported the discovery of an Antarctic continent west of the Ralleny islands; 1 visited the Fiji and the Hawaiian islands in 1840, explored the west coast of the United States, including the Columbia river, San Francisco Bay and the Sacramento river, in 1841, and returned by way of the Philippine islands, the Sulu archipelago, Borneo, Singapore, Polynesia and the Cape of Good Hope, reaching New York on the 10th of June 1842. He was court- mar tialled on his return, but was acquitted on all charges except that of illegally punishing men in his squadron. For a short time he was attached to the Coast Survey, but from 1844 to 1861 he was chiefly engaged in preparing the report of the expedition. Twenty-eight volumes were planned but only nineteen were published. Of these Wilkes wrote the Narrative (6 vols., 1845; 5 vols., 1850) and the volumes Hydrography and Meteorology (1851). The Narrative, contains much interesting material concerning the manners and customs

1 Thls discovery was made on the 19th of January 1840, one day before Dumont d'Urville sighted Adelie Land about 400 m. farther W. Thai Wilkes discovered an Antarctic continent was long doubted, and one of the charges against him when he was court-mart iallcd was that he had fabricated this discovery, but the expedition of Sir Ernest Shackleton in 1908-1909 corroborated Wilkes. That part of the Antarctic continent known as Wilkes Land was named in his honour.

and political and economic conditions in many places then little known. Other valuable contributions were the three reports of James D. Dana on Zoophytes (1846) , Geology (1849) and Crustacea (2 vols., 1852-1854). At the outbreak of the Civil War, Wilkes (who had reached the rank of commander in 1843 and that of captain in 1855) was assigned to the command of the " San Jacinto " to search for the Confederate commerce destroyer, "Sumter." On the 8th of November 1861 he stopped the British mail packet " Trent," and took off the Confederate commissioners to Europe, James M. Mason and John Slidell. Though he was officially thanked by Congress, his action was later disavowed by President Lincoln.

His next service was in the James river flotilla, but after reaching the rank of commodore, on the 1 6th of July 1862, he was assigned to duty against blockade runners in the West Indies. He was.disrated (becoming a captain on the retired list) in November 1862 on the ground that he had been too old to receive the rank of commodore under the act then governing promotions; and engaged in a long controversy with Gideon Welles, secretary of the navy. This controversy ended in his being court-martialled in 1864 and being found guilty on several counts and sentenced to public reprimand and suspension for three years. But on the 25th of July 1866 he was promoted to the rank of rear-admiral on the retired list. He died at Washington on the 8th of February 1877.

Tn addition to many shorter articles, reports, &c, he published Western America, including California and Oregon (1849) and Theory of the Winds (1856).

WILKES, JOHN (1727-1797), English politician, descended from a family long connected with Leighton-Buzzard in Bedford- shire, was born at Clerkenwell, London, on the 17th of October 1727, being the second son of Israel Wilkes, a rich distiller, and the owner, through his wife Sarah, daughter of John Heaton of Hoxton, of considerable house property in its north-eastern suburbs. After some training under private' tuition John Wilkes was sent to the university of Leyden, matriculating there on the 8th of September 1744. Several young men of talent from Scotland and England were studying in this Dutch university at that period, and a lively picture of their life, in which Wilkes displays the gaiety of temper which remained faithful to him all his days, is presented to us by Alexander Carlyle {Autobiog., i860, ed. J. H. Burton). With this training he acquired an intimate knowledge of classical literature, and he enlarged his mind by travelling through Holland. Flanders and part of Germany. At the close of 1748 he returned to his native land, and in a few months (October 1749) was drawn by his relations into marrying Mary, sole daughter and heiress of John Mead, citizen and grocer of London, who was ten years his senior. The ill-assorted pair— for she was grave and staid, while he rioted in exuberant spirits and love of society — lived together at Ayles- bury for some months, when, to make matters worse, they returned to town to dwell with the wife's mother. One child, a daughter, was born tothem (5th of August 1750), andthen Wilkes left his wife and removed to Westminster, where he kept open house for many young men about town possessing more wit than morals. In 1754 he contested the constituency of Berwick-upon-Tweed, but failed to gain the seat.

Wilkes was now a well-known figure in the life of the west end, and among his associates were Thomas Potter, the son of the archbishop of Canterbury, Sir Francis Dashwood, afterwards Lord 1c Dcspenccr, and

Lord Sandwich, the last of whom in after years showed great animosity towards his old companion in revelry. In July 1757, by a triangular arrangement in which Potter and the first William Pitt played the other parts, Wilkes was elected for Aylesbury, and for this constituency he was again returned at the general election in March 1761, Pitt was his leader in politics; but to Pitt he applied in vain for a seat at the Board of Trade, nor was he successful in his application for the post of ambassador at Constantinople, or for that of governor of Quebec. As he attributed these failures to the opposition o!" Lord Bute, he established a paper called the North Briton (June 1762), in which he from the first attacked the Scotch prime minister with exceeding bitterness, and grew bolder as it

proceeded in its course. One of its articles ridiculed Lord Talbot, the steward of the royal household, and a duel was the result. When Bute resigned, the issue of the journal was suspended; but, when the royal speech framed by George Grenville's ministry showed that the change was one of men only, not of measures, a supplementary number, No. 45, was published, 23rd of April 1763, containing a caustic criticism of the king's message to his parliament. Lord Halifax, the leading secretary of state, issued a general warrant " to search for authors, printers and pub- lishers," and to bring them before him for examination. Charles Churchill, the poet and a coadjutor in this newspaper enterprise, escaped through the good offices of Wilkes; but the chief offender was arrested and thrown into the Tower (30th of April 1763). A week later, however, he was released by order of the Court of Common Pleas on the ground that his privilege as a member of parliament afforded him immunity from arrest. General warrants were afterwards declared illegal, and Halifax himself, after a series of discreditable shifts, was cast in heavy sums, on actions brought against him by the persons whom he had injtrred — the total expenses incurred by the ministry in these lawless proceedings amounting to at least £100,000. So far Wilkes had triumphed over his enemies, but he gave them cause for rejoicing by an indiscreet reprint of the obnoxious No. 45, and by striking off at his private press thirteen copies of an obscene Essay on Woman, written by his friend Potter, in parody of Pope's Essay on Man, one of which got into the hands of Lord Sandwich. Immediately on the meeting of the House of Commons (15th of November 1763) proceedings were taken against him. Lord North moved that No. 45 was " a false, scandalous and seditious libel," and the paper was publicly burnt in Cheapside on the 4th of December. The Essay on Woman was on the same day brought before the Upper House by Lord Sandwich, and, on account of the improper use which had been made of Bishop Warburton's name as the

author of some coarse notes, the work was voted a breach of privilege, and Wilkes was ordered to be prosecuted in the Court of King's Bench for printing and publishing an impious libel. He was expelled from the House of Commons on the iolh of January 1764; and on the 21st of February he was found guilty in the King's Bench of reprinting No. 45 and of printing and publishing the Essay on Woman. Wilkes was on these dates absent from England. Some strong expressions applied to him by Samuel Martin, an ex-secretary of the treasury, had provoked a duel (16th of November 1763), in which Wilkes was severely wounded in the stomach. He withdrew to Paris, and as he did not return to England to receive his sentence in the law courts was pronounced an outlaw.

For several years Wilkes remained abroad, receiving £1000 a year from the leading Whigs, and in the course of his travels he visited many parts of Italy. In February 1768 he returned to London and sued the king for pardon, but in vain. His next step was to offer himself as a candidate for the representation of the city of London, when he was the lowest at the poll. Undaunted by this defeat, he solicited the freeholders of Middlesex to return him as their champion, and they placed him at the head of all competitors (28th of March). He appeared before the King's Bench, and on a technical point procured a reversal of his out- lawry; but the original verdict was maintained, and he was sentenced to imprisonment for twenty-two months as well as to a fine of £1000, and he was further ordered to produce securities for good behaviour for seven years after his liberation. His conduct was brought before the House of Commons, with the result that he was expelled from the Houscon the 3rd of February 1769, and with this proceeding there began a series of contests between the ministry and the electors of Middlesex without parallel in English history. They promptly re-elected him (16th of February), only to find him pronounced incapable of sitting and his election void. Again they returned him (16th of March) and again he was rejected. A fourth election then followed (13th of April), when Colonel Henry Lawes Luttrell, with all the influence of the court and the Fox family in his favour, obtained 296 votes, while 1T43 were given for Wilkes, but two days later the House declared that Luttrell had been

duly elected. Through these audacious proceedings a storm of fury broke out throughout the country. In the cause of " Wilkes and liberty " high and low enlisted themselves. His prison cell was thronged daily by the chief of the Whigs, and large sums of money were subscribed for his support. So great was the popular sympathy in his favour, that a keen judge of contem-porary politics declared that, had George III. possessed a bad and Wilkes a good character, the king would have been an outcast from his dominions. At the height of the combat in January 1769 Wilkes was elected an alderman for the city of London; in 1 771 he served as sheriff for London and Middlesex, and as alderman he took an active part in the struggle

between the corporation and the House of Commons by which freedom of publication of the parliamentary debates was obtained. His admirers endeavoured in 1772 to procure his election as lord mayor of London, but he was set aside by the aldermen, some of whom were allied with the ministry of Lord North, while others, as Oliver and Townshend, leant to the Liberalism of Lord Shelburne. In 1774, however, he obtained that dignity, and he retained his seat for Middlesex from the dissolution in 1774 until 1790. He moved in 1776 for leave to bring in a bill " for a just and equal representation of the people of England in parliament "; but attempts at parliamentary reform were premature by at least half a century. After several failures better fortune attended his efforts in another direction, for on the 3rd of May 1782 all the declarations and orders against him for his elections in Middlesex were ordered to be expunged from the journals of the House. In 1779 Wilkes was elected chamber- lain of the city by a large majority, and the office became his freehold for life. He died at his house in Grosvenor Square, London, on the 26th of December 1797. His daughter Mary, to whom he was tenderly attached, died on the 12th of March

1802.

Wilkes printed editions of Catullus (1788) and Theophrastus (1790), and at the time of his death had made considerable progress with a translation of Anacreon. His conversation was often sullied by obscenity and profanity; but he knew how to suit his conversation to his company, and his well-known assertion that, in spite of his squint and ugly as he was, with the start of a quarter of an hour he could get the better of any man, however good-looking, in the graces of any lady, shows his confidence in his powers of fascination. The king was obliged to own that he had never met so well-bred a lord mayor, and Dr Johnson, who made his acquaintance at the house of Dilly, the bookseller in the Poultry, confessed that " Jack has great variety of talk, Jack is a scholar, and Jack has the manners of a gentleman." It is doubtful how far he himself believed in the justice of the principles which he espoused. To George III. he remarked of his devoted friend and legal adviser, Serjeant Glynn, " Ah, sirl he was a Wilkite, which I never was." His writings were marked by great power of sarcasm. Two collections of his letters were published, one of Letters to his Daughter, in four volumes in 1804, the other Correspondence with his Friends, in which are introduced Memoirs of his Life, by John Almon, in five volumes, in 1805. A Life by Percy Fitzgerald was published in 1888. Essays on him are in Historical Gleanings, by J. E. Thorold Rogers, 2nd ser. (1870); Wilkes and Cobbett, by J. S. Watson (1870); and Wilkes, Sheridan and Fox, by W. F. Rae (1874). H> s connexion with Bath is set out in John Wilkes, by W. Gregory (1888), and that with the city of London in Modern History of the City, by Charles Welch (1896). A

fragment of his autobiography (Br. Museum Addit. MSS. 30865), chiefly de- scriptive of his exile in France and Italy, was printed for W. F. Taylor of Harrow in 1888. (W. P. C.)

WILKES-BARR£, a city and the county-seat of Luzerne county, Pennsylvania, U.S.A., on the north branch of the Susquehanna river, about 100 m. N.N.W. of Philadelphia. Pop. (1890), 37,718; (1000), 51,721, of whom 12,188 were foreign- born, including 2792 Germans, 2083 Welsh, 2034 Irish, 1578 English and 1000 Russian Poles; (1910 census), 67,105. Area, 4-8 sq. m. Wilkes-Barre is served by the Central Railroad of New Jersey, the Lehigh Valley, the Delaware, Lackawanna & Western, the Delaware & Hudson, the New York, Susquehanna & Western and the Pennsylvania railways, and by three inter- urban electric lines — the Wilkes-Barre & Hazleton, connecting with Hazleton, about 20 m. S., the Wilkes-Barre & Wyoming Valley, and the Lackawanna & Wyoming Valley, connecting with Scranton about 17 m. N.E. On the opposite bank of the river (which is here spanned by two iron bridges) lies Kingston.

The city is attractively situated in the historic Wyoming Valley. The principal public buildings include the county court-house, the post office, the city hall, the county gaol and the oth Regiment Armory. Among the city parks are Hollenback (102 acres) and Riverside (19 acres) parks, the River Common (35 acres) and the Frances Slocum Playground. In the city are the Harry Hillman Academy (non-sectarian), a secondary school for boys; the Malinckrodt Convent, the Wilkes-Barre Institute (Presby- terian), a school for girls; St Mary's Academy (Roman Catholic), for girls; the Osterhout Free Library (44,000 vols.), the Library of the Law and Library Association (10,000 vols.) and that of the Wyoming Historical and Geological Society (18,000 vols.), which was founded in 1858. Wilkes-Barre is situated in the centre of the richest anthracite coal region in the United States, Luzerne county ranking first in 1908 in the production of anthracite in Pennsylvania; and the value of the factory products increased from $8,616,765 in 1900 to $11,240,893 in 1905, or 30-5 %. Among important manufactures are foundry and machine-shop products, valued at $1,273,491 in 1905; silk and silk goods ($1,054,863); lace curtains, cotton goods, wirework, &c. The city is governed by a mayor elected for three years, and by a legislative body composed of a select council (one member from each of the t6 wards elected for four years) and of a common council (one member from each ward, elected for two years).

The township of Wilkes-Barre was one of five townships the free grant of

which, in December 1768, by the Susque- hanna Land Company of Connecticut was intended to encourage settlement and make good the company's claim to the Wyoming Valley (.). In May 1769 more than 100 settlers from New England, in command of Major John Durkee (1728-1782), arrived at this place. With others who came a few days later they creeled the necessary log cabins on the river bank, near the present Ross Street, and in June began to enclose these within a stockade, known as Fort Durkee. During the same summer Major Durkee gave the town its present name in honour of John Wilkes (1727-1797) and Colonel Isaac Barre (1726-1802), both stout defenders in parliament of the American colonists' cause before and during the War of Independence, and in the following year the town plat was made. In September 1769 the " First Pennamite- Yankee War," as the conflict between Connecticut and Pennsylvania for the possession of the valley is called, broke out. The Yankees lost Fort Durkee in November, but recovered it in the following February. The Pennamites erected Fort Wyoming on the river bank near the present Northampton Street in January 1771, but the Yankees took it from them in the following August. In the War of Independence, immediately after the battle of Wyoming (July 3, 1778), Wilkes-Barre was burned by the Indians and British Rangers; and again in July 1784, during the " Second Pennamite- Yankee War," twenty-three of the twenty-six buildings were burned. In 1786 the Pennsylvania legislature sent here Colonel Timothy Pickering, (q.v.) to organize Luzerne county, and to effect a reconciliation between the Connecticut settlers and the government of Pennsylvania. Colonel John Franklin (1749- 1831) led a counter movement, and was imprisoned on a charge of treason in October 1787, but Franklin's followers retaliated by kidnapping Pickering in June 1788, and kept him in the woods for nearly three weeks in a vain effort to make him promise to intercede for Franklin's pardon. Wilkes-Barre was gradually rebuilt after its destruction in 1784, and in 1806 the borough was erected, though it was not separated politically from the township until 1818 (or 1819). A new charter was granted to the borough in 1855, and Wilkes-Barre was chartered as a city in 1871.

See O. J. Harvey, A History of Wilkes-BarrS (3 vols., Wilkes-Barre,

1909-1910).

WILKIE, SIR DAVID (1785-1841), Scottish painter, was born on the 18th of November 1785, the son of the parish minister of Cults in Fifeshire. He very early developed an extraordinary love for art. In 1799, after he had attended school at Pitlessie, Kettle .and Cupar, bis father reluctantly yielded to his desire to become a painter; and through the influence of the earl of

Leven Wilkie was admitted to the Trustees' Academy in Edinburgh, and began the study of art under John Graham, the teacher of the school. From William Allan (afterwards Sir William Allan and president of the Royal Scottish Academy) and John Burnet, the engraver of Wilkie's works, we have an interesting account of his early studies, of his indomitable perseverance and power of close application, of his habit of haunting fairs and market-places, and transferring to his sketch- book all that struck him as characteristic and telling in figure or incident, and of his admiration for the works of Carse and David Allan, two Scottish painters of scenes from humble life. Among his pictures of this period are mentioned a subject from Macbeth, " Ceres in Search of Proserpine," and " Diana and Calisto," which in 1803 gained a premium of ten guineas at the Trustees' Academy, while his pencil portraits of himself and his mother, dated that year, and now in the possession of the duke of Buccleuch, prove that he had already attained considerable certainty of touch and power of rendering character. A scene from Allan Ramsay, and a sketch from Macneill's ballad of Scotland's Skaith, afterwards developed into the well-known " Village Politicians," were the first subjects in which his true artistic individuality began to assert itself.

In 1804 Wilkie returned to Cults, established himself in the manse, and began his first important subject-picture, " Pitlessie Fair," which includes about 140 figures, and in which he intro- duced portraits of his neighbours and of several members of his family circle. In addition to this elaborate figure-piece, Wilkie was much employed at the time upon portraits, both at home and in Kinghorn, St Andrews and Aberdeen. In the spring of 1805 he left Scotland for London, carrying with him his " Bounty-Money, or the Village Recruit," which he soon disposed of for £ 6, and began to study in the schools of the Royal Academy. One of his first patrons in London was Stodart, a pianoforte maker, a distant connexion of the Wilkie family, who commissioned his portrait and other works and introduced the young artist to the dowager-countess of Mansfield. This lady's son was the purchaser of the " Village Politicians," which attracted great attention when it was exhibited in the Royal Academy of 1806, where it was followed in the succeeding year by the " Blind Fiddler," a commission from the painter's lifelong friend Sir George Beaumont. Wilkie now turned aside into the paths of historical art, and painted his " Alfred in the Neatherd's Cottage," for the gallery illustrative of English history which was being formed by Alexander Davison. After its completion he returned to genre-painting, producing the " Card-Players " and the admirable picture of the " Rent Day," which was composed during recovery from a fever contracted in 1807 while on a visit to his native village. His next great work was the " Ale-House Door," afterwards entitled the " Village Festival " (now in the National Gallery), which was purchased by J J. Angerstein for 800

guineas. It was followed in 1813 by the well-known " Blind Man's Buff," a commission from the prince regent, to which a companion picture, the " Penny Wedding," was added in 1818.

Meanwhile Wilkie's eminent success in art had been rewarded by professional honours. In November 1809 he was elected an associate of the Royal Academy, when he had hardly at- tained the age prescribed by its laws, and in February 181 1 he became a full academician. In 1812 he opened an exhibition of his collected works in Pall Mall, but the experiment was unsuccessful, entailing pecuniary loss upon the artist. In 1814 he executed the " Letter of Introduction," one of the most delicately finished and perfect of his cabinet pictures. In the same year he made his first visit to the continent, and at Paris entered upon a profitable and delighted study of the works of art collected in the Louvre. Interesting particulars of the time are preserved in his own matter-of-fact diary, and in the more sprightly and flowing pages of the journal of Haydon, his fellow- traveller. On his return he began " Distraining for Rent," one of the most popular and dramatic of his works. In 1816 he made a tour through Holland and Belgium in company with Raimbach, the engraver of many of his paintings. The " Sir

Walter Scott and his Family," a cabinet-sized picture with small full-length figures in the dress of Scottish peasants, was the result of a visit to Abbotsford in 1818. " Reading a Will," a commission from the king of Bavaria, now in the New Pinakothek at Munich, was completed in 1820; and two years later the great picture of " Chelsea Pensioners Reading the Gazette of the Battle of Waterloo," commissioned by the duke of Wellington in 1816, at a cost of 1200 guineas, was exhibited at the Royal Academy.

In 1822 Wilkie visited Edinburgh, in order to select from the royal progress of George IV. a fitting subject for a picture. The " Reception of the King at the Entrance of Holyrood Palace " was the incident ultimately chosen; and in the follow- ing year, when the artist, upon the death of Raebern, had been appointed royal limner for Scotland, he received sittings from the monarch, and began to work diligently upon the subject. But several years elapsed before its completion; for, like all such ceremonial works, it proved a harassing commission, uncongenial to the painter while in progress and unsatisfactory when finished. His health suffered from the strain to v/hich he was subjected, and his condition was aggravated by heavy domestic trials and responsibilities. In 1825 he sought relief in foreign travel: after

visiting Paris, he passed into Italy, where, at Rome, he received the news of fresh disasters through the failure of his publishers. A residence at Toplitz and Carlsbad was tried in 1826, with little good result, and then Wilkie returned to Italy, to Venice and Florence. The summer of 1S27 was spent in Geneva, where he had sufficiently recovered to paint his " Princess Doria Washing the Pilgrims' Feet," a work which, like several small pictures executed at Rome, was strongly influenced by the Italian art by which the painter had been surrounded. In October he passed into Spain, whence he returned to England in June 1828.

It is impossible to over-estimate the influence upon Wilkie's art of these three years of foreign travel. It amounts to nothing short of a complete change of style. Up to the period of his leaving England he had been mainly influenced by the Dutch genre-painters, whose technique he had carefully studied, whose works he frequently kept beside him in his studio for reference as he painted, and whose method he applied to the rendering of those scenes of English and Scottish life of which he was so close and faithful an observer. Teniers, in particular, appears to have been his chief master; and in his earlier productions we find the sharp, precise, spirited touch, the rather subdued colouring, and the clear, silvery grey tone which distinguish this master; while in his subjects of a slightly later period — those, such as the " Chelsea Pensioners/' the " Highland Whisky Still " and the " Rabbit on the Wall," executed in what Burnet styles his second manner, which, however, may be regarded as only the development and maturity of his first — he begins to unite to the qualities of Teniers that greater richness and fulness of effect which are characteristic of Ostade. But now he experienced the spell of the Italian masters, and of Velazquez and the great Spaniards.

In the works which Wilkie produced in his final period he exchanged the detailed handling, the delicate finish and the reticent hues of his earlier works for a style distinguished by breadth of touch, largeness of effect, richness of tone and full force of melting and powerful colour. His subjects, too, were no longer the homely things of the genre-painter: with his broader method he attempted the portrayal of scenes from history, suggested for the most part by the associations of his foreign travel. His change of style and change of subject were severely criticized at the time; to some extent he lost his hold upon the public, who regretted the familiar subjects and the interest and pathos of his earlier productions, and were less ready to follow him into the historic scenes towards which this final phase of his art sought to lead them. The popular verdict had in it a basis of truth: Wilkie was indeed greatest as a genre- painter. But on technical grounds his change of style was criticized with undue severity. While his later works are admittedly more frequently faulty in form and draughtsmanship

than those of his earlier period, some of them at least (the " Bride's Toilet," 1837, for instance) show a true gain and development in power of handling, and in mastery over com- plex and forcible colour harmonies. Most of Wilkie's foreign subjects — the " Pifferari," " Princess Doria," the " Maid of Saragossa/' the " Spanish Podado," a " Guerilla Council of War," the " Guerilla Taking Leave of his Family " and the " Guerilla's Return to his Family " — passed into the English royal collection; but the dramatic " Two Spanish Monks of Toledo," also entitled the " Confessor Confessing," became the property of the marquis of Lansdowne. On his return to England Wilkie completed the " Reception of the King at the Entrance of Holyrood Palace," — a curious example of a union of his earlier and later styles, a " mixture " which was very justly pronounced by Hay don to be " like oil and water." His " Preaching of John Knox before the Lords of the Congrega- tion " had also been begun before he left for abroad; but it was painted throughout in the later style, and consequently presents a more satisfactory unity and harmony of treatment and handling. It was one of the most successful pictures of the artist's later period.

In the beginning of 1830 Wilkie was appointed to succeed Sir T. Lawrence as painter in ordinary to the king, and in 1836 he received the honour of knighthood. The main figure-pictures which occupied him until the end were " Columbus in the Convent at La Rabida " (1835); "Napoleon and Pius VII. at Fontainebleau " (1836); " Sir David Baird Discovering the Body of Tippoo Sahib " (1838); the " Empress Josephine and the FoTtune-Teller " (1838); and "Queen Victoria Presiding at her First Council " (1838). His time was also much occupied with portraiture, many of his works of this class being royal commissions. His portraits are pictorial and excellent in general distribution, but the faces are frequently wanting in drawing and character. He seldom succeeded in showing his sitters at their best, and his female portraits, in particular, rarely gave satisfaction. A favourable example of his cabinet- sized portraits is that of Sir Robert Liston; his likeness of W. Esdaile is an admirable three-quarter length; and one of his finest full-lengths is the gallery portrait of Lord Kellie, in the town hall of Cupar.

In the autumn of 1840 Wilkie resolved on a voyage to the East. Passing through Holland and Germany, he reached Constantinople, where, while detained by the war in Syria, he painted a portrait of the young sultan. He then sailed for Smyrna and travelled to Jerusalem, where he remained for some five busy weeks. The last work of all upon which he was en- gaged was a portrait of Mehcmet Ali, done at Alexandria. On his return voyage he suffered from an attack of illness at Malta, and died at sea off Gibraltar on the morning of the 1st of June 1 84 1. His body was consigned to the deep in the Bay of Gibraltar.

An elaborate Life of Sir David Wilkie, by Allan Cunningham, containing the painter's journals and his observant and well-con- sidered " Critical Remarks on Works of Art," was published in 1843. Redgrave's Century of Painters of the English School and John Burnet's Practical Essays on the Fine Arts may also be referred to for a critical estimate of his works. A list of the exceptionally numerous and excellent engravings from his pictures will be found in the Art Union Journal for January 1840. Apart from his skill as a painter Wilkie was an admirable etcher. The best of his plates, such as the " Gentleman at his Desk " {Laing, VII.), the " Pope examining a Censer " (Laing, VIII.), and the " Seat of Hands " (Laing, IV.), are worthy to rank with the work of the greatest figure-etchers. During his lifetime he issued a portfolio of seven plates, and in 1 875 Dr David Laing catalogued and published the complete series of his etchings and dry-points, supplying the place of a few copper-plates that had been lost by reproductions, in his Etchings of David Wilkie and Andrew Geddes. (J. M. G.)

WILKINS, SIR CHARLES (i749?-i836), English Orientalist, was born at Frome, Somersetshire, probably in 1749, and In 1770 he went to India as a writer in the East India Company's service. He was soon attracted to the study of Oriental languages, particularly Sanskrit, and did an important work towards facilitating such study by founding a printing press for these languages, taking a large personal share in the practical work of

preparing the type, fie returned to England in 1786, but con- tinued his study of Sanskrit, and he afterwards became librarian to the East India Company, and examiner at Haileybury on the establishment of the college there in 1805. Wilkins was knighted in 1833 in recognition of his services to Oriental scholarship, and he died in London in 1836. He was a pioneer in the department of learning with which his name was associated, being the first Englishman to acquire mastery of Sanskrit, and to make a thorough study of Indian inscriptions in that script. He compiled a Sanskrit grammar and published several translations from the sacred books of the East, besides preparing a new edition of Richardson's Persian and Arabic dictionary, and a catalogue of the manuscripts collected by Sir William Jones, who acknow- ledged his indebtedness to Wilkins, and whom the latter assisted in founding the Asiatic Society of Bengal.

WILKINS, GEORGE (fl. '1607), ' English playwright and pamphleteer, is first mentioned as the author of a pamphlet on the Three Miseries of Barbary, which probably dates from 1604. He was associated with the

King's Men, and was thus a colleague of Shakespeare. He was chiefly employed in remodelling old plays. lie collaborated in 1607 with William Rowley and John Day in The Travailes of the Three English Brothers. In the same year a play was produced winch was apparently entirely Wilkins's work. It is The Miseries of Inforst Mariage, and treats the story of Walter Calverlcy, whose identity is thinly veiled under the name of " Scarborough." This man had killed his two children and had attempted to murder his wife. The play had originally a tragic ending, but as played in 1607 ended in comedy, and the story stopped short before the catastrophe, perhaps because of objections raised by Mrs Calverley's family, the Cobhams. The crime itself is dealt with in A Yorkshire Tragedy, which was originally performed with three other plays under the title of All's One. It was entered on the Stationers' Register in 1608 as " written by William Shakespeare," pub- lished with the same ascription in that year, and reprinted in 1619 without contradiction of the statement. Mr Sidney Lee assigns to George Wilkins a share in Shakespeare's Pericles and possibly in Timon of Athens. Delius conjectured that Wilkins was the original author of Pericles and that Shakespeare re- modelled it. However that may be, Wilkins published in 1608 a novel entitled The Painfull Adventures of Pericles, Prynce of Tyre, being the true history of Pericles as it was lately presented by . . . John Goiver, which sometimes follows the play very closely.

Mr Fleay (Biog. Chron. of the Drama) says that the external evi- dence for the Shakespearian authorship of the Yorkshire Tragedy cannot be impugned, and in the absence of other authorship cannot be lightly set aside, but he does not abandon the hope of establishing; a contrary opinion. Both Mr Fleay and Professor A. W. Wˆard (Eng. Dram. Lit. ii. p. 182) seem to think that the story of Marina in Pericles was a complete original play by Shakespeare, and that the remodelling story should be reversed, i.e. that Pericles is a Shake- spearian play remodelled by a playwright, possibly Wilkins. Mr Lee {Diet. Nat. Biog., Art. " Wilkins ") says the Yorkshire Tragedy was " fraudulently ' assigned to Shakespeare by Thomas Pavier, the publisher.

WILKINS, JOHN (1614-1672), bishop of Chester, was born at Fawsley, Northamptonshire, and educated at Magdalen Hall, Oxford. He was ordained and became vicar of Fawsley in 1637, but soon resigned and became chaplain successively to Lord Saye and Sele, Lord Berkeley, and Prince Charles Louis, nephew of Charles I. and afterwards elector palatine of the Rhine. In 1648 he became warden of Wadham College, Oxford. Under him the college was extraordinarily prosperous, for, although a supporter of Cromwell, he was in touch with the most cultured royalists, who placed their sons in his charge. In 1659 Richard Cromwell appointed him master of Trinity College, Cambridge. At the Restoration in r66o he

was deprived, but appointed prebendary of York and rector of Cranford, Middlesex. In 1661 he was preacher at Gray's Inn, and in 1662 vicar of St Lawrence Jewry, London. He became vicar of Polebrook, Northamptonshire, in 1666, prebendary of Exeter in 1667, and in the following year prebendary of St Paul's and bishop of Chester. Possessing strong scientific tastes, he was the chief founder of the Royal Society

and its first secretary. He died in London on the igth of November 1672.

The chief of his numerous works is an Essay towards a Real Char- acter and a Philosophical Language (London, 1668), in which he ex- pounds a new universal language for the use of philosophers. He is remembered also for a curious work entitled The Discovery of a World in the Moon (1638, 3rd ed., with an appendix " The possibility of a passage thither," 1640). Other works are A Discourse concerning a New Planet (1640) ; Mercury, or the Secret and Swift Messenger (1641), a work of some ingenuity on the means of rapid correspond- ence; and Mathematical Magick (1648).

See P. A. Wright Henderson, The Life and Times of John Wilkins (1910), and also the article Aeronautics.

WILKINS, MARY ELEANOR (1S62-), American novelist, was born in Randolph, Massachusetts, on the 7th of January 1862, of Puritan ancestry. Her early education, chiefly from reading and observation, was supplemented by a course at Mount Holyoke Seminary, South Hadley, Mass. Her home was in her native village and in Brattleboro, Vermont, until her marriage in 1902 to Dr Charles M. Freeman of Metuchen, New Jersey. She contributed poems and stories to children's magazines, and published several books for children, including Young Lucrelia and other Stories (1802), The Pot of Gold and other Stories (1892), and Once upon a Time and other Child Verses (1897). For older readers she wrote the following volumes of short stories: A Humble Romance and other Stories (1887), A New England Nun and other Stories (1891), Silence and other Stories (1898), three books which gave her a prominent place among American short-story writers; The People of Our Neigh- borhood (1898), The Love of Parson Lord and other Stories (1900), Understudies (1901) and The Givers (1904); the novels Jane Field (1892), Pembroke (1894), Madelon (1896), Jerome, a Poor Man (1897), The Jamesons (1899), The Portion of Labor (1901) and The Debtor (1905); and Giles Corey, Yeoman (1893), a prose tragedy founded on incidents from New England history. Her longer novels, though successful in the portrayal of character, lack something of the unity, suggestiveness and charm of her short stories, which are notable contributions to modern American literature. She deals usually with a few traits peculiar to the village and country life of New England, and she gave literary permanence to certain characteristics of

New England life which are fast disappearing.

WILKINSBURG, a borough of Allegheny county, Pennsyl- vania, U.S.A., immediately E. of Pittsburg, of which it is a residential suburb. Pop. (1890) 4662; (1900) n, 886, of whom 1336 were foreign-born and 275 were negroes; (1910 census) 18,924. Wilkinsburg is served by the Pennsylvania railway and by interurban electric lines. It is a post-station of Pittsburg. In the borough are a Home for Aged Protestants (1882), the United Presbyterian Home for the Aged (1879), and Columbia hospital (1908). Settled in 1798 and known first as McNairville and then as Rippeyville, the place was renamed about 1840 in honour of William Wilkins (1779-1865), a member of the United States Senate in 1831-1834, minister to Russia in 1834-1835, a representative in Congress in 1843-1844, and secretary of war in President. John Tyler's cabinet in 1844-1845. In 1887 Wilkinsburg was incorporated as a borough.

WILKINSON, JAMES (1757-1825), American soldier and adventurer, was born in Calvert county, Maryland, in 1757. At the outbreak of the War of IndependenceJie abandoned the study of medicine to enter the American army, and he served with General Benedict Arnold in the Quebec campaign and was later under General Horatio Gates, acting from May 1777 to March 1778 as adjutant-general of the Northern Department. He was sent to Congress to report Gates's success against Bur- goyne, but his tardiness secured for him a sarcastic reception. Gates recommended him for a brigadier- general's commission for services which another actually performed, and succeeded in gaining it, but their friendship was broken by the collapse of the Conway Cabal against Washington in which both were implicated and about which Wilkinson had indiscreetly blabbed. Wilkinson then resigned (March 1778) his newly-acquired commission, but later re-entered the service in the quartermaster-

general's department, and was clothier-general from July 1779 to March 1781.

In common with many other army officers Wilkinson now turned toward the West, and in 1784 settled near the Falls of the Ohio (Louisville), where he speedily became a prominent merchant, and farmer and a man of considerable influence. He began to take an active part in the movement, for separate state- hood for Kentucky, and in 1787 he entered into an irregular commercial agreement with the Spanish officials of Louisiana. At this time, as his own papers in the Spanish archives show, he took an oath of allegiance to Spain and began to intrigue with his fellow-Kent uckians to detach the western settlements from the Union and bring them under the influence of the Louisiana authorities. His commercial connections at New Orleans enabled him to hold out the lure of a ready market at that port for Kentucky products, and this added greatly to the strength of the separatist movement. He neutralized the intrigues of certain British agents who were then working in Kentucky. For these various services he received until 1800 a substantial pension from the Spanish authorities, being officially known in their corre- spondence as " Number Thirteen." At the same time he worked actively against the Spanish authorities, especially through Philip Nolan. Wilkinson's ventures were not as lucrative as he hoped lor, anil in October 170,1 he was given a licut. colonel's commission in the regular army, possibly, as a contemporary suggested, to keep him out of mischief. During this year he took an active part in the minor campaigns which preceded General Arthur St Clair's disastrous defeat by the Indians. As brigadier general (from March 1792) and second in command, he served under General Anthony Wayne in the latter's successful cam- paign of 1794 against the Indians, and in this campaign he seems to have tried to arouse discontent against his superior among the Kentucky troops, and to have intrigued to supplant him upon the reduction of the army. Upon Wayne's death in 1796, Wilkinson became general in command of the regular army, retaining his rank as brigadier and likewise his Spanish pension. He seems to have tried to stir up both the Indians and the Spaniards to prevent the survey of the southern boundary of the United States in 1797 and 1798, and succeeded in delaying Commissioner Andrew Ellicott for several months in this import- ant task, At the same time his protege, the hiibusterer, Philip Nolan, was engaged in a reconnaissance for him west of the Mississippi. In 1803 Wilkinson was one of the commissioners to receive Louisiana from France, and in 1805 became governor of that portion of the Purchase above the 33rd parallel, with headquarters at St Louis. In his double capacity as governor of the Territory and commanding officer of the army, reasonably certain of his hold on Jefferson, and favourably situated upon the frontier remote from the centre of government, he attempted to realize his ambition to conquer the Mexican provinces of Spain. For this purpose in 1805 he entered into some sort of agreement with Aaron Burr, and in 1806 sent Z. M. Pike to

explore the most favourable route for the conquest of the south-west. Before his agent returned, however, he had betrayed his colleague's plans to Jefferson, formed the Neutral Ground Agreement with the Spanish commander of the Texas frontier, placed New Orleans under martial law, and apprehended Burr and some of his alleged accomplices. In the ensuing trial at Richmond the prisoners were released for lack of sufficient, evidence to convict, and Wilkinson himself emerged with a much damaged reputation. He was then subjected to a series of courts-martial and congressional investigations, but succeeded so well in hiding traces of hi? duplicity that in 181 2 he resumed his military command at New Orleans, and in 1813 was promoted major-general and took possession of Mobile. Later in this year he made a most miserable fiasco of the campaign against Montreal, and this finally brought his military career to a dishonourable end. For a time he lived upon his plantation near New Orleans, but later appeared in Mexico City as an applicant for a land grant, incidentally acting as agent for the American Bible Society. Here on the 28th of December [825 he succumbed to the combined effects of climate and of opium.

See Wilkinson's Memoirs of My Chvn Time (Philadelphia, 1816); untrustworthy and to be used with caution; W. R. Shepherd, " Wilkinson and the Beginning of the Spanish Conspiracy " in American Historical Review, vol. ix. (New York, 1904). (I. J..C.)

WILKINSON, JAMES JOHN GARTH (1812-1899), Sweden- borgian writer, the son of James John Wilkinson (died 1845), a writer on mercantile law and judge of the County Palatine of Durham, was born in London on the 3rd of June 1812. He studied medicine, and set up as a homoeopathic doctor in Wimpole Street in 1834. He was early attracted by the works of William Blake, whose Songs of Experience he endeavoured to interpret, and of Swedenborg, to the elucidation of whose writings he devoted the best energies of his life. Between 1840 and 1850 he edited Swedenborg's treatises on The Doctrine of Charity, The Animal Kingdom, Outlines of a Philosophic Argument on the Infinite } and Hieroglyphic K.ey to Natural and Spiritual Mysteries. Wilkinson's preliminary discourses to these translations and his criticisms of Coleridge's comments upon Swedenborg displayed a striking aptitude not only for mystical research, but also for original philosophic debate. The vigour of his thought won admiration from Henry James (father of the novelist) and from Emerson, through whom he became known to Carry 1c and Froude; and his speculation further attracted Tennyson, the Oliphants and Edward Maitland. He wrote an able sketch of Swedenborg for the Penny Cyclopaedia, and a standard biography, Emanuel Swedenborg (published in 1849); but interest in this subject far from exhausted his intellectual energy, which was, indeed, multiform. He was a traveller, a linguist, well

versed in Scan- dinavian literature and philology, the author of mystical poems entitled Improvisations from the Spirit (1857), a social and medical reformer, and a convinced opponent of vivisection and also of vaccination. He died at Finchlcy Road, South Hamp- stead, where he had resided for nearly fifty years, on 18th October 1890. He is commemorated by a bust. and portrait in the rooms cf the Swedenborgian Society in Bloomsbury Street, London.

*WILKINSON, JOHN (1728-1808), "the great Staffordshire iron-master/' was born in 172H at Clifton, Cumberland, where his father had risen from day labourer to be overlooker in an iron furnace. A box-iron, patented by his father, but said to have been invented by the son, helping laundresses to gratify the frilled taste of the dandies of the day, was the. beginning of their fortunes. This they made at Blackbarrow, near Furness. When he was about twenty, John moved to Staffordshire, and built, at Bilston, the first furnace there, and, after many experi- ments, succeeded in utilizing coal instead of wood-charcoal in puddling and smelting. The father, who now had works at Bersham, near Chester, was again joined by his son, who con- structed a new boring machine, of an accuracy heretofore unequalled. James Watt found that the work of this machine exactly tilled his requirements for his " fire-engine " for cylinders bored with greater precision. Wilkinson, who now owned the Bersham works, resolved to start the manufacture of wrought iron at Broseleyon a larger scale, and the first engine made by Boulton and Watt was for him to blow the bellows there. Here- tofore bellows were worked by a water wheel or, when power failed, by horses. His neighbours in the business, who were contemplating installing Newcomcn engines, waited to see how his would turn out. Great care was taken in all its parts, and Watt himself set it up early in 1776. Its success made the re- putation of Boulton and Watt in the Midland counties. Wilkin- son now found he had the power alike for the nicest and the most stupendous operations. The steam cylinder suggested to him the plan of producing blast now in use. He was near coal; he surrounded himself with capable men, whom he fully trusted; he made a good article, and soon obtained large orders and prospered. In 1786 he was making 32-pounders, howitzers, swivels, mortars and shells for government. The difficulty of getting barges to carry his war material down the Severn led him, in 1787, to construct the first iron barge — creating a wonder- ful sensation among owners and builders. Wilkinson taught trv French the art of boring cannon from the solid, and cast all the**

tubes, cylinders and iron work required for the Paris water-works, the most formidable undertaking of the day. He also erected the first steam engine in France, in connexion with these works.

Wilkinson is said to have anticipated by many years the introduction of the hot blast for furnaces, but ihe leathern pipes, then used, scorched, and it was not a success. His were the first coal-cutting machines. He proposed and cast the first iron bridge. It connected Broseley and Madeley, across the Severn, and its span of roo ft. 6 in. was considered a triumphal wonder. Wilkin- son was now a man of great means and greater influence. lie issued tokens of copper, bearing his likeness and on the reverse a forge and tools of the trade, silver coins for 3s. 6d., and also pound notes, as other tradesmen of that day did. He never wrote a letter without using the word iron, indeed he was iron- mad, and provided by will that he should be buried in an iron coffin, preferably in his garden at Castle Head, near Lindal. He died on the r4th of July 1S08.

Wilkinson was twice married without issue. His very large property was frittered away during a lawsuit brought by a nephew against the illegitimate children whom he had named as his heirs. It was carried from various courts in the kingdom to the House of Lords and then to the Court of Chancery. Here Lord Eldon decided for the defendants, thus reversing all previous decisions taken upon the law of the case.

WILKINSON, SIR JOHN GARDNER (1797-1875), English traveller and Egyptologist, was born on the 5th of October 1797, the son of the Rev. John Wilkinson, a well-known student of antiquarian subjects. Having inherited a sufficient income from his parents, who died when he was young, he was sent by his guardian to Harrow in 1S13, and to Exeter College, Oxford, in i8t6. He took no degree, and, suffering from ill-health, went to Italy, where he met Sir William Gel], and resolved to study Egyptology. Between 1S21 and 1S33 he travelled widely in the Nile Valley and began to publish the results. He returned to England in 1833 for the sake of his health, was elected fellow of the Royal Society in 1S34, published The Topography of Thebes and General Survey of Egypt (1835) arid Manners and Customs of the Ancient Egyptians (3 vols., 1837), and on the 26th of August 1839 was knighted by the Melbourne ministry. In 1842 he returned to Egypt and contributed to the Journal of the Geographical Society an article entitled " Survey of the Valley of the Natron Lakes." This appeared in r843, in which year he also published an enlarged edition of his Topo- graphy, entitled Moslem Egypt and Thebes, a work afterwards reissued in Murray's series. During 1844 he travelled in Monte- negro, Bosnia and Herzegovina, an account of his observations being published in 1848 (Dalmatia and Montenegro, 2 vols.). A third visit to Egypt in 1848-1849 resulted in a further article in the Journal, " On the

Country between Wady Halfah and Jebel Berkel " (1851); in r855 he again visited Thebes. Subse- quently he investigated Cornish antiquities, and studied zoology. He died at Llandovery on the 29th of October 1875. To his old school, Harrow, he had already in 1864 presented his collec- tions with an elaborate catalogue.

Besides the works mentioned he published Materia Hieroglyphica (Malta, 1828); Extracts from several Ilieroglyphical Subjects (1830); Topographical Suroey of Thebes (1830); facsimile of the Turin papyrus (1851). previously edited without the writing on the back of the papyrus by Lepsius; Architecture of Ancient Egypt (1850); A Popular A ccount of the Ancient Egyptians (1854) ; important notes in Rawlinson's Herodotus; Colour and Taste (1858) ; articles in archaeological and scientific periodicals.

WILKINSON, TATE (1739-1803), English actor and manager, was born on the 27th of October 1739, the son of a clergyman. His first attempts at acting were badly received, and it was to his wonderful gift of mimicry that he owed his success. His imitations, however, naturally gave offence to the important actors and managers whose peculiarities he hit off to the life. Garrick, Peg Woffington, Samuel Foote and Sheridan, after being delighted with the imitations of the others, were among t he most angry, when it came to their turn, and threatened never to forgive him. Garrick never did. As an actor, Wilkinson was most successful in Foote's plays, but his list of parts was a

long one. In Shakespearian characters he was- very popular in the provinces. In 1766 he became a partner of Joseph Baker in the management of several Yorkshire theatres, and sole manager after his partner's death in 1770 of these and others. In this capacity he was both liberal and successful. He died on the 1 6th of November 1803.

See his Memoirs (4 vols., 1790) and The Wandering Patentee (4 vols., 1795).

WILL, in philosophy. The " Problem of Freedom " provides in reality a common title under which are grouped difficulties and questions of varying and divergent interest and character. These difficulties arise quite naturally from the obligation, which metaphysicians, theologians, moral philosophers, men of science, and psychologists alike recognize, to give an account, consistent with their theories, of the relation of man's power of deliberate and purposive activity to the rest of the universe, In the main, no doubt, the problem is a metaphysical problem, and has its origin in the effort to reconcile that belief in man's freedom which is regarded by the unsophisticated moral con- sciousness as indisputable, with a belief in a

universe governed by rational and necessary laws. But the historical origin of the questions at issue is to be sought rather in theology than in metaphysics, while the discovery made from time to time by men of science of the inapplicability of natural laws or modes of operation (which they have been accustomed to regard as of universal range and necessity) to the facts or assumed facts of human activity, is a constant source of fresh discussions of the problem. Similarly the modern attempt upon the part of psychology to analyse (under whatever limitations and with whatever object of inquiry) all the forms and processes of human consciousness has inevitably led to an examination of the consciousness of human freedom: while the postulate of most modern psychologists that conscious processes are not to be considered as removed from the sphere of those necessary causal sequences with which science deals, produces, if the consciousness of freedom be admitted as a fact of mental history, the old metaphysical difficulty in a new and highly specialized form.

There is some ground nevertheless for maintaining, contrary to much modern opinion, that the controversy is fundamentally and in the main a moral controversy. It is true that the precise relation between the activities of human wills and other forms of activity in the natural world is a highly speculative problem and one with which the ordinary man is not immediately con- cerned. It is true also that the ordinary moral consciousness accepts without hesitation the postulate of freedom, and is unaware of, or imperfectly acquainted with, the speculative difficulties that surround its possibility. Moreover, much work of the highest importance in ethics in modern as well as ancient times has been completed with but scanty, if any, reference to the subject of the freedom of the will, or upon a metaphysical basis compatible with most of the doctrines of both the rival theories. The determinist equally with the libertarian moral philosopher can give an account of morality possessing internal coherence and a certain degree of verisimilitude. Yet it may be doubted (1) whether the problem would ever have arisen at all except for the necessity of reconciling the theological and metaphysical hypotheses of the omniscience and omnipotence of God with the needs of a moral universe: and (2) whether it would- retain its perennial interest if the incursions of modern scientific and psychological inquiry into the domain of human consciousness did not appear to come into conflict from time to time with the presuppositions of morality. The arguments proceeding from either of the disputants by means of which the controversy is debated may be largely or almost wholly speculative and philosophical. But that which produces the rival arguments is primarily a moral need. And there are not wanting signs of a revival in recent years of the earlier tendency of philosophical speculation to subordinate the necessities of metaphysical, scientific and even psychological inquiries to the prima facie demands of the moral

consciousness.

There is no trace of the emergence of the problem of freedom

in any intelligible or distinct form in the minds of early Greek physicists or philosophers. Their doctrines were mainly based upon a belief in the government of the universe Greek by some form of physical necessity, and though

soakers. different opinions might prevail as to the mode of opera- tion of the various forms of physical necessity the occasional recognition of non-material contributory causes never amounted to a recognition of the independence of human volition or intelligence. Nor can it be seriously maintained that the problem of freedom in the form in which it is presented to the modern mind ever became the subject of debate in the philosophy of Socrates, Plato or A,ristotle. It is true that Socrates brought into prominence the moral importance of rational and intelligent conduct as opposed to action which is the result of unintelligent caprice. Moral conduct was, according to Socrates, the result of knowledge while it is strictly impossible to do wrong knowingly. Vice, therefore, is the result of ignorance and to this extent Socrates is a determinist. But the subsequent speculations of Aristotle upon the extent to which ignorance invalidates responsi- bility, though they seem to assume man's immediate consciousness of freedom, do not in reality amount to very much more than an analysis of the conditions ordinarily held sufficient to constitute voluntary or involuntary action. The further question whether the voluntary acts for which a man is ordinarily held responsible arc really the outcome of his freedom of choice, is barely touched upon, and most of the problems which surround the attempt to distinguish human agency from natural and necessary causation and caprice or chance are left unsolved. For Aristotle remained content with a successful demonstration of the dependence of " voluntariness " as an attribute of conduct upon knowledge and human personality. And though ultimately the attribution of responsibility for conduct is further limited to actions which are the result of purposive choice (irpoaipeffis) , Aristotle appears to waver between a view which regards irpoaipeais as involving an ultimate choice between divergent ends of moral action and one which would make it consist in the choice of means to an end already determined. A similar absence of discussion of the main problem at issue is noticeable in Plato. It is true that in a famous passage in the tenth book of the Republic (x. 617 ff.) he seems to make human souls respon- sible through their power of choice for the destinies

which they meet with during their respective lives. But, as with Socrates, their power of making a right choice is limited by their degree of knowledge or of ignorance, and the vexed question of the relation of this determining intelligence to the human will is left unsolved. With the Stoic and Epicurean philosophies the problem as it shapes itself for the consideration of the modern world begins to appear in clearer outlines. Stoic loyalty to a belief in responsibility based on freedom of choice appeared difficult to reconcile with a belief in an all-pervading Anima Mundi, a world power directing and controlling actions of every kind. And though the Stoic doctrine of determinism did not, when applied to moral problems, advance much beyond the reiteration cf arguments derived from the universal validity of the principles of causality, nor the Epicurean counter-assertion of freedom avoid the error of regarding chance as a real cause and universal contingency as an explanation of the universe, it was nevertheless a real step forward to perceive the existence of the problem. Moreover, the argument by means of which Chrysippus endeavoured to prove the compatibility of determinism with ethical responsibility is in some respects an anticipation of modern views. For the distinction between main and contributory causes of conduct (causae adjuvantts and causae principales — the cutvov and ˆvvairiov of Platonic and Aristotelian philosophy) preserved the possibility of regarding character, the main cause, as the responsible and accountable element in morality. And there is much that is anticipatory of modern libertarian views in the psychological argument by which Carneades attempted at once to avoid the Epicurean identification of will with chance, and to prove the rationality of choice, undetermined by any external or antecedent necessity, as an explanation of human actions

snity.

(cf. Janet and Seailles, Hist, oj Problems of Philosophy — Psy- chology, p. 324).

It was not until the rise of Christianity as an historical religion that the difficulty of reconciling a belief in human freedom with a belief in the Divine government of the w r orld became apparent to its fullest extent. The Christian doctrine of the Creation at once challenged the pantheistic presuppositions of Hellenic thought and reinforced the belief already existing in will as a real cause. At the same time the dualism involved in the simultaneous acceptance of an optimistic account of the origin and nature of the universe (such as is implied in Christian theology) and a belief in the reality of moral evil witnessed to by the Christian doctrine of Redemption, intensified the difficulties already felt concerning man's responsibility and God's omnipotence. Neoplatonic philosophy had been in the main content either to formulate the contradiction or to deny the reality of one of the opposing terms. And traces of Neo- platonic influence, more

especially as regards their doctrine of the unreality of the material and sensible world, are to be found everywhere in the Christian philosophers of Alexandria, preventing or impeding their formulation of the problem of free- dom in its full scope and urgency. St Augustine was, perhaps, the first thinker to face, though not to solve, the true theological and moral difficulty inherent in Christian thought. Two lines of thought are to be traced in the most implacable hostility and contradiction throughout his system. On the one hand no thinker reiterates or emphasizes more cogently the reality of individual responsibility and of will. He affirms the priority of will to knowledge and the dependence of consciousness upon physical attention. He asserts also the fact that our human power of receiving divine illumination (i.e. a capacity of spiritual insight in no sense dependent upon the creative activity of the intellect) is conditioned by our spontaneous acts of faith. And he finds in the existence of divine foreknowledge no argument for the impotence or determined character of human acts of will. The timeless foreknowledge of the Deity foresees human actions as contingent, not as causally determined. But when Augustine is concerned to reconcile the reality of individual freedom with humanity's universal need of redemption and with the absolute voluntariness of Divine Grace, he is constrained to contradict most of those postulates of which in his advocacy of libertarianism he was an eager champion. He limits the possession of freedom to Adam, the first man, who, by abusing his prerogative, has corrupted the human race. Man as he now is cannot do otherwise than evil. Inherited incapacity for the choice of good is the punishment for Adam's misuse of freedom. The possibility of redemption depends upon the bestowal of Divine Grace, which, because it is in no instance deserved, can be awarded or withdrawn without injustice. And because Adam's choice necessitates punishment it follows that in some instances Divine Grace can never be bestowed. Hence arises in Augustine's system the doctrine of Predestination (q.v.). From the theo- logical standpoint every individual is predestined either by his natural birthright to evil or by Divine Grace to good, and the absolute foreknowledge and omnipotence of God excludes even the possibility of any initiative on the part of the individual by means of which he might influence God's timeless choice.

The medieval treatment of the problem follows in the main Augustinian or Aristotelian traditional lines of thought, though successive thinkers arrive at very diverse conclusions. Thomas Aquinas, for example, develops the Platonic f?f olss ' argument which proves the dependence of the will upon the intellect and makes the identification of morality with knowledge. Freedom exists for Thomas, if it exists at all, only as the power of choosing what is necessarily determined by the intellect to be choiceworthy, the various possibilities of choice being themselves presented by the understanding to the will. And though in a certain sense Divine

foreknowledge is compatible upon his view with human freedom, the freedom with which men act is itself the product of Divine determination. Man is predetermined to act freely, and Divine foreknowledge foresees human actions as contingent. Duns Scotus on the other

hand is the great champion of indeterminism. Upon his view the intellect must always be subordinate to the will, and to the will belongs the power of complete self-determination. Morality in effect — to such an extreme position is he driven in his opposi- tion to the Thomists— becomes the arbitrary creation, of the Divine Will and in no sense depends for its authority upon rational principles or is a form of knowledge.

The modern treatment of the problem from Descartes, Hobbes, Spinoza and Leibnitz down to Kant is too much inwoven into

the metaphysical systems of individual great philoso- Hobbes phers to afford the possibility of detailed treatment Descartes, m tne P resent article. Reference should be made

either to the individual philosophers themselves or to articles on metaphysics or on ethics. Hobbes is the great exponent of materialistic determinism. Jdeals and volitions are upon his view ultimately movements of the brain. Will is identified with appetite or fear, the causes of which are to be found only in the external world. Descartes advocates a kind of freedom which is apparently consistent with forms both of determinism and indeterminism. He explains the possibility of error on the ground that the mind possesses the liberum arbitritim indifferentiae and can always refuse to affirm the truth of a conclusion drawn from premises which are not self-evident. And even when the presentations before the mind are so clear that assent to their truth cannot be refused, the possibility of assenting still rests with the will, which can refuse to attend to any presentation, or can refuse assent with the sole motive of proving its freedom. Spinoza is a convinced deter- minist regarding the will as necessarily determined by ideas.

Extension, i.e. the spatial world, and the world of Splaor consciousness are alike attributes of the one sub- Leibnitz. stance which can only be called free in the sense of*

being determined by nothing but itself. Freedom in the moral sphere consists simply in the control of the passions by reason. Leibnitz retains this attenuated belief in moral freedom and combines with it a belief in the spontaneity of moral agents in the sense that they possess the power of

acting and need no other principle of action save the laws of their own natures. But inasmuch as the agreement between the acts of Leibnitz's monads is due to a divine pre-established harmony, and the theoretical contingency which in the abstract, i.e. as logically possible, can be predicated of their acts, is in practice non-existent, Leibnitz is in effect a determinist.

Locke's treatment of the problem is in some respects more interesting than the theories of other English philosophers

of his school. Freedom, according to Locke, belongs

Locke and t ˆ m nQt tQ th& wiU j £ we wi jj at all we are Hume. ' .

to that extent free, i.e. our actions express our pur- poses. If, on the other hand, we press Leibnitz's objection, i.e. that such an argument is no answer to the question whether an act of will can be free in the sense that it is not determined by reasons presented by the understanding, Locke replies that the will is in effect determined by the uneasiness of desire, i.e. by the desire to avoid pain. Hume's doctrine follows logically from his theory as to the nature of causality. If our belief in necessary connexion in the physical world is in reality an illusion, it follows that the opposition between freedom and necessity will be illusory also. On the other hand if our belief in the necessity of causal connexion is the result of custom, to custom will be due also the belief in a necessity governing human actions observable everywhere in men's ordinary opinions and practice. Contrasted with this belief in necessity the supposition we have of freedom is illusory, and, if extended so as to involve a belief that men's actions do not proceed from character or habitual disposition, immoral.

Kant's theory of freedom is, perhaps, the most characteristic doctrine of his system of ethics. Distinguishing between two worlds, the sensuous and the intelligible, the pheno- menal and the noumenal, Kant allows no freedom to the natural will determined by the succession of motives, desires and appetites which form the empirical and sensuous self. But in contrast with the phenomenal world goverufid by empirical 1

laws Kant sets the noumenal and intelligible world in which by a timeless act of will man is free to accept, the moral command of an unconditional imperative for no reason other than its own rational necessity as the deliverance of his highest nature. The difficulties of the Kantian system are mainly to be looked for in his account of the relation between the phenomenal and noumenal world.

In more recent times the controversy has been concerned either with the

attempted proof of determinism by the advo- cates of psychological Hedonism, an attempt which at the present time is generally admitted to have Modern failed; or with the new biological knowledge con- /SOT< cerning the influence of heredity and environment in its bearing upon the development of character and the possi- bility of freedom. The great advance of biological knowledge in recent times though it has in no sense created a new problem (men have always been aware of the importance of racial or hereditary physical qualities in their influence upon human conduct) has certainly rendered the existence of complete individual freedom (in the sense in which it was advocated by older libertarians) in the highest degree unlikely. The ad— vocal.es of freedom are content in the present day to postulate a relative power of influencing conduct, e.g.a, power of controlling inherited temperament or subduing natural passion. Such a relative freedom, indeed, taking into account the admitted inviolability of natural laws, was from the very beginning all that they could claim.

But it was inevitable that the enormous advances made by the physical and other sciences in modern times should bring with them a reasoned attempt to bring the phenomena of consciousness within the sphere controlled by physical laws and natural necessity. There will never perhaps in any period of the world's history be wanting advocates of materialism, who find in the sensible the only reality. But the materialism of modern times is more subtle than that of Hobbes. And the determinism of modern science no longer consists in a crude' denial of the reality of conscious processes, or an attempt to explain them as only a sublimated form of matter and its move- ments; it is content to admit the relative independence of the world of consciousness, while it maintains that laws and hypo- theses sufficient to explain material processes may be extended to and will be discovered to be valid of the changing sequences of conscious slates of mind. Moreover, much of the apparent cogency of modern scientific determinist arguments has been derived from the unguarded admissions or timorous acquiescence of their opponents. It is not enough merely to repel the in- cursions of physiological science, armed with hypotheses and theories valid enough in their own sphere, upon the domain oi consciousness. If the attack is to be finally repulsed it will be imperatively necessary for the libertarian to maintain that no full explanation of the physical universe can ever gain assent which does not take account of the reality and influence within the material world of human power of initiative and freedom. Of this necessity there is a growing consciousness in recent years, and no more notable exposition of it has been published than is contained in James Ward's Naturalism and Agnosticism. Nor is there any lack of evidence of a growing dissatisfaction on the part of many physiologists with the complacent assumption that the methods of physical science, and

particularly the con- ception of causal activity common to the sciences which study inorganic nature, can be transferred without further criticism to the examination of life and mind. Meanwhile the scientific onslaught upon the libertarian position has been directed from two chief quarters It has been maintained, on the one hand, that any theory which presupposes a direct correspondence between the molecular movements of the brain, and the states of consciousness which accompany them must make the freedom of the will impossible. On the other hand it is asserted that quite apart from any particular view as to the relation between mind and body the existence of the freedom of the will is necessarily incompatible with the principle of the conserva- tion of energy and is therefore in direct contradiction to

many it not most of the assured conclusions of the physical sciences.

As regards the first of these two main contentions, it must suffice here to point out the main difficulties in which a

determinist and especially materialist account of ʃ d /°" S ;_ tne relation between consciousness and the organic ism. processes whicli accompany it appears to be involved.

The arguments of thorough-going materialism can in most cases be met with a direct negative. No kind of evidence can be adduced sufficient to prove that consciousness is a secre- tion of the brain, art effect or even a consequent of material processes or modes of motion. No direct causal relationship between a molecular movement and a state of consciousness has ever been established. No physiologist has ever claimed the power to prophesy with any approach to accuracy the future mental states of any individual from an examination of his brain. And, though some kind of correspondence between the physical and conscious series of states has been observed and is commonly taken for granted in a number of instances, proof thai entire correspondence exists is still wanting, and the precise kind of correspondence is left undetermined. Nevertheless, the belief that material processes must be held sufficient to account for material changes in the human organism as in all other regions of the material world, can be held quite independently of any particular theory as to the relation between mind and body, and in many of its forms is equally destructive of a belief in the freedom of the will. It is a belief, too, which is increasingly prevalent in modern science. The theory of psychophysical parallelism involves no doubt in the minds of the majority of its upholders the further assumption

of some unity underlying both the physical and psychical series which may one day be discovered to be susceptible of scientific expression and interpretation. Certainly without some such assumption the hypo- thesis of an exact correspondence between the series described as parallel becomes, as Professor Ward has shown, unmeaning. And many scientific thinkers, while professing allegiance to a theory which insists upon the independence of each parallel series, in reality tacitly assume the superior importance if not the controlling force of the physical over the psychical terms. But a mere insistence upon the complete independence of the physical series coupled with the belief that its changes are wholly explicable as modes of motion, i.e. that the study of molecular physics is competent to explain all the phenomena of life and organic movements, is sufficient to eliminate the possibility of spontaneity and free origination from the universe. For if consciousness be looked upon as simply an epiphenomenon, an unaccountable appearance accompanying the succession of material changes, the possibility either of active interference by human volition at any point within the physical series or of any controlling or directing efficacy of consciousness over the whole set of material changes which accompany its activity becomes unthinkable. There are, nevertheless, serious diffi- culties involved in the supposition that the changes in the brain with which physiology and the biological sciences deal can be satisfactorily explained by the mechanical and mathematical conceptions common to all these sciences, or, indeed, that any of these organic changes is susceptible in the last resort of explanation derived from purely material premises. The phenomena of life and growth and assimilation have not been satisfactorily explained as mechanical modes of motion, and the fact that identical cerebral movements have not been dis covered to recur makes scientific and accurate prediction of future cerebral changes an impassibility. But more convincing than most of the philosophical arguments by which the theories of psychophysical parallelism have been assailed is the fact that it runs counter to the plain evidence of the ordinary conscious- ness. No matter to what extent the unphilosophical thinker may be under the influence of materialistic presuppositions, he always recoils from the conclusion that the facts of his mental life have no influence upon his physical movements. Meaning, design and purpose are to him terms far more explanatory of his movements in the outer world than the mechanical and

mathematical equivalents to which his actions will ultimately be reduced if the sciences should achieve their avowed purpose. To regard himself as a conscious automaton he can never be persuaded. Further, he finds in the series of antecedents and consequents capable of mathematical and spatial determination, which certain men of science present to him as their final account of his physical and psychical history, no real explanation of the

facts: he is far more inclined to look for an explanation of the efficacy of causal changes in the categories of will and purpose for which they are a substitution.

Nor, finally, is the last defensive position of scientific deter- minism — the theory, namely, that the freedom of the will is incompatible with the doctrine of the conservation of energy — to be accepted without question. That doctrine, if it is to possess cogency as a proof of the impossibility of the libertarian position, must assume that the amount of energy sufficient to account for physical and psychical changes is constant and invariable in quantity, an assumption which no scientific in- vestigator is competent to prove. A regulative principle which may possess great value when applied and confined to the comparatively abstract material of the mathematical and quasi- mathematical sciences is highly dangerous if extended to the investigation of living bodies. " In its present form, and since the development of the mechanical theory of heat, the principle of the conservation of energy certainly seems to apply to the whole range of physico-chemical phenomena. But no one can tell whether the study of physiological phenomena in general, and of nervous phenomena in particular, will not reveal to us, besides the vis viva or kinetic energy of which Leibnitz spoke, and the potential energy which was a later and necessary ad- junct, some new kind of energy which may differ from the other two by rebelling against calculation " (Bergson, Time and Free Will, Eng. trans, by F. L. Pogson, pp. 151, 152).

It is, however, from the development of the. scientific study of psychology more than from any other region of thought that light has been thrown upon the problem of freedom. The determinist presuppositions of psy- psychology. chology (determinist because they involve the applica- tion of the causal conceptions of modern science to mental phenomena) have in many instances in no way retarded the utilization of new information concerning mental processes in order to prove the reality of freedom. Bergson is perhaps the most notable instance of a philosopher fully conversant with psychological studies and methods who remains a convinced libertarian. But the contribution made by psychology to the solution of the problem has taken the form not so much of a direct reinforcement of the arguments of either of the opponent systems, as of a searching criticism of the false assumptions concerning conative processes and the phenomena of choice common alike to determinist") and libertarians. It has already been pointed out that the problem as it presented itself to utilitarian philosophers could lead only to a false solution, depending as it did upon a wholly fictitious theory as to the nature of desire. There are still many traces to be found in modern psychology of a similar unreal identification of desire with will. But, nevertheless, the new light thrown upon the unity of the self and the more

careful and accurate scrutiny made by recent psychologists of the phenomena of decision have rendered it no longer possible either for determinists to deny the fact of choice (whatever be their theory as to its nature) or for libertarians to regard the self or the will as isolated from and unaffected by other mental constituents and antecedents, and hence, by an appeal to wholly fictitious entities, to prove the truth of freedom. The self or the will can no longer be looked upon as possessing a kind of imperium in imperio, "this way and that dividing the swift mind." Ami if freedom of choice be a possibility at all, it must in future be regarded as the prerogative of a man's whole personality, exhibited continuously throughout the development of his character, displayed to soffit extent in all conscious conative processes, though especially apparent in crises necessitating deliberate and serious purpose. The mistake of earlier advocates of determinism lay in the

supposition that self-conscious moral action could be explained by the use of the same categories and upon the same hypotheses usually considered sufficient to explain the causal sequences observable in the physical world. Conduct was regarded as the result of interaction between character and environment; or it was asserted to be the resultant effect of a struggle between motives in which the strongest prevailed. And the libertarian- critic had before him a comparatively easy task when he ex- hibited the complete interdependence of character and en- vironment, or rather the impossibility of treating either as definite and fixed factors in a process explicable by the use of ordinary scientific categories.

It was not difficult to show that motives have meaning only with reference to a self, and that it is the self which alone has power to erect a desire into a motive, or that the attraction of an object of appetite derives much of its power from the character of the self to which it makes its appeal. What is possibly not so obvious is the extent to which libertarians have themselves been guilty of a similar fallacy. It is comparatively unimportant to the determinist whether the cause to which he attributes conduct be the self, or the will, or character, or the strongest motive, provided that each of these causes be regarded as definitely ascertainable and that its effects in sufficiently known circumstances be calculable. It is possible to treat will as a permanent cause manifesting itself through a series of sequent changes, and obedient to the laws which govern the development of the personality of the single individual.

And the libertarian, by his arguments showing that appeal must be made to

an act of will or of the self in the explanation of the phenomena of choice, does nothing directly ˆ b {lbri nS – to disprove tne trutn 0I sucn a contention. If, how- ianism. ever, it be argued by libertarians that no explanation is possible of the manner in which the self or the will makes its decisions and inclines to this motive or to that, while they still assert the independent existence of the self or will, then they are undoubtedly open to the retort of their opponents that upon such a theory no rational explanation of conduct will be possible. For to regard a particular decision as the effect of the " hat" of a self or will unmotived and uninfluenced by the idea of a future object of attainment seems to be equiva- lent to the simple statement that the choice was made or the decision taken. Such a theory can prove nothing either for or against the possibility of freedom.

Moreover, many of the arguments by which the position of rigid libertarians of the older school has been proved untenable

Idealism.

have been advanced by moral philosophers, and by thinkers not always inclined to regard psychology with complete sympathy. The doctrine of self-determination, advocated by T. H. Green and idealist writers of his school, has little or nothing in common with the doctrine that the self manifests its freedom in unmotived acts of will. The advocates of self-determination maintain that conduct is never determined, in the sense in which, e.g. movements in the physical world are determined, because man in virtue of his self-consciousness has a power of distinguishing himself from, even while he identifies himself with , a purely natural object of desire ; and this must always make it impossible to regard him as an object governed by purely natural forces. Consciousness and especially self- consciousness, can never be explained upon hypotheses adequate only to explain the blind working of the unconscious world. But the insistence of idealist writers upon the relation of the world of nature to conscious intelligence, and especially to a universal consciousness realizing itself throughout the history of in- dividuals, rendered it alike impossible to deny altogether some influence of environment upon character, and to regard the history of individual willing selves as consisting in isolated and unconnected acts of choice. Self-consciousness, if it be conceived as distinguishing itself from its past history or from the natural world, must be conceived also as in some sense related to the empirical self which has a history in time and to the natural organism in which it finds a home. It is the precise mode of this relation which idealist philosophers leave obscure.

Nor is that obscurity to any appreciable degree illuminated by the tendency also noticeable in idealist writers to find the true possession of freedom only in a self emancipated from the influence of irrational passion, and

liberated by knowledge from the dominion of chance or the despotism of unknown natural forces. Here also psychology, by its elucidation of the important part which instinctive appetites and animal impulses play in the development of intelligence, still more perhaps by arguments (based largely upon the examination of hypnotic subjects or the, phenomena of fixed ideas) which show the permanent influence of irrational or semi-rational suggestions or habits upon human conduct, has done much to aid and abet idealists in their contentions. It cannot in fact be denied that from one point of view human freedom is strictly relative, a posses- sion to be won only after painful effort, exhibiting itself in its entirety only in supreme moments when the self is unswayed by habit, and out of full knowledge makes an individual and personal choice. Ideal freedom will be the supreme achievement of a self completely moralized. But the process by which such freedom is eventually to be gained must, if the prize is to be worth the having, itself exhibit the gradual development of a self which, under whatever limitations, possesses the same liberty of choice in its early stages as in its latest. And no theory which limits the exercise of freedom to the choice only of what is strictly good or rational can avoid the imputation of destroying man's responsibility for the choice of evil.

But the most important point at issue between the opposing theories has remained throughout the history of the controversy, the morality or immorality of their respective solutions of the problem. The advocates of either theory must pro bi cni , in the last resort appeal to the direct evidence of the moral consciousness. It remains to give a brief sketch of the arguments advanced on either side.

It has always been maintained by convinced libertarians that without a belief in the freedom of the will morality becomes unmeaning (see Determinism). Moreover, without a belief in the freedom of the will the conception of moral obligation upon which the existence of morality depends and from which all other moral terms derive their meaning loses its chief significance. What is opposed to obligation, or at least always distinguished from it, is that very domain of necessity within which determinists would bring the will. For even when the felt obligation is absolute, where the will is completely moralized, where it is inconceivable in the case of a good man that the act which he performs should be other than it is, there the obligation which he recognizes is an obligation to choose autonomously, and as such is distinguished from desire or appetite or any of the other alleged determinants of action. If the question be asked " Where is the evidence for this alleged freedom to choose between alternatives?" the appeal is always made to the witness of the moral consciousness itself. No one, it is said, who ever feels remorse for the committal of a wrong act can honestly avoid the admission that at the moment when the act was committed he could have acted otherwise. No

one at the moment of action is ever aware that his will is being necessitated. What he is clearly conscious of is the power to choose. Any proof, in the scientific sense, that a man's acts arc due to his power of free initiative would be from the nature of the case impossible. For, inasmuch as scientific proof depends upon the evidence of causality, such efforts after scientific demonstration would end only by bringing either the man's whole personality or some element in it within the sequence of the chain of natural causes and effects, under the domination of that natural necessity from which as a conscious being he is free. The science of morality must be content in its search for causes to recognize the rationality of choice as a real determining agent in human affairs. And no account of the psychology of human action which regards conduct as due to self-determination, but leaves open the question whether the self is free to choose is, so it is argued, capable of providing an adequate theory of the admitted facts of moral consciousness.

We must now consider the arguments by which determinists

Punish meat.

attack the position of their opponents and the evidence which they adduce to show that the freedom of the will is no necessary

postulate for moral action. For thorough-going deter- minist minism of the older type the dependence of morality ethics. upon freedom did not of necessity prove an obstacle.

Hedonisticpsychology denied the libertarian hypothesis, but it denied also the absoluteness and intuitive character of moral obligation, and attached no validity to the ordinary interpreta- tion of terms like " ought " and duty. Modern determinists differ from the earlier advocates of their theory in their endeavour to exhibit at least the compatibility of morality with the absence of freedom, if not the enhancement of moral values which, according to some of its advocates, follows upon the acceptance of the deterministic account of conduct.

If a coherent theory capable of giving an explanation of the ordinary facts of morality and not involving too violent a breach with the meaning of moral terms in their accepted usage were all that need be required of determinists in order to reconcile the defenders of the moral consciousness to the loss of their belief in the will's freedom, it would follow without question that the determinists have proved their case. Neither the deterrent

nor the reformatory theories of punishment {q.v.) neces- sarily depend upon or carry with them a belief in the freedom of the will. On the contrary, a belief that conduct necessarily results upon the presence of certain motives, and that upon the application of certain incentives, whether of pain or pleasure, upon the presence of certain stimuli whether in the shape of rewards or punishments, actions of a certain character will necessarily ensue, would seem to vindicate the rationality of ordinary penal legislation, if its aim be deterrent or reformatory, to a far greater extent than is possible upon the libertarian hypothesis. Humanitarian moralists, who hesitate to believe in the retributive theory of punishment because, as they think, its aim is not the criminal's future well-being but merely the vindication through pain of an outrage upon the moral law which the criminal need never have committed, might welcome a theory which urges that the sole aim of punishment should be the exercise of an influence determining the criminal's future conduct for his own or the social good.

Moreover, the belief that the justice of punishment depends upon the responsibility of the criminal for his past offences and the ad- mission of the moral consciousness that his previous wrong-doing was freely chosen carries with it, so it is argued, consequences which the libertarian moralist might be willing to accept with reluctance. For whatever may have been the character of the individual in the past, it is possible upon the libertarian view that by the exercise of his freedom he has brought about in himself a complete change of character: he may be now the exact opposite in character of what he was then. Upon what grounds, therefore, shall we discriminate between the justice of punishing him for what he was at a previous period in his life and the injustice of forgiving him becauseof what he is in the present? While if the deterrent and reformatory theories alone provide a rational end for punishment to aim at then the libertarian hypothesis pushed to its extreme conclusion must make all punishments equally useless. For no punishments can prevent the individual from becoming a person of whatsoever character he chooses or from committing acts of whatsoever moral quality he determines to prefer. A similar line of argument would lead to the conclusion that the conception of the state as an educating, controlling and civilizing agency involves the belief that individual citizens can be influenced and directed by motives which have their origin in external suggestion, i.e. that the determinist theory alone provides a rational basis for state activity of whatever kind.

It might, however, be thought that whatever be the compati- bility of theories of punishment or of the activity of the state as a Remorse ^- oraWzmg agency with determinism, to reconcile the denial of freedom with a belief in the reality of remorse or penitence will be plainly impossible. Nevertheless there is no tendency on the part of modern determinists to evade the difficulty. They argue with considerable cogency that

determinism is very far from affording any ground for believing in the impotence of will. The belief that our actions have been determined in the past carries with it no argument that they will be of a like character in the future. Though in the future as in the past they must he equally determined, yet the forces that will determine their character in the future may be as yet unanalysed and unapparent. No man can exhaust by introspective analysis the hidden elements in his personality. The existence of feelings of remorse and penitence testify to the presence in the individual of motives to good conduct which, if acted upon and allowed full scope and development, may produce a complete change of character. Determinism is not necessarily the logic of despair. Moreover, in a certain sense the very feelings of remorse and penitence which are the chief weapons in the libertarians' armoury testify to the truth of the determinists' contention. For they are the natural and logical consequence of the acts which the penitent deplores. Such feelings follow the committal of acts of a certain character in a consciousness sufficiently moralized as inevitably as pain in the

natural world follows upon the violation of one of nature's laws. And they would lose a great part of their significance if they did not testify to the continued existence in a man s personality of motives and tendencies likely to influence his conduct in the future as they have already influenced it in the past. Nor is it possible to give any rational explanation of the idea of responsibility itself upon inde- terminist assumptions. For to hold a person to be a responsible agent is to believe that he possesses a certain fixity and stability of char- acter. Freedom in the sense of complete liberty of choice would seem to lead to the conclusion that free agents are irresponsible, un-accountable. The truth seems to be that throughout the history of the controversy the chief arguments for either side have been pro- vided by the extreme and exaggerated statements to which their opponents have been driven in the presentation of their case. So long as libertarians contend that what alone possesses moral value is unmotived choice, acts of will of which no explanation can be given save the arbitrary fiat of individual selves at the moment of decision, it is not difficult for determinists to exhibit the absurdities to which their arguments lead. It can easily be shown that men do as a matter of fact attach moral adjectives to environment, tempera-mental tendencies, natural endowments, instinctive desires, in a word to all or most of those forces moulding character, from which, according to libertarians, the individual's freedom of choice should be clearly distinguished and separated, and to which it can be and is frequently opposed. While it is not easy to avoid the suspicion that a choice of which nothing can be predicated, which is guided by no motive, influenced by no desire, which is due neither to the natural display of character nor to the influence of environment, is either merely fortuitous or the product of a philosophical theory.

But, as has been already suggested, the libertarian argument by no means necessarily leads to such extreme conclusions. The libertarian is not pledged to the belief that acts which alone exhibit real freedom are isolated acts which depend upon a complete change of character, a change which is in no sense continuous with, and is in no kind of relation to, the series of successive changes which make up an individual's mental and moral history. It is true that a consistent advocate of indeterminism must deny that the w r ill is determined by motives, and must admit that no reason can finally be given for the individual's choice beyond the act of choice itself. For to give a reason for choosing (where " reason " is not merely equivalent to the determinists' "cause" or "necessary antecedent") would simply be to find the explanation of the individual's choice in some previous decision. Moral conduct is conduct which follows upon the choice of ends, and to give a reason for the choice of an end in any particular instance is either to explain the nature of the end chosen and thus to describe the choice (a process which can in no sense show that the act of choice was itself necessitated), or it is to find the ground of the particular decision in its relation to an end already chosen. But whatever be the nature of the end chosen the libertarian is not con- cerned to deny that it must possess a fixed determinate character. If duty be chosen as opposed to pleasure the opposition between duty and pleasure is a necessary one. The recognition of such a necessary opposition is involved in the determinate act of choice. But the choice itself is neither necessary nor determined. The belief that libcrtarianism denies the binding force of habit or the gradual development of unchecked tendencies in character depends upon a similar misconception. The continuity of a man's life and purposes would be equally apparent whether he habitually performed the same acts and made the same decisions in virtue of his freedom of choice or as the product of necessary forces moulding his character in ac- cordance with fixed laws. just as the phenomena of sudden con- version, complete revolutions of character occurring to outward appearance in a momentary space of time, are no valid argument against determinism — they may be due to the sudden emergence of elements in life and character long concealed — so what looks like the orderly and necessary development of a character growing and exhibiting its activity in accordance with fixed laws may in reality be due to innumerable secret struggles and momentous decisions, acts of choice of which only the results are outwardly apparent. The ends which at any moment the individual is free to choose or reject possess a determinate character: their existence or non-existence as possibilities is also to a very large extent determined for him. No man can choose to become whatsoever he will, for the ends which he can accomplish are restricted in number as well as definite in quality. But the real strength of the libertarian position is to be found in the fact that consciousness is capable of distinguishing ends at all. Whenever, for example, there is an

admission on the part of any individual that in any previous act he made the attainment of pleasure his end rather than the performance of duty, there is also a tacit admission that he might. have acted otherwise. And the exist- ence of penitence and remorse is not merely a sign of the emergence in consciousness of elements in character nobler than and opposed to those tendencies which once held sway. They are feelings which are incapable of coming into being at all save when coupled with the judgment, " I ought to have acted otherwise because I possessed the power. " The same argument holds good concerning our feelings with regard to the justice or injustice of punishing a criminal if we believe that his will was determined. It may be politic or expedient to inflict pain upon a criminal in order either to effect an alteration in his character or to deter him or others from future performance of

acts of a certain character. But even with regard to the expediency of such punishments we may have doubts. For the very argument from the undeveloped possibilities of each man's character by which the determinist proves the compatibility of his theory with the phenomenon of sudden conversion and the like is sufficient also to prove that the state can never be sure that the punishments which it inflicts upon the individual will have the effect upon his character and conduct which it desires. It may be replied that experience makes it reasonably certain that the infliction of certain penalties will produce acts of a certain character and that the influence of certain incentives upon conduct may be established as reasonably probable by in- duction. But when the data are admittedly so uncertain is a valid inductive argument of such a character possible? And even if it were what would be its bearing upon the justice or injustice of inflicting punishments at all? The unsophisticated moral conscious- ness will still consider it unjust to punish a man for deeds of which he could not avoid the performance, and regard the alleged desire to produce in his future life consequences favourable to him- self or society as beside the mark and irrelevant to the question at issue.

At the moment of action the individual invariably regards himself as free to choose between alternatives. This immediate

consciousness of freedom persists upon another /ree-w/// occasion even though subsequent reflection upon position, conduct should lead the individual to regard himself

as determined at the very moment when he was aware of himself as free. It

is this immediate consciousness of the power of choosing between alternatives which the determinist finds so difficult to explain. He may regard it as an illusion, and attempt to prove the incompatibility of our consciousness of freedom with the facts of existence and the nature of the world. But, in ordinary cases of illusion, once let the reason for the illusion be discovered, and there is no longer the possibility of our being longer deceived. The phenomena which deceived us may continue to persist, but they no longer persist as illusory: the appearance which deceived us is seen in its true nature, even though it should still retain those characteristic marks or signs of reality which hitherto we regarded as significant of a nature which we now no longer believe it to possess. But can it be maintained that the same truth holds good of our consciousness of freedom? Is it possible to hold that determinist arguments arc of so convincing a character as to enable us to perceive at the moment of action the untrustworthy nature of our con- sciousness that we are free to choose between alternatives and to grasp beneath the appearance the underlying necessity which rules our wills? Our actual consciousness of freedom is not seriously disputed. And though reflection upon conduct may lead us to suppose that our past acts were determined, that desire of pleasure or the wish to avoid pain controlled our wills, the unphilosophical observer interprets, in offenders against morality, such arguments as a mere excuse. Moreover, remorse and penit- ence are witnesses in the wrongdoer to the truth of the interpreta- tion. On the other hand we have no such immediate conscious- ness of the necessity which is said to control our wills. We sharply distinguish that freedom which is the prerogative of human action from the necessary causation discoverable in nature. Within the domain of consciousness introspective analysis is unable to discover those chains of necessary sequences which it is the province of science to investigate in the physical world. And until the determinist can successfully explain to us how in a world obeying throughout its history necessary laws and limited in its nature to the exhibition of causal sequences the consciousness of freedom could ever have arisen, we may be content to trust the immediate affirmation of our moral selves.

For modern discussions of the problem consult Lotze, Micro- cosmus, i. 2ˆ6 seq., English trans. Martineau; Study of Religion, vol. ii. bk. iii. chap. 2; Ward, Naturalism and Agnosticism; Rashdall, The Theory of Good and Evil, vol. ii. bk. iii. ; Taylor, Elements of Metaphysics, bk. iv. chap. 4; McTaggart, Some Dogmas of Religion, v. ; Shadworth Hodgson, The Philosophy of Experience, iv. 118 seq.; Galloway, Studies in the Philosophy of Religion; Bergson, Essai sur les donnees immediates de la conscience; James, Tlie Will to Believe; Fonsegrive, Essai sur le libre arbitre; Renouvier, Les Diletnmes de la metaphysiqiie pure; Boutroux, La- Contingence des lois de la nature; Noel, La Conscience du libre arbilre; Boyce Gibson, Essay in

Personal Idealism on " The Problem of Freedom. "

(H. H. W.)

Roman law.

WILL, or Testament, the legal documentary instrument by which a person regulates the rights of others over his property or family after his death. 1 For the devolution of property not disposed of by will, see Inheritance, Intestacy. In strictness " will " is a general term whilst " testament " applies only to dispositions of personalty; but this distinction is seldom observed. The conception of freedom of disposition by will, familiar as it is in modern England, is by no means universal. In fact, complete freedom is the exception rather than the rule. Legal systems which are based upon Roman law, such as those of Scotland and France, allow the whole property to be alienated only where the deceased leaves no widow or near relatives. In France this restriction has met with condemnation from eminent legal and economical authorities. R. T. Troplong, for instance, held that "un peuple n'est pas libre, s'iln'a pas le droit de tester, et la liberte du testament est la plus grande preuve de la liberte civile." 2

History. — The will, if not purely Roman in origin, at least owes to Roman law its complete development — a development which in most European countries was greatly aided at a later period by ecclesiastics versed in Roman law. In India, accord- ing to the better opinion, it was unknown before the English conquest; in the Mosaic law and in ancient Athens the will, if it existed at all, was of a very rudimentary character. The same is the case with the Leges barbarorum, where they are unaffected by Roman law. The will is, on the other hand, recognized by Rabhinical and Mohammedan law. The early Roman will, as Sir II. Maine shows, s differed from the modern will in most important respects. It was at first effectual during the lifetime of the person w-ho made it; it was made in public; and it was irrevocable. Its original object, like that of adoption, was to secure the perpetuation of the family. This was done by securing the due vesting of the herediias in a person who could be relied upon to keep up the family rites. There is much probability in the conjecture that a will was only allowed to be made when the testator had no gentiles discoverable, or when the gentiles had w'aived their rights. It is certain from the text of Gains i that the earliest forms of will were those made in the comitia calata and those madewˆoc-mdMjOrontheeveof battle. The former were publisher! before the comitia, as representative of the patrician gentes, and were originally a legislative act. These wills were the peculiar privilege of patricians. At a later time grew up a form of plebeian will (testa- mentum per aes et libram), and the law of succession under testament was further modified by the influence of the praetor, especially in the direction of

recognition of fideicommissa or testamentary trusts. Codicilli or informal wills, also came into use, and were sufficient for almost every purpose but the appointment of an heir. In the time of Justinian a will foundedpartly on the jus civile, partly on the edict of the praetor, partly on imperial constitutions and so called testa- mentum iripertitum, w r as generally in use. The main points essential to its validity were that the testator should possess testamentary capacity, and that the will should be signed or acknowledged by the testator in the presence of seven witnesses, or published orally in open court. The witnesses must be idonei, or free from legal dis- ability. For instance, women and slaves were not good witnesses. The whole _ property of the testator could not be alienated. The rights of heirs and descendants were protected by enactments which secured to them a legal minimum, the querela inojp.ciosi testamenti being the remedy of those passed over. The age at which testa- mentary capacity began was fourteen in the case of males, twelve in the case of females. Up to a.d. 439 a will must have been in Latin; after that date Greek was allowed. Certain persons, especially soldiers, were privileged from observing the ordinary forms. The liability of the heir to the debts of the testator varied at different periods. At first it was practically unlimited. Then the law was gradually modified in his favour, until in the time of Justinian the heir who duly made an inventory of the property of the deceased was liable only to the assets to which he had succeeded. This limitation of liability is generally termed by the civilians beneficium iwoentarii. Something like the English probate is to be found in the rules for breaking the seals of a will in presence of the praetor. Closely con- nected with the will was the donatio mortis causa, the rules of which have been as a whole adopted in England (see below). An immense space in the Corpus juris is occupied with testamentary law. The whole of part v. of the Digest (books xxviii.-xxxvi.) deals with the subject, and so do a large number of constitutions in the Code and Novels.

The effect of Christianity upon the will was very marked. For instance, the duty of bequeathing to the Church was inculcated as

1 This is practically in accordance with the definition of Modestinus in Digest xxviii. r, r, voluntatis nostrae justa sententia de eo quod quis post mortem suam fieri velit.

2 Traits des donations entre-vifs el des testaments (1855), preface.

3 Ancient Law, chap. vi,

- *ii. 101.*

early as Constantine, and heretics and monks were placed under a (Usability to make a will or take gifts left by will. A will was often de- posited in a church. The canon law follows the Roman law Canon -k\x\ a still greater leaning to the advantage of the Church. " No Church property could be bequeathed. Manifest usurers

were added to the list of those under disability. For the validity of a will it was generally necessary that it should be made in the presence of a priest and two witnesses, unless where it was made in pias eausas. The witnesses, as in Roman law, must be idonei. Gifts to the Church were not subject to the deductions in favour of the heir and the children necessary in ordinary cases. 1 In England the Church succeeded in holding in its own hands for centuries jurisdiction in testamentary matters.

The Roman law of wills has had considerable effect upon English law. In the words of Sir II. Maine, "The English law of testa- mentary succession to personalty has become a modified English f rm of the dispensation under which the inheritances of aw ' Roman citizens were administered." 2 At the same time

there are some broad and striking differences which should be borne in mind. The following among others may be noticed. (1) A Roman testator could not, unless a soldier, die partly testate and partly intestate. The will must stand or fall as a whole. This is not the case in England. (2) There is no one in English law r to whom the universitas juris of the testator descends as it did to the Roman hercs, whose appointment was essential to the validity of a formal will, and who partook of the nature of the English heir, executor, adminis- trator, devisee and legatee. (3) The disabilities of testators differed in the two systems. The disability of a slave or a heretic is peculiar to Roman law, of a youth between fourteen and twenty-one to English law. {4) The whole property may be disponed of in England; but it was not so at Rome, where, except by the wills of soldiers, children could not be disinherited unless for specified acts of mis- conduct. During the greater part of the period of Roman law the heir must also have had his Falcidian fourth in order to induce him to accept the inheritance. (5) In English law all wills must conform to certain statutory requirements; the Romans recognized from the time of Augustus an informal will called codicilli. The English codicil has little in common with this but the name. It is not an informal will, but an addition to a will, read as apart of it, and needing the same formalities of execution. (6) The Roman legatum applied to both movables and immovables; in England a legacy or bequest is a gift of personalty only, a gift of real estate being called a devise. 3 (7) The Roman will spoke from the time of making; the English speaks from the

time of death. This difference becomes very im- portant in case of alteration in the position of the testator between the making of the will and his death. As a rule the Roman will co;]ld not, the English can, pass after-acquired property.

Liberty of alienation by will is found at an early period in England. To judge from the words of a law of Canute, intestacy appears to have been the exception at that time. How far the liberty extended is uncertain; it is the opinion of some authorities that complete disposition of land and goods was allowed, of others that limited rights of wife and children were recognized. However this may be, after the Conquest a distinction, the result of feudalism, to use a convenient if inaccurate term, arose between real and personal property. It will be convenient to treat the history of the two kinds of will separately.*

It became the law after the Conquest, according to Str E. Coke, 5 rhat no estate greater than for a term of years could be disposed of by will, unless in Kent, where the custom of gavelkind ^ prevailed, and in some manors and boroughs (especially

prope y. t < ne City of London), where the pre-Conquest law was preserved by special indulgence. The reason why devise of land was not acknowledged by law was, no doubt, partly todiscourage death- bed gifts in mortmain, a view supported by Glanvill, partly because the testator could not give the devisee that seisin which was- the principal element in a feudal conveyance. By means of the doctrine vA w»es, however, the devise of land was secured by a circuitous method, generally by conveyance to feoffees to uses in the lifetime of i he feoffor to such uses as he should appoint by his will (see Trust). Cp to comparatively recent times a will of lands still bore traces of its origin in the conveyance to uses inter vivos. On the passing of the Statute of Uses lands again became non-devisable, with a saving in the statute for the validity of wills made before the 1st of May 1536. The inconvenience of this state of things soon began to be felt, and was probably aggravated by the large amount of land thrown into the market after the dissolution of the monasteries. As a remedy an act was passed in 1540, and a further explanatory act in 1542-1543.

1 Most of the law is contained in Decretals, iii. 26, " De Testa- mentis."

-Ancient Law, chap. vi.

5 The distinction between bequest and devise did not always exist. For instance, the Assize of Northampton, c. 4, speaks of a devise {divisa} of chattels (sec Bequest).

4 Secular Laws, c. 68. 5 2 Inst. 7.

6 Many instances of such conveyances occur in Sir Harris Nicolas' Textamenta vetusta and in Fifty Earliest English Wills (1387-1 439), edited by Dt F. J. Furnivall in 1882.

The effect of these acts was to make lands held in fee simple devisable by will in writing, to the extent of two-thirds where the tenure was by knight service, and the whole where it was in socage. Corporations wcreiucapacitaled to receive, and married women, infants, idiots and lunatics to devise. An act of 1660, by abolishing tenure by knight service, made all lands devisable. In the same reign the Statute ol Frauds (1677) dealt with the formalities of execution. Up to this time simple notes, even in the handwriting of another person, con- stituted a sufficient will, if published by the testator as such. The Statute of Frauds required, intsr alia, that all devises should be in writing, signed by the testator or by some person for him in his presence and by his direction, and should also be subscribed by three or four credible witnesses. The strict interpretation by the courts of the credibility of witnesses led to the passing of an act in 1751-1752, making interested witnesses sufficient for the due execu- tion of the will, but declaring gifts to them void. The will of a man was revoked by marriage and the birth of a child, of a woman by marriage only. A will was also revoked by an alteration in circum- stances, and even by a void conveyance inter vivos of land devised by the will made subsequently to the date of the will, which was pre- sumed to be an attempt by the grantor to give legal effect to a change of intention. As in Roman law, a will spoke from the time of the making, so that it could not avail to pass after-acquired property without republication, which was equivalent to making a new will. Copyholds were not devisable before 1815, but were usually sur-rendered to the use of the will of the copyhold tenant; an act of 1815 made them devisable simply. Devises of lands have gradually been made liable to the claims of creditors by a series of statutes beginning with the year 1691.

The history of wills of personalty was considerably different, but to some extent followed parallel lines. In both cases partial preceded complete power of disposition. The general opinion of the best authorities is that by the common law so "fj

of England a man could only dispose of his whole personal P r °P er ***y-property if he left no wife or children ; if he left either wife or children he could only dispose of one-half, and one-third if he left both wife and children. The shares of wife and children were called their pars rationabilis. This pars raiionabilis is expressly recognized in Magna Carta and was sued for by the writ de ralionabili parte. At what period the right of disposition of the whole personalty***

superseded the old law is uncertain. That it did so is certain, and the places where the old rule still existed — the province of York, Wales and the City of London — were regarded as exceptions *The right of bequest in these places was not assimilated to the general law until compara tively recent times by acts passed between 1693 and 1726. A will of personalty could be made by a male at fourteen, by a female at twelve. The formalities in. the case of wills of personalty were not as numerous as in the case of wills of land. Up to 1838 a nuncupative or oral will was sufficient, subject, where the gift was of £30 or more, to the restrictions contained in the Statute of Frauds. The witnesses to a written will need not be " credible," and it was specially enacted by an act of 1705 that any one who could give evidence in a court of law was a good witness to a will of personalty. A will entirely in the testator's handwriting, called a holograph will, was valid without signature. At one time the executor was entitled to the residue in default of a residuary legatee. But the Executors Act 1830 made him in such an event trustee for the next of kin.*

Jurisdiction over wills of personalty was till 1858 in the ecclesi- astical courts, probate being granted by the diocesan court 7 if the goods of the deceased lay En the same diocese, in the provincial court of Canterbury (the prerogative court) or York (the chancery court) if the deceased had bona notabilia, that is, goods to the value of £5 in two dioceses. The ecclesiastical jurisdiction was of a very ancient origin. It was fully established under Henry II. , as it is mentioned by Glanvill. In the city of London wills were enrolled in the Court of Hustings from 1258 to 1688 after having been proved before the ordinary. Contested cases before 1858 were tried in the provincial court with an appeal originally to the Court of Delegates, later to the j udicial committee of the privy council. There were also a few special local jurisdictions, courts baron, the university courts, and others, probably for the most part survivals of the pre-Conquest period, when wills seem to have been published in the county court. The ecclesi- astical courts had no jurisdiction over wills of land, and the common law courts were careful to keep the ecclesiastical courts within their limits by means of prohibition. No probate of a will of land was necessary, and title to real estate by will might be made by pro- duction of the will as a document of title. The liability of the executor and legatee for the dehts of the testator has been gradually established by legislation. In general it is limited to the amount of the succession. Personal liability of the executor beyond this can by the Statute of Frauds only be established by contract in writing.

Modern English Low.— Such were the principal stages in the history of the law as it affected wills made before 1S3S or proved before 1858. The principal acts now in force are the Wills Act 1837, the amending act of 1852, the Court of Probate Act 1857,

T The testamentary jurisdiction of the archdeacon's court is alluded to by Chaucer in the " Friar's Tale," but it was afterwards completely superseded by the bishop's court.

the Judicature Acts 1873 and 1875 and the Land Transfer Act 1897. All but theacts of 1837 and 1852 deal mainly with what happens to the will after death, whether under the voluntary or contentious jurisdiction of the Probate Division (see Probate). Some of the earlier acts are still law, though of little importance since the more modern and comprehensive enactments.

The earliest on the statute roll is an act of Henry III. (1236), enabling a widow to bequeath the crops of her lands. Before the Wills Act uniformity in the law had been urgently recommended by the Real Property Commissioners in 1833. It appears from their report ' that at the time of its appearance there were ten different ways in which a will might be made under different circumstances.

The act of 1 837 affected both the making and the interpretation of wills. 2 Excluding; the latter for the present, its main provisions were these. All property, real and personal, and of whatever tenure, may be disposed of by will. If customary freeholds or copyholds be devised, the will must be entered on the court rolls. No will made by any person under the age of twenty-one is valid. Every will is to be in writing, signed at the foot or end thereof by the testator or by some person in his presence and by his direction, and such signature is to be made or acknowledged by the testator in the presence of two or more witnesses present at the same time, who are to subscribe the will in the presence of the testator. It is usual for the testator and the witnesses to sign every sheet. Publication is not necessary. A will is not void on account of the incompetency of a witness. Gifts to a witness or the husband or wife of a witness are void. A creditor or executor may attest. A will is revoked (except where made in exercise of a power of appointment of a certain kind) by a later will, or by destruction with the intention of revoking, but not by pre- sumption arising from an alteration in circumstances. Alterations in a will must be executed and attested as a will. A will speaks from the death of the testator, unless a contrary intention appear. An unattested document may be, if properly identified, incorporated in a will, but such a document, if executed subsequently to the will, is inoperative.

Rules of interpretation or construction depend chiefly on decisions of the

courts, to a smaller extent on statutory enactment. The law was gradually brought into its present condition through pre- cedents extending back for centuries, especially decisions of the court of chancery, the court par excellence of construction, as dis- tinguished from the court of probate. The court of probate did not deal unless incidentally with the meaning of the will; its juris- diction was confined to seeing that it was duly executed. The present state of the law of interpretation is highly technical. Some phrases have obtained a conventional meaning which the testators who used them probably did not dream of. Many of the judicial doctrines which had gradually become established were altered by the Wills Act. These provisions of the act have since that time themselves become the subject of judicial decision. Among other provisions are these, most of them to take effect only in the absence of a contrary intention. A residuary devise is to include estates comprised in la psed and void devises. A general gift of the testator's lands is to include copyholds and leaseholds. A general gift of real or personal estate is to include real or personal estate over which the testator had a general power of appointment. A devise without words of limitation is to pass the fee simple. The words " die without issue," or similar words, are to mean die without issue living at the time of the death of the person whose issue was named, not as before the act, an indefinite failure of issue, an estate tail being thus created. Trustees under an unlimited devise are to take the fee simple. Devises of estates tail are not to lapse if the devisee, though he pre- deceased the testator, left issue inheritable under the entail. Gifts to children or other issue leaving issue living at the testator's death are not to lapse. ' Rules of interpretation founded on principles of equity independent of statute are very numerous, and tor them the works devoted to the suoject must be consulted. Some of the more important, stated in as general a form as possible, are these. The intention of the testator is to be observed. This rule is called by Sir E. Coke the pole star to guide the judges. There is a presumption against intestacy, against double portions, against constructing merely precatory words to import a trust, &c. One part of the will is to be expounded by another. Interlineations and alterations are presumed to have been made after, not as in deeds before, execution. Words are supposed to be used in their strict and primary sense. Many wordsand phrases, however, such as " money," " residue " and " issue " and other words of relationship, have become invested with a technical meaning, but there has been a recent tendency to include illegitimate children in a gift to " children." Evidence is admissible in certain cases to explain latent ambiguity, and parol evidence of the terms of a lost will may be given as in the famous case of Sugden v. Lord St Leonards (1876), I Prob. Div. 154.

A will may be void, in whole or in part, for many reasons, which may be divided into two great classes, those arising from external circumstances

and those arising from the will itself. The main

examples of the former class arc revocation by burning, tearing, &c, by a later will, or by marriage of the testator (except as below), incapacity of the testator from insanity, infancy or legal disability (such as being a convict), undue influence and fraud, any one of which is ground for the court to refuse or revoke probate of a will, A will being ambulatory is always revocable, unless in one or two exceptional instances. Undue influence is a ground upon which frequent attempts are made to set aside wills. Its nature is well explained in a judgment of Lord Penzance's: " Pressure of whatever character, whether acting on the fears or the hopes, if so exerted as to overpower the volition without convincing the judgment, is a species of restraint under which no valid will can be made." 3 There is nothing corresponding to the querela inofficiosi testamenti, but un- natural provisions may be evidence of mental defect. The circum- stances appearing on the face of the will which make it open to ob- jection may either avoid it altogether or create a partial intestacy, the will remaining good as a whole. Where the will is not duly executed, e.g. if it is a forgery or if it is not signed by the testator or the proper number of witnesses, the will is not admitted to probate at all. Where it contains devises or bequests bad in law, as in general restraint of marriage, or tending to create perpetuities, or contrary to public policy, or to some particular enactment, only the illegal part is void. A remarkable instance is a well-known case in which a condition subsequent in a devise was held void as against public policy, l>eing a gift over of the estate devised in case the first devisee, the eldest son of an earl, did -not before his death obtain the lapsed title of duke of Bridgewater. 4

There are some wills of an exceptional kind which demand special notice. The King.— It was resolved in parliament in Richard II. 's reign (1392) that the king, his heirs and successors, might lawfully make their testaments. 5 In some later eases parliamentary authority has been given to royal wills, in others not. The executors of Henry IV. were confirmed in their office by letters patent of Henry V., those of Henry V. by parliament. The largest testamentary powers ever conferred on an English king were given to Henry VIII. by an act of 1 533-1 5 34, empowering him to limit and appoint the succession to the crown by will, in default of children by Jane Seymour or any future wife. By 39 & 40 Geo. III. c. 88 the king and his successor may devise or bequeath their private property. No court, however, has jurisdiction to grant probate of the will of a king. Guardian- ship.— As a general rule wills deal with property, but even at common law a will simply appointing a guardian was good. The common law was superseded by an act of 1660, under which a father may dispose of the custody of his unmarried infant children by will. The Guardianship of Infants Act 1886 extended such powers in certain cases to the mother.

Married Woman. — At common law a married woman could not (with a few exceptions) make a will without her husband's licence and consent, and this disability was specially pre- served by the Wills Acts of Henry VIII. and of 1837. A common mode of avoiding this difficulty was for the husband to contract before marriage to permit the wife to make an appointment disposing of personalty to a certain value. Courts of equity from an early time allowed her, under certain restrictions, to make a will of property held for her separate use. In some cases her husband could dispose ofher property by will, in others not. Thelaw as it existed previously to 1883 is now practically obsolete, the Married Women's Property Act 1882 enabling a married woman to dispose by will of any real or personal property as her separate property as a feme sole without the intervention of any trustee. The act also enables a married woman who is executrix of a will to act as if she were a feme sole. The Married Women's Property Act 1893 extended the act of 1882 by making it unnecessary for the will of a married woman to be re- executed or republished after the death of her husband. Alien.— Before 1870 an alien enemy resident in England could only dispose of property by will with the king's licence. The Naturalization Act 1870 enables him to do so as fully as a natural-born British subject. But if he be an alien domiciled abroad he cannot avail himself of Lord Kingsdown's Act (see below). Soldier and Sailor — Wills of soldiers in actual military service, and of sailors, are subject to special legis- lation, and are excepted from the operation of the Wills Act. The privilege only applies to wills of personal estate. Such wills may usually be made when the testator has attained the age of fourteen, and are not revoked by marriage only but by marriage and the birth of a child. Wills of soldiers on an expedition may be made by un- attested writing or by nuncupative testament before two witnesses. Wills of petty officers and seamen in the navy, and of marines, as far as relates to their pay or prize-money, must be attested by an officer, and wills made by a seaman in the merchant service must, if made at sea, be attested by the master or mate, if made on land by a super- intendent of a mercantile marine office, a minister of religion, justice of the peace, or consular or customs officer. See the Merchant Shipping Act 1894, s. 177. The wills of prisoners of war are subject to special regulations, and the Admiralty may at its discretion waive

' Fourth Report, p. 12.

*! By § 1 of the act the word **

will " includes codicil.

3 Hall v. Hall, L.R. 1 Prob. 481.

1 Egerlonv. EarlBrownlow, 4 House of Lords Cases, 210.

5 4 Inst. 335.

6 See the Collection of Royal Wills printed for the Society of Anti- quaries by J. Nichols (1780).

the due execution of wills in other instances. The effects of seamen, marines and soldiers, killed or dying in the service, are exempt from duty. Pay, wages, prize money and pensions due to persons employed in the navy may be paid out without probate where the whole assets do not exceed £32. The Board of Trade may at its dis- cretion dispense with probate of the will of a merchant seaman whose effects do not exceed £50 in value. By an act passed in 1868 the existing exemptions are extended to the sum of £100 in the case of civil service pay or annuities, of civil or military allowances charge- able to the army votes, and of army prize money. Will made under power. — A will made under a power of appointment is not revoked by marriage when the real or personal estate thereby appointed would not in default of appointment pass to the testator's executor or administrator or to the next of kin. Before the Wills Act a will exercising a power of appointment had to conform to any special requisitions in the power, but since the act the power is duly exercised if executed and attested like an ordinary will. Registration. — In the register counties memorials of wills affecting lands in those counties must be registered. Member of friendly society, &c — Members of friendly, industrial and provident societies, depositors in savings banks, and servants in certain public offices, may under the pro- visions of numerous acts make a nomination to an amount not ex- ceeding £100. Such nomination is practically equivalent to a will. and may be made at the age of sixteen.

At common law there could be no larceny of a will of lands. But now by the Larceny Act of 1861 stealing, injuring or concealing a will, whether of real or personal estate, is punishable with penal servitude for Hie. Forgery of a will (at one time a capital crime) renders the offender liable to the same penalty. Fraudulent con- cealment of a will material to the title by a vendor or mortgagor of land or chattels is, by the Law of Property Amendment Act 1859, a misdemeanour punishable by fine or imprisonment or both. It should be noticed that a contract to make a will containing pro- visions in favour of a certain person or certain persons is valid if it fulfil the requirements of the law regulating contract. A good example is Synge v. Synge (1894) I K.B. 466.

For death duties see Estate Duty, Legacy, Succession Duty..

The principal authorities for the English law are, for the formalities, Sir E. V. Williams, Executors', Hoklsworth and Vickers, Law of Succession; j. Williams, Wills and Succession; for the construction, the works of Sir James Wigram and of Messrs Jarman, F. V. Hawkins and Theobald. Precedents will be found in Hayes and Jarman's Concise, forms of Wills, and in ordinary collections of pre- cedents in conveyancing. For comparative law see E. Lambert, he Regime successoral (Paris, 1903).

The act of 1837 applies to Ireland. The main difference between

the law of the two countries is that in Ireland a bequest for masses

. for the repose of the testator's soul is valid, provided that

*an * the masses be public, in England such a bequest is void as tending to superstitious uses.*

Up to 1868 wills of immovables w r erc not allowed 111 Scotland. The usual means of obtaining disposition of heritage after death was a Sc tl d trust disposition and settlement by deed de praesenti, under

3a ' which the truster disponed the property to trustees according to the trusts of the settlement, reserving a life interest. Thus something very similar to a testamentary disposition was secured by means resembling those employed in England before the Wills Act of Henry VIII. The main disadvantage of the trust dis- position was that 'it was liable to be overthrown by the heir, who could reduce ex capite lectl all voluntary deeds made to his prejudice within sixty days of the death of his ancestor. In 1868 the Titles to Land Consolidation Act made it competent to any owner of lands to settle the succession to the same in the event of death by testa- mentary or mortis causa deeds or writings. In 1871 reduction ex capite lecti was abolished. A will of immovables must be executed with the formalities of a deed and registered to give title. The dis- ability of a woman as a witness was removed by the Titles to Land Consolidation Act. As to wills of movables, there are several im- portant points in which they differ from corresponding wills in England, the influence of Roman law being more marked. Males may make a will at fourteen, females at twelve. A nuncupative legacy is good to the amount of £100 Scots (£8, 6s. 8d.), and a holo- graph testament is good without witnesses, but it must be signed by the testator, differing in this from the old English holograph. By the Conveyancing Act 1874 such a will is presumed to have been executed on the date which it hears. Not all movables can be left, as in England. The movable property of the deceased is subject to jus relictac and legifim. See McLaren, Wills and Succession, for the law, and Judicial Styles for styles.

United States— By the constitutions of many states laws giving effect to informal or invalid wills are forbidden. The age of testamentary capacity varies very much. Eighteen is a common one. Full liberty of disposition is not universal. Home steads generally, and dower estates frequently, are not devisable. In some states only a disposable portion of the property can be left, so that children cannot lie disinherited without good cause, and in some children omitted in a will may still Lake

their share. It is frequently provided that a certain amount must be left to the widow. Louisiana follows French law, by which the testator can under no circumstances alienate by will more than half his property if he leave issue or ascendants. In dome states a married woman may not leave more than half her property away from her husband. Some require the husband's consent and subscription to make the wili of a married woman valid. Nuncupative and holograph wills are in use. The former are confined to personalty and must generally be reduced to writing within a short time after the words are spoken. In – Louisiana the mystic or sealed will still exists. The number of witnesses necessary for the validity of a will of any kind is usually two, sometimes three. Wills of soldiers and sailors are privileged, as in England. There arc several decisions of state courts that beliel in spiritualism does not of itscH constitute testamentary incapacity.

See Jarman, American edition by Randolph and Talcott.

France. — The law is mainly contained in ss. 967-1074 of the Code Civil. Wills in France may be of three kinds: (r) holo- graph, which must be wholly written, dated and signed by the testator; (2) made as a public instrument, i.e. received by two notaries before two witnesses or by one notary before four witnesses; this form of will must be dictated by the testator and written by the notary, must be read over to the testator in the presence of the witnesses and must be signed by testator and witnesses; (3) mystic, which are signed by the testator, then closed and sealed and delivered by him to a notary before six witnesses; the notary then draws up an account of the proceedings on the instrument which is signed by the testator, notary and witnesses. Legatees and their blood relations to the fourth degree may not be witnesses. Nuncupative wills are not recognized. Soldiers' and sailors' wills arc subject to special rules as in most other countries. Full liberty of dis- position only exists where the testator has no ascendants or descendants, in other cases his quantile disfonible is subject to reserve) if the testator has one child he may only dispose of half his estate, if two only one-third, if three or more only one-fourth; if he has no descendants but ascendants in both lines he may dispose of half, if ascendants in one line only he may dispose of three-fourths. The full age of testamentary capacity is twenty-one years, but minors over the age of sixteen may dispose by will of half of the estate of which they could dispose

had they been of full age. There is no restriction against married women making wills. A contract to dispose of the succession is invalid, s. 791.

The codes of the Latin races in Europe are in general accord- ance with the French law.

Germany. — Most of the law will be found in the Bilrgerlichcs Gesetzbuck, ss. 2064-2273. A holograph will, either single or joint, is allowed. Other wills must be declared before a judge or notary or (outside Germany) a consul. Two witnesses arc required, unless the witness be a notary or the registrar of the court, who is sufficient alone. The formalities may be relaxed in certain cases, such as imminent death, a state of siege, a prevailing epidemic, &c. Descendants, ascendants and the husband and wife, are entitled to compulsory portions {pflicht- tcilsberechligt). But those prima facie entitled may be deprived of their share for certain specified kinds of misconduct. A con- tract to make any specified testamentary disposition is in- operative. But a contract of inheritance {Erbvertrag) made inter vivos by direct disposition is valid in certain cases and will operate on the death of the contractor. The modes of revocation are much the same as in England (except marriage). But there is one peculiar to Germany, the inconsistency of a will with an Erbvertrag; in such an event the will is wholly or pro ianto revoked.

International Law.— There are three main directions which the opinion of jurists and the practice of courts have taken. (1) The whole property of the testator may be subjected to the law of his domieil. To this effect is the opinion of Savigny and the German practice. Certain modifications have been made by modern law, especially by the Einfuhriingsgesetz of 1896. (2) The property may be subjected to the law of the place where it happens to be at the

time of the testator's death. (3) The movable property may be sub- jected tc the law of the domicil. the immovable (including leaseholds) to the law of the place where it is situate, the lex loci rei sitae. England and the United States follow this rule. Testamentary capacity is generally governed by the law of the testator's domicil at the time of his death, the form of the instrument in most countries either by the law of his domicil or the law of the place where the will was made, at his option. The old rule of English law was to allow the former alternative only. The law was altered for the United Kingdom m 1861 by the Wills Act r86i (known as Lord Kingsdown's Act), by which a will made out of the United Kingdom by a

British subject • is, as far as regards personal estate, good if made according to the forms required by the law of the place where it was made, or by the law of the testator's domicil at the time of making it, or by the law —if the place of his domicil of origin. Subsequent change of domicil does not avoid such a will. Another act passed on the same day, the Domicile Act 1861, enacted that by convention with any foreign government foreign domicil with regard to wills could not be acquired by a testator without a year's residence and a written declaration of intention to become domiciled. By the same act foreign consuls may by convention have certain authority over the wills and property of subjects of foreign states dying in England. In the United States some states have adopted the narrow policy of enacting by statute the old common law rule, and providing that no will is valid unless made in the form required by the law of the state of the testator's domicil. The capacity of the testator, revocation and construction of a will, are governed by the law of the domicil of the testator at the time of his death — except in cases affected by Lord Kingsdown's Act, as he must be supposed to have used language in consonance with that law, unless indeed he express himself in technical language of another country. A good instance is Groos Case (1904), Prob. 269, where it was held that the will of a Dutch woman (at the time of her death domiciled in England) duly made in Holland was not revoked by her marriage, that being no ground of revocation by the law of Holland. 1 The persons who are to take under a will are_ decided by- different rules according as the property is movable or immovable, the former being governed by the law of the domicil, the latter by the lex loci rei sitae. It was held, however, in 1S81 by the court of appeal in England that, under the will of an Englishman domiciled in Holland, leaving personal property to children, children legitimated per subseqnens matrhnonitim could take, as they were legitimate by the law of Holland, though not by the law of England {re Goodman's Trusts, 17 Ch. D. 266). This principle was carried further in re Grey's Trusts (1892), 3 Ch. 88, where it was held that a legitimated child was entitled to share in a devise of English realty. But it is to be noted that a person born out of lawful wedlock, though legiti- mated, cannot succeed as heir to real estate in England (Birtwhistte v. Vardill, 2 Ci. and F. 89ˆ). A will duly executed abroad is generally required to be clothed with the authority of a court of the country where any property affected by the will is situate. (J- W.)

WILLARD, FRANCES ELIZABETH (1839-1898), American reformer, was born at Churchville, Monroe county, New York, on the 23th. of September 1839. She attended the Milwaukee Female College in 1S57 and in 1859 graduated at the North- western Female College at Evanston, Illinois. She then became a teacher, and in 1871-1874 she was president and professor of aesthetics of the Woman's College at Evanston, which became part of the

North-Western University in 1S73. In 1874 she became corresponding secretary and from 1879 until her death was president of ihc National Woman's Christian Temperance Union, and from 1S87 until her death was president of the World's Woman's Christian Temperance Union. She first spoke in favour of woman's suffrage in 1877; and in 1884 she was a member of the Executive Committee of the Prohibition party. In 1890 she was elected president of the Woman's National Council, which represented nearly all of the women's societies in America. She was one of the founders of Our Union, a New York publication in the interests of the National Woman's Christian Temperance Union, and of the Signal (after 1882 the Union Signal), which she edited in 1892-1898 and which Was the Illinois organ of the union. She died in New York City on the 18th of February 1898.

With Mary A. Livermore she edited A Woman of the Century (Buffalo, N.Y., 1893), which includes a sketch of her life; and she published Nineteen Beautiful Years (1864), a life of her sister; How to Win: A Book for Girls (1886), Glimpses of Fifty Years (1889), and, in collaboration with H. M. Winslow, MrsS. J. VVhiteand others, Occupations for Women (1897). See A. A. Gordon, The Beautiful Life of Frances E. Willard (Chicago, 1898), with an introduction by Lady Henry Somerset, and W. M. Thaver, Women Who Win (New York,

1896).

1 The law of Holland will be found set out in the case. It- is m general accordance with that of France.

WILLEMITE, a mineral consisting of zinc orthosilicate, ZiiaSrQi, crystallizing in the parallel-faced hemihedral class of the rhombohedral system. Crystals have the form of hexa- gonal prisms terminated by rhombohedral planes: there are distinct cleavages parallel to the prism-faces and to the base. Granular and cleavage masses are of more common occurrence. The colour varies considerably, being colourless, white, greenish- yellow, apple-green, flesh-red, &c. The hardness is 5§, and the specific gravity 3-9-4-2. A variety containing much manganese replacing zinc is called " troostite." Willemite occurs at Sterling Hill, Sussex county, and Franklin Furnace in New Jersey, where it is associated with other zinc ores (franklinite and zincite) in crystalline limestone. It has been found at only a few other localities, one of which is near Liege, and for this reason the mineral was named after William I. of the Nether- lands. Under the influence of- radium radiations, willemite fluoresces with a brilliant green colour. (L. J. S.)

WILLEMS, FLORENT JOSEPH MARIE (1823-1905), Belgian painter, was

born at Liege on the 8th of January 1823. He had no regular tuition in painting, but learnt by copying and restoring old pictures at Malines, where he lived from 1832. He made his debut at the Brussels Salon in 1842 with a " Music Party " and an "Interior of a 17th-century Guard-room" in the style of Terburg and Metsu. Soon afterwards he settled in Paris, where his pictures enjoyed considerable popularity under the second empire. Among his most famous works may be men- tioned " The Wedding Dress " (Brussels Gallery), " La Fete des grands-parents" (Brussels Gallery), " Le Baise-main " (Mine. Cardon's collection, Brussels), " Farewell " (Willems coll., Brussels), " The Arches of the Peace " (Delahaye coll., Antwerp) and "The Widow" (engraved by Desvachez). He died at Neuilly-sur- Seine on the 23rd of October 1905.

WILLEMS, JEAN FRANCOIS (1793-1846), Flemish writer, began life in the office of a notary at Anvers. He devoted his leisure to literature, and in 1S10 he gained a prize for poetry with an ode in celebration of the peace of Tilsit. He hailed with enthusiasm the constitution of the kingdom of the Netherlands, and the revival of Flemish literature; and he published a number of spirited and eloquent writings in support of the claims of the native tongue of the Netherlands. His political sympathies were with the Orange party at the revolution of 1830, and these views led him into trouble with the provisional government Willems, however, was soon recognized as the unquestioned leader of the Flemish popular movement, the chief plank in whose platform he made the complete equality of the languages in the government and the law courts. He died at Ghent in 1S46.

*Among his writings, which were very numerous, the most im- portant were: Les Sciences et les arts (1816), Aux Beiges (1818); Etude sur les origines et I'histoire des temps primitifs de la viUe d' Anvers (1828); Melanges de litterature et d'kistoire (1829); be*sides several learned critical editions of old Flemish texts.*

WILLESDEN, an urban district in the Harrow parliamentary division of Middlesex, England, suburban to London, lying immediately outside the boundary of the county of London (boroughs of Hammersmith and Kensington). Pop. (1SS1) 27,453; (1901) 114,811. It has increased greatly as a residential district, mainly of the working classes. There are, moreover, considerable railway works attached to Willesden Junction, where the suburban lines of the London & North Western, North London, and Great Western railways connect with the main line of the first-named company. Remains of Norman building have been discovered in the church of St Mary, which is of various dates, and has been much enlarged in modern times. Several ancient monuments and brasses are retained. There is a Jewish cemetery in Willesden Lane. The adjoining residential districts are Harlesden on the south, Kilburn and Brondesbury on the east, Crick! e

wood and Neasden (with the works of the Metro- politan railway) on the north.

At Domesday the manor of Willesden and Harlesden was held

by the canons of St Paul's. In the 12th century it was formed

into eight distinct manors, seven of which were held by the same

I number of prebendaries. A shrine or image of St Mary (Our

Lady of Willesden) was in the 15th century an object of pilgrim- age, but by the middle of the century following the ceremonies had fallen into abuse, and the shrine was suppressed.

WILLETTE, LEON ADOLPHE (1857-), French painter, illustrator, caricaturist, and lithographer, was born in Chalons- sur-Marne. He studied for four years at the Ecole des Beaux- Arts under Cabanel — a training which gave him a unique position among the graphic humorists of France. Whether comedy or tragedy, dainty triviality or political satire, his work is instinct with the profound sincerity of the artist. He set Pierrot upon a lofty pedestal among the imaginary heroes of France, and established Mimi Pinson, frail, lovable, and essentially good- hearted, in the aflections of the nation. Willet-te is at once the modern Watteau of the pencil, and the exponent of sentiments that move the more emotional section of the public. Always a poet, and usually gay, fresh, and delicate, in his presentation of idylls exquisitely dainty and characteristically Gallic, illustrating the more " charming" side of love, often pure and sometimes unnecessarily materialistic, Willette frequently reveals himself bitter and fierce, even ferocious, in his hatreds, being a violent though at the same time a generous partizan of political ideas, furiously compassionate with love and pity for the people — whether they be ground down under the heel of political oppres- sion, or are merely the victims ot unrequited love, suffering all the pangs of graceful anguish that are born of scornful treatment. There is charm even in his thrilling apotheosis of the guillotine, and in the introduction into his caricatures of the figure of Death itself. The artist was a prolific contributor to the French illus- trated press under the pseudonyms " Cemoi," " Pierrot," " Louison," " Bebe," and " Nox," but more often under his own name. He illustrated Melandri's Les Pierrots and Les Giboulles d'avril, and has published his own Pauvre Pierrot and other works, in which he tells his stories in scenes in the manner of Busch. He decorated several " brasseries artistiques " with wall-paintings, stained

glass, &c, notably Le Chat noir and La Palette d'or, and he painted the highly imaginative ceiling for La Cigale music hall. His characteristically fantastic " Parce Domine" was shown in the Franco-British Exhibition in 1908. A remarkable collection of his works was exhibited in 1888. His " Valmy " is in the Luxembourg, Paris.

WILLIAM (A.S. Wilhelm, 0. Norse Vilhidlmr; O. H. Ger. Willahdm, Willahalm, M. H. Ger. Wilkkelm, Willehalm, Mod.Ger. Wilhelm; Du. Willem; O. Fr. Villalme, Mod. Fr. Guillaume; from " will," Goth, vilja, and " helm," Goth, hilms, Old Norse kidlmr, meaning possibly "one who wills to protect"), a masculine proper name borne by many European sovereigns and others, of whom the more important are treated below in the following order: — (1) kings of England and Scotland. (2) Other sovereigns in the alphabetical order of their states. (3) Other ruling princes. (4) Prelates, Chroniclers, &c.

WILLIAM I. (1027 or 1028-1087), king of England, surnamed the Conqueror, was born in 1027 or ro28. He was the bastard son of Robert the Devil, duke of Normandy, by Arietta, the daughter of a tanner at Falaise. In 1034 Robert resolved on a pilgrimage to Jerusalem. Having no legitimate son he induced the Norman barons to acknowledge William as his successor. They kept their engagement when Robert died on his journey (1035).. though the young duke-elect was a mere boy. But the next twelve years was a period of the wildest anarchy. Three of William's guardians were murdered; and for some time he was kept in strict concealment by his relatives, who feared that he might experience the same fate. Trained in a hard school, he showed a precocious aptitude for war and government. He was but twenty years old when he stamped out, with the help of his overlord, Henry I. of France, a serious rising in the districts of the Bessin and Cotcntin, the object of which was to put in his place his kinsman, Guy of Brionnc. Accompanied by King Henry, he met and overthrew the rebels at Val-des-Dunes near Caen (1047). It was by no means his last encounter with Norman traitors, but for the moment the victory gave him an assured position. Next year he joined Henry in attacking their common enemy, Geoffrey Mattel, count of Anjou. Geoffrey occupied the

border fortress of Alencon with the good will of the inhabitants. But the duke recovered the place after a severe siege, and inflicted a terrible vengeance on the defenders, who had taunted him with his base birth ; he also captured the castle of Domf ront from the Angcvins (1049).

In 1051 the duke visited England, and probably received from his kinsman, Edward the Confessor, a promise of the English succession. Two years later he strengthened the claims which he had thus established by marrying Matilda, a daughter of Baldwin V. of Flanders, who traced her descent in

the female line from Alfred the Great. This union took place in defiance of a prohibi- tion which had been promulgated, in 1049, by the papal council of Reims. But the affinity of William and Matilda was so remote that political rather than moral considerations may have deter- mined the pope's action. The marriage was zealously opposed by Archbishop Malger of Rouen and Lanfranc, the prior of Bee; but Lanfranc was persuaded to intercede with the Curia, and Pope Nicholas II. at length granted the needful dispensation (1059). By way of penance William and his wife founded the abbeys of St Stephen and the Holy Trinity at Caen. The political difficulties caused by the marriage were more serious. Alarmed at the close connexion of Normandy with Flanders, Henry I. renounced the alliance which had long existed between the Capets and the house of Rollo. He joined forces with Geoffrey Martel in order to crush the duke, and Normandy was twice invaded by the allies. In each case William decided the campaign by a signal victory. The invasion of 1054 was checked by the battle of Mortemer; in 1058 the French rearguard was cut to pieces at Varaville on the Dive, in the act of crossing the stream. Between these two wars William aggrandized his power at the expense of Anjou by annexing Mayenne. Soon after the campaign of Varaville both Henry I. and Geoffrey Martel were removed from his path by death (1060). He at once recovered Maine from the Angevins, nominally in the interest of Herbert II., the lawful count, who became his vassal. In 1062, however, Herbert died and Maine was formally annexed to Normandy. This acquisition brought the Norman frontier almost to the Loire and isolated Brittany, long coveted by the Norman dukes, from the rest of France.

About 1064 the accidental visit of Harold to the Norman court added another link to the chain of events by which William's fortunes were connected with England. Whatever doubt hangs over the details of the story, it seems clear that the earl made a promise to support the claims of his host upon the English succession. This promise he was invited to fulfil in 1066, aftei the Confessor's death and his own coronation. Harold's perjury formed the chief excuse for the Norman Conquest of England, which in reality was a piratical venture resembling that of the sons of Tancred d'Hauteville in Lower Italy. William had some difficulty in securing the help of his barons. When consulted in a great council at Lillebonne they returned an unfavourable reply, and it was necessary to convince them individually by threats and persuasions. Otherwise the conditions were favour- able. William secured the benevolent neutrality of the emperor Henry IV.; the influence of the archdeacon Hildebrand obtained for the expedition the solemn approval of Pope Alexander H. Philip I. of France was a minor under the guardianship of William's father-in-law, the count of Flanders. With Tostig, the banished brother of Harold, William formed an alliance which proved of the utmost service. The duke and his Normans

were enabled, by Tostig's invasion of northern England, to land unmolested at Pevensey on the 28th of September 1066. On the 14th of October a crushing defeat was inflicted on Harold at the battle of Senlac or Hastings; and on Christmas Day William was crowned at Westminster.

Five years more were to elapse before he became master of the west and north. Early in 1067 he made a progress through parts of the south, receiving submissions, disposing of the lands of those who had fought against him, and ordering castles to be built ; he then crossed the Channel to celebrate his triumph in Normandy. Disturbances at once occurred in Northumbria, on the Welsh marches and in Kent; and he was compelled to

return in December. The year 1068 was spent in military expeditions against Exeter and York, in both of which the adherents of Harold had found a welcome. In 1069 Robert of Comincs, a Norman to whom William had given the earldom of Northumberland, was murdered by the English at Durham; the north declared for Edgar Atheling, the last, male representative of the West-Saxon dynasty; and Sweyn Estrithson of Denmark sent a fleet to aid the rebels. Joining forces, the Danes and English captured York, although it was defended by two Norman castles. The position seemed critical; but, fortunately for the king, the south and west gave no effective support to the rebellion. Marching rapidly on York he drove the Danes to their ships; and the city was then reduced by a blockade. The king ravaged the country as far north as Durham with such compleleness that traces of devastation were still to be seen sixty years later. Bui the English leaders were treated with politic clemency, and the Danish leader, Ja.rl Osbiorn, was bribed to withdraw his fleet. Early in 1070 the reduction of the north was completed by a march over the moors to Chester, which had not hitherto submitted but was now placed under an earl of William's choice. From this point we hear no more of general rebellions against the foreign rule. In 1071 a local rising in the lens caused some trouble. An outlawed Englishman, Hereward by name, fortified the Isle of Ely and attracted a number of desperate spirits to his side; amongst others came Morcar, formerly earl of Northumbria, who had been dis- appointed in the hopes which he based on William's personal favour. The king in person undertook the siege of Ely, which proved unexpectedly difficult. But the failure of the insurgents was a foregone conclusion.

Of the measures which William took to consolidate his authority we have many details; but the chronological order of his proceedings is obscure. The redistribution of land appears to have proceeded pari passu with the

reduction ot the country; and at every stage of the conquest each important follower received a new reward. Thus were formed the vast but straggling fiefs which are recorded in Domesday. The great earldoms of the West-Saxon period were allowed to lapse; the new earls, for the most part closely connected with William by the ties of blood or friendship, were lords of single shires; and only on the marches of the kingdom was the whole of the royal jurisdiction delegated to such feudatories. William's writs show not only that he kept intact the old system of governing through the sheriffs and the courts of shire and hundred, but also that he found it highly serviceable. Those whom he enfeoffed with land held it according to the law of Norman feudalism, which was already becoming precise. They were thus brought into close personal relations with the king. But he forced the most powerful of them to acknowledge the jurisdiction of the ancient local courts; and the old fyrd-system was maintained in order that the crown might not be wholly dependent on feudal levies. Though his forest-laws and his heavy taxation caused bitter complaints, William soon won the respect of his English subjects. They appear to have accepted him as the lawful heir of the Confessor; and they regarded him as their natural protector against feudal oppression. This is to be explained by his regard for legal forms, by his confirmation of the " laws of Edward " and by the support which he received from the church. Domes- day Book shows that in his confiscations he can have paid little attention to abstract justice. Almost every English landholder of importance was dispossessed, though only those who had actually borne arms against William should have been so treated. As far as possible Englishmen were excluded from all responsible positions both in church and state. After 1071 our accounts of William's doings become jejune and disconnected. Much of his attention must have been engrossed by the work of adminis- tration, carried on without the help of those elaborate institu- tions, judicial and financial, which were perfected by Henry I. and Henry II. William had few ministers of note. William Fitz Osbern, earl of Hereford, who had been his right-hand man in Normandy, fell in the civil wars of Flanders (1071). Odo, bishop of Bayeux, William's half-brother, lost favour and was

finally thrown into prison on a charge of disloyalty (1082). Another half-brother, Robert of Mortain, earl of Cornwall, showed little capacity. Of the king's sons Robert, though titular count of Maine, was kept in leading strings; and even William Rufus, who was in constant attendance on his father, never held a public office. The Conqueror reposed much con-fidence in two prelates, Lanfranc of Canterbury and Geoffrey of Coutances. They took an active part in the civil no less than the ecclesiastical government. But the king himself worked hard in hearing lawsuits, in holding councils and ceremonious courts, in travelling between England and Normandy, and finally in conducting military operations.

In 1072 he undertook a campaign against Malcolm, king of Scots, who had married Margaret, the sister of Edgar Atheling, and was inclined to promote English rebellions. When William reached the Forth his adversary submitted, did homage as a vassal, and consented to expel Edgar Atheling, who was subse- quently endowed with an English estate and admitted to William's favour. From Scotland the king turned to Maine, which had profited by the troubles of 1069 to expel the Norman garrisons. Since then the Manceaux had fallen out among themselves. The barons supported Azo of Liguria, the lawful successor of Herbert II. ; the citizens of Le Mans set up a commune, expelled Azo's representatives and made war on the barons. William had therefore no difficulty in reducing the country, even though Lc Mans was assisted by Fulk of Anjon (1073). In 1075 the king's attention was claimed by a conspiracy of the earls of Hereford and Norfolk, in which the Englishman Waltheof, earl of Northampton, was implicated to some degree, The rebels were defeated by Lanfranc in the king's absence; but William returned to settle the difficult question of theii punishment, and to stamp out the last sparks of disaffection. The execution of Waltheof, though strictly in accordance with the English law of treason, was a measure which he sanctioned after long hesitation, and probably from considerations of expediency rather than justice. This severity to a man who was generally thought innocent, is one of the dark stains on his career. In 1076 he invaded Brittany to get possession of the fugitive earl of Norfolk; but Philip of France came to the aid of the Bretons, and William gave way before his suzerain. The next few years were troubled by a quarrel between the king and his eldest son. Robert fled from Normandy and after aimless wanderings obtained from King Philip the castle of Gerberoi, in the Beauvaisis, from which he harassed the Norman marches. William besieged Gerberoi in 1079, &"d w ˆs wounded in single combat by his son. A little later they were reconciled; but the reconciliation was short-lived; to the end of the reign Robert was a source of trouble. In the years 1083-1085 there was a second rising in Maine which was not laid to rest until William had granted liberal terms to the leader, Hubert of Beaumont. In 1085 news arrived that Cnut the Saint, king of Denmark, was preparing to assert the claims of his house in England. The project fell through, but gave occasion for the famous moot at Salisbury in which William took an oath of direct allegiance from " all the land-sitting men that were in England " (1086). .While the danger was still impending he took in hand the compilation of Domesday Book. The necessary inquiries were ordered at the Christmas Council of 1085, and carried out in the following year. It is probable that William never saw the Domesday Book as we possess it, since he left England in the summer of 1086 and never returned. In 1087 he invaded the French Vexin to retaliate on the garrison of Mantes for raids committed on his territory. He sacked and burned the town. But as he rode out to view the ruins his horse plunged on the burning cinders and

inflicted on him an internal injury. He was carried in great suffering to Rouen and there died on the oth of September 1087. He was buried in St Stephen's at Caen. A plain slab still marks the place of his tomb, before the high altar; but his bones were scattered by the Huguenots in T562.

In a profligate age William was distinguished by the purity of his married life, by temperate habits and by a sincere piety. His most severe measures were taken in cold blood, as part of

his general policy; but his natural disposition was averse to unnecessary bloodshed or cruelty. His one act of wanton devastation, the clearing of the New Forest, has been grossly exaggerated. He was avaricious, but his church policy (see article English History) shows a disinterestedness as rare as it was honourable. In personal appearance he was tall and corpulent, of a . dignified presence and extremely powerful physique, with a bald forehead, close-cropped hair and short moustaches.

By Matilda, who died in Normandy on the 3rd of November 1083. William had four sons, Robert, duke of Normandy, Richard, who was killed whilst hunting, and the future kings, William II. and Henry I., and five or six daughters, including Adela, who married Stephen, count of Blois.

Of the original authorities the most important are the Gesta Willelmi, by William of Poitiers (cd. A. Duchesne hi Ilistoriae Normannorum scripteres, Paris, 1619); the Winchester, Worcester and Peterborough texts of the Anglo-Saxon Chronicle (ed. B. Thorpe, " Rolls " series. 2 vols., 1861, and also C. Plummer, 2 vols., Oxford, 1892-1899); William of Malmesbury's De gestis regum (cd. W. Stubbs, " Rolls " series, 2 vols., 1887-1889); William of Jumieges' Historia Normannorum (cd. A. Duchesne, op, oil.) ; Ordericus Vitalis' Historia ecclesiastica (ed. A. le Prevost, Soc. de Vhistorie de France, 5 vols., Paris, 1838-1855). Of modern works the most elaborate is E. A. Freeman's History of the Norman Conquest, vols. iii.— v. (Oxford, 1870-187C). Domesday Book was edited in 1783- 18 16 by II. Farley and Sir H. Ellis in four volumes. Of commentaries the following are important : Domesday Studies (cd. P. E. Dove, 2 vols., London, 1888-1891); Feudal England, by J. H. Round (London, 1895); Domesday Book and Beyond, by F. W. Maitland (Cambridge, 1897); English Society in the Eleventh Century, by P. Vinogradoff (Oxford, 1908). See also F. M. Stenton, William the Conqueror (1908). (H. W. C. D.)

WILLIAM II. (c. 1056-1100), king of England, surnamed Rufus, was the

third son of William I. by his queen Matilda of Flanders. Rufus was born some years before the conquest of England, but the exact date is uncertain. lie seems to have been his father's favourite son, and constantly appears in the Conqueror's company, although like his brothers he was carefully excluded from any share in the government either of England or Normandy. A squabble with Rufus was the immediate cause of Robert's first rupture with the Conqueror; in the ensuing civil war we find Rufus bearing arms on the royal side (1077- 1080). On this death-bed the Conqueror was inclined to dis- inherit his eldest son in favour of Rufus, who, by the early death of Prince Richard, was now left second in the order of succession. The king's advisers, however, used their influence to obtain a partition; Normandy was accordingly bequeathed to Robert, while Rufus was designated as the son on whom the Conqueror desired that the kingdom of England should devolve. With the help of Lanfranc the English were easily induced to accept this arrangement. Rufus was crowned at Westminster on the 26th of September 1087, fifteen days after the death of his father.

It may be in part the fault of our authorities that the reign of Rufus presents itself to us as a series of episodes between which the connexion is often of the slightest. In his domestic administration we can trace a certain continuity of purpose, and in his dealings with the Welsh and Scots he proceeded, though intermittently, along the broad lines of policy which his father had marked out. Beyond the Channel he busied himself with schemes, first for the reunion of England and Normandy, then for the aggrandisement of Normandy at the expense of France. But his attention was perpetually distracted by the exigencies of the moment. He threw himself into each particular design with unreflecting impetuosity, but never completed what had been well begun. The violence, the irregularity, the shameless- ness of his private life arc faithfully reflected in his public career. Even in cases where his general purpose could be justified, his methods of execution were crudely conceived, brutal and short- sighted. Rufus may well stand as the typical product of early feudalism. He was not without valour or glimmerings of chivalry, but perfidious to his equals, oppressive to his subjects, contemptu- ous of religion; with no sense of his responsibilities, and possessed by a fixed determination to exact the last farthing of his rights. The first year of his reign was troubled by a general conspiracy

among the baronage, who took up arms for Robert in the name of the hereditary principle, but with the secret design of sub- stituting a weak and indolent for a ruthless and energetic sovereign. Local risings in Norfolk, Somerset and the Welsh marches were easily repressed by the king's lieutenants. The castles of Kent and Sussex offered a more formidable resistance, since their lords were in direct communication with Robert of

Normandy, and were led by the able Odo of Baycux (q.v.) f the king's uncle, who had been released from prison at the opening of the reign. Rufus, however, made an earnest appeal to the native English, promising good laws, the abolition of unjust taxes and redress for those who had suffered by the afforestments of the late king. These promises, which he never attempted to fulfil, served the purpose of the moment. Followed by large contingents of the national militia he successfully laid siege to the strongholds of the rebels. They were leniently treated, and the arch-conspirator, Odo of Bayeux, left. England under a safe-conduct to sow fresh seeds of discord in Normandy. But Rufus resolved to take vengeance on his brother, and two years later invaded eastern Normandy. Encountering little resistance —for under Robert's rule the duchy had relapsed into a state of anarchy — he might have expelled the duke with no great trouble. But in 1091 a treaty was hastily patched up. Rufus retained the eastern marches of the duchy, and also received certain seaports. In return he undertook to aid Robert in reducing the rebellious county of Maine, and in recovering thp Cotentin from their younger brother, Henry Beauclcrk, to whom it had been pledged by the impecunious duke. Th-c last part of the agreement was duly executed. But Rufus then recrossed the Channel to chastise the Scots who in his absence had raided the north country. By a march to the Firth of Forth he vindi- cated English honour; Malcolm III. of Scotland prudently purchased his withdrawal, by doing homage (Aug. 1091) on the same terms which William I. had imposed in 1072. Next year Rufus broke the treaty by seizing the stronghold of Carlisle and the other lands held or claimed by Malcolm in Cumberland and Westmorland. Malcolm in vain demanded satisfaction; while attempting reprisals on Northumberland he was slain in an obscure skirmish (1093). Rufus immediately put forward a candidate for the vacant throne; and this policy, though at first unsuccessful, finally resulted in the accession of Edgar (1097), a son of Malcolm, who had acknowledged the English overlordship. Carlisle remained an English possession ; in the next reign Cumberland and Westmorland appear as shires in the accounts of the Exchequer. The Scottish policy of Rufus, though legally unjustifiable, was thus comparatively successful. In dealing with the Welsh he was less fortunate. Three cam- paigns which he conducted in North Wales, during 1095 and 1097, yielded no tangible result. The expansion of the Welsh marches in this reign was due to the enterprise of individual adventurers.

The affairs of Wales and Scotland did not prevent Rufus from resuming his designs on Normandy at the first opportunity, Robert was rash enough to reproach his brother with non- fulfilment of the terms arranged in 1091; and Rufus seized the excuse for a second invasion of the duchy (1094). Less prosper- ous than the first, and interrupted by a baronial conspiracy,

which kept Rufus in England for the whole of 1095, this enter- prise found an unexpected termination. Robert resolved to go upon Crusade and, to obtain the necessary funds, gave Normandy in pledge to his brother (1096). There can be no doubt that Rufus intended to remain in lasting possession of this rich security. The interests of Normandy at once became the first consideration of his policy. In 109S-1099 he recovered Maine at the cost of a vast expenditure on mercenaries, and commenced operations for the recovery of the Vexin. Early in 1 100 he accepted a proposal, made by William IX. of Aquitaine, that he should take over that duchy on terms similar to those arranged in the case of Normandy. Contemporaries were startled at the rapid progress of the king's ambitions, and saw the direct interposition of heaven in the fate which cut them short. On the 2nd of August 1100 Rufus fell, in the New

Forest, the victim of an arrow from an unknown hand. The common story names Walter TireJ, who was certainly close at hand and fled the country without venturing to abide the issue of a trial. But a certain Ralph of Aix is also accused; and Tirel, from a safe distance, solemnly protested his innocence.

It remains to notice the main features of the domestic ad- ministration which made the names of William and his minister, Ralph Flambard, infamous. Respecting the grievances of the laity we have few specific details. But we are told that the " moots" all over England were "driven" in the interests of the king; which perhaps means that aids were extorted from the shire-courts. We also learn that the forest-laws were rigorously administered; that the king revived, for .certain offences, the death-penalty which his father had abolished; that all men were vexed by unjust gelds and the feudal classes by unscrupulous misinterpretations of the customs relating to the incidents of wardship, marriage and relief.- On one occasion the militia were summoned in considerable numbers for a Norman expedition, which was no part of their duty; but when they arrived at the sea-coast they were bidden to hand over their journey money and go home. The incident is not uninstructive as a side-light on the king's finance. As to the oppression of the church we are more fully informed; after allowing for exaggeration there still remains evidence enough to prove that the ecclesiastical policy of Rufus was unscrupulously venal. Vacant sees and abbacies were either kept for years in the hands of the king, who claimed the right of a feudal guardian to appropriate the revenues so long as the vacancy continued; or they were openly sold to the highest bidder. The history of Anselm's relations with the king is fully narrated by the bio-

grapher Eadmer. Anselm received the see of Canterbury in 1093, after it had been in the king's hands for upwards of four years. William made the appointment in a moment of repentance, when sick and at death's door. But he resented Anselm's demand for full restitution of the temporalities and his refusal to make any payment, in the nature of an aid or relief, which might be construed as simoniacal. Other grounds of quarrel were found in the reproofs which the primate aimed at the vices of the court, and in his requests for leave to hold a church-council and initiate reforms. Finally, in 1095, Anselm exasperated the king by insisting on his right to recognize Urban II. as the lawful pope. By the " customs " of the Conqueror it had been the rule that no pope should be recognized in England without the king's permission; and Rufus was unwilling that the English Church should be committed to either party in the papal schism which had already lasted fifteen years. Anselm, on the other hand, asserted that he had accepted the primacy on the distinct condition that he should be allowed to acknowledge Urban. The dispute came before a great council which was held at Rockingham (Feb. 25, 1095). The king demanded that the assembly should adjudge Anselm guilty of contumacy, and was supported by the bishops. The lay barons, however, showed their ill-will towards the king's general policy by taking Anselm's part. Rufus was forced to give way. He recognized Urban, but entered upon intrigues at Rome to procure the suspension of the archbishop. Finding that Urban would not betray a loyal supporter, the king fell back upon his authority as a feudal suzerain. He taxed Anselm with having failed to provide a satisfactory quota of knights for the Welsh war (1097). The archbishop, seeing that he was never to be left in peace, and despairing of an opportunity to effect the reforms on which his heart was set, demanded urgently that he should be allowed to leave England for the purpose of visiting Urban. Both the king and the barons suspected that this was the first step towards an appeal to the pope's jurisdiction against that of the royal court. Leave was at first refused; but ultimately, as Anselm continued to press his demand, he was suffered to depart, not without experiencing some petty insults on his way (Oct. 1097). The motive of the king's apparent clemency was soon revealed. He seized the estates of the archbishopric, and kept them in his own hands for the future. The friends of the.archbishop were thus justified

in their assertion that the zeal of Rufus for his father's " customs " was a mere cloak for avarice and tyranny.

In appearance William II. was unattractive; bull-necked, with sloping shoulders, extremely corpulent and awkward in his gait. His long locks and clean-shaven face marked his predilection for the new-fangled fashions which contemporary ecclesiastics were never weary of denouncing. .His features were strongly marked and coarse, his eyes grey and deeply set; he owed his nickname to the fiery hue of his complexion. He stuttered

violently and in moments of passion was almost inarticulate. His familiar conversation was witty and blas- phemous. He was surrounded by a circle of vicious parasites, and no semblance of decorum was maintained in his household. His character was assailed by the darkest rumours which he never attempted to confute. He died unmarried and without issue.

The main authorities for the reign are the Peterborough Chronicle (ed. C. Plummer, 2 vols., Oxford, 1892-1899); Eadmer's Vita Ansclmi and Historia Novorum. (ed. M. Rule, " Rolls " series, 18S4); William of Malmesbury's De geslis return (cd. W. Stubbs, " Rolls " series, 2 vols., 1887-1889); Orderic Vitalis' Historia eccksiastica (ed. A. le Prevost, 5 vols., Paris, 1838- 1855). Of modern works the most exhaustive is E. A. Freeman's Reign of William Rufus (2 vols., Oxford, 1882). See also J. H. Round's Feudal England (London, 1895). (H. W. C. D.)

WILLIAM III. (1650-1702), king of England and prince of Orange, was the only son of William II., prince of Orange, stadtholder of the Dutch republic, and Mary, daughter of Charles I. of England, and was born at the Hague on the 4th of November 165c, eight days after his father's death. His father had attempted a coup d'etat, which had failed, with the result that on his death the office of stadtholder was abolished. Power passed into the hands of John de Witt, who represented the oligarchic element and the special interests of one province, Holland, and was taken from the Orange party which repre- sented the more democratic element and the more general interests of the Seven Provinces. William inherited the baleful lustre, without the substantial power, w r hich his ancestors had given to the name of Orange. He grew up among enemies, and became artful, suspicious and self-controlled, concealing his feeling behind the mask of an immobile, almost repulsive, cold- ness. Like Charles XII. of Sweden and the younger Pitt, he was a wonderful example of premature mental development.

In 1672 Louis XIV. suddenly invaded Dutch territory. The startling successes of the French produced a revolution among the Dutch people, who naturally turned for help to the scion of the house of Orange. On the 8th of July 1672 the states general revived the stadtholdcrate, and declared William stadt- holder, captain-general and admiral for life. This revolution was followed by a riot, in which John de Witt and his brother Cornelius were murdered by the mob at the Hague. Evidence may be sought in vain to connect William with the outrage, but since he lavishly rewarded its leaders and promoters this circumstance is not very much to his credit. The cold cynicism with which he acted towards de Witt is only matched by the heroic obstinacy with which he confronted Louis. Resolved as he said " to die in the last ditch," he rejected all thought of sur- render and appealed to the last resource of Dutch patriotisifl by opening the sluices and laying vast

tracts under water. The French army could not advance, while the French and English fleets were defeated by the Dutch admiral, De Ruyter. William summoned Brandenburg to his aid (1672) and made treaties with Austria and Spain (1673). In August 1674 he fought his first great battle at Seneffe, where, though the struggle was not unequal, the honours lay with Conde. The French evacuated Dutch territory early in 1674, but continued to hold places on the Rhine and in Flanders. In April 1677 William was badly beaten at St Omcr, but balanced his military defeat by France by a diplomatic victory over Fmgland. In November 1677 he married Mary, eldest daughter of James, duke of York, after- wards King James II., and undertook negotiations with England in the following year which forced ' Louis to make terms and sign the treaty of Nijmwegen in August 1678, which gave

Franche Comte and other places m Spanish Flanders to France. For some reason never yet made clear, but perhaps in order to produce a modification of terms which threatened the balance of power, William attacked the French army at Mons four days after the signature of peace. Luxembourg defeated him after a sanguinary and resultless struggle, and William gained nothing by his inexplicable action.

After the war Louis continued a course of aggression, absorb- ing frontier-towns in imperial or Spanish territory. William started a new coalition against him in October t68i by making a treaty with Sweden, and subsequently with the empire, Spain and several German princes. After absorbing Strassburg (1681), Louis invaded Spanish Flanders and took Luxemburg (1684). Even then the new league would not fight and allowed Louis in retain his conquests by the truce of Regensburg (1685), but none the less these humiliations gave rise to a more closely- knit and aggressive coalition, which was organized in 1686 and known as the League of Augsburg.

From 1677 onwards William had carefully watched the politics of England. On the accession of James II. in 1685 he forced the duke of Monmouth to leave Holland, and sought to dissuade him from his ill-starred expedition to England. He apparently tried to conciliate his father-in-law in the hope of bringing him into the League of Augsburg. At the same time he astutely avoided offending the party in England which was opposed to James. By November 1687 he had decided that it was hopeless to expect that James would join the league against Louis, and he therefore turned for support to the English opposition. He caused his chief minister Fagel to write a letter

expressing his disapprobation of the religious policy of James, which was published in November 1687. This announcement of his views was received with wild enthusiasm by the English who saw in him the friend of their liberties and their Church, But he knew too much of the English to suppose they would tolerate an armed invasion, and he accordingly made it clear that he would not undertake active interference unless he received a definite invitation from leading Englishmen. On the 30th of June 1688 Admiral Herbert, disguised as a blue- jacket, set out from England with a letter from seven influential Englishmen, asking William to " bring over an army and secure the infringed liberties " of England.

William set out from Holland with an army on the 2nd of November and landed at Torbay (Nov. 5th 1688). After a few days of hesitation, many influential noblemen declared for him in different parts of the country. James, who had at first joined his army at Salisbury, fell back to London and tried to negotiate. While his commissioners were amusing William, James sent off his wife and son to France, and tried to follow them. He was stopped in his flight by some fishermen at Faversham, and was forced to return to London. William insisted that he should be sent to Rochester, and there allowed him to escape to France. After this final flight of James, William, on the advice of an assembly of notables, summoned a convention parliament on the 22nd of January 1689. After a great deal of discussion, William was at length proclaimed joint-sovereign of England in conjunction with his wife, Mary (Feb. 13th 1689).

A constitutional settlement was effected by the end of 1689, almost all the disputed points between king and parliament being settled in favour of the latter. Though William by no means appreciated this confinement of his prerogative, he was too wise to oppose it. His own initiative is more clearly trace- able in the Toleration Act, extending liberty of private worship to Dissenters. He also succeeded in passing an Act of Grace and Indemnity in 1690. by which he calmed the violence of party passion. But in general his domestic policy was not very fortunate, and he can hardly claim any personal credit for the reassessment of the land-tax (1692), the creation of the national debt or the recoinage act (1693-1695). Further, he threatened the existence of the Bank of England, by lending his support to a counter-institution, the Land Bank, which ignominiously collapsed. Though he was not blind to the commercial interests of England, he was neglectful of the administration and affairs

of her oversea colonies. But though he Was unable to extract the best results from parliament he was always able to avert its worst excesses. In spite of strong personal opinions to the contrary, he accepted the Triennial Act (1694), the vote reducing the army to 10,000 men (1697), the vote disbanding his favourite Dutch Guards (1699) and even (November 1699)

a bill re- scinding the grants of forfeited Irish estates, which he had made to his favourites. The main cause of the humiliations William suffered from parliament lay in his incapacity to understand the party or cabinet system. In his view the best way to govern was to have both parties represented in the ministry, so that, as Whig and Tory fell out, the king came by his own. A study of his reign shows that this method was unsuccessful, and that his affairs went most smoothly when the parliamentary majority held the same views as the ministry. It is not often remembered that William possessed an experience of the workings of repre- sentative government in Holland, which was remarkably similar to that In England. Hence his mistakes though easy to understand are by no means so pardonable as were, for example, those of the Georges, who had been absolute monarchs in their own country. William's unpopularity with his new people was, on the whole, unjustified, but his memory is rightly darkened by the stain of the " Massacre of Glencoe." In 1692 he signed an order for the " extirpation " of the Macdonalds, a small clan in the vale of Glencoe. It is improbable that he meant his order to be literally executed, it is not certain that he knew they had taken the oath of allegiance to him. None the less, when the massacre was carried out with circumstances of revolting barbarity, William behaved as he had done after the murder of De Witt. Popular pressure forced him to bring the murderers to justice, to punish them and dismiss them his service. But shortly afterwards they were all received into favour; " one became a colonel, another a knight, a third a peer."

These and other actions indicate that William could show on occasion a cold and cynical ruthlcssness. But while admit- ting that his means were sometimes unprincipled, It must be recollected that his real ends were high and noble. "While he sometimes disregarded the wishes of others, no one was more ready to sacrifice his own feelings for the attainment of the master aim of his life, the restoration of the " Balance of Power," by the overthrow of the predominance of France. This was the real aim of William in going to England in 1688, He had set off to secure an ally against Louis, and he came back from his expedition with a crown on his head and a new nation at his back, united in its detestation of popery and of France.

As king of England he concluded treaties of alliance with the members of the League of Augsburg and sent a large army to oppose the French in Flanders. But his greatest immediate peril during 1689-1690 came from the circumstance that the French disputed the mastery of the seas with the Anglo-Dutch fleet, and that Ireland was strongly for King James. On the 1st of July 1690 the allies were badly beaten at sea off Bcachy Head, but on the same day William himself won a decisive victory over James's army at the Boyne in Ireland. Dublin and Drogheda soon fell and James fled from Ireland. The chances of continued resistance in Ireland, which depended on communication with France, were finally destroyed by the

great victory off Cape La Hogue (May 19th, 1692). Ireland was speedily conquered when once the supremacy of England on the sea became assured. Now the French fleet was definitely destroyed, and though a destruc- tive privateering warfare continued, England was no longer in danger of invasion.

The decisive successes for the Alliance were gained by its naval victories, whose importance William somewhat underrated and for whose execution he had only an indirect responsibility. In 1692 he lost Namur and was badly defeated at Steinkirk (August 4th), and in 1693 he was disastrously beaten at Neerwinden or Landen (July 19th). In 1695 he was able to resume the offensive and to retake Namur in a brilliant and, what was more unusual, a successful campaign. William had assumed the duties of commander-in-chief too young to learn the full duties of a pro- fessional soldier himself, and his imperious will did not suffer

others to direct him. Hence though often fertile in resource and ingenious in plan, he was always a brilliant amateur; and, though sometimes unlucky, he was never really the equal of such generals as Conde or Luxembourg.

In diplomacy William was as uniformly successful as in war he was the reverse. His unity of aim and constancy of purpose make him one of the greatest of modem diplomatists. He held together his ill-assorted coalition, and finally concluded peace at Ryswick in September 1697. Louis restored all his acquisitions since 1678, except Strassburg, and recognized William as king of England. During the subsequent years William tried to arrange a partition treaty with France, by which the domains of the childless Charles II. o£ Spain were to be divided at his death. But on the death of Charles in 1700 the whole heritage was left to France. William endeavoured to oppose this, and used Louis's recognition of James Edward the " Old Pretender " as king of England (Scpl ember 1701) to set the English people in a flame. War was already declared in 1702, but William, who had long been ailing, died from the combined effects of a fall from his horse and a chill on the 8th of March 1702. It was truly tragic that his doom should have come at the moment when he had once more drawn together a great alliance in Europe, and when he possessed a popularity in England such as he had never before enjoyed.

In viewing William's character as a whole one is struck by its entire absence of ostentation, a circumstance which reveals his mind and policy more clearly than would otherwise be the case. No one can doubt his real

belief in religion in spite of many moral failings or weaknesses. He was an unfaithful husband and often treated his wife with scant consideration; he was too fond of Dutch favourites like Keppel or worthless women like Lady Orkney. When it suited his interests he sanctioned the systematic corruption of members of parliament, and he con- doned massacres like those at the Hague or in Glencoe. On the other hand he did not hesitate to inflict considerable injury on his own people, the Dutch, by the terms of the treaty with England (16S9) , when it became clear that only in this way could England's co-operation be secured. The Dutch criticism on him has been that he might have done more to reform the clumsiness of their constitutional procedure, and thus given them some return for the crippling expenses of the war. English criticism avers that he ought to have recognized more fully the system of party government, and to have done more to promote our colonial and commercial development. Military historians point out that he sometimes sacrificed great advantages to impetuosity; naval experts that he sometimes threw away great opportunities by indifference. Some of these criticisms- are rather beside the mark, but were all true, they would not impair his essential greatness, which lay in another sphere. The best proof of his real powers of statesmanship is that the peace of Utrecht was subsequently made on the broad lines which he had laid down as the only security for European peace nearly a dozen years before its conclusion. While he lacked in diplomacy the arts of a Louis XIV. or the graces of a Marlborough, he grasped the central problems of his time with more clearness, or advanced solutions with more ultimate success, than any other statesman of his age. Often baffled, but never despairing, William fought on to the end, and the ideas and the spirit of his policy continued to triumph long after the death of their author.

Original Authorities. — Gilbert Burnet, History of my Own Time, ed. O. Airy (London, 1897) ; William Carstares (The King's Secretary) Papers, edited by J. McCormick (London, 1774); Queen Mary, Letters with Those of James II. and William III., ed. R. Doebner (Leipzig, 1886); Lettres et m&moires, edited by Countess Bentinct (London, 1880); duke of Portland, Hist. MSS. Comm. Report, xv. App. pt. iv. (London; 1897) ; Shrewsbury Correspondence , ed. W. Coxe (London, 1821); Shrewsbury MSS. — Hist. MSS. Comm. Rep. xv. vol. ii. pts. i. and ii. (London, 1903) ; Letters, ed. P. Grimblot (2 vols., London, 1848).

Modern Works (see also under James II.).— Dr Paul Haakc, Brandenburgische Politik in 1688-168Q (Kassel, 1896); Marquis of Halifax, Life, H. C. Foxcroft (2 vols.. London, 1898); Macaulay, History, vols. I.-vi.; Essays, vols, i.-iii. (London, 1898); Baroness Nyevelt, Court Life in the Dutch Republic (London, 1906); F. A. J. Mazure, Histoire de la revolution de 1688 (3 vols., Paris, 1848).

WILLIAM IV. (1765-1S37), king of England, third son of George III., was born at Buckingham Palace on the 21st of August J 765. In 1779 he was sent to sea and became a midship- man under Admiral Digby. Nest year he sailed under Rodney and took part in the action off Cape St Vincent (16th of January 1780). During the rest of the war the young prince saw plenty of service, for which he imbibed a strong liking, and so laid the foundation of his popularity. On the conclusion of the war he travelled in Germany, visiting Hanover and Berlin, where, he was entertained by Frederick the Great, In 1785 he passed for lieutenant; next year he was made captain and stationed in the West Indies. Shortly after 1787, being tired of his station, he sailed home without orders, and was punished for his insub- ordination by being obliged to stay at Plymouth (ill his ship was refitted, when he again sailed for the West Indies.

In 1789 he was made duke of Clarence. When war was declared against the French republic in 1793, he strongly sup- ported it and was anxious for active employment; but, though he was made rear-admiral of the red, he could obtain no com- mand. Thus condemned to inactivity, he amused or revenged himself by joining the prince of Wales and the duke of York in their opposition to the king. He threw himself into the dissi- pations of society, and his hearty geniality and bluff, sailor-like manners gained him popularity, though they did not secure him respect. He took his seat in the House of Lords, where he defended the extravagancies of the prince of Wales, spoke on the Divorce Bill, vehemently opposed the emancipation of slaves and defended slavery on the ground of his experience in the West Indies. Meanwhile he formed a connexion with Mrs Jordan, the actress, with whom he lived on terms of mutual affection and fidelity for nearly twenty years, and the union was only broken off eventually for political reasons. During all this period the prince had lived in comparative obscurity. The death of Princess Charlotte in 1817 brought him forward as in the line of succession to the crown. In 1818 he married Adelaide of Saxe- Meiningen. a lady half his age, without special attractions, but of a stronsr, self-willed nature, which enabled her subsequently to obtain great influence over her husband. On the death of the duke of York in 1S27 the duke of Clarence became heir to the throne, and in the same year he was appointed lord high admiral. In discharging the functions of that office he endeavoured to assume independent control of naval affairs, although his patent precluded him from acting without the advice of two members of his council. This involved him in a quarrel with Sir George Cockbum, in which he had to give way. As he still continued to act in defiance of rules, the king was at length obliged to call upon him to resign.

On the 28th of June 1830 the death of George IV. placed him on the throne. During the first two years of his reign England underwent an agitation more violent than any from which it had suffered since 168S.

William IV. was well-meaning and conscientious; but his timidity and irresolution drove ministers to despair, while his anxiety to avoid extremes and his want of insight into affairs prolonged a dangerous crisis and brought the country to the verge of revolution. Immediately after his accession the revolution of July broke out in France and gave a great impulse to the reform movement in England. The king, though he called himself an " old Whig," did not dismiss the Tory ministry which had governed the country during the last two years of his brother's reign; but the elections for the new parliament placed them in a minority. Within a fortnight of the opening of parliament they were beaten on a motion for the reform of the civil list, and resigned. Lord Giey undertook to form a ministry, with the avowed intention of bringing in a large measure of reform. This was not in itself displeasing to the king, who had liberal tendencies, and a few years before had supported Catholic emancipation. But, when the struggle in parliament began, his disinclination to take up a decided attitude soon exposed the government to difficulties. The first Reform Bill was introduced on the 1st of March 1831; the second reading was carried on the 21st of March by a majority of one. Shortly afterwards the government were beaten in committee.

and offered to resign. The king declined to accept their resigna- tion, but at the same time was unwilling to dissolve, although it was obvious that in the existing parliament a ministry pledged to reform could not retain office. From this dilemma William was rescued by the conduct of the opposition, which, anxious to bring on a change of ministry, moved an address against dissolution. Regarding this as an attack on his prerogative, William at once dissolved parliament (April 1831). The elections gave the ministry an overwhelming majority. The second Reform Bill was brought in in June, and passed its third reading (21st of September) by a majority of 109. A fortnight later (Sth of October) the Lords threw out the bill by a majority of 41. But after a protracted political crisis (sec the article on Grey, Charles Grey, 2nd earl) the king was compelled to consent to create a sufficient number of new peers to carry the bill, and the threat was successful in bringing about the passing of the act in 1S32.

During the rest of his reign William IV. had not much oppor- tunity of active political interference, but on one other occasion he made an unjustifiable use of his prerogative. Two years after the passing of the Reform Bill the ministry of Lord Grey had become unpopular. In July 1834 Lord Grey himself retired and Lord Melbourne took the lead. There were divergences of opinion in the cabinet, and the king strongly objected to the ministerial policy respecting the Irish Church. On the shallow pretext that Lord Althorp's removal to the Upper House would weaken the ministry in

the House of Commons, where, however, they still had a majority, he suddenly dismissed them and summoned Sir Robert Peel (r4th of November). Peel's ministry, containing many members who had been in the government on the king's accession, was called from its short duration " the ministry of the hundred days." Its formation clearly indicated that the Whig proclivities of the king, which had never been more than partial or lukewarm, had wholly disappeared. The step was regarded with general disapprobation. It was immediately followed by a dissolution, and the ministry soon found themselves in a minority. Beaten on Lord John Russell's motion respecting the Irish Church (3rd of April 1S35), Peel resigned and Melbourne again came into power. Under him the Whigs retained the lead during the remainder of the reign. This coup d'ital of November 1834 was the last occasion on which the English sovereign has attempted to impose an unpopular ministry on the majority in parliament.

In May 1837 the king began to show signs of debility, and died from an affection of the heart on the 20th of June, leaving behind him the memory of a genial, frank, warm-hearted man, but a blundering, though well-intentioned prince. He was succeeded by his niece Queen Victoria.

Authorities. — Correspondence of Earl Grey with William 1 V. and Sir Herbert Taylor (London, 1867); Fitzgerald's Life and Times of William IV.; Greville's Memoirs; Memoirs of Sir Robert Peel; the Creevey Papers; Civil Correspondence of the Duke of Wellington', Walpole's History of England; Martmeau's History of the Peace.

(G. W. P.)

WILLIAM (1143-1214), king of Scotland, surnamed "'the Lion," was the second son of Henry, earl of Huntingdon (d. 1151'), a son of King David L, and became king of Scotland on the death of his brother, Malcolm IV., in December 1165, being crowned at Scone during the same month. After his accession to the throne William spent some time at the court of the English king, Henry II.; then, quarrelling with Henry, he arranged in 1 1 68 the first definite treaty of alliance between France and Scotland, and with Louis VII. of France assisted Henry's sons in their revolt against their father in n 73. In return for this aid the younger Henry granted to William the earldom of Northumberland, a possession which the latter had vainly sought from the English king, and which was possibly the cause of their first estrangement. However, when ravaging the country near Alnwick, William was taken prisoner in July 11 74, and after a short captivity at Richmond was carried to Normandy, where he soon purchased bis release by assenting in December 1174 to the treaty of Falaise. By this arrangement the king and his nobles, clerical and lay, undertook to do homage to Henry and his son;

this and other provisions placing both the church and state of Scotland thoroughly under the suzerainty of England. William's next quarrel was with Pope Alexander III., and arose out of a double choice for the vacant bishopric of St Andrews. The king put forward his chaplain, Hugh; the pope supported the arch- deacon, John the Scot, who had been canonically elected. The usual interchange of threats and defiances followed; then after the death of Alexander in 1181 his successor, Lucius III., con- sented to a compromise by which Hugh got the coveted bishopric and John became bishop of Dunkeld. In 1188 William secured a papal bull which declared that the Church of Scotland was directly subject only to the sec of Rome, thus rejecting the claims to supremacy put forward by the English archbishop. This step was followed by the temporal independence of Scotland, which was one result of the continual poverty of Richard I. In December 1189, by the treaty of Canterbury, Richard gave up all claim to suzerainty over Scotland in return for 10,000 marks, the treaty of Falaise being thus definitely annulled.

In 1 1 86 at Woodstock William married Ermengarde de Beaumont, a cousin of Henry II., and peace with England being assured three years later, he turned his arms against the turbulent chiefs in the outlying parts of his kingdom. His authority was recognized in Galloway which, hitherto, had been practically independent; he put an end to a formidable insurrection in Moray and Inverness; and a series of campaigns taught the far north, Caithness and Sutherland, to respect the power of the crown. The story of William's relations with King John is interesting, although the details are somewhat obscure. Soon after John's accession in 1199 the Scottish king asked for the earldom of Northumberland, which Richard I.', iike his father, had refused to restore to Scotland. John, too, refused this de- mand, but the threatened war did not take place, and in 1200 William did homage to the English king, at Lincoln with the ambiguous phrase " saving his own rights." After a period of inaction war between the two countries again became imminent in 1209; but a peace was made at Norham. and about three years later another amicable arrangement was reached. Both these treaties seem to have been more favourable to England than to Scotland, and it is possible that William acknowledged John as overlord of his kingdom. W T illiam died at Stirling on the 4th of December 12 14 and was buried at Arbroath. He left one son, his successor Alexander II. . and two daughters, Margaret and Isabella, who were sent to England after the treaty of 1209, and who both married English nobles, Margaret becoming the wife of Hubert de Burgh. He also left some illegitimate children. William's reign is a very important period in the early history of Scotland, and may almost be said to mark an epoch in every department of public life. The relations of England and Scotland and of Scotland and France; the rise of towns, the development of trade and the

establishment of order in Scotland itself; and the attitude of the Scottish Church, both to the papal see and to England, were all vitally affected by the events of this reign. William founded and richly endowed the abbey at Arbroath, and many of the Scottish towns owe their origin to his charters.

See E. W. Robertson, Scotland under her Early Kings (Edinburgh, 1862) ; Lord Hailes, Annals of Scotland (Edinburgh, 1819) ; A. Lang, History of Scotland, vol. i. (1900) ; also Scotland : History.

WILLIAM I. (1797-18S8), king of Prussia and German emperor, was the second son of Frederick William III. of Prussia and Louise, a princess of Mecklenburg-Strelitz. He was born at Berlin on the 22nd of March 1797, and received the names of Wilhelm Friedrich Ludwig. He was a delicate child and had to be carefully nurtured. His constitution, however, was sound, and he became one of the most vigorous men in Germany. After the battle of Jena he spent three years at Konigsberg and Memcl. Meanwhile he had given evidence of sterling honesty, a strict love of order, and an almost passionate interest in everything relating to war. On the 1st of January 1807 he received an officer's patent, and on the 30th of October 1813 was appointed a captain. William accompanied his father in the campaign of 1S14, and early in the following year received the iron cross for personal bravery shown at Bar sur-Aube. He took part in the

entry into Paris on the 31st of March 1814, and afterwards visited London. He joined the Prussian army in the final campaign of the Napoleonic wars, and again entered Paris. The prince was made a colonel and a member of the permanent military commission immediately after his twentieth birthday, and al the age of twenty-one became a major-general. In 1820 he received the command of a division; and during the following nine years he had not only made himself master of the military system of his own country but studied closely those of the other European states. In 1825 he was promoted to the rank of lieutenant-general, and obtained the command of the corps of guards. On the nth of June 1829 he married Augusta, daughter of Charles Frederick, grand duke of Saxe-Weimar. This lady, who had imbibed the Liberal tendencies of the court of Weimar and later developed a keen sympathy with Catholicism, exercised afterwards as queen and empress a considerable influence at court, in a sense generally hostile to Bismarck's views. She died on the 7th of January 1890.

On the death of his father in 1840 — the new king, Frederick William IV., being childless — Prince William, as heir presumptive to the throne,

received the title of prince of Prussia. He was also marlc lieutenant-governor of Pomerania and appointed a general of infanlry. In politics he was decidedly conservative; but at the outbreak of the revolutionary movement of 1848 he saw that some concessions to the popular demand for liberal forms of government were necessary. He urged, however, that order should be restored before the establishment of a constitutional system. At this time he was the best-hated man in Germany, the mass of the Prussian people believing him to be a vehement supporter of an absolutist and reactionary policy. He was even held responsible for the blood shed in Berlin on the 18th of March, and was nicknamed the " Cartridge Prince," although he had been relieved nine days before of his command of the guards. So bitter was the feeling against him that the king entreated him to leave the country for some time, and accordingly he went to London, where he formed intimate personal relations with Prince Albert, Sir Robert reel, Lord John Russell, Lord Palmer- ston and other English statesmen. On the 8th of June he was back at Berlin, and on the same day he took his seat as member for Wirsitz in the Prussian national assembly, and delivered a speech in which he expressed belief in constitutional principles. In i84g, when the revolutionary party in the grand-duchy of Baden became dangerous, he accepted the command of " the army of operation in Baden and the Palatinate," and his plans were so judiciously formed and so skilfully executed that in the course of a few days the rebellion was crushed. At the beginning of the campaign an unsuccessful attempt was made on his life. In October 1849 he was appointed military governor of the Rhincland and Westphalia, and took up his residence at Coblenz. In 1854 the prince was raised to the rank of a field-marshal and made governor of the federal fortress of Mainz. When the king was attacked with a disease of the brain, Prince William assumed the regency (7th October 1858), and on his brother's death, on the 2nd of January 1861, succeeded him as William I.

The political events of William's regency and reign are told elsewhere (see Germany: History; Prussia: History). His personal inlluence upon these events is, however, of great importance and deserves separate notice. William was not a ruler of the intellectual type of Frederick the Great; but he believed intensely in the " God of battles " and in his own divine right as the vicegerent of God so conceived. He believed also in the ultimate union of Germany and in the destiny of Prussia as its instrument; and he held that whoever aspired to rule Germany must feize it for himself (Letter to von Natzmer of the 20th of May 1849, hi Natzmer's [Inter den Hohenzollem). But an attitude so wholly alien to the Libeial temper of contemporary Germany was tempered by shrewd common sense, and, above all, by a capacity to choose his advisers well and listen to their advice. Thus it came about that the regent, whose reactionary views were

feared, called the Liberals into office on Bismarck's advice, though later he did not hesitate to override the constitu- tion when the refusal of the supplies for the new armaments

made this course necessary. From September 1862, when Bismarck took office as minister president, William's personality tends to be obscured by that of his masterful servant, who remained beside him till his death. But Bismarck's Reminis- cences contain plentiful proof that his master was by no means a cipher. His prejudices, indeed, were apt to run athwart the minister's plans; as in the Schleswig-Holstein question, when the king's conscience in the matter of the claims of the Augufcten- burg prince threatened to wreck Bismarck's combinations. But, as Bismarck put it, the annexation of the duchies gave him " a taste for conquest," and in the campaign of 1866 the difficulty was to restrain the king, who wished to enter Vienna in triumph. Whatever may have been the feelings of the Prussians before the war, its striking success fully justified the king's policy, and on his return to Berlin he was received with unbounded enthusiasm.

In the events immediately preceding the Franco-German War of 1870-71 again it was Bismarck and not the king that gave the determining impulse. In the matter of the Hohenzollem candidature King William's attitude was strictly " correct." He was justified in refusing to discuss further with Benedetti the question of " guarantees," a matter which touched his honour; and if the refusal, courteously framed, was read in Paris as an insult, this was due to Bismarck's " editing " of the Ems telegram (see Bismarck). The result of the outcry in France and of the French declaration of war was that all Germany rallied round the king of Prussia, and when, on the 31st of July, he quitted Berlin to join his army, he knew that he had the support of a united nation. He crossed the French frontier on the nth of August, and personally commanded at the battles of Gravelolte and Sedan. It was during the siege of Paris, at his headquarters in Versailles, that he was proclaimed German emperor on the 18th of January 1871. On the 3rd of March i87r he signed the pre- liminaries of peace which had been accepted by the French Assembly; and on the 21st of March he opened the first imperial parliament of Germany. On the 16th of June he triumphantly entered Berlin at the head of his troops.

.After that period the emperor left the destinies of Germany almost entirely in the hands of Bismarck, who held the office of imperial chancellor. In his personal history the most notable events were two attempts upon his life in 1878 — one by a working lad called Hodel, another by an educated man, Karl Nobiling. On the first occasion the emperor escaped without injury, but on the second he was seriously wounded. These attacks grew out of the Socialist agitation; and a new Reichstag, elected for the purpose, passed a severe anti- Socialist law. which was after- wards from time to time

renewed. Until within a few days of his death the emperor's health was remarkably robust; he died at Berlin on the 9th of March 1888.

The reign ot William I. marked an era of vast importance in the history of Germany. In his time Prussia became the first power in Germany and Germany the first power in Europe, though these momentous changes were due in a less degree to him than to Bismarck and Moltke ; but to him belongs the credit of having recognized the genius of these men, and of having trusted them absolutely. Personally William maintained the best traditions of the Hohenzollerns, not only by the splendour of the achievements with which his name will always be intimately associated, but by the simplicity, manliness and uprightness of his daily life. By his marriage with Augusta of Saxe-Weimar William I. had two children : the crown prince Frederickˆ William (b. 1831), who succeeded him as Frederick III. (g.fl.), and the princess Louise (b. 1838), married in 1856 to the grand-duke of Baden.

William I.'s military writings were published in 2 vols, at Berlin in 1897. Of his letters and speeches several collections have ap- peared: Polilische Korrespondenz Kaiser Wilhelms I. (1890); Kaiser Wilhelms des Grossen Briefe, Reden und Sckrifkn (2 vols., 1905), and his correspondence with Bismarck (ed. Penzler, Leipzig, 1900). A large number of biographies have appeared in German, of which may be mentioned L. Schneider's Aus dem Leben Kaiser Wilhelms (3 vols., Berlin, 1888; Fr. translation, 1888); v. Bernhardi, Die ersten RegierungsjahreK. Wilhelms, Tagebuchblatler (Leipzig, 1895); Oncken, Das Zeiialler Kaiser Wilhelms (2 vols., Berlin, 1890 1892); F. Delbriick, Die Jugend des Konigs Friedrich Wilhelm IV. von Preussen und des Kaisers u. Konigs Wilhelm I., Tagebuchblatler. (Berlin, 1907); Blume, Kaiser Wilhelm und . . . Ronn als Btldner des preussisch-deutschen Heeres (Berlin, 1906) ; E. Marcks, Kaiser

Wilheim I. (Leipzig, 1897; 5th ed. 1905). In English have appeared

William of Germany, by Archibald Forbes (1888), a translation of Edouard Simon's The Emperor William and his Reign (2 vols., 1886). See abo Sybel's Founding of the German Empire (Eng. trans., New York, 1890-1891).

WILLIAM II. [Friedrich Wilheui Victor Albert] (1859-), king of Prussia and German emperor, was born on the 27th of January 1859 at Berlin, being the eldest child of Prince Frederick of Prussia, afterwards crown

prince and second German emperor, and of Victoria, princess royal of Great Britain and Ireland. On his tenth birthday he was appointed second lieutenant in the First Regiment of the Guards. From September 1874 to January 1877 he attended the gymnasium at Cassel; he studied for two years at Bonn, and was then for some time chiefly occupied with his military duties. In 1885 he was appointed colonel of the Hussars of the Guard. He was much influenced by the military atmosphere in which his life was spent, and was more in sympathy with the strongly mon- archical feelings of the emperor William and Bismarck than with the more liberal views of his own parents, but until the illness of his father in 1887 he took no part in political life. The death of his grandfather was quickly followed by that of his father, and on the 15th of June he became ninth king of Prussia and third German emperor. The chief events of his reign up to igio are narrated under Germany: History, but here it is necessary to dwell rather on the personality of the emperor himself. His first act was an address to the army and navy, while that to his people followed after three days. Throughout his reign, indeed, he repeatedly stated that the army was the true basis of his throne: " The soldier and the army, not parlia- mentary majorities, have welded together the German Empire. My confidence is placed on the army."

From the first he showed his intention to be his own chancellor, and it was this which brought about the quarrel with Bismarck, who could not endure to be less than all-powerful. The dismissal and disgrace of the great statesman first revealed the resolution of the new ruler; but, as regards foreign affairs, the apprehensions felt at his accession were not fulfilled. While he maintained and confirmed the alliance with Austria and Italy, in obedience to the last injunctions of his grandfather, he repeatedly attempted to establish more cordial relations with Russia. His overtures, indeed, were scarcely received with corresponding cordiality. The intimacy of Russia with France increased, and more than a year passed before the Russian emperor appeared on a short visit to Berlin. In 1890 the emperor again went to Russia, and the last meeting between him and Alexander III. took place at Kiel in the autumn of 1 89 1, but was marked by considerable coolness. By his visit to Copenhagen, as in his treatment of the duke of Cumberland and in his frequent overtures to France, the emperor showed the strong desire, by the exercise of his own great personal charm and ability, to heal the wounds left by the events of a generation before. In the autumn of 1888 he visited not only the courts of the confederate princes, but those of Austria and Italy. While at Rome he went to the Vatican and had a private con- versation with Pope Leo XIII., and this visit was repeated in 1895 and again in 1903. In 1889 the marriage of his sister, the Princess Sophie, to the duke of Sparta, took him to Athens; and thence he sailed to Constantinople. It was the first time that one of the

great rulers of Christendom had been the guest of the sultan. A more active interest was now taken by Germany in the affairs of the Levant, and the emperor showed that he would not be content to follow the secure and ascertained roads along which Bismarck had so long guided the country. It was not enough that Berlin had become the centre of the European system. The emperor was the apostle of a new Germany, which claimed that her voice should be heard in all political affairs, in whatever quarter of the globe they might rise. Once again, in 1898, he went to Constantinople. It was the time when the Armenian massacres had made the name of Abd-ul Hamid notorious, and the very striking friendliness shown towards him scarcely seemed consistent with the frequent;

claims made by the emperor to be the leader of Christendom; but any scruples were doubtless outweighed by the great impulse he was able to give to German influence in the East. From Constantinople he passed on to Palestine. He was present at the consecration of the German Protestant church of the Re- deemer. By the favour of the sultan he was able to present to the German Catholics a plot of ground, the Dormition de la Sainte Vierge, very near to the Holy Places.

The motive of his frequent travels, which gained for him the nickname of Der Reise-Kaiser, was not solely political, but a keen interest in men and things. His love of the sea was shown in an annual voyage to Norway, and in repeated visits to the Cowes regatta. He was a keen yachtsman and fond of all sorts of sport, and, though deprived of the use of his left arm through an accident when he was a child, he became an. excellent shot and rider.

At the time of his accession there was a strong manifestation of anti-British feeling in Berlin, and there seemed reason to suppose that the party from which it proceeded had the patronage of the emperor. Any temporary misunderstanding was removed, however, by his visit to England in 1889. For the next six years he was every year the guest of Queen Victoria, and during the period that Caprivi held office the political relations between Germany and Great Britain were very close. While the emperoi's> visits were largely prompted by personal reasons, they had am important political effect; and in 1890, when he was entertained at the Mansion House in London and visited Lord Salisbury at Hatfield, the basis for an entente cordiale seemed to be under discussion. But after 1895 the growth of the colonial spirit in Germany and the strong commercial rivalry with Great Britain, which was creating in Germany a feeling that a navy must be built adequate to protect German interests, made the situation as regards England more difficult. " And an unexpected incident occurred at the end of that year, which brought to a head all the latent feelings of suspicion and jealousy in both countries. On the occasion of the Jameson Raid he despatched to the president of the Transvaal a telegram, in which he con-

gratulated him that " without appealing to the help of friendly powers," he had succeeded in restoring peace and preserving the independence of his country. It was very difficult to regard this merely as an impulsive act of generous sympathy with a weak state unjustly attacked, and though warmly approved in Germany, it caused a long alienation from Great Britain. The emperor did not again visit England till the beginning of 1901, when he attended the deathbed and funeral of Queen Victoria. On this occasion he placed himself in strong opposition to the feelings of the large majority of his countrymen by conferring on Lord Roberts the Order of the Black Eagle, the most highly prized of Prussian decorations. He had already refused to receive the ex-presid-ent of the Transvaal on his visit to Europe. Meanwhile, with the other great branch of the English-speaking people in the LTnited States, it was the emperor's policy to cultivate more cordial relations. In 1902, on the occasion of the launching of a yacht built for him in America, he sent his brother Prince Henry to the United Stales as his representative. The occasion was rendered of international importance by his official attitude and by his gifts to the American people, which included a statue of Frederick the Great. The emperor also initiated in 1906 the exchange of professors betw T een German and American universities.

As regards home policy, the most important work to which the emperor turned his attention was the increase of the German naval forces. From the moment of his accession he constantly showed the keenest interest in naval affairs, and the numerous changes made in the organization were due to his personal initiative. It was in January 1895, at an evening reception to members of the Reichstag, that he publicly put himself at the head of the movement for making Germany a sea power. In all the subsequent discussions on the naval bills his influence was decisively used to overcome the resistance of the Reichstag. " Our future," he declared," is on the wafer," and in speeches in all parts of the country he combated the indifference of

the inland Germans to the sea. "I will not rest," he telegraphed to his brother, " till I have brought my navy to the same height at which my army stands." The development of German armaments during the next few years (see Navy) showed that this was no idle boast. But, while it was inevitable that the inference should be drawn that the Increase of the German navy was directed towards eventual hostilities with Great Britain, the emperor himself insisted that the real object was the preserva- tion of peace consistently with the maintenance of Germany's u place in the sun," In

March 1905, in a speech at Bremen, he declared the aim of the Hohenzollerns to be " a world-wide dominion founded upon conquests not gained by the sword, but by the mutual confidence of nations that press towards the same goal." " Every German warship launched/' he said, " is one guarantee more for peace on earth." In the same spirit he protested later, in an interview " published in the Daily Telegraph of the 28th of October 1908, that he had always been actuated by the friendliest feelings towards England, but that " Germany must be prepared for any eventualities in the East," and that, in view of the growing naval power of Japan, England should welcome the existence of a German fleet i(when they speak together on the same side in the great debates of the future " For to the emperor, who had published a cartoon, drawn by himself, representing the European powers in league against the Yellow Peril, the Anglo- Japanese alliance seemed a betrayal of the white race, an unnatural league which could not last. The justification of his naval policy so far as European affairs were concerned was revealed in the effective intervention of Germany in regard to France and Morocco in 1905, and in 1909 in the defiance of British policy when Austria, backed by Germany, tore up the treaty of Berlin in regard to Bosnia and Herzegovina.

In numerous rhetorical speeches the emperor had impressed the world with his personal conviction of autocratic sovereignty, and his monarchical activity was certain, sooner or later, to bring him into conflict with the constitutional limitations of his position as king of Prussia and German emperor. His imperial style, constitutionally but the honorary title of the primus inter pares in a free confederation of sovereign princes, was invested by him with something of the glamour of that of the Holy Roman emperors, with their shadowy claim to world-dominion. In speech after speech he proclaimed the world-mission of Germany, of which he himself was the divinely appointed instrument; Germans are " the salt of the earth 1 ;" they must not " weary in the work of civilization," and Germanism, like the spirit of imperial Rome, must expand and impose itself. 2 This new imperialism, too, had a religious basis s for " the whole of human life hinges simply and solely on our attitude towards our Lord and Saviour." 3 The emperor's progresses in the East were conceived in the spirit of the new crusade, at once Christian and German; and a solemn service, to which none but the emperor and his train were admitted, was held on the summit of the Mount of Olives. In the same spirit, too, the emperor dis- pensed the marks of his approval and disapproval beyond the borders of his own jurisdiction, sometimes with results which were open to criticism. The " Kruger telegram " has been mentioned; scarcely less characteristic was the message despatched by him on the 9th of April 1906, after the Algeciras conference, to Count Goluchowski, the Austro-Hungarian foreign minister, congratulating him on having proved " a brilliant second on the duelling-

ground." Goluchowski's retire- ment was mainly due to this compliment. In 1005 he bestowed the order Pour te Merite not only on the Japanese general Nogi, but also on the Russian general Stossel, the defender of Port Arthur, who was afterwards condemned by a Russian court- martial for dereliction of duty. In 1902 his telegram to the regent of Bavaria condemning the refusal of the clerical majority in the diet to vote £5000 for art purposes, and offering himself to supply the money, was regarded as an unwarrantable inter-

1 Speech at Bremen (March 1905).

3 Speech at Gniezno, Poland (August 1905).

8 Speech at confirmation of his son (Octoher 1903).

ference in the internal affairs of Bavaria and roused strong resentment among the clericals all over Germany.

Owing to the political conditions in Germany it was generally left for the Socialists to attack these excursions on the part of the emperor into fields which lay beyond his strict prerogative. But, apart from the traditional Lines of political cleavage, such as the inherited hatred of the Liberal South for the Hohenzollern " corporal's cane," other centres of dissatisfaction were coming into being. The emperor was isolated in his efforts to impose the old, strenuous, Prussian ideals of "self-denial, discipline, religion, avoidance of foreign contagion." With the growth of wealth Germany was becoming materialized and to some extent Americanized, partly through the actual reflux of emi- grants grown rich in the United States. In this new society, far removed from the days, denounced by the historian Gervinus, when the Germans were content to " fiddle and be slaves," the phrases which still woke responsive echoes in the squires of the Old Mark of Brandenburg were apt to create surprise, if not indignation; and in the great industrial classes the principles of Social Democracy spread apace. The emperor himself here and there even yielded a little to the new ideas, as when, in the famous " Babel and Bible " controversy of 1903, arising out of lectures in which Professor Delitzsch had derived Jewish mono- theism from Babylonian polytheism, he publicly accepted the main conclusion of the " higher criticism " of the Old Testament, while maintaining that the kernel and contents, God and His works, remain always the same; or when on the 17th of November 1906, on the 25th anniversary of William I. } s edict announcing national insurance, he promised further social reforms. But he was impatient of what he considered factious opposition, and was apt to appeal from the nation m parliament to the nation in arms, as when in jgo6, at the Silesian manoeuvres, he con- demned the critical spirit exercised towaids the

government, and invoked once more the protection of Germany's " Divine Ally." Clearly, this was an attitude which was inconsistent with the development of what prided itself on being a constitutional state; but there were obvious difficulties in the way of controlling the utterances of a ruler, vigorous, self-confident and conscious of the best intentions, who was also the master of many legions, whose military spirit he could evoke at will. In October 1906 the publication of Prince Hohenlohe's Memoirs, containing indiscreet revelations of the emperor's action in the dismissal of Bismarck, caused a profound sensation. A few months later, in February 1907, the prestige of the court was further damaged by various unsavoury revelations, made by Herr Harden in the Zukunft, as to the character of the " camarilla " by which the emperor was surrounded, and it was affirmed that a connexion could here be traced with the fall of Caprivi in 1894. The long- drawn-out trials and counter- trials left the character of the emperor entirely unstained, but they resulted in the disgrace of men who had been his confidants —Prince Philip Eulenburg, Count Kuno Moltke and others. The attitude of the emperor throughout was manly and sensible; and not the least satisfactory outcome of the whole sorry business was the issue, on the 28th of January 1907, of an edict, afterwards embodied in a bill, greatly modifying the law of lese-majeste, which in the earlier part of the reign had been used to ridiculous excess in the imprisonment of the authors of the slightest reflection on the person of the sovereign.

Anglo-German relations were apparently improved by a visit of the emperor to England in November 1907. But early in 1908 they were again strained by the revelation, made in The Times of the 6th of March, of a correspondence between the emperor and Lord Tweedmouth, the first lord of the admiralty, in which, in answer to friendly assurances on the emperor's part, the British secretary of state had communicated to him an outline of the new naval programme before it had even been laid on the table of the House of Commons. The angry controversy to which this gave rise, and the emperor's attempts to allay it, led at the end of the year to a serious crisis in his relations with his subjects. On the nth of August he had met Edward VII. at Cronberg; on the 30th, in a speech at Strassburg, he reiterated

the intention of Germany to maintain the high level of her armaments; and on the 28th of October there appeared in the Daily Telegraph an extraordinary " interview," authorized by him, in which he expounded his attitude. The document was a resume of his table-talk during his stay at Highcliffe Castle, on the Hampshire coast opposite the Isle of Wight, in the

autumn of 1Q07. In it he reiterated that his heart was set on peace; he declared that, so far from being hostile to the English, he had offended large sections of his people by his friendship for England. He instanced his refusal to receive the Boer delegates and his rejection of the proposals of France and Russia for a joint inter- vention to stop the South African War; he also mentioned the curious fact that at an early stage of the war he had himself drawn up a plan of campaign for the British and sent it to Windsor. It was on this occasion, too, that he made the sugges- tion of an eventual co-operation of the British and German fleets in the Far East. This pronouncement created a profound sensation, not only in Germany, where the indignation was intense, but in Russia, France and Japan, where it was regarded as a Machiavellian attempt to loosen existing alliances. In the German press and parliament a storm of protest arose. Prince Biilow, as technically responsible, handed in his resigna- tion, which was not accepted, and he was forced to make in the Reichstag the best defence that he could for the imperial indis- cretion, declaring that henceforth the emperor would show more reserve. The emperor publicly endorsed the chancellor's ex- planations, and for nearly two years maintained in public an almost unbroken silence. But this came to an end in a speech delivered at Konigsberg, on the 25th of August 1910. In this the emperor again laid special stress upon the divine right by which alone the kings of Prussia rule, adding: " considering myself as the instrument of the Lord, without heeding the views and opinions of the day, I go my way." This speech led to a debate, on a Socialist»interpellation, in the Reichstag (November 26). In reply to the enquiry what the government intended to do in fulfilment of the pledge given in 1908, the chancellor denied that the emperor had exceeded his constitutional rights, a view supported by the majority of the House.

The emperor married on the 27th of February 1881 Princess Aug'.] st e Victoria, daughter of Frederick, duke of Augustenburg, who in 1864 had come forward as claimant to the duchies of Schleswig- Holstein; the marriage had, therefore, some political importance, for it sealed the reconciliation of one of the dynasties that had suffered bv rhe ri=e of Prussia. They had six sons and one daughter: (l) Wilhelm, born 6th May 1882, Crown Prince, whose coming of age was celebrafed with much ceremony on his eighteenth birthday, and who married on the 6th of June 1905 the duchess Cecilia of Mecklenburg, their eldest son, Wilhelm, being born on the 4th of July 1906; (2) Eitei Friedrich, born on the 7th of July 1883; (3) Adalbert, born on the 14th of July 1884; (4) August Wilhelm, born on the 29th of January 1887; (5) Oskar, born on the 27th of July 1888; (6) Joachim, born on the 17th of December 1890; and (7) Viktoria Lui^c, born on the 13th of September 1892.

For the emperor's speeches, &c, see Kaiserreden. Reden zind Erlasse, Briefe und Tele-gramme Kaiser Wilhelms II. (Leipzig, 1902); translated by L.

Elkind, as The German Emperor's Speeches (London,

1904).

WILLIAM I. (1772-1844), king of the Netherlands, born at the Hague on the 24th of August 1772, was the son of William V., prince of Orange and hereditary stadtholder of the United Netherlands by Sophia Wilhelmina, princess of Prussia. In 17Q1 he married Frederica Wilhelmina, daughter of Frederick William II., king of Prussia, thus cementing very closely the relations between the houses of Orange-Nassau and Hohenzollern. After the outbreak of war with the French republic in 1793, he distinguished himself in the struggle against the revolutionary army under Dumouriez by the capture of Landrecies and the relief of Charleroi. By the victories of Pichegru the stadtholder and all his family were, how r ever, compelled to leave Holland and seek refuge in England, where the palace of Hampton Court was set apart for their use. He afterwards made Berlin his residence, and took an active part in the unfortunate campaign under the duke of York for the reconquest of the Netherlands. After the peace of Amiens he had an interview with Napoleon at Paris, and received some territory adjoining the hereditary domains

of the house of Nassau in Westphalia as a compensation for the abandonment of the stadtholderate and the domains of his house. William refused, however, in 1806, in which year by the death of his father he became prince of Orange, to separate his interests from those of his Prussian relatives, and fought bravely at Jena. Pie was therefore despoiled by Napoleon of all his possessions. In 1809 he accepted a command in the Austrian army under the archduke Charles and was wounded at the battle of Wagram. When Holland rose in revolt against French domination in 1813, after eighteen years of exile he landed at Scheveningen (on the igth of November) and was on the 3rd of December, amid uni- versal rejoicing, proclaimed prince sovereign of the Netherlands. His assumption in the following year of the title of king of the Netherlands was recognized by the powers, and by the treaty of Paris his sovereignty was extended over the southern as well as the northern Netherlands, Belgium being added to Holland " as an increase of territory." After the battle of Waterloo, in which Dutch and Belgian troops fought side by side under his command, the congress of Vienna further aggrandized him by making him sovereign of the territory of Luxemburg with the title of grand duke.

William had many excellent qualities, but his long life of exile and hardship had made him niggardly and narrow. He was unable to rise to the great opportunity which lay before him of creating out of the Dutch and Belgian provinces a strong and united state. Two hundred and fifty years of political separation and widely differing experiences had caused the two

kindred populations on this and that side of the Scheldt to grow apart in sentiment and tradition. This difference was still further accentuated by strong divergence in religious creed. Further, one-third of the Belgian provinces was inhabited by a Walloon population divided from the Flemings by racial characteristics and their use of a Romance instead of a Teutonic dialect. All these things William was inclined to ignore. He drew up a constitution, which was accepted unanimously by the Dutch, but was rejected by the Belgians, because it contained provisions for liberty of worship. The king, however, by a subterfuge declared that the fundamental law had been approved. The new constitution, therefore, started badly, and it was soon evident that William intended to make his will prevail, and to carry out his projects for what he conceived the social, industrial and educational welfare of the kingdom regardless of the opposi- tion of Belgian public opinion. The Belgians had many griev- ances. Their representation in the states general was exactly equal to that of the Dutch, though their population was in the proportion of seven to five. With the help of the official vote of ministers the Dutch were thus able to have a perpetual majority. The whole machinery of government was centralized at the Hague, and Dutchmen filled nearly all the principal posts. The attempt of the king to enforce the official use of the Dutch language, and the foundation of the so-called philosophical college at Louvain helped to exacerbate the growing discontent. The rapid advance of Belgium in industrial and manufacturing prosperity, due largely to the stimulus of William's personal initiative, did nothing to bring north and south together, but rather increased their rivalry and jealousy, for the Dutch pro- vinces had neither manufactures nor iron- and coal-mines, but were dependent, on agriculture and sea-borne commerce for their welfare. Such clashing of interests was sure to produce alienation, but the king remained apparently blind to the signs of the times, and the severe enforcement of a harsh law restricting freedom of the press led suddenly in 1830 to a revolt (see Belgium), which, beginning at Brussels at the end of August, rapidly spread over the whole country. The Dutch were almost without striking a blow expelled from the country, the strongly fortified seaport of Antwerp alone remaining in their hands. Had the king consented at once to the administrative autonomy of Belgium, and appointed the prince of Orange governor of the southern Netherlands, it is probable that the revolt might have been appeased. At the first there was undoubtedly a strong body of public opinion in favour of such a compromise, and the house of Orange had many adherents in the country. William,

however, was too proud and too obstinate to lend himself to such a course. He appealed to the powers, who had, in 1815, created and guaranteed the independence oi the kingdom of the Nether- lands. By the treaty of the

eighteen articles, however, concluded at London on the 29th of June 1S31, the kingdom of Belgium was recognized, and Leopold of Saxe-Coburg was elected king. William refused his assent, and in August suddenly invaded Belgium. The Belgian forces were dispersed, and the Dutch would have entered Brussels in triumph but for the intervention of the French. Still, however, William declined to recognize the new throne, and he had behind him the unanimous support of Dutch public opinion. For nine years he maintained this attitude, and resolutely refused to append his signature to the treaty of 1831. His subjects at length grew weary of the heavy expense of maintaining a large military force on the Belgian frontier and in 1839 the king gave way. He did so, however, on favourable terms and was able to insist on the Belgians yielding up their possession of portions of Limburg and Luxemburg, which they had occupied since 1830.

A cry now arose in Holland for a revision of the fundamental law and for more liberal institutions; ministerial responsibility was introduced, and the royal control over finance diminished. William, however, disliked these changes, and finding further that his proposed marriage with the countess d'Oultremont, a Belgian and a Roman Catholic, was very unpopular, he suddenly abdicated on the 7th of October 1840. After his abdication he married the countess and spent the rest of his life in quiet retirement upon his private estate in Silesia. He died in 1844.

See L. Jottsand, Guilla-ume d'Orange avant son avhiemenl au irone des Pays-Bas ; E. C. de Gerlache, Histoire du royaume des Pays- Bas depuis 1814 jusqu'en 1830 (3 vols., Brussels, 1842); W. H. de Beaufort, De eerste regeeringsjaren van Roning Wilkm I. (Amsterdam, 1886); H. C. Colenbrander, De Belgische Omiventeling (The Hague, 1905) ; T. Juste, Le Soulevement de. la Ilollande en 1813 et lafondation du royaume des Pays-Bas (Brussels, 1870) ; and P. Blok, Geschiedenis der Nederlandscke Volk, vols. vii. and viii. (Leiden, 1907-1908).

WILLIAM II. (r 702-1849), king of the Netherlands, son of William I., was born at the Hague on the 6th of December 1792. When he was three years old his family was driven out of Holland by the French republican armies, and lived in exile until 1813. He was educated at the military school at Berlin and afterwards at the university of Oxford. He entered the English army, and in 1811, as aide-de-camp to the duke of Wellington, took part in several campaigns of the Peninsula War. In 181 5 he com- manded the Dutch and Belgian contingents, and won high commendations for his courage and conduct at the battles of Quatre Bras and Waterloo, at the latter of which he was wounded. The prince of Orange married in 1816 the grand duchess Anna Paulowna, sister of the tzar Alexander I, He enjoyed consider- able popularity in Belgium, as well as in Holland for his affability and moderation, and in 1830, on the outbreak of the Belgian revolution,

he betook himself to Brussels, and did his utmost by personal conferences with the most influential men in the Belgian capital to bring about a peaceable settlement on the basis of the administrative autonomy of the southern provinces under the house of Orange. His father had given him powers to treat, but afterwards threw him over and rejected the terms of accommodation that he had proposed. He withdrew on this to England and resided there for several months. In April 1831 William took the command of a Dutch army for the invasion of Belgium, and in a ten-days' campaign defeated and dispersed the Belgian forces under Leopold I. after a sharp fight near Louvain. He would have entered Brussels in triumph, but his victorious advance was stayed by the intervention of the French. In 1840, on the abdication of his father, he ascended the throne as William II. The peace of 1839 had settled all differences between Holland and Belgium, and the new king found himself confronted with the task of the reorganization of the finances, and the necessity of meeting the popular demand for a revision ot the fundamental law, and the establishment of the electoral franchise on a wider basis. He acted with good sense and moderation, and, although by no means a believer in democratic ideas, he saw the necessity of satisfying public opinion and

frankly gave his support to larger measures of reform. The fundamental law was altered in 1848 and the Dutch monarchy, from being autocratic, became henceforth constitutional. The king's attitude secured for him the good will and affection of a people, loyal by tradition to the house of Orange, and the revolutionary disturbances of 1848 found no echo in Holland. William died suddenly on the 17th of March 1849.

See J. J. Abbink, Leven van Koning WUlem 11. (Amsterdam, '849); J. Bosscha, Het Leven van WUlem den Tweede, Koning der Nederlanden, 1793-1849 (Amsterdam, 1852); P. Blok, Geschiedenis der Nederlandscke Volk (Leiden, 1908). (G. E.)

WILLIAM III. (1817-1890), king of the Netherlands, son of William II., was born at Brussels on the 19th of February 1817. He married in 1839 Sophia, daughter of William I., king of Wiirttemberg. Sophia was an accomplished woman of high intelligence, but unfortunately the relations between the royal pair were far from cordial and finally ended in complete disagree- ment, and the breach between them continued until the death of the queen in 1877. The private life of the king in fact gave rise to much scandal; nevertheless he was an excellent con- stitutional monarch, and, though he never sought to win popular favour, succeeded in winning and retaining in a remark- able degree his people's affectionate loyalty. He had no sym- pathy with political liberalism, but throughout, his long reign of forty-two years, with a constant interchange of ministries and many ministerial crises, he never had a serious conflict with the states-general,

and his ministers could always count upon his fair-mindedness and an earnest desire to help them to further the national welfare. He was economical, and gave up a third of his civil list in order to help forward the task of establishing an equilibrium in the annual budget, and he was always ready from his large private fortune to help forward all schemes for the social or industrial progress of the country. It was largely due to his prudent diplomacy that Holland passed pacifically through the difficult period of the Luxemburg settlement in 1866 and the Franco-German War of 1870.

William III. had two sons by bis marriage with Sophia of Wiirttemberg, William (1841-1879), and Alexander (1843-1884). Both of them died unmarried. The decease of Prince Alexander left the house of Orange without a direct heir male, but the prospect of a disputed succession had fortunately been averted by the marriage of the king in 1879 with the princess Emma of Waldeck-Pyrmont. From this union a daughter, Wilhelmina, was born in 1880. On her father's death at the Loo, on the 23rd of November 1890, she succeeded as queen of the Nether- lands under the regency of her mother.

William was grand duke of Luxemburg by a personal title, and his death severed the dynastic relation between the kingdom of the Netherlands and the grand duchy. The sovereignty of the Luxemburg duchy passed to the next heir male of the house of Nassau, Adolphus, ex-duke of Nassau.

See J. A. Bruijne, Geschiedenis van Nedtrland in onzen tijd. (5 vols., Schiedam, 1889-1906); P. Blok, Geschiedenis der Ncderlandsche Volk (Leiden, 1908), vol. viii.; and G. L. Keppers, De regeeringvan Koning WUlem III. (Groningen, 1887). (G. E.)

WILLIAM (1227-1256), king of the Romans and count of Holland, was the son of Count Floris IV. and his wife Matilda, daughter of Henry, duke of Brabant. He was about six years of age when his father was killed in a tournament, and the fact that his long minority was peaceful and uneventful speaks well for the good government of his two paternal uncles, who were his guardians. William was, however, suddenly in 1247 to become a prominent figure in the great Guelph-Ghibelline struggle, which at that time was disturbing the peace of Europe. The quarrel between the church and the emperor Frederick II. had now reached an acute stage. Pope Innocent IV., who had failed in repeated efforts to induce various princes to accent the dignity of king of the Romans in place of the excommunicated Frederick, found the youthful William of Holland ready to accept the proffered crpwn. After a long siege William succeeded in taking the imperial city of Aix-la-Chapelle, where he was crowned on All Saints' Day 1248. As the recognized head of the Guelph party he spared no

efforts to win for himself friends

in Germany, but he never really succeeded in forming a party ! or gaining for himself a footing in the Empire during the lifetime of Frederick. With the extinction of the Hohenstaufen house in 1254 his chances were much improved, but shortly afterwards his death occurred on the 28th of January 1256 through his horse breaking through the ice during an obscure campaign among the Frisian marshes. William was more successful in his struggles with Margaret, countess of Flanders and Hainaut, known as " Black Meg." She wished her succession to pass to the sons of her second marriage with William of Dampierre in preference to those of his first marriage with Bouchard of Avennes. But John of Avennes, her eldest son, had married William's sister Aleidis. William took up arms in defence of his brother-in-law's rights and Margaret was decisively beaten at West Kappel in 1253, and was compelled to acknowledge John of Avennes as her successor to the county of Hainaut.

See A. IJlrirh. Geschichte des romischen Konigs, Wilhelm von Holland (Hanover, 1882).

WILLIAM I. (d. 1166), king of Sicily, son of King Roger II. by Elvira of Castile, succeeded in 1154. His title " the Bad" seems little merited and expresses the bias of the historian Falcandus and the baronial class against the king and the official class by whom he was guided. It is obvious, however, that William was far inferior in character and energy to his father, and was attached to the semi- Moslem life of his gorgeous palaces of Palermo. The real power in the kingdom was at first exercised by Maio of Bari. a man of low birth, whose title ammiratus ammiratoritm was the highest in the realm. Maio continued Roger's policy of excluding the nobles from the administration, and sought also to curtail the liberties of the towns. The barons, always chafing against the royal power, were encouraged to revolt by Pope Adrian IV., whose recognition William had not yet sought, by the Basileus Manuel and the emperor Frederick II. At the end of n 55 Greek troops recovered Bari and began to besiege Brindisi. William, however, was not devoid of military energy; landing in Italy he destroyed the Greek fleet and army at Brindisi (28th May 1156) and recovered Bari. Adrian came to terms at Bcnevento (18th June 1156), abandoned the rebels and confirmed William as king, and in 1158 peace was made with the Greeks. These diplomatic successes were probably due to Maio; on the other hand, the African dominions were lost to the Almohads (1156-1160), and it is possible that he advised their abandonment in face of the dangers threatening the kingdom down from the north. The policy of the minister led to a general conspiracy, and in

November 1160 he was murdered in Palermo by Matthew Boncllo, leader of the Sicilian nobles. For a while the king was in the hands of the conspirators, who purposed murdering or deposing him, but the people and the army iallied round him ; he recovered power, crushed the Sicilian rebels, had Bonello blinded, and in. a short campaign reduced the rest of the Regno. Thus freed from feudal revolts, William confided the government to men trained in Maio's school, such as the grand notary, Matthew d'Agello. His latter years were peaceful; he was now the champion of the true pope against the emperor, and Alexander III. was installed in the Lateran in November 1 165 bv a guard of Normans. William died on the 7th of May 1 166. (E. Cu.)

WILLIAM II. (d. 1 1 89), king of Sicily, was only thirteen years old at the death of his father William I. when he was placed under the regency oE his mother, Marguerite of Navarre. Until the king came of age in 1171 the government was controlled first by the chancellor Stephen of Ferche, cousin of Marguerite (n66-n68),and then by Walter Ophamil, archbishop of Palermo, and Matthew d'Ajello, the vice-chancellor. William's character is very indistinct. Lacking in military enterprise, secluded and pleasure-loving, he seldom emerged from his palace life at Palermo. Yet his reign is marked by an ambitious foreign policy and a vigorous diplomacy. Champion of the papacy and in secret league wUh the Lombard cities he was able to defy the common enemy, Frederick II. In 1171 and 1175 he made treaties with Genoa and Venice and his marriage in February 1177 with Joan, daughter of Henry II. of England, marks his high position

in European politics. To secure peace with the emperor he sanctioned the marriage of his aunt Constance, daughter of Roger II., with Frederick's son Henry, afterwards the emperor Henry VI., causing a general oath to be taken to her as his successor in case of his death without heirs. This step, fatal to the Norman kingdom, was possibly taken that William might devote himself to foreign conquests. 1

Unable to revive the African dominion, William directed his attack on Egypt, from which Saladin threatened the Latin kingdom of Jerusalem. In July 1174, 50,000 men were landed before Alexandria, but Saladin's arrival forced the Sicilians to re-embark in disorder. A better prospect opened in the confusion in Byzantine affairs which followed the death of Manuel Com- nenus (1180), and William took up the old design and feud against Constantinople. Durazzo was captured (nth June 1185) and in August Thessalonica surrendered to the joint attack of the Sicilian fleet and army. The troops then marched upon the capital, but the troop of the emperor Isaac Angclus overthrew the invaders on the banks of the Strymon (7th Sept. 1185). Thessalonica was at once abandoned and in n 89 William made peace with Isaac, abandoning all the conquests. He was now

planning to induce the crusading armies of the West to pass through his territories, and seemed about to play a leading part in the third Crusade. His admiral Margarito, a naval genius equal to George of Antioch, with 600 vessels kept the eastern Mediterranean open for the Franks, and forced the all -victorious Saladin to retire from before Tripoli in the spring of 11S8. In November 1189 William died, leaving no children. His title of " the Good " is due perhaps less to his character than to the cessation of internal troubles in his reign. The " Voyage " of Ibn-Giobair, a traveller in Sicily in 1183-1185, shows William surrounded by Moslem women and eunuchs, speaking and reading Arabic and living like " a Moslem king." (E. Cu.)

WILLIAM I. [Friedrich Karl] (1781-1864), king of Wiirt- temberg, son of Frederick, afterwards King Frederick L of Wurttemberg, was born at Liiben in Silesia on the 27th of September 1781. In his early days he was debarred from public life owing to a quarrel with his father, whose time-serving deference to Napoleon was distasteful to him. In 1814-1815 he suddenly rose into prominence through the Wars of Liberation against France, in which he commanded an army corps with no little credit to himself. On his accession to the throne of Wurttem- berg in 1816 he realised the expectations formed of him as a liberal-minded ruler by promulgating a constitution (1819), under which serfdom and obsolete class privileges were swept away, and by issuing ordinances which greatly assisted the financial and industrial development and the educational progress of his country. In 1848 he sought to disarm the revolutionary movement by a series of further liberal reforms which removed the restrictions more recently imposed at Metternich's instance by the Germanic diet. But his relations with the legislature, which had from time to time become strained owing to the bureaucratic spirit which he kept alive in the administration, were definitely broken off in consequence of a prolonged conflict on questions of Germanic policy. He cut the knot by repudiating the enactments of 1848-1849 and by summoning a packed parliament (1851), which re-enforced the code of 1819.

The same difficulties which beset William as a constitutional reformer impeded him as a champion of Germanic union. Intent above all on preserving the rights of the Middle. Germanic states against encroachments by Austria and Prussia he lapsed into a policy of mere obstruction. The protests which he made in 1820-1823 against Metternich's policy of making the minor German states subservient to Austria met with less success than they perhaps deserved. In 1849-1850 he made a firm stand against the proposals for a Germanic union propounded in the National Parliament at Frankfort, for fear lest the exaltation of Prussia should eclipse the lesser principalities. Though forced to accede to the proffering of the imperial crown to the king of Prussia, he Joined heartily in Prince

Schwarzenberg's schemes for undoing the work of the National Parliament, and by means of 1 Chalandon, La Domination nvrmande, ii. 389.

the coup d'etat described above forced his country into a policy of alliance with Austria against Prussia. Nevertheless his devotion to the cause of Germanic union is proved by the eager- ness with which he helped the formation of the Zollverein (1828- 1830), and in spite of his conflicts with his chambers he achieved unusual popularity among his subjects. He died on the 25th of June 1864, and was succeeded by his son Charles.

See Nick, Wilhelm /., Komg von Wiirttemberg, und seine Regierung (Stuttgart, 1864) ; P. Stalin, " Konig Wilhelm I. von Wiirttemberg," ZeUschnji jilr altgemeine Geschichte, 1885, pp. 353-367, 417-434.

WILLIAM IV., landgrave of Hesse (1532-1592), was the

son and successor of the landgrave Philip the Magnanimous. He took a leading part in safeguarding the results of the Reforma- tion and was indefatigable in his endeavours to unite the different sections of Protestantism for the sake of effective resistance against the Catholic reaction. His counsels were marred by his reluctance to appeal to arms at the critical moments of action, and by the slcnderness of his own resources, but they deserve attention for their broad common sense and spirit of tolerance. As an administrator of his principality he displayed rare energy, issuing numerous ordinances, appointing expert officials, and in particular establishing the finances on a scientific basis. By a law of primogeniture he secured his land against such testa- mentary divisions as had diminished his own portion of his father's estate. He not only patronized art and science, but continued as ruler the intercourse with scholars which he had cultivated in his youth.

William was a pioneer in astronomical research and perhaps owes his most lasting fame to his discoveries in this branch of study. Most of the mechanical contrivances which made Tycho Brahe's instruments so superior to those of his contemporaries were adopted at Casset about 1584, and from that time the observations made there seem to have been about as accurate as Tycho's; but the re- sulting longitudes were 6′ too great in consequence of the adopted solar parallax of 3'. The principal fruit of the observations was a catalogue of about a thousand stars, the places of which were deter- mined by the methods usually employed in the 16th century, con- necting a fundamental star by means of Venus with the sun, and thus. finding its longitude and latitude, while other stars could at any time be referred to the fundamental star. It should be noticed that clocks,

on which Tycho Brahe depended very little, were used at Cassel for finding the difference of right ascension between Venus and the sun before sunset; Tycho preferred observing the angular distance between the sun and Venus when the latter was visible in the daytime. The Hessian star catalogue was published in Lucius Barettus's Historia coelestis (Augsburg, 1668), and a number of other observations are to be found in Coeli ct siderum in eo errantium observationes Ilassiacae. (Leiden, 1618), edited by Willebrord Snell. R. Wolf, in his " Astronomischc Miuhcilungcn," No. 45 {Viertel-jahrsschrift der naturforschenden Gesellschaft in Zurich, T878), has given a resume of the manuscripts still preserved at Cassel, which throw much light on the methods adopted in the observations and reductions.

WILLIAM (1 533-1 584), surnamed the Silent, prince of Orange and count of Nassau, was born at the castle of Dillenburg in Nassau, on the 25th of April 1533. His grandfather, John, count of Nassau, had left his Netherland possessions to his eider son Henry, his German to his younger son William. This William of Nassau (d. 1559) had by his wife, Juliana of Stolberg, a family of five sons, of whom the subject of this notice was the eldest, and seven daughters. Henry became the trusted friend and counsellor of Charles V., and married (1 515) Claude, sister of Philibert, prince of Orange. Philibert, having no issue, made Rene, the son of Henry and Claude, his heir. Rene, at the age of twenty-six, was killed at the siege of St Dizier in 1544, and left his titles and great possessions by will to his cousin William, who thus became prince of Orange. William's parents were Lutherans, but the emperor insisted that the boy-successor to Rene's heritage should be brought up in his court at Brussels, as a Catholic. The remembrance of his ancestors' services and his own high qualities endeared William to Charles, who secured for him, at the age of seventeen, the hand of Anne of Egmont, heiress of the count of Buren. Anne died in 1558, leaving issue a son Philip William, prince of Orange and count of Buren, and a daughter. It was on the shoulder of the young prince of Orange that Charles V. leant when, in 1555. in the presence of a great assembly at Brussels, he abdicated, in favour of his

son Philip, the sovereignty of the Netherlands. William was also selected to carry the insignia of the empire to Ferdinand, king of the Romans, when Charles resigned the imperial crown. He had, at the age of twenty-one, been placed by the emperor, before his abdication, at the head of an army of 20,000 men in the war with France, and he continued to fill that post under Philip in 1556, but without, distinction. His services, as a diplomatist, were much more brilliant. He was one of the three plenipotentiaries who negotiated the treaty of Cateau-Cambresis (1559), and was largely responsible for bringing about a settle- ment so favourable to Spanish interests. After the conclusion of the peace, the prince spent some time at the French court, in the capacity of a state hostage for the

carrying out. of the treaty. It was during his sojourn in France that William by his discreetness acquired the soubriquet of le Tavilurne (the Silent), which has ever since clung to his name. The appellation is in no way expressive of the character of the man, who was fond of conversation, most eloquent in speech, and a master of persuasion. His two great adversaries of the decade, which followed the peace of Cateau-Cambresis, were in 1559 closely associated with him; Granvelle as a plenipotentiary, Alva as a fellow-hostage.

Up to this time the life of Orange had been marked by lavish display and extravagance. As a grand seigneur in one of the most splendid of courts, he surrounded himself with a retinue of gay young noblemen and dependents, kept open house in his magni- ficent Nassau palace at Brussels, and indulged in every kind of pleasure and dissipation. The revenue of his vast estales was not sufficient to prevent him being crippled by debt. But after his return from France, a change began to come over Orange. Philip made him councillor of state, knight of the Golden Fleece, and stadtholder of Holland, Zeeland and Utrecht; but there was a latent antagonism between the natures of the two men which speedily developed into relations of coolness and then of distrust. The harshness with which the stern laws against heretics were carried out, the presence of Spanish troops, the filling up of ministerial offices by Spaniards and other foreigners had, even before the departure of Philip for Spain (August 1559), stirred the most influential Netherland noblemen — foremost among them the prince of Orange, and the counts of Egmont and Hoorn — to a policy of constitutional opposition. With the advent of Margaret of Parma the situation became more serious. All state business was carried out by the Consulla: all power virtually placed in the hands of Cardinal Granvelle; the edicts against heretics enforced with the utmost severity; the number of bishoprics increased from three to fourteen (see Nether- lands). As a protest, Orange, Egmont and Hoorn withdrew from the council of state, and wrote to the king setting forth their grievances. At this time Orange was still nominally a Catholic, but his marriage in August 1561 with Anne, daughter and heiress of the elector Maurice of Saxony, with Lutheran rites, at Dresden, was significant of what was to come. It marked the beginning of that gradual change in his religious opinions, which was to lead William through Luthcranism to that moderate Calvinism which he professed after 1573. Of the sincerity of the man during this period of transformation there can be little doubt. Policy possibly played its part in dictating the particular moments at which the changes of faith were acknowledged. No student of the prince's voluminous corre- spondence can fail, however, to see that he was a deeply religious man. The charges of insincerity brought against him by his enemies arise from the fact that in an age of bigotry and fanati- cism the statesmanlike breadth and tolerance of William's treatment

or religious questions, and his aversion to persecution for matters of opinion, were misunderstood. His point of view was in advance of that of his time.

In the spring of 1564 the constitutional opposition of the great nobles to the policy of the king appeared to be successful. Granvelle was withdrawn, the Consulta abolished, and Orange, Egmont and Hoorn took their seats once more on the Council. They speedily found, however, that things did not mend. Granvelle had gone, but the royal policy was unchanged. In

August 1564 Philip issued an order for carrying out the decrees : of the Council of Trent, and for the strict execution of the placards against heretics. Protests, letters, personal missions were in vain, the king's will was not to be moved from its purpose. The spirit of resistance spread first to the lesser nobles, then to the people. Tn the memorable year 1566 came " the Com- promise," " the Request," the banquet at the Hotel Culemburg with its cries of " Vivent les Gueux " followed by the wild iconoclastic riots and outrages by bodies of fanatical Protestant sectaries at Antwerp and elsewhere. The effect of this last outbreak was disastrous. Philip was tilled with anger and vowed vengeance. The national leaders drew back, afraid to identify themselves with revolutionary movements, or the cause of extreme Protestantism. Egmont was a good Catholic, and took active steps to suppress disorder, and Orange himself at the request of the regent betook himself to Antwerp, where the citizens in arms were on the point of engaging in civil strife. At the risk of his life the prince succeeded in bringing about an accord, and as he proclaimed its terms to a sullen and half-hostile crowd he uttered for the last time the words, " Long live the King!" It was his final act of loyal service to a sovereign, who from secret emissaries that he kept at Madrid, he knew to be plotting the destruction of himself and his friends. In vain he endeavoured to rouse Egmont to a sense of his danger, and to induce hirn and other prominent leaders to take steps, if necessary by armed resistance, to avert their doom. Finding all his efforts fruitless William, after resigning all his posts, left the country (22nd of April 1567), and took up his residence with his family at the ancestral home of the Nassaus at Dillenburg.

At that very time Alva was quitting Madrid for his terrible mission of vengeance in the Netherlands (sec Alva). The story of the Council of Blood and of the executions of Egmont and Hoorn is told elsewhere. The prince of Orange was out of reach of the tyrant's arm, but by an act of imprudence he had left his eldest son, Philip William, count of Buren, studying at the

university of Lou vain. He was seized (February 1568) and carried off to Spain, to be brought up as an enemy to the political and religious principles of his father. He himself was outlawed, and his property confiscated. In March he published a lengthy defence of his conduct, entitled "Justification of the Prince of Orange against his Calumniators," and meanwhile strained every nerve to enlist an armed force for the invasion of the Netherlands. To raise money his brother, John of Nassau, pledged his estates, William himself sold his plate and jewels. An attack was made in three directions, but with disastrous results. The force under Louis of Nassau indeed gained a victory at Heiligerlee in Friesland (May 23rd), but met with a crushing defeat at the hands of Adva in person (July 21st) at Jemmingen. All seemed lost, but William's indomitable spirit did not despair. " With God's help," he wrote to his brother Louis, " I am determined to go on." In September he himself crossed the Meuse at the head of 18,000 infantry and 7000 cavalry. But Alva, while clinging to his steps, refused to fight, and William, through lack of funds, was compelled to disband his mercenaries, and withdraw over the French frontier (November 17th).

Then followed the most miserable period of Orange's life. In fear of assassination, in fear of creditors, he wandered about from place to place, and his misfortunes were aggravated by the bad conduct of his wife, Anne of Saxony, who left him. She was finally, on the ground of insanity, placed in close confinement by her own family, and remained incarcerated until her death six years later. During the years 1569-1572 the brothers William and Louis, the one in Germany, the other in France, were, however, actively preparing for a renewal of the struggle for the freedom of the Netherlands. The barbarities of Alva had caused Spanish rule to be universally hated, and the agents of the Nassaus .vere busy in the provinces rousing the spirit of resistance and trying to raise funds. In 1569 eighteen vessels provided with letters of marque from the prince of Orange were preying upon Spanish commerce in the narrow seas. Stimulated by the hope of plunder their number rapidly grew, until the wild and fierce corsairs — named " Beggars of the sea ;; (Gueux.de mer) —

became a terror to their enemies. The refusal of Queen Elizabeth in 1572 tc allow the Beggars to refit in English harbours led to

the first success of the patriot cause. On the isf. of April a force under the command of Lumbrcs and Tresling, being compelled to take refuge in the Maas, seized the town of Brill by surprise. Encouraged by their success they likewise took by assault the important sea-port of Flushing. Like wildfire the revolt spread through Holland, Zeeland, Utrecht and Friesland, and the principal towns, one after the other, submitted themselves to the authority of the prince of Orange as their lawful stadtholdcr. Louis of Nassau immediately afterwards dashed with a small force from t ranee into Hainault, and captured Valenciennes and Mons. In Moiis, however, Louis was blockaded by a superior Spanish force, and eventually forced to surrender. William crossed the Rhine with 20,000 men to relieve him, but he was out-gencralled by Alva, nearly lost his life during a night attack on his camp at Harmignies (September irth), and retired into Holland. Delft became henceforth his home, and he cast in his lot for good and all with the brave Hollanders and Zee- landers in their struggle for freedom, "being resolved," as he wrote to his brother John, " to maintain the affair there as long as possible and decided to find there my grave." It was his spirit, that, animated the desperate resistance that was offered to the Spanish arms at Haarlem and Alkmaar, and it was through his personal and unremitting exertions that, despite an attack of fever which kept him to his bed, the relief of Leiden, on the 3rd of October 1574, was effected just as the town had been reduced to the last extremity.

In order to identify himself more closely with the cause for which he was fighting, Orange had, on October 23rd, 1573, made a public profession of

the Calvinist religion. But he was never a bigot in religious matters. The three conditions which he laid down as the irreducible minimum on which negotiations could be based, and from which he never departed, were: (1) freedom of worship and liberty to preach the Gospel according to the word of God; (2) the restoration and maintenance of all the ancient charters, privileges and liberties of the land; (3} the withdrawal of all Spaniards and other foreigners from all posts and employments, civil and military. On these points he was inflexible, but he was a thoroughly moderate man. He hated religious tyranny whether it were exercised by Papist or Calvinist, and his political aims were not self-seeking. His object was to prevent the liberties of the Netherlands from being trampled underfoot by a foreign despotism, and he did not counsel the provinces to abjure their allegiance to Philip, until he found the Spanish monarch was intractable. But when the abjuration became a necessity he sought to find in Elizabeth of England or the duke of Anjou, a sovereign possessing sufficient resources to protect the land from the Spaniard.

William (24th of June 1575) took as his third wife, Charlotte de Bourbon, daughter of the duke of Montpensier. This marriage gave great offence to the Catholic party, for Charlotte was a renegade nun, having been abbess of Jouarre, and Anne of Saxony was still alive. In April t 576, an act. of Union between Holland and Zeeland was agreed upon and signed at Delft, by which supreme authority was conferred upon the prince, as ad interim ruler. In this year (1576} the outrages of the Spanish troops in the southern Netherlands, who had mutinied for want of pay, caused a revulsion of feeling. The horrors of the " Spanish Fury " at Antwerp (November 4th) led to a definite treaty being concluded, known as the Pacification of Ghent, by which under the leadership of the prince of Orange, the whole seventeen provinces bound themselves together to drive the foreigners out of thˆ country. This was supplemented by the Union of Brussels (January 1577) by which the Southerners pledged themselves to expel the Spaniards, but to maintain the Catholic religion and the king's authority. To these conditions William willingly assented; he desired to force no man's con- science, and as yet he professed to be acting as st ad t holder under the king's commission. On September 23rd he entered Brussels in triumph as the acknowledged leader of the whole I Deaole of the Netherlands, Catholic as well as Protestant, in

their resistance to foreign oppression. At this moment he touched the zenith of his career. It was, however, but a short- lived position of eminence. After the entry into Brussels followed the period of tangled intrigue during which

the archduke Matthias, the duke of Anjou, the palatine count John Casimir and Don John of Austria were all striving to secure for themselves a position of supremacy in the land. William had to steer a difficult course amidst shoals and quicksands, and never did his biilliant talents as diplomatist and statesman shine more brightly. But after the sudden death of Don John he found himself face to face with an opponent of abilities equal to his own in Lbe person of Alexander Farncse, prince of Parma, appointed governor general by Philip. Farnese skilfully fomented the jealousy of the Catholic nobles of the south — the Malcontents — against the prince of Orange, and the Pacification of Ghent was henceforth doomed. The Walloon provinces bound themselves together in a defensive league, known as the league of Arras (5th of January 1579) and by the exertions of John of Nassau (at that time governor of Gclderland) Holland, Zeeland, Utrecht, Gelderland and Zulph.cn replied by signing (29th of January) the compact known as the Union of Utrecht. William still struggled to keep the larger federation together, but in vain. The die was now cast, and the Northern and Southern Nether- lands from this time forward had separate histories.

On the 25th of March 1581 a ban was promulgated by King Philip against the prince of Orange, in which William was de- nounced as a traitor and enemy of the human race, and a reward of 25,000 crowns in gold or land with a patent of nobility was offered to any one who should deliver the world of this pest- William replied in a lengthy document, the Apology, in which he defended himself from the accusations brought against him, and on his part charged the Spanish king with a series of misdeeds and crimes. The Apology is valuable for the biographical details which it contains. William now felt that his struggle with Philip was a war a outrance, and knowing that the United Pro- vinces were too weak to resist the Spanish armies unaided, he endeavoured to secure the powerful aid of France, by making the duke of Anjou sovereign of the Netherlands. Holland and Zeeland were averse to this project, and to conciliate their prejudices Orange, provisionally, and after some demur, accepted from those provinces the offer of the countship (24th of July 1 581). Two days later the representatives of Brabant, Flanders, Utrecht, Gelderland, Holland and Zeeland assembled at The Hague, solemnly abjured the sovereignty of Philip, and agreed to accept the French duke as their sovereign in his place. Anjou was solemnly inaugurated by the prince in person at Antwerp, as duke of Brabant, on the 19th of February 1582. While at Antwerp an attempt was made upon William's life (March 18th) by a Biscayan youth, named Juan Jaureguy. Professing to offer a petition he fired a pistol at the prince's head, the ball passing in at the right ear and out by the left jaw. After hanging for some time between life and death, William ultimately recovered and was able to attend a thanksgiving service on the 2nd of May.

The shock and anxiety proved, however, fatal to his wife, Char- lotte de Bourbon. She expired on the 5th of May after a very short illness.

The French sovereign soon made himself impossible to his new subjects, and the hopes that William had based upon Anjou were sorely disappointed. The duke was dissatisfied with his position, aimed at being an absolute ruler, and tried to carry his ambitious ideas into effect by the treacherous attack on Antweip, which bears the name of the " French Fury." Its failure rendered Anjou at once ridiculous and detested, and his shameless mis- conduct brought no small share of opprobrium on William him- self. The trusty Hollanders and Zeelanders remained, however, staunchly loyal to him, and Orange now fixed his residence permanently in their midst. On the 7th of April 1583 he married in fourth wedlock Louise de Coligny, daughter of the famous Huguenot leader, and widow of the Seigneur de Teligny. With her, " Father William," as he was affectionately styled, settled at the Prinsenhof at Delft, and lived like a plain, homely Dutch burgher, quietly and unostentatiously, as became a man who had

spent his all in his country's cause, and whose resources were now of the most modest description.

Ever since the promulgation of the ban and the offer of a reward upon his life, religion and political fanaticism had been continually compassing his assassination, and the free access which the prince ga.ve to his person offered facilities for such a purpose, despite the careful watch and ward kept over him by the burghers of Delft and his own household. He was shot dead by a Burgundian, Balthazar Gerard, on the 9th of July 1584, as he was leaving his dining hall. Gerard was moved by devoted loyalty to his faith and king, and endured the torments of a barbarous death with supreme courage and resignation. William was buried with great pomp at the public charges in the Neuwe Kerk at Delft amidst the tears of a mourning people.

William the Silent was tall and well formed, of a dark com- plexion, with brown hair and eyes. He was the foremost states man of his time, capable of forming wise and far-reaching plans and of modifying them to suit the changing circumstances in which it was necessary to put them in execution. In moments of difficulty he displayed splendid resource and courage, and he had a will of iron, which misfortunes were never able to bend or break. To rescue the Netherlands from the tyrannical power of Spain, he sacrificed a great position, vast wealth and eventu- ally his life. He had the satisfaction, however, of knowing before he died that the cause for which he had endured so much and striven so hard had survived many dangers, and had acquired strength to offer successful resistance to the overwhelming power of King Philip. He was the real founder of the

independ- ence and greatness of the Dutch republic.

He left a large number of children. By Anne of Egmonf. he had a son Philip William, who was kidnapped from Louvain (1567) and educated at Madrid, and a daughter. By Anne of Saxony, a son Maurice (see Maurice of Nassau, prince of Orange) and two daughters. By Charlotte de Bourbon, six daughters. By Louise de Coligny, one son, Frederick Henry (see Frederick Henry, prince of Orange).

See Genhard, Correspondence de Guillaume le Taciiurne ; Groen von Prinsterer, Archives ou correspondance inedile de la maison d'Orangt-Nassau; Commelin, Wilhelm en Mauri's van Nassau, prinsen van Orangien, haer leven en bedrijf; Meursius, Gulidmus Auriacus; Putnam, William the Silent, Prince of Orange, the Moderate Man of the Sixteenth Century, Harrison, William the Silent', Vorsterman van Oyen, Het Vorstenhuis Orange-Nassau; Delaborde, Charlotte de Bourbon, princesse d Orange', Delaborde, Louise de, Coligny, prince.sse d'Orange; Blok, Geschiedenis van het Nederlandsche Volk, vol. ii. ; R. Fruin, Het voorspel van den tachtigjatigen oorlog; Motley, Rise of the Dutch Republic; Cambridge Modem History, vol. in. cc vi., vii. (G. E.)*

WILLIAM II. (1626-1650), prince of Orange, born at The Hague on the 27th of May 1626, was the son of Frederick Henry, prince of Orange, and his wife Amalia von Solms, and grandson of William the Silent. By the act of survivance passed in 163 1 the offices and dignities held by Frederick Henry were made hereditary in his family. On the 12th of May 1641 William married, in the royal chapel at Whitehall, Mary, princess royal of England, eldest daughter of King Charles I. At the time of the wedding the bridegroom was not yet fifteen years old, the bride was five years younger. William from his early youth accompanied his father in his campaigns, and already in 1643 highly distinguished himself in a brilliant cavalry fight at Burgcrhout (September 5). On the death of Frederick Henry William succeeded him, not only in the family honours and possessions, but in accordance with the terms of the act of survivance in all his official posts, as stadtholder of Holland, Zeeland, Utrecht, Gelderland, Overyssel and Groningen and captain-general and admiral-general cf the Union. At the moment of his accession to power the negotiations for a separate treaty of peace with Spain were almost concluded, and peace was actually signed at Miinstcr on the .30th of January 1648. By this treaty Spain recognized the independence of the United Netherlands and made large concessions to the Dutch. William, who had always been bitterly opposed to the policy of abandoning the French alliance in order to gain better terms from Spain, did his utmost to prevent the ratification, but matters were too far

advanced for his interposition to prevail in the face of the deter- mination of the states of Holland to conclude a peace so advan- tageous to their trade interests. William, however, speedily opened secret negotiations with France in the hope of securing the armed assistance of that power for the carrying out of his ambitious projects of a war of aggrandisement against the Spanish Netherlands and of a restoration of his brother-in-law, Charles II., to the throne of England. The states of Holland, on the other hand, were determined to thwart any attempts for a renewal of war. and insisted, in defiance of the authority of the captain- general supported by the states-general, in virtue of their claim to be a sovereign province, in disbanding a large part of the regiments in their pay. A prolonged controversy arose, which ended in the states-general in June 1650 commissioning the prince of Orange to visit the towns of Holland and secure a recognition of their authority. The mission was unsuccessful. Amsterdam refused any hearing at all. William resolved therefore to use force and crush resistance. On the 30th ot July six leading members of the states of Holland were seized and imprisoned in the castle of Loevestein. On the same day an attempt was made to occupy Amsterdam with troops. The citizens were, however, warned in time, and the gates closed. William's triumph was nevertheless complete. Cowed by the bold seizure of their leaders, the states of Holland submitted. The prince had now obtained that position of supremacy in the republic at which he had been aiming, and could count on the support, alike of the states-general and of the provincial states for his policy. He lost no lime in entering into fresh negotiations with the French government, and a draft treaty was already early in October drawn up in Paris and the Count d'Estrades was commissioned to deliver it in person to the prince of Orange. It was, however, never to reach his hands. William had, on the 8th of October, after his victory was assured, gone to his hunting seat at Dieren. Here on the 27th he became ill and returned to The Hague. The complaint proved to be small-pox, and on the 6th of November he died. William was one of the ablest of a race rich in great men, and had he lived he would probably have left his mark upon history. A week after his death his widow gave birth to a son. who was one day to become William III., king of England. ' (G. E.)

WILLIAM THE BRETON (c. 1160-c. 1225), French chronicler and poet, was as bis name indicates born in Brittany. He was educated at Mantes and at the university of Paris, afterwards becoming chaplain to the French king Philip Augustus, who employed him on diplomatic errands, and entrusted him with the education of his natural son, Pierre Chariot. William is supposed to have been present at the battle of Bouvines. His works are the Pkilippide and the Gesta Philippi II. regis Fran- coram. The former, a poem three versions of which were written by the author, gives some very interesting details about Philip Augustus and his time, including

some information about military matters and shows that William was an excellent Latin scholar. In its final form the Gesta is an abbreviation of the work of Rigord (q.v.), who wrote a life of Philip Augustus from 1170 to 1206, and a continuation by William himself from 1207 to 1220. In both works William speaks in very laudatory terms of the king; but his writings are valuable because he had personal knowledge of many of the facts which he relates. He also wrote a poem Karlotis, dedicated to Pierre Chariot, which is lost.

William's works have been edited with introduction by H. F. Delaborde as CEuvrer, de Rigord et de Guillaume le Breton (Paris, 1882-1885). and have been translated into French by Guizot in Collection des memoires relattfs d. Vhistoire de. France, tomes xi. and xii. (Paris, 1823-1835). See Delaborde's introduction, and A. Molinier, Les Sources de Vhistoire de France, tome iii. (Paris, 1903).

WILLIAM THE CLITO (1101-1128) was the son of Robert, duke of Normandy, by his marriage with Sibylla of Conversano. After his father's defeat and capture by Henry I. of England at the battle of Tinchebrai (1106) the young William fell into the hands of the conqueror. Henry magnanimously placed his nephew in the custody of Helias of Saint Saens, who had married a natural daughter of Duke Robert. Fearing for the safety

of the boy, Helias carried him, in 1111, to the court of Louis VI. of France. That sovereign joined with the discontented Norman barons and others of Henry's enemies in recognizing William as the rightful claimant to the duchy; Robert, a prisoner whom there was no hope of releasing, they appear to have regarded as dead in the eye of the law. William's claims furnished the pretext for two Norman rebellions. The first which lasted from 1112 to 1 1 20 was abetted by Louis, by Fulk V. of Anjou and by Baldwin VII. of Flanders. In the second, which broke out during n 23, Henry I. had merely to encounter the forces of his own Norman subjects; his diplomatic skill had been successfully employed to paralyse the ill-will of other enemies. In 1122 or 1123 William married Sibylle, daughter of Fulk of Anjou, and with her received the county of Maine; but Henry I. prevailed upon the Curia to annul this union, as being within the forbidden degrees. In 1127, however, the pretender obtained from Louis the hand of Johanna of Montferrat, half-sister of the French queen, and the vacant fief of Flanders. His own rigorous government or the intrigues of Henry I. raised up against William a host of rebels; a rival claimant to Flanders appeared in the person of Thierry or Dirk of Alsace. In besieging Alost, one of the strongholds of the rival party, William received a wound which mortified and proved fatal (July 28, 1128). He left no issue; although Duke Robert survived him and only died in 1134, the power of Henry I. was thenceforth undisputed by the Normans.

See Ordericus Vitalis, Hist, ecdesiaslica, and Sir James Ramsay's Foundations of England, vol. ii. (1898).

WILLIAM OF MALMESBURY (,;. to8o~c. 1143), English historian of the 12th century, was born about the year 10S0, in the south country. He had French as well as English blood in his veins, but he appears to have spent his whole life in England, and the best years of it as a monk at Malmesbury. His tastes were literary, and the earliest fact which he records of his career is that he assisted Abbot Godfrey (1081-1105). m collecting a library for the use of the community. The education which he received at Malmesbury included a smattering of logic and physics; but moral philosophy and history, especially the latter, were the subjects to which he devoted most attention. Later he made for himself a collection of the histories of foreign countries, from reading which he conceived an ambition to produce a popular account of English history, modelled on the great work of Bede. In fulfilment of this idea, William produced about 1 1 20 the first edition of his Gesta regum, which at once gave him a reputation. It was followed by the first edition of the Gesta pontijicum (1125). Subsequently the author turned aside to write on theological subjects. A second edition of the Gesta regum (1127) was dedicated to Earl Robert of Gloucester, whose literary tastes made him an appreciative patron. William also formed an acquaintance with Bishop Roger of Salisbury, who had a castle at Malmesbury. It may have been due to these friends that, he was offered the abbacy of Malmesbury in 1140. But he preferred to remain a simple bibliolhecarius. His one public appearance was made at the council of Winchester (1141). in which the clergy declared for the empress Matilda. About this date he undertook to write the Historia novella, giving an account of events since 1125. This work breaks off abruptly at the end of ir42. with an unfulfilled promise that it will be continued. Presumably William died before he could redeem his pledge.

He is the best English historian of his time. The master of a good Latin style, he shows literary instincts which are, for bis time, remarkably sound. But his contempt for the annalistic form makes him at times careless in his chronology and arbitrary in his method of arranging his material; he not infrequently flies off at a tangent to relate stories wˆhich have little or no connexion with the main narrative; his critical faculty is too often allowed to lie dormant. His researches were by no means profound; he gives us less of the history of his own time than we have a right to expect— far less, for example, than Orderic. He is, however, an authority of considerable value from 1066 onwards; many telling anecdotes, many shrewd judgments on persons and events, can be gleaned from his pages.

WILLIAM OF NANGIS— WILLIAM OF ST CALAIS

*who made use of the Chronicon. This work from 1113 to 1300, with continuations to 1368, has been edited by H. Geraud for the Societe de Vhistoire de France (Paris, 1843), and practically all William's writings are found in tome xx. of Dom Bouquet's Recueil des historians des Gaules el de la France (Paris, 1*738-1876). A French translation of the Chronicon is in tome xiii. of Guizot's Collection des memoires relatifs a Vhistoire de France (Paris, 1823-1S35).*

See A. Potthast, Biblicthe.ca historica (Berlin, 1896) ; and A. Molinier, Les Sources de Vhistoire de France, tome iii. (Paris, 1903;.

WILLIAM OF NEWBURGH (d. c. 1198), or, as he is sometimes styled, Guillclmus Parvus, English ecclesiastic and chronicler, was a canon of the Augustinian priory of Newburgh in the North Riding of Yorkshire. He was born about 1136, and lived at Ncwburgh from bis boyhood. Shortly before 1196 he began bis Historia rerum Anglicarum. This work, divided into five books, covers the period 1066-1198. A great part of it is derived from known sources, especially from Henry of Huntingdon, Jordan Fantosme, the Itinerarium regis Ricardi. or its French original, and a lost account, by Anselm the chaplain, of the captivity of Richard I. The value of Newburgh's work lies in his estimates of men and situations. Except for the years 1154-1173 and the reign of Richard he records few facts which cannot be found elsewhere; and in matters of detail he is prone to inaccuracy. But his political insight and his impartiality entitle him to a high place among the historians of the 12th century.

See the editions of the Historia by H. C. Hamilton (2 vols., London, 1856) and by R. Howtett in Chronicles of the Reigns of Stephen, &c. (" Rolls " series, 1884-1885), vols. i. and ii. In the latter edition a continuation, the Annates Furnesienses (1 190-1298), composed by a monk of Furness Abbey, Lancashire, is also given. See also Sir T. D. Hardy's Descriptive Catalogue (" Rolls " series, 1865), ii. p. 512; and II. E. Salter in the English Historical Review, vol. xxii. (1907).

(II. W.C. D.)

WILLIAM OF POITIERS (c. 1020-c. iogo), Norman chronicler, was born at Preaux, near Pont Audemer, and belonged to an influential Norman family. After serving as a soldier he studied at Poitiers, and then returning to Normandy became chaplain to Duke William (William the Conqueror) and archdeacon of Lisieux. He wrote an eulogistic life of the duke, the earlier and concluding parts of which are lost; and Ordericus Vitalis, who gives a short biography of him in his Historia cedes iastica, says that he also wrote verses. William's Gcsta Gnilclmi II. duels ■N ormannoYum , the extant part of which covers the period between 1047 and 1068, is valuable

for details of the Conqueror's life, although untrustworthy with regard to affairs in England. According to Freeman, " the work is disfigured by his constant spirit of violent partisanship." It was written between 1071 and 1077, and was used by Ordericus Vitalis.

The Gesta was first published by A. Duchesne in the Historiae Normamiorum scriptores (Paris, 1619); and it is also found in the Scriptores rerum gestarum Willelmi Conquestoris of ■ J. A. Giles (London, 1845). There is a French translation in tome xxix. of Guizot's Collection des memoires relatifs a Vhistoire de France (Paris, 1826). See G. Kdrting, Wilhelms von Poitiers Gesta Guilelm-i ducis (Dresden, 1875) ; and A. Molinier, Les Sources de Vhistoire de France, tome iii. (Paris, 1903).

WILLIAM OF ST CALAIS (Carilef) (d. 1096), bishop of Durham and chief counsellor of William Rufus, was a Norman monk and prior of St Calais in Maine, who received the see of Durham from the Conqueror (1081). In Durham annals he is honourably remembered as the prelate who designed the existing cathedral, and also for his reform of ecclesiastical discipline. His political career is less creditable. Honoured with the special confidence of William Rufus he deserted his patron's cause at the first sign of rebellion, and joined with Odo of Bayeux in urging Duke Robert of Normandy to claim the crown (1088). After the collapse of this plot William was put upon his trial before the Great Council. He claimed the right to be judged by his fellow-bishops alone; this claim being rejected he appealed to the see of Rome. This was the first case of an appeal to the pope from an English tribunal which had occurred since the 7th century. Rufus and Lanfranc did not venture to dispute the right of appeal, but contended that the bishop, as a royal vassal, could not appeal against the forfeiture of his temporalities. These were confiscated, and William left the kingdom, but no more was heard of his appeal, and in 1091 he regained the royal

Printed Works. — The Gesta regum covers, in its final form, the years 449-1127. But the later recensions add little, beyond fulsome dedications to Earl Robert, to the edition of 1120. The sources used are not always easy to trace. But for the pre-Conquest period William had at his disposal the works of Bede, Ado of Vienne and William of Jumiegcs; one or mure English chronicles similar to the extant " Worcester " and " Peterborough " texts; Asser's life of Alfred, and a metrical biography of /Ethelstan; the chronicles of S. Riquier and Fontanellc ; a collection of tales relating to the reign of the emperor Henry III.; and the lives of various saints. For the life of William 1. he draws on William of Poitiers; for the first crusade he mainly follows Fulcher of Chartres; his knowledge of Ansclm's primacy comes mainly from Eadmer; and at least up to 1 100, he makes use of an

English chronicle. The fifth and last book, dealing with the reign of Henry I., is chiefly remarkable for its de- sultoriness and an obvious desire to make the best case for that monarch, whose treatment of Anselm he prudently ascribes to Robert of Meulan (d. ruS). Both in this work and in the Gesta pontificum the later recensions are remarkable for the omission of certain passages which might give offence to those in high places. The deleted sentences usually relate to eminent persons; they some- times repeat scandal, sometimes give the author's own opinion. The Gcsta pontificum gives accounts of the several English sees and their bishops, from the beginning to about 1120; the later recensions continue the work, in part, to 1140. Many saints of the south and midlands are also noticed. This work, like the Gesta regum. contains five books; the fifth relates the life and miracles of St Aldhelm of Malmesbury, and is based upon the biography by Abbot Faricius; it is less useful than books i.-iv., which are of the greatest value to the ecclesiastical historian. The Historia novella is annalistic in form. It was projected soon alter the battle of Lincoln, as an apology for the supporters of the empress. The author embarks on special pleading in favour of Earl Robert and Bishop Roger cf Salisbury, but shows a certain liking for the personal character of Stephen, whose case he states with studious fairness.

The historical works of William of Malmesbury were edited by Savile in his Scriptores post Bed-am (London, 1506); but the text of that edition is full of errors. Sir T. D. Hardy edited the Gesta regttm and Historia novella for the English Historical Society in 1840, and put the criticism of the manuscripts on a sound basis. But the standard edition of these works is that of W. Stubbs in the " Rolls " series (l vol., in 2. 1887— 1889); the second part of this edition contains a valuable introduction on the sources and value of the chronicler. The Gesta pontificum has been edited for the " Rolls " series by N. G. S. A. Hamilton (London, 1870) from a manuscript which he was the first to identify as the archetype. Another work, De antiquitate Glastoniensis ecdesiae (a.d. 63-1126), is printed in Gale's Scriptores XV. (Oxford, 1601). Wharton in the second volume of his Anglia sacra (London, 1691) gives considerable portions of a life of Wulfstan which is an amplified translation of an Anglo- Saxon biography. Finally Stubbs in his Memorials of St Dunstan (" Rolls " scries, London, 1874) prints a Vita S. Dunstani which was written about 1126.

Unprinted Extant Works. — Among these are Miracles of the Virgin ; Liber super explanationem lamentationum Yeremiae prophetae; an abridgment of Amalarius' De divinis offtciis; De diclts et factis memorabilibits philosophorum; an epitome of the Historia of Hay mo of Fleury and some other works, historical and legal (autograph in the Bodleian) ; Lives of the English Saints. The MSS. of these works are to be found partly in the British Museum, partly in the Bodleian.

Lost Works. — A Vita Sancti Patricii and Miracula Sancti Benigni are mentioned in the prologue to the book on Glastonbury; a metrical life of St .Elfgyfu is quoted in the Gesta pontificum; Chronica Iribus libellis are mentioned in the prologue to the Historia novella, and a fragment of them is apparently preserved in the Brit. Mus. Lansdowne MS. 436. Leland gives extracts from an Itine- rarium Johannis abbatis, describing the journey of Abbot John to Rome in 1 140 (Leland, Collectanea, iii. 272). (H. W. C. D.)

WILLIAM OF NANGIS (d. 1300), French chronicler, was a monk in the abbey of St Denis. About 1285 he was placed in charge of the abbey library as castas cartarum, and he died in June or July 1300. Having doubtless done some work on the Latin manuscripts on which the Grandes Ckroniques de France are based, William wrote a long Chronicon, dealing with the history of the world from the creation until 1300. For the period before 1113 this work merely repeats that of Sigebert of Gembloux and others; but after this date it contains some new and valuable matter.

William's other writings are: Gesta Ludovici IX.; Gesta Philippi III., sive Audacis; Chronicon abbreviatum regum Francorum; and a French translation of the same work written for the laity. Making use of the large store of manuscripts at St Denis, William was a com- piler rather than an author, and with the exception of the latter part of the Chronicon-his writings do not add materially to our know- ledge of the time. Both his chronicles, however, became very popular and found several continuators, Jean de Joinville being among those

favour and his see. Thenceforward he showed the utmost subservience. He managed the king's case against Anselm, and at Rockingham (1005) actually claimed the right of appeal, when it was claimed by the archbishop. Notwithstanding his zeal for the royal interests, William was soon afterwards disgraced. He died in January 1006.

See E. A. Freeman, William Rufus (1882), and Symeon of Durham, vol. i. pp. 170-195 (Rolls ed,).

WILLIAM (c. 1130-c. 1 190), archbishop of Tyre and chronicler, belonged to a noble French family and was probably born in. Palestine about r 1 30. This, however, is only an inference from his works, borne out by the fact that he had seen Ralph, the patriarch of Antioch, who died about 1141; that he seems to call himself a contemporary historian from the accession

of Baldwin III. to the throne of Jerusalem, an event which he places in November 1142; and that he remembered the fall of Edessa in 1144. Unfortunately the chapter (xix. 12) which relates to his early life has been excised or omitted from every extant manuscript of his Historia, and this remark holds good, not only for the original Latin, but also for the French translation of the 13th century. William was still pursuing his studies in Europe when Amalric I. became king of Jerusalem in 1162, but he returned to Palestine towards the close of 1166, or early in 1167, and was appointed archdeacon of Tyre at the request of Amalric in August 1 167. In 1 168 he was sent on an embassy, the forerunner of several others, to the emperor Manuel I. at Constantinople, and in 1 160, at the time of the disastrous campaign against Damietta, he was obliged to take refuge in Rome from the " unmerited anger ' ' of his archbishop. But he was soon in Palestine again, and about]T7o he was appointed tutor to Amalric's son, Baldwin, afterwards King Baldwin IV. Towards the end of 11 74, soon after Baldwin's accession to the throne, he was made chancellor of the kingdom of Jerusalem, an office which he held until 1183, and less than a year later (May 1175) he was consecrated arch- bishop of Tyre. He was one of those who went to negotiate with Philip I., count of Flanders, in 1177, and in 1179 he was one of the bishops who represented the Latin Church of the East at the Lateran council in Rome. On his return to Palestine he stayed seven months at Constantinople with Manuel. This is William's last appearance in history, but he was writing his history in nSi, and this breaks off abruptly at the end of 1183 or early in 1 1 84. He died probably between 1187 and 1190. About fifty years later one of his continuators accused Heraclius, the patriarch of Jerusalem, of procuring his death by poison at Rome, but this story appears to be legendary. Equally untrustworthy is the theory which identifies William with the archbishop of Tyre sent to Europe to preach a new crusade in 1188. It is true that Matthew Paris speaks of the English king, Henry II., as receiving the cross from the hands of Wilklnius episcopus Tyrensis; but more contemporary writers omit the Christian name, while others write it Josce or Joscius.

If not the greatest, William of Tyre is at least among the greatest, of medieval historians. His Historia return in partibus transmarinis ges'aru?n, or Historia Hierosoiymitana or Belli sacri historia covers the period between 1095 and 11 84, and is the main authority for the history of the Latin kingdom of Jerusalem between 1127, where Fu Ichor of Chartres leaves off, and 1183 or 1 184, where Ernoul takes up the narrative. It was translated into French in the 13th century, or possibly before the end of the 12th, and this translation, known as the Chroniqiw d'outremer, or Livre d'Eracles or Livre du conquest, is quoted by Jean de Joinville, and increased by various continuations, is the standard account of the exploits

of the French warriors in the East. William's work consists of twenty-two books and a fragment of another book ; it extends from the preaching of the first crusade by Peter the Hermit and Pope Urban II. to the end of 1183 or the heginning of 1184. It was undertaken at the request of Amalric, who was himself a lover of history and who supplied the author with Arabic manuscripts, and William says of it, " in this work we have had no guide, whether Greek or Arab, but have had recourse to traditions only, save as regards a few things that we ourselves have seen." The " traditions " here referred to must be taken to include the Gesta Francorumai Tudebode, the writings of Fulcher of Chartres, of Baudry of Bourgueil and, above all, of Albert of Aix. From the beginning to about 1144 the Historia is taken from these writers; from 1 144 to the end it is contemporary and original.

William also wrote Historia de orienlalibus principibus. This work, which is now unfortunately lost, was partly based upon the

Arabic chronicle of a certain Said-ibn-Batrik (d. 940), patriarch of Alexandria.

No medieval writer, except perhaps Giraldus Cambrensis, possesses William's power of delineating the physical and mental features of his heroes. Very few, moreover, had his instinctive insight into what would be of real value to future ages; genealogy, topography, archaeology, social life, both political and ecclesiastical, and military and naval matters all find due exposition in his pages. It is hardly too much to say that from his work alone a fairly detailed map of the Levant, as it was in the 12th century, might be constructed; and it is impossible to praise too highly the scrupulous fidelity with which he defines nearly all the technical terms, whefcer relating to land or sea, which he uses. His chief fault is in his chronology, where, indeed, he is often at discord with himself. In the later books of the Historia his information, even regarding events taking place beyond the Nile or the Euphrates as well as in Europe, is singularly exact.

His powers of industry were exceptionally great, and although a man of much learning and almost certainly acquainted with Greek and Arabic, he is as ready to enliven his pages with a homely proverb as he is to embellish them with quotations from Cicero, Virgil, Ovid or Plato. A prelate of pious character, he was inclined to see the judgment of God on the iniquities of his fellow-countrymen in every disaster that overtook them and in every success which attended the arms of the Saracens.

As Belli sacri historia the Historia rerum was first published in 1549 at Basel. More recent editions are in J. P. Migne's Patrologia Latina, tome ccL, and In the " Recueil des historiens des croisades," Hist, occid.i- (Paris, 1844). Manuscripts are in the British Museum, London,. and in Corpus

Christi College, Cambridge. It has been translated into German by E. and R. Kausler (Stuttgart, 184S); into French in Guizot's Collection des mfrtnoires, tomes xvi., xviiL (Paris, 1824); into Italian and into Spanish. An English translation has been made for the Early English Text Society by M. N. Colvin (London, 1893). See the Hisioirelittcraire de la France, tome xiv. (1869); B. Kugler, Studien zur Geschichte des zweiien Kreuzzuges (Stuttgart, 1866); H. Prutz, Studien iiber Wilhehn von Tyrus (Hanover, 1883); and H. von Sybel, Geschichte des ersten Kreuzzuges (Leipzig, 1S81).

WILLIAM OF VALENCE (d. 1296), brother of Henry III. of England, was a son 'of John's widow, Isabelle of Angouleme, by her second marriage. William came to England with his brothers in 1247, and at once became a court favourite. He married Joan de Munchensi, the heiress to the Pembroke estates, whence he is som stimes styled carl of Pembroke. In 1258 he was attacked by the baronial opposition and forced to leave England. He returned in 1261, after Henry III. had repudiated the Provisions of Oxford, and fought on the royal side at Lewes (1264). Escaping from the pursuit of the victorious Montfortians, he later appeared at the head of a small army in Pembrokeshire. This gave the signal for the outbreak of a new civil war which ended with the defeat of Montfort at Evesham (1265). Valence accompanied Prince Edward to the Holy Land and, in later years, became a trusted agent of the crown, especially in the Welsh wars. The position of his estates made him the natural leader of all expeditions undertaken against Llewelyn from South Wales. He was also employed in Aquitaine. He died at Bayonne in 1296. Despite his oriipn he had become, in course of time, a respected leader of the baronage; and as a military commander rose high above the average level.

See K. Pauli's Geschichte von England, vol. iii. (Hamburg, 1853); W. H. Blaauw, Barons' War (1871J.

WILLIAM OF WYKEKAM (1323-1404), English lord chan- cellor and bishop of Winchester. William de Wykham, as he is called in earlier, William Wykeham in later life, has been variously guessed to be the son of a freedman carpenter, and an illegitimate son of Queen Isabella and Roger Mortimer {Notes and Queries, 10th s. i. 222). In sober truth (Life by Robert Heete in Keg. Winch. Coll. c. 1430) he was born at Wickham, Hants, in 1323 or 1324, son of John, whose name was probably Wykeham, but nicknamed Long, who was " endowed with the freedom of his ancestors," and " according to seme " had a brother called Henry Aas. His mother Sibyl was " of gentle birth," a daughter cf William Eowate and granddaughter of William Stratton of Stratton, Hants. His education at Win- chester, no doubt in the Great Grammar school or High school in Minster Street, was paid for by some patron unnamed by the biographer,

perhaps Sir Ralph Sutton, who is named first by Wykeham among his benefactors to be prayed for by his colleges. That he was, as stated by Archdeacon Thomas Martin, the

author of a Life of Wykeham, published in 15Q7, taught classics, French and geometry by a learned Frenchman on the site of Winchester College, is a guess due to Wykeham's extant letters being in French and to the assumption that he was an architect. After some unspecified secular employment, Wykeham became " under-notary (vice tabellio) to a certain squire, constable of Winchester Castle," probably Robert of Popham, sheriff of Hampshire, appointed constable on the 25th of April 1340, not as commonly asserted Sir John Scures, the lord of Wykeham, who was not a squire but a knight, and had held the office from 1321, though, from Scures being named as second of his bene- factors, Wykeham perhaps owed thisappointmenttohis influence. " Two or three years afterwards, namely after he was twenty," Wykeham " was transferred to the king's court," i.e. c, 1343. Wykeham has been credited (Gent, Mag. lxxxv. 189) with the living of Irstcad, Norfolk, of the king's gift on the 12th of July 1349. But apart from the fact that this Wykeham is described in the grant as (< chaplain," the probate of his will on the Sth of March 1376-1377 (Norwich Reg. Hcydon, f. 139) shows that he ■was a different person (H. Chitty in Notes and Queries, 10th ser. iv. 130). Our Wykeham first appears in the public records in 1350 as keeper of the manor of Rochford, Hants, during the minority of the heir, William Botreaux.

On the 12th of October 1352 Henry Sturmy of Elvetham, sheriff and escheator of Hants, and frequently a justice in eyre for the forests of Hants and Wilts, at Winchester, describes William of Wykeham as " my clerk " in a power of attorney dated at Winchester, to deliver seisin of lands in Meonstoke Ferrand, Hants, which he had sold to William of Edyndon, bishop of Winchester (Win. Coll. Lib. H. 249). On the 10th of November (not December as Lowth, Life of Wykeham, 14) Edyndon, by a letter dated at London, appointed William of Wykeham, clerk (not " my clerk " as Kirby, Archaeol. 57, ii. 292, where the deed is also misdated 1353), his attorney to take seisin of lands in Meonstoke Tour, Hants, which he had bought from Alice de Roche, daughter of William of Tour (ibid. f. 250). These lands were afterwards bought by Wykeham and given to Winchester College. On the 14th of April 1353 (Claus. 29 E. III. m. 29 d) Wykeham served as attorney of John of Foxle, of Bramshill, Hants, son of Thomas of Foxle, constable of Windsor Castle, in acknowledging payment of a debt due from John of Pall on, sheriff of Somerset and of Hants. On the 15th of

April 1356 schedules touching the New Forest and other forests in Hants and Wilts were delivered out of the Tower of London to William of Wykeham to take to the justices in eyre (Claus. 30 F". III. m. 19 d). In the same year on the 24th of August Peter- atte-Wode and William of Wykeham, clerk, were appointed keepers of the rolls and writs in the eyre for the forests of Hants and Wilts, of which Henry Sturmy was one of the justices. On the roth of May 1356 Wykeham first appears in the direct employment of the king, being appointed clerk of the king's works in the manors of Henley and Yeshampsted (Easthamp- stead) to pay all outgoings and expenses, including wages of masons and carpenters and other workmen, the purchase of stone, timber and other materials, and their carriage, under the view of one controller in Henley and two in Easthampstead. On the 8th of June Walter Nut hirst and Wykeham were made com- missioners to keep the statute of labourers and servants in the liberty of the Free Chapel (St George's), Windsor. On the 30th of October 1356 Wykeham was appointed during pleasure sur- veyor (supervisor) of the king's works in the castle of Windsor, for the same purposes as at Henley, with power to take workmen everywhere, except in the fee of the church or those employed in the king's works at Westminster, the Tower of Dartford, at the same wages as Robert of Bernham, probably Burnham, Bucks, who had been appointed in 1353, used to have, viz. is. a day and 3s. a week for his clerk. He was to do this under supervision of Richard of Teynton, John le Peyntour (the painter) and another. From this appointment it has been inferred that Wykeham was the architect of the " Round Table " at Windsor, which has been confused with the Round Tower, and a story which is first told by Archbishop Parker, writing thirty years

afterwards (Antiq. Brit. Eccles. ed. 1729, p. 385), relates that Wykeham nearly got into trouble for inscribing on it, u This made Wickam," which he only escaped by explaining that it did not mean that Wykeham made the tower, but that the tower was the making of Wykeham. But W T ykeham had nothing to do with building either the Round Tower or the Round Table. The Round Tower, called the High Tower in Wykeham 's day, is the Norman Keep. It was being refitted for apartments for the king and queen a little before Wykeham 's time, and his first accounts include the last items for its internal decoration, including 28 stained glass windows. The Round Table, a building 200 ft. in diameter for the knights of the Round Table, who preceded the knights of the Garter, had been built in 1344 (Chron. Angl. " Rolls " ser. No. 61, p. 17) when Wykeham had nothing to do with Windsor. The inscription, " This made Wykeham," did exist on a small square tower in the Middle Bailey formerly known as Wykeham Tower, now entirely rebuilt, with the inscription recopied and known as Winchester Tower. But it could hardly be of sufficient importance to cause Wykeham

to play the sphinx, and the story is apparently due to the Eliza- bethan love of quips. All that was built during the five years, 1356 to 1361, when Wykeham was clerk of the works, were the new royal apartments, two long halls and some chambers in the upper ward, quite unconnected with and east of the 'Round Tower, and a gateway or two leading to them, the order for building which was given on the 1st of August 1351 (Pipe Roll 30 Ed. III.). The accounts of Robert of Bernham, Wykeham's predecessor, who was a canon of St George's Chapel (Le Neve's Fasti, Hi. 378), are extant, and from the payments of is. a day to Mr John Sponle, mason and ordcrer or setter-out (ordinator) of the king's works, and Geoffrey of Carlton " appareller " of the carpentry work, it is clear that they, and not Bernham, were the architects and builders. Canon Bernham was only the paymaster and overlooker to see that men and materials were provided and to pay for them. While in 1353-1354 £1440 and in 1355-1356 £747 was expended under the supervision of Robert of Bernham, in 1357-1358 £867 was spent by Wykeham, including Winchester Tower. In 1358-1359 the expenditure rose to £1254, while between the 6th of June 1360 and the 12th of April 1361 it amounted to £2817. The chief items were a new Great Gate with two flanking towers, a belfry for St George's Chapel and houses in the Lower Bailey, probably for the canons, and in the Upper Bailey, probably for the royal household. On the 1st of November 1361 Wykeham was succeeded as clerk of the works by William of Mulsho, another canon of Windsor, who afterwards succeeded him also as dean of St Martin-le-Grand. Under Wykeham, William of Wynford, who appears in. 13.60 as "appareller" under Sponle, in 1361 became chief mason and ordinator, and he was probably what we should call the architect of the Great Gate, the rest of which was built under Wykeham's supervision. For wherever we find Wykeham building afterwards, we find Wynford as chief mason. When Wykeham was provost of Wells, Wynford was retained as architect on the 1st of February 1364-1365 at a fee of 40s. a year and 6d. a day when in Wells (Wells, Lib. Abb. f. 253). He was architect to Abingdon Abbey (at a fee of £3, 6s. 8d. and a furred robe) in 1375-1376 when the existing Outer Gate of the abbey w r as built (Abingdon Obed. Ace. Camd. Soc, 1892). lie was chief mason for Wykeham's works at Winchester Cathedral and for Winchester College, where his portrait may be seen in the east window of the chapel, and where his contract with the clerk of the works, an ex-scholar of the college, for the building of the outer gate, is still preserved.

The ascription to Wykeham of the invention of the Perpen- dicular style of medieval architecture is now an abandoned theory. In so far as he gave vogue to that style the credit must be given to William of Wynford, not to William of Wyke- ham. At all events he had very little to do with building Windsor Castle. How far he really was responsible for the other great castle

attributed to him, that of Queenborough Castle in the Isle of Sheppey, cannot be tested, as the building accounts for it are only parLially extant. The account from the 1st of

November 1361 to 1362 shows Simon of Bradstede, clerk of the works, then expending £1773, of which £100 was received by the hands of William of Wykeham at the exchequer, and that from 1369 shows Bernard Cokles, clerk of the works, expending £2306. The chief evidence cited in support of the theory that Wykeham owed his advancement to his skill as an architect is the remark in a tract Why Poor Priests have no benefices that " Lords will not present a clerk able of cunning of God's law and good life and holy ensample . . . but a kitchen clerk or a fancy clerk or wise in building castles or worldly doing, though he cannot well read his psalter." This tract has been attributed to WycliiTe, but without adequate authority, and it is thought to be of later date, and if Wykeham is meant by the castle- building clerk it only shows that popular repute is no guide to fact. That Wykeham, who was clearly an extremely good man of business, should, when clerk of the works, have played a considerable part in determining what works should be done and the general character of the buildings with which he was con- nected, we may believe; but to think that this attorney and notary, this keeper of the king's dogs (20th Aug. 1356, Devon's Issues of the Exchequer, 163) and of the king's forests, this carrier of rolls and paymaster at the exchequer, was also the architect of Windsor and Queenborough Castles, of Winchester Cathedral and College, is to credit Wykeham with a superhuman combina- tion of knowledge, of training and of functions.

That he gave great satisfaction to the king when once he was appointed surveyor at Windsor in 1356 is unquestionable. He is first called king's clerk on the 14th of November 1357, when he was given is. a day, beyond the wages he was already receiving for his offices at Windsor and elsewhere, " until peacefully advanced to some benefice. " Ecclesiastical benefices were the chief means by which, before the Reformation, the civil servants of the crown were paid for services which, being clerical, were also ecclesiastical, and for which the settled stipends were wholly inadequate. In his accumulation of benefices Wykeham seems to have distanced all his predecessors and successors, except perhaps John Maunsell, the chancellor of Henry III., and Thomas Wolscy, the chancellor of Henry VIH., the latter being a pluralist not in canonries and livings but in bishoprics.

Wykcham's first benefice was the rectory of Pulham, the richest in Norfolk,

worth £53 a year, or some £1600 of our money, to which he was presented on the 30th of November 1357. But this was not a " peaceful " advancement, for it was only in the king's patronage by reason of the temporalities of the see of Ely having been seized into the king's hands the year before, on account of the bishop being implicated in certain murders and robberies, which he denied, contesting the king's action in the papal court. On the 16th of April 1350 the king gave Wykeham a pension of £20 a year from the exchequer until he could obtain peaceful possession of Pulham. On this, and what may have been a similarly contested presentation to the canonry and prebend of Flixton in Lichfield cathedral on the 1st of March t$$q, repeated on the 22nd of August 1360, and supported by a mandate to the new bishop on the 29th of January 1361, Wykeham's latest biographer (George Herbert Moberly, Life of Wykeham, 1887, 2nd ed., 1893) has built an elaborate story of Wykeham's advancement being opposed by the pope because he was the leader of a national party against papal authority in England, The baselessness of this is clear when we find that Wykeham had obtained from Innocent VI., on the 27th of January 1357, an indulgence to choose his own confessor (Cal. Pap. Keg.), and on the 8th of July 1358 (Cal. Pap. Pet. i. 331) asked and obtained a papal provision to this very church of Pulham on the ground that it had passed to the pope's patronage by the promotion of its former possessor to the see of London. In spile of papal and royal authority, it is doubtful whether Wykeham obtained peaceful possession of Pulham till again presented to it by the king on the 10th of July 1361 after the bishop of Ely's death. The difficulty as to the prebend of Flixto-n was no doubt something of the same kind. Between bishop, pope and king the next vacant prebend in every great church was generally promised two or three deep before it was

vacant, and the episcopal and chapter registers are full of the contests which ensued.

Wykeham's civil offices rapidly increased. On the Ides (15th) of March J350 a French fleet sacked Winchelsea, carrying off the women and girls. On the 10th of July 1359 Wykeham was made chief keeper and surveyor, not only of Windsor, but of the castles of Dover, Baclley and Leeds (Kent), and of the manors of Foliejohn, Eton, Guildford, Kennington, Sheen (now Richmond), Eltham and Langly and their parks, with power to repair them and to pay for workmen and materials. On the 20th of February 1360, when another French invasion was feared, the bailiff of Sandwich was ordered to send all the lead he had to Wykeham for the works at Dover. In April the sheriffs of four batches of counties were each ordered to send forty masons to Wykeham at Windsor This secular activity was rewarded by presentation to the deanery of St Martin-le- Grand, with an order for induction on the 21st of May, on which day he was commissioned to

inquire by a jury of men of Kent into the defects of the walls and tower of Dover (Pat. 34 E. HI. pt. i. m. 12). On the 15th of August he was directed to hand over £40 given him for the purpose, to a successor, the treaty of Breligny having been made meanwhile and confirmed at Calais with Wykeham as one of the witnesses on the 24th of October. In January 1361 building work at Windsor was vigorously resumed, and again the sheriffs were ordered to contribute their quotas of 40 freestone masons and 40 cementarii to Wykeham's charge. On the 13th of February, on the joint petition of the kings of England and of France, the pope " provided " Wyke- ham to a canonry and dignity at Lincoln, notwithstanding his deanery and a prebend at Llandaff. On the 2nd of April four com- missioners were appointed to superintend the construction of the new castle ordered in the Isle of Sheppey, which when finished was called Queenborough, the purchases and payments, not the works, being under the beloved clerk, Wykeham. In this year came the second visitation of the Black Death, the Second Plague, as it was called, and carried off four bishops and several magnates, with many clerics, whose vacated preferments were poured on Wykeham. The bishop of Hereford being dead, on the 12th of July 1361, the king presented Wykeham to a prebend in Hereford cathedral, and on the 24th of July to one in Bromyard collegiate church; the bishop of St David's being dead, prebends in the collegiate churches of Abcrgwilly and Llandewybrewi were given him on the 16th of July. On the nth of August the pope, on the king's request, provided him with a prebend in St Andrew's Auckland collegiate church. This Mr Moberly curiously misrepresents as action against Wykeham. He in fact never obtained possession of it, probably because the pope had already " provided " it to Robert of Stretton, a papal chaplain, who, however, asked in January 1362 for a canonry at Lincoln instead, because he was " in fear and terror of a certain William of Wykeham. 3 ' On the 24th of September 1361 the king gave Wykeham a prebend in Beverley Minster, on the 1st of October the prebend of Oxgate in St Paul's (which he exchanged for Tattenhall on the 10th of December), on the 22nd of November a prebend in St David's cathedral, on the 20th of December a prebend in Wherwell Abbey, Hants. So far the Patent Rolls. The Salisbury records show him also admitted to a prebend there on. the 16th of August, which he exchanged for other prebends on the 9th and 15th of October. All these clerical preferments Wykeham held when he was a simple clerk, who had no doubt undergone the " first tonsure," but was not even ordained an acolyte till the 5th of December of this golden year. He added to his civil offices during the year that of clerk (ojficium cirograjfie) of the exchequer on the 24th of October. On the 9th of October he acted as attorney to the king in the purchase of the manor of Thunderley, Essex. Next year, 1362, he entered holy orders, being ordained subdeacon on the 12th of March and priest on the 12th of June,- and adding to his canonries and prebends one in

Shaftesbury Abbey on the 1 5th of July and another in Lincoln cathedral :on the 20th of August. Wykeham meanwhile was acting as keeper of the forests south of Trent and as a trustee for Juliana,

countess of Huntingdon. Next year, 1363, he was made a canon of the collegiate church in Hastings Castle on the 3rd of February, and of the royal chapel of St Stephen's, Westminster, then newly founded, or re-founded, on the 21st of April He obtained the archdeaconry of Northampton on the 26th of April, and resigned it on the 12th of June, having been promoted to that of Lincoln, the richest of all his preferments, on the 23rd of May. On the 31st of October he was made a canon of York, and on the 15th of December provost of the fourteen prebends of Combe in Wells cathedral, while at some date unknown he obtained also prebends in Bridgenorth collegiate church and St Patrick's, Dublin, and the rectory of Menheniot in Cornwall. On the 5th of May 1364 he became privy seal, and in June is addressed by the new pope ; Urban V., as king's secretary. On the 14th of March 1365 he was given 20s. a day from the exchequer " notwithstanding that he is living in the household." He was so much the king's factotum that Froissart (i. 249) says " a priest called Sir William de Wican reigned in England … by him everything was done and without him they did nothing." In fact, as privy seal he was practically prime minister, as Thomas Cromwell, was after- wards to Henry VIII. On the 7th of October 1366, William Edingdon, the treasurer of England and bishop of Winchester, died; on the 13th of October Wykeham was recommended by the king to the chapter of monks of St Swithun's cathedral priory and elected bishop.

A long story has been made out of Pope Urban V.'s delay in the recognition of Wykeham, which has been conjectured to have been because of his nationalist proclivities. But little more than the ordinary delays took place. On the 1st of December the king, " for a large sum of money paid down," gave Wykeham, not only the custody of the temporalities of the see, but all the profits from the day of Edingdon's death. On the nth the pope granted him the administration of the spiritu- alities. The papal court was then moving from Avignon to Rome, and on the 14th of July 1367 the bull of " provision " issued at Viterbo. Wykeham was in no hurry himself, as it was not till the 10th of October 1367 that he was consecrated, nor till the 9th of July 1368, after the war parliament which met on the 3rd of June had been dissolved on the roth of June, that he was enthroned. Meanwhile he had been made chancellor on the 17th of September 1367 — thus at the age of forty-three he held the richest ecclesiastical, and the best-paid civil,

office ir. the kingdom at the same time. The war in France was disastrous, how far through Wykeham's fault we have no means of knowing. When parliament again met in 1371, the blame was laid on the clerical ministers, under the iniiuence of WyciifTe. He had been born in the same year as Wykeham, and like him had profited by papal provisions to prebends in 1361, but had since led an attack on papal and clerical abuses. Parliament demanded that laymen only should be chancellor, treasurer, privy seal and chamberlain of the exchequer. On the 8th of March 1.372 Wykeham resigned the chancellorship, and Bishop Brantingham of Exeter the treasurership, and laymen were appointed in their places, though Sir Robert Thorp, who became chancellor, was master of Pembroke Hall at Cambridge, and as much a cleric as Wykeham had been when he was dean of St Martin-le-Grand and surveyor of Windsor Castle.

As soon as he became bishop Wykeham had begun his career as founder. In 1367 (Pat. 41 E. III. pt. 2, m. 5) he purchased the estates of Sir John of Boarhunt, near South wick, with which he endowed a chantry in Southwick Priory for his parents. Next year he began buying lands in Upsomborne, Hants, which he gave to Winchester College, and in Oxford, which he gave to New College. On the 1st of September 1373 he entered into an agreement (Episc. Reg. iii. 98) with Master Richard of Herton " gramaticus " for ten years faithfully to teach and instruct the poor scholars, whom the bishop maintained at his own cost, in the art of grammar, and to provide an usher to help him. Mean- while the war with France was even more unsuccessful uiider the lay ministry and John of Gaunt. In the parliament of 1373 Wykeham was named by the Commons as one of the eight peers to treat with them on the state of the realm. In the parliament

which met on the 12th of February 1.376, Lord Latimer and Alice Ferrers, the king's mistress, a lady of good birth, and not (as the mendacious St Albans chronicler alleged) the ugly but persuasive daughter of a tiler, were impeached, and Wykeham took a leading part, against Latimer, even to the exlcnt of opposing his being allowed counsel. At the dissolution of parliament a council of nine, of whom Wykeham was one, was appointed to assist the king. But on the 8th of June the. Black Prince died. Alice Perrers returned. John of Gaunt called a council on the 16th of October to impeach Wykeham on articles which alleged misapplication of the revenues, oppressive lines on the leaders of the free companies, taking bribes for the release of the royal French prisoners, especially of the duke of Bourbon, who helped to make him bishop, failing to send relief to Ponthieu and making illegal profits by buying up crown debts cheap. He was condemned on one only, that of halving a fine of £80 paid by Sir John Grey of Rotherfield for licence to alienate lands, and tampering with the rolls of chancery to conceal the transac- tion. Wykeham's answer was that he had reduced the fine because it was too large, and that he had received

nothing for doing so. Skipwith, a judge of the common pleas, cited a statute under which for any erasure in the rolls to the deceit of the king 100 marks fine was imposed for every penny, and so Wykeham owed 960,000 marks. Wykeham was convicted, and on the 17th of November his revenues were seized and bestowed on" the 15th of March 1377 on the young prince Richard, and he was ordered not to come within 20 m. of the king. He " brake up household . . . sending also to Oxford, whear upon almose and for God's sake he found 70 scollers, that they should depart to their frendis for he could no longer help or finde them " (Chron. Angliae, Ixxx.). But when convocation met in 1377 the bishops refused to proceed to business without Wykeham, and he was fetched back from Waverley Abbey. He was exempted, however, from the general pardon issued on the occasion of Edward IIl.'s jubilee. But on the 13th of June the prince restored his tempor- alities, on condition of his maintaining three galleys with 50 men-at-arms and 50 archers for three months, or providing the wages of 300 men. The St Albans monk says that this was obtained by a bribe to Alice Perrers. Meonstoke Perrers, part of the endowment of Winchester College, was certainly bought on the 1 2th of June 1380 from Sir William Windsor, her husband, whose name seems to be derived from Windsor, near Southampton water. As Hampshire people they may have helped Wykeham. But as Wykeham was of the party of the Black Prince and his widow Joan of Kent, no dea ex machina was needed.

On the 21st of June 1377 Edward III. died. Wykeham was present at the coronation of Richard II. on the 19th of July, and on the 31st of July full pardons were granted him under the privy seal, which at the request of Richard's first parliament were ratified under the great seal on the 4th of December 1377. Wyke- ham at once took an active part in the financial affairs of the new king, giving security for his debts and himself lending 500 marks, afterwards secured on the customs (Pat. 4 Rich. II. pt. i. m, 4). He then set to work to buy endowments for Winchester and New Colleges. On the 30th of June he obtained licence in mortmain and on the 26th of November issued his charter of foundation of " Seynt Marie College of Wynchestrc in Oxenford " for a warden and 70 scholars to study theology, canon and civil law and arts, who were temporarily housed in various old halls. On the 5th of March 1380 the first stone was laid of the present buildings, which were entered on by the college on the 14th of April 1386. The foundation of Winchester was begun with a bull of Pope Urban VI. on the 1st of June 137S, enabling Wykeham to found " a certain college he proposed to establish for 70 poor scholars, clerks, who should live college-wise and study in gram- maticals near the city of Winchester," and appropriate to it Downton rectory, one of the richest livings belonging to his bishopric. The bull says that the bishop " had, as he asserts, for several years administered the necessaries of life to scholars studying grammar in

the same city." On the 6th of October 13S2 the crown licence in mortmain was issued, on the ioth-i3th

of October the site was conveyed, and on the 20th of October 13S2 " Sancte Marie collegium" or in vulgar tongue " Seinte Marie College of Wynchestre by Wynchestre " was founded for a warden and " 70 pore and needy scholars studying and. becoming proficient in grammatical or the art and science of grammar." The first stone of the buildings was laid on the 26th of March 1388, and they were entered on by the scholars on the 28th of March 1394, not, as supposed at the quincentenary celebration in 1S03, in 1393. While the new buildings were being erected, the college remained in the parish of " St John the Baptist on the Kill " of St Giles, supplying scholars to New College then as since. A reference to this in a letter of Wykeham's of the 8th of April 1388 has given rise to the creation of an imaginary college of St John the Baptist at Winchester by the Rev. W. Hunt {Die. JVaL Biog. sub. " Chichcley "). The foundation was on the model of Mert.on and Queen's colleges at Oxford, to which grammar schools were attached by their founders, while fellows of Morton were the first wardens of both of Wykeham's colleges. Both were double the size of Merton, and the same size as the Navarre college of the queen of France and Navarre, founded at Paris in 1304, which also contained a school. But each of Wykeham's colleges contained as many members as the French queen's. The severance of the school which was to feed the college exclusively, placing it not at Oxford, but at Winchester, and constituting it a separate college, was a new departure of great importance in the history of education. Ten fellows and 16 choristers were added in 1394 to the 70 scholars, the choristers attending the school like the scholars, and being generally, during the first three centuries of the foundation, promoted to be scholars. The original statutes have not come down to us. Those which governed the colleges until 1857 were made in 1400. They state that the colleges were provided to repair the ravages caused by the Black Deaths in the ranks of the clergy, and for the benefit of those whose parents could not without help main- tain them at the universities, and the names of the boys ap- pointed by Wykeham and in his time show that " poor and indigent " meant the younger sons of the gentry, and the sons of yeomen, citizens of Winchester or London, and the middle classes generally, who needed the help of exhibitions.

The time which elapsed between the foundation and com- pletion of the colleges may be attributed to Wykeham's pre- occupation with politics in the disturbed state of affairs, due to the papal schism begun in 1370, in

which England adhered to Urban VI. and France to Clement VII., to the rising of the Commons in 138T, and the wars with France, Scotland and Spain during John of Gaunt's ascendancy. Then followed the constitutional revolution of the lords appellant in T388. When Richard II. took power on himself, on the 3rd of May 1389, he at once made Wykeham chancellor, with Brantingham of Exeter again as treasurer. Wykeham's business capacity is shown perhaps by the first record of the minutes of the privy council being kept during his term of office, and his promulgation in 1300 of general orders as to its business. At least one occasion is recorded in the minutes on which Wykeham, on behalf of the council, took a firm stand against Richard II. and that in spite of the king's leaving the council in a rage. Peace was made with France in August. On the meeting of parliament in January 1390 Wykeham resigned the great seal; and asked for an inquiry into the conduct of the privy council, and on being assured that all was well resumed it. He now showed that he had not by his charities wronged his relations by settling on his great- nephew and heir Thomas Wykeham, whom he had educated at Winchester and New College, Broughton Castle and estates, still held by his descendants in the female line, the family of Twisletoii-Wykcham-Ficnnes {peerage of Saye and Sele). In July 1391 he obtained a papal bull enabling him to appoint at pleasure coadjutors to do his episcopal business.

On the 27th of September 1391, Wykeham finally resigned the chancellorship. For three years after there are no minutes of the Council. On the 24th of November 1394 Wykeham lent the king the sum of £1000 (some £30,000 of our money), which same sum or another £1000 he promised on the 21st of February 1395

to repay by midsummer, and did so (Pat. 18, Rich. II. pt. ii. m. 23, 41). The murder of the duke of Gloucester, Richard's uncle, in 1397, was followed next year by the assumption of absolute power by Richard. Wykeham was clearly against these proceedings. He excused himself from convocation in 1397, and from the subservient parliament at Shrewsbury in 1398. The extraordinary comings and goings of strangers to Winchester College, just opposite the gates of the bishop's palace at Wolvcsey in 1399, suggest that he took part in the revolution of Henry IV. He appeared in the privy council four times at the beginning of Henry's reign (Proc. P.C. i. 100). On the 23rd of July 1400 he lent Henry IV. £500 for his journey towards Scotland, and in 1402 another £500, while a general loan for the war with France and Scotland on the 1st of April 1403 was headed by Wykeham

with £1000, the bishop of Durham lending . 1000 marks (£666, 13s. 4d.). and no one else more than £500. Meanwhile on the 29th of September 1394 he had begun the recasting of the nave of the cathedral with William

Wynford. the architect of the college, as chief mason, and Simon Membury, an old Wyke- hamist, as clerk of the works. On the 24th of July 1403, he made his will, giving large bequests amounting to some £10,000 (£300,000 of our money), to friends and relations and every kind of religious house. On the 16th of August 1404, he signed an agreement with the prior and convent for three monks to sing daily three masses in his beautiful chantry chapel in the nave of the cathedral, while the boys of the almonry, the cathedral choir-boys, were to say their evening prayers there for his soul. He died on the 27th of September 1.-104, aged eighty.

His effigy in the cathedral chantry and a bust on the groining of the muniment tower at Winchester college are no doubt authentic portraits. The pictures at Winchester and New College are late 16th-century productions. Three autograph letters of his, all in French, and of the years 1364-1366, are preserved, one at the British Museum, one at the Record Office, a third at New College, Oxford. A fourth letter imputed to Wykeham at the British Museum is shown alike by its contents and its handwriting not to be his.

See Thomas Martin, Wilhelmi Wicami (1597); K. Lowth, Life of Wykeham (1736); Mackenzie E. C. Walcott, William of Wyke- ham and his Colleges (1852); T. F. Kirby, Annals of Winchester College (1892) ; G. H. Moberly, Life of Wykeham (1S87) ;' A. F. Leach, History of Winchester College (1899); and the Calendars of Patent and Close Rolls. Edward III. and Richard IT. (A. F. L.)

WILLIAMS, JOHN (1582-1650), English archbishop and lord keeper, son of Edmund Williams of Conway, a Welsh gentleman of property, was born in March 15S2 and educated at St John's College, Cambridge. He was ordained about 1605, and in 1610 he preached before King James I., whose favour he quickly gained by his love of compromise. The result was the rapid promotion of Williams in the church; he obtained several livings besides prebends at Hereford, Lincoln and Peterborough. In i6r7 he became chaplain to the king, in 1610. dean of Salisbury, and in the following year dean of Westminster. On the fall of Bacon in 1621 Williams, who had meantime ingratiated himself with the duke of Buckingham, was appointed lord keeper, and was at the same time made bishop of Lincoln, retaining also the deanery of Westminster. An a political adviser of the king

Williams consistently counselled moderation and compromise between the unqualified assertion of the royal prerogative and the puritan views of

popular liberties which were now coming to the front. He warned Buckingham and Prince Charles of the perils of their project for the Spanish marriage, and after their return from Madrid he encountered their resentment by opposing war with Spain. The lord keeper's counsel of moderation was less pleasing to Charles I. than it had been to his father. The new king was offended by Williams's advice to proceed with caution in dealing with the parliament, with the result that within a few months of Charles's accession the Great Seal was taken from Williams. In the quarrel between the king and the Commons over the petition of right, Williams took the popular side in condemning arbitrary imprisonment by the sovereign. In the matter of ecclesiastical administration he similarly followed a middle course; but He had now to contend against the growing influence of Laud and the extreme high church party. A case was preferred against him in the Star Chamber of revealing state secrets, to which was added in 1635 a charge of subornation of perjury, of which he had undoubtedly been guilty and for which he was condemned in 1637 to pay a fine of £io,ooo, to be deprived of the temporalities of all his benefices, and to be imprisoned during the king's pleasure. He was sent to the Tower. In 1639 he was again condemned by the Star Chamber for libelling Laud, a further heavy fine being imposed for this offence. In 1641 he recovered his liberty on the demand of the House of Lords, who maintained that as a peer he was entitled to be summoned to parliament. When the Long Parliament met, Williams was made chairman of a committee of inquiry into innovations in the church; and he was one of the bishops consulted by Charles as to whether he should veto the bill for the attainder of StTafford. In December 1641 the king, anxious to conciliate public opinion, appointed Williams archbishop of York. In the same month he was one of the twelve bishops impeached by the Commons for high treason and committed to the Tower. Released on an undertaking not to go to Yorkshire, a promise which he did not observe, the archbishop was en- throned in York Minster in June 1642. On the outbreak of the Civil War, after visiting Conway in the Royalist interest, he joined the king at Oxford; he then returned to Whales, and finding that Sir John Owen, acting on Charles's orders, had seized certain property in Conway Castle that had been deposited with the archbishop for safe-keeping, he went over to the Parlia- mentary side and assisted in the recapture of Conway Castle in November 1646. Williams, who was a generous benefactor of St John's College, Cambridge, died on the 25th of March 1650. WILLIAMS, JOHN (1796-1839), English Nonconformist missionary, was born at Tottenham near London on the 29th of June 1706. He was trained as an ironmonger, and acquired considerable experience in mechanical work. Having offered himself to the London Missionary Society, he was sent, after some training, in 1816 to Eimco, in the Society Islands, where he rapidly acquired a knowledge of the native language. After staying there for a short time, he finally settled at Raiatea,

which became his permanent headquarters. His success as a missionary here and elsewhere was remarkable. The people rapidly became Christianized and adopted many of the habits of civilization. Williams was fairly liberal for his age, and the results of his labours among the Pacific Islands were essentially beneficial. He travelled unceasingly among the various island groups, planting stations and settling native missionaries whom he himself had trained. From the Society Islands he visited the Ilervey group, where he discovered, and stayed for a con- siderable time on, the island of Rarotonga. Most of the in- habitants of the group were converted in a remarkably short time, and Williams's influence over them, as over the people of other groups, was very great. Besides establishing Christianity and civilization among them, he also, at their own request, helped them to draw up a code of laws for civil administration upon the basis of the new religion. W r hile at Rarotonga he, with the help of the natives, built himself a 60-ft. ship, " The Messenger of Peace," within about four months; with this he

returned to Raiatea, and made voyages among other island groups, including Samoa and the neighbouring islands. Williams returned to England in 1834 (having previously visited New South Wales in 1S21); and during his four years' stay at home he had the New Testament, which he had translated into Raro- tongan, printed. Returning in 1838 to the Pacific, he visited the stations already established by him, as well as several fresh groups. He went as far west as the New Hebrides, and, while visiting Eromanga, one of the group, for the first time, was murdered by cannibal natives on the 20th of November 1839.

His Narrative of Missionary Enterprises in the South Sea Islands was published in 1837, and formed an important contribution to our knowledge of the islands with which the author was acquainted. See Memoir of John Williams, by Ebcnezer Prout (London, 1843); C. S. Hornc, The Story of the L.M.S., pp. 41-54.

WILLIAMS, ROGER (c. 1604-T684), founder of the colony of Rhode Island in America and pioneer of religious liberty, son of a merchant tailor, was born (probably) about 1604 in London. It seems reasonably certain that he was educated, under the patronage of Sir Edward Coke, at the Charter House and at Pembroke College, Cambridge, where he received his degree in 1627. According to tradition (probably untrue), he studied law under Sir Edward Coke; he certainly devoted himself to the study of theology, and in 1629 was chaplain to Sir William Masham ol Otes, in the parish of High Laver, Essex, but from conscientious scruples, in view of the condition of ecclesiastical affairs in England at the time, refused preferment. He soon decided to emigrate to New England, and, with his wife Mary, arrived at Boston early in February 163 1. In April he became

teacher of the church at Salem, Mass., as assistant to the Reverend Samuel Skelton. Owing to the opposition of the ecclesiastical authorities at Boston, with whose views his own were not in accord, he removed to Plymouth in the summer, and there remained for two years as assistant pastor. In August 1633 he again became assistant teacher at Salem, and in the following year succeeded Skelton as teacher. Here he incurred the hostility of the authorities of the Massachusetts Bay Colony by asserting, among other things, that the civil power of a state could properly have no jurisdiction over the consciences of men, that the King's patent conveyed no just title to the land of the colonists, which should be bought from its rightful owners, the Indians, and that a magistrate should not tender an oath to an unregenerate man, an oath being, in reality, a form of worship. For the expression of these opinions he was formally tried in July 1635 by the Massachusetts General Court, and at the next meeting of the General Court in October, he not having taken advantage of the opportunity given to him to recant, a sentence of banishment was passed upon him, and he was ordered to leave the juris- diction of Massachusetts within six weeks. The time was subsequently extended, conditionally, but in January 1636 an attempt was made to seize him and transport him to England, and he, forewarned, escaped from his home at Salem and pro- ceeded alone to Manton's Neck, on the east bank of the Seekonk river. At the instance of the authorities at Plymouth, within whose jurisdiction Manton's Neck was included, Williams, with four companions, who had joined him. founded in June 1636 the first settlement in Rhode Island, to which, in remembrance of " God's merciful providence to him in his distress," he gave the name Providence. He immediately established friendly relations with the Indians in. the vicinity, whose language he had learned, and, in accordance with his principles, bought the land upon which he had settled from the sachems Canonicus (c. 1565-1647) and Miantonomo. His influence with the Indians, and their implicit confidence in him, enabled him in 1636, soon after arriving at Providence, to induce the Narragansets to ally themselves with the Massachusetts colonists at the time of the Pcquot War, and thus to render a most effective service to those who had driven him from their community. Williams and his companions founded their new settlement upon the basis of complete religious toleration, with a view to its becoming "a shelter for persons distressed for conscience " (see Rhode Island). Many settlers came from Massachusetts and elsewhere,

among others some Anabaptists, by one of whom in 1639 Williams was baptized, he baptizing others in turn and thus establishing what has been considered the first Baptist church in America. Williams, however,

maintained his connexion with this church for only three or four months, and then became what was known as a " Seeker," or Independent, though he continued to preach. In June 1643 he went to England, and there in the following year obtained a charter for Providence, Newport and Ports- mouth, under the title " The Providence Plantations in the Narragansett Bay." He returned to Providence in the autumn of 1644, and soon afterwards was instrumental in averting an attack by the Narragansets upon the United Colonies of New England and the Mohegans. In r646 he removed from Providence to a place now known as Wickford, R.I. He was at various times a member of the general assembly of the colony, acted as deputy president for a short time in 1649, was president, or governor, from September 1654 to May 1657, and was an assistant in 1664. 1667 and 1670. In 1651, with John Clarke (1609 1676), he went to England to secure the annulment of a commission which had been obtained by William Coddington for the government of Rhode Island (Newport and Portsmouth) and Connecticut, and the issue of a new and more explicit charter, and in the following year succeeded in having the Coddington commission vacated. He returned in the summer of 1654, having enjoyed the friendship of Cromwell, Milton and other prominent Puritans; but Clarke remained in England and in 1663 obtained from Charles II. a new charter for "Rhode Island and Providence Plantations." Williams died at Provi- dence in March or April 1684; the exact date is unknown.

Though headstrong, opinionative and rigid in his theological views, he was uniformly tolerant, and he occupies a high place among those who have striven for complete liberty of conscience. He was the first and the foremost exponent in America of the theory of the absolute freedom of the individual in matters of religion; and Rhode Island, of which he was pre-eminently the founder, was the first colony consistently to apply this principle in practice.

Williams was a vigorous controversialist, and published, chiefly during his two visits to England, besides A Key into the Language of the Indians of America (written at sea on his first voyage to England (16431 ; reprinted in vol. i. of the Collections of the Rhode Island Historical Society (1827), and in series i. vol. iii. of the Massachusetts Historical Society Collections) ; Mr Cotton's Letter Examined and Answered (1644); The Bloody Tenent of Persecution for the Cause of Conscience (1644); Queries of Highest Consideration (1644); The Bloudy Tenent yet more Bloudy (1652); The Hireling Ministry none of Christ's (1652); Experiments of Spiritual Life and Health(l6$2) ; and George Fox Digged out of his Burrowes (1676).

His writings have been republished in the Publications of the Narragansetl Club (6 vols., Providence, 1866-1874), the last volume containing his extant letters, written between 1632 and 1682. The best biographies are those by Oscar Straus (New York, 1894) and E. J. Carpenter (ibid. 1910).

Also see J. D. Knowles, Memoir of Roger Williams (Boston, 1834), and Elton, Life of Roger Williams (London. 1852 ; Providence, 1 853) ; New England Hist, and Gen. Regis- ter, July and October 1889, and January 1899 ; and M. C.Tyler, History of American Literature, 1607-1765 (New York, 1878). For the best apology for his expulsion from Massachusetts, see Henry M. Dexter's As to Roger Williams and his "Banishment "from the Massachusetts Plantation (Boston, 1876), an unsuccessful attempt to prevent Massachusetts from revoking the order of banishment.

WILLIAMS, ROWLAND (1817-1870), English divine and scholar, was born at Halkyn, Flint, the son of Rowland Williams fd. 1854), canon of St Asaph, and educated at Eton and Cam- bridge. He was elected fellow of King's College, Cambridge, in 1830, and took orders in 1842. During the next few years he actively opposed the amalgamation of the sees of St Asaph and Bangor. In 1850 he became vice-principal and Hebrew lecturer at St David's College, Lampeter, where he introduced much- needed educational and financial reforms. He was appointed select preacher of Cambridge University in 1854, and preached a sermon on inspiration, afterwards published in his Rational Gmlliness after the Mind of Christ and Ike Written Voices of the Church (London, 1855). He was charged with heterodoxy, and Alfred Ollivant (1798-1882), bishop of LlandafT, required him to resign his chaplaincy, but he remained at the college in spite

of these difficulties. His views were further defined in Christi- anity and Hinduism' (Cambridge, 1856), an expansion of the Muir prize essay which he had won in 1848. He became vicar in 1858 of Broadchalke with Bowerchalke and Alvedistone, Wiltshire. As a result of his favourable review of Bunsen's " Biblical Re- searches " contributed to Essays and Reviews (i860) he was prosecuted for heterodoxy. An unfavourable judgment was given by the Canterbury Court of Arches in 1862, but reversed by the Privy Council in 1864. Williams died on the 18th of January

1870.

Besides the above works his most important production was a translation of the Hebrew Prophets with commentary (pt. i. 1866; pt. ii. edited by Mrs Williams 1871; pt. iii. though planned was never written). See Life and Letters, edited by Mrs Williams (2 vols., 1874) ; and T. K. Cheyne, Founders of Old Testament Criticism (1893).

WILLIAMS, SIR WILLIAM FENWICK, Bart. (1800-1883), British general, second son of Commissary-General Thomas Williams, barrack-master at Halifax, Nova Scotia, was born at Annapolis, Nova Scotia, on the 4th of

December 1800. He entered the Royal Artillery as second lieutenant in 1825. His services were lent to Turkey in 1841, and he was employed as a captain in the arsenal at Constantinople. He was British com- missioner in the conferences preceding the treaty of Erzerum in 1847, and again in the settlement of the Turko-Persian boundary in 1848 (brevet majority and lieutenant-colonelcy and C.B.). Promoted colonel, he was British commissioner with the Turkish army in Anatolia in the Russian War of 1854-56, and, having been made a ferik (lieutenant-general) and a pasha, he practically commanded the Turks during the heroic defence of Kars, repuls- ing several Russian attacks and severely defeating the Russian general Muraviev in the battle of Kars on 29th September 1855. Cold, cholera, famine and hopelessness of succour from without, however, compelled Williams to make an honourable capitulation on the 28th of November following. A baronetcy with pension for life, the K.C.B., the grand cross of the Legion of Honour and of the Turkish Medjidie, the freedom of the City of London with a sword of honour, and the honorary degree of D.C.L. of Oxford University, were the distinctions conferred upon him for his valour. Promoted major-general in November 1855 on his return from captivity in Russia, he held the Woolwich command, and represented the borough of Calne in parliament from 1856 to 1859. He became lieutenant-general and colonel-commandant Royal Artillery in 1864, general in 1868, commanded the forces in Canada from 1859 to 1865, held the governorship of Nova Scotia until 1870, and the governorship of Gibraltar until 1876. He was made G.C.B. in 1871, and Constable of the Tower of London in 1881. He died in London on the 26th of July 1883.

WILLIAMSBURG, a city and the county-seat of James City county, Virginia, U.S.A., on a peninsula between the York and James rivers, 48 m. by rail E.S.E. of Richmond, Pop. (1900) 2044; (1910) 2714. Williamsburg is served by the Chesapeake & Ohio railway. It is the seat of the Williamsburg Female Institute (Presbyterian), and of the College of William and Mary, chartered by the Crown in 1693 and the second oldest college in the United States. Besides the main building and the president's house, the College of William and Mary has a science hall, a gymnasium, a library building, an infirmary and dormitories; in front of the main building is a statue by Richard Hayward of Norborne Berkeley, Lord Botetourt (1717-1770), the most popular royal governor of Virginia. The college offers a classical course and a scientific course, two-thirds of the work in each being prescribed, and in connexion with the normal department is the Matthew Whaley Model and Practice School. In 1909 there were 21 instructors and 228 students in the college, 6 instructors and 140 pupils in the model school, and 20,000 volumes, many of them rare, in the library. Since 1892 the college has published the William and Mary College

Quarterly, an historical magazine.

Here in December 1776 was established the Phi Beta Kappa Society, the first American college " Greek Letter " Society, now an inter collegiate honorary fraternity. The college suf fered heavy losses during the War of Independence and in the Civil War. In June 1781 Lord Cornwallis made the president's house his headquarters, and the institution was closed for a few

months of that year. It was closed in i86r because of the Civil War, and the main building was occupied in turn by Confederate troops and by Federal troops until some of the latter burned it in 1862. Although reopened in 1869, the college was closed again from 1881 to 1888 because of the low state of its finances. In 1888 it was reorgan- ized under an act of the state legislature which provided for the addition of a normal course and an annual appropriation towards its maintenance. In 1893 Congress passed an act indemnifying it in some measure for its loss during the Civil War; and in 1906 its endowment was increased to more than $150,000 and it was made a state institution governed by a board (appointed by the governor) and receiving $35,000 annually from the state. Peyton Randolph, Edmund Randolph, Thomas Jefferson, James Monroe, John Tyler, Chief Justice John Marshall and General Winfield Scott were graduates of the college.

Bruton Parish Church, completed in 1717 and enlarged in 1752, is the second church of a parish dating from 1674. It contains a Bible given by King Edward VII., a lectern given by President Roosevelt, and some old relics. The church itself has been restored (1905-1907) so far as practicable to its original form and appearance. The Association for the Preservation of Virginia Antiquities has preserved a powder magazine, erected in 1 7 14, from which the last royal governor of Virginia, Lord Dunmore, removed the powder on the day after the encounter at Lexington, Massachusetts, and thus occasioned the first armed uprising of the Virginia patriots. The County and City Court- House was erected in 1769. The Eastern State Hospital for the Insane was opened here in 1773, but its original building was burned in 1885. Among several colonial residences are the George Wythe House, which was the headquarters of Washington during the siege of Yorktown in 1781, and the Peyton Randolph House. The principal industries are the manufacture of men's winter underwear, lumber and ice, and the shipment of lumber and farm and garden produce.

Williamsburg, originally named Middle Plantation from its position midway between the York and James rivers, was founded in 1632. It was immediately walled in and for several years it served as a refuge from Indian attacks. On the 3rd of August 1676 Nathaniel Bacon held here his " rebel " assembly of the leading men of the province, and in January 1677 two of the " rebels " were hanged here. In 1698 Middle Plantation was made the provincial capital; and in 1699 the present name was adopted in honour of William III. Williamsburg was chartered as a city in 1722. In 1736 the Virginia Gazette, the oldest newspaper in the South, was established here. In the capitol here Patrick Henry, on the 30th of May 1765, presented his historic resolutions and made his famous speech against the Stamp Act. On the 15th of May 1776, the Virginia Convention in session here passed resolutions urging the Continental Congress to declare for Independence. In 1779 Richmond became the seat of the state government, and in 1832 fire destroyed the last of the old capitol at Williamsburg with the exception of the foundations, which since 1897 have been cared for by the Association for the Preservation of Virginia Antiquities. In the Peninsula campaign of the Civil War the Battle of Williamsburg was fought on the 5th of May 1862 on the south- eastern outskirts of the city. The Confederate army under General J. E. Johnston was retreating from Yorktown toward Richmond and a part of it under General James Longstreet waited here to check the pursuit of the advance portion of the Union army under General E. V. Sumner. A Union division under General J. D. Hooker began a spirited attack at 7.30 a.m., other Union divisions dealt heavy blows, but they failed from lack of co-operation to rout the Confederates and at night the latter continued their retreat. The Union loss in killed, wounded and missing was 2 2 28; the Confederate about 1560.

See L. G. Tyler, Williamsburg, the Old Colonial Capital (Richmond, 1907), and his "Williamsburg, the Ancient Capital,' in L. P. Powell's Historic Tozvns of the Southern States (New York, 1900),

WILLIAMSON, ALEXANDER WILLIAM (1824-1904), English chemist, was born at Wandsworth, London, on the 1st of May 1824. After working under Leopold Gmclin at Heidelberg, and Liebig at Giessen, he spent three years in Paris studying the higher mathematics under Comte. In 1849 he was appointed professor of practical chemistry at University College, London,

and from 1855 until his retirement in 1887 he also held the professorship of chemistry. He had the credit of being the first to explain the process of etheriflcation and to elucidate the formation of ether by the interaction of sulphuric acid and alcohol. Ether and alcohol he regarded as substances analogous to and built up on the same type as water, and he further intro-

duced the water-type as a widely applicable basis for the classifi- cation of chemical compounds. The method of stating the rational constitution of bodies by comparison with water he believed capable of wide extension, and that one type, he thought, would suffice for all inorganic compounds, as well as for the best-known organic ones, the formula of water being taken in certain cases as doubled or tripled. So far back as 1850 he also suggested a view which, in a modified form., is of funda- mental importance in the modern theory of ionic dissociation, for, in a paper on the theory of the formation of ether, he urged that in an aggregate of molecules of any compound there is an exchange constantly going on between the elements which are contained in it; for instance, in hydrochloric acid each atom of hydrogen docs not remain quietly in juxtaposition with the atom of chlorine with which it first united, but changes places with other atoms of hydrogen. A somewhat similar hypothesis was put forward by R. J. E. Clausius about the same time. For his work on et aerification Williamson in 1862 received a Royal medal from the Royal Society, of which he became a fellow in 1855, and which he served as foreign secretary from 1873 to 1889. He was twice president of the London Chemical Society, in 1863-1865, and again in 1 860-1871. His death occurred on the 6th of May 1904, at Hindhcad, Surrey, England.

WILLIAMSON, SIR JOSEPH (1633-1701), English politician, was born at Brtdekirk, near Cockermouth, his father, Joseph Williamson, being vicar of this place. He was educated at St Bees, at Westminster school and at Queen's College, Oxford, of which he became a fellow, and in 1660 he entered the service of the secretary of state, Sir Edward Nicholas, retaining his position under the succeeding secretary, Sir Henry Bennet, afterwards earl of Arlington. For his connexion with the foundation of the London Gazette in 1665 see Newspapers. He entered parliament in 1669, and in 1672 was made one of the clerks of the council and a knight. In 1673 and 1674 he repre- sented his country at the congress of Cologne, and in the latter year he became secretary of state, having practically purchased this position from Arlington for £6000, a sum which he required from his successor when he left office in 1679. Just before his removal he had been arrested on a charge of sharing in the popish plots, but he had been at once released by order of Charles II. After a period of comparative inactivity Sir Joseph represented England at the congress of Nijmwegen in 1697, and in 1698 he signed the first treaty for the partition of the Spanish monarchy. He died at Cobham, Kent, on the 3rd of October 1701. Williamson was the second president of the Royal Society, but his main interests, after politics, were rather in antiquarian than in scientific matters. Taking advantage of the many opportunities of making money which his official position gave him, he became very rich. He left £6000 and his library to Queen's

College, Oxford; £5000 to found a school at Rochester; and £2000 to Thetford,

A great number of Williamson's letters, despatches, memoranda, &c, are among the English state papers.

WILLIAMSON, WILLIAM CRAWFORD (1816-1895), English naturalist, was born at Scarborough on the 24th of November 1816. His father, John Williamson, after beginning life as a gardener, became a well-known local naturalist, who, in con- junction with William Bean, first explored the rich fossilifcrous beds of the Yorkshire coast. He was for many years curator of the Scarborough natural history museum, and the younger Williamson was thus from the first brought up among scientific surroundings and in association with scientific people. William Smith, the " father of English geology," lived for two years in the Williamsons' house. Young Williamson's maternal grandfather was a lapidary, and from him he learnt the art of cutting stones, an accomplishment which he found of great use

in later years, when he undertook his work on the structure of fossil plants. Williamson very early made a beginning as an original contributor to science. When little more than sixteen he published a paper on the rare birds of Yorkshire, and a little later (in 1834) presented to the Geological Society of London his first memoir on the Mesozoic fossils of his native district. In the meantime he had assisted Lindley and Hutton in the preparation of their well-known Fossil Flora of Great Britain. On entering the medical profession he still found time to carry on his scientific work during his student days, and for three years acted as curator of the Natural History Society's museum at Manchester. After completing his medical studies at Univer- sity College, London, in 1841, he returned to Manchester to practise his profession, in which he met with much success. When Owens College at Manchester was founded in 1851 he became professor of natural history there, with the duty of teaching geology, zoology and botany. A very necessary division of labour took place as additional professors were appointed, but he retained the chair of botany down to 1892. Shortly afterwards he removed to Clapham, where he died on the 23rd of June 1895. Williamson's teaching work was not confined to his university classes, for he was also a successful popular lecturer, especially for the Gilchrist Trustees. His scientific work, pursued with remarkable energy throughout life, in the midst of official and professional duties, had a wide scope. In geology, his early work on the zones of distribution of Mesozoic fossils (begun in 1834), and on the part played by microscopic organisms

in the formation of marine deposits (1845), was of fundamental importance. In zoology, his investi- gations of the development of the teeth and bones of fishes (1842-1S51), and on recent Foraminifera, a group on which he wrote a monograph for the Ray Society in 1857, were no less valuable. In botany, in addition to a remarkable memoir on the minute structure of Volvox (1852), his work on the structure of fossil plants established British paleobotany on a scientific basis; on the ground of these researches Williamson may rank with A. T. Brongniart as one of the founders of this branch of science. His contributions to fossil botany began in the earliest days of his career, and he returned to the subject from time to time during the period of his geological and zoological activity. 'His investigation of the Mesozoic cycadioid fossil Zamia (now Williamsonia) gigas was the chief palaeobotanical work of this intermediate period. His long course of researches on the structure of Carboniferous plants belongs mainly to the latter part of his life, and his results are chiefly, though not wholly, embodied in a series of nineteen memoirs, ranging in date from 1871 to 1893, in the Philosophical Transactions. In this series, and in some works (notably the monograph on Sligviariaficoid.es, Palaeontographical Society, 1886), published elsewhere, Williamson elucidated the structure of every group of Palaeozoic vascular plants. Among the chief results of his researches may be mentioned the discovery of plants intermediate between ferns and'eycads, the description of the true structure of the fructification in the extinct cryptogamic family Spheno-phylleae, and the demonstration of the cryptogamic nature of the dominant Palaeozoic orders Calamarieae, Lepidodendreae and Sigillarieae, plants which on account of the growth of their stems in thickness, after the manner of gymnospermous trees, were regarded as phanerogams by Brongniart and his followers. After a long controversy the truth of Williamson's views has been fully established, and it is now known that the mode of growth, characteristic in present times, of dicotyledons and gymnosperms prevailed in Palaeozoic ages in every family of vascular cryptogams. Thus, as Count Solms-Laubach has pointed out, paleobotany for the first time spoke the decisive word in an important question of general botany. Williamson's work in fossil botany was scarcely appreciated at the time as it deserved, for its great merits were somewhat obscured by the author's want of familiarity with the modern technicalities of the science. Since, however, the subject has been seriously taken up by botanists of a newer school, the soundness of the foundation he laid has become fully recognized. It may be

added that he was a skilled draughtsman, illustrating all his works by his own drawings, and practising water-colour painting as his favourite recreation.

A full account of Williamson's career will be found in his auto- biography,

entitled Reminiscences of a Yorkshire Naturalist, edited by his wife (London, 1896). Among obituary notices may be mentioned that by Count Solms-Laubach, Nature (5th September 1895), and one by D. II. Scott in Proc. R.S. vol. lx. (1897).

(D. H. S.)

WILLIAMSPORT, a city and the county-scat of Lycoming county, Pennsylvania, U.S.A., on the north bank of the west branch of the Susquehanna river, about 70 m. N, by W. of Harrisburg. Pop. (1890) 27,132; (1:900) 28,757, 0I " whom 1144 were negroes and 2228 were foreign-born, including 1089 Ger- mans; (1910 census), 31,860. Area, about 7 sq. m. Williamsport is served by the New York Central & Hudson River, the Penn- sylvania, the Susquehanna & New York, and the Philadelphia & Reading railways, and by electric lines connecting with the neighbouring towns of Montoursville (pop. in 1900, 1665), South Williamsport (pop. in 1900, 3328), on the S. bank of the river, and Du Boistown (pop. in 1900, 650). The city has an attractive site, on a high plain, nearly surrounded by hills. It has five parks, Brandon (44 acres) within the city limits, and Vallamont, Starr Island, Sylvan Dell and Nippono in its suburbs. Williamsport is the seat of Williamsport Dickinson Seminary (Methodist Episcopal, co-educational, 1848), a secondary school. Among the principal buildings are the county court house, the city hall, the United States Government building, the Scottish Rite Cathedral, the Masonic Temple, a Y.M.C.A. building, and the James V. Brown Memorial Library (1907). In the city are a Boys' Industrial Home (1898), a Girls' Training School (1895), a Florence CriUenton Home (1895), a Home for Aged Coloured Women (1898), a Home for the Friendless (1872), and Williamsport Hospital (1873). There are practically no tenement houses. The value of factory products in 1905 was $11,738,473, 20-7% more than in 1900. Williamsport has the largest lumber market in Pennsylvania; lumber was for forty years the most important of its manufactures, and Williamsport was styled the " sawdust city." The decreasing importance of the industry is due to the virtual exhaustion of standing timber in the neighbourhood. Lumber and timber products were valued at $1,310,368 in 1905, and lumber and planing mill products at 8579,667. Among other manufactures are silk and silk goods, valued at $1,101,273 in 1905; foundry and machine shop products,, $1,164,737; rubber and leather boots and shoes, furniture, &c. The city has a large trade with the surrounding country. The water supply is derived from moun- tain streams S. of the city. Lycoming county was erected in 1795, in which year Williamsport was founded and became the county-scat, after a bitter contest with Jaysburg, which was then a village of only some half a dozen houses and which subsequently ceased to exist. Williamsport was incorporated asaboroughin 1806, and was chartered as a city in 1866.

WILLIAMSTOWN, a town of Bourke county, Victoria, Australia, 9 m. by rail S.W. of Melbourne. Pop. (1901) 14,083. Shipping is the chief business of the place, there being com- modious piers, breakwater, also provision for the repair of vessels, patent slips and shipbuilding yards. Several quarries of superior basalt are worked near the town, and brown coal of good quality has also been found. The flourishing industries include woollen-milling, bottle-making, fodder-compressing, meat-freezing and cycle-making.

WILLIAMSTOWN, a township of Berkshire county, Massa- chusetts, U.S.A., on the Hoosick and Green rivers, in the N.W. corner of the state, and about 20 m. N. of Pittsfield. Pop. (1890) 4221; (1900) 5013, of whom 929 were foreign-born and 138 were negroes; (1910 census), 3708. Williamstown is served by the Boston & Maine railway and by an interurban electric line to North Adams. It covers an area of about 49 sq. m. and contains five villages. Williamstown, the principal village, is a pleasant residential centre on the Green river; it is sur- rounded by beautiful scenery and its streets are shaded by some fine old trees. Mission Park (10 acres) here is adorned by native

*and foreign shrubs and by maples, elms, pines and arbor vitae, and ; ‘ Haystack Monument ” in this park marks the place where Samuel John Mills (1783-1818), in 1806, held the prayer meeting which was the forerunner of the American foreign missionary movement. Williamstown village is best known as the seat of Williams College, chartered in 1*93 as a successor to a ” free school ” in Williamstown (chartered in 1785 and endowed by a bequest of Colonel Ephraim Williams). Besides recitation and residence halls, it has the Lawrence Hall Library (1846), contain- ing (1010) 68,000 volumes, the Thompson Memorial Chapel (1904), the Laseli Gymnasium (1886), an infirmary (1895), the Hopkins Observatory (1837) and the Field Memorial Observatory (188 2) , the Thompson Chemical Laboratory (1802), the Thompson Biological Laboratory (1893) and the Thompson Physical Laboratory (1893). In r9io the college had 59 instructors and 537 studenls. The fourth president of the college was Mark Hopkins (*

The principal manufactures of the township are cotton and woollen goods (especially corduroy), and market gardening is an important industry. The limits of the township, originally called West Hoosac, were determined by a committee of the General Court of Massachusetts in 1749, and two or three years later the village was laid out. Two of the lots were immediately purchased by Captain Ephraim Williams (1 7 r 5-1 755), who was at the

time commander of Fort Massachusetts in the vicinity; several other lots were bought by soldiers under him; and in 1753 the proprietors organized a township government. Williams was killed in the battle of Lake George on the 8th of September 1755, but while in camp in Albany, New York, a few days before the battle, he drew a will containing a small bequest for a free school at West Hoosac on condition that the township when incorporated should be called Williamstown. The tow r nship was incorporated with that name in 1765.

See A. L. Perry, Origins in Williamstown (New York, 1804; 3rd ed. 1900); and Williamstown and Williams College (Norwood, Mass.,

1899).

WILLIAMS-WYNN, SIB WATKIN, Bart. (1592-1749), Welsh politician, was the eldest son and heir of Sir William Williams, Bart., of Llaniorda near Oswestry; his mother, Jane Thelwall, was a descendant of the antiquary, Sir John Wynn of Gwydir, Carnarvonshire. Educated at Jesus College, Oxford, Williams succeeded to Wynnstay near Ruabon and the estates of the Wynns on the death of a later Sir John Wynn in 1719, and took the name of Williarns-Wynn. He was member of parliament for Denbighshire from 1716 to r74r, and was prominent among the opponents of Sir Robert Walpole; as a leading and influential Jacobite he was in communication with the supporters of Prince Charles Edward before the rising of 1745, but his definite offer of help did not reach the prince until the retreat to Scotland had begun. He died on the 26th of September 1749. His first wife, Ann Vaughan (d. 1748), was the heiress of extensive estates in Montgomeryshire which still belong to the family. His son and heir, Sir Watkin Williams-Wynn, Bart. (1749-1789), was the father of another Sir Watkin (1772-1842), the 5th baronet. Two other sons attained some measure of distinction: Charles (1775- 1850), a prominent Tory politician, and Sir Henry ˆ783ˆ856), a diplomatist. A daughter, Frances Williams-Wynn (d. 1857), was the authoress of Diaries of a Lady of Quality, 1797-1844, w

See Askew Roberts, Wynnstay and the Wynns (Oswestry, 1876).

WILLIBRORD (or Wilbrord), ST (d. 738), English missionary, " the apostle of the Frisians," was born about 657. His father, Wilgils, an Angle or, as Alcuin styles him, a Saxon, of North- umbria, withdrew from the world and constructed for himself a little oratory dedicated to St Andrew. The king and nobles of the district endowed him with estates till he was at last able to build a church, over which Alcuin afterwards ruled. Willi-brord, almost as soon as he was weaned, was sent to be brought up at Ripon, where he must doubtless have come under the

influence of Wilfrid. About the age of twenty the desire of increasing his stock of knowledge (c. 679) drew him to Ireland, which had so long been the headquarters of learning in western Europe. Here he stayed for twelve years, enjoying the society of Ecgberht and Wihtberht, from the former of whom he received his commission to missionary work among the North-German tribes. In his thirty-third year (c. 690) he started with twelve companions for the mouth of the Rhine. These districts were then occupied by the Frisians under their king, Rathbod, who gave allegiance to Pippin of Herstal. Pippin befriended him and sent him to Rome, where he was consecrated archbishop (with the name Clemens) by Pope Sergius on St Cecilia's Day 696. 1 Bede says that when he returned to Frisia his see was fixed in Litra- jectum (Utrecht). He spent several years in founding churches and evangelizing, till his success tempted him to pass into other districts. From Denmark he carried away thirty boys to be brought up among the Franks. On his return he was wrecked on the holy island of Fosite (Heligoland), where his disregard of the pagan superstition nearly cost him his life. When Pippin died, Willibrord found a supporter in his son Charles Martel. He was assisted for three years in his missionary work by St Boniface (719-722), who, however, was not willing to become his successor.

He was still living when Bede wrote in 731. A passage in one of Boniface's letters to Stephen III. speaks of his preaching to the Frisians for fifty years, apparently reckoning from the time of his consecration. This would fix the date of his death in 738; and, as Alcuin tells us he was eighty-one years old when he died, it may be inferred that he was born in 657 — a theory on which all the dates given above are based, though it must be added that they arc substantially confirmed by the incidental notices of Bede. The day of his death was the 6th of November, and his body was buried in the monastery of Echternach, near Trier, which he had himself founded. Even in Alcuin's time miracles were reported to be still wrought at his tomb.

The chief authorities for Willibrord's life are Alcuin's Vita Willi- brordi, both in prose and in verse, and Bede's Hist. Eccl. v. cc. 9-1 1. See also Eddius's Vita Wilfridii, and J. Mabillon, Annates ordinis sancli Benedicti, lib. xviii.

WILLIMANTIC, a city of Windham county, Connecticut, U.S.A., in the township of Windham, at the junction of the Willimantic and Natchaug rivers to form the Shetuc/ket, in the E. part of the state, about 16 m. N.W. of Norwich. Pop. (1800) 8648; (1900) 8937, of whom 2491 were foreign-born; (1910 census) 11,230. It is served by the New York, New Haven & Hartford and the Central Vermont railways, and by electric lines to Baltic, Norwich and New London, and to South Coventry. It is the seat of a State Normal Training School, and has a public library and Dunham

Hall Library (1878). The Willimantic river provides good water-power, and there are various manu- factures. The total value of the factory product in 1905 was $4,902,447. The township of Windham was incorporated in 1692. Willimantic was settled in 182a, incorporated as a borough in r833, and chartered as a city in 1893. The name is from an Indian word meaning " good look-out " or " good cedar swamps."

WILLIS, NATHANIEL PARKER ˆ806-1867), American author, was descended from George Willis, described as a " Puritan of considerable distinction," who arrived in New England about 1630 and settled in Cambridge, Massachusetts. Nathaniel Parker was the eldest son and second child of Nathaniel Willis, a newspaper proprietor in Boston, and was born in Portland, Maine, on the 20th of January r8o6. After attending Boston grammar school and the academy at Andover, he entered Yale College in October 1823. Although he did not specially dis- tinguish himself as a student, university life had considerable influence in the development of his character, and furnished him with much of his literary material. Immediately after leaving Yale he published in r82? a volume of poetical Sketches, which attracted some attention, although the critics found in his verses more to blame than to praise. It was followed by Fugitive Poetry (1829) and another volume of verse (1831). He also

1 He had been consecrated bishop, also by Sergius, on a previous visit in 692.

contributed frequently to magazines and periodicals. In 1829 he started the American Monthly Magazine, which was continued from April of that year to August 1831, but failed to achieve success. On its discontinuance he went to Europe as foreign editor and correspondent of the New York Mirror. To this journal he contributed a series of letters, which, under the title Pencillings by the Way, were published at London in 1835 (3 vols.; Philadelphia, 1836, 2 vols.; and first complete edition, New York, 1841). Their vivid and rapid sketches of scenes and modes of life in the old world at once gained them a wide popu- larity; but he was censured by some critics for indiscretion in reporting conversations in private gatherings. Notwithstanding, however, the small affectations and fopperies which were his besetting weaknesses as a man as well as an author, the grace, ease and artistic finish of his style won general recognition. His " Slingsby Papers," a series of magazine articles descriptive of American life and adventure, republished in 1836 under the title Inklings of Adventure, were as successful in England as were his Pencillings by tlie Way in America. He

also published while in [England Melanie and other Poems (London, 1835; New York, 1837), which was introduced by a preface by Barry Cornwall (Procter). After his marriage to Mary Stace, daughter of General William Stace of Woolwich, he returned to America, and settled at a small estate on Oswego Creek, just above its junction with the Susquehanna. Here he lived off and on from r837 to 1842, and wrote Letters from under a Bridge (London, 1840; first complete edition, New York, 1844), the most charming of ail his works. During a short visit to England in 1839- 1 840 he published Two Ways of Dying for a Husband. Returning to New York, he established, along with George P. Morris, a newspaper entitled the Evening Mirror. On the death of his wife in 1845 he again visited England. Returning to America in the spring of 1846, he married Cornelia Grinnell, and estab- lished the National Press, afterwards named the Home Journal. In 1843 he published Dashes at Life with a Free Pencil, in 1846 a collected edition of his Prose and Poetical Works, in 1849 Rural Letters, and in r8so Life Here and There. In that year he settled at Idlewild on the Hudson river, and on account of failing health spent the remainder of his life chiefly in retirement. Among his later works were Hurry-Graphs (1851), Outdoors at Idlewild (1854), Ragbag (1855), Paul Fane (1856), and the Convalescent (1859), but he had survived his great reputation. He died on the 20th of January 1867, and was buried in Mount Auburn, Boston.

The best edition of his verse writings is The Poems, Sacred, Passionate and Humorous, of N. P. Willis (New York, 1868); 13 volumes of his prose, Complete Prose Works, were published at New York (1849-1859), and a Selection from his Prose Writings was edited by Henry A. Beers (New York, 1885). His Life, by Henry A. Beers, appeared in the series of " American Men of Letters " the same year. See also E. P. Whipple, Essays and Reviews (vol. i., 1848); M. A. de Wolfe Howe, American Bookmen (New York, 1898).

WILLIS, THOMAS (1621-1675), English anatomist and physician, was born at Great Bedwin, Wlblshire, on the 27th of January 1621. He studied at Christ Church, Oxford; and when that city was garrisoned for the king he bore arms for the Royalists. He took the degree of bachelor of medicine in 1646, and applied himself to the practice of his profession. In 1660, shortly after the Restoration, he became Sedleian professor of natural philosophy in place of Dr Joshua Cross, who was ejected, and the same year he took the degree of doctor of physic. In 1664 he discovered the medicinal spring at Astrop, near Bracklcy in Northamptonshire. He was one of the first members of the Royal Society, and was elected an honorary fellow of the Royal College of Physicians in 1664. In 1666, after the fire of London, he took a house in St Martin's Lane, and there rapidly acquired an extensive practice, his reputation and skill marking him out as one of the first physicians of his time. He died in St Martin's Lane on the 1 ith of

November 1675 and was buried in Westminster Abbey.

Willis was admired for his piety and charity, for his deep insight into natural and experimental philosophy, anatomy and chemistry, and for the elegance and purity of his Latin style. Among his

writings were Cerebri anatome nervorumque descriptio et usus (1664), in which he described what is still known, in the anatomy of the brain, as the circle of Willis, and Pharmaceulice rationales (1674), in which he characterized diabetes mellitus. He wrote in English A Plain and Easy Method for Preserving those that are Well from the Infection of the Plague, and for Curing such as are Infected. His Latin works were printed in two vols. 4to at Geneva in 1676, and at Amsterdam in 1682. Browne Willis (1682-1760), the antiquarian, author of three volumes of Surveys of the cathedrals of England, was his grandson.

See JVrunk, Roll of the Royal College of Physicians, London (2nd ed., vol. i., London, 1878).

WILLMORE, JAMES TIBBITTS (1800-1863), English line engraver, was born at Bristnall's End, Handsworth, near Birmingham, on the 15th of September 1800. At the age of fourteen he was apprenticed to William Radcliffe, a Birmingham engraver, and in 1823 he went to London and was employed for three years by Charles Heath. He was afterwards engaged upon the plates of Brockedon's Passes of the Alps and Turner's England and Wales. He engraved after Chalon, Leitch, Stan- field, Landseer, Eastlake, Creswick and Ansdell, and especially after Turner, from whose " Alnwick Castle by Moonlight," " The Old Temeraire," " Mercury and Argus," " Ancient Rome," and the subjects of the rivers of France, he executed many admirable plates. He was elected an associate engraver of the Royal Academy in 1843. He died on the 12th of March 1863.

WILLOBIE (or Willougitby) , HENRY (i575?-i5o6?), the supposed author of a poem called Willobie his Aviso, which derives interest from its possible connexion with Shakespeare's personal history. Henry Willoughby was the second son of a Wiltshire gentleman of the same name, and matriculated from St John's College, Oxford, in December 1591, at the age of sixteen. He is probably identical with the Henry Willoughby who graduated B.A. from Exeter College early in 1595, and he died before the 30th of June 1596, when to a new edition of the poem Hadrian Dorrell added an " Apologie " in defence of his friend the author " now of late gone to God," and another poem in praise of chastity written by Henry's brother, Thomas Willoughby. Willobie his Aviso, was licensed for the press on the 3rd of September 1594, four months after the entry of Shakespeare's Rape of

Lucrece, and printed by John Windet. It is preceded by two commendatory poems, the second of which, signed " Contraria Contrariis; Vigilantius; Dormitanus," contains the earliest known printed allusion to Shakespeare by name : — –

" Yet Tarquyne phtckt his glistering grape, And Shake-spearc paints poore Lucrece rape."

In the poem itself, Avisa, whose name is explained in Dorrell's " Epistle to the Reader " as Amans Uxor Inviolata Semper Amanda, takes up the parable alternately with her suitors, one of whom is introduced to the reader in a prose interlude signed by the author H. W., as Henrico Willobego Italo Hispalensis. This passage contains a reference which may fairly be applied to the sonnets of Shakespeare. It runs:

" H. W. being sodenly infected with the contagion of a fantasticall fit, at the first sitfht of A, . . . bewrayeth the secresy of his disease unto his familiar frend W. S. who not long before had tryed the curtesy of the like passion, and was now newly recouered … he determined to see whether it would sort to a happier end for this new actor, then it did for the old player."

Then follows a dialogue between H. W. and W. S., in which W. S.," the old player," a phrase susceptible of a double sense, gives somewhat commonplace advice to the disconsolate wooer.

Dorrell alleges that he found the MS. of Willobie his Avisa among his friend's papers left in his charge when Willoughby departed from Oxford on her majesty's service. There is no trace of any Hadrian Dorrell, and the name is probably fictitious; there is, indeed, good reason to think that the pseudonym, if such it is, covers the personality of the real author of the work. Willobie his Avisa proved extremely popular, and passed through numerous editions, and Peter Colse produced in 1596 an imitation named Penelope's Complaint.

See Shakspere Allusion-Books, part i., ed. C. M. Ingleby (New Shakspere Society, 1874); A. B. Grosart's " Introduction " to his I reprint of Willobie his Avisa (1880).

WILLOCK (or Willocks), JOHN (c. 1515-1585), Scottish reformer, was a native of Ayrshire and was educated at the university of Glasgow. After being a monk for a short time he embraced the reformed religion and went

to London, where, about 1542, he became chaplain to Henry Grey, afterwards duke of Suffolk, the father of Lady Jane Grey. On the accession of Mary to the English throne in 1553 he went to Emden in Friesland, where he practised as a physician, varying this pro- fession with visits to Scotland. He was associated with the leading Scottish reformers in their opposition to the queen regent, Mary of Lorraine, and the Roman Catholic religion, and in 1558 he returned definitely to his native land. Willock now began to preach and in 1550, was outlawed. Popular sympathy, however, rendered this sentence fruitless, and in the same year, being Knox's deputy as minister of St Giles' cathedral, Edinburgh, he frustrated the efforts of the regent to restore the Roman Catholic religion, and administered the communion for the first lime in accordance with the ideas of the reformers. He was one of the four ministers chosen by the convention of October 1559 to seats on the council of government, and was one of those appointed to compile the first book of discipline. About- 1562 he became rector of Loughborough in Leicestershire, but he retained his connexion with the Scottish church and was moderator of the general assembly in 1562, and again in 1564, in 1565 and in 1568. He died at Loughborough on the 4th of December 1585.

WILLOUGHBY, the name of an English family long settled in Nottinghamshire, and now represented by Baron Middleton. Having exchanged his name of Bugge for that of Willoughby, Richard de Willoughby became a judge during the reign of Edward II. and purchased the manors of Wollaton in Notting- hamshire and of Risley in Derbyshire. His son, Richard de Willoughby (d. 1362), was justice of the common pleas under Edward III. Richard's descendant, Dorothy, who became the heiress of the family estates, married Robert Willoughby of Bore Place, Kent, and their descendant, Sir Thomas Willoughby, Bart. (

Sir Hugh Willoughby, the seaman, was a member of this family. He was a son of Sir Henry Willoughby (d, 1528), and a grandson of Sir Hugh Willoughby of Wollaton. His early services were as a soldier on the Scottish borders, but he soon turned his thoughts to the sea, and was appointed captain of a fleet of three ships which set out in 1553 with the object of discovering a north-eastern passage to Cathay and India. Two of the three ships reached the coast of Lapland, where it was proposed to winter, and here Willoughby and his companions died of cold and starvation soon after January 1554. A few years later their remains, were found, and with them Willoughby's Journal, which is printed in vol. i. of R. Hakluyt's Principal Navigations.

Another famous member of this family was Sir Nesbit Josiah Willoughby (1777-1849), who entered the British navy in 1790 and was present at the battle of Copenhagen. In 1800, however, he was dismissed from the service

by the sentence of a court- martial for his insolent conduct towards a superior officer, a previous offence of this kind having been punished less severely. In 1803, on the renewal of war, as a volunteer he joined an English squadron bound for the West Indies, and was soon admitted again to the navy; his courage and promptness at Cape Francais were responsible for saving goo lives, and he distinguished himself on other occasions, being soon restored to his former rank in the service. After further services in the West Indies, during which he displayed marked gallantry on several occasions, Willoughby was tried by court-martial at Cape Town in 1808 on charges of cruelty; he seems to have taken a great delight in inflicting punishment, but he was acquitted with the advice to be more moderate in future in his language. \gain in the West Indies, where he commanded- the Nereide

frigate, he was responsible for the heroic defence made by his ship against a much stronger French force at Port Louis, Mauritius, in August 1810, when 222 out of his crew of 2S1 men were disabled before he surrendered. Undeterred by the severe wounds which he had received, and seeing no prospect of active service with the British fleet, Willoughby offered his services in 181 2 to the Russian government, and while serving with the Russian army he was captured by the French. He was taken to France, whence he escaped to England. Having seen a little more service in the navy, he was knighted in 1827, was made a rear-admiral in 1847, and died unmarried in London on the 19th of May 1849.

WILLOW {Salix}, a very well-marked genus of plants con- stituting, with the poplar {Populus), the order Salicaceac. Willows are trees or shrubs, varying in stature from a few inches, like the small British S. herbacea and arctic species generally, to 100 ft., and occurring most abundantly in cold or temperate climates in both hemispheres, and generally in moist situations; a few species occur in the tropical and sub-tropical portions of the three great continents. Their leaves are deciduous, alternate, simple, and generally much longer than broad, whence the term willow-leaved has become proverbial. At their base they are pro- vided with stipules, which are also modified to form the scales investing the winter buds. The flowers are borne in catkins (fig. 1), which are on one tree male (staminate) only, on another female (pistillate). Each male flower consists of a small scale or bract, in the axil of which are usually two, sometimes three, rarely five stamens, and still more rarely a larger number. In -addition there is a small glandular disk, which assumes different shapes in

Fig. 1. — Salix caprea — Common Sallow or Goat Willow.

1, Leaf shoot. 4, Female catkin.

2, Branchlet bearing male cat- 5. Female flower.

kins. 6, Capsule, opened.

3, Male flower. 7, Seed. .

i, 2, 4 reduced; 3, 5-7 enlarged.

different species. The female flowers are equally simple; consist- ing of a bract, from whose axil arises usually a very short stalk, surmounted by two carpels adherent one to the other for their whole length, except that the upper ends of the styles are separated into two stigmas. When ripe the two carpels separate in the form of two valves and liberate a large number of seeds, each provided at the base with a tuft of silky hairs, and containing a straight embryo without any investing albumen. The flowers appear generally before the leaves and arc thus rendered more conspicuous, while passage of pollen by the wind is facilitated. Fertilization is effected by insects, especially by bees, which are directed in their search by the colour and fragrance of the

flowers; but some pollen must also be transported by the wind to the female flowers, especially in arctic species which, in spite of the poverty of insect lite, set abundant fruit. The tuft of hairs at the base facilitates rapid dispersion of the seed, early germination of which is rendered desirable owing to its tenuity. Although the limitations of the genus arc well marked, and its recognition in consequence easy, it is otherwise with regard to the species. The greatest difference of opinion exists among botanists as to their number and the bounds to be assigned to each; and the cross-fertilization that takes place between the species intensifies the difficulty. Andersson, a Swede, spent nearly a quarter of a century in their investigation, and ultimately published a monograph which is the standard authority on the subject. He admits about a hundred species. Professor C. S. Sargent (Silva of North Ameruui) suggests 160 to 170 as the number of distinguishable species. Some botanists have enumerated 80 species from Great Britain alone, while others count only 12 or 15. Dr Buchanan White, who made a special study of the British willows, grouped them under 17 species with numerous varieties and hybrids. To illustrate the great perplexity surrounding the subject, we may mention that to one species, S. nigricans, one hundred and twenty synonyms

Fig. 2. — Salix fragilis — Crack Willow.

A, Flowering shoot from male 4, Female flower with and with-

plant. – out bract.

B, Flowering shoot from female 5, Single fruit from which the

plant. hairy seeds are escaping;

i, Foliage. one seed shown separately.

2, Catkin of fruits. A, B, 1, 2, about half nat. size,

3, Male flower. 3-5 enlarged.

have beer, attached. Some of these are doubtless such as no botanist, with adequate material for forming an opinion, would accept; but, after making the necessary deductions for actual mistakes and misstatements, there still remains a large number upon which legitimate differences of opinion prevail. Andersson says that he has rarely seen two specimens of this species which were alike in the collective characters offered by the stature, foliage and catkins. No better example could be found of the almost limitless variation in so-called species.

Few genera have greater claims to notice from an economic point of view. As timber trees many of the species are valuable from their rapidity of growth and for the production of light durable wood, serviceable for many purposes. Among the best trees of this kind are S. fragilis, the crack willow (fig. 2), especially the variety known as S. fragilis, var. Russtlliana. and S. alba, the white or

Huntingdon willow. These trees are usually found growing by rivers' banks or in other moist situations, and are generally pollarded for the purpose of securing a crop of straight poles. This plan is, however, objectionable; as inducing decay in the centre of the trunk. Where poles are required, it is better to treat the trees as coppice and to cut the trunk level with the soil. The wood of S. fragilis is used for cricket-bats; there is a great difference in the value for this purpose of timber from different soils; and wood of the female tree is said to be preferable to that of the maid S. caprea (fig. 1). a hedgerow tree, generally grows in drier situations. It is a useful timber tree, and its wood, like that of S. alba, is prized in the manufacture of charcoal. Its catkins are collected in England in celebration of Palm Sunday, the bright-coloured flowers being available in early spring when other decorations of the kind are scarce. _ Certain sorts of willow are largely used for basket-making and wicker-work. The species employed for this purpose are mostly of shrubby habit, and arc known under the collective name of osiers (see Basket, and Osihr). The best for planting is the bitter

osier, 6\ purpurea; planted on rich, well-drained soil, subject to occasional immersion, this willow may be grown profitably for basket-work. It is also w r ell adapted for forming wind-breaks or screens, or for holding the banks of streams and preventing the removal of the soil by the current. S. viminulis is one of the best of the green osiers, suitable for hoops and valuable for retaining the soil on sloping embankments. S. vilellina yields the yellow osiers. S. acuminata and other species do well by the seaside, and are serviceable as wind-screens, nursc-lrces and hedges. S. daphnoides, S. repens and other dwarf kinds are useful for binding heathy or sandy soil. In addition to their use for timber or basket-making, willows contain a large quantity of tannin in their bark. A valuable medicinal glucoside named salicin (q.v.) is also extracted from the bark. The wood, especially of 5. alba, is used for paper pulp. As ornamental trees some willows also take a high rank. The white willow is a great favourite, while the drooping habit of the weeping willow renders it very attractive. Though named S. babylonica, it is really a native of China, from which it has been widely spread by man; the willow of the Euphrates (Ps. exxxvii.) is in all probability Populus e.uphratica. S. babylonica is sometimes spoken of as Pope's willow, having been cultivated by that poet, or as Napoleon's willow, because his tomb at St Helena is overshadowed by a tree of _ this species, from which many offsets .exist or are reputed to exist in modern gardens. S. re gaits has very white, silvery leaves. S. rosmarinifolia is remarkable for its very narrow leaves— purplish above, silvery beneath.

The larvae of several nocturnal Lepidoptera'feed upon the leaves of the willows, and the trunk of the sallow is often injured by the perforations of the lunar hornet sphinx (Trochilium crabronifortne).

WILLOW-HERB, m botany, the popular name for the species

of Epiiobium, a genus of often tall herbaceous plants, several of which are natives of Britain. The slender stems bear narrow leaves and pink or purple flowers, which in the rose-bay (E. angustifolium) , found by moist river-sides and in copses, are 1 in. in diameter and form showy spikes. E. hirsutum, found by sides of ditches and rivers, a tall plant with many large rose-purple flowers, is known popularly as codlins-and-cream.

WILLS, WILLIAM GORMAN (1828-1891), Irish dramatist, was born at Kilmurry, Ireland, on the 28th of January 1828, the son of James Wills (1790-1868), author of Lives of Illustrious and Distinguished Irishmen (1839-1847). The son was educated at Waterford Grammar School and Trinity College, Dublin. After several years of journalistic and literary work in Dublin, he settled in London, where he wrote stories for the magazines. In 1868 he determined that he could make a better living at portrait, -painting, for which, though his art education had been meagre, he had

always had talent. He soon made a fair income, though in the long run his excessive Bohemianism. coupled with persistent absent-mindedness, lost him many sitters. Meanwhile he had begun to write for the stage. His first original work was the Man o'Airlie, produced at the Princess's theatre, London, in 1867. Early in 1872 he was engaged by Colonel Bateman as " dramatist to the Lyceum " at an annual salary. Under the terms of his agreement he wrote Medea in Corinth, Charles I. and Eugene Aram, all of which were produced at the Lyceum in 1872-1873. With Charles I., in which Mr (afterwards Sir Henry) Irving confirmed the reputation he had earned by his performance in The Bells, Wills made a popular success, which he repeated in Olivia (adapted from Goldsmith's Vicar of Wakefield) in 1873. From this date onwards Wills wrote continuously, and till 1887 his name was practically never absent from the bill of some London theatre. His work never, however, quite came up to the expectations which weˆe based on his genuine ability,

and much of it is of an inferior quality. In Claudian (Princess's Theatre, 1883) and Faust (Lyceum Theatre, 1885) he merely supplied the text to a variety of dramatic situations. In 1887 his mother, whom he had supported for many years, died, and after her death he seemed to have less incentive for work. Wills was a painter by choice, and never put his whole heart into his dramatic work. He had some skill in ballad-writing, shown in the well-known " I'll sing thee songs of Araby." He died on the 13th of December 1891.

WILLUGHBY, FRANCIS (1635-1672), English ornithologist and ichthyologist, son of Sir Francis Willughby, was born at Middlcton, Warwickshire, in 1635. Ileis memorable as the pupil, friend and patron as well as the active and original co-worker of John Ray (q.v.), and hence to be reckoned as one of the most important precursors of Linnaeus. His connexion with Ray dated from his studies at Trinity College, Cambridge (1653-1659) ; and, after concluding his academic life by a brief sojourn at Oxford, and acquiring considerable experience of travel in England, he made an extensive Continental tour in his company. The specimens, figures and notes thus accumulated were in great part elaborated on his return into his Ornitho'ogia, which, how- ever, he did not live to publish, having injured a naturally delicate constitution by alternate exposure and over-study. This work was published in 1676, and translated by Ray as the Ornithology of Fr. Willughby (London, 1678, fol.); the same friend published his Historia Piscium (1686, fob). Willughby died at Middleton Hall on the 3rd of July 1672.

In Ray's preface to the former work he gives Willughby much of the credit usually assigned to himself, both as critic and system- atise Thus, while founding on Gesner and Aldrovandus, he omitted their irrelevancies, being careful to exclude " hieroglyphics, emblems, morals, fables, presages or ought else pertaining to divinity, ethics, grammar, or any sort of humane learning, and present him [the reader! with what properly belongs only to natural history." Again, he not only devised artificial keys to his species and genera, but, " that he might clear up all these obscurities [of former writers] and render the knowledge and distinction of species facile to all that should come after, he bent his endeavours mainly to find out certain characteristic notes of each kind," while finally, in apolo- gizing for his engravings, he yet not unjustly claims that " they are best and truest of any hitherto graven in brass." (See also Ornithology.)

WILMINGTON, a city, a port of entry and the county-seat of New Castle county, Delaware, U.S.A., in the N. part of the state, near the Delaware river, at the mouth of Brandywine and Christiana creeks. Pop. (1890) 61,431; (1900) 76,508, of whom 10,478 were foreign-born (3820 Irish, 1762 German, 998 English) and 9736 were negroes; (1910 census) 87,411. Area, 10-18 sq. m. It is served by the Baltimore & Ohio, the Philadelphia, Baltimore & Washington (Pennsylvania) and the Philadelphia & Reading railways, and by several steamship lines. Wilmington Harbor includes Christiana Creek for 4 m. above its mouth and the navigable part (2 m.) of the Brandywine, which enters the Christiana about ij m. above its mouth. By 1881 the channel depth had been increased from 8j to 15 ft., in 1896-1906 it was increased to 21 ft. in the lower part of the harbour, and in 1908 the upper part was dredged to 18 or 19 ft. for widths of 100, 200 and 250 ft. Between 1836 and 1909 $994,404 was expended on the improvement of the harbour. Most of the streets which run from E. to W. are numbered; those which run from N. to S. are named, often in honour of prominent American statesmen. The public parks and squares have a total area of 381 acres; the most important parks are Brandywine and Rockford, which lie along and near Brandywine creek, in the northern part of the city. Among the buildings of interest are the City Hall (1798); Holy Trinity (Old Swedes) Church (1698), probably the oldest church in the United States which has been in continuous use; the building occupied by the Historical Society of Delaware (organized in 1864), which was the old First Presbyterian Meeting House, built in 1740; the County Court House; and the Federal building. In Wilmington, besides other educational institutions, is the Wilmington Friends' School (1748), the oldest preparatory school in the stare. The Wilmington Institute Free Library (69,000 volumes in 1910) was founded in 1788, but was not made

free to the public until 1894. Wilmington is the see of a Roman Catholic

bishop, and of a Protestant F,piscopal bishop.

The favourable situation, railway facilities and proximity to the coal-fields of Pennsylvania, West Virginia and Virginia, to the sources of supply of raw materials, and the water-power furnished by the Brandywine, combined with the enterprise of its citizens, have made Wilmington the most important manu- facturing centre of Delaware. In 1905 the value of the factory product of the city, $30,390,039, was 73-8% of the total product value of the state. The principal manufactures are tanned, curried and finished leather ($10,250,842), steam railway cars (83,597,736), foundry and machine-shop products ($3,432,118), paper and wood pulp ($1,904,556), &c. Shipbuilding ($1,780,904 in 1905) was established as early as 1 739, and in 1836 the first iron steamship and in 1854 the first iron sailing-boat built in the United States were built.here. On the Brandywine, near the city, arc the works of the Du Pont Powder Company, which extend over nearly 1000 acres, the largest powder plant in the world. The company was founded in 1802 by the French refugee, Eleuthere Irenee du Pont dc Nemours (1771-1834), who had learned from Lavoisier the modern methods of powder-making, and here introduced them into the United States. Wilmington is the port of entry of the customs district of Delaware, with branch offices at New Castle and Lewes. In 1909 the imports of the district were valued at $463,092.

The city is governed under a charter of r886, amended in 1893, by a mayor, who is chosen biennially and who appoints the board ' of water commissioners and the board of directors of the street and sewer departments, and by a unicameral legislature, the twelve members of which are elected by wards (except the presi- dent of the council, who is elected at large, and is acting mayor in the absence of the mayor). The council appoints the auditor, the clerk of council who acts as city clerk and various inspectors, &c. The police commission is appointed by the resident associate judge of New Castle county court. A board of education (two members from each ward), the city attorney and the city treasurer are elected by popular vote.

The site of Wilmington was settled in 1638 on behalf of the South Company of Sweden by Swedish and Dutch colonists, under the leadership of Peter Minuit. The fort which they built was called Christina, and the settlement that grew up around it, Christinaham, in honour of Queen Christina, daughter of Gustavus Adolphus. The fort was captured, without bloodshed, by Governor Peter Stuyvesant of New Netherland in 1655, but very few of the Swedes left Christinaham. The Swedish language and Swedish customs persisted, and the religion of the Swedes was tolerated. After the English conquest in 1664, especially after the annexation of the Delaware counties to Pennsylvania in 1682, Swedish influence declined. In

1731 a large part of the territory now included in the city was owned by Thomas Willing, who named it Willingtown. About eight years later, by a borough charter granted by William Penn, this named was changed to Wilmington, in honour of Spencer Compton, Earl of Wilming- ton (c. 1673-1743). During the War of Independence the battle of Brandywine was fought 13 m. N.W. of Wilmington. In the first, half of the 19th century Wilmington was the centre of a strong anti-slavery sentiment and was a " station " of the " Underground Railroad." In 1809 the borough was enlarged by a new charter; in 1832 Wilmington was chartered as a city. In 1900 the city contained 41-4% of the total population of the state and, under the state constitution of 1897, it elects five of the thirty-five representatives and two of the seventeen senators in the state legislature.

See Records of Holy Trinity (Old Swedes) Church (Wilmington, 1890); Benjamin Ferris, History of the Original Settlements on the Delaware, part iii. (Wilmington, 1846); and Elizabeth Montgomery, Reminiscences of Wilmington (Philadelphia, 1851).

WILMINGTON, a city, a port of entry and the county-seat of New Hanover county, North Carolina, U.S.A., on the Cape Fear river, about 30 rn. from its mouth, 10 m. in direct line from the ocean, and about 145 m. S.S.E. of Raleigh. Pop. (1890) 20,056; (1900) 20,976, of whom 10,407 were negroes and 467

were foreign-born; (1910 census) 25,748. It is the largest city and the chief seaport of the state. Wilmington is served by the Atlantic ("oast Line and the Seaboard Air Line railways, and by steamboat lines to New York, Philadelphia and Baltimore and to ports on the Cape Fear and Black rivers, and isconnected by an electric line with Wright sville Beach, a pleasure resort 12 m. distant on the Atlantic Ocean. Below Wilmington the channel of the Cape Fear river is 20 ft. deep throughout and in some parts 22 and 24 ft. deep; the width of the channel is to be made 270 ft. under Federal projects on which, up to the 30th of June 1000, there had been expended $4,344,029. Above Wil- mington the Cape Fear river is navigable for boats drawing 2 ft. for 115 m. to Fayetteville. The city lies on an elevated sand ridge and extends along the river front for about 2\ m. Among its prominent buildings are the United States Government Building, the United States marine hospital, the city and county hospital, the county court house, the city hall (which houses the public library) and the masonic temple. The city is the seat of Cape Fear Academy (1872) for boys, of the Academy of the Incarnation (Roman Catholic) and of the Gregory Normal

School (for negroes). The city is the see of a Protestant Episcopal bishop. Wilmington is chiefly a commercial city, and ships large quantities of cotton, lumber, naval stores, rice, market- garden produce and turpentine; in 1909 the value of its exports was $23,310,070 and the value of its imports $1,282,724. The total value of the factory product ill 1905 was $3,1 55,458, of which $893,715 was the value of lumber and timber products.

A settlement was established here in 1730 and was named New Liverpool; about 173? the name was changed to New Town; in 1739 the town was incorporated, was made the county-seat and was renamed, this time in honour of Spencer Compton, Earl of Wilmington {c, 1673-1743). In 1760 it was incorporated as a borough and in 1866 was chartered as a city. Some of Wilmington's citizens were among the first to offer armed resistance to the carrying out of the Stamp Act, compelling the stamp-master to take an oath that he would distribute no stamps. During most of 1781 the borough was occupied by the British, and Lord Cornwallis had his / headquarters here. Although blockaded by the Union fleet, Wilmington was during the Civil War the centre of an important intercourse between the Confederacy and foreign countries by means of blockade runners, and was the last important port open to the Confederates. It was defended by Fort Fisher, a heavy earthwork on the peninsula between the ocean and Cape Fear river, manned by 1400 men under Colonel William Lamb. A federal expedition of t 50 vessels under Admiral D. D. Porter and land forces (about 3000) under General B. F. Butler approached the fort on the 20th of December 1864; on the 24th the " Louisiana," loaded with 215 tons of powder, was exploded 400 yds. from the fort without doing any damage; on the 24th and 25th there was a terrific naval bombardment, which General Butler decided had not sufficiently injured 'the fort to make an assault by land possible; on the 13th and 14th of January there was another bombardment, and on the 15th a combined naval and land attack, in which General A. FT. Terry, who had succeeded General Butler in command, stormed the fort with the help of the marines and sailors, and took 2000 prisoners and 169 guns. The Union losses were 266 killed, 57 missing and 1018 wounded. A magazine explosion on the morning of the 16th killed about 100 men in each army. The city was evacuated immediately afterwards.

WILMOT, DAVID (1814-1868), American political leader, was born at Bethany, Pennsylvania, on the 20th of January 1814. He was admitted to the bar in 1834 and practised law in Towanda. Ho entered politics as a Democrat, served in the National House of Representatives from 1845 to 1851, and although he favoured the Walker Tariff, the Mexican War and other party measures, opposed the extension of slavery. On the 8th of August 1846, when a bill was introduced appropriating $2,000,000 to be

used by the president in negotiating a treaty of peace with Mexico, Wilmot immediately offered the following amendment: " Pro- vided, That, as an express and fundamental condition to the

acquisition of any territory from the Republic of Mexico by the United States, by virtue of any treaty which may be negoti- ated between them, and to the use by the Executive of the moneys herein appropriated, neither slavery nor involuntary servitude shall ever exist in any part of said territory, except for crime, whereof the party shall first be duly convicted." The amendment, famous in American history as the " Wilmot Proviso," was adopted by the House, but was defeated, with the original bill, by the Senate's adjournment. A similar measure was brought forward at the next session, the appropria- tion, however, being increased to $3,000,000, and the amendment being extended to include all territory which might be acquired by the United States; in this form it passed the House by a vote of 115 to 105; but the Senate refused to concur, passed a bill of its own without the amendment; and the House, owing largely to the influence of General Lewis Cass, in March 1847, receded from its position. The amendment was never actually adopted by Congress, and was in fact expressly repudi- ated in the Compromise of 1850, and its content declared unconstitutional by the Supreme Court in the Dred Scott case. Although known as the Wilmot Proviso it really originated with Jacob Brinkerhoff (1810-1880) of Ohio, Wilmot being selected to present it only because his party standing was more regular. The extension of the principle to territory other than that to be acquired from Mexico was probably due to Preston King (1806- 186$) of New York. Wilmot supported Van Buren in 1848 and entered the Republican party at the time of its formation, and was a delegate to the national conventions of 1856 and i860. He was president judge of the 13th Judicial District of Penn- sylvania in 1853-1861, United States senator in 1861-1863 and Judge of the United States Court of Claims in 1 863-1868. He died at Towanda, Pennsylvania, on the 16th of March 1868.

See G. P. Garrison, Westward Extension (New York and London,

1906).

WILSON, ALEXANDER (1766-1813), American ornithologist, was born in Paisley, Scotland, on the 6th of July 1766. His father, a handloom weaver, soon removed to the country, and there combined weaving with agriculture, distilling and smuggling – — conditions which no doubt helped to develop in the boy that love of rural pursuits and adventure which was to determine his career. At first he was placed with a tutor and destined for the church, but afterwards he was apprenticed as a weaver. Then he became a peddler and spent a year or two in travelling through Scotland, recording in his

journal every matter of natural history or antiquarian interest. Having incurred a short imprisonment for lampooning the master-weavers in a trade dispute, he emigrated to America in 1794. After a few years of weaving, peddling and desultory observation, he became a village schoolmaster, and in 1802 obtained an appoint- ment near Philadelphia, where he formed the acquaintance of William Bartram the naturalist. Under his influence Wilson began to draw birds, having conceived the idea of illustrating the ornithology of the United States; and thenceforward he steadily accumulated materials and made many expeditions. In 1806 he obtained the assistant-editorship of the American edition of ReeJs Encyclopaedia, and thus acquired more means and leisure for his great work, American Ornithology, the first volume of which appeared in the autumn of 1S08, after which he spent the winter in a journey" in search of birds and sub- scribers." By the spring of 1813 seven volumes had appeared; but the arduous expedition of that summer, in search of the marine waterfowl to which the remaining volume was to be devoted, gave a shock to his already impaired health, and he succumbed to dysentery at Philadelphia on the 23rd of August

1813.

Of his poems, not excepting the Foresters (Philadelphia, 1805), nothing need now be said, save that they no doubt served to develop his descriptive powers. The eighth and ninth volumesˆ of the American Ornithology were edited after his decease by his friend George Ord, and the work was continued by Luc'ien Bonaparte (4 vols., Philadelphia, 1825-1833). The complete work was re- published several times, and his Miscellaneous Prose Works and Poems was edited with a memoir by the Rev. A. B. Grosart (Paisley, 1876). A statue was erected to him at Paisley in 1876.

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WILSON, SIR D.— WILSON, H. H.

WILSON, SIR DANIEL (1816-1892), archaeologist and Canadian educational reformer, was horn in Edinburgh on the 5th of January 1S16, the son of Archibald Wilson, a wine- merchant, and Janet Aitken. After studying at the High School and the University of Edinburgh, he spent the next ten years in journalism and in other forms of literary work (London 1837-1842, Edinburgh 1842-1847). In 1845 he became secretary to the Scottish Society of Antiquaries, and in 1848 published Memorials of Edinburgh in the Olden Time, of which the chief value lies in the numerous illustrations, done by himself. In 1851 appeared his most important work, Prehistoric Annals of Scotland, which placed him in the front rank of archaeologists. In 1853 he became professor of History and English

Literature in the University of Toronto, where his practical ability and energy soon made him the most important member of the staff. While writing extensively on the archaeology and anthropology of Canada, and giving an impetus to the study, he produced nothing of lasting importance. His main work lay in asserting the claims of the University of Toronto, and of University College, the teaching body in connexion with it, against the sectarian universities of the province which denounced the provincial university as godless, and against the private medical schools in Toronto. Largely owing to Wilson's energy ■ in fighting for what he called " the maintenance of a national system of university education in opposition to sectarian or denominational colleges," the provincial university gained the chief position in the intellectual life of Ontario. Two of the sectarian universities, the Methodist and the Anglican, have now become united to the provincial university, but the Baptist and the Presbyterian (see Kingston) still retain a vigorous existence. He was equally successful in his struggle against the rival medical schools in Toronto, the chief of which is now incorporated with Toronto university. In his efforts to escape the control of local politicians he was less successful, and in some cases appointments to the provincial university were made for political rather than for academic reasons. Though seeing that in a young and democratic country the Scotch-American model must be followed rather than the English, and though resisting attempts to follow the practice of Oxford or Cambridge, Wilson was a believer in the merits of a modified form of the residential system. He was one of the first in Canada to cast aside the classical tradition, and as early as i860 had the courage (.0 s;ty: " It is just because . . . German and French are now the keys of so much modern philosophy and science that all wise Univer sity reformers arc learning to give to modern languages the place they justly claim in a liberal education." In 1881 he was made president of Toronto university; and in 1885 president of the literature section of the Canadian Royal Society; in 1888 he was knighted; and hi 1891 given the freedom of the city of Edinburgh. He died at Toronto on the 6th of August 1892.

Record of Historical Publications relating to Canada, edited by G. M. Wrong, vol. v. (Toronto and London, 1901), pp. 199-217, gives a good sketch of his career, and a bibliography of his numerous works. . (W. L. G.J

WILSON, HENRY (1812-1875), vice-president of the United States from 1873 to 1875, was born at Farmington, New Hamp- shire, on the 16th of February 18 12. His name originally was Jeremiah J. Colbaith. His father was a day-labourer and very poor. At ten years of age the son went to work as a farm- labourer. He was fond of reading, and before the end of his apprenticeship had read more than a thousand volumes. At the age of twenty-one, for some unstated reason, he had his name changed by Act of

the Legislature to that of Henry Wilson. At Natick, Massachusetts, whither he travelled on foot, he learned the trade of shoemaker, and during his leisure hours studied much and read with avidity. For short periods, also, he studied in the academies of Strafford, N.H., Wolfeborough, N.H,, and Concord, N.H. After successfully establishing himself as a shoe manufacturer, he attracted attention as a public speaker in. support of William Henry Harrison during the presidential campaign of 1S40. He was in the state House of Representatives in 1S41-42, 1846 and 1850. and in the Senate ia

1844-45 and 1851-52. In 1848 he left the Whig party and became one of the chief leaders of the Free Soil party, serving as presiding officer of that party's national convention in 1852, acting as chairman of the Free Soil national committee and editing from 1848 to 1851 the Boston Republican, which he made the chief Free Soil organ. The Free Soil party nominated him for governor of the state in 1853, but he was defeated. For a short time (1855) heidentinedhirnself with the American or Know Nothing party, and afterwards acted with the Republican party. In 1855 he was elected to the United States Senate and remained there by re-elections until 1873. His uncompromising opposition to the institution, of slavery furnished the keynote of his earlier senatorial career, and he soon took rank as one of the ablest and most effective anti-slavery orators in the United States. He had been deeply interested from 1840 until 1850 in the militia of his state, and had risen through its grades of service to that of brigadier-general. Upon the outbreak of the Civil War he was made chairman of the military committee of the Senate, and in this position performed most laborious and important work for the four years of the war. The Republicans nominated Wilson for the vice-presidency in 1S72, and he was elected; but he died on the 22nd of November 1875 before completing his term of office.

He published, besides many orations, a History of the Anti-Slavery

Measures of the Thirty- Seventh and Thirty-Eighth United States Congresses (1865); Military Measures of the United States Congress (1868); a History of the Reconstruction Measures of the Thirty-Ninth and Fortieth Congresses (1868) and a History of the Rise and Fall of the Slave Power in America (3 vols., 1872-1875), his most important work.

The best biography is that by Elias Nason and Thomas Russell, The Life and Public Services of Henry Wilson (Boston, 1876).

WILSON, HORACE HAYMAN (1786-1860), English orientalist, was born in London on the 26th of September 1786. He studied medicine at St Thomas's Hospital, and went out to India in 180S as assistant-surgeon on the Bengal establishment of the East India Company. His knowledge of

metallurgy caused him to be attached to the mint at Calcutta, where he was for a time associated with John Leyden. He became deeply interested in the ancient language and literature of India, and by the recommendation of Henry T. Colebrooke, he was in 1811 ap- pointed secretary to the Asiatic Society of Bengal. In i8r3 he published the Sanskrit text— with a graceful, if somewhat free, translation in English rhymed verse — of Kalidasa's charming lyrical poem, the Meghaduta, or Cloud-Messenger, lie prepared the first Sanskrit-English Dictionary (1 8 1 9) from materials compiled by native scholars, supplemented by bis own researches. This work was only superseded by the Sanskritwdrterbuch (1853 – 1876) of R. von Roth and Otto Bohtlingk, who expressed their obligations to Wilson in the preface to their great work. Wilson published in 1827 Select Specimens of the Theatre of the Hindus, which contained a very full survey of the Indian drama, transla- tions of six complete plays and short accounts of twenty-three others. His Mackenzie Collection (1828) is a descriptive catalogue of the extensive collection of Oriental, especially South Indian, MSS. and antiquities made by Colonel Colin Mackenzie, now deposited partly in the India Office, London, and partly at Madras. He also wrote a Historical Sketch of the First Burmese War, with Documents, Political and Geographical (1827), a Review of the External Commerce of Bengal from 1813 to 1828 (1830) and a History of British India from 1805 to 1S35, in continuation of Mill's History (1844-1848). He acted for many years as secretary to the committee of public instruction, and superintended the studies of the Sanskrit College in Calcutta. He was one of the staunchest opponents of the proposal that English should be made the sole medium of instruction in native schools, and became for a time the object of bitter attacks. In 1832 the university of Oxford selected Dr Wilson to be the first occupant of the newly founded Boden chair of Sanskrit, and in 1836 he was appointed librarian to the East India Company. He was an original member of the Royal Asiatic Society, of which he was director from 1837 up to the time of his death, which took place in London on the 8th of May i860.

A full list of Wilson's works may be found in an Annual Report of the Royal Asiatic Society for i860. A considerable number of Sanskrit MSS. (540 vols.) collected by Wilson in India are now in the Bodleian Library.

WILSON, JAMES (1742-1798), American statesman and

jurist, was born in or near St Andrews, Scotland, on the 14th of September 1742. He matriculated at the University of St Andrews In 1757 and was

subsequently a student at the universi- ties of Glasgow and Edinburgh. In 1765 he emigrated to America. Landing at New York in June, he went to Philadelphia in the following year and in 1 766-1 767 was instructor of Latin in the college of Philadelphia, later the university of Pennsylvania. Meanwhile he studied law in the office of John Dickinson, was admitted to the bar in 1767, removed first to Reading and soon afterward to Or 1 isle, and rapidly rose to prominence. In August 1774 he published a pamphlet Considerations on the Nature and Extent of the Legislative Authority of the British Parliament, in which he argued that parliament had no constitutional power to legislate for the colonies; this pamphlet strongly influenced members of the Continental Congress which met in September. Wilson was a delegate to the Pennsylvania provincial convention in January 1775, and he sustained there the right of Massa- chusetts to resist the change in its charter, declaring that as the force which the British Government was exercising to compel obedience was " force unwarranted by any act of parliament, unsupported by any principle of the common law, unauthorized by any commission from the crown," resistance was justified by " both the letter and the spirit of the British constitution "; he also, by his speech, led the colonies in shifting the burden of responsibility from parliament or the king's ministers to the king himself. In May 1775 Wilson became a member of the Continental Congress. When a declaration of independence was first proposed in that body he expressed the belief that a majority of the people of Pennsylvania were in favour of it, but as the instructions of the delegates from Pennsylvania and some of the other colonies opposed such a declaration, he urged postponement of action for the purpose of giving the constituents in those colonies an opportunity of removing such instructions. When independence was finally declared the unanimity of all the colonies except New York had been obtained. Receiving a commission as colonel in May 1775, Wilson raised a battalion of troops in his county of Cumberland, and for a short time in 1776 he took part in the New Jersey campaign, but his principal labours in 1776 and 1777 were in Congress. In January 1776 he was appointed a member of a committee to prepare an address to the colonies, and the address was written by him; he served on a similar committee in May 1777, and wrote the address To the Inhabitants of the United States, urging their firm support of the cause of Independence; he drafted the plan of treaty with France together with instructions for negotiating it; he was a member of the Board of War from its establishment in June 1776 until his retirement from Congress in September 1777; from January to September 1777 he was chairman of the Com- mittee on Appeals, to hear and determine appeals from the courts of admiralty in the several states; and he was a member of many other important committees. In September 1777 the political faction in his state which had opposed Independence again came into power, and Wilson was kept out of Congress until the close of the war; he was back

again, however, in 1783, and 1785-1786, and, advocating a sound currency, laboured in co-operation with Robert Morris to direct the financial policy of the Confederation.

Soon after leaving Congress in 1777 Wilson removed to Annapolis, Maryland, to practise law, but he returned to Phila- delphia in the following year. In 177Q he was commissioned Advocate-General for France, and in this capacity he represented Louis XVI. in all claims arising out of the French alliance until the close of the war. In 1 781-1782 he was the principal counsel for Pennsylvania in the Wyoming Valley dispute with Connecticut, which was decided in favour of Pennsylvania in December 17S2 by an arbitration court appointed by Congress. Wilson was closely associated with Robert Morris in organizing

the Bank of North America, and in the Act of Congress incorpor- ating it (December 31, 1781) he was made one of the directors. In 1782 the legislature of Pennsylvania granted a charter to this bank, but three years later it passed an act to repeal it. Wilson responded with a famous constitutional argument in which he sustained the constitutionality of the bank on the basis of the implied powers of Congress.

As a constructive statesman Wilson had no superior in the Federal Convention of 17S7. He favoured the independence of the executive, legislative and judicial departments, the supremacy of the Federal government over the state governments, and the election of senators as well as representatives by the people, and was opposed to the election of the President or the judges by Congress. His political philosophy was based upon implicit confidence in the people, and he strove for such provisions as he thought would best guarantee a government by the people. When the constitution had been framed Wilson pronounced it " the best form of government which has ever been offered to the world/' and he, at least, among the framers regarded it not as a compact but as an ordinance to be established by the people. During the struggle for ratification he made a speech before a mass meeting in Philadelphia which has been characterized as " the ablest single presentation of the whole subject." In the Pennsylvania ratification convention (November 21 to December 1ˆ, 1787) he was the constitution's principal defender. Having been appointed professor of law in the university of Pennsylvania in 1790, he delivered at that institution in 1790- 1791 a course of lectures on public and private law; some of these lectures, together with his speeches in the Federal convention, before the mass meeting in Philadelphia, and in the Pennsylvania ratification convention, are among the most valuable commen- taries on the constitution.

Wilson was a delegate to the state constitutional convention of 1 789-1

790, and a member of the committee which drafted the new constitution. In 1789 Washington appointed him an associate justice of the United States Supreme Court, and in 1793 he wrote the important decision in the case of Chiselm v. Georgia, the purport of which was that the people of the United States constituted a sovereign nation and that the United States were not a mere confederacy of sovereign states. He continued to serve as associate justice until his death, near Edenton, North Carolinaˆ on the 28th of August 1798.

Wilson's Works, consisting principally of his law lectures and a few speeches, were published under the direction of his son, Bird Wilson (3 vols v Philadelphia, 1803-1804). A revised edition in two volumes with notes by James D. Andrews was published in Chicago in 1S96. See also Documentary History of the Constitution of the United States of America, vols. i. and iii. (Washington, 1894); J. B. McMaster and F. D. Stone, Pennsylvania and the Federal Constitution, 1787-1788 (Philadelphia, 1888); L. H. Alexander (ed.), James Wilson (Philadelphia, 1908), a biographical sketch entitled " James Wilson, Nation-Builder," by L. H. Alexander, in the Green Bag, vol. 19 (1907); "James Wilson, Patriot, and the Wilson Doctrine," by Alexander, in the North American Review, vol. 183 (1906); Justice J. M. Harlan, "James Wilson and the Formation of the Constitution," in the American Law Review, vol. 34; B. A. Konkle et al. "The James Wilson Memorial," in the American Law Register, vol. 55 (1907).

WILSON, JAMES (1835-), American administrator, was born in Ayrshire, Scotland, on the 16th of August 1835. In 1851 he was taken by his parents to America, where they originally settled in Connecticut, but in 1855 removed to Tama county Iowa. He studied at Iowa College, and in 1861 became a farmer. He was a Republican member of the state House of Representa- tives in 1868-1873, and was its speaker in 1872-1873, and he was a member of the National House of Representatives from 1873 to 1877 and again in 1883-1885. From 1870 to 1874 he was a regent of the State University of Iowa; in 1 877-1883 was a member of the Iowa State Railway Commission, and from 1890 to 1897 was professor of agriculture at the Iowa Agricultural College, at Ames, and director of the State Agricultural Experi- ment Station. In March 1897 he became Secretary of Agriculture in President McKinley's Cabinet and served into President Taft's administration, holding office longer than any other cabinet officer since the organization of the government.

WILSON, JOHN (1627-1696), English playwright, son of Aaron Wilson, a royalist divine, was born in London in 1627. He matriculated from Exeter College, Oxford, in 164.4, and entered Lincoln's Inn two years later, being called to the bar in 1649. His unswerving support of the royal pretensions recommended him to James, duke of York, through whose influence he became Recorder of Londonderry about 1681. Hi Discourse of Monarchy (1684), a tract in favour of the succession of the duke of York, was followed (1685) by a " Pindarique " on his coronation. In 1688 he wrote Jus regium Coronae, a learned defence of James's action in dispensing wilh the penal statutes. He died in obscurity, due perhaps to his political opinions, in 1696. Wilson was the author of four plays, showing a vigorous and learned wit, and a power of character-drawing that place him rather among the followers of Ben Jonson than with the Restoration dramatists.

The Cheats (written in 1662, printed 1664, 1671, &c.) was played with great success in 1663. John Lacy found one of his best parts in Scruple, a caricature of a Presbyterian minister of accommodating morality. Andronicus Comnenius (1664), a blank verse tragedy, is based on the story of Andronicus Comnenus as told by Peter Heylin in his Cosmography. It contains a scene between the usurper and the widow of his victim Alexius which follows very closely Shake- speare's treatment of a parallel situation in Richard III. _ The Projectors (1665), a prose comedy of London life, is, like Moliere's L'Aiare, founded on the Aulularia of Plautus, but there is no evidence that Wilson was acquainted with the French play. Belphegor, or the Marriage of the Devil; a Tragi-comedy (1690), treats of a theme familiar to Elizabethan drama, but Wilson took the subject from the Belphegor attributed to Machiavelli, and alludes also to Straparola's version in the Notii. He also translated into English Erasmus's Encomium Moriae (1668).

See The Dramatic Works of John Wilson, edited with intro- duction and notes by James Maidment and W. H. Logan in 1874 for the " Dramatists of the Restoration " series.

WILSON, JOHN (1785-1854), Scottish writer, the Christopher North of Blackwood's Magazine, was born at Paisley on the 18th of May 1785, the son of a wealthy gauze manufacturer who died when John was eleven years old. He was the fourth child, but the eldest son, and he had nine brothers and sisters. 1 He was only twelve when he was first entered at the university of Glasgow, and he continued to attend various classes in that university for six years, being for the most part under the tutorship of Professor George Jardine, with whose family he lived. In these six years Wilson " made himself " in all ways, acquiring not inconsiderable scholarship, perfecting himself in all sports and exercises, and falling in love with a certain " Margaret," who was the object of his affections for

several years.

In 1803 Wilson was entered as a gentleman commoner at Magdalen College, Oxford. Few men have felt more than he the charm of Oxford, and in much of his later work, notably in the essay called " Old North and Young North," he has expressed his feeling. But it does not appear that his Magdalen days were altogether happy, though he perfected himself in " bruising," pedestrianism and other sports, and read so as to obtain a brilliant first class. His love affairs did not go happily, and lie seems to have made no intimate friends at his own college and few in the university. He took his degree in 1807, and found himself at twenty-two his own master, with a good income, no father or guardian to control him, and apparently not under any of the influences which in similar circumstances generally make it necessary for a young man to adopt some profession, if only in name. His profession was an estate on Windermere called Elleray, ever since connected with his name. Here he built, boated, wrestled, shot, fished, walked and otherwise diverted himself for four years, besides composing or collecting from previous compositions a considerable volume of poems, published in tRt2 as the Isle of Palms. Here he became intimate with Wordsworth, Coleridge, Southey and De Quincey.

1 His youngest brother was James Wilson " of Woorlville " (1795-1856), the zoologist. He purchased, on behali of Edinburgh University, in Paris, the Dufresne collection of birds, and arranged them on his return to Scotland. He contributed to Blackwood's Magazine and to the North British Quarterly Review, and wrote many ol the articles on natural history in the seventh edition of the Encyclopaedia Britannica.

He married in 181 1 Jane Penny, a Liverpool lady of good family, and four years of happy married life at Elleray succeeded; then came the event which made a working man of letters of Wilson, and without which he would probably have produced a few volumes of verse and nothing more. The major part of his fortune was lost by the dishonest speculation of an uncle, in whose hands Wilson had carelessly left it. But this hard fate was by no means unqualified. His mother had a house in Edinburgh, in which she was able and willing to receive her son and his family; nor had he even to give up Elleray, though henceforward he was not able constantly to reside in it. He read law and was called to the Scottish bar, in 1815, still taking many a sporting and pedestrian excursion, and publishing in 1816 a second volume of poems, The City of the Plague. In 1817, soon after the founding of Blackwood's Magazine, Wilson began his connexion with that great Tory monthly by joining with J. G. Lockhart in the October number, in a satire called the Chalice Manuscript, in the form of biblical parody, on the rival Edinburgh Review, its publisher and his contributors. From this time he was the principal writer for Blackwood's, though never its nominal

editor, the publisher retaining a certain supervision even over Lockhart's and " Christopher North's " contributions, which were the making of the magazine. In 1822 began the series of Nodes Ambrosianae, after 1825 mostly Wilson's work. These are discussions in the form of convivial table-talk, giving occasion to wonderfully various digressions of criticism, description and miscellaneous writing. From their origin it necessarily followed that there was much ephemeral, a certain amount purely local, and something wholly trivial in them. But their dramatic force, their incessant flashes of happy thought and happy expression, their almost incompar- able fulness of life, and their magnificent humour give them all but the highest place among genial and recreative literature. " The Ettrick Shepherd," an idealized portrait of James Hogg, one of the talkers, is a most delightful creation. Before this, Wilson had contributed to Blackwood's prose tales and sketches, and novels, some of which were afterwards published separately in Lights and Shadows of Scottish Life (1822), The Trials of Margaret Lyndsay (1823) and The Foresters (1825); later appeared essays on Spenser, Homer and all sorts of modern subjects and authors.

The first result of his new occupation on Wilson's general mode of life was that he left his mother's house and established himself (1819) in Ann Street, Edinburgh, with his wife and family of five children. The second was much more unloukcd for, his election to the chair of moral philosophy in the university of Edinburgh (1820). His qualifications for the post were by no means obvious, even if the fact that the best qualified man in Great Britain, Sir William Hamilton, was also a candidate, be left out of the question. But the matter was made a political one; the Tories still had a majority in the town council; Wilson was powerfully backed by friends, Sir Walter Scott at their head; and his adversaries played into his hands by attacking his moral character, which was not open to any fair reproach. Wilson made a very excellent professor, never perhaps attaining to any great scientific knowledge in his subject or power of expounding it, but acting on generation after generation of students with a stimulating force that is far more valuable than the most exhaustive knowledge of a particular topic. His duties left him plenty of time for magazine work, and for many years his contributions to Blackwood were extraordinarily voluminous, in one year (1834) amounting to over fifty separate articles. Most of the best and best known of them appeared between 1825 and 1835.

The domestic events of Wilson's life in the last thirty years of it may be briefly told. He oscillated between Edinburgh and Elleray, with excursions and summer residences elsewhere, a sea trip on board the Experimental Squadron in the Channel during the summer of 1832, and a few other unimportant diver- sions. The death of his wife in 1837 was an exceedingly

severe blow to him, especially as it followed within three years that of his friend Blackwood. For many years after, his literary work

was intermittent, and, with some exceptions, not up to the level of his earlier years. Late in 1850 his health showed definite signs of breaking up; and in the next year he resigned his professorship, and a Civil List pension of £300 a year was conferred on him. He died at Edinburgh on the 3rd of April

1854.

Only A very small part of Wilson'? extensive work was published in a collected and generally accessible form during his lifetime, the chief and almost sole exceptions being the two volumes of poems referred to, the Lights and Shadows of Scottish Life, and the Re- creations of Christopher North (1842), a selection from his magazine articles. These volumes, with a selected edition of the Nodes Ambrosianae in four volumes, and of further essays, critical and imaginative, also in four volumes, were collected and reissued uniformly after his death by his son-in-law, Professor J. F. Ferrier. The collection is very far from exhaustive; and, though it, un- doubtedly contains most of his best work and comparatively little that is not good, it has been complained, with some justice, that the characteristic, if rather immature, productions of his first eight years on Blackwood are almost entirely omitted, that the Nodes are. given but in part, if in their best part, and that at least three long, important and interesting series of papers, less desultory than is his wont, on " Spenser," on " British Critics " and the set called " Dies Roreales," have been left out altogether. Wilson's char- acteristics arc, however, uniform enough, and the standard edition exhibits them sufficiently, if not exhaustively. His poems may be dismissed at once as little more than interesting. . They would probably not have been written at all if he had not been a young man in the time of the full flood of the Lake school influence. His prose tales have in some estimates stood higher, but will hardly survive the tests of universal criticism. It is as an essayist and critic of the most abounding geniality, if not genius, of great acu to- ne ss, of extraordinary eloquence and of a fervid and manifold sympathy, in which he has hardly an equal, that Christopher North will live. His defects lay in the directions of measure and of taste properly so called, that is to say, of the modification of capricious likes and dislikes by reason and principle. He is constantly ex- aggerated, boisterous, wanting in refinement. But these are the almost necessary defects of his qualities of enthusiasm, eloquence and generous feeling. The

well-known adaptation of phrase in which he did not recant but made up for numerous earlier attacks on Leigh Hunt, " the Animosities are mortal, but the Humanities live for ever," shows him as a writer at his very best, but not without a little characteristic touch of grandiosity and emphasis. As a literary critic, as a sportsman, as a lover of nature and as a convivial humorist, he is not to be shown at equal advantage in miniature; but almost any volume of his miscellaneous works will exhibit him at full length in one of these capacities, if not in all.

See Christopher North, by Mrs Mary Cordon, his daughter (1862) ; and Mrs OHphant, Annals of a Publishing House; William Black- wood and his So?is (1S97).

WILSON, JAMES HARRISON (1837-), American cavalry soldier, was born at Shawneetown, Illinois, in 1837 and entered West Point military academy in 1855, graduating in i860. He was appointed to the engineer branch of the United States army, served in the Port Royal and Fort Pulaski operations, being breveted major for his gallant conduct at Pulaski, "was on M'CleDan's staff at Antietam as a lieutenant-colonel in 1862, and as a topographical engineer on the headquarters staff of the Army of the Tennessee during the Vicksburg and Chattanooga campaigns. His services in the intricate operations before Vicksburg were rewarded by promotion to brigadier-general U.S.V. In 1S64 he was appointed to command a division in Sheridan's cavalry corps, and played a distinguished part in the cavalry operations of the 4th to 6th of May during the battle of the Wilderness (for which he was breveted colonel U.S.A.), the so-called Richmond Raid, the operations on the Totopot.omoy, &c. Later in 1864 he commanded the cavalry of Thomas's army in Tennessee. During the closing operations of the war he led a cavalry expedition on a grand scale through the South-western states, occupying Selma, Montgomery and Macon, and capturing at different times nearly 7000 prisoners, including President Davis. He was promoted major-general of volunteers and breveted major-general U.S.A. shortly before the end of the war. Returning to duty in the regular army as a lieutenant- colonel of infantry for some years, he resigned in 1870 and engaged in engineering and railway construction. In 1898, during the Spanish-American War, he was appointed a major- general in the new volunteer army, and took part in the operations in Porto Rico. He served in the China expedition of igoo as a

brigadier- general and in iqoi was placed on the retired list as a brigadier-general U.S.A.

WILSON, RICHARD (1714-1782), English landscape painter, was born at Penegoes, Montgomeryshire, where his father was a clergyman, on the 1st of August 17 14. His early taste for art was observed by a relative of his

mother, Sir George Wynne, who in i72g sent him to London to study under Thomas Wright, a little-known portrait painter of the time, by whom he was instructed for six years. He then started on his own account, and was soon in a good practice. Among his commissions was a full-length of the prince of Wales and the duke of York, painted for their tutor, the bishop of Norwich. Examples of his portraits may be studied in Greenwich Hospital, in the Garrick Club, and in various private collections. In 1749 Wilson visited Italy, where he spent six years. He had previously executed some landscapes, but it was now that the advice of Zuccarelli and Joseph Vernet decided him to adopt this department of art exclusively. He studied Claude and Poussin, but retained his own individuality, and produced some admirable views of Rome and the Campagna. In 1755 he returned to England, and became one of the first of English, landscape painters. " Niobe," one of his most powerful works, was exhibited at the Society of Artists in 1760. On the establishment of the Royal Academy in 1768 he was appointed one of the original members, and he was a regulai contributor to its exhibitions till 1780. He frequently executed replicas of his more important subjects, repeating some of them several times; in the figures which he introduced in his landscapes he was occasionally assisted by Mortimer and Hayman. During his lifetime his landscapes were never widely popular; his temper was consequently embittered by neglect, and so impoverished was he that he was obliged to seclude himself in an obscure, half-furnished room in Tottenham Court Road, London. In 1776, however, he obtained the post of librarian to the Academy; and by the death of a brother he acquired a small property near Llanferras, Denbigh- shire, to which he retired to spend his last days, and where he died suddenly in May 1782. After his death his fame increased, and in 1814 about seventy of his works were exhibited in the British Institution. The National Gallery, London, contains nine of his landscapes.

The works of Wilson are skilled and learned compositions rather than direct transcripts from nature. His landscapes are treated with great breadth, and with a power of generalization which occasionally led to a disregard of detail. They are full of classical feeling and poetic sentiment; they possess noble qualities of colour, and of delicate silvern tone; and their handling is vigorous and easy, the work of a painter who was thoroughly master of his materials.

See Studies and Designs by Richard Wilson, done at Rome in the year if $2 (Oxford, 1S11); T. Wright, Some Account of the Life of Richard Wilson (London, 1824); Thomas Hastings, Etchings from the Works of Richard Wilson, with some Memoirs of his Life (London, 1825). Many of Wilson's best works were reproduced by Woollett and other engravers of the time.

WILSON, ROBERT (d. 1600), English actor and playwright, was a

comedian in the earl of Leicester's company, beginning with its establishment in 1574, and from 1583 to 1588 in the Queen's and afterwards in Lord Strange's company. He wrote several morality plays. In his Three Ladies of London (1584) he has the episode of the attempt of the Jew to recover his debt, afterwards adapted by Shakespeare in The Merchant of Venice. Another Robert Wilson (1579-1610), probably his son, was one of Henslowe's dramatic hack-writers.

WILSON, SIR ROBERT THOMAS (1777-1849), British general, was a son of the painter Benjamin Wilson (1721-1788), and obtained a commission in the 15th light dragoons in 1794, taking part in the famous charge at Villers-en-Cau chics. He was one of eight officers who received the emperor's commemora- tion medal (of which only nine were struck), the order of Maria Theresa and the dignity of Freiherr of the Empire. In the campaigns of Tourcoing and Tournay and in the retreat through Holland, Wilson repeatedly distinguished himself. In 1796 he became captain by purchase, in 1798 he served as a

brigade-major during the suppression of the Irish Rebellion, and in 179Q was with the 1 5th in the Helder-expedition. Having in 1S00 purchased a majority in a regiment serving in the Mediterranean he was sent on a military mission to Vienna in that year, but returned to lake part in the battle of Alexandria. In 1802 he published an account of the expedition to Egypt, which was shortly afterwards translated into French, and created a con- siderable impression by its strictures vpon French officers' barbarity. Wilson shortly afterwards produced a translation of General Regnier's work on the same campaign, with comments. Shortly afterwards Wilson published a work on the defects of the British army system which is remembered as the first protest against flogging. In 1804 he bought the colonelcy of the 19th light dragoons, in 1805 exchanged into the 20th, and in 1806 served with the 20th in the Cape of Good Hope expedition. In 1S07 he was employed as military attache of a mission to the king of Prussia, and so was present at Eylau, Heilsberg and Friedland, of which battles he published an account in 1810. Returning to England with despatches from St Petersburg he reached London before the Russian declaration of war and so gave the admiralty twenty-four hours' start in the operation at sea. In the early part of the Peninsular War Wilson raised and commanded the Lusitanian Legion, an irregular Portuguese corps which did good service in 1808 and i8og and formed the start ing-point of

the new Portuguese army organized by Beresf ord in 1 8 10. His services wore rewarded by knighthood, a colonelcy in the British army and the Portuguese order of the Tower and Sword. In 1S11, with the rank of brigadier-general, he went to Turkey, and in 1812 he travelled thence to Russia, where he was attached to Kutuzov's headquarters during the pursuit of the retreating French, being present at Malo-Jaroslavietz, Vyazma and Krasnoye. His account of the campaign, published in i860, is one of the most valuable works on these events. lie continued to serve with the Russian army during 1813 and distinguished himself at Lutzen and Bautzen, the emperor Alexander decorating him with the knighthood of the St George order on the battlefield. He was promoted major-general in the British army about the same time. He was at Dresden, Kulm and Leipzig, and distinguished himself at the last great battle so much that Schwarzenberg writing to the British ambassador at Vienna attributed to Wilson's skill a large part in the successful issue of the battle. But his services in the counsels of the Allies were still more important on account of the confidence reposed in him personally by the allied sovereigns. But Castlereagh, treating Wilson as a political opponent, removed him to the minor theatre of Italy, in spite of the protests of the British ambassador. With the Austrian Army of Italy he served through the campaign of 1814. In 1816 after Waterloo he contrived the escape of one of Napoleon's supporters, condemned to death by the Restoration government, and was imprisoned for three months with his comrade in this adventure, Captain Hcly- Hutchinson (3rd earl of Donoughmorc), and censured by the commander-in-chief in a general order. In 1817 he published The Military and Political Power oj Russia, in 1818 he became member of parliament for Southwark and in 182 1 he interposed between the mob and the troops on the occasion of Queen Caroline's funeral, for which his political opponents secured his dismissal from the army, without compensation for the price oE his commissions. He took an active part in politics on the opposition side, and also spent some time in Spain during the wars of 1822-23. On the accession of William IV., his political services in the formation of the Canning ministry of 1827 were rewarded by reinstatement in the army with the rank of lieutenant-general. But, disapproving of the Reform bill, he resigned his place in the Commons. He was promoted general in 1841 and appointed governor of Gibraltar in 1842. He died in London on the gth of May 1849.

Besides the works mentioned above, Wilson left a diary of his travels and experiences in 1812-1814, published in 1861. and an incomplete autobiography, published two years later.

WILSON, THOMAS (c. 1525-1581), English statesman and critic, the son of Thomas Wilson of Strubby, in Lincolnshire,

was born about 1525. He was educated at Eton and King's College, Cambridge, where he joined the school of Hellenists to which Cheke, Thomas Smith, Walter Haddon and others belonged . He graduated B.A. in 1546 and M.A. in 1549. In 1551 he produced, in conjunction with Walter Haddon, a Latin life of Henry and Charles Brandon, dukes of Suffolk. His earliest work of importance was The Rule of Reason, conteinynge the Arte oj Logique set forth inEngliske (15 5 1) , which was frequently reprinted. It has been maintained that the book on which Wilson's fame mainly rests, The Arte oj Rfietorique, was printed about the same time, but this is probably an error: the first edition extant is dated January 1553. It is the earliest systematic work of literary criticism existing in the English language. Wilson threw in his lot with the Dudley family, and when they fell, he fled to the Continent. He was with Sir John Chckc in Padua in 1555-1557, and afterwards at Rome, whither in 1558 Queen Mary wrote, ordering him to return to England to stand his trial as a heretic. He refused to come, but was arrested by the Roman Inquisition and tortured. He escaped, and fled to Ferrara, but in 1560 he was once more in London. Wilson became Master of St Katherine's Hospital in the Tower, and entered parliament in January 1563. In 1570 he published a translation, the first attempted in English, of the Olynthiacs and Philippics of Demosthenes, on which he had been engaged since 1556. His Discourse -upon Usury appeared in 1572. From 1574 to 1577, Wilson, who had now become a prominent person in the diplomatic world, was principally engaged on embassies to the Low Countries, and on his return to England he w r as made a privy councillor and sworn secretary of grate; Walsingham was his colleague. In 1580, although he was not in holy orders, Queen Elizabeth made Wilson dean of Durham. He died at St Katherine's Hospital on the 16th of June 1581, and was buried next day, " without charge or pomp," at his express wish. The Arte oj Rhetorique gives Wilson 'a high place among the earliest artificers of English style; and it is interesting to see that he was opposed to pedantry of phrase, and above all to a revival of uncouth medieval forms of speech, and encouraged a simpler manner of prose writing than was generally appreciated in the middle of the 16th century.

WILSON, THOMAS (1663-1755), English bishop, was born at Burton, Cheshire, and educated at Trinity College, Dublin. He was ordained in i686 ? and became curate at Newchurch Kenyon, Lancashire. In 1602 he was appointed chaplain to the oth earl of Derby, wdio in 1697 offered him the bishopric of Sodor and Man. He was consecrated bishop in 1698. His episcopate was marked by a number of reforms in the Isle of Man. New churches were built, libraries founded and books were printed in Manx, his Principles and Duties oj Christianity (London, 1707) being the first book published in that language. He also encouraged farming, and set the

example of planting fruit and forest trees. In order to restore discipline in the island he drew up in 1704 his well-known Ecclesiastical Constitutions. The judgments of his courts often brought him into conflict with the governors of the island, and in 1722 he was even im- prisoned for a time in Castle Rushen. In 1737, however, the jurisdiction of the civil and spiritual courts was better defined by new statutes, the lordship of the island having passed in 1736 to James Murray, 2nd duke of Atholl, with whom Wilson had no personal difficulties. In 1749 on Zinzendorf's invitation he accepted the title of Antistes — a synonym for bishop — in the Moravian Church.

A life of Wilson, by John Keble, was published with his Works (Oxford, 1847-1863). The Sodor and Man Theological School in the Isle of Man is called in his memory the Bishop Wilson School.

WILSON, SIR WILLIAM JAMES ERASMUS, generally known as Sir Erasmus Wilson (1809-1884), British surgeon and philanthropist, was born in London on the 25th of November 1S09, studied at St Bartholomew's Hospital in London, and at Aberdeen, and early in life became known as a skilful operator and dissector. It was his sympathy with the poor of London and a suggestion from Thomas Wakley of the Lancet, of which Wilson acted for a time as sub-editor, which first led him to take

up skin diseases as a special study. The horrible cases of scrofula, anaemia and blood-poisoning which he saw made him set to work to alleviate the sufferings of persons so afflicted, and he quickly established a reputation for treating this class of patient. It was said that he cured the rich by ordering them to give up luxuries; the poor, by prescribing for them proper nourishment, which was often provided out of his own pocket. In the opinion of one of his biographers, we owe to Wilson in great measure the habit of the daily bath, and he helped very much to bring the Turkish bath into use in Great Britain. He wrote much upon the diseases which specially occupied his attention, and his books, A Healthy Skin and Student's Book of Diseases of the Skin, though they were not received without criticism at the time of their appearance, long remained text- hooks of their subject. He visited the East in order to study leprosy, Switzerland that he might investigate the causes of goitre, and Italy with the purpose of adding to his knowledge of the skin diseases affecting an ill- nourished peasantry. He made a large fortune by his successful practice and by skilful investments, and, since he had no family, he devoted a great deal of his money to charitable and educational purposes. He founded in 1869 the chair and museum of dermatology in the Royal College of Surgeons, of which he was

chosen president in 1 88 1, and which just before his death awarded him its honorary gold medal, founded in 1800 and only six times previously awarded. He also founded a professorship of pathology at Aberdeen University. After the death of his wife the bulk of his property, some £200,000, went to the Royal College of Surgeons. In 1878 he earned the thanks of the nation, upon different grounds, by defraying the expense of bringing the Egyptian obelisk called Cleopatra's Needle from Alexandria to London, where it was erected on the Thames Embankment. The British government had not thought it worth the expense of transportation. He was knighted by Queen Victoria in 1881, and died at Westgate-on-Sea on the 7th of August 1884.

WILSON, WOODROW (1856-), American educationist, was born in Staunton, Virginia, on the 28th of December 1856. He graduated at Princeton in 1879, studied law at the University of Virginia in 1870-1880, practised law in Atlanta in 1882-1883, and received the degree of Ph.D. at Johns Hopkins University in 1886, his thesis being on Congressional Government (1885; and often reprinted). He was associate professor of 'history and political economy at Bryn Mawr in 1885-1888 and at Wcsleyan University in 1888-1890; professor of jurisprudence and political economy at Princeton in 1890-1895, of juris- prudence in 1895-1897, and subsequently of jurisprudence and politics; and in 1902 he became president of Princeton Univer- sity, being the first layman to hold that office. He retired in 1910, and was elected Democratic governor of New Jersey. His administration of the University was marked by the intro- duction of the "preceptorial" system, by the provision of dormitories and college eating-halls for members of the lower classes, and by the development of the graduate school.

He wrote: The State: Elements of Historical and Practical Politics, Sketch of Institutional History o-nd Administration (1889); The. State and Federal Government of the United States (1891) ; Division and Reunion, 1829-188Q (1893) in the " Epochs of American History " series; An Old Master and Other Political Essays (1893); Mere Literature and Other Essays (1893) ; George Washington (1896), an excellent biography; the popular History of the American People (1902} ; Constitutional Government in the United States (1908), being Columbia University Lectures; and in the seventh volume of the Cambridge Modern History the chapter on "State Rights. 1850-1860."

WILTON, a market town and municipal borough in the Wilton parliamentary division of Wiltshire, England, 86 m. W. by S. of London, on the London & South- Western and Great Western railways. Pop. (1001) 2203. It lies among the pastures beside the rivers Nadder and Wylye. The church of St Mary and St Nicholas was built in 1844 by Lord Herbert of

Lea, in a Roman- esque style, richly adorned with marbles and mosaics. The central entrance is upheld by twisted columns based upon stone lions. The belfry is detached. Wilton House, a little to the south, was founded by William Herbert, first earl of Pembroke

by the second creation, on the estates of the dissolved convent which were granted him by Henry VIII.

Tradition says that Shakespeare and his company played hert before James I. in 1603, and the house is rich in memories of Sir Philip Sidney the poet and soldier, of the artists Holbein and Vandyck, of the dramatists Jonson and Massinger, whose fathei was steward here, and of Inigo Jones the architect. The first folio edition of Shakespeare was dedicated, seven years after the poet's death, to the third earl and his brother. In style Wilton House is Italian of the 16th century, with a porch added by Holbein. The garden front was rebuilt and other changes made by the advice of Charles I., a frequent visitor; and many subsequent alterations were made. The art collections include the marbles gathered together by the eighth earl.

Carpet-making forms the main industry of Wilton; the most famous fabrics being those known as Wilton carpets; Saxony carpets made of short-staple wool; and the rich and durable Axminsters, long woven by hand at Axminster in Devonshire. It is also an important centre for the sale of sheep. The town is governed by a mayor, 4 aldermen and 12 councillors. Area, 1915 acres.

A chantry was founded here about a.d. 800, afterwards changed into a priory of Benedictine sisters, and refounded by Alfred. In 968 Wulftrude, a mistress of King Edgar, became abbess; and the same office was declined by her daughter Edith, who died at twenty-three. Miracles, it was said, were worked by Edith's remains, and she became patron saint of the convent, which afterwards gave shelter to many noble ladies and survived until the Dissolution. Its abbess was a baroness of England. Antiquaries have seen in Wilton the capital of a British kingdom. It was certainly the chief town of the Wilsaetas, or men of Wilts, whom Cynric the Saxon leader crushed in 556. It afterwards became a residence of the Wessex kings; and here, in 871, Alfred was severely defeated by the Danes. Wilton was burned in 1003 by Sweyn, the Danish king. After the Conquest it ranked among the richest of royal boroughs. In 1141 Queen Matilda celebrated Easter here with great pomp, and two years later, Stephen, who came to found a castle, was driven off by her adherents. The prosperity of Wilton began to fail when Icknield Street, the great highway of commerce, was diverted to pass through Salisbury in 1224; and its decline was hastened by the plague, by which a third of the townsfolk were swept away in 1349.

Wilton (Wyllon, Wiltune) was a seat of the West Saxon kings and a prosperous town until the removal thence in 1075 of the seat of the bishop of Sherborne to Sarum. The excessive number of markets held at the latter town in the 13th century caused its further decline into a poor and unimportant place. Sweyn burnt and sacked it in 1003, consequently under Edward the Confessor it rendered only £22. However, Domesday presents it as a valuable royal borough held in farm by the burgesses for £50. From 1204 onwards Wilton figures in various grants. Richard, earl of Cornwall, obtained it from Henry III., and William, earl of Pembroke, finally from Elizabeth. The first charter given by Henry I. (probably in nor) granted franchises to the burgesses of the merchant gild and company of Wilton as enjoyed by London and Winchester, and was confirmed by succeeding monarchs from Henry II, to Henry VI. The corpora- tion consisted in 1350 of a mayor, recorder, 5 aldermen, 3 capital burgesses, 11 common cduncilmen and other officers. the mayor being the returning officer. Two members were returned to parliament from 1293 to 1S32 and one from 1832 to 1885, at which date Wilton lost its separate representation.

In 1414 Henry V. granted a fair on July 21 and 22. This was cancelled in 1416 and another substituted on July 22 and the three preceding days. Two yearly fairs were obtained by the burgesses from Henry VII. for four days from April 23 and September 1. In 1792 the fair days w r ere November 13, September 12 and May 4; the two latter arc still held, that in September being one of the largest sheep fairs in the west of England. Henry III. granted three markets weekly on Monday, Wednesday and Friday, and Henry VI., in 1433, one on Wednesday. The latter was still held in 1825, but had ceased

WILTSHIRE [Wilts], a south-western county of England, bounded N.W. and N. by Gloucestershire, N.E. and E. by Berkshire, S.E. by Hampshire, S.W. and S. by Dorsetshire,

and W. by Somersetshire. The area is i374‘9 sq- rn- A great upland covers two-thirds of the county, comprising, in the north-east, Marlborough Downs, with Savernake Forest; in the centre, the broad undulating sweep of Salisbury Plain; and in the south, the more varied hills and dales of the Nadder watershed, the vale of Chalk and Cranborne Chase. Large tracts of the Chalk arc over 600 ft. above the sea, rising in many parts into steep and picturesque escarpments. Several peaks attain an altitude of 900 ft., and Inkpcn Beacon, on the borders of Berkshire, Wiltshire and Hampshire, reaches ion ft. Scattered in thousands over the downs lie huge blocks of

silicious Tertiary grits, called sarsen stones or grey wethers, which were used by the primitive builders of Stonehenge and Avebury. The underlying Greensand is exposed in the deeper valleys of the Chalk, such as the vale of Pewsey, dividing Salisbury Plain from Marlborough Downs, and the vale of Chalk, dividing the Nadder westward from the heights of Cranborne Chase. One of the most charming features of the county is its fertile and well-wooded valleys. Three ancient forests remain: Cranborne Chase, which extends into Dorset, was a royal deer-park as early as the reign of John, and, like Savernake Forest, contains many noble old oaks and beeches. The main part of the New Forest belongs to Hampshire; but No Man's Land and Hampworth Common, its outlying heaths and coppices, encroach upon the south-eastern corner of Wilts. Bentley Wood, 5 m. E. of Salisbury, and the Great Ridge and Grovely Woods between the Nadder and Wylye, are fine uplands parks. There is no great sheet of water, but the reservoir near Swindon, and the lakes of Longleat, Stourton and Fon thill in the south-west oT Earl Stoke near Westbury, and of Bowood, Corsham and Seagry near Chippen- ham, deserve mention for the beauty of their scenery. The upper reaches of the Thames skirt the north-eastern border, and three other considerable rivers drain the Wiltshire Downs. The Kennet, rising west of Marlborough, winds eastward into Berkshire and meets the Thames at Reading. The Lower or Bristol Avon flows from its source among the Cotteswolds in southern Gloucestershire, past Malmesbury, Chippenham, Melksham and Bradford, where it curves north-eastward into Somerset, finally falling into the Bristol Channel. Besides many lesser tributaries it receives from the south the Frome, which forms for about 5 m. the boundary between Wilts and Somerset. The East or Christchurch Avon, which rises near Bishops Cannings in the centre of the county, flows east and south into Hampshire, and enters the sea at Christchurch. Close to Salisbury it is joined by the united streams of the Nadder and the Wylye; by the Ebble, which drains the vale of Chalk; and by the Bourne, which flows south by west from its head near Ludgershall.

Geology. — As has been said, about two-thirds of the surface of Wilts is occupied by a great Chalk upland. Cropping out from beneath the Chalk is a fringe of the Selbornian — Upper Greensand and Gault — the former is well exposed in the vale of Pewsey, west of Devizes, and along the margins ot the vale of Wardour; it forms a broad, hilly tract from Mere through Stourton to Warminster. The Gault Clay runs regularly at the foot of the Upper Greensand ; it is excavated in several places for brick-making. The Lower Greensand, which oversteps the underlying formations, appears from beneath the Gault at Poulshot and follows the same line of outcrop northwards; a small outlier at Seend is worked for the iron it contains. About one-third of the county lying on the north-west side of the Chalk downs, including a portion of the vale of the White Horse, is occupied by

Jurassic rocks. The Upper Lias—the oldest formation in the county — forms the floor of the valley near Box; it is followed by the overlying Inferior Oolite and Fuller's Earth. Then succeeds the Great Oolite Series, which includes the famous building-stones of Bath, quarried at Winsley Down, near Bradford, and at Box, Corsham Down and other places in the neigh- bourhood. Above the freestones near Bradford comes the Bradford clay, with the well-known fossil Apiocrinus or pear-encrinite, followed by the Forest Marble limestones and clays. The rubbly Cornbrash crops at West wood, Trowbridge, and Malmesbury. Further east Hes the outcrop of Oxford ian strata, comprising the sandy Kellaways beds and overlying Oxford Clay, together forming a broad low-lying tract in which stand Trowbridge, Melksham, Chippenham and

Cricklade. Rising up from the eastern margin of the Oxfordian vale is the irregular scarp formed by the CoralHan oolitic limestones and marls. The iron ores of Westbury are obtained in this forma- tion. Another clay-bottomed vale lies on the eastern side of the CoralHan ground, from near Calne to Swindon, where it is exploited for bricks. It appears also between Seend, Coulston and West- bury; also between Mere and Semley. About the former place it is brought into apposition with Cretaceous rocks through the agency of an east to west fault. At Tisbury and near Potterne are small outcrops of Portlandian rocks which yield the familiar building- stones of Tisbury and Chilmark. Limestones and clays of Purbeck age lie in the vale of Wardour about Teffont Evias. At Dinton in the same vale the Wealden formation just makes its appearance.

In the south-eastern corner of the county there are tracts of Tertiary Reading Beds and London Clay east of Downton and on the Clarendon Hills; these are covered by Bagshot Beds at Alder- bury and Grinstead, also on Hampworth Common. Outliers of Reading Beds and London Clay occur about Great Bedwin ; the sarsen stones previously referred to represent the last remnants of a mantle of Tertiary rocks which formerly covered the district. Here and there drift gravels and brick earths, besides low-level river gravels, rest upon the older rocks.

Agriculture. — Some five-sixths of the total area, a high proportion, is under cultivation, but a large amount of this is in permanent pasture. The soil, a heavy reddish loam, with a subsoil of broken stones, in the north-west, but lighter in the chalk region, is essentially that of a pastoral country, although there are wide tracts of richer land, suitable for wheat and beans. Oats, however, are the largest grain crop. There is a small acreage classified as hill pasture. The green crops consist mainly of turnips, mangolds and swedes. Bacon- curing is carried on. Large numbers of sheep are bred on the downs, and dairy-farming is practised in the north-west. There are manufactures of condensed milk. An agricultural college is esta-

blished at Downton.

Manufactures, — A majority of the hands employed in factories and workshops are occupied in the locomotive works of the Great Western railway at Swindon. There are also large engineering works at Devizes. Cloth is still woven, though in greatly diminished quantities, at Trowbridge, Melksham, Chippenham and other places where water-power is available. Carpets are woven at Wilton, haircloth and coco-nut fibre at Melksham, silk at Malmes- bury, Mere and Warminster. Portland and Bath stone are quarried for building purposes, while iron ore from mines near Westbury is smelted in thar town.

Communications.— Three great railway lines traverse Wiltshire from E. to W., throwing out a number of branch lines to the larger towns. In the N. the Great Western main line passes through Swindon on its way from London to Bath, A second line of the same system runs also to Bath from Hungerford, by way of Devizes. South of Salisbury Plain the South-Western main line goes through Salisbury and the southern quarter of Wilts on its way into Somerset. The chief branch line is that between Salisbury and Westbury on the Great Western. The Midland & South-Western Junction rail- way runs north from Andover by Swindon, Cricklade and Ciren- cester. Swindon, Salisbury and Westbury are the three centres of railway traffic. The Avon is navigable as far as Salisbury, and goods are carried on the Thames & Severn Canal in the N.E., and on the Kennet & Avon Canal across Salisbury Plain. These waterways were formerly connected by a branch of the Berks & Wilts Canal, which runs S.W. from Berkshire, through Swindon and Melksham, but was closed in 1899.

The area of the ancient county is 879,943 acres, with a popula- tion in 1891 of 264,997 and in 1901 of 273,869. The area of the administrative county is 864,105 acres. The county contains 29 hundreds. The municipal boroughs are — Calne (pop. 3457), Chippenham (5074), Devizes (6532), Malmesbury (2854), Marl- borough (3887), Salisbury, a city and the county town (17,117), Swindon (45,006), Wilton (2203). The urban districts are — Bradford-on-Avon (4514), Melksham (24 50), Trowbridge (n, 5 26), Warminster (5547), Westbury (3305). Other small towns are Cricklade (1517), Downton (1786), Highworth (2047), Mere (1977), Pewsey (1722), Wootton Bassett (2258). The county is in the western circuit, and assizes are held at Salisbury and Devizes. It has one court of quarter sessions, and is divided into 16 petty sessional divisions. The boroughs of Devizes and Salisbury have separate courts of quarter sessions and commis- sions of the peace, and the borough of Marlborough has a separate commission of the peace. There aTe 335 civil parishes. Wiltshire is mainly in the diocese of Salisbury, but a considerable part is in that of Bristol, and small parts in those of Gloucester, Oxford and Winchester. It

contains 322 ecclesiastical parishes or districts, wholly or in part. The county is divided into five parliamentary divisions, each returning one member — Northern or Cricklade, North-western or Chippenham, Western or West-

bury, Eastern or Devizes and Southern or Wilton. It also contains the parliamentary borough of Salisbury, returning one member.

History. — The English conquest of the district now known as Wiltshire began in 552 with the victory of Cynric at Old Sarum, by which the way was opened to Salisbury Plain. Four years later, pushing his way through the vale of Pewsey, Cynric extended the limits of the West Saxon kingdom to the Marl- borough Downs by a victory at Barbury Hill At this period the district south of the Avon and the Nadder was occupied by dense woodland, the relics of which survive in Cranborne Chase, and the first wave of West Saxon colonization was chiefly confined to the valleys of the Avon and the Wylye, the little township of Wilton which arose in the latter giving the name of Wilsaetan to the new settlers. By the 9th century the district had acquired a definite administrative and territorial organization, Walstan, ealdorman of the Wilsactan, being mentioned as early as 800 as repelling an attempted invasion of the Mercians- Moreover, " Wiltunscire " is mentioned by Asser in 878, in which year the Danes established their head- quarters at Chippenham and remained there a year, plundering the surrounding country. In the time of /Ethelstan mints existed at Old Sarum, Malmesbury, Wilton, Cricklade and Marlborough. Wilton and Salisbury were destroyed by the Danish invaders under Sweyn in 1003, and in 1015 the district was harried by Canute.

With the redistribution of estates after the Conquest more than two-fifths of the county fell into the hands of the church; the possessions of the crown covered one-fifth; while among the chief lay proprietors were Edward of Salisbury, William, count of Ewe, Ralph de Mortimer, Aubrey de Vere, Robert Fitzgerald, Miles Crispin, Robert d'Oily and Osbern Giffard. The first carl of Wiltshire after the Conquest was William le Scrope, who received the honour in 1397. The title subsequently passed to Sir James Butler in 1449, Sir John Strafford in 1470, Sir Thomas Boleyn in 1529, and in 1550 to the Paulett family. The Benedictine foundations at Wilton, Malmcsbury and Amesbury existed before the Conquest; the Augustinian house at Bradenstoke was founded by Walter d'Evreux in 114 2; that at Lacock by Ela, countess of Salisbury, in 1232; that at Longleat by Sir John Vernon before 1272. The Cluniac priory of Monkton Farleigh was founded

by Humphrey de Bohun in 1 1 2 5 ; the Cistercian house at Kingswood by William de Berkeley in 1139; and that of Stanley by the Empress Maud in 11 54.

Of the forty Wiltshire hundreds mentioned in the Domesday Survey, Selkley, Ramsbury, Bradford, Melksham, Calne, Whorwellsdown, Westbury, Warminster ; Heytcsbury, Kinward- stone. Ambresbury, Underditch, Furstficld, Aldcrbury and Downton remain to the present day practically unaltered in name and extent; Thorngrave, Dunelawe and Cepeham hundreds form the modern hundred of Chippenham; Malmesbury hundred represents the Domesday hundreds of Cicemethorn and Sterchelee, which were held at farm by the abbot of Malmesbury; High- worth represents the Domesday hundreds of Crechelade, Scipe, Wurde and Staple; Kingbridge the hundreds of Chingbridge, Blachegrave and Thornhylle; Swanborough the hundreds of Rugeberge, Stodfa^d and Swaneberg; Branch the hundreds of Branchesberge and Dolesfeld; Cawden the hundreds of Cawdon and Cadworth. A noticeable feature in the 14th century is the aggregation of church manors into distinct hundreds, at the court of which their ecclesiastical owners required their tenants to do suit and service. Thus the bishop of Winchester had a separate hundred called Kurwel Bishop, afterwards absorbed in Downton hundred; the abbot of Damerham had that of Damerham; and the prior of St Swithin's that of Elstub, under each of which were included manors situate in different parts of the county.

The meeting-place of Swanborough hundred was at Swan- borough Tump, a hillock in the parish of Manningford Abbots identified as the moot-place mentioned in the will of King Alfred; that of Malmesbury was at Colepark; that of Bradford at Brad- ford Leigh; that of Warminster at Iley Oak, about 2 m. south of

Warminster, near Southleigh Wood. The shire court for Wilt- shire was held at Wilton, and until 1446 the shrievalty was enjoyed ex officio by the castellans of Old Sarum. Edward of Salisbury was sheriff at the time of the Domesday Survey, and the office remained hereditary in his family, descending to W 7 iUiam Longespee by his marriage with Eia, great-grand-daughter of Edward. In the 13th century the assizes were held at Wilton, Malmesbury and New Sarum.

On the division of the West Saxon see in 703 Wiltshire was included in the diocese of Sherborne, but in 905 a separate diocese of Wilton was founded, the see being fixed alternately at Ramsbury, Wilton and Sunning in Berkshire. Shortly before the Conquest Wilton was reunited to the Sherborne diocese, and by the synod of 1075-1076 the see was transferred to Salisbury. The archdeaconries of Wiltshire and Salisbury are mentioned

in 1180; in 1291 the former included the deaneries of Avebury, Malmesbury, Marlborough and Cricklade within this county, and the latter the deaneries of Amesbury, Potterne, Wilton, Chalkc and Wylyc. In 1535 the archdeaconry of Salisbury included the additional deanery of Salisbury, while Potterne deanery had been transferred to the archdeaconry of Wiltshire. The deaneries of the archdeaconry of Salisbury have remained unaltered; Wiltshire archdeaconry now includes the deaneries of Avebury, Marlborough and Potterne; and the deaneries of Chippenham, Cricklade and Malmesbury form part of the archdeaconry and diocese of Bristol.

The inhabitants of Wiltshire have always been addicted to industrial rather than warlike pursuits, and the political history of the county is not remarkable. In 108 6, after the completion of the Domesday Survey, Salisbury was the scene of a great council, in which all the landholders took oaths of allegiance to the king : and a council for the same purpose assembled at Salisbury in iii<5. At Clarendon in 1166 was drawn up the assize which remodelled the provincial administra- tion of justice. Parliaments were held at Marlborough in 1267 and at Salisbury in 1328 and 1384. During the wars of Stephen's reign Salisbury, Devizes and Malmesbury were garrisoned by Roger, bishop of Salisbury, for the empress, but in 1138 Stephen seized the bishop and captured Devizes Castle. In 1216 Marl- borough Castle was surrendered to Louis by Hugh de Neville. Hubert de Burgh escaped in 1233 from Devizes Castle, where he had been imprisoned in the previous year. In the Civil War of the 17th century Wiltshire actively supported the parlia- mentary cause, displaying a spirit of violent anti-Catholicism, and the efforts of the marquess of Hertford and of Lord Seymour to raise a party for the king met with vigorous resistance from the inhabitants. The Royalists, however, made some progress in the early stage of the struggle, Marlborough being captured for the king in 1642, while in 1643 the foiccs of the earl of Essex were routed by Charles I. and Prince Rupert at Aldbournc, and in the same year Waller, after failing to capture Devizes, was defeated in a skirmish at Roundway Down. The year 1645 saw the rise of the " Clubmen " of Dorset and Wiltshire, whose sole object was peace; they systematically punished any member of either party discovered in acts of plunder. Devizes, the last stronghold of the Royalists, was captured by Cromwell in 1645. In 1655 a rising organized on behalf of the king at Salisbury was dispersed in the same year.

At the time of the Domesday Survey the industrial pursuits of Wiltshire were almost exclusively agricultural; 390 mills are mentioned, and vineyards at Tollard and Lacock. In the succeeding centuries sheep-farming was vigorously pursued, and the Cistercian monasteries of Kingswood and Stanlegh exported wool to the Florentine and Flemish markets in the 13th

and 14th centuries. Wiltshire at this time was already reckoned among the chief of the clothing counties, the principal centres of the industry being Bradford, Malmesbury, Trowbridge, Devizes and Chippenham. In the 16th century Devizes was noted for its blankets, Warminster had a famous corn-market, and cheese was extensively made in north Wiltshire. Amesbury was famous for its tobacco pipes in the i6t.h century. The clothing trade went through a period of great depression in the

17th century, partly owing to the constant outbreaks of plague. Linen, cotton, gloves and cutlery were also manufactured in the county, silk at Malmesbury and carpets at Wilton.

In 1295 Wiltshire was represented by no less than twenty-eight members in parliament, the shire returning two knights, and the boroughs of Bedwin, Bradford, Calne, Chippenham, Cricklade, Devizes, Downton, Ludgershall, Malmesbury, Marlborough, Old Sarum, Salisbury and Wilton, two burgesses each, but the boroughsfor the most part made veryirregular returns. Hindon, Heytesbury and W r ootton Bassett were enfranchised in the 15th century, and at the time of the Reform Act of 18.32 the county with sixteen boroughs returned a total of thirty-four members. Under the latter act Great Bedwin, Downton, Heytesbury, Hindon, Ludgershall, Old Sarum and Wootton Bassett were disfranchised, and Calne, Malmesbury, Westbury and Wilton lost one member each- Under the act of 1868 the county returned two members in two divisions, and Chippenham, Devizes and Marlborough lost one member each. Under the act of 1885 the county returned five members in five divisions; Cricklade, Calne, Chippenham, Devizes, Malmesbury, Marl- borough, Westbury and Wilton were disfranchised; and Salisbury lost one member.

Antipiities. — Wiltshire is extraordinarily rich in prehistoric antiquities. The stone age is represented by a number of flint and stone implements, preserved in the unsurpassed collection at Salis- bury Museum. Stonehenge, with its circles of giant stones, and Avebury, with its avenues of monoliths leading to what was once a stone circle, surrounded by an earthwork, and enclosing two lesser circles, are the largest and most famous megalithic works in England. A valley near Avebury is filled with immense sarsen blocks, re- sembling a river of stone, and perhaps laid there by prehistoric architects. There are also menhirs, dolmens and cromlechs. Sur- rounded as they were by forests and marshy hollows, it is clear that the downs were densely peopled at a very early period. Circles, formed by a ditch within a bank, are common, as are grave-mounds or barrows. These have been classified according to their shape as bell-barrows, bowl-barrows and long barrows. Bones, ashes, tools, weapons and ornaments have been dug up from such mounds, ‘ many of which contain kistvaens or chambers of stone. The ” lynchets ” or terraces which score some of the hillsides are said to be the work of primitive agriculturists. Ancient strongholds are scattered over the county. Among the_ most remarkable are Vespasian’s Camp, near Amesbury; Silbury Hill, the largest artificial mound in Europe, near Avebury; the mounds of Marlborough and Old Sarum; the camps of Battlesbury and Scratchbury, near Warminster; Yarnbury, to the N, of

Wylye, in very perfect pre- servation; Casterley, on a ridgeway about 7 m. R.S.E. of Devizes; Whitcshcet and Winkclbury, overlooking the vale of Chalk; Chis- bury, near Savernake ; Sidbury, near Ludgershall ; and Figbury Ring, 3 m. N.E. of Salisbury. Ogbury, 6 in. N. of Salisbury, is an undoubted British enclosure. Durrington Walls, N. of Amesbury, are probably the remains of a British village, and there are vestiges of others on Salisbury Plain and Marlborough Downs.

There are many signs of the Roman rule. Wans Dyke or W T oden's Dyke, one of the largest extant entrenchments, runs west for about 60 m. from a point east of Savernake, nearly as far as the Bristol Channel, and is almost unaltered for several miles along the Marl- borough Downs. Its date is uncertain ; but the work has been proved, wherever excavated, to be Roman or Romano-British. It consists of a bank, with a trench on the north side, and was clearly meant for defence, not as a boundary. Forts strengthened it at intervals. Bokerly Dyke, which forms a part of the boundary between Wilts and Dorset, is the largest among several similar entrenchments, and has also a ditch north of the rampart.

Chief among the few monastic buildings gf which any vestiges remain are the ruined abbeys of Malmesbury and of Lacock near Melksham. There are some traces of the hospital for leprous women afterwards converted into an Austin priory at Maiden Bradley. Monkton Farleigh, farther north along the Somerset border, had its Cluniac priory, founded as a cell of Lewes in the 13th century, and represented by some outbuildings of the manor-house. A college for a dean and 12 prebendaries, afterwards a monastery of Bon- hommes, was founded in 1347 at Edington. The church, Decorated and Perpendicular, resembles a cathedral in size and stately beauty. The 14th century buildings of Bradenstoke Priory or Cleck Abbey, founded near Chippenham for Austin canons, are incorporated in a farmhouse. The finest churches of Wiltshire, generally Per- pendicular, were built in the districts where good stone could be obtained, while the architecture is more simple in the Chalk region, where flint was used perforce. Small wooden steeples and pyra- midal bell-turrets are not uncommon; and the churches of Purton, 3§ m. N.W. of Swindon, and Wanborough, 3 m. S.E., have each two steeples, one in the centre, one at the west end. St Lawrence's church at Bradford on Avon is one of the most perfect Saxon

ecclesiastical buildings in England ; and elsewhere there are fragments of Saxon work imbedded in later masonry. Such are three arches in the nave of Britford church, within a mile of Salisbury; the east end of the chancel at Burcombe, near Wilton; and parts of the churches at Bremhill, and at Manningford Bruce or Braose in the vale of Pewsey. St John's at Devizes retains its original Norman tower and has Norman masonry in its chancel; while the chancel of St Mary's, in the same town, is also Norman, and the

porch has characteristic Norman mouldings. The churches of Preshute, near Marlborough, Ditteridge or Ditcheridge, near Box, and Nether Avon, near Amesbury, preserve sundry Norman features. Early English is illustrated by Salisbury Cathedral, its purest and most beautiful example; and, on a smaller scale, at Amesbury, Bishops Cannings, Boyton in the vale of the W^ylye, Collingbourne Kingston, east of Salisbury Plain, Downton and Potterne, near Devizes. Bishopstone, in the vale of Chalk, has the finest Decorated church in the county, with a curious external cloister, and unique south chancel doorway, recessed beneath a stone canopy. Mere, close to the borders of Dorset and Somerset, is interesting not only for its Perpendicular church, but for a medieval chantry, used as a scboolhouse by Barnes, the Dorsetshire poet, and for its 14th' century dwelling-houses.

The castles of Wiltshire have been almost entirely swept away. At Old Sarum, Marlborough and Devizes only a few vestiges are left in walls and vaults. Castle Combe and Trowbridge castle have long been demolished, and of Ludgershall castle only a small frag- ment survives. The ruins of Wardour castle, standing in a richly wooded park near Tisbury, date from the 14th century, and consist of a hexagonal outer wall of great height, enclosing an open court. Two towers overlook the entrance. The 18th-century castle, one mile distant, across the park, is noteworthy for its collection of paintings, and, among other curiosities, for the " Glastonbury Cup," said to be fashioned out of a branch of the celebrated thorn- tree at Glastonbury. The number of old country houses is a marked feature in Wilts. Few parishes, especially in the N.W., are without their old manor-house, usually converted into a farm, but preserving its flagged roof, stone-mullioned windows, gabled front, two-storeyed

Sorch and oak-panelled interior. Place House, in Tisbury, and arton Farm, at Bradford, date from the 14th century. Fifteenth- century work is best exemplified in the manor-houses of Norrington, in the vale of Chalk; Teffont Evias, in the vale of Nadder; Potterne; aad Great Chaldfield, near Monkton Farleigh. At South Wraxatl the hall of a very' beautiful house of the same period is celebrated in local tradition as the spot where tobacco was first smoked in England by Sir Walter Raleigh and his host, Sir Walter Long. Later styles are represented by Longford Castle, near Salisbury, where the picture galleries are of great interest; by Heytesbury Park; by Wilton House at Wilton, Kingston House at Bradford, Bowood near Calne, Longleat near Warminster, Corsham Court, Littlecote near Ramsbury, Charlton House near Malmes- bury, Compton Chamberlayne in the Nadder valley, Grittleton House and the modern Castle Combe, both near Chippenham and Stourhead, on the borders of Dorset and Somerset, Each of these is noteworthy for its architecture! its art treasures or the beauty of its surroundings.

See Victoria County History, Wiltshire; Sir R. C. Hoare, The Ancient History of Wiltshire (2 vols., London, 1812-1821), The History of Modem Wiltshire (14 pts., London, 1822-1844) ! Aubrey's Collections for Wiltshire, edited by Sir T. PhilHpps, pts. 1, 2 (London, 1821); Leland's Journey through Wiltshire, A.D. 1540-1542, with notes by J. E. Jackson (Devizes, 1875); W. H. Jones, Domesday for Wiltshire (Bath, 1865); John Britton, The Beauties of Wiltshire (3 vols., London, 1801-1825); J. E. Jackson, The Sheriff's Tourn, Co. Wilis, a.D. 1439 (Devizes, 1872); see also Proceedings of the Wiltshire Archaeological and Natural History Society.

WIMBLEDON, a municipal borough and western residential suburb of London, in the Wimbledon parliamentary division of Surrey, England, adjoining the metropolitan borough of Wandsworth, 8 m. S.W. of Charing Cross, Pop. (1891), 25,777; (1901) 41,652. Wimbledon Common, to the north-west of the district, forms a continuation of Putney Heath and a pleasant recreation ground. It was the meeting-place of the Rifle Association from its foundation in i860 till 1888. The parish church of St Mary is supposed to date from Saxon times; but, after it had undergone various restorations and reconstructions, it was rebuilt in 1833 in the Perpendicular style. There are various other churches and chapels, all modern. A free library was established in 1887. Benevolent institutions are numerous. The corporation consists of a mayor, 6 aldermen, and 18 councillors. Area, 3221 acres.

Wimbledon (Wibbandune) is supposed to have been the scene of a battle in 568 between Ceawlin, king of Wessex, and iEthelberht, king of Kent, in which ˆEthelberht was defeated, and an earthwork which existed on the Common may have marked the site. At

Coombe's Hill and elsewhere British relics have been found. At Domesday Wimbledon formed part of the manor of Mortlake, held by the archbishops of Canterbury. Afterwards the name was sometimes used interchangeably with Mortlake, and in 1327 it is described as a grange or farm belonging to Mortlake. On the impeachment of Arundel, archbishop of Canterbury, in 1398, it was confiscated. In the reign of Henry VIII. Cromwell, earl of Essex, held the manor of Wimbledon, with Bristow Park as an appendage. On the confiscation of Cromwell's estates in 1540 it again fell to the crown, and by Henry VIII. it was settled on Catherine Tarr for life. By Queen Mary it was granted to Cardinal Pole. In 1574 Elizabeth bestowed the manor-house, while retaining the manor, on Sir Christopher Hatton,

who sold it the same year to Sir Thomas Cecil. In 1588 Elizabeth transferred the manor to his son Sir Edward Cecil, in exchange for an estate in Lincolnshire. At the time of the Civil War the manor was sold to Adam Baynes, a Yorkshireman, who shortly after- wards sold it to General Lambert; and at the Restoration it was granted to the queen dowager, Henrietta Maria, who sold it in i66r to George Digby, earl of Bristol. On his death in 1676 it was sold by his widow to the lord- treasurer Danby. Some years after Danby's death it was purchased by Sarah, duchess of Marlborough, who bequeathed it to her grandson, John Spencer. It was sold by the fifth Earl Spencer in 1877. Wimbledon House, built by Sir Thomas ('ceil in 1588, was replaced by another building in 1735 by the duchess of Marl- borough; this was destroyed by fire in 1785, and a new house, called Wimbledon Park House, was erected about 1S01. Wimbledon was incorporated in 1905.

WIMBORNE (Wimborne Minster), a market town, in the eastern parliamentary division of Dorsetshire, England, in| in. S.W. by W. from London by the London & South-Western railway; served also by the Somerset and Dorset railway. Pop. of urban district (1001) 3696. It is situated on a gentle slope above the river Allen near its confluence with the Stotir. The church or minster of St Cuthbcrga is a fine cruciform structure of various styles from Early Norman to Perpendicular, and consists of a central lantern tower, nave and choir with aisles, transepts without aisles, western or bell tower, north and south porches, crypt and vestry or sacristy, with the library over it. It contains a large number of interesting monuments, including a brass with the date 873 (supposed to mark the resting- place of King ˆthelred I.) , a lunar orrery of the 14th century and an octagonal Norrnan font of Purbeck marble. There is a church dedicated to St John the Evangelist. The free grammar school occupies modern buildings in the Elizabethan style. Near Wimborne is Canford Manor, the scat of Lord Wimborne, a mansion in the Tudor style, built by Blore in 1826, and improved from designs of Sir Charles Barry. The town depends chiefly on agriculture; but the manufacture of hose is carried on to a small extent, and there are also coachbuilding works.

Although Wimborne (Wimbum) has been identified with the Vindogladia of the Antonine Itinerary, the first undoubted evidence of settlement is the entry of the Anglo-Saxon Chronicle, under the date 718, that Cuthburh, sister of King Ine, founded the abbey here and became the first abbess; the house is also mentioned in a somewhat doubtful epistle of St Aldhelm in 705. The importance of the foundation made it the burial-place of King iEthclrcd in 871, and of King Sifferth in 962. ˆEthelwald seized and fortified Wimborne in his revolt in 901 against Edward the Elder. The early abbey was probably destroyed by the Danes in the reign of ˆthelred the Unready (978-1015), for in 1043 Edward the Confessor founded here a

college of secular canons. The college remained unaltered until 1496, when Margaret, countess of Richmond, obtained letters patent from her son, Henry VII., to found a chantry, in connexion with which she established a school. The continuance of this was recommended by the commissioners of 1547, and in 1562 Eliza- beth vested a great part of the property of the former college in a school corporation of twelve governors, who had charge of the church. New charters for the school were obtained from lames I. in 1 562 and from Charles I. At the conquest Wimborne

was a royal borough, ancient demesne of the crown, and part of the manor of Kingston Lacy, which Henry I. gave to Robert Mellent, earl of Leicester. From him it descended by marriage to the earls of Lincoln, and, then passing by marriage to Earl Thomas of Lancaster, it became parcel of the county and later of the duchy of Lancaster; an inquisition of 1352 found that Henry, duke of Lancaster, had 77s. 3d. rent of assize in the borough of Wimborne. The borough is again mentioned in 1487-1488, when John Plecy held six messuages in free burgage of the king as of his borough of Wimborne, but it seems to have been entirely prescriptive, and was never a parliamentary borough. The town was governed until the 19th century by two bailiffs, chosen annually at a court leet of the royal manor of Wimborne borough, part of the manor of Kingston Lacy. The market held here on Friday of each week is not mentioned in Domesday Book, but seems to be of early origin. Wimborne carried on considerable manufactures of linen and woollen goods until the time of Charles II., when they declined, their place being takSn by the stocking-knitting industry of the 1 8th century.

See John Hutchins, The History and Antiquities of the County of Dorset (3rd edition, Westminster, 1861) ; Anon., History of Wim- borne Minster (London, i860).

WIMPFFEN, EMMANUEL FELIX DE (1811-1884), French soldier. Entering the army from the military school of St Cyr, he saw considerable active service in Algeria, and in 1840 became captain, in 1847 chef de bataillon. He first earned marked distinction in the Crimean War as colonel of a Turco regiment, and his conduct at the storm of the Mamelon won him the grade of general of brigade. In the campaign of 1859 he was with General MacMahon at Magenta at the head of a brigade of Guard Infantry, and again won promotion on the field of battle. Between this campaign and that of 1870 he was mainly employed in Algeria, and was not at first given a command in the ill-fated " Army of the Rhine." ■ But when the earlier battles revealed incapacity in the commander of the 5th corps, De Wimpffen was ordered to take it over, and was given a dormant commission appointing him to command the Army of Chalons in case of Marshal MacMahon's disablement. He only arrived at the front in time to

rally the fugitives of the 5th corps, beaten at Beaumont, and to march them to Sedan. In the disastrous battle of the 1st of September, MacMahon was soon wounded, and the senior officer, General Ducrot, assumed the command. Ducrot was beginning to withdraw the troops when Wimpffen produced his commission and countermanded the orders^ In consequence it fell to him to negotiate the surrender of the whole French army. After his release from captivity, he lived in retirement at Algiers, and died at Paris in 1884. His later years were occupied with polemical discussions on the surrender of Sedan, the responsibility for which was laid upon him.

He wrote, amongst other works, Sedan (1871), La Situation de la France, el les reformes ' necessaires (1873) and La Nation armee

(1875)-

WINBURG, a town in the Orange Free State, 90 m. N.E. by rail of Bloemfontein. Pop. (1904) 2762, of whom 1003 were whites. It is built by the banks of a tributary of the Vet affluent of the Vaal, and is a trading centre for a large grain and pastoral district. It is joined to the trunk railway from Port Elizabeth to the Transvaal by a branch line from Smaldeel, 28 m. N.W. The town was founded in 1837 by Commandant H. Potgieter, one of the voortrekers, and was named by him in commemoration of a victory gained over the Matabele chief Mosilikatze. It became the capital of a quasi-independent Boer state, which included considerable areas north of the Vaal. In T848 the town and district were annexed to Great Britain and thereafter followed the fortunes of the Orange river sovereignty (see Orange Free State). In the Boer War of 1899-1902 Winburg was one of the Boer centres in the guerrilla fighting which followed the fall of Pretoria.

WINCHCOMB, a market town in the northern parliamentary division of Gloucestershire, England, 7 m. N.E. of Cheltenham. Pop. (1901) 2864. It is picturesquely situated among the Cotteswold Hills, in the narrow valley of the Isbourne stream. The Perpendicular church of St Peter, cruciform, with a central

tower, is a good example of its period. In the vicinity is Sudeley Castle, originally built by Thomas Boteler, Lord Sudeley (d. 1398). By gift of Edward VI. it came into the hands of Sir Thomas Seymour, fourth husband of Catherine Parr; this queen died here and was buried in the chapel. The castle suffered severely at the hands of the parliamentarians in 1644, and

remained ruinous until 1837, when a careful restoration was begun. There are a tower of the 14th century, and considerable remains of the 15th, the inhabited portion being mainly of Tudor date. There are flour mills, paper-works and tanneries at Winehcomb.

Excavations prove that there were both British and Roman settlements at Winehcomb (Wincelcumbe, Winckelcumbc) . It owed its growth to the foundation of religious houses by Offa and Coenwulf of Mercia in the 8th century. It became a borough in Saxon times, was the chief town of a shire to which it gave its name, and was the scat of government of the Mercian kings. Witenagemots were held there in 771 and 942. Harold, earl of Wessex, was the first overlord. It had become a royal borough by 10S7, and was granted by a charter of 1224 to the abbots of St Mary's to be held of the king by a rent of £50. Winehcomb never received a charter and was not incorporated, but as a borough by prescription it was governed by 2 bailiffs and 10 chief burgesses until the corporate body was dissolved by act of parliament in 18S3. It was never represented in parliament except by its mitred abbots before the dissolution of the monasteries. There is no trace of the original grant of a fair on July 17 (now held on July 28), but it is mentioned as already existing in a charter of 1221, which changed the market day from Sunday to Saturday. Elizabeth granted another fair on April 25 by charter in 1575. A Tuesday market was also granted under this charter, but the Saturday market only is now held. Both the modern fairs are horse and cattle fairs, but in the middle ages they were centres of the cloth manufacture. Tanning has been a local industry since the beginning of the 19th century, and paper and silk factories were introduced about 1830. Winch- comb took the side of the king in the Civil War and was twice plundered.

See Victoria County History, Gloucestershire; Emma Dent, Annals of Winchecombe (1877) ; David Royce, Winchecombe Cartulary

("1892).

WINCHELSEA, ANNE FINCH, Countess of (1661-1720), English author, daughter of Sir William Kingsmill of Sidmonton, near Southampton, was born in April 1661. Five months later her father died, and her mother married in 1662 Sir Thomas Ogle. Lady Ogle died in 1664, and nothing is heard of her daughter Anne until 1683, when she is mentioned as one of the maids of honour of Mary of Modena, duchess of York. She married in May 1684 Colonel Heneage Finch, who was attached to the duke of York's household. To him she addressed poems and versified epistles, in which he figures as Daphnis and she as Ardelia. At the Revolution Heneage Finch refused the oath of allegiance to William and Mary, and he and his wife had no fixed home until they were invited in 1690 to Eastwell Park, Kent,*

by Finch's nephew Charles, 4th earl of Winchelsea, on whose death in 1712 Heneage Finch succeeded to the earldom. The countess of Winchelsea died in London on the 5th cf August 1720, leaving no issue, her husband surviving until 1726.

Lady Winchelsea's poems contain many copies of verse addressed to her friends and contemporaries. She was to some extent a follower of the " matchless Orinda " in the fervour of her friendships. During her lifetime she published her poem "The Spleen" in Gildon's Miscellany (1701) and a volume of Poems in 1713 which included a tragedy called Aristomenes . With Alexander Pope she was on friendly terms, and one of the seven commendatory poems printed with the 1717 edition of his works was by her. But in the farce Three Hours after Marriage (1717) attributed to Gay, but really the work of Pope, Arbuthnot and Gay, she is ridiculed as the learned lady. Phoebe Clinket, a character assigned to Pope's hand. Lady Winchelsea's poems were almost forgotten when Wordsworth in the " Essay, supple- mentary to the Preface " of his Poems (1815), drew attention

*to her nature poetry, asserting that with the exception of Pope's *' Windsor Forest " and her " Nocturnal Reverie," English poetry between Paradise Lost and Thomson's Seasons did not present " a single new image of external nature." Words worth sent at Christmas iSro a MS. of extracts from Lady Winchelsea and other writers to Lady Mary Lowther, and his correspondence with Alexander Dyce contains some minute criticism and appreciation of her poetry.*

Mr Edmund Gosse wrote a notice of her poems for T. H. Ward's English Poets (vol. iii., 1880), and in 1884 came into possession of a MS. volume of her poems. A complete edilion of ner verse, The Poems of Anne, Countess of Winchelsea, was edited by Myra Reynolds (Chicago, 1903) with an exhaustive essay. See also E. Gosse, Gossip in a Library (1891), and E. Dowden, Essays, Modern and Elizabethan. Wordsworth's anthology for Lady Mary Lowther was first printed in 1905 (Oxford). Some of her work remains in MS. in the possession of Professor Dowden.

WINCHELSEA, ROBERT (d. 1313), archbishop of Canterbury, was probably born at Old Winchelsea. He studied and then taught at the universities of Paris and Oxford, where he attained celebrity as a scholar, and became rector of the former, and subsequently chancellor of the latter university. He held prebendal stalls in the cathedrals of Lincoln and St Paul's, and was made archdeacon of Essex about 1283, In December 1292 John Peckham, archbishop of Canterbury, died, and early in the following year Winchelsea was elected as his successor. His consecration, which took place at Aquila in September 1294, was delayed owing to the vacancy in

the papacy, but he found no difficulty in obtaining the temporalities of the see from King Edward I. Winchelsea is chiefly renowned as a strenuous upholder of the privileges of the clergy and the authority of the pope, and as a fearless opponent of Edward I. Strengthened by the issue of the papal bull Clericis laicos in 1296, he stimulated the clergy to refuse pecuniary assistance to Edward in 1297; but after the king had pronounced sentence of outlawry against the delinquents he instructed each clerk to decide this question for himself. Personally the archbishop still declined to' make any contribution towards the expenses of the French war, and his lands were seized and held by Edward until July 1297, when a somewhat ostentatious reconciliation between king and prelate took place at Westminster. He took some part in the movement which led to the confirmation of the charters by Edward later in the same year, but the struggle with the king did not exhaust his energies. He asserted his authority over his suffragans to the full; quarrelled with Pope Boniface VIII. over the presentation to a Sussex living, and was excommunicated by one of the pope's minions; and vigorously contested the claim of the archbishop of York to carry his cross erect in the province of Canterbury. Before these events, however, the quarrel with Edward had been renewed, although Winchelsea officiated in 1299 at the king's marriage with Margaret, daughter of Philip III., king of France. Joining the barons in demanding certain reforms from Edward at the parliament of Lincoln in 1301, he compelled the king to give way on the main issues; but the indignation which followed the claim of Pope Boniface to be the protector of Scotland, a claim which was supported by Winchelsea, led to the rupture of this alliance. It is probable that one of the reasons which led the archbishop to join in these proceedings was his hostility to Edward's adviser, Walter Langton, bishop of Lichfield, whom he sought to disgrace both in England and at Rome. The king cherished his indignation until his friend Clement V. became pope in 1305, when he made his final move against Winchelsea. Listening to Edward's envoys, Langton and Henry Lacy, earl of Lincoln, Clement suspended the archbishop, who, after vainly imploring the intercession of the king, left England and journeyed to the papal court at Bordeaux, remaining in exile until Edward's death in July 1307. The new king, Edward II., requested Clement to allow W 7 inchelsea to return to his see. The pope assented, but soon after his return to England early in 1308 the archbishop joined the king's enemies; even demanded the release from prison of his old enemy, Langton, and was one of the " ordainers " appointed in 13 10. He assisted the barons in their struggle

with Edward II. by a frequent use of spiritual weapons, and took part in the proceedings against the Templars. He died at Otford on the 1 ith of May 1313. Miracles were said to have been worked at his tomb in

Canterbury cathedral, but efforts to procure his canonization were unavailing. Although a secular priest Winchel- sea was somewhat ascetic, and his private life was distinguished for sanctity and generosity. As an ecclesiastic, however, he was haughty and fond of power; and he has been not inappropriately described as " the greatest churchman of the time."

See Chronicles of the Reigns of Edward I. and Edward II , edited with introduction by W. Stubbs (London, 1882-3883); S. Birching- ton, in the Anglia sacra., edited by II. Wharton (London, 1691); and W. Stubbs, Constihilional History, vol. ii. (Oxford, 3896).

WINCHELSEA, a village in the Rye parliamentary division of Sussex, England, 9 m. N.E. by E. from Hastings by the South Eastern and Chatham railways. Pop. (3901) 670. It stands on an abrupt hill-spur rising above flat lowlands which form a southward continuation of Romney marsh. This was within historic times a great inlet of the English Channel, and Winchclsea was a famous seaport until the 15th century. Two gates, the one of the time of Edward I., the other erected early in the 15th century, overlook the marshes; a third stands at a considerable distance west of the town, its position pointing the contrast between the extent of the ancient town and that of the shrunken village of to-day. The town was laid out by Edward I. with regular streets intersecting at right angles; the form is preserved, and in a picturesque open space in the centre stands the church of St Thomas a Becket. This comprises only the chancel and aisles of a building which, if entire, would rank as one of the finest parish churches in England. As it stands it is of the highest interest, showing remarkable Decorated work, with windows of beautiful and unusual design, and a magnificent series of canopied tombs. In the grounds of the residence called the Friars stands the shell of the apsidal choir of a Decorated chapel which belonged to a Franciscan house. Of a Dominican convent and other religious foundations and churches there are no remains.

The town of which the relics have been described w,as not the first of its name. On a site supposed to be about 3 m. S.E., and now therefore about i \ m. out in the English Channel, a seaport had grown up on a low peninsula. In 1236 and at various subsequent dates in the same century this town suffered severely from encroachments of the sea, and in 1266 it paid the penalty for its adherence to the cause of Simon de Montfort. The waves finally obliterated the site in 1288, and Edward I. thereafter planted the new town in a safe position. In the 14th and 15th centuries Winchelsea was frequently attacked by the French, and in 1350 Edward III. defeated the Spaniards in a naval action close by.

In the time of the Confessor Winchelsea (Winchenesel, Win- chelese, Wynchelse) was included in Rameslie which was granted by him to the

abbey of Fecamp. The town remained under the lordship of the abbey until it was resumed by Henry III. Its early importance was due to its harbour, and by 1066 it was probably already a port of some consequence. By the reign of Henry II., if not before, Winchelsea was practically added to the Cinque Ports and shared their liberties. After the destruction of Old Winchelsea, New Winchelsea, a walled town, flourished for about a hundred years and provided a large proportion of the ships furnished by the Cinque Ports to the crown; but the ravages of the French destroyed it, its walls were broken down, and the decay of the harbour, owing to the recession of the sea, prevented any later return of its prosperity. The corporation, which in 1 298 included a mayor, barons and bailiffs, was dissolved by an act of 1883.

Winchelsea as a Cinque Port was summoned to parliament in 1264-1265 and returned two members from 1366 till 1832, when it was disfranchised. The abbot of Fecamp seems to have originally held a market. In 1792 a market was held on Saturdays and a fair on the 14th of May, but no market or fair now exists. Ship- building and fishing were carried on in the 13th and 14th centuries. In later years Winchelsea became a great resort for smugglers, and the vaults originally constructed for the Gascon wine trade were used for storing contraband goods.

WINCHESTER, EARLS AND MARQUESSES OF. The title of earl of Winchester was first borne by Saier, or Seer, de Quincy, who was endowed by King John on the 13th of March 1207, with the earldom of Winchester, or the county of Southampton. Saicr de Quincy was one of the twenty-five barons named to enforce the observance of the Great Charter. He served in the Crusades at the siege of Damietta in 3219, and died soon after- wards, probably on the 3rd of November of that year. His second son Roger de Quincy {c. 1195-1264), who is said to have usurped the earldom during the absence of his elder brother Robert in the Holy Land, took part in the struggle between Henry III. and the barons. He died without male issue in April 1264, and the earldom reverted to the crown. It was revived in 1322 in favour of Hugh le Despenser, favourite of King Edward II., and was forfeited when he was put to death by the barons as a traitor in 1326. In 1472 the title, together with a pension of £200 a year from the customs of Southampton, but not the right of sitting in parliament, was given by King Edward IV. to a Burgundian, Louis de Bruges, lord of Gruthuyse and prince of Steenhuyse, as a reward for services rendered to himself while an exile on the continent. Louis de Bruges surrendered his patent to Henry VII. in 1499.

The marquessate of Winchester was created in 1551 in favour of William Paulet, or Pawlet, K.G., a successful courtier during four reigns, who died on the 10th of March 1572. It has de- scended in the male line of his

family to the sixteenth possessor. John Paulet, 2nd marquess (c. 1517-1576), was summoned to parliament as Baron St John during the life of his father, a distinction which was shared by his three immediate successors — William Paulet (

Three of the marquesses of Winchester were men of note. It is recorded of the founder of the family, William Paulet, that when asked how he had contrived to live through a long period of troubled times during four reigns, he replied that he came of the willow and not of the oak, ortus sum e salice non ex quercu. This saying, repeated by Sir Robert Naunton in his Fragmenta regalia, may possibly not have been due to the marquess himself, but if not it was well invented of a man who passed through many dangers and always contrived to keep, or to improve, his places. He was the son of Sir John Paulet of Basing, near Basingstoke in Hampshire, and his wife Alice or Elizabeth, daughter of Sir William Paulet of Hinton St George, Somerset. The year of his birth has been variously given as 1474 and 1485. Between 1532 and 1527 he was several times sheriff of Hampshire. He was knighted before 1525, and in that year became privy councillor. He was, henceforth, continually employed in the royal household and on the council, but Iris only military service was in the easy suppression of the Pilgrimage of Grace in 3536. In 1525 he was named master of the wards and keeper of the king's widows and idiots, that is to say he had the lucrative charge of persons of property who were wards in chivalry. He was a member of the House of Commons which

co-operated with the king in carrying out the separation of the Church from Rome between 1520 and 1536. He served on the courts which tried Sir Thomas More and Anne Boleyn, and he was employed to tell Catharine of Aragon that she and her daughter were degraded from their ra.nk. It is characteristic of the type of man that he did his work gently, and with a constant recollection of the changes of fortune. His personal kindness to Anne Boleyn, which she acknowledged, no doubt stood him in good stead on the accession of her daughter Queen Elizabeth. In 1538 he was created Lord St John, and he was enriched by a grant of the lands of Netley Abbey, near Southampton. He was appointed lord steward of the household, and lord chamber- lain, and became a knight of the garter in 1543. Henry VIII. named him one of the council of regency for his son Edward VI. During the reign of Edward VI., St John kept the favour both of the Protector Somerset, who made him lord keeper of the great seal, and of Somerset's enemy, the duke of Northumberland, who kept him in office. He was created earl of Wiltshire in 1550, and marquess of Winchester in ij.sr. On

the death of Edward VI., he trimmed cleverly between the parties of Lady Jane Grey, and Mary Tudor till he saw which was going to w r in, and then threw himself on the winning side. He opposed Queen Mary's marriage to Philip, prince of Spain (Philip II.), tili he saw she was set on it, and then gave his approval, for it was his wise rule to show just as much independence as enhanced the merit of his obedience. He was lord treasurer under Mary, and kept his place under Elizabeth, to whose ecclesiastical policy he gave his usual discreet opposition and final obedience. Win- chester died at his house of Basing on the 10th of March 1572. He had built it on so grand a scale that his descendants are said to have found it necessary to pull down a part. He married, first Elizabeth, daughter of Sir William Capel, Lord Mayor of London, by whom he had four sons and four daughters, and then Winifred, daughter of Sir John Bruges, alderman of London, and widow of Sir Richard Sackviile, by whom he had no children. It is said that one hundred and three of his descendants were alive at the date of his death.

His grandson, William Paulet, third marquess (c. 1535-1598) was one of the judges of Mary, queen of Scots, and author of a book called The Lord Marquesses Idleness which contains a Latin acrostic of extreme ingenuity on the words Regina nostra Angliae.

The fifth marquess, John Paulet (1628-1674), was a Roman Catholic. He lived much in retirement in order to be able to pay off debts left by his father. He is remembered by the ardour and sincerity of his loyalty to King Charles I. It is said that he caused the words " Aimez Loyaute " to be engraved on every pane of glass in his house of Basing. During the first Civil War it was fortified for the king, and stood a succession of sieges by the parliamentary forces between r643 and 1645. On the 14th of October 1645, it was stormed by Oliver Cromwell. The marquess, who fought valiantly, told Hugh Peters, chaplain of the New Model Army of the parliament, who had the vulgarity to crow over him, " That if the king had no more ground in England but Basing House, he would adventure as he did, and so maintain it to the utmost," fc " that Basing House was called Loyalty." The house caught fire during the storm and ■was burnt down, the very ruins being carried away by order of the parliament. The marquess was imprisoned in the Tower of London, but was finally allowed to compound for his estate; after the restoration of King Charles II. he was promised com- pensation for his losses, but nothing was given to him. He died in Englefield Park on the 5th of March 1674. He was three times married, first to Jane, daughter of Viscount Savage, by whom he had one son; then to Ilonora de Burgh, daughter of Richard, earl of St Albans and Clanricarde, by whom he had four sons; and then to Isabella Howard, daughter of Viscount Stafford.

See Doyle, Official Baronage (London, 1886) ; and J. A. Froude, History of England (London, 1856-1870), for the first marquess; J. P. Collier, Bibliographical Account of Early English Literature (London, 1865), for the second marquess; and Clarendon, History of the Rebellion (Oxford, 1886), for the fifth marquess.

WINCHESTER, a city and municipal and parliamentary borough of Hampshire, England, 66| m. S.W. by W. from London by the London & South- Western railway; served also by the Southampton branch of the Great Western railway, with a separate station. Pop. (igoi) 20,929. It occupies a hilly and picturesque site in and above the valley ot the Itchen, lying principally on the left bank. The surrounding hills are chalk downs, but the valley is well wooded.

Setting aside for the present the legends which place the foundation of a great Christian church at Winchester in the 2nd century, the erection of Winchester into an episcopal see may be placed early in the second half of the 7th century, though it cannot be dated exactly. The West Saxon see was removed hither from Dorchester on the Thame, and the first bishop of Winchester was Hcdda (cl, 705). The modern diocese includes nearly the whole of Hampshire, part of Surrey and very small portions of Wiltshire, Dorsetshire and Sussex. St Swithin (852-862), well knowm through the connexion of his feast day (15th July) with the superstition that weather-conditions thereon determine those of the next forty days, is considered to have enlarged the cathedral, as are .-Ethelweld (963-984) and Alphege (984-1005). The history of the Saxon building, however, is very slight, and as usual, its place was taken by a Norman one, erected by Bishop Walkelin (1070-1008). The cathedral church of St Swithin lies in the lower part of the city ill a wide and beautiful walled close. It is not very conspicuous from a distance, a low central tower alone rising above the general level of the roof. It consists of a nave, transepts, choir and retrochoir, all with aisles, and a lady-chapel forms the eastward termination. The work of the exterior, of whatever date, is severely plain. The cathedral, however, is the longest in England, and indeed exceeds any other church of its character in length, which is close upon 556 ft. Within, the effect of this feature is very fine. The magnificent Perpendicular nave is the work of Bishop Edington (1346-1366) and the famous William of Wykeham (1367-1404), by whom only the skeleton of Walkelin 's work was retained. The massive Norman work of the original building, however, remains comparatively intact in both transepts. The central tower is Norman, but later than Walkelin's structure, which fell in 1 107, a mishap which was readily attributed to divine wrath because King William II., who fell to the arrow in the neighbouring New Forest, had been buried here seven years earlier, in spite of his unchristian life. The tomb believed to be his is in the choir, but its identity has been widely disputed, and even an examination of the

remains has failed to establish the truth. The choir is largely Edington's work, though the clerestory is later, and the eastern part of the cathedral shows construction of several dates. Here appears the fine Early English construction of Bishop de Lucy (11S9-1204), in the retrochoir and the lady-chapel, though this was considerably altered later. Beneath the cathedral east of the choir there are three crypts, connected together. The western and the central chambers are Norman, and have apsidal terminations, while the eastern is Early English. The cathedral contains many objects of interest. The square font of black marble is a fine example of Norman art, its sides sculptured with scenes from the life of St Nicholas of Myra. The magnificent reredos behind the high altar must have been erected late in the 15th century; it consists of a lofty wall, the full width of the choir, pierced by two processional doors, and covered with tiersof rich canopied niches, the statues in which arc modern. A cross of plain ashlar stone in the centre shows where an immense silver crucifix was once attached; and a plain rectangular recess above the altar once contained a massive silver-gilt retable, covered with cast and repousse statuettes and reliefs. A second stone screen, placed at the interval of one bay behind the great reredos, served to enclose the small chapel in which stood the gold shrine, studded with jewels, the gift of King Edgar, which contained the body of St Swithin. Under many of the arches of the nave and choir are a number of very elaborate chantry chapels, each containing the tomb of its founder. Some of these have fine recumbent effigies, noble examples of English medieval sculpture;

the most notable are the monuments of Bishops Edington, Wykeham, Waynflete, Cardinal Beaufort, Langton and Fox. The door of iron grills, of beautiful design, now in the north nave aisle, is considered to be the oldest work of its character in England; its date is placed in the nth or 12th century. The mortuary chests in the presbytery contain the bones of Saxon kings who were buried here. The remains were collected in this manner by Bishop Henry de Blois (1129-1171), and again after they had been scattered by the soldiers of Cromwell. The choir stalls furnish a magnificent example of Decorated wood- work, and much stained glass of the Decorated and Perpendicular periods remains in fragmentary form. The library contains a Vulgate of the 12th century, a finely ornamented MS. on vellum.

In 1905 serious signs of weakness were manifested in the fabric of the cathedral, and it was found that a large part of the foundation was insecure, being laid on piles, or tree-trunks set flat, in soft and watery soil.

Extensive works of restoration, including the underpinning of the foundations with cement concrete (which necessitated the employment of clivers), were undertaken under the direction of Mr T. G. Jackson.

Relics of the monastic buildings are slight, and there are Early English arches and Perpendicular work in the deanery. Other old houses in the Close are very picturesque. Here formerly stood the house which Charles II. desired of Ken for Nell Gwyn. Ken refused it, but the king bore no malice, settling Nell Gwyn in another house near by, and afterwards raising Ken to the bishopric of Bath and Wells.

King Alfred founded a minster immediately north of the present site of the cathedral, and here he and other Saxon kings were buried. The house, known as Hyde Abbey, was removed (as was Alfred's body) to a point outside the walls considerably north of the cathedral, during the reign of Henry I. Here foundations may be traced, and a gateway remains. To the cast of the cathedral are ruins of Wolvesey Castle, a foundation of Henry de Blois, where the bishops resided. On the southern outskirts of the city, in a pleasant meadow by theltchen, is the Hospital of St Cross. This also was founded by Henry de Blois, in 1 136, whose wish was to provide board and lodging for 13 poor men and a daily dinner for 100 others. It was reformed by William of W'ykeham, and enlarged and mostly rebuilt by Cardinal Beaufort (1405-1447). The buildings form three sides of a quadrangle, with a lawn and sun-dial in its midst; while the fourth side is partly open, and partly formed by the magnificent cruciform church. The earliest parts of this building are late or transitional Norman, but other parts are Early English or Decorated. The work throughout is very rich and massive. St Cross is a unique example of a medieval almshouse, and its picturesqueness is enhanced by the curious costume of its inmates. It is still customary to provide a dole of bread and beer to all who desire it. The parish churches of Winchester are not of special interest, but the church of St S within is curious as occupying the upper part of the King's Gate. This gate and the West Gate alone remain of the gates in the walls which formerly surrounded the city. The West Gate is a fine structure of the 1,3th century. In the High Street stands the graceful Per- pendicular city cross. The county hall embodies remains of the Norman castle, and in it is preserved the so-called King Arthur's round table. This is supposed to date actually from the time of King Stephen, but the painted designs upon it are of the Tudor period.

Winchester is famous as an educational centre, and in addition to Winchester College there are several modern preparatory schools here. The College of St Mary, lying to the south of the cathedral close, is one of the greatest of English public schools. While a monastic school was in existence here from very early times, the college was originated in 1387 by William

of Wykeham, whose famous scheme of education embraced this foundation and that of New College, Oxford. The members on the founda- tion consisted of a warden, 10 fellows, 3 chaplains, 70 scholars and 16 choristers. The buildings were completed about 1395. The quadrangles, with the fine chapel, tower, hall xxvin. 23

and cloister are noteworthy, and there are extensive modern buildings.

The principal public buildings of the city are the gild-hall, public library and art school, museum, market house, mechanics' institution and barracks. The parliamentary borough returns one member and falls within the Andover division of the county. The corporation consists of a mayor, 6 aldermen and 18 councillors. Area, 1931 acres.

History. — The history of the earliest Winchester {Winton, Wynton) is lost in legend; tradition ascribes its foundation to Ludor Rous Hudibras and dates it ninety-nine years before the first building of Rome; earthworks and relics show that the Itchen valley was occupied by Celts, and it is certain from its position at the centre of six Roman roads and from the Roman relics found there that the Caer Gwent (White City) of the Celts was, under the name of Venta Belgarum, an important Romano- British country town. Hardly any traces of this survive, but mosaic pavements, coins, &c, have been discovered on the south side of High Street. The name of Winchester is indis- solubly linked with that of King Arthur and his knights, but its historical greatness begins when, after the conquest of the present Hampshire by the Gewissas, it became the capital of Wessex. Its importance was increased by the introduction of Christianity, although it was not at first the seat of a bishop, because, accord- ing to the later Winchester chronicler, King Cynegils wished for time to build a worthy church in the royal city; his son Cenwalh is said to have built the old minster. When the kings of Wessex became kings of all England, Winchester became, in a sense, the capital of England, though it always had a formid- able rival in London, which was more central in position and possessed greater commercial advantages. The parallel position of the two cities in Anglo-Saxon times is illustrated by the law of Edgar, ordaining that the standard of weights and measures for the whole kingdom should be " such as is observed at London and at Winchester." Under Alfred it became a centre of learning and education, to which distinguished strangers, such as St Grimbald and Asser the Welshman, resorted. It was the seat of Canute's government; many of the kings, including Ecgberht, Alfred, Edward the Elder and Canute, were buried there, and, in 1043, Edward the Confessor was crowned in the old minster. The city was sometimes granted as part of the dowry of a queen consort, and it was the home of Emma, the wife of ˆthelred the Unready and of Canute, and later of Edith, the wife of the Confessor.

Winchester was very prosperous in the years succeeding the Conquest, and its omission, together with London, from Domes- day Book is probably an indication of its peculiar position and importance; its proximity to the New Forest commended it to the Norman kings, and Southampton, only 12 m. distant, was one of the chief ports for the continent. The Conqueror wore his crown in state at Winchester every Easter, as he wore it at Westminster at Whitsuntide and at Gloucester at Christmas. The royal treasure continued to be stored there as it had been in Anglo-Saxon times, and was there seized by William Rufus, who, after his father's death, " rode to Winchester and opened the Treasure House." In the reign of Stephen and again in the reign of Henry II. the Court of Exchequer was held at Winchester, and the charter of John promises that the exchequer and the mint shall ever remain in the city; the mint was an important one, and when in 11 25 all the coiners of England were tried for false coining those of Winchester alone were acquitted with honour.

Under the Norman kings Winchester was of great commercial importance; it was one of the earliest seats of the woollen trade, which in its different branches was the chief industry of the town, although the evidence furnished by the Liber Winton (temp. Henry I. and Stephen) indicates also a varied industrial life. As early as the reign of Henry I. the gild of weavers is mentioned, and the millers at the same date render their account to the exchequer.

The gild merchant of Winchester claims an Anglo-Saxon origin, but the first authentic reference to it is in one of the

charters granted to the city by Henry II. The Liber Winton speaks of a " cnihts' gild," which certainly existed in the time of the Confessor. The prosperity of Winchester was increased by the St Giles's Fair, originally granted by Rufus to Bishop Walkelin. It was held on St Giles's Hill up to the 19th century, and in the middle ages was one of the chief commercial events of the year. While it lasted St Giles's Hill was covered by a busy town, and no trade was permitted to be done outside the fair within seven leagues, or at Southampton; the juris- diction of the mayor and bailiffs of the city was in abeyance, that of the bishop's officials taking its place.

From the time of the Conqueror until their expulsion by Edward I., Winchester was the home of a large colony of Jews, whose quarter in the city is marked to the present day by Jewry Street; Winchester is called by Richard of Devizes " the Jerusalem of England " on account of its kind

treatment of its Jews, and there alone no anti- Jewish riots broke out after the coronation of Richard I. The corporation of Winchester claims to be one of the oldest in England, but the earliest existing charters are two given by Henry II. , one merely granting to " my citizens of Winchester, who arc of the gild merchant with their goods, freedom from toll, passage and custom," the other confirming to them all liberties and customs which they enjoyed in the time of Henry I.; further charters, amplified and con- firmed by succeeding sovereigns, were granted by Richard I. and John. The governing charter till 1835 was that of 1587, incorporating the city under the title of the " Mayor, Bailiffs and Commonalty of the City of Winchester "; this is the first charter which mentions a mayor, but it says that such an officer had existed " time out of mind," and as early as 897 the town was governed by a wicgerefa, by name Beornwulf, whose death is recorded in the Anglo-Saxon Chronicle. There is a doubtful reference to a mayor in 1194, and the office certainly existed early in the 13th century. Until 1832 the liberty of the soke encompassing the city on almost every side was outside the jurisdiction of the city magistrates, being under the seignioralty of the bishop of Winchester.

Winchester seems to have reached its zenith of prosperity at the beginning of the 12th century; the first check was given during the civil wars of Stephen's reign, when the city was burned. However, the last entry concerning it in the Anglo- Saxon Chronicle says that Henry Plantagenet, after the treaty of Wallingford, was received with " great worship " in Winchester and London, thus recognizing the equality of the two cities; but the latter was rising at Winchester's expense, and at the second coronal ion of Richard I. (T294) the citizens of Winchester had the significant mortification of seeing in their own city the citizens of London take their place as cupbearers to the king. The loss of Normandy further favoured the rise of London by depriving Winchester of the advantages it had enjoyed from its convenient position with regard to the continent. Moreover, it suffered severely at the hands of Simon de Montfort the Younger (1265), although it still continued to be an occasional royal residence, and the Statute of Winchester (1285) was passed in a council held there. Meanwhile the woollen trade had drifted in great measure to the east of England; and an attempt made to revive the prosperity of Winchester in the 14th century by making it cne of the staple towns proved unsuccessful. The wine trade, which had been considerable, was ruined by the sack of Southampton (1338); a few years later the city was devastated by the black death, and the charter of Elizabeth speaks of " our city of Winchester now fallen into great ruin, decay and poverty." During the Civil War the city suffered much for its loyalty to Charles I. and lost its ancient castle founded by William I. After the Restoration a scheme was started to restore trade by making the Itchen navigable to Southampton, but neither then nor

when revived in the 19th century was it successful. Charles II., intending to make Winchester again a royal residence, began a palace there, which being unfinished at his death was used eventually as barracks. It was burnt down in 3894 and rebuilt in 1901. Northgate and Southgate were pulled down in 1781, Eastgate ten years later.

Westgate still stands at the top of the High Street. The guard- room was formerly used as a debtors' prison, now as a museum. The two weekly markets, still held in the Corn Exchange of Wednesday and Saturday, were confirmed by Elizabeth's charter; the latter dates from a grant of Henry VI. abolishing the Sunday market, whichjiad existed from early times. The same grant established three fairs — one on October 13 (the day of the translation of St Edward, king and confessor), one on the Monday and Tuesday of the first week in Lent, and another on St Swithin's day; the former two are still held. Winchester sent two members to parliament from 1295 to 1885, when the representation was reduced to one.

WINCHESTER, a town and the county-scat of Clark county, Kentucky, U.S.A., in the E. part of the Blue Grass region of the state, about 18 m. E. by S. of Lexington. Pop. (1890) 4519; C1900) 5964, including 3128 negroes; (1910) 7156. It is served by the Louisville & Nashville, the Chesapeake & Ohio and the Lexington & Eastern railways, the last being a short road (from Lexington to Jackson) extending into the mineral and timber region of Eastern Kentucky. The town is the seat of the Ken- tucky Wesleyan College (co-educational; Methodist Episcopal, South), opened in 1866, and of the Winchester Trades and Industrial School (1900). Winchester is in an agricultural, lumbering and stock-raising region, and has various manufactures. It was first incorporated in 1792.

WINCHESTER, a township of Middlesex county, Massa- chusetts, U.S.A., about 8 m. W. of Boston at the head of Upper Mystic Pond, one of the sources of the Mystic river. Pop. (1900) 7248, of whom 3968 were foreign-born and 140 were negroes; (3930) 9309. Area, 6 sq. m. Winchester is served by the southern division of the Boston & Maine railway, and is connected with Boston, Arlington, Mcdford, Stoneham and Woburn by electric lines. It is chiefly a residential suburb of Boston. Through the centre of the township winds the Aberjona river, which empties into Mystic Pond, in Winchester township, both favourite resorts for canoeing, &c. Wedge Pond and Winter Pond, in the centre of the township, are clear and beautiful sheets of water. The streets of Winchester are heavily shaded, the view as presented from the neighbouring hills being that of a continuous forest stretching from the beautiful Mystic Valley parkway (of the Metropolitan park system), of which more than one-half (50-2 acres) is in the southern part of the township, to the Middlesex Fells Reservation (another Metropolitan park), of which 261-9 acres are in the

eastern part; and there are a large public playground and a common. Horn Pond Mountain and Indian Hill arc about 320 ft. above sea-level. One of the pleasantest residential districts is Rangely, a restricted private park. The town-hall and library building is a fine structure; the library contains about 20,000 volumes, and the museum and collections of the Winchester Historical and Genealogical Society. The principal manufactures are leather and felt goods.

Winchester was originally within the limits of Charlestown. In 1638 allotments of land between the Mystic Pond and the present Wobum were made to various Charlestown settlers, including John Harvard and Increase Nowell (3590-1655), secretary of the Massachusetts Bay Colony in 1644-3649, and the new settlement was called Waterficld. Most of this territory in 1642 was incorporated in Wobum and was called South Woburn. In 1850 Winchester was separately incorporated, parts of Arlington (then West Cambridge) and Medford going to make up its area, and was named in honour of Colonel W. P. Winchester of Watertown, who left to the township a legacy for municipal works.

WINCHESTER, an independent city and the county-seat of Frederick county, Virginia, U.S.A., 87 m. by rail W.N.W. of Washington. Pop. (1800) 5196; (1900) 5163, including rro5 negroes; (3930) 5S64. Winchester is served by the Baltimore & Ohio and the Cumberland Valley railways. It is pleasantly situated in the fertile Shenandoah Valley about 720 ft. above sea-level. Fort Loudoun Seminary for girls occupies the site of old Fort Loudoun, and in the city is the Shenandoah Valley Academy, a military school for boys. The Handley library

(1910), a memorial to John Ilandley, a part of whose estate was bequeathed to establish industrial schools for the poor of Winchester, and an auditorium are owned by the municipality. The United States National Military Cemetery at Winchester contains the graves of 4480 Union soldiers. 2382 of them unknown, and adjoining it is the Confederate Stonewall Cemetery, with about 8000 graves. The manufacture of gloves is the leading industry; among the other manufactures are woollen and knit goods, flour, leather, lumber, paper and bricks. Electricity, generated at the Shenandoah river, is used for power in many of the factories.

A settlement was established in this vicinity as early as 1732. In 1752 the present name was adopted and the town was estab- lished by act of the colonial legislature. In 1756, during the Seven Years' War, George

Washington, in command of the provincial troops of Virginia, established his headquarters here and built Fort Loudoun. The town was incorporated in 1779. The Virginia Gazette and Winchester Advertiser, the first newspaper published in the Shenandoah Valley, was established here in 1787. In the Civil War, Winchester, because of its position in the lower Shenandoah Valley, played a great part, and was several times the scene of engagements between the Union and Confederate forces in 1862, Jackson's actions of Kerns town and Winchester; in the Gettysburg campaign, the capture of a Union garrison by Ewell (14-15 June 1863); and in Sheridan's campaign of 1864 the battle of Winchester or Opequon (Sept. 19, 1S64), for all of which see Shenandoah Valley Campaigns. Winchester was chartered as a city in 1852 and in 1906 the corporate limits were enlarged.

See J. E Norris (cd.), History of the Lower Shenandoah Valley (Chicago, 1890), and T. K. Cartmell, Shenandoah Valley Pioneers (Winchester, 1909).

WINCKELMANN, JOHANN JOACHIM (1717-1768), German archaeologist, was born at Stendal in Brandenburg on the 9th of December I7i7,the son of a poor shoemaker. He attended a gymnasium at Berlin and the school at Salzwedel, and in 1738 was induced to go as a student of theology to Halle. But he was no theologian, and he soon devoted himself with enthusiasm to Greek art and literature. With the intention of becoming a physician he attended medical classes at Jena; but means were insufficient and he was obliged to accept a tutorship near Magdeburg. From 1743 to 174S he was associate-rector of a school at Seehausen in the Altmark. He then went to Nothenitz near Dresden as librarian to Count Henry von Btinau, for whose history of the Holy Roman empire he collected materials. The treasures in the Dresden gallery awakened an intense interest in art, which was deepened by association with various artists, and especially with A. F. Oeser, who afterwards exercised so powerful an influence over Goethe. Winckelmann's study of ancient literature had inspired him with a desire to visit Rome, and he became librarian to Cardinal Passionei in 1754. This compelled him reluctantly to join the Roman Catholic Church.

In 175.V before leaving for Rome, Winckelmann published his Gedanken ttber die Nachahmung der griechischen Werke in Malerei und Bildhauerkunst (" Thoughts on the Imitation of Greek Works in Painting and Sculpture"), followed by a pretended attack on the work, and a defence of its principles, nominally by an impartial critic. The Gedanken contains the first statement of the doctrines he afterwards developed, and was warmly admired not only for the ideas it contained but for its style. Augustus III., elector of Saxony and king of Poland, granted him a pension

of 200 thalers, that he might prosecute his studies in Rome. He arrived in Rome in November 1755, became librarian to Cardinal Archinto, and received much kindness from Cardinal Passionei. After their deaths he was received as librarian and as a friend into the house of Cardinal Albani, who was forming his magnificent collection at Porta Salara. In 1763, while retaining this position, Winckelmann was made prefect of antiquities.

He devoted himself earnestly, at first with the aid of his friend A. R. Mengs, to the study of Roman antiquities, and gradually acquired an unrivalled knowledge of ancient art. In 1760

appeared his Description des pierres gravies du feu Baron de Slosch; in 1762 his Anmerkungen iiber die Baukunst der Alien (" Observations on the Architecture of the Ancients "), including an account of the temples at Paestum. In 1758 and 1762 he visited Naples, and from his Sendschreihen von den hercalanischen Enldeckungen (1762) and his Nachrichl von den neuesten her- culaniscken Enldeckungen (1764) scholars obtained their first real information about the treasures excavated at Pompeii and Herculaneum. Winckelmann again visited Naples in 1765 and 1767, and wrote for the use of the electoral prince and princess of Saxony his Bricje an Bianconi, which were published, eleven years after his death, in the Antologia romana. His masterpiece, the Geschichte der Kunst des Altcrlnwms (" History of Ancient Art "), issued in 1764, was soon recognized as a permanent contribution to European literature. In this work Winckelmann sets forth both the history of Greek art and the principles on which it seemed to him to be based. He also presents a glowing picture of the conditions, political, social and intellectual, which tended to foster creative activity in ancient Greece. The fundamental idea of his theory is that the end of art is beauty, and that this end can be attained only when individual and characteristic features are strictly subordinated to the artist's general scheme. The true artist, selecting from nature the phenomena fitted for his purpose, and combining them through the imagination, creates an ideal type marked in action by " noble simplicity and calm greatness " — an ideal type in which normal proportions are maintained, particular parts, such as muscles and veins, not being permitted to break the harmony of the general outlines. In the historical portion he used not only the works of art he himself had studied but the scattered notices on the subject to be found in ancient writers; and his wide knowledge and active imagination enabled him to offer many fruitful suggestions as to periods about which he had little direct information. Many of his conclusions based on the inadequate evidence of Roman copies have been modified or reversed by subsequent research, but the fine enthusiasm of the work, its strong and yet graceful style, and its vivid descrip- tions of works of art give it enduring value and interest. It marked an epoch by indicating the spirit in which the study of Groek art should be

approached, and the methods by which investigators might hope to attain to solid results. To Winckel- mann's contemporaries it came as a revelation, and exercised a profound influence on the best minds of the age. It was read with intense interest by Lessing, who had found in the earliest of Winckelmann's works the starting-point for his Laocoan.

Winckelmann contributed various admirable essays to the BiUiothek der schonen Wissenschaflcn; and in 1766 he published his Versuch einer Allegoric, which, although containing the results of much thought and reading, is not conceived in a thoroughly critical spirit. Of far greater importance was the splendid work entitled Monumenti anlichi inediii (1767-1768), prefaced by a Traitato preliminare, presenting a general sketch of the history of art. The plates in this work are representations of objects which had either been falsely explained or not explained at all. Winckelmann's explanations were of the highest service to archaeology, by showing that in the case of many works of art supposed to be connected with Roman history the ultimate sources of inspiration were to be found in Homer.

In 1768 Winckelmann went to Vienna, where he was received with honour by Maria Theresa. At Trieste on his way back he was murdered in an hotel by a man named Arcangeli to whom he had shown some coins presented by Maria Theresa (June 8th, 1768). He was buried in the churchyard of the cathedral of St Giusto at Trieste.

An edition of his works was begun by Fernow in 1808 and com- pleted by Meyer and Schulze (1808-1820). There are admirable studies of his character and work in Goethe's Winckelmann und sein Jahrhundert (1805), to which contributions were marie by Meyer and Wolf, and in Walter Pater's Renaissance (1902). The best biography of Winckelmann is by Justi, Winckelmann und seine Zeilgerwsse'n (2nd ed., 3 vols., Leipzig, 1898). A collection of letters, Bricje an seine Ziiricher Freunde, was published by Bliimner (Freiburg, 1882}.

(J. Si.;J. M..M.)

WIND (a common Teut. word, cognate with Skt. wtas, Lat. ventus, cf. " weather/' to be of course distinguished from to " wind," to coil or twist, O.Eng. windan, cf. "wander," "wend," &c.),a natural motion of the air, a current of air coming from any particular direction or with any degree of velocity. For the general account of winds, their causes, &c, see

Meteorology. Winds may be classified according to the strength or velocity with which they blow, varying from a calm, a breeze to a gale, storm or hurricane; for the varying scale of velocity per hour of these see Beaufort Scale, and for the measurement Anemo- meter. Another classification divides them into " regular" or "constant" winds, such as the "trade winds" {q-v.), and "periodic" winds, such as the "monsoon" (q.v.). There are many special winds, such as the " Fohn," " chinook," " mistral," " harmattan," " sirocco," which are treated under their in- dividual names. For the group of musical instruments known by the generic name of Wind Instruments see that heading.

WINDAU (Russian Vindava, Lettish Weniepils), a seaport and sea-bathing resort of western Russia, in the government of Courland, at the mouth of the Windau, on the Baltic Sea, no m. by rail N.W. of Riga. Pop. (1897), 7132. It has a castle built in 1290. The harbour, 20 and 25 ft. deep, is free from ice all the year round. Timber, grain and other commodities are exported to the annual value of two to three millions sterling; the imports range between three-quarters and one million sterling.

WIND BRACES, in architecture, diagonal braces to tie the rafters of a roof together and prevent " racking." In the better sort of medieval roofs they are arched, and run from the principal rafters to catch the purlins.

WINDEBANK, SIR FRANCIS (1 582-1646), English secretary of state, was the only son of Sir Thomas Windebank of Hougham , Lines., who owed his advancement to the Cecil family. Francis entered St John's College, Oxford, in 1509, coming there under the influence of Laud. After a few years' continental travel ($605-1608), he was employed for many years in minor public offices, and became clerk of the council. In June 1632 he was appointed by Charles I. secretary of state in succession to Lord Dorchester, his senior colleague being Sir John Coke, and he was knighted. His appointment was mainly due to his Spanish and Roman Catholic sympathies. The first earl of Portland, Francis, Lord Cottington, and Windebank formed an inner group in the council, and with their aid the king carried on various secret negotiations, especially with Spain. In December 1634 Windebank was appointed to discuss with the papal agent Gregorio Panzani the possibility of a union between the Anglican and Roman Churches, and expressed the opinion that the Puritan opposition might be crippled by sending their leaders to the war in the Netherlands. Windebank's efforts as treasury com- missioner in 1635 to shield some of those guilty of corruption led to a breach with Archbishop Laud, and the next year he was for a time disgraced for issuing an order for the conveyance of Spanish money to pay the Spanish troops in the Netherlands. In July 1638 he urged upon the king instant war with the Scots, and in 1640, when tumults were breaking out in England, he sent an

appeal from the queen to the pope for money and men. He was elected in March 1640 member of the Short Parliament for Oxford University, and he entered the Long Parliament in October as member for Corfe. In Decemberthe House learnt that he had signed letters of grace to recusant priests and Jesuits, and summoned him to answer the charge, but with the king's connivance he fled to France. From Calais he wrote to the first Lord Hatton, defending his integrity, and affirming his belief that the church of England was the purest and nearest the primitive Church. He remained in Paris until his death on the 1st of September 1646, shortly after he had been received into the Roman communion.

WINDERMERE, the largest lake in England, in the south- eastern part of the Lake District (q.v.). It is in the county of Westmorland, the boundary with Lancashire running from the head southward along the western shore, round the foot and northward along about one-third of the eastern shore.

It forms a narrow trough with a slightly curved axis of 10} m. The width at right angles to the axis never reaches 1 m. The area is 5-69 sq. m. The shores are generally steep, beautifully wooded and fretted with numerous little sheltered bays. The hills immediately surrounding the lake rarely reach 1000 ft., but the distant views of the mountains to the north and west contrast finely with the sylvan beauty of the lake itself. The middle of the lake, immediately opposite Bowness, is especially beautiful, for here a group of islands (Belle Isle, Thompson's Holme, the Lilies and others) divide the lake into two basins, the water about them seldom exceeding 50 ft. in depth. On the other hand, the greatest depth sounded in the northern basin is 219 ft., and in the southern 134. The lake receives the Rothay and Brathay streams at the head; Trout Beck also flows into the north basin, and Cunsey Beck from Esthwaite into the south. The lake is drained by the Leven. Steamers belonging to the Furness Railway Company ply regularly on Windermere, the chief stations being Lakeside, the terminus of a branch railway, beautifully situated at the foot, Ferry on the west shore below the islands, Bowness on the east and Waterhead, at the head, for Ambleside. The lake contains perch, pike, trout and char; there are several large hotels at Bowness and elsewhere on its shores.

The town of Windermere, above the eastern shore adjacent to Bowness (q.v.), is in the Appleby parliamentary division of Westmorland, and is the terminus of a branch of the London and North- Western railway from Oxenhoime junction. Numer- ous mansions and villas have grown up in the vicinity. Here, from Orrest Head, in the grounds of Elleray, where lived Pro- fessor Wilson (Christopher North), superb views over the whole lake and its surroundings are obtained. In 1905 Bowness and Windermere were united as a single urban district.

WINDHAM, WILLIAM (1750-1810), English politician, came from an ancient family long resident at Felbrigg, near Cromer in Norfolk. His father, Colonel William Windham (i7i7-i76i),was an adventurous soldier with a taste for languages, both ancient and modern; his son was born in Golden Square, London, on the 3rd of May r75o. He went to Eton, which he quitted in 1766 for the university of Glasgow, where he acquired the taste for mathematics which always distinguished him. In 1767 he matriculated as gentleman commoner at University College, Oxford, where he remained until 177 1. He never took the degree of B.A., but qualified as M.A. on the 7th of October 1782, and received the degree of D.C.L. on the 3rd of July 1793. He made a tour in Norway in 1773 and visited Switzerland and Italy between 1778 and 1780. His maiden speech on the political platform was delivered at Norwich on the 28th of January 1778, when he vehemently opposed the prosecution of the American war. His entrance into public life took place in April 1783, when he went to Ireland as chief secretary to Lord Northington, the lord-lieutenant in the coalition ministry of F'ox and Lord North. Windham was his own keenest critic, his distrust in his own powers and his disappointment at his own achievements being conspicuous on every page of his Diary. Sickness com- pelled his return to England early in July 1783, and he resigned his position in August; but change of scene and constant exercise restored him to health before the end of that year. In April 1784 he was returned to parliament as member for Norwich by a majority of 64 votes, thus scoring one of the few triumphs attained by the adherents of the coalition cabinet. This seat he retained until 1802, when he was beaten on account of his hostility to the peace of that year.

Though he strenuously opposed all proposals for parlia- mentary reform, to which most of the Whigs were deeply com- mitted, Windham remained in alliance with that party until after the outbreak of the French Revolution, when he and several of his chief allies joined Pitt. The place of secretary-at-war was conferred upon him in July 1794, and he was at the same time created a privy councillor, and admitted to a seat in the cabinet. Windham discharged the duties of his office with unflagging zeal, his efforts being particularly directed towards ameliorating the condition of the inferior grades of the army. In the autumn of

I7Q4 he was despatched to the duke of York's camp in Flanders with the views of his ministerial colleagues, but their advice could not counteract the military incapacity of the royal duke. When Pitt was frustrated in his intention of freeing the Roman Catholics from their political disabilities,

Windham, who in religious matters always inclined to liberal opinions, was one of the ministers who retired from office in February 1801. He was a constant opponent of all negotiations forpeace with France, preferring to prosecute the campaign at whatever cost until some decisive victory had been gained, and the temporary peace of Amiens, which was carried through under Addington's administration, did not meet with his approval. When he was ousted from the representation of Norwich in June 1802, a seat for the pocket borough of St Mawes in Cornwall was found for him. He declined a place in Pitt's new cabinet (May 1804) on the ground that the exclusion of Fox prevented the formation of an administration sufficiently strong in parliament and the country to cope with the dangers which threatened the safety of the nation, and he offered a general opposition to the measures which the prime minister proposed. On Pitt's death in January 1S06 the ministry of " All the Talents " was formed under the leadership of Lord Grenville, and Windham accepted the seals as secretary of state for war and the colonies. Fox's death necessitated several official changes; and a peerage was proposed for Windham, but he declined the proffered honour, and re- mained in office as long as the ministry existed. A general elect ion took place in November 1806 and Windham was elected for the county of Norfolk; but the election was declared void on petition, and he was compelled to sit for the borough of New Romney, for which he had also been elected. In 1807, when parliament was dissolved under the influence of the " No Popery " cry of Spencer Perceval, a seat was found for Windham at Iligham Ferrers. Liberty of religious opinion he uniformly supported at all periods of his life, and with equal consistency he opposed all outbreaks of religious fanaticism; hence with these convictions in his mind few of the domestic measures of the new ministers met with his approbation. Moreover, he disapproved of the expedition to the Scheldt, and thought the charges brought against the Duke of York, as commander-in-chief, required his retirement from office. At the same time he actively opposed the bill of Sir Samuel Romilly, his colleague on most political questions, for reducing the number of offences visited with the punishment of death. In July 1809 he received a blow on the hip whilst rendering assistance at a fire, which he thought little of at the time; but a tumour subsequently formed on the spot and an operation became necessary. This brought on a fever, and Windham rapidly sank. He died on the 4th of June 18 10, and was buried in the family vault at Felbrigg.

His speeches were published in three volumes in 1806, with a memoir by Thomas Amyot, his private secretary while he was in office in 1806, and his Diary was edited by Mrs Henry Baring in 1866. The passages in the latter work relative to Dr Johnson's declining days have been of considerable use to the later editors of Bos well.

WIND INSTRUMENTS (Fr. instruments a vent, Ger. Bias- instrumente,

Ital. strumenti da fiato), a numerous and powerful section of the orchestra, classified according to the acoustic properties of the instruments and to certain important structural features. The first great natural subdivision is that of (A) mouth blown, and (B) mechanically blown, instruments.

Section A falls into the classes of (1) wood wind, (2) brass wind, with their numerous subdivisions.

1. (a) Wood Wind. — :Pipes without embouchure or mouthpiece, such as the ancient Egyptian nay, a long flute with narrow bore held obliquely, and the syrinx or pan-pipes, both of which are blown by directing the breath not into the pipe but across the open end, so that it impinges against the sharp edge of the rim. (b) Pipes with embouchure but no mouthpiece, such as the transverse mite, piccolo and fife; see Fi.ute and Mouthpiece, (c) Pipes with whistle mouthpieces, an ancient contrivance, extensively used by primitive races of all ages, which finds application at the present day in the flageolet, the whistle, and in organ pipes known as the flue-work. A large class of medieval instruments, widely diffused but now obsolete, were known as recorders, beak or tipple-flutes, flutes d bee, fi&tes douces,ft&tes anglaises (Fr.), Plock or Blockftdten, Scknabelfioten

(Ger.). (<£) Reed instruments, by which are to be understood not reed pipes but instruments with reed mouthpieces, which subdivide again into two families owing to the very different acoustic conditions pro- duced by the combination of a reed mouthpiece with (1) a cylindrical pipe and(2) a conical pipe. These combinations influence not only the timbre, but principally the harmonics obtained by overblowing and used to supplement the fundamental scale given out as the lateral holes are uncovered one by one; the practical difference to the performer may be summed up as one of fingering, (di) comprises pipes with cylindrical bore with either single or double reed mouth piece, such as the clarinet family, the obsolete batyphone (q.v.) and the family of cromornes {q.v.). To these we may add theaulosand tibia of ancient Greece and Rome, which at different times had single and double reed mouthpieces. These pipes all overblow a twelfth. {di) Pipes with conical bore and either single or double reed mouth- piece. This class comprises the important members of the oboe family (with double reed) derived from the Schalmey and Pommer of the middle ages, the Schryari, an instrument which had an ephemeral existence at the end of the 16th century and consisted of an inverted cone with a double reed placed within a pirouette or capsule, which had the result of restricting the compass of the instrument to the fundamental scale, for harmonics can only be produced when the reed is controlled by the lips (see Reed Instruments). The modern family of saxophones with single reed mouthpiece, intended to replace the clarinets in military bands, may be classed with the wood wind, although actually made of brass for durability.*

The same may be said of the sarrusophones, a family of brass oboes with double reed, invented by M. Sarrus to replace the oboe in military bands. To these we may add the Cheng (q.v.) or Chinese organ, consisting of a set of pipes arranged 111 a hollow gourd and sounded by means of free-reeds, the air being fed to the pipes in the reservoir by the mouth through a pipe shaped like the spout of a tea-pot. The Cheng is important, asembodying the principle of the harmonium. (e) Wooden tubes of conical bore having lateral holes and sometimes from one to three keys, played by means of a cup or funnel mouth- piece, such as the obsolete cornet {q.v.) or Zinke, which enjoyed such widespread popularity during the 16th and 17th centuries, and their bass the serpent. The bagpipe and its drones and chaunter are indirectly mouthblown, with the exception of the Union or Irish and of the Border bagpipes, and of the French bagpipe known as musette, in which the bag is fed with air by means of bellows, instead of through an insufflation pipe.

2. The Brass Wind consists of the following classes: (a) Tubes of fixed length, such as the natural trumpet and French horn, all medieval horns and trumpets, including the busine, the tuba, the oHphant, the hunting horn and the bugle, the classical buccina, r-.ornu, lituus and tuba. The compass of all these was restricted to the few notes of the harmonic series obtained by overblowing. (6) Tubes of which the length is varied by a slide, such as the sackbut family, the slide trombone and slide trumpet. When the slide is drawn out the column of air is lengthened and the pitch proportion- ally lowered. Each position or shift of the slide enables the per- former to overblow the harmonic series a semitone lower, (c) Tubes of which the length is varied by lateral holes and keys. To this class belong the keyed bugle and its bass the ophicleide, the obsolete keyed trumpet and the bass horns and Russian bassoon, which immediately preceded the invention of valves. The saxophones and sarrusophones might also be classed with these (see above, 1 d2). {d) Tubes of which the length is varied by valves or pistons. This class is the most modern of all, dating from the invention of valves in 1815, which revolutionized the technique and scoring for brass instruments. A rational subdivision of valve instruments is made in Germany into whole and half instruments (see Bombardon and Valves), according as to whether the whole length of tubing comes into practical use or only half, or from the performer's point of view whether the fundamental note of the harmonic series can be produced, or whether the series begins with the second member, an octave above the first, in which case it is obvious that half the tubing is of no practical value. The principal piston instruments are : the whole instruments — contrabass and bass tubas, bombardons or helicons; the euphonium or tenor tuba; the half instruments — – saxhorns, Fliigelhorns, tenor horns, cornets, the valve trombone, valve trumpet and valve horn (French horn), and the Wagner

tubas, which are really the basses of the French horn and are played with funnel-shaped mouthpieces. The brass wind is further divided according to the shape of the mouthpiece used, (a) With funnel- shaped mouthpiece, such as the French horn, tenor horn and Wagner tubas; and (0) with cup-shaped mouthpiece, comprising all the other brass wind instruments except the bugle, of which the mouth- piece is a hybrid, neither true funnel nor true cup.

Section B: Mechanically Blown Instruments. — This section consists mainly of instruments having the air supply fed by means of bellows; it comprises the two classes: (1) with keyboard, (2) without keyboard.

1. This includes all kinds of organs: the ancient hydraulic organ or hydraulus, differing from the pneumatic only in that water pressure was used to compress the air supply instead of the bellows

being weighted by means of the foot and body of the performer at first and later by mcms of weights; the reed organ, consisting of pipes furnished with beating reeds, known also as the reed work when incorporated with the large church organ; the medieval portative and positive organs; the large modern church organ. To this class also belong the accordion and concertina and the numerous instruments of the harmonium type which have free instead of beating reeds, a difference which confers upon them the power of dynamic expression denied to all organs fitted with flue pipes or pipes having beating reeds. The com- plex instruments known as organized pianos also come within this category.

2. This comprises the bagpipes known as musette, and the Union or Irish and the Border bagpipes having a wind supply fed by bellows instead of by the insufflation pipe proper to the bagpipe; the barrel organ having instead of a keyboard a barrel studded with nails, which lift the valves admitting air to the flue pipes generally hidden within the case. (K. S.)

WINDISCHGRATZ, PRINCE ALFRED (17S7-1S62), Austrian field-marshal, entered the Austrian army in 1804, participated in all the wars against Napoleon and fought with distinction at Leipzig ami in the campaign of 1814. In the following years of peace he held successive commands in Prague, being appointed head of the army in Bohemia in 1840. Having gained a reputa- tion as a champion of energetic measures against revolution he was called upon to suppress the insurrection cf March 1848 in Vienna, but finding himself ill-supported by the ministers he

speedily threw up his post. Having returned to Prague he there showed firmness in quelling an armed outbreak, of the Czech separatists (June 1848). Upon the recrudescence of revolt in Vienna he was summoned at the head of a large army and reduced the city by a formal siege (Oct.. 20-29). Appointed to the chief command against the Hungarian rebels he gained some early successes and reoccupied Budapest (Jan. 1849), but by his slowness in pursuit he allowed the enemy to rally in superior numbers and to prevent an effective concentra- tion of the Austrian forces. In April 1849 he was relieved of his command and henceforth rarely appeared again in public life.

See Fur st Windischgrdtz. Eine Lebens-Skizze. Aus den Papier en eines Zeitgenossen der Sturm-Jahre 1848 und 1849 (2nd ed., Leipzig,

1898).

WINDMILL, a term used, in the widest sense, for a machine by which the energy of the wind is applied to useful purposes.

Windmills were cer- tainly used as early as the 12th century and are still largely employed in Holland in draining the polders and grinding trass. They are some- what extensively used in America for pumping and driving agrieult u ral machinery. In spite of the competition of more powerful and tractable motors, they are serviceable, especially in new countries, where fuel is scarce and where work can be done in- termittently. An inquiry was made in India in 1879 as to the possibility of using wind mills for irriga tio n (Profes- sional Papers on Indian Engineering, July 1S79), with the result that it was concluded their usefulness would be very limited. A windmill is not in any case a very powerful or efficient

Fig. 1— Windmill near Delft.

motor, and its work is variable and intermittent. In favourable positions, it will run on an average for eight hours out of the twenty-four. For pumping on a small scale, the intermittent action is least an objection, because there is generally a tank or storage reservoir regulating the delivery of the water. For driving dynamos windmills are least suitable, on account of the variation of speed, though some attempts to generate electricity by. wind power have been made, special arrangements being adopted for automatically regulating the speed.

European Windmills. — In all the older windmills a shaft, called the wind shaft, carried four to six arms or whips on which long rectangular narrow sails were spread. The wind shaft was placed at an inclination of io° or 15 with the horizontal, to enable the sails to clear the lower part of the mill.

The whip carrying the sail was often 30 to 40 ft. in length, so that the tips of the sails described a circle 60 to So ft. in diameter. The sails were rectangular, 5 to 6 ft. wide, and occupying five-sixths of the length of the whip. A triangular leading sail was sometimes added. Sometimes the sails consisted of a sail-cloth spread on a framework; at other times narrow boards were used. The oldest mill was no doubt the post mill, the whole structure being carried on a post; to bring the sails to face the wind, the structure was turned round by a long lever. The post mill was succeeded by the lower, smock or frock mill, in which the mill itself consisted of a stationary tower, and the wind shaft and sails were carried in a revolving cap rotating on the top of the tower. Andrew Meikle introduced in 1750 an auxiliary rotating fan at right angles to the principal sails, which came into action whenever the wind was oblique to the axis of the sails, automatically veering the sails or placing them normal to the wind. For safety, the sails must be reefed in high winds. In 1807, Sir W. Cubitt introduced automatic reefing arrangements. The sails were made of thin boards held up to the wind by weights. If the force of the wind exceeded a certain value the boards were pressed back and exposed little surface.

American Windmills. — These generally have the sails, 18 or more in number, arranged in an annulus or disk. The sails consist of narrow boards or slats arranged radially, each board having a constant or variable inclination to the wind's direction. An American mill presents a larger surface for a given length of sail than the older type, and consequently the construction is lighter. To turn the mill face to the wind a rudder is sometimes used projecting backward in a plane at right angles to the plane of rotation of the sails. Various arrangements are adopted for reefing the sails automatically, (a) In some an action equivalent to reeling is obtained by turning the sail disk oblique to the wind. The pressure on a side vane in the plane of rotation, controlled by a weight, turns the sail disk edgeways to the wind if the pressure exceeds a safe amount, (b) In centrifugal governor mills the slats forming the sails are connected in sets of six or eight, each set being fixed to a bar at the middle of its length. By rotating this bar the slats are brought end on to the wind, the action being analogous to shutting an umbrella. The slats are held up to the wind by a weight. A centrifugal governor lifts the weight if the speed becomes excessive and the sails are partially or completely furled. Many of the veering and reefing arrangements are very ingenious and too complicated to be described without detailed drawings. A description of some of these arrangements will be found in a paper by J. A. Griffiths (Proc. Inst. Civ. Eng., 119, p. 321) and in a " Report on Trials of Wind Pumping Engines at Park Royal in 1903 " {Joum. Roy. Agric, Soc, 64, p. 174).

Warner s Annular Sail Windmill. — Messrs Warner of London make a windmill somewhat similar to American mills. The shutters or vanes consist

of a frame covered with canvas, and these are pivoted between two angle-iron rings so as to form an annular sail. The vanes are connected with spiral springs, which keep them up to the best angle of weather for light winds. If the strength of the wind increases, the vanes give to the wind, forcing back the springs, and thus the area on which the wind acts diminishes. In addition, there are a striking lever and tackle for setting the vanes edgeways to the wind when the mill is stopped or a storm is expected. The

wheel is kept face to the wind by a rudder in small mills; in large mills a subsidiary fan and gear are used. Fig. 2 shows a large mill of this kind, erected in a similar manner to a tower mill. The tower is a framework of iron, and carries a revolving cap, on which the wind shaft is fixed. Behind is the subsidiary fan with its gearing

acting on a toothed wheel fixed to the cap. It is important that a wind-mill should con- trol itself so that it works efficiently in moderately strong winds and at the same time runs in very light winds, which are much more prevalent. It should also, by reefing or otherwise, secure safety in storms.

Table I. gives the mean velocity of the wind in miles per hour for an inland station, Kew, and a very ex-

fiosed station, Scilly, or each month during the period 1890-1899.

The pressure of the wind on a plane normal to its direction, com- posed partly of an excess front pressure and negative back pressure, is given by the relation RR ty IfVfiHˆvftˆl p =0-003 v 2 ,

-ˆJlfji. ai do pˆ gs fr where P is in pounds

per square foot and v the velocity of the wind in mtles per hour. It varies a little with the form" and size of the surface, but for the present purpose this variation may be disregarded. (See experi- ments by Dr Stanton at the National Physical Laboratory, Froc. Inst. Civ. Eng. 156, p. 78.) For velocities of 5, 10 and 20 m. per hour the pressures on a plane normal to the wind would be about 0075, 0-3 and 1-2 to per sq. ft. respectively, and these may be taken to be ordinary working velocities for windmills. In storms the pressures are much greater, and must be reckoned with _ in considering; the stability of the mill. A favourable wind velocity for windmills is 15 m. per hour.

Table I.

Fig. 2.— Warner's Annular Sail Windmill.

Kew .

Scilly .

Jan.

Feb.

March.

April.

May.

June.

8-o

20-6

8-5 19-5

8-5 18-4

7-5 16-1

7-5 14-1

7-0 129

Kew . Scilly .

July-

Aug.

Sept.

Oct.

Nov.

Dec.

70

12-4

7-0 13-9

60 14-6

6-5

17-2

7-0

iy-3

8-o

22-0

Pressure on Surfaces oblique to the Wind. — Let fig. 3 represent a plane at rest on which a wind current impinges in the direction Y\ , making an angle B with the normal 0

2 cos 8

lb per sq. ft.

r i -fcos 2 where p is the pressure in pounds per square foot on a plane struck

normally by the same wind.

In fig. 3 let AB be part of a windmill sail or vane at rest, XX being the plane of rotation and YY the direction of the wind. The angle 6 is termed the „,

weather of the sail. This ;

is generally a constant angle for the sail, but in some cases varies from a small angle at the outer

end to a larger angle near Y . OW 6 Y

*the axis of rotation. In mills of the European type, 6 = 12° to 18 , and the speed of the tips of the sails is 2ˆ to 3 times the velocity of the wind. In mills of the American *’*

type, 9 = 28° to 40 , and Vio. 3.

the speed of the tips of the

vanes is f to 1 time that of the wind. Then if Oa = n be the normal pressure on the sail or vane per square foot, ba = t is the effective component of pressure in the direction of rotation and

*. „ , 2 sin Scosd t—n sin B = p – — ; — ~9'tt- * 1 + cos 2 e*

When the sail is rotating in a plane at right angles to the wind direction the conditions are more complicated, in fig. 4 let XX be the plane of rotation of the vane and YY the direction of the wind. Let Oa be the normal to the vane, d being the weather of the vane. Let Qv=v be the velocity of the wind, Qu = u the velocity of the vane. Completing the parallelogram, Ov r ~v r is the velocity and direction of the wind relatively to the vane. v r = V (z. ,2 +z£ 5) =v sec tf>, tan

. It is clear that 6-- cannot be greater than 90°, or the vane would press on the wind instead of the wind on the vane. Substituting these values in the equations already given, the normal pressure on the oblique moving vane is

ˆ•003ˆsecˆ4ˆtf- J v i-r-cos 2 (0-H>)

in the direction of motion of the

The component of this pressure vane is

*ˆ „ „ 2 sin (0-hrt cos (5+ *) / = 003 v secV V ■>„ , ; ■■ ' ■■*

and the work done in driving the vane is tu — tv tan

2 sin (fl-f-0) cos (fl-H>) 1 + cos 2 (0+0)

•003 v A sec 8 4> tan <

foot lb per sq. ft. of vane per sec, where v is taken in miles per hour.

For such angles and

velocities as are I

usual in wi ndm ills

this would give for a

square foot of vane,-

near the tip about

0-003 &3 ft- lb perY_ Ol

sec. But parts of ”

the vane or sail

nearer the axis of

rotation are less

effective, and there

are mechanical fric- “!

tion and other ‘■

causes of ineffici- xl

ency. An old rule

based on experi-

h ig. 4.

ments by Coulomb on mills of the European type gave for the average effective work in foot lb per sec. per sq. ft. of sail

W = o-ooii i> 3 .

Table II. — In 150 Working Hours.

I.

II.

III.

IV.

V.

VI.

Revolutions of-w^ieel …. Double strokes of pump

Average effective horse-power

208,000

40,000

78,000

o-53

308,000

122,000

40,000

0-27

264,000 264,000

46,000

0-31

322,000

160,000

40,000

0-27

222,000 78,000 36,000

0-24

202,000

202,000 48,000 0-32

I. Goold Shapley and Muir, Ontario; wheel 16 ft. diameter, 18 vani ond prize). III. J. W. Titt. IV. R. Warner. V. J. W. Titt. VI. H. Syk<

(second pri;

vanes, 131 sq. ft. area (first prize). II. Thomas & Son

712

WINDOW

Some data given by Wolff on mills of the American type gave for the same quantity

VV = o-ooo45& 3 .

From some of the data of experiments by Griffiths on mills of the American type used in pumping, the effective work in pumping when the mill was working in the best conditions amounted to from O-0O05U 3 to o-ooo3« 3 ft. lb per sec. per sq. ft.

In 1903 trials of wind-pumping engines were carried out at Park Royal by the Royal Agricultural Society (Journ, Roy. Agric. Sac. Ixiv. 174). The mills were run for two months altogether, pumping against a head of 200 ft. The final results on six of the best mills are given in Table II.

A valuable paper by J. A. Griffiths {Proc. Inst. Civ. Rng. cxix. 321) contains details of a number of windmills of American type used for pumping and the results of a series of trials. Table III. contains an abstract of the results of his observations on six types of windmills used for pumping: — –

eastern doorway of the Erechtheum, which formed part of the original building of 430 B.C., have lately been found; they were rectangular windows with moulded and enriched architrave, resting on a sill and crowned with the cymatium moulding. Of later date, at Ephesus, remains of similar windows have been discovered. Of Roman windows many examples have been found, those of the Tabularium being the oldest known. A coin of Tiberius representing the temple of Concord shows features in the side wings which might be windows, but as statues are shown in them they are possibly only niches. Over the door of the Pantheon is an open bronze grating, which is thought to be the prototype of the windows which lighted the large halls of the Thermae, as it was absolutely necessary that these should be closed so as to retain the heat, the openings in the gratings being filled with glass. In some cases window openings were closed with thin slabs of marble, of which there are examples still existing in the churches of S. Martino and the Quattro Santi lncoronati at Rome. Similar slabs exist in the upper storey of the amphitheatre at Pola; it still remains, however, an open question

Table III.

I.

II.

III.

IV.

VI.

Diameter of wheel, feet ….

Sail area, square feet

Weather angle, outer ends …. ,, ,, inner ends ….

Pitch of vanes, outer ends, feet . ,, ,, inner ends, feet .

Height of lift, feet . . ; . . _ .

Velocity of wind at maximum efficiency:

per hour .

Ratio of velocity of tips of vanes to velocity of wind

Revolutions of mill, per minute

Actual horse-power

In 100 average hours in a calm locality —

Quantity of water lifted, gallons per hour In 100 average hours in a windy locality —

Quantity of water lifted, gallons per hour

miles

25

22-3 392

18° 47′

38 20′ 23-$ 20-6 100

29-2

“■5

104

43°

43 337

i3-i

*61*2*

4.3 7-0

•93 ‘77

5-0 6-8

0-018 0-098

495 816

306 629

5-8

■92

13-0

o-ou

153

287

6-5

•S2

I3‘3

0-025

135 271

i6-o

201

36°

36°

3<3-5 137

39-o

60

•65

7-5 0-024

259

525

14-2 157

30° 30°

25‘7

8-2

66-3

■91

12-6

0-065

267

540

28° 28°

17-0

6-4

387

8-5 -87 20-5 0-028

115

237

9-8

80

50° H°

22-4 7-2

3o- 7

60

73 12-5

C-0I2

145 270

I. Toowoomba; conical sail wheel with reefing vane. II. Stover; solid sail wheel with rudder; hand control. III. Perkins; solid wheel, automatic rudder. IV. and V. Althouse; folding sail wheel, rudderless. VI. Carlyle; special type, automatic rudder.

Table IV. gives the horse-power which may be expected, according to Wolff, for an average of 8 hours per day for wheels of the American type.

Diameter of Wheel in Feet.

Velocity of

Wind in Miles

per Hour.

Horse-power of Mill.

Revolutions of Wheel per Minute.

*8**

16

0-04

70-75

10

16

0-12

60-65

12

16

0-21

55-6o

■*4*

16

0-28

50-55

.6

16

0-41

45-5”

18

16

0-6l

4.0-45

20

16

0-78

35-4o

25

16

■*34*

30-35

Further information will be found in Rankine, The Steam Engine and other Prime Movers; Weisbach, The Mechanics of Engineering; and Wolff, The Windmill as a Prime Mover. (W. C. V.)

WINDOW (properly ” wind eye”), the term applied in archi- tecture (Ital. fenestra, Fr. fenetre, Span, ventana, Ger. Fenster) to an aperture or opening in a wall for the admission of light and air to the interior of a hall or room.

The earliest windows are those which constituted the clerestory windows of the Great Hall of Columns at Karnak; they were filled with vertical slabs of masonry pierced with narrow slits. Other Egyptian temples were lighted in the same way. In one at Der el Medinet at Thebes the window was divided by miniature columns with lotus capitals. Some of the small ivory carvings found at Nimroud by Layard, now in the British Museum, are evidently of Egyptian workmanship, as they have lotus columns forming a balustrade in the lower part of the window; and such features are shown in the Assyrian bas-reliefs as windows in the towers. Dr Arthur Evans’s discoveries at Cnossus have revealed, in the eastern portion of the palace, rectangular openings which were certainly windows, with raised sills and stone benches inside, and the repre- sentations of the ordinary houses at Cnossus on a series of plaques show that they were in two or three storeys with openings in the upper storeys filled with windows framed in timber with transoms and mullions. It was at one time thought that there were no windows in Greek temples, and those of the west front of the Erech- theum are known now to be later reconstructions of the Roman period, but the remains of two windows placed on either side cf the

as to the lighting of some of the temples in Rome, in which were placed all the magnificent statues from Greece, so as to enable them to be seen properly. The Pantheon was lighted by a circular opening in the dome 30 ft. in diameter; the rain therefore fell in at times, and consequently the pavement had a convex contour, there being also holes under the hypaethral opening in connexion with drains beneath the pavement. There was a window at the south end of the tepidarium of the Forum baths at Pompeii, said to have been filled with a bronze frame with glass in it, half an inch thick. Although no window frames have been found

inPompeii.theopeningsinthewalls show that some of the rooms were lighted by windows; one of them in the house of Diomede takes the form of a bow window with three lights in it.

In the later styles the windows assume much greater importance, and in Gothic cathedrals almost govern the whole design. Already, however, in the earliest Byzantine church, Sta Sophia at Con- stantinople, the windows constituted one of the chief features of the church ; the forty windows round the base of the cupola giving an exceptional lightness to the structure; besides, there are windows in the larger and smaller apses and in the north and south walls. The windows in the latter, which are of great size, are subdivided by marble mullions with pierced lattices between of transparent marbles.

In the later Byzantine churches the windows were of smaller dimensions, but always filled with marble screens, sometimes pierced, and the grouping of two or three under a single arch is the prevailing design.

In the Romanesque styles the windows are universally round- headed, with infinite variety of design in the mouldings and their enrichment, greater importance being sometimes given by having two or more rings of arches, the outer ones carried by small columns; this is varied in Norman work by dividing them with a shaft into two or more lights placed in shallow recesses under an arched head. Circular windows occur occasionally, as in the eastern transept of Canterbury, at Iffley church, Oxford, Barfreston and Patricksbourne in Kent. In all these early windows, which are usually small, greater light is obtained by splaying the jambs inside with a scoinson arch over them. The coupling together of two or more windows under a single arch, and the piercing of the tympanum above, led to the development of plate and rib tracery (see Tracery); also to that of the circular or rose windows, which throughout the Roman- esque and Gothic periods constituted very important features in the church, being placed high up in the west front over the porch or in the transepts; sometimes, and more particularly in French churches, they occupied the whole of the upper portion of the windows, having vertical lights under them, but the junction was never quite satisfactory.

Although the employment of tracery continued long after the classic revival, the examples generally are poor in design, and even in those that are more elaborate (as those of the period of Henry II. in the church at Le Grand Andely) the introduction of classic details in the ordinary and rose

windows was of too capricious a character to make them worthy of much attention. The early Renaissance architects in France in some cases, and notably in the apsidal chapels of St Pierre at Caen (1520), seemed to feel that the stained glass was too much cut up by the tracery and mullions, and omitted them altogether, trusting to the iron stanchions and cross-bars to carry their glass, so that a return was made to the simple semicircular-headed window of Roman times, retaining only the mouldings of the late Flamboyant period for the jambs and arch-moulds. Windows of this description, however, would be out of place in domestic architecture, so that the mullion window was there retained with two or three transoms, all moulded and with square heads; in the Tudor period cusping was introduced in the upper lights and occasion- ally in those below, and this custom lingered for a long time in the collegiate buildings of Oxford and Cambridge and in various houses throughout England.- In France, square-headed windows were almost always employed, owing to the earlier introduction there of the Renaissance style, when the decoration of the mullions, generally consisting of classic pilasters, required some kind of architrave, frieze and cornice, to render the order complete; eventually the mullion and transom disappear, and in the earlier work of the Louvre the windows are simple rectangular openings, fitted with wooden framework, and, like those in Rome, Milan and Genoa, depend for their architectural effect on the moulded classic jambs, and the lintel, frieze and small cornice over; and in cases where more importance was required, with small semicircular columns or pilasters carrying the usual entablature, with small pediments sometimes angular and sometimes semicircular, repeating in fact an ancient Roman design, of which almost the only examples known are the blank windows and niches which decorated some of the enclosure walls of the Roman thermae. In Florence and Siena the early windows of the Renais- sance often had semicircular heads and were coupled together, there being two lights to the window divided by shafts, thus continuing the tradition of those of the earlier Tuscan palaces; the same treatment was followed in Venice, Verona and other towns in the north-east, where the Gothic influence of the palaces in Venice created a transition; thus the mouldings of the windows of the Vendramini and Corner Spinelli palaces follow closely those of the Ducal Palace, but the arches are semicircular instead of being either pointed or ogee in form. Another type peculiar to Venice is a lofty window with semicircular head enclosed in a rectangular panel and crowned with a small entablature and pediment.

The only new combination of the 16th century in Italy, which was largely adopted in England by Inigo Jones and his followers in the 17th and 1 8th centuries, is the so-called Venetian or Palladian window, the finest example of which is that found in the Sala della Ragione or the basilica at Vicenza; it is true that it was here em- ployed by Palladio to light an open gallery,

but the composition was so generally approved that it led to its constant adoption for a window of more importance than the ordinary simple rectangular form. It consists of a central light with semicircular arch over, carried on an impost consisting of a small entablature, under which, and enclosing two other lights, one on each side, are pilasters. In the library at Venice, Sansovino varied the design by substituting columns for the two inner pilasters. The Palladian window was introduced by Inigo Jones in the centre of the garden front at Wilton, by Lord Burlington in the centres of the wings of the Royal Academy, and good examples exist in Holkham House, Norfolk, by Kent, and in Worcester College, Oxford. There do not seem to be any examples in either Germany, France or Spain. Circular and oval windows, lighting a mezzanine or the upper part of a hall, are found in Italy, France and England, sometimes over ordinary rectangular windows when the main front is decorated with semi- detached columns as in Hampton Court Palace. (R. P. S.)

WINDOW CORNICE, ap. ornamental framework of wood or composition to which window curtains are attached by rods with rings or hooks. Cornices are often gilded and of elaborate design, but they are less fashionable in the 20th century than before it had been discovered that elaborate draperies harbour dust and microbes. Like other pieces of furniture, they have reflected taste as it passed, and many of the carefully constructed examples of the latter part of the 18th century are still in use in the rooms for which they were made. Chippendale provided a famous series still in situ for the gallery at Harcwood House, the valances of which are, like the cornices themselves, of carved and painted wood.

WINDOW SEAT, a miniature sofa without a back, intended to fill the recess of a window. In the latter part of the 18th century, when tall narrow sash windows were almost universal, the window •seat was in high favour, and was no doubt in keeping with the

formalism of Georgian interiors. It differed much in decorative detail, but little in form. It stood as high from the floor as a chair; the two ends were identical, with a roll-over curve, more or less pronounced. The seats and ends were usually upholstered in rich fabrics which in many cases have remained intact. The legs followed the fashion in chairs and were square and tapered, or, somewhat later, round and reeded. Hepplewhite and the brothers Adam designed many graceful window seats, but they were produced by all the cabinet-makers of the period.

WINDOW TAX, a tax first levied in England in the year 1697 for the purpose of defraying the expenses and making up the deficiency arising from clipped and defaced coin in the recoinage of silver during the reign of William III. It was an assessed tax on the rental value of the house, levied

according to the number of windows and openings on houses having more than six windows and worth more than £5 per annum. Owing to the method of assessment the tax fell with peculiar hardship on the middle classes, and to this day traces of the endeavours to lighten its burden may be seen in numerous bricked-up windows.

The revenue derived from the tax in the first year of its levy amounted to £1,200,000. The tax was increased no fewer than six times between 1747 and 1808, but was reduced in 1823. There was a strong agitation in favour of the abolition of the tax during the winter of 1850- 1851, and it was accordingly repealed on the 24th of July 1851, and a tax on inhabited houses substituted. The tax contributed £1,856,000 to the imperial revenue the year before its repeal. There were in England in that year about 6000 houses having fifty windows and upwards; about 275,000 having ten windows and upwards, and about 725,000 having seven windows or less.

In France there is still a tax on doors and windows, and this forms an appreciable amount of the revenue.

WINDPIPE, the trachea (Gr. Tpaxeta, sc. apTijpla, literally, rough artery), the air tube which leads from the larynx to the bronchi and lungs (see Respiratory System).

WINDSOR, a city and port of entry of Essex county, Ontario, Canada, on the left bank of the Detroit river, opposite the city of Detroit. Pop. (1901) 12,153. It is on the Grand Trunk, Canadian Pacific, Pere Marquette and Michigan Central railways, which connect at this point with the railways of the United States by means of large and powerful car- ferries. It is the centre of an important agricultural and fruit-growing district, in which tobacco is also produced. Salt works, flour mills, canning factories, and the manufacture of type-setting machines are the principal industries. During the season of navigation it is the centre of a large coasting trade on the Great Lakes.

WINDSOR, a township of Hartford county, Connecticut, U.S.A., on the Connecticut and Farmington rivers, adjoining the city of Hartford on the N. Pop. (1890) 2954; (1900) 3614, .596 being foreign-born; (1910) 4178. Area about 27 sq. m. It is served by the New York, New Haven & Hartford railway and by electric lines to Hartford and to Springfield, Massachusetts. Among the buildings are the Congregational Church, built in T794 (the church itself was organized in 1630 in England), the Protestant Episcopal Church (1864) and the Roger Ludlow School. In Windsor are the Campbell School (for girls) and a public library (1888). The Loomis Institute (incorporated 1874 and 1905) for the gratuitous education of persons between 12 and 20 years of age has been heavily endowed by gifts of the

Loomis family. Tobacco and market vegetables are raised in Windsor, and among its manufactures are paper, canned goods, knit and woollen goods, cigars and electrical supplies. 1

In 1633 Captain William Holmes, of the Plymouth Colony, established near the mouth of the Farmington river a trading post, the first settlement by Englishmen in Connecticut; a more important and a permanent settlement (until 1637 called New Dorchester) was made in 1635 by immigrants from Dor- chester, Massachusetts, led by the Rev. John Wareham, Roger Ludlow and others. In 1639 representatives from Windsor, with those from Wethersfield and Hartford, organized the Con- necticut Colony. Among the original land-holders were Matthew Grant and Thomas Dewey, ancestors respectively of General

1 In the township of Windsor Locks (pop. 1910,3715)1 immediately north, cotton yarn and thread, silk, paper, steel and machinery are manufactured.

Windsor Castle.

U. S. Grant and Admiral George Dewey; and Captain John Mason (1600-1672), ihe friend of Miles Standish, was one of its early citizens. It was the birthplace of Roger Wolcott, of the older Oliver Wolcott (1726-1797),ˆ Oliver Ellsworth (whose home is now a historical museum), and of Edward Rowland Sill. Windsor has been called ” The Mother of Towns” ; it originally included the territory now constituting the present township, and the townships of East Windsor (1768), Ellington (1786), South Windsor (1845), Simsbury (1670), Granby (1786), East Granby (1858), Bloomneld (1835) and Windsor Locks (1854).

See H. R. Stiles, Ancient Windsor (2 vols., New York, 1891; revised edition).

WINDSOR (properly New Windsor), a municipal borough of Berkshire, England, and a parliamentary borough extending into Buckinghamshire. Pop. (1001) 14,130. The town, which is famous for its royal castle, lies on the west (right) bank of the Thames, 21 j m. W. of London by the Great Western railway, which serves it with a branch line from Slough. It is also the terminus of a branch of the London & South-Western railway. Here the Thames, from an easterly course, sweeps first nearly northward and then south-eastward.

The castle lies at the north-eastern edge of the town, on a slight but

commanding eminence, while the massive round tower in the centre, on its artificial mound, is conspicu- ous from far over the flat land to the east, north and west. The site of the castle is an irregular parallelo- gram measuring about 630 yds. by 180. On the west the walls enclosing the " lower ward," with the Clewer, Garter, Salisbury and Henry III. towers, overlook Thames Street and High Street, from which the "hundred steps" give access to the ward on the north, and the Henry VIII. gateway, opening from Castle Hill, on the south. This ward contains St George's Chapel in the centre, with the Albert Memorial Chapel on the east and the Horseshoe Cloisters on the west. To the north arc the deanery and the canon's residences, for the foundation attached to the royal chapel has the privileges of a " royal peculiar," the dean being exempt from episcopal jurisdiction. To the south are the guard-room and the houses of the military knights, or pensioners. The round tower occupies the :< middle ward" ; on its flag- turret the Union Jack or the Royal Standard is hoisted accord- ing as the sovereign is absent or present. The buildings in the " upper ward," east of this, form three sides of a square; the state apartments on the north, the private apartments on the east and the visitors' apartments on the south. Along the north side of the castle extends the north terrace, commanding, from its position above a steep slope, splendid views across the river to Eton on the Buckinghamshire side, and far over the valley. The east terrace, continuing the north, overlooks the gardens in front of the private apartments, and the south terrace •xmtinues farther, as far as the George IV. gateway. The Home Park lies adjacent to the castle on the south, east and north. The Great Park extends south of Windsor, where the land, rising gently, is magnificently timbered with the remnant of the old royal forest. The village of Old Windsor (in distinction from which the name of New Windsor is given to the borough) lies by the river, south of the Home Park. To the west of Windsor itself the village of Clewer has become a suburb of the town.

As early as the time of the Heptarchy a stronghold of some importance existed at Windsor, the great mound, which is moated, circular and about 125 ft. in diameter, being a remnant of this period. William the Conqueror was attracted by the forest as a hunting preserve, and obtained the land by exchange from Westminster Abbey, to which Edward the Confessor had given it. Thereafter the castle became what it remains, the chief residence of the English sovereigns. The Conqueror replaced the primitive wooden enclosure by a stone circuit -wall, and the first complete round tower was built by Henry III. about 1272, but tdward III. wholly reconstructed it on a more massive scale, About 1344, to form a meeting-place for his newly established order of Knights of the Garter. He selected this spot because, according to a legend quoted by the chronicler Froissart, it was on the summit of the mound that King Arthur used to sit

surrounded, by his Knights of the Round Table. The bulk of the existing round tower is of Edward's time, but its walls were heightened and the tali flag-turret added by the court architect, Sir Jeffrey Wyatville, in the reign of George IV. In addition to the Round Tower, Henry III. had constructed long lines of circuit-walls, crowned at intervals with smaller towers. He also built a great hall (the present chapter library) and other apart- ments, together with a chapel, which was afterwards pulled down to make room for the chapel of St George. The beautiful little dean's cloister preserves a portion of Henry's work in the south wall, a contemporary portrait of the king appearing in dis- temper on one of the arches. Another chapel was built by him and dedicated to his favourite saint, Edward the Confessor. This graceful building, with an eastern apse, is now called the Albert Memorial Chapel; some of Henry III.'s work still exists in the lower part of its walls, but the upper part was rebuilt in 1501-1503 by Henry VII., who intended it as a burial-place for himself and his line, before he began the chapel which bears his name and contains his tomb at Westminster Abbey. Some years later the unfinished chapel was given by Plenry VIII. to Cardinal Wolsey, and for long after it was known as " Wolsey's tomb-house." Wolsey engaged a Florentine sculptor named Benedetto, probably a son or nephew of Benedetto da Maiano (d. 1497), also a Florentine artist, to make him a costly tomb of marble and gilt bronze, with a recumbent effigy at the top, no doubt similar in design to Torrigiano's tomb of Henry VII. at Westminster. The rich bronze work of Wolsey's tomb was torn off and melted by order of the Commonwealth in 1642, and the metal was sold for the then large sum of £600. In 1805 the black marble sarcophagus, stripped of its bronze ornaments, was moved from Windsor and used as a monument over Nelson's grave in the crypt of St Paul's. Though Wolsey's tomb-house was roofed in and used for mass by James II., the stone vaulting was not completed until the whole chapel was fitted by Sir Gilbert Scott asamemorial to Albert, Prince Consort. Its internal walls were then lined with rich marbles, and decorated with reliefs by Baron Triqueti. The cenotaph of the Prince Consort stands before the altar, with the tombsof Prince Leopold, duke of Albany, and the duke of Clarence; the last erected by King Edward VII. , who was himself buried here in May 1910. In a vault beneath the chapel George III. and members of his family are buried.

The chapel of St George is one of the finest examples of Perpendicular architecture in England, comparable with two other royal chapels, that of King's College at Cambridge and that of Henry VII. at Westminster, which arc a little later in date. The building was begun by Edward IV., who in 1473 pulled down almost the whole of the earlier chapel, which had been completed and filled with stained glass by Edward III. in 1363. The nave of St George's was vaulted about the year 1490, but the choir groining was

not finished till 1507; the hanging pendants from the fan vaulting of the choir mark a later development of style, which contrasts strongly with the simpler lines of the earlier nave vault. In 1 516 the lantern and the rood-screen were completed, but the stalls and other fittings were not finished till after 151a. The chapel ranks next to Westminster Abbey as a royal mausoleum, though no king was buried there before Edward IV., who left directions in his will that a splendid tomb was to be erected with an effigy of himself in silver. Nothing remains of this except part of the wrought iron grille which surrounded the tomb, one of the most elaborate and skilfully wrought pieces of iron- work in the world, said to be the work of Quintin Matsys. The next sovereign buried here was Henry VIII.., who directed that his body should be laid beside that of Jane Seymour, in a magnificent bronze and marble tomb. The tomb was never completed, and what existed of its metal-work was probably melted down by the Commonwealth. No trace of it remains. Charles I. was buried here without service in 1649. Above the dark oak stalls hang the historic insignia of the Knights of the Garter, their swords, helmets and banners. On the stalls themselves appear a remarkable series of enamelled brass plates commemorating knights of the order. Many tombs and memorials are seen in the chantry chapels.*

WINDTHORST

*7*5*

The deanery, adjoining the dean's cloister, is dated 1500, but the Winchester tower to the north-east of it is the work of the famous prelate and architect William of Wykeham, who was employed by Edward III. on the greater part of this extension and alteration of Henry III.'s work. The Horseshoe cloisters were restored in Tudor style by Sir Gilbert Scott. The Norman gate on the north side of the round tower was rebuilt by Wykeham.

The site of the upper ward was built upon by Henry II., and, to a greater extent, by Edward III., but only in the foundations and lowest storey are remains of so early a period to be found. The buildings were wanting in homogeneity until their recon- struction was undertaken by Sir Jeffrey Wyatville under the direction of George IV'., for Charles II. was unable to carry out a similar intention, perhaps fortunately, as Sir Christopher Wren proposed drastic alterations. Charles, however, completed the so-called Star Building, named from the representation of the star of the Order of the Garter on the north front. Here the state apartments are situated. They include the throne room, St George's Hall, where meetings of the Order of the Garter are held, the audience and presence chambers, and the grand reception room, adorned with Gobelins tapestries, and the guard- room with armour. All these chambers contain also splendid pictures and other objects

of art; but more notable in this connexion are the picture gallery, the Rubens room or king's drawing-room, and the magnificent Van Dyck room. The ceilings of several of the chambers were decorated by Antonio Verrio, under the direction of Charles II. In the royal library, which is included among the private apartments, is a fine collec- tion of drawings by the old masters, including three volumes from the hand of Leonardo da Vinci. Here is also a magnificent series of eighty-seven portraits by Holbein, highly finished in sepia and chalk, representing the chief personages of the court of Henry VIII. There are, moreover, examples by Michelangelo and Raphael, though the series attributed to these masters are not accepted as genuine in their entirety.

South of the castle, beside the Home Park, is the Royal Mews. Within the bounds of the park is Frogmore (q-v.), with the Royal Mausoleum and that of the duchess of Kent, and the royal gardens. An oak-tree marks the supposed site of Heme's Oak. said to be haunted by the ghost of " Heme the hunter," a forest-ranger who hanged himself here, having fallen under the displeasure of Queen Elizabeth (Shakespeare, Merry Wives of Windsor, Act iv. sc. 4). A splendid avenue, the Long Walk, laid out in the time of Charles II. and William III., leads from George IV". 's gate on the south side of the castle straight into the heart of the Great Park, a distance of 3 m. Another fine and still longer straight avenue is Queen Anne's Ride, planted in 1707. Among various buildings within the park is Cumberland Lodge, built by Charles II. and taking name from the duke of Cumberland, who commanded the victorious royal troops at the battle of Culloden in 1746, and resided here as chief ranger. At the southern boundary of the park is a beautiful artificial lake called Virginia Water, formed by the duke. Windsor Forest formerly extended far over the south of Berk- shire, and into the adjacent county of Surrey, and even in 1790 still covered nearly 60,000 acres. It was disafforested by an act of 1813.

A few old houses remain in the town of Windsor, but the greater part is modernized. The church of St John the Baptist was rebuilt in 1822, but contains some fine examples town. °" Grinling Gibbons's wood-carving. There are statues*

of Queen Victoria, unveiled in the first Jubilee year, 1887, and of Prince Albert (1800). The town hall was built in 1686 by Sir Christopher Wren, who represented the borough in pailiament. The town was formerly celebrated for the number of its inns, of which there were seventy in 1650. The most famous were the " Garter" and the i: White Hart," the first of which was the favourite of Shakespeare's Sir John Falstaff, and is frequently mentioned in The Merry Wives of Windsor. The borough is under a mayor, 6 aldermen and iS councillors. Area, 2717 acres.

The parks.

History. — Windsor (Wyndeshour, Wyndsore, Windksore) was probably the site of a Roman settlement, two Roman tombs having been discovered at Tyle-Place Farm in 1S65, while a Roman camp and various antiquities were unearthed at St Leonard's Hill in 1705. The early history of Windsor centres round the now unimportant village of Old Windsor, which was a royal residence under Edward the Confessor; and Robert of Gloucester relates that it was at a fair feast which the king held there in 1053 that Earl Godwin met with his tragic end. By the Confessor it was granted to Westminster Abbey, but was recovered in exchange for two other manors by William I,, who erected the castle about 2 m. north-west of the village and within the manor of Clcwer, round which the later important town of New Windsor was to grow up. The earliest existing charter of New Windsor is that from Edward I. in 1277, which was confirmed by Edward II. in 1315-1316 and by Edward III. in 1328. This constituted it a free borough and granted to it a gild merchant and other privileges. The same king later leased it as fee farm to the burgesses on condition that they " did justice to merchants, denizen and alien and to the poor." The town does not seem to have been prosperous, and the fee-farm rent was reduced by several succceeding sovereigns. In 1439 extensive privileges were accorded to the burgesses by Henry VI., and Edward IV. in 1467 granted a charter of incorporation under the title of the " mayor, bailiffs and burgesses." Further confirmations of existing privileges were granted by Edward IV. in 1477, by Henry VII. in 1499, by Henry VIII. in 1515 and by Edward VI. in 1549- A fresh charter was granted by James I. in 1603, and the renewal of this by Chailes II. in 1664 incorporat- ing the town under the title of the " mayor, bailiffs and burgesses of the borough of New Windsor," remained the governing charter until 1&35. By the charter of Edward I. the county gaol was fixed at Windsor, but on the petition of the men of Berkshire it was removed thence to a more central town in the reign of Edward H. New Windsor sent two members to parliament from 1302 to 1335 and again from 1446 to 1865, omitting the parliaments of 1654 and 1656; by the act of 1867 it lost one member. The market is of ancient date, and in 1273 the abbess of Burnham is said to hold markets atBurnhamandBeaconsfield to the prejudice of the market at Windsor. Edward IV. in 1467 granted a fair on the feast of St Edward the Confessor, and the charter of 1603 mentions a Saturday market and three yearly fairs. No fairs are now held, but the Saturday market is still maintained. Windsor bridge is mentioned in _ the reign of Edward L; the present structure dates from 1822. The town has never had an important industry, but has depended almost entirely upon the castle and court.

The political history of Windsor centres round the castle, at which the Norman kings held their courts and assembled their witan. Robert

Mowbray was imprisoned in its dungeons in 1095, and at the Christmas court celebrated at Windsor in 1127 David of Scotland swore allegiance to the empress Maud. In 1175 it was the scene of the ratification of the treaty of Windsor. The castle was bestowed by Richard I. on Hugh, bishop of Durham, but in the next year was treacherously seized by Prince John and only surrendered after a siege. In 1217 Ingel- ram de Achie with a garrison of sixty men gallantly held the fortress against a French force under the count de Nevers. It was a centre of activity in the Barons' War, and the meeting-place of the parliament summoned by Henry in 1261 in rivalry to that of the barons at St Albans; two years later, however, it sur- rendered to Simon de Montfort. The appeal of high treason against Thomas Mowbray, duke of Norfolk, was heard by Richard II. in Windsor Castle in 1398. During the Civil War of the 17th century the castle was garrisoned for the parliament, and in 1648 became the prison of Charles, who spent his last Christmas within its walls.

See J. E. Tighe, Annals of Windsor (1858); Victoria County History: Berkshire.

WINDTHORST, LUDWIG (1812-1891), German politician, was born on the 17th of January T812 at Kaldenhof, a country house near Osnabriick. He sprang from a Roman Catholic

family which for some generations had held, important posts in the Hanoverian civil service. He was educated at the Carolinian, an endowed school at Osnabriick, and studied at the universities of Gottingen and Heidelberg. In 1S36 he settled down as an advocate in Osnabriick: his abilities soon procured him a con- siderable practice, and he was appointed president of the Catholic Cor.sistorium. In 1848 he received an appointment at the supreme court cf appeal for the kingdom of Hanover, which sat at Celle. In the next year the revolution opened for him, as for so many of his contemporaries, the way to public life, and he was elected as representative for his native district in the second chamber of the reformed Hanoverian parliament. He belonged to what was called the Great German party, and opposed the project of reconstituting Germany under the leader- ship of Prussia; he defended the government against the liberal and democratic opposition; at this time he began the struggle against the secularization of schools, which continued throughout his life. In 1S51 he was elected president of the chamber, and 111 the same year minister of justice, being the first Catholic who had held so high an office in Hanover. As minister he carried through an important judicial reform which had

been prepared by his predecessor, but had to retire from office be- cause he was opposed to the reactionary measures for restoring the influence and privileges of the nobility. Though he was always an enemy to liberalism, his natural independence of character prevented him from acquiescing in the reactionary measures of the king. In 1862 he again was appointed minister, but with others of his colleagues he resigned when the king refused his assent to a measure for extending the franchise. Windthorst took no part in the critical events of 1866; contrary to the opinion of many of his friends, after the annexation of Hanover by Prussia he accepted the fait accompli, took the oath of allegiance, and was elected a member both of the Prussian parliament and of the North German diet. At Berlin he found a wider field for his abilities. He acted as representative of his exiled king in the negotiations with the Prussian government concerning his private property and opposed the sequestration, thus for the first time being placed in a position of hostility to Bismarck. He was recognized as the leader of the Hanoverians and of all those who opposed the " revolution from above." He took a leading part in the formation of the party of the Centre in 1870-1871, but he did not become a member of it, fearing that his reputation as a follower of the king of Hanover would injure the party, until he was formally requested to join them by the leaders.

After the death of Hermann von Mallinckrodt (1821-1874) in 1874, Windthorst became leader of the party, and maintained that position till his death. It was cruelly owing to his skill and courage as a parliamentary debater and his tact as a leader that the party held its own and constantly increased in numbers during the great struggle with the Prussian government. He was especially exposed to the attacks of Bismarck, who attempted personally to discredit him and to separate him from the rest of the party. And he was far the ablest and most dangerous critic of Bismarck's policy. The change of policy in 1879 led to a great alteration in his position: he was reconciled to Bismarck, and even sometimes attended receptions at his house. Never, however, was his position so difficult as during the negotiations which led to a repeal of the May laws. In 1887 Bismarck appealed to the pope to use his authority to order the Centre to support the military proposals of the government. Windthorst took the responsibility of keeping the papal 'instructions secret from the rest of his party and of disobeying them. In a great meeting at Cologne in March 1887 he defended and justified his action, and claimed for the Centre full independence of action in ail purely political questions. In the social reform he supported Bismarck, and as the undisputed leader of the largest party in the Reichstag he was able to exercise influence over the action of the government after Bismarck's retirement. His relations with the emperor William II. became very cordial, and in 1891 he achieved a great parliamentary triumph by defeating the School bill and compelling Gossler

to resign. A

few days afterwards he died, on the 14th of March i8gi, at Berlin. He was buried in the Maricnkirchc in Hanover, which had been erected from the money subscribed as a testimonial to himself. His funeral was a most remarkable display of public esteem, in which nearly all the ruling princes of Germany joined, and was a striking sign of the position to which, after twenty years of incessant struggle, he had raised his party. Windthorst was undoubtedly one of the greatest of German parliamentary leaders: no one equalled him in his readiness as a debater, his defective eyesight compelling him to depend entirely upon his memory. It was his misfortune that nearly all his life was spent in opposition, and he had no opportunity of showing his abilities as an administrator. He enjoyed unbounded popularity and confidence among the German Catholics, but he was in no way an ecclesiastic: he was at first opposed to the Vatican decrees of 1870, but quickly accepted them after they had been proclaimed. He was a very agreeable companion and a thorough man of the world, singularly free from arrogance and pomposity; owing to his small stature, he was often known as "die kleine Excellent." He married in 1839. Of his three children, two died before him; his wife survived him only a few months.

Windthorst's Ausgewaklte Reden were published in three volumes (Osnabriick, 1901-1902). See also J. N. Knopp, Ludwig Windthorst: ein Lebensbild (Dresden, 1898); and Husgen, Ludwig Windthorst (Cologne, 1907). iJ.W.He.)

WINDWARD ISLANDS, a group and colony in the West Indies. They consist of the British island of St Lucia, St Vincent and Grenada, with a chain of small islands, the Grenadines, between the two latter islands. They are not a single colony, but a confederation of three separate colonies with a common governor-in-chief, who resides at St George's, Grenada. Each island retains its own institutions, and they have neither legis- lature, laws, revenue nor tariff in common. There is, however, a common court of appeal for the group as well as for Barbados, composed of the chief justices of the respective islands, and there is also a common audit system, while the islands unite in maintain- ing certain institutions of general utility. The Windward Islands, which, as a geographical division, properly include Barbados, derive their name from the fact that they are the most exposed of the Lesser Antilles to the N.E. Trade, the prevailing wind throughout the West Indies.

WINE (Lat. vinum, Gr. olvas), a term which when used in its modern sense without qualification designates the fermented product of grape juice. The fermented juices of other fruits or plants, such as the date, ginger, plum, &c, are also termed wine, but the material from which the wine is derived

is in such cases also added in qualification. The present article deals solely with wine derived from the grape (see Vine).

Historical. — The art of viticulture or wine-making is a very ancient one. In the East it dates back almost as far as we have historical records of any kind. In Egypt and in Greece the introduction oF wine was ascribed to gods ; in Greece to Dionysus; in Egypt to Osiris. The Hebrews ascribed the art of wine-making to Noah. It is probable that the discovery that an intoxicating and pleasant beverage could be made from grape juice was purely accidental, and that it arose from observations made in connexion with crushed or bruised wild grapes, much as the manufacture of beer, or in its earliest form, mead, may be traced back to the accidental fermentation of wild honey. In ancient times the cultivation of the vine indicated a relatively settled and stable form of civilization, inasmuch as the vine requires a considerable maturation period. It is probable, therefore, that viticulture was introduced subsequent to the raising of cereal crops. The Nabataeans were forbidden to cultivate the vine, the object being to prevent any departure from their traditional nomadic habits. The earliest examples of specific wines of which we have any record are the Chalybon wine, produced near Damascus, in which the Phoenicians traded in the time of Ezekiel (xxvii. 18), and which at a later date was much appreciated by the Persian kings; and the wines from the Greek islands (Chios, Lesbos, Cos). With regard to the introduction of the vine into other parts of Europe, it appears that it was brought to Spain

by the Phoenicians, and to Italy and southern Gaul from Greece. In the earliest Roman times the vine was very little cultivated in Italy, but gradually Rome and Italy generally became a great wine country. At a later date the republic sought to stimulate its home industry by prohibiting the importation of wine, and by restricting its cultivation in the colonies, thus preserving the latter as a useful market for Italian wines. According to Pliny, Spanish, Gallic and Greek wines were all consumed in Rome during the 1st century of the Christian era, but in Gaul the production of wine appears to have been limited to certain districts on the Rhone and Girondc. The cultivation of the vine in more northern parts (i.e. on the Seine and Moselle) was not commenced until after the death of Probus. Owing no doubt to the difficulties of transportation, wine was, in the middle ages, made in the south of England, and in parts of Germany, where it is now no longer produced (cf . Hehn, Ctdturpjianzen, &c, and Mommsen, Rbmische

Gesckichte, v. 98 et seq.). We know very little of the ancient methods of cultivating the vine, but the Romans— no doubt owing to the luxuriant ease with which the vine grows in Italy — appear to have trained it on trees, trellis work, palisades, &c. The dwarf form of cultivation now common in northern Europe does not appear to have obtained to any extent. It seems likely that the quality of the wine produced in ancient times was scarcely comparable to that of the modern product, inasmuch as the addition of resin, salts and spices to wine was a common practice. With regard to the actual making of the wine, this does not appear to have differed very much in principle from the methods obtaining at the present day. Plastering appears to have been known at an early date, and when the juice of the grapes was too thin for the pro- duction of a good wine, it was occasionally boiled down with a view to concentration. The first wine receptacles were made of skins or hides, treated with oil or resin to make them impervious. Later, earthenware vessels were employed, but the wooden cask — not to mention the glass bottle — was not generally known until a much later period.

Production. — The total wine production of the world, which, of course, fluctuates considerably from year to year, amounts to roughly 3000 million gallons. France and Italy are the chief wine-producing countries, the former generally producing rather more than the latter. During the phylloxera period Italy in some years had the greater output (e.g. 1886-1888 and 1890- 1892). The average production of the chief wine-producing countries will be gathered from the following table: —

Wine Production. Average Annual Production in Millions of Gallons for Quinquennial Periods.

Country.

Period.

1891-1895.

1896-1900.

1 901- 1 905.

France

Italy

Spain …'...

Au&tna-Hungary . Germany

770 674 521

74 113

49

988 689 412

123 120 64

1 1 26 840

39

178

74

The United States produces roughly 50, Bulgaria and Rumania each 40 and Servia 10 million gallons. The United Kingdom produces no wine, but the (‘ape and the Australian Common- wealth each produce some 5 million gallons.

The variation from year to year in the quantity of wine produced in individual countries is, of course, far greater than that observed in the case of beer or spirits. Thus, owing to purely climatic vagaries, the quantity of wine produced in Germany in 1891 was only 16 million gallons, whereas in 1896 it amounted to m millions. Simi- larly the French production, which was 587 million gallons in 1895, amounted to no less than 1482 millions in 1900. In the same way the Italian production has varied between 583 million gallons (1895) and 793 millions (1901), and the Spanish between 331 million gallons in 1896 and 656 millions in 1892.

Consumption. — It is only natural that the consumption of wine should be greatest in the countries where it is produced on the largest scale, but the discrepancy between the consumption of

different countries is little short of astonishing. Thus, at the present time, the consumption per head in France is practically a hundred times that of the United Kingdom and twenty times that of Germany — the latter, it must be remembered, being itself an important wine-producing area.

The following table will give some idea of the relative con- sumption of wine in different countries: —

Average Consumption of Wine per Head of Population.

Country.

France …. Italy …. Spain …. Portugal

Austria-Hungary . Germany United States . British Empire —

United Kingdom

Australia

Cape 1

Period.

1891-1895. 1896-1900. 1901-1905,

Gallons.

23-0 20-6

*21*1*

ll-o

2-9 1-19 0-30

o-37

1-09

Gallons.

28-8 20-0 16-4 20-3 3-2

1-38

0-32 0-40

I-I2

Gallons.

30-8 25-1 18-5 17-1 39 1-45

o-43

032 1 -30

1 Has varied between 1-9 and 3-7.

The whole of the wine consumed in the United Kingdom is imported. On the average somewhat more than one-third of the wine imported is derived from France, and about a quarter from Spain and Portugal respectively.

Wines imported into the United Kingdom in iqo6.

From

Nature of Wines.

Quantity.

Value.

(Gallons).

£

France .

Claret, burgundv,

champagne, &c.

4,105,302

2,221,423

Portugal

Chiefly port

3-707,377 l

1,099,727

Spain

Sherry, tarra-

*Germany 2 i Netherlands *

gona, &c.

2,808,751

397.840

Hock, Moselle .

1,268,662

729,002

Italy . . .

243-247

42,513

Total for foreign

countries

12,356,425

4,094,672

Australia

622,836

100,161

Total British

possessions .

777,689

123,891

1 The quantity of port received was exceptionally large. The average quantity is rather under 3 million gallons and the value about £850,000.

2 A considerable proportion of the German wines come to the United Kingdom via the Netherlands.

Of the wines imported from France, about one-quarter was Champagne and Saumur, the remainder consisting almost entirely of still wines, such as claret and burgundy.

Viticulture and Wine-making General Considerations. — Although the wine is cultivated in practically every part of the world possessing an appropriate

climate and soil, from California in the West to Persia in the East, and from Germany in the North to the Cape of Good Hope and some of the South American republics in the South, yet, as is the case also with the cereal crops and many fruits and vegetables, the wines produced in countries possessing temperate climates are-when the vintage is successful — finer than those made in hot or semi-tropical regions. Although, for instance, the wines of Italy, Greece, the Cape, &c, possess great body and strength, they cannot compare as regards elegance of flavour and bouquet with the wines of France and Germany. On the other hand, of course, the vagaries of the temperate climate of northern Europe frequently lead to a partial or complete failure of the vintage, whereas the wines produced in relatively hot countries, although they undoubtedly vary in quality from year to year, are rarely, if ever, total failures. The character of a wine depends mainly (a) on the nature of the soil; (b) on the general type of the climate; (c) on the variety of vine cultivated. The quality, as distinct from general character, depends almost entirely on

the vintage, i.e. on the weather conditions preceding and during the gathering of the grapes and the subsequent fermentation. Of all these factors, that of the nature of the soil on which the vine is grown is perhaps the most important. The same vine, ex- posed to practically identical conditions of climate, will produce markedly different wines if planted in different soils. On the other hand, different varieties of the vine, provided they are otherwise not unsuitable, may, if planted in the same soil, after a time produce wines which may not differ seriously in character. Thus the planting of French and German vines in other countries (e.g. Australia, the Cape) has not led to the production of directly comparable wines, although there may at first have been some general resemblance in character. On the other hand, the re- planting of some of the French vineyards (after the ravages due to the phylloxera) with American vines, or, as was more generally the case, the grafting of the old French stock on the hardy American roots, resulted, after a time, in many cases, in the production of wines practically indistinguishable from those formerly made.

Wine-making. — The art of wine-making is, compared with the manufacture of beer or spirits, both in principle and in practice a relatively simple operation. When the grapes have attained to maturity they are collected by hand and then transferred in baskets or carts to the press house. After the stalks have been removed either by hand or by a simple

apparatus the juice is expressed either — as is still the case in many quarters— by trampling under foot or hy means of a simple lever or screw press or by rollers. In the case of red wines the skins are not re- moved, inasmuch as it is from the latter that the colour of the wine is derived. The must, as the expressed juice of the grape is termed, is now exposed to the process of fermentation, which consists essentially in the conversion of the sugar of the must into alcohol and various subsidiary products. The fermenting operations in wine-making differ radically from those obtaining in the case of beer or of spirits in that (if we except certain special cases) no yeast is added from without. Fermentation is induced spontaneously by the yeast cells which are always present in large numbers in the grape itself. The result is that— as com- pared with beer or spirits — the fermentation at first is relatively slow, but it rapidly increases in intensity and continues until practically the whole of the sugar is converted. In the case of the production of certain sweet wines (such as the sweet Sauternes, Port and Tokay) the fermentation only proceeds up to a certain extent. It then either stops naturally, owing to the fact that the yeast cells will not work rapidly in a liquid containing more than a certain percentage of alcohol, or it is stopped artificially either by the addition of spirit or by other means which will be referred to below. As the character of a wine depends to a considerable extent on the nature of the yeast (see Fermentation), many attempts have been made of late years to improve the character of inferior wines by adding to the unfermented must a pure culture of yeast derived from a superior wine. If pure yeast is added in this manner in relatively large quantities, it will tend to predominate, inasmuch as the number oF yeast cells derived from the grapes is at the commencement of fermentation relatively small. In this way, by making pure cultures derived from some of the finest French and German wines it has been possible to lend something of their character to the inferior growths of, for instance, Cali fornia and Australia. It is not possible, however, by this method to entirely reproduce the character of the wine from which the yeast is derived inasmuch as this depends on other factors as well, particularly the constitution of the grape juice, conditions of climate. &c. The other micro-organisms naturally present in the must which is pitched with the pure culture are not without their influence oh the result. If it were possible to sterilize the must prior to pitching with pure yeast no doubt better results might be obtained, but this appears to be out of the question inasmuch as the heating of the must which sterilization involves is not a practicable operation. After the main fermenta- tion is finished, the young wine is transferred to casks or vats. The general method followed is to fill the casks to the bung-hole and to keep them full by an occasional addition of wine. The

secondary fermentation proceeds slowly and the carbonic acid formed is allowed to escape by way of the bung-hole, which in order to prevent

undue access of air is kept lightly covered or is fitted with a water seal, which permits gas to pass out of the cask, but prevents any return flow of air. During this secondary fermentation the wine gradually throws down a deposit which forms a coherent crust, known as argol or Ices. This consists chiefly of cream of tartar (bitartrate of potash), tartrate of lime, yeast cells and of albuminous and colouring matters. At the end of some four to five months this primary deposition is prac- tically finished and the wine more or less bright. At this stage it receives its first racking. Racking consists merely in separating the bright wine from the deposit. The wine is racked into clean casks, and this operation is repeated at intervals of some months, in all three to four times. As a general rule, it is not possible by racking alone to obtain the wine in an absolutely bright condition. In order to bring this about, a further operation, namely that of fining, is necessary. This consists, in most cases, in adding to the wine proteid matter in a finely divided state. For this purpose isinglass, gelatin or, in the case of high-class red wines, white of egg is employed. The proteid matter combines with a part of the tannin in the wine, forming an insoluble tannate, and this gradually subsides to the bottom of the cask, dragging with it the mechanically suspended matters which are the main cause of the wine's turbidity. In some cases purely mechanical means such as the use of Spanish clay or filtration are employed for fining, purposes. Some wines, particularly those which lack acid or tannin, are very difficult to fine. The greatest care is necessary to ensure the cleanliness and asepticity of the casks in which wine is stored or into which it is racked. The most common method of ensuring cask cleanliness is the operation known as " sulphuring." This consists in burning a portion of a sulphur "match" (i.e. a flat wick which has been steeped in melted sulphur, or simply a stick of melted sulphur) in the interior of the cask. The sulphurous acid evolved destroys such micro-organisms as may be in the cask, and in addition, as it reduces the supply of oxygen, renders the wine less prone to acidulous fermentation. Sweet wines, which are liable to fret, are more highly and frequently sulphured than dry wines. After the wine has been sufficiently racked and fined, and when it has reached a certain stage of maturation — varying according to the type of wine from, as a rule, two to four years — the wine is ready for bottling. Certain wines, however, such as some of the varieties of port, are not bottled, but are kept in the wood, at any rate for a considerable number of years. Wines so preserved, however, develop an entirely different character from those placed in bottle.

Chemistry of Wink

Maturation of the Grape. — The processes which take plac; in the grape during its growth and maturation are of considerable interest. E. Mach has made some interesting observations on this point. At first— i.e. at the beginning of July when the berries have attained to an appreciable size —

the specific gravity of the juice is very low; it contains very little sugar, but a good deal of acid, chiefly free tartaric acid and malic acid. The juice at this period contains an appreciable amount of tannin. As the berry grows the amount of sugar gradually increases, and the same up to a certain point applies to the acidity. The character of the acidity, however, changes, the free tartaric acid gradually disappearing, forming bitartrate of potash and being otherwise broken up. On the other hand, the free malic acid increases and the tannin decreases. When the grape is ripe, the sugar has attained to a maximum and the acidity is very much reduced; the tannin has entirely disappeared.

The following figures obtained by Mach afford an interesting illustration of these processes : —

At first the sugar in the juice consists entirely of dextrose, but later fructose (laevulosc) is formed. The sugar in ripe grape juice is practically invert sugar, -i.e. consists of practically equal parts of dextrose and fructose. The proportion of sugar present in the juice of ripe grapes varies considerably according to the type ot grape, the locality and the harvest. In temperate climates it varies as a rule between 15 and 20%, but in the case of hot climates or where the grapes are treated in a special manner, it may rise as high as 35 % and more.

Fermentation. — The fermentation of grape juice, t.e.ˆthe must, is, as we have seen, a relatively simple operation, consisting as it does in exposing it to the spontaneous action of the micro-organisms contained in it. The main products formed are, as in all cases of

Constitution of Grape Juice at Various Periods of Maturation. (E. Mach.)

719

Date of Analysis of Juice.

6th July.

12th Aug.

9th Sept.

12th Oct.

Specific gravity .

I-OIO

1-029

1-083

1-093

Per cent.

Per cent.

Per cent.

Per cent.

Sugar

Q-86

2-02

18-52

23-1?

Total acid (as

tartaric acid) .

2-66

3-46

0-87

0-71

Tartar

O-67

o-55

o-54

o-55

Malic acid

1-16

2-47

o-55

0-42

Tannin

0-106

0-012

alcoholic fermentation, ethylic alcohol, water and carbonic acid. At the same time various subsidiary products such as glycerin, succinic acid, small quantities of higher alcohols, volatile acids and compound esters are produced. In the case of red wines colouring matter is dissolved from the skins and a certain amount of mineral matter and tannin is extracted. It is to these subsidiary matters that the flavour and bouquet in wine are particularly due, at any rate in the first stages of maturation, although some of the substances originally present in the grape, such as ready-formed esters, essential oils, far and so on, also play a rfMe in this regard. In view of the fact that fresh grape juice contains innumerable bacteria and moulds, in addition to the yeast cells which bring about the alcoholic fermen- tation, and that the means which are adopted by the brewer and the distiller for checking the action of these undesirable organisms cannot be employed by the wine-maker, it is no doubt remarkable that the natural wine yeast so seldom fails to assert a preponderating action, particularly as the number of yeast cells at the beginning of fermentation is relatively small. The fact is that the constitution of average grape juice and the temperatures of fermentation which generally prevail are particularly well suited to the life action of wine yeast, and are inimical to the development of the other organ- isms. When these conditions fail, as is, for instance, the case when the must is lacking in acidity, or when the weather during the fermentation period is very hot and means are not at hand to cool the must, bacterial side fermentations may, and do, often take place. The most suitable temperature for fermentation varies according to the type of wine. In the case of Rhine wines it is between 20 and 25° C. If the temperatures rise above this, the fermentation is liable to be too rapid, too much alcohol is formed at a relatively early stage, and the result is that the fermentation ceases before the whole of the sugar has been transformed. Wines which have received a check of this description during the main fermentation are very liable to bacterial troubles and frets. In the case of wines made in

more southerly latitudes temperatures between 25 and 30 ° are not excessive, but temperatures appreciably over 30° frequently lead to mischief. The young wine immediately after the cessation of the main fermentation is very differently constituted from the must from which it was derived. The sugar, as we have seen, has disappeared, and alcohol, glycerin and other substances have been formed. At the same time the acidity is markedly reduced. This reduction of aci-dity is partly due to the deposition of various salts of tartaric acid, which are less soluble in a dilute alcoholic medium than in water, and partly to the action of micro-organisms. Young wines differ very widely in their composition according to class and vintage. The alcohol in naturally fermented wines may vary between 7 and 16 %, although these are not the outside limits. The acidity may vary between 0-3 and 1 % according to circumstances. The normal proportion of glycerin varies between 7 and 14 parts for every 100 parts of alcohol in the wine, but even these limits are frequently not reached or exceeded. The total solid matter or " extract," as it is called, will vary between 1-5 and 3-5% for dry wines, and the mineral matter or ash generally amounts to about one-tenth of the " extract." The tannin in young red wines may amount to as mucli as 0-4 or 0-5 , but in white wines it is much less. The amount of volatile acid should be very small, and, except in special cases, a percentage of volatile acid exceeding o-i to 0-15, according to the class of wine, will indicate that an abnormal or undesirable fermentation has taken place. As the wine matures the most noticeable feature in the first instance is the reduction in the acidity, which is mainly due to a deposition of tartar, and the disappearance of tannin and colouring matter, due to fining and the action of oxygen.

The taste and bouquet of wines in the earlier stages of their development, or within the first four or five years of the vintage, are almost entirely dependent upon constituents derived from the must, either directly or as a result of the main fermentation. In the case of dry wines, the quality which is known as " body " (palate-fulness) is mainly dependent on the solid, i.e. non-volatile, constituents. These comprise gummy and albuminous matters, acid, salts, glycerin and other matters of which we have so far little knowledge. The apparent " body " of the wine, however, is not merely dependent upon the absolute, quantity of solid — non-volatile — matters it con- tains, but is influenced also by the relative proportions in which

the various constituents exist. For instance, a wine which under favourable conditions would seem full and round may appear harsh or rough, merely owing to the fact that it contains a small quantity of suspended tartar, the latter causing temporary hyper- acidity and apparent " greenness." It has been found by experience also that wines which are normally constituted as regards the relative proportions of their various constituents, provided that the quantities of these do not fall below certain limits, are likely to develop

well, whereas wines which, although perfectly sound, show an abnormal constitution, will rarely turn out successful. The bouquet of young wines is due principally to the compound esters which exist in the juice or are formed by the primary fermentation. It was at one time thought that the quality of the bouquet was dependent upon the absolute quantity of these compound esters present, but the author and others have plainly shown that this is not the case. Among the characteristic esters present in wine is the well-known " ocnanthic ether," which consists principally of ethylic pelargonate. It does not follow that a wine which shows a pretty bouquet in the primary stages will turn out well. On the contrary, it is frequently the case that the most successful wines in after years are those which at first show very little bouquet. The maturation of wine, whether it be in bottle or in cask, is an exceedingly interesting operation. The wines which remain for a long period in cask gradually lose alcohol and water by evaporation, and therefore become in time extremely concentrated as regards the solid and relatively non- volatile matters contained in them. As a rule, wines which are kept for many years in cask become very dry, and the loss of alcohol by evaporation — particularly in the case of light wines — has as a result the production of acidity by oxidation. Although these old wines may contain absolutely a very large quantity of acid, they may not appear acid to the palate inasmuch as the other constituents, particularly the glycerin and gummy matters, will have likewise increased in relative quantity to such an extent as to hide the acid flavour. In the case of maturation in bottle the most prominent features are the mellowing of the somewhat hard taste associated with new wine and the development of the secondary bouquet. The softening effect of age is due to the deposition of a part of the tartar together with a part of the tannin and some of the colouring matter. The mechanism of the development of the secondary bouquet appears to be dependent firstly on purely chemical processes, principally that of oxidation, and secondly on the life activity of certain micro-organisms. L. Pasteur filled glass tubes entirely with new wine and then sealed them up. It was found that wine so treated remained unchanged in taste and flavour for years. On the other hand, he filled some other tubes partly with wine, the remaining space being occupied by air. In this case the wine gradually matured and acquired the properties which were associated with age. Wortmann examined a number of old wines and found that in all cases in which the wine was still in good condition or of fine character a small number of living organisms (yeast cells, Sec.) were still present. He also found that in the case of old wines which had frankly deteriorated, the presence of micro-organisms could not be detected. It is, how- ever, not absolutely clear whether the improvement observed on maturation is actually due to the action of these micro-organisms. It may be that the conditions which are favourable to the improve- ment of the wine are also favourable to the continued existence of the micro-organisms, and that

their disappearance is coincident with, and not the cause of, a wine's deterioration. It is frequently assumed that a wine is necessarily good because it is old, and that the quality of a wine increases indefinitely with age. This is, however, a very mistaken idea. There is a period in the life history of every wine at which it attains its maximum of quality. This period as a rule is short, and it then commences " to go back " or deteriorate. The age at which a wine is at its best is by no means so great as is popularly supposed. This age naturally depends upon the character of the wine and on the vintage. Highly alcoholic wines, such as port and sherry, will improve and remain good for a much longer period than relatively light wines, such as claret, champagne or Moselle. As regards the latter, indeed, it is nowadays held that it is at its best within a very short period of the vintage, and that when the charac- teristic slight " prickling " taste due to carbonic acid derived from the secondary fermentation has disappeared, the wine has lost its attraction for the modern palate. In the same way champagne rarely, if ever, improves after twelve to fourteen years. With regard to claret it may be said that as a general rule the wine will not improve after twenty-five to thirty years, and that after this time it will commence to deteriorate. At the same time there arc excep- tional cases in which claret may be found in very fine condition after a lapse of as much as forty years, but even in such cases it will be found that for every bottle that is good there may be one which is distinctly inferior.

Diseases Diseases of ike Vine. — The vine is subject to a number of diseases some of which are due to micro-organisms (moulds, bacteria), others to insect life. The most destructive of all these diseases is that of the phylloxera. The Phylloxera vastatrix is an insect belonging^ to the green fly tribe, which destroys the roots and leaves of the growing plant by forming galls and nodosities. Practically every wine- growing country has been afflicted with this disease at one time or

another. The great epidemic in the French vineyards in the years 1882 to 1885 led to a reduction of the yield of about 50%. Many remedies for this disease have been suggested, including total submersion of the vineyards, the use of carbon bisulphide for spray- ing, and of copper salts, but there appears to be little doubt that a really serious epidemic can only be dealt with by systematic destruc- tion of the vines, followed by replanting with resistant varieties. This, of course, naturally leads to the production of a wine somewhat different in character to that produced before the epidemic,

but this difficulty may be overcome to some extent, as it was in the Bordeaux vineyards, by grafting ancient stock on the roots of new and resistant vines. Oidium or mildew is only second in importance to the phylloxera. It is caused by a species of mould which lives on the green part of the plant. The leaves shrivel, the plant ceases to grow, and the grapes that are formed also shrivel and die. The most effective cure, short of destruction and replantation, appears to be spraying with finely divided sulphur. Another evil, which is caused by unseasonable weather during and shortly after the flowering, is known as couture. This causes the flowers, or at a later period the young fruit, to fall off the growing plant in large numbers.

Diseases of Wine. — These are numerous, and may be derived either directly from the vine, from an abnormal constitution of the grape juice, or to subsequent infection. Thus the disease known as tourne or casse is generally caused by the wine having been made or partly made from grapes affected by mildew. The micro-organism giving rise to this disease generally appears in the form of small jointed rods and tangled masses under the microscope. Wine which is affected by this disease loses its colour and flavour. The colour in the case or red wines is first altered from red to brown, and in bad cases disappears altogether, leaving an almost colourless solution. This disease 13 also caused by the wine lacking alcohol, acid and tannin, and to the presence of an excess of albuminous matters. The most common disease to which wine is subject by infection is that caused by a micro-organism termed mycoderma-vini (French fleurs de vin). This micro-organism, w r hich resembles ordinary yeast cells in appear- ance, forms a pellicle on the surface of wine, particularly when the latter is exposed to the air more than it should be, and its develop- ment is favoured by lack of alcohol. The micro-organism splits up the alcohol of the wine and some of the other constituents, forming carbonic acid and water. This process indicates a very intensive form of oxidation inasmuch as no intermediary acid is formed. One of the most common diseases, namely that producing acetous fermentation, differs from the disease caused by M. vini in that the alcohol is transformed into acetic acid. It is caused by a micro- organism termed Mycoderma aceti, which occurs in wine in small groups and chaplets of round cells. It is principally due to a lack of alcohol in the wine or to lack of acidity in the must. The micro- organism which causes the disease of bitterness (amer) forms longish branched filaments in the wine. Hand in hand with the development of a disagreeable bitter taste there is a precipitation of colouring matter and the formation of certain disagreeable secondary con- stituents. This disease is generally caused by infection and is favoured by a lack of alcohol, acid and tannin. Another disease which generally occurs only in white wines is that which converts the wine into a thick stringy liquid. It is the viscous or graisse disease. As a rule this disease

is due to a lack of tannin (hence its more frequent occurrence in white wines). The mannitic disease, which is due to high temperatures during fermentation and lack of acid in the must, is rarely of serious consequence in temperate countries. The micro-organism splits up the laevulose in the must, forming mannitol and different acids, particularly volatile acid. The wine becomes turbid and acquires a peculiarly bitter sweet taste, and if the disease goes further becomes quite undrinkable. It would appear from the researches of the author and others that the mannitol ferment is more generally present in wines than is supposed to be the case. Thus the author found in some very old and fine wines very appreciable quantities of mannitol. In these cases the mannitic fermentation had obviously not developed to any extent, and small quantities of mannitol appear to exercise no prejudicial effect on flavour.

Treatment of Diseases. — It was found by Pasteur that by heating wine out of contact with air to about 66° C. the various germs causing wine maladies could be checked in their action or destroyed. The one disadvantage of this method is that unless very carefully applied the normal development of the wine may be seriously retarded. In the case of cheap wines or of wines which are already more or less mature, this is not a matter of any great importance, but in the case of the finer wines it may be a serious consideration. Pasteurizing aloite, however, will only avail in cases where the disease has not gone beyond the initial stages, inasmuch as it cannot restore colour, taste or flavour where those have already been affected. In such cases, and also in others where pasteurizing is not applicable, some direct treatment with a view to eliminating or adding constituents which are in excess or lacking is indicated. In this regard it is somewhat difficult to draw the line between that which is a rational and scientific method for preventing waste of good material and sophistication pure and simple. It appears to the author^ how- ever, that where such methods are employed merely with a view to overcoming a specific malady and there is no intention of increasing

the quantity of the wine for purposes of gain, or of giving it a fictitious appearance of quality, these operations are perfectly justifiable and may be compared to the modifications of procedure which are forced upon the brewer or distiller who has to deal with somewhat abnormal raw material. It has been found, for instance, that in the case of the mannitic disease the action of the micro-organism may be checked, or prevented altogether, by bringing the acidity of the must up to a certain level by the addition of a small quantity of tartaric acid. Again, it is well known that in the case of the viscous disease the difficulty may be overcome by the addition of a small quantity of tannin. In the same way the disease caused by the mildew organism may be counteracted by a slight addition of alcohol and tannin. One method of assisting nature in wine-making, which is, in the opinion of

the author, not justifiable if the resulting product is sold as wine or in such a manner as to indicate that it is natural wine, is the process termed " gallisizing," so called from its inventor H. L. L. Gall, which has been largely practised, particularly on the Rhine. The process of Gall consists in adding sugar and water in sufficient quantity to establish the percentages of free acid and sugar which are characteristic of the best years in the must obtained in inferior years. Although there is no objection to this product from a purely hygienic point of view, it is not natural wine, and the products present in the must other than sugar and acid are by this process seriously affected. Another method of dealing with inferior must, due to J. A. C. Chaptal, consists in neutralizing excessive acid by means of powdered marble, and bringing up the sugar to normal proportions by adding appropriate- amounts of this substance in a solid form. There is less objection to this process than to the former, inasmuch as it does not result in a dilution of the wine. It is scarcely necessary to say that the indiscriminate addition of alcohol and water, or of either to must or to wine, must be regarded as a reprehensible operation.

Plastering. — In some countries, particularly in Italy, Spain and Portugal, it has been and still is a common practice to add a small quantity of gypsum to the fermenting must or to dust it over the grapes prior to pressing. It is said that wines treated in this manner mature more quickly, and that they are more stable and of better colour. It certainly appears to be the case that musts which arc plastered rarely suffer from abnormal fermentation, and that the wines which result very rarely turn acid. The main result ot plastering is that the soluble tartrates in the wine are decomposed, forming insoluble tartrate of lime and soluble sulphate of potash. It is held that an excess of the latter is undesirable in wine, but unless the quantity appreciably exceeds two grams per litre, no reasonable objection can be raised.

Basis Wines.— Wines which arc made not from fresh grape juice but from raisins or concentrated must, or similar material, are gener- ally termed basis wines. They are prepared by adding water to the concentrated saccharine matter and subsequently pitching with wine yeast at an appropriate temperature. Frequently alcohol, tannin, glycerin, and similar wine constituents are also added. If carefully prepared there is no objection to these basis wines from a hygienic point of view, although they have not the delicate qualities and stimulating effects of natural wines; unfortunately, however, these wines have in the past been vended on a large scale in a manner calculated to .deceive the consumer as to their real nature, but energetic measures, which have of late been taken in most countries affected by this trade, have done much to mitigate the evil.

Wines 01? Fkance

It may be safely said that there is no other country in which the general conditions are so favourable for the production of wine of high quality and on a large scale as is the case in France. The climate is essentially of a moderate character; the winters are rarely very cold, and the summers are seldom of the intensely hot and dry nature which is characteristic of most southerly wine countries. There are large tracts of gently undulating or relatively flat country which is, inasmuch as it ensures effective exposal of the vines to the sun, of a type particularly suited to viticulture. There is almost everywhere an efficient supply of water, and lastly the character of the soil is in many parts an ideal one for the production of wine high in quality and abundant in quantity. It may here be stated that a rich soil such as is suitable for the growth of cereal crops or vegetables is not, as a rule, an ideal one for the production of fine wines. The ideal soil for vine-growing is that which possesses a sufficiency, but not an excess, of nutriment for the plant, and which is so constituted that it will afford good drainage. The most important qualification, however, is that it should be so constituted as to preserve and store up during the relatively cold weather the heat which it has derived from the atmosphere during the summer. In this respect the famous Bordeaux or Gironde district is, perhaps, more fortunate than any other part of the world. The thrifty and methodical

habits of the French peasantry, and also the system of small holdings which prevails in France, have, there is little doubt, done much to raise the French wine industry to the pre-eminent position which it holds. There is perhaps no branch of agri- culture which requires more minute attention or for which a system of small holdings is more suitable than wine culture. At the present day, wine is produced in no less than 77 depart- ments in France, the average total yield during the past ten years being roughly 1000 million gallons. This is considerably more than the average produced previous to the phylloxera period (1882-1887). The highest production on record was in the year 1875, when roughly 1840 million gallons were produced. Although France produces such enormous quantities of wine it is a remark- able fact that more wine is imported into France than is exported from that country. The average imports are in the neighbour- hood of 120 million gallons, of which rather more than one-half comes from Algeria. The exports amount to roughly 40 million gallons. Of recent years (1S96-1007) the only vintages which have been deficient as regards quantity are those of 1897, 1898, 1902 and 1903, but even in the most unfavourable of these years (1898) the quantity exceeded 700 million

gallons. The greatest yield in this same period was in 1900, when over 1470 million gallons were produced. The number of different varieties of wines produced in France is remarkable. The red wines include the elegant and delicate (though not unstable) wines of the Gironde, and again the full, though not coarse, wines of the Bur- gundy district. Among the white wines we have the full sweet Sauternes, the relatively dry and elegant Graves and Chablis, and the light white wines which produce champagne and brandy.

Gironde (Bordeaux) Wines. — If France is the wine-growing country, par excellence, the Bordeaux district may be regarded as the heart and centre of the French wine industry. Although other parts of France produce excellent wines, the Gironde is easily first if high and stable character, elegance and delicacy, variety and quantity are considered together. The total area of the departments of the Gironde is about 2| million acres, and roughly one-fifth of this is under the vine. It forms a tract of country some 90 m. long by 60 m. broad, in which the chief watersheds are those of the Garonne, Dordogne, and their confluent the Gironde. The soil varies very considerably in its character, and it is due to these variations that so many different types of wine are produced in this district. It gener- ally consists of limestone, or of mixed limestone and clay, or or sand and clay, or of gravel, with here and there flint and rolled quartz. The subsoil is either of clay, of limestone, or mixed sand and clay, gravel, or of a peculiar kind of pudding stone which exists in a hard and a soft variety. It is formed of sand or fine gravel cemented by infiltrated oxide of iron. This stone is known locally under the name of alios. It is generally found at a depth of about 2 ft. under the better growths of the Medoc and Graves. The subsoils of someof the other districts (Cotes and St Emilion) contain much stone in the shape of flint and quartz. The finest wines of the M<5doc and Graves are largely grown on a mixture of gravel, quartz and sand with a subsoil of alios or clay. The Gironde viticultural region is divided into six main districts, namely, Mecloc, Sauternes, Graves, Cotes, Entre-deux-Mers and Palus. Although properly belonging to the Cotes, the St Emilion district is sometimes classified separately, as indeed, having regard to the excellence and variety of its wines, it has a right to be.

Medoc. — The most important subdivision of the Gironde district is that of the MeVioc. It is here that the wine which is known to us as claret is produced in greatest excellence and variety. The Mddoc consists of a tongue of land to the north of Bordeaux, bounded by the Garonne and Gironde on the east, and by the sea on the west and north. It is, roughly, 59 m. long by 6 to 10 m. broad. The soil varies considerably in nature, but consists mostly of gravel, quartz, limestone and sand on the surface, and of clay and alios beneath. The principal vines grown in the Meeloc are the Cabernet-Sauvignon, which is the most important, the Gros Cabernet, the

Merlot, the Carmencre, the Malbec, and the Verdot. All these produce red wines. Very little white wine is made in the Medoc proper. The method of vine cultivation is peculiar and characteristic. The vines are kept very low,' and as a rule only two branches or arms, which are trained at right angles to the stem, are permitted to form. This dwarf system of culture gives the Me"doc vineyards at a distance the appearance of a sea of small bushes, thereby producing an effect entirely different from, for instance, that seen on the Rhine with its high basket-shaped plants. The methods of making the wine in the Medoc are of the simplest description. The vintage generally takes place towards the end of September or the beginning of October. The grapes from which the stalks are partly or wholly (and occasion- ally not at all) removed are crushed by treading or some other simple

method, but sometimes even this is omitted, the juice being expressed by the weight of the grapes themselves, or by the pressure caused by incipient fermentation. Presses are not used in the ca§e of red wines until after fermentation, when they arc employed in order to separate the wine from the murk. As a rule the fermentation occupies from 6 to 10 days; by this time the must has practically lost the whole of its sugar, and the young wine is drawn off and filled into hogsheads. The secondary fermentation proper is generally finished at the end of about six weeks to two months, and the first racking takes place, as a rule, in February or March. Subsequent rackings are made about June and November of the same year, but in the following years, until bottling, two rackings a year suffice.

The Mecloc is divided into a number of communes (such as St Julien, Margaux, Pauillac, &c), and in these communes are situated the different vineyards from which the actual name of the wine is derived. Unlike the products of the different vineyards of most other districts, which are purchased by the merchants and vatted to supply a general wine for commerce, the yield of the principal estates of the Medoc are kept distinct and reach the consumer as the products of a particular growth and of a particular year. This

Sractice is almost without exception resorted to with what are nown as the " classed growths " and the superior " bourgeois " wines, whilst in seasons in which the wines are of good quality it is continued down to the lower grades. This classification of the Meˆdoc growths became necessary owing to the great variety of qualities produced and the distinct characteristic excellence of the individual vintages. There are four main classes or cms (literally growths, but more correctly types or qualities), namely, the " grands cms classes " or " classed growths " and the bourgeois, artisan and peasant growths. The " classed growths," which include all the most famous wines of the Medoc, are themselves subdivided into five sections or growths. This general classification, which was made by a conference of brokers in 1855 as a result of many years of observation dating back to the 18th century, is still very fairly descriptive of the average merit of the wines classified. The following is a list of the classed red wines of the MeVioc {i.e. claret) together with the names of the communes in which they are situated.

Classed Growths of the Medoc (Claret)

First Growths. Chateau Lafite, Pauillac.

„ Margaux, Margaux.

„ Latour, Pauillac.

Second Growths. Chateau Mouton-Rothschild, Pauillac.

,, Rauzan-Segla, Margaux.

,, Rauzan-Gassics, Margaux.

„ Leoville-Lascases, St Julien.

t , Leoville-Poyferre, St Julien.

,, Leoville-Barton, St Julien.

„ Durfort-Vivcns, Margaux.

,, Lascombes, Margaux.

,, Gruaud-Larose-Sarget, St Julien.

,, Gruaud Larose, St julien.

,, Brane- Cantenac, Cantcnac.

,, Pichon-Longueville, Pauillac.

,, Pichon-Longueville-Lalande, Pauillac. •

,, Ducru-Beaucaillou, St Julien. Cos d'Estournel, St Estephe. Chateau Montrose, St Estephe.

Third Growths, Chateau Kirwan, Cantenac.

,, D'Issan, Cantenac.

,, Lagrange, St Julien.

„ Langoa, St Julien.

,, Giscours, Labarde.

,, Malescot, Margaux.

,, Brown Cantenac, Cantenac.

,, Palmer, Cantenac.

,, La Lagune, Ludon.

f , Desmirail, Margaux.

,, Calon-Segur, St Estephe.

,, Ferriere, Margaux.

,, Becker, Margaux.

Fourth Growths. Chateau Saint-Pierre, St Juhen._

,, Branaire-Duluc, St Julien.

„ Talbot, St lulien.

(, Duhart-Milon, Pauillac.

,, Poujet, Cantenac.

,, La Tour Carnet, St Laurent.

,, Rochet, St Estephe.

,, Beychevelle, St Julien. Le Prieur6, Cantenac. Marquis de Terme, Margaux.

Fifth Growths.

Chateau Pontet-Canet, Pauillac.

,, Batailley, Pauillac.

Grand -Puy-Lacoste, Pauillac. Ducasse-Grand-Puy, Pauillac. Chateau Lynch-Bages, Pauillac.

,, Lynch-Moussas, Pauillac.

,, Dauzac, Labarde.

,, Mouton-d'Armailhacq, Pauillac.

,, Le Tertre, Arsac.

„ Haut-Bages, Pauillac.

,, Pedesclaux, Pauillac.

,, Bel grave, St Laurent.

„ Camcnsac, St Laurent.

Cos-Labory, St Estephe. Chateau Clerc-Milon, Pauillac.

,, Croizct-Rages, Pauillac.

,, Cantcmerle, Macau.

The quality of the Medoc red wines (and this applies also to some of the finer growths of the other Bordeaux districts) is radically different from that of wines similar in type grown in other parts of the world. The Gironde red wines have sufficient body and alcohol t<-.> ensure stability without being heavy or fiery At the same time, their acidity is very low and their bouquet characteristically delicate and elegant. It is to this relatively large amount of body and absence of an excess of acid and of tannin that the peculiarly soft effect of the Bordeaux wines on the palate is due. It has been said that chemistry is of little avail in determining the value of a wine, and this is undoubtedly true as regards the bouquet and flavour, but there is no gainsaying the fact that many hundreds of analyses of the wines of the Gironde have shown that they are, as a class, distinctly different in the particulars referred to from wines of the claret type produced, for instance, in Spain, Australia or the Cape. The quality of the wines naturally varies considerably with the vintage; but it is almost invariably the case that the wines of successful vintages will contain practically the same relative propor- tions of their various constituent?, although the absolute amounts present of these constituents may differ widely. It is the author's experience also that where a wine displays some abnormality as regards one or more constituents, that although it may be sound, it is rarely a wine of the highest class. The tables below will give a fair idea of the variations which occur in the same wine as a result of different vintages, and the variations due to differences of " growth " in the same vintage. These figures are selected from among a number published by the author in the Journal of the Institute of Brewing, April 1907.

and at a maximum in 1907, when close on 1000 hogsheads were obtained. Similarly, the Chateau Margaux, which yielded 1120 hogsheads in 1900, produced 280 hogsheads in 1903. The prices of the wines also are subject to great fluctuation, but in fair years will vary, according to class and quality, from £10 to ˆ30 per hogshead for the better growths.

The principal claret vintages of modern times have been those of 1858, 1864. 18G9, 1870, 1874, 1875, 1877, 1878, 1888, 1893, 1896, 1899 and 1900, while it was thought probable that many of the wines of 1904 to 1907 inclusive would turn out well. From 1882 to 1886 inclusive, the vintages were almost total failures owing to mildew. In 1887 to 1895 a number of fair wines were produced in each year, and the first really good vintage of the post-mildew-phylloxera period was that of 1888.

Most of the wines grown on a purely gravelly soil are termed " Graves," but there is a specific district of Graves which lies south of Bordeaux and west of the river, and extends as far as Graves Langon. The soil is almost a pure sandy gravel with a subsoil of varied nature, but principally alios, gravel, clay or sand. This district produces both red and white wines. The vines,

the methods of viticulture and vinification as regards the red wines of the Graves district, are similar to those of the Medoc. The wines are, if anything, slightly fuller in body and more alcoholic than those of the latter region. They possess a characteristic flavour which differentiates them somewhat sharply from the Me-Hoc wines. The Graves contains one vineyard, namely Chateau Haut-Brion, which ranks in quality together with the three first growths of the Medoc. The remainder of the red Graves arc not classified, but among the more important wines may be mentioned the following: in the commune of ressac, Chateau La Mission and Chateau Pape- Clement; in the commune of Villenave D'Ornon, Chateau La Ferrade; in Leognan, Chateau Haut-Bailly, Chateau Haut-Brion- Larrivet and Chateau Branon-Licterie ; in Martillac, Chateau Smith-Haut-Lafite.

The district of Sauternes produces the finest white w r ines of the Gironde, one might say of the whole of France. Whereas the white wines of the Graves are on the whole fairly dry and g aaternes light in character, the white wines of Sauternes are full and sweet, with a very fine characteristic bouquet. The district of Sauternes covers the communes of Sauternes, Bommcs and a part cf Barsac, Preignac, Fargues and St Pierre-de-Mons. The general configuration of the country is markedly different from that of the Medoc, consisting of a series of low hills rising easily from the river. The soil consists chiefly of mixed clay and gravel, or clay and lime- stone, and the vines chiefly used are the Sauvignon, the Semillon and the Muscatelle. The wines are made entirely from white grapes, and the methods of collecting the latter, and of working them up

Analyses of Ckdleau Lafite of Different Vintages. 1

Alcohol

Total Acidity.

Extract

Total

Vintage.

Description.

Per Cent.

(Solid

Ash.

Tartaric

Glvcerin.

Sugar.

by Vol.

Matter).

Acid.

1865

Chateau Lafite

11-26

4-17

26-83

2-18

2-28

7-99

I-IO

18/5

”

10-31

3-67

7-=5

1892

”

II-OO

4‘38

25-92

2-42

211

4-60

i-25

1896

,,

11-05

3‘5′

26-08

2-68

1-71

8-64

1-69

1899

,.

n-47

3-49

27-91

3-01

1-78

7-u

i-74

1905

”

io-75

3-02

25-34

2-42

2-42

7-52

2-12

A nalyses of Different Clarets of the Same Vintage. 1

Alcohol

Total Acidity.

Extract

Total

Vintage.

Description.

Per Cent.

(Solid

Ash.

Tartaric

Glycerin.

Sugar.

by Vol.

Matter).

Acid.

1900

Ch. Margaux

12-14

3-06

26-32

2-58

1 -50

8-76

i-93

Ch. Mouton-Rothschild

11-82

2-97

28-98

2-69

1-23

7-53

2-56

Ch. Larose

12-06

3-23

29-01

2-29

1-50

8-02

3-97

Ch. Bataillcy

12-14

3-15

26-54

2-39

1-48

8-45

2-27

Ch. Palmer (Margaux)

“■73

3-19

28-64

2-72

i-52

8-23

2-27

Ch. Smith-Haut-Lafite

I3-76

3-10

27-48

2-10

1-56

7-48

2-32

Second growth

10-91

3-32

29-44

2-84

i-75

6-99

1-72

Bourgeois growth

12-71

3-32

29-57

2-16

1-56

901

2-49

Peasant growth

n-47

3-58

20-97

1-71

2-50

7-18

1 ResuIts (excepting alcohol) are expressed in grams per litre, i.e. roughly parts per thousand.

The annual output of the Gironde during the last few years has been roughly 70 to 100 million gallons. In the decade 1876 to 1886 the average amount was barely 30 million gallons owing to the small yields of the years 1881 to 1885. In the years 1874 and 1875 the yield exceeded 100 million, gallons. The output of the classed growths varies considerably according to the vintage, but is on the average, owing to the great care exercised in the vineyards, greater than that of the lower-grade areas. Thus within recent years the output of the Chateau Lafite was at a minimum in 1903 when onlv 229 hogsheads (the hogshead of claret = 46 gallons) were produced,

into wine, are entirely different from those prevalent in the red wine districts. The grapes are allowed to remain on the vines some three to four weeks longer than is the case in the Medoc, and the result is that they shrivel up and become over-ripe, and so contain relatively little water and a very large quantity of sugar. This alone, however, does not account for the peculiar character of the Sauternes, for during the latter period of ripening a specific micro- organism termed Botrytis cinerea develops on the grape, causing a peculiar condition termed pourriture noble (German Edelfaule), which appears to be responsible for the remarkable bouquet observed

in the wines. When the grapes have attained the proper degree of ripeness, or rather over-ripeness, they are gathered with the greatest care, the berries being frequently cut off from the branches singly, and sorted according to their appearance. The grapes are then not crushed, but are immediately pressed, and the juice alone is subjected to fermentation. As a rule, three wines are made in the principal vineyards in three successive periods. The first wine, which is termed the vin de (He, is generally the sweetest and finest, the next (called the milieu) being somewhat drier and the last (vin de queue) being the least valuable. For some markets these wines are shipped separately, for others they are blended according to the prevalent taste. The musts from which the Sauternes wines are made are so concentrated that only a part of the sugar is transformed into alcohol, an appreciable portion remaining unfermented. These wines, therefore, require

very careful handling in order to prevent undesirable secondary fermentations taking place at a later period. They are subjected to frequent racking, the casks into which they are racked being more highly sulphured than is the case with red wines. This is necessary, not only to prevent fermentation recommencing, but also in order to preserve the light golden colour of the wine, which, if brought into contact with an excess of air, rapidly assumes an unsightly brown shade.

The 5auternes generally are full-bodied wines, very luscious and yet delicate; they possess a special seve, or, in other words, that special taste which, while it remains in the mouth, leaves the palate perfectly fresh. The finer growths of the Sauternes are classified in much the same way as the red wines of the Medoc. There are two main growths, the wines being as follows: —

Classification of Sauternes Grand First Growth. Chateau Yquem, Sauternes.

First Growths. Chateau La Tour Blanche, Bomrnes.

,, Peyraguey, Bomrnes.

., Yigneau, Bomrnes.

,, Suduiraud, Preignac.

,, Coutet, Barsac.

,, Climens, Barsac.

,, Bayle (Guiraud), Sauternes.

,, Rieussec, Fargues.

,, Rabaud, Bomrnes. Second Growths. Chateau Mirat, Barsac.

,, Doisy, Barsac.

„ Fcyxotto, Bomrnes.

,, d'Archc, Sauternes.

„ Fiihot, Sauternes.

,, Broustet-Nerac, Barsac.

„ Caillou, Barsac.

„ Suau, Barsac.

,, Malic, Preignac.

,, Romer, Preignac.

,, Lamotlie, Sauternes.

The production of the Sauternes vineyards is, as a rule, smaller than that of the chief red growths, and in consequence of this, and that the district is. a relatively small one, the prices of the finer growths are often very high.

The Cotes district consists of the slopes rising from the lower marshy regions to the cast of the Garonne and the Dordogne respectively. _ The best of the C6tes wines arc grown in the St Emilion

bttmmoa. rc gj on This region consists of the commune of St Emilion. together with the four surrounding communes. It produces wines of a decidedly bigger type than those of the Medoc, and is frequently called the Burgundy of the Bordeaux district. The classification of the St Emilion wines is very compli- cated, but in principle is similar to that of the Medoc wines. Among the better known wines of the first growths are the following: Chateau Ausone, Chateau Belair, Chateau Oos Fourtet, Chateau Pavie, Chateau Coutet, Chateau Cheval-Blanc, Chateau Figeac. The Chateau Ausone is of peculiar interest, inasmuch as it is here that the poet Ausonius possessed a magnificent villa and cultivated a vineyard (a.d. 300).

Falus and Entre-deux-Mers. — The above wines are grown in the marshy regions in the immediate neighbourhood of the Garonne and Dordogne. They produce useful but rather rough wines. The Entre-deux-Mers district forms a peninsula between the Garonne and Dordogne, comprising the arrondissements of La Reole, the south of Libourne and the east of Bordeaux. This district produces both red and white wines, but their character is not comparable to that of the Medoc or of the C6tes. They are generally employed for local consumption and blending.

The sparkling wine known to us as champagne takes its name from the former province which is now replaced by the departments of Marne, Haute-Marne, Aube and Ardennes. The best c . wines, however, are grown almost exclusively in the Marne “”

*district. The cultivation of the vine in the Champagne is P*2 a e**

of very ancient date. It appears that both red and white wines were produced there in the reign of the Roman emperor, Probus (in the 3rd century a.d.), and according to Victor Rendu the queue of wine was

already worth 19 livres in the time of Francis II., and had, in 1694, attained to the value of 1000 livres. It was at about the latter date that sparkling or effervescent wine was first made, for, according to M. Perrier, a publication of the year 1718 refers to the fact that wine of this description had then been known for some twenty years. The actual discovery of this type of wine is ascribed to Dom Perignon, a monk who managed the cellar of the abbey of Haut Villers from 1670 to 1715. It appears also that it was this same Dom Perignon who first used cork as a material for closing wine bottles. Up till then such primitive means as pads of hemp or cloth steeped in oil had been employed. It is very likely that the discovery of the utility of cork for stoppering led to the invention of effervescent wine, the most plausible explanation being that Dom Perignon closed some bottles filled with partially fermented wine, with the new material, and on opening them later observed the effects produced by the confined carbonic acid gas. The art of making the wine was kept secret for some time, and many mysterious fables were circulated concerning it; inter alia it was believed that the Evil One had a hand in its manufacture. It does not appear, however, to have become popular or consumed on a large scale until the end of the 18th century.*

The district producing the finest champagne is divided into two distinct regions, popularly known as the river and the mountain respectively. The former consists of the vineyards situated tin or in the neighbourhood of the banks of the Marne. The principal vine- yards in the valley, on the right bank of the river, are those at Ay, Dizy, Hautvillers and Mareuil ; on the left bank, on the slopes of Epernay and parallel with the river, those at Pierry and Moussy ; in the district towards the south-east, on the slopes of Avize, those of Avize, Cramant, Vert us and Mesnil. The chief vineyards in the " mountain " district are at Versy, Verzenay, Sillery, Rilly and Bouzy.

The soil in the champagne district consists on the slopes largely of chalk and in the plain of alluvial soil. It is interspersed with some clay and sand. The chief red vines of the champagne district are the Plaut-dore\ Franc-Pineau and the Plant vert dore\ The Plant gris, or Meunier, yields grapes of a somewhat inferior quality. The chief white vine is the Pineau, also known as Chardonay. The best! qualities of wine are made almost exclusively from the black grapes. For this reason it is necessary that the process of collection, separation and pressing should proceed as quickly as possible at vintage time in order that the juice may not, through incipient fermentation, dissolve any of the colouring matter from the skins. For the same reason the grapes are collected in baskets in order to avoid excessive pressure, and are transported in these to the press house. As there is no preliminary crushing, the presses used for extracting the juice have to be of a powerful character. As a rule, three qualities of wine are made from one batch of grapes, the first pressing yielding the best quality, whilst the second

and third are relatively inferior. After the must has been allowed to rest for some hours in order to effect a partial clearing, it is drawn off into barrels and fermented in the latter. The first racking and fining takes place about December. The wine is allowed to rest for a further short period, and if not bright is again racked and fined. It is then ready for bottling, but previous to this operation it is necessary to ascertain whether the wine contains sufficient remanent sugar to develop the " gas " necessary for effervescence. If this is not the case, sugar is added, generally in the form of fine cane or candied sugar. The bottles employed have to be of very fine quality, as the pressure which they have to stand may be as much as 7 to 8 atmospheres or mere. Formerly the loss through breakage was very great, but the art of making and selecting these bottles has greatly improved, and the loss now amounts to little more than 5 %, whereas formerly 25 % and even 30 % was not an uncommon figure. In the spring-time, shortly after bottling, the rise in temperature produces a secondary fermentation, and this converts the sugar into alcohol and carbonic acid. This fermentation proceeds throughout the summer months, and in the meantime a sediment which adheres to the side of the bottle is gradually formed. The bottles, which up till now have been in a horizontal position, are then, in order to prepare them for the next process, namely, that known as disgorging, placed in a slanting position, neck down- wards, and are daily shaken very slightly, so that by degrees the sediment works its way on to the cork. This process, which takes several weeks, is a very delicate one, and requires much skill on the part of the workman. When the whole of the sediment is on the cork, the iron clip, with which the latter is kept in position, is removed for a moment, and the force of the wine ejects the sediment and cork simultaneously. This operation also requires much skill in order to avoid an excessive escape of wine. An ingenious modification has of modern times been introduced, which consists in freezing part of the contents of the neck of the bottle. The cork may then be withdrawn and the sediment removed without any wine being lost.

After the sediment has been removed the wine is subjected to dosage, or liqueuring. It is by this process that the degree of sweetness required to suit the particular class of wine being made is attained. For wines exported to England very little liqueur is employed ; hi the case of some wines, known as Brut or Nature, none at all is added. Wines intended for consumption in France receive a moderate quantity of liqueur, but those for the Russian and South American markets, where very sweet wines are liked, receive

more. This liqueur is made of fine wine, brandy and candied sugar. The liqueuring is nowadays generally carried out by means of a machine which regulates the quantity to a nicety. Champagne is not, as is the case, for instance, with the classified growths of the Gironde, the product of a single vineyard. The bulk of the wine is made in vine- yards belonging to small peasant proprietors, who sell their produce to the great mercantile houses. The latter blend the wines received from the various proprietors, and the chief aim in this blending is to maintain the character of the wine which is sold under a particular trade mark or brand. Similarly, it has been said that, strictly speaking, there is no such thing as vintage champagne, for it is almost invariably the practice, in order to maintain the general character of a specific brand, to blend the new wines with some old wine or wines which have been vat ted for this particular purpose. These vattings, and indeed all blendings of any particular batch of wines, are termed cuvees. The vintage date, therefore, which is borne by " vintage champagne," refers rather to the date of vintage prior to bottling than to the age of the wine, although the main bulk of the wine of a certain ' ' vintage ' ' will actually have been made in the year indicated. It is not unusual in the case of champagne to add some sugar to the must in the years in which the latter is deficient in this regard. No legitimate objection can be raised to this practice inasmuch as champagne in any case must be regarded in the light of a manufactured article rather than as a natural product. The principal centres of the champagne trade are at Reims, Epernay, Ay and Avize. The total output of the Marne district has for the past three years averaged about 9 million gallons, but it occasionally runs as high as 20 million gallons. A great part of this wine, how- ever, is not suitable for making high-class champagne. As a rule, the supply considerably exceeds the demand, and the stock in hand at the present time amounts to roughly four years' consumption of finished wine, but to this must be added the stock existing in cask, which is considerable. For the period 1906-1907 the total number of bottles in stock amounted to over 121 millions, the bottles exported to over 23 millions, and the bottles required for internal commerce in France to something over 10 millions. There is, thus, at the present a total annual consumption of rather over 30 millions of bottles. The chief trade in champagne is with the United Kingdom, to which the finest varieties are exported. In the year 1906,

of access and of remarkably even temperature, at a very small cost. The method of manufacture is similar to that followed in the Champagne.

In the east of France, not far from the Jura, lies the oldest viti- cultural district of Europe, namely that of Burgundy. It is still so called, after the old French provinces, Upper and Lower Burgundy. It comprises the departments of the Yonne on the north-west, the C6te d'Or in the centre, and the Sa6ne-et -Loire on the south. In the Yonne are made chiefly the

white wines known to R .

us as Chablis; in the Sa&ne-et-Loire are made the red u rg""V- and white wines of Macon, and there is also, stretching into the department of the Rh6ne, the district producing the Beaujolais wines. The most important wines, however, the Burgundy wines proper, are made in the centre of this region on the range of low hills running north-east by south-west called the Cote d'Or, or the golden slope. The soil of the C&te d'Or is chiefly limestone, with a little clay and sand. The vineyards producing the best wines are situated about half-way up the slopes, those at the top producing somewhat inferior, and those at the foot and in the plain ordinary growths. Practically all the best vineyards (which are grown on flat terraces on the slopes, and not on the slopes themselves) face south-west and so get the full benefit of the sun's rays. The most important vine — in fact on the slopes of the C6te d'Or practically the only vine — is the Pineau or Noirien, but in the plain and in the districts of Macon and Beaujolais the Camay is much cultivated. The influence of the soil on one and the same vine is interestingly illustrated by the different character of the vines grown in those districts, the Beaujolais wines having far greater distinction than those of Macon. The commune of Beau ne must be regarded as the centre of the Burgundy district, and possesses numerous vineyards of the highest class. To the north of Beaune lie the famous vineyards of Chambertin, Clos Vougeot, Romance, Richebourg, Nuits St Georges and Corton; to the south those of Pommard, Volnay, Monthelie and Meursault with its famous white wines.*

The vinification of the Burgundy wines takes, place in cuves of 500 to 2000 gallons capacity, and it has for very many years been the common practice in vintages in which the must is d-cficient in saccharine to ensure the stability of the wine by the addition of some sugar in the cuve. The first rackings generally take place in February or March, and the second in July. The practice of sugaring has ensured greater stability and keeping power to the wines, which formerly were frequently irregular in character and difficult to preserve.

There is no official classification of the Burgundy wines, but the following is a list comprising some of the finest growths in geographical order, from north to south, together with the localities in or near which they are situated.

Analyses of Champagne. 3

No.

Description of Wine.

Vintage.

Alcohol per cent, by vol.

Total Acid.

Extract.

Ash.

Total

Tartaric

Acid.

Sugar (as invert

Sugar).

Glycerin.

Carbonic Acid.

I

2 3

.4 5 6

Champagne nature

Brut

Dry

Extra sec

Extra dry

Dry-

1892 1892 1892 1893 1893 1893

14-01 12-57 13-50 13-53 1256 14-44

5-22 3-23 599

5-oi

5-43 4- 80

20-95 19-78 27-07 22-95 23-18 30-33

1-17 2-53 1-16

I 10

i-J3

1-05

2-20

2-76

2-ro

2-18 2-49 2 04

3-36 1-32 9-20 7-84 7-23 13-86

7-55 7-64 9-10 6-50

8-i8

9-05

8-27 7-79 9-55

8-12

7-75

1, 161,339 gallons of champagne, to the value of £1,679,611, were imported into the United Kingdom. The general composition of high-class champagnes, as supplied to the English market, will be gathered from the preceding table, which is taken from a large number of analyses published by the author and a collaborator in the Analyst for January 1900.

It will be seen that, compared with the dry, light red wines, the proportion of sugar, alcohol and acidity is comparatively high in champagne, and the extract (solid matter) rather low.

The fruitful departments watered by the Loire and its tributaries produce considerable quantities of wine. The white growths of the – Loire have been

known for many centuries, but up to

saumur. 1%ˆ were used only as still wines. At that date, however, it was found that the wines of Saumur (situated in the department of the Maine-et-Loire) could be successfully converted into sparkling wines, and since then a considerable trade in this class of wine has developed. At first it was chiefly used for blending with the wines of the Champagne when the vintage in this district was insufficient, but at the present time it is largely sold under its own name. The imports of sparkling Saumur into the United Kingdom in 1906 amounted to 114,234 gallons, valued at _ £73-984- Although the average wholesale value of Saumur is considerably less than that of champagne, it compares favourably with the lower grades of that article, and in flavour and character is similar to the latter. The successful evolution of the Saumur sparkling wine industry is largely due to the fact that the range of limestone hills t _ at the foot of which the town is situated, afford by excavation illimitable cellarage, easy

Locality. Fixey . Fixin . Chambertin Morey . Chambulle Vougeot Flagey Vosne .

Nuits .

Aloxe .

Savigny

Beaune

Pommard

Volnay

San te nay

Meursault . Puligny

1. Red Wines.

Growth. Les Arvelets. Clos de la Perriere.

Chambertin, Clos de Bize, Clos 5t Jacques. Clos de Tart, Les Bonnes Mares, Les Larrets. Les Musigny. Clos de Vougeot. Les Grandes Eschezeaux. Romance- Conti, Les Richebourgs, La Tache.

Romance la Tache. Les Saint- Georges, Les Vaucrains, Les

Porrets, Les Pruliers, Les Boudots, Les

Thorey. Le Corton, Le Clos-du-Roi-Corton. Les Vergelesses.

Les F&ves, Les Greves, Le Clos de la Mousse. Les Arvelets, Les Rugiens. Les Caillerets, Les Charnpans. Les Santenots, Le Clos-Tavannes.

2. White Wines.

Les Perriercs, Les Genevricrcs. Montrachet, Les Chevaliers-Montfachett Lˆ Batard Montrachet.

SPAIN]

WINE

725

An interesting feature of the Cote d'Orjs the Hospice de Beaune, a celebrated charitable institution and hospital, the revenues of which are principally derived from certain vineyards in Beaune, Corton, Volnay and Pommard. The wines of these vineyards are sold every year by auction early in November, and the prices they make serve as standards for the valuation of the other growths.

To the south of Lyons, in the department of the DrSme, are made in the district of Valence the celebrated Hermitage red and white „ „ wines. The quality of sonic of these, particularly of the ' sweet white wines, is considered very fine. The quantity produced is very small. The red wines made at the present time are after the style of Burgundy and possess good keeping qualities.

If we except the wines of Roussillon, produced in the old province of that name, in the extreme south of France, the above constitute Midi tne principal varieties of French wines known in the

' United Kingdom. They form, however, but a small

fraction of the entire production of the country. The most prolific viticultural district of France is that known as the Midi, comprising the four departments of the Herault, Aude, Gard, and the Pyrenees- Orientales. Thus in 1901 the department of the Herault alone produced nearly 300 million gallons of wine, or approximately a quarter of the whole output of France. The average amount of wine made in the four departments for the past three years has been roughly 500 million gallons. These wines formerly were largely exported as vin de cargaison to South America, the United States, Australia, etc., and were also much employed for local consumption in other parts of France. Owing, however, to the fact that viti-

culture has made much progress in South America, in California, in Australia and particularly in Algeria, and also to the fact that the quality of these Midi wines has fallen off considerably since the phvlloxera period, the outlet for them has become much reduced. These and other reasons, notablv the manufacture of much fictitious wine with the aid of sugar (fortunately stopped by the rigid new wine laws), led to the grave wine crisis, which almost amounted to a revolution in the Midi in the spring and summer of 1907.

Viticulture has made great strides in Algeria during recent years. The first impetus to this department was given by the destruction ., w or crippling of many of the French vineyards during

Algeria. ˆ phylloxera period. The present output amounts to roughly 150 million gallons, and the acreage under the vine has increased from 107,048 hectares in 1S90 to 167,657 hectares in 1905. The wines, moreover, of Algeria are on the whole of decidedly fair quality, possessing body and strength and also stability. In this regard they are superior to the wines of the Midi.

Wines or Spain

The wines of Spain may be regarded as second in importance to those of France. Although the quantity produced is not so large as in Italy, the quality on the whole is decidedly superior to that of the latter country. There are three main types of wine with which consumers in the United Kingdom are familiar, namely Sherry, Tarragona (Spanish Port or Spanish Red) and wines of a claret type. The trade with the United Kingdom is of considerable proportions, the total quantity of Spanish wines imported in 1906 amounting to 1,689,049 gallons of red wine (to the value of £154,963), and white wines to the extent of 1,119,702 gallons (to the value of £242,877). _ .

The most important wine produced in the province of Andalusia, which is the chief vine-growing district of Spain, is that known to us as sherry, so called from the town of Jerezde laFrontera, Sherry. v hich is the centre of the industry. Sherry is produced in a small district bounded by San Lucar in the north-east, Jerez in the east and Port St Mary on the south. The total viticultural area amounts to about 20,000 acres. The soil is of very varying nature, and consists in some districts of the so-called aibarim (mainly chalk with some sand and clay), in others of burros, which is mainly sand cemented together with chalk and clay, and of arenas, which consists of nearly pure 'sand. Most of the vineyards in the Jerez district are upon albariza soil, those to the north and north-east are mainlv of barros, and those close to the seashore of arenas. The dominating vine is the Palomino,

which produces amontillados and finos. Other important vines are the Perruno and the Mantua Castellano. There is also a variety of Pedro-Ximenes, which, however, is net used for making ordinary wine, but for the purpose of preparing the so-called duke, a very sweet must or wine, made from over-ripe grapes, which, after fortification with spirit, is em- ployed for sweetening other wines. The process of vinification is comparatively simple. The grapes are, after gathering, dusted over with plaster of Paris, and then crushed hy treading in a shallow rectangular vessel termed the lagar. The juice, which is so obtained together with that which results from the pressing of the murk, is fermented in much the same manner as is customary in other countries. There are two main types of sherry known in the United Kingdom, namely, those of the amontiUado and those of the manzan- illa classes. The former are generally sweet and full-bodied, the latter light and dry. The manzanillas are mostly shipped in the natural state, except for the addition of a small quantity of spirit.

The amontillados maybe again divided into the finos and the olorosos the former being the more delicate. These distinctions are not of a hard and fast character, for they f rcq ucntly merely represent different developments of the same wine. Thus, according to Thudicum, the regular heavy sherry from albariza soil remains immature for a number of years and then becomes a fino. After five to eight years it may become an amontiUado, and if it is left in cask and allowed to develop, it will, after it attains an age of nine to fourteen years, become an Oloroso, and still later it may become a secco. In Jerez itself a different classification, namely that according to quality and not age, exists, which, however, is only employed locally. Thus the term palma is applied to fine dry wines when in their second or third years. These may be amontillados, but according to some they never become olorosos. Then there are varieties known as double and treble palma, and single, double and treble palo, the latter being the finest form of oloroso. Then there is the quality of wine termed raya. This is dry and sound, and forms a great part of the sherry exported to the United Kingdom. The sweetness of the sweet sherries is partly due to an inherent property of the wine (apart from any sugar they may contain) and partly to natural or added sugar. In some cases the fermentation of the must is stopped by the addition of spirit before the whole of the saccharine is con- verted, and the wines so prepared retain a proportion of the sugar naturally present in the must. In other cases dry wines are prepared and sugar is added to them in the form of dulce (see above). In order to prevent refermentation it is then necessary to fortify these wines with spirit. The standard of colour required for certain quantities is maintained by the addition of color. The latter is made by boiling wine down until it attains the consistency of a liqueur. The great bulk of sherry shipped to the United Kingdom is blended. The system of blending sherry in some respects recalls

that of the blending of Scotch whiskies. Wines of the same type are stored in vats or soleras, and the contents of the soleras are kept as far as possible up to a particular style of colour, flavour and sweet- ness. Prior to shipment the contents of various soleras are blended according to the nature of the article required.

In addition to the wines described above, there arc others of a similar nature grown in the vicinity, such as montilla (made in Cordova) and moguer (produced on the right bank of thcGuadalquivir).

The bulk of the sherry imported into the United Kingdom still consists of the heavier, fortified wines, varying in strength from 17 to 2i % of absolute alcohol, although the fiscal change introduced in 18S6, whereby wines not exceeding 30 proof (i.e. about 17% of alcohol) were admitted at a duty of is. 3d., as against 3s. for heavier wines, naturally tended to promote the shipment of the lighter dry varieties. In this connexion it is interesting to note that the im- portation of sherry into the United Kingdom on a considerable scale commenced in the 15th century, and that the wine shipped at that time was of the dry variety. It seems possible that sherry was the first wine known as sack in this country, but it is at least doubtful whether this word is, as some contend, derived from seek or sec, i.e. dry. According to Morew r ood it is more likely to have come from the Japanese Sakg or Sacki (see SAKlt), derived in its turn from the name of the city of Osaka.

Chemically the sweet sherry differs from the natural dry light wines in that it contains relatively high proportions of alcohol, extractives, sugar and sulphates, and small quantities of acid and glycerin. This is well illustrated by the following analysis : —

Analysis of Sherry (Fresenius).

Alcohol per cent by vol.

Grams per Litre.

Extract.

Total Acid.

Ash.

Glycerin.

Sugar.

Sulphates.

19-94

48-9

3-3

4-2

4-3

30-2

375

Malaga is a sweet wine (produced m the province of that name) which is little known in England, but enjoys considerable favour on the Continent. It is generally, as exported, a blend made Malaga, from vino dulce and vino secco, together with varying quantities of vino maestro, vino tiemo, arope and color. The vino dulce and vino secco are both made as a rule from the Pedro Jimenez (white) grape, the former in much the same way as the dulce. which is employed in the sherry industry, the latter by permitting fermenta- tion to take its normal course. The vino maestro consists of must which has only fermented to a slight degree and which has been " killed " by the addition of about 17% of alcohol. The vino tiemo is made by mashing raisins (6 parts) with water (2 parts) pressing, and then adding alcohol (1 part) to the must. Arope is obtained by concentrating vino dulce to one-third, and color by concentrating the arope over a naked fire. Malaga is therefore an interesting example of a composite wine. Besides the sweet variety, a coarse dry wine is also made, but this is little known abroad.

Another well-known wine district in the south of Spain is that of Rota, where a sweet red wine, known in England as tent (tinto), chiefly used for ecclesiastical purposes, is produced.

Wines of the Centre and North.— While the most important Spamsli wines are those grown in the southern province of Andalusia, the

central and northern districts also produce wine in considerable quantity,

and much of this is of very fair quality. Thus in the central district of Val de Penas and in the Rioja region (situated between Old Castile and Navarre) in the north-east are produced red wines which in regard to vinosity, body and in some other respects resemble the heavier clarets or burgundies of France — although not possessing the delicacy and elegance of the latter. They are shipped in some quantity to the United Kingdom as Spanish " claret " or Spanish " burgundy." The most important industry, outside the southern districts, is, however, that in Catalonia, where, in the neighbourhood of the town of that name, the wine known as Tarra- gona or Spanish " port " is produced. The finest Tarragona (which much resembles port) is made in the Priorato region, about 15 m. inland.

Wines of Portugal In the north-east of Portugal, not far from the town of Oporto — from which it takes its name and whence it is exported — is produced the wine, unique in its full-bodied and generous char- acter, known as port.

Port is grown in the Alto Douro district, a rugged tract of land some 30 to 40 m. long by 10 m. wide, which commences at a point on the river Douro some 60 m. above Oporto. The character of the Alto Douro is extremely mountainous and rugged. J. L. W. Thud'.chum, in his Treatise on Wines, gives a striking and almost poetical description of it as compared with Jerez. He says: "The vineyards of Jerez are so beautiful and

E reductive that they might well be termed the vineyards of Venus, adulating hills, easily accessible from all sides, are covered with a luxurious growth of vines. . . . Very different is the aspect of the Alto Douro. Here all is rock, gorge, almost inaccessible mountain, precipice and torrent, while over or along all these rude features of nature are drawn countless lines of stone walls by which man makes or supports the soil in which the vines find their subsistence. ... I thought that if Jerez was the vineyard of Venus, this Alto Douro vineyard must be termed the vineyard of Hercules." The vine- yards are, in fact, situated on artificially made terraces, supported by walls on the mountain sides. If this were not the case the heavy winter rains would wash away the soil. The climate of the Alto Douro is very variable. Intense heat in summer is followed by severe cold in winter. The soil is a peculiar clay-schist, on or alternating with granite, and it is to the peculiar conditions of climate and soil that port owes its remarkable qualities of colour, body and high flavour. There appears to be no predominant and distinct type of vine, such as is the case in other viticultural districts, but a number of varieties, mostly yielding grapes of a medium size are common to the Douro vineyards. The method of cultivation is generally that of a rational low culture, and in this respect differs from that employed in other parts of the country,- where the vines are either trained on trees or over trellis-work at some height from the ground.

Vinification. — The process of converting the Alto Douro grapes into wine differs in some material particulars from those employed elsewhere. The grapes are cut and then conveyed in baskets by the Gallegos (as the labourers who come specially from Galicia in Spain for this purpose are termed) to the winery. Here the stalks are removed, generally by a machine similar to the French egrappoir, and the grapes then placed in the lagar. This is a square stone vessel of considerable size made to hold up to fifteen pipes (the pipe equals 115 gallons) of wine. It is roughly 2 ft. deep and from 3 to 10 yds. wide. The grapes are first trodden for a period varying from twenty-four hours upwards, and are then allowed to ferment in the lagar itself. When the fermentation has reached a certain point it is generally the custom to again tread the must in order to extract as much colour as possible from the skins. In order to preserve the sweet quality of the wine, fermentation is not permitted to continue beyond a certain point. When this is reached the wine is drawn from the lagar over a strainer or some similar arrangement into vats yielding from five to thirty pipes. The murk remaining in the lagar is then pressed by means of a lever or beam press with which this vessel is fitted. In order to prevent the wine from fermenting further and so becoming dry, from 4 to 5 volumes of brandy are added to every 100 volumes of wine in the vats. The alcohol employed for this purpose is as a rule of high quality and made solely from wine. When, after the approach of the cold weather, the lees have dropped, the wines are racked and a further addition of brandy is made. The second racking takes place in March or April, and the wine is now placed in casks and sent to Oporto, where it is stored in large over-ground buildings termed lodges. A further addition of brandy is generally added before shipment. The great bulk of the wine is stored for many years before shipping, but this does not apply to the commoner varieties, nor to the finest wines, which, being the produce of a specific year, are shipped unblended and as a vintage wdne. The most famous vintages of recent times were those of 1847, 1851, 1863, j868, 1870, 1873, 1878, 1881, 1884 and 1887. A white port is also made in the Alto Douro, and this, although little known in England, is exported in considerable quantities to Germany and Russia. The white port is grown in vineyards which are not quite so favoured as regards position as

the red port growths. White port is made from white grapes, and a peculiarity of its manufacture is that the must is frequently fermented in the presence of the skins, which is most unusual in the case of white wines. This gives a certain stringency to white port, which is characteristic of the wine.

Diseases. — The Alto Douro has from time to time been sadly ravaged by the oidium and phylloxera. The former first made ita appearance about the middle of the 19th century, and reached a climax in 1856, when only

about 15,000 pipes, that is, about one- sixth of the usual quantity, was vintaged. In consequence of this, the exportation of port dropped from over 40,000 pipes in 1856 to about 16,000 pipes in 1858. Since then oidium has reappeared from time to time, but the remedy of spraying with finely divided sulphur, which was discovered at the time of the epidemic, has enabled the wine farmers to keep it under. The phylloxera, which appeared in Alto Douro in about 1868, also did enormous damage, and at one time reduced the yield to about one-half of the normal. At one time the position appeared to be desperate, particularly in view of the fact that the farmers refused to believe that the trouble was due to anything other than the continuous drought of successive dry seasons, but at the present time, after much expenditure of energy and capital, the condition of affairs is once more fairly satisfactory.

Port Wine Trade. — The port wine trade is of considerable import- ance to the United Kingdom not only because the chief trade in this wine is with that country, but also because a very large proportion of the capital invested in the industry is English. It is probable that the English capital locked up in the port industry amounts to some 2 millions sterling. In the period preceding the 'seventies of the last century practically the whole of the wine exported from Oporto came to Great Britain. Thus in the year 1864 there were exported to Great Britain 29,942 pipes and to the rest of the world 5677 pipes. The trade with the rest of the world, however, has gradually grown since then, the figures being as follows; —

Exports of Wine from Oporto. (

Year.

To

To Rest

Great Britain.

of the World.

Pipes.

Pipes.

1874

35.753

20,778

1884

30,281

31,741

1898

4I.°93

69.93 2

1903

32.832

65,058

1906

34.356

80,934

The growth of the export trade from Oporto with the rest of the world is principally due to the enormous increase in the quantity of wine sent to South America, chiefly Brazil, but only a small propor- tion of this (probably one-eighth) is port wine proper. The bulk of it consists of wine from the Minho and Beira districts. These facts also account for the apparent anomaly that the exports from Oporto are much higher than the total production of wine in the Alto Douro. At the present time the average production of the Alto Douro is about 50,000 pipes. During the last decade it was at a maximum in 1904, when 70,000 pipes were produced, and at a minimum in 1903, w r hen only 18,000 pipes were obtained. The value of the port taken by the United Kingdom was in the year 1906 over one million sterling, that is, rather less than half of the total value of all the French wines imported, but more than double the value of the total of Spanish wines.

The chemical features of interest in port are the relatively high proportions of alcohol (the bulk of the wine imported into the United Kingdom containing some 18 to 22% of alcohol), sugar and tannin. The sugar varies considerably according to the vintage, but as a rule amounts to from 7 % to 15%.

Other Portuguese Wines. — The wines of the Alto Douro only form a small proportion of the total quantity of wine produced in Portugal. The main

wine-grow r ing district outside that of Oporto is in the neighbourhood of Lisbon. The chief varieties are those grown at Torres Vedras, which are of a coarse claret type; at Collares, where a wine of a somewhat higher quality is produced; at Carcavellos, at the mouth of the Tagus; and at Bucellas. In the latter district is produced a white wine from the Riessling grape, which is commonly known in the United Kingdom as Bucellas Hock.

As far as the United Kingdom is concerned, the Madeira wine industry is mainly of interest in that it was largely developed by and is still chiefly in the hands of British merchants. Madeira The shipments to the United Kingdom, however, which reached a maximum in 1820, when over half a million gallons were imported, has fallen off to one-tenth of that amount, and the con- sumption in these islands was barely 20,000 gallons in 1906. This falling away in the taste for Madeira is partly ascribable to fashion and partly to the temporary devastation of the vineyards by the phylloxera in the middle of last century. The re-establishment of the vineyards and the consequent development of the industry did not, however, lead to a renewal of the trade on the former scale with this country. The output in 1906 amounted to 10,000 pipes (Madeira

pipe =92 gallons) and the export to 6010 pipes, of which quantity 1 95 1 pipes went to Germany, 1680 pipes to France, 796 pipes to Russia and 755 pipes to the United Kingdom. Madeira, like sherry and port, is a fortified Vine. The method of vinification is similar to that employed in other parts of Portugal, but the method employed for hastening the maturation of the wine is peculiar and character- istic. This consists in subjecting the wine, in buildings specially designed for this purpose, to a high temperature for a period of some months. The temperature varies from ioo° to 140 F. according to the quality of the wine, the lower temperature being used for the better wines. The buildings in which this process is carried out are built of stone and arc divided into compartments heated by means of hot air derived from a system of stoves and flues. Much of the characteristic flavour of Madeira is due to this practice, which hastens the mellowing of the wine and also tends to check secondary fermentation inasmuch as it is, in effect, a mild kind of pasteurization.

Wines of Germany Although the quantity of wine produced in Germany is com- paratively small and subject to great variations, the quality of the finer wines is, in successful years, of a very high order. In fact Germany is

the only country which produces natural (i.e. un- fortified} wines of so high a class as to be comparable with — although of an entirely different character from — the wines of France. The finer wines possess great breed and distinction, coupled with a very fine and pronounced bouquet, and in addi- tion they are endowed with the — in the case of lighter wines — rare quality of stability. The great inequalities observed in the different vintages and the exceptionally fine character of the wines in good years are, generally, due to the same cause, namely, to the geographical position of the vineyards. The wines of the Rhine are grown in the most northerly latitude at which viti- culture is successful in Europe, and consequently, when the seasons are not too unpropitious, they display the hardiness and distinction characteristic of northern products. During the period 1891-1905 the total production of Germany has averaged roughly 62 million gallons, attaining a maximum of 111 million gallons in 1896 and a minimum of 16 million gallons in 1S91. The trade with the United Kingdom is now a very considerable one, amounting in 1906 to roughly i\ million gallons to the value of three-quarters of a million sterling.

The wines grown m the Rheingau, Rheinhessen and in parts of the Palatinate are generally known by the name of Rhine wines, although Chine many of these are actually produced on tributaries of

*wines * nat river. Thus the well-known Hochheimer, from*

which the curious generic term " hock " employed in England for Rhine wines is derived, is made in the vicinity of the little village of that name situated on the Main, a number of miles above the junction of the latter with the Rhine. The Rheingau district proper stretches along the north bank of the Rhine from Bingen on the west to Mainz on the east. The most important wines in this region are those of the Johannisberg and of the Stein- berg. The vineyards of the former are said to have been planted originally in the nth century, but were destroyed during the Thirty Years' War. They were replanted by the abbot of Fulda in the 18th century. During the French Revolution the property passed into the hands of the prince of Orange, but after the battle of Jena, Napoleon deprived him of it and presented it to Marshal Kellermann. On the fall of Napoleon, the emperor of Austria took possession of the vineyard and gave it to Prince Mctternich. At the present time the property still belongs to the descendants of the latter. The vineyards of Steinberg belong to the state of Prussia. The vineyards of these two properties are tended with extraordinary care, and the wines, of which several qualities are made in each case, fetch ex- ceedingly high prices. The finest wines are produced in a manner somewhat similar to that employed for making the Sauternes. The grapes are allowed to become over-ripe and are then selected by hand. This process produces the so-called Auslese wines, which frequently fetch as much as 30s. or 40s.

a bottle. The other most important wines produced in the Rheingau and its extensions are those ot Marcobrunn, Geisenheim, Rudeshetm and Hochheim. The most important wines produced in Rheinhessen (on the left bank of the Rhine and south of the Rheingau) are those of Liebfraumilch, Nierstein, Oppenheim, Bodenheim, Laubenheim and Scharlachberg. In the Palatinate the most important growths are those of Forst, Deideshcim and Diirkheim.

*The wines of the Moselle are of a somewhat different character to those of the Rhine. Whereas the Rhine wines of the finer descriptions Moselle. are as a ru J e ˆ n ˆY * uu bodied and of marked vinosity, the Moselle wines are mostly light and of a somewhat delicate nature. While the Rhine wines generally improve in bottle- for a lengthy period, the Moselles arc as a rule at their best when com- paratively fresh. Indeed, many connoisseurs hold that when a*

Moselle ceases to show signs of the somewhat prolonged secondary fermentation, characterized by the slight prickling sensation produced on the palate (caused by the presence of bubbles of carbonic acid gas in the wine), that it has passed its best. The best-known growths of the Moselle are those of Brauneberg, Bernkastel, Picsport and Zcllingen. Some of the tributaries of the Moselle also produce wines which in quality approach those of the parent river. Among these may be cited the growths of Scharzhofberg, Geisberg and Bockstein.

Large quantities of wine are produced in Alsace-Lorraine, Baden and Wurttemberg, but the majority of these have little interest, inasmuch as they are used only for home consumption. Among the wines, however, which are well known may be mentioned the Franconian growths, amongst which the celebrated Stein wine, whicii is grown at the foot of the citadel of the town of Wtirzburg, and in the grand duchy of Baden the celebrated growths of Affenthal (red) and Markgrafler.

Practically all the important wines of Germany are white, although there are a few red growths of some quality, for instance that of Assmannshausen in the Rheingau. The latter is produced from the black Burgundy vine, the Pineau. In the Rheingau the predominant vine is the Riessling. This plant appears to be indigenous to the Rhine valley, and the finest wines are made exclusively from its grapes. In the hope of reproducing the characteristic of the Rhine wines, the Riessling has been planted in many young wine-producing countries, such as Australia, California and the Cape, and not entirely without success. It thrives best on rocky mountain slopes freely exposed to the sun, and requires a relatively high temperature to reach perfect maturity. In the lower lands, therefore, it is customary to plant, in addition to the Riessling, vines such as

Osterreicher and Kleinberger, which mature more readily than the former. Other vines, such as the Orleans and the Trammer, are also found in small quantities in the Rheingau. On the Moselle the Riessling and the Kleinberger are the chief growths. The vintage on the Rhine is, in order to permit the grapes to acquire the ' ' over- ripeness " necessary to the peculiar character of the wines, generally very late, rarely taking place before the end of October. The process of vinification is peculiar in that fermentation takes place in relatively small casks, the result being that there are frequently marked differences in the produce of the same growth and vintage.

The very great variations which are shown by the same growths of different vintages makes it impracticable in the case of the German white wines to give representative analyses of them. Comparing the fine wines of the better vintages with, for instance, the red wines of the Gironde, the main features of interest are the relatively high proportions of acid and glycerin and the low proportion of tannin which they contain.

Wines of Italy Italy ranks second to France as regards the quantity of wine produced, but in respect to quality a comparison is scarcely possible, inasmuch as the Italian wines are on the whole of a poor character. They display many of the features characteristic of southern wines, showing either an excessive vinosity coupled with a somewhat crude bouquet, or where the alcoholic strength is not high, a decided lack of stability. The reason for this is to be sought partly in the un- scientific methods of cultivation, and partly, in many districts, in the haphazard methods of vinification employed. The vines are to a great extent still trained on trees or trellis-work, or allowed to grow among the rest of the vegetation in the most casual manner. It must be stated, nevertheless, that of recent years a decided im- provement has set in in some quarters owing to the lively interest which the Italian government has taken in the subject, principally owing to the important export trade to America, Switzerland and other countries. The trade with the United States, which in 1887 amounted to little over 120,000 gallons, has risen to considerably over a million gallons. The exports to the Argentine Republic amount to roughly 4 million gallons, and to Switzerland from 4 to 8 million gallons. The trade with the United Kingdom is small, amounting to little over a quarter of a million gallons annually, and of a value rather less than £50,000. The total exports of Italy are on the average not far from 40 million gallons. The wines of northern Italy are on the whole of good colour, but somewhat harsh. Among the best-known wines in Piedmont are the Barolos and the wines of Asti, which are made from a species of muscatel grapes. They are of an agreeable flavour, and this especially applies to the white de- scriptions. A considerable quantity of sparkling wine is manu- factured in this district. Among the best-known wines of Lombardy are the Passella wines of

Valtclina. In central Italy the best growths are those of Chianti, Pomino, Montalcino, Carmignano and Monte- pulciano. Tuscany produces the greater part of these wines, which are of good but not excessive alcoholic strength, containing as a rule some 10ˆ % to n£ % of alcohol. The Montepulciano wines have a brilliant colour and high bouquet, and are of a sweet, luscious flavour. The wines of Chianti, near Siena, are often described as being of the claret tvpe, but actually they are somewhat similar to the growths of Beaujolais. The best Italian wines, however, are probably those grown in the Neapolitan district. The best of these is the celebrated Lacrima Christi, which is grown on the slopes of

Vesuvius from a vine bearing the same name. It has a fine red colour, and unites delicacy and a high bouquet with a sweet elegant taste. The white muscat wines of Vesuvius are also of good quality, and the island of Capri produces some excellent wine. Perhaps the best known of Italian wines in the United Kingdom is that produced in the neighbourhood of Marsala in the island of Sicily, which bears the name of the town from which it is exported. Marsala is a fortified white wine which is grown and made with considerable care. It is somewhat similar in character to the wines of Madeira, but its character also recalls some of the sherry types. It is vatted and blended in much the same way as sherry, and there is a considerable trade in this wine with the United Kingdom. In the neighbourhood of Palermo, Muscat and Malvcisie wines of very fair quality are made. The islands of Sardinia and Elba produce considerable quantities of wine, some of which is of fair quality.

Wines of Austria-Hungary In point of quantity Austria-I Iungary takes the fourth place among the wine-producing nations. The average production for the period 1901—1905 was 178 million gallons. Of this quantity Austria is responsible for roughly three-fifths and Hungary for the remaining two-fifths. The character of the Hungarian wine is, however, much higher than that of the Austrian growths. The quality of the bulk of the Austro-Hungarian wines has been improved of late years, principally owing to the endeavours of the respective governments to introduce scientific and modern methods among the wine-farmers. Since the recovery of the Hungarian vineyards from the phylloxera considerable efforts have been made to develop an export trade, but so far the wines of Hungary are not generally known in the United Kingdom. Nevertheless, Hungary produces at least one class of wine which may be considered of international

importance, namely, the famous Tokay. This is produced in the mountainous Hegyalia region in a district which has the town of Tokay for its centre. The vine Irorn which Tokay is made is the Fur mint. The finest varieties of Tokay are made entirely or mainly from Fur-mint grapes which have been allowed to become over-ripe in a manner somewhat similar to that obtaining in the Sauternes districts. In the case of Tokay, however, the transformation of the grape into what is practically a raisin is not brought about by the intervention of any particular micro-organism. The sun is sufficiently powerful to cause the evaporation of the water in the grape through the skin without any preliminary loosening of the latter by the action of the botrytis cinerea or any other micro-organism. The most precious variety of Tokay is the so-called essence. This is produced by placing the finest grapes in casks and drawing off the juice which exudes naturally as a result of the weight of the material. The Tokay essence is, even after many years, still a partially fermented wine, rarely containing more than 7 % to 9 % of alcohol. Indeed, it may be said that the main fermentation rarely, if ever, reaches a climax. Another variety of Tokay is the so-called szamorod. This is produced by pressing a mixture of dried grapes and fully ripe grapes and fermenting the must so obtained. It contains up to about 14% of alcohol and relatively little sugar. The most common kind of Tokay is the so- called Ausbruch wine. This is obtained by extracting dried grapes with the must of ordinary grapes. According to the amount of dried grapes (zibebs) employed, the wine is termed 1 to 5 " buttig." The Ausbruch. wines take from three to four years to ripen, and they may contain from 12% to 15% of alcohol and a little or a fair quantity of sugar, these factors varying according to the vintage and the number of " butts " of zibebs employed. Another variety of Tokay is the so-called mdsl&s. The term is applied to different varieties of wines according to the district, but in the neighbourhood of Tokay it generally refers to wines obtained by treating szamorod or Ausbruck residues with dry wine. In the neighbourhood of Me'nes sweet red wines produced by the Ausbruch system are also termed tn&slds. Hungary -produces a variety of other wines both strong, such as those of central Hungary', and relatively light, such as those of Croatia and Transylvania. The wines produced at Carlowitz (on the Danube), some 40 m. north-west of Belgrade, are somewhat stronger. They have a flavour somewhat resembling port, but are coarser, and lack the fine bouquet of the latter. The other chief vine-growing countries of the empire are Dalmatia, Lower Austria and Styria. Some of the Dalmatian wines are of fair quality, and somewhat resemble Burgundy.

Wines of the United States The cultivation of the vine has made very rapid strides in the United States during the past half-century. Whereas in 1850 the production amounted to little more than a million gallons, the output to-day ts, in good years, not far short of 50 million gallons. The result has

been that the domestic wines have now very largely displaced the foreign product for ordinary beverage purposes. At the same time, there is no reason to believe that the finer European wines will be entirely displaced, inasmuch as these are characterized by qualities of delicacy and breed which cannot be reproduced at will. At the same time, there is no doubt that much of the wine produced in the United States is of very fair quality, and this is largely due to the fact that the Americans have been at great pains to introduce the latest scientific methods in regard to the vine and ■wine-making. Thus in parts of California, where high temperatures

are liable to prevail during the vintage, the system — first employed in Algeria — of cooling the must during fermentation to the proper temperature by means of a series of pipes in which iced water circu- lates is now largely employed. The use of pirre culture yeast derived from many of the most famous European vineyards has also done much towards improving the quality. In California there are, in addition to the native growths, vines from almost every European wine-growing centre, and the produce of these goes by such names as Riesling, Hermitage, Sauternes, Ghianti, &c, in accordance with the district of origin of the vine. California is the largest wine- growing state, as the Pacific slope seems particularly suitable to vine- growing. At the present time there are about 280,000 acres under the vine in California, and the number of vines is about 90 millions. The annual production is about 30 million gallons, of which rather more than one-half is dry wine. A good deal of sweet wine is also made, particularly in the Fresno district, where, however, a large proportion of the grapes is grown with a view to making raisins. Following California, New York and Ohio are the most important wine-producing states. The centre of the wine trade of Ohio is at Sandusky on the shores of Lake Erie. Here, as well as at Cleveland, " champagnes " and " clarets " and " sparkling Catawba " are the chief wines produced. The latter was first made by Nicolas Longworth of Cincinnati. The Catawba is the chief growth of the Lake Erie district ; the other important vines being the Delaware and Concord. New York state, in which wine has been grown from a very early period, produces roughly three-quarters of all the domestic " champagnes." There arc about 75,000 acres under the vine in this state, and roughly 5 million gallons are produced annually. The wines grown on the Pacific slope are generally of a mild and sweet character, resembling in general nature the wines of southern Europe (Italy, Spain, Portugal). In the eastern and middle states the wines produced are of a lighter type and of drier flavour, and are somewhat similar to the growths of Germany and France. At the present time America exports a considerable quantity of wine, and there is some trade in the United Kingdom in Californian " claret."*

Wines of the British Empire The production of the British empire is very

small, amounting to roughly 10 million gallons, and this is produced almost entirely in the Cape of Good Hope and in the Australian Commonwealth. At present the average vintage of the Cape and of Australia is in each case roughly 5 to 6 million gallons. In 1905 New South Wales pro- duced 831,000, Victoria 1,726,000, and South Australia 2,846,000 gallons respectively. The trade of Australia w r ith the United Kingdom is now considerable, having increased from 168,188 gallons in J887 to 622,836 gallons in 1906. It is possible that the trade would grow much more rapidly than it has done if it were practicable to .ship the lighter varieties of wines. These, which would be suitable for ordinary beverage purposes, cannot as a rule stand the passage through the Red Sea, and it is therefore only possible to ship the heavier or fortified wines. It is doubtful, therefore, whether the products of the British Empire will ever displace European wines in the United Kingdom on a really large scale, for they cannot compete at present as regards quality with the finer wines of Europe, nor, for the reason stated, with the lighter beverage wines. The quality of the wine produced in the Cape and in Australia has im- proved very much of recent years, chiefly owing to the introduction of scientific methods of wine cultivation and of w r ine-making in much the same manner as has been the case in California. The red wines of Australia, particularly those of South Australia, some- what resemble French wines, being intermediate between claret and burgundy as regards their principal characteristics. There are several types of white wines, some resembling French Sauternes and Chablis and others the wines of the Rhine. It has been recog- nized, however, that it is impossible to actually reproduce the character of the European wines, and it is now generally held to be desirable to recognize the fact that Australian and Cape wines repre- sent distinct types, and to sell them as such without any reference to the European parent types from which they have been derived.

Other Countries Considerable quantities of wine are produced in the Balkan states, but the bulk of this is of a coarse description and only fit for local consumption. The average yield of Bulgaria and Rumania is prob- ably some 30 to 40 million gallons for each country, but in some years it is much larger. Thus in 1896 Rumania produced no less than 101 million gallons and Bulgaria 81 million gallons. The wine industry in Greece, which in ancient times and during the middle ages was of great importance, has now become, at any rate in point of quality, quite insignificant. At the present time a great part of the industry is devoted to the cultivation of the currant vine {Vitis corinthiaca) . There is a considerable export of currants and raisins and con- centrated wine must from this country. Many of the islands of the Mediterranean, from which the ancients drew their supplies of wine, such as Chios, Cos, Tenedos, Crete and Cyprus, still produce considerable quantities of wine, but the bulk of this is scarcely to the

modern European taste. Jn Asia wine is produced, according to Thudichum, principally in Caucasia and Armenia. In Persia, also, wines are made, especially in the Shiraz district. Russia also pro- duces a small quantity of wine, principally in the Crimea. (P£-;

WINEBRENNER, JOHN (1797-1860), American clergyman, founder of the " Church of God," was born in Glade Valley, Frederick, county, Maryland, on the 25th of March 1797. He studied at Dickinson College, Carlisle, Pennsylvania, was ordained in the German Reformed Church in 1820 and became a pastor at Harrisburg, Pennsylvania, where his revival preaching and his Revival Hymn-Book (1825) brought about a break between his followers and the Reformed Church. In 1830 he founded the Church of God (whose members are commonly called Wine- brennerians) ; he was speaker of its conference and edited its organ, The Church Advocate, until his death in Harrisburg on the 12th of September i860. He wrote Brief Views oj the Church of God (1 840) ; A Treatise on Regeneration (1 S44) ; Doctrinal and Practical Sermons (i860); and with I. B. Rupp, The History of all the Religious Denominations in the United States (1844).

The Church of God has three sacraments : baptism (by immersion) , feet washing and the Lord's Supper (administered to Christians only, in a sitting posture, and in the evening) ; it is generally Ar- . minian and pre-millenarian, and in government has local elders and deacons, an annual eldership composed of pastors and lay elders, and, chosen by (and from) the annual elderships, a general eldership which meets since 1905 once in four years. The denomination in 1906 numbered 518 organizations and 24,3=6 communicants, in the following states : Pennsylvania (11,157), Ohio (2980) , Indiana (1999), Illinois (1555), Maryland (1204), Missouri (1053), Iowa, West Virginia, Arkansas, Kansas, Oklahoma, Nebraska, Michigan, Wash- ington, Oregon and Minnesota. Under the general eldership are: Findlay College, Findlay, Ohio; Fort Scott Collegiate Institute, Fort Scott, Kansas; and an academy at Barkeyville, Pennsylvania. Some foreign missionary work is done in Bengal.

WINER, GEORG BENEDIKT (1789-1858), German Pro- testant theologian, was born at Leipzig on the 13th of April 1789. lie studied theology at Leipzig, where eventually (1832) he became professor ordinarius. From 1824 to 1830 he edited with J. G. V. Engelhardt the Neues kritisches Journal der theo- logischen Literatur, and alone from 1826 to 1832 the Zeitschrift fur wissenschaftliche Theologie. He is well

known as the author of a Grammatik des neutestamentlichen Sprachidioms (1821, 8th ed. revised by P. W. Schmiedel, 1894 ff.), of which several translations have appeared, the latest being by W. F. Moulton (1870, 3rd ed. 1882). He died on the 12th of May 1858.

His other works include : ˆComparative Darstellung des Lekrbegriffes der verschiedenen christlichm Kirchenparteien (1824; 4th ed. by P. Ewakl, 1882; Eng. trans. 1873), Biblisches Realworterbuch (1820; 3rd ed. 1 847-1 848, 2 vols.), Grammatik des biblischen und targumischen Chaldaismus (1824; 3rd ed. by B. Fischer, Chalddische Grammatik fur Bibel und Talmud, 1882; Eng. trans. 1845) and a useful Hand- buck der theologischen Literatur (1820; 3rd ed. 1838-1840, 2 vols.; supplement, 1842). Cf. W. Schmidt, " Zum Gedachtnis Dr G. B. Winers," in the Beitrdge zur sdeksischen Kirchengeschichte.

WINE-TABLE, a late 18th-century device for facilitating after-dinner drinking — the cabinetmakers called it a " Gentle- man's Social Table." It was always narrow and of semicircular or horseshoe form, and the guests sat round the outer circum- ference. In the earlier and simpler shapes metal wells for bottles and ice were sunk in the surface of the table; they were fitted with brass lids. In later and more elaborate examples the tables were fitted with a revolving wine-carriage, bottle-holder or tray working upon a balanced arm which enabled the bottles to be passed to any guest without shaking. The side opposite the guests was often fitted with a ncLwork bag. It has been con- jectured that this bag was intended to hold biscuits, but it is much more likely that its function was to prevent glasses and bottles which might be upset from falling to the floor. That the wine-table might be drawn up to the fire in cold weather without inconvenience from the heat it was fitted with curtains hung upon a brass frame and running upon rings. Sometimes the table was accompanied by a circular bottle-stand supported on a tripod into which the bottles were deeply sunk to preserve them from the heat of the fire. Yet another form was circular with a socket in the centre for the bottle. Wine-tables followed the fashion of other tables and were often irtlaid with wood or brass. They are now exceedingly scarce.

WIKFIELD, a city and the county-seat of Cowley county, Kansas, U.S.A., in the S. part of the state, on the Walnut river,

about 40 m. S.S.E. of Wichita. Pop. (1890) 5184; (1900) 5554, of whom 203 were foreign born and 282 were negToes; (1905) 7845; (1910) 6700. It is served by the Atchison, Topeka & Santa Fe, the Missouri Pacific, and the St Louis & San Francisco railways, and is connected by electric line with Arkansas City, Arkansas. In the city arc St John's Lutheran College (1893), the South-west Kansas College (Methodist Episcopal, opened in 1886), St Mary's Hospital and Training School

(1898), Winfield Hospital (1900), a Lutheran orphans' home and a State School for Feeble-minded Youth. Island Park (50 acres) is the meeting-place of a summer Chautauqua. Winfield is a supply and dis- tributing point for a rich farming country, in which large quantities of wheat and alfalfa are raised. Limestone is quarried near the city, and natural gas is found in the vicinity and piped in from eastern fields for general use in the city. The munici- pality owns and operates the waterworks and the electric -lighting plant. Winfield was settled in 1870 and incorporated in 1871.

WINGATE, SIR FRANCIS REGINALD (1861-), British general and administrator in the Sudan, was born at Broadfield, Renfrewshire, on the 25th of June 1861, being the seventh son of Andrew Wingatc of Glasgow and Elizabeth, daughter of Richard Turner of Dublin. He was educated at the Royal Military Academy, Woolwich, and became a lieutenant in the Royal Artillery in 1880. He served in India and Aden, 1881- 1883, and in the last-named year joined the Egyptian army on its reorganization by Sir Evelyn W r ood, and in the Gordon Relief Expedition of 1S84-1885 was A.D.C. and military secretary to Sir Evelyn. For his services he received the brevet rank of major. After holding an appointment in England for a brief period he rejoined the Egyptian army in 1886. He took part in the operations on the Sudan frontier in 1889, including the engagement at Toski and in the further operations in 1891, being present at the capture of Tokar. In 1894 he was governor of Suakin. His principal work was in the Intelligence branch of the service, of which he became director in 1892. A master of Arabic, his knowledge of the country, the examination of prisoners, refugees and others from the Sudan, and the study of documents captured from the Dervishes enabled him to publish in 1891 Mahdiism and the Egyptian Sudan, an authoritative account of the rise of the Mahdi and of subsequent events in the Sudan up to that date. Largely through his instrumentality Father Ohrwalder and two nuns escaped from Omdurman in 1891. Wingate also made the arrangements which led to the escape of Slatin Pasha in 1895. The English versions of Father Ohrwalder's narrative (Ten Years in the Mahdi's Camp, 1892) and of Slatin's book {Fire and Sword in the Sudan, 1896) were from Wingate's pen, being rewritten from a rough translation of the original German.

As director of military intelligence he served in the campaigns of 1896-1898 which resulted in the reconquest of the Sudan, including the engagement at Firket, the battles of the Atbara and Omdurman and the expedition to Fashoda. In an interval (March-June 1897) he went to Abyssinia as second in command of the Rennell Rodd mission. For his services he was made colonel, an extra A.D.C. to Queen Victoria, received the thanks of parliament and was created K.C M.G. Wingate was in com- mand of an expeditionary force which in November 1899 defeated the remnant of the Dervish host at Om Debrcikat, Kordofan, the khalifa being

among the slain. For this achievement he was made K.C.B. In December of the same year 3 on Lord Kitchener being summoned to South Africa, Sir Reginald Wingate succeeded him as governor-general of the Sudan and sirdar of the Egyptian army. His administration of the Anglo- Egyptian Sudan was conspicuously successful, the country, after the desolation of the Mahdia, rapidly regaining a measure of prosperity. In 1903 he was raised to the rank of major-general and in 1908 became lieutenant-general. He was also created a pasha and in 1905 received the honorary degree of D.C.L. from Oxford University. In 1909, at the request of the British government, Wingate undertook a special mission to Somaliland to report on the military situation in connexion with the proposed evacuation of the interior of the protectorate.

WINGFIELD, E. M.

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WINGFIELD, EDWARD MARIA (c. 1560-c. 1614), English colonist in America, was born at Stoneley, Huntingdonshire, about 1 560. He served as a soldier both in Ireland and the Low Countries, was one of the patentees of Virginia in 1606, and in 1607 accompanied the first colonists to Jamestown. He was elected president of the Council (15th May 1607), but his arbitrary manners, the fact that he was a Roman Catholic, and the suspicion that he was friendly toward Spain led to his deposition in September. He returned to England in April 1608, and died after 1613.

His amplified diary, entitled " A Discourse of Virginia," was pub- lished in Archaeologia Americana, vol. iv. (Worcester, i860), with introduction and notes by Charles Deane.

WINGFIELD, SIR RICHARD (c. 1460-1525), English diplo- matist, was one of the twelve or thirteen sons of Sir John Wing- field (d. 1481) of Letheringham, Suffolk. He became a courtier during the reign of Henry VII. and was made marshal of Calais in 151 1. With Sir Edward Poynings and others he was sent in 1 51 2 to arrange a holy league between the pope, the English king and other sovereigns, and in 1514 he went to the Nether- lands to try and arrange a marriage between the archduke Charles, afterwards the emperor Charles V., and Henry VIII. 's daughter Mary. In the intervals between these and similar errands Wingfield was occupied in discharging his duties at Calais, but in 1510 he resigned his post there and returned to England. In 1520 Sir Richard was appointed ambassador to the French court, and he helped to make the arrangements for the meeting between Henry VIII. and Francis I. at the Field of the Cloth of Gold. Twice during 1521 he visited Charles V., his object being to deter him from making war on France, and he was on an errand to Spain when he died at

Toledo on the 22nd of July 1525. In 1524 he had been made chancellor of the duchy of Lancaster. For bis services Wingfield received lands in various parts of England, including Kimbolton in Huntingdonshire, where he enlarged the castle.

Sir Richard had two brothers who attained some celebrity: Sir Robert (c. 1464-1539), a diplomatist, and Sir Humphrey (d. 1545), speaker of the House of Commons from 1533 to 1536. An elder brother, Sir John, sheriff of Norfolk and Suffolk in 1483, had a son Sir Anthony (c. 1458-1552), who was present at the Field of the Cloth of Gold, and became a member of the privy council and captain of the guard. One of his grandsons, Anthony Wingfield (c. 1550-ˆ. 1615), was public orator in the university of Cambridge, and another was Sir John Wingfield (d. 1506), a soldier who was governor of Gertruydcnberg from 1587 and 1589. Another of Sir Anthony's descendants, Sir Anthony Wingfield (d. 1638), was created a baronet in 1627. Another brother of Sir Richard, Ludovic, had a son, Sir Richard Wingfield, who was governor of Portsmouth under Queen Elizabeth. He was the father of another Sir Richard Wingfield (d. 1634), who served in Ireland and was created Viscount Powerscourt in 1618. He died without issue, and his Irish estates passed to a cousin, Sir Edward Wingfield (d. 1638), whose grandson, Folliott Wing- field (d. 1717), was created Viscount Powerscourt in 1665, but the title again became extinct when he died. In 1744 his cousin, Richard Wingfield (1607-1751), was created Viscount Powers- court, and his descendants have held this title until the present day. Mervyn Wingfield (1836-1004), the 7th viscount, was created a peer of the United Kingdom as Baron Powerscourt in 1885.

See Lord Powerscourt, Muniments of the Ancient Family of Wingfield (1894).

WINKELMANN, EDUARD (1838-1896), German historian, was born at Danzig on the 25th of June T838. He studied at the universities of Berlin and Gdttingen, worked at the Monu- menta Germaniae historica, and in 1869 became professor of history at the university of Bern, and four years later at Heidel- berg. He also spent some time in Russia, teaching at Reval and at the university of Dorpat. He died at Heidelberg on the 10th of February 1896.

Winkelrnann wrote a Geschichle der Angelsachsen his zum Tode KSnig Mlfreds (Berlin, 1883); and his residence in Russia induced him to compile a Bibliotkeca Livontae historica (St Petersburg, 1869-

1870, and Berlin, 1878) ; but his chief works deal with the history of the

Empire during the later middle ages. The most important of these are: Philipp von Schmaben und Otto IV. von Braunschweig (Leipzig. 1873-1878). Geschichle Kaiser Friedrichs II. und seiner Reiche 1212-123$ (Berlin, 1863) and 1235-1250 (Reval, 1865), Kaiser Friedrich II. (Leipzig, 1889-1898) and other writings on Frederick in the Jakrbucher der deutschen Geschichte (Leipzig, 1862 fol.J. He edited the Acta -imperii inedita (Innsbruck, 1880-1885), and with J. Ficker, Die Regesten des Kaiserreichs unter Wilhelm, Alfons X. und Richard (Innsbruck, 1882, 1901). Among Winkel- mann's other works are Allgemeine Verfas sun gs geschichte (Leipzig, 1901) and the Urkundenbuch der Universitat Heidelberg (Heidelberg,

1886).

WINKELRIED, ARNOLD VON. The incident with which this name is connected is, after the feat of William Tell, the best known and most popular in the early history of the Swiss Con- federation. We are told how, at a critical moment in the great battle of Sempach, when the Swiss had failed to break the serried ranks of the Austrian knights, a man of Unterwalden, Arnold von Winkelried by name, came to the rescue. Commending his wife and children to the care of his comrades, he rushed towards the Auslrians, gathered a number of their spears to- gether against his breast, and fell pierced through and through, having opened a way into the hostile ranks for his fellow-country- men, though at the price of his own life. But the Tell and Win- kelried stories stand in a very different position when looked at in the dry light of history, for, while in the former case imaginary and impossible men (bearing now and then a real historical name) do imaginary and impossible deeds at a very uncertain period, in the latter we have some solid ground to rest on, and Winkelried's act might very well have been performed, though, as yet, the amount of genuine and early evidence in support of it is very far from being sufficient.

The history of the Wmkelrieds of Stans from 1248 to 1534 has been minutely worked out from the original documents by Hermann von Liebenau, in a paper published in 1854, and reprinted at Aarau in 1862, with much other matter, in his book, Arnold von Winkelried, seine Zeit und seine That. They were a knightly family when we first hear of them about 1250, though towards the end of the 14th century they seem to have been but simple men without the honours of knighthood, and not always using their prefix " von." Among its members we find an Emi Winkelried acting as a witness to a contract of sale on the 1st of May 1367, while the same man, or perhaps another member of the family, Erni von Winkelried, is plaintiff in a suit at Stans on the 29th of September 1389, and in 1417 is thelandam- man (or head man) of Unterwaklen, being then called Arnold W'inkelriet. We have, therefore, a real man named Arnold Win- kelried

living at Stans about the time of the battle of Sempach. The question is thus narrowed to the points, Was he present at the battle, and did he then perform the deed commonly attri- buted to him ? This involves a minute investigation of the history of that battle, to ascertain if there are any authentic traces of this incident, or any opportunity for it to have taken place.

1. Evidence of Chronicles.— The earliest known mention of the incident is found in a Zurich chronicle (discovered in 1862 by G. von Wyss), which is a copy, made in 1476, of a chronicle written in or at any rate not earlier than 1438, though it is wanting in the 16th-century transcript of another chronicle written in 1466, which up to 1389 closely agrees with the former. It appears in the well- known form, but the hero is stated to be ein getriiwer man under den Eidgenozen, no name being given, and it seems clear that his death did not take place at that time. No other mention has been found in any of the numerous Swiss or Austrian chronicles till we come to the book De Helvetiae origine, written in 1538 by Rudolph Gwalther (ZwingH's son-in-law), when the hero is still nameless, being compared to Decius or Codrus, but is said to have been killed by his brave act. Finally, we read the full story in the original draft of Giles Tschudi's chronicle, where the hero is described as " a man of Unterwalden, of the Winkelried family," this being expanded in the final recension of the chronicle (1564) into " a man of Unterwalden, Arnold von Winckelried by name, a brave knight," while he is entered (in the same book, on the authority of the " Anniversary Book " of Stans, now lost) on the list of those who fell at Sempach at the head of the Nidwalden (or Stans) men as " Herr Arnold von Wine kelrict, Ritter," this being in the first draft " Arnold Winckelriet."

2. Ballads.— There are several war songs on the battle of Sempach which have come down to us, but in one only is there mention ol

Winkelried and his deed. This is a long ballad of 67 four-line stanzas, part of which (including the Winkelried section) is found in the additions made between 1531 and 1545 to Etterlin's chronicle by H. Berlinger of Basel, and the whole in Werner Steiner's chronicle (written 1532). It is agreed on all sides that the last stanza, attribut- ing the authorship to Halbsuter of Lucerne, " as he came back from the battle," is a very late addition. Many authorities regard it as made up of three distinct songs (one of which refers to the battle and Winkelried), possibly put together by the younger Halbsuter (citizen of Lucerne in 1435, died between 1470 and 1480), though others contend that the Sempach- Winkelried section bears clear

traces of having been composed after the Reformation began, that is, about 1520 or 1530. Some recent discoveries have proved that certain statements in the song usually regarded as anachronisms are quite accurate; but no nearer approach has been made towards fixing its exact date, or that of any of the three bits into which it has been cut up. la this song the story appears in its full-blown shape, the name of Winckelriet being given.

3. Lists of those who fell at Sempach. — We find in the " Anni- versary Book " of Emmetten in Unterwalden (drawn up in 1560) the name of " der Winkelriedt " at the head of the Nidwalden men; and in a book by Horolanus, a pastor at Lucerne (about 1563), that of " Erni Wmckelried " occurs some way down the list of Unterwalden men.

4. Pictures and Drawings. — In the MS. of the chronicle of Die- bold Schilling of Bern {c. 1480) there is in the picture of the battle of Sempach a warrior pierced with spears falling to the ground, which may possibly be meant for Winkelried; while in that of Diebold Schilling of Lucerne (1511), though in the text no allusion is made to any such incident, there is a similar picture of a man who has accomplished Winkelried's feat, but he is dressed in the colours of Lucerne. Then there is an engraving in Stumpf's chronicle (1548), and, finally, the celebrated one by Hans Rudolf Manuel (1551), which follows the chronicle of 1476 rather than the ballad.

The story' seems to have been first questioned about 1850 by Moritz von Stiirler of Bern, but the public discussion of the subject originated with a lecture by O. Lorenz on Leopold III. und die Schweizer Bunde, which he delivered in Vienna on March 21, i860. This began the lively paper war humorously called " the second war of Sempach," in which the Swiss (with but rare exceptions) main- tained the historical character of the feat against various foreigners — Austrians and others.

Most of the arguments against the genuineness of the story have been already more or less directly indicated. (1) There is the total silence of all the old Swiss and Austrian chroniclers until 1538, with the solitary exception of the Zurich chronicle of 1476 (and this while they nearly all describe the battle in more or less detail). The tale, as told in the 1476 chronicle, is clearly an interpolation, for it comes immediately after a distinct statement that " God had helped the Confederates, and that with great labour they had defeated the knights and Duke Leopold," while the passage immediately following joins on to the former quite naturally if we strike out the episode of the " true man," who is not even called Winkelried. (2) The date of the ballad is extremely uncertain, but cannot be placed earlier than at least 60 or 70 years after the battle, possibly 130 or 140, so that its claims to be regarded as embodying an oral contemporary tradition are of the slightest. (3) Similar feats have been

frequently rec ,rded, but in each case they are supported by authentic evidence vnich is lacking in this case. Five cases at least are known: a follower of the count of Hapsburg, in a skirmish with the Bernese in 1271; Stiilinger of Katisbon (Regensburg) in 1332, in the war of the count of Kyburg against the men of Bern and Solothurn; Conrad Royt of Lucerne, at Nancy in 1477; Henri Wolleben, at Frastanz in 1499, in the course ol the Swabian War; and a man at the battle of Kappel in 1531. (4) It is argued that the course of the battle was such that there was little or no chance of such an act being performed, or, if performed, of having turned the day. This argument rests on the careful critical narrative of the fight constructed by Herr Kleissnerand Herr Hart maun from the contemporary accounts which have come down to us, in which the pride of the knights, their heavy armour, the heat of the July sun, the panic which befell a sudden part of the Austrian army, added to the valour of the Swiss, fully explain the complete rout. Herr Hartmann, too, points out that, even if the knights (on foot) had been ranged in serried ranks, there must have been sufficient space left between them to allow them to move their arms, and therefore that no man, however gigantic, he might have been, could have seized hold of more than half a dozen spears at once,

Herr K. Biirkli (Der wahre Winkelried,— die Taktik der alien Ur schweizer, Zurich, 1886) has put forth a theory of the battle which is, he allows, .opposed to all modern accounts, but entirely agrees, he strongly maintains, with the contemporary authorities. According to this the fight was not a pitched battle but a surprise, the Austrians not having had time to form up into ranks. Assuming this, and rejecting the evidence of the 1476 chronicle as an inter- polation and full of mistakes, and that of the song as not proved to have been in existence before 1531, Herr Biirkli comes to the startling conclusion that the phalanx formation of the Austrians, as^well as the name and act of Winkelried, have been transferred to Sempach from the fight of Bicocca, near Milan (April 27, 1522), where a real leader of the Swiss mercenaries in the pay of France, Arnold Winkelried,

really met his death in very much the way that his namesake perished according to the story. Herr Biirkli confines his criticism to the first struggle, in which alone mention is made of the driving back of the Swiss, pointing out also that the chronicle of 147G and other later accounts attribute to the Austrians the manner of attack and the long spears which were the special characteristics of Swiss warriors, and that if Winkelried were a knight (as is asserted by Tschudi) he would have been clad in a coat of mail, or at least had a breastplate, neither of which could have been pierced by hostile lances.

Whatever may be thought of this daring theory, it seems clear that, while

there is some doubt as to whether such an act as Winkel- ried's was possible at Sempach, taking into account the known details of the' battle, there can be none as to the utter luck of any early and trustworthy evidence in support of his having performed that act in that battle. It is quite conceivable that such evidence may later come to light; for the present it is wanting.

Authorities. — See in particular Theodor von Liebcnau's Die Scklacht bei Sempach — Gede.nkbu.ck zur funften Sdcularfeier (1886), published at the expense of the government of Lucerne. This contains every mention or description of the battle or of anything relating to it, published or unpublished, in prose or in verse, com- posed within 300 years after the battle, and is a most marvellous and invaluable collection of original materials, in which all the evidence for Winkelried's deed has been brought together in a handy shape. Besides the works mentioned in the text, and the life of Winkelried by W. Oechsli in vol. Hii. of the Allgemeine deutscke Biographic, the following arc the most noteworthy publications relating to this controversy. In support of Winkelried's act: G. v. Wyss, Uber eine Zilrcher-Chronik aits dem i$ten Jahrhundert (Zurich, 1862); A. Daguet, "La Question de Winkelried," in the MusSe Neuchdtelois for December 1883; G. H. Ochsenbein, " Die Winkel- riedfrage," in the Sonntagsblatt of the Bund newspaper for January and February 1879; A. Bernoulli, Winkelrieds That bei Sempach (Basel, 1886); W. Oechsli, Zur Sempacker Schlachtfeier (Zurich, 1886); E. Secretan, Sempach et Winkelri-ed (Lausanne, 1886); and the summary in K. Dandliker's larger Geschicht-e der 'Schweiz, i. 550- 559 (3 r d ed., Zurich, 1893). Against Winkelried's claims we have the remarkable study of O. Kleissner, Die Quellen zur Sempacker Schlacht und die Winkelriedsage (Gbttingen, 1873); O. Hartmann, Die. Schlacht bei Sempach (Frauenfeld, 1886); and the concise sum- mary of the evidence given by M. v. Sturlcr (the first to suspect the story) in the Anzeiger fur Schweiz. Geschichte (1S81), 392-394.

(W. A. B. C.)

WINNIPEG, the capital of Manitoba, and chief city of Western Canada. It is situated at the junction of the Assinibolne and Red rivers in the middle of a wide plain. The river valley, being of exceptional richness, early attracted the traders, and 50 in the beginningof the 19th century gained the attention of Lord Selkirk, a benevolent Scottish nobleman who sent out in 1811-1815 several -hundreds of Highland settlers. On the site at the junction of the two rivers where Verandreye, the first white explorer to visit the Red river, had three-quarters of a century before this time erected Fort Rouge, and where some ten years earlier in the century the Nor'Westers of Montreal had erected Fort Gibraltar, the Hudson's Bay Company, which at the time Lord Selkirk and his friends controlled, erected Fort Douglas,

bearing the family name of the colonizer. After bloodshed between the rival fur companies, and their union in 1821, Fort Garry was erected, as a trading post and settlers 5 depot, and with some what elaborate structure, with stone walls, bastions and port- holes. Fort Garry (2) was erected at a considerable cost in 1835. A short distance north of this fort, about the year t86o, the first house on the plain was erected, and to the hamlet rising there was given the name of the lake 45 m. north, Winnipeg (Cree, Win, murky; nipiy, water). The name referred to the contrast between its water and that of the transparent lakes to the east. For ten years the hamlet grew — though .very slowly, it being more than four hundred miles from St Paul, the nearest town in Minnesota, to the south. The fur-tiaders did not seek to increase its size. When the transfer of Rupert's Land took place to Canada in 1870, the governor of Assimboia had his residence at Fort Garry, and here was the centre of government for the settlers over the area surrounding Fort Garry. Its acquisition by Canada and the influx of settlers from Eastern Canada led to the greater importance of Winnipeg, as the new town was now generally called. The establishment of Dominion government agencies, the formation of a local government, the machinery required for the government of the province, the influx of a small army of surveyors who mapped out and surveyed wide districts of the country, and the taking up of

free lands in all directions by Canadian settlers, all tended to build up the hamlet of Winnipeg into a considerable town.

The following figures of population show the remarkable increase of Winnipeg: (1870) 215; (1874) 1 1869; (1S85) I9.S74J (180S) 30,384; (1901) 42,340; (1905) 79,975; (1906) 9°, I 53> (r9°7) 100,000 (estimated). The rapid growth of the city, the character of the soil, and the high prices of material for street construction have led to a large and expensive civic organization. The city is governed by a mayor, four controllers, and twelve aldermen. The city possesses the public utility of w T ater, but the city street car system, gas, and private electric lighting are in the hands of a private company. The city has decided to introduce electric power from Winnipeg river, at a point some 50 m. distant. The streets are in some cases macadamized and in other cases block paved, and in still others asphalted. The Parks Board is a board appointed by the city council, and has the complete administration of a fixed percentage of the city taxes. The streets are boulevarded, trees planted on them, and both of these kept by the Parks Board. A number of well-kept small parks are found throughout the city, and a large park — the Assiniboine — is being

prepared and beautified. The greatest business street is Main Street, on which (north) the Great Canadian Pacific railway station and Royal Alexandra Hotel are situated, and (south) the Union station of the Canadian Northern and Grand Trunk Pacific railways are found. On or near this street (132 ft. wide) are placed the great financial institutions of the city, including eighteen chartered banks, many of which are ornaments to the city, and many loan, insurance, and real estate buildings and offices. The depart- mental stores and offices of the Hudson's Bay Company and its Fort Garry court, which stand on Main Street South, are worthy of that ancient company. The city hall, with park and volunteers' monument, are on the same street, while the lofty Union Bank, Mclntyre, and Bon Accord blocks are here wildernesses of offices of every description. The second great street, Portage Avenue, of the same width as Main Street, runs at right angles to Main Street, and is the mercantile street of the city. On this are the post office, Free Press office, Y.M.C.A. building, Aikins Block, T. Eaton & Co.'s enormous departmental shop, and the Ideal Building, which are worthy of note. The wholesale business street of the city is Princess, running parallel to Main Street; and the two most beautiful residential streets are Broadway and Assiniboine Avenues. All parts of the city are reached by the Winnipeg electric street railway, which runs north for 25 m. on the continuation of Main Street to the town of Selkirk, west along Portage Avenue for 12 m. to St James, Silver Heights, St Charles and Headingly, and south through Fort Rouge to River Park. At the north of the city are St John's episcopal buildings, including St John's College and boys' school. In the central part of the city are the parliament building, governor's residence, barracks, law courts, university, Manitoba College and Wesley College buildings. More than eighty churches, many of them of architectural value, are found scattered over the city, while the General Hospital, Women's Home, Children's Home, Children's Aid Shelter and Deaf and Dumb Institute speak of the benevolence of the citizens. One of the most striking features of Winnipeg is seen in the elaborate system of public schools. The buildings are not exceeded for beauty of design or for completeness of finish by any Canadian city and by few American cities.

The geographical position of Winnipeg is unique for the purposes of trade. Like Chicago it stands on the eastern border of the prairies. All western trade in Canada of the vast provinces of Manitoba, Saskatchewan, Alberta and British Columbia, must pass through the narrow belt of 100 m., lying between the international boundary line and Lake Winnipeg. Midway in this belt stands Winnipeg. The trade from the wide extent of three-quarters of a million of square miles of prairie and woodland, becoming more populous every year, must flow as through a narrow spout at Winnipeg; every railway must pass through Winnipeg. In consequence Winnipeg is already a 1 Incorporated in this year as a city.

considerable manufacturing centre. Its lumber and flour mills are its largest industries, but the following are found: aerated waters and breweries, tent makers, baking-powder manufactories, box manufacturers, brick makers, broom, brushes and carriage makers, cement blocks, manufacturing chemists, chocolate and cigar manufacturers, confectionery, copper plate, cornice makers, engine builders, gas fitters, ink manufacturers, jewelry makers, lime makers, milliners, opticians, paint makers, paper-box makers, photographers, pickle makers, planing mills, pork packers, publishers, pump makers, rubber-stamp makers, sash, door and blind factories, upholsterers, ventilating manu- factory, vinegar factories, foundries, wire and fence manu- factories. The area of the city is 12,700 acres.

WINNIPEG, a lake and river of Canada. The lake is in Saskatchewan, Manitoba and Keewatin, and is situated between 50° 20′ and 53 50′ N. and 96 20′ and 99° 15′ W. It covers an area of 8555 sq. m., is at an altitude of 710 ft. above the sea, is 260 m. long, 25 to 60 m. wide, and contains several large islands, including Reindeer (70 sq. m.) and Big Island (60 sq. m.). It is shallow, being nowhere more than 70 ft. in depth, and in con- sequence extremely stormy and dangerous. It abounds in fish, its white fish being especially celebrated. Its shores are low and on the south extremely marshy. The principal affluent rivers are: Red river, from the south; Winnipeg, Bloodvein, Berens and Poplar from the east; and the Dauphin and Sas- katchewan from the west. It receives the surplus waters of lakes Manitoba and Winnipegosis, and discharges by the river Nelson into Hudson Bay. The river Winnipeg rises near Savanne station in 48° 47′ N. and 89° 57′ W., and flows in a westerly direction under the names of Savanne, Seine, and Rainy rivers to the Lake of the Woods; issuing thence as the Winnipeg, it flows N.W. with an exceedingly tortuous and turbulent course to the lake of the same name. It is navigable from the foot of the Lake of the Woods to the head of Rainy lake — with a short portage at Fort Frances falls — a distance of 208 m. Its principal tributary is English river.

WINNIPEGOSIS, a lake of Manitoba and Saskatchewan, Canada, between 5r° 34′ and 53° 11′ N. and 99° 37′ and 101 06′ W. Its greatest length is 122 m. ; greatest width 17m.; shore- line 570 m. ; and area, exclusive of islands, 2000 sq. m. Its greatest ascertained depth is 38 Tt., and mean altitude 828 ft. above the sea. Mossy river from the south, draining Lake Dauphin, Swan, and Red Deer rivers are the only considerable streams that fall into it. It drains by the Waterhen river through Waterhen lake into Lake Manitoba, and thence by the Little Saskatchewan into Lake Winnipeg. It was discovered by the chevalier de la Verendrye in 1739.

WINONA, a city and the county-seat of Winona county, Minnesota, U.S.A., about 95 m. S.E. of St Paul, on the W. bank of the Mississippi

river, here crossed by three steel bridges. Pop. (1880) 10,208; (1890) r8,2o8; (1900) 19,714, of whom 5000 were foreign-born and 30 negroes; (1910 census) 18,583. There are large German and Polish elements in the population; and German and Polish journals, besides two dailies in English, are published here. Winona is served by the Chicago , Burlington & Quincy, the Chicago Great Western, the Chicago, Milwaukee & St Paul, the Green Bay & Western, and the Chicago & North- western railways, and by river steamboat lines. It is pictur- esquely situated on a broad, level terrace, slightly ele'ated above the river, and surmounted by steep bluffs rising to 400-500 ft. At Winona are the Winona General Hospital (r8g4), to which is attached a Nurses' Training School; the first State Normal School (opened in 1860), and Winona Seminary (1894) for girls, conducted by the Sisters of Saint Francis. The city has a public library (about 30,000 vols.), with a mural decoration by Kenyon Cox; a Federal building; a Masonic Temple; and several parks; and it owns its own water supply (operated by the Holly system). In 1905 the total value of the factory product was $7,850,236 (30-5% more than in rgoo). The site of the city was frequently used as a landing place in the old fur -trading days, but was not permanently settled until about 1853. Winona was first chartered as a city in 1857. A large part of it was destroyed

by fire in i860. The name Winona is said to be a Sioux word meaning " first-born daughter."

WINSFORD, an urban district in the Northwich parliamentaiy division of Cheshire, England, on the river Weaver, 6 m. S. of Northwich, on the London & North- Western railway and the Cheshire lines. Pop. (1901) 10,382. In the town, which is only second to Northwich in this respect, large quantities of salt are raised and conveyed to Liverpool for exportation; being shipped in flats down the Weaver, which has been rendered navigable by an elaborate system of locks. Rock-salt is procured, as well as that obtained from the brine-pools. Boat-building is an important accompanying industry, and more than half a million tons of salt are shipped annually. Owing to the pumping of the brine, large tracts of land have been submerged, and there is thus a constant danger to houses. The iron bridge across the Weaver, which was built in 1856, had to be raised thrice in the following twenty-six years. The town has received much benefit from philanthropists, Sir Joseph Verdin providing a technical school, and Sir John Brunner a guildhall and other buildings.

WINSLOW, EDWARD (1595-1655), one of the founders of the Plymouth

colony in America, was born in Droitwich, Worcestershire, England, on the 18th of October 1595. In 1 61 7 he removed to Leiden, united with John Robinson's church there, and in 1620 was one of the " pilgrims " who emigrated to New England on the " Mayflower " and founded the Plymouth colony. His wife, Elizabeth (Barker) Winslow, whom he had married in May 1618 at Leiden, having died soon after their arrival., he married, in May 1621, Mrs Susannah White, the mother of Peregrine White (1620-1704), the first white child born in New England. This was the first marriage in the New England colonics. Winslow was delegated by his associates to treat with the Indians in the vicinity and succeeded in winning the friend- ship of their chief, Massasoit (t. 1580-1661). He was one of the assistants from 1624 to 1647, except in 1633-1634, 1636-1637 and 1644-1645, when he was governor of the colony. He was also, in 1643, one of the commissioners of the United Colonics of New England. On several occasions he was sent to England to look after the interests of Plymouth and Massa- chusetts Bay, and defend these colonies from the attacks of such men as John Lyford, Thomas Morton (q.v.) and Samuel Gorton {q.v.). He left on his last mission as the agent of Massachusetts Bay, in October 1646, and spent nine years in England, where he held a minor office under Cromwell, and in 1654 was made a member of the commission appointed to determine the value of certain English ships destroyed by Denmark. In 1655 he was the chief of the three English commissioners whom Cromwell sent on his expedition against the Westlndiesto advise with its leaders Admiral Venables and Admiral William Penn, but died near Jamaica on the 8th of May 1655, and was buried at sea. Winslow's portrait, the only authentic likeness of any of the " Mayflower" " pilgrims," is in the gallery of the Pilgrim Society at Plymouth, Mass.

His writings, though fragmentary, are of the greatest value to the historian of the Plymouth colony. They include: Good N ewes from New England, or a True Relation of Things very Remarkable at the. Plantation of Pli 'mouth in New England (1624) ; Hypocrisie Unmasked ; by a True Relation of the Governor and Company of Massachusetts against Samuel Gorton, a Notorious Disturber of the Peace (1646), to which was added a chapter entitled " A Brief Narration of the True Grounds or Cause of the First Plantation of New England "; New England's Salamander (1647) ; and The Glorious Progress of the Gospel amongst the Indians in New England (1649). With William Bradford he also is supposed to have prepared a Journal of the Beginning and Proceeding of the English Plantation settled at Plymouth in New Eng- land (1622), which is generally known as " Mourt's Relation," owing to its preface having been signed by " G. Mourt." Some of his writings may be found reprinted in Alexander Young's Chronicles of the Pilgrims (Bqston, 1841).

See J. B. Moore's Memoirs of American Governors (New York, 1846) ; David P. and Frances K. Holton's Winslow Memorial (New York. 1877) and j. G. Palfrey's History of New England (3 vols., Boston, 1858-1864). Also see a paper by W. C. Winslow, " Governor Edward Winslow, his Place and Part in Plymouth Colony," in the A nnual Report of the A merican Historical Association for 1 895 (Washington, 1896).

His son, Josiah Winslow (1629-1680), was educated at Harvard College. He was elected a deputy to the General Court in 1653, was an "assistant" from 1657 to 1673, and governor from June 1673 until his death. From 1658 to 1672 he was one of the commissioners of the United Colonies of New England, and in 1675, during King Philip's War, he was commander-in-chief of the united forces of New England.

WINSOR, JUSTIN (1831-1897), American writer and librarian, was born in Boston, Massachusetts, on the 2nd of January 1831. At the age of nineteen he printed a History of Duxbury, Mass., the home of his ancestors. He left Harvard before graduation to study in Paris and Heidelberg, but not until he had planned an extended memoir of Garrick and his Contemporaries, the manuscript of which, in ten folio volumes with a mass of notes, is in the library of Harvard University. In 1866 Winsor was appointed a trustee of the Boston public library, and in 1868 its superintendent. In 1877 he became librarian of Harvard University, a position he retained until his death. He greatly popularized the use of both these great collections of books. While at the Boston public library he edited a most useful catalogue of books in history, biography and travel, and com- piled the first of a series of separate lists of works of historical fiction. In 1876 he began a series of monumental publications. The first was a Bibliography of the Original Quartos and Folios of Shakespeare with Particular Reference, to Copies in America. Unfortunately, all except about a hundred copies of this work were destroyed by fire. A small volume entitled The Reader's Handbook of the American Revolution (1879) is the model of a reasonable bibliography. In 1S80 he began the editing of the Memorial History of Boston (4 vols., 4to), with the co-operation of seventy writers. He so manipulated the contributions and supplemented them with notes as to give an air of unity to the whole work, and completed it in twenty-three months. He then set to work on a still larger co-operative book, The Narrative and Critical History of America, which was completed (1889) in eight royal octavo volumes. These great tasks had compelled Winsor to make a careful and systematic study of historical problems with the aid of contemporaneous cartography. Among the early results of this study were the Bibliography of Ptolemy's Geography (1884), and the Catalogue of the Kohl Collection of Maps relating to America (1886), published in the Harvard Library Bulletins. His vast knowledge took the final form of four volumes entitled Christopher Columbus (1891), Cartier

to Frontenac (1894), The Mississippi Basin (1895), and The Westward Movement (1897). Besides great stores of information hitherto accessible only to the specialist, these contain many strong expressions of dissent from currently received views. Winsor served for many years on the Massachusetts Archives Commission. His careful Report on the Maps of the Orinoco- Essequibo Region was prepared at the request cf the Venezuela Boundary Commission. He was one of the founders of both the American Library Association and the American Historical Association, and was president of both — of the former for ten years, 1876-1885, and the latter in 1886-18S7. He died in Cambridge on the 22nd of October 1897.

See Horace E. Scudder's "Memoir of Justin Winsor" in the Proceedings of the Massachusetts Historical Society (2nd series), vol. xii. Also the Harvard Graduates' Magazine (December 1897}. A bibliography of his writings is in Harvard College Library, Biblio- graphical Contributions, No. 54.

WINSTED, a borough in the township of Winchester, Litchfield county, Connecticut, U.S.A., on the Mad and Still rivers, in the N.W. part of the state, about 26 m. N.W. of Hartford. Pop. of the township (1890) 6183; (1900) 7763; of the borough (1900) 6804, of whom 1213 were foreign-born; (1910) 7754. The borough is served by the New York, New Haven & Hartford and the Central New England railways, and by electric railway to Torrington. Among the public institutions are the William L. Gilbert Home for friendless children and the Gilbert free high school, each endowed with more than $600,000 by William L. Gilbert, a prominent citizen; the Beardsley public library (1874), the Convent of Saint Margaret of Cortona, a Franciscan monastery, and the Litchfield County Hospital. In a park in

the central part of the borough there is a tower (60 ft. high) to the memory of the soldiers of Winsted who fell in the Civil War, and another park contains a soldiers' monument and a memorial fountain. Water power is derived from the Mad river and High- land lake, which is west of the borough and is encircled by the Wakefield boulevard, a seven-mile drive, along which there are many summer cottages. The manufactures include cutlery and edge tools, clocks, silk twist, hosiery, leather, &c. Winsted was settled in 1756 and chartered as a borough in 1858. The name Winsted was coined from Winchester and Barkhamsted, the latter being the name of the township immediately cast of Winchester. The township of Winchester was incorporated in

1771.

WINSTON-SALEM, two contiguous cities of Forsyth county, North Carolina, U.S.A., about 115m. N.W. of Raleigh. Pop. of Winston (1SS0) 28541 (1890) 8018; (190c) 10,008 (5043 negroes); (1910) 17,167. Pop. of Salem (1890) 271 1; (1900) 3642 (488 being negroes); (1910) 5533. Both cities are served by the Southern and the Norfolk & Western railways. Since July 1899, when the post office in Salem was made a sub-station of that of Winston, the cities (officially two independent municipalities) have been known by postal and railway authorities as Winston- Salem. Winston is the county-seat and a manufacturing centre. Salem is largely a residential and educational city, with many old-fashioned dwellings, but there are some important manufactories here also; it is the seat of the Salem Academy and College (Moravian) for women, opened as a boarding-school in 1802; and of the Slater Normal and Industrial School (non-sectarian) foi negroes, founded from the Slater Fund in 1892. The surround- ing country produces tobacco of a very superior quality, and to the tobacco industry, introduced in 1872, the growth of Winston is chiefly due; the manufacture of flat plug tobacco here is especially important. The total value of Winston's factory products increased from $4,887,649 in 1900 to $11,353,296 in 1905, or 132-3%.

. Salem was founded in 1766 by Friedrich Wilhelm von Marschall (1721-1802), a friend of Zinzendorf, and the financial manager of the board controlling the Moravian purchase made in North Carolina in 1753, consisting of 100,000 acres, and called Wachovia. The town was to be the centre of this colony, where missionary work and religious liberty were to be promoted, and it remained the home of the governing board of the Moravian Church in the South. In 1849 exclusive Moravian control of Salem's industries and trades was abolished; in 1856 land was first sold to others than Moravians, and in the same year the town was incorporated. Winston was founded in 1851 as the county- seat and was named in honour of Major Joseph Winston (T746- 1S15), a famous Indian fighter, a soldier during the W r ar of Independence and a representative in Congress in 1793-1795 and 1S03-1807. The growth of the two cities has been rapid since 1900.

See J. 11. Clewell, History of Wachovia in North Carolina (New York, 1902J.

WINTER, JOHN STRANGE, the pen-name of Henrietta

Eliza Vaughan Stannard (1856-), English novelist, who was born on the 13th of January 1856, the daughter of the Rev. H. V. Palmer, rector of St Margaret's, York. She early began to write fiction for different magazines,

producing sentimental stories, chiefly of army life. Two of these, Booties' Baby and Houp-la, which appeared originally in The Graphic in 1885, established her reputation, and she became a prolific novelist, producing some sixty other light and amusing books, the best of which deal with military life. An indefatigable journalist on matters affecting women, she was the first president of the Writers' Club (1892), and presided from 1901 to 1903 over the Society of Women Journalists. She married in 1S84 Arthur Stannard, a civil engineer.

*WINTER, PETER (c. 1755-1825), German dramatic composer, *as born at Mannheim about 1755. He received some instruc tion from the Abt Vogler, but was practically self-taught. After flaying in the Kapelle of the Elector Karl Theodor, at Munich, he became in 1776 director of the court theatre. When*

Mozart produced his Idomeneo at Munich in 1781, Winter, annoyed at his success, conceived a violent hatred for him; yet of more than thirty operas written by Winter between 1778 and 1820 very few were unsuccessful. His most popular work, Das unterbrochene Opferfest, was produced in 1796 at Vienna, where in 1797-1798 he composed Die Pyramiden von Babylon and Das Labyrinth, both written for him by Schickaneder in continuation of the story of Mozart's Zattberflote. He returned to Munich in 1798. Five years later he visited London, where he produced Calypso in 1803, Proserpina in 1804, and Zaira in 1805, with great success. His last opera, Sanger und Schneider, was produced in 1820 at Munich, where he died on the 17th of October 1825. Besides his dramatic works he composed some effective sacred music, including twentv-six masses.

WINTERFELDT, HANS KARL VON (1707-1757), Prussian general, was born on the 4th of April 1707 at Vanselow in Pomerania. His education was imperfect, and in later life he always regretted his want of familiarity with the French language. He entered the cuirassier regiment of his uncle, Major-General von Winterfeldt (now the 12th) in 1720, and was promoted cornet after two years' service. But he was fortunate enough, by his stature and soldierly bearing, to attract the notice of Frederick William I., who transferred him to the so-called giant regiment of grenadiers as a lieutenant. Before long he became a personal aide-de-camp to the king, and in 1732 he was sent with a party of selected non-commissioned officers to assist in the organization of the Russian army. While the guest of Marshal Miinnich at St Petersburg, Winterfeldt fell in love with and married his cousin Julie von Maltzahn, who was the marshal's stepdaughter and a maid-of-honour to the grand-duchess Elizabeth. On returning to Prussia he became intimate with the crown prince, afterwards Frederick the Great, whom he accompanied in the Rhine campaign of 1734. This intimacy, in view of his personal relations with the king, made W'intcr- fcldt's position

very delicate and difficult, for Frederick William and his son were so far estranged that, as every one knows, the prince was sent before a court-martial by his father, on the charge of attempting to desert, and was condemned to death. Winterfeldt was the prince's constant friend through all these troubles, and on Frederick II. 's accession he was promoted major and appointed aide-de-camp to the new sovereign.

When the first Silesian War broke out Winterfeldt was sent on a mission to St Petersburg, which, however, failed. He then commanded a grenadier battalion with great distinction at Moll- witz, and won further glory in the celebrated minor combat of Rothschloss, where the Prussian hussars defeated the Austrians (May 17, 1741). One month from this day Winterfeldt was made a colonel, as also was Zieten (q.v.), the cavalry leader who had actually commanded at Rothschloss, though the latter, as the older in years and service, bitterly resented the rapid pro- motion of his junior. After this Frederick chiefly employed Winterfeldt as a confidential staff officer to represent his views to the generals, a position in which he needed extraordinary tact and knowledge of men and affairs, and as a matter of course made many enemies.

In the short peace before the outbreak of the second war he was constantly in attendance upon the king, who employed him again, when the war was resumed, in the same capacity as before, and, after he had been instrumental in winning a series of success- ful minor engagements, promoted him (1745) major-general, to date from January 1743.

For his great services at Hohenfriedberg Frederick gave him the captaincy of Tatiau, which carried with it a salary of 500 thalcrs a year. At Katholisch-Hcnnersdorf, where the sudden and unexpected invasion of the Austro-Saxons was checked by the vigour of Zieten, Winterfeldt arrived on the field in time to take a decisive share. Once again the rivals had to share their laurels, and Zieten actually wrote to the king in disparagement of Winterfeldt, receiving in reply a full and generous recognition of his own worth and services, coupled with the curt remark that the king intended to employ General von Winterfeldt in anyway that he thought fit. During the ten years' peace that preceded

the next great war, Winterfeldt was in constant attendance upon the king, except when employed on confidential missions in the provinces or abroad. In 1756 he was made a lieutenant- general and received the order of the Black Eagle.

In this year he was feverishly active in collecting information as to the coalition that was secretly preparing to crush Prussia, and in preparing for the war. He took a leading part in the discussions which eventuated in Frederick's decision to strike the first blow. He was at Pirna with the king, and advised him against absorbing the Saxon prisoners into his own army. He accompanied Schwerin in the advance on Prague in 1757 and took a conspicuous part in the battle there. After the defeat of Kolin, however, Winterfeldt, whom Frederick seems to have regarded as the only man of character whom he could trust to conduct the more delicate and difficult operations of the retreat, found himself obliged to work in close contact with the king's brother. Prince William, the duke of Brunswick-Bevern, Zieten and others of his enemies. The operations which followed may be summarized by the phrase " everything went wrong "; after an angry scene with his brother, the prince of Prussia retired from the army, and when Frederick gave Winterfeldt renewed marks of his confidence, the general animosity reached its height. As it chanced, however, Winterfeldt fell a victim to his own bravery in the skirmish of Moys near Gorlitz on the 7th of September. His wound, the first serious wound he had ever received, proved fatal and he died on the 8th. The court enmities provoked by his twenty years' unbroken intimacy and influence with the king, and the denigration of less gifted or less fortunate soldiers, followed him beyond death. Prince William expressed the bitterness of his hatred in almost his last words, and Prince Henry's memoirs give a wholly incredible portrait of Winterfeldt's arrogance, dishonesty, immorality and incapacity. Frederick, however, was not apt to encourage incompetence in his most trusted officers, and as for the rest, Winterfeldt stood first amongst the very few to whom the king gave his friendship and his entire confidence. On hearing of Winterfeldt's death he said, " Einen Winterfeldt finde ich nie wieder," and a little later, " Er war ein guter Mensch, ein Seelenmensch, er war mein Freund." Winterfeldt was buried at his estate of Barschau, whence, a hundred years later, his body was transferred to the Invalidcn Kirchhof at Berlin. A statue was erected to his memory, which stands in the Wilhelmsplatz there, and another forms part of the memorial to Frederick the Great in Unter den Linden.

See Hans Karl v. Winterfeldt und der Tag von Moys (Gorlitz, 1857); and K. W. v. Schoning, Winterfeldts Beisetzung; eine biographische Skizze (Berlin, 1857).

WINTERGREEN, known botanically as Gaultheria procumbens, a member of the heath family (Ericaceae) , is a small creeping, evergreen shrub with numerous short erect branches bearing in the upper part shortly-stalked oval, thick, smooth shining leaves with sharp-toothed edge. The flowers are borne singly in the leaf axels and are pendulous, with a pale pink waxy-looking urn-shaped corolla. The bright crimson-red sub- globular, berry-like

fruit consists of the much-enlarged fleshy calyx which surrounds the small thin-walled many-seeded capsule. The plant is a native of shady woods on sandy soil, especially in mountainous districts, in southern Canada and the northern United States; it is quite hardy in England. The leaves are sharply astringent and have a peculiar aromatic smell and taste due to a volatile oil known as oil of winter green, used in medicine in the treatment of muscular rheumatism (for the therapeutic action see Salicylic Acid) . An infusion of the leaves is used, under the name mountain or Salvador tea, in some parts of North America as a substitute for tea; and the fruits are eaten under the name of partridge or deer berries. Other names for the plant are tea-berry, checker-berry, box-berry, jersey tea, spice-berry and ground holly.

See Bentley and Trimen, Medicinal Plants, t. 164.

WINTER'S BARK, the bark of Drimys Winteri, an evergreen tree belonging to the Magnolia family. It was formerly officinal in Europe, and is still held in esteem in Brazil and other parts

of South America as a popular remedy for scurvy and other diseases. The plant is a native of the mountains and highlands from Mexico to the Straits of Magellan.

WINTERTHUR, a flourishing industrial town in the Toss valley, canton of Zurich, Switzerland, and by rail 17 m. N.E. of Zurich. It is 1450 ft. above sea-level, and has a rapidly increasing population (in 1870, 9317; in 1S80, 13,502; in 1888, 15,805; and in 1900, 22,335), all German-speaking and nearly all Protestants. It is the point of junction of seven lines of railway, and is therefore of considerable commercial importance. Its main in- dustries are cambric-weaving, cotton-printing, the manufacture of machinery, and wine-growing, Stadtberg being the best variety of wine grown in the neighbourhood of the town. It is a modern, well-built town, with a fine town-hall and well-arranged school buildings. It suffered severely from the disastrous financial enterprise of the National Railway of Switzerland which it promoted. In 1878 it had to sell its property in that line, and from 1881 to 1885 it was in great difficulties in the matter of a loan of nine million francs guaranteed in 1874 by the town, together with three others in Aargau, to that ill-fated railway. As the three co-guarantor towns were unable to pay their share, the whole burden fell on Winterthur, which struggled valiantly to meet its liabilities, and was helped by large loans from the cantonal and federal governments.

The Roman settlement of Vitudurum [Celtic dur, water] was a little north-east of the present town, at the place now known as Ober Winterthur. It was there that in 919 Burkhard II., duke of Alamannia, defeated Rudolf II., king of Transjuran Burgundy. It was refounded in the valley in 11S0 by

the counts of Kyburg (their castle rises on a hill, 4 m. to the south of the town), who granted it great liberties and privileges, making it the seat of their district court for the Thurgau. In 1264 the town passed with the rest of the Kyburg inheritance to the Habsburgs, who showed very great favour to it, and thus secured its unswerving loyalty. In 1292 the men of Zurich were beaten back in an attempt to take the town. For a short time after the outlawry of Duke Frederick of Austria, it became a free imperial city (1415-T442); but after the conquest of the Thurgau by the Swiss Confederates (1460-1461) Winterthur, which had gallantly stood a nine-weeks' siege, was isolated in the midst of non- Austrian territory. Hence it was sold by the duke to the town of Zurich in 1467, its rights and liberties being reserved, and its history since then has been that cf the other lands ruled by Zurich. In 1717-1726 Zurich tried hard by means of heavy dues to crush the rival silk and cotton industries at Winterthur, which, how-ever, on the whole very successfully maintained its ancient rights and liberties against the encroachments of Zurich.

See H. Glitsch, Beitrage z. altern Winter thurer Verfassungsgeschichte (Winterthur, 1906); J. C. Troll, Geschichte d. Stadt Winterthur (8 vols., 1840-1850). (W. A. B. C.)

WINTHER, CHRISTIAN (1796-1876), Danish lyrical poet, was born on the 29th of July 1796 at Fensmark, in the province of Pracsto, where his father was priest. He went to the university of Copenhagen in 181 5, and studied theology, taking his degree in 1824. He began to publish verses in 1819, but no collected volume appeared until 1828. Meanwhile, from 1824 to 1830, Winther was supporting himself as a tutor, and with so much success that in the latter year he was able to go to Italy on his savings. In 1835 a second volume of lyrics appeared, and in 1838 a third. In 1841 King Christian VIII. appointed Winther to travel to Mecklenburg to instruct the princess Caroline, on the occasion of her betrothal to the Crown Prince of Denmark, in the Danish language. Further collections of lyrics appeared in 1842, 1848, 1850, 1853, 1865 and 1872. When he was past his fiftieth year Winther married. In 1851 he received a pension from the state as a poet, and for the next quarter of a century he resided mainly in Paris. Besides the nine or ten volumes of lyrical verse mentioned above, Winther published The Stag's Flight, an epical romance in verse (1855); In the Year of Grace, a novel (1874); and other works in prose. He died in Paris on the 30th of December 1876, but the body was brought to Den- mark, and was buried in the heart of the woods. In the verse of

Christian Winther the scenery of Denmark, its beechwoods, lakes and meadows, its violet-scented dingles, its hollows perfumed by wild strawberries, found such a loving and masterly painter as they are never likely to find again. He is the most spontaneous of lyrists; his little poems are steeped in the dew and light and odour of a cool, sunshiny morning in May. His melodies are art- less, but full of variety and delicate harmony. When he was forty-seven he fell in love, and at that mature age startled his admirers by publishing for the first time a cycle of love- songs. They were what were to be expected from a spirit so unfaded; they still stand alone for tender homage and simple sweetness of passion. The technical perfection of Winther' s verse, in its extreme simplicity, makes him the first song-writer of Denmark. (E. G.)

WINTHROP, JOHN (1588-1649), a Puritan leader and governor of Massachusetts, was born in Edwardston, Suffolk, on the 12th of January (O.S.) 1588, the son of Adam Winthrop of Groton Manor, and Anne (Browne) Winthrop. In December 1602 he matriculated at Trinity College, Cambridge, but he did not graduate. The years after his brief course at the university were devoted to the practice of law, in which he achieved considerable success, being appointed, about 1623, an attorney in the Court of Wards and Liveries, and also being engaged in the drafting of parliamentary bills. Though his residence was at Groton Manor, much of his time was spent in London. Mean- while he passed through the deep spiritual experiences char- acteristic of Puritanism, and made wide acquaintance among the leaders of the Puritan party. On the 26th of August 1629 he joined in the " Cambridge Agreement," by which he, and his associates, pledged themselves to remove to New England, provided the government and patent of the Massachusetts colony should be removed thither. On the 20th of October following he was chosen governor of the " Governor and Company of the Massachusetts Bay in New England," and sailed in the" Arbella" in March 1630, reaching Salem (Mass.) on the 12th of June (O.S.), accompanied by a large party of Puritan immigrants. After a brief sojourn in Charlestown, Winthrop and many of his imme- diate associates settled in Boston in the autumn of 1630. He shared in the formation of a church at Charlestown (afterwards the First Church in Boston) on the 30th of July 1630, of which he was thenceforth a member. At Boston he erected a large house, and there he lived till his death on the 26th of March (O.S.) 1649.

Winthrop's history in New England was very largely that of the Massachusetts colony, of which he was twelve times chosen governor by annual election, serving in 1629-1634, 1637-1640, in 1642-1644, and in 1646-1649, and dying in office. To the service of the colony he gave not merely unwearied devotion; but in its interests consumed strength and fortune. His own temper of mind was conservative and somewhat

aristocratic, but he guided political development, often under circumstances of great difficulty, with singular fairness and conspicuous magnanimity. In 1634-1635 he was a leader in putting the colony in a state of defence against possible coercion by the English government. He opposed the majority of his fellow- townsmen in the so-called " Antinomian controversy " of 1636- 1637, taking a strongly conservative attitude towards the questions in dispute. He was the first president of the Commissioners of the United Colonies of New England, organized in 1643. He defended Massachusetts against threatened parliamentary interference once more in 1645-1646. That the colony success- fully weathered its early perils was due more to Winthrop's skill and wisdom than to the services of any other of its citizens. Winthrop was four times married. His first wife, to whom he was united on the 16th of April 1605, was Mary Forth, daughter of John Forth, of Great Stambridge, Essex. She bore him six children, of whom the eldest was John Winthrop, Jr. {q.v.). She was buried in Groton on the 26th of June 1615. On the 6th of December 1615 he married Thomasine CLoplon, daughter of William Clopton of Castleins, near Groton. She died in childbirth about a year later. He married, on the 29th of April 1618, Margaret Tyndal, daughter of Sir John Tyrjdal,

of Great Maplested, Essex. She followed him to New England in 1 63 1, bore him eight children, and died on the 14th of June 1647. Late in 1647 or early in 1648 he married Mrs Martha Coytmorc, widow of Thomas Coytmorc, who survived him, and by whom he had one son.

Winthrop's Journal, an invaluable record of early Massachusetts history, was printed in part in Hartford in 1790; the whole in Boston, edited by James Savage, as The History of New England from 1630 to 1649, in 1825-1826, and again in 1853; and in New York, edited by James K. Hosmer, in 1908. His biography has been written by Robert C. Winthrop, Life and Letters of John Winthrop (2 vols., Boston, 1864, 1867; new ed. 1869); and by Joseph H. Twiehell, John Winthrop (New York, 1891). See also Mrs Alice M. Earle, Margaret Winthrop (New York, 1895). (W. Wk.)

WINTHROP, JOHN (1606-1676), generally 'known as John Winthrop the Younger, son of the preceding, born at Groton, England, on the 12th of February 1606. He was educated at the Bury St Edmunds grammar school and at Trinity College, Dublin, studied law for a short time after 1624 at the Inner Temple, London, accompanied the ill-fated expedition of the duke of Buckingham for the relief of the Protestants of La Rochelle, and then travelled in Italy and the Levant, returning to England in 1629. In 1631 he followed his father to Massa- chusetts, and was one of the "assistants" in 1635, 1640 and 1641, and from 1644 to 1649. He was the chief founder of Agawam (now Ipswich), Mass., in 1633, went to England in 1634, and in the following year returned as governor, for one year, of Connecticut,

under the Saye and Sele patent, sending out the party which built the fort at Say brook, at the mouth of the Connecticut river. He then lived for a time in Massachusetts., where be devoted himself to the study of science and attempted to interest the settlers in the development of the colony's mineral resources. He was again in England in 1641-1643, and on his return established iron-works at Lynn and Braintree, Mass. In 1645 he obtained a title to lands in south-eastern Connecticut, and founded there in 1646 what is now New London, whither he removed in 1650. He became one of the magistrates of Connecti- cut in 1651; in 1657-16 58 was governor of the colony; and in 1659 again became governor, being annually re-elected until his death. In 1662 he obtained in England the charter by which the eolonies of Connecticut and New Haven were united. Besides being governor of Connecticut, he was also in 1675 one of the commissioners of the United Colonies of New England. While in England he was elected to membership in the newly organized Royal Society, to whose Philosophical Transactions he con- tributed two papers, " Some Natural Curiosities from New England," and " Description, Culture and Use of Maize." He died on the 5th of April 1676 in Boston, whither he had gone to attend a meeting of the commissioners of the United Colonies of New England.

His correspondence with the Royal Society was published in series 1, vol. xvi. of the Massachusetts Historical Society's Proceedings. See T. F. War.ers's Sketch of the Life of John Winthrop the Younger (Ipswich, Mass., 1899).

Winthrop's son, Fitz-Jobn Winthrop (1638-1707), was educated at Harvard, though he did not take a degree; served in the parliamentary army in Scotland under Monck, whom he accompanied on his march to London, and returned to Connecti cut in 1663. As major-general he commanded the unsuccessful expedition of the New r York and Connecticut forces against Canada in 1690; from 1693 to 1697 he was. the agent of Con- necticut in London; and from 1698 until his death he was governor of Connecticut.

*WINTHROP, ROBERT CHARLES (1809-1894), American orator and statesman, a descendant of Governor John Winthrop (1 588-1649), was born in Boston, Massachusetts, on the 12th of May 1809. He graduated at Harvard in 1828, studied law with Daniel Webster and in 1831 was admitted to the bar. He was a member of the Massachusetts House of Representatives in 1 834-1840 — for the last three years as speaker, — and in 1840 was elected to the national House of Representatives as a Whig, serving from December 1840 to 1850 (with a short inter- mission, April- December 1842). He soon became prominent and was speaker of the Thirtieth Congress (1847-1849), though hi**

conservatism on slavery and kindred questions displeased ex- tremists, North and South, who prevented his re-election as speaker of the Thirty-first Congress. On the resignation of Daniel Webster to become secretary of state, Winthrop was appointed to the Senate (July 1850), but was defeated in the Massachusetts legislature for the short term (Jan. 30, 1851) and for the long term (April 24, 1851) by a coalition of Democrats and Free Soilers and served only until February 1851. In the same year he received a plurality of the votes cast for governor, but as the constitution required a majority vote, the election was thrown into the legislature, where he was defeated by the same coalition. Thereafter, he was never a candidate for political office. With the breaking up of the Whig party he became an independent and supported Millard Fillmore in 1856, John Bell in i860, and General G. B. McClellan in 1864. He was president of the Massachusetts Historical Society from 1855 to 1885, and for the last twenty-seven years of his life was president of the Peabody Trust for the advancement of education in the Southern States. Among his noteworthy orations of a patriotic character were those delivered at Boston in 1876, at Yorktown in 1881, and in Washington on the completion of the Washington Monu- ment in 1885. lie died in Boston on the 16th of November

1894.

Among his publications were Addresses and Speeches (Boston, 1852-1886); Life and Letters of John Winthrop (2 vols., Boston, 1864-1867); and Washington, Bow do-in and Franklin (Boston, 1876), See R. C. Winthrop, Jr., Memoir of R. C. Winthrop (Boston, 1897).

WINTHROP, a township and a summer resort of Suffolk county, Massachusetts, U.S.A., occupying a peninsula jutting out into Massachusetts Bay about 5 m. N.E. of Boston and 3 m. S.E. of Chelsea, and forming part of the north-eastern boundary of Boston Harbour. Pop. (1900) 6058, of whom 1437 were foreign- born and 43 were negroes; (1910, U.S. census) 10,132. Between May and October the population is estimated to be between 14,000 and 16,000. Area, i-6 sq. m. Winthrop is served by the Winthrop branch of the Boston, Revere Beach & Lynn railway, and by electric railway from Orient Heights to Revere, Chelsea, East Boston, Lynn and Boston. The township contains several villages connected by a railway loop; there are nine stations in its 5-3 m. of track. The peninsula has about 8 m. of water front on the ocean and the harbour. The northern part nearest the narrow neck connecting with the mainland is

a high bluff, known as Winthrop Highlands, having its north-eastern terminus in G rover's Cliff, a bold headland which forms the north-eastern- most point of the peninsula. On Grover's Cliff is Fort Heath, a battery of three powerful long-range guns. At the western end of the Highlands is Fort Banks (a part of Boston's harbour defence) , consisting of a masked battery of sixteen 1 2 in. mortars, each able to drop a 600 lb shell on a ship 6 m. at sea. From Grover's Cliff a fine sandy beach facing the open ocean leads to Great Head, the highest elevation on the peninsula. Winthrop Shore Drive (16-73 acres), one of the reservations of the Metro-politan park system, is a public parkway along the shore. From Great Head, a long sandy spit curves away southward, ending in Toint Shirley, a hillock and flat sandy plain, separated by Shirley Gut, a narrow channel of deep water, from Deer Island, on which are the Boston House of Correction and City Prison. At Point Shirley is the Point Shirley Club house; at the western foot of Great Head, on Crystal Bay, is the Winthrop Yacht Club house and anchorage; and at Winthrop Center on the west side are the Town Hall, the High School, the Public Library, the Masonic Hall, College Park Yacht Club and Ingleside Park. There are several large summer hotels.

Winthrop, first known as " Pullen Poynt " (Pulling Point) because the tide made hard pulling here for boatmen, was origin- ally a part of Boston; it was part of Chelsea from 1739 until 1846, when with Rumney Marsh it was separately incorporated as North Chelsea, from which it was set off as a township in 1852 under its present name, in honour of Deane Winthrop (1623-1704), who was a son of Governor John Winthrop, the elder, and whose hot^e is still standing. Point Shirley takes its name from Governor William Shirley who helped to establish a cod fishery

there in 1753. Before and after the War of Independence Winthrop was a favourite seaside home for Bostonians, many prominent families, including the Gibbons, Hancocks, Bartletts, Emersons, Lorings and Lowells, having country-seats here. The community was a secluded rural retreat until the construc- tion of the railway in 1876 converted it into a watering-place. See C. W. Hall, Historic Winthrop, 1630-1902 (Boston, 1902).

WINWOOD, SIR RALPH (c. 1563-1617), English politician, was born at Aynhoe in Northamptonshire and educated at St John's College, Oxford. In 1599 he became secretary to Sir Henry Neville (c. 1564-1615), the English ambassador in France, and he succeeded Neville in this position two years later, re- taining it until 1603. In this year Winwood was sent to The Hague as agent to the States- General of the United Provinces, and according to custom he became a member of the Dutch council of state. His hearty dislike of Spain coloured all his actions in Holland; he was anxious

to see a continuance of the war between Spain and the United Netherlands, and he expressed both his own views and those of the English government at the time when he wrote, " how convenient this war would be for the good of His Majesty's realms, if it might be maintained without his charge." In June 1608 Winwood signed the league between England and the United Provinces, and he was in Holland when the trouble over the succession to the duchies of Tiilich and Cleves threatened to cause a European war. In this matter he negotiated with the Protestant princes of Germany on behalf of James I. Having returned to England Sir Ralph became secretary of state in March 1614 and a member of parliament. In the House of Commons he defended the king's right to levy impositions, and other events of his secretaryship were the inquiry into the murder of Sir Thomas Overbury and the release of Raleigh in 1616. Raleigh was urged by Winwood to attack the Spanish fleet and the Spanish settlements in South America, and the secretary's share in this undertaking was the subject of com- plaints on the part of the representatives of Spain. In the rnidst of this he died in London on the 27th of October 1617. "It can hardly be doubted," says Gardiner, " that, if he had lived till the following summer, he would have shared in Raleigh's ruin." One of Winwood's daughters, Anne (d. 1643), married Edward Montagu, 2nd Baron Montagu of Boughton, and their son was Ralph Montagu, 1st cluke of Montagu.

Winwood's official correspondence and other papers passed to the duke of Montagu, and are now in the possession of the duke of Buccleuch. They are calendared in the Report of the Historical Manuscripts Commission on the manuscripts of the duke of Buc- cleuch. See the Introduction to this Report (1899); and also S. R. Gardiner, History of England, vols. ii. and iii. (1904-1907).

WINZET, NINIAN (1518-1592), Scottish polemical writer, was born in Renfrew, and was probably educated at the university of Glasgow. He was ordained priest in 1540, and in 1552 was appointed master of the grammar school of Linlithgow, from which town he was later " expellit and schott out " by the partisans of Dean Patrick Kinlochy, " preacher " there. He had also enjoyed the office of Provost of the Collegiate Church of St Michael in that town. He retired to Edinburgh, where the return of Queen Mary had given heart to the Catholics. There he took part in the pamphlet war which then raged, and entered into conflict with Knox and other leading reformers. He appears to have acted for a time as confessor to the queen. In July 1562, when engaged in the printing of his Last Blast, he narrowly escaped the vengeance of his opponents, who had by that time gained the upper hand in the capital, and he fled, on the 3rd of September, with the nuncio Gouda to Louvain. He reached Paris in 1565 and became a member of the " German Nation " of the university. At Queen Mary's request he joined Bishop Leslie on his embassy to Queen Elizabeth in 1571,

and remained with the bishop after his removal by Elizabeth's orders to ward at Fenny Staunton, Huntingdonshire. When further suspicion fell on Leslie and he was committed to the Tower, Winzet was permitted to return to Paris. There he continued his studies, and in 1574 left for Douai, where in the following year he became a licentiate. He was in residence at Rome from 1575 to 1577, and was then appointed by Pope

Gregory XIII. abbot of the Benedictine monastery of St James, Regensburg. There he died on the 21st of September 1592.

Winzet's works are almost entirely controversial. He justified his literary activity on the side of Catholicism on the double plea of conscience and the inability of the bishops and theologians to supply the necessary arguments {Virst Tractate, ed. S.T.S., i. p. 10). "We may nawayis langer contene vs," he writes, " bot expresse on al sydis as we think, referring _ > ur iugement to the haly Catholik Kirk." In his first work, Certaine Tractates (three in number), printed in 1562, he rates his fellow clergy for negligence and sin, invites replies from Knox regarding his authority as minister and his share in the new ecclesiastical constitution, and protests against the interference with Catholic burgesses by the magistrates of Edinburgh. The Last Blast, which was interrupted in publication, is an onslaught on heretics and a falsely ordained clergy. In his Buke of Four Scoir Tkre Qtteslions (1563), addressed to the " Calviniane Precheouris," in which he treats of church doctrine, sacraments, priesthood, obedience to rulers, free-will and other matters, he is dogmatic rather than polemical. lie translated the Commonitorium of Vincentius Lirinensis (1563), and wrote, in Latin, a Flagellum sectarionum and a Velitatio in Georgium Buchananum (1582).

Winze t's vernacular writings have been edited by J. Hewison for the S.T.S. (2 vols., 1888, 1890). The Tractates were printed, with a preface by David Laing, by the Mai t land Club (1 835). For Winzet's career see Zeigclbaucr, Historia rei literariae O.S.B. Hi., Mackenzie, Lives, iii., and the Introduction to S.T.S., edit. u.s.

WIRE (A.S. wir, a wire; cf. Swed. vire, to twist, M.H.G. uri-ere, a gold ornament, Lat. viriae, armlets, ultimately from the root wi, to twist, bind), a thin long rod of metal, generally round in section. The uses of wire are multifarious and diverse beyond all enumeration. It forms the raw material of important manufactures, such as the wire-net industry, wire-cloth making and wire-rope spinning, in which it occupies a place analogous to a textile fibre. Wire-cloth of all degrees of strength and fineness of mesh is

used for sifting and screening machinery, for draining paper pulp, for window screens, and for many other purposes. Vast quantities of copper and iron wire are employed for telegraph and telephone wires and cables, and as conductors in electric lighting. It is in no less demand for fencing, and much is consumed in the construction of suspension bridges, and cages, &c. In the manufacture of stringed musical instruments and philosophical apparatus wire is again largely used. Among its other sources of consumption it is sufficient to mention pin and hair-pin making, the needle and fish-hook industries, nail, peg and rivet making, and carding machinery; indeed there are few industries into which it does not more or less enter.

The physical properties requisite to make useful wire arc possessed by only a limited number of metals and metallic alloys. The metals must in the first place be ductile; and, further, the wire when drawn out must possess a certain amount of tenacity, the quality on which the utility of wire principally depends. The metals suitable for wire, possessing almost equal ductility, are platinum, silver, iron, copper, aluminium and gold; and it is only from these and certain of their alloys with other metals, principally brass and bronze, that wire is prepared. By careful treatment wire of excessive tenuity can be produced.

Diameter.

Strain.

In.

lb.

Gold ….

■*0162*

5-6i- 5-42

Platinum .

•*0161*

6-70- 6-59

Silver ….

•*oi57*

7-86- 7-78

Copper ….

•0177

IO-II-IO-20

Iron ….

•0169

*11*12-10-89*

Copper ….

-0605

233

•0640

203

Steel ….

•0600

342

Phosphor Bronze .

.0630

394

Dr W. H. Wollaston first succeeded in drawing a platinum wire g$jj

equal to less than the fifty- thousandth part of an inch. The accompanying table shows the comparative tenacity of the wire of metals and metallic alloys.

Wire was originally made by beating the metal out into plates, which were then cut into continuous strips, and afterwards rounded by beating. The art of wire-drawing docs not appear to have been known till the 14th century, and it was not introduced into England before the'second hall of the 17th century. Wire is usually drawn of cylindrical form; but it may be made of any desired section by varying the outline of the holes in the draw-plate through which it is passed in the process of manufacture. The draw-plate or

die is a piece of hard cast-iron or hard steel, or for fine work it may be a diamond or ruby. The object of utilizing precious stones is to enable the dies to be used for a considerable period without losing their size, and so producing wire of incorrect diameter. Diamond dies must be reborcd when they have lost their original diameter of hole, but the metal dies are brought down to size again by hammering- tip the hole and then drifting it out to correct diameter with a punch. The form of a die in section is shown by fig. I ; the bell-mouthed opening receives the wire, and when it is pulled through the hole at the end its diameter becomes re- duced accordingly. The action of draw- ing has the effect of hardening the wire and rendering it brittle, so that an- nealing must be done FlG. 1. at intervals to soften

it again for further drawing; the annealing is done in cast-iron pots, holding coils of wire which are raised to a red heat and then allowed to cool. Although the wire is kept air-tight as much as possible, some amount of scaling occurs, and pickling must be done to remove this scale before redrawing.

An important point in wire-drawing is that of lubrication to facilitate the operation and to lessen the wear on the dies. Various lubricants, such as oil, tallow, soapy water and stale beer, are em- ployed. Another method is to immerse the wire in a. sulphate of copper solution, so that a film of copper is deposited which forms a kind of lubricant, easing the drawing considerably; in some classes of wire the copper is left after the final drawing to serve as a preven- tive of rust.

The wire-drawing machines include means for holding the dies , accurately in position and for drawing the wire steadily through the holes. The usual design consists of a cast-iron bench or table having a bracket standing up to hold the die, and a vertical drum which rotates and by coiling the wire around its surface pulls it through the die, the coil of wire being stored upon another drum or " swift " which lies behind the die and reels off the wire as fast as required. The wire drum or " block :1 is provided with means for rapidly coupling or uncoupling it to its vertical shaft, so that the motion of the wire may be stopped or started instantly. The block is also tapered, so that the coil of wire may be easily slipped off upwards when finished. Before the wire can be attached to the block, a sufficient length of it must be pulled through the die; this is effected by a pair of gripping pincers on the end of a chain which is wound around a revolving drum, so drawing the pincers along, and with them the wire, until enough is through the die to be coiled two or three times on the block, where the end is secured by a small screw clamp or vice ready for the drawing operation. Wire has to be pointed or made smaller in diameter at the end before it can be passed through the die; the pointing is done by hammering, filing, rolling or swaging in dies, which effect a reduction in diameter. When the wire is

on the block the latter is set in motion and the wire is drawn steadily through the die; it is very important that the block shall rotate evenly and that it shall run true and pull the wire in an even manner, otherwise the " snatching " which occurs will break the wire, or at least weaken itin spots.

Continuous wire-drawing machines differ from the single-block machines in having a series of dies through which the wire passes in a continuous manner. The difficulty of feeding between each die is solved by introducing a block between each, so that as the wire issues it coils around the block and is so helped on to the next die. The speeds of the blocks arc increased successively, so that the elongation due to drawing is taken up and slip compensated for. The operation of threading the wire first through all the dies and around the blocks is termed " stringing-up." The arrangements for lubrication include a pump which floods the dies, and in many cases also the bottom portions of the blocks run in lubricant. The speeds at which the wire travels vary greatly, according to the material and the amount of reduction effected; rates from 100 ft. up to 900 ft. are possible, the higher speeds being those of continuous machines.

Wires and cables for electrical purposes are covered with various insulating materials, such as cotton, silk, jute and paper, wrapped in spiral fashion and further protected with substances such as paraffin, some kind of preservative compound, bitumen or lead sheathing or

steel taping. The stranding or covering machines employed in this work are designed to carry supplies of material and wind it on to the wire which is passing through at a rapid rate. Some of the smallest machines for cotton covering have a large drum, which grips the wire and moves it through toothed gears at a definite speed; the wire passes through the centre of disks mounted above a long bed, and the disks carry each a number of bobbins varying from six to twelve or more in different machines. A supply of covering material is wound on each bobbin, and the end is led on to the wire, which occupies a central position relatively to the bobbins; the latter being revolved at a suitable speed bodily with their disks, the cotton is consequently served on to the wire, winding in spiral fashion so as to overlap. If a large number of strands are required the disks are duplicated, so that as many as sixty spools may be carried, the second set. of strands being laid over the first. For the heavier cables, used for electric light and power, and submarine cables, the machines are somewhat different in construction. The wire is still carried through a hollow shaft, but the bobbins or spools of covering material are set with their spindles at right

angles to the axis of the wire, and they lie in a circular cage which rotates on rollers below. The various strands coming from the spools at various parts of the circumference of the cage all lead to a disk at the end of the hollow shaft. This disk has perforations through which each of the strands pass, thence being immediately wrapped on the cable, which slides through a bearing at this point. Toothed gears having certain definite ratios are used to cause the winding drum for the cable and the cage for the spools to rotate at suitable relative speeds which do not vary. The cages are multiplied for stranding with a large number of tapes or strands, so that a machine may have six bobbins on one cage and twelve on the other. In the case of sub- marine cahles, coverings of jute-served gutta-percha are employed, upon which a protective covering of steel wires is laid, subsequently treated with jute yarns or tapes and protected with coatings of compound. Messrs Johnson & Phillips, Ltd., of Charlton, Kent, make combination machines which lay the steel wires, apply the tapes and cover with the preservative compound, in one continuous operation. The wire is carried on bobbins in two rotating cages, having twelve bobbins each, and the jute bobbins, seventy-two in number, are mounted on disks, while the compound is supplied from steam-heated tanks, through which the cable is passed by rollers. A machine of this class will turn out as much as 8 m. of finished cable in a day of twelve hours. When a supply of steel wire has been used up, the next portions are united by electric welding.

Tapes of paper, rubber or jute are served from bobbins on disks and also in some designs from independent bobbins, each mounted on its own pin, set at a suitable angle in a frame, to give the spiral lead. In some instances seventy-two layers of paper are applied to high-tension cables. These cables are subsequently put into steam- heated tanks, hermetically sealed and connected to a vacuum pump, by which the moisture is drawn off as quickly as possible. When the cable is thoroughly dry a quantity of compound is admitted to the tank and so permeates the insulation. Lead is put on the outside of the paper in a press, which has dies through which the cable passes, and is covered with a uniform coating or tube of lead, forced into the dies and around the cable by hydraulic pressure. Steel tapes are in some cases used to armour cables and protect them from external injury; the tape is wound in a similar manner to the other materials already described.

Rubber covering of wires and cables is done by passing them through grooved rollers simultaneously with rubber strips above and below, so that the rubber is crushed on to the wires, the latter emerging as a wide band. The separate wires are parted forcibly, each retaining its rubber sheathing. Vulcanizing is afterwards done in steam-heated drums.

Many auxiliary machines are necessary in connexion with wire- and cable-

covering, as plant for preparing the rubber and paper, &c, cutting it into strips, winding it, measuring lengths, &c.

Wire Gauges, — In commerce, the sizes of wire are estimated by gauges which consist of plates of circular or oblong form having notches of different widths round their edges to receive wire and sheet metals of different thicknesses. Each notch is stamped with a number, and the wire or sheet, which just fits a given notch, is stated to be of, say, No. 10, n, 12, &c, of the wire gauge. But it is always necessary to state what particular gauge is used, since, unfortunately, uniformity is wanting. Holtzapffel investigated the subject, and published a valuable collection of facts relating thereto in 1846. A more exhaustive report was published by a committee of the Society of Telegraph Engineers in 1879 (Journ. Soc. Tel. Kng. viii. p. 476), a result of which was the sanctioning by the Board of Trade, in 1884, of the New ImperiaLStandard Wire Gauge. That report stated: " The different gauge's in use might be counted by hundreds. . . . F.very wire-drawer has gauges adjusted to suit special objects. When competition is keen, wire is commonly drawn by one gauge and sold by another; half sizes and quarter sizes are in constant use among the dealers, the wire being sold as whole sizes. Sometimes four or five different gauge plates have been made by one maker — some by which the workmen are paid, and others by which the wire is sold. . . The whole system is in confusion, and lends itself to those who desire to use fraudulent practices." Thomas Hughes (The English Wire Gauge, London, 1879) stated that, " In

the same town some use Stubs, some the Warrington, some the Lancashire, some the Yorkshire, some the Birmingham, some the iron wire gauge and some their own made wire gauge, all maintaining the gauge in their own possession to be the correct one,"

Gauges may be broadly divided into two groups, the empirical and the geometrical. The first include all the old ones, notably; the Birmingham (B.W.G.) and the Lancashire or Stubs. The origin of the B.W.G. is lost in obscurity. The numbers of wire were in common use earlier than 17.35- It is believed that they originally were based on the series of drawn wires, No. 1 being the original rod, and succeed- ing numbers corresponding with each draw, so that No. 10, for example, would have passed ten times through the draw plate. But the Birmingham and the Lancashire gauge, the latter being based on an averaging of the dimensions collated from a large number of the former in the possession of Peter Stubs of Warrington, have long held the leading position, and are still retained and used probably to a greater extent than the more recent geometrical gauges. There is no need, therefore, to give an account of the other and less known gauges which have been used by manufacturers. In no case is there any regular increment of dimensions from which a regular curve could be drawn.

The first attempt to adopt a geometrical system was made by Messrs Brown & Sharpe in 1855. They established a regular pro- gression of thirty-nine steps between the English sizes, No. 0000 (460 mils) and No. 36 (5 mils). Each diameter was multiplied by 0-890522 to give the next lower size. This is now the American gauge, and is used to a considerable extent in the U.S.A.

The Imperial Standard Wire Gauge, which has been sanctioned by the British Board of Trade, is one that was formulated by J. Latimer Clark. Incidentally, one of its recommendations is that it differs from pre-existing gauges scarcely more than they differ among themselves, and it is based on a rational system, the basis being the mil. No. 7/0, the largest size, is 0-50 in. (500 mils) in diameter, and the smallest, No. 50, is 0-001 in. (1 mil) in diameter. Between these the diameter, or thickness, diminishes by 10-557%, and the weight diminishes by 20%.

But the fact remains that a large number of gauges are still in common use, and that gauges of the same name differ and are therefore not authoritative. Sheet iron wire gauge differs from Stubs' steel wire gauge. Gauges for wire and plate differ. Accuracy can only be secured by specifying precisely the name of the gauge intended, or, what is generally better, the dimensions in decimals, which can always be tested with a micrometer. A decimal gauge has been proposed. Tables of decimal equivalents of the wire gauges have been prepared, and are helpful.

The circular forms of gauge are the most popular, and are generally 3 1 in. in diameter, with thirty-six notches; many have the decimal equivalents of the sizes stamped on the back. Oblong plates are similarly notched. Rolling mill gauges are also oblong in form. Many gauges are made with a wedge-like slot into which the wire is thrust; one edge being graduated, the point at which the movement of the wire is arrested gives its size. The graduations are those of standard wire, or in thousandths of an inch. In some cases both edges are graduated differently to serve for comparison between two systems of measurement. A few gauges are made with holes into which the wire has to be thrust. All gauges are hardened and ground to dimensions.

WIREWORM, a popular name for the slender, hard-skinned grubs or larvae of the click-beetles or Elateridae, a family of the Coleoptera (q-v.). These larvae pass a long life (two or three years) in the soil, feeding on the roots of plants, and they often cause much damage to farm crops of all kinds, but especially to cereals. A wireworm may be known by its broad, quadrate head and cylindrical or somewhat flattened body, all of whose segments are protected by a firm, chitinous cuticle. The three pairs of legs on the thoracic segments are short and the last abdominal segment is, as is

frequently the case in beetle grubs, directed downwards to serve as a terminal prolcg. The hinder end of the body is acutely pointed in the larvae of the species of Agriotes (.4. obscurus and A. lineatus) that are the best known of the wireworms, but in another common form (the grub of Athous kaemorrhoidalis) the tail is bifid and beset with sharp processes. The subterranean habits of wireworms make it hard to exterminate them when they have once begun to attack a crop, and the most hopeful practice is, by rotation and by proper treatment of the land, to clear it of the insects before the seed be sown. Passing easily through the soil on account of their shape, wireworms travel from plant to plant and thus injure the roots of a large number in a short time. (See Economic Entomology.) Other subterranean creatures — such as the " leather-jacket " grub of crane-flies — which have no legs, and geophilid centipedes, which may have over two hundred, are often confounded with the six-legged wireworms.

WIRKSWORTH, a market town in the western parliamentary division of Derbyshire, England, 14 m. N.N.W. of Derby, on a branch of the Midland railway. Pop. of urban district (1901) 3807. It is picturesquely situated at the head of the valley of a small tributary of the Derwent, at an elevation exceeding 500 ft., and is almost encircled by sharply rising hills. The cruciform church of St Mary, with a central tower and short spire, is in great part Early English, with Perpendicular additions; but considerable traces of a Norman building were revealed during a modern restoration. There is a manufacture of tape in the town, and lead-mining and stone-quarrying are carried on in the neighbourhood; relics of the Roman working of the lead mines have been discovered. A large brass vessel used as a standard measure for the lead ore, and dating from the time of Henry VIII., is preserved.

WISBECH, a municipal borough, market town, and port in the Wisbech parliamentary division of Cambridgeshire, England, 38 m. N. by W. of Cambridge, on the Great Eastern and the Great Northern and Midland joint railways. It lies in the flat fen country, on the river Ncne (mainly on the east bank), 11 m. from its outlet on the Wash. By the Wisbech canal it has communication with the Ouse. The church of St Peter and St Paul has a double nave, with aisles, the north arcade being Norman; but the rest of the building is mainly Decorated and Perpendicular. There are remains of a Norman west tower; the Perpendicular tower stands on the north side. The museum contains a valuable library and various collections, including antiquities and objects of art and natural history. Other in- stitutions include a grammar school founded in the middle of the 16th century and provided for by a charter of Edward VI., the Cambridgeshire hospital, a custom-house, a cattle- market, and an important corn-exchange, for Wisbech has a large trade in grain. A Gothic monument commemorates Thomas Clarkson (1 760-1846), a powerful opponent of the slave-trade, and a native of the town. The shipping trade is carried on both at the town itself and at Sutton Bridge, 8 m. lower down the river. The chief imports are coal, timber and iron, and the exports grain and other agricultural products and salt. Foreign trade is chiefly with the Russian Baltic ports. In the neighbourhood large quantities of fruit are grown, including apples, pears, plums, gooseberries, and strawberries. Potatoes, asparagus, and other vegetables are also grown for the London market. The town possesses agricultural implement works, coach- building works, breweries, ropeworks, planing and sawing mills, and corn and oil-cake mills. The borough is under a mayor, 6 aldermen, and 18 councillors. Area, 6476 acres.

Wisbech (Wisebec, i.e. Ousebec) is near a Roman embankment and tumuli. About 940 the manor is said to have been given to the abbey of Ely by Oswy and Leoflede; the abbot held it in 1086; and it became attached to the see of Ely with the other possessions of the monastery. The castle is alleged to have been built by William I., and was converted from a fortress in the fens into an episcopal palace between 1471 and 1473. The growth of Wisbech depended on its position and episcopal patronage. In 1 190 tenants of W'ishech Barton acquired an exemption from tolls throughout England, confirmed by John, Henry IV. and Henry V. The Gild of the Holy Trinity is mentioned in 1379, and grew rich and powerful. After its dissolution the townsmen became, in 1549, a corporation holding of the king, by a charter which transferred to them the property and duties of the gild, and was renewed in 1610 and 1669. By the Municipal Corporations Act of 1835 a mayor, aldermen and a council replaced the capital burgesses, the older governing body. The borough returned a member only to the parliament of 1658; its elected member, Secretary Thurloe, chose then to represent another constituency. A fair of twenty days from the vigil

of Holy Trinity was granted to the bishop of Ely in 1327. The mart still occupies by custom the interval between Lynn mart, of which it is probably an offshoot, and Stamford fair in mid-Lent. A pleasure fair, called the Statute Fair, takes place shortly before Michaelmas. Importance attaches to the horse fair, held in 1827 in the week before Whitsuntide and now on the

second Thursday in May and on July 25, and to the cattle fair in the beginning of August. Saturday was market day in 1792; a corn market is now held on Saturday, a cattle market on Thursday and Saturday. In 10S6 eels were prolific in Wisbech water. The port was noteworthy until a diversion of the Ouse, before 1292, rendered it hardly accessible. Drainage restored trade before 1634, and the act of 1773 for making Kinderley's Cut was the beginning of prosperity. From 1783 to 1825 agricul- tural produce was exported and coal imported. Hemp and flax had an importance, lost between 1827 and 1849, but responsible in 1792 for fairs on Saturday and Monday before Palm Sunday.

See W. Watson, History of Wisbech (Wisbech, 1827); N. Walker and C. Thomas, History of Wisbech (Wisbech, 1849); History of Wisbech (Wisbech and London, 1833).

WISCONSIN (known as "the Badger 1 state"), one of the North Central states of the United States of America. It is bounded on the E. by Lake Michigan, on the N. by the Upper Peninsula of Michigan and Lake Superior, on the W. by Min- nesota and Iowa, and on the S. by Illinois. Its greatest length from N. to S. (42 30′ N. Lat. to 47 3′ N. Lat.) is 300 m., and its greatest breadth (86° 49′ W. Long, to 92 54′ W. Long.) is 250 m. The greater part of the western boundary separating the state from Minnesota and Iowa consists of the Mississippi and St Croix rivers flowing S. and the Saint Louis river flowing into Lake Superior. The Menominee and Montreal rivers form a considerable part of the boundary line on the N. and E., separating it from the Upper Peninsula of Michigan. The state's lake shore boundary is more than 550 m. long. Included in Wis- consin are the Apostle Islands in Lake Superior, and Washington Island and a group of smaller islands at the entrance to Green Bay on the Lake Michigan side. The state occupies a total area of 56,066 sq. m., 2 810 of which are water surface. Roughly speaking, it divides the Great Lakes region from the upper valley of the Mississippi.

Physical Features. — Wisconsin forms part of the inner margin of an ancient coastal plain and the oldland of crystalline rocks about which the plain sediments were deposited. The plain and the old- land were well worn down by erosion and then were uplifted ; were dissected by stream valleys, and were glaciated. The surface is generally rolling and undulating, comprising, with the Upper Penin- sula of Michigan, a swelling elevation of

land between the three depressions represented by Lakes Michigan and Superior and the Mississippi and the St Croix rivers. The lowest elevations arc in the southern and central portions of the state, where the altitude averages between 580 and 600 ft. above sea-level. The highest points in the state are residual masses of relatively resistant rock rising above the erosion surface; such are: Rib Hill (1940 ft.) in Marathon county, in the north-central part, and some of the peaks of the Penokcc Range in the N. part of the state, which are about 1800 ft. high. From the N. highland two heights of land (1200 to 1600 ft.) extend southward well into the central portions of the state, dividing the greater part of its area into two natural drainage basins. The westernmost of these elevations separates the valleys of the Mississippi, and the St Croix from that of the Wisconsin river. The eastern elevation is a ridge or cucsta formed by an outcropping hard layer of the ancient coastal plain ; and it separates the Wisconsin river basin from the Fox River Valley and the streams flowing into Lake Michigan. Along the Mississippi and the Wisconsin runs a chain of bluffs varying in height from 200 to 300 ft., and in the E. a rocky limestone ridge or cuesta some 30 m. back from Lake Michigan extends from the Door county peninsula, E. of Lake Winnebago and as far south as the Illinois line. There are no large rivers flowing into Lake Superior and very little drainage in that direction, as from a point some 30 m. S. of the lake all the streams flow in a southerly direction. The Mississippi is the drainage basin for a greater part of the state. The St Croix river rises in the SAV. part of the Penokce Range and flows W. and S,, forming the western boundary of the state for 135 m. before it joins the Mississippi 20 m. below St Paul. Before it is joined by the Wisconsin, the Mississippi

1 The badger is not found in the state, and the name probably originated as a nickname fon •those lead miners N. of the Illinois line who came from the East, who lived in dug-outs like the hillside burrows of the badger, and who did not go home in winter like the miners from southern Illinois and farther south, who were called ” suckers,” a name borrowed from the migrating fish in the Rock, Illinois and other rivers flowing south. The name ” suckers ” was applied generally to all the people of Illinois, and the name ” badgers ” to the people of Wisconsin and ” badger state ” to the state.

2 Resides the area as given here, the state has jurisdiction over approximately 7500 sq. m. of Lake Michigan and 2378 sq. m. of Lake Superior.

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receives several rivers of considerable length, the most important of which are the Chippewa and the Black. The Wisconsin river rises on the Upper Michigan border and Hows S. and W. for 600 m. t joining the Mississippi near Prairie du Chen. It is navigable as far as Portage, some 200 m. from its mouth. The Fox river (more than 260 m. long) rises in the south central portion of the state, flows N. and E. by a circuitous route through Lake Winnebago, arid thence N. into Green Bay, and is the longest and most important stream draining into Lake Michigan. The Wolf river is its most important tributary, joining it from the N., in its upper course. Besides the Fox several smaller streams drain into the Lake Michigan basin. Among these are the Menominee and Oconto, which flow into Green Bay; an arm of Lake Michigan, and the Sheboygan and Milwaukee rivers emptying directly into the lake. The southern portion of the state is drained by several streams flowing across the Illinois boundary and finding their way eventually through other rivers into the Mississippi. The largest of these are the Rock, Des Plaines, Fox (of the Illinois), or Pishtaka, and the Pecatonica rivers. On account of glacial disturbance of the drainage, Wisconsin's many streams , provide water-powers of great value that have contributed much to the industrial prosperity of the state. The most valuable of these are the Fox, the Rock and the upper Wisconsin and its tributaries. Wisconsin has more than 2500 lakes, mostly in the glaciated N. and E, parts of the state. Of these the largest is Lake Winnebago, between Calumet, Outagamie, Fond du Lac and Winnebago counties, with an extreme length of 30 m. and a breadth of 10 m., and one of the largest bodies of water lying wholly within any state in the Union. On its banks are the important manufacturing cities of Oshkosh, Fond du Lac, Neenah and Menasha, and through it flows the Fox river. In the S. and E. portions of the state the lakes are beautiful clear bodies of water with sandy or

gravelled shores, and, as a rule, high banks heavily wooded. Many of them are famous as summer resorts, notably Lake Geneva, Green Lake, the lakes in Waukesha county and the famous " four lakes " near Madison.

Flora and Fauna. — Wisconsin was originally the native home of most of the wild fowl and animals found in the other North Central states. Deer were found in large numbers in all sections of the state, bear were common in the central and northern parts, bison were found in the south-west, wolves, lynx (" wild cats "), and foxes and other smaller animals particularly of fur-bearing varieties. The streams abounded in fish. The abundance of game made the region between the lakes and the Mississippi a favourite hunting ground of the Indians, and later a productive field for the trapper and fur trader. Bear, deer and lynx are still to be found in the less settled forest regions of the N. parts, and the fisheries are still important.

The avi-faunal life of Wisconsin is exceedingly varied; C. B. Cory (see Bibliography) enumerates 39S species for Wisconsin and Illinois, and of these probably not less than 350 occur in Wisconsin. The more characteristic and useful birds include many species of the sparrow, such as the song, swamp, Lincoln's chipping and field sparrow; the bank, barn, cliff, white-bellied and rough- winged swallow, as well as the purple martin and the chimney swift; ten or more species of fly-catchers, including the least, arcadian, phoebe, wood pewee, olive-sided and king bird; about ten species of wood- peckers, ot which the more common are the downy, hairy, yellow- bellied and golden-winged (flicker) ; about thirty species of warblers, including the parula, cerulean, Blackburnian, prothonotary, yellow Nashville, red-start, worm-eating and chestnut-sided ; and four or five species of vireos. The song-birds are well represented in the hermit thrush, wood thrush, Wilson's thrush (or veery), brown thrasher, robin, blue bird, bobolink, meadow lark, gold finch, &c. Among the game birds are the ruffed grouse (partridge), quail, prairie hen and wild turkey. The birds of prey include the red-shouldered, red- tailed, broad-winged, Cooper's, sharp-shinned and sparrow hawk and the bald eagle; the great horned, barred, barn, snowy, short- eared and screech owls. The ducks include the mallard, black duck, canvas-back and red-head; the Canadian goose, the snowy goose and the blue goose also appear during the migrating seasons.

Originally the greater portion of what is now Wisconsin was covered with forests, although in the S. and W. there w r ere consider- able tracts of rolling prairie lands. In the S. portion the predominat- ing trees were hickory, elm, oak and poplar. Along the shore of Lake Michigan, and extending inland a quarter of the distance across the state and northward through the Fox River Valley, there was a heavy belt of oak, maple, birch,

ash, hickory, elm and some pine. From the N. shores of Green Bay there stretched away to the N. and W. an enormous and unbroken forest of pines, hemlocks and spruce.

Climate. — The climate of the whole state is influenced by the storms which move eastward along the Canadian border and by those which move northward up the Mississippi Valley, and that of the eastern and northern sections is moderated by the Great Lakes. The winters, especially in the central and north-western sections, are long and severe, and the summers in the central and south-western sections are very warm; but the air is so dry that cold and heat are less felt here than they are in some humid climates with less extreme temperatures. The mean annual temperature for the state is 44 F. July, with an average temperature for the state of 70 , is the warmest month, and February, with an average of 15 , is the coldest. Within a period of thirty-eight years, from 1870 to 1908, extremes at Milwaukee ranged from 100 to – 25 , while at*

La Crosse, on the western border and less than 60 m. fa?ˆ "r north, they ranged during the same period from 104 to- 43°. The greatest extremes recorded at regular observing stations range from ui° at Brodhead, in Green county and near the southern border, on the 21st of July 1901 to – 48 at Barron, in Barron county in the north-western part of the state, on the 10th of February 1889. The average annual precipitation for the state is 31-5 in. Two-thirds of this comes in the six growing months from April to September inclusive, and the rain- fall is well distributed over all sections. There is an annual snowfall of 53 in. in the northern section, 40 in. in the southern section and 36 in. in the central section, which is quite evenly distributed through the months of December, January, February and March. In the northern section the heavy snowfall is caused by the cyclonic storms along the Canadian border, and in the southern section the snowfall is increased by the storms which ascend the Mississippi Valley. All sections of the state are subject to tornadoes. They occur more frequently in the western portion than in the eastern portion, but one of the most destructive in the history of the state occurred at Racine on the 18th of May 1883. This storm killed 25 persons, injured 100, and destroyed considerable property.

Agriculture. — Hay and grain are the most important crops. In 1909 the acreage of hay was 2,369,000 and the value of trie crop $34,800,000. In the production of the hardy cereals, barley, rye and buckwheat, Wisconsin ranks high among the states of the Union; but oats and Indian corn are the largest cereal crops in the state. The crop of oats was 79,800,000 bushels (raised. ; on 2 ,280,000 acres and valued at $31,122,000) in 1909; of Indian corn, 50,589,000 bushels (raised on 1,533,000 acres and valued at $30,353,000); of barley. 24,248,000 bushels (raised on 866,000 acres

and valued at $13,579,000 — a crop exceeded only by that of California and that of Minnesota) ; of wheat, 3,484,000 busnels (raised on 179,000 acres and valued at $3»345.°°);of rye, 4,727,ooobushels (raised on290,oooacresand valued at $3,214,000 — a crop exceeded only by that of Pennsylvania and that of Michigan) ; and of buckwheat, 22 1 ,000 bushels (grown on 1 8,000 acres and valued at $172,000). The potato crop is large, 26,724,000 bushels being raised in 1909 on 262,000 acres, a crop exceeded only in New York, Michigan and Maine. Tobacco also is a valuable crop: in 1909 37,170,000 lb, valued at $3,419,640, were grown on 31,500 acres. In 1909 14,000 acres of sugar beets were harvested and 34,340,000 lb of sugar were manufactured in the four beet sugar factories in the state. In the south-central part of the state there are valuable cranberry marshes. Orchard fruits, especially apples, are of increasing importance.

The raising of live-stock, particularly of dairy cows, is an important industry. In 1910, out of a total of 2,587,000 neat cattle, there were 1,506,000 milch cows. The total number of horses in the state was 669,000 in rgio, when they were valued at $80,949,000. There were 1,034,000 sheep, and 1,651,000 swine.

Manufactures. — The growth of manufacturing; has been rapid : in 1850 the value of the manufactures was $9,293,068; in i860, $27,849,467; in 1S70, $77,214,326; in 1880, $128,255,480; in 1890, $248,546,164; and in 1900, $360,818,942. The product under the factory system, excluding hand trades and neighbourhood industries, was $326,752,878 in 1900 and $411,139,681 in 1905. The most important of the state's manufactures in 1900 and in 1905 were lumber and timber products, valued in the latter year at $44,395,766 (Wisconsin being second in rank to the state of Wash- ington). About 60% (both in quantity and value) of the lumber sawed in 1905 was white pine; next in importance were hemlock (more than one-fourth in quantity), basswood (nearly 4%) and, in smaller quantities, birch, oak, elm, maple, ash, tamarack, Norway pine, cedar and. spruce. The value of the product of planing mills was $11,210,205 in I 9°5 anf l other important manufactures based on raw materials from forests were paper and wood pulp ($17,844,174) and furniture ("11,569,591). Second in value in 1905 were cheese, butter and condensed milk ($29,904,791), in the product of which Wisconsin ranked second to New York in 1900 and 1905. In 1905 Wisconsin ranked first of all the states in the value of butter, second in the value of cheese and fifth in the value of condensed milk; the dairy product of Wisconsin in this year was 17-8 % (by value) of that of the entire country. Foundry and machine-shop products ranked third in value in 1905, when they were valued at $29,908,001, and when iron and steel manufactures were valued at $10,453,750.*

Among the other important manufactures 1111905 were: malt liquors ($28,692,340) and malt ($8,740,103, being 113-7% more than in 1900); flour and grist-mill products ($28,352,237; about 60% was wheat flour); leather ($25,845,123); wholesale slaughtering and meat-packing ($16,060,423); agricultural implements ($10,076,760); carriages and wagons ($7,511,392); men's clothing ($6,525,276); boots and shoes ($6,513,563); steam railway cars, constructed and repaired ($6,511,731); hosiery and knit goods ($4,941,744); cigars ($4,372,139); mattresses and spring beds ($3,527,587); and electrical machinery, apparatus and supplies ($3,194,132).

In 1905, out of a total factory product of $41 1 ,139,681 , $259,420,044 was the value of goods made in factories in the twenty-two muni- cipalities of the state, with a population (1900) of at least 8000; but only 36-3 % of the total number of factories were in urban districts. More than one-third of the value of factory products was that of the manufactures of Milwaukee ($138,881,545). Racine ranked second with a factory product valued at $16,458,965. The manufacture of

furniture in Wisconsin is centralized especially in Sheboygan, where in 1905 was manufactured about one-third of the furniture made in the stale.

Mines and Quarries. — The lead mines of south-western Wisconsin played an important part in the early development of the state (see § History). When the main deposits had been worked down to the water level, mini 11ˆ (up to that time principally of lead) stopped and did not start again until about 1900, when the high price of zinc stimulated renewed working of these deposits. The principal ores are galena, sphalerite or zinc blende and smithsonite or zinc carbonate, which is locally called " dry bone " and which was the first zinc ore mined in the state. In 1908 the lead product was valued at $347,592 and the zinc product at $1,711,364, Wisconsin ranking fourth among the zinc-mining states. The production of iron ore in the Gogebic and Menominee ranges on the upper Michigan border is important. Red haematite was mined in Dodge county before 1854; in 1877 the deposits in Florence county were first worked, and in 1882 276,017 tons were shipped from that county; and about 1884 began the development of the Gogebic deposits in Iron and Ashland counties. The maximum output was in 1890, being 948,965 long tons; in 1902 it was 783,996 long tons (79% from Iron county); and in 1908, 733,993 tons. The output is almost entirely haematite. There are large deposits of stratified clay along the shores of Lake Michigan, from which is made a

cream-coloured brick, so largely used in Milwaukee that that city has been called the "cream city"; the total value of clay products in 1907 was $i,i27,8i9and in 1908 $95 8.395- By fat" the most valuable mineral output is building stone, which was valued in 1908 at $2,850,920, including granite ($1,529,781), limestone ($1,102,009) and sandstone ($219,130). In 1907 and 1908 the state ranked fifth among the states of the country in the value of granite quarried ; in 1902 it ranked fifteenth. The industry began in 1880, when the first quarry (at Granite Heights, Marathon county) was opened. The principal quarries are in Dodge, Green Lake (a blackish granite is quarried at Utley and a pinkish rhyolite at Berlin), Marathon, Marinette, Marquette, Sauk, Waupaca and Waushara counties. Wisconsin granite is especially suitable for monumental work. Limestone is found in a broad belt in the east, south and west; more than 40% of the total output in 1908, which was valued at $1,102,009, was used for road- making and more than one-sixth in the manufacture of concrete. In 1907 and 1908 Wisconsin ranked seventh among the states in the value of limestone quarried. The first limestone quarries were opened at Genesee, Waukesha county, in 1848; at Wauwatosa, near Milwaukee, in 1855; and near Bridgeport in 1856. Freshwater pearls are found in many of the streams; and in 1907 and 1908 Wisconsin ranked first among the states in the value of mineral waters sold, with a value of $(,526,703 in 1907 and $1,413,107 in 1908, although in both years the quantity sold in Wisconsin was less than in Minnesota or in New York. The most famous of these springs are in Waukesha county, whence W ? hite Rock, Bethesda, Clysmic and other waters are shipped.

Forests.— ~ln 1890 and in 1900 (when the wooded area was esti- mated at 31,750 sq. m., or 58% of the total area of the state) Wis- consin was the foremost state in the Union in the production of lumber and timber. In 1905 the value of the lumber and timber product was exceeded by that of Washington; but as late as 1908 Wisconsin was the chief source of the white pine supply. Next to white pine (used largely in shipbuilding) in value in 1908 were red or Norway pine (used in house building), hemlock (used for lumber and wood pulp) and white spruce, a very valuable lumber tree. In 1908 the area of the state forest reserve lands under a state board of forestry (chiefly in Oneida, Forest, Iron, Price and Vilas counties) was 253,573 ? cres ;. Forest fires have been numerous and exceedingly destructive in Wisconsin; the loss of timber and other property from this cause in. 1908 was about $9,000,000.

Fisheries. — The fisheries of Wisconsin are of considerable import- ance ; the catch in 1908 was valued at $1,067,170, lake trout and herring being the most valuable. There is a state board of com- missioners of fisheries (see below, § Government), which distributed in 1908 149,338,069 eggs, fry and fingerlings, including 112,075,000 wall-eyed pike and about

12,000,000 each of lake trout and whitefish. There are state hatcheries at Madison (for brook and rainbow trout), Bayfield (brook, rainbow and lake trout and whitcfish), Oshkosh (lake trout, whitefish and wall-eyed pike), Minocqua (pike, bass and muskallonge), Delafield (black bass and wall - eyed pike) and Wild Rose (brook trcut).

Transportation and Commerce.— Railway building in Wisconsin began in 1851, when a track was laid from Milwaukee to Waukesha (20 m.), which was extended westward in 1854 to Madison and in 1857 to the Mississippi at Prairie du Chicn. This line was the fore- runner of the great Chicago, Milwaukee & St Paul system, which now crosses the southern half of the state with two trunk lines and with one line parallels the shore of Lake Michigan. The Chicago & North -Western and the Chicago, St Paul, Minneapolis & Omaha, which it controls, are together known as" The North -Western Line." The tracks of the Chicago & North-Western (built to Janesville in 1855 and to Fond du Lac in 1858) form a network in the eastern part of the state, affording direct connexions with Chicago. The Chicago, St Paul, Minneapolis & Omaha extends into the western part of the state, where it connects with the trans-Mississippi lines

of the Chicago & North-Western. The Chicago, Burlington & Quincy (owned by the Great Northern and the Northern Pacific railways) traverses the state along its western boundary and gives it access to a third great railway system with transcontinental service. The Minneapolis, St Paul & Sault Ste. Marie, in which has been absorbed the old Wisconsin Central, crosses the state and extends into the Canadian North- West, sharing in the heavy grain traffic of that section, and, like the Duluth, South Shore & Atlantic, which runs along the Lake Superior shore, is a link in the trans-continental system of the Canadian Pacific, which controls both these roads. The Northern Pacific enters Wisconsin in its north-western corner and extends to the Lake Superior countiy. The Green Bay & Western railway between Winona and Kewaunee has ferry con- nexion across Lake Michigan. In 1900 there w r ere 6538 in. of track, and on the 1st of January 1909 7512 m. Characteristic of the commerce of the state is the shipment by the Great Lakes of bulky freight, chiefly iron ore, grain and flour and lumber. The return freight movement to the Wisconsin lake ports is made up chiefly of coal from the Lake Erie shipping points for the coalfields of Penn- sylvania and West Virginia. Milwaukee is one of the leading lake ports, and is the only port of entry in the state; its imports were valued at $796,285 in 1899 and at $4,493,635 in 1909, and its exports at $2726 in 1899 and at $244,890 in 1909.

To connect the upper Mississippi river and the Great Lakes, between 1840 and 1850 a canal was begun between the Fox, flowing into Green Bay, an arm of Lake Michigan and the Wisconsin river, flowing into the Mississippi,

1 and improvement of navigation on these rivers was undertaken by the state with the assistance of the Federal government; in 1853 the work came into the hands of a private corporation which in 1856 opened the canal. In 1872 it was taken over by the United States. In 1887 the route through the Wisconsin river was abandoned, and thereafter only the Fox river was improved. Up to June 1909 $3,810,421 had been spent by the Federal government on_ this improvement. Green Bay has communication with Lake Michigan, not only by way of its natural entrance, but by a government ship canal (built. 1872-1881 by a private company; taken over by the Federal government in 1893; maximum draft in 1909, 20 ft.; projected channel depth, 21 ft.) at Sturgeon Bay, an arm of Green Bay, which cuts across the Door county peninsula. In 1908 there passed through this canal 2307 vessels carrying cargoes of an estimated value of $18,261,455-15.

Population. — The populationof Wisconsin in 1890 was 1,686,880 (exclusive of 6450 persons specially enumerated); in 1900 the total was 2,069,042 — an increase of 22-2 % on the basis of the total at each enumeration; and in 1910 it reached a total of 2,333, 860. 2 The density of the population in 1910 was 42,2 to the square mile. Of the total population in 1900, 1,553,071, or 75-1%, were native- born, the increase in native-born since 1890 having been 32-3%, while there was a decrease of foreign-born of 0-6%. The falling off in foreign immigration in the decade 1890-1900 contrasts strongly with the increase of 28-1 % in the number of foreign-born in 1880- 1890. Of the native-born population in 1900, 84%, or 1,304,918, were born within the state. Of the foreign-born 242,777 were Germans, 61,575 were Norwegians, 26,196 were Swedes, 25,607 were natives of German Poland, 23,860 were English-Canadians and 23,544 were Irish. Of the total population 1,472,327 persons, or more than seven-tenths (71-2%), were of foreign parentage — i.e. either one or both parents were foreign-born — and 576,746 were of German, 134,293 of Norwegian, 76,593 of Irish and 70,585 of Polish parentage, both on the father's and on the mother's side. At the census of 1840, with the exception of a few thousand French- Canadians, the population was made up of American-born pioneers from the Eastern states, and in the southern portion of the terri- tory of a sprinkling of men from Kentucky, Virginia and farther south. Before the next census was taken the revolutionary move- ment of 1848 in Germany led to the emigration of thousands from that country to Wisconsin, and there was an increase of 886-9% in the population from 1840 to 1850. Norwegians and other Scandinavians, Irish, Poles, Dutch, Belgians and Swiss followed. Germans and Irish are now scattered throughout the state; but the German element predominates markedly in Milwaukee. Norwegians, Danes and Swedes arc more numerous in the western and northern counties. There are Finns in Douglas

county and Icelanders on Washington Island, in Green Bay. Poles are chiefly in Milwaukee, Manitowoc and Portage counties, Belgians and Dutch in Brown and Door counties, German Swiss in Green, Fond du Lac, Winnebago, Buffalo and Pierce counties, and Bohemians in Kewaunee county, where they form almost 50% of the population. Some Italians are massed in Vernon and Florence counties, and there are French Canadians in the north. There were 8372 Indians, of whom 1657 were not taxed, 2542 negroes, 212 Chinese and 5 Japanese in the state in 1900. The Indians include representatives of the Menominee (1487 m 1909), Stockbridge and Munsee (582) tribes under the Keshena School, Chippewa under the Lac du Flambeau School (705) and the La Points ■_ School (4453), Oneida (2259) under the Oneida

_ x The Fox and Wisconsin rivers are separated at Portage by a distance of only 2 m.

2 At each preceding census the population was as follows: (1840) 30,945, (1850) 305,391, (i860) 775.881, (1870) 1,054,670. By the state census of 190= it was 2,228,949.

School, Winnebago (1094) under the Wittenberg School and Pota- watomi (440) not under an agent. The civilized Brotherton and Stockbridge Indians live principally in Calumet county. Among religious denominations the Roman Catholics, with 505,264 members in 1906, had 50-5% of the total communicants or church members in the state. The Lutheran bodies ranked next with 284,286 members (including 153,690 of the Evangelical church, 49,535 of the United Norwegian church, 23,927 of the Synod for the Norwegian Evangelical church, 15,471 of the Evangelical Lutheran Joint Synod of Ohio, 15,220 of the Evangelical Lutheran Synod of Iowa and 8695 of the General Council). Only one other state (Pennsylvania) had a larger percentage of the total membership of this denomination. There were 57,473 Methodists (chiefly of the Methodist Episcopal Church), 26,163 Congregational ists and 21,716 Baptists.

Government. — The original constitution of the state, adopted in 184S, and amended in 1869, 1S70, 1874, 1877, 1881, 1882, 1902 and 1908, is still in force. An amendment may be proposed by either house of the legislature, and if passed by two successive legislatures by a majority of the members elected to each house must be submitted to the people for ratification by a majority vote. A constitutional convention may be called on the recom- mendation of a majority of the Senate and Assembly if this

proposal receives a majority vote at the next election for members of the legislature. Suffrage was originally granted to every male 1 twenty-one years of age or upwards resident in the state for one year preceding any election — if he were a white citizen of the United States, or a white of foreign birth who had declared his intention to be naturalized, or an Indian declared by Congress a citizen of the United States, or a civilized person of Indian descent not a member of any tribe; and the constitution pro- vided that the legislature might by law give suffrage to others than those enumerated if such an act of legislature were approved by a majority of the popular vote at a general election. By an amendment of 1882 the word " white " was omitted and by an amendment of 1908 it was provided that those foreign-born and unnaturalized in order to become electors must have declared their intentions to become citizens before the 1st of December 190S, and that " the rights hereby granted to such persons shall cease on the first day of December a.d. 191 2." The amend- ment of 1908 also permits the legislature to provide for the registration of electors in incorporated cities and villages.

The official ballot is of the blanket type, with names of candi- dates in party columns, but with no candidate's name repeated on the ballot and with no emblems to mark the party columns. In 1909 an act was passed permitting county boards to adopt a " coupon " ballot. 2 Since 1905 there has been a direct nomina- tion system of primaries for all officers except delegates to national nominating conventions.

Executive power is vested in a governor and a lieutenant- governor, elected for two years. The governor's salary (since 1869) is $5000 a year and the lieutenant-governor's $1000. Candidates for either office must be citizens of the United States and qualified electors of the state. The lieutenant-governor is pre- sident of the Senate with a casting voU, only. A bill vetoed by the governor becomes a law if it is approved by two-thirds of the members present in each house; and a bill not returned by the governor within six days (excepting Sunday; before 1908 the constitutional limit was three days) after its presentation to him becomes a law unless the return of the bill is prevented by the adjournment of the legislature. The governor has pow r er to grant reprieves, commutations and pardons, except for treason — he may suspend execution of sentence for treason until action is taken by the legislature— and in cases of impeachment.

The administrative officers, a secretary of state, a treasurer and an attorney-general, arc elected for two years and act as commissioners of public lands. The secretary of state is ex- ojjicio auditor; and he acts as governor if the regularly elected

1 Excepting persons under guardianship, those weak-minded or insane,

those convicted (without restoration to civil rights) of treason or felony, and those who have engaged (directly or indirectly) in a duel.

2 The coupon ballot was proposed for use throughout the state, but was defeated by popular vote in April 1906. The ticket is made up of as many coloured sheets as there are party organizations (plus one for independent nominations), and the name of each candidate is on a perforated slip, which must be detached if it is to be voted.

governor and lieutenant-governor die, are removed from office or are absent from the state. A state superintendent of public instruction is chosen by popular vote for a four-year term. Other administrative officers are a commissioner of insurance (from 1867 to 1878 the secretary of the state was commissioner of insurance; the office became elective in 1881); a commissioner of labour and industrial statistics; three railroad commissioners, 3 who have jurisdiction over all public utilities, including telegraph and telephone; a commissioner of banking; a dairy and food commissioner ; a state superintendent of public property ; three tax commissioners who act (since 1901) as a state board of assessment; commissioners of fisheries (established 1874); a state board of agriculture (1897); and a state board of forestry (1905, succeeding a department created in 1903).

The legislature consists of a Senate and an Assembly and meets biennially, and when called in special session by the governor to transact special business definitely named in the governor's call. The number of assemblymen cannot be less than 54 or more than 100, and the number of senators must be not mo^e than one-third or less than one-fourth the number of members of the Assembly. In 1910 there were 33 senators and 100 assemblymen. Elections to the Senate and Assembly arc biennial 4 and the term of members of the Assembly is two years, but the senatorial term is four years and only one-half of the members are elected each two years. A candidate for either house must have resided in the state at least one year, must be a qualified elector in the district from which he is chosen, and may not be a member of Congress or hold any military or civil office under the United States. Since 1855 a state census has been taken every ten years, and on the basis of these censuses the legislature re-apporlions the Senate and Assembly districts. Each member of the legis- lature receives $500 a year and 10 cents a mile for mileage. Any bill may originate in either house, and either house may amend a bill passed by the other. Special legislation of several specified kinds is forbidden, especially by amendments of 1871 and 1892; and the constitution as adopted in 1848 prohibited the legislature's authorizing any lottery or granting any divorce. The Assembly may impeach civil officers by a majority of all elected members, and the Senate to try impeachments; for conviction a two-thirds

vote of all members present is required.

The judicial power of the state is vested: in a supreme court 5 of seven members (salary $6000 a year; elected for a term of ten years; the senior justice is chief justice) with appellate jurisdiction throughout the state, general superintend- ence over all inferior courts, power to issue, hear and determine writs of habeas corpus, mardamus, injunction, quo warranto, certiorari and other original and remedial writs; nineteen (only five under the constitution of 1848) circuit courts, of one judge each except in the second circuit (including Milwaukee) in which there are four judges, elected (at a spring election, and not at the general state election) by the voters of the circuit district; probate judges, one elected (for two years) in each county, except where the legislature confers probate powers on inferior courts; and in towns, cities and villages, justices of the peace, elected for two years.

Local Government. — Wisconsin has the mixed or township-county system of local government. Each township (or " town," as it is commonly called) elects at its annual town meeting on the first Tuesday in April three supervisors, a clerk, a treasurer, one or more assessors, two justices of the peace, from one to three constables, and, if the town has a library, a librarian. Justices of the peace hold office for two years, other town officers for one year only, except that in a county having a population of 100,000 or more (Milwaukee county), town meetings are biennial and all officers are elected for two years. For other than school purposes rates must not exceed 2 % of the assessed valuation of the taxable property in the town. The chairmen of the several town boards of supervisors, with the

3 The office of railroad commissioner was created in 1874, became elective in 1881 and was replaced under an act of 10,05 by a com- mission of three members, which received jurisdiction over other public service corporations in 1907.

4 Until 1881 elections to the legislature were held annually, and the term of assemblymen was one year and of senators two years.

- *Not separately organized until 1853; the judges of the circuit court acted as justices of the supreme court.*

supervisor of each ward of a city and the supervisor of each village in the county, constitute the county board of supervisors, and each county elects biennially, at the general election in November, a clerk, a treasurer, a

sheriff, a coroner, a clerk of the circuit court, a district-attorney, a register of deeds and a surveyor. The county board represents the county, is entrusted with the care of the county property and the management of the county business, appoints a supervisor of assessments and levies the taxes necessary to defray the county expenses. The county board also elects a county high- way commissioner for a term of three years, is required to designate a system of prospective county highways, and may levy a special tax and borrow money for the development of the system. Cities are chartered according to population, 1 with a mayor, a single legislative chamber known as the board of aldermen or city council and the usual administrative officers and boards. The mayor, aldermen, treasurer, comptroller, justices of the peace and supervisors must be elected by the people, but the other offices are filled as the council of each city directs. An act of 1909 provides for the adoption of government by commission in any city of the second, third or fourth class which votes for this form of government at an election called by a petition signed by 25 % ot the voters at the preceding election for mayor.

Miscellaneous Laws.— A married woman may manage her separate property as if she were single. A widow is entitled to a dower in one-third of her husband's real estate, and a widower is life tenant by courtesy of all the real estate of w r hich his wife died seized and not dis- posed of by her last will, unless she leaves issue by a former husband, to whom the estate might descend, in which case her estate passes immediately to such issue. If either husband or wife dies intestate and leaves no issue the surviving spouse is entitled to the entire estate of the deceased, both real and personal. The causes for an absolute divorce are adultery, impotency, sentence to imprisonment for a term of three years or more, wilful desertion for one year, cruel or inhuman treatment, habitual drunkenness and voluntary separation for five years. For any other cause than adultery an action for a divorce cannot be brought unless one of the parties has been a resident of the state for two years immediately preceding the suit. Neither party is permitted to marry a third party until one year after the divorce has been obtained. Adultery is punishable by imprisonment in the state prison for not more than three years nor less than one year, or by a fine not exceeding $1000 nor less than S200. A husband who wilfully abandons his wife, leaving her destitute, or who refuses to support her when he is able to do so, may be punished by imprisonment in the state prison not exceeding one year or in the county jail or workhouse not more than six months nor less than fifteen days, and for ten days, in the discretion of the judge, he may be kept on a bread and water diet. A homestead owned and occupied by any resident of the state and consisting of not more than 40 acres of agricultural land outside the limits of a city or village, or one-fourth of an acre within a city or village, together with the

dwelling-house and other appurtenances, is exempt from liability for debts other than labourers', mechanics' and pur- chase-money liens, mortgages and taxes. If the homestead is sold the proceeds from the sale, to an amount not exceeding $5000, are likewise exempt for a period of two years, provided they are held for the purpose of procuring another homestead. If the owner is a married man his homestead cannot be sold or mortgaged without his wife's consent. The employment of children under fourteen years of age in any factory, workshop, mine, bowling alley or beer garden is forbidden, and their employment at any gainful occupation is permitted only during the vacation of the public school. A child between fourteen and sixteen years of age may be employed at a gainful occupation only upon the recommendation of the school principal or clerk of the board of education. No child under sixteen years of age may be employed longer than fifty-five hours in any one week, more than ten hours in any one day, more than six days in any one week, of between 60 p.m. and 7-0 a.m.

Other radical legislation, especially in regard to railways, has included: the Porter Law, regulating rates, which was enacted in 1874 during the " Granger Movement," was modified from time to time, and was displaced by a law of 1905 (in 1908 declared constitu- tional so long as stockholders receive a " reasonable compensation " on investments) creating a state railway commission, and providing for the physical valuation of railways on an ad valorem basis for taxation ; a law (1907) making 2 cents a mile the maximum fare; an anti- tipping law (1905); a law forbidding the sale of cigarettes; an act (1907) forbidding insurance companies to do both participating and non-participating business; and an eight-hour labour law in effect on the 1st of January 1908.

Finance. — Revenue for state purposes is derived principally from taxes on corporations, from an inheritance tax and from departmental and institutional fees and charges; that for counties, towns,' villages and cities from a general property tax. The general property tax has long been employed almost wholly for educational purposes only. The state tax on railways and other public service corporations is

'The first class comprises cities having a population of 150,000 or more (Milwaukee) ; the second class those having a population between 40,000 and 150,000; the third class those having a popu- lation between 10,000 and 40,000; the fourth class those having a population less than 10,000.

levied on an ad valorem basis; but telephone companies are taxed by collecting a percentage of the gross receipts. Insurance companies are taxed on premiums and income. In 1908 the constitution was amended to permit a graduated tax on incomes, privileges and occupations. A poll tax is levied for highway purposes in towns and villages, but the general charter law

does not provide for the collec- tion of poll taxes in cities. The proceeds from corporation taxes in- creased from $1,711,387 in 1899 to $3,969,771 in 1908. The state receipts from all sources increased from $4, 070, 3i6forthe year ending September 30, 1899, to 88,299,982 for the year ending June 30, 1908; the disbursements in the latter year were 87,762,771 or $537,211 less than the receipts.

As a result of the failure of " wildcat " banks during the Territorial period, a clause was inserted in the state constitution forbidding the legislature to charter a bank or pass a general banking law until the people had voted in favour of banks, and providing further that no bank charter or general banking law should be of any force until a majority of the voters at a general election had approved of it. The people gave their approval to a general banking law in 1852, and state banks were incorporated under it. Private banks and one savings bank were also chartered. In 1903 a state banking depart- ment was created under the management of a commissioner of bank- ing appointed by the governor with the concurrence of the Senate for a term of five years. Under this law private banks became state banks, and all except national banks arc examined by the commissioner, his deputy or some person appointed by the com- missioner, at least once a year. When satisfied that a bank has become insolvent, the commissioner may take possession of it and wind up its affairs. In 1909 there were 470 state banks and 3 savings banks with total resources amounting to $140,155,455.

To prevent such extravagant expenditures for internal improve- ments as had brought disaster to Michigan and other states, the framers of the constitution of Wisconsin inserted a clause limiting its aggregate indebtedness to $100,000 for all purposes other than to repel an invasion, to suppress an insurrection or for defence in time of war, and the state is free from debt with the exception of that contracted on account of the Civil War. This war debt, although amounting to .$2,251,000, is held by four state educational funds. A constitutional amendment, adopted in 1874, limits the indebtedness of each county, city, town, village and school district to 5 % of the value of its taxable property.

Education. — Wisconsin has an excellent free public school system, which was established in 1848 and which provides a graded system of instruction in country district and city schools, high schools and normal schools and the University of Wisconsin (incorporated 184S; see Wisconsin, University of). By a law of 1907 school attendance (24 weeks per annum in the country — a law of 1903 had required only 20 weeks — 32 weeks in cities) was made compulsory for children between seven and fourteen years of age who do not live more than 2 m. from school by the nearest travelled public highway. In 1907-1908 27-2% of those between seven and fourteen

years of age in the state attended no school. The total public school enrolment in 1909- 1910 was 466,554. In 1901 a law was enacted providing for state graded schools of two classes, which must be opened for at least nine months each year; graded schools of the first class (of three or more departments) receive $300 a year each from the state, and graded schools of the second class (of two depart- ments only) receive $200 a year each from the state. About 1906 rural graded schools, outside of villages, were first organized. There are twenty-tw T o day schools for the deaf. There are a few township high schools (28 out of 285 in 1909), and these receive from the state one-half of the total annually paid for teachers' salaries; for free high schools the first state provision was made in 1875. There are special kindergarten training departments in the Milwaukee and Superior schools, depart- ments for manual training at Oshkosh and Platteville, and a training department in domestic science at the Stevens Point school. The first kindergarten officially connected with any American state normal school was opened at Oshkosh in 1880. The state normal schools arc supported largely from the interest ($89,137 in 1908) of a fund ($1,957,230 in 1908) created in 1865 from the sale of swamp and overflowed lands, and from an annual state tax ($230,000 in 1908). In addition to the state university the state maintains at Platteville a school of mines, opened in 1908. Under state control there is a system of teachers' and farmers' institutes. A Free Library Commission of five members created in 1895 maintains about 650 circulating free public libraries comprising more than 40,000 volumes. In 1907 there were about 960,000 volumes in public township.

libraries for which a law of 1887 had made provision; since

1895 the formation of such libraries has been mandatory, and books, chosen by the county superintendent, are bought from a fund of 10 cents for every person of school age in towns, villages and cities of the fourth class. An act of 1901 permits county boards to establish county systems of travelling libraries. In 1908 the total expenditure for public education in the state was $12,547,574; of this sum $10,604,294 was spent for common schools, high schools and graded schools, $1,091,135 for the university, and $547 ,661 for normal schools. The total income for schools in 1907-1908 was $1,773,659, of which $1,379,410 was from the seven-tenths-of-a-mill tax, $200,000 was from licence fees and taxes upon corporations (for salaries of rural school inspectors) and $194,249 the income from the common school fund which in that year amounted to $3,845,929.

Educational institutions of collegiate rank are Beloit College (1846; originally Congregational, now undenominational) at Beloit; Carroll College (1846, Presbyterian), at Waukesha; Lawrence College (1S47; Methodist Episcopal), at Appleton; Concordia College (1881; Lutheran), Marquette University (1864, Roman Catholic), and Milwaukee-Downer College (1895; non-sectarian, for women; an outgrowth of Downer College, Congregational and Presbyterian, founded at Fox Lake in 1S53), all at Milwaukee; Milton College (1867; Seventh Day Baptist), at Milton; Northwestern University (1865; Lutheran) at Walertown; Ripon College (1851; originally under Presbyterian and Congregational control, now non-sectarian), at Ripon; Way land University (1855; co-educational; Baptist), at Beaver Dam; and the following Roman Catholic schools: St Clara Academy (1847; Dominican) at Sinsiniwa, St Francis Seminary (1853) at St Francis, and St Lawrence College (1861, Capuchin) at Mt Calvary. There are also many private academies and trade or technical schools, and six industrial schools for Indians.

Charitable and Penal Institutions. — In the number and equipment of its reformatory, charitable and penal institutions, Wisconsin stands high. These institutions are under the general direction ot a state board of control (established in 1905) of five members (one a woman), appointed by the governor for a term of five years. This board has charge of the following institutions: a State Hospital for the Insane (i860) at Mendota; the Northern Hospital for the Insane (1873) at Winnebago, 4 m. N. of Oshkosh; a School for the Deaf (1852) at Delavan, Walworth county, in which the teaching is principally oral and which includes a high school; a School for the Blind (1849; taken over by the state in 1850) at Janesville; an Industrial School for Boys (opened in i860, as a House of Refuge) at Waukesha, with a farm of 404 acres; the State Prison (1853) at Waupun; State Public School for Dependent and Neglected Children (1886) at Sparta, wUh a farm of 234 acres; Wisconsin Home for Feeble Minded (1896) at Chippewa Falls; Wisconsin State Re- formatory (1898), near Green Bay; and Wisconsin State Tubercu- losis Sanatorium (1907) at Wales, Waukesha county. In addition the board has partial control over the Wisconsin Workshop for the Blind (1903) at Milwaukee, where there is a willow ware factory, and the Wisconsin Industrial School for Girls (1875) also at Mil- waukee. Its powers of inspection extend over 5 semi-state in- stitutions, 33 county insane asylums, 69 gaols, 48 poor-houses, 50 private benevolent institutions and 206 police stations and lockups. The board has also power of visitation and inspection over the Wisconsin Veterans' Home at Waupaca, founded in 1887 by the state department of the Grand Army of the Republic. In the state's treatment of the insane, chronic cases are separated and sent to the county asylums. The labour of convicts in the state prison is leased; until 1878 the state itself supervised

manufacturing in the prison; then for twenty-live years the convicts were employed in making shoes for a Chicago firm ; and since 1903 the state has received 65 cents a day for the labour of each convict, and at least 300 convicts are employed in the manufacture of socks and stockings, from which in 1906-1908 (two yeais) the income to the state was $156,890. In 1910 a binding twine factory was established in the prison. In the state reformatory the labour of some inmates is leased to tailors, and the others make brooms or bricks, or work in a cabinet shop or on the farm. Since 1907 a parole law has been in force for prisoners with a good record at the state prison. By a law of 1909 certain offenders are placed under probation under the supervision of the State Board of Control.

History. — Politically Wisconsin has been under French domination (from 1634 to 1760); under British domination (from 1760, formally 1763, to 1783); and under that of the United States since 1783. But the British influence on the com- munity was negligible, and British rule was never more than

nominal and was confined to the military posts. When American troops occupied the posts at Green Bay and Prairie du Chien in 1S16, thirty-three years after it had become a part of the territory of the United States, the region was still almost ex- clusively French in manners, customs and population; and so it remained for nearly two decades.

The region comprised in the present state of Wisconsin, when first explored by Europeans, was a favourite hunting-ground for the Indians who constantly crossed this region between the Great Lakes and the upper Mississippi. The Indian population of Wisconsin in the first half of the 17th century was probably larger than that of any region of similar size east of the Mississippi. Among the many different tribes were the Sioux, Chippewa, Kickapoo, Menominee, Mascoutin, Potawatomi, Winnebago, and Sauk and Foxes. In the eastern and southern portions of the region there are still numerous mounds, the relics of an earlier Indian civilization. 1 In the lead regions in the S.W., with the help of Pawnee slaves, the Indians worked the lead diggings in a rough way. The whole course of the early history of Wis- consin was profoundly influenced by these racial and geographic considerations. The French adventurers, bent on finding either a " North- west passage " or some land route to the Pacific (which they believed to be no farther west than the Mississippi) , naturally went west by the water routes of Wisconsin; as a fine field for their bartering and trading with water-courses by which they could con- vey their pelts and skins back to Montreal, the region attracted the coureurs de bois and fur traders; and it seemed promising also to the zealous French Catholic missionaries. The impelling influences on the French settlement of the region were the love of explora- tion and adventure, the commercial instinct and religious zeal.

Jean Nicolct, an experienced explorer, was sent west by Samuel de Champlain, the governor-general of New France, in the summer of 1634 to investigate mysterious rumours of a people known as " the men of the sea " who were thought by some to be Tatars or Chinese. 2 After a long and difficult journey into a region which he seems to have been the first white man to enter, Nicolet landed on the soil of Wisconsin at a point oh Green Bay about 10 m. below the present city of Green Bay. Near what is now known as Red Banks there was a populous village of Winnebago, which welcomed and entertained him. He made a treaty with the Indians, went up the Fox river to a point somewhere near the present city of Berlin (Green Lake county) where he found another large village, and returned to Green Bay and thence to his post on Lake Huron.

Twenty years later Pierre Esprit, Sieur de Radisson, and Medard Chouart, Sieur des Groseilliers, started (1654) from Quebec, crossed Lakes Huron and Michigan, wintered in Wis- consin, ascended the Fox, crossed to the Wisconsin and possibly reached the Mississippi river eighteen years before Jacques Marquette and Louis Joliet In 1659-1660 they were again in the West, but the opposition of the French authorities pre- vented their further explorations.

The first of the missionary pioneers was the Jesuit, Father Rene Menard, who in 1661 lost his life on the upper Wisconsin river. In 1665 Father Claude Allouez established the first per- manent mission in Wisconsin on the shores of Chequamegon Bay, near the first trading post established by Radisson and Groseilliers. In 1669 he was succeeded by Father Jacques Marquette {g.v.) and went to the Fox River Valley; there he established the mission of St Francis Xavier at the first rapids 3 on the Fox river near a populous Indian village. About this mission, one

1 One of the most famous of these mounds is the so-called Elephant Mound, 4 m. S. of Wyalusing, in Grant county in the S.W. corner of the state, near the Mississippi river; it is an effigy mound, and a drifting of earth changed its original shape, that of a bear, so that it roughly resembled an elephant; see pp. 91-93 of the Twelfth Annual Report (1894), Bureau of American Ethnology.

2 These " gens de mer " were the Winnebago Indians; the name " ouinipegou," meaning " men of the fetid water," was interpreted by the French to apply to salt water, whereas it probably referred to sulphur springs near Lake Winnipeg, from which the Winnebago came to Green Bay.

3 It was from these " rapides des peres " (rapids of the fathers) that De Pere was named.

of the most successful established by the Jesuits in the West, gathered a group of traders who formed a settlement that for many years existed as a transient post and store-house for trappers.

Father Marquette, forced in 167 1 by Indian wars to abandon his post on Chequamcgon Bay, settled with the Huron at the Straits of Mackinac, whence in May 1673 accompanied by Louis Joliet he set out for the Mississippi river. They halted at De Pere, set off down the Fox-Wisconsin route, followed the Wis- consin to its mouth and came out upon the Mississippi near the site of the present city of Prairie du Chicn, on July 17th, exactly two months after they left St Ignace mission on Mackinac Island. After descending the Mississippi to the mouth of the Arkansas they returned by way of the Des Plaines portage, paddled along the western shore of Lake Michigan, and arrived at De Pere. In September 1670 Robert Cavelier, Sieur de la Salle, and Henri de Tonty entered the mouth of the Fox river in the li Griffon," the first ship to sail the Great Lakes. In the same year Daniel Greysolon Du Luth, a coureur de hols, explored the upper Missis- sippi and the Wisconsin and Black rivers. In 1680 Father Louis Hennepin, a Recollet Franciscan who had accompanied La Salle, followed the Mississippi northward from the mouth of the Illinois along the western border of Wisconsin to the site of the present city of St Paul. The same course was followed by the fur-trader, Pierre Charles Le Sueur, in 1683.

In 1671 Simon Francois Daumont Saint-Lusson at Sault Ste Marie had taken formal possession of the region in the name of the king of France; in 1685 Nicolas Perrot (1644-e. 1700), a trader who had first visited the wilds of Wisconsin probably as early as 1665, was appointed " commandant of the West," and this event closes the period of exploration and begins that of actual occupation. Traders had begun to swarm into the country in increasing numbers, and to protect them from the Indians and to control properly the licensed fur-trade a military force was necessary. Perrot built a chain of forts along the Mississippi and a post (the present Galena, Illinois) near the southern boundary of the state, where he discovered and worked a lead mine. In 1712 the slaughter of a band of Foxes near Detroit was the signal for hostilities which lasted almost con- tinuously until 1740, l and in which every tribe in the Wisconsin country was sooner or later involved either in alliance with the Foxes or with the French; the Chippewa, always hostile to the Foxes, the Potawatomi and the Menominee sided with the French. This war seriously interfered with the French plans of trade development and exploitation, and by rendering difficult the maintenance of a chain of settlements which might have con-

nected Canada and Louisiana was a contributing cause of the final overthrow of French dominion. In this period permanent military posts were established at Green Bay and Chequamegon (r 7 1 8) ; in 17 18 it was reported that traders had settled at Green Bay and De Pere; in 1727 a post was established on Lake Pepin.

Wisconsin was little disturbed by the Seven Years' War. Yet the French and Indians of Wisconsin contributed their quota to the French armies — a force of half-breeds and Indians under a half-breed, Charles Michel de Langlade (1729-1800). After the fall of Montreal (Sept. 1760) Robert Rogers, who had been sent to Detroit to occupy the French posts in the West, dispatched Captain Henry Balfour with a force of British and Colonial troops to garrison Mackinac and the Wisconsin posts which had been dismantled and were almost deserted. He arrived at La Baye (Green Bay) in October 1761, and left there a garrison under Lieut. James Gorrell of the 60th (Royal American Foot) Regiment. The traders who accompanied them were the nucleus of the first English-speaking colony on Wisconsin soil. The French fort was rechristened Fort Edward Augustus. The period of British occupation was brief. On the outbreak of the conspiracy of Pontiac Lieut. Gorrell was compelled (in July 1763) to evacuate the fort, and make his way to Montreal. 2 When

1 In that year the Foxes were scattered or forced to surrender by Pierre Paul le Perriere, sicur Marin, who had been appointed com- mandant of the West in 1729.

- *It was not until 1814 that a British force again occupied a Wisconsin post.*

the conspiracy was crushed in 1765, Wisconsin was reopened for traders, and not only French but American merchants and travellers flocked into the region. Among these were Alexander Henry (1739-1824), who as early as 1760 had visited the site of Milwaukee, and who now obtained a monopoly of the Lake Superior trade, and Jonathan Carver (q.v.), who in 1766 reached Green Bay on his way to the Mississippi.

In 1774 was passed the Quebec Act for the government of the Province of Quebec into which the Wisconsin region was incorporated by this act, but it had little effect on the French settlements west of Lake Michigan, which remained tlnoughout the entire British period a group of detached and periodically self-governing communities. Little as they cared for their British rulers the Wisconsin voyagcurs and kahitans, influenced probably by their cupidity and by actual money payments, for the most part adhered to the British cause during the War of Independence. De Langlade led his French and Indian forces against the American frontier communities west

of the Alleghanies. This pro-British spirit, however, did not dominate the whole Wisconsin region, and while De Langlade was harassing the Pennsylvania and Virginia frontier, Godefrey de Linctot, a trader of Prairie du Chien, acting as agent for George Rogers Clark, detached several western tribes from the British adherence, and personally led a band of French settlers to his aid. The close of the war, although it conveyed the region to the sovereignty of the United States, was not followed by American occupation. In this period, however, the fur-trade assumed proportions of greater importance, and trading posts were established by the North-west Company (Canadian). In 1786 a more systematic attempt was made to work the lead mines by Julien Dubuque, who obtained the privilege from the Indians. In 1787 Wisconsin became part of the North-west Territory, but it was not until after the ratification of Jay's treaty that in 1796 the western posts were evacuated by the British. Before the actual military occupation (1816) by the United States, American traders had begun to enter into a sharp rivalry for the Indian trade. In 1800 Wisconsin was included in the newly organized Indiana Territory; and in 1809 on the admission of Indiana as a state it was attached to Illinois. During the second war with Great Britain, the Wisconsin Indians and French settlers generally sided with the British, and in 1814 many of them participated in Major William McKay's expedition against Fort Shelby at Prairie du Chien. In 1816 Fort Howard was built at Green Bay, and Fort Crawford at Prairie du Chien. In the same year was confirmed the treaty negotiated in 1804 by William Henry Harrison, by the terms of which the Indian title to the lead region was extinguished. In 1810 the product of lead had been about 400,000 lb, largely mined and smelted by Indians, but the output was now increased enormously by the American miners who introduced new machinery and new methods, and by 1820 there were several thousand miners in the region, in- cluding negro slaves who had been brought north by Southern prospectors from Kentucky and Missouri. In 1818 Illinois was admitted to the Union and Wisconsin was incorporated in Michigan Territory, and at that time American civil government in the Wisconsin region was first established on an orderly and permanent basis. Wisconsin then comprised two counties, Brown (cast) and Crawford (west), with county seats at Green Bay and Prairie du Chien. Until 1830 the fur-trade, controlled largely by John Jacob Astor's American Fur Company, con- tinued to be the predominating interest in the Wisconsin region, but then the growing lead mining industry began to overshadow the fur-trade, and in the mining region towns and smelting furnaces were rapidly built. Indian miners were soon driven out of business and were nearly crowded out of their homes. Friction between the settlers and the Indians could not long be avoided, and in 1827 Red Bird and his band of Winnebago attacked the whites, but after some bloodshed they were defeated by Major William Whistler (1780-1863) of Fort Howard. Five years later occurred a more

serious revolt, the Black Hawk War (see Black Hawk), which also grew out of the dispute over the mineral lands.

The Black Hawk War not merely settled the Indian question so far as Wisconsin was concerned, but made the region better known, and gave an appreciable impetus to its growth. A series of Indian treaties in 1820, 1S31, 1S32 and 1833 extinguished the Indian titles and opened up to settlement a vast area of new land. The first newspaper, the Green Bay Inlelligeticer, began publication in 1833. In 1S34 two land offices were opened, and by 1836, 878,014 acres of land had been sold to settlers and speculators. A special census showed a population of more than 11,000 in 1836. The new growth started a movement for a separate Territorial organization for that part of Michigan lying west of Lake Michigan, but this was not finally accomplished until 1836, when Michigan entered the Union. The new Territory of Wisconsin comprised not only the area included in the present state, but the present Iowa and Minnesota and a considerable portion of North and South Dakota. 1 Henry Dodge (1782-1867) was appointed its first governor by President Jackson. The first Territorial Council met in 1S36 at Old Belmont, now Leslie, Lafayette county, but in December of that year Madison was selected as the capital, after a contest in which Fond du Lac, Milwaukee, Racine, Green Bay, Portage and other places were considered, and in which James Duane Doty, later governor, owner of the Madison town plat, was charged with bribing legislators with town lots in Madison. In 1838 the Territory of Iowa was erected out or all that part of Wisconsin lying west of the Mississippi, The movement for the admission of Wiscon- sin to the Union was taken up in earnest soon after 1840, and after several years' agitation, in which Governor Doty took a leading part, on the 10th of August 1846 an Enabling Act intro- duced in Congress by Morgan L. Martin, the Territorial delegate, received the approval of President Polk. Meanwhile the Terri- torial legislature had passed favourably on the matter, and in April the act was ratified by a popular vote of 12,334 to 2487. The first constitution drafted was rejected (5th April 1847) owing to the articles' relating to the rights of married women, exemptions, the elective judiciary, &c. A second convention, thought to be more conservative than the first, drafted another constitution, which on the 13th of March 1848 was adopted by 16,709 ayes and 6394 noes. The constitution was approved by Congress and signed by the president on the 29th of May 1848; the first state election had already been held on the 8th of May, and Governor Nelson Dewey and other state officers were sworn into office on the 7th of June. In the same year the free public school system was established, and the great stream of

Ger- man immigration set in. Railway construction began in 1851. Wisconsin was a strong anti-slavery state. In 1854 one of the first steps in the organization of the Republican party (q.v.) was taken at Ripon. In the same year a fugitive slave named Glover was seized at Racine and was afterward rescued by an anti-slavery mob from Milwaukee; the State Supreme Court rendered a decision which declared the Fugitive Slave Law to be null and void in Wisconsin.

In 1856 a contested election for the governorship between Governor William A. Barstow (1813-1865), a candidate for re-election, and his Republican opponent, Coles Bashford (1816- 187S), threatened to result in civil war. But the courts threw out " supplementary returns" (possibly forged by the canvassers) and decided in favour of Bashford, who was the first Republican to hold an office; with two exceptions Wisconsin has elected Republican governors ever since. The state gave its electoral 1 Wisconsin, as the last state to be created wholly out of the old North-West Territory, was the loser inboundary disputes with neigh- bouring states. As originally planned, Wisconsin would have in- cluded that part of Illinois west of a line running across the southern end of Lake Michigan; and the inhabitants of this tract actually voted to join Wisconsin, but Congress paid no attention to their demands, and this strip of land, including Chicago, became a part of Illinois. After the Toledo War (sec Toledo, Ohio), to recompense Michigan for her losses to Ohio the northern peninsula, geographically a part of the Wisconsin region, was given to Michigan. Finally a larger tract of land E. of the Mississippi, which include St Paul, part of Minneapolis and Duluth, was cut off from Wisconsin on her admission to the Union to form with other land farther west the new Territory of Minnesota. See " The Boundaries of Wisconsin " in vol. xi. of Wisconsin Historical Collections.

vote for Lincoln in 1S60 and supported the administration during the Civil War. The policy of the state to keep its regiments full rather than send new regiments to the front made the strength of a Wisconsin regiment, according to General W. T. Sherman, frequently equal to a brigade. The whole number of troops furnished by Wisconsin during the war was 91,379. hi January 1874 a Democratic Liberal Reform administration came into power in the state with William R. Taylor as governor. At the legislative session which followed, the Potter law, one of the first attempts to regulate railway rates, was passed. The railways determined to evade the law, but Taylor promptly brought suit in the State Supreme Court and an injunction was issued re- straining the companies from disobedience. In 1876, however, the Republicans regained control of the state government and the law was modified. In 1889 the passage of the Bennett law, providing for the enforcement of the teaching of English in all public and parochial schools, had a wide political effect. The Germans, usually Republicans,

roused for the defence of their schools, voted the Democratic state ticket at the next state election (1890), with the result that George Wilbur Peck, 2 the Democratic nominee, was chosen governor hy 30,000 plurality. The Bennett law was at once repealed, but not until 1895 did the Republicans regain control of the administration. It was accomplished then after a Democratic gerrymander had been twice overthrown in the courts. Since that time, however, the Republican party has grown more secure, and it has placed on the statute books a series of radical and progressive enactments in regard to railway rate legislation and taxation, publicity of campaign expenditures and a state-wide direct primary law (1905). In all these reforms a leading part was taken by Governor Robert M. LaFollette (b. 1855), who was elected to the United States Senate in 1905. Opposition to his political programme resulted in a serious split in the Republican ranks, the opposition taking the old name of " Stalwarts " and his followers came to be known as " Halfbreeds." Governor LaFollette, however, could draw enough support from the Democrats to maintain the control of the state by the Republicans. Wisconsin had several times been visited by disastrous forest fires. One in the north-eastern counties (Oconto, Brown, Door, Shawano, Manitowoc and Kewaunee) in 1871 resulted in the loss of more than a thousand lives. Another serious fire occurred in the north-west in July 1894.

Governors of Wisconsin Territorial. Henry Dodge …. Democrat 1836-1841 James Duane Doty . . . Whig 1 841-1844

Nathaniel P. Tallmadge . . „ 1S44-1845

Henry Dodge …. Democrat 1845-1848

State.

Nelson Dewey …. Democrat 1848-1852

Leonard J. Farweli … ,, 1852-1854

1854-1856

William j

Arthur McArthur 3 Coles Bashford Alex. W. Randall . Louis P. Harvey . Edward Salomon . James T. Lewis . ‘ . Lucius Fairchild . C. C. Washburn . William R. Taylor Harrison Ludington William E. Smith . Jeremiah M. Rusk William D. Hoard George W. Peck . William H. Uphani Edward Scofield . Robert M. LaFollette 4 James 0. Davidson 5 . F. E. McGovern .

Republican 1856

1856-1858 1858-1862 1862

1862-1864

1864-1866

1866-1872

,, 1S72-1874

Democrat 1874-1876

Republican 1876-1878

1878-1882

„ 1882-1889

1S89-1891

Democrat 1891-1895

Republican 1 895-1 897

„ 1897-1901

,, 1901-1906

1906-1911

„ 1911-

2 Peck (b. 1840) was a printer and then a journalist, founded in 1874 at La Crosse the Sun, which in 1878 he removed to Milwaukee, and was the author of many humorous sketches, notably a series of volumes of which the hero is " Peck's Bad Boy."

3 Lieut. -Governor; succeeded BarsLow, who resigned during a contest with Bashford.

4 Resigned to become a member of the United States Senate.

5 Lieut. -Governor: elected governor in 1906 and 1.908.

WISCONSIN, UNIVERSITY OF

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WISCONSIN, UNIVERSITY OF, a co-educational institution of higher learning at Madison, Wisconsin, the capital of the state, established in 1848 under stale control, supported largely by the state, and a part of the stale educational system. The university occupies a picturesque and beautiful site an an irregular tract (600 acres), including both wooded hills and undulating meadow lands stretching for 1 m. along the shores of Lake Mendota. The main building, University Hall (1859; enlarged 1897-1899 and 1905-1906), which, crowns University Hill, is exactly 1 in. from the state capitol. The other buildings include North Hall (1850), South Hall (1854), Science Hall (1887), the Biology Build- ing (1911), the Chemical Building (1904-1905), the Hydraulic Laboratory (1905), the Engineering Building (1900), the Law School (1894), Chadbourne Hall (1870; remodelled in 1896) for women, Lathrop Hall (1910) for women, Assembly Hall (1879), the Chemical Engineering Building (1885), Machine Shops (1885), the armoury and gymnasium (1894), a group of half a dozen buildings belonging to the College of Agriculture and the Washburn Observatory (1878; a gift of Governor C. C. Washburn). On the lower campus is the building of the Wisconsin State Historical Society.

The university includes a college of letters and science, with general courses in liberal arts and special courses in chemistry, commerce, journalism, music, pharmacy and training of teachers and library work; a college of engineering, with courses in civil, mechanical, electrical, chemical and mining engineering, and an applied electro-chemistry course; a college of agriculture, with a government experiment station, long, middle and short courses in agriculture, a department of home economics, a dairy course and farmers' institutes; a college of law (3 years' course); a college of medicine, giving the first two y~ars of a medical course; a graduate school; and an extension division, including departments of in- struction by lectures, of correspondence study, of general information and welfare, and of debating and public discussion. There is a summer session, in which, in addition to courses in all the colleges and schools, instruction is offered to artisans and apprentices and in library training. The college of agriculture, one of the largest and

best equipped in the country, provides also briefer courses of practical training for farmers and farmers' wives. In connexion with the state department of health, instruction on the prevention and treat- ment of tuberculosis is provided, exhibits and instructors or demon- strators being sent to every part of the state. The state hygienic laboratory is conducted by the university. On the university campus is the forest products laboratory (1910) of the United States govern- ment. At Milwaukee there is a university settlement associated with the social work of the university.

Admission to the university is on examination or certificate from accredited

high schools or academies. Tuition is free for residents of the state. Courses in the first two years are largely prescribed, in the last two years elective " under a definite system." In 1910 there were 395 instructors and 4947 students (3560 men and 1387 women). The university library proper, of 163,000 volumes and 40,000 pamphlets, is housed in the Historical Society's building, in which are also the collection of the Historical Society and that of the Wisconsin Academy of Arts and Sciences — a total in 1910 of 404,000 books and 202,000 pamphlets.

The grounds, buildings and equipments of the university are valued at $2,000,000. The income of the university, including income from the Federal land grants, from invested productive funds and from state tax levies, exceeds one million dollars annually. Since 1905 the state legislature has appropriated for the current expenses of the university a 3 mill tax. More than $2,000,000 was left to the university in 1908 for a memorial theatre, research professorships and graduate fellowships by William Freeman Vilas (1840-1908), who graduated at the university in 1858 and was postmaster-general of the United States in 1885-1888, secretary of the interior in 1888- 1889 and U.S. senator from Wisconsin in 1891-1897.

An act for the creation of a university to be supported by the Territory was passed by the first session of the Territorial legis- lature in 1836, but except for the naming of a board of trustees the plan was never put into operation. A similar act for the establishment of a university at Green Bay had no more result. In 1838 a university of the Territory of Wisconsin was created by act of the Territorial legislature and was endowed, with iwo townships of land. This was the germ- of the state university, provision for which was made in the state constitution adopted in 1848. The university was incorporated by act of the legislature in that year with a board of regents as the governing body, chosen by the legislature. 1 A preparatory department was opened in the autumn of that year, and John H. Lathrop (1799- 1866), a graduate of Yale, then president of the university of Missouri, was chosen as the first chancellor of the new institution. He was inaugurated in 1850, and in that year North Hall, the first building, was erected. The first academic class graduated in 1854. In the same year the Federal Congress (which had granted to the state seventy-two sections of salt-spring lands, and as no such lands were found in the state, had been petitioned to change the nature of the grant) granted seventy-two sections to be "sold in such manner as the legislature may direct for the benefit and in aid of the university." The Federal land grants, however, which ought to have supported the university, were sacrificed to a desire to attract immigrants, and the institution for many years was compelled to get along on a small margin which rendered extension difficult; and the university permanent fund was soon impaired for the construction of buildings. Henry

Barnard in 1859 succeeded Lathrop as chancellor, but resigned in 1861. After the Civil War, the office of chancellor was displaced by that of president. Paul Ansel Chadbourne (1823-1883), a graduate (and afterwards president) of Williams College, became presi- dent in 1867, and in his presidency (1867-1870) the university was reorganized, a college of law was founded, co-education was established and the agricultural college was consolidated with the university, a radical departure from the plan adopted in most of the Western states. In 1871-1874 John Hanson Twombly, a graduate of Wesleyan University and one of the founders of Boston University, was president, and the legislature first provided for an annual state tax of $10,000 for the university. With the coming to the presidency (1874) of John Bascom (b. 1827), another graduate of Williams, the university began a new period of development; the preparatory department was

1 The university is now governed by regents, of whom two — the president of the university and the state superintendent of public instruction — are ex officio, and the others are appointed by the governor for a term of three years, two from the state at large and one from each congressional district.

abolished in 1880, and the finances of the university were put on a firm basis by the grant of a state tax of one-tenth of a mill. Under the presidency (1887-1892) of Thomas Chrowder Chambcr- lin (b. 1843), a graduate of Beloit College and a member of the U.S. Geological Survey, the university attendance grew from 500 to 1000 students, and buildings were erected for the college of law, dairy school and science hall. Under President Charles Kendall Adams (1835-1002), who was a graduate of the univer- sity of Michigan, where as professor of history he had introduced in 1869-1870 the German method of " seminar " study and research, and who had just resigned the presidency (1885-1892) of Cornell University, the enrolment of the university increased from 1000 in 1892 to 2600 in 1901, and the growth of the graduate school was particularly notable. Under Charles Richard Van- Hise. 1 who was the first alumnus to become president and who succeeded President Adams in 1904, the growth of the university continued, and its activities were constantly enlarged and the scope of its work was widened.

See S. H. Carpenter, A Historical Sketch of the University of Wisconsin from 184Q to 1876 (Madison, 1876), and R. G. Thwaites, The University of Wisconsin, its History and its Alumni (Ibid., 1900).

WISDOM, BOOK OF, or Wisdom of Solomon (Sept. 2oˆa 2,a\oj}j.uvos; Lat. Vulg. Liber sapiential), an apocryphal book of the " Wisdom Literature ; ' (q.v.), the most brilliant production of pre-Christian Hebrew philosophical thought, remarkable both for the elevation of its ideas and for the splendour of its diction. It divides itself naturally, by its contents, into two parts, in one of which the theme is righteousness and wisdom, in the other the early fortunes of the Israelite people considered as a righteous nation beloved by God.

The first part (ch. i.-ix.) falls also into two divisions, the first (i.-v.) dwelling on the contrast between the righteous and the wicked, the second (vi.-ix.) setting forth the glories of wisdom. After an exhortation to the judges of the earth to put away evil counsels and thus avoid death, the author declares that God has made no kingdom of death on the earth, but ungodly men have made a covenant with it: certain sceptics (probably both Gentile and Jewish) holding this life to be brief and without a future, give themselves up to sensuality and oppress the poor and the righteous; but God created man to be immortal (ii. 23), and there will be compensation and retribution in the future: the good will rule (on earth), the wicked will be hurled down to destruction, though they seem now to flourish with long life and abundance of children (ii.v.). At this point Solomon is intro duced, and from the following section (vi.-ix.) the book seems to have taken its title. Solomon reminds kings and rulers that they will be held to strict account by God, and, urging them to learn wisdom from his words, proceeds to give his own experience: devoting himself from his youth to the pursuit of wisdom he had found her to be a treasure that never failed, the source and embodiment of all that is most excellent and beautiful in the world — through her he looks to obtain influence over men and immortality, and he concludes with a prayer that God would send her out of his holy heavens to be his companion and guide.

The second part of the -book (x.-xix.) connects itself formally with the first by a summary description of the role of wisdom in the early times: she directed and preserved the fathers from Adam to Moses (x. i-xi. 1). From this point, however, nothing is said of wisdom — the rest of the book is a philosophical and imaginative narrative of Israelite affairs from the Egyptian oppression to the settlement in Canaan. A brief description of how the Egyptians were punished through the very things with which they sinned (though the punish- ment was not fatal, for God loves all things that exist), and how judgments on the Canaanites were executed gradually (so as to give them time to repent), is followed bv a dissertation on the origin, various forms, absurdity and results of polytheism and idolatry (xiii.xv.): the worship of natural objects is said to be less blame worthy than the worship of images — this latter, arising from the desire to honour dead children and living kings (the Euhemeristic theory), is inherently absurd,

and led to all sorts of moral depravity. In the four last chapters the author, returning to the history, gives a detailed account of the provision made for the Israelites in the wilderness and of the pains and terrors with which the Egyptians were plagued.

1 President VanHise (b. 1857) graduated at the university of Wisconsin in 1879, became instructor in geology there in 1883, in 1897 became consulting geologist of the Wisconsin Geological' and Natural History Survey, and in 1900 became geologist in charge of the Division of Pre-Cambrian and Metamorphic Geology, U.S. Geological Survey. He wrote Correlation Papers — Archaean and Algonkian (1892), Some Principles Controlling the Deposition of Ores (1901). A Treatise on Metamorphism (1903) and several works with other authors on the different iron regions of Michigan.

It is not easy to determine whether the book is all from the same author. On the one hand, it may be said that one general theme — the salvation and final prosperity of the righteous — is visible throughout the work, that God is everywhere represented as the supreme moral governor of the world, and that the con- ception of immortality is found in both parts; the second part, though differing in form from the first, may be regarded as the historical illustration of the principles set forth in the latter. On the other hand, it must be admitted that the points of view in the two parts are very different: the philosophical conception of wisdom and the general Greek colouring, so prominent in the first part, are quite lacking in the second (x. i-xi. 1 being regarded as a transition or connecting section inserted by an editor). While the first has the form of a treatise, the second is an address to God; the first, though it has the Jewish people in mind, does not refer to them by name except incidentally in Solomon's prayer; the second is wholly devoted to the Jewish national experiences (this is true even of the section on idolatry). It is in the second that we have the Finer ethical conception of God as father and saviour of all men, lover of souls, merciful in his dealings with the wicked — in the first part it is his justice that is emphasized; the hope of immortality is prominent in the first, but is mentioned only once (in xv. 3) in the second. The two parts are distinguished by difference of style; the Hebrew principle of parallelism of clauses is employed far more in the first than in the second, which has a number of plain prose passages, and is also rich in uncommon compound terms. In view of these differences there is ground for holding that the second part is a separate production which has been united with the first by an editor, an historical haggadic sketch, a midrash, full of imaginative additions to the Bib'.ical narrative, and en- livened by many striking ethical reflections. The question, however, may be left undecided.

Both parts of the book ignore the Jewish sacrificial cult. Sacrifices are not

mentioned at all ; a passing reference to the temple is put into Solomon's mouth (ix. 8). Moses is described (xi. 1) not as the great lawgiver, but as the holy prophet through whom the works of the people were prospered. (It may be noted, as an illustration of the allusive style of the book, that, though a number of men are spoken of, not one of them is mentioned by name; in iv. 10-14, which is an expansion of Gen. v. 24, the reader is left to recognize Enoch from his knowledge of the Biblical narrative.) In the second part of the book there is no expression of " messianic " hope; in the first part the picture of the national future agfees_in general (if its expressions are to be taken literally) with thatgivenin thebook of Daniel: the Jews are to have dominion over the peoples (iii. 8), and to receive from the Lord's hand the diadem of beauty (v. 16), but there is no mention of particular nations. The historical review in the second part is coloured by a bitter hatred of the ancient Egyptians; whether this springs from resentment of the former sufferings of the Israelites or is meant as an allusion to the circum- stances of the author's own time it is hardly possible to say.

The book appears to teach individual ethical immortality, though its treatment of the subject is somewhat vague. On the basis a of Gen. i.-iii. it is said (li. 23 f.) that God created man for immortality (that is, apparently, on earth) and made him an image of his own being, but through the envy of the devil death came into the world, yet (iii. 1-4) the souls of the righteous are in the hand of God, and, though they seem to die, their hope is full of immortality. The description, however, appears to glide into the conception of national immortality (iii. 8, v. 16), especially in the fine sorites in vi. 17-20: the beginning of wisdom is desire for instruction, and devoted regard to instruction is love, and love is observance of her laws, and obedience to her laws is assurance of incorruption, and incorruption brings us near to God, and therefore desire for wisdom leads to a kingdom (but the nature of the kingdom is not stated). The individualistic view is expressed in xv. 3: the knowledge of God's power (that is, a righteous life) is the root of immortality. This passage appears to exclude the wicked, who, however, are said (iv. 20) to be punished hereafter. The figurative nature of the language respecting the future makes it difficult to determine precisely the thought of the book on this point; but it seems to contemplate continued existence hereafter for both righteous and wicked, and rewards and punishments allotted on the basis of moral character. Angels are not mentioned; but the serpent of Gen. iii. is, for the first time in literature, identified with the devil (" Diabolos," ii. 24, the Greek translation of the Hebrew " Satan ") ; the r61e assigned him (envy) is similar to that expressed in " Secrets of Enoch," xxxi. 3-6; he is here introduced to account for the fact of death in the world. In iii. 4 the writer, in his polemic against the prosperous ungodly men of his time, denies that death, short life and lack of children are to be considered

misfortunes for the righteous — over against these things the possession of wisdom is declared to be the supreme good. The ethical standard of the book is high except in the bitterness displayed towards the " wicked," that is. the enemies of the Jews. The only occurrence in old Jewish literature (except in Ecclus. xiv. 2) of a word for "conscience" is found in xvii. 11 (avveidTjfiLs) : wickedness is timorous under the condemnation of conscience (the same thought in Prov. xxviii. 1). The book is absolutely monotheistic, and the character ascribed to the deity is ethically pure with the exception mentioned above.

The style shows that the book was written in Greek, though naturally it contains Hebraisms. The author of the first part was in all probability an Alexandrian Jew; nothing further is known of him; and this is true of the author of the second part, if that be a separate production. As to the date, the decided Greek colouring (the conception of wisdom, the list of Stoic virtues, viii. 7, the idea of pre-existence, viii. 20, and the ethical conception of the future life) points to a time not earlier than the 1st century B.C., while the fact that the history is not allegorized suggests priority to Philo; probably the work was composed late in the 1st century B.C. (this date would agree with the social situation described). Its exclusion from the Jewish Canon of Scripture resulted naturally from its Alexandrian thought and from the fact that it was written in Greek. It was used, however, by New Testament writers (vii. 22 f., Jas. iii. 17, vii. 26; Heb. i. 2 f., ix. 15; 2 Cor. v. 1-4, xi. 23; Acts xvii. 30, xiii. 1-5, xiv. 22-26; Rom. i. 18-32, xvi. 7; 1 Tim. iv. 10), and is quoted freely by Patristic and later authors, generally as inspired. It was recognized as canonical by the council of Trent, but is not so regarded by Protestants.

Literature. — The Greek text is given in O. F. Fritzschc, Lib. Apocr. Vet. Test. (1871); W. J. Deane, Bk. of Wisd. (1881); H. B. Swete, Old Test, in Grk. (1st ed., 1891; 2nd ed., 1897; Eng. trans, in Deane, 1881); W. K. Churton, Uncan. and Apocr. Script. (1884); C. J. Ball, Variorum Apocr. (1892); Revised Vers, of Apocr. (1895). Introductions and Comms. : C. L. W. Grimm in Kursgef. Exeg. Hdbch. z. d. Apocr. d. A. T. (i860); E. C. Bissell in Lange-Schaff (i860) ; W. J. Deane (1881) ; F. W. Karrar in Wace's Apocr. (1888) ; Ed. Reuss, French ed. (1878), Ger. ed. (1894); E. Schurcr, Jew. People (Eng. trans., 1891); C. Siegfried in Kautzsch, Apocr. (1900); Tony Andre, Les Apocr. (1903). See also the articles in Hcrzog-Hauck's Realencyclopddie; Hastings, Did. Bible; Cheyne and Black, Encycl. Bibl. (C. H. T.)*

WISDOM LITERATURE, the name applied to the body of Old Testament and Apocryphal writings that contain the philo- sophical thought of the later pre-Christian Judaism. Old Semitic philosophy was a science not of ontology in the modern sense of the term, but of practical life. For the Greeks " love of wisdom " involved inquiry into the basis and origin of things; the Hebrew " wisdom " was the capacity so to order life as to get out of it the greatest possible good. Though the early Hebrews (of the time before the 5th century B.C.) must have reflected on life, there is no trace of such reflection, of a systematic sort, in their extant literature. " Wise men " are distrusted and opposed by the prophets. The latter were concerned only with the maintenance of the sole w r orship of Yahweh and of social morality. This was the task of the early Hebrew thinkers, and to it a large part of the higher energy of the nation was devoted. The external law given, as was believed, by the God of Israel, was held to be the sufficient guide of life, and everything that looked like reliance on human wisdom was regarded as disloyalty to the Divine Lawgiver. While the priests developed the sacrificial ritual, it was the prophets that represented the theocratic element of the national life — they devoted themselves to their task with noteworthy persistence and ability, and their efforts were crowned with success; but their virtue of singlemindedness carried with it the defect of narrowness — they despised all peoples and all countries but their own, and were intolerant of opinions, held by their fellow-citizens, that were not wholly in accordance with their own principles.

The reports of the earlier wise men, men of practical sagacity in political and social affairs, have come to us from unfriendly sources; it is quite possible that among them were some who took interest in life for its own sake, and reflected on its human moral basis. But, if this was so, no record of their reflections has been preserved. The class of sages to whom we owe the

Wisdom Books did not arise till a change had come over the national fortunes and life. The firm establishment of the doctrine of practical monotheism happened to coincide in time with the destruction of the national political life (in the 6th century B.C.). At the moment when this doctrine had come to be generally accepted by the thinking part of the nation, the Jews found themselves dispersed among foreign communities, and from that time were a subject people environed by aliens, Babylonian, Persian and Greek. The prophetic office ceased to exist when its work was done, and part of the intellectual energy of the people was thus set free for other tasks than the establishment of theistic dogma. The ritual law was substantially completed by the end of the 5th century B.C.; it became the object of study, and thus arose a class of scholars, among whom were some who, under the influence of the general culture of the time, native and foreign, pushed their investigations beyond the limits of the national law

and became students and critics of life. These last came to form a separate class, though without formal organization. There was a tradition of learning (Job viii. 8, xv. 10) — the results of observation and experience were handed down orally. In the 2nd century B.C., about the time when the synagogue took shape, there were established schools presided over by eminent sages, in which along with instruction in the law much was said concerning the general conduct of life (see Pieke Aboth). The social unification produced by the conquests of Alexander brought the Jews into intimate relations with Greek thought. It may be inferred from Bcn- Sira's statements (Ecclus. xxxix. 1-11) that it was the custom for scholars to travel abroad and, like the scholars of medieval Europe, to increase their knowledge by personal association with wise men throughout the world. Jews seem to have entered eagerly into the larger intellectual life of the last three centuries before the beginning of our era. For some the influence of this association was of a general nature, merely modifying their conception of the moral life; others adopted to a greater or less extent some of the peculiar ideas of the current systems of philosophy. Scholars were held in honour in those days by princes and people, and Ben-Sira frankly adduces this fact as one of the great advantages of the pursuit of wisdom. It was in cities that the study of life and philosophy was best carried on, and it is chiefly with city life that Jewish wisdom deals.

The extant writings of the Jewish sages are contained in the books of Job, Proverbs, Psalms, Ben-Sira, Tobit, Ecclesiastes, Wisdom of Solomon, 4th Maccabees, to which may be added the first chapter of Pirke Aboth (a Talmudic tract giving, probably, pre-Christian material). Of these Job, Pss. xlix., lxxiii., xcii. 6-8 (5-7)1 Kccles., Wisdom, are discussions of the moral govern- ment of the world; Prov., Pss. xxxvii., cxix., Ben-Sira, Tob. iv., xil. 7-11, Pirke, are manuals of conduct, and 4th Maccab. treats of the autonomy of reason in the moral life; Pss. viii., xix. 2-7 (1-6), xxix. 3-10, xc. 1-12, cvii. 17-32, exxxix. , cxliv. 3 f., cxlvii. 8 f. are reflections on man and physical nature (cf. the Yahweh addresses in Job, and Ecclus. xlii. 15-xliii. 33). Sceptical views are expressed in Job, Prov. xxx. 2-4 (Agur), Eccles. ; the rest take the current orthodox position.

Though the intellectual world of the sages is different from that of the prophetic and legal Hebraism, they do not break with the fundamental Jewish theistic and ethical creeds. Their monotheism remains Semitic — even in their conception of the cosmogonic and illuminating function of Wisdom they regard God as standing outside the world of physical nature and man, and do not grasp or accept the idea of the identity of the human and the divine; there is thus a sharp distinction between their general theistic position and that of Greek philosophy. They retain the old high standard of morals, and in some instances go beyond it, as in the injunctions to be kind to enemies (Prov. xxv. 21 f.) and to do to no man

what is hateful to one's self (Tob. iv. 15) ; in these finer maxims they doubtless repre- sent the general ethical advance of the time.

They differ from the older writers in practically ignoring the physical supernatural — that is, though they reg-drd the miracles of the ancient times (referred to particularly in Wisdom xvi.-xix.) as historical facts, they say nothing of a miraculous element in the life of their own time. Angels occur only in Job and Tobit, and there in noteworthy characters : in Job they are beings whom God charges with folly (iv. 18), or they are mediators between God and man

(v. 1, xxxiii. 23), that is, they are humanized, and the Elohim beings (including the Satan) in the prologue belong to a popular story, the figure of Satan being used by the author to account for Job's calamities; in Tobit the " affable " Raphael is a clever man of the world. Except in Wisdom ii. 24 (where the serpent of Gen. Hi. is called " Diabolos "), there is mention of one demon only (Asmodeus, in Tob. iii. 8, 17), and that a Persian figure. Job alone introduces the mythical dragons (iii. 8, vii. 12, ix. 13, xxvi. 12) that occur in late prophetical writings (Amos ix. 3; I=a. xxvii. 1); as the earliest of the Wisdom books, it is the friendliest to supernatural machinery.

Like the prophetical writings before Ezekiel, the Wisdom books, while they recognize the sacrificial ritual as an existing custom, attach little importance to it as an element of religious life (the fullest mention of it is in Ecclus. xxxv. 4 ff., 1); the difference between prophets and sages is that the former do not regard the ritual as of divine appointment (Jer. vii. 22) and oppose k as non- moral, while the latter, probably accepting the law as divine, by laying most stress on the universal side of religion, lose sight of its local and mechanical side (see Ecclus. xxxv. 1-3). Their broad culture (reinforced, perhaps, by the political conditions of the time) made them comparatively indifferent to Messianic hopes and to that conception of a final judgment of the nations that was closely connected with these hopes: a Messiah is not mentioned in their writings (not in Prov. xvi. 10-15), and a. final judgment only in Wisdom of Solomon, where it is not of nations but of individuals. In this regard a comparison between them and Daniel, Enoch and Psalms of Solomon is instructive. Their interest is in the ethical training of the individual on earth.

There was nothing in their general position to make them in- hospitable to ethical conceptions of the future life, as is shown by the fact that so soon as

the Egyptian-Greek idea of immortality made itself felt in Jewish circles it was adopted by the author of the Wisdom of Solomon; but prior to the 1st century B.C. it docs not appear in the Wisdom literature, and the nationalistic dogma of resurrection is not mentioned in it at all. Everywhere, except in the Wisdom of Solomon, the Underworld is the old Hebrew inane abode of all the dead, and therefore a negligible quantity for the moralist. Nor do the sages go bsyond the old position in their ethical theory : they have no philosophical discussion of the basis of the moral fife; their standard of good conduct is existing law and custom; their motive for right-doing is individual eudaemonislic, not the good of society, or loyalty to an ideal of righteousness for its own sake, but advantage for one's self. They do not attempt a psychological explanation of the origin of human sin; bad thought (yiscr ro', Ecclus. xxxvii. 3) is accepted as a fact, or its entrance into the mind of man is attributed (Wisd. ii. 24)to the devil (the serpent of Gen. iii.). In fine, they eschew theories and confine themselves to visible facts.

It is in keeping with their whole point of view that they claim no divine inspiration for themselves: they speak with authority, but their authority is that of reason and conscience. It is this definitely rational tone that constitutes the differentia of the teaching of the sages. For the old external law they substitute the internal law: conscience is recognized as the power that approves or condemns conduct {i/-'l i x'7, Ecclus. xiv. 2; (rwetSijfm, Wisd. Sol. xvii. 11). Wisdom is represented as the result of human reflection, and thus as the guide in all the aflairs of life. It is also sometimes conceived of as divine (in Wisd. of Sol. and in parts of Prov. and Ecclus., but not in Eccles.), in accordance with the Hebrew view, which regards all human powers as bestowed directly by God ; it is identified with the fear of God (Job xxviii. 28; Prov. i. 7; Ecclus. xv. 1 ff.) and even with the Jewish law (Ecclus. xxiv. 23). But in such passages it remains fundamentally human; no attempt is made to define the limits of the human and the divine in its composition — it is all human and all divine. The personification of wisdom reaches almost the verge of hypostasis: in Job xxviii. it is the most precious of things; in Prov. viii. it is the companion of God in His creative work, itself created before the world; in Ecclus. xxiv. the nationalistic con- ception is set forth: wisdom, created in the beginning, compasses heaven and earth seeking rest and finds at last its dwelling-place in Jerusalem (and so substantially 4th Maccabees) ; the height of sublimity is reached in Wisd. of Sol. vii., where wisdom, the bright- ness of the everlasting light, is the source of all that is noblest in human life.

Greek influence appears clearly in the sages' attitude toward the phenomena of life. God, they hold, is the sole creator and ruler of the world; yet man is free, autonomous — God is not responsible for men's

faults (Ecclus. xv. 11-20); divine wisdom is visible in the works of nature and in beasts and man (Job xxxviii. f. ■ Pss. viii., exxxix.). On the other hand, there is recognition of the inequalities and miseries of life (Job; Ecclus. xxxiii. 11 ff., xl. 1-11; Eccles.), and, as a result, scepticism as to a moral government of the world. In Job, which is probably the earliest of the philosophical books, the question whether God is just is not definitely answered: the prologue affirms that the sufferings of good men, suggested by the sneer of Satan, are intended to demonstrate the reality of human goodness; elsewhere (v. 17, xxxiii. 17 ff.) they are regarded as disciplinary; the Yahweh speeches declare man's inability to understand God's dealings; the prosperity of the wicked is nowhere explained. The ethical manuals, Prov. (except xxx. 2-4) and Ecclus.,

are not interested in the question and ignore it; Agur's agnosticism (Prov. xxx. 2-4) is substantially the position of the Yahweh speeches in Job directed against the " unco-wise " of his day. Koneleth'a scepticism (in the original form of Ecclesiastes) is deep-seated and far-reaching: though he is a theist, he sees no justice in the world, and looks on human life as meaningless and resultless. For him death is the end-all, and it is against some such view as this that the argument in Wisd. of Sol. ii.-v. is directed. With the establishment of the belief in ethical immortality this phase of scepticism vanished from the Jewish world, not, however, without leaving behind it works of enduring value.

In all the Wisdom books virtue is conceived of as conterminous with knowledge. Salvation is attained not by believing but by the perception of what is right; wisdom is resident in the soul and identical with the thought of man. Yet, with this adoption of the Greek point of view, the tone and spirit of this literature remain Hebrew.

The writings of the sages are all anonymous. No single man appears as creator of the tendency of thought they represent; they are the product of a period extending over several centuries, but they form an intellectual unity, and presuppose a great body of thinkers. The sages may be regarded as the beginners of a universal religion: they felt the need of permanent principles of life, and were able to set aside to some extent the local features of the current creed. That they did not found a universal religion was due, in part at least, to the fact that the timt; was not ripe for such a faith; but they left material that was taken up into later systems.

Literature. — K. Siegfried, Philo von Alexandria (1S75); J. Drummond, Philo Judaeus (1888) ; H. Bois, Origines d. I. phil. Judeo-Alex. (1890); T. K. Chevne, Job and Sol. (1887) and Jew. Relig. Life, &c. (1898). ' (C. H. T.)*

WISE, HENRY ALEXANDER (1806-1876), American poli- tician and soldier, was born at Drummondtown (or Accomac), Accomack county, Virginia, on the 3rd of December 1806. He graduated from Washington (now Washington and Jefferson) College, Pennsylvania, in 1825, and began to practise law in Nashville, Tennessee, in 1828. He returned to Accomack county, Va., in 1830, and served in the National House of Repre- sentatives in 1833-1837 as an anti-nullification Democrat, but broke with the party on the withdrawal of the deposits from the United States Bank, and was re-elected to Congress in 1837, 1839 and 1841 as a Whig, and in 1843 as a Tyler Democrat. From 1844 to 1847 he was minister to Brazil. In i85o-i85r he was a member of the convention to revise the Virginia con- stitution, and advocated white manhood suffrage, internal improvements, and the abolition of imprisonment for debt. In 1855 he was elected governor of the state (1856-1860) as a Democrat. John Brown's raid occurred during his term, and Wise refused to reprieve Brown after sentence had been passed. He strongly opposed secession, but finally voted for the Virginia ordinance, was commissioned brigadier-general in the Confederate army and served throughout the war. He died at Richmond, Va., on the 12th of September 1876. He wrote Seven Decades of the Union 1790-1860 (1872).

His son, John Sergeant Wise (b. 1S46), United States attorney for the Eastern District of Virginia in 1881-1883, and a member of the National House of Representatives in 1883-18S5, wrote The End of an Eva (1899) and Recollections of Thirteen Presidents (1906).

See the Life of H. A. Wise, by his grandson, B. H. Wise (1899).

WISE, ISAAC MAYER (1819-1900), American Jewish theo- logian, was born in Bohemia, but his career is associated with the organization of the Jewish reform movement in the United States. From .the moment of his arrival in America (1846) his influence made itself felt. In 1854 he was appointed rabbi at Cincinnati. Some of Ms actions roused considerable opposition. Thus he was instrumental in compiling a new prayer-book, which he designed as the " American Rite " (Minhag America). He was opposed to political Zionism, and the Montreal Con- ference (1897), at his instigation, passed resolutions disapproving of the attempt to establish a Jewish state, and affirming that the Jewish Messianic hope pointed to a great universal brotherhood. In keeping with this denial of a Jewish nationality, Wise believed in national varieties of Judaism, and strove to harmonize the synagogue with local circumstances and sympathies. In 1848

he conceived the idea of a union, and after a campaign lasting a quarter of a century the Union of American Hebrew Congrega- tions was founded (1873) in Cincinnati. As a corollary of this he founded in 1875 the " Hebrew Union College " in the same city, and this institution has since trained a large number of ,the rabbis of America. Wise also organized various general assemblies of rabbis, and in 1889 established the Central Con- ference of American Rabbis. He was the first to introduce family pews in synagogues, and in many other ways " occidental- ized " Jewish worship.

See D. Philipson, The Reform Movement in Judaism (1907). (I. A.)
WISEMAN, NICHOLAS PATRICK STEPHEN (1802-1865), English cardinal, was born at Seville on the 2nd of August 1802, the child of Anglo-Irish parents recently settled in Spain for business purposes. On his father's death in 1805 he was brought to Watcrford, and in 1810 he was sent to Ushaw College, near Durham, where he was educated until the age of sixteen, when he proceeded to the English College in Rome, reopened in 1818 after having been closed by the Revolution for twenty years. He graduated doctor of theology with distinction in 1825, and was ordained priest in the following year. He was apppointed vice-rector of the English College in 1827, and rector in 1828 when not yet twenty-six years of age. This office he held until 1840. From the first a devoted student and antiquary, he devoted much time to the examination of oriental MSS. in the Vatican library, and a first volume, entitled Horae Syriacae, published in 1827, gave promise of a great scholar. Leo XII. apppointed him curator of the Arabic MSS. in the Vatican, and professor of oriental languages in the Roman university. At this date he had close relations, personal and by correspondence, with Mai, Bunsen, Burgess (bishop of Salisbury), Tholuck and Kluge. His student life was, however, broken by the pope's command to preach to the English in Rome; and a course of his lectures, On the Connexion between Science and Revealed Religion, deservedly attracted much attention, his general thesis being that whereas scientific teaching has repeatedly been thought to disprove Christian doctrine, further investigation has shown that a reconstruction is possible. He visited England in 1835-1836, and delivered lectures on the principles and main doctrines of Roman Catholicism in the Sardinian Chapel, Lincoln's Inn Fields, and in the church at Moorfields, now pulled down. Their effect was considerable; and at Pusey's request Newman reviewed them in the British Critic (December 1836), treating them for the most part with sympathy as a triumph over popular Protestantism. To another critic, who had taken occasion to point out the resemblance between Catholic and pagan cere- monies, Wiseman replied, boldly admitting the likeness, and maintaining that it could be shown equally well to exist between. Christian and heathen

doctrines. In 1836 he founded the Dublin Review, partly to infuse into the lethargic English Catholics higher ideals of their own religion and some enthusiasm for the papacy, and partly to enable him to deal with the progress of the Oxford Movement, in which he was keenly interested. At this date he was already distinguished as an accomplished scholar and critic, able to converse fluently in half-a-dozen languages, and well informed on most questions of scientific, artistic or antiquarian interest. In the winter of 1838 he was visited in Rome by Macaulay, Manning and Gladstone. An article by him on the Donatist schism appearing in the Dublin Review in July 1839 made a great impression in Oxford, Newman and others seeing the force of the analogy between Donatists and Anglicans. Some words he quoted from St Augustine influenced Newman pro- foundly: " Quapropter securus judicat orbis terrarum bonos non esse qui se dividunt ab orbe terrarum." And preaching at the opening of St Mary's church, Derby, in the same year, he anticipated Newman's argument on religious development, published six years later. In 1840 he was consecrated bishop, and sent to England as coadjutor to Bishop Walsh, vicar-apostolic of the Central district, and was also appointed president of Oscott College near Birmingham. Oscott, under his presidency, became a centre for English Catholics, where he was also visited by many distinguished men, including foreigners and non-Catholics. The

Oxford converts (1845 anQl later) added considerably to Wise- man's responsibilities, as many of them found themselves wholly without means, while the old Catholic body looked on the new- comers with distrust. It was by his advice that Newman and his companions spent some time in Rome before undertaking clerical work in England. Shortly after the accession of Pius IX. Wiseman was appointed temporarily vicar-apostolic of the London district, the appointment becoming permanent in February 1849. On his arrival from Rome in 1847 he acted as informal diplomatic envoy from the pope, to ascertain from the government what support England was likely to give in carrying out the liberal policy with which Pius inaugurated his reign. In response Lord Minto was sent to Rome as "an authentic organ of the British Government," but the policy in question proved abortive. Residing in London in Golden Square, Wiseman threw himself into his new duties with many-sided activity, working especially for the reclamation of Catholic criminals and for the restoration of the lapsed poor to the practice of their religion. He was zealous for the establishment of religious communities, both of men and women, and for the holding of retreats and missions. He preached (4th July 1848) at the opening of St George's, Southwark, an occasion unique in England since the Reformation, 14 bishops and 240 priests being present, and six religious orders of men being represented. The progress of Catholicism was undeniable, but yet Wiseman found himself steadily opposed by a minority among his own clergy, who disliked his

Ultramontane ideas, his " Romanizing and in- novating zeal," especially in regard to the introduction of sacred images into the churches and the use of devotions to the Blessed Virgin and the Blessed Sacrament, hitherto unknown among English Catholics. In July 1850 he heard of the pope's intention to create him a cardinal, and he took this to mean that he was to be permanently recalled to Rome. But on his arrival there he ascertained that a part of the pope's plan for restoring a diocesan hierarchy in England was that he himself should return to England as cardinal and archbishop of Westminster. The papal brief establishing the hierarchy was dated 29th September 1850, and on 7th October Wiseman wrote a pastoral, dated " from out of the Flaminian Gate " — a form diplomatically correct, but of bombastic tone for Protestant ears — in which he spoke enthusiastically, if also a little pompously, of the " restoration of Catholic England to its orbit in the ecclesiastical firmament." Wiseman travelled slowly to England, round by Vienna; and when he reached London (nth November) the whole country was ablaze with indignation at the " papal aggression," which was misunderstood to imply a new and unjustifiable claim to territorial rule. Some indeed feared that his life was endangered by the violence of popular feeling. But Wiseman displayed calmness and courage, and immediately penned an admirable Appeal to the English People (a pamphlet of over 30 pages), in which he explained the nature of the pope's action, and argued that the admitted principle of toleration included leave to establish a diocesan hierarchy; and in his con- cluding paragraphs he effectively contrasted that dominion over Westminster, which he was taunted with claiming, with his duties towards the poor Catholics resident there, with which alone he was really concerned. A course of lectures at St George's, Southwark, further moderated the storm. In July 1852 he pre- sided at Oscott over the first provincial synod of Westminster, at which Newman preached his sermon on the " Second Spring "; and at this date Wiseman's dream of the rapid conversion of England to the ancient faith seemed not incapable of realization. But many difficulties with his own people shortly beset his path, due largely to the suspicions aroused by his evident preference for the ardent Roman zeal of the converts, and especially of Manning, to the dull and cautious formalism of the old Catholics. The year 1854 was marked by his presence in Rome at the definition of the dogma of the immaculate conception of the Blessed Virgin (8th December), and by the publication of his historical romance, Fabiola, a tale of the Church of the Cata- combs, which had a very wide circulation and was translated into ten languages. In 1S55 Wiseman applied for a coadjutor, and

George Errington, bishop of Plymouth, his friend since boyhood, was

appointed, with the title of archbishop of Trebizond. Two years later Manning was appointed provost of Westminster and he established in Bays water his community of the " Oblatcs of St Charles." All Wiseman's later years were darkened by Errington's conscientious but implacable hostility to Manning, and to himself in so far as he was supposed to be acting under Manning's influence. The story of the estrangement, which was largely a matter of temperament, is fully told in Ward's biography. Ultimately, in July i860, Errington was deprived by the pope of his coadjutorship with right of succession, and he retired to Prior Park, near Bath, where he died in 1886. In the summer of 1858 Wiseman paid a visit to Ireland, where, as a cardinal of Irish race, he was received with enthusiasm. His speeches, sermons and lectures, delivered during his tour, were printed in a volume of 400 pages, and show an extraordinary power of rising to the occasion and of speaking with sympathy and tact. Wise- man was able t.o use considerable influence with English poli- ticians, partly because in his day English Catholics were wavering in their historical allegiance (.0 the Liberal party. As the director of votes thus doubtful, he was in a position to secure concessions that bettered the position of Catholics in regard to poor schools, reformatories and workhouses, and in the status of their army chaplains. In 1863, addressing the Catholic Congress at Malines, he stated that since 1830 the number of priests in England had increased from 434 to 1242, and of convents of women from 16 to 162, while there were 55 religious houses of men in 1863 and none in 1S30. The last two years of his life were troubled by illness and by controversies in which he found himself, under Manning's influence, compelled to adopt a policy less liberal than that which had been his in earlier years. Thus he had to con- demn the Association for the Promotion of the Unity of Christen- dom, with which he had shown some sympathy in its inception in 1857; and to forbid Catholic parents to send their sons to Oxford or Cambridge, though at an earlier date he had hoped (with Newman) that at Oxford at least a college" or hall might be assigned to them. But in other respects his last years were cheered by marks of general regard and admiration, in which non-Catholics joined; and after his death (16th February 1865) there was an extraordinary demonstration of popular respect, as his body was taken from St Mary's, Moorfields, to the cemetery at Kensal Green, where it was intended that it should rest only until a more fitting place could be found in a Roman Catholic cathedral church of Westminster. On the 30th of January 1907 the body was removed with great ceremony from Kensal Green and reburicd in the crypt of the new cathedral, where it lies beneath a Gothic altar tomb, with a recumbent effigy of the archbishop in full pontificals.

Wiseman was undoubtedly an eminent Englishman, and one of the most learned men of his time. He was the friend and corre- spondent of many

foreigners of distinction, among whom may be named Dollinger, Lamennais, Montalembert and Napoleon III. As a writer he was apt to be turgid and prolix, and there was a some- what un-English element of ostentation in his manner. But his accomplishments and ability were such as would have secured for him influence and prominence in any age of the Church; and besides being highly gifted intellectually and morally, he was marked by those specially human qualities which command the interest of all students of life and character. He combined with the principles known as Ultramontane no little liberality of view in matters ecclesiastical. He insisted on a poetical interpretation of the Church's liturgy; and while strenuously maintaining her Divine commission to teach faith and morals, he regarded the Church as in other respects a learner; and he advocated a policy of conciliation with the world, and an alliance with the best tendencies of contemporary thought. It was, in his judgment, quite in accord- ance with the genius of the Catholic Church that she should con- tinuously assimilate -all that is worthy in the civilization around.

See the biography by Wilfrid Ward, The Life and Times of Cardinal Wiseman (2 vols., 1897; fifth and cheaper edition, 1900).

(A. W. IIu.)

WISHART, GEORGE (c. 1313-1546), Scottish reformer, born about 1513, belonged to a younger branch of the Wisharts of Pitarrow. His early life has been the subject of many conjectures; but apparently he graduated M.A., probably at King's College, Aberdeen, and taught as a schoolmaster at Montrose. Accused

of heresy in 1 538, he fled to England, where a similar charge was brought against him at Bristol in the following year. In 1539 or 1 540 he started for Germany and Switzerland, and returning to England became a member of Corpus Christi College, Cam- bridge. In 1543 he went to Scotland in the train of a Scottish embassy which had come to London to consider the treaty of marriage between Prince Edward and the infant queen of Scots. There has been much controversy whether he was the Wishart who in April 1544 approached the English government with a proposal for getting rid of Cardinal Beaton. Roman Catholic historians such as Bellesheim, and Anglicans like Canon Dixon, have accepted the identification, while Froude does not dispute it and Dr Gairdner avoids committing himself (Letters and Papers of Henry VIII. vol. xix. pt. i., Introd. pp. xxvii-xxviii). There was another George Wishart, bailie of Dundee, who allied himself with Beaton's murderers; and Sir John Wishart (d. 1576), afterwards a Scottish judge, has also claims to the doubtful distinction. Sir John was certainly a friend of Creighton, laird of Branston, who was deeply implicated in the plot, but Creighton also befriended the reformer during his evangelical labours in

Midlothian. The case against the reformer is not proven and is not probable.

His career as a preacher began in T544. and the story has been told in glowing colours by his disciple John Knox. He went from place to place in peril of his life denouncing the errors of Rome and the abuses in the church at Montrose, Dundee, Ayr, in Kyle, at Perth, Edinburgh, Leith, Haddington and elsewhere. At Ormiston, in December 1545, he was seized by the earl of Bothwell, and transferred by order of the privy council to Edin- burgh castle on January 19, 1546. Thence he was handed over to Cardinal Beaton, who had him burnt at St Andrews on March 1. Foxe and Knox attribute to him a prophecy of the death of the Cardinal, who was assassinated on May 29 follow- ing, partly at any rate in revenge for Wishart 's death.

Knox's Hist.; Reg. P.C. Scotland; Foxc's Acts and Monuments; Hay Fleming's Martyrs and Confessors of St Andrews; Cramond's Truth about Wishart (189S) ; and Did. of Nat. Biogr. vol. lxii. (248-251, 253-254)- (A. F. P.)

WISHAW, a municipal and police burgh of Lanarkshire, Scotland. Pop. (root) 20,873. It- occupies the face of a hill a short distance south of the South Calder and about 2 m. N. of the Clyde, 15 m. E.S.E. of Glasgow by the Caledonian railway. It owes its importance to the development of the coal and iron industry, and was created a police burgh in 1853. It was ex- tended to include the villages of Cambusnethan and Craigneuk in 1S74. The chief public buildings are the town-hall, Victoria hall, the public library and the parish hall, and there is also a public park.

WISLICENUS, JOHANNES (1835-1902), German chemist, was born on the 24th of June 1835 at Klein-Eichstedt, in Thu- ringia. In 1S53 he entered Halle University, but in a few months emigrated to America with his father. For a time he acted as assistant to Professor E. N. Horsford at Harvard, and in 1855 was appointed lecturer at the Mechanics' Institute in New York. Returning to Europe in 1856, he continued his studies at Zurich University, where nine years later he became professor of chemistry. This post he held till 1872. He then succeeded A. F. L. Strecker in the chair of chemistry at Wurzburg, and in 1885, on the death of A. W. H. Kqlbe, was appointed to the same professorship at Leipzig, where he died on the 6th of December 1902. As an original investigator he devoted himself almost exclusively to organic chemistry, and especially to stereo- chemistry. His work on the lactic acids cleared up many difficulties concerning the combination of acid and alcoholic properties in oxy-acids in general, and resulted in the discovery of two substances differing in physical properties though possessing a structure of proved chemical identity. To this

phenomenon, then noticed for the first time, he gave the name of " geometrical isomerism." So far back as 1869, before the publication of the doctrine of J. H. van't Hoff and J. A. Le Bel, he expressed the opinion that the ordinary constitutional formulae did not afford an adequate explanation of certain carbon compounds, and

suggested that account must be taken of theverschiedeneLagerung ihrer Atome im Raume. Later (see Die raumlichc Anordnung der Atome in organischen Moiekiilen, 1887) he extended the application of the van't Hoff-Le Bel theory, believing that it, together with the supposition that there are " specially directed forces, the affinity-energies," which determine the relative position of atoms in the molecule, afforded a method by which the spatial arrangement of atoms in particular cases may be ascer- tained by experiment. Wisliccnus is also known for his work on aceto-acetic ester and its application as a synthetical agent. He was awarded the Davy medal by the Royal Society in 1898.

WISMAR, a seaport town of Germany, in the grand-duchy of Mecklenburg-Schwerin, situated on the Bay of Wismar, one of the best harbours on the Baltic, 20 m. by rail N. of Schwerin. Fop. (1905) 21,902. The town is well and regularly built, with broad and straight streets, and contains numerous handsome and quaint buildings in the northern Gothic style. The church of St Mary, a Gothic edifice of the 13th and 14th centuries, with a tower 260 ft. high, and the church of St Nicholas (1381-1460), with very lofty vaulting, are regarded as good examples of trie influence exercised in these northern provinces by the large church of St Mary in Lubeck. The elegant cruciform church of St George dates from the 14th and 15th centuries. The Furstenhof, at one time a ducal residence, but now occupied by the municipal authorities, is a richly decorated specimen of the Italian early Renaissance style. Built in 1552-1565, it was restored in 1877-1870. The " Old School," dating from about 1300, has been restored, and is now occupied as a museum. The town hall (rebuilt in 1829) contains a collection of pictures. Among the manufactures of Wismar are iron, machinery, paper, roofing-felt and asphalt. There is a considerable trade, especially by sea, the exports including grain, oil-seeds and butter, and the imports coal, timber and iron. The harbour is deep enough to admit vessels of 17-ft. draught, and permits large steamers to unload along its quays. Two miles from Wismar lies the watering-place of Wendorf,

Wismar is said to have received civic rights in 1229, and came into the possession of Mecklenburg in 1301. In the 13th and 14th centuries it was a

flourishing Hanse town, with important woollen factories. Though a plague carried off 10,000 of the inhabitants in 1376, the town seems to have remained tolerably prosperous until the 16th century. By the peace of Westphalia in 1648 it passed to Sweden, with a lordship to which it gives its name. In 1803 Sweden pledged both town and lordship to Mecklenburg for 1,258,000 thalers, reserving, however, the right of redemp- tion after 100 years. In view of this contingent right of Sweden, Wismar was not represented in the diet of Mecklenburg until 1897. In 1903 Sweden finally renounced its claims. Wismar still retains a few relics of its old liberties, including the right to fly its own flag.

See Burmcister, Beschreibung von Wismar (Wismar, 1857); Willgeroth, Gesdiichte der Stadt Wismar, pt. i.. (Wismar, 1898); and Bruno Schmidt, Der Sckwedisch-mecklenburgische Pfandvertrag iiber Stadt und Herrschaft Wismar (Leipzig, 1901).

WITAN, or Witenagemot (from 0. Eng. wita, pi. witan, a wise man, and gemot, a meeting, from 0. Eng, metan, to meet), the national council in England in Anglo-Saxon times. Its origin is obscure. There is some resemblance between it and the two assemblies mentioned by Tacitus in the Germania, a larger and a smaller one, but this analogy must not be pressed too far. In Anglo-Saxon England in the 7th and 8th centuries it seems certain that each of the larger kingdoms, Kent, Wessex, Mercia and Northumbria, had its separate witan, or council, but there is a difference of opinion as to whether this was identical with, or distinct from, the folkmoot, in which, theoretically at least, all freemen had the right to appear. H. R. von Gneist {History of the English Constitution) agrees that the two assemblies were identical, and a somewhat similar view is put forward by J. M. Kemble (Saxons in England) and E. A. Freeman (History of the Norman Conquest). Freeman advances the theory that the right of all the freemen to attend the gemot had for practical purposes fallen into disuse, and thus the assembly had come to

be confined to the Wise men. In other words, the folkmoot had become the witan. Evidence in support of this view is sought for in the accounts in the Anglo-Saxon Chronicle and elsewhere, where the decisions of the witan were received with loud expres- sions of approval or of disapproval by an assembled crowd, and it is argued that this is a survival from an earlier age, when all the freemen attended the witan. But the attendance of the crowd can be otherwise explained." The meetings referred to were probably those of exceptional interest, such as the election or the coronation of a king, and people from the neighbourhood were there merely as interested, and sometimes excited, spectators. The contrary opinion, that the two assemblies were distinct, is held, although with characteristic caution, by Stubbs {Const. Hist. vol. L). He thinks that on the union of the kingdoms

the witans were merged into one another, while the folkmoot became the shiremoot. As the number of kings decreased the number of witans decreased, until early in the 9th century there was one king and one witan in all England.

*The power of the witan varied according to the personality of the reigning king, being considerable under a weak ruler, but inconsiderable under a strong one. Generally speaking, it diminished as the years went by, and from "necessary assenters " its members became " merely attesting witnesses." Its duties are shown by the preamble to the laws of Ine, king of Wessex, and 200 years later by the preamble to those of Alfred the Great, while several similar cases could be instanced. Ine legislates " with the counsel and with the teaching of Cenred my father and of Hcdde my bishop, and of Eorcenwald my bishop, with all my ealdormen and the most distinguished witan of my people" (Stubbs, Select Charters), and Alfred issues his code of laws " with the counsel and consent of his witan." Thus the members of the witan were primarily counsellors. With their consent the king promulgated laws, made grants of land, appointed bishops and ealdormen, and discharged the other duties of government. The witan was also a court of justice, Earl Godwine and many other offenders receiving sentence of outlawry therein. Its members had the power of electing a new king, although the area of their choice was strictly limited by custom and also the right of deposing a king, although this seems to have been infrequently exercised. Its members signed the charters by which the king conveyed grants of land to churches and to individuals, and it is from the extant charters that we mainly derive our knowledge about the composition of the witan. It consisted, in addition to the king, his sons and other relatives, of the bishops and later some abbots, of some under-kings and the ealdormen of the shires or provinces, and of a number of ministri, or king's thegns. These ministri were nominees of the king; they included the important members of his household, and their number gradually increased until it outstripped that of all the other members. * The witan appears probably to have had no fixed place of meeting, and to have assembled around the person of the king, wherever he might be. In the later years of its existence, at least, it met three times a year, at Easter, Whitsuntide and Christmas. The number of counsellors attending the meetings of the witan varied considerably from time to time. " In a witenagemot held at Luton in November a.d. 931 were the two archbishops, two Welsh princes, seventeen bishops, fifteen ealdormen, five abbots and fifty-nine ministri. In another, that of Winchester of A.n. 934, were present the two archbishops, four Welsh kings, seventeen bishops, four abbots, twelve ealdormen and fifty-two ministri. These are perhaps the fullest extant lists. Of Edgar's witenagemots, the one of a.d. 966 contained the king's mother, two archbishops, seven bishops, five ealdormen and fifteen ministri; and this is*

a fair specimen of the usual pro- portion " (Stubbs, Const. Hist. ch. vi.). Almost immediately after the Norman Conquest the word fell into disuse.

See also D. J. Medley, English Constitutional History (1907); H. M. Chadwick, Studies on Anglo-Saxon Institutions (1905); and the article Parliament. (A. W. H.)*

WITCH and WIZARD. These two words are now generally used of an adept of the black art, a sorcerer, magician, female

and male respectively (see Magic and Witchcraft). " Witch," formerly of common gender, represents O. Eng. wicca (masc), wicce (fern.), agent-nouns to wiccian, to practise sorcery, probably a causative verb from O. Eng. wica?i, to give way (cf- " weak "), and therefore signifying to avert (evil), conjure away So Nonveg. vikja means (i) to turn aside, (2) to exorcise. The participial u wicked " means witch-like. " Wizard " is formed from " wise," with the slightly contemptuous Anglo-French suffix -ard, as in drunkard, laggard, sluggard, &c.

WITCH BROOMS, or " Birds' Nests," in botany, peculiar broom-like growths often seen on the branches of many trees. They are a dense development of branching twigs formed at one place on a branch as the result of the irritation set up by the presence of a mite or a fungus.

WITCHCRAFT, a term often used of magical practices of all sorts, but here confined to the malevolent (" black ") magic of women. It should, however, be noted that the male witch occasionally appears in folklore, while " white witchcraft " is common; the practices of the witch of Endor are akin rather to spiritualism than witchcraft. The German term hexe was not originally applied to human beings at all, but to child- devouring demons, corresponding to the Roman latnia; and it is used in this sense till the 14th century, it does not appear in literature in its present sense till some time in the 13th century.

The modern European conception of the witch is perhaps the result of the fusion of several originally discrete ideas. In some countries we find the distinction made between con- jurers, witches and sorcerers; the former were supposed to raise the devil by means of spells and force him to do their will; the witch proceeded by way of friendly pact with an evil spirit; a third class produced strange effects, without the aid of spirits (sec Magic), by means of images or forms of words. We also find a distinction drawn "between diviners, mathematici (= astrologers), crystal-gazers,

necromancers and others; but it must be remembered that our knowledge for the earlier period is rather of learned ideas than of the actual popular beliefs, and for the later period of the popular belief sophisticated by ecclesi- astical subtleties. In present-day belief the witch is, like the savage magician, initiated by another or herself performs ceremonies believed to give her magical powers. She possesses a familiar (see Lycantiiropy; .Magic), whose form she can assume; she can ride through the air in some cases and is •equally adept at all kinds of magic. Sir A. C. Lyall maintains that the witch is a person who works magic by her own powers, not by the aid and counsel of supernatural beings; but this view, though it may be true of poisoning and similar features formerly reckoned a part of witchcraft, does not apply to the European witch. Witchcraft and possession arc found in close relation in the psychical epidemics of the middle ages, but are otherwise unrelated.

Witchcraft among Primitive Peoples.— Although magical powers are everywhere attributed to women, witchcraft as here defined is by no mca"ns universal; in Europe alone is the woman the almost exclusive repository of magical powers; in the Congo the muntundango maybe either amznor a, woman, and in fact the sexes are said to be engaged in magical pursuits in approximately equal numbers; in Australia men are much more concerned with magic than women, but the latter have certain forms peculiar to themselves in the central area, and, as in medieval Europe, it is largely concerned with sexual matters. At the present day the European witch is almost invariably old, but this is not characteristic of the female magician of primitive peoples, or not to the same extent; it must be remembered that the modern idea of witchcraft is largely a learned product — the result of scholastic and inquisitorial ingenuity, mingled to a greater or less extent with genuine folk beliefs. In India, among the Agariyas of Bengal, the instruction in witchcraft is given by the old women; but the pupils arc young girls. The Indian witch is believed to have a cat familiar; there, as in Europe, many tests are applied to witches; they may be thrown into water, or their identity discovered by various forms of divination; or they may be known by the fact that beating them with the

castor oil plant makes them cry out. As a punishment the witch may be shaved, made to drink dirty water, or otherwise ill-used.

Witchcraft in Classical Times. — Our knowledge of witchcraft in pagan antiquity is slight, but Horace has left us an elaborate description of the proceedings of two witches in the Esquiline cemetery. At the new moon they steal into it to gather bones and noxious herbs, their feet bare, their hair loose and their robes tucked up. So far from aiming at secrecy, however, they alarm their neighbours with their cries. Making a hollow in the ground they rend a black lamb over it to summon the dead. Then taking two

images, one of wool representing a witch, one of wax representing the man whose infidelity she wishes to punish, a witch performs magical ceremonies; the moon turns red, hell hounds and snakes glide over the spot. Then they bury the muzzle of a wolf and burn the waxen image; as it melts, so fades the life of its prototype. In Greece Thcssalian women had the reputation of being specially powerful witches; their poisons were famous and they were said to be able to make the moon descend from the sky.

Medieval Witchcraft. — We know less of early and medieval witchcraft than of modern savage and popular beliefs; our knowledge of it is drawn partly from secular sources — the laws against, and in later times the trials for the offence — partly from ecclesiastical sources; but in each case the popular creed is filtered through the mind of a writer who did not necessarily understand or share the belief. For the earlier period we have penitentials, decisions of councils, discussions as to the possi- bility of the various kinds of witchcraft, as to their exact re- lation to the sin of heresy or as to the mechanism by which the supposed results were achieved; at a later period the trials of witches before the Inquisition are of great importance; but the beliefs of this period must be sharply distinguished from those of the earlier one. Finally we have a great mass of material in the secular trials of the 16th and two following centuries.

There are marked differences in the character of the witch- craft beliefs of different countries, due perhaps in part to the influence of the Inquisition, which reacted on the popular con- ceptions, in part to real differences in the original folk beliefs. In northern countries the witches' Sabbath never seems to assume any importance; in Germany, in the form of the Brocken assembly on May Eve, it is a prominent feature, and in England we may bring it into relation with the belief that at certain periods of the year demons and spirits arc abroad and have special powers; in south Europe the idea of the Sabbath seems to owe much of its prominence to the association of witchcraft with heresy and the assemblies of the Waldenses and others. Again, the " evil eye " (q.v.) is especially associated with the south of Europe; and the "ligature" (production of impotence by magical means, often only with reference to a specified individual) has always played a far larger part in the conception of witch- craft than it has in the less amorous northern climes, and it is doubtless due to this in great part that woman in this part of Europe is so prominent in magic; in the north, on the other hand, we find the storm-raising woman, hardly yet extinct in the north of Scotland, already famous in pre-Christian times; we may perhaps connect the importance of woman in Germany in part with the conception of the Wild Hunt and the spirits who fly by night, though doubtless other factors played their part.

Development of Ideas.— In. the history of European witchcraft we may

distinguish three periods: (1) down to A.D. 1230, in which the real existence of some or even all kinds of magic is doubted, and the various species arc clearly held asunder in secular and ecclesiastical writings; (2) from 1230 to i43°» during which, under the influence of scholasticism, the doubts as to the possibility and reality of witchcraft gradually vanish, while side by side with this theoretical development the practice of the Inquisition instils the new conception into the popular mind and produces the impression that a great recrudescence of witchcraft was in progress; (3) from 1430 onwards the previously disparate conceptions became fused, at any rate in literature, and we reach the period of witch persecution, which did not come to an end till the 17th or even the iSth century.

In the first of these three periods we find (i) the conception nf the malefica, who, in common with her male counterpart, uses poison, spells and waxen images, produces tempests, works by means of the evil eye and is regarded as the cause of impotence, a feature which continually called the attention of theologians and jurists to the question of magic by the problems raised by suits for divorce or nullity of marriage. (2) Side by side with her, we find, this time without a male counterpart, the slriga, frequently embodying also the ideas of the lamia and larva; originally she is a female demon, in bird form (and in many parts of the world female demons are specially malignant), who llies by night, kills children or even handsome young men, in order to eat them, assumes animal form, sometimes by means of an ointment, or has an animal familiar, rides on a besom, a piece of wood or an animal, and is sometimes brought into connexion with the souls of the dead. This latter feature arises from the gradual fusion of the belief in the slriga, the Unholde, with the kindly suite of Frau Holde, the souls for whom the tabulae fortunae were spread. The flight through the air is so common a feature in the savage creed that the demon-idea of the striga in Europe can hardly be a genuine folk-belief; or, if it is, it must have existed side by side with a similar witch-belief, of which no traces seem to exist in the earlier literature. The same remark applies to belief in transformation. Although the develop- ment of the sexual element is mainly of later date and con- temporaneous with the evolution of the Sabbath idea, the con- mbitus dacmonum was certainly not unknown to the period before 800. This intrusion of the incubus in the domain of witchcraft was probably due to the attitude of the church towards magic.

Ecclesiastical and Civil Law. — For the attitude of the church to witchcraft there are three factors to be considered: (1) the Biblical recognition of its reality; (2) the universal belief in demons and magic; and (3) the

identification of these demons with heathen deities. The orthodox view fluctuates between the theory that witchcraft is idolatry, a recognition of real powers, and that it is disobedience, a superstitious following of non-existent gods. The Biblical conception of a witch is a person who deals with familiar spirits (Lev. xx. 20), and the express provision that a witch should not be suffered to live (Ex. xxii. 18) could have left no doubt that the crime was a real one in the Mosaic law. Although the familiar plays but a small part in this early period, we find that the church early came to the conclusion that witchcraft depended on a compact with demons; in the synod of Elvira (a.d. 306) it was pronounced to be one of the three canonical sins — apostasy— and punished by the refusal of communion, even on the death-bed. Augustine lays down (De docl. chr. n. xx.) that witchcraft depends on a pact with the devil; at Worms in a.d. 829 the Erankish bishops declared that the devil aided both sexes to prepare love potions, to cause storms and to abstract milk, fruits of the field, &c.

It must not, however, be supposed that all kinds of witchcraft were equally recognized. The inmissores tempestalum and the poisoners by magical means were commonly recognized as real; but the striga was usually regarded as a pure superstition. An Irish synod (c. A.D. 800) pronounces a Christian to be anathema, who ventures to believe in the possibility of flight through the air and blood-sucking; Stephen of Hungary (997-1038) like-wise distinguishes the malefica from the striga; Rcgino of Priim (c. 906) concludes that the flight by night with the devil and the goddess Diana is a delusion, the work of the devil. Burchard of Worms (d. 1023) prescribes two years' penance for the belief that the Unholde kill Christians, cook them and eat their hearts, which they replace by a piece of wood, and then wake them. Agobard and others even express doubts as to the reality of weather-making. For those who took this view, and even for others who, like John of Damascus, accepted the striga, a mild attitude, in strong contrast to the later persecutions, was the accepted policy. The Synod of Reisbach (799) demands penance for witchcraft, but no punishment in this life. John of Damascus, Agobard, John of Salisbury and Burchard are equally mild.

For the church witchcraft was a canonical sin, or superstition; for the civil law it was a violation of the civil rights of others, so far as real results were produced. Consequently we' find the legal distinction between the malefica and the striga is equally marked. The Frankish and Alemannish laws of a.d. 500-600 accept the former but regard the latter as mere superstition. The Lex Salica indeed punished the striga as a murderess, but only exacted wcrgeld. Rothar forbade judges to kill the slriga, and Charlemagne even punished the belief in them. The Alemanni (a.d. 600) forbade private torture of women suspected of witchcraft or strigism. But although witchcraft was criminal, and we find occasional laws against sorliariae

(Westfranks, a.d. 873), or expulsions (from Pomcrania, rr24, &c), in this period the crime is unimportant save where maleficium is com- bined with treason and the person of the king is aimed at.

Further Development. — In the second period (r 230ˆ430) we have to deal with two factors of fundamental importance: (1) the elaboration of demonology and allied ideas by the schol- astics, and (2) the institution of the Inquisition to deal with the rising flood of heresy. At the beginning of this era the prevalent view of the striga seems to have been that she really existed; Caesar of Heisterbach (c. t225) recognizes the female monster who kills children; William of Paris (c. 1230) agrees that lamiae and strigae eat children, but they are allied to the dominae noctumae; that they are real women is a foolish belief. Scholastic ingenuity, however, soon disposed of rationalistic objections to human flights through the air; the ride of disembodied spirits, led by the devil, Diana, Herodias (the Aradia of modern Italy), &c, became the assemblies of witches to do homage to the devil. But this fusion was not the work of the scholastics alone; for the church, witchcraft had long consisted in the recognition of demons. The new sects, especially the Cathars, who held that the influence of the devil had perverted the teachings of Christianity, were, like the early Christians, the object of unfounded charges, in this case of worship of the devil; this naturally led to the belief that they were given to witchcraft.

From the 7 th century onwards women and priests figure largely in the accusations of witchcraft, the latter because their office made the canonical offence more serious, the former because love potions, and especially impotentia ex maleficio, are the weapons of the female sex. With the rise and development of the belief in the heretics' Sabbath, which first appears early in the nth century, another sexual element — the concuhitus ' daemonum — began to play its part, and soon the predominance of woman in magic was assured. In 1250 certain bishops gave to the Dominican Etienne de Bourbon (Stephanus de Borbone, d. c. 1261) a description of the Sabbath; and twenty- five years later the Inquisition took cognisance of the first case of this kind; from the 14th century onwards the idea was indissolubly connected with witchcraft.

In the first half of this second period, witchcraft was still superstition for the canon law, a civil wrong for the secular law; later, although these ideas still persisted, all magic was held to be heresy; its reality and heretical nature was expressly maintained by Thomas Aquinas. Already in 1 2 58 the inquisitors took cognisance of magic as heresy, and from 1320 onwards there was a great increase in the number of cases. At first the witch was handed over to the secular arm for execution, either as an obstinate heretic or as the worker of evil magic; later it was found necessary to make provision for the numerous cases in which the offender abjured; it was

decided that repentance due to fear did not release the witch from the consequences of her heresy.

Towards the end of the second period the jurisdiction passed in France from the spiritual to the secular courts by a decision of the parlement of Paris in 1391. The inquisitors did not, however, resign their work, but extended their sphere of opera- tions; the great European persecution from 1434 to 1447 was ecclesiastical as well as secular. In the third period (r430 onwards) the opening of which is marked by this attempt to root out witchcraft, we find that the work of the scholastics and inquisitors has resulted in the complete fusion of originally

distinct ideas and the crystallization of our modern idea of witch. To the methods of the inquisitors must be ascribed in great part the spread of these conceptions amongst the people; for the Malleus Maleficarum or Inquisitor's Manual (1480), following closely on the important bull Summit desiderantes affectibus (Innocent VIII., 1484), gave them a handbook from which they plied their tortured victims with questions and were able to extract such confessions as they desired; by a strange perversion these admissions, wrung from their victims by rack or thumb-screw, were described as voluntary.

The subsequent history of witchcraft may be treated in less detail. In England the trials were most numerous in the r7th century; but the absence of judicial torture made the cases proportionately less numerous than they were on the European continent. One of the most famous witch-finders was Matthew Hopkins, himself hanged for witchcraft after a career of some three years. Many of his methods were not far removed from actual torture; he pricked the body of the witch to find anaes- thetic areas; other signs were the inability to shed tears, or repeat the Lord's Prayer, the practice of walking backwards or against the sun, throwing the hair loose, intertwining the fingers, &c. Witches were also weighed against the Bible, or thrown into water, the thumbs and toes tied crosswise, and those who did not sink were adjudged guilty; a very common practice was to shave the witch, perhaps to discover insensible spots, but more probably because originally the familiar spirit was supposed to cling to the hair. The last English trial for witchcraft was in 171 2, when Jane VVenham was convicted, but not executed. Occasional cases of lynching continue to occur, even at the present day.

Tn Scotland trials, accompanied by torture, were very frequent in the 17th

century. A famous witch-finder was Kincaid. The last trial and execution took place in 1722.

In New England there was a remarkable outburst of fanaticism — the famous Salem witchcraft delusion — in 1691-1692 ; but many of the prisoners were not convicted and some of the convicts received the governor's pardon (see Salem, Mass.).

On the continent of Europe the beginning of the 16th century saw the trial of witchcraft cases taken out of the hands of the Inquisition in France and Germany, and the influence of the Malleus became predominant in these countries. Among famous continental trials may be mentioned that of a woman named Voisin in 1680, who was burnt alive for poisoning, in connexion with the Marquise de Brinvillicrs. Trials and executions did not finally cease till the end of the 18th century. In Spain a woman was burnt in 1781 at Seville by the Inquisition; the secular courts condemned a girl to decapitation in t782; in Germany an execution took place in Posen in 1703. In South America and Mexico witch-burning seems to have lasted till well on into the second half of the 19th century, the latest instance apparently being in 1888 in Peru.

The total number of victims of the witch persecutions is variously estimated- at from 100,000 to several millions. If it is true that Benedict Carpzov (1595-1666) passed sentence on 20,000 victims, the former figure is undoubtedly too low.

Rise of Ihe Critical Spirit. — It is commonly assumed and has been asserted by Lecky that the historical evidence for witch- craft is vast and varied. It is true that a vast amount of authority for the belief in witchcraft may be quoted; but the testimony for the occurrence of marvels is small in quantity, if we except the valueless declaration of the victims of torture; testimony as to the pathological side of witchcraft is abundant, but affords no proof of the erroneous inferences drawn from the genuine phenomena. IE this uncritical attitude is found in our own day, it is not surprising that the rationalistic spirit was long in making its appearance and slow in gaining the victory over superstition. From the 15th century onwards the old view that transformation and transportation were not realities but delusions, caused directly by the devil, began to gather force. Among the import- ant works may be mentioned Johann Weier's De Praestigiis Daemonum (1563), Reginald Scott's (c. 1538-1590) Discovery of Witcltcraft (1584) which was ordered to be burnt by King

James I., who had himself replied to it in his Daetnonologie (1597), Balthasar Bekker's Betooverde Wereld (1691), which, though it went farther in the direction of scepticism, had less influence than Friedrich v.

Spee's Caulio criminalis (1631). In France Jean Uvier defended the rationalistic view, and Jean Bodin demanded that he should be sent to the stake for his temerity.

Psychology of Witchcraft. — Although at the height of the witch persecution torture wrung from innocent victims valueless confessions which are at best evidence that long-continued agony of body may be instrumental in provoking hallucinations, there can be no doubt that witches commonly, like the magician in lower planes of culture, firmly believe in their own powers, and the causes of this seem to be not merely subjective. (1) Ignorance of the effects of suggestion leads both the witch and others to regard as supernormal effects which are really due to the victim's belief in the possibility of witchcraft. This applies especially to cases of " ligature. " (2) Telepathy (q.v.) seems in some cases to play a part in establishing the witch's reputation; some evidence has been produced that hypnotism at a distance is possible, and an account of her powers given by a French witch to Dr Gibotteau suggests that this element cannot be neglected in appraising the evidence for witchcraft. (3) Whatever be the real explanation of the belief in poltergeists (q.v.) and " physical phenomena " (q.v.), the belief in them rests on a very different basis from that of the belief in lycanthropy; exaggera- tion and credulity alone will not explain how these phenomena come to be associated with witchcraft. On the other hand, subjective causes played their part in causing the witch to believe in herself. (4) Auto-suggestion may produce hallucinations and delusions in otherwise sane subjects; and for those who do not question the reality of witchcraft this must operate power- fully. (5) The descriptions of witches show, that in many cases their sanity was more than questionable; trance and hysteria also played their part. (6) It is uncertain to what extent drugs and salves have helped to cause hallucination ; but that they had some share seems certain, though modern experimenters have been led to throw doubt on the alleged effects of some of the drugs; here too, however, the effects of suggestion must be reckoned with ; w r e do not associate the use of tobacco with hallucinations, but it was employed to produce them in Haiti in the same way as hemp among the Bantu of the present day. (7) Hallucinations occurring under torture must have tended to convince bystanders and victims alike, no less than the accept- ance of suggestions, positive and negative.*

As regards the nature of the ideas accepted as a result of suggestion or auto-suggestion, they were on the one hand derived, as we have seen, from ecclesiastical and especially scholastic sources; but beneath these elements is a stratum of popular belief, derived in the main perhaps from pagan sources, for to this day in Italy witchcraft is known as la vecchia religione, and has been handed down in an unbroken tradition for countless generations.

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Bastian, Der Mensch in der Geschtchte. On witchcraft and insanity, sec Hack-Tuke, History of Insanity; 0. Snell, Hexenprocesse und Geistesstdrung. For a discussion of the evidence for the real existence of witchcraft, see E. Gurney, Phantasms of the Living, vol. i. ; F. Podmore, Modern Spiritualism, i. 13. (N. W. T.)

WITCH-HAZEL, in botany, the common name for a North American shrub, Hamamelis virginica, known in gardens. The clusters of rich yellow flowers begin to expand in the autumn before the leaves fall and continue throughout the winter. The bark and leaves are astringent, and the seeds contain a quantity of oil and arc edible. The name is derived from the use of the twigs as divining rods, just as hazel twigs were used in England.

Britten and Holland (Dictionary of English Plant Names, p. 247) quote three British plants under this name: (1) Wyeh elm (Ulmus montana), which, according to Parkinson (Theatr. 1403), was called 11 Witch hasell,"- because the leaves are " like unto the leaves of the Hasell nut "; (2) Hornbeam (Carpinus Betulus), which, according to Gerard, was so called in some places from its likeness to the elm or " wich Hazell tree ";

and (3) Mountain ash {Pyras Aucuparia).

WITCH OF AGNESI, in geometry, a cubic curve invented by Maria Gaetana Agnesi. It is constructed by the following method: Let AQB be a semicircle of diameter AB, produce MQ the ordinate of Q to P so that MQ : MP :: AM : AB. Then the locus of P is the witch. The cartesian equation, if A be taken as origin and AB(= 2

WITHAM, an urban district in the Maldon parliamentary division of Essex, England, 39 m. N.E. by E. from London by the Great Eastern rail- way. Pop. (1901) 3454. It lies on the River Brain, an affluent of the Blackwater, also known as the Guith, a form connected with the name Witham. The church of St Nicholas is principally Decorated, but retains earlier portions. Roman bricks appear in its fabric, and premise a Roman station in the vicinity. Surrounding the church (which stands in a high-lying portion of the town known as Chipping Hill) there are earthworks, possibly the remains of a fortification recorded as made by order of Edward the Elder in 913, but perhaps of British origin.

WITHER, GEORGE (1 588-1667), English poet and satirist, son of George Wither, of Hampshire, was born at Bentworth, near Alton, on the nth of June 1588. He was sent to Magdalen College, Oxford, at the age of fifteen, and remained at the univer- sity for two years. His neighbours appear to have had no great opinion of him, for they advised his father to put him to " some mechanic trade." He was, however, sent to one of the Inns of Chancery, eventually obtaining an introduction at court. He wrote an elegy (1612) on the death of Prince Henry, and a volume of gratulatory poems (1613) on the marriage of the princess Elizabeth, but his uncompromising character soon prepared trouble for him. In 161 1 he published Abuses Stript and Whipt, twenty satires of general application directed against Revenge, Ambition, Lust and other abstractions. The volume included a poem called " The Scourge," in which the lord chancellor was attacked, and a series of epigrams. No copy of this edition is known, and it was perhaps suppressed, but in 1613 five editions appeared, and the author was lodged in the Marshalsea prison. The influence of the Princess Elizabeth, supported by a loyal " Satyre " to the king, in which he hints that an enemy at court had fitted personal meanings to his general invective, secured his release at the end of a few months. He had figured as one of the interlocutors, " Roget," in his friend William Browne's Shepherd's Pipe, with which were bound up eclogues by other poets, among them one by Wither, and during his imprisonment he wrote what may be regarded as a continuation of Browne's work, The Shepherd's Hunting (printed 1615), eclogues in which the two poets appear as " Willie " and " Roget " (in later editions " Philarete "). The fourth of these eclogues contains a famous passage in praise of poetry. After his release he was admitted (:6i 5) to

Lincoln's Inn, and in the same year he printed privately Fidelia, a love elegy, of which there is a unique copy in the

Bodleian. Other editions of this book, which contained the lyric " Shall I, wasting in despair," appeared in 1617 and 1619. In 1621 he returned to the satiric vein with Wither's Motto.' Nee kabeo, nee careo, nee euro. Over 30,000 copies of this poem were sold, according to his own account, within a few months. Like his earlier invective, it was said to be libellous, and Wither was again imprisoned, but shortly afterwards released without formal trial on the plea that the book had been duly licensed. In 1622 appeared his Faire-Virtue, The Mtstresse of Phil' Arete, a long panegyric of a mistress, partly real, partly allegorical, written chiefly in the seven-syllabled verse of which he was a master. Wither began as a moderate in politics and religion, but from this time his Puritan leanings became more and more pronounced, and his later work consists of religious poetry, and of con- troversial and political tracts. His Hynmes and Songs of the Church (162 2-1623) were issued under a patent of King James I. ordaining that they should be bound up with every copy of the authorized metrical psalms offered for sale (see Hymns). This patent was opposed, as inconsistent with their privilege to print the " singing-psalms," by the Stationers' Company, to Wither's great mortification and loss, and a second similar patent was finally disallowed by the House of Lords. Wither was in London during the plague of 1625, and in 1628 published Britain's Remembrancer, a voluminous poem on the subject, interspersed with denunciations of the wickedness of the times, and prophecies of the disasters about to fall upon England. He also incidentally avenged Ben jonson's satire on him as the " Chrononiastix " of Time Vindicated, by a reference to Ben's " drunken conclave." This book he was obliged to print with his own hand in con-sequence of his quarrel with the Stationers' Company. In 1635 he was employed by Henry Taunton, a London publisher, to write English verses illustrative of the allegorical plates of Crispin van Passe, originally designed for Gabriel Rollenhagen's Nucleus emblematum selectissimorum (1610-1613). The book was published as a Collection of EmMemes, Ancient and Modeme, of which the only perfect copy known is in the British Museum. The best of Wither's religious poetry is contained in Heleluiah: or Britain's Second Remembrancer, which was printed in Holland in 1641. Many of the poems rise to a high point of excellence. Besides those properly entitled to the designation of hymns, the book contains songs of singular beauty, especially the Cradle- song (" Sleep, baby, sleep, what ails my dear "), the Anniversary Marriage Song (" Lord, living here are we "), the Perambulation Song (" Lord, it hath pleased Thee to say "), the Song for Lovers (" Come, sweet heart, come, let us prove "), the Song for the Happily Married (" Since they in singing take delight ") and that for a Shepherd ("Renowned men their herds to keep") — (Nos.

50 in the first part, 1 7 and 24 in the second, and 20, 2 1 and 41 in the third). There is also in the second part a fine song (No. 59), full of historical as well as poetical interest, upon the evil times in which the poet lived, beginning —

" Now are the times, these arc the days

Which will those men approve Who take delight in honest ways

And pious courses love; Now tO t the world it will appear

That innocence of heart Will keep us far more free from fear

Than helmet, shield or dart."

Wither wrote, generally, in a pure nervous English idiom, and preferred the reputation of " rusticity " (an epithet applied to him even by Baxter) to the tricks and artifices of poetical style which were then in favour. It may be partly on that account that he was better appreciated by posterity than by his contemporaries.

Wither had served as captain of horse in 1639 in the expedition of Charles I. against the Scottish Covenanters, and his religious rather than his political convictions must be accepted as the explanation of the fact that, three years after the Scottish expedition, at the outbreak of the Great Rebellion, he is found definitely siding with the parliament. He sold his estate to raise a troop of horse, and was placed by a parliamentary committee in command of Farnham Castle. After a few days' occupation he left the place undefended, and marched to London. His own

house near Farnham was plundered, and he himself was captured by a troop of Royalist horse, owing his life to the intervention of Sir John Denham on the ground that so long as Wither lived he himself could not be accounted the worst poet in England. After this episode he was promoted to the rank of major, lie was present at the siege of Gloucester (1643) and at Naseby (1645). He had been deprived in 1643 of his nominal command, and of his commission as justice of the peace, in consequence of an attack upon Sir Richard Onslow, who was, he maintained, responsible for the Farnham disaster. In the same year parlia- ment made him a grant of £2000 for the loss of his property, but he apparently never received the full amount, and complained from time to time of his embarrassments and of the slight re- wards he received for his services. An order was made to settle

a yearly income of £150 on. Wither, chargeable on Sir John Dcnhanrs sequestrated estate, but there is no evidence that he ever received it. A small place given him by the Protector was forfeited " by declaring unto him (Cromwell) those truths which he was not willing to hear of." At the Restoration he was arrested, and remained in prison for three years. He died in London on the 2nd of May 1667.

His extant writings, catalogued in Park's British Bibliographer, number over a hundred. Sir S. E. Brydges published The Shepherd' s Hunting (1814), Fidelia (1S15J and Fair Virtue (1818), and a selection appeared in Stanford's Works of the British Poets, vol. v. (1819). Most of Wither's works were edited in twenty volumes for the Spenser Society (1871—1882); a selection was included by Henry Morley in his Companion Poets (1891); Fidelia and Fair Virtue are included in Edward Arber's English Garner (vol. iv\, 1882; vol. vi, 1883), and an excellent edition of The Poetry of George Wither was edited by F. Sidgwick in 1902. Among A. C Swinburne's Miscellanies there is an amusing account of a copy of a selection from Wither's poems annotated by Lamb, then by Dr Nott, whose notes were the subject of further ruthless comment from Lamb.

WITHERITE, a mineral consisting of barium carbonate (BaC0 3), crystallizing in the orthorhombic system. The crystals are invariably twinned together in groups of three, giving rise to pseudo-hexagonal forms somewhat resembling bipyramidal crystals of quartz, the faces are usually rough and striated horizontally. The colour is dull white or sometimes greyish, the hardness is 3ˆ and the specific gravity 4-3. The mineral is named after \V. Withering, who in 17S4 recognized it to be chemically distinct from barytes. It occurs in veins of lead ore at Hexham in Northumberland, Alston in Cumberland, Angle- zark, near Chorley in Lancashire, and a few other localities. Witherite is readily altered to barium sulphate by the action of water containing calcium sulphate in solution, and crystals are therefore frequently encrusted with barytes. It is the chief source of barium salts, and is mined in considerable amount.s in North- umberland. It is used for the preparation of rat poison, in the manufacture of glass and porcelain, and formerly for refining sugar. (L. J. S.)

WITHERSPOON, JOHN (1723-1794), Scottish- American divine and educationalist, was born at Gilford, Yester parish, East Lothian, Scotland,' on the 5th of February 1722/1723, the son of a minister of the Scotch Established Church, James Wither- spoon (d. 1750); and a descendant on the distaff side from John Welch and John Knox. He studied at Haddington, and gradu- ated in 1739 at the university of Edinburgh, where he completed a divinity course in 1743. He was licensed to preach by the Haddington presbytery in 1743, and after two years as a pro- bationer was

ordained (1745) minister of the parish of Beith. His Ecclesiastical Characteristics (1753), Strious Apology (1764), and History of a Corporation of Servants discovered a few years ago in the Interior Farts of South America (1765), attacked various abuses in the church and satirized the " moderate " party. In 1757 he had become pastor at Paisley; and in 1769 he received the degree of D.D. from Aberdeen. He was sued for libel for printing a rebuke to some of his parishioners who had travestied the sacrament of the Lord's Supper; and after several years in the courts he was ordered to pay damages of £150, which was raised by his parishioners. He refused calls to churches in Dublin and Rotterdam, and in 1766 declined an invitation brought him by Richard Stockton to go to America as president

of the College of New Jersey (now Princeton University) ; but he accepted a second invitation and left Paisley in May 176S. His close relation with the Scotch Church secured important material assistance for the college of which he now became president, and he toured New England to collect contributions. He secured an excellent set of scientific apparatus and improved the in- struction in the natural sciences; he introduced courses in Hebrew and French about 1772; and he did a large part of the actual teaching, having courses in languages, divinity, moral philosophy and eloquence. In the American Presbyterian church he was a prominent figure; he worked for union with the Congregationalists and with the Dutch Reformed body; and at the synod of 17S6 he was one of the committee which reported in favour of the formation of a General Assembly and which drafted " a system of general rules for . . . government." In politics he did much to influence Irish and Scotch-Irish Presbyterians to support the Whig party. He was a member of the provincial congress which met at New Brunswick in July 1774; presided over the Somerset county committee of corre- spondence in 1774-1775; was a member of the New Jersey constitutional convention in the spring of 1776; and from June 1776 to the autumn of 1779 and in 1780-1783 ho was a member of the Continental Congress, where he urged the adoption of the Declaration of Independence, being the only clergyman to sign it. He became a member of the secret committee of corre- spondence in October 1776, of the Board of War In October 1777, and of the committee on finance in 1778. He opposed the issue of paper money, supported Robert Morris's plan for a national bank, and was prominently connected with all Con- gressional action in regard to the peace with Great Britain. He had lost the sight of one eye in 1784, and in 1791 became quite blind. He died on his farm, Tusculum, near Princeton, on the 15th of November 1794.

There is a statue of Withcrspoon in Fainnount Park, Philadelphia, and another on the University Library at Princeton. His Essay on the Connexion between the Doctrine of Justification by the Imputed Righteousness of

Christ and Holiness of Life (1756) was his principal theological work. He also published several sermons, and Con- siderations on the Nature and Rxtent of the legislative Authority of the British^ Parliament (1774), sometimes attributed to Benjamin Franklin. His collected works, with a memoir by his son-in-law, Samuel Stanhope Smith (who succeeded him as president of the college), were edited by Dr Ashbel Green (New York, 1801-1802). See also David Walker Woods, John Wither spoon (New York, 1906); and M. C. Tvler, Literary History of the American Revolution, vol. ii.

(1897).

WITNESS (from 0. Eng. witan, to know), in law, a person who is able from his knowledge or experience to make statements relevant to matters of fact in dispute in a court of justice. The relevancy and probative effect of the statements which he makes belong to the law of evidence (q.v.). In the present article it is only proposed to deal with matters concerning the position of the witness himself. In England, in the earlier stages of the common law, the jurors seem to have been the witnesses, for they were originally chosen for their knowledge or presumed knowledge of the facts in dispute, and they could (and can) be challenged and excluded from the jury if related to the parties or otherwise likely to show bias (see Jury). The Scottish jurors' oath con- tains the words " and no truth conceal," an obvious survival from the time when a juror was a witness.

Modern views as to the persons competent to give evidence are very different from those of Roman law and the systems derived from it. In Roman law the testimony of many persons c

petency.

was not admissible without the application of torture, and a large body of possible witnesses was excluded for reasons which have now ceased to be considered expedient, and witnesses were subject to rules which have long become obsolete. Witnesses must be idonei, or duly qualified. Minors, certain heretics, infamous persons (such as women convicted of adultery), and those interested in the result of the trial were inadmissible. Parents and children could not testify against one another, nor could slaves against their masters, nor those at enmity with the party against whom their evidence was offered. Women and slaves could not act as witnesses to a will. There were also some hard and fast rules as to number. Seven witnesses were necessary for a will, five for a mancipatio or manumission, or to determine the question whether a person were free or a slave. As under the Mosaic law, two witnesses were gener- ally necessary as a minimum number to prove any fact. Unius

responsio testis omnino non audiatur are the words of a constitution of Constantine. The evidence of a single witness was simply semi- plena probatio, to be supplemented, in default of a second witness, by torture or by reference to oath. The canon law followed the Roman law as to competence, but extended the disabilities to excommuni- cated persons and to a layman in a criminal charge against a clerk, unless he were actually the prosecutor. The evidence of a notary was generally equivalent to that of two ordinary witnesses. The evidence of the pope and that of a witness who simply proved baptism or heresy (according to some authorities) are perhaps the only other cases in which canon law dispensed with confirmatory evidence. It is probable that the incompetence of Jews as witnesses in Spain in the 14th and 15th centuries was based on what is termed " want of religion," i.e. heresy or unwillingness to take the Christian oath on the gospels. But in England until their expulsion they were in the status of slaves (captivi) of the king. A policy similar to that of Roman law was followed for centuries in England by excluding the testimony of parties or persons interested, of witnesses for a prisoner, and of infamous persons, such as those who had been attainted or had been vanquished in the trial by battle, or had stood in the pillory. All these were said vocetn non habere. In the days of trial by battle a party could render a witness against him incompetent by challenging and defeating him in the judicial combat. Women were generally regarded as wholly or partially incompetent. English law had also certain rules as to the number of witnesses necessary. Thus under a statute of 1383 (6 Rich. II. St. 2, c. 5) the number of compurgators necessary to free an accused person from complicity in the peasant revolt was fixed at three or four. Five was the number necessary under the Liber feudorum for proving ingratitude to the lord. In one instance in old Scots law the number of witnesses had the curious effect of determining the punishment. By the assizes of King William, the ordeal of water was undergone by the accused on the oaths of three witnesses; if to them the oaths of three seniores were added, the penalty was immediate hanging.

In the course of the gradual development of the law of evidence, which is in a sense peculiar to the English system, the fetters of the Roman rules as to witnesses were gradually shaken off. In civil cases all disabilities by interest, relationship, sex or crime have been swept away. The witness need not be idoneus in the Roman sense, and objections which in Roman law went to his competence, in English law go to his credibility. The only general test of compet- ency is now understanding. It excludes lunatics, idiots, dotards and children of tender years; a person convicted of perjury

is said to be competent if convicted at common law, but incompetent if convicted under the act of Elizabeth. No trial ever takes place now under this act, and on this point the act seems to have been virtually repealed by Lord Denman's Act (1843; 6 & 7 Vict. c. 85). The disqualification is not absolute as to lunatics; as to children it is sometimes made to depend on whether they are able to understand the nature of the witness's oath. And in certain eases within the Criminal Law Amendment Act 1885 and the Prevention of Cruelty to Children Act 1904, the unsworn evidence of children of tender years is admissible but needs corroboration.

Non-judicial witnesses are those who attest an act of unusual importance, for the due execution of which evidence may afterwards be required. They are either made necessary by law, as the witnesses to marriages and wills, or used hy genera! custom, as the witnesses to deeds. In some cases the attestation has become a mere form, such as the attestation of the lord chancellor to a writ of summons (see Writ).

The rule of English law as to the number of witnesses necessary is expressed in the phrase testes ponder antur non numerantur. But there are certain exceptions, all statutory. Two witnesses are necessary to make a will valid; two are required to be present at a marriage and to attest the entry in the marriage register; 1 and in the case of blasphemy, perjury, personation and most forms of treason, two or more witnesses are necessary to justify conviction. Witnesses to bills of sale under the Bills of Sale Act 1882, and wit- nesses on a charge of personation at elections, are required to be " credible." And in the case of dishonour of a foreign bill of ex- change the evidence of a notary public is required, probably a survival from the law merchant or a concession to continental practice. A warrant of attorney must be attested by a solicitor, and certain conveyances of property held on charitable uses must be attested by two solicitors. In certain civil cases the evidence of a single witness is not sufficient unless corroborated in some material particular — not necessarily by another witness — e.g. in actions of breach of promise of marriage, or affiliation proceedings and matri- monial causes, or where unsworn evidence of children is admissible. In practice, but not in strict law, the evidence of an accomplice is required to be corroborated.

The English common law in theory has never permitted examina- tion by torture — unless certain forms of cross-examination can be so described. In trials in the court of admiralty the Roman system was used until 1536 {28 Henry VIII. c. 15). Torture in Scotland w-as abolished at the Union.

1 The provisions of the Marriage Act 1823 appear to be directory. Non-compliance does not invalidate the marriage, but creates diffi- culty as to its proof in other proceedings, e.g. for bigamy.

In criminal cases an accused person could not formerly be sworn as a witness or examined by the court, though he was free to make statements. The origin of this rule is by some traced to the maxim nemo le?ietur prodere seipsum, by others to the theory that the petty jury were the prisoner's witnesses. Moreover, witnesses for the defence could not be examined on oath in cases of treason and felony until 1702 in England, 1711 in Ireland and 1735 in Scotland. The husband or wife of the accused could not be examined on oath as a witness either for the prosecution or the defence except in pro- secutions for treason or for personal injuries done by one spouse to the other. This exclusion was in accord with the disqualification of parties to civil causes; but there was a lack of reciprocity, for the prosecutor was a competent witness because the crown is the nominal prosecutor. The rule had to a certain extent a beneficial effect for the defence, in saving the accused from cross-examination, which in certain periods and in political trials would have led to abuse. On the_ abolition of other disqualifications that of the accused was left. This inconsistency led to much legal discussion and to piecemeal, and ultimately complete, change in the law. In 1878 the Criminal Code Commission recommended that prisoners should be allowed to give evidence on their own behalf on oath. Since 1872 many statutes have been passed rendering accused persons and their husbands or wives competent witnesses on charges of particular offences. Most of these acts do not make them compellable witnesses.

By the Criminal Evidence Act 1898 (60 and 61 Vict. c. 36) the defendant, or the wife or husband of the defendant, is made a com- petent but not a compellable witness for the defence at every stage of criminal proceedings, subject to certain conditions, of which the principal are that a prisoner shall not be called except on his or her own application, and that the failure of th? prisoner or his wife or her husband to give evidence is not to be the subject of comment by the prosecution, and that the prisoner may not be cross-examined as to any previous offence or conviction or as to character, unless the proof of a previous offence is admissible evidence in the case, or unless he or she has given evidence of his or her good character, or cross-examined with that view, or unless the nature and conduct of the defence is such as to involve imputations on the character of the prosecutor or the witnesses for the prosecution. The act applies to Great Britain but not to Ireland. It has been extended to proceed- ings before naval and military courts-martial. This statute abrogates the common law rule making an accused person incompetent, and in practice supersedes most of the prior particular statutes. But it is necessary to observe that as to certain offences named in the schedule of the act and in other earlier or later acts, the husband or wife is competent without the consent of the accused ; and that proceedings by indictment for obstruction or non-repair

of public ways, bridges and rivers arc for purposes of evidence treated as civil proceedings.

Quite apart from statute a husband or wife has always and neces- sarily been a competent witness in criminal proceedings against the other spouse in respect of personal injuries.

Even where a witness is competent, his statements, whether of fact or of expert opinion, are not admissible in evidence unless he has taken the required oath, 2 or, where he conscientiously objects to taking an oath or by want of religion would not be bound by the oath, has made the substituted affirmation or declaration. This question was settled in 1888 after the entry of Mr Bradlaugh into parliament. Unless he is duly sworn, &c., there is no enforceable sanction for false evidence (see Perjury). English law has gradually accepted as sufficient any form of oath which the witness is prepared to accept as binding on "him in accordance with his religious beliefs, whether he be Christian or Jew, Mahommedan, Hindu, Sikh or Buddhist. At one time peers in certain proceedings testified on their honour unsworn, but now no distinction is made except as already stated in the case of young children.

The attestation of documents out of courts of justice is ordinarily not on oath; but where the documents have to be proved in court the attesting witnesses are sw r orn like others, and the only judicial exception is that of witnesses ordered to produce documents (called in Scotland " havers ") who are not sworn unless they have to verify the documents produced. Questions as to competence (including questions of the right to affirm instead of swearing or as to the proper form of oath) are settled by examination by the court without oath, on what is termed the voir dire. The evidence of judicial witnesses is taken viva voce at the trial, except in interlocutory proceedings and in certain matters in the chancery division and in bankruptcy courts. Where the witness cannot attend the court or is abroad his evidence may be taken in writing by a commissioner delegated by the court, or by a foreign tribunal under letters of request issued by the court in which the cause is pending. The depositions are returned by the delegated authority to the court of trial. Under English law evidence must be taken viva voce in a criminal trial, with a few exceptions, e.g. where a witness who has made a deposition before a magistrate at an earlier stage in the case is dead or unable to travel, or m certain cases within the Merchant Shipping Acts, or of offences in India or by crown officials out of England. In Europe commissions

2 The giving of evidence unsworn appears to have been at one time regarded as a privilege. The men of Ripon, for instance, were by a charter of /Ethelstan to be believed on their yea and nay in eˆ disputes.

vogatoires are freely used to obtain written depositions for the purpose of criminal trials, and are allowed to be executed in Kngland. In England the viva voce examination of witnesses is not conducted by the presiding judge but by the advocates in the cause, and the witness is called not by the court but by the party. The court, however, has full power to call witnesses not called by either party, or to examine witnesses on questions not inquired into by the advocates of either party.

The examination of a witness by the advocate of the side for which he is called is termed " examination-in-chief " ; when by the advocate of the other party it is called " cross-examination. " The judge, and by his leave the jurors, are free to question the witness. But the main duty of the judge is not himself to interrogate the witness but to see that neither side asks irrelevant or vexatious questions (see R.S.C. 1883, order 36, rule 38). _

As a general rule competent witnesses are also compellable, except the king; i.e. they can be required to attend the court and to take the oath and to answer all relevant questions. But by At eorf- ^^ sra i- u i- es as to evidence in criminal cases the accused ance. j g nQ| _ a compilable witness, nor in many specified cases

is the husband or wife of the accused. The attendance of witnesses is secured in the following manner: In civil actions in the High Court of Justice by writ of subpoena personally served with tender of the necessary journey money (see Writ) ; in civil actions in county courts by witness summons; in criminal proceedings before the High Court of Justice or a court of assize or quarter sessions by crown office subpoena or by recognizance entered into before justices when the accused was committed for trial. In proceedings before justices out of quarter sessions the attendance of a witness is secured by witness summons or if need be by arrest on warrant of a justice. In criminal cases tender of expenses is not essential. Where a witness refuses to attend or to be sworn or to answer, hp is summarily punishable for contempt if the court is one of record, 1 and liable to imprisonment if the proceedings are before a court of summary jurisdiction. Various acts of parliament deal with compelling appearance before committees of parliament, courts martial and other tribunals of a special nature. The attendance of a witness who is in custody is obtained by writ of habeas corpus ad testificandum or by judge's order in certain cases, or by order of the home secretary under the Prison Act 1898. A witness's expenses in a civil case are payable by the v party calling him and are included in the costs of the cause. Scales of allowances are scheduled to

the Rules of the Supreme Court and the County Court Rules. Failure of a witness duly summoned to attend in a civil action exposes him to liability in respect of pecuniary damage done to the party by his absence. In criminal cases the witness's expenses fall on the party calling him, but in prosccutionsforfelony and many misdemeanours the expenses ire paid out of the local rate in accordance with scales fixed by the home secretary (sec Cos,ts).

A witness is privileged from arrest on civil process while he is in attendance on a court of justice or is on his way to or from the court (eundo, morando et redeundo). The privilege does not exempt from arrest on a criminal charge. All witnesses except the defendant in a criminal case are entitled to object to answer any question put to them in court on the ground that the answer might tend to criminate them or to expose them to a penalty or forfeiture, or where the question is as to the fact of adultery. The defendant in a criminal case if sworn as a witness is not entitled to refuse to answer questions tending to prove him guilty of the offence for which he ie being tried, and a witness cannot refuse to answer a question on the ground that the answer might involve admission of a debt cr subject him to a civil action (1806, c. 37).

Witnesses are also privileged from making disclosure of matters known to them in the following cases: (1) Public officers, as to matters coming within their official cognizance if they can swear that it is inconsistent with the public service to disclose them. This applies to statesecrets, and extends tojurorsas to what passed among them, and the public prosecutor; and the police on this ground refuse to disclose the sources of information leading to prosecutions for crime. (2) Lawyers, as to communications between themselves and their clients, unless the communications are in themselves part of a criminal or unlawful enterprise. English law declines to extend professional privilege to communications between doctor and patient or priest and penitent. In most European countries, and in many British colonies, medical privilege is recognized as to matters com- municated to the doctor or even discovered by him in attending the patient. In Catholic countries confessions to a priest are sacred. In England it is not now the practice to insist on evidence by a minister of religion as to matters confessed to him as such. (3) Communications between husband and wife during the marriage have always been privileged from disclosure, and this privilege is preserved by modern legislation (1853, c – 83, s. 3,; 1898, c. 36, s. i.d.).

It is correlative to the obligation of a witness to testify that no action may be brought against him under English law for any statement however defamatory, however irrelevant, and however malicious, made by hiin in the course of his testimony in judicial proceedings {Seaman v. Netherclift,

1876, 1 C.P.I). 540; Hodson v. Pare, 1899, 1 Q.B.455). The only remedy, if the statement is deliber- ately false, is to prosecute him for perjury.

1 In ecclesiastical courts the punishment was by excommunication.

On charges of treason lists of the witnesses to be called by the crown must be supplied to the accused. In ordinary indictable cases there is no such obligation, but the names of the witnesses for the crown are written on the back of the indictment; and where the witnesses have not been examined at the preliminary inquiry it is now established practice to require notice to the accused of their names, and a precis of what they will be called to prove. In Scotland in all indictable cases a list of witnesses must be served on the accused (the panel) (1887, c. 35), and the same rule is observed in France. In the United States the same course is adopted where a capital offence is charged.

Scotland. — The rules as to competence of witnesses have been made substantially the same as in England by modern legislation O837, c. 37. s-9; 1840, c. 59, s. 1; 1852, c. 27; 1874, c 64). Their attendance is procured by citation. Witnesses to produce documents are called " havers. "

The evidence of witnesses is taken on oath (in the Scots form) or affirmation. Their privileges are substantially the same as in England, but they may be sued for irrelevant defamatory statements volunteered during their evidence, the law of Scotland on this point being the same as under the Dutch Roman law (see Nathan, Common Law of S. Africaˆ § 1593).

British Possessions.— In India the law as to witnesses and evidence is consolidated in the Indian Evidence Act 1872, which contains in code form the substance of the English law on the subject. The test of competency is understanding : " all persons shall be competent to testify unless the court considers that they are prevented from understanding the questions put to them or from giving rational answers to these questions by tender years, extreme old age, disease whether of body or mind, or of any other cause of the same kind. A lunatic is not incompetent to testify unless he is prevented by his lunacy from understanding the questions put to him and giving rational answers to them ' (s. 118). In criminal proceedings the defendant is not, but the husband or wife of the defendant is, com- petent (s. 120). Under the Indian Oaths Act (x. of 1873) Hindus or Mahommedans or persons objecting to make an oath may affirm (s. 6). The court may accept an oath or solemn affirmation in any form common amongst or held as binding by persons of the per- suasion or religion to which the witness belongs, unless it is repugnant to justice or decency (s. 8). In the rest of the British empire the law as to witnesses does not differ materially from that of England, but has in most colonies been incorporated in statutes or codes

(e.g. British Guiana, Ord. No. 20 of 1893). Colonial legislation has provided for the evidence of accused persons under conditions similar to but not identical with those prevailing in England. In colonies with a large native population there is from time to time a tendency to reject the evidence of coloured witnesses against Europeans.

United States. — The rules of the United States as to witnesses have a common origin with those of England and are on the same lines, but in most states depend on the particular provisions of state codes. The number of witnesses necessary for the attestation of a marriage or will is not uniform in all the states. While slavery was lawful, the evidence of slaves (and in some states that of free persons of colour) was not received for or against whites. These rules appear not to have been absolutely overridden by the 14th amendment to the Federal Constitution, and the laws of Delaware and Nebraska discriminate against free persons of colour. Incompetency by con- viction of perjury or subornation is retained in federal laws (Rev. Stat. § 5392) and in those of a few states (see Wigmore, p. 654 «).

European Countries. — In the law of most European states the Roman law as to the competency and examination of witnesses is more closely followed than in countries whose law is based on that of England. In criminal cases the prisoner is not only competent but necessary, and the whole system of procedure is inquisitorial, beginning with interrogation of the accused, not by the state prose- cutor, but by the president of the court. In view of this system it is not surprising that the English conception of the rules of proof and relevancy, known as the law of evidence, is not accepted ; since under the continental system the person who puts the questions is the person who has to determine their relevancy. In France con- sanguinity and affinity to the parties disqualify a witness in civil cases, and he is also asked whether he is employe or servant of the parties (Code Civil, Proc. 262, 268). In criminal cases a like inquiry is made. Consanguinity and affinity in the case of lineals may be made ground of disqualification if the objection is taken, as may pecuniary interest in the penalty {Code d'instr. Crim. 75, 322). Husband and wife cannot testify for or against each other eve,n after divorce (?&.)• In France disability to be a witness may be inflicted as part of the punishment on conviction for certain crimes (Code Penal, art. 42). (W. F. C.)

WITNEY, a market town in the Woodstock parliamentary division of Oxfordshire, England, on the river Windrush, a tributary of the Thames, 75I m. W.N.W. of London on the East Gloucestershire branch of the Great Western railway. Pop. of urban district (1901) 3574. The urban district was extended in iSgSto include portions of the scattered villages of Hailey and

Curbridge. Witney is the seat of an old-established industry in blanket-making, and gloves and other woollen goods are also made. The broad main street contains several picturesque houses of the 17th century and later, and in it stands the Butter Cross, supported on columns and dating from 1683. The grammar school was founded in 1683, and a Blue Coat Schoolin 1723. The great church of St Mary is one of the finest in the county. It is cruciform with a lofty central tower and spire, the latter considered to be a direct development of the early spire of the cathedral at Oxford. The tower is Early English, but the church exhibits the other styles, including a remarkable Norman porch. At Coggs, in the water-meadows bordering the river immediately below Witney, a priory was attached to the Benedictine Priory of Fecamp, and of this there are Early English remains in the vicarage, while the church is mainly Decorated. The foundation, however, dates from the nth century.

The manor of Witney {Wyttineye, Wytnay, Wytney) was held by the see of Winchester before the Conquest. It was sold in 1649, but was given back to the bishopric at the Restoration. In the middle of the 18th century it was leased by the bishop of Winchester to the duke of Marlborough. W r itney was a borough by prescription at least as early as 1278, and sent representatives to parliament with more or less regularity from 1304 to 1330. The government was by the steward and bailiffs of the bishop of Winchester, assisted by constables, wardmen and other officers. A woollen industry was probably established at an early date, for there is reference to a fulling mill in a charter of King Edgar dated 909. In 1641 the blanket-makers petitioned 'the crown against vexatious trade regulations; in 1673 the town is described as " driving a good trade for blankets and rugs." In 1 7 11 the blanket-makers obtained a charter making them into a company, consisting of a master, assistants, two wardens and a commonalty. In 1231 the bishop of Winchester received a grant of a five days' fair at Witney at the feast of St Leonard. In 1278 the bishop was declared to have at Witney a weekly market on Thursday and two fairs on the day of Ascension and on St Leonard's day. A further grant of two yearly fairs was made in 1414 to the bishop of Winchester at his manor of Witney, namely, on the vigil and day of St Clement the Pope, and at the feast of St Barnabas.

See J. A. Giles, History of Witney (London, 1852) ; Victoria County History, Oxon; W. J. Monk, History of Witney (1894).

WITOWT, or Witold (1350-1430), grand-duke of Lithuania, son of Kiejstut, prince of Samogitia, first appears prominently in 1382, when the Teutonic Order set him up as a candidate for the throne of Lithuania in opposition to his cousin Jagiello (see Wladislaus), who had treacherously murdered Witowt's father and seized his estates. Witowt, however, convinced him- self that the German knights were far more dangerous than his Lithuanian rival; he accepted pacific overtures from Jagiello and became his ally. When Jagiello ascended the throne of Poland as Wladislaus II. in 1386, Witowt was at first content with the principality of Grodno; but jealousy of Skirgiello, one of Jagiello's brothers, to whom Jagiello committed the government of Lithuania, induced Witowt to ally himself once more with the Teutonic Order (treaty of Konigsbcrg, 24th of May 1390). He strengthened his position by givinghis daughter Sophia in marriage to Vasily, grand-duke of Muscovy; but he never felt secure beneath the wing of the Teutonic Order, and when Jagiello removed Skirgiello from the government of Lithuania and offered it to Witowt, the compact of Ostrow (5th of August 1392) settled all differences between them. Nevertheless, subsequent attempts on the part of Poland to subordinate Lithuania drove Witowt for the third time into the arms of the Order, and by the treaty of Salin in 1398, Witowt, who now styled himself

Supretnus Dux Lithuaniae, even went so far as to cede his ancestral province of Samogitia to the knights, and to form an alliance with them for the conquest and partition of Pskov and Great Novgorod. His ambition and self-confidence at this period knew no bounds. He nourished the grandiose idea of driving out the hordes of Tamerlane, freeing all Russia from the Tatar yoke, and proclaiming himself emperor of the

North and East. This dream of empire was dissipated by his terrible defeat on the Lower Dnieper by the Tatars on the 12th of August 1399. He was now convinced that the true policy of Lithuania was the closest possible alliance with Poland. A union between the two countries was effected at Vilna on the 18th of January 1401, and was confirmed and extended by subsequent treaties. Witowt was to reign over Lithuania as an independent grand-duke, but the two states were t-o be in- dissolubly united by a common policy. The result was a whole series of wars with the Teutonic Order, which now acknowledged Swidrygiello, another brother of Jagiello, as grand-duke of Lithuania; and though Swidrygiello was defeated and driven out by Witowt, the Order retained possession of Samogitia, and their barbarous methods of " converting " the wretched inhabitants finally induced Witowt to rescue his fellow-country- men at any cost from the tender mercies of the knights. In the beginning of 1409 he concluded a treaty with Jagiello at Novo- grudok for the purpose, and on the 9th cf July 1410 the combined Polish-Lithuanian forces, reinforced by Hussite auxiliaries, crossed the Prussian border. The rival forces encountered at Griinewald, or Tannenberg, and there on the 14th or 15th July 1410 was fought one of the decisive battles of the world, for the Teutonic Knights suffered a crushing blow from which they never recovered. After this battle Poland-Lithuania began to be regarded in the west as a great power, and Witowt stood in high favour with the Roman curia. In 1429, instigated by the emperor Sigismund, whom he magnificently entertained at his court at Lutsk, Witowt revived his claim to a kingly crown, and Jagiello reluctantly consented to his cousin's corona- tion; but before it could be accomplished Witowt died at Troki, on the 27th of October 1430. He was certainly the most imposing personality of his day in eastern Europe, and his martial valour was combined with statesmanlike foresight. –

See Jozef Ignacz Kraszewski, Lithuania under Witowt. (Pol.) (Wilna, 1850) ; Augustin Theiner, Vetera Monumenta Poloniae (Rome, 1860-1864); Karol Szajnocha, Jadwiga and Jagiello (Pol.) (Lcmberg, 1 850-1 856); Teodor Narbutt, History of the Lithuanian Nation (Pol.) (Wilna, 1835-1836); Codex epistolaris Witoldi Magni (ed. Prochaska, Cracow, 1882). (R. N. B.)

WITSIUS, HERMANN (1636-1708), Dutch theologian, was born at Enkhuysen, North Holland, and studied at Groningen, Leiden and Utrecht.

He was ordained to the ministry, becoming pastor at Westwoud in 1656 and afterwards at Wormeren, Goesen and Leeuwaarden, and became professor of divinity successively at Franeker (1675) and at Utrecht (1680). In 1698 he went to Leiden as the successor of Friedrich Spanheim the younger (1632-1701). He died at Leiden on the 22nd of October 1708.

Witsius tried to mediate between the orthodox theology and the " federal " system of Johannes Cocceius, but did not succeed in pleasing either party. The more important of his works are: Judaeus ckristianizans — circa principia fidei et S3. Trim'tatetn (Utrecht, 1661); De oeconomia fnedtrum Dei cum kominibus (1677, still regarded as one of the clearest and most suggestive expositions of the so-called " federal " theology) ; Diatribe de septem epzstolarum apocalypticarum sensu historico ac prophetico (Franeker, 1678); Exercitationes sacrae in symholum quod apostolorum dicitur et in orationem Dominicam (Franeker, 1681); Miscellanea sacra (Utrecht, 1692-1700, 2 vols.).

WITTE, SERGE JULIEVICH, Count (1849-), Russian statesman, was born at Tiftis, where his father (of Dutch extrac- tion) was a member of the Viceregal Council of the Caucasus. His mother was a lady of the Fadeyev family, by whom he was brought up as a member of the Eastern Orthodox Church and thoroughly imbued with nationalist feeling in the Russian sense of the term. After completing his studies at Odessa University, in the faculty of mathematics and physical science, and devoting some time to journalism in close relations with the Slavophils and M. Katkov, he entered in 1877 the service of the Odessa State railway, and so distinguished himself in the trans- port operations necessitated by the Turkish campaign of 1877-1878, that he was soon afterwards appointed general traffic manager of the South-Western railway of Russia and member of an Imperial commission which had to study the whole question of railway construction and management throughout

the empire. His speciality was an intimate acquaintance with the problem of railway rates in connexion with the general economic development of the country, and in 1884 he published a work on the subject which attracted some attention in the official world. Among those who had discovered his exceptional ability in matters of that kind was M. Vishnegradski, minister of finance, who appointed him head of the railway department in the finance ministry. In 1892 he was promoted to be minister of ways of communication, and in the following year, on the retirement of Vishnegradski, he succeeded him as minister of finance. In this important

post he displayed extraordinary activity. He was an ardent disciple of Friedrich List and sought to develop home industries by means of moderate protection and the introduction of foreign capital for industrial purposes. At the same time he succeeded by drastic measures in putting a stop to the great fluctuations in the value of the paper currency and in resuming specie payments. The rapid extension of the railway system was also largely due to his energy and financial ingenuity, and he embarked on a crusade against the evils of drunkenness by organizing a government monopoly for the sale of alcohol. In the region of foreign policy he greatly contributed to the extension of Russian influence in northern China and Persia. Naturally of a combative temperament, and endowed with a persevering tenacity rare among his country- men, he struggled for what he considered the liberation of his country from the economic bondage of foreign nations. Germany was, in his opinion, the neighbour whose aggressive tendencies had to be specially resisted. He was therefore not at all persona grata in Berlin, but the German imperial authorities learned by experience that he was an opponent to be respected, who under- stood thoroughly the interests of his country, and was quite capable of adopting if necessary a vigorous policy of reprisals. During his ten years' tenure of the finance ministry he nearly doubled the revenues of the empire, but at the same time he made for himself, by his policy and his personal characteristics, a host of enemies. He was transferred, therefore, in 1903 from the influential post of finance minister to the ornamental position of president of the committee of ministers. The object was to deprive him of any real political influence, but circumstances brought about a different result. The disasters of the war with Japan, and the rising tide of revolutionary agitation, compelled the government to think of appeasing popular discontent by granting administrative reforms, and the reform projects were revised and amended by the body over which M. Witte presided. Naturally the influence of a strong man made itself felt, and the president became virtually prime minister; but, before he had advanced far in this legislative work, he was suddenly trans- formed into a diplomatist and sent to Portsmouth, N. H., U.S.A., in August 1905, to negotiate terms of peace with the Japanese delegates. In these negotiations he showed great energy and decision, and contributed largely to bringing about the peace. On his return to St Petersburg he had to deal, as president of the first ministry under the new constitutional regime, with a very difficult political situation (sec Russia: History); he was no longer able to obtain support, and early in 1906 he retired into private life.

WITTELSBACH, the name of an important German family, taken from the castle of Wittelsbach, which formerly stood near Aichach on the Paar in Bavaria. In 1124, Otto V., count of Scheyern(d\ n 55), removed the residence of his family to Wittels- bach, and called himself by this name.

Otto was descended from Luitpold, duke of Bavaria and margrave of Carinthia, who was killed in 907 fighting the Hungarians. His son, Arnulf I., called the Bad, drove back the Hungarians, and was elected duke of Bavaria in 913. Arnulf, who was a candidate for the German crown in 919, claimed to be independent, and openly defied the German king, Conrad I. In 921, however, he recog- nized the authority of Henry I. the Fowler, in return for the right to dispense justice, to coin money and to appoint the bishops in Bavaria. He died at Regcnsburg in 937, and his elder son, Eberhard, fought in vain to retain the duchy. In 938 it was given by the German king, Otto I., the Great, to Arnulf 's brother,

Bertold I., with greatly reduced privileges. Arnulf 's younger son, Arnulf II., continued the struggle against Otto I., and some- time before his death in 954 was made count palatine in Bavaria. This office did not become hereditary, however, and his descend- ants bore simply the title of counts of Scheyern until about 11 16, when the emperor Henry V. recognized Count Otto V. as count palatine in Bavaria. His son, Count Otto VI., who succeeded his father in irss, accompanied the German king, Frederick 1., to Italy in 1154, where he distinguished himself by his courage, and later rendered valuable assistance to Frederick in Germany. When Henry the Lion, duke of Saxony and Bavaria, was placed under the imperial ban in ri8o, Otto's services were rewarded by the investiture of the dukedom of Bavaria at Altenburg. Since the time of Otto I. Bavaria has been ruled by the Wittelsbachs.

Otto died at Pfullendorf in ir83, and was succeeded in the duchy by his son, Louis I. (1174-1231), but the dignity of count palatine in Bavaria passed to his brother Otto, whose son Otto, succeeding in 1189, murdered the German king Philip at Bamberg on the 2istof June 1208. He was placed under the ban by the emperor Otto IV., and was killed at Oberndorf, near Regensburg, by Henry of Kalden, marshal of the empire, in March 1209. His lands passed to his son Louis, then only nine years old, who began his rule in 1192. In 1208 he destroyed the ancestral castle of Wittelsbach, the site of which is now marked by a church and an obelisk.

At first Louis supported Otto IV. in his struggle with Frederick of Hohenstaufen (the emperor Frederick II.), but deserted his cause when Frederick invested his son, Otto, with the Palatinate of the Rhine in i2r4. Louis appears to have been previously promised this succession, and to strengthen his claim married his son, Otto, to Agnes, the sister of Henry, the count palatine, who died without heirs in r2i4. Louis accompanied the Crusaders to Damietta in 1221, and governed Germany as regent from 1225 until r228, when he deserted Frederick II. at the instigation of Pope Gregory IX. He was murdered at the bridge of Kelheim on the 15th of September r23i, and the emperor was generally suspected of complicity in

the deed. Louis' son, Otto the Illustrious (1206-1253), undertook the government of the Palatinate in 1228, and became duke of Bavaria in 1231. He was attached to the Hohenstaufen by the marriage of his daughter, Elizabeth, with Conrad, son of Frederick II. in 1246. He supported Frederick in his struggle with the anti-kings, Henry Raspe, landgrave of Thuringia, and William II., count of Holland, and was put under the papal ban by Pope Innocent IV., Bavaria being laid under an interdict. When King Conrad IV. went to Italy in T25r, Otto remained as his representative in Germany, until his death on the 29th of November 1253. He left two sons, Louis and Henry, who reigned jointly until 1255, when a division of the lands was made, by which Louis II. (r228-i294) received upper Bavaria and the Palatinate of the Rhine, and Henry I. (d. 1290) lower Bavaria. Louis, who soon became the most powerful prince in southern Germany, was called " the Stern," because in a fit of jealousy he caused his first wife, Maria of Brabant, to be executed in 1 2 56. He was the uncle and guardian of Conradin of Hohenstaufen, whom he assisted to make his journey to Italy in 1267, and accompanied as far as Verona. When Conradin was executed in 1268 Louis inherited his lands in Germany, sharing them with his brother Henry. In 1273 he was a candidate for the German crown, but was in- duced to support Rudolph, count of Habsburg, whose eldest daughter, Matilda, he married in this year. He was a great source of strength to the Habsburgs until his death in 1294. Lower Bavaria was ruled by the descendants of Henry I. until the death of his great-grandson, John I., in 1340, when it was again united with upper Bavaria. The sons of Louis, Rudolph I. (d. 1319) and Louis, who became German king as Louis IV. in 13 14, ruled their lands in common, but after some trouble be- tween them Rudolph abdicated in 1317.

In r329 the most important division of the Wittelsbach lands took place. By the treaty of Pavia in this year, Louis granted the Palatinate of the Rhine and the upper Palatinate of Bavaria

to his brother's sons, Rudolph II. (d. 1353) and Rupert I. Rupert, who from 1353 to 1390 was sole ruler, gained the electoral dignity for the Palatinate of the Rhine in 1356 by a grant of some lands in upper Bavaria to the emperor Charles IV. It had been exer- cised from the division of 1329 by both branches in turn. The descendants of Louis IV. retained the rest of Bavaria, but made several divisions of their territory, the most important of which was in 1392, when the branches of Ingoldstadt, Munich and Landshut were founded. These were reunited under Albert IV., duke of

Bavaria-Munich (T447-1508) and the upper Palatinate was added to them in 1628. Albert's descendants ruled over a united Bavaria, until the death of Duke Maximilian III. in 1777, when it passed to the Elector Palatine, Charles Theodore. The Palatinate of the Rhine, after the death of Rupert I. in 1390, passed to his nephew, Rupert II., and in 1398 to his son, Rupert III., who was German king from 1400 to 1410. On his death it was divided into four branches. Three of these had died out by 1559, and their possessions were inherited by the fourth or Simmcrn line, among whom the Palatinate was again divided (see Palatinatf,).

In 1742, after the extinction of the two senior lines of this family, the Sulzbach branch became the senior line, and its head, the elector Charles Theodore, inherited Bavaria in 1777. He died in 1799, and Maximilian Joseph, the head of the Zweibrucken branch, inherited Bavaria and the Palatinate. He took the title of king as Maximilian I.

In 1623, when the elector Frederick V. (the " Winter King ") was driven from his dominions, the electoral privilege was trans- ferred to Bavaria, and in 1648, by the Peace of Westphalia, an eighth electorate was created for the Wittelsbachs of the Palatinate, and was exercised by the senior branch of the family.

The Wittelsbachs gave three kings to Germany, Louis IV., Rupert and Charles VII. Members of the family were also margraves of Brandenburg from 1323 to 1373, and kings of Sweden from 1654 to I7r8.

See J. Dollinger, Das Hans Wittelsbach und seine Bedeutnng in der deutscken Geschichte (Munich, 1880); J. F. Bohmer, Wittelsbachische Regesten bis 1340 (Stuttgart, 1854); F. M. Wittmann, Monumenta Wittelsbacensin (Urkundenbuch, Munich, 1857-1861); K. T. Heigel, Die Wittelsbacher (Munich, 1880); F. Leitschuh, Die Wittels- backer in Bay em (Bamberg, 1894).

WITTEN, a town of Germany, in the Prussian province of Westphalia, favourably situated among the coal-fields of the Ruhr, 14 m. E. of Essen and 15 m. N.E. of Elberfeld by rail. Pop. (1905) 35,841. It is an important seat of the steel industry. Other industries arc the making of soap, chemicals and beer. Witten was made a town in 1825. . See Hassel, Wittener Ortskunde und Ortsgesetze (Witten, 1903).

WITTENBERG, a town of Germany, in the Prussian province of Saxony, situated on the Elbe, 59 m. by rail S.W. of Berlin, on the main line to Halle and at the junction of railways to Falkenberg,TorgauandRosslau. Pop. (1905) 20,332. The three suburbs which adjoin the town are not older than 1817. Witten- berg is interesting chiefly on account of its close

connexion with Luther and the dawn of the Reformation; and several of its buildings arc associated with the events of that time. Part of the Augustinian monastery in which Luther dwelt, at first as a monk and in later life as owner with his wife and family, is still preserved, and has been fitted up as a Luther museum. It contains numerous relics of Luther and portraits and other paintings by the Cranachs. The Augusteum, built in 1564- 1583 on the site of the monastery, is now a theological seminary. The Schiosskirche, to the doors of which Luther nailed his famous ninety-five theses in 1517, dates from 1439-1499; it was, however, seriously damaged by fire during the bombardment of 1760, was practically rebuilt, and has since (1885-1892) been restored. The old wooden doors, burnt in 1760, were replaced in 1858 by bronze doors, bearing the Latin text of the theses. In the interior of the church are the tombs of Luther and Melanchthon, and of the electors Frederick the Wise, by Peter Vischer the elder (1527) , and John the Constant, by Hans Vischer; also portraits of the reformers by Lucas Cranach the younger.

The parish church, in which Luther often preached, was built in the 14th century, but has been much altered since Luther's time. It contains a magnificent painting by Lucas Cranach the elder, representing the Lord's Supper, Baptism and Confession, also a font by Hermann Vischer (1457). The present infantry barracks were at one time occupied by the university of Witten- berg, .founded in 1502, but merged in the university of Halle in 1815. Luther was appointed professor of philosophy here in 1508; and the new university rapidly acquired a considerable reputation from its connexion with the early Reformers. In opposition to the strict Lutheran orthodoxy of Jean it repre- sented the more moderate doctrines of Melanchthon. In the Wittenberg Concord (1536) the reformers agreed to a settlement of the eucharistic controversy. Shakespeare makes Hamlet and Horatio study at Wittenberg. The ancient electoral palace is another of the buildings that suffered severely in 1760; it now contains archives. Melanchthon's house and the house of Lucas Cranach the elder (1472-1553), who was burgomaster of Wittenberg, are also pointed out. Statues of Luther (by Schadow), Melanchthon and Bugenhagen embellish the town. The spot, outside the Elster Gate, where Luther publicly burned the papal bull in 1520, is marked by an oak tree. Floriculture, iron-founding, distilling and brewing are carried on.- The formerly considerable manufacture of the heavier kinds of cloth has died out.

Wittenberg is mentioned as early as 11S0. It was the capital of the little duchy of Saxe- Wittenberg, the rulers of which after- wards became electors of Saxony; and it continued to be a Saxon residence under the Ernestine electors. The Capitulation of Wittenberg (1547) is the name given to the treaty by which John Frederick the Magnanimous was compelled to resign the electoral dignity and most of his territory to the

Aibertine branch of the Saxon family. In 1760 the town was bombarded by the Austrians. It was occupied by the French in 1806, and refortified in 1813 by command of Napoleon; but in 1814 it was stormed by the Prussians under Tauentzicn, who received the title of " von Wittenberg " as a reward. Wittenberg continued to be a fortress of the third class until the reorganiza- tion of the German defences after the foundation of the new empire led to its being dismantled in 1873.

See Mcyncrt, Geschichie der Stadt Wittenberg (Dessau, 1845) ; Stier, Die Schiosskirche zu Wittenberg (Wittenberg, i860); ZitzlafT, Die Begrabnissslallen Wiltenbergs und ihre Denhndler (Wittenberg, 1897); and Gurlitt, "Die Lutherstadt Wittenberg," in Muther's Die Kunst (Berlin, 1902).

WITTENBERGE, a town of Germany, in the Prussian province of Brandenburg, on the Elbe, near the influx of the Stepenitz into that river, 77 m. N.W. from Berlin by the main line of rail- way to Hamburg, and at the junction of railways to Stendal, Ltineburg and Perleberg. Pop. (1905) 18,501. The magnificent bridge here spanning the Elbe, one mile in length, was built in 1851 at a cost of £237,500. The chief industries are the manufacture of railway plant, cloth, wool, soap, shoddy, furniture, bricks and cement.

WITTGENSTEIN, LUDWIG ADOLF PETER, Count, prince of Sayn-Wittgenstem-Ludwigsburg (1769-1843), Russian soldier, was descended from a family of formerly independent counts in Westphalia. His father had settled in Russia, and he entered the army, distinguishing himself in the Polish War of 1794- 95, and. then serving in the Caucasus. In 1805ˆ he fought at Austerlitz, in 1806 against the Turks and in 1807 against Napoleon at Fricdland and against the Swedes in Finland. In the war of tSt2 he commanded the right wing army of the Russians. In the campaign of 1813 in January he took over the command of the Russian army after Kutuzov's death. But after the defeats of the Spring campaign he laid down this command and led an army corps during the Dresden and Leipzig campaigns, and at Bar-sut-Aube in the 1814 campaign he was severely wounded. In 1823 he was promoted field -marshal, and in 1828 he was appointed to command the Russian army in the war against Turkey. But ill health soon obliged him to retire. In 1834 the king of Prussia gave him the title of prince. He died on the nth of June 1843.

WITTINGAU (Czech, Tfebon), a town of Bohemia, 95 m. S. of Prague by

rail. Pop. (1900) 5467, mostly Czech. The parish church is a Gothic edifice of the 14th century, with fine cloisters; and the Lusnic chateau, once belonging to the family of Rosen- berg, and now to Prince Schwarzenberg, dating from the 15th century, is reputed to contain the most extensive and valuable archives in Bohemia. The artificial cultivation of fish, now chiefly carp, in the numerous ponds that surround the town dates from the 14th century.

WITU, or Vitu, ?, sultanate of East Africa included in the Tanaland province of the British East Africa protectorate. It extends along the coast from the town of Kipini at the mouth of the Ozi river (2 30′ S.) to the northern limit of Manda Bay (2° S.); area 1200 sq. m. The chief town, Witu, is 16 m. N. of Kipini. The state was founded by Ahmed- bin-Fumo Luti, the last Nabhan sultan of Patta (an island off the coast), who was conquered by Seyyid Majid of Zanzibar. Ahmed, about 1E00, took refuge in the forest district, and made himself an indepen- dent chief, acquiring the title of Simba or the Lion. In 1885 Ahmed was induced to place his country under German protec- tion, and in 1S87 the limits of Witu were fixed by international agreement. In 1890 Germany transferred her protectorate to Great Britain. In the September of that year a British naval force under Admiral Sir E. Fremantle was sent against the sultan Bakari, who had succeeded Ahmed in 18S7 and by whose orders nine German traders and settlers had been murdered. Disorders continued until 1894, and in the following year Omar-bin -Hamed of the Nabhan dynasty — an ancient race of Asiatic origin — was recognized as sultan. The sultan is guided by a British resident, and the state since the accession of Sultan Omar has been both peaceful and prosperous. The population of the sultanate is over 15,000; of the town of Witu 6000, chiefly Swahilis. The port of Witu is Mkonumbi (pop. 1000).

WIVELISCOMBE (pronounced Wilscomb), a market town in the western parliamentary division of Somersetshire, England, 9! m. W. of Taunton by the Great Western railway. Pop. (iqoi), 2246. It stands on a picturesque sloping site in a hilly district, and has some agricultural trade and a brewing industry, while in the neighbourhood are slate quarries.

Traces of a large Roman camp may still be seen to the south- east of Wiveliscombe {Wellescombe, Wilscombe, Wiviscombe) , which is near the line of a Roman road, and hoards of Roman coins have been discovered in the neighbourhood. The town probably owed its origin to the suitability of its position for defence, and it was the site of a Danish fort, later replaced by a Saxon settlement. The overlords were the bishops of Bath and Wells, who had a palace and park here. They obtained a grant of freewarren in 1257. No charter granting self-government to Wiveliscombe has been found, and the only evidence for the traditional existence of a borough is

that part of the town is called " the borough," and that until the middle of the 19th century a bailiff and a portreeve were annually chosen by the court leet. A weekly market on Tuesdays, granted to th,e bishop of Bath and Wells in 1284, is still held. During the 17th and 18th centuries the town was a centre of the woollen manufacture.

WLADISLAUS (Wladislaw), the name of four kings of Poland and two Polish kings of Hungary. 1

Wladislaus I. (1260-1333), king of Poland, called Lokietek, or " Span-long," from his diminutive stature, was the re-creator of the Polish realm, which in consequence of internal quarrels had at the end of the 13th century split up into fourteen in- dependent principalities, and become an easy prey to her neigh- bours, Bohemia, Lithuania, and, most dangerous of all, the Teutonic Order. In 1296 the gentry of Great Poland elected Wladislaus, then prince of Cujavia, to reign over them; but

1 In Hungarian history the Polish Wladislaus (Mae. Ulaszlo) is distinguished from the Hungarian Ladislaus (LaszloJ. They are reckoned separately for purposes of numbering. Besides the Wladislaus kings of Poland, there were three earlier dukes of this name: Wladislaus I. (d. 1102), Wladislaus II. (of Cracow, d. 1163) and Wladislaus III., duke of Great Poland and Cracow (d. 1231). By some historians these are included in the numbering of the Polish sovereigns, King Wladislaus I. being thus IV. and so on.

distrusting the capacity cf the taciturn little man, they changed their minds and placed themselves under the protection of the powerful Wenceslaus, king of Bohemia, who was crowned at Gnesen in 1300. Wladislaus thereupon went to Rome, where Pope Boniface VIII., jealous of the growing influence of Bohemia, adopted his cause; and on the death of Wenceslaus in 1305 Wladislaus succeeded in uniting beneath his sway the princi- palities of Little and Great Poland. From the first he was beset with great difficulties. The towns, mostly of German origin, and the prelates headed by Muskata, bishop of Cracow, were against him because he endeavoured to make use of their riches for the defence of the sorely pressed state. The rebellious magistrates of Cracow he succeeded in suppressing, but he had to invoke the aid of the Teutonic Order to save Danzig from the margraves of Brandenburg, thus saddling Poland with a far more dangerous enemy; for the Order not only proceeded to treat Danzig as a conquered city, but claimed possession of the whole of Pomerania. Wladislaus thereupon (1317) appealed to Pope John XXII., and a tribunal of local prelates appointed by the holy see ultimately (Feb. 9, 1321) pronounced judgment in favour of Wladislaus, and condemned the Order not only to restore Pomerania but also to pay heavy damages. But the knights appealed to

Rome; the pope reversed the judgment of his own tribunal; and the only result of these negotiations was a long and bloody six years' war (1327-1333) between Poland and the Order, in which all the princes of Central Europe took part, Hungary and Lithuania siding with Wladislaus, and Bohemia, Masovia and Silesia with the Order. It was not till the last year but one of his life that Wladislaus succeeded with the aid of his Hungarian allies in inflicting upon the knights their first serious reverse at Plowce (27th of September 1332). In March 1333 he died. He had laid the foundations of a strong Polish monarchy, and with the consent of the pope revived the royal dignity, being solemnly crowned king of Poland at Cracow on the 20th of January 1320. His reign is remarkable for the development of the Polish constitution, the gentry and prelates being admitted to some share in the government of the country.

See Max Perlbach, Preussisch-polnische Sludien zur Geschichle des Mittelalters (Halle, 1886); Julius A. G. von Pflugk-Harttung, Der deutsche Orden im Kampfe Ludwigs des Bayern mil der Kurie (Leipzig,

1900).

Wladislaus II., Jagxello (1350-1434), king of Poland, was one of the twelve sons of Olgierd, grand-duke of Lithuania, whom he succeeded in 1377. From the very beginning of his reign Jagiello was involved in disputes with the Teutonic Order, and with his uncle, the valiant Kiejstut, who ruled Samogitia independently. By the treaty of Dawidyssek (June 1, 1380) he contracted an alliance with the knights, and two years later, acting on the advice of his evil counsellor, Wojdyllo, enticed Kiejstut and his consort to Krewo and there treacherously murdered them (Aug. 15, 1382). This foul deed naturally drove Witowt {q.v.), the son of Kiejstut, into the arms of the Order; but both princes speedily recognized that the knights were the real enemies of Lithuania, and prudently composing their differ- ences invaded Prussian territory. This was the beginning of the fifty years' struggle with the Teutonic Order which was to make the reign of Jagiello so memorable. He looked about him betimes for allies against the common enemy of the Slavonic races, and fortune singularly favoured him. The Poles had brought their young queen Jadwiga home from Hungary, and in 1384 Jagiello sent a magnificent embassy to Cracow offering her his hand on condition that they shared the Polish crown. Jadwiga had long been betrothed to William of Austria; but she sacrificed her predilections for her country's good. On the 15th of February 1386 Jagiello, who had previously been elected king of Poland under the title of Wladislaus II., accepted the Roman faith in the cathedral of Cracow, and on the 18th his espousals with Queen Jadwiga were solemnized.

Jagiello's first political act after his coronation was the conversion of

Lithuania to the true religion. This solemn act was accomplished at Vilna, the Lithuanian capital, on the 17th of February 1387, when a stately concourse of nobles and prelates,

headed by the king, proceeded to the grove of secular oaks beneath which stood the statue of Perkunos and other idols, and in the presence of an immense multitude hewed down the oaks, destroyed the idols, extinguished the sacred fire and elevated the cross on the desecrated heathen altars, 30,000 Lithuanians receiving Christian baptism. A Catholic hierarchy was imme- diately set up. A Polish Franciscan, Andrew Wassilo, was con- secrated as the first Catholic bishop of Vilna, and Lithuania was divided ecclesiastically into seven dioceses. Mainly on the initiative of Queen Jadwiga, Red Russia with its capital the great trading city of Lemberg was persuaded to acknowledge the dominion of Poland; and there on the 27th of September 13S7 the hospoclars of Walachia and Moldavia for the first time voluntarily enrolled themselves among the vassals of Poland.

With savage Lithuania converted and in close alliance with Catholic Poland, the Teutonic Order was seriously threatened. The knights endeavoured to re-establish their position by sowing dissensions between Poland and Lithuania. In this for a time they succeeded (see Witowt); but in 1401 Jagiello recognized Witowt as independent grand-duke of Lithuania (union of Vilna, January 18, 1401), and their union was cemented in the battle of Griincwald, which shook the whole fabric of the Teutonic Order to its very foundations. Henceforth a remarkable change in the whole policy of the Order was apparent. The struggle was no longer for dominion but for existence. Fortunate for them, in Jagiello they possessed an equally cautious and pacific opponent. Wladislaus II., in sharp contrast to Witowt, was of anything but a martial temperament. He never swerved from Ms main object, to unite Poland and Lithuania against the dangerous denationalizing German influences which environed him. But he would take no risks and always preferred craft to violence. Hence his leaning upon the holy see in all his disputes with his neighbours. Hence, too, his moderation at the peace of Thorn (1st of February 1411), when the knights skilfully extricated themselves from their difficulties by renouncing their pretensions to Samogitia, restoring Dobrzyn and paying a war indemnity; Jagiello was content to discredit them rather than provoke them to a war & ouirance. Equally skilful was Jagielio's long diplo- matic duel with the emperor Sigismund, then the disturbing element of Central Europe, who aimed at the remodelling of the whole continent and was responsible for the first projected partition of Poland.

Jagiello was married four times. At the dying request of the childless Jadwiga he espoused a Styrian lady, Maria Cillei, who bore him a daughter, also called Jadwiga. His third wife, Elizabeth Grabowska. died without issue, and the question of the succession then became so serious that Jagielio's advisers counselled him to betroth his daughter to Frederick of Hohcn- zollern, who was to be educated in Poland as the heir to the throne. But in 1422 Jagiello himself solved the difficulty by wedding Sonia, princess of Vyazma, a Russian lady rechristened Sophia, who bore him two sons, Wladislaus and Casimir. both of whom ultimately succeeded him. Jagiello died at Grodko near Lemberg in 1434.. During his reign of half a century Poland had risen to the rank of a great power, a position she was to retain for nearly two hundred years under the dynasty which Jagiello had founded.

See August Sokolowski, History of Poland, .vol. i. (Pol.) (Vienna, 1903); Carl Edward Napierski, Russo- Lithuanian Acts (Rus.) (St Petersburg, 1868); Monumenta Mcdii Aevi (Cracow, 1882) ; Karol Szajnocha, Jadiviga and Jagiello (Pol.) (Lemberg, 1855-1856)

Wladislaus III. (1424-1444), king of Poland and Hungary, the eldest son of Wladislaus II. Jagiello, by his fourth wife, Sophia of Vyazma, was born at Cracow on the 31st of October 1424, succeeding to the throne in his tenth year. The domestic troubles which occurred during his minority had an important influence upon the development of the Polish constitution; but under the wise administration of Zbigniew Olesnicki Poland suffered far less from her rebels than might have been anticipated, and Wladislaus gave the first proof of his manhood by defeating the arch-traitor Spytek of Melztyn in his camp at Grotnik on the 4th of May 1439. On the sudden death of the emperor Albert, who was also king of Bohemia and Hungary, the Hungarians

elected Wladislaus as their king, despite the opposition of the widowed empress Elizabeth, already big with the child who subsequently ascended the Hungarian throne as Wladislaus V. But Wladislaus ILL, who was solemnly crowned king of Hungary at Buda by the Magyar primate in July 1440, had to fight against the partisans of the empress for three years till Pope Eugenius IV. mediated between them so as to enable Wladislaus to lead a crusade against the Turks. War was proclaimed against Sultan Murad II. at the diet of Buda on Palm Sunday 1443, and with an army of 40,000 men, mostly Magyars, the young monarch, with Hunyadi commanding under him, crossed the Danube, took Nish and Sofia, and advancing to the slope of the Balkans, returned to Hungary covered with glory. Europe resounded with the praises of the youthful hero, and the Venetians, the Genoese, the duke of Burgundy and the pope encouraged Wladislaus to continue the war by offering him every assistance. But at this

juncture the sultan offered terms to Wladislaus through George Brankovic, despot of Scrvia, and, by the peace of Szeged (July 1, 1444), Murad engaged to surrender Servia, Albania and whatever territory the Ottomans had ever con- quered from Hungary, including 24 fortresses, besides paying an indemnity of 100,000 florins in gold. Unfortunately, Wladis- laus listened to the representations of the papal legate, Cardinal Julian Cesarini, who urged him in the name of religion to break the peace of Szeged and resume the war. Despite the repre- sentations of the Poles and of the majority of the Magyars, the king, only two days after solemnly swearing to observe the terms of the treaty, crossed the Danube a second time to co-operate with a fleet from the West which was to join hands with the land army at Gallipoli, whither also the Greeks and the Balkan Slavs were to direct their auxiliaries. But the Walachians were the sole allies of Hungary who kept faith with her, and on the bloody field of Varna, November the 10th, 1444, Wladislaus lost his life^and more than a fourth of his army.

See Julian Bartoszewicz, View of the Relations of Poland with the Turks and Tatars (Pol.) (Warsaw, i860); August Sokolowski, History of Poland, vol. ii. (Pol.) (Vienna, 1904) ; Ign&cz Acsady, History of the Hungarian Realm, vol. i. (Hung.) (Budapest, 3905).

Wladislaus IV. (1595-1648), king of Poland, son of Sigismund III., king of Poland, and Anne of Austria, succeeded his father on the throne in 16.32. Prom his early youth he gave promise of great military talent, and served his apprenticeship in the science of war under Zolkiewski in the Muscovite campaigns of 1610-1612, and under Chodkiewicz in 1617-1618. Wladislaus's first official act was to march against the Muscovites, who had declared war against Poland immediately after the death of Sigismund, and were besieging Smolensk, the key of Poland's eastern frontier. After a series of bloody engagements (Aug. 7-22, 1632) Wladislaus compelled the tsar's general to abandon the siege, and eventually to surrender (March 1, 1634) with his whole army. Meanwhile the Turks were threatening in the south, and Wladislaus found it expedient to secure his Muscovite conquests. Peace was concluded at the river Polyankova on the 28th of May 1634, the Poles conceding the title of tsar to Michael Romanov, who renounced all his claims upon Livonia, Esthonia and Courland, besides paying a war indemnity of 200,000 rubles. These tidings profoundly impressed Sultan Murad, and when the victorious Wladislaus appeared at Lemberg, the usual starting-point for Turkish expeditions, the Porte offered terms which were accepted in October, each power engaging to keep their borderers, the Cossacks and Tatars, in order, and divide between them the suzerainty of Moldavia and Walachia, the sultan binding himself always to place philo-Polish hospodars on those slippery thrones. In the follow- ing year the long-pending differences with Sweden were settled, very much to the advantage of Poland, by the truce of Stumdorf, which was to last for

twenty-six years from the 1 2th September 1635. Thus externally Poland was everywhere triumphant. Internally, however, things were in their usually deplorable state owing to the suspicion, jealousy and parsimony of the estates of the realm. They had double reason to be grateful to Wladislaus for defeating the enemies of the republic, for he had also paid for the expenses of his campaigns out of his own pocket.

yet he could not obtain payment of the debt due to him from the state till 1643. ˆ e was bound by the pacta conventa which he signed on his accession to maintain a fleet on the Baltic. He proposed to do so by levying tolls on all imports and exports passing through the Prussian pcrts which had been regained by the truce of Stumdorf. Sweden during her temporary occupa- tion of these ports had derived from them an annual income of 3,600,000 gulden. But when Wladislaus, their lawful possessor, imposed similar tolls in the interests of the republic, Danzig pro- tested and appealed to the Scandinavian powers. Wladislaus's little fleet attempted to blockade the port of the rebellious city, whereupon a Danish admiral broke the blockade and practically destroyed the Polish flotilla. Yet the sejm, so sensitive to its own privileges, allowed the insult to the king and the injury to the state to pass unnoticed, conniving at the destruction of the national navy and the depletion of the treasury, " lest warships should make the crown too powerful." For some years after this humiliation, Wladislaus became indifferent to affairs and sank into a sort of apathy; but the birth of his son Sigisrmmd (by his first wife, Cecilia Renata of Austria, in 1640) gave him fresh hopes, and he began with renewed energy to labour for the dynasty as well as for the nation. He saw that Poland, with her existing constitution, could not hope for a long future, and he determined to bring about a royalist reaction and a reform along with it by every means in his power. He began by founding the Order of the Immaculate Conception, consisting of 72 young noblemen who swore a special oath of allegiance to the crown, and were to form the nucleus cf a patriotic move- ment antagonistic to the constant usurpations of the diet, but the sejm promptly intervened and quashed the attempt. Then he conceived the idea of using the Cossacks, who were deeply attached to him, as a means of chastising the szlachta, and at the same time forcing a war with Turkey, which would make his military genius indispensable to the republic, and enable him if successful to carry out domestic reforms by force of arms. His chief confidant in this still mysterious affair was the veteran grand hetman of the crown, Stanislaw Koniecpolski, who under- stood the Cossacks better than any man then living, but differed from the king in preferring the conquest of the Crimea to an open war with Turkey. Simultaneously Wladislaus

contracted an offensive and defensive alliance with Venice against the Porte, a treaty directly contrary indeed to the pacta conventa he had sworn to observe, but excusable in the desperate circumstances. The whole enterprise fell through, owing partly to the death of Koniecpolski before it was matured, partly to the hastiness with which the king published his intentions, and partly to the careful avoidance by the Porte of the slightest occasion of a rupture. Frustrated in all his plans, broken-hearted by the death of his son (by his second wife, Marie Ludwika of Angouleme, Wladislaus had no issue), the king, worn out and disillusioned, died at Merccz on the 20th of May 1648, in his 52nd year. After his cousin Gustavus Adolphus, whom in many respects he strikingly resembled, he was indubitably the most amiable and brilliant of all the princes of the House of Vasa.

See Wiktor Czermak, The Plans of the Turkish Wars of Wladislaus TV. (Pol.) (Cracow, 1895); V. V. Volk-Karachevaky, The Struggle of Poland with the Cossacks' (Rus.) (Kiev, 1899); Letters and other Writings of Wladislaus IV. (Pol.) (Cracow, 1845). (R. N. B.)

WOAD, a herbaceous plant, known botanically as Tsatis tincioria (natural order Cruciferae), which occurs sporadically in England in fields, on banks and chalk-pits. The erect branched stem, 1 to 3 ft. in height, bears sessile leaves and terminal clusters of small yellow flowers 1 , the brown pendulous pods are ˆ in. long. The ancient Britons stained themselves with this plant. It is still cultivated in Lincolnshire.

WOBURN, a market town in the northern parliamentary division of Bedfordshire, England, with a station (Woburn Sands), on a branch of the London & North-Western railway, 2 m. from the town and 51 m. N.W. by N. from London. Pop. (1001) 1 1 20. It lies in a hollow of a northern spur of the Chiltern Hills, in a finely wooded locality. There is some agricultural trade, and a little straw-plaiting and lace-making are carried on. To the west

of the town lies Woburn Park, the demesne of Woburn Abbey, the seat of the dukes of Bedford. The a,bbey was a Cistercian foundation of 1145, but only scanty remains of the buildings are seen in the mansion which rose on its site. This, with most of the abbey lands, was granted by Henry VIII. to John, Lord Russell, in 1547, who was created earl of Bedford in 1550 (the dukedom dating from 1694). The mansion was begun in 1744; it contains a magnificent collection of paintings and other objects of art.

WOBURN, a city of Middlesex county, Massachusetts, U.S.A., 10 m. W. by N.W. of Boston. Pop. (1890) 13,499; (1900) 14,254, of whom 3840 were foreign-born and 261 were negroes; (1910, U.S. census) 15,308.

Area, 12-6 sq. m. Woburn is served by the southern division of the Boston & Maine railway, and is connected with Burlington, Lexington, Reading, Stoneham, Wilmington, Winchester, Arlington, Boston and Lowell by electric railways. In the city area are several villages, including Wcburn proper, known as " the Centre," North Woburn, Woburn Highlands, Cummingsville (in the western part), Mis- hawum (in the north-east), Montvale (in the east) and Walnut Hill (also in the east). There are two ancient burying- grounds; the oldest, on Park Street, dates from about 1642 and contains the graves of ancestors of four presidents — Cleveland, Benjamin Harrison, Franklin Pierce and Garfield — and a granite obelisk to the memory of Loammi Baldwin (1744-1807). On Academy Hill is the Warren Academy building used by a Free Industrial School. Forest Park (53 acres) is a fine stretch of natural woods, and there are several small parks and squares; on Woburn Com- mon is the Public Library, by H. H. Richardson, the gift of Charles Winn. The building houses an art gallery and historical museum, and a library of about 50,000 volumes especially rich in Americana. Among colonial bouses still standing are the birthplace of Count Rumford (in North Woburn), built about 1714, and now preserved by the Rumfcrd Historical Association as a depository for the Rumford Library and historical memorials, and the Baldwin mansion (built partly in 1661 and later enlarged), the home of Loammi Baldwin (1780-1838), known as " the father of civil engineering in America." Woburn's manufactories are concentrated within a small area. The city is the most important leather manufacturing centre of New England: in 1905 the value of the leather product was $2,851,554, being 61-3% of the value of all factory products ($4,654,067); other manufactures are chemicals, leather-working machinery, boots and shoes, glue and cotton goods. Market gardening is an important industry.

Woburn, first settled about 1638-1640, was incorporated as a township under its present name in 1642, and was the first township set off from Charicstown. It then included a large part of the present Winchester and the greater part of the present Wilmington and Burlington, separately organized in 1730 and 1799 respectively. It was named after Woburn in Bedfordshire by its chief founder, Edward Johnson (1599-1672), whose work, The Wonder-Working Providence of Zion's Saviour (1654; latest ed. 1910), was one of the earliest historical accounts of the Massachusetts Bay Colony. The leather industry was established by David Cummings at Cummingsville shortly before the War of Independence. Woburn's industrial growth dates from the construction through the township of the old Middlesex Canal. The city was chartered in 1888.

See P. L. Converse, Legends of 'Woburn, 1642-1892 (2 vols., Woburn, 1892-1896) ; Samuel Scwall, History of Woburn, 1640(0 i860 (Boston, 1868); F. E. Wetherell, Two Hundred and Fiftieth Anniversary of Woburn

(Woburn, 1892); and G. M. Champney in S. A. Drake's History of Middlesex County (2 vols., Boston, 1880).

WOCHUA (Aciiua), a pygmy people of Africa, living in the forests of the Mabode district, south of the Welle. They were discovered (1880-1883) by Dr W. Junker, who described them as " well proportioned, though the oval-shaped head seemed somewhat too large for the size of the body." Some are of light complexion, like the Akka and Batwa, but as a general rule they belong to the darker, crisper-haired, more genuine negro stock.

WODEN, a deity of the Anglo-Saxons, the name being the Anglo-Saxon counterpart of the Scandinavian Odin (q.v.). In German the same god was called Wodan or Wuotan. Owing

to the very small amount of information which has come down to us regarding the gods of ancient England and Germany, it cannot be determined how far the character and adventures attributed to Odin in Scandinavian mythology were known to other Teutonic peoples. It is clear, however, that the god was credited with special skill in magic, both in England and Germany, while the story of the Langobardic migration (see Lombards) represents him as the dispenser of victory. From Woden also most of the anglo-Saxon royal families traced their descent. By the Romans he was identified at an early date with Mercurius, whence our name " Wednesday " (Woden's day) as a translation of dies Mercurii. Tacitus states that the ancient Germans worshipped Mercurius more than any other god, and that they offered him human sacrifices. Many scholars connect the origin of the deity with the popular German and Swedish belief in a raging host (in Germany called das wutende Heer or Wutes Heer, but in Sweden Odens Jagt), which passes through the forests on stormy nights. There is evidence, however, that deities similar to Woden were known to some of the ancient peoples of central Europe, e.g. the Gauls and Thracians. See Teutonic Peoples, ail Jin. (H. M.C.)

WODROW, ROBERT (1670-1734), Scottish historian, was born at Glasgow, being a son of James Wodrow, professor of divinity. He was educated at the university and was librarian from 1697 to 1701. From 1703 till his death, on the 21st of March 1734, he was parish minister at Eastwood, near Glasgow. He had sixteen children, his son Patrick being the " auld Wodrow " of Burns's poem '" Twa Herds." His great work, The History of the Sufferings of the Church of Scotland from the Restoration to the Revolution, was published in two volumes in 1721-1722 (new ed. with

a life of Wodrow by Robert Burns, D.D., 1807-1808). Wodrow also wrote a Life (1S28) of his father. He left two other works in MS. — Memoirs of Reformers and Ministers of the Church of Scotland, and Analecta: or Materials for a History of Remarkable Providences, -mostly relating to Scotch Ministers and Christians. Of the former, two volumes were published by the Maitland Club in 1834-1845 and one volume by the New Spalding Club in 1890; the latter was published in four volumes by the Maitland Club in 1842-1S43.

Wodrow left a great mass of correspondence, three volumes of which, edited by T. M'Crie, appeared in 1843-1844. The Wodrow Society, founded in Edinburgh to perpetuate his memory, was in existence from 1841 to 1847, several works being published under its auspices.

WOELFL, JOSEPH (1772-1812), Austrian pianist and com- poser, was born in 1772 at Salzburg, where he studied music under Leopold Mozart and Michael Haydn. After a short residence at Warsaw he produced his first opera, Der Hbllenberg, with some success at Vienna, where it was soon followed by Das schone Milchmddchen and some other dramatic pieces. His fame now rests upon his compositions for the pianoforte, and the skill with which he is said to have met their formidable demands upon his power as an executant. The perfection of his technique was immeasurably enhanced by the enormous stretch of his fingers (his hand could strike a thirteenth with ease); and to his wide grasp of the keyboard he owed a facility of execution which he turned to excellent account, especially in his extempore performances. His technique was superior even to that of the young Beethoven, who played in company with him at the house of Count Wetzlar, and in memory of this exhibition of good-humoured rivalry he dedicated to Beethoven his " Three Sonatas," Op. 6. Quitting Vienna in 1798, he exhibited his skill in most of the great European capitals, and, after spending some years in Paris, made his first appearance in London on the 27th of May 1805. Here he enjoyed a long term of popularity, crowned about 1808 by the publication of his sonata, Op. 41, containing some variations on " Life let us cherish." This, on account of its technical difficulty, he entitled Non Plus Ultra; and, in reply to the challenge, Dussek's London pub- lishers reprinted a sonata by that composer, originally called Le Retour d Paris, with the title Plus Ultra, and an ironical dedication to Non Plus Ultra. Woelfl died in Great Marylebone Street, London, on the 21st of May 1812.

WOFFINGTON, MARGARET [Peg] (c. 1714-1760), English actress, was born at Dublin, of poor parents. As a child of ten she played Polly Peachum in a lilliputian presentation of The Beggar's Opera, and danced and acted at various Dublin theatres until 1 740, when her success as Sir Harry Wildair in The Constant Couple secured her a London engagement.

In this, and as Sylvia in The Recruiting Officer, she had a pronounced success; and at Drury Lane and Covent Garden, as well as in Dublin, she appeared in all the plays of the day to ever growing popularity. Among her best impersonations were the elegant women of fashion, like Lady Betty Modish and Lady Townley, and in " breeches parts " she was unapproachable. She lived openly with Garrick, and her other love affairs were numerous and notorious, but her generosity and kindness of heart were equally well known. She educated her sister Mary, and cared for and pensioned her mother. She built and endowed by will some almshouses at Teddington, where she lived quietly after her retirement in 1757,

See Austin Dobson's introduction to Charles Reade's novel Peg Woffingion (London, 1899), and Augustin Daly's Woffington: a Tribute to t)ie Actress and the Woman (1888).

WOHLER, FRIEDRICH (1800-1882), German chemist, was born at Eschersheim, near Frankfort on the-Main, on the 31st of July 1800. In 1814 he began to attend the gymnasium at Frankfort, where he carried out experiments with his friend Dr J. J, C. Buch. In 1820 he entered Marburg University, and next year removed to Heidelberg, where he worked in Leopold Gmelin's laboratory. Intending to practise as a physician, he took his degree in medicine and surgery (1S23), but was persuaded by Gmelin to devote himself to chemistry. He studied in Berzelius's laboratory at Stockholm, and there began a lifelong friendship with the Swedish chemist. On his return he had proposed to settle as a Privatdozent at Heidelberg, but accepted the post of teacher of chemistry in the newly established technical school {Gewerbeschule) in Berlin (1825), where he remained till 1831. Private affairs then called him to Cassel, where he soon became professor at the higher technical school. In 1836 he was appointed to the chair of chemistry in the medical faculty at Gottingen, holding also the office of inspector-general of pharmacies in the kingdom of Hanover. This professorship he held until his death on the 23rd of September 1882.

Wohler had made the acquaintance of Liebig, his junior by three years, in 1825, and the two men remained close friends and allies for the rest of their lives. Together they carried out a number of joint researches. One of the earliest, if not the earliest, was the investigation, published in 1830, which proved the polymerism of cyanic and cyanuric acid, but the most famous were those on the oil of bitter almonds (benzaldehyde) and the radicle benzoyl (1832), and on uric acid (1837), which are of fundamental importance in the history of organic chemistry. But it was the achievement of Wohler alone, in 1828, to break down the barrier held to exist between organic and inorganic chemistry by artificially preparing urea, one of those substances which up to that time it had been thought could only be produced through the agency of " vital force." Most of his

work, however, lay in the domain of inorganic chemistry. The isolation of the elementary bodies and the investigation of their properties was one of his favourite pursuits. In 1827 he obtained metallic aluminium as a fine powder, and in 1845 improved methods enabled him to get it in fully metallic globules. Nine years after- wards H. E. Sainte-Claire Deville, ignorant of what he had done, adopted the same methods in his efforts to prepare the metal on an industrial scale; the result of Wohler 's claim of priority was that the two became jˆood friends and joined in a research, published in 1856-1857, which yielded "adamantine boron." By the same method ashad succeeded with aluminium (reduction of the chloride by potassium) Wohler in 1828 obtained metallic beryllium and yttrium. Later, in 1849, titanium engaged his attention, and, proving that what had up to that time passed as the metal was really a cyanonitride, he showed how the true metal was to be ob- tained. He also worked at the nitrides, and in 1857 with H. Buff carried out an inquiry on the compounds of silicon in which they prepared the previously unknown gas, silicon hydride or silicurettea hydrogen. A problem to which he returned repeatedly was that of separating nickel and cobalt from their ores and freeing them from arsenic; and in the course of his long laboratory practice he worked out numerous processes for the preparation of pure chemicals and methods of exact analysis.

The Royal Society's Catalogue enumerates 276 separate memoirs written by him, apart from 43 in which he collaborated with others.

In 1831 he published Grundriss der anorganischen Chemie, and in 1840 Grundriss der organischen Chemie, both of which went through many editions. Still more valuable for teaching purposes was his Mineralanalyse in Beispielen (1861), which first appeared in 1853 as Praktiscke Obungen in der chemischen Analyse. Chemists also had to thank him for translating three editions of the Lehrbuch oi Berzelius and all the successive volumes of the Jahresbericht into German from the original Swedish. He assisted Liebig and Boggendorff in the Handworterbuch der reinen und angewandten Chemie, and was joint- editor with Liebig of the Annalen der Chemie und Pharmacie.

A memoir by Hofmann appeared in the Ber. deut. chem. Gesellsch. (1882), reprinted in Zur Erinnerung an vorangegangene Freunde (r888).

WOHLGEMUTH, MICHAEL (1434-1519), German painter, was born at Nuremberg in 1434. Little is known of his private life beyond the fact that

in 1472 he married the widow of the painter Hans PlcydenwuriT, whose son Wilhelm worked as an. assistant to his stepfather. The importance of Wohlgemuth as an artist rests, not only on his own individual paintings, but also on the fact that he was the head of a large workshop, in which many different branches of the fine arts were carried on by a great number of pupil-assistants, including Albert Diirer. In this atelier not only large altar-pieces and other sacred paintings were executed, but also elaborate rotables in carved wood, con- sisting of crowded subjects in high relief, richly decorated with gold and colour, such as pleased the rather doubtful Teutonic taste of that time. Wood-engraving was also carried on in the same workshop, the blocks being cut from Wohlgemuth 's designs, many of which are remarkable for their vigour and clever adaptation to the special necessities of the technique of woodcutting. Two large and copiously illustrated books have woodcuts supplied by Wohlgemuth and his stepson Wilhelm Pleydenwurff. The first is the Schatzkammer der wahren Reichthilmcr des Heils, printed by Koburger in 1401; the other is the Hisloria mundi, by Schedel, 1493-1494, usually known as the Nuremberg Chronicle, which is highly valued, not for the text, but for its remarkable collection of spirited engravings.

The earliest know r n work by Wohlgemuth is a retable con- sisting of four panels, dated 1465, now in the Munich gallery, a decorative work of much beauty. In 1479 he painted the retable of the high altar in the church of St Mary at Zwickau, which still exists, receiving for it the large sum of 1400 gulden. One of his finest and largest works is the great retable painted for the church of the Austin friars at Nuremberg, now moved into the museum; it consists of a great many panels, with figures of those saints whose worship was specially popular at Nuremberg. In 1 501 Wohlgemuth was employed to decorate the town hall at Goslar with a large series of paintings; some on the ceiling are on panel, and others on the walls are painted thinly in tempera on canvas. As a portrait-painter he enjoyed much repute, and some of his works of this class are very admirable for their realistic vigour and minute finish. Outside Germany Wohl- gemuthˆ paintings are scarce: the Royal Institution at Liverpool possesses two good examplesˆ" Pilate washing his Hands," and " The Deposition from the Cross," parts probably of a large altar- piece. During the last ten years of his life Wohlgemuth appears to have produced Uttle by his own hand. One of his latest paintings is the retable at Schwabach, executed in 1508, the contract for which still exists. He died at Nuremberg in

1519.

See the reproductions in Die Gemdlde von Diirer und Wohlgemuth, by Richl and Thode (Nuremberg, 1889-1805).

WOKING, a market town in the Chcrtscy parliamentary division of Surrey, England, 24 m. S.W. of London by the London and South-Wcstern railway. Pop. of urban district (1S91) 9786; (1001) 16,244. The river Wey and the Basing- stoke canal pass through the parish. St Peter's church dates from the 13th century. Modern structures include a public hall, and an Oriental institute (in the building erected For the Royal Dramatic College, including a museum oT Eastern anti- quities, a mosque, and residences for Orientals). In the vicinity are the Surrey county asylum and a female convict prison. Near Woking is Brook wood cemetery, belonging to the London Necropolis Company, with a crematorium. xxviii. 25

WOKINGHAM, a market town and municipal borough in the Wokingham parliamentary division of Berkshire, England, 36 m. W. by S. of London by the South-Western railway, served also by the South-Eastern and Chatham railway. Pop. (1901) 3551. It lies on a slight eminence above a valley tributary to that of the river Loddon, in a well-wooded district on the outskirts of the former royal forest of Windsor. The church of St Laurence is Perpendicular, greatly altered by restoration. Two miles west of the town is the village of Bearwood. The trade of Wokingham is principally agricultural. The borough is under a mayor, 4 aldermen and 12 councillors. Area, 557 acres.

W'okingham (Wokyngham, Oakingham, Ockingham), which was within the limits of YVindsor Forest, was formerly situated partly in Berkshire and partly in a detached piece of Wiltshire, which is now annexed to Berkshire; the Berkshire portion of the town was in the manor of Sonning, which was held by the bishops of Salisbury from before the Conquest until the reign of Elizabeth. The earliest existing charter to Wokingham is that of Elizabeth (1583), which recites and confirms some ancient customary privileges respecting the election of an alderman and other corporate officers. The governing charter for more than 250 years was that of James I. (1612), incorporating it as a free town under the title of the " Alder- man and Burgesses of the Town of Wokingham in the Counties of Berks and Wilts." Under the provisions of the Municipal Corpora- tions Act of 1882 a new charter of incorporation was granted, in- stituting a municipal body to consist of a mayor, 4 aldermen and 12 councillors. Wokingham was assessed at £50 for ship-money, Reading being assessed at £220. It had at this time a manufacture of silk stockings, which flourished as early as 1625, and survived up to the 19th century. The town shared in the benefactions of Laud, whose father was born there. The Tuesday market, which is still held and which, during the first half of the 19th century, was famous for poultry, was granted to the bishop of Salisbury by Henry III. (1219), who also granted (1258) two annual fairs to be held on the vigil, day and morrow of St Barnabas and All .Saints respectively; the latter is still kept up, the former appears in the list of fairs held in 1792.

*WOLCOT, JOHN (1738-1819), English satirist and poet, known under the pseudonym of Petek. Pindar, was the son of Alexander Wolcot, surgeon at Dodbrooke, adjoining Kingsbridge. in Devonshire, and was baptized there on the 9th of May 1738. He was educated at Kingsbridge free school, at the Bodmin and Liskeard grammar schools, and in France. For seven years he was apprenticed to his uncle, John Wolcot, a surgeon at Fowey, and he took his degree of M.D. at Aberdeen in 1767. In 1769 he was ordained, and went to Jamaica with his uncle's patient, Sir William Trelawny, the new governor. In 1772 he became incumbent of Vere, Jamaica, but on the death of his patron (nth of December 1772) he returned to England, and settled as a physician at Truro. In 1 781 Wolcot went to London, and took with him the young Cornish artist, John Opie, whose talents in painting he had been the first to recognize. Before they left Cornwall Opie apparently made a rash engagement to share his profits with Wolcot, but a breach between them occurred soon after they settled in London. Wolcot had already achieved some success in a Supplicating Epistle to the Reviewers (1778), and after his settlement in London he threw off with' marvellous rapidity a succession of pungent satires. George III. was his favourite subject of ridicule, and his peculiarities were described or distorted in The Lousiad (1785), Peeps at St James's (1787) and The Royal Visit to Exeter. Two of Wolcot *s happiest satires on the " farmer king " depicted the royal survey of Whitbread's brewery, and the king's naive wonder how the apples got into the apple dumplings. In his Expostulatory Odes (1789) he eulogized the prince of Wales. BoswelFs biography of Johnson was ridiculed in An Epistle to James Boswell (1786), and in the same year followed another piece, called Bozzy and Pioszi. Other subjects were found in Sir Joseph Banks and the Emperor of Morocco (1790), and a Complimentary Epistle to James Bruce (1790). Among his early satires were Lyric Odes to the Academicians (1782), and another series on the same subject, Farewell Odes (1786). He specially attacked Benjamin West, but expressed great admiration for the landscapes of Gains- borough and Richard Wilson. Wolcot was himself no mean artist, and in 1 797 appeared Six Picturesque Views from Paintings by Peter Pindar, engraved by Aiken. In 1795 he disposed of his works to the booksellers for an annuity of £250. His*

various pieces were published in 1796 in four octavo volumes ! and often reprinted. Wolcot cared little whether he hit above or below the belt, and the gross vituperation he indulged in spoils much of his work for present-day readers; but he had a broad sense of humour, a keen eye for the ridiculous, and great felicity of imagery and expression. Some of his serious

pieces — his rendering of Thomas Warton's epigram on Sleep and his Lord Gregory, for example — reveal an unexpected fund of genuine tenderness. In William Giflord, who attacked him in the Epistle to P. Pindar, he for once met with more than his match. Wolcot made a personal assault on his enemy in Wright's shop in Piccadilly, but Giflord was too quick for him, and Wolcot was soundly thrashed. He died at Latham Place, Somers Town, London, on the 14th of January 1819, and seven days later was buried, as he had desired, near Samuel Butler, the author of Hudibras, in St Paul's, Covent Garden.

Polwhele, the Cornish historian, was well acquainted with Wolcot in his early life, and the best account of his residence in the west is found in vol. i. of Polwhele's Traditions and in Polwhele's Biographical Sketches, vol. ii. Cyrus Redding was a frequent visitor at the old man's house, and has described Wolcot's later days in his Past Celebrities, vol. i., and his Fifty Years' Recollections, vols. i. and ii.

WOLCOTT, ROGER (1679-1767), American administrator, was born in Windsor, Connecticut, on the 4th of January 1679, the son of Simon Wolcott (d. 1687). He was a grandson of Henry Wolcott (1578-1655) of Galdon Manor, Tolland, Somerset, who emigrated to New England in 1628, assisted John Mason and others to found Windsor, Conn., in 1635, and was a member of the first General Assembly of Connecticut in 1637 and of the House of Magistrates from 1643 to his death. 1 Roger Wolcott was early apprenticed to a weaver and throve at this trade; he was a member of the Connecticut General Assembly in 1709, one of the Bench of Justices in 1710, commissary of the Connecticut forces in the expedition of 1711 against Canada, a member of the Council in 1714, judge of the county court in 1721 and of the superior court in 1732, and deputy-governor and chief-justice of the superior court in 1741. He was second in command to Sir William Pepperrell, with rank of major-general in the expedition (1745) against Louisbourg, and was governor of Connecticut in 1751-1754. He died in what is now East Windsor, on the 17th of May 1767.

He wrote Poetical Meditations (1725), an. epic on Tte Agency of the Honourable John Winthrop in the Court of King Charlm the Second (printed in pp. 262-298 of vol. iv., series I, Collections of Massachusetts Historical Society), and a pamphlet to prove that " the New England Congregational churches are and always have been consociated churches." His Journal at the Siege of Louisbourg is printed in pp. 131-161 of vol. i. (i860) of the Collections of the Connecticut Historical Society.

His son, Erastus Wolcott (1722-1793) was a member of the Connecticut General Assembly and its speaker; he was a brigadier-general of

Connecticut militia in the War of Inde- pendence, and afterwards a judge of the Superior Court of Connecticut.

Another son, Oliver Wolcott (1726-1797), graduated at Yale in 1747 and studied medicine with his brother Alexander (1712-1795). In 1751 he was made sheriff of the newly estab- lished Litchfield county and settled in Litchfield, where he practised law. He was a member of the Council in 1774-17S6 and of the Continental Congress in 1775-1776, 1778 and 1780- 1784. Congress made him a commissioner of Indian affairs for the Northern Department in 1775, and during the early years of the War of Independence he was active in raising militia in Connecticut. He was one of the signers of the Declaration of Independence; commanded Connecticut militia that helped to defend New York City in August 1776; in 1777 organized more Connecticut volunteers and took part in the last few days of the campaign against General John Eurgoyne; and in 1779 commanded the militia during the British invasion of Con- necticut. In 1784, as one of the commissioners of Indian affairs for the Northern Department, he negotiated the treaty of Fort Stanwix (22nd Oct.) settling the boundaries of the Six Nations. 1 Henry Wolcott the younger (d. 1680) was one of the patentees of Connecticut under the charter of 1662.

In 1786- 1796 he was lieutenant-governor of Connecticut, and in November 1787 was a member of the Connecticut Convention which ratified the Federal Constitution ; he became governor in 1796 upon the death (15th Jan.) of Samuel Huntington, and served until his death on the 1st of December 1797.

See the sketch by his son Oliver in Sanderson's Biography of the Signers of the Declaration of Independence (Philadelphia, 1820-1827). Oliver's son, Oliver Wolcott, jun. (1760-1833), graduated at Yale in 1778, studied law in Litchfield under Judge Tapping Reeve, and was admitted to the bar in 1781. With Oliver Ellsworth he was appointed (May 1784) a commissioner to adjust the claims of Connecticut against the United States. In 1788 he was made comptroller of public accounts of Connecticut;' in the next year was appointed auditor of the Federal Treasury; in June 1791 became comptroller of the Treasury , and in February 1795 succeeded Alexander Hamilton as Secretary of the Treasury. At the end of 1800 he resigned after a bitter attack by the Democratic-Republican press, against which he defended himself in an Address to the People of the United Stales. In 1801-1802 he was judge of the Circuit Court of the Second District (Connecti- cut, Vermont and New York), and then entered business in New York City, where he was president of the short-lived Merchants' Bank (1803) and president (1812-1814) of the Bank of North America. With a brother he then founded factories at Wolcott- ville (near Litchfield). He re-entered politics as a leader of the " Toleration Republicans," attempting to

oust the Congregational clergy from power by adopting a more liberal constitution in place of the charter; he was defeated for governor in 1815, but in 1817 presided over the state convention which adopted a new constitution, and in the same year was elected governor, serving until 1827. He died in New York City on the 1st of June 1833.

His grandson, George Gibbs (1815-1873), in 1846 edited Memoirs of the Administration of Washington and John Adams . . . from the Papers of Oliver Wolcott, Secretary of the Treasury. Wolcott wrote British influence on the Affairs of the United States Proved and Ex- plained (1804).

A grandson of the second Oliver's brother Frederick was Roger Wolcott (1847-1901), who graduated at Harvard in 1870, and was admitted to the Suffolk bar in 1874. He practised law in Boston, and served in the Massachusetts House of Repre- sentatives in 1882-1884 as a Republican. In 1892 he was elected lieutenant-governor (re-elected 1893 and 1895), and in 1896 became acting-governor upon the death (5th March) of Governor Frederick T. Greenhalge. He was elected governor in 1896 and served until 1900. He died on the 21st of December 1901.

Edward Oliver Wolcott (1848-1905), a memberof the same family ,went to Colorado, became interested in silver mining there, was a U.S. Senatorin 1889-1901, and was a prominent Republican bimetallist.

See William Lawrence, Roger Wolcott [1847-1901] (Boston, 1902), and for all the family, Samuel Wolcott, Memorial of Henry Wolcott, one of the first Settlers of Windsor, Connecticut, and of some of his Descendants (New York, 1881).

WOLF, FRIEDRICH AUGUST (1759-1824), German philo- logist and critic, was born on the 15th of February 1759 at Hainrode, a little village not far from Nordhausen, in the province of Hanover. His father was the village schoolmaster and organist. In time the family removed to Nordhausen, and there young Wolf went to the grammar school, where he soon acquired all the Latin and Greek that the masters could teach him, besides learning French, Italian, Spanish and music. The precocity of his attainments was only equalled by the force of will and confidence in his own powers which characterized him throughout life. After two years of solitary study; at the age of eighteen, Wolf went (1777) to the university of Gottingen. His first act there was a prophecy — one of those prophecies which spring from the conscious power to bring about their fulfilment. He had to choose his " faculty," and chose one which then existed only in his own mind, the faculty of " philology." What is even more remarkable, the omen was accepted. He carried his point, and was enrolled as he desired. C. G. Heyne was then the chief ornament of Gottingen, and Wolf and he

were not on good terms. Heyne excluded him from his lectures, and brusquely condemned

Wolf's views on Homer. Wolf, however, pursued his studies in the university library, from which he borrowed with his old avidity. During 1779-1783 Wolf was a schoolmaster, first at Ilfeld, then at Osterode. His success as a teacher was striking, and he found time to publish an edition of the Symposium of Plato, which excited notice, and led to his promotion (1783) to a chair in the Prussian university of Halle. The moment was a critical one in the history of education. The literary impulse of the Renaissance was almost spent; scholarship had become dry and trivial. A new school, that of Locke and Rousseau, sought to make teaching more modern and more human, but at the sacrifice of mental discipline and scientific aim. Wolf was eager to throw himself into the contest on the side of antiquity. In Halle (1783-1807), by the force of his will and the enlightened aid of the ministers of Frederick the Great, he was able to carry out his long-cherished ideas and found the science of philology. Wolf denned philology broadly as 'i know- ledge of human nature as exhibited in antiquity." The matter of such a science, he held, must be sought in the history and education of some highly cultivated nation, to be studied in written remains, works of art, and whatever else bears the stamp of national thought or skill. It has therefore to do with both history and language, but primarily as a science of interpretation, in which historical facts and linguistic facts take their place in an organic whole. Such was the ideal which Wolf had in his mind when he established the philological seminarium at Halle.

Wolf's writings make little show in a library, and were always subordinate to his teaching. During hi? time at Halle he pub- lished his commentary on the Leptines of Demosthenes (1789) — which suggested to his pupil, Aug. Boeckh, the Public Economy of Athens— and a little later the celebrated Prolegomena to Homer (1795). This book, the work with which his name is chiefly associated, was thrown off in comparative haste to meet an immediate need. It has all the merits of a great piece of oral teaching — command of method, suggest iveness, breadth of view. The reader does not feel that he has to do with a theory, but with great ideas, which are left to bear fruit in his mind (see Homer). The publication led to an unpleasant polemic with Heyne, who absurdly accused him of reproducing what he had heard from him at Gdttingen.

The Halle professorship ended tragically, and with it the happy and

productive period of Wolf's life. He was swept away, and his university with him, by the deluge of the French invasion. A painful gloom oppressed his remaining years (1807-1824), which he spent at Berlin. He became so fractious and intolerant as to alienate some of his warmest friends. He gained a place in the department of education, through the exertions of W. von Humboldt. When this became unendurable, he once more took a professorship. But he no longer taught with his old success; and he wrote very little. His most finished work, the Darstellung der Alterthumswissenschaft, though published at Berlin (1807), belongs essentially to the Halle time. At length his health gave way. He was advised to try the south of France. He got as far as Marseilles, and, dying there on the 8th of August 1824, was laid in the classic soil of that ancient Hellenic city.

Mark Pattison wrote an admirable sketch of Wolf's life and work in the North British Review of June 1865, reproduced in his Essays (1889); see also J. E. Sandys, Hist, of Class. Schol. iii. (1908), pp. 51-60. Wolf's Rhine Sc'hriften were edited by G. Rernhardy (Halle, 1869). Works not included are the Prolegomena, the Letters to Heyne (Berlin, 1797), the commentary on the Leptines (Halle, 1789) and a translation of the Clouds of Aristophanes (Berlin, 1811). To these must be added the Vorlesungen on Iliad i.-iv., taken from the notes of a pupil and edited by Usteri (Bern, 1830). (D. B. M.)

WOLF, HUGO (1860-1903), German composer, was born on the 13th of March i860 at Windischgraz in Styria. His father, who was in the leather trade, was a keen musician. From him Hugo learned the rudiments of the piano and the violin. After an unhappy school life, in which he showed little aptitude for anything but music, he went in 1875 to the Conservatoire. He appears to have learned very little there, and was dismissed in 1877 because of a practical joke in the form of a threatening

letter to the director, for which he was perhaps unjustly held responsible. From the age of seventeen he had to depend upon himself for his musical training. By giving lessons on the piano and with occasional small help from his father he managed to ■ live for several years in Vienna, but it was a life of extreme hardship and privation, for which his delicate constitution and his proud, sensitive and nervous temperament were particularly ill-suited. In 1884 he became musical critic to the Salonblatt, a Viennese society paper, and contrived by his uncompromisingly trenchant and sarcastic style to win a notoriety which was not helpful to his future prospects. His ardent discipleship of Wagner was unfortunately linked with a bitter opposition to Brahms, for whose works he always retained an ineradicable dislike. The publication at the end of 1887 of twelve of his songs seems to have definitely decided the course of his genius, for about

this time he retired from the Salonblatt, and resolved to devote his whole energies to song-composition. The nine years which followed practically represent his life as a composer. They were marked by periods of feverish creative activity, alternating with periods of mental and physical exhaustion, during which he was sometimes unable even to bear the sound of music. By the end of 1 89 1 he had composed the bulk of his works, on which his fame chiefly rests, 43 Morikc Lieder, 20 Eichendorff Licder, $t Goethe Lieder, 44 Licder from Geibel and Heyse's Spanisches Liederspiel, and 22 from Heyse's Italienisches Liederbuch, a second part consisting of 24 songs being added in 1896. Besides these were 13 settings of lyrics by different authors, incidental music to Ibsen's Fest auf Solhaug, a few choral and instrumental works, an opera in four acts, Der Corregidor, successfully produced at Mannheim in June 1896, and finally settings of three sonnets by Michelangelo in March 1897. In September of this year the malady which had long threatened descended upon him; he was placed in an asylum, released in the following January, only to be immured again some months later by his own wish, after an attempt to drown himself in the Traunsee. Four painful years elapsed before his death on the 22nd of February 1903. Apart from his works and the tragedy of his last years there is little in Wolf's life to distinguish it frora that of other struggling and unsuccessful musicians. His touchy and difficult temperament perpetually stood in the way of worldly success. What little he obtained was due to the persevering efforts of a small band of friends, critics and singers, to make his songs known, to the support of the Vienna Wagner- Verein, and to the formation in 1895 of the Hugo- Wolf -Verein in Berlin. No doubt it was also a good thing for his reputation that the firm of Schott undertook in 1 89 1 the publication of his songs, but the financial result after five years amounted to 85 marks 35 pfennigs (about £4., 10s.). He lived in cheap lodgings till in 1S96 the generosity of his friends provided him with a house of his own, which he enjoyed foF one year.

Among the song composers who have adopted the modern standpoint, according to which accepted canons of beauty and of form must yield if they interfere with a closer or more vivid realization of dramatic or emotional expression, Wolf holds a place in which he has no rival, not because of the daring origin- ality of his methods and the remarkable idiosyncrasies of his style, but because these are the direct outcome of rare poetical insight and imaginative power. He has that gift of vision which makes the difference between genius and talent. His frequent adoption of a type of song built upon a single phrase or leit-motiv in the accompaniment has led to the misleading statement that his work represents merely the transference of Wagnerian principles to song. In reality the forms of Wolf's songs vary as widely as those of the poems which he set. No less remarkable is the immense range of style at his command. But with Wolf

methods of form and style are so inseparably linked with the poetical conceptions which they embody, that they can hardly be considered apart. His place among the greatest song-writers is due to the essential truth and originality of his creations, and to the vivid intensity with which he has presented them. These results depend not merely on musical gifts that are exceptional, but also upon a critical grasp of poetry of the highest order.

No other composer has exhibited so scrupulous a reverence for the poems which he set. To displace an accent was for him as heinous an act of sacrilege as to misinterpret a conception or to ignore an essential suggestion. Fineness of declamation has never reached a higher point than in Wolf's songs. Emphasis should also be laid upon the objective and dramatic attitude of his mind. He preferred to make himself the mouthpiece of the poetry rather than to use his art for purposes of self-revelation, avoiding for his songs the works of those whom with healthy scorn he termed the Ich-Poeten. Hence the men and women characterized in his songs are living realities, forming a veritable portrait gallery, of which the figures, though unmistakably the work of a single hand, yet maintain their own separate identity. These statements can be verified as well by a reference to the simpler and more melodious of his songs, as to those which are of extreme elaboration and difficulty. Among the former may be named Das verlassene Magdlein in der Friike and Der Gartner (Morike), Versc.kwie.gene, Licbe and Der Musikant (Eichendorff), Anakreons Grab (Goethe), Alle gingen, Herz, zur Ruh' and Hers, was fragst (Spanisches Liederspiel), Nos. I and 4 of the Ilalienisches Liederbuch, and among the latter Aeohharfe and Der Feuerreiler (Morike), Ganymed And Prometheus (Goethe) . (W. A. J. F.)

WOLF, JOSEPH (1820-1890), Anglo-German artist, the son of a German farmer, was born in 1820 at Miinstermaifeld, on the river Moselle, in the Rhine Province. In his boyhood he was an assiduous student cf bird and animal life, and showed a remark- able capacity as a draughtsman of natural history subjects. His powers were first recognized by Professor Schlegel of the Leiden museum, who gave him employment as an illustrator. In 1848 he settled in London, where he remained till his death on the 20th of April i8gg. He made many drawings for the Zoological Society, and a very large number of illustrations for books on natural history and on travel in various countries; but he also won a considerable success as a painter.

See A. H. Palmer, The Life of Joseph Wolf (London, 1895).

WOLF (Cants lupus), the common English name for any wild member of

the typical section of the genus Canis (see Caenivoea) . Excluding some varieties of domestic dogs, wolves are the largest members of the genus, and have a wide geographical range, extending over nearly the whole of Europe and Asia, and North America from Greenland to Mexico, but are not found in South America or Africa, where they are replaced by other members of the family. They present great diversities of size, length and thickness of fur, and coloration, although resembling each other in all important structural characters. These differences have given rise to a supposed multiplicity of species, expressed by the names C. lycaon (Central Europe), C. laniger and C. niger (Tibet), the C. occidentalis, C. nubilus, C. mexicanus, &c, of North America, and the great blackish-brown Alaskan C. pambasileus, the largest of them all. But it is doubtful whether these should be regarded as more than local varieties. In North America there is a second distinct smaller species, called the coyote or prairie-wolf (Canis latrans), and perhaps the Japanese wolf (C. kodophylax) may be distinct, although, except for its smaller size and shorter legs, it is scarcely distinguishable from the common species. The wolf enters the N.W. corner of India, but in the peninsula is replaced by the more jackal-like C. pallipes, which is probably a member of the jackal group, and not a wolf at all.

The ordinary colour of the wolf is yellowish or fulvous grey, but almost pure white and entirely black wolves are known. In northern countries the fur is longer and thicker, and the animal generally larger and more powerful than in the southern portion of its range. Its habits are similar everywhere and it is still, and has been from time immemorial, especially known to man in all the countries it inhabits as the devastator of sheep flocks. Wolves do not catch their prey by lying in ambush, or stealing up close and making a sudden spring, but by fairly running it down in open chase, which their speed and remarkable endurance enable them to do. Except during summer when the young families of cubs are being separately provided for by their parents, they assemble in troops or packs, often in relays, and by their

combined and persevering efforts are able to overpower and kill deer, antelopes and wounded animals of all sizes. It is singular that such closely allied species as the domestic dog and the Arctic fox are among the favourite prey of wolves, and ; as is well known, children and even full-grown people are not in- frequently the objects of their attack when pressed by hunger. Notwithstanding the proverbial ferocity of the wolf in a wild state, many instances are recorded of animals taken when quite young becoming tame and attached to the person who has brought them up, when they exhibit many of the ways of a dog. They can, however, rarely be

trusted by strangers.

The history of the wolf in the British Isles, and its gradual extir- pation, has been thoroughly investigated by Mr J. E. Harting in his work on Extinct British Animals, from which the following account is abridged. To judge by the osteological remains which the re- searches of geologists have brought to light, there was perhaps scarcely a county in England or Wales in which, at one time or another, wolves did not abound, while in Scotland and Ireland they must Wave been still more numerous. The fossil remains _ which have been discovered in Britain are not larger than, nor in any way to be distinguished from, the corre5ponding bones and teeth of European wolves of the present day. Wolf-hunting was a favourite pursuit of the ancient Britons as well as of the Anglo-Saxons. In Athelstan's reign these animals abounded to such an extent in York- shire that a retreat was built by one Acehorn, at Flixton, near Filey, wherein travellers might seek refuge if attacked by them. As is well known, great efforts were made by King Edgar to reduce the number of wolves in the country, but, notwithstanding the annual tribute of 300 skins paid to him during several years by the king of Wales, he was not altogether so successful as has been commonly imagined. In the reign of Henry III. wolves were sufficiently numerous in some parts of the country to induce the king to make grants of land to various individuals upon the express condition of their taking measures to destroy these animals wherever they could be found. In Edward II. 's time, the king's forest of the Peak, in Derbyshire, is especially mentioned as infested with wolves, and it was not until the reign of Henry VII. (1485-1509) that wolves appear to have become finally extinct in England. This, however, is rather a matter of inference from the cessation of all mention of them in local records than from any definite evidence of their extirpation. Their last retreat was probably in the desolate wolds of Yorkshire. In Scotland, as might be supposed from the nature of the country, the wolf maintained its hold for a much longer period. There is a well-known story of the last of the race being killed by Sir Ewen Cameron of Locniel in 1680, but there is evidence of wolves having survived in Suthcrlandshire and other parts into the following century (perhaps as late as 1743), though the date of their final extinction cannot be accurately fixed. In Ireland, in Cromwell's time, wolves were particularly troublesome, and said to be increas- ing in numbers, so that special measures were taken for their destruc- tion, such as the offering of large rewards for their heads, and the prohibition (in 1652) of the exportation of " wolf-dogs," the large dogs used for hunting the wolves. The active measures taken then and later reduced their numbers greatly, so that towards the end of the century they became scarce, but, as in the case of the sister island, the date of their final disappearance cannot now be ascertained. It has been placed, upon the evidence of somewhat doubtful traditions, as late as 176G.

It is owing to their position that the British Islands have been able to clear themselves of these formidable and destructive animals, for France, with no natural barriers to prevent their incursions from the continent to the east, is liable every winter to visits from numbers of these animals. (W.H.F.; R.L.)*

WOLFDIETRICH, German hero of romance. The tale of Wolfdietrich is connected with the Merovingian princes, Theodoric and Theodebert, son and grandson of Clovis; but in the Middle High German poems of Ortnit and Wolfdietrich in the Heldenbuch (q.v.) Wolfdietrich is the son of Hugdietrich, emperor of Con- stantinople. Repudiated and exposed by his father, the child was spared by the wolves of the forest, and was educated by the faithful Berchtung of Meran. The account of his parents and their wooing, however, differs in various texts. After the emperor's death Wolfdietrich was driven from his inheritance by his brothers at the instigation of the traitor Sabene. Berch- tung and his sixteen sons stood by Wolfdietrich. Six of these were slain and the other ten imprisoned. It was only after long exile in Lombardy at the court of King Ortnit that the hero returned to deliver the captives and regain his kingdom. Wolfdie- trich's exile and return suggested a parallel with the history of Dietrich of Bern, with whom he was often actually identified; and the Mentors of the two heroes, Hildebrand and Berch- tung, are cast in the same mould. Presently features of the

Wolfdietrich legend were transferred to the Dietrich cycle, and in the Anhang to the Heldenbuch it is slated in despite of all his- torical considerations that Wolf die trich was the grandfather of the Veronese hero. Among the exploits of Wolfdietrich was the slaughter of the dragon which had slain Ortnit {q.v.). He thus took the place of Hardheri, one of the mythical Hartung brothers, the original hero of this feat. The myth attached itself to the family of Clovis, around which epic tradition rapidly gathered. Hugdictrich is generally considered to be the epic counterpart of Theodoric (Dietrich), eldest son of Clovis. The prefix was the barbarian equivalent of Frank, 1 and was employed to distinguish him from Theodoric the Goth. After his father's death he divided the kingdom with his brothers. Wolfdietrich represents his son Theodebert (d, 548), whose succession was disputed by his uncles, but was secured by the loyalty of the Prankish nobles. But father and son are merged by a process of epic fusion in Wolfdietrich. The rape of Sydrat, daughter of the heathen Walgunt of Salnecke, by Hugdietrich disguised as a woman, is typical of the tales of the wooing of heathen princesses made fashionable by the Crusades, and was probably extraneous to the original legend. It may, however, also be

put on a semi- historical basis by adopting the suggestion of C. Voretzsch (Epischc Studien I. Die Comp. des Huon von Bordeaux, Halle iqoo), that Wolfdietrich is far more closely connected with Theodoric than Theodebert, and that Hugdietrich, therefore, stands for Clovis, the hero, in the Merovingian historians, of a well-known Brautfahrtsaga.

Ortnit and Wolfdietrich have been edited by Dr J. L. Edlen von Lindhausen (Tubingen., 1906). G. Sarrazin, in Zeitsckr. fur deutsche Phil. (1896), compared the legend of Wolfdietrich with the history of Gundovald, as given by Gregory of Tours in books vi. and vii. of his Hist. Francorum.

WOLFE, CHARLES (1791-1823), Irish poet, son of Theobald Wolfe of Blackhall, Co. Kildare, was born on the 14th of December 1791. He was educated at English schools and at Trinity College, Dublin, where he matriculated in 1809 and graduated in 1814. He was ordained priest in 181 7, and obtained the curacy of Ballyclog, Co. Tyrone, which he shortly exchanged for that of Donoughmore in the same county. He died at Cork on the 21st of February 1823 in his thirty-second year. Wolfe was well known as a poet in Trinity College circles. He is remembered, however, solely by his stirring stanzas on the " Burial of Sir John Moore," written in 1816 in the rooms of Samuel O'Sullivan, a college friend, and printed in the Newry Telegraph.

See John Russell, Remains of the Rev. Charles Wolfe (2 vols., 1825; 4th cd., 1829), and a correspondence in Notes and Queries, 8th series, vol. viii. pp. 145, 178, 235, 253, 331 and 418.

WOLFE, JAMES (1727-1759), British general, the hero of Quebec, was born at Westerham in Kent on the 2nd of January 1727. At an early age he accompanied his father, Colonel {afterwards Lieutenant-General) Edward Wolfe, one of Marl- borough's veterans, to the Carthagena expedition, and in 1741 his ardent desire for a military career was gratified by his appoint- ment to an ensigncy. At the age of fifteen he proceeded with the 1 2th Foot (now Suffolk Regiment) to the Rhine Campaign, and at Dettingen he distinguished himself so much as acting adjutant that he was made lieutenant. In 1744 he received a company in Barrel's regiment (now the 4th King's Own). In the Scottish rising of the " Forty-five " he was employed as a brigade-major. He was present at Hawley's defeat at Falkirk, and at Culloden. With his old regiment, the 12th, Wolfe served in the Flanders campaigns of the duke of Cumberland, and at Val (Lauffeld) won by his valour the commendation of the duke. Promotion followed in 1749 to a majority, and in 1750 to the lieutenant - colonelcy of the 20th, with which he served in Scotland. Some years later he spent six months in Paris. When war broke out afresh in 1757 he served as a staff officer in the unfortunate Rochefort expedition, but his prospects

were not affected by the failure, for had his advice been taken the result might well have been different. Next year he was sent to

1 " Hugo Theodoricus iste dicitur, id est Franc.us, quia olim omnes Franci Hugones vocabantur . . ., " Annates Quedlinburg. (Pertz Script, iii. 420.)

N. America as a brigadier-general in the Louisburg expedition under Amherst and Boscawen. The landing was effected in the face of strenuous opposition, Wolfe leading the foremost troops. On the 27th of July the place surrendered after an obstinate defence; during the siege Wolfe had had charge of a most important section of the attack, and on his lines the fiercest fighting took place. Soon afterwards he returned to England to recruit his shattered health, but on learning that Pitt desired him to continue in America he at once offered to return. It was now that the famous expedition against Quebec was decided upon, Wolfe to be in command, with the local rank of major-general. In a brief holiday before his departure he met at Bath Miss Lowther, to whom he became engaged. Very shortly afterwards he sailed, and on the 1st of June 1759 the Quebec expedition sailed from Louisburg (see Quebec) . After wearisome and disheartening failures, embittered by the pain of an internal disease, Wolfe crowned his work by the decisive victory on the Plains of Abraham (13th of September 1759) by which the French permanently lost Quebec. Twice wounded earlier in the fight, he had refused to leave the field, and a third bullet passing through his lungs inflicted a mortal injury. While he was lying in a swoon some one near him exclaimed, " They run; see how they run!" " Who run? " demanded Wolfe, as one roused from sleep. " The enemy," was the answer; " they give way everywhere." Wolfe rallied for a moment, gave a last order for cutting off the retreat, and murmuring, " Now God be praised, I will die in peace," breathed his last. On the battle-ground a tall column bears the words, "Here died Wolfe victorious on the 13th of September 1759." In the governor's garden, in Quebec, there is also a monument to the memory of Wolfe and his gallant opponent Montcalm, who survived him only a few hours, with the inscrip- tion " Wolfe and Montcalm. Mortem virtus communem, famam historia, monumentum posteritas dedit" In Westminster Abbey a public memorial to Wolfe was unveiled on the 4th of October

1773.

See R. Wright, Life of Major-General James Wolfe (London, 1864); F. Parkrnan, Montcalm and Wolfe (London, 1884); Twelve British Soldiers (London, 1899) ; General Wolfe's Instructions to Young Officers (1768 -1780) ; Bccklcs Willson, The Life and Letters of James Wolfe (1909) ; and A. G. Bradley, Wolfe (1895).

WOLFENBUTTEL, a town of Germany, in the duchy of Brunswick, situated on both banks of the Oker, 7 m. S. of Brunswick on the railway to Harzburg. Pop. (1905) 19,083. Lessing was ducal librarian here, and the old library building, designed in 1723 in imitation of the Pantheon at Rome, contains a marble statue of him. The library, including 300,000 printed books and 10,000 MSS., was, however, transferred to a large and new Renaissance edifice in 1887. It is especially rich in Bibles, incunabula and books of the early Reformation period, and contains some fragments of the Gothic bible of Ulfilas. Opposite the old library is the palace, now occupied by a> seminary. The ducal burial-vault is in the church of St Mary.

A castle is said to have been founded on the site of Wolfen- buttel by a margrave of Meissen about 1046. When this began in 1267 to be the residence of the early Brunswick or Wolf en- biittel line of counts, a town gradually grew up around it. In 1542 it was taken by the Saxons and Hessians, who, however, evacuated it five years later after the battle of Muhlberg. In the Thirty Years' War, in June 1641, the Swedes, under Wrangel and Konigsmark, defeated the Austrians under the archduke Leopold at Wolfenbuttel. The town passed wholly into the possession of the Brunswick-Wolfenbiittel family in 1671, and for nearly one hundred years enjoyed the distinction of being the ducal capital. In 1754, however, Duke Charles transferred the ducal residence to Brunswick.

See Voges, Erzdhlungen aus der Geschickte der Stadt Wolfenbuttel (Wolfenbuttel, 1882); von Heinemann, Die herzogliche BibUothek zu WolfenbiiUel (2nd ed., Wolfenbuttel, 1894). For the " Wolfen- buttel fragments " see Lessing and Reimarus.

WOLFF, CASPAR FRIEDRICH (1733-1794), German anato- mist and physiologist, justly reckoned the founder of modern embryology, was born in 1733 at Berlin, where he studied anatomy and physiology under the elder J. F. Meckel. He

graduated in medicine at Halle in 1759, his thesis being his famous Tkeoria generationis. After serving as a surgeon in the Seven Years' War, he wished to lecture on anatomy and physiology in Berlin, but being refused permission he accepted a call from the empress Catharine to become professor of those subjects at the academy of St Petersburg, and acted in this capacity until his death there in 1 794.

While the theory of " evolution " in the crude sense— i.e. a simple growth in. size and' unfolding of organs all previously existent in the germ— was

in possession of the field, his researches on the develop- ment of the alimentary canal in the chick first clearly established the converse view, that of epigenesis, i.e. of progressive formation and differentiation of organs from a germ primitively homogeneous. He also largely anticipated the modern conception of embryonic layers, and is said even to have foreshadowed the cell theory.

WOLFF (less correctly Wolf), CHRISTIAN (1679-1754), German philosopher and mathematician, the son of a tanner, was born at Breslau on the 24th of January 1679. At the university of Jena he studied first mathematics and physics, to which he soon added philosophy. In 1703 he qualified as Privatdozent in the university of Leipzig, where he lectured till 1706, when he was called as professor of mathematics and natural philosophy to Halle. Before this time he had made the acquaintance of Leibnitz, of whose philosophy his own system is a modification. In Halle Wolff limited himself at first to mathematics, but on the departure of a colleague he added physics, and presently included all the main philosophical disciplines. But the claims which Wolf! advanced on behalf of the philosophic reason (see Rationalism) appeared impious to his theological colleagues. Halle was the headquarters of Pietism, which, after a long struggle against Lutheran dogmatism, had itself assumed the characteristics of a new orthodoxy. Wolff's professed ideal was to base theological truths on evidence of mathematical certitude, and strife with the Pietists broke out openly in 1721, when Wolff, on the occasion of laying down the office of pro-rector, delivered an oration " On the Practical Philosophy of the Chinese " (Eng. tr. 1750), in which he praised the purity of the moral precepts of Confucius, pointing to them as an evidence of the power of human reason to attain by its own efforts to moral truth. For ten years Wolff was subjected to attack, until in a fit of exasperation he appealed to the court for protection. His enemies, however, gained the ear of the king Frederick William I. and represented to him that, if Wolff's determinism were recognized, no soldier who deserted could be punished, since he would only have acted as it was necessarily predetermined that he should. This so enraged the king that he at once deprived Wolff of his office, and commanded him to leave Prussian territory within forty-eight hours on pain of a halter. The same day Wolff passed into Saxony, and presently proceeded to Marburg, to which university he had received a call before this crisis. The landgrave of Hesse received him with every mark of distinction, and the circumstances of his expulsion drew universal attention to his philosophy. It was everywhere discussed, and over two hundred books and pamphlets appeared for or against it before 1737, not reckoning the systematic treatises of Wolff and his followers. In 1740 Frederick William, who had already made overtures to Wolff to return, died suddenly, and one of the first acts of his successor, Frederick the Great,

was to recall him to Halle. His entry into the town on the 6th of December 1740 partook of the nature of a triumphal procession. In 1743 he became chancellor of the university, and in 1745 he received the title of Freiherr from the elector of Bavaria. But his matter was no longer fresh, he had outlived his power of attracting students, and his class-rooms remained empty. He died on the 9th of April 1754.

The Wolffian philosophy held almost undisputed sway in Germany till it was displaced by the Kantian revolution. It is essentially a common-sense adaptation or watering-down of the Leibnitzian system; or, as we can hardly speak of a system in connexion with Leibnitz, Wolff may be said to have methodized and reduced to dogmatic form the thoughts of his great predecessor, which often, however, lose the greater part of their suggestiveness in the process. Since his philosophy disappeared before the influx of new ideas and the appearance of more speculative minds, it has been customary to dwell almost exclusively on its defects — the want of depth or fresh-

ness of insight, and the aridity of its neo- scholastic formalism, which tends to relapse into verbose platitudes. But this is to do injustice to Wolff's real merits. These are mainly his comprehensive view of philosophy, as embracing in its survey the whole field of human knowledge, his insistence everywhere on clear and methodic ex- position, and his confidence in the power of reason to reduce all subjects to this form. To these must be added that he was practically the first to "teach philosophy to speak German." The Wolffian system retains the determinism and optimism of Leibnitz, but the monadology recedes into the background, the monads falling asunder into souls or conscious beings on the one hand and mere atoms on the other. The doctrine of the pre-established harmony also loses its metaphysical significance, and the principle of sufficient reason introduced by Leibnitz is once more discarded in favour of the principle of contradiction which Wolff seeks to make the funda- mental principle of philosophy. Philosophy is defined by him as the science of the possible, and divided, according to the two faculties of the human individual, into a theoretical and a practical part. Logic, sometimes called philosophia rationalis, forms the introduc- tion or propaedeutic to both. Theoretical philosophy has for its parts ontology or philosophia prima, cosmology, rational psycho- logy and natural theology ; ontology treats of the existent in general, psychology of the soul as a simple non-extended substance, cosmology of the world as a whole, and rational theology of the existence and attributes of God. These are best known to philo- sophical students by .Kant's treatment of them in the Critique of Pure Reason. Practical philosophy is subdivided into ethics, economics and politics. Wolff's moral

principle is the realization of human perfection.

Wolff's most important works are as follows: Anfangsgriinde alter mathematischen Wissenschaften (1710; in Latin, Elementa matheseos universae, 1713-1715); Verniinftige Gedanken von den Krdften des menschlichen Verstandes (1712; Eng. trans. 1770); Vern. Ged. von Gott, der Welt und der Seele des Menschen (1719) ; Vern. Ged. von der Menschen Thun und Lassen (1720); Vern. Ged. von dem gesellsckaft-lichen Leben der Menschen (1721) ; Vern. Ged. von den Wirkungen der Natur (1723); Vern. Ged. von den Absichten der natiirlichen Dinge (1724); Vern. Ged. von dem Gebrauche der Theile in Menschen, Thieren und Pfianzen (1725) ; the last seven may briefly be described as treatises on logic, metaphysics, moral philosophy, political philosophy, theoretical physics, teleology, physiology : Philosophia rationalis, sive logica (1728); Philosophia prima, sive Onlologia (1729); Cosmologia generalis (1731); Psychologia empirically^); Psychologia rationalis (1734) ; Theologia naturalis (1736-1737) ; Philosophia practica universalis (1738-1739); Jus naturae and Jus Gentium (1 740— 1 749) ; Philosophia moralis (1 750-1 753) . His Kleine philosophische Schriften have been collected and edited by G. F. Hagen (1736-1740). In addition to Wolff's autobiography (Eigene Lebensbeschreibung, ed. H. Wuttke, 1841) and the usual histories of philosophy, see W. Schrader in Allgemeine deutsche Biographic, xliv.; C. G. Ludovici, Ausfuhrlicher Enlwurf einer volU stdndigen Historie der Wolff schen Philosophic (1736-1738); J. Dcschamps, Cours abregi de la philosophic "wolffienne (1743); F. W. Kluge, Christian von Wolff der Pkilosoph (1831); W. Arnsperger, Christian Wolffs Verhaltnis zu Leibniz (1897). (A. S. P.-P. ; X.)

WOLFF, JOSEPH (1795-1862), Jewish Christian missionary, was born at Weilersbach, near Bamberg, Germany, in 1795. His father became rabbi at W T urttemberg in 1S06, and sent his son to the Protestant lyceum at Stuttgart. He was converted to Christianity through reading the books of Johann Michael von Sailer, bishop of Regensburg, and was baptized in 181 2 by the Benedictine abbot of Emaus, near Prague. Wolff was a keen Oriental scholar and pursued his studies at Tubingen and at Rome, where he was expelled from the Collegio di Propaganda in 1818 for attacking the doctrine of infallibility and criticizing his tutors. After a short stay in the monastery of the Redemptorists at Val Sainte near Fribourg, he went to London, entered the Anglican Church, and resumed his Oriental and theological studies at Cambridge. In 1821 he began his missionary wander ings in the East by visiting Egypt, the Sinaitic peninsula, Jerusalem, Aleppo, Mesopotamia, Persia, Tiflis and the Crimea, returning to England in 1826, when Edward Irving introduced him to Lady Georgina Walpole, 6th daughter of Horatio Walpole, earl of Orford, whom he married in February 1827. In 1828 Wolff set out to search for the ten tribes, travelling through

Anatolia, Armenia, Turkestan and Afghanistan to Simla and Calcutta, suffering many hardships but preaching with en- thusiasm. He visited Madras, Pondicherry, Tinncvclly, Goa and Bombay, travelling home by Egypt and Malta. In 1836 he found Samuel Gobat in Abyssinia, took him to Jiddah, and him- self visited Yemen and Bombay, going on to the United States, where he was ordained deacon in 1837, and priest in 1838

In the same year he was given the rectory of Linthwaite in Yorkshire. In 1843 he went to Bokhara to seek two British officers, Lieut.- Colonel C. Stoddart and Captain A. Conolly, and narrowly escaped the death that had overtaken them; his Narrative of tins mission went through seven editions between 1845 and 1852. In 1845 he was presented to the vicarage of He Brewers, Somerset, and was planning another great missionary tour when he died on the 2nd of May 1862.

He puhlished several Journals of his expeditions, especially Travels and Adventures of Joseph Wolff (2 vols., London, i860).

His son, Sir Hen~ry Drummond Wolff (1830-1908), was a well-known English diplomatist and Conservative politician, who started as a clerk in the foreign office and was created K.C.M.G. in 1862 for various services abroad. In 1874-1880 he sat in parliament for Christchurch, and in 1880-1S85 for Ports- mouth, being one of the group known as the " Fourth Party." In 1885 he went on a special mission to Constantinople in con- nexion with the Egyptian question, and as the result various awkward difficulties, hinging on the sultan's suzerainty, were got over. In 1888 he was sent as minister to Teheran, and from 1892 to 1900 was ambassador at Madrid. He died on the nth of October 1908. Sir Henry was a notable raconteur, and he did good service to the Conservative party by helping to found the Primrose League. He was created G.C.M.G. in 187S and G.C.B. in 1889.

WOLFRAMITE, or Wolfram, a mineral consisting of iron- manganese tungstate, (Fe, Mn)W0 4 . The name is of doubtful origin, but it has been assumed that it is derived from the German Wolf and Rahm (froth), corresponding with the spuma lupi of old writers, a term hardly appropriate, how r ever, to the mineral in question. Wolframite crystallizes in the monoclinic system, with approximation to an orthorhombic type; and the crystals offer perfect pinacoidal cleavage. The colour of wol- framite is generally dark brownish-black, the lustre metallic or adamantine, the hardness 5 to 5-5, and the specific gravity 7-1 to 7-5. Wolframite may be

regarded as an isomorphous mixture, in variable ratio, of iron and manganese tungstates, sometimes with a small proportion of niobic and tantalic acids. It was in wolframite that the metal tungsten was first recognized in 1785 by two brothers, J. J. and F. d'Elhuyar. At the present time the mineral is used in the manufacture of tungsten-steel and in the preparation of certain tungstates.

Wolframite is commonly associated with tin-ores, as in many parts of Cornwall, Saxony and Bohemia. In consequence of the two minerals, cassiterite and wolframite, having nearly the same density, their separation becomes difficult by the ordinary processes of ore- dressing, but may be effected by means of magnetic separators, the wolframite being attracted by powerful magnets. A process intro- duced many years ago by R. Oxland consisted in roasting the mixed ore with carbonate of soda, when the wolfram was converted into sodium tungstate, which was easily removed as a soluble salt. Wolframite occurs at many localities in the United States, notably at Trumbull, Conn., where it has been mined, and at Monroe, Conn., where it accompanies bismuth ores. Other localities are in Mecklen- burg county, N.C., and in the Mammoth mining district, Nevada. Wolframite has in some cases resulted from the alteration of scheelite (q.v.), though on the contrary pseudomorphs are known in which scheelite has taken the form of wolframite. By oxidation wolframite may become encrusted with tungstic ochre, or tungstite, sometimes known as wolframine, a name to be carefully distinguished from wolframite.

As the relative proportions of iron and manganese vary in wolfram- ite, the composition tends towards that of other minerals. Thus there is a manganous tungstate (MnWOO known as hubnerite, a name given by E. N. Riotte, in 1865, in compliment to Adolph Hiibner, a Saxon mineralogist. There is also a mineral which contains little more than ferrous tungstate (FeW0 4), and is known as ferberite, having been named by A. Breithaupt in 1863 after Rudolph Ferber. The original hubnerite came from the Mammoth district, Nevada, and the ferberite from the Sierra Almagrera in Spain. It is possible that such minerals may represent the extreme terms in the series formed by the varieties of wolframite.

(F.W.R.)*

WOLFRAM VON ESCHENBACH, the most important and individual poet of medieval Germany, flourished during the end of the 1 2th and beginning of the 13th century. lie was one of the brilliant group of Minnesingers whom the Landgrave Herrmann of Thuringia gathered round him at the historic

castle of the Wartburg. AVe know by his own statement that he was a

Bavarian, and came of a knightly race, counting his achieve- ments with spear and shield far above his poetical gifts. The Eschenbach from which he derived his name was most prob- ably Ober-Eschenbach, not far from Pleinfeld and Nuremberg; there is no doubt that this was the place of his burial, and so late as the 17th century his tomb was to be seen in the church of Ober-Eschenbach, which was then the burial place of the Teutonic knights. Wolfram probably belonged to the small nobility, for he alludes to men of importance, such as the counts of Abenberg, and of Wertheim, as if he had been in their service. Certainly he was a poor man, for he makes frequent and jesting allusions to his poverty. Bartsch concludes that he was a younger son, and that while the family seat was at Eschenbach, Wolfram's home was the insignificant estate of Wildenburg (to which he alludes), now the village of Wehlenberg. Wolfram seems to have disdained all literary accomplishments, and in fact insists on his unlettered condition both in Parzival and in Willehalm. But this is somewhat perplexing, for these poems are beyond all doubt renderings of French originals. Were the poems read to him, and did he dictate his translation to a scribe? The date of Wolfram's death is uncertain. We know that he was alive in 1216, as in Willehalm he laments the death of the Landgrave Herrmann, which took place in that year, but how long he survived his friend and patron we do not know.

Wolfram von Eschenbach lives in, and is revealed by, his work, which shows him to have been a man of remarkable force and personality. He has left two long epic poems, Parzival and Willehalm (the latter a translation of the French chan- son de geste Aliscans), certain fragments, Titurel (apparently intended as an introduction to the Parzival), and a group of lyrical poems, Wackier -Lieder. These last derive their name from the fact that they record the feelings of lovers who, having passed the night in each other's company, are called to separate by the cry of the watchman, heralding the dawn. These Tage Lieder, or Wackier Lieder, are a feature of Old German folk-poetry, of which Wagner has preserved the tradition in the warning cry of Brangaene in the second act of Tristan. But the principal interest of Wolfram's work lies in his Parzival, immeasurably the finest and most spiritual rendering of the Perceval-Grail story.

The problem of the source of the Parzival is the crux of medieval literary criticism (see Perceval), These are the leading points. The poem is divided into sixteen books. From iii. to xii., in- clusive, the story marches pari passu with the Perceval of Chretien de Troyes, at one moment agreeing almost literally with the French text, at the next introducing details quite un-known to it. Books i. and ii., unrepresented in Chretien, relate the fortunes of the hero's father, and connect the story closely with the house of Anjou; the four concluding books agree with the commencement, and further connect the Grail story with that of the Swan Knight, for the first time

identifying that hero with Parzival's son, a version followed by the later German romance of Lohengrin. At the conclusion Wolfram definitely blames Chretien for having mistold the tale, while a certain Kiot, the Provencal (whom he has before named as his source), had told it aright from beginning to end. Other peculiarities of this version are the representation of the Grail itself as a stone, and of the inhabitants of the castle as an ordered knighthood, Templeisen; the numerous allusions to, and evident familiarity with, Oriental learning in its various branches; and above all, the connecting thread of ethical interpretation which runs through the whole poem. The Parzival is a soul-drama; the conflict between light and darkness, faith and doubt, is it? theme, and the evolution of the hero's character is steadily ant? consistently worked out. The teaching is of a character strangely ,at variance with the other romances of the cycle. Instead of an asceticism, based upon a fundamentally low and degrading view ' of women, Wolfram upholds a sane and healthy morality; chastity, rather than celibacy, is his ideal, and a loyal observance , of the marriage bond is in his eyes the highest virtue. Not . retirement from the world, but fulfilment of duty in 4 the world,

is the goal he marks out for attainment. Whether views so large, so sane and so wholesome, are to be placed to the credit of the German poet, or of his French source (and modern criticism is leaning more and more to a belief in the existence of Kiot), the Parzival is the work of a remarkable personality, and, given the age and the environment, a unique literary achievement.

Wolfram has moments of the highest poetical inspiration, but his meaning, even for his compatriots, is often obscure. He is in no sense a master of language, as was Gottfried von Strassbourg. This latter, in a very interesting passage of the Tristan, passes in review the poets of the day, awarding to the majority praise for the excellence of their style, but one he does not name, only blaming him as being so obscure and involved that none can tell what his mea.ning may be; this un-named poet has always been understood to be Wolfram von Eschenbach, and in a passage of Willehalm the author refers to the unfavourable criticisms passed on Parzival. Wolfram and Gottfried were both true poets, but of widely differing style. Wolfram was, above all, a man of deeply religious character (witness his intro- duction to Willehalm), and it seems to have been this which specially impressed the mind of his compatriots; in the 13th- century poem of Der Wartburg-Krieg it is Wolfram who is chosen as the representative of Christianity, to oppose the enchanter Klingsor von

Ungerland. (J. L. W.)

WOLGAST, a seaport town of Germany, in the Prussian province of Pomerania, situated on the river Peene, which separates it from the island of Usedom, 30 m. by rail E. of Greifswald. Pop. (1905) 8346. There are various manufactures. Wolgast became a town in 1247, and after being the residence of the duke of Pomerania-Wolgast, it was ceded to Sweden in 1648. It was captured four times during the Thirty Years' War, and in 1675 by Frederick William, elector of Brandenburg. It was restored to Germany in 1815.

See B. Heberlein, Beitrdge zur Geschichte tier Burg und Stadt Wolgast (Wolgast, 1892).

WOLLASTON, WILLIAM (1650-1724), English philosophical writer, was born at Coton-Clanford in Staffordshire, on the 26th of March 1659. On leaving Sidney Sussex College, Cambridge, in 1681 . he became an assistant master at the Birmingham grammar- school, and took holy orders. In 1688 an uncle left him a fortune. He then moved to London, married a lady of wealth, and devoted himself io learning and philosophy. He embodied his views in the one book by which he is remembered, The Religion of Nature Delineated (1st ed. 1722; 2nd ed. 1724). He died in October

1724.

Wollaston's Religion of Nature, which falls between Clarke's Discourse of the Unchangeable Obligations of Natural Religion and Butler's Sermons, was one of the popular philosophical books of its day. To the 8th edition (1750) was added a life of the author. The book was designed to be an answer to two questions : Is there such a thing as natural religion? and, If there is, what is it? Wol- laston starts with the assumption that religion and morality are identical, and labours to show that religion is " the pursuit of happi- ness by the practice of truth and reason." He claims originality for his theory that the moral evil is the practical denial of a true proposition and moral good the affirmation of it (see Ethics). Wol- faston also published anonymously a small book, On the Design of the Book of Ecclcsiastes, or the Unreasonableness of Men's Restless Con- tention for the Present Enjoyments, represented in an English Poem (London. 1691).

See John Clarke, Examination of the Notion of Moral Good and Evil advanced in a late book entitled The Religion of Nature Delineated (London, 1725); Drechsler, Uber Wollaston's Moral-Philosophic (Erlangen, 1802); Sir Leslie Stephen's History of English Thought in the Eighteenth Century (London, 1876), ch. iii. and eh. ix. ; H. Sidgwick's History of

Ethics (1902), pp. 198 sq.

WOLLASTON, WILLIAM HYDE (1766-1S28), English chemist and natural philosopher, was born at East Dereham, Norfolk, on the 6th of April 1766, the second of seventeen children. His father, the Rev. Francis Wollaston (1731-1815), rector of Chislehurst, grandson of the William Wollaston noticed above, was an enthusiastic astronomer. Wollaston was educated at Charterhouse, and afterwards at Caius College, Cambridge, of which he became a fellow. He took the degrees of M.B. (1787) and M.D. (1793), starting to practise medicine in 1789 at Bury St Edmunds, whence he soon removed to London. But he made

little way, and failed to obtain a vacant physiciansbip at StGeorge's hospital; the result was that he abandoned medicine and took to original research. He devoted much attention to the affairs of the Royal Society, of which he was elected a fellow in 1793 and made secretary in 1806. He was elected interim president in June 1820, on the death of Sir Joseph Banks; but he did not care to enter into competition with Sir Humphry Davy, and the latter was elected president at the anniversary meeting in November 1820. Wollaston became a member of the Geological Society of London in 1812, and served frequently on the Council and for some time as a vice-president. Beyond appearing at the meetings of learned societies he took little part in public affairs; he lived alone, conducting his investigations in a deliberate and exhaustive manner, but in the most rigid seclusion, no person being admitted to his laboratory on any pretext. Towards the close of 1828 he felt the approach of a fatal malady — a tumour in the brain — and devoted his last days to a careful revisal of his unpublished researches and industrial processes, dictating several papers on these subjects, which were afterwards published in the Philosophical Transactions, He died in London on the 22nd of December 1828.

Most of Wollaston's original work' deals more or less directly with chemical subjects, but diverges on all sides into optics, acoustics, mineralogy, astronomy, physiology, botany and even art. In chemistry he made a speciality of the platinum metals. Platinum itself he discovered how to work on a practical scale, and he is said to have made a fortune from the secret, which, however, he disclosed in a posthumous paper (1829); and he was the first to detect the metals palladium (1804) and rhodium (1805) in crude platinum. In regard to palladium his conduct was open to criticism. He anonymously offered a quantify of the metal for sale at an instru- ment-maker s shop, issuing an advertisement in which some of its main properties were described. Richard Chevenix (1774-1830), a chemist, having bought some of the substance, decided after ex- periment that it was not a simple body as claimed, but an alloy of mercury with platinum, and in 1803 presented a paper to the Royal Society setting forth this view. As

secretary, Wollaston saw this paper when it was sent in, and is said to have tried to persuade the author to withdraw it. But having failed, he allowed the paper, and also a second by Chevenix of the same tenor in 1805, to be read without avowing that it was he himself who had originally detected the metal, although he had an excellent opportunity of stating the fact in 1804 when he discussed the substance in the paper which announced the discovery of rhodium. In 1809 he proved the ele- mentary character of columbium (niobium) and titanium. In optics he was the first, in 1802, to observe the dark lines in the solar spectrum. Of the seven lines he saw, he regarded the five most prominent as the natural boundaries or dividing lines of the pure simple colours of the prismatic spectrum, which he supposed to have four primary divisions. He described the reflecting goniometer in 1809 and the camera lucida in 1812, provided microscopists with the " Wollaston doublet," and applied concavo-convex lenses to the purposes of the oculist. His cryophorus was described in 1813, in a paper "On a method of freezing at a distance." In 1821, after H. C. Oersted (1777-1851) had shown that a magnetic needle is deflected by an electric current, he attempted, in the laboratory of the Royal Institution in the presence of Humphry Davy, to convert that deflection into a continuous rotation, and also to obtain the reciprocal effect of a current rotating round a magnet. He failed in both respects, and when Michael Faraday, who overheard a portion of his conversation with Davy on the subject, was subsequently more successful, he was inclined to assert the merit ol priority, to which Faraday did not admit his claim. Among his other papers may be mentioned those dealing with the formation of fairy rings (1807), a synoptic scale of chemical equivalents (1814), sounds in- audible to ordinary ears (1820), the physiology of vision (l824\the apparent direction of the eyes in a portrait (1 824) and the comparison of the light of the sun with that of the moon and fixed stars (1829).

In geological circles Wollaston is famous for the medal which bears his name, and which (together with a donation fund) is annually awarded by the council of the Geological Society of London, being the result of the interest on 1 1000 bequeathed by Wollaston for " promoting researches concerning the mineral structure of the earth.' The first award was made in 1 83 1. The medal is the highest honour bestowed by the society: it was originally made of palladium, but is now made of gold.

An appreciative essay on Wollaston will be found in George Wilson's Religio Chemici (1862).

WOLLASTONITE, a rock-forming mineral consisting of calcium metasilicate, CaSiOa, crystallizing in the monoclinic system and belonging to the pyroxene (q.v.) group. It differs, however, from other members of this group in having cleavages, not parallel to the prism-faces, but in two

directions perpendicular to the

plane of symmetry. Crystals are usually elongated parallel to the axis of symmetry and flattened parallel to the ortho-pinacoid, hence the early name " tabular spar"; the name wollastonite is after W. H. Wollaston. The mineral usually occurs in white cleavage masses. The hardness is 5, and the specific gravity 2-85. It is a characteristic product cf contact-metamorphism, occurring especially, with garnet, diopside, &c, in crystalline limestones. Crystals are found in the cavities of the ejected limestone blocks of Monte Somma, Vesuvius. At Santa Fe in the State of Chiapas, Mexico, a large rock-mass of wollastonite carries ores of gold and copper: here are found large pink crystals which are often partially or wholly altered to opal. (L. J. S.)

WOLLIN, an island of Germany, in the Prussian province of Pomerania, the more easterly of the islands at the mouth of the Oder which separate the Stettiner Haff from the Baltic Sea. It is divided from the mainland on the E. by the Dievenow Channel, and from Usedom on the W. by the Swine. It is roughly triangular in shape, and has an area of g5 sq. m. Heath and sand alternate with swamps, lakes and forest on its surface, which is flat, except towards the south-west, where the low hills of Lebbin rise. Cattle- rearing and fishing are the chief resources of the inhabitants, who number about 14,000. Misdroy, on the N.W. coast, is a favourite sea-bathing resort, and some of the other villages, as Ostswine, opposite Swinemiinde, Pritter, famous for its eels, and Lebbin, are also visited in summer. Wollin, the only town, is situated on the Dievenow, and is connected with the mainland by three bridges. It carries on the industries of a small seaport and fishing-town. Pop. (1900) 4679.

Near the modern town once stood the ancient and opulent Wendish city of Wolin or Jumne, called Julin by the Danes, and Winetha or Vineta (i.e. Wendish town) by the Germans. In the roth and nth centuries it was the centre of an active and extensive trade. Adam of Bremen (d. 1076) extols its size and wealth, and mentions that Greeks and other foreigners frequented it, and that Saxons were permitted to settle there on equal terms with the Wends, so long as they did not obtrude the fact of their Christianity. The Northmen made a settlement here about 970, and built a fortress on the " silver hill," called Jomsburg, which is often mentioned in the sagas. Its foundation was attributed to a legendary Viking exiled from Denmark, called Palnotoke or Palnatoki. The stronghold of Jomsburg was destroyed in 1098 by King Magnus Barfod of Norway. This is probably the

origin of the legend that Vineta was overthrown by a storm or earthquake and overwhelmed by the sea. Some submarine granite rocks near Damerow in Usedom are still popularly regarded as its ruins. The town of Wollin became in 1140 the seat of the Pomeranian bishopric, which was transferred to Kammin about n 70. Wollin was burnt by Canute VI. of Den- mark in 1183, and was taken by the Swedes in 1630 and 1759 and by the Brandenburgers in 1659 and 1675.

See Khull, Die Geschichte Palnatokis und der Jomsburger (Graz, 1892}; Koch, Vineta in Prosa und Poesie (Stettin, 1905); W. von Raumer, Die Insel Wollin (Berlin, 1851); Haas, Sagen und Erzak- lungen von den Inseln Usedom und Wollin (Stettin, 1904).

WOLLONGONG, a seaport of Camden county, New South Wales, Australia, 49 m. by rail S. of Sydney, the third port and chief harbour on the S. coast of the colony. Pop. (1901) 3545. Its harbour, known as Belmont Basin, is excavated out of the rock, having an area of 3 acres, and a depth of 18 ft. at low water. A breakwater protects its mouth; it has a lighthouse, and is defended by a fort on Signal Hill. It is the port for the Osborne- Wallsend and Mount Pleasant collieries, which are connected with it by rail. It lies at the foot of Mount Keira, amid fine mountain and coast scenery.

WOLOF (Woloff, Jolof), a Negroid people of Senegal, French West Africa. They occupy the seaboard between St Louis and Cape Verde and the south bank of the Senegal from its mouth to Dagana. Farther inland the districts of the Walo, Cayor Baol and Jolof (the last, the name of a chief division of the nation, being sometimes used as the national name) are almost exclu- sively peopled by Wolof. The cities of St Louis and Dakar are both in the Wolof country, and throughout the French Sudan

no military station is without a Wolof colony, preserving national speech and usages. The name is variously explained as meaning ” speaker ” or ” black.” The Wolof justify both meanings, for they are at once far the blackest and among the most garrulous of all African peoples. They arc a very tall race, with splendidly proportioned busts but weak and undeveloped legs and flat feet.

The Wolof language is spoken throughout Senegambia, and numerous grammars, dictionaries and vocabularies have appeared since 1825. There is, however, no written literature. The Wolof preserve their national songs, legends and proverbs by memory, but have little knowledge of letters beyond the Arabic characters on their paper spells and amulets. ‘ Wolof, a typical agglutinating language, differs from all other African forms of speech. The roots, almost all monosyllables ending in consonants, are

determined by means of suffixes, and coalesce while remaining invariable in their various meanings. By these suffixes the meaning of the words is endlessly modified.

Most Wolof are nominally Mahommedans, and some near the Christian missions profess Christianity, but many pagan rites are still observed. Animal worship is prevalent. The capture of a shark is hailed with delight, and familv genii have offerings made to them, the most popular of these household deities, the lizard, having in many houses a bowl of milk set aside for it daily. The Wolof have three hereditary castes, the nobles, the tradesmen and musicians (who are despised), and the slaves. These latter are kindly treated. Polygyny is customary.

The old kingdom of Cayor, the largest of Wolof states, has been preserved by the French. The king is elected, but always from the ruling family, and the electors, themselves unable to succeed, only number four. When elected the king receives a vase said to contain the seeds of all plants growing in Cayor, and he is thus made lord of the land. In earlier days there was the Bur or " Great Wolof," to whom all petty chiefs owed allegiance. The Wolof are very loyal to the French, and have constantly proved themselves courageous soldiers.

WOLOWSKI, LOUIS FRANCOIS MICHEL RAYMOND (1810- 1876), French economist and politician, was born in Warsaw and educated in Paris, but returned to Warsaw and took part in the revolution of 1830. Sent to Paris as secretary to the legation by the provisional government, he settled there on the suppression of the Polish rebellion and was naturalized in 1834. In 1833 he founded the Revue de legislation et de jurisprudence, and wrote voluminously on economic and financial subjects. He established the first Credit Foncier in France in 1853, and in 1864 became professor of political economy at the Conservatoire in succession to J. A. Blanqui. He was a member of the national assembly from 1848 to 1851, and again from 1871 till his election as a senator in 1876. He was a strong free-trader and an ardent bimetallist.

Of his works the following are the more important : Mobilisation du credit fancier (1839); De I' organisation industrielle de la France avant Colbert (1842) ; Les Finances de la Russie (1864) ; La Question des banques (1864); La Liberie commercials (1869) ;L' Or et V argent (1870).

WOLSELEY, GARNET JOSEPH WOLSELEY, Viscount (1833-), British field marshal, eldest son of Major Garnet Joseph Wolseley of the King's Own Borderers (25th Foot), was born at Golden Bridge, Co. Dublin, on the 4th of June 1833. Educated at Dublin, he obtained a commission as ensign in the 12th Foot in March 1852, and was transferred to the 80th Foot,

with which he served in the second Burmese War. He was severely wounded on the 19th of March 1853 in the attack of Donabyti, was mentioned in despatches, and received the war medal. Promoted to be lieutenant and invalided home, he exchanged into the 90th Light Infantry, then in Dublin. He accompanied the regiment to the Crimea, and landed at Balaklava in December 1854. He was selected to be an assistant engineer, and did duty with the Royal Engineers in the trenches before Sevastopol. He was promoted to be captain in January 1855, after less than three years' service, and served throughout the siege, was wounded at the Quarries on the 7th of June, and again in the trenches on the 30th of August. After the fall of Sevastopol Wolseley was employed on the quartermaster-general's staff, assisted in the embarkation of the troops and stores, and was one of the last to leave the Crimea in July 1856. For his services he was twice mentioned in despatches, was noted for a brevet majority, received the war medal with clasp, the 5th class of the French Legion of Honour, the 5th class of the Turkish Mejidie and the Turkish medal. After six months' duty with the 90th

Foot at Aldcrshot, he went with it again, in March 1857, to join the expedition to China under Major-General the Hon. T. Ashbuinham. Wolseley embarked in command of three com- panies in the transport " Transit," which was wrecked in the Strait of Banka. The troops were ail saved, but with only their arms and a few rounds of ammunition, and were taken to Singa- pore, whence, on account of the Indian Mutiny, they were despatched with all haste to Calcutta. Wolseley distinguished himself at the relief of Lucknow under Sir Colin Campbell in November, and in the defence of the Alambagh position under Outram, taking part in the actions of the 22nd of December 1857, the 12th and ifith of January 1858, and the repulse of the grand attack of the 21st of February. In March he served at the final siege and capture of Lucknow. He was then appointed deputy-assistant quartermaster-general on the staff of Sir Hope Grant's Oudh division, and was engaged in all the operations of the campaign, including the actions of Bari, Sarsi, Nawabganj, the capture of Faizabad, the passage of the Gumti and the action of Sultanpur. In the autumn and whiter of 1858 he took part in the Baiswara, trans-Gogra and trans-Rapti campaigns, ending with the complete suppression of the rebellion. For his services he was frequently mentioned in despatches, and, having received his Crimean majority in March 1858, was in April 1859 promoted to be lieutenant-colonel, and received the Mutiny medal and clasp. Wolseley continued to serve on Sir Hope Grant's staff in Oudh, and when Grant was nominated to the command of the British troops in the Anglo-French

expedition to China in i860, accom- panied him as deputy-assistant quartermaster-general. He was present at the action at Sin-ho, the capture of Tang-ku, the storming of the Taku Forts, the occupation of Tientsin, the battle of Pa-le-eheau and the entry into Peking. He assisted in the re-embarkation of the troops before the winter set in. He was mentioned in despatches, and for his services received the medal and two clasps. On his return home he published the Narrative of the War with China in i860.

In November 1861 Wolseley was one of the special service officers sent to Canada to make arrangements for the reception of troops in case of war with the United States in connexion with the mail steamer " Trent " incident, and when the matter was amicably settled he remained on the headquarters staff in Canada as assistant quartermaster-general. In 1865 he became a brevet colonel, was actively employed the following year in connexion with the Fenian raids from the United States, and in 1867 was appointed deputy quartermaster-general in Canada. In 1869 his Soldiers' Pocket Book for Field Service was published, and has since run through many editions. In 1870 he success- fully commanded the Red river expedition to put down a rising under Louis Riel at Fort Garry, now the city of Winnipeg, the capital of Manitoba, then an outpost in the Wilderness, which could only be reached through a network of rivers and lakes extending for 600 m. from Lake Superior, traversed only by Indians, and where no supplies were obtainable. The admir- able arrangements made and the careful organization of the transport reflected great credit on the commander, who on his return home was made K. CM. G. andC.B.

Appointed assistant adjutant-general at the war office in 1871 he worked hard in furthering the Cardwell schemes of army reform, was a member of the localization committee, and a keen advocate of short service, territorial regiments and linked battalions. From this time till he became commander-in- chief Wolseley was the prime mover and the deciding influence in practically all the steps taken at the war office for promoting the efficiency of. the army under the altered conditions of the day. In 1873 he commanded the expedition to Ashanti, and, having made all his arrangements at the Gold Coast before the arrival of the white troops in January 1874, was able to com- plete the campaign in two months, and re-embark them for home before the unhealthy season began. This was the campaign which made his name a household word in England. He fought the battle of Amoaful on the 31st of January, and, after five days' fighting, ending with the battle of Ordahsu, entered Kumasi, which he burned. He received the thanks of both Houses of

Parliament and a grant of £25,000, was promoted to be major- general for distinguished service in the field, received the medal and clasp and was made G.C.M.G. and K.C.B. The freedom of the city of London was

conferred upon him with a sword of honour, and he was made honorary D.C.L. of Oxford and LL.D. of Cambridge universities. On his return home he was appointed inspector-general of auxiliary forces, but had not held the post for a year when, in consequence of the native unrest in Natal, he was sent to that colony as governor and general commanding. In November 1876 he accepted a seat on the council of India, from which in 1878, having been promoted lieutenant-general, he went as high-commissioner to the newly acquired possession of Cyprus, and in the following year to South Africa to supersede Lord Chelmsford in command of the forces in the Zulu War, and as governor of Natal and the Transvaal and high commissioner of South-East Africa. But on his arrival at Durban in July he found that the war in Zululand was practically over, and after effecting a temporary settlement he went to the Transvaal. Having reorganized the administration there and reduced the powerful chief Sikukuni to submission, he returned home in May 18S0 and was appointed quartermaster-general to the Forces. For his services in South Africa he received the Zulu medal with clasp, and was made G.C.B.

In 1882 he was appointed adjutant-general to the forces, and in August of that year was given the command of the British forces in Egypt to suppress the rebellion of Arabi Pasha (see Egypt: Military Operations). Having seized the Suez Canal, he disembarked his troops at Ismailia, and after a very short and brilliant campaign completely defeated Arabi Pasha at Tel-el-Kebir, and suppressed the rebellion. For his services he received the thanks of parliament, the medal with clasp, the bronze star, was promoted general for distinguished service in the field, raised to the peerage as Baron Wolseley of Cairo and Wolseley, and received from the Khedive the 1st class of the order of the Osmanieh. In 1884 he was again called away from his duties as adjutant-general to command the Nile expedi- tion for the relief of General Gordon and the besieged garrison of Khartum. The expedition arrived too late: Khartum had fallen, and Gordon was dead; and in the spring of 1885 com- plications with Russia over the Penjdeh incident occurred, and the withdrawal of the expedition followed. For his services he received two clasps to his Egyptian medal, the thanks of parliament, and was created a viscount and a knight of St Patrick. He continued at the war office as adjutant-general to the forces until 1890, when he was given the command in Ireland. He was promoted to be field marshal in 1894, and was nominated colonel of the Royal Horse Guards in 1895, in which year he was appointed by the Unionist government to succeed the duke of Cambridge as commander-in-chief of the forces. This was the position to which his great experience in the field and his previous signal success at the war office itself had fully entitled him. His powers were, however, limited by a new order in council, and after holding the appointment for over five years, he handed over the command-in -chief to

Earl Roberts at the commencement of 1901. The fact that the unexpectedly large force required for South Africa was mainly furnished by means of the system of reserves which Lord Wolseley had originated was in itself a high tribute to his foresight and sagacity; but the new conditions at the war office had never been to his liking, and on being released from responsibility he brought the whole subject before the House of Lords in a speech which resulted in some remarkable disclosures.

Lord Wolseley had been appointed colonel-in-chief of the Royal Irish Regiment in 1898, and in 1901 was made gold- stick in waiting. He married in 1867 Louisa, daughter of Mr A. Erskine, his only child, Frances, being heiress to the viscountcy under special remainder. A frequent contributor to periodicals, he also published The Decline and Fall of Napoleon (1895), The Life of John Churchill, Duke of Marlborough, to the Accession of Queen Anne (1894), and The Story of a Soldier's Life (1903), giving in the last-named work an account of his career down to the close of the Ashanti War.

WOLSEY, THOMAS (c. 1475-1530), English cardinal and statesman, born at Ipswich about 1475, was son of Robert Wolsey (or Wuley, as his name was always spelt) by his wife Joan. His father is generally described as a butcher, but he sold other things than meat ; and although a man of some property and a church- warden of St Nicholas, Ipswich, his character seems to have borne a striking resemblance to that oE Thomas Cromwell's father. He was continually being fined for allowing his pigs to stray in the street, selling bad meat, letting his house to doubtful char- acters for illegal purposes, and generally infringing the by-laws respecting weights and measures (extracts from the Ipswich records, printed in the Athenaeum, 1900, i. 400). He died in September 1496, and his will, which has been preserved, was proved a few days later.

Thomas was educated at Magdalen College, Oxford; but the details of his university career are doubtful owing to the defective- ness of the university and college registers. He is said to have graduated B.A, at the age of fifteen (i.e. about 1490); but his earliest definite appearance in the records is as junior bursar of Magdalen College in 1498-1499, and senior bursar in 1499- 1500, an office he was compelled to resign for applying funds to the completion of the great tower without sufficient authority (W. D. Macray, Reg. of Magdalen College, i. 29-30, 133-134). He must have been elected fellow of Magdalen some years before; and as master of Magdalen College school he had under his charge three sons of Thomas Grey, first marquess

of Dorset. Dorset's beneficent intentions for his sons' pedagogue probably suggested Wolsey's ordination as priest at Marlborough on March io, 1498, and on October 10, 1500, he was instituted, on Dorset's presentation, to the rectory of Limington in Somerset. His connexion with Magdalen had perhaps terminated with his resignation of the bursarship, though he supplicated for the degrees of B.D. and D.D. in 1510; and the college appears to have derived no advantage from Wolsey 's subsequent greatness.

At Limington he came into conflict with law and order as represented by the sheriff, Sir Amias Paulet, who is said by Cavendish to have placed Wolsey in the stocks; Wolsey retali- ated long afterwards by confining Paulet to his chambers in the Temple for five or six years. Dorset died in 1501, but Wolsey found other patrons in his pursuit of wealth and fame. Before the end of that year he obtained from the pope a dispensation to hold two livings in conjunction with Limington, and Arch- bishop Deane of Canterbury also appointed him his domestic chaplain. Deane, however, died in 1503, and Wolsey became chaplain to Sir Richard Nanfan, deputy of Calais, who apparently recommended him to Henry VII. Nanfan died in 1507, but the king made Wolsey his chaplain and employed him in diplomatic work. In 1508 he was" sent to James IV. of Scotland, and in the same year he pleased Henry by the extraordinary expedition with which he crossed and recrossed the Channel on an errand connected with the king's proposal of marriage to Margaret of Savoy. His ecclesiastical preferments, of which he received several in 1506-1509, culminated in his appointment by Henry to the deanery of Lincoln on February 2 , 1 509.

Henry VIII. made Wolsey his almoner immediately on his accession, and the receipt of some half-dozen further ecclesiastical preferments in the first two years of the reign marks his growth in royal favour. But it was not till towards the end of 1511 that Wolsey became a privy councillor and secured a controlling voice in the government. His influence then made itself felt on English policy. The young king took little pains with the government, and the control- of affairs was shared between the clerical and peace party led by Richard Fox (q.v.) and Archbishop Warham, and the secular and war party led by Surrey. Hitherto pacific counsels had on the whole prevailed; but Wolsey, who was nothing if not turbulent, turned the balance in favour of war, and his marvellous administrative energy first found full scope in the preparations for the English expedition to Biscay in 1512, and for the campaign in northern France in 1533. He brought about the peace with France and marriage between Mary Tudor and Louis XII. in 15 14, and reaped his reward in the bishoprics of Lincoln and Tournai, the archbishopric of York, which was

conferred on him by papal bull in September, and the cardinal- ate which he had sent Polydore Vergil to beg from Leo X. in May 1 5 14, but did not

receive till the following year. Neverthe- less, when Francis I. in 1515 succeeded Louis XII. and won the battle of Marignano, Wolsey took the lead in assisting the emperor Maximilian to oppose him; and this revival of warlike designs was resented by Fox and Warham, who retired from the government, leaving Wolsey supreme. Maximilian proved a broken reed, and in 1518 Wolsey brought about a general pacification, securing at the same time his appointment as legate a latere in England. He thus superseded Warham, who was legatus natus, in ecclesiastical authority; and though legates & latere were supposed to exercise only special and temporary powers, Wolsey secured the practical permanence of his office.

The election of Charles V. as emperor in 1519 brought the rivalry between him and Francis I. to a head, and Wolsey was mainly responsible for the attitude adopted by the English government- Both monarchs were eager for England's alliance, and their suit enabled Wolsey to appear for the moment as the arbiter of Europe. England's commercial relations with Charles V.'s subjects in the Netherlands put war with the emperor almost out of the question; and cool observers thought that England's obvious policy was to stand by while the two rivals enfeebled each other, and then make her own profit out of their weakness. But, although a gorgeous show of friendship with France was kept up at the Field of Cloth of Gold in 1520, it had been deter- mined before the conference of Calais in 1521, at which Wolsey pretended to adjudicate on the merits of the dispute, to side actively with Charles V. Wolsey had vested interests in such a policy. Parliament had in 1513-1515 showed signs of strong anti-clerical feeling; Wolsey had in the latter year urged its speedy dissolution, and had not called another; and he prob- ably hoped to distract attention from the church by a spirited foreign policy, as Henry V. had done a century before. He had, moreover, received assurances from the emperor that he would further Wolsey's candidature for the papacy; and although he protested to Henry VIII. that he would rather continue in his service than be ten popes, that did not prevent him from secretly instructing his agents at Rome to press his claims to the utmost. Charles, however, paid Wolsey the sincere compliment of thinking that he would not be sufficiently subservient on the papal throne; while he wrote letters in Wolsey 's favour, he took care that they should not reach their destination in time; and Wolsey failed to secure election both in 1521 and 1524. This ambition dis- tinguishes his foreign policy from that of Henry VII., to which it has been likened. Henry VII. cared only for England; Wolsey's object was to play a great part on the European stage. The aim of the one was national, that of the other was oecumenical.

In any case the decision taken in 1521 was a blunder. Wolsey's assistance helped Charles V. to that position of predominance which was strikingly illustrated by the defeat and capture of Francis I. at Pavia in 1525; and the balance of power upon which England's influence rested was destroyed.

Her efforts to restore it in 1526-1528 were ineffectual; her prestige had depended upon her reputation for wealth derived from the fact that she had acted in recent years as the paymaster of Europe. But Henry VII.'s accumulations had disappeared; parliament resisted in 1523 the imposition of new taxation; and the attempts to raise forced loans and benevolences in 1 526-1 528 created a storm of opposition. Still more unpopular was the brief war with Charles V. in which Wolsey involved England in 1 52S. The sack of Rome in 1527 and the defeat of the French before Naples in 1528 confirmed Charles V.'s supremacy. Peace was made in 1529 between the two rivals without England being consulted, and her influence at Wolsey's fall was less than it had been at his accession to power.

This failure reacted upon Wolsey's position at home. His domestic was sounder than his foreign policy: by his develop- ment of the star chamber, by his firm administration of justice and maintenance of order, and by his repression of feudal jurisdiction, he rendered great services to the monarchy. But the inevitable opposition of the nobility to this policy was not

mitigated by the fact that it was carried out by a churchman; the result was to embitter the antagonism of the secular party to the church and to concentrate it upon Wolsey's head. The control of the papacy by Charles V., moreover, made it impossible for Wolsey to succeed in his efforts to obtain from Clement VII. the divorce which Henry VIII. was seeking from Charles V.'s aunt, Catherine of Aragon. An inscription on a contemporary portrait of Wolsey at Arras calls him the author of the divorce, and Roman Catholic historians from Sanders downwards have generally adopted the view that Wolsey advocated this measure merely as a means to break England's alliance with Spain and confirm its alliance with France. This view is unhistorical, and it ignores the various personal and national motives which lay behind that movement. There is no evidence that Wolsey first suggested the divorce, though when he found that Henry was bent upon it, he pressed for two points: (i.) that an applica- tion should be made to Rome, instead of deciding the matter in England, and (ii.) that Henry, when divorced, should marry a French princess.

The appeal to Rome was a natural course to be advocated by Wolsey, whose despotism over the English church depended upon an authority derived from Rome; but it was probably a mistake. It ran counter to the ideas suggested in 1527 on the captivity of Clement VII., that England and France should set up indepen- dent patriarchates; and its success depended

upon the problem- atical destruction of Charles V.'s power in Italy. At first this seemed not improbable; French armies marched south on Naples, and the pope sent Campeggio with full powers to pro- nounce the divorce in England. But he had hardly started when the French were defeated in 1528; their ruin was completed in 1529, and Clement VII. was obliged to come to terms with Charles V., which included Campcggio's recall in August 1520.

Wolsey clearly foresaw his own fall, the consequent attack on the church and the triumph of the secular party. Parlia- ment, which he had kept at arm's length, was hostile; he was hated by the nobility, and his general unpopularity is reflected in Skelton's satires and in Hall's Chronicle. Even churchmen had been alienated by his suppression of monasteries and by his monopoly of ecclesiastical power; and his only support was the king, who had now developed a determination to rule himself. He surrendered all his offices and all his preferments except the archbishopric of York, receiving in return a pension of 1000 marks (equal to six or seven thousand pounds a year in modern currency) from the bishopric of Winchester, and retired to his sec, which he had never before visited. A bill of attainder, passed by the Lords, was rejected at Cromwell's instigation and probably with Henry's goodwill by the Commons. The last few months of his life were spent in the exemplary discharge of his archi- episcopal duties; but a not altogether unfounded suspicion that he had invoked the assistance of Francis 1., if not of Charles V. and the pope, to prevent his fall involved him in a charge of treason. He was summoned to London, but died on his way at Leicester abbey on November 30, and was buried there on the lollowing day.

The completeness of Wolsey's fall enhanced his former appear- ance of greatness, and, indeed, he is one of the outstanding figures in English history. His qualities and his defects were alike exhibited on a generous scale; and if his greed and arrogance were colossal, so were his administrative capacity and his appetite for work. " He is," wrote the Venetian ambassador Giustiniani, " very handsome, learned, extremely eloquent, of vast ability and indefatigable. He alone transacts the business which occupies all the magistrates and councils of Venice, both civil and criminal; and all state affairs are managed by him, let their nature be what it may. He is grave, and has the reputation of being extremely just; he favours the people exceedingly, and especially the poor, hearing their suits and seeking to despatch them instantly." As a diplomatist he has had few rivals and perhaps no superiors. But his pride was equal to his abilities. The familiar charge, repeated in Shakespeare, of having written Ego el mens rex, while true in fact, is false in intention, because no Latin scholar could put the words in any other order; but

it reflects faithfully enough Wolsey's mental attitude. Gius- tiniani explains

that he had to make proposals to the cardinal before he broached them to Henry, lest Wolsey " should resent the precedence conceded to the king." " He is," wrote another diplomatist, " the proudest prelate that ever breathed." He arrogated to himself the privileges of royalty, made servants attend him upon their knees, compelled bishops to tie his shoe- latchets and dukes to hold the basin while he washed his hands, and considered it condescension when he allowed ambassadors to kiss his fingers; he paid little heed to their sacrosanct char- acter, and himself laid violent hands on a papal nuncio. His egotism equalled Henry VIII. 's; his jealousy and ill-treatment of Richard Pace, dean of St Paul's, referred to by Shakespeare but vehemently denied by Dr Brewer, has been proved by the publication of the Spanish state papers; and Polydore Vergil, the historian, and Sir R. Sheffield, speaker of the House of Commons, were both sent to the Tower for complaining of his conduct. His morals were of the laxest description, and he had as many illegitimate children as Henry VIII. himself. For his son, before he was eighteen years old, he procured a deanery, four archdeaconries, five prebends and a chancellorship, and he sought to thrust him into the bishopric of Durham. For himself he obtained, in addition to his archbishopric and lord chancellor- ship, the abbey of St Albans, reputed to be the richest in England, and the bishopric first of Bath and Wells, then of Durham, and finally that of Winchester. He also used his power to extort enormous pensions from Charles V. and Francis I. and lavish gifts from English suitors. His New Year's presents were reckoned by Giustiniani at 15,000 ducats, and the emperor paid — or owed — him 18,000 livres a year. His palaces outshone those of his king, and few monarchs could afford such a display of plate as commonly graced the cardinal's table. His founda- tions at Oxford and Ipswich were, nevertheless, not made out of his superabundant revenues, but out of the proceeds of the dissolution of monasteries, not all of which were devoted to those laudable objects.

That such a man would ever have used the unparalleled powers of ecclesiastical jurisdiction with which he had been entrusted for a genuine reformation of the church is only a pious opinion cherished by those who regret that the Reformation was left for the secular arm to achieve; and it is useless to plead lack of opportunity on behalf of a man who for sixteen years had enjoyed an authority never before or since wielded by an English subject. Wolsey must be judged by his deeds and not by doubtful in- tentions. During the first half of his government he materially strengthened the Tudor monarchy by the vigorous administration of justice at home and by the brilliance of his foreign policy abroad. But the prestige he secured by 1521 was delusive; its decline was as rapid as its growth, and the expense of the policy involved taxation which seriously weakened the loyalty of the people. The concentration of civil and ecclesiastical power by Wolsey in the hands of a churchman provided a precedent for its concentration by Henry

VIII. in the hands of the crown; and the personal example of lavish ostentation and loose morals which the cardinal-archbishop exhibited cannot have been without influence on the king, who grew to maturity under Wolsey's guidance.

The Letters and Papers of Henry VIII., vols, i.iv., supplemented by the Spanish and Venetian Calendars, contain almost all that is known of Wolsey's public career, though additional light on the divorce has been thrown by Stephen Ehses' Romische Dokumente (1893). Cavendish's brief Life, which is almost contemporary, has been often edited. Fiddes's huge tome (1724) is fairly exhaustive. Brewer, in his elaborate prefaces to the Letters and Papers (reissued as his History of the Reign of Henry VIII.), originated modern ad miration for Wolsey; and his views arc reflected in Crcighton's Wolsey in the " Twelve English Statesmen " series, and in Dr Gairdner's careful articles in the Diet. Nat. Biog. and Cambridge Modern History. A less enthusiastic view is adopted in H. A. L. Fisher's volume (v.) in Longmans' Political History (1906) and in A. F. Pollard's Henry VIII. (1902 and 1905). (A. F. P.)

WOLTER, CHARLOTTE (1834-1897), Austrian actress, was born at Cologne on the 1st of March r834, and began her artistic career at Budapest in 1857. She played minor parts at the Kar(

theatre in Vienna, and soon obtained an engagement at the Victoria theatre in Berlin, where she remained until 1861. Her performance of Hermione in the Winter's Tale took the playgoing world by storm, and she was given in 1862 an appointment at the Vienna Hofburg theatre, to which she remained faithful until her death on the 14th of June 1897. According to her wish, she was buried in the costume of Iphigenia, in which role she had achieved her most brilliant success. Charlotte Wolter was one of the great tragic actresses of modern times. Her repertory included Medea, Sappho, Lady Macbeth, Mary Stuart, Preciosa, Phedre, Adrienne Lecouvreur, Jane Eyre and Messalina, in which character she was immortalized by the painter Hans Makart. She was also an inimitable exponent of the heroines in plays by Grillparzer, Hehbcl, Dumas and Sa.rdou.

See Ehrenfeld, Charlotte Wolter (Vienna, 1887) ; Hirschfeld, Charlotte Walter, ein Erinnerungsblatt (1897),

WOLVERHAMPTON, HENRY HARTLEY FOWLER, Vis- count (1830-), English statesman, was born at Durham on the 1 6th of May 1830. He

became a prosperous solicitor in Wolverhampton, and coming of a Liberal nonconformist family took a prominent part in politics. In 1880 he was elected Liberal member of parliament for Wolverhampton, and was re-elected for the east division at successive contests. In 1884-1885 he was under-secrctary for the Home Office, and in 1886 financial secretary to the treasury. In Mr Gladstone's 1802-1894 ministry he was president of the local government board ; and in Lord Rosebery's cabinet, 1894-1895, secretary of state for India. In these and the succeeding years of opposition he was recognized as a sound economist and a sober administrator, as well as a universally respected representative of nonconformist views. In Sir Henry Campbell-Bannerman's cabinet, 1905-1908, he was chancellor of the duchy of Lancaster, and he retained this office in Mr Asquith's ministry, but was transferred to the House of Lords with a viscountcy (April 1908). He retired in 1910. His daughter, Ellen Thorneycroft Fowler, who married Mr A. L. Felkin in 1903, became well known as a novelist with her Con- cerning Isabel Carnaby (1898) and other books.

WOLVERHAMPTON, a market town, and municipal, county and parliamentary bprough of Staffordshire, England, 125 m. N.W. from London by the London & North-Western railway, served also by the northern line of the Great Western and by a branch of the Midland railway. Pop. (1891) 82,622; (1901) 94,187, It lies at the north-western edge of the group of great manufacturing towns extending S.E. to Birmingham, but there are pleasant residential suburbs to the west, where the country is rich and well wooded. The situation is elevated and healthy. The church of St Peter is a fine cruciform building, with S. porch and central tower. The lower part of the tower and the S. transept date from the 13th century; the nave, clerestory, upper part of the tower and N. transept from the 15th; the chancel was rebuilt in the restoration, completed in 1865, with an apsidal termination. The chief public buildings are the town hall (1871), exchange, agricultural hall, free library and theatres. A large free grammar school, founded in 1515 by Sir Stephen Jermyns, a native of the town and alderman of London, occupies modern buildings (1876). There are a Blue Coat school (1710) and a school of art. The benevolent institutions include a general hospital, the eye infirmary, orphan asylum, nursing institution and institute of the society for outdoor blind. In Queen Square is an equestrian statue of Albert, Prince Consort, unveiled by Queen Victoria in 1866, and on Snow Hill a statue (1879) of Charles Pelham Villicrs. There are parks on the east and west of the town, and a new racecourse (1887) replaces that formerly on the site of the west park. In the district S. and E. of Wolverhampton (the Black Country) coal and ironstone are mined. Ironmongery and steel goods of all kinds, especially locks, machinery, tools and cycles, are produced; there are also tin and zinc works. Large agricultural markets are supplied from the districts W.

and N. of the town. An annual fair is held at Whitsuntide. In 1902 an industrial and art exhibition was held. The parliamentary borough of Wolverhampton has three divisions, each returning one member. The town is governed

by a mayor, 12 aldermen and 36 councillors. Area, 3525 acres. Wednesfield (pop. 4883), Heath Town or Wednesfield Heath (9441) and Willeniiall (18,515) are neighbouring urban districts, with populations employed in the manufacture of locks, keys and small iron goods, in iron and brass foundries, varnish works, &c.

The town of Wolverhampton (Handone, Wohernehamptone, W ollernehampton) seems to have grown up round the church of St Mary, afterwards the royal free chapel of Wolverhampton, probably founded in 996 by Wulfruna, widow of the earl of Northampton, who in that year endowed it with extensive lands. The estates of the clerks of Handone are enumerated in Domes- day. In 1204 John granted the manor of Wolverhampton to the church, and at the Reformation it was held by the dean of the collegiate body; in 1553 Edward VI. granted the college and manor to Dudley, duke of Northumberland, but Mary, at the beginning of her reign, refounded the college and restored to it its property, and this arrangement was confirmed by Elizabeth. Henry III. (1258) granted the Wednesday market, which is still held, and a fair for eight days, beginning on the eve of the feast, of SS. Peter and Paul (June 29). During the Great Rebellion the sympathies of Wolverhampton were royalist. In 1645 it was for a time the headquarters of Prince Rupert, while Charles I. lay at Bushbury to the north. At the end of the 17th century the market was esteemed the second market in the county. An account of Wolverhampton published in 1751 stated that the chief manufacture was locks, "here being the most ingenious locksmiths in England," and attributed the slow growth of the town to the fact that most of the land was church property. Wolverhampton was incorporated in 1848 as a municipal borough. It was not represented in parliament until after the passing of the Reform Bill (1832), under which it returned two members unti] in 1885 the representation was increased to three. The county borough dates from 1888.

WOLVERTON, a town in the Buckingham parliamentary division of Buckinghamshire, England, near the river Ouse, 52ˆ m. N.W. by N. of London by the London & North-Western railway. Pop. (1001) 5323. Its modern growth and importance arc the result of the establishment of carriage works by the railway company. There are also printing works. A steam tramway connects the town with the old market town of Stony Stratford on the Ouse, 2 m. W.

WOMBAT, the title of the typical representatives of the marsupial family Phascolomyidae (see Marsupialia). They have the dental formula: i\, c. ft, p. •§-, m. |; = 24. All the teeth are

Tasmanian Wombat (Fkascolomys ursinus).

of continuous growth, having persistent pulps. The incisors are large and chisel-like, much as in rodents. The body is broad and depressed, the neck short, the head large and flat, the eyes small and the tail rudimentary and hidden in the fur. The

limbs are equal, stout and short. The feet have broad, naked, tuberculated soles; the forefeet with five distinct toes, each furnished with a long, strong and slightly curved nail, the first and fifth considerably shorter than the other three. The hind- feet have a very short nailless first toe; the second, third and fourth toes partially united by integument, of nearly equal length; the fifth distinct and rather shorter; these four are provided with long and curved nails. In the typical group of the genus Phascolomys we find the following characters: — Fur rough and coarse; ears short and rounded; muzzle naked; postorbital process of the frontal bone obsolete; ribs fifteen pairs. Vertebrae: C. 7, D. 15, L. 4, S. 4, Ca. 10-12. The wombat of Tasmania and the islands of Bass's Straits (/-". ur sinus), and the closely similar but larger P. platyrhinus of the southern portion of the mainland of Australia, belong to this group. On the other hand, in the hairy-nosed wombat (P. latijrons) of Southern Australia, the fur is smooth and silky; the ears are large and more pointed; the muzzle is hairy; the frontal region of the skull is broader than in the other section, with well-marked postorbital processes; and there are thirteen ribs. Vertebrae: C. 7,D. 13, L. 6, S.4, Ca. 15-16.

In general form and action wombats resemble small bears, having a somewhat similar shuffling manner of walking, but they are still shorter in the legs, and have a broader and Matter back. They live entiiely on the ground, or in burrows or holes among rocks, and feed on grass, roots and other vegetable substances. They sleep during the day, but wander forth at night in search of food, and are shy and gentle, though they can bite strongly when provoked. The only noise the Tasmanian wombat makes is a low hissing, but the hairy-nosed wombat is said to emit a short quick grunt when annoyed. The prevailing colour of the last-named species, as well as P. ur sinus of Tasmania, is brownish grey. The large wombat of the mainland is variable in colour, some individuals being pale yellowish

brown, others dark grey and some black. The length of the head and body is about 3 ft. Fossil remains of wombats, some of larger size than any now existing, have been found in caves and Pleistocene deposits in Australia. (R – L-)*

WOMBWELL, an urban district in the Barnsley parliamentary division of the West Riding of Yorkshire, England, 4 m. S.E. of Barnsley, on the Great Central and Midland railways. The inhabitants arc chiefly employed in the extensive collieries. Pop. (1901) 13,252.

WOMEN, The very word " woman " (O. Eng. wifmann), etymologically meaning a wife (or the wife division of the human race, the female of the species Homo), sums up a long history of dependence and subordination, from which the women of to-day have only gradually emancipated themselves in such parts of the world as come under " Western civilization." Though married life and its duties necessarily form a predominant element in the woman's sphere, they are not necessarily the whole of it; and the " woman's movement " is essentially a struggle for the recognition of equality of opportunity with men, and for equal rights irrespective of sex, even if special relations and conditions are willingly incurred under the form of partnership involved in marriage. The difficulties of obtaining this recognition are obviously due to historical causes combined with the habits and customs which history has produced.

The dependent position of women in early law is proved by the evidence of most ancient systems which have in whole or -^. in part descended to us. 1 In the Mosaic law divorce was a privilege of the husband only, 2 the vow of a woman might be disallowed by her father or husband, 3 and daughters could inherit only in the absence of sons, and then they must marry in their tribe. 4 The guilt or innocence of a wife accused of adultery might be tried by the ordeal of the bitter water. 5 Besides these instances, which illustrate the

1 But in the earliest extant code, however, that of Khammurahi, the position of women was free and dignified. See Babylonian Law.

*- Deut. xxiv. 1. * Numb. xxx. 3.*

4 Numb, xxvii., xxxvi. fi Numb. v. n.

subordination of women, there was much legislation dealing with, inter alia, offences against chastity, and marriage of a man with a captive heathen woman or with a purchased slave. So far from second marriages being restrained, as they were by Christian legislation, it was the duty of a childless widow to marry her deceased husband's brother. In India

subjection was a cardinal principle. " Day and night must women be held by their pro- tectors in a state of dependence," says Manu. 8 The rule of inheritance was agnatic, that is, descent traced through males to the exclusion of females. 7 The gradual growth of stridkana, or property of a woman given by the husband before or after marriage, or by the wife's family, may have led to the suttee, for both the family of the widow and the Brahmans had an interest in getting the lite estate of a woman out of the way. 8 Women in Hindu law had only limited rights of inheritance, and were disqualified as witnesses.

In Roman law a woman was even in historic times completely dependent. If married she and her property passed into the power of her husband; if unmarried she was (unless a vestal virgin) under the perpetual tutelage of her father during his life, and after his death of her agnates, that is, those of her kinsmen by blood or adoption who would have been under the power of the common ancestor had he lived. Failing agnates, the tutelage probably passed to the gens. The wife was the purchased property of her husband, and, like a slave, acquired only for his benefit. A woman could not exercise any civil or public office. In the words of Ulpian, " feminae ab omnibus officiis civilibus vel publicis remotae sunt." 9 A woman could not continue a family, for she was "caput et finis familiae suae," 10 could not be a witness, surety, tutor, or curator; she could not adopt or be adopted, or make a will or contract. She could not succeed ab intestato as an agnate, if further removed than a sister. A daughter might be disinherited by a general clause, a son only by name. On the other hand, a woman was privileged in some matters, but rather from a feeling of pity for her bodily weakness and presumed mental incapacity 11 than for any more worthy reason. Thus she could plead ignorance of law as a ground for dissolving an obligation, which a man could not as a rule do; she could accuse only in cases of treason and witchcraft; and she was in certain cases exempt from torture. In succession ab inteslato to immovable property Roman law did not, as does English, recognize any privilege of males over females.

Legal disabilities were gradually mitigated by the influence of fictions, the praetorian equity and legislation. An example of the first was the mode by which a woman freed herself from the authority of her tutor by fictitious cession into the authority of a tutor nominated by herself, or by sale of herself into the power of a nominal husband on the understanding that he was at once to emancipate her to another person, who then manu- mitted her. The action of equity is illustrated by the recognition by the praetor of cognatic or natural as distinguished from agnatic or artificial relationship, and of a widow's claim to succeed on the death of her husband intestate and without relations. Legislation, beginning as early as the Twelve Tables, which for- bade excessive mourning for the dead by female mourners, did not progress uniformly towards enfranchisement of women. For instance,

the Lex Voconia (about 169 B.C.), called by St Augustine the most unjust of all laws, provided that a woman could not be instituted heir to a man who was registered as owner of a fortune of 100,000 asses. 1 ‘ 2 A constitution of Valentinian I. forbade bequests by women to ecclesiastics. But the tendency

6 Ch. ix. § 2 (Sir W. Jones’s translation).

7 Whether this was the oldest rule of inheritance has been much debated. That birth of a child §ave the mother certain legal rights in a primitive stage of society is the view of many writers. See especially Das Mutterreckl of J. J. Bachofen (Stuttgart, 1861).

B Maine, Early History of Institutions, lect. xi.

Dig. i. 16, 195. 10 Ibid %

11 Imbecillitas is the term used more than once in the texts of Roman law.

12 The way in which this law was evaded was by non-enrolment of the testator in the census (see Montesquieu, Esprit des lots, bk. xxvii.). Another way was by leaving her the inheritance by fideicotn- missum (see Trust).

of legislation was undoubtedly in the direction indicated. Adoption of women was allowed by Diocletian and Maximian in 291. The tutelage of women of full age was removed by Claudius, and, though afterwards in part revived, has disappeared by the time of Justinian. This implied full testamentary and contractual liberty. In regard to the separate property of the married woman, the period of dos had by the time of Justinian long superseded the period of manus. The result was that, in 6pite of a few remaining disabilities, such as the general incapacity to be surety or witness to a will or contract, of a wife to make a gift to her husband, of a widow to marry within a year of her husband’s death, the position of women had become, in the words of Sir H. Maine, ” one of great personal and proprietary independence.” 1 For this improvement in their position they were largely indebted to the legislation of the Christian emperors, especially of Justinian, who prided himself on being a protector of women.

The followin j are a few of the matters in which Christianity appears to have made alterations, generally but perhaps not always improve- ments, in the law. As a rule the influence of the church was exercised in favour of the abolition of the disabilities imposed by the older law upon celibacy and

childlessness, of increased facilities for entering a professed religious life, 2 and of due provision for the wife. The church also supported the political power of those who were her best friends. The government of Pulcheria or Irene would hardly have been endured in the days of the pagan empire. Other cases in which Christianity probably exercised influence may be briefly stated. (1) Ail differences in the law of succession ah inteslato of males and females were abolished by Justinian. (2) The appointment of mothers and grandmothers as tutors was sanctioned by the same emperor. (3) He extended to all cases the principle established by the Senatus Consultum Tertullianum (158), enabling the mother of three (if a freed woman four) children to succeed to the property of her children who died intestate, and gave increased rights of succession to a widow. (4) The restrictions on the marriage of senators and other men of high rank with women of low rank were extended by Constantine, but almost entirely removed by Justinian. (5) Second marriages were discouraged (especially by making it legal to impose a condition that a widow s right to property should cease on re-marriage), and the Leonine Constitutions at the end of the 9th century made third marriages punishable. (6) The same constitutions made the bene- diction of a priest a necessary part of the ceremony of marriage. 3 The criminal law in its relation to women presents some points of interest. Adultery was punished with death by Constantine, but the penalty was reduced by Justinian to relegation to a convent. A woman condemned for adultery could not re-marry. A marriage between a Christian and a Jew rendered the parties guilty of adultery. Severe laws were enacted against offences of unchastity, especially procurement and incest. It was a capital crime to carry off or offer violence to a nun. A wife could not commit furlum of her husband's goods, but he had a special action rerum amotarum against her. By several sumptuary constitutions, contained in the Code, bk. xi., women as well as men were subject to penalties for wearing dress or ornaments (except rings) imitating those reserved for the emperor and his family. Actresses and women of bad fame were not to wear the dress of virgins dedicated to Heaven. If a consul had a wife or mother living with him, he was allowed to incur greater expense than if he lived alone. The interests of working women were protected by enactments for the regulation of the gynoecia, or workshops for spinning, dyeing, &c.

The canon law, looking with disfavour on the female inde- pendence prevailing in the later Roman law, tended rather in the opposite direction. The Decretum specially inculcated subjection of the wife to the husband, and obedience to his will in all things. 4 The chief differences between canon and Roman law were in the law of marriage, especially in the introduction of publicity and of the formalities of the ring and the kiss. The benediction of a priest was made a necessary part of the ceremony, as

indeed it had been made by the civil power, as has been already stated, in the post-Justinian period of Roman law. But in practice this rule appears to have fallen into disuse until it was again revived by the council of Trent. It was, however, the

1 Ancient Law, ch. v. Hence the necessity of such laws as the Lex Oppia (see Sumptuary Laws).

- *A remarkable example of this tendency was the provision that an actress might leave the stage and break her contract of service with impunity in order to become a nun. Even under the pagan emperors a constitution of Diocletian and Maximian in 285 had enacted that no one was to be compelled to marry {Cod. v. 4, 14).*

' See R. T. Troplong, De Vinfluence du christianisme sur le droit civil.

- *Pt. ii. caus. xxxiii. qu. v. ch. 16.*

rule of the English common law after the Reformation. The ceremony was not to be performed during Lent. The woman was to be veiled during the ceremony. A promise of marriage was so sacred that it made a subsequent marriage with another person void. Spiritual cognation was a bar to marriage. The sentence of the church was made necessary for divorce. As to women in general the law does not say very much. Women, even relatives, were not to live with priests unless in case of necessity. They were not to approach the altar or fill any public office of the church; nor might they lend money on usury. Baptism might be valid although administered by a woman. Women who had professed religion could not be forced to give evidence as witnesses. In some cases the evidence of women was not receivable. 5

The early law of the northern parts of Europe is interesting from the different ways in which it treated women. In the words of Sir H. Maine 6 — " The position of women in these barbarous systems of inheritance varies very greatly. Sometimes they inherit, either as individuals or as classes, only when males of the same generation have failed. Sometimes they do not in- herit, but transmit a right of inheritance to their male issue. Sometimes they succeed to one kind of property, for the most part movable property, which they probably took a great share in producing by their household labour; for example, in the real Salic law (not in the imaginary code) there is a set of rules of succession which, in my opinion, clearly admit women and their descendants to a share in the inheritance of movable property, but confine land exclusively to males and the descend- ants of males. . . . The idea is that the proper mode of providing for a woman is by giving her a marriage portion; but, when she is once married

into a separate community consisting of strangers in blood, neither she nor her children are deemed to have any further claim on the parent group." Among the Scandinavian races women were under perpetual tutelage, whether married or unmarried. The first to obtain freedom were the widows. 7 As late as the code of Christian V., at the end of the 17th century, it was enacted that if a woman married without the consent of her tutor he might have, if he wished, administration and usufruct of her goods during her life. 8 The provision made by the Scandinavian laws under the name of morning-gift was perhaps the parent of the modern settled property. 8 The Brehon law of Ireland excepted women from the ordinary course of the law. They could distrain or contract only in certain named cases, and distress upon their property was regulated by special rules. In the pre-Conquest codes in England severe laws were denounced against unchastity, and by a law of Canute a woman was to lose nose and ears for adultery. The laws of Athelstan contained the peculiarly brutal provision for the punishment of a female slave convicted of theft by her being burned alive by eighty other female slaves. Other laws were directed against the practice of witchcraft (?.!>.) by women. Monogamy was enforced both by the civil and ecclesiastical law; and second and third marriages involved penance. A glimpse of cruelty in the household is aflordcd by the provision, occurring no less than three times in the ecclesiastical legislation, that if a woman scourged her female slave to death she must do penance. Traces of wife-purchase are seen in the law of Ethelbert, enacting that if a man carry off a freeman's wife he must at his own expense procure the husband another wife. The codes contain few provisions as to the property of married women, but those few appear to prove that she was in a better position than at a later

s On this branch of the subject see Manssen's Ilel Christendom en de Vrouiu (Leiden, 1877).

6 Early Law and Custom, ch. v.

7 See StiernhoCk, De jure Sveonum (Stockholm, 1672), bk. ii. ch. i. ; Messenius, Leges Svecorum (Stockholm, 1714).

8 Bk. iii. ch. xvi. §§ 1, 2.

9 The development of the bride-price no doubt was in the same direction. Its original meaning was, however, different. It was the sum paid by the husband to the wife's family for the purchase of part of the family property, while the morning-gift was paid as fyretium virginitatis to the bride herself. In its English form mornmg-gift occurs in the laws of Canute; in its Latinized form of morgangiva it occurs in the Leges Henrici Primi.

period. The laws of Ine gave her a third of her husband's property ; the laws of Edmund as to betrothal allowed this to be increased to half by antenuptial contract, to the whole if she had children and did not re-marry after her husband's death. No doubt the dower ad ostium ecdesiae favoured by the church generally superseded the legal rights where the property was large (in fact this is specially provided by Magna Carta, c. 7). "Provisio hominis tollit provisionem legis." The legal rights of a married woman apart from contract were gradually limited, until by the time of Glanvill her person and property had become during her husband's lifetime entirely at his disposal, and after his death limited to her dower and her pars raiionahilis.

A few of the more interesting matters in which the old common and statute law of England placed women in a special position may be noticed. A woman was exempt from legal duties more particularly attaching to men and not performable by deputy. She could apparently originally not hold a proper feud, i.e. one of which the tenure was by military service. 1 The same principle appears in the rule that she could not be endowed of a castle maintained for the defence of the realm and not for the private use of the owner. She could receive homage, but not render it in the form used by men, and she was privileged from suit and service at the sheriff's tourn. She was not sworn to the law by the oath of allegiance in the Ieet or tourn, and so could not be outlawed, but was said to be waived. She could be constable, either of a castle or a vill, but not sheriff, unless in the one case of Westmorland, an hereditary office, exercised in person in the 17th century by the famous Anne, countess of Dorset, Pembroke and Montgomery. In certain cases a woman could transmit rights which she could not enjoy. On such a power of trans- mission, as Sir H. Maine shows, 2 rested the claim of Edward III. to the crown of France. The claim through a woman was not a breach of the French constitutional law, which rejected the claim 0/ a woman. The jealousy of a woman's political influence is strikingly shown by the case of Alice Pcrrers, the mistress of Edward III. She was accused of breaking an ordinance by which women had been forbidden to do business for hire and by way of maintenance in the king's court. 3

By Magna Carta a woman could not accuse a man of murder except of that of her husband. This disability no doubt arose from the fact that in trial by battle she naturally did not appear in person but by a champion. She was not admitted as a witness to prove the status of a man on the question arising whether he were free or a villein. She could not appoint a

testamentary guardian, and could only be a guardian even of her own children to a limited extent. Her will was revoked by marriage, that of a man only by marriage and the subsequent birth of a child. By 31 Hen. VI. c. 9 the king's writ out of chancery was granted to a woman alleging that she had become bound by an obligation through force or fraud. By 39 Hen. VI. c. 2 a woman might have livery of land as heiress at fourteen. Benefit of clergy was first allowed to women partially by 21 Jac T. c- 6, fully by 3 Will. & M. c 9 and 4 and 5 Will. & M. c. 24. Public whipping was not abolished until 57 Geo. III. c. 75, whipping in all cases until I Geo. IV. c. 57. Burning was the punishment specially appropriated to' women convicted of treason or witchcraft. A ; case of sentence to execution by burning for petit treason occurred as lately as 1784. In some old statutes very curious sumptuary regula- tions as to women's dress occur. By the sumptuary laws of Edward III. in 1363 (37Edw. lll.ee. 8-14) women were in general to be dressed according to the position of their fathers or husbands. Wives and daughters of servants were not to wear veils above twelvepence in value. Handicraftsmen's and yeomen's wives were not to wear silk veils. The use of fur was confined to the ladies of knights with a rental above 200 marks a year. Careful observance of difference of rank in the dress was also inculcated by 3 Edw IV. c. 5. The wife or daughter of a knight was not to wear cloth of gold or sable fur, ot a knight -bachelor not velvet, of an esquire or gentleman not velvet, satin or ermine, of a labourer not clothes beyond a certain price or a girdle garnished with silver. By 22 Edw. IV. c, I, cloth of gold and purple silk were confined to women of the royal family. It is worthy of notice that at the times of passing these sumptuary laws the trade interests of women were protected by the legislature. By 37 Edw. III. c. 6, handicraftsmen were to use only one mystery, but women might work as they had been accustomed 3 Edw. IV. c. 3

1 It is remarkable that the great fiefs of France, except the Isle of France, the special apanage of the crown, all became in time female fiefs. This is shown by the table at the end of Laboulaye's Recherches.

2 Early Law and Custom, ch. v.

3 Rot. Pari., vol. iii. p. 12.

forbade importation of silk and lace by Lombards and other alien strangers, imagining to destroy the craft of the silk spinsters and all such virtuous occupations for women. In some cases the wives and daughters of tradesmen were allowed to assist in the trades of their husbands and fathers; see, for instance, the act concerning tanners, 1 Jac. I. c. 22. Some trading corporations, such as the East India Company, recognized no distinction of sex in their members. The disabilities imposed on women by

substantive law are sometimes traceable in the early law of procedure. For instance, by the Statute of Essoins (12 Edw. II. st. 2), essoin de servitio regis did not lie where the party was a woman; that is, a woman (with a few exceptions) could not excuse her absence from court by alleging that she was on public duty. The influence of the church is very clearly traceable in some of the earlier criminal legislation. Thus by 13 Edw. I. st. I, c. 34, it was punishable with three years' imprisonment to carry away a nun, even with her consent. The Six Articles, 31 Hen. VIII. c. 14, forbade marriage and concubinage of priests and sanctioned vows of chastity by women.

In Scotland, as early as Regiam Majestatem (12th century) women were the object of special legal regulation. In that work the mercheta mulieris (probably a tax paid to the lord on the marriage of his tenant's daughter) was fixed at a sum differing according to the rank of the woman. Numerous ancient laws dealt with trade and sumptu- ary matters. By the Leges Quatuor Burgorum female brewsters mak- ing bad ale were to forfeit eightpence and be put on the cucking-stool, and were to set an ale-wand outside their houses under a penalty of fourpence. The same laws also provided that a married woman committing a trespass without her husband's knowledge might be chastised like a child under age. The Statuta Gilde of the 13th century enacted that a married woman might not buy wool in the streets or buy more than a limited amount of oats. The same code also ensured a provision for the daughter of one of the gild-brethren unable to provide for herself through poverty, either by marrying her or putting her in a convent. By the act 1429, c. 9, wives were to be arrayed after the estate of their husbands. By 1457, c. 13, no woman was to go to church with her face covered so that she could not be known. 1581, c. 18, was conceived in a more liberal spirit, and allowed women to wear any head-dress to which they had been accustomed. 1621, c. 25, permitted servants to wear their mistress's cast-off clothes, 1681, c. 80, contained the remarkable provision that not more than two changes of raiment were to be made by a bride at her wedding. In its more modern aspect the law is in most respects similar to that of England. (J. W.)

In separate legal articles attention is drawn, on various sub- jects, to any special provisions or disabilities affecting „ women; see, for instance, Evidence, Divorce, English Makriage, Children {Law relating to), Infant, law Husband and Wife. The movement for removing specially the older disabilities has progressed at such different women rates in various countries that it is impossible to do more than note here the chief distinctions remaining under English law in 1910.*

Civil Rights. —The age at which a girl can contract a valid marriage, in English law, is, following the Roman law, twelve; she is thus two years in

advance of a boy, who must be fourteen. Under thcˆInfants Settlement Act 1855, a valid settlement could be made by a woman at seventeen with the approval of the court, the age for a man being twenty; by the Married Women's Property Act 1907 any settle- ment by a husband of his wife's property is not valid unless executed by her if she is of full age, or confirmed by her after she attains full age. An unmarried woman is liable for the support of illegitimate children till they attain the age of sixteen. She is generally assisted, in the absence of agreement, by an affiliation order granted by magis- trates. A married woman having separate property is, under the Married Women's Property Acts 1882 and 1908, liable for the support of her parents, husband, children and grandchildren becoming chargeable to any union or parish. At common law the father was entitled as against the mother to the custody of a legitimate child up to the age of sixteen, and could only forfeit such right by mis- conduct. But the Court of Chancery, wherever there was trust property and the infant could be made a ward of court, took a less rigid view of the paternal rights and looked more to the interest of the child, and consequently in some cases to the extension of the mother's rights at common law. Legislation has tended in the same direction. By the Infants' Custody Act 1873, the Court of Chancery was empowered to enforce a provision in a separation deed, giving up the custody or control of a child to the mother. The Judicature Act 1873, § 25 (10), enacted that in questions relating to the custody and education of infants the rules of equity should prevail. The Guardianship of Infants Act 1886 largely extended the mother's powers of appointing and acting as a guardian, and gave the court a discretion to regard the mother's wishes as to the custody of the children. The Summary Jurisdiction (Married Women) Act 1895 enabled a court of summary jurisdiction, to whom a married woman has made application, to commit to the applicant the custody oi any children of the marriage between the applicant and her husband, while under the age of sixteen years.

The most remarkable disabilities under which women were still placed in 1910 were (1) the exclusion of female heirs from intestate succession to real estate, unless in the absence of a male heir (see Inheritance; Succession); and (2) the fact that a husband could obtain a divorce for the adultery of his wife, while a wife could only obtain it for her husband's adultery if coupled with some other cause, such as cruelty or desertion.

Suits in which either necessarily or practically only women are plaintiffs are : breach of promise, affiliation (q.v.) and (though not nominally) seduction (<7-i'.).

The action for breach of promise l may indeed be brought by a man, but this is very rare, and its only real interest is as a protection for women. It may be brought by but not against an infant, and not against an adult if he or she has merely ratified a promise made during; infancy; it may be brought against but not by a married man or woman (in spite of the inherent incapacity of such a person to have married the plaintiff), and neither by nor against the personal representatives of a deceased party to the promise (unless where special damage has accrued to the personal estate of the deceased). The promise need not be in writing. The parties to an action are by 32 and 33 Vict. c. 68 competent witnesses; the plaintiff cannot, however, recover a verdict without his or her testimony being corroborated by other material evidence. The measure of damages is Lo a greater extent than in most actions at the discretion of the jury; they may take into consideration the injury to the plaintiff's feelings, especially if the breach of promise be aggravated by seduc- tion. Either party has a right to trial by jury under the rules of the Supreme Court, 1883. The action cannot be tried in a county court, unless by consent, or unless remitted for trial there by the High Court. Unchastity of the plaintiff unknown to the defendant when the promise was made and dissolution of the contract by mutual consent are the principal defences which are usually raised to the action. Bodily infirmity of the defendant is no defence to the action, though it may justify the other party in refusing to marry the person thus affected. Where the betrothed are within prohibited degrees of consanguinity or affinity, there can be no valid promise at all, and so no action for its breach.

Criminal Law. — There are some offences which can be committed only by women, others which can be committed only against them. Among the former are concealment of birth (in ninety-nine cases out of a hundred), the now obsolete offence of being a common scold, and prostitution '(q.v.) and kindred offences. Where a married woman commits a crime in company with her husband, she is generally presumed to have acted by his coercion, and so to be entitled to acquittal. This presumption, however, was never made in witchcraft cases, and is not now made in cases of treason, murder and other grave crimes, or in crimes in which the principal part is most usually taken by the wife, such as keeping a brothel. In fact, the exceptions to the ol d presumption are now pe rhaps more numerous

1 The action for breach of promise of marriage is in some of its incidents peculiar to English law. In Roman law, betrothal (spon- salia) imposed a duty on the betrothed to become husband and wife within a reasonable time, subject to the termination of the obligation by death, repudiation by the words conditione tua non utor, or lapse of time, the time fixed being two years. No action lay for breach of promise to marry unless arrhae sponsalitiae had been given, i.e. earnest of the bargain, to be forfeited by

the party refusing to carry it out. The arrha might also be given by a parent, and was equally liable to forfeiture. A provincial governor, or one of his relations or household, could not recover any arrha that might have been given, it being supposed that he was in a position of authority and able to exercise influence in forcing consent to a betrothal. In the canon law breach of the promise made by the sponsalia, whether de praesenti or de future, a division unknown to Roman law, does not without more appear to "have sufficed to found an action for its breach, except so far as it fell under ecclesiastical cognizance as laesio fidei, but it had the more serious legal effect of avoiding as a canonical disability the subsequent marriage, while the original sponsalia continued, of a betrothed person to any other than the one to whom he or she was originally betrothed. The sponsalia became inoperative, either by mutual consent or by certain supervening impediments, such as ordination or a vow of chastity. The canonical disability of pre-contract was removed in England by 32 Hen. VIII. c. 38, re-established in the reign of Edward VI., and finally abolished in 1753. In England the duty of the parties is the same as in Roman lav,, viz. to carry out the contract within a reasonable time, if no time be specially fixed. Formerly a contract to marry could be specifically enforced by the ecclesiastical court compelling a cele- bration of the marriage in facie ecdesiae. The last instance of a suit for this purpose was in 1752, and the right to bring it was abolished in 1753 by Lord Hardwicke's Act (26 Geo. II. c. 33). In Scotland a promise tn the nature of sponsalia defuturo not followed by consummation may be resiled from, subject to the liability of the party in fault to an action for the breach, which by 6 Geo. IV. c. 120, s. 28, is a proper cause for trial by jury. If, however, the sponsalia be de praesenti, and, according to the more probable opinion, if they be de futuro followed by consummation, a pre- contract is constituted, giving a right to a decree of declarator of marriage and equivalent to marriage, unless declared void during the lifetime of the parties.*

than those falling within it. The doctrine of coercion and the practice of separate acknowledgment of deeds by married women (necessary before the Married Women's Property Act) seem to be vestiges of the period when women, besides being chattels, were treated as chattels. Formerly a wife could not steal her husband's property, but since the Married Women's Property Act this has become possible. Adultery is no crime, England being almost the only country where such is the case. It was punished by fine in the ecclesiastical courts up to the 17th century, and was made criminal for a short time by an ordinance of the Long Parliament. The offences which can be committed only against women are chiefly those against decency, _ such as rape, procurement and similar crimes, in which a considerable change in the law in the direction of increased protection to women was made by the Criminal L-?w Amendment Act 1885. In regard to the

protection given to a wife against her husband modern legislation has considerably strengthened the wife's position by means of judicial separation and maintenance in case of desertion (sec Divorce). The whipping of female offenders was abolished in 1820. Chastisement of a wife by a husband, possibly at one time lawful to a reasonable extent, would now certainly constitute an assault. The husband's rights are limited to restraining the wife's liberty in case of her misconduct.

In Scotland the criminal law differs slightly from that of England. At one time drowning was a punishment specially reserved for women. Incest (q.v.), or an attempt to commit incest, has always been punishable as a crime. Adultery and fornication are still nominally crimes, but criminal proceedings in these cases have fallen into desuetude. The age of testamentary capacity is still twelve, not twenty-one, as in England.

The whole idea of women's position in social life, and their ability to take their place, independently of any question of sex, in the work of the world, was radically changed mˆher in the English-speaking countries, and also in the more education progressive nations beyond their bounds, during the ˆ °ˆits irjth century. This is due primarily to the movement resu ' for women's higher education and its results. To deal in detail with this movement in various countries would here be tco intricate a matter; but in the English-speaking countries at all events the change is so complete that the only curious thing now is, not what spheres women may not enter, more or less equally with men, but the few from which they are still excluded.

Before the accession of Queen Victoria, there was no systematic education for English women, but as the first half of the 19th century drew to a close, broader views began to be held on the subject, while the humanitarian movement, as well as the rapidly increasing number of women, helped to put their education on a sounder basis. It became more thorough; its methods were better calculated to stimulate intellectual power; and the conviction that it was neither good, nor politic, for women to remain intellectually in their former slate of ignorance, was gradually accepted by every one. The movement owed much to Frederick Denison Maurice, He was its pioneer; and Queen's College (1848), which he founded, was the first to give a wider scope to the training of its scholars. Out of its teaching, and that of its professors (including Charles Kingsley), grew nearly all the educational advantages which women enjoy to-day; and to the women who were trained at Queen's College we owe some of the best teaching in England. Bedford College, Cheltenham College, the North London Collegiate School for Girls, the Girls' Public Day School Company's schools, are some of those which sprang into life in different parts of England, and were filled, as rapidly as they were opened, by the girls of the middle and professional classes. From their teaching came the final stage

which gave women the same academic advantages as men. Somerville College and Lady Margaret Kail at Oxford, Girton and Newnham Colleges at Cambridge, Westfield College in London, St Hilda's College, St Hugh's Hall, Hollo way College, Owens College, the Manchester and Birmingham and Victoria Universities, and other colleges for women in all parts of the United Kingdom, are some of the later but equally successful results of the movement. The necessity for testing the quality of the education of women, however, soon began to be felt. The University of Cambridge was the first to institute a special examination for women over eighteen, and its example was followed by Oxford; but while London, Dublin (Trinity College), Belfast (Queen's), Victoria, Edinburgh, Glasgow, and St Andrews universities now grant degrees, Oxford and Cambridge still denied them in 1910. In the act of 190S establishing the new Roman

Catholic university in Ireland, it was provided that two members of the senate should be women; and Queen's University, Belfast, had three women in 1910 in its senate. Women may point with justifiable pride to the fact that within a very few years of their admission to university examinations, they provided at Cambridge both a senior classic and a senior wrangler. In America (see Co-education) the movement has gone much farther than in Great Britain.

The temperate, calm, earnest demeanour of women, bcth in the schools and in university life, awakened admiration and respect from all; and the movement brought into existence a vast number of women, as well-educated as men, hard-working, persevering and capable, who invaded many professions, and could hold their ground where a sound education was the found- ation of success. The pioneers of female education spent their energies in developing their higher and more intellectual ideals, but later years opened up other positions which better education has enabled women to fill. In the literary field they soon invaded journalism (see Newspapers), and took an important place on the staffs of libraries and museums. They form an important (and in America, the predominating) section of the teaching profession in the state schools, and in all research work play an increasingly valuable part. It is not possible for every woman to be a scholar, a doctor (see below), a lawyer, 1 or possibly to attain the highest position in professions where competition with men is keen, but the development of women's work has opened many other outlets for their energies. As members of school boards, factory inspectors, poor law guardians, sanitary inspectors, they have had ample scope for gratifying their ambition and energy. The progress made in philanthropy and religious

activity 2 is largely due to their devotion, under the auspices of countless new societies. And increasing provision has been made, in the arts and crafts, for the furtherance of their careers. There are successful women architects now working in England, and in 1905 a woman won the silver medal of the Royal Society of British Architects; a large number of women travel for business firms; in decorative work, as silversmiths, dentists, law copyists, proof-readers, and in plan tracing women work with success; wood-carving has become almost as recognized a career for them as that of typewriting and shorthand, in which an increasing

1 Women have long practised law in the United States, and in 1896 the benchers 01 the Ontario Law Society decided to admit them to the bar. In France in December 1900 an act was passed enabling women to practise as barristers, and Madame Petit was sworn in Paris, while a woman was briefed for the defence in a murder case in Toulouse in 1903, this being the first case of a woman pleading in a European criminal court. In Finland and Norway women have long practised as barristers, and in Denmark since 1908 they have been admitted as assistants to lawyers. By the law of the Nether- lands they are admitted as notaries. In England a special tribunal of the House of Lords presided over by the Lord Chancellor decided in 1903 not to admit women to the English bar, on the grounds that there was no precedent and that they were not desirous of creating one; but numbers of women take degrees in law in British universi- ties, and several have become solicitors.

1 In the olden times before the Reformation in England various religious communities absorbed a large number of the surplus female population, and in High Church and Roman Catholic circles many ladies still enter various sisterhoods and devote their lives to teaching the young, visiting the poor and nursing the sick. In the Church of England the only office which remained open to women was the modest one of churchwarden, and this office is not infre- quently filled by women. The Convocation of Canterbury in 1908 refused by a majority of two to admit women to parochial church councils, though qualified persons of the female sex may vote for parochial lay representatives on the church council. In the Inde- pendent Churches there are fewer restrictions. Among the Con- gregationalists women have equal votes on all questions and may become deacons or. even ministers; Miss Jane Brown has been recognized as pastor of Brotherton Congregational Church, York- shire, and Miss L. Smith as pastor of that in Cardiff, and in the Methodist Church women frequently act as local preachers. The same equality and share in religious work is accorded to women by the Baptists, the Society of Friends and the Salvation Army, the success of which is largely due to them. In Unitarian congregations in the United States and Australia many women have been ap- pointed ministers, and in England the Rev. Gertrude von Petzold held in 1910 the post of

minister of the Narborough Road Free Christian Church, Leicester,

number are finding employment. Agriculture and gardening have opened up a new field of work, and, with it, kindred occupa- tions.

Women have always found a peculiarly fitting, sphere as nurses, though it is only in recent years that nursing (q.v.) has been professionalized by means of proper education. But their admission to the medical profession itself was one of the earliest triumphs of the 19th-century movement. It began in America, but was quickly followed up in England. After having been refused admission to instruction by numerous American medical schools, Miss Elizabeth Blackwellwas allowed to enter as a student by the Geneva Medical College, N.Y., in 1847, from which she graduated in 1849. Hers was the first woman's name to be placed on the Medical Register of the United Kingdom (1859). In Great Britain the struggle to obtain admission to the teaching schools and to the examinations for medical degrees and diplomas was long and bitter. Though the Society of the Apothecaries admitted Mrs Garrett Anderson (q.v.) to their diploma in 1865, it w r as only after a series of rebuffs and failures that women were admitted to the degree examina- tions of the various universities. In August 1876 an " enabling " act was passed, empowering the nineteen British medical examining bodies to confer their degrees or diplomas without distinction of sex. In 1908 the Royal College of Physicians and Surgeons decided to admit women to their diplomas and fellowships. In the meantime women doctors had become a common phenomenon.

Women in England may fill some of the highest positions in the state. A woman may be a queen, or a regent, and as queen regnant has, by 1 Mary, sess. 3, c. 1, as full rights as a king. Among the public offices a woman may position. hold are those of county, borough, parish and rural or urban district councillor, overseer, guardian of the poor, church- warden and sexton. In 1908 Mrs Garrett Anderson was elected mayor of Aldeburgh, the first case of a woman holding that position. Women have also been nominated as members of Royal Commissions (e.g. those on the Poor Law and Divorce). A woman cannot serve on a jury, but may, if married, be one of a " jury of matrons" empanelled to determine the condition of a female prisoner on a writ de ventre insfiiciendo. She can vote (if unmarried or a widow) in county council, municipal, poor law and other local elections. The granting of the parliamentary franchise to women was, however, still withheld in 1910. The history of the movement for women's suffrage is told below. It may be remarked that, with or without the possession of a vote on their own account, politics in England have in modern times been very considerably influenced by the work of women as speakers, canvassers and organizers. The great Conservative auxiliary political organization, the Primrose League, owes its main success to

women, and the Women's Liberal Federation, on the opposite side, has done much for the Liberal party. The Women's Liberal Unionist Association, which came into being in 1886 at the time of the Irish Home Rule Bill, also played an active part m defence of the Unionist cause.

The movement for the abolition of the sex distinction in respect of the right conferred upon certain citizens to share in the election of parliamentary representatives dates for t

practical purposes from the middle of the 19th century. su //„™ The governmental systems of the ancient world were based without exception on the view that women could take no part in state politics, except in oriental countries as monarchs. Exceptional women such as Cleopatra, Semiramis, Arsinoe, might in the absence of men of the royal house, and by reason of royal descent or personal prestige, occupy the throne, and an Aspasia might be recognized as the able head of a political salon, but women in general derived thence no political status. Though Christianity and a broadening of men's theories of life tended to raise the moral and social status of women, yet Paul definitely assigns subservience as the proper function of women, and many of the fathers looked upon them mainly as inheriting the temptress function of Eve. This view generally obtained through- out the middle ages, though here and there glimmerings of a new

idea are seen; many of the great English abbesses discharged their territorial duties as landowners, and women as custodians of castles voted for knights of the shire. In the 17th and 18th centuries in England and America, under the influence of advanc- ing political theory, and in France in the 18th century, this idea began to take shape. In England the writings of Mary Astell (Serious Proposal to Ladies, 1697) and others led to the gradual revision of the inherited idea of the education and the true sphere of women, while in 1790 Mary Wollstonecrait published her Vindication of the Rights of Women. In America the dawning of a political consciousness is evidenced by the claim made in 1647 by Margaret Brent to sit in the Assembly of Maryland as the executor of Lord Baltimore, and by the requests made by Abigail Adams (wife of John Adams), Mercy Otis Warren and Hannah Lee Corbin, that women taxpayers should enjoy direct representation. In France the movement towards democracy did not in the hands of Rousseau include the enfranchisement of women, and Comte taught that women were politically inferior to men; Condorcet, however, demanded equal rights for both sexes. Although, through an oversight, women could vote under the first constitution of New Jersey from 1776 to 1S07, there is no doubt that women's suffrage had made practically no progress in any country till comparatively late in the 19th century. There has been considerable discussion as to whether women had constitutionally a right to vote in England prior to the Reform Act of r832 (see Mrs C. C. Stopes, British Freewoman). The discussion, however, is one of purely antiquarian interest, and the Reform Act made quite clear what had certainly been the recognized custom before, by introducing specifically the word " male " in the new franchise law (2 and 3 Will. IV., cap. 45, sections 19 and 20).

The earliest known handbill representing the modern " women's suffrage" movement in England dates from about 1847, and in 1857 the first society was formed in Sheffield, the "Sheffield Female Political Association," due largely to the work of a Quaker lady, Anne Kent of Chelmsford. In July of the same year Mrs John Stuart Mill published an article in the Westminster Review. 1 The earliest outstanding figure, however, is Lydia Ernestine Becker (1827-1890), descended on the mother's side from an old Lancashire family, her father being the son of a German who settled in England in early youth. She became a well-known botanist, and an intimate friend of Charles Darwin. In 1858 the Englishwoman's Journal was started, and by this time there was a vigorous agitation for the alteration of the law relating to the property and earnings of married women. Among the leaders of that movement were Barbara Leigh Smith (Mrs Bodichon) and Bessie Rayner Parkes (Madame Belloc). At the same time a famous group of women, Emily Davies, Miss Beale and Miss Buss(founders respectively of the Cheltenham Ladies' College and the North

London Collegiate School) and Miss Garrett (Dr Garrett Anderson), Miss Helen Taylor (John Stuart Mill's stepdaughter) and Miss Wolstenholme (afterwards Mrs Elmy), discussed women's suffrage at the " Kensington Society."

A new era began with the election in 1865, as member for West- minster, of John Stuart Mill, who placed women's suffrage in his election address. From that time the subject became more or less prominent in each successive parliament. Mill presented the first petition in May 1867. In 1868 the case of Chorlton v. Lings was decided against women applicants for the vote by the Court of Common Pleas, and a similar decision was given by the Supreme Court of Appeal in Scotland. From this time the efforts of the various local committees (in London, Manchester, Bristol, Edinburgh and Birmingham) were directed to promoting a bill in parliament, and to forwarding petitions (an average of 200,000 signatures a year was maintained from 1870 to 1880). The Women's Suffrage Journal was founded in 1870, and in the same year Jacob Bright moved the second reading of the Women's Disabilities Bill which was carried by a majority of 33 votes. Mr Gladstone then threw his opposition into the scale, and the bill

1 This article was written in reference to the Women's Rights Convention held in Worcester, Mass., U.S.A., in October 1850.

was rejected in committee by 220 to 94. In 1871 the same bill was again lost by 220 to 151, in spite of a memorial headed by Florence Nightingale, Mary Carpenter, Augusta Webster, Harriet Martineau, Frances Power Cobbe and Anna Louisa Chisholm (Mrs H. W. Chisholm). G. O. Trevclyan's Household Franchise Bill in 1873 raised the hopes of the women's suffragist, and Mr Joseph Chamberlain at a great Liberal meeting in Birmingham carried a resolution in favour of the proposed change. From 1874 to 1876 the bill was in charge of a conservative, Mr Forsyth, and, despite the opposition of John Bright and the efforts of a parliamentary committee for " maintaining the integrity of the franchise," the number of supporters was well maintained. The work proceeded uneventfully from 1876 to 1884, huge meetings being held in all the chief towns. In 1880 the franchise was conferred upon women owners in the Isle of Man, subsequently upon women occupiers also. In 1883 a great Liberal conference at Leeds voted in favour of women's suffrage under the leadership of Dr Crosskey and Walter S. B. M'Laren. The next notable event in the movement was the defeat of W. Woodall's amendment to the Reform Bill (1884), providing that words importing the masculine gender should include women, by 271 votes to 135, Mr Gladstone again making a powerful appeal to his party to withdraw the support which they had given in the past. 104 Liberal members crossed over in answer to this appeal.

Numerous bills and resolutions followed year by year in the names of W. Woodall, L. H. Courtney (Lord Courtney, whose bill was read a second time without a division, 1886), W. S. B. M'Laren, Baron Dimsdale, Caleb Wright, Sir Albert K. Rollit, F. Faithfull Begg (r897; second reading majority 71). Up to 1906 all those attempts had failed, in most cases owing to time being taken for government business.

The period 1906 to igro witnessed entirely new developments. The suffragists of the existing societies still carried on their constitutional propaganda, and various bills were introduced. In r907 Mr W. H. Dickinson's bill was talked out, and in 1908 Mr II. Y. Stanger's bill was carried on its second reading by a majority of 179, but the government refused facilities for its progress. Prior to this, however, a number of suffragists had come to the conclusion that the failure of the various bills was due primarily to government hostility. Furthermore the advent of a Liberal government in 1906 had aroused hopes among them that the question would be officially taken up. Questions were therefore put by women to Liberal cabinet ministers at party meetings, and disturbances occurred, with the result that Miss Christabel Pankhurst and Miss Annie Kenney were fined in Manchester in 1906. A certain section of suffragists thereafter decided upon comprehensive opposition to the government of the day, until such time as one or other party should officially adopt a measure for the enfranchisement of women. This opposition took two forms, one that of conducting campaigns against government nominees (whether friendly or not) at bye- elections, and the other that of committing breaches of the law with a view to drawing the widest possible attention to their cause and so forcing the authorities to fine or imprison them. Large numbers of women assembled while parliament was sitting, in contravention of the regulations, and on several occasions many arrests were made. Fines were imposed, but practically all refused to pay them and suffered imprisonment. At a later stage some of the prisoners adopted the further course of refusing food and were forcibly fed in the gaols.

The failure of all the bills previously drafted on the basis of exact equality between the sexes, and the fact that both Unionists and Liberals refused to make the matter a party question, coupled with a general feeling of discomfort at the relations between the so-called " militant " suffragists and the authorities, led in the spring of 1910 to the formation of a committee (called the Conciliation Committee) of members of parliament under the presidency of the earl of Lytton. This committee, consisting of some 55 members belonging to all parties, succeeded in agree- ing upon a new bill based upon the occupier franchise established by the Municipal Franchise Act of 1884. It was urged on behalf of this bill that jl would establish the principle on a sufficiently

representative basis without altering the numerical balance of parties in the country. It was calculated that slightly over i, ooo ; ooo women would be enfranchised. After considerable pressure both inside the house and outside, Mr Asquith consented to give two days of government time for the debate, and the second reading, moved by the Labour member, Mr D. J. Shackleton, was carried by a majority of no votes. A further attempt to commit the bill to a Grand Committee failed by 175 votes; the bill was therefore sent to a committee of the whole house, and Mr Asquith announced that he would not give further facilities. It was noteworthy that, though the bill was opposed as undemocratic by Mr Lloyd-George and other Liberals, it was supported by 32 out of 40 of the Labour members, and evidence was given that a large proportion of the new voters would have been working women.

The leading women's suffrage societies may here be mentioned. All these societies have advocated precisely the same view, namely that women should have the same electoral privileges as men, whatever franchise system be adopted.

1. The National Union of Women's Suffrage Societies is the oldest organization. It began about 1867 as a number of separate local committees, and after various reorganizations a great amalgamation of all local societies was framed in 1896 under the present title. This union had 200 branches in 1910, All the early suffragists belonged to this body, and in latter years the chief name is that of Mrs Henry Fawcett. The union pursued continuously the " constitutional " policy and stood apart altogether from the " militant " societies. Its official organ, The Common Cause, was founded in 1908.

2. The National Women's Social and Political Union, associated chiefly with the name of Mrs Fmmeline Pankhurst and Miss Christa- bel Pankhurst, formed in 1906, originated the more " militant " policy. Its income in 1909-1910 reached the figure of £60,000, and up to September 1910 some 500 of its members had undergone imprisonment. It undertook a widespread campaign of meetings, and though at first its speakers were subjected to an opposition of a violent character, there was no doubt that the movement received from its activities a wholly new stimulus. Its official organ, Votes for Women, obtained a large circulation.

Societies ol various kinds multiplied. In 1907 were formed (3) the Women's Freedom League (chiefly associated with the name of Mrs C. Despard, a prominent supporter of the Labour party), whose members

objected to the internal administration of the Social and Political Union, but agreed in adopting its policy in a modified form ; and (4) the Men's League for Women's Suffrage, a society which included men of all parties, and in September 1910 adopted the anti-government election policy. Numerous other party 1 and non-party societies were formed, and resolutions supporting the principle, either in the abstract or as a part of adult suffrage, were passed by various Conservative, Liberal and Labour conferences and associations.

The remarkable prominence of the movement and the fact that successive parliaments contained a majority of pledged suffragists led to the formation of opposition societies. In 1908 was formed the Women's National Anti-Suffrage League, of men and women, which drew into its ranks prominent persons such as Lord Cromer, Lord Curzon, Lady Jersey and Mrs Humphry Ward; and about the same time the Men's League for Opposing Women's Suffrage came into existence. These two leagues amalgamated in December 19 10, as the National League for Opposing Women's Suffrage, with Lord Cromer as president. The Anti-Suffrage Review was founded in 1909.

In New Zealand a measure for the enfranchisement of women, introduced by Richard Seddon, was carried in September 1893 (in the upper house by a majority of 2;. In Australia the vote has been extended to all adult women both in the states (the first being South Australia, 1894, the last Victoria, 1908) and for the Commonwealth parliament. They have, moreover, the right to sit in the representative assemblies.

The movement assumed an organized form in the United States somewhat earlier than in the United Kingdom. It arose out of the interest taken by women in the temperance and anti- slavery agitations; and was fostered by the discussion on women's property rights. In 1840 the question was raised in a more acute form by the exclusion of women delegates from the World's Convention, and in 1848 the first women's suffrage convention was held at Seneca Falls, the leading spirits being Mrs Elizabeth Cady Stanton, Martha C. Wright and Lucretia Mott. Later conventions at Salem and Worcester, Massachusetts, in 1850,

1 E.g. the Conservative and Unionist Women's Franchise Associa- tion, of which the countess of Selborne became president in 1910.

were the predecessors of annual meetings, but the extravagant dress adopted by some of the women brought ridicule upon the movement, which was further thrown into the background Dy the Civil War. In 1869 were formed: (1) in New York, the National Women's Suffrage Association, and (2) in Cleveland, the American Woman's Suffrage Association. In 1890 these iv;o societies amalgamated as the National American Woman's

Suffrage Association, of which in 1900 Mrs Carrie Chapman Catt became president. The question was considered by a select committee in the 48th Congress, and 200 petitions, repre- senting millions of individuals, were presented in 1900. The Labour and Socialist parties in general supported the women's claim, but there was considerable opposition in other parties. In 5 states (Wyoming since 1869; Colorado, 1893; Utah, 1896; Idaho, 1896; and Washington, 1910) women are electors, and in 25 states they have exercised the school suffrage. In Louisiana they obtained the suffrage in connexion with tax levies in 1898. Anti-suffrage societies have also been formed in Brooklyn (1894), Massachusetts (1895), Illinois (1897), Oregon (1899).

In Finland all adult men and women over the age of 24, excluding paupers, received the right to vote for members of the Diet in 1906, in which year nineteen women became members of the Diet. In Norway, where there is male suffrage for men over 25 years of age, women w T ere entitled to vote by a law of 1907, provided they or, if married, their husbands (i.e. where property is jointly owned) had paid income tax on an annual income of 400 kroner (£22) in the towns, or 300 kroner (£16, 10s.) in country districts. In Sweden a suffrage bill was carried in the lower but rejected in the upper house in 1909. In all the chief countries there are suffrage societies of greater or less strength. In Russia the question was placed in the forefront of the demands made by the Duma in 1906, and in 1907 propertied women received the right to confer votes on their sons who would otherwise be unenfranchised. In France a feminist congress met at Lyons in 1909.

The International Woman Suffrage Alliance originated in the United States in 1888. Its membership increased steadily, and at the Convention held in London in 1909 delegates were present from twenty-two countries. In the United Kingdom this Alliance is represented by the National Union of Women's Suffrage Societies, A social and propagandist club was founded in London in 1909 with an international membership. An international journal under the title Jus Sujfragii (Brussels) was founded in 1907.

Authorities. — It is impossible to do more than mention a few works out of many dealing with various phases of the modern " women's movement. " See Alice Zimmern's Renaissance of Girls' Education in England (1898) ; A. R. Cleveland, Women under English Law (1896); J. L. de Lanessan, L'Education de la femme moderns (1908); M. Ostrogorski, Femme an point de vue du droit public (1892); Mrs C. P. Gilman, Women and Economics (1899); Miss C, E. Collet, Report on Changes in the Employment of Women (1898; Pari, papers, C. 8794); B. and M. Van Vorst, Woman in industry (1908) ; A. Loria, Le Fkminisme an point de vue sociologique (1907); Helen Blackburn, Record of Women's Suffrage, in the United

Kingdom (1902); Susan B. Anthony, History of Woman's Suffrage, in the United States (4 vols., 1881-1902); C. C. Stopcs, British Free Women (1894); W. Lyon Blease, The Emancipation of Women (1910). The classical exposition of the arguments on behalf of women's suffrage is J. S. Mill's Subjection of Women; the most important statement in opposition is perhaps that of Professor A. V. Dicey in the Quarterly Review (Oct. 1908). (X.)

WOOD, ANTHONY A 2 (1632-1695), English antiquary, was the fourth son of Thomas Wood (1580-1643), B.C.L. of Oxford, where Anthony was born on the 17th of December 1632. He was sent to New College school in 1641, and at the age of twelve was removed to the free grammar school at Thame, where his studies were interrupted by civil war skirmishes. He was then placed under the tuition of his brother Edward (1627-1655), of Trinity College; and, as he tells us, " while he continued in this condition his mother would alwaies be soliciting him to be an apprentice which he could never endure to heare of." He was entered at Merton College in 1647, and made postmaster. In i6$2 he amused himself with ploughing and bell-ringing,

2 In the Life he speaks of himself and his family as Wood or a Wood, the last form being a pedantic return to old usage adopted by himself. A pedigree is given in Clark's edition.

WOOD, MRS HENRY-

and " having had from his most tender years an extraordinary ravishing delight in music," began to teach himself the violin, and was examined for the degree of B.A. He engaged a music- master, and obtained permission to use the Bodleian, " which he took, to be the happiness of his life." He was admitted M.A. in 1655, and in the following year published a volume of sermons by his late brother Edward. He began systematically to copy monumental inscriptions and to search for antiquities in the city and neighbourhood. He went through the Christ Church registers, " at this time being resolved to set himself to the study of antiquities." Dr John Wallis, the keeper, allowed him free access tc the university registers in 1660; " here he layd the foundation of that book which was fourteen years afterwards published, viz. Hist, et Antiq. Univ. Oxon" He also came to know the Oxford collections of Brian Twyne to which he was greatly indebted^ He steadily investigated the muniments of all the colleges, and in 1667 made his first journey to London, where he visited Dugdale, who introduced him into the Cottonian library, and Prynne showed him the same civility for the Tower records. On October 22, i66g, he was sent for by the delegates of the press, " that whereas he had taken a great deal of paines in writing the Hist, and Antiq. of the Universitie of Oxon, they

would for his paines give him an 100 It. for his copie, conditionally, that he would suffer the book, to be translated into Latine." He accepted the offer and set to work to prepare his English MS. for the translators, Richard Peers and Richard Reeve, both appointed by Dr Fell, dean of Christ Church, who under- took the expense of printing. In 1674 appeared Historia el antiquitates Universitatis Oxoniensis, handsomely reprinted " e Thcatro Sheldoniano," in two folio volumes, the first devoted to the university in general and the second to the colleges. Copies were widely distributed, and university and author received much praise. On the other hand, Bishop Barlow told a corre- spondent that " not only the Latine but the history itself is in many things ridiculously false" (Genuine Remains, 1693, p. 183). In 167S the university registers which had been in his custody for eighteen years were removed, as it was feared that he would be implicated in the Popish plot. To relieve himself from suspicion he took the oaths of supremacy and allegiance. During this time he had been gradually completing his great work, which was produced by a London publisher in 1691-1692, 2 vols, folio, Athenae Oxonienses: an Exact History of ail the Writers and Bishops who have had their Education in the University of Oxford from 1500 to 1690, to which are added the Fasti, or Annals for the said time. On the 29th of July 1693 he was condemned in the vice-chancellor's court for certain libels against the late earl of Clarendon, fined, banished from the university until he recanted, and the offending pages burnt. The proceedings were printed in a volume of Miscellanies published by Curll in 1714. Wood was attacked by Bishop Burnet in a Letter to the Bishop of Lichfield and Coventry (1693, 4to), and defended by his nephew Dr Thomas Wood, in a Vindication of the Historiographer, to which is added the Historiographers Answer (1693), 4X0, reproduced in the subsequent editions of the Athenae. The nephew also defended his uncle in An Appendix to the Life of Bishop Seth Ward, 1697, 8vo. After a short illness he died on the 28th of November 1695, and was buried in the outer chapel of St John Baptist (Merton College) , in Oxford, where he superintended the digging of his own grave but a few days before.

He is described as " a very strong lusty man, " of uncouth manners and appearance, not so deaf as he pretended, of reserved and temper- ate habits, not avaricious and a despiser of honours. He received neither office nor reward from the university which owed so much to his labours. He never married, and led a life of self-denial, entirely devoted to antiquarian research. Bell-ringing and music were his chief relaxations. His literary style is poor, and his taste and judg- ment are frequently warped by prejudice, but his two great works and unpublished collections form a priceless source of information on Oxford and her worthies. He was always suspected of being a Roman Catholic, and invariably treated Jacobites and Papists better than Dissenters in the Athenae, but he died in communion

with the Church of England.

Wood's original manuscript (purchased by the Bodleian in 1846) was first published by John Gutch as The History and Antiquities of the Colleges and Halls in Ike University of Oxford, with a con-

tinuation (1786-1790, 2 vols. 4to), and The History and Antiquities of the University of Oxford (1792-1796, 3 vols. 4to), with portrait of Wood. To these should be added The Antient and Present State of the City of Oxford, chiefly collected by A. a Wood, 'with additions by the Rev. Sir J. Peshall (1773, 4to; the text is garbled and the editing very imperfect). An admirable edition of the Survey of the Antiquities of the City of Oxford, composed in 1661-66 by Anthony Wood, edited by Andrew Clark, was issued by the Oxford Historieal Society (1889-1899, 3 vols. 8vo). Modius Solium, a Collection of Pieces of Humour, chiefly ill-natured personal stories, was published at Oxford in 1751, i2mo. Some letters between Aubrey and Wood were given in the Gentleman's Magazine (3rd scr., ix. x. xi.). Wood consulted Dr Hudson about getting a third volume of the Athenae printed in Holland, saying, " When this volume comes out I'll make you laugh again " (Reliq. Hearnianae, i. 59). This was included in a second edition of the Athenae published by R. KnapJock and J. ' Tonson in 1721 (2 vols, folio), " very much corrected and enlarged, with the addition of above 500 new lives." The third appearedas "a new edition, with additions, and a continuation by Philip Bliss" (1813-1820, 4 vols. 4to). The Ecclesiastical History Society proposed to bring out a fourth edition, which stopped at the Life, ed. by Bliss (1848, 8vo; see Gent. Mag., N.S., xxix. 135, 268). Dr Bliss's inter- leaved copy is in the Bodleian, and Dr Griffiths announced in 1859 that a new edition was contemplated by the Press, and asked for additional matter (see Notes and Queries. 2nd ser., vii. 514, and 6th scr., vi. 5, 51). Wood bequeathed his library (127 3Y1SS. and 970 printed books) to the Ashmolean Museum, and the keeper, William Huddesford, printed a catalogue of the MSS. in 1761. In 1858 the whole collection was transferred to the Bodleian, where 25 volumes of Wood's MSS. had been since 1690. Many of the original papers from which the Athenae was written, as well as several large volumes of Wood's correspondence and all his diaries, are in the Bodleian.

We are intimately acquainted with the most minute particulars of Wood's life from his Diaries (1 657-1695) and autobiography; all earlier editions are now superseded by the elaborate work of Andrew Clark, The Life and Times of Anthony Wood, Antiquary, of Oxford, 1632-169$, described by

himself (Oxford Historical Society, 1891-1900, 5 vols. 8vo). See also Reliquiae Hearnianae, ed. Bliss (2nd ed., 1869, 3 vols. i2mo): Hearne's Remarks and Collections (Oxford Historical Society, 1885-1907), vols, i.-yiii. ; Macray's Annals of the Bodleian Library (2nd ed., 1890); Nichols's Literary Anecdotes, i. iv. v. viii. ; Noble's Biogr. History of England, i. (H. R. T.)

WOOD, MRS HENRY [Ellen] (1814-1887), English novelist, was born at Worcester on the 17th of January 1814. Her maiden name was Price; her father was a glove manufacturer in Worcester. She married Henry Wood in 1836, and after her marriage lived for the most part in France, her husband, who died in 1866, being, at the head of a large shipping and banking firm. In 1S60 she wrote a temperance tale, Danesb-ury House, which gained a prize of £100 offered by the Scottish Temperance League; but before this she had regularly contri- buted anonymous stories to periodicals. Her first great success was made with East Lynnc (1861), which obtained enormous popularity. It was translated into several languages, and a number of dramatic versions were made. The Channings and Mrs Halliburton's Troubles followed in 1862; Vemer"s Pride and The Shadow of Ashlydyat in 1863; Lord Oakburn i s Daughters, Oswald Cray and Trevlyn Hold in 1864. She became proprietor and editor of the Argosy magazine in 1867, and the Johnny Ludlow tales, published anonymously there, are the most artistic of her works. Among the thirty-five novels Mrs Henry Wood produced, the best of those not hitherto mentioned were Roland Yorke (1869); Within the Maze (1872) and Edina (1876). She continued to edit the Argosy, with the assistance of her son, Mr C. W. Wood, till her death, which occurred on the 10th of February 1887.

Memorials of Mrs Henry Wood, by her son, were published in 1894.

WOOD, SIR HENRY EVELYN (1838-), British field marshal, was born at Braintree, Essex, on the 9th of February 1838, the youngest son of Sir John Page Wood, Bart. Educated at Marlborough, he entered the Royal Navy in 1852, and served as a midshipman in the Russian war, being employed on shore with the naval brigade in the siege operations before Sevastopol, mentioned in despatches, and severely wounded at the assault on the Redan on June 18, 1855. Immediately afterwards he left the navy for the army, becoming a cornet in the 13th Light Dragoons. Promoted lieutenant in 1856, he exchanged into the 17th Lancers in 1857, and served in the Indian Mutiny with distinction as brigade-major of a flying column, winning the

Victoria Cross. In 1861 he Lecame captain, in 1862 brevet- major,

exchanging about the same time into the 73rd Highlanders (Black Watch), but returned to the cavalry three years later. Having meantime served as an aide-de-camp at Dublin, he was next employed on the staff at Aldershot until 1871, when he was appointed to the 90th (now 2nd Scottish Rifles) as a regimental major. In 1867 he had married the Hon. Mary Fauline South- well, sister of the 4th Lord Southwell, In 1873 he was promoted brevet lieutenant-colonel, and in 1874 served in the Ashanti War (brevet-colonel); in 1874-1878 he was again on the staff at Aldershot, and in November 1878 he became regimental lieu- tenant-colonel, the 90th being at that time in South Africa engaged in the Kaffir War. In January 1879 he was in command of the left column of the army that crossed the Zulu frontier, and shortly afterwards he received the local rank of brigadier-general. Under him served Colonel Redvers Buller and also the Boer leader, Piet Uys, who fell at Inhlobana, but the re- pulse at that place was more than counterbalanced by the successful battle of Kambula. At the close of the war Sir Evelyn Wood, who received the K.C.B. for his services, was appointed to command the Chatham district. But in January iS8r he was again in South Africa with the local rank of major- general, and after Sir G. P. Colley's death at Majuba it fell to his lot to negotiate the armistice with General Joubcrt. Re- maining in Natal until February 1882, he then returned to the Chatham command, having meantime been promoted sub-stantive major-genera!. In 1882 he was made a G.C.M.G. and commanded a brigade in the Egyptian expedition. He remained in Egypt for six years. From 1883 to 1885 he was Sirdar of the Egyptian army, which he reorganized and in fact created. During the Nile operations of 1884-85 he commanded the forces on the line of communication of Lord Wolseley's army. In 1886 he returned to an English command, and two years later (January 1889), with the local rank of lieutenant-general, he was appointed to the Aldershot command. He became lieu- tenant-general in 1891, and was given the G.C.B. at the close of his tenure of the command, when he went to the War Office as quartermaster-general. Four years afterwards he became adjutant-general. He was promoted full general in 1895. He commanded the II. Army Corps and Southern Command from 190: to 1904, being promoted field marshal on the 8th of April 1903. In 1907 he became colonel of the Royal Horse Guards. After retiring from active service he took a leading part, as chair- man of the Association for the City of London, in the organization of the Territorial Force. Sir Evelyn Wood published several works, perhaps the best known of which to the soldier are Achievements of Cavalry (1897) and Cavalry in Ike Waterloo Campaign (1896). He also wrote The Crimea in iSs4andini8g4\ an autobiography, From Midshipman to Field Marshal; and The Revolt in Hindostan.

WOOD, JOHN GEORGE (1827-1889), English writer and lecturer on

natural history, was born in London on the 21st of July 1827. He was educated at Ashbourne grammar school and at Merton College, Oxford; and after he had taken his degree in 1 848 he worked for two years in the anatomical museum at Christ Church under Sir Henry Acland. In 1852 he was ordained a deacon of the Church of England, became curate of the parish of St Thomas the Martyr, Oxford, and also took up the post of chaplain to the Boatmen's Floating Chapel at Oxford. He was ordained priest in 1854, and in that year gave up his curacy to devote himself for a time to literary work. In 1858 he accepted a readership at Christ Church, Newgate Street, and he was assistant-chaplain to St Bartholomew's Hospital, London, from 1S56 until 1862. Between 1868 and 1876 he held the ofhee of precentor to the Canterbury Diocesan Choral Union. After 1876 he devoted himself to the production of books and to delivering in all parts of the country lectures on zoology, which he illustrated by drawing on a black-board or on large sheets of white-paper with coloured crayons. These " sketch lectures," as he called them, were very popular, and made his name widely known both in Great Britain and in the United States. In 1883- 1884 he delivered the Lowell lectures at Boston. Wood was

for a time editor of the Boy's Own Magazine. His most important work was a Natural History in three volumes, but he was better known by the series of books which began with Common Objects of the Sea-Shore, and which included popular monographs on shells, moths, beetles, the microscope and Com- mon Objects of the Country. Our Garden Friends and Foes was another book which found hosts of appreciative readers. He died at Coventry on the 3rd of March 1889.

WOOD, SEARLES VALENTINE (1798-1880), English palaeon- tologist, was born on the 14th of February 1798. He went to sea in i8ri as a midshipman in the East India Company's service, which he left, however, in 1826. He then settled at Hasketon near Woodbridge, Suffolk. He devoted himself to a study of the mollusca of the Newer Tertiary (Crag) of Suffolk and Norfolk, and the Older Tertiary (Eocene) of the Hampshire basin. On the latter subject he published A Monograph of the Eocene Bivalves of England (1861-1871), issued by the Palaeonto- graphical Society. His chief work was A Monograph of the Crag Mollusca (1848-1856), published by the same society, for which he was awarded the Wollaston medal in i860 by the Geological Society of London; a supplement was issued by him in 1S72- 1874, a second in 1879, and a third (edited by his son) in 1882. He died at Martlesham, near Woodbridge, on the 26th of October 1880. His son, Searles Valentine Wood (1830-1884), was for some years a solicitor at Woodbridge, but gave up the pro- fession and devoted his energies to geology, studying especially the structure of the

deposits of the Crag and glacial drifts.

WOODBRIDGE, a market town in the Woodbridge parlia- mentary division of Suffolk, England; 79 m. N.E. by E. from London by the Great Eastern railway. Pop. of urban district (1901) 4640. It is prettily situated near the head of the Deben estuary, which enters the North Sea 10 m. S. by E. The church of St Mary the Virgin is a beautiful Perpendicular structure, with a massive and lofty tower of flint work. The large estate left by Thomas Seekford of Sekfordc (1578) endows the grammar school and hospital. Woodbridge Abbey, built by Seekford, occupies the site of an Augustinian foundation of the 12th century. There is a large agricultural trade, and general fairs and horse fairs are held.

WOODBURY, CHARLES HERBERT (1864-), American marine painter, was born at Lynn, Massachusetts, on the 14th of July 1864. He graduated at the Massachusetts Institute of Technology, Boston, in 1886, was a pupil of the Academie Julien, Paris. He was president of the Boston Water Color Club, and became associate of the National Academy of Design, New York. His wife, Marcia Oakcs Woodbury, born in 1865 at South Berwick, also became known as a painter.

WOODBURY, LEVI (1780-1851), American political leader, was born at Francestown, New Hampshire, on the 22nd of December 1789. He graduated from Dartmouth College in 1809, was admitted to the bar in 1812, and was a judge of the superior court from 1816 to 1823. In 1823-1824 he was governor of the state, in 1825 was a member and speaker of the state House of Representatives, and in 1825-1831 and again in 1841- 1845 was a member of the U.S. Senate. He was secretary of the navy in 1831-1834, secretary of the treasury in 1S34-1841, and associate justice of the U.S. Supreme Court from 1846 until his death, at Portsmouth, New Hampshire, on the 4th of September 1851. From about 1825 to 1845 Woodbury was the undisputed leader of the Jacksonian Democracy in New England.

See his Writings, Political, Judicial and Literary (3 vols., Boston, 1852), edited by Nahum Capen; and an article in the New England Magazine, new series, xxxvii. p. 658 (February 1908).

WOODBURY, a city and the county-seat of Gloucester county, New Jersey, U.S.A., in the western part of the state, 9 m. S. of Philadelphia. Pop. (1900) 4087, including 246 foreign-born and 517 negroes; (1910) 4642. It is served by the West Jersey & Seashore Railroad. Among its public institutions is the Dept- ford Institute Free Library. There are various manufactures. Woodbury is said to have been settled about 1684; it became the county-seat in 1787. It was chartered as a borough in 1854

and as a city in 1870.

WOOD-CARVING, the process whereby wood is ornamented with design by means of sharp cutting tools held in the hand. The term includes anything within the limit of sculpture in the round up to hand-worked mouldings such as help to compose the tracery of screens, &c.

Material. — The texture of wood limits the scope of the carver in that the substance consists of bundles of fibres (called grain) growing in a vertical direction without much lateral cohesive strength. It is therefore essential to arrange the more delicate parts of a design i: with the grain " instead of across it, and the more slender stalks or leaf-points should not be too much separ- ated from their adjacent surroundings. The failure to appreciate these primary rules may constantly be seen in damaged work, when it will be noticed that, whereas tendrils, tips of birds' beaks, &c. ; arranged across the grain have been broken away, similar details designed more in harmony with the growth of the wood and not too deeply undercut remain intact. Oak is the most suitable wood for carving, on account of its durability and toughness without being too hard. Chestnut (very like oak), American walnut, mahogany and teak are also very good woods; while for tine work Italian walnut, lime, sycamore, apple, pear or plum, are generally chosen. Decoration that is to be painted and of not too delicate a nature is as a rule carved in pine.

Tools. — The carver requires but few kinds of tools:— (1) the gouge — a tool with a curved cutting edge — used in a variety of forms and sizes for carving hollows, rounds and sweeping curves; (2) the chisel, large and small, whose straight cutting edge is used for lines and cleaning up flat surfaces; (3) the " V" tool used for veimng, and in certain classes of flat work for emphasizing lines. A special screw for fixing work to the bench, and a mallet, complete the carver's kit, though other tools, more or less legitimate, are often used, such as a router for bringing grounds to a uniform level, bent gouges and bent chisels for cutting hollows too deep for the ordinary tool.

Method. — The process for relief carving is usually as follows. The carver first fixes the wood to his bench by means of the screw already referred to. He then (a) sketches on the main lines of his idea, indicating the flowers, foliage, &c; or (b) should the design be very intricate or of a geometrical character, he traces the whole design from a pattern first prepared on paper; or (c) he may combine the first two methods. Next he grounds out

*the spaces between the lines with a gouge to a more or less uniform depth. Then he " bosts " the upstanding pattern that remains, i.e. he models and shapes the details of his design, carefully balancing the lights and shadows; and finally, after having obtained the result he desires, he cleans up the whole. The quicker he works, the fewer times he goes over the same part, the more sketchy the** subsidiary portions, the less high finish he puts into the detail, the better the result. Incised work, chip-carving, &c, are generally finished at once and not in stages. Much carved work, that of savage nations for instance, is of course carved without the assistance of a bench. Many small articles, too, are carved in the hand. Little models of antelopes or bears, so familiar in Switzerland, are carved in this way with a tool somewhat like a half-open knife but with the blade fixed.*

Style. — From the remotest ages the decoration of wood has been a foremost art. The tendency of human nature has always been to ornament every article in use. Just as a child of to-day instinctively cuts patterns on the bark of his switch freshly taken from the hedgerow, so the primitive man, to say nothing of his more civilized successor, has from the earliest times cut designs on every wooden article he is accustomed to handle. The North American Indian carves his wooden fish-hook or his pipe stem just as the Polynesian works patterns on his paddle. The native of British Guiana decorates his cavassa grater with a well-conceived scheme of incised scrolls, while the savage of Loango Bay distorts his spoon with a hopelessly unsuitable design of perhaps figures standing up in full relief carrying a hammock.

Figure-work seems to have been universal. The craving to

represent one's god in a tangible form finds expression in number- less ways. The early carver, and, for that matter, the native of the present day, has always found a difficulty in giving expression to the eye, and at all times has evaded work. it by inlaying this feature with coloured material. Obsidian, for example, is used by the modern Easter Islander in common with the Egyptian craftsman of the earlier dynasties. To carve a figure in wood is not only more difficult but is less satisfactory than marble (for which see Sculpture), owing to the tendency of wood to crack, to be injured by insects, or to suffer from changes in the atmosphere. The texture of the material, too, often proves fatal to the expression of the features, especially in the classic type of youthful face. On the other hand, magni- ficent examples exist of the more rugged features of age: the beetling brows, the furrows and lines neutralizing the defects of the grain of the wood. However, in ancient work the surface was not of such consequence, for figures as a rule were painted.

It is not always realized at the present day to what extent colour has even

from the most ancient times been used to enhance the effect of wood-carving and sculpture. The modern Colour prejudice against gold and other tints is perhaps due to the fact that painted work has been vulgarized. One associates coloured carvings too readily with theatre galleries and the triumphal car of the circus procession. The " restored" work too of some church screens does anything but encourage the revival of this time-honoured custom. The arrangement of a proper and harmonious scheme of colour is not the work of the house- painter, but of the specially trained artist. Witness the old coloured screens of Norfolk, the harmonious greens and reds, the proper proportion of gold, the panels adorned with saints on backgrounds of delicate diaper work, and compare these triumphs of decoration with the rougher blues and reds of the average restored screen, and one ceases to wonder why we now prefer the wood plain.

Of late years carving has gone out of fashion; a change has come about. The work is necessarily slow, thus causing charges to appear high. Other and cheaper methods of decoration have driven carving from its former place. Machine work has much to answer for, and the endeavour to popularize the craft by means of the village class has not always achieved its own end. The gradual disappearance of the individual artist, elbowed out as he has been by the contractor, is fatal to the continuance of an art which can never flourish when done at so much a yard. So long as the carver is expected to work to some one else's pattern — so long as he is, in detail at least, not his own designer — this art, which attained its zenith in the glories of the 15th-century cathedral and in the continental domestic work of the hundred years to follow, can never hope to live again.

*Ancient Work before the Christian Era.— The extreme dryness of the climate of Egypt accounts for the existence of a number of wood- carvings from this remote period (see Egypt: Art and – , Archaeology). Some wood panels from the tomb of Hosui ˆyP** at Sakkarah are of the III. dynasty (over 4000 B.C.). The carving consists of hieroglyphs and figures in low relief, and the style is ex- tremely delicate and fine: A stool shown on one of the panels has the legs shaped like the fore and hind limbs of an animal, a form common in Egypt for thousands of years.*

In the Cairo museum may be seen the statue of a man of 50 years of age, of the period or the great pyramid, possibly 4000 B.C. The expression of the face and the realism of the carriage „.

have never been surpassed by any Egyptian sculptor of " .

this or any other period. The figure is carved out of a solid block of sycamore, and in accordance with the Egyptian custom the arms are joined on. The eyes are inlaid with pieces of opaque white quartz, with a line of

bronze surrounding to imitate the lid; a small disk of transparent rock crystal forms the iris, while a tiny bit of polished ebony fixed behind the crystal imparts to, it a lifelike sparkle. ” The IV., V. and VI. dynasties cover the finest period of Egyptian sculpture. The statues found in the tombs show a freedom of treatment which was never reached in later times. They are ali portraits, which the artist strove his utmost to render exactly like his model. For these are not, like more modern statues, simply works of art, but had primarily a religious signification ” (Maspero), As the spirits of the deceased might inhabit these ” Ka ” statues, the features and proportions were closely copied.

There are to be found in the principal museums of Europe many Egyptian examples of the utmost interest — mummy cases of human

beings with the face alone carved, animal mummy cases, some- times boxes, with the figure of a lizard, perhaps, carved in full relief standing on the lid. Sometimes the animal,

Mummy

cat, sitting on its haunches, for example, or a jackal,

crouching on all fours, would be carved in the round and its hollowed body used as the case itself.

Of furniture, folding seats like the modern campstool, and chairs with legs terminating in the heads of beasts or the feet of animals, Furniture st ^’ ex ‘ st – Beds supported by lions’ paws (XI. and XII. dynasties, from Gcbclcin, now in the Cairo Museum), head- rests, 6 or 8 in. high, shaped like a crutch on afoot, very like those used by the native of New Guinea to-day, are carved with scenes, &c, in outline. In the British Museum may be seen a tiny little coffer, 4 in. by 2\ in., with very delicate figures carved in low relief. This little box stands on cabriole legs \ of an inch long with claw {eet, quite Louis Quinze in character. There are incense ladles, the handle representing a bouquet of lotus flowers, the bowl formed like the leaf of an aquatic plant with serrated edges (from Gurnah, XVIII. dynasty); mirror handles, representing a little pillar, or a lotus stalk, sometimes surmounted by a head of Hathor (the Egyptian Venus) or of Besu (god of the toilet) ; pin-cushions, in the shape of a small round tortoise with holes in the back for toilet pins, which were also of wood with dog-head ends (XI. dynasty, Cairo Museum) ; and perfume boxes such as a fish, the two halves forming the bottom and top — the perfume or pomatum was removed by little

wooden spoons, one shaped in the form of a cartouche emerging from a full-blown lotus, another shaped like the neck of a goose, a third consisting of a dog running with a fish in its mouth, the fish forming the bowl. The list might be prolonged, but enough has been said to show to what a pitch of refinement the art of wood-carving had reached thousands of years before the birth of Christ.

Of the work of Assyria, Greece and Rome, little is actually known except from history or inference. It may be safely assumed that the Assyria craft kept pace with the varying taste and refinement of Greece and a ˆ ˆ 1C °ˆ er civilizations. Important pieces of wood Rome, sculpture which once existed in Greece and other ancient

countries are only known to us from the descriptions of Pausanias and other classic waiters. Many examples of the wooden images of the gods {tyavo.) were preserved down to late historic times. The Palladium, or sacred figure of Pallas, which was guarded by the Vestal Virgins in Rome and was fabled to have been brought by Aeneas from the burning Troy, was one of these wooden i-oava.

*First Eleven Centuries after Christ. — Wood-carving examples of this period are extremely rare. The carved panels of the main doors of St Sabina on the Aventine Hill, Rome, arc very interesting speci- mens of early Christian relief sculpture in wood, dating, as the dresses show, from the 5th century. The doors arc made up of a large number of small square panels, each minutely carved with a scene from the Old or New Testament. The whole feeling of these reliefs is thoroughly classic, though of course in a very debased form. A very fine fragment of Byzantine art (nth-i2th centuries) is preserved in a monaster}" at Mount Ath'os in Macedonia. It consists of two panels (one above the other) of relief sculpture, surmounted by a semicircular arch of conventional foliage springing from columns ornamented with animals in foliage of spiral form. The capitals and bases are square, each face being carved with a figure. It is a wonderfully fine piece of work, conceived in the best decorative spirit. In Scandinavian countries we find some very early work of ex- cellent design. In the Christiania Museum there are some fine chairs Scaadlna- °ˆ tne 9** 1 or I0t ˆ centur ' es carved with that particular . fc flat and broad treatment of scroll and strapwork so*

eminently suited to soft wood. In the Copenhagen Museum there are panels from Iceland in the same style. The cele- brated wooden doorways of Aal (a.d. 1200) (Plate II. fig. 3), Sauland, Flaa, Soloer and-othcr Norwegian churches (Christiania Museum) are only an elaboration of the same treatment of dragons and intricate scroll work, a style which we still see carried on in the door-posts of the 15th century in the Nordiska Museum,

Stockholm, and in the Ice- landic work of quite modern times. In these early days the leaf was not much developed in design. The carver depended almost entirely on the stalk, a style of work which has its counterpart in Burmese work of the 17th century.

Gothic Period (isth-isth Centuries). — It was towards the end of this epoch that wood-carving reached its culminating point. The choir stalls, rood-screens, roofs, rotables, of England, France and the Teutonic countries of Europe, have in execution, balance and pro- portion, never at any time been approached. In small designs, in detail, in minuteness, in mechanical accuracy, the carver of this time has had his rivals, but for greatness of architectural conception, for a just appreciation of decorative treatment, the designer of the 15th century stands alone.

It should always be borne in mind that colour was the keynote of this scheme. The custom was practically universal, and enough traces remain to show how splendid was the effect of these old Gothic churches and cathedrals in their perfection. The priests in their gorgeous vestments, the lights, the crucifix, the banners and incense, the frescoed or diapered walls, and that crowning glory of Gothic art, the stained glass, were all in harmony with these beautiful schemes of coloured carved work. Red, blue, green, white snd gilding were the tints as a rule used. Not only were the screens painted in

colours, but the parts painted white were often further decorated with delicate lines and sprigs of foliage in conventional pattern. The plain surfaces of the panels were also adorned with saints, often on a background of delicate gesso diaper, coloured or gilded (Southwold). Nothing could exceed the beauty of the triply chs or retables of Germany, Flanders (Plate I. fig. 1) or France; carved with scenes from the New r Testament in high relief arranged under a delicate lace- work of canopies and clustered pinnacles glistening with gold and brilliant colours. In Germany the effect was further enhanced by em- phasizing parts of the gilding by means of a transparent varnish tinted with red or green, thus giving a special tone to the metallic lustre.

The style of design used during this great period owes much of its interest to the now obsolete custom of employing direct the crafts- man and his men, instead of the present-day habit of giving the work to a contractor. It is easy to trace how" those bands of carvers travelled about from church to church. In one district the designer would employ a particular form and arrangement of vine leaf, while in another adjoining quite a different style repeatedly appears. Judging by results, this system produced the best class of work both in design and execution. The general scheme was of course planned by one master mind, but the carrying out of each section, each

part, each detail, was left to the individual workman. Hence that variety of treatment, that endless diversity, which gives a charm and interest to Gothic art, unknown in more symmetrical epochs. The Gothic craftsman appreciated the cardinal fact that in design beautiful detail does not necessarily insure a beautiful composition, and sub- ordinated the individual part to the general effect. He also often carved in situ, a practice seldom if ever followed in the present day. Here and there one comes across the work of long years ago still unfinished. A half-completed bench-end, a fragment of screen left plain, clearly show that sometimes at least the church was the workshop.

Gothic and Renaissance: a Comparison.- — Gothic design roughly divides itself into two classes: (1) the geometrical, i.e. tracery and diaper patterns, and (2) the foliage designs, where the mechanical scroll of the Renaissance is as a rule absent. The lines of foliage treatment, so common in the bands of the 15th-century rood- screens and the panel work especially of Germany, serve to illustrate the widely different motives of the craftsmen of these two great epochs. Again, while the Renaissance designer as a rule made the two sides of the panel alike, the Gothic carver seldom repeated a single detail. While his main lines and grouping corresponded, his detail differed. Of numberless examples a 15th-century chest {Plate III. fig. 6) in the Kimstgewerbe Museum, Berlin, may be re- ferred to. The arrangements of foliage, &c, on top, back and front, are typical of Gothic at its best.

End of the 12th century- 13 00. — As this section treats of wood- carving in Europe generally, and not of any one country alone, the dates just named must be of necessity only approximate. The 13th century was marked not only by great skill both in design and treat- ment, but also much devotional feeling. The craftsman seems to have not merely carved, but to have carved to the glory of God. At no time was work more delicately conceived or more beautifully cut. This early Gothic style certainly lent itself to fine finish, and in this respect was more suited to stone treatment than to wood. But the loving care bestowed on each detail seems to point to a religious devotion which is sometimes absent from later work. Very good examples of capitals (now, alas, divided down the centre) are to be seen in Peterborough cathedral. Scrolls and foliage spring from groups of columns of four. Some Italian columns of the same date (Victoria and Albert Museum) should be compared, much to the advantage of the former. Exeter cathedral boasts misereres un- surpassed for skilful workmanship; mermaids, dragons, elephants, masks, knights and other subjects introduced into foliage, form the designs. Salisbury cathedral is noted for its stall elbows, and the reredos in the south transept of Addisham, Kent, is another fine example testifying to the great skill of the 13th-century wood- carvers. A very interesting set of stalls, the early history of which is unknown, was placed in Barming church, Kent, about

the year 1868. The book rest ends are carved with two scrolls and an animal standing between, and the ends of the stalls with, figure sculpture: Christ rescuing souls from Hell, Samson slaying the lion, St George and the dragon, &c. The work of these stalls is that of an artist who knew what effect he wanted to produce and got it. There is in the Berlin Museum a very fine example of a 13th-century prayer desk from Johannisldrche in Herford. The front is carved in three panels under arches, two with vine leaves and grapes and the other with an oak tree conventionally treated. Along the arches is carved in Latin " this three-divisioned desk has John with the help of Thomas carved. Who "will not praise this work may he then be removed," a somewhat drastic method of obtaining favourable criticism.

ijoo—rj8o. — During this period foliage forms, though still conven- tional, more closely followed nature. The canopy w r ork of the choir of Winchester contains exquisite carvings of oak and other leaves. The choir stalls of Ely and Chichester and the tomb of Edward III. in Westminster Abbey are all fine examples of this period. Exeter boasts a throne— that of Bishop Stapledon (A.D. 1308-1326) stand- ing 57 ft. high — which remains unequalled for perfection of pro- portion and delicacy of detail (Plate IV. fig. 8). In France the stalls

I— CENTRE PANEL OF RETABLE IN DIJON MUSEUM. FLEMISH

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of St Benoit-sur-Loire, Lisieux, and Evreux are good 14th-century examples. But little Gothic work is now to be seen in the churches of this country. It is to the museums we have to look for traces of the old Gothic carvers. The two retables in Dijon Museum, the work of Jacques de Baerze

(1301), a sculptor of Flanders, who carved for Philippe le Hardi, duke of Burgundy, are masterpieces of design and workmanship. The tracery is of the very finest, chiefly gilt on back- grounds of diapered gesso (Plate I. fig. 1).

1380-1520. — Towards the end of the 14th century carvers gave up natural foliage treatment to a great extent, and took to more con- ventional forms (Plate III. fig. 4). The oak and the maple no longer inspired the designer, but the vine was constantly employed. A very large amount of 15th-century work remains to us, but the briefest reference only can be made to some of the more beautiful examples that help to make this period so great.

The rood screen, that wonderful feature of the medieval church, was now universal. It consisted of a tall screen of usually about ~, . 1 1 ft. high, on the top of which rested a loft, i.e. a platform

screen about 6 ft. in width guarded on either side by a gallery

and either on the top or in front of that, facing the nave, was placed the rood, i.e. a large crucifix with figures of St Mary and St John on either side. This rood screen sometimes spanned the church in one continuous length (Leeds, Kent), but often filled in the aisle and chancel arches in three separate divisions (Church Hand- borough, Oxon.). The loft was as a rule approached by a winding stair built in the thickness of the aisle wall. The lower part of the screen itself was solid panelled to a height of about 3 ft. 6 in. and the upper part of this panelling was filled in with tracery (Carbrook, Norfolk), while the remaining fiat surfaces of the panels were often pictured with saints on a background of delicate gesso diaper (South- wold, Suffolk). Towards the end of this period the employment of figures became less common as a means of decoration, and the panels were sometimes filled- entirely with carved foliage (Swimbridge, Devon). The upper part of the rood screen consisted of open arches with the heads filled in with pierced tracery, often enriched with crockets (Seaming, Norfolk), embattled transoms (Castle Hedingham, Essex), or floriated cusps (Eye, Suffolk). The mulHons were con- stantly carved with foliage (Cheddar, Somerset), pinnacles (Causton, Norfolk), angels (Pilton, Devon), or decorated with canopy work in gesso (Southwold). But the feature of these beautiful screens was the loft with its gallery and vaulting. The loft floor rested on the top of the rood screen and was usually balanced and kept in position by means of a groined vaulting (Harberton, Devon) or a cove (Eddington, Somerset). The finest examples of vaulting are to be seen in Devon (Plate IV. fig. 10). The bosses at the intersections of the ribs and the carved tracery of the screen at Honiton stand unrivalled. Many screens still possess the beam which formed the edge of the loft floor and on which the

gallery rested. It was here that the medieval rood- screen carver gave most play to his fancy, and carved the finest designs in foliage tc be seen throughout the whole Gothic period. Although these massed moulds, crests and bands have the appearance of being carved out of one log, they were in practice invariably built up in parts, much of the foliage, &c, being pierced and placed in hollow moulds in order to increase the shadow. As a rule the arrangement consisted of a crest running along the top, with a smaller one de- pending from the lower edge, and three bands of foliage and vine between them (Feniton, Devon). The designs of vine leaves at Kenton (Plate IV. fig. 10), Bow and Dartmouth, all in Devon, illustrate three very beautiful treatments of this plant. At Swim- bridge, Devon, there is a very elaborate combination; the usual plain beads which separate the bands are carved with twisted foliage also. At Abbots Kerswell and other places in the district round Totnes the carvers introduced birds in the foliage with the best effect. The variety of cresting used is very great. That at Winchcomb, Gloucester, consists of dragons combined with vine leaves and foliage. It illustrates how Gothic carvers sometimes repeated their patterns in as mechanical a way as the worst workmen of the present time. Little can be said of the galleries, so few remain to us. They were nearly all pulled down when the order to destroy the roods was issued in 1548. That they were decorated with carved saints under niches (Llananno, Wales), or painted figures (Strencham, Worcester), is certain from the examples that have survived the Reformation. At Atherington, Devon, the gallery front is decorated with the royal coat of arms, other heraldic devices, and with prayers. The Breton screen at St Fiacre-le-Faouet is a wonderful example of French work of this time, but does not compare with the best English examples. Its flamboyant lines and its small tracery never obtained any foot- hold in England, though screens carved in this way (Colebrook, Devon) are sometimes to be found.

The rood was sometimes of such dimensions as to require some support in addition to the gallery on which it rested. A carved beam was used from which a chain connected the rood itself. At Cullompton, Devon, such a beam still exists, and is carved with foliage; an open cresting ornaments the under side and two angels support the ends. This particular rood stood on a base of rocks, skulls and bones, carved out of two solid logs averaging 18 in. wide and 21 in. high, and together measuring 15 ft. 6 in. long; there are round holes along the top which were probably used for lights.

No country in Europe possesses roofs to equal those of England in the 15th century. The great roof of Westminster Hall (see Roof)

remains to the present day without an equal. In Norfolk and Suffolk roofs abound of the hammer-beam class ; that at Woolpit, Suffolk, is of the first rank. Each bracket is carved with „

strongly designed foliage, the end of every beam termin- s ‘

ates in an angel carrying a shield, and the purlins are crested, while each truss is supported by a canopied niche (containing a figure) resting on an angel corbel. Here, too, as at Ipswich and many other churches, there is a row of angels with outspread wings under the wall-plate. This idea of angels in the roof is a very beautiful one, and the effect was of course much enhanced by the colouring. The roof at St Nicholas, King’s Lynn, is a magnificent example of tie- beam construction. The trusses are filled in with tracery at the sides and the centres more or less open, and the beams, which are crested and embattled, contain a row of angels on either side. In Devon, Cullompton possesses a very fine semicircular ceiling supported at intervals by ribs pierced with carving. Each compartment is divided up into small square panels, crossed by diagonal ribs of cresting, while every joint is ornamented with a boss carved in the decorative way peculiar to the Gothic craftsman. The nave roof of Manchester cathedral is nearly flat, and is also divided up into small compart- ments and bossed ; the beams arc supported by carved brackets resting on corbels with angels at each base.

In the 15th century, choir stalls with their canopies continued to increase in magnificence. Manchester cathedral (middle of 15th century) and Henry VII. ‘s chapel in Westminster Abbey (early 16th) are good examples of the fashion of massing v, °„ r

pinnacles and canopies; a custom which hardly com- a s ‘

pares with the more simple beauty of the 14th-century work of Ely cathedral. The stalls of Amiens cathedral were perhaps the finest in the world at the beginning of the 16th century. The cresting employed, though common on the Continent, is of a kind hardly known in England, consisting as it does of arches springing from arches, and decorated with crockets and finials. The tabernacle work over the end seats, with its pinnacles and flying buttresses, stretches up towards the roof in tapering lines of the utmost delicacy. The choir stalls (the work of Jorg Syrlin, 1468) in Ulm cathedral are among the finest produced by the German carver (Plate III. fig. 4). The front panels are carved with foliage of splendid decorative bold- ness, strength and character; the stall ends were carved with foliage and sculpture along the top edge, as was sometimes the case in Bavaria and France as well as Germany.

In early times the choir alone possessed seats, the nave being left bare. Gradually benches were introduced, and during the. 15th century became universal. The ” poppy-head ” form of ornament now reached perfection and was constantly used for seats other than those of the choir. The name

refers to the carved finial which is so often used to complete the top of the bench end and is peculiarly English in character. In Devon and Cornwall it is rarely met with (Ilsington, Devon). In Somerset it is more common, while in the eastern counties thousands of examples remain. The quite simple fleur-de-lys form of poppy-head, suitable for the village, is seen in perfection at Trunch, Norfolk, and the very- elaborate form when the poppy-head springs from a crocketed circle filled in with sculpture, at St Nicholas, King's Lynn. Often the foliage contained a face (Cley, Norfolk), or the poppy-head consisted of figures or birds only (Thurston, Suffolk) or a figure standing on a dragon (Great Brincton, Northampton); occasionally the traditional form was departed from and the finial carved like a lemon in outline (Bury St Edmunds) or a diamond (Tirley, Glos.). In Denmark an ornament in the form of a large circle sometimes takes the place of the English poppy-head. In the Copenhagen Museum there is a set of bench ends of the 15th century with such a decoration carved with coats of arms, interlacing strap-work, &c. But the old 15th- century bench end did not depend entirely on the poppy-head for its embellishment. The side was constantly enriched with elaborate tracery (Dennington, Norfolk) or with tracery and domestic scenes (North Cadbury, Somerset), or would consist of a mass of sculpture in perspective, with canopy work, buttresses and sculptured niches, while the top of the bench end would be crowned with figures carved in the round, of the finest craftsmanship. Such work at Amiens cathedral is a marvel alike of conception, design and execution. In the Kunstgewerbe Museum, Berlin, some beautiful stall ends are to be seen. Out. of a dragon's mouth grows a conventional tree arranged and balanced in excellent proportion. On another stall end a tree is carved growing out of the mouth of a fool. This custom of making foliage grow out of the mouth or eyes is hardly defensible, and was by no means confined to any country or time. We have plenty of Renaissance examples of the same treatment.

Before the 15th century preaching had not become a regular institution in England, and pulpits were not so common. However, the value of the sermon began to be appreciated from the use to which the Lollards and other sects put this method "«j"w. of teaching doctrine, and pulpits became a necessity. A very beautiful one exists at Kenton, Devon. It is, as is generally the case, octagonal, and stands on a foot. Each angle is carved with an upright column of foliage between pinnacles, and the panels, which are painted with saints, are enriched with carved canopies and foliage ; it is, however, much restored. The pulpit at Trull, Somerset, is noted for its fine figure carving. A large figure standing under a canopy fills each of the panelled sides, while many other smaller

Bench ends.

Font covers.

figures help to enrich the general effect. Examples of Gothic sound- ing boards are very rare; that, together wi'.h the pulpit, in the choir of Winchester is of the time of Prior SUkstede (1520), and is carved with his rebus, a skein of twisted silk.

The usual form of font cover during the hundred years before the Reformation was pyramidal, the ribs of the salient angles being straight and cusped (Frindsbury,Kent)or of curved outline and cusped (St Mildred, Canterbury). There is a very charming one of this form at Colebrook, Devon. It is quite plain but fur a little angel kneeling on the top, with its hands clasped in prayer. But the most beautiful form is the massed collection of pinnacles and canopy work, of which there is such a fine example at Sudbury, Suffolk. It was not uncommon to carve a dove on the topmost pinnacle (Castleacre, Norfolk), in allusion to the descent of the Holy Spirit. The finest font in England is un- doubtedly that of Unord, Suffolk. It rises some 20 ft. in height, and when the panels were painted with saints and the exquisite taber- nacle work coloured and gilded, must have been a masterpiece of Gothic craftsmanship. A cord connecting the tops of these covers with the roof or with a carved beam standing out from the wall, something like a crane (Salle, Norfolk), was used to remove the cover on the occasion of baptism.

Many lecterns of the Gothic period do not exist to-day. They usually had a double sloping desk which revolved round a central Lecte s moa lded post. The lectern at Swanscombe, Kent, has a circle of good foliage ornamenting each face of the book rest, and some tracery work at either end. The box form is more common in France than in England, the pedestal of such a lectern being surrounded by a casing of three or more sides. A good ex- ample with six sides is in the church of Vance (France), and one of triangular form in the Musee of Bourges, while a four-sided box lectern is still in use in the church of Lenham, Kent. The Gothic prayer desk, used for private devotional purposes, is hardly known in England, but is not uncommon on the Continent. There is a beautiful specimen in the Musee, Bourges; the front and sides of the part for kneeling are carved with that small tracery of flowing char- acter so common in France and Belgium during the latter part of the 15th century, and the back, which rises to a height of 6 ft., contains a little crucifix with traceried decoration above and below.

A word should be said about the ciboria, so often found on the Ctborla continent of Europe. In tapering arrangement of taber- nacle work they

rival the English font covers in delicacy of outline (Musee, Rouen).

Number-! of doors are to be met with not only in churches but also in private houses. Lavcnham, Suffolk, is rich in work of this latter Doors class. In England the general custom was to carve the

head of the door only with tracery (East Brent, Somerset), but in the Tudor period doors were sometimes covered entirely with " linenfold " panelling (St Albans Abbey). This form of decoration was exceedingly common on the Continent as well as in England. In France the doors towards the latter part of the 15th century were often square-headed, or perhaps had the corners rounded. These doors were usually divided into some six or eight oblong panels of more or less equal size. One of the doors of Bourges Cathedral is treated thus, the panels being filled in with very good tracery en- riched with crockets and coats of arms. But a more restrained form of treatment is constantly employed, as at the church of St Godard, Rouen, where the upper panels only are carved with tracery and coats of arms and the lower adorned with simple linenfold design.

To Spain and the Teutonic countries of Europe we look for the most important object of church decoration, the retable; the Reformation accounting for the absence in England of any work of this kind. The magnificent altar-piece in Schleswig cathedral was carved by Hans Bruggerman,and consists, like many others, of a number of panels filled with figures standing some four or five deep. The figures in the foremost rows are carved entirely separate, and stand out by themselves, while the background is composed of figure work and architecture, &c, in diminishing per- spective. The panels are grouped together under canopy work forming one harmonious whole. The genius of this great carver shows itself in the large variety of the facial expression of those wonderful figures all instinct with life and movement. In France few retables exist outside the museums. In the little church of Marissel, not far from Beauvais, there is a retable consisting of eleven panels, the crucifixion being, of course, the principal subject. And there is a beautiful example from Antwerp in the Musee Cluny, Paris; the pierced tracery work which decorates the upper part being a good example of the style composed of interlacing segments of circles so common on the Continent during late Gothic times and but seldom practised in England. In Spain the cathedral of Valladolid was famous for its retable, and Alonso Cano and other sculptors frequently used wood for large statuary, which was painted in a very realistic way with the most startlingly lifelike effect. Denmark also possessed a school of able wood-carvers who imitated the great altar-pieces of Germany. A very large and well-carved example still exists in the cathedral of Roskilde. But besides these great altar- pieces tiny little models were carved on a scale the minuteness of which staggers the beholder. Triptychs and shrines, &c,

measuring but a few inches were filled in with tracery and figures that excite the utmost wonder. In the British Museum there is such a triptych

Altar pieces.*

Domestic work.

(Flemish, 151 1) ; the centre panel, measuring an inch or two square, is crowded with figures in full relief and in diminishing perspective, after the custom of this period. This rests on a semicircular base which is carved with the Lord's Supper, and is further ornamented with figures and animals. The whole thing inclusive measures about 9 in. high, and, with the triptych wings open, 5 in. wide. The extra- ordinary delicacy and minuteness of detail of this microscopic work baffle description. There is another such a piece, also Flemish, in the Wallace collection, which rivals that just referred to in mis- applied talent. For, marvellous as these works of art are, they fail to satisfy. They make one's eyes ache, they worry one as to how the result could ever have been obtained, and after the first astonish- ment one must ever feel that the same work of art on a scale large enough for a cathedral could have been carved with haif the labour.

*With regard to panelling generally, there were, during the last fifty years of the period now under review, three styles of design followed by most European carvers, each of which at- _ „, tained great notoriety. Firstly, a developed form of small Kanea * c S ,, tracery which was very common in France and the Netherlands. A square-headed panel would be filled in with small detail of flam- boyant character, the perpendicular line or mullion being always subordinate, as in the German chasse (Musee Cluny), and in some cases absent, as the screen work of Evreux cathedral shows us. Secondly, the " linenfold " design. The great majority of examples are of a very conventional form, but at Bere Regis, Dorsetshire, the designs with tassels, and at St Sauveur, Caen, those with fringe work, readily justify the universal title applied to this very decorative treatment of large surfaces. At the beginning of the 1 6th century yet another pattern became the fashion. The main lines of the design consisted of flat hollow mouldings sometimes in the form of inter- lacing circles (Gatton, Surrey), at other times chiefly straight (Rochester cathedral), and the intervening spaces would be filled in with cusps or sprigs of foliage. It marks the last struggle of this great school of design to withstand the oncoming flood of the new art — the great Renaissance. From this time onw r ard Gothic work, in spite of various attempts, has never again taken a place in domestic decoration. The lines of the tracery style, the pinnacle, and the crocket — unequalled as they have always been in devotional ex- pression — are universally considered unsuited for decoration in the ordinary dwelling-house.*

But little reference can be made to the domestic side of the period which ended with the dawn of the 16th century, because so few remains exist. On the Continent we have a certain pro- portion of timbered houses, the feature of which is the sculpture. At Bayeux, Bourges, Reims and pre-eminently Rouen, we see by the figures of saints, bishops or virgins, how much the religious feeling of the middle ages entered into the domestic life. In England the carved corner post (which generally carried a bracket at the top to support the overhanging storey) calls for comment. In Ipswich there are several such posts. On one house near the river, that celebrated subject, the fox preaching to geese, is carved in graphic allusion to the dissemination of false doctrine.

Of mantelpieces there is a good example in the Rouen Museum. The overhanging corners are supported by dragons and the plain mouldings have little bunches of foliage carved at either end, a custom as common in France during the 15th century as it was in England a century earlier; the screen beam at Eastbourne parish church, for example.

As a rule, cabinets of the 15th century were rectangular in plan. In Germany and Austria the lower part was often enclosed, as well as the upper; the top, middle and lower rails being carved with geometrical design or with bands of foliage (Museum, Vienna). But it was also the custom to make these cupboards with the corners cut off, thus giving five sides to the piece of furniture. A very pretty instance, which is greatly enhanced by the metal work of the lock plates and hinges, is in the Musee Cluny, and there are other good specimens with the lower part open in the Victoria and Albert Museum, South Kensington.

The chest was a very important piece of furniture, and is often to be met with covered with the most elaborate carving (Orleans Museum). There is a splendid chest (14th century) in the Cluny Museum ; the front is carved with twelve knights in armour standing under as many arches, and the spandrels are filled in with faces, dragons and so on. But it is to the 15th century that we look for the best work of this class; there is no finer example than that in the Kunstgewerbe Museum, Berlin (Plate III. fig. 6). The front is a very animated hunting scene most decoratively arranged in a scheme of foliage, and the top bears two coats of arms with helms, crests and mantling. But the more general custom in chest decoration was to employ tracery with or without figure work; Avignon Museum contains some typical examples of the latter class.

A certain number of seats used for domestic purposes are of great interest. A good example of the long bench placed against the wall, with lofty panelled back and canopy over, is in the Musee Cluny, Paris. In the Museum at Rouen is a long seat of a movable kind with a low panelled

back of pierced tracery, and in the Dijon Museum there is a good example of the typical chair of the period, with arms and high panelled and traceried back. There was a style of design admirably suited to the decoration of furniture when made of softwood such as pine. It somewhat resembled the excellent Scandinavian

Plate ILL

Flu:, F. A. Crdian. FMu. F. A. Cralun.*

Fig. S. -DETAIL OF BISHOP STAPLFDOVH Fig. 9,-FLEMISH PANEL. Fu,. 10.-DETAIL OF ROOD-SCKEEN rHRONE, 130S-1326 A.D. RENAISSANCE, VAULTING. Late 15th renturv. EXEIEK CATHEDRAL, ˆth century. KENTON, DEVON.

Plgure work.

treatment of the ioth-i2th centuries already referred to. A pattern of Gothic foliage, often of beautiful outline, would be simply grounded out to a shallow depth. The shadows, curves and twists only being emphasized by a few well-disposed euts with a " V " tool; and of course the whole effect greatly improved by colour. A. Swiss door of the 15th century in the Berlin Museum, and some German, Swiss and Tiroiese work in the Victoria and Albert Museum, offer patterns that might well be imitated to-day by those who require simple decoration while avoiding the hackneyed Elizabethan forms.

It is hard to compare the figure work of England with that on the Continent owing to the disastrous effect of the Reformation. Rut when we examine the roofs of the Eastern counties, the bench ends of Somerset, or the misereres in many parts of the country, we can appreciate how largely wood sculpture was used for purposes of decoration. If as a rule the figure work was not of a very high order, we have conspicuous exceptions in the stall elbows of Sherborne, and the pulpit of Trull, Somerset. Perhaps the oldest instance is the much-mutilated and much restored effigy of Robert, duke of Normandy, in Gloucester Cathedral (12th century), and carved, as was generally the case in England, in oak. At Clifton Reynes, Buckingham, there are two figures of the 13th century. They are both hollowed out from

the back in order to facilitate seasoning the wood and to prevent cracking. During the 13th, 14th and 1 5th centuries there are numberless instances of figure carving of the most graphic description afforded in the misereres in many of our churches and cathedrals. But of figures carved in the round apart from their surroundings hardly an instance remains. At the little chapel of Cartmel Fell, in the wilds of Westmorland, there is a figure of Our Lord from a crucifix, some 2 ft. 6 in. in length. The cross is gone, the arms are broken away, and the feet have been burned off. A second figure of Our Lord (originally in the church of Keynes Inferior) is in the museum of Caerleon, and a third, from a church in Lincolnshire, is now in a private collection. On the conti nent some of the finest figure work is to be found in the retables, some of which are in the Victoria and Albert Museum. A Tiroiese panel of the 15th century carved in high relief, representing St John seated with his back to the onlooker, is a masterpiece of perspective and foreshortening, and the drapery folds are perfect. The same may be said of a small statue of the Virigin, carved in lime by a Swiss hand, and some work of the great Tylman Reimcnschncider of Wurzburg (1468-1531) shows that stone sculptors of medieval times were not ashamed of wood.

Renaissance Period (i6th-i?th Centuries). — With the beginning of the 16th century the great Renaissance began to elbow its way in to the exclusion of Gothic design. But the process was not sudden, and much transition work has great merit. The rood screen at Hurst, Berkshire, the stall work of Cartmel Priory, Westmorland, and the bench ends of many of the churches in Somerset, give good illustra- tions. But the new style was unequal to the old in devotional feeling, except in classic buildings like St Paul's cathedral, where the stalls of Grinling Gibbons better suit their own surroundings. The rest of this article will therefore be devoted in the main to domestic work, and the exact location of examples can only be given when not the property of private owners or where the public have access.

During the 16th century the best work is undoubtedly to be found on the Continent, France, Germany and the Netherlands producing numberless examples not only of house decoration but of furniture as well. The wealth of the_ newly discovered American continent was only one factor which assisted in the civilizing influence of this time, and hand in hand with the spread of commerce came the desire for refinement. The custom of building houses chiefly in wood wherever timber was plentiful continued. Pilasters took the place of pinnacles, and vases or dolphins assisted the acanthus leaf to oust the older torms of design. House fronts of wood gave ample scope to the carver. That of Sir Paul Pinder (1600), formerly in Bishopsgate, but now preserved in the Victoria and Albert Museum, is a good example of decorative treatment without overloading. The brackets carved in the shape of monsters which support the projecting upper storey

are typical of hundreds of dwellings, as for instance St Peter's Hospital, Bristol. The panels, too, of Sir Paul Pinder's house should be noted as good examples of that Jacobean form of medallion surrounded by scroll work which is at once as decorative as it is simple.

In England that familiar style known as Elizabethan and Jacobean prevailed throughout the 16th and 17th centuries. At the present time hardly a home in the land has not its old oak chest carved with the familiar half circle or scroll border along the top rail, or the arch pattern on the panels. The court cupboards, with their solid or open under parts and upper cornice supported by turned balusters of extravagant thickness, are to be seen wherever one goes. And chairs, real as well as spurious, with solid backs carved in the usual flat relief, are bought up with an avidity inseparable from fashion. Four-post bedsteads are harder to come by. The back is usually broken up into small panels and carved, the best effect being seen in those examples where the panelling or the framework only is decorated . The dining-hall tables often had six legs of great substance, which were turned somewhat after the shape of a covered cup, and were carved with foliage bearing a distant resemblance to the acanthus. Rooms were generally panelled with oak, sometimes divided at intervals by flat pilasters and the upper frieze carved with scroll

work or dolphins. But the feature which distinguished the period was the fire mantel. It always must be the principal object in a room, and the Elizabethan carver fully appreciated this fact. By carving the chimney breast as a rule to the ceiling and covering the surrounding walls with more or less plain panelling, the designer, by thus concen- trating the attention on one point, often produced results of a high order. Caryatid figures, pilasters and friezes were among the custom- ary details employed to produce good effects. No finer example exists than that lately removed from the old palace at Bromley-by-Bow to the Victoria and Albert Museum. The mantelshelf is 6 ft. from the ground and consists of a deep quadrant mould decorated with flat scroll work of good design. The supporting pilasters on either side are shaped and moulded in the customary Jacobean manner and are crowned by busts with Ionic capitals on the heads. Above the shelf the large centre panel is deeply carved with the royal coat of arms with supporters and mantling, and on either side a semicircular arched niche contains a figure in classic dress. The Elizabethan carver often produced splendid staircases, sometimes carving the newel posts with heraldic figures bearing coats of arms, &c. The newels of a staircase at Ilighgate support different types of Cromwellian soldiers, carved with great vivacity and life. But in spite of ex- cellent work, as for example the beautiful gallery at Hatfield, the carving of this period did not, so far as England was concerned, compare with other epochs, or with contemporary work in other parts of Europe. Much of the work is badly drawn and badly

exe- cuted. It is true that good decorative effects were constantly ob- tained at the very minimum of cost, but it is difficult to discover much merit in work which really looks best when badly cut.

In France this flat and simple treatment was to a certain extent used. Doors were most suitably adorned in this way, and the split baluster so characteristic of Jacobean work is often to be met with. There are some very good cabinets in the museum at Lyngby, Denmark, illustrating these two methods of treatment in com- bination. But the Swiss and Austrians elaborated this style, greatly improving the effect by the addition of colour. However, the best Continental designs adopted the typical acanthus foliage of Italy, while still retaining a certain amount of Gothic feeling in the strength of the lines and the " cut " of the detail (Plate IV. fig. 9). Panelling — flften long and narrow — was commonly used for all sorts of domestic purposes, a feature being a medallion in the centre with a simple arrangement of vase, dolphins, dragons, or birds and foliage filling in the spaces above and below.

The cabinets of Holland and Belgium are excellent models of design. These pieces of furniture were usually arranged in two storeys with a fine moulded and carved cornice, mid division and plinth. The pilasters at the sides, and small raised panels carved only on the projecting part, would compose a very harmonious whole. A proportion of the French cabinets are decorated with caryatids not carved in the best taste, and, like other French wood- work of this period, are sometimes overloaded with sculpture. The doors of St Maclou, Rouen, fine as they are, would hardly to-day be held up as models for imitation. A noteworthy set of doors belong to the H6tel de Ville, Oudenarde. The central door contains twelve and that on either side eight panels, each of which is carved with Renaissance foliage surrounding an unobtrusive figure. In the Palais de Justice we see that great scheme of decoration which takes up the whole of the fireplace end of the hall. Five large figures carved in the round are surrounded by small ones and with foliage and coats of arms.

In Italy, the birthplace of the Renaissance, there is much fine work of the 16th century. A very important school of design was promoted by Raphael, whose patterns were used or adapted by a large number of craftsmen. The shutters of " Raphael's Stanze " in the Vatican, and the choir stalls in the church of St Pietro de' Cassinesi at Perugia, are among the most heautiful examples of this style of carving. The work is in slight relief, and carved in walnut with those graceful patterns which Raphael developed out of the newly discovered remains of ancient Roman wall painting from the palace of Nero and other places. In the Victoria and Albert Museum are many examples of Italian work (Plate IV. fig. 11) : the door from a convent near Parma, with its three prominent masks and heavy gadroon moulds; a

picture frame with a charming acanthus border and. egg and tongue moulds on cither side; and various marriage chests in walnut covered with very elaborate schemes of carving. It is sometimes difficult to distinguish Spanish, or for that matter South of France work, from Italian, so much alike is the character. The Spaniards yield to none in good workmanship. Some Spanish panels of typical Italian design are in the Victoria and Albert Museum as well as cabinets of the purest Renaissance order. There is a wonderful Portuguese coffer (17th century) in this section. The top is deeply carved in little compartments with scenes from the life of Our Lord.

i?th-i8th Centuries. — In England the great school of Grinling Gibbons arose. Although he carved many beautiful mouldings of conventional form (Hampton Court Palace, Chatsworth, &c), his name is usually associated with a very heavy form of decoration which was copied direct from natare. Great swags of drapery and foliage with fruit and dead birds, ike, would be carved in lime a foot thick. For technical skill these examples are unsurpassed; each grape would be undercut, the finer stalks and birds' legs stand out quite

separate, and as a consequence soon succumb to the energy of the housemaid's broom. Good work of this class is to be found at Pet worth; Trinity College, Oxford; Trinity College, Cambridge; St Paul's cathedral; St James', Piccadilly; and many other London churches.

During the reigns of Louis XIV. and XV. the principal merit of carved design, i.e. its appropriateness and suitability, gradually disappeared. Furniture was often carved in a way hardly legitimate. The legs, the rails of tables and chairs, the frames ot cabinets, of looking-glasses, instead of being first made for construction and strength, and then decorated, were first designed to carry cherubs' heads and " rococo " (i.e. rock and shell ornament), quite regardless of utility or convenience. A wealth of such mistaken design was also applied to state carriages, to say nothing of bedsteads and other furniture. However, the wail panelling of the mansions of the rich, and sometimes the panelling of furniture, was decorated with rococo design in its least illegitimate form. The main part of the wood surface would be left plain, while the centre would be carved with a medallion surrounded by foliage, vases or trophies of torches and musical instruments, &c, or perhaps the upper part of the panel would be thus treated. France led the fashion, which was more or less followed all over Europe. In England gilt chairs in the style of Louis XV. were made in some quantities. But Thomas Chippen- dale, Ince and Mayhew, Sheraton,

Johnson, Heppehvhite and other cabinet-makers did not as a rule use much carving in their designs. Scrolls, shells, ribbon, ears of corn, &c, in very fine relief, were, how- ever, used in the embellishment of chairs, &c, and the claw andball foot was employed as a termination to the cabriole legs of cabinets and other furniture.

The mantelpieces of the i8th century were as a rule carved in pine and painted white. Usually the shelves wore narrow and supported by pilasters often of flat elliptic plan, sometimes by caryatids, and the frieze would consist of a raised centre panel carved with a classic scene in relief, or with a mask alone, and on either side a swag of flowers, fruit and foliage.

Interior doorways were often decorated with a broken pediment more or less ornate, and a swag of foliage commonly depended from either side over a background of scroll work. The outside porches so often seen in Queen Anne houses were of a character peculiar to the 1 8th century. A small platform or curved roof was supported by two large and heavy brackets carved with acanthus scroll work. The staircases were as a rule exceedingly good. Carved and pierced brackets were fixed to the " open strings " (i.e. the sides of the steps), giving a very pretty effect to the graceful balustrade of turned and twisted columns.

Renaissance figure work calls for little comment. During the l6th century many good examples were produced— those priestly statues in the museum of Sens for example. But the figure work used in the decoration of cabinets, &c, seldom rose above the ordinary level. In the 18th century cherubs' heads were fashionable and statuettes were sometimes carved in boxwood as ornameuts.but as a means of decorating houses wood sculpture ceased to be. The Swiss, however, have kept up their reputation for animal sculpture to the present day, and still turn out cleverly carved chamois and bears, &c; as a rule the more sketchily cut the better the merit. Their more ambitious works, their groups of cows, &c, sometimes reach a high level of excellence.

Of the work of the 19th century little can be said in praise. Out- side and beyond the present-day fashion for collecting old oak there seems to be no demand for carved decoration. In church work a certain number of carvers find occupation, as also for repairs or the production of imitations. But the carving one is accustomed to see tn hotels or on board the modern ocean palace is in the main the work of the machine. There is no objection to the machine in itself, as it only grounds out and roughly models the design which is finished by hand. Its fatal drawback is that it is of commercial value only when a large number of panels of the same pattern are turned out at the same time. It is this repetition which takes away the life of good work, which places that gulf between the contract job and the indi- vidual

effort of the artist. The price of all labour has so greatly in- creased, to build a house is so much more expensive than it was before the days of the trades union that none but the very rich can afford to beautify their home in the way to which our forefathers were accustomed.

Coptic. — In the early medieval period, screens and other fittings were produced for the Coptic churches of Egypt by native Christian workmen. In the British Museum there is a set of ten small cedar panels from the church door of Sitt Miriam, Cairo (33th century). The six sculptured figure panels arc carved in very low relief and the four foliage panels are quite Oriental in character, intricate and fine both in detail and finish. In the Cairo Museum there is much work treated after the familiar Arab style, while other designs are quite Byzantine in character. The figure work is not of a very high order. ■ Mohammedan Work. — Nothing can exceed the skill with which the Moslem wood-carvers of Persia. Syria, Egypt and Spain designed and executed the richest panelling and other decorations for wall linings, ceilings, pulpits and all kinds of fittings and furniture^ The mosques and private houses of Cairo, Damascus and other Oriental cities are full of the most elaborate and minutely delicate, wood- work. A favourite style of ornament was to cover the surface with

very intricate interlacing patterns, formed by finely moulded ribs; the various geometrical spaces between the ribs were then filled in with small pieces of wood carved with foliage in slight relief. The use of different woods such as ebony or box, inlaid so as to emphasize the design, combined with the ingenious richness of the patterns, give this class of woodwork an almost unrivalled splendour of effect. Carved ivory is also often used for the filling in of the spaces. The Arabs are past masters in the art of carving flat surfaces in this way. A gate in the mosque of the sultan Bargoug (Cairo, 14th century) well illustrates this appreciation of lines and surfaces. The pulpit or mimbar (15th century) from a Cairo mosque, now in the Victoria and Albert Museum, is also a good example in the same style, the small spaces in this case being filled in with ivory carved in flat relief.

Screens made up of labyrinths of complicated joinery, consisting of multitudes of tiny balusters connecting hexagons, squares or other forms, with the flat surfaces constantly enriched with small carvings, are familiar to every one. In Cairo we also have examples in the mosque of Qoua (12th century) of that finely arranged geometrical interlacing of curves with foliage terminations which distinguishes the Saracenic designer. Six panels in the Victoria and Albert Museum (13th century; Plate II. fig. 5), and work on the tomb of the sultan Ei Ghoury (16th century), show how deeply this form of decoration was ingrained in the Arab nature. Figure work and animals were sometimes introduced, in medieval fashion, as in the six

panels just referred to, and at the hdpital du Moristan (13th centurjO and the mosque of El Nesfy Qeycoun (14th century). There is a magnificent panel on the door of Beyt-el-Emyr. This exquisite design is composed of vine leaves and grapes of conven- tional treatment in low relief. The Arab designer was fond of breaking up his panelling in a way reminding one of a similar Jacobean custom. The main panel would be divided into a number of hexagonal, triangular or other shapes, and each small space filled in with conventional scroll work. Much of this simple flat design reminds one of that Byzantine method from which the Elizabethan carvers were inspired.

Persia. — The Persian carvers closely followed Arab design. A pair of doors of the 14th century from Samarkand (Victoria and Albert Museum) are typical. Boxes, spoons and other small articles were often fretted with interlacing lines of Saracenic character, the delicacy and minuteness of the work requiring the utmost patience and skill. Many of the patterns remind one of the sandalwood work of Madras, with the difference that the Persians were satisfied with a much lower relief. Sometimes a very beautiful result was obtained by the sparing use of fretted lattice pattern among foliage. A fine panel ofthc 14th century in the Victoria and Albert Museum shows how active was Arab influence even as far as Bokhara.

India and Burma. — Throughout the great Indian peninsula wood- carving of the most luxurious kind has been continuously produced for many centuries. The ancient Hindu temples were decorated with doors, ceilings and various fittings carved in teak and other woods with patterns of extreme richness and minute elaboration. We have architectural remains from Kashmir Smats (Punjab) dating from the 3rd_or 4th century, the patterns employed being of a bold and decorative character strongly resembling the best Elizabethan design. The doors of the temple of Sonmath, on the north-west coast, were famed for their magnificence and were highly valued as sacred relics. In 1024 they were carried off to Ghazni by the Moslem conqueror, Sultan Mahmud, and are now lying at the fort at Agra. The gates which now exist are very fine specimens of ancient wood- carving, but are probably only copies of the original very early doors. The Asiatic carver, like certain of his European brethren, is apt to be carried away by his own enthusiasm and to overcrowd his surfaces. Many a door, column, gallery or even a whole house-front is covered with the most intricate design bewildering to behold (Bhera, Shahpur). But this is not always the case, and the Oriental is at times more restrained in his methods. Architectural detail is to be seen with only a simple enrichment carved round the framing, producing the happiest result. The Hindu treatment of the circle is often exceedingly good, and might perhaps less rarely inspire western design. Sometimes native work strongly resembles Scandinavian of the 12th century. The scrolls are designed on the same

lines, and foliage and flowers (beyond elementary buds) are not employed (Burma, 17th century, Victoria and Albert Museum). The pierced work of Bombay calls for note. Foliage, fruit and flowers are con- stantly adapted to a scheme of fret-cut decoration for doors or windows as well as the frames of chairs and the edges of tables. A reference should also be made to those wonderful sandalwood tables, cabinets ahd boxes to be seen in Southern India, always covered with design, often with scores of figures and monsters with every space filled in with the minutest decoration. Many of the gong stands of Burma show the highest skill; the arrangement of two figures bearing a pole from which a gong hangs is famdiar. The Burmese are sculptors of proved merit.

China and Japan. — In these countries the carver is unrivalled for deftness of hand. Grotesque and imitative work of the utmost perfection is produced, and many of the carvings of these countries, Japan in particular, are beautiful works of art, especially when the carver copies the lotus, lily or other aquatic plant- A favourite form of decoration consists of breaking up the architectural surfaces, such as ceilings, friezes, &c, into framed squares and filling up each

panel with a circle, or diamond of conventional treatment with a spandrel in each corner (door of T'ai-he' Hall, Pekin). A very Chinese feature is the finial of the newel post, so constantly left more or less straight in profile and deeplv carved with monsters and scrolls. A heavily enriched moulding bearing a strong resemblance to the gadroon pattern is commonly used to give emphasis to edges, and the dragon arranged in curves imitative of nature is frequently employed over a closely designed and subordinated background. The general rule that in every country designers use much the same means whereby a pattern is obtained holds good in China. There arc forms of band decoration here which closely resemble those of Gothic Europe, and a chair from Turkestan (3rd century) might almost be Elizabethan, so like are the details. Screens of grill form, so familiar in Mahommedan countries, are common, and the deeply grounded, closely arranged patterns of Bombay also have their counterparts. The imperial dais in the Ch'ien-Ch'ing Hall, Pekin, is a masterpiece of intricate design. The back consists of one central panel of considerable height, with two of lesser degree on either side luxuriously carved. The whole is crowned with a very heavy crest of dragons and scroll work; the throne also is a wonderful example of carved treatment, and the doors of a cabinet in the same building show how rich an effect of foliage can be produced without the em- ployment of stalk or scroll. The Chinaman, who is unequalled as a

microscopic worker, does not limit himself to ivory or metal. One might almost say, he wastes his talent on such an ungrateful material as wood. In this material fans and other trifles are carved with a delicacy that courts disaster.

In Japan much of the Chinese type is apparent. The native carver is fond of massing foliage without the stalk to lead him. He appears to put in his foliage, fruit and flowers first and then to indicate a stalk here and there, thus reversing the order of the Western method. Such a treatment, especially when birds and beasts are introduced, has the highest decorative effect. But, as such close treatment is bound to do, it depends for success to some extent upon its scheme of colour, A long panel in the Victoria and Albert Museum, depicting merchants with their packhorse (Plate IV. fig. 7), strongly resembles in its grouping and treatment Gothic work of the 15th century, as for example the panel of St Hubert in the museum at Chalons. The strength and character of Japanese figure work is quite equal to the best Gothic sculpture of the 15th century.

Savage Races.— There is a general similarity running through the carved design of most races of primitive culture, the " chip " form of ornament being almost universally employed. Decorated sur- faces depending almost entirely upon the incised line also obtain all over the uncivilized world, and may no doubt be accounted for by the extensive use of stonecutting tools. The savage carver shows the same tendency to over-exalt his art by crowding on too much design as the more civilized craftsman of other lands, while he also on occasion exercises a good deal of restraint by a harmonious balance of decoration and plain space. So far as his chip designs and those patterns more or less depending on the line are concerned, his work as a rule is good and suitable, but when he takes to figure work his attempts do not usually meet with success. Primitive carving, generally, shows that very similar stages of artistic development arc passed through by men of every age and race.

A very favourite style of " chip " pattern is that formed by small triangles and squares entirely covering a surface (Hervey Islanders), the monotony being sometimes varied by a band of different arrange- ment in the middle of the article or at the top or bottom. _ This form of art is hardly of a kind calculated to enlarge the imagination, though so far as the cultivation of patience and accuracy is concerned, has no equal. But many natives, as for example the Fiji Islanders, employ chip designs rivalling those of Europe in variety. Upon occasion the savage appreciates the way in which plain surfaces contrast and emphasize decorated parts, and judiciously restricts his skill to bands of decoration. or to special points (Marquesa Islands). The Ijos of the lower Niger design their paddles in a masterly way, and show a fine sense of proportion between the plain and the decorated

surface. Their designs, though slightly In relief, are of the chip nature. The method of decorating a subject with groups of incised !ines> straight or curved, though often very effective and in every way suitable, is not a very advanced form of art and has decided limits. The native of the Congo docs good work of this kind.

Carving in relief is common enough, idols being produced in many forms, but savage relief work seldom calls for praise. The Kafir carves the handle of his spoon perhaps in the form of a giraffe, and in the round, with each leg cut separately and the four hoofs meeting at the bowl, hardly a comfortable form of handle to hold. The North American Indian shows a wider invention than some nations, the twist in various shapes being a favourite treatment say of pipe stems. The Papuan has quite a style of his owj /; he uses a scroll of the form familiar in Indian shawls, and in some cases the scroll entwines in a way which faintly suggests the guilloche. The native of New Guinea also employs the scroll for a motive, the flat treatment of which reminds one of a similar method in use in Scandinavian countries. The work of the New Zealander is greatly in advance of the average primitive type; he uses a very good scheme of scroll work fur decorative purposes, the lines of the scrolls often being en- riched with a small pattern in a way reminding one of the familiar Norman treatment, as for example the prows of his canoes. The

Maori sometimes carves not only the " bargeboards " of his house but the gables also, snakes and grotesque figures being as a rule introduced; the main posts and rafters, too, of the inside receive attention. Unlike the Hindu he has a good idea of decorative pro- portion, and does not plan his scheme of design on too small a scale.

Authorities. — Marshall, Specimens of Antique Carved Furniture and Woodwork (1S88); Franklyn Crallan, Details of Gothic Wood- carving (1896) ; Spring Gardens Sketch-book ; Sanders, Examples of Carved Oak Woodwork of the i6ih and ijih Centuries (1883); Colling, Medieval Foliage and Decoration (1874) ; Bond, Screens and Galleries ('90S) ; Paukert, Die Zimmergothick (1904) ; J. Lessing, IIolz schnitzereien (Berlin, 1882) ; Rouyer, La Renaissance; Rowe, Practical Wood-carving (1907). (F.A. C.)

WOODCHUCK, the vernacular name of the common North American representative of the marmots (see Marmot), scientific- ally known as Arctomys monax. The typical race of this species ranges from New York to Georgia and westward to the Dakotas, but it is represented by a second and darker race in Labrador, and by a third in Canada; while several other North American species, have been named. The ordinary woodchuck measures about 18 in. in length, of which the tail forms a third. In colour it is usually brownish black above, with the nose, chin, cheeks and throat

tending to whitish, and the under parts brownish chestnut; while the feet and tail are black and blackish. Like other marmots it is a burrower.

WOODCOCK (O. Eng. wude-cocc, wudu-coc, and wudu-snite), the Scolopax rusticula L of ornithology, a game-bird which is prized both by the sportsman and for its excellence for the table. It has a long bill, short legs and large eyes- suggestive of its nocturnal or crepuscular habits — with mottled plumage of black, chestnut and umber-brown, ashy-grey, buff and shining white — the last being confined to the tip of the lower side of the tail- quills, but the rest intermixed for the most part in beautiful combination. Setting aside the many extreme aberrations from the normal colouring which examples of this species occasionally present (and some of them arc extremely curious, not to say beautiful), there is much variation' to be almost constantly observed in the plumage of individuals, in some of which the richer tints prevail while others exhibit a greyer coloration. This variation is often, but not always, accompanied by a variation in size or at least in weight. 2 The paler birds are generally the larger, but the difference, whether in bulk or tint, cannot be attributed to age, sex, season or, so far as can be ascertained, to locality. It is, notwithstanding, a very common belief among sportsmen that there arc two " species " of woodcock, and many persons of experience will have it that, beside the differences just named, the "little red woodcock" invariably flics more sharply than the other. However, a sluggish behaviour is not really associated with colour, though it may possibly be correlated with weight — for it is quite conceivable that a ,fat bird will rise more slowly, when flushed, than one which is in poor condition. Ornithologists are practically unanimous in declaring against the existence of two " species " or even " races, ,; and, moreover, in agreeing that the sex of the bird cannot be determined from its plumage, though there are a few who believe that the young of the year can be discriminated from the adults by having the outer web of the first quill-feather in the wing marked with angular notches of a light colour, while the old birds have no trace of this lt Vandyke "ornament. Careful dissections, weighings and measurings seem to show that the male varies most in size; on an average he is slightly heavier than the female, yet some of the lightest birds have proved to be cocks. 3

Though there are probably few if any counties in the United Kingdom in which the woodcock does not almost yearly breed, especially since a " close time " has been afforded by the legislature for the protection of the species, there can be no doubt that by far the greater number of those shot in the British Islands have come from

1 By Linnaeus, and many others after him, misspelt rusticola. The correct form of Pliny and the older writers seems to have been first restored in i8i6"by Oken (Zoologie, ii. p. 589).

2 The difference in weight is very great, though this seems to have been exaggerated by some writers. A friend who has had much experience tells us that the heaviest bird he ever knew weighed i6£ oz., and the lightest 9 oz. and a fraction.

3 Cf. Dr Hoffmann's monograph Die Waldschnepfe, ed. 2, p. 35, published at Stuttgart in ;887.

abroad.mostly, it is presumed, from Scandinavia These amˆ on the east coast in autumn— generally .about the middle oi October Soften in an exhausted and impoverished state. If unmolested, thev are soon rested, pass inland, and, as would appear, in a marvel lously short time recover their condition. Iheir future destination Bern's to be greatly influenced by the state of the weather. If cold or frost stop their supply of food on the eastern side of Great Britain they press onward and, letting alone Ireland, into which the im- migrant stream is pretty constant, often crowd into the extreme "outh-west, as Devonshire and Cornwall, and to the Isles of Solly, while not a few betake themselves to the unknown ocean, finding there doubtless a watery grave, though instances are on record ol examples having successfully crossed the Atlantic and reaching Newfoundland, New Jersey and Virginia. . .

Witt .regard to the woodcock which breed in Britain, pairing takes place very early in February and the eggs are laid often before the middle of March. These are four in number, of a yellowish cream-colour blotched and spotted with reddish brown, and seldom take the pyriform shape so common among those of Limicohne birds. The nestˆalways made on the ground amid trees or underwood and usually near water or at least in a damp locality— is at first little more than a slight hollow in the soil, but as incubation proceeds dead leaves are collected around its margin until a considerable mass is accumulated. During this season the male woodcock perlorms.at twilight flights of a remarkable kind, repeating evening after evening (and it is believed at dawn also) precisely the same course, which generally describes a triangle, the sides of which may be a quarter of a mile or more long. On these occasions the bird s appearance on the wing is quite unlike that which it presents when hurriedly flying after being flushed, and though its speed is great the beats of the wings are steady and slow. At intervals an extraordinary sound is produced, whether from the. throat o the bird as « commonly averred, or from the plumage is uncertain. This characteristic flight is in some parts of England called " reading, and the track taken by the bird a " cock-road." 1 In England m former times

advantage was taken of this habit to catch the simple performer in nets called ‘ ‘ cock-shutts,” which were hung between trees across the open glades or rides of a wood. A still more interesting matter ,n relation to the breeding of woodcocks is the fact, finally established on good evi- dence, that the old birds transport their newly hatched offspring, presumably to places where food is more accessible 1 he young are clasped between the thighs of the parent, whose legs hang down during the operation, while the bill is to some extent, possible only at starting, brought into operation to assist in adjusting the load it not in bearing it through the air. 2

Woodcock inhabit suitable localities across the northern part of the Old World, from Ireland to Japan, migrating southward towards autumn. As a species they arc said to be resident m the Azores and other Atlantic Islands; but they are not known to penetrate very far into Africa during the winter, though in many Parts of India they are abundant during the cold weather, and reach even Ceylon and Tenasscrim. The popular belief that woodcock liv e ” by suction ” is perhaps hardly vet expoded; but those who have observed them in confinement know that they have an almost insatiable appetite for earthworms, which the birds seek by probing soft ground with their highly sensitive and flexible bill. This fact seems to have been first placed on record by Bowles,* who noticed it in the royal aviary at San Ildetonso in Spain, and it has been corroborated by other observers, and especially by Montagu, who discovered that bread and milk made an excellent substitute for their ordinary food. They also do well on chopped raw meat.*

The eastern part of North America possesses a woodcock, much smaller than, though generally (and especially in habits) similar to, that of the Old continent. It is the Scolopax minor of most authors , but, chiefly on account of its having the outer three primaries re- markably attenuated, it has been placed in a separate genus, Philohela. In lava is found a distinct and curiously coloured species, described and figured by Horsfield (Trans. Linn Society, xuu p. 191, and Zoolog Researches, pi.) as S. salurata. To this h. Seebohm (Geo- graphical Distribution of the Family Charadrndae p. 506) referred the S. rosenbergi of Schlegel (Nederl. Tijds v. d. Dierkunde.iv. p. 54) from New Guinea. Another species is 5. rochussem from the Moluccas , this has, lik e the snipe, the lower part of the t ibia bare of fe athers^ ^A.JNM

• The etymology and consequently the correct spelling of these ex- pressions seem to be very uncertain. Some would derive the word from the French rider, to rove or wander, but others connect it with the Scandinavian rode, an open space in a wood (see Nates and Queries scr 5, ix. p. 214, and ser. 6, viii. pp. 523. 524). Looking to the regular routine followed by the bird, the natural supposition would be that it is simply an application of the

English word road.

• Cf. 1. E. Halting, Zoologist (1879), pp. 433:44°, a ” d ,™ Ir ™°” s excellent illustration. Sir R. Payne-Gallwey, m the Badminton Library ” (Shooting, ii. p. 118, note), states that he himself has witnessed the performance. . . . . ..

s The pair of muscles said by Loche (Expl. Sclent, de I Algerie, 11. p 293) to exist in the maxilla, and presumably to direct the move- ment of the bill, do not seem to have been precisely described.

1 Introduccion a la hisloria natural y a la geografia fiscta de ‘ Espana, pp. 454, 455 (Madrid, 1775)-

WOOD ENGRAVING, the art of engraving (q.v.) on wood, by lines so cut that the design stands in relief. This method of engraving was historically the earliest, done for the purpose of taking impressions upon paper or other material. It is natural that wood engraving should have occurred first to the primitive mind because the manner in which woodcuts are printed is the most obvious of all the kinds of printing. If a block of wood is inked with a greasy ink and then pressed on a piece of paper, the ink from the block will be transferred at once to the paper, on which we shall have a black patch exactly the size and shape of the inked surface. Now, suppose that the simple Chinese who first discovered this was ingenious enough to go a step further, it would evidently occur to him that if one of the elaborate signs, each of which in his own language stood for a word, were drawn’ upon the block of wood, in reverse, and then the whole of the white wood sufficiently cut away to leave the sign in relief, an image of it might be taken on the paper much more quickly than the sign could be copied with a camel-hair brush and Indian ink. No sooner had this experiment been tried and found to answer than block-printing was discovered, and from the printing of signs to the printing of rude images of things, exactly in the same manner, the step was so easy that it must have been made insensibly. Wood engraving, then, is really nothing but that primitive block-cutting which prepared for the printer the letters in relief now replaced by movable types, and the only difference between a delicate modern woodcut and the rude letters in the first printed books is a difference of artistic skill and knowledge. In Chinese and Japanese woodcuts we can still recognize traditions of treatment which come from the designing of their written characters. The main elements of a Chinese or a Japanese woodcut, uninfluenced by European example, are dashing or delicate outlines and markings of various thickness, exactly such as a clever writer with the brash wou d make with his Indian ink or vermilion. Often we get a perfectly black blot, exquisitely shaped and full of careful purpose, and these broad vigorous blacks are quite in harmony with the kind of printing

for which wood engraving is intended.

It has not hitherto been satisfactorily ascertained whether wood engraving came to Europe from the East or was re- discovered by some European artificer. The precise date of the first European woodcut is also a matter of doubt, but here we have certain data which at least set limits to the possibility of error. European wood engraving dales certainly from the first quarter of the 15th century. It used to be believed that a cut of St Christopher (now in the Rylands library, Manchester), rudely executed and dated 1423, was the Adam of all our wood- cuts, hut since 1844 investigations have somewhat shaken this theory. There is a cut in the Brussels library, of the " Virgin and Child " surrounded by four saints, which is dated 1418, but the composition is so elegant and the drawing so refined and beautiful, that one has a difficulty in accepting the date, though it is received by many as authentic, while it is repudiated by others in the belief that the letters have been tampered with. The " Virgin and Child " of the Paris library is without date, but is supposed, apparently with reason, to be earlier than either of the two mentioned; and Dclaborde proved that two cuts were printed in 1406. The " Virgin and Child " at Pans may be taken as a good representative specimen of very early European wood engraving. It is simple art, but not bad art. The forms are drawn in bold thick lines, and the black blot is used with much effect in the hollows and recesses of the design. Beyond this there is no shading. Rude as the work is, the artist has expressed exquisite maternal tenderness in the chief details of the design. The Virgin is crowned, and stands against a niche-like decoration with pinnacles as often seen in illuminated manuscripts. In the woodcut this architectural decoration is boldly but effectively drawn. Here, then, we have real art already, art in which appeared both vigour of style and tenderness of feeling. , , .

The earliest wood engraving consisted of outlines and white spaces with smaller black spaces, cut with a knife not with a graver, and shading lines are rare or absent. Before passing

to shaded woodcuts we may mention a kind of wood engraving practised in the middle of the 15th century by a French engraver (often called Bernard Milnet, though his name is a matter of doubt) and by other engravers nearer the beginning of that century. This method is called the crible, a word for which there is no convenient translation in English, unless we call it drilled. It means riddled with small holes, as a target may be riddled with small shot. The effect of light and dark is produced in this kind of

engraving by sinking a great number of round holes of different diameters in the substance of the wood, which, of course, all come white in the printing; it is, in effect, a sort of stippling in white. When a more advanced kind of wood engraving had become prevalent the crible was no longer used for general purposes, but it was retained for the grounds of decorative wood engraving, being used occasionally in borders for pages, in printers' marks and other designs, which were survivals in black and white of the ancient art of illuminating. Curiously enough, this kind of wood engraving, though long disused for purposes of art, was in recent times revived with excellent effect for scientific purposes, mainly as a method of illustration for astronomical books. The black given by the untouched wooden block represents the night sky, and the holes, smaller or larger, represent in white the stars and planets of lesser or greater magnitude. The process was perfectly adapted to this purpose, being cheap, rapid and simple. It has also been used in a spasmodic and experimental manner by one or two modern engravers.

The earlier workmen turned their attention to woodcut in simple black lines, including outline and shading. In early work the outline is firm and very distinct, being thicker in line than the shading, and in the shading the lines are simple, without cross-hatchings, as the workmen found it easier and more natural to take out a white line-like space between two parallel or nearly parallel black lines than to cut out the twenty or thirty small white lozenges into which the same space would have been divided by cross-hatchings. The early work would also sometimes retain the simple black patch which we find in Japanese woodcuts, for example, in the " Christmas Dancers," of Wohlgemuth, all the shoes are black patches, though there is no discrimination of local colour in anything else. A precise parallel to this treatment is to be found in a Japanese woodcut of the " Wild Boar and Hare," given by Aime Humbert in his book on Japan, in which the boar has a cap which is a perfectly black patch though all other local colour is omitted. The similarity of method between Wohlgemuth and the Japanese artist is close: they both take pleasure in drawing thin black lines at a little distance from the patch and following its shape like a border. In course of time, as wood engravers became more expert, they were not so careful to spare themselves trouble and pains, and then cross-hatchings were introduced, but at first more as a variety to relieve the eye than as a common method of shading. In the 16th century a simple kind of wood engraving reached such a high degree of perfection that the best work of that time has never been surpassed in its own way.

Wood engraving in the 16th century was much more conventional than it became in more recent times, and this very conventionalism enabled it to express what it had to express with greater decision and powen The wood engraver in those days was free from many difficult conditions which

hampered his modern successor. He did not care in the least about aerial perspective, and nobody expected him to care about it; he did not trouble his mind about local colour, but gener- ally omitted it, sometimes, however, giving it here and there, but only when it suited his fancy. As for light-and-shade, he shaded only when he wanted to give relief, but never worked out anything like a studied and balanced effect of light-and-shade, nor did he feel any responsibility about the matter. What he really cared for, and generally attained,, was a firm, clear, simple kind of drawing, con- ventional in its indifference to the mystery of nature and to the poetic sentiment which comes to us from that mystery, but by no means indifferent to fact of a decided and tangible kind. The wood engraving of the 16th century was a singularly positive art, as positive as carving; indeed, most of the famous woodcuts of that time might be translated into carved panels without much loss of character. Their complete independence of pictorial conditions might be illustrated by many examples. In Durer's " Salutation " the dark blue of the sky above the Alpine mountains is translated by

dark shading, but so far is this piece of local colour from being carried out in the rest of the composition that the important foreground figures, with their draperies, are shaded as if they were white statues. Again, the sky itself is false in its shading, for it is without gradation but the shading upon it has a purpose, which is to prevent the upper part of the composition from looking too empty, and the convention- alism of wood engraving was so accepted in those days that the artist could have recourse to this expedient in defiance alike of pictorial harmony and of natural truth. In Holbein's admirable series of small well-filled compositions, the " Dance of Death," the firm and matter-of-fact drawing is accompanied by a sort of light-and-shade adopted simply for convenience, with as little reference to natural truth as might be expected in a stained-glass window. There is a most interesting series of little woodcuts drawn and engraved in the 16th century by J. Amman as illustrations of the different handicrafts and trades, and entitled " The Baker," " The Miller," " The Butcher," and soon. Nothing is more striking in this valuable series than the remarkable closeness with which the artist observed everything in the nature of a hard fact, such as the shape of a hatchet or a spade; but he sees no mystery anywhere — he can draw leaves but not foliage, feathers but not plumage, locks but not hair, a hill but not a landscape. In the " Witches' Kitchen," a woodcut by Hans Baldung (Grun) of Strassburg, dated 15 10, the steam rising from the pot is so hard that it has the appearance of two trunks of trees denuded of their bark, and makes a pendant in the composition to a real tree on the opposite side which does not look more sub- stantial. Nor was this a personal deficiency in Grun. It was Durer's own way of engraving clouds and vapour, and all the engravers of that time followed it.*

Their conceptions were much more those of a carver than those of a painter. Durer actually did carve in high relief, and Grtin's " Witches' Kitchen " might be carved in the same manner without loss. When the engravers were rather draughtsmen than carvers, their drawing was of a decorative character. For example, in the magnificent portrait of Christian III. of Denmark by Jacob Binck, one of the very finest examples of old wood engraving, the face and beard are drawn with few lines and very powerfully, but the costume is treated strictly as decoration, the lines of the patterns being all given, with as little shading as possible, and what shading there is is simple, without cross-hatching.

The perfection of simple wood engraving having been attained so early as the 16th century by the use of the graver, the art became extremely productive. During the' 17th and 18th centuries it still remained a comparatively severe and con- ventional form of art, because the workmen shaded as much as possible either with straight lines or simple curves, so that there was never much appearance of freedom. Modern wood engraving is quite a distinct art, being based on different principles, but between the two stands the work of an original genius, Thomas Bewick (1753-1828). Although apprenticed to an engraver in 1767, he was never taught to draw, and got into ways and habits of his own which add to the originality of his work, though his defective training is always evident. His work is the more genuine from his frequent habit of engraving his own designs, which left him perfect freedom of interpretation; but the genuineness of it is not only of the kind which comes from independence of spirit, it is due also to his fidelity to the technical nature of the process, a fidelity very rare in the art.

The reader will remember that in wood engraving every cutting prints white, and every space left untouched prints black. Simple black lines are obtained by cutting out white lines or spaces between them, and crossed black lines have to be obtained by laboriously cutting out all the white lozenges between them. In Bewick's cuts white lines, which had appeared before him in the Fables of 1772, are abundant and are often crossed, but black lines are never crossed; he is also quite willing to utilize the black space, as the Japanese wood-engravers and Durer's master Wohlgemuth used to do. The side of the frying-pan in the vignette of " The Cat and the Mouse " is treated precisely on their principles, so precisely indeed that we have the line at the edge for a border. In the vignette of " The Fisher-man," at the end of the twentieth chapter of the Memoir, the space of dark shade under the bushes is left quite black, whilst the leaves and twigs, and the rod and line too, are all drawn in pure white lines. Bewick, indeed, was more careful in his adherence to the technical conditions of the art than any of the primitive woodcutters except those who worked in cribU and who used white lines as well as their dots. Such a thing as a fishing-net is an excellent test of this dis- position. In the interesting series by J. Amman

already mentioned there is a cut of a man fishing in a river, from a small punt, with a net. The net comes dark against the light surface of the river, and Amman took the trouble to cut a white lozenge for every mesh. Bewick, in one of his vignettes, represents a fisherman mending his nets by the side of a stream. A long net is hung to dry on four up- right sticks, but to avoid the trouble of cutting out the lozenges. Bewick artfully contrives his arrangement of light and shade so that the net shall be in light against a space of black shade under some

bushes. This permits him to cut every string of the net by a simple white line, according to his practice of using the white line whenever he could. He used it with great ability in the scales of his fish, but this was simply from a regard to technical convenience, for when he engraved on metal he marked the scales of his fish by black lines. These may seem very trifling considerations to persons unacquainted with the fine arts, who may think that it can matter little whether a fishing-net is drawn in black lines or in white, but the fact is that the entire destiny of wood engraving depended on preserving or rejecting the white line. Had it been generally accepted as it was by Bewick, original artists might have followed his example in engraving their own inventions, because then wood engraving would have been a natural and comparatively rapid art; but when the black line was preferred the art became a handicraft, because original artists have not time to cut out thousands of little white spaces. The reader may at once realize for himself the tediousness of the process by compar- ing the case with which one writes a page of manuscript with the labour which would be involved in cutting away, with perfect accuracy, every space, however minute, which the pen had not blackened with ink.

Wood engraving in the first three quarters of the 19th century had no special character of its own, nothing like Bewick's work, which had a character derived from the nature of the process; but on the other hand, the modern art is set to imitate every kind of engraving and every kind of drawing. Thus we have woodcuts that imitate line engraving, others that copy etching and even mezzotint, whilst others try to imitate the crumbling touch of charcoal or of chalk, or the wash of water-colour, the greyncss of pencil, or even the w r ash and the pen-line together. The art has been put to all sorts of purposes; and though it is not and cannot be free, it is made to pretend to a freedom which the old masters would have rejected as an affectation. Rapid sketches are made on the block with the pen, and the modern wood-engraver set himself patiently to cut out all the spaces of white, in which case the engraver is in reality less free than his predecessor

in the 1 6th century, though the result has a false appearance of liberty. The w r oodcut is like a polyglot who has learned to speak many other languages at the risk of forgetting his own. And, wonderful as may be its powers of imitation, it can only approximate to the arts which it imitates; it can never rival each of them on its own ground. It can convey the idea of etching or water-colour, but not their quality; it can imitate the manner of a line engraver on steel, but it cannot give the delicacy of his lines. In its most modern development it has practically succeeded in imitating the grey tonalities of the photograph. Whatever be the art which the wood engraver imitates, a practised eye sees at the first glance that the result is nothing but a woodcut. Therefore, although we may admire the supple- ness of an art which can assume so many transformations, it is certain that these transformations give little satisfaction to severe judges. At the same time, as the ultimate object was not only reproduction, but reduplication by the printing-press, the drawbacks mentioned are far outweighed by the practical advantages. In manual skill and in variety of resource modern wood engravers far excel their predecessors. A Belgian wood engraver, Stephane Pannemaker, exhibited at the Salon of 1876 a woodcut entitled " La Baigneuse," which astonished the art- world by the amazing perfection of its method, all the delicate modelling of a nude figure being rendered by simple modula- tions of unbroken line. Both English and French publications have abounded in striking proofs of skill. The modern art, as exhibited in these publications, may be broadly divided into two sections, one depending upon line, in which case the black line of a pen or pencil sketch is carefully preserved, and the other depending upon tone, when the tones of a sketch with the brush are translated by the wood engraver into shades obtained in his own way by the burin. The first of these methods requires extreme care, skill and patience, but makes little demand upon the intelligence of the artist; the second leaves him more free to interpret, but he cannot do this rightly without understanding both tone and texture.

The woodcuts in Dore's Don Quixote are done by each method alternately, many of the designs having been sketched with a pen upon the block, whilst others are shaded with a brush in Indian ink and white, the latter being engraved by interpreting the shades of the brush. In the pen drawings the lines are Dora's, in the brush draw- ings the lines are the engraver's. In the night scenes Pisan usually

adopted Bewick's system of white lines, the block being left untouched in its blackness wherever the effect permitted. English wood engraving showed to great advantage in such newspapers as the Illustrated London News and the Graphic of that day, and also in vignettes for book illustration. A certain standard of vignette engraving was reached by Edmund Evans in Birket Foster's edition of Cowper's Task, not likely to be surpassed in its own way, either for delicacy of tone or for careful preservation of the drawing.

An important extension of wood engraving was due to the invention of compound blocks by Charles Wells about the year i860. Formerly a woodcut was limited in size to the dimensions of a block of boxwood cut across the grain, except in the primitive condition' of the art, when commoner woods were used in the direction of the grain; but by this invention many small blocks were fitted together so as to form a single large one, sometimes of great size. They could be separated or joined together again at will, and it was this facility which rendered possible the rapid production of large cuts for the newspapers, many cutters working on the same subject at once, each taking his own section.

The process employed for wood engraving may be briefly described as follows. The surface of the block is lightly whitened with Chinese white so as to produce a light yellowish-grey tint, and on this the artist draws, either with a pen if the work is intended to be in line, or with a hard-pointed pencil and a brush if it is intended to be in shade. If it is to be a line woodcut the cutter simply digs out the whites with a sharp graver or scalpel (he has these tools of various shapes and sizes), and that is all he has to do; but if the drawing on the wood is shaded with a brush, then the cutter has to work upon the tones in such a manner that they will come relatively true in the printing. This is by no means easy, and the result is often a disappoint- ment, besides which the artist's drawing is destroyed in the process. It therefore became customary to have the block photographed before the engraver touches it, when the drawing is specially worth preserving. This was done for Leighton's illustrations to Romola. By a later development the drawing, made upon paper, was by photography printed on the block, and the drawing remained untouched as a witness for or against the engraver.

In recent years the position of wood engraving in Great Britain has wholly changed. Up to 1880 and for a little while longer it was the chief means of book and newspaper illustration, and a frequent method of fine-art reproduction; but by the beginning of the 20th century it had been all but driven out of the field by " process " work of various kinds. It still flourishes in its commoner style for commercial and mechanical work; it is still occasionally maintained in its finest form by a sympathetic publisher here and there, who deplores and would arrest its decay. But the photograph and its facsimile reproduction have captivated the public, who want " illustration " and who do not want "art." The great body of the wood engravers have therefore found their occupation entirely gone, while the minority have found themselves forced to devote their skill to " re-touching " the process-block — sometimes carrying their work so far that the print from the finished block is a close imitation of a wood engraving. This system has been carried farthest m America; it is rarely seen elsewhere.

It is not only to considerations of economy that is due the supersession of engraving by ” process.” The apparent supe- riority of truthfulness claimed by the photograph over the artist’s drawing is a factor in the case — the public forgetting that a photographic print shows us what a thing or a scene looks like to the undiscriminating lens, rather than what it looks like to the two eyes of the spectator, who unconsciously selects that part of the scene which he specially wishes to see. The rank and file of the engravers— even those who can ” engrave ” after a picture as well as “cut ” a “special artist’s ” sketch — succumbed not only to the public, but to the artists themselves, who frequently insisted upon the process-block for the translation of their work. They preferred the greater truth of outline (though not necessarily of tone) which is yielded by ” process,” to all the inherent charm of the beautiful (and expensive) art of xylography.

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In Great Britain a few engravers of high rank and ability still followed the art which was raised to so high a pitch by VV. J. Linton (d. 1898). Such were Mr Charles Roberts, Mr Biscombe Gardner, Mr Comfort, Mr Ulrich and a few more — the first two the better engravers for being also practising artists. But there is every reason to fear that if wood engraving as a craft, for ordinary purposes, ceases to exist, wood engraving as a fine art must disappear as well — as there would be nothing to support the young craftsman, during the years of apprenticeship and practice required to make an ” artist ” of him, and nothing to compensate him if he fail to attain at once the highest accomplishment.

Another circumstance which has contributed to the overthrow of wood engraving in England is the rapture begotten of the extra- ordinary executive perfection to which the art had been brought in America. These engravings, published in magazines and books having wide circulation in England, awakened not an intelligent but a foolish appreciation among the public. Just as the over- refinement of engraving on steel of Finden and his school killed his art by stripping it of all interest, so the unsurpassable perfection of the American wood engraver, by the law of paradox, effectually stifled xylography in England, as it has since done to an almost equal degree in America. The reason is simple. With the object of ” dis- individualizing ” himself, as he called it, the engraver sought to suppress his own recognizable manner of craftsmanship when trans- lating the work of the artist for the public; and the more he suc- ceeded tn effacing himself, and the more he refined and elaborated his technique and imitated textures, and the more he developed extreme minuteness and excessive dexterity (so as to secure faithful- ness and smoothness), the more closely

did the result approximate to a photograph and nothing more. The result, in fact, became the reductio ad absurdum of the passion for the minute and the perfection of mere technique. The result was amazing in its completeness, but curiously grey and monotonous; and matter-of-fact publishers and public alike preferred the photograph, which in their eyes did not differ so very much (except in being a little greyer and more monotonous) reproduced by the half-tone block, while the cost of the latter was but a fraction of that of the former. The extreme elaboration, satisfying a craving of an acrobatic kind, defeated, its own end. The public were pleased for a time, and the result has been disastrous for the art.

In England, in spite of the International Society of Wood En- gravers, of which little is now heard, there are no signs of a general revival, and it seems as if the art must be born again, so long as the public interest in photographs continues. Charles Ricketts and Miss Housman have gone back to a Diireresque, or Florentine, manner of the Early Renaissance woodcut, while others are striving to begin engraving where Bewick hegan it. If the true art is ever restored, the revival will rather be based on a revolt against the greyness of the process-block, and the offensively shiny surface of the chalk-coated paper on which it is printed, than on any aesthetic delight in intelligent wood engraving, its expressive line, its delicate, pearly tones, and its rich, fat blacks.

In America, where the power of resuscitation is great, the miracu- lous technical perfection brought about by Timothy Cole and Frederick Juengling, as leadersoftheschool, has promptly given way to a greater feeling for art and a lesser worship of mechanical achieve- ment, and, within strict limits, wood engraving is saved. Curi- ously enough, Cole (an Englishman by birth) was equally a leader in recognizing the danger which his own brilliant proficiency had helped to bring about. The "decadent" de luxe who had over- whelmed his art in the refinements which threatened to destroy it, and who had been seconded by the splendid printing-presses of America (which might without exaggeration be called instruments of precision), gave up what may be termed hyper-cngraving, and, surrendering his wonderful power of imitating surfaces and textures, changed his manner. He became broader in handling; his example was followed by others, and wood engraving in a very few hands still prospers m the United States.

In France, where the art has reached the highest perfection and the most consummate and logical development, it flourishes up to a certain point on the true artistic instinct of the engraver, on the taste of an intelligent and appreciative public, and on official recogni- tion and encouragement. Nevertheless, it was found necessary to establish a " Society of Wood Engravers " (with a magazine of its own) to protect it against the inroad of

the process-block. The art doubtless produces more engravers of skill than it can provide work for; hut that is evidence rather of vitality than of decay. Lepere, Baude, Jonnard and Florian have been among the leaders who, in different styles of wood engraving, have sustained the extraordinarily high level which has been attained in France, and which is fairly well maintained by virtue of the encouragement on which it has thriven heretofore. Florian, who died in 1900, was a man who successfully sought to obtain effects of tone rather than line, leaving masses of unengraved surface to enhance the delicate beauty of his pearly greys. But in rebelling against the mechanical style formerly so much in vogue in Germany, of indicating roundness of form by curved lines carried as far as possible at right angles to the convexity, and in substituting more or less longitudinal lines of shading, he sacrificed a good deal of the logic of form-rendering, and started a method that Vas not been entirely successful.

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In Germany the artistic standard is lower than in France. It is true that few outside Germany could model a head as finely as M. Klinkicht in his own style of a judicious mingling of the black line and the white line; but, as a rule, German engraving is far more precise, more mechanical, more according to formula, and heavier and more old-fashioned than that of either France or America. The art has been injured by the great " studios " or factories designed to flourish on strictly business principles, workshops which, in the edu- cation of the craftsman, to some extent annihilated the artist. A few there are, however, of great ability and taste. The attempt to print wood engravings in colours has done little to improve the status of the art. In other countries, however, " original " work helped to raise the standard. Thus the work of Elbridgc Kingslcy, who would sit down in the woods and engrave the scene before him directly on to the block, exercised no little influence in America. The similar ability of Lepere to engrave directly from nature, whether from the trees of Fontaineblcau Forest or the palace of Westminster, has in its time been much appreciated in his own country and in England. The efforts at block-printing by Charpentier and others, not only with colour, but by reinforcing it with blocks that print neither lines nor colour but " blind " pattern, raised or depressed upon the paper, are evidence of the movement by which new methods have been sought to interest the public. The immediate results have not been very serious, yet the fact shows the existence of a vitality that gives some hope for the future. But while the practice of dry-printing upon " surface paper " is maintained, it is hopeless to expect in the im- mediate future, in Great Britain at least, any permanently good results from orthodox wood engraving.

See the works cited under Engraving; and also J. Jackson, Treatise on

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WOODFALL, HENRY SAMPSON (173.9-1805), English printer and journalist, was born in London on the 21st of June 1739. His father, Henry Woodfall, was the printer of the newspaper the Public Advertiser, and the author of the ballad Darby and Joan, for which his son's employer, John Darby, and his wife, were the originals. H. S. Woodfall was apprenticed to his father, and at the age of nineteen took over the control of the Public Advertiser. In it appeared the famous letters of " Junius." Woodfall sold his interest in the Public Advertiser in 1793. He died on the 12th of December 1S05. His younger brother, William Woodfall (1746-1803), also a journalist, established in 1789 a daily paper called the Diary, in which, for the first time, reports of the parliamentary debates were published on the morning after they had taken place.

WOODFORD, an urban district in the Walthamstow (S.W.) parliamentary division of Essex, England, 9 m. N.E. from Liverpool Street station, London, by a branch of the Great Eastern railway. Pop. (1901) 13,798. Its proximity to the southern outskirts of Epping Forest has brought it into favour both with residents and with holiday visitors from London. A converted mansion, Woodford Hall, forms a convalescent home. On high ground to the N. is the ecclesiastical parish (one of three) of Woodford Wells, where there is a mineral spring.

WOOD GREEN, an urban district in the Tottenham parlia- mentary division of Middlesex, England, suburban to London, 7 m. N. of St Paul's Cathedral, on the Great Northern railway. Pop. (1891) 25,831,(1901) 34,233. The name covers a populous residential district lying north of

Hornsey and west of Tottenham. To the west lies Muswell Hill, with the grounds and building of the Alexandra Palace, an establishment somewhat similar to the Crystal Palace. It was opened in 1873, destroyed by fire almost immediately, and reopened in 1S75. Muswell Hill

took name from a holy well, of high repute for curative powers, over which an oratory was erected early in the 12 th century, attached to the priory of St John of Jerusalem in Clerkenwell.

*WOOD-LOUSE, a name commonly applied to certain terres- trial Crustacea of the order Isopoda (see Mai.acoste.aca}, which are found in damp places, under stones or dead leaves, or among decaying wood. They form the tribe Oniscoidea and are distin- guished from all other Isopoda by their habit of living on land and breathing air, and by a number of structural characters, such as the small size of the antennules and the absence of the mandibular pulp. As in most Isopods, the body is flattened, and consists of a head, seven thoracic segments which are always free, and six abdominal segments which may be free or fused. The (* telson ” is not separated from the last abdominal segment. The head bears a pair of sessile compound eyes as well as the minute antennules and the longer antennae. Each of the seven thoracic segments carries a pair of walking legs. The appendages of the abdomen (with the exception of the last pair) are flat membranous plates and serve as organs of respiration. In many cases their outer branches have small cavities opening to the outside by slit-like apertures, and giving rise internally to a system of ramifying tubules filled with air. From their similarity to the air tubes or tracheae of insects and other air-breathing Arthropods these tubules are known as ” pseudo- tracheae.”*

The female wood-louse carries her eggs, after they are extruded from the body, in a pouch or ” marsupium ” which covers the under surface of the thorax and is formed by overlapping plates attached to the bases of the first five pairs of legs. The young, on leaving this pouch, are like miniature adults except that they are without the last pair of legs. Like all Arthropoda, they cast their skin frequently during growth. As a rule the skin of the hinder half of the body is moulted some days before that of the front half, so that individuals in process of moulting have a very peculiar appearance.

Some twenty-four species of wood-lice occur in the British Islands. Some,

like the very common slaty-blue Porcellio scaber, are practically cosmopolitan in their distribution, having been transported, probably by the uncon- scious agency of man, to nearly all parts of the- globe. Equally common is the brown, yellow-spotted Oniscus asellus. Armadillidium vulgare belongs to a group which have the power of rolling themselves up into a ball when touched and resembles the millipede Glomeris. It was formerly employed in popular medicine as a ready-made pill. The largest British species is Ligia oceanica, which frequents the sea-shore, j ust above high- water mark. In many points of structure, for instance in the long, many-jointed antennae, it is intermediate, as it is in habits, between the truly terrestrial forms and their marine allies. Finally, one of the most interesting species is the little, blind, and colourless Platyartkrus hoffmannseggi, which lives as a guest or commensal in the nests of ants. (W. T. Ca.)

WOODPECKER, a bird that pecks or picks holes in wood, and from this habit is commonly reputed to have its name; but it is in some parts of England also known as " Woodspeight >! (erroneously written " Woodspite ") — the latter syllable being cognate with Ger. Specht and Fr. Epetchc, possibly with Lat. Picus} More than 300 species have been described, and they have been very variously grouped by systematise ; but all admit that they form a very natural family Picidae of Coraciiform

1 The number- of English names, ancient and modern, by which these birds are known is very great, and even a bare list of them could not be here given. The Anglo-Saxon was higora or higere, and to this may plausibly be traced " hickwall," nowadays used in some parts of the country, and the older " hickway," corrupted first into " highhaw," and, after its original meaning was lost, into " hewhole," which in North America has been still further corrupted into " high- hole " and more recently into " high-holder." Another set of names includes " whetde " and " woodwalc," which, different as they look, have a common derivation perceptible in the intermediate form " witwale." TheMid. Eng. wodehake (= woodhack) is another name apparently identical in meaning with that commonly applied to woodpecker. .

Common Wood-louse. Oniscus aselfois.

birds, their nearest allies being the toucans. They are generally of bright particoloured plumage, in which black, white, brown olive, green, yellow, orange or scarlet — the last commonly visible on some part of the head — mingled in varying proportions, and most often strongly contrasted with one another, appear; while the less conspicuous markings take the form of bars, spangles, tear-drops, arrow-heads or scales. Woodpeckers inhabit most parts of the world, with the exception of Madagascar and the

Australian Region, save Celebes and Flores; but it may be worth stating that no member of the group is known to have occurred in Egypt.

Of the three British species, the green woodpecker, Gecinus or Picus viridis, though almost unknown in Scotland or Ireland, is the commonest, frequenting wooded districts, and more often heard than seen, its laughing cry (whence the name " Yaffil " or " Yaffle,' by which it is in many parts known), and undulating flight afford equally good means of recognition, even when it is not near enough for its colours to be discerned. About the size of a jay, its scarlet crown and bright yellow rump, added to its prevailing grass-green plumage, make it a sighLly bird, and hence it often suffers at the hands of those who wish to keep its stuffed skin as an ornament. B,esides the scarlet crown, the cock bird has a patch of the same colour running backward from the base of the lower mandible, a patch that in the hen is black. 2 Woodpeckers in general are very shy birds, and to observe the habits of the species is not easy. Its ways, however, are well worth watching, since the ease with which it mounts, almost always spirally, the vertical trunks and oblique arms of trees as it searches the interstices of the bark for its food, flying off when it reaches the smaller or upper branches — either to return to the base of the same tree and renew its course on a fresh line, or to begin upon another tree near by — and the care it shows in its close examination, will repay a patient observer. The nest almost always consists of a hole. chiselled by the bird's strong beak, impelled by very powerful muscles, in the upright trunk or arm of a tree, the opening being quite circular, and continued as a horizontal passage that reaches to the core, whence it is pierced downward for nearly a foot. There a chamber is hollowed out in which the eggs, often to the number of six, white, translucent and glossy, are laid with no bedding but a few chips that may have not been thrown out. 3 The young are not only hatched entirely naked, but seem to become fledged without any of the downy growth common to most birds. Their first plumage is dull in colour, and much marked beneath with bars, crescents and arrowheads.*

Of generally similar habits are the two other woodpeckers which inhabit Britain — the pied or greater spotted and the barred or lesser spotted woodpecker — Dendrocopus major and D. minor — each of great beauty, from the contrasted white, blue-black and scarlet that enter into its plumage. Both of these birds have an extraordinary habit of causing by quickly- repeated blows of their beak on a branch, or even on a small bough, a vibrating noise, louder than that of a watchman's rattle, and enough to excite the attention of the most incurious. Though the pied woodpecker is a resident in Britain, its numbers receive a considerable accession nearly every autumn.

2 A patch of conspicuous colour, generally red, on this part is

characteristic of very many woodpeckers, and careless writers often call it " mystacial," or some more barbarously " moustachi'al." Considering that moustaches spring from above the mouth, and have nothing to do with the mandible or lower jaw, no term could be more misleading.

3 It often happens that, just as the woodpecker's labours are over, a pair of starlings will take possession of the newly-bored hole, and, by conveying into it some nesting furniture, render it unfit for the rightful tenants, who thereby suffer ejectment, and have to begin all their trouble again. It has been stated of this and other wood- peckers that the chips made in cutting the hole are carefully removed by the birds to guard against their leading to the discovery of the nest. The present writer, however, had ample opportunity of ob- serving the contrary as regards this species and, to some extent, the pied woodpecker next to be mentioned. Indeed there is no surer way of finding the nest of the green woodpecker than by scanning the ground in the presumed locality, for the tree which holds the nest is always recognizable by the chips scattered at its foot.

The three species just mentioned are the only woodpeckers that inhabit Britain, though several others are mistakenly recorded as occurring in the country — and especially the great black woodpecker, the Picus martins of Linnaeus, which must be regarded as the type of that genus. 1 This fine species considerably exceeds the green woodpecker in size, and except for its red cap is wholly black. It is chiefly an inhabitant of the fir forests of the Old World, from Lapland

to Galicia and across Siberia

to Japan. In North America

this species is replaced by

Picus pUeatus, there generally

known as the logcock, an

From Cambridge Natural History, vol. ‘ equally fine species, but varie-

ix., “Birds,” by permission of Macmiikn & gated with white; and farther

°” T l c , , ,, T , . to the southward occur two

Lesser Spotted Woodpecker. , ± . .,, n . .

that are nner still, P. princi- palis, the ivory-billed woodpecker and P. imperialis. The Picinae indeed flourish in the New World, nearly one-half of the described species being American, but of the large number that inhabit Canada and the United States we can mention only a few.

First of these is the Californian woodpecker, Melanerpes for- micivorus, which has been said to display an amount of providence beyond almost any other bird in the number of acorns it fixes tightly in holes which it makes in the bark of trees, and thus ” a large pine forty or fifty feet high will present the appearance of being closely studded with brass nails, the heads only being visible.” This is not done to furnish food in winter, for the species migrates, and only returns in spring to the forests where its supplies are laid up. It has been asserted that the acorns thus stored are always those which contain a maggot, and, being fitted into the sockets pre- pared for them cup-end foremost, the enclosed insects are unable to escape, as they otherwise would, and are thus ready for consump- tion by the birds on their return from the south. ˆ But this state- ment has again been contradicted, and, moreover, it is alleged that these woodpeckers follow their instinct so blindly that ” they do not distinguish between an acorn and a pebble,” so that they ” fill up the holes they have drilled with so much labor, not only with acorns but occasionally with stones ” (cf. Baird, Brewer and Ridgway, North American Birds, n. pp. 569-571).

The next North-American form deserving notice is the genus Colaptes, represented in the north and east by C. auratus, the golden- winged woodpecker or flicker, in most parts of the country a familiar bird, but in the south and west replaced by the allied C. mexicanus, easily distinguishable among other characteristics by having the shafts of its quills

red instead of yellow. It is curious, however, that, in the valleys of the upper Missouri and Yellowstone rivers, where the range of the two kinds overlaps, birds are found presenting an extraordinary mixture of the otherwise distinctive features of each.

Other North American forms are the downy and hairy wood- peckers, small birds with spotted black and white plumage, which are very valuable as destroyers of harmful grubs and borers; the red- headed woodpecker, a very handsome form with strongly contrasted red, black and white plumage, common west of the Alleghany Mountains; and the yellow-bellied woodpecker (" sapsucker ")•

Some other woodpeckers deserve especial notice — the Colaples or Snroplex campeslris, which inhabits the treeless plains of Paraguay and La Plata; also the South- African woodpecker Geocolaptes olivaceus, which lives almost entirely on the ground or rocks, and picks a hole for its nest in the bank of a stream (Zoologist, 1882, p. 208).

The woodpeckers, together with the wrynecks (q.v.), form a very natural division of scansorial birds with zygodactylous feet, and were regarded by T. H. Huxley as forming a distinct division of birds to which he gave the name Celeomorphae, whilst W. K. Parker separated them from all other birds as Saiirognathae. (A. N.)

WOODS, SIR ALBERT (1816-1904), English herald, son of Sir William Woods, Garter king-of-arms from 183S to his death in 1842, was born on the 16th of April 1816. In 1838 he became a member of the chapter of the Heralds' College, of which he was appointed registrar in 1866. In 1869 he was knighted and became Garter king-of-arms. In this capacity he was entrusted

1 The expression Picus martins _ was by old writers used in a very general sense for all birds that climbed trees, not only woodpeckers, but for the nuthatch and tree-creeper (qq-v.) as well. The adjective martins loses all its significance if it be removed from Picus, as some even respectable authorities have separated it.

with many missions to convey the order to foreign sovereigns; he was also registrar from 1S78 of the orders of the Star of India and of the Indian Empire; and from 1869 was king-of-arms of the order of St Michael and St George. He officiated at the coronations both of Queen Victoria and of King Edward VII., and his authority on questions of precedence was xinique. His later distinctions were K.C.B. (1897), K.C.M.G. (1899) and G.C.V.O. (1903). He died on the 7th of January 1904.

WOODS, LEONARD (1774-1S54), American theologian, was born at Princeton, Massachusetts, on the 19th of June 1774. He graduated at Harvard in 1796, and in 1798 was ordained pastor of the Congregational Church at West Newbury. He was prominent among the founders of Andover Theological Seminary „. and was its first professor, occupying the chair of Christian theo- logy from 1808 to 1846, and being professor emeritus until hip death in Andover on the 24th of August 1854. He helped to establish the American Tract Society, the American Education Society, the Temperance Society and the American Board of Commissioners for Foreign Missions. He was an orthodos Calvinist and an able dialectician. His principal works (5 vols., Andover, 1S49-50) were. Lectures on the Inspiration of the Scriptures (1829), Memoirs of American Missionaries (1833), Examination of the Doctrine of Perfection (1841), Lectures on Church Government (1843), and Lectures on Swedenborgianism (1846); he also wrote a History of Andover Seminary (1848), completed by his son.

His son, Lkonakd Woods (1807-1878), was born in West Newbury, Mass., on the 24th of November 1807, and gradu- ated at Union College in 1827 and at Andover Theological Seminary in 1830. His translation of Georg Christian Knapp's Christian Theology (1831-1S33) was long used as a text-book in American theological seminaries. He was assistant Hebrew instructor (1832-1833) at Andover, and having been licensed to preach by the Londonderry Presbytery in 1830 was ordained as an evangelist by the Third Presbytery of New York in 1833. In 1834-1837 he edited the newly established Literary and Theological Review, in which he opposed the "New Haven" theology. After being professor of sacred literature in the Bangor Theological Seminary for three years, he was president of Bowdoin College from 1839 to 1866, and introduced there many important reforms. From June 1867 to September 1868 Dr Woods worked in London and Paris for the Maine Historical Society, collecting materials for the early history of Maine; he induced J. G. Kohl of Bremen to prepare the first volume (1868) of the Historical Society's Documentary History, and he dis covered a MS. of Hakluyt's Discourse on Western Planting, which was edited, partly with Woods's notes, by Charles Dean in 1877. 'He died in Boston on the 24th of December 1878. He was a remarkable linguist, conversationalist and orator, notable for his uncompromising independence, his opinion that the German reformation was a misfortune and that the reformation should have been within the church.

See E. A. Park, Life and Character of Leonard Woods, Jr. (Andover,

1880).

Alva Woods (1794-1887), a nephew of the elder Leonard and the son of

Abel Woods (1765-1850), a Baptist preacher, graduated at Harvard in 1817 and at Andover Theological Seminary in 1821, and was ordained as a Baptist minister. In 1824-1828 he was professor of mathematics and natural philosophy at Brown University, acting as president in 1826-1827;. in 1828-1831 was president of Transylvania University, Lexington, Kentucky; and in 1831-1837 was president of the University of Alabama at Tuscaloosa, where he organized the Alabama Female Athenaeum. After 1839 he lived in Providence, R.I.

WOODSTOCK, a town and port of entry of Oxford county, Ontario, Canada, 80 m. S.W. of Toronto by rail, on Cedar creek, the Thames river and the Grajid Trunk and Canadian Pacific railways. Pop. (T901) S853. It is in one of the best agricultural sections of the province, and has a large export trade in cheese, butter and farm produce. Organs, pianos and agricultural implements are manufactured. Tt contains a resi- dential school, under the control of the Baptist church, affiliated with McMaster University; Toronto.

WOODSTOCK, a market town and municipal borough in the Woodstock parliamentary division of Oxfordshire, England, 72ˆm. W.N. W. of London, the terminus (Blenheim and Wood- stock) of a branch of the Great Western railway. Pop. (1901) 1684. The little river Glyme, in a steep and picturesque valley, divides the town into New and Old Woodstock. The church of St Mary Magdalene, in New Woodstock, is of Norman date, but has additions in the later styles, and a west tower built in 1785. The town-hall was erected in 1766 after the designs of Sir William Chambers. The picturesque almshouses were erected in 1798 by Caroline, duchess of Marlborough. The town rs dependent chiefly on agriculture, but a manufacture of leather gloves (dating from the 16th century) is carried on. Wood- stock is governed by a mayor, 4 aldermen, and 12 councillors. Area, 156 acres.

After the battle of Blenheim the manor of Woodstock was by Act 3 and 4 of Queen Anne, chap. 4, bestowed in perpetuity on John, duke of Marlborough. In 1723 it was destroyed, being already ruinous, and the site levelled after the erection of Blenheim House, a princely mansion erected by Parliament for the duke of Marlborough in consideration of his military services, and especially his decisive victory at Blenheim. The sum of £500,000 was voted for the purchase of the manor and the erection of the building, a huge pile built by Sir John Vanbrugh (q.v,), in a heavy Italo-Corinthian style. The greater part of the art treasures and curios were sold

in 1S86, and the great library collected by Charles Spencer, carl of Sunderland, the son-in-law of the first duke of Marlborough, in 1881. The magnificent park contains Fair Rosamund's well, near which stood her bower. On the summit of a hill stands a column commemorating the duke. Blenheim Park forms a separate parish.

*Domesday describes Woodstock (Wodestock, Wodestok', Wodc- stok) as a royal forest; it was a royal seat from early times and ˆEthelred is said to have held a council there, and Henry I. to have kept a menagerie in the park. Woodstock was the scene of Henry II. *s courtship of Rosamund Clifford (" Fair Rosa- mund ' ;). It was a favourite royal residence until the Civil War, when the manor house was " almost totally destroyed."*

In the Hundred Rolls of 1279 Woodstock is described as a vill, but a burgess is alluded to in the same document, and it returned two members to parliament as a borough in 1302 and 1305. A mayor of Woodstock was witness to a deed in 1398, but the earliest known charter of incorporation was that from Henry VI. in 1453, establish- ing the vill of New Woodstock a free borough, with a merchant gild and the same liberties and customs as New Windsor; and incorporat- ing the burgesses under the title of the " Mayor and Commonalty of the Vill of New Woodstock." The mayor and a serjeant-at-mace were to be elected by the commonalty, and an independent borough court was established for the trial of all civil actions and criminal offences. The borough was also exempted from the burden of sending repre- sentatives to parliament, but it again returned two members in 1553 and then regularly from 1570 until 1881, when the representation was reduced to one member. In 1885 the borough was dis- franchised. The charter of Henry VI. was confirmed by Henry VII., Edward VI. and Elizabeth, but before 1580, when an ordinance was drawn up for the government of the borough, the corporation had considerably developed, including a high steward, recorder, mayor, 6 aldermen, 20 common councillors, a town clerk and a crier of the court ; and the new charter granted by Charles IT. in 1665 did little more than confirm this corporation. The hamlet of Old Woodstock is said to have been founded by Henry I., and was never included within the borough. The existing Tuesday market is stated in the Hundred Rolls of 1279 to have been granted by Henry II. and the St Matthew's fair by John. The latter was confirmed in 1453, with the addition of a fair at the feast of St Mary Magdalen. Queen Elizabeth in 1565 granted to the mayor and commonalty a market on Friday, and two fairs of four days each at the feast of St Nicholas and Lady Day,

See Rev. E. Marshall, Early History of Woodstock Manor (Oxford, 1873); Adolphus- Ballard, Chronicles of Royal Borough of Wood- stock; Victoria County History, Oxfordshire.

WOODWARD, JOHN £1665-1728), English naturalist and geologist, was born in Derbyshire on the tst of May 1665. At the age of sixteen he went to London, where he studied with Dr Peter Barwick, physician to Charles II. In 1692 he was appointed professor of physic in Gresham college. In 1693 he was elected F.R.S., in 1695 was made M.D. by Archbishop Tenison and also by Cambridge, and in 1702 became F.R.C.P.

*While still a student he became interested in botany and natural history, and during visits to Gloucestershire his attention was attracted by the fossils that are abundant in many parts of that county; and he began to form the great collection with which his name is associated. His views were set forth in An Essay toward a Natural History of the Earth and Terrestrial Bodies, especially Minerals, 6 > *c. (1695; 2nd ed. 1702, 3rd ed. 1723). This was followed by Brief Instructions for making Observations in all Parts of ike World (1 696) . He was author also of A n A ttempt towards a Natural History of the Fossils of England (2 vols., 1728 and 1729). In these works he showed that the stony surface of. the earth was divided into strata, and that the enclosed shells were originally generated at sea; but his views of the method of formation of the rocks were entirely erroneous. In his elaborate Catalogue he described his rocks, minerals and fossils in a manner far in advance of the age. He died on the 25th of April 1728, and was buried in Westminster Abbey.*

By his will he directed that his personal estate and effects were to be sold, and that land of the yearly value of one hundred and fifty pounds was to be puchased and conveyed to the University of Cambridge. A lecturer was to be chosen, and paid £100 a year to read at least four lectures every year, on some one or other of the subjects treated of in his Natural History of the Earth. Hence arose the Woodwardian professorship of geology. To the same university he bequeathed his collection of English fossils, to be under the care of the lecturer, and these formed the nucleus of the Woodwardian museum at Cambridge. The specimens have since been removed to the new Sedgwick museum.

A full account of Woodward's life and views and a portrait of him are given in the Life and Letters of the Rev. Adam Sedgwick, by J. W. Clark and T. McK. Hughes, where it is mentioned that his paper, read before the Royal Society in 1699, entitled Some Thoughts and Experi- ments concerning Vegetation, " shows that the author should be ranked as a founder of experimental plant-physiology, for he was one of the first to employ the method of water-culture, and to make refined experiments for the investigation of plant-life."

See also The Lives of the Professors of Gresham College, by Jo'""n Ward (1740).

WOODWARD, SAMUEL (1790-1838), English geologist and antiquary, was born at Norwich on the 3rd of October 1790. He was for the most part self-educated. Apprenticed in 1804 to a manufacturer of camlets and bombazines, a taste for serious study was stimulated by his master, Alderman John Herring and by Joseph John Gurney. Becoming interested in geology and archaeology, he began to form the collection which after his death was purchased for the Norwich museum. In 1820 he obtained a clerkship in Gurney's (afterwards Barclay's) bank at Norwich, and Hudson Gurney and Dawson Turner (of Yarmouth), both fellows of the Royal Society, encouraged his scientific work. He communicated to the Archaeologia articles on the round church towers of Norfolk, the Roman remains of the country, &c, and other papers on natural history and geology to the Mag. Nat. Hist, and Phil. Mag. He died at Norwich on the 14th of January 1838. He was author of A Synoptical Table of British Organic Remains (1830), the first work of its kind in Britain; An Outline of the Geology of Norfolk (1833); and of two works issued post- humously, The- Norfolk Topographer's Manual (184.2) and The History and Antiquities of Norwich Castle (1847).

His eldest son, Bernard Bolingbroke Woodward (1816-1869), was librarian and keeper of the prints and drawings at Windsor Castle from i860 until his death. The second son, Samuel Pickworth Woodward (1821-1865), became in 1845 professor of geology and natural history in the Royal Agricultural College, Cirencester, and in 184S was appointed assistant in the depart- ment of geology and mineralogy in the British Museum. He was author of A Manual of the Mollusca (in three parts, 1851, 1853 and 1856).

S. P. Woodward's son, Horace Bolingbroke Woodward (b. 1848), became in 1863 an assistant in the library of the Geological Society, and joined the Geological Survey in 1867, rising to be assistant-director. In 1803-1894 he was president of the Geologists' Association, and he published many important works on geology. Samuel Woodward's youngest son, Henry Woodward

(b. 1832) became assistant in the geological department of the British Museum in 1858, and in 1S80 keeper of that depart- ment. He became F.R.S. in 1873, LL.D. (St Andrews) in 1878, president of the Geological Society of London (1804-1896), and was awarded the Wollaston medal of that society in iqo6. He published a Monograph of the British Fossil Crustacea, Order Merostomata (Palaeontograph. Soc. 1866- 1878); A Monograph of Carboniferous Trilobites (Pal. Soc. 1883-1884), and many articles in scientific journals. He was editor of the Geological Magazine

from its commencement in

1864.

Sec Memoir of S. Woodward (with bibliography) in Trans. Norfolk Nat. Soc. (1879), and of S. P. Woodward (with portrait and biblio- graphy), Ibid. (1882), by H. B. Woodward.

WOOL, WORSTED AND WOOLLEN MANUFACTURES.

*Wool is a modified form of hair, distinguished by its slender, soft and wavy or curly structure, and, as seen under the micro- scope, by its highly imbricated or serrated surface. At what point an animal fibre ceases to be hair and becomes wool it is impossible to determine, because the one by imperceptible gradations merges into the other, so that a continuous chain can be formed from the finest and softest merino to the rigid bristles of the wild boar. Thus the fine soft wool of the Australian merino merges into the cross-bred of New Zealand; the cross- bred of New Zealand merges into the long English and lustre wool, which in turn merges into alpaca and mohair-materials with clearly marked but undeveloped scale structure. Again, such animals as the camel and the Cashmere goat yield fibres, which it would perhaps be difficult to class rigidly as either wool or hair. **

Wool is one of the most important of the textile fibres. Owing to the case with which it may be spun into thread, and the com-

fort derived from clothing made of wool, it would Britain, naturally be one of the first textiles used by mankind

for clothing. Ancient records prove the high antiquity of wool textures and the early importance of the sheep. The different kinds of wool and the cloth made from them in antiquity are described by Pliny and referred to by other writers, and among the arts which the British Isles owe to the Romans not the least important is the spinning and weaving of wool. The sheep certainly was a domestic animal in Britain long before the period of the Roman occupation; and it is probable that some use was made of sheep skins and of wool. But the Romans established a wool factory whence the occupying army was supplied with cloth- ing, and the value of the manufacture was soon recognized by the Britons, of whom Tacitus remarks, " Inde etiam habitus nostri honor et frequens toga" {Agric. c. 21). The product of the Winchester looms soon established a reputation abroad, it being remarked that " the wool of Britain is often spun so fine that it is in a manner comparable to the spider's thread." This reputation was maintained throughout the middle ages, and the fibre was in great demand in the Low Countries and other continental centres. There are many

allusions to woollen manufactures in England in early times; but the native industry could not rival the products of the continent, although the troubles in various industrial centres, from time to time, caused skilled workers in wool to seek an asylum in England. In the time of William the Conqueror Flemish weavers settled under the protection of the queen at Carlisle, but subsequently they were removed to Pembrokeshire. At various subsequent periods there were further immigrations of skilled Flemish weavers, who were planted at different places throughout the country. The cloth fair in the church yard of the priory of St Bartholomew was instituted by Henry II.; gilds of weavers were established; and the exclusive privilege of exporting woollen cloth was granted to the city of London. Edwaid III. made special efforts to encourage wool industries. lie brought weavers, dyers and fullers from Flanders; he himself wore British cloth; but to stimulate native industry he prohibited, under pain of life and limb, the exportation of English wool. Previous to this time English wool had been in large demand on the continent, where it had a reputation exceeded only by the wool of Spain, The

customs duties levied on the export of wool were an important source of the royal revenue. Edward III.'s prohibitory law was, however, found to be unworkable, and the utmost that both he and his successors were able to effect was to hamper the export trade by vexatious restrictions and to encourage much smuggling of wool. Thus while Edward III. limited the right of exporting to merchant strangers, Edward IV. decreed that no alien should export wool and that denizens should export it only to Calais. Legislation of this kind prevailed till the reign of Elizabeth, when the free exportation of English wool was permitted; and Smith, in his Memoirs of Wool, points out that it was during this reign that the manufacture made the most rapid progress. In 1660 the absolute prohibition of the export of wool was again decreed, and it was not till 1825 that this law was finally repealed. The results of the prohibitory law were exceedingly detrimental; the production of wool far exceeded the consumption; the price of the raw material fell; wool-" running " or smuggling became an organized traffic; and the whole industry became disorganized. Extraordinary expedients were resorted to for stimulating the demand for woollen manufactures, among which was an act passed in the reign of Charles II. decreeing that all dead bodies should be buried in woollen shrouds — an enactment which remained in the Statute Book, if not in force, for a period of 120. years. On the opening up of the colonies, every effort was made to encourage the use of English cloth, and the manufacture was discouraged and even prohibited in Ireland.

It was not without reason that the attention of monarchs and legislators was so frequently directed to the wool industries. Wool was indeed " the flower and strength and revenue and blood of England," and till the

development of the cotton trade t towards the end of the iSth century, the wool industries were, beyond comparison, the most important sources of wealth in the country. Towards the close of the 17th century the wool produced in England was estimated to be worth £2,000,000 yearly, furnishing £8,000,000 worth of manufactured goods, of which there was exported about £2,000,000 in value. In 1700 the official value of woollen goods exported was about £3,000,000, and in the third quarter of the century the exports had increased in value by about £5oo,oooonly. In 1774 Dr Campbell {Political Survey of Great Britain) estimated the number of sheep in England at ro,ooo,ooo or 12,000,000, the value of the wool produced yearly at £3,000,000, the manufactured products at £12,000,000, and the exports at £3,000,000 to £4,000,000. He also reckoned that the industry then gave employment to 1,000,000 persons. These figures, in the light of the dimensions of present-day industries, may appear small, but they bore a predominant relationship to the other great sources of employ- ment and trade of the period. In 1800 the native crop of wool was estimated to amount to 06,000,000 lb; and, import duty not being imposed till 1802, the quantity brought from abroad was 8,600,000 lb, 6,000,000 lb of which came from Spain, In 1825 the importation of colonial wool became free, the duty leviable having been for several previous years as high as 6d. per lb, and in 1844 the duty was finally remitted on foreign wool also.

Sheep were introduced at Jamestown in Virginia in 1609, and in 1633 the animals were first brought to Boston. Ten years later a fulling mill was erected at Rowley, Mass., "by Mr Rowley's people, who were the first that set America. upon making cloth in this western world.'"' The factory woollen industry was, however, not established till the close of the iSth century, and if is recorded that the first carding machine put in operation in the United States was constructed in 1794 under the supervision of John and Arthur Schofield.

For centuries the finer wools used for cloth-making throughout Europe had been obtained from Spain— the home of the famous merino breed developed from races of sheep originally introduced into the Peninsula by the Moors. Till W ooh° early in the 19th century the superiority of Spanish merinos remained unchallenged, but the Peninsular War and its attendant evils produced a depreciation of quality concurrently

Wool la Australia.

with the introduction of Saxon and Silesian wools, which suddenly supplanted the product of Spain. The Spanish merino sheep had been

introduced into Saxony by the elector in 1765, and by judicious crossing with the best native race developed the famous electoral breed. Merinos were carried to Hungary in 1775, and to France in 1776, and in 1786 Daubehton brought them to Ram- bouillet, whence a famous race developed. In 1802 the first merinos known to have left pure descendants were taken to the United States, and in 1800-1810 an importation (4000) of merino sheep was made.

The introduction of the merino sheep into the United States was an important move, but its results are not to be compared with the results of the introduction of the merino sheep Yˆt'S- ' nto Australasia about the end of the 18th century and „;„, into South America a little later. It is probable that

the marked improvement in the appearance of the first sheep taken out by the early colonists suggested the possibilities of Australia as a wool-growing country. As has been noted above, marked endeavours were being made at this time to extend the merino breed of sheep, so that it was but natural that this breed should be given the first chance. That marked success did not attend the first endeavours is shown by the fact that the London Colonial Wool Sales originated in the necessity of selling Australian wools just for what they would bring under the hammer, as distinct from the private treaty method of selling and buying the more highly priced continental merinos. It should here be noted that the Australian fine wools were first shipped from Botany Bay, hence the now universal term " botany " for fine wools. The colonists were not to be repressed however, and eventually, through the endeavours of Captain MacArthur, Sir J. Banks, the Rev. Samuel Marsden and others, the merino breed became established on a firm basis, and in a comparatively short time Australian wools were no longer a drug on the market. The evolution was not to stop, however, with the development of merino flocks and the exporting of merino wool. No doubt early in the 1 9th century the possibilities of raising larger sheep on the better coastal pasturage was naturally suggested. Until about 1885 this tendency was largely repressed owing to the demand for merino as distinct from cross-bred wool. In other words wool was the dominating factor. But with the possibilities and the develop- ment of the frozen meat trade from 1880 to 1890 this condition was changed, and the tendency to breed a large sheep with a valuable carcass and mediocre wool grew apace. New Zealand was specially adapted for this development; thus New Zealand frozen mutton completely dominated New Zealand wool. In this manner it came about that cross-bred wool supplanted merino wool to a very considerable extent throughout Australasia. This change would have been serious for the wool comber and spinner had not the Bradford combers, spinners and manu- facturers put their shoulder to the wheel and developed a world- wide renown for their cross-bred tops, yarns and fabrics. Again the change was not altogether for the bad so far as the Australian sheep was concerned. Sheep-breeding developed into a real science, and remarkable results were obtained with such crosses as Merino-Lincoln, Merino-Leicester, Merino-Shropshire; all probably originating in the first place in the desire to produce a large-bodied early-fattening sheep, but later developing into a strenuous endeavour to develop more useful types of wools. Thus the wool produced from the first cross Merino-Lincoln

might be very defective judged from a pure merino stand- point, but by breeding back to the merino practically none of the useful merino characteristics were sacrificed, while length of staple was added and the weight of the fleece perhaps doubled.

A somewhat different evolution has taken place in later years with reference to the interior sheep stations. The merino sheep will thrive where a larger sheep would starve, hence its value for the stations where salt-bush dominates all vegetation. But the merino sheep is a " wool " sheep, not a " frozen mutton " sheep, hence all crossing here was carried out with the idea of simply developing the weight of fleece and if possible retaining

the merino wool characteristics. The most marked develop- ment in this direction was effected by the introduction of the United States merino or Vermont breed. Opinions differ as to the wisdom of this introduction. The weight of fleece carried per sheep has been remarkably increased, and the fact that up to the present weight multiplied by price per lb paid in London or elsewhere has been entirely in favour of first and second cross Vermonts, has undoubtedly influenced breeders in its favour Against this must be placed the fact that the Australian- Vermont merino cross produces a sheep of unstable physique, naturally unable to withstand drought, and — worst of all so far as London is concerned — producing a fleece very difficult to judge for yield of pure scoured wool. Again, the Australian- Vermont first cross is very liable to produce a very strong botany wool, while what is required is a long but fine wool technically termed a long and shafty 6o's to 64's quality.

Hardly second in importance to Australia as a w'ool-growing country comes South America, or more correctly Argentina along with Patagonia, Punta Arenas and the Falkland Islands. In most years Australia has produced the south' greater bulk, but just occasionally S. America has come America. out top and is likely to do so more frequently in the future owing to the remarkable developments there taking place. The history of the introduction of the merino sheep into S. America may be briefly summed up as follows. In 1842 Henri Solanet, a Frenchman, began to shear the comparatively few sheep round Buenos Aires. His example was soon followed by Edouardo Olivera and Jose Placer. The idea almost at once came to these pioneers of importing well-bred rams, and as S. America is essentially a Latin country it was but natural that the French flocks of Rambouillet should be first drawn upon. With the development of the meat trade — just as in the case of Australia and New Zealand — a larger carcass was then sought after. This led to the introduction of the Lincoln ram and the develop- ment of cross-bred flocks about the year 1885. Perhaps this cross was favoured owing to the skill of the Bradford spinners, who made excellent use of the cross-bred wool produced. Flocks

of sheep were first introduced into the Falkland Islands in 1867. The pasturage here being limited, the flocks have probably attained their limit, but from the Falkland Islands flocks have been passed on to Punta Arenas, where there is practically un- limited pasturage. The chief centres from which wool from S. America comes to Europe are Buenos Aires, which exports chiefly long and cross-bred wools, Montevideo, which exports chiefly merino wools, and the Falkland Islands and Punta Arenas, which export mostly wools of the finer type. The industry is largely in the hands of Englishmen. Unfortunately, however, the British manufacturer early took a dislike to the Buenos Aires, &c, wools, and consequently these wools go largely to the continent of Europe. To-day they by no means merit their previous bad name, and the Bradford comber and spinner are endeavouring to make up for lost opportunities.

Prior to the introduction of the merino sheep into Australia it had been introduced into S. Africa by the Dutch. There the climate was not so helpful as was that of Australia. The newly acclimatized sheep appears to have cast its south " wool at about the fifth generation and to have generally Africa. deteriorated, necessitating the reintroduction of fresh blood form Europe. In this manner have been developed the Cape flocks and the considerable Cape wool trade — largely centred at Port Elizabeth, East London, Cape Town, Mossel Bay and Port Natal. The country is evidently specially adapted for the rearing of the merino type oT sheep, as cross-bred Cape wool is practically unknown. The term snow-white Cape wool, on the other hand, betokens a quality of whiteness no doubt due to the atmospheric and pasturage conditions. Cape wools are also known as non-felting wools, and consequently are largely employed in the manufacture of flannels. In 1907 most marked endeavours were being made to develop the Cape flocks by the introduction of some thousands of Australian merino sheep. The opinion of wool experts was that the Cape had a great future before it as a wool-producing country.

Large quantities of wool also come from the East and from Russia, while even Iceland contributes its quota. It is interesting

to note that, notwithstanding all the developments in- other " stanced, Europe still maintains its supremacy as the countries, chief wool-producing continent, though, as the wool

is largely manufactured locally, one hears little of European wools.

The following statistics give an idea of the development of the colonial and foreign wool trade as gauged by the London wool sales:

say if finality weights :

has been reached. The following list gives average

Bales.

Bales.

1814 . .

■ • *165*

1870

■ . *673.314*

1824 . .

1,620

1890

. *1,509,666*

IS34 . .

16,926

1901

1,602,726

1840 . .

• ■ *44,502*

1903

■ – *1,319,365*

1850 . .

■ • *158,558*

It must not be forgotten, however, that a large quantity of S. American, W. Indian, Russian, &c, wools, along with mohair and alpaca, come through Liverpool, and consequently are not taken into account here.

With reference to wools grown in the United Kingdom the truth seems to be that a fine short wool has never been produced.

English wool is known the world over as being of a long wools, an d lustrous type, which was doubtless that so much in

demand in the middle ages. That it was as long and lustrous as the typical Leicester or Lincoln of to-day is doubtful, as the new Leicester breed of sheep was only fully developed by Mr Bakewell after the year 1747, and the latter day Lincoln was even a later development of a similar character. What the exact type of English wool or wools was prior to the 18th century will probably never be decided, but from the closing years of that century there is no difficulty in being fairly precise. As already remarked, the long and lustrous wools are the typical English, being grown in Lincolnshire, Yorkshire, Nottingham- shire, Devonshire, &c, in fact in all those districts where the pasturage is rich and specially fitted for carrying a heavy sheep. It is claimed that the lustre upon the wool is a direct result of the environment, and that to take a Lincoln sheep into Norfolk means the loss of the lustre. This is partially true, but it is perhaps better to take a larger view and remember that the two influencing factors are race and environment: which is the more potent it is impossible to say. Attempts were made in the 1 8th century to develop a fine wool breed in England, George IV. importing a number of merino sheep from Spain. The discovery was soon made that it was impossible to maintain a breed of pure merinos in Great Britain, but the final outcome was by no means unsatisfactory. By crossing with the in- digenous sheep a race of fairly fine woolled sheep was developed, of which the present day representative is the Southdown — a sheep which feeds naturally on the Downs of Sussex, &c, forming a marked contrast to the artificially turnip-fed Lincoln, Leicester, &c, sheep. Following the short, curly Southdown, but rather longer, come such as the Sussex, Oxford and Hampshire Down sheep; these are followed by such as the Shropshires and Shropshire crosses, Kent and Romney Marsh, until at last the chain from the Southdown to the Lincoln is completed. Of course there are several British wools not included in this chain. Scotch or black-face wool is long and rough, but well adapted for being spun into carpet yarns. Welsh wool has the peculiarity of early attaining its limit of shrinkage when washed, and hence is specially chosen for flannels. Shetland wool is of a soft nature specially suited for knitting yarns, while Cheviot wool — said to be a cross between merino sheep saved from the wreck of the Great Armada and the native Cheviot sheep — has made the reputation of the Scottish manufacturers for tweeds. North wool — wool from an animal of the Border Leicester and Cheviot breed — Ripon, Wensleydale and Teasdale wools are also specially noted as lustre wools, Ripon and Wensleydale wools being, by many judges, considered superior so far as lustre is concerned to Lincoln and Leicester.

Such remarkable advances have been made in the weights of fleeces carried by sheep of particular breeds that it is difficult to

Breed.

Weight of Average Fleece. Merino (Australian) 6 lb

Merino (South

American) . . 65 lb

Merino-Lincoln . 8-10 th

Breed.

Southdown Lincoln . Shetland Cashmere

Weight of Average Fleece.

68)

12 lb

4 lb 4 oz.

In 1885 the average weight of wool per sheep per year was about 5 lb, while 7 to 8 lb is now the average weight. Roughly speaking the weights of Australian fleeces are to-day about double as compared with 1885.

The prevailing colour of sheep's wool is white, but there are races with black, brown, fawn, yellow and grey shades of wool. For manufacturing purposes generally white wool is, physical of course, most valuable, but for the homespuns, which character- in earlier times absorbed the bulk of wool, natural istks o f colours were in many cases used with good effect. In domestic spinning, knitting, and weaving, natural colours are still largely taken advantage of, as in the cases of rough yams, Shetland knitted shawls, Highland tweeds, &c.

As has already been indicated, the distinction between wool and hair lies chiefly in the great fineness, softness, and waved delicacy of woollen fibre, combined with a highly serrated surface. These peculiarities are precisely the characters which give wool its distinctive value as a textile fibre, the mest distinctive character- istic of all being the serrated structure which specially belongs to wool and markedly aids the important property of felting, upon which many of its applications depend. The serrations of wool and the wavy structure it assumes are closely connected, those wools which have the greatest number of serrations being usually most finely waved in

structure. The appearance presented by wool under the microscope is shown in figs. 1-6 (Plate). Under the influence of moisture and pressure, aided by alkalis or acids, masses of wool thoroughly mat together, by the mutual inter- locking of the fibres. It is thus that the shrinking and thickening of woollen textures under washing is accounted for, the capacity of wool cloth for felting or fulling being due to this condition of the fibre, possibly along with a certain shrinkage of the true fibre mass. The serrations are most numerous, acute, pointed and distinct in fine merino wools, as many as 2800 per in. being counted in specimens of the finest Saxony wools. In the Leicester wool of England, on the other hand, which is a long bright staple, the serratures are not only much fewer in number, counting about 1800, but they are also less pronounced in character, so that the fibre presents a smoother, less waved character. In some inferior wools the serrations are not so many as 500 per in. A similar difference may be noted in the fineness of the fibres. The finest wool has a diameter of from xnVtf to xiTViy in., whilst coarse Algerian wools may rise to a maximum diameter of about -yˆ hi.

Other distinguishing qualities of good wool consist in uni- formity and strength of fibre with freedom from tender or weak portions in its length, a condition which not unfrcquently arises from ill health in the sheep, or is due to violent climatic changes. In ill-bred wool there may also be found intermingled " kemps " or dead hairs — straight, coarse, dull fibres which show con- spicuously among the wool, and become even more prominent in the manufactured and dyed goods, as they will not take dye. Wool also possesses a softness of touch and an elasticity both in the raw and manufactured condition which distinguish it from all other fibres. In length of staple it varies very much, attaining in combing wools to a length of as much as 1 5 to 20 in.

In dealing with wool from a practical point of view it must be recognized that it is by no means a simple body, but has a somewhat complex physical structure. Its composi- chemical tion in the raw state may be said to be threefold. character- Thus, there is the wool-yolk — what may be termed a £ˆ 0/ natural impurity; the wool-fat, which is not only present in the yolk but also permeates the fibre and seems to give it its plastic and soft handle; and the cell structure proper of the fibre. The natural impurity or wool-yolk is truly a skin product and is a protector of the wool-fibre rather than part of the true fibre substance. The wool-fat also may be regarded as

independent of the true fibrous substance, but it is well to recognize that if the wool-fibre be entirely freed from the wool-fat it loses its plastic and elastic nature and is considerably damaged. In cleansing wool the true fibre

mass may be disturbed and partially destroyed not only by dry but also by " wet " heat, and may be entirely disintegrated by means of alkalies, &c, with heat. The wool-fibre will almost free itself from the natural impurities — the yolk — in the presence of tepid water. This is taken advantage of in the various steeping machines placed on the market, which partially scour the wool by means of its own yolk — principally through the potash salts present.

According to Hummel the composition of the average wool-yolk is as follows : —

Moisture^ . . . 4to24%|Dirt . . ". . 3 to 24% Yolk . .' . . 12 „ 47% I Wool-fibre. . . 15 „ 72%

The potash salts are usually recovered from the wash-water products and a marked economy thereby effected.

The natural wool-fat — popularly known as " lanoline " — may be partially got rid of in the steeping process, but it is almost invariably necessary to free the wool still further from it by actually scouring the wool on either the " emulsion " or " solvent " method, in either case the action being largely physical. As previously pointed out, however, all the wool-fat must not be taken away from the fibre, or the fibre will lose its " nature." According to Dr Bowman, the chemical composition of the cell structure of the average wool-fibre is: —

Carbon 50-8

Hydrogen 7-2

Nitrogen 18-5

Oxygen 21-2

Sulphur . . . 2-3

It is said to be a most complex body of which the probable formula is CwHisrNsSOis.

If wool is burnt, it largely resolves itself into ammonia gas — whence it derives its characteristic odour — and carbon "beads" or "re- mains," which serve to distinguish wool from cotton, which, upon being burnt, does not smoulder but burns with a flash and leaves no beads. For further particulars on the organic nature of the wool- fibre see Fibres.

The bulk of the wool of commerce comes into the market in the

form of fleece wool, the product of a single year's growth, cut from

the body of the living animal. The first and finest clip,

Lamb, called lambs' wool, may be taken from the young sheep at

Wˆth about theage of eight months. When the animal is not*

e er shorn till it attains the age of twelve or fourteen months w0 ° ' the wool is known as hogg or hogget, and, like lambs'

wool, is fine and tapers to a point. All subsequently cut fleeces are known as wether wool, and possess relatively somewhat less value than the first clip. Fleece wool as it comes into the market is " in the grease," that is, unwashed and with all the dirt which gathers to the surface of the greasy wool present ; or it is received as " washed " wool, the washing being done as a preliminary to the sheep-shearing, or, in some few cases, it is scoured and is consequently stated as "_ scoured." Skin wool is that which is obtained from sheep which either die or are killed. Typical skin wool is that which has been removed by a sweating process. The worst type of skin wool — technically known as " slipe " — is removed from the skins by lime, which naturally affects the handle of the wool and renders it difficult to bring into a workable condition later. Mazamet in France is the great continental centre for skin wools.

Where there is abundance of water and other conveniences it is the practice to w f ash or half-wash sheep previous to shearing, and such wool comes into the market as washed or half-

*washintr was hed fleece. The surface of a fleece has usually a thick ** coating of dirt, and in the case of merino breeds the fleece surface is firmly caked together into solid masses, from the adhesion of dirt to the wool constantly moist with the exudation from the skin of the greasy yolk or " suint," so that in an unwashed very greasy fleece 30% of weight may represent dirt, and about 40% the greasy suint which lubricates the wool, while the pure wool is not more than one-third part of the whole. Where running streams exist, the sheep are penned by the side of the water, and taken one by one and held in the stream while they are washed, one man holding and the other washing. The operation is objectionable in many ways, as it pollutes the stream, and it dissipates no mean amount of potash salts, valuable for manure or for other chemical purposes. Sheep washing appliances are now largely employed, the arrangement consisting of a pen into which the sheep are driven and subjected to a strong spray of water either hot or cold, which soaks the fleece and softens the dirt. This done, they are caused to swim along a tank which narrows towards the exit, and*

just as they pass out of the pen they are caught and subjected to a strong douche of pure water. They should then be kept

on grass land free from straw, sand, &c. f so that the woo. may be sheared free from vegetable matter, &c. AEter a few days the wool of a washed sheep is sufficiently dry for shearing or clipping.

The relative advantages of shipping wool in the greasy or washed state have been fiercely debated. Although there are naturally exceptions, the superiority of greasy wool is now generally recognized. This is not only because the wool more fully retains its nature, but because it is more readily judged for " yield " and its spinning qualifies are, perhaps, more readily estimated.

The following list gives an idea of the yield in clean wool of the chief commercial varieties, from which it will be noted that roughly merino greasy wool yields about 50% clean wool and English about 75 % clean wool.

Type of Wool. Yield per cent of

Clean Wool.

Australian Merino 50%

Cape „ 48 %

South American Merino 45%

New Zealand Cross-bred 75%

South American Cross-bred 75%

English Southdown 80%

,, Shropshire 80%

„ Lincoln 75%

Mohair 85%

Alpaca 85 %

A skilful shearer will clip the fleece from a sheep in one unbrokeo continuous sheet, retaining the form and relative positions of the mass almost as if the creature had been skinned. In this _. unbroken condition each fleece is rolled up by itself and s i,t a rinr tied with its own wool,

*which greatly facilitates the sorting ^**

or stapling which all wool undergoes for the separation of the several qualities which make up the fleece. Mechanical shears have almost revolutionized the shearing industry, a good shearer shearing from 100 to 200 sheep per day.

On the great Australian sheep stations wool classing is one of the most important operations, largely taking the place of sorting in the English wcol trade. This is no doubt due to the wonderful w . success which has attended the efforts of the Australian classia sheep breeders to breed a sheep of uniform staple through- out. Thus the fleeces as taken from the sheep are skirted and trimmed on one table and then passed on to the classer, who places them in the 56's, 6o's, 64/s, 70's, 8o's or 90's class according to their fine- ness, these numbers approximately indicating the worsted counts to which it is supposed they will spin. The shorter Australian wools not coming under any of these heads are classed as super-clothing, ordin- ary clothing, &c, being more suitable for the woollen industry.*

The art of sheep shearing, skirting, classing, packing and trans- porting has been brought up to a wonderful state of perfection in Australia, and the " get up " of the wool is usually much superior to the " get up " of the " home-clip." Of late there has been an outcry against the prevalence of vegetable matter in colonial wools, but it seems probable that with the adoption of a suitable woolpack, and the exercising of a little more care in sorting at the home end, this difficulty will be satisfactorily surmounted.

Sorting or stapling was formerly a distinct industry, and to some extent it is so still, though frequently the work is done on the premises of the comber or spinner. Carding wools are ,,, separated and classed differently from combing wools, and °Z }

in dealing with fleeces from different breeds, the classifica- soring, tion of the sorter varies. In the woollen trade short-staple wool is separated into qualities, known, in descending series from the finest to the most worthless, as picklock, prime, choice, super, head, seconds, abb and breech, and the proportions in which the higher and lower qualities are present are determined by the " class " of the fleece. In the worsted trade the classification goes, also in descending series, from fine, blue, neat, brown, breech, downright, seconds, to abb for English wools. The last three are short and not commonly used in the worsted trade. The greater proportion of good English long wool will be classified as blue, neat and brown; it is only in exceptional cases that more than from 5 to 8 % is " fine " on the one hand, or of lower quality than breech on the other. Generally speaking, the best portion of a fleece is from the shoulders and side of the animal.

The quality decreases towards the tail end of the sheep, the " britch " being frequently long, strong and irregular. The belly wool is short, worn and dirty, as is also the front of the throat, while on the head and shins the product is short, stiff and straight, more like hair than wool and is liable to contain grey hairs. The colonial wools come " classed," and consequently are only as a rule sorted into three or four qualities. Thus a 6o's fleece may be sorted into 56's, ordinary 6o's, super 6o's and skirtings.

The sorter works at a table or frame covered with wire netting through which dust and dirt fall as he handles the wool. Fleeces which have been hard packed in bales, especially if unwashed, go into dense hard masses, which may be heated till the softening of the yolk and the swelling of the fibres make them pliable and easily opened up. When the fleece is spread out the stapler first divides it into two equal sides; then he picks away all straws, large burrs, and tarry frag- ments which are visible; and then with marvellous precision and certainty he picks out his separate qualities, throwing each lot into

WOOL, WORSTED, AND WOOLLENS

Plate.

Fig. 4.— ALPACA WOOL HAIR (X320;.

Fir. 2. LEICESTER WOOL (X.',2o).

X

Fig. 3— NEW ZEALAND CROSS-BRED WOOL (X320). Fig. 6.- AUSTRALIA MERINO WOOL (X320).*

Photomicrographs of the moat representative hairs and wools used in the textile industries.

XXVIII So.*

WOOL, WORSTED AND WOOLLEN MANUFACTURES 809

Neck

its allotted receptacle. Sorting is very far removed from being a mere mechanical process of selecting and separating the wool from certain parts of the fleece, because in each individual fleece qualities and proportions differ, and it is only by long experience that a stapler is enabled, almost as it were by instinct, rightly to divide up his lots, so as to produce even qualities of raw material. Cleanliness is most essential if the wool sorter is

to keep his health and not succumb to the dread disease known as " anthrax " or " wool-sorters' disease." Certain wools such as Persian, Van mohair, &c, are known to be very liable to carry the anthrax bacilli, and must be sorted under the con- ditions imposed by government for " dangerous wools." Ordinary or non-dangerous wools are perfectly harmless from this point of view.

The washing which a fleece may have received on the live sheep is not sufficient for the ordinary purposes of the manufacturer. On the careful and complete manner in which scouring is Scouring, effected much depends. The qualities of the fibre may be seriously injured by injudicious treatment, while, if the wool is imperfectly cleansed, it will dye unevenly, and the manufactur- ing operations will be more or less unsatisfactory. The water used for scouring should be soft and pure, both to save soap and still more

because the insoluble lime soap formed in dissolving soap in hard water is de- posited on the wool fibres and becomes so fixed that its removal is a matter of ex- treme difficulty. In former times stale urine was a favourite medium in which to scour wool; but that is now a thing of the past, and a specially prepared potash soap is the detergent prin- cipally relied on. Excess of alkali has to be guarded against, since uncombined caustic acts energetically on the wool fibre — especially in the presence of heat — and is indeed a solvent of it. A soap solution of too great strength leaves the wool harsh and brittle, and the same detrimental result arises when the soapy solu- tion is applied too hot.

In former days, when the method of hand-scouring

—Qualities of Wool in a Lincoln Fleece.

*_. . . ,. , * ..ˆ – prevailed, the wool to be*

The numbers mdicate the quality of washed was olaced with hot

, , . , . – washed was placed with hot

wool taken from the respective section3 soaped in a large scouring of the fleece. Thus the finest quality « fo v y – or vatp and tw ° -44's— 1S found on the shoulders, while men with { leg k t

the coarsest bntch is found on the stirring it gent i y about t \ n hind- quarters of the sheep. the detergent loosened and

separated the dirt and dis- sociated the grease. The wool was then lifted out and drained, after which it was rinsed in a current of clean water to

remove the " scour " and then dried. These operations are now performed in scouring machines. Many firms now steep the wool previous to the true scouring operation, the object being to scour the wool with its own potash salts, to obtain wash-waters so fully charged with the potash salts that these salts, &c, may be readily extracted and put to some good use, and lastly to save the artificial scouring agent employed in the true scouring operation. The scouring of wool has passed through many vicissitudes during the past fifty years, but to-day the principle upon which all scouring machines are based is that wool naturally opens out in water. The mechanical arrangements of the machines are such as to ensure the passage of the wool without undue lifting and " stringing," to obviate the mixing of wool grease, sand, dirt, &c, once taken out of the wool with that woo! again, to give time for the thorough action of the scouring agents, so that neither too strong a solution nor too great a heat be employed, and to allow of the ready cleansing of the machines so that there is no unnecessary waste of time. In England the recognized type of merino wool-washing machine is the fork-frame bowl. Three to five of these machines are employed. The " scour " is strongest and hottest in the first bowl (unless this is used as a " steeper ') as the wool at first is protected from the caustic by the wool-fat, &c, present. The last bowl is simply a rinsing bowL With modern " nip rollers " botany wool is sufficiently dry to be passed on directly — say by pneumatic conveyers — to the carding. This the worsted spinner does, thereby saving time and money. The woollen spinner, however, may require the wool for blending, and so may require it dry and in a fit state for oiling. He, therefore, will employ one or other of the drying pro- cesses to be immediately described. For English and cross-bred wools more agitation in the scouring bath may be desirable. If so, the eccentric fork action machine is employed, in which the agitation of the bath is satisfactorily controlled by the setting of the forks which propel the wool forward. An average wool will be in the

scouring liquor about eight minutes, the temperature will vary from 120 F. to 1 io° F., and the length of bath through which it will have passed will be from 48 to 60 ft.

It is interesting to note that the " emulsion " method of wool scouring as described above is practically universal in England. In the United States of America the " solvent " method is largely in use, for the two points aimed at are quantity of production and cheapness. Quality is sacrificed to quantity and cheapness results from the ease with which the agent employed — say carbon disulphide — is recovered by volatilizing and condensing, thus being usea over and over again.

Botany wools should leave the wool-washing machine in a fit condition to be fed immediately on to the carder, provided that the first cylinders are

clothed with galvanized wire. Cross-bred and English wool, however, require artificially drying.

The more gently and uniformly the drying can be effected the better is the result attained ; over-drying of wool has to be specially guarded against. By some manufacturers the wool from wool the squeezing rollers is whizzed in a hydro-extractor, drying. which drives out so much of the moisture that the further drying is easily effected. The commonest way, how r ever, of drying is to spread the wool as uniformly as possible over a framework of wire netting, under or over which is a range of steam-heated pipes. A fan blast blows air over these hot pipes, and the heated air passes up and is forced upwards through the layer of wool which rests on the netting or downwards, as the case may be. In this case, unless the wool is spread with great evenness, it gets unequally dried, and at points where the hot air escapes freely it may be much over-dried. A more rapid and uniform result may be obtained by the use of the mechanical wool drier, a close chamber divided into horizontal com- partments, the floors of which have alternate fixed and movable bars. Under the chamber is a tubular heating apparatus, and a fan by which a powerful current of heated air is blown up the side of the chamber, and through all the shelves or compartments successively, either following or opposing the wool in its passage through the machine. The wool is introduced by a continuous feed at one side of the chamber; the strength of the blast carries it up and deposits it on the upper shelf, and by the action of the movable bars, which are worked by cranks, it is carried forward to the opposite end, whence it drops to the next lower shelf, and so on it travels till at the ex- tremity of the lower shelf it passes out by the delivery lattice well and equally dried. Another drying machine in extensive use is what is known as the " Jumbo Dryer." This consists of a large revolving cylinder or churn which turns over the wool — as a churn turns butter — and owing to its inclination passes it from one end to the other. A hot air blast follows the wool through the machine. In this and in all drying machines it is more important to get the moisture laden air away from the wool than to develop a great heat.

The dried wool may be in a partially matted condition. If so, it must be opened out and the whole material brought into a uniformly free and loose condition. This is effected in the Willey, Teasing. which consists of a large drum and three small cylinders mounted in an enclosed frame. The drum is armed with ranges of powerful hooked teeth or spikes, and is geared to rotate with great rapidity, making about 500 revolutions per minute. The smaller cylinders, called workers, are also provided with strong spikes; they are mounted over the drum and revolve more slowly in a direction contrary to the drum, the spikes of which just clear those of the workers. The wool is fed into the drum, which carries it round with great velocity ; but, as it passes on, the locks are caught by the spikes of the workers, and in the

contest for possessing the wool the matted locks are torn asunder till the whole wool is delivered in a light, free and disentangled condition. It is a debatable point as to whether willowing should precede scouring. Some scourers always willow prior to scouring, while others never subject the wool to this opera-, tion, which is advantageous in some cases and not in others.

For certain classes of wool, notably Buenos Aires, still another preparing operation is essential at this stage — that is, the removal of burrs or small persistently adherent seeds and other Barring. fragments of vegetable matter which remain in the wool. Two methods of effecting this — one chemical, the other mechanical — may be pursued. The chemical treatment consists in steeping the wool in a dilute solution of sulphuric acid (or other carbonizing agent), draining off the dilute acid by means of the hydro extractor, and then heat-drying in a temperature of about 250 F. The acid leaves the wool practically uninjured, but is concentrated on the more absorbent vegetable matter, and the high heat causes it to act so that the vegetable matter becomes completely carbonized. The burrs are then crushed and the wool washed in water rendered sufficiently alkaline to neutralize any free acid which may remain, and dried. The same burr-removing effect is obtained by the use of a solution of chloride of aluminium, a method said to be safer for the wool and less hurtful to the attendant workmen than is the sulphuric acid process. For mechanical removing of burrs, a machine some- thing like the Willey in appearance is employed. The main feature of this apparatus is a large drum or swift armed with fine short spikes curved slightly in the direction in which it rotates. By a series of beaters and circular brushes the wool is carried to and fed oft these short spikes, and in its rotation the burrs, owing to their weight, hang out from the swift. The swift as it travels round is met by a

series of three burring rollers rotating in an opposite direction, the projecting rails of which knock the burrs off the wool. The burrs fall on a grating and are ejected, with a certain amount of wool ad- hering Lo them, by another rotating cylinder. With wools not too burry the worsted spinner largely depends upon burring rollers placed upon the first cylinder of the " carder," and possibly to one or other of the patent pulverizing processes applied further on in the card. In the latter process a complete pulverizing of the burrs is aimed at, this being effected by the introduction of specially con- structed pulverizing rollers between the first doffer and the last swift of the carding engine.

The processes hitherto described are common to merino, cross-bred or botany wools be they intended for w r oollen or worsted yarns

*From this point, however, differentiation starts. Wool aad COS mav 11QW ˆ e manipulated with the idea of converting it worsteds, mto * e ˆ W- 1 '-). woollen or worsted fabrics. In a general*

way it may be said that woollen yarns are those made from short wools possessed of high felting qualities, which are prepared by the process of carding; whereby the fibres are as far as possible crossed and interlaced with each other, and that the card ed-sli vers, though perhaps hard spun on. the mule frame, form a light Huffy yarn, which suits the conditions when woven into cloth for being brought into the semi-felted condition by milling which is the dis- tinguishing characteristic of woollen cloth. On the other hand, worsted yarns are generally made from the long lustrous varieties of wool; the fibres are so combed as to bring them as far as possible parallel to each other; the spinning is usually effected on the frame, and the yarn is spun into a compact, smooth and level thread, which, when woven into. cloth, is not necessarily milled or felted. At all points, however, woollen and worsted yarns as thus defined overlap each other, some woollens being made from longer wool than certain worsteds, and some worsteds made from short staple wool, carded as well as combed. Worsted yarn is now largely spun on the mule frame, while milling or felting is a process done in all degrees — woollen being sometimes not at all milled, while to some worsteds a certain milled finish is given. The fun- damental distinction between the two rests in the crossing and interlacing of the fibres in preparing woollen yarn — an operation confined to this alone among all textiles, while for worsted yarn the fibres are treated, as in the case of all other textile materials, by processes designed to bring them into a smooth parallel relation- ship to each other.

To obtain a sliver which can be satis- factorily spun into a typical woollen thread Woollen tne following operations are

necessary: widowing, oiling and

blending, teasing, carding (two » ' or three operations), condensing and roving. Spinning

3 u ' upon the woollen mule completes the series of operations all of which are designed to lead up to the desired result. Of the foregoing operations the carding is perhaps the most important as it is certainly one of the most interesting. At the same time it must be fully realized that deficiencies in any one of these operations will result in bad work at every subsequent process. For example, let an unsatisfactory combination of materials be _ blended together and there will be trouble in both carding and spinning. The roving opera- tion included above is not always necessary. In the old days, if a really fine thread were required, roving was absolutely necessary,

as the carder could not turn off a sliver tine enough to be spun at one operation. To-day, however, with the " tape " condensers, such fine slivers can be turned off the condenser that there is no difficulty in spinning directly to the required count. In some few cases, however, it may be cheaper to rove than to condense fine; again, certain physical characteristics appertain to the roved thread, as distinct from the condensed thread, which may occasionally be of use to the cloth constructor.

*At the beginning of the 19th century woollen cloths were made of wool — some of them of the very finest wool obtainable. To-day _, ,, woollen cloths are made from any and every kind of 17 * material, of which the following are the most important:*

noils (botany, cross-bred, English, alpaca and mohair),

mungo, shoddy, extract, flocks, fud (short mill waste), cotton sweeping, silk waste, &c, etc.; in fact it is said that anything which has two ends to it can be incorporated into a woollen thread ■ and cloth. It does not follow, however, that all woollen cloth is cheap and nasty. On the contrary the west of England still pro- duces the finest woollen fabrics of really marvellous texture and beauty, and Batley, Dewsbury. &c, produce many fabrics which are certainly cheap and yet anything but nasty. The first essential for blending is that the materials to be blended should be fairly finely divided. This is effected by passing each material, if necessary, through the willow or through the " fearnaught " — a machine coming between the willow and card—prior to beginning the "blend-stack." Sometimes it may be that a blending of different colours of wools to obtain a definite " colour mixture " is necessary, more often it will

be a blending of various materials, such as noils, mungo, cotton, &c, to obtain a cheap blend which may be spun into a satisfactory warp or w r eft yarn. The blender proceeds as follows: first a layer of No. 1 material—say wool — is spread over the required area on the floor; it is then lightly oiled. A layer of No. 2 material — say noils — is now added to the first layer; then another layer of wool with rather more oiling; then No. 2, then No. 1 with still more oil until all the material is built up into layers in the stack. The stack is now beaten down sideways with sticks, and then the more or less mixed mass is passed through the willow and fearnaught still further to mix it prior to carding, where the true and really fine mixing takes place. After passing through the fearnaught the material is sheeted and left to " mellow," this no doubt consisting in the oil applied distributing itself throughout the material. If wool and cotton are blended together the wool must be oiled first, or the blend w r ill not work to the greatest advantage. The oil may be best Gallipoli olive oil — which should not turn rancid—

but there are many good oils — and un- fortunately many bad oils — placed on the market at a reasonable rate which the really skilled judge may use to advantage. The per- centage of oil varies from 2 % to 10 % — this remark applies both to the woollen and worsted trades — and there is no guide as to the amount required, saving and excepting experience, observation and common sense. Automatic oiling arrangements have been applied in the woollen trade with only a moderate amount of success, the sprinkling of the oil by means of a watering-can on the stack, made as described above, still being most in favour. The oil serves to lubricate the fibres, and to render them more plastic and consequently more workable, and to bind the fibrous mass together and thus pre- vent " fly " during the passage through the cards.

Carding was originally effected by hand, two flat boards with con-

and oiling.

-Sectional View of Carder; illustrating the principles of carding.

*venient handles, covered with teeth or card clothing, serving as a means of teasing out lock by lock, fibre by fibre, reversing root to tip and tip to root, so that a perfect mixing of the fibres re- c „->_ suited. It was but natural that, when an attempt was made a ** to render the carding operation more;mechanical, the operation should be converted into a continuous one* through the adoption of rollers in place of flats. Flats combined with rollers still maintain their position in cotton carding, but in wool carding the pure roller card is employed. The factors of carding are size of rollers, speeds of rollers, inclination of teeth and density of card clothing. Probably no operation in the textile industries is so little understood as carding. Thus the long wool carder would think a man an idiot who suggested the running of the teeth of the various cylinders actually into one another, while the short mungo carder regularly carries out this idea, and soon. The underlying principle of carding, however, is shown in fig. 8,in which a sectional drawing of part of a card is given. The wool is carried into the machine on a travelling lattice and de- livered to the feed rollers A, A', A" of which A and A" in turn are stripped by the licker-in B working at a greater speed point to smooth side. This in turn is stripped by the angle stripper C again w r orking at a greater speed point to smooth side, which in its turn is stripped by the swift D — the " carrying -forward " and swiftest carding cylinder in the machine. The swift carries the wool forward past the stripper E— -which as a matter of fact is stripped by the swift still working point to smooth side — into the slowly retreating teeth of the first worker F, which, being set a fair distance from the swift, just allows well laid-down wool to pass, but catches any projecting and uncarded staples. The worker in its turn is stripped by the stripper E', which in turn is*

stripped by the swift as already described. The passage of the wool forward through the machine depends upon its being carried past each worker in turn. Thus from beginning to end of a machine the workers are set closer and closer to the swift, so that the last worker only allows com- pletely carded wool to pass it. Immediately on passing the last worker F' the wool is brushed up on the surface of the swift by the " fancy " G — as a rule the only cylinder whose teeth actually work into the teeth of the swift and the only cylinder with a greater surface speed than the swift. The swift then throws its brushed-un

coating of wool into the slowly retreating teeth of the doffer H, which carries it forward until angle stripper C strips the doffer, to be in its turn stripped by swift D' and so on. Thespeeds of the cylinders are in the first pla.ee obviously dependent upon the principle of carding adopted, the greater speed always stripping (save in the case of the fancy). As to whether the speed shall be obtained by actual revolutions or by a larger diameter of cylinder depends upon the nature of the wool to be carded (long or short), the part which each cylinder has to play in the card, and upon the question of wear of clothing and power consumed. As a rule the strippers are all driven from a smaller circumference of the swift to obtain conveni- ently the necessary reduction in speed, and the slowly revolving workers are chain driven from the doffer, which indirectly receives its motion from the swift. The principles involved in the relative inclinations of teeth are very apparent, bu_ the principles involved in the relative densities of teeth on the respective cylinders are again much involved and little understood.

A complete scribbler or first card engine consists of a breast, or small swift, and two swifts with the accompanying workers, strippers, fancies, doffers, &c. The wool is stripped from this card as a thin film by means of the doffing comb. This is usually weighed on to the next machine — whether intermediate or condenser — a given weight giving a definite count of condensed sliver. Should an intermediate be employed, there must be an automatic feed, taking the wool, as stripped from the last doffer of the intermediate, and feeding it perfectly evenly on to the feed sheet of the condenser. The con- denser is usually a one-swifted card, the only difference in principle being that, whereas the sliver comes out of the scribbler or inter- mediate in one broad film, it is broken up into a number of small continuous slivers or films, each one of which will ultimately be drafted or drawn out and twisted into a more or less perfect thread. These slivers — which are delicate and pith-like in substance — are wound on to light bobbins, and these bobbins are placed on the mule for the final roving and spinning operations. There are many forms of condensing mechanisms

such as the single-doffer, the double- doffer and the tape-condensers, but their construction is too complex to be described here. Whatever the type may be, the result is that noted above, but it should be noted that the tape enables a much finer sliver to be taken from the card than is possible with either the single- or double-doffer condenser.

The principles involved in mule spinning are comparatively simple,

but the necessary machinery is very complex; indeed it is question-

able if a more ingenious machine than the mule exists.

" e The pith-like slivers received from the card-loom must be

spaaag, attenuated until the correct count of yarn is obtained; they must be twisted while this attenuation or drafting is in process, otherwise they would at once break; and after being attenuated to the required finenessthe requisite number of turns must be inserted. Great stress must be laid on the effects of what is termed the " draft- ing-twist " noted above; it is probably this simultaneous drafting and twisting which develops the most pronounced characteristics of the woollen yarn and cloth, and differentiates it entirely from the

strengthens them and thus from beginning to end equalizes the

thread. Upon the completion of drafting the spindles are thrown on to " double_speed " to complete the twisting of the 72″ of yarn just spun as rapidly as possible, the carriage being allowed torun inwards for a few inches, to allow for the take-up due to twisting. The mule now stops dead, baeks-off the turns of yarn from the bottom of the spindle to the top,_the faller H wire falls into position to guide the thread on to the spindle to form the required cop G, and the counter- faller I wire rises to maintain a nice tension on the yarn. The carriage now runs in, the spindles being revolved to wind up the yarn, and, in conjunction with the guiding on of the faller wire, builds up a firm cop or spool, as the case may be.

Woollen mules are made with several hundred spindles and of varying pitch to suit particular requirements. Thus if the mules are to follow a set of say three carders with a tape condenser, and are required to spin fine counts, the pitch of the spindles may be much finer than ordinary, but a greater number will be required to work up the sliver delivered by the set of machines. There are many other details which require careful consideration; the inclination of the spindles, for example, must be suited to the material to be spun. And when all the mechanical arrangements are perfect there is still the necessity of correct judgment as to the qualities of the blend in hand, for in this case perhaps more than in any other the

machine must be adjusted to the material and not the material to the machine.

F "F

Fig. 9. — Sectional View of the Woollen Mule. worsted yarn and cloth. The mule (see fig. 9) consists of the de- livery cylinders A, upon which the sliver bobbins B from the con- denser are placed, which deliver the slivers as required to the front delivery rollers C (these rollers controlling perfectly the delivery of sliver for each stretch of the carriage), and the carriage EE carrying the spindles which may be run close up to the front de- livery rollers and about two yards away from them to effect the " spin, " which is of an intermittent character. The spindles D are turned by bands passing round a tin drum K in the carriage, but this motion, and every other motion in the mule, is controlled perfectly from the headstock. In brief, the operation of spinning is as follows: as the carriage begins to recede from the delivery rollers these rollers deliver condensed sliver at about the same rate as the carriage moves out, the spindles putting in a little twist. When the carriage has perhaps completed half its traverse (say 36") away from the front rollers these suddenly stop delivering the condensed sliver, the carriage goes more and more slowly outwards until it completes its traverse, drafting the sliver out to perhaps double the length. This drafting could not be effected but for the" drafting-twist, " which, running into the thin parts of the yarn during drafting,

Fig. 10. — Plan and Section of a Preparing Box (Sheetcr). A is the back-shaft receiving Its motion from the driving shaft upon which are the pulleys. This back-shaft A drives the back- rollers B at a slow speed by the reducing train of wheels C ; also the front rollers D at a much quicker speed through the train of wheels E, and the fallers F at an intermediary speed by means of the levels and screws G. G. The wool is " made up " on the feed sheet and on emerging from the front rollers is built up layer by layer into the lap H, which is finally broken across and feeds up at the next machine.

The yarn as delivered by the mule is " single " and will serve as warp or weft for the great bulk of woollen cloths, warp being as a rule twisted harder than weft. Sometimes for strength, sometimes for colour, however, it will be necessary to twist two or more of these single strands together. This is best effected on a twisting frame of the ring type, which consists of delivery rollers, to deliver a specified length of yarn in relationship to the turns of the spindles, and the spindjes, which serve to put in twist and to wind the yarn upon the bobbin or tube, which they carry by reason of the retarding action of the traveller. Fancy twists such as knops, loops, slubs, &c, may also 'be produced if the frame is fitted up with two pairs of delivery rollers and two or three special but simple appliances.

The essential feature of a worsted yarn is straightness of fibre. Prior to the introduction of automatic machinery there was little difficulty in attaining this characteristic, as long wool was invariably employed and the sliver was made up by hand and then twisted. With the introduction of Arkwright's " water frame " or "throstle " the necessity for prepared slivers became apparent, and with the later introduction of cap and mule spinning the necessity for perfectly prepared slivers has been so accentuated that the preparatory machinery has quite

*Worsted yarn manu- facture**

;eeded the actual spinning machine in extent and complexity, t scour the slivers again, this being effected in what is termed •-day there are three distinct methods of producing worsted yarn. | washing machine. This machine as shown in fig., u usually

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Fig. ii. — Sectional View of Back-washer.

A are the delivering rollers, B, B are the immersing rollers in the first tank, C, C are the press rollers to squeeze out superfluous liquors, D is the immersing roller in the second tank, and C, C are the press rollers for the second tank. Drying cylinders E to E" may be arranged as "live- heat " cylinders, as secondary heated cylinders or as air drying cylinders. The roller F directs the slivers into the back rollers G of the gill-box, which in turn delivers up the slivers to the fallcrs H, which in turn delivers the wool to the front rollers I.*

Firstly, there is the preparing and spinning of the true worsted I of two scouring tanks with immersing rollers, drying cylinders, a

thread, this being made from long English and colonial wool. In ‘ gill-box and oiling motion. The slivers on emerging from this machine

this class should also be included mohair and

alpaca. Secondly, there is the preparing and

spinning of what are known as cross-bred and

botany yarns, these being made from cross-bred

and botany wools. Thirdly, there is the preparing

and spinning of short botany wools on the French

system. There is a fourth class of worsted yarns,

principally carpet and knitting yarns, which are

treated in a much. readier manner than any of the

foregoing, but as the treatment is analogous — with

the elimination of certain processes — to the second

of the foregoing, it is not necessary to refer specially

to it.

To obtain a sliver or ” roving ‘ which can be satisfactorily spun into a typical worsted thread the following operations are necessary : — preparing (five or six operations), back- washing, straightening, combing, straightening and drawing (say six opera- tions), and finally spinning on the flyer frame.*

*After long wool has been scoured and dried it is necessarily considerably entangled, and if it were to Preaarintr ˆ com bed straight away a large propor- p ** tion of the long fibres would be broken and combed out as ” noil ” or short fibre. To obviate this the wool is fed as straight as pos- sible into a sheeter gill-box ; after thit- it passes through other two sheeter gill-boxes, then through say three can gill-boxes. As shown in fig. 10 the main features of a preparing or gill-box are the following : the feed sheet upon which the wool is ” made up,” the back rollers B which take hold of the wool and deliver it to the fallers F which, work- ing away from the back*

rollers more quickly than the wool is delivered, comb it out. The faflers in turn deliver the wool to the front rollers D, which, "taking in the wool more quickly than the fallers delivering it, again draft and comb it, but with a reversing of the former combing operation. The wool emerges from the front rollers as thin attenuated continuous fibre about 12 in. wide, which is wound upon an endless leather sheet H from which the box takes its name. When a sliver of sufficient thickness has been wound upon the sheet, it is broken across and fed up at the next gill-box. The fourth gill- box delivers into cans instead of on to a sheet. A number of cans are then placed behind the fifth box and the slivers from these fed up into the back rollers, and similarly with the sixth. The primary object of " preparing " or gilling is to straighten and parallelize the fibres m the sliver. This is effected by means of the combining or doubling and drafting to which the slivers are subjected. In addition to this, how- ever, a level sliver suitable for combing is formed by A, A is the large comb circle and B, B' the two small comb circles. The sliversare the combined action of the drafting and doubling delivered by the mechanism C to the feed boxes D, being thrown across the pins of which has taken place at each box. t he large and small circles at position E. A stroke at F suitably directs the fringes of

Oil will have been added to the wool at the first fibre as the circles separate and the combed fibres are taken hold of by drawing-off prepanng-box to cause the fibres to work well. ro Ilers G and G' and combined to form the " top." The brushes H, Hand the noil Back . Were this all, there would perhaps not knives I clear the small circles of the " noil." The feed knife J in conjunction with

waiting be the necessity for back-washing. But the inclined planes at K are instrumental in feeding a previously directed length of the shvers during their passage through sliver over the two circles as they practically touch one another at the point E, and so the prepanng-boxes become sullied naturally, and the process is continued. in addition, owing to the opening out of the

locks of wool, dirt which was not " got at " in the scouring now works I should be clean, fairly straight and in good condition for combing, out and further sullies the slivers. It is consequently necessary to 1 Their condition may be further improved by passing them through

one or two more gill-boxes, prior to combing, to ensure straightness of fibre and even distribution of the lubricant.

Prior to the mechanical era wool was combed immediately after scouring;

there was no preparatory process. As a matter of fact Cambin t ‘ ie ˆ TS ˆ combing process took the place of the processes g ‘ just described and was termed ” straightening,” the ” combing proper ” following. Prior to the invention of a really satisfactory mechanical comb, between 1850 and i860, the combing operation was the limitation of the worsted trade. English wools could be satisfactorily combed by hand, and perhaps the results of combing botany or fine wools by hand were satisfactory so far as quality of result was concerned, but the cost was largely prohibitive. The history of the colonial wool trade is inextricably bound up with the combing industry. How eventually botany wools were combed by machinery and how the wool industry was thereby revolutionized can only be briefly referred to here. About 1779 Dr Edmund Cart- wright invented two distinct types of combs, the vertical and the horizontal circular. The former type was developed on the conti- nent by Heilmann and others, and has only within the last five years taken its rightful place as a successful short wool comb in this country. The latter type was worked upon by Donisthorpe, Noble, Lister, the Holdens and others, and largely through the ” driving ” force of Lister (later Lord Masham) was made a truly practical success about the year 1850. Latter-day combs of this type may be readily grouped under three heads. The Lister or ” nip ” comb is specially suitable for long wools and mohair and alpaca. The Holden or square-motion comb is specially suited for short and very good quality wools. The last type, the Noble, is the most popular of all and, by a change of large ‘and small circles, may be adapted to the combingof long, medium or short wools. As the great bulk of cross- bred and a considerable proportion of botany wool is combed upon the Noble comb a brief description is here called for. The object of all wool combing is to straighten the long fibres and to comb out from the slivers treated all the fibres under a certain length, leaving the long fibres or ” top ” to form the sliver which is eventually spun into the worsted yarn. The Noble comb, which so effectually accom- plishes this, consists in the main of a large revolving circle A inside which revolve two smaller circles B, B’ as shown in fig. 12, each of which touches the larger comb circle at one point only. At this point the slivers of wool to be carded are firmly dabbed into the pins of both the large and small circles. As the circles continue to revolve

Fig. 13. — Section of Wool Drawing Rollers. A, A’ are the back-rollers in a drawing box of which A is positively driven and A’ driven by friction which may be varied at will. Carriers B, B’, B” simply control the fibres of which the sliver is composed during drafting. The front rollers C, C — of which C is positively driven and C driven by friction — running at a greater speed than A, A’ draft or elongate the slivers as required.- The carriers B, B’, B” should be speeded to run at a suitable rate to assist the drafting operation, more by support than by direct aid. Rollers A, A’ must hold the sliver,

hence they are fluted. Rollers C, C must pull the sliver somewhat severely, hence roller C is covered with leather. The yarn delivered by the front rollers is slightly twisted and wound into a double-headed bobbin of convenient size on the " flyer-system."

they naturally begin to separate, combing the wool fibres between them, the short fibres or " noil " being retained in the teeth of both small and large circles, the long fibres hanging on the inside of the large circle and on the outside of the small circle. A stroker or air

blast at F now directs these long fibres into the vertical rollers, G and G', shown here in plan, which draw them out, thus separating them from the short fibres. There are at least four pairs of drawing-off rollers in a comb, and the fibres drawn off by each — be it noted continuously — are united to form a sliver which is passed through a

Fig. 14. — Two-Spindle Drawing-Box.

revolving funnel into a can. The short fibres, or " noil," are lifted out of the pins of the small circle by "noil knives." Thecontinuous slivers, the ends of which remain in the pins of the large circle after the drawing-off rollers have been passed, are now lifted up until these ends are above the pins, at the same time an additional length of sliver being drawn into the comb, so that, as they reach the second small circle, they are ready to be again dabbed into the pins of both circles and the combing operation repeated. Thus the combing on a Noble comb is absolutely continuous. All the movements of this machine — with the exception of the dabbing-brush motion — are circular, so that mechanically it is an almost perfect machine. As illustrating the extent of the combing industry, it is interesting to note that even the making of dabbing- brushes is a separate and by no means unimportant trade.

After combing it is usual to pass the " top " through two gill-boxes termed " finishers." The last of these boxes, ana often the first, delivers the " top " in the form of a ball, thus it is often spoken of as a " balling gill-box," This stage marks one of the great divisions of the worsteo trade, the comber taking the wool up to this point, but now handing it forward in the shape of top to the " worsted spinner," who draws and spins the slivers into the most desirable worsted yarns.

*English tops are usually prepared for spinning by seven or eight operations. Three of these operations are effected in gill-boxes of a somewhat similar type to the preparing-box, only lighter Qrawlnu in build. The remaining four are drawing-boxes, i.e. as ***

shown in figs. 13 and 14, they consist of back and front rollers with small carrving-rollers — not gjlls — to support the wool in between. Thus an English set of drawing usually consists of a single-can gill- box, a double-can gill-box, a two-spindle gill-box, a four-spindle drawing-box, a four-spindle weigh-box, a six-spindle drawing-box, two six-spindle finishers and three thirty-spindle rovers. About fifteen flyer frames of 160 spindles each will be required to follow this set, although the balance varies partly in accordance with the counts spun to, in this case 1/32's English being the standard.

The object of drawing is to obtain firstly a level sliver from which an even thread may be spun, and secondly to reduce the compara- tively thick top down to a relatively thin roving from which the required count of yarn may be spun. Of course parallelism of fibres must be retained throughout, so far as possible. To accomplish these objects doubling and drafting is resorted to. ThuB the ends put up at the back of the above boxes will be 6, 6, 4, 4, 3, 3, 2 re- spectively, while the drafts may be 5, 6, 8, 8, 6, 9, 9 approximately.

As the drafts markedly preponderate over the doublings, so in exactly this proportion will the sliver be reduced in thickness.

The flyer spinning frame is very similar to the drawing frame, consisting of back rollers, carriers and front rollers, with the necessary « , , spindle and flyer to put twist into the yarn and to wind it

" _ upon. the. bobbin. From the two-spindle gill-box to the spinning frame the spindle, bobbin and flyer combination is em- ployed with the object just mentioned. From fig. 15 the action of this combination will be clearly understood. Drafting takes place as usual bet %v ecu the back and front rollers, the carriers controlling the yarn between the two. On emerging from the front rollers the yarn usually passes through an eyelet, to centre it over the centre of the spindle; it then takes a turn or two round the flyer leg, through the twizzle or eyelet on the flyer and on to the bobbin F. The flyer may be freely rotated by means of the wharl J and through the spindle G upon the top of which it is screwed. The bobbin fits loosely over the spindle and rests upon the lifter plate I ; this latter, being controlled by the lifter mechanism, slowly raises and lowers the bobbin during the " spin ." past the fixed plane of delivery of the yam, i.e. the eyelet of the revolving flyer. Now, if for one moment it be considered that the bobbin may not revolve on the spindle but may be

Carding of medium and short wools for worsted yarns.

the operation of carding. On first thought it might be imagined that carding would result in broken fibres and a poor yield of top. That this is not so is evident from the fact that there is a tendency to card wools from 7 to 10 in. long, this tendency being due to the relative cheapness of carding as compared with preparing. If long wools were fed directly on to a swift,_ no doubt serious breakage of fibre would occur, but it is customary to place before the first swift of a w r orsted card a series of four opening rollers and dividers — with their accompanying " burring rollers " — to open out the wool gradually, so that when it eventually reaches the first swift it is so opened out that further opening out instead of breakage occurs. Some carders use a breast or small swift in place of those opening rollers — mostly on account of economy. The swift is usually sur- mounted with four workers and strippers and is very similar to the woollen carder, save that the workers and dofler are larger, thereby effecting more of a combing action and working economically by reason of the greater wearing surface brought into play. As botany wool is usually brought directly from the wash bowl to the feed sheet of the card, it is usual to clothe the first cylinders with galvanized wire clothing.

After the carding the wool is back-washed and gilled — on similar lines to English wool — and then is ready for combing. The largest combers of botany wools, Messrs Isaac Holden & Co., _. employ the square-motion comb, in fact this comb is wmbuig known in the trade as the Holden comb. Other combers, however, almost without exception employ the Noble comb with a fine " set over," i.e. fine spinning of the comb circles After combing, the tops are ""finished " by being passed

medium and fiae wools.

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Fig. 15. — Section of Flyer Spindle.

C, C are the front rollers of a drawing or spinning frame, delivering the sliver to a centring board D , con- taining an eye for each sliver, from which the sliver passes to the flyer E and finally to the bobbin F, which rests on the lifter-plate 1 and is tra- versed up and down by this plate according to the lengthof bobbin em ployed. The flyer E is screwed on to the spindle G which is suitably held by the sheath, bolster, &c, shown at H, and in the footstep at K. The spindle is turned by a tape passing round the wharl J and thence to an ordinary tin-drum.

Fig. 16. — Spindle Cone Drawing-Box.

slid up and down by the lifter motion, then, if the front rollers deliver the

necessary yarn, the flyer will wrap it in successive layers upon the bobbin — but no twist will be inserted. On the other hand, if the bobbin is perfectly free upon the spindle and the front rollers cease delivering yarn, then the flyer, by means of the yarn, will pull the bobbin round at the same speed as it goes itself, and the yarn will be twisted but not wound upon the bobbin. By obtaining an action in between these two extremes both twisting and winding on to the bobbin is effected. The speed of the bobbin is suitably retarded by washers placed between it and the lifter plate, so that it just drags sufficiently to wind up the yarn " paid out " by the front rollers. The turns per inch are in proportion to the yarn delivered and the revolutions of the flyer. Thus if, while 1 in. of yarn is delivered, the flyer revolves twelve times the turns per inch will be approximately twelve. This in brief is the theory of the spindle, flyer and bobbin action.

Wools not more than 7 in. long are usually prepared for combing by

through two finisher -boxes, the last of which " balls ,; the tops ready for marketing.

*Short wools are drawn and spun on very similar lines to the longer wools, save that the boxes are more in number and are in some cases lighter in build. The boxes usually employed in a botany set are as follows: two double-head can gill-boxes, two drawing two-spindle gill-boxes, a four-spindle drawing-box, a six- a , spindle weigh-box,an eight-spindle drawing-box,twoeight- s P' a **' B & spindle finishing-boxes, two twenty-four-spindle second finishers, three thirty- two- spindle dandy reducers, ten thirty-two-spindle dandy rovers, w r ith ten two-hundred-spindle cap spinners to follow.*

The doublings as a rule are about 7, 6, 6, 6, 5, 5, 5, 4, 4, 2 and the drafts 5, 6, 6, 7, 7, 7, 8, 8, Sat the respective boxes, an endeavour as a rule being made to obtain a roving of which 40 yds. =2 drams, as this is the most convenient size for being spun into fine botany count of yarn.

Following the lead of the cotton trade endeavours have been made

to positively control the driving and speed of both flyer and bobbin in all the drawing" frames of such sets as that described ab»ve. Such control is usually effected by a pair of cones, from which this system has taken its name, viz, " cone " drawing. In fig. 16 a usual type of cone drawing-box is illustrated. The chief advantages of this system seem to be the possibilities of employing larger bobbins, and thus obtaining greater production, the consumption of relatively less power, and more particularly the production

of a softer sliver with less twist, partaking more of the character of a French roving. Spinning is usually effected upon the cap frame (see fig. 17) — a frame in which the bobbin, resting upon a fixed spindle, is itself driven at say 5000 revolutions per minute to put in the twist, while the friction of the yarn on the cap which covers the bobbin enables the bobbin to wind up upon itself the yarn as delivered by the front rollers. The weakness and the strength of the cap frame is that to make reasonably hard bobbins the bobbins must he driven at a high speed.

The French are noted for a special system of worsted spinning, which, pro- French ‘ ducing s °ft botany yarns of a drawing marked type, is worthy of and more than passing comment.

spinning. T he . P re P ara ri°n is very similar to the preparation of botany yarns for the English system save that as a rule the order of the operations are carding, gilling, combing, back-washing and finishing. The char- acteristic features of the method lie in the subsequent drawing and spinning. The drawing-box as shown in fig. 18 con- sists of back rollers, porcupine or re- volving gill, front rollers, rubbers and winding-up arrangement. Thus there is no twist inserted , the slivers being treated softly and openly right away through the processes. A set of this type usually con- sists of two gill-boxes preparing for combing, comb, back-washing machine and two finishing gill-boxes, first draw- ing frame, second drawing frame, the stubbing frame, the roving frame and the self-acting mule. After leaving the last box as a fine soft pith-like sliver, spin- ning is effected upon the worsted mule. The main differences between the worsted and the woollen mule are firstly, the worsted mule is fitted with preliminary drafting rollers, and secondly, there is little or no spindle draft. As the mule is an intermittent worker it is natural to contrast it with the cap frame, which runs continuously. What the real advan- Fig. 17. — Section of Cap tage is it is difficult to say, but the mule- Spindle, spun worsted yarn trade is Incoming C, Care the front rollers yearly of more importance, and it is of a cap spinning frame de- pleasing to note that English spinners livering the yarn through are at last doing a fair share of this the centring board D under business.

the edge of the cap E to Upon whichever system the yarns have the bobbin F, which rests been spun it will frequently be necessary upon the tube and wharIG, uoubling to tw °f 0, d them and some- which in turn rest upon the twisting,’ timcs to three- and fourfold lifter-rail T, which effects ete , them. Again the fashion some-

*the necessary traversing. * times runs upon fancy twists,*

The spindle H is simply and then it is necessary to be able to screwed into

the frame- produce the various styles of cloud, loop, work, and does not re- curl, knop, &c, yarns. Twofolding is volve, but simply acts as done upon the flyer, cap and ring frames, a support for the cap and The main difference between the cap as a centre of motion for and the ring frame is that in the latter the tube and bobbin. a small bent piece of wireˆ termed a

traveller, revolved round a ring hy the pull of the spindle through the yarn, serves as the retarder to enable the bobbin to wind the yarn, delivered by the front rollers on to itself (see fig. 19). Fancy twisters are almost universally on the ring system.

Yarns are placed on the market in eight forms, viz. in hank, on

spools, on paper tubes, on bobbins, on cops, in cheeses, in the warp

Yarns- ˆall form and dressed upon the loom beam. Thus the

manufacturer can order the yarn which he requires in

the form best suited to his purpose.

Although in some few cases special means must be employed for the weaving of woollens, worsteds and stuff goods, still the main Weaving, principles are the same for all classes of goods (see Weav- ing). Attention may here be concentrated on the char- acteristic principles of woollen and worsted manufacture.

The characteristic feature of wool and of wool yarns and cloths is the quality of " felting." This quality has always been made use of in woollen cloths, but in worsted cloths, until eompara- pi B / s fjiag tively recently, it has been largely ignored. To-day, processes. however, cloths are made, ranging from the truest woollen to the typical worsted, of which it would be impossible to indicate the type of yarn employed without very careful analysis. As it is obviously impossible to give here every variety of finish

E . B

Fig. 18.— Section of French Drawing-Box.

A, A', delivery rollers which control the slivers during the drafting operation. B is the porcupine (or circular gill) and C are the front drafting rollers. D is the funnel through which the slivers pass to the consolidating rubbers E, E, F is a second funnel and G is the condensed sliver wound up at a uniform rate on the roller H. employed, the two typical styles for woollen and worsted cloths are dealt with in detail, and further to elucidate the matter the finishing of a Bradford " stuff " or " lustre " piece is also

given in outline.

*The fabric on leaving the loom is first mended and then scoured. The operation of scouring is effected in a ” dolly,” and must thoroughly clear the piece so that it is free to take the w Q oliea desired finish. The piece is now soaped and ” milled,” i.e. ciotft felted. Milling may be effected either in the stocks or in finishing the milting machine. The stocks, the main features of which are huge hammers which are caused to fall or are driven iK > sitively into the cloth, exert a bursting action eliminat- ing the thread structure. The milling machine acts more by compression, arrangements being made to compress the cloth in length or breadth at will. After milling scouring follows to clear the cloth thoroughly of the milling agents previous to the finishing proper. The cloth is now taken in a damp state to the tentering machine and, being hooked upon a frame running into a *■ heated chamber, is stretched in width and dried in this condition. Raising follows, this being effected by sub- jecting the surface of the fabric to the action of ” teazles ” fixed on a large revolving cylinder, the whole machine being termed a ” gig.” After raising the fabric is ” cropped ” by being passed over a blade near which revolving knives work, on the principle of a lawn-mower, shear- ing and levcllingthe piece. Sometimes fab- rics are raised wet, especially if a velvet finish is required. Brush- FlG. 19. — Section of Ring Spindle, ing follows to clear the A ; H thc spind i c su i ta bly shaped to ra- p-ece of all stray fibres. ceive the bobbin at B , with a wharl for 1 he fabric is now ready turmng at Cj runn i ng i n tue specially for crabbing, which designed rec eptacle D, ‘which may be consists in winding it scrcwcd f irm i y into the spindic rail. The tightly on to a perforated trave | ler E is drawn round the ring F by roller through which thc sp i n ji e act j ng through the yarn as steam may be blown or shown in the lan The spindle is a upon which the piece fixture and the rmg _ ra ii ; s traversed to may be boiled. 1 he distribute the yarn on the bobbin. pieces are then rewound*

and the operation repeated at least once, to obtain even distribution of finish. Being now ready for pressing, the fabric is cuttled, usually with press papers between each cuttle, and placed in the hydraulic

press either hot or cold. After pressing dry steaming is frequently- necessary to take away cakiness and a certain false lustre which some- times develops. Final cuttling completes the finishing operations.

Worsted cloth finishing is very similar to woollen cloth finishing save that

*some of the operations are less severe. Mending, scouring, Worst d milling ant l tentering are similar. The raising as a rule is cloth * effected by brushing, although it is by no means un- Bttiahlna coramon to raise worsteds on the gig. Cropping, crabbing, pressing and steaming are the same as for woollen fabrics. Of course the real difference between the woollen and the worsted cloth is due to the selection of the right material, to correct roving, spinning and fabric structure: finishing simply comes as a "de- veloper " in the case of the woollen fabric, while in the case of the typical worsted fabric it simply serves as a" clearer," the cloth really being made in. the loom. A woollen cloth as it leaves the loom is unsightly and in a sense may be said to be made in the finishing, although it is truer to say " developed " in the finishing: in the case of the worsted cloth it is altogether otherwise.*

A cotton warp, lustre weft style, is treated altogether differently from either of the foregoing. It is first crabbed, then steamed, then Lustre scoured and dried, then singed by being passed over a finishing rec '-h°t copper plate or through gas jets, then scoured ' again, and if necessary dyed. It is then washed, dried, then tentered and finally pressed. Of course these operations are applied with discrimination to the varied styles of goods made in the Bradford district. Thus,for instance, the finishing of an " Italian " may be considerably varied from the foregoing, being more complex, while other styles, such as plain all-wool goods, are treated very simply.

It will be gathered from the foregoing remarks that the varieties of wool textures are many and very different in character. This is perhaps realized best by contrasting a heavy melton cloth weighing say 24-30 oz. per yard with a fine mohair texture weighing say 2-3 oz. per yard. None the less remarkable is the difference in appearance of varieties of wool textures. A rough Harris tweed, for example, contrasts strangely with a smooth fine wool Italian. Of course these differences are not created in any one process or merely by the selection of the raw material or yarn. Every process of manufacture must be directed to attain the desired end, and it is well to realize that huge businesses have been built up upon what, by the outsider, would only be regarded as unimportant details.

The principal styles of woollen cloth are tweeds, meltons, Venetians, beavers, doeskins, buckskins, cassimeres and diagonals. The largest class is the tweed, as this ranges from very expensive coatings and trouserings to the cheap styles made of the re-manufactured materials. Tweeds for ladies' wear also form a large class.

The principal styles of worsted cloths arc coatings and trouserings, delaines, voiles, merinos, cashmeres, lastings, crˆpe-de-chines, amazons, Orleans, lustres of various types (plain and figured), alpacas, Italians,

moreens, &c, &c. Many of these are made entirely of worsted yarns, but others are compound so far as material or yarn is concerned. Thus amazons are made from mule-spun worsted warp and a woollen weft. Lustres are made from fine hard spun cotton warp and English or mohair weft, and so on. Perhaps the most interesting point to note is the skill developed by English de- signers during recentyears. Fifty years ago the continental designer ruled the market. To-day the English designer can at least claim an equality with and in some respects is already considered as superior to his continental rival.

Prior to the development of native ingenuity and skill England

Varieties of woollens mad worsteds.

*was remarkable as a wool-growing country, most of the wool being shipped to the continent, so that it may be said that the wool 01 England met the skill of southern Europe in Flanders, which w ., thus became the great textile centre so far as wool was " J"*J concerned. With the development of native skill under fyf,ˆ the fostering care of several of the English monarchs— * notably Edward III. and James I. — it was but natural to expect that endeavours would be made to manufacture English wool at home and export the woven cloth. With the remarkable colonial develop- ments of the 17th, 18th and 19th centuries, in conjunction with the invention of the spinning frame and power-loom, this expectation was most fully realized, at least so far as ordinary wearing fabrics were concerned. Latterly, however, with the development of skill in newly developed countries, the tendency has been to partially revert to the old conditions. Thus in 1850 Bradford's chief export was cloth, in 1875 the yarn trade had markedly developed, in 1900 the top trade was well established, and to-day Bradford has a large wool export trade. Fabrics are made for the home and general export trade; yarns are exported mostly to the continent; tops and wool mostly to the United States of America.*

The following tables give a useful idea of (a) the sources of supply of the raw material, wool, also of the changes which have taken place in the trade since 1800; (b) the changes in monetary statistics value of the chief sorts of wool during recent years; (c) the number of factories and of persons employed in the textile industries during the past half -century ; (d) growth of the export trade in woollens and worsteds of the United Kingdom during the past century. For further details see Hooper's admirable tables now issued by the Bradford Chamber of Commerce.

Prior to the development of the factory system and the remarkable development in textile appliances at the end of the 18th and beginning of the 19th centuries, the textile industries were scattered centres of all over

the country, only in sonic few cases more or less laaastry accidental centralizing occurring. To-day it may be said that the wool industry is centralized where the coal supply of south Yorkshire meets the wool supply of north Yorkshire, i.e. in the Bradford and Leeds districts, though much of the wool dealt with in this district is imported and consequently can only be said to follow the trend already established. Of course there are wool manu- facturing districts other than those mentioned. Scotland is noted for its Scotch tweeds manufactured in the Hawick and Galashiels district, the West of England still makes some magnificent all-wool cloths; Norwich guards a remnant of its once flourishing worsted industry and Leicester has developed a remarkable hosiery trade. Again, firms whose existence is due to individual enterprise are still studded up and down the country, and manage to compete fairly well with the main manufacturing districts. Since about 1856, however, there can be no doubt that the English wool trade has been centring more and more round Bradford, while the remanu- factured materials and the blanket trade is centred round Batley and Dewsbury. Wales retains only a fragment of its once large flannel trade, this trade now being located in Yorkshire, with the exception of one or two individual firms elsewhere. The carpet trade is centred in Halifax, Kidderminster and Glasgow. Whether further centralization may be looked for is questionable. Specialization undoubtedly favours Bradford, as there the wool, top, yarn and fabric branches of the industry are individually developed to great advantage; but the development of means of communication and some such factor as electric or water power may radically disturb the present balance of the industry. (A. F. B.)

Imports of Wool into the United Kingdom from the Principal Countries, Foreign and Colonial.

Country.

1800.

1820.

1840.

i860.

1880.

1900.

1905-

1907.

New South Wales) . . Bales

Queensland \ ■

Victorian

5 248,408

240,922

308,628

658

213

25,820

46,092

224,777

(124,401

148,659

130,128

78,186

306,817

255,131

261.724

330,326

Tasmanian

180

11,721

16,731

23,653

18,225

13,770

22,147

South Australian ….

3,484

23,554

109,917

50,720

76,469

89,637

West Australian ….

1,992

9,211

26,317

44,623

41,467

New Zealand

17,870

189,441

395,693

394.390

442,973

Cape and Natal

29

3,477

55,7H

190,614

102,268

192,210

259,691

Total Colonial . . Bales

658

422

44,502

240,136

1,054,430

1,221,163

1,327,167

1,624,997

East Indian and Persian .

7,611

62,226

112,716

142,518

153.841

159,818

Chinese

119

1,672

4,151

7,284

15.060

German

1,170

14,609

63,278

19,681

28,119

9,126

6,636

n,533

Spanish

30,318

17,681

5,273

4,199

14,603

896

1.732

4.077

Portuguese

9,622

475

1,569

24,503

14,356

5,242

11, 018

10.214

Russian

25

150

11,776

22,150

45,417

28,018

7.404

15,889

Turkish, Egyptian and North African

76

380

5,492

17,545

49,853

39,108

43,104

5L725

Peruvian and Chilean

25

40,004

69,068

52.876

70,423

55. ^3

53,493

Buenos Aires and Montevidean

5.058

9,852

22,077

52,839

70,348

Falkland Islands and Punta Arenas

4,700

28,784

34,903

53,249

Italian and Trieste ….

“84

334

4,055

719

2,565

2,768

3,889

2,761

Sundry

487

1,479

2,519

15.172

35,973

37,!5°

46,485

43.176

Goat's Wool

".915

57,449

69,445

101,712

109,077

Total Bales

42,44a

35.555

186,079

492,491

1,484,581

1,680,869

1. 853.177

2,225,417

WOOLLETT— WOOLNER

Prices per lb in each Year of some Colonial, Foreign and English Wools, also of Alpaca and Mohair.

817

Material.

1874.1

1880.

1885.

1890.

1895-

1900.

1901. 2

1902. 2

1905-

d.

d.

d.

d.

d.

d.

d.

d.

d.

Port Philip — Greasy

14I

13 i

10

i n

8?

Hi

9i

13

i3i

Adelaide — Greasy .

ni

1 of

6|

51

9 I

6ˆ

8J

9,

Cape — Greasy

i6i

I2{

9,

9i

7,

7,

9 !

54

% I

Buenos Aires — Greasy .

7i

7i

4i

51

4l

4

4l

British Wool .

22

i6i

9i

10

9i

7i

6-A

6

ill

*iSl-17**

Alpaca ….

33-35

*I3-I5**

*12^-14**

22-14}

14I-27

16-13

I2|-l6

I5i-i9i

Mohair ….

35-45

27-35-21

14-19

*18-13**

14-30

20i-I7

19-17

15

I3i-i6 {

1 Year of the highest values of wools ever reached within recent times.

2 Years of the lowest values of wools ever reached within recent times.

Summary of Woollen and Worsted Factories and of Persons employed in the same in the United Kingdo

■

1867.

1874.

1885.

1889.

1901.

1904.

Factories

Rag grinding machines . Woollen carding sets Worsted combing machines . Spinning spindles Doubling spindles . Power looms ….

Children (half timers) Persons working full time —

Males

Females

2,649

1,038

6,455,879

519,629

118,875

33,054

94.838 134.368

2,617

1,276

5,449,495

558,9H

140,274

38,416

106,005 135,712

2,751

5,375,102 769,492 139,902

24,636

“2,935 145,684

2,517

5,604,535 969,812 131,506

22,940

120,441 158,175

7.475

102,876

M9,558

2,382

900

6,700

2,924 ,

5,625,477

1,059,049

104,514

Summary of Exports of Wool, Wool Waste, Noils, Tops, Yarns

and Fabrics from the United Kingdom.

1840.

1882.

1890.

1900.

1907.

lb

lb

lb

lb

lb

British Wool

5,000,000

13,800,000

19,500,000

24,900,000

34,500,000

Foreign and Colonial

2,000,000

264,100,000

342,200,000

197,500,000

314,200,000

Waste .

Noils .

Tops

Worsted Yarn

Mohair, &c, Yarn

Woollen Yarn

Cloths .

Apparel

29,840,300

8,752,200

1 ,992,400

£18,768,634

£1,380,000

2,397,600 10,234,700

9,016,000 39,510,100 12,959,600

1,572,700

£20,418,482

£1,700,000

i,593,ioo

7,897,400

28,031,200

56,075,900

10,397,700

1,088,300

£15,682,154

£1,700,000

8,937,100 12,689,700 35,580,000 55,521,700 17,782,800

2,576,100

£22,153,680

£2,550,546

WOOLLETT, WILLIAM (1735-1785), English engraver, was born at Maidstone, of a family which came originally from Holland, on the 15th of August 1735. He was apprenticed to John Tinney, an engraver in Fleet Street, London, and studied in the St Martin's Lane academy. His first important plate was from the " Niobe " of Richard Wilson, published by Boydell in 1761, which was followed in 1763 by a companion engraving from the " Phaethon " of the same painter. After West he engraved his fine plate of the "Battle of La Hogue "(1781), and the " Death of General Wolfe " (1776), which is usually considered Woollett's masterpiece. In 1775 he was appointed engraver-in-ordinary to George III. ; and he was a member of the Incorporated Society of Artists, of which for several years he acted as secretary. He died in London on the 23rd of May

1785-

In his plates, which unite work with the etching-needle, the dry-point and the graver, Woollett shows the greatest richness and variety of execution. In his landscapes the rendering of water is particularly excellent. In his portraits and historical subjects the rendering of flesh is characterized by great softness and delicacy. His works rank among the great productions of the English school of engraving. Louis Fagan, in his Catalogue Raisonne of the Engraved Works of William Woollett (1885), has enumerated 123 plates by this engraver.

WOOLHAN, JOHN'(i72o-i772), American Quaker preacher, was born in Northampton, Burlington county, New Jersey, in August 1720. When he was twenty-one he went to Mount Holly, where he was a clerk in a store, opened a school for poor children and became a tailor. After 1743 he spent most of his time as an itinerant preacher, visiting meetings of the Friends in various parts of the colonies. In 1 7 7 2 he sailed for London to visit Friends in the north of England, especially Yorkshire, and died in York of

smallpox on the 7th of October. He spoke and wrote against slavery, refused to draw up wills transferring slaves, induced many of the Friends to set their negroes free, and in 1760 at Newport, Rhode Island, memorialized the Legislature to forbid the slave trade. In 1763 at Wehaloosing (now Wyalusing), on the Susquehanna, he preached to the Indians; and he always urged the whites to pay the Indians for their lands and to forbid the sale of liquor to them.

Woolman wrote Some Considerations on the Keeping of Negroes (1754 ; part ii., 1762) ; Considerations on Pure Wisdom and Human Policy, on Labor, on Schools, and on the Right Use of the Lord's Outward Gifts (1768) ; Considerations on the True Harmony of Man- kind, and How it is to be Maintained (1770); and A Word of Re- membrance and Caution to the Rich (1793) ; and the most important of his writings, The Journal of John Woolman' s Life and Travels t« the Service of the Gospel (1775), which was begun in his thirty-sixth year and was continued until the year of his death. The best-known edition is that prepared, with an introduction, by John G. Whittier in 1 87 1. The Works of John Woolman appeared in two parts at Philadelphia, in 1774-1775, and have often been republished; a German version was printed in 1852.

WOOLNER, THOMAS (1825-1892), British sculptor and poet, was born at Hadleigh, Suffolk, on- the 17th of December 1825. When a boy he showed talent for modelling, and when barely thirteen years old was taken as an assistant into the studio of William Behnes, and trained during four years. In December 1842 Woolner was admitted a student in the Royal Academy, and in 1843 exhibited his " Eleanor sucking Poison from the Wound of Prince Edward." In 1844, among the competitive works for

decorating the Houses of Parliament was his life-size group of " The Death of Boadkea." In 1846 he had at the Royal Academy a graceful bas-relief of Shelley's " Alastpr." Then came (1847) " Feeding the Hungry," a bas-relief, at the Academy; and at the British Institution a brilliant statuette

of " Puck " perched upon a toadstool and with his toe rousing a frog. " Eros and Euphrosyne " and " The Rainbow " were seen at the Academy in 1848.

Woolner became, in the autumn of 1848, one of the seven Pre-Raphaelite Brethren, and took a leading part in The Germ (1850), the opening poem in which, called " My Beautiful Lady," was written by him. He had already modelled and exhibited portraits of Carlyle, Browning and Tennyson. Unable to make his way in art as he wished, Woolner in 1852 tried his luck as a gold-digger in Australia. Failing in this, he returned to England in 1857, where during his absence his reputation had been in- creased by means of a statue of " Love " as a damsel lost in a day- dream. Then came his second portraits of Carlyle, Tennyson and Browning, the figures of Moses, David,, St John the Baptist and St Paul for the pulpit of Llandaff cathedral, the medallion portrait of Wordsworth in Grasmere church, the likenesses of Sir Thomas Fairbairn, Rajah Brooke of Sarawak, Mrs Tennyson, Sir \V. Hooker and Sir F. Palgrave. The fine statue of Bacon in the New Museum at Oxford was succeeded by full-size statues of Prince Albert for Oxford, Macaulayfor Cambridge, William III. for the Houses of Parliament, London, and Sir Bartle Frere for Bombay; busts of Tennyson, for Trinity College, Cambridge, Dr Whewell, and Archdeacon Hare; statues of Lord Lawrence for Calcutta, Queen Victoria for Birmingham, Field for the Law Courts, London, Palmerston for Palace Yard, the noble colossal standing figure of Captain Cook that overlooks the harbour of Sydney, Xew South Wales, which is Woolner's masterpiece in that class; the recumbent effigy of Lord F. Cavendish (murdered in Dublin) in Cartmel church, the seated Lord Chief Justice White- side for the Four Courts, Dublin, and John Stuart Mill for the Thames Embankment, London; Landseer, and Bishop Jackson for St Paul's, Bishop Fraser for Manchester, and Sir Stamford Rafllcs for Singapore. Among Woolner's busts are those of Newman, Darwin, Sedgwick, Huxley, Cobden, Professor Lush- ington, Dickens, Kingsley, and Sir William Gull, besides the repetition, with variations, of Gladstone for the Bodleian, Oxford, and Mansion House, London, and Tennyson. The last was acquired for Adelaide, South Australia. Woolner's poetic and imaginative sculptures include " Elaine witji the Shield of Lancelot," three fine panels for the pedestal of the Gladstone bust at

Cambridge, the noble and original " Moses " which was commissioned in 1861 and is on the apex of the gable of the Manchester Assize Courts, and two other works in the same building; "Ophelia," a statue (1869); "In Memoriam "; " Virgilia sees in a vision Coriolanus routing the Volsces "; " Guinevere "; " Mercury teaching a shepherd to sing," for the Royal College of Music; " Ophelia," a bust (1878); " Godiva," and " The Water Lily."

In 1864 he married Alice Gertrude Waugh, by whom he had two sons and four daughters. He was elected an associate of the Royal Academy in 1871, and a full member in 1874. Woolner wrote and published two amended versions of " My Beautiful Lady " from The Germ, as well as " Pygmalion " (1881), "Silenus" (1884), "Tiresias" (1886), and "Poems" (1887) comprising" Nelly Dale " (1886) and" Children." Having been elected professor of sculpture in the Royal Academy, Woolner began to prepare lectures, but they were never delivered, for he resigned the office in 1879. He died suddenly on the 7th of October 1892, and was buried in the churchyard of St Mary's, Hcndon.

WOOLSACK, i.e. a sack or cushion stuffed with wool, a name more particularly given to the seat of the lord chancellor in the House of Lords. It is a large square cushion of wool, without back or arms, covered with red cloth. It is stated to have been placed in the House of Lords in the reign of Edward III. to re- mind the peers of the importance of the wool trade of England. The earliest legislative mention, however, is in an act of Henry VIII. (c. 10 s. 8): " The lord chancellor, lord treasurer and all other officers who shall be under the degree of a baron of a parlia- ment shall sit and be placed at the uppermost part of the sacks in the midst of the said parliament chamber, either there to sit MTvvn ati»» form or nnon the uttermost sack." The woolsack is

technically outside the precincts of the house, and the lord chancellor, wishing to speak in a debate, has to advance to his place as a peer.

WOOLSEY, THEODORE DWIGHT (1801-1889), American educationalist, was born in New York City on the 31st of October 1 801. He was the son of a New York merchant, a nephew of Timothy D wight , president of Yale, and a descendant of Jonathan Edwards. He graduated at Yale in 1820; was a tutor at Yale in 1823-1825; studied Greek at Leipzig, Berlin and Bonn in 1827-1830; became professor of Greek language and literature at Yale in 1831; and was elected president of the college and entered the Congregational ministry in 1846. He resigned the presidency in 187 1, and died on the 1st of July 1889 in New Haven, During his administration the college grew rapidly, the scientific school and the school of fine arts were established, and the scholarly tone of the college was greatly improved. Much of his attention in his last years was devoted to the American

commission for the revision of the authorized version of the New Testament, of which he was chairman (1871-T881). He prepared excellent editions of Alcestis (1834), Antigone (1835), Prometheus (1837) and Gorgias (1843). He published several volumes of sermons and wrote for the New Rnglander, of which he was a founder, for the North American Review, for the Prince- ion Review and for the Century, and his Introduction lo the Study of International Law, designed as an Aid in Teaching and in Historical Studies (i860) and his Divorce and Divorce Legislation (1882) went through many editions. He also wrote Political Science, or the State Theoretically and Practically Considered (1877), and Communism and Socialism, in their History and Theory (1880), His son, Theodore Salisbury Woolsey (b. 1852), became pro- fessor of international law at Yale in 1878. He was one of the founders of the Yale Review (1892, a continuation of the New Rnglander), and is the author of America's Foreign Policy (1892).

WOOLSTON, THOMAS (1669-1731), English deist, born at Northampton in 1669, the son of a " reputable tradesman," entered Sidney College, Cambridge, in 1685, studied theology, took orders and was made a fellow of his college. After a time, by the study of Origcn, he became possessed with the notion of the importance of an allegorical interpretation of Scripture, and advocatca its use in the defence of Christianity both in his sermons and in his first book, The Old Apology for the Truth of the Christian Religion against the Jews and Gentiles Revived (1705). For many vears he published nothing, but in 1720-1721 the publication of letters and pamphlets in advocacy of his notions, with open challenges to the clergy to refute them, brought him into trouble. It was reported that his mind was disordered, and he lost his fellowship. From 1721 he lived for the most part in London, on an allowance of £30 a year from his brother and other presents. His influence on the course of the deistical con- troversy began with his book, The Moderator between an Infidel and an Apostate (1725, 3rd ed. 1729). The "infidel" intended was Anthony Collins (q.v.) } who had maintained in his book alluded to that the New Testament is based on the Old, and that not the literal but only the allegorical sense of the prophecies can be quoted in proof of the Messiahship of Jesus; the " apostate " was the clergy who had forsaken the allegorical method of the fathers. Woolston denied absolutely the proof from miracles, called in question the fact of the resurrection of Christ and other miracles of the New Testament, and maintained that they must be interpreted allegorically, or as types qf spiritual things. Two years later he began a series of Discourses on the same subject, in which he applied the principles of his Moderator to the miracles of the Gospels in detail. The Discourses, 30,000 copies of which were said to have been sold, were six in number, the first appear- ing in 1727, the next five 1728-1729, with two Defences in 1729-

1730. For these publications he was tried before Chief Justice Raymond in 1729 and sentenced (November 28) to pay a fine of £25 for each of the first four Discourses, with imprisonment till paid, and also to a year's imprisonment and to give security for his good behaviour during life. He failed to find this security, and remained in confinement until his death on the 21st of January 1731.

Upwards of sixty more or less weighty pamphlets appeared in reply to his Moderator and Discourses. Amongst the abler and most popular of them may be mentioned Z. Pearce's The Miracles of Jesus Vindicated (1729); T. Sherlock's The Tryal of the Witnesses of the Resurrection of Jesus (1729, 13th ed. 1755); and N. Lardner's Vindication of Three of Our Saviour's Miracles (1729), Lardner being one of those who did not approve of the prosecution of Woolston (see Lardner's Life by Kippis, in Lardner's Works, vol. i.).

See Life of Woolston prefixed to his Works in five volumes (London, 1733); Memoirs of Life and Writings of William Whiston (London, 1749, pp. 231-235); Appendix to A Vindication of the Miracles of our Saviour, &c, by J. Ray (2nd ed., 1731) ; J. Cairns, Unbelief in the Eighteenth Century (1880); Sayous, Les Deistes anglais (1882); and the article Deism, with its bibliography.

WOOLWICH, a S.E. metropolitan borough of London, England, bounded W. by Greenwich and Lewisham, and ex- tending N., E. and S., to the boundary of the county of London. Pop. (1901) 117,178. Area, 8276-6 acres. ItsN. boundary is in part the river Thames, but it includes two separate small areas on the N. bank, embracing a portion of the district called N. Woolwich. The area is second to that of Wandsworth among the metropolitan boroughs, but is not wholly built over. The most populous part is that lying between Shooter's Hill Road (the Roman Watling Street) and the river, the site falling from an elevation of 418 ft. at Shooter's Hill to the river level. To the E. lies Plumstead, with the Plumstead marshes bordering the river to the N. , and in the S. of the borough is Eltham. A large working population is employed in the Royal Arsenal, which occupies a large area on the river-bank, and includes the Royal Gun Factory, Royal Carriage Department, Royal Laboratory and Building Works Department. The former Royal Dockyard was made over to the War Office in 1872 and converted into stores, wharves for the loading of troopships, &c. The Royal Artillery Barracks, facing Woolwich Common, originally erected in 1775, has been greatly extended at different times, and consists of six ranges of brick building, including a church in. the Italian Gothic style erected in 1863, a theatre, and a library in connexion with the officers' mess-room.

Opposite the barracks is the memorial to the officers and men of the Royal Artillery who fell in the Crimean War, a bronze figure of Victory cast out of cannon captured in the Crimea. Near the barracks is the Royal Artillery Institution, with a fine museum and a lecture hall. On the W. of the barrack field is the Royal Military Repository, within the enclosure of which is the Rotunda, originally erected in St James's Park for the reception of the allied sovereigns in 1814, and shortly afterwards transferred to its present site. It contains models of the principal dockyards and fortifications of the British empire, naval models of all dates, and numerous specimens of weapons of war from the remotest times to the present day. On the Common is the Royal Military Academy, a castellated building erected from the design of Sir J. Wyatville in 1801, where cadets are trained for the artillery and engineer services. There are a number of other barracks. At the S.E. extremity of the Common is the Herbert Military Hospital. Among several military memorials, one in the Academy grounds was erected to the Prince Imperial of France, for. two years a student in the Academy. Other institutions include the Woolwich polytechnic and the Brook fever hospital, Shooter's Hill. The parish church of St Mary Magdalene was rebuilt, in 17 26-1 7 29, near the site of the old one dating from before the 12th century. Woolwich Common (142 acres) is partly within this borough, but mainly in Greenwich. South of it is Eltham Common (37 acres), and in the E. of the borough are Plumstead Common (103 acres) and Bostall Heath (134 acres). Behind the Royal Military Academy is a mineral well, the " Shooter's Hill waters " mentioned by Evelyn. Near Woolwich Common there are brick and tile kilns and sand and chalk pits, and there are extensive market- gardens in the locality. The parliamentary borough of Woolwich returns one member. The borough council consists of a mayor, 6 aldermen, and 60 councillors. It was only by the London Government Act 1899 that Woolwich was brought into line with other London districts, for in 1855, as it had previously become a local government district under a local board, it was left untouched by the Metropolis Management Act.

Woolwich (Wulewich) is mentioned in a grant of land by King Edward in 964 to the abbey of St Peter at Ghent. In Domesday the manor is mentioned as consisting of 63 acres of land. The Roman Watling Street crossed Shooter's Hill, and a Roman cemetery is supposed to have occupied the site of the Royal Arsenal, numerous Roman urns and fragments of Roman pottery having been dug up in the neighbourhood. Woolwich seems to have been a small fishing village until in the beginning of the 16th century it rose into pro- minence as a dockyard and naval station. There is evidence that ships were built at Woolwich in the reign of Henry VTL, but it was with the purchase by Henry VIII. of two parcels of land in the manor of Woolwich, called Boughton's Docks, that the foundation of the town's

prosperity was laid, the launching of the " Harry Grace de Dieu," of 1000 tons burden, making an epoch in its history. Wool- wich remained the chief dockyard of the English navy until the introduction of iron ship building, but the dockyard was closed in 1869, The town became the headquarters of the Royal Artillery on the establishment of a separate branch of this service in the reign of George I. Land was probably acquired for a military post and store dep6t_at Woolwich in. 1667, in order to erect batteries against the invading Dutch fleer, although in 1664 mention is made of store- houses and sheds for repairing ship carriages. In 1668 guns, carriages and stores were concentrated at Woolwich, and in 1695 the laboratory was moved hither from Greenwich. Before 1716 ordnance was obtained from private manufacturers and proved by the Board of Ordnance. In 1716 an explosion took place at the Moorfields Foundry, and it was decided to build a royal brass foundry at the " Tower Place," as the establishment at Woolwich was called until 1805. Founders were advertised for, and records show that Andrew Schalch of Douai was selected. In 1741 a school of instruction for the military branch of the ordnance was established here. It was not until 1805, however, that the collection of establishments at Woolwich became the Royal Arsenal.

See C. H. Grinling, T. A. Ingram and B. C. Polkinghorne, Survey and Record of Woolwich and West Kent (Woolwich, 1909),

WOOLWICH-AND-READING BEDS, in geology, a series of argillaceous and sandy deposits of lower Eocene age found in the London and Hampshire basins. By the earlier geologists this formation was known as the "Plastic Clay" so called by T. Webster in 1816 after the Argile plastique of G. C. F. D. Cuvier and A. Brongniart. It was called the " Mottled Clay " by J. Prcstwich in 1S46, but in 1853 he proposed the name " Wool- wich-and-Reading Beds " because the other terms were not applicable to the different local aspects of the scries.

Three distinct types of this formation are recognized: (1) The Reading type, a series of lenticular mottled clays antf sands, here and there with pebbly beds and masses of line sand converted into quartzite. These beds are generally unf ossiferous. They are found in the N. and W. portions of the London Basin and in the Hampshire Basin. (2) The Woolwich type, grey clays and pale sands, often full of cstuarine shells and in places with a well-marked oyster bed. At the base of the shell-bearing clays in S.E. London there are pebble beds and lignitic layers. The Woolwich beds occur in- W. Kent, the E. borders of Surrey, the borders of E. Kent, in S. Essex and at Ncwhaven in Sussex. (3) A third type consisting of light-coloured false-bedded sands with marine fossils occurs in E. Kent. Where it rests on the Thanet beds it is an argillaceous greensand with rounded flint pebbles; where it rests on the Chalk it is more clayey and the flints are less rounded

and are green-coated. Except in the Hampshire basin the Woolwich-and-Reading beds usually rest on the Thanet beds, but they are found on the Chalk near Bromley, Charlton, Hungerford, Hertford, Reading, &c. In Dorsetshire the Reading beds appear on the coast at Studland Bay and at other points inland. The " Hertfordshire Pudding Stone "'is a well-known rock from near the base of the formation ; it is a flint pebble, conglomerate in a siliceous matrix. The fossils, estuarine, freshwater and marine, include Corhicula cuneiformis, C. tellinella, Ostreabellovacina, Vivaparus lentus, Planorbis hemistoma, Melania (Melanatria) in- quinata, Neritina globulus, and the remains of turtles, crocodiles, sharks, birds (Gastornis) and the mammal Coryphodon. Bricks, tiles and coarse pottery and occasionally firebricks have been made from the clay beds in this formation.

See Eocrnk; also J. Prestwich, Q.J.G.S. (1854), x. ; W. Whitaker, " Geology of London," Mem. Geol. Survey, i. and ii. (1889) and Sheet Memoir, No. 268.

WOONSOCKET, a city of Providence county, Rhode Island, U.S.A. 3 on both banks of the Blackstone river, about 16 m. N. by W. of Providence. Pop. (1900) 28,204; (1905, state census). 32,196 Ci3,734 foreign-bom, including 8939 French Canadians and 1369 Irish)-; (1910) 38,125. Woonsocket is served by the New York, New Haven & Hartford railway and by an interurban electric line. Among its institutions are the Sacred Heart College and the Harris Institute Public Library, founded (1863) by Edward Harris, a local manufacturer. Woonsocket has ample

water power from the Blackstone river and its tributaries, the Mill and the Peters rivers. The value of its factory products in 1905 was $19,260,537. Worsted and woollen yarns are manu- factured in Woonsocket by the French and Belgian processes. Other manufactures are cotton goods and yarns, rubber goods, clothes wringers, silks,bobbins and shuttles, and foundry products.

The first settlement in the vicinity was made apparently about 1666 by Richard Arnold, who at about that time built a saw-mill on the bank of the Blackstone river. Woonsocket was set off from Cumberland and was incorporated as a township in 1867; was en- larged by the addition of a part of Smithfield in 1871, and was chartered as a city in 1888.

WOOSTER, a city and the county-seat of Wayne county, Ohio, U.S.A., on

Killbuck Creek, about 50 m. S. by W. of Cleveland. Pop. (1900) 6063 (407 foreign-born); (1910) 6136. Wooster is served by the Baltimore & Ohio and the Penn- sylvania! railways. It is the seat of the university of Wooster (co-educational; Presbyterian; founded in 1866 and opened in 1870), which in 1909 had 37 instructors and 15+7 students. The Ohio Agricultural Experiment Station is in the city, which also has various manufactures. Wooster was laid out in 1808, was incorporated as a town in 1817, and became a city of the second class in 1869. It was named in honour of General David Wooster (1 7 10-1 777), who was killed in the War of Independence.

WOOTTON BASSETT, a market town in the N. parliamentary division of Wiltshire, England, 83 m. W, of London by the Great Western railway. Pop. (1901) 2200. It is the junction of the direct railway (1903) between London and the Severn tunnel with the main line of the Great Western system. The town has large cattle markets and an agricultural trade.

Wootton Bassett {Wodeton, Wotlon) was held in the reign of Edward the Confessor by one Levenod, and after the Norman Conquest was included in the fief of Miles Crispin. About a century later the manor was acquired by the Basset family. The town received its first charter from Henry VI., and returned members to parliament from 1446-1447 until the passing of the Reform Act of 1832. In 1371 Elizabeth granted to the town a market on Tuesday and two fairs each to last two days, at the feasts of St George the Martyr and the Conception of the Virgin. In 1679 the town received a charter from Charles II., and the corporation consisted of a mayor, two aldermen and 12 capital burgesses, until abolished by the Municipal Corporations Act of 1886, under which the property is now vested in seven trustees, one of whom is appointed by the lord of the manor, and there are also two aldermen and four elected members. In 1836 fairs were instituted on the Tuesday before the 6th of April and on the Tuesday before the nth of October, which are still maintained, and a large cattle market is held on the first Wednesday of every month. The manufacture of broadcloth was formerly carried on, but is now entirely decayed.

WORCESTER, EARLS AND MARQUESSES OF. Urso de Abitot, constable of Worcester castle and sheriff of Worcester- shire, is erroneously said to have been created earl of Worcester in 1076. Waleran de Beaumont (1104-1166), count of Meulan in France, a partisan of King Stephen in his war with the empress Matilda, was probably earl of Worcester from 1136 to 1145. He was deprived of his earldom, became a crusader and died a monk. From 1397 to 1403 the earldom was held by Sir Thomas Percy (c. 1343-1403), a brother of Henry Percy, 1st earl of Northumber- land. Percy served with distinction in France during the reign of Edward III.; he also held an official position on the Scottish borders, and under Richard II.

he was the admiral of a fleet. He deserted Richard II. in 1399, and was employed and trusted by Henry IV., but in 1403 he joined the other Percies in their revolt; he was taken prisoner at Shrewsbury, and subsequently beheaded, the earldom becoming extinct. The title of earl of Worcester was revived in 1421 in favour of Richard Beauchamp, Lord Abergavenny, but lapsed on his death in 1422. The next earl was John Tiptoft, or Tibetot, a noted Yorkist leader during the wars of the Roses, who was executed in 1470 (see below). On the death of his son, Edward, in 1485 the earldom reverted to the crown.

In February 1514 the earldom was bestowed by Henry VIII.

on Charles Somerset (c. 1460-1526), a bastard son of Henry Beaufort, duke of Somerset. Having married Elizabeth, daughter of William Herbert, carl of Huntingdon, he was styled Baron Herbert in right of his wife, and in 1506 he was created Baron Herbert of Ragland, Chepstow and Gower. He was chamberlain of the household to Henry VUI. His son Henry, 2nd earl (c. 149 5-1 548), obtained Tintern Abbey after the dissolution of the monasteries. The title descended in direct line to Henry, the 5th earl (1577-1646), who advanced large sums of money to Charles I. at the outbreak of the Great Rebellion, and was created marquess of Worcester in 1643.

Edward Somerset, 2nd marquess of Worcester (1601-1667), is better known by the title of earl of Glamorgan, this earldom having been conferred upon him, although somewhat irregularly, by Charles I. in 1644. He became very prominent in 1644 and 1645 in connexion with Charles's scheme for obtaining military help from Ireland and abroad, and in 1645 he signed at Kilkenny, on behalf of Charles, a treaty with the Irish Roman Catholics; but the king was obliged by the opposition of Ormonde and the Irish loyalists to repudiate his action. Under the Common- wealth he was formally banished from England and his estates were seized. At the Restoration his estates were restored, and he claimed the dukedom of Somerset promised to him by Charles I., but he did not obtain this, nor was his earldom of Glamorgan recognized. He was greatly interested in mechanical experi- ments, and his name is intimately connected with the early history of the steam-engine {q.v.). His Century of the Names and Scantlings of such Inventions as at present I can call to mind to have tried and perfected (1663) has often been reprinted. He died on the 3rd of April 1667.

See Henry Dircks, Life, Times and Scientific Labours of the 2nd Marquess of Worcester (1865); Sir J. T. Gilbert, History of the Irish Confederation and the War in Ireland (Dublin, 1882— 1891).

His only son Henry (1629-1700), the 3rd marquess, abandoned the Roman Catholic religion and was a member of one of Crom- well's parliaments. But he was quietly loyal to Charles II., who in 1682 created him duke of Beaufort. As the defender of Bristol, the duke took a considerable part in checking the progress of the duke of Monmouth in 1683, but in 1688 he surrendered the city to William of Orange. He inherited Badminton, still the resi- dence of the dukes of Beaufort, and died there on the 21st of January 1700. The Worcester title was henceforth merged in that of Beaufort (q.v.). Henry, the 7th duke (1792-1853), was one of the greatest sportsmen of his day, and the Badminton hunt owed much to him and his successors, the 8th duke (1824- 1899) and 9th duke (b. 1847).

WORCESTER, JOHN TIPTOFT, Earl or (1427-147°), was son of John Tiptoft (1373-1443), who was Speaker of the House of Commons in 1406, much employed in diplomacy by Henry V., a member of the council during the minority of Henry VI., and created Baron Tiptoft in 1426. The younger Tiptoft was educated at Oxford, where John Rous says that he was one of his fellow-students; he is stated to have been a member of Balliol College. He married Cicely, daughter of Richard Neville, earl of Salisbury, and widow of Henry Beauchamp (d. 1445), duke of Warwick. In 1449 he was created earl of Worcester. His wife died in 1450, but he continued the association with the Yorkist party. During York's protectorate he was treasurer of the exchequer, and in 1456-1457 deputy of Ireland. In 1457 and again in 1459 he was sent on embassies to the pope. He was abroad three years, during which he made a pilgrimage to Jerusalem; the rest of the time he spent in Italy, at Padua, where he studied law and Latin; at Ferrara, where he made the acquaintance of Guarino of Verona; and at Florence, where he heard the lectures of John Argyropoulos, the teacher of Greek. He returned to England early in the reign of Edward IV., and on the 7th of February 1462 was made constable of England. In this office he had at once to try the earl of Oxford, and judged him by " lawe padoue " (sc. of Padua; Warkworth, 5). In 1463 he commanded at sea, without success. In the following year as constable he tried and condemned Sir Ralph Grey and other Lancastrians. In 1467 he was again appointed deputy of Ireland.

During a year's office there he had the earl of Desmond attainted, and cruelly put to death the earl's two infant sons. In 1470, as constable, he condemned twenty of Warwick's adherents, and had them impaled, " for which ever afterwards the carl was greatly hated among the people, for their disordinate death that he used contrary to the law of the land "

(Warkworth, 9). On the Lancastrian restoration Worcester fled into hiding, but was discovered and tried before the earl of Oxford, son of the man whom he had condemned in 1462. He was executed on Tower Hill on the 18th of October 1470.

Worcester was detested for his brutality and abuse of the law, and was called " the butcher of England " (Fabyan, 659). More than any of his contemporaries in this country he represents the combination of culture and cruelty that was distinctive of the Italians of the Renaissance. Apart from his moral character he was an accomplished scholar, and a great purchaser of books in Italy, many of which he presented to the university of Oxford. He translated Cicero's De amicitia and Buonaccorso's Declara- tion of Nobleness, which were printed by Caxton in 1481. Caxton in his epilogue eulogized Worcester as superior to all the temporal lords of the kingdom in moral virtue as well as in science. Worcester is also credited with a translation of Caesar's Com- mentaries printed in 1530. His " ordinances for justes and triumphes," made as constable in 1466, are printed in Harring- ton's Nugae antiquae. Worcester was a patron of the early English humanist John Free, and his Italian friends included, besides those already mentioned, Lodovico Carbo of Ferrara, and the famous Florentine bookseller Vespasiano da Bisticci.

Authorities. — For Worcester's English career see especially the contemporary accounts in Three Fifteenth Century Chronicles, Collections of a London Citizen (Gregory's Chronicle), and Wark- worth's Chronicle — all three published by the Camden Society. Vespasiano da Bisticci gave an account of him in his Vite di uomini illustri, i. 322-326, ap. Opere inedite rare nella provincia dell' Emilia. See also Blades' Life of Caxton, i. 79, ii. 73. (C. L. K.)

WORCESTER, WILLIAM (c. 141 5-c. 1482), English chronicler, was a son of William of Worcester, a Bristol citizen, and is some- times called William Botoner, his mother being a daughter of Thomas Botoner. He was educated at Oxford and became secretary to Sir John Fastolf. When the knight died in 1459, Worcester, although one of his executors, found that nothing had been bequeathed to him, and with one of his colleagues, Sir William Yelverton, he disputed the validity of the will. How- ever, an amicable arrangement was made and Worcester obtained some lands near Norwich and in Southwark. He died about 1482. Worcester made several journeys through England, and his Ilinerarium contains much information. The survey of Bristol is of the highest value to antiquaries. Portions of the work were printed by James Nasmith in 1778, and the part relating to Bristol is in James Dallaway's Antiquities of Bristowe (Bristol, 1834).

Worcester also wrote Annates rerum Anglicarum, a work of some value for

the history of England under Henry VI. This was published by T. Hearne in 1728, and by Joseph Stevenson for the " Rolls " series with his Letters arid Papers illustrative of the Wars of the English in France during the Reign of Henry VI. (1864). Stevenson also printed here collections of papers made by Worcester respecting the wars of the English in France and Normandy. Worcester's other writings include the last Acta domini Johannis Fastolf. See the Paston Letters edited by J. Gairdner (1904) ; and F. A. Gasquet, An Old English Bible and other Essays (1897).

WORCESTER, a town of the Cape province, S. Africa, 109m. by rail (58 in a direct line) N.E. of Cape Town, and the starting point of the railway to Mossel Bay and Port Elizabeth. Pop. (1904) 7885. It lies in the Little Karroo, about 800 ft. above the sea at the foot of the Hex River mountains. Tanning and wagon-building are among the industries, but the surrounding country is one of the largest wine and brandy producing districts in the province. At Brandvlei, 9 m. S., near the Breede river are thermal springs with a temperature of 145 ° F.

WORCESTER, an episcopal city and county of a city, muni- cipal, parliamentary, and county borough, and county town of Worcestershire, England, on the river Severn, 120J m. W.N.W. of London. Pop. (1901) 46,624. It is served by the Great Western railway and by the Bristol-Birmingham line of the

Midland railway. Branches of the Great Western diverge to Malvern and Hereford, and to Leominster. Worcester lies mainly upon the left (E.) bank of the Severn, which is here a broad and placid river, the main part of the city lying on a ridge parallel with its banks. The city is governed by a mayor, 12 aldermen and 36 councillors. Area 3242 acres.

The cathedral church of Our Lord and the Blessed Virgin Mary is beautifully placed close to the river. The see was founded by the advice of Archbishop Theodore of Canterbury about 679 or 680, though, owing to the opposition of the bishop of Lichfield it was not finally established till 780. In its formation the tribal division was followed, and it contained the people of the Hwiccas. The bishop's church of St Peter's, with its secular canons, was absorbed by Bishop Oswald into the monastery of St Mary. The canons became monks, and in 983 Oswald finished the building of a new monastic cathedral. After the Norman Conquest the saintly bishop of Worcester, Wulfstan, was the only English prelate who was left in possession of his see, and it was he who first undertook the building of a great church of stone according to the Norman pattern. Of the work of Wulf- stan, the outer walls of the nave, aisles, a part of the walls of the transepts, some shafts and the crypt remain. The crypt (1084) is one of the four apsidal crypts in England, the others being those in Winchester,

Gloucester and Canterbury cathedrals. Wulfstan's building seems to have extended no farther than the transepts, but the nave was continued, though much of it was destroyed by the fall of the central tower in 1175. The two W. bays of the nave date from about 1160. In 1203 Wulfstan, who had died in 1095, was canonized, and on the completion and dedication of the cathedral in 1218, his body was placed in a shrine, which became a place of pilgrimage, and thereby brought wealth to the monks. They devoted this to the building of a lady chapel at the E. end, extending the building by 50 ft.; and in 1224 was begun the rebuilding of the choir, in its present splendid Early English style. The nave was remodelled in the 14th century, and, excepting the W. bays, shows partly Decorated but principally early Perpendicular work. The building is cruciform, and is without aisles in the transepts, but has secondary choir-transepts. A Jesus chapel (an uncommon feature) opens from the N. nave aisle, from which it is separated by a very beautiful modern screen of stone, in the Perpendicular style. Without, the cathedral is severely plain, with the exception of the ornate tower, which dates from 1374, and is 196 ft. in height. The principal dimensions of the cathedral are — extreme length 425 ft. (nave 170 ft., choir 1S0 ft.), extreme width 145 ft. (choir 78 ft.), height of nave 68 ft. The monastic remains lie to the S. The cloisters are of Perpendicular work engrafted upon Norman walls, being entered from the S. through a fine Norman doorway. In them the effect of the warm red sandstone is particularly beautiful. An interesting Norman chapter house adjoins them on the E., its Perpendicular roof supported on a central column, while on the S. lies the Refectory, a fine Decorated room (1372) now devoted to the uses of the Cathedral School. There are also picturesque ruins of the Guesten Hall (1320). A very extensive restoration was begun in 1857, upwards of £100,000 being spent. Among the monuments in the cathedral, that of King John, in the choir, is the earliest sepulchral effigy of an English king in the country. There is an altar tomb, in a very fine late Perpendicular chantry chapel, of Arthur, Prince of Wales, son of Henry VII., who died in 1502. There are also monuments of John Gauden, the bishop who wrote Icon basilike, often attributed to Charles I., of Bishop Hough by Roubillac, and of Mrs Digby by Chantrey.

Of the eleven parish churches, St Alban's has considerable Norman remains, St Peter's contains portions of all Gothic styles, St Helen's, with a fine peal of bells commemorating the victories of Marlborough, has also Gothic portions, but the majority were either rebuilt in the 18th century, or are modern. St Andrews has a beautiful spire, erected in 1751, 155 ft. 6 in. in height. Holy Trinity preserves the ancient roof of the Guesten Hall. St John's in Bedwardine was made a parish church in i37i-

WORCESTER

There are no remains of the old castle of Worcester; it adjoined the monastery so closely that King John gave its yard to the monks, and after that time it ceased to be a stronghold. The Commandery, founded by St Wulfstan in 1085, was a hospital, and its name appears to lack authority. It was rebuilt in Tudor times, and there remains a beautiful hall, with music gallery, canopied dais, and a fine bay window, together with other parts. The wood-carving is exquisite. There arc many old half-timbered houses. The guild-hall (1723) is an admirable building in the Italian style; it contains a portrait of George III., by Sir Joshua Reynolds, presented by the king to commemorate his visit to the city at the triennial musical festival in 1788. This, the Festival of the Three Choirs, is maintained here alternately with Gloucester and Hereford. The corporation possesses some interesting old charters and manuscripts, and good muni- cipal regalia. Public buildings include the shire-hall (1835), Corn Exchange and market-house. Fairs are held thrice annually. The Victoria Institute includes a library, museum and art gallery. The cathedral school was founded by Henry VIII. in 1541, Queen Elizabeth's, in a modern building, in 1563; there are also a choir school, and municipal art, science and technical schools. In the vicinity of the city there is a large Benedictine convent, at Stanbrook Hall, with a beautiful modern chapel. The Clothiers' Company possesses a charter granted by Queen Elizabeth; but the great industries are now the manufacture of gloves and of porcelain. A company of glovers was incorporated in 1661. The manufacture of porcelain is famous. The materials employed are china clay and china stone from Cornwall, felspar from Sweden, fire-clay from Stour- bridge and Broseley, marl, flint and calcined bones. The Royal Porcelain works cover 5 acres. Among Worcester's other trades are those of iron, iron goods and engineering works, carriage making, rope spinning, boat building, tanning and the produc- tion of chemical manures and of cider and perry. There is a considerable carrying trade on the Severn.

The charities are numerous, and include St Oswald's hospital, Nash's almshouses, Wyatt's almshouses, the Berkeley hospital, Goulding hospital, Shevvring's hospital, Inglethorpe's alms- houses, Waldgrave's almshouses, Moore's blue-coat school, Queen Elizabeth's charity, and others.

Traces of British and Roman occupation have been discovered at Worcester {Wigeran Ceasler, Wigornia), but its history begins with the foundation of the episcopal see. Being the chief city on the borders of Wales, Worcester was frequently visited by the kings of England. In ii3g it was' taken by the Empress Maud and retaken and burnt by Stephen in 1 149. It surrendered to Simon de Montfort in 1263. In 1642, during the Great Rebellion, a handful of cavaliers was besieged here, and in spite of an attempted relief

by Prince Rupert, the city was pillaged, as it was again in 1646. In i65r Charles II. with the Scottish army marched into Worcester, where he was welcomed by the citizens. Cromwell took up his position on the Red Hill just outside the city gates. Lambert succeeded in passing the Severn at Upton, and drove back the Royalist troops towards Worcester. Charles, seeking an advantage of this division of the enemy on opposite sides of the river, attacked Cromwell's camp. At first he was successful, but Cromwell was reinforced by Lambert's troops in time to drive back Charles's foot, who were not supported by the Scottish horse, and the rout of the King's force was complete.

In the reign uf King Alfred, J5thelred and /Ethelflead, ealdor- man and lady of the Mercians, at the request of the bishop " built a burgh at Worcester " and granted to him half of their rights and privileges there " both in market and street within the borough and, without." Richard I. in 1189 granted the town to the burgesses at a fee-farm of £24, and Henry III. in 1227 granted a gild merchant and exemption from toll, and raised the farm to £30. The first incorporation charter was granted by Philip and Mary in 1554 under the title of bailiffs, aldermen, chamberlains and citizens, but James I. in 1622 made the city a separate county and granted a corporation of a mayor, 6 aldermen, and a common council consisting of one body of 24 citizens, including the mayor and aldermen, and another

body of 48, who elected the mayor from among the 24. By the Municipal Reform Act of 1835 the government was again altered. The burgesses returned two members to parliament from 1295 to 1885, when the number was reduced to one. As early as 1 203 the men of the town paid 100s. for licence to buy and sell cloth as they had done in the time of Henry III., and in 1590 the weavers, walkers and clothiers received an incorporation charter, but the trade had already begun to decline and by ˆ89 had ceased to exist. Its place was taken by the manufacture of porcelain, introduced in 1751 by Dr Wall, and by the increasing manufacture of gloves, a trade in which is known to have been carried on in the 1.5th century.

See Victoria County History, Worcester; John Noake, Worcester in Olden Times (1849) ; Valentine Green, The History and Antiquities of the City and Suburbs of Worcester (1796).

WORCESTER, a city and the county-seat of Worcester

county, Massachusetts, U.S.A., about 44 m. W. of Boston on the Blackstone river, a branch of the Providence river. Pop. (1900) n8,42t (37,652 foreign-born); (1905, state census) 128,135; (1910) 145,986. Area, 39 sq. m. Worcester is served by the Boston & Albany, the New York, New Haven & Hartford and the Boston & Maine railways, and is

connected with Springfield and Boston by interurban electric lines. The park system of the city comprises about twenty tracts with a total area of more than 1 100 acres; among them are Elm Park (88 acres) in the W. including Newton Hill (670 ft. above sea-level), and Green Hill Park (500 acres) in the N.E. Other parks are Institute Park (18 acres) and Boynton Park (113 acres) in the N.W. on Salisbury Pond, given to the city by Stephen Salisbury; Dodge Park (13 acres, N.); Burncoat Park (42 acres, N.E.); ('handler Hill Park (80 acres, E.); Hadwen (50 acres), University (14 acres) and Crompton Park (15-25 acres) in the S.W. and S.; and Greenwood (12-65 acres), Beaver Brook (15-5 acres), Tatnuck (2-94 acres), Kendrick (14-87 acres) and Vernon Hill (16-4 acres). Two miles N.E. of the centre of the city lies lake Quinsigamond, 4 m. long, from which flows the river of the same name, a branch of the Blackstone. On its shores is Lake Park (no acres). Fronting the Common, a wooded square in the centre of the city, is the City Hall, near which is a bronze statue, by D. C. French, of G. F. Hoar. On the Common there is a monument, designed by Randolph Rogers, to the soldiers and sailors of the Civil War, and one to Colonel Timothy Bigelow (1739-1790), one of Worcester's soldiers of the War of Independence. The E. side of the Common was the site of an old burying ground, and the W. side of the First Church, built in 1663. About J m. N. of the Common is Lincoln Square, adjacent to which is the granite Court House; in front of it is a statue of General Charles Devens (1820-1891) by French. The old Salisbury mansion, dating back to Colonial days, stands in this square. At Salisbury ' Street and Park Avenue are the library and museum (1910) of the American Antiquarian Society, established in 181 2 by Isaiah Thomas, with a collection of interesting portraits, a library of 99,000 vols, and many thousands of pamphlets, particu- larly rich in Americana. The Art Museum was erected and endowed (1899-1903) by Stephen Salisbury, and contains a fine collection of casts, many valuable paintings, and the Ban- croft Collection of Japanese art. The city has many fine churches.

Worcester is an important educational centre. Clark University was established here in 1889 by Jonas Gilman Clark as a purely graduate institution. In 1902 Clark College -was opened for undergraduate work under the presidency of Carroll D. Wright, with a separate endowment of $1,300,000. In i9to it had 30 teachers and 177 students. The university in 1910 had r5 instructors,. 103 students and a library of 50,000 volumes. Under G. Stanley Hall, who was made president in 1888, the university became well known for its work in child-psychology. Worcester Polytechnic Institute (founded in 1865 by John Boynton of Templefon, Massachusetts; opened in 1868) is one of the best-equipped technical schools of college rank in the country; in 1910 it had 49 instructors, 515 students and a library of 12,700 vols.; the buildings are near Institute Park.

On Packachoag Hill or Mt. St James (690 ft.) is the Jesuit college of the Holy Cross, with a preparatory school, founded in 1843 by Benedict J. Fenwick, bishop cf Boston, and chartered in 1S65; in 1910 it had 30 instructors and 450 students. There is a Stale Normal School (1874), and connected with it a kindergarten training school (1910).

The city library (175,000 vols.), founded in 1859, was one of the first in the country to be open on Sunday. There are four daily newspapers, one printed in French. From 1775 to 1848 was published here the weekly edition of the Worcester Spy, established by Isaiah Thomas in 1770 hi Boston as the Massa- chusetts Spy and removed by him to Worcester at the outbreak of the War of Independence; a daily edition was published from 1845 to 1904. Early in the 19th century the city was an important publishing centre.

Worcester is one of the most important manufacturing centres in New England: in 1905 the value of the factory product was $52,144,965, ranking the city third among the cities of the state. Manufacturers of hardware and tools at an early date laid the foundation for the present steel and other metal industries, in which 42 8% of all the workers were employed in 1905. A large proportion are employed in the wire and wire-working industries, one plant, that of the American Steel and Wire Company, employing about 5000 hands; in 1905 the total value of wire-work was $1,726,088, and of foundry and machine shop products $7,327,095.

The first grant of land in this part of the Blackstone Valley was made in 1657, and the town, Quansigamond (or Quinsiga- mond) Plantation, was laid out in October 1668. In 1675, on the outbreak of King Philip's War, it was temporarily abandoned. In 1684 it was settled again and its name was changed to Wor- cester because several leaders in the settlement were natives of Worcester, England. In 1713 the vicinity was opened up to settlement, a tavern and a mill were constructed, and a turnpike road was built to Boston. Worcester was incorporated as a town in 1722. In 1755 a small colony of the exiled Acadians settled here. At the outbreak of the War of Independence Worcester was little more than a country market town. During Shays's Rebellion it was taken by the rebels and the courts were closed. The first real impetus to its. growth came in 1835 with the construction of the Boston & Worcester railway, and it received a city charter in 1848. The strong anti-slavery sentiment of the city led in 1S54 to a serious riot, owing to an apparent attempt to enforce the Fugitive Slave

Law. In Worcester, or within a radius of a dozen miles of it, were the homes of Elias Howe, inventor of the sewing machine; Eli Whitney, inventor of the cotton gin; Erastus Bigelow (1814-1879), inventor of, the carpet weaving machine; Dr Russell L.Hawes, inventor of an envelope machine; Thomas Blanchard (1788-1864), inventor of the machine for turning irregular forms; Samuel Crompton (1753-1827) and Lucius James Knowles (1819-1884), the perfectors of the modern loom; and Draper Ruggles, Joel Nourse and J. C. Mason, per- fectors of the modern plough and originators of many inventions in agricultural machinery.

See F. E. Blake, Incidents of the First and Second Settlements of Worcester (Worcester, 1S84); Wm. Lincoln, History of Worcester to 18,36 (Worcester, 1837); also same extended to 1862 by Charles Hersey (Worcester, 1862); D. H. Hurd, History of Worcester County (Worcester, 2 vols., 1889); I. N. Metcalf, Illustrated Business Guide to City of Worcester (Worcester, 1880); C. F. Jewett, History of Worcester County (2 vols., Worcester, 1879); the Collections and Pro- ceedings (1881 sqq.) of the Worcester Society of Antiquity (instituted in 1877).

WORCESTERSHIRE, a midland county of England, bounded N. by Staffordshire, E. by Warwickshire, S. by Gloucestershire, W. by Herefordshire, and N.W. by Shropshire. The area is 751 sq. m. It covers a portion of the rich valleys of the Severn and Avon, with their tributary valleys and the hills separating them. The Severn runs through the county from N. at Bewdley to S. near Tewkesbury, traversing the Vale of Worcester. – Follow- ing this direction it receives from the E. the Stour at Stourport, the Salwarpe above Worcester, and the Avon, whose point of junction is just outside the county. The Avon /alley is known

in this county as the Vale of Evesham, and is devoted to orchards and market gardening. The Cotteswold Hills rise sharply from it on the S.E., of which Bredon Hill, within this county, is a conspicuous spur. The Avon forms the county boundary with Gloucestershire for a short distance above its mouth. The Tcmc joins the Severn from the W. below Worcester, and forms short stretches of the W. boundary. Salmon and lam- preys are taken in the Severn; trout and grayling abound in the Teme and its feeders. Besides the Cotteswolds, the most important hills are the Malvern and the Lickey or Hagley ranges. The Malverns rise abruptly from the flat Vale of Worcester on the W. boundary, being partly in Herefordshire, and reach a height of 1395 ft. in the Worcester Beacon, and 1 1 14 in the Hereford Beacon. They arc divided by the Teme from a lower N. continuation, the Abberley Hills. The Lickey Hills cross the N.E. corner of the county, rarely exceeding iooo ft. Their N. part is called the Clent Hills. Partly within the county are the sites of two ancient forests. That of Wyre, bordering the Severn on the W. in the N. of Worcestershire and in Shropshire, retains to

some extent its ancient character; but Malvern Chase, which clothed the slopes of the Malvern Hills, is hardly recognizable.

Geology. — Archean gneisses and schists (Malvernian) and volcanic rocks (Uricoiiia'n) form the core of the Malvern Hills; being the most durable rocks in the district, they form the highest ground. Similarly tuffs and volcanic grits (Barm: Green rocks) crop out in the Lickey Hills near Bromsgrove. They arc succeeded by the Cambrian rocks (Hollybush Sandstone and Malvern Shales) , which are well developed at the S. end of the Malvern Hills, where in places the Archean rocks have been thrust over them. The Lickey Quartzite, probably of the same age as the Hollybush Sandstone, is extensively quarried for roadstone. Strata of Ordovician age being absent in Worcestershire, the Silurian rocks rest imconformably on the earlier formations; they include the Upper Llandovery, Wenlock and Ludlow series. These dip steeply W. from the Malvern and Abberley axis and plunge under the Old Red Sandstone ; some of the lower beds are represented at the Lickey, while the Wenlock Limestone forms some sharp anti- clines at Dudley. The Silurian strata are rich in marine fossils, and the included limestones (Woolhope, Wenlock and Aymestry) are all represented m the Malvern district. The Old Red Sandstone succeeds the Silurian on the W. borders of the county. The Carboni- ferous Limestone and Millstone Grit were not deposited, so that the Coa! Measures rest unconformably on the older rocks. These are represented in the Wyre Forest coalfield near Bewdley and in the S. end of the S. Staffordshire coalfield near Halesowen; they contain rich seams of coal and ironstone and several intrusions of basalt (dhustone, Rowley-rag). The so-called Permian red rocks are now grouped with the Coal Measures; some intercalated breccias cap the Clent Hills (1036 ft.). The Triassic red rocks- — unconformable to all below— cover the centre of the county, and on the W. are faulted against the older rocks of the Malverns; they include the Bunter sandstones and pebble-beds, and the Keuper sandstones and marls, the beds of rock-salt in the latter yielding brine-springs (Droitwich, Stoke Prior). A narrow and seldom-exposed outcrop of Rhaetic beds introduces the marine Liassic formation which occupies most of the S.E. of the county; the Lower Lias consists of blue clays and limestones; the latter are burnt for lime and yield abundant ammonites. The sands and limestones of the Middle Lias and the clays of the Upper Lias are present in the lower slopes of Bredon Hill and of the Cotteswolds, and are succeeded by the sands and oolitic limestones of the Inferior Oolite. Glacial deposits— boulder-clay, isolated boulders, sand and gravel — are met with in many parts of the county, while later valley-gravels have yielded remains of mammoth, rhinoceros, &c. Coal, ironstone, salt, limestone and. road- stone are the chief mineral products.

Climate and Agriculture. — The climate is generally equable and healthy,

and is very favourable to the cultivation of fruit, vegetables and hops, for which Worcestershire has long held a high reputation, the red marls and the rich loams being good both for market gardens and tillage. About five-sixths of the area of the county is under cultivation, and of this about rive-eighths is in permanent pasture. Orchards are extensive, and there are large tracts of woodland. Wheat and oats are the principal grain crops. Turnips are grown on about one-third of the green crop acreage, and potatoes on about une-fourth. There is a considerable acreage under beans. In the neighbourhood of Worcester there are large nurseries.

Industries.— In the N. Worcester includes a portion of the Black Country, one of the most active industrial districts in England. Dudley, Netherton and Brierley Hill, Stourbridge, Halesowen, Oldbury and the S. and W. suburbs of Birmingham, have a vast population engaged in iron-working in all its branches, from engineer- ing works to nail-making, in the founding and conversion, galvaniz- ing, finishing and extracting of metals, in chemical and glass works. Worcester is famous for porcelain, Kidderminster for carpets and

Redditch for needles, fish-hooks, &c. Salt is produced from brine at Droitwich and Stoke. The fire-clays and limestone of the N. unite with the coal measures to form a basis of the industries in the Black Country. Furniture, clothing and paper-making and leather-work- ing are also important.

Communications. — The Great Western railway serves Evesham, Worcester, Droitwich and Kidderminster, with branches from Worcester to Malvern and into Herefordshire, from Kidderminster to Tenbury and the W-, and from the same junction to Dudley and Birmingham. The London & North-Western system touches Dudley. The Midland company's line between Derby, Birmingham and Bristol runs from N. to S. through the county, with a branch diverging through Droitwich and Worcester, another serving Malvern from Ashchurch, and an alternative route from Birmingham to Ashchurch by Redditch and Evesham. The Severn is an im-portant highway; the Avon, though locked up to Evesham, is little used save by pleasure-boats. Canals follow the courses of the Stour and the Salwarpe, and serve the towns of the Black Country.

Administration and Population. — The area of the ancient county is 480,560 acres, with a population in 1901 of 488,338. The area of the administrative county is 480,059 acres. The county is of very irregular

shape, and has detached portions enclaved in Herefordshire, Staffordshire, Warwickshire and Gloucestershire. It comprises five hundreds. The municipal boroughs are Bewdley (2866), Droitwich (4201), Dudley (48,733), Evesham (7101), Kidderminster (24,681) and Worcester (46,624). Dudley and the city and county town of Worcester are county boroughs. The urban districts arc Bromsgrove (8418), King's Norton and Northfield (57,122; forming a S. suburb of Birming- ham), Lye and Wollescote (10,976; adjacent to Stourbridge), Malvern (16,449), North Bromsgrove (5688), Oldbury (25,191), Redditch (13,493), Stourbridge (16,302) and Stourport (4529). Halesowen (4057), Pershore (3348), Tenbury (2080) and Upton- upon-Severn (2225) may be mentioned among other towns. The count}' is in the Oxford circuit, and assizes are held at Worcester. It has one court of quarter-sessions, and is divided into 17 petty sessional divisions. Worcester and Dudley have separate courts of quarter-sessions, and all the boroughs have commissions of the peace. The total number of civil parishes is 239. The ancient county, which is mostly in the diocese of Worcester, with a few parishes in that of Hereford, contains 231 ecclesiastical parishes or districts wholly or in part. The county contains five parliamentary divisions — West or Bewdley, East, South or Evesham, Mid or Droitwich, and North or Oldbury. The parliamentary boroughs of Kidderminster and Worcester return one member each, and parts of the boroughs of Dudley and Birmingham are included in the county.

History. — The earliest English settlers in the district now known as Worcestershire were a tribe of the Hwiccas of Gloucestershire, who spread along the Severn and Avon valleys in the 6th cen- tury. By 679 the Hwiccan kingdom was formed into a separate diocese with its see at Worcester, and the Hwiccas had made themselves masters of the modern county, with the exception of the N.W. corner beyond the Abberley Hills. From this date the town of Worcester became not only the religious centre of the district, but the chief point of trading and military communi- cation between England and Wales. A charter of the reign of Alfred alludes to the erection of a " burh " at Worcester by Edward and ˆEthelffead, and it was after the recovery of Mercia from the Danes by Edward that the shire originated as an administrative area. The first political event recorded by the Saxon Ckronide in Worcestershire is the destruction of Worcester by Hardicanute in 1041 in revenge for the murder of two of his tax-gatherers by the citizens.

In no county has the monastic movement played a more important part than in Worcestershire. Foundations existed at Worcester, Evesham, Pershore and Fladbury in the 8th century; at Great Malvern in the nth century, and in the 12th and 13th centuries at Little Malvern, Westwood, Bordesley, Whistones, Cookhill, Dudley, Halesowen and Astley. At the time

of the Domesday Survey more than half Worcestershire was in the hands of the church. The church of Worcester held the triple hundred of Oswaldslow, with such privileges as to exclude the sheriff's jurisdiction entirely, the profits of all the local courts accruing to the bishop, whose bailiffs in 1276 claimed

to hold his hundred outside Worcester, at Dryhurst, and at Wimborntree. The two hundreds owned by the church of West- minster, and that owned by Pershore, had in the 13th century been combined to form the hundred of Pershore, while the hundred of Evesham owned by Evesham Abbey had been con- verted into Blakcnhurst hundred; and the irregular boundaries and outlying portions of these hundreds are explained by their having been formed out of the scattered endowments of their ecclesiastical owners. Of the remaining Domesday hundreds, Came, Clent, Cresselaw and Esch had been combined to form the hundred of Halfshire by the 13th century, while Doddingtree remained unchanged. The shire-court was held at Worcester.

The vast possessions of the church prevented the growth of a great territorial aristocracy in Worcestershire, and Dudley Castle, which passed from William Fitz-Ansculf to the families of Payncl and Someri, was the sole residence of a feudal baron. The Domesday fief of Urse d'Abitot the sheriff, founder of Worcester Castle, and of his brother Robert le Despenser passed in the 12th century to the Beauchamps, who owned Elmley and Hanley Castles. The possessions of William Fitz Osbern in Doddingtree hundred and the Temc valley fell to the crown after his rebellion in 1074 and passed to the Mortimers. Hanley Castle and Malvern Chase were granted by Henry III. to Gilbert de Clare, with exemption from the sheriff's jurisdiction.

The early political history of Worcestershire centres round the city of Worcester. In the Civil War of the 1 7th century Worcester- shire was conspicuously loyal. On the retreat of Essex from Worcester in 1642 the city was occupied by Sir William Russell for the king, and only surrendered in 1646. In 1642 Prince Rupert defeated the parliamentary troops near Powick. Sudeley Castle surrendered in 1644, and Dudley and Hartlebury by command of the king in 1646.

The Droitwich salt-industry was very important at the time of the Domesday Survey, Bromsgrove alone sending 360 cartloads of wood yearly to the salt-works. In the 13th and 14th centuries Bordesley monastery and the abbeys of Evesham and Pershore exported wool to the Florentine and Flemish markets, and in the 16th century the Worcestershire clothing industry gave employment to 8000 people; fruit-culture with the manufacture of cider and perry, nail-making and glass-making also flourished at this period. The clothing in- dustry declined in the 17th

century, but the silk-manufacture re- placed it at Kidderminster and Blockley. Coal and iron were mined at Dudley in the 13th century.

As early as 1295 Worcestershire was represented by sixteen members in parliament, returning two knights for the shire and two burgesses each for the city of Worcester and the boroughs of Broms- grove, Droitwich, Dudley, Evesham, Kidderminster and Pershore. With the exception of Droitwich, however, which was represented until 131 1 and again recovered representation in 1554, the boroughs ceased to make returns. Evesham was re-enfranchised in 1604, and in 1606 Bewdley returned one member. Under the Reform Act of 1832 the county returned four members in two divisions; Droitwich lost one member; Dudley and Kidderminster were re-enfranchised, returning one member each. In 1867 Evesham lost one member.

Antiquities. — Remains of early camps are scarce, but there are examples at Berrow Hill near the Teme, W. of Worcester, at Round Hill by Spetchlcy, 3 m. E. of Worcester, and on the Herefordshire Beacon. Roman remains have been discovered on a few sites, as at Kempsey on the Severn, S. of Worcester, at Ripple, in the S. near Upton, and at Droitwich. There are remains of the great abbeys at Evesham and Pershore, and the fine priory church at Malvern, besides the cathedral at Worcester. There are further monastic remains at Halesowen and atBordesley near Redditch, and there was a Benedictine priory at Astley, 3 m. S.W. of Stourport. There. are fine churches in several of the larger towns, as Bromsgrove. The village churches are generally of mixed styles. Good Norman work remains in those of Martley, 8 m. N.W. of Worcester, Astley, Rous Lench in the Evesham district, Bredon near Pershore, and Bockleton in the N.W. of the county; while the Early English churches of Kempsey and Ripple are noteworthy. In domestic architecture, the half-timbered style adds to the picturesqueness of many streets in the towns and villages; and among country houses this style is well exemplified in Birts Morton Court and Easting- ton Hall, in the district S. of Malvern, in Elmley Lovett Manor between Droitwich and Kidderminster, and in Pirton Court near

Kempsey. Westwood Park is a mansion of the 16th and 17th centuries, with a picturesque gatehouse of brick; the site was formerly occupied by a Benedictine nunnery. Madresfield Court, between Worcester and Malvern, embodies remains of a fine Elizabethan moated mansion.

See Victoria County History, Worcestershire; T. R. Nash, Collec- tions for

the History of Worcestershire (2 vols., London, 1781-1799); Sir Charles Hastings, Illustrations of the Natural History of Worcester- shire (London, 1 834) ; VV. D. Curzon, Manufacturing Industries of Worcestershire (Birmingham, 1883); W. S. Brassington, Historic Worcestershire (Birmingham, 1893). See also publications of the Worcester Historical Society.

WORDSWORTH, CHARLES (1806-1892), Scottish bishop, son of Christopher Wordsworth, Master of Trinity, was born in London on the 22nd of August 1806, and educated at Harrow and Christ Church, Oxford. He was a brilliant classical scholar, and a famous cricketer and athlete; he was in the Harrow cricket eleven in the first regular matches with Eton (1822) and Winchester (1825), and is credited with bringing about the first Oxford and Cambridge match in 1827, and the first university boat-race in 1828, in both of which he took part. He won the Chancellor's Latin verse at Oxford in 1827, and the Latin essay in 1831, and took a first-class in classics. From 1830 to r833 he had as pupils a number of men (including W. E. Gladstone and H. E. Manning) who afterwards became famous. He then travelled abroad during 1833-1834, and after a year's work as tutor at Christ Church (1834-1835) was appointed second master at Winchester. He had previously taken holy orders, though he only became priest in 3840, and he had a strong religious influence with the boys. In 1839 he brought out his Greek Grammar, which had a great success. In 1846, however, he resigned; and then accepted the wardenship of Trinity College, Glenalmond, the new Scottish Episcopal public school and divinity college, where he remained from 1847 to 1854, having great educational success in all respects; though his views on Scottish Church questions brought him into opposition at some important points to W. E. Gladstone. In 1852 he was elected bishop of St Andrews, Dunkeld and Dunblane, and was consecrated in Aberdeen early next year. He was a strong supporter of the establishment, but conciliatory towards the Free churches, and this brought him into a good deal of controversy. He was a voluminous writer, and one of the company of revisers of the New Testament (1870-1881), among whom he displayed a conservative tendency. He died at St Andrews on the 5th of December 1892. He was twice married, first in 1835 to Charlotte Day (d. 1839), and secondly in 1846 to Katherine Mary Barter (d. 1897). He had thirteen children altogether.

See his Annals of my Early Life (1891), and Annals of My Life, edited by W. Earl Hodgson (1893); also The Episcopate of Charles Wordsworth, by his nephew John, bishop of Salisbury (1899).

WORDSWORTH, CHRISTOPHER (1774-1846), English divine and scholar, youngest brother of the poet William Words- worth, was born on

the 9th of June 1774, and was educated at Trinity College, Cambridge, where he became a fellow in 1798. Twelve years later he received the degree of D.D. He took holy orders, and obtained successive preferments through the patron- age of Manners Sutton, bishop of Norwich, afterwards (1805) archbishop of Canterbury, to whose son Charles (afterwards Speaker of the House of Commons, and viscount Canterbury) he had been tutor. He had in 1802 attracted attention by his defence of Granville Sharp's then novel canon " on the uses of the definitive article" in New Testament textual criticism. In 1S10 he published an Ecclesiastical Biography in 6 volumes. On the death of Bishop Mansel, in 1820, he was elected Master of Trinity, and retained that position till 1841, when he resigned. He is regarded as the father of the modern " classical tripos," since he had, as vice-chancellor, originated in 1821 a proposal for a public examination in classics and divinity, which, though then rejected, bore fruit in 1822. Otherwise his mastership was un- distinguished, and he was not a popular head with the college. He died on the 2nd of February 1846, at Buxted. In his Who urate Ikon Basiiike? (1824), and in other writings, he advocated the claims of Charles I. to its authorship; and in 1836 he

published, in 4 volumes, a work of Christian Institutes, selected from English divines. He married in 1804 Miss Priscilla Lloyd (d. 1815), a sister of Charles Lamb's friend Charles Lloyd; and he had three sons, John W. (1805-1839), Charles (q.v.), and Christopher (q.v.); the two latter both became bishops, and John, who became a fellow and classical lecturer at Trinity College, Cambridge, was an industrious and erudite scholar.

WORDSWORTH, CHRISTOPHER (1807-1885), English bishop and man of letters, youngest son of Christopher Wordsworth, Master of Trinity, was born in London on the 30th of October 1807, and was educated at Winchester and Trinity, Cam- bridge. He, like his brother Charles, was distinguished as an athlete as well as for scholarship. He became senior classic, and was elected a fellow and tutor of Trinity in 1830; shortly afterwards he took holy orders. He went for a tour in Greece in 1832-1833, and published various works on its topography and archaeology, the most famous of which is " Wordsworth's " Greece (1839). In 1836 he became Public Orator at Cambridge, and in the same year was appointed headmaster of Harrow, a post he resigned in 1844. He then became a canon of West- minster, and from 1850 to 1870 he held a country living in Berkshire. In 1865 he was made archdeacon of Westminster, and in 1869 bishop of Lincoln. He died on the 20th of March 1885. He was a man of fine character, with a high ideal of ecclesiastical duty, and he spent his money generously on church objects. As a scholar he is best known for his edition of the Greek New Testament (1856-1860), and the Old Testament (1864-1870), with commentaries; but his writings were many in number, and included a volume of devotional verse, The

Holy Year (1862), Church History up to A.D. 451 (1881-1883), and Memoirs of his uncle the poet (1851), to whom he was literary executor. His Inscriptions Pompeianae (1837) was an important contribution to epigraphy. He married in 1-838 Susanna Hartley Frere (d. 1884), and had a family of seven; the eldest son was John (b. 1843), bishop of Salisbury (1885), and author of Frag- ments of Early Latin (1874); the eldest daughter, Elizabeth (b. 3840), was the first principal (1879) of Lady Margaret Hall, Oxford.

His Life, by J. H. Overton and Elizabeth Wordsworth, was pub- lished in 1888.

WORDSWORTH, DOROTHY (1771-1855), English writer and diarist, was the third child and only daughter of John Wordsworth of Cockermouth and his wife, Anne Cookson- Crackanthorpe. The poet William Wordsworth was her brother and a year her senior. On the death of her father in 1783, Dorothy found a home at Penrith, in the house of her maternal grandfather, and afterwards for a time with a maiden lady at Halifax. In 1787, on the death of the elder William Cookson, she was adopted by her uncle, and lived in his No.-folk parish of Forncett. She and her brother William, who dedicated to his sister the Evening Walk of 1792, were early drawn to one another, and in 1794 they visited the Lakes together. They determined that it would be best to combine their small capitals, and that Dorothy should keep house for the poet. From this time forth her life ran on lines closely parallel to those of her great brother, whose companion she continued to be till his death. It is thought that they made the acquaintance of Coleridge in

1797-

From the autumn of 1795 to July 1797 William and Dorothy Wordsworth took up their abode at Racedown, in Dorsetshire. At the latter date they moved to a large manor-house, Alfoxden, in the N. slope of the Quantock hills, in W. Somerset, S. T. Cole- ridge about the same time settling near by in the town of Nether Stowey. On the 20th of January 1798 Dorothy Wordsworth began her invaluable Journal, used by successive biographers of her brother, but first printed in its quasi-entirety by Professor W. Knight in 1897. The Wordsworths, Coleridge, and Chester left England for Germany on the 14th of September 1798; and of this journey also Dorothy Wordsworth preserved an account, portions of which were published in 1897. On the 14th of May 1800 she started another Journal at Grasmere, which she kept very fully until the 31st of December of the same year. She

resumed it on the ist of January 1802 for another twelve months, closing on the nth of January 1803. These were printed first in i88q. She composed Recollections of a Tour in Scotland, in 1803, with her brother and Coleridge; this was first published in 1874. Her next contribution to the family history was her Journal oj a Mountain Ramble, in November 1805, an account of a walking tour in the Lake district with her brothei. In July 1820 the Wordsworths made a tour on the continent of Europe, of which Dorothy preserved a very careful record, portions of which were given to the world in 1884, the writer having refused to publish it in 1824 on the ground that her " object was not to make a book, but to leave to her niece a neatly-penned memorial of those few interesting months of our lives." Meanwhile, without her brother, but in the company of Joanna Hutchinson, Dorothy Wordsworth had travelled over Scotland in 1822, and had composed a Journal of that tour. Other MSS. exist and have been examined carefully by the editors and biographers of the poets, but the records which we have mentioned and her letters form the principal literary relics of Dorothy Wordsworth. In i82g she was attacked by very serious illness, and was never again in good health. After 1836 she could not be considered to be in possession of her mental faculties, and became a pathetic member of the interesting household at Grasmcre. She outlived the poet, however, by several years, dying at Grasmere on the 25th of January 1855.

It would be difficult to exaggerate the importance of Dorothy Wordsworth's companionship to her illustrious brother. He has left numerous tributes to it, and to the sympathetic originality of her perceptions. " She," he said, " gave me eyes, she gave me ears;

And humble cares, and delicate fears;

A heart the fountain of sweet tears;

And love, and thought, and joy."

The value of the records preserved by Dorothy Wordsworth, especially in earlier years, is hardly to be over-estimated by those who desire to form an exact impression of the revival of English poetry. When Wordsworth and Coleridge refashioned imagina- tive literature at the close of the 18th century, they were daily and hourly accompanied by a feminine presence exquisitely attuned to sympathize with their efforts, and by an intelligence which was able and anxious to move in step with theirs. " S. T. C. antl my beloved sister," William Wordsworth wrote in 1832, " are the two beings to whom my intellect is most indebted." In her pages we can put our finger on

the very pulse of the machine; we are present while the New Poetry is evolved, and the sensitive descriptions in her prose lack nothing but the accomplishment of verse. Moreover, it is certain that the sharp- ness and fineness of Dorothy's observation, " the shooting lights of her wild eyes," actually afforded material to the poets. Coleridge, for instance, when he wrote his famous lines about " The one red leaf, the last of its clan," used almost the very words in which, on the 7th of March 1798, Dorothy Wordsworth had recorded- " One only leaf upon the top of a tree . . . danced round and round like a rag blown by the wind."

It is not merely by the biographical value of her notes that Dorothy Wordsworth lives. She claims an independent place in the history of English prose as one of the very earliest writers who noted, in language delicately chosen, and with no other object than to pre- serve their fugitive beauty, the little picturesque phenomena of homely country.hfe. When we speak with very high praise of her art in this direction, it is only fair to add that it is called forth almost entirely by what she wrote between 1798 and 1803, for a decline similar to that which fell upon her brother's poetry early invaded her prose; and her later journals, like her Letters, are less interest- ing because less inspired. A Life by E. Lee was published in 1886; but it is only since 1897, when Professor Knight collected and edited her scattered MSS-, that Dorothy Wordsworth has taken her independent place in liLcrary history. (E. G.)

WORDSWORTH, WILLIAM (1770-1850), 'English poet, was born at Cockermouth, on the Derwent, in Cumberland, on the 7th of April 1770. He was the son of John Wordsworth (1741-1783), an attorney, law agent to the first earl of Lonsdale, a prosperous man in his profession, descended from an old Yorkshire family of landed gentry. On the mother's side also Wordsworth was connected with the middle territorial class:

his mother, Anne Cookson, was the daughter of a well-to-do mercer in Penrith, but her mother was Dorothy Crackanthorpe, whose ancestors had been lords of the manor of Newbiggin, near Penrith, from the time of Edward III. He thus came of " gentle " kin, and was proud of it. The country squires and farmers whose blood (lowed in Wordsworth's veins were not far enough above local life to be out of sympathy with it, and the poet's interest in the common scenes and common folk of the North country hills and dales had a traceable hereditary bias. William Wordsworth was one of a family of five, the others being Richard (1768-1816), Dorothy (q.v.), John (1772-1S05), and Christopher {q.v.).

Though his parents were of sturdy stock, both died prematurely, his mother when he was eight years old, his father when he was thirteen. At the age of eight Wordsworth was sent to school at Hawkshead, in the Esthwaite valley

in Lancashire. His father died while he was there, and at the age of seventeen he was sent to St John's College, Cambridge. He did not distinguish himself in the studies of the university, and for some time after taking his degree of B.A., in January 1791, he showed what seemed to his relatives a most perverse reluctance to adopt any regular profession. His mother had noted his " stiff, moody and violent temper " in childhood, and it seemed as if this family judgment was to be confirmed in his manhood. After taking his degree, he was pressed to take holy orders, but would not; he had no taste for the law; he idled a few months aimlessly in London, a few months more with a Welsh college friend, with whom he had made a pedestrian tour in France and Switzer- land during his last Cambridge vacation; then in the November of 1791 he crossed to France, ostensibly to learn the language, made the acquaintance of revolutionaries, sympathized with them vehemently, and was within an ace of throwing in his lot with the Girondins. When it came to this, his relatives cut off his supplies, and he was obliged to return to London towards the close of 1792. But still he resisted all pressure to enter any of the regular professions, published his poems An Evening Walk and Descriptive Sketches in 1793, and in 1794, still moving about to all appearance in stubborn aimlessness among his friends and relatives, had no more rational purpose of livelihood than drawing up the prospectus of a periodical of strictly republican principles to be called " The Philanthropist."

But all the time from his boyhood upwards a great purpose had been growing and maturing in his mind. The Prelude expounds in lofty impassioned strain how his sensibility for nature was " augmented and sustained," and how it never, except for a brief interval, ceased to be " creative " in the special sense of his subsequent theory. But it is with his feelings to- wards nature that The Prelude mainly deals; it says little regarding the history of his ambition to express those feelings in verse. It is the autobiography, not of the poet of nature, but of the worshipper and priest. The salient incidents in the history of the poet he communicated in prose notes and in familiar discourses. Commenting on the couplet in the Evening Walk —

" And, fronting the bright west, yon oak entwines Its darkening boughs and leaves in stronger lines — "

he said:

" This is feebly and imperfectly exprest; but I recollect distinctly the very spot where this first struck me. It was on the way between Ilawkshead and Ambleside, and gave me extreme pleasure. The moment was important in my poetical history; for I date from it my consciousness of the infinite variety of natural appearances which had been unnoticed by the poets of

any age or country, so far as I was acquainted with them; and I made a resolution to supply in some degree the deficiency. I could not at that time have been above fourteen years of age."

About the same time he wrote, as a school task at Hawkshead, verses that show considerable acquaintance with the poets of his own country at least, as well as some previous practice in the art of verse-making. 1 The fragment that stands at the

1 Memoirs of William Wordsworth, by Canon Wordsworth, vol. i. pp. 10, 11. According to his own statement in the memoranda dictated to his biographer, it was the success of this exercise that " put it into hia head to compose verses from the impulse of his own

beginning of his collected works, recording a resolution to end his life among his native hills, was the conclusion of a long poem written while he was still at school. And, undistinguished as he was at Cambridge in the contest for academic honours, the Evening Walk, his first publication, was written during his vacations. 1 He published it in 1793, to show, as he said, that he could do something, although he had not distinguished himself in university work. There are touches here and there of the bent of imagination that became dominant in him soon after- wards, notably in the moral aspiration that accompanies his Remembrance of Collins on the Thames: —

" O glide, fair stream! for ever so Thy quiet soul on all bestowing, Till all our minds for ever flow As thy deep waters now are flowing."

But in the main this first publication represents the poet in the stage described in the twelfth book of The Prelude: — " Bent overmuch on superficial things, Pampering myself with meagre novelties Of colour and proportion ; to the moods Of time and season, to the moral power, The affections, and the spirit of the place Insensible."

But, though he had not yet found his distinctive aim as a poet, he was inwardly bent upon poetry as " his office upon earth."

In this determination he was strengthened by his sister Dorothy {q.v.), who with rare devotion consecrated her life henceforward to his service. A timely legacy enabled them to carry their purpose into effect. A friend of his, whom he had nursed in a last illness, Raisley Calvert, son of the steward of the duke of Norfolk, who had large estates in Cumberland, died

early in 1795, leaving him a legacy of £900. It may be well to notice how opportunely, as De Quincey half-ruefully remarked, money always fell in to Wordsworth, enabling him to pursue his poetic career wiihout distraction. Calvert's bequest came to him when he was on the point of concluding an engagement as a journalist in London. On it and other small resources he and his sister, thanks to her frugal management, contrived to live for nearly eight years. By the end of that time Lord Lonsdale, who owed Wordsworth's father a large sum for pro- fessional services, and had steadily refused to pay it, died, and his successor paid the debt with interest. His wife, Mary Hutchinson, whom he married on the 4th of October 1802, brought him some fortune; and in 1813, when in spite of his plain living his family began to press upon his income, he was appointed stamp-distributor for Westmorland, with an income of £500, afterwards nearly doubled by the increase of his district. In 1842, when he resigned his stamp-distributorship, Sir Robert Peel gave him a Civil List pension of £300.

To return, however, to the course of his life from the time when he resolved to labour with all his powers in the office of poet. The first two years, during which he lived with his self- sacrificing sister at Racedown, in Dorset, were spent in half- hearted and very imperfectly successful experiments, satires in imitation of Juvenal, the tragedy of The Borderers? and a poem in the Spenserian stanza, now entitled Guilt and Sorrow. How much longer this time of self-distrustful endeavour might have continued is a subject for curious speculation; an end was put to it by a fortunate incident, a visit from Coleridge, who had read his first publication, and seen in it, what none of the public critics had discerned, the advent of " an original poetic genius." mind." The resolution to supply the deficiencies of poetry in the exact description of natural appearances was probably formed while he was in this state of boyish ecstasy at the accidental revelation of his own powers. The date of his beginnings as a poet is confirmed by the lines in The Idiot Boy, written in 1798 —

" I to the Muses have been bound

These fourteen years by strong indentures."

1 In The Prelude, book iv., he speaks of himself during his first vacation as " harassed with the toil of verse, much pains and little progress."

2 Not published till 1842. For the history of this tragedy see Memoirs, vol. i. p. 113; for a sound, if severe, criticism of it, A. C. Swinburne's Miscellanies, p. 118. And yet it was of the blank verse of The Borderers that Coleridge spoke when he wrote to Cottle that " he felt a little man by the side of his friend."

Stubborn and independent as Wordsworth was, he needed some friendly voice from the outer world to give him confidence in himself. Coleridge rendered him this indispensable sendee. He had begun to seek his themes in

" Sorrow, that is not sorrow, but delight; And miserable love, that is not pain To hear of, for the glory that redounds Thcrelrom to human kind, and what we are."

He read to his visitor one of these experiments, the story of the ruined cottage, afterwards introduced into the first book of Tlie Excursion. 3 Coleridge, who had already seen original poetic genius in the poems published before, was enthusiastic in his praise of them as having " a character, by books not hitherto re fleeted. "

June 1797 was the date of this memorable visit. So pleasant was the companionship on both sides that, when Coleridge returned to Nether Stowey, in Somerset, Wordsworth at his instance changed his quarters to Alfoxden, within a mile and a half of Coleridge's temporary residence, and the two poets lived in almost daily intercourse for the next twelve months. During that period Wordsworth's powers rapidly expanded and matured; ideas that had been gathering in his mind for years, and lying there in dim confusion, felt the stir of a new life, and ranged themselves in clearer shapes under the fresh quickening breath of Coleridge's swift and discursive dialectic.

The Lyrical Ballads were the poetic fruits of their companion- ship. Out of their frequent discussions of the relative value of common life and supernatural incidents as themes for imaginative treatment grew the idea of writing a volume together, composed of poems of the two kinds. Coleridge was to take the super- natural; and, as his industry was not equal to his friend's, this kind was represented by the Ancient Mariner alone. Among Wordsworth's contributions were The Female Vagrant, We are Seven, Complaint of a Forsaken Indian Woman, The Last of the Flock, The Idiot Boy, The Mad Mother (" Her eyes are wild "), The Thorn, Goody Blake and Harry Gill, The Reverie of Poor Susan, Simon Lee, Expostulation and Reply, The Tables Turned, Lines left upon a Yew-tree Seat, An Old Man Travelling (" Animal Tranquillity and Decay "), Lines above Tintern Abbey. The volume was published by Cottle of Bristol in September 1798.

It is necessary to enumerate the contents of this volume in fairness to the contemporaries of Wordsworth, for their cold or scoffing reception of his first distinctive work. Those Words- worthians who give up The Idiot Boy, 4, Goody Blake and The Thorn as mistaken experiments have no right to triumph over the first derisive critics of the Lyrical Ballads, or to wonder at the dullness that failed to see at once in this humble issue from an obscure

provincial press the advent of a great master in literature. It is true that Tintern Abbey was in the volume, and that all the highest qualities of Wordsworth's imagination and of his verse could be illustrated from the lyrical ballads proper in this first publication; but clear vision is easier for us than it was when the revelation was fragmentary and incomplete.

Although Wordsworth was not received at first with the respect to which he was entitled, his power was not entirely without recognition. There is a curious commercial evidence of this, which ought to be noted, because a perversion of the fact is sometimes used to exaggerate the supposed neglect of Wordsworth at the outset of his career. When the Longmans

9 The version read to Coleridge, however, must have been in Spen- serian stanzas, if Coleridge was right in his recollection that it was in the same metre with The Female Vagrant, the original title of Guilt and Sorrow.

4 The defect of The Idiot Boy is really rhetorical, rather than poetic. Wordsworth himself said that " he never wrote anything with so much glee," and, once the source of his glee is felt in the nobly affectionate relations between the two half-witted irrational old women and the glorious imbecile, the work is seen to be executed with a harmony that should satisfy the most exacting criticism. Poetically, there- fore, the poem is a success. But rhetorically this particular attempt to "breathe grandeur upon the very humblest face of human life " must be pronounced a failure, inasmuch "as the writer did not use sufficiently forcible means to disabuse his readers of vulgar prepossessions.

took over Cottle's publishing business in 1799, the value of the copyright of the Lyrical Ballads, for which Cottle had paid thirty guineas, was assessed at nil. Cottle therefore begged that it might be excluded altogether from the bargain, and presented it to the authors. But in 1800, when the first edition was exhausted, the Longmans offered Wordsworth £100 for two issues of a new edition with an additional volume and an explana- tory preface. The sum was small compared with what Scott and Byron soon afterwards received, but it shows that the public neglect was hot quite so complete as is sometimes represented. Another edition was called for in 1802, and a fourth in 1805. The new volume in the 1800 edition was made up of poems composed during his residence at Goslar in Germany (where he went with Coleridge) in the winter of 1798-1799, and after his settlement at Grasmere in December 1799. It contained a large portion of poems now universally accepted: — Ruth, Nutting, Three Years She Grew, A Poet's

Epitaph, Ilartleap Well, Lucy Gray, The Brothers, Michael, The Old Cumberland Beggar, Poems on the Naming of Places. But it contained also the famous Preface, in which he infuriated critics by presuming to defend his eccentricities in an elaborate theory of poetry and poetic diction.

This document (and let it be noted that all Wordsworth's Prefaces are of the utmost interest in historical literary criticism) is constantly referred to as a sort of revolutionary proclamation against the established taste of the 18th century. For one who has read Wordsworth's original, hundreds have read Coleridge's brilliant criticism, and the fixed conception of the doctrines put forth by Wordsworth is taken from that. 1 It is desirable, therefore, considering the celebrity of the affair, that Words- worth's own position should be made clear. Coleridge's criticism of his friend's theory proceeded avowedly " on the assumption that his words had been rightly interpreted, as purporting that the proper diction for poetry in general consists altogether in a language taken, with due exceptions, from the mouths of men in real life, a language which actually constitutes the natural conversation of men under the influence of natural feelings." Coleridge assumed further that, when Wordsworth spoke of there being " no essential difference between the language of prose and metrical composition," he meant by language not the mere words but the style, the structure and the order of the sentences; on this assumption he argued as if Wordsworth had held that the metrical order should always be the same as the prose order. Given these assumptions, which formed the popular interpretation of the theory by its opponents, it was easy to demonstrate its absurdity, and Coleridge is very generally supposed to have given Wordsworth's theory in its bare and naked extravagance the coup de grdce. But the truth is that neither of the two assumptions is warranted; both were expressly disclaimed by Wordsworth in the Preface itself. There is not a single qualification introduced by Coleridge that was not made by Wordsworth himself in the original statement. 2 In the first place, it was not put forward as a theory of poetry in general, though from the vigour with which he carried the war into the enemy's country it was naturally enough for polemic purposes taken as such; it was a statement and defence of the principles on which his own poems of humbler life were composed. Wordsworth also assailed the public taste as " depraved," first

1 Sir Henry Taylor, one of the most acute and judicious of Words- worth's champions, came to this conclusion in 1834.

2 Although Coleridge makes the qualifications more prominent than they were in the original statement, the two theories are at bottom so closely the same that one is sometimes inclined to suspect that parts, at least, of the original emanated from the fertile mind of Coleridge himself. The two poets certainly discussed the subject together in Somerset when the first ballads

were written, and Coleridge was at Grasmere when the Preface was prepared in 1800. The diction of the Preface is curiously Hartleian, and, when they first met, Coleridge was a devoted disciple of Hartley, naming his first son after the philosopher, while Wordsworth detested analytic psychology. If Coleridge did contribute to the original theory in 1798 or 1800, he was likely enough to have forgotten the fact by 18 14. At any rate, he evidently wrote his criticism without making a close 3tudy of the Preface, and what he did in effect was to restate the original theory against popular misconceptions of it.

and mainly in so far as it was adverse to simple incidents simply treated, being accustomed to " gross and violent stimulants," " craving after extraordinary incident," possessed with a " degrading thirst after outrageous stimulation," " frantic novels, sickly and stupid German tragedies, and deluges of idle and extravagant stories in verse." This, and not adherence to the classical rule of Pope, which had really suffered deposition a good half century before, was the first count in Wordsworth's defensive indictment of the taste of his age. As regards the " poetic diction," the liking for which was the second count in his indictment of the public taste, it is most explicitly clear that, when he said that there was no essential difference between the language of poetry and the language of prose, he meant words, plain and figurative, and not structure and order, or, as Coleridge otherwise puts it, the " ordonnance " of composition. Coleridge says that if he meant this he was only uttering a truism, which nobody who knew Wordsworth would suspect him of doing; but, strange to say, it is as a truism, nominally acknowledged by everybody, that W'ordsworth does advance his doctrine on this point. Only he adds — " if in what I am about to say it shall appear to some that my labour is unnecessary, and that I am like a man fighting a battle without enemies, such persons may be reminded that, whatever be the language outwardly holden by men, a practical faith in the opinions which I am wishing to establish is almost unknown."

What he wished to establish was the simple truth that what is false, unreal, affected, bombastic or nonsensical in prose is not less so in verse. The form in w T hich he expresses the theory was conditioned by the circumstances of the polemic, and readers were put on a false scent by his purely incidental and collateral and very much overstrained defence of the language of rustics, as being less conventional and more permanent, and therefore better fitted to afford materials for the poet's selection. But this was a side issue, a paradoxical retort on his critics, seized upon by them in turn and made prominent as a matter for easy ridicule; all that he says on this head might be cut out of the Preface without affecting in the least his main thesis. The drift of this is fairly apparent all through, but stands out in unmistakable clearness in his criticism of the passages from Johnson and

Cowper: —

" But the sound of the church-going bell These valleys and rocks never heard, Ne'er sighed at the sound of a knell Or smiled when a Sabbath appeared."

The epithet " church-going " offends him as a puritan in grammar; whether his objection is well founded or ill founded, it applies equally to prose and verse. To represent the valleys and rocks as sighing and smiling in the circumstances would appear feeble and absurd in prose composition, and is not less so in metrical composition; " the occasion does not justify such violent expressions." These are examples of all that Wordsworth meant by saying that " there is no essential differ- ence between the language of prose and metrical composition." So far is Wordsworth from contending that the metrical order should always be the same as the prose order, that part of the Preface is devoted to a subtle analysis of the peculiar effect of metrical arrangement. What he objects to is not departure from the structure of prose, but the assumption, which seemed to him to underlie the criticisms of his ballads, that a writer of verse is not a poet unless he uses artificially ornamental language, not justified by the strength of the emotion expressed. The furthest that he went in defence of prose structure in poetry was to main- tain that, if the words in a verse happened to be in the order of prose, it did not follow that they were prosaic in the sense of being unpoetic — a side-stroke at critics who complained of his prosaisms for no better reason than that the words stood in the order of prose composition. Wordsworth was far from repudiating elevation of style in poetry. " If," he said, " the poet's subject be judiciously chosen, it will naturally, and upon fit occasion, lead him to passions the language of which, if selected truly and judiciously, must necessarily be dignified and variegated, and alive with metaphors and figures."

Such was Wordsworth's theory of poetic diction. Nothing could be more grossly mistaken than, the notion that the greater part of Wordsworth's poetry was composed in defiance of his own theory, and that he succeeded best when he set his own theory most at defiance. The misconception is traceable to the authority of Coleridge. His just, sympathetic and penetrat- ing ciiticism on Wordsworth's work as a poet did immense service in securing for him a wider recognition; but his proved friendship and brilliant style have done sad injustice to the poet as a theorist. It was natural to assume that Coleridge, if any- body, must have known what his friend's theory was; and it was natural also that readers under the charm of his

lucid and melodious prose should gladly grant themselves a dispensation from the trouble of verifying his facts in the harsh and cumbrous exposition of the theorist himself. 1

The question of diction made most noise, but it was far from being the most important point of poetic doctrine set forth in the Preface. If in this he merely enunciated a truism, generally admitted in words but too generally ignored in practice, there was real novelty in his plea for humble subjects, and in his theory of poetic composition. Wordsworth's remarks on poetry in general, on the supreme function of the imagination in dignifying humble and commonplace incidents, and on the need of active exercise of imagination in the reader as well as in the poet, are immeasurably more important than his theory of poetic diction. Such sayings as that poetry " takes its origin from emotion recollected in tranquillity," or that it is the business of a poet to trace " how men associate ideas in a state of excitement," are significant of Wordsworth's endeavour to lay the foundations of his art in an independent study of the feelings and faculties of men in real life, unbiased as far as possible by poetic custom and convention. This does not mean that the new poet was to turn his back on his predecessors and never look behind him to what they had done. Wordsworth was guilty of no such extra- vagance. He was from boyhood upwards a diligent student of poetry, and was not insensible to his obligations to the past. His purpose was only to use real life as a touchstone of poetic substance. The poet, in Wordsworth's conception, is distinctively a man in whom the beneficent energy of imagination, operative as a blind instinct more or less in all men, is stronger than in others, and is voluntarily and rationally exercised for the benefit of all in its proper work of increase and consolation. Not every image that the excited mind conjures up in real life is necessarily poetical. It is the business of the poet to select and modify for his special purpose of producing immediate pleasure.

There were several respects in which the formal recognition of such elementary principles of poetic evolution powerfully affected Wordsworth's practice. One of these may be indicated by saying that he endeavoured always to work out an emotional motive from within. Instead of choosing a striking theme and working at it like a decorative painter, embellishing, enrich- ing, dressing to advantage, standing back from it and studying effects, his plan was to take incidents that had set his own imagination spontaneously to work, and to study and reproduce with artistic judgment the modification of the initial feeling, the emotional motive, within himself. To this method he owed much of his strength and also much of his unpopularity. By keeping his eye on the object, as spontaneously modified by his own imaginative energy, he was able to give full and undis- tracted scope to all his powers in poetic coinage of the wealth that his imagination

brought. On the other hand, readers

1 Wordsworth was not an adroit expositor in prose, and he did not make his qualifications sufficiently prominent, but his theory of diction taken with those qualifications left him free without in- consistency to use any language that was not contrary to " true taste and feeling." He acknowledged that he might occasionally have substituted " particular for general associations," and that thus language charged with poetic feeling to himself might appear trivial and ridiculous to others, as in The Idiot Boy and Goody Blake; he even went so far as to withdraw Alice Fell, first puhlished in 1807, from several subsequent editions; but he argued that it was danger- ous for a poet to make alterations on the simple authority of a few individuals or even classes of men, because if he did not follow his own judgment and feelings his mind would infallibly be debilitated.

whose nature or education was different from his own, were repelled or left cold and indifferent, or obliged to make the sym- pathetic effort to see with his eyes, which he refused to make in order that he might see with theirs.

" He is retired as noontide dew

Or fountain in a noon-day grove,

And you must love him ere to you

He will seem worthy of your love."

From this habit of taking the processes of his own mind as the standard of the way in which " men associate ideas in a state of excitement," and language familiar to himself as the standard of the language of " real men," arises a superficial anomaly in Wordsworth's poetry, an apparent contradiction between his practice and his theory. His own imagination, judged by ordinary standards, was easily excited by emotional motives that have little force with ordinary men. Most of his poems start from humbler, slighter, less generally striking themes than those of any other poet of high rank. But his poetry is not correspond- ingly simple. On the contrary, much of it, much of the best of it — for example, the Ode to Duty, and that on the Intimations of Immortality — is intricate, elaborate and abstruse. The emotional motive is simple; the passion has almost always a simple origin, and often is of no great intensity; but the imagina- tive structure is generally elaborate, and, when the poet is at his best, supremely splendid and gorgeous. No poet has built such magnificent palaces of rare material for the ordinary everyday homely human affections. It is because he has in- vested our ordinary everyday principles of conduct, which are so apt to become threadbare, with such imperishable robes of finest texture and

richest design that Wordsworth holds so high a place among the great moralists in verse.

His practice was influenced also, and not always for good, by his theory that poetry " takes its origin from emotion recollected in tranquillity." This was a somewhat doubtful corollary from his general theory of poetic evolution. A poem is complete in itself; there must be no sting in it to disturb the reader's content with the whole; through whatever agita- tions it progresses, to whatever elevations it soars, to this end it must come, otherwise it is imperfect as a poem. Now the imagination in ordinary men, though the process is not expressed in verse, and the poet's special art has thus no share in producing the effect, reaches the poetic end when it has so transfigured a disturbing experience, whether of joy or grief, that this rests tranquilly in the memory, can be recalled without disquietude, and dwelt upon with some mode and degree of pleasure, more or less keen, more or less pure or mixed with pain. True to his idea of imitating real life, W'ordsworth made it a rule for himself not to write on any theme till his imagination had operated upon it for some time involuntarily; it was not in his view ripe for poetic treatment till this transforming agency had subdued the original emotion to a state of tranquillity. 1 Out of this tranquillity arises the favourable moment for poetic composition, some day when, as he contemplates the subject, the tranquillity disappears, an emotion kindred to the original emotion is re- instated, and the poet retraces and supplements with all his art the previous involuntary and perhaps unconscious imagina- tive chemistry.

When we study the moments that W T ordsworth found favour- able for successful composition, a very curious law reveals itself, somewhat at variance with the common conception of him as a poet who derived all his strength from solitary communion with nature. We find that the recluse's best poems were written under the excitement of some break in the monotony of his quiet life — change of scene, change of companionship, change of occupation. The law holds from the beginning to the end of his poetic career. An immense stimulus was given to his powers by his first contact with Coleridge after two years of solitary and abortive effort. Above Tinttrn Abbey was composed

2 The Prelude contains a record of his practice, after the opening lines of the first book —

" Thus far, O friend! did 1, not used to make A present joy the matter of a song, Pour forth," &c

during a four days' ramble with his sister; he began it on leading Tintern, and concluded it as he was entering Bristol. His residence amidst strange scenes and " unknown men " at Goslar was particularly fruitful: She Dwelt among the Untrodden Ways, Ruth, Nutting, There was a Boy, Wisdom and Spirit of the Universe, all belong to those few months of unfamiliar environment. The breeze that met him as he issued from the city gates on his homeward journey brought him the first thought of The Prelude.

At the end of 1799 he was settled at Grasmere, in the Lake District, and seeing much of Coleridge. The second year of his residence at Grasmere was unproductive; he was " hard at work " then on The Excursion; but the excitement of a tour on the Continent in the autumn of 1802, combined perhaps with a happy change in his pecuniary circumstances and the near prospect of marriage, roused him to one of his happiest fits of activity. His first great sonnet, the Lines on Westminster Bridge, was composed on the roof of the Dover coach; the first of the splendid series " dedicated to national independence and liberty," the most generally impressive and universally intelli- gible of his poems, Fair Star of Evening, Once did She hold the Gorgeous East in Fee, Toussaint; Milton, thou shotddst he Living at this Hour; It is not to be Thought of that the Flood, When I have Borne in Memory what has Tamed, were all written in the course of the tour, or in London in the month after his return. A tour in Scotland in the following year, 1803, yielded the Highland Girl and The Solitary Reaper, Soon after his return he resumed The. Prelude; and The Affliction of Margaret and the Ode to Duty, his greatest poems in two different veins, were coincident with the exaltation of spirit due to the triumphant and successful prosecution of the long-delayed work. The Character of the Happy Warrior, which he described to Harriet Martineau as " a chain of extremely valooahle thoughts," though it did not fulfil " poetic conditions," 1 was the product of a calmer period. The excitement of preparing for publication always had a rousing effect upon him; the preparation for the edition of 1807 resulted in the completion of the ode on the Intimations of Immortality, the sonnets The World is too much with us, Methought I saw the Footsteps of a Throne, Two Voices are there, and Lady, the Songs of Spring were in the Grove, and the Song at the Feast of Brougham Castle. After 1807 there is a marked falling off in the quality, though not in the quantity, of Wordsworth's poetic work. It is significant of the comparatively sober and laborious spirit in which he wrote The Excursion that its progress was accompanied by none of those casual sallies of exulting and exuberant power that mark the period of the happier Prelude. The completion of The Excursion was signalized by the production of Laodamia. The chorus of adverse criticism with which it was received inspired him in the noble sonnet to Haydon-— High is our Calling, Friend. He rarely or never again

touched the same lofty height.

It is interesting to compare with what he actually accom- plished the plan of life-work with which Wordsworth settled at Grasmere in the last month of 1709. 2 The plan was definitely conceived as he left the German town of Goslar in the spring of 1799. Tired of the wandering unsettled life that he had led hitherto, dissatisfied also with the fragmentary occasional and disconnected character of his lyrical poems, he longed for a permanent home among his native hills, where he might, as one called and consecrated to the task, devote his powers con- tinuously to the composition of a great philosophical pcem on " Man, Nature and Society." The poem was to be called The Recluse, " as having for its principal subject the sensations and

1 This casual estimate of his own work is not merely amusing but also instructive, as showing — what is sometimes denied — that Words- worth himself knew well enough the difference between " poetry- " and such " valuable thoughts ' as he propounded in The Excursion .

2 Word-worth's residences in the Lake District were at Dove Cottage, Yownend, Grasmere, from December 1799 till the spring of 1808; Alk'ii Bank, from 1808 to 1811; the parsonage at Grasmere, from ifitr to 1S13; Rydal Mount, for the rest of his life. Dove Cottage was bought in 1891 as a public memorial, and is held by trustees.

opinions of a poet living in retirement." He communicated the design to Coleridge, who gave him enthusiastic encouragement to proceed. But, though he had still before him fifty years of peaceful life amidst his beloved scenery, the work in the pro- jected form at least was destined to remain incomplete. Doubts and misgivings soon arose, and favourable moments of felt inspiration delayed their coming. To sustain him in his resolu- tion he thought of writing as an introduction, or, as he put it, an antechapel to the church which he proposed to build, a history of his own mind up to the time when he recognized the great mission of his life. One of the many laughs at his expense by unsympathetic critics has been directed against his saying that he wrote this Prelude of fourteen books about himself out of diffidence. But in truth the original motive was distrust of his own powers. He turned aside to prepare the second volume of the Lyrical Ballads and write the explanatory Preface, which as a statement of his aims in poetry had partly the same purpose of strengthening his self-confidence. From his sister's Journal we learn that in the winter of 1801-1802 he was " hard at work on The Pedlar " — the original title of The Excursion. But this experiment on the larger work was also soon abandoned. It appears from a letter to his friend Sir George Beaumont that his health was far from robust, and in particular that he could not write without intolerable physical uneasiness. His next start with The Prelude, in the spring of 1804,

was more prosper- ous; he dropped it for severa 1 months, but, resuming again in'the spring of 1805, he completed it in the summer of that year. In r8o7 appeared two volumes of collected poems. It was not till 1814 that the second of the three divisions of The Recluse, ultimately named The Excursion, was ready for publication; and he went no further in the execution of his great design.

The derisive fury with which The Excursion was assailed upon its first appearance has long been a stock example of critical blindness, yet the error of the first critics is seen to lie not in their indictment of faults, but in the prominence they gave to the faults and their generally disrespectful tone towards a poet of Wordsworth's greatness. Jeffrey's petulapt " This will never do," uttered, professedly at least, more in sorrow than in anger, because the poet would persist in spite of all friendly counsel in misapplying his powers, has become a byword of critical cocksureness. But The Excursion has not " done," and even Wordsworthians who laugh at Jeffrey are in the habit of repeating the substance of his criticism.

Jeffrey, it will be seen, was not blind to the occasional felicities and unforgetable lines celebrated by Coleridge, and his general judgment on The Excursion has been abundantly ratified. 3 It is not upon The Excursion that Wordsworth's reputation as a poet can ever rest. The two " books " entitled The Church- yard among the Mountains are the only parts of the poem that derive much force from the scenic setting; if they had been published separately, they would probably have obtained at once a reception very different from that given to The Excursion as a whole. The dramatic setting is merely dead weight, not because the chief speaker is a pedlar — Wordsworth fairly justifies this selection — but because the pedlar, as. a personality to be known, and loved, and respected, and listened to With interest, is not completely created.

There can be little doubt that adverse criticism had a depressing influence on Wordsworth's poetical powers, notwithstanding his nobly expressed defiance of it and his determination to hold on in his own path undisturbed. Its effect in retarding the sale of his poems was a favourite topic with him in his later years; 4 but the absence of general appreciation, and the ridicule of what he considered his best and most distinctive work, contributed in all probability to a still more unfortunate result — the pre- mature depression and deadening of his powers.

3 Ward's English Pods, iv. 13.

4 Matthew Arnold heard him say that " for he knew not how many years his poetry had never brought him in enough to buy his shoe-strings " (preface to Selection, p. v.)- The literal facts are that he received £100

from the Longmans in 1800, and nothing more till he was sixty-five, when Moxon bought the copyright of his writings for £1000 (Prose Works, iii. 437).

3'

*For five years after the condemnation of The Excursion Wordsworth published almost nothing that had not been com- posed before. The chief exception is the Thanksgiving Ode of 1816. In 1S15 he published a new edition of his poems, in the arrangement according to faculties and feelings in which they have since stood; and he sought to explain his purposes more completely than before in an essay on "(Poetry as a Study." In the same year he was persuaded to publish The White Doe of Rylstone, written mainly eight years before. In purely poetic charm The White Doe ought to be ranked among the most perfect of Wordsworth's poems. But Jeffrey, who was too busy to enter into a vein of poetry so remote from common romantic sentiment, would have none of The White Doe: he pronounced it " the very worst poem ever written," and the public too readily endorsed his judgment. Two other poems, with which Wordsworth made another appeal, were not more successful. Peter Bell, written in 1798, was published in 1819; and at the instigation of Charles Lamb it was followed by The Waggoner, written in 1805. Both were mercilessly ridiculed and parodied. These tales from humble life are written in Wordsworth's most uncon- ventional style, and with them emphatically " not to sympathize is not to understand." k ■ * '*

Meantime, the great design of The Recluse languished. The neglect of what Wordsworth himself conceived to be his best and most characteristic work was not encouraging; and there was another reason why the philosophical poem on man, nature, and society did not make progress. Again and again in his poetry Wordsworth celebrates the value of constraint, and the disadvantage of " too much liberty/' of " unchartered freedom." 1 The formlessness of the scheme prevented his working at it con- tinuously. Hence his " philosophy " was expressed in casual disconnected sonnets, or in sonnets and other short poems connected by the simplest of all links, sequence in time or place. He stumbled upon three or four such serial ideas in the latter part of his life, and thus found beginning and end for chains of considerable length, which may be regarded as fragments of the' project which he had not sufficient energy of constructive power to execute. The Sonnets on the River Duddon, written in 1820, follow the river from its source to the sea, and form a partial embodiment of his philosophy of nature. The Ecclesi- astical Sonnets, written in 1820-1821, trace the history of the church from the Druids onwards, following one of the great

streams of human affairs, and exhibit part of his philosophy of society. A tour on the continent in 1820, a tour in Scotland in 1831, a tour on the west coast in 1833, a tour in Italy in 1837, furnished him with other serial forms, serving to connect mis- cellaneous reflections on man, nature and society; and his views on the punishment of death were strung together in still another series in 1840.

It was Coleridge's criticism in the Biographia Literaria (181 7), together with the enthusiastic and unreserved championship of Wilson in Blackwood's Magazine in a series of articles between 1819 and 1822 (Recreations of Christopher North), that formed the turning-point in Wordsworth's reputation. From 1820 to 1S30 De Quincey says it was militant, from 1830 to 1840 triumphant. On the death of Southey in 1843 he was made poet laureate. He bargained with Sir Robert Peel, before accepting, that no official verse should be required of him; and his only official composition, an ode on the installa- tion of the Prince Consort as chancellor of Cambridge university in 1847. is believed to have really been written either by his son-in-law Edward Quillinan or by his nephew Christopher (afterwards bishop of Lincoln). He died at Rydal Mount, after a short illness, on the 23rd of April 1850, and was buried in Grasmere churchyard. His wife survived him till 1859, when she died in her 90th year. They had five children, two of whom had died in 181 2; the two surviving sons, John (d. 1875) and William (d. 1883), had families; the other child, a daughter, Dora, Wordsworth's favourite, married Edward Quillinan in 1841 and died in 1847.

1 See the Sonnet, Nuns fret not, &c, The Pass of Kirkstone and the Ode to Duty.

Professor Knight brought out in 1882-1886 an eight- volume edition of the Poetical Works, and in 1889 a Life in three volumes. The Memoirs of the poet were published (1851) by his nephew, Bishopˆ Christopher Wordsworth. The " standard text " of the works is the edition of 1849-1850. The " Aldine " edition (1892) is edited by Edward Dowden. The one-volume " Oxford " edition (1895), edited by Thomas Hutchinson, contains every piece of verse known to have been published or authorized by Wordsworth, his Prefaces, &c., and a useful chronology and notes. Among critics of Wordsworth especially interesting for various reasons we may mention De Quincey (Works, vols. ii. and v.), Sir Henry Taylor (Works, vol. v.), Matthew Arnold (preface to Selection), Swinburne (Miscellanies), F. W. H. Myers (" Men of Letters" series), Leslie Stephen (Hotirs in a Library, 3rd series, " Wordsworth's Ethics "), Walter Pater {Appreciations), Walter Raleigh {Wordsworth, 1903). Wordsworth's writings in prose were collected by DrGrosart (London, 1876). This collection contained the previously unpublished Apology for a French

Revolution, written in 1793, besides the scarce tract on the Convention of Cintra (1809) and the political addresses To the Free- holders of Westmoreland (1818). Wordsworth's Guide to the Lakes originally appeared in 1810 as an introduction to Wilkinson's Select Views, and was first published separately in 1822. (W. M.; H. Ch.)

WORKINGTON, a municipal borough, seaport and market town in the Cockermouth parliamentary division of Cumberland, England, 34 m. S.W. of Carlisle, served by the Cockermouth, Keswick & Penrith, the London & North Western and the Cleator & Workington Junction railways. Pop. (1001) 26,143. It lies on the S. bank of the river Derwcnt, at its outflow into the Irish Sea. The harbour is safe, hcing protected by a stony beach and by a breakwater. The Lonsdale dock is 45 acres in extent. The port was made subordinate to that of Maryport in 1892. There are large collieries in the neighbourhood of the town, the workings in some cases extending beneath the sea, and blast furnaces, engineering works, cycle and motor works, ship- building yards and paper mills. The borough is under a mayor, 7 aldermen and 21 councillors. Area, 2245 acres. Near'the town is Workington Hall, a castellated structure retaining some of the ancient rooms, including that in which Mary, .queen of Scots, is said to have slept when she escaped to England after the battle of Langside in May 1568.

WORKS AND PUBLIC BUILDINGS, BOARD OF, an adminis- trative department in England. In 1832 the public works arid buildings of Great Britain were for the first time placed under the control of a responsible minister of the crown, and were assigned to the commissioners of woods and forests. In- 1S51 the department of public works was erected into a board under the name of Office of Works and Public Buildings. The first commissioner of works is the head of the board, and has the custody of the royal palaces and parks and of all public buildings not specially assigned to other departments; he is a member of the government and frequently has a seat in the cabinet.

WORKSOP, a market town in the Bassetlaw parliamentary division of Nottinghamshire, England, on the Great Central and the Midland railways, and on the Chesterfield Canal, 155 m. E.S.E. of Sheffield. Pop. of urban district (1001) 16,112. To the S. lies that portion of Sherwood Forest popularly known as the dukeries. The church of St Mary and St Cuthbert is an old priory church, once divided internally into two parts, the E. dedicated to St Mary being for the use of the canons, and the W. dedicated to St Cuthbert for the parishioners. At the Reformation only the W. portion of the church was spared, and for many years it was in a dilapidated condition until it was restored with Perpendicular additions. Behind it are the ruins of the lady chapel, containing some fine Early English work. The priory gatehouse, chiefly in the Decorated style, now forms the entrance to

the precincts of the church. It is supposed to have been built early in the 14th century by the 3rd Lord Furnival, when the market was established. Of the priory itself the only remains are a wall at the N.W. corner of the church which includes the cloister gateway. There was formerly a Norman keep on the castle hill. The manor-house, built by John Talbot, 1st earl of Shrewsbury, and occasionally occupied by Mary, queen of Scots, during her captivity under the 6th earl, was in great part destroyed by fire in 1761, and when the estate came into the possession of the duke of Newcastle in 1840 the ruined portion was removed and a smaller mansion built.

The town hall and free library are the principal public buildings of Worksop. Malting is the principal industry. A large corn market and a cattle and horse fair are held. The town also possesses brass and iron foundries, agricultural implement works, saw-mills and chemical works; and there is a consider- able trade in Windsor chairs and wood for packing-cases for Sheffield cutlery. There are collieries at Shireoaks, 3 m. W.

WORLD, a word which has developed a wide variety of mean- ings from its original etymological sense of the " age of man," " course of man's life." In 0. Eng. it appears under its true form weoruld, being a compound of wcr, man (cf. Lat. vir), and yldo, age, from eald, eld, old. Of the various meanings the principal are the earth (q.v.), as a planet, or a large division of the earth, such as the " old world," the eastern, the " new world," the western hemisphere; the whole of created things upon the earth, particularly its human inhabitants, mankind, the human race, or a great division of mankind united by a common racial origin, language, religion or civilization, &c. A derived meaning is that of social life, society, as distinct from a religious life.

WORM, 1 a term used popularly to denote almost any kind of elongated, apparently limbless creature, from a lizard, like the blindworm, to the grub of an insect or an earthworm. Linnaeus applied the Latin term Vermes to the modern zoological divisions Mollusca, Coelentera, Protozoa, Tunicata, Echinoderma (qq.v.), as well as to those forms which more modern zoologists have recognized as worms. As a matter of convenience the term Vermes or Vermidea is still employed, for instance in the Inter- national Catalogue of Zoological Literature and the Zoological Record, to cover a number of wormlike animals. In systematic zoology, however, the use of a division Vermes has been abandoned, as it is now recognized that many of

the animals that even a zoologist would describe as worms belong to different divisions of the animal kingdom. The so-called flatworms (Platyelmia, q.v.), including the Planarians (q.v.), Flukes (see Trematodes), Cestodes (see Tapeworm) and the curious Mesozoa (q.v.), are no doubt related. The marine Nemertine worms (see Nemertina) are isolated. The thick-skinned round worms, such as the common horse-worm and the threadworms (see Nematoda), together with the Nematomorpha (q.v.), Ckaetosomatida (q.v.), Desmoscolecida (q.v.) and Acanthocephala (q.t.), form a fairly natural group. The Rotifera (q.v.), with probably the Kinorhyncha (q.v.) and Gastrotricha (q.v.), . are again isolated. The remaining worms are probably all coelomate animals. There is a definite Annelid group (see Annelida), including the Archiannclida, the bristleworms (see Chaeto- poda), of which the earthworm (q.v.) is the most familiar type, the Myzostomida (q.v.), Hirudinea (see Leech) and the armed Gephyreans (see Echiuroidea) . The unarmed Gephyreans (see Gephvrea) are now separated from their former associates and divided into two groups of little affinity, the Sipunculoidea and the Priapuloidea (qq.v.). The Phoronidea (q.v.) are now associated with Hemichordata (q.v.) in the line of vertebrate ancestry, whilst the Chaetognatha (q.v.) remain in solitary isolation.

Mention is made under TATEWORM of the worms of that species inhabiting the human body as parasites, and it will be convenient here to mention other parasitic varieties. The most common human parasite is the A scaris lumbricoides or round worm, found chiefly in children and occupying the upper portion of the intestine. They are usually few in number, but occasionally occur in such large numbers that they cause intestinal obstruction. Unlike the tape- worm no intermediate host is required for the development of this worm. It develops from direct ingestion of the larvae. Various

T The O. Eng. wyrm represents a word common to Teutonic languages for a snake or worm, cf. Ger. Wurm, Dan. and Swed. orm, Du. Worm. The Lat. vermis must be connected. The Sanskrit word is krimi, which has given kermes, the cochineal insect, whence ” crimson.” Skeat takes the ultimate root to be kar, to move, especially in a circular motion, seen in ” curve,” ” circle,” &c. The word ” worm ” is applied to many objects resembling the animals in having a spiral shape or motion, as the spiral thread of a screw, or the spiral pipe through which vapour is passed in distillation (q.v.). As a term of disparagement and contempt the word is also used of persons, from the idea of wriggling or creeping on the ground, partly, too, perhaps, with a reminiscence of Genesis iii. 14.

symptoms, such as diarrhoea, anaemia, intermittent fever, restless- ness, irritability and convulsions are attributed to these worms. The treatment is

the administration of santonin, followed by a purgative. The threadworm or Oxyuris vermicularis is a common parasite infecting the rectum. The larvae of this worm are also directly swallowed, and infection probably takes place through water, or possibly through lettuces and watercress. The symptoms caused by threadworms are loss of appetite, anaemia and intense irritation and itching. The treatment consists in the use of enemata containing quassia, carbolic acid, vinegar or turpentine or even common salt. In addition mild purgatives should be given.

WORMS, a city of Germany, in the grand-duchy of Hesse- Darmstadt, situated in a fertile plain called the Wonnegau, on the left bank of the Rhine, 25 m. S. of Mainz, 20 m. N.W. of Heidelberg, and 9 m. by rail N.W. of Mannheim. Pop. (1895) 28,636; (.1905) 43i84i, about a third of whom are Roman Catholics. The town is irregularly built, and some of the old walls and towers still remain, but its general aspect is modern. The principal church and chief building is the spacious cathedral of SS. Peter and Paul, which ranks' beside those of Spires and Mainz among the noblest Romanesque churches of the Rhine (see Architecture : Romanesque and Gothic in Germany) . This magnificent basilica, with four round towers, two large domes, and a choir at each end, has a specially imposing exterior, though the impression produced by the interior is also one of great dignity and simplicity, heightened by the natural colour of the red sandstone of which it is built. Only the ground plan and the lower part of the western towers belong to the original building consecrated in 11 10; the remainder was mostly finished by 1 181, but the west choir and the vaulting were built in the 13th century, the elaborate south portal was added in the 14th century, and the central dome has been rebuilt. The ornamenta- tion of the older parts is simple to the verge of rudeness; and even the more elaborate later forms show no high development of workmanship. The baptistery contains five remarkable stone reliefs of the late 15th century. The cathedral is 358 ft. long, and 89 ft. wide, or including the transepts, which are near the west end, ri8 ft. (inside measurements). It belongs to the Roman Catholic community, who possess also the church of St Martin and the church of Our Lady (Liehjraucnkirche) , a handsome Gothic edifice outside the town, finished in 1467. The principal Protestant place of worship is the Trinity church, built in 1726. Second in interest to the cathedral is the church of St Paul, also in the Romanesque style, and dating from 1102-1116, with a choir of the early 13th century, cloisters and other monastic buildings. This church has been converted into an interesting museum of national antiquities. The late Romanesque church of St Andrew is not used. The old synagogue, an unassuming building erected in the nth century and restored in the 13th, is completely modernized. The Jewish community of Worms (about 1300 in number) claims to be the most ancient in Germany and to have existed

continuously since the Christian era, though the earliest authentic mention of it occurs in 588. A curious tradition, illustrating the efforts of the dispersed people .to conciliate their oppressors, asserts that the Jews of Worms, gave their voice against the crucifixion, but that their messenger did not arrive at Jerusalem until after the event.

The town hall was rebuilt in 1884. The Bischofshof, in which the most famous diet of Worms (1521) was held, is now replaced by a handsome modern residence. The Luginsland is an old watch-tower of the 13th century. In the Lutherplatz rises the imposing Luther monument (unveiled in 1868), on a platform 48 ft. sq. In the centre the colossal statue of Luther rises, on a pedestal at the base of which are sitting figures of Peter Waldo, Wycliffe, Hus and Savonarola, the heralds of the Reformation; at the corners of the platform, on lower pedestals, are statues of Luther's contemporaries, Melanchthon, Reuchlin, Philip of Hesse, and Frederick the Wise of Saxony, between which are allegorical figures of Magdeburg (mourning), Spires (protesting) and Augsburg (confessing). The greater part of the work, which took nine years to execute, was designed by Rietschel, and carried out after his death in 1861 by Gustav Kietz (1826-1908), Adolf von Donndorf (b. 183.5) and Johannes Schilling (b. 1828). The " Rosengarten " on the opposite bank of the Rhine.

associated with the stories of the wooing of Kriemhild (see infra) , has been laid out in keeping with the old traditions and was opened with great festivities in 1906. Extensive burial-grounds, ranging in date from neolithic to Merovingian times, have recently been discovered near the city.

The trade and industry of Worms are important, and not the least resource of the inhabitants is vine-growing, the most famous vintage being known as Liebfraumilch, grown on vine- yards near the Liebfrauenkirche. The manufacture of patent leather employs about 5000 hands. Machinery, wool, cloth, chicory, slates, &c, are also produced. Worms possesses a good river harbour, and carries on a considerable trade by water.

Worms was known in Roman times as Borbetomagus, which in the Merovingian age became Wormatia, afterwards by popular etymology connected with Wurm, a dragon. The name Borbeto- magus indicates a Celtic origin for the town, which had, however, before Caesar's time become the capital of a German tribe, the Vangiones. Drusus is said to have erected a fort here in 14 B.C. In 413 the emperor Jovinus permitted the Burgundians under their king Guntar or Guntiar to settle on the left bank

of the Rhine between the Lauter and the Nahe. Here they founded a kingdom with Worms as its capital. Adopting Arianism they came into conflict with the Romans, and under their king Gundahar or Gundicar (the Gunther of the Nibelungenlied) rose in 435 against the Roman governor Aetius, who called in the Huns against them. The destruction of Worms and the Bur- gundian kingdom by the Huns in 436 was the subject of heroic legends afterwards incorporated in the Nibelungenlied (q.v.) and the Rosengarten (an epic probably of the late 13th century). In the Nibelungenlied King Gunther and Queen Brunhild hold their court at Worms, and Siegfried comes hither to woo Kriemhild.

Worms was rebuilt by the Merovingians, and became an episcopal see, first mentioned in 614, although a bishop of the Vangiones had attended a council at Cologne as early as 347. There was a royal palace from the 8th century, in which the Frankish kings, including Charlemagne, occasionally resided. The scene of the graceful though unhistorical romance of Einhard and Emma, the daughter of Charlemagne, is laid here.

Under the German kings the power of the bishops of Worms gradually increased, although they never attained the importance of the other Rhenish bishops. Otto I. granted extensive lands to the bishop, and in 979 Bishop Hildbold acquired comital rights in his city. Burchardl. (bishop from 1000 to i025)destroyed the castle of the Franconian house at Worms, built the cathedral and laid the foundations of the subsequent territorial power of the see. There were frequent struggles between the bishops and the citizens, who espoused the cause of the emperors against them; and were rewarded by privileges which fostered trade. Herny IV. granted a charter to Worms in 1074, and held a synod there in 1076, by which Pope Gregory VII. was declared deposed. Henry V. acquired Worms in n 21 by the treaty of Wurzburg, built a castle and granted privileges to the city, which retained its freedom until 1801, in spite of the bishops, who ruled a small territory south of the city, on both sides of the Rhine, and resided at Ladenburg near Mannheim till 162 2.

The city of Worms was frequently visited by the imperial court, and won the title of " Mother of Diets." The concordat of Worms closed the investiture controversy in n 22. The " perpetual peace " {ewiger Landfriede) w r as proclaimed by the emperor Maximilian I. at the diet of 1495, and Luther appeared before the famous diet of 1521 to defend his doctrines in the presence of Charles V. Four years later, Worms formally embraced Protestantism, and religious conferences were held there in 1540 and 1557. It suffered severely during the Thirty Years' War. After being sacked "in turn by Mansfeld, Tilly and the Spaniards, it was taken by Oxenstierna in 1632, who held a convention here with his German allies. The imperial- ists again took Worms in 1635, and it admitted the French

under Turenne in 1644. The French under Melac burnt the city almost entirely in 1689, and it has only fully recovered from this blow in recent years. Thus the population, which

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in its prosperous days is said to have exceeded 50,000, had sunk in 181 5 to 6250.

By the treaty of Worms in 1743 an offensive alliance was formed between Great Britain, Austria and Sardinia. The French under Custine took the city by surprise in 1792 and it was annexed by the peace of Luneville in 1801 to France, together with the bishop's territories on the left bank of the Rhine. The remaining episcopal dominions were secularized in 1803 and given to Hesse-Darmstadt, which acquired the whole by the Vienna Congress in 1815. In 1849 the Baden revolutionaries seized Worms, but were overthrown by the Mecklenburgers and Prussians in May of that year.

See Zorn, Wormser Chronik (Stuttgart, 1857); Fuchs, Geschichte der Stadt Worms (Worms, 1868) ; F. Soldan, Der Reichstag zu Worms, 152 1 (Worms, 1883); Beitrdge zur Geschichte der Stadt Worms (Worms, 1 896) ; G. Wolf, Zur Geschichte der Juden in Worms (Breslau, 1862); Nover, Das altc und neue Worms (Worms, 1895).

WORMWOOD, the popular name for an aromatic herb known botanically as Artemisia Absinthium, a member of the family Compositae. It grows from 1 to 3 ft. high and is silkily hairy; the leaves are small and much cut, and the flowers are small yellow hemispherical heads among the leaves at the end of the branches. It grows in waste places. It is a tonic and vermifuge and used to flavour drinks. A closely allied species is A . vulgaris, mugwort, also an aromatic herb, with larger and broader leaves, which are white woolly beneath, and erect woolly heads of reddish-yellow flowers.

WORSBOROUGH, an urban district in the Holmnrth parlia- mentary division of the W. Riding of Yorkshire, England, 3 m. S. of Barnsley, near the Sheffield & Barnsley branch of the Great Central railway, and on a branch of the Dearne & Dove canal. Pop. (1901) 10,336. The church of St Mary is an interesting structure with remains of Norman work, but chiefly of Early English date. There are extensive collieries and gunpowder mills near, and in the town iron and steel works and corn mills.

WORSHIP (i.e. " worth-ship," O. Eng. weorBscipe), honour, dignity, reverence, respect. The word is used in a special sense of the service, reverence and honour paid, by means of devotional words or acts, to God,

to the gods, or to hallowed persons, such as the Virgin Mary or the saints, and hallow r ed objects, such as holy images or relics. In this sense, however, it must be borne in mind that the Roman Catholic Church distinguishes three kinds of worship: (1) latria, the worship due to God alone (from Gr. Aarpeia, service, esp. the service of the gods, worship), and (2) hyperdulia, the worship or adoration due to the Virgin Mary as the Mother of God (from Gr. imp, above, and fouAeia, service), and (3) dulia, that due to the saints. (See also Adoration.) The public service of God in church is known as " divine worship " or " divine service " (see Liturgy). In the sense of " revere " or " respect," the verb " to worship " occurs in the English Prayer-book, in the phrase " with my body I thee worship " in the Marriage Service. In this sense the term " worship " is also used as a title of honour in speaking of or addressing other persons of position. Thus a mayor is spoken of as " his worship the mayor," or " the worshipful the mayor." Magis- trates are addressed as " your worship."

WORSLEY, PHILIP STANHOPE (1835-1866), English poet, son of the Rev. Charles Worsley, was born on the 12th of August 1835, and was educated at Highgate grammar school and Corpus Christi College, Oxford, where he won the Newdigate prize in 1857 with a poem on " The Temple of Janus." In 1861 he published a translation of the Odyssey, followed in 1865 by a translation of the first twelve books of the Iliad, ih both of which he employed the Spenserian stanza with success. In 1863 appeared a volume of Poems and Translations. Worsley died on the 8th of May 1866. His translation of the Iliad was com- pleted after his death by John Conington.

WORSLEY, an urban district in the Eccles parliamentary division of Lancashire, England, 6 m. W.N.W. of Manchester by the London & North-Western railway. Pop. (1901) 12,462. Its growth is a result of the development of the cotton manu- facture and of the neighbouring collieries.

WORTH, CHARLES FREDERICK (1825-1895), the famous dressmaker, was born at Bourne, Lincolnshire, in 1825. His fatht-r, a country solicitor, having lost his money in speculation. Charles was sent to London as an apprentice to Swan & Edgar, drapers. Thence, in 184(5, he went to Paris, without capital or friends, and after twelve years in a wholesale silk house he began business as a dressmaker in partnership with a Swede named Dobergh. His originality and skill in design won the patronage of the empress Eugenie, and, through her, of fashionable Paris, After the Franco-German War, during which he turned his house into a military hospital, his

partner retired, and Worth con- tinued the business, which employed 1200 hands, with his two sons John and Gaston- -both naturalized Frenchmen. For more than thirty years he set the taste and ordained the fashions of Paris, and extended his sway over all the civilized and much of the uncivilized world. He died on the 10th of March 1895.

WORTH, a village of Alsace, on the Sauer, 6 m. N. of Hagenau, which gives its name to the battle of the 6th of August 1870, fought between the Germans under the crown prince of Prussia and the French under Marshal MacMahon. The battle is also called Rcichshoffen and Froschweiler.

The events which led up to the engagement, and the general situation on the 6th are dealt with under Franco-German War. During the 5f.l1 of August the French concentrated in a selected position running nearly N. and S. along the Sauer Bach on the left front of the German TTT. army which was moving S. to seek them. The position is marked from right to left by Morsbronn. the Niederwald, the heights W. of Worth and the woods N.E. of Froschweiler. E. of the Sauer the German III. army was moving S, towards Hagenau, when their cavalry found the French position about noon. Thereafter the German vedettes held the French under close observation, while the laller moved about within their lines and as far as the village of Worth as if in peace quarters, and this notwithstanding the defeat of a portion of the army at Weissenburg on the previous day. The remnant of the force which had been engaged, with many of its wounded still in the ranks, marched in about noon with so soldierly a bearing that, so far from their depressing the morale of the rest, their appearance actually raised it.

About 5 p.m. some horses were watered at the Sauer, as in peace, without escort, though hostile scouts were in sight. A sudden swoop of the enemy's hussars drove the party back to camp. The alarm was sounded, tents were struck and the troops fell in all along the line and remained under arms until the confusion died down, when orders were sent to fall out, but not to pitch the tents. The army therefore bivouacked, and but for this incident the battle of the next day would probably not have been fought. A sudden and violent storm broke over the bivouacs, and when it was over, the men, wet and restless,, began to move about, light fires, &c. Many of them broke out of camp and went into Worth, which was unoccupied, though Prussians were only ,300- yds. from the sentries. These fired, and the officer commanding the Prussian outposts, hearing the confused murmur of voices, ordered up a battery, and as soon as there was light enough dropped a lew shells into Worth. The stragglers rushed back, the French lines were again alarmed, and several batteries on their side took up the challenge.

The Prussian guns, as strict orders had been given to avoid all engagement

that day, soon withdrew and were about to return to camp, when renewed artillery fire was heard from the S. and presently also from the N. In the latter direction, the II. Bavarian corps had bivouacked along the Mattstall-Langen- sulzbach road with orders to continue the march if artillery were heard to the S. This order was contrary to the spirit of the III. army orders, and moreover the V. Prussian corps to the S. was in ignorance of its having been given.

The outpost battery near Worth was heard, and the Bavarians at once moved forward. Soon the leading troops were on the crest of the ridge between the Sauer and the Sulzbach, and the divisional commander, anxious to prove his loyalty to his new allies — his enemies in 1866 — ordered his troops to attack, giving the spire of Froschweiler, which was visible over the woods, as

the point of direction. The French, however, were quite ready and a furious fusillade broke out, which was multiplied by the echoes of the forest-clad hills out of all proportion to the numbers engaged. The Prussian officers of the V. corps near Dieffenbach, knowing nothing of the orders the Bavarians had received, were amazed; but at length when about 10.30 a.m. their comrades were seen retiring, in some cases in great disorder, the corps commander, General von Kirchbach, decided that an effort must at once be made to relieve the Bavarians. His chief of staff had already ordered up the divisional and corps artillery (84 guns in all), and he himself communicated his intention of attacking to the XL corps (General von Bose) on his left and asked for all available assistance. A report was also despatched to the crown prince at Sulz, 5 m. away.

Meanwhile the XI. corps had become involved in an engage- ment. The left of the V. corps" outposts had over night occupied Gunstett and the bank of the Sauer, and the French shortly after daylight on the 6th sent down an unarmed party to fetch water. As this appeared through the mist, the Prussians naturally fired upon it, and the French General Lartiguc (to whose division the party belonged), puzzled to account for the firing, brought up some batteries in readiness to repel an attack. These fired a few rounds only, but remained in position as a precaution.

Hearing the firing, the XI. corps' advanced guard, which had marched up behind in accordance with the general movement of the corps in changing front to the west, and had halted on reaching the Kreuzhecke Wood, promptly came up to Spachbach and Gunstett. In this movement across country to Spachbach some bodies appear to have exposed themselves, for French artillery at Elsasshausen suddenly opened fire, and the shrapnel bursting high, sent showers of bullets on to the house roofs of Spachbach, in which village a battalion had just halted. As the falling tiles made the

position undesirable, the major in command ordered the march to be resumed, and as he gave the order, his horse ran away with him towards the Sauer. The leading company, seeing the battalion commander gallop, moved off at the double, and the others of course followed. Coming within sight of the enemy, they drew a heavy shell fire, and, still under the impression that they were intended to attack, deployed into line of columns and doubled down to the river, which they crossed. One or two companies in the neighbourhood had already begun to do so, and the stream being too wide for the mounted officers to jump, presently eight or ten companies were across the river and out of superior control. By this time the French outposts (some 1500 rifles), lining the edge of the Niederwald, were firing heavily. The line of smoke was naturally accepted by all as the objective, and the German companies with a wild rush reached the edge of the wood.

The same thing had happened at Gunstett. A most obstinate struggle ensued and both sides brought up reinforcements. The Prussians, with all their attention concentrated on the wood in their front, and having as yet no superior commanders, soon exhibited signs of confusion, and thereupon General Lartigue ordered a counter attack towards the heights of Gunstett, when all the Prussians between the Niederwald and the Sauer gave way. The French followed with a rush, and, fording the Sauer opposite Gunstett, for a moment placed the long line of German guns upon the heights in considerable danger: At this crisis a fresh battalion of the XL corps arrived by the road from Surburg to Gunstett, and attacked the French on one flank whilst the guns swept the other. The momentum of the charge died cut, and the French drifted backwards after an effort which compelled the admiration of both sides.

In the centre the fight had been going badly for the V. corps. As soon as the 84 guns between Dieffenbach and Spachbach opened fire the French disappeared from sight. There was no longer a target, and, perhaps to compel his adversary to show himself, von Kirchbach ordered four battalions to cross the river- These battalions, however, were widely separated, and coming under fire as soon as they appeared, they attacked in two groups, one from Worth towards Froschweiler, the other from near Spachbach towards the Calvary spur, E. of

Elsasshausen. Both were overpowered by infantry fire. A frac- tion of the S. party maintained itself all day in the elbow of the Hagenau chaussee, which formed a starting-point for subsequent attacks. But the rest were driven back in great confusion. Once more the dashing counter-attack of

the French was thrown into confusion by the Prussian shell fire, and as the French fell

the attack against the Niederwald with such of his forces as had arrived, and had ordered General von Schkopp's brigade, which was then approaching, to join the troops collecting to the east of Gunstett. Schkopp, however, seeing that his present line of advance led him direct on to the French right about Morsbronn and kept him clear of the confusion to be seen around Gunstett,

Contours at interuala of 10 metres W metres- = 32-3 fepf

back the Prussian infantry, now reinforced, followed them up (about 1 p.m.). The commander-in-chief of the German III. army (the crown prince Frederick) now appeared on the field and ordered Kirchbach to stand fast until the pressure of the XI. corps and Wiirttemberg division could take effect against the French right wing. The majority of these troops had not yet reached the field. Von Bose, however, seeing the retreat of the troops of the V. corps, had independently determined to renew

Ctnery Walter sc

disregarded the order and continued to advance on Morsbronn. This deliberate acceptance of responsibility really decided the battle, for his brigade quietly deployed as a unit' and compelled the French right wing to fall back.

To cover the French retreat Michel's brigade of cavalry was ordered to charge. The order was somewhat vague, and in his position under cover near Eberbach, General Michel had no know- ledge of the actual situation. Thus it came about that, without

reconnoitring or manoeuvring for position, the French cavalry rode straight at the first objective which offered itself, and struck the victorious Prussians as they were crossing the hills between the Albrechtshauserhof and Morsbronn. Hence the charge was costly and only partly successful. However, the Prussians were ridden over here and there, and their attention was sufficiently absorbed while the French infantry rallied for a fresh counter- stroke. This was made about 1.20 p.m. with the utmost gallantry, and the Prussians were driven off the hillsides between the

Albrechtshauserhof and Morsbronn which they had already won. But the counter-attack soon came under the fire of the great artillery mass above Gunstett, and, von Bose having at length concentrated the main body of the XI. corps in the meadows between the Niederwald and the Sauer, the French had to with- draw. Their withdrawal involved the retreat of the troops who had fought all day in defence of the Niederwald.

By 3 p.m. the Prussians were masters of the Niederwald and the ground S. of it on which the French right wing had originally stood, but they were in indescribable confusion after the prolonged fighting in the dense undergrowth. Before order could be restored came another fierce counter-stroke. As the Prussians emerged from the N. edge of the wood, the French reserves suddenly came out from behind the Elsasshausen heights, and striking due S. drove the Prussians back. It was a grave crisis, but at this moment von Schkopp, who throughout all this had kept two of his battalions intact, came round the N.W. comer of the Wald, and these fresh battalions again brought the French to a standstill. Meanwhile von Kirchbach, seeing the progress of the XI. corps, had ordered the whole of his command forward to assault the French centre, and away to the right the two Bavarian corps moved against the French left, which still main-tained its original position in the woods N.E. of Froschweiler.

MacMahon, however, was not beaten yet. Ordering Bonne- mains' cavalry division to charge, by squadrons to gain time, he brought up his reserve artillery, and sent it forward to case-shot range to cover a final counter-stroke by his last intact battalions. But from his position near Froschweiler he could not see into the hollow between Elsasshausen and the Niederwald. The order was too late, and the artillery unlimbered just as the counter attack on the Niederwald alluded to above gave way before von Schkopp's reserve. The guns were submerged in a flood of fugitives and pursuers. Elsasshausen passed into the hands of the Germans. To rescue the guns the nearest French in- fantry attacked in a succession of groups, charging home the bayonet with the utmost determination. Before each attack the Prussians immediately in front gave way, but those on the flanks swung inwards and under this converging fire each French attempt died out, the Prussians following up their retreat. In this manner, step by step, in confusion which almost defies analysis, the Prussians conquered the whole of the ground to the S. of the Froschweiler- Worth road, but the French still held on in the village of Froschweiler itself and in the woods to the N. of the road, where throughout the day they had held the two Bavarian corps in check with little difficulty. To break down this last stronghold, the guns of the V. and XI. corps, which had now come forward to the captured ridge of Elsasshausen, took the village as their target; and the great crowd of infantry, now flushed with victory but in the direst confusion, encouraged by the example of two horse artillery batteries which galloped boldly

forward to case-shot range, delivered one final rush which swept all resistance before it.

The battle was won and cavalry only were needed to reap its consequences, but the Prussian cavalry division had been left behind without orders and did not reach the battlefield till late at night. The divisional cavalry squadrons did their best, but each pursued on its own account, and the results in prisoners and guns fell far short of what the opportunity offered. Under cover of darkness the French escaped, and on the following day the cavalry division was quite unable to discover the direction of the retreat.

MacMahon received no support from the neighbouring French troops (see Franco-German War). The battle was won by over-

powering weight of numbers. The Prussian general staff were able to direct upon the field no fewer than 75,000 infantry, 6000 cavalry, and 300 guns, of which 71,000 rifles, 4250 sabres and 234 guns came into action, against 32,000 rifles, 4850 sabres and 101 guns on the French side. The superiority of the French chassepot to the needle guns may reasonably be set against the superior number of rifles on the German side, for though the Germans were generally, thanks to their numbers, able to bring a converging fire upon the French, the latter made nearly double the number 01 hits for about the same weight of ammunition fired, but the French had nothing to oppose to the superior German artillery, and in almost every instance it was the terrible shell fire which broke up the French counter attack. All of these attacks were in the highest degree honourable to the French army, and many came nearer to imperilling the ultimate success of the Germans than is generally supposed. One other point deserves special attention. As soon as the fighting became general, all order in the skirmisher lines disappeared on both sides, and invariably, except where the Prussian artillery fire inter- vened, it was the appearance of closed bodies of troops in rear of the fighting line which determined the retreat of their opponents. Even in the confused fighting in the Niederwald, the mere sound of the Prussian drums or the French bugles induced the adversary to give way even though drums and bugles frequently appealed to non-existent troops.

The losses of the Germans were 9270 killed and wounded and 1370 missing, or 13%; those of the French were about 8000 killed and wounded, and perhaps 12,000 missing, and prisoners, representing a total loss of about 41 . Some French regiments retained a sem- blance of discipline after suffering enormous losses. The 2nd Turcos lost 93, 13th hussars 87%, and thirteen regiments in all lost over 50% of their strength.

See the French and German official histories of the war; H. Bonnal,

Frosckwiller (1899); H Kunz, Schlacht von Worth (1891) and Kriegsgesch. Beispiele, Nos. 13-18; R. Tournes, De Gunstett au Niederwald and Le Calvaire ; and Commandant Grange, " Les Realit6s du champ de batafflc," Revue d'infanterie (1908-1910). (F. N. M.)

WORTHING, a municipal borough and seaside resort in the Lewes parliamentary division of Sussex, England, 61 m. S. by W. from London by the London, Brighton & South Coast rail- way. Pop. (1901) 20,015. It has a fine marine parade, and a promenade pier, and there is a long range of firm sands. A public park, 21 acres in extent, was opened in 188 1. The principal buildings are several modern churches, the town hall (1834), municipal buildings, free library, literary institute, infirmary and convalescent homes. The mother parish of Worthing is Broad- water, the church of which, 1 m. north of Worthing, is a cruciform building, and a fine example of transitional Norman work. A Roman villa, evidence of the existence of pottery works, and a so-called mile-stone, have been discovered at Worthing. The town was incorporated in 1890, and is under a mayor, 8 alder- men and 24 councillors. Area, 1439 acres.

WOTTON, SIR HENRY (1568-1639), English author and diplomatist, son of Thomas Wotton (1521-1587) and grand- nephew of the diplomatist Nicholas Wotton (q.v.), was born at Bocton Hall in the parish of Bocton or Boughton Malherbe, Kent. 1 He was educated at Winchester School and at New College, Oxford, where he matriculated on the 5th of June 1584. Two years later he removed to Queen's College, graduating B.A. in 1588. At Oxford he was the friend of Albericus Gentilis, then professor of Civil Law, and of John Donne. During his residence at Queen's he wrote a play, Tancredo, which has not survived, but his chief interests appear to have been scientific. In qualifying for his M.A. degree he read three lectures De oculo, and to the end of his life he continued to interest himself in physical experiments. His father, Thomas Wotton, died in 1587, leaving to his son the very inadequate maintenance of a hundred marks a year. About 1 589 Wotton went abroad, with a view probably to preparation for a diplomatic career, and his travels appear to have lasted for about six years. At Altdorf he met Edward, Lord Zouch, to whom he later addressed a series of letters (1590-1593) which contain much political and other news. These {Reliquiae Wottonianae, pp. 585 et seq. 1685) provide a record of the journey. He travelled by way of Vienna

1 His elder half-brother, Edward Wotton (1548-1626), entered the service of Sir Francis Walsingham, and in 1585 was sent on an im- portant errand to James VI. of Scotland. In 1602 he was made comptroller of the royal household, and in 1603 he was created Baron Wotton of Marley. The peerage became extinct on the death of his son Thomas, the 2nd baron (1588-1630).

and Venice to Rome, and in 1593 spent some time at Geneva in the house of Isaac Casaubon, to whom he contracted a consider- able debt. He returned to England in 1594, and in the next year was admitted to the Middle Temple. While abroad he had from time to time provided Robert Devereux, second earl of Essex, ‘ with information, and he now definitely entered his service as one of his agents or secretaries. ■ It was his duty to supply intelligence of affairs in Transylvania, Poland, Italy and Germany. Wotton was not, like his unfortunate fellow-secretary, Henry Cufie, who was hanged at Tyburn in 1601, actually in- volved in Essex’s downfall, but he thought it prudent to leave England, and within sixteen hours of his patron’s apprehension he was safe in France, whence he travelled to Venice and Rome. In 1602 he was resident at Florence, and a plot to murder James VI. of Scotland having come to the ears of the grand-duke of Tuscany, Wotton was entrusted with letters to warn him of the danger, and with Italian antidotes against poison. As ” Ottavio Baldi ” he travelled to Scotland by way of Norway. He was well received by James, and remained three months at the Scottish court, retaining his Italian incognito. He then returned to Florence, but on receiving the news of James’s accession hurried to England. James knighted him, and offered him the embassy at Madrid or Paris; but Wotton, knowing that both these offices involved ruinous expense, desired rather to represent James at Venice. He left London in r6o4 accompanied by Sir Albertus Morton, his half-nephew, as secretary, and William Bedell, the author of an Irish translation of the Bible, as chaplain. Wotton spent most of the next twenty years, with two breaks (1612-1616 and 1619-1621), at Venice. He helped the Doge in his resistance to ecclesiastical aggression, and was closely associated with Paolo Sarpi, whose history of the Council of Trent was sent to King James as fast as it was written. Wotton had offended the scholar Caspar Schoppe, who had been a fellow student at Altdorf. In 1611 Schoppe wrote a scurrilous book against James entitled Ecclesiasticus, in which he fastened on Wotton a saying which he had incautiously written in a friend’s album years before. It was the famous definition of an ambassador as an “honest man sent to lie abroad for the good of his country.” It should be noticed that the original Latin form of the epigram did not admit of the double meaning. This was adduced as an example of the morals of James and his servants, and brought Wotton into temporary disgrace. Wotton was at the time on leave in England, and made two formal defences of himself, one a personal attack on his accuser addressed to Marcus Weber of Strassburg, and the other privately to the king. He failed to secure further diplomatic employment for some time, and seems to have finally won back the royal favour by obsequious support in parliament of James’s claim to impose

arbitrary taxes on merchandise. In 1614 he was sent to the Hague and in 1616 he returned to Venice. In 1620 he was sent on a special embassy to Ferdinand II. at Vienna, to do what he could on behalf of James's daughter Elizabeth, queen of Bohemia. Wotton's devotion to this princess, expressed in his exquisite verses beginning " You meaner beauties of the night," was sincere and unchanging. At his departure the emperor presented him with a jewel of great value, which Wotton received with due respect, but before leaving the city he gave it to his hostess, because, he said, he would accept no gifts from the enemy of the Bohemian queen. After a third term of service in Venice he returned to London early in 1624 and in July he was installed as provost of Eton College. This office did not relieve him from his pecuniary embarrassments, and he was even on one occasion arrested for debt, but he received in 1627 a pension of £200, and in 1630 this was raised to £500 on the understanding that he should write a history of England. He did not neglect the duties of his pro- vostship, and was happy in being able to entertain his friends lavishly. His most constant associates were Izaak Walton and John Hales. A bend in the Thames below the Playing Fields, known as " Black Potts," is still pointed out as the spot where Wotton and Izaak Walton fished in company. He died at the beginning of December 1639 and was buried in the chapel of Eton College.

Sir Henry Wotton was not an industrious author, and his writings are very small in bulk. Of the twenty-five poems printed in Reliquiae W ottonianae only fifteen are Wotton's. But of those fifteen two have obtained a place among the best known poems in the language, the lines already mentioned " On his Mistris, the Queen of Bohemia," and " The Character of a Happy Life."

During his lifetime he published only The Elements of Architecture (1624), which is a paraphrase from Marcus Vitruvius Pollio, and a Latin prose address to the king on his return from Scotland (1633). In 1G51 appeared the Reliquiae Wottonianiae, with Izaak Walton's Life. An admirable Life and Letters, representing much new material, by Logan Pearsall Smith, was published in 1907. See also A. W. Ward, Sir Henry Wotton, a Biographical Sketch (1898).

WOTTON, NICHOLAS (c. 1497-1567), English diplomatist, was a son of Sir Robert Wotton of Boughton Malherbe, Kent, and a descendant of Nicholas Wotton, lord mayor of London in i4r5 and 1430, and member of parliament for the city from 1406 to 1429. He early became vicar of Boughton Malherbe and of Sutton Valence, and later of Ivychurch, Kent; but, desiring a more worldly career, he entered the service of Cuthbert Tunstall, bishop of London. Having helped to draw up the Institution of a Christian Man, Wotton in 1539 went to arrange the marriage between Henry VIII. and Anne of Cleves and the union of Protestant princes which

was to be the complement of this union. He crossed over to England with the royal bride, but, unlike Thomas Cromwell, he did not lose the royal favour when the king repudiated Anne, and in 1 541 , having already refused the bishopric of Hereford, he became dean of Canterbury and in 1544 dean of York. In 1543 he went on diplomatic business to the Nether- lands, and for the next year or tw T o he had much intercourse with the emperor Charles V- He helped to conclude the treaty of peace between England and France in 1546, and was resident ambassador in France from 1546 to 1549. Henry VIII. made Wotton an executor of his will and left him £300, and in 1549, under Edward VL, he became a secretary of state, but he only held this post for about a year. In 1550 he was again sent as envoy to Charles V., and he was ambassador to France during the reign of Mary, doing valuable work in that capacity. He left France in 1557, but in 1558 he was again in that country, helping to arrange the preliminaries of the treaty of Cateau Cambresis. In 1560 he signed the treaty of Edinburgh on behalf of Elizabeth, and he had again visited the Netherlands before his death in London on the 26th of January 1567.

His brother, Sir Edward W r otton (1489-1551), was made treasurer of Calais in 1540, and was one of those who took part in the overthrow of the protector Somerset. His son, Thomas Wotton (1521-1587) was the father of Sir Henry Wotton (q.v.).

WOTTON, WILLIAM (1666-1727), English scholar, son of the Rev. Henry Wotton, was born in his father's parish of Wrentham, Suffolk, on the 13th of August 1666. He was not yet ten years old when he was sent to Catherine Hall, Cambridge, having by this time a good knowledge of Latin, Greek and Hebrew. He obtained a fellowship at St John's College, and was elected an F.R.S. in 1687. Wotton is chiefly remembered for his share in the controversy about the respective merits of ancient and modern learning. In his Reflections upon Ancient and Modem Learning (1694, and again 1697) he took the part of the moderns, although in a fair and judicial spirit, and was attacked by SwiEt in the Battle of the Books. During some of his later years Wotton resided in Wales and gave himself to the study of Celtic, making a translation of the laws of Howel Dda, which was published after his death (1730). Having taken holy orders, he was a prebend of Salisbury from 1705 until his death at Buxted, Essex, on the 13th of February 1727.

Wotton wrote a History of Rome (1701) and Miscellaneous Dis- coveries relating to the Traditions and Usages of the Scribes and Phari- sees (1718).

WOUND (0. Eng. wwkˆ, connected with a Teutonic verb, meaning to strive, fight, suffer, seen in O. Eng. winnan, whence Eng. " win") , a solution in the continuity of the soft parts of the body. Con- tused wounds, or bruises,

are injuries to the cellular tissues in which the skin is not broken. In parts where the tissues are lax the signs of swelling and discoloration are more noticeable than

in the tenser tissues. The discoloration is caused by haemorrhage into the tissues {ecchymosis), and passes from dark purple through green to yellow before it disappears. If a considerable amount of blood is poured forth into the injured tissues it is termed a kaematoma. The treatment of a bruise consists in the application of cold lotion, preferably an evaporating spirit-lotion, to limit the subcutaneous bleeding. The haemorrhage usually becomes absorbed of its own accord even in haematomata, but should suppuration threaten an incision must be made and the cavity aseptically evacuated.

Open wounds are divided into incised, lacerated, punctured and gunshot wounds. Incised wounds are made by any sharp instrument and have their edges evenly cut. In these wounds there is usually free haemorrhage, as the vessels are cleanly divided. Lacerated- wounds are those in which the edges of the wound are torn irregularly. Such injuries occur frequently from accidents with machinery or blunt instruments, or from bites by animals. The haemorrhage is less than from incised wounds, and the edges may be bruised. Punctured wounds are those in which the depth is greater than the external opening. They are generally produced by sharp-pointed instruments. The chief danger arises from puncture of large blood- vessels, or injury to important structures such as occur in the thorax and abdomen. It is also difficult to keep such wounds surgically clean and to obtain apposition of their deeper parts, and septic germs are often carried in with the instrument.

The treatment of incised wounds is to arrest the bleeding (see Haemorrhage), cleanse the wound and its surroundings, removing all foreign bodies {splinters, glass, &c), and obtain apposition of the cut surfaces. This is usually done by means of sutures or stitches of silk, catgut, silkwormgut or silver wire. If the wound can be rendered aseptic, incised wounds usually heal by first intention. In lacerated wounds there is danger of suppuration, sloughing, erysipelas or tetanus. These wounds do not heal by first intention, and there is consequently considerable scarring. The exact amount of time occupied in the repair depends upon the presence or not of septic material, as lacerated wounds are very difficult to cleanse properly. Carbolic acid lotion should be used for cleansing, while torn or ragged portions should be cut away and provision made for free drainage.

It is not always possible to apply sutures at first, but the wound may be packed with iodoform gauze, and later, when a clean granulating surface has been obtained, skin-grafting may be required. In extensive lacerated wounds, where the flesh has been stripped from the bones, where there is spreading gangrene, or in such wounds in conjunction with comminuted fractures or with severe sepsis supervening, amputation of a limb may be called for. Punctured wounds should be syringed with carbolic lotion, and all splinters and foreign bodies removed. The location of needles is rendered comparatively easy by the use of the Rontgen rays; the wound can then be packed with gauze and drained. If a large vessel should have been injured, the wound may have to be laid open and the bleeding vessel secured. Should paralysis indicate that a large nerve has been divided, the wound must also be laid open in order to suture the injured structure.

It is only possible here to mention some of the special character- istics of gunshot wounds. In the modern small-bore rifle (Lee- Metford, Mauser) the aperture of entry is small and the aperture of exit larger and more slit-like. Therf 1 is usually but little haemorrhage. Should no large vessel be torn, and should no portion of septic clothing be carried in, the wound may heal by first intention. Such bullets may be said to disable without killing. They may drill a clean hole in a bone without a fracture, but sometimes there is much splintering. Abdominal wounds may be so small that the intestine may be penetrated and adhesions of neighbouring coils of intestine cover the aperture. Martini-Henry bullets make larger apertures, while soft-nosed or " dum-dum " bullets spread out as soon as the bullet strikes, causing great mutilation and destruction of the tissues. Shell wounds cause extensive lacerations. Small shot may inflict serious injury should one of the pellets enter the eye. In gunshot wounds at short distance the skin may be blackened owing to the particles of carbon lodging in it. The chief dangers of gunshot wounds are haemorrhage, shock and the carrying in of septic material or clothing into the wound.

WOUWERMAN, PHILIP (1619-1668), Dutch painter of battle and hunting scenes, was born at Haarlem in May 1619. He learned the elements of his art from his father, Paul Joosten Wouwerman, an historical painter of moderate ability, and he then studied with the landscape painter, Jan Wynants (1620- 1679). Returning to Haarlem, he became a member of its gild of painters in 1642, and there he died in May 1668. About 800 pictures were enumerated in John Smith's Catalogue raisonne (1840) as the work of Philip Wouwerman, and in C. Hofstede de Groot's enlarged Catalogue, vol. h\ (1909), the number exceeds 1200; but probably many of these are the productions of his brothers Peter (1623-1682) and Jan (1629-1666), and of his

many other imitators. His authentic works are distinguished by great spirit

and are infinitely varied, though dealing recurrently with cavalry battle-pieces, military encampments, cavalcades, and hunting or hawking parties. He is equally excellent in his vivacious treatment of figures, in his skilful animal painting, and in his admirable and appropriate landscape backgrounds. Three different styles have been observed as characteristic of the various periods of his art. His earlier works are marked by the prevalence of a foxy-brown colouring, and by a tendency to angularity in draughtsmanship; the productions of his middle period have greater purity and brilliancy; and his latest and greatest pictures possess more of force and breadth, and are full of a delicate silvery-grey tone.

See the Catalogue raisonnb of the works of the most eminent Dutch and Flemish Painters of the 17th Century, by De Groot, vol. ii. (1909), referred to above.

WRAITH, a general term in popular parlance for the appear- ance of the spirit of a living person. (See " Phantasms of the Living," under Psychical Research.)

WRANGEL, FRIEDRICH HEINRICH ERNST, Count von (1784-187 7), Prussian general field marshal, was born at Stettin, on the 13th of April 1784. He entered a dragoon regiment in 1796, became cornet in 1797, and second lieutenant in 1798. He fought as a subaltern against Napoleon, especially distinguish- ing himself as Heilsberg in 1807, and receiving the order pour h mtrite. In the reorganization of the army, Wrangel became successively first lieutenant and captain, and won distinction and promotion to lieutenant-colonel in the War of Liberation in 1813, won the Iron Cross at Wachau near Leipzig, and became colonel in 18 15. He commanded a cavalry ■ brigade in 1821, and two years later was promoted major-general. He commanded the 13th Division, with headquarters at Minister, in Westphalia, in 1834, when riots occurred owing to differences between the archbishop of Cologne and the crown, and the, determination and resolution with which he treated the clerical party prevented serious trouble. He was promoted lieutenant-general, received many honours from the court, enjoyed the confidence of the Junker party, and commanded successively at Konigsberg and Stettin. In 1S48 he commanded the II. Corps of the German Federal army in the Schleswig-Holstein campaign, was promoted general of cavalry, and won several actions. In the autumn he was summoned to Berlin to suppress the riots there. As governor of Berlin and commander-in-chief of the Mark- of Brandenburg (appointments which he held till his death) he proclaimed a state of siege, and ejected the Liberal president and members of the Chamber. Thus on two occasions in the troubled history of Prussian revival Wrangel's uncompromising sternness achieved its object without bloodshed. From this time onwards he was most prominent in connexion with the

revival of the Prussian cavalry from the neglect and inefficiency into which it had fallen during the years of peace and poverty after 181 5. In 1856, having then seen sixty years' service, he was made a field marshal. At the age of eighty he commanded the Austro-Prussian army in the war with Denmark in 1864 and though he was too old for active work, and often issued vague or impracticable orders (he himself had always desired that the young and brilliant " Red Prince," Frederick Charles, should have the command), the prestige of his name, and the actual good work of Frederick Charles, Moltke and Vogel von Falckenstein among the Prussian, and of Gablenz among the Austrian generals, made the campaign a brilliant success. After the capture of Diippel he resigned the command, was created a count, and received other honours. In 1S66 "Papa" Wrangel assisted in the Bohemian campaign, but without a command on account of his great age. He took a keen interest in the second reorganization of the cavalry arm 1866-1870, and in the war with France in 1870-71. He died at Berlin on the 2nd of November 1877. On the seventieth anniversary of his entering the army his regiment, the 3rd Cuirassiers, was given the title " Graf Wrangel."

See supplement to Militdr. Wochenhlatt (1877), an d ˆ ves by von Koppen and von Maltitz (Berlin, 1884).

WRANGEL, KARL GUSTAV VON (1613-1676), Swedish soldier, was descended from a family of Esthonian origin, branches

of which settled in Sweden, Russia and Germany. His father, Hermann von Wrangel (1587-1643), was a Swedish field marshal in Gustavus Adolphus's wars. Karl Gustav was born near Upsala on the 23rd of December 1613, and at the age of twenty distinguished himself as a cavalry captain in the war against the Army of the League. Three years later he was colonel, and in 1638 major-general, still serving in Germany. In 1644 he commanded a fleet at sea, which defeated the Danes at Fehmarn on the 23rd of October. In 1646 he returned to Germany as a field marshal and succeeded Torstensson as commander-in-chief of the Swedish army in Germany, which post he held during the last three campaigns of the Thirty Years' War. Under Wrangel and Turenne the allied Swedish and French armies marched and fought in Bavaria and Wurttemberg. At the outbreak of a fresh Polish war in 1655 Wrangel commanded a fleet, but in 1656 he was serving on land again and commanding, along with the Great Elector of Brandenburg, in the three days' battle of Warsaw. In 1657 he invaded Jutland and in 1658 passed over the ice into the islands and took Kronborg. In 1657 he was appointed admiral and in 1664 general of the realm, and as such he was a member of the regency during the minority of Charles XL But his last campaign was unfortunate. Commanding, ineffectively owing to his broken health, in the war against Brandenburg, he was recalled after his stepbrother Waldcmar, Freiherr von Wrangel (164 7-1676), had been defeated at Fehrbellin. He died at Riigen shortly afterwards, on the 5th of July 1676.

WRASSE, a name given to the fishes of the family Labridae generally, and more especially to certain members of the family. They are very abundant in the tropical zone, less so in the temperate, and disappear altogether in the Arctic and Antarctic Circles. Their body is gener- ally compressed, like that of a carp, covered with smooth (cycloid) scales; they possess one dorsal fin only, the anterior portion of which consists of numerous spines. Many wrasses are readily recognized by their thick lips, the inside of which is sometimes curi- ously folded, a peculiarity which has given to them the German name of " lip-fishes." The dentition of their jaws consists of strong conical teeth, of which some in front, and often one at the hinder end of the upper jaw, are larger than the others. But the principal organs with which they crush shell- fish, crustaceans and other hard substances are the solid and strongly-toothed pharyngeal bones, of which the lower are coalesced into a single flat triangular- plate. All wrasses are surface fishes, and rocky parts of the coast overgrown with seaweed are their favourite haunts in the temperate, and coral- reefs in the tropical seas. Some 450 species of wrasses (including parrot-wrasses) are known, chiefly from the tropics.

Of the British wrasses the ballan wrasse (Labrus maculatus) and the striped or red or cook wrasse (Labrus mixtus) are the most common. Both belong to the genus Labrus, in which the teeth stand in a single series, and which has a smooth edge of the praeoper- culum and only three spines in the anal fin. The ballan wrasse is the larger, attaining to a length of 18 in., and, it is said, to a weight of 8 lb; its colours are singularly variegated, green or brownish, with red and blue lines and spots; the dorsal spines are twenty in number. The cook wrasse offers an instance of well-marked secondary sexual difference — the male being ornamented with blue streaks or a blackish band along the side of the body, whilst the female has two or three large black spots across the back of the tail. This species possesses only from sixteen to eighteen spines in the dorsal fin. The goldsinny or corkwing (Crenilabrus melops) is much more frequent on the S. coasts of England and Ireland than farther N., and rarely exceeds a length of 10 in. As in other wrasses, its colours are beautiful, but variable ; but it may be readily distinguished from the two preceding species by the toothed edge of the praeoperculum. The three other British wrasses are much scarcer and more local, viz. Jago's goldsinny (Ctenolabrus rupestris), with a large black spot on the anterior dorsal spines and another on the base of the upper caudal rays; Acantho- labrus palloni, which is so rarely captured that it lacks a vernacular name, but may be easily recognized by its five anal spines and by the teeth in the jaws forming a band; and the rock-cook (Centra-

Lips of Labrus festivus.

labrus exoletus), which also has five anal spines, but has the jaws armed with a single series of teeth.

On the Atlantic coasts of the t. states of the United States the wrasses are represented by the genus Tautoga. The only srjecies of this genus, known by the names of tautog or blackfish, is much esteemed as food. It is caught in great numbers, and generally sold of a weight of about 2 lb.

WRAXALL, SIR NATHANIEL WILLIAM (1751-1831), English author, was born in Queen's Square, Bristol, on the 8th of April 1751. He was the son of a Bristol merchant, Nathaniel Wraxall, and his wife Anne, great niece of Sir James ThornhiU the painter. He entered the employment of the East India Company in 1769, and served as judge-advocate and paymaster during the expeditions against Guzerat and Baroche in 1 7 71. In the following year he left the service of the company; and returned to Europe. He visited Portugal and was pre- sented to the court, of which he gives a curious account in his Historical Memoirs; and in the N. of Europe he made the acquaintance of several Danish nobles who had been exiled for their support of the deposed Queen Caroline Matilda, sister of George III.

Wraxall at their suggestion undertook to endeavour to persuade the king to act on her behalf. He was able to secure an interview with her at Zcll in September 1774. His exertions are told in his Posthumous Memoirs. As the queen died on the nth of May 1775, his schemes came to nothing and he complained that he was out of pocket, but George III. took no notice of him for some time. In 1775 he published his first book, Cursory Remarks made in a Tour through some of the Northern Parts of Europe, which reached its fourth edition by 1807, when it was renamed A Tour Round the Baltic. In 1777 he travelled again in Germany and Italy. As he had by this time secured the patronage of important people, he obtained a complimentary lieuterant's commission from the king on the application of Lord Robert Manners, which gave him the right to wear uniform though he never performed any military service. In this year he published his Memoirs of the Kings of France of the Race of Valois, to which he appended an account of his tour in the Western, Southern and Interior Provinces of France. In 177S he went again on his travels to Germany and Italy, and accumu- lated materials for his Memoirs of the Courts of Berlin, Dresden, Warsaw and Vienna (1795). In 1780 he entered parliament and sat till 1794 for Hint on in Wiltshire, Ludgershall and Wallingford, in succession. He published in 1795 the beginning of a History of France from the Accession of Henry III. to the Death of Louis XI V ., which was never completed. Little is known of his later years except that he was made a baronet by the prince regent in 1813. His Historical Memoirs appeared in 1815. Both they and the Posthumous Memoirs (1836) are very readable and have real historical value. Wraxall married Miss Jane Lascelles in 1789, and died suddenly at Dover on the 7th of November 1831. His grandson, Sir F. C. Lascelles Wraxall (1828-1865), was a miscellaneous writer of some note.

See preface to The Historical and Posthumous Memoirs of Sir N. W. Wraxall, by H. B. Wheatley (London, 1884).

WREATH (0. Eng. imwd, from wr&an, to twist), a band of leaves, flowers or metal, twisted into a circular form, and used either as a chaplct or diadem for the head or as an ornament to be hung upon or round an object. For the ancient usages of crowning victors in the games with wreaths, and the bestowal of them as marks of honour see Crown and Coronet.

WRECK, a term which in its widest sense means anything without an apparent owner that is afloat upon, sunk in, or cast ashore by the sea; in legal phraseology, as appears below, it has a narrower meaning. Old Norman forms of the word, varec and veresc, are to be found in charters of 1181 and later date; and the former is still in use in Normandy. Latinized it becomes wreccum, wreckum or wareclum; and such phrases as maris ejectum, jactura maris, adventura maris, shipbryche, are all used as

descriptions of wreck. In Anglo-Saxon charters sde-£pwyrp, and in the charters of the Cinque Ports invenliones, a translation of " findalls," probably a. t local word, are synonymous with wreck. Formerly an appreciable source of revenue to the crown, afterwards a valuable addition to the income of a landowner

on the sea coast, wreck has almost within modern times ceased to be a perquisite of either, or to enrich the casual finder at the expense of its rightful owner. The history of the law as sketched below will indicate how this has come about.

History. — Of old it seems to have been the general rule in the civilized maritime countries of Europe that the right to wreck be- longed to the sovereign, and formed part of the royal revenue. This was so under the Roman, French and feudal law; and in Eng- land the common law set out in the statute De praerogativa regis (17 Edw. II., 1324), providedthat the king has wreck of the sea, whales and sturgeons taken in the sea and elsewhere within the kingdom, except in certain places privileged by the king. This right, which it is said had for its object the prevention of the practice of destroying the property of the shipwrecked, was, however, gradually relaxed; and the owner of wreck was allowed to recover it if he made claim to it, and gave proof of his ownership within a certain time — fixed at a year or a year and a day alike by a decree of Antonine the Great, the feudal law. the general maritime law, the law of France and English law. Richard I. released his prerogative right to wreck to the extent of allowing children, or if there were none, brothers and sisters of a perishing owner, to have his goods; and Henry III., by a charter of 1236, allowed the owner of wrecked good?! to have his property again if he claimed within three months, provided that any man or beast escaped from the ship. The statute of Westminster the First (1276, 3 Edw. I.) provided that where a man, a dog or a cat escape alive out of the ship, such ship or barge or anything in it shall not be adjudged wreck, but the goods shall be saved and kept by view of the sheriff, coroner or the king's bailiff, and delivered into the hands of such as are of the town where the goods were found, so that if any one sue for those goods and prove that they were his, or perished within his keeping, within a year and a day, they shall be restored to him without delay, and if not they shall remain to the king or to such others to whom the wreck be- longed. In 1277 the statute De officio coronatoris made provision for the safe custody of wreck, but coroners were relieved of their duties in respect of wreck by the Coroners Act 1887. An act of 1353 pro- vided for the delivery to the merchants of goods

coming to land which may not be said to be wreck, on payment of salvage. In Scotland, a statute of Alexander II., similar to that of Westminster, declared that where any creature escapes alive from a wrecked vessel, the goods cast away are not accounted wreck, but are to be preserved by the sheriff for those who within a year shall prove their property therein; otherwise they shall escheat to the crown. For a long time the view of English law was that the right to recover wrecked property depended on the fact of a live creature escaping, though in Hale's words, " because it was lex odiosa to add affliction to the afflicted, it was bound up with as many limits and circum- stances, and restricted to as narrow a compass as might be "; and the admiralty records illustrate the statement. Thus in 1382 the prior of Wymondham claimed as wreck a ship which came ashore with no one on board, the men having left her for fear of their lives because of an enemy ship which was about to capture her; but the king's council, before whom it came, by certiorari from the admiral of the north, decided against the claim. In 1543, ships grounded on the Goodwins were held to be waif and wreck, although their crews to save their lives made their way to shore; and in 1637a ship in the Cinque Ports was proceeded against in admiralty and condemned, " no man or dog being on board, but only a dead man with his head shot off. " Upon the institution of the office of lord high admiral early in the 15th or at the close of the 14th century, it became usual for the crown to grant to the lord admiral by his patent of appoint- ment, amongst other proficua et commoditates appertaining to his office, wreck of the sea; and when, early in the reign of Henry VIII., vice-admirals of the coast were created, the lord admiral by patent under his own hand delegated to them his rights and duties in the several counties, including those in connexion with wreck. He did not, however, part with the whole of his emoluments; his vice- admirals were required to render an account of the proceeds of wreck, and to hand over to him a part, usually one-half, of their gains. This system, depending not upon any statute, but apparently upon an arrangement between the lord-admiral and his vice-admirals, continued until the year 1846. In that year an act (9 & 10 Vict, c. 99) was passed forbidding the vice-admirals to intermeddle with wreck, and it required the receivers of droits of admiralty to receive all wreck from the finders and to detain it for twelve calendar months; at the end of that period it was to be sold and the proceeds carried to the credit of the consolidated fund. The transfer to this fund of the hereditary casual revenues of the crown had previously been effected by legislation in the first years of the reigns of William IV. and Victoria, by which the civil list was instituted. The last lord-admiral, however, who beneficially enjoyed the proceeds of wreck was the duke of Buckingham in the reign of Charles I. Prince George of Denmark, Queen Anne's husband and lord-admiral, took wreck by his patent, but by a collateral instrument he surrendered the greater part of the revenues of his office to the crown. Not- withstanding

this arrangement, the vice-admirals of counties, who, in the absence of a lord high admiral, received their appointments sometimes from the crown and sometimes from the commissioners of the admiralty, appear to have taken the whole or part of the

proceeds of wreck until the passing of the act of 1846. The ancient law by which the unfortunate owner was deprived of his property, if no living thing escaped from the wreck, had during the 16th and 17th centuries been gradually but tacitly relaxed; it required, however, a decision of Lord Mansfield and the king's bench in 1771 (Hamilton v. Davis, 5 Burr. 2732) to settle the law definitely that, whether or no any living creature escaped, the property in a wreck remains in the owner. In Scotland it seems that the same law had been laid down in 1725, and there are indications that upon the continent of Europe there had before this date been a relaxation of the old law in the same direction. As early as 1269 a treaty with Norway provides that owners of ships wrecked upon the coasts of England or Norway should not be deprived of their goods (Rym. Foed. 1450). The system under which the lord-admiral antt the vice- admirals of counties had for more than three centuries taken charge of wreck never worked well. Their interest was directly opposed to their duty; for it was to the interest of every one concerned, except the owners and crews of ships in distress, that nothing should land alive. Apart from this, the system discouraged legitimate salvors. The admirals and vice-admirals had by degrees assumed that all salvage operations were exclusively their business; they took possession of wreck brought or cast ashore, whether it was legal wreck or not, and this often gave rise to conflicts with outside working salvors. It was not until the 17th century that working salvors established the right, which they now have, to a lien upon property saved as a security for adequate remuneration of their exertions in saving it; and if the vice-admirals restored to its owners wreck that had come to their hands, they did so only upon payment of extravagant demands for salvage, storage and often legal expenses. A curious side light is thrown upon their practices by the case of an English ship that went ashore on the coast of Prussia in 1743. Frederick the Great restored her to her owners, but before doing so he exacted from them a bond for the full value of ship and cargo, and the condition of the bond was that the owners would within six months produce a certificate under seal of the English admiralty that by the law of England no " salvage " was payable to the crown or to the admiral of England in the like case of a Prussian ship going ashore upon an English coast. The records of the admiralty court show that Frederick's action in this case was intended as a protest, not against the payment of a fair reward to salvors of Prussian ships, but against exactions by English vice-admirals and their officers. Stories of wilful wrecking of ships and of even more evil deeds are probably exaggerations, but modern research has

authenticated sufficient abuses to show that further legislation was necessary to regulate the taking possession of wreck and ships in distress by " sea-coasters. " Previously to the passing of the act of 1846 the only substantial protection against plunder which owners of a wrecked ship could get was to apply to the ad- miralty judge for a commission enabling them or their agents to take possession of what came ashore; but to obtain such a commission took time and cost money, and before the commissioners arrived at the scene of the wreck a valuable cargo would have disappeared and been dispersed through the country. Plunder of wrecks was common, and the crowds that collected for the purpose set law at defiance. The vice-admirals, even if they had been able, did little to protect the ship wrecked. Complaints from the lord-admiral that they neglected to render accounts of their profits were constant; and although the crown and the lord-admiral profited little by wreck, there is reason to think that the gains of vice-admirals and their officers, and also of landowners and dwellers on the coast, were more considerable. Many of the vice-admirals' accounts of the 17th and following centuries are extant. Most of them are for trifling sums, but occasionally the amounts are considerable. A vice-admiral for Cornwall charges himself in his account for the years 1628-1634 with [a sum of £29,253, and in 1624 the duke of Buckingham found it worth his – while to buy out the rights of the warden of the Cinque Ports over wreck within his jurisdiction for £1000 in addition to an annuity of £ˆ00 for the warden's life. At the close of the 17th century the vice-admirals were required to make affidavits as to the amount of their gains ; in 1709 twenty of them swore that their office was worth less than £50 in the year.*

The right of the warden of the Cinque Ports to wreck, above alluded to, was derived from charters granted to the ports by Edward I. and his successors; many other seaports enjoyed a similar right under early charters. It would seem that these rights were of some value, for in 1829 the little townE of Dunwich and Southwold litigated at a cost of £1000 the question whether a tub of whisky picked up at sea belonged to the admiralty jurisdiction of the one town or the other; and the town of Yarmouth is said to have spent no less than £7000 upon a similar question. It was partly in order to put an end to all dealings with wreck by local admiralty courts that the Municipal Corporations Act of 1835 was passed, abolishing all of them, except that of the Cinque Ports.

Grants of wreck to individuals are earlier than those to towns. Even before the conquest it seems to have been not unusual for grantees from the crown of lands adjoining the sea to get the fran- chise of wreck included in their grants. A charter purporting to be of the year 1023 contains a grant by King Canute to the abbot of Canterbury of wreck found at sea below low-water mark as far as a

man could by wading touch it with a sprit (Kemble, Cod. Dipl., No. 737). There is reason to think that before the end of the reign of Henry II. the crown had granted away its right to wreck round a ˆreat part of the coast of England. Although a landowner of the present day, who under such a grant is entitled to wreck, will, in respect of wreck itself, derive no substantial benefit, nevertheless the grant may be of great value as evidence of his right to the fore- shore; and even where no grant of wreck can be produced, if he can show that he and his predecessors have been accustomed to take possession of wreck on the foreshore, it is strong evidence as against the crown of his right to the foreshore, and a lost grant may be presumed. As to these grants of wreck Hale says that " though wreck of the sea doth de jure communi belong to the king, yet it may belong to a subject by charter or by prescription.... Sometime wreck hath belonged to an honour by prescription, as in the honour of Arundel, sometimes to the owner of a county. The lords of all counties palatine regularly had wreccum maris within their counties palatine as part of their jura regalia, but yet inferior lords might prescribe for wreck belonging to their several manors within a county palatine. The earl of Cornwall had wreccum maris per totum comitatum Cornubiae; for though Cornwall was not a county palatine, it had many royalties belonging to it, viz. as against the king, though particular lords might prescribe for wreck against the earl " (De jure maris, i. vii.; Hargrave, 41). In the Isle of Man unreclaimed wreck, whether cast on shore or found in the sea, within the headlands of Man, belongs to the lord, now the crown by purchase from the duke of Athol; in the Channel Islands all wreck cast on shore or within reach of a person standing on shore, except certain valuables which go to the crown, belongs to the lord of the manor if not reclaimed within a year and a day; while in Wales the old law made everything thrown on shore belong to the king, for " the sea is a packhorse of the king " (A. G. v. Jones, 2 H. <& C. 347). In Scotland, as in England, unclaimed wreck belonged to the crown and was often granted to subjects, generally under the style of " wrak, waith and ware," the last two words signifying derelict and seaweed. It was so granted to the earl of Orkney in 1581. It was occasionally dealt with by the Scottish parliament. Thus by an act of 1426, ships wrecked on the coast of Scotland were to be escheat to the king if they belonged to a country observing a similar law, otherwise to have the favour shown to ships of Scotland. In France under the name of droit de bris or droit d'&pave similar grants were made to feudal seigneurs.

From early times a distinction was made in English law between wreck cast ashore and wreck that is floating or sunken below low- water mark. Wreck

proper, or common, law wreck, ejectum maris, is what is cast by the sea upon the shore; for " nothing shall be said to be wreccum maris, but such goods as are cast or left upon the land " (Sir H. Constable's Case, 1599, 5 Rep. 106), and this belonged to the kins jure coronae, and was dealt with by the common law. Floating and sunken wreck belonged to the crown as inter regalia, but was granted to the lord-admiral jure regis. Even when the office of lord nigh admiral is in abeyance, and the duties performed by com- missioners, as now, these rights are distinguished from the other royal revenues as belonging to the crown in its office of admiralty, or, as they are commonly known, droits of the admiralty. From early times the lord-admiral tried to usurp, and there are several instances of his actually usurping jurisdiction over wreck proper; and in the reign of Richard II. special statutes (which were only declaratory of the common law) were passed for the purpose of confining his jurisdiction to its proper limits. One of these (15 Ric. II.) declared that " of all manner of contracts, pleas and quereles, and all other things arising within the bodies of the counties as well by land as by water and also of wreck of the sea, the admiral's court shall have no manner of cognizance, power nor jurisdiction, but all such manner of contracts, pleas and quereles, and all other things rising within the bodies of counties as well by land as by water as afore, and also wreck of the sea, shall be tried by the laws of the land and not before nor by the admirai nor his lieutenant in any wise."

In spite of this statute, instances still occurred of the admiralty court exercising this jurisdiction, until by frequent prohibition by the common law courts, especially in the 17th century, and by the admission of the admiralty judges themselves, it was recognized as beyond the scope of their authority. These admiralty droits are classified as flotsam, jetsam, lagan and derelict. In Lord Coke's words, flotsam is " when a ship sinks or otherwise perishes, and the goods float on the sea "; jetsam is " when goods are cast out of a ship to lighten her when in danger of sinking, and afterwards the ship perishes "; and Hgan, or lagan, is " when heavy goods are, to lighten the ship, cast out and sunk in the sea tied to a buoy or cork, or some- thing that will notsink, in order that they may be found again and recovered." Derelict is a ship or cargo, or part of it, abandoned by its master and crew sine spe recuperandi et sine animo revertendi. " None of these goods," adds Coke, " which are so called, are called wreck so long as they remain in or upon the sea;but if any of them by the sea be put upon the land then they shall be said to be wreck" (Sir H. Constable's Case, 1599, 5 Rep. 106; and 2 Inst. 167). Hale says" they are not wreck of the sea but of another nature, neither do they pass by wreccum maris as is recorded in Sir Henry Constable's case and the case of the 3 Edw. II., where they are styled adventurae maris. And as they are of another nature, so they are of another

cognizance or jurisdiction, viz, the admiral jurisdiction. Flotsam, jetsam and lagan, and other sea est rays, if they are taken up in the wide ocean, belong to the taker of them if the owner cannot he known. But if they be taken up within the narrow seas that do belong to the king, or in any haven, port or creek or arm of the sea, they do prima facie and of common right belong to the king, in case where the ship perisheth or the owner cannot be known. . . . But if the owner can be known he ought to have his goods again, for the casting them overboard is not a loss of his property. Although the right of these adventures of the sea within the king's seas belongs to him where the owner cannot be known, yet the king hath little advantage of it, for by the custom of the English seas the one moiety of what is gained belongs to him that saves it [this is not the present rule]. ... A subject may be entitled to these as he may be entitled to wreck — ■ (1) by charter; (2) by prescription" (Dejure maris; Hargrave, 41, 42). The difference between these two kinds of wreck is clearly brought out in R. v. 49 Casks of Brandy (1836, 3 Hagg. Ad. 257; and R. v. 2 Casks of Tallow, ibid. 294)— -a dispute between the crown and a grantee of wreck, where it was decided that objects picked up below low-water mark, and within 3 m. of it, as also objects afloat between high- and low-water marks, never having touched the ground, are droits of the crown, whereas objects picked up aground between high- and low-water marks, or though aground, yet covered by the waves, are wreck.

The distinction that Hale draws in the above passage between sea waifs or estrays taken on the high seas, and those taken in the seas of the realm, seems to be founded on the occupatio of the civil law; but although favoured by the similar rule existing in the case of royal fish, it has not been recognized by the courts, which have always held that in both cases they are droits of the crown in its office of admiralty, and, subject to the right of the salvor to rew r ard and the right of the owner to reclaim them in a year and a day, go to the royal revenue (Lord Stowell, The Aquila, 1798, 1 C. Rob. 37). Lord Stowell bases this prerogative right "on the general rule of civilized countries that what is found derelict on the seas is acquired beneficially for the sovereign, if no owner shall appear." It seems that this wˆas also Coke's view (2 Inst. 168).

The provisions of the Merchant Shipping Act 1894, mentioned below, upon the subject of droits of admiralty arc not clear. In practice the only droits of the admiralty that are commonly dealt with are anchors that have been slipped or parted from in heavy weather. In the Downs and other roadsteads these are " swept for by creepers towed over the sea bottom, and in former days sweeping for anchors was a common industry. In the Downs large sums have been made after gales in this way. In the 17th century it became customary to obtain from the crown grants of the right to fish for sunken wreck and treasure not only upon English coasts but all

over the world.

Although a ship on board which, or by means of which a man was killed, might be a deodand (g_.v,), yet qua wreck she was not subject to forfeiture as deodand.

Present British Law. — From the above sketch of the develop- ment of the law of wreck it will be seen that it owes little to the legislature. After the act of 1353 no statute dealt with the sub- ject until 1712. In that year a salvage act was passed, but it made no material alteration in the law; and although during the i§th and early 19th centuries several acta were passed dealing fragmentarily with wreck and salvage, the act of 1846, above mentioned, is the only one that calls for notice. That act was embodied in and added to by the Merchant Shipping Act 1854, which again was repealed, re-enacted and added to by the Merchant Shipping Act 1894. The last mentioned act contains the whole of the existing statute law upon the subject of wreck within the territorial waters of the United Kingdom. For its purposes wreck includes jetsam, flotsam, lagan and derelict, found in or on the shores of the sea or any tidal water. The term does not extend to a barge adrift in the Thames, nor a raft of timber adrift; it must be the hull, cargo or appurten- ances of a vessel. Under the Sea Fisheries Act 1883, passed to give effect to the North Sea Fisheries Convention, the provisions of the Merchant Shipping Act as to wreck apply to fishing boats with their rigging and gear.

The provisions of the Merchant Shipping Act dealing with wreck (ninth part) may be summarized as follows: The Board of Trade (as the receiver-general of droits of admiralty) has the general super- intendence of wreck in the United Kingdom, and appoints receivers of wreck for the whole coast, who are paid by fees. Where a British or foreign vessel is wrecked, stranded or in distress, at any place on or near the coasts or any tidal water within the limits of the kingdom, it is the duty of the receiver for the district to proceed there and give directions for preserving the ship, the lives on board her and her cargo and apparel. He can require the assistance of any person, especially the master of any vessel, or the use of any waggons, carts or horses, near at hand; and for this purpose any person may,

unless there is a public road equally convenient, pass and repass with or without horses or carriages over any adjoining lands without the owner's or occupier's consent, doing as little damage as possible, and may also deposit there any things recovered from the ship; any damage so done is a charge

on the ship, cargo or articles, and is recoverable like salvage (q. v.). Penalties are imposed on any owner or occupier hindering the operations. The receiver has power to suppress any plundering or disorder, or any hindering of the preser- vation of the ship, persons, cargo or apparel. Where any vessel, wrecked or in distress as above, is plundered, damaged or destroyed, by any riotous or tumultuous assembly ashore or afloat, compensa- tion must be made to her owner in England and Scotland by the same authority which would be liable to pay compensation in cases of riot (q.v.), and in Ireland in cases of malicious injuries to property. In the absence of the receiver, his powers may be exercised by the following officers or persons in successive order, viz. a chief officer of customs, principal officer of coast-guard, inland revenue officer, sheriff, justice of the peace, and naval or military officer on full pay. These persons act as the receiver's agent and put the salvage in his custody, but they are not entitled to any fees nor are they deprived of any right to salvage by so doing. An examination is also directed to be held, in cases of ships in distress on the coasts of the kingdom, bv a wreck receiver, wreck commissioner or his deputy, at the request of the Board of Trade or a justice of the peace, by evidence on oath as to the name and description of ship, name of master, shipowner and owner of cargo, ports to and from which the ship was bound, the occasion of the ship's distress, the services rendered and the like. The act provides as follows for dealing with wreck: Any one finding wreck, if he is the owner of it, must give notice of his having done so to the receiver of the district, and if he is not the owner he must de- liver it to that officer as soon as possible, except for reasonable cause, e.g. if, as a salvor, he retains it with the knowledge of the receiver. No articles belonging to a wrecked ship found at the time of the casualty must be taken or kept by any person, whether their owner or not, but must be handed over to the receiver. The receiver taking possession of any wreck must give notice of it, with a descrip- tion, at the nearest custom-house, and if the wreck is in his opinion worth more than £20, also to Lloyd's. The owner of any wreck in the hands of a receiver must establish his claim to it within a year, and on so doing, and paying all expenses, is entitled to have it restored to him. Where a foreign ship has been wrecked on or near the coast, and any articles forming part of her cargo are found on or near the coast, or are brought into any port, the consular officer of the foreign country to which the ship or cargo belongs is deemed to be the agent for the owner so far as the custody and disposal of the articles is concerned. The receiver may in certain cases, e.g. where the value is small, sell the wreck and hold the proceeds till claimed. The right to unclaimed wreck belongs to the crown, except in places where the crown has granted that right to others. Persons so entitled, such as admirals — vice-admirals are mentioned in the act (sed quaere) — lords of manors and the like, are entitled, after giving the receiver notice and particulars of their title, to

receive notice from the receiver of any wreck there found. ■ Where wreck is not claimed by an owner within a year after it was found, and has been in the hands of a receiver, it can be claimed by the person entitled to wreck in the place where it was found, and he is entitled to have it after paying expenses and salvage connected with it; if no such person claims it, it is sold by the receiver, and the net proceeds are applied for the benefit of the crown, either for the duchy of Lancaster or the duchy of Cornwall; or if these do not claim it, it goes to the crown. Where the title to unclaimed wreck is disputed, the dispute may be settled summarily as in cases of salvage; either party, if dissatisfied, may within three months after a year since the wreck came into the hands of the receiver proceed in any competent court to establish his title. Delivery of unclaimed wreck by the receiver discharges him from liability, but does not prejudice the title thereto. The Board of Trade has power to purchase rights of wreck. No person exercising admiralty jurisdiction as grantee of wreck may interfere with wreck otherwise than in accordance with the act. Duties are payable on wrecked goods coming into the United Kingdom or Isle of Man as if they had been imported thither; and goods wrecked on their home- ward voyage may be forwarded to their original destination, or, if wrecked on their outward voyage, to their port of shipment, on due security being taken for the protection ot the revenue. Wreck com- missioners may be appointed by the lord chancellor to hold investi- gations into shipping casualties, to act as judges of courts of survey, and to take examinations in respect of ships in distress.

The owner of a wrecked ship, sunk by his negligence in a navigable highway, so as to be an obstruction to navigation, if he retains the ownership of her, is liable in damages to the owner of any other ship which without negligence runs into her. If, however, the owner has taken steps to indicate her position, or the harbour authority at his request has undertaken to do so, no action lies against him for negligence either in rem or in personam. He may, however (whether the sinking was due to his negligence or not), abandon the ship, and can thus Tree himself from any further liability in respect of her. If he abandons her to any other person- — e.g. an underwriter — who pays for her as for a total loss, that person does not become liable for her unless he takes possession or control in any way. Harbour authorities generally have by local statute, as they have by the

general Harbours, Docks and Piers Clauses Act 1847 (if incorporated in their own act), the power of removing the wreck in such a case, and recouping themselves for their expenses from its proceeds. The general act also gives a personal right of action against the owner for any balance of expense over the value of the wreck; but if the owner has abandoned it, and no one else has taken it, neither he nor any one else is liable. A

particular or local act (as e.g. one of the State of Victoria) may, however, fasten this liability on the person who is owner at the time when the ship is wrecked, and then he cannot free himself of it. A harbour authority is not obliged to remove a wreck because it has power to do so, unless it takes dues from vessels using the harbour where the wreck lies, or in some way warrants that the harbour is safe for navigation, in which case it is under an obligation to do so. Further statutory provision is now made in this respect by the Merchant Shipping Act, which empowers harbour authorities to raise, remove or destroy (and meantime buoy or light), or to sell and reimburse themselves out of the proceeds of any vessel or part of a vessel, her tackle, cargo, equipment and stores, sunk, stranded or abandoned in any water under their control, or any approach thereto, which is an obstruction or danger to navi- gation or lifeboat service. They must first give due notice of such intention, and must allow the owner to have the wreck on his paying the fair market value. The act gives similar powers to lighthouse authorities, with a provision that any dispute between a harbour and lighthouse authority in this respect is to be determined finally by the Board of Trade. Provision is also made by statute for the burial of bodies cast on shore from the sea by wreck or otherwise within the limits of parishes, or, in extra-parochial places, by the parish officers or constables at the cost of the county ; and lords of manors entitled to wreck may defray part uf the cost of burial of bodies cast up within the manor, as evidence of their right of wreck.

The method of dealing with wreck outside territorial waters (which does not come within the scope of the act) is governed by the previous general law relating to droits of admiralty. The Board of Trade, as receiver-general, in its instructions to receivers, directs that wreck picked up at sea out of the limits of the United Kingdom, or brought to it by British ships, is to be taken possession of by the receiver and held by him on behalf of the owners, or, if the owners do not claim it, on behalf of the crown. Derelict ships picked up at sea outside territorial limits and brought into British ports must be delivered to the receiver and kept by him until the owner can be found (but not longer than a year and a day). Wreck picked up but of territorial limits by a foreign ship need not be interfered with by the receiver, unless upon application by a party interested. For the receiver's rights with respect to property in distress and its liability to salvage, sec Salvage.

By an act of 1896 it is the duty of the master of a British ship to report to Lloyd's agent, or to the secretary of Lloyd's, any floating derelict ship which he may fall in with at sea. Under the Merchant Shipping Act, it is a felony to take wreck found in territorial limits to a foreign port, and it is punishable by fine to interfere with a wreck. The receiver has power, by means of a search warrant from a justice, to search for wreck which he has

reason to believe is con- cealed. By the general criminal law in Scotland plundering wreck is punishable at common law; and in England and Ireland it is a felony to plunder or steal any wreck or part thereof, to destroy any wreck or part thereof, to prevent or impede any person on board a wreck from saving himself, and to exhibit any false signal with the intent of endangering any ship, or to do anything tending to the immediate loss or destruction of a ship for which no other punishment is provided.

Authorities. — Du Cange, Glossarium, tit. " Wreckum "; Chief- Justice Hale, De jure maris; Hargrave, Tracts (London, 1787); Palmer, haw of Wreck, Law Tracts (London, 1843); Marsden. Select Pleas of Admiralty, Selden Society (London, 1892 and 18977 ; Records of the Admiralty and of the High Court of Admiralty, Public Record Office (London) ; Victoria County History, Cornwall, and other seaboard counties; Maritime History, by M. Oppenheim (1906, &c.) ; Board of Jrade Instructions as to Wreck and Salvage (London).

(R. G. M.; G. G. P.)*

WREDE, KARL PEILIPP, Prince von (1 767-1838), Bavarian field-marshal, was born at Heidelberg on the 29th of April 1767, and educated for the career of a civil official under the Palatinate government, but on the outbreak of the campaign of 1799 he raised a volunteer corps in the Palatinate and was made its colonel. This corps excited the mirth of the well- drilled Austrians with wfeom it served, but its colonel soon brought it into a good condition, and it distinguished itself during Kray's retreat on TJlm. At Hohenlinden Wrede commanded one of the Palatinate infantry brigades with credit, and after the peace of Luncville he was made lieutenant-general in the Bavarian army, which was entering upon a period of reforms. Wrede soon made himself very popular, and distinguished himself in opposing the Austrian invasion of 1805. The Bavarians were for several years the active allies of Napoleon, and Wrede was

engaged in the campaign against Prussia, winning especial dis- tinction at Pultusk. But the contemptuous attitude of the French towards the Bavarian troops, and accusations of looting against himself, exasperated the general's fiery temper, and both in 1807 and in 1809 even outward harmony was only maintained by the tact of the king of Bavaria. In the latter year, under Lefebvre, Wrede conducted the rearguard operations on the Isar and the Abens, commanded the Bavarians in the bitter Tirolese war, was wounded in the decisive attack at Wagram, and returned to Tirol

in November to complete the subjection of the mountaineers. Napoleon made him a count of the Empire in this year. But after a visit to France, recognizing that Napoleon would not respect the independence of the Rhine states, and that the empire would collapse under the emperor's ambitions, he gradually went over to the anti-French party in Bavaria, and though he displayed his usual vigour in the Russian campaign, the retreat convinced him that Napoleon's was a losing cause and he left the army. At first his resignation was not accepted, but early in 1813 he was allowed to return to Bavaria to reorganize the Bavarian army. But he had no intention of using that army on Napoleon's side, and when the king of Bavaria resolved at last to join Napoleon's enemies, W rede's army was ready to take the field. In concert with Schwarzenberg Wrede threw himself across Napoleon's line of retreat from Germany at Hanau, but on the 30th of October he was driven off the road with heavy losses. Next year, after recovering from a dangerous wound, he led a corps in the invasion of France, and supported Blucher's vigorous policy. In 181 5 the Bavarians took the field but were not actively engaged. After Waterloo, Wrede, who had been made a prince in 1814, played a conspicuous part in Bavarian politics as the opponent of Montgelas, whom he succeeded in power in 1817, and in 1835 he was made head of the council of regency during the king's absence. He died on the 12th of December 1838. See lives by Riedel (1844) and Heilmann (1881).

WREN, SIR CHRISTOPHER (1632-1723), English architect, the son of a clergyman, was born at East Knoyle, Wiltshire, on the 20th of October 1632; he entered at Wadham College, Oxford, in 1646, took his degree in 1650, and in r653 was made a fellow of All Souls. While at Oxford Wren distinguished himself in geometry and applied mathematics, and Newton, in his Prin- cipia, p. 19 (ed. of ˆ13), speaks very highly of his work as a geometrician. In 1657 he became professor of astronomy at Gresham College, and in 1660 was elected Savilian professor of astronomy at Oxford. It is, however, as an architect that Wren is best known, and the great fire of London, by its destruction of the cathedral and nearly all the city churches, gave Wren a unique opportunity. Just before the fire Wren was asked by Charles II. to prepare a scheme for the restoration of the old St Paul's. In May 1666 Wren submitted his report and designs (in the All Souls collection), for this work; the old cathedral was in a very ruinous state, and Wren proposed to remodel the greater part, as he said,' " after a good Roman manner," and not, " to follow the Gothick Rudeness of the old Design." According to this scheme only the old choir was left; the nave and transepts were to be rebuilt after the classical style, with a lofty dome at the crossing — not unlike the plan eventually carried out.

In September of the same year (1666) the fire occurred, and the old St Paul's was completely gutted. From 1668 to 1670 attempts were being

made by the chapter to restore the ruined building; but Dean Sancroft was anxious to have it wholly rebuilt, and in 1668 he had asked Wren to prepare a design for a wholly new church. This first design, the model for which is preserved in the South Kensington Museum, is very inferior to what Wren afterwards devised. In plan it is an immense rotunda surrounded by a wide aisle, and approached by a double portico; the rotunda is covered with a dome taken from that of the Pantheon in Rome; on this a second dome stands, set on a lofty drum, and this second dome is crowned by a tall spire. But the dean and chapter objected to the absence of a structural choir, nave and aisles, and wished to follow the medieval cathedral arrangement. Thus, in spite of its having

been approved by the king, this design was happily abandoned- much to Wren's disgust; and he prepared another scheme with a similar treatment of a dome crowned by a spire, which in 1675 was ordered to be carried out. Wren apparently did not himself approve of this second design, for he got the king to give him permission to alter it as much as he liked, without showing models or drawings to any one, and the actual building bears little resemblance to the approved design, to which it is. very, superior in almost every possible point. Wren's earlier designs have the exterior of the church arranged with one order of columns; the division of the whole height into two orders was an immense gain in increasing the apparent scale of the whole, and makes the exterior of St Paul's very superior to that of St Peter's in Rome, which is utterly dwarfed by the colossal size of the columns and pilasters of its single order. The present dome and the drum on which it stands, masterpieces of graceful line and harmonious proportion, were very important alterations from the earlier scheme. As a scientific engineer and practical architect Wren was perhaps more remarkable than as an artistic designer. The construction of the wooden external dome, and the support of the stone lantern by an inner cone of brickwork, quite inde- pendent of either the external or internal dome, are wonderful examples of his constructive ingenuity. The first stone of the new St Paul's was laid on the 21st of June 1675; the choir was opened for use on the 2nd of December 1697; and the last stone of the cathedral was set in 17 10.

Wren also designed a colonnade to enclose a large piazza forming a clear space round the church, somewhat after the fashion of Bernini's colonnade in front of St Peter's, but space in the city was too valuable to admit of this. Wren was an enthusiastic admirer of Bernini's designs, and visited Paris in 1665 in order to see him and his proposed scheme for the rebuilding of the Louvre. Bernini showed his design to Wren, but would not let him copy it, though, as he said, he " would have given his skin " to be allowed to do so.

After the destruction of the city of London Wren was employed to make

designs for rebuilding its fifty burnt churches, and he also prepared a scheme for laying out the whole city on a new plan, with a series of wide streets radiating from a central space. Difficulties arising from the various ownerships of the ground prevented the accomplishment of this scheme.

Among Wren's city churches the most noteworthy are St Michael's, Cornhill; St Bride's, Fleet Street, and St Mary-le-Bow, Cheapside, the latter remarkable for its graceful spire; and St Stephen's, W'albrook, with a plain exterior, but very elaborate and graceful interior. In the design of spires Wren showed much taste and wonderful power of invention. He was also very judicious in the way in which he expended the limited money at his command; he did not fritter it away in an attempt tc make the whole of a building remarkable, but devoted it chiefly to one part or feature, such as a spire or a rich scheme of internal decoration. Thus he was in some cases, as in that of St James's, Piccadilly, content to make the exterior of an almost barnlike plainness.

The other buildings designed by Wren were very numerous. Only a few of the principal ones can be mentioned: — the Custom House, the Royal Exchange, Marlborough House, Buckingham House, and the Hall of the College of Physicians — now destroyed; others which exist are — at Oxford, the Sheidonian theatre, the Ashmolean museum, the Tom Tower of Christ Church, and Queen's College chapel; at Cambridge, the library of Trinity College and the chapel of Pembroke, the latter at the cost of Bishop Matthew Wren, his uncle. The western towers of West- minster Abbey are usually attributed to Wren, but they were not carried out till 1735-1745, many years after Wren's death, and there is no reason to think that his design was used. Wren (D.C.L. from 1660) was knighted in 1673, and was elected president of the Royal Society in 168 1. He was in parliament for many years, representing Plympton from 1685, Windsor from 1689, and Weymouth from 1700. He occupied the post of surveyor of the royal works for fifty years, but by a shameful cabal was dismissed from this office a few years before his death.

He died in 1723, and is buried under the choir of St Paul's; on a tablet over the inner north doorway is the well-known epitaph — Si monumenlum requiris, circumspice.

For further information the reader should consult the Parentalia, published by Wren's grandson in 1750, an account of the Wren family_ and especially of Sir Christopher and his works; also the two biographies of

Wren by Elmes and Miss Philliraore; Milman, Annals of St Paul's (1868); and Longman, Three Cathedrals dedi- cated to St Paid in London (1873), pp. 77 seq. See also Clayton, Churches of Sir C. Wren (18ˆ.8-1849); Taylor, Towers and Steeples of Wren (London, 1881) ; Niven, City Churches (London, 1887), illustrated with fine etchings ; A. H. Mackmurdo, Wren's City Churches (1883); A. Stratton, The Life, Work and Influence of Sir Christopher Wren (1897) ; Lena Milman, Sir Christopher Wren (1908). In the library of All Souls at Oxford are preserved a large number of drawings by Wren, including the designs for almost all his chief works, and a fine series showing his various schemes for St Paul's Cathedral. (J.H.M.)

WREN (O. Eng. wr&nna, Mid. Eng. wrenne; Icel. rindilf) , the popular name for birds of the Passerine family Troglodytidae, of which the best known example is Troglodytes parvulus, the little brown bird — with its short tail, cocked on high — inquisitive and familiar, that braves the winter of the British Islands, and even that of the European continent. Great interest is taken in this bird throughout all European countries, and, though in Britain comparatively few vernacular names have been applied to it, two of them—" jenny " or " kitty-wren " — are terms of endearment. M. Rolland records no fewer than 139 local names for it in France; and Italy, Germany and other lands are only less prolific. Many of these carry on the old belief that the wren was the king of birds, a belief connected with the fable that once the fowls of the air resolved to choose for their leader that one of them which shoidd mount highest. This the eagle seemed to do, and all were ready to accept his rule, when a loud burst of song was heard, and perched upon him was seen the wren, which unseen had been borne aloft by the giant. The curious associa- tion of this bird with the Feast of the Three Kings, on which day in S. Wales, or, in Ireland and in the S. of France, on or about Christmas Day, men and boys used to "hunt the wrenˆ" addressing it in a song as " the king of birds," is remarkable.

The better known forms in the United States are the house- wren, common in the eastern states; the winter- wren, remarkable for its resonant and brilliant song; the Carolina-wren, also a fine singer, and the marsh-wren, besides the cactus wrens and the canon-wrens of the western states.

Wrens have the bill slender and somewhat arched: their food consists of insects, larvae and spiders, but they will also take any small creatures, such as worms and snails, and occasionally eat seeds. The note is shrill. The nest is usually a domed struc- ture of ferns, grass, moss and leaves, lined with hair or feathers, and from three to nine eggs are produced, in most of the species white.

The headquarters of the wrens are in tropical America, but they reach

Greenland in the N. and the Falkland Islands in the S. Some genera are. confined to the hills of tropical Asia, but Tro- glodytes, the best known, ranges over N. and S. America, Asia and Europe.

The Troglodytidae by no means contain all the birds to which the name " wren " is applied. Several of the Sylviinae (cf. Warbler) bear it, especially the beautiful little golden-crested wren (cf. Kinglet) and the group commonly known in Britain as " willow-wrens " — forming the genus Phylloscopus. Three of these are habitual summer- visitants. The largest, usually called the wood-wren, P. sibilatrix, is more abundant in the N. than in the S. of England, and chiefly frequents woods of oak or beech. It has a loud and peculiar song, like the word twee, sounded very long, and repeated at first slowly, but afterwards more quickly, while at uncertain intervals comes another note, which has been syllabled as chea, uttered about three times in succession. The wilfow-wren proper, P. trochilus, is in many parts of Great Britain the commonest summer-bird, and is the most generally dispersed. The third species, P. collyhita or minor (frequently but most wrongly called Sylvia rufa or P. rufus), commonly known as the chiffchafr, from the peculiarity of its con- stantly repeated two-noted cry, is very numerous in the S. and W. of England, but seems to be scarcer N. These three species make their nest upon or very close to the ground, and the building is always domed. Hence they are commonly called " oven-birds," and occasionally, from the grass used in their structure, " hay-jacks," a name common to the white-throat {q.v.) and its allies. (A. N.)

WRESTLING (0. Eng. wr&stlian), a sport in which two persons strive to throw each other to the ground. It is one of the most primitive and universal of sports. Upon the walls of the temple- tombs of Beni Hasan, near the Nile, are sculptured many hundred scenes from wrestling matches, depicting practically all the holds and falls known at the present day, thus proving that wrestling was a highly developed sport at least 3000 years before the Christian era. As the description of the bout between Odysseus and Ajax in the 23rd book of the Iliad, and the evolutions of the classic Greek wrestlers, tally with the sculptures of Beni Hasan and Nineveh, the sport may have been introduced into Greece from Egypt or Asia. In Homer's celebrated description of the match between Ajax and Odysseus the two champions wore only a girdle, which was, however, not used in the classic Greek games. Neither Homer nor Eustathius, who also minutely depicted the battle between Ajax and Odysseus, mentions the use of oil, which, however, was invariable at the Olympic games, where wrestling was introduced during the i8lh Olympiad. The Greek wrestlers were, after the application of the oil, rubbed with fine sand, to afford a better hold .

Wrestling was a very important branch of athletics in the Greek games, since it formed the chief event of the pentathlon, or quintuple games (see

Games. Classical) . All holds were allowed, even strangling, butting and kicking. Crushing the fingers was used especially in the pancralion, a combination of wrestling and boxing. Wrestlers were taught to be graceful in all their move- ments, in accordance with the Greek ideas of aesthetics. There were two varieties of Greek wrestling, the ttclXij &p8f), or upright wrestling, which was that generally practised, and the AXfofcprts (icbXuns, lucta volutatoria) or squirming contest after the con- testants had fallen, which continued until one acknowledged defeat. It was this variety that was employed in the pancration. The upright wrestling was very similar to the modern catch-as- catch-can style. In this three falls out of five decided a match. A variation of this style was that in which one of the contestants stood within a small ring and resisted the efforts of his adversary to pull him out of it. Other local varieties existed in the different provinces. The most celebrated wrestler of ancient times was Milo of Crotona {c. 520 B.C.), who scored thirty-two victories in the different national games, six of them at Olympia. Greek athletic sports were introduced into Rome in the last quarter of the 2nd century B.C., but it never attained to the popularity that it enjoyed in Greece.

Among the Teutonic peoples wrestling, at least as a method of fighting, was of course always known; how popular it had become as a sport during the middle ages is proved by the voluminous literature which appeared on the subject after the invention of printing, the most celebrated work being the Ringer- Kunst of Fabian von Auerswald (1539). Albrecht Diirer made 1 19 drawings illustrating the different holds and falls in vogue in the 15th and 16th centuries. These singularly resembled those used in the Greek games, even to certain brutal tricks, which., however, were considered by the German masters as not gesel- liglich (friendly) and were not commonly used. Wrestling was adopted by the German Tumvereine as one of their exercises, but with the elimination of tripping and all holds below the hips. At present the most popular style in Europe is the so-called Graeco-Roman.

In Switzerland and some of the Tirolcse valleys a kind of wrestling flourishes under the name of Schwingen (swinging). The wrestlers wear sckwingkosen or wrestling-breeches, with stout belts, on which the holds are taken. The first man down loses the bout. In Styria, wrestlers stand firmly on both feet with right hands clasped. When the word is given each tries to push or pull the other from his stance, the slightest movement of a foot sufficing to lose.

The popularity of wrestling has survived in many Asiatic countries, particularly in Japan, where the first match recorded took place in 23 B.C., the victor being Sukune, who has ever since been regarded as the tutelary deity of wrestlers. In the 8th century the emperor Shomu made wrestling one of the features of the annual harvest " Festival of the Five Grains,"

the victor being appointed official referee and presented with a fan bearing the legend, " Prince of Lions." In 858 the throne of Japan was wrestled for by the two sons of the emperor Buntoku, and the victor, Koreshito, succeeded his father under the name of Seiwa. Imperial patronage of wrestling ceased in 1175, after the war which resulted in the establishment of the Shogunate, but continued to be a part of the training of the samurai or military caste. About 1600, professional wrestling again rose to importance, the best men being in the employ of the great daimios or feudal nobles. It was, nevertheless, still kept up by the samurai, and eventually developed into the peculiar combination of wrestling and system of doing bodily injury called ju-jutsu (?.'»'.), which survives with wrestling as a separate though allied art. The national championships were re-established in 1624, when the celebrated Shiganosuke won the honour, and have continued to the present day. The Japanese wrestlers, like those of India, lay much stress upon weight and are generally men of great bulk, although surprisingly light on their feet. They form a gild which is divided into several ranks, the highest being composed of the joskiyori, or elders, in whose hands the superintendence of the wrestling schools and tournaments lies, and who in feudal times used to rank next to the samurai. The badges of the three highest ranks are damask aprons richly embroidered. Every public wrestler must have passed through a thorough course of instruction under one of the joshiyori and have undergone numerous practical tests. The wrestling takes place in a ring 12 ft. in diameter, the wrestlers being naked but for a loin-cloth. At the command of the referee the two adversaries crouch with their hands on the ground and watch for an opening. The method is very similar to that of the ancient Greeks and the modern catch-as-catch-can style, except that a wrestler who touches the ground with any part of his person except the feet, after the first hold has been taken, loses the bout.

Indian wrestling resembles that of Japan in the great size of its exponents or Pulwans, and the number and subtlety of its attacks, called penches. It is of the " loose " order, the men facing each other nude, except for a loin-cloth, and manoeuvring warily for a hold. Both shoulders placed on the ground simul- taneously constitute a fall.

In Great Britain wrestling was cultivated at a very early age, both Saxons and Celts having always been addicted to it, and English literature is full of references to the sport. On St James's and St Bartholomew's days special matches took place through- out England, those in London being held in St Giles's Field, whence they were afterwards transferred to Clerkenwell. The

lord mayor and his sheriffs were often present on these occasions, but the frequent brawls among the spectators eventually brought public matches into disrepute. English monarchs have not disdained to patronize the sport, and Henry VIII. is known to have been a powerful wrestler.

It was inevitable, in a country where the sport was so ancient and so universal, that different methods of wrestling should grow up. It is likely that the " loose " style, in which the con- testants took any hold they could obtain, generally prevailed throughout Great Britain until the close of the 18th century, when the several local fashions became gradually coherent; but it was not until well into the 19th that their several rules were codified. Of these the " Cumberland and Westmorland " style, which prevails principally in the N. of England (except Lanca- shire) and the S. of Scotland, is the most important. In this the wrestlers stand chest to chest, each grasping the other with locked hands round the body with his chin on the other's right shoulder. The right arm is below and the left above the ad- versary's. When this hold has been firmly taken the umpire gives the word and the bout proceeds until one man touches the ground with any part of his person except his feet, or he fails to retain his hold, in either of which cases he loses. When both fall together the one who is underneath, or first touches the ground, loses. If both fall simultaneously side by side, it is a " dog-fall," and the bout begins anew. The different manoeuvres used in British wrestling to throw the adversary are

called " chips," those most important in the " Cumberland and Westmorland " or " North Country " style being the " back- heel," in which a wrestler gets a leg behind his opponent's heel on the outside; the " outside stroke," in which after a sudden twist of his body to the left the opponent is struck with the left foot on the outside of his ankle; the " hank," or lifting the opponent off the ground after a sudden turn, so that both fall together, but with the opponent underneath; the " inside click," a hank applied after jerking the opponent forward, the pressure then being straight back; the " outside click," a back- heel applied by a wrestler as he is on the point of being lifted from the ground — it prevents this and often results in over- setting the opponent; the " cross-buttock," executed by getting one's hip underneath the opponent's, throwing one's leg across both his, lifting and throwing him; the " buttock," in which one's hip is worked still further under that of the opponent, who is then thrown right over one's back; the " hipe " or " hype," executed by lifting the opponent, and, while swinging him to the right, placing the left knee under his right leg and carrying it as high as possible before the throw; the " swinging hipe," in which the opponent is swung nearly or quite round before the hipe is applied; and the " breast-stroke," which is a sudden double twist, first to one side and then to the other, followed by a throw.

In the "Cornwall and Devon" or "West Country" style the men wrestle in stout, loosely cut linen jackets, the hold being anywhere above the waist or on any part of the jacket. A bout is won by throwing the opponent on his back so that two shoulders and a hip, or two hips and a shoulder (three points), shall touch the ground simultaneously. This is a difficult matter, since ground wrestling is forbidden, and a man, when he feels himself falling, will usually turn and land on his side or face. Many of the " chips " common to- other styles are used here, the most celebrated being the " flying mare," in which the opponent's left wrist is seized with one's right, one's back turned on him, his left elbow grasped with the left hand and he is then thrown over one's back, as in the buttock. Until com- paratively recently there was a difference between the styles of Cornwall and Devon, the wrestlers of the latter county having worn heavily-soled shoes, with which it was legitimate to belabour the adversary's shins. In 1826 a memorable match took place between Polkinhorne, the Comish champion, and the best wrestler of Devon, Abraham Cann, who wore " kicking-boots of an appalling pattern." Polkinhorne, however, encased his shins in leather, and the match was eventually drawn.

The " Lancashire " style, more generally known as " catch- as-catch-can," is practised not only in Lancashire and the adjacent districts, but throughout America, Australia, Turkey and other countries. It is the legitimate descendant and repre- sentative of the ancient Greek sport and of the wrestling of the middle ages. A bout is won when both shoulders of one wrestler touch the floor together. No kicking, striking or other foul practices arc allowed, but theoretically every hold is legitimate. Exceptions are, however, made of the so-called strangle-holds, which are sufficiently described by their designation, and any hold resulting in a dislocation or a fracture. This style contains practically all the manoeuvres known to other methods, and in its freedom and opportunity for a display of strategy, strength and skill, is the most preferable. A fall, though invariably begun standing, is nearly always completed on the ground (mat). The holds and " chips " are so numerous and complicated as to make anything but an elaborate description inadequate. The best book on the subject is the Handbook of Wrestling by Hugh F. Leonard (1897).

In Scotland a combination of the Cumberland and catch-as- catch-can styles has attained some popularity, in which the wrestlers begin with the North Country hold, but continue the bout on the ground should the fall not be a clean one with two shoulders down.

In Ireland the national style is called " collar and elbow " (in America, "back-wrestling"), from the holds taken by the

two hands. The man loses, any part of whose person, except the feet, touches the ground.

The style mostly affected by the professional wrestlers of Europe at the present day is the Gracco-Roman (falsely so called, since it bears almost no resemblance to classic wrestling), which arose about i860 and is a product of the French wrestling schools. It is a very restricted style, as no tripping is allowed, nor any hold below the hips, the result being that the bouts, which are contested almost entirely prone on the mat, are usually tediously long. British and American wrestlers, being accus- tomed to their own styles, are naturally at a disadvantage when wrestling under Graeco-Roman rules.

WREXHAM (Welsh- Gwrecsam, in the Anglo-Saxon Chronicle Wrighleshani), a market town and parliamentary and municipal borough of Denbighshire, N. Wales, n m. S.S.W. of Chester, with stations on the Great Western railway, and on the Great Central railway, 202 m. from London. Pop. (1901) 14,966. " One of the seven wonders of Wales " is St Giles's church, of the 14th, 15th and 16th centuries, with a panelled tower of several stages erected between 1506 and 1520, and containing ten famous bells cast (1726) by Rudhall; the interior is Decor- ated, and has two monuments by Roubilliac to the Myddletons, Wrexham is the seat of the Roman Catholic bishop of Menevia, whose diocese includes all Wales except Glamorganshire. The endowed free school was established in 1603. The markets and fairs are good, and the ales, mills (corn and paper) and tanneries locally famous. Brymbo Hall, in the neighbourhood, is said to have been built from a design by Inigo Jones, as were probably Gwydyr chapel (1633) and the Conwy bridge (1636), both at Llanrwst. Erddig Hall was noted for its Welsh MSS. Near Wrexham, but in a detached portion of Flintshire, totheS.E., is Bangor-is-coed (Bangor yn Maelor), the site of the most ancient monastery in the kingdom, founded before 180; some 1200 monks were slain here by /Ethelfrith of Northumbria, who also spoiled the monastery. Bangor-is-coed was probably Antoninus's Bovium, and the Banchorium of Richard of Ciren- cester. Wrightesham was of Saxon origin, and lying E. of Offa's Dyke, was yet reckoned in Mercia. It was given (with Bromfield and Yale, or Idl) by Edward I. to Earl Warenne.

WRIGHT, CARROLL DAVIDSON (1840-1909), American statistician, was born at Dunbarton, New Hampshire, on the 25th of July 1840. He began to study law in 1S60, but in 1862 enlisted as a private in a New Hampshire volunteer regiment. He became colonel in 1864, and served as assistant-adjutant- general of a brigade in the Shenandoah Valley campaign. He was admitted to the New Hampshire bar after the war, and in 1867 became a member of the Massachusetts and United States bars.

From 1872 to 1873 he served in the Senate of Massachu setts, and from 1873 to 1878 he was chief of the Massachusetts Bureau of Statistics of Labor. He was U.S. commissioner of labour from 1885 to 1905, and in 1893 was placed in charge of the Eleventh Census. In 1894 he was chairman of the com- mission which investigated the great railway strike of Chicago, and in 1902 was a member of the Anthracite Strike Commission. He was honorary professor of social economics in the Catholic university of America from 1895 to 1904; in 1900 became professor of statistics and social economics in Columbian (now George Washington) University, from 1900 to 1901 was univer- sity lecturer on wage statistics at Harvard, and in 1903 was a member of the special committee appointed to revise the labour laws of Massachusetts. In 1902 he was chosen president of Clark College, Worcester, Mass., where he was also professor of statistics and social economics from 1904 until his death. Dr Wright was president of the American Association for the Advancement of Science in 1903, and in 1907 received the Cross of the Legion of Honour for his work in improving industrial conditions, a similar honour having been conferred upon him in T906 by the Italian government. He died on the 20th of February 1909.

His publications include The Factory System of the United States (1880); Relation of Political Economy to the Labor Question (1882); History of Wages and Prices in Massachusetts, 1752-1883 (1885);

The Industrial Evolution of the United States (1887); Outline of Practical Sociology (1899); Battles of Labor (1906); and numerous pamphlets and monographs on social and economic topics.

WRIGHT, CHAUNCEY (1830-1875), American philosopher and mathematician, was born at Northampton, Mass., on the 20th of September 1830, and died at Cambridge, Mass., on the 12th of September 1875. In 1852 he graduated at Harvard, and became computer to the American Ephemeris and Nautical Almanac. He made his name by contributions on mathematical and physical subjects in the Mathematical Monthly. He soon, however, turned his attention to metaphysics and psychology, and for the North American Review and later for the National he wrote philosophical essays on the lines of Mill, Darwin and Spencer. In 1870-71 he lectured on psychology at Harvard. Although, in general, he adhered to the evolution theory, he was a free lance in thought. Among his essays may be men- tioned The Evolution of Self-Consciousness and two articles published in 1871 on the Genesis of Species. Of these, the former endeavours to explain the most elaborate psychical activities of men as developments of elementary forms of con- scious processes in the animal kingdom as a whole; the latter is a defence of the theory of natural selection against the attacks of St George Mivart, and appeared in an English edition on the suggestion of Darwin. From 1863 to 1870 he was

secretary and recorder to the American Academy of Arts and Sciences, and in the last year of his life he lectured on mathematical physics at Harvard.

His essays were collected and published by C E. Norton in 1877, and his Letters were edited and privately printed at Cambridge, Mass., in 1878 by James Bradley Thayer.

WRIGHT, JOSEPH (1734-1797), styled Wright of Derby, English subject, landscape and portrait painter, was born at Derby on the 3rd of September 1734, the son of an attorney, who was afterwards town-clerk. Deciding to become a painter, he went to London in 1751 and for two years studied under Thomas Hudson, the master of Reynolds. After painting portraits for a while at Derby, he again placed himself for fifteen months under his former master. He then settled in Derby, and varied his work in portraiture by the production of the subjects seen under artificial light with which his name is chiefly associated, and by landscape painting. He married in 1773, and in the end of that year he visited Italy, where he remained till 1775. While at Naples he witnessed an eruption of Vesuvius, which formed the subject of many of his subsequent pictures. On his return from Italy he established himself at Bath as a portrait-painter; but meeting with little encouragement he returned to Derby, where he spent the rest of his life. He was a frequent contributor to the exhibitions of the Society of Artists, and to those of the Royal Academy, of which he was elected an associate in 1781 and a full member in 17S4. He, however, declined the latter honour on account of a slight which he believed that he had received, and severed his official con- nexion with the Academy, though he continued to contribute to the exhibitions from 1783 till 1794. He died at Derby on the 29th of August 1797. Wright's portraits are frequently defective in drawing, and without quality or variety of handling, while their flesh tints are often hard. He is seen at his best in his subjects of artificial light, of which the " Orrery J? (1766), the property of the corporation of Derby, and the " Air-pump " (1768), in the National Gallery, are excellent examples. His " Old Man and Death " (r7"4) is also a striking and individual production. An exhibition of Wright's works was brought together at Derby in 1883, and twelve of his pictures were shown in the winter exhibition of the Royal Academy in 1S86.

His biography, by William Bemrose, was published in 1885.

WRIGHT, SILAS (1795-1847), American political leader, was born at Amherst, Mass., on the 24th of May 1795. He graduated at Middlebury College, Vermont, in 181 5, was ad- mitted to the bar in 1819, and began practice at Canton, in northern New York. He was appointed surrogate of St Lawrence county in 1820, and was successively a member of the state Senate in 1824-1826, a member of the national House of Repre- sentatives

in 1827-1829, comptroller of the state in 1829-1833,

U.S. senator in 1833-1844, and governor of New York in 1844- 1846. During his public life he had become a leader of the Democratic party in New York, Martin Van Buren being his closest associate. He was an influential member of the so-called " Albany Regency," a group of Democrats in New York, includ- ing such men as J. A. Dix and W. L. Marcy, who for many years virtually controlled their party within the state. Wright's integrity in office was illustrated in 1845, when the " anti-rent troubles " (see New York) broke out and it seemed probable that the votes of the disaffected would decide the coming election. The governor asked and obtained from the legislature the power to suppress the disturbance by armed force, and put an end to what was really an insurrection. When the national Demo- cratic party in 1844 nominated and elected James K.. Polk to the presidency, instead of Martin Van Buren, Wright and the state organization took an attitude oi armed neutrality towards the new administration. Renominated for governor in 1846, Wright was defeated, and the result was by many ascribed in part to the alleged hostility of the Polk administration. He died at Canton on the 27th of August 1847.

The best biography is that by J. D. Hammond, Life and Times of Silas Wright (Syracuse, N.Y., 1848), which was republished as vol. iii. of that author's Political History of New York.

WRIGHT, THOMAS (1809-1884), British palaeontologist, was born at Paisley in Renfrewshire on the 9th of November 1809. He studied at the Royal College of Surgeons in Dublin, and qualified as a doctor in 1832. Soon afterwards he settled at Cheltenham, and graduated M.D. at St Andrews in 1846. He devoted his leisure to geological pursuits, became an active member of the Cotteswold Naturalists' Club (founded in 1846), and gathered a fine collection of Jurassic ammonites and echino- derms. He contributed to the Palaeontographical Society monographs on the British fossil Echinodermata from the Oolitic and Cretaceous formations (1855-1882); he also began (1878) a monograph on the Lias ammonites of the British Islands, of which the last part was issued in 1885, after his death. He wrote many papers in the Ann. and Mag. Nat. Hist. and Proc. Cotteswold Club. The Wollaslon medal was awarded to him by the^Geological Society of London in 1878, and he was elected F.R.S. in 1879. He died at Cheltenham on the 17th of November 1884.

WRIGHT, THOMAS (1810-1877), English antiquary, was born near

Ludlow, in Shropshire, on the 2rst of April 1810. He was descended from a Quaker family formerly living at Bradford, Yorkshire. He was educated at the old grammar school, Ludlow, and at Trinity College, Cambridge, where he graduated in 1834. While at Cambridge he contributed to the Gentleman's Magazine and other periodicals, and in 1835 he came to London to devote himself to a literary career. His first separate work was Early English Poetry in Black Letter, with Prefaces and Notes (1836, 4 vols. i2mo), which was followed during the next forty years by a very extensive series of publications, many of lasting value. He helped to found the British Archaeological Association and the Percy, Camden and Shakespeare societies. In 1S42 he was elected corresponding member of the Academie des Inscriptions et Belles Lettres of Paris, and was a fellow of the Society of Antiquaries as well as member of many other learned British and foreign bodies. In 1859 he superintended the excavations of the Roman city of Uriconium, near Shrewsbury, of which he issued a description. He died at Chelsea on the 23rd of December 1877, in his sixty-seventh year. A portrait of him is in the Drawing Room Portrait Gallery for October 1st, 1859. He was a great scholar, but will be chiefly remembered as an industrious antiquary and the editor of many relics of the middle ages.

His chief publications are — Queen Elizabeth and her Times, a Scries of Original Letters (1838, 2 vols.); Reliquiae antiquae (1839- 1843, again 1845, 2 vols.), edited with Mr J. O. Halliwell-Phirlipps; W. Mapes's Latin Poems (1841, 4I0, Camden Society); Political Ballads and Carols, published by the Percy Society (1841); Popular Treatises on Science (1841); H'islory of Ludlow (1841, &c. ; again 1852); Collection of Latin Stories (1842, Percy Society); The Vision and Creed of Piers Ploughman (1842, 2 vols.; 2nd ed. T 1855); Bio- graphia liieraria, vol. i. Anglo-Saxon Period (1842), vol. H. Anglo-

Norman Period (1846); The Chester Plays (1843-1847, 2 vols., Shakespeare Society) ; St Patrick's Purgatory (1844) ; A necdota liieraria (1844); Archaeological Album (1845,410); Essays connected with England in the Middle Ages (1846, 2 vols.); Chaucer's Canter- bury Tales (1847-1851, Percy Society), a new text with notes, re- printed in 1 vol. (1853 and 1867); Early Travels in Palestine (1848, Bonn's Antiq. Lib.) ; England under the House of Hanover (1848, 2 vols., several editions, reproduced in 1868 as Caricature History of the Georges) ; Mapes, De nugis curialium (1850, 4to, Camden Society) ; Geoffrey Gaimar's Metrical Chronicle (1850, Caxton Society) ; Narratives of Sorcery and Magic (1851, 2 vols.) ; The Cell, the Roman and the Saxon (1852; 4th ed., 1885); History of Fulke Fi-tz Warine (T 855); Jo. de Garlandia, De triumphis ecclesiae (1856, 4to, Rox- burghe Club) ; Dictionary of Obsolete and Provincial English (1857) ; A Votume of Vocabularies (1857; 2nd ed.,

by R. P. Wiilcker, 1884, 2 vols.) ; Les Cent Nouvelles nouvelles (Paris, 1858, 2 vols.) ; Malory's History of King Arthur (1858, 2 vols., revised 1865) ; Political Poems and Songs from Edward III. to Richard 111. (1859-1861, 2 vols., " Rolls " series) ; Songs and Ballads of the Reign of Philip and Mary (i860, 4to, Roxhurghe Club); Essays on Archaeological Subjects (1861, 2 vols.); Domestic Maimers and Sentiments in England in the Middle Ages (1862, 4to, reproduced in 1871 as The Homes of other Days); Roll of Arms of Edward I. (1864, 4to) ; Autobiography of Thomas Wright (1736-1797), his grandfather (1864) ;. History of Caricature (1865, 4to) ; Womankind in Western Europe (1869, 4to) ; Anglo-Latin Satirical Poets of 12th Century (1872, 2 vols., " Rolls " series).

WRIGHT, WILLIAM ALDIS (1836-), English man of letters, was educated at Trinity College, Cambridge, and in 1888 became vice-master of the college. He was one of the editors of the Journal of Philology from its foundation in 1868, and was secretary to the Old Testament revision company from 1870 to T885. He edited the plays of Shakespeare published in the " Clarendon Press " series (1868-1897), a l yo with W. G. Clark the " Cambridge " Shakespeare (1863-1866; 2nd ed. 1891-1893) and the " Globe" edition (1864). He published (1899) a fac- simile of the Milton MS. in the Trinity College library, and edited Milton's poems with critical notes (1903). He was the intimate friend and literary executor of Edward FitzGerald, whose Letters and Literary Remains he edited in 1889. This was followed by the Letters of Edward FitzGerald to Fanny Kenible (1895), his Miscellanies (1900), More Letters of Edward Fitz- Gerald (1901), The Works of Edward FitzGerald (7 vols., 1903). He edited the metrical chronicle of Robert of Gloucester (1887), Generydes (1878) for the Early English Text Society, and other texts.

WRIST, in anatomy, the carpus or carpal articulation in 'man, the joint by which the hand is articulated with the fore-arm (sec Anatomy: Superficial and Artistic; and Skeleton: Ap- pendicular). The word means by origin "that which turns," and is formed from the O. Eng. wrffian, to twist.

WRIT (0. Eng. gewrit, writ, from wriian, to write), in law, a formal order from the crown or a delegated executive officer to an inferior executive officer or to a private person, enjoining some act or omission. 1 The word represents the Latin brevis or breve (sometimes Englished into "brief 5 in the older authori- ties), so called, according to Bracton and Fleta, from its " shortly " expressing the intention of the framer (quia breviter et paucis verbis intentionem proferentis expo-nit) . 2

The breve can be traced back as far as Paulus (about a.d. 220), who wrote a work Ad edictum de brevibus, cited in the Vatican Fragment, § 310, In the Corpus juris the word generally means a summary or report. In Cod.

vii. 44, breviculum means a summary of the grounds of a judgment. The interdiclum of Roman law some- times represents the writ of English law; e.g. there is considerable likeness between the Roman interdictum de libera homine exhibendo and the English writs of habeas corpus and de homine replegiando. From Roman law the breve passed into the Liber feudorum and the canon law, in both in a sense differing from that at present borne by the writ of Eng'ish law. The breve testatum of the Liber feudorum was an instrument in writing made on the land at the time of giving seisin by the lord to the tenant, and attested by the seals of the lord

1 There seems to be no authentic definition of writ. That of Reeves is " a settled form of precept applicable to the purpose of compelling defendants to answer the charge alleged by plaintiffs" (1 Hist, of the Eng. Law, 415).

2 It is perhaps doubtful whether inlentio is here used in its ordinary sense or in the technical signification which it bore as a part of the Roman formula.

and the pares curiae or other witnesses. In England such witnesses were part of the Inquest, and joined in the verdict in case of disputed right until 12 Edw. II. st. 1, c. 2. The breve testatum in England developed into the feoffment, later into the deed of grant; in Scot- land into the charter, and later into the disposition. In canon law breve or brevilegium denoted a letter from the pope, sealed with the seal of the fisherman and less formal than a bull. In old English ecclesiastical law a brief — still named in one of the rubrics of the Book of Common Prayer — meant letters patent to churchwardens or other officers for the collection of money for church or charitable purposes. 1 (For counsel's brief see under Brief.)

The writ in English law still occupies a very important position,

which can scarcely be understood without a sketch of its history.

„ˆ u The whole theory of pleading depends in the last

History, , . , ? ■ -Vi 1 • 1

resort upon the writ, the plaintiffs claim simply expanding its terms.

Writ or breve was at first used in a less technical sense than that which it afterwards assumed: thus in the Leges Jlenrici Primi it simply means a letter from the king, and in the Assize of Clarendon (1166) imbreviari

means to be registered. It became formalized by the reign of Henry II., and precedents are given by Glanvill. The writ process was at that date the foundation of all civil justice in the king's court, and of much in the lower courts, and was a profitable source of revenue to the exchequer. Writs were not framed on any scientific scheme, but as occasion arose, and were frequently the result of compromise in the struggle between the king's and the lords' courts. Every writ had to be purchased {breve perquirere was the technical term). This purchase developed in later times into the payment of a fine to the king where the damages were laid above £40. The usual scale was 6s. 8d. for every 100 marks claimed. In suing out a writ of covenant, the basis of the proceedings in levying a fine, the king was entitled to his primer fine, i.e. one-tenth of the annual value ofthe land concerned. The sale of writs was forbidden by Magna Carta and other statutes in certain cases, especially that of the writ de odio et atia in favour of the liberty of the subject. A solicitor was so called because his original duty was to solicit or sue out a writ and take the due proceedings by paying the proper fine. The costs of a writ purchased were first allowed to a successful demandant by the Statute of Gloucester, 1278. The counterpart of the writ (contrabreve) was usually filed in court with the custos brevium. Through the Norman period the prerogative of issuing writs seems to have been undisputed. Glanvill's precedents did not exhaust all possible forms, for in the time of Bracton, in the 13th century, it was still possible to frame new writs at the pleasure of the crown. The Provisions of Oxford in 1258 put an end to this by enacting that the chancellor should not seal anything out of course {i.e. any writ for which there was no precedent) by the will of the king, but that he should do it by the council. In 1285 the Statute of Westminster the Second re-established the power of the crown within certain limits, that is, in causes of action in a similar case falling under the same law (in consimili casu cadente sub eodem jure) as those for which precedents of writs already existed in the chancery. These pre- cedents were recorded about 1227 in the Registrum brevium, called by Sir Edward Coke the oldest book in the common law. 2 Apart from the powers given bv the statute, new writs could only be issued by the authority of parliament, and writs are sometimes found set out in statutes, especially in the Statutum Walliae, 1284, where precedents of the most usual writs will be found. The Statute of Westminster the Second itself contained precedents of the writ of formedon and of many others. The original flexibility of the writ was thus limited within comparatively narrow bounds. The right to the issue of the writ determined the right of action. If the writ was not sufficient to found an action, the writ was said to fail (cadere). So essential was the writ that it was a legal axiom in Bracton that no one could sue at law without a writ, and it was called by Coke, in his introduction to Littleton, " the heartstrings of the common law." As such it occupied an important place in some of the leading statutes dealing with constitutional rights. The Statute

of Marl- bridge, 1267, forbade a lord to distrain his freeholders to answer for their freeholds, or for anything touching their freeholds, without the king's writ. By 25 Edw. III. st. 5, c. 4 (1342), it was accorded, asserted and stablished that none should be taken by petition or suggestion made to the king or his council unless by indictment or presentment in due manner or by process made by writ original at the common law. 42 Edw. III. c. 3 (1359) provided that no man should be put to answer without presentment before justices, or matter of record, or by due process and writ original according to the old law of the land. Both these statutes were recited and the general principle confirmed by 16 Car. I. c. 10 (1G41). Uniformity of procedure was secured by 27 Hen. VIII. c. 24 (1536), by which all writs were to be in the king's name in a county palatine or liberty,

1 See W. A. Bewcs, Church Briefs (1896). The lines in Cowper's " Charity " allude to such a brief: —

" The brief proclaimed it visits every pew, But first the squire's — a compliment but due." 1 See article by F. W. Maitland in 3 Harvard Law Rev. 177.

but tested by those who had the county palatine or liberty. It was not until 1731 that, by virtue of 4 Geo. II. c. 26, writs were framed in the English language. They had previously heen in Latin ; this accounts for the Latin names by which a large number are still known.

The writ w r as issued from the common law side of the chancery, and was in the special charge of the hanaper and petty bag offices. 3 Though issuing from the king's chancery, it did not necessarily direct the trial of the question in the king's court. In whatever court it was returnable, it called in the aid of the sheriff as executive officer. It was either addressed to him or, if addressed to the party alleged to be in default, it concluded with a threat of constraint by the sheriff in the event of disobedience, generally in those terms, et, nisi feceris, vicecomes de N. facial ne amplius clamorem audiam pro defectu justitiae. If the writ was returnable in the county court or the lord's court, the sheriff or the lord sat as the deputy of the king, not by virtue of his inherent jurisdiction. The writ was not necessary for the initiation of proceedings in these courts or before the justices in eyre, but a custom seems to have grown up of suing out a writ from the king where the claim was above 40s. Cases were transferred from the lord's court to the county court by writ of toll (so called because it removed, tollit, the case), from the latter to the king's court by writ of pone (so called from its first word). By Magna Carta the power of bringing a suit in the king's court in the first instance by writ of praecipe was taken away, and the writ was thence- forth only returnable in the king's court where the tenant held of the king in capite, or where the lord had no court or abandoned his right.

Hence it became a common form in the writ of right to allege that the lord had renounced his court {dominus remisit curiam) so as to secure trial in the king's court.

Besides being used for the trial of disputes, writs addressed to sheriffs, mayors, commissioners or others were in constant use for financial and political purposes, e.g. for the collection of fifteenths, scutage, tallage, &c. f for summons to the council and later to parlia- ment, and for dissolving a parliament, the last by means of the rarely occurring writ de revocatione parliamenti.

There were several divisions of writs (excluding those purely financial and political), the most important being that into original and judicial, the former (tested in the name of the king) issued to bring a suit before the proper court, the latter (tested in the name of a judge) issued during the progress of a suit or to enforce judgment. Original were either optional, i.e. giving an option of doing a certain act or of showing cause why it was not done, beginning with the words praecipe quod reddat, the principal example being the writ on which proceedings in a common recovery (see Fine) were based, or peremptory, i.e. calling on a person to do a certain act, beginning with the words si A. fecerit te securum. Original were also either de cursu (also called by Bracton formata) or magistral\a, the former those fixed in form and depending on precedent, the latter those framed by the masters in chancery under the powers of the Statute of Westrninster the Second. They were also either general or special, the latter setting forth the grounds of the demand with greater particularity than the former. In regard to real estate they might be possessory or ancestral. By 5 Geo. II. c. 27 (1732) special writs were confined to causes of action amounting to £\o or upwards. There was also a division of writs into writs of right {ex debito jus- titiae), such as habeas corpus, and prerogative w r rits {ex gratia), such as mandamus and prohibition. Coke and other authorities mention numerous other divisions, but those which have been named appear to be the principal.

The most interesting form of writ from the historical point of view was the writ of right {breve de recto) , called by Blackstone " the highest writ in the law," used at first for debt and other personal claims, afterwards confined to the recovery of real estate as the writ of right par excellence. It was so called from the words plenum rectum contained in it, and was the remedy for obtaining justice for ouster from or privation of the freehold. By it property as welt as posses- sion could be recovered. It generally lay in the king's court, as has been said, by virtue of a fictitious allegation. In that case it was addressed to the sheriff and was called a writ of right close. When addressed to the lord and tried in his court, it was generally a writ of right patent. After the appearance of the tenant the demandant in a writ of

right counted, that is, claimed against the tenant accord- ing to the writ, but in more precise terms, the writ being as it were the embryo of the future count. The trial was originally by battle (see Trial), but in the reign of Henry II. an alternative and optional procedure was introduced, interesting as the earliest example of the substitution of something like the jury {q.v.) for the judicial combat. A writ de magna assisa eligenda was directed to the sheriff command- ing him to return four knights of the county and vicinage to the court, there to return twelve other knights of the vicinage to try upon oath the question contained in the writ of right (technically called the mise). This mode of trial was known as trial by the grand assize. Generally the whole of the sixteen knights were sworn, though twelve was a sufficient number. The last occasion of trial by the grand

3 The place where writs were deposited was called breviarium or breviorium. This use of the word must be distinguished from legal compendia, such as the Breviarium Alarici or Breviarium extrava- ganhum.

assize was in 1835. But long before that date possessory had from their greater convenience tended to supersede proprietary remedies, and in most cases the title was sufficiently determined by the assizes of other kinds, especially that of novel disseisin and later by pro- ceedings in ejectment. The oath of the champion on proceedings in a writ of right where the alternative of the judicial combat was accepted was regulated by statute, 3 Edw. I. c. 41 (1275). The writ of right is also interesting as being the basisof the law of limitation. By the Statute of Merton (1226) no seisin could be alleged by the demandant but from the time of Henry II. By 3 Edw. I. c. 39 the time was fixed at the reign of Richard I., by 32 Hen. VIII. c. 2 (1541) at sixty years at the most. There were other writs of right with special names, e.g. the writ of right by the custom of London for land in London, the writ of right by advowson, brought by the patron to recover his right of presentation to a benefice, and the writs of right of dower, ne injuste vexes and de rationabili parte, the latter brought by coparceners or brothers in gavelkind. Coheirs and coparceners also had the nuper obiit for disseisin by one of themselves. There were also writs in the nature of a writ of right, e.g. formedon, brought by a reversioner on discontinuance by a tenant in tai! and given by the statute De Bonis Conditionalibus ; escheat, brought by the lord where the tenant died without an heir; ne injuste vexes, to prohibit the lord from exacting services or rents beyond his due; de nativo habendo, to recover the inheritance in a villein; and the little writ of right close according to the custom of the manor, to try in the lord's court the right of the king's tenants in antient demesne. They had also the writ of

monstr aver tint.

Up to 1832 an action was (except as against certain privileged persons, such as attorneys) begun at law by original writ, and writ practically became the equivalent of action, and is so used in old books of practice. The law was gradually altered by legislation and stil! more by the introduction of fictitious proceedings in the common law courts, by which the issue of the original writ was suspended, except in real actions, which were of comparatively rare occurrence. The original writ is no longer in use in civil procedure, an action being now in all cases commenced by the writ of summons, a judicial writ, a procedure first introduced in 1832 by 2 Will. IV. c. 39. In the following year an immense number of the old writs was abolished by the Real Property Limitation Act 1833. An exception was made in favour of the writ of right of dower, writ of dower unde nihil habet, quare impedit and ejectment, and of the plaints for freebench and dower in the nature of writs of right. Ejectment was remodelled by the Common Law Procedure Act 1852; the other writs and plaints remained up to the Common Law Procedure Act 18G0, by which they were abolished. Other writs which have been superseded by simpler proceedings, generally by ordinary actions, are those of the four assizes of novel disseisin, juris utrum, mort d'auncester and darrein presentment, conspiracy, estrepement and waste, false judgment, monstrans de droit, nuisance, partition, praemunire, quo warranto, scire facias, subpoena and warrantia chartae.

The number of writs, especially those connected with ecclesiastical procedure, was so large that any exhaustive list of them is almost impossible, but a few of those of more special interest Obsolete w hich have become obsolete may be shortly mentioned. writs. Admensuratio lay against persons usurping more than

their share of property. It was either dotis or pasturae, the latter, like the Scottish ' souming and rouming, " being the remedy for surcharge of common, for which also quod, permittas lay. Alias and pluries writs were issued when a previous writ had been disobeyed. Apostata capiendo was the mode of apprehension of a monk who had broken from his cloister. Assistance went to. the sheriff to assist the party or an officer of chancery to gain possession of land. Attaint lay to inquire by a jury of twenty-four whether a jury of twelve had given a false verdict. Decies lantum also lay against a juror who had accepted a bribe, so called because he had to refund ten times the sum received. Audita querela was a means of relieving a de- fendant by a matter of discharge occurring after judgment. After having been long practically superseded by stay of execution it was finally abolished by the rules made under the Judicature Act 1875. Beaupleader lay to prohibit the taking of a tine de pulcre placitando, forbidden by the Statute of Marlbridge (1268). 1 Capias, latitat and quominus are

interesting as showing the extraordinary mass of fictitious allegation in the old procedure of the common law courts before 1832. By capias ad respondendum followed by alias and pluries the court of common pleas was enabled to take cognizance of an action without the actual issue of an original writ. The capias was a judicial writ issued to follow an original writ of trespass quia clausum fregit. The issue of the original writ and after a time the issue of the capias became mere fictions, and proceedings commenced with the issue of another writ called capias testatum. On return of the writ the plaintiff elected to proceed with a cause of action other than trespass, and the real merits of the case were eventually reached in this tortuous manner. After being served with the capias the defendant was bound to put in common or special bail, the former being sufficient in all but exceptional cases. Here again there was a

1 Relief from " miskenning " or " mescheninga, " or fine for beau- pleader, was often granted in charters to towns, as by that of Henry I. to London.

fiction, for his common bail were John Doe and Richard Roe. The same fictitious pair also appeared on the side of the plaintiff as his pledges for the due prosecution of his action. By latitat and quo- minus the courts of king's bench and exchequer respectively assumed jurisdiction by a further series of fictions over ordinary civil actions. The writ of latitat, following the bill of Middlesex, itself in later times generally a fiction, alledged that the defendant was in hiding out of Middlesex, after committing a trespass quia clausum fregit, for which he was in the custody of the king's marshal in the Marshalsea prison. The real cause of action was then stated in what was called the ac etiam clause. The writ of quominus alleged that the plaintiff was the king's debtor, and that through the defendant's default he was unable to discharge the debt. De cautione admittenda was a curiosity. It enjoined a bishop to admit an excommunicated person to absolution on condition of his giving security to obey the commands of the church. Deceit or disceit lay for the redress of anything done deceitfully in the name of another, but was especially used to reverse a judgment in a real action obtained by collusion. Distraint of knighthood was a mode of obtaining money for the crown by the exercise of the prerogative of forcing every one who held a knight's fee under the crown to_ be knighted or to pay a fine. The earliest extant writ was issued in 1278. It was abolished in 1641 by 16 Car. I. c. 20. Entry was a possessory remedy against one alleged to hold land unlawfully. It was divided into a large number of kinds, and was the subject of much of the old real property learning. The ones ˆ most commonly occurring were the writs of entry in the Per and in the post, the former alleging, the latter not, the title of the heir from the original disseisor. When writ had come to be equivalent in meaning to action, one of the divisions of possessory actions was into writs of entry and writs of assize. A special writ of entry for dower was given by 6 Edw. I. c. 7.

Excommunicato capiendo was the authority for arresting an excommunicated person and detaining him until he was reconciled to the church, when he was liberated by the writ de excommunicato liberando. These proceedings were abolished and the writ de contumace capiendo substituted in 1817. Faux judgment was for revising the decision of an inferior court. Haeretico comburendo was issued on certificate of conviction for heresy by the ecclesiastical court. A case of burning two Arians under this writ occurred as lately as the reign of James I. It was abolished by 29 Car. II. c. 9. Ilomine replegiando, mainprise and odio et atia (or bono et malo) were all ancient means of securing the liberty of the subject, long superseded by the more effective pro- cedure of habeas corpus. The last of the three enjoined the sheriff to inquire whether a committal on suspicion of murder was on just cause or from malice and ill-will. It was regulated by Magna Carta and the Statute of Westminster the Second, but, having been abused to the advantage of sheriffs, it was abolished in 1355 by 28 Edw. III. c. 9. It was possibly among the means — like the writ of right — by which the trial by battle and the appeal of felony tended to become obsolete. Leproso amovendo explains itself. Moderate misericordia was the means of reviewing an excessive amercement of an inferior court, especially after an amercement had tended to become a fixed sum of twelve pence. Nisi prius was given by the Statute of Westminster the Second, 13 Edw. I. c. 30. Its place is now taken by the commission of nisi prius. Orando pro rege et regno, before the present Book of Common Prayer, enjoined public prayers for the high court of parliament. Protection was given for enabling a man to be quit of suits brought against him while absent beyond seas. It was dealt with by a large number of old statutes, but none has been issued since 1692. Quare ejecit infra terminum was the old remedy of the lessee for eviction by the lessor. Rebellion was a means of enforcing obedience to the process of the court of chancerv. In modern procedure attachment takes its place. Rege inconsulto commanded judges of a court not to proceed in a case which might prejudice the king until his pleasure should be known. Replevin was a survival of the most archaic law. The procedure consisted of writ on writ to an almost unlimited extent. It origin- ally began by the issue of a writ of replevin or replegiari facias. The case might be removed from the county court to a superior court by writ of recordari facias loqudam. If the distrainor claimed a property in the goods distrained, the question of property or no property was determined by a writ de propHetate probanda, and, if decided in favour of the distrainor, the distress was to be returned to him by writ de retomo habendo. If the goods were removed or concealed, a writ of rescous or capias in withernam enabled the sheriff, after due issue of alias and pluries writs, to take a second distress in place of the one removed. It is said that the question whether goods taken in withernam could be replevied was the only one which the Admirable Crichton found himself unable to answer. Restitutione

extracti ab ecclesia lay for restoring a man to a sanctuary from which he had been wrongfully taken. Secta lay for enforcing the duties of tenants to their lord's court, e.g. secta ad molendinum, where the tenants were bound to have their corn ground at the lord's mill. Seisina habenda allowed delivery of lands of a felon to the lord after the king had had his year, day and waste. Vi laica removenda is curiously illustrative of ancient manners. It lay where two parsons contended for a church, and one of them entered with a great number of laymen and kept out the other by force. As lately as 1867 an application for the issue of the writ was made to the chancery court of the Bermuda Islands, but refused on the ground that fhe

writ was obsolete, and that the same relief could be obtained by injunction. On appeal this refusal was sustained by the privy council.

*Of writs now in use, other than those for elections, all are judicial, or part of the process 1 of the court, except perhaps the writ of error Writs now * Q cr ' mma l cases. They are to be hereafter issued out ta use. °^ Lne centra l office of the supreme court, or the office of the clerk of the crown in chancery. By the Crown Office Act 1877 the wafer great seal or the wafer privy seal may be attached to writs instead of the impression of the great or privy seal. The judicial writs issue chiefly, if not entirely, from the central office, with which the old crown office was incorporated by the Judicature (Officers) Act 1879. The crown office had charge of writs occurring in crown practice, such as quo warranto and certiorari.*

In local civil courts, other than county courts, writs are usually issued out of the office of the registrar, or an officer of.similar juris- diction. By the Borough and Local Courts of Record Act 1872, writs of execution from such courts for sums under £20 may be stamped or sealed as of course by the registrar of a county court, and executed as if they had issued from the county court. In county court practice the warrant corresponds generally to the writ of the supreme court. Most of the present law on the subject of writs is contained in the Rules of the Supreme Court, 1883, Ord. xlii.xliv., and in the Crown Office Rules 1906. Both sets of rules contain numerous precedents in their schedules. By Ord. ii. r. 8 of the rules of 1883 all writs (with certain exceptions) arc to be tested in the name of the lord chancellor, or, if that office be vacant, in the name of the lord chief justice. The main exceptions are those which occur in crown practice, which are tested by the lord chief justice. The writ of error bears the teste uf the king "witness ourselves." Before the issue of most writs a praecipe, or authority to the proper officer to issue the writ, is necessary. This is of course not to

be confounded with the old original writ of praecipe. Writs affecting land must generally.be registered in order to bind the land (see Land Registra hon). A writ cannot as a rule be served on Sunday. Some of the Tnore important modern writs (other than those of an extrajudicial nature) may be shortly noticed. Habeas corpus, mandamus, prohibi- tion, scire facias and others are treated separately. Writs are gener- ally, unless where the contrary is stated, addressed to the sheriff. Abatement or nocumento amovendo enjoins the removal of a nuisance in pursuance of a judgment to that effect. Ad quod damnum is for the purpose of inquiring whether a proposed crown grant will be to the damage of the crown or others. If the inquiry be determined in favour of the subject, a reasonable fine is payable to the exchequer by. 27 Edw. I. st. 2 (1299). Attachment is issued as a means of supporting the dignity of the court by punishment for contempt of its orders (see Contempt of Court). Since the Judicature Acts a uniform practice has been followed in all the branches of the high court, and a writ of attachment can now only be issued by leave of the court or a judge after notice to the party against whom it is to be issued. Capias: the old writs of capias ad satisfaciendum and capias utligatum may still be used, but their importance has been much diminished since the alterations made in the law by the Debtors Act 1869 and the abolition of civil outlawry (see Out- lawry). Certiorari is a writ in very frequent use, by which the pro- ceedings of an inferior court arc brought up for review by the high court. In general it lies for excess of jurisdiction as mandamus does for defect. The Summary Jurisdiction Act 1879 makes the writ no longer necessary where a special case has been stated by a court of quarter sessions. Delivery enforces a judgment for the delivery of property without giving the defendant (unless at the option of the plaintiff) power to retain it on payment of the assessed value. Distringas lay to distrain a person for a crown debt or for his appearance on a certain day. Its operation has been much curtailed by the substitution of other proceedings by the Crown Suits Act 1865 and the rules of the supreme court. It now seems to He only against inhabitants for non- repair of a highway. Dis- tringas nuper vicecomitem is a writ calling on an ex-sherifl to account for the proceeds of goods taken, in execution. Elegit is founded on the Statute of Westminster the Second, 1285, and is so named from the words of the writ, that the plaintiff has chosen (elegit) ˆ this particular mode of satisfaction. It originally ordered the sheriff to seize a moietv of the debtor's land and all his goods, save his oxen and beasts of the plough. By the Judgments Act 1838, the elegit was extended to include the whole of the lands, and copyholds as well as freeholds. By the Bankruptcy Act 1883, an elegit no longer applies to goods. Error, the last remaining example of an original writ was at one time largely used in both civil and criminal pro ceedings. It was abolished in civil procedure by the rules_ma.de under the Judicature Act 1875, and in criminal cases by the Criminal Appeal Act 1907. Exigent (with proclamation) forms part of the

process of outlawry now existing only against a criminal. It depends on several statutes, commencing in 1344, and is specially mentioned in the Statute of Provisors of Edward III., 25 Edw. III. st. 6. Extent is the writ of execution issued by the crown for a crown debt of record. The sale of chattels seized under an extent takes place under a writ of venditioni exponas. A crown debtor is

1 It may be noticed that by the interpretation, clause of the Sheriffs Act 1887 the expression " writ " includes any process.

entitled to an extent in aid against a person indebted to him. Where a crown debtor has died a writ reciting his death, and so called diem clausit extremum, issues against his property. Fieri facias is the ordinary writ of execution on a judgment commanding the sheriff to levy the sum, interest and costs on the personal property of the party. Where the sheriff has not sold the goods, venditioni exponas issues to compel him to do so. Where the party is a beneficed clergyman,the writ is one of fieri facias de bonis ecclesiasticis or of sequestrari facias (addressed to the bishop). The latter writ also issues in other cases of an exceptional nature, as against a corporation and to seize a pension. It is addressed to commissioners, not to the sheriff. Habere facias possessionem is given to the owner of a tithe or rent charge, enabling him to have possession of the lands chargeable there-with until arrears due to him are paid. Indicavit is still nominally grantable under the statute De Conjunction Feoffatis of 1306, and is a particular kind of prohibition granted to the patron of an advowson. Inquiry issues for the assessment of damages by the sheriff or his deputy. It represents to some extent the old writ of justicies, and the later writ of trial allowed by 3 & 4 Will. IV. c. 42, but is narrower in its operation, for under the last-named writs the whole case or issues under it could be tried. Before an inquiry the liability has been already established. Levari facias is the means of levying execution for forfeited recognizances. The Bankruptcy Act 1883 abolished it in civil proceedings. Ne exeat regno was at one time issued by virtue of the prerogative to prevent any person from leaving the realm, a form of restraint of liberty recognized by parliament in 5 Ric. II. c. 2. It has now become a means of prevent- ing one who owes an equitable debt of £50 or more from quitting the kingdom, and so withdrawing himself from the jurisdiction of the court without giving security for the debt. It is usually issued on an ex parte motion in the chancery division, but is rare in practice, having been superseded by proceedings under the Debtors Act 1869. Non omittas is for executing process by the sheriff in a liberty or franchise, where the proper officer has neglected to do so. It rested originally chiefly upon the Statute of Westminster the Second, c. 39, and is now regulated by the Sheriffs Act 1887, which repeals the previous enactment. Possession enjoins the sheriff to give possession of land to the party entitled thereto under a judgment for such possession. It fills the place

of the old writ of assistance. In admiralty, where the judgment is for possession of a ship, the writ is addressed to the marshal. Procedendo is the converse of prohibi- tion. It directs the lower court to proceed with the case. It also lies to restore the authority of commissioners suspended by super- sedeas. Restitution restores property, either real or personal, after the right to it has been judicially declared. Thus it lies on behalf of the owner of real property under the statutes of forcible entry and of the owner of personal property under the Larceny Act 1861. Signiftcavit, once a writ, appears since 57 Geo. III. c. 127 to be merely a notice. It is a part of the process against a person disobeying the order of an ecclesiastical court, and consists in a notification to the crown in chancery of the disobedience. Thereupon a writ de con- tumace capiendo issues for his arrest. On his subsequent obedience or satisfaction, a writ of deliverance is granted. Precedents of these writs are given in the act named. Subpoena is the ordinary means of securing the presence of a witness in court, and is addressed to the person whose attendance is required. It is so called from its containing the words " and this you are not to omit under the penalty of £100," &c. The subpoena may be either ad testificandum, to give evidence, or duces tecum, to produce documents, &c, or both combined. By special order of a judge a subpoena may be issued from any court in England, Scotland or Ireland to compel the attend- ance of a witness out of the jurisdiction. Summons is the universal means of commencing an action in the high court. It is addressed to the defendant, and may be either generally or specially indorsed with a statement of the nature of the claim made. The latter form of in- dorsement is allowed in certain cases of debt or liquidated demand, and gives the plaintiff the great advantage of entitling him to final judgment in default of appearance by the defendant, and even in spite of appearance unless the defendant can satisfy a judge that he ought to be allowed to defend. No statement of claim is necessary in case of a specially indorsed writ, the indorsement being deemed to be the statement. The writ may be issued out of the central office or out of a district registry, and the plaintiff may name on his writ the division of the high court in which he proposes to have the case tried. There are special rules governing the issue of writs in probate and admiralty actions. The writ remains in force for twelve months, but may be renewed for good cause after the expiration of that time. Service must be personal, unless where substituted service is allowed, and in special cases, such as actions to recover land and admiralty actions. Service out of the jurisdiction of a writ or notice of a writ is allowed only by leave of the court or a judge. Notice of the issue of a writ, and not the writ itself, is served on a defendant who is neither a British subject nor in British dominions. The law is contained in the Rules of the Supreme Court, especially orders ii.-xi. and xiv. Supersedeas commands the stay of proceedings on another writ. It is often combined with procedendo, where on a certiorari or prohibition the high court has

decided in favour of the jurisdiction of the inferior court. It is also used for removing from the commission of the peace, and for putting an end to the authority of any persons acting under commission from the crown. Venire facias is the first proceeding in

outlawry, calling upon the party to appear. Under the old practice a venire facias de novo was the means of obtaining a new trial. Ventre inspiciendo appears still to be competent, and is a curious relic of antiquity. Jt issues on the application of an heir presumptive in order to determine by a jury of matrons whether the widow of a deceased owner of lands be with child or not. Almost exactly the same proceeding was known in Roman law.

The principal writs of a non-judicial nature relate to parliament 01 some of its constituent elements. Parliament is summoned by the king's writ issued out of chancery by advice of the privy council. The period of forty days once necessary between the writ and the assembling is now by an act of 1852 reduced to thirty-five days. Writs of summons are issued to the lords spiritual and temporal before every new parliament. Those to Irish representative peers are regulated by the Act of Union, those to archbishops and bishops by the Ecclesiastical Commissioners Act 1847. New peerages are no longer created by writ, but the eldest son of a peer is occasionally summoned to the House of Lords in the name of a barony of his father's. With respect to election of members of the House of Commons, the procedure differs as the election takes place after a dissolution or on a casual vacancy. After a dissolution the writ is issued, as already stated, by order of the crown in council. For a single election the warrant for a new writ is issued during the session by the speaker after an order of the house made upon motion ; during the recess by the speaker's authority alone. The warrant is addressed to the clerk of the crown in chancery for Great Britain, to the clerk of the crown and hanaper of Ireland. A supersedeas to a writ has sometimes been ordered where the writ was improvidently issued. The time allowed to elapse between the receipt of the writ and the election is fixed by the Ballot Act 1872, sched. 1, at nine days for a county or a district borough, four days for any other borough. The writ is to be returned by the returning officer to the clerk of the crown with the name of the member elected endorsed on the writ. Sehed. 2 gives a form of the writ, which is tested, like the writ of error, by the king himself. The returning officer is the sheriff in counties and counties of cities, generally the mayor in cities and boroughs, and the vice-chancellor in universities. Other writs for election are those for convocation, which is by 25 Hen. VIII. c. 19 summoned by the archbishop of the province on receipt of the king's writ,

and for election of coroners, vcrderers of royal forests, and some other officers whose office is of great antiquity. The writ de coronatore eligendo, addressed to the sheriff, is specially preserved by the Coroners Act 1887.

Offences relating to writs are dealt with by the Criminal Law Consolidation Acts of 1861 and other statutes. The maximum penalty is seven years' penal servitude.

Scotland.—" Writ "is a more extensive term than in England. Writs are either judicial or extrajudicial, the latter including deeds and other instruments — as, for instance, in the Lord Clerk Register Act 1879, and in the common use of the phrase " oath or writ " as a means of proof. In the narrower English sense both " writ " and " brieve " are used. The brieve was as indispensable a part of the old procedure as it was in England, and many forms are given in Regiam Majestatem and Quoniam Attachiamenta. It was a command issued in the king's name, addressed to a judge, and ordering trial of a question stated therein. It was drawn by the writers to the signet, originally clerks in the office of the secretary of state. Its conclusion was the will of the summons. In some cases proceedings which were by writ in England took another form in Scotland. For instance, the writ of attaint was not known in Scotland, but a similar end was readied by trial of the jury for wilful error. 1 The English writ of ne exeat regno is represented by the meditatio fugae warrant. Most proceedings by brieve, being addressed to the sheriff, became obsolete after the institution of the court of session, when the sheriffs lost much of that judicial power which they had enjoyed to a greater extent than the English sheriff (see Sheriff). 2 An English writ of execution is represented in Scotland by diligence, chiefly by means of warrants to messengers-at-arms under the authority of signet letters in the name of the king. See the Writs Execution Act 1868. The brieve, however, has not wholly dis- appeared. Brieves of tutory, terce and division among heir-por- tioners are still competent but not in use. Other kinds of brieve have been superseded by simpler procedure, e.g. the brieve of service of heirs, representing the older breve de morte antecessors, by a petition to the sheriff under the Titles to Land Consolidation Act 1S68 and the brieve of perambulation by a declaratory action. The brieve of cognition of insane persons is now one of the few of practical im- portance. The old brieves of furiosity and idiotcy were abolished, and this new form was introduced by the act last named. Writs eo nomine have been the subject of much modern legislation. The writs of capias, habeas, certiorari and extent were replaced by other proceedings by the Exchequer Court Act 1856. The writs of dare constat, resignation and confirmation (whether granted by the crown or a subject superior) were regulated by the act of 1868. By the

1 An example occurring in the reign of James VI. will be found in Pitcairn,

Criminal Trials, i. 216.

2 Explanations of many of the older writs will be found in Lord Clerk Register Skene's De verborum significatione (1641), and styles in Spotiswood, Stile of Writs (1715).

same act crown writs are to be in the English language and registered in the register of crown writs. Writs need not be sealed unless at the instance of the party against whom they are issued. Writs of progress (except crown w r rils, writs of dare constat and writs ol acknowledgment) were abolished by the Conveyancing Act 1874. The dare constat writ is one granted by the crown or a subject superior for the purpose of completing title of a vassal's heirs to lands held by the deceased vassal. Where the lands are leasehold the writ of acknowledgment under the Registration of Leases Act 1857 is used for the same purpose. By the Writs Execution Act 1877 the form of warrant of execution on certain extracts of registered writs is amended. Extracts of registered w r rits are to be equivalent to the registered writs themselves. Writs registered in the register of sasines for preservation only may afterwards be registered for preservation and execution. By 22 Geo. II. c. 48, passed for the purpose of assimi- lating the practice of outlawry for treason in Scotland to that in use in England, the court before which an indictment for treason or misprision of treason is found, is entitled on proper cause to issue writs of capias, proclamation and exigent. la some respects the proceedings in parliamentary elections differ from those in use in England. Thus the writ in university elections is directed to the vice-chancellors of Edinburgh and Glasgow respectively, but not to those of St Andrews and Aberdeen, and there is an extension of the time for the return in elections for Orkney and Shetland, and for the Wick burghs. Representative peers of Scotland were by the Act of Union to be elected after writ issued to the privy council of Scotland, On the abolition of the privy council a proclamation under the great seal was substituted by 6 Anne, c. 23.

United States. — Writs in United States courts arc by Act of Congress to be tested in the name of the chief justice of the United States. By state laws writs are generally bound to be in the name of the people of the state, in the English language, and tested in the name of a judge. Writs of error have been the subject of much legislation by the United States and by the states. In New York writs of error and of ne exeat have been abolished. Writs as parts of real actions have been generally superseded, but in Massachu- setts a writ of entry on disseisin is still a mode of trying title. WVits of dower and of estrepement are still in use in some states. By the law of some states, e.g. New Jersey, writs of election are issued to supply casually occurring vacancies in the legislature. The writ of assistance, already named, has its interest in constitutional history. Before the War of Independence it was

issued to .revenue officers to search premises for smuggled goods. It was on this writ that it was first contended in 1761 that a colonial court had jurisdiction to examine the constitutionality of a legislative act authorizing the issue of the writ. Sec Quincy's Massachusetts Rep. App., I. 520.

Authorities. — The importance of the writ in procedure led to the compilation of a great body of law and precedent at an early date. In addition to the Registrum brevium there were, among other old works, the Natura brevium, first published in 1325; Thcloall, Le Digest des briefes originales (1579); Fitzherbert, Le Noitvel Natura brevium (1588); Hughes, Original Writs (1655); Thesaurus brevium (1661) ; Brownlow, Brevia judicialia (1662) ; Ojficina brevium (1679). See too Coke upon Littleton, 158, 159, 2 Coke's Inst. 39; and Du Cange. 3 Many precedents will be found in the collection of parliamentary writs and in Stubbs's Select Charters. The Crown Office Rules, 1906, contain many precedents of the modern writs used in crown practice. Old books of practice, such as Tidd's Practice, Corner's Crown Practice and Booth's Real Actions, contain much law on the subject. For the history, Spence's Rquitahle Juris- diction, vol. i. bk. ii. ch. viii. ; Forsyth's Hist, of Trial by Jury, Steohen ; On Pleading, Bigelow's Hist, of Procedure, ch. iv. ; Pollock and M ait- land, Hist, of Eng. Law, and W. S. M'Kechnie, Magna Carta may be consulted. There appears to be no book dealing with the writ in modern practice, but sufficient Information is contained in the ordinary treatises on procedure. (J. W.)

WRITERS TO THE SIGNET, in Scotland, a society of law agents corresponding to solicitors in England. They were originally clerks in the secretary of state's office and prepared the different writings passing the signet; every summons is still signed on its last page by a writer to the signet. By the Titles to Land Consolidation (Scotland) Act 1868. they have the exclusive privilege of preparing all crown writs, charters, precepts.. &c, from the sovereign or the prince of Scotland. They have no charter but are usually considered a corporation by long custom; they have office-bearers and are members of the College of Justice. On the Act of Union there was much debate as to whether writers to the signet should be eligible to the Scottish bench. It was finally decided that they should be eligible aften ten years' practice. But, with the exception of Hamilton of Pencaitland in 17×2, no writer to the signet has ever had a seat on the bench.

3 A reference to Du Cange will show the great variety of .the non-legal uses of brevis or breve. It may mean, inter alia, an annual rent, an amulet, a notice of the death of a monk. Brevetum signified what are now known as ship's papers.

WRITING

WRITING (the verbal noun or " to write," 0. Eng. writan, to inscribe), the use of letters, symbols or other conventional characters, for the recording by visible means of significant sounds; more specifically, the art of tracing by hand these symbols on paper or other material, by pen and ink, pencil, stylus or other such means, as opposed to mechanical methods such as printing. The principal features in the development of writing in its primary sense are dealt with in separate articles (see Alphabet, Palaeography, Inscriptions, Book, Manu- script, Shorthand, &c). Here it is only necessary briefly to refer to the origins of a system which has eventually followed the history of the various languages and has been stereotyped by the progress of typography (q.v.). Very early in the history of mankind three needs become pressing. These are {a) to recall at a particular time something that has to be done; (6) to com- municate with some other person who is not present, nor for the moment easily accessible; (c) to assert rights over tools, cattle, &c, by a distinctive mark, or by a similar mark to distinguish one's own production (e.g. a special make of pottery) from that of others. The last-named use, out of which in time develops every kind of trade-mark, is itself a development of the earlier property mark. The right to property must be established before traffic, whether by way of barter or of sale, is possible.

Every one is familiar with devices to achieve the first of these aims; one of the commonest is to tie a knot in a hand-

kerchief. It is obvious that by multiplying the signs. number of knots a number of points equal to the

number of knots might in this way be referred to, though it is probable that the untrained memory would fail to recall the meaning attached to more than a very limited number of knots. The simplest application of these knots is in keeping a record of a number of days, as in the story related by Herodotus (iv. q8), to the effect that Darius, on crossing the Ister in his Scythian expedition, left with the Greeks appointed to guard the bridge a thong with a number of knots equal to the number of days that their watch over the bridge was to be continued. One knot was to be undone each day, and if the king had not returned by the time that all the knots were undone, the Greeks were to break down the bridge and go away. A development of this is found in the Peruvian quipus, which consists of a number of thongs or cords hanging from a top-band or cross-bar. In its simplified form, knots are merely tied upon the individual cords. In its more elaborate forms the cords are of different colours, and are knotted together so as to form open loops of various shapes. In the Antiguedades Peruanas, 1 we are told that the knots of the quipus in all probability indicated only numbers originally,

but that as time went on the skill of the makers became so great that historical events, laws and edicts could thus be communicated. In every place of any importance there was an official whose business it was to interpret quipus received from a distance, and to make quipus himself. If, however, the quipus which was received came from a distant province, it was not intelligible without an oral explanation. Unfortunately, the art of interpretation of quipus is lost, so that it is impossible to ascertain how far the knots were merely a mnemonic for the messenger, and how far they were intelligible without explanation to a stranger. Similar mnemonics are said to have been used in the remotest antiquity amongst the Chinese, the Tibetans, and other peoples of the Old World. 2

Similar in character to the quipus is the message-stick, which

is still in use amongst the natives of Australia. A branch of a

_ tree is taken and notches made upon it. These are

sticks. ‘ now cut with a knife; in earlier times they were made

with the edge of a mussel shell. The notches are made in the presence of the messenger, who receives his instructions while they are being made. The notches are thus merely aids to memory, and not self-explanatory, though if messages fre- quently passed between two persons, practice would in time help the person to whom the message was sent to guess at the

1 Quoted by Middcndorf , Das Runa Simi oder die Keshua Sprache (Leipzig, 1890), p. 8. 1 Cf. Andree, Ethnologische Paralklen und Vergleiche, i. p. 184 sqq.

meaning, even without a verbal explanation. The following was the method of the Wotjoballuk of the Wimmera river in Victoria. 3 ” The messenger carried the message-stick in a net bag, and on arriving at the camp to which he was sent, he handed it to the headman at some place apart from the others, saying to him, ‘ So-and-so sent you this/ and he then gives his message, referring as he does so to the notches on the message-stick; and if his message requires it, also enumerates the days or stages, as the case may be,” by a method of counting on different parts of the body.

For the purposes of communication with absent persons, however, another method commended itself, which in time was adopted also for mnemonic purposes. This method was the beginning whence some forms at least of later pebbles. writing have been derived. From the very earliest times to which the energy of man can be traced, date two kinds of writing: (a) engraving of a visible object on some hard substance, such as the flat surface of a bone; {b) drawing, painting or engraving marks which could

again be identified. Of the first kind are the engravings of reindeer, buffaloes and other animals by the cave men of prehistoric times; of the second are a large number of pebbles discovered by M. Ed. Piette at Mas d'Azil, on the left bank of the Arize, an account of which was published by the discoverer in V 'Anthropologic (1896), vii. 384 sqq. This layer of coloured pebbles is intercalated between the last layer of the Reindeer Age and the first of the Neolithic period. The layer is over 2 ft. thick, of a reddish-black colour, and along with the pebbles are found cinders, peroxide of iron, teeth of deer perforated, probably in order to be strung like beads, harpoons of various kinds, and the bones of a large number of animals, some wheat, and, in the upper part of the layer, nuts, cherry-stones and plums. The stones were coloured with peroxide of iron. The characters are of two kinds: (a) a series of strokes which possibly indicate numbers, (h) graphic symbols. The stones were scattered about without connexion or relation one with another. Whatever the meaning may be, it is clear that the markings are not accidental. It is noticeable, however, that none of them definitely represent any animal, though some of them bear a certain resemblance to caterpillars or serpents. Others look like rough attempts to represent trees and river plants. A great number closely resemble symbols of the alphabet. Piette himself was inclined to see in the symbols the forerunners of the later syllabaries and alphabets of the East, nine of them agreeing with forms in the Cypriot syllabary (see below) and eleven with those of the Phoenician alphabet. A certain amount of likeness, however, could not well be avoided, for as soon as the artist advances beyond the single perpendicular or horizontal line he must, by crossing two lines, get forms which resemble alphabetical symbols. It might be therefore a safer conclusion to suppose that if they passed beyond magic symbols, to be buried like the Australian ckuringa, they were conventional marks understood by the members of the clan or tribe which frequented the caves of Mas d'Azil. It has been suggested that, like similar things among the American Indians, they may have been used in playing games or gambling.

A very large number of conventional marks, however, are demonstrably reductions from still older forms, conventional marks often developing out of pictographs. Picto- American graphy has, in fact, left its traces in all parts of the picture- world. It has, however, been most widely developed writing, in the New World as a system lasting down to modern times. The American Indians, besides picture-writing, used also (1) the simple mnemonic of a notched stick to record various incidents, such as the number of days spent on an expedition, the number of enemies slain and the like; (2) wampum belts, consisting of strung beads, which could be utilized as a mnemonic, exactly like a rosary. Wampum belts, however, were employed in more intricate forms; white beads indicated peace, purple or violet meant war. Sometimes a pattern was made in the belt with beads

of a different colour, as in the belt presented to

8 A. W. Howitt in Journal of the Anthropological Institute, xviii. (1889), P. $18 sqq.

William Peim on the making of a treaty with the Leni-Lenape chiefs in 1682. Here, in the centre of the belt, two figures, in- tended to represent Penn and an Indian, join hands, thus clearly indicating a treaty. Very simple pictures are drawn upon birch bark, indicating by their order the subjects in a series of song- chants with sufficient precision to enable the singer to recall the theme of each in his recitation. An account can be kept of sales or purchases by representing in perpendicular strokes the number of items, and adding at the end of each series a picture of the animal or object to which the particular series refers. Thus three strokes followed by the picture of a deer indicate that the hunter has brought three deer for sale. A conventional symbol (a circle with a line across it) is used to indicate a dollar, a cross represents ten cents, and an upright stroke one cent, so that the price can be quite clearly set forth. This practice is followed in many other parts of -the world. In clay tablets discovered by Dr Arthur Evans during his exploration of the great palace at Knossos, in Crete, a somewhat similar method of enumeration is followed; while at Athens conventional symbols were used to distinguish drachmae and obols upon the revenue records, of which considerable fragments are still preserved.

In comparatively recent times, according to Colonel Mallery (10th Annual Report of American Bureau of Ethnology), the Dakota Indians invented a chronological table, or winter count, wherein each year is recorded by a picture of some important event which befell during that year. In these pictures a con- siderable amount of symbolism was necessary. A black upright stroke indicates that a Dakota Indian was killed, a rough outline of the head and body spotted with blotches indicates that in the year thus indicated the tribe suffered from smallpox. Some- times, in referring to persons, the symbol is of the nature of a rebus. Thus, Red Coat, an Indian chief, was killed in the winter of 1807-1808; this fact is recorded by a picture of a red coat with two arrows piercing it and blood dripping. There is, however, nothing of the nature of a play upon words intended, and even when General Manyadier is represented as a figure in European dress, with the heads of two deer behind his head and connected with his mouth, no rebus was intended (many a deer), but the Indians supposed that his name really meant this, like their own names Big Crow, Little Beaver, and so

forth. Here the Mexicans proceeded a stage further, as in the often quoted case of the name of Itz-coatl, literally knife-snake, which is ordinarily represented by a reptile (coatl) with a number of knives (itz) projecting from its back. It is, however, also found divided into three words, itz-co-atl — knife-pot- water — and represented by a different picture accordingly. The Mexicans, moreover, to indicate that the picture was a proper name, drew the upper part of the human figure below the symbol, and joined them by a line, a practice adopted also amongst their northern neighbours when, as in names like Little-Ring, the representation would hardly be sufficiently definite. Simple abstract notions could also be expressed in this picture-writing. Starvation or famine was graphically represented by a human figure with the ribs showing prominently. A noose amongst the Mexicans was the symbol for robbery, though more logically belonging to its punishment. In a Californian rock-painting reproduced by Mallery (p. 638), sorrow is represented by a figure from whose eyes drop tears. This could be abbreviated to an eye with tears falling from it, a form recorded by Schoolcraft as existing amongst the Ojibwa Indians. The symbol is so obvious that it is found with the same value among Egyptian hieroglyphics.

The civilization of the American Indians was nowhere very high, and for their simple needs this system, without further development, sufficed. It was different in the more elaborate civilizations which prevailed among the ancient peoples of the Old World, to whom with certainty the development of writing from pictography can be ascribed — the Assyrians (see Cunei-form), Egyptians (see Egypt) and Chinese (see China). Here more complex notions had to be expressed. The development of the system can be traced through many centuries, and, as might be expected, this development shows a tendency to conventionalize the pictorial symbols employed. Out of

conventionalized forms develop (a) syllabaries, (b) alphabets. As regards the latter the historical evolution is traced in the article Alphabet. The account given under China (language) gives a good idea of the development of a syllabary from picto- graphic writing.

*The Egyptian system of writing is perhaps the oldest of known scripts, and was carried on till the Ptolemaic period, when the more convenient Greek alphabet led to its gradual disuse. p But, as in Chinese, the fact that it was so long in use led ˆP”** 1 ‘ to the conventionalizing of the pictures, and in many cases to a complete divorcement between the symbol and the sound repre- sented, the original word having often become obsolete. In this case it is no longer possible to trace it. Attempts have been made to connect the three great pictographic systems of the Old World, some authorities holding that the Chinese migrated eastwards from Babylonia, while others contend that the civilization of Egypt sprang originally from the valley of the Euphrates, and that the ancient Egyptians were of the same stock as the*

Somali and were overlaid and permeated by a Semitic conquest and civilization. But there is no clear evidence that the Egyptian system of writing was not a development in the Nile Valley itself, or that it was either the descendant or the parent of the pictographic system which developed into the cuneiform of Assyria and neighbouring lands.

Egyptian started from the same point as every other pictographic system — the representation of the object or the concrete expression of the idea. But, like the Chinese, it took the further step, short of which the American Indian pictographs stopped ; it converted its pictures into a syllabary from which there was an imperfect develop- ment towards an alphabet. _ Egyptian, however, never became alphabetic in the sense in which the western languages of modern Europe are alphabetic. This is attributed to the natural conserva- tism of the people, and the influence of the artist scribes, who, as Mr F. LI. Griffith has pointed out, " fully appreciated the effect of decorative writing ; to have limited their choice of signs by alphabetic signs would have constituted a serious loss to that highly important body. " The effect of this love for decoration, combined with a desire for precision, is shown by the repetition several times over in the symbols of the sounds contained in a word. The development of Egyptian was exactly parallel to Chinese. A combination of sounds, which was originally the name of an object, was represented by the picture of that object. This picture again, like Chinese, and like the Indian name " Little-Ring," required at the end a determin- ative—a picture of the kind of object intended — in order to avoid ambiguity. As the alphabet represented only consonants and semi- consonants, and the Egyptian roots consisted mostly of only three letters, the parallelism with Chinese is remarkably close.

*The cuneiform script spread to other people who spoke tongues in no way akin to those of either its inventors, the Sumcrians, or their conquerors, the Semitic Babylonians. A widespread huih series of inscriptions, found in many parts of Asia and n**tne t even in the Aegean, which are generally described as Hittite (q.v.) are written in a script of pictographic origin, though probably independent of Babylonian in its development.*

*It is noteworthy that at a very early period a colony of Greeks from the Peloponnese, speaking a dialect closely akin to the Arcadian, dialect (which is known to us only from a much later – ˆ period), had settled in the island of Cyprus. Alone **yP"* a ' among the Greeks this colony did not write in an alphabet, but under some Asiatic influence adopted a syllabary. Even when the island came again closely in touch with their Greek kinsfolk, after the Persian wars, the Greek inhabitants continued to write in their syllabary. In the recent excavations made by the authorities of the British Museum an inscription of the 4th century B.C. was dis- covered, whereon a dedication to Dcmeter and Persephone was given first*

in Greek letters and repeated below in the syllabary, the Greek (as universally at so late a period) reading from left to right, the syllabary from right to left. This syllabary has five vowel symbols, but it could not distinguish between long and short vowels. In its consonant system it is unable to distinguish between breathed, voiced and aspirated stops, thus having but one symbol to represent n, 5« and 0e. It is, of course, unable to represent a final consonant, but this is achieved by using the symbol for a syllable ending in e conventionally for the final consonant. Thus ka-se stands for k&s, the Cyprian equivalent of nal, " and. " There are symbols for ta, for te, for H, for to, for tu, though none for t, and similarly for most of the other consonants. There is, however, no symbol for wu (Fv) ; ya, ye, yi occur, but no yo or yu. AtˆVpi is expressed by ta-ma-ti-ri, where ti stands for t alone; sa-ta-sa-to-ro stands or ZraaavBpw (genitive). _ Here it is to be observed (1) that v preceding another consonant is omitted altogether, the vowel being probably nasalized as in French; (2) that, as in the previous word, there is a sort of vowel euphony whereby the unnecessary vowel accompanying t takes the colour of the succeeding vowel. In other cases, however, it follows the preceding vowel, as in a-ri-si-to-pa-to-o-a-risi-ta-go- ra-u = , Apta , T6avTo(s) 6 Apivra-ybpov.

For literature on the history of writing, see the bibliographies to the articles Alphabet, &c., and under the headings of the various languages and peoples.

WROTHAM, an urban district in the Medway parliamentary division of Kent, England, 10 m. W. by N. of Maidstone, on the South-Eastern & Chatham railway. Pop. (1901) 3571. The church of St George, Early English and later, contains numerous brasses; and near it is the site of a palace of the archbishops of Canterbury, maintained until the time of Archbishop Simon Islip (c. 1350). S.W. of Wrotham is the village of Ightham, in which is a fine quadrangular moated manor-house, the Mote, in part of the 14th century, but with portions of Tudor dates.

WRYNECK (Ger. Wendehals, Dutch draaihaken, Fr. tor col), a bird so called from its way of writhing its head and neck, especially when captured on its nest in a hollow tree. The lynx 1 torquilla is a regular summer visitant to most parts of Europe, generally arriving a few days before the cuckoo, and is known in England as " cuckoo's leader " and " cuckoo's mate," but occasionally is called " snake-bird," not only from the undulatory motions just mentioned, but from the violent hissing with which it seeks to repel an intruder from its hole. 2

The unmistakable note of the wryneck is merely a repetition of what may be syllabled que, que, que, many times in succession, rapidly uttered at first, but gradually slowing and in a continually falling key. This is only heard during a few weeks, and for the rest of the bird's stay in Europe it seems to be mute. It feeds almost exclusively on injects, especially on ants. It is larger than a sparrow, but its plumage is not easily described, being beautifully variegated with black, brown, buff and grey— the last produced by minute specks of blackish brown on a light ground — the darker markings disposed in patches, vermiculated bars, freckles, streaks or arrow heads — and the whole blended most harmoniously, so as to recall the coloration of a goatsucker (g.v.) or of a woodcock {q.v.). The wryneck commonly lays its translucent white eggs on the bare wood of a hole in a tree, and it is one of the few wild birds that can be induced to go on laying by abstracting its eggs day after day, and thus upwards of forty have been taken from a single hole — but the proper complement is from six to ten. As regards Britain, the bird is most common in the S.E., its numbers decreasing rapidly towards the W, and N., so that in Cornwall and Wales and beyond Cheshire and Yorkshire its occurrence is but rare, while it appears only by accident in Scotland and Ireland.

Some writers have been inclined to recognize five other species of the genus lynx; but the so-called 7, japonica is specifically in- distinguishable from /. torquilla; while that designated, through a mistake in the locality assigned to it, I. indica, has been found to be identical with the I. pectoralis of S. Africa. Near to this is I. pulchri- eollis, discovered by_ Emin Pasha in the E. of the Bar-el-Djebel {Ibis, 1884, p. 28, pi. iii.). Another distinct African species is the i". aequaiorialis, originally described from Abyssinia. The wrynecks (see Woodpecker) form a subfamily Iynginae of the Picidae, from the more normal groups of which they differ but little in internal structure, but much in coloration and in having the tail-quills flexible, or at least not stiffened to serve as props as in the climbing Picinae. (A. N.)

WRY-NECK (Eat. Torticollis), a congenital or acquired deformity, characterized by the affected side of the head being drawn downwards towards the shoulder together with deviation of the face towards the sound side. There are various forms. (1) The congenital, due to a lesion of the sterno-mastoid muscle, either the result of a malposition in utero or due to the rupture of the muscle in the delivery of the aftercoming head in the birth of the breech presentation. (2) The rheumatic, due to exposure to a draught or cold. This is commonly known as " stiff-neck." (3) The nervous or spasmodic, the result of (a) direct irritation of the spinal accessory nerve or its roots, or {b) the result of cerebral irritation. In this form there is generally a family history of nervous diseases, notably epilepsy. This spasm is one of a group of nervous spasms known as " tics," a variety of habit spasm. The character of the movements varies with the muscles involved,

the most usual muscle being the sterno- mastoid. The spasm ceases during sleep. Many cases are also due to hysteria and some to spinal caries. W T hen wry-neck is congenital, massage and manipulation may be tried and some form of apparatus. Failing this, division of the muscle surgically

1 Frequently misspelt, as by Linnaeus in his later years, Yunx.

2 The peculiarity was known to Aristctte, and possibly led. to the cruel use of the bird as a love-charm, to which several classical writers refer, as Pindar (Pyth. iv. 214; Nem. iv. 35), Theocritus (iv. 17. 30) and Xenophon {Memorabilia, iii. n. 17, 18). In one part at least of China a name. Shay ling, signifying " Snake's neck," is given to it {Ibis, 1875, p. 125).

may be practised. In the spasmodic forms, anti-neurotic treat- ment is recommended, the use of the bromides, valerianates and belladonna, and hydrobromide of hyoscine injected into the muscles has been found of value. T. Grainger Stewart re- commends in persistent tic the trial of continuous and regular movements in (he affected group of muscles with a view to replacing the abnormal movements by normal ones. In severe cases it may be necessary to cut down on and stretch or excise the spinal accessory nerve. In rheumatic torticollis the spasm is usually overcome by the application of hot compresses and appropriate anti-rheumatic treatment.

WUCHANG, the capital of the combined provinces of Hup-eh and Hu-nan, China. It is one of the three cities, Wuchang, Hanyang and Hankow, which stand together at the mouth of the Han river, and is situated on the right bank of the river Yangtsze, almost directly opposite the foreign settlement of Hankow. It is the seat of the provincial government of the two Hu or Hu-kwang, as these provinces are collectively termed, at the head of which is a viceroy. Next to Nanking and Canton, it is one of the most important vice-royalties in the empire. It possesses an arsenal and a mint. The provincial government has established ironworks for the manufacture of rails and other railway material. As the works did not pay under official management, they were transferred to the director-general of railways. Wuchang is not open to foreign trade and residence, but a considerable number of missionaries, both Roman Catholic and Protestant, live within the walls. The native population i? estimated at 800,000, including cities on both banks. Wuchang is an important junction on the trunk railway from Peking to Canton; and is on the route of the Sze-ch'uen railway.

WUCHOW, a treaty port in the province of Kwang-si, China, opened to foreign trade in 1897, and situated on the left bank of the Si-kiang (W r est river) at its junction with the Fu or K wei-Kiang (Cassia) river. It is 2 20 m. above Canton, with which it is in navigable connexion for vessels

drawing up to 8 ft. of water. In 1908 the value of the trade passing through the maritime customs amounted to £1,566,000, representing, how- ever, only a portion of the trade. Of this total, two-thirds were for imports, consisting principally of cotton and cotton goods, kerosene oil, woollens, &c. Sugar, various oils, hides and aniseed were the chief exports. The native population is estimated at 65,000. At Shuihing the river flows for 5 m. through a deep gorge bordered by limestone cliffs 2000 ft. hi height. Farther up the river threads its way through a series of rocky defiles, forming at intervals wr_at seems an inland lake with no apparent outlet. During summer floods the water thus pent up by the gorges rises at Wuchow 50 or 60 ft. In consequence of the variation of river level, the principal offices and shops are built upon pontoons which are moored alongside the river-bank. The situation of Wuchow makes it the natural distributing centre between Kwei-chow, Kwang-si and Canton. Great things were therefore expected of it as a treaty port, but disorders in Kwang- si delayed the fulfilment of the hopes. Trade, however, has improved, and a large native passenger traffic has sprung up between it and Canton. It is connected with Hong Kong and Shanghai by telegraph.

WUHU, a district city in the province of .Ngan-hui, China, about 1 m. from the S. bank of the Yangtsze -kiang, with which it is connected by a straggling suburb. It is about 50 m. above Nanking, and in 185S it was marked out as a treaty port, but was not opened to trade until 1877. It is connected by canals with the important cities of Ning-Kwo Fu, T'ai-p'ing Hien, Nan-ling Hien and Ching Hien, the silk districts in the neigh- bourhood of the two last cities being within 50 m. of Wuhu. Coal to a considerable extent exists in the country round. At first its commercial progress was very slow, the older ports of Kiu-kiang and Chin-kiang militating against its success; but of late there has been a distinct improvement in the trade of the port, the net value of which was about £3,000,000 in 1906. The principal exports are rice, cotton, wheat, tea, furs and feathers, For the production of feathers large quantities of ducks are reared in the surrounding districts. Of imports, opium formed

the most considerable item; other imports being matches, needles, sandalwood and window glass. The city, which is one of the largest of its rank in China, was laid desolate during the T'ai-p'ing rebellion, but has been repeopled, the population being estimated (1906) at 137,000. The streets arc compara- tively broad and are well paved. The land set apart for the British settlement, advantageously situated, was little built upon. A new general foreign settlement was opened in 1905.

WULFENITE, a mineral consisting of lead molybdate, PbMoO, crystallizing in the hemimorphic-tetartohedral class of the tetragonal system. Crystals usually have the form of thin square plates bevelled at the edges by pyramidal planes. They have a brilliant resinous to adamantine lustre, and vary in colour from greyish to bright yellow or red: the hardness is 3, and the specific gravity 6-7. Small amounts of calcium are sometimes present isomorphously replacing lead. The mineral occurs in veins of lead ore, and was first found in the 18th century in the lead mines at Bleiberg in Carinthia. Bright yellow crystals are found in New Mexico and Utah, and brilliant red crystals in Arizona.*

WULFHERE (d. 675), king of the Mercians, was a younger son of King Penda, and was kept in concealment for some time after his fathers defeat and death in 655. In 65S or 659, however, the Mercians threw off the supremacy of Oswio, king of Northumbria, and Wulfhere became their king. He took energetic measures to spread Christianity, and was greatly helped by his bishop, Jaruman, and afterwards by St Chad. Outside Mercia he did something to induce the East and the South Saxons to accept. Christianity, and is said to have founded one or two monasteries. He gained Lindsey from Northumbria in 657, and was successful against Wessex. He extended his borders in all directions, and was the founder of the passing greatness of Mercia, although he lost Lindsey just before his death. Wulfhere's wife was Eormenhild, a daughter of Ercon- berht, king of Kent, and he was succeeded by his brother Aethel- red. His only son Coenred became king in 704 in succession to Aethclred. His only daughter was St Werburga or Werburh, abbess of Ely.

See Bede, Historia ecclesiastica, ed. C. Plummer (Oxford, 1896); and J. R. Green, The Making of England (1897-1S99).

WULFSTAN, archbishop of York from 1003 until his death in May 1023, and also bishop of Worcester from 1003 to 1016, is generally held to be the author of a remarkable homily in alliterative English prose. Its title, taken from a manuscript, is Lupi sermo ad Anglos, quando Dani maxime prosecuti sunt eos, quodfuit anno 1014. It is an appeal to all classes to repent in the prospect of the imminent day of judgment, and gives a vivid picture of the desperate condition of England in the year of King Aethelred II. 's flight (1014). Of the many other homilies ascribed to Wulfstan very few are authentic. Subsequent legislation, especially that of Canute, bears clear traces of his influence.

See the edition of his homilies by A. Napier (Berlin, 1883) ; also the same writer's Vber die Werke des altenghschen Erzbischofs Wulfstan (Gottingen dissertation, 1882), and his paper in An English Miscellany (Oxford, 1901, pp. 355 f.) ; also A. Brantll in H. Paul's Grundriss der germanischen

Philologie (2nd ed., 1901-1909), ii. pp. 1110-1112.

WULFSTAN, ST (c. 101 2-1095), bishop of Worcester, was born at Little Itchington near Warwick and was educated in the monastic schools of Evesham and Peterborough. He became a monk at Worcester, and schoolmaster and prior in the cathedral monastery there. In 1062 he was chosen bishop of Worcester, and the choice was approved by the witan; with some reluctance Wulfstan accepted, and was consecrated at York in September. The sec of Worcester and the archbishopric of York had been held together before 1062 by Archbishop Aldred, who, when he was compelled to resign Worcester, retained twelve manors belonging to the see, which Wulfstan did not recover for some years. About 1070, however, it was decided thatWorcester was in the province of Canterbury. Although he had been on friendly terms with Harold, the bishop submitted to William at Berk- hampstead, and he was very useful in checking the rebellious barons during the revolt of ˆ1075. He was equally loyal to

William II. in his struggle with the Welsh. Wulfstan's relations with his ecclesiastical superiors were not so harmonious, and at one time both Lanfranc of Canterbury and Thomas of York unsuccessfully demanded his removal. He was the only survivor of the Anglo-Saxon bishops when he died on the 18th of January 1095. In 1203 he was canonized by Pope Innocent III. By his preaching at Bristol Wulfstan is said to have put an end to the kidnapping of English men and women and selling them as slaves. He rebuilt the cathedral church of Worcester, and some parts of his building still remain.

Lives of St Wulfstan by Hemming and Florence of Worcester are in H. Wharton's Anglia sacra (1691J. See also E. A. Freeman, Norman Conquest (1867-1879).

WULLENWEBER, JURGEN (c. 1492-1537), burgomaster of Liibeck, was born probably at Hamburg. Settling in Liibeck as a merchant he took some part in the risings of the inhabitants in 1530 and 1531, being strongly in sympathy with the demo- cratic ideas in religion and politics which inspired them. Having joined the governing council of the city and become leader of the democratic party, he was appointed burgomaster early in 1533 and threw himself into the movement for restoring Liibeck to her former position of influence. Preparations were made to attack the Dutch towns, the principal trading rivals of Liibeck, when the death of Frederick I., king of Denmark, in April 1533 changed the position of affairs. The Liibeckers objected to the bestowal of the Danish crown upon any prince favourable to the Empire or the Roman religion, and Wullenweber went to Copenhagen to discuss the matter. At length an alliance was concluded with Henry VIII. of England; considerable support was obtained in N. Germany; and in 1534

an attack was made on Christian, duke of Holstein, afterwards King Christian III., who claimed the throne. At first the Lubeckers gained several successes, but Christian of Holstein appeared before Liibeck; the efforts of Wullenweber to secure allies failed; and the citizens were compelled to make peace. The imperial court of justice at Spires restored the old constitution, and in August 1535 the aristocratic party returned to power. Soon afterwards Wullen- weber was seized by Christopher, archbishop of Bremen, and handed over to his brother Henry II., duke of Brunswick Wolfenbuttel. Having been tortured and sentenced to death as a traitor and an Anabaptist, he was beheaded at Wolfenbuttel on the 29th of September 1537. Wullenweber, who was long regarded as a popular hero in Liibeck, inspired tragedies by Heinrich Kruse and Karl Ferdinand Gutzkow, and a novel by Ludwig Kohler.*

See G. W T aitz, Liibeck unter Jurgen Wullenweber und die europaische Politih (Berlin, 1855-1856).

WUNDT, WILHELM MAX (1832-), German physiologist and philosopher, was born on the 16th of August 1832 at Neck- arau, in Baden. He studied medicine at Tubingen, Heidelberg and Berlin, and in 1857 began to lecture at Heidelberg. In 1864 he became assistant professor there, and in 1866 was chosen to represent Heidelberg in the Baden Chamber, but soon resigned. In 1874 he was elected regular professor of philosophy at Zurich, and in the following year was called to the corresponding chair at Leipzig, where he founded an Institute for Experimental Psychology, the precursor of many similar institutes. The list of Wundt's works is long and comprehensive, including physi- ology, psychology, logic and ethics. His earlier works deal chiefly with physiology, though often in close connexion with psychology, as in the Vorlesungen ilber die Menscken- und Tier- seele (1863; 4th ed., 1906; trans. Creighton and Titchener, 1896), Lehrbuch der Physiologic des Menscken (1865; 4th ed., 1878), and Grundziige der physiologischen Psychologie (1874; 6th ed., 3 vols., 1008). He published an important work on Logik (1880- 1883; 3rd ed., 1906-1907), and this was followed in 1886 by his Etkik (3rd ed., 1903). According to Wundt, the straight road to ethics lies through ethnic psychology, whose especial business it is to consider the history of custom and of ethical ideas from the psychological standpoint. We must look for ethics to supply the corner- stone of metaphysics, and psychology is a necessary propaedeutic. The System der Philosophic (1899; 3rd ed., 1907) contained the results of Wundt's work up to that date, both ia

the domain of science and in the more strictly philosophic field. The metaphysical or ontological part of psychology is in Wundt's view the actual part, and with this the science of nature and the science of mind are to be brought into relation, and thus con- stituted as far as possible philosophical sciences. In 1892 Wundt published Hypnotismus und Suggestion. Subsequent important works are the Grundriss der Psychologic (1896; 8th ed., 1907; trans. Judd, 3rd ed., 1907); Volker psychologic (1900-1906); Einleitung in die Philos. (1901 ; 4th ed., 1906). Two other works, containing accounts of the work of himself and his pupils, are Philosophische Studien (1883-1902) and Psychologiscke Studien (1905 foil.).

WUNTHO, a native state of Upper Burma annexed by the British and incorporated in the district of Katha in 1892. Wuntho was classed by the Burmese as a Shan state, but was never on the same footing as the true Shan states, and only escaped be- coming an integral part of the Burmese empire through Burmese want of system. The Shan name is Wying Hso, " the city of the high." It had an area of about 2400 sq. m. with 150,000 in- habitants, and lay midway between the Irrawaddy and Chindwin rivers. When the British annexed Upper Burma in 1885 the state became a refuge for rebels and dacoit leaders. Finally in 1891 the state broke out into open rebellion, the sawbwa was deposed, and a force of 1800 troops under. General Sir George Wolseley occupied the town of Wuntho and reduced the state to order,

WUPPER, a river of Germany, a right-bank tributary of the Rhine, rising in the Sauerland near Meinerzhagen. The most remarkable part of its course is that in the so-called Wuppertal. In this section, 30 m. in length, it passes through the populous towns of Barmen and Elberfeld and supplies water- power to about five hundred mills and factories. Leaving the hills above Opladen, it debouches on to the plain and enters the Rhine at Rheindorf between Cologne and Dusseldorf, after a course of 63 m.

See A. Schmidt, Die Wupper (Lennep, 1902).

Wt)RTTEMBERG, a kingdom of Germany, forming a tolerably compact mass in the S.W. angle of the empire. In the south it is cleft by the long narrow territory of Hohenzollern, belonging to Prussia; and it encloses six small enclaves of Baden and Hohen- zollern, while it owns nine small exclaves within the limits of these two states. It lies between 47 34′ 48″ and 49° 35′ 17″ N., and between 8° 15′ and io° 30′ E. Its greatest length from N. to S. is 140 m.; its greatest breadth is 100 m.; its boundaries, almost entirely arbitrary, have a circuit of 1116 m.; and its total area is 7534 sq. m., or about -ˆth of the entire empire. It is bounded on the E. by Bavaria, and on the other three sides by Baden, with the exception of a

short distance on the S., where it touches Hohenzollern and the lake of Constance.

Physical Features. — Wiirttemberg forms part of the South-German tableland, and is hilly rather than mountainous. In fact the un- dulating fertile terraces of Upper and Lower Swabia may be taken as the characteristic parts of this agricultural country. The usual estimates return one-fourth of the entire surface as " plain," less than one-third as " mountainous," and nearly one-half as " hilly." The average elevation above the sea-level is 1640 ft. ; the lowest point is at Bottingen (410 ft.), where the Neckar quits the country; the highest is the Katzenkopf (3775 ft.), an the Hornisgrinde, on the western border.

The chief mountains are the Black Forest (q.v.) on the west, the Swabian Jura or Rauhe Alb stretching across the middle of the country from south-west to north-east, and the Adelegg Mountains in the extreme south-east, adjoining the Algau Alps in Bavaria. The Rauhe Alb or Alp slopes gradually down into the plateau on its south side, but on the north it is sometimes rugged and steep, and has its line broken by isolated projecting hills. The highest summits are in the south-west, viz, the Lemberg (3326 ft.), Ober-Hohenberg (3312 ft.) and Plettenberg (3293 ft.). To the south of the Rauhe Alb the plateau of Upper Swabia stretches to the lake of Constance and eastwards across the Iller into Bavaria. Between the Alb and the Black Forest in the north-west are the fertile terraces of Lower Swabia, continued on the north-cast by those of Franconia

About 70 % of Wurttemberg belongs to the basin of the Rhine, and about 30% to that of the Danube. The principal river is the Neckar, which flows northward for 186 m. through the country to join the Rhine, and with its tributaries the Rems, Kocher, Jagst, Ens, &c, drains 57 % of the kingdom. The Danube flows from east

to west across the south half of Wurttemberg, a distance of 65 m., a small section of which is in Hohenzollern. Just above Ulm it is joined by the Iller, which forms the boundary between Bavaria and Wurttemberg for about 35 m. The Tauber in the north-east joins the Main; the Argen and Schusscn in the south enter the lake of Constance. The lakes of Wurttemberg, with the exception of those in the Black Forest, all lie south of the Danube. The largest is the Federsee (1 sq. m.), near Buchau. About one-fifth of the lake of Constance is reckoned to belong to Wiirttemberg. Mineral springs are abundant; the most famous spa is Wildbad, in the Black Forest. The climate is temperate, and colder among the mountains in the south than in the north. The mean temperature varies at different points from 43° to 50° F. The abundant forests induce much rain, most of which falls in the summer. The soil is on the whole fertile and well cultivated, and agriculture

is the main occupa- tion of the inhabitants.

Population.— The population of the four departments (Kreise) into which the kingdom is divided is shown below: —

District {Kreis).

Area in sq. m.

Pop.

1900.

Pop.

1905-

Density

1905.

Black Forest (Schwarz-

wald) .... Jagst . . . . . Danube (Donau) .

1286

1844

1985 2419

745.669

5 9,258 400,126 514,427

811,478

541 ,662

407,059 541,980

631

293 205 223

Total . .

7534

2,169,480

2,302,179

306

The population is particularly dense in the Neckar valley from Esslingen northward. The mean annual increase from 1900 to 1905 amounted to 1-22%- 8-5% of the births are illegitimate. Classified according to religion, about 69% are Protestants, 30% Roman Catholics, and Jews amount to about \%. Pro- testants largely preponderate in the Neckar district, Roman Catholics in that of the Danube. The people of the north-west belong to the Alamannic stock, those of the north-east to the Franconian, and those of the centre and south to the Swabian. According to the latest occupation census, nearly half of the entire population is supported by agriculture, and a third by industrial pursuits, mining and commerce. In 1910, 506,061 persons were engaged in agriculture and kindred occupations, 432, T14 in industrial occupations, and 100,109 in trade and commerce.

The largest towns in the kingdom are Stuttgart (with Cann- stadt), Ulm, Heilbronn, Esslingen, Reutlingen, Ludwigsburg, Goppingen, Gmiind, Tubingen, Tuttlingen and Ravensburg.

*Agriculture. — Wurttemberg is essentially an agricultural state, and of its 4,821,760 acres, 44-9 % are agricultural land and gardens, i-i % vineyards, r7*Q % meadows and pastures, and 30*8 % forest. It possesses rich meadowlands, cornfields, orchards, gardens, and hills covered with vines. The chief agricultural products are oats, spelt, rye, wheat, barley, hops. To these must be added wine (mostly of excellent quality) of an annual value of about one million sterling, peas and beans, maize, fruit, chiefly cherries and apples, beets and tobacco, and garden and dairy produce. Of live stock, cattle, sheep and pigs are reared in considerable numbers, and great attention is paid to the breeding of horses.*

Mining. — Salt and iron are the only minerals of great industrial importance found in Wurttemberg. The salt industry only began to be of importance at the beginning of the 19th century. The iron industry, on the other hand, is of great antiquity, but it is hampered by the entire absence of coal mines in the country. Other minerals produced are granite, limestone, ironstone and fireclay.

Manufactures. — The old-established manufactures embrace linen, woollen and cotton fabrics, particularly at Esslingen and Goppingen, and paper-making, especially at Ravensburg, Heilbronn and other places in Lower Swabia. The manufacturing industries assisted by the government

developed rapidly during the later years of the 19th century, notably metal working, especially such branches of it as require exact and delicate workmanship. Of particular import ance are iron and steel goods, locomotives (for which Esslingen enjoys a great reputation), machinery, motor-cars, bicycles, small arms (in the Mauser factory at Obernnorf), all kinds of scientific and artistic appliances, pianos (at Stuttgart), organs and other musical instruments, photographic apparatus, clocks (in the Black Forest), electrical apparatus, and gold and silver goods. There are also ex- tensive chemical works, potteries, cabinet -making workshops, sugar factories, breweries and distilleries. Water-power and petrol largely compensate for the lack of coal. Among other interesting develop- ments is the manufacture of liquid carbonic acid gas procured from natural gas springs beside the Fyach, a tributary of the Neckar.

Commerce. — The principal exports are cattle, cereals, wood, pianos,

salt, oil, leather, cotton and linen fabrics, beer, wine and spirits. The chief commercial cities are Stuttgart, Ulm, Heilbronn and Fried- richshafen. The book trade of Stuttgart, called the Leipzig of South Germany, is very extensive.

Communications. — In 1907 there were 1219 m. of railways, of which all except 159 m. belonged to the state. The Neckar, the Schussen and the lake of Constance are all navigable for boats; the Danube begins to be navigable at Ulm. The roads of Wiirttemberg are fairly good; the oldest of them are Roman. Wiirttemberg, like Bavaria, retained the control of its own postal and telegraph service on the foundation of the new German empire.

Constitution. — Wiirttemberg is a constitutional monarchy and a member of the German empire, with four votes in the federal council (Bundesrat), and seventeen in the imperial diet. The constitution rests on a law of 1819, amended in 1868, in 1874, and again in 1906. The crown is hereditary, and conveys the simple title of king of Wiirttemberg. The king receives a civil list of £103,227. The legislature is bi-cameral. The upper chamber (Standesherren) is composed of adult princes of the blood, heads of noble families from the rank of count (Graf) upwards, repre- sentatives of territories (Standesherrsckaften) , which possessed votes in the old German imperial diet or in the local diet; it has also' members (not more than 6) nominated by the king, 8 members of knightly rank, 6 ecclesiastical dignitaries, a repre- sentative of the university of Tubingen, and 1 of the technical high school of Stuttgart, 2 representatives of commerce and

industry, 2 of agriculture, and 1 of handicrafts. The lower house (Abgeordnetenhaus) has 92 members, viz. a representa- tive from each of the administrative divisions (Oberamtsbezirke), 63 in all without Stuttgart, which has 6 representatives; also 1 from each of the six chief provincial towns, and 17 members elected by the two electoral divisions (Mandeswahlkreise) into which the kingdom is divided. The latter class of members as well as those for Stuttgart are elected on the principle of proportional representation. The king appoints the president of the upper chamber; since 1874 the lower chamber has elected its own chairman. Members of both houses must be over twenty-five years of age, and parliaments are elected for six years; the suffrage is enjoyed by all male citizens over twenty- five years of age, and voting is by ballot.

The highest executive is in the hands of a ministry of state (Staatsministerium) , consisting of six ministers respectively of justice, foreign affairs (with the royal household, railways, posts and telegraphs), the interior, public worship and education, war and finance. There is also a privy council, consisting of the ministers and some nominated councillors (wirkliche Staatsrote), who advise the sovereign at his command. The judges of a special supreme court of justice, called the Staatsgerichlshof (which is the guardian of the constitution), are partly elected by the chambers and partly appointed by the king. Each of the chambers has the right to impeach the ministers. The country is divided into four governmental departments (Kreise) and subdivided into sixty-four divisions (Oberamtsbezirke), each of which is under a headman (Oberamtmann) assisted by a local council (Amlsversammlung). At the head of each of the four departments is a government (Regierung).

Religion. — The right of direction over the churches resides in the king, who has also, so long as he belongs to the Protestant Church, the guardianship of the spiritual rights of that Church. The Pro- testant Church is controlled (under the minister of religion and education) by a consistory and a synod — the former consisting of a president, 9 councillors and 6 general superintendents or " prelates " from six principal towns, and the latter of a representative council, including both lay and clerical members. The Roman Catholic Church is subject to the bishop of Rottenburg, in the archdiocese of Freiburg. Politically it is under a Roman Catholic council, appointed by government. The Jews also, since 1828, have been subject to a state-appointed council (Oberkirchenbehbrde). _

Education. — According to official returns there is not an individual in the kingdom above the age of ten years who cannot both read and write. The higher branches of learning are provided in the uni- versity of Tubingen, in the technical high school (with academic rank) of Stuttgart, the veterinary high school at Stuttgart, the commercial college at Stuttgart, and the

agricultural college of Hohenheim. There are gymnasia and other schools in all the larger towns, while every commune has a school. There are numerous schools and colleges for women. There is also a school of viticulture at Weinsberg.

Army. — By terms of the convention of 187 1 the troops of Wiirttem- berg form the XIII. army corps of the imperial German army.

Finances. — The state revenue for 1909-1910 was estimated at £4,840,520, which is nearly balanced by the expenditure. About one-third of the revenue is derived from railways, forests and mines; about £1,400,000 from direct taxation; and the remainder from in- direct taxes, the post-office and sundry items. In 1909 the public debt amounted to £29,285,335, of which more than £27,000,000 was incurred for railway construction. Of the expenditure over £900,000 is spent upon public worship and education, and over £1,200,000 goes in interest and repayment of the national debt. To the treasury of the German empire the kingdom contributed £660,000.

Authorities. — See Wurttembergische Jahrbucher fiir Statistik und Landeskunde; Das Kdnigreich Wiirttemberg, eine Beschreibung nach Kreisen, Oberdmtern und Gemeinden (Stuttgart, 1904) ; Statislisches Handbuch fiir das Kdnigreich Wiirttemberg (Stuttgart, 1885 fol.) ; Das Kdnigreich Wiirttemberg, eine Beschreibung von Land, Volk und Stoat (1893); the Jahresberichte der Handels- und Gewerbekammern in Wiirttemberg; Lang, Die Entwickelung der Bevblkerung Wurttem- bergs im Laufe des lyten Jahrhunderts (Tubingen, 1903); Engel and Schulze, Geognosticher Wegweiser durch Wiirttemberg (Stuttgart, 1908) ; G6z, Staatsrechl des Konigreichs Wurttemberg (Tubingen, 1908) ; and F. Bitzer, Regierung und Stdnde in Wurttemberg (Stutt- gart, 1882).

History. — The origin of the name Wurttemberg is uncertain, but the once popular derivation from Wirth am Berg is now universally rejected. Some authorities derive it from a proper name, Wiruto or Wirtino; others from a Celtic place-name, Virolunum or Vcrdunum. At all events from being the name of a castle near the village of Rothenberg, not far from Stuttgart, it was extended over the surrounding country, and as the lords of this district increased their possessions so the name covered an ever-widening area, until it reached its present denotation. Early forms of it are Wirtenberg, Wirtembenc and Wirtenberc. Wirtemberg was long current, and in the latter part of the 16th century Wiirtemberg and Wurttemberg appeared. In 1806 Wurttemberg was adopted as the official spelling, though Wiirtemberg is also common and occurs sometimes in official documents and even on coins issued after that date.

As far as we know, the first inhabitants of the country were the Celts, and then the Suebi. In the 1st century a.d. the Romans conquered the land and defended their position there by a ram- part (limes). Early in the 3rd century the Alamanni drove the Romans beyond the Rhine and the Danube, but in their turn they were conquered by the Franks under Clovis, the decisive battle being fought in 496. For about four hundred years the district was part of the Frankish empire, being administered by counts, but in the 9th century it was incorporated with the German duchy of Swabia. The duchy of Swabia was ruled by the Hohenstaufen family until the death of Conradin in 1268, when a considerable part of it fell to the count of Wurttemberg, the representative of a family first mentioned about 1080, a certain Conrad von Beutelsbach, having called himself after his ancestral castle of Wurttemberg. The earliest count about whom anything is known is one Ulrich, who ruled from 1241 to 1265. He was marshal of Swabia and advocate of the town of Ulm, and had large possessions in the valleys of the Neckar and the Rems. Under his sons, Ulrich II. and Eberhard I., and their successors the power of the family grew steadily. Eberhard (d. 1325) was the opponent, and not always the unsuccessful one, of three German kings; he doubled the area of his county and transferred his -residence from Wiirttemberg to Stuttgart. His successors were not perhaps equally important, but all added something to the area of Wurttemberg. The lands of the family were several times divided, but in 1482 they were declared indivisible and were united under Count Eberhard V., called im Bart. This arrangement was confirmed by the German king, Maximilian I., and the imperial diet in 1495.

Eberhard was one of the most energetic rulers that Wiirttem- berg ever had, and in 1495 his county was raised to the rank of duchy. Dying in 1496, he was succeeded by his cousin, Duke Eberhard II., who, however, was deposed after a short reign of two years. The long reign (1498-1550) of Ulrich I., who succeeded to the duchy while still a child, was a most eventful period for the country, and many traditions cluster round the name of this gifted, unscrupulous and ambitious man. The extortions by

which he sought to raise money for his extravagant pleasures excited a rising known as that of the arme Konrad (poor Conrad) , not unlike the rebellion in England led by Wat Tyler; order was soon restored, and in 1514 by the treaty of Tubingen the people undertook to pay the duke's debts in return for various political privileges, which in effect laid the foundation of the constitutional liberties of the country. A few years later Ulrich quarrelled with the Swabian League, and its forces, helped by

William IV., duke of Bavaria, who was angered by the treatment meted out by Ulrich to his wife Sabina, a Bavarian princess, invaded Wiirttemberg, expelled the duke and sold his duchy to the emperor Charles V. for 220,000 gulden. Charles handed over Wiirttemberg to his brother, the German king, Ferdinand L, who was its nominal ruler for a few years. Soon, however, the discontent caused by the oppressive Austrian rule, the disturb- ances in Germany leading to the Peasants' War and the commo- tions aroused by the Reformation gave Ulrich an opportunity to recover it. Aided by Philip, landgrave of Hesse, and other Protestant princes, he fought a victorious battle against Fer- dinand's troops at Lauffen in May 1534, and then by the treaty of Cadan he was again recognized as duke, but was forced to accept his duchy as an Austrian fief. He now introduced the reformed doctrines and proceeded to endow Protestant churches and schools throughout his land. Ulricb/s connexion with the league of Schmalkalden led to another expulsion, but in 1547 he was reinstated by Charles V., although on somewhat onerous terms.

Ulrich's son and successor, Christopher (3 515-1568), completed the work of converting his subjects to the reformed faith. He introduced a system of church government, the Grosse Kirchen- ordnung, which has endured in part to the present day. In this reign a standing commission was established to superintend the finances, and the members of this body, all of whom belonged to the upper classes, gained considerable power in the state, mainly at the expense of the towns. Christopher's son Louis, the founder of the Collegium Ufastre, died childless in 1503 and was succeeded by a kinsman, Frederick I. (1557-1608). This energetic prince, who disregarded the limits placed to his authority by the rudimentary constitution, by paying a large sum of money, induced the emperor Rudolph II. in 1599 to free the duchy from the suzerainty of Austria. Thus once again Wiirttemberg became a direct fief of the Empire. Unlike his predecessor, the next duke, John Frederick (1 582-1628), was not allowed to become an absolute rider, but was forced to recognize the checks on his power. During this reign, which ended in July 162S, Wiirttemberg suffered severely from the Thirty Years' War, although the duke himself took no part in it. His son and successor Eberhard III. (1614-ˆ674), however, plunged into it as an ally of France and Sweden as soon as he came of age in 1633, but after the battle of Nordlingen in 1634 the duchy was occupied by the imperialists and he himself was for some years an exile. He was restored by the peace of West- phalia, but it was to a depopulated and impoverished country, and he spent ■his remaining years in efforts to repair the disasters of the great war. During the reign of Eberhard IV. (1676-1733), who was only one year old when his father Duke William Louis died in 1677, Wiirttemberg made the acquaintance of another destructive enemy. In 1688, 1703 and 1707" the French entered the duchy and inflicted brutalities and sufferings

upon the inhabitants. The sparsely populated country afforded a welcome to the fugitive Waldenses, who did something to restore it to prosperity, but this benefit was partly neutralized by the extrava- gance of the duke, anxious to provide for the expensive tastes of his mistress, Christiana Wilhelmina von Gravenitz. Charles Alexander, who became duke in 1733, had embraced the Roman Catholic faith while an officer in the Austrian service. His favourite adviser was the Jew Suss Oppenheimer, and it was thought that master and servant were aiming at the suppression of the diet and the introduction of the Roman Catholic religion. However, the sudden death of Charles Alexander in March 1737 put an abrupt end to these plans, and the regent, Charles Rudolph of Wiirttemberg-Neuenstadt, had Oppenheimer hanged.

Charles Eugene (1728-1793), who came of age in 17445 was gifted, but vicious and extravagant, and he soon fell into the hands of unworthy favourites. He spent a great deal of money in building palaces at Stuttgart and elsewhere, and took the course, unpopular to his Protestant subjects, of fighting against Prussia during the Seven Years' War. His whole reign was disturbed by dissensions between the ruler and the ruled, the duke's irregular and arbitrary methods of raising money arousing great discontent. The intervention of the emperor and even of foreign powers was invoked, and in 1770 a formal arrangement removed some of the grievances of the people. But Charles Eugene did not keep his promises, although in his old age he made a few further concessions. He died childless, and was succeeded by one brother, Louis Eugene (d. 1795), and then by another, Frederick Eugene (d. 1797). This latter prince, who had served in the army of Frederick the Great, to whom he was related by marriage, educated his children in the Protestant faith. Thus, when his son Frederick II. became duke in 1797, the ruler of Wiirttemberg was again a Protestant, and the royal house has adhered to this faith since that date. During Frederick Eugene's short reign the French invaded Wiirttemberg, com- pelled the duke to withdraw his troops from the imperial army and to pay a sum of money.

Frederick II. (1754-1816), a prince whose model was Frederick the Great, took part in the war against France in defiance of the wishes of his people, and when the French again invaded and devastated the country he retired to Erlangen, where he re- mained until after the conclusion of the peace of Luneville in 1801. By a private treaty with France, signed in March 1802, he ceded his possessions on the left bank of the Rhine, receiving in return nine imperial towns, among them Reutlingen and Heil- bronn, and some other territories, amounting altogether to about 850 sq. m. and containing about 124,000 inhabitants. He also accepted from Napoleon the title of elector. These new districts were not incorporated with the duchy, but remained separate; they were known as New Wiirttemberg and were ruled without a diet. In 1805 Wiirttemberg took up arms on the side of France,

and by the peace of Pressburg in December 1805 the elector was rewarded with various Austrian possessions in Swabia and with other lands in the neighbourhood. On the 1st of January 1806 Frederick assumed the title of king, abrogated the constitution and united old and new Wurttemberg. Subsequently he placed the property of the church under the control of the state. In 1806 he joined the Confederation of the Rhine and received further additions of territory containing 160,000 inhabitants; a little later, by the peace of Vienna in October 1809, about 110,000 more persons were placed under his rule. In return for these favours Frederick joined Napoleon in his campaigns against Prussia, Austria and Russia, and of 16,000 of his subjects who marched to Moscow only a few hundreds returned. Then after the battle of Leipzig he deserted the waning fortunes of the French emperor, and by a treaty made with Metternich at Fulda in November 1813 he secured the confirma- tion of his royal title and of his recent acquisitions of territory, while his troops marched with those of the allies into France. In 181 5 the king joined the Germanic Confederation, but the congress of Vienna made no change in the extent of his lands. In the same year he laid before the representatives of his people the sketch of a new constitution, but this was rejected, and in the midst of the commotion Frederick died on the 30th of October 18 16.

At once the new king, William I., took up the consideration of this question and after much discussion a new constitution was granted in September 1819. This is the constitution which, with subsequent modifications, is still in force, and it is described in an earlier section of this article. A period of quietness now set in, and the condition of the kingdom, its education, its agriculture and its trade and manufactures, began to receive earnest attention, while by frugality, both in public and in private matters, King William helped to repair the shattered finances of the country. But the desire for greater political freedom had not been entirely satisfied by the constitution of 1819, and after 1830 there was a certain amount of unrest. This, «owever,

soon passed away, while trade was fostered by the inclusion of Wurttemberg in the German Zollverein and by the construction of railways. The revolutionary movement of 1848 did not leave Wurttemberg untouched, although no actual violence took place within the kingdom. The king was compelled to dismiss Johannes Schlayer (1 792-1860) and his other ministers, and to call to power men with more liberal ideas, the exponents of the idea of a united Germany. A democratic constitution was pro- claimed, but as soon as the movement had spent its force the liberal

ministers were dismissed, and in October 1849 Schlayer and his associates were again in power. By interfering with popular electoral rights the king and his ministers succeeded in assembling a servile diet in 1851, and this surrendered all the privileges gained since 1848. In this way the constitution of 1819 was restored; and power passed into the hands of a bureaucracy. Al- most the last act of William's long reign was to conclude a concordat with the Papacy, but this was repudiated by the diet, which preferred to regulate the relations between church and state in its own way.

In July 1864 Charles I. (1823-1891) succeeded his father William as king and had almost at once to face considerable difficulties. In the duel between Austria and Prussia for supre- macy in Germany, William I. had consistently taken the part of the former power, and this policy was equally acceptable to the new king and his advisers. In 1866 Wurttemberg took up arms on behalf of Austria, but three weeks after the battle of Konig- gratz her troops were decisively beaten at Tauberbischofsheim, and the country was at the mercy of Prussia. The Prussians occupied the northern part of Wurttemberg and peace was made in August 1866; by this Wiirttemberg paid an indemnity of 8.000,000 gulden, but at once concluded a secret offensive and defensive treaty with her conqueror.

The end of the struggle was followed by a renewal of the democratic agitation in Wurttemberg, but this had achieved no tangible results when the great war between France and Prussia broke out in 1870. Although the policy of Wurttemberg had continued antagonistic to Prussia, the country shared in the national enthusiasm which swept over Germany, and its troops took a creditable part in the battle of Worth and in other opera- tions of the war. In 1871 Wiirttcmberg became a member of the new German empire, but retained control of her own post office, telegraphs and railways. She had also certain special privileges with regard to taxation and the army, and for the next ten years the policy of Wurttemberg was one of enthusiastic loyalty to the new order. Many important reforms, especially in the realm of finance, were introduced, but a proposal for a union of the railway system with that of the rest of Germany was rejected. Certain reductions in taxation having been made in 1889, the reform of the constitution became the question of the hour. The king and his ministers wished to strengthen the con- servative element in the chambers, but only slight reforms were effected by the laws of 1874, 1876 and 1879, a more thorough settlement being postponed. On the 6th of October 1891 King Charles died suddenly, and was succeeded by his cousin William II. (b. 1848), who continued the policy of his predecessor. The reform of the constitution continued to be discussed, and the election of 1895 was memorable because of the return of a power- ful party of democrats. King William had no sons, nor had his only Protestant kinsman, Duke Nicholas (1 833-1 903); consequently the succession would ultimately pass to a

Roman Catholic branch of the family, and this prospect raised up certain difficulties about the relations between church and state. The heir to the throne in 1910 was the Roman Catholic Duke Albert (b. 1865).

Between 1900 and 1910 the political history of Wurttemberg centred round the settlement of the constitutional and the educational questions. The constitution was revised in 1906 on the lines already indicated, and a settlement of the education difficulty was brought about in 1909. In 1904 the railway system was united with that of the rest of Germany.

For the history of Wurttemberg see the Wirttembergisches Ur- kundenbuch (Stuttgart, 1849-1907); and the Darstellungen aus der

wiirttembergiscken Geschickte (Stuttgart, 1904 fol.). Histories are those of P. F. Stalin, Geschickte Wurttembergs (Gotha, 1882-1887);

E. Schneider, Wurttembergische Geschickte (Stuttgart, 1896); Bel- schner, Gesckichte von Wiirttemberg in Wort und Bild (Stuttgart', 1902); Weller, Wurttemberg in der deutschen Gesckichte (Stuttgart, 1900); K. V. Frirker and Th. von Gessier, Geschickte der Verfassung Wurttembergs (Stuttgart, 1869) ; Hieber, Die wurttembergische Verfassungsreform von iyo6 (Stuttgart, J906) ; and R. Schmid, Reformations gesckichte Wurttembergs (Hcilbronn, 1904). See also Golther, Der Stoat und die katholiscke Kircke im Konigreick Wiirttem- berg (Stuttgart, 1874); B. Kaisstx, Geschickte des Volkssckulwesens in Wurttemberg (Stuttgart, 1895-1897) ; Bartens, Die ivirtsckaftliche Entwickelung des Konigreichs Wiirttemberg (Frankfort, 1901); W. von Ileyd, Bibliographie der wilrttembergischen Geschickte (1895- 1896), Band iii. by Th. Schon (1907); D. Schafer, Wurttembergische Geschichtsqueilen (Stuttgart, 1894 fol.) ; and A. Pfister, Konig Friedrick von Wurttemberg und seine Ze.it (Stuttgart, 1888).

WURTZ, CHARLES ADOLPHE (1817-1884), French chemist, was born on the 26th of November 181 7 at Wolfisheim, near Strassburg, where his father was Lutheran pastor. W T hen he left the Protestant gymnasium at Strassburg in 1834, his father allowed him to study medicine as next best to theology. He devoted himself specially to the chemical side of his profession with such success that in 1839 he was appointed " Chef des travaux chimiques " at the Strassburg faculty of medicine. After graduating there as M.D. in 1843, with a thesis on albumin and fibrin, he studied for a year under J. von Liebig at Giessen, and then went to Paris, where he worked in J. B. A. Dumas's private laboratory. In 1845 he became assistant to Dumas at the Ecole de Medecine, and four years later began to give lectures on organic chemistry in his place. His laboratory at the Ecole dc Medecine was very poor, and to supplement it he opened a private one in 1850 in the Rue Garenciere; but soon afterwards the house was sold,

and the laboratory had to be abandoned. In 1850 he received the professorship of chemistry at the new Institut Agronomique at Versailles, but the Institut was abolished in 1852. In the following year the chair of organic chemistry at the faculty of medicine became vacant by the resignation of Dumas and the chair of mineral chemistry and toxicology by the death of M. J. B. Orfila. The two were united, and Wurtz appointed to the new post. In 1866 he undertook the duties of dean of the faculty of medicine. In this posicion. he exerted himself to secure the rearrangement and reconstruc- tion of the buildings "devoted to scientific instruction, urging that in the provision of properly equipped teaching laboratories France was much behind Germany (see his report Les Hautes Etudes pratiques dans les univer sites allemandes, 1870). In 1875, resigning the office of dean but retaining the title of honor- ary dean, he became the first occupant of the chair of organ/c chemistry, which he induced the government to establish at the Sorbonne; but he had great difficulty in obtaining an adequate laboratory, and the building ultimately provided was not opened until after his death, which happened at Paris on the 10th of May 1884. Wurtz was an honorary member of almost every scientific society in Europe. He was one of the founders of the Paris Chemical Society (1858), was its first secretary and thrice served as its president. In 1880 he was vice-president and in 1881 president of the Academy, which he entered in 1867 in succession to T. J. Pelouzc. He was made a senator in 1881.

Wurtz s first published paper was on hypophosphorous acid (1842), and the continuation of his work on the acids of phosphorus (1845) resulted in the discovery of sulphophosphoric acid and phosphorus oxychloride, as well as of copper hydride. But his original work was mainly in the domain of organic chemistry. Investigation of the cyanic ethers (1848) yielded a class of substances which opened out a new field in organic chemistry, for, by treating those ethers with caustic potash, he obtained methylamine, the simplest organic derivative of ammonia (1849), and later (1851) the compound ureas. In 1855, reviewing the various substances that had been obtained from glycerin, he reached the conclusion that glycerin is a body of alcoholic nature formed on the type of three molecules of water, as common alcohol is on that of one, and was thus led (1856) to the discovery of the glycols or diatomic alcohols, bodies similarly related to the double water type. This discovery he worked out very thoroughly in investigations of ethylene oxide and the poly- ethylene alcohols. The oxidation of the glycols led him to homo- logues of lactic acid, and a controversy about the constitution of the latter with H. Kolbe resulted in the discovery of many new facts*

and in a better understanding of the relations between the oxy- and the amido-acids. In 1867 Wurtz prepared neurine synthetically by the action of trimethylamine on glycol-chlorhydrin, and in 1872 he discovered aldol, pointing out its double character as at once an alcohol and an aldehyde. In addition to this list of some of the new substances he prepared, reference may be made to his work on abnormal vapour densities. While working on the olerines he noticed that a change takes place in the density of the vapour of amylene hydrochloride, hydrobromidc, &c, as the temperature is increased, and in the gradual passage from a gas of approximately normal density to one of half-normal density he saw a powerful argument in favour of the view that abnormal vapour densities, such as are exhibited by sal-ammoniac or phosphorus pentachlonde. are to be explained by dissociation. From 1865 onwards he treated this question in several papers, and in particular maintained the dis- sociation of vapour of chloral hydrate, in opposition to H. Sainte- Claire Devillc and M. Berthelot.

For twenty-one years (1852-1872) Wurtz published in the Annates de chimie ct de physique abstracts of chemical work done out of France, The publication of his great Dictionnaire de chimie pure et appliquee, in which he was assisted by many other French chemists, was begun in 1869 and finished in 1878; two supple- mentary volumes were issued 1880-1886, and in 1892 the publication of a second supplement was begun. Among his books are Chimie medicate (1 864) , Legons elementaires de chimie moderne (1 867) , Tfieorie des atomes dans la conception du monde (1874), La Thiorie atomique (1878), Progres de I 'Industrie des matieres colorantes arti- ficielles (1876)' and Traiie de chimie biologique (1880-1885). His Histoire des doctrines chimiques, the introductory discourse to his Dictionnaire, but published separately in 1868, opens with the well- known dictum, " La chimie est une science francaise."

For his life and work, with a list of his publications, see Charles Friedel's memoir in the Bulletin de la Societe Chimique (1885); also A. W. von Hofmann in the Ber. dent, chem, Gesellsch. (1887), re- printed in vol. iii. of his Zur Erinnerung an vorangegangene Freunde

(1888).

WURZBURG, a university town and episcopal see of Bavaria, Germany, capital of the province of Lower Franconia, situated on the Main, 60 m. by rail S.E. from Frankfort and at the junction of main lines to Bamberg and Nuremberg. Pop. (1905) 80,220. An ancient stone bridge (1474-1607), 650 ft. long and adorned with statues of saints, and two modern bridges, the Luitpold (1887) and the Ludwig (1894), connect the two parts of the

town on each side of the river. On the lofty Leistenberg stands the fortress of Marienberg, which from 1261 to 17 20 was the residence of the bishops. The main part of the town, on the right bank, is surrounded by shady promenades, the Ringstrasse and the quay.

Wiirzburg is" quaintly and irregularly built; many of the houses are interesting specimens of medieval architecture; and the numerous old churches recall the fact that it was long the capital of an ecclesiastical principality. The principal church is the imposing Rdmanesque cathedra], a basilica with transepts, begun in 1042 and consecrated in 1189. The four towers, how- ever, date from 1240, the (rococo) facade from 1711-1719, and the dome from 1731. The spacious transepts terminate in apses. The exterior was restored in 1882-1883. The beautiful Marien- kapelie, a Gothic edifice of 1377-1441, was restored in 1S56; it is embellished with twenty statues by Tilman Riemen- schneider (d. 1531). The Haugerstifts church, with two towers and a lofty dome, was built in the Italian Renaissance style in 1670- 1691. The bones of St Kilian, the patron saint of Wiirzburg, are preserved in the Neumtinster church, which dates from the nth century; Walther von der Vogelweide is buried in the adjoining cloisters. The church of St Burkhard is externally one of the best-preserved architectural monuments in the city. It was built in 1033-1042, in the Romanesque style, and was restored in 1168. The Late Gothic choir dates from 1494,-1497. The Neubaukirche, or university church, curiously unites a Gothic exterior with a Classical interior. The Protestant church of St Stephen (1782-1789) originally belonged to a Benedictine abbey. Of the secular buildings in Wiirzburg the most con- spicuous is the palace, a huge and magnificent edifice built in 1720-1744 in imitation of Versailles, and formerly the residence of the bishops and grand-dukes of Wiirzburg. The Julius hospital, a large and richly endowed institution affording food and lodging to 600 persons daily, was founded in 1576 by Bishop Julius Echter von Mespelbrunn (1545-1619). In 1906 it was

arranged to convert this into a residential college for students, the hospital being removed to a site outside the town. The quaint town hall dates in part from 1456. Among the other chief buildings are the government offices, the law courts, the theatre, the Maxschule, the observatory and the various univer- sity buildings.

A university was founded at Wiirzburg in 1403, but it only existed for a few years. The present university was founded by Bishop Julius in 1582. The medical faculty speedily became famous, and has remained the most important faculty in Wiirz- burg ever since. Here W. K. Rontgen discovered the " Rontgen rays " in 1896. Wiirzburg was long the stronghold of Jesuitism in Germany, and the Roman Catholic theological faculty still attracts a large number of students. The university has a library containing

300,000 volumes, and is attended by about 1400 students. In no other university city of Germany has so much of the medieval academic life been preserved.

Wiirzburg is surrounded by vineyards, which yield some of the best wine in Germany. Its principal industries are the manufacture of tobacco, furniture, machinery, scientific instru- ments and railway carriages. It has also breweries, and produces bricks, vinegar, malt and chocolate.

The site of the Leistenberg was occupied by a Roman fort, and was probably fortified early in the 13th century. Wirce- birgum is the old Latin form of the name of the town; Herbi- polis (herb town) first appears in the 12th century. The bishopric was probably founded in 741, but the town appears to have existed in the previous century. The first bishop was St Burkbard, and his successors soon acquired much temporal power; about the 12th century they had ducal authority" in Eastern Franconia. It is not surprising that quarrels broke out between the bishops and the citizens, and the latter espoused the cause of the emperor Henry IV., while the former joined the emperor's foes. The struggle continued intermittently until 1400, when the citizens were decisively defeated and submitted. Several imperial diets were held in Wiirzburg, chief among these being the one of 1180 when Henry the Lion, duke of Saxony, was placed under the ban.

By the peace of Luneville the bishopric was secularized, and in 1803 Wiirzburg passed to Bavaria. The peace of Pressburg in 1S05 transferred it, under the name of an electorate, to Ferdinand, formerly grand-duke of Tuscany, who joined the confederation of the Rhine and took the title of grand-duke of Wiirzburg. In 181 5 the congress of Vienna restored Wiirzburg to Bavaria. The Wurzburg Conference is the name given to the meeting of representatives of the smaller German states in 1859 to devise some means of mutual support. The conference, however, had no result. Wurzburg was bombarded and taken by the Prussians in 1866, in which year it ceased to be a fortress. The bishopric of Wurzburg at one time embraced an area of about 1900 sq. m. and had about 250,000 inhabitants. A new bishopric of Wurzburg was created in 1817.

For the town see S. Gobi, Wiirzburg, Ein kuUurhistorisches Stddtebild (Wiirzburg, r8g6) ; J. Gramich, Verfassung und Ver- waltung der Stadt Wurzburg (Wiirzburg, 1882); M. Cronthal, Die Stadt Wiirzburg im Bauernkriege (Wurzburg, 1887); Heffner, Wurz- burg und seine Umgebungen (Wiirzburg', 1871); Beckmann, Fiihrer durch Wurzburg (1906); and Hollander and Hessler, Malerisches aus AU-Wurzburg (Wurzburg, 1898). For the university see F. X. von Wegele, Geschichte der Universitdt Wurzburg (Wiirzburg, 1882). For the bishopric see J. Hofmann, Die Heiligen und Seligen des Bistums Wurzburg {Wiirzburg,

1889); F. J. B. Stamminger and A. Amrhein, Franconia sacra. Geschichte des Bistums Wurzburg (Wiirzburg, 1889-1901); and T. Henner, Die herzagliche Gewalt der Bisckofe von Wurzburg (Wurzburg, 1874).

WURZEN, a town of Germany in the kingdom of Saxony, on the Mulde, here crossed by two bridges, 15ˆ m. by rail N.E. of Leipzig on the main line (via Riesa) to Dresden. Pop. (1905) 17,212. It has a cathedral dating from the 12th century, a castle, at one time a residence of the bishops of Meissen and now utilized as law courts, several schools and an agricultural college. The industries comprise iron-founding, weaving and brewing, and the making of machinery, carpets, cigars, furniture, leather and paper.

Wurzen was founded by the Sorbs, and was a town early in the I2th century, when Herwig, bishop of Meissen, founded a monastery here. In 1581 it passed to the elector of Saxony, and in the Thirty Years' War was sacked by the Swedes.

WUTTKE, KARL FRIEDRICH ADOLF (1819-1870), German Protestant theologian, was born at Breslau on the 10th of November 1S19. He studied theology at Breslau, Berlin and Halle, where he eventually became professor ordinarius; and is known as the author of a treatise on Christian ethics (Hand- buch der chrisUichen Sittenlehre, 1860-1863, 3rd ed. 1874-1875; Eng. trans., New York, 1873) and works on heathen religion {Die Geschichte des Heidentums, 1851-1853) and superstition {Der deutsche Volksaberglaube der Gegenwatt, 1865, 2nd ed. 1869). He died on the 1 2th of April 1870.

WYANDOT, or Huron (q.v.), a tribe of N. American Indians of Iroquoian stock. When first met by the French early in the 17th century, the Wyandots lived between Georgian Bay and Lake Simcoe, Ontario. They were then estimated at about 10,000, scattered over twenty villages. They were continually the victims of raids on the part of their neighbours the Iroquoian league of six nations and the Sioux, being driven from place to place, and a dispersal in 1650 resulted in one section settling in Quebec, while others found their way to Ohio, where they fought for the English in the Wars of Independence and 181 2. By a treaty made in 1817 the latter section was granted territory in Ohio and Michigan, but the larger part of this was sold in 1810, In 1S42 they migrated to Kansas. In 1855 many became citizens, the remainder being in 1867 removed to a reservation (now N.E. Oklahoma), numbering about 400 in 1905. The Hurons at Lorelte, in Quebec, also number about 400.

See Handbook of American Indians, cd. F. W. Hodge (Washington, 1907), s.v. " Huron."

WYANDOTTE, a city of Wayne county, Michigan, U.S.A., on the Detroit river, about 6 m. S. by W. of Detroit. Pop. (1900) 5183, of whom 1267 were foreign-born; (1904) 5425; (1910) 8287. It is served by the Michigan Central, the Lake Shore & Michigan Southern, the Detroit, Toledo & Ironton,and (for freight enly) the Detroit & Toledo Shore Line railways, and by two interurban electric lines. Salt and limestone are found here and the city has various manufactures. Wyandotte was first settled about 1820, was laid out as a town in 1854, and chartered as a city in 1867.

WYANDOTTE CAVE, a cave in Jennings township, Crawford county, Indiana, U.S.A., 5 m. N.E. of Leavenworth, on the Ohio river, and 12 m. from Corydon, the early territorial capital. The nearest railway station is Milltown, 9 m. distant. The cave is in a rugged region of high limestone hills, in one of which its main entrance is found, 220 ft. above the level of the Blue river, whose original name, the Wyandotte, was transferred to the cave by Governor David Wallace; it having previously been styled the Mammoth Cave of Indiana, the Epsom Salts Cave, and the Indiana Saltpetre Cave. The exact date of discovery is not known; but early records show it to have been pre- empted by a Dr Adams in 181 2 for the manufacture of saltpetre, and his vats and hoppers are still to be seen. After the War of 1812 he relinquished his claim; and in 1819 the ground was bought from the United States government by Henry P. Roth- rock, whose heirs are its owners. The earliest account is in Flint's Geography (1831); the first official report of it was by Dr R. T. Brown (1831); and it was first mapped by the writer (r ˆ55)j whose map was revised by John Collett, state geologist (1878). No instrumental survey has been made, nor have all its intricate windings been explored. Its known passages aggregate more than 23 m. in length, and 144 places are named as noteworthy. The "Old Cave " contains the saltpetre works, and ends in a remarkable chamber exactly 144 ft. long and 56 ft. wide, in which stands the Pillar of the Constitution, a stalagmitic column perfectly cylindrical and 71 ft. in circumference, entirely composed of crystalline carbonate of lime (satin-spar), fluted and snow-white. A cavity in the column was first claimed by H. C. Hovey as a prehistoric quarry, proved to be such by the stag horns and boulder pounders found in its vicinity. His

careful estimate of the rate of stalagmitic growth showed that 1000 years would have been needed to form the lip now covering the incision.

In the N. arm of the newer part of the cave, opened m 1850, is an immense room, styled Rothrock's Cathedral, 1000 ft. in circumference and 200 ft.

high, with a rugged central hill 135 ft. high, surmounted by statuesque stalagmites, near which is another quarry of satin- spar with similar fragments, pounders and aboriginal relics. When Mr Hovey visited this cave in 1855 he found many extinct torches, charcoal embers, poles and pounders, as well as numerous footprints, in the soft nitreous earth of certain avenues, which were left by exploring parties previous to the coming of the white man.

In the Pillared Palace a number of large alabaster shafts had been thrown down and fragments carried away. Near by were so-called " bear-wallows," which proved to be the remains of an aboriginal workshop, where masses of flint were broken into rectangular blocks; and spalls and flint-chips en- cumber the floor and choke the passage-way. Milroy's Temple is magnificent room, 100 by 150 ft. i its dimensions. Tt contains many remarkable formations; and its dis- play of helictites, or twisted stalactites, is unsurpassed.

As Wyandotte Cave has no large streams and few pools or springs, its fauna and flora are not extensive. Formerly bears, wolves and other wild animals took refuge in its fastnesses; and bats, rats, mice and salamanders are frequent visitors. Blind crawfish (Cambarus pellucidus) inhabit the Craw- fish Spring. Cave crickets (Hadenoecus subterraneus) abound. A dozen kinds of insects, with a few varieties of spiders, flies and worms, complete the meagre list. The flora 1 include mainly forms brought in from the outside. ■■-vf-ˆ,5.

For more full descriptions of Wyandotte Cave and its contents, see Hovey's Celebrated American Caverns, pp. 123-153; Indiana State Geological Reports, by R. T Brown, E. T. Cox, John Collett and W. S. Blatchley; and concerning cave fauna reports and papers by C. H. Eigenmann, professor of zoology, Indiana State University. (H. C. H.)

WYANT, ALEXANDER H. (1836-1892), American artist, was born at Port Washington, Ohio, on the nth of January 1836. He was a pupil of Hans Gude in Carlsruhe, Germany. A trip with a government exploring expedition in the west of America undermined his health, and he painted mainly in the high altitudes of the Adirondack Mountains. He was elected a full member of the National Academy of Design, New York, in 1869, and died in New York City on the 29th of November 1892. He was only moderately appreciated during his lifetime, though after his death his works were eagerly sought for.

WYAT, SIR THOMAS (1 503-1 542), English poet and states- man, elder son of Henry Wyat, or Wiat, afterwards knighted, and his wife Anne, daughter of John Skinner of Reigate, Surrey, was born at Allington Castle, near Maidstone, Kent, in 1503. His father (1460-1537) belonged to a Yorkshire family, but bought Allington about 1493. He was an adherent of the Lancastrian party, and was imprisoned and put to the torture by Richard III. The family records (in the possession of the earl of Romney) relate that during his imprisonment he was saved from starvation by a cat that brought him pigeons. At the accession of Henry VII. he became knight of the Bath (1509), knight banneret (1513) and held various offices at court. His son, Thomas Wyat, was admitted at St John's College, Cam bridge, when about twelve years of age, took his B.A. degree in 1518, and proceeded M.A. in 1522. The vague statement of Anthony a Wood {Atken. Oxon. i. 124), that he was transferred to Oxford to attend Wolsey's new college there, has no foundation in fact. He married very early Elizabeth Brooke, daughter of the 3rd

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Lord Cobham. The marriage was an unhappy one, for a letter (29th March 1537) from the lady’s brother to Thomas Cromwell comjilains that Wyat had gone abroad and made no provision for his wife, and a letter from the Spanish ambassador Chapuys to Charles V. (oth Feb. 1542) speaks of her having been re- pudiated by her husband. As early as 1516 Wyat was server extraordinary to the king, and in 1524 he was at court as keeper of the king’s jewels. He was one of the champions in the Christmas tournament of 1525. His father had been associated with Sir Thomas Bolcyn as constable of Norwich Castle, and he had thus been early

acquainted with Anne Boleyn. He appears to have been generally regarded as her lover, but it is possible that the relations between them were merely of the fashionable poetic sort. In 1526 he was sent with Sir Thomas Cheney to congratulate Francis I. on his safe return from Spain; in 1527 he accompanied Sir John Russell, afterwards 1st earl of Bedford, on an embassy to the papal court. He was sent by Russell, who was incapacitated by a broken leg, to negotiate with the Venetian republic. On his return journey to Rome he was taken prisoner by the Spanish troops, who demanded 3obo ducats for his ransom, but he contrived to escape. In 1528 he was acting as high marshal at Calais with a salary of two shillings per day, and was only superseded in November 1530. During the following years he was constantly employed in Henry's service, and was apparently high in his favour. He was, however, sent to the Tower in 1536, perhaps because it was desired that he should incriminate the queen. His father's correspondence with Cromwell does not suggest that his arrest had anything to do with the proceedings against Anne Boleyn, but the connexion is assumed {Letters and Papers of Henry VIII. vol. x. No. 919) in the letters of John Hussey to Lord Lisle, deputy of Calais. The Roman Catholic writer, Nicholas Harpsfield, makes a circumstantial statement {Pretended Divorce . , . Camden Soc. p. 253) that Wyat had confessed his intimacy with Anne to Henry VIII. and warned him against marrying her; but this, in view of his continued favour, seems highly improbable. He was released after a month's imprisonment, and in the autumn of that year took part in the suppression of the Lincolnshire rising. In March 1537 he was knighted, and a month later was sent abroad as ambassador to Charles V., whose ill-will had been revived by the declaration of the illegitimacy of the princess Mary. In 1538 he was joined by Edmund Bonner, then a simple priest, and one Simon Haynes, and seems to have been ashamed of their bad manners, and to have offended them in various ways. Bonner fcad evidently been desired by Thomas Cromwell to send his own account of the negotiations. He wrote to Cromwell (2nd Sept. 1538) a long letter (Petyt MS. 47, Middle Temple; first printed in the Gentleman's Magazine, June 1850) in which he accused Wyat of disloyalty to the king's interests, and of many personal slights to himself. Wyat was unsuccessful in the difficult affairs entrusted to him, but so long as Cromwell ruled he had a firm friend at court, and no notice was taken of Bonner's allegations. Cromwell even seems to have taken some care of his private affairs, which were left in considerable disorder. He was recalled in April 1539, but later in the same year he was employed on another embassy to the emperor, who was on his way to the Low Countries. After Cromwell's death Wyat's enemies renewed their attacks, and he was imprisoned (17th Jan. 1 541) in the Tower on the old charges, with the additional accusation of treasonable correspondence with Cardinal Reginald Pole. Being privately informed of the nature of the charges, he prepared an eloquent and manly defence of

his conduct in two documents addressed to the Privy Council and to his judges, in which he cleared himself effectually and exposed his accusers' motives. He was released at the intercession of the queen, Catherine Howard, on condition that he confessed his guilt and took back his wife, from whom he had been separated for fifteen years, on pain of death if he were thenceforth untrue to her (see Chapuys to Charles V., March 3541). He received a formal pardon on the 21st of March, and received during the year substantial marks of the king's favour. In the summer of the neit year he was sent to Falmouth to meet the ambassadors

of the emperor. The heat brought on a fever to which he succumbed at Sherborne, Dorset, on the nth of October. A Latin elegy on his death was written by his friend John Leland, 11 Naenia in mortem Thomae Viati equitis incomparabilis " ; and Henry Howard, earl of Surrey, celebrated his memory in some well-known lines beginning " Wyat resteth here, that quick could never rest," and in two sonnets.

Wyat's work falls readily into two divisions: the sonnets, rondeaus, and lyric poems dealing with love; and the satires and the version of the penitential psalms. The love poems probably date from before his first imprisonment. A large number were published in 1557 in Songes and SoneUes {Tottel's Miscellany). Wyat's contributions number 96 out of a total of 310. These have been supplemented from MSS. He was the pioneer of the sonnet in England, and the acknowledged leader of the " company of courtly makers who . . . having travailed in Italie and there tasted the sweet and stately measures and stile of the Italian Poesie, as novices newly crept out of the schooles of Dante, Arioste and Petrarche, greatly pollished our rude and homely maner of vulgar Poesie, from that it had been before " (Putten- h&m's Art of English Poesie, 1589). 1 Wyat wrote in all thirty - one sonnets, ten of which are direct translations of Petrarch. The sentiment is strained and artificial. ' Wyat shows to greater advantage in his lyrical metres, in his epigrams and songs, especially in those written for music, 2 where he is less hampered by the conventions of the Petrarcan tradition, to which his singularly robust and frank nature was ill-fitted. His thought is generally far in advance of his technical skill, and his disciple Surrey has been far more widely recognized, chiefly because of the superior smoothness of his versification. His works arc preserved in a MS. in possession of the Harrington family, which originally belonged to Wyat himself, and in another belonging to the duke of Devonshire in which are inscribed the names of Wyat's sister, Margaret Lee, and of the duchess of Richmond, Surrey's sister. The text differs considerably from Tottel's, which has been generally adopted. Wyat wrote three excellent satires — " On the mean and sure estate," dedicated to John Poms, " Of the Courtier's Life," to the same, and " How to use the court and himself." They are written in ierza rima and in form and matter owe much to Luigi Alamanni.

In the " Penitential Psalms " each is preceded by a prologue describing the circum- stances under which the psalmist wrote, and the psalms themselves are very freely paraphrased, with much original matter from the author. They were published in 1549 by Thomas Raynald and John Harrington as Certayne Psalmes . . . drawen into English meter by Sir Thomas Wyat Knygkt.

None of Wyat's other poems were printed until fifteen years after his death, in Songes and SoneUes. The standard edition of his works is that by Dr G. F. Nott, forming the second volume (1816) oi The Works of Henry Howard, Earl of Surrey, and of Sir Thomas Wyat the Elder, with an exhaustive memoir. Some family papers, now in the possession of the earl of Romney, were collected by Richard Wyat in 1727. Some use of these is made in The History of Botley Parish (1892), by J. Cave Browne. See also Brewer and Gairdner, Letters and Papers of Henry VIII. (especially from 1536 to 1542J; The Poetical Works of Sir Thomas Wyalt (r866), with a memoir in the Aldine Edition of the British Poets ; Professor E. Arber's introductory matter to the edition of Songes and Sonneites (1870) in his English Reprints; R. Alscher, " Sir Thomas Wyatt …" (1886), in Wiener Beitrdge zur deutschen u. engl. Pkilologie, giving a full account of Wyat's metrical practice; W. E. Simonds, Sir Thomas Wyatt (Boston, 1889); W. J. Courthope, Hist, of Eng. Poetry, vol. ii. (1897), the second chapter of which is devoted to a critical study of Wyat; E. Flugel, " Die handschriftliche tlberlieferung der Gedichte von Sir Thomas Wyat," in Anglic, vol. xviii.; F. M. Padelford, Early Sixteenth Century Lyrics (1907).

WYAT, SIR THOMAS (d. 1554), English conspirator, son of the preceding, was over twenty-one in 1543, but the date of his birth is uncertain. He is said to have accompanied his father on his mission to Spain, and to have been turned into an enemy of the

1 Ed. J. Haslewood, Ancient Critical Essays, i. 48 (i8ii).

2 One of the most musical of the pieces printed in his works, however, " The Lover complayneth the unkindnes of his Love," beginning " My lute, awake," is sometimes attributed to George Boleyn, Lord Rochford (see E. Bapst, Deux Gentilshommes pontes de la cour de Henri VIII, p. 142).

Spaniards by the menaces of the Inquisition. In . 1537 he married Jane, daughter of Sir William Hawte of Bishopsbourne in Kent, by whom he had ten children. Wyat was noted in his youth as dissipated, and even as

disorderly. He is known to have had a natural son, whose mother Elizabeth was a daughter of Sir Edward Darrell of Littlecote. In 1542 he inherited the family property of Allington Castle and Boxley Abbey on the death of his father. From 1543 to 1550 he saw service abroad as a soldier. In 1 554 he joined with the conspirators who combined to prevent the marriage of Queen Mary with Philip the prince of Spain, afterwards King Philip II. A general movement was planned; but his fellow-conspirators were timid and inept, the rising was serious only in Kent, and Wyat became a formid- able rebel mostly by accident. On the 22nd of January 1554 he summoned a meeting of his friends at his castle of Allington, and the 25th was fixed for the rising. On the 26th Wyat occupied Rochester, and issued a proclamation to the county. The country people and local gentry collected, but at first the queen's supporters, led by Lord Abergavenny and Sir Robert Southwell, the sheriff, appeared to be able to suppress the rising with ease, gaining some successes against isolated bands of the insurgents. But the Spanish marriage was unpopular, and Kent was more affected by the preaching of the reformers than most of the country districts of England. Abergavenny and Southwell were deserted by their men, who either disbanded or went over to Wyat. A detachment of the London train-bands sent against him by Queen Mary, under the command of the duke of Norfolk, followed their example. The rising now seemed so formidable that a deputation was sent to Wyat by the queen and council to ask for his terms. He insisted that the Tower should be surrendered to him, and the queen put under his charge. The insolence of these demands caused a reaction in London, where the reformers were strong and were at first in sympathy withhim. When he reached Southwark on the 3rd of February he found London Bridge occupied in force, and was unable to penetrate into the city. He was driven from Southwark by the threats of Sir John Brydges (or Bruges), afterwards Lord Chandos, who was prepared to fire on the suburb with the guns of the Tower. Wyat now marched up the river to Kingston, where he crossed the Thames, and made his way to Ludgate with a part of his following. Some of his men were cut off. Others lost heart and deserted. His only hope w r as that a rising would take place, but the loyal forces kept order, and after a futile attempt to force the gate Wyat surrendered. He was brought to trial on the 1 5th of March, and could make no defence. Execution was for a time delayed, no doubt in the hope that in order to save his life he would say enough to compromise the queen's sister Elizabeth, afterwards Queen Elizabeth, in whose interests the rising was supposed to have been made. But he would not confess enough to render her liable to a trial for treason. He was executed on the nth of April, and on the scaffold expressly cleared the princess of all complicity in the rising. His estates were afterwards partly restored to his son George, the father of the Sir Francis Wyat (d. 1644) who was governor of Virginia in 1621-26 and 1630- 1642. A fragment of the castle of Allington is still

inhabited as a farm-house, near Maidstone, on the bank of the Medway.

See G. F. Nott, Works of Surrey and of Sir Thomas Wyat (1815); and Froude, History of England.

WYATT, JAMES (1746-1813), English architect, was born at Burton Constable in Staffordshire on the 3rd of August 1746. He was the sixth son of Benjamin Wyatt, a farmer, timber merchant and builder. At the age of fourteen his taste for drawing attracted the attention of Lord Bagot, newly appointed ambassador to the pope, who took him with him to Rome, where he spent five or six years in studying architecture. He returned to England in 1766, and gained his first great success by the adaptation for dramatic purposes of the Pantheon in Oxford Street, London (1772), a work which was destroyed by fire twenty years later. In 1776 he was made surveyor of West- minster Abbey, and in 1778 and the following years executed many important commissions at Oxford. During this earlier period Wyatt share'd the prevailing

contempt for Gothic architecture; thus the New Buildings at Magdalen College, Oxford, designed by him, formed part of a scheme, the plans for which are extant, which involved the demolition of the famous medieval quadrangle and cloisters. He built many country houses in the classic style, of which he proved himself a master. Gradually, however, he turned his attention to Gothic, the spirit of which, in spite of his diligent study of medieval models, he never understood. The result is still visible in such " Gothic " freaks as that at Ashridge Park, Hertfordshire, built for Lord Bridgewater to replace the ancient priory, and in the lamentable " restorations," e.g. in Salisbury and Lichfield cathedrals, which earned for him even among contemporary archaeologists the title of " the Destroyer." Of these Gothic experiments the most celebrated was Fonthill Abbey, built for Beckford (the eccentric author of Vathek), the great tower of which speedily collapsed, while much of the rest has been pulled down. None the less, Wyatt must be regarded as the pioneer of the " Gothic revival," while his general influence may be gauged by the fact that nearly every county and large town in England possesses or possessed buildings by him.

On the death of Sir William Chambers in 1796, he was appointed surveyor-general to the Board of Works. In 1785 he became a member of the Royal Academy, and during a mis- understanding between Benjamin West and the Academy, in 1805, he filled the presidential office at the wish of King George 111. He was killed by a fall from his carriage on the 4th of September 1813, and was buried in Westminster Abbey. His son, Benjamin Dean Wyatt (1775-1850?), who succeeded him as surveyor of Westminster Abbey, was also an architect of some distinction.

WYCHERLEY, WILLIAM (c. 1640-1716), English dramatist, was born about 1640 at Clive, near Shrewsbury, where for several generations his family had been settled on a moderate estate of about £600 a year. Like Vanbrugh, Wycherley spent his early years in France, whither, at the age of fifteen, he was sent to be educated in the very heart of the " precious " circle on the banks of the Charente. Wycherley's friend, Major Pack, tells us that his hero " improved, with the greatest refinements," the " extraordinary talents " for which he was " obliged to nature." Although the harmless affectations of the circle of Madame de Montausier, formerly Madame de Rambouillct, are certainly not chargeable with the " refinements " of Wycher- ley's comedies — comedies which caused even his great admirer Voltaire to say afterwards of them, " II sernble que les Anglais prennent trop de liberte et que les Franchises n'en prennent pas assez " — these same affectations seem to have been much more potent in regard to the " refinements " of Wycherley's religion.

Wycherley, though a man of far more intellectual power than is generally supposed, was a fine gentleman first, a responsible being afterwards. Hence under the manipulations of the heroine of the " Garland " he turned from the Protestantism of his fathers to Romanism — turned at once, and with the same easy alacrity as afterwards, at Oxford, be turned back to Pro- testantism under the manipulations of such an accomplished master in the art of turning as Bishop Barlow. And if, as Macaulay hints, Wycherley's turning back to Romanism once more had something to do with the patronage and unwonted liberality of James II., this merely proves that the deity he worshipped was the deity of the " polite world " of his time — gentility. Moreover, as a professional fine gentleman, at a period when, as the genial Major Pack says, " the amours of Britain would furnish as diverting memoirs, if well related, as those of France published by Rabutin, or those of Nero's court writ by Petronius," Wycherley was obliged to be a loose liver. But, for all that, Wycherley's sobriquet of " Manly Wycherley " seems to have been fairly earned by him, earned by that frank and straightforward way of confronting life which, according to Pope and Swift, characterized also his brilliant successor Vanbrugh. That effort of Wycherley's to bring to Buckingham's notice

the case of Samuel Butler (so shamefully neglected by the court Butler had served) shows that the writer of even such heartless plays as The Country Wife may be familiar with generous im- pulses, while his uncompromising lines in defence of Buckingham, when the duke in his turn fell into trouble, show that the in- ventor of so shameless a fraud as that which forms the

pivot of The Plain Dealer may in actual life possess that passion for fairplay which is believed to be a specially English quality. But among the " ninety-nine " religions with which Voltaire ac- credited England there is one whose permanency has never been shaken — the worship of gentility. To this Wycherley remained as faithful to the day of his death as Congreve himself. And, if his relations to that " other world beyond this," which the Puritans had adopted, were liable to change with his environ- ments, it was because that " other world " was really out of fashion altogether.

Wycherley's university career seems also to have been in- fluenced by the same causes. Although Puritanism had certainly not contaminated the universities, yet English " quality and politeness " (to use Major Pack's words) have always, since the great rebellion, been rather ashamed of possessing too much learning. As a fellow-commoner of Queen's College, Oxford, Wycherley only lived (according to Wood) in the provost's lodgings, being entered in the public library under the title of " Philosophiae Studiosus " in July 1660. And he does not seem to have matriculated or to have taken a degree.

Nor when, on quitting Oxford, he took up his residence in the Inner Temple, where he had been entered in 1659, did he give any more attention to the dry study of the law than was proper to one so warmly caressed " by the persons most eminent for their quality or politeness." Pleasure and the stage were alone open to him, and probably early in 1671 was produced, at the Theatre Royal, Love in a Wood. It was published the next year. With regard to this comedy Wycherley told Pope — told him " over and over " till Pope believed him — believed him, at least, until they quarrelled about Wycherley's verses — that he wrote it the year before he went to Oxford. But we need not believe him: the worst witness against a man is mostly himself. To pose as the wicked boy of genius has been the foolish ambition of many writers, but on inquiry it will generally be found that these inkhorn Lotharios are not nearly so wicked as they would have us believe. When Wycherley charges himself with having written, as a boy of nineteen, scenes so callous and so depraved that even Barbara Palmer's appetite for profligacy was, if not satisfied, appeased, there is, we repeat, no need to believe him. Indeed, there is every reason to dis- believe him, — not for the reasons advanced by Macaulay, how- ever, who in challenging Wycherley's date does not go nearly deep enough. Macaulay points to the allusions in the play to gentlemen's periwigs, to guineas, to the vests which Charles ordered to be worn at court, to the great fire, &c, as showing that the comedy could not have been written the year before the author went to Oxford. We must remember, however, that even if the play had been written in that year, and delayed in its production till 1672, it is exactly this kind of allusion to recent events which any dramatist with an eye to freshness of colour would be certain to weave into his dialogue. It is not

that " the whole air and spirit of the piece belong to a period subsequent to that mentioned by Wycherley," but that " the whole air and spirit of the piece " belong to a man — an experi- enced and hardened young man of the world — and not to a boy who would fain pose as an experienced and hardened young man of the world. The real defence of Wycherley against his foolish impeachment of himself is this, that Love in a Wood, howsoever inferior in structure and in all the artistic economies to The Country Wife and The Plain Dealer, contains scenes which no inexperienced boy could have written — scenes which, not for moral hardness merely, but often for real dramatic ripeness, are almost the strongest to be found amongst his four plays. With regard to dramatic ripeness, indeed, if we were asked to indicate the finest touch in all Wycherley, we should very likely select a speech in the third scene of the third act of this very

play, where the vain, foolish and boastful rake Dapperwit, having taken his friend to see his mistress for the express pur- pose of advertising his lordship over her, is coolly denied by her and insolently repulsed. " I think," says Dapperwit, " women take inconstancy from me worse than from any man breathing."

Now, does the subsequent development of Wycherley's dramatic genius lead us to believe that, at nineteen, he could have given this touch, worthy of the hand that drew Malvolio ? Is there anything in his two masterpieces — The Country Wife or The Plain Dealer — that makes it credible that Wycherley, the boy, could have thus delineated by a single quiet touch vanity as a chain-armour which no shaft can pierce — vanity, that is to say, in its perfect development ? However, Macaulay (forgetting that, among the myriad vanities of the writing frater- nity, this of pretending to an early development of intellectual powers that ought not to be, even if they could be, developed early is at once the most comic and the most common) is rather too severe upon Wycherley's disingenuousness in regard to the dates of his plays. That the writer of a play far more daring than Etheredge's She Would if She Could — and far more brilliant too — should at once become the talk of Charles's court was inevitable; equally inevitable was it that the author of the song at the end of the first act, in praise of harlots and their offspring, should touch to its depths the soul of the duchess of Cleveland. Possibly Wycherley intended this famous song as a glorification of Her Grace and her profession, for he seems to have been more delighted than surprised when, as he passed in his coach through Pall Mall, he heard the duchess address him from her coach window as a " rascal," a " villain," and as a son of the very kind of lady his song had lauded. For his answer was perfect in its readiness: " Madam, you have been pleased to bestow a title on me which belongs only to the fortunate." Perceiving that Her Grace received the compliment in the spirit in which it was meant, he lost no time in calling upon her, and was from that moment

the recipient of those " favours " to which he alludes with pride in the dedication of the play to her. Vol- taire's story (in his Letters on the English Nation) that Her Grace used to go to Wycherley's chambers in the Temple dis- guised as a country wench, in a straw hat, with pattens on and a basket in her hand, may be apocryphal — very likely it is — for disguise was quite superfluous in the case of the mistress of Charles II. and Jacob Hall, but it at least shows how general was the opinion that, under such patronage as this, Wycherley's fortune as poet and dramatist, " eminent for his quality and politeness," was now made.

Charles, who had determined to bring up his son, the duke of Richmond, like a prince, was desirous of securing for tutor a man so entirely qualified as was Wycherley to impart what was then recognized as the princely education, and it seems pretty clear that, but for the accident, to which we shall have to recur, of his meeting the countess of Drogheda at Bath and secretly marrying her, the education of the young man would actually have been entrusted by his father to Wycherley as a reward for the dramatist's having written Love in a Wood.

Whether Wycherley's experiences as a naval officer, which he alludes to in his lines "On 1 Sea Fight which the Author was in betwixt the English and the Dutch," occurred before or after the production of Love in a Wood is a point upon which opinions differ, but on the whole we are inclined to agree with Macaulay, against Leigh Hunt, that these experiences took place not only after the production of Love in a Wood but after the production of The Gentleman Dancing Master, in 1673. We also think, with Macaulay, that he went to sea simply because it was the " polite " thing to do so — simply because, as he himself in the epilogue to The Gentleman Dancing Master says, " all gentlemen must pack to sea."

This second comedy was published in 1673, but was probably acted late in r67i. It is inferior to Love in a Wood. In The Relapse the artistic mistake of blending comedy and farce damages a splendid play, but leaves it a splendid play still. In The Gentleman Dancing Master this mingling of discordant

elements destroys a play that would never in any circumstances have been strong — a play nevertheless which abounds in animal spirits, and is luminous here and there with true dramatic points.

It is, however, on his two last comedies — The Country Wife E/nd The

Plain Dealer— that must rest Wycherley's fame as a master of that comedy of repartee which, inaugurated by Etheredge, and afterwards brought to perfection by Congreve and Vanbrugh, supplanted the humoristic comedy of the Eliza- bethans. The Country Wife, produced in 1672 or 1673 and published in 1675, is so full of wit, ingenuity, animal spirits and conventional humour that, had it not been for its motive — a motive which in any healthy state of society must always be as repulsive to the most lax as to the most moral reader— it would probably have survived as long as the acted drama remained a literary form in England. So strong, indeed, is the hand that could draw such a character as Majory Pinchwife (the un- doubted original not only of Congreve's Miss Prue but of Van- brugh's Hoyden), such a character as Sparkish (the undoubted original of Congreve's Tattle), such a character as Horner (the undoubted original of all those cool impudent rakes with whom our stage has since been familiar), that Wycherley is certainly entitled to a place alongside Congreve and Vanbrugh. And, indeed, if priority of date is to have its fair and full weight, it seems difficult to challenge Professor Spalding's dictum that Wycherley is " the most vigorous of the set."

In order to do justice to the life and brilliance of The Country Wife we have only to compare it with The Country Girl, after- wards made famous by the acting of Mrs Jordan, that Bowdlerized form of The Country Wife in which Garrick, with an object, more praiseworthy than his success, endeavoured to free it of its load of unparalleled licentiousness by disturbing and sweetening the motive — even as Voltaire afterwards (with an object also more praiseworthy than his success) endeavoured to disturb and sweeten the motive of The Plain Dealer in La Prude. While the two Bowdlerized forms of Garrick and Voltaire are as dull as the &sop of Boursault, the texture of Wycherley's scandalous dialogue would seem to scintillate with the changing hues of shot silk or of the" neck of a pigeon or of a shaken prism, were it not that the many-coloured lights rather suggest the miasmatic radiance of a foul ditch shimmering in the sun. It is easy to share Macaulay's indignation at Wycherley's satyr-like defilement of art, and yet, at the same time, to protest against that disparage- ment of their literary riches which nullifies the value of Macaulay's criticism. And scarcely inferior to The Country Wife is The Plain Dealer, produced probably early in 1674 and published three years later, — a play of which Voltaire said, " Je ne connais point de comedie chez les anciens ni chez les moderns ou il y ait autant d'esprit." This comedy had an immense influence, as regards manipulation of dialogue, upon all subsequent English comedies of repartee, and he who wants to trace the ancestry of Tony Lumpkin and Mrs Hardcastle has only to turn to Jerry Blackacre and his mother, while Manly (for whom Wycherley's early patron, the duke of Montausier, sat), though he is perhaps overdone, has dominated this kind

of stage character ever since. If but few readers know how constantly the blunt sententious utterances of this character are reappearing, not on the stage alone, but in the novel and even in poetry, it is because a play whose motive is monstrous and intolerable can only live in a monstrous and intolerable state of society; it is because Wycherley's genius was followed by Nemesis, who always dogs the footsteps of the denier of literary art. When Burns said —

" The rank is but the guinea stamp, The man's the gowd for a' that " ;

when Sterne, in Tristram Shandy, said, "Honours, like impres- sions upon coin, may give an ideal and local value to a bit of base metal, but gold and silver will pass all the world over without any other recommendation than their own weight," what did these writers do but adopt — adopt without improving — Manny's fine saying to Freeman, in the first act: — " I weigh the man, not his title; 'tis not the king's stamp can make the

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metal better or heavier "? And yet it is in the, fourth and fifth acts that the coruscations of Wycherley's comic genius are the most dazzling; also, it is there that the licentiousness is the most astonishing. Not that the worst scenes in this play are really more wicked than the worst scenes in Vanbrugh's Relapse, but they are more seriously imagined. Being less humorous than Vanbrugh's scenes, they are more terribly and earnestly realistic; therefore they seem more wicked. They form indeed a striking instance of the folly of the artist who selects a story which cannot be actualized without hurting the finer instincts of human nature. When Menander declared that, having selected his plot, "he looked upon his comedy as three parts finished, he touched upon a subject which all workers in drama — all workers in imaginative literature of every kind — would do well to consider. In all literatures — ancient and modern — an infinite wealth of material has been wasted upon subjects that are unworthy, or else in- capable, of artistic realization; and yet Wycherley's case is, in our literature at least, without a parallel. No doubt it may be right to say, with Aristotle, that comedy is an imitation of bad characters, but this does not mean that in comedy art may imitate bad characters as earnestly as she may imitate good ones, — a fact which Thackeray forgot when he made Becky Sharp a murderess, thereby destroying at once what would otherwise have been the finest specimen of the comedy of convention in the world. And perhaps it was because Vanbrugh was conscious of this law of art that he blended comedy with farce. Perhaps he felt that the colossal depravity of intrigue in which the English comedians indulged needs to be not only warmed by a super- abundance of humour but softened by the playful mockery of farce before a dramatic circle such as

that of the Restoration drama can be really brought within human sympathy. Plu- tarch's impeachment of Aristophanes, which affirms that the master of the old comedy wrote less for honest men than for men sunk in baseness and debauchery, was no doubt unjust to the Greek poet, one side of whose humour, and one alone, could thus be impeached. But does it not touch all sides of a comedy like Wycherley's — a comedy which strikes at the very root of the social compact upon which civilisation is built? As to comparing such a comedy as that of the Restoration with the comedy of the Elizabethans, Jeremy Collier did but a poor service to the cause he undertook to advocate when he set the occasional coarseness of Shakespeare alongside the wickedness of Congreve and Vanbrugh. And yet, ever since Macaulay's essay, it has been the fashion to speak of Collier's attack as being levelled against the immorality of the " Restoration dramatists." It is nothing of the kind. It is (as was pointed out so long ago as 1699 by Dr Drake in his little-known vigorous reply to Collier) an attack upon the English drama generally, with a special reference to the case of Shakespeare. While dwelling upon that noirious and highly immoral play Hamlet, Collier actually leaves un- scathed the author of The Country Wife, but fastens on Congreve and Vanbrugh, whose plays — profligate enough in all conscience — seem almost decent beside a comedy whose incredible vis motrix is " the modish distemper."

That a stage, indeed, upon which was given with applause A Woman Killed with Kindness (where a wife dies of a broken heart for doing what any one of Wy c h er l e y's married women would have gloried in doing) should, in seventy years, have given with applause The Country Wife shows that in historic and social evolution, as in the evolution of organisms, " change " and ((progress " are very far from being convertible terms. For the barbarism of the society depicted in these plays was, in the true sense of the word, far deeper and more brutal than any barbarism that has ever existed in these islands within the historic period. If civilization has any meaning at all for the soul of man, the Englishmen of Chaucer's time, the Anglo-Saxons of the Heptarchy, nay, those half -naked heroes, who in the dawn of English history clustered along the southern coast to defend it from the invasion of Caesar, were far more civilized than that " race gangrenee "— the treacherous rakes, mercenary slave? and brazen strumpets of the court of Charles II. , who did their best to substitute for the human passion of love (a passion which

was known perhaps even to palaeolithic man) the promiscuous intercourse cf the beasts of the field. Yet Collier leaves Wycherley unassailed, and

classes Vanbrugh and Congrevc with Shakespeare !

It was after the success of The Plain Dealer that the turning- point came in Wycherley's career. The great dream of all the men about town in Charles's time, as Wycherley's plays all show, was to marry a widow, young and handsome, a peer's daughter if possible — but in any event rich, and spend her money upon wine and women. While talking to a friend in a bookseller's shop at Tunbridge, Wycherley heard The Plain Dealer asked for by a lady who, in the person of the countess of Drogheda, answered all the requirements. An introduction ensued, then love-making, then marriage — a secret marriage, probably in 1680, for, fearing to lose the king's patronage and the income therefrom, Wycherley still thought it politic to pass as a bachelor. He had not seen enough of life to learn that in the long run nothing is politic but " straightforwardness." Whether because his countenance wore a pensive and subdued expression, suggestive of a poet who had married a dowager countess and awakened to the situation, or whether because treacherous con- fidants divulged his secret, does not appear, but the news of his marriage oozed out — it reached the royal ears, and deeply wounded the father anxious about the education 01 his son. Wycherley lost the appointment that was so nearly within his grasp — lost indeed the royal favour for ever. He never had an opportunity of regaining it, for the countess seems to have really loved him, and Love in a Wood had proclaimed the writer to be the kind of husband whose virtue prospers best when closely guarded at the domestic hearth. Wherever he went the countess followed trim, and when she did allow him to meet his boon companions it was in a tavern in Bow Street opposite to his own house, and even there under certain protective conditions. In summer or in winter he was obliged to sit with the window open and the blinds up, so that his wife might see that the party included no member of a sex for which her husband's plays had advertised his partiality. She died, however, in the year after her marriage and left him the whole of her fortune. But the title to the property was disputed; the costs of the litigation were heavy — so heavy that his father was unable (or else he was unwilling) to come to his aid; and the result of his marrying the rich, beautiful and titled widow was that the poet was thrown into the Fleet prison. There he remained for seven years, being finally released by the liberality of James II. — a liberality which, incredible as it seems, is too well authenticated to be challenged. James had been so much gratified by seeing The Plain Dealer acted that, finding a parallel between Manly's " manliness " and his own, such as no spectator had before discovered, he paid off Wycherley's execution creditor and settled on him a pension of £200 a year. Other debts still troubled Wycherley, however, and he never was released from his embarrassments, not even after succeeding to a life estate in the family property. In coming to Wycherley's death, we come to the worst allegation

that has ever been made against him as a man and as a gentleman. At the age of seventy-five he married a young girl, and is said to have done so in order to spite his nephew, the next in succession, knowing that he himself must shortly die and that the jointure would impoverish the estate.

Wycherley wrote verses, and, when quite an old man, prepared them for the press by the aid of Alexander Pope, then not much more than a boy. But, notwithstanding all Pope's tinkering, they remain contemptible. Pope's published correspondence with the dramatist was probably edited by him with a view to giving an impression of his own precocity. The friendship between the two cooled, according to Pope's account, because •Wycherley took offence at the numerous corrections on his verses. It seems more likely that Wycherley discovered that Pope, while still professing friendship and admiration, satirized his friend in the Essay on Criticism. Wycherley died on the 1st of January 1716. and was buried in the vault of the church in Covent Garden. (T.W.-D.)

WYCLIFFE 1 (or Wyclif), JOHN (c. 1ˆ0-1384), English reformer, was born, according to John Leland, 2 our single authority on the point, at Ipreswel (evidently Hipswell), 1 m. from Richmond in Yorkshire. The date may have been some- where about 1320. Leland elsewhere mentions that he " drew his origin " from W T y cliff c-on-Tccs {Collectanea, ii. 329), so that his lineage was of the ancient family which is celebrated by Scott in Marmion. The Wycliffes had a natural connexion with the college at Oxford which had been founded in the latter part of the previous century by their neighbours, the Balliols of Barnard Castle; and to Balliol College, then distinctively an "arts" college, 3 John Wycliffe in due time proceeded. It has been generally believed, and was in fact believed not many years after his death, that he was a fellow of Merton College in 1356; but this identification probably rests on a confusion with a con- temporary. That the future reformer was a fellow of Balliol is implied in the fact that some time after 1356, but before the summer of 1360, he was elected master. This office he held but a short time. So soon as 1361 he accepted a college living, that of Filiingham in Lincolnshire, and probably left Oxford for some time. In the same year the name of a certain " John de Wyclif of the diocese of York, M.A." appears as a suppliant to the Roman Curia for a provision to a prebend, canonry and dignity at York (Cal. of Entries in the Papal Registries, cd. Bliss, Petitions, i. 390). This was not granted, but Wycliffe received instead the prebend of Aust in the collegiate church of Westbury-on- Trym. In 1365 one " John de Wyclif " was appointed by Simon Islip, archbishop of Canterbury, to the wardenship of Canterbury Hall, a house which the archbishop founded for a mixed body of monks and secular clergy, and then — as a result of the inevitable quarrels — filled exclusively with the latter. Two years later, however, lslip's successor, the monk Simon Langham, reversed the process, replacing the intruded

seculars by monks. The dispossessed warden and fellows appealed to Rome, and in 1371 judgment was given against them. The question of the identity of the warden of Canterbury Hall with the reformer is still a matter of dispute. It has been understood as referred to by Wycliffe him- self (De ecclesia, cap. xvi. pp. 370 sq.), and was assumed by the contemporary monk of St Albans (Chron. Angl. 'Rolls "ser.p.115) and by Wycliffe's opponent William Woodford (Fasc. Zizan. P 5 t 7)j w h° found in WyclifTe's resentment at this treatment the motive for his attacks on the religious orders; it has likewise been assumed by a series of modern scholars, including Loserth (Realencyklopadie, 1908 ed., vol. xxi. p. 228, § 35), who only denies the deductions that Woodford drew from it. Dr Rashdall, on the other hand, following Shirley, brings evidence to show that the Wycliffe of Canterbury Hall could not have been the reformer, but was the same person as the fellow of Merton, this being the strongest argument against the identification of the latter with the reformer. The confusion is increased by the appearance of yet another " John Wyclif " or " Wiclif " on the

1 A note is necessary as to the spelling of Wycliffe's name. Out of thirteen contemporary entries in documents, twelve give " y " in the first syllable. In not one of these is there a " ck " (though once a " kc ") (see F. D. Matthew in the Academy, June 7, 1884). The chroniclers, &c, offer every imaginable variety of spelling, and it is possible that one favourite form in more recent times, " Wick- HfTe," derived its popularity from the old play on the name, " nequam vita," which we find in Gascoigne. The spelling adopted in the present article is that of the village from which Wycliffe derived his name; it is also preferred by the editors of the Wycliffe Bible, by Mil man and by Stubbs. " Wyclif " has the support of Shirley, of T: Arnold and of the Wyclif Society; while " Wiclif " is the popular form in Germany.

2 Itinerary, Stow's transcript, Bodleian Library, Tanner MS. 464, f. 45 (Leland's original being mutilated at this place). Hearne misprinted the name " Spreswel " and thus set all Wycliffe's bio- graphers on a search after a vox nikili. The identification of Spres- well with the site of a vanished hamlet near Wycliffe on the Tees, about 1 m. from that of a supposed " Old Richmond,'" accepted by Loserth on the authority of Lechler, is unsupported by any trustworthy evidence.*

3 See a document of 1325 printed in the appendix to the Fourth Report of the Historical Manuscripts Commission, pp. 442 sq. Provision for theological study was made by the benefaction of Sir Philip Somerville in 1340 (Lyte, IlisL of the Univ. oj Oxford, p. 154,

books of Queen's College, as paying rent for rooms as a " pen- sioner " or "commoner" for the years 1371-1372, 1374-1375 and 13S0-13S1. It has thus been commonly assumed {e.g. by Loserth) that the reformer was at one time in residence at Queen's, the date being given as 1363. It is probable, however, that the John Wiclif of the Queen's College accounts is the same as the John Wyclif who appears in the College computus for 1371-1372 as one of the " almonry boys " of the College, and, therefore, certainly not the reformer. 1

These questions, even that of the wardenship of Canterbury, are, however, essentially unimportant, unless we are prepared with Woodford to impute mean motives to a great man. What is certain is that long before Wycliilc had become a power outside Oxford his fame was established in the university. He was acknowledged supreme in the philosophical disputations of the schools, and his lectures were crowded. His influence was, however, purely academic, nor does it seem to have been inspired at the outset by any conscious opposition to the established order in the church; and, as Loserth points out, it was not until he was drawn into the arena of the politico-ecclesiastical conflicts of the day that Wycliffe became of world-importance. It has beeu generally assumed that this happened first in 1366, and that Wycliffe published his Determinatio quaedam de dominio in support of the action of parliament in refusing the tribute demanded by Pope Urban V.; but Loserth has shown that this work, which contains the first trace of that doctrine of dominium or lordship which Wycliffe afterwards developed in a sense hostile to the whole papal system, must be assigned to a date some eight years later. Wycliffe, in fact, for some years to come had the reputation of a good " curialist." Had it been other- wise, the pope would scarcely have granted him (January 1373) a licence to keep his W^estbury prebend even after he should have obtained one at Lincoln (Col. Papal Letters, ed. Bliss and Twem- low, iv. 193). Moreover, it is uniformly asserted that Wycliffe fell into heresy after – his admission to the degree of doctor (Fasc. Ziz. p. 2), and the papal document above quoted shows that he had only just become a doctor of theology, that is in 1372.

This, of course, does not mean that Wycliffe's tendencies may not already have been sufficiently pronounced to call attention to him in high places as a possibly useful instrument for the anti-papal policy of John of Gaunt and his party. Evidence of royal favour was soon not wanting. On the 7th of April 1374, he was presented by the crown to the rectory of Lutterworth in Leicestershire, which he held until his death; and on the 26th of July he was nominated one of the royal envoys to proceed to Bruges to confer with the papal representatives on the long vexed question of " provisions "

(q.v.). It is probable that he was attached to this mission as theologian, and that this was so is sufficient proof that he was not yet considered a persona ingraia at the Curia. The rank he took is shown by the fact that his name stands second, next after that of the bishop of Bangor, on the commission, and that he received pay at the princely rate of twenty shillings a day. The commission itself was appointed in consequence of urgent and repeated com- plaints on the part of the Commons; but the king was himself interested in keeping up the papal system of provisions and reservations, and the negotiations were practically fruitless.

After his return to England Wycliffe lived chiefly at Lutter- worth and Oxford, making frequent and prolonged visits to London, where his fame as a popular preacher was rapidly estabUshed. It is from this period, indeed, that dates the development of the trenchant criticisms of the folly and corrup- tion of the clergy, which had gained him a ready hearing, into a systematic attack on the whole established order in the church. It was not at the outset the dogmatic, but the political elements

1 See H. T. Riley's remarks in the Second Report of the Historical Manuscripts Commission, appendix, pp. 141 sq. The appearance of a John Wyclif on the books of Queen's led to the common mistake, repeated in Milman's Hist, of Latin Christianity (bk. xiii. ch. vi)., that Wycitffe began his university career at Queen's College. The whole question is argued at length by Dr Rashdall in the Diet Nat. Bios:.

in the papal system that provoked his censure. The negotiations at Bruges had doubtless strengthened the sympathy which he already felt for the anti-curial tendencies in English politics from Edward I.'s time onwards, and a final impulse was given by the attitude of the " Good Parliament " in 1376; in the autumn of that year he was reading his treatise on civil lordship (De civili dominio) to his students at Oxford. Of its propositions some, according to Loserth, were taken bodily from the 140 titles of the bill dealing with ecclesiastical abuses introduced in the parliament; but it may perhaps be questioned whether Wycliffe did not rather inspire the bill than the bill Wycliffe. However this may be, the reformer now for the first time publicly proclaimed the revolutionary doctrine that righteousness is the sole indefeasible title to dominion and to property, that an unrighteous clergy has no such title, and that the decision as to whether or no the property of ecclesiastics should be taken away rests with the civil power — " politicorum qui intendunt praxi et statui regnorum " (De civ. dom. i. 37, p. 269). It was unlikely that a doctrine so convenient to the secular authorities should long have remained a mere subject of obscure debate in the schools; as it was, it was advertised abroad by the in- discreet zeal of its orthodox opponents, and Wycliffe could declare that it was not his fault if it had been brought down into the streets and " every sparrow twittered

about it."

If the position at which Wycliffe had now arrived was originally inspired, as Loserth asserts, by his intimate knowledge of and sympathy with the legislation of Edward I., i.e. by political rather than theological considerations, the necessity for giving to it a philosophical and religious basis led inevitably to its development into a criticism not only of the political claims but of the doctrinal standpoint of the church. As a philosopher, indeed, Wycliffe was no more than the last of the conspicuous Oxford scholastics, and his philosophy is of importance mainly in so far as it determined his doctrine of dominium, and so set the direction in which his political and religious views were to develop. In the great controversy between Realism and Nominalism he stood on the side of the former, though his doctrine of universals showed the influence of the criti- cisms of Ockharn and the nominalists. He is Platonic in his con- ception of God as the forma rerum in whom the rationes exemplares etist eternally, being in fact his Word, who is omnia in omnibus (l Cor. xv. 28) ; every creature in respect of its esse intelligibile is God, since every creature is in essence the same as the idea, and all rationes ideates are essentially the same as the Word of God (De dominio divino, pp. 42, 43). There is one ens t the ens analogum, which includes in itself and comprehends all other entia — all uni- versals and all the individual parts of the universe (De dom. div. pp. 58 sq.). The process by which the primary ens is specificated, or by which a higher and more general class passes into sensible exist- ence, is that it receives the addition of substantial form whereby it is rendered capable of acquiring qualities and other accidents (ibid. pp. 48 sq.). To Wycliffe the doctrine of arbitrary divine decrees was anathema. The will of God is his essential and eternal nature, by which all his acts are determined ; it was thus with the creation, since God created all things in their primordial causes, as genera and species, or else in their material essences, secundum rationes absconditas seminales (ibid. p. 66). God's creation is conditioned by his own eternal nature; the world is therefore not merely one among an infinity of alternatives, an arbitrary selection, so to speak, but is the only possible world; it is, moreover, not in the nature of an eternal emanation fr.om God, but was created at a given moment of time— to think otherwise would be to admit its absolute necessity, which would destroy free-will and merit. Since, however, all things came into being in this way, it follows that the creature can produce nothing save what God has already created. 2 So then all human lordship is derived from the supreme oyerlordship of God and is inseparable from it, since whatever God gives to his servants is part of himself, from the first gift, which is the esse intelligibile, i.e. really the divine essence, down to those special gifts which flow from the communication of his Holy Spirit; so that in him we live and move and have our being. But, in giving, God does not part with the lordship of the

thing given; his gifts are of the nature of fiefs, and whatever lordship the creature may possess is held subject to due service to the supreme overlord. Thus, as in feudalism, lordship is distinguished from possession. Lordship is

2 This leads to the question of predestination and free-will, in which Wycliffe takes a middle position with the aid of the Aristotelian distinction between that which is necessary absolutely and that which is necessary on a given supposition. God does not will sin, for he only wills that which has being, and sin is the negation of being; he necessitates men to perform actions which are in them- selves neither right nor wrong; they become right or wrong through man's free agency.

not properly proprietary, and property is the result of sin ; Christ and his apostles had none. 1 The service, however, by which lord- ship is held of God is righteousness and its works; it follows that the unrighteous forfeit their right to exercise it, and may be deprived of their possessions by competent authority.

The question, of course, follows as to what this authority is, and this Wycliffe sets out to answer in the Determinatio quaedam de dominio and, more elaborately, in the De civili dominio. Briefly, his argument is that the church has no concern with temporal matters at all, that for the clergy to hold property is sinful, and that it is lawful for statesmen {politici) — who are God's stewards in temporals — to take away the goods of such of the clergy as, by reason of their unrighteousness, no longer render the service by which they hold them. That the church was actually in a condition to deserve spoliation he refused, indeed — though only under pressure — to affirm; but his theories fitted in too well with the notorious aims of the duke of Lancaster not to rouse the bitter hostility of the endowed clergy. With the mendicant orders he continued for a while to be on good terms.

Hitherto Wycliffe had made no open attack on the doctrinal system of the church, and for some time he had been allowed to spread his doctrines without hindrance. Early in 1377, however, Archbishop Sudbury summoned him to appear before the bishop of London, and answer certain charges laid against him. The nature of these accusations is not stated, but their purport can hardly be doubtful. On the inlh of February 1377, Wycliffe made his appearance at St Paul's. He was accom- panied by the duke of Lancaster, by Lord Percy, marshal of England, and by four doctors of the four mendicant orders. The trial, however, came to nothing; before Wycliffe could open his' mouth, the court was broken up by a rude brawl

between his protectors and Bishop Courtenay, ending in a general riot of the citizens of London, who were so much enraged by the insult to their bishop in his own cathedral church—coming as this did at the same time as a serious attempt at an invasion by the duke in parliament of their civic liberties (Chron. Angl. p. 120) — that they would have sacked his palace of the Savoy had not Courtenay himself intervened.

Wycliffe had escaped for the time, but his enemies did not rely solely on their own weapons. Probably before this they bad set their case before the pope; and on the 22nd of May five bulls were issued by Gregory XL, who had just returned to Rome from Avignon, condemning eighteen (or in other copies nineteen) " conclusions " drawn from Wycliffe's writings. All the articles but one are taken from his De civili dominio. The bulls truly stated Wycliffe's intellectual lineage; he was following in the error of Marsilius of Padua; and the articles laid against him are concerned entirely with questions agitated between church and state — how far ecclesiastical censures could lawfully affect a man's civil position, and whether the church had a right to receive and hold temporal endowments. The bulls were addressed to the archbishop of Canterbury and the bishop of London, the university of Oxford, and the king. The university was to take Wycliffe and send him to the prelates; the latter were then to examine the truth of the charges and to report to the pope, Wycliffe being meanwhile kept in confinement. The execution of the papal bulls was impeded by three separate causes — the king's death on the 21st of June; the tardy action of the bishops, who enjoined the university to make a report, instead of simply sending Wycliffe to them; and the unwillingness of the university to admit external authority, and, above all, the pope's right to order the imprisonment of any man in England. The convocation of the university, indeed, as the St Albans

1 See R. L. Poole's preface to his edition of the De dominio divino, where Wycliffe's indebtedness to Richard Fitz Ralph, archbishop of Armagh, for his views on lordship and property is shown at some length (pp. xxxiv sq.). Fitz Ralph had been a fellow of Balliol, and was vice-chancellor of the university in or about 1333 (A. a Wood, Fasti Oxon p. 21, ed. Gutch, 1790)' The first four books of his De pauperie Satvatoris were edited by R. L. Poole for the Wycliffe Society, and published in 1890 in an appendix to the edition of the De dominio divino. Fitz Ralph also taught that lordship was con- ditioned by grace, and that property had come into the world with sin. Fitz Ralph's work was, however, directed to the settlement of the controversy raised by the mendicant orders as to " possession " and " use"; Wycliffe extended the scope of the doctrine so as to include all civil and ecclesiastical society.

chronicler 2 states with lamentation, made serious objections to receiving

the bull at all; and in the end it merely directed Wycliffe to keep within his lodgings at Black Hall for a time.

If the university was disposed to favour the reformer, the government was not less so. John of Gaunt was for the moment in retirement; but the mother of the young king appears to have adopted his policy in church affairs, and she naturally occupied a chief position in the new council. As soon as parlia- ment met in the autumn of 1377, Wycliffe was consulted by it as to the lawfulness of prohibiting that treasure should pass out of the country in obedience to the pope's demand. Wycliffe's affirmative judgment is contained in a state paper still extant; and its tone is plain proof enough of his confidence that his views on the main question of church and state had the support of the nation. 3 Indeed he had laid before this same parliament – his answer to the pope's bulls, with a defence of the soundness of his opinions. His university, moreover, confirmed his argu- ment; his tenets, it said, were true {i.e. orthodox), though their expression was such as to admit of an incorrect interpretation. But Wycliffe was still bound to clear himself before the prelates who had summoned him, and early in 1378 he appeared for this purpose in the chapel of Lambeth Palace. His written defence, expressed in some respects in more cautious language than he had previously used, was laid before the council; but its session was rudely interrupted, not only by an inroad of the London citizens with a crowd of the rabble, but also by a messenger from the princess of Wales enjoining them not to pass judgment against Wycliffe; and thus a second time he escaped, either without sentence, or at most with a gentle request that he would avoid discussing the matters in question. Meanwhile his " pro- testatio " was sent on to Rome. Before, however, any further step could be taken at Rome, Gregory XI. died.

In the autumn of this year Wycliffe was once more called upon to prove his loyalty to John of Gaunt. The duke had violated the sanctuary of Westminster by sending a band of armed men to seize two squires who had taken refuge there. One of them was taken by a stratagem, the other murdered, together with the servant of the church who attempted to resist his arrest. After a while the bishop of London excommunicated all concerned in the crime (except only the king, his mother and his uncle), and preached against the culprits at Paul's Cross. At the parliament held at Gloucester in October, in the presence of the legates of Pope Urban VI. , Wycliffe read an apology for the duke's action at Westminster, pleading that the men were killed in resisting legal arrest. The paper, which forms part of the De ecclesia, lays down the permissible limits of the right of asylum, and maintains the right of the civil power to invade the sanctuary in order to bring escaped prisoners to justice.

The schism in the papacy, owing to the election of Clement VII. in

opposition to Urban VI.,. accentuated Wycliffe's hostility to the Holy See and its claims. His attitude was not, indeed, as yet fully developed. He did not object to a visible head of the church so long as this head possessed the essential quali- fication of righteousness, as a member of the elect. It was only later, with the development of the scandals of the schism, that Wycliffe definitely branded the pope, qua pope, as Antichrist; 4 the sin of Silvester I. in accepting the donation of Constantine had made all his successors apostates {Sermones, ii. 37). The year 1378, indeed, saw the beginning of an agressive pro- paganda which was bound sooner or later to issue in a position wholly revolutionary. Wycliffe's criticism of the established order and of the accepted doctrines had hitherto been mainly

2 When he says that the bull was only received at Oxford shortly before Christmas, he is apparently confounding it with the prelates' mandate, which is dated December 18 (Lewis, appendix xvii.). — Chron. Angl. p. 173.

a In one text of this document a note is appended, to the effect that ihe council enjoined silence on the writer as touching the matter therein contained (Fasciculi Zizaniorum, p. 271). This, if true, was apparently a measure of precaution.

4 So he describes the popes in the first sermon in vol. ii. of the Sermones. This may very probably refer to the two rival popes (cf. Buddensieg, Polemical Works, intr. p. xxi). Book hi. of his Opus evangelicum is also significantly entitled De Antichristo.

confined to the schools; he now determined to carry it down into the streets. For this purpose he chose two means, both based on the thesis which he had long maintained as to the supreme authority of Holy Scripture, as the great charter of the Christian religion. The first means was his institution of the "poor" or "simple" priests to preach his doctrines throughout the country; the second was the translation of the Vulgate into English, which he accomplished with the aid of his friends Nicholas Hereford and John Purvey (see Bible, English). This version of the Bible, and still more his numerous sermons and tracts, established Wycliffe's now undisputed position as the founder of English prose writing.

The choice of secular priests to be his itinerant preachers was significant of another change of attitude on Wycliffe's part. Hitherto he had been on good terms with the friars, whose ideal of poverty appealed to him; as

already mentioned, four doctors of the mendicant orders had appeared with him at his trial in 1377. But he had come to recognize that all organized societies within the church, " sects " as he called them, were liable to the same corruption, while he objected fundamentally to the principle which had established a special standard of morality for the " religious." On the other hand. Wycliffe's itinerant preachers were not necessarily intended to work as rivals to the beneficed clergy. The idea that underlay their mission was rather analogous to that which animated Wesley four centuries later. Wycliffe aimed at supplementing the services of the church by regular religious instruction in the vernacular; and his organization included a good number of men who held or had held respectable positions in their colleges at Oxford. The influence of their teaching was soon felt throughout the country. The common people were rejoiced by the plain and homely doctrine which dwelt chiefly on the simple " law " of the gospel, while they no doubt relished the denunciation of existing evils in the church which formed, as it were, the burthen of such discourses. The feeling of disaffection against the rich and careless clergy, monks and friars was widespread but undefined. Wycliffe turned it into a definite channel.

Meanwhile, in addition to his popular propaganda and his interventions in politics, Wycliffe was appealing to the world of learning in a series of Latin treatises, which followed each other in rapid succession, and collectively form his summa theologiae. 1 During the years 1378 and 1379 he produced his works on the truth of Holy Scripture, on the church, on the office of king, on the papal power.

Of all these, except the third, the general character has already been indicated. The De officio regis is practically a declaration of war against the papal monarchy, an anticipation of the theocratic conception of national kingship as established later by the Reforma- tion. The king is God's vicar, to be regarded with a spiritual fear second only to that due to God, and resistance to him for personal wrong suffered is wicked. His jurisdiction extends over all causes. The bishops — who are to the king as Christ's Humanity is to his Divinity — -derive their jurisdiction from him, and whatever they do is done by his authority. 2 Thus in his palpable dignity, towards the world, the king is superior to the priest; it is only in his impalpable dignity, towards God, that the priest is superior to the king. Wycliffe thus passed from an assailant of the papal to an assailant of the sacerdotal power ; and in this way he was ultimately led to examine and to reject the distinctive symbol of that power, the doctrine of transubstantiation. 3

1 J. Loserth, in his paper "Die Genesis von Wiclifs Summa Theologiae ' ' (Sitzungsber. der k. A kad. der Wissensch., Vienna , 1908, vol. 156) gives

proofs that the Summa was not produced on a previously thought out plan, but that even the larger works forming part of it " were the outcome of those conflicts which were fought out inside and outside the Good Parliament," i.e. they were primarily intended as weapons in the ecclesiastico-political controversies of the time.

1 Episcopi, sui officiates et curati sui, tenentur in qualicunque tali causa spiritualiter cognoscere auctoritate regis; ergo rex Per Ulos. Sunt enim tales legii homines regis. See De officio regis (ed. A. W. Pollard and Charles Sayle, from Vienna MSS. 4514, 3933, Wyclif Soc. 1887), cap. vi. p. 119.

3 Sporadic attacks had been made on this before, though it had not been formally challenged in the schools. See the interesting case of the heretic priest Ralph of Tremur in the Register of John de Grandison, Bishop of Exeter, edited by F. C. Hingeston- Randolph (London and Exeter, 1894), pp. 1147 and 1179.

Wycliffe himself had for some time, both in speech and writing, indicated the main characteristics of his teaching on the Euchar- ist. It was not, however, till 1379 or 1380 4 that began a formal public attack on what he calls the " new " doctrine in a set of theses propounded at Oxford. These were followed by sermons, tracts, and, in 1381, by his great treatise De eucharistia. Finally, at the close of his life, he summed up his doctrine in this as in other matters in the Trialogus.

The language in which he denounced transubstantiation antici- pated that of the Protestant reformers: it is a " blasphemous folly," a " deceit," which " despoils the people and leads them to commit idolatry "; B philosophically it is nonsense, since it presupposes the possibility of an accident existing without its substance; it over- throws the very nature of a sacrament. Yet the consecrated bread and wine are the body and blood of Christ, for Christ himself says so (Fasc. Zizan. p. 115); we do not, however, corporeally touch and break the Lord's body, which is present only sacramentaliter, spiritua- liter et virtualiter — as the soul is present in the body. The real presence is not denied; what Wycliffe " dares not affirm " is that the bread is after consecration " essentially, substantially, corpore- ally and identically " the body of Christ (16.). His doctrine, which was by no means always consistent or clear, would thus seem to approximate closely to the Lutheran doctrine of consubstantiation, as distinguished from the Zwinglian teaching accepted in the xxviii. Article of Religion of the Church of England, that "the means whereby the body of Christ is received and eaten in the Supper is Faith." 8

A public attack by a theologian of Wycliffe's influence on the doctrine on which the whole system of the medieval church was based could not be

passed over as of mere academic interest. The theologians of the university were at once aroused. The chancellor, William Barton, sat with twelve doctors (six of whom were friars), and solemnly condemned the theses. Wycliffe appealed, in accordance with his principles, not to the pope, but to the king. But the lay magnates, who were perfectly ready to help the church to attain to the ideal of apostolic poverty, shrank from the responsibility of lending their support to obscure propositions of the schools, which, for no practical end, involved undoubted heresy and therefore the pains of hell. John of Gaunt, accordingly, hastily sent down a messenger enjoining the reformer to keep silence on the subject. The rift thus created between Wycliffe and his patrons in high places was, moreover, almost immediately widened by the outbreak of the great Peasants' Revolt of 1381, the result of which was to draw the conservative elements in church and state together, in defence of their common interests.

With the Peasants' Revolt it has been supposed that Wycliffe had something to do. The only positive fact implicating him is the confession of one of its leaders, John Ball, that he learned his subversive doctrines from Wycliffe. But the confession of a condemned man can seldom be accepted without reserve; and we have not only the precise and repeated testimony of Knyghton that he was a " precursor " of Wycliffe, but also documentary evidence that he was excommunicated as early as 1366, long before Wycliffe exposed himself to ecclesiastical censure. Wycliffe in truth was always careful to state his communistic views in a theoretical way; they are confined to his Latin scholastic writings, and thus could not reach the people from him directly. At the same time it is very possible that his less scrupulous followers translated them in their popular dis- courses, and thus fed the flame that burst forth in the rebellion. Perhaps it was a consciousness of a share of responsibility for it that led them to cast the blame on the friars. In any case Wycliffe's advocates must regret that in all his known works there is only one trace of any reprobation of the excesses that accompanied the outbreak.

4 1 38 1 (corrected by the editor from 3380) is the date given in Shirley's edition of the Fasciculi Zizaniorum. F. D. Matthew, in the Eng. Hist. Rev. for April 1890 (v. 328), proves that the date must have been 1379 or 1380.

6 Trialogus, lib. iv., cap. 22 ; De Euch. p. 2433.

8 The difference is summed up by Mclanchthon, in his rejection of Bucer's eirenicon, thus : — Fucum faciunt hominibus per hoc quod dicunt vere a- desse corpus, et tamen postea addunt contemplatione fidei, i.e. imaginatione. Sic iterum negani praesentiam realem. Nos docemus, quod corpus Christi vere et realiter adest cum pane vel in pant [Corpus

Reformatorum, ii. 222 sq.).

In the spring following the Revolt his old enemy, William Courtenay, who had succeeded the murdered archbishop Sud- bury as archbishop of Canterbury, resolved to take measures for stamping out Wycliilc's crowning heresy. He called a court of bishops, theologians and canonists at the Blackfriars' convent in London, which assembled on the 17th to 21st of May and sat with intervals until July. This proceeding was met by a hardly expected manifestation of university feeling on Wycliffe's side. The chancellor, Robert Rygge, though he had joined in the condemnation of the theses, stood by him, as did also both the proctors. On Ascension Day (the 15th of May) his most pro- minent disciple, Nicholas Hereford, was allowed to preach a violent sermon against the regulars in the churchyard of St Frideswyde. The archbishop protested through his com- missary, the Carmelite Dr Peter Stokes, who was charged with the execution of the archbishop's mandate (on the 28th of May) for the publication in the university of the decision of the Blackfriars' council, by which 24 articles extracted from Wycliffe's works were condemned, ten as heretical and fourteen as erroneous. The reply of the chancellor was to deny the archbishop's jurisdiction within the university, and to allow Philip Repington, another of Wycliffe's disciples, to preach on Corpus Christi day before the university. Chancellor and preacher were guarded by armed men, and Stokes wrote that his life was not safe at Oxford. The chan- cellor and proctors were now summoned to Lambeth, and directed to appear before the Blackfriars' court on the 12th of June. The result was that the university officers were soon brought to submission. Though they were, with the majority of regent masters at Oxford, on the side of Wycliffe, the main question at issue was for them one of philosophy rather than faith, and they were quite prepared to make formal submission to the authority of the Church, For the rest, a few of the reformer's more prominent adherents were arrested, and imprisoned until they recanted.

Wycliffe himself remained at large and unmolested. It is said indeed by Knyghton that at a council held by Courtenay at Oxford in the following November Wycliffe was brought forward and made a recantation; but our authority fortunately gives the text of the recantation, which proves to be nothing mere nor less than a plain English statement of the condemned doctrine. It is therefore lawful to doubt whether Wycliffe appeared before the council at all, and even whether he was ever summoned before it. Probably after the overthrow of his party at Oxford by the action of the Blackfriars council Wycliffe found it advisable to withdraw permanently*

to Lutter- worth. That his strength among the laity was undiminished is shown by the fact that an ordinance passed by the House of Lords alone, in May 13S2, against the itinerant preachers was annulled on the petition of the Commons in the following autumn. In London, Leicester and elsewhere there is abundant evidence of his popularity. The reformer, however, was growing old. There was work, he probably felt, for him to do, more lasting than personal controversy. So in his retirement he occupied him self, with restless activity, in writing numerous tracts, Latin and English. To this period, too, belong two of his most important works: — the Trialogus and the unfinished Opus emngdicum.

The Trialogus is as it were his summa summarum theologiae, a summing up of his arguments and conclusions on philosophy and doctrine, cast in the form of a discussion between three persons, Alithia, representing " solid theology," Phronesis, representing " subtle and mature theology," and Pseusiis, representing " captious infidelity " whose function is to bring out the truth by arguing and demonstrating: against it. The Trialogus was the best known and moHt influential of all Wycliffe's works, and was the first to be printed (1525), a fact which gave it a still greater vogue. It is also significant that all the only four known complete MSS. of the work, preserved in the Imperial Library at Vienna, arc of Hussite origin. The note of both the Trialogus and of the Opus evangelicum, Wy- cliffe's last work, is their insistence on the " sufficiency of Holy Scripture."

In T3S2, or early in 1383, Wycliffe was seized with a paralytic stroke, in spite of which he continued his labours. In 1384 it is stated that he was cited by Pope Urban VI. to appear before him

at Rome; but to Rome he never went. On the 28th of December of this year, while he was hearing mass in his own church, he received a final stroke, from the effects of which he died on the New Year's eve. He was buried at Lutterworth ; but by a decree of the council of Constance, May 4, 1415, his remains were ordered to be dug up and burned, an order which was carried out, at the command of Pope Martin V., by Bishop Fleming in 1428.

A sober study of Wycliffe's life and works justifies a conviction of his complete sincerity and earnest striving after what he believed to be right. If he cannot be credited (as he has been by most of his biographers) with all the Protestant virtues, he may at least claim to have discovered the secret of the immediate dependence of the individual Christian upon God, a relation which needs no mediation of any priest, and to which the very sacraments of the Church, however desirable, are not essentially necessary. When he divorces the idea of the Church from any connexion with its official or formal constitution, and conceives it as consisting exclusively of

the righteous, he may seem to have gone the whole length of the most radical reformers of the 1 6th century. And yet, powerful as was his influence in England, his doctrines in his own country were doomed to perish, or at best to become for a century and a half the creed of obscure and persecuted sectaries (see Lollakds). It was otherwise in Bohemia, whither his works had been carried by the scholars who came to England in the train of Richard II. 's queen, Anne of Bohemia. Here his writings were eagerly read and multiplied, and here his disciple, John Huss (q.v.), with less originality but greater simplicity of character and greater moral force, raised Wycliffe's doctrine to the dignity of a national religion. Extracts from the De ecclesia and the De potentate Papae of the English reformer made up the greater part of the De ecclesia of Huss, a work for centuries ascribed solely to the Bohemian divine, and for which he was condemned and burnt. It was Wycliffe's De sufficientia legis Christi that Huss carried with him to convert the council of Constance; of the fiery discourses now included in the published edition of Wycliffe's Sertnones many were like-wise long attributed to Huss. Finally, it was from the De euckaristia that the Taboritcs derived their doctrine of the Lord's Supper, with the exception of the granting of the chalice to the laity. To Huss, again, Luther and other continental reformers owed much, and thus the spirit of the English reformer had its influence on the reformed churches of Europe.

Bibliography. — The documentary materials for Wycliffe's biography are to be found in John Lewis's Life and Siijferings of J. Wiclif (new ed., Oxford, 1820), which contains a valuable appendix of illustrative papers and records; Foxe's Acts and Monuments, vol. hi., ed. 1855, with app. ; Forshall and Madden's preface to the Wycliffe Bible, p. vii. note, Oxford, 1851; W. W. Shirley's edition of the Fasciculi Zizaniorum, a collection of contemporary docun.ents bearing on the history of Wycliffe and the Lollards, with inter- spersed narrative and comments (probably the work of Thomas Netter of Walden) (1858) ; and H. T. Riley's notices in the appendices to the Second and Fourth Reports of the Historical Manuscripts Commission. Among contemporary records the narrative of a rr.onk of St Albans — a bitter opponent of John of Gaunt— is of conspicuous value; it was published, under the title of Chronicon Aneliae, by Sir E. Maunde Thompson (1874). Of this the account in Walsing- ham's Historia Anglicana (ed. II. T. Riley, 1863, 1864) is mainly a modified version. Knyghton, who wrote De. eventibus Angliae at Leicester in the heart of what may be called the Wycliffe country, is very well informed as to certain passages in the reformer's history, though his chronology is extremely faulty (ed. J. R. Lumby, 1889- 1895). There are valuable notices also in the continuation of the Eulogium kistoriarum (vol. iii., ed. F. S. Haydon, 1863), in the Chronicle of Adam of Usk (ed. E. M. Thompson, 1876), and in irore than one of the continuations of Higden. For the study

of Wycline's theology the controversial works of Wodeford and Walden are important, but must necessarily be used with caution.

Of modern biographies that by G. V. Lcchler (Johann von Wiclif und die Vorgeschichle der Reformation., 2 vols., Leipzig, 1873; partial Eng. trans., by P. Lorimer, 1878, 1881 and 1884) is by far the most comprehensive; it includes a detailed exposition of the reformer's system, based to a considerable extent on works which were then unpublished. Shirley's masterly introduction to the Fasciculi Zizaniorum, and F. D. Matthew's to his edition of English Works of Wyctif hitherto unprinted (1880), as well as Creighton's History oj the Papacy, vol. i., 1882, and Sir H. C. Maxwell Lyte's account in his History of the University of Oxford (1886), add to or correct our stock of biographical materials, and contain much valuable criticism.

Wycliffe's political doctrine is discussed by Mr R. L. Poole (Illustra- tions of the History of Medieval Thought, 1884); and his relation to Huss is elaborately demonstrated by Dr J. Loserth {Bus und Wiclif, Prague, 1884; also Eng. trans.)-

See also G. M. Trcvclyan, England in the Age of Wydiffe (London, 1899); Oman, History of England 1377-1485 (London, 1906), pp. 511 ft. for authorities; W. W. Capes, "History of the English Church in the 14th and 15th Centuries," in Hist, of the Eng. Church, ed. Stephen anil Hunt (London, 1900). Many references to more recent monographs on particular points will be found in J. Loserth 's article ' ' Wiclil , " in Herzog-Hauck, Realencyklopddie (3rd ed. , 1908J, xxi. pp. 225-227.

Wycliffe's works are enumerated in a Catalogue by Shirley (Oxford, 1865). Of his Latin works only two had been published previously to 1880, the De officio pastorali, ed. G. V. Lechler (Leipzig, 1863) and the Trialogus, ed. Lechler (Oxford, 1869). The pious hope expressed by the learned editor of the Trialogus in his preface, that English scholars might be moved to publish all Wycliffe's Latin works, began to be realized in 1882 with the foundation at Oxford of the Wyclif Society, under the auspices of which the following have been published : — Polemical Tracts, ed. R. Buddensieg, (2 vols., 1883) ; De chili dominio, vol. i. ed. R. L. Poole, vols, ii.-iv., ed. J. Loserth (1885-1905;; De composicione hominis, ed. R. Beer (1884); De Ecclesia, cd. Loserth (1886); Dialogus sive speculum ecclesiae mili- tants, ed. A. W. Pollard (1886); Se.rmones, ed. Loserth, vols, i.-iv. (1887-1890) : De officio regis, ed. A. W. Pollard and C. Sayle (1887) ;

De. apostasta, ed. M. Dziewicki (1889); De, dominio divino, ed. R. L. Poole [,1890); Quaestioncs. De ente praedicamentali, ed. R, Beer (1 891) ; De. euckaristia traclatus major, ed. Loserth (1893) ; De blasphemia, ed. Dziewicki (1894); Logica (3 vols., ed. Dziewicki, 1895-1899); Opus evangelicum, ed. Loserth (4 vols., 1898), parts iii. and iv. also bear the title De Antichristo; De Simonia, ed. Herz- berg-Frankel and Dziewicki (1898); De veritatae. sacrae scripturae, ed. R. Buddensieg (3 vols., 1905) ; Miscellanea philosophica, ed. Dziewicki (2 vols., 1905) (vol. . has an introduction on Wycliffe's philosophy): De potestate papae, ed. Loserth (1907).

For Wycliffe's English works see Select English Works, ed. T. Arnold (3 vols., 1869-1871), and English Works hitherto unprinted, ed. F. D. Matthew (1880), chiefly sermons and short tracts, of many of which the authenticity is uncertain. The Wicket (Nuremberg, 1546; reprinted at Oxford, 1828) is not included in either of these collections. (R. L. P.; W. A. P.)

WYCOMBE (officially Chepping Wycombe, also Chipping or High Wycombe), a market town and municipal borough in the Wycombe parliamentary division of Buckinghamshire, England, 34 m. W. by N. of London by the Great Western railway. Pop. (1901) 15,542. The church of All Saints, originally of Norman foundation, was rebuilt in 1273 by the abbess and nuns of Godstow near Oxford, and was largely reconstructed early in the 15th century. For the grammar school, founded c. 1550 by the mayor and burgesses, a new building was erected in 1883. There are remains of a Norman hospital of St John the Baptist, consisting of arches of the chapel. The market-house and guildhall was erected in 1757. The family of Petty, with whom the town has long been connected, occupied the mansion called Wycombe Ahbey. Lord Beaconsheld's mansion of Hughenden is ii m. N. of the town. Among a number of almshouses are some bearing the name of Queen Elizabeth, endowed in 1562 out of the revenues of a dissolved fraternity of St Mary. The principal industry is chair-making, and there are also flour and paper mills. The borough is under a mayor, 8 aldermen and 24 councillors. Area, 1734 acres. The burgesses of Wycombe have ancient rights of common pasturage on the neighbouring Rye Mead.

There are various British remains in the neighbourhood of Chipping Wycombe {Wiciimbe, Wycumbee, Cheping Wycombe, Cheping Wich-kam), bat the traces of a Roman settlement are more important. In Domesday Book the manor only is mentioned, but in 1 199 the men of Wycombe paid tallage to the king. In 1225-1226 Alan Basset granted to the burgesses the whole town as a free borough. This grant was confirmed by Henry TIL, Edward I., Henry IV. and Mary. In 1558. however, a new

charter of incorporation was granted in reward for the loyalty shown to Queen Mary. It was confirmed by Elizabeth in 1598 and by James I. in 1609 with certain additions. Cromwell granted another charter, but it was burnt after the Restora- tion, and the last charter was granted by Charles II. in 1663. The corporation was remodelled under the Municipal Corporations Act of 1X35, and now consists of a mayor, 6 aldermen and 18 councillors. Wycombe returned two burgesses to parliament in 1300 and con- tinued to send members until 1885. The franchise was enlarged after 1832, and in 1867 the borough was deprived of one of its members. A market was granted by Basset to the burgesses in 1226, and at the present day it is held every Friday, the day fixed by the charter of Queen Mary. Two statutory fairs were held under the

charter of 1558, but in 1792 only one fair was neid on the Monday before Michaelmas for hiring, but there is now a pleasure fair on the same day.

See John Parker, History and Antiquities of Wycombe (1878).

WYE, a river of England, famous for its beautiful scenery. It rises in Montgomeryshire on the E. slope of Plinlimmon, close to the source of the Severn, the estuary of which it joins after a widely divergent course. Its length is T30 m.; its drainage area (which is included in the basin of the Severn), 1609 sq. m. Running at first S.E. it crosses the W. of Radnor- shire, passing Rhayader, and receiving the Elan, in the basin of which are the Birmingham reservoirs. It then divides Radnor- shire from Brecknockshire, receives the Ithon on the left, passes Builth, and presently turns N.E. to Hay, separating Radnorshire from Herefordshire, and thus forming a short stretch of the Welsh boundary. The river, which rose at an elevation exceeding 2000 ft., has now reached a level of 250 ft., 55 m. from its source. As it enters Herefordshire it bends E. by S. to reach the city of Hereford. It soon receives the Lugg, which, augmented by the Arrow and the Frome, joins from the N. The course of the Wye now becomes extremely sinuous; and the valley narrows nearly to Chepstow. For a short distance the Wye divides Herefordshire from Gloucestershire, and for the rest of its course Gloucestershire and Monmouthshire. It passes Mon- mouth, where it receives the Monnow on the right, and finally Chepstow, 2 m. above its junction with the Severn estuary. The river is navigable for small vessels for 15 m. up from the mouth on high tides, but there is not much traffic above Chep- stow. The average spring rise of the tide is 38 ft. at Chepstow, while 50 ft. is sometimes exceeded; the average neap rise is 28ˆ ft. The scenery is finest between Rhayader and Hay in the upper part, and from Goodrich, below Ross, to Chepstow in the lower, the second being 1 he portion which gives the Wye its fame.

The name of Wye belongs also to two smaller English rivers— (1) a right-

bank tributary of the Derbyshire Derwent, rising in the uplands near Buxton, and having part of its early course through one of the caverns characteristic of the district; (2) a left-bank tributary of the Thames, watering the valley of the Chilterns in which lies Wycombe and joining the main river near Bourne End.

WYKES, THOMAS, English chronicler, was a canon regular of Oseney Abbey, near Oxford. Hewasthe author of a chronicle extending from 1066 to 1 289, which is printed among the monastic annals edited by H. R. Luard for the " Rolls " Series. He gives an account of the barons' war from a royalist standpoint, and is a severe critic of Montfort's policy. He is of some value for the reign cf Edward I. His work is closely connected with the Oseney Annals, which are printed parallel with his work by Luard, but from 1258 to 1278 Wykes is an independent authority.

See H. R. Luard's Annales monast-ki, vol. iv. (1869); and earlier edition in Gale's Scriptorcs quinque, pp. 21-128.

WYLIE, ALEXANDER (1815-18S7), British missionary, was born in London on the 6th of April i8r5, and went to school at Drumlithie, Kincardineshire, and at Chelsea. While appren- ticed to a cabinet-maker he picked up a Chinese grammar written in Latin, and after mastering the latter tongue made such good progress with the former, that in 1846 James Legge engaged him to superintend the London Missionary Society's press at Shanghai. In this position he acquired a wide knowledge of Chinese religion and civilization, and especially of their mathe- matics, so that he was able to show that Sir George Horner's method (1819) of solving equations of all orders had.been known to the Chinese mathematicians of the 14th century. He made several journeys into the interior, notably in 1858 with Lord Elgin up the Yang-tsze and in 1868 with Griffith John to the capital of Sze-ch'uen and the source of the Han. From 1863 he was an agent of the British and Foreign Bible Society. He settled in London in 1877, and died on the roth of February 1887.

In Chinese he published books on arithmetic, geometry, algebra (De Morgan's), mechanics, astronomy (Ilerschel's), and The Marine Steam Engine (T. J. Main and T. Brown), as well as trans- lations of the first two gospels. In English his chief works were Notes on Chinese Literature (Shanghai, 1867), and scattered articles collected under the title Chinese Researches by Alexander Wylie (Shanghai, 1897).

See H. Cordier, Life and Labours of A. Wylie (18S7).

WYLIE, ROBERT (1839-1877), American artist, was born in the Isle of Man in 1839. He was taken to the United States when a child, and studied in the schools of the Pennsylvania Academy of the Fine Arts, Philadelphia, the directors of which sent him to France in 1863 to study. He won a medal of the second class at the Paris Salon of 1872. He went to Pont Aven, Brittany, in the early sixties, where he remained until his death on the 4th of February 1877. He painted Breton peasants and . scenes in the history of Brittany; among his important works was a large canvas, " The Death of a Vendean Chief," now at the Metropolitan Museum of Art, New York.

WYMONDHAM (pronounced Windham), a market town in the mid-parliamentary division of Norfolk, England, 10 m. S.W. of Norwich by the Great Eastern railway. Pop. (1901) 4764. The church of St Mary the Virgin rises on an eminence on the outskirts of the town. It was attached to a Benedictine priory, founded about the beginning of the 12th century as a cell of St Albans abbey by William de Albini. In 1448 this foundation became an abbey. The nave is of ornate Norman work, with a massive triforium, surmounted by a Perpendicular clerestory and a beautiful wooden roof. The broad N. aisle is Perpendicular, and has also a very fine rood screen. At the W. end there is a lofty and graceful Perpendicular tower. The choir, which was used as the conventual church, has left only slight traces, and one arch is standing of a large chapel which adjoined it on the S. In the centre of the town is a picturesque half-timbered market cross (1616), with an octagonal upper chamber raised on massive pillars of wood. A chapel, dedicated to St Thomas of Canterbury, is used as a grammar school. At Wymondham on the 7th of July a festival was formerly held in honour of the saint. It was at this festival in 1549 that the rebellion of Robert Ket or Kett came to a head.

WYNAAD, or Wain ad, a highland tract in S. India, forming part of Malabar district, Madras. It consists of a table-land amid the W. Ghats, 60 m. long by 30 m. broad, with an average elevation of 3000 ft.; pop. (1901) 75,149. It is best known as the district where a large amount of British capital was sunk during the decade 1876-1886 in gold mines. It had yet earlier been a coffee-planting district, but this industry has recently declined. Tea, pepper and cardamoms are produced in increasing quantities. There are also valuable forest reserves.

WYNDHAM, SIR CHARLES (1837-), English actor, was born in Liverpool on the 23rd of March 1837, the son of adoctor. He was educated abroad, at King's College, London and at the College of Surgeons and the Peter Street Anatomical School, Dublin, but his taste for the stage was too strong

for him to take up either the clerical or the medical career, suggested for him, and early in 1862 he made a first appearance in London as an actor. Later in the year, being in America, he volunteered during the Civil War, and became brigade surgeon in the Federal army, resigning in 1864 to appear on the stage in New York with John Wilkes Booth. Returning to England, he played at Manchester and' Dublin in Her Ladyship's Guardian, his own adaptation of Edward B. Hamley's novel Lady Lee's Widowhood. He reappeared in London in 1866 as Sir Arthur Lascellcs in Morton's All that Glitters is not Gold, but his great success at that time was in F. C. Burnand's burlesque of Black-eyed Susan, as Hatchett, " with dance." This brought him to the St James's theatre, where he played with Henry Irving in Jdalia; then with Ellen Terry in Charles Reade's Double Marriage, and Tom Taylor's Still Waters Run Deep. As Charles Surface, his best part for many years, and in a breezy three-act farce, Pink Dominoes, by James Albery, and in Brighton, an anglicized version of Saratoga by Branson Howard (1842-1908), who married his sister, he added greatly to his popularity both at home and abroad. In 1876 he took control of the Criterion theatre. Here he produced a long succession of plays, in which he took the leading part, notably a number of old English comedies, and in such modern plays as The Liars, The Case of Rebellious Susan and others by Henry Arthur Jones; and he became famous for his acting in David Garrick. In 1899 he opened his new theatre, called Wyndham's. In 1902 he was

knighted. From 1885 onwards his leading actress was Miss Mary Moore (Mrs Albery), who became his partner in the proprietorship of the Criterion and Wyndham's theatres, and of his New Theatre, opened in 1903; and her delightful acting in comedy made their long association memorable on the London stage.

WYNDHAM, SIR WILLIAM, Bart. (1687-1740), English politician, was the only son of Sir Edward Wyndham, Bart., and a grandson of William Wyndham (d. 1683) of Orchard Wynd- ham, Somerset, who was created a baronet in 1661. Educated at Eton and at Christ Church, Oxford, he entered parliament in 1 7 to and became secretary-at-war in the Tory ministry in 1712 and chancellor of the exchequer in 1713. He was closely associated with Lord Bolingbroke, and he was privy to the attempts made to bring about a Jacobite restoration on the death of Queen Anne; when these failed he was dismissed from office. In 1715 the failure of a Jacobite movement led to his imprison- ment, but he was soon set at liberty. Under George I. Wyndham was the leader of the opposition in the House of Commons, fighting for his High Church and Tory principles against Sir Robert Walpole. He was in constant communication with the exiled Bolingbroke, and after 1723 the two were actively associ- ated in abortive plans for the overthrow of Walpole. He died at Wells on the 17th of June

1740. Wyndham's first wife was Catherine, daughter of Charles Seymour, 6th duke of Somerset. By her he had two sons, Charles, who became 2nd earl of Egre- mont in 1750, and Percy, who took the name of O'Brien and was created earl of Thomond in 1756.

The Wyndham Family. Sir John Wyndham, a Norfolk man, was knighted after the battle of Stoke in 1487 and beheaded for high treason on the 2nd of May 1502. He married Margaret, daughter of John Howard, duke of Norfolk, and his son Sir Thomas Wyndham (d. 1521), of Felbrigg, Norfolk, was vice- admiral of England under Henry VIII. By his first wife Sir Thomas was the father of Sir John Wyndham, who married Elizabeth, daughter of John Sydenham of Orchard, Somerset, and founded the Somerset branch of the family, and also of Sir Edmund Wyndham of Felbrigg, who was sheriff of Norfolk at the time of Robeit Ket's rebellion. By his second wife Sir Thomas was the father of the seaman Thomas Wyndham (c. 1510-1553), an account of whose voyage to Morocco in 1552 is printed in Hakluyt's Voyages.

From Sir John Wyndham of Orchard Wyndham was de- scended Thomas Wyndham (1681-1745), lord chancellor of Ireland from 1726 to 1739, who in 1731 was created Baion Wynd- ham of Finglass, a title which became extinct on his death. His nephew, Henry Penruddocke Wyndham (1736-1819), the topo- grapher, wrote A Gentleman's Tour through M onmouthshife and Wales in June and July 1774 (1775); and Wiltshire from Domes- day Book, with a Translation of the Original Latin into English (Salisbury, 1788).

Sir John Wyndham of Orchard Wyndham was also the ancestor of the Windhams of Felbrigg, who adopted this form of spelling the family name, the most noteworthy members of which were the statesman William Windham (q.v.) f and Sir Charles Ash Windham (1810-1870), a soldier who commanded in the Crimea and in the Indian Mutiny.

The Wyndhams are also connected through a female line with the family of Wyndham-Quin, which holds the earldom of Dun- raven. Valentine Richard Quin (1752-1824), of Adare, county Limerick, was created Baron Adare on the union with England in 1800, and earl of Dunraven and Mount-Earl in 1822. His son, the 2nd earl (1 782-1850), married Caroline (d. 1870), daughter and heiress of Thomas Wyndham of Dunraven Castle, Glamorgan- shire, and took the name of Wyndham-Quin. Their son, the 3rd earl (1812-1871), who was created a peer of the United Kingdom as Baron Kenry in 1866, was a well-known man of science, especially interested in archaeology. His son, Windham Thomas Wyndham-Quin (b. 1841), the 4th earl, was under- secretary for the colonies in 1885-1887, and became later a prominent figure in Irish politics, as

chairman of the Irish Land Conference and president of the Irish Reform Association;

he was also prominent as a yachtsman, competing for the America cup (see Yachting) in 1893 an d 1895.

WYNN, SIR JOHN (1553-1627), Welsh antiquary, was the son of Morris Wynn and descended from the princes of Wales. He was educated at Oxford, succeeded to his father's estate of Gwydir in Carnarvonshire in 1580, and was member of parlia- ment for this county in 1586. In 1606 he was made a knight and in 161 1 a baronet. He was interested in several mining ventures and also found time for antiquarian studies. He died on the 1st of March 1627. At Llanrwst Wynn founded an hospital and endowed a school. His History of the Gwydir FamUy, which had a great reputation in North Wales, was first published by Daines Harrington in 1770, and in 1878 an edition was published at Oswestry. It is valuable as the only work which describes the state of society in North Wales in the 15th and the earlier part of the 1 6th century. His son Richard (d. 1649) was in attendance on Prince Charles, afterwards Charles I., when he visited Spain in ˆ623, and was afterwards treasurer to Queen Henrietta Maria; he wrote an account of the journey to Spain, published by T. Hearne in 1729 with the Historia viiae et regni Kicardi II. He built the bridge over the Conway at Llanrwst. The baronetcy became extinct in 1719, when Wynnstay, near Ruabon, passed to Sir Watkin Williams, who took the name of Williams-Wynn and founded the family of that name.

*Sir John Wynn's estate of Gwydir came to the 1st duke of Ancaster in the 17th century by his marriage with the heiress of the Wyims. On the death of the last duke in 17 70, Gwydir was inherited by his sister Priscilla, Lady Willoughby de Eresby in her own right,. whose husband was created Baron Gwydir. On the death of Alberic, Lord Willoughby de Eresby (1870), this title (now merged in that of earl of Ancaster) fell into abeyance between his two daughters, while that of Baron Gwydir passed to his cousin and heir male Gwydir itself was sold by the earl of Ancaster in 1895, the house and part of the estate being bought by Earl Carrington, w*ho also claimed descent from Sir John Wynn.*

WYNTOUN, ANDREW OF (?i35o-?i42o), author of a long metrical history of Scotland, called the Orygynale Cronykil of Scotland, was a canon regular of St Andrews, and prior of St Serf's in Lochleven. He wrote the Chronicle at the request of his patron. Sir John of Wemyss, whose

representative, Mr Erskine Wemyss of Wemyss Castle, Fifeshire, possesses the oldest extant MS. of the work. The subject is the history of Scotland from the mythical period (hence the epithet " original ") down to the accession of James I. in 1406. The earlier books are of no historical value, but the later have in all outstanding matters stood the test of comparison with contemporary records. The philological interest is great, for few works of this date, and no other of like magnitude, are extant in the vernacular.

The text is preserved in eight MSS., of which three are in the British Museum, the Royal (17 D xx.), the Cottonian (Nero D. xi.) and the Lansdowne (197); two in the Advocates' library, Edinburgh (19, 2, 3 and 19, 2, 4), one at Wemyss Castle (u.s.) ; one in the university library at St Andrews, and one, formerly in the possession of the Boswells of Auchinleck, now the property of Mr John Ferguson, Duns, Berwickshire. The first edition of the Chronicle (based on the Royal MS.) was published by David Macpherson in 1795; the second by David Laing, in the series of " Scottish Historians " (Fdin., 1872). Both are superseded by the elaborate edition by Mr Amours for the Scottish Text Society (1906).

WYOMING, one of the Central Western states of the United States of America, situated between the parallels cf latitude 41 and 45 K., and the meridians of longitude 27 and 34 W. of Washington. It is bounded on the N. by Montana, on the E. by S. Dakota and Nebraska, on the S. by Colorado and Utah, and on the W. by Utah, Idaho, and a small southward projection of Montana. The state has a length of about 375 m. E. and W. along its southern border and a breadth of 276 m. N. and S. It has an area of 97,914 sq. m., of which 320 sq. m. are water surface

Physical Features. — The greater portion of the state belongs to the Great Plains Province, which extends from N. to S. across the United States between the 100th meridian and the Rocky Mountains. Within this province are found the Black Hills of S. Dakota, and thˆir W. slopes extend across the boundary into N.E, Wyoming. The N.W. portion of the state is occupied by the S. end of the

Northern Rocky Mountain Province; and the N. end of the Southern Rockies extends across the Colorado line into southern Wyoming. The Great Plains in Wyoming have an elevation of from 5000 to 7000 ft. over much of the state, and consist of flat or gently rolling country, barren of tree growth, but often covered with nutritious grasses, and affording pasturage for vast numbers of live stock. Erosion buttesand mesas occasionally rise as picturesque monuments above the general level of the plains, and in the vicinity of the mountains the plains strata, elsewhere nearly horizontal, are bent sharply upward and carved by erosion into " hogback " ridges. These features are well developed about the Bighorn

Mountains, an outlying member of the Rockies which boldly interrupts the con- tinuity of the plains in north-central Wyoming. The plains sedi- ments contain important coal beds, which are worked in nearly every county in the state. In the region between the Northern and Southern Rockies, the plains are interrupted by minor Mountain groups, volcanic buttes and lava flows, among which the Leucite Hills and Pilot Butte are prominent examples.

Notwithstanding these elevations, this portion of the state makes a distinct break in the continuity of the Northern and Southern Rockies, giving a broad, relatively low pass utilized by the Oregon Trail in early days, and by the Union Pacific railway at a later period. The Black Hills District in the N.E. contains the Little Missouri Buttes and the Mato Tepee (or Devil's Tower), prominent erosion remnants of volcanic intrusions. Local glaciation has modified the higher levels of the Bighorn Mountains, giving glacial cirques, alpine peaks and many mountain lakes' and waterfalls. Several small glaciers still remain about the base of Cloud Peak, the highest summit in the range (13,165 ft.). The Southern Rockies end in broken ranges with elevations of 9000 ft. and over. That portion of the Northern Rockies extending into the N.W. of the state affords the most magnificent scenery. Here is the Yellowstone National Park (q.v.). Just S. of the Park the Teton Mountains, rising abruptly from the low basin of Jackson's Hole to elevations of 10,000 and 11,000 ft., form a striking feature. In the Wind River Range, farther S.E., are Gannett Peak (13,775 ft.), the highest point in the state, and Fremont Peak (13,720 ft.). In addition to the hot springs of the Yellowstone region, mention should be made of large hot springs at Thermopolis and Saratoga, where the water has a temperature of about 135 F.

Much of the state is drained by branches of the Missouri river, the most important being the Yellowstone, Bighorn and Powder rivers flowing N. r and the Cheyenne and North Platte flowing E. The Green river, a branch of the Colorado, flow's S. from the S.W. of the state, while the Snake river rises farther N. and flows W. to the Pacific drainage. S.W. of the centre of the state is an area with no outward drainage, the streams emptying into desert lakes.

Fauna. — Great herds of bison formerly ranged the plains and a few are still preserved in the National Park. The white-tailed Virginia deer inhabits the bottom lands and the mule deer the more open country. Lewis's prairie dog, the cottontail rabbit, the coyote, the grey wolf and the kit fox are all animals of the plains. In the mountains are elk, puma, lynx, the varying hare and snowshoe rabbit, the yellow-haired porcupine, Fremont's and Bailey's squirrels, the mountain sheep, the four-striped chipmunk, Townsend's spermo- phile, the prong-horned antelope, the cinnamon pack-

rat, grizzly, brown, silvertip and black bears and the wolverine. Other animals, more or less common, are the black-tailed deer, the jackrabbit, the badger, the skunk, the beaver, the moose and the weasel. The prairie rattlesnake is common in the dry plains country.

The streams are well stocked with rainbow and brook trout. The former fish were introduced from Calif orniain 1885. They thrivein the Wyoming streams and rivers and are superior game fish. Specimens of eight and ten pounds weight have been taken by rod and fly fishermen from the Big Laramie river. Other fish native to the waters of the state are the sturgeon, catfish, perch (locally called pike), buffalo fish, flathead and sucker.

There is a great variety of birds. Eared grebes and ring-billed gulls breed on the sloughs of the plains, and rarely the white pelican . nests about the lake shores. Here, too, breed many species of ducks, the mallard, gad wall, baldpate, three species of teal, shoveler, pin- tail, hooded mergansers, and Canada geese; other ducks and geese are migrants only. Formerly the trumpeter swan nested here. On the plains a few waders breed, as the avocet, western willet and long- billed curlew; but most are birds of passage. At high altitudes the mountain plover is found ; the dusky grouse haunts the forests above 8000 ft. ; the white-tailed ptarmigan is resident in the alpine regions; and on the plains are found the prairie sharp-tailed grouse and the sage-hen. The turkey-buzzard is found mainly in the plains country. Various hawks and owls are common; the golden eagle nests on the mountain crags and the burrowing owl on the plains. The red-naped sapsueker and Lewis's woodpecker are conspicuous in wooded lands; Nuttall's poor-will, Say's phoebe, the desert horned lark, Bullock's oriole, the yellow-headed blackbird and McCown's longspur are characteristic of the open lowlands.

Flora. — Forest growth in Wyoming is limited to the highest mountain ranges, the most important forests being in the Black Hills region in the K.E., on the lower slopes of the Bighorn Mountains, and in the Rocky Mountain ranges of the N.W. of the state, including Yellowstone National Park. The yellow pine is the most important tree in the Bighorns, and small lodge-pole pine makes up the greater

part of the N.W. forests. White fir is found above the foothill zone, and heavy growths of cottonwood along the streams in the Bighorn region. The Douglas spruce and Rocky Mountain white pine are common in the forests of the Medicine Bow Mountains, from which much of the native lumber

used in the S. of the state is secured. Other trees are the juniper, willow, green ash, box eldei, scrub oak, wild plum and wild cherry. Occasional cottonwoods along streams are the only trees on the plains. The common sage brush, artemisia, is the characteristic shrub of the plains where the soil is comparatively free from alkali, and is abundant in the valleys of the arid foothills. Where alkali is present, the plains may be nearly barren, or covered with grease wood and species of atriplex, including the so-called white sage. Grease wood is likewise abundant in the foothills wherever the soil contains alkali. Various species ot nutritious grasses cover much of the plains and foothills, and even clothe the apparently barren mountain peaks.

Climate. — In the lower Bighorn Valley, summer temperatures rise to 95 or 100 , but at heights of 6000 to 7000 ft- on neighbouring ranges, summer temperatures seldom rise above 90 °, and frosts may occur at any time Elevations under 6000 ft. have a mean annual temperature of from 40 ° to 47 , but high mountain areas and cold valleys may have mean temperatures as low as 34 The air is clear and dry, and although temperatures of ioo° are recorded, sun- strokes are practically unknown. Winter temperatures as low as -51 ° have been recorded, but these very low temperatures occur in the vallevs rather than on the higher elevations. The cold is sharp and bracing rather than disagreeable, on account of the dryness of the air; and the periods of cold weather are generally of short duration. The winter climate is remarkably pleasant as a rule, and outdoor work may usually be carried on without discomfort.

The following figures give someridea of the climatic variations. At Basin, in the Bighorn Valley, the mean winter temperature is 16°, the summer mean 72 . Thayne, on the mountainous W. border of the stare, nas a winter mean of 19 , and a summer mean of but 59°; Cheyenne in the S.E., has a winter mean of 27°, and a summer mean of 65 . The percentage of sunshine in the state is high. Precipitation varies in different areas from 8 to 20 in., the average for the state being 12-5 in. Wyoming thus belongs with the arid states, and irrigation is necessary for agriculture. A greater pre- cipitation doubtless prevails on the higher mountains, but trust- worthy records are not available. Spring is the wettest season. The prevailing winds are W. and reach a high velocity on the level plains.

Soil. — While some of the more arid districts have soils so strongly alkaline as to be practically unreclaimablc, there are extensive areas of fertile lands which only require irrigation to make them highly productive. Alluvial deposits brought down by mountain streams, and strips of flood plain along larger streams on the plains are very fertile and well repay irrigation. Lack of water rather than poverty of sod renders most 'of the plains region fit for grazing only. In the mountains, ruggedness combines with thin and scattered soil to make these districts of small agricultural value.

Agriculture. —The total area in farms in 1880 was 124,433 acres, ° which 83,122 acres (66 8%) were improved; in 1900 it was 8,124,536 acres, of which 792,332 acres (9-8%) were improved. The large increase in unimproved acreage in farms was principally due to the increased importance in sheep-raising. In 1909 Wyoming ranked first among the states in the number of sheep and the production of wool. The number of sheep in 1909 was 7,316,000, valued at $32,190,000, being more than one-eighth in numbers and nearly one- seventh in value of all sheep in the United States. The production of wool in 1909 was 38,400,000 lb of washed and unwashed wool and 12,288.000 lb of scoured wool. The average weight per fleece was 8 lb. The Bureau of Animal Industry of the U.S. Department of Agri- culture has made experiments in breeding range sheep in Wyoming. The total number of neat cattle on farms and ranges in 1910 was 986,000 (including 27,000 milch cows) valued at $26,277,000; horses, 148,000, valued at $i2,284,ooo; 1 mules, 2000, valued at $212,000; and swine, 21,000, valued at §178,000.*

In 1909 the hay crop (alfalfa, native hay, timothy hay, &c.) was 665,000 tons, valued at $5,918,000 and raised on 277,000 acres. The cereal crops increased enormously in the decade 1899-1909. The principal cereal crop in 1909 was oats, the product of which was 3,500,000 bushels, grown on 100,000 acres and valued at $1,750,000. The wheat crop increased from 4674 bushels in 1879 to 2,297,000 bushels in 1909, grown on 80,000 acres and valued at $2,274,000. The product of Indian corn in 1909 was 140,000 bushels, grown on 5000 acres and valued at $109,000.

Mining. — The development of Wyoming's naturally rich mineral resources has been retarded by inadequate transport and by in- sufficient capital. The value of the state's mineral product was $5,684,286 in 1902 and §9,453,341 in 1908. In 1908 Wyoming ranked twelfth among the states of the Union in the value of its output of bituminous coal. Other mineral products of the state are

1 The breed of horses in Wyoming has improved rapidly; in 1904, when the U.S. Department of Agriculture purchased eighteen mares and a stallion in hope of improving the American carriage horse, six of the mares were from Wyoming and were principally of Morgan stocks.

copper, gold, iron, petroleum, asbestos, soda, silver and lead, gypsum, stone and clay products. The original coal supply of the present state has been estimated (by the United States Geological Survey) at 424,085,000,000 short tons of the bituminous or sub-bituminous variety, this amount being second only to that for North Dakota, 500,000,000,000 short tons i which, however, is entirely lignite. Goal was first mined in what is now r Wyoming in 1865, probably in con- nexion with the building of the Union

Pacific railway, and the pro- duct in that year was 800 short tons. Thereafter the industry developed steadily and the product in 1908 was 5,489,902 tons, valued at $8,868,(57, In 1908 (and for several years before) the largest product of coal (2,180,933 tons) came from Sweetwater county, in the S.W. of the state, and Uinta county (adjoining Sweet- water county on the W.) had the next largest product, 1 ,380,488 tons. Sheridan county, in the north-central part of the state, Carton county, in the south-central part and Weston county in the N.E. were the next largest producers. The product of coal to the end of 1908 was 125,000,000 short tons, or 0-029 % °f the estimated supply.

The mining product next in value to coal in 1908 was copper, taken chiefly in Carbon county in a zone of brecciated quartzite underlying schist, the original ore being chalcopyrite, with possibly some pyrite, a secondary enrichment, which has produced im- portant bodies of chalcocite in the upper workings, but these are replaced by chalcopyrite at greater depth. The production in 1908 was 2,416,197 ft>, valued at $318,938. The gypsum product (from the Laramie plains) in 1908 was 31,188 tons, valued at $94,935.

There are extensive deposits of petroleum and natural gas, which have become of commercial importance. Oil has been found in eighteen different districts, the fields being known as follows : — The Carter, HilUard, Spring Valley and Twin Creek in Uinta county ; the Popo Agie, Lander, Shoshone, Beaver and a part of Dutton in Fremont county; the Rattlesnake, Arrago, Oil Mountain and a part of Dutton, Powder river and Salt Creek in Natrona county; part of Powder river and Salt Creek in Johnson county; Newcastle in Weston county ; Belle Fourche in Crook county ; Douglas in Converse county and Bonanza in Bighorn county. The Popo Agie and Lander fields produce the largest quantities of oil, the wells being

Eartly gushers from which a heavy fuel oil is obtained. This is now eing used by the Chicago & North Western Railroad Company on its locomotives, and it is also used in Omaha (Nebraska) by manufactur- ing establishments. There is a great variety in the grades of oils Produced in the state, ranging from the heavy asphaltic oils of the opo Agie and Lander fialds to the high-grade lubricants and superior light products obtained from the wells in the Douglas, Salt Creek and Umta county fields. Natural gas in quantity has been found in the Douglas field and in Bighorn county.

The iron deposits are very extensive, and the ores consist of red haematites, magnetites, titanic, chrome and manganese irons. In nearly every county there arc veins of iron ore of varying extent and quality, the most important being at Hartville, Laramie county, Iron Mountain, Albany county, the Seminole and Rawlins in Carbon county. The Hartville ores are

remarkable for their high grade and purity, running from 60 to 70% metallic iron, with 2! to 5% silica, and only traces of sulphur and phosphorus. The ore is a red haema- tite occurring in slate. The iron ore from this district obtained the grand prize at the World's Fair held in Chicago in 1 893, in competi- tion with iron ores from all parts of the world. The Hartville iron deposits are worked by the Colorado Fuel & Iron Company, which ships large quantities of ore to its furnaces at Pueblo, Colorado. The discovery of natural gas in the Douglas oil field has opened up the possibility of working a smelting plant at the mines by means of this cheap and convenient fuel. The distance to be covered by a pipe line is not prohibitive, and the matter has been under considera- tion by the owners and lessees of the iron mines.

There are sandstone deposits in Carbon county, which supplied the stone for the Capitol at Cheyenne and the state penitentiary; and from the Iron mountain quarries in Laramie county was taken the white variety used in building the Carnegie library and the Federal building in Cheyenne. Sandstones and quartzites were also quarried in 1902 in Albany, Crook and Uinta counties. Limestone occurs in thick formations near Lava Creek, and in the valley of the Fast Fork of the Yellowstone river; also near the summit of the Owl Creek range, and in the Wind River range. Gold was discovered on the Sweetwater river in 1867, and placer and quartz deposits have been found in almost every county in the state. Sulphur has been found near Cody and Thermopolis.

Irrigation.— The irrigable area of Wyoming is estimated at about 6,200,000 acres, lying chiefly in Bighorn, Sheridan and Johnson counties in the N.W 7 . of the state, and in Laramie, Albany and Carbon counties in the S.E., though there are large tracts around the head- waters of the Bighorn river, in Fremont county in the west-central part, along the North Platte river and its tributaries in Converse county in the central part, and along the Green river and its tribu- taries in Sweetwater and Uinta counties in the S.W. Under the Carey Act and its amendments Congress had in 1909 given to the state about 2,000,000 acres of desert land on condition that it should be reclaimed, and in that year about 800,000 acres were in process of reclamation, mostly by private companies. Settlers intending to occupy such lands must satisfy the state that they have entered into contracts with the irrigating company for a sufficient water-right

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and a perpetual interest in the irrigation works. The principal undertaking of the Federal government is the Shoshone project in Bighorn county. This provides for a storage reservoir, controlled by Shoshone dam on Shoshone river, about 8 m. above Cody ; a canal diverting water from Shoshone reservoir round the N. of Shoshone dam and covering lands in the vicinity of Cody, Corbett, Eagle Nest and Ralston; a dam at Corbett about 16 m. below the reservoir diverting water to Ralston reservoir and thence to lands in the vicinity of Ralston, Powell, Garland, Mantua and Frannie, and a dam on the Shoshone river near Eagle Nest diverting water into a canal covering the lands of the Shoshone River Valley. This project was authorized in 1904; it will affect, when completed, 131,900 acres, of which in 1909 about 10,000 acres were actually under irriga- tion. Near Douglas, in Converse county, there is a reinforced con- crete dam, impounding the waters of Laprele Creek, to furnish water for over 30,000 acres, and power for transmitting electricity. There are large irrigated areas in Johnson and Sheridan counties.

Forests.— The woodland area of Wyoming in 1900 was estimated at 12,500 sq. m. (13% of the area of the state), of which the United States had reserved about 3500 sq. m. in the Yellowstone National Park and 5207 sq. m., chiefly in the Bighorn Mountains in the N., and the Medicine Bow Mountains in the S.E. of the state. The saleable timber consists almost entirely of yellow pine, though there is a relatively small growth of other conifers and of hard-wood trees.

Manufactures. — Wyoming's manufacturing industries are relatively unimportant. In the period 1 900-1 905 the value of factory pro- ducts increased from $3,268,555 to $3,523,260; the amount of capital invested, from $2,047,883 to $2,695,889, and the number of establishments from 139 to 169; the average number of employees decreased from 2060 to 1834. In the same period (1900—1905), the value of the products of urban l establishments decreased from $1,332,288 to $1,244,223, and the amount of capital invested in- creased from $871,531 to $988,615; but the value of the products of rural establishments increased from $1,936,267 to $2,279,037, and the capital invested from$i, 176,352 to $1,707,274. The values of the products of the principal industries of the state in 1905 were: car and general shop construction and repairs by steam railway companies, $1,640,361; lumber and timber products, $426,433; flour and grist mill products, $283,653; butter, $114,354. Among other manufactures were gypsum wall-plaster, saddlery and harness, malt liquors and tobacco, cigars and cigarettes.

Transport. — There has been relatively little development of trans- port facilities in Wyoming. The railway mileage, which was only 459 m. in 1870, increased to 1002 m. in 1890, 1280 m. in 1905, and 1623 m. on

the ist of January 1909. The Union Pacific railway crosses the S. of the state, connects with the Oregon Short Line at Green river and extends both E. and S. from Cheyenne. The Colorado & Southern (controlled by the Chicago, Burlington & Quincy Railroad Company) extends N. from Cheyenne to Orin Junction, where it connects with the Chicago & North Western, which runs across the south-central part of the state as far as Lander (under the name of the Wyoming & NorthWestern railroad). Four branches of the Chicago, Burlington & Quincy system enter or cross the state. One extends from Cheyenne S.E. to Holdredge, Nebraska; the main line crosses the N.E. of the state to Billings, Montana, whence it extends S. to Cody and Kirby in the Bighorn basin, Wyoming; while another branch from Alliance, Nebraska, extends to the iron mines at Guernsey. The Chicago, Burlington & Quincy was build- ing in 19 10 a new line from the N.W. to connect with the Colorado & Southern line at Orin Junction, passing through Douglas. When completed to Orin Junction this will be a main through route from the Mexican Gulf to the N.W. Pacific coast. There are also several shorter railways in the state, and various stage lines reach the more inaccessible regions.

Population. — The population in 1870 was 91 18; in 1880, 20,789; in 1890, 60,705; in 1900, 02,531; in 1910, 145,965. The density of the population was o-6 per sq. m. in 1890 and i-.S per sq. m. in ryio, there being in this year only one state with a smaller average number of inhabitants to the sq. m., namely Nevada, with 0-7. Of the total population in 1900, 88,051,. or 96-2%, were whites; 1686 were Indians; 940 were negroes; 461 were Chinese and 393 were Japanese. The Indians are all taxed. They belong to the Arapaho and Shoshoni tribes. 2 The Wind River Reservation, under the Shoshoni School, is in the central part of the state. There were 17,415 foreign-born in the state in igoo, of whom 2596 were English, 2146 Germans, 1727 Swedes, 1591 Irish, 1253 Scotch and 1220 Finns. Of the 41,993 persons of foreign parentage (i.e. having either or both parents of foreign birth) in that year 4973 were of English, 4571 of German, and 4482 of Irish parentage, i.e. on both the father's and the mother's side. Of the 75,116 born in the United States,

1 That is, those in the two municipalities (Cheyenne and Laramie) having a population in 1900 of more than 8000.

1 The Report of the Commissioner of Indian Affairs for 1909 gives 854 Arapaho and 816 Shoshoni under the Shoshoni School.

19,507 were natives of Wyoming, 6112 were born in Iowa, S009 in Nebraska, 4923 in Illinois, 4412 in Missouri and 3750 in Utah. Among the numbers of religious denominations in 1906 the Roman Catholics, with 10,264 communicants, had the largest membership, followed by the Latter-

*day Saints, or Mormons, with 5211 communicants (21-8% of the total church membership for the state), the Protestant Episcopalians with 1741, the Methodists with 161 2 and the Presbyterians with 984. The urban population (i.e. the population of places having 4000 inhabitants or more) increased from 18,078 in 1890 to 26,657 in 1900 or 47*5%, the urban being 28-8% of the total population in 1900. The semi-urban population (i.e. population of incor- porated places, or the approximate equivalent, having fewer than 4000 inhabitants) decreased in the same period from 14,910 to 12,725, and the rural population (i.e. the population outside of incorporated places) increased from 29,567 to 53,149, which was 78-7% of the total increase. The principal cities of the state (with population) in 1900 were: Cheyenne, 14,087; Laramie, 8207; Rock Springs, 4363; Rawlins, 2317, and Evanston, 2110. After 1900 the population of the centre and N. of the state increased in proportion faster than the older settled portions in the S. In 1910 Sheridan (840S) in Sheridan county, Douglas in Converse county and Lander in Fremont county were as import- ant as some of the older towns of the southern part of the state.*

Government. — Wyoming is governed under its first constitution, which was adopted in November 1889. An amendment may be proposed by either branch of the legislature. If it is approved by two-thirds of the members of each branch, it must be sub- mitted to the people at the next general election and, if approved by a majority of the electors, it then becomes a part of the con- stitution. Whenever two-thirds of the members elected to each branch of the legislature vote for a convention to revise or amend the constitution and a majority of the people voting at the next general election favour it, the legislature must provide for calling a convention. Suffrage is conferred upon both men and women, and the right to vote at a general election is given to all citizens of the United States who have attained the age of twenty-one years, are able to read the constitution, and have resided in the state one year and in the county sixty days immediately preceding, with the exception of idiots, insane persons, and persons convicted of an infamous crime; at a school election the voter must also own property on which taxes are paid. General elections are held biennially, in even-numbered years, the first Tuesday after the first Monday in November, and each new administration begins the first Monday in the' following January .

Executive. — The governor is elected for a term of four years. He must be at least thirty years of age, and have resided in the state for five years next preceding his election. If the office becomes vacant the secretary of state becomes acting governor; there is no lieu- 1 tenant-governor, The governor, with the concurrence of the Senate, appoints the atLorney-general, the state engineer and the members of several boards and commissions. I le has the power to veto bills, to pardon, to grant reprieves and commutations, and to

remit fines and forfeitures, but the Board of Charities and Reform constitutes a Board of Pardons for investigating all applications for executive clemency and advising the governor with respect to them. The secretary of state, auditor, treasurer and superintendent of public instruction are elected for the same term as the governor.

Legislature.— The legislature consists of a Senate and a House of Representatives. The number of representatives must be not less than twice nor more than three times the number of senators. One- half the senators and all the representatives are elected every two years. Both senators and representatives are apportioned among the several counties according to their population; each county, how- ever, is entitled to at least one senator and one representative. The legislature meets biennially, in odd-numbered years, on the second Tuesday in January, and the length of its sessions is limited to forty days. All bills for raising a revenue must originate in the House of Representatives, but the Senate may propose amendments. The governor has three days (Sundays excepted) in which to veto, any bill or any item in an appropriation bill, and a two-thirds vote of the members elected to each house is required to override his veto.

Judiciary. — The administration of justice is vested principally in a supreme court, district courts, justices of the peace and municipal courts. The supreme court consists of three justices who are elected by the state at large for a term of eight years, and the one having the shortest term to serve is chief justice. The court has original

jurisdiction in quo warranto and mandamus proceedings against state officers and in habeas corpus cases, general appellate jurisdiction, and a superintending control over the inferior courts. It holds two terms annually, at the capital, one beginning the first Monday in April and one beginning the first Monday in October. The state is divided into four judicial districts, and in each of these a district judge is elected for a term of eight years. The district courts have original juris- diction in all actions and matters not expressly vested in some other court and appellate jurisdiction in cases arising in the lower courts. Justices of the peace, one of whom is elected biennially in each precinct, have jurisdiction in civil actions in which the amount in controversy docs not exceed $200 and the title to or boundary of real estate is not involved, and in criminal actions less than a felony and in which the punishment prescribed by law does not exceed a fine of $100 and imprisonment for six months. Each incorporated city or town has a municipal court for the trial of offences arising under its ordinances.

Local Government.— A board of three commissioners is elected in each county, one for four years and one for two years at each biennial election. It has the care of the county property, manages the county business, builds and repairs the county buildings, apportions and orders the levying of taxes, and establishes the election precincts. The other county officers are a treasurer, a clerk, an attorney, a surveyor, a sheriff, a coroner and a superintendent of schools, each elected for a term of two years. A justice of the peace and a con- stable are elected for and by each precinct. Cities and towns are incorporated under general laws.

Miscellaneous Laws. — A married woman may hold, acquire, manage and convey property and carry on business independently of her husband. When a husband or a wife dies intestate one-half of the property of the deceased goes to the survivor ; if there are no children or descendants of any child three-fourths of it goes to the survivor; if there are no children or descendants of any child and the estate does not exceed $10,000 the whole of it goes to the sur- vivor. The causes for a divorce are adultery, incompetency, con- viction of a felony and sentence to imprisonment therefor after marriage, conviction of a felony or infamous crime before marriage provided it was unknown to the other party, habitual drunkenness, extreme cruelty, intolerable indignities, neglect of the husband to provide the common necessaries of life, vagrancy of the husband and pregnancy of the wife before marriage by another man than her husband and without his knowledge. The plaintiff must reside in the state for one year immediately preceding his or her application for a divorce unless the parties were married in the state and the applicant has resided there since the marriage. Neither party is permitted to marry a third party until one year after the divorce has been granted. The desertion of a wife or of children under fifteen years of age is a felony punishable with imprisonment for not more than three years nor less than one year. The homestead of a house- holder who is the head of a family or of any resident of the state who has attained the age of sixty years is exempt, to the value of $1500, or 160 acres of land, from execution and attachment arising from any debt, contract or civil obligation other than taxes, purchase money or improvements, so long as it is occupied by the owner or his or her family, and the exemption inures for the benefit of a widow, widower or minor children. If the owner is married the homestead can be alienated only with the consent of both husband and wife. The family Bible, school books, a lot in a burying-ground and $500 worth of personal property are likewise exempt to any person who is entitled to a homestead exemption. A day s labour in mines and in works for the reduction of ores is limited to eight hours except in cases of emergency where life or property is in imminent danger. The sale of intoxicating liquors is licensed only in incorporated cities and towns.

Charities and Corrections. — The state charitable and penal institu- tions consist of the Wyoming General Hospital at Rock Springs, with one branch at Sheridan and another branch at Casper; the Big Horn Hot Springs at Thermopolis, the Wyoming State Hospital for the, Insane at Evanston, the Wyoming Home for the Feeble- Minded and Epileptic at Lander, the Wyoming Soldiers' and Sailors' Heme near Buffalo, and the State Penitentiary at Rawlins. The general supervision and control of all these institutions is vested in the Board of Charities and Reform, consisting of the governor, the secretary of state, the treasurer, the auditor, and the superintendent of public instruction; the same officers also constitute the Board of Pardons. Convicts other than those for life are sentenced to the penitentiary for a maximum and a minimum term, and when one has served his minimum term the governor, under rules prescribed by the Board of Pardons, may release him on parole, but he may be returned to prison at anytime upon the request of the Board of Pardons.

Education.— The administration of the common school system is vested in the state superintendent of public instruction, county superintendents and district boards. Whenever 100 freeholders request it, the county commissioners must submit to the voters of a proposed high school district the question of establishing a high school district, and each precinct giving a majority vote for it consti- tutes a part of such a district for establishingand maintainingahigh school. All children between seven and fourteen years of age must attend a public, private or parochial school during the entire time that the public school of their district is in session unless excused by

the district board. The common schools are maintained with the proceeds of school taxes and an annual income from school funds which are derived principally from lands. At the head of the educa- tional system is the University of Wyoming (1886), at Laramie (q.v.); it is governed by a board of trustees consisting of its president, the superintendent of public instruction, and nine other members ap- pointed by the governor with the concurrence of the Senate for a term of six years. It is maintained with the proceeds from funds derived principally from lands and with a university tax amounting in 1909 to one-half mill on a dollar.

Finance. — The principal sources of revenue are a general property tax, a tax on the gross receipts of express companies, a tax on the gross products of mines, an inheritance tax, a poll tax and the sale of liquor licences. Railways, telegraph lines and mines are assessed by the state board of equalization, which consists of the secretary of state, the treasurer and. the auditor. Other property is assessed by the county assessors. The county commissioners constitute the county board of equalization. A commissioner of taxation who is appointed by the governor with the concurrence of the

Senate for a term of four years exercises a general supervision over all tax officers and the boards of equalization. By a law enacted in 1909 county commissioners are forbidden to levy a tax which will yield more than 10 % in excess of that raised the preceding year. The constitution limits the state tax for other than the support of educa- tional and charitable institutions and the payment of the state debt and the interest thereon to four mills on the dollar; the county tax for other than the payment of the county debt and the interest thereon to twelve mills on the dollar; the tax of an incorporated city or town for other than the payment of its debt and the interest thereon to eight mills on the dollar. The constitution also forbids the creation of a state debt in excess of 1 % of the assessed value of the taxable property in the state ; of a county debt in excess of 2 % of the assessed value of the taxable property in the county ; or of a municipal debt for any other purpose than obtaining a water supply in excess of 2%, unless for building sewerage, when a debt of 4% may be authorized. Wyoming entered the Union with a bonded indebtedness of $320,000. This has been reduced as rapidly as the bonds permit, and on the 30th of June 1910 the debt was only

$140,000.

History.— Spanish historians have claimed that adventurers from the Spanish settlements in the S. penetrated almost to the Missouri river during the first half of the 17th century and even formed settlements within the present limits of Wyoming, but these stories are more than doubtful. The first white men certainly known to have traversed the region were Sieur de la Verendrye and his sons, who working down from Canada spent a part of the year 1 743-1744 examining the possibilities of the fur trade. Apparently no further French explorations were made from that direction, and the transfer of Canada from France to Great Britain (1763) was followed by lessened interest in ex- ploration. The expedition of Meriwether Lewis and William Clark in 1804-1806 did not touch the region, but a discharged member of the party, John Colter, in 1807 discovered the Yellowstone Park region and then crossed the Rocky Mountains to the head of Green river. 'Trappers began to cover the N. portion about the same time, and in 181 1 the overland party of the Pacific Fur Company crossed the country on their way to Astoria. In 1824 William H. Ashley with a considerable party explored and trapped in the Sweetwater and Green river valleys, and in 1826 wagons were driven from St Louis to Wind river for the Rocky Mountain Fur Company. Captain B. L. E. Bonneville was the first to cross the Rockies with wagons (1832), l and two years later Fort Laramie, near the mouth of the Laramie river, was established to control the fur trade of the Arapahoes, Cheyennes and Sioux.

The United States exploring expedition, commanded by John Charles

Fremont, explored the Wind River Mountains and the South Pass in 1842, under the guidance of Kit Carson. From this time the favourite route to the Pacific led through Wyoming; 2 but of all the thousands who passed few or none settled per- manently within the present limits of the state, partly because of the aridity of the land and partly because of the pronounced hostility of the Indians. For the latter reason the National Congress on the 19th of May 1846 authorized the construction at intervals along the trail of military stations for the protection of the emigrant trains, and Fort Kearny was built (1848) and Fort Laramie was purchased (1849). The great

1 See Washington Irving, Adventures of Captain Bonneville (New York, i860).

2 See Francis Parkman, The Oregon Trail (Boston, 1849).

Mormon migration passed along the trail in 1847-1849, and in 1853 fifty-five Mormons settled on Green river at the trading post of James Bridger, which they purchased and named Fort Supply. This S.W. corner of the present state was at that time a part of Utah. With the approach of United States troops under Albert Sidney Johnston in 1857, Fort Supply was abandoned, and in the next year the Mormon settlers retired to Salt Lake City, again leaving the region almost without permanent inhabitants.

The Indians saw with alarm the movement of so many whites through their hunting grounds and became increasingly un- friendly. By a treaty negotiated at Fort Laramie in 1851, the Arapahoes, Sioux, Cheyennes and others agreed to confine themselves within the territory bounded by ioo° and 107° W. longitude and 39 and 44° N. latitude; but, besides minor con- flicts, a considerable portion of the garrison of Fort Laramie was killed in 1854 and there was trouble for more than twenty years. During the Civil War (1861-1865) the Indians were especially bold as they realized that the Federal troops were needed else- where. Meanwhile, there began a considerable migration to Montana, and the protection of the N. of the trail demanded the construction of posts, of which the most important were Fort Reno, on the Powder river, and Fort Phil Kearny in the Bighorn Mountains. In spite of the treaty allowing the opening of the road, during a period of six months fifty-one hostile demonstrations were made, and on the 21st of December 1866 Captain W. J. Fetterman and seventy-eight men from F'ort Phil Kearny were ambushed and slain. Hostilities con- tinued in 1867, but the troops were hampered on account of the scarcity of cavalry. Congress

in 1867 appointed a commission to arrange a peace, but not until 1868 (29th April, at Fort Laramie) were any terms agreed upon. The posts on the Montana trail were abandoned, and the Indians agreed to remove farther E. and to cease attacking trains, not to oppose railway construction, &c. The territory N. of the Platte river and E. of the Big- horn Mountains was to be reserved as an Indian hunting ground and no white men were to settle on it without the consent of the Indians; Gold was discovered on the Sweetwater river in 1867, and a large inrush of population followed. This unorganized territory E. of the Rocky Mountains was a part of Dakota, and in January 1868 Carter (later Sweetwater) county was erected. Farther E. Cheyenne was laid out by the Union Pacific Railroad (July 1867), a city government was established in August, newspapers began publication, and Laramie county was organized before the arrival of the first railway train on the 13th of November 1867. About six thousand persons spent the winter in Cheyenne, and disorder was checked only by the organization of a vigilance committee. Almost the same scenes followed the laying off of Laramie in April 1868, when 400 lots were sold during the first week and 500 habitations were erected within a fortnight. Albany and Carbon counties were organized farther W. in the same year.

A bill to organize the Territory of Wyoming had been intro- duced into Congress in 1865, and in 1867 the voters of Laramie county had chosen a delegate to Congress. He was not permitted to take a seat, but his presence in Washington hastened action, and on the 25th of July 1868 the act of Congress establishing a Territory with the present boundaries was approved by President Andrew Johnson. The portion of the Territory E. of the Rocky Mountains was taken from Dakota and that W. from Utah and Idaho, and included parts of the three great additions to the original territory of the United States. That portion E. of the mountains was a part of the Louisiana Purchase (1803), the W. portion above 42 was a part of the Oregon country, and that S. of that parallel came by the Mexican cession of 184S. The first governor, John A. Campbell, was appointed in April 1869, and the organization of the Territory was completed in May of the same year. At the first election, on the 2nd of September i860, 5266 votes were cast. The legislature established the seat of government at Cheyenne, and granted full suffrage and the right of holding office to women. The first great inrush of population, following the discovery of gold and the opening of the rail- way, brought many desperate characters, who were held in check

only by the stern, swift measures of frontier justice. After the organization of the Territory, except for the appearance of organized bands of highwaymen in 1877-1879, there was little turbulence, in marked contrast with conditions in some of the neighbouring Territories. Agriculture began

in the narrow but fertile river valleys, and stock-raising became an important industry, as the native grasses are especially nutritious. The history of the Territory was marked by few striking events other than Indian troubles. The N.E. of the Territory, as has been already said, had been set apart (1868) as a hunting ground for the Sioux Indians, but the rumour of the discovery of gold in the Black Hills and the Bighorn Mountains in 1874-187 5 caused a rush to the region which the military seemed powerless to prevent. The resentful Indians resorted to war. After a long and arduous contest in Wyoming, Montana and Dakota, which lasted from 1874 to 1879, and during which General George A. Custer (q.v.) and his command were killed in 1876 on the Little Bighorn in Montana, the Indians were thoroughly subdued and confined to reservations. The settlers in Wyoming shared the general antipathy to the Chinese, common to the western country. On the 2nd of September 1885 the miners at Rock Springs attacked about 400 Chinamen who had been brought by the railway to work in the mines, killing about fifty of them and driving the remainder from the district. Governor Warren summoned Federal troops and prevented further destruction of liTe and property.

The Territory increased in population and more rapidly in wealth, owing chiefly to the large profits in cattle raising, though this prosperity suffered a check during the severe winter of 1886-1887, when nearly three-fourths of the range cattle died of exposure. Agitation for statehood increased, and on the 30th of September 1889 a constitution was formed which was adopted by the people in November of the same year. The Constitution, which continued the Territorial provision of full suffrage for women, met the approval of Congress, and on the 10th of July 1890 Wyoming was formally admitted as a state. Since admission the progress of the state has been steady. Extensive irrigation projects have made available many thousand acres of fertile land, and much more will be subjected to cultivation in the future as the large ranges ate broken up into smaller tracts. In some sections a system of dry-farming, by which the scanty rainfall is protected from evaporation by deep ploughing and mulching the soil, has proved profitable.

The transition of the principal stock-raising industry from large herds of cattle to small, and the utilization of the ranges for sheep grazing almost exclusively covered a period of over twenty years preceding 1910, during which time many conflicts occurred between range cattle-owners and sheep flockmasters over the. use of the grazing grounds. The settler also, who selected his home- stead covering watering places to which the raˆnge cattle formerly had free access, came into conflict with the cattlemen. Some of these small settlers owned no cattle, and subsisted by stealing calves and unbranded cattle (mavericks) belonging to the range cattlemen. In parts of the state it became impossible to get a jury composed of these small

squatters to convict anybody for stealing or killing cattle, and so bad did this become that, in 1892, certain cattlemen formed a small army of mounted men and in- vaded the central part of the state with the avowed intention of killing all the men generally considered to be stock thieves, an episode known as the Johnson County Raid. This armed body, consisting of over fifty men, surrounded a log cabin and shot down two of the supposed cattle " rustlers," the latter defending themselves bravely. The country round was roused and large numbers of settlers and others turned out and besieged the cattlemen, who had taken refuge in some ranch buildings. Their case was becoming desperate when a troop of Federal cavalry arrived, raised the siege, and took the cattlemen back to Cheyenne as prisoners. They were subsequently held for murder, but were finally released without trial. Since that time experience has proved that the grazing ranges of the state are better suited to sheep than cattle, the former being much more profitable and better able to stand the cold on the open range.

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While many cattlemen have been driven out of business by the encroachments of sheep, the majority of the present flockmasters were range cattle owners in the past and have changed to the more profitable occupation. At the present time serious collisions between sheep and cattle owners are rare. There are still many cattle in the state, but they are divided up into small herds, no longer depending upon the open range for a precarious sub- sistence during the winter, but are sheltered and fed during winter storms on the hay ranches. The breeds of cattle are far superior now to the old range stock, so that it pays to take care of them; many thousands are fed during the winter on alfalfa hay. Governors of Wyoming

Territorial.

John A. Campbell ' 18G9-1875

John M. Thayer 1875-1878

John W. Hoyt 1878-1882

William Hale 1882-1885

Francis E. Warren 1885-1886

George W. Baxter (acting) 1886-1887

Thomas Moonlight 1887-1J89

Francis E. Warren 1889^90*

State. Francis E. Warren Republican 1890

Amos W. Barber (acting) . „ 1890-1892

J.E.Osborne …. Dem.-Populist 1892-1895 W. A. Richards …. Republican 1895-1899 De Forest Richards … „ 1899-1903

Fenimore Chatterton 1 (acting) . ., 1903-1905

Bryant R. Brooks … „ 1905-1911

J. M. Carey …. Democrat 1911-

Birmography. — H. C. Beeler, Report to the Governor of Wyoming by the State Geologist (Cheyenne, 1904), and " Geology and Mineral Resources of Wyoming," pp. 113-118 of Rept. of Proc. Am. Mining Cong., 7th Ann. Sess. (1905), a general account of the geology and mineral resources of Wyoming; C. A. White, " Geology and Physio- raphy of a portion of North-western Colorado and adjacent parts of Jtah and Wyoming," pp. 677-712 of 9th Ann. Rept. U.S. Gcol. Survey, 1887-1888 (Washington, 1889); F. E. Mathes, "Glacial Sculpture of Bighorn Mountains, Wyoming," pp. 167-190 of Pt. ii. of 2Tst Ann. Rept. U.S. Geol. Survey, 1899-1900 (Washington, 1900); N. H. Darton, " Preliminary Description of the Geology and Water Resources of the Southern Half of the Black Hills and adjoining regions in South Dakota and Wyoming," pp. 489-599 of Pt. iv. of 21st Ann. Rept. U.S. Geol. Survey, 1899-1900 (Washington, 1901); A. C. Spencer, " Mineral Resources of the Encampment Copper Region, Wyoming," pp. 163-169, U.S. Geol. Survey Bull. No. 213 (Washington, 1903) ; Mineral Resources of the United Stales published annually by the U.S. Geological Survey; and material indexed in the various bibliographies (e.g. Bulh. 301, 372 and 409) of the U.S. Geological Survey ; Aven Nelson, Report on the Flora of Wyoming, Wyoming Experiment Station, Bull. 28 (1896) ; A. J. Henry, Climatology of the United States, U.S. Weather Bureau Bull. Q (Washington, 1906); for industries, population, &c, the Reports of the U.S. Census generally; Department of Immigration of the state, Some Views of Wyoming (1908); The State of Wyoming, published by authority of the state legislature (1908); F. Chatterton, secretary of state, The State of Wyoming (1904) ; and reports of the various state officers mentioned in the text; Revised Statutes of Wyoming (Laramie, 1S99); Wyoming Irrigation Laws (1908); G. R. Hebard,

Govern- ment of Wyoming (San Francisco, 1904); H. H. Bancroft, Nevada, Colorado and Wyoming (San Francisco, 1890), and Utah (San Fran- cisco, 1889); E. R. Talbot, My People of the Plains (New York, 1906); W. M. Raine, Wyoming, a Story of the Outdoor West (New York, 1909). An interesting picture of former conditions in Wyoming is given in Owen Wister's novel, The Virginian (1902).

WYOMING VALLEY, a valley on the N. branch of the Susque- hanna river, in Luzerne county, Pennsylvania, U.S.A. Its name is a corruption of a Delaware Indian word meaning " large plains." The valley, properly speaking, is about 3ˆ m. wide and about 25 m. long, but the term is sometimes used historically in a broader sense to include all of the territory in the N.E. of the state once in dispute between Pennsylvania and Connecticut. In Connecticut the Susquehanna Land Company was formed in r 753 t° colonize the valley, and the Delaware Land Company wasformedin 1754 for the region immediately W.of the Delaware river. The rights of the Six Nations to all this territory were purchased at Albany. New York, by the Susquehanna Company in 1754, but the work of colonization was delayed for a time by the Seven Years' War. A few colonists sent out by the Susque- hanna Company settled at Mill Creek near the present site of 1 In place of De Forest Richards, deceased.

Wilkes-Barre in 1763, but were (October 15th) attacked and driven away by the Indians. In December 1768 the company divided a part of the valley into five townships of 5 sq. m. each, granting to forty proprietors the choice of one of these on con- dition that they should take possession of it by the 1st of February 1769, and the other four townships to 200 settlers on condition that they should follow by the 1st of May. The first group arrived on the 8th of February, the first division of the larger body on the 12th of May, and the five original towns of Wilkes- Barre (q.v.), Kingston {q.v.'), Hanover, 2 Plymouth and Pittston were soon founded.

In the meantime the Six Nations (in 1768) had repudiated their sale of the region to the Susquehanna Company and had sold it to the Penns; the Penns had erected here the manors of Stoke and Sunbury, the government of Pennsylvania had com- missioned Charles Stewart, Amos Ogdcn and others to lay out these manors, and they had arrived and taken possession of the block-house and huts at Mill Creek in January 1769. The conflict which followed between the Pennsylvania and the Con- necticut settlers is known as the first Pennamite- Yankee War. Although defeated in the early stages of the conflict, the Yankees or Connecticut, settlers finally rallied in August 1771 and com- pelled the Pennsylvanians to retreat, and the war terminated with the defeat of Colonel William Plunket (1720-1791) and about 700 Pennsylvanians by a force of 300 Yankees under Colonel Zebulon Butler (1731-179.5) in the battle of " Rampart Rocks " on the

25th of December 1775. The General Assembly of Connecticut, in January 1774. erected the valley into the town- ship of Westmoreland and attached it to Litchfield county, and in October 1776 the same body erected it into Westmoreland county. On the 3rd of July 1778, while a considerable number of the able-bodied men were absent in the Connecticut service, a motley force of about 400 men and boys under Colonel Zebulon Butler were attacked and defeated near Kingston in the " battle of Wyoming" by about 1100 British, Provincial (Tory) and Indian troops under Major John Butler, and nearly three-fourths were killed or taken prisoners and subsequently massacred. Thomas Campbell's poem, Gertrude of Wyoming (1809), is based on this episode, various liberties being taken with the facts. As the War of Independence came to a close the old trouble with Pennsylvania was revived. A court of arbitration appointed by the Continental Congress met at Trenton, New Jersey, in 1782, and on December 30th gave a unanimous decision in favour of Pennsylvania, The refusal of the Pennsylvania government to confirm the private land titles of the settlers, and the arbitrary conduct of a certain Alexander Patterson whom they sent up to take charge of affairs, resulted in 1784 in the outbreak of the second Pennamite- Yankee War. The Yankees were dispossessed, but they took up arms and the government of Pennsylvania despatched General John Armstrong with a force of 400 men to aid Patterson. Armstrong induced both parties to give up their arms with a promise of impartial justice and protection, and as soon as the Yankees were defenceless he made them prisoners. This treachery and the harsh treatment by Patterson created a strong public opinion in favour of the Yankees, and the government was compelled to adopt a milder policy. Patterson was withdrawn, the disputed territory was erected into the new county of Luzerne (1786), the land titles were confirmed (1787), and Colonel Timothy Pickering (q.v.) was commissioned to organize the new county and to effect a reconciliation. But a few of the settlers under the lead of Colonel John Franklin (1749-1831) attempted to form a separate state government. Franklin was -seized and imprisoned, under a warrant from the State Supreme Court. As Pickering was held responsible for Franklin's imprisonment, some of Franklin's followers in retaliation kidnapped Pickering and carrying him into the woods, tried in vain for nearly three weeks to get from him a promise to intercede for Franklin's pardon. The trouble was again revived by the repeal in 1790 of the confirming act

2 Several Scotch-Irish families from Lancaster county, Pennsyb vania, accepted Connecticut titles and settled at Hanover under Captain Lazarus Stewart.

of 17S7 and by a subsequent decision of the United States Circuit Court, unfavourable to the Yankees, in the case of Van Horn versus Dorrance. All of the claims were finally confirmed, by a series of statutes passed in 1 799, 1802 and 1807. Since 1808, mainly through the development of its coal mines (see Pittston, Pa), the valley has made remarkable progress both in wealth and in population.

For a thorough study of the early history of Wyoming Valley see O. J. Harvey, A History of. Wilkes-Barri (3 vols., Wilkes- Barre, 1909-1910); see also H. M. Hoyt, Brief of a Title in the Seventeen Townships in the County of Luzerne (Harrisburg, 1879).

WYON, THOMAS (1792-1817), English medallist, was born at Birmingham. He was apprenticed to his father, the chief engraver of the king's seals, and studied in the schools of the Royal Academy, London, where he gained silver medals in both the antique and the life class; he also obtained a gold medal from the Society of Arts. He was appointed probationary engraver to the mint in 181 1, and soon after engraved his medal commemorative of the peace, and his Manchester Piti medal. In 181 5 he was appointed chief engraver to the mint. His younger brother, Benjamin Wyon (1802-1858), his nephews, Joseph Shepherd Wyon (1836-1873) and Alfred Benjamin Wyon (1837-1884), and his cousin, William Wyon (1795-1851), were also distinguished medallists.

WYSE, SIR THOMAS (1791-1862), Irish politician, belonged to a family claiming descent from a Devon man, Andrew Wyse, who is said to have crossed over to Ireland during the reign of Henry II. and obtained lands near Waterford, of which city thirty-three members of the family are said to have been mayors or other municipal officers. From the Reformation the family had been consistently attached to the Roman Catholic Church. Thomas Wyse was educated at Stonyhurst College and at Trinity College, Dubiin, where he distinguished himself as a scholar. After 181 5 he passed some years' in travel, visiting Italy, Greece, Egypt and Palestine. In 1821 he married Laetitia (d. 1872), daughter of Lucicn Buonaparte, and after residing for a time at Viterbo he returned to Ireland in 1S25, having by this time inherited the family estates. He now devoted his great oratorical and other talents to forwarding the cause of Roman Catholic emancipation, and his influence was specially marked in his own county of Waterford, while his standing among his associates was shown by his being chosen to write the address to the people of England. In 1830, after the passing of the Roman Catholic Relief Act; he was returned to parliament for county Tipperary, and he attached himself to the Liberal party and voted for the great measures of the reform era. But he was specially anxious to secure

some improvement in the education of the Irish people, and some of his proposals were accepted by Mr E. G. Stanley, afterwards 14th earl of Derby, and the government. He was chairman of a committee which inquired into the condition of education in Ireland, and it was partly owing to his efforts that provincial colleges were established at Cork, Galway and Belfast. His work as an educational pioneer also bore fruit in England, where the principles of state control and inspection, for which he had fought, were adopted, and where a training college for teachers at Battersea was established on lines suggested by him. From 1835 to 1847 he was M.P. for the city of Waterford arid from 1&39 to 1841 he was a lord of the treasury; from T846 to 1849 he was secretary to the board of control, and in 1849 he was sent as British minister to Greece. He was very successful in his diplomacy, and he showed a great interest in the educational and other internal affairs of Greece. In 1857 he was made a K.C.B., and he died at Athens on the 16th of April 1862. Wyse wrote Historical Sketch of the late Catholic Association of Ireland (1829); An Excursion in the Peloponnesus (1858, new ed. 1865); and Impressions of Greece (1871). His two sons shared his literary tastes. They were Napoleon Alfred Bonaparte Wyse (1822-1895); and William Charles Bonaparte Wvse (1S26-1892), a student of the dialect of Provence.

WYTTENBACH, DANIEL ALBERT (1746-1820), German- Swiss classical scholar, was born at Bern, of a family whose nobility and distinction he loved to recall. In particular, he was

proud of his descent from Thomas Wyttenbach, professor of theology in Basel at the end of the 15th and beginning of the 10th century, who numbered the Reformer Zwingli and other distinguished men among his pupils. Wyttenbach's own father was also a theological professor of considerable note, first at Bern, and then at Marburg. His removal to Marburg, which took place in 1756, was partly due to old associations, for he had studied there under the famous Christian Wolff, and em- bodied the philosophical principles of his master in his own theological teaching. Young Wyttenbach entcred'at the age of fourteen the university of Marburg, and passed through a four years' course there. His parents intended that he should become a Lutheran pastor. The first two years were given up to general education, principally to mathematics, " philology,"' philosophy and history. The professor of mathematics, Spangenberg, acquired great influence over young Wyttenbach. He is said to have taught his subject with great clearness, and with equal seriousness and piety, often referring to God as the supreme mathematician, who had constructed all things by number, measure and weight. " Philology " in the German universities of that age meant Hebrew and Greek. These two languages were generally handled by the same professor, and were taught almost solely to theological students. Wyttenbach's university course at Marburg

was troubled about the middle of the time by mental unrest, due to the fascination exercised over him by Bunyan's Pilgrim's Progress. The disorder was cured by Spang- enberg. The principal study of the third year was metaphysics, which took Wyttenbach entirely captive. The fourth and last year was to be devoted to theology and Christian dogma. Wyttenbach had hitherto submitted passively to his father's wishes concerning his career, in the hope that some unexpected occurrence might set him free. But he now turned away from theological lectures, and privately devoted his time to the task of deepening and extending his knowledge of Greek literature. He possessed at the time, as he tells us, no more acquaintance with Greek than his own pupils at a later time could acquire from him during four months' study. He was almost entirely without equipment beyond the bare texts of the authors. But Wyttenbach was undaunted, and four years' persistent study gave him a knowledge of Greek such as few Germans of that time possessed. His love for philosophy carried him towards the Greek philosophers, especially Plato. During this period Ruhnken's notes on the Platonic lexicon of Timaeus fell into his hands. Ruhnken was for him almost a superhuman being, whom he worshipped day and night, and with whom he imagined himself as holding converse in the spirit. When W'yttenbach was twenty-two he determined to seek elsewhere the aids to study which Marburg could not afford. His father, fully realizing the strength of his son's pure passion for scholarship, permitted and even advised him to seek Heyne at Gottingen. From this teacher he received the utmost kindness and encouragement, and he was urged by him to dedicate to Ruhnken the first-fruits of his scholarships. Wyttenbach therefore set to work on some notes to Julian, Eunapius and Aristaenetus, and Heyne wrote to Ruhnken to bespeak his favourable consideration for the work. Before it reached him Ruhnken wrote a kind letter to Wyttenbach, which the recipient "read, re-read and kissed," and another on receipt of the tract, in which the great scholar declared that he had not looked to find in Germany such know- ledge of Greek, such power of criticism, and such mature judg- ment, especially in one so young. By Heyne's advice, he worked hard at Latin, which he knew far less thoroughly than Greek, and we soon find' Heyne praising his progress in Latin style to both Ruhnken and Valckenaer. He now wrote to ask their advice about his scheme of coming to the Netherlands to follow the profession of a scholar. Ruhnken strongly exhorted Wyttenbach to follow his own example, for he too had been designed by his parents for the Christian ministry in Germany, but had settled at Leiden on the invitation of Hemsterhuis. Valckenacr's answer was to the same effect, but he added that Wyttenbach's letter would have been pleasanter to him had it been free from excessive compliments. These letters were

forwardedto the elder Wyttenbach, with a strong recommendation from Heyne. The old man had been himself in Leiden in his youth, and entertained an admiration for the scholarship of the Netherlands; so his consent was easily won. Young Wyttenbach reached Leiden in 1770. A year was spent with great content- ment, in learning the language of the people, in attending the lectures of the great " duumviri " of Leiden, and in collating MSS. of Plutarch. At the end of 1771 a professor was wanted at Amsterdam for the College of the Remonstrants. By the recommendation of Ruhnken, Wyttenbach obtained the chair, which he filled with great success for eight years. His lectures took a wide range. Those on Greek were repeated also to the students of the university of Amsterdam (the " Athenaeum "). In 1775 a visit was made to Paris, which was fruitful both of new friendships and of progress in study. About this time, on the advice of Ruhnken, Wyttenbach began the issue of his Bibliotkeca critica, which appeared at intervals for the next thirty years. The methods of criticism employed were in the main those established by Hemsterhuis, and carried on by Valckenaer and Ruhnken, and the publication met with accept- ance from the learned all over Europe. In 1777 the younger Burmann (" Burmannus Secundus ") retired from his professor- ship at the Athenaeum, and Wyttenbach hoped to succeed him. When another received the appointment, he was sorely discouraged. Only his regard for Ruhnken and for Dutch freedom (in his own words " Ruhnkeni et Batavae libertatis cogitatio ") kept him in Holland. For fear of losing him, the authorities at Amsterdam nominated him in 1779 professor of philosophy. In 1785 Toll, Burmann's successor, resigned, and Wyttenbach was at once appointed to succeed him. His full title was " professor of history and eloquence and Greek and Latin literature." He had hardly got to work in his new office when Valckenaer died, and he received a call to Leiden. Greatly to Ruhnken's disappointment, he declined to abandon the duties he had so recently undertaken. In 1787 began the internal commotions in Holland, afterwards to be aggravated by foreign interference. Scarcely during the remaining thirty-three years of Wyttenbach's life was there a moment of peace in the land. About this time two requests were made to him for an edition of the Moralia of Plutarch, for which a recension of the tract De sera numinis vindicta had marked him out in the eyes of scholars. One request came from the famous " Societas Bipontina," the other from the delegates of the Clarendon Press at Oxford. Wyttenbach, influenced at once by the reputa- tion of the university, and by the liberality of the Oxonians in tendering him assistance of different kinds, declined the offer of the Bipontine Society, — very fortunately, since their press was soon destroyed by the French. The fortunes of Wyttenbach's edition curiously illustrate the text " habent sua fata libelli." The first portion was safely

conveyed to Oxford in 1794. Then war broke put between Holland and Great Britain. Randolph, Wyttenbach's Oxford correspondent, advised that the next portion should be sent through the British ambassador at Hamburg, and the MS. was duly consigned to him " in a little chest well protected by pitch." After sending Randolph a number of letters without getting any answer, Wyttenbach in disgust put all thought of the edition from him, but at last the missing box was discovered in a forgotten corner at Hamburg, where it had lain for two years and a half. The work was finally com- pleted in 1805. Meanwhile Wyttenbach received invitations from his native city Bern, and from Leiden, where vacancies had been created by the refusal of professors to swear allegiance to the new Dutch republic set up in 1795, to which Wyttenbach

had made submission. But he only left Amsterdam in 1799, when on Ruhnken's death he succeeded him at Leiden. Even then bis chief object in removing was to facilitate an arrangement by which the necessities of his old master's family might be relieved. His removal came too late in life, and he was never so happy at Leiden as he had been at Amsterdam. Before long appeared the ever-delightful Life of David Ruhnken. Though written in Latin, this biography deserves to rank high in the modern literature of its class. Of Wyttenbach's life at Leiden there is little to tell. The continual changes in slate affairs greatly disorganized the universities of Holland, and Wyttenbach had to work in face of much detraction; still, his success as a teacher was very great. In 1S05 he narrowly escaped with his life from the great gunpowder explosion, which killed 1 50 people, among them the Greek scholar Luzac, Wyttenbach's colleague in the university. One of Wyttenbach's letters gives a vivid account of the disaster. During the last years of his life he suffered severely from illness and became nearly blind. After the conclusion of his edition of Plutarch's Moralia in 1805, the only important work he was able to publish was his well-known edition of Plato's Phaedo. Many honours were conferred upon him both at home and abroad, and in particular he was made a member of the French Institute. Shortly before his death, he obtained the licence of the king of Holland to marry his sister's daughter, Johanna Gallien, who had for twenty years devoted herself to him as housekeeper, secretary and aider in his studies. The sole object of the marriage was to secure for her a better provision after her husband's death, because as the widow of a professor she would be entitled to a pension. Johanna Gallien was a woman of remarkable culture and ability, and wrote works held in great repute at that time. On the festival of the ter- centenary of the foundation of the university cf Marburg, celebrated in 1827, the degree of doctor was conferred upon her. Wyttenbach died of apoplexy in 1820, and he was buried in the garden of his country house near Amsterdam, which stood, as he noted, within sight of the dwellings of Descartes and Boethaave.

Although his work can hardly be set on the same level as that of Hemsterhuis, Valckenaer and Ruhnken, yet he was a very eminent exponent of the sound methods of criticism which they established. These four men, more than any others after Bentley, laid the founda- tions of modern Greek scholarship. The precise study of grammar, syntax and style, and the careful criticism of texts by the light of the best manuscript evidence, were upheld by these scholars in the Netherlands when they were almost entirely neglected elsewhere on the Continent, and were only pursued with partial success in England. Wyttenbach may fairly be regarded as closing a great period in the history of scholarship. He lived indeed to see the new birth of German classical learning, but his work was done, and he was un- affected by it. Wyttenbach's criticism was less rigorous, precise and masterly, but perhaps more sensitive and sympathetic, than that of his great predecessors in the Netherlands. In actual acquaintance with the philosophical writings of the ancients, he has probably never been surpassed. In character he was upright and simple-minded, but shy and retiring, and often failed to make himself appreciated. His life was not passed without strife, but his few friends were warmly attached to him, and his many pupils were for the most pait his enthusiastic admirers. Wyttenbach's biography was written in a somewhat dry and lifeless manner by Mahne, one of his pux>ils. who also published some of his letters. His Opuscula, other than those published in the Bibliotkeca critica, were collected in two volumes (Leiden, 1823). (J- S. R.)

WYVERN, or Wivekn, the name of an heraldic monster, with the forepart of a winged dragon and the hind part of a serpent or lizard (see Heraldry). The earlier spelling of the word was viiver or where; 0. Eng. wyvre; O. Fr. wivre, mod. giire. It is a doublet of " viper," with an excrescent n, as in " bittern," M. Eng. bitore.

Xthe twenty-fourth letter of the English alphabet. Its position and form are derived from the Latin alphabet, which received them from the Western Greek alphabet. The alphabet of the Western Greeks differed from the Ionic, which is the Greek alphabet now in general use, by the shape and position of X and of some other consonants. The Ionic alphabet placed x (£) immediately after N and, in the oldest records, in the form ˆ, from which the ordinary Greek capital H was developed. The position and shape of this symbol show clearly that it was taken from the Semitic Samekh, which on the Moabite stone appears as ˆ. Why the Greeks attached this value to the symbol is not clear; in Semitic the symbol indicates the ordinary s. Still less clear is the origin of the form X> which in the Ionic

alphabet stands for x (ft followed by a breath). In a very ancient alphabet on a small vase found in 1882 at Formello near the ancient Veii in Etruria, a symbol appears after N consisting of three horizontal and three vertical lines, 5). From this it has been suggested that both forms of the Greek x are derived, H by removing the vertical lines, X in its earliest form f" by removing the four marginal lines. The Ionic symbol, however, corresponds closely to the earliest Phoenician, so that this theory is not very plausible for H, and there are various other possibilities for the develop ment of X (see Alphabet). This symbol appears in the very early Latin inscriptions found in the Roman Forum in 1899 as ■/-. In its usual value as ks it is superfluous. In the Ionic alphabet it was useful, because there it represented a single sound, w r hich before the invention of the symbol had to be represented by kk. In the alphabet in use officially at Athens before 403 B.C. x was written by x°" (kks). In English there is an interesting variation of pronunciation in many words accord- ing to the position of the accent: if the accent precedes, x is pronounced ks; if it follows, x is pronounced gz: compare exit (eksit) with exdet {egzact).

The symbol X was used both by the Romans and the Etruscans for the numeral 10. Which borrowed from the other is uncertain, but the Etruscans did not use X as part of their alphabet, X with a horizontal line over it was used for 10,000, and when a line on each aide was added, [Xl for a million. (P. Gi.)

XANTHI (Turkish Eskijc), a town of European Turkey in the vilayet of Adrianople; situated on the right bank of the river Eskije and at the S. foot of the Rhodope Mountains, 29 m. W. of Gumuljina by the Constantinople-Salonica railway. Pop. (1905) about 14,000, of whom the bulk are Turks and Greeks in about equal proportions, and the remainder (about 4000) Armenians, Roman Catholics or Jews. There are re- mains of a medieval citadel, and on the plain to the S. the ruins of an ancient Greek town. Xanthi is built in the form of an amphitheatre and possesses several mosques, churches and monasteries, a theatre with a public garden, and a municipal garden. A preparatory school for boys and girls was founded and endowed by Mazzini. The town is chiefly notable for the famous Yenidjc tobacco.

XANTHIC ACID (xanthogenic acid), C 2 H 5 0-CS-SH, an organic acid named from the Greek %av86s } yellow, in allusion to the bright yellow colour of its copper salt. The salts of this acid are formed by the action of carbon bisulphide on the alcoholates, or on alcoholic solutions of the caustic alkalis. They react with the alkyl iodides to form dialkyl esters of the dithio-carbonic arid, which readily decompose into mercap- tans and thiocarbamic esters on treatment with ammonia : C.H 6 0-CS-SRi-r-NH 3 =C,H 5 0-CS-NH 2 +R 1 -SH; with the alkali alcoholates they give salts

of the alkyl thiocarbonic acids: C,H 5 0-CS-SR-f-CH 3 OK+H,0-CH 3 0-CO'SK-fC 2 H 5 OH-|-R-SH. Ethyl xanthic add, C 2 H 5 0-CS-SH, is obtained by the ac- tion of dilute sulphuric acid on the potassium salt at o° C. (Zeise, Berz. Jahresb., 3, p. 83). It is a colourless oil which is very unstable, decomposing at 25 C. into carbon bisulphide

and alcohol. The potassium salt crystallizes in colourless needles and is formed by shaking carbon bisulphide with a solution of caustic potash in absolute alcohol. On the addi- tion of cupric sulphate to its aqueous solution it yields a yellow precipitate of cupric xanthate. Potassium xanthate is used in indigo printing and also as an antidote for phylloxera. Tschugaeff (Ber., 1899, 32, p. 3332) has used the xanthic ester formation for the preparation of various terpenes, the methyl ester when distilled under slightly diminished pressure decom- posing, in the sense of the equation, C„H 2 n_rO.CS-SCH 3 = CnHan-a+COS-hCHsSH. According to the author molecular change in the hydrocarbon is prevented, since no acid agent is used.

XANTHIPPE, the wife of Socrates (q.v.). Her name has become proverbial in the sense of a nagging, quarrelsome woman. Attempts have been made to show that she has been maligned, notably by E. Zeller (" Zur Ehrenrettung der Xanthippe," in his Vortrage imd Abhandlungen, i., 1875).

XANTHONE (dibenzo-7-pyrone, or diphenylene ketone oxide), Ci3H 8 C>2, in organic chemistry, a heterocyclic compound con- taining the ring system shown below. It is obtained by the oxidation of xanthene (methylene diphenylene oxide) with chromic acid; by the action of phosphorus oxychloride on disodium salicylate; by heating 2-2'-dioxybenzophenone with concentrated sulphuric acid; by distilling fluoran with lime; by the oxidation of xanthydrol (R. Meyer, Ber., 1893, 26, p. 1277); by boiling diazotized 2-2'-diaminobenzophenone with water (Heyl., Ber., 1898, 31, p. 3034); by heating salol with concentrated sulphuric acid (C. Graebe, Ann., 1889, 254, p. 280), and by heating potassium-ortho-chlorobenzoate with sodium phenolate and a small quantity of copper powder to 180-190 C. (F. Ullmann, Ber., 1905, 38, pp. 729, 2120, 2211). It crystallizes in needles which melt at 173-174 and boil at 349-350 C, and are volatile in steam. Its solution in concentrated sulphuric acid is of a yellow colour and shows a marked blue fluorescence. The carbonyl group is not kctcnic in character since it yields neither an oxime nor hydrazone. When fused with caustic potash it yields phenol and salicylic acid. Mild reducing agents convert it into xanthydrol, the group > CO becoming >CH-OH, whilst a strong reducing agent like hydriodic acid converts it into xanthene, the group > CO becoming >CHa. Phosphorus pentasulphide at 140-150° C. converts it into xanthion by transformation of >CO to >CS (R. Meyer, Ber., 1900, ^, p. 2580), and this latter com-

pound condenses with hydroxylamine to form xanthone oxime.

All four mono- hydroxyxantho nes are known, and are prepared by heating; salicylic acid with either resorcin, pyrocatechin or hydro- quinone; they are yellow crystalline solids, which act as dyestufifs. The l'7-dihydroxyxanthone, known as euxanthone, is prepared by heating euxanthic. acid with hydrochloric acid or by heating hydro- quinone carboxyhc acid with /3-resorcylic acid and acetic anhydride (S. Kostanecki, Ber., 1891, 24. p. 3983; C. Graebe, Ann., i88g, 254, p. 298). It is also obtained from Indian yellow (Graebe, ibid.), formed in the urine of cows fed on mango leaves. It crystallizes in yellow needles which sublime readily. On fusion with caustic potash it decomposes with formation of tetrahydroxy-benzophenone, which then breaks up into resorcin and hydroqmnone. The isomeric i-6-dihydroxyxanthone, isoeuxanthone, is formed when £-resorcylic acid is heated with acetic anhydride.ˆ Gentisein. or I- 3"7'trihydroxyxanthone, is found in the form of its methyl ether (gentisin) in gentian root; it is obtained synthetically by condensing phloroglucin with hydroquinone carboxylic acid.

Xanthene, C n HioO, may be synthesized by _ condensing phenol with ortho-cresol in the presence of aluminium chloride. Its tetramethyl-diamino derivative, which is formed by condensing formaldehyde with dimethyl-meta-aniiiiophenol. and subsequent elimination of water from the resulting diphenyl methane derivative, is the leuco base of pyronine, into which it passes by oxidation.

/\/ CH \/\N(caj, ci(ca;.vA/\ ° / V 7

Pyronine.

XANTHUS (mod. Guniik), an ancient city of Lycia, on the river Xanthus (Eshen Chai) about 8 m. above its mouth. It was besieged by the Persian general Harpagus (546 B.C.), when the acropolis was burned and all the inhabitants perished (Herod, i. 176). The city was afterwards rebuilt; and in 42 B.C. it was besieged by the Romans under M. Junius Brutus. It was taken by storm and set on fire, and the inhabitants perished in the flames. The ruins lie on a plateau, high above the left bank of the river. The nearest port is Kalamaki, whence a tedious ride of three to four hours round the edge of the great marsh of the Eshen Chai brings the traveller to Xanthus. The whole plan of the city with its walls and gates can be discerned. The well-preserved theatre is remarkable for a break in the curve of its

auditorium, which has been con- structed so as not to interfere with a sarcophagus on a pedestal and with the " Harpy Monument " which still stands to its full height, robbed of the reliefs of its parapet (now in the British Museum). In front of the theatre stands the famous stele of Xanthus inscribed on all four sides in Lycian and Greek. Be- hind the theatre is a terrace on which probably the temple of either the Xanthian Apollo or Sarpedon stood. The best of the tombs — the " Payava Tomb," the " Nereid Monument," the " Ionic Monument " and the " Lion Tomb " — are in the British Museum, as the result of Sir Chas. Fellows's expedition; only their bases can be seen on the site. A fine triple gateway, much polygonal masonry, and the walls of the acropolis are the other objects of most interest.

See 0. Benndorf and G. Niemann, Reisen in Lykien uud Karien (1884). (U. G. H.)

XAVIER, FRANCISCO DE (1506-1552), Jesuit missionary and saint, commonly known in English as St Francis Xavicr and also called the " Apostle of the Indies." He was the youngest son of Juan de Jasso, privy councillor to Jean d'Albref , king of Navarre, and his wife, Maria de Azpilcueta y Xavier, sole heiress of two noble Navarrese families. He was born at his mother's castle of Xavier or Xavero, at the foot of the Pyrenees and close to the little town of Sanguesa, on the 7th of April 1506, according to a family register, though his earlier biographers fix his birth in 1497. Following a. Spanish custom of the time, which left the surname of either parent optional with children, he was called after his mother; the best authorities write " Francisco de Xavier " (Lat. Xaverius) rather than " Francisco Xavier," as Xavier is originally a place-name. In 1524 he went to the university of Paris, where he entered the College of St Barbara, then the headquarters of the Spanish and Portuguese students, and in 1528 was appointed lecturer in Aristotelian philosophy at the College de Beauvais. In 1530 he took his degree as master of arts. He and the Savoyard Pierre Lcfevrc, who shared his lodging, had already, in 1529, made the acquaintance of Ignatius of Loyola — like Xavier a native of the Spanish Basque country. Ignatius succeeded, though in Xavier's case after some opposition, in gaining their sympathy for his missionary schemes (see Loyot.a, Ignatius ot); and they were among the company of seven persons, including Loyola himself, who took the original Jesuit vows on the 15th of August 1534. They continued in Paris foi- two years longer; but on November 15th, 1536, they started for Italy, to concert with Ignatius plans for converting the Moslems of Palestine. In January 1537 they arrived in Venice. As some months must elapse before they could sail for Palestine, Ignatius determined that the time should be spent partly in hospital work at Venice and later in the journey to Rome. Accordingly, Xavier devoted himself for nine weeks to the hospital for incurables, and then set out with

eight companions for Rome, where Pope Paul III. sanctioned their enterprise. Returning to Venice, Xavier was ordained priest on Midsummer Day T537; but the outbreak of war between Venice and Turkey put an end to the Palestine expedition, and the companions dispersed for a twelvemonth's home mission work in the Italian cities. Nicolas Bobadilla and Xavier betook themselves first to Monselice and thence to Bologna, where they remained till summoned to Rome by Ignatius at the close of 1538.

Ignatius retained Xavier at Rome until 1541 as secretary to the Society of Jesus (see Jesuits for the events of the period 1538-41). Meanwhile John III., king of Portugal, had re- solved on sending a mission to his Indian dominions, and had applied through his envoy Pedro Mascarenhas to the pope for six Jesuits. Ignatius could spare but two, and chose Bobadilla and a Portuguese named Simao Rodrigues for the purpose. Rodrigues set out at once for Lisbon to confer with the king, who ultimately decided to retain him in Portugal. Bobadilla, sent for to Rome, arrived there just before Mascarenhas was about to depart, but fell too ill to respond to the call made on him.

Hereupon Ignatius, on March 15th, 1540, told Xavier to leave Rome the next day with Mascarenhas, in order to join Rodrigues in the Indian mission. Xavier complied, merely waiting long enough to obtain the pope's benediction, and set out for Lisbon, w r here he w r as presented to the king, and soon won his entire confidence, attested notably by procuring for him from the pope four briefs, one of them appointing him papal nuncio in the Indies. On April 7th, 1341, he sailed from Lisbon with Martini Alfonso de Sousa, governor designate of India, and lived amongst the common sailors, ministering to their religious and temporal needs, especially during an outbreak of scurvy. After five months' voyage the ship reached Mozambique, where the captain resolved to winter, and Xavier was prostrated with a severe attack of fever. When the voyage was resumed, the ship touched at Malindi and Sokofra, and reached Goa on May 6th, 1542. Exhibiting his brief to D. Joao d'Albuquerque, bishop of Goa, he asked his permission to officiate in the diocese, and at once began walking through the streets ringing a small bell, and telling all to come, and send their children and servants, to the " Christian doctrine " or catechetical instruction in the principal church. He spent five months in Goa, and then turned his attention to the " Fishery Coast," where he had heard that the Paravas, a tribe engaged in the pearl fishery, had relapsed into heathenism after having professed Christianity. He laboured assiduously amongst them for fifteen months, and at the end of 1543 returned to Goa.

At Travancore he is said to have founded no fewer than forty- five Christian settlements. It is to be noted that his own letters contain, both at

this time and later on, express disproof of that miraculous gift of tongues with which he was credited even in his lifetime, and which is attributed to him in the Breviary office for his festival. Not. only was he obligc/1 to employ interpreters, but he relates that in their absence he was com- pelled to use signs only.

He sent a missionary to the isle of Manaar, and himself visited Ceylon and Mailapur (Meliapur), the traditional tomb of St Thomas the apostle, which he reached in April 1544, remaining there four months. At Malacca, where he arrived on September 25th, 1545, he remained another four months, but had compara- tively little success. While in Malacca he urged King John III. of Portugal to set up the Inquisition in Goa to repress Judaism, but the tribunal was not set up until 1560. After visiting Amboyna, the Moluccas and other isles of the Malay archipelago, he returned to Malacca in July 1547, and found three Jesuit recruits from Europe awaiting him. About this time an attack upon the city was made by the Achinese fleet, under the raja of Pedir in Sumatra; and Xavier's early biographers relate a dramatic story of how he roused the governor to action. This story is open to grave suspicion, as, apart from the miracles recorded, there are wide discrepancies between the secular Portuguese histories and the narratives written or inspired by Jesuit chroniclers of the 17th century.

While in Malacca Xavier met one Yajiro, a Japanese exile (known to the biographies as Anger, Angero or Anjiro), who fired him with zeal for the conversion of Japan. But he first revisited India and then, returning to Malacca, took ship for Japan, accompanied by Yajiro, now known as Paul of the Holy Faith. They reached Kagoshima on the 15th of August 1549, and remained in Japan until the 20th of November 1551. (See Japan, § viii.) On board the " Santa Cruz," the vessel in which he returned from Japan to Malacca, Xavier discussed

with Diogo Pereira, the captain, a project for a missionary journey to China. He devised the plan of persuading the viceroy of Portuguese India to despatch an embassy to China, in. whose train he might enter, despite the law which then ex- cluded foreigners from that empire. He reached Goa in February 1552, and obtained from the viceroy consent to the plan of a Chinese embassy and to the nomination of Pereira as envoy. Xavier left India on the 25th of April 1552 for Malacca, intending there to meet Pereira and to re-embark on the "Santa Cruz.' J

The story of his detention by the governor (officially styled captain) of Malacca — a son of Vasco da Gama named Alvaro de Ataide or Athayde — is told with many picturesque details by F. M. Pinto and some of the Jesuit biographers, who have pilloried Ataide as actuated solely by malice and self-interest. Ataide appears to have objected not so much to the mission as to the rank assigned to Pereira, whom he regarded as unfit for the office of envoy. The right to send a ship to trade with China was one for which large sums were paid, and Pereira, as com- mander of the expedition, would enjoy commercial privileges which Ataide had, ex officio, the power to grant or withhold. It seems doubtful if the governor exceeded his legal right in re- fusing to allow Pereira to proceed; 1 in this attitude he remained firm even when Xavier, if the Jesuit biographers may be trusted, exhibited the brief by which he held the rank of papal nuncio, and threatened Ataide with excommunication. On Xavier's personal liberty no restraint was placed. He embarked without Pereira on July 16th, 1552. After a short stay at Singapore, whence he despatched several letters to India and Europe, the ship at the end of August 1552 reached Chang-chuen-shan (St John Island) off the coast of Kwang-tung, which served as port and rendezvous for Europeans, not then admitted to visit the Chinese mainland.

Xavier was seized with fever soon after his arrival, and was delayed by the

failure of the interpreter he had engaged, as well as by the reluctance of the Portuguese to attempt the voyage to Canton for the purpose of landing him. He had arranged for his passage in a Chinese junk, when he was again attacked by fever, and died on December 2nd, or, according to some authorities, November 27th, 1552. He was buried close to the cabin in which he had died, but his body was later transferred to Malacca, and thence to Goa, where it still lies in a magnificent shrine (see J. N. da Fonseca, An Historical and Archaeological Sketch of Goa, Bombay, 1878). He was beatified by Paul V. in 1619 and canonized by Gregory XV. in 1621.

In appearance Xavier was neither Spanish nor Basque. He had blue or grey eyes, and fair hair and beard, which turned white through the hardships he endured in Japan. That he was of short stature is proved by the length of the coffin in which his body is still preserved, less than 5 ft. 1 in. (Fonseca, op. cit. p. 296). Many miracles have been ascribed to him; an official list of these, said to have been attested by eye- witnesses, was drawn up by the auditors of the Rota when the processes for his canonization were formed, and is preserved in manuscript in the Vatican library. The contention that Xavier should be regarded as the greatest of Christian mis- sionaries since the first century a.d. rests upon more tangible evidence. His Jesuit biofraphers attribute to him the con- version of more than 700,000 persons in less than ten years; and though these figures are absurd, the work which Xavier accomplished was enormous. He inaugurated new missionary enterprises from Hormuz to Japan and the Malay Archipelago, leaving an organized Christian community wherever he preached; he directed by correspondence the ecclesiastical policy of John III. and his viceroy in India; he established and con- trolled the Society of Jesus in the East. Himself an ascetic and a mystic, to whom things spiritual were more real than the visible world, he had the strong common sense which

1 See R. S. Whiteway, Rise of the Portuguese Power in India (London, 1898), appendix A. The question is complicated by the fact that the Sixth Decade of Diogo do Couto, the best contemporary historian of these events, was suppressed by the censor in its original form, and the extant version was revised by an ecclesiastical editor.

distinguished the other Spanish mystics, St Theresa, Luis de Leon or Raimon Lull. This quality is nowhere better exemplified than in his letters to Gaspar Baertz (Barzaeus), the Flemish Jesuit whom he sent to Hormuz, or in his sugges- tions for the establishment of a Portuguese staple in Japan. Supreme as an organizer, he seems also to have had a singularly attractive personality, which won him the friendship even of the pirates and bravos with whom he was forced to consort on his voyages. Modern critics of his work note that he made no attempt to understand the oriental religions

which he attacked, and censure him for invoking the aid of the Inquisi- tion and sanctioning persecution of the Nestorians in Malabar. He strove, with a success disastrous to the Portuguese empire, to convert the government in Goa into a proselytizing agency. Throughout his life he remained in close touch with Ignatius of Loyola, who is said to have selected Xavier as his own successor at the head of the Society of Jesus. Within a few weeks of Xavier's death, indeed, Ignatius sent letters recalling him to Europe with that end in view.

Bibliography.— Many of the authorities on which the biographies of Xavier have been based are untrustworthy, notably the Pere- grina-cam of F. M. Pinto (q.v.), which minutely describes certain incidents of his life in the Far East (especially in Japan and Malacca). Xavier's extant letters, supplemented by a few other 16th-century documents, outweigh all other evidence. It is perhaps noteworthy that Xavier himself never mentions Pinto; but the omission may be explained by the numerous gaps in his correspondence. ˆ A critical text of the letters, with notes, bibliography and a life in Spanish, will be found in Monumenta Xaveriana ex Autographis vel ex Anti- quioribus Exemplis collecta, vol. i. (Madrid, 1899-1900), included in Monumenta historica Societatis Jesu. ' For translations, The Life and Letters of St Francis Xavier, by H. Coleridge, S.J. (2 vols., London, 1872), is useful, though the historical commentary has little value. There are numerous older and uncritical biographies by members of the Society; best and earliest are De vita Francisca Xaverii . . . libri sex, by O. Torsellino (Tursellinus) (Antwerp, 1596; English by T. F., The Admirable Life of St Francis Xavier, Paris, 1632); and Historic da Vtda do Padre Francisco de Xavier, &c, by Joao Luceria (Lisbon, 1600). Later works by the Jesuits Bartoli, MafTei, de Sousa, Poussines, Menchacha, Leon Pages and others owe much to Torsellino and Lucena, but also incorporate many traditions which can no longer be verified. St Francois de Xavier, sa vie et ses lettres, by J. M, Cros, S.J. (2 vols., Toulouse, 1900), embodies the results of long research. The Missionary Life of St Francis Xavier, by the Rev. H. Venn, prebendary of St Paul's cathedral, London (London, 1862), is polemical, but contains an interesting map of Xavier's journeys. For a non-partisan account of Xavier's work in the East, sec K. G. Jayne, Vasco da Gama and his Successors, chapters 25-32 (London, 19.10); and Otis Cary, A History of Christianity in Japan (2 vols., London, 1909). (K. G. J.)

XENIA, a city and the county-seat of Greene county, Ohio, U.S.A., in the township of Xenia, about 3 m. E. of the Little Miami river, and about 55 m. S.W. of Columbus and about 6$ m. N.E. of Cincinnati. Pop. (1900) .8696, of whom 410 were foreign-born ; (19 10 census) 8706. Xenia is served by the Cincinnati, Hamilton & Dayton, and the Pittsburg, Cincinnati, Chicago & St Louis (Pennsylvania System) rail- ways, and by

interurban electric lines to Springfield and Dayton. It is the seat of the Ohio Soldiers' and Sailors' Orphans' Home and of the Xenia. Theological Seminary (United Presby- terian; founded in 1794 at Service, Pa., and united in 1874 with the Theological Seminary of the North-West, founded in 1839 at Oxford, Ohio). About 3 m. N.E., at Wilberforce, is Wilber- force University (co-educational; opened in 1856 and reorganized in 1863), conducted by the African Methodist Episcopal Church. The public buildings of Xenia include a public library, the county court-house and the municipal building. Xenia is situated in a fine farming and stock-raising region, and among its manu- factures are cordage and twine, boots and shoes, carriages and machinery. The township was first settled about 1797. Xenia was laid out as a village in 1803, was incorporated as a town in 1808 and was chartered as a city in 1870.

XENOCRATES, of Chalcedon, Greek philosopher, scholarch or rector of the Academy from 339 to 314 B.C., was bom in 396. Removing to Athens in early youth, he became the pupil of the Socratic Aeschines, but presently joined himself to Plato, whom he attended to Sicily in 361. Upon his master's death

(347 B.C.), in company with Aristotle he paid a visit to Hermias at Atarneus. In 339, Aristotle being then in Macedonia, Xenocrates succeeded Speusippus in the presidency of the school, defeating his competitors Menedemus and Heracleides by a few votes. On three occasions he was member of an Athenian legation, once to Philip, twice to Antipater. Soon after the death of Demosthenes in 322, resenting the Macedonian influence then dominant at Athens, Xenocrates declined the citizenship offered to him at the instance of Phocion, and, being unable to pay the tax levied upon resident aliens, was, it is said, sold, or on the point of being sold, into slavery. He died in 314, and was succeeded as scholarch by Polemon, whom he had reclaimed from a life of profligacy. Besides Polemon, the statesman Phocion, Chaeron, tyrant of Pellene, the Academic Grantor, the Stoic Zeno and Epicurus arc alleged to have frequented his lectures.

Xenocrates's earnestness and strength of character won for him universal respect, and stories were remembered in proof of his purity, integrity and benevolence. Wanting in quickness of apprehension and in native grace, he made up for these deficiencies by a con- scientious love of truth and an untiring industry. Less original than Speusippus, he adhered more closely to the letter of Platonic doctrine, and is accounted the typical representative of the Old Academy. In his writings, which were numerous, he seems to

have covered nearly the whole of the Academic programme; but meta-physics and ethics were the subjects which principally engaged his thoughts. He is said to have invented, or at least to have emphasized, the tripartition of philosophy under the heads of physic, dialectic and ethic.

In his ontology Xenocrates built upon Plato's foundations: that ts to say, with Plato he postulated ideas or numbers to he the causes of nature's organic products, and derived these ideas or numbers from unity (which is active) and plurality (which is passive). But he put upon this fundamental dogma a new interpretation. Accord- ing to Plato, existence is mind pluralized: mind as a unity, i.e. universal mind, apprehends its own plurality as eternal, immutable, intelligible ideas; and mind as a plurality, i.e. particular mind, perceives its own plurality as transitory, mutable, sensible things. The idea, inasmuch as it is a law of universal mind, which in par- ticular minds produces aggregates of sensations called things, is a "determinant" (irtpas ?x

His cosmology, which is drawn almost entirely from the Timaeus, and, as he intimated, is not to be regarded as a cosmogony, should be studied in connexion with his psychology. Soul is a self-moving number, derived from the two fundamental principles, unity {iu) and plurality (Suds bopurrvs), whence it obtains its powers of rest and motion. It is incorporeal, and may exist apart from body. The irrational soul, as well as the rational soul, is immortal. The universe, the heavenly bodies, man, animals, and presumably plants, are each of them endowed with a soul, which is more or less perfect according to the position which it occupies in the descending scale of creation. With this Platonic philosopheme Xenocrates combines the current theology, identifying the universe and the heavenly bodies with the greater gods, and reserving a place be- tween them and mortals for the lesser divinities.

If the extant authorities are to be trusted, Xenocrates recog- nized three grades of cognition, each appropriated to a region of its own — viz. knowledge, opinion and sensation, having for their respective objects supra-celestial s or ideas, celestials or stars, and infra-celestials or things. Even here the mythological tendency displays itself — vorira, Soˆaara and ala&T\Tb. being severally committed to Atropos, Lachesis and Clotho. Of Xenocrates's

logic we know only that with Plato he distinguished to na9′ airro and to tt/ jos tc, rejecting the Aristotelian list of ten categories as a super- fluity.

Valuing philosophy chiefly for its influence upon conduct, Xeno- crates bestowed especial attention upon ethics. The catalogue of his works shows that he had written largely upon this subject; but the indications of doctrine

which have survived are scanty, and may be summed up in a few sentences. Things are goods, ills or neutrals. Goods are of three sorts — mental, bodily, external; but of all goods virtue is incomparably the greatest. Happiness con- sists in the possession of virtue, and consequently is independent of personal and extraneous advantages. The virtuous man is pure, not in act only, but also in heart. To the attainment of virtue the best help is philosophy ; for the philosopher does of his own accord what others do under the compulsion of law. Speculative wisdom and practical wisdom are to be distinguished. Meagre as these statements are, they suffice to show that in ethics, as elsewhere, Xenocrates worked upon Platonic lines.

Xenocrates was not in any sense a great thinker. His meta- physic was a travesty rather than a reproduction of that of his master. His ethic had little which was distinctive. But his austere life and commanding personality made him an effective teacher, and his influence, kept alive by his pupils Polemon and Crates, ceased only when Arcesilaus, the founder of the so-called Second Academy, gave a new direction to the studies of the school.

See D. Van de Wynpersse, De Xenocraie Chalcedonio (Leiden, 1822) ; C. A. Brandis, Gesch. d. griechisch-romischen Philosophic (Berlin, 1853), ii. 2, I ; E. Zeller, Philosophie d. Griechen (Leipzig, 1875), ii. 1; F. W. A. Mullach, Fragmenta Philosophorum Grae- corum (Paris, 1881), iii. (H. Ja.)

XENOPHANES of Colophon, the reputed founder of the Eleatic school of philosophy, is supposed to have been born in the third or fourth decade of the 6th century B.C. An exile from his Ionian home, he resided for a time in Sicily, at Zancle and at Catana, and afterwards established himself in southern Italy, at Elea, a Phocaean colony founded in the sixty-first Olympiad (536-533). In one of the extant fragments he speaks of himself as having begun his wanderings sixty-seven years before, when he was twenty-five years of age, so that he was not less than ninety-two when he died. His teaching found expres- sion in poems, which he recited rhapsodically in the course of his travels. In the more considerable of the elegiac fragments which have survived, he ridicules the doctrine of the migration of souls (xviii.), asserts the claims of wisdom against the pre- valent athleticism, which seemed to him to conduce neither to the good government of states nor to their material prosperity (xix), reprobates the introduction of Lydian luxury into Colophon (xx.), and recommends the reasonable enjoyment of social pleasures (xxi.) . Of the epic fragments, the more important are those in which he attacks the " anthropomorphic and an- thropopathic polytheism " of his contemporaries. According to Aristotle, " the first of Eleatic unitarians was not careful to say whether the unity which he postulated was finite or in- finite, but, contemplating the

whole firmament, declared that the One is God." Whether Xenophanes was a monotheist, whose assertion of the unity of God suggested to Parmenides the doctrine of the unity of Being, or a pantheist, whose assertion of the unity of God was also a declaration of the unity of Being, so that he anticipated Parmenides — in other words, whether Xenophanes's teaching was purely theo- logical or had also a philosophical significance — is a question about- which authorities have differed and will probably continue to differ. The silence oT the extant fragments, which have not one word about the unity of Being, favours the one view; the voice of antiquity, which proclaims Xenophanes the founder of Eleaticism, has been thought to favour the other.

Of Xenophanes's utterances about (1) God, (2) the world, (3) knowledge, the following survive: (1) " There is one God, greatest among gods and men, neither in shape nor in thought like unto mortals. . . . He is all sight, all mind, all ear (i.e. not a composite organism). . . . Without an effort ruleth he all things by thought. . . . He abideth ever in the same place motionless, and it be- fitteth him not to wander hither and thither. . . . Yet men imagine gods to be born, and to have raiment and voice and body, like themselves. . . . Even so the gods of the Ethiopians are swarthy and flat-nosed, the gods of the Thracians are fair-haired and blue- eyed. . . . Even so Homer and Hesiod attributed to the gods all that is a shame and a reproach among men — theft, adultery deceit and other lawless acts. . . . Even so oxen, lions and horses if they had hands wherewith to grave images, would fashion god;

after their own shapes and make them bodies like to their own. (2) From earth all things are and to earth all things return. . . . From earth and water come all of us. . , . The sea is the well whence water springeth. . . . Here at our feet is the end of the earth where it reacheth unto air, but, below, its foundations are without end. . . . The rainbow, which men call Iris, is a cloud that is purple and red and yellow. (3) No man hath certainly known, nor shall certainly know, that which he saith about the gods and about all things; for, be that which he saith ever so perfect, yet doth he not know it; all things are matters of opinion. . . . That which I say is opinion like unto truth. . . . The gods did not reveal all things to mortals in the beginning; long is the search ere man findeth that which is better."

There is very little secondary evidence to record. " The Eleatic school." says the Stranger in Plato's Sophist, 242 D, " beginning with Xenophanes, and even earlier, starts from the principle of the unity of all things." Aristotle,

in a passage already cited, Meta- physics, A5, speaks of Xenophanes as the first of the Eleatic unitarians, adding that his monotheism was reached through the contempla- tion of the obpavfa. Theophrastus (in Simplicius s Ad Physica, 5) sums up Xenophanes's teaching in the propositions, " The All is One and the One is God." Timon fin Sext. Empir. Pyrrh. i. 224), ignoring Xenophanes's theology, makes him resolve all things into one and the same unity. The demonstrations of the unity and the attributes of God, with which the treatise De Melissa, Xenophane et Gorgia (now no longer ascribed to Aristotle or Theophrastus) ac- credits Xenophanes, are plainly framed on the model of Eleatic proofs of the unity and the attributes of the Ent, and must therefore be set aside. The epitomators of a later time add nothing to the testimonies already enumerated.

Tims, whereas 111 his writings, so far as they are known to us, Xenophanes appears as a theologian protesting against an anthro- pomorphic polytheism, the ancients seem to have regarded him as a philosopher asserting the unity of Being. How are we to under- stand these conflicting, though not irreconcilable, testimonies? According to Zeller, the discrepancy is only apparent. The Greek gods being the powers of nature personified, pantheism lay nearer to hand than monotheism. Xenophanes was, then, a pantheist. Accordingly his assertion of the unity of God was at the same time a declaration of the unity of Being, and in virtue of this declaration he is entitled to rank as the founder ot Eleaticism, inasmuch as the philosophy of Parmenides was his forerunner's pantheism divested of its theistic element. This reconciliation of the internal and the external evidence, countenanced as it is by Theophrastus, one of the best informed of the ancient historians, and approved by Zeller, one of the most learned of the modern critics, is more than plausible; but there is something to be said on the contrary part. In the first place, it may be doubled whether to a Greek of the 6th century pantheism was nearer than monotheism. Secondly, the external evidence does not bear examination. The Platonic testimony, if it proved anything, would prove too much, namely, that the doctrine of the unity of Being originated, not with Xeno- phanes, but before him; and, in fact, the passage from the Sophist no more proves that Plato attributed to Xenophanes the philosophy of Parmenides than Theaetetus, 1.60 D, proves that Plato attributed to Homer the philosophy of Heraclitus. Again, Aristotle's de- scription of Xenophanes as the first of the Eleatic unitarians does not necessarily imply that the unity asserted by Xenophanes was the unity asserted by Parmenides; the phrase, "contemplating the firmament, he declared that the One is God," leaves it doubtful whether Aristotle attributed to Xenophanes any philosophical theory whatever; and the epithet d-ypoˆorepos discourages the belief that Aristotle regarded Xenophanes as the author of a new and important departure. Thirdly, when Xenophanes himself says that theories about gods and about things

are not knowledge, that his own utterances are not verities but verisimilitudes, and that, so far from learning things by revelation, man must laboriously seek a better opinion, he plainly renounces the "disinterested pursuit of truth." If then he was indifferent to the problem, he can hardly be credited with the Eleatic solution. In the judgment of the present writer, Xenophanes was neither a philosopher nor a sceptic. He was not a philosopher, for he despaired of knowledge. He was not a sceptic, if by "sceptic" is meant the misologist whose despair of knowledge is the consequence of disappointed endeavour, for he had never hoped. Rather he was a theologian who arrived at his theory of the unity of the Supreme Being by criticism of the contemporary mythology. But, while he thus stood aloof from philosophy, Xenophanes influenced its development in two ways; first, his theological henism led the way to the philo- sophical henism of Parmenides and Zeno; secondly, his assertion that so-called knowledge was in reality no more than opinion taught his successors to distinguish knowledge and opinion, and to assign to each a separate province.

Apart from the old controversy about Xenophanes's relations to philosophy, doubts have recently arisen about his theological position. In fragments i., xiv., xvi., xxi., &c, he recognizes, thinks Freudenthal. a plurality of deities; whence it is inferred that, besides the One God, most high, perfect, eternal, who, as immanent intelligent cause, unifies the plurality of things, there were also

lesser divinities, who govern portions of the universe, being them selves eternal parts of the one all-embracing Godhead. Whilst it can hardiy be allowed that Xenophanes, so far from deny- ing, actually affirms a plurality of gods, it must be conceded to Freudenthal that Xenophanes's polemic was directed against the anthropomorphic tendencies and the mythological details of the con- temporary polytheism rather than against the polytheistic principle, and that, apart from the treatise De Melisso Xenophane et Gorgia, now generally discredited, there is no direct evidence to prove him a consistent monotheist. The wisdom of Xenophanes, like the wisdom of the Hebrew Preacher, showed itself, not in a theory of the uni- verse, but in a sorrowful recognition of the nothingness of things and the futility of endeavour. His theism was a declaration not so much of the greatness of God as rather of the littleness of man. His cosmology was an assertion not so much of the immutability of the One as rather of the mutability of the Many. Like Socrates, he was not a philosopher, and did not pretend to be one; but, as the reasoned scepticism of Socrates cleared the way for the philo- sophy of Plato, so did Xenophanes's " abnormis sapientia" for the philosophy of Parmenides.

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XENOPHON Greek historian and philosophical essayist, the son of Gryllus, was born at Athens about 430 B.C. 1 He belonged to an equestrian family of the deme of Ercbia. It may be inferred from passages in the Hellenica that he fought at Arginusae (406), and that he was present at the return of Alcibiadcs (408), the trial of the Generals and the overthrow of the Thirty. Early m life he came under the influence of Socrates, but an active life had more attraction for him. In 401, being invited by his friend Proxenus to join the expedition of the younger Cyrus against his brother, Artaxeixes II. of Persia, he at once accepted the offer. It held out the prospect of riches and honour, while he was little likely to find favour in democratic Athens, where the knights were regarded with suspicion as having supported the Thirty. At the suggestion of Socrates, Xenophon went to Delphi to consult the oracle; but his mind was already made up, and he at once proceeded to Sardis, the place of rendezvous. Of the expedition itself he has given a full and detailed account in his Anabasis, or the " Up-Country March." After the battle of Cunaxa (401), in which Cyrus lost his life, the officers in command of the Greeks were treacherously murdered by the Persian satrap Tissaphernes, with whom they were negotiating an armistice with a view to a safe return. The army was now in the heart of an unknown country, more than a thousand miles from home and in the presence of a troublesome enemy. It was decided to march northwards up the Tigris valley and make for the shores of the Euxine, on which there were several Greek colonies. Xenophon became the leading spirit of the army; he was elected an officer, and he it was who mainly directed the retreat. Part of the way lay through the wilds of Kurdistan, where they had to encounter the harassing guerrilla attacks of savage mountain tribes, and part through the highlands of Armenia and Georgia. After a rive months' march they reached Trapezus [Trebizond] on the Euxine (February 400), where a tendency to demoraliza- tion began to show itself, and even Xenophon almost lost his control over the soldiery. At Cotyora he aspired to found a new colony; but the idea, not being unanimously accepted, was abandoned, and ultimately Xenophon with his Greeks arrived at Chrysopolis [Scutari] on the Bosporus, opposite Byzantium. After a brief period of service under a Thradan chief, Seuthes,*

they were finally incorporated in a Lacedaemonian army which

1 As the description of the Ionian campaign of Thrasyllus in 410 (Hellenica, i. 2) is clearly derived from Xenophon's own reminiscences, he must have taken part in this campaign, and cannot therefore have been less than twenty years of age at the time.

had crossed over into Asia to wage war against the Persian satraps Tissaphemes and Pharnabazus. Xenophon, who accompanied them, captured a wealthy Persian noblemari, with his family, near Pergamum, and the ransom paid for his recovery secured Xenophon a competency for life.

On his return to Greece Xenophon served under Agesilaus, king of Sparta, at that time the chief power in the Greek world. With his native Athens and its general policy and institutions he war. not in sympathy. At Coroneia (394) he fought with the Spartans against the Athenians and Thebans, for which his fellow-citizens decreed his banishment. The Spartans provided a home for him at Scillus in Klis, about two miles from Olympia; there he settled down, to indulge his tastes for sport and literature. After Sparta's crushing defeat at Leuctra (371), Xenophon was driven from his home by the people of Elis. Meantime Sparta and Athens had become allies, and the Athenians repealed the decree which had condemned him to exile. There is, however, no evidence that he ever returned to his native city. According to Diogenes Laertius, he made his home at Corinth. The year of his death is not known; all that can be said is that it was later than 355, the date of his work on the Revenues of Athens.

The Anabasis (composed at Scillus between 379 and 371) is a work of singular interest, and is brightly and pleasantly written. Xeno- phon, like Caesar, tells the story in the third person, and there is a straightforward manliness about the style, with a distinct flavour of a cheerful lightheartedness, which at once enlists our sympathies. His description of places and of relative distances is very minute and painstaking. The researches of modern travellers attest his general accuracy. It is expressly stated by Plutarch and Diogenes Lacruus that the Anabasis was the work of Xenophon, and the evidence from style is conclusive. The allusion (Hellenica,' iii. i, 2) to Themistogenes of Syracuse as the author shows that Xenophon published it under an assumed name.

The Cyropaedia, a political and philosophical romance, which describes the

boyhood and training of Cyrus, hardly answers to its name, being for the most part an account of the beginnings of the Persian empire and of the victorious career of Cyrus its founder. The Cyropaedia contains in fact the author's own ideas of training and education, as derived conjointly from the teachings of Socrates and his favourite Spartan institutions. It was said to have been written in opposition to the Republic of Plato. A distinct moral purpose, to which literal truth is sacrificed, runs through the work. For instance, Cyrus is represented as dying peacefully in his bed, whereas, according to Herodotus, he fell in a campaign against the Massagetae.

The Hellenica written at Corinth, after 362, is the only contem- porary account of the period covered by it (411-362) that has come down to us. It consists of two distinct parts; books L and ii., which are intended to form a continuation of the work of Thucydides, and bring the history down to the fall of the Thirty, and books iii.-vii., the Hellenica proper, which deal with the period from 4.01 to 362, and give the history of the Spartan and Theban hegemonies, down to the death of Epaminondas. There is, however, no ground for the view that these two parts were written and published as separate works. There is probably no justification for the charge of deliberate falsification. It must be admitted, however, that he had strong political prejudices, and that these prejudices have influenced his narrative. He was a partisan of the reactionary movement which triumphed after the fall of Athens; Sparta is hisideal,_ and Agesilaus his hero. At the same time, he was a believer in a divine overruling providence. He is compelled, therefore, to see in the fall of Sparta the punishment inflicted by heaven on the treacherous policy which had prompted the seizure of the Cadmea and the raid of Sphodrias. Hardly less serious defects than his political bias are his omissions, his want of the sense of proportion and his failure to grasp the meaning of historical criticism. The most that can be said in his favour is that as a witness he is at once honest and well informed. For this period of Greek history he is, at any rate, an indispensable witness.

The Memorabilia, or " Recollections of Socrates," in four books, was written to defend Socrates against the charges of impiety and corrupting the youth, repeated after his death by the sophist Poly crates. The work is not a literary masterpiece; it lacks coherence and unity, and the picture it gives of Socrates fails to do him justice. Still, as far as it goes, it no doubt faithfully describes the philosopher's manner of life and style of conversation. ˆ It was the moral and practical side of Socrates's teaching which most interested Xenophon; into his abstruse metaphysical speculations he seems to have made no attempt to enter : for these indeed he had neither taste nor genius. Moving within a limited range of ideas, he doubtless gives us " considerably less than the real Socrates, while Plato gives us something more." It is probable that the work in its present form is an abridgment.

Xenophon has left several minor works, some of which are very interesting and give an insight into the home life of the Greeks.

The Oeconomics (to some extent a continuation »f the Memorabilia, and sometimes regarded as the fifth book of the same) deals with the management of the house and of the farm, and presents a pleasant and amusing picture of the Greek wife and of her home duties. There are some good practical remarks on matrimony and on the respective duties of husband and wife. The treatise, which is in the form of a dialogue between Socrates and a certain Isehomachus, was translated into Latin by Cicero.

Intheessayson horsemanship (Hippike) and hunting (Cynegeticus), Xenophon deals with matters of which he had a thorough practical knowledge. In the first he gives rules how to choose a horse, and then tells how it is to be groomed and ridden and generally managed. The Cynegeticus deals chiefly with the hare, though the author speaks also of boar-hunting and describes the hounds, tells how they are to be bred and trained, and gives specimens of suitable names for them. On all this he writes with the zest of an enthusiastic sportsman, and he observes that those nations whose upper classes-, have a taste for field-sports will be most likely to be successful in war. Both treatises may still be read with interest by the modern reader.

The. Hipparchicus explains the duties of a cavalry officer; it is not, according to our ideas, a very scientific treatise, showing that the art of war was buu very imperfectly developed and that the military operations of the Greeks were on a somewhat petty scale. He dwells at some length on the moral qualities which go to the making of a good cavalry officer, and hints very plainly that there must be strict attention to religious duties.

The Agesilaus is a eulogy of the Spartan king, who had two special merits in Xenophon's eyes: he was a rigid disciplinarian, and he was particularly attentive to all religious observances. We have a summary of his virtues rather than a good and striking picture of the man himself.

The Hiero works out the line of thought indicated in the story of the Sword of Damocles. It is a protest against the notion that the "tyrant " is a man to be envied, as having more abundant means of happiness than a private person. This is one of the most pleasing of his minor works; it is cast into the form of a dialogue between Hiero, tyrant of Syracuse, and the lyric poet Simonides.

The Symposium, or " Banquet," to some extent the complement of the Memorabilia, is a brilliant little dialogue in which Socrates is the prominent figure. He is represented as " improving the occasion," which is that of a

lively Athenian supper-party, at which there is much drinking, with flute-playing, and a dancing-girl from Syracuse, who amuses the guests with the feats of a professional conjuror. Socrates's table-talk runs through a variety of topics, and winds up with a philosophical disquisition on the superiority of true heavenly love to its earthly or sensual counterfeit, and with an earnest exhortation to one of the party, who had just won a victory in the public games, to lead a noble life and do bis duty to his country.

There are also two short essays, attributed to him, on the political constitution of Sparta and Athens, written with a decided bias in favour of the former, which he praises without attempting to criticize. Sparta seems to have presented to Xenophon the best conceivable mixture of monarchy and aristocracy. The second is certainly not by Xenophon, but was probably written by a member of the oli- garchical party shortly after the beginning of the Peloponnesian War. In the essay on the Revenues of Athens (written in 355) he offers suggestions for making Athens less dependent on tribute received from its allies. Above all, he would have Athens use its influence for the maintenance of peace in the Greek world and for the settle- ment of questions by diplomacy, the temple at Delphi being for this purpose an independent centre and supplying a divine sanction. The Apology, Socrates's defence before his judges, is rather a feeble production, and in the general opinion of modern critics is not a genuine work of Xenophon, but belongs to a much later period. Xenophon was a man of great personal beauty and considerable intellectual gifts; but he was of too practical a nature to take an interest in abstruse philosophical speculation. His dislike of the democracy of Athens induced such lack of patriotism that he even fought on the side of Sparta against his own country. In religious matters he was narrow minded, a believer in the efficacy of sacrifice and in the prophetic art. His plain and simple style, which at times becomes wearisome, was greatly admired and procured him many imitators.

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XERXES (the Greek form of the Pers. Khshayarsha; Old Testament Ahasverus, Akhashvcrosh — i.e. Ahasuerus (q.v.) — with wrong vocalization and substitution of y for v, instead of Akhshamrsh; in Aramaic inscriptions and papyri from Egypt the name is written Khshai' arsh) , the name of two Persian kings of the Achaemenid dynasty.

1. Xerxes I., son of Darius I. and Atossa, the daughter of Cyrus the Great, and therefore appointed successor to his father in preference to his eldest half-brothers, who were born before Darius had become king (Herod, vii. 2 f.). After his accession in October 4S5 B.C. he suppressed the revolt in Egypt which had broken out in 486, appointed his brother Achaemenes as satrap and " brought Egypt under a much heavier yoke than it had been before " (Herod, vii. 7). His predecessors, especially Darius, had not been successful in their attempts to conciliate the ancient civilizations. This probably was the reason why Xerxes in 4S4 abolished the " kingdom of Babel " and took away the gciden statue of Bel (Marduk, Merodach), the hands of which the legitimate king of Babel had to seize on the first day of each year, and killed the priest who tried to hinder him.' Therefore Xerxes does not bear the title of " King of Babel " in the Babylonian documents dated from his reign, but " King of Persia and Media," or simply " King of

countries ” (i.e. of the world). This proceeding led to two rebellions, probably in 484 and 479; in the Babylonian documents occur the names of two ephemeral kings, Shamash-irba and Tarziya, who belong to this time. One of these rebellions was suppressed by Megabyzus, son of Zopyrus, the satrap whom the Babylonians had slain. 2

Darius had left to his son the task of punishing the Greeks for their interference in the Ionian rebellion and the victory of Marathon. From 483 Xerxes prepared his expedition with great care: a channel was dug through the isthmus of the peninsula of Mount Athos; provisions were stored in the stations on the road through Thrace; two bridges were thrown across the Hellespont. Xerxes concluded an alliance with Carthage, and thus deprived Greece of the support of the power- ful monarchs of Syracuse and Agrigentum. Many smaller Greek states, moreover, took the side of the Persians (” Medized “), especially Thessaly, Thebes and Argos. A large fleet and a numerous army were gathered. In the spring of 480 Xerxes set out from Sardis. At first Xerxes was victorious everywhere. The Greek fleet was beaten at Artemisium, Thermopylae stormed, Athens conquered, the Greeks driven back to their last line of defence at the Isthmus of Corinth and in the Bay of Salamis. But Xerxes was induced by the astute message of Thcmistocles (against the advice of Artemisia of Halicarnassus) to attack the Greek fleet under unfavourable

1 Herod, i. 183, by Ctesias changed into a plundering of the tomb of Belitanas or Belus: cf. Aelian, Var. Hist. 13, 3; Aristobulus ap. Arrian vii. 17, 2, and Strabo xvi. p. 7,””.

2 Ctesias, Pcrs. 22: his Icgemt.irv .lislory is transferred by Herodotus, iii. 150 ff., to the former rebellion against Darius.

conditions, instead of sending a part of his ships to the Pelopon- nesus and awaiting the dissolution of the Greek armament. 3 The battle of Salamis (28th of September 480) decided the war (see Salamis). Having lost his communication by sea with Asia, Xerxes was forced to retire to Sardis; the army which he left in Greece under Mardonius was in 479 beaten at Plataea (q.v.). The defeat of the Persians at Mycale roused the Greek cities of Asia.

Of the later years of Xerxes little is known. He sent out Sataspes to attempt the circumnavigation of Africa (Herod, iv. 143), but the victory of the Greeks threw the empire into a state of languid torpor, from which it could not rise again. The king himself became involved in intrigues of the harem (cf. Herod, ix. 108 ff. — compare the late Jewish novel of Esther, in which a remembrance of the true character of the king is retained) and was much dependent upon courtiers and eunuchs. He left inscriptions at Persepolis,

where he added a new palace to that of Darius, at Van in Armenia, and on Mount Elvend near Ecbatana; in these texts he merely copies the words of his father. In 465 he was murdered by his vizier Artabanus (

2. Xerxes II., son and successor of Artaxerxes I., was assassinated in 424 after a reign of forty-five days by his brother Secydianus or Sogdianus, who in his turn was murdered by Darius II. (q.v.).

See Ctesias, Pers. 44; Diod. xii., 64, 71, and the chronographers ; neither of the two ephemeral kings is mentioned in the canon of Ptolemy nor in the dates of Babylonian contracts of this time.

The name Xerxes was also borne by a king of Armenia, killed about 212 B.C. by Antiochus the Great (Polyb. viii. 25; Johannes Antiochenus, p. 53; his name occurs on copper coins); and by a son of Mithradates the Great of Pontus (Appian, Mithr. 108, 117). (Ed. M.) ■

XIPHILINUS, JOANNES, epitomator of Dio Cassius, lived at Constantinople during the latter half of the nth century a.d. He was a monk and the nephew of the patriarch of Con- stantinople of the same name, a well-known preacher (Migne, Patrologia Graeca, cxx.). The epitome (kithcr/ai) of Dio was prepared by order of Michael Parapinaces (1071-1078), but is unfortunately incomplete. It comprises books 36-80, thepcriod included being from the times of Pompcy and Caesar down to Alexander Severus. In book 70 the reign of Antoninus Pius and the early years of Marcus Aurelius appear to have been missing in his copy, while in books 78 and 79 a mutilated original must have been used. Xiphilinus divided the work into sections, each containing the life of an emperor. He omitted the name of the consuls and sometimes altered or emended the original. The epitome is valuable as preserving the chie f inci- dents of the period for which the authority of Dio is wanting.

See H. Rcimar's edition of Dio Cassius, ii. ; J. Melber's Dio in Teubner series; C. Wachsmuth, Einleitung in das Studium der alien Geschichte (1895); W. Christ, Geschichte der griechisclien Litteratur (1808).

X-RAY TREATMENT. The X rays (see Rontgen Rays) are now used extensively in medical work for purposes of treatment. They have been found tc be valuable in many forms of skin disease, more particularly in those of a chronic character; They have a favourable influence upon glandular tumours, as for example in enlargements of the lymphatic glands, of the spleen and of the thyroid gland. They give useful palliative effects in certain forms of malignant disease, although it is not yet certain that any permanent cures of cancerous conditions have been obtained by their use. In the disease known as rodent ulcer, which is a process of destructive

ulceration, and to that extent presents features allied to cancer, there is no doubt of the efficacy of X-ray treatment lor bringing about a complete cure in the majority of cases, provided that the disease has not advanced too deeply into the tissues.

3 See G. B. Grundy, Great Persian War (1901), and in criticism \V. W. Tarn, " The Fleet of Xerxes," in Journal of Hellenic Studies (1908), 202-34: also Macan's notes on Herod, iv.-vi. (1895), and authorities fur Plataea, Salamis.

The idea of using X rays in the treatment of disease arose from the recognition of the injurious effects which followed the prolonged application of the rays for diagnostic purposes. It fell to the lot of many early workers with X rays to notice the production of an inflammation of the skin, or a falling out of the hair over parts which had been subjected to X rays, and Leopold Freund, of Vienna, has stated that his first attempts to utilize X rays in treatment were made in 1896 to cure a hairy mole and were prompted by what he had read of such occur- rences. A definite action of the rays upon the skin having been observed, their employment in the treatment of skin diseases followed as a natural corollary. Amongst the earliest investi- gators of the possible therapeutic effects of X rays the names of Schiff, Freund, Kienbbck, Holtzknecht, Sjogren and Stenbeck may be mentioned. In Great Britain Sir Malcolm Morris, E. Dore and J. H. Sequeira were amongst the earliest investi- gators.

For operating successfully with an agent capable of producing decidedly harmful effects when, given in large doses it is neces- sary to have some method of measurement, and the need for this quickly became apparent when X rays were used for treat- ment. The results of X-ray photography had already shown that the tubes employed were capable of emitting radiations of very varying powers of penetration, and that the tubes were by no means constant in this respect; and the question whether highly penetrating rays or rays of feeble penetration were to be preferred for therapeutic use became the subject of much discussion. It is now recognized that the rays which act upon the tissues are those which are absorbed by the tissues, and consequently the softer or less penetrating rays are now regarded as those to be used in treatment. So too the problem of measuring the quantity of rays emitted by a tube during a given time began to call for a solution, if that were in any way possible. In 1901 Bcnoist designed an apparatus by which the quality of the rays emitted by a tube at any moment could be accurately determined, and in 1902 Holtzknecht brought

out the first quantitative device. It was called a chromo- radiometer, and it enabled the dose administered to a patient to be observed, and recorded for future guidance. Holtzknecht also drew up a scale of units by means of which the indications of his apparatus could be interpreted. The units of Holtz- knecht are still used to express the dosage of X rays, though his apparatus has been superseded. Holtzknecht's method of measurement consisted in observing the change of colour in certain pastilles when exposed to X rays, and his apparatus consisted of a scale of tints, and a number of pastilles of a yellow tint which acquired a green colour during exposure. The composition of these was kept a secret, but analysis revealed in them the presence of potassium sulphate combined with celluloid or gelatine. The pastilles were laid upon the surface under treatment, and their change of colour was compared at intervals with the scale of standard tints.

It was next thought that under suitable conditions the measurement of the current passing through the X-ray tube might serve as a guide to the quantity of X rays emitted by the tube, but, although this is the case to a certain extent, the method of quantity measurement which is now employed almost universally in X-ray treatment is that devised by Sabouraud and Noire, and used with signal success by them in an enormous number of cases of ringworm, in which disease measurement of dose is of the most critical importance, for the following reason. The cure of ringworm by X rays requires that all the hair of the affected region shall be caused to fall out, but, nevertheless, it is necessary for obvious reasons that the hair should grow again after the disease has disappeared. Now if the dose of X rays be insufficient the hair does not come out and no cure results, while if the dose be too great the hair comes out but does not grow again; and the margin of safety is quite a narrow one. The method of Sabouraud and Noire which has proved itself reliable for such critical measurements of dosage as are required for ringworm treatment, has to-day the universal acceptance of all X-ray workers for other forms

of X-ray treatment, although the use of their pastilles has certain disadvantages.

Sabouraud's pastilles consist of small disks of platino- cyanide of barium. This chemical compound has a bright yellow-green colour when freshly prepared, and changes through gradations of yellow to a brown colour when exposed to X rays. The pastilles are supplied in a book with which a permanent tint of colour is supplied, to indicate the colour change in the pastille which corresponds with a quantity of X rays equal to the maximum dose which the healthy skin will stand with- out inflammatory consequences. This is often spoken of as a " pastille dose." As the amount of irradiation needed to produce the change of colour is considerable, the

salt is fixed, during the treatment, at a point half-way between the source of the rays and the skin surface under treatment. During an exposure the chemical salt, in the form of a small disk of the material on cardboard, is adjusted in the required position by means of a pastille holder, and it is examined at intervals during the course of the exposure, until it has reached the required tint. When in the holder the pastille must be protected from light, and should have a piece of metal as a backing, if its indications are to be accurate.

In X-ray treatment some protection of the surrounding healthy parts is usually necessary. With this object various methods of shielding have been devised, either by coverings of the patient by impermeable materials, or by enclosing the tube in an impermeable box. Both methods arc used, but tube-boxes are the most convenient, and most instrument makers now supply these boxes with suitable windows or openings of different sizes for the passage of the pencil of rays which is to fall upon the part under treatment.

The effect of the rays on healthy tissues is in the main a destructive one, but some of the cells of the tissues are more sensitive to the rays than are others; and this permits of a selective effect being obtained, with the destruction of some cells and not of the whole tissue. Young cells, and actively growing cells, are the most susceptible, and for this reason it is possible to influence the glands of the skin and the papillae of the hairs with a dose which will not destroy the skin itself. The art of successful working with X rays is based upon a careful adjust- ment of the dose so as to secure a selective destruction of the morbid elements, and to avoid wholesale damage to the part treated. The effects of excessive doses of X rays is to pro- duce an inflammation which may result in painful sores which obstinately refuse to heal for many weeks or months. A quantity up to double that of the usual maximum or pastille dose may be employed in urgent cases without risk of any serious inflammation, but anything over this is to be avoided most carefully. In the treatment of ringworm the exact pastille dose must not be exceeded, for after a dose of about one and a half pastilles the fall of the hair is likely to be followed by permanent baldness.

In X-ray treatment it is customary to make use of moderate currents, and to bring the X-ray tube in its tube-holder and box into position so that the pencil of rays may fall upon the part to be treated. The distance of the skin surface from the centre of the tube must be known, and the pastille arranged in place accordingly. Fifteen centimetres is a usval distance, and at this distance a tube working with a current of a milliampere should give the full therapeutic dose or " pastille dose " in about 15 minutes. In general X-ray treatment it is quite usual at the present time to proceed by the method of full doses at rather long intervals. From the experience obtained by Sabouraud in numerous cases of ringworm it has been found that a full

dose must not be repeated untilamonth haselapsed. So too in the treatment of rodent ulcer full doses at long intervals are now thought better than smaller doses repeated more often, and such doses are more easily measured by the Sabouraud pastille, which records large doses more simply than small ones, in which the slighter changes of tint are not easy to distinguish.

A great amount of work has been done with X rays for the treatment of cancer, but it is now recognized that the X rays

do not cure a cancer, although they are of value for the relief 01 pain and for the healing of cancerous ulcers. Diminution of size in cancerous growths has frequently been observed, and in some instances sarcomatous tumours have completely disappeared under X-ray treatment. Sooner or later, however, the cancer or sarcoma returns either in the original site or elsewhere ; and the patient dies of the disease. It is probable that X-ray treatment is able to prolong life in a fair number of cases, and by its agency in causing a healing of ulceration in cancer cases it is able to give valuable relief both to the body and mind of the patient, and this relief may last for a year or more.

In rodent uiccr X rays are usually sufficient to provide a lasting cure, but there are some exceptions, as for instance when the rodent ulcer has been long neglected, and has spread deeply so as to invade bony structures. An important factor in the successful treatment of rodent ulcer by X rays is to continue the applications at intervals for several months after apparent cure. If this precaution is omitted there is a very great likelihood of relapse taking place later on.

In the treatment of skin diseases by X rays the method finds a very suitable field. Almost all chronic skin affections yield to X-ray treatment fairly quickly, and maximal doses are not usually necessary.

In ringworm X rays have achieved wonderful results. The rays act upon the hair papillae, and not upon the ringworm fungus. They cause a shedding of the hair fifteen days after exposure and the fungus then dies out from the hair follicles, so that when in due course the hair begins to grow again after a period of two months it grows healthily and without disease. The X-ray treatment of ringworm has been a real advance, and Sabouraud has told us of the enormous pecuniary saving which has been effected in Paris by the shortening of the stay of the ringworm cases in the special schools

maintained there for the affected children.

In lupus X rays are valuable, but not fully satisfactory. The treatment by the rays will often succeed in bringing about a healing of the ulceration of lupus, but relapses are frequent, because foci of infection are apt to remain in the healed scar tissue and after a period of quiescence these may gradually provoke fresh mischief.

X-ray treatment is of service for the treatment of enlarged " strumous " glands in the neck. "When these glands are in the early stages, and there has not been any softening or breaking down of the gland tissue, the application of X rays, a few times repeated in moderate doses, will determine the subsidence of the enlargement and may effect a complete cure.

In the massive glandular enlargements of lymphadenoma a great reduction of the tumours can be brought about by heavy doses of X rays, but the results are to give a symptomatic rather than a real cure, for fresh glandular growths take place internally, and the usual course of the disease is not fundamentally modified.

So too in leukemia, the symptom of excessive abundance of white cells in the circulating blood can be surprisingly altered for the better by X rays, but generally without real cure of the underlying condition. The effect appears to be due to a direct destructive action upon the leucocytes or white corpuscles of the blood.

Quite recently the use of X rays in fibroid tumours of the uterus has been advocated, particularly by Courmelles in France and Albert-Schonberg in Germany. The action of the rays seems to be in part due to their influence upon the activity of the ovaries and in part to a direct effect upon the growing fibroids themselves, causing decrease of activity, relief of symptoms and reduction of the tumours. (H. L. J.)

XYLANDER, GUILIELMUS (Wit.hf.lm Holtzman, accord- ing to his own spelling) (1532-1576), German classical scholar,

was born at Augsburg on the 26th of December 1532. He studied at Tubingen, and in 1558, when in a state of abject poverty (caused, according to some, by his intemperate habits), he was appointed to succeed Micyllus (Molshem, Molseym or Molsheym) in the professorship of Greek at Heidelberg, which he exchanged for that of logic (publicus organi Aristotelii interpres) in 1562. He died at Heidelberg on the 10th of February 1576. Xylander was the author of a number of important works, among which his Latin translations of Dio Cassius (1558), Plutarch

(1560-1570) and Strabo (1571) deserve special mention. He also edited (1568) the geographical lexicon of Stephanus of Byzantium; the travels of Pausanias (completed after his death by F. Sylburg, 1583); the Meditations of Marcus Aurelius (1558, the editio princeps based upon a Heidelberg MS. now lost; a second edition in 1568 with the addition of Antoninus Liberalis, Phlegon of Tralles, an unknown Apollonius, and Antigonus of Carystus— – all paradoxographers) ; and the chronicle of George Cedrenus (1566). He translated the first six books of Euclid into German with notes, the Arith- metica of Diophantus, and the De quattuor mathematicis scientiis of Michael Psellus into Latin.

XYLENE, or Dimethyl Benzene, C 6 H 4 (CH 3) 2 . Three isomeric hydrocarbons of this formula exist; they occur in the light oil fraction of the coal tar distillate, but they cannot be separated by fractional distillation owing to the closeness of their boiling points. The mixture can be separated by shaking with sulphuric acid, whereupon the ortho and meta forms are converted into soluble sulphonic acids, the para form being soluble only in concentrated acid; the ortho and meta acids may be separated by crystallization of their salts or sulphon- amides. Ortho-xylene is obtained from ortho-brom toluene, methyl iodide and sodium as a colourless mobile liquid boiling at 142 , melting at ~?S°, and having a specific gravity of 0-8932 at 0°. Oxidation by potassium permanganate gives phthalic acid; whilst chromic acid gives carbon dioxide and water. Meta- or iso-xylene, the most important isomer, may be prepared by nucleus-synthetic reactions, or by distilling mesitylenic acid, C e H 3 (CH3)2C0 2 H, an oxidation product of mesitylene, C fl H; f (CH 3)3, which is produced on the condensation of acetone, with lime; this reaction is very important, for it orientates met a —com pounds. It boils at 139°, melts at -54°, and has a specific gravity of 0-8812. Para-xylene is obtained when camphor is distilled with zinc chloride, but it is best prepared from para-brom-toluene or dibrombenzene, methyl iodide and sodium. Dilute nitric acid oxidizes it first to para-toluic acid and then to terephthalic acid. It boils at 138 , melts at 15°, and has a specific gravity of o-88oi at o°.

XYLOPHONE (Fr. xylophone; Ger. Xylophon, Strohjledel or Holzharmonika; Ital. armonica de legno), a small instrument of percussion, of definite sonorousness, used in the orchestra to mark the rhythm. The xylophone consists of a series of little wooden staves in the form of a half cylinder and graduated in size. The staves, each of which represents a semitone, ˆrest on two, three or four wooden bars, covered with straw and converging to form an acute angle. They are so arranged that each stave is isolated. In some models the staves are grouped in two rows, comprising the naturals and the accidentals. The xylophone is played with two little wooden hammers, and has a compass of two or three octaves. The quality of tone is inferior to that of the steel harmonica or glockenspiel. (K. S.)

XYSTUS, the Greek architectural term for the covered portico of the gymnasium, in which the exercises took place during the winter or in rainy weather; this was known as the t-vvrds 8p6fJos, from its polished floor (%vet.v, to polish). The Romans applied the term to the garden walk in front of the porticoes, which was divided into flower beds with borders of box, and to a promenade between rows of large trees.

Y— YACHTING

Ythe twenty-fifth letter of the English alphabet, one of four variants («, v, w, y) which have been developed out of one Greek symbol. It was taken into the

Roman alphabet as a form distinct from V in the ist century B.C., when it was desired to represent the sound of the Greek v more accurately than could be done by the ordinary Roman alphabet. Many Greek words had been borrowed from Greek long before this and pronounced like genuine Latin words. Thus the proper name IIuppos was borrowed as Bitrrus, $p{rycs as Bruges. But with the growth of literary knowledge this was felt to be a very inexact repre- sentation of the Greek sounds, and the words were respelt as Pyrrhus and Phryges. The philosopher Pythagoras is said to have regarded this letter as a symbol of human life (Servius, on Virgil, Aeneid vi. 136). To this there are various references in the Roman poets. Two lines of Persius (iii. 56-57) seem to throw some light upon the particular form of Y intended' " Et tibi quae Samios diduxit littera ramos

surgentem dextro monstravit liniite callem.' These lines appear to imply that the letter took the form y, which can only be one of the oldest forms (X) written from right to left. The straight road is the difficult, the deviating line is the easier path of vice. Anglo-Saxon took over the Roman Y with its Roman value of the " modified «" (il), and employed it accordingly for the sound which arose from a u sound under the influence of an tin the following syllable :fyUan," fill," cp. Gothic fuiljan; mus, " mouse," plural mils, from an earlier lost musis. The y sounds were often confused with i, whence, in modern English, mice.*

The vowel use was the only use of the old symbol. The consonant Y is of a different origin. The early English g (always hard as in gig) was palatalized before e and i sounds into a consonant i (i) or y, which was written in Middle English with the symbol 3. With this letter also was written the original consonant i (?'), which appears in Latin as i (J) in iuguin, iuvencus. This Latin sound seems, at least initially, to have represented two originally separate sounds, for Greek represents the first sound of iugum by

f iˆuyoif), while in other words it represents a i (y) of other languages by the " rough breathing " {h or '): ayvbs, " holy," is the same word as the Sanskrit yajnas. The English words that correspond etymologic idly to iugum and iuvencus are " yoke " and "young." In Northern English the symbol 5 survived longer than in the southern part of the island, and in Scottish documents of the 16th century was confused with 2. From this cause various Scottish names that weie never pronounced with 2 arc so spelt, as Menzies (Mengies), Dalziel, Cadzow. In otheis like Mackenzie, z is now universally pronounced, though as late as the middle of the r8th century Lord Karnes decrared that to hear Mackenzie pronounced with a z turned his stomach. (P.Gi.)

YABLONOI, or Yablonovoi (" Apple Mountains," known to the Mongols as Dynze-daban), a range of E. Siberia, stretching N.E. from near the sources of the river Kerulen (N.E. of Urga in N. Mongolia) to the bend of the river Olekma in 56 N., and forming the S.E. border ridge of the upper terrace of the great plateau of Central and E. Asia. Its summits reach alti- tudes of 5000-6000 ft., culminating in Mount Sokhondo (8040 ft.) near the Transbaikal-Mongolia frontier. The range serves as the water-parting between the streams which flow to the Pacific and those which flow to the Arctic Ocean, and is a dividing line between the Siberian and the Daurian flora. The passes have altitudes of 2000-3500 ft. The range is a continuation of the Kentei Mountains of Mongolia, but is not orographically connected with the St.anovoi Mountains, farther to the N.E., though the names Yablonoi and Stanovoi are commonly used alternatively. The latter are the S.E. border-range of the lower terrace and are connected with the Great Khingan Mountains.

YACHOW-FU, a prefectural city in the province of Sze- ch'uen, China, in 30 N,, 103 E.; pop. about 40,000. It is situ- ated in a valley on the banks of the river Ya, where tea is grown. The town owes its importance to the fact that it stands at the parting of the tea and tobacco trade route to Tibet via Tachien- lu and the cotton trade route to west Yun-nan via Ningyuen-Fu. The city wall measures 2 m. in circumference, and is pierced by four gates. Yachow-Fu is first mentioned during the Chow dynasty (1122-255 B.C.).

YACHTING, the sport of racing in yachts 1 and boats with sails, and also the pastime of cruising for pleasure in sailing steam or motor vessels. Yacht racing dates from the beginning of the 19th century; for, although there were sailing yachts long before, they were but few, and belonged exclusively to princes and other illustrious personages. For instance, in the Anglo- Saxon period Athelstan had presented to him by the king of Norway a magnificent royal vessel, the sails of which were purple and the head and deck wrought with gold, apparently a kind of state barge. Elizabeth had

one, and so has every English sove- reign since. During her reign a pleasure ship was built (1588) at Cowes (Isle of Wight), so that the association of that place with the sport goes back a very long time. In 1660 Charles II. was presented by the Dutch with a yacht named the " Mary," until which time the word "yacht" was unknown in England. The Merrie Monarch was fond of sailing, for he designed a yacht of 25 tons called the " Jamie," built at Lambeth in 1662, as well as several others later on. In that year the " Jamie "was matched for £100 against a small Dutch yacht, under the duke of York, from Greenwich to Gravesend and back, and beat her, the king steering part of the time — apparently the first record of a yacht match and of an amateur helmsman. Mr Arthur H. Clark, in his History of Yachting (1904), traces the history of pleasure craft from 1600 to 1815, and gives an interesting illustrated account of the vachts belonging to Charles II.

The first, authentic record of a sailing club is in 1720, when the Cork Harbour Water Club, now known as the Royal Cork Yacht Ciub, was established in Ireland, but the yachts were small. Maitland, in his History of London (1739) mentions sailing and rowing on the Thames as among the amusements then indulged in; and Strutt, in his Sports and Pastimes (1801), says that the Cumberland Society, consisting of gentlemen partial to this pas- time, gave yearly a silver cup to be sailed for in the vicinity of London. The boats usually started from Blackfriars Bridge, went up the Thames to Putney, and returned to Vauxhall, being, no doubt, mere sailing boats and not yachts or decked vessels. From the middle to the end of the 18th century yacht- ing developed very slowly: although matches were sailed at Cowes as far back as 1780, very few yachts of any size, say 35 tons, existed in 1800 there or elsewhere. In 1812 the Royal Yacht Squadron was established by fifty yacht-owners at Cowes and was called the Yacht Club, altered to the Royal Yacht Club in 1820; but no regular regatta was held there until some years later. The yachts of the time were built of heavy materials, like the revenue cutters, full in the fore body and fine aft; but it was soon discovered that their timbers and scantlings were unnecessarily strong, and they were made much lighter. It was also found that the single-masted cutter was more weatherly than the brigs and schooners of the time, and the former rig was adopted for racing, and, as there was no time allowance for difference of size, they were all built of considerable dimensions.

Early English Yachts. — Among the earliest of which there is any record were the " Pearl," 95 tons, built by Sainty at Wyvenhoe near Colchester in 1820, for the marquess of Anglesey, and the "Arrow," 84 tons, originally 61 ft. 9ˆ in. long and 18 ft. si in. beam, built by Joseph Weld in 1822, which for many years remained extant as a racing yacht, having been rebuilt and

1 The English word " yacht " is the Dutch jacht, jagt, iromjachten, " to hurry," " to hunt." See also Ship and Shipbuilding.

altered several times, and again entirely rebuilt in 1887-88. The Thames soon followed the example of the Solent and established the Royal Thames Yacht Club in 1823, the Clyde founding the Royal Northern Yacht Club in 1824, and Plymouth the Royal Western in 1827. In this year the Royal Yacht Squadron passed a resolution disqualifying any member who should apply steam to his yacht — the enactment being aimed at T. Assheton Smith, an enthusiastic yachtsman and fox-hunter, who was having a paddle-wheel steam yacht called the " Menai " built on the Clyde. In 1830 one of the largest cutters ever constructed was launched, viz. the " Alarm," built by Inman at Lymington for Joseph Weld of Lulworth Castle, from the lines of a famous smuggler captured off the Isle of Wight. She was 82 ft. on the load-line by 24 ft. beam, and was reckoned of 193 tons, old measurement, in which length, breadth and half-breadth (supposed to represent depth) were the factors for computation. Some yachtsmen at this time preferred still larger vessels and owned square-topsail schooners and brigs like the man-o'-war brigs of the day, such as the " Waterwitch," 381 tons, built by White of Cowes, in 1832, for Lord Belfast, and the " Brilliant," barque, 493 tons, belonging to J. Holland Ackers, who invented a scale of time allowance for competitive sailing. In 1834 the first royal cup was given by William IV. to the Royal Yacht Squadron. In 1836 the Royal Eastern Yacht Club was founded at Granton near Edinburgh; in 1838 the Royal St George's at Kingstown and the Royal London; in 1843 the Royal Southern at Southampton and the Royal Harwich; in 1844 the Royal Mersey at Liverpool and the Royal Victoria at Ryde. The number of vessels kept pace with the clubs — the fifty yachts of 1812 increasing nearly tenfold before the middle of the century.

First Alteration in Type. — In 1848, after J. Scott Russell had repeatedly drawn attention to the unwisdom of constructing sailing vessels on the " cod's head and mackerel tail " plan, and had enunciated his wave-line theory, Mare built at Blackwall an entirely new type of vessel, with a long hollow bow and a short after-body of considerable fulness. This was the iron cutter " Mosquito," of 59 ft. 2 in. water-line, 15 ft. 3 in. beam, and measuring 50 tons. Prejudice against the new type of yacht being as strong as against the introduction of steam, there were no vessels built like the " Mosquito," with the excep- tion of the " Volante," 59 tons, by Harvey of Wyvenhoe, until the eyes of English yachtsmen were opened by the Americans three years later. About this period yacht racing had been

gradually coming into favour in the United States, the first yacht club being founded at New York in 1844 by nine yacht- owners; and in r846 the first match between yachts in the States was sailed, 25 m. to windward and back from Sandy Hook lightship, between J. C. Stevens's new centre-board sloop " Maria," ryo tons, 100 ft. water-line and 26 ft. 8 in. beam, with a draught of 5 ft. 3 in. of water, and the " Coquette," schooner, 74 tons, belonging to J. H. Perkins, the latter winning; but the appearance of the " Maria," which had a clipper or schooner bow, something like that of the racing cutters of r88y-88, did much for yachting in America. Stevens then commissioned George Steers of New York, builder of the crack pilot schooners, to construct a racing schooner to visit England in the year of the great exhibition, and the result was the " America " of 1 70 tons. She crossed the Atlantic in the summer of 1851, but failed to compete for the Queen's cup at Cowes in August, although the club for that occasion threw the prize open to all the world, as her owner declined to concede the usual time allowance for difference of size. The members ef the Yacht Squadron, not wishing to risk the reproach of denying the visitor a fair race, decided that their match for a cup given by the club, to be sailed round the Isle of Wight later in the same month, should be without any time allowance. The " America," thus exceptionally treated, entered and competed against fifteen other vessels. The three most dangerous com- petitors being put out through accidents, the " America " passed the winning-post 18 minutes ahead of the 47-ton cutter " Aurora," and won the cup; but, even if the time allowance

had not been waived, the American schooner yacht would still have won by fully a couple of minutes. The prize was given to the New York Yacht Club and constituted a challenge cup, called " the America's cup," for the yachts of all nations, by the deed of gift of the owners of the winner. (See below for a complete account of these races.)

Not only was the " America " as great a departure from the conventional British type of yacht as the " Mosquito," but the set of her sails was a decided novelty. In England it had been the practice to make them baggy, whereas those of the " America " were flat, which told materially in working to windward. The revolution in yacht designing and canvasing was complete, and the bows of existing cutters were lengthened, that of the "Arrow " among others. The " Alarm " was also lengthened and turned into a schooner of 248 tons, and the " Wildfire," cutter, 59 tons, was likewise converted. Indeed there was a complete craze for schooners, the " Flying Cloud," " Gloriana," " Laila Rookh," " Albertine," " Aline," " Egeria," " Pantomime " and others being built, between 1852 and 1865, during which period the centre-board, or sliding keel, was applied to schooners as well as sloops in America. The national or cutter rig was nevertheless not neglected in England, for Hatcher of Southampton built the

35-ton cutter "Glance" — the pioneer of the subsequent 40-tonners — in 1855, and the " Vampire " — the pioneer of the 20-tonners — in 1857, in which year Weld also had the " Lul- worth," an 82-ton cutter of comparatively shallow draught, constructed at Lymington. At this time too there came into existence a group of cutters, called " flying fifties " from their tonnage, taking after the "Mosquito" as their pioneer; such were the " Extravaganza," " Audax " and " Vanguard." In 1866 a large cutter was constructed on the Clyde called the " Condor," 135 tons, followed by the still larger " Oimara," 163 tons, in 1867. In 1868 the " Cambria " schooner was built by Ratsey at Cowes for Ashbury of Brighton, and, having proved a successful match-sailer, was taken to the United States in 1870 to compete for the America's cup, but was badly beaten, as also was the " Livonia " in 1S71.

The First Great Era ef Yacht Racing. — The decade between 1870 and 1880 may be termed the first Golden Age of yachting, inasmuch as the racing fleet had some very notable additions made to it, of which it will suffice to mention the schooners " Gwendolin," " Cetonia," " Corinne," " Miranda " and " Waterwitch "; the large cutters " Kriemhilda," " Vol au Vent," " Formosa," " Samcena " and " Vanduara," a cutter built of steel; the 40-tonners " Foxhound," " Bloodhound," " Myosotis " and " Norman "; the 20-tonners " Vanessa." (Hatcher's masterpiece), " Quickstep," " Enriqueta," " Louise " and " Freda "; and the yawls " Florinda," " Corisande," " Jullanar " and " Latona." The " Jullanar " may be noted as a specially clever design. Built in 1874 from the ideas of Bentall, an agricultural implement maker of Maldon, Essex, she had no dead wood forward or aft, and possessed many improvements in design which were embodied and developed by the more scientific naval architects, G. L. Watson, William Fife, jun., and others in later years. Lead, the use of which commenced in 1846, was entirely used for ballast after 1870 and placed on the keel outside.

Of races there was a plethora; indeed no fewer than 400 matches took place in 1876, as against 63 matches in 1856, with classes for schooners and yawls, for large cutters, for 40- tonners, 20-tonners and 10-tonners. The sport, too, was better regulated, and was conducted on a uniform system: the Yacht- Racing Association, established in 1875, drew up a simple code of laws for the regulation of yacht races, which was accepted by the yacht clubs generally, though a previous attempt to introduce uniformity, made by the Royal Victoria Yacht Club in 1868, had failed. The Association adopted the rule for ascertaining the size or tonnage of yachts which had been for many years in force, known as the Thames rule; but in 1879 they altered the plan of reckoning length from that taken on deck to that taken at the load water-line, and two years later they adopted an entirely new system of calculation.

The Plank-on-edge. — These changes led to a decline in yacht- racing, the new measurement exercising a prejudicial effect on the sport, as it enabled vessels of extreme length, depth and narrowness, kept upright by enormous masses of lead on the outside of the keel, to compete on equal terms with vessels of greater width and less depth, in other words, smaller yachts carrying an inferior area of sail. The new type was known as the "lead mine" or plank-on-edge type. Of this type were the yawls " Lorna " and " Wendur," the cutters " May," " Annasona," " Sleuth-hound/' " Tara/' " Marjoric " and " Margarite " — the most extreme of all being perhaps the 40-tonner " Tara," six times as long as she was broad, and unusually deep, with a displacement of 75 tons, 38 tons of lead on her keel, and the sail-spread of a 60-tonner like " Neva."

In 1884 two large 80-ton cutters of the above type were built for racing, the " Genesta " on the Clyde and the " Irex " at Southampton. Having been successful in her first season, the former went to the United States in 1885 in quest of the America's cup; but she was beaten by the " Puritan," which had a moderate draught of 8 ft. 3 in. of water, considerable beam and a deep centre-board. The defeat of the " Genesta " was not surprising; she drew 13 ft. of water, had a displacement or weight of 141 as against the " Puritan's " 106 tons, and a sail area of 7S87 sq. ft. to the American's 7982 — a greater mass with less driving power. Still, she did not leave the States empty-handed, as she won and brought back the Cape May and Brenton Reef challenge cups, though they were wrested from her by the " Irex " in the following year. The same thing happened to the " Galatea," which was beaten by the " May- flower " in 1886. In all classes in British waters the narrow type was not carried to excess; indeed, as the narrowness of the new yachts increased annually, so did the popularity of racing decrease.

Plank-on-edge Type abandoned, — Prior to 1886 it had been the custom in Great Britain for several reasons to build the yachts deep, narrow, wall-sided, with very heavy lead keels and heavy displacement. The system of measurement had been a tonnage measurement, and under this system designers found, from the knowledge they had then attained from racing trials, that a narrow heavy vessel would beat a wider and lighter craft when both were measured by the tonnage rules. In America this was not the case. There a much lighter and wider form of yacht had been in vogue, having shallower draught and relying upon a centre-board for weatherliness instead of a deep lead keel. Hence in the International contests from 1884 to 1886 for the America's cup and other events the

*trials were between deep and narrow British yachts and shallow and broad American yachts. Even in 1887, when G. L. Watson built the " Thistle," much broader than " Genesta " and " Galatea," this vessel was met and defeated by a*far wider and shallower American sloop, namely, the " Volunteer " above referred to. British yachtsmen claimed that their narrow deep-keeled vessels were more weatherly and better sea-boats than the light American sloops, but racing honours rested with the Americans.*

In 1S87 the plank-on-cdge type was completely abandoned in the United Kingdom. Thenceforward, therefore, the old spirited contests between deep British yachts and shallow American sloops ceased. Whilst Britain abandoned her narrow deep type, America soon also began to modify the old shallow centre-board sloop type, and so between 1887 and 1893 the rival types began to converge very rapidly, until the old idea of a race for the America's cup being a test of a British type against an American type completely died out. Races sailed for that trophy, after 1887, were less and less trials of oppos- ing national types, but merely contests between British and American designed yachts built upon the same general principle of similar type.

Dixon Kemp in 1887 induced British yachtsmen to abandon the system of measuring yachts by tonnage and to adopt a new system of rating them by water-line length and sail area.

The new r system contained no taxes or penalties upon beam or depth nor upon " over all " length. The only factors measured were the water-line and the area of the sails. All the old tonnage rules taxed the length and the breadth. The effect of this change of the system measurement was electrical. It crushed the plank-on-edge type completely. There was not another boat of the kind built.

Revival of Yacht-Racing under Length and Sail Area Rule. — Yachtsmen were greatly pleased with the broader and lighter types of yachts that designers began to turn out under the length and sail area rule. They were more comfortable and drier in a seaway than the old vessels. The first large cutters built with considerable beam were " Yarana " and " Petronilla " in 1888, and in 1889 the first of Lord Dunraven's Valkyries was a vessel that was much admired. Then in 1890 " Iverna," a handsome clipper-bowed cutter owned by Mr Jameson, came out and raced against " Thistle." Meanwhile, up to 1892 a host of splendid 40-raters had been built; " Mohawk," " Deerhound," " Castanet," " Reverie," " Creole," " Thalia," "Corsair/' "White Slave," "Queen Mab " and " Varuna " formed a class the like of which had never been surpassed in British waters. Watson, Fife and Payne were the most suc- cessful designers.

While a revival of yachting in the larger classes was notable under the rule Dixon Kemp had originated, the sudden popularity attained in the small classes in the Solent was even more remark- able. Under the tonnage rules deep narrow 3-tonners, 5-tonners and 10-tonners had raced about the coast, but the Solent did not seem to attract a greater number of yachtsmen as small boat sailors than the Thames, Mersey or Irish ports. Moreover, the Clyde really remained the most advanced centre of small yacht sailing. At Southampton, prior to Dixon Kemp's rule being adopted by the Yacht-Racing Association in 1887, there were some sporting classes of so-called ltchen Ferry boats which raced on a rating consisting of length on the water-line only. As there was no tax upon their sail, they were built (according to the ideas of designers in 1885 or 1886, who had not by that time absorbed the knowledge of the value of bulb-keels) with great beam, immense displacement and very thick heavy lead keels and huge sail-spread. A sail area of 2200 sq. ft, was crowded on to a 30-foot yacht, and one 3G-footer even carried a jointed spinnaker boom 56 ft. in length. It was not surprising that such a type never became popular; indeed the Southampton length classes in the 'eighties were no better than the extremely narrow 5-tonners and 3-tonners. The 5-tonner '' Doris," built by Watson in 1885, was 33 ft. 8 in. L.W.L., 5 ft. 7 in. beam, 7 ft. draught; displacement of 12-55 tons; 1681 sq. ft. of sail. The " Yvonne," built by Fife in 1889, was 34-1 ft. L.W.L., 9 ft. beam, 8-1 ft. draught, with a displacement of 12-9 tons and a sail area of 1726 sq. ft. The difference in dimensions between " Doris" and " Yvonne " shows how the beam and sail-carrying power was in- creased in the new type, for " Yvonne " could beat the " Doris " with the greatest ease. With the advent of the length and sail area rule the Solent at once became the fashionable rendezvous for small racing yachts, and the craft known as the Solent classes, 5-raters, 2ˆ-raters, i-raters and praters, flourished greatly.*

The Second Great Era in Yachting. — As the years 1870 to t88o will always be remembered for the great schooners and the glorious fleet of old-fashioned cutters and yawls, which showed such fine sport before they were outbuilt by the planks- on-edge, so will the seasons following 1892 be identified with the big cutter racing. In that year it was commonly said that yachtsmen would build no more very large cutters. The revival under the length and sail area rule had so far extended to " Iverna," " Tarana," " Petronilla," and " Valkyrie I." being built in the first class, but then there had been a pause of some years during which large numbers of 40-raters, 20-raters and the Solent classes had been built. Just when the critics were declaring that in the future no yachtsmen would build a class racer larger than a 40-rater (60 ft. L.W.L. with 4000 sq. ft. of sail), the prince of Wales (afterwards Edward VII.) gave an order for the cutter " Britannia," while Lord Dunraven built " Val- kyrie II.," Mr A. D. Clarke " Satanita"

and Mr Peter Donald- son " Caliuna"; and in this same season (1S93), an American yachtsman took the Herreshoff yacht " Navahoe " over the Atlantic. The new vessels averaged 87 ft. L.W.L. and carried about 10,300 sq. ft. of canvas, their beam being as much as 23 ft. They were an entirely different type from " Iverna " or

*" Thistle," being developed from the form of the 40-raters " Varuna " and " Queen Mab." The main differences between the " Britannia " and other yachts of her year and the older vessels was that the new yachts had an overhanging shallow- sectioned mussel or pram bow instead of a fiddle or clipper bow with a wedge-shaped transverse section; the outline of the under-water profile was hollow, sloping in a concave curve from the deep part of the keel under the mast to the forward end of the water-line; trie keel was deep, practically developing into a fin. The new vessels skimmed over the waves instead of cutting and plunging through them. The seaworthiness, speed, weatherliness and general handiness for racing purposes of the cutters of 1S93 far exceeded all previous results. Yacht designing and building now became a science demanding the highest tax upon the skill and ingenuity of the naval architect. The cutter *' Valkyrie II." visited the United States in 1893, but Lord Dunraven's vessel was beaten by the "Vigilant." Curiously enough, when the crack Herreshoff cutters " Navahoe " and " Vigilant " visited the British Isles they were severely beaten by the British yachts. In 1893 the " Navahoe " started 13 times and only won two first prizes. In 1894 " Vigilant " did a little better, but she only won six races in 19 starts. During the years that followed the " Britannia " held a wonderful record: —*

Other

Starts.

Prizes.

Prizes.

Total.

Value.

1893 .

24

9

33

£1572

189+

48

36

2

38

2799

1895 ■

50

38

2

40

3040

1896

58

14

10

24

1562

1897 . . .

20

10

2

12

IOOO

219

122

25

H7

£9973

Some other famous racing yachts which were built under the length and sail area rule were " Ailsa " (1895), a first-class cutter designed by Fife, " Isolde," a very beautiful 40-rater for Mr Donald- son by the same designer, " Caress," a 40-rater by Watson, and the 20-raters " Audrey," from Lord Dunraven's own model, " Niagara " by Herreshoff, and the " Sibbick "- designed 5-rater "Norman," owned by Captain Orr-Ewing. Since the introduction of Dixon Kemp's rule the smaller classes from 20-rating right down tu ˆ-rating had been built in great numbers, but whilst these classes had flourished exceedingly, the type of boat built had developed a very peculiar form. Each succeeding craft was made lighter and lighter in weight and more extreme in the overhang at the bow and stern. The stabilir.y was now attained by means of a cigar- shaped piece of lead placed at the bottom of a steel plate or fin, the hull of the boat being nothing more than the bowl of a dessert spoon resting upon the water.

Pin and Bulb Keels. Downfall of Length and Sail Area Rule. — It was apparent in 1895 that if plate and bulb skimming- dishes could win all the prizes in the 20-rating and smaller classes, it would be easy to design a modified form of fin and bulb yacht to beat " Isolde," " Britannia " and " Ailsa " in the larger classes. It was equally obvious that a skimming- dish of " Britannia's " or " Isolde's " rating would be an utterly useless machine with no cabin accommodation or head room, and that the evolution of such type would be as bad for the sport as the development of the old plank-on-edge had been in 1885. It seemed strange that whilst the old tonnage rule had evolved the plank-on-edge ten years previously, the sail area measure- ment now evolved a plank-on-side, balanced by a fin. The fact was that designers had solved the problem. The rule measured only the length and the area of canvas. Taking the length of the vessel on the water-

line as constant, then the vessel with the smallest possible weight could be driven with less sail at the same speed as vessels with greater weight and greater sail. This solution of the problem was not apparent to designers from 1S80 to 1885, because of the difficulty of obtaining stability. From 1880 to 1885 stability was obtained by means of very heavy keels. In 1895 the stability was obtained by means of a light piece of lead placed at the bottom of a deep steel fin. " Niagara," " Audrey " (20-raters) and " Norman "(5-rater) were thus built. They were wonderful sailing machines in heavy weather, — fast, powerful, handy and efficient in all weathers.

But if head room and cabin accommodation are considered essential parts of a yacht these fliers, as" yachts," were entirely inefficient.

The Firsl Linear Rating Rule. — To endeavour to check the tendency to build skimming-dishes the Yacht-Racing Association introduced in 1896 a new system of measurement which was proposed by Mr R. E. Froude. The novelty of the system consisted of a tax upon the skin girth of the yacht, whereby a vessel with hollow midship section was penalized by her girth being measured round the skin surface. Froude's first system of rating began on the 1st of January 1896 and ended at the close of the year 1900. It therefore had a career of five seasons. The measurement of the yacht was obtained by che following formula: —

Length L.W.L. + beam-r-|skin girth J 1 V sail area ,. ■ — = linear rating.

This rule partially failed in its object. It was hoped that the skin-surface measurement would prevent the fin-bulb type being successful, but Froude and his colleagues had under-estimated the possible developments of exaggerated pram bows, immense scow-shaped shoulders and stern-lines, all of which could be introduced into the skimming-dish type with great success. So, notwithstanding the small premium on displacement this rule contained, the dishes could still beat the full-bodied yachts.

Yachts built in the small classes were very shallow bodied, and in the 20-rating and 40-rating, now called the 52 ft. and 65 ft. classes respectively, were uncomfortably shallow. The best vessels in the large classes were undoubtedly well formed and useful yachts; indeed inthe larger classes the rule seems to have checked excesses. Under this rule in 1896 the German Emperor ordered a huge first- class cutter, the " Meteor II.," from Watson. By sheer size and power this vessel outsailed " Britannia." She carried a main boom of 96 ft. long against the " Britannia's" boom of 91 ft. In 1900 Watson designed another great cutter called the " Distant Shore," the same size as " Britannia," but she was not launched until 1901. In 1900 also Watson crowned all his previous successes by turning out the yawl " Sybarita," the same size as " Meteor." " Senta Tutty," " Eelin " and " Astrild," and finally " Khama," were amongst the 65-footcrs, and " Penitent," " The Saint," " Morning Star" and " Senga " about the best 52-footers. Probably the yacht which emphasized the possibilities of the rule more than any of her con- temporaries was Captain Orr-Ewing's 36-footer " Sakuntala," built by Sibbick. She was a complete scow-shaped skimming-dish. The 30-footers " Marjory " and " Flatfish " were similar craft, and they outsailed everything in their respective classes in the Solent. Although many fine vessels, including the schooner " Rainbow " and others, were built under this rule, it was obviously insufficient to check the hollow-sectioned type.

The Second Linear Rating Rule.— This rule, also suggested by Froude, was introduced on the 1st of January 1901. The confidence of yachtsmen had been decidedly shaken by the previous rule, and the Y.R.A. agreed to fix this rule for a period of seven years. The object of the rule was to ensure a big- bodied vessel. The formula was: —

Length + breadth –

- Ig'irth f 4ˆ+i V sail area _

linear rating.

Now the novelty of this rule was the new tax d. This d represents the difference in feet between the measurement of the girth of the yacht's hull taken round the skin surface and the girth at the same place measured with a string pulled taut. This measurement is taken ˆrths of the distance from the fore end of the water-line. It is easy to see that in a full-bodied yacht cT=a small unit, whilst in a hollow-bodied yacht d = & larger unit. Four times d being taken, it followed that_ hollow-bodied yachts w r ere heavily penalized. This ingenious d measurement was evolved by Alfred Benson, a Danish scientist and yachtsman. The rule, so far as the development of a full-bodied cabin yacht went, proved very successful. It had certain marked

faults: the measurement of the girth at a fixed station caused a shallow-ness of keel at that particular spot, and there was no check upon the full pram bows, which when introduced into vessels of heavy displacement strained the ships terribly as they smashed into a heavy seaway. The new racing yachts generally, however, from 1S96 onwards, proved worthy and fast vessels.

As an instance of what could be done with them, in 1901 a memor- able match was sailed on the Clyde between the Watson cutter

" Kariad " (originally the " Distant Shore," previously mentioned) and the same designer's 90-foot yawl " Sybarita." It was blowing a gale of wind, and the yachts raced from Rothesay round Ailsa Craig and back, a distance of 75 m., averaging 12-3 knots, with closed reefed sails, housed topmasts and in a mountainous sea. Several steam yachts attempted to accompany them, but all put back owing to the roaring sea that was running near the Craig. .The yawl had the advantage of being the larger vessel, and " Sybarita " on this occasion won one of the greatest races ever recorded in Scottish waters.

Class Raring, Handicapping and Cruiser Racing. — Yacht racing may be subdivided under these three heads. Yacht racing by rating measurement or tonnage, when either the first yacht to finish is the winner, or the yacht saving her time by a fixed scale of time allowance in proportion to the rating of the vessel and the length of the course, is called class racing, and it obviously tends to encourage the fastest possible vessel under the current rating rule to be produced. It has always been regarded as the highest form of the sport. It is naturally, however, the most expensive form, because only the most up-to-date and perfectly equipped vessels can keep in the first flight.

From time to time, chiefly from about the years 1884 and 1885 onwards, handicaps framed according to merits have been fashion- able amongst yachtsmen. They were originally devised to afford amusement and sport to out-classed racers and cruisers, but they obviously did nothing to encourage owners to build very fast vessels, nor to stimulate improvement in design. When a handicap is allotted to each vessel according to her assumed speed, the slowest and most ill-designed craft should have an equal chance with the best. Nevertheless, owing to the expense of class racing, handicap racing thrived greatly during the period of the first and second Girth Rules. During these periods, too, the third style of yacht racing came into vogue,

namely cruiser racing; either very fast cruisers were built specially for the purpose of handicap racing, or a number of yachts of exactly similar design were built specially to the owner's orders for the purpose of racing in a class together. The fast handicap cruisers had the great advantage over class racers from 1S96 up to 1906, inasmuch as they were much more strongly built. " Valdora " (107 tons), " Brynhild " (160 tons), " Leander," " Namara," " Rosamond," " Merrymaid " and many others were yachts of the former type. In form they did not differ vastly from the racers of their period, but in scantling of hull, fittings, bulwarks and rig they were more comfortable and better vessels than their class-racing sisters. It was obvious in the larger classes that many yacht-owners were not prepared to put up with the discomfort of the thin-skinned racers. During the whole period of the Girth Rules (1896 to 1906), while the class racers developed a good enough form of body — they were latterly yachts w r ith plenty of cabin room — they were necessarily built in the lightest possible manner, the lightest steel frames being covered with the thinnest planking and decks for the sake of saving weight. The light scantling began to tell severely upon large yacht lacing. Meanwhile, in the small classes, the Solent one-design class, South Coast one-design class, numerous Belfast one-design classes, Redwings, Whitewings and a host of others, show how an inexpensive form of cruiser racing had usurped the place of class racing and competitive designing. Many yachts- men felt that if handicap racing and one-design racing were to usurp the place of the higher form of class racing the whole sport of yacht- ing must soon deteriorate. It was obvious that had handicap racing and the one-design principle been seriously introduced in 1880 or 1886 and obtained a strong hold on yachtsmen such im- proved types as the modern cruisers of 1906 would never have been evolved. For all the best cruisers, even the "Valdora " and the ketches " Cariad I." and " Cariad II.," are but modified types evolved from the crack racers. Hence yachtsmen began to give careful attention — during the early period of the Second Linear Rating rule— to suggestions that in the future every class-racing yacht should be built according to a fixed table of scantlings, so that her hull should be as strong as a bona fide cruiser.

Yachts Built under the Second Linear Rating Rule. — Few large vessels were built expressly for racing under this rule; indeed the Fife 65-footer " Zinita " (1904) was the only light- scantling yacht of any importance. However, two very hand- some first-class vessels were constructed to the rule: " White Heather I." by fife in 1904, and " Nyria " by Nicholson in 1906; they were some 12 ft. shorter than the great cutters of " Britannia's " year and altogether smaller, having less beam and draught and some 1700 sq. ft. less sail area. The growing dissatisfaction of yacht-owners at the extreme light scantling of modern racing yachts was strongly demonstrated by the fact that both " White Heather I." and " Nyria " were

specially ordered to be of heavy scantling, and they were classed Ai at

Lloyd's. They were therefore of the semi-cruiser type. "Nyria," however, was the extreme type of a yacht of her period in shape, although heavy in construction. The only conspicuous fault to be found with the form of the racing yachts under the rule was a skimping of the mean draught and an exaggeration of the full pram-shaped overhanging bow.

The 52-footers were a very popular class. Fife made a great advance in yacht architecture with a 52-foot cutter called the " Mag- dalen " (1901). All the other successful vessels under the rule — " Camellia " (Payne), " Lucida " and " Maymon " (Fife), " Moyana" and " Britomart " (Mylne), and the first-class cutter " Nyria " — followed her closely in type. An interesting trial took place in 1906, when the first-class cutter " Kariad " (1900) was brought out to compete with " Nyria " and " White Heather I.," and decidedly out-sailed, — showing that yacht architecture had steadily improved in the past six seasons.*

International Rules Introduced. — In April 1904 Mr Heckstall Smith drew the attention of German, French and British yachtsmen to the fact that the yacht measurement rules (then different in the various countries) were generally due to terminate about the end of 1907, and suggested that many advantages would accrue if an international rule .jo aid be agreed upon. The Yacht-Racing Association agreed to take the matter up, and at two International Conferences, held in London in January and June 1906, an international rule of yacht measurement and rating was unanimously agreed to by all the nations of Europe. America alone refused to attend the Conference. Mr R. E. Froude struck the keynote of the object of the Conference by a statement that the ideal yacht should be a vessel combining " habitability with speed." The truth of this axiom was generally accepted. Old plank-on-edge types under the tonnage rules, were habitable but slow. Skimming- dishes at- tained the maximum speed, but were uninhabitable. Neither therefore attained the ideal type. A good form was attained in 1901 with " Magdalen," but since that year the bane of light construction had become harmful to yachting. Hence the conference aimed at a rule which would produce a yacht combining habitability with speed. They adopted a form of linear rating comprising certain penalties upon hollow mid- ship section (i.e. Benzon's d tax) and also upon full pram bows. The following was adopted as the rule by which all racing yachts in FJuropc are rated:—

L-fB + |G + aJ-r-iV5-F _Ratmg – m i mear un its, %£. either ft. or 2 metres.

W 7 here L = Length in linear units.

,, B= Extreme beam in linear units.

„ G = Girth in linear units.

„ rf = Girth difference in linear units.

„ S = Sail area in square units.

,, F = Freeboard in linear units.

The length L for the formula is the length on the water-line, with the addition (1) of the difference between the girth, covering- board to covering-boardj at the bow water-line ending, and twice the freeboard at that point, and (2) one-fifth of the difference between the girth, covering-board to covering-board, at the stern water-line ending, and twice the freeboard at that point. The additions {1) and (2) penalize the full overhangs and the bow overhang in particular. The girth, G, is the chain girth measured at that part of the yacht at which the measurement is greatest, less twice the freeboard at the same station, but there are certain provisions allowing the measurement of girth generally to be taken 0-55 from the bow end of the water-line. The girth difference, d in the formula, is the difference between the chain girth, measured as above described, from covering- board to covering-board, and the skin girth Uetween the same points, measured alcng the actual outline of the cross- section.

For racing the yachts are divided into eleven classes. Class A is for schooners and yawls only, above 23 metres (75-4 ft.) of rating, with a time allowance of four seconds per metre per mile. AH the yachts in this class must be classed Ai. In racing, yawls sail at their actual rating and schooners at 12% less than their actual rating. The other classes are the ten

separate cutter classes, in which there is no time allowanc whatever: —

International Classes approximating

Corresponding

Limit to Number

Classes in English

on Board during a Race.

to L.W.L. of Yacht.

Feet.

23 metres rating.

75-4

No limit

19 „ ..

62-3

20

15 – M

49-2

14

12 ,, ,,

394

10

IO ,, ,,

32-8

8

9

29-5

6

8 ., ,.

26-2

5

7 -. ,, . .

23-0

4

6

19-7

! 5

16.4

2

Under the international rule the old trouble of ultra-light scantling in racing yachts has been completely abolished, for all yachts must be built under the survey and classed with one of the Ihree classification societies — Lloyd's Register of British and Foreign Shipping, Germanischer Lloyd, or Bureau Veritas; and yachts of the international cutter classes enumerated above so built will be classed R., denoting that their scantlings are as required for their respective rating classes. This rule was introduced on the 1st of January 1008; England, Germany, France, Norway, Sweden, Denmark, Austria-Hungary, Belgium, Holland, Italy, Spain, Finland, Russia and the Argentine Republic agreed to adopt it until December 31st, 1917. England adopted the new system a year before it formally became international, on the 1st of January 1907.

Racing Yachts Built under the International Rides. — The new rule produced the type of yacht desired — a vessel combining habitability with speed. Amongst the handsomest examples were the German Emperor's schooner "Meteor" (1909), and the schooner " Germania " (1908), 400 tons or 31J metres measurement, Class A, both built by Krupp's at Kiel. German designed, German built, and German rigged and manned, they demonstrated the wonderful strides made by Germany in yacht- ing. A few years before there were not a dozen smart yachts in Germany, and indeed the Kaiserlichcr Yacht Club at Kiel was only founded in 1887. The " Germania " holds the record over the old " Queen's course " at Cowes, having in 1908 sailed it a quarter of an hour faster than any other vessel. Her time over the distance of about 47 to 48 nautical m. was 3 hours

Ilerreshoff built a wonderful racing schooner of A class for the international rules called the " Westward," and in the races this Yankee clipper sailed at Cowes she proved the most wcathcrly schooner ever built.

It is interesting to recall some old records of speed over courses inside the Isle of Wight.

Date.

Yacht..

Distance.

Time.

Remarks.

1858

The Arrow

45 miles

4 h. 19 m.

Cutter) Same Cutter) vessel,.

1872

The Arrow

50 »

4 h. 40 m.

1872

Kriemhilda

50 ,.

4 h. 37 tn.'

Cutter.

1883

Marjorie

. 50 „

4 h. 26 in.

Cutter.

1883

namoena

50 »

4 h. 15 m.

Cutter.

1885

Lorna

50 „

4 h. 14 rn.

Yawl.

1885

Trex

50 »

4 h. 7 m.

Cutter.

1870

Egeria

50 „

4 h. 27 m.

Schooner.

187.S

Olga

50 ,, .

4 h. 25 m.

Schooner.

1879

Enchantress

50 „

4 h. 18 m.

American schooner.

1908

Cicely

46 „

3 h. 43 m.

British sch.

1902

Meteor

47 ..

3 h. 50 m.

American sch.

1908

Shamrock

47 „

4 h. m.

British cutter, onlv 75 feet L.W.L.

1908

Germania

47 m

3 h. 35 m.

German sch.

In 1907, 1908, 1909 and 1910, 389 yachts were built under the international rules:— A class, 3; 23 metres class, 3; 15 metres class, 15; 12 metres, 21; 10 metres, 33; 9 metres, 17; 8 metres, 88; 7 metres, 46; 6 metres, 144; and- 5 metres, 22. The 23-metre cutters "Shamrock," designed by Fife (1908), belonging to Sir Thomas Lipton, " White Heather It." (Fife; 1907), owned by Mr Kennedy, and " Brynhild" (Nicholson; 1907), owned ■ by Sir James Pender; and also " Ostara," 1 5 metres (Mylne ; 1909) , owned by Mr W. P. Burton; " Hispania," 15 metres (Fife; 1909), owned by the king of Spain; " Alachic and Cintra " (Fife) in the 12-metre class, have been amongst the best yachts built for the international rules. During the seasons of 19Q8, 1909 and 1910 there was splendid sport in England, Germany, France, Belgium, .Norway- and Sweden, and indeed all over the continent; the yachts were very closely matched, the 15-metres (49-2 ft.), 8-metres (26-2 ft.) and 6-metres (19-7 ft.) proving perhaps the most popular. The national authorities of the countries which adopted the inter- national rules in 1906 have now formed an International Yacht-Racing Union, under the chairmanship of the British Yacht-Racing Association.

35 min. 11 sees., or at the rate of 13-1 knots. In 1910

YACHT-BUILDING STATISTICS. The number and tonnage of yachts shown on Lloyd's Register (1909) as built in the several countries are as follows:—

COUNTRIES.

TOTAL.

United Kingdom.

British Colonies.

Belgium

and Holland,

Denmark.

France.

Germany

and Austria.

Italy.

Norway and

Sweden.

Othcr

co un ikies.

Steam axd Motor Yachts: — Total

Sailing Yachts: — Total

Grand Total

No. Tons.

No. j Tons.

No. | Tons.

No. |Tcn=.

No. 1 Tons.

No.) Tons.

No. Tons.

No. | Tom.

No. j Tons.

No. j Tons.'

1, 443U a °. '6?

137 1 3.775

271 |3, 231

76 | 2,454

T2o| 2,643

27 | 5,498 ro6 I 1,911

182] 6,745

347 1 4.062

86 j 6,602 647 j 6,8ˆ4

20 | 427 49 | 57i

37 1 1,648

305 j 3.S99

286 [66,107

269 1 13,298

2,294! 283,418

5,274] 94,009

4,594 J 347,670

408 [7,006 [205 j 5,007

1.33 | 7.4og

52g 10,807

733 | 13.488

69 908

342] 5,547

555 j 79.4o;

7,568 j 377.427

American yachts of 75 gross registered tons and upwards are included under "Other Countries"; the number of these yachts built in America is 248 of 67,1 19 tons.

In 1909, in the United Kingdom, from January to May, the time of the year when yachts are generally constructed, there w r ere building, or built, 27 steam yachts of 3471 tons, and 28 sailing yachts of 963 tons; this includes only yachts of 10 tons and upwards. Excluding the small craft

built in America, particulars of which are difficult to obtain, there were on the register 7568 yachts with a tonnage of 377,427. In 1887 there was a total of about 3000 yachts on the register with a tonnage of 132,718. Since that date, therefore, in round figures, 1500 had been added to the number and more than 100,000 tons to the tonnage. This fact seems to show- clearly the extension of the pastime ofyachting.

The America's Cup.

This international trophy was originally a cup given by the Royal Yacht Squadron at Cowes, Isle of Wight, on the 22nd of August 1851, for a race open to all yachts, with no time allowance of any kind, the course being " round the Isle of Wight, inside the No Man's buoy and Sand. Head buoy and outside the Nab." Fifteen vessels took up their stations off Cowes and started from moorings. In the table on the following page are the names of the competitors. '

.The fleet started at io o'clock. At the No Man'sbuoy the yachts were in a cluster, " Volante " leading, then "Freak" "Aurora," " Gipsy Queen," " America," " Beatrice," ". Alarm," "Arrow " and " Bacchante " in the order named. The other six brought. up; the rear, and the " Wyvern " returned to Cowes. Passing out to the

Yacht.

Rig.

Tons.

Owner.

Beatrice

Schooner

161

Sir W. P. Carew.

Volante

Cutter

48

Mr J. L. Craigie.

Arrow

Cutter

81

Mr T. Chamberlayne.

Wyvern

Schooner

205

The duke of Marlborough.

lone .

Schooner

75

Mr A. Hill.

Constance .

Schooner

218

The marquis of Conyngham.

Gipsy Queen

Schooner

160

Sir H. B. Hoghton.

Alarm

Cutter

193

Mr T. Weld. Lord Alfred Paget.

Mona

Cutter

82

America

Schooner

170

Messrs Stevens.

Brilliant

3-masted schooner

392

Mr G. H. Ackers.

Bacchante .

Cutter

80

Mr B. H. Jones.

Freak

Cutter

60

Mr W. Curling.

Eclipse

Cutter

5″

Mr H. S. Fearon.

Aurora

Cutter

84

Mr T. Le Marchant.

eastward the ” America ” went inside the Nab, a course which was contrary to the printed programme, but an objection afterwards made on this score against her was not persisted in. Off Sandown Bay the ” America ” obtained a long lead and in a freshening wind carried away her jibboom. Here the ” Aurora ” was second boat. The ” Volante ” sprung her bowsprit and gave up. The ” Arrow ” ran ashore and the ” Alarm ” went to her assistance, so both were out of the race. Abreast of Ventnor the American schooner was a mile ahead of ” Aurora,” which was the last British craft to keep her in sight in a thick haze that blew up from the S.W. late in the afternoon. At the Needles the wind dropped until it was very light, and the :i America ” was then some 6 m. ahead of ” Aurora,” the time being about 6 p.m. The finish was: —

America (winner) . . 8.37 p.m. Aug. 22.

Aurora …. 8.58 p.m. Aug. 22.

Bacchante . . 9.30 p.m. Aug. 22.

Eclipse . . . 9.45 p.m. Aug. 22.

Brilliant . . . 1.20 a.m. Aug. 23.

The ” America ” was built at New York by the firm of George & James R. Steers for the special purpose of competing with British yachts at Cowes. George Steers, who was born in New York, designed her, the designer being a son of Henry Steers, a shipwright at Dartmouth. The registered owners of the vessel were Mr J. C. Stevens, the commodore of the NewYorkYacht Club, Mr C.A.Stevens, Mr H. Wilkes and Mr J. B. Finlay. Her crew consisted of thirteen all told, seven seamen before the mast, two mates, cook, steward, boy and master. The cost of building was set down at £24 per ton, and her builder was to receive one-third more should she succeed ” in out-sailing any competitors of the same tonnage in England.” The vessel had a long lean hollow entrance and rather short but fine run, but her lines were graceful and clean and the transverse sections amidships very gentle and shapely. She had a clipper bow and elliptical stern. Her sails

particularly were superior in cut to those of the English vessels. Her masts raked, and she carried a mainsail laced to the boom, which in those days was almost unknown in England, a foresail, and a jib, also set ona boom and on an immensely heavy forestay which was the chief support of the foremast. She carried a small main topsail with a short yard and small jackyard. Occasionally she set also a flying jib on a jibboom, but this was not regarded as of much account. The principal dimensions of the "America" were: tonnage 171; length over all 94 ft.; on the keel 82 ft.; beam 22 ft. 6 in. ; foremast 79 ft. 6 in.; mainmast 81 ft. (with a rake of 2| in. to the foot in each mast); hollow bowsprit 17 ft. out board only; foregaff 24 ft.; maingaff 28 ft.; mainboom 56 ft. She was ballasted with pig-iron; 21 tons of the iron were permanently built into the vessel and the rest stowed inside. Below deck she was comfortably fitted for the living accommodation of the owner, guests and crew, and a cockpit on deck was a feature that few English yachts of the period possessed.

The cup won at Cowes by the " America," although not originally intended as a challenge cup, was afterwards given to the New York Yacht Club by the owner of the " America as a challenge trophy and named the " America's cup." In 1887 the sole surviving owner of the cup, George L. S. Schuyler, attached to the trophy a deed of gift which sets forth the conditions under which all races for the cup must take place. In brief the conditions are: (1) That the races must be between one yacht built in the country of the challenging club and one yacht built in the country of the club holding the cup.

(2) That the size of the yachts, if of one mast, must be not less than 65 ft. L.W.L. and not more than 90 ft. L.W.L. If of two-masted rig not less than 80 ft. L.W.L. and not more than 115 ft. L.W.L.

(3) The challenging club must give ten months' notice of the race, and accompanying the challenge must be sent the name, rig and the following dimensions: length L.W.L.; beam and draught of water of the challenging vessel (which dimensions shall not be exceeded), and as soon as possible a custom-house registry of the vessel. (4) The vessel must proceed under sail on her own bottom to the place where the contest is to take place.

The deed of gift, however, is an elastic document, for it contains the following clause which is known as the Mutual Agreement Clause: " The club challenging for the cup and the club holding the same may by mutual consent make any arrangement satisfactory to both as to the dates, courses, number of trials, rules and sailing regulations, and any and all other conditions of the match, in which case also the ten months' notice may be waived."

In 1870 Mr James Ashbury of Brighton challenged with the schooner " Cambria," and in 1871 with another schooner the " Livonia." In both cases the event was a test of rival types, " Cambria " and " Livonia " being old-fashioned British schooners while the vessels they met were the pick of the American broader and shallower types. " Cambria " had to meet fourteen opponents, but in 1 87 1 the " Livonia " raced against one opponent only. The Americans, however, although they agreed to race one vessel only against the " Livonia," brought several yachts up to the line and only selected their defender at the last moment. The first defender which " Livonia " had to meet was the " Columbia," which won the first and second events. In the third meeting, however, in a very strong wind the British schooner hammered the " Columbia " severely, and eventually the American yacht, having carried away some gear, was beaten by a quarter of an hour. In the two remain- ing races of the series the Americans were represented by the " Sappho," which easily defeated the " Livonia."

The next challenges came from Canada in 1876 and 1881, but neither the schooner " Countess of Dufferin " nor the sloop " Ata- lanta " met with any success.

The races of 1885 and 1886, when Sir Richard Sutton challenged with " Genesta " and Lieutenant Henn, R.N., with " Galatea," were interesting chiefly because they were of the nature of trials between the heavy plank-on-edge type of cutter and the prevailing American type of broad light-draught sloop. The contests proved the superiority of the American sloops.

In 1886 the plank-on-edge type was abandoned in England, and when the Scottish yacht " Thistle " was built in 1887 to chal- lenge for the cup it was hoped that she would meet with success. " Thistle, " however, although of greater beam and proportionately lighter displacement than such vessels as " Genesta " and " Galatea," was quite easily defeated by the centre-board sloop " Volunteer!" Thus once again did the lighter American type prevail even against the modified form of the " Thistle."

The race between the " Thistle " and " Volunteer " of 1887 may be said to have been the last race for the cup wherein there was any marked difference between the type of the boats contesting. In all subsequent races the form of the challenger and defender became approximately similar, but while the types were gradually converging the American yachts were still usually somewhat lighter in displacement than the challengers. The " Thistle " was the first vessel built in Great Britain expressly for the match, and after her race in 18S7 the types in fashion on both sides of the Atlantic rapidly converged, and deep-draught fin-keeled vessels with deep fins and light shallow hulls took the place of the former types of the shallow American sloops and deep-keeled wall-sided British cutters. In 1892 some

*splendid semi-fin-kceled cutters of the new pattern were built in the 40-rating class for the ordinary English coast regattas, and in 1893 the fin-keel type in England was even more successful. The first class cutters " Britannia," " Valkyrie II.," " Satanita " and " Calluna," built in 1893, handsomely defeated a Herreshoff yacht, the " Navahoe," which went over from America to race against them. On the strength of the victories of " Valkyrie II." and " Britannia " many British yachtsmen anticipated success for Lord Dunraven when he raced for the America's cup with his cutter " Valkyrie II." in the autumn of 1893. The Americans, however, had built a fine fleet of defenders, " Colonia," " Pilgrim," " Jubilee " and " Vigilant," and the latter beat " Valkyrie II." In the follow- ing season the " Vigilant " crossed the Atlantic and raced in British waters in 1894 against the " Britannia," and was frequently beaten. G. L. Watson, who had designed "Thistle" and "Valkyrie II." as well as " Britannia," was commissioned by Lord Dunraven to design " Valkyrie III." specially for an " America's cup " race in 1895. "Valkyrie III." was a very extreme fin-keeled boat, and for the first time the challenger appeared to have outbuilt the defending designer. " Valkyrie III." carried 13,027 sq. ft. of sail to the American " Defender's " 12,602. It was said that the Watson boat actually had less displacement. Both were 90 ft. L.W.L., " Valkyrie III." being 129 ft. over all against " Defender's " 123, and "Valkyrie III." 26*2 ft. beam against "Defender's" 23-03 ft. The races were unsatisfactory. In the first race Lord Dunraven claimed that " Valkyrie III." was hampered by the wash of steamers following the race, and his yacht was 8 m. 49 sec. astern. In the second race " Valkyrie " beat " Defender " by 49 seconds on the corrected time and actually by I m. 14 sec, but there was a foul at the start in which "Defender" was partially disabled. On protest the English yacht was disqualified, so that both events counted to " Defender." In the third race Lord Dunraven objected that ballast had been added to the American yacht since measure- ment, and the " Valkyrie III." merely crossed the line and retired, giving the " Defender " the match.*

In 1899, 1901 and 1903 Sir Thomas Lipton tried to win the cup

with three very costly and extreme vessels, " Shamrock I.," " Shamrock II." and " Shamrock III." No. I. and No. III. were designed by W. Fife, and No. II. by G. L. Watson. In 1899 " Shamrock I." was rather easily defeated by " Columbia." In 1901 the Americans were not especially successful in building the vessel which they had prepared to defend the cup, and in the trial races the old 1899 yacht " Columbia," sailed by Captain Charles Barr — a half-brother of the skipper of the Scottish yacht " Thistle " — defeated

the new vessel " Constitution," which had been built for the defence of the trophy for 1901 ; consequently the New York Yacht Club again selected the " Columbia to defend the cup against " Shamrock II." After very close racing the " Columbia " — which was the better handled boat — retained the prize.

The next contest for the cup was in 1903. On this occasion Herreshoff turned out in " Reliance " a wonderful example of a large fin-keeled boat with full pram-bow and light skimming-dish hull. She was of tile lightest possible construction (bronze with steel web frames), 90 ft. length L.W.L., 144 ft. length over all, with 16,160 sq. ft. of sail area, 25 ft. 10 in. beam, and a draught of 19 ft.

?in. " Reliance " was a far more extreme vessel than " Shamrock II." The latter had a deeper body and a less prammed overhang forward. With the same water-line as " Reliance," the English yacht had rather over a foot less beam. The chief difference in dimensions, however, was in the sail area; "Shamrock III." carried 14,337 sq. ft., or 1823 sq. ft. less than " Reliance." The result was a very easy victory for the " Reliance."

Races for the America's Cup

Date.

Aug. 22, 1851 Aug. 8, 1870 Oct. 16, 1 87 1 Oct. 18, 1871 Oct. 19, 1871 Oct. 21, 1871 Oct. 23, 1871 Aug. 11, 1876 Aug. 12, 1876 Nov. 9, 1881 Nov. 10, 1881 Sept. 14, 1885 Sept. 16, 1885 Sept. 9, 1886 Sept. 11, 1886 Sept. 27, 1887 Sept. 30, 1887

Name.

Tonnage.

America

Aurora

Magic

Cambria

Columbia

Livonia

Columbia

Livonia

Livonia

Columbia

Sappho

Livonia

Sappho

Livonia

Madeleine C'tess.of Dufferin

Madeleine C'tess.of Dufferin

Mischief

Atlanta

Mischief

Atlanta

Puritan

Genesta

Puritan

Genesta

Mayflower

Galatea

Mayflower

Galatea

Volunteer

Thistle

Volunteer

Thistle

170

47

972 227-6 220 280 220 280 280 220

3»

280 310 280

15I-49

13820 151-49 138-20

79-27

84

79-27

84 140

80 140

80

171-74 171-14 171-74 171-14 209-08 253-94 209-08 253-94

Course.

Allows

From Cowes around Isle of Wight (Aurora

second). N.Y.Y.C. Course (Cambria tenth).

N.Y.Y.C. Course.

20 miles to windward off Sandy Hook Light- ship and return. N.Y.Y.C. Course (Columbia disabled).

20 miles to windward off Sandy Hook Lightship

and return. N.Y.Y.C. Course.

N.Y.Y.C. Course.

20 miles to windward off Sandy Hook Lightship

and return. N.Y.Y.C. Course.

16 miles to leeward from Buoy 5 off Sandy Hook

and return. N.Y.Y.C. Course.

20 miles to leeward off Sandy Hook Lightship

and return. N.Y.Y.C. Course.

20 miles to leeward off Sandy[Hook Lightship

and return. N.Y.Y.C. Course.

20 miles to windward off Scotland Lightship and return.

M.S.

28 38 38 39 5

o 6

Elapsed Time.

H. M. S. 10 37 o 10 55 o

4 7 54 34 57 17 42

43 o

1 335

6 49I

53 5 12 38 33 24

4 38

4 38 5

5 4 4i

5 24 55

5 34 53 7 19 47

7 46 o

4 17 9 4 48 244 4 54 53 36 52 6 5 22 52 3 14

5 20 26 41 39 21

6 49

7 18 48

4 53 18

5 12 46 5 42 561

5 54 5i

Corrected Time.

H. M. S. 10 37 o 10 55 o

3 58 26

4 37 38 6 19 41 6 46 45

3 7 4if

*3 18 15**

25

17 35 36 2

9 23 46 17

11 44 23 54 34 53

18 46

46 o

. 17 9

4 45 29ˆ

4 54 53 33 47

6 5 22 24

3 14

4 52 26 41 38 43

49 °.

18 9 53 18

*12 41 **

5 42 561 5 54 45

Sailing Length.

Oct. 7, 1893 Oct. 9, 1893 Oct. 13, 1893 Sept. 7, 1895 Sept. 10, 1895 Sept. 12, 1895 Oct. 16, 1899 Oct. 17, 1899 Oct. 20, 1899 Sept. 28, 1901 Oct. 3, 1901 Oct. 4, 1901 Aug. 22, 1903 Aug. 25, 1903 Sept. 3, 1903

Vigilant

Valkyrie II.

Vigilant

Valkyrie II.

Vigilant

Valkyrie II.

Defender

Valkyrie III.

Defender

Valkyrie III.

Defender

Valkyrie III.

Columbia

Shamrock

Columbia

Shamrock

Columbia

Shamrock

Columbia

Shamrock II.

Columbia

Shamrock II.

Columbia

Shamrock II.

Reliance

Shamrock III.

Reliance

Shamrock III.

Reliance

Shamrock III.

96-78

93-n

9678

93-n

96-78

93-57 100-36 101-49 100-36 101-49 100-36*

ioi-49

102-135 101-092 102-135 101-092 102-135 102-565 102355 103-79 102-355 103-79 102-355 103-79 108-41

104-37 108-41

104-37 108-39

104-37

1 5 miles to windward off Scotland Lightship and

return. Course — equilateral triangle — 30 miles.

15 miles to windward off Scotland Lightship and

return. 15 miles to windward off Scotland Lightshipand

return. Course — equilateral triangle — 30 miles.

15 miles to windward and return from Sandy

Hook Lightship. 1 5 miles E.S.E. from Sandy Hook Lightship and

return — 30 miles. 10 miles triangular from Sandy Hook Lightship

— 30 miles. 15 miles S. by W. from Sandy Hook Lightship

and return — 30 miles. 15 miles E. by S. from Sandy Hook Lightship

and return — 30 miles. Course — equilateral triangle — 30 miles.

15 miles S.S.E. from Sandy Hook Lightship and

return — 30 miles. 15 miles to windward and return — 30 miles.

Course — equilateral triangle — 30 miles.

15 miles to windward and return — 30 miles.

M

. S.

1

48

1

48

1

33 29

29

29

6

6 16

43

43

43

1

57

1

57

1

57

M. S.

5 47

13 23

25 1 37 24 24 39

26 52

o 24

8 44'

56 25

55 9t

44 12

53 53

4 7

37 o

3 25 44 43 31 7*

31 44 13 18 16 10 33 40 33 38

32 17 3 41 17 3 14 54

3 18 10

4 28 o Didni

M.S.

5 '47 11 35 25 1 35 36

24 39

25 19 59 55

8 44 55 56 55 9 43 43

4 53 53

5 4 1

3 38 9

3 44 43

4 30 24

31 44 12 35 16 10

32 57

33 38 32 17 39 20

_ 14 54

3 16 12

4 28 o finish.

1 Rcmeasured. j Disqualified for fouling ” Defender.” t Withdrew on crossing the line. XXVIII. 29

§ (Tarried away topmast and withdrew. (13. H.-S.)

SgS

YAK,— YAKUTSK

YAK, the wild (and domesticated) ox of the Tibetan plateau; a species nearly allied to the bison group. The yak, Bos (Poepkagus) grunniens, is one of the finest and largest of the wild oxen, characterized by the growth of long shaggy hair on the flanks and under parts of the body and the well-known bushy tail. In Europe a false impression of the yak is prevalent, owing to the fact that all the specimens imported have belonged either 1 to a small domesticated breed from Darjiling, or to half-breeds; ‘ the latter being generally black and white, instead of the uniform

Domesticated Yak, Bos (Poephagus) grunniens.

black of the pure-bred and wild animal. None of such half- breeds can compare with the magnificent half-tamed animals kept by the natives of the elevated Rupsu plateau, S. of the Indus, where they afford the only means of transport by this route between Ladak and India. But even these are inferior to the wild yak, which stands nearly 6 ft. at the shoulder, and is absolutely confined to the arid central plateau of Tibet. Yak have the great disadvantage that they will not eat corn, and the larg’e pure-bred animals will not live at low elevations. The tails are used in India as fly-whisks, under the name of chowris. The title of ” grunting ox ” properly belongs only to the domesticated breed.

YAKUB KHAN (1840-), ex-amir of Afghanistan, son of the amir Shere AH, was born in 1S49. He showed great ability at an early age, and was made governor of Herat by his father, but broke into open rebellion against him in 1870, and was imprisoned in 1874 in Kabul. However, when Shere AH in 1878 fled before the British, he handed over the government to Yakub, who, on his father's death in the following February, was proclaimed amir, and signed a treaty of peace with the British at Gandamak. He. agreed to receive a British resident, and was in turn to receive a subsidy and support against foreign attack. But in September of the same year his revolted troops attacked the British residency, and the resident, Sir Louis Cavagnari, and his staff and suite were cut to pieces. This outrage was instantly avenged, for in October Earl (then Sir Frederick) Roberts with a large force defeated the Afghans on the 6th and took possession of Kabul on tb D 12th. Yakub Khan thereupon abdicated, took refuge in the British camp, and was sent to India on the 13th of December.

YAKU-SHIMA, an island belonging to Japan, lying S. of Kiu- shiu, in 30° 30′ N. and 130° 30′ E. It is an irregular pentagon, 14 m. in width and the same in length. It is separated from Tanega-shima by the Vincennes Strait (Yaku-kaikyo), 12- m. wide, and its surface is broken by lofty mountains, of which Y;ie-dakc rises to a height of 6515 ft., and Eboshi-dake to a height of 4840 fl. It is covered with dense forest, in which are some of the finest cryptomeria in Japan, known as Yaku-sugi.*

YAKUTSK, a province of E. Siberia, including nearly the whole of the basin of the Lena, and covering an area of 1,530,253 iq, m. It has the Arctic Ocean on '.he N., the governments of

Yeniseisk and Irkutsk on the W., and Irkutsk and Amur on the S., and is separated from the Pacific (Sea of Okhotsk) by the narrow Maritime Province. The Vitim plateau, 2500 to 3500 ft. in altitude, bordered on the S.E. by the Stanovoi Moun- tains, occupies the S.E. portion of the province. Its moist, elevated valleys, intefsected by ranges of flat, dome-shaped hills, which rise nearly 1000 ft. above the plateau, form an immense desert of forest and marsh, visited only by Tungus hunters, save in the S.W., where there are a few gold-mining settlements. The high border-ridge of the plateau (see Siberia) stretches from the South Muya Mountains towards the N.E., thus compelling the river Aldan to make a great bend in that direction. An alpine country skirts the plateau all along its N.W. margin, and contains productive gold-mines in the spurs between the Vitim and the Lena. The latter stream drains the outer base of this alpine region. It is a wild land, traversed by several chains of mountains, all having a N.E. strike, and intersected by deep, narrow valleys, down which the mountain-streams tumble uncontrolled. The whole is clothed with dense forests, through which none but the Tunguses can find their way. The summits of

the mountains; 4000 to 6000 ft., mostly rise above the limits of tree vegetation, but in no case pass the snow-line. The summits and slopes alike are strewn with dtbris of crystalline rock, mostly hidden under thick incrustations of lichens, amid which the larch alone is able to find sustenance. Birch and aspen grow on the lower slopes; and in the narrow valley bottoms thickets of poplar and willow or patches of grass spring up on the scanty alluvium. All the necessaries of life for the gold-diggings have to be shipped from Irkutsk down the Lena, and deposited at entrep6ts, whence they are transported in winter by means of reindeer to their destination. A line drawn from the mouth of the Vitim N.E. towards that of the Alcjan separates the mountain regions from the elevated plains (1500 to 2000 ft.) which fringe the highlands all the way from the upper Lena to Verkhne-Kolymsk, and probably to the mouth of the Kolyma. Vast meadows, sometimes marshy, extend over these plains in the S.W.; farther N. mosses and lichens are the predominant vegetation. The surface is much furrowed by rivers and diversified by mountain-chains (Verkhoyansk, Kolymsk and Alazeya) about the real character of which little is known. Beyond the elevated plains vast tundras, carpeted with mosses and lichens, stretch to the shores of the ice-bound ocean.

The Arctic coast is indented by several bays— Borkhaya and Yana E. of the Lena delta, and Omulakh, Kolyma and Chaun still farther E. _ The islands fall into three groups— the Lyakhov, the Anjou or New Siberian and the De Long Islands. The Medvyezhie (Bear) Islands off the Kolyma and the two Ayun Islands in Chaun Bay are merely littoral. Wrangel Land seems to be the outer island of a great and as yet unknown archipelago. Every year a narrow passage close to the coast is left almost free of ice, enabling a ship or two sometimes to reach the estuary of the Yenisei, or even the delta of the Lena.

The great artery of Yakutsk, the Lena, rises on the W. slope of the Baikal Mountains, close to Lake Baikal. About 6o° N. it receives from the right its first great tributary, the Vitim (1250 m. in length), which is navigable by steamers in its lower course. The Olekma (700 m.) is navigable only in the very lowest part of its; course, and the Aldan (1155 m.) is navigated from Ust-Maysk. On the left is the Vilyui (1300 m.), which has an immense drainage area on the lower plains, and has been navigated since 1S87. The lower course of the Lena is subject to terrible inundations when the ice breaks up on its tipper reaches. The Olenek (1200 m.), which enters the Arctic Ocean to the VV. of the Lena, is also a con- siderable river; the Yana (750 m.), Indigirka (950) and Kolyma (lloo) all rise in the mountain region between 61 ° and 62 N., and flow N. and N.E. into the Arctic Ocean.

The granites, granitic syenites and gneisses of the high plateau are wrapped

about by a variety of crystalline slates, Huronian and Laurentian; and Silurian and Devonian limestones and sandstones extend over vast areas. Farther N. the Carboniferous, Cretaceous and Jurassic formations are spread over a wide region, and the whole is covered with Glacial deposits in the highlands and with post-Glacial elsewhere. The mineral wealth of Yakutsk is very great; but gold and salt (obtained from springs) only are worked. Coal has been discovered on the Vilyui and on the lower Lena.

Yakutsk has unparalleled extreme of cold and heat. At*

*Verkhoyansk on the Yana (67 34′ N. and 134 20′ E.), frosts of — 79*5°.F- have been observed, and the average temperature of the three winter months is —ˆ3-1°; even that of March only is little above the freezing-point of mercury (— 37-9°). Neither bst-Yansk (70 55′ N., but close to the sea coast) nor Yakutsk, nor even the polar station of Sagastyr at the mouth of the Lena (73° 23′ N.), has a winter so cold and so protracted. Anrl yet at Sagastyr temperatures of — 63-6° have been observed, and the average temperature of February is only "43-6°. At Yakutsk the average temperature of the winter is — 40-2°, and the soil is frozen to a depth of 600 ft. (Middendorff). The Lena, both at Kirensk and at Yakutsk, is free from ice for only 161 days In the year, the Yana at Ust-Yansk for 105. At Yakutsk only 145 days and at Verkhoyansk only 73 have no snow; the interval between the latest frosts of one season and the earliest frosts of the next is barely 37 days.*

The bulk of the inhabitants are Yakuts; there are some 20,000 Russians, many of them exiles, and a certain number of Tunguses, Tatars, Lamuts and Chukchis. The estimated pop. ' in iqo6 was 300,600. The Yakuts belong to the Turkish stock, and speak a dialect of Turkish, with an ad-mixture of Mongolian words. They call themselves Sokha or Sakhov (pi. Sokhalar or Sakhalov), their present name having been borrowed by the Russians from the Tunguses, who call them Yeko or Yekot. Most probably they once inhabited 5. Siberia, especially the upper Yenisei, where a Tatar tribe calling itself Sakha still survives in Minusinsk. They ate middle-sized, have dark and rather narrow eyes, a broad flat nose, thick black hair and little beard. They are very laborious and enterprising, and display in schools much more intelligence than the Tunguses or Buryats. Their implements show a great degree of skill and some artistic taste. They live in log yurtas or huts, with small windows, into which plates of ice or pieces of skin are inserted instead of glass. During summer they abandon their wooden dwellings and encamp in conical tents of birch bark. Their food is

chiefly flesh, and they drink kumiss, or mares' milk. Though nearly all are nominally Christians, they retain much of their, original Shamanism. Their settlements are now steadily advancing S. into the hunting domains of the Tunguses, who give way before their superior civilization.

The province is divided into five districts, the chief towns of which are Yakutsk, Oiekminsk, Sredne-Kolymsk, Verk- hoyansk and Viluisk. Though the production of gold from gold washings has been on the decrease, over 15,000 workers are employed in the Olekma and Vitim gold-mines. Only 43,000 acres are under crops, chiefly barley. Most of the inhabitants are engaged in live-stock breeding, and keep rein- deer and sledge-dogs. Fish is an important article of food, especi- ally in the Kolyma region. In the N. hunting is important, the skins taken being principally those of squirrels, ermines, hares, foxes, Arctic foxes, and a few sables, beavers and bears.

The principal channel of communication is the Lena. As soon as the spring arrives, scores of boats are built at Kachungsk, Verkholensk and Ust-Ilginsk, and the goods brought on sledges in winter from the capital of Siberia, including con- siderable amounts of corn and salt meat, are shipped down the river. A few steamers descend to the delta of the Lena, and return with cargoes of fish and furs. Cattle are brought from Transbaikalia. Two routes, mere horse-tracks, radiate from Yakutsk to Ayan and to Okhotsk. Manufactured goods and groceries are imported to Yakutsk by the former.

See F. Thiess, Das Gouvernement Jakutsk in Ostsibirien, in Peter- mann's Mitteilungen (1897), and_ Maydcll, Reisen und Forschungen im Jakutskischtn Gebiel in Ostsibirien (St Petersburg, 2 vols., 1895— 1896). (P. A. K.; J. T. Be.)

YAKUTSK, a town of Asiatic Russia, capital of the province of the same name, in 62 2′ N. and 129 44′ E., 1165 m. N.E. of Irkutsk, on a branch of the Lena. Pop. about 7000. The old fort is destroyed, except its five wooden towers. The wooden houses are built upon high basements to protect them from the floods. Yakutsk possesses a theological seminary and a cathedral. Its merchants carry on trade in furs, mammoth ivory and reindeer hides. The town was founded in 1632.

YALE UNIVERSITY, the third oldest university in the United States, at New Haven, Connecticut.

The founders of the New Haven colony, like those of Massa- chusetts Bay, cherished the establishment of a college as an essential part of their ideal of a Christian state,, of which educa- tion and religion should be the basis and the chief fruits. New Haven since 1644 had contributed annually to the

.support of Harvard College, but the distance of the Cambridge school from southern New England seemed in these days considerable; and a separate educational establishment was also called for by a divergent development in politics and theology. Yale was founded by ministers selected by the churches of the colony, as President Thomas Clap said, to the end that they might " educate ministers in our own way," Though " College land " was set apart in 1647, 1 Yale College had its actual beginning in 1700 when a few clergymen met in the New Haven with the purpose " to stand as trustees or undertakers to found, erect and govern the College" for which at various times donations of books and money had been made. The formal establishment was In 1701. The Connecticut legislature in October granted a charter which seems to have been partly drafted by Judge Samuel Sewall of Boston; the Mather family also were among those in Boston who welcomed and laboured for the establishment of a seminary of a stricter theology than Harvard, and the ten 2 clergymen who were the founders and first trustees of the College were graduates of Harvard.

The legislature, fearful of provoking in England attention either to the new school or to- the powers used in chartering it, assumed merely to license a " collegiate school," and made its powers of conferring degrees as unobtrusive as possible. In 1702 the teaching of Yale began. In the early years the upper students studied where the rector lived, and considerable groups of the lower students were drawn off by their tutors to different towns. In 1716 the trustees purchased a lot in New Haven, and in the next year the College was'establjshed there by the legislature. Commencement was held at New Haven in the same year, but the last of the several student bodies did not disband until 1719. The school did not gain a name until the completion of the first building in 1718. This had been made possible by a gift from Elihu .Yale ■(.1645-1721), a native of Boston and son of one of the original settlers of New Haven; he had amassed great wealth in India, where he was, governor of the East India Company's settlement at Madras. The trustees accordingly named it Yale College in his honour. . The charter of 1701 stated that the end of the school was the instruction of youth " in the arts and sciences," that they might be fitted " for public employment, both in church and civil state." To the clergy, however, who controlled the College, theology was the basis, security and test of " arts and sciences." In 1722 the rector, Timothy Cutler, was dismissed because of a leaning toward . Episcopacy. Various special tests were em- ployed to preserve the doctrinal purity of Calvinism among the instructors; that of the students was carefully looked after. In 1753 a stringent test was fixed by the Corporation to ensure the orthodoxy of the teachers. This was abolished in 1778, From 1808 to 1818 the President and tutors were obliged to signify assent to a general formulation of orthodox belief. When George Whitefield, in 1740, initiated by his preaching the " Great

Awakening," a local schism resulted in Connecticut between " Old Lights " and " New Lights." When the. College set up an independent church the Old Lights made the contention that the College did not owe its foundation to the original trustees, but to the first charter granted by the legislature, which might therefore control the College. This claim President Clap triumphantly controverted (1763), but Yale fell in con- sequence under popular distrust, and her growth was delayed by the shutting off of financial aid from the legislature.

By the first charter (1701) the trustees of the College were required to be ministers (.for a long time, practically,

1 In 1668 the Hopkins Grammar School, next after the Boston Latin School the oldest educational institution of this grade in the Unitcd_ States, was established in New Haven.

2 This number was increased to eleven, the full number allowed by the charter, within a month after it was granted.

Congregationalists) residing in the colony. By a supplementary act of 1723 the rector was made ex-officio a trustee. By a second charter (1745) ample powers were conferred upon the president (rector) and fellows, constituting together a governing board or Corporation. This charter is still in force. In 1792 the governor and lieutenant-governor of the state, and six state senators, were made ex-officio members of the Corporation. In 1872 the six senators were replaced by six graduates, chosen by the alumni body. The clerical element still constitutes one half of the Corporation. In the first half of the 19th century, under the lead of Nathaniel W. Taylor {q.v.) : the Divinity School of Yale became nationally prominent for " Taylorism " or " New Haven Theology." Daily attendance at prayers is still required of all college students.

The first college professorship established was that of divinity (1755), which, in a sense, was the beginning of extra-college or university work. The theological department was not organized as a distinct school until 1822. In 1770 a second professorship was established, of mathematics and natural philosophy. Timothy Dwight (president, 1795-1S17) planned the establishment of professional schools; his term saw the foundation of the Medical School (1813) besides the Divinity School. In 1803 a chair was created for Benjamin Silliman, Sr. (1779-1864) in chemistry and natural history; English grammar and geography did not disappear from the

curriculum until 1826, nor arithmetic until 1830; political economy was intro- duced in 1825, and modern languages (French) in the same year. Not until 1847 did modern history receive separate recognition. The Library had been given the status of an independent department in 1843. Compulsory commons were abolished in 1842, thus removing one feature of a private boarding school. Corporal punishment (" cuffing " of the offender's ears by the President) had disappeared before the War of Independence; and so also had the custom of printing the students' names according to their social rank, and using a " degradation " in precedence as punishment; while Dwight abolished the ancient custom of fagging, and the undemocratic system of fines that enabled a rich student to live as he pleased at the expense only of his pocket. The School of Law was established in 1843. Instruction to graduates in non-profes- sional courses seems to have been begun in 1826. The appoint- ment of Edward E. Salisbury to the chair of Arabic and Sanskrit (1841) was the first provision at Yale for the instruction of graduates by professors independent of the College. About the same time graduate instruction in chemistry became important. (In 1846 also a chair of agricultural chemistry was established — the first in the country.) In 1846 an extra-College department of Philosophy and Arts was created, conferring degrees since 1852; and from this were separated in 1854 the sciences, which were entrusted to a separate Scientific School, the original promoter of agricultural experiment stations in the United States. Since that time this school and the College have developed much as complementary and co-ordinate schools of undergraduates, Yale affording in this respect a very marked contrast with Harvard. Graduate instruction was concentrated in 1871 into a distinct Graduate School. This with the three traditional professional schools — the Art School, established in 1866 (instruction since 1869), and the first university art school of the country, the Music School, established in 1894 (instruction since 1800), and the Forest School, established in 1900 — make up the University, around the College. For the founding of the Peabody Museum of Natural History, George Peabody, of London, contributed $150,000 in 1866. The Observatory, devoted exclusively to research, was established in 1871. In 1887 the name Yale " University " was adopted. The organic unity of the whole was then recognized by throwing open to students of any department the advantages of all. In 1886, for the first time, a president was chosen who was not of the College faculty, but from the University faculty.

Great as were the changes in the metamorphosis of old Yale, none had more influence upon its real and inner life than the gradual extension of the freedom accorded the students in

the selection of their studies. In 1854 there was no election permissible until late in the Junior year. In 1876, 1884 and 1893 such freedom was

greatly extended. In 1892 the work of the Graduate School was formally opened to women (some pro- fessors having admitted them for years past by special consent). Yale was the first college in New England to take this step.

The buildings number sixty-four in all. Connecticut Hall (1750-52), long known as South Middle College, a plain brick building, is the only remainder of the colonial style (restored. 1905). Around it are fourteen buildings forming a quadrangle on the College campus on the W. side of the New Haven Green, between Elm and Chapel Streets. The oldest are the Old Library (1842) and Alumni Hall (1853). Others are the Art School (1864), Farnam Hall (1869), Durfee Hall (1870), Lawrance Hall (1886), Battell Chapel (1876), Osborn Hal! (1889), Vanderbilt Hall (1894), Chit- tenden Hall (1888) and Linsly Hall (1908). Dwight Hall, erected in 1886 for the Yale University Christian Association, Welch Hall (1892) and Phelps Hall complete the quadrangle. Across from the W. side of the quadrangle is the Peabody Museum (1-876). On the N. side of Elm Street is a row of buildings, including the Gymnasium (1892), the Divinity School (1870) and the Law School (1897), University Avenue leads N. from the College campus to the University court or campus, on which are the Bicentennial Buildings (1901-2). E. and N.E. of the University court are the buildings of the Sheffield Scientific School. Farther N.E. are the Observatory, Hammond Metallurgical Laboratory, Forestry Building and Infirmary, and to the S.W. of the College campus are the Medical School and University Clinic.

The University is organized in four departments — Philosophy and the Arts, Theology, Medicine, and Law — each with a distinct faculty. The first embraces the Academical Department (College), the Sheffield Scientific School, — named in honour of Joseph Earle Sheffield (1793— 1882), a generous benefactor, — the School of the Fine Arts, the Department of Music, the Graduate School and the Forest School, founded in 1900 by a gift of $150,000 from J. W. Pinchot and his wife. Other institutions organized inde- pendently of any one department are: the Library, the Peabody Museum of Natural History, the Astronomical Observatory and the Botanical Garden, established in 1900 on the estate of Professor O. C. Marsh. The special treasures of the Library include the classical library of Ernst Curtius; the collection of Oriental books and manuscripts made by Edward E. Salisbury (1814-1901); the Chinese library of Samuel Wells Williams (1812-1884); a Japanese collection of above 3000 volumes; the Scandinavian library of Count Riant; the collection of Arabic manuscripts made by Count Landberg; the political science collection or Robert von Mohl; a copy of Newton's Principia presented to the College by the author; manuscripts of Jonathan Edwards; and large parts- of a gift of nearly a thousand volumes given to Yale in 1733 by Bishop George Berkeley, who

also gave to the College his American farm, as a basis of a scholarship, the first established in America. The Library is especially strong in the departments of American history, medieval history and English dramatic literature. Its total number of volumes in 1910 was nearly 600,000, exclusive of many thousand pamphlets. The Peabody Museum contains an un- rivalled collection of Silurian trilobites; a fine collection of pseudo-morphs; a beautiful collection of Chinese artistic work in stone made by Samuel Wells Williams; a notable mineralogical collec- tion; a fine collection of meteorites made by Professor Hubert Anson Newton (1 830-1 896); and the magnificent palaeontological collection of Professor O. C. Marsh. The School of the Fine Arts possesses the Jaryes gallery of Italian art, a remarkable collection of Italian "primitives " dating from the nth to the 17th century; the Alden collection of Belgian wood -carvings, of the 17th century; and a large collection of modern paintings among which are fifty-four pictures by John Trumbull. The organization of the Trumbull collection in 1831 was the first step taken in the United States toward the introduction of the fine arts into . a university. The equipment of the Observatory consists principally of a six-inch heliometer by Repsold, an eight-inch equatorial by Grubb, and two sets of equatorially mounted cameras for photo- graphing meteors.

In the College and the Medical School four years are required to complete the course of instruction; in the Divinity School and the Law School, three years; in the Forest School, two years; and in the Scientific School there are both three-year and five-year courses, five years being required for all engineering degrees. Ad- mission to the College is gained only by passing an examination in Latin, Greek or substitutes for Greek, French or German, English, mathematics and ancient history. Admission to the Scientific School is also only by examination. Substantially the equivalent of a college degree is required for admission to the Divinity School, but the Medical School and the Law School require only two years of college work, and a student may obtain a degree from Yale College and a degree in divinity, medicine or law in six years. The Forest School, with an extensive equipment at New Haven and a Forest Experiment Station comprising about

200 acres of forest and open land at Milford, Pike county, Pennsyl- vania — the estate of J. W. Pinchot — is open only to such graduates of colleges and scientific schools as have had a suitable scientific training, especially in advanced botany. It confers the degree of Master or Forestry.

In the College the individual courses are arranged in twenty-six groups within three divisions, and each student must complete Before graduation both a major and a minor in some one of the three divisions and one minor in each of the other two divisions. In the Freshman and Sophomore years the student's freedom of election is further restricted. In the Scientific School there is a somewhat different system of groups. The College confers only the degree of Bachelor of Arts, but the Scientific School confers the degrees of Bachelor of Philosophy, Master of Science (requiring at least one year of resident graduate study), and the engineering degrees. In the Divinity School the student has the choice of three courses — the historical, the philosophical and the practical — or, by the use of electives, he may combine the three ; the study of Hebrew is required only in the historical course. In the Law School there is one course for candidates for the degree of Bachelor of Laws and another for candidates for the degree of Bachelor of Civil Law, the latter requiring the study of Roman law and allowing the sub- stitution of certain studies in political science for some of the law subjects. The Graduate School confers the degrees of Master of Arts and Doctor of Philosophy; the School of Music, the degree of Bachelor of Music; and the School of Fine Arts, which is open to both sexes, the degree of Bachelor of the Fine Arts.

In 1910 the body of officers and instructors in all departments numbered 496, and the students 3312.

In addition to the regular work of the departments there are several lecture courses open to all students of the University. Among them are: the Dodge Lectures on the Responsibilities of Citizenship (1900); the Bromley Lectures on Journalism, Litera- ture and Public Affairs (1900); the Lyman Beecher Lectures on Preaching (1871); the Silliman Memorial Lectures (1884) on subjects connected with " the natural and moral world "; the Stanley Woodward Lectures (1907) by distinguished foreigners; the Harvard Lectures (1905) by members of the faculty of Harvard University; the Sheffield Lectures on scientific subjects; and the Medical Alumni Lectures.

The principal publications with which the University is more or less closely associated are : The Yale Review, a Quarterly Journal for the Scientific Discussion of Economic, Political and Social Questions, edited by Professors in Political Science and History; the Yale Law Journal, edited by a board of students; the Yale Medical Journal, edited by members of the Medical Faculty with the assistance of a board of students; the Yale Alumni Weekly; and the Yale News, a daily paper managed by the students. The Yale Bicentennial Publications contain reprints of Research Papers from the Kent Chemical Laboratory, Studies in Physiological Chemistry and Contributions to Mineralogy and Petrography. Numerous other publications of the Yale University Press are issued only with the approval of the

University.

In addition to several million dollars invested in lands and build- ings the University possessed at the end of 1909 productive funds amounting to $10,561,830 (in 1886, $2,111,000). The income from all sources for the year 1908-9, exclusive of benefactions ($1,469,515), was $1,240,208. Up to 1908 more than three-fourths of all the University buildings had been erected as private gifts; the rest were built with College funds, or from legislative grants.

Yale shares with its fellow colleges founded in colonial days the advantages of old traditions and social prestige. In par- ticular it shared these with Harvard so long as New England retained its literary and intellectual dominance over the rest of the country. But the spirit of the two institutions has always been very different. Harvard has on the whole been radical and progressive; Yale conservative. Yale could not draw, like Harvard, on the leaders of the New England schools of letters and philosophy to fill her professorial chairs. Her " compara- tive poverty, the strength of college feelings and traditions " (President Hadley) united with the lesser stimulus of her intellectual environment to delay her development. Harvard's transformation into a modern university was more spontaneous and rapid; Yale remained much longer under the dominance of collegiate traditions. But, according to Dr Charles F. Thwing {The American College in American Life, New York, 1897), of the men filling " the highest political and judicial offices, " and coming from American colleges founded before 1770, Yale had helped (up to 1897) to train the largest number. On the roll of her alumni are such names as Philip Livingston, Eli Whitney, John C. Calhoun, James Kent, Samuel F. B. Morse, Chief-Justice Morrison R. Waite and President Taft.

The Presidents have been as follows: in 1701-1707, Abraham

Pierson (1645-1707); pro lent. 1707-1719, Samuel Andrew (1656-1737); in 1719-1722, Timothy Cutler (1684-1765); in 1722-1726, office filled by the College trustees in rotation; in 1726-1739, Elisha Williams (1694-1755); in 1739-1766, Thomas Clap (1703-1767); pro tern. 1766-1777, Naphtali Daggett (1727- 1780); in i777~ I 79S> Ezra Stiles (1727-1795); in 1795-1817, Timothy D wight (1752-1817); in 1817-1846, Jeremiah Day (1773-1S67); in 1846-1871, Theodore Dwight Woolsey (1801- 18S9); in 1871-1886, Noah Porter (1811-1892); in 1886- 1899, Timothv Dwight (b. 1828); and Arthur Twining Hadley (b. 1856).

See Universities and their Sons (Boston, 5 vols., 1898-1900); Charles E. Norton, Arthur T. Hadley et al., Pour American Uni- versities (New York,

1895) ; Timothy Dwight, Memories of Yale Life and Men, i8p-i8gg (New York, 1903}: Franklin Bowditch Dexter, Sketch of the History of Yale University (New York, 1887), and Biographical Sketches of Yale College with Annals of the College History, i>?oi~ijq2 (New York, 4 vols., 1885-1907); B. C. Steiner, The History of Education in Connecticut, Circular of Information No. 2 of the United States Bureau of Education (Washington, 1893); L. S. Welch and Walter Camp, Yale, Her Campus, Class Room and Athletics (Boston, 1899); Charles Franklin Thwing, A History of Higher Education in America (New York, 1906).

YALTA, a seaport of Russia, in the government of Taurida, on the S. coast of the Crimea, at the foot of the Yaila Mountains, 32 m. S. of Simferopol. Pop. 13,269. It is the Galita or Jalita of the Arab geographers. Its roadstead is open, and the annual mean temperature is 56-5° F. The town is a fashion- able summer resort.

YAM, a term usually applied to the tubers of various species of Dioscorea. These are plants with thick tubers (generally a development of the base of the stem), from which pro- trude long, slender, annual climbing stems, bearing alternate or opposite, entire or lobed leaves and unisexual flowers in long clusters. The flowers are gene- rally small and individually incon- spicuous, though collectively showy. Each consists of a greenish bell-shaped or flat perianth of six pieces, enclosing six or fewer stamens in the male flowers, and surmounting a three-celled, three- winged ovary in the female flowers. The ovary ripens into a membranous cap- sule, bursting by three valves to liberate numerous flattish or globose seeds. The species are natives of the warmer regions of both hemispheres. According to Professor Church's analysis of the Chinese yam, it contains more nitrogenous matter, but less starch, than potatoes: in 100 parts there are of water 82-6, starch 13-1, albumen 2-4, fat 0-2, woody fibre 0-4 and mineral matter 1-3 parts.

D. saliva and D. alata are the species most widely diffused in tropical and subtropical countries. D. aculeata, grown in India, Cochin China and the South Sea Islands, is one of the best varieties. D. Batatas, the Chinese yam, is hardy in Great Britain, but the great depth to which its enormous tubers descend renders its cultivation unprofitable. It has deeply penetrating, thick, club-shaped, fleshy roots, full of starch, which when cooked acquire a mild tastelike that of a potato; they grow 3 ft. or upwards in length, and. sometimes

Yam (Dioscorea Batatas). Branch about j nat. size. Root much reduced.

weigh more than l\ lb. The plant grows freely in deep sandy soil, moderately enriched. The sets, consisting of pieces of the roots, may be planted in March or April, and require no other culture than the staking of the climbing stems. They should not be dug up before November, the chief increase in their size taking place in autumn. They sometimes strike downwards 2 or 3 ft. into the soil, and must be carefully dug out, the upper slender part being reserved for propagation, and the lower fleshy portion eaten after having been allowed a few days to dry. The tubers of D. alata sometimes weigh 100 lb. Most of the yams contain an acrid principle, which is dissipated in cooking.

The only European Dio.sf.orea is that known as D. pyrenaica, a native of the Pyrenees, a remarkable instance of a species growing at a long distance from all its congeners. True yams must not be confounded with the sweet potato, Ipomoea Batatas, as they sometimes are in London markets. The common black bryony (Tamus communis) of hedges in England is closely allied to the yams of the tropics, and has a similar root-stock, which is reputed to be poisonous.

For the history of the yam, and its cultivation and uses in India, see G. Watt, Dictionary of the Economic Products of India, in. (1890).

YAMA (Sanskrit "twin," in allusion to his being twin with his sister Yami, traditionally the first human pair), in Hindu mythology, judge of men and king of the unseen world. He was the first mortal to die, and having discovered the way to the other world is the guide of the dead. Three hymns in the Rig Veda are addressed to him.

YAMAGATA, ARITOMO, Prince (1838-), Japanese field-marshal, was born in Choshu. He began life as an ordinary samurai and rose steadily in reputation and rank, being created a count in 1884, a marquess in 1895 (after the war with China) and a prince in 1907 (after the war with Russia). He twice held the post of premier, and was the leader of Japanese con- servatism, being a staunch opponent of party cabinets.

YAHBOLI, a town of Bulgaria, on the river Tunja, 49 m. W. of Burgas by rail. Pop. (1906) 15,708. It has a large agricul- tural trade, being situated in the centre of one of the chief corn districts. In the town are the remains of old fortifications, and the ruins of a fine mosque. The bezetlan, or old market-house, is entire, but is now used as a military magazine. An ancient Macedonian town lay some 4 m. N., but Yamboli is first men- tioned in the nth century, when it was known by the Byzan- tines as Dampolis or Hyampolis.

YAH£THIN, a town and district in the Meiktila division of Upper Burma.

The town has a station on the railway 275 m. N. of Rangoon. Pop. (igoi) 8680. It is an important centre of trade with the Shan States. The district lies between the Shan States and the Meiktila, Magwe and Toungoo districts; area, 4258 sq. m.; pop. (iqoi) 243,197, showing an increase of 18% in the decade. The staple crop is rice, which is irrigated from tanks and canals. Millets and oil-seeds are grown in the N., where drought has more than once caused distress. There are special industries of inlaid metal-work and ornamental pottery. Besides the chief town, Pyinmana and Pyawbwe, both also on the railway, carry on an active trade with the Shan States.

YANAON, or Yanam, a French settlement in India, near the mouth of the river Godavari, within the Godavari district of Madras. It is situated in 16° 44′ N. and 82 13′ E.; area, 5 sq. m.; pop. (1901) 5005. Yanaon was founded about 1750, and followed the vicissitudes of French history in S. India. It was finally restored to the French by the treatv of 1815.

YANCEY, WILLIAM LOWNDES (1814-1863), American political leader, son of Benjamin Cudworth Yancey, an able lawyer of South Carolina, of Welsh descent, wsls born near the Falls of the Ogeechee, Warren county, Georgia, on the 10th of August 18×4. After his father's death in 1817, his mother remarried and removed to Troy, New York. Yancey attended Williams College for one year, studied law at Greenville, South Carolina, and was admitted to the bar. As editor of the Green- ville (South Carolina) Mountaineer (1834-35), he ardently opposed nullification. In 1835 he married a wealthy woman, and in the winter of 1836-1837 removed to her plantation in Alabama, near Cahaba (Dallas county), and edited weekly papers there and in Wetumpka (Elmore county), his summer home. The accidental poisoning of his slaves in 1839 forced him to

devote himself entirely to law and journalism; he was now an impassioned advocate of State's Rights and supported Van Buren in the presidential campaign of 1840. He was elected in 1841 to the state House of Representatives, in which he served for one year; became state senator in 1843, and in 1844 was elected to the national House of Representatives to fill a vacancy, being re-elected in 1845. In Congress his ability and his unusual ora- torical gifts at once gained recognition. In 1846, however, he resigned his seat, partly on account of poverty, and partly because of his disgust with the Northern Democrats, whom he accused of sacrificing their principles to their economic interests. His entire energy was now devoted to the task of exciting resistance to anti-slavery aggression. In 1848 he secured the adoption by the state Democratic convention of the so-called " Alabama Platform," which was endorsed by the legislatures of Alabama and Georgia and by Democratic state conventions in Florida and Virginia, declaring that it was the duty of Congress not enly to allow slavery in all

the territories but to protect it, that a territorial legislature could not exclude it, and that the Democratic party should not support for president or vice- president a candidate " not . „ . openly and unequivocally opposed to either of the forms of excluding slavery from the territories of the United States mentioned in these resolutions." When the conservative majority in the national Democratic convention in Baltimore refused to incorporate his ideas into the platform, Yancey with one colleague left the convention and wrote an Address to the People oj Alabama, defending his course and denouncing the cowardice of his associates. Naturally, he opposed the Compromise of 1850, and went so far as openly to advocate secession; but the conservative clement was in control of the state. Disappointment of the South with the results of " Squatter Sovereignty " caused a reaction in his favour, and in 1858 he wrote a letter advocating the appointment of committees of safety, the formation of a League of United Southerners, and the repeal of the law r s making the African slave-trade piracy. After twelve years' absence from the national conventions of the Democratic party, he attended the Charleston convention in' April i860, and again demanded the adoption of his ideas. Defeated by a small majority, he again left the hall, 1 followed this time by the delegates of Alabama. Mississippi, Louisiana, South Carolina, Florida, Texas, and two of the three delegates from Delaware. On the next day the Georgia delegation and a majority of the Arkansas delegation withdrew. In the Balti- more convention of the seceders he advocated the nomination of John C. Breckinridge, and he made a tour of the country on his behalf. In Alabama he was the guiding spirit in the secession convention and delivered the address of welcome to Jefferson Davis on his arrival at Montgomery. He refused a place in President Davis's cabinet. On the 31st of March 1861 he sailed for Europe as the head of a commission sent to secure recognition of the Confederate government, but returned in 1862 to take a seat in the Confederate Senate, in which he advocated a more vigorous prosecution of the war. On account of his failing health, he left Richmond early in 1863, and on the 27th of July- died at his home near Montgomery.

See J. W. Du Bose, Life and Times of W. L. Yancey (Birmingham, Ala., 1892); W. G. Brown, The Lower South in. American History (New York, 1902) ; and Joseph Hodgson, The Cradle of the Con- federacy (Mobile, Ala., 1876).

YANG-CHOW FU, a prefectural city in the province of Kiang- su, China, forming the two distinct cities of Kiang-tu and Kan- ch'uan, on the Grand Canal, in 32 21′ N., iiq° 15′ E. Pop, about 100,000. The walls arc between three and four miles in circumference. The streets are well supplied with shops, and there are handsome temples, colleges, and ether public buildings. There was a serious religious outbreak in 1868, when Hudson Taylor, the founder of the China Inland Mission, opened a station here; but

Yang-chow is now one of the centres of the Protestant

1 It is probable that Yancey was approached with the offer of the vice-presidential nomination on the Douglas ticket by George N. Sanders. There was a movement to nominate him on the ticket with Breckinridge also.

missionaries in the province. Yang-chow Fu possesses an early historical connexion with foreigners, for Marco Polo ruled over it for three years by appointment from Kublai Khan (?i282-8s). YANGTSZE-KIANG, a great river of China, and the principal commercial watercourse of the country. It is formed by the junction of a scries of small streams draining the E. slopes of the Tibetan plateau, and for the first third of its course flows almost parallel with the Mekong and the Sal ween, each, however, separated from the other by intervening ridges of great height. The total length of the Yangtsze is calculated to be not less than 3000 m. Although the term Yangtsze is applied by Europeans to the whole couise of the river, in China it indicates only the last three or four hundred miles, where it flows through a division of the empire which in ancient time was known as " Yang," a name which also survives in the city of Yang-Chow in the province of Kiang-su. The ordinary official name for the whole river is Ch'ang Kiang (pronounced in the north, Chiang) or Ta Chiang, meaning the " long river " or the " great river." Popularly in the upper reaches every section has its local name. As it emerges from Tibet into China it is known as the Kinsha Kiang or river of Golden Sand, and farther down as the Pai-shui Kiang. In Sze-ch'uen, after its junction with the large tributary known as the Min, it is for some distance called the Min-kiang, the people being of opinion that the Min branch is in fact the main river. The fall in the upper reaches is very rapid. At the junction of the two main affluents in Upper Tibet, where the river is already a formidable torrent barely ford able at low water, the altitude is estimated at 13,000 ft. From Patang (8540 ft.) to Wa-Wu in Sze-ch'uen (1900 ft.) the fall is about 8 ft. per mile, thence to Hwang-kwo-shu (1200 ft.) about 6 ft. per mile, and farther down to Pingshan (io3g ft.) the fall is about 3 ft. per mile. At Pingshan, in the province of Sze-ch'uen, the river first becomes navigable, and the fall decreases to about 6 in. per mile down to Chungking (630 ft.). From Chungking through the gorges to Ich'ang (130 ft.), a distance of nearly 400 m., the fall again increases to about 14 in. per mile; but from Ich'ang down to the sea, a distance of 1000 m., the fall is exceedingly small, being as far as Hankow at the rate of i\ in., and from Hankow to the mouth at the rate of little more than 1 in. per mile. The last 200 m. are practically a dead level, for at low-water season there is a rise of tide enough to swing ships as far up as Wuhu, 200 m.

from the mouth.

The principal tributaries, counting from the sea upwards, are:

(1) the outlet from Poyang lake, draining the province of Kiang-si;

(2) the Han river, entering on the left bank at Hankow; (3) the outlet from Tungt'ing lake on the right bank, draining the pro- vince of Hu'nan; (4) the three great rivers of Sze-ch'uen, the Kialing, the To Kiang and the Min, all entering on the left bank; and (5) the Yaiung, draining a vast area on the borderland between Sze-ch'uen and Tibet. The whole drainage area is about 650,000 sq. m., of which more than four-fifths lie above Hankow. The period of low water is from December to March. The melting of the snows on the Tibetan highlands combined with the summer rainfall causes an annual rise in the river of from 70 to 90 ft. at Chungking and from 40 to 50 at Hankow and Kiukiang. The mean volume of water discharged into the sea is estimated at 770,000 cub, ft. per second. The quantity of sediment carried in solution and deposited at the mouth is similarly estimated at 6428 million cub. ft. per annum, representing a subaerial denudation of the whole drainage area at the rate of one foot in 3707 years. (See Journal of the China Branch of the Royal Asiatic Society, vol. xvL, Dr Guppy.)

The Yangtsze- kiang forms a highway of first-class importance. As the rise in the river is only about 130 ft. for the first 1000 m., it resembles a huge canal expressly formed for steam navigation. Except at winter low water, steamers of 5000 or 6000 tons can reach Hankow with ease. Between Hankow and Ich'ang, especially above the outlet from Tungt'ing lake, the volume of water diminishes very much, and as the channel is continually shifting with the shifting sand-banks, navigation is more difficult. Above Ich'ang, where the river flows' between rocky gorges, and where a series of rapids are encountered, navigation is still more difficult. But taking the Yangtsze as a whole, with its numerous subsidiary streams, canals and lakes, it forms a highway of communication unrivalled in any other country in the world. About half the sea-borne com- merce of all China is further distributed by means of the Yangtsze and its connexions, not to mention the interchange of native pro- duce between the provinces, which is carried by native sailing craft numbered by thousands.

The Yangtsze valley as a political term indicates the sphere of

influence or development which hy international agreement wa$ assigned to Great Britain. This was first acquired in a somewhat negative manner by the Chinese government giving an undertaking, which they did in 1898, not to alienate any part of the Yangtsze valley to any other power. A more

*formal recognition of the British claim was embodied in the agreement between the British and Russian governments in 1899 for the delimitation of their respective railway interests in China, Russia agreeing not to interfere with British projects in the basin of the Yangtsze, and Great Britain agreeing not to interfere with Russian projects north of the Great Wall (Manchuria). The basin or valley of the Yangtsze was de- fined to comprise all the provinces bordering on the Yangtsze river, together with the provinces of Ho-nan and Chehekiang. This agree- ment was communicated to the Chinese government, and has been generally acknowledged. The object of the negotiations was to guard against conflict of railway interests; in all other respects the policy known as that of the " open door " was advocated by Great Britain and the chief commercial states. This policy was more fully declared by mutual engagements entered into in 1900 by the Great Powers on the initiative of the United States, whereby each undertook to guarantee equality of treatment to the commerce of all nations within its own sphere. As to railway enterprise, an agreement of 191c admitted French, German and American financial interests equally with those of great Britain in the pro- jected line from Hankow to Sze-ch*uen. (G. J.)*

YANKEE, the slang or colloquial name given to a citizen of the New England states in America, and less correctly applied, in familiar European usage, to any citizen of the United States. It was used by the British soldiers of their opponents during the War of Independence, and during the Civil War by the Confederates of the Federal troops and by the South of the North generally. The origin of the name has given rise to much speculation. In Dr William Gordon's History of the American War (ed. 1789, i. 324) it is said to have been a cant word at Cambridge, Mass., as early as 17 13, where it was used to express excellency, and he quotes such, expressions as " a Yankee good horse." Webster gives the earliest recorded use of itsaccepted meaning, from Oppression, a Poem by an American (Boston, 1765), " From meanness first this Portsmouth Yankee rose," and states that it is considered to represent the Indian pronunciation of " English " or Anglais, and was applied by the Massachusetts Indians to the English colonists. On the other hand, the Scots " yankic," sharp or clever, would seem more probable as the origin of the sense represented in the Cambridge expression. Other suggestions give a Dutch origin to the name. Thus it may be a corruption of " Jankin," diminutive of " Jan," John, and applied as a nickname to the English of Connecticut by the Dutch of New York. Skeat {Etym. Diet., iqio) quotes a Dutch captain's name, Yanky, from Dampier's Voyages (ed. 1699, i. 38), 'and accepts the thecry that " Yankee " was formed from Jan, John, and Kees, a familiar diminutive of Cornelius (H. Logeman, Notes and Queries, 10th scries, iv. 509, v. 15).

YANKTON, a city and the county-seat of Yankton county, South Dakota,

U.S.A., on the left bank of the Missouri river, about 60 m. N.W. of Sioux City, Iowa. Pop. (1900) 4125 (850 foreign-born); (1910) 3787. It is served by the Chicago, Milwaukee & St Paul, the Great Northern, and the Chicago & North-Western railways. The Missouri is navigable at this, point, and the city has a. considerable river traffic. Yankton is the seat of Yankton College (founded by Congregationalists in 1881, opened in 1882; now non-sectarian). The city is built on a nearly level plateau, averaging about 1200 ft. above the sea-level. It is in a rich grain-growing and stock-raising district, has grain-elevators, and manufactures flour, beer and cement. The water supply is obtained from artesian wells. The first permanent settlement, a trading post, was made here in 1858, when a treaty was concluded with the Yankton Indians. This was the first settlement made in the Missouri Valley in Dakota. Yankton was laid out in 1S59, ˆst chartered as a city in 1869, rechartered in 1873, and in 1910 adopted a commission form of government. In 1861-82 Yankton was the capital of the Territory of Dakota. The name is a corruption of the Sioux name Ihanktomvan, meaning " end village."

YAOS, or Ajawa, a Bantu-Negroid people of east-central Africa, whose home is Lhc country 'around the upper reaches of

the Rovurm river, and the north of Portuguese East Africa. They are an enterprising and intelligent race, and have spread into British territory south of Lake Nyasa and throughout the Shire districts. They are the tallest and strongest of the natives in the Mozambique country, have negroid features and faces which are noticeable for their roundness, and, for Africans, have light skins. They have long been popular among Europeans as carriers and servants. They earned, however, a bad name as slave-traders, and gave much trouble to the British authorities in Nyasaland until 1896, when they were reduced to submission. They do not tattoo except for tribal marks on their foreheads. The women wear disks of ivory or burnished lead in the sides of their nostrils, and some, probably of Anyanja origin, disfigure the lip with the pelele or lip-ring. The Yaos have elaborate ceremonies of initiation for the youth of both sexes. They bury their dead in a contracted position, the grave being roofed with logs and earth sprinkled over; in the case of a rich man, some of his property is buried with him and the rest is inherited by his eldest sister's son.

See Miss A. Werner, The Natives of British Central Africa (1906) ; Sir H. H. Johnston, British Central Africa (1897); H. L. Duff, Nyasaland under the Foreign Office (1903), For the Yao language see Bantu Languages.

YA'QtJBI [Ahmad ibn abi Ya'qUb ibn Ja'far ibn Wahb ibn Wadih] (9th century), Arab historian and geographer, was a great-grandson of WagUh, the freedman of the caliph Mansur. Until 873 he lived in Armenia and Khorasan; then he travelled in India, Egypt and the Maghrib, where he died in 89t. His history is divided into two parts. In the first he gives a comprehensive account of the pre-Mahommedan and non-Mahommedan peoples, especiatl} r of their religion and literature. For the time of the patriarchs his source is now seen to be the Syriac work published by C. Bezold as Die Schatzhohle. In his account of India he is the first to give an account of the stories of Kalila and Dimna, and of Sindibad (Sinbad). When treating of Greece he gives many extracts from the philosophers (cf. M. Klamroth in the Zeitschrift der deutschen morgenlandischen Gesellsckaft, vols. xl. and xli.). The second part contains Mahommedan history up to 872, and is neither extreme nor unfair, although he inherited Shi'ite leanings from his great-grandfather. The work is characterized by its detailed account of some provinces, such as Armenia and Khorasan, by its astronomical details and its quotations from religious authorities rather than poets.

Edition by T. Houtsma (2 vols., Leiden, 1883). Ya'qubi's geo- graphy, the Kitab ul-Buiddn, contains a description of the Maghrib, with a full account of the larger cities and much topographical and political information (ed." M. de Goeie, Leiden, 1892). (G. W. T.)

YAQUT, or Yakut (Yaqut ibn 'Abdallah ur-Rumi) (1179- 1229), Arab geographer and biographer, was born in Greece of Greek parentage, but in his boyhood became the slave of a merchant of Hamah (Hamath), who trained him for commercial travelling and sent him two or three times to Kish in the Persian Gulf (on his journeys, cf. F. Wiistenfeld, " Jacut's Reisen " in the Zeitschr. d.deutsch. morg. Gesellsckaft, vol, xviii. pp. 307-493). In 1194 he quarrelled with his master and had to support himself by copying; he took advantage of the opportunity of studying under the grammarian al-'Ukbari. After five years he returned to his old master and again travelled for him to Kish, but on his return found his master dead, and set up for himself as a bookseller and began to write. During the next ten years he travelled in Persia, Syria, Egypt and visited Merv, Balkh, Mosul and Aleppo. About 1222 he settled in Mosul and worked on his geography, the first draft of which was ready in 1224. After a journey to Alexandria in 1227 he went to Aleppo, where he died in 1229. In his large geography, the Mu'jam td-Buldan (ed. F. Wiistenfeld, 6 vols., Leipzig, 1866-73), tne places men- tioned in the literature or the stories of the Arabs are given in alphabetical order, with the correct vocalization of the names, an indication whether they are Arabic or foreign and their locality. Their history is often sketched with a special account of their conquest by the Moslems and the name of the governor at the time is recorded. Attention is also given to the monuments they contain and the celebrities

who were bcrn in

them or had lived there. In this way a quantity of old literature, both prose and poetry, is preserved by Yaqut.

The parts of this work relating to Persia have been extracted and translated by Barbier de Meynard under the title Dictionnaire geographique, historique el litteraire de la Perse (Paris, 1871). Some account of its sources is given in F, J. Heer's Die historischen und geographischen Quellen in Jacut's geographischem Worterbuch (Strassburg, 1898), and the material relating to the Crusades is treated by H. Derenbourg, " Les Croisades d'apres le dictionnaire geographique de jacout " in the volume of the Cenlenaire de I'ecole des langnes orientates vivantes, 71-92. A digest of the whole work was made by Ibn 'Abdulhaqq (d. 1338) under the title Marasid ul-Ittila (ed. T. G. j. Juynboll, Leiden, 1850-1864). Yaqut also wrote a dictionary of geographical homonyms, the Mushtarik (ed. F. Wiistenfeld, Gottingen, 1846). Besides all this activity in geography Yaqut gave his attention to biography, and wrote an important dictionary of learned men, the Mu'Jam ul-Udaba 1 . Parts of this work exist in MS. in different libraries; vol. i. has been edited by

D. S. Margoliouth, Irshad al-Arib II a Md'rifat al Adlb (London, 1908). (G. W. T.)

YARKAND (Chinese name Soche Fu), the chief town of the principal oasis of Chinese Turkestan, on the Yarkand-Darya, in 38 25′ N., 77 16′ E., and 3900 ft. above sea-level. The settlements of the Yarkand oasis occupy the S.W. corner of

E. Turkestan, and are scattered along the numerous rivers which issue from the steep slopes of the Pamir in the W., and the Kara- koram and Kucn-Lun Mountains in the S. The oasis of Kashgar limits it in the N., and a tract of desert separates it from the oasis of Khotan in the S.E. The Yarkand-Darya and its numer- ous tributaries, which are fed by the glaciers of the mountain regions, as also many rivers which are now lost in the steppe or amidst the irrigated fields, bring abundance of water to the desert; one of them is called Zarafshan (" gold-strewing "), as much on account of the fertility it brings as of its auriferous sands. Numberless irrigation canals carry the water to the fields, which occupy a broad zone of loess skirting the base of the mountains. In the spurs of the mountains there are rich pasturages, where goats, yaks, camels, sheep and cattle are reared. The oasis of Yarkand is regarded as the richest of E. Turkestan, and its popu- lation probably numbers about 200,000 inhabitants. Wheat, barley, rice, beans and various oil-yielding plants are grown, and melons, grapes, apples and other fruits. The cotton tree and the mulberry are

cultivated in the warmer parts of the oasis. Gold, lead and precious stones are found in the mountains, though only the first-named is worked. Yarkand is renowned for its leather-ware and saddlery. Carpets and silk fabrics, cotton and woollen goods are manufactured. The population consists of Persians, who now speak Turkish, and of Turkish Sarts.

The town of Yarkand, which has a population of about 100,000 (5000 houses in the city, and as many in Yanghishar and the suburbs), is situated on the river of the same name, five days' journey S.E. from Kashgar. It is surrounded by a thick earthen wall, nearly 4 m. long, with towers in the Chinese style of archi- tecture, and is well watered by canals. The square fortress of Yanghishar, which was built by the Chinese, stands within 400 yds. of the walls of the town. This is one of the three strong places in Chinese Turkestan. The ten mosques and madrasas of Yarkand a although poorer than those of Bokhara or Samarkand, enjoy wide renown in the Moslem world. There is a brisk trade, especially in horses, cotton, leather-ware and all kinds of im- ported manufactured goods.

Yarkand is surrounded by a number of smaller towns, the chief of which are — Yanghi-hissar, which has about 600 houses, Tashkurgan on the Pamirs, Posgam (1600 houses), Kargalyk, at the junction of the routes leading to Ladakh and Khotan (2000 houses), Sanju (2000), Tagarchi, Kartchum, Besh-taryk (1800) and Guma (3000).

Yarkand was very imperfectly known until the second half of the 19th century. Marco Polo visited it between 1271 and 1275, and Goes in 1603; but the continuous wars (see Turkestan) prevented Europeans from frequenting it, so that until 1863 the information borrowed from medieval travellers and from Chinese sources, with that supplied by the pundit Mir Isset Ullah in 1812, was all that was known about the Yarkand region. The first European who reached it in the 19th century was Adolph Schlagint-weit, who passed by YarkancI in August 1857, but was killed a few days later at Kashgar. The pundit Mohammed Hamid visited it

in 1863 and determined its geographical position and altitude. Later information is due to Robert Shaw and G. W. Hayward, who stayed at Yarkand in 1869, and to Sir Douglas Forsyth, who first visited it in 1870. Three years later he visited it again with an expedition which had Gordon, Bellew, Chapman, Trotter, Biddulph and Stoliczka as members, and afterwards published a detailed report upon the scientific results of the mission. In 1886, after a remarkable journey through E. Turkestan, A. D.

Carey reached Yarkand and spent the winter there. It was again visited by Dr Lansdeli in 1888, and by Dr Aurel Stein in 1906. The Swedish Protestant missionaries whose headquarters are at Kashgar main- tain a medical mission at Yarkand.

YARMOUTH, a seaport town and port of entry, Yarmouth county, Nova Scotia, Canada, on the Dominion & Atlantic railway, 218 m. from Halifax. Pop. (1901) 6430. Steamers run daily to Boston (Mass.), and weekly to St John (N.B.) and Halifax. It contains the county buildings, and has good schools and small local manufactories. Fish and lumber are exported in large quantities.

YARMOUTH (Great Yarmouth), a municipal, county and parliamentary borough, watering-place, and seaport of Norfolk, England (with a small portion in Suffolk), 121 m. N.E. from London by the Great Eastern railway, served also by the Midland & Great Northern joint line. Pop. (1901) 51,316. It lies on a long and narrow peninsula of sand, between the North Sea and the Breydon Water (formed by the rivers Yare and Waveney) and the river Bure. The neighbouring country is very flat, but the Bure affords access to the Norfolk Broads, which give the district its well-known individuality. The old town of Great Yarmouth was built chiefly along the E. bank of the Y'are, but the modern town has extended beyond its ancient walls, of which some remains exist, to the seashore, where there are a marine drive and three piers. On the landward or Suffolk side of the estuary is the suburb of Southtown, and farther S. that of Gorleston. The principal features of Yarmouth are the N. and S. quays, and the straight narrow lanes called " rows," 145 in number, running at right angles to them. These rows were at one time inhabited by the wealthy burgesses, and many of the houses, now tenanted by the poorer classes, have panelled rooms with richly decorated ceilings. The old town is connected with Little Yarmouth by a bridge across the Yare of stone and iron, erected in 1854. The Bure is crossed by a suspension bridge. The church of St Nicholas, founded in itoi by Herbert Losinga, the first bishop of Norwich, and consecrated in 1110, is one of the largest parish churches in England. It is cruci- form, with a central tower, which perhaps preserves a part of the original structure, but by successive alterations the form of the church has been completely changed. The Transitional clerestoried nave, with columns alternately octagonal and circular, was rebuilt in the reign of King John. A portion of the chancel is of the same date. About fifty years later the aisles were widened, so that the nave is now the narrowest part of the building. A grand W. front with towers and pinnacles was constructed in 1330-1338, but the building was interrupted by a visitation of the plague. In the 16th century the monu- mental brasses were cast into weights and the gravestones cut into grindstones. Within the church there were at one time eighteen chapels, maintained by gilds or private families, but these were

demolished by the Reformers, who sold the valuable utensils of the building and applied the money to the widening of the channel of the harbour. During the Commonwealth the Independents appropriated the chancel, the Presbyterians the N. aisle and the Churchmen were allowed the remainder of the building. The brick walls erected at this time to separate the different portions of the building remained till 1847. In 1864 the tower was restored, and the E. end of the chancel rebuilt; in 1869-1870 the S. aisle was rebuilt; and in 1884 the S. transept, the W. end of the nave and the N. aisle underwent restoration. The width of the nave is 26 ft., and the total length of the church is 236 ft. St John's is a noteworthy modern church, and the Roman Catholic church is a handsome Gothic building erected in 1850. A grammar-school was founded in 1551, when the great hall of the old hospital, founded in the reign of Edward I. by Thomas Fastolfe, was appropriated to its use.

It was closed from 1757 to 1860, was re-established by the charity trustees, and settled in new buildings in 1872. Among the principal public buildings are the town hall and public offices (1883); a picturesque toll-house of the 14th century, carefully preserved and serving as a free library; assembly rooms, museum, drill hall, custom house, barracks at South- town and theatres. Among charitable and benevolent institu- tions are a royal naval lunatic asylum, three hospitals, and fishermen's hospital, the North Sea Church Mission and various homes and minor charities. To the S. of the town, on the part of the peninsula known as the South Denes, are a race-course and a Doric column erected in 1817 to commemorate Lord Nelson, To the N. (on the North Denes) arc golf links. Winter gardens were opened in 1904. The municipal and parliamentary borough became coextensive by the inclusion in the former of Gorleston in 1890. The parliamentary borough, returning one member, falls between the E. division of Norfolk and the Lowestoft division of Suffolk. Yarmouth is governed by a mayor, 12 aldermen and 36 councillors. Area, 3568 acres.

Yarmouth Roads, off the coast, afford excellent anchorage except in E. or N.E. winds. The channel to the quays was made by Joost Jansen, a Dutch engineer, in 1567, and affords a depth at the bar of 12 ft, at low water. The herring and mackerel fisheries are most important, and fish-curing is an extensive industry, Yarmouth bloaters being widely famous. The fishing fleet numbers some 500 vessels of 20,000 tons, and employs about 3000 hands. The principal imports are coal, timber and seeds, and exports are grain and fish. Other industries are ship and boat building, rope, twine and trawl- net manufactories, silk-crape works and makings.

Yarmouth (Gernemwaj Yernemuth), which lies near the site of the Roman camp of Gariannonum, is believed to have been the landing-place of Cerdic in the 5th century. Not long afterwards, the convenience of its situation

having at- tracted many fishermen from the Cinque Ports, a permanent settlement was made, and the town numbered seventy burgesses before the Conquest. Henry I. placed it under" the rule of a reeve. The charter of King John (1208), which gave his bur- gesses of Yarmouth general liberties according to the customs of Oxford, a gild merchant and weekly hustings, was amplified by several later charters asserting the rights of the borough against Little Yarmouth and Gorleston. In 1552 Elizabeth granted a charter of admiralty jurisdiction, afterwards con- firmed and extended by James I. In 1668 Charles II. incor- porated Little Yarmouth in the borough by a charter which with one brief exception remained in force till 1703, when Anne replaced the two bailiffs by a mayor, reducing the alder- men and common councilmcn to eighteen and thirty-six. By the Boundary and Municipal Corporation Acts of 1832 and 1855, Gorleston was annexed to the borough, which became a county borough in 1888. Yarmouth returned two members to parliament from 1300 to 1868, when it was disfranchised until 1885. From the nth to the 18th century the herring trade, which has always been the main industry of Yarmouth, was carried on at an annual fair between Michaelmas and Martinmas. This was regulated by the barons of the Cinque Ports, and many quarrels arose through their jurisdiction and privileges. Yarmouth has had a weekly market at least from the 13th century.

See Victoria County History, Norfolk; H. Swindcn, History of Great Yarmouth (1772); C. J. Palmer, History of Great Yarmouth (i854)-

YARMOUTH, a small port at the western extremity of the Isle of Wight, England, on the shore of the Solent, where the estuary of the Yar debouches. Pop. (igoi) 903. Steamers connect it with the London & South-Western railway at Lymington on the mainland, and it is also served by the Isle of Wight Central line. The church contains a fine monument to Admiral Sir Robert Holmes, who took New Amsterdam, afterwards New York, from the Dutch.

The place appears in the Domesday Survey of 1086 under the name of Ermud; it was then assessed at 1 hide 2 J virgates, and held in parage by Aluric and Wislac, two of the king's thegns who had also held it under Edward the Confessor. The first charter was granted by Baldwin dc Red vers in 1 135, _ and was confirmed by- Edward I., Hcnrv VI., Edward IV. and Elizabeth, but the earliest

charter of incorporation was from James I., instituting a governing body of

a mayor and twelve chief burgesses, with power to choose a steward, town clerk and serjeant-at-mace. Under the Municipal Corporations Act of 1883 the corporation was abolished and the administration vested in a town trust of eleven members. Yar- mouth and Newport returned members to parliament as one borough in 1295, but no further returns were made until 1584, from which date Yarmouth continued to send representatives until disfranchised by the Reform Act of 1832. The charter from James I. instituted a Wednesday market and a fair at the feast of St James, which were maintained until within recent years. In the 18th century Yar- mouth was a notorious smuggling centre. In 1206 John embarked from Yarmouth for the expedition to La Rochelle. The town was burnt by the French in 1337 and in 1544. In the 16th century, at the time of the expectation of the Spanish invasion, a small fort was built called Carey's Sconce, the remains of which are to be seen at the W. of the town. In 1648 Charles I. was brought to Yarmouth on his way from Carisbrooke to Hurst Castle; and in 1671 Charles II. and his court were entertained at Yarmouth by Admiral Sir Robert Holmes, governor of the island.

YARN, 1 the name given to any textile fibre when prepared by the process of spinning for being woven into cloth. It is only in a few minor and exceptional cases, such as the weaving of haircloth or wire, that there is any making of fabrics without the previous spinning of yarn. But yarn is of the most diverse description, and its value varies in proportion to its lustre, its bleaching and dyeing properties, its fineness, strength, elasticity, uniformity of diameter, smoothness, suppleness and colour in its natural condition. Yarn is single, folded and fancy, and if twisted to the right it is called twist way, and if to the left, weft way, but those terms do not necessarily imply that the yarn is for either warp or weft.

Single Yarn consists of fibrous matter as twisted together during the process of spinning. If it is intended for warp it should be strong, elastic and smooth; if for weft it has less twist and is spongy. The raw material from which yarn is made has much to do with its appearance and value. Thus Cotton. Yarn, although it varies from a soft spongy thread to a closely compacted one, is generally dull in appearance, soft, pliable and of but moderate strength and elasticity. Dulness in this material is not, however, a constant feature; when combed and gassed it is brighter than when simply carded, and when mercerized it assumes a high lustre. Cotton- waste Yarn is of two classes, both of low counts, and is made from the cotton wasted in the preparing, spinning and weaving operations: one from soft material that had not previously been spun; the other from hard threads which are broken up into separate fila- ments. The best grades of cotton have been spun into commercial threads, 588,000 yds. of which weigh 1 lb, but for experimental purposes much finer threads have been spun. For yarn in more general use the range is up to 250,000 yds. per lb. When spun from

soft waste it is up to 13,400 yds. per lb, and from hard waste it is up to 2520 yds. per lb. Linen Yarn is of two kinds, namely, Line and Tow. In their natural conditions both are stiff, inelastic and somewhat rough, but the method of spinning has much to do with their appearance. If spun wet they are more compact, smoother and brighter than when spun dry; yet line yarn is always stronger and better in these respects than tow, which is by comparison soft, full and hairy. Both bleach to a pure white, hecomc lustrous and moderately soft. Exceptionally fine linen yarn contains 180,000 yds. per lb, but the range of line yarn in general use is up to 60.000 yds. per lb, and that of tow 10,000 yds. per lb. Woollen Yarn is soft, spongy, hairy, elastic, moderately strong and possesses felting properties in a high degree; it bleaches indifferently but dyes readily. It is spun into threads that range up to 15,000 yds. per ft). Several kinds of waste yarn are spun from wool, such as Shoddy, Mungo and Extract, most of which are irregular, lustreless and only suitable for coarse counts, but they dye well. Shoddy is made from the liberated fibres of soft spun woollen threads and cloths that have not been felted. Mungo is made from the liberated fibres of hard spun woollen yarn, and felted cloths, while Extract is made from the woollen material contained in mixed goods, the vegetable fibrous matters from which have been destroyed by acids and heat. Worsted Yarn is made from combed wool, and is, as a consequence, uniform in diameter, lustrous, smooth, very elastic and strong. It is spun into threads that range up to 56,000 yds. per lb. Silk is made into Net, Spun and Noil yarns, all of which arc readily dyed. Net Silk yields Organzine and Tram; both are, in pro portion to diameter, the strongest and most elastic of textile threads, and are highly lustrous and smooth; but organzine is hard twisted and used for warp, while tram is slightly twisted and used for weft. They give a range up to 450,000 yds. per lb. Spun Silk is made by combing and spinning the material wasted during the conversion of cocoons into fabrics; it is less lustrous and elastic than net silk,

1 The etymology is uncertain, but apparently the word is cognate with " cord." The meaning " tale " comes from something spun out.

also weaker. Silk Neil is made from the fibres rejected by the comber during the making of spun silk, and is inferior in all respects to spun silk. Mixed Yarn is obtained by mixing and spinning different fibrous materials together; as cotton and wool, silk and ramie, and the proportions in which they are mixed vary from 10% to 80% of the most expensive fibre.. The counts of single yarns made from different fibres are differently expressed as are occasion- ally those spun in different districts from similar fibres. Cotton yarns are based upon the number of hanks, of 840 yds., contained in 1 lb; linen, upon the number of leas, of 300 yd,*., in 1 R>; worsted, upon the number of hanks, of 560 yds., in I lb. Wool is expressed in the West of England by the number of hanks, of 320 yds., in I lb.; in parts of*

Yorkshire by the number of skeins, of 1520 yds., in 6 lb; in some parts of the United States by the number of runs, of 1600 yds., in 1 lb. Silk is expressed by the weight of 1000 yds. in drams; also by the weight, in deniers, of 476 meters, the denier being an Italian weight equal to ˆJga part of 1 lb ; spun silk, by the number of hanks, of 840 yds., in 1 lb.

Folded Yarn.— Yarn is folded to impart increased strength, elasticity and smoothness, and is used, both glazed and unglazed, for warp and weft in ordinary fabrics. It is also made for such special purposes as sewing, lace-making, crocheting and hosiery. The counts of these yarns are expressed according to the number of threads twisted together, as 2/50 8 , 3/60"; the former indicating that two threads of 50 s , and the latter three threads of 60 s , were twisted together to yield yarn of 25 hanks and 20 hanks per lb respectively; the count of the single yarn being invariably named in the cotton, linen, woollen and worsted trades. With spun silk the practice adopted is to name the count of the folded yarn; thus, 70/2 and 40/3 imply that two threads of 140 8 and three threads of 120 s were respectively folded together. Sewing Cotton should be smooth and strong, and much of it is from two to six cord. When two or three cord, the doubling twist is in the opposite direction to that of the singles. When more than three cord, it usually under- goes two twistings, the first in the same direction as the single threads, the second is in the opposite direction to, and more closely twisted than the first. Thus: — A six-cord thread is first folded and twisted two into one, then three strands of two fold are twisted into one; after which it is sized and polished. Lace Yarn should be strong, elastic, smooth and spun twist way in the singles, but doubled weft way. Crochet Yarn is bulky, elastic and has a corded appearance. It is twice doubled: the first time it is twisted in the opposite direction to the singles, the second time in the same direc- tion as the singles. HosieryYarnis often a soft, bulky, single thread, but it is also folded, sometimes without being twisted, at other times it is slightly twisted. There are two types, namely, wool and silk, neither of which need be made.from the fibres named. For the former a hairy surface is not objectionable, but the latter should be smooth, and may be gassed. Polished Yarn may be either single or folded, but it should be fully twisted and level. It is bleached or dyed in hanks, immersed in size and polished with brushes while the size is moist.

Fancy Yarn is made by twisting together threads of different counts, colours, materials or twistings, at regular or irregular tensions, and in the same or opposite directions. The effects thus produced are known in commerce under a great variety of names, of which the following are a few. Grandrelle is probably the _ one in greatest demand ; it has a mottled effect which is due to uniformly twisting together two threads of different colours, but of approxi- mately equal counts. In some cases the folding twist is slight, in others it is considerable. Mockˆ Grandrelle presents a

similar appearance to true grandrelle, but is made at the spinning machine by twisting together two rovingg that are dyed in different colours. Flaked Yarn has a cloudy appearance imparted to it, (a) by twisting a hard spun thread with a roving, which, at regular or irregular intervals is made thick and thin by drawing rollers; (&) by supply- ing, intermittently, during carding or spinning, tufts of extra fibre to a thread ; or ic) as in Knickerbocker Yarn, by dropping small quantities of dyed fibres into two, similar or dissimilar, rovings at the spinning machine, or into two, similar or dissimilar, threads at the doubler. Corkscrewed Yarn has a spiral surface effect which may be produced in different ways, such as twisting threads together that differ in tension, in count and in the quantity or direction of the twist in the single threads. If a fine, hard spun/single or folded thread be twisted with a coarse, soft spun single, the coarse thread will wrap itself about the fine one and give a corrugated surface. Chain, and other effects may be given by two foldings and twistings, if for the first doubling a coarse soft thread is twisted with a finer one having medium twist, and for the second a still finer thread is twisted with the twofold one, but in the opposite direction and with a different number of twists per inch. Gimp Yarn is spiral in struc- ture and requires two doublings, the first to form a twofold spiral, then, at the second doubling, a fine tight thread is added. Knopped Yarn is formed by twisting together several strands, one of which is at intervals delivered in greater lengths than the others, in order to allow a loop to be made; the direction of twist in one single may differ from that in another. Curled Yarn is produced by twist – iug two supple threads round a longer and stiffer one, after which a fourth thread is added. (T. W. F.)

YAROSLAVLˆYATES, E. H.

907

YAROSLAVL, or Yaroslav, a government of central Russia, separated from the government of Moscow by the governments of Vladimir and Tver on the S., and having Tver and Novgorod on the W., Volgoda on the N. and Kostroma on the E. It is one of the smallest, but most populous and busiest, governments of Great Russia; area, 13,747 sq. m. It consists of a broad and shallow depression, elongated from W. to E., where the Volga flows at a level of 260 to 230 ft. above the sea, while the surrounding hills rise to 700 or 800 ft. In the W., especially between the Mologa and the Sheksna, the country contains very many marshes and ponds, and there are low and marshy tracts in the S. about Rostov.

Jurassic clays, sandstones and sands cover nearly the whole of Yaroslavl, but they are concealed almost everywhere under thick deposits of Glacial boulder clay, which is regarded by Russian geologists as the bottom

moraine of the great ice-cap of the Glacial period. Triassic " variegated marls," widely disseraiuated through- out the whole of the middle Volga region, undoubtedly underlie nearly all the Jurassic deposits of the government, but only a feW patches emerge at the surface; many salt springs exist in these deposits. The Upper Carboniferous limestones crop out only in the NAV. and towards the E. The chief mineral products are bog-iron ores, sulphate of copper and pottery clay. Peat occurs in thick beds. There are several mineral springs. The soil is mostly a kind of loess of moderate fertility; sandy tracts are not uncommon.

The principal river is the Volga, which traverses the government for 180 m., making a great bend to the N. The chief towns — Rybinsk, Yaroslavl, Mologa, Roman ovo-B or isoglyebsk, Uglich and Myshkin— are situated on its banks, and a brisk traffic is carried on, both by the river itself and by two canals, Mariinsk and Tikhvinsk, which connect it with the Neva through its tributaries the Sheksna and the Mologa. Another tributary of the Volga is the Kotorost, which has many factories on its banks and is navigated, especially in spring. The Kostroma flows along the E. border and is a channel for the export of timber and fuel.

The forests, chiefly fir and Scotch pine, cover one-third of the area ; but they are l>eing rapidly destroyed. The flora bears a northern stamp, owing to the presence of the dwarf birch, of the Arctic rasp- hern,' (Rub us arcticus), and of Linnaea borealis.

The average temperature at the city of Yaroslavl is 40 F. (January, 6-5°; July, 61-5°); the prevailing SAV. and W. winds render it moister than in central Russia. The rivers remain frozen 118 to 183 days every year.*

The population, which is thoroughly Russian, numbered 1,175,900 in 1906. The government is divided into ten districts, the chief towns of which are Yaroslavl, Danilov, Lyubim, Mologa, Myshkin, Poshekhon, Romanovo-Botisoglyebsk, Ros- tov, Rybinsk and Uglich. Yaroslavl belongs to the manufac- turing region of central Russia, but the domestic character of many industries permits the inhabitants to cultivate their fields and also to work in small factories. The peasants and peasant communities own over 5,000,000 acres, or about 57% of the total area, of which they have acquired nearly 1,000,000 acres by purchase since their emancipation in 1 861; 30% is held by private persons, and 7% by the crown. There were in 1900 1,169,000 acres (13-3 % of the total area) under cereals, the principal crops being rye, wheat, oats, barley and potatoes. Flax is widely culti- vated both for linseed and fibre, and both fresh and dried vegetables are exported; Rostov enjoys a great reputation as the centre of this industry. Live-stock breeding is of only less importance than agriculture, and poultry is exported. Large numbers find employment in the making of

hardware, locks, felt boots, gloves, wooden wares, pottery and metallic wares. Factories have considerably developed; the principal are cotton, flax and woollen mills, flour-mills, tobacco factories, distilleries, breweries, chicory works, tanneries, candle works, petroleum refineries, machinery, chemical and match works. Rybinsk and Yaroslavl are the chief commercial centres, but Rostov, Molcga, Romanovo and Poshekhon carry on an active trade in corn, timber and manufactured wares. Many of the male population annually leave their homes to work all over Russia as locksmiths, masons, plasterers, waiters in restaurants, greengrocers, tailors, gardeners, carpenterb, joiners, pilots, boatmen.

As early as the gth century the Slavs had become masters of the Yaroslavl territory, which was formerly occupied by

the Finnish tribes of Vess and Merya, as also by Mordvinians, Muroms and Cheremisses in the S. Rostov was already in existence; but Yaroslavl, Rybinsk and Uglich begin to be mentioned in the annals only in the nth and 12th centuries. The independent principality of Rostov was divided in the 13th century into three parts, but these were soon afterwards successively annexed to Moscow.

YAROSLAVL, a town of Russia, capital of the government of the same name, on the right bank of the Volga, at its con- fluence with the Kotorost, 174 m. by rail N.E. of Moscow. Pop. about 70,000. Yaroslavl is an archiepiscopal see. The Uspenskiy cathedral was begun in 1215 and rebuilt in 1646-48; the churches of the Preobrazhenskiy monastery, St John's and Voskreseniye elate from the 15U1 and 17th centuries. Yaroslavl has a lyceum, founded (1803) by a wealthy member of the Demidov family. The manufactories include cotton- mills, flour-mills, tobacco and linen factories. The town was founded in 1026-36. It became the chief town of a principality in 12 18 and remained so until 147 1, when it fell under the dominion of Moscow.

YARRELL, WILLIAM (1784-1856), British naturalist, was born in London on the 3rd of June 1784. His father was a newspaper agent, and he succeeded to the business, and pro- secuted it till within a few years of his death. He acquired the reputation of being the best shot and the first angler in the metropolis, and soon also became an expert naturalist. In 1825 he was elected a fellow of the Linnean Society, of which he subsequently became treasurer, and was a diligent contributor to their Transactions; and he was one of the original members of the Zoological Society. The greater part of his leisure towards the end of his life was devoted to his two great works, The History of British Fishes (2 vols., 1836) and The History of British Birds (2 vols., 1843). These works from the first took rank as standard authorities. He died at Yarmouth on the 1st of September 1856.

YARROW, a river and parish of Selkirkshire, Scotland. The river, issuing from St Mary's Loch, flows for 14 m. E. by N. to the Tweed, which it joins about 3 m. below the county town. The stream and vale are famous in poetry. Only a fragment remains of Dryhope Tower, on Dryhopc Burn, the home of Mary Scott, " the flower of Yarrow," whom Walter Scott of Harden married about 1576. On Douglas Burn, a left-hand tributary, are the ruins of the keep of " the good " Sir James Douglas, the friend of Robert Bruce; and Blackhouse, Mount Benger and the. farm of Altrive are all connected with James Hogg. Near Broadmcadows Sir William Douglas, the knight of Liddesdale, was murdered by his kinsman (1353) in revenge for the death of Sir Alexander Ramsay of Dalhousie at Hermitage Castle. The body lay for a night in Lin-dean church, now in ruins, near Selkirk, before its burial in Melrose Abbey. On the right bank are the ruins of Newark Castle, built by James III. in 1466 as a hunting seal, afterwards the property of the Scotts of Buccleuch. It was burned by the English in 1548, but the tower was restored. On the right side of the Yarrow is Bowhill, a seat of the duke of Buccleuch.

YATAGHAN (from Turk, yataghan; sometimes spelled in English " attaghan " and " ataghan "), the name of a type of sword common to Mahommedan peoples. It has no guard or quillons, but a large and often decorated pommel; its blade has a double curve on the cutting edge, first concave and then convex; the back is usually straight (see Sword).

YATES, EDMUND HODGSON (1831-1894), English journalist and author, son of Frederick Henry Yates (1797-1842), was born at Edinburgh on the 3rd of July 1831. His father and mother {nSe Brunton; 1799-1860) were both prominent figures on the London stage from about 181 7 onwards. Edmund Yates was educated at Highgate School and at Dusseldorf. In 1847 he obtained a clerkship in the General Post Office, with which he continued to be connected up to 1872, becoming in 1862 head of the missing letter department. He married in 1853, and soon began to write for the press. Charles Dickens made him dramatic critic to the Daily News, and he was a contributor

to Household Words. He wrote several farces which were acted between 1857 and i860. In 1855 he had begun writing a column ior the Illustrated Times (under Henry Vizetelly), headed " The Lounger at the Clubs ": this was the first attempt at combining " smart " personal paragraphs with the better class of journalism, and in 1858 Yates was made editor of a new paper called Town Talk, which carried the innovation a step forward. His

first number contained a laudatory article on Dickens, and the second a disparaging one on Thackeray, containing various personal references to private matters. Thackeray, regarding this as a serious affront, brought the article before the committee of the Garrick Club, of which he contended that Yates had made improper use, and the result was that Yates was expelled. Besides editing Temple Bar and Tinsley's Maga- zine, Yates during the 'sixties took to lecturing on social topics, and published several books, including his best novel, Black Sheep (1867); and under the heading of " Le Flaneur" he continued in the Morning Star the sort of " personal column " which he had inaugurated in the Illustrated Times. On his re- tirement from the Post Office in 1872 he went to America on a lecturing tour, and afterwards, as a special correspondent for the New York Herald, travelled through Europe. But in 1874, with the help of E. C. Grenville Muiray, he established a new London weekly, The World, " a journal for men and women," which he edited himself. The paper at once became a success, and Yates bought out Grenville Murray and became sole pro- prietor. The World was the first of the new type of " society papers," abounding in personal criticism and gossip: one of its features was the employment of the first person singular in its columns, a device by which the personal element in this form of journalism was emphasized. After Truth was started in 1877 by Mr Henry Labouchere (who was one of Yates's earliest contributors), the rivalry between the two weeklies was amus- ingly pointed by references in The World to what " Henry " said, and in Truth to the mistakes made by " Edmund." In 1885 Yates was convicted of a libel in 1884 on Lord Lonsdale, and was imprisoned in Holloway gaol for seven weeks. In the same year he published his Recollections and Experiences in two volumes. He died on the 20th of May 1894. He had been the typical Jldneur in the literary world of the period, an entertaining writer and talker, with a talent for publicity of the modern type — developed, no doubt, from his theatrical parentage — which, through his imitators, was destined to have considerable influence on journalism.

YATES, MARY ANN (1728-1787), English actress, was the daughter of William Graham, a ship's steward. In 1753 she appeared at Drury Lane as Marcia in Samuel Crisp's (d. 1783) Virginia, Garrick being the Virginius. She was gradually en- trusted with all the leading parts. Mrs Yates, whose husband, Richard Yates (c. 1706-1796), was a well-known comedian, succeeded Mrs Cibber as the leading tragedian of the Eng- lish stage, and was in turn succeeded — and eclipsed — by Mrs Siddons.

YATES, RICHARD (1818-1873), American political leader, was born at Warsaw, Kentucky, on the 18th of January 1818. He graduated at the Illinois College at Jacksonville in 1S38, was admitted to the bar, and entered politics as a Whig. From 1842 to 1845 and again in 1849 ne

served in the state House of Representatives. He was a representative in Congress in 1851- 1855, but having become a Republican, was defeated for a third term. From 1861 to 1865 he was governor of Illinois, and was successful in enlisting troops and in checking the strong pro- Southern sentiment in the state. He was a member of the United States Senate in 1865-71, and was prominent in Reconstruction legislation. He died at St Louis, Missouri, on the 27th of November 1873. His son Richard (b. i860) was governor of Illinois from 1901 to 1905.

YATSAUK, called by the Shans Lawksawk, a state in the central division of the southern Shan States of Burma. Area, 2197 sq. m. Pop. (1901), 24,839, of whom less than one-half are Shans; revenue, £2000. The crops grown are rice, segamum, cotton, ground-nuts and oranges. As a whole the state is moun-

tainous, with ranges running N. and S. The main range has a general height of 5000 ft., with peaks, such as Loi Sampa, rising to 7846 ft. The middle and S., however, consist of open roll- ing country, with an average height of 3500 ft. To the N. the country falls away to the Nam Tu (Myitnge), where there are fine teak forests, as well as along the Nam Lang and Nam Et, which with the Zawgyi form the chief rivers of the state. Most of them disappear underground at intervals, which makes the extraction of timber impossible except for local use. Lawksawk, the capital, stands on the N. bank of the Zawgyi, near a small weedy lake. The old brick walls and the moat are falling into decay. The chief at the time of annexation had been at war with the Bur- mese, but refused to submit to the British, and fled to Keng Hung, where he died some years afterwards. The sawbwa chosen in 1887 belonged to another Shan ruling house. He died in 1900, and was succeeded by his son.

YATUNG, a trade-market of Tibet, situated in the mouth of the Chumbi valley near the Indian frontier. According to the Con- vention of 1890-93, the market at Yatung was opened to India, and the conduct of the Tibetans in building a wall across the road between Yatung and Tibet was one of the incidents that led up to the British mission of 1904. According to the treaty of that year, a British trade-agent was to be maintained at Yatung.

YAUCO, a city of the department of Ponce, Porto Rico, 20 m. W. by N. of the city of Ponce. Pop. (1899) 6108. Yauco is served by the American Railroad of Porto Rico. The city is situated about 1 50 ft. above the sea, and has a delightful climate. It is connected by a wagon road with its port, Guanica (pop. about 1000), which has an excellent harbour. Coffee and tobacco are the chief industries. Yauco was first settled in i75°-

YAVORSKY, STEPHEN (c. 1658-1722), Russian archbishop and

statesman, one of the ablest coadjutors of Peter the Great, was educated at the Kiev Academy and various Polish schools. Becoming a monk, he settled at the Kiev Academy as a preacher and professor, being appointed prefect of the institution and prior of the monastery of St Nicholas. He attracted the attention of Peter by his funeral oration over the boyar Shein, and was made archbishop of Ryazan in 1700. In 1702, on the death of the last patriarch of Moscow, Yavorsky was appointed custodian of the spiritualities of the patriarchal see. Not- withstanding frequent collisions with Peter, and his parti- ality for the unfortunate tsarevich Alexius, Yavorsky was too valuable a man to be discarded. In 172 1 he was made first president of the newly erected Holy Synod, but died in the following year.

Yavorsky's chief works are his Rock of the Faith of the Orthodox- Catholic Eastern Church and Dogmatic, Moral and Panegyrical Sermons. See Y. T. Samarin, Stephen Yavorsky (Rus.) (Moscow, 1844); I. Morev, " The Rock of the Faith" of the Metropolitan Stephen Yavorsky (Rus.) (Petersburg, 1904).

YAWL, the name of a special rig of small sailing vessels or yachts, with two masts, the mainmast cutter-rigged, and a small mizzen stepped far aft with a spanker or driving sail. The name has also been applied to a small ship's boat rowed with four or more oars. The word is apparently an adaptation of the Dutch jol, skiff.

The English " jolly-boat," a small bluff-bowed, wide-transomed ship's boat, swung at the stern of a vessel for ready use, is probably a corruption of the Danish form of the word jolle. Other authori- ties take it to be a corruption of a late 15th-century jolywat, a small ship's boat, which is supposed to represent galiote, galliot (see Galley). A galliot, however, was never a small boat, but an in- dependent vessel propelled by oars or sails.

YAWS, the name in use in the British West Indies for a contagious inoculable tropical disease, running a chronic course and characterized by a peculiar eruption, together with more or less constitutional disturbance. It is known by various local names in different parts. In the French Antilles it is called pian; in Brazil, boba ; on the west coast of Africa, gatiu, dubl and taranga; in Fiji, coko; in the Malay Peninsula, purru; in the Moluccas, bouton d ' Amboine; in Samoa, tonga or tono; in Basutoland, makaola; and in Ceylon it is

spoken of under the name of parangi. The name framboesia was first given to the disease by Sauvages in 1759 from the likeness of the typical excrescences to a raspberry. For many years yaws was thought to be peculiar to the African negro, either in his home (both west and east coasts) or in the West Indies and Brazil. But a disease the same in every respect has long been known in the East Indies (first mentioned by Bontius early in the 17th century), affecting the Malays rather than the negroes, its chief seats being Amboyna, Ternate, Timor, Celebes, Java and Sumatra. It has been identified by De Rochas and other observers in New Caledonia and Fiji.

The general course of the disease is as follows. Previous to the eruption there may or may not be any disorder of health: in children (who form a large part of the subjects of yaws) there will probably be rheumatic pains in the limbs and joints, with languor, debility and upset of the digestion; in adults of ordinary vigour the eruption is often the first sign, and it is attended with few or no constitutional troubles. The eruption begins as small pimples like a pin's head, smooth and nearly level with the surface; they have a little whitish speck on their tops, grow rapidly and reach the size of a sixpence or a shilling. The pustules then break and a thick viscid ichor exudes and dries upon them as a whitish slough and around their base as a yellowish-brown crust. Beneath the whitish slough is the raspberry excrescence or yaw proper, a reddish fungous growth with a nodular surface. The favourite seats of the eruption are the forehead, face, neck, arm-pits, groin, genitals, perinaeum and buttocks. Hairs at the seat of a yaw turn white. In young children or infants the corners of the mouth ulcerate, as in syphilis, and the perineal excrescences resemble condylomata. The pustules and excrescences do not all arise in one crop: some are found mature while others are only starting. If the patient be of sound constitution and good reaction, the yaws may reach the full size of a mulberry in a month, in which case they will probably be few; but in persons of poor health they may take three months to attain the size of a wood-strawberry, in which case they will be numerous inversely to their size. Often there is one yaw much larger than the rest, and longer in falling; it is called the " master yaw "" or mother yaw." On the soles of the feet (less often on the palms of the hands) the bursting yaws are as if imprisoned beneath the horny cuticle; they cause swelling and tenderness of the foot, until set free by paring the callous skin down to the quick; these yaws are called " crab yaws " or tubbas. Usually a yaw is painless unless when rubbed or irritated. The absence of pain is used as a diagnostic sign if there be any doubt as to the nature of the attack: a pustule is opened and a lit tie of the juice of capsicum dropped into it; if it be a yaw, no smarting will be felt. In some cases a few yaws will show themselves long after the primary attack is over; these are called " memba yaws " (from " remember

“), the term being sometimes applied also to protracted cases with successive crops of eruption. Six weeks is the average time in a good case, from the first of the eruption to the fall of the excrescences; in such regular cases a scar remains, it may be for many months, darker than the rest of the (negro) skin. But the disease is often a much more tedious affair, the more protracted type having become common in the West Indies of recent years. In such cases the eruption comes out by degrees and as if with difficulty, crop after crop; foul, excavating and corroding ulcers may remain, or a limb may be in part seamed and mutilated by the scars of old ulceration. The scars after ulceration are not

so dark as the skin around.

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Aetiology. — Yaws is a highly contagious disease. It is neither hereditary nor congenital. The disease spreads by contact with previously infected cases, though it has been stated that infection also arises from inhabiting dirty houses, the floors and walls of which are contaminated with yawey matter from former yaw cases; and it is also believed, and has been proved by experiment, that infection may be con- veyed by flies, which act as go-betweens, carrying infective material from a yaws sore to an ordinary ulcer. The virus must be introduced directly through a breach of the skin or mucous membrane; an attack in childhood gives a large degree of immunity for the rest of life. A micrococcus was found by Pierez and Nicholls in the tubercles of yaws, but a pure culture of this micro-organism failed to give rise to yaws in animals into whom it was injected experimentally, and in no instance was it present in the blood. In 1905 Aldo Castellani demonstrated in yaws the presence of a slender spirillum, which he named the Spirochaeta pertenuis or Spirochaeta palli- dula. It was also experimentally proved by him (1) that the material taken from persons suffering from yaws and con- taining the Spirochaeta pertenuis is infective to monkeys;

(2) that when the Spirochaeta pertenuis is removed by filtration the material becomes inert; (3) that the injection of blood from the general circulation of a yaws patient gave positive results in monkeys; (4) by means of the Bordet-Gengou reaction it is possible to detect specific yaws anti-bodies and antigen.

The prophylaxis consists in the segregation of the patients suffering from the disease, the antiseptic dressing of the erup- tion, the application of a covering to protect it from flies, and the thorough cleansing and disinfection of infected houses and clothing, even the demolition of houses in endemic centres, and finally the compulsory notification of cases of yaws to the

local sani tary au thori ty .

As regards treatment, the malady in a person of good con- stitution runs its course and gets well in a few weeks. What- ever tends to check the eruption, such as exposure to chill, is to be avoided. A week's course of cream of tartar and sulphur (confection of sulphur) at the beginning of the illness is often resorted to, so as to bring the eruption well out. The patient should remain indoors, in a well-aired room, and take daily warm baths and diluent drinks. If the excrescences are flabby and unhealthy, it is an indication for generous diet. When the eruption is declared, iodide of potassium and arsenic are very beneficial. As external applications, weak lotions of zinc or carbolic acid may be used, and, if the excrescences are irri- table, a watery solution of opium. Tedious and unhealthy yaws should be dressed with a wash of sulphate of zinc or of copper; the same may be applied to a yaw ulcer. The crab yaws of the horny soles or palms, after they are let through by paring the cuticle, may be dusted with alum powder.

On the whole, the mortality is small. In 7157 West Indian cases treated in various hospitals there were only 185 deaths, a mortality of 25 S per Lhousand (Nicholls).

YAZDEGERD ("made by God," Izdegerdes), the name of three Sassanid kings of Persia. (1) Yazdegerd I., son of Shapur III., 399-420, called " the sinner " by the Persians, was a highly intelligent ruler, who tried to emancipate himself from the dominion of the magnates and the Magian priests. He punished the nobles severely when they attempted op- pression; he stopped the persecution of the Christians and granted them their own organization. With the Roman Empire he lived in peace and friendship, and is therefore as much praised by the Byzantine authors (Procop. Pers. i. 2; Agath. iv. 26) as he is blamed by the Persians. After a reign of twenty years he appears to have been murdered in Khorasan.

(2) Yazdegerd II., was the son of Bahrain V. Gor, 438-457. He persecuted the Christians and Jews, and had a short war with Rome in 441. He tried to extend his kingdom in the East and fought against the Kushans and Kidarites (or Huns).

(3) Yazdegeed III., a grandson of Chosroes II., who had been murdered by his son Kavadh II. in 628, was raised to the throne in 632 after a series of internal conflicts. He was a mere child and never really ruled; in his first year the Arabic invasion began, and in 637 the battle of Kadisiya decided the fate of the empire. Ctesiphon was occupied by the Arabs, and the king fled into Media. Yazdegerd fled from one district to another, till at last he was murdered at Merv in 651 (see Cali- phate, sect. A. 1). The Parsees,

who use the old Persian calendar, continue to count the years from his accession (era of Yazdegerd, beginning June i6th, a.d. 632). (Ed. M.)

YEAST (O.E. giest or gyst; the root yes-, to boil, ferment, is seen in Sansk. nir-yasa, exudations from trees, and Gr. £ehv, to boil), a cellular organism produced in the alcoholic fcrrnenta- tion of saccharine liquids (see Fungi, Fermentation, Brewing).

YEATS, WILLIAM BUTLER (1865-), Irish author, son of J. B. Yeats (b. 1839), a distinguished Irish artist and member of the Royal Hibernian Academy, was born at Sandymount, Dublin, on the 13th of June 1865. At nine years old he went to live with his parents in London, and was sent to the Godolphin School, Hammersmith. At fifteen he went to the Erasmus Smith School in Dublin. Later he studied painting for a short time at the Royal Dublin Society, but soon turned to

literature, contributing poems and articles to the Dublin Uni- versity Review and other Irish periodicals. In 1888 he was encouraged by Oscar Wilde to try his fortune in London, where he published in r88o his first volume of verse, The Wanderings of Oisin; its original and romantic touch impressed discerning critics, and started a new interest in the " Celtic " movement. The same year and the next he contributed to Mr Walter Scott's " Camelot Series," edited by Ernest Rhys, Fairy and Folk Tales, a collection of Irish folklore, and Tales from Carleton, with original introductions. In 1891 he wrote anonymously two Irish stories, John Sherman and Dhoya, for Mr Fisher Unwin's " Pseudonym Library." In 1892 he published another volume of verse, including The Countess Kathleen (a romantic drama), which gave the book its title, and in 1893 The Celtic Twilight, a volume of essays and sketches in prose. He now submitted his earlier poetical work to careful revision, and it was in the revised versions of The Wanderings of V 'sheen and The Countess Kathleen, and the lyrics given in his collected Poems of 1895 that his authentic poetical note found adequate expression and was recognized as marking the rise of a new Irish school. In the meantime he had followed The Countess Kathleen with another poetical drama, The Land of Heart's Desire, acted at the Avenue Theatre for six weeks in the spring of 1894, published in May of that year. He contributed to various periodicals, notably to the National Observer and the Bookman, and also to the Book of the Rhymers' Club — the English Parnasse Contemporain of the early 'nineties. With Edwin J. Ellis he edited the Works of William Blake (r893), and also edited A Book of Irish Verse (1895). In 1897 ap- peared The Secret Rose, a collection of Irish legends

and tales in prose, with poetry interspersed, containing the stories of Hanrahan the Red. The same year he printed privately The Tables of the Law and the Adoration of the Magi, afterwards published in a volume of Mr Elkin Mathews's " Vigo Street Cabinet " in 1904. In 1889 he published 'The Wind among the Reeds, containing some of his best lyrics, and in 1900 another poetical drama, The Shadowy Waters. He now became specially interested in the establishment of an Irish literary theatre; and he founded and conducted an occasional periodical (appear- ing fitfully at irregular intervals), called first Beltain and later Samhain, to expound its aims and preach his own views, the first number appearing in May 1899. In the autumn of 1901 Mr F. R. Benson's company produced in London the play Diarmitid and Crania, written in collaboration by him and George Moore. In 1902 he published his own first original play in prose, Cathleen ni Houlihan, which was printed in Samhain in October that year. In 1903 he collected and published a volume of literary and critical essays, to which he gave the title, Ideas of Good and Evil. In the same and the following years he published a collected edition of his Plays for an Irish Theatre, comprising Where There is Nothing, The Hour- Glass, Cathleen ni Houlihan, The Pot of Broth, The King's Threshold and Oh Baile's Strand. In 1904 he also edited two volumes of Irish Representative Tales. Whether or not " Celtic " is the right word for it, Mr Yeats's art was quickly identified by enthusiasts with the literary side of the new Irish national movement. His inspiration may be traced in some measure to the Pre-Raphaelites and also to Blake, Shelley and Maeter- linck; but he found in his native Irish legend and life matter apt for his romantic and often elfin music, with its artful sim- plicities and unhackneyed cadences, and its elusive, inconclusive charm.

See«the section on W. B. Yeats in Poets of the Younger Generation by Wiliiam Archer .(1902), and for bibliography up to June 1903, English Illustrated Magazine, vol. xxix. (N.S.) p. 288. A library edition of his collected works in prose and verse was issued by Mr Bullen from the Shakespeare Head Works, Stratford-on-Avon, in 8 vols., 1908.

YECLA, a town of E. Spain, in the extreme N. of the pro- vince of Murcia, on the Yecla-Villena railway; it is situated on the W. slope of Monte Castillo, which rises above the left bank of the Arroyo del Jua. Pop. (1900) 18,743. The chief

buildings are a half-ruined citadel, a modern parish church with a pillared Corinthian facade, and a town hall standing in a fine arcaded square. Yecla has a thriving trade in the grain, wine, oil, fruit and esparto grass produced in the sur- rounding country.

YEISK, a town of Russia, in the province of Kuban (Caucasus), founded in

1848 on a sandbank which separates the shallow Bay of Yeisk from the Sea of Azov, 76 m. S.W. of Rostov- on-the-Don. Pop. 35,446. Notwithstanding its shallow road- stead, Yeisk has grown with great rapidity, and exports corn, linseed and wool. There are wool-cleansing factories, oil-works and tanneries.

YELLOW FEVER, a specific infective tropical fever, the germ of which is transmitted by the Stegomyia fasciala or domestic mosquito, occurring endemically in certain limited areas. The area of distribution includes the West Indies, Mexico, part of Central America, the W. coast of Africa and Brazil.

The first authentic account of yellow fever comes from Bridge- town, Barbados, in 1647, where it was recognized as a " nova pestis " that was unaccountable in its origin, except that Ligon, the historian of the colony, who was then on the spot, connected it with the arrival of ships. It was the same new pestilence that Dutertre, writing in r667, described as having occurred in the French coiony of Guadeloupe in 1635 and 1640; it recurred at Guadeloupe in 1648, and broke out in a peculiarly disastrous form at St Kitts the same year, and again in 1652; in 1655 it was at Port Royal, Jamaica; and from those years onwards it became familiar at many harbours in the West Indies and Spanish Main. It appeared at the Brazilian ports in 1849. In 1853 it appeared in Peru and in 1820 on the W. coast of Africa. In Georgetown (British Guiana) 69% of the garrison died in

1840.

During the great period of yellow fever (1793-1805), and for some years afterwards, the disease found its way time after time to various ports of Spain. Cadiz suffered five epidemics in the 1 8th century, Malaga one and Lisbon one; but from 1800 down to i82r the disease assumed much more alarming proportions, Cadiz being still its chief seat, while Seville, Malaga, Cartagena, Barcelona, Palma, Gibraltar and other shipping places suffered severely, as well as some of the country districts nearest to the ports. In the severe epidemic at Barcelona in the summer of r82i, 5000 persons died. At Lisbon in 1857 upwards of 6000 died in a few weeks. In New Orleans 7970 people died in 1833, 3093 in 1867, and 4056 in 1878. In Rio 4160 died in 1850, 1943 in 1852, and 1397 in 1886.

Certain distinct conditions have seemed to be necessary for an outbreak. Foremost we may notice a high atmospheric temperature, one of 75 F. or over. As the thermometer sinks, the disease ceases to spread. Moisture favours the spread of yellow fever, and epidemics in the tropics have usually occurred about the rainy season. Seaport towijs are most affected. In many instances the elevated airy and hygienic quarters of a town may

escape, while the shore districts are decimated. Usually the disease does not spread to villages or sparsely popu- lated districts. Certain houses become hotbeds of the disease, case after case occurring in them; and it is usually in houses that the disease is contracted. A house may be said to be infected when it contains infected mosquitoes, whether there be a yellow-fever patient there or not. Ships become infected in the same way, the old wooden trading ships affording an ideal hiding-place to the Stegomyia in a way that the modern and airy steamship does not.

The incubation period of yellow fever is generally four or five days, but it may be as short as twenty-four hours. There are usually three marked stages: (1) the febrile period, (2) the period of remission or lull, (3) in severe cases, the period of reaction. The illness usually starts with languor, chilliness, headache, and mus- cular pains, which might be the precursors of any febrile attack. These are followed by a peculiar look of the eyes arid face, which is characteristic: the face is flushed, and the eyes suffused at first and then congested or ferrety, the nostrils and lips red, and the tongue scarlet— these being the most obvious signs of

universal congestion of the skin, mucous membranes and organs. Meanwhile the temperature has risen to fever heat, and may reach a very high figure (maximum of no Fahr., it is said); the pulse is quick, strong and full, but may not keep up in these characters with the high temperature throughout. There are all the usual accompaniments of high fever, including hot skin, failure of appetite, thirst, nausea, restlessness and delirium (which may or may not be violent) ; albumen will nearly always be found in the urine. The fever is continued; but the febrile excitement comes to an end after two or three days. In a certain class of ambulatory or masked cases the febrile reaction may never come out, and the shock of the infection after a brief interval may lead unexpectedly and directly to prostration and death. The cessation of the paroxysm makes the stadium, or lull, characteristic of yellow fever. The hitherto militant or violent symptoms cease, and prostration or collapse ensues. The internal heat falls below the normal; the action of the heart (pulse) becomes slow and feeble, the skin cold and of a lemon-yellow tint, the act of vomiting effortless, like that of an infant, the first vomit being clear fluid, but afterwards black from an admixture of blood. It is at this period that the prospect of recovery or of a fatal issue declares itself. The prostration following the paroxysm of fever may be no more than the weak- ness of commencing recovery, with copious flow of urine, which even then is very dark-coloured from the presence of blood. The prostration will be all the more profound

according to the height reached by the temperature during the acute paroxysm. Much blood in the vomit and in the stools, together with all other haemorrhagic signs, is of evil omen. Death may also be ushered in by suppression of urine, coma and convulsions, or by fainting from failure of the heart. In severe types of the disease an apoplectic, an algid and a choleraic form have been described.

The case mortality averages from 12 to 80%. In Rio in 1898 it reached the appalling height of 94-5%. In cities where it is endemic the case mortality is usually lower. In 269 cases observed by Sternberg, the mean mortality was 27-7%. In 158 cases of yellow fever in Vera Cruz in 1905 there were 91 deaths. The death-rate, however, tends to vary in different epidemics. In the epidemic occurring in Zacapa, Mexico, in 1905 in a population of 6000 there were 700 cases, and the mortality among the infected was 40%.

Treatment.— -The patient should be removed from the focus of infection and nursed in a well-ventilated room, screened from mosquitoes. The further treatment is symtomatic. A purga- tive, followed by hot baths, is useful in the early stages to relieve congestion, high temperature may be controlled by sponging; vomiting, by ice; or, if haemorrhagic, by ergot, perchloride of iron or other styptics; and pilocarpine may be given if the urine be scanty. Sternberg has introduced a system of treatment by alkalis to counteract the hyperacidity of the intestinal contents and increase the (low of urine. Of 301 whites treated by this method only 7-3 % died, and of 72 blacks all recovered.

Causation. — The pathology of the disease is discussed in the article Parasitic Diseases. In 1881 Dr Charles Finlay, of Havana, propounded the theory that mosquitoes were the carriers of the infection. Numerous theories had previously been brought forward, notably that of the Bacillus ictcroides, described by Sanarclli; but it is now certain that this organism is not the cause. Other authorities held that the disease was spread by contagion, by miasmata, or some other of the vague agencies which have always been put forward in the absence of exact knowledge. Finlay's mosquito theory remained in abey- ance until attention was again drawn to it by the demonstration in recent years of the part played by these insects in the causa- tion of other tropical diseases. The mosquito selected by Finlay was the Stegomyia fasciata, a black insect with silvery markings on the thorax, which is exceedingly common in the endemic area. It frequents towns, and breeds in any stagnant water about houses. Specimens were caught, fed upon yellow-fever patients, kept for a fortnight, and then allowed to bite susceptible persons established in a special camp with other susceptible persons as a control. Those bitten developed the fever, the

others did not. An American commission was appointed in 1900, consisting of Walter Reed, James Carroll, A. Agramonte and Lazear, and its conclusions were: that the Stegomyia jasciata is the agent of infection, that the virus of yellow fever is present in the blood during the first three days of the fever, and is generally absent on the fourth; that the germ is so small that it can pass through a Chamberland porcelain filter; that the bite of all infected Stegomyia does not produce yellow fever (about 35% of the experiments proving negative); that mos- quitoes fed on yellow-fever blood were not capable of giving rise to infection until after a lapse of twelve or fourteen days, but the insects retained their infective power for at least fifty-seven days. It can therefore be concluded that the virus of yellow fever is a parasite, requiring as in malaria an alternate passage through a vertebrate and an insect host, the analogy to malaria being very complete. E. Marchoux and P. L. Simond, of the French Yellow Fever Commission to Rio de Janeiro, 1906, have observed an interesting fact in connexion with the S. jasciata. In order to lay her eggs she must first have a feed of blood, three days after which she lays them. Before she lays her eggs she strikes both day and night, after that period at night only. Persons bitten in the day-time, therefore, do not develop yellow fever, while those bitten at night do. This may explain the impunity with which Europeans may visit an infected district in the day-time provided that they are careful not to sleep there at night. It was stated by Marchoux and Simond that an infected mosquito transmits the parasite to her eggs, the progeny proving infective.

Prophylaxis. — Following on the publication of these experi- ments there was instituted a vigorous campaign against mos- quitoes in Havana in 1901, based on the methods applied to the suppression of malaria, and carried out under the direction of Major W- C. Gorgas of the United States army, chief sanitary officer of Havana. The work was begun on the 27th of February 19OT. An order was issued that all receptacles containing water were to be kept mosquito-proof; sanitary inspectors were told off for each district to maintain a constant house-to-house inspection, and to treat all puddles, &c, with oil; receptacles found to contain larvae were destroyed and their owners fined; breeding- grounds near the town were treated by draining and oil; hospitals and houses containing yellow-fever patients were screened; infected and adjacent buildings were fumigated with pyrethrum powder. The results exceeded all expectation, and after January 1902 the disease entirely ceased to originate in Havana. Cases occasionally now come into Havana from Mexican ports, but are treated under screens with impunity in ordinary city hospitals and never at any time infect the city. Thus in 1907 there was one death from yellow fever, and the general death-rate of Havana from all diseases was 17 per thousand. In the Bulletin of Public Health and Charities of Cuba it is stated there only occurred between 1905-9 a total of 345 cases of yellow fever in all Cuba,

where formerly -they numbered many thousands, and in April 1910 the republic was declared to be entirely free from the disease.

Among other modern outbreaks in which sanitary measures have triumphed in the suppression of yellow fever were the outbreak in New Orleans in 1905, in which a medical staff of 50 with sub- ordinates to the number of 1203 started immediately on the outbreak to clean up the city; the outbreak in Belize, British Honduras, in 1905; the anti-yellow-fever campaign undertaken in the British W. Indies in 1906-9. As soon as the Isthmian Canal commissioners took over the administration of the Panama Canal Zone they undertook a vigorous campaign against the mosquito, as the result of which yellow fever was successfully banished. Colonel Gorgas in his 1908 report wrote: " It is now three years since a case of yellow fever has developed in the Isthmus, the last being in November 1905."

Rio de Janeiro, which had lost 28,078 inhabitants in 13 years by yellow fever, and Santo, have also waged war against the disease; as a result of the a,nti- Stegomyia policy the deaths from yellow fever in Rio fell to 42 in 1906, 39 in 1907, 4 in 1908, and o in 1909.

See Sir P. Manson, Tropical Diseases (1907) ; arricle" Yellow Fever " in Ailbutt and "Rolleston's System of Medicine; Sir R. Boyce, Report on Yellow Fever in Honduras (1906), and Health and Administration in the West Indies (1910) ; Bulletins of the U.S. Yellow Fever Institute; Annates de I 'Instilul Pasteur (January 1906}.

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YELLOWSTONE NATIONAL PARK

YELLOWSTONE NATIONAL PARK, an American national reservation, situated mainly in N.W. Wyoming, U.S.A., dedi- cated by the United States government as " a public park or pleasure ground for the benefit and enjoyment of the people." It is nearly a rectangle in shape, with a length, from N. to S., of 62 m., a width of 54 m. and an area of approximately 3350 sq. m. It extends into Montana, on the N., about 2\ m. and into Montana and Idaho, on the W., 2 m. Except at its main en- trance, through the valley of the Yellowstone on the N., the park is entirely surrounded by national forests: the Gallatin and Absaroka national forests, on the N.; the Shoshone and the Beartooth, on the E.; the Teton, on the S.; and the Taighee, the Madison and the Gallatin, on the W.

The central portion, comprising an area of about 2000 sq. m., is an undulating volcanic plateau with a mean elevation above the sea of about 8000 ft. Along the entire E. border stretches the Absaroka range, with

peaks exceeding n,ooo ft. (Index Peak, 11,740 ft.) in height. On the N. is the Snowy range with its snow-capped peaks. W. of the Snowy the Gallatin range extends S. for 20 m. along the W. border. Electric Peak, in the N.W. corner of the park, rises to a height of 11,155 ft. Near the S. end of the park are the Red Mountains, which culminate in Mt. Sheridan (10,385 ft.) and afford a mag- nificent view of the whole region; and farther S. the N. spur of the lofty Tetons juts across the S. border.

In the production of these mountains and plateau there was first, at the close of the Cretaceous period, an upheaval of the earth's substance to form a mountain rim and a depressed basin. Subsequently, in the Tertiary period, there were two enormous outpourings of volcanic material — first andesitic lava, and later, after a long interval of quiet, rhyolitic — which nearly half filled the basin, converted it into a plateau and broke up the mountain rim. Two centres of volcanic activity were Mt. Sheridan, in the S., and Mt. Washburn, in the N. The volcanoes have long been extinct, but the diminished energy now causes hot springs and geysers in all parts of the plateau, about 100 in number. More than half, including the largest and finest, are in the upper and the lower Geyser basins, near the head of the Madison, here known as the Firehole, river. Several others are farther N. in the Norris basin upon Gibbon river, a branch of the Madison, and others are farther S. in the Shoshone basin.

Excelsior, the largest geyser, with a crater about 300 ft. long and 200 ft. wide, has not been active since 1890, but for several years after its discovery it threw up at intervals a huge mass of water to a height of 200-250 ft. Old Faithful, at regular intervals of 65-70 minutes, throws up a column of hot water 2 ft. in diameter to a height of 125-150 ft., and the eruption lasts 4-4I minutes. The Giant, at intervals of 2 to 4 days or more, throws up a column to a height of 250 ft. for 90 minutes. The Beehive (so called from the shape of its cone), the Grand and the Lone Star throw up columns to a height of 200 ft. but at irregular intervals. In the Norris basin are the Black Growler and the Hurricane, which consist of small apertures through which steam rushes with such tremendous force that it may be heard for miles. The hot springs are widely distri- buted over the plateau and number from 3000 to 4000. The water of most of the springs and geysers holds silica in solution in con- siderable quantities, so that as it cools and evaporates it deposits a dazzling white sinter which has covered many square miles of the valleys and contrasts strongly with the dark green of the surrounding forests. The springs, geysers and steam vents are scattered over it in the most irregular fashion. The silicious matter has also built up around the springs and geysers cones or mounds of considerable size and great beauty of form. The water of many of the springs contains sulphur, iron, alum and other materials in solution, which in places stain the pure white sinter with bright bands of colour. The tints and hues of

some of the pools are of matchless beauty. Near the N. boundary of the park there is a group of about 70 active springs, known as- the Mammoth Hot Springs, which hold carbonate of lime in solution. Their deposits have built across a small valley or ravine a series of broad, flat, concentric terraces beautiful in form and 300 ft. in height. The water which trickles over the rims of the pools and basins on the upper terraces is a transparent blue, while the formation itself contains a network of fibrous algae which gives it a wonderful variety of colours. In the lower Geyser basin are the Mammoth Paint Pots, a group of mud springs with colours varying according to the mineral ingredients in the steam, which not only colours the mud but also forms it into imitative figures. Near the centre of the park is Mud Caldron, a circular crater about

40 ft. deep with the boiling mud at the bottom. Although there have been some changes in the thermal energy in the park since 1871, there has been no appreciable diminution. Certain springs and geysers lose some of their energy at intervals, while others gain; certain geysers have become quiescent, but some new ones have been formed.

The Continental Divide crosses the park in a S.E. direction from the meeting-point of the states of Wyoming. Idaho and Montana. The small section S. of the Divide is drained by the Snake river into the Columbia river and the Pacific Ocean; the large section N. of the Divide is drained by the Yellowstone and Madison rivers into the Missouri, the Mississippi and the Gulf of Mexico. The Lewis river, a fork of the Snake, has its origin in the beautiful Shoshone Lake, and the Heart river, another fork of the Snake, rises in Heart Lake, under Mt, Sheridan.

The Yellowstone drains the entire E. section. Rising just beyond its S. limits, it flows into and through Yellowstone Lake, a mapni- ficent sheet of water, very irregular in shape, dotted with forested islands, having an area of about 140 sq. m., lying 7741 ft. above the sea and nearly surrounded by lofty mountains. A few miles below the lake, the river, after a succession of rapids, leaps over a cliff, making the Upper Fall, 109 ft. in height. Half a mile lower down it rolls over the Lower Fall, which has a clear descent of 308 ft. The river at this point carries, at the average stage of water, about 1200 cub. ft. per second. With this fall the river enters the " Grand Canyon," which in many scenic effects is unequalled. Its depth is not great, at least as compared with the canyons upon the Colorado river system; it ranges from 600 ft. at its head to 1200 near the middle, where it passes the Washburn Mountains. Its length to the mouth of Lamar river is 24 m. It is cut in the volcanic plateau, and its ragged broken walls, which are inclined at very steep angles, are of a richness of colouring that almost defies description, a colouring that is produced by the action of the thermal springs, at the base of the canyon, upon the mineral pigments in the lava-

Bright orange, yellow, red and purple hues predominate and are set off very effectively against the dark green pines with which the margins of the canyon arc fringed, and the white foam of the river at the bottom of the chasm. Near the foot of the Grand Canyon, Tower creek, which drains the concavity of the horseshoe formed by the Washburn Mountains, enters the Yellowstone. Just above its mouth this stream makes a beautiful fall of 132 ft. into the gorge in which it joins the river. A few miles farther down, the Yellow- stone is joined by an E. branch, Lamar river, which drains a large part of the Absaroka Range. Then it enters the Third Canyon, from which it emerges at the mouth of Gardiner river. The latter stream drains an area of elevated land by means of its three forks, and upon each of them occurs a fine fall in its descent toward the Yellowstone. The Madison rises in the W. of the park and flows in a generally N. and then W. course out of the park. Its waters are mainly collected from the rainfall upon the plateaux, and from the hot springs and geysers, most of which are within its drainage area. Upon this river and its affluents are several fine falls. Indeed, all the streams in this region show evidence, in the character of their courses, of a recent change of level in the surface of the country.

The climate, influenced by the high elevation, is character- ized by long and severe winters and short summers with great diurnal extremes of temperature. But the low temperature causes the moisture -laden winds to deposit here greater quantities of rain and snow than in the semi-arid regions below, which not only promote the growth of vegetation, but cause the activity of the springs, geysers and waterfalls. The mean annual temperature at the station of the United States Weather Bureau, near the N. boundary, is 39 F. The summer (June, July and August) mean is 59 ; the winter (December, January and February) mean, 20 .

Extremes have ranged from 96 in July to 35 in February. The temperature has fallen to 30 in July, and a warm summer day may at any time be followed by frost at night. The mean annual pre cipitation is 19-6 in. Much of this is in the form of snow, and nearly half of it is during the four months from December to March; in the four dryest months, from July to October, it is only 4-4 in. Some snow falls in every month except July and August, and the average annual snowfall amounts to 94-7 in. The prevailing winds are S.

About four-fifths of the park is covered with dense forests of black pine (Pinus Murrayana), balsam, fir, spruce, cedar and poplar. These trees do not attain a large size. A low blueberry {V actinium myrtilis) forms a thick underbrush in much of the forest. Choke-cherries, gooseberries, buffalo-berries, red currants and black currants grow along the streams ■ *and In moist places of the lower altitudes. In the glades are*

bunch-grass and a variety of flowering plants; buttercups, daisies, forget-me-nots and other wild flowers may be found near melting snow-banks in August. In the hot-spring districts are plants with peculiarities both of those common to the desert and those common to the seashore. In the N.E. corner of the park fossil forests rise one above the other. After the destruction of one forest by volcanic eruptions another grew over it; it, too, was buried under volcanic material, and the process was repeated several times.

The native fauna is abundant and varied. The policy of the government which protects game, both in the park and in the surrounding national forests, has induced elk, deer, ante- lope, mountain-sheep, bears, porcupines, coyotes, squirrels, gophers and woodchucks to take shelter here. There are also a few moose and some beavers. Black, brown and grizzly bears may be seen at almost any time during the summer season feeding on the garbage from the hotels. A few wild bison still remain at large, and besides these there is a herd of about too confined within a pasture in the Lamar Valley. The lakes and rivers are well stocked with trout and other fish, and visitors have the privilege of catching a limited number with rod and line. Robins, bluebirds, warblers, chickadees, finches, vireos, wrens, yellow-headed blackbirds, nutcrackers, nut- hatches, meadow-larks, sparrows, woodpeckers, swifts, kingbirds and several other species of small birds are found in the park, but the number of each is not great. Among birds of prey are the golden eagle, bald eagle, hawks and owls. Geese, ducks, cranes, pelicans and gulls are very numerous in the autumn months.

The park is under the supervision of a superintendent who is appointed and instructed by the Secretary of the Interior. It is policed, however, by troops of United States cavalry with headquarters at Fort Yellowstone, near the Mammoth Hot Springs, and the building of roads and other improvements is under the direction of the Secretary of War. The only rail- way approaches to the park are a branch of the Northern Pacific railway up the valley of the Yellowstone to the main gate at Gardiner, Montana, and a branch of the Oregon Short Line up the valley of the North Fork of the Snake to Yellow- stone, Montana. Automobiles are not allowed within the park, and the principal means of conveyance is by stage coaches and by a steamboat on Yellowstone Lake. There are hotels at the Mammoth Hot Springs, at the principal geyser basins and at Yellowstone Lake. The hotels and stage lines open for the tourist season early in June and close in the

middle of September.

The strange phenomena of this region were known to some of the Indians; they were discovered by John Colter, a member of the Lewis and Clark expedition, in 1807; the region was visited by James Bridger before 1840; an account of the geysers was published at Nauvoo, Illinois, in The Wasp, a Mormon paper, in 1842; Captain W. F. Raynolds, of the United States Corps of Topographical Engineers, with full knowledge of Bridger's accounts, was ordered to explore the region in 1859, and yet, chiefly because of the persistent in- credulity with which the accounts of the phenomena were received, the region remained practically unknown until 1870. From 1863 to 1866 gold seekers repeatedly confirmed the early reports, and the publication of their accounts in Western papers gradually aroused interest. In i86g a private exploring party, consisting of David E. Folsom, C. W. Cook and William Peterson, set out from the gold-fields of Montana with the express purpose of verifying or refuting the rumours, and they returned full of enthusiasm. In 1870 a semi-official expedition, led by Henry D. Washburn, the surveyor-general of Montana, and Lieutenant Gustavus C. Doane of the Second United States Cavalry, made the " Yellowstone Wonderland " widely known, A year later an expedition under Dr Ferdinand V. Hayden (1829-1887) made a large collection of specimens and photographs, and with these data, together with the reports of this and the Washburn-Doane expedition, Congress was induced to reserve the area from settlement, which was done by an act approved the 1st of March 1872. In that year

further explorations were made, and in subsequent years army expeditions continued the work of exploration. In 1878 a map of the park based upon triangulation was drawn up by the Hayden survey, and in 1883-85 a more detailed map was made by the United States Geological Survey, and a systematic study of its geological phenomena was instituted.

See Arnold Hague, Geology of the Yellowstone National Park (Washington, 1899), "Geological History of the Yellowstone National Park," in the Annual Reports of the Smithsonian Institu- tion (ibid., 1893 J, and "The Yellowstone National Park," in Scrihncr's Magazine (May, 1904); W. H. Weed, "Formation of Travertine and Siliceous Sinter by the Vegetation of Hot Springs," in the oth Annual Report of the Director of the United States Geological Survey (Washington, 1889); descriptions in the 5th, 6th and 12th Reports of the Hayden Geological and Geographical Survey of the Territories (ibid., 1871,1872 and 1878); J. H. Raftery, His- torical and Descriptive Sketch of the Yellowstone National Park, Senate Document No. 752, 2nd Session of the 60th Congress (ibid., 1909); H. M. Chittenden, Yellowstone National Park, Historical and Descriptive (Cincinnati, 1895); and Annual Reports of the Superintendent of the Park (Washington, 1880

sqq.).

YEMEN (Yaman), a province of Arabia, forming the S.W. corner of the peninsula, between 12 35′ and 18 N., and 42 and 47 E., bounded on the N. by Asir and on the E. by the Dahna desert and Hadramut. Ptolemy and the ancient geographers in general include the whole peninsula under the name of Arabia Felix {ebhoiˆv), in which sense they translate the Arabic Yemen, literally " right hand," for all Arabia S. of the Gulf of Akaba was to the right from their standpoint of Alexandria; the Mahommedan geographers, however, viewing it from Mecca, confine the term to the provinces S. of Hejaz, including Asir, Hadramut, Oman and part of southern Nejd. The Turkish vilayet of Yemen includes Asir, and extends along the Red Sea coast from El Laith in the N. to Shekh Said at the straits of Bab-el-Mandeb; its land boundary on the E. is undefined, except in the S.E., where the boundary between Turkish territory and that of the independent tribes under British protection was defined by an agreement between Great Britain and Turkey in 1904, by a line running approximately N.E. from Shekh Said to the Dahna desert. The main physical characteristics of the province are described in the article Arabia. A lowland strip 20 to 30 m. wide extends along its western and southern coasts, skirting the great mountain range which runs along the whole western side of the Arabian peninsula, and attains its greatest height in the Jibal, or high- lands of Yemen; beyond this mountain zone the interior plateau falls gradually towards the N.E. to the Dahna desert.

The lowland, or Tehama, is hot and generally sterile; it contains oases, however, near the foot of the mountains, fertilized and irrigated by hill streams and supporting many large villages and towns. The most important, of these are Abu Arish, Bet el Fakih and Zubed in the western Tehama, the latter a thriving town of 20,000 inhabitants and the residence of a Turkish kaimakam ; and Abyan and Lahej, the chief place of the independent Abdali tribe, in the southern Tehama. Hodeda and Aden are the only ports of commercial importance, Lohaia and Ghalefika have sunk to insignificant fishing villages, and Mokha, the old centre of the coffee trade, is now almost deserted. The Jibal forms a mountainous zone some 50 m. in width rising steeply from the foothills of the Tehama to an average height of 9000 ft.; many summits exceed 10,000 ft. — the highest fixed by actual survey is Jebcl Manar, 10,565 ft., about 10 m. E. of the town of Ibb. With its temperate climate and regular rainfall, due to the influence of the S.W. monsoon, the Jibal must be considered the most favoured district of Arabia. The villages are substantially built of stone, often picturesquely situated on the spurs and crests of the hills, the houses clustering round the dars or towers which dominate the cultivated slopes and valleys. The principal crops are wheat, barley, millet and coffee, the last-named more particularly on the western slopes of the range within reach of the moist

sea-breezes. In many places the hill- sides, otherwise too steep for cultivation, are cut into terraced fields supported by stone walls; the name given by the Greek geographers to the range of S. Arabia was no doubt intended to describe the step-like appearance of the hills due to this method of cultivation. A special characteristic of the Yemen highlands ifl that fields and inhabited sites are found at tjie highest elevations, the mountain-tops forming extensive plateaux, often scarped on every side and only accessible by difficult paths cut in the cliffs which encircle them like the escarpments 01 a natural fortress; a remarkable example of this is Jebel Jihaf on the Aden border, 8000 ft.

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above sea-level and 4000 ft. above the Kataba valley, an isolated plateau some 6 m. long, containing thirty or forty villages.

The principal town of the Jibal is Ta'iz, the seat of a Turkish mutassarif; its present population does not exceed 4000, but it was formerly a large city, and from its position in the centre of a com- paratively fertile district at the junction of several trade routes it must always be important. It contains five mosques and the Turkish government offices and barracks, and in the business quarter several cafes and shops kept by Greeks. The climate is unhealthy, perhaps owing to its position in a low valley, 4400 ft. above sea-level, at the foot of the lofty Jebel Sabur (9900 ft.), and even in Niebuhr's time many of the houses in the city were in ruins. Thirty miles further N. are the small towns of Ibb (6700 ft.) and Jibla, about 5 m. apart, typical hill towns with their high stone-built houses and paved_ streets. To the E. on the main road to the coast via Zubed is Ucten, the centre of a coffee-growing district; 80 m. to the N. is Manakha, a Turkish post on the main road from Hodeda to the capital, and the chief place of Jebel Haraz, which produces the best coffee in Yemen. Another group of hill towns lies still further N. in the mountain mass between the Wadi Maur and Wadi La'a, where the strongholds of Dhafir, Afar, Haja and Kaurkaban held out for long against the Turkish advance; the last-named town, now almost deserted, was once a city of 20,000 inhabitants, and the capital of a small principality which preserved its independence during the earlier Turkish occupation between 1536 and 1630.

The inner or plateau zone of Yemen stretches along the whole length of the province, with an average width of 120 m.; it lies entirely to the E. of the high range, and has therefore a smaller rainfall than the Jibal; its general character is that of a steppe increasing in aridity towards the E. where it merges in the desert, but broken in places by rocky ranges, some of which

rise 2000 ft. above the general level, and which in the Hamdan district N. of Sana show evidence of volcanic action. It is intersected by several wadi systems, of which the principal are those in the N. uniting to form the Wadi Nejran, in the centre the Wadi Kharid and Shibwan running to the Jauf, and in the S. the Wadi Bana and its affluents draining to the Gulf of Aden. The plateau has a gradual fall from the watershed near Yarim, 8500 ft. above sea-level, to less than 4000 ft. at the edge of the desert.

The northern part nearly down to the latitude of Sana, is the territory of the warlike Ilashid and Bakil tribes, which have never submitted to the Turks, and in 1S92 and again in 1904-5 drove the Turkish troops from almost every garrison in the province, and for a time held the capital Sana itself for the Imam Muhammad Yahiya, the representative of the old dynastv that ruled in Yemen from the expulsion of the Turks in 1630 till its rcconquest in 1871. The principal places are Sa'da, the residence of the Imam, an important town on the old pilgrim road 120 m. N. of Sana, Khaiwan and Khamr. In the N.E., bordering on the desert, is the district of Nejran, a mountainous country with several fertile valleys including the Wadi Nejran, Bedr and Habuna, all probably draining N.E. to the Wadi Dawasir. Further S. is the oasis of Jauf, a hollow or depression, as its name signifies, containing many villages, and of great antiquarian interest as the central point of the old Minaean and Sabaean kingdoms, known to the ancients from the earliest historical times through their control of the frankincense, trade of S. Arabia. Ma'in, identified by Halevy as the seat of the former, is on a hilltop surrounded by walls still well preserved. Numerous other ruins were found by him in the neighbourhood, together with inscriptions supporting the identification. Marib, the Sabaean capital, was celebrated for its great dam, built according to tradition by the Queen of Sheba, and the bursting of which in a.d. 120 is said to have led to the abandonment of the city. This was, however, more probably due to the deterioration of the country through desiccation, which has forced the settled population farther west- ward, where Sana became the centre of the later Himyaritic kingdom. The Arh'ab district drained by the Wadi Kharid and Shibwan between Sana and the Jauf is covered with Himyaritic ruins, showing that the land formerly supported a large settled population where owing to the want of water cultivation is now impossible.

South of this independent tribal territory the principal places are Amran and Shibam on the road leading N. from the capital Sana; Dhamar (a town of 4000 inhabitants, the residence of a kaimakam, and the seat of an ancient university) and Yarim are on the road leading S. to Aden; and two days' journey to the E. is Rada in the extreme S.E. of Turkish Yemen, formerlv a large town, but now much decayed. From near Rada the boundary runs S.W. to the small town of Ka'taba through which the direct road passes from Aden to Sana. The territory to the S. and E. is occupied

by independent tribes under British protection, of which the principal are the Yafa\ the Haushabi and the Abdali.

The inhabitants of Yemen are settled, and for the most part occupied in agriculture and trade, the conditions which favour the pastoral or Bedouin type found in Hejaz and Nejd hardly exist- ing. As in the adjoining province of Hadramut, with which Yemen has always been closely related, the people are divided into four classes: (1) The Seyyids or Ashraf, descendants of the prophet, forming a religions aristocracy; < (2) the Kabail, or tribesmen, belonging to the Kahtanic or original S. Arabian stock, who form

the bulk of the population, and are the only class habitually carrying arms; (3) the trading class; (4) the servile class, mostly of mixed African descent, and including a number of Jews. These latter wear a distinctive garb and occupy separate villages, or quarters in the towns. Owing to the hardships to which they have been exposed through the disturbed state of the country, many are emigrating to Jerusalem.

See C. Niebuhr, Travels and Description of Arabia (Amsterdam, '774); D. G. Hogarth, Penetration of Arabia (London, 3904); E. Glaser, Geschickte und Geographic Arabiens (Berlin, 1890), and in Petermann's Mitt. (1886); R. Manzoni, II Yemen (Rome, 1884); A. Deflers, Voyage en Yemen (Paris, 1889); S M. Zwemer, Arabia (Edinburgh, 1900); W. B. Harris, A Journey through Yemen (London, 1893); H. Burchardt, Z. d. Ges. fur Erdkunde (Berlin, 1902), No. 7. (R. A. W.)

YENISEI, a river of Asia, which rises in two principal head- streams, the Bei-kem and the Khua-kem, on the plateau of N.W. Mongolia — the former on the S. flank of the Sayan Mountains in 97° 30′ E. and 52 20′ N., and the latter in marshes a few miles W. of Lake Kosso-gol. They have a westerly course, but after uniting they turn N., through the Sayan Mountains in the wild gorge of Kemchik, in 92 E. Thence the river makes its way across the Alpine region that borders the Sayan Mountains on the N. until it emerges upon the steppes at Sayansk (53 io' N.). Augmented by the Abakan on the left and the Tuba on the right, it traverses the mining region of Minusinsk, approaches within 6 m. of the Chulym, a tributary of the Ob, intersects the Siberian railway at Krasnoyarsk, and is joined first by the Kan and then by the Upper (Verkhnyaya), the Stony (Podkamennaya), and the Lower (Nizhnyaya) Tunguzka, all from the right. The Upper Tun- guzka, known also as the Angara, drains Lake Baikal, and is navigable from Irkutsk. The Yenisei continues N. to the Arctic Ocean, joined on the left by the Zym, Turukhan and Ingarevka, and on the right by the Kureika and Daneshkina. After the confluence of the Angara, the stream continues to widen out to 30 m., its bed being littered

with islands until it breaks into its delta (240 m. long). The length of the river is nearly 3000 m., and the area of its drainage basin 970,000 sq. m. It is navigable as far up as Minusinsk, a distance of 1840 m,, and is free from ice on the average for 155 days at Turukhansk and for 196 days at Krasnoyarsk. A canal connects the Great Kaz, a tributary of the Yenisei, with the Ket, an affluent of the Ob.

YENISEISK, a government of E. Siberia, extending from the Chinese frontier to the shores of the Arctic Ocean, with an area of 986,908 sq. m. It has the governments of Tobolsk and Tomsk on the W., Yakutsk and Irkutsk on the E., N.W. Mon- golia on the S. and the Arctic Ocean on the N. Its southern extremity being in 51 45′ N. and its northern (Cape Chelyuskin) in 77 38', it combines a great variety of orographica' types, from the Sayan alpine regions in the S. to the tundras of the Arctic littoral.

The border-ridge of the high plateau of N.W. Mongolia, which is known under the general name of the Western Sayans, and reaches altitudes of 7000 to.Sooo ft., limits it on the S. This is flanked on the north-western slope by a zone, nearly 100 m. wide, characterized by narrow valleys separating parallel chains of mountains, which are built up of crystalline slates, 6000 to 7000 ft. high. Here in the impenetrable forests a few Tungus families live by hunting. Towards the S., in the basins of the Tuba, Sisim, Yus, Kan, Agul and Biryusa, the valleys of the alpine tracts contain rich auriferous deposits, and numerous gold-washings have been established along the taiga. A flattened range of mountains, hardly attaining more than 3000 to 3500 ft., shoots N.E. from the Kuznetskiy Ala-tau, and separates the dry steppes of Minusinsk and Abakan from the next terrace of plains, 1200 to 1700 ft. in altitude, which also stretch N.E. from Barnaul in the government of Tomsk to Krasnoyarsk, and into the upper basin of the Vilui. Another system of mountains, known as the Yeniseisk Taiga, rises on the outer border of this terrace, in the space between the upper Tunguzka, or Angara, and the Podkamen- naya Tunguzka. This system consists of several parallel chains running S.W. to N.E., and reaching 2500 to 3500 ft. in altitude, though they are much lower on the left bank of the Yenisei. For many years past the Yeniseisk Taiga has been one of the most productive auriferous regions of Siberia, on account not so much of the percentage of gold in its alluvial deposits (which are poor in comparison with those of Olekminsk) as of the facilities for supplying the gold-fields with food produced in the steppes of Minusinsk.

Beyond the Yeniseisk Taiga begin the lowlands, which at no point rise more

than a few hundred feet above the sea. They slope gently towards the Arctic Ocean and are covered with lakes, scanty forests and marshes; and, as they approach the ocean, they assume more and move the character of barren tundras. Beyond 70 N. trees occur only along the courses of the rivers. Two ranges, however, break the monotony of the lowlands — the Tungusk, which stretches N.E., between the Khatanga and Anabar rivers, and the Byrranga mountains, which skirt the N.W. shore of the Taimyr peninsula. The shores of the Arctic Ocean are indented by deep estuaries, that of the Taz penetrating 600 m. into the interior of the continent, and that of the Yenisei 300 m. Taymyr, Thaddeus and Khatanga Bays are wide and deep indentations, ice-bound almost all the year round. Taymyr peninsula, between the Yenisei and the Khatanga, is a stony tundra.

The government is drained by the Yenisei and its affluents. In 55 N. this river approaches the Chulym, a tributary of the Ob, from which it is separated by an isthmus only 6 m. in width. The possibility of connecting the two great river systems of Siberia at this point has often heen discussed; the difficulty is that the Chulym valley is 440 ft. higher than the other.

Yeniseisk is rich in all kinds of metals and minerals. Gold dust appears in the N. Yeniseisk Taiga, in the region of the Kuznetskiy Ala-tau and its spurs, with the basins of the Tuba, Sisim and Black and White Yus, and in the upper parts of the tributaries of the Kan and Agul. Silver ore is found in the basin of the Abakan, but the mines have been abandoned. Iron ore occurs almost everywhere in S. Yeniseisk, but there is only one iron-work on the Abakan. Salt-lakes are common.

The climate, though very severe throughout, offers great varieties. The Minusinsk steppes have a dry and relatively mild climate. At Krasnoyarsk (55® 1′ N.) the climate is more severe, and the winds are disagreeable. The yearly fall of snow is so small that the winds blow it away in the neighbourhood of the town. The town of Yeniseisk (58° 27 N.) has an average temperature below freezing- point, and at Turukhansk the coldest month (February) averages — 24° F. On the Taymyr peninsula the average summer tempera- ture hardly reaches 45°.

The highlands of Sayan and Ala-tau are thickly clothed with forests of cedar, pitch-pine, larch, elder and hirch, with rhodo- dendrons, Berberis and Ribes; the Scotch fir appears only in the lower and drier parts of the valleys. The summits and slopes of the mountains are strewn with debris and boulders, and thickly carpeted with lichens and mosses; but there are patches of meadow- land brightened with flowers, most of which are known in Europe. Still, the flora is poor as a rule, and Dr Martianov, after several years' labour, succeeded in collecting only 104 species of phanero- gams. 1 On the other hand; the Minusinsk plains and the steppes of the

Abakan are bright with flowers scattered amid the common Gramineae, and in June and July with the Polygala, Dianthus, Medicago, Lathyrus, yellow sweet-scented lily, and scores of other flowers, mostly familiar in Europe, but attaining in Yeniseisk a larger size and greater brilliancy of colour. The rich carpet of grass and flowers is overtopped by the tall white blossoms of Arckangelica and Spiraea Ulmaria, and by the blue masses of Veronica longtfolia. The meadows of the moister localities, surrounded by thickets of willow, poplar, wild cherry and hawthorn, are still more attractive, on account of their wealth in anemones, violets, gentians and so on, and the numerous creepers which festoon the trees and shrubs. Dr Martianov's lists enumerate a total of 760 flowering and 760 cryp- togamic plants. Of the lower Fungi and parasitical Myxomycetes 1300 species were noted, and out of the 823 species hitherto described by specialists no fewer than 124 have proved to be new. Farther N. the flora is similar in character to that of the Siberian lowlands (sec Siberia). In the Taimyr peninsula it is represented by only 124 species of flowering plants.

The steppes of the upper Yenisei have been inhabited from a very remote antiquity, and numberless kurgans, or burial- mounds, graves, rock inscriptions and smelting furnaces of the successive inhabitants are scattered all over the prairies of Abakan and Minusinsk. 2 The present population exhibit traces of all Lheir predecessors. Numerous survivals of Turkish and Samoyedic tribes are found in the steppes and in the Sayans; but some of them are greatly reduced in numbers. The estimated population in 1906 was 657,900. It is almost entirely Russian, the rest (about 10%) consisting of Samoyedes, Tatars, Tunguses, Yakuts, Mongols and Ostyaks. The government is divided into five districts, the chief towns of which are Krasno- yarsk, Achinsk, Kansk, Minusinsk and Yeniseisk.

1 N. Martianov, " Materials for a Flora of the Minusinsk Region," in Trudy oi the Kazan Society of Naturalists (xi. 3, 1882).

2 See W. Radlov, Aus Sibirien (2 vols., Leipzig, 1880), and N. Savenkov, in Isvestia of the East Siberian Geographical Society (xvii., 1887).

Some 1,117,000 acres (0-2 %) are under crops, the principal being rye, wheat, oats, barley and potatoes. Live-stock, including rein- deer, breeding is very extensively carried on. Fishing, especially on the lower Yenisei, is of great importance. Sables are not now to be found, and the hunters obtain chiefly squirrels, foxes, Arctic foxes and bears. In the middle of the 19th century 350,000 to 525,000 oz. of gold were obtained annually in N. and S. Yeniseisk, but by the end of the century the output had dropped to less than 100,000 oz. Salt is extracted as well as Epsom salts. Coal has been found on the Lower TunguEka, near the mouth of the Yenisei, and in many places in the S. of the government. Silver, copper, lead, brown coal or

lignite, rock-salt, graphite and mica all exist in large quantities, but are not regularly mined. There are several dis- tilleries. The trade is in furs (exported), and in groceries and manu- factured goods (imported). The gold-fields of the Yeniseisk Taiga are supplied with grain and cattle by river from the Minusinsk region, and with salt, spirits and iron by the Angara. The govern- ment is traversed from W. to E. by the Siberian railway, and con- siderable efforts have been made to establish regular steamer com- munication between the mouth of the Yenisei and W. Europe. For some years before the close of the 19th century steamers (e.g. that of the English Captain Wiggins) reached the mouth of the Yenisei, importing provisions and machinery for the gold mines. Efforts have been made to clear the rapids of the Angara, so as to bring Lake Baikal into steamer communication with the Yenisei. Owing to the shallowness, however, of the small tributaries of the Yenisei, the canal connecting the Yenisei with the Ob has not 'proved as serviceable as was expected. (P. A. K.; J. T. Be.)

YENISEISK, a town of Asiatic Russia, capital of the govern- ment of the same name, on the right bank of the Yenisei, 170 m. N.N.W. of Krasnoyarsk, with which it has regular communica- tion by steamer. Pop. 12,000. It is the centre of a gold- mining region, and has a public library and a natural history and archaeological museum. The town was founded in 1618.

YEOLA, a town of British India, in the Nasik district of Bombay, on the chord line of the Great Indian Peninsula railway, 18 m. from Manniad junction. Pop. (1901) 16,559. There are important manufactures of cotton and silk cloth and thread, and also of gold and silver wire. At the time of its foundation Ycola was under the emperor of Delhi; it subse- quently passed into the hands of the rajas of Satara and then the Peshwas. Finally it was given in grant to Vithal, the ancestor of the present chief of Vinchur.

YEOMAN, a term of which the various meanings fall into two main divisions, first that of a class of holders of land, and secondly that of a retainer, guard, attendant or subordinate officer or official. The word appears in M.E. as $eman } $aman and yeman; it does not appear in O.E. Various explanations of the first part have been suggested, such as jung- tnann, young man, and yeme-man, attendant, from yeme, care; but it is generally accepted that the first part is the same word as the Ger. Can, district, province, and probably occurs in G.E. as gea in Sfidri-gSa, Surrey, i.e. southern district, and other place-names. Thus in O. Frisian is found gdman, a villager; Bavarian, gaumann, peasant. " Yeoman " thus meant a countryman, a man of the district, and it is this sense which has survived in the special use nf the word for a class of landholders, treated below. For the transition in meaning to a guard of the sovereign's body and to officials of a royal household see Yeomen of the Guard and Valet. In the British

royal household there are, besides the Yeomen of the Guard, a yeoman of the wine and beer cellar, a yeoman of the silver pantry and yeoman state porters. The term also occurs in the title of the first assistant to the Usher of the Black Rod, the Yeoman Usher of the Black Rod. In the British navy there are petty officers in charge of the signalling styled " Yeomen of Signals." For the history and present organization of the "yeomanry cavalry" sec Yeomanry and United Kingdom (§ Army).

The extent of the class covered by the word " yeoman " in England has never been very exactly defined. Not only has the meaning of the word varied from century to century, but men writing about it at the same time have given to it different in- terpretations. One of the earliest pictures of a yeoman is that given by Chaucer in the Prologue to the Canterbury Tales. Here, represented as a forester, he follows the esquire as a retainer or dependant. The yeomen of the ages succeeding Chaucer are, however, practically all occupied in cultivating the

land, although, doubtless from its younger sons, the class furnished retainers for the great lords, men-at-arms and archers for the wars, and also tradesmen for the towns. Stubbs (Const. Hist. vol. iii.) refers to them as " a body which in antiquity of possession and purity of extraction was probably superior to the classes that looked down upon it as ignoble," and Medley (Eng. Const. Hist.) describes the yeomen as in the 15th century representing on the whole " the small freeholders of the feudal manor." Holinshed, in his Chronicle, following Sir T. Smyth (De republica Anglorum), and W. Harrison (Description of England), describes them as having free land worth £6 annually, and in times past 40s., and as not entitled to bear arms, being tor the most part farmers to gentlemen, and this description may be accepted as the popular idea of the yeoman in the 16th century. He formed the intermediate class between the gentry and the labourers and artisans, the line of demarcation, however, being not drawn very distinctly.

The yeomen were the smaller landholders, and in the 15th century were practically identical with the forty-shilling free- holders who exercised the franchise under the act of 1430. Occasionally they found their way into parliament, for in 1446 the sheriffs were forbidden to return vallctti (i.e. yeomen) as members, but this prohibition had very little result. Soon, however, the name appears to have included tenant farmers as well as small freeholders. Thus Latimer, in his famous sermon before Edward VI., says: " My father was a yeoman, but had no land of his own"; the bishop

represents the yeoman as an exceedingly prosperous person, and the same opinion had been expressed about a century before by Sir John Fortescue in his Governance of England. The decay of the class began with the formation of large sheep farms in the r6th century, but its decline was very slow, and the yeomen furnished many sturdy recruits to the parliamentary party during the Civil War. Their decay was accelerated during the iSth century, when many of them were bought out by the large landowners, while they re- ceived another blow when the factory system destroyed the country's domestic industries. Many writers lament the decay of the yeoman in the rSth and roth centuries, but this is partly accounted for by the fact that they exclude all tenant farmers from the class, which they confine to men cultivating their own land. Thus the wheel has come full circle and the word means to-day much the same as it meant in the early part of the 15th century.

YEOMANRY, the name given to the volunteer mounted troops of the home defence army of Great Britain, ever since their original formation; it indicated that recruiting, organization and command were upon a county basis, the county gentlemen officering the force, the farmers and yeomen serving in its ranks, and all alike providing their own horses. Although the yeomanry was created in 1761, it was not organized until 1794. Under the stimulus of the French War recruiting was easy, and 5000 men were quickly enrolled. A little later, when more cavalry was needed, the Provisional Cavalry Act was passed, whereby a sort of revived knight-service was established, every owner of ten horses having to find and equip a horseman, and all who owned fewer than ten, grouped by tens of horses, similarly finding one. But an amending act was soon passed, by which yeomanry cavalry could be substituted for provisional cavalry in the county quota. This gave a great stimulus to yeomanry recruiting, as similar enactments had done in the case of the infantry volun- teers. But even so the provisional cavalry, which was embodied only in counties that did not supply the quota in yeomanry, was stronger than the yeomanry at the peace of Amiens. At that peace, partly with a view to preserving internal order, partly because of the probable renewal of the war, the yeomanry was retained, although the provisional cavalry was disbanded. There was thus a nucleus for expansion when Napoleon's threatened invasion (1803-5) called out the defensive powers of the country, and as early as December 1803 there were in England, Scotland and Ireland 44,000 yeomen. At the same time the limitations as to place of service (some undertaking to serve in any part of Great Britain, some within a specified military

district, most only in their own county) were abolished. The unit of organization was the troop of 80-100, but most of the force was grouped in regiments of five or more troops, or in " corps " of three or four troops.

Permanent paid adjutants and staff sergeants were allowed to corps and regiments, but no assistance was given in the shape of officers on the active list and serving non-commissioned officers of the army and militia. Equipment, supply and mobilization arrangements were purely regimental, and through all the war years most of the troops and squadrons were ready to take the field, with equipment, food and forage, complete at a day's notice. They were trained as light cavalry, and armed with sabre and pistol. But a few town corps had mounted riflemen, and several corps, both in town and country, had one or more dismounted troops, who were carried on vehicles similar to the " Expedition or Military Fly " pictured by Rowlandson.

From the extinction of Chartism to the South African War the history of the yeomanry is uneventful. The strength of the force gradually sank to ro,ooo. But when it became apparent that mounted troops would play a decisive part in the war against the Boers, the yeomanry again came to the front. Of its 10,000 serving officers and men, 3000 went to South Africa in newly formed battalions of " Imperial Yeomanry," armed and organized purely as mounted rifles, and to these were added over 32,000 fresh men, for whom the yeomanry organization at home and at the seat of war provided the cadres and training, while the home yeomanry not only filled up its gaps but expanded. In 1901 the yeomanry, now all styled " Imperial," was re- modelled; and the strength of regiments was equalized on a four-squadron basis. In the prevailing conditions practically all regiments were able to recruit up to the increased establish- ment, and the strength of the force was more than trebled. Fresh regiments were formed, some in the towns, others on the nucleus of special corps disbanded at the close of the South African War. In 1907 the yeomanry became part of the new Territorial Force (see United Kingdom, § Army).

YEOMEN OF THE GUARD, originally "Yeomen of the Guard of (the body of) our Lord the King," or in the 1 5th-century Latin, " Valecti garde (corporis) domini Regis," the title (main- tained with but a slight variation since their institution in 1485, the official wording under Edward VII. being " The King's Body Guard of the Yeomen of the Guard ") of a permanent military corps in attendance on the sovereign of England, as part of the royal household, whose duties, now purely ceremonial, were originally that of the sovereign's personal bodyguard. They are the oldest existing body of the kind, having an unbroken record jfrom 1485, as well as the oldest military body in England. Before that time there had been forms of royal guard, but no permanent institution. Under Edward I. we find in England the " cross- bowmen of the household," and under Edward II. an "Archer guard of the King's body "; but the "Archers of the King," " of the crown " or " of the household," who appear in the records up to 1454, seem to have had no continuous establish- ments. Apparently each sovereign, on

coming to the throne, established a new Guard of his own particular followers. It was not till Henry VII. created the " Yeomen of the Guard " that the royal bodyguard came into regular existence. The first warrants to individual " Yeomen of the Guard " date from September 16, 1485, and it is a fair inference that the Guard was created by the king on the battlefield of Bosworth (August 22, 1485), its first members being men who had shared Henry's exile in Brittany, followed him on his return, and fought as his private Guard in that action. The warrant of September 18, 1485, now in the Record Office, " to William Brown, Yeoman of the King's Guard," corroborates this view — " in consideration of the good service that oure humble and faithful subject William Browne Yeoman of oure Garde hath heretofore doon unto us as well beyonde the see as at our victorieux journeye." It is argued by Sir Reginald Hennell that the title of " Yeomen of the Guard " signified Henry VII. 's intention to choose the special protectors of his person not from the ranks of the nobility, but from the class just below them (see Yeoman), who had

proved in war the backbone of the national strength. The term valecti, or " valets " (see Valet), was already in use, as signifying personal attendants, with none of the modern menial sense of the word.

The first official recorded appearance of the king's bodyguard of the Yeomen of the Guard was at the coronation of its founder Henry VII. at Westminster Abbey on the 31st of October 1485, when it numbered 50 members. This number was rapidly increased, for there is an authentic roll of 126 attending the king's funeral in 1509. Henry VIII. raised the strength of the Guard to 600 when he took it to visit Francis I. of France at the Field of the Cloth of Gold. In Queen Elizabeth's reign it numbered 200. The corps was originally officered by a captain (a post long associated with that of vice-chamberlain), an ensign (or standard-bearer), a clerk of the cheque (or chequer roll, his duty being to keep the roll of every one connected with the household), besides petty officers, captains, sergeants or ushers. In 1669 Charles II. reorganized the Guard and gave it a fixed establishment of 100 yeomen, officered by a captain, a lieutenant, an ensign, a clerk of the cheque and four corporals, which is the present organization and strength. The only variation is that the captaincy is now a ministerial appointment filled by a nobleman of distinction under the lord chamberlain, and that the old rank of " corporals " has been changed to " exon," a title derived from " exempt," i.e. exempted from regular regimental duty for employment on the staff. Formerly officers on the active list were given these appointments in addition to their own.

The original duties of the Guard were of the most compre- hensive nature. They were the king's personal attendants day and night at home and abroad. They were responsible for his safety not only on journeys and on the battlefield, but also within the precincts of the palace itself. The regulations for making of the king's bed in Tudor times were of the most elabor- ate formality. No one but the Yeomen of the Guard under an officer might touch it. Each portion was separately examined. Each sheet or coverlet was laid with the greatest ceremony, and the sovereign could not retire to rest until the work was reported as well and truly done. The existence of the custom is verified at the present day by the designations Y.B.H. (" Yeomen Bed-Hangers ")andY.B.G. (" Yeomen Bed-Goers "), which are still affixed against the names of certain yeomen on the roll of the Guard. Another of their duties outside the palace is retained, viz. the searching of the vaults of the houses of parliament at the opening of each session, dating from the " Gunpowder Plot " in 1605, when the Yeomen of the Guard seized Guy Fawkes and his fellow-traitors and conveyed them to the Tower. Owing to the destruction by fire of most of the records of the Guard in St James's Palace in 1809. the precise history of the search is a matter of controversy. It is recorded in the papers of the House of Lords that the Guard conducted it in 1690 and that it has been continuous since 1760, but Sir Reginald Hennefl's contention is that it dated from 1605 and has since been regularly observed.

Though the corps from the earliest day was composed of foot-soldiers, during royal progresses and journeys a portion of the Guard formed a mounted escort to the sovereign until the end of the Georgian period.

The dress worn by the Yeomen of the Guard is in its most striking characteristics the same as it was in Tudor times. It has consisted from the first of a royal red tunic with purple facings and stripes and gold lace ornaments. Sometimes the sleeves have been fuller and the skirts longer. "Red knee-breeches and red stockings (white in Georgian period only), flat hat, and black shoes with red, white and blue rosettes are worn. Queen Elizabeth added the ruff. The Stuarts replaced the ruff and round hats with fancy lace and plumed hats. Queen Anne discarded both the ruff and the lace. The Georges reintroduced the ruff, and it has ever since been part of the permanent dress. But the most interesting point connected with the dress is that the gold -embroidered emblems on the back and front of the coats tell the history of the consolidation of the kingdoms of

Great Britain and Ireland. From 1485, when the Guard was created, till 1603, the emblems were the Tudor crown with the Lancastrian rose, and the initials of the reigning sovereign. When the Stuarts succeeded the Tudors in 1603, they substi- tuted the St Edward's crown for the Tudor, and added under it and the initials the motto " Dieu et mon Droit," which

is still worn. When William and Mary came to the throne in 1689, their initials were entwined, W.M.R.R. (William, Mary, Rex, Regina), the only instance of the queen and king's initials being so placed. Anne restored the Tudor crown, and added the thistle to the rose on the official union with Scotland in 1709. The Georges reverted to the St Edward's crown, and on the union with Ireland in 1801 George III. added the shamrock to the rose and thistle. No change was made during Queen Victoria's reign. But Edward VII. ordered the Tudor crown to be substituted for the St Edward's, and now the coats of the Guard are as they were in 1485, with the additions of the motto " Dieu et mon Droit " and the shamrock and the thistle.

Up to 1830 the officers of the Guard wore the same Tudor dress as the non-commissioned officers and men, but when William IV. ordered that in future no civilian should be appointed, and that the purchase and sale of officers' commissions should cease, the old Tudor dress was discontinued, and the officers were given the dress of a field officer of the Peninsular period.

There has also been little or no change in the arms of the Guard. No doubt they retained during Henry VII. 's reign (1485-1509) the pikes with which they had helped to win the battle of Bosworth Field. Under Henry VIII. archery became a national pastime, and the long-bow and arrow were issued to at least one-half of his Guard. When firearms came into use, a certain portion were armed with the harquebus, the Guard being given buff cross belts to support the weight on service. When on duty in the palace gold-embroidered cross belts took the place of the service buff, and are worn now as part of the state dress. The present weapons of the Guard are a steel gilt halberd with a tassel of red and gold, and an ornamental sword.

The real fighting days of this Guard ended with the Tudor period, but it was only at the end of the reign of George II. that the Guard's function of attending a sovereign on the battlefield ceased. . Their last duty in this nature was at the battle of Dettingen (1743), when they accompanied the king as personal attendants. For a brief period during the Georgian era the Guard lost to a certain extent its distinctive military character, and a custom crept in of filling vacancies with civilians, who bought their places for considerable sums, the appointments of the yeomen proper and the officers being of great value. But William IV. put a stop to the practice. The last civilian retired in 1848, and the Guard regained its original military character. Every officer (except the captain), non-com- missioned officer and yeoman must have served in the Home or Indian army or Royal Marines. They are selected for distinguished conduct in the field, and their pay is looked upon as a pension for the same. The officers must be of the rank of captain and over, and the yeomen of that of sergeant or warrant

officer.

The Guard has a permanent orderly room in St James's Palace, where the routine of duty is carried on by the adjutant and " clerk of the cheque," the latter old true designation being retained after the former modern title m Under the orderly room is a guard room lined with lockers in which the uniforms are stored. They are in charge of a resident ward robe -keeper. Here the division for duty musters once a week in the season and once a fortnight at other times, and here the yeomen dress for state functions. These now are confined to receptions of foreign potentates, levees, courts and state banquets, the Guard still taking part in the searching of the houses of parliament, the ceremony of the distribution of Maundy money in Westminster Abbey and in the Epiphany offerings of gold, frankincense and myrrh in thv? Chapel Royal, St James's Palace. The yeomen live in their own homes.*

The nickname " Beef-eaters," which is sometimes associated with the Yeomen of the Guard, had its origin in 16G9, when Count Cosinio, grand duke of Tuscany, was in England, and, writing of the size and stature of this magnificent Guard, said, " They are great caters of beef, of which a very large ration is given them daily at the court, and they might be called Beef-eaters." The supposed derivation from " Buffetier " {i.e. one who attends at the sideboard) has no authority.

A singular misapprehension exists as regards the Tower warders. Wearing as they do the same uniform, except the cross belt which used to hold the harquebus, and being so much more before the public in their daily duty as warders of the Tower, they are often thought erroneously to be Yeomen of the Guard. They had their

origin in 1509—10 in the twelve Yeoman of the Guard whom young King Henry VIII. left, when he gave up the Tower of London as a permanent residence, to show that it was still a royal palace. When the Tower was finally given up as a royal residence they became warders and were deprived of the dress, but were given it back in Edward VI. 's reign, on a petition from the lord protector, who had been confined tnere and to whom the warders had been most considerate. They are now a distinct body, but in an honorary sense still termed " Fix tra ordinary of the Guard." But they perform no state functions, being solely yeomen warders under the orders of the constable of the Tower. They are all old soldiers.

A brief notice of the other royal guard will be appropriate. In 1509. Henry VIII., envying the magnificence cf the bodyguard of Francis I. of FYancc, decided to have a noble guard of his own, which he accordingly instituted and called " The Gentlemen Speers." It was composed of young nobles gorgeously attired. In 1539 this guard was reorganized and called " Gentleman Pen- sioners," This title it retained till William IV. 's reign, when the corps regained its military character, the king on their petition giving them their present designation, " The Honourable Corps of Gentlemen-at-Arms."

See The History of the King's Body Guard of the Yeomen of the Guard, by Colonel Sir Reginald Hemiell, D.S.O., Lieutenant of the Yeomen of the Guard (1904), (R. He.)

YEOTMAL, a town and district of India, in Berar. The town stands at an elevation of 1476 ft. Pop. (1901) 10,545. It was formerly the headquarters of Wun district, but in 1905 a new district of Yeotmal was established, covering the former Wun district, with additions from the district of Basim. Cotton-ginning and pressing are carried on. The town is also the chief trading centre in the district, and is connected by read with Dhamangacn station, 29 m. distant.

The District of Yeotmal has an area of 5183 sq. m. It is a wild hilly country, intersected by offshoots from the Ajanta mountains. The hills are bare, or clothed only with dwarf teak or small jungle; but on the heights near Wun town the bamboo grows abundantly, and small bamboos are fcund in the ravines. The Wardha and Penganga, which bound the district on the E. and S., unite at its S.E. comer. The Penganga drains the greater part of the district. The tiger, leopard and hyena abound; bears, wolves and jackals are also numer- ous; while small game is plentiful. The climate is enervating and unhealthy; the annual rainfall averages about 41 in. Pop. (1901) 575,957. The principal crops are millets, cotton, pulses, oil-seeds and wheat. Coal has been found, and iron ore abounds.

See Yeotmal District Gazetteer (Calcutta, 1908).

YEOVIL, a market town and municipal boiough in the S. parliamentary division of Somersetshire, England, on the Great Western and South-Western railways, 127 m. W. by S. of London. Pop. (1901) 9S61. The town lies on the river Yeo, and is a thriving place, with a few old houses. The church of St John the Baptist is a perpendicular cruciform structure, consisting of chancel, nave of seven bays, aisles, transepts and lofty western tower. There are some 15th- and 16th-century brasses, a dark cradle roof, and an early 13th-century crypt under the chancel. The town is famous for its manufacture of gloves (dating from 1565). Its agricultural

trade is consider- able. The town is governed by a mayor, 4 aldermen and 12 councillors. Area, 654 acres. Yeovil (Gyoele, Evill, Ivle, Yeoele) before the Conquest was part of the private domains of the Anglo-Saxon kings. The town owed its origin to trade, and became of some size in the 13th century. In 14th-century documents it is described as a town or borough governed by a portreeve, who frequently came into conflict with the parson of St John's church, who had become lord of the manor of Yeovil during the reign of Henry III. The corporation in the iSth century consisted of a portreeve and eleven burgesses, and was abolished when the town was reincorporated in 1853.

Fairs on the 17th of July and the 6th of November were held under grant of Henry VII., and were important for the sale of leather and of woollen cloth, both made in the town. The Friday market dates from 1215. There is a great market every other Friday and a monthly horse sale.

YERKES, CHARLES TYSON (1837-1905), American capitalist, was born of Quaker parentage, in Philadelphia, Pennsylvania, on the 25th of June 1837. He was a clerk in a grain-commission bouse, an exchange broker (1858-61) and a banker (1861-86),

When he failed in 187 1 he refused to give any preference to the city of Philadelphia for bonds sold on its account, and was convicted of " misappropriating city funds," and sentenced to two years and nine months in the penitentiary. After serving seven months of this sentence he was pardoned, and the City Council afterward passed an ordinance cancelling the municipality's claim against him. He established a banking business in Chicago in r88i; in 1886 got control of the Chicago City Railway Company, and within the next twelve years organized a virtual monopoly of the surface and elevated railway service of Chicago. Ke disposed of his street railway interests in Chicago, and removed to London (1900). There he acquired in 1901 a controlling interest in the Metropolitan District railway, and by organizing the finances of the Under- ground Electric Railways Company he took an important initiative in extending the system of London electric railways. Yerkes gave to the university of Chicago the great telescope installed in the Yerkes Observatory at Lake Geneva, Wisconsin, and gathered in his New York residence a remarkable collection of paintings, tapestries and rugs, which were sold at auction in April 1910 for $2,034,450. He died in New York on the 29th of December 1905.

YETHOLM, a village of Roxburghshire, Scotland. Pop. (1901) 571. It is situated on Bowmont Water, 7ˆ m. S.E. of Kelso, and 5 m. S.S.W. of Mindrum in Northumberland, the nearest railway station. It is divided into two quarters, Kirk Yetholm on the right and Town Yetholm on the left of the stream. The name is said to be the O.E. yet, " gate," and holm (here the

same as kam), " hamlet," meaning u the hamlet at the gate " of Scotland, the border being only if m. distant. Since about the middle of the 17th century the district has been the head- quarters of a tribe of gipsies.

YEW (Tax-us baccata), a tree which belongs to a genus of Coniferae (see Gymnospehms), in which the ordinarily woody

Yew. i, shoot with male flowers; 2, leaf and in section; 3, branch bearing two ripe seeds each w r ith its crimson aril; 4, male flowers; 5, stamens; 6, 7, female flower in different stages; 8, section of ripe seed and aril, a. 1, slightly reduced; 2, and 4 to 8, enlarged.

cone is represented by a single seed surrounded by a fleshy cup. Usually it forms a low-growing evergreen tree of very

diverse habit, but generally with dense spreading branches, thickly covered with very dark green linear leaves, which are given off from all sides of the branch, but which, owing to a twist in the base of the leaf, become arranged in a single series on each side of it. The trees are usually dioecious, the male flowers being borne on one individual and the female on another, although instances occur in which flowers of both sexes are formed on the same tree. The male flowers are more or less globular and occur in the axils of the leaves. They consist of a number of overlapping brownish scales, gradually increasing in size from below upwards and surrounding a naked stalk that bears at its summit a head of four to eight stamens. Each stamen has a flat five-lobcd top, something like a shield; from its under surface, five, six or more pollen cases hang down, and these open lengthwise to liberate the globose pollen-grains. The female flowers are also placed each separately in ihe axil of a leaf, and consist of a number of overlapping scales, as in the male. These scales surround a cup which is at first shallow, green and thin (the so-called aril), but which subsequently becomes fleshy and red, while it increases so much in length as almost entirely to conceal the single straight seed. It is clear that the structure of the female flower differs from that of most conifers, from which it is now often separated in a distinct order, Taxaceae.

The poisonous properties, referred to by classical writers such as Caesar, Virgil and Livy, reside chiefly if not entirely in the foliage. This, if eaten by horses or cattle, especially when it has been cut and thrown in heaps so as to undergo a process of fermentation, is very injurious. The leaves have also been used for various medicinal purposes, but are not employed now.

An alkaloid iaxine, said to depress the circulation, is extracted. It forms white crystals soluble in alcohol and ether. As a timber tree the yew is used for cabinet-work, axle-trees, bows and the like, where strength and durability are required.

The yew occurs wild over a large area of the northern hemi- sphere. In N.E. America and in Japan trees are found of a character so similar that by some botanists they are all ranged under one species. Generally, however, the European yew, T. btu.-c.ata, is regarded as native of Europe, N. Africa, and Asia as far as the Himalayas and the Amur region, while the American and Japanese forms are considered to represent distinct species. The yew is wild in Great Britain, forming a characteristic feature of the chalk downs of the southern counties and of the vegetation of parts of the Lake District and elsewhere. The evidence of fossil remains, antiquities and place-names indicates that it was formerly more widely spread in Europe than at the present day. The varieties grown in the United Kingdom are numerous, one of the most striking being that known as the Irish yew — a shrub with the pyra- midal or columnar habit of a cypress, in which the leaves spread from all sides of the branches, not being twisted, as they usually are, out of their original position. In the ordinary yew the main branches spread more or less horizontally, and the leaves are so arranged as to be conveniently exposed to the influence of the light; but in the variety in question the branches are mostly vertical, and the leaves assume a direction in accordance with the ascending direction of the branches. The plants have all sprung from one of two trees found growing wild more than a hundred years ago on the mountains of Co. Fermanagh in Ireland, and afterwards planted in the garden of Florence Court, a seat of the earl of Enniskillen.

The yew is a favourite evergreen tree, either for planting separately or for hedges, for which its dense foliage renders it well suited. Its derive growth when pruned has led to its extensive use in topiary- work, which was introduced by John Evelyn and became very prevalent at the close of the 17th and the beginning of the 18th centuries. The wood is very hard, close-grained and of a deep red- brown colour internally. The planting of the yew in churchyards was at one time supposed to have been done with a view to the supply of yew staves. Rut, while importation from abroad was fostered, there seems to have been no statute enforcing the cultiva- tion of the yew in Great Britain; a statute, however, of Edward I. (cited in The Gardeners' Chronicle, 6th March 1880, p. 306) states that the trees were often planted in churchyards to defend the church from

high winds. The Crowhurst yew, mentioned by Evelyn as 30 ft. in circumference, still exists. The large yew at Ankerwyke, near Staines, with a trunk 30! ft. in circumference, in sight of which Magna Carta was signed (1215), probably exceeds a thousand years of age. The fine yew in

Buckland churchyard, near Dover, was removed in 1880 to a distance of 60 yds. The trunk had been split so that it had a direction nearly parallel with the soil. This huge tree was moved with a ball of soil round its roots, 16 ft. 5 in. by 15 ft. 8 in., by 3 ft. 6£ in. in depth, the weight of the entire mass being estimated at 56 tons. The dimensions of the tree in 1880 were as follows: " circumference of the main trunk, 22 ft.; of the upright portion of the trunk, 6 ft. 10 in.; second horizontal trunk, 10 ft. 10 in.; do,, south limb forking off at 9 ft. from the main trunk,

7 ft. 10 in.; do., west limb forking off at 9 ft. from the main trunk,

8 ft. 8 in. ; extent of branches from centre of main trunk southwards, 30 ft. 10 in., and from north to south, 48 ft.; they extend from the main trunk, westward 33 ft." The tree was replanted so that the horizontal portions were replaced in their original erect position and the natural symmetry restored.

For further details see Veitch, Manual of Coniferae (1900) ; Elwes and Henry, Trees of Great Britain and Ireland (1906).

YEZD, or Yazd, a province of Persia, bounded S. by Kerman, W. by Fars and Isfahan, and N. and E. by the central Persian deserts. It contains an area of about 20,000 sq. m.., but its population barely exceeds 100,000, of whom about half inhabit the capital of the province. Its subdivisions are: (1) the city of Yezd and immediate environs; (2) Ardakan; (3) Bafk; (4) Taft; (5) Kuhistan (Pish Kuh, Mian Kuh, Pusht Kuh, on the slopes and in the valleys of the Shir Kuh, a part of the great Central Range of Persia W. of the city of Yezd, and rising to an elevation of 11,000 ft.); and (6) Shahr i Babek. The last is situated far S. near Kerman, and sometimes is regarded as part of that province. The revenues slightly exceed £60.000 a year. Much silk is grown in the district, but is not sufficient for the silk stuffs which Yezd manufactures with its 1000 looms, and raw silk (about 75,000 lb yearly) has to be obtained from Khorasan and Gilan. Great quantities of felts (nimads), white and yellow cotton stuffs, the latter a kind of nankeen made of Gossypium herbaceum, are also manufactured and exported. Other exports are opium, madder and almonds. The grain produced suffices for only two or three months' consumption, and supplies have to be brought from Khorasan, so that wheat and barley are dearer than at other places in Persia. The part of the district situated in the plain is much exposed to moving sands, which render cultivation difficult and at times impossible.

YEZD, the capital of the province of the same name in Persia, situated 192 m. N.W. of Kerman, 162 m. S.E. of Isfahan, in 31 54′ N. and 54 22′ E., at an elevation of 4240 ft. Its population, 100,000 in 1810, is now

estimated at 50,000, including 2000 Jews and 1300 Zoroastrians. 1 The city is divided into the Shahr i nau (new town) and Shahr i kohneh (old town), separated by a wall with two gates. The ark, or citadel, in the E. of the town, is fortified with walls, bastions and dry ditch, and contains the governor's residence. The bazaar is in good repair and well stocked; other parts of the town are irregularly planned, with dark, narrow streets. There are eighteen mosques, one, the Masjed i Jama, also called Masjed i Mir Chakhmak, is an old and decayed structure originally built in 1110, with a lofty and imposing frontage dating from 1472. There are seven colleges. The caravanserais number thirty- three. There are telegraph (English staff since 1903) and post offices. The Englishman in charge of the telegraph office acts as British vice-consul.

YEZIDIS, a sect of devil-worshippers, calling themselves Dasni, who are found in Kurdistan, Armenia and the Caucasus. Their religion has points of connexion with old Iranian and Assyrian beliefs and traces of Manichaeism and Kest onanism. Thus they regard the devil as the creative agent of the Supreme God, a reinstated fallen angel who is the author of evil. They avoid mentioning his name and represent him by the peacock. They regard Christ as an angel in human form and recognize

1 In 1879 the Zoroastrian community of Yezd numbered 6483, 1242 residing in the city, 5241 in the villages; in 1892 the com- munity numbered 6908, and as many have emigrated, it is computed that it now numbers not more than 7000.

Mahomet as a prophet with Abraham and the patriarchs. They believe in a future life and practise both circumcision and baptism. The name is probably derived from the Kurdish and Persian Yazddn, God; though some have connected it with the city of Yezd, or with Yezid, the second Omayyad caliph (720-24). Their sacred book is called Al-Yahah, and its chief exponent was Shaikh Adi {c. 1200).

See Layard, Ninevak and its Remains (London, 1850); Menant, Les Yizidis (Paris, 1892).

YEZO, or Ezo, the most northerly of the five principal islands forming the Japanese empire, the five being Yezo, Nippon, Shi- koku, Kiushiu and Formosa. It is situated between 45 50′ and 41 21′ N. and between 146° 7′ and 130 n' E.; its coast-line measures 1423-32 m., and it has an area of 30,148-41 sq. m. On the N. it is separated from Sakhalin by Soya Strait

(La Perousc) and on the S. from Nippon by Tsugaru Strait. Its northern shores are washed by the Sea of Okhotsk, its southern and eastern by the Pacific Ocean, and its western by the Sea of Japan.

Orography. — The highest mountain in the island is Ishikaridake (6955 ft.) and the next in importance is Tokachi-dake (6541 ft.). Yubari-take in Ishikari has a height of 6508 ft., and in the province of Kushiro are O-akan-dakc (4470 ft.) and Meakan-take (4500 ft.)- Dr Rein's investigations led him to state that Tokachi-dake forms a species of central elevation whence most of the principal rivers flow towards the sea, and that the mountain system is a continuation, on the \V., of the Sakhalin range, and on the E. of the Kuriles range; the former consisting of granite and old schists, the latter chiefly of volcanic formations. Near Hakodate are two conspicuous volcanic peaks, Komaga-take (3822 ft.) and Tokatsu-Hake (3800 ft.) ; and 24 m. from Kushiro (by rail) is a volcano called Atosa-nobori, or Iwo-zan (sulphur mountain), whence great quantities of first-rate sulphur are exported to the United States. Mention must also be made of Rishiri, an islet on the extreme N.W. of Yezo, which has a peak of the same name rising to a height of nearly 6000 ft.

Rivers. — 'Yezo boasts the largest river in the Japanese empire, the Ishikari-gawa, which is estimated to measure 275 m. Its other large rivers are the Teshio-gawa (192 m.),the Tokachi-gawa (120 m.), the Shiribeshi-gawa (88 m.) 7 the Kushiro-gawa (81 m.), the Toshi- betsu-gawa (64 m.), and the Yubetsu-gawa (64 m.). The valley of the Ishikari is believed to be the most fertile part of the island; the Tokachi is navigable to a point 56 m. from its mouth, but the Teshio has a bar which renders its approach extremely difficult. A peculiarity of several of the rivers is that, on approaching the sea- shore, they run parallel to it for some distance before finding an exit. Those flowing to the S. coast take a W. direction, those flowing to the E. coast a N. direction. This is attributed to the fact that the prevailing winds set up the sand so as to deflect the rivers from their straight course. Nearly all these rivers abound with salmon, the most remarkable in that respect being the Nishibetsu-gawa, which yields an average of over 2000 tons of fish annually.

Lakes. — There are no large lakes, the most extensive — Toyako, Shikotsuko and Kushiroko — not having a circumference of more than 25 m. Lagoons, however, are not uncommon. The largest of these — Saruma-ko in Kitami — is some 17 m. long by 7 wide. It abounds with oysters nearly as large as those for which the much smaller lagoon at Akkeshi is famous, the molluscs measuring about 18 in. in length.

Climate. — The climate differs markedly from that of the main island of Japan, resembling rather the climate of the British Isles, though the winter

is longer and more severe, and the atmosphere in the warm season contains a greater quantity of moisture. During five months the country is under snow, its depth averaging about 2 ft. in the regions along the southern coast and more than 6 ft. in the northern and western regions. An ice-drift, setting from the north and working southwards as far as Nemuro, stops all sea trade on the E. coast during January, February and March, though the W. coast is protected by the warm current of the Kuro-shiwo. Fogs prevail along the E. coast during the summer months, and it is not uncommon to find a damp, chilly atmosphere near the sea in July, whereas, a mile inland, rhe thermometer stands at 8o° or 90 F. in the shade, and magnolia trees are in full blossom.

Zoology. — Tsugaru Strait has been shown by Captain T. W. Blakiston, R.A., to form a line of zoological division. _ Pheasants and monkeys are not found on the Yezo side of this line, though thev abound on Nippon, and, on the other hand, Yezo has grouse antf solitary snipe which do not exist in Nippon. The Yezo bear, too, is. of a distinct species, and the island has an abundance of singing birds which are absent S. of the strait. There are also notable differences in the flora, the trees and flowers of Yezo re-sembling those of the British Isles rather than those of Japan.

Population.— The island seems to have been originally peopled by a semi-barbarous race of pit-dwellers, whose modern repre- sentatives are to be found in the Kuriles or their neighbours of Kamchatka and Sakhalin, These autochthons were driven

out by the Ainu, and the latter, in their turn, succumbed to the Japanese. The population of Yezo is 605,742, of whom 17,573 are Ainu. There is a steadily growing but not large emigration from Japan proper to Yezo. Yezo is divided into ten provinces, the names of which, beginning from the S-, are Oshima, Shiribeshi, Ishikari, Teshio, Kitami, Iburi, Hidaka, Tokachi, Kushiro and Nemuro. Of these, Oshima, Shiribeshi and Ishikari are by far the most important. There are only three towns having a population of over 20,000, viz. Hakodate (50,314), Sapporo (46.147) and Otaru (34,586). Other towns of importance are Fukuyama (formerly called Matsumae), the seat of government in feudal days, Esashi, Mombetsu, Oiwake, Tomakomai, Piratori (the chief Ainu settlement), Mororan, Kushiro, Akke-shi, Nemuro, Horobetsu, Yunokawa, Abashiri and Mashike. Yunokawa, 42 m. from Hakodate, is much frequented for its hot springs; Oiwake is the junction of the main line of railway with the branch to the Yubari collieries; Kushiro exports coal and sulphur; Akkeshi is celebrated for its oysters.

Industries and Products. — Marine products constitute the prin- cipal wealth of Yezo. Great quantities of salmon, sardines and codfish are taken.

The salmon are salted for export to Nippon and other parts of Japan; the sardines are used as an agricultural fertilizer, their value varying from £2 to £5 per ton ; and the cod- fish serve for the manufacture of oil. An immense crop of edible seaweed is also gathered and sent to Chinese markets as well as to Japanese. This kombu, as it is called, sometimes reaches a length of 90 ft. and a width of 6 in. The herring fishery, too, is a source of wealth, and the canning of Akkeshi oysters as well as of salmon gives employment to many hands. Vast tracts are covered with a luxuriant growth of ash, oak, elm, birch, chestnut and pine, but, owing to difficulties of carriage, this supply of timber has not yet been much utilized. One of the earliest acts of the Meiji govern- ment was to develop the resources of Yezo and encourage Japanese to emigrate thither. Free grants of agricultural land were made, roads were constructed, model farms established, beet-sugar factories and sawmills opened, horse-breeding undertaken, foreign fruit trees planted and railways laid. The outlays incurred did not immediately bear fruit, but they attracted large numbers of settlers. During recent years attention has been attracted to the mineral resources of Yezo. Coal of fair quality is abundant, and a railway has been built for its carriage; an apparently inex- haustible supply of sulphur is obtained from a mountain near Kushiro lake; petroleum seems likely to pay exploiters, and in 1899 gold was discovered at Usotannai, Pankanai and other places along the Poropetsu river, near Esashi in Kitami province.

Communications.— The. roads are few and in bad order, but there is a railway which, setting out from Hakodate in the extreme S., runs, via Sapporo and Iwamizawa, to the extreme N., with branches from Iwamizawa, S. to Mororan and E. to Poronai, and from Oiwake N.E to the Yubari coal-mines. There is also a line W. along the S. coast from Nemuro. In districts beyond the railway, travelling is done on horseback, there being an abundant supply of ponies. There is good coastwise communication by steamer.

History. — Yezo was not brought under Japan's effective control until medieval times. In 1604 the island was granted in fief to Matsumae Yoshihiro, whose ancestor had overrun it, and from the close of the 18th century the E. was governed by officials sent by the shogun, whose attention had been attracted to it by Russian trespassers. In 1871 the task of developing its resources and administering its affairs was entrusted to a special bureau, which employed American agriculturists to assist the work and American engineers to construct roads and rail- ways; but in 1881 this bureau was abolished, and the govern- ment abandoned to private hands the various enterprises it had inaugurated.

YGGDRASIL, in Scandinavian mythology, the mystical ash tree which symbolizes existence, and binds together earth,, heaven and hell. It is the

tree of life, of knowledge, of fate, of time and of space. Its three roots go down into the three great realms — (1) of death, where, in the well Hvergelmer, the dragon Nidhug (Nic-hoggr) and his brood are ever gnawing it; (2) of the giants, where, in the fountain of Mimer, is the source of wisdom; (3) of the gods, Asgard, where, at the sacred fountain of Urd, is the divine tribunal, and the dwelling of the Fates. The stem of Yggdrasil upholds the earth, while its branches overshadow the world and reach up beyond the heavens. On its topmost bough sits an eagle, between whom and Nidhug the squirrel Ratatoskr runs to and fro trying to provoke

strife. Honey-dew falls from the tree, and on it Odin hung nine nights, offering himself to himself. G. Vigfusson and York Powell {Corpus Poeiicum Boreale, Oxford, 1883) see in Yggdrasil not a primitive Norse idea, but one due to early contact with Christianity, and a fanciful adaptation of the cross.

*YO-CHOW FU, a prefectural city in the Chinese province of Hu-nan, standing on high ground E. of the outlet of Tung- t'ing Lake, in 29 18 N., 113° 2′ E. Pop. about 20,000. It was opened to foreign trade in 1899. The actual settlement is at Chinling-ki, a village sh *n. below Yo-chow and half a mile from the Yangtsze. From Yo-chow the cities of Chang sha and Chang te are accessible for steam vessels drawing 4 to 5 ft. of water by means of the Tung-t'ing Lake and its affluents, the Siang and Yuen rivers. The district in which Yo-chow Fu stands is the ancient habitat of the aboriginal San Miao tribes, who were deported into S.W. China, and who, judging from some non-Chinese festival customs of the people, would appear to have left traditions behind them. The present city, which was built in 1371, is about 3 m. in circumference and is entered by four gates. The walls are high and well built, but failed to keep out the T'aip'ing rebels in 1853, Situated between Tung-t'ing Lake and the Yangtsze-kiang, Yo-chow Fu forms a depot for native products destined for export, and for foreign goods on their way inland. The net value of the total trade of the port in 1906 was 747,000 taels.*

YOGI, a Hindu religious ascetic. The word yoga means union, and first occurs in the later Upanishads; and yogi means one who practises yoga, with the object of uniting his soul with the divine spirit. This union, when accomplished by the individual soul, must enhance its susceptibilities and powers, and so the yogis claim a far-reaching knowledge of the secrets of nature and extensive sway over men and natural phenomena. The most usual manifestation of this power is a state of ecstasy, of the nature of self-

ljypnotism.

YOKOHAMA, a seaport of Japan on the W. shore of Tokyo Bay, 18 m. S. of Tokyo by rail. It stands on a plain shut in by hills, one of which, towards the S.E., terminates in a promontory called Honmoku-misaki or Treaty Point. The temperature ranges from 95 to 43 F., and the mean temperature is 57-7°. The cold in winter is severe, owing to N. winds, while the heat is great in summer, though tempered by S.W. sea breezes. The rainfall is about 70 in. annually. In 1859, when the neighbour- ing town of Kanagawa was opened to foreigners under the treaty with the United States, Yokohama was an insignificant fishing village; and notwithstanding the protests of the foreign representatives the Japanese government shortly after- wards chose the latter place as the settlement instead of Kana- gawa. The town grew rapidly — in 1886 the population was 111,179 (3904 foreigners, including 2573 Chinese, 625 British and 256 Americans, while in 1903 there were 314,333 Japanese and 2447 foreigners (1089 British, 527 Americans, 270 Ger- mans, 155 French) besides about 3800 Chinese. The Japanese government constructed public works, and excellent water was supplied from the Sagamigawa. The foreign settlement has well-constructed streets, but the wealthier foreigners reside S. of the town, on the Bluff. The land occupied by foreigners was leased to them by the Japanese government, 20% of the annual rent being set aside for municipal expenses. The harbour, which is a part of Tokyo Bay, is good and commodious, somewhat exposed, but enclosed by two breakwaters. There is a pier 2000 ft. long, and two docks were opened in 1897 and 1898, with lengths of 351 ft. and 478 ft. 10 in., and depths of 26 ft. 2 in. and 28 ft. on the blocks at ordinary spring tides. The average depth in the harbour at high water is about 46 ft., with a fall of tide of about 8 ft., the entrance being marked by a lightship and two buoys. The railway connecting Yokohama with Tokyo was the first in Japan, and was constructed in 1872. The value of exports and imports, which in 1880 was £3.792,991 and £5,378,385, and in the ensuing five years averaged £4.638,635 and £4.366,507, had increased in 1905 to £14,861,823 and £19,068,221. Metals and metal goods, rice, wool and woollen goods, and cotton and cotton goods

are the chief imports; and silk, silk goods and tea are the chief exports.

YOKOSUKA, a seaport and naval station of Japan, on the W. shore of Tokyo Bay, 12 m. S. of Yokohama. The town is connected by a branch line with the main railway from Tokyo. The port is sheltered by hills and affords good anchorage. The site was occupied by a small fishing village until 1865, when the shogun's government established a shipyard here. In 1868 the Japanese government converted the shipyard into a naval dockyard, and subsequently carried out many improve- ments. In 1884 the

port became a first-class naval station; and naval barracks, warehouses, offices, hospitals, &c, were established here. The dockyard was first constructed by French engineers ; but after 1875 the work passed entirely into the hands of Japanese engineers.

YOLA, once a native state of West Africa, forming part of the Fula emirate of Adamawa, now a province in the British protectorate of Nigeria, The province, which has an area of 16,000 sq. m., occupies the S.E. of the protectorate and both banks of the upper Benue. It is bounded S. and E. by the German colony of Cameroon, N. by the British province of Bornu, and W. by the British provinces of Bauchi and Muri. It has an estimated population of 300,000. The capital is Yola, a town founded by the Fula conqueror Adama about the middle of the 19th century. It was the capital of the emirate of Adamawa, the greater part of which is now a German pro- tectorate. The town is situated in 9 12′ N-, 12 40′ E. and is built on the left or S. bank of the Benue, 480 rn. by river from Lokoja. It can be reached by shallow draught steamers when the river is in flood. The Niger Company had trading relations with Yola before the establishment of British administration in Northern Nigeria. In 1901 the reigning emir, a son of Adama, forced them to evacuate their station, and, all attempts to establish friendly relations proving unavailing, the British government despatched an expedition from Lokoja in August i9or. The emir was deposed and a new emir installed in his place. The hostility of certain pagan tribes had to be over- come by British expeditions in January and April of 1902. By 1903 the province was brought fairly under administrative control, and divided into three administrative divisions — the N.W. with a station at Gazi, the N.E. and the S. with Yola for its station. The new emir proved friendly and loyal, but though appointed in 3 901 was not formally installed till October 1904, when he took the customary oath, of allegiance to the British crown and accepted all the conditions with regard to the suppression of slavery, &c. The slave markets were imme- diately closed as a result of British occupation, and any slave-trading which is still done is smuggled. In 1903 an exploring expedition was sent up the Gongola, one of the principal rivers of the Yola province, and as a result the navigability of the river for steam launches as far as Gombe at high water was demonstrated. An important means of communication with the province of Bornu was thus established, and a rich agri- cultural district opened to development. The Gongola valley was in ancient times extensively cultivated, and the population are readily returning to the land. Cotton, rice and tobacco are among the heavy crops (see Nigeria, Adaxawa).

YOLANDE for Isabella] OF BRIENNE (1212-1228), the daughter of John of Brienne, who had married Mary, daughter of Conrad of Montferrat, heiress on the death of Amalric II, of the kingdom of Jerusalem. Yolande

inherited the throne on her mother's death in 1212, but her father ruled as her guardian. In 1225 she married the'empcror Frederick II., the pope hoping by this bond to attach the emperor firmly to the crusade. Immediately upon his marriage Frederick demanded all the rights of sovereignty in the kingdom of Jerusalem, which he claimed to exercise in his wife's name. His action led to difficulties with John, who did not relish the loss of his position. Yolande died in 1228 after the birth of a son, Conrad, and her husband then continued to rule, though not without opposition.

YONGE, CHARLOTTE MARY (1823-1901), English novelist and writer on religious and educational subjects, daughter of William

Crawley Yonge, 52nd Regiment, and Frances Mary Bargus, was born on the nth of August 1823 at Otterbourne, Hants. She was educated by her parents, and from them inherited much of the religious feeling and High Church sympathy which coloured her work. She resided at Otterbourne all her life, and was one of the most prolific writers of the Victorian era. In 1841 she published five works of fiction, including The Clever Woman of the Family, Dynevor Terrace and The Trial] and after that she was the author of about 120 volumes, including novels, tales, school manuals and biographies. Her first conspicuous success was attained with The Heir of Redclyffe (1853), which enjoyed an enormous vogue. The Daisy Chain (1856) continued the success; and among her other popular books may be mentioned Heartsease (1854), The Y oung Stepmother (1861) and The Dove in the Eagle's Nest (1866). In more serious fields of literature she published Landmarks of History (three series, 1852-57), History of Christian Names (1863), Cameos of English History (1868), Life of Bishop Patteson (1874), English Church History for Use in Schools (1883) and many others. She also edited various educational works, and was for more than thirty years editor of the Monthly Packet. She died at Otterbourne on 23rd March 1001. Her books err on the side of didacticism, but exercised a wide and wholesome influence. The money realized by the early sales of The Daisy Chain was given to the building of a missionary college at Auckland, N.Z., while a large portion of the proceeds of The Heir of Redely fe was devoted to the missionary schooner," The Southern Cross. "

See Charlotte Mary Yonge: an Appreciation, by Ethel Romanes

(1908).

YONGE, JOHN (1467-1516), English ecclesiastic and diplo- matist, was born at Heyford, Oxfordshire, and educated at Winchester and New

College, Oxford, where he became a fellow in 1485. He was ordained in 1500 and held several livings before receiving his first diplomatic mission to arrange a commercial treaty with the archduke of Austria in 1504, and in the Low Countries in 1506 in connexion with the projected marriage between Henry VII. and Margaret of Savoy. In 1507 he was made Master of the Rolls, and in the following year was em- ployed in various diplomatic missions. He was one of the ambassadors who arranged the Holy League in 1513, and accom- panied Henry VIII. during the ensuing' campaign. In 1514 he was made dean of York in succession to Wolsey, and in 1515 he was one of the commissioners for renewing the peace with Francis I. He died in London on the 25th of April 1516. Yonge was on terms of intimate friendship with Dean Colet, and was a correspondent of Erasmus.

YONGE, SIR WILLIAM, Bart. (c. 1693-1755), English politician, was the son of Sir Walter Yonge of Colyton, Devon- shire, and great-great-grandson of Walter Yonge of Colyton (?i 581-1649), whose diaries (1604-45), more especially four volumes now in the British Museum (Add. MSS. 18777-18780), are valuable material for history. In 1722 he was elected to parliament as member for Honiton; and he succeeded his father, the third baronet, in 1731. In the House of Commons he attached himself to the Whigs, and making himself useful to Sir Robert Walpole, was rewarded with a commissioner ship of the treasury in 1724. George II., who conceived a strong antipathy to Sir William, spoke of him as "Stinking Yonge"; but Yonge conducted himself so obsequiously that he obtained a commissionership of the admiralty in 1728, was restored to the treasury in 1730, and in 1735 became secretary of state for war. He especially distinguished himself in his defence of the govern- ment against a hostile motion byPulteneyin 1742. Making friends with the Pelhams, he was appointed vice-treasurer of Ireland in 1746; and, acting on the committee of manage- ment for the impeachment of Lord Lovat in 1747, he won the applause of Horace Walpole by moving that prisoners impeached for high treason should be allowed the assistance of counsel. In 1748 he was elected F.R.S. He died at Escott, near Honiton, on the 10th of August 1755. By his second wife, Anne, daughter and coheiress of Thomas, Lord Howard of Effingham, he had two sons and six daughters. He enjoyed some reputation as a

versifier, some of his lines being even mistaken for the work, of Pope, greatly to the disgust of the latter; and he wrote the lyrics incorporated in a comic opera, adapted from Richard Brome's The Jovial Crew, which was produced at Drury Lane in 1730 and had a considerable vogue.

His eldest son, Sir George Yonge (1731-1812), was member of parliament for Honiton continuously from 1754 to 1794, and held a number of different government appointments, becoming a lord of the admiralty (1766-70), vice-treasurer for Ireland (1782), secretary of state for war (1782-94, with an interval from April to December 1783), master of the mint (1794-99). In 1799 he was appointed governor of the Cape of Good Hope. Serious charges being brought against his administration, which was marked by great lack of judgment, he was re- called in 1801. lie died on the 25th of September 1812. The baronetcy became extinct at his death.

YONKERS, a city of Westchester county, New York, U.S.A., on the E. bank of the Hudson river, immediately adjoining New York City on the N. Pop. (1900) 47,931, of whom 14,634 were foreign-born and 1005 were negroes; (1910, U.S. census) 79,803. Yonkers is served by three divisions of the New York Central & Hudson River railway, and is connected with New- York City and other places E. and N. by interurban electric lines. It has also during most of the year steamboat service on the Hudson. There are two principal residential districts: one in the N., including Amackassin Heights and (about 1 m. W.)Glenwood, where are the old Colgate Mansion and " Grey- stone," the former home of Samuel J. Tilden; the other in the S., including Ludlow, Van Cortlandt Terrace and Park Hill (adjoining Riverdale in the borough of the Bronx) , a park- like reserve with winding streets and drives. The business and manufacturing districts occupy the low lands along the river. Among the public buildings are the City Hall, the High School and a Manual Training School, and Yonkers is the seat of St Joseph's Theological Seminary (Roman Catholic; 1896), the Halsted School (founded 1874) for girls, and a business college. It has a good public library (established 1893; 25,000 vols, in 1910), and the Woman's Institute (1880) and the Holly- wood Inn Club (1897; for working-men) have small libraries. Philipse Manor Hall, built originally about 1682 as the mansion of the son of Frederick Philipse (1626-1702), the lord of Philipsburgh, and enlarged to its present dimensions in 1745, is of some historic interest. It was confiscated by act of the legislature in 1779 because its owner, Frederick Philipse (1746- 1785), was suspected of Toryism, and was sold in 1789. In 1867 it passed into the possession of Yonkers, and from 1872 to 1908 was used as the city hall. In 1908 it was bought by the state, and is now maintained as a museum 'for colonial and revolu- tionary relics. It is one of the best examples of colonial archi- tecture in America. In the square before it stands a monument to the soldiers and sailors of the Civil War. Yonkers is an important manufacturing city, and in 1905 the value of its factory products was $33,548,688.

On the site of Yonkers stood an Indian village known as Nappeckamack, or town of the rapid water, at the time of the settlement of the Dutch in New

Amsterdam; and a great rock, near the mouth of the Neppcrhan Creek, was long a place of Indian worship. The territory was part of the " Keskeskick purchase," acquired from the Indians by the Dutch W. India Company in 1639. In 1646 the tract was included in the grant to Adrian van der Donck, the first lawyer and historian of New Netherland, author of A Description of NewNetherland (r656), in Dutch. His grant, known as " Colen Donck " (Donck's Colony), embraced all the country from Spuyten Duyvil Creek, N. along the Hudson to the Amackassin Creek, and E. to the Bronx river. Some squatters settled here before 1646. Van der Donck encouraged others to remove to his lands along the Hudson river, and in 1649 ne built a saw-mill near the mouth of the Nepperhan Creek, which for many years was called " Saw-Mill river." The whole settlement soon came to be called " De Jonkheer's Land " or " De Jonkheea'S " — meaning the estate of the young lord, as Van der Donck was called by

his tenants— and afterwards Yonkers. Subsequently the tract passed largely into the hands of Frederick Philipse and became part of the manor of Philipsburgh. Ear]y in the War of Inde- pendence Yonkers was occupied for a time by part of Washing- ton's army, and was the scene of several skirmishes. The town of Yonkers was incorporated in 1788 and the village in 1855. I" lS 7 2 Yonkers became a city; at the same time the southern part, was separately incorporated as Kingsbridge, which in 1874 was annexed to New York.

See Frederic Shonnard and W. W. Spooner, History of West- Chester County (New York, 1900); J. T. Scharf, History of Westchester County (New York, 1886) ; and Allison, History of Yonkers (New York, 1896).

YONNE, a department of central France, formed partly from the province of Champagne proper (with its depend- encies, Senonais and Tonnerrois), partly from Burgundy proper (with its dependencies, the county of Auxerre and Avallonnais) and partly from Gatinais (Orleanais and Ile-de- France). It is bounded by Aube on the N.E., Cote-d'Or on the S.E., Xievre on the S., Loiret on the W. and Seine-ct- Marne on the N.W. Pop. (1906) 315,199. Area, 2880 sq. m. The highest elevation (2000 ft.) is in the granitic highlands of Morvan, in the S.E., where other peaks range from 1300 to 1600 ft. The department belongs to the basin of the Seine, except a small district in the S.W. (Puisaye), which belongs to that of the Loire. The river Yonne flows through it from S. to N.N.W., receiving on the right bank the Cure, the Serein and the Armaneon, which water the S.E. of the department. Farther N. it is joined by the Vanne, between which and the*

Armaneon lies the forest-clad plateau of the Pays d'Othe. To the W. of the Yonne, in the Puisaye, are the sources of the Loing, another tributary of the Seine, and of its affluents, the Ouanne and the Lunain. The Yonne is navigable throughout the department, and is connected with the Loire by the canal of Nivernais, which in turn is connected with that of Briare, which connects the Seine and the Loire. The climate is tem- perate, except in the Morvan, where the extremes of heat and cold are greater, and where the rainfall is most abundant. The prevailing winds are S.W. and W.

The department is essentially agricultural. Wheat and oats are the chief cereals; potatoes, sugar-beel, lucerne, mangold- wurzel and other forage plants are also cultivated, and there is much good pasture.

The vineyards of the Tonnerrois and Auxerrois produce the finest red wines of lower Burgundy, a,nd those of Chablis the finest white. The wine of the Cfite St Jacques (Joigny) is also highly esteemed. Cider-apples are the chief fruit. Charny is a centre for the rearing of horses. Forests cover considerable areas of the department and consist chiefly of oak, beech, hornbeam, elm, ash, birch and pine. Quarry products include building-stone, ochre and cement. Among the industrial establishments are tanneries, tile-works, saw-mills and breweries, but there is little manufac- turing activity. Cereals, wines, firewood, charcoal, ochre and bark are exported.

The department is served chiefly by the Paris-Lyon railway. The canal of Burgundy, which follows the valley of the Armaneon, has a length of 57 m. in the department, that of Nivernais, following the valley of the Yonne, a length of 33 m. The department con- stitutes the archiepiscopal diocese of Sens, has its court of appeal in Paris, its educational centre at Dijon, and belongs to the district of the V. army corps. It is divided into five arrondissements (37 cantons, 486 communes), of which the capitals are Auxerre, also capital of the department, Avallon, Sens, Joigny and Tonnerre, which with those of Chablis, St Florcntin and Vˆzelay are its most noteworthy towns and are treated separately. Yonne is rich in objects of antiquarian and architectural interest. At Pontigny there is a Cistercian abbey, where Thomas Becket spent two years of his exile. Its church is an excellent type of the Cistercian architecture of the 12th century. The fine I2th-centurv chateau of Druyes, which stands on a hill overlooking the village, once belonged to the counts of Auxerre and Nevers. Villeneuve-sur-Yonne has a medieval keep and gateways and a church of the 13th and 16th centuries. The Renaissance chateaux of Fleurigny, Ancy-le-France and Tanlay, the last-named for some time the property of the Coligny family, and the chateau of St Fargeau, of the 13th century, rebuilt by Mademoiselle de Montpensier under Louis XIV., are all architecturally remarkable. At St More there are remains of the Roman road from Lyons

to Gallia Belgica and of a Roman fortified post.

YORCK VON WARTENBURG, HANS DAVID LUDWIG,

Count (17 50-1830), Prussian general field-marshal, was of Eng- lish ancestry. He entered the Prussian army in 1772, but after seven years' service was cashiered for disobedience. Entering the Dutch service three years later he took part in the operations of 1783-84 in the East Indies' as captain. Returning to Prussia in 1785 he was. on the death of Frederick the Great, reinstated in his old service, and in 1794 took part in the operations in Poland, distinguishing himself especially at Szekoczyn. Five years afterwards Yorck began to make a name for himself as commander of a light infantry regiment, being one of the first to give prominence to the training of skirmishers. In 1805 he was appointed to the command of an infantry brigade, and in the disastrous Jena campaign he played a conspicuous and successful part as a rearguard commander, especially at Alten- zaun. He was taken prisoner, severely wounded, in the last stand of Blticher's corps at Liibeck. In the reorganization of the Prussian army which followed the peace of Tilsit 3 Yorck was one of the leading figures. At first major-general com- manding the West Prussian brigade, afterwards inspector- general of light infantry, he was finally appointed second in command to General Grawert, the leader of the auxiliary corps which Prussia was compelled to send to the Russian War of 1812. The two generals did not agree, Grawert being an ooen partisan of the French alliance, and Yorck an ardent patriot; but before long Grawert retired, and Yorck assumed the com- mand. Opposed in his advance on Riga by the Russian General Steingell, he displayed great skill in a series of combats which ended in the retirement of the enemy to Riga. Throughout the campaign he had been the object of many overtures from the enemy's generals, and though he had hitherto rejected them, it was soon borne in upon him that the Grand Army was doomed. Marshal Macdonald, his immediate French superior, retreated before the corps of Diebitsch, and Yorck found himself isolated. As a soldier his duty was to break through, but as a Prussian patriot his position was more difficult. He had to judge whether the moment was favourable for the war of liberation; and, whatever might be the enthusiasm of his junior staff-officers, Yorck had no illusions as to the safety of his own head. On December 30th the general made up his mind. The Convention of Tauroggen " neutralized " the Prussian corps. The news was received with the wildest enthu- siasm, but the Prussian Court dared not yet throw off the mask, and an order was despatched suspending Yorck from his command pending a court-martial. Diebitsch refused to let the bearer pass through his lines, and the general was finally absolved when the treaty of Kalisch definitely ranged Prussia on the side of the Allies. Yorck's act was nothing less than the turning-point of Prussian history. His veterans formed the nucleus of the forces of East

Prussia, and Yorck himself in public took the final step by declaring war as the commander of those forces. On March 17th, 18.13, he made his entry into Berlin in the midst of the wildest exuberance of patriotic joy. On the same day the king declared war. During 1813-14 Yorck led his veterans with conspicuous success. He covered "Bliicher's retreat after Bautzen and took a decisive part in the battles on the Katzbach. In the advance on Leipzig his corps won the action of Wartenburg (October 4) and took part in the crowning victory of October 18th. In the campaign in France Yorck drew off the shattered rem- nants of Sacken's corps at Montmirail, and decided the day at Laon. The storm of Paris was his last fight. In the campaign of 1815 none of the older men were employed in Blucher's army, in order that Gneisenau (the ablest of the Prussian generals) might be free to assume command in case of the old prince's death. Yorck was appointed to a reserve corps in Prussia, and, feeling that his services were no longer required, he retired from the army. His master would not accept his resignation for a considerable time, and in 182 1 made him general neldmarshal. He had been made Count Yorck von Wartenburg in 1814. The remainder of his life Was spent on hift estate of Klein-Ols, the gift of the king. He died there on the 4th of

October 18.30. A statue (by Rauch) was erected to him in Berlin in 1855.

See Seydlitz, Tagebuck des Preussischen Armee Korps 1812 (Berlin, 1823); Droyscn, Leben des G. F. M. Grafen Yorck von Wartenburg (Berlin, 1851).

YOREDALE SERIES, in geology, a local phase of the lower Carboniferous rocks of the N. of England. The name was introduced by J. Phillips on account of the typical develop- ment of the phase in Yoredale (Wenslcydale), Yorkshire. In the Yorkshire dales the Carboniferous rocks assume an aspect very different from that which obtains in the S. Beds of detrital sediment, sandstones, shales and occasional ironstones and thin coals separate the limestones into well-denned beds. These limestone beds have received various names of local significance (Hardraw Scar, Simonstone, Middle, Underset, Main and many others), and owing to the country being little disturbed by faulting and being much cut up by the streams, they stand out as escarpments on either side of the valleys. The first indication of the intercalation of thick detrital deposits within the massive limestone is seen in Ingleborough and Peny- ghent; but as the rocks are traced N. the detrital matter increases in quantity and the limestones diminish, till in North- umberland the whole Carboniferous series assumes the Yoredale phase, and consists of alternations of detrital and calcareous

beds, no massive limestone being seen.

The Yoredale limestones are characterized by the presence of Productus giganteus and the brachiopod fauna usually associated with it. The main limestone of Weardale is full of corals, including Lonsdaleia fioriformis, Dibunopkyllum sp., Cyciophyllunt pachyen- dotkecurn, ike., and has a typical Visean fauna; it would therefore correspond, palaeontologically, with the upper part of the Carboni- ferous Limestone of Derbyshire. On Ingleborough the limestones are not verv fossil if erous, but the Main Limestone contains small corals of a zaphrentoid type and an upper Visean fauna. Posi- donomya Beckeri occurs fairly low down in the series in the Shale above the Hardraw Scar and Gayls limestones, but it is not accom- panied by any of the goniatites or other cephalopods and lamelli- branchs which characterize the Posidonomya Beckeri beds of the Pendleside Series, the faunas of the Yoredale and Pendleside phases being very distinct. The Red Bed Limestone of Leyburn, the upper- most limestone of the series, is very rich in fish remains, which are identical in many cases with those found in the topmost beds of the massive Carboniferous Limestone at Bolt Edge quarry in Derbyshire. The shales between the limestones are rich in fossils and contain abundant single corals referable to Zapkrentis enniskil- leni, Cydophyllum pachyendothecum and others; these, though high-zonal forms, occur low down in the Yoredale strata, even m the shale above the Hardraw Scar limestone. In the Derbyshire area and farther N. these corals would indicate the uppermost beds of the limestone series of those districts, and their early appearance in rhe Yoredale area is probably entirely due to conditions of environment. Attempts have been made to correlate rocks in a number of widely separated areas with the Yoredale strata, but on wholly insufficient grounds. It is clear that the exact relation- ship which the Yoredale series of the type area bears as a whole to the lower Carboniferous rocks of the Midlands- N. and S. Wales, &c, on the one hand, and to the Pendleside series on the other, has yet to be established on a firm palaeontological basis.

See Mem. Geol. Survey, " Geology of Mallerstang " ; W. Hind, Proc. Yorks. Geol: and Poly. Soc. (1902), xiv. part iii.; and Rep. Brit. Ass.., " Life Zones Brit. Carb. Rocks " (T901).

YORK (House of), a royal line in England, founded by Richard, duke of York {q.v.), who claimed the crown in opposi- tion to Henry VI. It may be said that his claim, at the time it was advanced, was rightly barred by prescription, the house of Lancaster having then occupied the throne for three genera- Lions, and that it was really owing to the misgovcrnment of Margaret of Anjou, and her favourites that it was advanced at all. Yet it was founded upon strict principles of lineal descent. For the duke was descended from Lionel, duke of Clarence, the third son of Edward III.,

while the house of Lancaster came of John of Gaunt, a younger brother of Lionel. One thing which might possibly have been considered an element of weakness in his claim was that it was derived (see the Table) through females — an objection actually brought against it by Chief- Justice Fortescue. But a succession through females could not reasonably have been objected to after Edward III.'s claim to the crown of France; and, apart from strict legality, the duke's claim was probably supported in the popular estimation by the

fact that he was descended from Edward III. through his father no less than through his mother. For his father, Richard, earl of Cambridge, was the son of Edmund, duke of York, fifth son of Edward III.; and he himself was the direct lineal heir of this Edmund, just as much as he was of Lionel, duke of Clarence. His claim was also favoured by the accumulation of hereditary titles and estates. The earldom of Ulster, the old inheritance of the De Burghs, had descended to him from Lionel, duke of Clarence; the earldom of March came from the Morti- mers, and the dukedom of York and the earldom of Cambridge from his paternal ancestry. Moreover, his own marriage with Cecily Neville, though she was but the youngest daughter of Ralph, 1st earl of Westmorland, allied him to a powerful family in the north of England, to whose support both he and his son were greatly indebted.

The reasons why the claims of the line of Clarence had been so long forborne are not difficult to explain. Roger Mortimer, 4th earl of March, was designated by Richard II. as his suc- cessor; but he died the year before Richard was dethroned, and his son Edmund, the 5th earl, was a child at Henry IV. J s usurpa- tion. Henry took care to secure his person; but the claims of the family troubled the whole of his own and the beginning of his son's reign. It was an uncle of this Edmund who took part with Owen Glendower and the Percics; and for advocating the cause of Edmund Archbishop Scropc was put to death. And it was to put the crown on Edmund's head that his brother-in- law Richard, earl of Cambridge, conspired against Henry V. soon after his accession. The plot was detected, being revealed, it is said, by the earl of March himself, who does not appear to have given it any encouragement; the earl of Cambridge was beheaded. The popularity gained by Henry V. in his French campaigns secured the weak title of the house of Lancaster against further attack for forty years.

Richard, duke of York, seems to have taken" warning by his father's fate; but, after seeking for many years to correct by other means the weakness of Henry VI. 's government, he first took up arms against the ill advisers who were his own personal enemies, and at length claimed the crown in parliament as his right. The Lords, or such of them as did not purposely

stay away from the House, admitted that his claim was unimpeach- able, but suggested as a compromise that Henry should retain the crown for life, and the duke and his heirs succeed after his death. This was accepted by the duke, and an act to that effect received Henry's own assent. But the act was repudiated by Margaret of Anjou and her followers, and the duke was slain at Wakefield fighting against them. In little more than two months, however, his son was proclaimed king at London by the title of Edward IV., and the bloody victory of Towton imme- diately after drove" his enemies into exile and paved the way for his coronation. After his recovery of the throne in 1471 he had little more to fear from the rivalry of the house of Lancaster. But the seeds of distrust had already been sown among the members of his own family, and in 1478 his brother Clarence was put to death — secretly, indeed, within the Tower, but still by his authority and that of parliament — as a traitor. In 1483 Edward himself died; and his eldest son, Edward V., after a nominal reign of two months and a half, was put aside by his uncle, the duke of Gloucester, who became Richard III., and then caused him and his brother Richard, duke of York, to be murdered. But in little more than two years Richard was slain at Bosworth by the earl of Richmond, who, being proclaimed king as Henry VII., shortly afterwards fulfilled his pledge to marry the eldest daughter of Edward IV. and so unite the houses of York and Lancaster.

Here the dynastic history of the house of York ends, for its claims were henceforth merged in those of the house of Tudor. But, although the union of the Roses ought to have extinguished controversy, a host of debatable questions and plausible pre- texts for rebellion remained. The legitimacy of Edward IV. 's children had been denied by Richard III. and his parliament, and, though the act was denounced as scandalous, the slander might still be reasserted. The duke of Clarence had left two

Genealogical Table of the House of York

Edward III.

, L

Edward, the Black Prince.

I

Richard II.

(dethroned 1390).

William of Hatfield (died young).

Lionel, =■ Elizabeth, d. of duke of I William de Burgh, Clarence. earl of Ulster.

Edmund, duke of York.

Edmund Mortimer, = Philippa. third earl of March. I

John of Gaunt,

duke of Lancaster.

I

Henry IV.

Henry V. duke of York.

Thomas

of Woodstock,

duke of Gloucester.

Roger Mortimer, =E!sanor Holland,

fourth earl of March.

eldest daughter of

Thomas, second

earl of Kent.

Edward, prince of Wales.

Edmund Mortimer, fifth earl of March.

William of Windsor (died young) .

Anne Mortimer = Richard, sari of Cambridge I (executed 1415)-

Cecily Neville, daughter of = Richard, duke of York Ralph, earl of Westmoreland, j (killed in battle 1460).

Edward IV. (d. 14 I

George, duke of Clarence (attainted 147SJ.

Edward V. (murdered 1483)-

Richard,

duke of York

(murdered 1483).

Richard TIT, (killed in battle 1485).

Edward , prince of Wales

(

Anne, married Henry Holland, duke of Exeter, and had no child by him. By her second husband. Sir Thomas St Leger.she had a daughter married to Sir Gko. Manners, Lord Rons, and mother of the first earl of Rutland.

Elizabeth =John de la Pole, I duke of Suffolk id. 1491).

Edward, earl of Warwick (executed 1499).

Margaret,

countess of Salisbury

(executed 1541J.

ˆSir Richard Pole.

John da la Pole, Edmund Humphrey and

carl cf Lincoln de la Pole Edward,

(d. 1487J. id. 1513). churchmen.

Richard Four

de la Pole daughters.

id. 1525)-

Henry Pole, Sir Geoffrey Pole, Arthur Pole. Reginald Pole,

Lord Montague of Lordington, cardinal,

(executed 1539). Sussex.

Five sons and one daughter. Among the former were Arthur and Edmund, who were prisoners in the Tower.

children, a son and a daughter, and the attainder of their father could not be a greater bar to the crown than the attainder of Henry VII. himself. Seeing this, Henry had, immediately after his victory at Bosworth, secured the person of the son, Edward, earl of Warwick, and kept him a prisoner in the Tower of London. Yet a formidable rebellion was raised in his behalf by means of Lambert Simnel, who was defeated and taken prisoner at the battle of Stoke in 1487. The earl of Warwick lived for twelve years later in unjust confinement, and was ultimately put to death in 1499 because he had consented to a plot for his own liberation. As to his sister Margaret, she was married to one of Henry VIL's Welsh followers, Sir Richard Pole (or Poole), and could give no trouble, so that, when Henry VIII. came to the throne, he thought it politic to treat her with kindness. He made her countess of Salisbury, reversed her brother's attainder, created her eldest son, Henry, Lord Mon- tague, and caused one of her younger sons, Reginald, who dis- played much taste for learning, to be carefully educated. This, however, was the very thing which involved the whole family in ruin. For Henry looked to the learning and abilities of Reginald Pole to vindicate before Europe the justice of his divorce from Catherine of Aragon ; and, when Pole was conscientiously compelled to declare the very opposite, the king's indignation knew no bounds. Pole himself was safe, having secured some time before a retreat in Italy. He was even made a cardinal by the pope. But this only made matters worse for his family at home: his brother, Lord Montague, and even his mother, the aged countess of Salisbury, were beheaded as traitors because they had continued to correspond with him. Cardinal Pole, however, came back to his own country with great honour in the reign of Queen Mary, and was made archbishop of Canter- bury on the deprivation of Cranmer.

Early in the reign of Queen Elizabeth, two nephews of the cardinal, Arthur and Edmund Pole, being ardent young men, conspired to go over to the duke of Guise in France, hoping to return with an army into Wales and so promote the claims of Mary Queen of Scots to the crown of England, for which service the elder, Arthur, expected to be restored to the dukedom of Clarence. The result was that they were condemned to death, but were only imprisoned for the rest of their days in the Tower, where they both carved inscriptions on the walls of their dungeon, which are still visible in the Beauchamp tower.

Another branch of the house of York might have given trouble

Ursula, married to Henry, Lord Stafford, son of Edward, duke of Buckingham.

to the Tudors if they had not been narrowly watched and ulti- mately extinguished. Of the sisters of Edward IV., the eldest, Anne, who married the duke of Exeter, left only one daughter by her second husband, Sir Thomas St Leger; but the second, Elizabeth, married John de la Pole, duke of Suffolk, and had several children. Their eldest son was created earl of Lincoln during his father's life, and Richard HI., after the death of his own son, had designated him as his successor. Disappointed of a kingdom by the success of Henry VII., he joined in Simnei's rebellion and was killed at the battle of Stoke. His brother Edmund thus became heir to his father; but in the reduced circumstances of the family he agreed to forbear the title of duke and take that of earl of Suffolk. He continued for some years in favour with the king, who made him a knight of the Garter; but, having killed a man in a passion, he fled abroad and was entertained at the court of the emperor Maximilian, and after- wards at that of Philip, king of Castile, when resident in the Low Countries before his departure for Spain. Philip, having been driven on the English coast when going to take possession of his Spanish kingdom, was entertained at Windsor by Henry VII., to whom he promised to deliver up the fugitive on condition that his life should be spared. Edmund de la Pole accordingly was brought back to England and lodged in the Tower. Though the promise to spare his life was kept by the king who gave it, his son Henry VIII. caused him to be executed in 1513, when war broke out with France, apparently for treasonable corre- spondence with his brother Richard, then in the French service. After his death Richard de la Pole, remaining in exile, called himself earl of Suffolk, and was flattered occasionally by Francis I. with faint hopes of the crown of England. He was killed at the battle of Pavia in 1525. There were no more De la Poles who could advance even the most shadowy pretensions to disturb the Tudor dynasty. (J. Ga.)

YORK, EDMUND OF LANGLEY, Duke of (1341-1402), fifth son of Edward III., was born at King's Langley in Hertford- shire on the 5th of June 1341. He accompanied his father on a campaign in France in 1359, was created earl of Cambridge in 1362, and took part in expeditions to France and Spain, being present at the sack of Limoges in 1370. After marrying Isabella (d. 1393), daughter of Peter the Cruel, king of Castile, he was appointed one of the English lieutenants in Brittany, whither he led an army in 1375. A second campaign in Brittany was followed in 1381 by an expedition under the earl's leadership to

aid Ferdinand, king of Portugal, in his struggle with John I., king of Castile; but after a period of inaction Edmund was compelled to return to England as Ferdinand had concluded an independent peace with Castile. Accompanying Richard II. on his march into Scotland, he was created duke of York in August 1385, and subsequently on three occasions he acted as regent of England. In this capacity he held a parliament in 1395, and he was again serving as regent when Henry of Lancaster, after- wards Henry IV., landed in England in July 1399. After a feeble attempt to defend the interests of the absent king, York joined the victorious invader; but soon retired from public life, and, in the words of Froissart as translated by Lord Berners, " laye styll in his cast ell, and medled with nothynge of the busynesse of Englande." He died at King's Langley on the 1st of August 1402. York was a man who preferred pleasure to business, and during the critical events of his nephew's reign he was content to be guided by his more ambitious brothers, the dukes of Lancaster and Gloucester. His second wife was Joan, or Johanna (d. 1434), daughter of Thomas Holland, earl of Kent, but his only children were two sons and a daughter, Constance (d. 1416), by his first wife.

YORK, EDWARD, Dtjke of (c. 1373-1415), elder son of the preceding, was created earl of Rutland in 1390. Being an intimate friend of his cousin, Richard II., he received several important appointments, including those of admiral of the fleet, constable of the tower of London and warden of the Cinque Ports. He accompanied the king to Ireland in 1394 and was made earl of Cork; arranged Richard's marriage with Isabella, daughter of Charles VI. of France; and was one of the king's most active helpers in the proceedings against the "lords appellant " in 1397. As a reward he secured the office of con- stable of England and the lands in Holdcrncss which had previously belonged to his murdered uncle, Thomas of Wood- stock, duke of Gloucester, together with other estates and the title of duke of Aumerle or Albemarle. He appears to have deserted Richard in 1399, but only at the last moment; and in Henry IV. 's first parliament he was vigorously denounced as the murderer of Gloucester. After declaring that his part in the proceedings of 1397 had been performed under constraint, his life was spared, but he was reduced to his former rank as earl of Rutland, and deprived of his recent acquisitions of land. It is uncertain what share Rutland had in the conspiracy against Henry IV. in January 1400, but his complete acquittal by parliament in 1401, and the .confidence subsequently reposed in him by the king, point to the conclusion that he was not seriously involved. Serving as the royal lieutenant in Aquitaine and in Wales, Rutland, who became duke of York on his father's death in 1402, was, like all Henry's servants, hampered by want of money, and perhaps began to feel some irritation against the king. At all events he was concerned in the scheme, concocted in 1405 by his sister, Constance,

widow of Thomas le Despencer, earl of Gloucester, for seizing the young earl of March, and his brother Roger Mbrtimer } and carrying them into Wales. On her trial Constance asserted that her brother had instigated the plot, which also included the murder of the king, and York was imprisoned in Pevensey castle. Released a few months later, he was restored to the privy council and regained his estates, after which he again served Henry in Wales and in France. York led one division of the English army at. Agincourt, where, on- the 25th of October 1415. he was killed by "much hete and thronggid." He was buried in Fotheringhay church. The duke left no children and was succeeded as duke of York by his nephew, Richard.

York compiled the May sire of the Game, a treatise on hunting which is largely a translation of the Livrede Ckasseoi Gaston Phochus, count of Foix. This has been edited by W. A. and F. Baillie- Grohman (1904).

YORK, FREDERICK AUGUSTUS, Duke of (1763-1827), second son of George III., was born at St James's Palace on the 16th of August 1763. At the age of six months his father secured his election to the rich bishopric of Osnabriick. He was invested a knight of the Bath in 1767, a K.G. in 1771, and was gazetted

colonel in 1780. From 1781 to 1787 he lived in Germany, where he attended the manoeuvres of the Austrian and Prussian armies. He was appointed colonel of the 2nd horse grenadier guards (now 2nd Life Guards) in 1782, and promoted major-general and appointed colonel of the Coldstream Guards in 1784. He was created duke of York and Albany and earl of Ulster in 1784, but retained the bishopric of Osnabriick until 1803. On his return to England he took his seat in the House of Lords, where, on December 15. 1788, he opposed Pitt's Regency Bill in a speech which was supposed to have been inspired by the prince of Wales. A duel fought on Wimbledon Common with Colonel Lennox, afterwards duke of Richmond, served to increase the duke of York's popularity, his acceptance of the challenge itself and his perfect coolness' appealing strongly to the public taste. In 1791 he married Princess Frederica Charlotte Ulrica Catherina (b. 1767), daughter of Frederick William II. of Prussia. The princess was enthusiastically received in London, but the marriage was not happy, and a separation soon took place. The princess retired to Oatlands Park, Weybridge, where she died on the 6th of August 1820.

In 1793 the duke of York was sent to Flanders in command of the English contingent of Coburg's army destined for the invasion of France (sec French Revolutionary Wars). On his return in 1705 the king promoted him field-marshal, and on April 3rd, 1798, appointed him commander-in-chief. His second command was with the army sent to invade Holland in conjunction with a Russian corps d'artn&e in 1799. Sir Ralph Abercromby

and Admiral Sir Charles Mitchell in charge of the vanguard had succeeded in capturing the Dutch ships in the Helder, but from time of the duke's arrival with the main body of the army disaster" followed disaster until, on the 17th of October, the duke signed the convention of Alkmaar, by which the allied expedition withdrew after giving up its prisoners. Although thus unsuccessful as commander of a field army the duke was well fitted to carry out reforms in the army at home, and to this task he devoted himself with the greatest vigour and success until his enforced retirement from the office of com- mander-in-chief on the 18th of March 1809, in consequence of his relations with Mary Ann Clarke (1776-1852), who was convicted of profiting by her intimacy with the duke to extract money from officers by promising to recommend them for promotion. A select committee was appointed by the House of Commons to inquire into the matter, and the duke w T as acquitted of having received bribes himself by 278 votes to 196. Two years later, in May 1811, he was again placed at the head of the army by the prince regent, and rendered valuable services in this position. Fie died on the 5th of January 1827 and was buried at St George's Chapel, Windsor.

A firm friendship seems to have existed between the duke and his elder brother, afterwards George IV., and he is also said to have been his father's favourite son. He was very popular, thanks to his amiable disposition and a keen love of sport, but it is as the organizing and administrative head of the army that he has left his mark. He was untiring; in his efforts to raise the tone of the army, restore discipline, weed out the undesirables, and suppress bribery and favouritism. He founded the Duke of York's School for the sons of soldiers at Chelsea, and his name is also com- memorated by the Duke of York's column in Waterloo Place.

YORK, RICHARD, Duke of (1411-1460), was born on the 2 1 st of September 141 1', the son of Richard, earl of Cambridge, second son of Edmund of Langley, duke of York. By the death of his uncle Edward at Agincourt he became duke of York, and on the death of Edmund Mortimer in 1425 he succeeded to his claims as representing in the female line the elder branch of the royal family. He had been kindly treated by Henry V., and his name appears at the head of the knights made by the little Henry VI. at Leicester on the 19th of May 1426. York's first service was in France during 1430 and 1431. In 1432 he obtained livery of his lands and afterwards went over to Ireland to take possession of his estates there. In January 1436 he was appointed lieutenant-general of France and Normandy, but did not enter on his command till June. He showed vigour and capacity, and recovered Fecamp and some other places in

Normandy. Probably he was not supported cordially by the home government, and in 1437 applied to be recalled. One authority alleges that his council thwarted him in his desire to relieve Montereau. because he had been discharged from his office (Chronicles of London, 143). York returned to England in the autumn of 1437. From this time at all events he attached himself to the war-party of which Humphrey of Gloucester was head, in opposition to the government under Cardinal Beaufort. By his marriage in 1438 to Cicely, sister of the earl of Salis- bury, he allied himself to the rising family of the Nevilles. On the 2nd of July 1440 York was again appointed to the French command. His previous experience made him stipulate for full powers and a sufficient revenue. He did not, however, go to Rouen till June 1441. During his second governorship York maintained, if he could not improve, the English position in Normandy. He was again hampered by his political oppo- nents at home, and at the end of 1446 was recalled, on the pretext that his term of office had expired. The death of Humphrey of Gloucester in February 1447 made York the first prince of the blood. Suffolk, now Henry's chief minister, found a convenient banishment for a dangerous rival by appointing York to be lieutenant of Ireland for ten years (oth of December 1447). York, however, contrived, to put off his departure for eighteen months. During his absence in Ireland English dis- content came to a crisis in Jack Cade's rebellion. The use made of the names of Mortimer and York, however unauthorized, shows the trend of popular opinion. In September 1450 York landed in Wales. His opponents endeavoured to waylay him, but he came to London with an armed retinue and forced himself into the king's presence. Nevertheless he declared his loyalty and that he desired only justice and good government. He took part in the punishment of Cade's supporters, and dis- countenanced a proposal in parliament that he should be declared heir to the crown. In March 1452 he came once more in arms to London, and endeavoured to obtain Somerset's dis- missal. On a promise that his rival should be held in custody he disbanded his men, and thus outwitted found himself virtu- ally a prisoner. However, a nominal agreement was concluded, and York accepted the king's pardon. The situation was changed by the birth of a prince of Wales and the king's illness in October 1453. After a struggle with the queen and Somer- set, York secured his recognition as protector on the 27th of March 1454. He declared that he accepted the post only as a duty, and, though he put his own friends in power, exercised his authority with moderation and on the side of good order. But at the end of the year the king's sudden recovery brought York's protectorate to an end. When it was clear that the queen and Somerset would proceed to extremities, York and his friends took up arms in self-defence. Even when the two armies met at St Albans, York endeavoured to treat for settle- ment. The issue was decided by the defeat and death of Somerset on the 22nd of May 1455. York used his success with

moderation.' He became constable of England, and his friends obtained office. This was no more than a change of ministers. But a return of the king's illness in October 1455 made York again for a brief space protector. Henry recovered in February 1456, and Margaret, his queen, began to assert herself. Finally, at Coventry, in October, the Yorkist officials were displaced. Still there was no open breach, and in March 1458 there was even a ceremonial reconciliation of all parties at St Paul's in London. York would not again accept honour- able banishment to Ireland, but made no move till the queen's preparations forced him to act. In September 1459 both parties were once more in arms. York protested that he acted only in self-defence, but the desertion of his best soldiers at Ludlow on the 12th of October left him helpless. With a few followers he escaped to Ireland, where his position as lord- lieutenant was confirmed by an Irish parliament, and he ruled in full defiance of the English government. In March 1460 the earl of Warwick came from Calais to concert plans with his leader. York himself only landed in England on the 8th of September, two months after Warwick's victory at North-

ampton. All pretence of moderation was put aside, and he marched on London, using the full arms of England, and with his sword borne upright before him. On reaching Westminster, York took up his residence in the royal palace, and formally asserted his claim to the throne in parliament. In the end a compromise was arranged, under which Henry was to retain the crown for life, but Richard was to succeed him. On the 8th of November he was accordingly proclaimed heir-apparent and protector. Meantime the queen was gathering her friends, and early in December, Richard went north with a small force. He kept Christmas at Sandal Castle near Wakefield. There, on the 30th of December, he was hemmed in by a superior force of Lancastrians. Declaring that he had never kept castle in the face of the enemy, Richard rashly offered battle, and was defeated and slain. His enemies had his head cut off, and set it up on the walls of York adorned with a paper crown.

Richard of York was not a great statesman, but he had qualities of restraint and moderation, and might have made a good king. He had four daughters and four sons. Edmund, earl of Rutland, his second son, was killed at Wakefield. The other three were Edward IV., George, duke of Clarence, and Richard III.

See The Paston Letters with Dr Gairdner's Introduction; Thre& Fifteenth Century Chronicles, arid Collectio?is of a. London Citizen (published by the Camden Society) ; Chronicles of London (ed. C. L. Kingsford, 1905) ; J. S. Stevenson's Wars of the Englishin France (Rolls Series). The French

chronicles of Matthieu d'Escouchy, T. Basin and Jehan Waurin should also be consulted (these three are published by the Societe de VIHstoire de France). For modern accounts see especially Sir James Ramsay's Lancaster and York t and The Political History of England, vol. iv.. by Professor C. Oman.

(C. L. K.)

YORK, a city, municipal, county and parliamentary borough, the scat of an archbishop, and the county town of Yorkshire, England, 18S m. N. by W. from London by the Great Northern railway. It is an important junction of the North-Eastern railway. Pop. (1901) 77,914. It lies in a plain watered by the river Ouse, at the junction of the Foss stream with the main river. It has narrow picturesque streets, ancient walls, and, besides the cathedral, many churches and buildings of architectural interest.

York was a Roman station (see below), and large collections of Roman remains are preserved in the hospitium of St Mary's Abbey. Of these a great proportion came from the cemetery and from the foundations of the railway station. A note- Worthy relic of the Roman occupation, however, appears in its original place. This is the so-called multangular tower, on the N.W. of the city walls. Its base is Roman, of mingled stone and brick work. The city walls date in part from Norman times, but are in the main of the 14th century. Their circuit is a little over 2ˆ m., and the area enclosed is divided by the river Ouse, the larger part lying on the left bank. The walls have been carefully preserved and are remarkably perfect. On the E. for a short distance the river Foss took the place of a wall. Of the gates, called Bars, the best specimen is Micklegate Bar on the S.W., where the heads of traitors were formerly exposed. It is a square tower built over a circular, probably Norman, arch, and has embattled corner turrets. Others are Eootham Bar, the main entrance from the N., also having a Norman arch; Monk Bar (N.E.), formerly called Goodramgate, but renamed in honour of General Monk, and Walmgate Bar, of the time of Edward I., retaining the barbican repaired in 1648. The castle stands in the angle between the Ouse and the Foss immediately above their junction. Of the fortress built by William the Conqueror in 1068 some portions were probably incorporated in Clifford's tower, the shell of which, showing an unusual ground plan of four intersecting circles, rises from an artificial mound. The castle serves as the prison and county courts.

The cathedral of St Peter, commonly known as the minster,. has no superior in general dignity of form among English cathedrals. Tt is in the form of a Latin cross, consisting of nave with aisles, transepts, choir with aisles, a central tower, and

two W. towers. The palace of the archbishops is at Bishop- thorpe, 25 m. S. of York. It is of various dates, and includes slight remains of the Early English palace of Archbishop Grey. The diocese includes over half the parishes in Yorkshire, and also covers very small portions of Durham, Nottinghamshire and Lincolnshire.

The extreme external length of the cathedral is 524 ft. 6 in , the breadth across the transepts 250 ft., the height of the central tower 213 ft., and the height of the western towers 202 ft. The material is magnesian limestone. The cathedral occupies the site of the wooden church in which King Edwin was baptized by Paulinus (q.v.) on Easter Day 627. After his baptism Edwin, according to Bede, began to construct " a large and more noble basilica of stone," but it was partly destroyed during the troubles which followed his death, and was repaired by Archbishop Wilfrid. The building suffered from fire in 741, and, after it had been re- paired by Archbishop Albert, was described by Alcuinas "a most magnificent basilica." At the time of the Norman invasion the Saxon cathedral, with the library of Archbishop Egbert, perished in the fire by which the greater part of the city was destroyed, the only refic remaining being the central wall of the crypt. It was reconstructed by Archbishop Thomas of Bayeux (1070- 1100); but of this building few portions remain. The apsidal choir and crypt were reconstructed by Archbishop Roger (1 154—81), the S. transept by Archbishop Walter de Grey (1216— 1255), and the N. transept and central tower by John Romamis, treasurer of the cathedral (1228-56). With the exception of the crypt, the transepts are the oldest portions of the building now remaining. They represent the Early English style at its best, and the view across the great transept is unsurpassed for archi- tectural effect. The S. transept is ihc richest and most elaborate in its details, one of its principal features being the magnificent rose window; and the N. transept contains a series of beautiful lancet windows called the Five Sisters. The foundation of the new nave was laid by Archbishop Romanus (1286-96), son of the treasurer, the building of it being completed by Archbishop William de Melton about 1340. The chapter-house, a magnificent ornate building, was built during the same period. The W. front, con- sisting of a centre and two divisions corresponding with the nave and aisles, has been described as " more architecturally perfect as a composition and in its details than that of any other English cathedral," the great window above the door being considered by some superior to the famous E. window at Carlisle.

In 1361 Archbishop Thoresby (1352-73) began the lady chapel and

presbytery, both ;n the Early Perpendicular style. The re- building of the choir, begun about the same period, was not com- pleted till about 1400, It is Late Perpendicular, the great E. window being one of the finest in the world. With the rebuilding of the choir the whole of the ancient Norman edifice was removed, the only Norman architecture now remaining being the E. portion of the crypt of the second period, built by Archbishop Roger (1154- 1191). To correspond with later alterations, the central tower was recased and changed into a Perpendicular lantern tower, the work being completed in 1444- The S. W. tower was begun in 1432 during the treasurership of John de Bermingham, and the N.W. tower in 1470. W 7 ith the erection of this tower the church was com- pleted as h now stands, and on the 3rd of February 1472 it was re- consecrated by Archbishop Neville. On the 2nd cf February 1829 the woodwork of the choir was set on fire by Jonathan Martin, a madman. On the 2nd of May 1840 a fire broke out in the S.W. tower, reducing it to a mere shell. The stained glass both in the cathedral and in other churches of the city is particularly note- worthy; its survival may be traced to the stipulation made by the citizens when surrendering to parliament in the civil wars that it should not be damaged.

The following is a list of the archbishops of York:—

16. Wulfstan, 928-956.

17. Oskyte!, 956-972.

18. Ethclwold, 972.

19. Oswald, 972-992.

20. Adulf, 992-1002.

21. Wulfstan, 1002-1023.

22. Alfric Puttoc, 1023-1050.

23. Kinsi, 1050-1060.

24. Ealdred, 1060-1067.

25. Thomas of Bayeux, 1070-

1100.

26. Gerard, 1101-1108.

27. Thomas, 1108-1114.

28. Thurstan, 1114-1140.

29. William Fitzherbert, 1143- 1147. (His election was disputed, and he was deprived by the pope.)

30. Henry Mordac, 1147-1153.

Paulinus. 627-633.

Chad, 664-669.

Wilfrid, 669-678, (He again held the see in 686 — for how long is not certain — Bosa retiring in his favour.)

Bosa, 678-:. 705.*

John of Beverley, 705-718.

Wilfrid II., 718-732.

Egbert, 732-766.

Albert, 766-782.

Eanbalcl I., 782-796.

Eanbald II., 796-812.

11. Wulfsi, 812-831.

12. Wigmund, 837-854.

13. Wulfhere, 854-890. 14- Ethelbald, 890-895- 15. Redewald, 895-928.

William Fitzherbert, re- instated, 1 153 to 1 154.

Roger of Pont l'Eveque,

1154-1181.

(The see was now vacant for ten years.)

32. Geoffrey, 1191-1207.

(The see was vacant for nine years.)

33. Walter de Grey, 12 16-1255.

34. Sewal de Bovil, 1256-1258.

35. Geoffrey of Ludham, 1258-

1265.

36. Walter Giffard, 1266-1279.

37. William of Wickwaine,

1279-1286.

38. John Romanus, 1286-1296.

39. Henry of Newark, 1298-

1299-

40. Thomas ot Corbridge, 1300-

1304.

Greenfield, 1306-

31.

42,

William

I315-

William

43-

44. 45-

de Melton, la Zouche,

‘317-

1340.

William la Zouche, 1342-

1352.

John Thoresby, 1352-1373. Alexander Neville, 1374-

1388.

46. Thomas Htzalan, 1388-

1396.

47. Robert Waldby, 1397-1398.

48. Richard Scrope, 1398-1405.

49. Henry Bowet, 1407-1423.

50. John Kemp, 1426-1452.

51. William Booth, 1452-1464.

52. George Neville, 1464-1476.

53. Laurence Booth, 1476-1480.

54. Thomas Scott, 1480-1500.

55. Thomas Savage, 1 501- 1 507.

56. Christopher Bainbridge,

1508-1514.

57. Thomas Wolsey

button, 1595-

58. Edward Lee, 1531-1544.

59. Robert Holgate, 1545-1554.

60. Nicholas Heath, 1555-1559-

61. Thomas Young, 1561-1568.

62. EdwardGrindal, 1570-1576.

63. Edwin Sandys, 1577-1588.

64. John Piers, 1588-1594.

65. Matthew Hu

1606.

66. Tobias Matthew, 1606-1628.

67. George Monteign, 1628.

68. Samuel Harsnett, 1628-1631.

69. Richard Neile, 1632-1640.

70. John Williams, 1641-1650.

71. Accepted Frewen, 1660-

1664.

72. Richard Sterne, 1664-1683.

73. John Dolben, 1683-1686.

74. Thomas Lamplugh, 1688-

1691.

75. John Sharp, 1691-1714.

76. William Dawes, 17 13-1724.

77. Lancelot Blackburne, 1724-

1743-

78. Thomas Herring, 1743-1747.

79. Matthew Hutton, 1747-

1757.

80. John Gilbert, 1757-1761.

81. Robert Hay Drummond,

1761-1776.

82. William Markham, 1777-

83.

1807.

Edward

1808-:

Thomas

i860. Charles

Vernon Harcourt,

847.

Musgrave, 1847-

Longley,

Thomas

1 860-1862.

86. William Thomson, 1863-

1891.

87. William Connor Magee, 1 89 1.

88. William Datrymple Mac-

lagan, 1891-190S.

89. Cosmo Gordon Lang, 1908-

- *These bishops did not receive the pall as metropolitans.*

I5M.-I530.

Next to the cathedral, the most interesting building in York is St Mary's Abbey, situated in Museum Gardens, founded for Bene- dictines by Alan, lord of Richmond, in 1078, its head having the rank of a mitred abbot with a seat in parliament. The principal remains of the abbey (see Abbey) are the N. wall and the ruins of the church, in the Early English and Decorated styles, and the principal gateway with a Norman arch. They lie near the cathedral, outside the walls. The hospitium, of which the upper part is of wood, contains a collection of Roman antiquities; the building is of the 14th and 15th centuries. A considerable portion of the abbey was employed for the erection of the king's manor, a palace for the lord president of the north, now occupied as a school for the blind. In the

gardens is also the ambulatory of St Leonard's hospital, founded by King Aethelstan and rebuilt by Stephen. St William's College, near the minster, was founded in 1453 as a college for priests holding chantries in the minster; its restoration as a church house and meeting- place for convocation was under- taken in 1906. York also possesses a large number of churches of special architectural interest, including All Saints, North Street, Early English, Decorated and Perpendicular, with a spire 120 ft. in height; Christ Church, with S. door in the Decorated style, supposed to occupy the site of the old Roman palace; Holy Trinity, in Goodramgate, Decorated and Perpendicular, with Perpendicular tower; Holy Trinity, Micklegate, formerly a priory church, now restored, showing Roman masonry in its walls; St Denis, Walm- gate, w r ith rich Norman doorway and Norman tower arches; St Helen's, St Helen's Square, chiefly Decorated; St John's, North Street, chiefly Perpendicular; St Margaret's, Walmgate, cele- brated for its curiously sculptured Norman porch and doorway; St Mary the Elder, Bishophill, Early English and Decorated, with brick tower, rebuilt in 1659; St Mary the Younger, Bishophill, with a square tower in the Saxon style, rebuilt probably in the 13th century; St Mary, Castlegate, with Perpendicular tower and spire 154 ft. in height, the body of the church dating back to tran- sitional Norman times; St Michael-le-Belfry, founded in 1066, but rebuilt in 1538 in Late Perpendicular style; St Martin's-le-Grand, fine Perpendicular; and St Martin's cum Gregory, Early English and Perpendicular. Among modern churches is the Roman Catholic pro-cathedral, standing near the cathedral.

The guild-hall, with a fine old room in Perpendicular style erected in 1446, contains a number of stained-glass windows. Adjoining it are handsome municipal buildings (1891), and near it is the mansion house, built in 1725 from designs by the earl of Burlington. The courts of justice were opened in 1892. Assembly rooms, a corn exchange, barracks and a theatre are the other chief buildings.

The public institutions include the Yorkshire Philosophical Society, whose museum, in the Grecian style, was opened in 1830, and the free library in the building of the York Institute of Science and Art. The principal schools are St Peter's cathedral grammar-school (originally endowed in 1557), Archbishop Holgate's grammar-school, the York and diocesan grammar-school, and the bluccoat school for boys (founded in 1705), with the associated greycoat school for girls. There are numerous charities.

The chief industrial establishments are iron foundries, railway and motor

engineering works, breweries, flour-mills, tanneries and manufactories of confectionery, artificial manure, &c. There is water communication by the Ouse with the Humber, and by the Foss Navigation to the N.E. This is under the control of the corporation. The parliamentary borough returns 2 members. The county borough was created in 1888. The municipal borough is under a lord mayor, 12 aldermen and 36 councillors. The city within the municipal limits constitutes a separate division of the county. The municipal city and the Ainsty (a district on the S.W. included in the city bounds in 1449) are for parliamentary purposes included in the N. Riding, for registration purposes in the E. Riding, and for all other purposes in the W. Riding. The parliamentary borough extends into the E. Riding. Area, 3730 acres.

History. — York is known to have been occupied by the Britons, and was chosen by the Romans as their most important centre in north Britain and named Ebordcum or Eburacum. The fortress of Legio VI. Victrix was situated near the site of the cathedral, and a municipality {colonid) grew up, near where the railway station now is, on the opposite side of the Ouse. Many inscriptions and a great quantity of minor objects have been found. The emperor Hadrian visited York in a.d. 120, and, according to tradition, the body of the emperor Severus who died there in a.d. 211 was burnt on Severus Hill, near the city. After the death of Constant ine Chlorus, which also took place in York, his son Constantino the Great, who, according to an ancient but incorrect tradition, was born there, was also inaugurated emperor there. A bishop of York is mentioned, along with, and with precedence of, bishops of London and Lincoln (the last name is uncertain) as present at the council of Aries in 314. Nothing is known of the history of the city from the time the Romans withdrew from Britain in 410 until 627, when King Edwin was baptized there, and where shortly afterwards Paulinus, the first arch- bishop, was consecrated. In the time of Archbishop Egbert (732-766) and of Alcuin, at first a scholar and afterwards master of the cloister school, York became one of the most celebrated places of education in Europe. It was also one of the chief Danish boroughs, and Earl Siward is said to have died there in 1055. In 1066 it was taken by Harold Hardrada, and in 1068 the men of the north of England, rising under Edgar Aetheling and Earl Waltheof, stormed the castles which William I. had raised, putting to death the whole of the Norman garrison. The Conqueror in revenge burnt the town and laid waste the country between the Humber and Tees. York was frequently visited by the kings of England on the way to Scotland, and several important parliaments were held there, the first being that of 1175, when Malcolm, king of Scotland, did homage to Henry II. In the reign of Richard I., the citizens rose against the Jews, who fled to the castle. Here, however, they were obliged to surrender, many killing themselves after putting to death their wives and children, the rest

being massacred by the citizens. The council of the North was established in York in 1537 after the suppression of the Pilgrimage of Grace. In 1642 York was garrisoned by Royalists and besieged by the parliament. It was relieved by Prince Rupert, but surrendered after the battle of Marston Moor. Being under the rule of the earls of Northumbria, York is not mentioned in the Domesday Survey. In the first charter (which is undated) Henry II. granted the citizens a merchant gild and all the free customs which they had in the time of Henry I. Richard I. in ng4 granted exemption from toll, &c, throughout the kingdom, and King John in 1200 con- firmed the preceding charters, and in 1212 granted the city to the citizens at a fec-farm of £160 a year. These charters were confirmed by most of the early kings. Richard II. con- ferred the title of lord mayor, and a second charter, given in 1392, shows that the government then consisted of a lord x xvm. 30

mayor and aldermen, while a third in 1396 made the city a county of itself and gave the burgesses power to elect twe sheriffs. Edward IV. in 1464 incorporated the town undei the title of " Lord Mayor and Aldermen," and in 1473 directed that all the citizens should choose the mayor from among the aldermen. As this led to constant disputes, Henry VII. arranged that a common council, consisting of two men from each of the more important gilds and one from each of the less important ones, should elect the mayor. The city is now governed under a charter of Charles II., confirming that of 1464, the governing body consisting of a lord mayor, 12 aldermen and 36 councillors. The city has returned two members to parliament since 1295. During the 14th century there were constant quarrels between the citizens and the abbey of St Mary's about the suburb of Bootham, which the citizens claimed as within the jurisdiction of the city, and the abbey as a separate borough. In 1353 the king took the borough of York into his own hands, " to avoid any risk of disturbance and possible great bloodshed such as has arisen before these times," and finally in the same year an agreement was brought about by Archbishop Thoresby that the whole of Bootham should be considered a suburb of York except the street called St Marygate, which should be in the jurisdiction of the abbey.

From the time of the conquest York was important as a trading and commercial centre. There were numerous trade gilds, one of the chief being that of the weavers, which received a charter from Henry II. During the 17th and 18th centuries the trade declined, partly owing to the distance of the city from the sea, and partly owing to the regulations of the trade gilds.

See Franc/js Drake, Eboracum: or the History and Antiquities of the City of York, from its original to the present time (1736); Extracts from the Municipal Records of the City of York during the Reigns of Edward IV., Edward V. and Richard III. (1843); Victoria County History, Yorkshire; J.

Raine, York (1893); A. P. Purey- Cust, York Minster (1897), Heraldry of York Minster (Leeds, 1890) ; B. S. Rowntree, Poverty: a Study of Town Life (1901).

YORK, a township of York county, Maine, U.S.A., on the Atlantic coast about 45 m. S.W. of Portland, and 9 m. by rail N.E. of Portsmouth, New Hampshire. Pop. (1910) 2802. Area, 64 sq. m. York is at the terminus of the York Harbor and Beach division of the Boston & Maine railway. In York village is the county gaol (1653-54), preserved by the Old York Historical and Improvement Society as a museum of local antiquities. Two colonial taverns also remain. York Harbor, York Beach, York Cliffs and Long Beach are attractive summer villages. The first settlement was made about 1624. In April 1 64 1 Sir Ferdinando Gorges, proprietor of the province of Maine, erected this into the Borough of Agamenticus, and on the 1st of March 1642 he chartered it as a city under the name of Gorgeana. In 1652, when Massachusetts extended her jurisdiction over Maine, the city of Gorgeana became the town of York. In 1692 most of the houses were burned by the Indians and the inhabitants killed or taken captive. York was the shire town of Yorkshire from 1716 to 1 735, the shire town with Portland (then Falmouth) of the district of Maine from 1735 to 1760, and a county-seat of York county from 1760 to 1832. During the middle of the 18th century York had considerable trade with the West Indies and along the coast, and as late as the middle of the 19th century it had important fishing interests. Its development as a summer resort was begun about 1873, but until 1887, when the railway reached it, its chief means of access was by stage from Ports- mouth.

See J. P. Baxter, Agamenticus, Bristol, Gorgeana, York (Portland, 1904); G. A. Emery, Ancient City of Gorgeana and Modern Town of York (Boston, 1873); and Pauline C. Bouve, "Old York, a Forgotten Seaport," in the New England Magazine (July 1902).

YORK, a city and the county-seat of York county, Nebraska, U.S.A., about46m. W.byN.ofLincoln. Pop. (1900) 5132; (igio) 6235. It is served by the Chicago, Burlington & Quincy and Chicago & North-Westcrn railways. It is the seat of the School of the Holy Family and of York College (founded in 1S90,

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co-educational). The city is situated in a farming and stock- raising region,

and among its manufactures are foundry products, bricks and flour. York was settled in 1864, was laid out in 1869, was incorporated as a town in 1875 and was chartered as a city in 1877.

YORK, a city and the county seat of York county, Pennsylvania, U.S.A., about 100 m. W. of Philadelphia and about 28 m. S.E. of Harrisburg. Pop. (1900) 33,708—1304 being foreign-born and 776 negroes; (1910) 44,750. York is served by the Maryland & Pennsylvania, the Northern Central (Pennsylvania) and the Western Maryland railways. Among the public buildings arc the County Court House (1899) and a large Federal Building (1910). York is the seat of the York Collegiate Institute (1873), founded by Samuel Small (d. 1885) and of the York County Academy (17S5). The Historical Society of York (1895) has a valuable collection of documents relating to local history. York is the commercial centre for a rich agricultural region, and has manu- factures of foundry and machine-shop products, silk goods, &c. The total factory product in 1905 was valued at $14,258,696.

York, the first permanent settlement in the state W. of the Susquehanna, was laid out in 1741 in what was then the Manor of Springettsbury (named in honour of Springett Penn, a grand- son of William Penn) by Thomas Cookson, a surveyor for Richard and Thomas Penn, then the proprietors of the colony, and was named after York, England. The first settlers were chiefly Germans from the Rhenish Palatinate, who were Lutherans, Reformed, Mennonites and Moravians. English Quakers and Scotch-Irish settled here also. The settlement lay on the Monocacy road, the main line of travel to the S. and S.W., and it grew rapidly, especially between 1748 and 1731. In 1749 the county of York was erected (from Lancaster county) and York was made the county seat. In 1754 York had 2iq ; houses and 1000 inhabitants. Troops from York took part in the Seven Years' War and the War of American Independence. In the old county court-house (built in 1754-56, pulled down in 1841) the Continental Congress sat from the 30th of September 1777 to the 27th of June 1778, having left Philadelphia on the approach of the British, and having held a day's session at Lancaster. At York the Congress passed the Articles of Confederation (15th of November 1777) and received news of the American victory at Saratoga and of the signing of treaties between the United States and France. The Conway cabal came to an end here, and the arrival here of Baron Steuben and of Lafayette in 1777 helped the American cause. In September 1778, $1,500,006 in silver lent by France to the United States was brought to York; and Benjamin Franklin's press, removed from Philadelphia, issued $10,000,000 of Continental money. Thomas Paine here wrote part of his Fifth Crisis. Philip Livingston, a signer of the Declaration of Independence, is buried here. In the Civil War, Confederate troops under General John B. Gordon entered York on the

28th of June 1863, and a small Federal force retreated before them; and the battle of Gettysburg was fought about 28 m. E. York was incorporated as a borough in 1787 and was chartered as a city in 1887.

See G. R. Prowell, The City of York, Past and Present (York, 1904), and C. A. Hawkins and H. E. Landis, York and York County (ibid. 1901).

YORKE, CHARLES (1722-1770), English lord chancellor, second son of Philip Yorke, 1st earl of Hardwicke, was born in London on the 30th of December 1722, and was educated at Corpus Christi College, Cambridge. His literary abilities were shown at an early age by his collaboration with his brother Philip in the Athenian Letters. In 1745 he published an able treatise on the law of forfeiture for high treason, in defence of his father's treatment of the Scottish Jacobite peers; and in the following year he was called to the bar. His father being at this time lord chancellor, Yorke obtained a sinecure appoint- ment in the Court of Chancery in 1747, and entered parliament as member for Reigate, a seat which he afterwards exchanged for that for the university of Cambridge. He quickly made' his mark in the House of Commons, one of his earliest speeches being in favour of his father's reform of the marriage law. In

1751 he became counsel to the East India Company, and in 1756 he was appointed solicitor-general, a place which he re- tained in the administration of the elder Pitt, of whose foreign policy he was a powerful defender. He resigned with Pitt in 1761, but in 1762 became attorney-general under Lord Bute. He continued to hold this office when George Grenville became prime minister (April 1763), and advised the government on the question raised by Wilkes's North Briton. Yorke refused to describe the libel as treasonable,, while pronouncing it a high misdemeanour. In the following November he resigned office. Resisting Pitt's attempt to draw him into alliance against the ministry he had quitted, Yorke maintained, in a speech that extorted the highest eulogy from Walpole, that parliamentary privilege did not extend to cases of libel; though he agreed with Pitt in condemning the principle of general warrants. . Yorke, henceforward a member of the Rockingham party, was elected recorder of Dover in 1764, and in 1765 he again became attorney-general in the Rockingham administration, whose policy he did much to shape. He supported the repeal of the Stamp Act, while urging the simultaneous passing of the Declaratory Act. His most important measure was the constitution which he drew up for the province of Quebec, and which after his resignation of office became the Quebec Act of 1774. On the accession to power of Chatham and Gra f ton ill 1767, Yorke resigned office, and took little part in the debates in parliament during the next four years. In 1770 he was invited by the duke of Grafton, wher Camden was dismissed from the chancellorship, to take his seat on the woolsack. He had, however,

explicitly pledged him: elf to Rockingham and his party not to take office with Grafton. The king exerted all his personal influence to overcome Yorke's scruples, warning him finally that the great seal if now refused would never again be within his grasp. Yorke yielded to the king's entreaty, went to his brother's house, where he met the leaders of the Opposition, and feeling at once overwhelmed with shame, fled to his own house, where in three days he was a dead man (January 20, 1770). The patent raising him to the peerage as Baron Morden had been made out, but his last act was to refuse his sanction to the sealing of the document.

Charles Yorke was twice married. His son by his first marriage became earl of Hardwicke; his eldest son by his second marriage, Charles Philip Yorke (1 764-1834), member of parlia- ment fof Cambridgeshire and afterwards for Liskeard, was secretary of state for war in Addington's ministry in 1801, and was a strong opponent of concession to the Roman Catholics. He made himself exceedingly unpopular in 1810 by bringing about the exclusion of strangers, including reporters for the press, from the House of Commons under the standing order, Which led to the imprisonment of Sir Francis Burdett in the Tower and to riots in London. In the same year Yorke joined Spencer Perceval's government as first lord of the admiralty; he retired from public life in 1818, and died in 1834. Charles Yorke's second son by his second marriage was Sir Joseph Sydney Yorke (1768-1831), an admiral in the navy, whose son succeeded to the earldom of Hardwicke.

See under Hardwicke, Philip Yorke, 1st Earl of.

YORKSHIRE, a north-eastern county of England, bounded N. by Durham, E. by the North Sea, S.E. by the Humber estuary (separating it from Lincolnshire), S. by Nottingham- shire and Derbyshire) S.W. for a short distance by Cheshire, W. by Lancashire and N.W. by Westmorland. It is the largest county in England, having an area of 6066-1 sq. m., and being more than double the size of Lincolnshire, which ranks next to it. In a description of the county it is con- stantly necessary to refer to its three great divisions, the North Riding, East Riding and West Riding (see Riding, and map of England, Sections 1., II.).

The centre of the county is a plain, which in the S., about the head of the Humber, resembles the Fens in character. The hills W. of the central plain, covering nearly the whole of the W. Riding and the N.W. of the N. Riding, are part of the great Pennine Chain iq.v.). These hills consist of high-lying moorland, and are

not generally remarkable for great beauty of outline. The higher parts are bleak and wild, and the slope towards the central plain is gradual. The chief beauty of the district is to be found in the numerous deeply scored valleys or dales, such as Teesdale, Swaledale, Wensleydale (q.v.), Nidderdale, Wharfedale and Aire- dale, in which the course of the streams is often broken by water- falls, such as High Force in Teesdale and Aysgarth Force in Wensley- dale.

The hills E. of the central plain cannot be similarly considered as a unit. In the N., wholly within the N. Riding, a line of heights known as the Cleveland Hills, forming a spur of the N. Yorkshire Moors, ranges from 1000 to nearly 1500 ft., and overlooks rather abruptly the lowest part ot the Tees valley. The line of greatest elevation approaches the central plain, and swings sharply S. in the Hambleton Hills to overlook it, while to the S. of the line long deep dales carry tributary streams S. to the river Derwent, thus draining to the Ouse. Eastward the N. Yorkshire moors give immediately upon the coast. Their higher parts consist of open moorland. The remarkable upper valley of the Derwent {q.v,) marks off the N. Yorkshire moors from the Yorkshire wolds of the E. Riding, the river forming the boundary between the N. and E. Ridings. The wolds superficially resemble the moors, inasmuch as they abut directly on the coast E., run thence W., and swing S. to overlook the central plain. At the S. extremity they sink to the shore of the H umber. Their greatest elevation is found near the W. angle (Howardian Hills), but hardly reaches 800 ft. Eastward they encircle a low-lying fertile tract bounded S. by the Humber and E. by the North Sea. The name of Holderness is broadly applied to this low tract, though the wapentake of that name includes properly only the E. of it.

The diverse character of the coast may be inferred from the foregoing description. In the north, S. of Teesmouth, it is low for a short distance; then the E. abutments of the Cleveland Hills form fine cliffs, reaching at Boulby the highest elevation of sea- cliffs in England (666 ft.). Picturesque valleys bearing short streams break the line, notably that of the Esk, reaching the sea at Whitby. The trend of the coast is at first S.E. and then S. South of Scarborough it sinks with the near approach of the Derwent valley, begins to rise again round the shallow sweep of Filey Bay, and then springs seaward in the fine promontory of Flamborough Head (see Bridlington). South of this, after the sharp incurve of Bridlington Bay, the low coast-line of Holderness succeeds, long and unbroken, as far as Spurn Point, which encloses the mouth of the Humber. Encroachments of the sea are frequent, but much land has been reclaimed.

There are several watering-places on the coast in high favour with visitors from the manufacturing districts. The principal, from N. to S. are Redcar, Saltburn-by-the-Sea, Whitby, Robin Hood's Bay, Scarborough (the largest of all), Filey, Bridlington and Horn- sea. There are numerous mineral springs in Yorkshire, the principal being those at Harrogate. There is also a spa at Scarborough, and others are Askern near Doncaster, Boston Spa near Harrogate, Croft on the Tees near Darlington, Hovingham, hear Malton, Guisbrough in Cleveland and Slaithwaite near Huddersfield. The springs are chiefly sulphurous and chalybeate.

By far the greater part of Yorkshire is within the drainage basin of the Ouse. which with the Trent makes the estuary of the Humber (q.v,). It is formed in the central plain by ˆhe junction of the Ure and Swale, both rising in the Pennine hills; but whereas the Swale drains the N. of the plain, the Ure, traversing Wensleydale, is enclosedby the hills over the greater part of its course. The Ouse also receives from the Pennine district the Nidd, traversing Nidder- dale, the Wharfe, the Aire, with its tributary the Calder, and the Don. The Aire rises in the fine gorge of Malham Cove, from the subterranean waterways in the limestone. None of these tribu- taries is naturally navigable, but the Aire, Calder and Don are in part canalized. From the E. the principal tributary is the Derwent, which on entering the central plam follows a course roughly parallel to that of the Ouse, and joins it in its lower part, between Selby and Howden. The Foss joins the Ouse at York. In the W. the county contains the headwaters of several streams of the W. slope of the Pennines, draining to the Irish Sea; of these the principal is the Ribble. In the N. the Tees forms most of the boundary with the county of Durham, but receives no large tributary from Yorkshire. In the S. of the W. Riding a few streams drain to the Trent. In Holderness, debarred by the wolds from the general drainage system of the county, the chief stream is the Hull. The only : sheets of water of any size are Semmcr Water, in a branch of Wensley- dale; Malham Tarn, near the head of Airedale, the effluent of which quickly disappears into an underground channel; and Hornsea Mere, near the flat seacoast at Hornsea.

Geology. — The great variety in the scenery of Yorkshire is but a reflection of the marked differences in the geological substructure. The stratification is for the most part regular, but owing to a great line of dislocation nearly coincident with the W. boundary of the county the rocks dip towards the E-, while the strike of the strata is from N. to S. The bold and picturesque scenery of the western hills and dales is due to the effects of denudation among the harder rocks, which here come to the surface. The strata in the Pennines

consist of (1) older Palaeozoic rocks, viz. a faulted inlier of Silurian and Ordovician at Horton in Ribblesdale, and a small patch of Silurian at

Sedbergh with inliers of Coniston limestone; (2) the Carboniferous or Mountain Limestone, which has been subjected to great dislocations, the more important of which are known as the N. and S. Craven faults ; (3) the Yoredale series, consisting of shales, flagstones, limestones and thin seams of coal ; and (4) the Millstone Grit, forming part of the hilly moorlands, and capping many of the loftier eminences. In the W. Riding the Pennine range forms part of the elevated country of Craven and Dent. The scenery in the W. of the N. Riding is somewhat similar to that in Craven, except that the lower hills are of sharper outline owing to the perpendicular limestone scars. To the intermingling of the limestone with the softer rocks are due the numerous "forces" or waterfalls, which are one of the special features of the scenery of this district. The action of water on the limestone rocks assisted by joints and faults has given rise to extensive caverns, of which the best examples are those of Clapham and Ingleton in the W. Riding, as well as to subterranean watercourses. At Brimham, Plumpton and elsewhere there are fantastic masses of rocks due to irregular weathering of the Millstone Grit. The Pennine region is bounded on the S.E. by the Coal Measures, forming the N. of the Derbyshire, Nottingham and Yorkshire coal-field, which in Yorkshire extends from Sheffield N. to Leeds. The noted fireclays of the Leeds district are obtained from this formation. To the E. the Coal Measures dip beneath the unconformable Permian beds, with magnesian limestone and marl slate, of which a narrow band crops up from Masham southwards. The Permian strata are overlain to the E. by the Trias or New Red Sandstone, scarcely ever exposed, but having been partly worn away is covered with Glacial deposits of clay and gravel, forming the low-lying Vale of York, extending from the Tees S. to Tadcaster and E. beyond York to Market Weighton. Near Middlesbrough red rock with gypsum and rock-salt (100 ft.) have been proved. Farther E. the Triassic beds are overlain by Lias and Oolite; Rhaetic beds have been recorded from near Northallerton. The Lias crops to the surface in a curve extending from Redcar to the Humber. , In the Middle Lias there is a seam of valuable iron ore, the source of the prosperity of the Cleveland region. The moorlands extending from Scarborough and Whitby are formed of Liassic strata, topped with the estuarine beds of Lower Oolite, rising gradually to the N,E» and attaining at Burton Head a height of 1489 ft., the greatest elevation of the Oolite formation in England- In the Oolitic " Dogger " series the magnetic iron ore of Rosedale is worked. Corallian rocks form the scarp of the Hambleton hills and extend E. ori the N. of the Vale of Pickering through Hackness to the coast, and S.W. of the vale to the neighbourhood of Malton. The, Vale of Pickering is underlaid by faulted Kimeridge Clay. Lias and Oolites fringe the E. of the Vale of York to Ferriby on the Humber. In the S.E. of the county, Cretaceous rocks cover up the older strata, N. to the Vale of Pickering and W. to the Vale of York^ The Chalk forms the Yorkshire wolds and the country S. through Driffield, Beverley and

Holderness.

The Yorkshire coast between Redcar and Flamborough presents a continuous series of magnificent exposures of the strata from the Lower Lias to the Chalk. The Upper Lias fossils and jet of Whitby and alum shale of Saltwick are well known. At Scarborough the Corallian, Oxford Clay, Kellaways Rock, Cornbrash and Upper Estuarine beds are well exposed in the cliffs. In Filey Bay the Kimeridge Clay appears on the coast, but it is covered farther S. by the historic beds of Speeton, representing the marine equivalents of Portland, Purbeck, Wealden, and Lover Greensand of S. England. Over the Speeton beds lies the Red Chalk, the Yorkshire equivalent of the Upper Greensand and Cault. The evidences of glacial action are of unusual interest and variety; the great thickness of boulder clay on the coast is familiar to all, but inland also great deposits of glacial clay, sand and gravel obscure the older geology. The Vale of Pickering and many of the smaller northern valleys were at que period the sites of Glacial lakes, and the " warp " which covers much of the Vale of York is a fluvio-glacial deposit. The Cleveland Dike is an intrusive igneous dike of augite-andesite of Tertiary age which can be traced across the country in a N.W. direction from the neighbourhood of Fylmgdales Moor.

Minerals. — The coal-field in the W. Riding is one of the chief sources of mineral w r ealth in Yorkshire, the most valuable scams being the Silkstone, which is bituirirous and of the highest reputa- tion as a house coal, and the Barnsley Thick Coal, the great seam of the Yorkshire coal-field, which is of special value, on account of its semi-anthracitic quality, for use in iron-smelting and in engine furnaces. Associated with the Upper Coal Measures there is_ a valuable iron ore, occurring in the form of nodules. Large quantities of fireclay are also raised, as well as of gannister and oil-shale. Middlesbrough is the most important centre .of pig-iron manu- facture in the kingdom. Lead ore is obtained in the Yoredale beds of the Pennine range in Wharfedale, Airedale, Nidderdale, Swale- dale, Arkendale and Wensleydale. Slates and flagstones are quarried in the Yoredale rock's. In the Millstone Grit there arc several beds of good building stone, but that most largely quarried is the magnesian limestone of the Permian series, which, however, is of somewhat variable quality.

Agriculture.-— Nearly nine-tenths of the E. Riding is under cultivation, but of the N. and W. Ridings only from three- fifths to seven-tenths— proportions explained by the different physical conditions. The till or boulder clay of Holderness is the richest soil in Yorkshire, and the chalk

wolds, by careful cultivation, form one of the best soils for grain crops The central plain bears all kinds of crops excellently. Wheat is grown in the E. and W. Ridings, but oats are the principal grain crop in these ridings, and barley exceeds wheat in all three. The bulk of the acreage under green crops is devoted to turnips and swedes. A little flax is grown, and liquorice is cultivated near Pontefract. The proportion of hill pasture is greatest in the N. Riding and least in the E., and the N. and W. Ridings are among the principal sheep-farming districts in England. Cattle, for the rearing of which the W. Riding is most noted, do not receive great attention. The Teeswater 'breed, however, is increasing in Yorkshire, and in Holderness there is a short-horned breed, chiefly valuable for its milking qualities. Cheese-making is largely carried on in some districts. Of sheep perhaps the most common breeds are the Leicester, Lincoln and South Down, and crosses between the Cheviot and the Leicester. Large numbers of pigs are kept at the dairy farms and fed mainly on whey. The small breed is that chiefly in favour. Yorkshire bacon is famous. Draught horses are generally of a somewhat mixed breed, but the county is famed for its hunters and carriage and saddle horses. The breed of Cleveland bays is much used for carriages.

Manufactures. — The industrial district of south Yorkshire occupies the S. of the W. Riding, and may be taken as marked off approximately by the watershed from the similar district in S. Lancashire. The W. Riding is now the chief seat of the woollen manufacture of the United Kingdom, and has almost a monopoly in the production of worsted cloths. The early development of the industry was in part due to the abundance of water-power, while later the presence of coal helped to maintain it on the introduction of steam-power. In this in- dustry nearly all the most important towns arc engaged, while the names of several of the largest are connected with various specialities. Thus, while almost every variety of woollen and worsted cloth is produced at Leeds, Bradford is especially concerned with yarns and mixed worsted goods, Dewsbury and Batley with shoddy, Huddersfield with fancy goods and Halifax with carpets. The cotton industry of Lancashire has also penetrated to the neighbourhood of Halifax. Among the characteristics of the industrial population, the love of music should be mentioned. Choral societies are numerous, and the work of some of those in the larger towns, such as Sheffield, Leeds and Bradford, has attracted wide notice. Next to the woollen industry comes the manufacture of iron and steel machinery and implements of every variety, which is common to most of the larger centres in the district. Sheffield is especi- ally famous for iron-work, fine metal-work and cutlery. The development of the iron ore deposits of Cleveland dates only from the middle of the 19th century. About two and a half million tons of pig-iron are produced in this district annually, and there are considerable attendant industries, such as the production of steel, and shipbuilding. The chemical

manu- facture is important both here and in the W. Riding, where also a great variety of minor industries have sprung up. Such are leather working (at Leeds), the manufacture of clothing, printing and bleaching, and paper-making. Besides coal and iron ore, great quantities of clay, limestone and sandstone are raised. Excellent building-stone is obtained at several places in the W. Riding: The sea-fisheries are of some importance, chiefly at Hull, Scarborough, Whitby and Filey.

Communications. — N. and E. of Leeds communications are provided almost wholly by the North-Eastern railway, the main line of which runs from Leeds and from Doncastcr N. by York, Thirsk and Northallerton. The main junction with the Great Northern line is effected immediately N. of Doncaster, at which town are the Great Northern works. This company serves the chief centres of the W. Riding, as do also the Midland, Great Central, London & North-Westem, Lancashire & Yorkshire, and North-

Eastern companies, the trains working over a close network of lines, while the system of run king-powers held by one or more companies over the lines of another assists intercommunication. The Midland main line to Carlisle runs by Leeds, Skipton and Settle through the hilly country of the W. The Hull & Barnsley line runs from Hull to Barnsley. A complete system of canals links the centres of the southern W. Riding with the sea both E. and W., the Aire & Calder Navigation communicating with the Ouse at Goole; the Huddersfield canal runs S.W. into Lancashire, crossing the watershed by the long Stanedge tunnel, and other canals are the Leeds & Liverpool, Calder & Nebble Navigation, and the Sheffield & South Yorkshire Navigation, which gives access from Sheffield to the Trent. The Aire & Calder Naviga- tion, the most important of these canals, which has branches from Castleford to Leeds and Wakefield, and other branches to Barnsley, Bradford and Selby, has a total length of 85 m., and has been much improved since its construction. It was projected by John Rennie and opened in 1826, with a depth of 7 ft. and locks measuring 72 by 18 ft. Its depth now varies from 8 ft. 6 in. to 10 ft., and over a distance of 28 m., between Goole and the collieries, the locks have been enlarged to 460 by 25 ft., and the width of the canal to 90 ft. The chief ports are Middlesbrough on the Tees, Hull on the Humber, and Goole on the Ouse.

Population and Administration. — The area of the ancient county is 3,882,328 acres. Its population in 1891 was 3,208,521, and in 1001, 3,584,762, The population increased over fiveiold between 1801 and 10.01; the increase in the W. Riding ex- ceeding sevenfold. The manner in which the population is distributed may be inferred from the following statement of the parliamentary divisions, parliamentary, county and muni- cipal boroughs, and urban districts in the three ridings. It should be premised that each of the three ridings is a dis- tinct administrative county;

though there is one high sheriff for the whole county. The city of York (pop. 77,914) is situated partly in each of the three ridings.

The West Riding has an area of 1,771,562 acres, with a popula- tion in 1891 of 2,445,033, and in 1901 of 2,750,493. Of this area the S. industrial district, considered in the broadest application of the term as extending between Sheffield and Skipton, Sheffield and Doncaster, and Leeds and the county boundary, covers rather less than one-half. The area thus defined includes the parliamen- tary divisions of Barnsley, Colne Valley, Elland, Hallamshire, Holmfirth, Keighley, Morlev, Normanton, Pudsey, Rotherham, Shipley, Sowerby, Spen Valley. It also includes parts of the divisions of Barkston Ash, Doncaster, Osgoldcross, Otley and Skipton (a small part). The remaining parts of these last divisions, with that of Ripon, cover the rest of the riding. Each division returns one member. The following are parliamentary boroughs: Bradford, returning 3 members, Dewsbury 1, Halifax 1, Hudders- field 1, Leeds 5, Pontefract 1, Sheffield 5, Wakefield 1. All these are within the industrial district. Within this district are the following municipal boroughs (pops, in 1901): Barnsley (41,086), Batley (30,321), Bradford, city and county borough (279,767), Brighouse (21735), Dewsbury (28,060), Doncastcr (28,932), Halifax, county borough (104,936), Huddersfield, county borough (95,047), Keighley (41,564), Leeds, city and county borough (428,968), Morley (23,636), Ossett (12,903), Pontefract (13,427), Pudsey (14,907), Rotherham (54,349), Sheffield, city and county borough (409,070), Todmorden (partly in Lancashire, 25,418), Wakefield, city (41,413). The only municipal boroughs elsewhere in the riding are Harrogate (28,423) and Ripon (cathedral city, 8230). Within the industrial region there are 113 other urban districts, those with populations exceeding 10,000 being Bingley (18,449), Castleford (17,386), Cleckhcaton (12,524), Elland (10,412), Feather- stone (12,093), Handsworth (13,404), Hoyland Nether (12,464), Liverscdge (13,980), Mexborough (10,430), Mirfield (11,341), Nor- manton (12,352), Rawmarsh (14,587), Rothwell (11,702), Saddle- worth (12,320), Shipley (25,573), Skipton (11,986), Sowerby Bridge (11,477), Stanley (12,290), Swinton (12,127), Thornhill (10,290), Wombwell (13,252), Worsborough (10,336). The only urban dis- tricts in the West Riding not falling within the industrial region arc— Goole (16,576), Ilkley (7455), Knaresborough (4979) and Selby

(7786).

The North Riding has an area of 1,362,378 acres, with a popu- lation in 1891 of 359,547 and in 1901 of 377-338. It comprises the parliamentary divisions of Richmond, Cleveland, Whitby, and Thirsk and Malton, each returning one member; and the parlia- mentary boroughs of Middlesbrough (one member), Scarborough (one member), and parts of Stockton-on-Tees

and York. The municipal boroughs are Middlesbrough, county borough (91,302), Richmond (3837), Scarborough (38,161) and Thornaby-on-Tees (16,0ˆ4). The urban districts are Eston (1 1,199), Guisborough (564s), HinderweH (193/), Kirklington-cum-Upsland (255), Loftus (6508), Malton (4758), Masham (1955), Northallerton (4009), Ormesby (9482), Pickering (3491), Redcar (7695), Saltburn-by-the- Sea (2578), Scalny (1350), Skelton and Brotton (13,240), South

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Bank in Normanby (9645}, Whitby (11,755). Of these, all ex- cept Kirklington, Malton, Masham, Northallerton, Pickering and Whitby arc in the populous Cleveland district. Besides Pickering, there lie at the S. of the Cleveland hills the small towns of Kirkby Moorside (1550) and Helmslcy (1363). South of the last-named is the village of Amplcforth, with its large Roman Catholic college, founded in 1802, and accommodating, in fine modern buildings, about 120 students.

The East Riding has an area of 750,039 acres, with a population in 1891 of 341,560 and in 1901 of 385,007. It comprises the parliamentary divisions of Buckrose, Howdenshirc and Holderncss, each returning one member; and contains the parliamentary borough of Hull, returning three members, and part of that of York. The municipal boroughs are Beverley (13,183), Bridlington (12,482), Hedon (1010), and Hull, or Kingston-upon-Hull, a city and county of a city and county borough (240,259). The urban districts are Cottingham, near I lull (3751), Filey (3003), Driffield (57 6 6)t Hcsslc, near Hull (3754), Hornsea (2381), Norton, near Malton (3842), Pocklington (2463) and Withernsea (1426).

The West Riding comprises 9 wapentakes and the liberty of Ripon. It has one court of quarter sessions and is divided into

26 petty sessional divisions. The boroughs of Bradford, Doncaster, Leeds, Pontefract, Rotherham and Sheffield, and the liberty of Ripon, have separate courts of quarter sessions and commissions of the peace; and Barnsley, Batley, Brighouse, Dewsbury, Hali- fax, Harrogate, Huddersfield, Keighley, Morley, Ossett and Wake- field have commissions of the peace. The liberty and borough of Ripon arc rated separately from the West Riding for the purposes of the county rate.

The North Riding comprises II wapentakes, and the liberties of E. and W. Langbaurgh and of Whitby Strand. It has one court of quarter sessions and

is divided into 19 petty sessional divisions. The boroughs of Richmond and Scarborough have separate courts of quarter sessions and commissions of the peace, and the borough of Middlesbrough has a commission of the peace. The East Riding comprises 6 wapentakes and has one court of quarter sessions, and is divided into 12 petty sessional divisions, while Hull has a separate court of quarter sessions and commis- sion of the peace, and Beverley has a separate commission of the peace. The city of York has a separate court of quarter sessions and commission of the peace. Yorkshire is in the N.E. circuit. The total number of civil parishes is 1586. The county contains

1178 ecclesiastical parishes and districts wholly or in part. It is divided between the dioceses of York, Ripon and Wakefield, with small parts in those of Manchester, Southwell, Durham and Lincoln. Y'ork is the seat of the northern archdiocese.

History.—- The kingdom of Deira (q.v.), which was afterwards to include the whole of the modern Yorkshire, is first known to us in the 6th century, an Anglian tribe having seized the pro- montory at the mouth of the Humber, named by the invaders Holderness, followed by the gradual subjugation of the whole district now known as the East Riding. The wolds between Weighton and Flamborough Head were then mere sheep-walks, and the earliest settlements were chiefly confined to the rich valley of the lower Uerwent, but the district around Weighton became the Deirati sacred ground, and Goodmanham is said to mark the site of a temple. The area computed in the modern West Riding constituted the British kingdom of Elmet, and at this date presented a desolate and unbroken tract of moor- land in the N.; in the central parts about iLeeds stretched a forest region where the last wolf seen in Yorkshire is said to have been slain by John of Gaunt; while in the S. the forest and fen of Hatfield Chase presented a barrier to invasion broken only by the line of Watling Street, which crossed the Don at Doncaster, the Aire at Castleford and the Wharfe at Tadcaster. The N. continuation of the road from York through Catterick to the Tees opened the way to the fertile plain in the heart of the modern North Riding, the S.E. of which offered an unbroken forest area, later known as the forest of Galtres, which in the middle ages stretched from York N. to Easing- wold and Craike and E. to Castle Howard, and as late as the 16th century lay a waste and unfrequented region abounding only in deer. Ella, the first king of Deira, extended his ter- ritory N. to the Wear, and his son Edwin completed the conquest of the district which was to become Yorkshire by the subjuga- tion of Elmet, prompted thereto by vengeance on its king,

Cerdic, for the murder of his uncle Hereric. Traces of the " burhs " by which Edwin secured his conquests are perhaps visible in the group of earthworks at Barwick and on the site of Cambodunum, but the district long remained scantily popu- lated, and as late as the 17th century deer were said to be as plentiful in Hatfield Chase as " sheep upon a hill," for Prince Henry in 160a was asserted to have killed 500 in one day's hunting. The defeat of Edwin at Hatfield in 633 was followed by a succession of struggles between Mercia and Northumbria for the supremacy over Deira, during which the boundaries underwent constant changes. After the Danish conquest of Deira, Guthrum in 875 portioned the district among his fol- lowers, under whose lordship the English population were for the most part allowed to retain their lands. Cleveland came under Scandinavian influence, and the division into tithings probably originated about this date, the boundaries being arranged to meet at York, which, as the administrative and commercial centre of the district, rapidly increased in importance, and it has been estimated that in a.d. iooo it had a population of over 30,000. At the battle of Stamford Bridge in 1066 Harold Hardrada, who had seized York, and Earl Tosti were both defeated and slain by Harold of England. The merciless harrying with which the Conqueror punished resistance to his claims is proved by the reiterated entries of waste land in the Domesday Survey, and for many years all the towns between York and Durham lay uninhabited. In 1138 the forces of David of Scotland were defeated near Northallerton in the Battle of the Standard. In the barons' wars of the reign of Henry II. Thirsk and Malgeard Castles, which had been garrisoned against the king by Roger dc Mowbray, were captured and demolished. In the harrying of the northern counties by the forces of Robert Bruce in 1318, Northallerton, Boroughbridge, Scarborough and Skipton were reduced to ashes. In 1322, at the battle of Boroughbridge, the rebel barons were defeated by the forces of Edward II. In 1399 Richard II. was murdered in Pontefract Castle. In 1405 Archbishop Scrope and Thomas Mowbray joined in the insurrection against Henry IV., and led the citizens of York to Skipton Moor, where, after a defeat by the earl of

Westmorland; the leaders were beheaded under the walls of York. In 1408 the rebel forces of the earl of Northumberland were defeated by Sir Thomas Rokesby. high sheriff of Yorkshireˆ at Bramham Moor near Tadcaster. In 1453 a skirmish between the Percies and (he Nevilles at Stamford Bridge was the opening event in the struggle between the houses of York and Lancaster; in 1460 the duke of York was defeated and slain at Wake- field; in 1461 the Lancastrians were defeated at Towton. The suppression of the monasteries roused deep resentment in Yorkshire, and the inhabitants flocked to join the Pilgrimage of Grace, Skipton Castle being the only place immediately N. of the Humber which remained loyal to the

king. On the outbreak of the Civil War of the 17th century, opinion was divided in York shire, the chief parliamentary families being the Fairfaxes and the Hothams, while the Puritan clothing-towns of the West Riding also sided with the parliament. Sir William Savile captured Leeds and W 7 akefield for the king in 1642, and in 1643 Newcastle, having defeated the Fairfaxes at Adwalton Moor, held all Yorkshire except Hull, which the Hothams, moved by jealousy of the Fairfaxes, had already designed to give up. In 1644, however, the Fairfaxes secured the East and West Ridings", while Cromwell's victory at Marston Moor was followed by the capture of York, and in the next year of Pontefract and Scar- borough.*

On the redistribution of estates after the Norman Conquest, Alan of Brittany, founder of Richmond Castle, received a vast fief which became the honour of Richmond; Ilbert de Laci was rewarded with lands which afterwards constituted the honour of Pontefract. Earl Harold's estate at Conings.burgh passed to William de Warenne, earl of Surrey, together with Sandal Castle, which on the expiration of the Warenne line in the 14th century was bestowed on Edmund Langley, duke of York. Other great Domesday landholders were William de Percy, founder of the abbey of Whitby; Robert de Bruce, ancestor of the royal line of Scotland, the head of whose fief in Cleveland was trans- ferred in the 12th century from Danby Castle to Skelton; Roge; de Busli owned a large tract in S. Yorkshire, of which Tickhill was the head; the archbishop of York enjoyed the great lordship of Sherburn, and Howdenshire was a liberty of the bishop oi Durham. Among the great lordships of the middle ages for which Yorkshire was distinguished were: Topcliffe, the honour of the Percies; Thirsk, of the Mowbrays; Tanfield, of the Marmions; Skipton, of the Cliffords; Middleham, of the FitZT Hughes and Nevilles; Helmsley, of the de Roos; Masham and Bolton, of the Scropes; Sheffield, of the Furnivalls and Talbots; Wakefield, of the duke of York. The Fairfaxes were settled in Yorkshire in the 13th century, and in the 16th century Denton became their chief seat.

The shire court for Yorkshire was held at York, but extensive privileges were enjoyed by the great landholders. In the 13th century Henry de Lacy, earl of Lincoln, claimed to hold the sheriff's tourn at Bradford and Leeds; his bailiff administered the wapentake of Stainclif in his court at Bacskalf and Slaidburnj and his steward judged cases of felony in his court at Almond- bury. The archbishop of York held the sheriff's tourn at Otley, and had his own coroners at York, Hull, Beverley and Ripon. Eudo la Zouche held the sheriff's tourn at Bingley, and Thomas de Furnivall in Hallamshire. The bailiffs of Tickhill Castle also held tourns in place of the sheriff. The bishop of Durham had a court at Hoveden, and the king's bailiffs were excluded from executing their office in his estates of Howdenshire and Allerton- shire. The abbot of St Mary's York had his own

coroners in the wapentake of Ryedale, and the abbot of Bella Landa in Sutton. The prior of Bradenstoke held a court in his manor of Wales. The archbishop of York, Robert de Ros, and the abbot of St Mary's York judged felonies at their courts in Holderness. The liberty of Ripon (q.v.) t city of Ripon, still constitutes a franchise of the archbishops of York.

In the 13th century the diocese of York included in this county the archdeaconry of York, comprising the deaneries of York, Pontefract, Doncaster and Craven; the archdeaconry of Cleveland, comprising the deaneries of Buhner, Cleveland

and Ryedale; the archdeaconry of East Riding, comprising the deaneries of Harthill (Hull), Buckrose, Dickering and Holder- ness; and the archdeaconry cf Richmond, comprising the deaneries of Richmond, Catterick, Boroughbridge and Lonsdale. In 1541 the deaneries of Richmond were transferred to Henry VIII. 's new diocese of Chester. Ripon was created an episcopal see by act of parliament in 1836, and the deaneries of Craven and Pontefract were formed into the archdeaconry of Craven within its jurisdiction, together with the archdeaconry of Richmond. The archdeaconry of Sheffield was created in 1884 to include the deaneries of Sheffield, Rotherharn, Ecclesfield and Wath. In 1888 the area of the diocese of Ripon was reduced by the creation of the see of Wakefield, including the archdeaconry of Halifax with the deaneries of Birstall, Dewsbury, Halifax, Silkstone and Wakefield, and the archdeaconry and deanery of Huddersfield. The diocese of Ripon now includes in this county the arch- deaconries of Craven with three deaneries, Richmond with three deaneries and Ripon with seven deaneries. The diocese of York includes the archdeaconries of York with six deaneries, Sheffield with four deaneries, East Riding with thirteen deaneries and Cleveland with nine deaneries.

The great woollen industry of Yorkshire originated soon after the Conquest, and the further development of this and other characteristic industries may be traced in the articles on the various industrial centres. The time of the American War marked the gradual absorption by Yorkshire of the clothing trade from the E. counties. Coal appears to have been used in Yorkshire by the Romans, and was dug at Leeds in the 13th century. The early fame of Sheffield as the centre cf the cutlery and iron trade is demonstrated by the line in Chaucer, " a Sheffield whitel bore he in his hose." In the 13th century a forge is mentioned at Rosedale, and the canons of Gisburn had four " fabricae " in blast in Glaifidale in Cleveland. In the 16th century

limestone was dug in many parts of Elmet, and Huddlestone, Hesselwood and Tad- caster had famous quarries; Pontefract was famous for its liquorice, Aberford for its pins, Whitby for its jet. Alum was dug at Guisboroiigh, Sandsend, Dnnsley and Whitby in the 17th century, and a statute of 1659 forbade the importation of alum from abroad, in order to encourage its cultivation in this country. Bolton market was an important distributive centre for cotton materials in the 17th century, and in 1787 there were eleven cotton mills in the county.

Parliamentary Representation. — The county of York was repre- sented by two knights in the parliament of 1295, and the boroughs of Beverley, Hedon, Malton, Pickering, Pontefract, Ripon, Scar- borough, Thirsk, Tickhil!, Yarm and York each by two burgesses. Northallerton acquired representation in 1298, Boroughbridge in 1300, King.Uon-on-Hull and Ravensburgh in 1304. In most of the boroughs the privilege of representation was allowed to lapse, and from 1328 until 1547 only York, Scarborough and Kingston-on-Hull returned members. Hedon, Thirsk, Ripon and Beverley regained the franchise in the 16th century, and Boroughbridge, Knares- borough, Aldborough and Richmond also returned members. Pontefract was represented in 1623, New Malton and Northallerton in 1640. In 1826 two additional knights were returned for the shire of York, and 14 boroughs were represented. Under the Reform Act of 1832 the county returned 6 members in 3 divisions — 2 for each riding; Aldborough, Boroughbridge and Hedon were dis- franchised ; Northallerton and Thirsk lost 1 member each ; Bradford, Halifax, Leeds and Sheffield acquired representation by 2 members each, and Wakefield and Whitby by 1 member each. Under the act of 1S68 the representation of the West Riding division was increased to 6 members in 3 divisions; Dewsbury and Middles- brough were enfranchised, returning I member each; Leeds now returned 3 members; Knaresborough, Malton, Richmond and Ripon lost I member each. Beverley was disfranchised in 1870. (For arrangements under the act of 1885 see § Administration.)

Antiquities.— 01 ancient castles Yorkshire retains many interesting examples. The fine ruins at Knaresborough, Pickering, Pontefract, Richmond, Scarborough and Skipton arc described under their respective headings. Barden Tower, picturesquely situated in upper Wharfedalc, was built by Henry dc Clifford (d. 1523), called the " shepherd lord " from the story that he was brought up as a shepherd. He was a student of astronomy and astrology. Bolton Castle, which rises majestically above Wensleydale, was pronounced by Leland " the fairest in Richmondshirc." It is a square building with towers at the corners, erected in the reign of Richard II. by Richard Scrope. chancellor of England, It was occupied by Queen Mary while under the charge of Lord Scrope, was besieged during the civil wars, and rendered untenable in 1647. Of Bowes Castle, in the North Riding

near Barnard Castle, there remains only the square keep, supposed to have been built by Alan Niger, 1st earl of Richmond, in the 12th century, but the site was occupied by the Romans. Cawood Castle, on the Ouse near Setby, retains its gate

way tower erected in the reign of Henry VI. The castle, said to have been founded by ˆLthelstan in 620, was the palace of the archbishops of York, and Wolsey resided in it. Conisborough Castle stands by the Don between Rotherharn and Doncaster. Its origin is uncertain, but dates probably from Saxon times. The keep and portions of the walis remain; and the ruin possesses additional interest from its treatment in Scott's Ivankoe. The ruins of Danby Castle, which is supposed to have been built shortly after the Conquest by Robert de Bruce or Brus, are of various dates. Harewood Castle in lower Wharfedale was founded soon after the Conquest, but contains no portions earlier than the reign of Edward III. The keep of Helmsley Castle was built late in the 12th century probably by Robert de Ros, surnamed Fursan; the earthworks are apparently of much earlier date. There are picturesque remains of the quadrangular fortress of Middlcham in Wensleydale, built in the 12th century by Robert FitzRanuIph, afterwards possessed by the Nevilles, and rendered untenable by order of parliament in 1647. Mulgrave Castle, near the modern residence of the same name in the Whitby district, is said to have been founded two centuries before the Conquest by a Saxon giant named Wade or Wadda. Parts are clearly Norman, but some cf the masonry suggests an earlier date. The castle was dismantled after the civil wars. There are slight remain, of the 15th century, of Ravensworth Castle, near Richmond. This was probably an early foundation of the family of Fit'z Hugh. Sheriff Hut ton Castle, between York and Malton, was the foundation of Bertram de Bulmer in the reign of Stephen ; the remains are of the early part of the 15th century, when the property passed to the Nevilles. Spofforth Castle, near Harrogate, was erected by Henry de Percy in i 309. Its ruins range from the period of foundation to the 15th century. Of Tickhill Castle, near Doncaster, built or enlarged by Roger de Busli in the nth century, there are foundations of the keep and fragments of the walls. Of Whorlton Castle in Cleveland, the Perpendicular gatehouse is very tine. One side remains of the great quadrangular fortress of Wressell, E. of Selby, built by Thomas Percy, earl of Worcester, in the reign of Richard II. Some of the mansions in the county incorporate remains of ancient strongholds, such as those at Gilling, under the Hambleton Hills in the North Riding, Ripley near Harrogate, and Skeltonin Cleveland. Medieval mansions are numerous, a noteworthy example being the Eliza- bethan hall of Burton Agnes, in the N. of Holderness.

In ecclesiastical architecture Yorkshire is extraordinarily rich. At the time of the Dissolution there were 28 abbeys, 26 priories, 23 nunneries, 30

friaries, 13 cells, 4 commanderies of Knights Hospitallers and 4 preceptories of Knights Templars. The principal monastic ruins are described under separate headings and else- where. These are Bolton Abbey (properly Priory), a foundation of Augustinian canons; Fountains Abbey, a Cistercian foundation, the finest and most complete of the ruined abbeys in England; the Cistercian abbey of Kirkstall near Leeds (q.v.); the Cistercian abbey of Rievaulx, and the Benedictine abbey of St Mary, at York. For the plans and buildings of Fountains, Kirkstall and St Mary's, York, see Abbey. Separate reference is also made to the ruins of Jervaulx (Cistercian) and Coverham (Premonstratensian) in Wensleydale, and to the remains at Bridlington, Guisborough, Malton, Whitby, Easby near Richmond, Kirkham near Malton, Monk Bretton near Barnsley, and Mount Grace near Northallerton. There are fine though scanty remains of Byland Abbey, of Early English date, between Thirsk and Malton; the abbey was founded for Cistercian monks in the 12th century, and was previously established at Old Byland near Rievaulx. There was a house of Premonstratensians at Egglestone above the Tees near Barnard Castle. Other ruins arc the Cistercian foundations of the 12th century at Meaux in Holderness, Roche, E. of Rotherharn, and Sawley in Ribblesdale; the Benedictine nunneries of Marrick in upper Swaledale, and Rosedale under the high moors of the N.E.; and the Gilbertine house of Watton in Holderness, of the 12th century, converted into a dwelling.

Descriptions are given in the articles on the respective cities and towns of the cathedral or minster at York, and of the numerous churches in that city; of the cathedral churches at Ripon and Wakefield; of the minster and the church of St Mary at Beverley; and of the fine parish churches at Bradford, Bridlington (the old priory church), Hedon, Hull, Rotherharn, Selby. (abbey church), Sheffield and Thirsk. In Holderness are the splendid churches of Howden and Patrington, both in the main Decorated ; and the fine late Norman building at Kirkburn. A very perfect though small example of a Norman church is seen at Birkin on the Aire below Pontefract. At Nun Monkton near York is a beautiful Early English church, formerly belonging to a Benedictine nunnery. Goodmanham in the S. Wolds is the scene, in all probability, of the conversion by Paulinus of Edwin of Northumbria in 625, who was afterwards baptized at York. At Kirkdale near Kirkby Moorside in the N. Riding is a singular example of an inscribed sundial of pre-Conquest date. At Lastingham in the same district is a very fine and early Norman crypt.

See Victoria County History, Yorkshire : T. Allen, History of the County of Yvrk (3 vols., London, 1828-31); T. Baines, York- shire Past and Present, including an account of the woollen trade

of Yorkshire by E. Baines (2 vols., London, 1871-77); John Burton, Monaskcon Eboracense (London, 1758-59); W. Smith, Old Yorkshire (London, 1881); G. Frank, Ryedale and North Yorkshire Antiquities (York, 1888); G. R. Park, Parliamentary Representation of Yorkshire (Hull, 1886); A. D. H. Leadman, Proelia Eboracensia, Battles fought in Yorkshire (London, 1891); T. D. Whi taker, History of Richmondshire (London, 1823), History of Craven (London, 1878), 'History of Leeds and Elmet (2 vols., Leeds, 1 816); J. Wainwright, Yorkshire; Wapentake of Strafford and TickhUl, vol. i. (Sheffield, 1826); W. Grainge, Castles and Abbeys of Yorkshire (York, 1855); J. Hunter, South Yorkshire (2 vols., London, 1828-31); J. J. Sheahan and T. Whellan, History of the City of York, the Ainsty Wapentake, and the East Riding of York- shire (3 vols., Beverley, 1855-57); T. Langdale, Topographical Dictionary of Yorkshire (Northallerton, 1809); G. H. de S. >J. Plantagenet Harrison, History of Yorkshire (London, 1879, &c.) ; see also publications of the Yorkshire Archaeological and Topo- graphical Society.

YORKTOWN, a town and the county-seat of York county, Virginia, U.S.A., on the York river 10 m. from its mouth, and about 60 m. E.S.E. of Richmond. Pop. (ioto) 136. It is served by the Baltimore, Chesapeake & Richmond steamship line, and about 63 m. distant is Lee Hall, a station on the Chesa- peake & Ohio railway. Large deposits of marl near the town are used for the manufacture of cement. In the main street is the oldest custom-house in the United States, and the house of Thomas Nelson (1738-1789), a signer of the Declaration of Independence. In commemoration of the surrender of Lord Cornwallis in October 1781, there is a monument of Maine granite (100 ft. 6 in. high) designed by R. M. Hunt and J. Q. A. Ward; its corner-stone was laid in 1881 during the centennial celebra- tion of the surrender, and it was completed in 1883. Yorktown was founded in 1601, as a port of entry for York county. It became the county-seat in 1696, and although it never had more than about 200 houses its trade was considerable until it was ruined by the War of Independence. In that war the final victory of the Americans and their French allies took place at Yorktown.

Baffled by General Nathanael Greene in his campaign in the Carolinas, his diminished force (fewer than 1400) sadly in need of reinforcement, and persuaded that the more southern colonies could not be held until Virginia had been reduced, Lord Cornwallis marched out of Wilmington, N. Carolina, April 25th, 1781, arrived at Petersburg, Virginia, on May 20th, and there with the troops which had been under William Phillips and Benedict Arnold and with further reinforcements from New York raised his army to more than 7000 men. Facing him_ in Richmond was Lafayette,

whom Washington had sent earlier in the year with a small force of light infantry to check Arnold, and who had now been placed in command of all the American troops in Virginia. Cornwallis's first attempt was to prevent the union of Lafayette and General Anthony Wayne. Failing in this, he retired down the James in the hope, it is thought, of receiving further reinforcements from General Henry Clinton. Clinton, who had not approved Cornwallis's plan against Virginia, at first ordered him to send a portion of his troops to aid in the defence of New York; but as other rein- forcements came to New York, and as the home government ap- proved Cornwallis's plan, Clinton resolved to establish a permanent base in the Chesapeake and directed Cornwallis to fortify a post for the protection of the British navy. Cornwallis seized Yorktown and Gloucester early in August and immediately began to fortify them. While Cornwallis was marching from N. Carolina to Virginia, Washington learned that a large French fleet under Count de Grasse was to come up from the West Indies in the summer and for a brief period co-operate with the American and French „ H armies. At a conference (May 21st) at Wethersfield,

Yorktown Q onTi ˆ cX \ cu ˆ t w jth the French commanders, Washington campaign, £ avouret j a p] an f or a j om t attack on New York when De Grasse should arrive. An attack on the British ih Virginia was, however, considered, and the minutes of the con- ference with some suggestions from Rochambeau having been sent to De Grasse, he announced in a letter received the 14th of August that he should sail for the Chesapeake for united action against Cornwallis. About the same time Washington learned from Lafayette that Cornwallis was fortifying Yorktown. Sir Samuel Hood with 14 ships-of-the-!ine arrived at the Chesapeake from the West Indies three days ahead of De Grasse, and proceeding to New York warned Admiral Thomas Graves of the danger. Graves took command of the combined fleet, 19 ships-of-the-hne, and on the 31st of August sailed for the Chesapeake in the hope of preventing the union of the French fleet from Newport, under Count de Barras, with that under De Grasse. He arrived at the Chesapeake ahead of De Barras, but after an encounter with De Grasse alone (September 5th), who had 24 ships-of-the-line, he

was obliged to return to New York to refit, and the French wei'c left in control of the coast. Leaving only about 4000 men to guard the forts oil the Hudson, Washington set out for Virginia with the remainder of his army immediatelv after learning of De Grasse's plan, and the French land forces followed. The French fleet transported the allied army from the head of the Chesapeake to the vicinity of Williamsburg, and on the 28th of September it marched to Yorktown. Receiving, on the same day, a despatch from Clinton promising relief, and fearing the enemy might out- flank him, Cornwallis abandoned his outposts during the following night and withdrew to his inner defences, consisting of .seven redoubts and six batteries

connected by intrenchments, besides batteries along the river bank. The allies, 16,000 strong, took possession of the abandoned posts and closed in on the town in a semicircle extending from Wormley Creek below it to about a mile above it, the Americans holding the right and the French the left. On the night of October 5ih-6th the allies opened the first parallel about 600 yds. from the British works, and extend- ing from a deep ravine on the N.W. to the river bank on the S.E., a distance of nearly 2 m. Six days later the second parallel was begun within 300 yds. of the British lines, and it was practically completed on the night of the 14th and 15th, when two British redoubts were carried by assault, one by the Americans led by Alexander Hamilton and one by the French led by Lieut. -Colonel G. de Deux-Ponts. In the morning of the 16th Cornwallis ordered Lieut. -Colonel Abercrombie to make an assault on two French batteries. He carried them and spiked eleven guns, but they were recovered and the guns were ready for service again twelve hours later. On the night of the 16th and 17th Cornwallis attempted to escape with his army to Gloucester on the opposite side of the river, but a storm ruined what little chance of success there was in this venture. In grave danger of an assault from the allies, Cornwallis offered to surrender on the 17th; two days later his whole army, consisting of 7073 officers and men, was surrendered, and American Independence was practically assured. The British loss during the siege was about 156 killed and 326 wounded; the American and French losses were 85 killed and 199 wounded.

In 1862 the Confederate defences about Yorktown were besieged for a month (April 4- May 3) by the Army of the Potomac under General M'Clellan. There was no intention on the part of the Confederate commander-in-chief, Joseph Johnston, to do more than gain time by holding Yorktown and the line of the Warwick river as long as possible without serious fighting, and without imperilling the line of retreat en Richmond; and when after many delays M' Clellan was in a position to assault with full assistance from his heavy siege guns, the Confederates fell back on Williamsburg.

SeeT. N. Page, " Old Yorktown," in Scribner's Magazine (October, 1881) ; H. P. Johnston, The Yorktown Campaign and the Surrender of Cornwallis (New York, 1881); A. S. Webb, The Peninsular Cam- paign (New York, 1882); and J. C. Ropes, Story of the Civil War., vol. ii.

YORUBAS; YORUBALAND. The Yoruba, a group of Negro tribes, have given their name to an extensive area in West Africa, in the hinterland of Lagos. The Yoruba are of true Negro stock, in many respects typical of the race, but among them are found persons with fighter ˆkins and features recalling the Ha.mil.ic or Semitic peoples. This arises, in all probability, from an infiltration of Berber and Arab blood through the Fula (q.v.). The

Yoruba themselves have traditions of an Oriental origin. They are divided into many tribes, among the best known being the Oyo = Yoruba proper, the Egba, Jebu, Ife and Ibadan. They are sometimes called by the French Nago, and are known to the Sierra Leonis, many of whom are of Yoruba descent, as Aku. A considerable proportion of the American negroes are also said to be of Yoruba origin. For a long period the Yoruba were raided by the Dahomeyans and other coast tribes, to sell as slaves to the white traders. They are both an urban and agricultural people. Pottery, weaving, tanning, dyeing, and forging are among their industries. The houses of chiefs, often containing fifty rooms, are well built, and decorated with carvings representing symbolic devices, fabulous animals and scenes of war or the chase.

The Yoruba have considerable administrative ability. Their system of government places the power in a council of elders pre- sided over by a chief who owes his position to a combination o£ the principles of heredity and election. 1 The ruling chief must

1 R. E. Dennett states that the government is based on the rule of four great chiefs who respectively represent the phases of family life, namely, (1) the deified head of the family, called Orisha; (2! the

always be taken from the members of one of two families, the succession in many cases passing from one to the other family alternately. Primogeniture is not necessarily considered.

Before the introduction of letters the Yoruba are said to have employed knotted strings for recording events. Their language, which has been reduced to writing and carefully studied, has pene- trated as far E. as Kano in the Hausa country. The best known dialectic varieties are those of Egba, Jebu, Ondo, Ife, Illorin and Oyo (Yoruba proper, called also Nago) ; but the discrepancies are slight. The most marked feature, a strong tendency towards monosyllabism — produced by phonetic decay — has given rise to the principle of intonation, required to distinguish words originally different but reduced by corruption to the condition of homophones. Besides the tones, of which there are three, — high, low and middle, — Yoruba has also developed a degree of vocalic harmony, in which the vowels of the affixes are assimilated to that of the root. Inflexion, as in Bantu, is effected chiefly by prefixes; and there is a remarkable power of word-formation by the fusion of several relational elements in a single compound term. The Bible and several other books have been translated into Yoruba, which as a

medium of general intercourse in West Africa ranks in importance next to Hausa and Mandingan. The Yoruba religion is that usually known as fetishism.

The YoruDa country extends from Benin on the E. to Dahomey on the \V. (where it somewhat overlaps the French frontier), being bounded N. by Borgu and S. by the coastlands of Lagos. It covers about 25,000 sq. m. Most of it is included in the British protectorate of Southern Nigeria. The land is moder- ately elevated and a large part of it is densely forested. It is well watered; the rivers belong mainly to the coast systems, though some drain to the Niger. The history of Yorubaland, as known to Europeans, does not go back beyond the close of the 17th century. At that time it was a powerful empire, and had indirectly come — through its connexion with Benin and Dahomey — to some extent under European influence. There was also a much slighter Moslem influence. One tradition brought the founder of the nation from Bornu. The Yoruba appear to have inhabited their present country at least as early as a.d. 1000. In the 18th century the Yoruba were constantly engaged in w'arfare with their Dahomeyan neighbours, and in 1738 they captured Kana, the sacred city of the kings of Dahomey. From 1747 to the time of King Gezo (1818) the Dahomeyans paid tribute to Yoruba. It was not until the early years of the 19th century that the Yoruba came as far S. as the sea, when they founded a colony at Lagos. About 1825 the province of Illorin, already permeated by Moslem influences from the north, declared itself independent of the Yoruba, and shortly afterwards Yorubaland was overrun by Fula invaders. From this time (1830-35) the Yoruba empire — there had been six confederate kingdoms — was broken up into a number of comparatively weak states, who warred with one another, with the Dahomeyans and with their Moslem neighbours. The advent of the British at first led to further complications and fighting, but gradually the various tribes gained confidence in the colonial government and sought its services as peacemaker. A treaty placing their country under British protection was signed by the Egba in January 1893, and the subsequent extension of British control over the other portions of Yorubaland met with no opposition.

Though divided into semi-independent states, the Yoruba retain a feeble sense of common nationality. The direct repre- sentative of the old Yoruba power is the alafin or king of Oyo occupying the N. and central parts of the whole region. Round this central state, which has lost much of its importance, are grouped the kingdoms of Illorin, Ijesa, Ife and Ondo in the E., Mahin and Jebu in the S. and Egba in the W. The ruler of each of these states has a title characteristic of his office. Thus the chief of Ife bears the title of oni (a term indicating spiritual supremacy!. To the oni of Ife or the alafin of Oyo all the other great chiefs announce their succession. The oni,

says Sir William MacGregor, is regarded as the fountain of honour, and without his consent no chief can assume the privi- lege of wearing a crown. The most important of the Yoruba

fatherhood; (3) motherhood; (4) sonship. The chief representing motherhood is brother to the mother, and-in the developed state has become the Balogun or war lord.

states is Egba, the ruling chief of which is the alake of Abeokuta (see Abeokuta).

Yorubaland is a country of comparatively large cities. The alafin resides at Oyo, on a headstream of the Oshun, a place which has succeeded the older capitals, Bohu and Katunga, lying farther N. and destroyed during the wars with the Fula. Oyo is exceeded in size by several other places in Yorubaland, where the inhabitants have grouped themselves together for mutual protection in walled towns. Thus have sprung up the important towns of Abeokuta on the Ogun, due N. of Lagos; Ibadan on a branch of the Omi, 30 m. S. of Oyo; and Illorin, capital of the Illorin state, besides several other towns with a population of some 40,000.

Sec A. Dalzell, The History of Dahomey (London, 1793); A. B Ellis, The Yoruba-speaking Peoples of the Slave Coast of West Africa (London, 1894) ; R. E. Dennett, Nigerian Studies, or the Religions and Political System of the Yoruba (London, 1910); C. F. Harford- Batter4hy, Niger and Yoruba Routes (London, 1895-96) ; and Lagos and Nigeria.

YOSAI [Kikuchi] (1781-1878), Japanese painter, was the son of a samurai named Kawara, of Yedo. He w r as adopted by the Kikuchi family, who were old hereditary retainers of the Tokugawa clan. When eighteen, he became a pupil of Takata Enjo; but, after studying the principles of the Kano, Shijo, and Maruyama schools — in the latter, perhaps, under Ozui, a son of Okyo — he developed an independent style, having some affinities with that of Tani BunchS, He was one of the last of the great painters of Japan; and his illustrated history of Japanese heroes, the Zenken Kojitsu, is a remarkable specimen of his power as a draughtsman in black and white.

YOSEMITE, a famous valley on the W. slope of the Sierra Nevada of California, about 150 m. E. of San Francisco and 4000 ft. a,bove the sea. It is 7 m. long, half a mile to a mile wide, and nearly a mile deep, eroded out of hard massive granite by glacial action. Its precipitous walls present a great variety of forms, and the bottom, a fuled-up lake basin, is level and park-like. The most notable of the wall rocks are: El Capitan, 3300 ft. high, a sheer, plain mass of granite; the Three Brothers, North Dome,

Glacier Point, the Sentinel, Cathedral, Sentinel Dome and Cloud's Rest, from 2800 to nearly 6000 ft. high; and Half Dome, the noblest of all, which rises at the head of the valley to the height of 4740 ft. These rocks illustrate on a grand scale the action of ice in mountain sculpture. For here five large glaciers united to form the grand trunk glacier that eroded the valley and occupied it as its channel. Its moraines, though mostly obscured by vegetation and weathering, may still be traced; while on the snowy peaks at the headwaters of the Merced a considerable number of small glaciers, once tributary to the main Yosemite glacier, still exist. The Bridal Veil Fall, 900 ft. high, is one of the most interesting features of the lower end of the valley. Towards the upper end the great Yosemite Fall pours from a height of 2600 ft. The valley divides at the head into three branches, the Tenaya, Merced and South Fork canyons. In the main (Merced) branch are the Vernal and Nevada Falls, 400 and 600 ft. high. The Nevada is usually ranked next to the Yosemite among the five main falls of the valley, and is the whitest of all the falls. The Vernal, about half a mile below the Nevada, is famous for its afternoon rainbows, At flood-time it is a nearly regular sheet about 80 ft. wide, changing as it descends from green to purplish-grey and white. In the S. branch, a mile from the head of the main valley, is the Illilouette Fall, 600 ft. high, one of the most beautiful of the Yosemite choir.

Considering the great height of the snowy mountains about the valley, the climate of the Yosemite is remarkably mild. The vegetation is rich and luxuriant. The tallest pines are over 200 ft. high; the trunks of some of the oaks are from 6 to 8 ft. in diameter; violets, lilies, golden-rods, ceanothus, man- zanita, wild rose and azalea make broad beds and banks ov bloom in the spring; and on the warmest parts of the walls flowers blossom in every month of the year.

The valley was discovered in 1851 by a military company in pursuit of marauding Indians; regular tourist travel began in 1856. The first permanent settler in the valley was Mr J. C. Lamon, who built a cabin in the upper end of it in i860 and planted gardens and orchards. In 1864 the valley was granted to the state of California by act of Congress on condition that it should be held as a place of public use, resort and recreation inalienable for all time, was re-ceded to the United States by California on the 3rd of March 1905, and is now included in the Yosemite National Park.

In the number and height of its vertical falls and in the massive grandeur of

El Capitan and Half Dome rocks Yosemite is unrivalled. But there are many other valleys of the same kind. The most noted of those in the Sierra, visited every summer by tourists, hunters and mountaineers, are the Hetch Hetchy Valley, a wonderful counter- part of Yosemite in the Tuolumne canyon; Tehipitee Valley, in the Middle Fork canyon of King's river; and the King's river Yosemite in the South Fork canyon, the latter being larger and deeper than the Merced Yosemite. All are similar in their trends, forms, sculpture and vegetation, and are plainly and harmoniously related to the ancient glaciers. The Romsdal and Naerodal of Norway and Lauterbrunnen of the Alps are well characterized glacial valleys of the Yosemite type, and in S.E. Alaska many may be observed in process of formation.

See the Annual Reports (Washington, 1891 sqq.) of the Super- intendent of the Park; the Guide to ttie Yosemite published by the California Geological Survey ; John Muir, Our National Parks (Boston, 1901); and Bunnell's Discovery of the Yosemite (New York, 1893). a- Mu.)*

YOUGHAL (pronounced Yawl), a seaport, market town and watering-place of county Cork, Ireland, on the W. side of the Blackwater estuary, and on the Cork & Youghal branch of the Great Southern & Western railway, 26I m. E. of Cork. Pop. (1901) 5393. The collegiate church of St Mary, in the later Decorated style, was erected in the nth century, but rebuilt in the t3th, and since that time frequently restored. It contains a beautiful monument to the 1st earl of Cork. The college was founded by an earl of Desmond in 1464- There are still a few fragments of the Dominican friary founded in 1269. The Clock Gate (1771) is noticeable, and portions of the old walls are to be seen. Myrtle Grove was formerly the residence of Sir Walter Raleigh. He was mayor of Youghal in 1588-89, and is said to have first cultivated the potato here. The harbour is safe and commodious, but has a bar at the mouth. At the N. extremity of the harbour the river is crossed by a bridge on wooden piles. The principal exports are corn and other agricultural produce; the imports are coal, culm, timber and slate. Coarse earthenware and bricks are manufactured. Fine point-lace commanding high prices is made by the Presentation Sisters. The Blackwater is famous for salmon, and sea-fishing is important. The Strand, the modern portion of the town, has all the attributes of a seaside resort.

Youghal (Eschaill, " the Yew wood ") was made a settlement of the Northmen in the 9th century, and was incorporated by King John in 1209. The Franciscan monastery, founded at Youghal by FitzGerald in 1224, was the earliest house of that order in Ireland. Sir Roger Mortimer landed at Youghal in 1317. The town was plundered by the carl of Desmond in 1579. In 1641 it was garrisoned and defended by the earl of Cork. In 1649 it declared for the parliament, and was occupied as his headquarters

by Cromwell. It sent two members to parliament from 1374 till the Union, after that only one down to 1885.

YOUNG, ARTHUR (1741-1820), English writer on agriculture and social economy, second son of the Rev. Arthur Young, rector of Bradfield, in Suffolk, chaplain to Speaker Onslow, was born on the nth of September 1741. After being at a school at Lavenham, he was in 1758 placed in a mercantile house at Lynn, but showed no taste for commercial pursuits. He published, when only seventeen, a pamphlet On the War in North America, and in 1761 went to London and started a periodical work, entitled The Universal Museum, which was dropped by the advice of Samuel Johnson. He also wrote four novels, and Reflections on the Present State of Affairs at Home

and Abroad in 1759. After his father's death in 1759, his mother had given him the direction of the family estate at Bradfield Hall; but the property was small and encumbered with debt. From 1763 to 1766 he devoted himself to farming on his mother's property. In 1765 he married a Miss Allen; but the union is said not to have been happy, though he was of domestic habits and an affectionate father. In 1767 he undertook on his own account the management of a farm in Essex. He engaged in various experiments, and embodied the results of them in A Course of Experimental Agriculture (1770). Though Young's experiments were, in general, unsuccessful, he thus acquired a solid knowledge of agriculture. He had already begun a series of journeys through England and Wales, and gave an account of his observations in books which appeared from 1768 to 1770-— A Six Weeks' Tour through the Southern Counties of England and Wales, A Six Months' Tour through the North of England and the Farmer's Tour through the East of England. He says that these books contained the only extant information relative to the rental, produce and stock of England that was founded on actual examination. They were very favourably received, being translated into most European lan- guages by 1792.

In 1768 he published the Farmer's Letters to the People of England, in 1771 the Farmer's Calendar, which went through a great number of editions, and in 1774 his Political Arithmetic, which was widely translated. About this time Young acted as parliamentary reporter for the Morning Post. He made a tour in Ireland in 1776, publishing his Tour in Ireland in 1780. In 1784 he began the publication of the Annals of Agriculture, which was continued for 45 volumes: this work had many con- tributors, among whom was George HI., writing under the nam de plume of " Ralph Robinson." Young's first visit to France was made in 1787. Traversing that country m every direction just before and during the first movements of the Revolution, he has given valuable notices of the condition of the people and

the conduct of public affairs at that critical juncture. The Travels in France appeared in 2 vols, in 1792. On his return home he was appointed secretary of the Board of Agriculture, then (1793) just formed under the presidency of Sir John Sinclair. In this capacity he gave most valuable assistance in the collection and preparation of agricultural surveys of the English counties. His sight, however, failed, and in 181 1 he had an operation for cataract, which proved unsuccessful. He suffered also in his last years from stone. He died on the 20th of April 1820. He left an autobiography in MS., which was edited (1898) by Miss M. Betham-Edwards, and is the main authority for his life; and also the materials for a great work on the " Elements and practice of agriculture."

Arthur Young was the greatest of all English writers on agri- culture; but it is as a social and political observer that he is best known, and his Tour in Ireland and Travels in France are still full of interest and instruction. He saw clearly and exposed unsparingly the causes which retarded the progress of Ireland. He strongly urged the repeal of the penal laws which pressed upon the Catholics; he condemned the restrictions imposed by Great Britain on the commerce of Ireland, and also the perpetual interference of the Irish parliament with industry by prohibitions and bounties. He favoured a legislative union of Ireland with Great Britain, though he did not regard such a measure as absolutely necessary, many of its advantages being otherwise attainable.

The soil of France he found in general superior to that of England, and its produce less. ' Agriculture was neither as weli understood nor as much esteemed as in England. He severely censured the higher classes for their neglect of it. " Banishment (from court) alone will force the French nobility to execute what the English do for pleasure — reside upon and adorn their estates." Young saw the commencement of violence in the rural districts, and his sym- pathies began to take the side of the classes suffering from the excesses of the Revolution. This change of attitude was shown by his publication in 1793 of a tract entitled The Example of France a Warning to England. Of the profounder significance of the French outbreak he seems to have had little idea, and thought the crisis would be met by a constitutional adjustment in accordance with the English type. He strongly condemned the metayer system, then widely prevalent in France, as " perpetuating poverty and exclud- ing instruction " — as, in fact, the ruin of the country. Some of his phrases have been often quoted by the advocates of peasant

proprietorship as favouring; their view. " The magic of property turns sand

to gold. ‘ ” Give a man the secure possession of a bleak rock, and he will turn it into a garden; give him a nine years’ lease of a garden, and he will convert it into a desert.” But these sentences, in which the epigrammatic form exaggerates a truth, and which might seem to represent the possession ot capital as of no importance in agriculture, must not be taken as conveying his approbation of the system of small properties in general. He approved it only when the subdivision was strictly limited, and even then with great reserves; and he remained to the end what J. S. Mill calls him, ” the apostle of la grande culture”

The Directory in 1801 ordered his writings on the art to be trans- lated and published at Paris in 20 volumes under the title of Le Cultivateur anglais. His Travels in France were translated in 1793-94 °y Soules; a new version by M. Lesage, with an intro- duction by M. de Lavergne, appeared in 1856. An interesting review of the latter publication, under the title of Arthur Young ct la France de 178Q, will be found in M. Baudrillart’s Publicises modernes (2nd ed., 1873).

YOUNG, BRIGHAM (1801-1877), second president of the Church of Jesus Christ of Latter-Day Saints, was born in Whittingham, Vermont, on the 1st of June 1801. He died in Salt Lake City, Utah, on the 29th of August 1877. (See Mormons.)

YOUNG, CHARLES MAYNE (1777-1856), English actor, was the son of a surgeon. His first stage appearance was in Liver- pool in 1798 as Douglas, in Home’s tragedy. His first London appearance was in 1807 as Hamlet. With the decline of John Philip Kemble, and until the coming of Kean and Macready, he was the leading English tragedian. He retired in 1832.

YOUNG, EDWARD (1683-1765), English poet, author of Night Thoughts, son of Edward Young, afterwards dean of Salisbury, was born at his father’s rectory at Upham, near Winchester, and was baptized on the 3rd of July 1683. He was educated on the foundation at Winchester College, and matri- culated in 1702 at New College, Oxford. He soon removed to Corpus Christi, and in 1 708 was nominated by Archbishop Tenison to a law fellowship at All Souls’, for the sake of Dean Young, who died in 1705. He took his degree of D.C.L. in 1719. His first publication was an Epistle to … . Lord Lansdoune (1713). It was followed by a Poem on the Last Day (1713), dedicated to Queen Anne; The Force of Religion: or Vanquished Love (1714), a poem on the execution of Lady Jane Grey and her husband, dedicated to the countess of Salisbury; and an epistle to Addison, On the late Queen’s Death and His Majesty’s Accession to the Throne (17 14), in which he made indecent haste to praise the new king. The fulsome style of these dedications ill accords with the pious tone of the poems, and they are omitted in the edition of his works drawn up by

himself. About this time began his connexion with Philip, duke of Wharton, whom he accompanied to Dublin in 1 717. In 1 7 19 his play of Busiris was produced at Drury Lane, and in 1721 his Revenge. The latter play was dedicated to Wharton, to whom it owed, said Young, its " most beautiful incident." Wharton promised him two annuities of £100 each and a sum of £600 in consideration of his expenses as a candidate for parliamentary election at Cirencester. In view of these promises Young said that he had refused two livings in the gift of All Souls' College, Oxford, and had also sacrificed a life annuity offered by the marquess of Exeter if he would act as tutor to his son. Wharton failed to discharge his obligations, and Young, who pleaded his case before Lord Chancellor Hardwicke in 1740, gained the annuity but not the £600. Between 1725 and 1728 Young published a scries of seven satires on The Universal Passion. They were dedicated to the duke of Dorset, Bubb Dodington (afterwards Lord Melcombe), Sir Spencer Compton, Lady Elizabeth Germain and Sir Robert Walpole, and were collected in 1728 as Love of Fame, the Universal Passion. This is qualified by Samuel Johnson as a " very great performance," and abounds in striking and pithy couplets. Herbert Croft asserted that Young made £3000 by his satires, which compensated losses he had suffered in the South Sea Bubble. In 1726 he received, through Walpole, a pension of £200 a year. To the end of his life he continued to urge on the government his claims to preferment, but the king and his advisers persisted in regarding this sum as an adequate settlement.

Young was nearly fifty when he decided to take holy orders. It was reported that the author of Night Thoughts was not, in his earlier days, " the ornament to religion and morality which he afterwards became," and his intimacy with the duke of Wharton and with Lord Melcombe did not improve his reputation. A statement attributed to. Pope probably gives the correct view; " He had much of a sublime genius, though without common sense; so that his genius, having no guide, was perpetually liable to degenerate into bombast. This made him pass a foolish youth, the sport of peers and poets; but his having a very good heart enabled him to support the clerical character when he assumed it, first with decency and afterwards with honour " (0. Ruffhead, Life of A. Pope, p. 291). In 1728 he was made one of the royal chaplains, and in 1 730 was presented to the college living of Welwyn, Hertfordshire. He married in 1731 Lady Elizabeth Lee, daughter of the 1st earl of Lichfield. Her daughter, by a former marriage with her cousin Francis Lee, married Henry Temple, son of the 1st viscount Palmerston. Mrs Temple died at Lyons in 1736 on her way to Nice. Her husband and Lady Elizabeth Young died in 1740. These successive deaths are supposed to be the events referred to in the Night Thoughts as taking place " ere thrice yon moon had filled her horn " (Night i.). In the preface to the poem Young states that the occasion of the poem

was real, and Philander and Narcissa have been rather rashly identified with Mr and Mrs Temple. M. Thomas suggests that Philander represents Thomas Tickell, who was an old friend of Young's, and died three months after Lady Elizabeth Young. It was further supposed that the infidel Lorenzo was a sketch of Y r oung's own son, a statement disproved by the fact that he was a child of eight years old at the time of publication. The Complaint, or Night Thoughts on Life, Death and Immortality, was published in 1742, and was followed by other " Nights," the eighth and ninth appearing in 1745. In 1753 his tragedy of The Brothers, written many years before, but suppressed because he was about to enter the Church, was produced at Drury Lane. Night Thoughts had made him famous, but he lived in almost uninterrupted retirement, although he continued vainly to solicit preferment. He was, however, made clerk of the closet to the princess dowager in 1761. He was never cheerful, it was said, after his wife's death. He disagreed with his son, who had remonstrated, apparently, on the excessive influence exerted by his housekeeper Miss (known as Mrs) Hallows. The old man refused to sec his son before he died, but is said to have forgiven him, and left him his money. A description of him is to be found in the letters of his curate, John Jones, to Dr Samuel Birch. He died at Welwyn on the 5th of April 1765.

Young is said to have been a brilliant talker. He had an extraordinary knack of epigram, and though the Night Thoughts is long and disconnected it abounds in brilliant isolated passages. Its success was enormous. It was translated into French, German, Italian, Spanish, Portuguese, Swedish and Magyar. In France it became one of the classics of the romantic school. The suspicion of insincerity that damped the enthusiasm of English readers acquainted with the facts of his career did not exist for French readers. If he did not invent " melancholy and moonlight " in literature, he did much to spread the fashionable taste for them. Madame Klopstock thought the king ought to make him archbishop of Canterbury, and some German critics preferred him to Milton. Y 7 oung wrote good blank verse, and Samuel Johnson pronounced Night Thoughts to be one of " the few poems " in which blank verse could not be changed for rhyme but with disadvantage.

Other works by Young are: The Instalment (to Sir R. Walpole, 1726); Cynthio (1727); A Vindication of Providence . . . (1728), a sermon; An Apology for Punch (1729), a sermon; Imperium Pelagi, a Naval Lyrkk . . . (1730); Two Epistles to Mr Pope concerning the Authors of the Age (l 730); A Sea-Piece . . . (1733); The Foreign Address, or The Best Argument for Peace (1734) ; The Centaur not Fabulous; in Five Letters to a Friend (1755); An Argument . . . for the Truth of His [Christ's] Religion (1758), a sermon preached before the king; Conjectures on Original Composi- Hon . . . (1759). addressed to Samuel Richardson; and Resignation ' . . . (1762),

a poem.

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Night Thoughts was illustrated by William Blake in I797i and by Thomas Stothard in 1799. The Poetical Works of the Rev. Edward Young . . . were revised by himself for publication, and a com- pleted edition appeared in 1778. The Complete Works, Poetry and Prose, of the Rev. Edward Young . . ., with a life by John Doran, appeared in 1854. His Poetical Works are included in the Aldine Edition of the British Poets, with a life by J . Mitford (1830-1836, 1&57 and 1866). Sir Herbert Croft wrote the life included in Johnson's Lives of the Poets, but the critical remarks are by Johnson. For Young s influence on foreign literature see Joseph Texte, Jean Jacques Rousseau, A Study of the Literary Relations between France and England during the Eighteenth Century (Eng. trans., 1889), pp. 304-14; and J. Barnstoff, Young's Nachtgedanken und ihr Einfluss auf du dentsche Lilteratur (1895). See also W. Thomas, Le Poele Edurnrd Young (Paris, 1901), who gives an exhaustive study of Young's life and work.

YOUNG, JAMES (1811-18S3), Scottish industrial chemist, was born in Glasgow on the 13th of July 1811. During his apprenticeship to his father, a carpenter, he attended evening classes at Anderson's College, where he had Lyon Playfair and David Livingstone for fellow-pupils; and the ability he showed was such that Thomas Graham, the professor of chemistry, chose him as lecture assistant in 1832. About 1839, on the recommendation of Graham, whom in 1837 he had accom- panied to University College, London, he was appointed chemist at James Muspratt's alkali works in Lancashire; in connexion with alkali he showed that cast-iron vessels could be satisfactorily substituted for silver in the manufacture of caustic soda, and worked out improvements in the production of chlorate of potash. But his name is best known in connexion with the establishment of the Scottish mineral-oil industry. In 1847 Lyon Playfair informed him of a spring of petroleum which had made its appearance at Ridding's Colliery at Alfreton in Derbyshire, and in the following year he began to utilize it for making both burning and lubricating oils. This spring was practically exhausted by r85i. It had served to draw Young's attention to the question of oil-production, and in 1850 he took out his fundamental patent for the dis- tillation of bituminous substances. This was socn put into operation in Scotland, first with the Boghead coal or Torbane- hill mineral, and later with bituminous shales, and though he had to face much litigation Young successfully employed it in the manufacture of naphtha and lubricating oils, and subsequently of illuminating oils and paraffin wax, until in 1866, after the patent had expired, he transferred his works to a limited company. In 1872 he suggested the use of caustic lime to prevent the corrosion of iron ships by the bilge water, which he noticed was

acid, and in 1878 he began a determina- tion of the velocity of white and coloured light by a modifica- tion of H. L. Fizeau's method, in collaboration with Professor George Forbes (b. 1849), at Pitlochry. The final results were obtained in t88o-8i across the Firth of Clyde from Kelly, his house at Wemyss Bay, and a hill above Indian, and gave values rather higher than those obtained by M. A. Comu and A. A. Mkhelson. Young was a liberal supporter of David Livingstone, and also gave £10,500 to endow a chair of technical chemistry at Anderson's College. He died at Wemyss Bay on the 14th of May 1883.

YOUNG, THOMAS (1773-1829), English man of science, belonged to a Quaker family of Milverton, Somerset, where he was born on the 13th of June 1773, the youngest of ten children. At the age of fourteen he was acquainted with Latin, Greek, French, Italian, Hebrew, Persian 'and Arabic. Beginning to study medicine in London in 1792, he removed to Edinburgh in 1794, and a year later went to Gottingcn, where he obtained the degree of doctor of physic 101796. In 1797 he entered Emmanuel College, Cambridge. In the same year the death of his grand-uncle, Richard Brocklesby, made him financially independent, and in 1799 he established himself as a physician in Welbeck Street, London. Appointed in 1801 professor of physics at the Royal Institution, in two years he delivered ninety-one lectures. These lectures, printed in 1807 {Course of Lectures on Natural Philosophy), contain a remark- able number of anticipations of later theories. He resigned his professorship in 1803, fearing that its duties would interfere

with his medical practice. In the previous year he was ap- pointed foreign secretary of the Royal Society, of which he had been elected a fellow in 1794. In 1811 he became physician to St George's Hospital, and in 1814 he served on a committee appointed to consider the dangers involved by the general introduction of gas into London. In 1816 he was secretary of a commission charged with ascertaining the length of the seconds pendulum, and in 1818 he became secretary to the Board of Longitude and superintendent of the Nautical Almanac. A few years before his death he became interested in life assurance, and in 1827 he was chosen one of the eight foreign associates of the French Academy of Sciences. He died in London on the 10th of May 1829.

Young is perhaps best known for his work in physical optics, as the author of a remarkable series of researches which did much to establish the undulatory theory of light, and as the discoverer of the interference of light (see Interference). He has also been called the founder of physiological optics. In 1793 he explained the mode in which the eye accommodates itself to vision at different distances as depending on change of the curvature of the crystalline lens; in 1801 he described the defect known as

astigmatism; and in his Lectures he put forward the hypothesis, afterwards developed by H. von Helmholtz, that colour perception depends on the presence in the retina of three kinds of nerve fibres which respond respectively to red, green and violet light. In physiology he made an important contribution to haemadynamics in the Croonian lecture for 1808 on the " Functions of the Heart and Arteries," and his medical writings included An Introduction to Medical Literature, including a System of Practical Nosology (i8t3) and A Practical and Historical Treatise on Consumptive Diseases (18 r 5).

In another field of research, he was one of the first successful workers at the decipherment of Egyptian hieroglyphic, inscrip- tions; by 1814 he had completely translated the enchorial (demotic) text of the Rosetta stone, and a few years later had made considerable progress towards an understanding of the hieroglyphic alphabet (see Egypt, § Language and Writing). In 1823 he published an Account of the Recent Discoveries in Hieroglyphic Literature and Egyptian Antiquities. Some of his conclusions appeared in the famous article of Egypt which in 1818 he wrote for the Encyclopedia Brilannica.

His works were collected, with a Life by G. Peacock, in 1855.

YOUNG MEN'S CHRISTIAN ASSOCIATION, 1 an organization for social and religious work among young men, founded in England by Sir George Williams (1821-1905), a merchant of London. Williams's organization grew out of meetings he held for prayer and Bible-reading among his fellow-workers in a dry goods business in the city of London, and was founded in 1844; on the occasion of its jubilee its originator was knighted. Similar associations, indeed, had been in existence in Scotland at a much earlier date. In 1824 David Naismith, who also founded city missions in London and Glasgow, started the Glasgow Young Men's Society for Religious Improvement, a movement which spread to various parts of the United Kingdom, France and America: later the name was changed to the Glasgow Young Men's Christian Association. The object of such associations is to provide in large towns a rendezvous for young men who are compelled to live in lodgings or in the apartments provided by the great business houses. An associate of the Y.M.C.A. must not only be of good moral character, but must also express his adherence to the objects and principles of the association. To be a member means a definite acceptance of the doctrines of the Evangelical Christian faith. In 1910 there were about 400 associations in England, Ireland and Wales, and 226 in Scotland — besides various soldiers' and other auxiliaries. The total membt-jship was about 146,000. Some of the buildings, notably in the Midlands and the north of England, are very fine. The London Association, which from 1880 until shortly before its demolition in 1908 used Exeter

Hall, Strand, has erected a 1 Commonly abbreviated Y.M.C.A.

handsome block of buildings in Tottenham Court Road, de- signed to provide, in addition to the usual features, bedrooms at a reasonable rent.

The Young Men's Christian Association is seen at its best in the United States. It is true that Germany has more associations than any other country, but of its 2129 branches only 142 have their own buildings, and the total member- ship is only 125.000. In America, however, the associations have been built on a broad basis and worked with enterprise and business skill. Thus they have been able to secure the generous support of many of the leaders of commerce. America has over 1900 associations, and the total membership is 456,000. In Greater Britain the associations are numerous and flourishing, and Canada has 35,000 members. There are many active associations in Switzerland, Norway, Denmark and the Nether- lands, and indeed the Y.M.C.A. is now well known all over the world. Even in Japan, China and Korea there are 150 branches with a membership of nearly 12,000. The value of associa- tion buildings all over the world is £11,940,000 (America, £8,900,000; Greater Britain, £1,912,000; United Kingdom, £1,128,000).

The Young Women's Christian Association was founded in 1855, by two ladies simultaneously. In the south of England Miss Robarts started a Prayer Union with a purely spiritual aim; in London Lady Kinnaird commenced the practical work of opening homes and institutes for young women in business. In 1877 the two branches united in the Young Women's Christian Association, which seeks to promote the aU-round welfare of young women by means of residential and holiday homes, club rooms, restaurants, noon rest rooms, classes and lectures, and other useful departments. The Young Women's Christian Association has spread all over the world, and the total membership is about half a million.

YOUNGSTOWN, a city and the county-seat of Mahoning county, Ohio, U.S.A., on the Mahoning river, about 60 m. S-E. of Cleveland. Pop. (1900) 44,885 (12,207 being foreign-born especially English, Irish and German); (1910 census) 79,066. It is served by the Baltimore & Ohio, the Erie, the Lake Shore & Michigan Southern, the Pennsylvania, and the Pittsburg & Lake Erie railways, and by interurban electric lines. The Rayen High School (incorporated 1856) was endowed under the will of Judge William Rayen (1776-1854). The Reuben McMillan Public Library (about 25,000 volumes in 1910) is housed in a building finished in 1910 and is named in honour of Reuben McMillan (1S20-1898), formerly superintendent of schools. Among other public buildings are the post office

and Federal court house, the county court house, 'the city and the Mahoning Valley hospitals, and the Y.M.C.A. building. The business district lies in the valley on the N. of the river; the resi- dential districts are chiefly on the neighbouring hills. Youngs- town has four parks, including Mill Creek (483 acres). East End (60 acres) and Wick (48 acres), presented to the city by the Wick family, descendants of the merchant Henry Wick (1771-1845). The value of its factory products increased from $33>9°8,459 in 1906 to $48,126,885 in 1905. The most im- portant establishments are blast-furnaces, iron and steel works (of the U.S. Steel Corporation) and rolling mills.

Youngstown was named In honour of John Young (1763- 1825), a native of Petcrsbo rough, New Hampshire, who in 1796 bought from the Connecticut Land Company a tract of land upon which the city now stands, and lived there from 1799 until 1S03. The first permanent settlement was made prob- ably in 1796 by William Hillman. The tract was set off as a township in 1800, and the first township government was organized in 1802; the town was incorporated in 1848, and was chartered as a city of the second class in 1867. The county- seat of Mahoning county was removed From Canfield to Youngs- town in 1876, and after much litigation the legality of this removal was confirmed by the United States Supreme Court in 1879. The first iron-mining in the region was done in 1803 by Daniel Eaton, who in 1804 built the first blast-furnace W. of Pennsylvania and N. of the Ohio river. Eaton also built in 1826 the first blast-furnace within the present limits of Youngs- town.

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YPRES (Flemish Yperen), a town of Belgium, in the province of West Flanders, of which it was formerly considered the capital. Pop. (1904) 17,073. It is situated 35 m: S. of Ostend and 12 m. W. of Courtrai, on the Yperlee, a small river flowing into the Yser, both of which have been canalized. In the 14th century it ranked with Bruges and Ghent, and its popula- tion in its prime reached 200,000. It is remarkable chiefly for its fine Halles or cloth market, with a facade of over 150 yds. in length. The main building was begun in 1201 and com- pleted in 1304. The cathedral of St Martin dates from the 13th century, with a tower of the 15th century. Jansen, bishop of Ypres and the founder of the Jansenist school, is buried in the cathedral. The Butchers' Hall is also of interest and dates from the 15th century. Although Ypres is unlikely to regain the importance it possessed when its " red-coated " contingent turned the day in the great battle of Courtrai (T302), it has an important linen and lace trade and a great butter market. The Belgian cavalry training-school is established at Ypres.

YPSILANTI, or Hytsilanti, the name of a family of Phan- ariot Greeks claiming descent from the Comneni. Alexander Y'psilanti (1725-ˆ05) was dragoman of the Porte, and from 1774 to 1782 hospodar of Wallachia, during which period he drew up a code for the principality. He was again appointed hospodar just before the outbreak of the war with Austria and Russia in r7go. He allowed himself to be taken prisoner by the Austrians, and was interned at Briinn till 1792. Returning to Constantinople, he fell under the suspicion of the sultan and was executed in 1805. His son Constantine (d. 1816), who had joined in a conspiracy to liberate Greece and, on its discovery, fled to Vienna, had been pardoned by the sultan and in 1799 appointed by him hospodar of Moldavia. Deposed . in 1805, he escaped to St Petersburg, and in 1806, at the head of some 20,000 Russians, returned to Bucharest, where he set to work on a fresh attempt to liberate Greece. His plans were ruined by the peace of Tilsit ; he retired to Russia, and died at Kiev. He left five sons, of whom two played a conspicuous part in the Greek war of independence.

Alexander Ypsilanti (1 792-1828), eldest son of Constantine Ypsilanti, accompanied his father in 1805 to St Petersburg, and in 1809 received a commission in the cavalry of the Imperial Guard. He fought with distinction in 1812 and 1813, losing an arm at the battle of Dresden, and in r8i4 was promoted colonel and appointed one of the emperor's adjutants. In this capacity he attended Alexander I. at the congress of Vienna, where he was a popular figure in society (see La Garde-Cham- bonas, Souvenirs). In 1817 he became major-general and com- mander of the brigade of hussars. In 1820, on the refusal of Count Capo dTstria to accept the post of president of the Greek Hctairia Philike, Ypsilanti was elected, and in 1821 he placed himself at the head of the insurrection against the Turks in the Danubian principalities. Accompanied by several other Greek ofliccrs in the Russian service he crossed the Pruth on the 6th of March, announcing that he had the support of a " great power." Had he advanced on Ibraila he might have prevented the Turks entering the principalities and so forced Russia to accept the fait accompli. Instead, he remained at Jassy, disgracing his cause by condoning the massacres of Turkish merchants and others. At Bucharest, whither he advanced after some weeks' delay, it became plain that he could not rely on the Vlach peasantry to rise on behalf of the Greeks; even the disconcerting expedient of his Vlach ally Theodore Vladimiresco, who called on the peasants to present a petition to the sultan against Phanariot misrule, failed to stir the people from their apathy. Then, wholly unexpectedly, came a letter from Capo dTstria upbraiding Ypsilanti for mis- using the tsar's name, announcing that his name had been struck off the army list, and commanding him to lay down his arms. Ypsilanti's decision to explain away the tsar's letter could only have been justified by the success of a

cause which was now hopeless. There followed a series of humiliating defeats, culminating in that of Dragashan on the 19th of June.

Alexander, accompanied by his brother Nicholas and a remnant of his followers, retreated to Rimnik, where he spent some days in negotiating with the Austrian authorities for permission to cross the frontier. Fearing that his followers might surrender him to the Turks, he gave out that Austria had declared war on Turkey, caused a Te Deum to be sung in the church of Kosia, and, on pretext of arranging measures with the Austrian commander-in-chief, crossed the frontier. But the Austria of Francis I. and Metternich was no asylum for leaders of revolts in neighbouring countries. Ypsilanti was kept in close con- finement for seven years, and when released at the instance of the emperor Nicholas I. of Russia, retired to Vienna, where he died in extreme poverty and misery on the 31st of January 1828.

Demetrios Ypsilanti (1793-1832), second son of Prince Constantine, distinguished himself as a Russian officer in the cam- paign of 1814, and in the spring of 1821 went to the Morea, where the war of Greek independence had just broken out. He was one of the most conspicuous of the Phanariot leaders during the earlier stages of the revolt, though he was much hampered by the local chiefs and by the civilian element headed by Mavro- cordato. In January 1822 he was elected president of the legislative assembly; but the ill-success of his campaign in central Greece, and his failure to obtain a commanding position in the national convention of Astros, led to his retirement early in 1823. In 1828 he was appointed by Capo dTstria commander of the troops in East Hellas. He succeeded, on the 25th of September 1829, in forcing the Turkish commander Asian Bey to sign a capitulation at the Pass of Petra, which ended the active operations of the war. He died at Vienna on the 3rd of January 1832.

Gregory Ypsilanti (d. 1835), third son of Prince Constantine, founded a princely family still settled near Briinn. Nicholas Ypsilanti wrote Memoires valuable as giving material for the antecedents of the insurrection of 1820 and the part taken in them by Alexander I. of Russia. They were published at Athens in 1 901.

See the works cited in the bibliography of the article Greek Independence, War of, especially the AokIaww Iotqpkkov of J. Philemon.

YPSILANTI, a city of Washtenaw county, Michigan, U.S.A., on the Huron river, 30 m. W. by S. of Detroit. Pop. (1900) 7378; ˆyo-l) 75S7; (191°) 6230. It is served by the Michigan Central and the Lake Shore & Michigan

Southern railways, and is the seat of the Michigan State Normal College (1849). There are various manufactures. Ypsilanti was laid out and named in honour of Demetrius Ypsilanti, the Greek patriot, in 1825; it was incorporated as a village in 1832, and chartered as a city in 1858.

YSAYE, EUGENE {1858-), Belgian violinist, was born at Liege, where he studied with his father and under R. Massart, at the Conservatoire, until he was fifteen; he had some lessons from Wieniawski, and later from Vieuxtemps. In 1879 Ysaye played in Germany, and next year acted as leader of Bilse's orchestra in Berlin; he appeared in Paris in 1883, and for the first time in London at a Philharmonic concert in 1889. He was violin professor at the Brussels Conservatoire from 1886 to 1898, and instituted the celebrated orchestral concerts of which he was manager and conductor. Ysaye first appeared as con- ductor before a London audience in 1900, and in 1907 conducted Fidelia at Covent Garden. The sonata concerts in which he played with Raoul Pugno (b. 1852), the French pianist, became very popular in Paris and Brussels, and were notable features of several London concert seasons. As a violinist he ranks with the finest masters of the instrument, with extraordinary tempera- mental power as an interpreter. His compositions include a Programme Symphony (played in London, 1905), a Piano Concerto, and a " Suite Wallonne."

YSTAD, a seaport of Sweden on the S. Baltic coast, in the district (I tin) of Malmohus, 39 m. E.S.E. of Malmo by rail. Pop. (1900) 9862. Two of its churches date from the 13th century. Its artificial harbour, which admits vessels drawing 19 ft., is freer from ice in winter than any other Swedish Baltic port. Apart from a growing import trade in coal and machinery,

its commerce has declined; but it is among the first twelve manufacturing places in Sweden, having large mechanical workshops.

YTTERBIUM (Neo-Ytteebium) [symbol, Yb; atomic weight, 172-0 (0 = 16)], a metallic chemical element belonging to the rare earth group. Mixed with scandium it was discovered by Marignac in gadolinite in 1878 (see Rare Earths). The oxide, YD2O3, is white and forms colourless salts; the crystallized chloride, YbCl3-6H 2 0, forms colourless, deliquescent crystals; the anhydrous chloride sublimes on healing (C. Matignon, Ann. chim. phys., 1906 (8), 8, p. 440). In 1907 G. Urbain separated ytterbium into two new elements, neo-ytterbium and lutecium (atomic weight, 174-0) ; and in 1908 C. A. von Welsbach published the same result, naming his elements aldebaranium and cassiopeium (on the question of priority see F. Wenzel, Zeil. anorg. Chem., 1909, 64, p. 119).

YTTRIUM [symbol, Y; atomic weight, 89-0 (0 = 16)], a metallic chemical element. In its character yttrium is closely allied to, and in nature is always associated with, cerium, lanthanum, didymium and erbium (see Rare Earths). For the prepara- tion of yttrium compounds the best raw material is gadolinite, which, according to Konig, consists of 22-61% of silica, 34-64 of yttria, Y2O3, and 42-75 of the oxides of erbium, cerium, didy- mium, lanthanum, iron, beryllium, calcium, magnesium and sodium. The extraction (as is the case with all the rare earths) is a matter of great difficulty. Metallic yttrium is obtainable as a dark grey powder by reducing the chloride with potassium, or by electrolysing the double chloride of yttrium and sodium. It decomposes water slowly in the cold, and more rapidly on heat- ing. Yttria, Y a Oj, is a yellowish white powder, which at high temperatures radiates out a most brilliant white light It is soluble, slowly but completely, in mineral acids. It is recog- nized by its very characteristic spark spectrum. Solutions of yttria salts in their behaviour to reagents are not unlike those of zirconia. The atomic weight was determined by Cleve.

YUCATAN, a peninsula of Central America forming the S.E. extremity of the republic of Mexico and including the states of Campeche and Yucatan and the territory of Quintana Roo. Small parts of British Honduras and Guatemala are also in- cluded in it. The natural boundary of the peninsula on the S. is formed in part by the ridges extending across N. Guatemala, the line terminating E. at the lower part of Chetumal Bay, and \V. at Laguna de Terminos. From this base the land extends N. between the Gulf of Mexico and Caribbean Sea in nearly rectangular form for about 280 m., with about the same extreme width in longitude. It has a mean breadth of about 200 m., a coast-line of 700 m. and an area of about 55,400 sq.m.

The coast on the N. and W. is low, sandy and semi-barren, and is made dangerous by the Campeche banks, a northward extension of the peninsula, covered with shifting sands. The outer shore-line on the N. for nearly 200 m. consists of a narrow strip of low sand dunes, within which is a broad channel terminat- ing to the E. in a large lagoon. There are a number of openings through the outer bank and several small towns or ports have been built upon it. The E. coast consists of bluffs, indented with bays and bordered by several islands, the larger ones being Cozumel (where Cortes first landed), Cancum, Mujeres and Contoy. There is more vegetation on this coast, and the bays of Chetumal, Espiritu Santo, Ascencion and San Miguel (on Cozumel Island) afford good protection for shipping. It is, however, sparsely settled and has little commerce.

The peninsula is almost wholly composed of a bed of coralline and porous limestone rocks, forming a low tableland, which rises gradually toward the S. until it is merged in the great Central American plateau. It is covered

with a layer of thin, dry soil, through the slow weathering of the corai rocks. The surface is not so level and monotonous as it appears on many maps; for, although there are scarcely any running streams, it is diversified by a few lakes, of which Bacalar and Chichankanab are the largest, as well as by low isolated hills and ridges in the W-, and in the E. by the Sierra Aha, a range of moderate elevation traversing the whole peninsula from Catoche Point S. to the neighbourhood of Lake Peteu in Guatemala. The culminating points of the W. ridges do not exceed 900 ft., and some authorities estimate it at 500 ft.

The climate of Yucatan is hot and dry; the Gulf Stream, which sweeps by its N. shores, adds to its naturally high temperature, and the absence of high mountainous ridges to intercept the moisture-bearing clouds from the Atlantic gives it a limited rainfall. The temperature ranges from 75 to 98 F. in the shade, but the heat is modified by cool sea winds which prevail day and night throughout the greater part of the year. The atmosphere is also purified by the fierce temporales, or ‘ northers,” which occasionally sweep down over the Gulf and across this open region. The dry season lasts from October to May, the hottest months appear to be in March and April, when the heat is increased by the burning of the corn and henequen fields. The rains are quickly absorbed by the light porous soil and leave only temporary effects on the surface, where arboreal growth is stunted and grasses are commonly thin and harsh. For the most part the climate of Yucatan is healthy, though enervating. There are undramed, swampy districts in Campeche, in the vicinity of the Tcrminos Lagoon, where malarial diseases are prevalent, and the same conditions prevail along the coast where mangrove swamps are found. Yellow fever epidemics are common on the Campeche coast, and sometimes appear at Progreso and Merida. The sites of some of the old Maya cities are also considered dangerous at certain seasons.

All the N. districts, as well as the greater part of the Sierra Alta, are destitute of large trees; but the coast-lands on both sides towards Tabasco and British Honduras enjoy a sufficient rainfall to support forests containing the mahogany tree, several valuable cabinet woods, vanilla, logwood and other dye-woods. Logwood forests fringe all the lagoons and many parts of the seaboard, which are flooded during the rainy season. The chief cultivated plants are maize, the sugar-cane, tobacco, cotton, coffee and especially hene- quen, the so-called ” Sisal hemp,” which is a strong, coarse fibre obtained from the leaves of the Agave rigida, var. elongata. It requires very little moisture, grows luxuriantly on the thin

calcareous soil of Yucatan and is cultivated almost exclusively by the large landowners. It is used chiefly in the manufacture of coarse sack- cloth, cordage and hammocks, and is exported in large quantities. The labour needed in this industry is supplied by Indian peons, who live in a state ot semi -servitude and are paid barely enough to sustain life.

History and Antiquities. — The modern history of Yucatan begins with the expedition of Francisco Hernandez de Cordova, a Spanish adventurer settled in Cuba, who discovered the E. coast of Yucatan in February 1517, when on a slave-hunting expedition. He followed the coast round to Campeche, but was unable to penetrate the interior. In 1518 Juan de Grijalva followed the same ccast, but added nothing to the information sought by the governor of Cuba. In 1519 a third expedition, under Hernando Cortes, the conqueror of Mexico, came into collision with the natives of the island of Cozumel. In 1525 the inland part, of the peninsula was traversed by Cortes during an expedition to Honduras. The conquest of the peninsula was undertaken in 1527 by Francisco de Montejo, who en- countered a more vigorous opposition than Cortes had on the high plateau of Anahuac. In 1549 Montejo had succeeded in establishing Spanish rule over barely one-half of the peninsula, and it was never extended further. The Spaniards found here the remains of a high aboriginal civilization which had already entered upon decline. There were deserted cities falling into ruins, and others, like Chichen-itza, Uxmal and Tuloom, which were still inhabited by remnants of their former Maya popula- tions. The Mayas have left no record of their institutions or of the causes of their decline, beyond what may be deduced from their ruined structures. The number and extent of these ruins (temples, palaces, ball courts, market-places, &c.) indicate large towns in the midst of thickly settled, productive districts, for there were then, so far as can be determined, no means of supporting large urban populations through commercial exchanges. The exhaustion of the soil in the vicinity of towns, or epidemics brought on by insanitary habits, might easily cause depopulation in so hot a climate. Other remains which bear witness to the civilization of the Mayas are the paved highways and the artificial reservoirs (aguadas) designed for the preservation of water for towns through the long dry season. These aguadas were huge basins, paved and cemented, with underground cisterns, also lined with stone and cement, which may have been used for the protection of water against heat when the principal supply had become exhausted. The great problem in all the Maya settlements of Yucatan was that of securing and preserving a water supply for the dry

season. Some of their towns were built near large under- ground reservoirs, called cenotes, that afforded a perennial supply. Since the Spanish conquest, the Mayas have clung to the semi-barren, open plains of the peninsula, and have more than once revolted. They seceded in 1839 and

maintained their independence until 1843. I n J &47 another revolt followed, and the Indians were practically independent through- out the greater part of the peninsula until near the beginning of the Diaz administration. In 1910 there was another revolt with some initial successes, such as the capture of Valladolid, but then the Indians withdrew to the unknown fastnesses of Quintana Roo.

The Mexican State of Yucatan is bounded N. by the Gulf of Mexico, E. and S. by the territory of Quintana Roo, S. and W. by the state of Campeche. Pop. (1900) about 306,000. The railways include the three lines of the United Railways of Yucatan (373 m.), and a line from Merida to Peto (145 m.). The capital is Merida, and its principal towns, inhabited almost exclusively by Indians and mestizos, are Valladolid, Acanceh, Tekax, MotuI, Temax, Espita, Maxcanu, Hunucma, Tixkokob, Peto and Progreso, the port of Merida.

Quintana Roo was separated from the state of Yucatan in 1902 and received a territorial government under the imme- diate supervision of the national executive. It comprises the sparsely settled districts along the E. coast of the peninsula, and the wooded sections of the S., which have not been thoroughly explored. Its population is estimated at 3000, but as its inhabitants never submitted to Spanish and Mexican rule, and have maintained their independence against over- whelming odds for almost four centuries, this estimate should be accepted as a conjecture. Little is known of the wild tribes of the territory.

YUCCA, 1 a genus of the order Liliaceae (q-v.), containing about thirty species. They occur in greatest frequency in Mexico and

Yucca gioriosa in flower, much reduced, i, flower, abt. §nat. size; 2, diagram showing arrangement of the parts of the flower in horizontal plan.

the S.W. United States, extending also into Central America, and occurring in such numbers in some places as to form straggling

**A Spanish word meaning "bayonet," recalling the form and character of the leaves.*

forests. They have a woody or fibrous stem, sometimes short, and in other cases attaining a height of 15 to 20 ft., and branching at the top into a series of forks. The leaves are crowded in tufts at the ends of the stem or branches, and are generally stiff and sword-shaped, with a sharp point,

sometimes flaccid and in other cases fibrous at the edges. The numerous flowers are usually white, bell-shaped and pendulous, and are borne in much-branched terminal panicles. Each flower has a perianth of six regular pieces, and has as many hypogynous stamens, with dilated filaments, bearing relatively small anthers. The three- celled ovary is surmounted by a short thick style, dividing above into three stigmas, and ripens into a succulent berry in some of the species, and into a dry three-valved capsule in others. The flowers are fertilized by the agency of moths.

A coarse fibre is obtained by the Mexicans from the stem and foliage, which they utilize for cordage, and in the S.E. United States the leaves of some species, under the name " bear-grass," are used for seating chairs, &c. The fruits, which resemble small bananas, are cooked as an article of diet; and the roots contain a saponaceous matter used in place of soap.

Many of the species are hardy in Great Britain, and their striking appearance renders them attractive in gardens even when not in flower. They thrive in a rich, light soil, and are propagated by divisions planted in the open ground, or by pieces of the thick, fleshy roots in sandy soil under heat. Their rigid foliage, invested by thick epidermis, enables them to resist the noxious air of towns better than most plants. A popular name for the plant is " Adam's needle.' The species which split up at the margins of their leaves into filaments are called " Eve's thread."*

YUE-CHI (or Yueh-Chih), the Chinese name of a central Asiatic tribe who ruled in Bactria and India, are also known as Kushans (from one of their subdivisions) and Indo-Scythians. They appear to have been a nomad tribe, inhabiting part of the present Chinese province of Kan-suh, and to have been driven W. by Hlung-nu tribes of the same stock. They conquered a tribe called the Wusun, who lived in the basin of the Hi river, and settled for some time in their territory. The date of these events is placed between 175 and 140 B.C. They then attacked another tribe known as Sakas, and drove them to Persia and India. For about twenty years it would seem that the Yue-Chi were settled in the country between the rivers Chu and Syr-Darya, but here they were attacked again by the Hiung-nu, their old enemies, with whom was the son of the defeated Wusun chieftain. The Yue-Chi then occupied Bactria, and little is heard of them for a hundred years. During this period they became a united people, having previously been a confederacy of five tribes, the principal of which, the Kushans (or Kwei-Shwang), supplied the new national name. They also to some extent gave up their nomadic life and became civilized. Bactria about this time was said to contain a thousand cities, and though this may be an exaggeration it was probably a meeting-place of Persian and Hellenic culture: its kings Demetrius and Eucratides had invaded India. It is therefore not surprising to find the warlike and mobile Yue-Chi following the same road and taking

fragments of Persian and Greek civilization with them.

*The chronology of this invasion and of the history of the Kushans in India must be regarded as uncertain, though we know the names of the kings. Indian literature supplies lew data for the period, and the available information has been collected chiefly from notices in Chinese annals, from inscriptions found in India, and above all from coins. From this evidence it has been deduced that a king called Kozulokadphises, Kujulakasa or Kieu-tsieu-k'io (? a.d. 45-85) united the five tribes, conquered the Kabul valley and annihilated the remnants of Greek dominion. He was succeeded, possibly after an interval, by Ooemokadphises (Himakapisa or Yen-kao-tsin-tai) , who completed the annexation of N. India. Then followed Kanishka (? c. a.d. 123-53), wno * s celebrated throughout eastern Asia as a patron of the Buddhist church and convener of the third Buddhist council. He is also said to have conquered K ash gar, Yarkand and Kholan. His successors were Huvishka and then Vasudcva, who may have died c. a.d. 225. After Vasudeva's reign the power of the Kushans gradually decayed, and they were driven back into the*

valley of the Indus and N.E. Afghanistan. Here, according to Chinese authorities, their royal family was supplanted by a dynasty called Ki-to-lo (Kidara) , who were also of Y'ue-Chi stock, but belonged to one of the tribes who had remained in Bactria when the Kushans marched to India. The subsequent migration of the Kitolo S. of the Hindu Kush was due to the movements of the Jwen-Jwen, who advanced W. from the Chinese frontier. Under this dynasty a state known as the Little Kushan kingdom flourished in Gandhara (E. Afghanistan) about a.d. 430, but was broken up by the attacks of the Hunas.

Some authorities do not accept the list of Kushan kings as given above, and think that Kanishka must be placed before Christ and perhaps as early as 58 B.C.: also that there was another king with a name something like Vasushka before or after Huvishka. In any case the invasion of the Yue-Chi cannot have been very long before or very long after the Christian era, and had an im- portant influence on Indian civilization. Their coins show a remarkable union of characteristics, derived from many nations. The general shape and style are Roman: the inscriptions are in Greek or in a Persian language written in Greek letters, or in Kharoshthi: the reverse often bears the figure of a deity, either Greek (Herakles, Helios, Selene) or Zoroastrian (Mithra, Vata, Verethraghna) or Indian (generally Siva or a war god). One figure called Sarapo appears to be the Egyptian Serapis, and others arc perhaps Babylonian deities. On the obverse is generally the king, who, in the earlier coins at any rate, wears a long open coat, knee boots and a tall cap — clearly the costume of a nomad from the north. The Gandhara school of sculpture, of which the best specimens conic from the

neighbourhood of Kanishka s capital, Purushpura (the modern Peshawar), is a branch of Gracco-Roinan art adapted to Oriental religious subjects. The Yue-Chi were probably the principal means of disseminating it in India, though all movements which kept open the communications between Bactria and Persia and India must have contributed, and the first introduction was due to the short-lived Graeco-Bactrian conquest (180-130 B.C.). The importance of the Gandharan influence on the art of India and all Buddhist Asia is now recognized. Further, it is probably in the mixture of Greek, Persian and Indian deities which characterizes the pantheon of the Kushan kings that are to be sought many of˜the features found in Mahayanist Buddhism and Hinduism (as distinguished from the earlier Brahmanism). Kanishka and other monarchs were zealous but probably by no means exclusive Buddhists, and the conquest of Khotan and Kashgar must have facilitated the spread of Buddhist ideas to China. It is also probable that the Yue-Chi not only acted as intermediaries for the introduction of Creek and Persian ideas into India, and of Indian ideas into China, but left behind them an important element in the population of N. India.

It is hard to say whether the Yue-Chi should be included in any of the recognized divisions of Turanian tribes such as Turks or Huns. Nothing whatever is known of their original language. Such of the inscriptions on their coins as are not in Greek or an Indian language are in a form of Persian written in Greek uncials. In this alphabet the Greek letter £ (or raLher a very similar letter with the loop a little lower down) is used to represent sk, and there are some peculiarities in the use of apparently connected with the expression of the sounds h and w. Thus Paonano Pao Kanhpki Kopano is tobe read as something like Shdhandn Sh&k Kanuhki Koshan : Kanishka the Kushan, king of kings. This Persian title became in later times the special designation of the Kushan kings and is curiously parallel to the use of Arabic and Persian titles (padishah, sullan, etc.) by the Ottoman Turks. The physical type represented on these coins has a strong prominent nose, large eyes, a moderately abundant beard and somewhat thick or projecting lips. Hence, as far as any physical characters can be formulated for the various tribes (and their validity is very doubtful) the Yue-Chi type is Turkish rather than Mongol or Ugro-Finnic. In such points of temperament as military ability and power of assimilating Indian and Persian civilization, the Yue- Chi also resemble the Turks, and some authorities think that the name Turushka or Turukha sometime?, applied to them by Indian writers is another evidence of the connexion. But the national existence and name of the Turks (q.v.) seem to date from the 5th century a.d., so that it is an anachronism to speak of the Yue-Chi as a division of them. The Yue-Chi and Turks, however, may both represent parallel developments of similar or even originally identical tribes. The

Mahommedan writer Alberuni states that in former times the kings of the Hindus (among whom he mentions Kanik or Kanishka) were Turks by race, and this may represent a native tradition as to the affinities of the Yue-Chi. Some authors consider that the Yue-Chi are the same as the Getae and that the original form of the name was Yiit or Get, which is also supposed to appear in the Indian J at.

See Vincent Smith, Early History of India (1908); Hocrnle and Stark, History of India (1905); Rapson, Indian Coins (1898); Gardner, Coins of Greek and Scythian Kings in India (1886) ; Franke, Beitrage aus Chinesischen Queilen zur Kenntnis der Turkvolker und

Skythen (1904), and numerous articles by Cunningham, Fleet, A. Stein, Vincent Smith, Sylvian Levi, E. H. Parker and others in the Journal of the Royal Asiatic Society, Journal asiatique, Asiatic Quarterly, &c. Owing to the new evidence which is continually being brought forward, the most recent writings on this subject are generally to be preferred. (C. El.)

YUKON, the largest river in Alaska, and the fifth largest in N. America. With its longest tributaries not in Alaska, the Lewes and the Teslin (or Hootalinqua) , its length is about 2300 m., in the form of a great arc, beginning in the Yukon District of British Columbia, near the Pacific Ocean, and ending at the Bering Sea coast. Its catchment area is about 330,000 sq. m., more than one-half of which lies in Canada. The Lewes river rises in Lake Bennet (Yukon District) on the N. slope of the Coast Range, about 25 m. inland from the Lynn Canal (at the head of Chatham Strait), and flows N. through a chain of lakes, its confluence with the Pelly river, at Selkirk, Yukon District, about 120 m. due E. of the Alaskan - Canadian boundary, forming the headwaters of the Yukon. Flowing thence N.W., the Yukon turns abruptly to the S.W. near Fort Yukon, Alaska, on the Arctic Circle, and continues nearly at right angles to its former course to a point S. of the head of Norton Sound, where it turns again and flows in a N.W. direction, emptying into the Sound from its S. shore. The length of the river, from its headwaters to its mouth, is about 1500 m.

The Yukon Valley comprises four sub-provinces, or physiographic divisions; in their order from the headwaters of the river these divisions have been called the " Upper Yukon," " Yukon Flats," " Rampart Region " and "■ Lower Yukon." The " Upper Yukon " Valley is about 450 m. long and from 1 to 3 m. broad, and is flanked by walls rising to th.e plateau level from 1500 to 3000 ft. above the stream. In this part of its course the Yukon

receives from the S. the Selwyn river (about 40 m. below the junction of the Lewes and Pelly rivers); from the W. the White river (about 66 m. below the Selwyn); from the N. the Stewart river (about 10 m. helow the White), one of the largest tributaries of the Yukon; from the E. the Klondike river (near 64 N.); from the W. Forty- mile Creek (about 40 m. above the Alaskan-Canadian boundary line), and many other smaller streams. The " Yukon Flats flank the river for about 200 m. and are from 40 to 100 m. wide. Here the stream varies in width from 10 to nearly 20 m., and involves a confused network of constantly changing channels. Here, too, the river makes its great bend to the S.W., and its channels are constantly changing. The " Flats " are monotonous areas of band bars and low islands, thickly wooded with spruce. The principal tributaries here are the Porcupine river (an important affluent, which enters the main stream at the great bencf about 3 m. N. of the Arctic Circle); the Chandlar river, also confluent at the great bend, from the N., and, near the W. edge of the Flats, the Dall river, also from the N. The " Rampart Region " begins near 66° N., where the " Flats " end abruptly, and includes about no m. of the valley, from 1 to 3 m. wide, and extending to the mouth of the Tanana, No large tributaries are received in this part of the river. The Lower Yukon includes that portion between the Ramparts and the sea, a stretch of about 800 m. At the mouth of the Tanana (which enters the main stream from the S.) the gorge opens into a lowland from 15 to 20 m. wide. Along the NAY. boundary of the valley are low mountains whose base the Yukon skirts, and it continues to press upon its N. bank until the delta is reached. The valley is never less than 2 or 3 m., and the river has many channels and numerous islands; it has walls nearly to the head of the delta, though about 100 m. above the delta the S. wall merges into the lowland coastal plain; the relief is about 1000 ft.*

At the W. edge of the Ramparts the Yukon receives the Tanana river, its longest tributary lying wholly within Alaska. The Tanana Valley is about 400 m. long, nearly parallel to the Yukon from about due W. of its headwaters to the great bend, and drains about 25,000 sq.m. Its sources are chiefly glaciers in the Alaskan Range, and it receives many tributaries. The Yukon delta begins near 63 ° N. Here the main stream branches into several channels which follow N. or NAV. courses to Norton Sound. The northern- most of these channels is the Apoon Pass, and the most southerly is Kwikluak Pass; their outlets are about 75 m. apart on the coast, and from 40 to 50 m. from the head of the delta. Between them is a labyrinth of waterways, most of the intervening land being not more than 10 ft. above low tide. The stream is mud- laden throughout its course, and though the sediment is heavier above the " Flats " than below them (where the slower current permits the settling of much of the silt), so much of it is carried to the river's mouth that the delta is being steadily extended.

Immediately S. of the Yukon delta proper is that of the Kush- kowim, into which undoubtedly the Yukon's waters once found their way.

The Yukon is navigable from May till September, and steamers ply on several of its larger tributaries, making the aggregate navigable waters about 3500 m., about three-fourths of which are in Alaska. The nearest harbour for ocean-going vessels is a poor one at St Michael's Island, about 60 m. N.E. of the delta; here freight and passengers are transferred to flat-bottomed river steamers. These enter the delta and the river by the Apoon Pass, which is about 4 ft. deep at mean low water, the current varying from Ij to 4 m. an hour. The Lewes (about 400 m. long) is navigable (with some difficulty, during low water, at Lake Lebarge) as far as White Horse Rapids, which, with Miles Canyon, obstruct the river for a few miles; above them the stream is again navigable to its source, about 100 m, beyond. The Pacific & Arctic railway from Skagway to White Horse (in m.) overcomes these obstructions, however, for traffic and travel; and even the dangerous White Horse Rapids may be run by a skilful pilot in a small boat, as was done repeatedly by the gold-seekers in 1896-97. The Stewart river, seldom less than 150 yds. wide, is navigable by light-draught steamers to Frazer Falls, a distance of nearly 200 m. The Porcu- pine is navigable, in high water, to about the Alaska- Yukon boundary line (c. 90m.) ; the Chandlar for a few miles; the Tanana (which is-about 500 m. long) for about 225 m. to the Chena river (which is navigable for about 100 m.) ; and the Tolovana, another affluent of the Tanana, is also navigable for about 100 m.

In 1842-43 the Yukon was explored by the Russian Lieu- tenant Zagoskin, who built a trading post at Nulato, ascended the river (which he called the Kwikpak) as far as the Tanana, made a track survey of the stream to that point and reported that it was not navigable beyond there. In 1861 Robert Kennicott made his way overland by the Hudson Bay route from the Mackenzie river down the Yukon to Fort Yukon, and in 1865 he and Captain Charles S. Bulkley led the expedition sent out by the Western Union Telegraph Company to survey a route for a land telegraph line to Europe by way of Alaska and Siberia. Kennicott died at Nulato in 1866, and the expedition was abandoned in that year, but explorations were continued by other members, notably Dr William H. Dall/ with the result that valuable surveys were made and the Yukon identified as the Kwikpak of the earlier Russian surveys. Captain C. W. Ray- mond made a reconnoissance of the Yukon in 1S69; the Indian route by the Lewes to. the headwaters of the Yukon was used by gold prospectors as early as 1881, while in 1883 Lieutenant Frederick Schwatka (1849-1892) crossed the Chilkoot Pass (which he called " Perrier Pass "), descended the Lewes to Fort Selkirk, and down the river to the sea. Charles W. Homan, who accompanied Schwatka, made the first sketch survey of the great system;

since then it has been frequently explored, but much of the region has not been mapped.

See Alfred H. Brooks, The Geography and Geology of Alaska, U.S. Geol. Survey, Document No. 201 (Washington, 1906); also G. M. Dawson, Yukon District and British Columbia, Annual Report of the Geol. and Natural History Survey of Canada, vol. 3, pt. I (1889); William Ogilvie, The Klondike Official Guide (Buffalo, N.Y., 1898); C. W. Haynes, "An Expedition through the Yukon District," Nat. Geog. Mag. vol. 4 (1892); R. G. McConnell, Salmon River Gold Fields, Summary of Report of Geol. Survey of Canada (1901); idem, The Macmillan River, Yukon District, Summary of Report of the Geological Survey of Canada for 1902; A. H. Brooks, A Reconnaissance in the Tanana and White River Basins in 1898, Twentieth Annual Report, U.S. Geol. Survey (Washington, 1900); and A Reconnaissance from Pyramid Harbor to Eagle City, Alaska, Twenty-first Annual Report, ibid. (Washington, 1900), and other sources cited by Brooks in the first-named work.

YUKON TERRITORY, the most westerly of the northern territories of Canada, bounded S. by British Columbia, W. by Alaska, N. by the Arctic Ocean and E. by the watershed of Mackenzie river. It has an area of 207,076 sq. m. The territory is chiefly drained by the Yukon river and its tributaries, though at the S.E. corner the headwaters of the Liard river, flowing into the Mackenzie, occupy a part of its area. The margins of the territory are mountainous, including part of the St Elias

1 William Healey Dall (1845-) t American naturalist, was born in Boston, Massachusetts, served with the United States Coast Survey of Alaska from 1871 to 1884, became honorary curator of the United States National Museum in i88o,and in 1893 was appointed professor of invertebrate palaeontology at the Wagner Institute of Science, Philadelphia. He was palaeontologist to the United States Geological Survey in 1884-1909. The white moun- tain sheep, or Dall's sheep (Ovis dalli), discovered in 1884, was named in his honour.

range with the highest mountains in Canada at the S.W. corner (Mount Logan and Mount St EKas), and the N. extension of the Rocky Mountains along the S, and N.E. sides; here, however, not very lofty. The interior of the territory is high toward the S.E. and sinks toward the N.W., and may be described-as a much- dissected peneplain with low mountains to the S. The most important feature of the hydrography is the Yukon (q.v.) and the

rivers which flow into it. The Klondike gold mines are reached by river boats, either coming up from St Michael at its mouth, or down 460 m. from White Horse. The White Horse route is now used almost entirely, since the White Pass railway, m m. long, was constructed from Skagway, on Lynn Canal, an inlet of the Pacific. As the voyage up the Pacific coast from Vancouver or Victona is almost entirely through sheltered waters, the journey to the Klondike is very attractive in summer. Com- paratively little snow is seen in crossing White Pass during summer, though there are patches on the low mountains on each side. The Rocky Mountains, N.E. of the interior plateau, are somewhat snowy, but apparently with no large glaciers; but the St Elias range to the S.W. is buried under immense snownelds, from which great glaciers project into the valleys. The rocks are largely ancient schists and eruptives, Palaeozoic or Archean, but considerable areas are covered with Mesozoic and Tertiary rocks, some of which include important seams of lignite or coal, the latter especially in the neighbourhood of White Horse. There have been comparatively recent volcanic eruptions in the region, as shown by a layer of white ash just beneath the soil for many miles along the river, and by a quite perfect cone with a crater and lava stream; but there are no records of volcanic outbreaks within the short modern history of the territory.

Before the discovery of gold on the Forty Mile and other rivers flowing into the Yukon the region was inhabited only by a few Indians, but the sensational finds of rich placers in the Klondike {q.v.) in 1896 brought in a vigorous population centred in the mines and at Dawson City, which was made the capital of the newly constituted Yukon Territory. When the White Pass railway was built, White Horse at its N. terminus became of importance, and since then a fluctuating body of prospectors and miners has been at work, not only in the Klondike but at various points along the other rivers. The territory is ruled by a governor and council, partly elective, seated at Dawson, and has a representative in the parliament of the Dominion. Almost the only economic product of the territory was at first gold, but copper and other ores later began to attract attention in the S. near White Horse. Though so near the Pacific the Yukon territory has a rigorous continental climate with very cold winters seven months long, and delightful sunny summers. Owing to the lofty mountains to the W. the amount of rain and' snow is rather small, and the line of perpetual snow is more than 4000 ft. above sea-level, so that glaciers are found only on the higher mountains; but the moss-covered ground is often perpetually frozen to a depth of 100 or 200 ft. Vegetation is luxuriant along the river valleys, where fine forests of spruce and poplar are found, and the hardier grains and vegetables are cultivated with success. (A. P. C.)

YULE, SIR HENRY (1820-1889), British Orientalist, was born on the 1st of May 1820, at Inveresk, near Edinburgh, the son of Major William Yule

(1764-1839), translator of the Apothegms of Ali. He was educated at Edinburgh. Addiscombe and Chatham, and joined the Bengal Engineers in 1840. He served in both the Sikh wars, was secretary to Colonel (afterwards Sir) Arthur Phayre's mission to Ava (1855), and wrote his Narrative of the Mission to ike Court of Ava (1858). He retired in 1862 with the rank of colonel, and devoted his leisure to the medieval history and geography of Central Asia. He published Cathay and the Way Thither (1866), the Book of Ser Marco Polo 1871-75), for which he received the gold medal of the Royal Geographical Society, and brought out with Dr Arthur C. Burnell TI obson-J obson (1S86), a dictionary of Anglo-Indian colloquial phrases. For the Hakluyt Society, of which he was for some time president, he edited (1863) the Mirabilia descripta

of Jordanus and The Diary of William Hedges (1887-89). The latter contains a biography of Governor Pitt, grandfather of Chatham. From 1875 to l8S 9 Yule was a member of the Council of India, being appointed K. C.S.I, on his retirement. He died on the 30th of December 1889.

See Memoir by his daughter, prefixed to the posthumous third edition of Marco Polo (1903).

YULE, the season of Christmas (q.v.). This word is chiefly used alone as an archaism or in poetry or poetical language, but is more common in combination, as in " yule-tide," " yule- log," &c. The Old English word appears in various forms, e.g. gedla, iula, geol, gehhol, gehhel; cognate forms are Icel, j6l; Dan, juul; Swed. jul. It was the name of two months of the year, December and January, the one the " former yule" (se aerra gcola), the other the " after yule " (se aeftera gedla), as coming before and after the winter solstice {Cotton MS. Tib. B, i.; and Bede, De Temporum Ratione, 13, quoted in Skeat, Etym. Diet., 1898). According to A. Fick (Vergleichendes Worterbuch der Indogermaniscken Sprachen, vol. iii. 245, 1874) in proper meaning is noise, clamour, the season being one of rejoicing at the turning of the year among Scandinavian peoples before Christian times.

YUN-NAN {i.e. Cloudy South), a S.W. province of China, bounded N. by Sze-ch'uen, E. by Kwci-chow and Kwang-si, S. by Burma and the Lao tribes and W. by Burma and Tibet; area estimated at from 122,000 to 146,000 sq. m. Though the second largest province of the empire, its population is esti- mated at only 12,000,000. The inhabitants include many races besides Chinese, such as Shans, Lolos and Maotsze. The Musus, in N.W. Yun-nan, once formed an independent kingdom which extended into E. Tibet. Many of the inhabitants are nominally Moslems. The greater part of the province may be said to consist of an extensive plateau, generally from 5000 to 7000 ft. in altitude, containing numerous

valley plains, which is divided in the N. by mountain ranges that enter at the N.W. corner and separate the waters of the Yangtsze-kiang, the Mekong and the Salween. The mountains attain heights of 16,000 ft. The climate is generally healthy and equable; on the plateau the summer heat seldom exceeds 86°, and in winter there is little snow. The principal rivers are the Yangtsze- kiang (locally known as the Kinsha-kiang = Golden Sand river), which enters Yun-nan at its N.W. corner, flows first S.E. and then N.E., forming for a considerable distance the N. boundary of the province; the Mekong, which traverses the province from N. to S. on its way to the sea through Annam; the Salween, which runs a parallel course through its W. portion; and the headwaters of the Songkoi, which rises in the S.E. of the province. This last-named river is navigable from the Gulf of Tongking to Man-hao, a town ten days' journey from Yun-nan Fu. There are two large lakes— one in the neighbourhood of Ta-li Fu, which is 24 m. long by 6 m. broad, and the other near Yun-nan Fu, which measures from 70 to 80 m. in circumference.

Besides Yun-nan Fu, the capital, the province contains thirteen prefectural cities, several of which — Teng-ch'uen Fu, Ta-li Fu, Yung-ch'ang Fu, Ch'u-siung Fu and Lin-gan Fu, for example — arc situated in the valley plains. Mcngtsze, Szcmao and Momein (or T&ng-yueh) are open to foreign trade. Yun-nan Fu is connected by railway (1910) with Tongking. The line v.hich starts from Haiphong runs, in Yun-nan, via Mengtsze hsien (a great commercial centre), to the capital. Several important roads intersect the province; among them are — 1. The road from Yun-nan Fu to Bnamo in Burma via Ta-li Fu (12 days), Tcng-yueh Chow or Momein (8 days) and Manwyne — beyond Ta-li Fu it is a difficult mountain route. 2. The road from Ta-li Fu N. to Patang via Li-kiang Fu, which thus connects W. Yun-nan with Tibet. 3. The ancient trade road to Canton, which connects Yun-nan Fu with Pai-s§ Fu, in Kwang-si, on the Canton West River, a land journey which occupies about twenty days. From this point the river is navigable to Canton.

Agricultural products include rice and maize (the principal crops), wheat, barley and oats. The poppy was formerly ex- tensively cultivated, but after the anti-opium edict of 1906 vigorous measures were taken to stamp out the cultivation of the plant. In certain localities the sugar-cane is grown. Tea from Pu-erh Fu in S. Yun-nan is appreciated throughout the empire. Fruits and vegetables are plentiful, and there are large herds of buffaloes,

goats and sheep. Silkworms are reared. The chief wealth of Yun-nan

consists, however, in its minerals. Copper is the most important of the minerals worked. Silver and gold are produced, but they are not known to exist in any large quantities. Lead is of frequent occurrence, and indeed the area through which copper, silver, lead, tin and zinc are distributed in sufficient quantities to make mining answer, comprises at least 80,000 sq. m. Coal is also found and several salt mines are worked. The ores are generally of good quality, and are easy of extraction. Cotton yarn and cloth, petroleum, timber and furs are among the chief imports; copper, tin, hides and tea arc important exports; medicines in the shape not only of herbs and roots, but also of fossils, shells, bones, teeth and various products of the animal kingdom; and precious stones, principally jade and rubies, are among the other exports.

Yun-nan, long independent, was subdued by Kublai Khan, but was not finally incorporated in the empire until the 17th century. It was the principal centre of the great Mahommedan rebellion, which lasted sixteen years and was suppressed in 1872. Even in 1910 the province had not wholly recovered from the effects of that struggle and the barbarity with which it was stamped out. The opening of Christian (Protestant) mission work in Yun-nan began in 1877, and was one result of the murder of Mr Margary (see China, History, § D).

See H. R. Davies, Yun-nan, the Link between India and the Yangtze (Cambridge, 1909); A. Little, Across Yunnan (London, 1910); Rev. J. M'Carthy, "The Province of Yunnan," in The Chinese Empire (London, 1907); L. Richard, Comprehensive Geography of the Chinese Empire (Shanghai, 1908).

YUN-NAN FU, the capital of the province of Yun-nan, China, in 25 6′ N., 102 52′ E. It is about 500 m. by rail N.N.W. of the port of Haiphong, Tongking. The population was returned in 1907 at 45,000. Originally the surrounding district was known as the " land of the southern barbarians." The city is situated on a plain, and is surrounded by fortified walls, 6} m. in circuit. For many years Mahommedans have been numerous in the city and neighbourhood; and in 1855 a Mahommedan rising occurred. Before the rebellion Yun-nan Fu had a prosperous aspect; the shops were large and well supplied with native silken goods, saddlery, &c, while English cotton, Russian cloths and raw cotton from Burma constituted the main foreign merchandise. Employ- ment for large numbers of work-people was found in the copper factories. A mint at Yun-nan Fu issued annually 101,000,000 cash. Nearly ruined by the rebellion, the city took many years to recover its prosperity. A fresh impetus to commerce was given by the opening in 1910 of the railway from Tongking, a line built by French engineers and with French capital. The construction of a British railway to connect Burma with Yun-nan Fu and onwards to the Yangtsze-kiang has been in

contemplation.

YURIEV (formerly Dorpat, also Dorpt; Russian, Derpt; Esthonian, Tarto and Tartolin; in Lettish, 1'ehrbata), a town of W. Russia, in the government of Livonia, situated on the Embach, 1 58 m. by rail N.E. of Riga, in 58 23′ N. and 26 23′ E. Pop. 42,421. The principal part of the town lies S. of the river, and the more important buildings are clustered round the two eminences known as the Domberg (cathedral hill) and the Schlossberg (castle hill), which in the middle ages were occupied by the citadel, the cathedral and the episcopal palace. Owing to a great fire in 1777, the town is almost entirely modern; and its fortifications have been transformed into promenades. Besides a good picture gallery in the Ratshof, and the 13th- century church of St John, Yuriev possesses a university, with an observaLory, an art museum, a botanical garden and a library of 250,000 volumes, which are housed in a restored portion of the cathedral, burned down in 1624. The university was founded by Gustavus Adolphus of Sweden in 1632; but in 1699 teachers and students removed to Pernau on the advance

of the Russians, and on the occupation of the country by Peter the Great again took flight to Sweden. In spite of the treaty of 1 7 10 and the efforts of the Livonian nobles, it was not till 1802 that its restoration was effected under the patronage of Alexander I. Down to 1895, in which year it was thoroughly Russified, the university was German in spirit and in sentiment. It is now attended by some 1700 students annually. The astronomical department is famous, owing partly to the labours of F. G. W. von Struve (1820-39), anu< partly to Fraunhofer's great refracting telescope, presented by the emperor Alexander I. There are monuments to the naturalist K. E. von Baer (1886) and Marshal Barclay de Tolly (1849), and the town is the headquarters of the XVIII. army corps.

The foundation of Dorpat is ascribed to Yaroslav, prince of Kiev, and is dated 1030. In 1224 the town was seized by the Teutonic Knights, and in the following year Bishop Her- mann erected a cathedral on the Domberg. From that date till about 1558 the town enjoyed great prosperity, and the population reached 50,000. In 1558 it was captured by the Russians, but in 1582 was yielded to Stephen Bathori, king of Poland. In 1600 it fell into the hands of the Swedes, in 1603 reverted to the Poles, and in 1625 was seized by Gustavus Adolphus of Sweden. The Russians again obtained temporary possession in 1666, but did not effect a permanent occupation till 1704. In 1708 the bulk of the population were removed to the interior of Russia.

YUSAFZAI, a large group of Pathan tribes, originally immigrants from the neighbourhood of Kandahar, which includes those of the Black Mountain,

the Bunerwals, the Swatis, the people of Dir and the Panjkora valley, and also the inhabitants of the Yusaf zai plain in Peshawar district of the North-West Frontier Province of India. Three sections of the tribe, the Hassanzais, Akazais and Chagarzais, inhabit the W. slopes of the Black Mountain, and the Yusafzai country stretches thence to the Utman Khel territory. The trans-border Yusafzais are estimated at 65,000 fighting men, giving a total population of about 250,000. The Yusafzais are said to be descended from one Mandai, who had two sons, Umar and Yusaf. Umar died, leaving one son, Mandan; from Mandan and Yusaf come the two primary divisions of the Yusafzais, which are split into numerous subdivisions, including the Isazais, Malizais, Akazais, Ranizais and Utmanzais.

YUZGAT, the chief town of a sanjak of the same name in the Angora vilayet of Asia Minor, altitude 4380 ft., situated 105 m. E. of Angora, near the head of a narrow valley through which the Angora-Sivas road runs. The town was built largely out of the ruins of Nefez Keui (anc. Tavium), by Chapan Oghlu, the founder of a powerful Dere Bey family. There is a trade in yellow berries and mohair. The sanjak is very fertile, and contains good breeding-grounds, upon which horses, camels and cattle are reared. The population, about 15,000, includes a large Armenian community.

YVETOT, a town of N. France, capital of an arrondissement in the department of Seine-Inf6rieure, 24 m. N.W. of Rouen on the railway to Havre. Pop. (1906) 6214. Cotton goods of various kinds and hats are made here, and trade is carried on in agricultural products. The church (18th century) con- tains a marble altar from the Carthusian monastery at Rouen, fine woodwork of the 17th century from the. abbey of St Wandrille, and a handsome pulpit. The town is the seat of a sub-prefect and has tribunals of first instance and of commerce, and a chamber of arts and manufactures. The lords of Yvetot bore the title of king from the 15th till the middle of the 16th century, their petty monarchy being popularized in one of Beranger's songs. In 1592 Henry IV. here defeated the troops of the League.

9+8

Z— ZACATECAS

Zthe twenty-sixth letter of the English alphabet and the last, although till recent times the alphabets used by children terminated not with z but with &, or £V. For & the English name is ampersand, i.e. " and per se and, "though the Scottish name eperskand, i.e. "Et,per wand," is more logical and also more clearly shows its origin to be the Latin et, of which it is but the manuscript form. To the following of z by & George Eliot refers when

she makes Jacob Storey say, " He thought it (s) had only been put to finish off th' alphabet like, though ampusand would ha' done as well, for what he could see." Z is put at the end of the alphabet because it occupied that position in the Latin alphabet. In early Latin the sound represented by z passed into r, and consequently the symbol became useless. It was therefore removed from the alphabet and G (g.v.) put in its place. In the ist century B.C. it was, like y, introduced again at the end, in order to represent more precisely than was before possible the value of the Greek Z, which had been previously spelt with s at the beginning and ss in the middle of words: sona=£wvr}, "belt"; tarpessita = rpa- jreˆirˆs, "banker." The Greek form was a close copy of the Phoenician symbol X, and the Greek inscriptional form remained in this shape throughout. The name of the Semitic symbol was Zayin, but this name, for some unknown reason, was not adopted by the Greeks, who called it Zeta. Whether, as seems most likely, Zeta was the name of one of the other Semitic sibilants Zade (Tzaddi) transferred to this by mistake, or whether the name is a new one, made in imitation of Eta (77) and Theta {&), is disputed. The pronunciation of the Semitic letter was the voiced s, like the ordinary use of z in English, as in zodiac, raze. It is probable that in Greek there was a considerable variety of pronunciation from dialect to dialect. In the earlier Greek of Athens, Northwest Greece and Lesbos the pronunciation seems to have been zd, in Attic from the 4 th century B.C. onwards it seems to have been only a voiced s, and this also was probably the pronunciation of the dialect from which Latin borrowed its Greek words. In other dialects, as Elean and Cretan, the symbol was apparently used for sounds resembling the English voiced and unvoiced th (5, J>). In the common dialect (kolvv;) which succeeded the older dialects, f became a voiced s, as it remains in modern Greek. In Vulgar Latin the Greek Z seems to have been pronounced as dy and later y; di being found for 2 in words like baptidiare for baptizare, " baptize," while conversely z appears for di in forms like saconus, zabulus, for diaconus, "deacon/' diabulus, "devil." Z also is often written for the consonantal I (J) asinzunior ioriunior, "younger" (see Grandgent, Introduction to Vulgar Latin, §§ 272, 339). Besides this, however, there was a more cultured pronunciation of z as dz, which passed through French into Middle English. Early English had used 5 alone for both the unvoiced and the voiced sibilant; the Latin sound imported through French was new and was not written with z but with g or i. The successive changes can be well seen in the double forms from the same original, jealous and zealous. Both of these come from a late Latin zelosus, derived from the imported Greek fiJXos. Much the earlier form is jealous; its initial sound is the dz which in later French is changed to z (voiced s). It is written gelows or ichus by Wycliffe and his contemporaries, the form with i is the ancestor of the modern form. The later word zealous was borrowed after the French dz had become s. At the end of words this 2 was pronounced ts as in the*

English assets, which comes from a late Latin ad satis through an early French asez, " enough." With 2 also is frequently written zh, the voiced form of sh, in azure, seizure. But it appears even more fre quently as j before u, and as si or ii before other vowels in measure, decision, transition, &c, or in foreign words as g, as in rouge. For the 3 representing g and y in Scottish proper names see under Y. (P. Gl.)

ZAANDAM (incorrectly Saaedam), a town of Holland, in

the province of North Holland, on the river Zaan, 6| m. N.W of Amsterdam, with which it is connected by railway and steamer. Pop. (1905) 23,773. It is of typically Dutch appear- ance, with low, brightly coloured houses. It has an important trade in timber, and numerous windmills in the vicinity provide power for oil, cement and paper works, timber-sawing and corn-grinding. At Zaandam is preserved the wooden hut which Peter the Great occupied for a week in 1697 while studying shipbuilding and paper-making.*

ZABERN (French, Saverne), a town of Germany, in the imperial province of Alsace-Lorraine, district of Lower Alsace, situated on the Rhine-Marne canal at the foot of a pass over the VosgeSj and 27 m. N.W. of Strassburg by the railway to Deutsch Avricourt. Pop. (1900) 8490. Its principal building, the former episcopal residence, rebuilt by Cardinal dc Rohan in 1779, is now used as barracks. There are also a 15th century church and an antiquarian museum. In the vicinity are the ruined castles of Hoch-barr, Grossgcroldscck, Ochsenstein and Greifcnstein. Hence a beautiful road, immortalized by Goethe in Dichtung und Wahrheit, leads across the Vosges to Pfalzburg.

Zabern (Tres Tabernae) was an important place in the times of the Romans, and, after being destroyed by the Alamanni, was rebuilt by the emperor Julian. During the Peasants' War the town was occupied, in 1525, by the insurgents, who were driven out in their turn by Duke Anton of Lorraine. It suffered much from the ravages of the Thirty Years' War, but the epis- copal castle, then destroyed, was subsequently rebuilt, and in 1852 was converted by Louis Napoleon into a place of residence for widows of knights of the Legion of Honour.

See Fischer, Geschichte der Stadt Zabern (Zabern, 1824).

ZABRZE, a town of Germany, in the extreme S.E. of Prussian Silesia, on the railway between Gleiwitz and Konigshutte. Pop. (1905) 55,634. Like other towns in this populous region, it is an important manufacturing centre, having coal-mines, iron, wire, glass, chemical and oil works, breweries, &c.

ZACATECAS, a state of Mexico, bounded N. by Durango and Coahuila, E. by San Luis Potosi, S. by Aguascalientes and Jalisco, and W. by Jalisco and Durango. Area, 24,757 sq, m. Pop. (1900) 462,190. It belongs wholly to the great central plateau of Mexico, with an average elevation of about 7700 ft. The state is somewhat mountainous, being traversed in the W. by lateral ranges of the Sierra Madre Occidental, and by numerous isolated ranges in other parts — Mazapil, Norillos, Guadalupe and others. There are no large rivers, only the small head-streams of the Aguanaval in the N., and of the Guazamota, Bolanos and Juchipila in the W., the last three being tributaries of the Rio Grande de Santiago. As the rain- fall is light this lack of 'streams suitable for irrigation is a draw- back to agriculture. The climate is dry and generally healthy, being warm in the valleys and temperate in the mountains. The agricultural products are cereals, sugar and maguey, the first being dependent on the rainfall, often failing altogether, the second on irrigation in the lower valleys, and the latter doing best in a dry climate on a calcareous soil with water not far beneath the surface. There is also a considerable produc- tion of peaches, apricots and grapes, the last being made into wine. A few cattle are raised, and considerable attention is given to the rearing of sheep, goats and swine. A natural product is guayule, a shrub from which rubber is extracted. The chief industry of Zacatecas, however, is mining for silver, gold, mercury, copper, iron, zinc, lead, bismuth, antimony and salt. Its mineral wealth was discovered soon after the conquest, and some of its mines are among the most famous of Mexico, dating from 7546. One of the most productive of its silver mines, the Alvarado, has records which show a production of nearly $800,000,000 in silver between 1548 and 1:867. The state is traversed by the Mexican Central and the Mexican ■National railways. Its manufactures are limited chiefly to the

reduction of mineral ores, the extraction of rubber from guayule, the making of sugar, rum, mescal, pulque, woollen and cotton fabrics, and some minor industries of the capital. The capital is Zacatecas, and the other principal towns are Sombrerete (pop. 10,000), an important silver-mining town 70 m. N.W. of the capital (elevation 8430 ft.); Ciudad Garcia (about 9500); Guadalupe (9000); Pinos (8000), a mining town; San Juan de Mezquital (7000); and Fresnillo (6300), an important silver- and copper-mining centre.

ZACATECAS, a city of Mexico, capital of the state of Zacatecas, 442 m. by the Mexican Central railway N.W. of Mexico city. Pop. (1900) 39,912. It is built in a deep, narrow ravine, S050 ft. above sea-level, with narrow,

crooked streets climbing the steep hillsides, and white, flat-roofed houses of four and five storeys overtopping each other. Its streets are well paved, and are lighted with electricity. The city is well drained and has a fine aqueduct for its water supply. The cathedral is an elaborately carved red-stone structure with un- finished towers and richly decorated interior. Several domed churches occupy prominent sites. The National College and the Colegio de Nuesta Senora de Guadalupe with its fine library may be noticed. Overlooking the city from an elevation of 500 ft. is the Bufa Hill, which is crowned by a chapel and is a popular pilgrimage resort. The Guadalupe chapel near the city has elaborate decorations, including frescoes, onyx steps, silver rails and paintings, and a curious tiled dome. The in- dustries comprise carriage building, weaving and the manu- facture of coarse pottery. The town is an important com- mercial centre.

Zacatecas was founded in 1546 and was built over a rich vein of silver discovered by Juan de Tolosa in the same year. This and other mines in the vicinity attracted a large population, and it soon became one of the chief mining centres of Mexico. It was made a city in 1585 by Philip II.

ZACH, FRANZ XAVER, Baron von (1754-1832), German astronomer, was born at Pesth on the 4th of June 1754. He served for some time in the Austrian army, and afterwards lived in London from 1783 to 1786 as tutor in the house of the Saxon minister, Count Briihl. In 1786 he was appointed by Ernest II. of Saxe-Coburg-Gotha director of the new observatory on the Seeberg at Gotha, which was finished in 1791. From 1806 Zach accompanied the duke's widow on her travels in the south of Europe. He died in Paris on the 2nd of September 1832.

Zach published Tables of the Sun (Gotha, 1792; new and improved edition, ibid.. 1804), and numerous papers on geographical subjects, particularly on the geographical positions of many towns and places, which he determined on his travels with a sextant. His principal importance was, however, as editor of three scientific j ou rnals of great value : A llgcmeine Geographische Ephemeriden (4 vols., Gotha, 1798-99), Monatliche Correspondenz zur Beforderung der Erd- und Himmels-Kunde (28 vols., Gotha, 1800-13, from 1807 edited by B. von Lindenau), and Correspondance astronomique, geo- graphique, hydro graphique, et statistique (Genoa, 1818-26, 14 vols., and one number of the 15th suppressed at the instigation of the Jesuits).

ZACHARIAE VON LINGENTHAL, KARL SALOMO (1769- 1843), German jurist, was born on the 14th of September 1769 at Meissen in Saxony, the son of a lawyer, and received his early education at the famous public school of St Afra in that town. He afterwards studied philosophy, history, mathematics and law at the university of Leipzig. In

1792 he went to Wittenberg University as tutor to one of the counts of Lippe, and con- tinued his legal studies. In 1794 he became privatdozent, lecturing on canon law, in 1798 extraordinary professor, and 1802 ordinary professor of feudal law. From that time to his death in 1843, with the exception of a short period in which public affairs occupied him, he poured out a succession of works covering the whole field of jurisprudence, and was a copious contributor to periodicals. In 1807 he received a call to Heidelberg, then beginning its period of splendour as a school of law. There, resisting many calls to Goltingen, Berlin and other universities, he remained until his death. In 1820 he took his seat, as representative of his university, in the upper house of the newly constituted parliament of Baden. Though

he himself prepared many reforms — notably in the harsh criminal code— he was, by instinct and conviction, conservative and totally opposed to the violent democratic spirit which dominated the second chamber,, and brought it into conflict with the grand-duke and the German federal government. After the remodelling of the constitution in a "reactionary" sense, he was returned, in 1825, by the district of Heidelberg to the second chamber, of which he became the first, vice- president, and in which he proved himself more " loyal " than the government itself. With the growth of parliamentary Liberalism, however, he grew disgusted with politics, from which he retired altogether in 1829. He now devoted himself wholly to juridical work and to the last days of his life toiled with the ardour of a young student. His fame extended beyond Germany. The German universities then enjoyed, in regard to legal questions of international importance, a jurisdiction dating from the middle ages; and Zachariae was often con 1 – sulted as to questions arising in Germany, France and England. Elaborate " opinions," some of them forming veritable treatises — e.g. on Sir Augustus d'Este's claim to the dukedom of Sussex, Baron de Bode's claim as an English subject to a share in the French indemnity, the dispute as to the debts due to the elector of Hesse- Cassel, confiscated by Napoleon, and the constitutional position of the Mecklenburg landowners — were composed by Zachariae. Large fees which he received for these opinions and the great popularity of his lectures made him rich, and he was able to buy several estates; from one of which, Lingenthal, he took his title when, in 1842, he was ennobled by the grand- duke. He died on the 27th of March 1843. He had married in 1811, but his wife died four years later, leaving him a son, Karl Eduard.*

Zachariae's true history is in his writings, which are extremely numerous and multifarious. They deal with almost every branch of jurisprudence; they are philosophical, historical and practical, and relate to Roman, Canon, German, French and English law. The first book of much consequence which he published was Die Einheif des Stouts und der Kirche

mit Riicksicht auf die Deutsche Reicksverfassung (1797), a work on the relations Of church and state, with special reference to the constitution of the empire, which displayed the writer's power of analysis and his skill in making a complicated set of facts appear to be deductions from a few principles. In 1805 appeared Versuch einer allgemeinen Hermeneutik des Rechts; and in 1806 Die Wissenschaft der Gesetzgebung, an attempt to find a new theoretical basis for society in place of the opportunist politics which had led to the cataclysm of the French Revolution. This basis he seemed to discover in something re- sembling Bentham's utilitarianism. Zachariae's last work of importance was Vierzig Bucher vom Staate (1839-42), to which his admirers point as his enduring monument. It has been compared to Montesquieu's VEsprit des lois, and covers no small part of the field of Buckle's first volume of the History of Civilization, But though it contains proof of vast erudition and many original ideas as to the future of the state and of law, it lacks logical sequence, and is, consequently, full of contradictions. Its fundamental theory is, that the state had its origin, not in a contract (Rousseau- Kant), but in the consciousness of a legal duty. What Machiavelli was to the Italians and Montesquieu to the French, Zachariae aspired to become to the Germans; but he lacked their patriotic inspiration, and so failed to exercise any permanent influence on- the constitutional law of his country. Among other important works of Zachariae are his Staatsrecht, and his treatise on the Code Napol&on, of which several French editions were published, and which was translated into Italian. Zachariae edited with Karl loseph Mittermaier the Kritische Zeitschrifl fur Rechls-wissenschaft und Gesetzgebung des Auslandes, and the introduction which he wrote illustrates his wide reading and his constant desire for new light upon old problems. Though Zachariae's works have been superseded, they were in their day epoch-making, and they have been superseded by books which, without them, could not have been written.

For an account of Zachariae and his works, see Robert von Mohl, Geschichte u. Literatur der Staatswissenschaften (1855-58), and Charles Brocher, K. S. Zachariae, sa vie et ses ceuvres (1870); cf. also his biography in A 11 gem. Deutsche Biographie (vol. 44) by Wilhelm Fischer, and Holtzcndorff, Rechts- Lexicon, Zachariae von Lingenthal.

His son, Kael Editard Zachakiae (1812-1804), also an eminent jurist, was born on the 24th of December 181 2, and studied philosophy, history, mathematics and languages, as well as jurisprudence, at Leipzig, Berlin and Heidelberg. Having

made Roman and Byzantine law his special study, he visited Paris in 1832 to examine Byzantine MSS., went in 1834 to St Petersburg and Copenhagen for the same purpose, and in 1835 worked in the libraries of Brussels, London, Oxford, Dublin, Edinburgh and Cambridge. After a few months as a practising lawyer and privatdozent at Heidelberg, he went in 1837, in search of materials, to Italy and the East, visiting Athens, Constantinople and the monasteries of Mount Athos. Having a taste for a country life, and none for teaching, he gave up his position as extraordinary professor at Heidelberg, and in 1845 bought an estate in the Prussian province of Saxony. Here he lived, engaged in scientific agriculture and interested in Prussian politics, until his death on the 3rd of June 1894.

He produced an enormous mass of works of great importance for students of Byzantine law. The task to which he devoted his life was, to discover and classify the sources of Byzantine_ law hidden away in the libraries of the East and West; to re-edit, in the light of mocfern criticism, those sources which had already been published ; to write the history of Byzantine law on the basis of this hitherto undiscovered material; and finally, to apply the results to the scientific elucidation of the Justinian law. His Jus Graeco-Romanum, of which the first part was published in 185G, the last in 1891, is the best and most complete collection of the sources of Byzantine law and of the Novels from the time of , Justin II. to 1453. On the general history of the subject he wrote two epoch-making works, the Historiae Graeco-Romani juris de- lineatio, cum appendice ineditorum (Heidelberg, 1839), an d Innere Gesckichte des grieschisch-romischen Rechis. I, Personalrecht; II. Erbrecht; III. Die Gesckichte des Sachenreohts und Obligations- rr.ckt (Leipzig, 1856), the third edition of which appeared under the title Gesckichte des griechisch-romischen Rechts (1892). In this last work, which covered ground hitherto unexplored, Byzantine is treated as a development of Justinian law, and incidentally many obscure points in the economic and agrarian conditions of the Eastern empire are elucidated. For a list of Zachariae's other works, see Allgem. Deutsche Biogr., art. by Wilhelm Fischer.

ZACHARIAS, ST, pope from 741 to 752, was a Greek by birth, and appears to have been on intimate terms with Gregory III., whom he succeeded (November 741). Contemporary history dwells chiefly on his great personal influence with the Lombard king Luitprand, and with his successor Rachis; it was largely through his tact in dealing with these princes in a variety of emergencies that the exarchate of Ravenna was rescued from becoming part of the Lombard kingdom. A correspondence, of considerable extent and of great interest, between Zacharias and St Boniface, the apostle of Germany, is still extant, and shows how great was the influence of this pope on events then passing in France and Germany: he encouraged the deposition of Childeric, and it was with his sanction that Boniface crowned Pippin as king of the Franks at Soissons in 752. Zacharias is stated to have remonstrated with the emperor Constantine Copronymus on the part he had taken in the iconoclastic con- troversy. He died on the 14th of March 752, and was succeeded by Stephen II.

The letters and decrees of Zacharias are published in Migne, Patrolog. lat. lxxxix. p. 917-960.

ZAGAZIG (Zakazlk), a town of Lower Egypt, capital of the province of Sharkia. Pop. (1907) 34,999, including 2617 Copts and 1355 Greeks. It is built on a branch of the Fresh Water or Ismailia canal, and on the Al-Mo'izz canal (the ancient Tanitic channel of the Nile), and is 47 m. by rail N.N.E. of Cairo. Situated on the Delta in the midst of a fertile district, Zagazig is a great centre of the cotton and grain trade of Egypt. It has large cotton factories and the offices of numerous European merchants. About a mile south of the town are the ruins of Bubastis (q.v.).

ZAHRINGEN, the name of an old and influential German family, taken from the castle and village of that name near Freiburg-im-Breisgau. The earliest known member of the family was probably one Bezelin, a count in the Breisgau, who was living early in the nth century. Bezelin's son Bertold I. (d. 1078) was count of Zahringen and was related to the Hohen- staufen family. He received a promise of the duchy of Swabia, which, however, was not fulfilled, but in 1061 he was made duke of Carinthia. Although this dignity was a titular one only Bertold lost it when he joined a rising against the emperor

Henry IV. in 1073. His son Bertold II. (d. mi), who like his father fought against Henry IV., inherited the land of the counts of Rheinfelden in 1090 and took the title of duke of Zahringen; he was succeeded in turn by his sons, Bertold III. (d. 1122) and Conrad (d. 1152). In 1127 Conrad inherited some land in Burgundy and about this date he was appointed by the German king, LoLhair the Saxon, rector of the kingdom of Burgundy or

Aries. This office was held by the Zahringens until 1218 and hence they are sometimes called dukes of Burgundy. Bertold IV. (d. 1186), who followed his father Conrad, spent much of his time in Italy in the train of the emperor Frederick I.; his son and successor, Bertold V., showed his prowess by reducing the Burgundian nobles to order. This latter duke was the founder of the town of Bern, and when he died in February 1218 the main line of the Zahringen family became extinct. By extensive acquisitions of land the Zah- ringens had become very powerful in the districts now known as Switzerland and Baden, and when their territories were divided in 1218 part of them passed to the counts of Kyburg and thence to the house of Habsburg. The family now ruling in Baden is descended from Hermann, margrave of Verona (d. 1074), a son of duke Bertold I., and the grand-duke is thus the present representative of the Zahringens.

See E. J. Leichtlen, Die Zahringer (Freiburg, 1831); and E. Heyck, Gesckichte der Herzoge von Zahringen (Freiburg, 1891), and Urkunden, Siegel und Wappen der Herzoge von Zahringen (Freiburg,

1892).

ZAHRINGEN, a village of Germany, in the grand duchy of Baden, situated under the western slope of the Black Forest, 2 m. from Freiburg-im-Breisgau, and on the. railway from Heidelberg to Basel. Pop. (1900) 1200. Above the village on a spur of the mountains, 1500 ft. above the sea, lie the ruins of the castle of Zahringen, formerly the stronghold of the ducal line of that name (see above).

See Schopfiin, Historia Zaringo-Badensis (Karlsruhe, 1763-66, 7 vols.).

ZAILA, or Zetla; a town on the African coast of the Gulf of Aden, 124 m. S.W. of Aden and 200 m. N.N.E. of Harrar. Zaila is the most western of the ports of the British Somaliland protectorate, being 1 70 m. N.W. of Berbera by the coast caravan track. The town is surrounded on three sides by the sea; land- ward the country is unbroken desert for some fifty miles. The principal buildings, which date from the days of Egyptian occupation (1875-1884) are of white (coral) stone; the Somali dwellings are made of grass. Zaila has a good sheltered anchorage much frequented by Arab sailing craft, but heavy draught steamers are obliged to anchor a mile and a half from the shore. Small coasting boats lie off the pier and there is no difficulty in loading or discharging cargo. The water supply of the town is drawn from the wells of Takosha, about three miles distant; every morning camels, in charge of old Somali women and bearing goatskins filled with water, come into the town in picturesque procession. The population varies from 3000 to 7000, the natives, who come in the cool season to barter their goods, retiring to the highlands in hot weather. The chief traders are

Indians, the smaller dealers Arabs, Greeks and Jews. The imports, which reach Zaila chiefly via Aden, are mainly cotton goods, rice, jowaree, dates and silk; the exports — of which go per cent, are from Abyssinia — are principally coffee, skins, ivory, cattle, ghee and mother-of-pearl.

Zaila owed its importance to its proximity to Harrar, the great entrepot for the trade of southern Abyssinia. The trade of the port received, however, a severe check on the opening (1901-2) of the railway to Harrar from the French port of Jibuti, which is 3 5 m. N.W. of Zaila. A steamer from Aden to Zaila takes fifteen hours to accomplish the journey; caravans proceeding from Zaila to Harrar occupy from ten days to three weeks on the road.

For history and trade statistics, see Somaliland, British.

ZAIMUKHT, the name of a small Pathan tribe on the Kohat border of the North-West Frontier Province of India. The Zaimukhts inhabit the hills to the south of the Orakzais

between the Miranzai and Kurram valleys. Their country may be described as a triangle, with the range of hills known as the Samana as its base, and the village of Thai in the Kurram valley as its apex. This includes a tract on its western side occupied by an Orakzai clan. The total area is about 400 sq. m., of which the Orakzais occupy a fourth. The Zaimukhts are a fine-looking powerful race, with a fighting strength of some 3000 men.

ZAIRE, a name by which the river Congo was formerly known. Zaire is a Portuguese variant of a Bantu word (nzari) meaning river. In the 16th and 17th centuries the powerful native kingdom of Congo possessed both banks of the lower river, and the name of the country was in time given to the river also. Until, however, the last quarter of the 19th century ” Zaire ” was frequently used to designate the stream. It is so called by Camoens in the Lusiads. Since H. M. Stanley’s discoveries ” Congo ” has become the general name for the river from its mouth to Stanley Falls, despite an effort on the part of Stanley to have the stream re-named Livingstone. (See Congo, river.)

ZAISAN, or Zaisansk, a town of Russian Central Asia, in the province of Semipalatinsk, near the Chinese frontier, at an altitude of 2200 ft. and near the S.E. corner of Lake Zaisan. Pop. (1897) 4471. Lake Zaisan, situated in an open valley between the Altai range on the north-east and the Tarbagatai on the south, lies at an altitude of 1355 ft. It has a length of 65 m., a width of 14 to 30 m., an area of 707 sq. m., and a maximum

depth of 50 ft. Its water is fresh, as it receives the Black Irtysh and the Kendyrlyk from the east, and several smalt streams from the west, all of which leave the lake at its north-west extremity by the White Irtysh. The fisheries, which yield abundantly, are in the hands of the Siberian Cossacks. The lake is generally frozen from the beginning of November to the end of April.

ZALEUCUS, of Locri Epizephyrii in Magna Graecia, Greek lawgiver, is supposed to have flourished about 660 B.C. The statement that he was a pupil of Pythagoras is an anachronism. Little is known of him, and Timaeus even doubted his existence, but it is now generally agreed that this is an error. He is said to have been the author of the first written code of laws amongst the Greeks. According to the common story, the Locrians consulted the Delphic oracle as to a remedy for the disorder and lawlessness that were rife amongst them. Having been ordered to make laws for themselves, they commissioned one Zaleucus, a shepherd and slave (in later tradition, a man of distinguished family) to draw up a code. The laws of Zaleucus, which he declared had been communicated to him in a dream by Athena, the patron goddess of the city, were few and simple, but so severe that, like those of Draco, they became proverbial. They remained essentially unchanged for centuries, and the Locrians subsequently enjoyed a high reputation as upholders of the law. One of the most important provisions was that the punishment for different offences was definitely fixed, instead of being left to the discretion of the judge before whom a case was tried. The penalty for adultery was the loss of the eyes, and in general the application of the lex talionis was enjoined as the punishment for personal injuries. Special enactments concerning the rights of property, the alienation of land, settle- ment in foreign countries, and various sumptuary laws {e.g. the drinking of pure wine, except when ordered medicinally, was forbidden) are attributed to him. After the code was firmly established, the Locrians introduced a regulation that, if a citizen interpreted a law differently from the cosmopolis (the chief magistrate), each had to appear before the council of One Thousand with a rope round his neck, and the one against whom the council decided was immediately strangled. Any one who proposed a new law or the alteration 01 one already existing was subjected to the same test, which continued in force till the 4th century and even later. Zaleucus is often confused with Charondas, and the same story is told of their death. It is said that one of Zaleucus's laws forbade a citizen, under penalty of death, to enter the senate-house bearing a

weapon. During the stress of war, Zaleucus violated this law; and, on its being pointed out to him, he committed suicide by throwing himself upon the point of his sword, declaring that the law must be vindicated.

See Bentlcy, Dissertation on the Epistles of Phalaris; F. D. Gerlach,

Zaleukos, Charondas, Pythagoras (1858); G. Busolt, Griechische Gcschichte, i.; Schol. on Pindar, Oi. x. 17; Strabo vi. p. 259; Diod. Sic. xii. 20, 21; Demosthenes, In Timocratem, p. 7441 Stobaeus, Florilegium, xliv. 20, 21, where the supposed preface of Zaleucus and the collection of laws as a whole is spurious; Su'idas, s.v., who makes him a native of Thurii; Cicero, De Legions, ii. 6. See also article Greek. Law.

ZALMOXIS, or Zamolxis, a semi-mythical social and re- ligious reformer, regarded'as the only true God by the Thracian Getae. According to Herodotus (iv. 94), the Getae, who be- lieved in the immortality of the soul, looked upon death merely as going to Zalmoxis. Every five years they selected by lot one of the tribesmen as a messenger to the god. The man was thrown into the air and caught upon the points of spears. If he did not die, he was considered unfit to undertake the mission and another was chosen. By the euhemeristic Hellespontine Greeks Herodotus was told that Zalmoxis was really a man, formerly a slave of Pythagoras at Samos, who, having obtained his freedom and amassed great wealth, returned to Thrace, and instructed his fellow-tribesmen in the doctrines of Pythagoras and the arts of civilization. He taught them that they would pass at death to a certain place, where they would enjoy all possible blessings for all eternity, and to convince them of this he had a subterranean chamber constructed, to which he withdrew for three years. Herodotus, who declines to commit himself as to the existence of Zalmoxis, expresses the opinion that in any case he must have lived long before the time of Pythagoras. It is probable that Zalmoxis is Sabazius. the Thracian Dionysus or Zeus; Mnaseas of Patrae identified him with Cronus. In Plato {Charmides, 15S B) he is mentioned with Abaris as skilled in the arts of incantation. No satisfactory etymology of the name has been suggested.

ZAMAKHSHARI [Abu-1 Qasim Matmud ibn 'Umar uz- Zamakhsharl] (1074-1143), Arabian theologian and grammarian, was born at Zamakhshar, a village of Khwarizm, studied at Bokhara and Samarkand, and enjoyed the fellowship of the jurists of Bagdad. For many years he stayed at Mecca, from which circumstance he was known as Jar-tdlah (" God's client "). Later he returned to Khwarizm, where he died at the capital Jurjanlyya. In theology he was a pronounced Mo'tazilite (see Mahommedan Religion: section Sects). Although he used Persian for some of his works he was a strong supporter of the superiority of the Arabic language and an opponent of the Shu'ubite movement. Zamakhshari's- fame as a commentator rests upon his commentary on the Koran, called al-Kashshaf (" the Revealer "). In spite of its Mo'tazilite theology it was famous among scholars and was the basis of the widely-read commentary of Baidhaw! (q.v.). It has been edited by W. Nassau Lees (Calcutta, 1856), and has been printed at Cairo (1890), Various glosses on it have been written by different authors. His chief grammatical work is the Kitab

ul-mufassal, written about 1120 and edited by J. P. Broch (2nd ed., Christiania, 1879). Many commentaries have been written on this work, the fullest being that of Ibn Ya'ish (d. 1245), edited by G. Jahn (2 vols., Leipzig, 1876-86).

Of his lexicographical works the Kitab Muqaddimat ul-Adab was edited as Samachscharii Lexicon Arab. Pers. (ed. J. G. Wetzstein, 2 vols., Leipzig, 1844), and the Asas ul-baldgha, a lexicon of choice words and phrases, was printed at Bulaq, 1882. Of his adab works the Nawabigh ul-kalim, an anthology, was edited by H. A. Schultens (Leiden, 1772), by B. de Meynard in the Journal asiatique, ser. 7, vol, vi., pp. 313 ff. (cf. M. de Goeje in Zeitschr. d. deutsch. morg. Gesellschaft, vol. xxx. pp. 569 ff.). The Atwaq udh-Dhahab was edited by J. von Ilammer-Purgstall (Vienna, 1835); by H. L. Fleischer (Leipzig, 1S35); by G. Weil (Stuttgart, 1863); and by B. de Meynard (Paris, 1876; cf. de Gocjc as above). (G. W. T.)

ZAMBEZI, the fourth in size of the rivers of Africa, and the largest of those flowing eastwards to the Indian Ocean. Its length (taking all curves into consideration) is about 2200 m. The area of its basin, according to Dr Bludau, is 513,500 sq. m.,

or rather less than half that of the Nile. The main channel is clearly marked from beginning to end. The river takes its rise in ir° 21′ 3″ S., 24 22′ E, The source lies in British territory in a depression of an undulating country 5000 ft. above the sea, covered with bracken and open forest. The water, like that of all the rivers of the neighbourhood, issues from a black marshy bog, and quickly collects into a well-defined stream. In the first hundred miles of its course the river is known as the Yambeshe — in sound almost identical with its name in its lower course, though intervening sections are known as Liam- beshe, Liambai, &c. Eastward of the source the water- parting between the Congo and Zambezi basins is a well-marked belt of high ground, falling abruptly north and south, and running nearly east and west between n° and 12 S. This distinctly cuts off the basin of the Luapula (the main branch of the upper Congo) from that of the Zambezi. In the neighbour- hood of the source, however, the water-parting is not so clear, but the two river systems do not connect.

The Upper River, — The infant Zambezi, after pursuing a south- westerly course for about 150 m., turns more directly south and, soon after the 12° S. is crossed, is joined by a stream (coming from the north-west) whose source is near a marshy lake called Dilolo, 4600 ft. above sea-level in 11°

50′ S., 22″ 10′ E. Lake Dilolo was at one time believed to communicate with the Kasai river, one of the great affluents of the Congo flowing north-west, but this is not the case. Dilolo belongs to the Zambezi system only, sending water to that river after heavy rain. The Zambezi as it flows southward receives on either side numerous small tributaries. A few miles above Kakengi (in 12° 24′ S.), the Zambezi, narrow, picturesque and tortuous, suddenly widens from 100 to 350 yds. Below Kakengi are a number of rapids ending (13 7′ S.) in the Sapuma cataracts. At this point the river flows tumultuously through a rocky fissure.

The first of its large tributaries to enter the Zambezi is the Kabompo, a left-hand affluent . It joins the main stream in 14 26′ S. A little lower down (in r4° 18′ S.) the Zambezi receives from the west the waters of a much larger stream than the Kabompo, namely, the Lungwebungu. (For details concerning these and the other chief tributaries of the Zambezi, sec below.) The savannah forest, which has hitherto characterized the country, now gives place to a more open bush valley, studded with Borassus palms. Dense vegetation is confined to narrow strips of matted forest which skirt the first few hundred yards of the sources of the Zambezi and its tributaries during the first 100 m. or so. The land, from 5000 ft. at the source, falls gradually to 3600 ft. at Kakengi — a distance of 220 m. From this point until the Victoria Falls are reached— 500 m.— the level of the Zambezi basin is very uniform, the fall being in this distance 600 ft. only. Twenty miles below the confluence of the Lungwebungu the country becomes flat, and in the rainy seasons is largely covered by floods. Some 50 m. farther down, the Luanginga, which with its tributaries drains a large area to the westward, joins the Zambezi. A few miles higher up on the east the main stream is reinforced by the waters of the Luena. On the same (eastern) side a little below the junction of the Luanginga and the Zambezi stands Lialui, the capital of the Barotse (q.v.). The river, which for some distance has had a slight western as well as southern trend, now turns distinctly south-east. From the east the Zambezi continues to receive numerous small streams, but on the west is without tributaries for 150 m. f when the great river formerly misnamed the Chobe, but known to the natives as Kwando or LinyantCj joins it (in 17 47′ S.). Before this junction is effected, the Gonye Falls, the work of erosion (16 40′ S.), offer an interruption to navigation, whilst below the falls are numerous rapids. The western bank of the Zambezi, which in this part of its course is very tortuous, is German territory from the most southern of these rapids — Katima Molilo (17 28′ S.) — to the confluence of the Kwando, including the right or northern bank of the lower course of the last-named river; this narrow strip of land projecting from the main portion of German South- West Africa expressly to allow Germany access to the Zambezi.

Below the junction of the Kwando and the Zambezi the river bends almost

due east. The stream has hitherto flowed, in the main, in a gentle steady current, the depth of water, owing to the breadth of the channel, not being great. But its character is about to change. As it flows' eastward towards the border of the great central plateau of Africa it reaches a tremendous chasm in the floor of the earth, and thus the Victoria Falls (g.v.) t the largest waterfalls in the world, are formed.

The Middle Zambezi. — The Victoria Falls are reached some 60 m. after the Kwando confluence is passed, and below them the river continues to flow due east for about 120 m. It then cuts its way through perpendicular walls of basalt from 60 to 100 ft. apart. \ his dismal canyon, named by Major St Hill Gibbons " The Devil's Gorge,"" is 8 m. long. Towering over the rocks which form the banks of the river are precipitous hills, 700 to 800 ft. high. The

river flows swiftly through the gorge, the current being continually interrupted by reefs. Beyond the gorge are a succession of rapids, ending with those called Molele, which is 146 m. below the Victoria Falls. In this distance the fall of the river is 800 ft. From the Devil's Gorge the Zambezi takes a decided trend north whilst still pursuing its general easterly course. For the nest 700 m. until the Kebrabasa Rapids are reached, the river flows through well- defined and occasionally rocky banks. Besides the rapids already mentioned there are several others in the middle stretch of the river, forming impediments to navigation at low water. One of the most difficult passages is that of a grand gorge a little above the mouth of the Loangwa, in about 30 E., named by Major Gibbons Livingstone's Kariba, in distinction from a second Kariba (= "gorge") a little beyond the Kafukwe confluence. Between the two gorges the river is generally unobstructed, but at the western end of the second Kariba navigation is dangerous at low water. Exclusive of the Shire (q.v.) the Loangwa and the Kafukwe (also called Kafue) just mentioned are the two largest left-hand tributaries of the Zambezi. The Kafukwe joins the main river in : 5° 57′ S. in a quiet deep stream about 200 yds. wide. From this point' the northward bend of the Zambezi is checked and the stream continues due east. At the confluence of the Loangwa (15 37′ S.) it enters Portuguese territory, and from this point to the sea both banks of the river belong to that kingdom. At the Kebrabasa Rapids — 800 rn. below the Victoria Falls — the Zambezi is sharply deflected to the south, the river at this point breaking through the continental escarpment to reach the sea. The Kebrabasa Rapids, which extend about 45 m.— the road taking a detour of 70 m. — are absolutely unnavigable, and with them the middle stretch of the Zambezi as definitely ends as does the upper river at the Victoria Falls.

The Lower River. — The lower Zambezi — 400 m. from Kebrabasa Rapids to the sea— presents no obstacles to navigation save the shallowness of the

stream in many places in the dry season. This shallowness arises from the different character of the river basin. Instead of, as in the case of the middle Zambezi, flowing mainly through hilly country with well-defined banks, the river traverses a broad valley and spreads out over a large area. Only at one point, the Lupata Gorge, 200 m. from its mouth, is the river confined be- tween high hills. Here it is scarcely 200 yds. wide. Elsewhere it is from 3 to 5 m. wide, flowing gently in many streams. The river- bed is sandy, the banks are low and reed-fringed. At places, however, and especially in the rainy season, the streams unite into one broad swift-flowing river. About 100 m. from the sea the Zambezi receives the drainage of Lake Nyasa through the river ShirS. On approaching the ocean, which it reaches in 18 50′ S. the Zambezi splits up into a number of branches and forms a wide delta. Each of the four principal mouths — Milambe, Kongone, Luabo and Timbwe — is obstructed by a sand-bar. A more northerly branch, called the Chinde mouth, has a minimum depth at low water of 7 ft. at the entrance, and of 12 ft. farther in, and is the branch used for navigation, fcxty miles farther north is a river called the Qua-Qua or Quilimanc, from the town founded by the Portuguese ,at its mouth. This stream, which is silting up, re- ceives in the rainy season the overflow of the Zambezi.

The region drained by the Zambezi may be represented as a vast broken-edged plateau 3000 or 4000 ft. high, composed in the remote interior of metamorphic beds and fringed with the igneous rocks of the Victoria Falls. At Shupanga, on the lower Zambezi, thin strata of grey and yellow sandstones, with an occasional band of limestone, crop out on the bed of the river in the dry season, and these persist beyond Tete, where they are associated with extensive seams of coal. Coal is also found in the district just below the Victoria Falls. Gold-bearing rocks occur in several places.

Four Thousand Miles of Navigable Water.— As a highway into the interior of the continent the Zambezi, like all other large African rivers, in greater or less degree, suffers on account of the bar at its mouth, the shallowness of its stream, and the rapids and cataracts which interrupt its course. Nevertheless its importance to com- merce is great, as the following recapitulation of . its navigable stretches will show. (1) From the sea to the Kebrabasa Rapids, 400 m. (2) From Chikoa (above Kebrabasa) to within 140 rn. of the Victoria Falls, 700 m. (3) From the rapids above the Victoria Falls to the Katima Molilo Rapids, 100 m. (4) Above the Gonye Falls to the Supunia cataract, 300 m. (5) Above the Supuma cataract, 120 m. Thus for 1620 m. of its course the Zambezi is navigable for steamers with a draught of from 18 to 28 in. Were the obstruction caused by the Kebrabasa Rapids removed, there would be a clear passage from the sea almost to the foot of the cataracts below the Victoria Falls. The difficulty at Kebrabasa might be removed either by the cutting of a side channel or the

building of a dam to convert the gorge into a lake, to be connected with the river below by a lock and weir.

Several of the Zambezi affluents are also navigable for many miles. The Lungwebungu, which enters the upper river, is navigable for a long distance, thus supplying communication with the extreme north-West corner of the Zambezi basin. Parts at least of the Luena, Kafukwe, Loangwa and the Kwando tributaries are also capable of being navigated. The possibility of connecting tb 1*

Kwando with the navigable waters of the Okavango, at the point where the overflow mentioned below takes place, has likewise been suggested. The Shire is also navigable for a considerable distance. The sum of such navigable reaches within the Zambezi basin as exceed 100 m. is nearly 4000 m.

Tributaries. — The tributaries of the Zambezi are very numerous. The course of the more important streams is as follows: The Kahompo, which flows in from the east in ahout 14 8′ S., rises not far from 11° 34′ S., 25° 17′ E. in the high land which forms the eastern watershed between the Zambezi and Congo systems. In I3i° S. it receives on the right bank a tributary, the Lunga, said to be more important than the upper Kabompo itself, and rising somewhat farther north. The Lungwebungu, which enters the Zambezi from the west in 14° 35′ S., is a strong, deep stream 200 yds. wide in its upper course, flowing in a valley bordered by undula- tions of white sand covered by thin forest, its floor forming at times an inundated plain 2 to 3 m. wide.

The Kwando, largest of the western affluents of the Zambezi, formerly known as the Chobe and frequently spoken of as the Linyante from the ruined capital of the Makololo, situated on its lower course, rises in about 12° 40′ S., 18″ 50′ E., and flows in a generally straight course south-east to 17 30′ S., at which point it makes a sudden bend to the south before flowing east to the Zambezi. In this eastward stretch the Kwando for some 70 m. flows through a vast reedy swamp or lake studded with alluvial islands. Apart from its head-streams, it receives most of its tribu- taries from the west, and at its most southern bend is joined by the Magwe'- kwana, which in time of flood receives some of the surplus water of the Okavango (see Ngami). This surplus water, received after most of the flood water of the Kwando has passed, raises the level of the lake and holds up the waters of the Kwando for some miles above it.

Of the streams which enter the upper Zambezi from the east, the largest, after the Kabompo, is the Luena, which rises in 16° S., 26° E., and flows first north-west, afterwards west-south-west, joining the main river a little north of 15 S. Others arc the Njoko joining in 17 8′ S., the Machili, which enters in about 25 E., the Lumbi, 16 45′ S., and the Umgwezi, 17 37′ S. The largest tributary of the middle Zambezi — the Kafukwe — rises in about I[°. 35′ S. at an elevation of 4400 ft. in thick forest country. The main head-stream, which flows first south-east, afterwards south- west, is joined in 14° 35′ S. by the Lunga or Luanga, an important right-bank tributary, the united stream then flowing first south, afterwards due east. The lower Kafukwe is a large navigable river until about 40 m. from its mouth, but it then descends from the plateau by a series of falls and cataracts, the drop being over 1000 ft. in 15 m., one very high fall occurring in a stupendous chasm. The next great tributary to the cast is the Loangwa (also called Luangwa) which in its upper course runs parallel to the western shores of Lake Nyasa, having its source not far from the north-west corner of the lake. The main stream flows in a generally level valley, hounded by steep plateau escarpments, and is for the most part shallow and rapid, though fairly wide. In 14° 30′ S., however, it passes through narrow gorges with a speed of 8 or 9 m. an hour. In 15° 5′ S. it is joined by the Lunsefwa, which, with its tributary, the Lukosasi, drains a large extent of the western plateau, its basin being separated by the Mchinga mountains from that of the Loangwa. The Loangwa joins the Zambezi a little above the town of Zumbo. For some distance its lower course forms the frontier between Portuguese and British territory. From the south the middle Zambezi receives various rivers which water northern Matabele and Mashona lands — namely, the Shangani, Sanyati.and Hanyani, besides minor streams. The Mazoe, which also rises in Mashonaland, joins the Zambezi below the Kebrabasa Rapids.

Exploration of the River. — The Zambezi region was known to the medieval geographers as the empire of Monomotapa and the course of the river, as well as the position of Lakes Ngami and Nyasa, was filled in with a rude approximation to accuracy in the earlier maps. These were probably constructed from Arab information. The first European to visit the upper Zambezi was David Livingstone in his exploration from Bechu- analand between 1851 and 1853. Two or three years later he descended the Zambezi to its mouth and in the course of this journey discovered the Victoria Falls. During 1858-60, accom- panied by Dr (afterwards Sir) John Kirk, Livingstone ascended the river by the Kongone mouth as far as the Falls, besides tracing the course of its tributary the Shire and discovering Lake Nyasa. For the next thirty-five years practically no additions were made to our knowledge of the river system. In 1889 the entrance of vessels from the sea was much facilitated by the discovery by

Mr D. J. Rankin of the Chinde channel north of the main mouths of the river. Major A. St Hill Gibbons and his assistants, during two expeditions, in 1805-96 and 1898-1900, ably continued the work of exploration begun by Livingstone

in the upper basin and central course of the river. Of non- British travellers Major Serpa Pinto examined some of the western tributaries of the river and made measurements of the Victoria Falls (1878). Steamers had been used on the lower river — the "Ma-Robert" and the "Pioneer " — by the Livingstone expedition of 1858-61, but the utilization of the Zambezi as a commercial highway was inconsiderable until after the discovery of the Chinde mouth. The first steamer placed on the river above the Kebrabasa Rapids was the "Constance " launched by the Gibbons expedition at Chikoa in September 1898. She steamed to beyond the Guay confluence, and being ultimately sold to a commercial company, was used to carry goods on the middle Zambezi. The first steamer placed on the river above the Victoria Falls was the " Livingstone," launched in August

1902.

See David and Charles Livingstone, Narrative of an Expedition to the Zambesi and its Tributaries (1865); A. de Serpa Pinto, How I Crossed Afnea (1881); D. J. Rankin in Proc. R. G. S. (March 1890) ; A. Sharpe, ibid. (December, 1890) ; H. S. Bivar, " Curso medio do Zambeze," B. S. G. I.isboa, vol. xxiv. (1906); G. W. Lamplugh in Geo. Jnl., vol. xxxi. (1908); F. Coillard, On the Threshold of Central Africa (London, 1897), and A. St H. Gibbons. Africa from South to North through Marotseland (2 vols., London, 1904), which gives the results of a detailed examination of the upper Zambezi valley (with map). The last-named author has kindly revised the account given above. (F. R. C.)

ZAMBOANGA, the capital of the Moro Province, and of the District (or Comandancia) of Zamboanga, and a port of entry, on the island of Mindanao, Philippine Islands, at the S. ex- tremity of the western peninsula. Pop. (1903) 3281; of the comandancia, 20,692. Zamboanga has one of the most health- ful sites in the islands, its climate being decidedly cooler than that of Manila. Since the American occupation the trade has greatly increased and various improvements have been planned or are under way, including a new custom-house, better facilities for docking, pavements, bridges, and public parks. The Pro- vincial Capitol, one of the finest government buildings in the Philippines, was completed in 1908. There is considerable valuable timber in the vicinity, live-stock is extensively raised, and rice, copra, hemp, sugar-cane, tobacco, and sweet potatoes are other important products. Zamboanga was one of the oldest Spanish settlements in the islands, it having been taken and fortified as a

base against the Moros, and it still contains an old stone fort. Many of the inhabitants are descendants of slaves who escaped from the Moros and sought Spanish protection. A Spanish patois, called " Zamboangueno," is spoken by most of the native inhabitants.

ZAMINDAR, or Zemindar (from Persian zamin= " land "), an Indian landholder. In official usage the term is applied to any person, whether owner of a large estate or cultivating member of a village community, who is recognized as possessing some property in the soil, as opposed to the ryot (?.».), who is regarded as having only a right of occupancy, subject in both cases to payment of the land revenue assessed on his holding. The zamindari system obtains throughout northern and central India, and also in the permanently settled estates of Madras.

The raja of Benares had certain special rights as zamindar, and in 1910 it was arranged to make part of his " family domain" a new native state with an area of 887 sq. m. (pop.

362,000).

ZAMINDAWAR,- a district of Afghanistan, situated on the right bank of the Helmund river to the N.W. of Kandahar, bordering the road which leads from Kandahar to Herat via Farah. Zamindawar is a district of hills, and of wide, well populated, and fertile valleys watered by important affluents of the Helmund. The principal town is Musa Kala, which stands on the banks of a river of the same name, about 60 m. N. of Girishk. The whole of this region is a well-known hot- bed of fanalicism, the headquarters of the Achakzais, the most aggressive of all Durani tribes. It was from Zamindawar that much of the strength of the force which besieged Kandahar under Ayub Khan in 1880 was derived; and it was the Zamin-

dawar contingent of tribesmen who so nearly defeated Sir Donald Stewart's force at Ahmad Khel previously. The control of Zamindawar may be regarded as the key to the position for safeguarding the route between Herat and Kandahar.

ZAMORA, an inland province of north-western Spain, one of the three into which the former province of Leon has since 1833 been divided; bounded on the W. by Portugal and Orense, N. by Leon, E. by Valladolid, and S. by Salamanca. Pop. (1900) 275,545; area, 4097 sq. m. Zamora is traversed from east to west by the river Duero or Douro (?.».), which receives within

the province the Valderaduey and the Esla on the right and the Guarena on the left; the Tormes also skirts the south- western boundary for some 25 m. Except in the north-west, where it is entered by two outlying ridges of the Cantabrian Mountains, the Sierra de la Culebra and Sierra de Pefia Negra, the surface consists of a level or slightly undulating plateau; its lowest point is 1070 ft. above sea-level. Its plains, especially the valley of the Esla, yield large quantities of grain and pulse; wine and flax are also produced; and on the higher grounds large numbers of merino sheep and goats are reared, chiefly for export to Portugal. The manufactures of Zamora are unimportant. Three lines of railway, from Astorga on the N., Salamanca on the S., and Medina del Campo on the E., traverse the province and meet at the city of Zamora; there is a lack of good roads, and it is largely for this reason that the mines and extensive forests are neglected. The only towns with more than 5000 inhabitants are Zamora (pop., 1900, 16,287) andToro (8379), which are described in separate articles. The people of the province are very poor, badly educated, and lacking in enterprise. {See also Leon.)

ZAMORA, an episcopal city, and the capital of the Spanish province of Zamora; on the right bank of the river Duero (Douro), and at the junction of railways from Salamanca, Medina del Campo and Astorga. Pop. (1900) 16,283. Zamora occupies a rocky height overlooking the Duero, a little below its confluence with the Valderaduey. The river is crossed by a fine 14th-century bridge of sixteen pointed arches. The citadel of Zamora dates from the 8th century. The small but beautiful cathedral, one of four 12th-century churches in the city, is a Romanesque building, with a square tower, a dome above the crossing, and an elaborately-decorated interior. It was com- pleted about 11 7 5, and contains some interesting medieval tombs, and paintings by Fernando Gallegos (1475-1550). Tne other principal buildings are the 17th-century town-hall, the palace of the provincial assembly, a hospital with curious Gothic windows, an ecclesiastical seminary, and a school of engineering. The trade is chiefly agricultural, but linen and woollen goods, pottery, hats, leather, and spirits are manu- factured in small quantities.

In the early period of the Christian re-conquest Zamora, from its position on the north bank of the Duero, was a place of considerable strategic importance. It was taken from the Moors by Alphonso I. of Leon in 748, but was again held by them for short periods in 813, 939, 963, 984 and 986. It was entirely repaired by Ferdinand I. of Castile and Leon, who in 1061 gave it to his daughter Dona Urraca. After his death in 1065 his son Sancho II. disputed possession with Urraca and laid siege to the city, but without success, although the famous Ruy Diaz de Bivar was among his warriors, and indeed at this time received his title of " The Cid." Zamora became subject to Alphonso VI. in 1073.

ZAMOYSKI, JAN (1541-1605), Polish statesman, was the son of Stanislaw, Castellan of Chelm, and Anna Herburtowna, who belonged to. one of the most ancient ar.d illustrious families in Poland. After completing his education at Paris, Strassburg, and at Padua, where as rector of the academy he composed his celebrated work De senatu romano (Venice, 1563), he returned home in 1565, one of the most consummate scholars and jurists in Europe. His essentially bold and practical genius sought at once the stormy political arena. He was mainly instru- mental, after the death of Sigismund II., in remodelling the Polish constitution and procuring the election of Henry of

Valois. After the flight of that prince Zamoyski seems to have aimed at the throne himself, but quickly changed his mind and threw all his abilities into the scale in favour of Stephen Bathory and against the Austrian influence. By his advice, at the beginning of January 1576 a diet was summoned to Jedrzejow to confirm the election of Bathory, and from the time of that monarch's arrival in Poland till his death ten years later Zamoyski was his foremost counsellor. Immediately after the coronation, on the 1st of May 1576, Zamoyski was appointed chancellor, and in 1580 ivielki hetman, or commander-in-chief, so that he was now the second highest dignitary in the kingdom. He strenuously supported Stephen during his long struggle with Ivan the Terrible, despite the obstruction and parsimony of the diet. He also enabled the king in 1585 to bring the traitorous Samuel Zborowski to the scaffold in the face of a determined resistance from the nobility. On the death of Stephen, the Zboruwski recovered their influence and did their utmost to keep Zamoyski in the background. Their violence prevented " the pasha," as they called him, from attending the convention summoned to Warsaw on the death of Bathory; but at the subsequent election diet, which met at Warsaw on the 9th of July 1587, he appeared at the head of 6000 veterans and intrenched himself with his partisans in what was called " the Black Camp " in contradistinction to " the General Camp " of the Zborowski. Zamoyski was at first in favour of a member of the Bathory family, with which he was united by ties of amity and mutual interest; but on becoming convinced of the impossibility of any such candidature, he pronounced for a native Pole, or for whichever foreign prince might be found most profitable to Poland. The Habsburgs, already sure of the Zborowski, bid very high for the support of Zamoyski. But though he was offered the title of prince, with the Golden Fleece and 200,000 ducats, he steadily opposed the Austrian faction, even at the imminent risk of a civil war; and on the 19th of August procured the election of Sigismund of Sweden, whose mother was Catherine Jagiellonica. The opposite party imme- diately elected the Austrian Archduke Maximilian, who there- upon made an attempt upon Cracow. But Zamoyski traversed all the plans of the Austrian faction by routing the archduke at the battle of Byczyna (January

24, 1588) and taking him prisoner. From the first there was a certain coldness between the new king and the chancellor. Each had his own plan for coping with the difficulties of the situation; but while Zamoyski regarded the Habsburgs with suspicion, Sigismund III. was disposed to act in concert with them as being the natural and strongest possible allies for a Catholic power like Poland. Zamoyski feared their influence upon Poland, which he would have made the head of the Slavonic powers by its own en- deavours. Zamoyski was undoubtedly most jealous of his dignity; his patriotism was seldom proof against private pique ; and he was not always particular in his choice of means. Thus at the diet of 1 589 he prevailed over the king by threaten- ing to leave the country defenceless against the Turks, if the Austrians were not excluded from the succession. In general, however, his Turkish policy was sound, as he consistently adopted the Jagicllonic policy of being friendly with so dangerous a neighbour as the Porte. His views on this head are set out with great force in his pamphlet, La dejjaicte des Tartares et Turcs (Lyons, 1590). The ill-will between the king and the chancellor reached an acute stage when Sigismund appointed an opponent of Zamoyski vice-chancellor, and made other ministerial changes which limited his authority; though ulti- mately, with the aid of his partisans and the adoption of such desperate expedients as the summoning of a confederation to annul the royal decrees in 1592, Zamoyski recovered his full authority. In 1595 Zamoyski, in his capacity of commander- in-chief, at the head of 8000 veterans dethroned the anti-Polish hospodar of Moldavia and installed in his stead a Catholic convert, George Mohila. On his return he successfully sustained in his camp at Cecora a siege by the Tatar khan. Five years later (October 20, 1600) he won his greatest victory at Ter- goviste, when with a small well-disciplined army he routed

Michael the Brave, hospodar of Walachia and Moldavia. But heyond securing the Polish frontier Zamoyski would never go. He refused to wage war with Turkey even under the most favour- able circumstances, nor could he be drawn into the Holy League against the Ottomans in 1600. When pressed by the papal legate and the Austrian envoys to co-operate at the head of all the forces of the league, he first demanded that in case of success Moldavia, Walachia and Bessarabia should fall to Poland, and that she should in the meantime hold Olmutz and Breslau as guarantees. The refusal of the Austrians to accept these reasonable terms justified Zamoyski's suspicion that the league would use Poland as a cat's-paw, and the negotiations came to nothing. Statesman though be was, Zamoyski cannot, however, be called a true patriot. Polish historians, dazzled by his genius and valour, are apt to over- look his quasi- treasonable conduct and

blame Sigismund III. for every misadventure; but there can be no doubt that the king took a far broader view of the whole situation when he attempted to reform the Polish constitution in 1605 by streng- thening the royal power and deciding all measures in future by a majority of the diet. These reforms Zamoyski strenuously opposed. The last speech he delivered was in favour of the anarchic principle of free election. He died suddenly at Zamosc on the 3rd of June 1605.

See Vincent Laureo, 1 574-78 , et ses depeches inediles (Ital.) (Warsaw, 1877); Augustin Theiner, Vetera monumenta Poloniae et Lituaniae vol. ii. (Rome, 1862); Adam Tytus Dzialynski, Collectanea vitam resgue gestas J. Zamoyocii illustrantia (Posen, 1881). (R. N. B.)

ZANARDELLI, GIUSEPPE (1826-1903), Italian jurisconsult and statesman, was born at Brescia on the 29th of October 1826. A combatant in the volunteer corps during the war of 1848, he returned to Brescia after the defeat of Novara, and for a time earned a livelihood by teaching law, but was molested by the Austrian police and forbidden to teach in consequence of his refusal to contribute pro-Austrian articles to the press. Elected deputy in 1859, he received various administrative appointments, but only attained a political office in 1876 when the Left, of which he had been a prominent and influential member, came into power. Minister of public works in the first Depretis cabinet of 1876, and minister of the interior in the Cairoli cabinet of 1878, he in the latter capacity drafted the franchise reform, but created dissatisfaction by the indecision of his administrative acts, particularly in regard to the Irre- dentist agitation, and by his theory of repressing and not in any way preventing crime, which led for a time to a perfect epidemic of murders. Overthrown with Cairoli in December 1878, he returned to power as minister of justice in the Depretis cabinet of 1881, and succeeded in completing the commercial code. Abandoned by Depretis in 1883, he remained in opposi- tion until 1887, when he again joined Depretis as minister of justice, retaining his portfolio throughout the ensuing Crispi ministry, until the 31st of January 1891. DuriDg this period he promulgated the Criminal Code, and began the reform of the magistracy. After the fall of the Giolitti cabinet in 1893, Zanardelli made a strenuous but unsuccessful attempt to form an administration. Elected president of the chamber in 1894 and 1896, he exercised that office with ability until, in December 1897, he accepted the portfolio of justice in the Rudini cabinet, only to resign in the following spring on account of dissensions with his colleague, Visconti-Venosta, over the measures necessary to prevent a recurrence of the tumults of May 1898. Returning to the presidency of the chamber, he again abandoned his post in order to associate himself with the obstructionist campaign against the Public Safety Bill (1899-1900), and was rewarded by being enabled to form an administration with the support of the Extreme Left upon the fall

of the Saracco cabinet in February 1901. He was unable to achieve much during his last term of office, as his .health was greatly impaired; his Divorce Bill, although voted in the chamber, had to be with- drawn on account of the strong opposition of the country. He retired from the administration on the 2nd of November 1903, and died on the 21st of December following.

ZANELLA, GIACOMO (1820-1888), Italian poet, was born at Chiampo, near Vicenza, on the 9th of September 1820, and was educated for the priesthood. After his ordination he be- came professor at the lyceum of his native place, but his patriotic sympathies excited the jealousy of the Austrian authorities, and although protected by his diocesan, he was compelled to resign in 1853. After the liberation of Venetia, the Italian government conferred upon him a professorship at Padua, and he achieved distinction as a poet on the publication of his first volume of poems in 1868. In 1872 grief for the death of his mother occasioned a mental malady, which led to the resigna- tion of his professorship. After his complete and permanent recovery he built himself a villa on the bank of his native river, the Astichello, and lived there in tranquillity until his death on the 17th of May 1888. His last published volume contains a series of sonnets of singular beauty, addressed to the river, resembling Wordsworth's " Sonnets to the Duddon," but more perfect in form; and a blank verse idyll, " II Pettirosso " (" The Redbreast "), bearing an equally strong, though equally accidental, resemblance to the similar compositions of Coleridge. His ode to Dante, and that on the opening of the Suez Canal, are distinguished by great dignity. Of his other compositions, the most individual are those in which, deeply impressed by the problems of his day, he has sought to reconcile science and religion, especially the fine dialogue between Milton and Galileo, where the former, impressed by Galileo's predictions of the intellectual consequences of scientific progress, resolves " to justify the ways of God to man." Zanella was a broad-minded and patriotic ecclesiastic, and his character is justly held in equal honour with his poetry, which, if hardly to be termed powerful, wears a stamp of peculiar elegance and finish, and asserts a place of its own in modern Italian literature.

ZANESVILLE, a city and the county-seat of Muskingum county, Ohio, U.S.A., on the Muskingum river, at the mouth of the Licking river, about 60 m. E. cf Columbus. Pop. (1890) 21,009; (1 900) 23,538, of whom 1435 were foreign-born; (1910, census) 28,026. Zanesville is served by the Baltimore & Ohio, the Pennsylvania, the Cleveland, Akron & Columbus, the Ohio River & Western, the Wheeling & Lake Erie, the Zanesville & Western, and the Ohio & Little Kanawha (B. and 0. system) railways, by a belt line around the city, and by the Ohio Electric and the Sou th-E astern Ohio electric inter- urban lines. By a series of locks and dams the

Muskingum river has been made navigable for small vessels to the Ohio and above Zanesville to Dresden, where connexion is made with the Ohio Canal extending north to Cleveland. Within the city limits the Muskingum is crossed by seven bridges (including a notable concrete Y bridge) and the Licking by two. The business districts of the city lie on both sides of the two rivers; the residential districts being chiefly on the hills to the north and west. Among the principal buildings are the Federal building, the county court-house, the Soldiers and Sailors' Monumental Building, containing a large auditorium, the Masonic and Oddfellows' temples, the Market building, con- taining city offices, a National Guard armoury, the John Mclntire public library, the John Mclntire Children's Home (1880), the Helen Purcell home for women, the county infirmary, the Bethesda Hospital (1890), and the Good Samaritan hospital (1902; under the Franciscan Sisters). The John Mclntire public library (about 20,000 volumes) is a consolidation of the Zanesville Athenaeum (1827) and the Eunice Buckingham library of the former Putnam Female Seminary (1835) here; Andrew Carnegie contributed $50,000 for the erection of the building. John Mclntire (1759-1815), one of the early settlers, provided by will for the maintenance of a school for poor children, and such a school was maintained from 1836 to 1856, when it was transferred to the city school system, annual con- tributions being made from the fund for poor children; later the Mclntire Home was founded, and in 1902 donations to the city school system were discontinued and the entire revenues of the estate devoted to the maintenance of the Home, which is a model of its kind. Zanesville is an important centre for the

manufacture of art and domestic pottery, plain and ornamental tile, building and paving bricks, and other clay products. In 1905 it ranked sixth among the cities of the country in the amount of pottery produced, and third in the degree of the specialization of that industry. In 1905 the value of all factory products was $7,047,637, of which $1,144,384 (16-2 per cent.) represented pottery, terra-cotta, and fireclay products.

Zanesville was first piatted in 1800 by Ebenezer Zane (1747- 181 r) of Wheeling, Virginia (now West Virginia), his brother Jonathan, and John Mclntire, his son-in-law, of Alexandria, Va., who under an act of Congress of 1796 surveyed a road from Wheeling to what is now Maysville, Kentucky, and received for this service three sections of land. Jonathan Zane and Mclntire selected the land at the point where the new road crossed the Muskingum river. The settlement was first called Westbourne and later was named Zanesville; a post office was established in 1802.

Zanesville became the county-seat upon the creation of Muskingum county in 1804, was the capital of the state from 1810 to 1812, was incorporated as a town in 1814, and was chartered as a city in 1850.

ZANGWILL, ISRAEL (1864-), Jewish man of letters, was born in London on the 14th of February 1864. His early childhood was spent in Plymouth and at Bristol, where he received his first schooling. He was in his ninth year when his parents settled in Spitalfields, and he entered the Jews' Free School, where eventually he became a teacher. Concurrently with his teaching work he took his degree with honours at London University. He had already written a fantastic tale entitled The Premier and the Painter in collaboration with Louis Cowen, when he resigned his position as a teacher owing to differences with the school managers and ventured into journalism. He founded and edited Ariel, The London Puck, and did much miscellaneous work on the London press. He made his literary reputation with a novel, The Children of the Ghetto (1892), which was followed by Ghetto Tragedies (1893); The Master (1895); Dreamers of the Ghetto (1898); The Mantle of Elijah (1901); and other tales and novels of great interest dealing with Jewish life. Children of the Ghetto was produced in a play in New York with success in 1899, and has since been extensively played both in English and Yiddish. Others of his plays are: Merely Mary Ann, played at the Duke of York's theatre, and The Serio- Comic Governess; Nurse Marjorie; and The M ' filing Pot, all produced in New York. Mr Zangwill was the founder of the International Jewish Territorial Organization (see Zionism).

ZANTE (anc. Zacynthus), an island of Greece, one of the Ionian group, in the Ionian Sea, in 37 40′ N. lat. and 21 E. long., is 25 m. long, about 12 broad, and 64 m. round, with an area of 277 sq. m., and a population in 1907 of 42,502. Zante lies 8 m. S. of Cephalonia, forming with it, Lcucas and Ithaca a crescent -shaped insular group, which represents the crests of a submerged limestone ridge facing the Gulf of Patras. Zante is of somewhat irregular oval shape, with its main axis disposed in the direction from north-west to south-east, and indented by a deep inlet at its southern extremity. The surface is mainly occupied by an extensive and highly productive central plain, skirted on the west side by a range of bare limestone hills from tooo to 1200 ft. high, which fall gently landwards, but present bold steep cliffs towards the sea, and which culminate north- wards in Mount Skopos, the ancient Elatos (t6oo ft.), the highest point in the island. On the east side the plain is also limited by a low ridge, which still justifies the epithet of nemorosa, or the " wooded," applied by Virgil to Zacynthus. These hills arc densely clothed to their summits with an exuberant growth of olives, figs, myrtles, laurels, oranges, aloes, vines and other sub-tropical plants. The central plain is highly cultivated, forming an almost continuous stretch of gardens and vineyards, varied here and there

with a few patches of cornfields and pasture lands. Here is grown a peculiar dwarf vine, whose fruit, the "' currant " (from " Corinth ") of commerce, forms the chief resource and staple export of Zante, as well as of the neigh- bouring mainland. The vine, which grows to a height of 3 ft., begins to yield in seven years and lasts for over a century. From

the grape, which has a pleasant bitter-sweet taste, a wine is also extracted, which is said to excel all others in flavour, fire and strength. Besides this species, there are nearly forty different kinds of vine and ten of the olive, including the karu- dolia, which yields the best edible olive berry. For size, vigorous growth and productiveness the olive tree of Zante is rivalled only by that of Corfu.*

The island enjoys a healthy climate; and, although there are no perennial streams, an abundant supply of good water . is obtained from the numerous springs, occurring especially in the eastern and central districts. But earthquakes are frequent and at times disastrous. During recent times the most de- structive were those of 1811, 1820, 1840 and 1893; and, although the prevailing geological formations are sedimentary, chiefly calcareous, there seems no doubt that these disturbances are of igneous origin. Other indications of volcanic agency 1 are the oil springs occurring on the coast, and even in the bed of the sea near Cape Skhiari on the north side, and especially, the famous pitch or bituminous wells already mentioned by Hero- dotus (Hist., bk. iv.). These have been productive throughout the historic period and still yield a considerable supply of pitch. They are situated in a swamp near the coast village of Chieri, and comprise two basins, with alternate layers of water .and bitumen, the lower sheet of water apparently communicating with the sea.

Zante, capital of the island, is a considerable seaport on the east side, with a population in 1907 of 13,501. It occupies the site of the ancient city of Zacynthus, said to have been founded by Zacynthus, son of a legendary Arcadian chief, Dardanus, to whom was also attributed the neighbouring citadel of Psophis. But of this, as well as of the temple of Artemis that formerly crowned Mount Skopos, no vestiges can now be discovered:

Traditionally the island formed part of the territory of Ulysses, king of Ithaca. It was peopled in ancient times by settlers variously represented as coming from Achaea or Arcadia. It figures occasionally in history as a base for belligerents in the Ionian Sea. Thus during the Peloponncsian War it served as a naval station for the Athenians, who again in 374 B.C. endeavoured to acquire it for a similar purpose; in 357 it became the headquarters of Dion on his expedition against Syracuse. In 217 it was seized by Philip V. of Macedon. The Romans captured it in 211, but restored it temporarily to Philip; in 191, wishing to keep it out of the hands

of ambitious Greek powers, they definitely annexed it. In 86 it was raided by Mithradates' admiral Archelaus during a short foray into Ionian waters. Under the Roman Empire Zante was included in the province of E pirns. In the nth century it passed to the Norman kings of Sicily; after the Fourth Crusade it be- longed at various times to the despots of Epirus, the emperors of Constantinople, and the Orsiiui counts of Cephalonia. After remaining from 1357 to 1482 in the hands of the Tocco family it became a Venetian possession. In 1797 it was ceded to France, and after a short occupation by the Russians was brought under British protection; in 1864 it was ceded with the other Ionian islands to the Greek kingdom.

The long Venetian occupation is reflected in the appearance, character, and to some extent even the language and religion of the Zantiots. Nearly all the aristocracy claim Venetian descent; most of the upper classes are bilingual, speaking both Greek and Italian; and a considerable section of the popula- tion are Roman Catholics of the Latin rite. Even the bulk of the people, although mainly of Greek stock, form in their social usages a connecting link between the Hellenes, whose language they speak, and the Western nations by whom they were so long ruled.

See B. Schmidt, Die Insel Zakynthos (Freiburg, 1899); B. V. Head, Historia Numorum (Oxford, 1887), pp. 359-60.

ZANY, a fool or silly person. Xhe word came into English in the 16th century from Ital. Zane, mod. Zanni, an abbrevia- tion of the name Giovanni (John). This familiar form of the name was given by Italians to a special type of clown or buffoon who acted as an attendant or follower of the regular

professional clown on the stage and made clumsy and ludicrous attempts to mimic his performance.

ZANZIBAR, a sultanate and British protectorate of East Africa. The sultanate, formerly of much larger, extent (see below. History), was reduced in 1890 to the islands of Zanzibar and Pemba, some adjacent islets, the nominal sovereignty of the coast line — for ten miles inland — of the protectorate of British East Africa (g.v.), and the possession, also nominal, of five ports on the Benadir coast, leased to Italy. (In IQ05 the sultan of Zanzibar sold his sovereign rights to these ports to Italy. See Somaliland: § Italian.) The islands of Pemba and Zanzibar have a collective area of 1020 sq. m. and an estimated population (1Q09) of

250,000.

Topography, &c — The political and commercial, as well as the geographical, centre of the state is the fertile and densely peopled island of Zanzibar, which lies at a mean distance of 20 m. from the mainland, between 5 40′ and 6° 30′ S. Pemba (g.v.) to the north and the more distant Mafia (to the south) form with Zanzibar an independent geological system, resting on a foundation of coralline reefs, and constituting a sort of outer coast-Hne, which almost everywhere presents a rocky barrier to the Indian Ocean. All three are disposed parallel to the mainland, from which they are separated by shallow waters, mostly under thirty fathoms, strewn wirh numerous reefs dangerous to navigation, especially in the Mafia channel opposite the Rufiji delta. (For Mafia, see German East Africa.) Some 6 m. N. of Zanzibar and forming part of the corai reef is the small, densely wooded island of Tumbatu. Its inhabitants are excellent sailors.

Zanzibar island is 47 m. long and 20 broad at its greatest breadth. It has an area of 640 sq. m. The island, called Unguja m Swahili, is not exclusively of coralline formation, several heights of a reddish ferruginous clay rising in gentle slopes 400 to 450 ft. hi the centre and double that in the north. There are several tolerable natural harbours, used only by Arab dhows, the port of Zanzibar sufficing for the general trade. The forests which formerly covered the island have largely disappeared; the eastern half is now mostly covered with low scrub. The western part is noted for the luxuri- ance and variety of its flora, notwithstanding the absenceof timber trees. Among fruit-trees the coco-nut palm is conspicuous. Each tree yields 100 to T20 nuts a year. In places there are extensive groves of these trees, elsewhere the palms grow indiscriminately among other trees, which include the mangrove (in swampy districts), lemons, sweet and sour limes, the bread fruit, papaw, pomegranate, tamarind, the orange and mango trees. The two last-named and plantains and bananas are abundant. The mango trees attain a great size. Many of the fruit-trees and plants have been introduced from India and Malaysia, such as the mangosteen, guava, durian, cinnamon, nutmeg and cloves, all of which thrive well. The soil seems specially suited for the clove, which, although nearly destroyed by a terrible cyclone in 1872, completely recovered from that disaster.

Although the fauna is almost exclusively continental, Zanzibar till recently possessed a distinct variety of monkey (Colobus kirkU), which appears to be now extinct. Other varieties of monkeys are fairly numerous. Hippopotami have occasionally swum to the island. Wild boars and servals are common, pythons are found in the swamps. Camels and bullocks are used as draught animals.

Climate, — The great heat and the excessive moisture of the atmos- phere

render the climate very trying, especially to Europeans. The year is divided into two seasons, according to the direction of the monsoons. The north-east monsoon sets in about the end of November, the south-west monsoon in April. The " hot season " corresponds with the north-east monsoon, when the minimum readings of the thermometer often exceed 8o° F. In June to September the minimum readings drop to 72 , the mean annual temperature being about 8o°. Rain falls in every month of the year. December, April and May are the rainiest months, August to October the driest. The average annual rainfall (18 years' observations) is 65 in. (In 1859 as much as 170 in. were registered.)

Inhabitants. — On the east side of the island the inhabitants, a Bantu-speaking race of low development, probably represent the aboriginal stock. They are known as Wahadimu and are noted as good fishermen, cattle raisers, and skilled artisans. In the west, and especially in the capital (for which, see below), the population is of an extremely heterogeneous character, including full-blood and half-caste Arabs, Goanese, Parsis, Hindus, Comoro Islanders, Swahili {q.v.) of every shade, and representatives of tribes from all parts of East Africa. The Arabs number about 7000; Asiatics (mostly British Indians), 20,000; whites (chiefly British), 250. Besides the port of Zanzibar there are no large towns. Chuaka is a pleasant health resort on the eastern shore facing the Indian Ocean.

Production. — Cloves and copra are the chief products of the island. There are also extensive chilli and rubber planta- tions. The muhogo (cassava), the tobacco plant and vanilla are cultivated on a smaller scale; experiments in cot ton grow ing proved unsuccessful. The shambas (plantations) are mostly the property of Arabs. The labourers are chiefly Swahilis, and were formerly slaves. The labour available at harvest time is often inadequate, and year after year a large proportion of the clove crop has remained unpicked. As its prosperity depended much more on its transit trade (Zanzibar being the entrepot for all the East African ports as far south as the Zambezi) than on agriculture the resources of the island were somewhat neglected; but when in the early years of the 20th century the competition of Mombasa and Dar-es-Salaam was felt, efforts were made to increase the number and productiveness of the crops and also to decrease costs by providing better means of transport. Good roads were made by the government, and an American company built a 3-ft. gauge railway from Zanzibar town to the north of the island, where are the chief plantations. Rice is imported in large quantities from Rangoon and Bombay. Besides rice, cassava, grown on the island, and fish (which is abundant) are the chief foods of the natives. The pigeon pea (cajanus Indicui) is commonly grown, and the Wahadimu and Watumbata cultivate the betel-nut creeper.

Revenue and Currency. — Custom duties are the chief source of revenue. Other sources are registration and market fees, hut tax (one dollar per hut) on government ground, post office receipts, &c, and the produce of crown shambas. A sum of £17,000 a year is paid to the government by the British East Africa Protectorate for the right to administer the mainland portion of the sultanate; the Zanzibar government also receives some £10,000 a year interest on the purchase money paid by Germany and Italy for the part of Zanzibar territory acquired by those Powers. In 1900 the revenue was £123,000 and the expenditure £131,000. In 1902 the sultan, on the advice of the British government, appointed a financial adviser, under whose care the finances steadily improved. In 1906 the revenue was £191,000, the expenditure £156,000. In the last- named year there was a public debt of £88,000. The principal items of expenditure come under^ the heads of administration, public works, civil list and military" police.

The coinage system is somewhat complicated. The Maria Theresa dollar (equalling approximately 3s. gd.) is used as a standard of value in price quotations, but the coin is not in circulation. The Indian rupee is in universal currency and the British sovereign is legal tender at the fixed rate of 15 rupees to £l. The division of the rupee into annas and pice was abolished in 1908 and the rupee divided into 100 cents. In the same year the government issued notes of 5, 10, 20, 50 and 100 rupees. British weights and measures are used in wholesale transactions, with the exception of the frasila, which equals 35 ^ avoir.

Religion, ■ Education and Justice. — Mahommedanism is the dominant religion. Most of the inhabitants are Sunnis of the Shah" school, but the sultan and his relatives are schismatics of the Ibadhi sect. There are several Protestant and Roman Catholic missions with branches on the mainland. These missions maintain schools. The government supports kuttabs in which elementary education is given in Arabic and the vernacular, and more advanced schools in which English, geography and arithmetic are taught. In December 1892 the sultan delegated to the British agent and consul-general his right to try all cases in which a British subject is plaintiff or accuser, and the defendant or accused is a Zanzibar subject. The British court also tries all cases in which other Europeans (and Americans) are concerned, the consular jurisdiction exercised by other Powers having been finally abolished in 1907. Cases between natives are tried by Moslem tribunals. There is a military police force under a British officer.

History. — From the earliest times of which there is any record the African seaboard from the Red Sea to an unknown distance southwards was subject to Arabian influence and dominion. Egyptians, Chinese and Malays also appear to have visited the coast. At a later period the coast towns were founded or conquered by Persian and Arab Mahommedans who, for the

most part, fled to East Africa between the 8th and nth centuries on account of the religious differences of the times, the refugees being schismatics. Various small states thus grew up along the coast, Mombasa seeming to be the most important. These states are sometimes spoken of as the Zenj empire, though they were never, probably, united under one ruler. Kilwa (q.v.) was regarded as the capital of the " empire." The

seaboard itself took the name of Zanquebar (corrupted to Zanzibar by the Banyan traders), the Balid ez-Zenj, or " Land of the Zenj " of the Arabs, a term which corresponds to the Hindu-bar, or " land of the Hindu," formerly applied to the west coast of India. By Ibn Batuta, who visited the coast in 1328, and other Arab writers the Zenj people are referred to in a general way as Mahommedan negroes; and they are no doubt still represented by the semi-civilized Mahommedan Bantus now collectively known as the SwahiH or " coast people," and in whose veins is a large admixture of Asiatic blood. The Zenj " empire " began to decline soon after the appearance of the Portuguese in East African waters at the close of the 15th century. To them fell in rapid succession the great cities of Kilwa with its 300 mosques (1505), Mombasa the" Magnificent " (1505), and soon after Malindi and Mukdishu the " Immense " (Ibn Batuta). The Portuguese rule was troubled by many revolts, and towards the end of the 16 th century the chief cities were ravaged by the Turks, who came by sea, and by the Zimbas, a fierce negro tribe, who came overland from south of the Zambezi. On the ruins of the Portuguese power in the 17th century was built up that of the Imams of Muscat. Over their African dominions the Imams placed volts or viceroys, who in time became independent of their overlord. In Mombasa power passed into the hands of the Mazrui family. The island of Zanzibar, conquered by the Portuguese in 1 503-8, was occupied by the Arabs in 1730, and in 1832 the town of Zanzibar, then a place of no note, was made the capital of his dominions by the Sayyid Said of Muscat, who reconquered all the towns formerly owning allegiance to the Imams, Mombasa being taken by treachery in 1837. On the death of Said in 1856 his dominions were divided between his two sons, the African section falling to Majid, who was succeeded in 1870 by his younger brother Bargash ibn Said, commonly knoAvn as sultan of Zanzibar. Bargash witnessed the dismemberment of his dominions by Great Britain, Germany and Italy (see Africa, § .5), and in March 1888 left to his successor, Sayyid Khalifa, a mere fragment of the territories over which he had once ruled. The Sayyids Majid and Bargash acted largely under the influence of Sir John Kirk (q.v.), who from 1866 to 1887 was consular representative of Great Britain at Zanzibar. By Sir John's efforts a treaty for the

suppression of the slave trade throughout the sultanate had been concluded in 1873.

In the negotiations between the Powers for the partition of Africa the supremacy of British interests in the island was acknowledged by Germany and France, thus rendering a treaty made in 1862 between France and Great Britain recognizing the " independence " of Zanzibar of no effect. On the 4th of November i8go the sultanate was proclaimed a British protectorate, in conformity with conventions by which Great Britain on her part ceded Heligoland to Germany and renounced all claims to Madagascar in favour of France. 1 Sultan (Sayyid) Ali, who had succeeded his brother Sayyid Khalifa in February 189c, in August following issued a decree which resulted in the liberation of large numbers of slaves. Sayyid Ali was succeeded in March 1893 by Hamed bin Thwain, on whose death in August 1896 his cousin, Sayyid Khalid, proclaimed himself sultan, and seized the palace. The British government disapproved, and to compel Khalid's submission the palace was bombarded by warships. Khalid fled to the German consulate, whence he was removed to the mainland, and Hamed bin Mahommed, brother of Hamed bin Thwain, was installed sultan by the British representative (27th of August 1896). The government was reconstituted under British auspices in October 1891, when Sir Lloyd Mathews 3 was appointed prime minister, and the

1 By the Zanzibar Order in Council, 1906, the protectorate of Zanzibar was limited to the islands of Zanzibar and Pemba, includ- ing the territorial waters thereof and any islets within those waters.

2 Sir Lloyd Mathews (1850-1901) was a British naval officer. He served in Ashanti 1873-74 and went to Zanzibar in 1875 as lieutenant on a ship engaged in the suppression of the slave trade. In 1877 he was selected to command the military force being raised by Sayyid Bargash and thereafter devoted his services entirely to the Zanzibar government. He was made a K.C.M.G. in 1894.

sultan made virtually a crown pensioner, '"With a "civil list of 120,000 rupees. In 1897 the legal status of slavery was abolished, compensation being given to slave owners. In July 1902 Hamed bin Mahommed died, and w r as succeeded by his son Ali bin Hamud, born in 1885. The British government is repre- sented by an agent and consul-general, without whose sanction no important steps can be undertaken. This officer also administered the East Africa Protectorate, but the dual appoint- ment was found to hamper the progress of both protectorates, and in 1904 when Mr Basil S. Cave was given charge of the Zanzibar protectorate another officer was appointed for the mainland. In 1906 the British agent assumed more direct control over the protectorate and again reorganized the adminis-

tration, Capt. (locally general) A. E. H. Raikes being appointed prime minister. These changes, together with the abolition of foreign consular jurisdiction, led to many reforms in the government and the increased prosperity of the Zanzibari.

Authorities.— J. L. Krapf, Travels . . . in Eastern Africa (London, i860) ; Precis of Information concerning . . . Zanzibar (War Office, London. 1902); W. W. A. Fitzgerald, Travels in , . . the island of Zanzibar (London, 1898); 11. S. Newman, Banani, the Transition from Slavery to Freedom in Zanzibar (London, 1898); Sir C. Eliot, The East Africa Protectorate (London. 1905) ; R. N. Lyne, Zanzibar in Contemporary Times (London, 1905), a useful historical summary, with bibliography of British Blue Books; Drumkeys' Year Book for East Africa (annually since 1908); and the annual reports to the British Foreign Office.

ZANZIBAR, an East African seaport, capital of the island and sultanate of the same name, in 6° 9′ S., 39 15′ E. The town is situated on the western side of the island, 26 m. N.E. of the mainland port of Bagamoyo, which is visible from Zanzibar in very clear weather. Zanzibar is built on a triangular-shaped peninsula about a mile and a half long which runs from east to west, forming a safe and spacious roadstead or bay with a minimum depth of water exceeding five fathoms. Ocean steamers anchor in the roadstead and are loaded and discharged by lighters. The harbour, frequented by British, German and French steamers, warships and Arab dhows, affords a constant scene of animation. Viewed from the sea, the town presents a pleasant prospect with its mosques, white flat-topped houses, barracks, forts, and round towers. The most prominent buildings are the Sultan's palace and the Government offices (formerly the British consulate), the last-named situated at the Point, the south-west horn of the bay. To the left of the palace — viewed from the sea — is the " stone ship," a series of water tanks (now disused) the front of which is cleverly carved to resemble a ship. The town consists of two quarters — Shangani, the centre of trade and residence of the sultan, and the eastern suburb, formerly separated from the rest of the town by the Malagash lagoon, an inlet of the sea, now drained. For the most part Zanzibar consists of a labyrinth of narrow and dirty streets, in which live the Banyans, Singalese, the negro porters, fishermen and half-castes. There are numerous markets. In Shangani are the houses of the European merchants and the chief Arabs, and the headquarters of various Protestant and Roman Catholic missions. Characteristic of the streets are the carved and massive wooden doors, whose blackness con- trasts with the white stone of the houses, and the bright red of the acacias in the garden enclosures. Ndia Kun or Main Road extends from the Sultan's palace to the (new) British Agency at Mnazi Moja, a castellated building situated in beautiful grounds. Along this thoroughfare are the custom house, the post office buildings (an imposing

edifice) and several con- sulates. In a turning of! Main Street is the residence of Tippoo Tib (now an hotel). Next to this house is the English Club, and in the same street are the law courts (built 1909-10). The Anglican cathedral (built 1873-79) a- semi-Gothic coral building, occupies the site of the old slave market. The Roman Catholic cathedral — in the Renaissance style— is one of the finest build- ings in East Africa. On the outskirts of the town at Mnazi Moja is a public park, a golf course and cricket ground. Zanzibar is well suDplied with pure water brought from the neighbouring .hills.

ZAPAROS— ZARHON

Submarine cables connect Zanzibar with all parts of the world; whilst lines of steamships from Europe and India make it a regular port of call. It was not, however, until 1910 that direct steamship communication with London was established. The average annual value of the external trade for the five years 1902-6 was: imports, £1,075,580; exports, £1,084,224. In 1907 the imports were valued at £1,232,957, the exports at £i,o7o ; o67. The figures for 1908 were: imports, £969,841; exports, £977,628. Many of the imports brought from the neighbouring mainland also figure as exports. Of these the most important are ivory, and rhinoceros horn, gum copal, hides and skins. Cloves, clove stems and copra are the chief exports, the production of the island. The bulk of the articles named, with the exception of copra, are sent to the United Kingdom; India, however, has a larger trade with Zanzibar than any other country. From it are imported food stuffs (rice, grain, flour, ghee, groceries) and piece goods. The copra is sent almost exclusively to Marseilles. The most valuable articles of import are piece goods and rice. The piece goods come chiefly from the United Kingdom, India, America and the Netherlands, the rice entirely from India. Other imports of value are building material, coal, petroleum and sugar.

The motley population of Zanzibar is indicative of the com- mercial importance of the city. Its geographical position has made it the key of East Africa from Cape Guardafui to Delagoa Bay. ” When you play on the flute at Zanzibar ” (says an Arab proverb) ” all Africa as far as the lakes dances.” From the time (1832) when Seyyid Said of Muscat fixed on the town as the capital of his empire, Zanzibar became the centre of the trade between the African continent, India, Arabia and the Persian Gulf, as well as Madagascar and the Mauritius. It also speedily obtained a large trade with Europe and America. The Americans were the first among white merchants to realize the possibilities of the port, and a United States consulate was established as early as 1836. The name Merikani, applied to cotton goods and blankets on the east coast, is a testimony to the enterprise of the American trader. Zanzibar is to a greater degree than any other city the capital of negro Africa; made so, however, not by the negroes but by

Arab conquerors and traders. The aspect of the city has changed since the establishment of the British protectorate, the suppression of the slave market and of slavery itself, and the enforcement of sanitation; but Professor Henry Drummond in Tropical Africa (1888) aptly sketched the characteristics of Zanzibar in pre-protectorate days when he wrote of it as a ‘ : cesspool of wickedness Oriental in its appearance, Mahomrnedan in its religion, Arabian in its morals … a fit capital for the Dark Continent.” Neverthe- less Zanzibar in those days was the focus of all exploring and missionary work for the interior, the portal through which civilizing influences penetrated into the eastern section of equatorial Africa. The growth of the British and German protectorates on the neighbouring shores led in the early years of the 20th century to considerable trade which had hitherto gone through Zanzibar being diverted to Mombasa and Dar-es-Salaam, but Zanzibar maintains its supremacy as the great distributing centre for the eastern seaboard.

ZAPAROS, a tribe or group of tribes of South American Indians of the river Napo. They occupy some 12,000 sq. m. between the Napo and the Pastaza. Their only industries are hammock plaiting and fishing-net weaving. Polygamy is general. They wear a long skirt of bark fibre.

ZARA (Serbo-Croatian Zadar), the capital of Dalmatia, Austria. Pop. (1900), of town and commune, 32,506; includ- ing a garrison of 1330. Zara is situated on the Adriatic Sea, 52 m. S.E. of Trieste, and opposite the islands of Ugliano and Pasman, from which it is separated by the narrow Channel of Zara. It is the meeting-place of the provincial diet, and the seat of a Roman Catholic archbishop and an Orthodox bishop. The promontory on which it stands is separated from thi main- land by a deep moat, practically making an island of the city. In 1873 the ramparts of Zara were converted into elevated promenades commanding extensive views to seaward and to

landward. Of its four old gates one, the Porta Marina, in- corporates the relics of a Roman arch, and another, the Porta di Terraferma, was designed in the 16th century by the Veronese artist Sanmichele. The chief interest of Zaia lies in its churches, the most remarkable of which is the cathedral of St Anastasia, a fine Romanesque basilica, built between 1202 and 1205. The churches of St Chrysogonus and St Simeon arc also in the Romanesque style, and St Mary’s retains a fine Romanesque campanile of 1105. The round church of St Donatus, tradi- tionally but erroneously said to have been erected in the gth century on the site of a temple of Juno, is used for secular purposes. The church treasuries contain some of the finest Dalmatian metal-work; notably the silver ark or re- liquary of St Simeon (1380), and the pastoral staff of Bishop Valaresso (1460). Most of the Roman remains were used in the construction of the fortifications. But two

squares are embellished with lofty marble columns; a Roman tower stands on the east side of the town; and some remains of a Roman aqueduct may be seen outside the ramparts. Among the other chief buildings are the Loggia del Comune, rebuilt in 1565, and containing a public library; the old palace of the priors, now the governor's residence; and the episcopal palaces. The harbour, to the north-east of the town, is safe and spacious, and it is annually entered by about 2500 small vessels, mainly engaged in the coasting trade. Large quantities of maraschino are distilled in Zara; and the local industries include fishingj glass-blowing, and the preparation of oil, flour and wax.

In the early days of the Roman empire Zara was a flourishing Roman colony under the name of Jadera, subsequently changed to Diadora. It remained united with the eastern empire down to 998, when it sought Venetian protection. For the next four centuries it was always under Venetian or Hungarian rule, changing hands repeatedly. It was occupied by the Hungarians at the end of the 12th century, but was recaptured by the Venetians in 1202, with the aid of French crusaders on their way to Palestine. In 1409 it was finally purchased from Hungary by Venice for 100,000 ducats. In 1792 it passed into the possession of Austria. From 1809 to 1813 it belonged to France.

About 15 m. S.E. is Zara Vecchia, or Old Zara, an insignificant village on the site of Biograd, the former residence of the Croatian kings, which was destroyed during the wars between Venice and Hungary.

See Angelo Nam, Zara, e suoi Dintorni (Zara, 5878), and Notizie Storiche della Cittd di Zara, (Zara, 1883).

ZARCILLO Y ALCARAZ, FRANCISCO (1707-1781); Spanish sculptor, was born in Murcia on the 12th of May 1707. At the age of twenty he completed the statue of St Ines of Monte- pulciano, which had been begun for the Dominicans at Murcia by his father. On the death of the latter the care of the family fell upon Francisco, who with the help of his brothers and sisters organized a workshop. In 1765 he also founded a small academy, which, however, was speedily dissolved owing to dis- union among the members. In the Errnita dc Jesus in Murcia may be seen Zarcillo's scenes from the Passion of Our Lord, a vast work in which all the sculptor's qualities and defects are revealed. In the church of St Miguel are an Immaculate Conception and a St Francis. Mention should also be made of the Christ at the Well in the church of Santa Maria dellas Gracias in Murcia, and of the sculptures in San Pedro and in the Capucine monastery in Murcia. Zarcillo worked in wood, which was coloured. The ascription of the stone sculptures on the facade of the St Nicolas Church in Murcia to him rests on conjecture. He died at Murcia in 1781.

See B. Haendcke, Studien zur Geschichte der spanischen Plastik (Strassburg, 1900).

ZARHON, a mountain in Morocco, 9ˆ m. N. of Mequinez, on whose hillside is the town Mulai Idris Zarh6n, so called after Mulai Idris I., the founder of the Moorish empire, who was buried there in a.d. 791. The whole town is considered as a sanctuary, pays no taxes, provides no soldiers and is never visited save by Mahommedans. Near the town are the ruins

of Volubilis — Kasar Fara'on or Pharaoh's Castle, once the Roman capital, and the first home of Idris.

ZARIA, a province of the British protectorate of Northern Nigeria. It lies approximately between 5° 5c/ and 8° 30′ E. and 9° 20′ and ii° 30′ N. It has an area of 22,000 sq. m. and an estimated population of about 250,000. The province, of which a great portion consists of open rolling plains, is watered by the Kaduna affluent of the Niger and its many tributaries, and is generally healthy and suitable for cultivation. The chief towns are Zaria, the capital of the emirate, 87 m. S.W. of Kano, and Zungeru, the headquarters of the British adminis- tration for the whole of Northern Nigeria. The British station at Zaria town, with an elevation of 2150 ft., has so far proved the healthiest and most agreeable point of occupation in the protectorate. The climate here for a great portion of the year is bracing, and in the cold season there is frost at night.

The British capital at Zurtgeru, in the south-western corner of the province, less fortunate than Zaria, has only an elevation of about 450 ft. above the sea. The climate, though better than that of Lokoja, is still relaxing and trying for Europeans. The site of Zungeru, 6° 9′ 40″ E. o° 48′ 32″ N., was selected in 1901. By the summer of 1902 brick houses for the public departments, a residency, a hospital, barracks and a certain number of houses for the civilian staff had been erected, and the town is now a flourishing settlement, having all the appearance of an English suburban town with shaded avenues and public gardens clustering on either side of the river Dago, over which several bridges have been thrown.

Zaria is not a great grain-producing province. Its principal crop is cotton, of which the surplus is available for purposes of trade, and among the Mahommedan population there is a grow- ing demand for cloth, agricultural and culinary implements, Birmingham goods, soap, oil, sugar

and European provisions. The construction of roads, telegraphs and other public works consequent upon the British occupation of the province makes somewhat heavy calls upon the local labour supply and ac- centuates to some of the large landowners the inconvenience resulting from the abolition of the slave trade, but the practice of owning domestic slaves is not forbidden, and it is the policy of the administration to render the transition from slave labour to free labour as gradual as possible.

The ancient state of Zaria, also called Zeg-Zeg by the geo- graphers and historians of the middle ages, was one of the original seven Hausa states. It suffered all the fluctuations of Hausa history, and in the 13th and early 14th centuries seems to have been the dominating state of Hausaland. At later periods it underwent many conquests and submitted in turn to Kano, Songhoi and Bornu. At the end of the 18th century it was an independent state living under its own Mahommedan rulers; but, like the rest of northern Hausaland, it was con- quered in the opening years of the 19th century by the emissaries of the Fula Dan Fodio. It remained a Fulani emirate paying allegiance to Sokoto up to the period of the British occupation of Nigeria, January 1900. Early in 1900 a British garrison was placed at Wushishi, a town in the south-western corner of the emirate which marks the limit of navigation of the Kaduna river. The emir of Zaria professed friendliness to the British, and at his own request British troops were quartered at his capital, in order to protect him from the threatened attacks of Kontagora. In March 1902 the province was taken under British administrative control. Throughout that year it was found that, notwithstanding his friendly professions, the emir of Zaria was intriguing with Kano and Sokoto, then openly hostile to Great Britain, while at the same time he continued, contrary to his undertaking in return for British protection, to raid for slaves and to perpetrate acts of brutal tyranny and oppression. He was deposed in the autumn of 1902, and after the Sokoto-Kano campaign of 1903, which assured the supremacy of Great Britain in the protectorate, another emir was appointed to Zaria. The new emir, Dan Sidi, took the oath of allegiance to the British crown and accepted his appointment on the condi- tions required of all the Nigerian native rulers. He afterwards

continued to act in loyal co-operation with the British ad- ministration.

The province has been organized for administration on the same system as the rest of the protectorate. It has been divided into four administrative districts, each under a British assistant resident. A good cart road suitabJe for wheeled LrafFic has been constructed between Zungeru and Zaria, and the Kaduna lias been handsomely bridged at a point near Wushishi, which is the meeting-point of main caravan roads, and whence there is at certain seasons of the year uninterrupted water carriage to the mouth of the Niger.

The development of trade was further facilitated in the early days of the British occupation by the building of a light railway from Barijuko, a point on the Kaduna river below Wushishi, to Zungeru. This line was superseded by the construction, in 1907-1909, of a 3 ft. 6 in. railway from Baro, a port on the lower Niger, to Zungeru, whence the line was continued to Zaria,

The taxation scheme introduced by the British administra- tion works satisfactorily, and the revenue shows a regular surplus. Courts of justice have been established in the administrative districts. In 1904 Zaria suffered from the mis- fortune of a famine, but excellent harvests restored prosperity in the following year, and the province shows every sign of contentment under existing rule. The main artery of commerce which runs from Zaiia to Wushishi has been rendered not only safe and peaceful, but has been made so much more commodious by the construction of a good road and by the bridging cf the river that the north and south trade is steadily increasing. The local movements of trade throughout the province are also greater.

A large portion of the province is occupied by pagan tribes, especially in the south and the south-west. These districts require more direct British supervision than the Fula districts, in which the native administration, under British control,, is fairly efficient. The creation of an administrative division at Kachia with a British station and garrison at Kachia town had an excellent effect, and the resident was able to report in 1905 that " the inhabitants of the once dangerous pagan districts now buy cloth, kolas and salt from the traders in exchange for mats, rubber, palm oil and corn, instead of seizing these articles as they formerly did." (F, L.L.)

ZARLINO, GIOSEFFO (1517-1590), Italian musical theorist, surnamed from his birthplace Zaelinus Clgdiensis, was born at Chioggia, Venetia, in 1517 (not 1540, as Burney and Hawkins say). Studying in his youth for the Church, he was admitted to the minor orders in 1539 and ordained deacon in i54r at Venice; but he soon devoted himself entirely to the study of music under the guidance of Adrian Willaert, then choirmaster at St Mark's. Willaert, dying in 1562, was succeeded by Cipriano di Rore, on whose removal to Parma in 1565 Zarlino was elected choirmaster. Though now remembered chiefly for invaluable contributions to the theory of music, it is evident that he must have been famous both as a practical musician and as a composer; for, notwithstanding the limited number of his printed works, consisting of a volume entitled M odulationes Sex Vocum (Venice, 1566), and a few motets and madrigals scattered through the collections of Scotto and other contemporary pub- lishers, he both produced and superintended the public per- formance of some important pieces in the service of the republic. First among these was the music written to celebrate the battle of Lepanto (on the 7th of October 1571). Again, when Henry III.

cf France passed through Venice on his return from Poland in 1574, Zarlino directed on board the "Bucentaur" the per- formance of an ode for which he himself had composed the music, to verses supplied by Rocco Benedetti and Cornclio Frangipani. The ode was followed by a solemn service in St Mark's, in which Zarlino's music formed a prominent feature, and the festival concluded with the representation of a dramatic piece entitled Orjeo composed by Zarlino. When the church of S. Maria della Salute was founded in 1577 to commemorate the plague, he composed a solemn mass for the occasion. No one of these works is now known to be in existence; the only

example we possess of Zarlino's compositions on a grand scale is a MS. mass for four voices, in the library of the Philharmonic Lyceum at Bologna. He died at Venice on the 14th, or according to some the 4th, of February 1590.

Zarlino's first theoretical work was the Istiiutioni Armonicke (Venice, 1558; reprinted 1562 and 1573). This was followed by the Dimosirationi Armonicke, (Venice, 1571 ; reprinted 1573) and by the Sopplimenti Musicali (Venice, 1588). Finally, in a complete edition of his works published shortly before his death Zarlino reprinted these three treatises, accompanied by a Tract on Patience, a Discourse on the True date of the Crucifixion of Our Lord, an essay on The Origin of the Capuchins, and the Resolution of Some Doubts Concerning the Correction of the Julian Calendar (Venice, 1589). 1

The Istiiutioni and Dimostrationi Armonicke deal, like most other theoretical works of the period, with the whole science of music as it was understood in the 16th .century. The earlier chapters, treat- ing chiefly of the arithmetical foundations of the science, differ but little in their line of argument from the principles laid down by Pietro Aron, Zacconi, and other early writers of the Boeotian school; but in bk. ii. of the Institutions Zarlino boldly attacks the false system of tonality to which the proportions of the Pytha- gorean tetrachord, if strictly carried out in practice, must inevit- ably lead. The fact that, so far as can now be ascertained, they never were strictly carried out in the Italian medieval schools, at least after the invention of counterpoint, in no wise diminishes the force of the reformer's argument. The point at issue was, that neither in the polyphonic school, in which Zarlino was educated, nor in the later monodic school, of which his recalcitrant pupil, Vincenzo Galilei, was the most redoubtable champion, could those proportions be tolerated in practice, however attractive they

might be to the theorist in their mathematical aspect. So persistently does the human ear rebel against the division of the tetrachord into two greater tones and a leimma or hemitone, as represented by the fractions I, §, ||-j|, that, centuries before the possibility of reconciling the demands of the ear with those of exact science was satisfactorily demonstrated, the Aristoxenian school advocated the use of an empirical scale, sounding pleasant to the sense, in pre- ference to an unpleasing tonality founded upon immutable pro- portions. Didymus, writing in the year 60, made the first step towards establishing this pleasant- sounding scale upon a mathe- matical basis, by the discovery of the lesser tone; but unhappily he placed it in a false position below the greater tone. Claudius Ptolemy (130) rectified this error, and in the so-called syntonous or intense diatonic scale reduced the proportions of his tetrachord to $, T V i|, — i.e. the greater tone, lesser tone, and diatonic semi- tone of modern music. 2 Ptolemy set forth this system as one of eight possible forms of the diatonic scale. But Zarlino uncom- promisingly declared that the syntonous or intense diatonic scale was the only form that could reasonably be sung; and in proof of its perfection he exhibited the exact arrangement of its various diatonic intervals, to the fifth inclusive, in every part of the diapason or octave. The proportions are precisely those now universally accepted in the system called " just intonation." But this system is practicable only by the voice and instruments of the violin class. For keyed or fretted instruments a compromise is indispensable. To meet this exigency, Zarlino proposed that for the lute the octave should be divided into twelve equal semitones; and after centuries of discussion this system of " equal temperament " has, within the last thirty-five years, been universally adopted as the best attainable for keyed instruments of every description. 3

Again, Zarlino was in advance of his age in his classification of the ecclesiastical modes. These scales were not, as is vulgarly supposed, wholly abolished in favour of our modern tonality in the 17th century. -Eight of them, it is true, fell into disuse; but the medieval Ionian and Hypo-ionian modes are absolutely identical with the modern natural scale of C ; and the Aeolian and Hypo- aeolian modes differ from our minor scale, not in constitution, but in treatment only. Medieval composers, however, regarded the Ionian mode as the least perfect of the series and placed it last in order. Zarlino thought differently and made it the first mode, changing all the others to accord with it. His numerical table, therefore, differs from all others made before or since, prophetically assigning the place of honour to the one ancient scale now recog- nized as the foundation of the modern tonal system.

These innovations were violently opposed by the apostles of the monodic school. Vincenzo Galilei led the attack in a tract entitled

1 Ambros mentions an edition of the Istitutioni dated 1557, and one of the Dimostrationi dated 1562. The present writer has never met with either.

3 We have given the fractions in the order in which they occur in the modern system. Ptolemy, following the invariable Greek method, placed them thus — }|, {J, fa. This, however, made no difference in the actual proportions.

3 It was first used in France, for the organ, in 1835; in England, for the pianoforte in 1846 and for the organ in 1854. Bach had advocated it in Germany a century earlier; but it was not gene- rally adopted.

xxviii. 3?

Discorso Intorno alle Opere di Messer Gioseffe ZarlitiOy and followed it up in his famous Dialogo,, defending the Pythagorean system in, very unmeasured language. It was in answer to theBe strictures ‘ that Zarlino published his Sopplementi.

ZARNCKE, FRIEDRICH KARL THEODOR (1825-1891), German philologist, was born on the yth of July 1825 at Zahrenstorf, near Briiel, in Mecklenburg, the son of a country pastor. He was educated at the Rostock gymnasium, and studied (1 844-1847) at the universities of Rostock, Leipzig and Berlin. In 1848 he was employed in arranging the valuable library of Old German literature of Freiherr Karl Hartwig von Meusebach (1781-1847), and superintending its removal from Baumgartenbrtlck, near Potsdam, to the Royal Library at Berlin. In 1850 he founded at Leipzig the Literarisches Ccntral- blatt fiir Deutschland. In 1852 he established himself as Privat- dozenl at the university of Leipzig, and published an excellent edition of Sebastian Brant’s NarrenschijJ (1854), a treatise Zur Nibeiungenfrage (1854), followed by an edition of the Nibelungen- lied (1856, 12th ed. 1887), and Beitrage zur Erlauterung und Geschickte des Nibelungenliedes (1857). In 1858 he was ap- pointed full professor, and commenced a series of noteworthy studies on medieval literature, most of which were published in the reports (Berichte) of the Saxon Society of Sciences. Among them were that on the old High German poem Mus- pilli (i860); Gesang vom heiligen Georg (1874); the legend of the Priester Johannes (1874); Der Graltempel (1876), and the Annolied (1887). He also wrote a valuable treatise on Christian Reuter (1S84), on the portraits of Goethe (1884), and published the history of Leipzig university, Die urkundlichen Quellen zur Geschickte der Universitat Leipzig (1857) and Die deutschen Universitaten im Mittelalter (1857). Two volumes of his Kleine Schrifien appeared in 1897.

See Zur Erinnerung an den Hsimgang von Dr Friedrick Zarncke (1891);

Franz Vogt in Zeitschrift fiir deutsche Pkilologie; Eduard Zarncke in Biograpkisches Jahrbuchfur Altertumswissenschaft (1895) ; and E, Sievers in Allgemeine deutsche Biographic.

ZEALAND (also Sealand or Seeland; Danish SjaeUand), the largest island of the kingdom of Denmark. It is bounded N. by the Cattegat, E. by the Sound, separating it from Sweden, and the Baltic Sea, S. by narrow straits separating it from Falster, Moen, and smaller islands, and W. by the Great Belt, separating it from Fiinen. Its nearer point to Sweden is 3 m., to Fiinen 11. Its greatest extent from N. to S. is 82 m., from E. to W. 68 m., but the outline is very irregular. The area is 2636 sq. m. The surface is for the most part undulating, but on the whole little above sea-level; the highest elevations are in the south-east, where Cretaceous hills (the oldest geological formation on the island) reach heights of upwards of 350 ft. The coast is indented by numerous deep bays and fjords; the Ise Fjord in the north, with its branches the Roskilde Fjord on the east and the Lamme Fjord on the west, penetrates inland for about 25 m. There are no rivers of importance; but several large lakes, the most considerable being Arre and Esrom, occur in the north-east. The soil is fertile and produces grain, especially rye and barley, in great abundance, as well as potatoes and other vegetables, and fruit. The scenery, especi- ally in the neighbourhood of the fjords, is pleasant, lacking the barrenness of some portions of the kingdom.

Zealand is divided into five amter (counties). (1) Frederiksborg, in the north, named from the palace of Frederiksborg. In the north-east, where the coast approaches most nearly to Sweden, is Helsingor or Elsinore. (2) Kjobenhavn, south of Frederiksborg. The capital is that of the kingdom, Copenhagen (Kjobenhavn). The only other town of importance is the old cathedral city of Roskilde on the fjord of that name. Off the little port of Kjoge in the south the Danes under Nils luel defeated the Swedes in 1677, and in another engagement in 17 10 the famous Danish commander Hvitfcldt sank with his ship. (3) Holback, west of Kjobenhavn. The chief town, Holbaek, lies on an arm of the Ise Fjord. In the west is the port of Kallundbcrg, with regular communication by steamer with Aarhus in Jutland. It has a singular Romanesque church of the 12th century. The district is diversified with small lakes, as the Tiis So. (4) Soro, occupying the south-western part of the island. The chief town, Soro, lies among woods on the small Soro lake. It was formerly the seat of a university, ano remains an important educational centre. Its chuich, of the

1 2th century, contains the tombs of the poet Holberg (d. 1754) and of some of the Danish kings. Slagelse in the west, an agri- cultural centre; is an ancient town dating back to the 12th century. Here Hans Christian Andersen, the poet, received part of his education. Korsor is an important seaport. (5) Praesto, the most southerly county. The capital, Praesto, is a small port on the inner lagoon of a bay of this name, on the east coast. In the west is the ancient town of Naestvcd; in the south, Vordingborg, with a ruined castle and a small harbour. The railway here crosses a great bridge on to the small Masnedo, whence there is a ferry to Orehoved on Falster island, a link in the direct route between Copenhagen and Berlin.

ZEBRA, the name used for all the sLripcd members of the horse-tribe, although properly applicable only to the true or mountain zebra. The latter species (Equus zebra) inhabits the mountainous regions of the Gape Colony, where, owing to the advances of civilized man into its restricted range it has become very scarce, and is even threatened with extermination, but it exists in the form of a local race in Angola. The second species, Burchell's zebra (Equus burchelli), is represented by a large number of local races, ranging from the plains north of the Orange river to north-east Africa.

Equus zebra is the smaller of the two (about 4 ft. high at the shoulders), and has longer ears, a tail more scantily clothed with hair, and a shorter mane. The general ground colour is white, and the stripes are black; the lower part of the face is bright brown. With the exception of the abdomen and the inside of the thighs, the whole of the surface is covered with stripes, the legs having narrow transverse bars reaching quite to the hoofs, and the base of the tail being also barred. The outsides of the ears have a white tip and a broad black mark occupying the greater part of the surface, but are white at the base. Perhaps the most constant and obvious distinction between this species and the next is the arrangement of the stripes on the hinder part of the back, where there arc a number of short transverse bands reaching to the median longitudinal dorsal stripe, and unconnected with the uppermost of the broad stripes which pass obliquely across the haunch from the flanks towards the root of the tail. There is often a median longitudinal stripe under the chest.

Typically, Burchell's zebra, or the bonte-quagga (Equus burchelli), is a rather larger and more robust animal, with

The True or Mountain Zebra (Equus zebra).

smaller ears, a longer mane, and fuller tail. The general ground- colour of the body is pale yellowish brown, the limbs nearly white, the stripes dark brown or black. In the typical form the stripes do not extend on to the

limbs or tail; but there is a great variation in this respect, and as we proceed north the striping increases, till in the north-eastern E. burchelli granti the legs are striped to the hoofs. There is a strongly marked median longitudinal ventral black stripe, to which the lower ends of the transverse side stripes are usually united, but the

dorsal stripe (also strongly marked) is completely isolated in its posterior half, and the uppermost of the broad haunch stripes runs nearly parallel to it. A much larger proportion of the cars is white than in the other species. In the middle of the wide intervals between the broad black stripes of the flanks and haunches fainter stripes are generally seen. It is closely

Fig. 2. — Burchell's Zebra (E. burchelli).

allied to the quagga, but the typical form, in which the resem- blance is closest, is extinct. The Abyssinian and Somali Grevy's zebra (E. grevyi) is markedly distinguished by its enormous ears and more numerous and narrower black stripes. The flesh of Burchell's zebra (or quagga, as it is often called) is relished by the natives as food, and its hide is very valuable for leather. Although the many attempts that have been made to break in and train zebras for riding and driving have sometimes been rewarded with partial success, the animal has never been domesticated in the true sense of the word (see House).

(W. H. F.; R. L.) ZEBULUN, a tribe of Israel, named after Jacob's sixth " son " by Leah. The narrator of Gen. xxx. 20 offers two etymologies of the name, from the roots z-b-d, ! ' give/' and z—b—l r " exalt (?)." l The country of Zebulun lay in the fertile hilly country to the north of the plain of Jezreel, which forms the first step towards the mountains of Asher and Naphtali, and included the goodly upland plain of el-Battof. The description of its boundaries is obscure, owing in some measure to its position between Issachar and Naphtali, with one or the other of which it is fre- quently combined. At one period Zebulun, like Dan and Asher (Judges v. 17), would seem to have reached the sea and bordered on Phoenician territory (Gen. xlix. 13, Deut. xxxiii. 18 seq.). In the latter passage allusion is made to a feast upon a sacred mountain held by Zebulun and Issachar in common, and to the wealth these tribes derived from commerce by sea. Zebulun had a chief part in the war with Sisera (Judges iv. 6, v. 18; see Deborah); it is said to have furnished at least one of the "judges," Elon the Zebulonite (Judges xii. 11 seq.); and the prophet Jonah, who foretold the victories of Jeroboam II., came from the border town of Gaih-hepher (probably the modern el-Meshhed) (2 Kings xiv. 25). The deportation of the northern tribes under Tiglath Pileser IV. (2 Kings xv. 29) appears to have included Zebulun (Isa. ix. 1). Nazareth lay within the territory of Zebulun but is not mentioned in the Old Testament. (S. A. C.)*

ZECHARIAH, son of Bcrcchiah, son of Iddo (or by contrac- tion, son of Iddo), a prophet of the Old Testament. He appeared in Jerusalem along with Haggai (q.v.), in the second year of Darius Hystaspis (520 B.C.), to warn and encourage the

1 A connexion with a divine name (cf. Baal-Zebul) is not im- probable; see H. W. Hogg, Ency. Bib., art. " Zebulun."

Jews to address themselves at length to the restoration of the Temple. 1 Supported by the prophets, Zerubbabel and Joshua set about the work, and the elders of Judah built and the work went forward (Ezra v. 1 seq., vi. 14). The first eight chapters of the book of Zechariah exactly fit into this historical setting. They are divided by precise chronological headings into three sections — (a) chap. i. 1-6, in the eighth month of the second year of Darius; (b) chap. i. 7-vi. 15, on the twenty-fourth day of the eleventh month of the same year; (c) chap, vii.-viii., on the fourth day of the ninth month of the fourth year of Darius. The first section is a preface containing exhortation in general terms. The main section is the second, containing a series of night visions, the significant features of which are pointed out by an angel who stands by the prophet and answers his questions.

i. 7-17. The divine chariots and horses that make the round of the world by Yahweh's orders return to the heavenly palace and report that there is still no movement among the nations, no sign of the Messianic crisis. Seventy years have passed, and Zion and the cities of Judah still mourn. Sad news! but Yahweh gives a comfortable assurance of His gracious return to Jerusalem and the rebuilding of Mis temple.

i. 18-21 (Heb. ii. 1-4). Four horns, representing the hostile world-power that oppresses Israel and Jerusalem, are cast down by four smiths.

ii. 1— 1 3 (Heb. ii. 5-17). The new Jerusalem is laid out with the measuring line. It is to have no walls, that its population may not be limited, and it needs none, for Yahweh is its protection. The catastrophe of " the land of the north " is near to come; then the exiles of Zion shall stream back from all quarters, the converted heathen shall join them, Yahweh Himself will dwell in the midst of them, and even now lie stirs Himself from His holy habitation.

iii. 1-10. The high priest Joshua is accused before Yahweh by Satan, but is acquitted and given rule in Yahweh's house and courts, with the right of access to Yahweh in priestly intercession. The restoration of the temple and

its service is a pledge of still higher things. The promised " branch " (or ' : shoot," $mah'), the Messiah, will come; the national kingdom is restored in its old splendour; and a time of general felicity dawns, when every man shall sit happy under his vine and under his fig tree. As by rights the Messianic kingdom should follow immediately on the exile, ' it is probable that the prophet designs to hint in a guarded way that Zerubbabel, who in all other places is mentioned along with Joshua, is on the point of ascending the throne of his ancestor David. The jewel with seven facets is already there, the inscrip- tion only has still to be engraved on it (iii. 9). The charges brought against the high priest consist simply in the obstacles that have hitherto impeded the restoration of the temple and its service ; and in like manner the guilt of the land (iii. 9) is simply the still continuing domination of foreigners.

iv. 1-14. Beside a lighted golden candlestick of seven branches stand two olive trees — Zerubbabel and Joshua, the two anointed ones— specially watched over by Him whose seven eyes run through the whole earth- This explanation of the vision is separated from the description by an animated dialogue, not quite clear in its expression, in which it is said that the mountain of obstacles shall disappear before Zerubbabel, and that, having begun the building of the temple, he shall also bring it to an end in spite of those who now mock at the day of small beginnings.

v. 1-4. A written roll flies over the Holy Land; this is a con- crete representation of the curse which in future will fall of itself on all crime, so that, e.g., no man who has suffered theft will have- occasion himself to pronounce a curse against the thief (cf. Judges

xvii. 2).

v. 5— 1 1 . Guilt, personified as a woman, is cast into an ephah- measure with a heavy lid and carried from Judah to Chaldaea, where it is to have its home for the future.

vi. i-S. The divine teams, four in number, again traverse the world toward the four winds, to execute Yahweh's commands. That which goes northward is charged to wreak His anger on the north country. The series of visions has now reached its close, returning to its starting-point in i. 7 sqq.

1 The alleged foundation of the second temple in 536 (Ezra iii. 8-13; cf. iv. 1-5, 24) is open to doubt, because (a) the statements of the compiler of Ezra are not contemporary evidence, (&) the contemporary Haggai and Zechariah seem to imply that this work first began in 520 (Hag. ii. 18; Zech. viii. 9; cf. Ezra v. 2). If, on the ground of Ezra v. 16, we accept the

truth of an original foundation in 536 (so Driver, Minor Prophets, p. 148), that event was admittedly formal only and without success, so that the real beginning was made in 520. Wellhausen (Isr. und Mid. Gesch., 3rd ed., p. 160) rejects the earlier foundation; on the other hand, he insists, with the majority of scholars and against Kosters, on the actual return of exiles in 537 to form the nucleus of the post-exilic community (loc. cit., p. 157 k.).

An appendix follows (vi. 9-15). Jews from Babylon have brought gold and silver to Jerusalem; of these the prophet must make a crown designed for the " branch " who is to build Yahweh's house and sit king on the throne, but retain a good understanding with the high priest. Zerubbabel is certainly meant here, and, if the received text names Joshua instead of him (vi. 11), this is only a correction, made for reasons easy to understand, which breaks the context and destroys the sense and the reference of " them both " in verse 13.

The third section (chaps, vii.-viii.), dated from the fourth year of Darius, contains an inquiry whether the fast days that arose in the captivity are still to be observed, with a comforting and encouraging reply of the prophet.

Thus throughout the first eight chapters the scene is Jeru- salem in the early part of the reign of Darius. 2 Zerubbabel and Joshua, the prince and the priest, are the leaders of the com- munity. The great concern of the time and the chief practical theme of these chapters is the building of the temple; but its restoration is only the earnest of greater things to follow, viz., the glorious restoration of David's kingdom. The horizon of these prophecies is everywhere limited by the narrow con- ditions of the time, and their aim is clearly seen. The visions hardly veil the thought, and the mode of expression is usually simple, except in the Messianic passages, where the tortuous- ness and obscurity are perhaps intentional. Noteworthy is the affinity between some notions evidently not first framed by the prophet himself and the prologue to Job — the heavenly hosts that wander through the earth and bring back their report to Yahweh's throne, the figure of Satan, the idea that suffering and calamity are evidences of guilt and of accusations pre- sented before God.

Passing from chaps, i.-viii. to chaps, ix. seq., we at once feel ourselves transported into a different world.

(1) Yahweh's word is accomplished on Syria-Phoenicia and Philistia; and then the Messianic kingdom begins in Zion, and the Israelites detained among the heathen, Judah and Ephraim combined, receive a part in it. The might of the sons of J[avan is broken in battle against this kingdom (ch. ix.). After an inter- mezzo of three verses (x. 1-3: "Ask rain of Yahweh,

not of the diviners “) a second and quite analogous Messianic prophecy follows. The foreign tyrants fall; the lordship of Assyria and Egypt has an end; the autonomy and martial power of the nation are restored. The scattered exiles return as citizens of the new theocracy, all obstacles in their way parting asunder as when the waves of the Red Sea gave passage to Israel at the founding of the old theocracy (x. 3-12). Again there is an interlude of three verses (xi. 1-3): fire seizes the cedars of Lebanon and the oaks of Bashan. 3

(2) The difficult passage about the shepherds follows. The shepherds (rulers) of the nation make their flock an article of trade and treat the sheep as sheep for the shambles. Therefore the inhabited world shall fall a sacrifice to the tyranny of its kings, while Israel is delivered to a shepherd who feeds the sheep for those who make a trade of the flock (i«>rj wp, xi. 7, II = ” they that sell them,” ver. 5) and enters on his office with two staves, ” Favour ” and ” Union.” He destroys ” the three shepherds’” in one month, but is soon weary of his flock and the flock of him He breaks the staff ” Favour,” i.e. the covenant of peace with the nations, and asks the traders for his hire. Receiving thirty pieces of silver, he casts it into the temple treasury and breaks the staff ” Union,” i.e. the brotherhood between Judah and Israel. He is succeeded by a foolish shepherd, who neglects his flock and lets it go to ruin. At length Yahweh intervenes ; the foolish shepherd falls by the sword ; two-thirds of the people perish with him in the Messianic crisis, but the remnant of one-third forms the seed of the new theocracy (xi. 4-17 taken with xiii. 7-9, according to the necessary transposition proposed by Ewald). All this must be an allegory of past events, the time present to the author and his hopes for the future beginning only at xi. 17, xiii. 7-9.

(3) Chap. xii. presents a third variation on the Messianic promise. All heathendom is gathered together against Jerusalem and perishes there. Yahweh first gives victory to the countryfolk of Judah and then they rescue the capital. After this triumph the noblest houses of Jerusalem hold, each by itself, a great lamentation over a martyr ” whom they have pierced ” (or ” whom men have

2 The historical occasion of the emergence of Haggai and Zechariah was supplied by the scries of revolts following the suc- cession of Darius in 522 (cf. Driver, op. cit., p. 150). His recon- quest of Babylon in 520 may, in particular, have seemed the prelude to the Messianic age (Wellhausen, Gesch., p. 161 «.).

z ” The cedars of Lebanon, the oaks of Bashan, the forest of Jordan represent the national might of the heathen kingdoms ” (Wellh., Die Kl. Proph., 3rd ed., p. 192).

pierced "). It is taken for granted that the readers will know who the martyr is, and the exegesis of the Church applies the passage to our Lord. Chap. xiii. 1-6 is a continuation of chap. xii.; the dawn of the day of salvation is accompanied by a general purging away of idolatry and the enthusiasm of false prophets.

(4) Yet a fourth variation of the picture of the incoming of the Messianic deliverance is given in chap. xiv. The heathen gather against Jerusalem and take the city, but do not utterly destroy the inhabitants. The Yahweh, at a time known only to Himself, shall appear with all His saints on Mount Olivet and destroy the heathen in battle, while the men of Jerusalem take refuge in their terror in the great cleft, that opens where Yahweh sets His foot. Now the new era begins, and even the heathen do homage to Yahweh by bringing due tribute to the annual feast of tabernacles. All in Jerusalem is holy down to the bells on the horses and the cook- ing-pots.

There is a striking contrast between chaps. i.—viii. and chaps, ix.-xiv. The former prophecy is closely linked to the situation and wants of the community of Jerusalem in the second year of Darius I. x and relates to the restoration of the temple and, perhaps, the elevation of Zerubbabel to the throne of David. In chaps. ix.xiv., however, " there is nothing about the restora tion of the temple, or about Joshua and Zerubbabel; but we read of the evil rulers, foreign and native alike, who maltreat their subjects, and enrich themselves at their expense. 1 There are corresponding differences in style and speech, and it is particularly to be noted that, while the superscriptions in the first part name the author and give the date of each oracle with precision, those in the second part (ix. i., xii. 1) are with- out name or date. That both parts do not belong to the same author is now generally admitted, as is also the fact that chaps, ix.-xiv. are of much later date. 2 The predictions of these chapters have no affinity either with the prophecy of Amos, Hosca and Isaiah, or with that of Jeremiah. The kind of eschatology which we find in Zech. ix.xiv. was first intro duced by Ezekiel, who in particular is the author of the con- ception that the time of deliverance is to be preceded by a joint attack of all nations on Jerusalem, in which they come to final overthrow (Ezek. xxxviii. seq.; Isa. lxvi. 18-24; Joel). The importance attached to the "temple service, even in Messianic times (Zech. xiv.), implies an author who iived in the ideas of the religious commonwealth of post-exile times. A future king is hoped for; but in the present there is no Davidic king, only a Davidic family standing on the same level with other noble families in Jerusalem (xii. 7, 12). The " bastard " (mixed race) of Ashdod reminds us of Neh. xiii. 23 sqq.; and the words of ix. 12 (" to-day, also, do I declare that I will render double unto thee ") have no sense unless they refer back to the deliver- ance from

Babylonian exile. But the decisive argument is that in ix. 13 the sons of Javan, i.e. the Greeks, appear as the representatives of the heathen world-power. This part of the prophecy, therefore, is later than Alexander, who overthrew the Persian empire in 333. Egypt and Assyria (x. 10, n) must be taken to represent the Ptolemaic and Seleucid kingdoms, which together made up for the Jews the empire of the sons of Javan. 3

The whole prophecy, however, is not a unity. By reference to the analysis given above, it will be seen that there arc four sections in Zech. ix.-xiv., viz. (1) ix., x. (xi. 1-3); (2) xi. 4-17, xiii. 7-9; (3) xii., xiii. 1-6; (4) xiv., which are more or less independent of each other. Of these (3) and (4) are of marked eschatological characte;, and show little contact with definite historical events

1 Driver, op. cit., p. 229, who also refers to the differences of Messianic outlook, and the substitution of an atmosphere of war for one of peace.

2 Earlier critics made the second part the older. Chaps, ix.-xi. were ascribed to a contemporary 01 Amos and Hosca, about the middle of the 8th century B.C., because Ephraim is mentioned as well as Judah, and Assyria along with Egypt (x. 10), while the neighbours of Israel appear in ix. 1 sq. in the same way as in Amos i.-ii. That chaps, xii.-xiv. also were pre-exilic was held to appear especially in the attack on idolatry and lying prophecy (xiii. 1-6); bur, as this prophecy speaks only of Judah and Jerusalem, it was dated after the fall of Samaria, and assigned to the last days of the Judaean kingdom on the strength of xii. 11, where an allusion is seen by some to the mourning for King Josiah, slain in battle at Megiddo.

J What follows is summarized from Wellhausen, Die Kleinen Propheten, pp. 190, 192, 195-197.

(except xii. 7, which suggests the Maccabean age). On the other hand (1) implies a period when the Jews were governed by the Seleucids, since it is against these that the anger of Yahweh is first directed (ix. I, 2). 4 This section, therefore, belongs to the first third of the 2nd century B.C., when the Jews were first held in the power of the Seleucids. 5 The same date may be assigned to (2), where the traffickers in the sheep may be regarded as the Seleucid rulers, and the shepherds as the Jewish high priests and ethnarchs; the prelude to the Maccabean revolt largely consisted of the rapid and violent changes here figured. In particular, the evil shepherd of xi. 15 f. may be Menelaus; whilst the disinterested speaker may be Hyrcanus ben Tobias (cf. xi. 13 and II. Mace. iii. il).

Recent criticism (for further details see G. A. Smith, The Book of the Twelve Prophets, ii. pp. 450 f., and Driver, Minor Prophets, pp. 232-234)

shows some difference of opinion as to the question of unity, and also of actual date within the Greek period. Whilst G. A. Smith (following Stade) and Marti find no adequate ground for the further division of Zech. ix.xiv., Driver (following Nowack) accepts the fourfold division indicated above (" Four anonymous Prophecies, perhaps the work of four distinct Prophets," op. cit., p. 235). In regard to date, G. A. Smith (here also following Stade) accepts the earlier part of the Greek period (306—278). With this Driver provisionally agrees, whilst Nowack thinks no more can be said than that (1) belongs to the Greek and (2)(4) to the post- exilic period in genera!. On the other hand, Marti assigns the whole to 160 B.C. (Maccabean period; a little later than Well- hausen) and sees a number of references to historical personages of that age. The chief arguments to be urged against this late date are the character of the Hebrew style (Driver, op. cit., p. 233) and the alleged close of the prophetic canon by 200; but perhaps neither of these can be regarded as very convincing.

Recent Literature. — Nowack, Die Kleinen Propheten (1897; ed. 2, 1903); Wellhausen, Die Kleinen Propheten? (189S); G, A. Smith, The, Book of the Twelve Prophets (in The Expositor's Bible), vol. ii. (pp. 253-328, 447-490) (1898); Marti, Dodekaprophetan, ii. (1904); Driver, Minor Prophets, ii. (in The Century Bible, 1906; the most useful for the general reader). The article in Hastings's Dictionary of the Bible (vol. h\, pp. 967-970) (1902), by Nowack, is a reproduction from his work cited above; the article in the Ency. Bibl. by Wellhausen is a revision of his article in the 9th edition of the Ency. Brit., and the present independent revision is in some points indebted to it. (J. We.; H. W. R.)*

ZEDEKIAH (Hebrew for " righteousness of Yah[weh]"), son of Josiah, and the last king of Judah (2 Kings xxiv. 17 sqq.; 2 Chron. xxxvi. 10 seq.). Previously known as Mattaniah (" gift of Yah[weh] "), he was appointed king by Nebuchadrezzar after the capture of Jerusalem (597 B.C.) and his name changed to Zedekiah. He held his position under an oath of allegiance, but after three years (cf. Jehoiakim, 2 Kings xxiv. 1) began an intrigue with Moab, Edom, Ammon, Tyre and Sidon, which the prophet Jeremiah vigorously denounced (Jer. xxvii. seq.; cf. also Ezek. xvii. n-21). It is possible that he was summoned to Babylon to explain his conduct (Jer. Ii. 59; the Septuagint reads " from Zedekiah"; see also xxix. 3). Nevertheless, relations were maintained with Egypt and steps were taken to revolt. The Babylonian army began to lay siege to Jerusalem in the ninth year of his reign, and a vain attempt was made by Pharaoh Hophra to cause a diversion. The headings to the prophecies in Ezek. xxix. sqq. suggest that fuller details of the events were once preserved, and the narratives in Jer. xxxii.-xxxiv., xxxvii. give some account of the internal position in Jerusalem at the time. After six months a breach was made in the city, Zedekiah's flight was cut off in the Jordan Valley and he was

taken to Nebuchadrezzar at Riblah. His sons were killed, and he was blinded and carried to Babylon in chains (cf, Ezek. xii. 10-14). Vengeance was taken upon Jerusalem, and, on the seventh day of the fifth month, 586 B.C., Nebuzaradan sacked the temple, destroyed the walls and houses, and deported the citizens, only the poorest peasantry of the land being left behind. See Jews (History). § 17 seq. (S.A.C.)

ZEEHAN, a town of Montagu county, Tasmania, 225 m. direct N.W. of Hobart, on the Little Henty river. Pop. (1901) 5014. It is an important railway centre, and from it radiate lines to Strahan, its port on the Macquarie Harbour, to Dundas, to Williamsfordj \nd to Burnie, where connexion is made to

4 Hadrach, i.e the Assyrian Hatarika, apparently denotes a district S. of Hamath (between Palmyra and the Mediterranean).

fi Wellhausen, Sketch of the History of Israel and Judah, pp. 137,

139.

Launceston and Hobart. The town is lighted by electricity and has an academy of music and a state-aided school of mines. It is the principal centre of the silver-lead mining district, and has large smelting works.

ZEELAND (or Zealand), a province of Holland, bounded S.E. and S. by Belgium, W. by the North Sea, N. by South Holland, and E. by North Brabant. It has an area of 690 sq. m. and a population (1905) of 227,292. Zeeland consists of the delta islands formed about the estuaries of the Maas and Scheldt with its two arms, the Honte or Western Scheldt, and the Ooster Scheldt, together with a strip of mainland called Zeeland-Flanders. The names of the islands are Schouwen and Duive- land, St Filipsland, To] en, North Beveland, South Beveland and Walchercn. The history of these islands is in every case one of varying loss and gain in the struggle with the sea. They were built up by the gradual accumulation of mud deposits in a shallow bay, separated by dunes from the North Sea. As late as the 12th and 13th centuries each of these islands con- sisted of several smaller islands, many of whose names are still preserved in the fertile polders which have taken their place. Lying for the most part below sea-level, the islands are pro- tected by a continuous line of artificial dikes, which hide them from view on the seaward side, whence only an occasional church steeple is seen. The islands of Schouwen and Duive- land are united owing to the damming of the Dykwater; St Filipsland, or

Philipsland, and South Beveland are connected with the mainland of North Brabant by naturally formed mud banks.

The soil of Zeeland consists of a fertile sea clay which especi- ally favours the production of wheat; rye, barley (for malting), beans and peas, and flax are also cultivated. Cattle and swine are reared, and dairy produce is largely exported; but the sheep of the province are small and their wool indifferent. The industries (linen, yarn-spinning, distilling, brewing, salt-refining, shipbuilding) are comparatively unimportant. The inhabi- tants, who retain many quaint and archaic peculiarities of manner and dress, speak the variety of Dutch known as Low Frankish.

The chief towns on the island of Schouwen are the ports of Zicriksee and Brouwcrshaven. On the well-wooded fringe of the dunes on Lhc west side of the island are the two villages of Renesse and Haamstede, the seats in former days of the two powerful lordships of the same name. St Maartensdyk on the adjoining island of Tolen was formerly the seat of a lordship which belonged successively to the families of Van Borssele, Burren and Orange-Nassau. There is a monument of the Van Borsseles in the Reformed church. The castle built here in the first half of the 14th century was demolished in 1819. The island of South Beveland frequently suffered from inundations and experienced a particularly disastrous one in 1530. In the same century the flourishing walled town of Reimenswaal and the island of Borsele or Borssele disappeared beneath the waves; but the last-named was gradually recovered during the 17th century. This island gave its name to the powerful lord- ship of the same name. Goes is the chief town on South Beveland. Oyster-breeding is practised on the north coast of the island, especially at Wemeldinge and Ierseke or Yerseke. Ierseke was once a town of importance and the seat of a lord- ship, while at Wemeldinge there was formerly an establishment of the Templars. In 1866 South Beveland and Walcheren were joined by a heavy railway dam, a canal being cut through the middle of the former island to restore the connexion between the East and West Scheldt. South Beveland is sometimes called the " granary " and Walcheren the " garden " of Zeeland. The principal towns in Walcheren are Middelburg, the chief town of the province, Flushing andVeere; all three connected by a canal (1867-72) which divides the island in two. The fishing village of Arnemuiden flourished as a harbour in the 16th century, but decayed owing to the silting up of the sand. Domburg is pleasantly situated at the foot of the dunes on the west side of the island, and in modern times has become a popular but primitive watering-place. It is a very old town,

having received civic rights in the 13th century, ;and from time to time Roman remains and other antiquities have. been dug. out of the sands. Between Domburg and the village of West- kapelle there stretches the

famous Westkapelle sea-dike. The mainland of Zeeland-Flanders was formerly also composed of numerous islands which were gradually united by the accumula- tion of mud and sand, and in this way many once flourishing commercial towns, such as Sluis and Aardenburg, were reduced in importance. The famous castle of Sluis, built in 1385, was partly blown up by the French in 1794, and totally demolished in 1818. Yzendyke represents a Hansc town which nourished in the 13th century and was gradually engulfed by the sea. Similarly the original port of Breskens was destroyed by in- undations in the 15th and 16th centuries. The modern town rose into importance in the 19th century on account of its good harbour. The old towns of Axel and Halst were formerly important fortresses, and as< such were frequently besieged in the 16th, 17th and 18th centuries. Tcr Ncuzen was strongly fortified in 1833-39, a nt - has a flourishing transit trade, as the port of Ghent, by the canal constructed in 1825-27.*

ZEERUST, a town of the Transvaal, 149 m. by rail, via Krugersdorp, N.N.W. of Pretoria and ˆ$ m. N.E. of Mafeking. Pop. (1904) 1945. It was founded in 186S and is the chief town of the Marico district, one of the most fertile regions of South Africa. In the neighbourhood are lead, zinc and silver mines, and some .20 m. S. are the Malmani goldfields. The Marico Valley was occupied early in the 19th century by Mata- bele, who had come from Zululand. They were driven out by Boer trekkers in 1837. To Boer cultivation the valley of the Marico river owes its fertility. Wheat and oats are largely cultivated and almost all sub-tropical fruits flourish. Follow- ing the relief of Mafeking, 17th of May 1900, Zeerust was occupied by the British under General R. S. S. Baden-Powell. Railway connexion with Pretoria was established in 1907.

ZEISSBERG, HEINRICH, Ritter von (1830-1899), Austrian historian, was born in Vienna on the 8th of July 1839, and in 1865 became professor of history at the university of Lemberg. In 1871 he removed to Innsbruck; in 1873 he was appointed professor at the university of Vienna, and here he was historical tutor to the crown prince Rudolph. In 1891 he was made director of the Vienna institute for historical research, and in 1896 director of the imperial court library at Vienna. He resigned his professorial chair in 1897 and died on the 27th of May 1899.

Zeissberg's writings deal mainly with the history of Austria and of Poland, and among them the following may be mentioned : — Die polniscke Geschichtsschreibung des Mittelalters (Leipzig, 1873); Arno, erster Erzbischof von Salzburg (Vienna, 1863); Die Kriege Kaiser Ileinrichs II. mil Herzog Boleslaw I. von Polen (Vienna, 1868); Rudolf von Habsburg una der osterreichische Staatsgedanke (Vienna, 1882); JJber das Rechtsverfahren Rudolfs von Habsburg gegen Ottokar von Bokmen

(Vienna, 1887); and Der osterreichische Erbfolgestreit nach dem Tode des Konigs Ladislaus Posthumus, 1457-58 (Vienna, 1879). Dealing with more recent times he wrote: — Zur deutschen Kaiserpolitik Oesterreichs: ein Beitrag zur Geschichte des Revolution sjahres 179$ (Vienna. 1899) ; Zwei Jahre belgischer Geschichte 1791-92 (Vienna, 1891); Belgien unter der Generalstatt- halterschafl Erzherzog 'Karls 1793-94 (Vienna, 1893-94); Erzherzog Karl von Oesterre-ich. Lebensbild (Vienna, 1895); and Franz Josef 1, (Vienna, 1888). He edited three volumes of the Quellen zur Geschichte der Deutschen Kaiserpolitik Oesterreichs wdhrend der fra? izosischen Revolulionskriege 1790-1801 (Vienna, 1882-1885,

1890).

ZEITUN ■(= " olive "), the name of several places in Turkey and Egypt, but principally an Armenian town in the Aleppo vilayet, altitude about 4000 ft., situated in the heart of Mt. Taurus, about 20 rn. N.N.W. of Marash. The inhabitants, about 10,000, all Christians, are of a singularly fine physical type, though too much inbred, and are interesting from their character and historical position as a remnant of the kingdom of Lesser Armenia. The importance of Zeitun dates from the capture of Leo VI. by the Egyptians in 1375, and it probably became then a refuge for the more active and irreconcilable Armenians; but nothing certain is known of the place till, 300 years later. It long maintained practical independence as

a nest of freebooters, and it was only in 1878 that the Turks, after a long conflict, were enabled to station troops in a fort above the town. In 1890 there was a serious revolt, from the worst consequences of which the town was saved by the inter- cession of the British consul at Aleppo warned in time by the devoted energy of T. Christie, American missionary at Marash; and in T895, after the Armenian massacres had commenced elsewhere, the people again rose, seized the fort, and, after holding out for more than three months against a large Turkish force, secured honourable terms of peace on the mediation of the consuls of the Powers at Aleppo. The inhabitants seem to be abandoning their robber customs and devoting themselves to oil and silk culture. In consequence transit trade through the passes of eastern Taurus (see Marash), long almost anni- hilated by fear of the Zeitunli marauders, revived considerably. The governor must be a Christian, and certain other privileges are secured to the Zeitunlis during their good behaviour.

(D.G.H.)

ZEITZ, a town of Germany, in the extreme south of the Prussian province of Saxony, pleasantly situated on a hill on the Weisse (White) Elster, 28 m. by rail S.S.W. of Leipzig on the line to Gera, and with branches to Altenburg and Weissen- fels. Pop. (1885) 19,797; (1900) 27,391. The river is here crossed by two iron bridges, and one stone and one timber bridge, and the upper and lower towns are connected by a funicular railway. The Gothic abbey church dates from the 15th century, but its Romanesque crypt from the 12th. The old Franciscan monastery, now occupied by a seminary, con- tains a library of 20,000 volumes. Just outside the town rises the Moritzburg, built in 1564 by the dukes of Saxe-Zeitz, on the site of the bishop's palace; it is now a reformatory and poorhouse. Zeitz has manufactures of cloth, cottons and other textiles, machinery, wax-cloth, musical instruments, vinegar, cigars, &c. ; and wood-carving, dyeing and calico-printing are carried on. In the neighbourhood there are considerable deposits of lignite, and mineral-oil works.

Zeitz is an ancient place of Slavonic origin. From 968 till 1028 it was the seat of a bishopric, afterwards removed to Naumburg, 152 m. to the N.W., and styled Naumburg-Zcitz. In 1564 the last Roman Catholic bishop died, and his dominions were thenceforward administered by princes of Saxony. From 1653 till 1718 Zeitz was the capital of the dukes of Saxe-Zeitz or Sachsen-Zeitz. It thereafter remained in the possession of the electors of Saxony until 181 5, when it passed to Prussia.

See Rothe, Aus der Geschichte der Stadl Zeitz (Zeitz, 1876); and Lange, Chronik des Bisthums Naumburg (Naumburg, 1891).

ZELLER, EDUARD (1814-1908), German philosopher, was born at Klcinbottwar in Wurttemberg on the 22nd of January 1814, and educated at the university of Tubingen and under the influence of Hegel. In 1840 he was Privatdoze.nl of theology at Tubingen, in 1847 professor of theology at Bern, in 1849 professor of theology at Marburg, migrating soon after- wards to the faculty of philosophy as the result of disputes with the Clerical party. He became professor of philosophy at Heidelberg in 1862, removed to Berlin in 1872, and retired in 1895. His great work is his Philosophic tier Griecken (1844- 5a). This book he continued to amplify and improve in the light of further research; the last edition appeared in 1902. It has been translated into most of the European languages and became the recognized text-book of Greek philosophy. He wrote also on theology, and published three volumes of philo- sophical essays. He was also one of the founders of the T/teologischc Jahrbiicher, a periodical which acquired great im- portance as the exponent of the historical method of David Strauss and Christian Baur. Like most of his contemporaries he began with Hegelianism, but subsequently he developed a system on his own lines. He

saw the necessity of going back to Kant in the sense of demanding a critical reconsideration of the epistemological problems which Kant had made but a partially successful attempt to solve. None the less his merits as an original thinker are far outshone by his splendid services to the history of philosophy. It is true that his view of Greek

thought is somewhat warped by Hegelian formalism. He is not alive enough to the very intimate relation which thought holds to national life and to the idiosyncrasy of the thinker. He lays too much stress upon the " concept," and explains too much by the Hegelian antithesis of subjective and objective. Nevertheless his history of Greek philosophy remains a noble monument of solid learning informed with natural sagacity. He received the highest recognition, not only from philosophers and learned societies all over the world, but also from the emperor and the German people. In 1894 the Emperor Wil- liam II. made him a " Wirklicher Geheimrat " with the title of " Excellenz," and his bust, with that of Helmholtz, was set up at the Brandenburg Gate near the statues erected to the Emperor and Empress Frederick. He died on the 19th of March 1908.

The Philosophic der Griechen has been translated into English by S. F. Alleyne (2 vols., 1881) in sections: S. F. Alleyne, Hist, of Gk. Phil, to the time of Socrates (1881); O. J. Reichel, Socrates and the Socratic Schools (1868; 2nd cd. 1877); S. F. Alleyne And A. Goodwin, Plato and the Older Academy (1876); Costelloe and Muirhead, Aristotle and the Earlier Peripatetics (1897) ; O- J. Reichel, Stoics, Epicureans and Sceptics (1870 and 1880); S. F. Alleyne, Hist, of Eclecticism in Gk. Phil. (1883). The Philosophic appeared in an abbreviated form as Grundriss d. Gesch. d. Griech. Philos. (1883; 5th ed. 1898); Eng. trans, by Alleyne and Evelyn Abbott (1866), under the title, Outlines of the Hist, of Gk. Philos. Among his other works are: — Platonische Studien (1839); Die AposteT-geschichte kril. untersuchl (1854; Eng. trans. J. Dare, 1875-76); Entwickelung d. Monotheismus hei a. Griech. (1862); Gesch. d. chrisllich. Kirche (1898); Gesch. d. deutsch. Philos. seil Leibniz (1873, ed. 1875); Staal und Kirche (1873); Strauss in seinen Leben und Schriften (1874; Eng. trans. 1874); Cber Bedeutung und Aufgabe d. Erkenntniss-Theorie (1862); Uber teleolog. und mechan. Naturerkldrung (1876); Vorlrdge und Abhandlungen (1865-84); Religion und Philosophic bei den Rbmern (1866, ed. 1871) ; Philosoph. Aufsdtze (1887).

ZEMARCHUS (fl. 568), Byzantine general and traveller. The Turks, by their conquest of Sogdiana in the middle of the 6th century, gained control of the silk trade which then passed through Central Asia into Persia. But the Persian king, Chosroes Nushirvan, dreading the intrusion of Turkish influ- ence, refused to allow the old commerce to continue, and the Turks after many rebuffs consented to a suggestion made by their mercantile

subjects of the Soghd, and in 568 sent an embassy to Constantinople to form an alliance with the Byzan- tines and " transfer the sale of silk to them." The offer was accepted by Justin II., and in August 568, Zemarchus the Cilician, " General of the cities of the East," left Byzantium for Sogdiana.. The embassy was under the guidance of Maniakh, " chief of the people of Sogdiana," who had first, according to Menander Protector, suggested to Dizabul (Disaboulos, the Bu Min khan of the Turks, the Mokan of the Chinese), the great khan of the Turks, this " Roman " alliance, and had himself come to Byzantium to negotiate the same. On reaching the Sogdian territories the travellers were offered iron for sale, and solemnly exorcised; Zemarchus was made to " pass through the fire " (i.e. between two fires), and strange ceremonies were performed over the baggage of the expedition, a bell being rung and a drum beaten over it, while flaming incense-leaves were carried round it, and incantations muttered in " Scythian." After these precautions the envoys proceeded to the camp of Dizabul (or rather of Dizabul's successor, Bu Min khan having just died) " in a hollow encompassed by the Golden Mountain," apparently in some locality of the Altai. They found the khan surrounded by astonishing barbaric pomp — gilded thrones, golden peacocks, gold and silver plate and silver animals, hangings and clothing of figured silk. They accompanied him some way on his march against Persia, passing through Talas or Turkestan in the Syr Daria valley, where Ilsfian Tsang, on his way from China to India sixty years later, met with another of Dizabul's successors. Zemarchus was present at a banquet in Talas where the Turkish kagan and the Persian envoy exchanged abuse; but the Byzantine does not seem to have witnessed actual fighting. Near the river Oekh (Syr Daria ?) he was sent back to Constantinople with a Turkish embassy and with

envoys from various tribes subject to the Turks. Halting by the " vast, wide lagoon " (of the Ara-1 Sea?), Zemarchus sent off an express messenger, one George, to announce his return to the emperor. George hurried on by the shortest route, " desert and waterless," apparently the steppes north of the Black Sea: while his superior, moving more slowly, marched twelve days by the sandy shores of " the lagoon " ; crossed the Emba, Ural, Volga, and Kuban (where 4000 Persians vainly lay in ambush to stop him); and passing round the western end of the Caucasus, arrived safely at Trebizond and Constantinople. For several years this Turkish alliance subsisted, while close intercourse was maintained between Central Asia and Byzan- tium; when another Roman envoy, one Valentinos (Ovahwrlvos), goes on his embassy in 575 he takes back with him 106 Turks who had been visiting Byzantine lands; but from 579 this friendship rapidly began to cool. It is

curious that all this travel between the Bosporus and Transoxiana seems not to have done anything to correct, at least in literature, the wide- spread misapprehension of the Caspian as a gulf of the Arctic Ocean.

See Menander Protector, Ilcpi Tlp&rfikuiv ˆPca/xa'uav irpds "EBmj {De Legationibus Romanorum ad Gentes), pp. 295-302, 380-85, 397-404, Bonn edition (xix.) t 1828 (= pp. 806-11, 883-87, 899-907, in Migne, Pairolog. Grace, vol. cxiii., Paris, 1864); H. Yule, Cathay, clx.cfxvi. (London, Hakluyt Society, 1866); L. Cahun, Introduc tion a Vhistoire de I'Asie, pp. 108-18 (Paris, 1896); C. R. Beazlcy, Dawn of Modern Geography, i. 186-89 (London, 1897). (C. R. B.)

ZENAGA (Sanhaja, Senajeh), a Berber tribe of southern Morocco who gave their name to Senegal, once their tribal home. They formed one of the tribes which, uniting under the leadership of Yusef bin Tashfm, crossed the Sahara and gave a dynasty to Morocco and Spain, namely, that of the Almoravides (q.v.). The Zeirid dynasty which supplanted the Fatimites in the Maghrib and founded the city of Algiers was also of Zenaga origin. The Zenaga dialect of Berber is spoken in southern Morocco and on the banks of the lower Senegal, largely by the negro population.

ZENANA (Persian zanana), the apartments of an Eastern house in which the women of the family are secluded (see Harem), This is a Mahommedan custom, which has been introduced into India and has spread amongst the Hindus. The zenana missions are missions to Indian women in their own homes.

ZEN AT A, or ZanAtA, a Berber tribe of Morocco in the dis- trict of the central Atlas. Their tribal home seems to have been south of Oran in Algeria, and they seem to have early claimed an Arab origin, though it was alleged by the Arabs that they were descendants of Goliath, i.e. Philistines or Phoenicians (Ibn Khaldun, vol. iii. p. 184 and vol iv. p. 597). They were formerly a large and powerful confederation, and took a pro- minent part in the history of the Berber race. The Beni- Marin and Wattasi dynasties which reigned in Morocco from 1 213 to 1548 were of Zenata origin.

ZEND-AVESTA, the original document of the religion of Zoroaster {q.v.), still used by the Parsees as their bible and prayer-book. The name " Zend-Avesta " has been current in Europe since the time of Anquetil Duperron (c. 1771), but the Parsees themselves call it simply Avesta, Zend {i.e. "inter- pretation ") being specially employed to denote the transla- tion and exposition of a great part of the Avesta which exists in Pahlavi. Text and translation are often spoken of together in Pahlavi books as Avistak va Zand (" Avesta and Zend "), whence — through a misunderstanding— our

word Zend-Avesta. The origin and meaning of the word " Avesta " (or in its older form, Avistak) are alike obscure; it cannot be traced further back than the Sasanian period. The language of the Avesta is still frequently called Zend; but, as already implied, this is a mistake. We possess no other document written in it, and on this account modern Parsee scholars, as well as the older Pahlavi books, speak of the language and writing indifferently as Avesta. As the original home of the language can only be very doubtfully conjectured, we shall do well to follow the usage sanctioned by old custom and apply the word to both.

Although the Avesta is a work of but moderate compass (comparable, say, to the Iliad and Odyssey taken together), there nevertheless exists no single MS, which gives it in entirety. This circumstance alone is enough to reveal the true nature of the book: it is a composite whole, a collection of writings, as the Old Testament is. It consists, as we shall afterwards see, of the last remains of the extensive sacred literature in which the Zoroastrian faith was formerly set forth.

Contents.— As we now have it, the Avesta consists of five parts — the Yasna, the Vispered, the Vendidad, the Yashts, and the Khordah Avesta.

1. The Yasna, the principal liturgical book of the Parsees, in 72 chapters {haiti, ha), contains the texts that are read by the priests at the solemn yasna (Izeshne) ceremony, or the general sacrifice in honour of all the deities. The arrangement of the chapters is purely liturgical, although their matter in part has nothing to do with the liturgical action. The kernel of the whole book, around which the remaining portions are grouped, consists of the Gathas or " hymns " of Zoroaster (g.f.), the oldest and most sacred portion of the entire canon. The Yasna accordingly falls into three sections of about equal length: — {a) The introduction (chaps. 1-27) is, for the most part, made up of long-winded, mono- tonous, reiterated invocations. Yet even this section includes some interesting texts, e.g. the Haoma (Horn) Yasht (9, 11) and the ancient confession of faith (12), which is of value as a document for the history of civilization, {b) The Gathas (chaps. 28-54) contain the discourses, exhortations and revelations of the prophet, written in a metrical style and an archaic language, different in many respects from that ordinarily used in the Avesta. As to the authenticity of these hymns, see Zoroaster. The Gathas proper, arranged according to the metres in which they are written, fall into five subdivisions (28-34, 43 – 46i 47 _ 5°. 5 1 . 53)- Between chap. 37 and chap. 43 is inserted the so-called Seven-Chapter Yasna {haptanghaiti) , a number of small prose pieces not far behind the Gathas in antiquity, (c) The so-called Later Yasna {Aparo Yasno) (chaps. 54-72) has contents of considerable variety, but consists mainly of invocations. Special mention ought to be made of the Sraosha {Srosh) Yasht (57), the prayer to fire (62), and the great liturgy for the

sacrifice to divinities of the water (63-69).

2. The Vispered, a minor liturgical work in 24 chapters (karde), is alike in form and substance completely dependent on the Yasna, to which it is a liturgical appendix. Its separate chapters are interpolated in the Yasna in order to produce a modified — or expanded — Yasna ceremony. The name Vispered, meaning " all the chiefs " {vispe ratavo), has reference to the spiritual heads of the religion of Ormuzd, invocations to whom form the contents of the first chapter of the book.

3. The Vendidad, the priestly code of the Parsees, contains in 22 chapters (fargard) a kind of dualistic account of the creation (chap. 1), the legend of Yima and the golden age (chap. 2), and in the bulk of the remaining chapters the precepts of religion with regard to the cultivation of the earth, the care of useful animals, the protection of the sacred elements, such as earth, fire and water, the keeping of a man's body from defilement, together with the requisite measures of precaution, elaborate ceremonies of purifica- tion, atonements, ecclesiastical expiations and so forth. These prescriptions are marked by a conscientious classification based on considerations of material, size and number; but they lose them- selves in an exaggerated casuistry. Still the whole of Zoroastrian legislation is subordinate to one great point of view: the war — preached without intermission- — against Satan and his noxious creatures, from which the whole book derives its name; for " Ven- didad " is a modern corruption for vi-daevd-datem — " the anti- demonic Law." Fargard 18 treats of the true and false priest, of the value of the house-cock, of the four paramours of the she-devil, and of unlawful lust. Fargard 19 is a fragment of the Zoroaster legend: Ahriman tempts Zoroaster; Zoroaster applies to Ormuzd for the revelation of the law, Ahriman and the devils despair, and flee down into hell. The three concluding chapters are devoted to sacerdotal medicine.

The Yasna, Vispered and Vendidad together constitute the Avesta in the stricter sense of the word, and the reading of them appertains to the priest alone. For liturgical purposes the separate chapters of the Vendidad are sometimes inserted among those of the Yasna and Vispered. The reading of the Vendidad in this case may, when viewed according to the original intention, be taken as corresponding in some sense to the sermon, while that of the Yasna and Vispered may be said to answer to the hymns and prayers of Christian worship.

4. The Yashts, i.e. " songs of praise," in so far as they have not been received already into the Yasna, form a collection by them- selves. They contain invocations of separate Izads, or angels, number 21 in all, and are of widely divergent extent and antiquity. The great Yashts — some nine or

ten — are impressed with a higher stamp: they are cast almost throughout in a poetical mould, and represent the religious poetry of the ancient Iranians. So far they

may be compared to the Indian Rig-Veda. Several of them may have been cemented together from a number of lesser poems or songs. They are a rich source of mythology and legendary history. Side by side with full, vividly coloured descriptions of the Zoroas- trian deities, they frequently interweave, as episodes, stories from the old heroic fables. The most important of all, the 19th Yasht, gives a consecutive account of the Iranian heroic saga in great broad lines, together with a prophetic presentment of the end of this world.

5. The Khordah Avesta, i.e. the Little Avesta, comprises a collec- tion of shorcer prayers designed tor all believers — the laity included —and adapted for the various occurrences of ordinary life. In part, these brief petitions serve as convenient substitutes for the more lengthy Yashts — especially the so-called Nyaishes.

Over and above the five books just enumerated, there are a considerable number of fragments from other books, e.g. the Nirangistdn, as well as quotations, glosses and glossaries.

The Larger Avesta and the Twenty-one Nasks. — In its present form, however, the Avesta is only a fragmentary rem- nant of the old priestly literature of Zoroasl nanism, a fact confessed by the learned tradition of the Parsees themselves, according to which the number of Yashts was originally thirty. The truth is that we possess but a trifling portion of a very much larger Avesta, if we are to believe native tradition, carry- ing us back to the Sassanian period, which tells of a larger Avesta in twenty-one books called nasks or nosks, as to the names of which we have several more or less detailed accounts, parti- cularly in the Pahlavi Dlnkard (oth century a.d.) and in the Rivayats. From the same sources we learn that this larger Avesta was only a part of a yet more extensive original Avesta, which is said to have existed hefore Alexander. We are told that of a number of nasks only a small portion was found to be extant " after Alexander." For example, of the seventh nask, which " beWe Alexander " had as many as fifty chapters, there then remained only thirteen; and similar allegations are made with regard to the eighth, ninth, tenth and other nasks. The Rivayats state that, when after the calamity of Alexander they sought for the books again, they found a portion of each nask, but found no nask in

completeness except the Vendidad. But even of the remains of the Avesta, as these lay before the author of the gth century, only a small residue has survived to our time. Of all the nasks one only, the nineteenth, has come down on us intact — the Vendidad. All else, considered as wholcsj have vanished in the course of the centuries.

It would be rash summarily to dismiss this old tradition of the twenty-one nasks as pure invention. The number twenty-one points, indeed, to an artificial arrangement of the material; for twenty-one is a sacred number, and the most sacred prayer of the Parsees, the so-called Ahuno Vairyo (Ilonovar) contains twenty-one words; and it is also true that in the enumeration of the nasks we miss the names of the books we know, like the Yasna and the Yashts. But we must assume that these were included in such or such a nask, as the Yashts in the seventeenth or Bakdn Yasht ; or, it may be that other books, especially the Yasna, are a com- pilation extracted for liturgical purposes from various nasks. Further, the statements of the Dlnkard leave" on us a very distinct impression that the' author actually had before him the text of the nasks, or at all events of a large part of them: for he expressly states that the eleventh nask was entirely lost, so that he is unable to give the slightest account of its contents. And, besides, in other directions there are numerous indications that such books once realty existed. In the Khordah Avesta, as we now have it, we find two Srosh Yashts; with regard to the first, it is expressly stated in old MSS. that it was taken from the lladokhi nask (the twentieth, according to the Dlnkard). From the same nask also a considerable fragment (Yts. 21 and 22 in Westergaard) has been taken. So, also, the Nirangistan is a portion of the seventeenth (or H us par am) nask. Lastly, the numerous other fragments, the quotations in the Pahlavi translation, the many references in the Bundahish to passages of this Avesta not now known to us, all presuppose the existence in the Sassanian period of a much more extensive Avesta literature than the mere prayer-book now in our hands. The existence of a larger Avesta, even as late as the 9th century A.D., is far from being a mere myth. But, even granting that a certain obscurityˆ still hangs undispellcd over the problem of the old Avesta, with its twenty-one nasks, we may well believe the Parsees themselves, when they affirm that their sacred litera- ture has passed through successive stages of decay, the last of which is represented by the present Avesta. In fact 'we can clearly trace this gradual process of decay in certain portions of the Avesta during the last few centuries. The great Yashts are not of very*

frequent occurrence in the manuscripts: some of them, indeed, are already met with but seldom, and MSS. containing all the Yashts are of extreme rarity. Of the fifteenth, seventeenth and nineteenth Yashts the few useful copies that we possess are derived from a single MS. of the year 1591 a.u.

Origin and History. — While all that Herodotus (i. 132) has to say is that the Magi sang "the theogony " at their sacrifices, Pausanias is able to add (v. 27. 3) that they read from a book. Hermippus, in the 3rd century B.C., affirmed that Zoroaster, the founder of the doctrine of the Magi, was the author of twenty books, each containing 100,000 verses. According to the Arab historian, Tabari, these were written on 12,000 cow- hides, a statement confirmed by Masudi, who writes: "Zartusht gave to the Persians the book called Avesta. It consisted of twenty-one parts, each containing 200 leaves. This book, in the writing which Zartusht invented and which the Magi called the writing of religion, was written on 12,000 cowhides, bound together by golden bands. Its language was the Old Persian, which now no one understands." These assertions sufficiently establish the existence and great bulk of the sacred writings. Parsee tradition adds a number of interesting statements as to their history. According to the Arda-Viraf-Nam-a the religion revealed through Zoroaster has subsisted in its purity for 300 years, when Iskander Rumi (Alexander the Great) invaded and devastated Iran, and burned the Avesta which, written on cowhides with golden ink, was preserved in the archives at Persepolis. According to the Dinkard, there were two copies, of which one was burned, while the second came into the hands of the Greeks. One of the Rivayato relates further: " After the villainy of Alexander, an assemblage of several high-priests brought together the Avesta from various places, and made a collection which included the sacred Yasna, Vispered, Vendidad and other scraps of the Avesta." As to this re-collection and redaction of the Avesta the Dinkard gives various details. One of the Arsacid kings, Vologeses (I. or III.?), ordered the scattered remnants of the Avesta to be carefully preserved and recorded. The first of the Sassanian kings, Ardashlr Babagan (226-240), caused his high-priest, Tanvasar, to bring together the dispersed portions of the holy book, and to compile from these a new Avesta, which, as far as possible, should be a faithful reproduction of the original. King Shapur I. (241-272) enlarged this re-editcd Avesta by collecting and incorporating with it the non-religious tractates on medicine, astronomy, geography and philosophy. Under Shapur II. (309-380) the nasks were brought into complete order, and the new redaction of the Avesta reached its definitive conclusion.

Historical criticism may regard this tradition, in many of its features, as mere fiction, or as a perversion of facts made for the purpose of transferring the blame for the loss of a sacred literature to other persons than those actually responsible for it. We may, if wc choose, absolve Alexander from the charge of vandalism of which he is accused, but the fact nevertheless remains, that he ordered the palace at Persepolis to be burned (Diod., xvii. 72; Curt., v. 7). Even the statement as to the one or two complete copies of the Avesta may be given up as the invention of a

later day. Nevertheless the essential ele- ments of the tradition remain unshaken, viz. that the original Avesta, or old sacred literature, divided on account of its great bulk and heterogeneous contents into many portions and a variety of separate works, had an actual existence in numerous copies and also in the memories of priests, that, although gradually diminishing in bulk, it remained extant during the period of foreign domination and ecclesiastical decay after the time of Alexander, and that it served as a basis for the redaction subsequently made. The kernel of this native tradition — the fact of a late collection of older fragments — appears indisputable. The character of the book is entirely that of a compilation.

In its outward form the Avesta, as we now have it, belongs to the Sassanian period— the last survival of the compilers' work already alluded to. But this Sassanian origin of the Avesta must not be misunderstood: from the remnants and heterogeneous

fragments at their disposal, the diasceuast or diasceuasts com- posed a new canon — erected a new edifice from the materials of the old. In point of detail, it is now impossible to draw a sharp distinction between that which they found surviving ready to their hand and that which they themselves added, or to define how far they reproduced the traditional fragments with verbal fidelity or indulged in revision and remoulding. It may reasonably be supposed, not only that they constructed the external framework of many chapters, and also made some additions of their own — a necessary process in order to weld their motley collection of fragments into a new and coherent book. — but also that they fabricated anew many formulae and imitative passages on the model of the materials at their dis- posal. In this consisted the "completion" of Tanvasar, ex- pressly mentioned in the account of the Dinkard. All those texts in which the grammar is handled, now with laxness and want of skill, and again with absolute barbarism, may probably be placed to the account of the Sassanian redactors. All the grammatically correct texts, together with those portions of the Avesta which have intrinsic worth, especially the metrical passages, are indubitably authentic and taken ad verbum from the original Avesta. To this class, above all, belong the Gathas and the nucleus of the greater Yashts. Opinions differ greatly as to the precise age of the original texts brought together by subsequent redactors; according to some, they are pre-Achacmenian; according to Darmesteter's former opinion, they were written in Media under the Achaemenian dynasty; according to some, their source must be sought in the east, according to others, in the west of Iran-

But to search for a precise time or an exact locality is to deal with the question too narrowly; it is more correct to say that the Avesta was worked at from the time of Zoroaster down to the Sassanian ■ period. Its oldest portions, the Gathas, proceed from the prophet himself. This conclusion is inevitable for every one to whom Zoroaster is an historical personality, and who does not shun the .labour of an unprejudiced research into the meaning of those difficult texts (cf. Zoroastf.r). The rest of the Avesta, in spite of the opposite opinion of orthodox Parsees, does not even claim to come from Zoroaster. As the Gathas now con- stitute the kernel of the most sacred prayer-book, viz. the Yasna, so they ultimately proved to be the first nucleus of a religious literature in general. The language in which Zoroaster taught, especially a later development of it, remained as the standard with his followers, and became the sacred language of the priesthood of that faith which he had founded; as such it became, so to speak, absolved from the ordinary conditions of time and space. Taught and acquired as an ecclesiastical language, it was enabled to live an artificial life long after it had become extinct as a vernacular — in this respect comparable to the Latin of the middle ages or the Hebrew of the rabbinical schools. The priests, who were the composers and repositories of these texts, succeeded in giving them a perfectly general form. They refrained from practically every allusion to ephemeral or local circumstances. Thus we search vainly in the Avesta itself for any precise data to determine the period of its composition or the place where it arose. The original country of the religion, and the seat of the Avesta language, ought perhaps to be sought rather in the east of Iran (Seistan and the neighbouring districts). But neither the spiritual literature nor the sacred tongue remained limited to the east. The geography of the Avesta points both to the east and the west, particularly the north-west of Iran, but with a decided tendency to gravitate towards the east. The vivid descrip- tion of the basin of the Hilment (Yaskt 10, 65-69) is peculiarly instructive. The language of the Avesta travelled with the Zoroastrian religion and with the main body of the priesthood, in all probability, that is to say, from east to west; within the limits of Iran it became international.

As has been already stated, the Avesta now in our hands is but a small portion of the book as restored and edited under the Sassanians. The larger part perished under the Mahommedan rule and under the more barbarous tyranny of the Tatars, when through

conversion and extermination the Zoroastrians became a mere remnant that concealed its religion and neglected the necessary copying of manuscripts. A most meagre proportion only of the real religious and ritual writings, the sacerdotal law and the liturgy, has been preserved to our time. The great bulk— over three- fourths of the Sassanian contents — especially the more secular literature collected, has fallen a prey to oblivion. The

under- standing of the older Avesta texts began to die away at an early period. The need for a translation and interpretation became evident; and under the Later Sassanians the majority of the books, if not the whole of them, were rendered into the current Pahlavi. A thorough use of this translation will not be possible until we have it in good critical editions, and acquaintance with its lan- guage ceases to be the monopoly of a few privileged individuals. For the interpretation of the older texts it is of great value where they are concerned with the fixed, formal statutes of the church. But when they pass beyond this narrow sphere, as particularly in the Gathas, the Pahlavi translator becomes a defective and un- reliable interpreter. The Parsee priest, Neryosangh, subsequently translated a portion of the Pahlavi version into Sanskrit.

The MSS. of the Avesta are, comparatively speaking, of recent date. The oldest is the Pahlavi Vispered in Copenhagen, dated 1258. Next come the four MSS. of the Herbad Mihirapan Kai Khusro at Cambay (1323 and 1324), two Vendidads with Pahlavi in London and Copenhagen, and two Yasnas with Pahlavi in Copen- hagen and formerly in Bombay (now Oxford). Generally speaking, the MSS. fall off in quality and carefulness in proportion to their lateness; though an honourable exception must be made in favour of those proceeding from Kirman and Yazd in Persia, mostly dating from the 17th and 18th centuries.

The first European scholar to direct attention to the Avesta was Hyde of Oxford, in his Histaria Re.ligionis Veterum Persarwn eoramque Magormn (1700), which, however, failed to awake any lasting interest in the sacred writings of the Parsees. The merit of achieving this belongs to the enthusiastic orientalist Anquetil Duperron, the fruit of whose prolonged stay in India (1755-1761) and his acquaintance with the Parsee priests was a translation (certainly very defective) of the Zend-Avesta. The foundation of a scientific exegesis was laid by Burnouf. The interpretation of the Avesta is one of the most difficult problems of oriental philology. To this very day no kind of agreement has been reached by con- flicting schools, even upon some of the most important points. The value of the Pahlavi interpretation was overrated by Spiegel, Darmesteter, but wholly denied by Roth. The truth lies between these two extremes. Opinion is divided also as to the significance of the Avesta in the literature of the world. The exaggerated enthusiasm of Anquetil Duperron has been followed, especially since Spiegel's translation, by an excessive reaction. Upon the whole, the Avesta is a monotonous book. The Yasna and many Yashts in great part consist 01 formulae of prayer which are as poor in contents as they arc rich in verbiage. The book of laws (Vendidad) is characterized by an arid didactic tone; only here and there the legislator clothes his dicta in the guise of graceful dialogues and tales, or of poetic descriptions and similitudes; and then the book of laws is transformed into

a didactic poem. Nor can we deny to the Yashts, in their depiction of the Zoroastrian angels and their presentment of the old .sagas, a certain poetic feeling, at times, and a pleasant diction. The Gathas are quite unique in their kind. As a whole, the Avesta, for profundity of thought and beauty, stands on a lower level than the Old Testa- ment. But as a religious book-ˆ — the most important document of the Zoroastrian faith, and the sole literary monument of ancient Iran- — the Avesta occupies a prominent position in the literature of the world. At the present day its significance is decidedly underrated. The future will doubtless be more just with regard to the importance of the book for the history of religion in general and even of Christianity.

Editions. — Zend-Avesta, ed. by N. L. Westergaard (Copenhagen 1 852-54), complete; K. Spiegel, Avesta (Vienna, 1853-58), only Vendidad, Vispered and Yasna, but with the Pahlavi translation; K. Geldner (Stuttgart, 1886-96). Translations. — Anquetil Duper- ron, Zend-Avesta, Ouvrage de Zoroastre (Paris, 1771); Fr. Spiegel, 3 vols. (Leipzig, 1852-63), both completely antiquated. Avesta traduit par C. de Harlez, ed. 2 (Paris, 18S1); The Zend-Avesta, Part I. Vendidad, Part II. Slrosahs, Yashts and Nydyisk, tr. by J. Darmesteter, Part III. Yasna, Visparad, &c, by L. II. Mills (Oxford, 1880-87), in the Sacred Books of the East; Le Zend-Avesta, traduction nouvelle par J. Darmesteter, 3 vols. (Paris, 1892-93) (Annates du Musee Guimet) — a most important work.

Literature. — Anquetil Duperron (see above); Haug, Essays on the Sacred Language, &c, of the. Parsis, especially in the new edition by E. W. West (London, 1878); De Harlez, Introduction a V etude de V Avesta (Paris, 1881); Max Duncker, Geschichte des Aliertums, vol. iv.; Eduard Meyer, Geschichte des Altertums, vol.'i. (Stuttgart, 1884) ; J. Darmesteter, in the Introduction to his translation (see above) ; K. Geldner, Avesta- Litter atur in the Grundriss der iranischen Philologie, by Geiger and Knhn (Strassburg, 1896), vol. 2, 1 f.; E. W. West, Contents of the Nasks, S. B. E. 37 (Oxford, 1892). (K. G.)

ZENGG, a royal free town of Hungary, in the county of Lika-Krbava, Croat ia-Slavoni'a, 34 m. S.E. of Fiume, on the Adriatic Sea. Pop. (1900) 3182. Zengg lies at the entrance to a long cleft among the Velebit Mountains, down which the bora, or N.N.E. wind, sweeps with such violence as often to render the harbour unsafe, although the Austrian Lloyd steamers call regularly. Apart from the cathedral of its Roman Catholic bishop, a gymnasium, and some ancient fortifications, the town contains

little of interest. It carries on a small trade in tobacco, fish and salt. The island of Veglia faces the town and the port of San Giorgio lies 5 m. S.

The captaincy of Zengg was established, in the 15th century, by King Matthias Corvinus of Hungary, as a check upon the Turks; and subsequently, until 1617, the town became famous as the stronghold of the Uskoks.

ZENITH (from the Arabic), the point directly overhead; its direction is denned by that of the plumb-line.

ZENJAN, or Zanjan, a town of Persia, capital of the Kbamseh province, about 205 m. N.W. of Teheran, on the high road thence to Tabriz, at an elevation of 5180 ft. It has a population of about 25,000 and post and telegraph offices, and was one of the original strongholds of the Eabi sectarians, who held it against a large Persian force from May 1850 to the end of the year, when most of them were massacred. It has extensive gardens, well watered by the Zanjaneh river, which flows south of it. The well-stocked bazaar supplies the neighbouring districts.

ZENO, East Roman emperor from 474 to 491, was an Isaurian of noble birth, and originally bore the name of Trascalissaeus, which he exchanged for that of Zeno on his marriage with Ariadne, daughter of Leo I., in 468. Of his early life nothing is known; after his marriage (which was designed by Leo to secure the Isaurian support against his ambitious minister Aspar) he became patrician and commander of the imperial guard and of the armies in the East. While on a campaign in Thrace he narrowly escaped assassination; on his return to the capital he avenged himself by compassing the murder of Aspar, who had instigated the attempt. In 474 Leo I. died after appointing .as his successor Leo the son of Zeno and Ariadne; Zeno, however, with the help of his mother-in-law Verina. succeeded in getting himself crowned also, and on the death of his son before the end of the year became sole emperor. In the following year, in consequence of a revolt fomented by Verina in favour of her brother Basiliscus, and the antipathy to his Isaurian soldiers and administrators, he was compelled to take refuge in Isauria, where, after sustaining a defeat, he was compelled to shut himself up in a fortress. The growing mis-government and unpopularity of Basiliscus ultimately enabled Zeno to re-enter Constantinople unopposed (476); his rival was banished to Phrygia, where he soon afterwards died. The remainder of Zeno's reign was disturbed by numerous other less formidable revolts. Since 472 the aggressions of the two Ostrogoth leaders Theodoric had been a constant source of danger. Though Zeno at times contrived to play them off against each other, they in turn were able to profit by his dynastic rivalries, and it was only by offering them pay and high command that he kept them from

attacking Constanti- nople itself. In 487 he induced Theodoric, son of Theodemir, to invade Italy and establish his new kingdom. Zeno is de- scribed as a lax and indolent ruler, but he seems to have husbanded the resources of the empire so as Lo leave it appreci- ably stronger at his death. In ecclesiastical history the name of Zeno is associated with the Henoticon or instrument of union, promulgated by him and signed by all the Eastern bishops, with the design of terminating the Monophysite controversy.

See J. B. Bury, The Later Roman Empire (London, 1889), i. pp. 250-274; E. W. Brooks in the English Historical Review (J 893), pp- 209-238; \V. Earth, Der Kaiser Zeno (Basel, 1894).

ZENO OF ELEA, son of Teleutagoras, is supposed to have been born towards the beginning of the 5th century B.C. The pupil and the friend of Parmenides, he sought to recommend his master's doctrine of the existence of the One by contro-

verting the popular belief in the existence of the Many. In virtue of this method of indirect argumentation he is regarded as the inventor of " dialectic," that is to say, disputation having for its end not victory but the discovery or the transmission of truth. He is said to have been concerned in a plot against a tyrant, and on its detection to have borne with exemplary constancy the tortures to which he was subjected; but autho- rities differ both as to the name and the residence of the tyrant and as to the circumstances and the issue of the enterprise.

In Plato's Parmenides, Socrates, " then very young," meets Parmenides, " an old man some sixty-five years of age," and Zeno, " a man of about forty, tall and personable," and engages them In philosophical discussion. But it may be doubted whether such a meeting was chronologically possible. Plato's account of Zeno's teaching {Parmenides, 128 seq.) is, however, presumably as accurate as it is precise. In reply to those who thought that Parmenides's theory of the existence of the One involved inconsistencies and absurdities, Zeno tried to show that the assumption of the existence of the Many, that is to say, a plurality of things in time and space, carried with it inconsistencies and absurdities grosser and more numerous. In early youth he collected his arguments in a book, which, accord- ing to Plato, was put into circulation without his knowledge.

Of the paradoxes used by Zeno to discredit the belief in plurality and motion, eight survive in the writings of Aristotle and Simplicius. They are commonly stated as follows. 1 (1) If the Existent is Many, it must be at once infinitely small and infinitely great — infinitely small, because the parts cf which it consists must be indivisible and therefore without magnitude; infinitely great, because, that any part having magnitude may

be separate from any other part, the intervention of a third part having magnitude is necessary, and that this third part may be separate from the other two the intervention of other parts having magnitude is necessary, and so on ad infinitum. (2) In like manner the Many must be numerically both finite and infinite — numerically finite, because there are as many things as there are, neither more nor less; numerically infinite, because, that any two things may be separate, the intervention of a third thing is necessary, and so on ad infinitum. (3) If all that is is in space, space itself must be in space, and so on ad infinitum. (4) If a bushel of corn turned out upon the floor makes a noise, each grain and each part of each grain must make a noise likewise; out, in fact, it is not so. (5) Before a body in motion can reach a given point, it must first traverse the half of the distance; before it can traverse the half of the distance, it must first traverse the quarter; and so on ad infinitum. Hence, that a body may pass from one point to another, it must traverse an infinite number of divisions. But an infinite distance (which Zeno fails to distinguish from a finite distance infinitely divided) cannot be traversed in a finite time. Conse- quently, the goal can never be reached. (6) If the tortoise has the start of Achilles, Achilles can never come up with the tortoise; for, while Achilles traverses the distance from his starting-point to the starting-point of the tortoise, the tortoise advances a certain distance, and while Achilles traverses this distance, the tortoise makes a further advance, and so on ad infinitum. Consequently, Achilles may run ad infinitum without overtaking the tortoise. [This paradox is virtually identical with (5), the only difference being that- whereas in (5) there is one body, in (6) there are two bodies, moving towards a limit. The " infinity " of the premise is an infinity of subdivisions of a distance which is finite; the " infinity " of the conclusion is an infinity of distance. Thus Zeno again confounds a finite distance infinitely divided with an infinite distance. If the tortoise has a start of 1000 ft. Achilles, on the supposition that his speed is ten times that of the tortoise, must traverse an infinite number of spaces — -1000 ft., 100 ft., 10 ft., &c. — and the tortoise must traverse an infinite number of spaces — 100 ft., 10 ft., I ft., &c. — before they reach the point, distant from their starting-points imj ft. and iii£ ft. respectively, at which the tor- toise is overtaken. In a word, 1000-f 100-f-io &e., in (6) and i+i+i &c, in (5) are convergent series, and rm^and 1 are the limits to which they respectively approximate.] (7) So long as anything is in one and the same space, it is at rest. Hence an arrow is at rest at every moment of its flight, and therefore also during the whole of its flight. (8) Two bodies moving with equal speed traverse equal spaces in equal time. But, when two bodies move with equal speed in opposite directions, the one passes the other in half the time in which it passes it when at rest. These pro- positions appeared to Zeno to be irreconcilable. In short, the ordinary belief in plurality and motion seemed to him to involve fatal inconsistencies, whence

he inferred that Parmenides was justified in distinguishing the mutable movable Many from the

1 See Zeller, Die PkilosopUe d. Griechen, i. 591 seq.; Grundriss, 54.

immutable immovable One, which alone is really existent. In other words, Zeno re-affirmed the dogma, " The Ent is, the Non-ent is not."

If tradition has not misrepresented these paradoxes of time, space and motion, there is in Zeno's reasoning an element of fallacy. It is indeed difficult to understand how so acute a thinker should confound that which is infinitely divisible with that which is infinitely great, as in. (1), (2), (5), and (6); that he should identify space and magnitude, as in (3) ; that he should neglect the imperfection of the organs of sense, as in (4); that he should deny the reality of motion, as in (7); and that he should ignore the relativity of speed, as in (8) : and of late years it has been thought that the conventional statements of the paradoxes, and in particular of those which are more definitely mathematical, namely (5), (6), (7), (8), do less than justice to Zeno's acumen. Thus, several French writers — notably, Tannery and Noel — regard them as dilemmas advanced, with some measure of success, in refuta- tion of specific doctrines attributed to the Pythagoreans. " One of the most notable victims of posterity's lack of judgment," says Rertrand Russell, " is the Elealic Zeno. Having invented four arguments all immeasurably subtle and profound, the gross- ness of subsequent philosophers pronounced him to be a mere ingenious juggler, and his arguments to be one and all sophisms. After two thousand years of continual refutation, these sophisms were reinstated, and made the foundation of a mathematical renais- sance, by a German professor, who probably never dreamed ofany connexion between himself and Zeno. Weierstrass, by strictly banishing all infinitesimals, has at last shown that we live in an unchanging world, and that the arrow at every moment of its flight is truly at rest." " The interpretation of Zeno's last four paradoxes given by Messrs. Noel and Russell," says G. H. Hardy, "may be briefly stated as follows: The notion of time, which seems at first sight to enter into (5) and (6), should be eliminated. The former should be regarded as asserting that the whole is, not temporally, but logically, subsequent to the part, and that there- fore there is an infinite regress in the notion of a whole which is infinitely divisible— a view which at any rate demands a serious refutation. The kernel of the latter lies in the perfectly valid proof which it affords that the tortoise passes through as many positions as Achilles — a view which embodies an accepted doctrine of modern

mathematics. The paradox of the arrow (7), says Mr Russell, is a plain statement of a very elementary fact: the arrow is at rest at very moment of its flight: Zeno's only mistake was in inferring (if he did infer) that it was therefore at the same point at one moment as at another. Finally, the last paradox may be interpreted as a valid refutation of the doctrine that space and time are not infinitely divisible. How far this interpretation of Zeno is historically justifiable, may be doubtful. But one may well believe that there was in his mind at any rate a foreshadowing of some of the ideas by which modern mathematicians have finally laid to rest the traditional difficulties connected with infinity and continuity."

Great as was the importance of these paradoxes of plurality and motion in. stimulating speculation about space and time, their direct influence upon Greek thought was less considerable than that of another paradox — strangely neglected by historians of philosophy — the paradox of predication. We learn from Plato (Parmenides, 127 D) that " the first hypothesis of the first argument " of Zeno's book above mentioned ran as follows: " If existences are many, they must be both like and unlike [unlike, inasmuch as they are not one and the same, and like, inasmuch as they agree in not being one and the same, Proclus, On the Parmenides, ii. 143I. But this is impossible; for unlike things cannot be like, nor like things unlike. Therefore exist- ences are not many." That is to say, not perceiving that the same thing may be at once like and unlike in different relations, Zeno regarded the attribution to the same thing of likeness and unlikeness as a violation of what was afterwards known as the principle of contradiction; and, finding that plurality entailed these attributions, he inferred its unreality. Now, when without qualificaiion he affirmed that the unlike thing cannot be like, nor the like thing unlike, he was on the high road to the doctrine maintained three-quarters of a century later by the Cynics, that no predication which is not identical is legitimate. He was not indeed aware how deeply he had committed himself; otherwise he would have observed that Ms argument, if valid against the Many of the vulgar, was valid also against the One of Parmenides, with its plurality of attri- butes, as well as that, in the absence of a theory of predication, it was useless to speculate about knowledge and being. But others were not slow to draw the obvious conclusions; and it may be conjectured that Gorgias's sceptical development of

the Zenonian logic contributed, not less than Protagoras's sceptical development of the Ionian physics, to the diversion of the intellectual energies of Greece from the pursuit of truth to the pursuit of culture.

For three-quarters of a century, then, philosophy was at a standstill; and, when in the second decade of the 4th century the pursuit of truth was resumed, it was plain that Zeno's paradox of predication must be disposed

of before the problems which had occupied the earlier thinkers — the problem of know- ledge and the problem of being — could be so much as attempted. Accordingly, in the seventh book of the Republic, where Plato propounds his scheme of Academic education, he directs the attention of studious youth primarily, if not exclusively, to the concurrence of inconsistent attributes; and in the Phaedo, 102 B-103 A, taking as an instance the tallness and the short- ness simultaneously discoverable in Sirnmias, he offers his own theory of the immanent idea as the solution of the paradox. Sirnmias, he says, has in him the ideas of tall and short. Again, when it presently appeared that the theory of the immanent idea was inconsistent with itself, and moreover in- applicable to explain predication except where the subject was a sensible thing, so that reconstruction became necessary, the Zenonian difficulty continued to demand and to receive Plato's best attention. Thus, in the Parmenides, with the paradox of likeness and unlikeness for his text, he inquires how far the current theories of being (his own included) are capable of providing, not only for knowledge; but also for predication, and in the concluding sentence he suggests that, as likeness and unlikeness, greatness and smallness, &c, are, relations, the initial paradox is no longer paradoxical; while in the Sophist, Zeno's doctrine having been shown to be fatal to reason, thought, speech and utterance, the mutual kqivcqvLo. of ei§)j which are not arret nad' avTa is elaborately demonstrated. It would seem then that, not to Aril.isthenes only, but to Plato also, Zeno's paradox of predication was a substantial difficulty; and we shall be disposed to give Zeno credit accordingly for his perception of its importance.

In all probability Zeno did not observe that in his contro- versial defence of Eleaticism he was interpreting Parmenidcs's teaching anew. But so it was. For, while Parmenides had recognized, together with the One, which is, and is the object of knowledge, a Many, which is not, and therefore is not known, but nevertheless becomes, and is the object of opinion, Zeno plainly affirmed that plurality, becoming and opinion are one and all inconceivable. In a word, the fundamental dogma, " The Ent is. the Non-ent is not," which with Parmenides had been an assertion of the necessity of distinguishing between the Ent, which is, and the Non-ent, which is not, but becomes, was with Zeno a declaration of the Non-ent's absolute nullity. Thus, just as Empedocles developed Parmenides's theory of the Many to the neglect of his theory of the One, so Zeno developed the theory of the One to the neglect of the theory of the Many. With the severance of its two members Eleaticism proper, the Eleaticism of Parmenides, ceased to exist.

The first effect of Zeno's teaching was to complete the dis- comfiture of philosophy. For the paradox of predication, which he had used to disprove the existence of plurality, was virtually a denial of all speech and all thought, and thus led to a more comprehensive scepticism than that which

sprang from the contemporary theories of sensation. Nevertheless, he left an enduring mark upon Greek speculation, inasmuch as he not only recognized the need of a logic, and grappled, how- ever unsuccessfully, with one of the most obvious of logical problems, but also by the invention of dialectic provided a new and powerful instrument against the time when the One and the Many should be reunited in the philosophy of Plato.

Bibliography, — F. W. A. Mullach, Pragmenta Pkilosophorum Graecorum (Paris, i860), i. 266 seq. ; Zeller, Die Philosophic d. Griecken (Leipzig, 1876), i. 534-552; P. Tannery, Pour I'Histoire de la Science Hellene (Paris, 1887), pp. 247-261; II. Diels, Die Fragmente der Vorsokratiker (Berlin, iuo6, 1907). On the mathe- matical questions raised by certain of Zeno's paradoxes, see G. Noel, Revue de Metaphysique et de Morale, i. 107-125, and Hon. Bertrand

Russell, Principles of Mathematics (Cambridge, 1903), pp. 346-354. For histories of philosophy and other works upon Eleaticism see Parme.mdes. (H. Ja.)

ZENO OF SIDON, Epicurean philosopher of the first century B.C., and contemporary of Cicero. In the De Nature Deorum (i. 34), Cicero states that he was contemptuous of other philo- sophers and even called Socrates " the Attic Buffoon." Diogenes Laertius and Cicero both speak of him with respect and describe him as an accurate and polished thinker. He held that happi- ness' includes not merely present enjoyment and prosperity, but also a reasonable expectation of their continuance. His views were made the subject of a special treatise by Posidonius.

ZENO OF TARSUS, Stoic philosopher and pupil of Chry- sippus, belonged to the period of the Middle Stoa. He appears to have accepted all the Stoic doctrines except that he denied the final conflagration of the universe (see Stoics).

ZENOEIA (Gr. Zi)vo^ia), queen of Palmyra, one of the heroines of antiquity. Her native name was Septimia Bath- zabbai, a name also borne by one of her generals, Septimius Zabbai. 1 This remarkable woman, famed for her beauty, her masculine energy and unusual powers of mind, was well fitted to be the consort of Odainatti (see Odaenathus) in his proud position as Dux Orientis; during his lifetime she actively seconded his policy, and after his death in a.d. 266-7 she not only succeeded to his position but determined to surpass it and make Palmyra mistress of the

Roman Empire in the East. Wahab-allath or Athenoddrus (as the name was Graecized), her son by Odainath, being still a boy, she took the reins of government into her own hands. Under her general-in-chief Zabdii, the Palmyrenes occupied Egypt in a.d. 270, not without a struggle, under the pretext of restoring it to Rome; and Wahab-allath governed Egypt in the reign of Claudius as joint ruler with the title of fiaaikebs (king), while Zenobia herself was styled fiao-iXiao-ar] (queen). In Asia Minor Palmyrene garrisons were established as far west as Ancyra in Galatia and Chalcedon opposite Byzantium, and Zenobia still pro- fessed to be acting in the interests of the Roman rule. In his coins struck at Alexandria in a.d. 270 Wahab-allath is named along with Aurelian, but the title of Augustus is given only to the latter; a Greek inscription from Byblos, however, mentions Aurelian (or his predecessor Claudius) and Zenobia together as "Ztfiaurbs and Xeˆaar-f} (i.e. Augustus and Augusta, C.I.G. 4503 b). When Aurelian became emperor in 270 he quickly realized that the policy of the Palmyrene queen was endangering the unity of the empire. It was not long before all disguises were thrown off; in Egypt Wahab-allath began to issue coins without the head of Aurelian and bearing the imperial title, and Zenobia's coins bear the same. The assumption marked the rcjecLion of all allegiance to Rome. Aurelian instantly took measures; Egypt was recovered for the Empire by Probus (close of 270), and the emperor himself prepared a great expedi- tion into Asia Minor and Syria. Towards the end of 271 he marched through Asia Minor and, overthrowing the Palmyrene garrisons in Chalcedon, Ancyra and Tyana, he reached Antioch, where the main Palmyrene army under Zabda and Zabbai, with Zenobia herself, attempted to oppose his way. The at- tempt, however, proved unsuccessful, and after suffering con- siderable losses the Palmyrenes retired in the direction of Emcsa (now Horns), whence the road lay open to their native city. The queen refused to yield to Aurelian's demand for surrender, and drew up her army at Emesa for the battle which was to decide her fate. In the end she was defeated, and there was nothing for it but to fall back upon Palmyra across the desert. Thither Aurelian followed her in spite of the difficulties of transport, and laid siege to the well-fortified and provisioned city. At the critical moment the queen's courage seems to have failed her; she and her son fled from the city to seek

1 See the Palmyrene inscriptions given in Vogiie\ Syrie centrale, Nos. 28, 29 = Cooke, North-Semitic Inscriptions, Nos. 130, 131. Zabbai, an abbreviation of some such form as Zahd-ila. = dozvry of God, was a common Palmyrene name; it occurs in the Old Testa- ment, Ezr x. 28; Neh. iii. 20.

help from the Persian king; 2 they were captured on the bank of the Euphrates, and the Palmyrenes, losing heart &X this disaster, capitulated (a.d. 272). Aurelian seized the wealth of the city but spared the

inhabitants; to Zenobia he granted life; while her officers and advisers, among whom was the celebrated scholar Longinus, were put to death. Zenobia figured in the conqueror's splendid triumph at Rome, and by the most probable account accepted her fall with dignity and closed her days at Tibur, where she lived with her sons the life of a Roman matron. A few months after the fall of Zenobia, Palmyra revolted again; Aurelian unexpectedly returned, destroyed the city, and this time showed no mercy to the population (spring, 273).

Among the traditions relating to Zenobia may be mentioned that of her discussions with the Archbishop Paul of Samosata on matters of religion. It is probable that she treated the Jews in Palmyra with favour; she is referred to in the Talmud; as protecting Jewish rabbis (Talm. Jer. Ter. viii. 46 b).

The well-known account of Zenobia by Gibbon (Decline and Fall, i. pp. 302-312 Bury's edition) is based upon the imperial biographers (Ilistoria Augusta) arid cannot be regarded as strictly historical in detaiL An obscure and distorted tradition of Zenobia as an Arab queen survived in the Arabian story of Zabba, daughter of 'Amr b. Zarib, whose name is associated with Tadmor and with a town on the right bank of the Euphrates, which is no doubt the Zenobia of which Procopius speaks as founded by the famous queen. See C. de Perceval, Essai sur I'kist. des Arabes, ii. 28 f., 197 f. ;Tabari, i. 757 f. See further Palmyra. (G. A. C.)*

ZENOBIUS, a Greek sophist, who taught rhetoric at Rome during the reign of Hadrian (a.d. i 17-138). He was the author of a collection of proverbs in three books, still extant in an abridged form, compiled, according to Suidas, from Didymus of Alexandria and " The Tarrhacan " (Lucillus of Tarrha in Crete). Zenobius is also said to have been the author of a Greek translation of Sallust and of a birthday poem {ywedXiaKov) on Hadrian.

Editions by T. Gaisford (1836) and E. L. Lcutsch-F. W. Schneide-

win (1839), "and in B. E. Miller, Melanges de litierature grecque (1868); see also W. Christ, Griechische Litter -aturgeschichle (1898).

ZENODOCHIUM (Gr. fyvoboxtiov, £hos } stranger, guest, bkxˆBo.t, to receive), the name given by the Greeks to a building erected for the reception of strangers.

ZENODOTUS, Greek grammarian and critic, pupil of Philetas (q.v.) of Cos, was a native of Ephesus. He lived during the reigns of the first two Ptolemies, and was at the height of his reputation about 280 B.C. He was the first superintendent of the library at Alexandria and the first critical editor (8toptfo:T7js) of Homer. His colleagues in the librarianship were

Alexander of Aetolia and Lycophron of Chalcis, to whom were allotted the tragic and comic writers respectively, Homer and other epic poets being assigned to Zenodotus. Although he .has been reproached with arbitrariness and an insufficient know- ledge of Greek, in his recension he undoubtedly laid a sound foundation for future criticism. Having collated the different MSS. in the library, he expunged or obelized doubtful verses, transposed or altered lines, and introduced new readings. He divided the Homeric poems into books (with capitals for the Iliad, and small letters for the Odyssey), and possibly was the author of the calculation of the days of the Iliad in the Tabula Iliaca. He does not appear to have written any regular com- mentary- on Homer, but his Homeric YAwcrcrat (lists of unusual words) probably formed the source of the explanations of Homer attributed by the grammarians to Zenodotus. He also lectured upon Hesiod, Anacrcon and Pindar, if he did not publish editions of them. He is further called an. epic poet by Suidas, and three epigrams in the Greek Anthology are assigned to him.

There appear to have been at least two other grammarians of the same name: (1) Zenodotus of Alexandria, surnamed

2 Whether Shapur or his son Hormuzdi Is not certain; Shapur's death is variously placed in 269 and 272.

6 h affra; (2) Zenodotus of Mallus, tlie disciple of Crates, who like his master attacked Aristarchus.

See F. A. Wolf, Prolegomena ad Homerum, section 43 (1859 edition) ; H. Duntzer, Be Zenodoii studiis Homericis (1848) ; A. Romer, Uber die Homer recension des Zenodotus (Munich, 1885); F. Susemihl, Geschickte der griechiscken Litter atur in der Alexan- drmerzeit, i. p. 330, ii. p. 14; J. E. Sandys, Hist, of Class. Schol. (1906), ed. 2, vol. i. pp. 119-121.

ZENTA, a market town of Hungary, in the county of Bacs- Bodrog, 133 m. S.E. of Budapest by rail. Pop. (1900) 28,582. It is situated on the right bank of the river Thciss, and is historically known for the decisive victory won in its vicinity by Prince Eugene of Savoy over the Turks on the nth of September 1697.

ZEOLITES, a family of minerals consisting of hydrated silicates of alumina with alkalis or alkaline earths or both. The water they contain is readily lost, and before the blowpipe it is expelled with intumescence; hence the name zeolite, from the Greek £eiv (to boil) and XtBos (a stone), given by

A. Cron- stedt in 1758. In some other characters, as well as in their origin and mode of occurrence, they have points in common. Several species have been distinguished; of which the following are the more important. Apophyllite {q.v.) and pectolite (see Pyroxene) are also sometimes included.

u„„i,„j; („ fHeulandite . G^up. \ E istflbite .

fWellsite . .

Stilbite J Phillipsite

Group. I Harmotome .

I Stilbite . .

Gismondite .

Laumontite

Chabazite Jr ial ? Z ? e ‘ Group. \ Levynite .

Analcite .

*II*CaAl 2 (S10 a) 6 +3H s O.*

H 1 (Sr,Ba,Ca)Al 2 (SiO a) 6 —f-3H 2 0.

II 4 CaAU(SiO :i) B +3II 2 0.

(Ra, Ca, Kn)Al s Si 3 O 10 +3H s O.

(K a . Ca)Ab(SiO a) 4 +4H 9 0.

H a (K 2 , Ba)AL(Si0 3) 5 +5H 2 0.

CaAU(SiO a)e+6IUO.

CaAl 2 (Si0 3)4+4H 2 0.

H 4 CaAl«Si 4 Oi+2HaO.*

(Ca, Na 2)Al 2 (SiO02+4H 2 O, &c.

(Na., Ca)Al 2 (Si0 3)4+6H 2 0.

CaAl a Si 3 O 10 +5H 2 O.

NaAl(Si0 3) a +H a O.

fNatrolitc. . . . Na s Al,Si 8 Oio+2H 2 0.

NatrolitelMesolite …. (Ca, Na 2)Al 2 Si 3 O 10 +2H 2 O.

Group.) Scolecite …. CaAl 2 Si s O ao +3H 2 0. [Edingtonite . . . BaAl 2

Si 3 O 10 +3H 2 O. Thomsonite . . . (Na 2 , Ca)Ala(SiO0»+2jH a O.

Some of the chemical formulae given above are only ap- proximate, since in some species the composition varies between certain limits and can be best expressed by the isomorphous mixing of different molecules (see, for example, Chabazite). They are all readily decomposed by hydrochloric acid, usually with the separation of gelatinous silica. By the action of various reagents several substitution products have been prepared artificially: thus, crystallized products, in which the alkalis or alkaline earths are replaced by ammonium or silver, &c, have been obtained.

The zeolites are often beautifully crystallized, and belong to several crystal-systems. The crystals usually show evidences of twinning, and when examined in polarized light they fre- quently exhibit optical anomalies and a complex structure. The hardness (H.~ 35-5ˆ) and specific gravity (2-0-2-4) are comparatively low, and so are the indices of refraction and the double refraction.

The water of zeolites presents many points of interest. Laumon- tite loses water on exposure to air, and the crystals soon crumble to powder unless they are kept in a moist atmosphere. All the zeolites lose a portion of their " water of crystallization " in dry air (over sulphuric acid), and a considerable portion at a tempera- ture of ioo D C, increasing in amount to 200 or 300 ; the actual amount lost depending not only on the temperature, but also on the tension of aqueous vapour in the surrounding atmosphere. In some species the remaining water is expelled only at a red heat, and is therefore to be regarded as " water of constitution." With the progressive loss of water there is a progressive change in the optical characters of the crystals. When a partially dehydrated and opaque crystal is exposed to moist air the water is reabsorbed, the crystal becoming again transparent and regaining its original optical characters. Not only may water be reabsorbed, but such substances as ammonia, hydrogen sulphide and alcohol may be absorbed in definite amounts and with an evolution of heat. The water of zeolites may therefore be partly driven off and reabsorbed

or replaced by other substances without destroying the crystalline structure of the material, and it would thus secmˆto differ from the water of crystallization of most other hydrated salts.

Zeolites are minerals of secondary origin and in most cases have resulted by the decomposition of the felspars of basic igneous rocks: in fact their chemical composition is somewhat analogous to that of the felspars with the- addition of water. Nepheline and sodah'te are often altered to zeolites. They usually occur as crystals lining the amygdaloidal and other cavities of

basalt, melaphyre, &c. Usually two or more species are associated together, and often with agate, calcite and some other minerals. Less frequently they occur in cavities in granite and gneiss, and in metalliferous veins {e.g. harmotome) ; while only exceptionally are they primary con- stituents {e.g. analcite) of igneous rocks. Several species have been observed in the Roman masonry at the hot springs of Bourbonne- les-Bains in France: and phillipsite has been dredged from the floor of the deep sea.

See Analcite, Chabazite, Harmotome, Heulandite, Natro- lite, Phillipsite, Scolecite, Stilbite. (L. J. S.)

ZEPHANIAH, the ninth of the minor prophets in the Bible. The name [Yah[weh] "hides" or "treasures"; there is a similar Phoenician compound of Baal) is borne by various individuals, in Jer. xxix. 25 (cf. Hi. 24); Zech. vi. 10,14; 1 Chron. vi. 36, and among the Jews of Elephantine in Egypt (5th century e.c). The prophet's ancestry is traced through Cushi (cf. Jer. xxxvi. 14) to his great-grandfather Hezekiah, who may, in spite of 2 Kings xx. 18, xxi. 1, be the well-known king of Judah (c. 720-690). This would agree fairly with the title (i. 1) which makes the prophet a contemporary of King Josiah (e. 637), and this in turn appears to agree (a) with the internal conditions (i. 4-6, cf. 2 Kings xxiii. 4, 5, 12) which, it is held, are evidently earlier than Josiah's reforms (620); (b) with the denunciation of the royal household, but not of the (young) king himself (i. 8, iii. 3); (c) with the apparent allusion in ch. i. to the invasion of the Scythians (perhaps c. 626), and (d) with the anticipated downfall of Assyria and Nineveh (ii. 13, 607 B.C.). Zcphaniah's prophecies are charac- terized by the denunciation of Judah and Jerusalem and the promise of a peaceful future, and these are interwoven with the idea of a world-wide judgment resulting in the sovereignty of a universally recognized Yahweh. The theme in its main outlines is a popular one in biblical prophecy, but when these 53 verses are carefully examined and compared with pro- phetical thought elsewhere, several difficult problems arise, an adequate solution of which cannot as yet be offered.

After the title (i. 1) and the announcement of the entire destruc- tion of every living thing (2-3), the fate of Judah and Jerusalem is heralded (4-6). The name of Baal (so LXX.; remnant implies a date after Josiah's reforms) and of the idolatrous priests will be cut off, together with them that worship the " host of heaven " (condemned later than 620 in Jer. xix. 13, cf. xliv. 15-19) and swear by the Ammonite god Milcom (or perhaps by their Moloch; for the persistence of his grim cult, see Moloch). Silence is enjoined at the presence of Yahweh {v. 7, cf. Zech. ii. 13) and there follows a fine description of " the Day of Yahweh ' (vv. 7-18).' The inveterate popular belief in the manifestation of the warring deity on behalf of his people {e.g. Isa. xxxiv. 8, lxiii. 4; Jer. xlvi. 10; Obad. 15 ; Ezek.

xxx. 3) is treated (a) ethically, as a day of Judgment upon sin and pride (Amos v. 1.8 ; Isa. ii. 12-21) and (b) apocalyptically, is bound up with ideas of a universal doom. Punishment will fall upon an oppressive court, upon those who wear foreign apparel, and who " leap over the threshold " {v. 9, cf. I Sam. v. 5, a Philis- tine custom) — a protest against heathen intercourse, for which cf. Isa. ii. 6, and Costume, Oriental. The blow falls upon the north side of Jerusalem {v. 10 seq., the merchant quarter (?), cf. Zech. xiv. 21); the city will be ransacked and the indifferent or apathetic, who thought that Yahweh could do neither good nor evil (so, of the idols, Isa. xli. 23; Jer. x. 5) will be ruined. With v. 13 contrast the promises Isa. lxv. 21. " That day is a day of wrath " {v. 15) z with celestial signs (cf. Amos v. 18, 20, viii. 9; Isa. xiii. 10; Joel ii. 2, iii. 15), war and distress, when wealth shall not avail (v. 18, cf. Isa. xiii. 17, of the Medes against Babylon, and more generally Ezek. vii. 19). Thus Yahweh s jealousy fired by the dishonour shown towards him in Judah will make an end of ail them that dwell in the earth (v. 18, cf. v. 2 seq., and see Isa. x. 23, where a remnant is promised).

1 For " day " (i.e. of battle) cf. the Arab usage, W. R. Smith, Proph. of Israel, p. 398. The victorious and divine kings of Egypt in the XlXth and XXth Dynasties are likened to Baal in his ' ' hour " (J. H. Breasted, Hist. Doc'. Eg., iii. §§ 312, 326, iv. §106).

2 The Vulgate Dies trae dies ilia, whence the striking hymn by Thomas of Celano (c. 1250),

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ZEPHANIAH

Chap. ii. opens probably " Get you shame, and be ye ashamed, O nation unabashed, before ye become as chaff that passeth away " (the last two clauses of v. 2 arc doublets). With this very general call to repentance (cf. Amos v. 6, 15; Jer. iv. 14, &c.) is joined a particular appeal to " the humble ones of the earth " (». 3, cf. 111. 12; Isa. xi. 4; Ps. Ixxvi. 9) to seek righteousness and humility, per- adventure (but LXX. so that) they may be hid in the day of Yahweh's wrath (cf. Isa. xxvi. 20). " For " the cities of the Philistines shall be destroyed (v. 4. cf. on i. 9 above), and an oracle of woe is uttered against their land (v. 5 seq.). With a sudden transition the " remnant of the house of Judah " is promised the maritime coast (v. 7, read by the sea for thereupon), and this is enhanced by the tidings of the return of the captivity. This thought is developed further. Yahweh has " heard " (cf. Isa. xvi. 6, 13 seq.; Jer. xlviii. 29 sqq.; Ezek. xxxv., 12) " the reproach of Moab and the revihngs of the Ammonites," and the Lord of Hosts, the God of Israel, swears by his life that both shall

be destroyed for their hostility towards his people, and the remnant of his nation shall possess their territory (it. 8-10). After turning aside to Yahweh's supre- macy (a. 11, iii. 9 seq.) the chapter continues with a short and vague doom " also " upon Cush (Ethiopia) " slain by my sword " (cf. Isa. lxvi. 16), and a more detailed prophecy upon Assyria and Nineveh. The exulting and boastful city (cf. Babylon, Isa. xlvii. 8, 10, with xlv. 5 seq.) shall be a haunt of wild animals (cf. Babylon, Isa. xiii. 2d sqq., and more especially Edom ibid, xxxiv. 11-13) and is pictured as shortly to be made desolate (v. 15, with the last words cf. Jerusalem, Jer. xix. 8, Edom, xlix. 17).

In chap. iii. there are again changing situations. The defiant, polluted and oppressive city is condemned for failing to regard the warnings. Her secular and religious leaders are denounced, and stress is laid, not upon foreign cults, but upon the rampant treachery and profanation (cf. Mai. ii. 11; Isa. lvi. 10-12, and especially Ezek. xxii. 25-28). Yahweh in the midst of her is " righteous ,: (cf. Neh. ix. 3}, and especially the " Deutcro-Isaiah," xl. sqq.), 1 but al- though the nations round about have been cut off and destroyed, Jerusalem, instead of taking warning in order to escape destruction, has been persistently corrupt (to. 1-7; »• 2, cf. Jer. ii. 30 and often). " Therefore, wait ye for me, saith Yahweh, for the day when I arise as a witness"' (so read in v. 8, cf. Mic. i. 2; Mai. iii. 5). But there is another sudden transition — in that day Yahweh shall assemble all nations and kingdoms to pour out upon them his anger (v. 8). This judgment upon the world will be followed by a universal conversion (v. 9, cf. ii. II) and "from beyond the rivers of Cush " (cf. ii. 12) tribute will be brought to Yahweh (cf. Isa. xlv. 14, and especially xviii. 1,7; some reference to a return of dispersed Jews may be suspected in the now corrupt text). " In that day " (i.e. after the judgment, implied by v. 7 seq.) there will be a puri- fied Judah (cf. often in Isaiah, i. 24 sqq., iv. 2-6) and, with the removal of the proud, there will be left an afflicted, poor and trusting people (v. 12). " The remnant of Israel," also, shall dwell in peace and piety (v. 13; cf. the corrupt people who are to be " refined," Jer. ix. 3-9). Next, a noteworthy jubilant note is struck when " the daughter of Zion " is bidden to exult (v. 14, cf. Zech. ii. 10, ix. 9), for the "judgments" are removed, _ the " enemy " is cleared away. Yahweh, the mighty deliverer, is in her midst as " king of Israel " (Isa. xxiv. 23, xliv. 6), he will take joy in her (cf. Isa. lxii. 5, lxv. 19), and she shall no more see evil. In conclusion (w. 18-20), he will gather them that are in exile away from the sacred festivals, w r ho were a cause of " reproach " (cf. Ezek. xxxvi. 15; Isa. liv. 4; Neh. i. 3); he will "deal with" all oppressors and restore the outcast and the lame (cf. Mic. iv. 6 seq. ; Ezek. xxxiv. 16). She shall become a praise and a name (cf. Jer. xxxiii. 9) when Yahweh brings back the captivity " before your eyes " (i.e. in your generation).

It is a natural assumption that prophecies have a practical end and refer to existing or impending conditions. 2 But although one single leading motive runs through the book of Zcphaniah there are abrupt transitions which do not concern mere subjective considerations of logical or smooth thought, but material and organic changes representing different groups of ideas. The instruments of Yahweh's anger (ch. i.) are not so real or prominent on the political horizon as, for example, in Isaiah, Jeremiah or Habakkuk. The true date of the Scythian inroad and its results for Judah and Philistia are less important when it is observed that the doom upon Philistia, the vengeance upon Moab and Amnion and the promises for Judah (ch. ii.) belong to a large group of prophecies against certain historic enemies (Edom included) who are denounced for their contempt, hostility and intrusion. These prophecies

1 The idea of " righteousness " (s-d-}t), or loyalty, appears to have implied the mutual bonds uniting the community and its deity, see Journ. Theol. Stud., 1908, p. 632 n. I ; Expositor, Aug. 1910, p. 120.

2 Material familiar to contemporary thought is naturally used (see especially H. Gressmann, Vr sprung d. israel-jud. Eschatologie; J. M. P. Smith, Biblical World, 1910, pp. 223 sqq.).

are in large measure associated traditionally with the fall of Jerusalem, and to such a calamity, and not to the inroad of the Scythians, the references to the " remnant " and the " cap- tivity " can only refer. 3 The anticipation of future events is of course conceivable in itself, but the promises (in ch. ii.) presuppose events other and later than those with which the Scythians were connected. On the other hand, it is entirely intelligible that a prophecy relating to Scythians should have been re-shaped to apply to later conditions, and on this view it is explicable why the indefinite political convulsions should be adjusted to the exile and why the gloom should be relieved by the promise of a territory extending from the Mediterranean to the Syrian desert (ii. 7, 9)- Af ler a period of punishment (cf. Lamentations) Yahweh's jealousy against the semi-heathen Judah has become a jealousy for his people, and we appear to move in the thought of Haggai and Zechariah, where the remnant are comforted by Yahweh's return and the dispersed exiles are to be brought back (cf. Zech. i. 14-17. ™- 2-I 7)- But in ch. iii. other circles of thought are manifest. Israel's enemies have been destroyed, her own God Yahweh has proved his loyalty and has fulfilled his promises, but the city remains polluted (»». 1-7, cf. Isa. lviii. seq.; Malachi). Once more doom is threatened, and once more we pass over into a later^ stage where Yahweh has vindicated his supremacy and Zion is glorified. Instead of the realities of history we have the apocalyptical feature of the gathering of the nations (v. 8); the thought may be illustrated from Zech. xii. i.-xiii. 6, where Jerusalem is attacked,

purged and delivered, and from Zech. xiv. where the city is actually captured and half the people are removed into captivity (cf. Zeph. iii. 11 purging, 15 removal of the enemy, 18-20 return of the captivity). The goal is the vindication of Israel and of Israel's God, and the establishment of universal monotheism (ii. n, iii. 9 seq.). The foe which threatened Judah has become the chastiser of Ethiopia and Assyria (ii.) and the prelude to the golden age (iii., cf. Ezek. xxxviii. seq.). No longer does Y'ahweh contend for recognition with Baal and the "host of heaven" (i. 4-6); the convulsions of history are Yahweh's work for the instruction and amend- ment of Israel (iii. 6 seq.); the heathen gods prove helpless (ii. n), but in what manner the conviction of Yahweh's great- ness is brought home is not stated. 4

If Jer. iv. 5-vi. 30 originally referred to the Scythians, it has been revised to refer to the Chaldeans; also in Ezek. xxxviii. seq. the northern foe has been associated with the great world- judgment. The replacing of the sequel of Amos (q.v.) by one which presupposes a later historical background, the addendum to the prophecy against Moab (Isa. xvi. 13 seq.), the pessimistic glosses in Isa. xlviii., the variations in the Hebrew and Greek text of Jeremiah, and the genera! treatment of prophecies of judgment and promise, exemplify certain literary processes which illustrate the present form of Zcphaniah. In Isaiah and Zechariah, notably, older and later groups of prophecies are preserved, whereas here the new preludes and new sequels suggest that the original nucleus has passed through the hands of writers in touch with those vicissitudes of thought which can be studied more completely elsewhere. It is not to be supposed that the elimination of all later passages and traces of revision will give us Zephaniah's prophecies in their original extent. In fact the internal religious and social conditions in i. 4-6 or iii. 1-4 do not compel a date before Josiah's reforms. The doom of Cush is still in the future in Ezek. xxx. 4; and if the impending fall of Nineveh (ii. 13) implies an early date, yet it is found in writings which have later additions (Nahum), or which are essentially later (Jonah, cf. Tobit xiv. 4 [LXX], 8, 10, 15); cf. also the use of Assyria for Babylon (Ezra vi. 22) or Syria (Zech. x. 10). Historical references in prophecies are a The " humble " (ii. "3) can scarcely be identified with the " remnant " and, as in iii. 12, are viewed as a small pious com- munity such as we find in the Psalms (see Nowack's Comm.).

4 See further W. R. Smith, art. " Zephaniah," Ency. Bnt., 9th ed., who points out that " in the scheme of Isaiah it is made clear that the fall of the power that shatters the nations cannot fail to be recognized as Yahweh's work."

not always decisive (Ezek. xxxii., for example, looks upon Edom and Sidon as dead), and while the continued revision of the book allows the presumption that the tradition ascribing its inception to the time of Josiah may be authentic, it is doubt- ful how much of the original nucleus can be safely recognized. These are problems which concern not only the criticism of biblical prophetical writings as a whole, but also the historical vicissitudes of the period over which they extend (see Jews; Palestine : History) .

According to late tradition Zephaniah, like Habakkuk, was of the tribe of Simeon (cf. Micah of Mareshah and Obadiah of Beth- haccerem, see Cheyne, Ency. Bib., col. 3455). The apocryphal prophecy of Zeph. (Clement of Alex., Strom., v. 11, 77; see Schiirer, Gesch. Volk. Isr., iii. 271 seq.) merely illustrates the tendency to utilize older traditions. See further on textual, metrical and literary de- tails, \V. R. Smith (note 4, previous page), reprinted in Ency. Bib., with additions by S. R. Driver, j. A. Selbie in Hastings's Diet. Bib., J. Lippl in Bibl. Studien (1910), and the commentaries on (all or portions of) the Minor Prophets bv A. B. Davidson (Camb. Bible, 1896); G. A. Smith (1898); W. Nowack (1903); K. Marti (1904; especially valuable); Driver (Cent. Bib., 1906); Von Hoonacker (190S). (S. A. C.)

ZEPHYRINUS, ST, bishop of Rome from about 198 to 217, succeeded Victor I. He is described as a man of little intel- ligence or strength of character, and the somewhat important controversies on doctrine and discipline that marked his ponti- ficate are more appropriately associated with the names of Hippolytus and of Calixtus, his principal adviser and afterwards his successor.

ZEPHYRUS, in Greek mythology, the west wind (whence the English " zephyr/' a light breeze), brother of Boreas, the north wind, and son of the Titan Astraeus and Eos, the dawn. He was the husband of Chloris, the goddess of flowers, by whom he had a son, Carpus, the god of fruit (Ovid, Fasti, v. 197); by the harpy Podarge he was also the father of Xanthus and Balius, the horses of Achilles. Being spurned by Hyacinthus (g.v.), he caused his death by accident at the hands of Apollo. He was identified by the Romans with Favonius, and Chloris with Flora.

ZERBST, a town of Germany, in the duchy of Anhalt, situated on the Nuthe, 11 m. N.W. of Dessau and 27 m. S.E. of Magdeburg by the railway Dessau-Leipzig. Pop. (1900) 17,095. It is still surrounded in part by old walls and bastions, while other portions of the whilom fortifications have been converted into pleasaitt promenades. It contains five churches, one of

which (St Nicholas), built in 1446-88, is a good example of the late Gothic style as developed in Saxony, with its spacious proportions, groined vaulting, and bare simple pillars. The town hall dates from about 1480, but it was disfigured by addi- tions in the beginning of the 17th century. It contains the municipal museum, among the chief treasures of which is a Luther Bible illustiated by Lucas Cranach the younger. The palace (1681-1750) has been used as a depository of archives since 1872. There are several quaint old houses, with high gables, in the market-place, in the middle of which stand a Roland column, of about 1445, and a bronze figure known as the Butterjungfer (butter-girl), of uncertain origin and meaning, but now regarded as the palladium of the town. The old Franciscan monastery, with fine cloisters, founded in 1250, contains the gymnasium; a Cistercian nunnery of 12 14 has been converted into barracks; and the Augustinian monastery of 1390 has been a hospital since 1525. Gold and silver articles, silk, plush, cloth, leather, soap, starch, chemicals and carriages are among the chief manufactures. Iron-founding is carried on; and several breweries are engaged in the preparation of Zerbstcr bitter beer; which enjoys considerable repute.

Zerbst is an ancient town, mentioned in 949. In 1307 it came into the possession of the Anhalt family, and from 1603 till 1793 was the capital of the collateral branch of Anhalt- Zerbst. In 1793 it passed to Anhalt-Dessau.

ZERMATT, a mountain village at the head of the Visp valley and at the foot of the Matterhorn, in the canton of the Valais, Switzerland. It is 22i m. by rail from Visp in the Rhone valley, and there is also a railway from Zermatt past the Riffel

inns to the very top of the Gornergrat (10,289 ft.). The village is 5315 ft. above the sea, and in 1900 had 741 permanent in- habitants (all Romanists save 9, and all but 12 German-speaking), resident in 73 houses. Formerly Zermatt was called " Pra- borgne," and this name is mentioned in the Swiss census of 1888. Its originally Romance population seems to have been Teutonised in the course of the 15th century, the name " Matt " (now written " Zermatt," i.e. the village on the meadows) first occurring at the very end of that century. Zermatt was long known to botanists and geologists only, and has an in- teresting though very local history. De Saussure in 17S9 was one of the first tourists to visit it. But it was not till the arrival of M. Alexandre Seiler in 1854 that its fame as one of the chief tourist resorts in the Alps was laid, for tourists abound only where there are good inns. When M. Seiler died in 189 1 he was proprietor of most of the great hotels in and around Zermatt. The Matterhorn, which frowns over the village from which it takes its name, was not conquered till 1S65, Mr E. Whymper and two guides then alone surviving the terrible accident in

which their four comrades perished. The easy glacier pass of the St Theodule (10,899 ft.) leads S. in six hours from the village to the Val Tournanche, a tributary glen of the valley of Aosta.

ZERO, the figure in the Arabic notation for numbers, nought, cipher. The Arabic name for the figure was sifr, which meant literally an empty thing. The old Latin writers on arithmetic translated or transliterated the Arabic word as zephyrum; this in Ital. became sejiro, contracted to zero, borrowed by F. zero, whence it came late into English. The Spanish form cifra, more closely resembling the original Arabic, gave O. Fr. cifre, mod. chiffre, also used in the sense of mono- gram, and English " cipher " which is thus a doublet. In physics, the term is applied to a point with which phenomena are quantitatively compared, especially to a point of a graduated instrument between a positive and negative or ascending and descending scale, as in the scales of temperature.

ZEULENRODA, a town of Germany, in the principality of Reuss-the-Elder, situated on a high plateau in a well-wooded and hilly country, 35 m. N. from Hof by the railway to Werdau. Pop. (1900) 9419. The town contains a handsome town hall, several churches and schools, and carries on an active industry in cotton and woollen stocking manufacture. Zeulenroda is mentioned as a village as early as 1399, and it obtained muni- cipal rights in 1438. Since 1500 it has belonged to the Greiz branch of the Reuss line of princes.

ZEUS, the Greek counterpart of the Roman god, Jupiter iq.v.). In the recorded periods of Hellenic' history, Zeus was accepted as the chief god of the pantheon of the Greeks; and the religious progress of the people from lower to higher ideas can be well illustrated by the study of his ritual and personality. His name is formed from a root div, meaning " bright." which appears in other Aryan languages as a formative part of divine names, such as the Sanskrit Dydas, "sky"; Latin Dions, Jovis, Diespiter, divus; Old English Tiw) Norse Tyr. The conclusion that has been frequently drawn from these facts, that all the Indo-Germanic stocks before their dispersal worshipped a personal High God, the Sky-Father, has been now seen to be hazardous. 1 Nevertheless, it remains probable that Zeus had already been conceived as a personal and pre-eminent god by the ancestors of the leading Hellenic tribes before they entered the peninsula which became their historic home. In the first place, his pre-eminence is obviously pre-Homeric; for Homer was no preacher or innovator in religion, but gives us some at least of the primary facts of the contemporary religious beliefs prevailing about 1000 B.C.: and he attests for us the supremacy of Zeus as a belief which was unquestioned by the average Hellene of the time; and appreciating how slow was the process of religious change in the earlier period, we shall believe that the god had won this position long before the

Homeric age. In the next place, we cannot trace the origin of his worship

1 See, however, Schrader, Prehistoric Antiquities of the Aryan ! Peoples (trans. Jevons), 416-419.

back to any special stock or particular locality; we cannot find a single community that did not possess his worship or that preserved any legend that suggests a late date for its introduction. Doubtless, it has very ancient and close asso- ciations with Thessaly; for most of the leading tribes must have entered Hellas by this route, and remembered the moun- tain Olympus that dominates this region as the earliest home of his cult, and took with them to their most distant settlements the cult-title 'OUnmos. Also, some of the prehistoric stocks in Thessaly, like the Achaean Aeacidae, may have regarded him as specially their ancestor. But to maintain therefore that he originated in Thessaly as the special deity of a single tribe, who were able to impose him upon the whole of Hellas, is against the analogies offered by the study of the special cults of Greek polytheism. But if we assume that he was the aboriginal Hellenic High God, we must be quite ready to admit that the separate communities were always liable to cherish other divinities with a more ardent and closer devotion, whether divinities that they brought with them or divinities that they found powerfully established in the conquered lands, Athena or Hera, for instance, in Attica or Argolis, or Poseidon in the Minyan settlements. This in fact is a frequent fate of a " High God" in polytheistic systems; he is vaguely praised and reverenced, but lower divine powers are nearer to the people's love or fear.

The Cretan legend of his birth and origin, which gave rise to the Cretan cult of Zeus Kfnrraywtis, 1 "Zeus born in Crete," may appear evidence against the theory just set forth. But it is not likely that any birth-legend belongs to the earliest stratum of the Zeus-religion. The Aryan Hellenes found in many of the conquered lands the predominant cult of a mother-goddess, to whom they gradually had to affiliate their own High God: and in Crete they found her cult associated with the figure of a male divinity who was believed to be born and to die at certain periods; probably he was an early form of Dionysus, but owing to his prominence in the island the Hellenic settlers may have called him Zeus; and this would explain the markedly Dionysiac character of the later Zeus-religion in Crete. _

We can now consider the question how the god was imagined in the popular belief of the earliest and later periods. Homer is our earliest literary witness; and the portrait that he presents of Zeus is too well known

to need minute description. To appreciate it, we must distinguish the lower mythologic aspect of him, in which he appears as an amorous and capricious deity lacking often in dignity and real power, and the higher religious aspect, in which he is conceived as the All-Father, the Father of Gods and men in a spiritual or moral sense, as a God omnipotent in heaven and earth, the sea and the realms below, as a God of righteousness and justice and mercy, who regards the sanctity of the oath and hears the voice of the suppliant and sinner, and in whom the pious and the lowly trust. In fact the later Greek religion did not advance much above the high-water mark of the Homeric, although the poets and philosophers deepened certain of its nobler traits. But Homer we now know to be a relatively late witness in this matter. How much of his sketch is really primitive, and what can we learn or guess concerning the millennium that preceded him? His God is pronouncedly individual and personal, and probably Zeus had reached this stage of character at the dawn of Hellenic history. Yet traces of a pre-deistic and animistic period sur- vived here and there; for instance, in Arcadia we find the thunder itself called Zeus (Zeis Kepavvos) in a Mantincan inscrip- tion, 2 and the stone near Gythium in Laconia on which Orestes sat and was cured of his madness, evidently a thunder-stone, was named itself Zcts KaTrirtira?, which must be interpreted as "Zeus that fell from heaven"; 3 we here observe that the personal God does not yet seem to have emerged from the divine thing or divine phenomenon. Yet the Arcadians, like the other Greeks, had probably long before Homer risen above this stage of thought; for Greek religion was so strongly

conservative that it preserved side by side the deposits of differ- ent ages of thought sundered perhaps by thousands of years.

Again the Homeric Zeus is fully anthropomorphic; but in many domains of Greek religion we discover the traces of therio- morphism, when the deity was regarded as often incarnate in the form of an animal or the animal might itself be worshipped in its own right. We seem to find it latent in the Arcadian worship of Zeus Atwcuos and the legend of King Lycaon. 1 he latter offers a cannibal-meal to the disguised God, who turns him into a wolf for his sins; and the later Arcadian ritual in honour of this God betrays a hint of lycanthropy; some one who partook of the sacrifice or who swam across a certain lake was supposed to be transformed into a wolf for a certain time. 4 Robertson Smith 5 was the first to propose that we have here the traces of an ancient totemistic sacrifice of a wolf-clan, who offered the " theanthropic " animal " the man-wolf " to the wolf-God. The totemistic theory in its application to Creek religion cannot be here discussed; but we may note that there is no hint in the story that the wolf was offered to Zeus and that the, name Aumtos could not originally have designated the " wolf "God: for from the stem.Xwo we should get the adjective Xwaos, not Xuicaios; the latter is better derived frcm a word such

as Xuraj = ” light,” and may allude to the God of the clear sky; in fact the wolf, which was a necessary animal in the ritual and legend of Apollo Ainaos, may have strayed casually into association with Zeus AiKaios, attracted hy a false etymology. Another ritual, fascinating for the glimpse it affords of very old-world thought, is that of the Diipolia, the yearly sacrifice to Zeus Polieus on the Acropolis at Athens. 6 In this an ox was slaughtered with ceremonies unique in Greece; the priest who slew him fled and remained in exile for a period, and the axe that was used was tried, condemned and flung into the sea; the hide of the slain ox was. stuffed with hay, and this effigy of the ox was yoked to the plough and feigned to be alive. Again Robertson Smith saw here the ” thean- thropic” animal, the Ox-God-man, eaten sacramentally by an ox-tribe, and so sacred that his death is a murder that must he atoned for in other ways and by a feigned resurrection. We recognize indeed the sacramental meal and the sanctity of the ox; but the animal may have acquired this sanctity tempo- rarily through contact with the altar; wc need not suppose an ox-clan— the priest was merely fiovT-riz ” the herdsman “— nor assume the permanent sanctity of ihe ox, nor the belief that the deity was permanently incarnate in the ox: the main parts of the ceremony can be explained as cattle-magic intended to appease the rest of the oxen or to prevent them suffering sympathetically through the death of one. We may indeed with Mr Andrew Lang explain the many myths of the bestial transformations of Zeus on the theory that the God was the tribal ancestor and assumed the shape of the animal-totem in order to engender the tribal patriarch; 7 but on the actual cults of Zeus theriomorphism has left less trace than on those of many other Hellenic deities. The animal offered to him may become temporarily sacred; and its skin would have magic properties: this explains his use of the aegis, the goat- skin, as a battle-charm; but of a Goat-Zeus, a Ram-Zeus, or a Wolf-Zeus, there is no real trace.

The peculiar characteristic of his earliest ritual was the human sacrifice; besides the legend of King Lycaon, we find it in the story of the house of Athamas and in the worship of Zeus Aa4>icmos of Thessaly, 8 and other examples are recorded. The cruel rite had ceased in the Arcadian worship before Pliny wrote, but seems to have continued in Cyprus till the reign of Hadrian. It was found in the worship of many other divinities of Hellas in early times, and no single explanation can be given that would apply to them all. A hypothesis favoured by Dr Frazer, that the victim is usually a divine man, a priest-king

1 Corp. Inscr. Graex. 2554. ‘Bull. Corr. Hell., 1878, p.

1 Pausan. iii. 22. I.

> Pliny, Nat. Hist. y’m. 5 Article on ” Sacrifice s Cf . Porphyry, ii. 29,

24- A- . .

7 Myth, Ritual and Religion, 11. 176

2; Pausan. viii. 2, § 3 and § 6. in Ency. Brit., 9th ed.

(from Theophrastus) and Pausan. 1.

30

1 Herod, vii. 197.

ZEUS

977

incarnating the God, may be well applied to the Athamantid sacrifice and to that of King Lycaon; for he derives his name from the divinity himself, and according to one version 1 he offers his own child; and the Lycaonid legend presents one almost unique feature, which is only found elsewhere in legendary Dionysiac sacrifice, the human flesh is eaten, and the sacrifice is a cannibalistic- sacrament, of which the old Mexican religion offers conspicuous example. Yet it is in this religion of Zeus that we see most clearly the achievement of progressive morality; Zeus himself punishes and abolishes the savage practice; the story related by Plutarch, 5 how a kid was substituted miracu- lously for Helen when she was led to the altar to be offered, is a remarkably close parallel to the biblical legend of Abraham's sacrifice of Isaac.

We can now consider the special attributes of the anthropo- morphic God. His character and power as a deity of the sky, who ruled the phenomena of the air, so clearly expressed in Homer, explains the greater part of his cult and cult-titles. More personal than Ouranos and Helios— with whom he has only slight associations — he was worshipped and invoked as the deity of the bright day ('Ajudptos, AevKatos, Avkcuos), who sends the rain, the wind and dew ("Oju/Sptoj, Nates, 'Terios, Ovpios, Eud.j'e/io?. 'Ikˆoios), and such a primitive adjective as fiuVerˆs, applied to things " that fall from heaven," attests the primeval significance of the name of Zeus. But the thunder was his most striking manifestation, and no doubt he was prime vally a thunder-God, KepcuVtos, Kepauroj96Xos, 'AorpaTCitos. These cult-titles had originally the force of magic invocation, and much of his ritual was weather-magic: the priest of Zeus Avnaios, in time of drought, was wont to ascend Mount Lycaeum and dip an oak-bough in a sacred fountain, and by this sympathetic means produce mist. 3 A god of this character would naturally be worshipped on the mountain-tops, and that these were very frequently consecrated to him is shown by the large number

of appellatives derived from the names of mountains. 4 But probably in his earliest Hellenic period the power of Zeus in the natural world was not limited to the sky. A deity who sent the fertilizing rains would come to be regarded as a god of vegetation, who descended into the earth and whose power worked in the life that wells forth from the earth in plant and tree. Also the close special association of the European Thunder-God and the oak-tree has recently been exposed. 6 Homer calls the God of the lower world Zeus KaraxBovios and the title of Zeus XSovios which was known to Hesiod, occurred in the worship of Corinth; 7 and there is reason to believe that Eubouleus of Eleusis and Tro- phonius of Lebadeia are faded forms of the nether Zeus; in the Phrygian religion of Zeus, which no doubt contains primitive Aryan elements, we find the Thunder-God associated also with the nether powers. 8*

A glimpse into a very old stratum of Hellenic religion is afforded us by the records of Dodona. A Dodonean liturgy has been preserved which, though framed in the form of an invocation and a dogma, has the force of a spell-prayer — " Zeus was and is and will be, oh great Zeus: earth gives forth fruits, therefore call on Mother Earth." 9 Zeus the Sky-God is seen here allied to the Earth-Goddess, of whom his feminine counter- part, Dionc, may have been the personal form. And it is at Dodona that his association with the oak is of the closest. His prophet-priests the Selloi " with unwashed feet, couching on the ground," 10 lived about the sacred oak, which may be re- garded 11 as the primeval shrine of the Aryan God, and inter- preted its oracular voice, which spoke in the rustling of its leaves or the cooing of its doves. Achilles hails the Dodonean God as XliXaayme, either in the sense of " Thessalian " or

1 Clemens, Protrept. p. 31 P.

*2 Parallels, 35. 3 Pausan. viii. 38, 3. *FarneU, Cults of the Greek States, i. 154; rcf. 66-89.*

5 See Chadwick in Anthropological Joum., iqoo, on "The Oak and the Thunder-God." 6 //. ix. 457.

'■' Works and Days, 456; Pausan. ii. 2, 8.

8 Joum. Hellen. Stud. iii. 124; v. 257. 9 Pausan. x. 12, 10.

10 Horn. //. xvi. 233. u Chadwick, op. cit.

"primitive"; 12 and Zeus, we may believe, long remained at Dodona such as he was when the Hellenic tribes first brought him down from the Balkans, a high God supreme in heaven and in earth.

We may also believe that in the earliest stages of worship he had already acquired a moral and a social character. The Homeric view of him as the All-Father is a high spiritual con- cept, but one of which many savage religions of our own time are capable. The family, the tribe, the city, the simpler and more complex organisms of the Hellenic polity, were specially under his care and direction. In spite of the popular stories of his amours and infidelities, he is the patron-God of the mono- gamic marriage, and his union with Hera remained the divine type of human wedlock. " Reverence Zeus, the Father-God": " all fathers are sacred to Zeus, the Father-God, and all brothers to Zeus the God of the family ": these phrases of Aristophanes and Epictctus 13 express the ideas that, engendered his titles Hdrpwos, Tafxi}\Los, TeXeios, 'Opoyvios. In the Eu?nenides of Aeschylus 14 the Erinyes are reproached in that by aiding Clytemnestra, who slew her husband, " they are dishonour- ing and bringing to naught the pledges of Zeus and Hera, the marriage-goddess"; and these were the divinities to whom sacrifice was offered before the wedding, 15 and it may be that some kind of mimetic representation of the " Holy Marriage," the Ttpos 7a/.tos, of Zeus and Hera formed a part of the Attic nuptial ceremonies. 16 The " Holy Marriage " was celebrated in many parts of Greece, and certain details of the ritual suggest that it was of great antiquity: here and there it may have had the significance of vegetation-magic, 17 – like the marriage of the Lord and Lady of May; but generally it seems to have been only regarded as a divine counterpart to the human ceremony. Society may have at one time been matrilinear in the com- munities that become the historic Hellenes; but of this there is no trace in the worship of Zeus and Hera. 18

In fact, the whole of the family morality in Hellas centred in Zeus, whose altar in the courtyard was the bond of the kins- men; and sins against the family, such as unnatural vice and the exposure of children, are sometimes spoken of as offences against the High God. 19

He was also the tutelary deity of the larger organization of the phratria; and the altar of Zeus ˆpdrptos was the meeting- point of the phrateres, when they were assembled to consider the legitimacy of the new applicants for admission into their circle. 20

His religion also came to assist the development of certain legal ideas, for instance, the rights of private or family pro- perty in land; he guarded the allotments as Zeus KXdpios, 21 and the Greek commandment " thou shalt not remove thy neighbour's landmark " was maintained by Zeus "Optoj, the god of boundaries, a more personal power than the Latin Jupiter Terminus. 32

His highest political functions were summed up in the title TloXieus, a cult-

name of legendary antiquity in Athens, and frequent in the Hellenic world. 23

His consort in his political life was not Hera, but his daughter Athena Polias. He sat in her judgment court kwi IlaXXafita) where cases of involuntary homicide were tried. 24 With her he shared the chapel in the Council-Hall of Athens dedicated to them under the titles of BouXaios and BouXaia, " the inspirers of counsel," by which they were worshipped in many parts of

12 11. xvi. 233.

13 Arist. Nub. 1468; Epict. Diatrib. iii. ch. 11.

14 213-214. 15 Schol. Aristoph. Thesm. 973.

19 Photius, s.v. 'Upfc y&ixos.

17 See Frazer's Golden Bough, 2nd ed. 1. 226-227.

13 The attempts to discover the traces of matrilinear society in Greek religion may be regarded as mainly unsuccessful: vide A. B. Cook, Class. Rev. 1906 (October, November), " Who was the wife of Zeus?"

w Dio. Chrys. Or. 7 (Dind. i. 139).

20 Demosth. Contra Macartatum, 1078, i.

21 Pausan. viii. 53, 9. 22 Plato's Laws, 842 E.

53 Vide Farnell, op. cit. u 159; ref. 107-109.

54 Corp. Inscr. Attic, iii. 71 and 273,

97 8

ZEUXIS

Greece. 1 The political assembly and the law-court were conse- crated to Zeus 'A7opaIos,° and being the eternal source of justice he might be invoked as AuuuAovvos " The Just." 3 As the god who brought the people under one government he might be worshipped as Q.a.vdTuios; A as the deity of the whole of Hellas, 'EXXdKios, 5 a title that belonged originally to Aegina and to the prehistoric tribe of the Aeacidae, and had once the narrower application to the " Thessalian Hellenes," but acquired the Pan-Hellenic sense, in fact expanded into the form napeXXqwos, perhaps about the time of the Persian wars, when thanks- giving for the victory took the

form of dedications'and sacrifice to " Zeus the Liberator " — 'EXeu&pios. 6 Finally, in the for- mulae adopted for the public oath, where many deities were invoked, the name of Zeus was the masterword.

There is reason for thinking that this political character of Zeus belongs to the earliest period of his religion, and it re- mained as long as that religion lasted. Yet in one respect Apollo was more dominant in the political life; for Apollo possessed the more powerful oracle of Delphi. Zeus spoke directly to his people at Dodona only, 7 and with authority only in ancient times; for owing to historical circumstances and the disadvantage of its position, Dodona paled before Delphi.

It remains to consider briefly certain moral aspects of his cult. The morality attaching to the oath, so deeply rooted in the conscience of primitive peoples, was expressed in the cult of Zeus "Opmos, the God who punished perjury. 8 The whole history of Greek legal and moral conceptions attaching to the guilt of homicide can be studied in relation to the cult- appella- tives of Zeus. The Greek consciousness of the sin of murder, only dimly awakened in the Homeric period, and only sensitive at first when a kinsman or a suppliant was slain, gradually expands till the sanctity of all human life becomes recognized by the higher morality of the people: and the names of Zeus MeiXixios, the dread deity of the ghost-world whom the sinner must make " placable," of Zeus "lKecnos and IIpotrrpo7ratos, to whom the conscience-striken outcast may turn for mercy and pardon, play a guiding-part in this momentous evolution. 9

Even this summary reveals the deep indebtedness of early Greek civilization to this cult, which engendered ideas of im- portance for the higher religious thought of the race, and which might have developed into a monotheistic religion, had a prophet-philosopher arisen powerful enough to combat the polytheistic proclivities of Hellas. Yet the figure of Zeus had almost faded from the religious world of Hellas some time before the end of paganism; and Lucian makes him complain that even the Egyptian Anubis is more popular than he, and that men think they have done the outworn God sufficient honour if they sacrifice to him once in five years at Olympia. The history of religions supplies us with many examples of the High God losing his hold on the people's consciousness and love. In the case of this cult the cause may well have been a certain coldness, a lack of enthusiasm and mystic ardour, in the service. These stimulants were offered rather by Demcter and Dionysus, later by Cybele, Isis and Mithras.

Bibliography. — For older authorities see Preller-Robert, Grie- chische Mythologie, i. pp. 1 15-159; Welcker's Gruchische Gotterlehre, ii. pp. 178-216; among recent works, Gruppe's Griechische Mytho- logie, ii. pp. 1100-1121; Farnell's Cults of the Greek States, vol. i. pp. 35-1 78 ;

Darembcrg and Saglio, Dictionnaire des antiquitSs grecques el romaines, s.v., "Jupiter"; A. B. Cook's articles in Classical Review, 1903-1904, "Zeus, Jupiter, and the Oak": for cult- monuments and art-representations, Overbeck, Kunst-Mythologie, vol. i. (L. R. F.)

ZEUXIS, a Greek painter, who flourished about 420-390 B.C., and described himself as a native of Heraclea, meaning pro- bably the town on the Black Sea. He was, according to one

1 Antiphon vi. p. 789; Pausan. i. 3, 5:cf. Corp. Inscr. Attic iii. 683.

s Farnell. op. cit. vol. i. p. 162.

3 Amer. Journ. Archaeol.. 1905, p. 302.

' C. I. A. 3, 7. Head, Hist. Num. p. 569.

s Herod, ix. 7. 4; Pind. Hem. v. 15 (Schol.).

' Simonides, l'rag. 140 (Bergk), Strab. 412.

7 There was a minor oracle of Zeus at Olympia. See Oracle.

a Pausan. v. 24, 9. 9 Farnell, op. cit. vol. i. pp. 64-69.

1. Zeus surrounded by Deities.

2. Eros crowned with Roses.

3. Marsyas bound.

4. Pan.

5. Centaur family.

6. Boreas or Triton.

7. Infant Heracles strangling the

serpents in presence of his parents, Alcmena and Am- phitryon.

account, a pupil of Damophilus of Himera in Sicily, the other statement being that he was a pupil of Neseus of Thasos. After- wards he appears to have resided in Ephesus. His known works are —

8. Alcmena, possibly another name for 7.

9. Helena at Croton,

10. Penelope.

11. Menelaus.

12. Athlete.

1 3. An old Woman.

14. Boy with grapes.

15. Grapes.

16. Monochromes.

17. Plastic works in clay.

In ancient records we are told that Zeuxis, following the initiative of Apollodorus, had introduced into the art of paint- ing a method of representing his figures in light and shadow, as opposed to the older method of outline, with large flat masses of colour for draperies, and other details, such as had been practised by Polygnotus and others of the great fresco painters. The new method led to smaller compositions, and often to pictures consisting of only a single figure, on which it was more easy for the painter to demonstrate the combined effect of the various means by which he obtained perfect round- ness of form. The effect would appear strongly realistic, as compared with the older method, and to this was probably due the origin of such stories as the contest in which Zeuxis painted a bunch of grapes so like reality that birds flew towards it, while Parrhasius painted a curtain which even Zeuxis mistook for real. It is perhaps a variation of this story when we are told (Pliny) that Zeuxis also painted a boy holding grapes towards which birds flew, the artist remarking that if the boy had been as well painted as the grapes the birds would have kept at a distance. But, if the method of Zeuxis led him to real roundness of form, to natural colouring, and to pictures consisting of single figures or nearly so, it was likely to lead him also to search for striking attitudes or motives, which by the obviousness of their meaning should emulate the plain intelligibility of the larger compositions of older times. Lucian, in his Zeuxis, speaks of him as carrying this search to a novel and strange degree, as illustrated in the group of a female Centaur with her young. When the picture was exhibited, the spectators admired its novelty and overlooked the skill of the painter, to the vexation of Zeuxis. The pictures of Heracles strangling the serpents to the astonishment of his father and mother (7), Penelope (10), and Menelaus Weeping (n) are quoted as instances in which strong motives naturally presented themselves to him. But, in spite of the tendency towards realism inherent in the new method of Zeuxis, he is said to have retained the ideality which had characterized his predecessors. Of all his known

works it would be expected that this quality would have appeared best in his famous picture of Helena, for this reason, that we cannot conceive any striking or effective incident for him in her career. In addition to this, however, Quintilian states {Inst. Oral. xii. 10, 4) that in respect of robustness of types Zeuxis had followed Homer, while there is the fact that he had inscribed two verses of the Iliad (iii 156 seq.) under his figure of Helena. As models for the picture he was allowed the presence of five of the most beautiful maidens of Croton at his own request, in order that he might be able to " transfer the truth of life to a mute image." Cicero (De Invent, ii. 1, 1) assumed that Zeuxis had found distributed among these five the various elements that went to make up a figure of ideal beauty. It should not, however, be understood that the painter had made up his figure by the process 01 com- bining the good points of various models, but rather that he found among those models the points that answered to the ideal Helena in his own mind, and that he merely required the models to guide and correct himself by during the process of transferring his ideal to form and colour. This picture also is said to have been exhibited publicly, with the result that Zeuxis made much profit out of it. By this and other means,

we are told, he became so rich as rather to give away his pic- tures than to sell them. He presented his Alcmena to the Agrigentines, his Pan to King Archclaus of Macedonia, whose palace he is also said to have decorated with paintings. Accord- ing to Pliny (N.H. xxxv. 62), he made an ostentatious display of his wealth at Olympia in having his name woven in letters of gold on his dress. Under his picture of an athlete (12) he wrote that " It is easier to revile than to rival " (jueo/ˆtrerat us tiaWov rf ni}xr)

ZHELESNOVODSK, a health resort of Russian Caucasia, in the province of Terek, lying at an altitude of 1885 ft. on the S. slope of the Zhelesnaya Gora (2805 ft.), 11 m. by rail N.N.W. from Pyatigorsk. It possesses chalybeate springs of tempera- ture 5 6 §-96° Fahr. ; the buildings over the springs were erected in 1893. The season lasts from early in June to the middle of September.

ZHITOMIR, or Jitomir, a town of western Russia, capital of the government of Volhynia, on the Teterev river, 83 m. W.S.W. of Kiev. Pop. (1000) 80,787, more than one-third Jews. It is the see of an archbishop of the Orthodox Greek Church and of a Roman Catholic bishop. Two printing ofTiccs in Zhitomir issue nearly one-half of all the Hebrew books printed in Russia. The Jewish merchants carry on a considerable export trade in agricultural produce, and in timber and wooden wares from the forests to

the north. Kid gloves, tobacco, dyes and spirits are manufactured.

Zhitomir is a very old city, tradition tracing its foundation as far back as the times of the Scandinavian adventurers, Askold and Dir (9th century). The annals, however, mention it chiefly in connexion with the invasions of the Tatars, who plundered it in the 13th, 14th and 17th centuries (1606), or in connexion with destructive conflagrations. It fell under Lithuanian rule in 1320, and during the 15th century was one of the chief cities of the kingdom. Later it became part of Poland, and when the Cossacks rose under their chieftain, Bogdan Chmielnicki (1648), they sacked the town. It was annexed to Russia along with the rest of the Ukraine in 1778.

ZHOB, a valley and river in the N.E. of Baluchistan. The Zhob is a large valley running from the hills near Ziarat first eastward and then northward parallel to the Indus frontier, till it meets the Gomal river at Khajuri Kach. It thus becomes a strategic line of great importance, as being the shortest route between the North-West Frontier Province and Quetta, and dominates all the Pathan tribes of Baluchistan by cutting between them and Aighanistan. Up to the year r884 it was practically unknown to Europeans, but the Zhob Valley Expe- dition of that year opened it up, and in 1889 the Zhob Valley and Gomal Pass were taken under the control of the British Government. The Zhob Valley was the scene of punitive British expeditions in 1884 and 1890. In 1890 Zhob was formed into a district or political agency, with its headquarters at Fort Sandeman: pop. (1901) 3552. As reconstituted in 1903, the district has an area of 9626 sq. m.; pop. (1901) 69,718, mostly Pathans of the Kakar tribe.

See Sir T. H. Holdich's Indian Borderland (1901) ; Bruce's Forward Policy (1900); McFall's With the Zhob Field Force (1895); and Zhob District Gazetteer (Bombay, 1907).

ZIARAT (" a Mahommedan shrine "), the summer residence of the chief commissioner of Baluchistan, and sanatorium for the European troops at Quetta: 8850 ft. above the sea and

33 m. by cart-road from the railway. There is a good water- supply, and the hills around are well-wooded and picturesque.

ZICHY (of Zich and Vasonykeo), the name of a noble Magyar family, conspicuous in Hungarian history from the latter part of the 13th century onwards. Its first authentic ancestor bore the name of Zayk, and this was the surname of the family until it came into possession of Zich in the 15th century. It first came into great prominence in the 16th century, being given country rank in 1679 in the person of the imperial general Stefan Zichy (d. 1693). His descendants divided, first into two branches: those of Zichy-

Palota and Zichy-Karlburg. The Palota line, divided again into three: that of Nagy-Lang, that of Adony and Szent-Mikl6s, and that of Palota, which died out in the male line in 1874. The line of Zichy-Karlburg (since 181 1 Zichy-Ferraris) split into four branches: that of Vedrod, that of Vezsony, and those of Daruvar and Csics6, now extinct.

Count Ka"rot.y Zichy (1753-1826) was Austrian war minister in 1809 and minister of the interior in 1813-1814; his son, Count Ferdinand (1783-1862) was the Austrian field-marshal condemned to ten years' imprisonment for surrendering Venice to the insurgents in r848 (he was pardoned in 1851). Count Odon [Edmund] Zichy (1809-1848), administrator of the county of Veszprem, was hanged on the 30th of September 1848 by order of a Hungarian court-martial, presided over by Gorgei, for acting as Jellachich's emissary to the imperial general Roth. Count Ferenc Zichy (1811-1900) was secre- tary of state for commerce in the Szechcnyi ministry of 1848, but retired on the outbreak of the revolution, joined the im- perial side, and acted as imperial commissary; from 1874 to 1880 he was Austrian ambassador at Constantinople. Count Odon Zichy (1811-1894) was remarkable for his great activity in promoting art and industry in Austria-Hungary; he founded the Oriental Museum in Vienna. His son, Count Eugen Zichy (b. 1837), inherited his father's notable collections, and followed him in his economic activities; he three times visited the Caucasus and Central Asia to investigate the original seat of the Magyars, publishing as the result Voyages au Caucase (2 vols., Budapest, 1897) and Dritte asiatische Forsckungsreise (6 vols., in Magyar and German; Budapest and Leipzig, 1900- 1905). Count Ferdinand Zichy (b. 1829), vice-president of the Hungarian stadtholdership under the Mailath regime, was condemned in 1863 under the press laws to the loss of his titles and to imprisonment. In 1867 he was elected to the Hungarian parliament, at first joining the party of Dcak, and subsequently becoming one of the founders and leaders of the Catholic People's Parly (see Hungary, History). His second son, Count AladAr Zichy (b. 1864), also a member of the Catholic People's Party, was made minister of the royal house- hold in the Wekerle cabinet of 1906. Count Janos Zichy (b. 1868), also from 1896 to 1906 a member of the Catholic People's Party in the Lower House, and after 1906 attached to Andrassy's Constitutional Party, was of importance as the confidant of the heir to the throne, the Archduke Francis Ferdinand. Count Geza Zichy (b. 1849), nephew of the Count Ferenc mentioned above, studied under Liszt and be- came a professional pianist; in 1891 he became intendant of the Hungarian national opera-house, a member of the Hungarian Upper House and head of the Conservatoire at Budapest. Count MihAly Zichy (b. 1829), one of the most conspicuous Hungarian painters, was appointed court painter at St Peters-burg in 1847 and accompanied the Russian emperors on their various

journeys. The National Gallery at Budapest possesses some of his paintings, notably that of "Queen Elizabeth before the coffin of Francis Deak"; but he is best known for his illustrations of the works of the great Magyar writers (Petofy, Arany, &c).

ZIEM, FELIX FRANCOIS GEORGE PHILIBERT (1821-), French painter, was born at Beaune (Cote d'Or) in 1821. Having studied at the art school of Dijon, where he carried off the grand prix for architecture, he went to Rome in 1839 and there continued his studies. The years from 1845 to 1848

were spent in travel in the south of France, Italy and the East, where he found the glowing sunlight and the rich colour peculiarly suited to his temperament. His reputation is, how- ever, not based so much on his orientalist canvases as on his pictures of Venice, which are generally characterized by the intensity of the sunny glow on the red sails and golden-yellow buildings under a deep blue sky. Many of his Venetian pic- tures are purely imaginative, and their appeal is entirely due to their qualities of colour, his architectural drawing being frequently faulty and careless. After " Sunrise at Stamboul," which Theodore Gautier called " the finest picture of modern times," he received the Legion of Honour in 1857, and was made an officer in 1878. The majority of his paintings have gone to American private collections, but two of his finest pictures, " The Doge's Palace in Venice" (1852), and a marine- painting, are at the Luxembourg Museum, and a " View of Quai St Jean, Marseilles " at the Marseilles Gallery, whilst many others are to be found in the leading private collections of modern pictures in France, England and Germany. In collaboration with Luc de Vos he illustrated The Death of Paganini.

See Felix Ziem, by L. Roger-Miles (Librairie de Part, Paris).

ZIERIKSEE, a town in the province of Zeeland, Holland, on the south side of the island of Schouwen. Pop. 6800. It is a very old town, and formerly flourished exceedingly on account of its trade and fishing, and important salt-making industry, and now is the chief market centre and port in the island. Among the principal buildings are the town-hall (15th century); the Great Church, which was rebuilt after a fire in 1832, but retains the lofty tower (1454) belonging to the earlier building; the Little Church, the prison and the exchange. The chief public square occupies the site of a residence of the counts of Zeeland dating from 1048.

ZIETEN, HANS JOACHIM VON (1690-17S6), Prussian general- field-marshal, began his military career as a volunteer in an infantry regiment. He retired after ten years' service, but soon afterwards became a lieutenant of dragoons. Being involved in some trade transactions of his squadron-commander, he was cashiered, but by some means managed to obtain reinstatement, and was posted to a hussar corps, then a new arm. At that time light cavalry work was well known only to the Austrians, and in 1735 Rittmeister von Zieten made the Rhine campaign under the Austrian general Baronay. In 1 741, when just promoted lieutenant-colonel, Zieten met his old teacher in battle and defeated him at the action of Roth-schloss. The chivalrous Austrian sent him a complimentary letter a few days later, and Winterfeld (who was in command at Rothschloss) reported upon his conduct so favourably that Zieten was at once marked out by Frederick the Great for high command. Within the year he was colonel of the newly formed Hussar regiment, and henceforward his promotion was rapid. In the ' : Moravian Foray " of the following year Zieten and his hussars penetrated almost to Vienna, and in the retreat to Silesia he was constantly employed with the rearguard. Still more distinguished was his part in the Second Silcsian War. In the short peace, the hussars, like the rest of the Prussian cavalry, had undergone a complete reformation; to iron dis- cipline they had added the dash and skirmishing qualities of the best irregulars, and the hussars were considered the best cf their arm m Europe. Zieten fought the brilliant action of Moldau Tein almost on the day he received his commission as major-general. In the next campaign he led the famous Zietenritt round the enemy's lines with the object of delivering the king's order to a distant detachment. At Hohenfriedberg- Striegau and at Katholisch-Hennersdorf the hussars covered themselves with glory. Hennersdorf and Kesselsdorf ended the second war, but the Prussian army did not rest on its laurels, and their training during the ten years 1 peace was careful and unceasing. When the Seven Years' War broke out in 1756 Zieten had just been made lieutenant-general. At Reichen- berg and at Prag he held important commands, and at the dis- astrous battle of Kolin (18th June 1757) his left wing of cavalry

was the only victorious corps of troops. At Leuthen, the most brilliant battle of the 18th century, Zieten's cavalry began the fighting and completed the rout of the Austrians. He continued, during the whole of the war, to be one of Frederick's most trusted generals. Almost the only error in his career of battles was his misdirection of the frontal attack at Torgau, but he redeemed the mistake by his desperate assault on the Siptitz heights, which eventually decided the day. At the peace, General Zieten went into retirement, the hero alike of the army and the people. He died in 1786. Six years later Frederick's suc- cessor erected a column to his memory on the Wilhclmsplatz in Berlin.

See the Lives by his daughter, Frau von Blumenthal (Berlin. 1800), by Hahn (5th ed., Berlin, 1878), by Lipue-Weissenfeld (2nd ed., Berlin, 1878), and by Winter (Leipzig, 1886).

ZIMBABWE, a Bantu name, probably derived from the two words zimba (" houses ") and mabgi (" stones "), given to certain ruins in South-East Africa. Its use is not confined to Southern Rhodesia and should not properly be restricted to any one particular site. For, as the medieval Portuguese stated, it is merely a generic term for the capital of any considerable chief, and it has been applied even by them to several distinct places. From about 1550 onwards the Zimbabwe generally referred to by Portuguese writers was at a spot a little north of the Aiur district, not far from the Zambezi. There is some reason, however, to suppose that before this the capital of the Monomo- tapa was situated much farther south, and it may plausibly be identified with the most extensive ruins as yet known, viz. those near Victoria (Mashonaland) to which popular usage has now attached par excellence the name of Zimbabwe.

These ruins were discovered by Adam Renders in 186S and explored by Karl Mauch in 1871. They became well known to English readers from J. T. Bent's account of the Ruined Cities of Mashonaland, but the popularity of that work dis- seminated a romance concerning their age and origin which was only dispelled when scientific investigations undertaken in 1005 showed it to be wholly without historical warrant. Even before this it had been clear to archaeologists and ethnologists that there was no evidence to support the popular theory that Zimbabwe had been built in very ancient days by some Oriental people. Swan's measurements, which had misled Bent into accepting a chronology based on a supposed orientation of the " temple," had been shown to be inexact. There was no authentic instance of any inscription having been found there or elsewhere in Rhodesia. Numerous objects had been dis- covered in the course of excavations, but not one of them could be recognized as more than a few centuries old, while those that were not demonstrably foreign imports were of African type.

The explorations conducted in 1905 added positive evidence. For it was proved that the medieval objects were found in such positions as to be necessarily contemporaneous with the foundation of the buildings, and that there was no super- position of periods of any date whatsoever. Finally from a comparative study of several ruins it was established that the plan and construction of Zimbabwe arc by no means unique, and that this site only differs from others in Rhodesia in respect of the great dimensions and the massiveness of its individual buildings. It may confidently be dated to a period not earlier than the 14th or 15th century a.d., and attributed to the same Bantu people the remains of whose stone-fenced kraals are found at

so many places between the Limpopo and the Zambezi.

There are three distinct though connected groups of ruins at Zimbabwe, which are commonly known as the " Elliptical Temple," the "Acropolis" and the "Valley Ruins." The most famous is the first, which is doubly misnamed, since it is not a temple and its contour is too unsym metrical to be de- scribed properly as elliptical. It is an irregular enclosure over 800 ft. in circumference, with a maximum length of 292 ft. and a maximum breadth of 220 ft., surrounded by a dry-built wall of extraordinary massiveness. This wall is in places over 30 ft. high and 14 ft. wide, but is very erratic in outline and

variable in thickness. The most carefully executed part is on the south and south-east, where the wall is decorated by a row of granite monoliths beneath which runs a double line of chevron ornament. The interior has been much destroyed by the ravages of gold-seekers and amateur excavators. Enough, however, remains to show that the scheme was a combination of such a stone kraal as that at Nanatali with the plan of a fort like those found about Inyanga. The only unique feature is the occurrence of a large and a small conical tower at the southern end, which Bent and others considered to be representatives of the human phallus. Their form, however, is not sufficiently characteristic to warrant this identification, though it may be noted that the nearest approximation to phallic worship is found amongst the most typical of African peoples, viz. the Ewe-speaking natives of the West Coast. The floor of the enclosure is constituted as in the other Zimbabwe buildings by a thick bed of cement which extends even outside the main wall. This cement mass is heightened at many places so as to make platforms and supports for huts. Groups of these dwellings are enclosed by subsidiary stone walls so as to form distinct units within the larger precinct.

The " Acropolis " is in some ways more remarkable than the great kraal which has just been described. It is a hill rising 200 to 300 ft. above the valley, fortified with the minutest care and with extraordinary ingenuity. The principles of con- struction, the use of stone and cement are the same as in the " elliptical " kraal; there is no definite plan, the shape and arrangement of the enclosures being determined solely by the natural features of the ground. Between this and the " ellip- tical " kraal are the " Valley Ruins," consisting of smaller buildings which may have been the dwellings of those traders who bartered the gold brought in from distant mines. Zimbabwe was probably the distributing centre for the gold traffic

carried on in the middle ages between subjects of the Monomotapa and the Mahommedans of the coast.

Compare also the articles Rhodesia: Archaeology, and Monomotapa.

See D. Randall-MacU'er, Mediaeval Rhodesia (London, 1906) ; Journal of Anthrop. Inst., vol. xxxv. ; Geog. Journal (1906); Mauch's report in Ausland (1872) is now only of bibliographical interest, while Bent's Ruined Cities of Mashonaland (1892) and R. N. Hall's Great Zimbabwe (1905) are chiefly valuable for their illustrations. 1 (D. R.-M.)

ZIMMERMANN, JOHANN GEORG, Ritter von (1728- 1795), Swiss philosophical writer and physician, was born at Brugg, in the canton of Aargau, on the 8th of December 1728. He studied at Gottingen, where he took the degree of doctor Of medicine; and he established his reputation by the disserta- tion, De irritabilitate (1751). After travelling in Holland and France, he practised as a physician in his native place, and here he wrote Uber dw Einsamkeit (1756, emended and enlarged, 1784-85) and Vom Nationalstok (1758). These books made a great impression in Germany, and were translated into almost every European language. They are now only of historical interest. In Zimmermann's character there was a strange combination of sentimentalism, melancholy and enthusiasm; and it was by the free and eccentric expression of these qualities that he excited the interest of his contemporaries. Another book by him, written at Brugg, Von der Erfahrung in der Arzneiwissenschafl (1764), also attracted much attention. In 1768 he settled at Hanover as private physician of George III. with the title of Hofrat. Catherine II. invited him to the court of St Petersburg, but this invitation he declined. He attended Frederick the Great during that monarch's last illness, and afterwards issued various books about him, of which the chief were Uber Friederich den Grossen und meine Unlerredung mit ihm kurz vor seinem Tode (1788) and Fragmente Uber Friedrich den Grossen (1790). These writings display extraordinary

1 [In 1909 Hall published another volume, Prehistoric Rhodesia, in which- he maintained, in emphatic opposition to Dr Maclver's conclusions, that the ruins were of ancient date and not the un- aided work of Bantu negroes. See the review by Sir Harry Johnston in the Geog. Jnl., Nov. iqoq. Ed.1

personal vanity, and convey a wholly false impression of Frederick's character. Zimmermann died at Hanover on the 7U1 of October 1795.

See A. Rengger, Zimmermann's Briefe an einige seiner Freunde in der Schweiz (1830); E. Bodemann, Johann Georg Zimmermann, sein Leben und Usher ungedruckte Briefe an ikn (Hann., 1878); and R. Ischer, Johann Georg Zimmermann's Leben und Werke (Berne, 1893).

ZINC, a metallic chemical element; its symbol is Zn, and atomic weight 65-37 (0 = 16). Zinc as a component of brass (xaX/eos, opd-xo-ˆnos) had currency in metallurgy long before it became known as an individual metal. Aristotle refers to brass as the " metal of the Mosynoeci," 2 which is produced as a bright and light-coloured xaˆras, not by addition of tin, but by fusing up with an earth. Pliny explicil ly speaks of a mineral KOOjUefa or cadmia as serving for the conversion of copper into aurichalcum, and says further that the deposit (of zinc oxide) formed in the brass furnaces could be used instead of the mineral. The same process was used for centuries after Pliny, but its rationale was not understood. Stahl, as late as 1702, quoted the formation of brass as a case of the union of a metal with an earth into a metallic compound; but he subsequently adopted the view propounded by Kunckel in 1677, tnat " cadmia " is a metallic calx, and that it dyes the copper yellow by giving its metal up to it.

The word zinc (in the form zinken) was first used by Para- celsus, who regarded it as a bastard or semi-metal; but the word was subsequently used for both the metal and its ores. Moreover, zinc and bismuth were confused, and the word spiauter (the modern spelter) was indiscriminately given to both these metals. In 1597 Libavius described a "peculiar kind of tin " which was prepared in India, and of which a friend had given him a quantity. From his account it is quite clear that that metal was zinc, but he did not recognize it as the metal of calamine. It is not known to whom the discovery of isolated zinc is due; but we do know that the art of zinc-smelting was practised in England from about 1730. The first continental zinc-works were erected at Liege in 1807.

Occurrence. — Zinc does not occur free in nature, but in com- bination it is widely diffused. The chief ore is zinc blende, or sphalerite (see Blende), which generally contains, in addition to zinc sulphide, small amounts of the sulphides of iron, silver and cadmium. It may also be accompanied by pyrites, galena, arsenides and antimonides, quartz, calcitc, dolomite, &c. It is widely distributed, and is particularly abundant in Germany (the Harz, Silesia), Austro-Hungary, Belgium, the United States and in England (Cumberland, Derbyshire, Cornwall, North Wales). Second in importance is the carbonate, cala- mine (q.v.) or zinc spar, which at one time was the principal ore; it almost invariably contains the carbonates of cadmium, iron, manganese, magnesium and calcium, and may be con- taminated with clay, oxides of iron, galena and calcite; " white calamine " owes its colour to much clay; " red calamine " to admixed iron and manganese oxides. Calamine chiefly occurs in Spain, Silesia and in the United States. Of less importance is the silicate, Zn.SiOii-HiO, named electric calamine or hemi- morphite; this occurs in quantity in Altenburg near Aix-la- Chapelle, Sardinia, Spain and the United States (New Jersey, Pennsylvania, Missouri, Wisconsin). Other zinc minerals are willemite (q.v.), Zn 2 Si04,

hydrozincite or zinc bloom, ZnCOr2Zn(OH) 2 , zincite (q.v.) or red zinc ore, ZnO, and frank- linite, 3(Fe,Zn)0-(Fe,Mn) 2 3 .

Production. — Until about 1833 the supply of zinc was almost entirely obtained from Germany, but in this year Russia began to contribute about 2000 tons annually to the 6000 to 7000 derived from Germany. Belgium entered in 1837 with an output of about 2000 tons; England in 1855 with 3000; and the United States in 1873 with 6000 tons. The productions of Germany, Belgium and the United States have enormously and fairly regularly increased; the rise has been most rapid in the United

2 From the name of this tribe the German word Messing, brass, is undoubtedly derived (see K. B. Hoffmann, Zeil. f. Berg, and Huttenwesen, vol. 41).

States. England, France, Spain and Austria have _ been fairly constant producers. Germany produced 155,799 tons nl 1900, and 198,208 in 1905; Belgium, 120,000 in 1900 and 143,165 in 1905; the United States, 1 r 1,000 in 1900 and 183,014 in 1905. The world's supply was 445438 tons in 1900, and 654,367 in 1905.

Metallurgy Th.3 principles underlying the extraction of zinc may be sunw marized as: (1) the ore is first converted into zinc oxide; (2) the oxide is distilled with carbon and the distillate of metallic zinc condensed. Oxide of zinc, like most heavy metallic oxides, is easily reduced to the metallic state by heating it to redness with charcoal; pure red zinc ore may be treated directly; and the same might be done with pure calamine of any kind, because the carbon dioxide of the zinc carbonate goes off below redness and the silica of zinc silicate only retards, but does not prevent, the reducing action of the charcoal. Zinc blende, however, being zinc sulphide, is not directly reducible by charcoal; but it is easy to convert it into oxide by roasting: the sulphur goes off as sulphur dioxide whilst the zinc remains in the (infusible) form of oxide, ZnO. In practice, however, we never have to deal with pure zinc minerals, but with complex mixtures, which must first of all be subjected to mechanical operations, to remove at least part of the gangue, and if possible also of the heavy metallic impurities (see Ore-Dressing). '

As ores of zinc are usually shipped before smelting from widely separated places — Sweden, Spain, Algiers, Italy, Greece, Australia and the Rocky Mountains region of North America — it is important that they be

separated from their mixtures at_ theˆ mines. The difficulty in separating zinc blende from iron pyrites is well known, and probably the most elaborate ore-dressing works ever built have been designed with this end in view. The Wetherill system of magnetic concentration has been remarkably successful in separating the minerals contained in the well-known deposit in Sussex county, NJ. Here very clean non-magnetic concentrate of willemite, which is an anhydrous zinc silicate and a very high- grade zinc ore, is separated from an intimate mixture of willemite, zincite and franklinites, with calcite and some manganese silicates. The magnetic concentrates contain enough zinc to be well adapted to the manufacture of zinc oxide. Magnetic concentration is also applied in the removal of an excess of iron from partially roasted blende. Neither mechanical nor magnetic concentration can effect much in the way of separation when, as in many complex ores, carbonates of iron, calcium and magnesium replace the isomorphous zinc carbonate, when some iron sulphide containing less sulphur than pyrites replaces zinc sulphide, and when gold and silver are contained in the zinc ore itself. Hence only in exceptional cir- cumstances is it possible to utilize a large class of widely distri- buted ores, carrying from 10 to 35 per cent, of zinc, in which the zinc alone, estimated at 2d. a pound, is worth from about £2 to £7 per ton of ore. The ores of the Joplin district, in the Ozark uplift in the Mississippi Valley, are remarkable in that they are specially adapted to mechanical concentration. The material as mined will probably not average over 10 per cent, of zinc, but the dressed zinc ore as sold ranges from 45 to 62 per cent, of zinc. This region now furnishes the bulk of the ore required by the smelters of Illinois, Missouri and Kansas.

The ore, even if it is not blende, must be roasted or calcined in order to remove all volatile components as completely as possible, because these, if allowed to remain, would carry away a large proportion of the zinc vapour during the distillation. If the zinc is present as blende, this operation offers considerable difficulties, because in the roasting process the zinc sulphide passes in the first instance into sulphate, which demands a high temperature for its conversion into oxide. Another point to be considereˆ in this connexion is that the masses of sulphur dioxide evolved, being destructive of vegetable life, are an intolerable nuisance to the neighbourhood in which the operations take place. For the de sulphurization of zinc blende where it is not intended to collect and save the sulphur there are many mechanical kilns, •generally classified as straight-line, horse-shoe, turret and shaft kilns; all of these may be made to do good work on moderately clean ores which do not melt at the temperature of desulphurization. But the problem of saving the sulphur is yearly becoming more im- portant. In roasting a ton of rich blende containing 60 per cent, of zinc enough sulphur is liberated to produce one

ton ol strong sulphuric acid, and unless this is collected not only are poisonous gases discharged, but the waste is considerable. When sulphuric or sulphurous acid is to be collected, it is important to keep the fuel gas from admixture with the sulphur gases, and kilns for this purpose require some modification. If hot air is introduced into the kiln, the additional heat developed by the oxidation of the zinc and the sulphur is sufficient to keep up a part of the reaction; but for the complete expulsion of the sulphur an externally-fired muffle through which the ore is passed is found to be essential.

Distillation of the. Oxide with Charcoal. — The distillation process in former times, especially in England, used to be carried out " per descensum." The bottom of a crucible is perforated by_ a pipe which projects into the crucible to about two-thirds of its

height. The mixture of ore and charcoal is put into the crucible around the pipe, the crucible closed by a luted-on lid, and placed in a furnace constructed so as to permit of the lower end of the pipe projecting into the ash-pit. The zinc vapour produced descends through the pipe and condenses into liquid zinc, which is collected in a ladle held under the outlet end of the pipe. For manufacturing purposes a furnace similar to that used for the making of glass was employed to heat a circular row -of crucibles standing on a shelf along the wall of the furnace. This system, however, has long been abandoned.

The modern processes may be primarily divided into two groups according to the nature of the vessel in which the operation is effected. These distilling vessels are called retorts if they are supported only at the ends, and the furnace using them is termed a Belgian furnace. If they are supported at intervals along a flat side, they are called muffles, and the furnace is known as a Silesian furnace. Various combinations and modifications of these two types of furnace have given rise to distinctive names, and as each system has its advantages and disadvantages local conditions determine which is the better.

In the Belgian process the reduction and distillation are carried out in cylindrical or elliptical retorts of fire-clay, from 3 ft. 3 in. to 4 ft, 9 in. long and 6 to 10 in. internal diameter. Some forty- six or more retorts, arranged in parallel horizontal rows, are heated in one furnace. The furnaces are square and open in front, to allow the outlet ends of the retorts to project: they are grouped together by fours; and their several chimneys are within the same enclosure. Each retort is provided with two adapters, namely, a conical pipe of fire-clay, about 15 in. long, which fits into the retort end, and a conical tube of sheet iron, which fits over the end of the fire-clay pipe, and which at its outlet end is only about an inch wide. To start a new

furnace, the front side is closed provisionally by a brick wall, a fire lighted inside, and the tempera- ture raised very gradually to a white neat. After four days' heating the provisional front wall is removed piecemeal, and the retorts, after having been heated to redness, are inserted in corresponding sets. The charge of the retorts consists of a mixture of IIOO R> of roasted calamine and 550 lb of dry powdered coal per furnace. A newly started furnace, however, is used for a time with smaller charges. Supposing the last of these preliminary distillations to have been completed, the residues left in the retorts are removed, and the retorts, as they lie in the hot furnace, are charged by means of semi-cylindrical shovels, and their adapters put on. The charging operation being completed, the temperature is raised, and as a consequence an evolution of carbon monoxide soon begins, and becomes visible by the gas bursting out into the characteristic blue flame. After a time the flame becomes dazzling white, showing that zinc vapour is beginning to escape. The iron adapters are now slipped on, and left on for two hours, when, as a matter of experience, a considerable amount of zinc has gone out of the retort, the greater part into the fire-clay adapter, the rest into the iron cone. The former contains a mixture of semi-solid and molten metal, which is raked out into iron ladles and cast into plates of 66 to 77 lb weight, to be sold as " spelter." The contents of the iron recipient consist of a powdery mixture of oxide and metal, which is added to the next charge, except what is put aside to be sold as " zinc dust." This dust may amount to 10 per cent, of the total production. As soon as the adapters have been cleaeed of their contents, they are replaced, and again left to themselves for two hours, to be once more emptied and replaced, &c. The com- plete exhaustion of the charge of a furnace takes about eleven hours.

In the Silesian process the distillation is conducted in specially constructed muffles of a prismatic shape arched above, which are arranged in two parallel rows within a low-vaulted furnace, similar to the pots in a glass furnace. As a rule every furnace accom- modates ten muffles. Through an orifice in the outlet pipe (which is closed during the distillation by a loose plug) a hot iron rod can be introduced from time to time to clear away any solid zinc that may threaten to obstruct it. As soon as the outlet pipe has become sufficiently hot the zinc flows through it and collects in conveniently placed receptacles. About six or eighthoursafterstart- ing the distillation is in full swing and in twenty-four hours it is completed, A frcsli charge is then put in at once, the muffles being cleared only after three successive distillations. The distillate consists of a conglomerate of drops (' ' drop zinc ") . It is fused up in iron basins lined with clay, and cast out into the customary form of cakes.*

The chief improvements in the plant of these processes are con- cerned with the manufacture of the retorts or muffles, and especially with the

introduction of gas-firing. Even a machine of simple type, like the ordinary drain-pipe machine, in which the retorts are made by forcing the plastic clay mixture through a die, may result in greater economy and uniformity than is possible when retorts are made by hand. When hydraulic pressure to the amount of 2000 to 3000 lb per square inch is applied, the saving is unques- tioned, since less time is required to dry the pressed retort, its life in the furnaces is longer, its absorption of zinc is less, and the loss of zinc by passage through its walls in the form of vapour is reduced.

Three modes of gas-firing are to be noticed, each of which is adapted to special local conditions, (a) The gas is made from the fuel in a detached fireplace and conducted while hot into the com- bustion chamber of the furnace, and the air for complete combustion is heated by the products of combustion on their way to the chimney. {b) Both the producer gas and the air are heated before they enter the combustion chamber, as in the Siemens system of regenerative firing, (c) Natural gas is piped to the furnace, where it meets air heated by the chimney gases. The primary advantages of gas-firing are that less fuel is required, that there is better control of the heat in the furnace, and that larger and more accessible furnaces can be built. In Silesia the introduction of gas-firing has led to the use of furnaces containing eighty muffles. In the United States, Belgian furnaces of type (a) are built to contain 864 retorts; of type (fc), to contain 300 to 400 retorts; and of type ©, prefer- ably about 600 retorts. The use of gas-fired furnaces greatly simplifies manual labour. On a direct-fired furnace at least one man, the brigadier, must be an expert in all the operations involved ; but with a gas furnace a division of labour is possible. One man who understands the use of gaseous fuel can regulate the heat of a thousand or more retorts. The men who charge and empty the retorts, those who draw and cast the metal, and those who keep the furnace in repair, need not know anything about the making or using of gas, and the men who make the gas need not know anything about a zinc furnace. Again, in direct-fired furnaces there are commonly seven or eight rows of retorts, one above another, so that to serve the upper rows the workman must stand upon a table, where he is exposed to the full heat of the furnace and requires a helper to wait upon him. With gas-firing the retorts can be arranged in four horizontal rows, all within reach of a man on the furnace-room floor. Furthermore, with the large furnaces which gas-firing makes possible mechanical appliances may be substituted for manual labour in many operations, such as removing and replacing broken retorts, mixing and conveying the charge, drawing and casting the metal, charging and emptying the retorts, and removing the residues and products.

Refining. — The specific effects of different impurities on the physical properties of zinc have only been imperfectly studied. Fortunately, however, the small amounts of any of them that are likely to be found in commercial zinc are not for most purposes very deleterious. It is generally recognized that the purest ores produce the purest metal. Grades of commercial zinc are usually based on selected ores, and brands, when they mean anything, usually mean that the metal is made from certain ores. Chemical control of the metal purchased is not nearly as common as it should be, and the refining of zinc is at best an imperfect opera- tion. To obtain the metal chemically pure a specially prepared pure oxide or salt of zinc is distilled. A_ redistilled zinc, from an ordinarily pure commercial zinc, is often called chemically pure, but redistillation is seldom practised except for the recovery of zinc from galvanizer's dross and from the skimmings and bottoms of the melting furnaces of zinc rolling mills. The only other method of refining is by oxidizing and settling. A bath, even of very impure zinc, is allowed to stand at about the temperature of the melting-point of the metal for forty-eight or more hours, where- upon the more easily oxidizable impurities can be largely removed in the dross at the top, the heavier metals such as lead and iron settling towards the bottom. This method is rarely practised except by the rollers of zinc. A certain amount of refined zinc can be dipped from the furnace; a further amount, nearly free from iron, can be liquated out of the ingots cast from the bottom of the bath in a subsequent slow remelting, and it is sometimes possible to eliminate a zinciferous lead which collects in the sump of the furnace. Owing to the fact that at temperatures between its melting and, boiling point zinc has a strong affinity for iron, it is often contaminated by the scraper while being drawn from the condenser, as is shown by the fact that the scraper wears away rapidly. As each retort in a furnace is in all essentials a separate crucible, and as the metal from only a few of them goes into a single ingot, there can be no uniformity either in the ingots made from the same furnace during a day's run or in those made from several furnaces treating the same ore. Some brassfounders break from a single ingot the quantity of zinc required to produce the amount of brass they wish to compound in one crucible, but when perfect uniformity is desired the importance of remelting the zinc on a large scale cannot be too strongly emphasized.

Electrolytic Separation of Zinc, — The deposition of pure zinc is beset with many difficulties. Zinc being more electro-positive even than nickel, all the heavy metals must be removed before its deposi- tion is attempted. Moreover, unless the conditions are closely watched, it is liable to be thrown down in a spongy form. M. Kiliani found that the sponge was produced chiefly when a weak solution, or a low current-density, was used, and that hydrogen was usually evolved simultaneously; sound deposits resulted from the use of a current-density of 200 amperes, or more, per sq.

ft., and strong solutions. The cause of the spongy deposit is variously explained, some (Siemens and Halske) ascribing it to the existence of a compound of zinc and hydrogen, and others, among whom are G. Nahnsen, F. Mylius and A. Fromm, F. Foerster and

W. Borchers, trace it to the presence of oxide, produced, for example, either by the use of a solution containing a trace of basic salt of zinc (to prevent which the bath should be kept just— almost imper- ceptibly—acid), or by the presence of a more electro-negative metal, which, being co-deposited, sets up local action at the expense of the zinc. Many processes have been patented, the ore being acted upon by acid, and the resulting solution treated, by either chemical or electrolytic means, for the successive removal of the other heavy metals. The pure solution of zinc is then electrolysed. E. A. Ashcroft patented a process of dealing with complex ores of the well-known Broken Hill type, containing sulphides of silver, lead and zinc, but the system was abandoned after a long trial on a practical scale. A full account ot the process (Trans. Inst. Min. and Met., 189S, vol. vi. p. 282) has been published by the inventor, describing the practical trial at the Cockle Creek Works. The ore was crushed roasted, and leached with sulphuric acid (with or without ferric sulphate); the solution was purified and then electrolysed for zinc with lead anodes and with a current- density of 5 amperes per sq. ft. at 2-75 volts when diaphragms were used, or 2-5 volts when they were dispensed with, or with 30 amperes per sq. ft. at 3 or 2-5 volts respectively, the electrolyte containing 1 -2 lb of zinc in the form of sulphate, and \ to | oz. of sulphuric acid, per gallon. The current efficiency was about 83 per cent. Canvas diaphragms were used to prevent the acid formed by electrolysis at the anode from mixing with the cathode liquor, and so hindering deposition. C. Hoepfner has patented several processes, in one of which (No, 13,336 of 1894) a rapidly rotating cathode is used in a chloride solution, a porous partition separating the tank into anode and cathode compartments, and the chlorine generated by electrolysis at the anode being recovered. Hoepfner's processes have been employed both in England and in Germany. Nahnsen's process, with an electrolyte containing alkali-metal sulphate and zinc sulphate, has been used in Germany, and a process invented by Dlcffenbach has also been tried in that country. Siemens and Halske have proposed the addition of oxidizing agents such as free halogens, to prevent the formation of zinc hydride, to which they attribute the formation of zinc- sponge. Borchers and others deposit zinc from the fused chloride. In Borchers' process the chloride is heated partly by external firing, partly by the heat generated owing to the use of a current- density of 90 to 100 amperes per sq. ft.*

Properties

Zinc is a bluish-white metal, showing a high lustre when freshly fractured.

It fuses at 415° C. and under ordinary atmospheric pressure boils at 1040 C. Its vapour density shows that it is monatomic. The molten metal on cooling deposits crystals belong- ing to the hexagonal system, and freezes into a compact crystal- line solid, which may be brittle or ductile according to circum- stances. If zinc be cast into a mould at a red heat, the ingot produced is laminar and brittle; if cast at just the fusing-point, it is granular and sufficiently ductile to be rolled into sheet at the ordinary temperature. According to some authorities, pure zinc always yields ductile ingots. Commercial " spelter " always breaks under the hammer; but at ioo° to 150 C. it is susceptible of being rolled out into even a very thin sheet. Such a sheet, if once produced, remains flexible when cold. At about 200° C, the metal becomes so brittle that it can be pounded in a mortar. The specific gravity of zinc cannot be expected to be perfectly constant; according to Karsten, that of pure ingot is 6-915, and rises to 7-191 after rolling. The coefficient of linear expansion is 0-002,905 for ioo° from o° upwards (Fizeau). The specific heat is 0-09555 (Regnault). Compact zinc is bluish white; it does not tarnish much in the air. It is fairly soft, and clogs the file. If zinc be heated to near_ its boiling-point, it catches fire and burns with a brilliant light into its powdery white oxide, which forms a reek in the air {lana phihsophica, " philosopher's wool "). Boiling water attacks it appreciably, but slightly, with evolution of hydrogen and formation of the hydroxide, Zn(QH) 2 . A rod "of perfectly pure zinc, when immersed in dilute sulphuric acid, is so very slowly attacked that there is no visible evolution of gas; but, if a piece of platinum, copper or other more electro - positive metal be brought into contact with the zinc, it dissolves readily, with evolution of hydrogen and formation of the sulphate. The ordinary impure metal dissolves at once, the more readily the less pure it is. Cold dilute nitric acid dissolves zinc as nitrate, with evolution of nitrous oxide. At higher temperatures, or with stronger acid, nitric oxide, NO, is produced besides or instead of nitrous. Zinc is also soluble in soda and potash solutions, but not in ammonia.

Applications. — Zinc is largely used for "galvanizing" iron, sheets of clean iron being immersed in a bath of the molten metal and then removed, so that a coat of zinc remains on the iron, which is thereby protected from atmospheric corrosion. It is also a con- stituent of many valuable alloys; brass, Muntz-metah pinchbeck, tombac, are examples. In technological chemistry it finds applica- tion as a reducing agent, e.g. in the production of aniline from nitrobenzene, but the use of iron is generally preferable in view of the cheapness of this metal.

Compounds

Zinc forms only one oxide, ZnO, from which is derived a well-characterized scries of salts. It is chemically related to cadmium and mercury, the resemblance to cadmium being especially well marked ; one distinction is that zinc is less basigenic. Zinc is capable of isomorphously replacing many of the bivalent metals — magnesium, manganese, iron, nickel, cobalt and cadmium.

Zinc oxide, ZnO, is maufactured for paint by two processes — directly from the ore mixed with coal by volatilization on a grate, as in the Wetherill oxide process, and by oxidizing the vapour given off by a boiling bath of zinc metal. The oxide made by the latter method has generally a better colour, a finer texture, and a greater covering power. It is also manufactured by the latter process from the metallic zinc liquated out of galvanizer's dross. It is an infusible solid, which is intensely yellow at a red heat, but on cooling becomes white. This at least is true of the oxide produced from the metal by combustion; that produced from the carbonate, if once made yellow at a red heat, retains a yellow shade permanently. By heating the nitrate it is obtained as hemimorphous pyramids belonging to the hexagonal system; and by heating the chloride in a current of steam as hexagonal prisms. It is insoluble in water; it dissolves readily in all aqueous acids, with formation of salts. It also dissolves in aqueous caustic alkalis, including ammonia, forming " zincates " [e.g. Zn(OK)a]. Zinc oxide is used in the arts as a white pigment (zinc white) ; it has not by any means the covering power of white lead, but offers the advantages of being non-poisonous and of not becoming discoloured in sulphuretted hydrogen. It is used also in medicine.

Zinc hydroxide, Zn (OH) 2 , is prepared as a gelatinous precipitate by adding a solution of any zinc salt to caustic potash. The alkali must be free from carbonate and an excess of it must be avoided, otherwise the hydrate redissolves. It is a white powder, and is insoluble in water. To acids and to alkalis it behaves like the oxide, but dissolves more readily.

Zinc chloride, ZnCU, is produced by heating the metal in dry chlorine gas, when it distils over as a white translucent mass, fusing at 250 and boiling at about 400 . Its vapour-density at 900 C. corresponds to ZnCl 2 . It is extremely hygroscopic and is used in synthetical organic chemistry as a condensing agent. It dis- solves in a fraction of its weight of even cold water, forming a syrupy solution. A solution of zinc chloride is easily produced from the metal and hydrochloric acid; it cannot be evaporated to dryness without considerable decomposition of the hydrated salt into oxychloride and hydrochloric acid, but it may be crystallized as ZnClj'H 2 0. A concentrated solution of zinc chloride converts starch, cellulose and a

great many other organic bodies into soluble compounds; hence the application of the fused salt as a caustic in surgery and the impossibility of filtering a strong ZnCfe solution through paper (see Cellulose). At a boiling heat, zinc chloride dissolves in any proportion of water, and highly concentrated solutions, of course, boil at high temperatures; hence they afford a convenient medium for the maintenance of high temperatures.

Zinc chloride solution readily dissolves the oxide with the forma- tion of oxychlorides, some of which are used as pigments, cements and for filling teeth in dentistry. A solution of the oxide in the chloride has the property of dissolving silk, and hence is employed for removing this fibre from wool.

Zinc bromide, ZnBr2, and Zinc iodide, Znl2, are deliquescent solids formed by the direct union of their elements. With ammonia and alkaline bromides and iodides double salts are formed.

Zinc sulphide, ZnS, occurs in nature as blende (q.v.), and is arti- ficially obtained as a white precipitate by passing sulphuretted hydrogen into a neutral solution of a zinc salt. It dissolves in mineral acids, but is insoluble in acetic acid.

Zinc sulphate, ZnSOH-7H 2 G, or white vitriol, y~ prepared by dissolving the metal in dilute sulphuric acid. If care be taken to keep the zinc in excess, the solution will be free from all foreign metals except iron and perhaps manganese. Both are easily removed by passing chlorine through the cold solution, to produce ferric and manganic salt, and then digesting the liquid with a washed precipitate of basic carbonate, produced from a small portion of the solution by means of sodium carbonate. The iron and manganese are precipitated as hydroxides, and are filtered off. The filtrate is acidified with a little sulphuric acid and evaporated to crystallization. The salt crystallizes out on cooling with 7 mole- cules of water, forming colourless orthorhombic prisms, usually small and needle-shaped. They are permanent in the air. Accord- ing to Poggiale, 100 parts of water dissolve respectively of (/H 2 0) salt, 115-2 parts at,o°, and 653-6 parts at ioo°. At ioo° C. the crystals lose 6 of their molecules of water; the remaining molecule goes off at 250 , a temperature which lies close to that at which the salt begins to decompose. The anhydrous salt, when exposed to a red heat, breaks up into oxide, sulphur dioxide and oxygen. An impure form of the salt is prepared by roasting blende at a low temperature. In the arts it is employed in the preparation of varnishes, and as a mordant for the production of colours on calico. A green pigment known as Rinmann's green is prepared by mixing 100 parts of zinc vitriol with 2-5 parts of cobalt nitrate and heating the mixture to redness, to produce a compound of the two oxides.

Zinc sulphate, Tike magnesium sulphate, unites with the sulphates of the potassium metals and of ammonium into crystalline double salts, ZnS0 4 - R2S04 + 6H20, isomorphous with one another and the magnesium salts.

Zinc carbonate, ZnC0 5 , occurs in nature as the mineral calamine (q.v.), but has never been prepared artificially, basic carbonates, ZnC0 3 .xZn(OH)2, where x is variable, being obtained by precipi- tating a solution of the sulphate or chloride with sodium carbonate. To obtain a product free of CI or SO, there must be an excess of alkali and the zinc salt must be poured into the hot solution of the carbonate. The precipitate, even after exhaustive washing with hot water, still contains a trace of alkali: but from the oxide, prepared from it by ignition, the alkali can be washed away. The basic carbonate is used as a pigment.*

Of zinc phosphates we notice the minerals hopeite, Zn. a (PO^^HaO, and tarbuttite, Zn 3 (POi)2.Zn(OH) 2 , both found in Rhodesia.

Analysis. —From neutral solutions of its salts zinc is precipitated by sulphuretted hydrogen as sulphide, ZnS — a white precipitate, soluble, but by no means readily, in dilute mineral acids, but insoluble in acetic acid. In the case of acetate the precipitation is quite complete ; from a sulphate or chloride solution the greater part of the metal goes into the precipitate; in the presence of a sufficiency of free HC1 the metal remains dissolved; sulphide of ammonium precipitates the metal completely, even in the presence of ammonium salts and free ammonia. The precipitate, when heated, passes into oxide, which is yellow in the heat and white after cooling; and, if it be moistened with cobalt nitrate solution and re-heated, it exhibits a green colour after cooling.

Zinc may be quantitatively estimated by precipitating as basic carbonate, which is dried and ignited to zinc oxide. It may also be precipitated as zinc ammonium phosphate, NTUZnPO^ which is weighed on a filter tared at 100 . Volumetric rr

also been devised.

methods have

Pharmacology and Therapeutics of Zinc Compounds

Zinc chloride is a powerful caustic, and is prepared with plaster of Paris in the form of sticks for destroying warts, &c. Irs use for this purpose at the present day is, however, very rare, the knife or galvanocautery being preferred in most cases. The salt is a corrosive irritant poison when taken internally. The treat- ment is to wash out the stomach or give such an emetic as apo- morphine, and, when the stomach has been emptied, to

administer demulcents such as white of egg or mucilage. Numerous other salts of zinc, used in medicine, arc of value as containing this metal. Certain others are referred to in relation with the important radicle contained in the salt. Those treated here are the sulphate, oxide, carbonate, oleate and acetate. All these salts are mild astringents when applied externally,- as they coagulate the albumen of the tissues and of any discharge which may be present. In virtue of this property they are also mild haemostatics, tending to coagu- late the albumens of the blood and thereby to arrest haemorrhage. Lotto Rubra, the familiar " Red Lotion," a solution of zinc sulphate, is widely used in many catarrhal inflammations, as of the ear, urethra, conjunctiva, &c. There are also innumerable ointments.

These salts have been extensively employed internally, and indeed they are still largely employed in the treatment of the more severe and difficult cases of nervous disease. The sulphate is an excellent emetic in cases of poisoning, acting rapidly and without much nausea or depression. < For these reasons it may also be given with advantage to children suffering from acute bronchitis or acute laryngitis. _

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ZINCITE, a mineral consisting of zinc oxide (ZnO), crystalliz- ing in the hemimorphic-hemihedral class of the rhombohedral system. Distinct crystals are of rare occurrence; they have the form of a hexagonal pyramid terminated at one end only by a basal plane. There is a perfect cleavage parallel to the basal plane, and usually the mineral is found as platy foliated masses. The blood-red colour and the orange-yellow streak are char- acteristic features. The hardness is 4ˆ, and the specific gravity is 5-6. Some manganese is usually present replacing zinc. It is found in the zinc mines at Sterling Hill and Franklin Fur- nace in Sussex county, New Jersey, where it is associated with franklinite and willemitc in crystalline limestone, and is mined as an ore of zinc. Artificial crystals of a white or yellowish colour are not infrequently formed by sublimation in zinc furnaces.

ZINDER, a town on the northern margin of the central Sudan. Zindcr is a great emporium of the trade across the Sahara between the Hausa states of the south and the Tuareg countries and Tripoli in the north. Its ruler was formerly subordinate to Bornu, but with the decline of that kingdom shook off the yoke of the sultan, and on the conquest of that country by Rabah (q.v.) seems to have maintained his independence. The country of which Zinder is the capital is known as Damerghu. It is semi-fertile, and supports considerable numbers of horses and sheep, besides troops of camels. By the Anglo-French agreement of June 1898 it was included in the French sphere, having already been the object of French political action. The explorer Cazemajou was assassinated there in 1897, but the town was occupied in July 1899, after a slight resistance, by Lieutenant Pallier of the reconstructed Voulet-Chanoinc mission (see Senegal, country). A French post (named Fort Cazemajou) was built outside the town on a mound of huge granite blocks. Zinder was the first point in the Sudan reached by F. Foureau after his great journey across the Sahara via Air in 1899. Subsequently Commandant Gadel, from his head- quarters at Zinder, mapped and pacified the surrounding region, and sent out columns of meharistes (camel-corps) which occupied the oasis o£ Air and Bilma in 1906. Zinder is a large and fine town surrounded with high earthen walls, very thick at the base and pierced with seven gates. Its houses, in part built of clay, in part of straw, are interspersed with trees. There is an important colony of Tuareg merchants, who occupy the suburb of Zengu, and who deal in a variety of wares, from cotton, silks, spices, ostrich feathers, &c, to French scent bottles. Salt is a great article of merchandise. A busy market is held outside one of the gates. Administratively Damerghu is dependent on the French colony of Upper Senegal and Niger.

See Cazemajou, in Bui. Com. de V Afrique Francaise (1900) ; F. Foureau, in La Geographie (December 1900), D' Alger au Congo par le Tchad (Paris, 1902); Joalland, in La Geographie, vol. iii- (1901); E. Arnaud and M. Cortier, Nos Confins Sahariens (Paris, 1908J ; C. Jean, Les Touarag du Sud-Est (Paris, 1909).

ZINGERLE, IGNAZ VICENZ (r825-i8o2), Austrian poet and scholar, was born, the son of. the Roman Catholic theologian and orientalist, Pius Zingerle (1801-1881), at Meran on the 6th of June 1825. He began his studies at Trient, and entered for a while the Benedictine monastery at Marienberg. Abandoning the clerical profession, he returned to Innsbruck, where, in 1848, he became teacher in the gymnasium, and in 1859 professor of German language and literature at the university. He died at Innsbruck on the 17th of September 1892.

Zingerle is known as an author by his Zeitgedichte (Tnnsbruck, 1848); Von den Alpen (1850); Die Milllerin, a village tale (1853); Der Bauer von Longvall (1874); and Erzdhlunge.n aus dtm Burg- grafenamte (1884). His ethnographica.1 writings and literary studies, dealing especially with the Tirol, have, however, rendered him more famous. Among them may be mentioned his editions of Konig Laurin (1850), of the legend, Von den keyligen drei Kunigen (1855); Sagen aus Tirol (1850, 2nd ed. 1891); Tirol. Natur, Geschichie and Sage im Spiegel deutscher Dichtung (1851); Die Personen- und Tatifnamen Tirols (1855) ; Sitten, Brduche und Meinungen des Tiroler-Volkes (2nd ed. 1871); Das deutsche Kinder- spiel im Mittelalter (2nd ed. 1S73); Schildereien aus Tirol (1877, new series, 1888). With E. I na ma- Stern egg, he edited Tiroliscke Weistumer (5 vols., 1875-1891).

ZINNIA, in botany, a genus of the natural order Compositae, containing about a dozen species of half-hardy annual or per- ennial herbs or undershrubs, natives of the southern United States and Mexico. The numerous single and double garden forms are mostly derived from Zinnia elegans, and grow about 2 ft. high, producing flowers of various colours, the double ones being about the size of asters, and very handsome. The colours include white, yellow, orange, scarlet, crimson and purple. Zinnias do best in a rich deep loamy soil, in a sunny position. They should be sown on a gentle hotbed at the end of March or in April and planted out early in June.

ZINZENDORF, NICOLAUS LUDWIG, Count of Zinzendorf and Pottendorf (1700-1760), German religious and social re- former, was born on the 26th of May 1700 at Dresden. His

ancestors belonged to Lower Austria, but had taken the Pro- testant side in the Reformation struggle, and settled near Nuremberg. Both his parents belonged to the Pietist circle and the lad had Philipp Jakob Spener for his godfather. His father died six weeks after he was born. His mother married again when he was four years old, and he was educated under the charge of his pious and gifted grandmother, 1 Catherine von Gersdorfj who did much to shape his character. His school days were spent at Halle amidst Pietist surroundings, and in 1 7 16 he went to the university of Wittenberg, to study law and fit himself for a diplomatic career. Three years later he was sent to travel in Holland, in France, and in various parts of Germany, where he made the personal acquaintance of men distinguished for practical goodness and belonging to a variety of churches. On his return he visited the branches of his family settled at Oberbirg and at Castell. During a lengthened visit at Castell he fell in love with his cousin Theodora; but the widowed countess, her mother, objected to the marriage, and the lady afterwards became the wife of Count Henry of Reuss. Zinzen- dorf seems to

have considered this disappointment to be a call to betake himself to some special work for God. He had previously, in deference to his family, who wished him to become a diplomatist, rejected the invitation of August Francke to take Baron von Canstein's place in the Halle orphanage; and he now resolved to settle down as a Christian landowner, spending his life on behalf of his tenantry. He bought Berthelsdorf from his grandmother, and selected John Andrew Rot he for pastor and John George Heiz for factor; he married Erdmute Dorothea, sister of Count Henry of Reuss, and began living on his estate. His intention was to carry out into practice the Pietist ideas of Spener. He did not mean to found a new church or religious organization distinct from the Lutheranism of the land, but to create a Christian association the members of which by preach- ing by tract and book distribution and by practical benevolence might awaken the somewhat torpid religion of the Lutheran Church. The " band of fcur brothers " (Rothe, pastor at Berthelsdorf; Melchior Schaffer, pastor at Gbriitz; Francis von Wattewille, a friend from boyhood; and himself) set them- selves by sermons, books, journeys and correspondence to create a revival of religion, and by frequent meetings for prayer to preserve in their own hearts the warmth of personal trust in Christ. From the printing-house at Ebersdorf large quantities of books and tracts, catechisms, collections of hymns and cheap Bibles were issued; and a translation of Johann Arndt's True Christianity was published for circulation in France. A dislike of the high and dry Lutheran orthodoxy of the period gave Zinzendorf some sympathy with that side of the growing rationalism which was attacking dogma, while at the same time he felt its lack of earnestness, and of a true and deep under- standing of religion and of Christianity, and endeavoured to counteract these defects by pointing men to the historical Christ, the revelation of the Father. He seems also to have doubted the wisdom of Spener's plan of not separating from the Lutheran Church, and began to think that true Christianity could be best promoted by free associations of Christians, which in course of time might grow into churches with no state con- nexion. These thoughts took a practical turn from his connexion with the Bohemian or Moravian Brethren. Zinzendorf offered an asylum to a number of persecuted wanderers from Moravia (see Moravian Brethren), and built for them the village of Herrnhut on a corner of his estate of Berthelsdorf. The re- fugees who came to this asylum (between 1722 and 1732— the first detachment under Christian David) from various regions where persecution raged, belonged to more than one Protestant organization. Persecution had made them cling pertinaciously to small peculiarities of creed, organization and worship, and they could scarcely be persuaded to live in peace with each other. Zinzendorf devoted himself to them. He, with his wife and children, lived in Herrnhut and brought Rothe with him. He had hard work to bring order out of the confusion. He had to*

1 A volume of Spiritual Songs, written by Zinzendorf's grand- mother Catherine, was published in 1729 by Paul Anton.

satisfy the authorities that his religious community could be brought under the conditions of the peace oil Augsburg; he had to quiet the suspicions of the Lutheran clergy; and, hardest of all, he had to rule in some fashion men made fanatical by perse- cution, who, in spite of his unwearied labours for them, on more than one occasion, it is said, combined in his own house to denounce him as the Beast of the Apocalypse, with Rothe as the False Prophet. Patience had at last its perfect work, and gradually Zinzendorf was able to organize his refugees into something like a militia Chrisii, based not on monastic but on family life. He was able to establish a common order of worship in 1727, and soon afterwards a common organization, which has been described in the article Moravian Brethren. Zinzendorf took the deepest interest in the wonderful missionary enterprises of the Brethren, and saw witli delight the spread of this Protestant family order in Germany, Denmark, Russia and England. He travelled widely in its interests, visiting America in 1741-42 and spending a long time in London in 17 50. Missionary colonies had by this time been settled in the West Indies (1732), in Greenland (17,33), amongst the North American Indians (1 735) ; and before Zinzendorf's death the Brethren had sent from Herrnhut missionary colonies to Livonia and the northern shores of the Baltic, to the slaves of North Carolina, to Surinam, to the Negro slaves in several parts of South America, to Travancore in the East Indies, to the Copts in Egypt and to the west coast of South Africa. The community in Herrnhut, from which almost all these colonies had been sent out, had no money of its own, and its expenses had been almost exclusively furnished by Zinzendorf. His frequent journeyings from home made it almost impossible for him to look after his private affairs; he was compelled from time to time to raise money by loans, and about 1750 was almost reduced to bankruptcy. This led to the establishment of a financial board among the Brethren, on a plan furnished by a lawyer, John Frederick Kobcr, which worked well. In 1752 Zinzendorf lost his only son, Christian Renatus, whom he had hoped to make his successor; and four years later he lost his wife Erdmute, who had been his counsellor and confidante in all his work. Zinzendorf remained a widower for one year, and then (June 1757) contracted a second marriage with Anna Nitschmann, on the ground that a man in his official position ought to be married. Three years later, overcome with his labours, he fell ill and died (on the oth of May 1760), leaving John de Wattewille, who had married his eldest daughter Benigna, to take his place at the head of the community.

Zinzendorf had a naturally alert and active mind, and an enthusiastic temperament that made his life one of ceaseless planning and executing. Like Luther, he was often carried away by strong and vehement feelings, and he was easily upset both by sorrow and joy. He was an eager seeker after truth, and could not understand men who at all costs kept to the opinions they had once formed; yet he had an exceptional talent for talking on religious subjects even with those who differed from him. Few men have been more solicitous for the happiness and comfort of others, even in little things. His activity and varied gifts sometimes landed him in oddities and contradictions that not infrequently looked like equivocation and dissimulation, and the courtly training of his youth made him susceptible about his authority even when no one disputed it. He was a natural orator, and though his dress was simple his personal appearance gave an impression of distinction and force. His projects were often misunderstood, and in 1736 he was even banished from Saxony, but in 1749 the government rescinded the decree and begged him to establish within its jurisdiction more settlements like that at Herrnhut.

He wrote a large number of hymns, of which the best known are " Jesus, Thy blood and righteousness," and " Jesus, still lead on." A selection of his Sermons was published by G. Clemens in 10 vols., his Diary (1716-1719) by G. Reichel and J, Th. Miiller (Herrnhut, 1907), and his Hymns, Sec, by H. Bauer and G. Burk- hardt (Leipzig, 1900).

See A. G. Spangenberg, Leben des Grafen von Zinzendorf (Barby, 1772-1775) ; L. von Schrautenbach, Dtr Graf v. Zinzendorf (Gnadau, 1871; written in 1782, and interesting because it gives Zinzendorf's

relations to such Pietist rationalists as J. K. Dippel); F. Bovet,

he Comte de Zinzendorf (Paris, i860; Eng. tr. A Pioneer of Social Christianity, by T. A. Seed, London, 1896); B. Becker, Zinzen- dorf im Verhdltniss z. Philosophic u. Kirdwnthum seiner Zeii (Leipzig, 1886); H. Roraer, Zinzendorf s Leben und Werken (Gnaudau, 1900), and other literature mentioned under Moravian Brethren and in the article " Zinzendorf " by J. Th. Miiller in Hauck-IIerzog's Realencyk. fur prot. Theologie u. Kirche.

ZION, or Sion (Heb. ji'x, perhaps from nns " to be dry," jts "to set up," or p "to protect"; Arabic analogies favour the meaning " hump," " summit of a ridge," and so " citadel "), the name of the Jebusite stronghold at Jerusalem captured by David (2 Sam. v.). Zion (which is synonymous with the Ophel) is properly the southern part of the eastern hill l on the top of which was built the temple, so that the name came to be given to the whole hill (2 Kings xix. 31. Isaiah xxiv. 23 and throughout 1 Maccabees), to all

Jerusalem (Isaiah i. 27, cf. iv. 3), and even to the nation or its spiritual nucleus. Thus the people of Jerusalem are spoken of as " the daughter of Zion " (Isaiah i. 8), the name being often personified and idealized, especially in Isaiah ii., and in the Psalter, e.g. Ps. lxxxvii. 5, " Every one calls Zion his mother."

See G. A. Smith, Jerusalem (London, 1908).

ZIONISM. One of the most interesting results of the anti- Semitic agitation (see Anti-Semitism) has been a strong revival of the national spirit among the Jews in a political form. To this movement the name Zionism has been given. In the same way that anti-Semitism differs from the Jew-hatred of the early and middle ages. Zionism differs from previous manifestations of the Jewish national spirit. It was originally advocated as an expedient without Messianic impulses, and its methods and pro posals have remained almost harshly modern. None the less it is the lineal heir of the attachment to Zion which led the Babylonian exiles under Zerubbabel to rebuild the Temple, and which flamed up in the heroic struggle of the Maccabees against Antiochus Epiphanes. Without this national spirit it could, indeed, never have assumed its present formidable proportions. The idea that it is a set-back of Jewish history, in the sense that it is an unnatural galvanization of hopes long since abandoned for a spiritual and cosmopolitan, conception of the mission of Israel, is a controversial fiction. The consciousness of a spiritual mission exists side by side with the national idea. The great bulk of the Jewish people have throughout their history re- mained faithful to the dream of a restoration of their national life in Judea. Its .manifestations have suffered temporary modifications under the influence of changing political condi- tions, and the intensity with which it has been held by individual Jews has varied according to their social circumstances, but in the main the idea has been passionately clung to.

The contention of some modern rabbis that the national idea is Messianic, and hence that its realization should be left to the Divine initiative (e.g. Chief Rabbi Adler, Jewish Chronicle, 25th November 1898), is based on a false analogy between the politics of the Jews and those of other oppressed nationalities. As all Hebrew politics were theocratic, the national hope was neces- sarily Messianic. It was not on that account less practical or less disposed to express itself in an active political form. The Messianic dreams of the Prophets, which form the frame- work of the Jewish liturgy to this day, were essentially politico- national. They contemplated the redemption of Israel, the gathering of the people in Palestine, the restoration of the Jewish state, the rebuilding of the Temple, and the re-establish- ment of the Davidic throne in Jerusalem with a prince of the House of David. How little the dispersed Jews regarded this essentially political programme as a mere religious ideal is shown by their attitude towards the pseudo-Messiahs who

endeavoured to fulfil it. Bar Cochba (a.d. 117-138) lived at a period when a Jewish national uprising might well have been exclusively political, for the dissolution of the kingdom was

1 Christians of the 4th century removed the name to the S.W. hill, and this tradition has persisted until modern times, when archaeological and topographical evidence has re-identified Sion with the E. hill.

scarcely half a century old, and Palestine still had a large Jewish population. None the less Bar Cochba based his right to lead the Jewish revolt on Messianic claims, and throughout the Roman Empire the Jews responded with enthusiasm to his call. Three centuries later Moses of Crete attempted to repeat Bar Cochba's experiment, with the same results. In the 8th century, when the Jews of the West were sufficiently remote from the days of their political independence to have developed an exclusively spiritual conception of their national identify, the Messianic claims of a Syrian Jew named Serene shook the whole of Jewry, and even among the Jews of Spain there was no hestitation as to whether they had a right to force the hands of Providence. It was the same with another pseudo-Messiah named AbuTsa Obadia, who unfurled the national banner in Persia some thirty years later.

During the middle ages, though the racial character of the Jews was being transformed by their Ghetto seclusion, the national yearning suffered no relaxation. If it expressed itself exclusively in literature, it was not on that account under- going a process of idealization. (Cf. Abrahams's Jewish Life in the Middle Ages, pp. 24-25.) The truth is that it could not have expressed itself differently. There could have been no abandonment of national hopes in a practical sense, unless the prospect of entering the national life of the peoples among whom they dwelt had presented itself as an alternative. Of this there was not the remotest sign. The absence of militant Zionism during this period is to be accounted for partly by the want of conspicuous pseudo-Messiahs, and partly by the terror of persecution. Unlike the modern Greeks, the medieval Jews could expect no sympathy from their neighbours in an agitation for the recovery of their country. One may imagine what the Crusaders would have thought of an international Jewish conspiracy to recapture Jerusalem. In the 15th century the aversion from political action, even had it been possible, must have been strengthened by the fact that the Grand Signor was the only friend the Jews had in the world. The nationalist spirit of the medieval Jews is sufficiently reflected in their liturgy, and especially in the works of the poet,

Jehuda Halevi. It is impossible to read his beautiful Zionide without feeling that had he lived another twenty years he would have gladly played towards the pseudo-Messiah David Alroy {circa 1160) the part that Akiba played towards Bar Cochba.

The strength of the nationalist feeling was practically tested in the 16th century, when a Jewish impostor, David Reubeni {circa 1530), and his disciple, Solomon Molcho (1501-1532), came forward as would-be liberators of their people. Through- out Spain, Italy and Turkey they were received with enthusiasm by the bulk of their brethren. In the following century the influence of the Christian Millenarians gave a fresh impulse to the national idea. Owing to the frenzy of persecution and the apocalyptic teachings of the Chiliasts, it now appeared in a more mystical form, but a practical bias was not wanting. Menasseh ben Israel (1604-1657) co-operated with English Millenarians to procure the resettlement of the Jews in England as a preliminary to their national return to Palestine, and he regarded his marriage with a scion of the Davidic family of Abarbanel as justifying the hope that the new Messiah might be found among his offspring. The increasing dispersion of the Marranos or crypto-Jews of Spain and Portugal through the Inquisition, and the persecution of the Jews in Poland, deepened the Jewish sense of homelessness the while the Millenarians encouraged their Zionist dreams. The Hebraic and Judeophil tendencies of the Puritan revolution in England still further stirred the prevailing unrest, and some Jewish rabbis are" said to have visited England in order to ascertain by genealogical investigations whether a Davidic descent could be ascribed to Oliver Cromwell. It only wanted a leader to produce a national movement on a formidable scale. In 1666 this leader presented himself at Smyrna, in the person of a Jew named Sabbatai Zevi (1626-1676), who proclaimed himself the Messiah. The news spread like wildfire, and despite the opposition of some of the leading rabbis, the Jews everywhere prepared for the journey

to Palestine. Not alone was this the case with the poor Jews of Lithuania and Germany, but also with well-to-do communities like those of Venice, Leghorn and Avignon, and with the great Jewish merchants and bankers of Hamburg, Amsterdam and London. Throughout Europe the nationalist excitement was intense. Even the downfall and apostasy of Sabbatai were powerless to stop it. Among the wealthier Jews it partially subsided, but the great bulk of the people refused for a whole century to be disillusionized. A Messianic frenzy seized upon them. Encouraged on the one hand by Christian Millenarians like Pierre Jurien, Oliger Pauli, and Johannes Speeth, pandered to by Sabbataic impostors like Cardoso, Bonafoux, Mordecai of Eisenstadt, Jacob Qucrido, Judah Chassid, Nehemiah Chayon and Jacob Franks, and maddened by fresh oppressions, they became fanaticized to the verge of demoralization.

The reaction arrived in 1778 in the shape of the Mendels- sohnian movement. The growth of religious toleration, the attempted emancipation of the English Jews in 1753, and the sane Judeophilism of men like Lessing and Dohm, showed that at length the dawn of the only possible alternative to national- ism was at hand. Moses Mendelssohn (172CJ-1786) sought to prepare his brethren for their new life as citizens of the lands in which they dwelt, by emphasizing the spiritual side of Judaism and the necessity of Occidental culture. His efforts were suc- cessful. The narrow nationalist spirit everywhere yielded before the hope or the progress of local political emancipation. In 1806 the Jewish Sanhedrin convened by Napoleon virtually repudiated the nationalist tradition. The new" Judaism, how- ever, had not entirely destroyed it. It had only reconstructed ' it on a wider and more sober foundation. Mendclssohnian culture, by promoting the study of Jewish history, gave a fresh impulse to the racial consciousness of the Jews. The older nationalism had been founded on traditions so remote as to be almost mythical; the new race consciousness was fed by a glorious martyr history, which ran side by side with the histories of the newly adopted nationalities of the Jews, and was not unworthy of the companionship. From this race consciousness came a fresh interest in the Holy Land. It was an ideal rather than a politico-nationalist interest — a desire to preserve and cherish the great monument of the departed national glories. It took the practical form of projects for improving the circum- stances of the local Jews by means of schools, and for reviving something of the old social condition of Judea by the establish- ment of agricultural colonies. In this work Sir Moses Monte- fiore, the Rothschild family, and the Alliance Israelite Uni- verselle were conspicuous. More or less passively, however, the older nationalism still lived on — especially in lands where Jews were persecuted — and it became strengthened by the revived race consciousness and the new interest in the Holy Land. Christian Millenarians also helped to keep it alive. Lord Ashley, afterwards Lord Shaftesbury, Colonel Gawler, Mr Walter Cresson, the United States consul at Jerusalem, Mr James Finn, the British consul, Mr Laurence Oliphant and many others organized and supported schemes for the benefit of the Jews of the Holy Land on avowedly Restoration grounds. Another vivifying element was the reopening of the Eastern Question and the championship of oppressed nationalities in the East by the Western Powers. In England political writers were found to urge the re-establishment of a Jewish state under British protection as a means of assuring the overland route to India (Hollingsworth, Jews in Palestine, 1852). Lord Palmerston was- not unaffected by this idea (Finn, Stirring Times, vol. i. pp. 106-112), and both Lord Beaconsfield and Lord Salisbury supported Mr Laurence Oliphant in his negotiations with the Porte for a concession which was to pave the way to an auton- omous Jewish state in the Holy Land. In 1854 a London Jew attempted to float a company " for the purpose of enabling the descendants of Israel to obtain

and cultivate the Land of Promise " {Hebrew Observer, 12th April). In 1876 the publica- tion of George Eliot's Daniel Deronda gave to the Jewish nationalist spirit the strongest stimulus it had experienced since the appearance of Sabbatai Zevi.

It was not, however, until the spread of anti-Semitic doctrines through Europe made men doubt whether the Mendelssohnian denationalization of Judaism possessed the elements of per- manency thai the Jewish nationalist spirit reasserted itself in a practical form. As long as the anti-Semites were merely polemical, the nationalists were mute, but when in Russia their agitation took the form of massacres and spoliation, followed by legislation of medieval harshness, the nationalist remedy offered itself. In 1882 several pamphlets were published by Jews in Russia, advocating the restoration of the Jewish state. They found a powerful echo in the United States, where a young Jewish poetess, Miss Emma Lazarus, passionately championed the Zionist cause in verse not unworthy of Jehuda Halevi. But the movement did not limit itself to literature. A society, " Chovevi Zion," was formed with the object of so extending and methodizing the establishment of agricultural colonies in Palestine as to make the' eventual acquisition of the country by the Jews possible. From the beginning it was a gieat success, and branches, or " tents " as they were called, were established all over the world. At the same time two other great schemes for rescuing the Jewish people from oppression were brought before the public. Neither was Zionist, but both served to encourage the Zionist cause. One was due to the initiative of Mr Cazalet, a financier who was interested in the Euphrates Valley Railway project. With the assistance of Mr Laurence Oliphant he proposed that the concession from the Porte should include a band of territory two miles wide on each =ide of the railway, on which Jewish refugees from Russia should be settled. Unfortunately the scheme failed. The other was Baron de Hirsch's colossal colonization association (see Hirsch, Maurice de). This was neither political nor Zionist, but it was supported by a good many members of the ((Chovevi Zion," among them Colonel Goldsmid, on the ground that it might result in the training of a large class of Jewish yeomen who would be invaluable in the ultimate settlement of Palestine. (Interview in Daily Graphic, 10th March iSq2.)

None of these projects, however, proved sufficiently inspiring to attract the great mass of Jewish nationalists. The Chovevi Zion was too timid and prosaic; the Hirsch scheme did not directly appeal to their strongest sympathies. In 1897 a striking change manifested itself. A new Zionist leader arose in the person of a Viennese journalist and playwright, Dr

Theodore Herzl (1860-1904). The electoral successes of the anti-Semites in Vienna and Lower Austria in 1895 had impressed him with the belief that the Jews were unassimilable in Europe, and that the time was not far distant when they would be once more submitted to civil and political disabilities. The Hirsch scheme did not, in his view, provide a remedy, as it only trans- planted the Jews from one uncongenial environment to another. He came to the conclusion that the only solution of the problem was the segregation of the Jews under autonomous political conditions. His first scheme was not essentially Zionist. He merely called for a new exodus, and was ready to accept any grant of land in any part of the world that would secure to the Jews some form of self-government. The idea was not new. In 1566 Don Joseph Nasi had proposed an autonomous settle- ment of Jews at Tiberias, and had obtained a grant of the city from the Sultan for the purpose. In 1652 the Dutch West India Company in Curacao, in 1654 Oliver Cromwell in Surinam, and in 1659 the French West India Company at Cayenne had at- tempted similar experiments. Marshal de Saxe in 1749 had projected the establishment of a Jewish kingdom in South America, of which he should be sovereign; and in 1825 Major M. M. Noah purchased Grand Island, in the river Niagara, with a view to founding upon it a Jewish state. All these projects were failures. Dr Herzl was not slow to perceive that without an impulse of real enthusiasm his scheme would share the fate of these predecessors. He accordingly resolved to identify it. with the nationalist idea.' His plan was set forth in a pamphlet, entitled The Jewish Slate, which was published in German, French and English in the spring of 1896. It explained in detail how the new exodus was to be organized and how the

state was to be managed. It was to be a tribute-paying state under the suzerainty of the Sultan. It was to be settled by a chartered company and governed by an aristocratic republic, tolerant of all religious differences. The Holy Places were to be exterritorialized. The pamphlet produced a profound sensa- tion. Dr Herzl was joined by a number of distinguished Jewish literary men, among whom were Dr Max Nordau and Mr Israel Zangwill, and promises of support and sympathy reached him from all parts of the world. The haute finance and the higher rabbinate, however, stood aloof.

The most encouraging feature in Dr Herzl 's scheme was that the Sultan of Turkey appeared favourable to it. The motive of his sympathy has not hitherto been made known. The Armenian massacres had inflamed the whole of Europe against him, and for a time the Ottoman Empire was in very serious peril. Dr Herzl's scheme provided him, as he imagined, with a means of securing powerful friends. Through a secret emissary, the Chevalier de Newlinsky, whom he sent to London in May 1896, he offered to present the Jews a charter in Palestine pro- vided they used their

influence in the press and otherwise to solve the Armenian question on lines which he laid down. The English Jews declined these proposals, and refused to treat in any way with the persecutor of the Armenians. When, in the following July, Dr Herzl himself came to London, the Maccabaean Society, though ignorant of the negotiations with the Sultan, declined to support the scheme. None the less, it secured a large amount of popular support throughout Eurcpe, and in 1910 Zionism had a following of over 300,000 Jews, divided into a thousand electoral districts. The English membership is about 15,000.

Between 1897 and 1910 the Zionist organization held nine international Congresses. At the first, which met at Basel, a political programme was adopted on the following terms: —

" Zionism aims at establishing for the Jewish people a publicly and legally assured home in Palestine, For the attainment of this purpose the Congress considers the following means serviceable: (r) The promotion of the settlement of Jewish agriculturists, artisans and tradesmen in Palestine. (2) The federation of all Jews into local or general groups, according to the laws of the various countries. (3) The strengthening of the Jewish feeling and consciousness. (4) Preparatory steps for the attainment 01 those governmental grants which are necessary to the achievement of the Zionist purpose."

Subsequent congresses founded various institutions for the promotion of this programme, notably a People's Hank known as the Colonial Trust, which is the financial instrument of political Zionism, a National Fund for the purchase of land in Palestine and a Palestine Commission with subsidiary societies for the study and improvement of the social and economic condition of the Jews in the Holy Land. For the purposes of these bodies about £400,000 was collected in small sums and invested. Very little practical work of any abiding value, however, was accomplished, and on the political side the career of Zionism had up to the end of 1910 proved a failure.

In May 1901 and August 1902 Dr Herzl had audiences of the Sultan Abdul Hamid, and was received with great distinction, but the negotiations led to nothing. Despairing of obtaining an immediate charter for Palestine, he turned to the British government with a view to securing a grant of territory on an autonomous basis in the vicinity of the Holy Land, which would provisionally afford a refuge and a political training-ground for persecuted Jews. His overtures met with a sympathetic reception, especially from Mr Chamberlain, then Colonial Secretary, and Earl Percy, who was Under-Secretary for Foreign Affairs (October T902). At first a site for the proposed settle- ment was suggested in the Sinai peninsula, but owing to the

waterless character of the country the project had to be abandoned. Then Mr Chamberlain, who -in the inteival had paid a visit to Africa, suggested the salubrious and uninhabited highlands of the East Africa Protectorate, and in 1903 the British government formally offered Dr Herzl the Nasin Gishiu plateau, 6000 sq. m. in area. No such opportunity for creating a Jewish self-governing community had presented itself since

the Dispersion, and for a moment it seemed as if Zionism were really entering the field of practical politics. Unhappily it only led to bitter controversies, which nearly wrecked the whole movement. The British offer was submitted to the Sixth Congress, which assembled at Basel in August 1903. It was received with consternation and an explosion of wrath by the ultra-nationalist elements, who interpreted it as an abandon- ment of the Palestine idea. By his personal influence Dr Herzl succeeded in obtaining the appointment of a commission to examine the proposed territory, but its composition was largely nationalist, and in the following year the Congress gladly availed itself of certain critical passages in the report to reject the whole scheme.

Meanwhile Zionism had suffered an irreparable blow by the death of Dr Herzl (1004). He was succeeded by Mr David WoltTsohn, a banker of Cologne, but there was in truth nobody who in ability and personal dignity and magnetism could take his place. The movement was further shaken by the dis- sensions which followed the rejection of the East African project- Mr Israel Zangwill led an influential minority which combined with certain non-Zionist elements to found a rival organization under the name of the ITO (Jewish Territorial Organization) with a view to taking over the East African offer or to establish an autonomous place of refuge elsewhere. Thus freed from all moderating elements the Zionists hardened into an exclusively Palestinian body, and under the auspices of Mr Wolfisohn fresh negotiations were opened with the Porte. These, how- ever, were rendered finally hopeless by the Turkish revolution, which postulated a united Ottoman nationality, and resolutely set its face against any extension of the racial and religious autonomies under which the integrity of the Empire had already severely suffered.

During 1905-1910 the Jewish national idea, for all practical purposes, was in a state of suspended animation. The re- covery oi the Holy Land appeared more distant than ever, while even the establishment of an independent or autonomous Jewish state elsewhere, for which the ITO was labouring, had encountered unexpected difficulties. On the rejection of the

British offer by the Zionists Mr Zangwill approached the Colonial Office, but he was too late, as the reserve on the Nasin Gishiu plateau had already been officially withdrawn. The ITO then turned its attention to Cyrenaica, and an expedition to examine the country was sent out (1908), but it was not found suitable. A project for combining all the Jewish organizations in an effort to secure an adequate foothold in Mesopotamia in con- nexion with the scheme for the irrigation of that region was subsequently proposed by Mr Zangwill, but up to January ign it had not been found practicable. The ITO, howe.ver, did valuable work by organizing an Emigration Regulation Department for deflecting the stream of Jewish emigration from the overcrowded Jewry of New York to the Southern states of the American Union, where there is greater scope for employment under wholesome conditions. For this purpose a fund was formed, to which Mr Jacob Schiff contributed £100,000 and Messrs Rothschild £20,000.

Although the Zionist organization was numerically strong — indeed, the strongest popular movement Jewish history had ever known — its experience from 1897 to 1910 rendered it very doubtful whether its nationalist aspirations could, humanly speaking, ever be fulfilled. From Turkey, cither absolutist or democratic, it appeared hopeless to expect any willing re- laxation of the Ottoman hold on Palestine, while in the event of a dissolution of the Empire it was questionable whether Christendom — and especially the Roman and Greek Churches- would permit the Holy Land to pass to the Jews, even though the Holy Places were exterritorialized. Should these obstacles be overcome, still more formidable difficulties would await the Jewish state. The chief of these is the religious question. The state would have to be orthodox or secular. If it were orthodox it would desire to revive the whole Levitical polity, and in these circumstances it would either pass away through internal chaos or would so offend the modern political spirit that it would be

I soon extinguished from outside. If it were secular it would not

be a Jewish state. The great bulk of its supporters would refuse

I to live in it, and it would ultimately be abandoned to an

I outlander population consisting of Hebrew Christians and

Christian Millenarians.

Modern Zionism is vitiated by its erroneous premises. It is based on the idea that anti-Semitism is unconquerable, and thus the whole movement, is artificial. Under the influence of religious toleration and the naturalization laws, nationalities are daily losing more of their racial character. The

coming nationality will be essentially a matter of education and economics, and this will not exclude the Jews as such. With the passing away of anti-Semitism, Jewish nationalism will disappear. If ihe Jewish people disappear with it, it will only be because either their religious mission in the world has been accomplished or they have proved themselves unworthy of it.

Literature.— A Zionist bibliography has been published by the Federation of American Zionists. Besides the works already cited in the body of this article, see on the early nationalist move- ment Graetz, Gaschichte der Juden, under the heads of the various pseudo-Messiahs and their adherents. Jewish agricultural colonies will be found discussed very fully in The Jewish Encyclopedia, vol. i. pp. 240-262. For early Zionist projects see Publications of the American Jewish Historical Society, No. 8, pp. 75-118; Laurence OHphant, Land of Gilead; "Mrs Oliphanr, Life of Laurence Oliphant, pp.168 et seq. The Zionist movement since 1895 is fully recorded m its official organ, Die Welt (Vienna). For proceedings of the Congresses see the Official Protocols published for each year by the society " Erez Israel " of Vienna; also Herzl, Der Baseler Congress (Vienna, 1897). On the movement generally, see Herzl's Zionistische Sckriften, edited by Dr Leon Kellner; Ten Years of Zionism (Cologne, 1907) ; Nordau, Zionism, its History and its A ims (London, 1905) ; J. de Haas, Zionism, Jewish Needs and Jewish Ideals; also articles by I. Zangwill in Cosmopolis (October 1897), Contemporary Review (October 1899) and Fortnightly Review (April 19 10) • Dr Caster in Asiatic Quarterly Review (October 1897); H. Rentwitch in Nineteenth Century (October 1897), and Fortnightly Review (December 1898); Reich in Nineteenth Century (August 1897); Lucien Wolf in Jewish Quarterly Review (October 1904: " The Zionist Peril "). On the ITO see pamphlets and leaflets published by the Jewish Territorial Organization; also the Report of the Commission on Cyrenaica (London, 1909). (L. W.)

ZIRCON, a mineral composed of zirconium silicate, some- times used as a gem-stone. It is believed that the name comes from the Arabic zargun, and is essentially the same as " jar- goon," the name given to certain varieties of zircon. The mineral crystallizes in the tetragonal system, generally in com- binations of square prisms and square pyramids, as in figs. 1 and 2. Zircon is isomorphous with cassiterite and rutile, and

Fig. 1.

Fig. 2.

like them may occur in geniculated twins. There is no distinct cleavage, and the mineral breaks with a conchoidal fracture. The hardness is about 7-5. It is notable that the specific gravity has a very wide range, extending from

*a little below 4 to rather more than 4*7, and being thus greater than that of any other gem-stone. Rarely colourless, zircon is usually brown or red, sometimes orange, yellow or green, and occasionally parti -coloured or zoned. Whilst common zircon is opaque, the gem-varieties are transparent. The dichroism of coloured zircons is always feeble; the double refraction usually strong and of positive sign; and the optical properties of some zircons suggest a biaxial mineral. It was pointed out long ago by Sir A. H. Church that many transparent zircons afford a spectrum*

marked by certain absorption-bands, a property perhaps due to the presence of uranium.

The effect of heat on zircon is remarkable. Most coloured zircons, exposed to a high temperature, either change or lose their colour, but this loss is attended by a gain in brilliancy. The " Matura diamonds " of Ceylon are zircons which have been thus artificially decolorized. Certain zircons when heated in a Bunsen-flame glow with an orange incandescence, whilst others may emit an orange glow when ground on a copper- wheel fed with diamond-dust. Even exposure to sunlight will sometimes modify the colour and lustre of a zircon. Some zircons sufTer contraction when heated, so that the specific gravity becomes raised; but the behaviour of zircons in this respect shows such anomalies that S. Stevanovic has been led to suggest the existence of three classes of zircon. One group has a specific gravity of 4-0 and another of 4-7, both remaining un- changed in density when heated. L. J. Spencer, who has studied some remarkable crystals from Ceylon, calls the former a-zircon, and the latter /3-zircon. A third class has specific gravity between 4-0 and 4-7, and increases in density on heating. These stones consist, according to Spencer, of an inter- growth of a-zircon or /3-zircon, with a third unstable modifica- tion which he distinguishes as 7-zircon,

Whilst zircon is usually regarded as a zirconium silicate (ZrSiO) it is sometimes placed with the oxides as consisting of ZrCVSiO?. A small proportion of ferric oxide seems to be always present, and to this the colour of zircon, according to G. Spezia, may be ascribed. Traces of so many elements have been recorded in certain zircons that it was at one time pro- posed to call the species polycrasilite from the Greek ttoKvs (many) and Kpaais (mixture). Zircon is used as a source of zirconia in various preparations, for incandescent gas- mantles, &c. It was in this mineral that zirconia was originally discovered by M. H. Klaproth in 1789.*

Zircon fit for use as a gem-stone is often known as " noble " or " precious zircon." The red and orange stones are termed hyacinth (g.v.) and jacinth, whilst those of other colours, as also the colourless transparent zircons, are called jargoon (q.v.). The lyncurium of the ancients, described as an amber- coloured stone used for signets, is supposed by some authorities to have been zircon and by others amber. The gem varieties of zircon are found in detrital deposits, especially in Ceylon and in New South Wales, where they accompany sapphire, &c. They occur also in the Anakie sapphire district, near Emerald, in Queensland. A. K. Coomaraswamy has pointed out that most of the stones in the gem-gravels of Ceylon, known locally as toramalli, are zircons rather than tourmalines.

Zircon is an accessory constituent of many rocks, especially granite, where it appears to have crystallized at an early stage of consolidation. In microscopic sections, viewed by transmitted light, the zircon by virtue of its high refractive power appears to stand out in relief. It forms an important constituent of the zircon-syenite of Norway. Zircon occurs also in many basic eruptive rocks, notably the basalts of the Rhine and Central France. Being but little subject to alteration, it is common in secondary deposits, as in auriferous and other sands, occurring usually in small characteristic crystals, with rounded angles. Fine crystals of zircon are found in the ilmen Mountains in Russia, and in Renfrew co., Ontario, where it occurs in crystalline limestone. Many localities in the United States yield zircon, especially in New York state and in North Carolina : it has been largely worked in Henderson co., N.C. Zircon occurs also in Tasmania. Certain varieties of zircon have received distinctive names, such as the azorite, which occurs in sanidine-trachyte in the Azores. Several other minerals seem to be altered zircon, generally hydrated, such as malacon, cyrtolite and oerstedite, the last being a Norwegian mineral containing titanium and magnesium. Auerbachitc is a Russian mineral closely related to zircon. (F. W. R.)*

ZIRCONIUM [symbol Zr, atomic weight oo-6 (0=i6)], a metallic chemical element. Klaproth in 1789 analysed the mineral zircon or hyacinth and found it to contain a new earth, which he called (t zirconia." The metal was obtained by Berzelius as an iron-grey powder by heating potassium zircono- fluoride with metallic potassium. The amorphous metal also results when the chloride is heated with sodium; the oxide reduced with magnesium; or when fused potassium zircono-

fluoride is electrolysed (Wedekind, Zeit. Elektrockem., 1904, 10, p. 331). Troost produced crystallized zirconium by fusing the double fluoride with aluminium in a graphite crucible at the temperature of melting iron, and extracting the aluminium from the melt with hydrochloric acid. It is more conveniently prepared by heating the oxide with carbon in the electric

furnace. The crystals look like antimony, and are brittle, and so hard as to scratch glass and rubies; their specific gravity is 4-25. The powdery metal burns readily in air; the crystalline metal re- quires to be heated in an oxyhydrogen flame before it catches fire. Mineral acids generally attack the crystallized metal very little even in the heat; aqua regia, however, dissolves it readily, and so docs hydrofluoric acid. In its chemical affinities zirconium resembles titanium, cerium and thorium; it occurs in company with these elements, and is tetravalent in its more important salts.

*Zirconium oxide or zirconia, Zr02, has become important since its application to the manufacture of mantles for incandescent gas-lighting. For its extraction from zircon the mineral is heated and quenched in water to render it brittle, and then reduced to a fine powder, which is fused with three to four parts of acid potassium fluoride in a platinum crucible. When the mass is quietly fusing, the crucible is heated for two hours in a wind-furnace. The porcelain-like melt is powdered, boiled with water, and acidified with hydrofluoric acid, and the residual potassium fluosilicate is filtered off. The filtrate on cooling deposits crystals of potassium zirconofluoride, K 2 ZrFe, which are purified by crystallization from hot water. The double fluoride is decomposed with hot concen- trated sulphuric acid; the mixed sulphate is dissolved in water; and the zirconia is precipitated with ammonia in the cold. The precipitate, being difficult to wash, is (after a preliminary washing) re-dissolved in hydrochloric acid and re-precipitated with ammonia. Zirconium hydroxide, Zr(OH)4, as thus obtained, is quite appre- ciably soluble in water and easily in mineral acids, with formation of zirconium salts, e.g. ZrCU. But, if the hydroxide is precipitated in the heat, it demands concentrated acids for its solution. The hydroxide readily loses its water at a dull red heat and passes into anhydride with vivid incandescence. Zirconia can be obtained crystalline, in a form isomorphous with cassiterite and rutile, by fusing the amorphous modification with borax, and dissolving out with sulphuric acid. The anhydrous oxide is with difficulty soluble even in hydrofluoric acid ; but a mixture of two parts of concen- trated sulphuric acid and one of water dissolves it on continued heating as the sulphate, Zr(SQi) 2 . Zirconia, when heated to white- ness, remains unfused, and radiates a fine white light, which sug- gested its utilization for making incandescent gas mantles; and, in the form of disks, as a substitute for the lime-cylinders ordi- narily employed in " limelight." Zirconia, like stannic and titanic oxides, unites not only with acids but also with basic oxides. For instance, if it be fused with sodium carbonate, sodium zirconate, Na2ZrOg, is formed. If the carbonate be in excess, the salt Na4ZrO< results, which when treated with water gives Na 2 ZrsOi7 * i2H 2 O p which crystallizes in hexagonal plates. When heated in a loosely covered crucible with magnesium the nitride Zrˆ Ng is formed (Wedekind, Zeit. anorg. Ckem., 1905, 45, p. 385).*

Zirconium hydride, ZrH 2l is supposed to be formed when zirconia is heated with magnesium in an atmosphere of hydrogen. Zirconium fluoride, ZrF$, is obtained as glittering monoclinic tables (with 3H2O) by heating zirconia with acid ammonium fluoride. It forms double salts, named zircono- fluorides, which are isomorphous with the stanni- and titan i- fluorides. Zirconium chloride, ZrCU, is pre- pared as a white sublimate by igniting a mixture of zirconia and charcoal in a current of chlorine. It has the exact vapour-density corresponding to the formula. It dissolves in water with evolution of heat; on evaporation a basic salt, ZrOCl 2 -8H 2 0, separates out in star-shaped acicular aggregates. Zirconium bromide, ZrBr4, is formed similarly to the chloride. Water gives the oxybromide ZrOBr 2 . Zirconium iodide, Zrl, was obtained as a yellow, micro- crystalline solid by acting with hydriodic acid on heated zirconium (Wedekind, Ber., 1904, 37, p. 1135). It fumes in air; with water it gives ZrOIa-SHsO; and with alcohol ethyl iodide and zirconium hydroxide are formed. The iodide combines with liquid ammonia to form Zrl4-SNH 3 ; and with ether to give Zrl4-4(C 2 Hfi)aO. Zirconium combines with sulphur to form a sulphide, and with carbon to form several carbides. The sulphate, Zr(SO<) 2 , is a white mass obtained by dissolving the oxide or hydroxide in sulphuric acid, evaporating and heating the mass to nearly a red heat. Since it forms a series of double sulphates, Ruer (Zeit. anorg. Chem., 1904, 42, p. 87) regards it as a dibasic acid, ZrOSOrSCˆHj, and that the crystalline sulphate is Zr0SO4-S04H 3 '3H 3 O (not Zr(S04)2'4H 2 0). Zirconium also forms double sulphates of the type Zr a 3 (S0 4 M)2- wH 2 0, where M=K, Rb, Cs, and n=8 for K, 15 for Rb, 11 for Cs (Rosenheim and Frank, Ber., 1905, 38, p. 812). The atomic weight was determined by Marignac to be 90-03; I Bailey (Proc. Roy. Soc, 1890, 46, p. 74) deduced the value 89-95.*

ZIRKEL, FERDINAND (183S-), German geologist and petrographer, was born at Bonn on the 20th of May 1838. He was educated in his native town, and graduated Ph.D. at the university in 1861. In early years he was engaged in teaching geology and mineralogy in Vienna. He became professor of geology in 1863 in the university of Lemberg, in 1868 at Kiel, and in 1870 professor of mineralogy and geology in the university of Leipzig.

His numerous papers and essays include Geologische Skizze von der WestMste Schottlands (1871); Die Struklur der Variohte (1875); Microscopical Petrography (in Report of U.S. Geol. Exploration of 40th Par., vol. vi., 1876); Limurit aus der Vallee de Lesponne (1879); Vber den

Zirkon (1880). His separate works include Lehrbuch der Pelrographie (1866; 2nd ed. 1893, 1894); Die tmkro- skopische Beschaffenheit der Mineralim und Gesteine (1873).

ZITHER (Ger. Zither, ScUagzither, Streicheither ; Ital. cithara), a name applied in modern Germany to the ancient cithara (q.v.), to the cittern (q.v.), and to an instrument which is a kind of psaltery, consisting of a shallow sound-chest with ribs having the outline of a flattened jug (termed in German Flaschen- fortn, bottle-shape). In the centre of the sound-board is a rose sound-hole, and the finger-board with frets lies along the straight side of the zither in front of the performer. The number of the strings varies, but 36, 38 and 42 are the most usual. Over the finger-board are four or five strings known as violin, on which the melody is played. These five melody strings are stopped with the thumb and fingers of the left

12345 nand and P lucked with tne tnumb

■*g — -1 1 — – of the right hand, which usually*

has a thumb ring with plectrum. Nos. 1 and 2 are steel strings; No. 3 of brass, and 4 and 5 of spun wire; the bass is played with the fingers of the right hand, and in order to facilitate the . fingering the strings are tuned in fourths and fifths. Most of the other strings from the 6th are of gut. All the strings lie horizontally across the sound-board, being fastened in the usual manner to hitch and wrest pins. The zither is placed on the table in front of the performer, who holds his right arm so that the wrist rests on the side of the zither parallel with

No. 1 is only used for pas- sages in double notes and for chords.

the hitch pins, the thumb being over the finger-board.

The foregoing remarks apply to the discant and concert zither; the elegiac or bass zither is of similar construction but larger, and is a transposing instrument, having the same notation as the former, the real sounds being a fourth lower. These zithers are the favourite instruments of the peasants in the Swiss and Bavarian highlands, and are sometimes seen in the concert halls of north and western Germany. The Streichzither, or bowed zither, has a body of heart- or pear-shape similar to that of the cittern, but without the long neck of the latter. The finger-board covers the whole of the sound- board with the exception of a few inches at the tapering end, which is finished off with a raised nut or bridge, the bow being applied in the centre of this gap. The bowed zither has little feet and is placed on a table when being played. There are four strings corresponding to those of the violin or viola, but the tone is nasal and glassy. ,

The spelling of the word with a Z had already become usual in the early 17th century, for, although the instrument described above did not then exist, Cither was the name by which the cittern was known in Germany, and Michael Praetorius, writing m 1618, spells it with both " C " and " Z."

Z1TTAU, a town of Germany, in the kingdom of Saxony, on the left bank of the Mandau, near its confluence with the Neisse, close to the Bohemian and Silesian frontier, 25 m. by rail S.E. of Bautzen, 48 E.S.E. of Dresden and at the junction of lines to Reichenberg (in Bohemia), Eibau and Hermsdorf. Pop. (1905) 34,706. The town hall dates from 1844, and contains a beautiful hall with rich stained glass windows. Among the six Evangelical churches, the following are noticeable: that of St John, rebuilt in 1834-37, with twin spires, and the church of St Peter and St Paul, with its elegant tower, which formerly belonged to an old Franciscan monastery. The latter was restored in 1882 and part of it fitted up as an historical

museum. Another wing of this building contains the muni- cipal library of 40,000 volumes and valuable manuscripts; Zittau is well equipped with schools, including a. gymnasium and a commercial school, which are both accommodated in the Johanneum, and several technical institutions. There are also a theatre, well-equipped public baths and a richly endowed hospital. Zittau is one of the chief manufacturing towns of Saxony. The leading branch of industry is linen and damask weaving; but woollen stuffs, trimmings, &c, are also produced in the factories of the town, and in the surrounding weaving villages, sixty-six of which, with 113,455 (19°°) inhabitants, are included in the municipal jurisdiction. The corporation owns valuable forests on the mountains of Upper Lusatia and other estates, the annual income of which is about £15,000. There are various steam-

mills, iron-foundries, brick-fields and potteries near the town, and extensive deposits of lignite.

Zittau is of Wendish origin (Chytawa is its Wendish name), and was made a town by Ottocar II. of Bohemia. It was one of the six towns of the Lusatian League (1346), at which period it belonged to Bohemia. It suffered severely in the Hussite wars and in the Thirty Years' War, and was bombarded and burnt by the Austrians in 1757 during the Seven Years' War. The musical composer Marschner (1795-1861) was born at Zittau.

See Carpzov, Analecta fastorum Zittaviensium (Leipzig, 1716); Moschkau, Zittau und seine Vmgebung (5th ed., Zittau, 1893); and Lamprecht, Wegweiser durch Zittau und dasZiltauer Gebirge (Zittau,

1901).

ZITTEL, KARL ALFRED VON (1839-1904), German palae- ontologist, was born at Bahlingen in Baden on the 25th of September 1839. He was educated at Heidelberg, Paris and Vienna. For a short period he served on the Geological Survey of Austria, and as assistant in the mineralogical museum at Vienna. In 1863 he became teacher of geology and mineralogy in the polytechnic at Carlsruhe, and three years later he suc- ceeded Oppel as professor of palaeontology in the university of Munich, with the charge of the state collection of fossils. In 1880 he was appointed to the geological professorship, and eventually to the directorship of the natural history museum of Munich. His earlier work comprised a monograph on the Cretaceous bivalve mollusca of Gosau (1863-66); and an essay on the Tithonian stage (1870), regarded as equivalent to the Purbeck and Wealden formations. In 1873-74 he accompanied the Rohlfs expedition to the Libyan desert, the primary results of which were published in Uber den geolo- gischen Bau der Ubyscken Wiiste (1880), and further details in the Palaeontographica (1883). Dr Zittel was distinguished for his palaeontological researches. From 1869 until the close of his life he was chief editor of the Palaeontographica (founded in 1846 by W. Dunker and H. von Meyer). In 1876 he com- menced the publication cf his great work, Handbuch der Palaeon- tologie, which was completed in 1893 in five volumes, the fifth volume on palaeobotany being prepared by W. P. Schimper and A. Schenk. To make his work as trustworthy as possible Dr Zittel made special studies of each great group, commencing with the fossil sponges, on which he published a monograph (1877-79). I Q l8 95 h e i ssue d a summary of his larger work entitled Grundziige der Palaeontologie (ed. 2, part 1, Inverte- brata, revised by Dr Zittel in 1903; the American edition of 1900 by C. R. Eastman is so revised, sometimes in opposition to Zittel's views, as to be practically an independent work). He was author of Aus der Urseit (1873, ed. 2, 1875); and Die Sahara (1883). In 1899 he

published Geschichte der Geologie und Palaeontologie bis Ende des 19 Jahrhunderis, a monumental history of the progress of geological science (Eng. trans., Mrs Maria M. Ogilvie-Gordon, 1901). Dr Zittel was from 1899 president of the Royal Bavarian Academy of Sciences, and in 1894 he was awarded the Wollaston medal by the Geological Society of London. He died on the 5th of January 1904.

Obituary with portrait and bibliography, by Dr F. L. Kitchin, Geol. Mag. (February 1904).

ZIZKA, JOHN (c. 1376-1424), Bohemian general and Hussite leader, was born at Trocnov in Bohemia, of a family which belonged to the gentry. He took part in the civil wars in Bohemia in the reign of Wenceslaus IV., during which he lost one eye in a skirmish. He was from his youth connected with the court, and held the office of chamberlain to Queen Sophia. 2iika's name first became prominent when the Hussite movement began. When in 1419 a\ Hussite procession was stoned at Prague from the town hall, Zizka headed those who threw the town councillors from its windows. When a temporary armis- tice was concluded between the partisans of King Sigismund and the citizens of Prague, Zizka marched to Plzefi (Pilsen) with his followers, but soon left that city, and, after defeating at Sudomer the partisans of Sigismund, arrived at Tabor, the newly founded stronghold of the advanced Hussites. Zizka took a large part in the organization of the new military com- munity and became one of the four captains of the people (hejtmanc) who were at its head. Meanwhile Sigismund, king of the Germans and king of Hungary, invaded Bohemia, claiming the crown as the heir of his brother Wenceslaus. Menaced by Sigismund, the citizens of Prague entreated the Taborites for assistance. Led by Zizka and their other captains, the Taborites set out to take part in the defence of the capital. At Prague Zizka and his men took up a strong position on the hill then known as the Vitkov, on the spot where Zizkoz, a suburb of Prague, now stands. At the end of June (1420) the siege of the city began, and on the 14th of July the armies of Sigismund made a general attack. A strong German force assaulted the position on the Vitkov which secured the Hussite communications with the open country. Mainly through the heroism of Zizka, the attack was repulsed, and the forces cf Sigismund abandoned the siege. Shortly afterwards (August 22, 1420} the Taborites left Prague and returned to Tabor. Zizka was now engaged in constant warfare with the partisans of Sigismund, particularly with the powerful Romanist, Ulrich of Rosenberg. By this struggle, in which Zizka was invariably successful, the Hussites obtained possession of the greatest

part of Bohemia, which Sigismund now left for a time. It was proposed to elect a Polish prince to the throne; but meanwhile the estates of Bohemia and Moravia, who met at Caslav on the 1st of June 1421, decided to appoint a provisional government, consisting of twenty members chosen from all the political and religious parties of the country, Zizka, who took part in the deliberations at Caslav, being elected as one of the two representatives of Tabor. He summarily suppressed some disturbances on the part of a fanatical sect called the Adamites. He continued his campaigns against the Romanists and ad- herents of Sigismund; and having captured a small castle near Litomefice (Leitmeritz) he retained possession of it — the only reward for his great services that he ever received or claimed. According to the Hussite custom he gave the biblical name of " Chalice " to this new possession, and henceforth adopted the signature of il Zizka of the Chalice." Later, in 1421, he was severely wounded while besieging the castle of Rabi, and lost the use of his remaining eye. Though now totally blind, he continued to command the armies of Tabor. At the end of 142 1 Sigismund, again attempting to subdue Bohemia, obtained possession of the important town of Kutna Hora (Kuttenberg). Zazka, who was at the head of the united armies of Tabor and Prague, at first retreated to Kolin; but after having received reinforcements he attacked and defeated Sigismund's army at the village of Nebovid between Kolin and Kutna Hora (January 6, 1422). Sigismund lost 12,000 men and only escaped himself by rapid flight. Sigismund's forces made a last stand at Nemecky Brod (Deutschbrod) on the 10th of January, but the city was stormed by the Bohemians, and, contrary to Zrzka's orders, its defenders were put to the sword. Early in 1423 internal dissensions among the Hussites led to civil war. Zizka, as leader of the Taborites, defeated the men of Prague and the Utraquist nobles at Horic on the 27th of April; but shortly afterwards the news that a new crusade against Bohemia was being prepared, induced the Hussites to

conclude an armistice at Konopist on the 24th of June 142$. As soon, however, as the so-called crusaders had dispersed with- out even attempting to enter Bohemia, the internal dissensions broke out afresh. During his temporary rule over Bohemia Prince Sigismund Korybutovic of Poland had appointed as governor of the city of Kralove Hradec (Koniggratz) Borek, lord of Miletinek, who belonged to the moderate Hussite, the so-called Utraquist, party. After the departure of the Polish prince the city of Kralove Hradec, in which the democratic party now obtained the upper hand, refused to recognize Borek as its ruler, and called Zizka to its aid. He acceded to the demand and defeated the Utraquists under Borek at the farm of Strachov, near the city of Kralove Hradec (August 4, 1423). Zizka now attempted to invade Hungary, which was under the rule of his old enemy King Sigismund. Though this Hungarian campaign was unsuccessful

owing to the great superiority of the Hungarians, it ranks among the greatest military exploits of Zizka, on account of the skill he displayed in retreat. In 1424, civil war having again broken out in Bohemia, Zizka decisively defeated the Praguers and Utraquist nobles at Skalic on the 6th of January, and at Malesov on the 7th of June. In September he marched on Prague, but on the 14th of that month peace was concluded between the Hussite parties through the influence of John of Rokycan, afterwards Utraquist arch- bishop of Prague. It was agreed that the now reunited Hussites should attack Moravia, part of which country was still held by Sigismund's partisans, and that Zizka should be the leader in this campaign. But he died of the plague at Pribyslav (October 11, 1424) before reaching the Moravian frontier.

See Count LiUzow, Bohemia: an Historical Sketch (London 1896) ; Louis Leger, Jean Zizka in " Nouvelles eludes Slaves," deuxieme strie (Paris, 1886), the best account of Zizka's career for those unacquainted with the Bohemian language; Tomek, Jan Zizka, and Dejepis Mesta Prahy; Palacky, History of Bohemia. Zizka is the hero of a novel by George Sand, of a German epic by Meissner, and of a Bohemian tragedy by Alois Jirasek. (L.)*

ZLATOUST, a town of Russia, in the government of Ufa, close to the river Ufa, in a picturesque valley of the middle Urals, 1925 ft. above sea level, 199 m. by rail E.N.E. of the town of Ufa. Pop. 20,973. The town has a first-class meteoro- logical and magnetical observatory, a cathedral and a museum; it is the seat of the mining administration for the Zlatoust district, and has a brisk trade in agricultural produce and manufactured wares.

ZNAIM (Czech Znojmo), a town of Austria, in Moravia, 50 m. S.W. of Briinn by rail. Pop. (1900) 16,261, mostly German. It is picturesquely situated on the left bank of the Thaya. The site of the former fortifications is occupied by a promenade. The Rauberturm is a relic of the old castle of the margraves of Moravia; the round castle-chapel, known as the heathen temple (Heiden-Tempel), in the Romanesque style of the 12th century, was at one time considered the most ancient building in Moravia. The Gothic church of St Nicholas was built about 1348 by the emperor Charles IV.; the town house, with a Gothic tower, 250 ft. high, dates from about 1446. The ancient and once powerful Premonstratensian abbey of Bruck, east of the town, is now occupied as barracks.

The present town of Znaim was founded in 1226 by Ottacar I. of Bohemia on the site of Znojmo, the ancient capital of the tributary margraves of Moravia, which had been destroyed in 1145. Znaim is best known to history for the armistice con- cluded here in 1809 after the battle of Wagram between Napoleon I. and the archduke Charles. In 1866 the

Prussians occupied the town from July 13th till September 3rd. The novelist Karl Postl (1793-1864), who wrote under the pseudonym of Charles Sealsfield, was born at Poppitz, i\ m. S.W.

ZOBEIR RAHAMA (1830-), Egyptian pasha and Sudanese governor, came of the Gemaab section of the Jaalin, and was a member of a family which claims descent from the Koreish tribe through Abbas, uncle of Mahomet. He became prominent as the most energetic and intelligent of the Arab ivory and slave traders who about i860 established Ujsmselves

on the White Nile and in the Bahr-el-Ghazal. Nominally a subject of Egypt, he raised an army of several thousand well- armed blacks and became a dangerous rival to the Egyptian authorities. At the height of his power Zobeir was visited (1871) by Georg Schwcinfurth, who found him " surrounded with a court which was little less than princely in its details" {Heart of Africa, vol. ii., chap. xv.). In i86<;an expedition sent from Khartum into the Bahr-el-Ghazal was attacked by Zobeir and completely defeated, its commander being slain. Zobeir represented that he was blameless in this matter, received a " pardon," and was himself appointed governor of the Bahr- el-Ghazal, where he was practically independent. In 1873 he attacked the sultan of Darfur, and the khedive Ismail gave him the rank of bey and sent troops to co-operate. After he had conquered Darfur (1874), Zobeir was made a pasha, but he claimed the more substantial reward of being made governor-general of the new province, and went to Cairo in the spring of 1876 to press his title. He was now in the power of the Egyptian authorities, who prevented his return, though he was allowed to go to Constantinople at the outbreak of the Russo- Turkish War. In 1878, however, his son Suleiman, having got possession of the Bahr-el-Ghazal, and acting on instructions from his father, defied the authority of General Gordon, the new governor- general of the Sudan. Gordon sent Romolo Gessi against Suleiman, who was subdued after an arduous campaign and executed. Duiing the campaign Zobeir offered, if he were allowed to return to the Sudan, to restore order and to pay a revenue of £25,000 a year to the khedive. Gordon declined this help, and subsequently, for his instigation of the revolt, Zobeir was condemned to death, but the trial was a farce, the sentence was remitted, and he remained at Cairo, now in high favour with the khedival court. In March 1884, Gordon, who had been sent to Khartum to effect, if possible, the relief of the Egyptian garrisons in the Sudan, astonished Europe by requesting that Zobeir, whose son he had overthrown and whose trade he had ruined, should be sent to Khartum as his successor. 1 Zobeir, described

by Sir Reginald Wingate, who knew him well, as " a quiet, far-seeing, thoughtful man of iron will — a born ruler of men " (Mahdiism and the Egyptian Sudan, book v.), might have been able to stem the mahdist movement. But to re- instate the notorious slave-dealer was regarded in London as too perilous an expedient, even in the extreme circumstances then existing, although Colonel Stewart (Gordon's companion in Khartum), Sir Evelyn Baring and Nubar Pasha in Cairo, and Queen Victoria and Mr Gladstone, all favoured such a course. In March 1885 Zobeir was arrested in Cairo by order of the British government for treasonable correspondence with the mahdi and other enemies of Egypt, and was interned at Gibraltar. In August 1887 he was allowed to return to Cairo, and after the reconquest of the Sudan was permitted (1890) to settle in his native country. He established himself on his estates at Geili, some 30 m. N. of Khartum.

See Gordon, Charles George, and the authorities there cited.

ZODIAC (6 fadiaKos kvk\os, from $&hiov } " a little animal "), in astronomy and astrology, an imaginary zone of the heavens within which lie the paths of the sun, moon and prin- cipal planets. It is bounded by two circles equidistant from the ecliptic, about eighteen degrees apart; and it is divided into twelve signs, and marked by twelve constellations. These twelve constellations, with the symbols of the signs which corre- spond to them, are as follows: —

Libra, the Balance ˆ

Scorpio, the Scorpion Tfi

Sagittarius, the Archer yft

Capricornus, the Goat v3

Aquarius, the Water-carrier skj

Pisces, the Fishes x

Aries, the Ram

r

Taurus, the Bull

tr

Gemini, the Twins

M

Cancer, the Crab

60

Leo, the Lion

Q,

Virgo, the Virgin

W

1 Gordon and Zobeir met in Cairo on the 25th and 26th of January (see Egypt No. 12 of 1884) and Gordon from that time onward asked for Zobeir's help. It was not, however, until the loth of March that his wish was made public, in a telegram from Khartum published in The Times.

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The signs — the Greek Saˆe/carˆjuopia — are geometrical divisions thirty degrees in extent, counted from the spring equinox in the direction of the sun ; s progress through them. The whole series accordingly shifts westward through the effect of precession by about one degree in seventy-two years. At the moment of crossing the equator towards the north the sun is said to be at the first point of Aries; some thirty days later it enters Taurus, and so on through Gemini, Cancer, Leo, Virgo, Libra, Scorpio, Sagittarius, Capricornus, Aquarius and Pisces. The constellations bearing the same names coincided approxi- mately in position, when Hipparchus observed them at Rhodes, with the divisions they designate. The discrepancy now, how- ever, amounts to the entire breadth of a sign, the sun's path in Aries lying among the stars of Pisces, in Taurus among those of Aries, &c.

Assyria and Babylonia.— The twelvefold division of the zodiac was evidently suggested by the occurrence of twelve full moons in successive parts of it in the course of each year. This ap- proximate relation was first systematically developed by the early inhabitants of Mesopotamia, and formed the starting- point for all their divisions of time. As the year separated, as it were of itself, into twelve months, so the day was divided into twelve " double hours," and the great cosmical period of 43,200 years into twelve " sars." Each sar, month and hour was represented at once visibly and symbolically by a twelfth part of the " furrow " drawn by the solar Bull across the heavens. The idea of tracing the sun's path among the stars was, when it occurred to Chaldaean astronomers, an original and, relatively to their means, a recondite one. We owe to its realization by them the constitution and nomenclature of the twelve signs of the zodiac. Assyrian cylinders and inscriptions indicate for the familiar series of our

text-books an antiquity of some four thousand years. Ages before Assur-bani-pal reigned at Nineveh the eighth month (Marchesvan) was known as' " the month of the star of the Scorpion," the tenth (Tebet) belonged to the " star of the Goat," the twelfth (Adar) to the " star of the Fish of Ea." 2 The motive underlying the choice of symbols is in a few cases obvious, but in most remains conjectural. The attributes of the deities appointed to preside over the months and signs were to some extent influential. Two of them, in-deed, took direct possession of their respective portions of the sky. The zodiacal Virgo is held to represent the Assyrian Venus, Ishtar, the ruling divinity of the sixth month, and Sagittarius the archer-god Ncrgal, to whom the ninth month was dedicated. But no uniform system of selection was pur- sued; or rather perhaps the results of several systems, adopted at various epochs, and under the influence of varying currents of ideas, became amalgamated in the final series.

This, there is reason to believe, was the upshot of a preˆ historic reform. So far as positive records go, Aries was always the first sign. But the arrangement is, on the face of it, a comparatively modern one. None of the brighter stars of the constellation could be said even roughly to mark the equinox much before 1800 B.C.; during a long stretch of previous time the leading position belonged to the stars of Taurus. 3 Numerous indications accordingly point to a corresponding primitive zodiac. Setting aside as doubtful evidence derived from interpretations of cuneiform inscriptions, we meet, in connexion with Mithraic and Mylittic legends, reminiscences of a zodiac and religious calendar in which the Bull led the way, 4 Virgil's

Candidus auratis aperit cum cornibus annum Taurus

perpetuates the tradition. And the Pleiades continued, within historical memory, to be the first asterism of the lunar zodiac.

2 Lcnormant, Origines de VHisioire, i. 236.

3 The possibility should not, however, be overlooked that the " stars of the months " were determined by their heliacal risings (see Bosanquet and Sayce on Babylonian astronomy, in Monthly Notices Roy. Astr. Soc'. xl. 117). This would give a further exten- sion backwards of over 1000 years, during which the equinox might have occurred in the month of the Ram.

1 J. B. F. Lajard, Recherches sur le Culte de Mithra, p. 605.

In the Chaldaean signs fragments of several distinct strata of thought appear to be embedded. From one point of view they shadow out the great epic of the destinies of the human race; again, the universal solar myth claims a share in them; hoary traditions were brought into ex post facto connexion with them; or they served to commemorate simple meteorological and astronomical facts.

The first Babylonian month Nisan, dedicated to Ami and Bel, was that of "sacrifice"; and its association with the Ram as the chief primitive object of sacrifice is thus intelligible. 1 According to an alternative explanation, the heavenly Ram, placed as leader in front of the flock of the stars, merely em- bodied a spontaneous figure of the popular imagination. An antique persuasion, that the grand cycle of creation opened under the first sign, has. been transmitted to modem cognizance by Dante (Inf. i. 38). The human race, on the other hand, was _ supposed to have come into being under Taurus. The

" or ° ' solar interpretation of the sign goes back to the far- off time when the year began with Taurus, and the sun was conceived of as a bull entering upon the great furrow of heaven as he ploughed his way among the stars. In the third month and sign the building of the first city and the em a . f ra tricidal brothers — theRomulus and Remusof Roman legend — were brought to mind. The appropriate symbol was at first indifferently a pile of bricks or two male children, always ,, on early monuments placed feet to feet. The retro-

grade movement of a crab typified, by an easy asso- ciation of ideas, the retreat of the sun from his farthest northern excursion, and Cancer was constituted the sign of the summer solstice. The Lion, as the symbol of fire, ' represented the culmination of the solar heat. In

the sixth month, the descent of Ishtar to Hades in search of her lost husband Tammuz was celebrated, and the sign of the Virgin had thus a purely mytho- logical signification.

The history of the seventh sign is somewhat complicated. The earlier Greek writers — Eudoxus, Eratosthenes, Hip- parchus — knew of only eleven zodiacal symbols, but made one do double duty, extending the Scorpion across the seventh and eighth divisions. The Balance, obviously indicating the equality of day and night, is first mentioned as the sign of the Libra autumnal equinox by Geminus and Varro, and ob-

and tained, through Sosigenes of Alexandria, official re-

Scar P kh cognition in the Julian calendar. Nevertheless, Virgil (Georg. i.

32) regarded the space it presided over as so much waste land, provisionally occupied by the " Claws " of the Scorpion, but readily available for the apotheosis of Augustus. Libra was not of Greek invention. Ptolemy, .who himself chiefly used the " Claws " (XijXai), speaks of it as a distinctively Chaldaean sign; 2 and it occurs as an extra- zodiacal asterism in the Chinese sphere. An ancient Chinese law, moreover, prescribed the regularization of weights and measures at the spring equinox. 1 No representation of the seventh sign has yet been discovered on any Euphratean monu- ment ; but it is noticeable that the eighth is frequently doubled, 4 and it is difficult to avoid seeing in the pair of zodiacal scorpions carved on Assyrian cylinders the prototype of the Greek scorpion and claws. Both Libra and the sign it eventually superseded thus owned a Chaldaean birthplace. The struggle of rival systems of nomenclature, from which our zodiacal series resulted, is plainly visible in their alternations; and the claims of the competing signs were long sought to be conciliated by representing the Balance as held between the claws of the Scorpion.

The definitive decline of the sun's power after the autumnal

1 Sayce, Transactions of the Society of Biblical Archaeology, iii.

162.

2 In citing a Chaldaean observation of Mercury dating from 235 B.C. (Almagest, ii. 170. ed. Halma).

3 See Vranographit Chinoise, by Gustav Schlegel, who, however, claims an extravagant antiquity for the Chinese constellational system.

- *Lenormant, Origines, i. 267.*

equinox was typified by placing a Scorpion as the symbol of darkness in the eighth sign. Sagittarius, figured later as a Centaur, stood for the Babylonian Mars. Capricornus Sagtt- the sign of the winter solstice, is plausibly connected t&rius, with the caprine nurse of the young solar god in Oriental legends, of which that of Zeus and Amalthia is a Capri- variant. 5 The fish-tailed Goat of the zodiac presents comas. a close analogy with the Mexican calendar sign Cipactli, a kind of marine monster resembling a narwhal. 6 Aquarius is a still more exclusively meteorological sign than Leo. The eleventh month was known in Euphratean regions as that of " want and rain." The deluge was tradi- tionally associated with it. ' It was represented in zodiacal symbolism by the god Ramman, crowned with a tiara and pouring water from a vase, or more generally by the vase and water without the god. The resumption of agricultural labours after the deluge was commemorated in the twelfth month, and a mystical association

of the fishes, which were its pk™. sign, with the life after death is evident in a monu- ment of Assyrian origin described by Clermont-Ganneau, showing a corpse guarded by a pair of fish-gods.' The doubling of the sign of Pisces still recalls, according to Sayce, 8 the arrange- ment of the Babylonian calendar, in which a year of 360 days was supplemented once in six years by a thirteenth month, a second Adar. To the double month corresponded the double sign of the " Fishes of Hea." 9

Cyclical Meaning of the Succession of Signs. — The cyclical meaning of the succession of zodiacal signs, though now ob- scured by interpolations and substitutions, was probably once clear and entire. It is curiously reflected in the adventures of the Babylonian Hercules, the solar hero Gilgamesh (see GlL- gamesh, Epic or). They were recorded in the comparatively late surviving version of the 7th century B.C., on twelve tablets, with an obvious design of correlation with the twelve divisions of the sun's annual course. Gilgamesh's conquest of the divine bull was placed under Taurus; his slaying of the tyrant Khum- baba (the prototype of Geryon) in the fifth month typified the victory of light over darkness, represented in plastic art by the group of a lion killing a bull, which is the form ordinarily given to the sign Leo on Ninevite cylinders. "> The wooing of Ishtar by the hero of the epic falls under Virgo, and his encounter with two scorpion men, guardians of the rising and the setting sun, under Scorpio. The eleventh tablet narrates the deluge; the twelfth associates the apotheosis of Eabani with the zodiacal emblems of the resurrection.

In the formation of the constellations of the zodiac little regard was paid to stellar configurations. The Cbaldaeans chose three stars in each sign to be the " councillor gods " of the planets. 11 These were called by the Greeks " decans," because ten degrees of the ecliptic and ten days of the year were presided over by each. The college of the decans was con- ceived as moving, by their annual risings and settings, in an " eternal circuit " between the infernal and supernal regions. Modern asterisms first appear in the Phaenomena of Eudoxus about 370 B.C. But Eudoxus, there is reason to believe, con- sulted, not the heavens, but a celestial globe of an anterior epoch, on which the stars and the signs were forced into un- natural agreement. The representation thus handed down (in the verses of Aratus) has been thought to tally best with the state of the sky about 2000 B.C.; 12 and the mention of a pole- star, for which Eudoxus was rebuked by Hipparchus, seems, as W. T. Lynn pointed out," to refer to the time when a Draconis

s Lenormant, Origines, i. 267.

"Humboldt, Vues des Cordilleres (1810), p. 157.

7 Rev. Archeol. (1879), p. 344.

8 Trans. Soc. Bibl. Archaeol., iii. 166.

9 The god Ea or Hea, the Oannes of Berossus, equivalent to the fish-god Dagon, came to the rescue of the protagonist in the Chal- daean drama of the deluge.

10 Lenormant, Origines, i. 240.

11 Diod. Sic., Hist., ii. 30, where, however, by an obvious mistake the number of " councillor gods " is stated at only thirty.

12 R. Brown, Babylonian Record, No. 3, p. 34.

13 Babylonian Record, No. 5, p. 79.

stood near the pole. The data afforded by Eudoxus, however, are far too vague to serve as the basis of any chronological conclusion.

Egyptian Zodiacal Signs. — The Egyptians adopted from the Greeks, with considerable modifications of its attendant sym- bolism, the twelve-fold division of the zodiac. Aries became the Fleece; two Sprouting Plants, typifying equality or resem- blance, stood for Gemini; Cancer was re-named Scarabaeus; Leo was converted, from the axe-like configuration of its chief stars, into the Knife: Libra into the Mountain of the Sun, a reminiscence, apparently, of the Euphratean association of the seventh month with a " holy mound," designating the biblical tower of Babel. A Serpent was the Egyptian equi- valent of Scorpio; the Arrow only of Sagittarius was retained; Capricornus became " Life," or a Mirror as an image of life; Aquarius survived as Water; Taurus, Virgo and Pisces re-mained unchanged. 1 The motive of some of the substitutions was to avoid the confusion which must have ensued from the duplication of previously existing native asterisms; thus, the Egyptian and Greek Lions were composed of totally different stars. Abstractions in other cases replaced concrete objects, with the general result of effacing the distinctive character of the Greek zodiac as a " circle of living things."

Spread of Greek System. — Early Zoroastrian writings, though impregnated with star-worship, show no traces of an attempt to organize the heavenly array. In the Bundahish, however (9th century), the twelve " Akhtars," designated by the same names as our signs, lead the army of Ormazd,

while the seven "Awakhtars" or planets (including a meteor and a comet) fight for Ahriman. The knowledge of the solar zodiac thus turned to account for dualistic purposes was undoubtedly de- rived from the Greeks. By them, too, it was introduced into Hindustan. Aryabhata, about the beginning of the Christian era, reckoned by the same signs as Hipparcbus. They were transmitted from India by Buddhist missionaries to China, but remained in abeyance until the Jesuit reform of Chinese astronomy in the 17th century.

Chinese Zodiacal Signs. — The native Chinese zodiacal system was of unexampled complexity. Besides divisions into twenty- eight and twenty-four parts, it included two distinct duodenary series. The tse or " stations " were referred by E. C. Biot to the date nil B.C. Measured from the winter solstice of that epoch, they corresponded, in conformity with the Chinese method of observation by intervals of what we now call right ascension, to equal portions of the celestial equator. 2 Projected upon the ecliptic, these were considerably unequal, and the tse accordingly differed essentially from the Chaldaean and Greek signs. Their use was chiefly astrological, and their highly figurative names — " Great Splendour," " Immense Void," "Fire of the Phoenix," &c. — had reference to no particular stars. They became virtually merged in the European series, stamped with official recognition over two centuries ago. The twenty-four tsieki' or demi-Zˆe were probably invented to mark the course of weather changes throughout the year. Their appellations are purely meteorological.

The characteristic Chinese mode of dividing the " yellow road " of the sun was, however, by the twelve " cyclical animals " — Rat, Ox, Tiger, Hare, Dragon or Crocodile, Serpent, Horse, Sheep, Monkey, Hen, Dog, Pig. The opening sign corresponds to our Aquarius, and it is remarkable that the rat is, in the far East, frequently used as an ideograph for "water." But here the agreement ceases. For the Chinese scries has the strange peculiarity of proceeding in a retrograde direction or against the course of the sun. Thus, the second sign (of the Ox) occupies the position of Capricorn, the third that of Sagittarius, and so on. The explanation of this seeming anomaly is to be found in the primitive destination of the " animals " to the purposes of an "horary zodiac." Their succession, established to mark the hours of day and night, was not unnaturally

1 Brugsch, Z. D. M. C, ix. 513.

5 Biot, Journ. des Savans, 1839, p. 729, and 1840, p. 151; Gaubil, Hist, de VAstr. Chinoise, p. 9.

associated with the diurnal revolution of the sphere from east to west. 3 They are unquestionably of native origin. Tradition ascribes their invention

to Tajao, minister of the emperor Hwang-ti, who reigned c. 2697 B.C., and it can scarcely be placed later than the 7th century B.C. 4

The Chinese circle of the " animals " obtained early a wide diffusion. It was adopted by Tatars, Turks and Mongols, in Tibet and Tong-king, Japan and Korea. It is denominated by Humboldt 5 the "zodiac of hunters and-shepherds," and he adds that the presence in it of a tiger gives it an exclusively Asiatic character. It appears never to have been designed for astronomical employment. From the first it served to char- acterize the divisions of time. The nomenclature not only of the hours of the day and of their minutest intervals was supplied by it, but of the months of the year, of the years in the Oriental sixty-year cycle, and of the days in the " little cycle " of twelve days. Nor has it yet fallen into desuetude. Years " of the Rat," "of the Tiger," " of the Pig," still figure in the almanacs of Central Asia, Cochin China and Japan.

Aztec Zodiacal Signs. — A large detachment of the " cyclical animals " even found its way to the New World. Seven of the twenty days constituting the Aztec month bore names evidently borrowed from those of the Chinese horary signs. The Hare (or Rabbit), Monkey, Dog and Serpent reappeared without change; for the Tiger, Crocodile and Hen, unknown in America, the Ocelot, Lizard and Eagle were substituted as analogous. The Aztec calendar dated from the 7th century; but the zodiacal tradition embodied by it was doubtless much more ancient. Of the zodiac in its true sense of a partitioned belt of the sphere there was no aboriginal knowledge on the American continent. Mexican acquaintance with the signs related only to their secondary function as dies (so to speak) with which to stamp recurring intervals of time.*

Lunar Zodiac. — The synodical revolution of the moon laid down the lines of the solar, its sidereal revolution those of the lunar zodiac. The first was a circlet of "full moons"; the second marked the diurnal stages of the lunar progress round the sky, from and back again to any selected star. The moon was the earliest " measurer " both of time and space; but its services can scarcely have been rendered available until stellar " milestones " were established at suitable points along its path. Such were the Hindu nakshatras, a word originally signifying stars in general, but appropriated to designate certain small stellar groups marking the divisions of the lunar track. They exhibit in an exaggerated form the irregularities of dis-tribution visible in our zodiacal constellations, and present the further anomaly of being frequently reckoned as twenty-eight in number, while the ecliptical arcs they characterize are in- variably twenty-seven. Now, since the moon revolves round the earth in 27ˆ days, hesitation between the two full numbers might easily arise; yet the real explanation of the difficulty appears to be different. The superfluous asterism, named Abkijit, included

the bright star a Lyrae, under whose influence the gods had vanquished the Asuras. Its invocation with the other nakshatras, remoteness from the ecliptic notwithstanding, was thus due (according to Max Muller's plausible conjecture) 7 to its being regarded as of especially good omen. Acquaintance with foreign systems of twenty-eight lunar divisions tended doubtless to fix its position, which remained, nevertheless, always equivocal. 8 Alternately admitted into or rejected from the series, it was finally, some six or seven centuries ago, eliminated by the effects of precession in reversing the order of culmination of its limiting stars.

The notion of a twenty-seven-fold division of the zodiac was deeply rooted in Hindu tradition. The number and the name were in early times almost synonymous. Thus a nakshatra-ntdla

3 Humboldt, Vues des CordiUeres, p. 168.

- *G. Schlegel, Ur. Chin., pp. 37, 561. 5 Op. cit., p. 219.*

6 Ibid., p. 152 ; Prescott, Conquest of Mexico, hi. 321 (ed. i860).

7 Rig-Veda Samhita, vol. iv. (1862), Preface, p. lxii.

8 Whitney, Journ. Am. Orient. Soc., viii. 394.

denoted a necklace of twenty-seven pearls; 1 and the funda- mental equality of the parts was figured in an ancient legend, by the compulsion laid upon King Soma (the Moon) to share his time impartially between all his wives, the twenty-seven daughters of Prajapati. Everything points to a native origin for the system of nakshatras. Some were named after ex- clusively Vedic deities; they formed the basis of the sacrificial calendar of the Brahmins; the old Indian names of the months were derived from them; their existence was pre-supposed in the entire structure of Hindu ritual and science. 2 They do not, however, obtain full recognition in Sanskrit literature until the Brahmana period (7th or 8th century B.C.). The Rig-Veda contains only one allusion to them, where it is said that " Soma is placed in the lap of the nakshatras " ; and this is in a part including later interpolations.

Positive proof of the high antiquity of the Hindu lunar zodiac is nevertheless afforded by the undoubted fact that the primitive series opened with Krittika (the Pleiades) as the sign of the vernal equinox. The arrangement would have been correct about 2300 B.C.; it would scarcely

have been possible after 1800 B.C. 3 We find nowhere else a well-authenticated zodiacal sequence corresponding to so early a date. The reform by which Krittika, now relegated to the third place, was superseded as the head of the series by " Acvini" 4 was accomplished under Greek influence somewhere near the beginning of the Christian era. For purposes of ritual, however, the Pleiades, with Agni or " Fire " as their presiding deity, continued to be the first sign. Hindu astronomy received its first definite organization in the 6th century, with results embodied in the Surya-Siddhdnta. Here the " signs " and the " constellations " of the lunar zodiac form two essentially distinct systems. The ecliptic is divided into twenty-seven equal parts, called bhogas or arcs, of 800′ each. But the nakshatras are twenty-eight, and are represented by as many "junction stars" {yogatara), carefully determined by their spherical co-ordinates. The successive entries of the moon and planets into the nakshatras (the ascertainment of which was of great astrological importance) were fixed by means of their conjunctions with the yogdtdras. These, however, soon ceased to be observed, and already in the nth century, al- Biriini could meet with no Hindu astronomer capable of point- ing out to him the complete scries. Their successful identifi- cation by Colebrooke 5 in 1807 had a purely archaeological interest. The modern nakshatras are twenty-seven equal ecliptical divisions, the origin of which shifts, like that of the solar signs, with the vernal equinox. They are, in fact, the bhogas of the Surya-Siddhdnta. The mean place of the moon in them, published in all Hindu almanacs, is found to serve un except ion ally the ends of astral vaticination. 6

The system upon which it is founded is of great antiquity. Belief in the power of the nakshatras evidently inspired the invocations of them in the Atharva-Veda. In the Brahmana period they were distinguished, as " deva " and " yama," the fourteen lucky asterisms being probably associated with the waxing, the four- teen unlucky with the waning moon. 7 A special nakskatra was appropriated to every occurrence of life. One was propitious to marriage, another to entrance upon school-life, a third to the first ploughing, a fourth to laying the foundation of a house. Festivals for the dead were appointed to be held under those that included but one star. Propitiatory abstinences were recommended when the natal asterism was menaced by un- favourable planetary conjunctions. The various members of the body were parcelled out among the nakshatras, and a rotation of food was prescribed as a wholesome accompaniment of the moon's revolution among them. 8

1 Max M tiller, op. cit., p. lxiv. 2 Ibid., p. 42.

3 A. Weber, Indische Stud-ien. x. 241.

4 Named from the Acvins, the Hindu Castor and Pollux. It is composed of the stars in the head of Aries, and is figured by a horse's head. 5 As. Res., ix. 330.

6 J. B. Biot, Jztudes sur I'Astronomie Indicnne, p. 225.

7 A. Weber, " Die Vedischen Nachrichten von den Naxatra," in Berliner Abhandlungen (1861), p. 309.

8 Ibid., p. 322; H. Kern, Die Yogatara des Varamihira ; W r eber's Ind. Stud., xv. 1 74-181.

The nomenclature of the Hindu signs of the zodiac, save as regards a few standard asterisms, such as AQvini and Krittika, was far from uniform. Considerable discrepancies occur in the lists given by different authorities. 9 Hence it is not sur- prising to meet in them evidence of foreign communications. Reminiscences of the Greek signs of Gemini, Leo, Libra, Sagit- tarius, Capricornus and Pisces are obvious severally in the Hindu Two Faces, Lion's Tail, Beam of a Balance, Arrow, Gazelle's Head (figured as a marine nondescript) and Fish, The correspondence does not, however, extend to the stars; and some coincidences adverted to by Humboldt between the nakshatras and the zodiacal animals of Central Asia are of the same nominal character. 10 Mexican loans are more remarkable. They were apparently direct as well as indirect. The Aztec calendar includes nakskatra titles borrowed, not only through the medium of the Tatar zodiac, but likewise straight from the Indian scheme, apart from any known intervention. The " three footprints of Vishnu," for example, unmistakably gave its name to the Mexican day Ollin, signifying the " track of the sun"; and both scries further contain a "flint weapon/' a "stick," and a "house." 11 Several houses and couches were ranged along the Hindu zodiac with the naive idea of providing resting-places for the wandering moon.

Relative Antiquity of Hindu, Chinese and Arabian Systems. — Relationship of a more intimate kind connects the Hindu lunar mansions with those of the Arabs and Chinese. The resem- blance between the three systems is indeed so close that it has been assumed, almost as axiomatic, that they must have been framed from a single model. It appears nevertheless to have become tolerably clear that the nakshatras were both native to India, and the sieu to China, but that the manazil were mainly of Indian derivation. The assertion, paradoxical at first sight, that the twenty-eight " hostelries " of the Chinese sphere had nothing to do with the moon's daily motion, seems to convey the actual fact. Their number, as a multiple of four, was pre- scribed by the quaternary partition of the heavens, funda^- mental in Chinese astronomy. It was considered by Biot to have been originally

twenty-four, but to have been enlarged to twenty-eight about 1100 B.C., by the addition of determinants for the solstices and equinoxes of that period. 12 The essential difference, however, between the nakshatras and the sieu is that the latter were equatorial, not ecliptical, divisions. They were measured by the meridian-passages Gf the limiting stars, and varied in amplitude from 2 42′ to 30 24′ } z The use of the specially observed stars constituting or representing the sieu was as points of reference for the movements of sun, moon and planets. They served, in fact, and still serve (though with astrological ends in view), the precise purpose of " fundamental stars " in European astronomy. All that is certainly known about the antiquity of the sieu is that they were well established in the 3rd century B.C. Their initial point at the autumnal equinox marked by Kio (Spica Virginis) suits a still later date; and there is no valid evidence that the modern series resulted from the rectification of an older superannuated arrangement, analogous to the Krittika sequence of nakshatras. The Hindu zodiacal constellations belong then to an earlier epoch than the Chinese " stations," such as they have been transmitted to our acquaintance. Yet not only were the latter an independent invention, but it is almost demonstrable that the nakshatras, in their more recent organization, were, as far as possible, assimilated to them. The whole system of junction stars was doubtless an imitation of the sieu; the choice of them by the Hindu astronomers of the 6th century a.d. was plainly instigated by a consideration of the Chinese fist, compiled with a widely different intent. "Where they varied from it, some intelligible reason can generally be assigned for the change. Eight junc- tion stars lie quite close to, seven others are actually identical with, Chinese determinants; u and many of these coincidences

9 Sir William Jones, .As. Res., , ii. 294-95.

10 Humboldt, Vues des Cordilleres, p. 154. u Ibid., p. 152.

12 Biot, Journ. des Savans (1845), p. 40.

13 G. Schlegel, Ur. Chin., p. 77. u Biot, Eludes, p. 136.

are between insignificant and, for the purposes of ecliptical division, inconveniently situated objects.

Arabian Mansions of the Moon. — The small stellar groups characterizing the Arab " mansions of the moon " {manazil al- kamdr) were more equably distributed than either the Hindu or Chinese series. They presented,

nevertheless, striking re- semblances to both. Twenty-four out of twenty-eight were formed, at least in part, of nakshatra or sieu stars. 1 That the Arab was essentially a copy of the Hindu lunar zodiac can scarcely admit of doubt. They were divided on the same principle; each opened at the spring equinox; the first Arab sign Sharatan was strictly equivalent to the Hindu Ajvini; and eighteen constellations in each were virtually coincident. The model of the sieu was, however, also regarded. Eighteen Chinese determinants were included in the Arab asterisms, and of these five or six were not nakshatra .stars; consequently, they must have been taken directly from the Chinese series. Nor were the Greek signs without effect in determining the names of the manazil? the late appearance of which, in a complete form, removes all difficulty in accounting for the various foreign influences brought to bear upon them. They were first enumerated by Alfarghani early in the gth century, when the Arabs were in astronomy the avowed disciples of the Hindus. But, although they then received perhaps their earliest quasi- scientific organization, the mansions of the moon had for ages previously figured in the popular lore of the Bedouin. A set of twenty-eight rhymes associated their heliacal risings with the changes of season and the vicissitudes of nomad life; their settings were of meteorological and astrological import; 3 in the Koran (x. 5) they are regarded as indispensable for the reckoning of time. Yet even this intimate penetration into the modes of thought of the desert may be explained by prehistoric Indian communication. The alternative view, advocated by Weber, that the lunar zodiac was primitively Chaldaean, rests on a very shadowy foundation. It is true that a word radically identical with manazil occurs twice in the Bible, under the forms mazzaloth and mazzaroth (2 Kings xxiii. 5; Job xxxviii. 32); but the heavenly halting-places which it seems to designate may be solar rather than lunar. Euphratean exploration has so far brought to light no traces of ecliptical partition by the moon's diurnal motion, unless, indeed, zodiacal associations be claimed for a set of twenty-eight deprecatory formulae against evil spirits inscribed on a Ninevite tablet. 4

The safest general conclusions regarding this disputed subject appear to be that the sieu, distinctively and unvaryingly Chinese, cannot properly be described as divisions of a lunar zodiac, that the nakshatras, though of purely Indian origin, became modified by the successive adoption of Greek and Chinese rectifications and supposed improvements; while the manazil constituted a frankly eclectic system, in which elements from all quarters were combined. It was adopted by Turks, Tatars and Persians, and forms part of the astronomical paraphernalia of the Bundahish.- The sieu, on the other hand, were early naturalized in Japan.

Astrological Systems. — The refined system of astrological predic- tion based upon the solar zodiac was invented in Chaldaca, obtained a second

home and added elaborations in Egypt, and spread irre- sistibly westward about the beginning of the Christian era. For genethliacal purposes the signs were divided into six solar and six lunar, the former counted onward from Leo, the " house " of the sun. the latter backward from the moon's domicile in Cancer. Each planet had two houses — a solar and a lunar — distributed according to the order of their revolutions. Thus Mercury, as the planet nearest the sun, obtained Virgo, the sign adjacent to Leo, with the corresponding lunar house in Gemini; Venus had Libra (solar) and Taurus (lunar) ; and so for the rest. A ram frequently stamped on coins of Antiochus, with head revered towards the moon and a star (the planet Mars), signified Aries to be the lunar house oi_ Mars. With the respective and relative positions in the zodiac of the sun, moon and planets, the character of their action

1 Whitney, Notes to Siirya-Siddhanta, p. 200.

2 Ibid., p. 206.

3 A. Sprenger, Z. D. M. G., xiii. 161; BirflrJ, Chronology, trans, by Saehau (London, 1879), p. 336 seq.

4 Lenormant, Chaldean Magic, p. I.

on human destiny varied indefinitely. The influence of the signs, though secondary, was hence overmastering: Julian called them flew Swiijuay, 5 and they were the objects of a corresponding veneration. Cities and kingdoms were allotted to their several patronage on a system fully expounded by Manilius : —*

Hos erit in fines orbis pontusque notandus, Quern Deus in partes per singula dividit astra, Ac sua cuique dedit tutelae regna per orbem, Et proprias gentes atque urbes addidit altas, In quibus exercent praestantia sidera vires. 5 Syria was assigned to Aries, and Syrian coins frequently bear the effigy of a ram ; Scythia and Arabia fell to Taurus, India to Gemini. Palmyra, judging from numismatic evidence, claimed the favour of Libra, Zeugma that of Capricorn; Leo protected Miletus, Sagit- tarius Singara. 7 The " power of the signs " was similarly dis- tributed among the parts of the human body : —

Et quanquam communis eat tutela per omne Corpus, et in proprium divisis artubus exit: Namqiie aries capiti, taurus eervicibus haeret; Brachia sub geminis censentur, pectora cancro. 3

Warnings were uttered against surgical treatment of a member through whose sign the moon happened to be passing ; 9 and zodiacal anatomy was an indispensable branch of the healing art in the Middle Ages. Some

curious memorials of the superstition have survived in rings and amulets, engraven with the various signs, and worn as a kind of astral defensive armour. Many such, of the 14th and 15th centuries, have been recovered from the Thames. 10 Individuals, too, adopted zodiacal emblems. Capricornus was impressed upon the coins ot Augustus, Libra on those of Pythodoris, queen of Pontus ; a sultan of Iconium displayed Leo as his " horoscope " and mark of sovereignty; Stephen of England chose the protection of Sagittarius.

*Egyptian Astrology. — In Egypt celestial influences were con- sidered as emanating mainly from the thirty-six " decans " of the signs. They were called the " media of the whole circle of the zodiac"; u each ten-day period of the Egyptian year was con- secrated to the decanal god whose section of the ecliptic rose at its commencement; the body was correspondingly apportioned, and disease was cured by invoking the zodiacal regent of the part affected." As early as the 14th century B.C. a complete list of the decans was placed among the hieroglyphs adorning the tomb of Seti I.; they figured again in the temple of Rameses II., 13 and characterize every Egyptian astrological monument. Both the famous zodiacs of Dendera display their symbols, unmistakably identified hy Lepsius. The late origin of these representations was established by the detection upon them of the cartouches of Tiberius and Nero. As the date of inception of the circular zodiac now at Paris the year 46 B.C. has, however, been suggested with high probability, from (among other indications) the position among the signs of the emblem of the planet Jupiter." Its design was most likely to serve as a sort of thema coeli at the time of the birth of Caesarion. The companion rectangular zodiac still in situ on the portico of the temple of Isis at Dendera suits, as to constella- tional arrangements, the date 29 a.d. It set forth, there is reason to believe, the natal scheme, not of the emperor Tiberius, as had been conjectured by Lauth," but of the building it served to decorate. The Greek signs of the zodiac, including Libra, are obvious upon both these monuments, which have thrown useful light upon the calendar system and method of stellar grouping of the ancient Egyptians. 1 **

Planispheres. — An Egypto-Greek planisphere, first described by Bianchini, 17 resembles in its general plan the circular zodiac of Dendera. The decans are ranged on the outermost of its five concentric zones; the. planets and the Greek zodiac in duplicate occupy the next three; while the inner circle is unaccountably reserved for the Chinese cyclical animals. The relic was dug up on the Aventine in 1705, and is now in the Louvre. It dates from the 2nd or 3rd century A.o. The Tatar zodiac is not unfrequently found engraven on Chinese mirrors in polished bronze or steel of the 7th century, and figured on the " plateau of the twelve hours "

5 " Orat. in Solem," Op., i. 148 (ed. 1696).

6 Astr., bk. iv. ver. 696 seq.

7 Eckhel, Descriptio Nummorum Antiochiae Syriae, pp. 18, 25.

8 Manilius, Astr., bk. iv. ver. 702-5.

9 A. J. Peirce, Science of the Stars, p. 84.

10 Journ. Arch. Soc. xiii. 254, 310, and xx. 80.

11 In a fragment of Hermes translated by Th. Taylor at p. 362 of his version of Iamblichus.

12 Pettigrew, Superstitions Connected with Hist, of Medicine, p. 30.

13 Lepsius, Chronologie der Aegypter, part i. p. 68.

14 Ibid., p. 102.

lfi Les Zodiaques de Denderah, p. 78.

16 See Kiel's Das feste Jahr von Denderah (1878).

17 Mem. de V Acad., Paris, 1708, Hist., p. no; see also Hum- boldt, Vues des CordilUres, p. 170; Lepsius, op. cit., p. 83; Frohner, Sculpture du Louvre, p. 17.

in the treasury of the emperors of the Tang dynasty. 1 Probably the most ancient zodiacal representation in existence is a fragment of a Chaldaean planisphere in the British Museum, once inscribed with the names of the twelve months and their governing signs. Two only now remain. 2

A zodiac on the " astrological altar of Gabies " in the Louvre illustrates the apportionment of the signs among the inmates of the Roman Pantheon; 3 and they occur as a classical reminiscence in the mosaic pavements- of San Miniato and the baptistery at Florence, the cathedral of Lyons, and the crypt of San Savino at Piacenza. 4 Zodiacal symbolism became conspicuous in medieval art. Nearly all the French cathedrals of the 12th and 13th centuries exhibit on their portals a species of rural calendar, in which each month and sign has its corresponding labour. The zodiac of Notre Dame of Paris, opening with Aquarius, is a noted instance. 5 A similar series, in which sculptured figures of Christ and the Apostles are associated with the signs, is to be seen in perfect preservation on the chief

doorway of the abbey church at Vezelay. The cathedrals of Amiens, Sens and Rheims are decorated in the same way. In Italy the signs and works survive fragmentarily in the baptistery at Parma, completely on the porch of the cathedral of Cremona and on the west doorway of St Mark's at Venice, They are less common in England; but St Margaret's, York, and the church of Ifftey in Oxfordshire offer good specimens. In the zodiac of Merton College, Oxford, Libra is represented by a judge in his robes and Pisces by the dolphin of Fitzjamcs, warden of the college, 1482-1507. The great rose-windows of the Early Gothic period were frequently painted with zodiacal emblems; and some frescoes in the cathedral of Cologne contain the signs, each with an attendant angel, just as they were depicted on the vault of the church at Mount Athos. Giotto's zodiac at Padua was remarkable (in its undisturbed condition) for the arrangement of the signs so as to be struck in turns, during the corresponding months, by the sun's rays.' 1 The "zodiac of labours" was replaced in French castles and hotels by a " zodiac of pleasures," in which hunting, hawking, fishing and dancing were substituted for hoeing, planting, reaping and ploughing. 8*

It is curious to find the same sequence of symbols employed for the same decorative purposes in India as in Europe. A perfect set of signs was copied in 1764 from a pagoda at Verdapettah near Cape Comorin, and one equally complete existed at the same period on the ceiling of a temple near Mindurah."

The hieroglyphs representing the signs of the zodiac in astrono- mical works are found in manuscripts of about the 10th century, but in carvings not until the 15th or 16th. 10 Their origin is unknown; but some, if not all of them, have antique associations. The hiero- glyph of Leo, for instance, occurs among the symbols of the Mithraic worship. 11

See also the article Astrology, and the separate articles on the constellations. The whole subject of the history of the zodiac is very obscure. See generally Franz Boll, Sphaera (Leipzig, 1903); also the bibliographies to Astrology and Babylonian and Assyrian Religion. (A. M. C.)

ZODIACAL LIGHT, a faint illumination of the sky, sur- rounding the sun and elongated in the direction of the ecliptic on each side of the sun. It is lenticular in form, brightest near the sun, and shades off by imperceptible gradations, generally becoming invisible at a distance of oo° from the sun. Until a recent time it was never observed except in or near the zodiac; hence its designation. Its breadth varies with the time and place of observation, depending upon the position of the ecliptic with respect to the horizon. In the tropics, where the ecliptic is nearly perpendicular to the horizon, it may be seen after the end of twilight on every clear evening, and

before

I Schlegel, Ur. Chin., p. 561 ; Pettigrew, Journ. Arch. Soc, viii. 2t.

a Fox Talhot. Trans. Soc. Bibl. Archaeol. iv. 260.

5 Menard, La Mythologic dans V Art, p. 388. 4 Fowler, Archaeologia, xliv. 172.

b Viollet-le-Duc, Diet, de V Arch. Francaise, ix. 551; Le Gentil, Mem. de V Acad., Paris. 1785, p. 20.

6 Fowler, Archaeologia, xliv. 150. 7 Ibid., p. 175.

8 Viol! et-le- Due, Diet, de V Arch., ix. 551.

9 John Call. Phil. Trans, lxii. 353. CF. Houzeau, Bibliographic Astronomique, vol. i. pt. i. p. 136, where a useful sketch of the general results of zodiacal research will be found.

10 R. Brown, Archaeologia, xlvii. 341; Sayce, in Nature, xxv.

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II See Lajard, Culte de Mithra, pi. xxvii. fig. 5, &c. The actual symbol y can be carried back to about 250 B.C. (see Journal of the Asiatic Society of Bengal, vol. 50 (1881), 171, No. 20, and plate 17, No. 6) ; it occurs there with an Assyrian winged hull. But there is nothing to prove that it there, or elsewhere, means Taurus; it is found, in the same early period, with a lion as well as with a bull — on coins, seals, &c.

twilight on every clear morning, unless blotted out by moon- light. It then presents a nearly vertical wedge-shaped form, the base of which extends 15 or 20 on each side of the point at which the ecliptic intersects the horizon. The point of the wedge is quite indefinite, the extremely diffuse light gradually fading into invisibility at a height which may range from 50 to 70° or even more, according to the keenness of the observer's vision. The boundary everywhere is ill defined so that no exact statement of the extent of the light can be made. The brightness is at its maximum along its central line, called the axis of the light. Along this axis the brightness continually increases as the sun is approached. Owing to the softness of the outline, it is not possible to fix the position of the axis with precision; but, so far as observations have been made, it is found that it lies near the ecliptic, though deviating from it by a quite sensible amount.

Having this position, the conditions of visibility will be best when the

ecliptic, and therefore the axis of the light, are nearly perpendicular to the horizon, and, as the angle between the ecliptic and horizon becomes acute, will deteriorate, slowly at first, mote and more rapidly afterwards, owing to the increasing effect of atmospheric absorption. This effect is enhanced by the light being brighter as we approach the sun. More and more of the brighter regions of the light will then be near the horizon the more acute the angle. The result is that the light can be only indistinctly seen when the angle with the horizon is less than 45 , unless in a region where the atmosphere is un- usually clear. From this statement of the conditions it will be seen that the tropical zone is the most favourable for observa- tion, and that the most favourable hour of the day at which the light can be seen must always be the earliest after sunset and the last before sunrise. Practically this is when twilight is first ended in the evening, and about to begin in the morning. At these hours the angle of the ecliptic with the horizon varies with the season. At the close of evening twilight the angle is greatest about three weeks before the vernal equinox. The months of February and March are therefore best for the evening observations in the northern hemisphere, but the light can generally be seen from January until April. Similar favourable conditions prevail in the morning from September to November.

It is clear that the light proceeds from a region surrounding the sun, and lenticular in form, the axis of the lens being nearly perpendicular to the ecliptic, while the circumference extends at least to the orbit of the earth. If it did not extend so far as this it could not be seen as frequently as it is at a distance of go° from the sun. The accompanying figure shows the form of the outline, as it would appear to an observer on an outer planet were the light of the sun cut off. The hypothesis which best explains all the phenomena is that the light is that of the sun reflected from an extremely tenuous cloud of particles having the form and extent described, and becoming more and more tenuous as the earth's orbit is approached until, immediately outside the orbit, it fades into complete invisibility. The fact that the light widens out toward the sun leads to the inference that it entirely surrounds the sun. It is therefore of interest to test this inference by observations at midnight in such a lati- tude that the distance of the sun below the horizon is no more than necessary to preclude the possibility of twilight. Such an opportunity is offered when the sun is near the summer solstice, in latitudes not differing much from 50 north. A transparent atmosphere and clear horizon are necessary, conditions which can best be secured on a mountain top. The visibility of a light corresponding to the inference was shown by Simon Newcomb, by observations at the top of the Brienzer Rothorn, in 1905. Previously to this, E. E. Barnard had observed the same phenomenon at Chicago. The only source of doubt as to the validity of the conclusion that this is really the zodiacal light arises from

the possibility that, after the close of the ordinarily recognized twilight, there may be a faint illumination arising from the reflection of light by the very rare upper atmosphere, shown by the phenomena of meteors to extend some hundred miles or more above the earth's surface. The problem of

separating a possible effect produced in this way from the zodiacal light proper may seem to offer some difficulty. But the few observations made show that, after ordinary twilight has ended in the evening, the northern base of the zodiacal light extends more and more toward the north as the hours pass until, towards midnight, it merges into the light of the sky described by the two observers mentioned. Yet more conclusive are the observations of Maxwell Hall at Jamaica, who reached con- clusions identical with those of Barnard and Ncwcomb, from observations of the base of the light at the close of twilight, which he estimated at 6o° in the line through the sun.

These observations show that the outline on that portion of the light commonly seen in the morning or evening is concave instead of convex, as it would be were the cloud strictly lenti- cular. The actual outline of the cloud is that of which a section through the sun is shown in the figure. Since the tenuous edge of the lens extends beyond the earth's orbit it follows that there must be some zodiacal light, whether it can be seen or not, passing entirely across the sky, along or near the ecliptic. Observations of this zodiacal band are therefore of great interest. It has been seen to stretch across the sky at midnight by several observers, especially Barnard, to whom it appears 3 to 4 wide. He found it to be best seen during the months of October, November and May.

Intimately connected with this band and with the zodiacal light is the Gegenschein, or counter-glow, a faint illumination of the sky in the region opposite the sun, which may generally be seen by a trained eye when all the conditions are favourable. Unfavourable conditions are moonlight, nearness to the Milky Way, and elevation of the light above the horizon (and there- fore a depression of the sun below the horizon) of less than 20 , and the presence in the region of any bright planet. The Milky Way renders the object invisible during the months of June, July, December and January. Its light is so faint and diffuse that it is impossible to assign dimensions to it, except to say it covers a region of several degrees in extent. Barnard, the most successful observer, assigns diameters of 5 or even io° or more. From what has been said of its position it is evident that the zodiacal band, when seen across the sky, must include it. It may

therefore be regarded as an intensification of this band, possibly produced by the increased intensity of the light when reflected nearly back toward the sun, and therefore toward the earth. From the description given of the zodiacal band and the Gegenschein, it is clear that these objects should be best seen at the highest elevation, especially within the tropics. But the only well-authenticated observations we have of this kind show anomalies which have never been cleared up. This is especially the case with those of Chaplain George Jones, who spent eight months at Quito, Peru, at an elevation of more than 9000 ft., for the express purpose of observing the pheno- menon in question. He saw the zodiacal band at midnight as a complete arch spanning the sky, agreeing in this point with the observations of Barnard. One anomaly of his ob- servations is his description of the arch as sometimes so bright

as to resemble the Milky Way, a condition which would make it easily visible at ordinary altitudes. Another anomaly is that he never saw the Gegenschein, but describes the band as equally bright in all its parts, except near the horizon. We are there- fore forced to the conclusion that either he must have been a quite untrustworthy observer, or that there are anomalies in the phenomena which are yet to be explained.

The latter possibility is also suggested by the curious fact that the visibility of the light does not seem to be proportional

to the transparency of the atmosphere. Barnard reports it as sometimes best seen when the sky is slightly milky, while during the observations already mentioned from the Rothorn the Gegenschein was scarcely, if at ail, visible, though the conditions were exceptionally favourable. It has even been said that observers at great elevations have failed to see the zodiacal light; but it is scarcely credible that this failure could arise from any other cause than not knowing what it was or where to look for it. Moreover, it has been well seen by Hansky from the observatory on the summit of Mont Blanc.

In studying the causes of the phenomenon, we must clearly distinguish between the apparent form as seen from the earth, and the real form of the lenticular- shaped cloud. The former refers to the earth, which is continually changing the point of view of the observer as he is carried around the sun. while the latter relates to the invariable position of the matter which reflects the light. First in importance is the question of the position of the principal plane, passing through the sun, and containing the circumferential regions of the cloud. This plane must be near, but riot coincident with, that of the ecliptic. It has therefore a node and a certain inclination to the ecliptic. The determination of these elements requires that, at some point within the tropics where the atmosphere is clear, observa- tions of the position of the axis of the light among the stars should

be made from time to time through an entire year. In view of the simplicity of the necessary appliances, and of the small amount of labour that would be required, we find a singular paucity of such observations. The most elaborate attempt in the required direction was made by the American chaplain, George Jones, during a voyage of the "Mississippi " in the Pacific Ocean, in 1852-54. Owing to the varying latitude of the ship, and the fact that the observer attempted to draw curves of equal brilliancy instead of the central line, the- required conclusions cannot be drawn with certainty from these observations. More recently Maxwell Hail in Jamaica made a satisfactory deter- mination during the months from January to March, July and October, and carefully discussed his results. But the observa- tions do not extend continuously throughout the year, and do not include a sufficient length of the central line on each evening to enable us to distinguish certainly the heliocentric latitude of the central line, as distinct from its apparent geocentric position. Yet his observations are of the first importance as showing the smallncss of the deviation of the central line from the ecliptic. When smoothed out, the maximum latitude is less than 3°, which seems to preclude the coincidence of the central plane of the light with that of the sun's equator. Hall also reaches the interesting conclusion that the plane in question seems to lie near the invariable plane of the solar system, a result which might be expected if the light proceeded from a swarm of independent meteoric particles moving around the sun. Chaplain Jones concluded, from his observations at Quito, that the central line of f he arch made an angle of 3° 20′ with the ecliptic, the ascending node being in Taurus, near longitude 62 . This is about 40 from the ascending node of the invariable plane, so that there is a well-marked deviation of his results from those of Hall.

Yet more divergent are the conclusions of Francis J. Bayldon, R.N.R., who made many observations while on voyages through the Pacific Ocean between Australia and the west coast of North America. He places the ascending node at the vernal equinox, and assigns an inclination of 4 . He found that as the ob- server moved to the north or south the axis of the light appeared to be displaced in the direction of the motion, which is the op- posite of the effect due to parallax, but in the same sense as the effect of the greater atmospheric absorption of the light on the side nearest the horizon. He also describes the moon as adding to the zodiacal light during her first and last quarters, a result so difficult to explain that it needs confirmation. It is noteworthy that he could see the zodiacal band across the entire sky during the whole of every very clear moonless night in tropical regions.

If we accept the general conclusion already drawn as to the

form and boundary of the region from which the light emanates, the next question is that of the matter sending it forth. The most plausible view is that we have to do with sunlight reflected from meteoric particles moving round the sun within the region of the lens. The polariscope and the spectroscope are the only instruments by the aid of which the nature of the matter can be inferred. The evidence afforded by these instruments is not, however, altogether accordant. In 1867, Angstrom, observing at Upsala in March, obtained the bright auroral line (WX. 5567), and concluded that in the zodiacal light there was the same material as is found in the aurora and in the solar corona, and probably through all space. Upsala, however, is a place where the auroral spectrum can often be observed in the sky, even when no aurora is visible, and it has generally been believed that what Angstrom really saw was an auroral and not a zodiacal spectrum.

Professor A. W. Wright, of New Haven, also made careful cbservations leading to the conclusion that the spectrum differs from sunlight only in intensity. Some evidence has also been found by the same observer of polarization, showing that a considerable portion of the light must be reflected sunlight. The observations of Maxwell Hall also embraced some made with the spectroscope. He was unable to see any marked deviation of the spectrum from that of the sun; but it does not appear that either he or any other of the observers dis- tinctly saw the dark lines of the solar spectrum. Direct proof that we have to do with reflected sunlight is therefore still incomplete.

The question whether the Gegenschein can be accounted for by the reflection of light from the same matter as the zodiacal band is still unsettled. Taking the general consensus of the observations it would seem that its light must be so much brighter than that of the band as to imply the action of some different cause. In this connexion may be mentioned the in- genious suggestion of S. Arrhenius, that the phenomenon is due to corpuscles sent off by the earth and repelled by the sun in the same way that they are sent off from a comet and form its tail, in other words, the light may be an exceedingly tenuous cometary tail to the earth, visible only because seen through its very great length. The view that no cause intervenes addi- tional to that producing the zodiacal band is strengthened, though not proved, by a theorem due to F. R. Moulton of Chicago. He shows that, supposing the cloud of particles to move around the sun in nearly circular orbits immediately outside the earth, the perturbations by the earth in the motion of the particles will result in their retardation in that part of the orbit nearest the earth, and therefore in their always being more numerous in a given space in this part of the orbit than in any other. This view certainly accounts for some intensifica- tion of the light, to which

may be added the intensification produced by the vertical reflection of the. sunlight.

A new interest was given to the subject by the investigations of H. H. Seeliger, published in 1906, who showed that the observed excess of motion of the perihelion of Mercury may be accounted for by the action of that portion of the matter re- flecting the zodiacal light, which lies nearest to the sun. Plaus- ible though his result is, the subject still requires investigation. It seems not unlikely that the final conclusion will be that instead of the reflecting matter being composed of solid particles it is an exceedingly tenuous gaseous envelope surrounding the sun and revolving on an axis the mean position of which is between that of the sun's equator and that of the invariable plane of the solar system.

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ZOFFANY, JOHANN (1733-1810), British painter, whose father was architect to the prince of Thurn and Taxis, was born in Frankfort-on-Main. He ran away from home at the age of thirteen and went to Rome, where he studied art for nearly twelve years. In 175S he left for England, and after

under- going some hardships was brought into fashion by royal patronage, and in 1769 was included among the foundation members of the Royal Academy. He went to Florence in 1772 with an introduction from George III. to the grand duke of Tuscany, and did not return until 1779. During this second stay in Italy he met with much success, and was commanded by the empress Maria Theresa to paint a picture of the royal family of Tuscany; this work he executed so much to the satisfaction of the empress that in 177S he was created a baron of the Austrian empire. He went next to India, where he lived from 1783 to 1790, to which period belong some of his best- known paintings; but the last twenty years of his life were spent in England. He died in 1810 and was buried in Kew churchyard. His portrait groups of dramatic, celebrities are, perhaps, the most highly esteemed of his many productions; they have considerable technical merit and show much shrewd insight into character. Several of the best arc in the Garrick Club, London.

ZClLUS (c 400-320 B.C.), Greek grammarian of Amphipolis in Macedonia. According to Vitruvius (vii., preface) he lived during the age of Ptolemy Philadelphus (285-247 B.C.), by whom he was crucified as the punishment of his criticisms on the king. This account, however,, should probably be rejected. Zoilus appears to have been at one time a follower of Isocrates, but sub- sequently a pupil of Polycrates, whom he heard at Athens, where he was a teacher of rhetoric. Zoi'lus was chiefly known for the acerbity of his attacks on Homer (which gained him the name of Homeromastix, " scourge of Homer "), chiefly directed against the fabulous element in the Homeric poems. Zoilus also wrote against Isocrates and Plato, who had attacked the style of Lysias of which he approved. The name Zoilus came to be generally used of a spiteful and malignant critic.

See LI. Friedlander, De Zoilo aliisque Homeri Obtrectatoribus. (Kdnigsbcrg-, 1895); J. E. Sandys, History of Classical Scholarship (2nd ed. 190G).

ZOISITE, a rock-forming mineral, consisting of basic calcium and aluminium silicate, Ca 2 (AK)H)Al 2 (Si04)3, crystallizing in the orthorhombic system. It is closely related to cpidote (q.v.) both in the angles of the crystals and in chemical composition: a zoisite containing some iron replacing aluminium may be identical in composition with an epidote (" clinozoisite ") poor in iron. The crystals are prismatic in habit and are deeply furrowed parallel to their length; terminal planes are rare; there is a perfect cleavage parallel to the brachy-pinacoid. Columnar and compact masses are more common. The hard- ness is 6ˆ and the specific gravity 3-25-3-37. The colour is often grey; a rose-red variety, known as " thulite," occurs with sky-blue vesuvianite at Telemarken in Norway, and has been used to a limited extent as an ornamental stone. Accord- ing to

differences in the optical characters, two kinds nf zoisite have been distinguished. Zoisite is a product of dynamo- metamorphism, and occurs as a constituent of some crystalline

schists, such as amphibolite and eclogite. It was first observed by Baron Zois (after whom it was named) in the eclogite of Sau-Alpe in Carinthia; other localities are the Ducktown copper mines in Tennessee, where it occurs embedded in chalcopyritc; Loch Garve in Ross-shire, &c. The " saus-surite " of the Alps and elsewhere, which has resulted from the alteration of the plagioclasc felspar of gabbro, consists largely of zoisite with epidote. (L. J. S.)

ZOLA, EMILE EDOUARD CHARLES ANTOINE (1840-1902), French novelist, was born in Paris on the 2nd of April 1S40, his father being an engineer, part Italian and part Greek, and his mother a Frenchwoman. The father seems to have been an energetic, visionary man, who, dying while his only son was a little lad, left to his family no better provision than a lawsuit against the municipality of the town of Aix It was at Aix, which figures as Plassans in so many of his novels, that the boy received the first part of his education. Thence he proceeded, in 1858, to Paris, where, as later at Marseilles, he failed to obtain his bachelor's degree. Then came a few years of terrible poverty; but at the beginning of 1862 he obtained a clerkship, at the modest salary of a pound a week, in the house of Hachette the publisher. Meanwhile he was writing apace, but nothing of particular merit. His first book, Conks a Ninon, appeared on the 24th of October 1864, and attracted some attention, and in January 1866 he determined to abandon clerking and take to literature. Vigorous and aggressive as a critic, his articles on literature and art in Villemessant's paper L'Evine-ment created a good deal of interest. So did the gruesome but powerful novel, Therese Raquin (1867). Meanwhile, with characteristic energy, Zola was projecting something more im- portant: the creation of a world of his own, like that of Balzac's Comedie Humaine — the history of a family in its various rami- fications during the Second Empire. The history of this family, the Rougon-Macquart, was to be told in a series of novels con-taining a scientific study of heredity — science was always Zola's ignis fatuus — and a picture of French life and society. The first novel of the series, La Fortune des Rougon, appeared in book form at the end of 1871. It was followed by La Curec (1874), Le Ventre de Paris (1874), La Conquete de Plassans (1875). La Faule de V AbbS Mouret (1875), Son Excellence Eugene Rougon (1876) — all books unquestionably of immense ability, and in a measure successful, but not great popular successes. Then

came L'Assommoir (1878?), the epic of drink, and the author's fortune was made. Edition followed edition. He became the most discussed, the most read, the most bought novelist in France — the sale of V Assommoir being even exceeded by that of Nana (1880) and La Debacle (1892). From the Fortune des Rougon to the Docteur Pascal (1893) there are some twenty novels in the Rougon-Macquart scries, the second half of which includes the powerful- novels Germinal (1885) and La Terre (1888). In 1888 Zola departed from his usual vein in the idyllic story of Le Reve. Zola also wrote a series of three romances on cities, ' Lourdes, Rome, Paris (1894-98), novels on the " gospels " of population (FSamditt) and work (Travail), a volume of plays, and several volumes of criticism, and other things. These books are based on study and observation; the novels are crowded with characters. The whole is a gigantic opus, the fruit of immense labour, of an admirable tenacity — so many pages written, morning after morning, without inter- mission, during some thirty years. He prided himself on his motto, Nulla dies sine linea.*

Zola was the apostle of the " realistic " or " naturalistic " school; but he was in truth not a "' naturalist " at all, in so far as " naturalism " is to be regarded as a record of fact. He was an idealist, but while other idealists idealize the nobler elements in human nature, so has he, for the most part — the later books, however, show improvement — idealized the elements that are bestial. He saw man's lust, greed, gluttony, as in a vision, magnified, overwhelming, portentous. And what he saw he presented with tremendous power. His style may lack the classic qualities of French prose — lightness, delicacy, sparkle; it certainly has not Daudet's colour and felicity of

touch. The first impression it produces may be one of heaviness, and the later " gospels " on population and work are distinctly ponderous. But for rendering the gloomy horror of the sub- jects in which he most delights — detail on detail being accumu- lated till the result is overwhelming — Zola has no superior. Some of his descriptions of crowds in movement have never I been surpassed.

Zola played a very important part in the Dreyfus affair, which convulsed French politics and social life at the end of the 19th century. At an early stage he came to the conclusion that Dreyfus was the innocent victim of a nefarious conspiracy, and on the 13th of January 1898, with his usual intrepidity, he pub- lished in the Aurore newspaper, in the form of a letter beginning with the words J'accuse, a terrible denunciation of all those who had had a hand in hounding down that unfortunate officer. Zola's object was a prosecution for libel, and a judicial inquiry into the whole affaire, and at the trial, which took place in Paris in February, a fierce flood of light was thrown on the case. The chiefs of the army put forth all their

power, and Zola was condemned. He appealed. On the 2nd of April I he Cour de Cassation quashed the proceedings. A second trial took place at Versailles, on the 18th of July, and without waiting the result Zola, by the advice of his counsel and friends, and for reasons of legal strategy, abruptly left France and took refuge in England. Here he remained in hiding, writing Fico-ndile, till the 4th of June 1899, when, immediately on hearing that there was to be a revision of the first Dreyfus trial, he returned to Paris. Whatever may be thought of the affaire itself, there can be no question of Zola's superb courage and disinterested- ness.

On the morning of the 29th of September 1902 Zola was found dead in the bedroom of his Paris house, having been accidentally asphyxiated by the fumes from a defective flue. He received a public funeral, at which Captain Dreyfus was present. Anatole France delivered an impassioned oration at the grave. At the time of his death Zola had just completed a novel, Viriti, dealing with the incidents of the Dreyfus trial. A sequel, Justice, had been planned, but not executed. After a life of constant struggle and an obloquy which never relaxed, the sensational close of Zola's career was the signal for an extraordinary burst of eulogy. The verdict of posterity will probably be kinder than the first, and less unmeasured than the second. Zola's literary position would have more than qualified him for the French Academy. 1 He was several times a candidate in vain. (F. T. M.)

Sec Ltmilc Zola, Novelist and Reformer (1904), giving a full account of his life and work, by E. A. Yfzetelly, who translated and edited many of his works in English ; also P. Alexis, Emile Zola, Notes dun ami; F. Brunetiere, Le Roman Naturaliste (1883); vols, iii., v. and vi. of the Journal des Goncourt (1888-92) ; E. Hennequin, Quelques Ecrivains francais (1890); R. H. Sherard, J&mile Zola: a biographical and critical study (1903) ; A. Laporte, llmile Zola, I'homme el l'(euvre (1894) with a bibliography. A complete report of the proceedings against Zola is printed m Le Proces Zola (2 vols. 1898, Eng. trans. 1898).

ZOLKIEWSKI, STANISLAUS (1547-1619), the most illustrious

member of an ancient Ruthenian family which emigrated to Galicia in the 15th century. During the interregnum in Poland after the death of Henry of Valois, Zolkiewski was an ardent partisan of the chancellor Zamoyski, and supported the can- didature of Stephen Bathory, under whose banner he learned the art of war in the Muscovite campaigns. On the death of Stephen, Zolkiewski vigorously supported the policy of Zamoyski, and took an active part in the battle of Byczyna, when the Austrian archduke Maximilian was defeated by the Polish chancellor. Shortly afterwards Zolkiewski was made castellan of Lemberg and acting commander-in-chief. On the accession of Sigismund III. he retired from court and divided his

time between improving his estates, where he built towns and for- tresses, and disciplining the Cossacks, with whom he enjoyed great influence. In 1601-2 he served with distinction in the Livonian war against the Swedes, whom he defeated at Reval. During the insurrection of Nicholas Zebrzydowski he led the

army which routed the rebels at Guzow in 1607, though pro- testing against the necessity of shedding " his brothers' blood." For his services he received the palatinate of Kiev. He was opposed to the expedition sent to place the false Demetrius on the throne of Muscovy; but nevertheless accompanied the king to Smolensk and was sent thence with a handful of men against Moscow. On his way thither he defeated and captured Tsar Vasily Shuiski at the battle of Klushino (July 14, 1610), and two months later entered the Russian capital in triumph. His tactful and conciliatory diplomacy speedily won over the boyars, whom he persuaded to offer the Muscovite crown to the Polish crown prince, Wladislaus. For a moment it seemed possible that the Vasa family might occupy the throne of Ivan the Terrible; but Sigismund III. would not consent to the re- ception of his son into the Greek Church, and refused to ratify the terms made with the boyars. Zolkiewski then returned to the Polish camp and assisted in the reduction of Smolensk, but Moscow in the meantime drove out the Polish garrison and proclaimed a native dynasty under Michael Romanov. When Zolkiewski presented his captives, Tsar Vasily and his family, to the Polish diet, he received an ovation and was rewarded with the dignity of hetman wielki (commander-in-chief). For the next few years he defended the Ukraine against the Tatars and Cossacks, and in 161 7 was involved in a war with the Porte owing to the unauthorized interference of the Polish nobles in the affairs of VVallachia and Moldavia. Unable to defeat the vastly superior forces of the Turkish commander Skinder, he concluded with him an advantageous truce at Jaruda (27th of August i6r8), by the terms of which he pledged himself to curb the Cossacks and at the same time renounced all the claims of Poland to the Danubian principalities. Thus he saved the one army of Poland to guard her southern frontier from appa- rently inevitable destruction. On his return he was fiercely assailed by the diet for not risking everything in a pitched battle, but Zolkiewski defended himself with an eloquence which silenced his most venomous opponents. The peace of Jaruda was then confirmed, and the king conferred upon Zolkiewski the grand-chancellorship, an honour he had neither desired nor expected. Fresh attacks were presently made against him for failing, it was alleged, to prevent the Tatar incursions. So deeply wounded was the hero by these calumnies that when in 1610 he was sent

against the Turks he publicly declared that he would never return alive unless victorious. He was as good as his word. Surrounded near the Dniester by countless hosts of Turks, Tatars and Janissaries, he retreated through the Steppes, fighting night and day without food or water, towards Cecora. By the time he reached it, he sawclearly that success was impossible, and deliberately determined to die where he stood. Disguising himself so that his dead body might not be recognized, he turned upon the pursuers and was slain after a desperate resistance (6th of October 1620). His head was cut off, exhibited in the Turkish camp and then sent to Constantinople as a present to the sultan, from whom it was subse- quently ransomed at a great price. Zolkiewski is one of the most heroic figures in Polish history. An accomplished general, a skilful diplomatist, and a patriot who not only loved his country above all things, but never feared to tell his countrymen the truth, he excelled in all private and public virtues. As a writer he made a name by an important history of his Muscovite campaigns.

See Stanislaw Gabryel Kozlowski, Life of Stanislaus Zolkiewski (Pol.) (Cracow, 1904). (R. N. B.)

Z5LLNER, JOHANN KARL FRIEDRICH (1834-ˆ82), German astronomer and physicist, was born at Berlin on the 8th of November 1834. From 1872 he held the chair of astro- physics at Leipzig University. He wrote numerous papers on photometry and spectrum analysis in Poggendorff's Annalen and Berichte der k. sdchsischen Gesellschaft der Wissenschaflen, two works on celestial photometry (Grundsiige drier attgemeinen Photometric des Himmels, Berlin, 1861, 4to, and Photometrische Uniersuchungen, Leipzig, 186.5, 8vo), and a curious book, Ueber

die Natur der Cometen (Leipzig, 1872, 3rd ed. 1883). He died at Leipzig on the 25th of April 1882.

ZOLLVEREIN (Ger. Zoll, toll, customs, and Verein, union), a term used generally for a certain form of Customs Union, but specially for the system among the German states which was in force between 1819 and 1871 (see Taeiff, and Germany: History).

ZOMBOR, a town of Hungary, capital of the county of Bacs Bodrog, 146 m. S. of Budapest by rail. Pop. (1900) 29,036, two-thirds Servians. It is situated in a fertile plain near the Franz Josef canal, which connects the Danube and the Theiss, and is the centre of the corn and cattle trade of an extensive area.

ZONARAS, JOANNES (John), Byzantine chronicler and theo- logian, nourished at Constantinople in the 12th century. Under Alexius I.

Comnenus he held the offices of commander of the bodyguard and private secretary to the emperor, but in the succeeding reign he retired to Hagia Glykeria (one of the Princes' Islands), where he spent the rest of his life in writing books. His most important work, 'Etutojui) 'Itrroptcov (compendium of history), in eighteen books, extends from the creation of the world to the death of Alexius (1118). The earlier part is largely drawn from Josephus; for Roman history he chiefly followed Dio Cassius, whose first twenty books are not otherwise known to us. His history was continued by Nicetas Acominatus. Various ecclesiastical works have been attributed to Zonaras — com- mentaries on the Fathers and the poems of Gregory of Nazianzus; lives of Saints; and a treatise on the Apostolical Canons — and there is no reason to doubt their genuineness. The lexicon, however, which has been handed down under his name (ed. J. A. H. Tittmann 1808) is probably the work of a certain Antonius Monachus (Stein's Herodotus, ii. 479 f.).

Complete edition in Migne, Patrologia Graeca, exxxiv. exxxv. exxxvii. ; the Chronicon by M. Pinder and T. Buttner-Wobst in the Bonn Corpus Scriptorum Hist. Byz. (1841-97) and by L. Din- dorf in the Teubner series (1868-76) ; see bibliography in C. Krum- bacher, Geschiehte der byzantinischen Litteratur (2nd ed. 1897).

ZONE (Gr. %&vr], a girdle, from £covvvvai, to gird), a term for a belt or girdle, now used chiefly in the transferred sense of a demarcated area. Thus the earth's surface is divided, for classification of climates, into five climatic zones: the two temperate and the two frigid zones and the tropical or torrid zone. (See Climate and Climatology.)

ZOOLOGICAL DISTRIBUTION (also known as Zoogeography), the science dealing, in the first place, with the distribution of living animals on the surface of the globe (both land and water), and secondly with that of their forerunners (both in time and in space). The science is thus a side-branch of zoology, 1 in- timately connected on the one hand with geography and on the other with geology. It is a comparatively modern science, which dates, at all events in its present form, from the second half of the 19th century.

Different parts of the land-surface of the globe are. inhabited by different kinds of animals, or, in other words, by different faunas. These differences, in many cases at any rate, are not due to differences of temperature or of climate; and they do not depend on the distance of one place from another. The warm-blooded land-animals of Japan are, for example, very much more closely related to those of the British Isles than is the corresponding fauna of Africa to that of Madagascar. Again, on the hypothesis of the evolution of one species from another, in the case of land-animals

unprovided with the means of flight such resemblances and differences between the faunas of different parts of the world depend in a great degree on the presence or absence of facilities for free communication by land between the areas in question. Prima facie, therefore, it is natural to suppose that the fauna of an island will differ more from that of the adjacent continent than will those of different parts of that continent from one another.

To a great extent this is the case; and if the present con- tinents and islands had always been in statu quo, the proposition 1 For the distribution of plants, see Plants: Distribution.

would, for the most part at any rate, be universally true. Geology has, however, taught us that many parts of what are now continents formed at earlier periods of the earth's history portions of the ocean-bed, while what are now islands have in some instances been connected with the adjacent mainlands, or even with land-masses the sites of which are now occupied by the open sea.

We can hope, therefore, to understand and explain the present distribution of terrestrial animal life only by taking into account what geology teaches us as to past changes in the configuration of the land-masses of the globe, accompanied by investigations into the past history of animals themselves, as revealed by their fossil remains.

Although to understand the reason of many facts in the present distribution of animals — as, for example, why tapirs are con- fined to the Malay countries and South America — it is essential to study fossil faunas, yet it has been found possible from the consideration of existing faunas alone to map out the land- surface of the globe into a number of zoological " regions," or provinces, more or less independent of the ordinary geographical boundaries, and severally characterized by a greater or smaller degree of distinctness in the matter of their faunas. One of the pioneers in this line of research was Dr P. L. Sclater, who in a paper on the geographical distribution of birds, published in

the Journal of the Linnean Society of London for 1858, was enabled to derine and name six of such zoological regions; these being mainly based on the distribution of the perching or passerine birds. Two years later Dr A. Rnssel Wallace, in the same journal, discussed in some detail the problems presented by the distribution of animals in the Malay Archipelago and Australasia. This preliminary essay was followed in 1876 by the appearance of the latter author's Geographical Distribu- tion of Animals, an epoch-making work, which may be said to have first put the study of the distribution of animals generally on a thoroughly firm and scientific basis. With some slight modifications, the names proposed for the six zoological regions by Dr Sciater were adopted by Dr Wallace. Certain changes in regard to the limits and number of the zoological regions adopted by Sclater and Wallace have been proposed; but the original scheme forms the basis of all the later modifications, and these eminent naturalists are entitled to be regarded as the fathers of the study of distributional zoology. T. H. Huxley was also one of those who did much to advance the science in its early days, while among those who have proposed more or less important modifications of the original scheme special mention may be made of Dr W. T. Blanford, Dr A. Heilprin, Prof. P. Matschie and Prof. Max Weber.

The zoological regions proposed by Dr Sclater were based mainly on the distribution of the perching birds; but in the writings of Dr Wallace and of later authors mammals were

very largely taken into consideration, and in later schemes there has been a similarly extensive use of the evidence afforded by mammalian distribution. That different groups of animals do not agree with another in the matter of geographical distri- bution will be evident when we reflect that in many instances there are very great differences in the relative ages of such groups, or, at all events, in the dates of their dispersal, or " radiation," over the surface of the earth. The radiation and dominance of reptiles, for example, greatly antedated that of either birds or mammals. Consequently, the zoological regions indicated by the present geographical distribution of the former group are very different from those suggested by the distribution of the two latter. If zoological regions are based on the evidence of the existing distribution of animals, groups with a relatively late radiation are clearly to be preferred to those the dispersal of which was earlier. Mammals and birds, therefore, are of greater value from this point of view than reptiles; while the absence of the power of flight in the great hulk of the class renders the evidence afforded by mammals superior to that derived from birds. The marked general agreement between the geographical distribution of birds on the one hand and of mammals on the other is, however, a fact of the greatest im- portance in regard to the value of the zoological regions estab- lished on their evidence. Further testimony

in the same direc- tion is afforded by the distribution of certain other groups'ˆ more especially spiders (Arachnida); and it is also noteworthy that the distribution of the three main divisions of the human race accords to a certain extent with the boundaries of some of the zoological regions based on the distribution of the lower animals.

With regard to the theory of the polar origin of life and the gradual dispersal of animals from the arctic regions, it may be briefly stated that the presumed series of radiations of life southward from the northern pole can have nothing to do with the present geographical distribution of animals, since we have abundant evidence that mammals have been spread over the whole of the warmer parts of the globe since, at any rate, the commencement of the Tertiary period, while the radiation of reptiles commenced at a much earlier epoch.

As regards barriers to the free dispersal of nonvolant terrestrial animals these may be grouped under two main heads, namely, climatic and geographical, of which the second is by far the more important. At the present day a certain number of animals are fitted tc live respectively only in hot and in cold climates. The man-like apes and elephants among mammals, and trogOns and parrots among birds, are, for example, now exclusively dwellers in tropical or subtropical climates; whereas the polar bear, the musk-ox and ptarmigan are equally characteristic of the arctic zone. To a great extent this must be regarded as a comparatively modern adaptive feature, since many of these arctic and tropical animals belong to groups the distribu- tion of which, either in the past or the present, is more or less independent of climate. Elephants, for instance, formerly in-t-habited Siberia at a time when the climate, although probably less cold than at present, was certainly not tropical; while the polar bear is a specialized member of a group some of the representatives of which are denizens of the tropics.

It is true, indeed, that within the limits of the different zoological regions temperature-control has had an important influence on the distribution of animals, and has resulted m certain cases in the formation of life-zones, as in North America. As remarked, however, by H. A. Pilsbry and J. H. FerrissHn connexion with the distribution of land-molluscs," 'the lifeˆ zones of the United States as mapped by Dr C. H. Merriam emphasize the secondary and not the primary facts of distribu- tion. The laws of temperature-control do not define trans- continental zones of primary import zoologically. These zones are secondary divisions of vertical fife-areas of which the mol- luscan faunas were evolved in large part independently." And what is true of molluscs will hold good in the case of several other groups.

1 Proc. Academy oj Philadelphia, 1906, p. 123.

There is also the phenomenon of vertical temperature-control. On this subject Dr A. R. Wallace has written (Ency. Brit., gth ed., art. " Distribution "): " As we ascend lofty mountains, the forms of life change in a manner somewhat analogous to the changes observed in passing from a warm to a cold country. This change is, however, far less observable in animals than in plants; and it is so unequal in its action, and can so frequently be traced to mere change of climate and deficiency of food, that it must rank as a phenomenon of secondary importance. Vertical distribution among animals will be found in most cases to affect species rather than generic or family groups, and to involve in each case a mass of local details. . . . The same remarks apply to the bathymetrical zones of marine life. Many groups are confined to tidal, or shallow, or deeper waters; but these differences of habit- are hardly geographical, but in- volve details, suited rather to the special study of individual groups." Temperature-control is therefore mainly a factor which has acted independently in the different zoological regions of the globe, and as such demands little or no further mention in a general sketch of the present nature.

The same remark will apply in the case of the influence of humidity on distribution, and also as regards " station." To illustrate the latter we may take the instances of the European squirrel and the chamois, the former of which is found only in wooded districts and is entirely absent from the open plains, while the latter occurs only in the isolated mountain ranges of the Pyrenees, the Alps, the Apennines and the Caucasus. The distributional area of both may, however, be regarded as includ- ing Europe generally, so that these local restrictions of range have nothing to do with the wider problems of distribution.

Very dillerent is the case with regard to geographical barriers to the free dispersal of terrestrial animals. It should be ob- served, however, that even these act with different degrees of intensity in the case of different groups. From the fact that the great majority of them are oviparous, reptiles, whose powers of dispersal in the adult state are generally as restricted as those of mammals, have an advantage over the latter in that their eggs may be carried long distances on floating timber down rivers and thence across the ocean, or may even bˆ occasionally transported by birds. The eggs of

batrachians, Jke those of fresh-water fishes, will in some cases at any rate withstand being frozen, and hence conceivably may be transported by floating ice. Adult insects may be carried in the same manner as the eggs of reptiles. After all, however, such unusual means of transport are probably of no great importance; and it seems most likely that the varying features in the geographical dis- tribution of different groups of animals are due much more to differences in the dates of radiation, or dispersal of those groups, than to varying degrees of facility for overcoming natural geographical barriers to dispersal.

The greatest barriers of ail are formed by the ocean and the larger rivers; and from the former factor it follows that zoo- logical regions coincide to a considerable extent — although by no means altogether — with the main geographical (as distinct from political) divisions of the earth's surface. In the main, mammals and other nonvolant terrestrial animals are debarred from crossing anything more than comparatively narrow channels of the sea, while even these and the larger rivers form a more or less effectual barrier to the dispersal of the great majority of the species. Hence it results that oceanic islands are usually devoid of such forms of life; while it may be laid down, as a general rule, that the existence of nearly allied types of terrestrial animals in countries now separated by stretches of sea implies a former land- connexion between them. There are, however, in many cases great difficulties in determining the nature of such connexions, largely owing to the fact that we are still in the dark as to whether the dispersal of many groups of animals has taken place down the lines of the present continents from north to south or equatorially by means of belts of land long since swallowed up by the ocean. In this connexion it may be remarked, as tending against the old idea of the radiation of all the modern groups of terrestrial

animals from the north towards the south, that there is decisive evidence to prove the existence during the Tertiary period (so far at least as mammals are concerned) of certain great centres of development, and in some instances, at all events, also of radiation, in the southern hemisphere; one of these develop- mental centres being in Africa a second in South America, and a third in Australia.

To the general law that straits and arms of the sea form an effectual barrier to the dispersal of the larger land-animals, and more especially mammals, certain exceptions may be pleaded. Jaguars have, for instance, been known to cross the Rio de la Plata, while tigers constantly swim from island to island m the delta of the Ganges and probably also in the Malay Archipelago, and a polar bear has been observed swimming twenty miles away from land in Bering Sea. Deer, certain antelopes, pigs and elephants are also good swimmers; while hippopotamuses and crocodiles — especially

the latter — can cross channels of considerable width. The great tropical and subtropical rivers also carry down masses of floating soil or large trees upon which mammals and reptiles are borne, and although in many or most instances such are swept out to sea and their occupants drowned, in other instances they may be stranded upon the opposite bank or shore where their living freight can effect a landing. Such instances, however, cannot be very frequent, and they cannot affect widely sundered countries, owing to the lack of food supplies. Moreover, supposing a mammal to have reached a new land, unless it happened to be a pregnant female, or unless another individual of the opposite sex be similarly stranded, it would eventually die without progeny. Even in the case of a pregnant female, there is no certainty that the offspring, if but one, would be a male; and even supposing this to be the case, the progeny might perish from the attacks of other animals or from inbreeding. On the whole, it may be said, that instances of such methods of dispersal must be relatively few and can affect only countries not very widely sundered. The most important case that can be cited is the occurrence of a pig and an extinct hippopotamus in Madagascar, which probably reached that island by swimming from Africa. As a rule, a strait like that separating Ceylon from India may be considered an effectual barrier to the dispersal of large land-animals.

Although the Rio de la Plata has effectually prevented the amphibious carpincbo from reaching Argentina, deserts form even more impassable barriers than large rivers, the Sahara having prevented the North African fauna from reaching the heart of that continent. High and continuous mountain- ianges are likewise most effective in restricting the range of animals; this being more especially the case when, like the Himalaya, their trend is equatorial instead of, as in the case of the Rocky Mountains and the Andes, from north to south in the direction of the main continental extension. Forests also present great obstacles to animal migration, although this is to a great extent of a local nature and comes, in fact, under the category of " station." Indeed, there appears to be no in- stance of the separation of one zoological region from another by forest alone.

Lastly it should be mentioned that ice may serve as a factor in the dispersal of animals by acting as a bridge between different land-areas; and at some period this means of communi- cation may have aided in the great migrations of animals that have taken place between the Old and the New World by way of what is now Bering Sea.

I. Terrestrial Distribution The zoological regions recognized by Dr A. R. Wallace in 1876, which are in the main identical with those Zoological proposed by Dr P. L. Sclater in 1858, and are chiefly Regions. based on the distribution of birds and mammals, are as follows:—

1. Falaec relic, which includes Europe to the Azores and Iceland, temperate rtsia from the high Himalaya and west of the Indus, with Japan, and China from Ningpo and to the north of the watershed

of the Yang-tse-kiang ; also North Africa and Arabia, to about the line of the tropic of Cancer.

2. Ethiopian, including Africa south of the tropic of Cancer, as well as the southern part of Arabia, with Madagascar and the adjacent islands.

3. Oriental, or Indo-Malay, comprising India and Ceylon, the Indo-Chinese countries and southern China, and the Malay Archi- pelago as far as the Philippines, Borneo and Java.

4. Australian, composed of the remainder of the Malay Archi- pelago, Australia, New Zealand and all the tropical islands of the Pacific:, as far east as the Marquesas and the Low Archipelago.

5. Neotropical, which comprises South America and the adjacent islands, the West Indies or Antilles, and Central America and Mexico.

6. Near die, consisting of temperate and arctic North America, with Greenland.

H These six regions," remarks Dr Wallace, " although all of primary importance from their extent, and well marked by their total assemblage of animal forms, vary greatly in their zoological richness, their degree of isolation and their relation- ship to each other. The Australian region is the most peculiar and the most isolated, but it is comparatively small and poor in the higher animals. The Neotropical region comes next in peculiarity and isolation, but it is extensive and excessively rich in all forms of life. The Ethiopian and Oriental regions are also very rich, but they have much in common. The Palae- arctic and Nearctic regions being wholly temperate are less rich, and they too have many resemblances to each other; but while the Nearctic region has many groups in common with the Neotropical, the Palaearctic is closely connected with the Oriental and Ethiopian regions."

In Dr Sciater's original scheme the first four of the above regions were bracketed together under the designation of Palaeogaea, and the fifth and sixth, or those belonging to the New World, as Neogaea, T. H. Huxley, in a

paper on the distribution of game-birds, published in the Proceedings of the Zoological Society of London for 1868, instead of dividing the world into an eastern and a western division, adopted a northern and a southern division, calling the former Arctogaea, and the latter (which included Australasia and the Neotropical region of Messrs Sclater and Wallace, but not the Ethiopian region) Notogaea.

In 1874 Dr Sclater, 1 taking mammals as well as birds into consideration, adopted Huxley's Arctogaea as the major northern division to include the Nearctic, Palaearctic, Oriental and Ethiopian regions; and instead of Huxley's Notogaea recognized three primary divisions, namely, Dendrogaea for the Neotropical region, Antarctogaea for the Australian region (in a somewhat restricted sense), and Ornithogaea for New Zealand and Polynesia.

The tendency of these amendments on the original scheme of a simple division into six regions was to recognize three primary divisions of higher rank than such " regions." This view was adopted in 1890 by Dr W. T. Blanford, 2 who proposed to designate these three major divisions of the earth's land surface respectively the Australian, the South American and the Arctogaean regions. A weak point in this scheme is that since the term a region " is likewise applied to the subdivisions of Arctogaea, there is a danger of confusion between the primary and secondary divisions. An amendment proposed anony- mously a in 1893 was to substitute the names Notogaea, Neogaea and Arctogaea for the three primary divisions of Dr Blanford. Yet another emendation, suggested by R. Lydekker 4 and subsequently adopted by Prof. H. F. Osborn, 5 was to designate these three primary divisions as " realms," and to reserve the name " region " for their subdivisions.

Emendations on the original scheme also included modifica- tions in the limits of the regions themselves. In 1878, for instance, Dr A. Heilprin 6 (in accordance with a suggestion of

1 Manchester Science Lectures, ser. 5 and 6, p. 202 seq.

5 Proc. Geol. Soc. (London, 1890), p. 76.

3 Natural Science, iii. 289.

4 Geographical Distribution of Mammals (London, 1896), p. 27.

6 " Correlation between Tertiary Mammal Horizons of Europe and America," Annals New York Academy, xiii. 48 (1900).

8 The Geographical and Geological Distribution of Animals (London,

1878).

Prof. A. Newton) proposed to nuite the Nearctic with the Palaearctic region under the name of Holarctic; separating at the same time from the former a " transitional " Sonoran, and from the latter a similar Mediterranean, or Tyrrhenian, region, while he also recognized a distinct Polynesian region, distinguished in the main by negative characters. The Sonoran region was subsequently adopted by Dr C. H. Merriam 7 in 1892, and later on by Dr Blanford in the address already cited, the title being, however, changed to Medic-Columbian. A most important proposal was also embodied in Dr Blanford's scheme, namely, the separation from the Ethiopian region of Madagascar and the Comoro islands to form a separate Malagasy region. Another modification of the original scheme was to transfer the island of Celebes, together with Lombok, Flores and Timor, from the Australian to the Oriental region, or to regard them as repre- senting a transitional region between the two. 8 The effect of this change was practically to abolish " Wallace's line " (the deep channel between the islands of Bali and Lombok and thence northward through the Macassar Strait), the deepest channel being really situated to the eastward of Timor.

The later evolution of the scheme, as presented by Dr Max Weber, 9 may be tabularized, with some slight alteration, as follows, the " realms " being printed in. capitals, the regions and sub-regions in ordinary type, and the transitional regions in italics: —

I. Holarctic.

I. Arctogaea _2. Ethiopian. 3. Malagasy. 4. Oriental.

I I

Nearctic Palaearctic Sonoran Mediterranean Austro- Malayan

II. Neogaea III. Notogaea.

5. Neotropical- 6. Australian

(?) 7. Polynesian

(?) 8. Hawaiian.

In the accompanying map the Sonoran and Mediterranean transitional regions are represented as equivalent in value to the main regions, and the Austro-Malayan transitional region is not indicated. The recognition of a Polynesian and still more of a Hawaiian region, is provisional.

The most distinct of the three primary realms is undoubtedly Notogaea, the Australian section of which is the sole habitat of egg-laying mammals (Monotremata) and of a great Sotogaca. variety of marsupials, inclusive of the whole of the diprotodonts, with the exception of the few (discuses) found in the A 11 stro- Malayan transitional region. Apart from monotremes and marsupials, the only indigenous mammals found in Notogaea are rodents and bats, with perhaps a pig in New Guinea; although it is most probable that the latter is introduced, as is almost certainly the dingo, or native dog, in Australia. The rodents are all referable to the family Muridae, and are mostly of peculiar types, such as the golden water-rat (Hydromys) and the jerboa-rats (Coni- lurus, Notomys, &c.) ; they are, however, in many instances more or less nearly related to species found in Celebes, the mountains of the Philippines and Borneo, and apparently represent an ancient fauna. The mammalian fauna of Notogaea is practically limited to the Australian region, its indigenous representatives in New Zealand being only a couple of bats. The monotremes are in all probability the survivors of a group which was widely spread in Jurassic times; while marsupials, as represented by the American opossums (Didelphyidac) , had a very wide range even as late as the OHgocene division of the Tertiary period. The diprotodont mar- supials may not improbably have originated within the Australian region, or this region conjointly with the Austro-Malayan transi- tional region.

Notogaea is likewise the home of a number of peculiar types of birds, some of which range, however, into the Austro-Malayan area, that is to say, Celebes and Ceram. In the Australian region the

7 " The Geographical Distribution of Life in North America with special reference to the Mammalia," Proc. Biol. Soc, Washington, vol. vii. pp. 1-64 (1892).

8 See W. L. Sclater, " The Geography of Mammals," part v., Geographical Journal, 1896; M. Weber, " On the Origin of the Fauna of Celebes," Ann. Mag. Nat. Hist., ser. 7, vol- iii. pp. 121-136 (1899), and Der lndo-australische Archipel und die Geschichte seiner Tierwelt (Jena, 1902); Lydekker, "Celebes: a Problem in Distribution," Knowledge, vol. xxi. pp. 175-177 (1898); see also Deer of All Lands, p. 168 (1898).

a Die Sdugetiere (Jena, 1904), p. 308.

peculiar avian families include the birds-of-paradise (Paradiseidae), the honeysuckers (Meliphagidae) and the lyre-birds (Menuridae) among the perching group, the cockatoos (Cacatuidae) and lories (Loriidae) among the parrots, the mound-builders, or brush-turkeys (Megapodiidae) among" the game-birds, and the cassowaries and emeus (Casuariidae and Dromaeidae) in the ostrich group. The peculiarity of the region is also marked by the absence of certain widely spread family groups, such as the barbets (Megalaemidae), the otherwise cosmopolitan woodpeckers (Picidac), the trogons (Trogonidae), and the pheasant and partridge tribe (Phasianidae).*

The reptiles, owing probably to their earlier radiation, are much /ess peculiar, such widely spread types as the monitors (Varanidae) and skinks, (Scincidac) being abundant, as are also crocodiles (Croco- dilidae). The tortoises belong, however, exclusively to the side- necked group (Pleurodira), now restricted to the southern hemi- sphere; among these the most noteworthy being the giant horned tortoise (Mtuiania) from the Pleistocene of Queensland, which belongs to a genus elsewhere known only from the South American Tertiary. The Australian lung-fish (Ceratodus, or Neoceratodus) is the sole survivor of a widely spread Triassic and Jurassic type. The salmon tribe (Salmonidae), however, is notable for its absence, although one peculiar form occurs in New Zealand ; and the Cyprinidae, or carps, are wanting throughout the realm, this absence extending to Celebes, although in Borneo the group is abundantly represented.

New Zealand, here provisionally included in a separate Poly- nesian region, is characterized by the absence of all indigenous mammals except two bats, each representing a peculiar genus. Among birds, the Neogaeic family Meliphagidae includes several peculiar genera, as does also the widely spread starling group (Sturnidae); while the parrots of the genera Stringops and Nestor are likewise peculiar. Still more noteworthy is the abundance of the ostrich group, represented by the living kiwis (Apteryx), and the moas (Dinornithidae) which have been exterminated within comparatively recent times. Reptiles are scarce, but among them the tuatcra lizard {Sphenodon) is especially noteworthy on account of being the sole survivor of an ordinal group (Rhynchocephalia) widely spread during Triassic and Jurassic times.

Of the Hawaiian area (whether or no rightly regarded as a dis- tinct region), it must suffice to state that it is the sole habitat of the gorgeously coloured birds known as mamos, or sickle-bills (Drepanididae).

With regard to the origin of the modern fauna of Notogaea, and more especially the Australian region, as here restricted, we enter extremely debatable ground. Dr Wallace, who refused to admit the existence of any great inter-continental connexions in the past, was of opinion that

Australia received the ancestors of its marsupials and monotremes from Asia by way of the Austro- Malayan area (as it certainly has its rodents) " far back in the Secondary period." This view has been endorsed by the present writer 1 who suggested the early Eocene as the most probable date of immigration; and it has also received the assent of Dr Max Weber, 9 ' who is of opinion that in pre- Tertiary— very likely Creta- ceous — times Australia was united by land with Asia. A Euro- Asiatic fauna inhabited this land, from which during the Eocene a southern portion was cut off by partial submergence, this southern portion being the modern Australia and New Guinea, the home of monotremes, marsupials and ancient forms of other groups, such as cassowaries and birds-of-paradise, while widely distributed specialized types are wanting. Northwards extended a coral-sea, in the islands of which dwelt primitive rodents, insectivores and other ancient groups, with perhaps cuscuses. During the Miocene, great changes of level took place in the archipelago, which attained its present form in the Pleistocene. Celebes was insulated early, Java later. Intermittent land-connexions took place, which allowed of periodical immigrations of Asiatic forms from one side and of Australian types from the other. The question is left undecided whether the cuscuses of the Austro-Malayan islands are remnants of the primitive Euro-Asiatic fauna or later immigrants from Australia. The suggestion is also made that the Australian and Philippine rodents are survivors of the original pre-Tertiary fauna, although it is admitted that the specialization of Hydromys is against this. The author fails to see "any evidence in favour of a former connexion of Australasia with either South America or a former large antarctic continent (Antarctica).

While, admitting that this may be the true explanation, Mr B. A. Bensley' considers it possible that opossums (Didelphyidae) , which he regards as the ancestral stock of the marsupials, may have effected an entrance into Neogaea by way of Antarctica. In either event, he would place the date of entry as post-Eocene; but against this view is the occurrence of remains of a diprotodont marsupial (Wynyardia) in Tasmaniun strata believed to be of Eocene age. Prof. Baldwin Spencer 4 is also of opinion that the

1 I.ydekker, Geographical Distribution of Mammals (1896).

- *Der Indo-Austr all soke Archipel, &c. (Jena, 1902).*

1 American Naturalist, xxv. 260 and 261 (1902).

4 Report of Horn Expedition to Central Australia, pp. 187 and

iˆS 11896).

Australian, marsupials and monotremes reached their present habitat by means of a land-connexion in the south subsequent to the insulation of New Zealand. This, of course, implies the exist- ence of an extinct southern marsupial fauna of which we have no knowledge except in the case of the Epanorthidae of Patagonia.

That Australia formed part of a great equatorial land-belt con- necting the southern continents in Jurassic times appears to be demonstrated by the evidence of the " Gondwana flora." The question is whether such a connexion— either by way of Antarctica or not— persisted in the case of Neogaea long enough to admit of the ancestors of the modern fauna (supposing it all to have come by a southern route) having effected an entrance. The existence of such a land-bridge was suggested by Sir Joseph Hooker in 1847; and the idea of a late connexion between Neogaea and Notogaea has been adopted by L. Riitimeyer (1867), Captain F. W. Hut ton (1873), Prof. H. O. Forbes (1893), Mr C. Hedley (1895), Dr Ii. von Ihering (1891 and 1900), Prof. H. F. Osborn, who takes an inter- mediate view of the extent of the part played by Antarctica (iqco), and by Dr A. F. Ortmann (1902). On the other hand, Dr T. 'Gill (1875) believed in the existence of an " Eogaea " connecting the three great continents exclusive of Antarctica; and in 18S4 Capt. Hutton, abandoning his former view, suggested the connexion of Australia and South America by means of a mid-Pacific continent. A summary of these views, with references, is given by Dr Ortmann in vol. xxxv. pp. 139-142 of the American Naturalist (1901).

So far as mammals are concerned, the evidence in favour of a comparatively late land-connexion is weakened by the recent view that certain supposed Patagonian Tertiary marsupials, such as Proihylacinus, are really creodont Carnivora. On the other hand (putting aside these carnivores), Mr W. J. Sinclair 5 is of opinion that the living South American marsupial Caenolestes and its extinct relatives are annectant forms between diprotodonts and polypro- todonts, and not far removed from the ancestral stock which gave rise to the Australian phalangers. The occurrence in the .Tertiary of Patagonia of primitive opossums, which cannot be regarded as ancestral to the modern South American forms, is also an important determination. From this, coupled with the testimony afforded by the- invertebrate faunas, he considers himself justified in stating that " considerable evidence is now available to show that a land-connexion between Patagonia and the Australian region existed not later than the close of the Cretaceous or the beginning of the Tertiary, and it is possible that at this time the interchange of marsupials between the two continents was effected. Whether the marsupials originated in South America and migrated thence to Australia, or the reverse, cannot tit present be determined." The above-mentioned tortoises of the genus Miolania also

appear to afford strong evidence of the persistence of the Jurassic connexion between Notogaea and Neogaea to a comparatively late epoch.

Again, Prof. W. B. Benham, 6 from the evidence of earthworms, is strongly disposed to believe in a late connexion between the areas in question. From their invariable association with angio- spermous plants, this author is of opinion that earthworms are a comparatively modern group, which did not attain any important development before the Cretaceous. The ancestral type would appear to have been more or less nearly related to the existing Notiodrilus, of which the headquarters, if not the birthplace, wag the " Melanesian plateau." New Zealand and the neighbouring islands,: which possess the most ancient worm-fauna, were separated at an early date from this plateau. From this area the primitive worms travelled in one direction into the Austro-Malayan countries', while in another, by way of Antarctica, they reached South America and Africa. With this brief summary of the chief views, this part of the subject must be dismissed without the writer being com- mitted to any definite conclusion.

Next to Notogaea the most distinct faunistic continental area, so far at any rate as its present and later Tertiary mammals are concerned, is Neogaea, containing, as we have seen, only JVeo.gaea. the Neotropical region. It is remarkable as being, with the exception of Notogaea, the only land-area which contains at the present day more than one living genus of marsupials, and also a large middle Tertiary marsupial fauna. The living marsupials include a large number of true opossums, constituting the family Didelphyidae and Caenolestes the surviving representative of the Epanorthidae of the Patagonian Tcrtiaries. The opossums are represented by the genera Chironectes and Didelphys; the latter divisible into a number of sub-genera of which the typical group alone ranged into North America. Whether the modern opossums belong to the endemic Neogaeic fauna, or whether they are late immigrants from the north (where they were represented in the Oligocene of both hemispheres), is a question in regard to which a definite answer can scarcely at present be given. It appears, however, that Microbioiherium and certain allied forms from the middle Tertiary of Patagonia are endemic representatives of the Didelphyidae which did not give rise to the modern types. The Epanorthidae, in the opinion of Prof. Max Weber, indicate a sub- ordinal group by themselves; and if this be correct their evidence

5 Proc. Amer. Phil. Soc, xlix. 73 (1905).

6 Report, Australian Assoc, ix. 319 (1903)-

in favour of a land-connexion between Neogaea and Notogaea cannot have the weight attributed to it by Mr W. J. Sinclair.

The typical Edentata (sloths, anleaters and armadillos) are at the present day practically confined to Neogaea where they have existed from the date of the Santa Cruz beds of Patagonia (which are probably of Miocene age). A few armadillos, however, have penetrated into Texas; and in the Pleistocene epoch several repre- sentatives of the extinct ground-sloths (Megatheriidae) and a glyptodon, or giant armadillo, also ranged into North America. The group is, however, essentially Neogaeic. Among the monkeys the Cebidae, or American monkeys, and their relatives the Hapalidae, or marmosets, are likewise peculiar to Neogaea, where they date from the Santa Cruz epoch. The vampire-bats, or Phyllostoma- ttdae, are likewise peculiar to this realm, and are doubtless also endemic. With the exception of a few shrew-mice, which have evidently entered from the north, continental Neogaea is at the present day devoid of Insectivora. It is, however, very note- worthy that one peculiar family (Solcnodontidae) of the order, apparently nearly allied to the Malagasy Centetidae (tenrecs), occurs 111 the West Indies, while the extinct Necrolestes, believed to be near akin to the African golden moles (Chrysochloridae), is found in the Santa Cruz beds. Rodents of more or less peculiar types are highly characteristic of Neogaea and for the most part date from the Santa Cruz epoch. Among these the Caviidae, Chin- chillidae and Oetodontidae are peculiar to this realm, while the Capromyidae are common to the Ethiopian region of Arctogaea, but are unknown elsewhere.

Ungulates are in the main very poorly represented in Neogaea and include only the llama group (guanaco, &c), tapirs, and certain small or medium - sized deer related to North American types. Palaeontological evidence tells us that these, like certain peculiar genera of horses now extinct (such as Hippidi-um) and mastodons, were comparatively recent intruders into the realm from the north. On the other hand, Neogaea at the date of the deposition of the Santa Cruz beds was the home of certain endemic groups of ungulates, such as the Toxodontia and Litopterna, some of the representatives of which (Toxodonand Macrauchema) flourished during the Pleistocene Pampcan epoch.

Of the Carnivora, the civet group (Viverridae) is absent, and the representatives of the dog tribe (Canidae), bears (Ursidae), of which there is only a single existing representative, cats (Felidae), and probably raccoons (Procyonidae), must be regarded as intruders from the north, although several genera of the last-named group are peculiar to the area. In the Santa Cruz epoch the place of these modern specialized Carnivora was taken by marsupial-like creodonts, such as Prothylaciniis.

In birds Neogaea is especially rich and contains more than a score of family groups unknown elsewhere. Several of these, such as the tyrant-birds

(Tyrannidae), manakins (Pipridae), chatterers (Cotingidae), ant-thrushes (Formicariidae), the oven-bird group (Dendrocolaptidae), plant - cutters(Phytotomidae), and wren-thrushes (Pteroptychidae), belong to a low and generalized type of the perch- ing, or passerine, group. Among the so-called picarian birds, which arc likewise a generalized type, the big-billed toucans (Rham- phasiidae), puff-birds (Bucconidae), jacamars (Galbulidae), motmots (Momoudae).aiidthe vast assemblage of humming-birds (Trochilidae) are in the main peculiar to this realm, although some of the last- named family wander to the northward in summer. The condors (Catbartidae), form a highly characteristic Neogaeic family; while the hoatzin {Opislhocomus) represents another. Of the higher forms of perching-birds the quit-quits (Coerebtdae), greenlets (Vireonidae), the hang-nests and many other representatives of the Icteridae, and the tanagers (Tanagridae) are exclusively Neogaeic; while crows, starlings, thrushes, ■, warblers and flycatchers are either rare or wanting, although the finches are abundant. Parrots are numerous, and represented by peculiar forms such as the macaws (Ara) and conures or ordinary South American parrots (Conurus). Very characteristic of the rea'in, and unknown elsewhere are the curassows and guans (Cracidae) among the game-birds, the chajas, or screamers (Palamcdeklae), the trumpeters (Psophiidae), sun- bitterns (Eurypygidae), and the seriema (Cariamidae). Allied apparently to the last is Pkororhachos, a giant extinct bird from the Santa Cruz beds with a skull nearly as Targe as that of a pony. The tinamous (Tinamidae), possibly an annectant type between game-birds and the ostrich group, and the rheas or American ostriches (Rheidae) are likewise exclusively Neogaeic. It may be added that the distribution of all the members of the ostrich group affords a strong argument in favour of a former union of the southern continents, especially as their earliest known represen- tative 15 African. , ˆ Among reptiles, the tortoises, with the exception of representa- tives of the terrestrial genus Testudo, all belong to the Pleurodira, and include several peculiar generic types such as Chelys (matamata) and one, Podocnemis, common to Madagascar. The occurrence in the Tertiary of Patagonia of a representative of Miolania, else- where known only from the Pleistocene of Queensland, has been already mentioned. A number of snakes of the boa group (Boinae) occur in the realm, to which the genus Eunectes (anacondas) is restricted; but Boa itself, like Podocnemis among the tortoises, is

common to Neogaea and Madagascar. The blind burrowing- snakes of the family Glauconiidae occur throughout the warmer parts of the realm, and are also found in Africa and south-western Asia. The caimans or South American alligators (Caiman) are solely Neogaean; the iguanas (Iguanidae) are mainly peculiar to the realm, although a few inhabit North America, and there are two outlying genera in Madagascar and a third in

Fiji. The tejus (Tejidae) are wholly Neogaean. The Xantusiidae are exclusively Central American and Antillean; while the Amphisbaenidae are practically restricted to Neogaea and Africa. On the other hand, Laccrtidae, Varanidac and Agamidae arc absent. Tailed amphi- bians are unknown south of Central America; but the region is the home of several peculiar types of toads, such as Pipa (Surinam toad) belonging to an otherwise Ethiopian section, and the majority of the family Cystignathidac, as exemplified by the horned toad and the escuerso (Ceratophrys), the remainder of the group being Australian.

Freshwater fishes are very abundant in Neogaea, where they are represented by a number of peculiar generic and certain family types; some of the members have developed the remarkable habit of feeding upon the floating fruits abundant in the rivers of the tropical forest-districts.

The electric eels (Gymnotidae) are peculiar to the waters of Neogaea, as are certain other groups, such as the armoured cat- fishes (Loricariidae), while true cat-nshes (Siluridae) are extremely abundant. Perhaps, however, the most remarkable feature of the fish-fauna of Neogaea is its affinity to that of the Ethiopian region. Among the lung-fishes the family Lepidosirenidae is, for example, restricted to the two areas, with one genus in each, as is also the family Characinidae- Much the same may be said of the Cichlidae, which have, however, representatives in the Malagasy and Oriental regions; and the Cyprinodontidae, which are extremely abundant in Neogaea (where certain of their representatives are separated by some naturalists as a distinct family, Poeciliidae) likewise present the same general type of distribution, although their area includes the southern fringe of the Palacarctic sub-region and a considerable portion of the Oriental region.

As regards the past history of Neogaea, Professor Carl Eigcn- mann, writing in the Popular Science Monthly for June 1906, observes that " in the earliest Tertiary tropical America consisted of two land-areas, Archiguiana and Archamazonia, separated by the lower valley of the Amazon, which was still submerged. There was a land-mass, Hellenis, between Africa and South America, possibly in contact with Guiana and some point in tropical Africa. This land-mass, which was inhabited, among other things, by fishes belonging to the families Lepidosirenida (lung-fishes), Poeciliidae, Characinidae, Cichlidae and Siluridae (cat-fishes), sank beneath the surface of the ocean, forcing the fauna in two directions, towards Africa and towards South America, exterminating all types not moved to the east or to the west. From these two rudiments have developed the present diverse faunas of Africa and South America, each reinforced by intrusions from the ocean and neighbouring land-areas, and by autochthonous development within its own border. . . . The connexion between Africa and

South America existed before the origin of present genera, and even before the origin of some of the present families and sub-families, some time before the early Tertiary. There has never been any exchange between Africa and South America since that time."

This connexion between Neogaea and Africa was doubtless a continuation of the old Jurassic equatorial land-belt to which allusion has been already made; freshwater fishes being probably a group of earlier radiation than mammals. Perhaps the distri- bution of the reptilian genera common to Neogaea and Madagascar may be explained in the same manner, although tortoises apparently identical with Podocnemis occur in the Eocene of Europe (as well as in that of Africa and India), so that this group may have radiated from the north. Whether the evidence of the Cystignathidae among the amphibians and of the extinct Miolania among chelonians is also evidence of the persistence of the Jurassic connexion between Neogaea and Notogaea till a considerably later epoch must, for the present, be left an open question. The distribution of other families of lizards is, however, not in favour of such a connexion, the Laccrtidae and Agamidae being confined to the Old World, inclusive of Australia but exclusive of Madagascar, while the cosmo- politan Scincidae, so abundant hi Notogaea, are extremely scarce in Neogaea.

Reverting to the mammalian fauna, its evidence, combined with that of geology, indicates that during the greater portion of the Tertiary period South America was isolated from North America, and inhabited by its autochthonous fauna of monkeys, marmosets, sloths, ground-sloths, ant-eaters, armadillos, glyptodonts, toxodonts, macrauchenias (together with certain other peculiar ungulates), rodents, marsupials and creodonts, as well as by Pkororhachos, rheas, tinamous and probably some of the other groups of birds now peculiar to the area. This state of things continued till the later Miocene or Pliocene epoch, during some portion of which a connexion was established with North America by way of the isthmus of Darien. By means of this new land-bridge a certain proportion of the autochthonous fauna of Neogaea was enabled

to effect an entrance into North America, as is exemplified by the occurrence there of ground-sloths and glyptodonts. Simultaneously a large immigration of northern forms took place into Neogaea; these invaders from Arctogaea, including cats and sabre-toothed tigers, bears, fox-like

dogs, raccoons, llamas, horses, tapirs, deer, mastodons and perhaps opossums. While representatives of most of these invaders have persisted to the present day, some groups, such as horses and mastodons, have entirely disappeared, as has also a large portion of the autochthonous fauna. Here it may be well to notice that the evidence for the Insulation of Neogaea during a large portion of the Tertiary period does not by any means rest only on that supplied by mammals. C. H. Gilbert and E. C. Starks, 1 for instance, in a work on the fishes of the two sides of the isthmus of Darien, wrote as follows:—" The ichthyological evidence is over- whelmingly in favour of the existence of a former open communica- tion between the two oceans, which must have become closed at a period sufficiently remote from the present to have permitted the specific differentiation of a very large majority of the forms involved. ... All evidence concurs in fixing the date of that connexion at some time prior to the Pleistocene, probably in the early Miocene." This, it will be observed, agrees almost precisely with the conclusions drawn from the fossil mammalian faunas of North and South America, which indicate that land-communicarion between those two continents was interrupted during a consider- able portion of the Tertiary epoch, and only re-established (or [?] established for the first time) either towards the close of the Miocene or the early part of the riiocene epoch.

The South American mammalian fauna, as we now know it, is, then, a complex, consisting of an original autochthonous element and of a large foreign infusion from the north. As to the origin of the latter, there is no difficulty; but some degree of obscurity still prevails with regard to the source of the autochthonous fauna. According to Prof. Eigenmann's interpretation of the evidence of the fresh-water fishes the early Tertiary Atlantic " Hellenis " may have been in contact with Guiana on the one side and tropical Africa on the other. That such a connexion did really exist in Tertiary times is the conclusion reached by Dr C. W. Andrews, 2 as the result of his studies of the Tertiary vertebrate fauna of the Fayum district of Egypt, as expressed in the following passage:— "Speaking generally, it appears that (i) probably in Jurassic times Africa and South America formed a continuous land-mass; (2) in the Cretaceous period the sea encroached southwards over this land, forming what is now the South Atlantic. How far this depression had advanced southwards at the end of the Secondary period is not clear, but it appears certain that the final separation of the two continents did not take place till Eocene times, and that there may have been a chain of islands between the northern part of Africa and Brazil which persisted even till the Miocene."

By this route, as was suggested considerably earlier by Prof. VV, B. Scott and subsequently by the present writer, Neogaea may have received a considerable portion of its autochthonous mammal- fauna. Further reference to this point is made later; but it may be added that the evidence

of the laud-faunas is supplemented by that of the shallow-water marine faunas on the two sides of the Atlantic, which present a striking similarity.

In an address to the British Association at the meeting in 1905 in South Africa Mr G. A. Boulenger expressed himself, however, as by no means satisfied with the evidence of a Tertiary connexion between Africa and South America. " It is undeniable," he observed, "that the hypothesis of a South Atlantic land-com- munication in the Eocene has much in its favour, and when this is really established, all difficulty in explaining the distribution of the Cichhdae will have disappeared. In the meanwhile … we must not construct bridges without being sure of our points of attachment." In this connexion it may be mentioned that those who explain the distribution of certain forms -of life by the former existence of a land-connexion between the southern continents by way of " Antarctica," have attached some importance to the exist- ence of fishes of the genus Galaxias in the freshwaters of New Zealand, Australia, South America and the Cape. This evidence has been shattered by Mr Boulenger's description (in a memoir of the fishes of the Congo) of a marine representative of the genus in question from the Southern Ocean.

For the zoological subregions of Neogaea the reader must refer, as in the case of most of the other regions, to special works on zoological distribution.

*As Arctogaca includes the whole of the rest of the land-surface of the globe (with the exception of Antarctica) it is almost impossible Arctosaea to ˆ ve an ˆ E enera ' diagnosis even of its mammalian * " fauna. It may be mentioned, however, that at the present day monotremes are wholly wanting, while marsupials are represented only by one or two species of opossums (Dzdelpkys) in North America and hy cuscuses (Pkalanger) in the Austro- Malayan subregion. The true or typical Edentata are, if we except late wanderers from Neogaea into North America, absent from this realm at the present date and during the Pleistocene; the alleged occurrence of a ground-sloth in the Pleistocene of*

L Mem. Calijornian Academy, vol. iv. (1904).

1 Catalogueˆ/ the Tertiary Vertebrata ef the Fayum (London, 1906),

Madagascar being probably due to a misinterpretation. On the other hand, this region, and more especially its eastern half, is the great home of the ungulate mammals. Indeed rhinoceroses may be considered absolutely characteristic of Arctogaea, since at one time or another they have ranged over the whole area, except Mada- gascar, and are quite unknown elsewhere. _ The modern land Carnivora are likewise an essentially

Arctogaeic group, which only found its way into Neogaea at a comparatively recent epoch; and the realm may be said to have been the birthplace of most of the higher groups of placental mammals. The tortoises of the family Trionychidae form an exclusively Arctogaean group, once ranging all over the realm, although long since extinct in Europe.

If Madagascar be excepted, the Ethiopian region (or Ethiopia) is the most distinct of all the regions of Arctogaea. So distinct is it that, on the evidence of the distribution of moths, Ethiopian Dr H. S. Packard 3 has suggested that it should be sepa- rej ˆ 01I# rated from Arctogaea to form a realm by itself, under _ the name of Apogaea. The mammalian fauna, even exclusive of the Tertiary one of Egypt, does not, however, countenance such a separation. By Sclater and Wallace, Madagascar was included in the Ethiopian region, but that island was subsequently made a region by itself by Dr Blanford. This separation of Madagascar to form a Malagasy region has met w r ith general acceptance; but in the opinion of Mr R. I. Pocock, who bases his conclusion on the distribution of trapdoor-spiders (which inother respects accords curiously well with that of mammals), it is not justified. The mammalian evidence appears, however, to be overwhelmingly strong in its favour; and it also receives support from reptilian distribution. All are agreed that the Ethiopian region should exclude that part of Africa which lies, roughly speaking, north- ward of the tropic of Cancer. By Sclater and Wallace the region was taken to include that portion of Arabia lying to the south of the same tropic; but Mr Pocock 6 has pointed out that this separation of Arabia into two portions is not supported by the distribution of scorpions, and he would refer the whole of it to the Mediterranean transitional region. The occurrenceˆ a tahr- goat (Hemitragus) in Oman lends some support to this proposal since that genus has no representative in Africa, and occurs else- where only in the Himalaya and the mountains of southern India. Other writers have not accepted Mr Pocock's emendation; and the reference of the northern half of Arabia to the Mediterranean and of the southern half to the Ethiopian region is usually followed. The area is admittedly a meeting-ground of at least two faunas.*

Discoveries in the Fayum district of Egypt have conclusively proved that during the early (Eocene) part of the Tertiary period Ethiopia was a great centre of development, and subsequently of dispersal, instead of having received (as was formerly supposed) the w r hole of its higher modern mammalian fauna from the north. In this Ethiopian centre w T ere developed the ancestors of the elephants (Proboscidca) and of the hyraxes (Hyracoidea) ; the latter group being represented by species of much larger size than the existing forms, some of the former of which ranged into southern Europe during the later Tertiary. It was also the home of a peculiar subordinal group of ungulates (Barypoda), typified by

Arsinoitherium, and may likewise have been the birthplace of the swine (Suidae) as the earliest known representative of that group {Geniohyus) occurs in _ the Fayum Eocene. The hippopotamuses (Hippopotamidae), which appear to be descended from the Tertiary Antnracotheriidac, may likewise be of Ethiopian origin, and the same may turn out to be the case with the giraffe group (Giraffidae) although definite evidence with regard to the latter point is wanting. The occurrence of an ostrich-like flightless bird in the Fayum Eocene— the oldest known representative of that group — is sugges- tive that the Ratitae originated in Ethiopia, which would pecord well with their distribution both in the present and the past. A giant land-tortoise (Testudo) is likewise known from the Fayum beds, and as it is allied to the species recently or still inhabiting Madagascar and the Mascarene islands, there is a strong probability that Ethiopian Africa was likewise the centre of development and dispersal of that group.

Turning to its existing mammalian fauna, Ethiopia possesses a number of peculiar family or generic groups, and is also nearly equally well characterized by the absence of others. As remarked by Wallace, one of its characteristics is the great number of species of large size. Among the Primates, it is the home of the typical, group of the Negroid branch cf the human species, whose northern limits coincide approximately with the boundary of the region itself, being replaced in northern Africa by races of the Caucasian stock. Gorillas and chimpanzees (Anlkropopitkecus) are peculiar to the region, as are also baboons (Papio and Theropithecus), if southern Arabia be included. Monkeys abound, and although in most cases nearly allied to those of the Oriental region, are generically

3 Science, ser. 2, vol. xix. p. 221 (1904). Dr Packard groups Notogaea and Neogaea in a single realm under the name Antarc- togaea. Some other writers, such as Dr H. Gadow, take Notogaea to include all the three southern continents, and employ the term Arctogaea for the rest of the world.

- *Proc. Zool. Soc, London, 1903, pp. 340-368.*

5 Natural Science, vol. iv., pp. 353~3 6 4 (1894)-

distinct. The Prosimiae, or iemuroids, include the galagos (Galago) and pottos (Perodictycus) , of which the latter are akin to the Oriental loriscs, while the former are quite distinct from the Malagasy lemurs. Among the Carnivora, the aard-wolf (Proteles), the hunting-dog {Lycaon) and the

long-eared fox (Otocyon) are peculiar generic types, as are several forms of mungooses (Herpestinac) ; while the spotted hyaena forms a subgenus by itself. The bear- family (Ursidae), on the other hand, is totally absent. In the great ungulate order the African elephant is widely sundered from its Asiatic cousin, as are the two species of rhinoceros from their representatives in the Oriental region; indeed each group is sub- generically distinct. The hy raxes, forming the suborder Hyra- coidea, are, with the exception of a single outlying Syrian species, confined to Ethiopia. Zebras and true wild asses are likewise peculiar to the region. More remarkable is the extraordinary number of peculiar genera of antelopes, a few of which range, however, into North Africa, Syria and Arabia; the African buffaloes are markedly different from those of Asia; and sheep and goats are absent from the region, with the exception of intruding into it to some extent in the mountains of the Sudan and Abyssinia. The giraffe-family (Giraffidae), as represented by giraffes (Girajfa) and the okapi (Ocapia), is absolutely confined to this region, from which the deer-tribe (Cervidae) is completely absent. Chevrotains, or mouse-deer, are represented by the peculiar genus Dorcatherivm (or Ilyomoschus); in the pigs the wart-hogs (Phacochoerus) , forest- hogs (Hylochoerus) , and the bush-pigs (subgenus Potantochoerus) , with the exception of one Malagasy species, are now unknown elsewhere, as are also hippopotamuses. Rodents include a number of peculiar types, among which may be noticed the scaly-tailed squirrels (Anomaluridae), the jumping-hares (Pedetes), the strand- moles (Bathyergidae), the crested-rats (Lophiomys), and the cane- rats (Thryonomys, or Aulacodus); the last being nearly allied to South American forms. In the Insectivora, moles (Talpidae) are absent, the jumping-shrevs (Macroscelididae) are solely African, although ranging north of the Sahara, while the golden moles (Chrysochloridac) and the Potamogalidae are exclusively Ethio- pian. Lastly, the ant-bears, or aard-varks (Orycteropodidae), represent a suborder of the Edentata unknown elsewhere; while the African pangolins (Manidae) differ markedly from their Oriental kindred.

The Ethiopian birds are less peculiar. The ostrich (Slrutkio) ranges, in suitable localities, all over the region, thus entering the Mediterranean transition region in the north. The guinea fowls (Numidinae) form a subfamily confined to Ethiopia and Madagascar, where true pheasants are unknown. Other peculiar types are plantain-eaters (Musophagidae), colies (Coliidae), wood- hoopoes (Irrisoridae), barbets (Megalaemidae), ground-hornbills (Bucorvus), secretary-birds (Serpentariidae), glossy starlings (Lam- protornis), ox-peckers {Buphaga), the genera Laniarius and Tele- phones, as well as a number of others, all of which are unknown in Madagascar. In addition to true pheasants, wrens (Troglodyt- idae) and water-ousels (Cinclidae) are unknown in the Ethiopian region.

Apart from the widespread Trionychoidea (of which there are two genera

peculiar to the region), the Ethiopian fresh-water tortoises belong to the section Pleurodira ; the two genera Pelo- medusa and Sternothaerus being common to Africa and Madagascar, and unknown elsewhere. The Amphisbaenidae are common to Neogaea and Ethiopia, to the exclusion of Madagascar; but the Gerrhosauridae and Zonuridae, on the other hand, arc restricted to the present region and Madagascar, which also form the head- quarters of chameleons. In contrast to the latter community Is the absence in Madagascar of Agamidae and Varanidae, which are common in Ethiopia. The absence of slow-worms and their kindred (Anguidac) is a marked negative feature of the present region. As regards batrachians, the region has no salamanders or other tailed forms, but, in common with India, possesses caecilians (Apoda); while it shares the group of tongucless toads (Aglossa) with Neogaea, its peculiar family being the Xenopodidae, in contra- distinction to the South American Pipidae. The Pclobatidae are absent, and true toads are few, but frogs are abundant.

Among fishes, Africa south of the Sahara possesses a number of peculiar types. With Neogaea it shares the possession of the typical lung-fishes (Lepidosirenidae), while it is the hahitat of the species of bichir {Polypterus) and Calamoichihys, the sole survivors of the ancient group of fringe-finned ganoids (Crossopterygii). The other families peculiar to Ethiopia are the Mormyridae (pro- boscis-fishes), Pantodontidae, and Phractolaemidae; the two latter being represented only by a single species each. The Notopteridae, Ophiocephalidae, Anabantidae, Osphromenidae and Mastacemhe- lidae are common to Ethiopia and the Oriental region. In addition to the Lepidosirenidae, the Charaeinidae are peculiar to this region and Neogaea. The Cichlidae occur in Madagascar, Ethiopia, the Oriental region and Neogaea; and the Osteoglossidae are common to the last three of these regions, as well as Australia, while the Nandidae are Ethiopian, Oriental and Neotropical. On the whole, the affinities of the fish-fauna of Ethiopia are nearest to that of the Oriental region, and, secondly, to that of South America.

Although invertebrates do not come within the scope of the

present article, It may be mentioned that Ethiopia is remarkable for the total absence of fresh-water cray-fishes.

As regards its past history, Ethiopian Africa, was jn connexion with India during the Triassic and Jurassic periods, the two areas collectively forming " Gondwanaland," which doubtless constituted a portion of the equatorial land-belt referred to as existing during the epochs in question. Gondwanaland was the home of a large section of the anomodont reptiles

from which mammals have sprung; and it is quite probable that the evolution of the latter group took place within the present area. Between the Trias and the Eocene little or nothing is known of the vertebrate palaeontology of Ethiopia; 1 and in Egypt there is also a long gap between the lower Miocene and certain Pliocene beds in the Wadi .Natrun. The Tertiary deposits of southern Europe and northern India indicate, however, that Ethiopian Africa was in free communi- cation with these countries during the upper Miocene and Pliocene epochs. There occur, for instance, either in south-eastern Asia or southern Europe, or both, during the latter period numerous genera of antelopes now restricted to Ethiopia, as well as giraffes, okapi-like ruminants {Palaeotragus), elephants and rhinoceroses of an African type, probably zebras, hippopotamuses, baboons, chimpanzees and ostriches. Owing to imperfect knowledge of Pliocene Africa, it is impossible to say whether these types were first developed in Ethiopia or to the north-east, and consequently whether or not Professor Huxley was right in his theory that the modern higher mammalian fauna of Ethiopia came from the north. It has, how- ever, been suggested that while the Bovidae are an autochthonous Ethiopian group, the Cervidae originated in either the Holarctic or the Oriental region; a theory which if confirmed will materially aid in explaining the absence of the latter group from Ethiopia. It is supported to some extent by the fact that we are acquainted with primitive ancestral deer in the European Tertiary, while the ancestors of the Bovidae are at present unknown. Whatever be the truth on this point, it is manifest that whether the middle Tertiary Bovidae migrated from Ethiopia to Asia or in the opposite direction, there must have been some cause which barred the entrance by the same route into the latter area of all members of the deer-tribe (as well as bears). It should be added that although the ancestral Proboscidea were Ethiopian, the passage from the mastodons into the true elephants appears to have taken place in Asia ; a circumstance which would imply the Asiatic origin of the African elephant.

The evidence in favour of the continuation of the Mesozoic land- bridge between Ethiopia and Neogaea has been discussed under the heading of the latter area. If the arguments in favour of such a connexion are valid, it is to the old mammal fauna of Ethiopia that we must probably look for the progenitors of the Santa Cruz fauna of Patagonia. Very noteworthy is the alleged occurrence of remains of primitive armadillos in the Oligocene beds of southern Europe in association with those of pangolins and aard-varks; since, If these fossils be rightly determined, there at once arises the probability of Africa having been the original home of the entire Edentate order.

In the case of an island lying so close to the African continent as docs Madagascar the natural expectation would be that its fauna should be

*intimately related to that of the former. „ . As a matter of fact— in the case of mammals and birds, a , gaSy at any rate — it is much more distinct from the Ethiopian *** on ‘ fauna than is the latter from the fauna of either the Oriental or the Holarctic region. The evidence — from the above-mentioned groups — in favour of recognizing a distinct Malagasy region is in fact positively overwhelming, while it is also supported in some degree by the distribution of groups other than those named. In place of the Ethiopian assemblage of apes, monkeys, baboons, galagos and pottos, Madagascar (together with the Comoro islands) possesses an absolutely unique fauna of icuiurs, constituting the family Lemuridae, which, as now understood, is confined to this island, where it is represented by the three subfamily-groups of sifakas (Indrisinae), true lemurs (Lemurinae), and aye-ayes (Chiro- myinae). All these animals agree with one another in the char- acters of the tympanic region of the skull; thereby differing from the African and- Oriental Prosimiae, but agreeing with the European Oligocene Adapts ,ˆ which must apparently be regarded as the ances- tral form. This is a striking confirmation of the theory advanced many years ago by Huxley that Madagascar received its lemuroid fauna from Europe at a very early date, since which time, at any rate, it has been isolated from Africa. Some of the Pleistocene Malagasy lemurs were much larger than any of the living forms, rivalling in this respect a chimpanzee. The Carnivora are repre- sented only by a small number of species, mostly referable to peculiar genera, of Viverridae, among which the fossa (Cryplo- procta) is the largest. In the ungulates there are only two extinct species of hippopotamus and a living bush-pig, the ancestors of all three of which probably crossed the Mozambique channel by swim- ming; and Edentata are equally conspicuous by their absence. Insectivora, on the other hand, are represented by the tenrecs (Centetidae), with numerous generic types, whose nearest relatives*

1 The fossils of the TJitenhage beds, now generally classed as I Jurassic, consist chiefly of invertebrates and plants.

appear to be the west Indian solenodons. The bats are likewise different from those of the mainland; a notable feature being the occurrence of nving-foxes of the Asiatic and Australian genua Ptervpus. Of trie countless rodents of Africa, all are wanting; while the only members of that group inhabiting the island are . certain rat like animals collectively constituting the family Neso myidae.

The birds are scarcely less remarkable than the mammals, such common Ethiopian types as the ostrich, secretary-bird, honey- guides (Indicator), wood-hoopoes, ground-hornbills, ox-peckers, barbets and glossy starlings being entirely unknown. On the other hand, the Malagasy region, inclusive of the Mascarcne islands, comprises quite a number of distinctive bird - genera, such as Mesites, Tylas, A rtamia, Calicaiicus, Euryceros, Phikpitta, Atelornis and Leptosomus; the first of these representing a peculiar family of game-birds, while the last, including only the kirombo, forms a subfamily of rollers (Coracndae). In the Pleistocene the ostrich group was represented by various species of Aepyornis, probably the original of the legendary roc; while within historic times Mauritius and Reunion were the respective homes of the two species of dodo (Didus), and Rodriguez was inhabited by the solitaire (Pezophaps), the three constituting the family Dididae. The guinea-fowls, on the contrary, form a group common to the Ethiopian and Malagasy regions and are unknown elsewhere.

Many of the features of the reptilian fauna are alluded to under the headings of Neogaea and the Ethiopian region. Among lizards, the absence of Agamidae, Veranidae, Lacertidae, Amphisbaenidae and Anguidae is very remarkable, since all these except the last are Ethiopian. In addition, Madagascar possesses, apart frorn the cosmopolitan skinka and geckos, only Gerrhosauridae, Zonuridae and chameleons (Chamaelcontidae), which are essentially African groups. Affinity with Neogaea is indicated by the presence of a few iguanas, of snakes of the boa group (especially the genus Boa), and of Podocnetms among the tortoises. The other pleurodiran tortoises are, however, of an Ethiopian type. The same may perhaps be said with regard to the giant land -tortoises of the genus Testudo, which in Pleistocene or modern times were spread over all the islands of the region, while they existed in Africa in the Eocene, as well as in India in the Pliocene. The spider-tortoise {Pyxis) is a peculiar cryptodiran Malagasy genus. In the matter of batrachians the Malagasy region lacks both coecilians (Apoda) and tongueless toads (Aglossa), while it has abundance of true frogs (Raninae), among them the Oriental genus Rhacophorus. Of fishes, the peculiar Ethiopian types are absent from the present region, although the community of the Cichlidae to Neogaea and the Ethiopian, Malagasy and Oriental regions is noteworthy. It may be added that Madagascar differs from Ethiopia in possessing one fresh-water cray-fish, the representative of a genus by itself.

The radical distinctness of the Malagasy fauna is thus demon- strated from all sides. That the island has been separated from Ethiopia during the greater portion of the Tertiary period is self- evident. The interpretation of its relationships with other regions is, however, exceedingly difficult. It is generally considered that the Comoro and Seyehelle groups mark the line of a former con- nexion between Madagascar and India, and also with South

Africa; but it is evident that this line must have been closed to the passage of mammals since a very remote date, as is exemplified by the fact that the lorises of Ceylon and southern India are quite distinct from the Malagasy lemurs, and much nearer to the African pottos. Whether the occurrence of South American types of reptiles (boas, Podacnemis, and iguanas) in Madagascar and not in Africa can be held to indicate a late connexion with Neogaea by way of the Pacific, cannot yet be decided. The occurrence of iguanas in Fiji is, however, as noteworthy as is the community of Miolania to Patagonia and Queensland. Moreover, Polynesia is evidently a subsiding area. In the opinion of Captain F. Button 1 the land- shells of the genus Endodonta, which range all through Polynesia, New Zealand, eastern Australia, New Guinea and the Philippines, with an outlier in Ceylon, afford the best evidence in favour of a Polynesian continent, the Singhalese outlier pointing to the conclu- sion that this group of molluscs originally came from the north. The molluscan evidence will not, however, explain the South American connexion.

Zoological evidence of the latter connexion, by way of Antarctica, is afforded by the earthworms of the family Acanthodrilidae, which are unknown north of the equator, although their occurrence in Madagascar may point to a northern origin. Additional evidence of a connexion with Patagonia is afforded by the occurrence in the Tertiary strata of- South America and New Zealand of a number of shallow-water marine invertebrates. Further, the occurrence of these forms in older strata in South America than in New Zealand suggests that the migration took place from the former to the latter area.

The relatively small and wholly t tropical or subtropical Oriental region was originally taken to include the Punjab; but in a memoir, of which an abstract appeared in the Proceedings of the Royal Society ol London for 1900 (vol. lxvii. p. 484), Dr Blanford came

Oriental region.

1 Index Faunae Novae- Zealandiae (London, 1904).

to the conclusion that the Punjab differs so remarkably in its fauna from the rest of India that it cannot be included in the Oriental region, and must be assigned to the Mediter- ranean transitional region. To the latter belongs also the Himalayan area above the forests, as does Tibet. India proper, together with Ceylon, is regarded as a single subdivision of the Oriental region, under the title of Cisgangetic, while the Himalaya and Burma form a second subregion, the Transgangetic, which also includes southern China, Tonquin, Siam and Cambodia. A third subregion, the Malayan, includes southern Tenasserim, the Malay Peninsula, and the Malay Archipelago

exclusive of Celebes. In the map in the present article the last-named island is included in the present region, although, as stated, it is by preference referred to an Austro-Malay transitional region. Wallace drew the main line dividing the Oriental from the Australian region between the islands of Bali and Lombok, and between Borneo and Celebes: " The strait [between Bali and Lombok] is here fifteen miles wide, so that we may pass in two hours from one great division of the earth to another, differing as essentially in their animal life as Europe does from America. If we travel from Java or Borneo to Celebes or the Moluccas, the difference is still more striking." The hydrographic results obtained by the Dutch Siboga Expedition show, however, that although there exists a line of great depth separating the two areas, this line on no point corresponds to " Wallace's line." On the contrary, it passes east of Timor and through the Banda and Molucca seas, separating Sula from Buru, Obi and Halmaheira. For this line which replaces " Wallace's line," Dr A. Pelseneer has proposed the name of " Weber's line." It is this " W'eber's line" which marks the real division between the Arctogaeic and the Notogaeic faunas, although it has been convenient to make Celebes the centre of an intermediate transitional region.

The Oriental region agrees with the Ethiopian in being inhabited by elephants, rhinoceroses, buffaloes, several large representatives of the Felidae (among which the lion, leopard and hunting-leopard are common to the two areas), and numerous civets and mungobses. The elephant and the three species of rhinoceros are, however, subgenerically distinct from their Ethiopian relatives, and the buffaloes are also widely different from those of Africa. Wild cattle (of the subgenus Bibos), as represented by the gaur and the bantin, are peculiar to this region; and, with the exception of gazelles, antelopes are poorly represented, although the three genera Antilope (blackbuck), Tetraceros (chousingha), and Trcgo- camelus (nilgai) are restricted to the area. Southern India has one tahr (Hemilragus) in its mountains, and this genus also occurs in the Himalaya, where serows (Nemorhaedus) and gorals (Urotragus) — rgoat-like antelopes ranging through the Malay countries — are likewise met with. Deer (Cervidae) are abundant, and include three peculiar subgenera of Cervus, namely Rusa, Hydaphus and Rucervtts, to the exclusion of the typical fed deer group. The typical Tragulus represents the chevrotains; and the pigs, unlike those of Ethiopia, belong to the typical section of Sus. In addition to Neogaea, the Malay subregion is now the sole habitat of tapirs (Tapiridae). A notable distinction from Ethiopia is the presence of bears, which are, however, distinct from the typical Ursus arctus group of the north. 3 Borneo and Sumatra form the home of the orang-utan (Simia), the sole Oriental representative of the Simiidae, while the gibbons (Hylobatidae), which range as far west as the eastern Himalaya, are

restricted to the region. The monkeys are all generically distinct from those of Ethiopia, The tarsier repre- sents a family (Tarsiidae) by itself; and the lorises a subfamily (Nycticebinae) peculiar to the forest-tracts. Fruit-bats of the genera Pteropus, Rousettus and Cynapterus help to distinguish the region from Ethiopia; while among the Insectivora the tupais, or tree-shrews (Tupaiidae), with three genera, and the rat-shrews (Gym- nurinae), also with three generic modifications, are likewise solely Oriental. The cobegos, or flying- lemurs (Galeopitkecus) , represent an ordinal group (Dermoptera) peculiar to this region; while there are several distinctive genera of rodents, especially in the mountains of the Philippines, where some approximate closely to the Australian type represented by Hydromys.

Pangolins, of a type different from those of Ethiooia, alone repre- sent the Edentata. A striking feature of the mammalian fauna of' the region is the presence of so many peculiar and probably archaic types in the Malay subregion, and the affinity of the fauna of this area to that of western Africa. Both districts may be said to be highly conservative in the matter of their faunas.

The birds arc extremely abundant, and include a number of peculiar genera to which detailed reference is impossible. There is no representative of the ostrich group ; and the place of guinea- fowls is taken by pea-fowl {Pavo) and argus-pheasants (Argtisiana), while francolins {Francoli?ius) abound. Attention may be directed to the abundance of pheasants, pigeons, king- fishers, sunbirds, flycatchers and starlings. The babblers (Timcliidae) arc especially numerous, the group allied to the hill-robin (I.iothrix) being peculiar to the region, as are also the green bulbuls (CfUoropsis). True

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One member of this group has recently been described from : Shan States.

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bulbuls (Pycnonbtidae) and king-crows (Dicruridae) art? also more abundant than elsewhere; while the broad-bills (Eurylaemidae) are peculiar.

Among reptiles, the long-snouted crocodiles of the genera Gavialis and Tomisloma are elsewhere unknown at the present day. The river-tortoises of the family Trionychidae. have three peculiar genera ; white the other fresh-water tortoises differ from those of Ethiopia in belonging to the

section Cryptodira, of which there are a number of peculiar generic types. The family Platysternidae is solely repre- sented by a tortoise confined to the Malay countries. In the lizards the family Anguidae is represented by one genus; Agamidae are very abundant; and include several types peculiar to the region, among which may be noticed the flying-dragons {Draco). Chameleons are rare. The burrowing-snakes of the genus TypMops are exceedingly numerous; the allied Ilysiidae are common to India and Neogaea; while the Uropeltidae are restricted to India and Ceylon. In the presence of pythons the region agrees with Ethiopia, as it does in possessing cobras; but it divides with Neogaea the range of the Amblycephalidae, while it is also inhabited by pit-vipers (Crotalmae), which form an exclusively Asiatic and American group. Among the Amphibia, the region agrees with Ethiopia in possessing representatives of the limbless Apoda, but differs in the presence of frogs of the family Pelobatidae, while toads (Bufonidae) and true frogs (Raninae), especially those of the genus Rhacophorus, are abundant.

Of the fishes it must suffice to state that lung-fishes and ganoids are absent, as are also Mormyridae. But the families Ophio- cephalidae (serpent-heads) and . Rhynchobdellidae (or Mastacem- bˆlidae), which have a few African representatives, are abundant; while the Cobitidae are a group unknown in Ethiopia. Siluridae and Cyprinidac are common.

Allusion has been already made to the presence of African forms of mammals in the Tertiary depositˆ of northern India (some of which are, however, within the Mediterranean transition-region) ; and it may be added that remains of a baboon (Papio) and of a large pangolin allied to the west African species have been found in Madras.

Few words must suffice for the Malayan transitional area, which embraces Celebes, the Moluccas, &c. ; and t has a fauna showing a blending of that of the Oriental with that of the Australian Austro- region. While Celebes possesses a small buffalo allied Malayan t0 t j ie T n dj an species r a monkey (Cynopithecus), and a tra J sh,oa ‘ peculiar type of pig (Babirusa), it has also cuscuses region. (Phalanger), while cassowaries, cockatoos and other Notogaeic types occur in the area. A notable feature is also the absence of Cyprinidae (carps) from Celebes, although they are abundant in Borneo.*

The Mediterranean transition-region, the limitations of which are approximately shown on the map, must likewise be dismissed with brief notice; its fauna at the eastern end being Meaner’ intermediate between those of the Oriental and the rauesn Holarctic region, while in the west it serves as the trans ion- ˆ_ man ‘ s _i an( ] between the Holarctic and the Ethiopian reg on. faunas. The most distinct portion of the Mediterranean

fauna is undoubtedly that of Tibet, where are such peculiar types among mammals as the takin (Budorcas), the chiru antelope (Pan- thofops), the yak, representing a subgenus of Bos, snub-nosed monkeys (Rhino pithecus), the giant panda (Aeluropus), and certain peculiar shrews (Nectogale).

Farther west the great mole-rat (Spalax), the rabbit (subgenus Oryctolagus) and the two species of fallow-deer (subgenus Dama), are very characteristic of the Mediterranean zone, which is also the home of the addax antelope (A ddax), the Barbary sheep (sub- genus Ammotragus) , and numerous true sheep, wild goats and gazelles. Citnodaclylus , the gundi, is a characteristic North African genus of rodents. It is also noteworthy that with the Mediter- ranean zone we enter the domain of typical deer of the red deer group (Cervus), and of bears of the brown bear group (Ursus arctus). The wolf and the fox are also animals whose territory we reach on entering the Mediterranean zone, although neither of these, or the brown bear, are confined to this tract, or even to the Palae- arctic section of the Holarctic region.

Reference to many other animals of the Mediterranean tract will be found under the heading of the Palaearctic subregkin.

The Holarctic region, which comprises, the whole of the land lying northward of the Mediterranean transitional zone in the eastern, and north of the Sonoran zone in the western Holarctic hemisphere, is the largest of all the zoological provinces n ˆ °°" of the globe. The whole territory is extra-tropical, and it Is Inhabited at the present day neither by monotremes, mar-supials, edentates, lemurs nor monkeys, although representatives of the three latter occur in portions of the Mediterranean transi- tional region. The types common to the eastern and western halves of this region are to be met with on the two sides of the northern Pacific, and it is evident that the main communication took place by way of Bering Strait, although it has been suggested that there was also a land-bridge connecting the European continent with Iceland, and thus with Greenland.

Among characteristic groups of mammals common to the two

halves of the Holarctic region (or in some instances of portions of the adjacent transitional zones to the southward) the following may be mentioned: elk {Alces), reindeer (Rangifer), wapiti {Cervus canadensis and its Asiatic representatives), bison (subgenus Bison), bighorn sheep (Ovis canadensis and its representatives in north- eastern Asia), musk-ox (Ovibos), now extinct in the eastern hemi- sphere, glutton or wolverine (Gulo), brown bear {Ursus arctus and its representatives in north-east Asia and America), lynx (Felts lynx), wolf (Canis lupus), fox (C. vulpes), pine-marten (Mustela mattes and the allied American form), ermine and weasel

(Putorius), variable hare (Lepus timidus and its relatives), picas (Ochotona, or Lagcmys), be&vtrs(Castor) , ma rmots (A rctomys), chipmunks (Tamias), susliks {Spermopkilus, or Citillus), jumping-mice (Zapus), field-mice, or voles {Microtus, or Arvicola), lemmings (Lemmus and Dicro- stonyx), mole-shrews (Urolrichus), 1 and several genera of bats. To these may be added, as more exclusively arctic forms, the polar bear {Ursus maritimus) , and the arctic fox {Cants iagopus). There are likewise many groups or species of birds common to the two divisions of the region. Among reptiles, the pond-tortoises of the

fenus Emys, ii we include their Pleistocene range, are an essentially lolarctic (and Mediterranean Sonoran) group. In regard to fishes, the whole area is characterized by the abundance of sturgeons (Acipenseridae), carps (Cyprinidae), pike (Esocidae), and the salmon group (Salmonidae), coupled with the scarcity of cat-fishes (Siluridae).

Further testimony in favour of the unity of the Holarctic region is afforded by the presence on the two sides of the Pacific (and in most cases nowhere else) of true alligators (Alligator), giant salamanders (Cryptobranchus and Megalobatrachus, really scarcely worthy of separation) , and shovel-beaked sturgeons (Scapkirhynchus), Again, it is highly probable that Pere David's deer of Central Asia, alone representing the genus Elaphurus, is akin to the f or k-an tiered deer, Mazama, of North America ; and many other analogous instances might be quoted. Finally, the distribution of earth- worms affords the strongest confirmation of the view that the two halves of the Holarctic region form but a single zoological province, with the Mediterranean and Sonoran zones as transitional appen- dages.

*In briefly reviewing some of the chief faum'stic areas of the Palaearctic, as distinct from the Nearctic, subregion, it will be convenient to include some of the groups and species inhabiting the transitional Mediterranean zone, much of paia *' which is in reality only a portion of the Palaearctic sub-araicsub ' region. Distinctive of the area in this wider sense are re£oa ~ a number of wild sheep, such as Ovis musimon, gmelini, ammon, poll, &c, which have no representatives on the other side of Bering Strait, as well as wild goats, like Capra hircusaegagrus, C. ibex, and C. sibirica, belonging to an exclusively Old World genus. The saiga antelope {Saiga) and the chamois (Rupicapra) may also be regarded as Palaearctic (in the sense of Old World) types; as are also wild horses (Equus caballus przewalskii) , and the kiang (E. kemionus) and onager (E. hemippus), the two latter being commonly termed wild asses, although widely different from the African animals properly so-called. There are also many peculiar types of deer, inclusive of the red deer (Cervus elaphus), Pere David's deer (Elaphurus), the roe-deer (Capreolus), and the musk- deer (Moschus) ; while the Chinese water-deer (llydrelaphus) is one of the characteristic*

forms from the Mediterranean zone. Camels (Camelus) are a type quite unknown east of Bering Sea. Among the Carmvora, reference may be made to the raccoon-dog (Nydereutes), the panda (Aelurus), now a Himalayan and Chinese type, but occurring in the later Tertiary of England and the con- tinent, and the tiger (Felis tigris); the last being essentially a Siberian and Mongolian animal which only reached India at a comparatively recent date, and never penetrated to Ceylon. Badgers (Meles) are unknown in the Nearctic region. Tn the Insectivora the water-shrew (Neomys or Crossofius) is exclusively Palaearctic, as is the allied Dipfomesodon, while the desmans (Myogale), although a Mediterranean type, are solely Old World. Among the rodents, reference may be made to the Old World family of the dormice (GHridae or Myoxidae), of which the genera Glis and Muscardinus are restricted to the area; as are the hamsters (Cricetus) and zokors {Ellobius and Siphneus)in the Muridae, and Euchoreutes, Alactaga, and Platycercomys in the jerboa-group (Jaculidae, or Dipodidae). Sminthus is another characteristic Palaearctic (and Mediterranean) rodent. To continue the list would merely be wearisome, without any compensating advantage; but it may be added that there are a number of characteristic extinct forms, among the most notable of the latter of which are the aurochs or wild bull (Bos taurus primigenius) and the giant Irish deer (Cervus [Megaceros] giganteus).

Of the remaining groups of vertebrates characteristic of this subregion space admits or but scant mention. Among abundant and more or less characteristic birds, reference may be made to thrushes, warblers, jays, magpies, buntings, sparrows, and (in the eastern part of the Mediterranean zone) pheasants, pratincoles,

1 The American form is often separated as Neurotrichus, but this does not affect the relationship of the two areas.

coursers (Glareolidae), and bustards (Otididae), of which there are numerous genera confined to the area. The two families last named, together with that of the Panuridae (represented by the bearded tit), being solely Old World, are of themselves sufficient to distinguish the Palaearctic from the Nearctic fauna.

Of reptiles there is not much to be said, the Palaearctic subregion, in its restricted sense, being characterized hy the poverty of its fauna, several of

the widely spread families of the Old World, such as the Yaranidae and Agamidac, stopping short of its southern limits. Among batrachians, the tailed salamanders are common in this and the Mediterranean region (as in the northern hemi- sphere generally), the genera Salamandra and Chioglossa, as well as the frogs and toads of the genera Alytes and Pelobates, being unknown in the Nearctic subregion, while newts (Molge) abound in the Palaearctic and are rare in the Nearctic subregion. The olm [Proteus) is a native of the Mediterranean rather than the proper Palaearctic area.

As regards fishes, the subregion differs from the Nearctic province by the absence of bony-pike (Lepidosteidae), bow-fins (Amiidae), and the familv Catostomatidae, as typified by the " suckers," " red horses" and '" stone-rollers " of the genus Catostomus, and the presence of loaches (Cobitidae) and barbels (Barbus).

As compared with the Palaearctic (and Mediterranean) province ot the Holarctic region the Nearctic subregion (together with the Sonoran transitional zone) is characterized by the extreme Neerctlc poverty of its fauna of hollow-horned ruminants. Of subregion. thege ˆ b ; son ; s gener [ca ll y (an d subgenerically) identical with its European relative, while the musk-ox can scarcely be regarded as a distinctive Nearctic type, seeing that it is only since the Pleistocene epoch that it has ceased to be a denizen of northern Europe and Asia. The only other living members of the group are the bighorn sheep (Ouii canadensis), which has representatives in Kamchatka and north-eastern Siberia, and the while, or Rocky Mountain goat (Oreamnus, or Haplaceros), which is a peculiar type. All must be regarded as originally immigrants from Europe; and it is noteworthy that in the Nearctic Pleistocene are several extinct types of musk-oxen, together with certain other genera which may possibly serve to connect the white goat and the musk-ox with the scrow and the takin of the Old World. The deer (Cervidae), apart from the three Old World types alluded to under the heading of the Holarctic region, are altogether peculiar types referable to the genus Mazama (subgenus Dorcdaphus, Cariacus or Odocotleus), but they may be akin to the Asiatic Elaphurus, and the group is certainly of Old World origin. The same may be said of the bears (Ursidac), in which the black bear (Ursus americanus) is a peculiar species, although probably allied to the Himalayan U. torqualus. In the brown bear group (U. arctus) it is noteworthy that while the Alaskan forms are very close to those inhabiting Kamchatka and Amurland, the Rockv Mountain grizzly, which has penetrated farther into the continent, is more distinct. The grey-fox (subgenus Vrocyon) is a characteristic Nearctic type. Among other groups of mammals, the following generic groups distinguish the Nearctic from the Palaearctic subregion, although some of them enter the Sonoran area. In the Insectivora we have Blarina, Scalops and Scupanus ; in the Carnivora

Procyon among the raccoons, Mephitis among the skunks, and Taxidea among the badgers. Cynomys (" prairie-dog ") is a characteristic rodent; and in the same order a very important feature is the replacement of all the true rats and mice (Murinae) of the Old World by the deer-mice and their allies belonging to the subfamily Cricetinae, which is but poorly represented in the Old World. Peromyscus is a very characteristic Nearctic genus, although it has an analogue in the Old World in the form of the single representative of the Persian Calomyscus. The wood-rats of the genus Neoloma and the musquash (Fiber) are characteristic Nearctic types of the vole-group. More important is the family Haplodontidae, represented only by the sewellels (Haplodon, or Aplodon), all the members of which are exclusively North American, although some are Sonoran. The pocket-gophers (Geomyidae) and kangaroo-rats (Heteromyidae) are also solely American, though more developed in the Sonoran than in the Nearctic area; Geomys and Thomomys in the former and Pero- gnathus in the latter family are, however, found in the Nearctic area. Lastly, among the rodents, we have the Canadian porcupine (Erithizon), typifying the New World family Erithizontidae. Among bats it must suffice to state that the genus Lasiurus (Atalapha) is solely North American.

Reference to the Tertiary mammal-faunas of North America must be of the briefest. It may be mentioned that even in the Pleistocene these display a much greater development of large forms than occurs at the present day, while a notable feature at this epoch is the mingling of Arctogaeic and Neogaeic types, as exemplified by the occurrence of elephants and mastodons alongside of ground-sloths {Megalonyx and Mylodon). In the Pliocene and Miocene, the fauna was more of an Old World type, including a great development of camels (Tylopoda) , horses (Equidae) , rhinoceroses (Rhinocerotidae), mastodons, &c, but also a number of peculiar types, such as the ruminating oreodonts (Oreodontidae, or Merycodidae), the perissodactyle Titanotheriidae, and the more generalized Uintatheriidae, which typify a subordinal ungulate group

by themselves. It has been suggested that some of the more widely spread of these groups, such as the camels and horses, may- have originated in the New World, but there seems at least an equal probability that Central Asia — or a land-area common to Asia and America— may have been their birthplace.

The earliest Tertiary North American fauna is that of the lowest, or Puerco, Eocene, which includes a number of mammals of various types, some of the largest being of the approximate dimensions of a mastiff. Evidently the Puerco epoch was a period of great development and radiation on the part of mammals; its fauna including primitive creodont Carnivora, amblypodous and condy- larthrous Ungulata, and a number of smaller

types, some of which were probably related to the modern Rodentia, Insectivora and Primates. As only a foreshadowing of the Puerco mammals is found in the under upper Cretaceous Laramie beds, >t has been suggested that the fauna was largely of northern origin.

Bv the middle of the Eocene period the more generalized types of trie Puerco fauna had almost disappeared, although a few creo- donts survived till the Oligocene. It is surmised that the low brain-capacity of the members of this fauna rendered them unfit to cope with the irruption of more highly organized mammals which suddenly appeared on the scene in the Lower Eocene; this new fauna, it is conjectured, may have developed from a side-line of the original Puerco stock which had remained in the old northern home at the time of the earlier radiation.

" Assuming that the Puerco mammals," observes Mr Madison Grant, 1 " were driven out of more northerly or boreal lands, where they had originally developed, by a declining temperature, it is conceivable that some animals remained behind and adjusted themselves to the changed conditions, until a still further increase of cold freed them also to follow the path of their predecessors, southward. ,

"Some of these Lower Eocene types of this second radiation, which are found in the Wasatch beds of Wyoming, have sent down lines of descendants, which have ultimately culminated in existing animals. At this time first appear the horses, tapirs, rhinoceroses, camels and dogs (or rather the ancestral stocks thereof). Some of these animals, such as the horses and rhinoceroses, are found con- temporaneously in Europe, others, like the (ancestral) camels, are peculiar to America [some of the later types have recently been discovered in Asia]. ...

" Being more highly organized and better adapted to their environment, these new types entirely supplanted the older fauna, and by the Oligocene this transformation was complete, and the older fauna had disappeared. This Wasatch fauna culminated, and then faded gradually away on this [American] continent, until in the Middle Pleistocene it was largely supplanted by arrivals from Asia."

The relationship of the fauna to that of South America, and the interchanges which took place between the two during the Pleis- tocene and Pliocene epochs, have been already sufficiently discussed when treating of Neogaea.

Of the birds of the Nearctic subregion and the adjacent Sonoran zone, there are a very large number of peculiar genera in the pas- serine order, a large proportion of which are referable to the finch- group (Fringillidae),

and the American warblers (Mniotiltidae), the latter being solely a New World family; there are also a few stragglers from the Neogaeic family of tanagers (Tanagridae). Among game-birds the turkeys (Meleagris), the ruffed grouse (Bonasa), the prairie-grouse [Tympanuchus, or Cupidonia), the sage-cock (Centrocercus) , the prairie-chicken (Pedioecetes), and several genera of the American partridges (Odontophorinae), such as Lophortyx and Ortyx(" bob-white "), may be cited as characteristic Nearctic groups, although some extend farther south. Turning to reptiles, the presence of rattlesnakes (Crotalus) is a feature broadly distinguishing the Nearctic subregion (together with America generally) from the Palaearctic; in the more southern territories we also enter the domain of iguanas; while among chelonians we have the family of snappers (Chelydridae), the " stink-pot terrapins " (Cinostcrnidae), and in the Testudinidae the box-tortoises (Cisludo), and the terrapins of the genera Chrysemys and Malaccckmmys are solely American, although some of them range far to the south, while during the Pliocene the snappers were represented in Europe. TThere are several more or less peculiar types of North American amphibians, but since these are for the most part Sonoran in range, they may be best noticed in a later paragraph. |,

From that of the Palaearctic (ˆ-Mediterranean) subregion the fish- fauna of the Nearctic subregion (together with that of at least much of the Sonoran area) is broadly distinguished by the presence of bony-pike (Lepidosteidae) , bow-fins (Amiidae), and the members of the family Catostomatidae, for which there appears to be no collective English name, as well as by the absence of the loach family (Cobitidae), and barbels (Barbus) among the Cyprinidae.

The last of the zoological provinces into which the land-surface of the globe is divided on the evidence of the distribution of mammals and birds is the Sonoran, which, although often regarded as an

1 " The Origin and Relationship of the Large Mammals of North America," Rep. New York tool. Soc. (1904), p. 7.

independent region, is best ranked (on Prof. Max Weber's scheme) as a transitional zone between the Ncarctic subrcgion of the Sonoran Holarctic region of Arctogaea, on the one hand, and transition- N?°g ae a on the other. Its fauna is indeed essentially a zone. mixture of Nearctic and

Neotropical types (inclusive of

those originally indigenous to Neogaca and such as are properly immigrants from the north) together with a few more or less wholly endemic forms. Marsupials are represented by opossums (Diddphys) , and armadillos by Tatusia. Peccaries (Dicotyks, or " Tagassu ") make their appearance, but the fork-antlered deer {Mazama) are mainly of the northern type. The pronghorn antelope, representing the family Aniilocapridae, may be regarded as mainly a Sonoran type; and the same may be said with regard to the pocket-gophers (Geomyidae) and kangaroo-rats (Heteromyidae), some of the genera of which are peculiar to this area. Among cricetine rats, Rhithrodonlomys, Sigmodon and Neofibcr are charac- teristically Sonoran. In the Carnivora the three genera of skunks, Mephitis, Ccnepatm and Spilogale are represented, as are the three raccoon genera Procyon, I\ 7 asua and Bassariscus; the third in each case being mainly confined to this zone. Scalops and Notiosorex among the Insectivora are almost exclusively Sonoran, while Blarina and Scapanus here attain their maximum develop- ment.

Omitting all reference to birds, it may be mentioned that among reptiles the poisonous lizards (Helodcrmatidae) and the chclonian family Dermatemydidae, with two or three genera, are almost or quite exclusively Sonoran; while such southern types as iguanas become more numerous than in the north. The Mississippi alli- gator is also Sonoran, although with a congener in China. Among batrachians the salamanders of the genera Cryptobranchus (if dis- tinct from the Old World Megalobatrachus) , Amphiuma, Typhlo- molge, Nectunts and Siren, together with Scaphiopus and certain other genera of the frog and toad groups, arc exclusively American and mainly Sonoran. The axolotls, or tiger-salamanders (Ambly-stoma), are also a group attaining a great development in this zone, although also ranging to the northward, and likewise recurring in south-eastern Asia.

So far as birds and mammals are concerned, the Antarctic con- tinent can scarcely represent a distinct zoological province; its . fauna consisting mainly of certain peculiar generic groups Antarctica, Q j sea j s (w hich are at least as much inhabitants of the pack-ice as of the continent) together with a number of species of penguins — a group common to the extremities of the three great southern continents — and certain other birds.

The zoological provinces already discussed are based on the present distribution of mammals and birds (see further Mammalia „ ,„. and Bird). The distribution of reptiles and batrachians,

rf a° e tnat °^ f resn -water fishes, by no means accords with

*“hiM m ” *■ m ˆicated by mammals and birds, probably owing niton’s to tne earner radiation,- or rather radiations, of the * former groups, and different zoological provinces have been proposed to indicate their distribution, as is more fully recorded in the articles Batrachia and Reptiles.*

From the evidence of batrachian distribution Dr H. Gadow adopts the view that the world may be divided into a northern and a southern half, for the former of which the name Arctogaea is adopted, while Norogaea is used for the latter. It would, how- ever, be much better if entirely new terms were proposed, since the use of the former in a sense different from that in which they arc now employed in the case of mammals is liable to create con- fusion. Notogaea, which (in this sense) includes Australia, Poly- nesia and the Neotropical region, is characterized by the presence of that family of frogs known as the Cystignathidae, combined with the preponderance of the section Arcifera, the representatives of which form nearly 90 per cent, of the Anura (frogs and toads) inhabiting this half of the globe. Arctogaea, on the other hand, is characterized by the absence of Cystignathidae, and is divisible into two main provinces, or regions, respectively termed Pcriarctic and Palaeotropical. Of these latter, the Periarctic province is characterized by the presence of salamanders and their allies (Urodela), which are indeed almost peculiar to the area. It is divisible into the (1) Western Palaearctic, (2) Eastern Palaearctic and (3) Nearctic subregions, of which the first two approximately correspond to the Palaearctic subregion phis the Mediterranean transition-zone of the mammalian scheme, w r hile the third repre- sents the combined Nearctic and Sonoran areas. The Palaeo- tropical region has few salamanders or newts; but possesses caecilians (Apoda) which are wanting in the Periarctic; and includes the Ethiopian, Oriental, Malagasy and Austro- Malayan areas of the system -based on mammalian distribution, together with Melanesia. Whether the region should be broken up into the four above-named divisions, or regarded as indivisible, may he a matter of opinion; but if such divisions be adopted, they have no approach to the corresponding mammalian areas, the Oriental tract not even possessing a peculiar subfamily. It is thus evident, as might have been expected, that the zoological provinces indi- cated by the distribution of batrachians are in no wise comparable to those based on mammalian evidence.

As regards reptiles, Dr H. Gadow has remarked that since the

various orders have come into existence at very different geological periods, and have each followed their own line of dispersal, no scheme of zoological distribution can be formulated for the class as a whole. In the case of the

crocodilian order little informa- tion of importance can be gathered from its present distribution, seeing that representatives of all the principal groups occur together in the older Tertiary deposits of Europe. It is, however, of some interest to note that caimans (Caiman) are restricted to Neogaea (in the mammalian sense); while the long-snouted Gavialis and Tomistoma are equally confined to the Oriental region. An impor- tant feature in the present distribution of chelonians is the restric- tion of the section Pleurodira to the southern hemisphere (inclusive of all the three southern continents, as well as Madagascar), and thus in no wise corresponding to the " batrachian Notogaea," The value of this feature in chelonian distribution is to some extent discounted by the occurrence of Pleurodira in the northern hemi- sphere during the Eocene period.

In regard to lizards (Lacertilia), Dr Gadow remarks that their distribution does not support the division of the land-areas of the globe into a northern and a southern half; the marked distinctness of the lacertian fauna of the New from that of the Old World point- ing in the same direction. On the other hand, lizards countenance Lhe view " that the Palaeotropical region is but the tropical and therefore richer continuation of the now impoverished Palaearctic subrcgion."

The present distribution of snakes, according to the same natu- ralist, indicates that the Ophidia are a group of late radiation, while it further suggests that some of the divisions adopted in classifica- tion are not natural ones. Perhaps the most important fact Is that the two families, Boidae (boas and pythons) and Typhlopidae (blind burro wing-snakes), which alone retain vestiges of hind-limbs, occur all over the tropical zone, while certain allied families are found in portions of the same. The restriction of true vipers (Viperinae) to the Palaeotropical and Periarctic areas of the batra- chian distributional scheme is a noteworthy fact. The pit-vipers (Crotallnae), however, may perhaps be presumed to have originated in the Palaearctic area, whence they reached and spread all over America, although they were unable to enter either Africa or Australia. The absence of all venomous snakes (which abound in Africa and India) from Madagascar, is a fact harmonizing with mammalian distribution, so far as the peculiarity of the fauna of that island is concerned.

For a fuller account of the distribution of fishes, both fresh- water and marine, see Ichthyology; here it will suffice to refer to a zoo-geographical scheme, based on the present n/cˆJAM- distribution of the freshwater families, adopted by „ .

fresh-

Dr A. C. L. G. Gunther. According to this scheme, the land-surface of the

earth is divided into three parallel zones, the Northern, the Equatorial and the Southern. The ˆ M J r Northern zone is characterized by the presence of sturgeons ***””• (Acipenseridae), the paucity of cat-fishes (Siluridae), and the abund- ance of carps (Cyprinidae), the salmon-tribe (Salmonidae), and pike (Esocidae). This zone falls naturally into an eastern and a western section. In the first, forming the Palaearctic, or Europe- Asiatic region, bony-pikes (Lepidosteidae) are lacking, while loaches (Cobitidac) and barbels_ (Barbus) abound. In the second section, constituting the Nearctic or North American region, bony-pikes, bow-fins (Amiidae), and the family Catostomatidae, all of which are unknown in the Palaearctic area, are present, while loaches and barbels are lacking.*

The Equatorial zone is divisible into two provinces: an Eastern, characterized by the presence of carps and of the family (Anaban- tidae) typified by the well-known ” climbing-perch,” and a Western province, in which these two groups are wanting. The Eastern province includes an Indian (Oriental) region, in which lung-fishes (Dipnoi) are absent, while serpent-heads (Ophioccphalidae), Masta- cembelidae and loaches are numerous; and an African (Ethiopian) region, distinguished by the presence of lung-fishes, bichirs (Crossop- terygii), and proboscis-fishes (Morrnyridae), the abundance of chromids (Chromididac) and characinids (Characinidae) , and the lack of loaches. The Western Equatorial province is likewise divisible into two regions, namely, a Tropical American (Neotropical), distinguished by the possession of lung-fishes and electric eels and the abundance of chromids and characinids, and a Tropical Pacific (Australian and Hawaiian) characterized by the presence of Dipnoi (widely different, however, from those of Africa and South America, which are nearly related), and the lack of chromids and characinids.

Lastly, the Southern zone is characterized by the absence of carps and the scarcity of cat-fishes, while the salmon tribe is replaced by the Haplochitonidae and pike by the Galaxiidae (since this classification was proposed a marine Galaxias has been discovered). This zone includes only a single (Antarctic) region, embracing Tasmania and the south-eastern point of Australia, New Zealand and Patagonia and Tierra del Fuego.

It will be seen that the present distribution of fishes, although showing certain features in common, by no means accords as a whole with that of mammals. Indeed”, it is suggestive of the period of the earth’s history when there was an extensive and more or less continuous belt of eauatorial land

[MARINE

For the distribution of invertebrate animals generally, the reader may be referred to the articles dealing with the various groups Distribu l ˆ at . assemD ‘ a g e – An exception must, however, be*

tiaa of ‘ ma de with regard to that group of spiders known as

spiders.

the Mygalomorphae (which. includes the trap-door spiders)

on account of the remarkable general similarity presented by its distribution to that of mammals. According to Mr R. I. Pocock, 1 the distribution of this group justifies the mapping of the world into the following zoological regions: — (l) The Holarctic, including Europe north of the southern mountain-chains, North Asia, and North America north of about the 45th parallel of latitude. (2) The Mediterranean, including South Europe, Africa north of the Sahara and the desert-regions of south-western Asia. (3) The Sonoran, comprising the United States of America south of about the 45th parallel and the plateau of Mexico. (4) The Ethiopian, embracing Africa south of the Sahara, South Arabia and Mada- gascar. The last-mentioned island ranks merely as a subregion of the Ethiopian. (5) The Oriental, including India, Ceylon, Burma, Siam, and all the Indo- and Austro-Malayan Islands to Australia; ” Wallace’s line ” being non-existent so far as spiders are con- cerned. (6) The Australian, containing Australia and New r Zea- land; the latter being worthy of recognition as a subregion. (7) The Neotropical, including Central America, apart from the Mexican plateau, the West Indiesand South America.

These spiders furnish, moreover, strong evidence in favour of a former union between Africa and South America, and of a con- nexion between the Afro-Mascarene and Austro-Zealandian con- tinents on the one hand and Austro-Zcalandia and the southern extremity of South America on the other. As regards the ” regions, ” apart from the greater divisions, or ” realms, ‘ the distribution of these spiders accords with remarkable closeness to that of mammals, if we except the more intimate connexion indicated between the faunas of Ethiopian Africa and Madagascar.

The fact that the generally accepted scheme of division of the land-surface of the globe into zoological regions is based almost entirely upon the present distribution of mammals and birds has already been emphasized. It is perhaps only fair to quote the views of Dr A. E. Ortm.ann 8 (who has devoted much study to the distribution of animals), although they by no means wholly commend themselves to the present writer: —

" (1) Any division of the earth's surface into zoo- geographical regions which starts exclusively from the present distribution of animals, without considering its origin, must be unsatisfactory, since always only certain cases can be taken in, while others remain outside of this scheme. (2) Considering the geological development of the distribution of animals, we must pronounce it impossible to create any scheme whatever that covers all cases. (3) Under these circumstances, it is incorrect to regard the creation of a scheme of animal distribution' as an important Feature or purpose of zoo- geographical research. "

Dr Ortmann adds in a later paragraph, " the chief aim of zoo-geographical study consists — as in any other branch of biology — in the demonstration of its geological development."

II. Marine Distribution

That the fauna of the ocean, apart from the influence of temperature, would be much more uniform, and therefore less susceptible of being divided into zoological provinces, or regions, will be apparent from a glance at the map of the world on Mercator's projection, in which the fact that the three great oceans— the Pacific, the Atlantic and the Indian — are in free communication with one another in the southern hemisphere is clearly brought out. There is, however, more than this; for there is evidence that during the early part of the Tertiary period the Pacific and the Atlantic were not separated by the isthmus of Darien; while there is a probability that the Medi- terranean was at one time in communication with the Red Sea, and that other connexions of a like nature have existed. ■ In addition to this general community of the marine fauna of the world, there is the further important fact that such faunas may be divided into three main, and for the most part perfectly distinct, groups: namely, the littoral, or shallow water, fauna, the abyssal, or deep-sea, fauna, and the pelagic, or surface, fauna. Of these three the first alone is really suscep- tible of division into more or less ill-defined zoological regions, the other two being practically uniform in character. More-

1 Ptoc. Zool. Soc, London, 1903, vol. i. p. 340.

2 Proc. Amer. Phil, Soc, xli. p. 267 (1902).

over, these three faunas are for the most part perfectly well defined; the pelagic being very sharply sundered from the abyssal, although there may in certain instances be a tendency for the littoral to merge locally into the abyssal. As regards the sharp demarcation between the pelagic and the abyssal faunas, an idea was formerly current that whales, which are essentially pelagic animals, when " sounding/' descended to abyssal depths

in the ocean. A moment's reflection will show the absurdity of such a supposition; for no surface-dwelling animal could possibly support the enormous pressure existing at great depths, which would crush in the body-cavities. Evi- dence of this is afforded by the fact that when fishes are brought to the surface from great depths their bodies are practically broken to pieces by the removal of the normal pressure, while their scales start from the skin and the eyes from ,their sockets. The absolute darkness prevailing at great depths would be another bar to pelagic animals descending to the ocean abysses. We may accordingly regard the pelagic and the abyssal faunas as perfectly distinct and widely sundered from one another; as widely sundered in the case of some species as are beings living in three-dimension space from these (if such there be) inhabiting space of four or more dimensions.

Modern research shows that invertebrates, and probably also fishes, live at the greatest depths that have yet been reached by the dredge, and the inference from this is that they n eeD ,. sea occur everywhere. The general results of these explora- /-„«1. tions is indeed to show that the fauna of the ocean depths is much the same all the world over, and that identical species occur at points sundered as widely as possible from one another. The ocean floor, as has been well remarked, with its uniformity in the matter of temperature, food, station and general conditions of life, contains, in fact, no effectual barriers to the almost indefinite dispersal of species.

The following general conclusions with regard to the deep-sea fauna were arrived at after working out the material and evidence obtained during the cruise of H.M.S. " Challenger " ; — (1) Animal- life is present at all depths on the ocean floor. (2) At extreme depths life is not nearly so abundant as at moderate depths; but since representatives of all classes of marine invertebrates are met with at all depths, this poverty probably depends more upon certain causes affecting the composition of the bottom deposits, and the degree to which the bottom-water is provided with chemical substances necessary for animals, rather than upon conditions immediately associated with depth. (3) There is reason to believe that the fauna of " blue water " is chiefly restricted to two belts; one at or near the surface, and the other near the bottom, the intervening zone being more or less completely devoid of inhabitants. From the surface-zone a continual ram of organic debris is falling to the bottom, which, however, in the case of the greatest depths may be completely dissolved in desrensu. (4) Although all the chief groups of invertebrates are represented in the abyssal fauna their relative proportions arc unequal; molluscs, crabs and annelids being, as a rule, scarce, while echinoderms and sponges predominate. (5) Depths below 500 fathoms are inhabited by a practically uniform fauna, the genera being usually cosmopolitan, although the species may differ, and be represented by allied forms in widely sundered areas. (6) The abyssal

fauna, so far as invertebrates are con- cerned, is of an archaic type as compared with shallow-water faunas. (7) The most characteristic and archaic abyssal types seen to be most abundant and to attain their maximum dimensions in the southern ocean. (8) In general character the abyssal fauna approximates to that of shallower water in polar latitudes, doubt- less owing to the fact that the conditions of temperature, on which the distribution of marine animal life mainly depends, are nearly the same.

In reference to the abundance of sponges in the deep-sea fauna, it may be mentioned that the calcareous group is absent, arid that among the siliceous section, the Hexactinellidae, of which the Venus flower-basket {Eupleciello) and glass-rope sponge {llyalonemd) are familiar representatives, are exceedingly abundant; this group being likewise of great geological antiquity. Corals are sparse and belong for the most part to the Turbinolidac. Echinoderms are represented by all the existing ordinal groups; some of the crinoids, or stone-lilies, belong to the family Apiocrinidae, which attained its maximum development during the Jurassic epoch; and somewhat similar relationships are exhibited by certain of the brittle-stars (Ophiuroidea). Very noteworthy is the great develop- ment of the sea-cucumber group (Holothuroidea), and likewise the bizarre forms assumed by some of its abyssal representatives. Molluscs, however, are poorly represented, and it is not improbable that cephalopods (nautilus and cuttlefish group) are wanting. Bivalves of the genera Leda and Area have, however, been obtained from a depth of 16,000 ft. Lamp-shells (Brachiopoda) are likewise

Considerable difficulty exists in determining from what depths fishes are dredged. Although many species display various struc- tural peculiarities, such as a huge head, or an attenuated ribbon- like body, while special phosphorescent organs are very generally present, yet deep-sea fishes as a whole do not represent an ordinal or sectional group by themselves, but are drawn from a number of families, certain members of which have adapted themselves to an abyssal existence. A preponderance of representatives of the families Macruridae, Ophidiidac and Scorpclidae is, however, notice- able.

Whether light or temperature is the prepotent agency in regu- lating the limitations of the deep-sea fauna, has long been a debated question. It may be noted that reef-building corals, which require an average temperature of

from 70 to 75 F. and one which never falls below 68°, are never found below a depth of 20 fathoms (120 ft.). Nevertheless, there are several areas where a tempera- ture of from 70 to 77 obtains to depths of between 80 and 100 fathoms. It is further remarkable that well-characterized deep-sea faunas are locally met with in comparatively shallow waters, one such area occurring in the European Atlantic and a second in the Mediterranean, where they live within the 100-fathom zone. Light, which was formerly supposed not to penetrate to a greater depth than the 40 to 50 fathom-line, has also been regarded as the chief agent controlling vertical distribution. It appears, however, as Prof. Heilprin has remarked, " more than likely that not a single cause, but a combination of causes, is operative in bringing about the general results. That the deep-sea fauna is a fauna of darkness must be admitted; but this is so from the nature of the case rather than a matter of choice resting with the animals composing it."

After referring to the fact of the dissimilarity between the faunas of the two poles, Dr A. E. Ortmann, in a paper on the origin of the deep-sea fauna, 1 observes that we have reason to believe that each of these faunas had a separate origin, " the north-polar fauna being a derivate of the old Mesozoic Mediterranean, the south-polar fauna of the old Pacific fauna. The first developed along the shores of the northern continents, while the second had its original home on the shores of the Antarctic continent. We know that there is a strange element among the littoral fauna of the southern extremities of the continents, differing entirely from the arctic fauna, and we cannot but think that this is a remnant of the old Tertiary antarctic fauna. The above considerations give us a threefold origin of the present deep-sea fauna: — (1) An ancient Mesozoic (or pre-Tertiary) constituent, derived from a transformed part of the old warm-water fauna of the deep sea, adapted to the changed climatic conditions. It is clearly autochthonous. (2) A more modern, immigrant, Tertiary constituent, which came from the north-polar littoral waters, and immigrated into the deep sea together with the cool water (or after it had cooled). This element goes back to an old pre-Tertiary stock that lived in the warm littoral waters of the old Tethys (Mediterranean Sea), but as a cool-water fauna, it is not older than Tertiary. (3) Another Ter- tiary element, corresponding to the second one, but belonging to the south pole, which is finally to be traced back to the warm waters of the old Pacific Ocean of pre-Tertiary times."

The surface, or pelagic, fauna contains some of the smallest and actually the largest of all living animals, for among its members _, are included a host of so-called animalcules on the one

j hand and the whales on the other. The essential char-

fauntT acteristic of pelagic animals is that they pass the whole of their

existence swimming at or near the surface of the ocean, and only by accident touch the shores or the bottom. Much information with regard to the smaller pelagic creatures will be found in the article Plankton. Among the groups included in the pelagic fauna may be mentioned the radiolarian animalcules, together with certain representatives of the Foraminifera; the siphon-bearing jelly-fishes, such asPhysalia (Portuguese man-of-war), Velella, Porpita, &c. ; all the pterouod molluscs, such as Clio, Ciione and Cavolinia (Hyalaea), together with less aberrant gas- tropods, like Janthina (violet-snail), Atlanta and Glaucus; a few cephalooodous molluscs, such as the paper-nautilus (Argonauta) and .Spirilla; and a number of social ascidians, like Salpa and Pyrosoma. Crustaceans belonging to the entomostracous (shelled) and schizopod divisions abound; and there is a group of insects ijialobates) , belonging to the order Hemiptera, whose home is on the ocean-surface at, practically, any distance from land. Fishes form no inconsiderable portion of the pelagic fauna, among these being the true flying-fishes, or flying-herrings (Exocoetus), herrings, mackerel, tunny, flying-gurnards (Dactyloptera) , sword-fishes {Histio- phoras), sea-horses- (Hippocampus), pipe-fishes (Fistularia) and many of the sharks. With the exception of the comparatively few fluviatile species, the whole of the cetacean mammals— that is to say, whales, grampuses, porpoises, dolphins, &c. — claim a place among the surface-fauna of the ocean. Whether the sea-cows f'Sirenia) should likewise be included is doubtful, as they hold a somewhat intermediate position in regard to habits between ceta- ceans and seals. While they agree with the former in never (or very rarely) landing and in bringing forth their young at sea, they

1 Rep. Eighth International Geographic Congress, p. 619.

comeinshore to feed. Turtles certainly cannot be considered truly pelagic, since they come ashore to lay their eggs.

A large proportion of the smaller pelagic animals are more or less completely transparent, while others, such as the violet-snail, have developed an azure tint which renders them as inconspicuous as possible in the waste of waters. In the case of the larger animals, .like mackerel and the finner- whales, the same result is attained by the under surface of the body being silvery white (thus rendering 1 them invisible when looked at from below against the sky), and the upper surface olive or blackish green, sometimes, as in themackerel; "■ mottled to harmonize with the ripple of the waves.

The distribution of whales and dolphins has been taken by P. L. and W. L. Sclater to some extent as a basis in dividing the ocean into zoological regions. Since, however, such regions were mainly defined on the distributional evidence afforded by seals and sea- cows, they are best

considered in connexion with the shaUow^ water fauna.

The shallow-water, or littoral, fauna includes all marine animals' which belong neither to the deep-sea nor to the surface fauna, and is the most important of all three. In addition to the „. u ^ great bulk of marine invertebrates, the littoral fauna – e ,fLiL r may be taken to include the reef-building corals (whose f^" ath distributional limitations under the influence of tempera- ture-control have been already mentioned) and likewise seals and sea-cows among mammals, and turtles among reptiles.

" The fauna of the coast," observes Prof. H. N. Moseley, " has not only given origin to the terrestrial and fresh-water faunas,: it has through all time, since life originated, given additions to the pelagic fauna in return for having received from it its starting- point. It has also received some of these pelagic forms back again to assume a fresh littoral existence. The terrestrial fauna has returned some forms to the shores, such as certain shore-birds, seals and the polar bear; and some of these, such as the whales ■ and a small oceanic insect (Halobates), have returned thence to pelagic lite.

" The deep-sea fauna has probably been formed almost entirely from the littoral, not in most remote antiquity, but only after food, derived from the ddbris of the littoral and terrestrial faunas and floras, became abundant in deep water. It was in the littoral region that all the primary branches of the zoological family-tree were formed; all terrestrial and deep-sea forms have passed through a littoral phase, and amongst the representatives of the littoral fauna the recapitulative history, in the form of series of larval conditions, is most completely retained." m ri

From the distribution of certain groups of animals, „ a ."V . it has been attempted (as stated) to divide the ocean zoo ^ Ka into a number of zoological provinces, or regions. J ^S 01,S * Among the more important of such schemes, the following may be mentioned.*

The reef-building corals, whose limitations are defined by con- ditions of temperature and depth, are necessarily restricted to certain seas and coasts within or near the tropics. c . u They abound," wrote Dr A, R. Wallace in the ninth «£«,. edition of the present work, "in and near the West * ;*

Indies, on the east coast of Africa, in the Indian Ocean, in the: Malay and Pacific archipelagoes, and on the coast of Australia; while they are absent from the whole of the west coasts of South. America and of Africa, from the Indian peninsula, and from much of the east coast of South America. The coral-reefs of the Ber- mudas, in 33 N. lat., are the farthest from the equator; in the Red Sea they reach 30 N., in the Pacific 27° N., while they nowhere extend to more than 29 S. of the equator. , . . The coral regions

are therefore somewhat peculiar, and differ considerably from those which best exhibit the distribution of other marine animals. The regions adopted by Prof. J. D. Dana are three — the first com- prising the Red Sea and Indian Ocean; the second, the whole of the Pacific islands and the adjacent coasts of Australia; and the third the West Indies. This last region is the most isolated in position; and it is not surprising that it should contain the largest proportion of peculiar forms. The corals of the Central Pacific are also very peculiar, as arc those of the Red Sea and Indian Ocean."

*Prof. J. D. Dana 3 proposed to divide the oceans into three main areas according to the distribution of Crustacea. These areas are respectively termed the Occidental, the Africo- European eras- and the Oriental. The first comprises both coasts of , America; the second, the western shores of the Atlantic, V****

both African and European; while the third comprehends re &° BS » the vast area from the east coast of Africa to the Central Pacific. Each of these regions is subdivided into climatal and local provinces, but the primary divisions can alone be mentioned here. The facts adduced in support of this scheme of distribution are interest- ing. At the date of Prof. Dana's memoir 47 genera were known to be exclusively American, 15 being common to both the east and west coasts; but as 26 genera were said to be confined to the west and 6 to the east coast, these two provinces are really distinct,' even if they do not form primary regions. The Africo- European region had 19 peculiar genera, and only 8 in common with the

2 See Amer. Journ. Science, ser. 2, vol. xvi. p. 155 (1853).

American region; so that the eastern and western shores of the Atlantic appear decidedly more distinct than the eastern and western coasts of America. The extensive Oriental region is by far. the richest.

From the distribution of the species (not genera) of barnacles, or cirrhipeds, which are an aberrant group of Crustacea, Darwin considered that the ocean might be divided into the following regions, viz.: — (i) The North Atlantic, comprising North America and Europe down to N. lat. 30 ° ; (2) The West American, from Bering Strait to Tierra del Fuego; {3) The Malayan, from India to New Guinea, and (4) The Australian, comprising Australia and New Zealand: the Malayan and Australian regions being the richest in cirrhipeds.

One of the earliest students of the geographical distribution of marine animals was Dr S. P. Woodward, who, in his Manual of „ .. the Mollusca, proposed a scheme of zoo-geographical

rer'ons" re S' ons – He adopted three main divisions for the ^* f – * warmer parts of the ocean, namely, the Atlantic, the Indo-Pacific and the West American; and these Wallace was inclined to regard as the only valid marine molluscan regions. The Indo-Pacific region extends from the Red. Sea and the east coast of Africa to the eastern Pacific islands, and corresponds to Prof. Dana's Oriental region for Crustacea, many species ranging over nearly the whole area. The Atlantic region unites the fauna of the east coast of America with that of West Africa and South Europe, but has considerable affinity with that of West America, many genera being common to both areas. Several genera appear restricted to the north temperate zone, which in Wallace's opinion should perhaps form a distinct region. Numerous genera are con- fined to the Indo-Pacific region. The Atlantic coasts have few peculiar genera of importance, while the west coast of America has hardly any, the difference of its fauna from that of the Atlantic on the one side and the Pacific on the other heing chiefly specific. It is stated that while there is not a single species common to the east and west coasts of tropical South America, the corresponding coasts of North America have a large number in_ common, while others are so closely representative as to be almost identical.*

Inclusive of an Arctic province of somewhat doubtful value, Dr Woodward's three main regions were divided into 18 sub- regions; but, according to a somewhat modified later scheme, these may be arranged in four main groups, as follows: —

Regions.

Subregions.

Regions.

Subiegiocs.

C. Australian

{2. Neozealanian.

A. Atlantic

_ 3. Celtic. 4. Lusitanian.

v –

and ClR-

r 1. Aleutian.

CUM POLAR

5. W. African.

2. Calif orniap.

6. S. African.

3. Panamic.

B. Indo-

J 1. Indo-Pacific. “J 2. Japanese.*

D. American .

4. Peruvian.

5. Magellanic.

Pacific .

6. Argentinian.

7. Caribbean.

-8. Transatlantic.

Fish Regions. — From the distribution of shore-haunting fishes, Dr A. C. L. G. Gunther l suggested the following marine zoological regions, the characteristic family and generic types of which we are prevented by limitations of space from discussing: —

I. Arctic Ocean. II. Northern Temperate Zone.

A. Temperate N. Atlantic.

1. British district.

2. Mediterranean district.

3. N. American district.

B. Temperate N. Pacific.

1. Kamchatkan district.

2. Japanese district.

3. Californian district.

III. Equatorial Zone.

A. Tropical Atlantic.

B. Tropical Indo-Pacific.

C. Pacific Coast of Tropical America.

1. Central American district.

2. Galapagos district.

3. Peruvian district.

IV. Southern Temperate Zone.

1. Cape of Good Hope district.

2. South Australian district.

3. Chilean district.

4. Patagonian district. V. Antarctic Ocean.

Mammalian Regions. — The last scheme of marine zoological regions necessary to mention is one proposed by P. L. and W. L. Sclater ! on the distributional evidence afforded by seals, sea-cows

1 See Study of Fishes (London, 1880).

- The Geography of Mammals (London, 1899).

and cetaceans. According to this, we have the following six regions, viz. :—

(i) Arctatlantica (North Atlantic), characterized by the pre- sence of seals of the subfamily Phocinae, with the genera Halichoerus peculiar to it, and Phoca common to it and No. iv.; the absence of sea-cows; and (it is stated) by the bottle-nosed whales (Hy-perdodon) being peculiar to this area. (ii) Mesatlantica (Mid Atlantic), the sole habitat of the monk- seal (Monachus) and the manatis {Manatus). (iii) Philopelagica (Indian Ocean, &c), characterized, by the

presence of dugongs and the absence of seals, (iv) Arctirenia (North Pacific), agreeing with No. i. in the pos- session of Phoca but distinguished by also having sea- bears and sea-Hons {Otariidae) ; formerly the habitat of the northern sea-cow {Rkytina), and now of the grey whale (Rhachianectes). (v) Mesirenia (Mid Pacific), without Phocinae or sea-cows, but with the elephant-seal (Macrorhimts) , from the south, and also Otariidae. (vi) Notopelagica (Southern Ocean), with four peculiar genera of seals (Phocidae), numerous sea-bears and sea-lions, and two peculiar genera of cetaceans, the pigmy-whale (Neobalaena) and Arnoux's beaked-whale (Berardius). To explain the absence of sea-bears and sea-lions from the North Atlantic, and likewise the existence of manatis on both Atlantic coasts, the authors of this scheme call in the aid of a land-con- nexion between Africa and South America, which presented a barrier to the northward progress of the former, while its coasts afforded a means of dispersal to the latter. As the Otariidae are at present unknown previous to the Miocene, such an explanation, if valid, requires the persistence of the ancient land-bridge across the Atlantic to a much later date than is commonly supposed.

III. Distribution in Time

The subject of the distribution of animals in time, i.e. the relative dates of their first appearance on the earth, and in the case of extinct forms the length of their sojourn there, can be treated but. briefly; reference being restricted to the larger groups, and not even all of these being mentioned. The dates of appearance and disappearance of the various groups are only relative, for although many more or less vague attempts have been made to determine the age of the earth, there is no possibility of indicating in years the length of time occupied by the deposition of any one stratum or series of strata. AH that can be attempted is to say that one stratum (and conse- quently the remains of animals that may be entombed in it) is older or younger, as the case may be, than another. For the sequence and names of the various strata, or time-periods of the geological record, see Geology. An important factor in regard to the past history of animals is the imperfection of the geological record. Recent discoveries have rendered this im- perfection much less marked than was formerly the case. There are, however, still many very serious gaps; and we have, for instance, no definite information as to whei'e and when the transformation from reptiles into mammals took place.*

It may nevertheless be emphatically affirmed that the geo- logical, or rather the palaeontological, record indicates a gradual progression in the status of animals from the lowest to the highest fossiliferous strata. That is to say, the earlier animals were creatures of comparatively low grade (although certain repre- sentatives of such groups may have attained a relatively high

degree of specialization), and that as we ascend the geological ladder higher and higher types of animals make their appearance, till the series culminates in man himself — the crowning effort of creation, in the modern evolutionary signification of that term. It is not, indeed, to be supposed that the higher groups made their appearance exactly according to their relative grades (or what we regard as such) ; all that can be affirmed is that in the main the higher forms have made their appearance later than the lower. The record is thus almost exactly what it might be expected to be on the theory of evolution; while it also accords fairly well — if regarded with sufficient breadth of view— with the Biblical narrative of creation.

A brief survey of the time-distribution of the leading groups of animals ma}' now be undertaken, commencing with the highest and concluding with the lowest groups.

IN TIME]

ZOOLOGICAL DISTRIBUTION

1017

As the highest of all vertebrates, it is natural to expect that mammals should be one of the latest groups of that assemblage „ . to make their appearance; and this as a matter of fact

*m s * they are, although it is by no means improbable that birds arc the latest of all. Mammals are commonly stated to commence in the Trias, where they are presumed to bs repre- sented by Microlestes in Europe and by Dromatherium in North America. From the fact, however, that the approximately con- temporary Tritylodon, which has cheek-teeth very like those of the former, appears to be in great degree intermediate between reptiles and mammals, it is by no means improbable that none of these Triassic creatures were true mammals. Undoubted mammals occur in the lower Jurassic Stonesfield Slate, in the upper Jurassic Permian beds, and, very sparingly, in the Wealden of England; while a large fauna has been discovered in Jie upper Cretaceous of North America. The mammals included among these Mesozoic forms appear, for the most part at any rate, to be referable to the Marsupialia, Insectivora, and, not improbably, the Monotremata (see Marsupialia). After the lowest Eocene (when the Puerto fauna represented an inferior and apparently non-progressive type) mammals became abundant; and during that epoch most if not all of the existing orders made their appear- ance. The lower Eocene representatives of several of the orders, such as the Condylarthra among the Ungulata and the Creodonta among Carnivora, belonged, however, to low suborders*

which dis- appeared more or less completely by the O'ngocene. Several sub-ordinal groups of Ungulata developed and became extinct at later periods than the Eocene; but with the exception of the Ancylo- poda and Tillodontia (whose right to ordinal distinction is by no means universally admitted), none of the Tertiary orders of mammals are extinct. At the present day— as during the greater part of the Tertiary epoch — mammals are the dominant terrestrial repre- sentatives of the Vertcbrata. We have at present no evidence of the existence of Cretacea before the lower Eocene.

Although some of the three-toed bipedal tracks in the Trias of the Connecticut valley were formerly supposed to have been made a. rf by birds, there is little doubt that they are really due

s ' to diuosaurian reptiles. The class Aves, so far as we

know, is therefore first represented by the long-tailed Archaeo- pteryx of the upper Jurassic, which represents a subclass (or order) by itself. Toothed birds also existed in the upper Cretaceous of both Europe and North America, but all these appear referable to existing ordinal (or subordinal) groups. By the lower Eocene, when teeth appear to have been entirely lost, most or all of the existing ordinal groups were developed, since which date the majority at all events have steadily increased.

In contradistinction to both the preceding classes, reptiles, which date from the Permian, are a waning group, at all events so far as both terrestrial and marine forms of large bodily

Reptiles.

size are concerned. The Permian reptiles were small

or medium-sized creatures, few in number, and of generalized character. The one existing order dating from that epoch (when it was represented by Protorosaurus) is the Rhynchocephalia, of which the sole survivor is the New Zealand tuatara {Spkenodon). The Mesozoic period, from the Trias to the Chalk, is the true " age of reptiles," a number of orders being confined to that period. It is noteworthy, however, that the Triassic forms were in the case of the marine groups very generally of small size, and apparently amphibious, or perhaps freshwater. Of the various extinct Meso- zoic orders, the Dinosauria, as demonstrated by their footprints in the sandstone of the Connecticut valley, were represented by species of huge size even in the Trias. The other extinct orders whose distribution was approximately coequal with the Mesozoic period were the ichthyosaurs (Ichthyopterygia), the plesiosaurs (Sauropterygia), and the pterodactylcs (Ornithosauria). The Chelonia and Crocodilia (if we include the Phytosauria) date from the

Trias, but arc also dominant forms at the present day. But the mammal-like Anomodontia (Theromorpha), w r hich ranged from South Africa to India and Russia, were solely Triassic. The Squamata, including lizards and snakes, together with the extinct Cretaceous Pythonomorpha {Mosasaurus , &c), did not come into being till the upper Jurassic, or lower Cretaceous, and constitute the great bulk of the existing members of the class.

Batrachia, as represented by the labyrinthodonts, or Steno- cephalia, carry the origin of vertebrates one stage further back,

namely, to the upper Carboniferous. The stegocephalians, Wans " which appear to have included the ancestors of the anomo-

dont reptiles, died out at the close of the Triassic epoch. The existing representatives of the class date, so far as is known, only from the Tertiary, but it is not improbable that the limbless caecilians (Apoda) may really be much older, since they appear to be related to the Stcgocephalia.

The class Pisces is the lowest and at the same time the oldest representative of the Vertebrata, dating from the lower Ludlow Fish beds of the upper Silurian. The oldest group is that

es ' of the sharks and rays (Elasmobranchii), in which the orders Pleuropterygii, Ichthyotomi and Acanthodii are confined to the Palaeozoic. The lung-fishes (Dipnoi) are also an ancient group, although surviving in the form of three genera widely

sundered in space; the order Arthrodrra (as represented by Coc~ costeus of the Devonian) was solely Palaeozoic. Of the subclass Teleostomi, the fringe-finned group (Crossopterygti) attained its maximum in the Palaeozoic, although it survives in the shape of two African genera. In the case of the subclass Teleostomi the enamel-scaled, or ganoid, division was abundant during the Palaeo- zoic andearly Mesozoic periods (and still survives in North America), but the modern soft scaled bony fishes did not make their appear ance till the Cretaceous, or thereabouts.

Of the class Agnatha, as typified by the modern lampreys, the palaeontological record is very imperfect. There is, however, an armoured subclass, the Ostracodermi, represented by Pterichthys, Cephalaspis, &c, which was confined to the Lam P re y s ' upper Silurian and Devonian ; and Palaeospondylus of the Devonian has been regarded as an early lamprey (Cyclostomi). Whether the so-called conodonts, ranging from the upper Cambrian to the Carboniferous, are really teeth of lampreys, has not been definitely ascertained.

The lamp-shells, or Brachiopoda, form an exceedingly ancient group, dating from the lower Cambrian, and surviving at the present day, although in greatly diminished numbers com- ‘ .. m pared to the Palaeozoic epoch, when they far surpassed Jl i0 ” the now dominant bivalve molluscs. The group attained _ po ‘ its maximum in the Silurian, when, as in the Palaeozoic genera, nearly all the forms belonged to the hingeless section. With the beginning of the Mesozoic period the waning of the brachiopods, which had set in with the Devonian, became more pronounced, and was continued throughout the Mesozoic formations. A remark- able feature is the survival to the present day of the Cambrian genera Lingula, Discina and Crania (or closely allied types).

The Polyzoa, of which the sea-mats (Flustra) are well-known representatives, date from the Ordovician ; the Palaeozoic Po t vxoaos forms belonging almost exclusively to the section Cyclo- stomata, which attained its maximum in the Jurassic; while the dominant modern Chilostomata came in with the Tertiary.

The Mollusca, of which the great bulk are marine and the majority of the remainder freshwater, arc perhaps the most important of all fossils from the chronological point of view. Since the M three principal classes (Pclecypoda, Gastropoda and MoUuscs – Cephalopoda) are represented in the upper Cambrian, it is evident that the origin of the group was much earlier. In the Palaeozoic the chambered cephalopods of the section Tetrabranchiata (now represented by the nautilus) were the dominant forms; the bivalves (Pelecypoda) and gastropods showing a relatively poor develop- ment. The tetrabranchiate cephalopods continued throughout the Mesozoic, when they were specially represented by the ammonites ; but by the Tertiary they had become almost extinct. The section Dibranchiata (cuttle-fishes) commenced with the Mesozoic. The bivalves and gastropods have shown a steady increase to the present day, and are now the dominant forms.

*Insects date from the Ordovician graptolite- slates of Sweden, where they are represented by Protocimex; the next oldest being Pataenblattina of the French upper Silurian. From the . ˆ Devonian about a dozen forms are known, belonging flSec *s- to several groups; and from the Coal-measures extensive Insect- faunas have been described. All the Palaeozoic forms lack most of the distinctive features by which the modern groups are char- acterized, the majority of them showing kinship to the cockroach group.*

The Myriapoda (centipedes and millipedes) are of comparatively little importance as fossils. The class dates from the Devonian, and is abundant in the Coal-measures; the Palaeozoic forms M for the most representing two orders- — Archipolypoda Myrm’ and Protosyngnatha — peculiar to that

*period, of which P ot * St the second has only a single known species. The modern centipedes (Chilopoda) date mainly from the Tertiary, although several Car- boniferous genera have been assigned to the group. Millipedes (Diplopoda), although known from the Cretaceous of Greenland, elsewhere date from the Tertiary.*

The class Arachnida, now taken to include trilobites and king- crabs, as well as scorpions and spiders, is ancient. Scorpions — not far removed from existing types — are known in the Silurian, while true spiders occur in the Coal-measures. Thegreat majority of the more typical Palaeozoic arachnids are, however, referred to an order by themselves— the Anthracomarti. King-crabs (Xiohosura) date from the Silurian, the existing genus Limulus occurring in the Trias; but the gigantic eurypterids (Eurypterida) and the trilobites (Trilobita) are exclusively Palaeo- zoic, the former dating from the Ordovician, and the latter from the upper Cambrian.

Most of the existing ordinal groups of the class Crustacea appear to date from the Palaeozoic ; the decapods (lobsters and crabs) which represent the highest development of the class, _ did not, however, attain a dominant position till well ™ ns ” on in the Mesozoic, and are at their maximum in the present day; genuine crabs (Brachyura) apparently not having come into existence till the Cretaceous.

Among the Echinodermata, the classes Blastoidea and Cystoidea are exclusively Palaeozoic, while the stone-lilies (Crinoidea) forni a

Arach- nids.

Coelea-

terates.

group, dating from the same epoch, now on the verge of extinction. The sea-urchins (Echinoidea), which date from the Ordovician but – hj attain no great development till the Mesozoic, the

Jr “” starfishes (Asteroidea) and brittle-stars (Ophiuroidca),

which also date from the Ordovician, and the sea- cucumbers (Holothuroidea), which appear to he represented in the Carboniferous, do not seem, however, to have attained their full development till the modern

period.

That the Annelida are a very ancient group is indicated by the occurrence of remains of marine worms in the Ordovician; while A Hit " trac ks " or " burrows " apparently point to the exist-

ence of the class in the lower Cambrian, if not indeed in the Laurentian.

The earliest-known representatives of the Coelenterata occur in the upper Cambrian, where we find primitive types of hydroid

polyps, especially the graptolites, which lived only till

the Silurian, and have no near relatives. The equally

isolated stromatoporids, on the other hand, commenced in the Ordovician and survived till the Devonian. The corals (Actinozoa) were completely differentiated from the Hydrozoa in the Ordovician. Most of the Palaeozoic actinozoans belong to the Rugosa (inclusive of the four-rayed corals) which did not survive the Permian, but the Aporosa are also well represented. In the Mesozoic and Tertiary as well as at the present day the Aporosa and Porosa became, however, the dominant forms.*

As might have been expected from their low grade of organiza- tion, the sponges (Porifera) were strongly represented in the early

formations; the oldest known form occurring in the Sponges. ˆr e | sn Cambrian. In the Silurian and Carboniferous silicious sponges were extraordinarily abundant, and are repre- sented by several extinct groups.

Foram'inifera, extremely abundant in the Carboniferous, date at any rate from the Ordovician, where the existing genus Saccam-

mina has been identified. The Chalk consists almost Protozoa. ent j re iy f foraminifers. The Radiolaria, as represented by the Polycystina, are believed to date from the Silurian, or even the Cambrian, but did not attain their maximum till the Mesozoic or Tertiary. The so-called Eflaoflff.of.theXaurentian is not admitted to be of organic origin.

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ZOOLOGICAL GARDENS, sometimes called Zoological Parks, institutions in which wild animals are kept in captivity. Their primary object is to gratify the pleasure most persons take in viewing at close range the curious and beautiful living products of nature, but they serve also as means of instruction in natural history, providing material for museums and for investigations in comparative anatomy and pathology, while they may have a commercial value as pleasure resorts, or as show grounds for the display of animals that have been imported or bred for sale.

According to Captain Stanley Flower, director of the Zoological Gardens at Giza, Cairo, Egypt, the ancient Egyptians kept various species of wild animals in captivity, but the first Zoo- logical Garden of which there is definite knowledge was founded in China by the first emperor of the Chou dynasty, who reigned about 1 100 B.C. This was called the "Intelligence Park," and appears to have had a scientific and educational object. The ancient Greeks and Romans kept in captivity large numbers of such animals as leopards, lions, bears, elephants, antelopes, giraffes, camels, rhinoceroses and hippopotamuses, as well as ostriches and crocodiles, but these were destined for slaughter at the gladiatorial shows. In later times royal persons and great feudal magnates frequently kept menageries of wild animals, aviaries and aquaria, and it is from these that modern public Gardens have taken their origin. Henry I. (1100-1135) estab- lished a menagerie at Woodstock, Oxfordshire, England. This was transferred to the

Tower of London, apparently in the reign of Henry III., and kept up there until at least 1828. Philip VI. had a menagerie in the Louvre at Paris in 1333, Charles V. maintained collections at Conflans, Tournelles and in Paris, and Louis XI. formed a menagerie at Plessis les Tours in Touraine, which after his death was re-established at the Louvre in Paris and enlarged by collections obtained in North Africa. It was destroyed by Henry III. Henry IV. had a small collection, which included an elephant. Louis XIII. kept some animals at Versailles, whilst his son Louis XIV. founded the famous " Menagerie du Pare" at Versailles, which received many animals from Cairo, was maintained for over a century, and furnished much valuable material to French naturalists and anatomists. It gradually decayed, however, and was almost extinguished by the mob in 1780. In 1793 the Paris Museum of Natural History was re-established by law, and Buffon's idea of attaching to it a menagerie was carried out; the latter, as the collection in the Jardin des Plantes, still survives.

In Germany the elector Augustus I. founded a menagerie at Dresden in 1554. In the New World, according to Prescott, King Nezahualcoyotl had zoological gardens at Tezcuco in Mexico in the middle of the 15th century, whilst in the next century Cortes found aviaries and fishponds at Iztapalapan.

and Montezuma II., emperor of Mexico in the beginning of the 1 6th century, maintained large collections of animals in the gardens of his capital.

Most of the modern zoological gardens date from com- paratively recent years, and there are a larger number stocked with a finer collection of animals, more suitably housed, than at any past time in the history of the world. According to a reference list compiled by Captain Stanley Flower, there were 102 actually existing public gardens or parks containing col- lections of wild animals in 1010, while there are also a consider- able number of private collections. It is possible to refer here only to the more important of these.

Africa.— The Zoological Gardens at Giza, Cairo, are a govern- ment institution administered by the Public Works Department. The grounds are beautifully laid out and the collection is particularly rich in African animals, to which the climate is well adapted. The Khartum Zoological Gardens are free to the public and are under the control of the municipality, but the collection of animals is under the Game Preservation

Department. The Transvaal Zoo- logical Gardens at Pretoria are a government institution, and are associated with the Museum.

America, North. — The Zoological Park at Bronx Borough, New York City, opened in 1899, is one of the largest in the world. It is con- trolled by the Zoological Society of New York, with representatives of the municipality of the City of New Y'ork, and is financed largely out of municipal funds, and is open free to the public five days a week. The Park occupies nearly 300 acres, of great natural beauty, which has been increased by the judicious arts of the landscape gardener. It contains many fine buildings, designed on the most modern lines, but its special feature is a series of spacious enlosures for large herds of bison and deer. In a sense it serves also as a national reserve, and has already been an important factor in the preservation of the American bison. The National Zoological Park at Washington, D.C., was founded by Congress in 18S9-1890 " for the advancement of science and the instruction and recreation of the people." The site was purchased by the United States government, and all the expenses come from national funds, the management being vested in the Smithsonian Institution. The Park consists of about 265 acres of undulating land with natural woods and rocks, traversed by a gorge cut by Rock Creek, a tributary of the Potomac. The river and gorge extend into the country far beyond the Park, and in addition to the animals that have been introduced, there are many wild creatures living in their native freedom, such as musk rats in the creek, grey squirrels, crested cardinals and turkey buzzards. The varied natural con- ditions form an almost ideal site for a collection of animals; great care and skill have been expended on the designing and construc- tion of the houses, the collection receives many accessions from various government departments, including the foreign consular ser- vice, and the whole institution is rapidly becoming a model of what is possible. The Zoological Gardens in Fairmount Park, Phila- delphia, resemble the gardens of the Zoological Society of London, on which they were modelled. They are controlled by the Zoo- logical Society of Philadelphia, founded in 1859, and are supported partly by subscriptions of members, partly by gate-money and partly bv an allowance from the city of Philadelphia. They contain an admirable collection, well housed and carefully managed, a specially interesting feature being the careful quarantine system of new arrivals and the post-mortem examinations of animals that have died. There are many smaller collections in the United States and several in Canada, but none of these present features of special interest.

America, South. — The Zoological Gardens at Buenos Aires are supported by the municipality, and contain many interesting animals, well housed in beautiful surroundings. The director issues a popular illustrated guide and a valuable quarterly scientific journal. At Para, Brazil, is a good collection

attached to the Museum Goeldi, and there are unimportant collections at Rio de Janeiro and Bahia.

Asia. — There are many small collections in different parts of Asia, but the only garden of great interest is at Alipore, Calcutta, supported chiefly by gate-money and a contribution from govern- ment, and managed by an honorary committee. It was estab- lished in 1875 by the government of Bengal, in co-operation with the public, and is 33 acres in area. An extremely interesting collection is maintained, the variety of bird life, both feral and in captivity, being notable.

Australia and New Zealand. — There are Zoological Gardens at Melbourne (founded in 1857), Adelaide, Sydney and Perth, and small gardens at Wellington, New Zealand, supported partly by private societies and partly by the municipalities. These collec- tions are not specially rich in the very interesting and peculiar native fauna, but devote themselves preponderatingly to imported animals.

Europe. — There are a large number of zoological gardens in Europe, but those of real importance are not numerous. The

Imperial Menagerie of the palace of Schonbrunn, Vienna, was founded about 1752. The public are admitted free to the greater part of the grounds, but the gardens and collection are the pro- perty of and are supported by the emperor of Austria. The collec- tion is fine and w r ell cared for in heautiful surroundings. The garden and large menagerie of the Royal Zoological Society of Antwerp were founded in 1843, and have been maintained at a very high level. The collection is not usually very rich in species, but there have been great and long-continued successes in the breeding of large animals such as hippopotamuses, lions and ante : lopes, and a very large business- is done in domesticated birds, water-fowl and cage birds- The annual sales of wild animals, held in the Gardens, chiefly surplus stock from various European Gardens, are famous. The revenue is derived partly from sub- scriptions, partly from gate-money, from the fine concert-hall and refreshment pavilions, and from sales. The Gardens of the Zoo- logical Society of London in Regent's Park, founded in 1828, extend to only about 35 acres, but the collection, if species and rare animals be considered rather than the number of individuals, has always been the finest in existence The Society is not assisted by the state or the municipality, but derives its revenue from the subscriptions of Fellows, gate-money, Garden receipts and so forth. In addition to the menagerie, there is an infirmary and operating room, an anatomical and pathological laboratory, and the Society holds scientific meetings and publishes stately volumes containing the results of zoological research. Partly because of its long and successful existence, and partly because of the extensive

possessions of Great Britain throughout the world, the Zoological Society of London has been able to exhibit for the first time in captivity a greater number of species of wild animals than probably the total of those shown by all other collections. The Royal Zoological Society of Ireland, founded in 1830, maintains a fine collection in the Phoenix Park at Dublin, and has been specially successful in the breeding of lions. The Bath, Clifton and West of England Zoological Society owns small but extremely well-managed Zoo- logical Gardens, well situated on the edge of Clifton Downs. Messrs Jennison have maintained since 1831 a Zoological Collection in their pleasure Park at Belle Vue, Manchester. The animals exhibited are selected chiefly because of their popular _ interest, but the arrangements for housing are. specially ingenious and successful, those for monkeys and snakes being notable. The Zoologisk Have at Copenhagen, founded in 1859, contains a good collection, with a specially well -designed monkey-house. At Lyons and at Marseilles in France there are beautifully situated Gardens with small collections, in each case owned and controlled by the municipalities. In Paris there are two well-known Gardens. That of the Jardin des Plantes was founded in 1793 and is under the control of the Museum authorities. It is open free to the public and generally contains a good collection of mammals. The larger and better known Jardin d'Acclimatation in the Bois de Boulogne ' is owned and conducted by a private company. It was founded in 1858 and is beautifully situated and well laid out. In addition to wild animals it usually contains many domesticated creatures of commercial value. In recent years it has been somewhat neglected and presents no features of special interest, but efforts are being made to revive its prosperity. Germany contained in 1910 nineteen Zoological Gardens in active existence whilst several others were in process of formation. In most cases they are associated with concert-halls and open-air restaurants, which account for much of their material prosperity, but the natural taste of the people for wild animals, and the increasing scientific and commercial enter- prise of the nation have combined to make the collections rich and interesting. The great Gardens at Berlin were founded in 1844, and belong to a private company, but owe much to the interest and beneficence of the Royal House. The collection is extremely good, the houses are well constructed and sumptuously decorated, and the general management is conducted on the most adequate scientific lines. The Zoological Gardens at Breslau, founded in 1863 and owned by a private company, although not large, contain many fine buildings and are a notably well-managed institution. They possessed a fine gorilla, keeping it alive for a longer period than has been done in any other zoological collec- tion. The beautiful Gardens at Cologne, founded in i860, contain many interesting features and in particular one cf the finest aviaries in Europe. The Gardens of the Zoological Society of Hamburg, founded in 1863, always contain a large and fine collection and display

many ingenious devices for the housing of the animals. More recently C. Hagenbeck has constructed a remarkable zoo- logical park at Stellingen, near Hamburg. The cfiief featureof this is a magnificent panorama, from the central pGint of which large collections cf wild animals are visible without any inter- vening bars. The background consists of artificial rockwork, sup- ported on huge wooden scaffoldings. The surface is formed of cement moulded over metal gimmcl-work, and arranged to form ledges and boulders, peaks and escarpments, and faced with coloured sand and paint. It is made sufficiently strong to bear the weight of the animals, which arc confined within their bounds by undercut overhanging ridges, and by deep and wide ditches, masked by rockwork. The arrangement is extremely successful from the

spectacular point of view, and very suitable where most of the animals are young and in process of training. The chief gardens in Holland are at Amsterdam, owned by the society " Natura Artis Magistra." In addition to the menagerie, founded in 1838, and since then remaining one of the chief collections of the world, the Society owns a fine aquarium, and supports a museum and library. The garden at Rotterdam is also of high interest. The zoological collections of other European countries arc of little importance.

Certain general remarks may be made on the efficient manage- ment of the zoological gardens.

Finance. — Disbursements for rent, rates and taxes naturally vary- according to the special conditions; in a large number of cases public land is provided free of cost, and in a smaller number of cases the institutions, in view of their useful public functions, are relieved of the ordinary burden of taxation. In London, where rent, rates and taxes have all to be paid, precisely as if the gardens were a profit-distributing private institution, the annual expendi- ture under these headings amounts to about £2000. The staff, excluding purely scientific departments, costs about £6coo per annum; gardening department, about £1500 per annum; main- tenance of buildings, enclosures, paths and so forth, about £4000 per annum; provisions for animals, about £5000 per annum; litter, water, heating and general menagerie expenses about £3000 per annum. These figures are based chiefly on the London expendi- ture and relate to a collection which is probably more varied than any other, but not specially large in numbers, containing on an average a little over 3000 individuals. The cost of maintaining the collection depends on the numbers received by purchase, in exchange, or presented, but for an average of about £2000 per annum a

collection such as that in London can be adequately maintained. The cost of new buildings varies too much to make any individual figures useful.

Many of the zoological gardens are owned by private companies and derive their income entirely from gate-money, menagerie sales, rent of refreshment rooms, concert-halls and other auxiliary public attractions, any profits being distributed amongst the members of the company. In other cases the gardens are assisted by public authorities, in return for which a certain number of free days are given. In other cases again, as in the case of London, the income is derived partly from the subscriptions of members, who in return receive privileges as to admission, and partly from gate-money and menagerie receipts, all the income being expended on the maintenance of the institution and on scientific purposes.

Nature of Collection. — This depends to a certain extent on the object of the institution. The species and varieties of mammals and birds that have a commercial value as farmyard stock or as pets, are for the most part easy to keep, are attractive to the public and may be a source of profit. Some of the smaller gardens in Europe, and perhaps a majority of those in other parts of the world, pay much attention to this side, but the more important collections are as much as possible limited to natural species and wild animals. In theory every wild species has its place in a zoological collection, but the actual choice is limited by so many practical considerations that the better-known collections are remarkably alike. Birds and mammals take the first place; the leading collections devote a good deal of attention to reptiles and batrachians; fishes and aquatic invertebrata are most often to be found only when there arc special aquaria, whilst non-aquatic invertebrates are seldom to be seen and at most consist of a few moths and butterflies, spiders, scorpions and centipedes, molluscs and crustaceans. Within these limits, the first choice falls on large and well-known creatures which every one can recognize and desires to see. The large Carnivora, lions, tigers, jaguars and leopards are the first favourites; then follow monkeys, then the large un- gulates, elephants, rhinoceroses and hippopotamuses, camels and giraffes, deer and antelopes and equine animals, whilst birds are appreciated chiefly for plumage and song. Animals vary very greatly in viability (sec Longevity), and practical experience has shown that certain species bear captivity well, whilst others for reasons that appear to be psychological as well as physical quickly succumb. Many animals of great zoological interest, from their nocturnal habits, or natural disposition, display themselves so seldom that their possession is valueless from the point of view of the public, whilst closely allied species are not distinguished except by trained observers. If the object of a collection is simplv to provide a hardy and popular exhibition, it is neither difficult nor very cost)}' to get together and to maintain. But if the object be, as in the case of the greater zoological

institutions, to get together as many species as possible, and to exhibit animals that have not been hitherto obtained, the possible range is enormous and the cost very great.

Sources of Animals. — A certain number of wild animals are born in captivity and from time to time the possession of a successful stock enables one collection to supply many others. At one time London was able to supply many Continental gardens with giraffes, and Dublin and Antwerp have had great successes with lions, whilst antelopes, sheep and cattle, deer and equine animals are always to be found breeding in one collection or another. Such

stocks, however, usually fail in time, partly from too close inter- breeding, partly from the ordinary chances of mortality, and partly from the cumulative effects of strange conditions. Fresh-caught wild animals have to be obtained to replenish the stock. In the majority of cases the conditions of success are that the wild creatures should be obtained as young as possible, kept in their native iocalities until they have become accustomed to man and to such food as they can be given at their ultimate destinations. The percentage of failure is greatest when fresh-caught adults are hurried to Europe or America. Individuals, moreover, vary greatly in their capacity to respond successfully to new conditions of life, and it is less costly and more practical if the selection be made in their natural homes. The most promising sources of new animals for collections are young creatures which have been partly tamed by hunters, traders or natives, and which have been acquired by travellers. Many of these find their way to the great shipping-ports, where there have grown up establishments that trade in wild animals. Occasionally special expeditions are arranged to procure numbers of particular birds or mammals, but these are extremely costly and tha mortality is usually high.

Area and Site. — The areas occupied vary from about 300 acres (New York) to about 8 acres (Bristol, England). In the larger gardens, however, the greater part of the space is engaged by a few extensive enclosures for herds of herbivorous animals, and where no attempt is made to associate the function of a game reserve with that of a menagerie a smaller area is quite satisfactory. From the point of view of public convenience, too large a space is fatiguing and makes it more difficult to see the animals, whilst the expenses of maintenance, drainage and supervision increase out of proportion to the advantages. The older gardens have followed too closely the idea of small cages, designed to guard an animal securely rather than to display it in a fitting environment, but if exercise, light and air are provided, animals do better in a relatively small than in a relatively large enclosure. With regard to situation, the ideal would be to have the collection placed in the open country, far from centres of population. But

as menageries are supported for the public and in most cases by the public, such a site is im- practical, and if the soil, drainage and exposure are reasonably good, experience shows that a thriving collection may be maintained in the immediate vicinity of large towns.

Hygiene. — The first requisite is strict attention to cleanliness. A collection of animals must be compared with public institutions such as barracks, or infirmaries. There must be an abundant supply of fresh air and of water, and a drainage system as complete as possible. The soil of yards and the floors and walls of houses rapidly become contaminated, and the ideal condition w r ould be to have an impermeable flooring covering the whole area, and supplied with suitable layers of sand, sawdust, peat-moss or other absorbent substances which can be changed at frequent intervals. The buildings should be constructed on the most modern hospital lines, with smooth^ walls and rounded corners, so that complete cleansing and disinfecting are possible. It has been shown abundantly, however, that even the best designed and best cared for buildings rapidly become contaminated, and it is probable that the costly and massive buildings of the more modern Gardens are erroneous in principle, and should be replaced by light and cheap structures not intended to last longer than a few years. In most temperate climates, artificial heating is necessary, at least occa- sionally, in many cases, but the tendency has been to be more sedulous of warmth than of ventilation. Cold-blooded animals, Such as reptiles and batrachians, thrive best in an equable tem- perature, and, especially in the case of snakes, frequently can be induced to feed only when their temperature has been raised to a certain point. But the vast majority of birds and mammals not only can endure a large range of temperature, but thrive best when they are subjected to it. Protection from violent draught and shelter from extremes of heat and cold are necessary, but in most cases the choice is best left to the animals themselves, and the most successful arrangements consist of free exposure to the open air, with access to warmth and shelter. All collections of living beings are subject to epidemics, and in an ideal menagerie special precautions _ should be taken. New arrivals should be quarantined, until it is certain that they are in a satisfactory condition of health. Sickly animals should be at once isolated, and their cages and enclosures disinfected, whilst as a matter of routine the enclosure in which any animal has died should be cleansed, and according to the results of post-mortem examination, which should be made in every case, appropriate measures of disinfection employed.

Feeding. — The food must be as varied as possible, and special attention should be given to the frequency and quantity of the supply. It is important that no more should be supplied at a time than is necessary, as most animals rapidly foul their food, and except in a few special cases, wild animals are peculiarly liable to the evil results of stale or putrid substances.

Quantities can be learned from experience, and from watching individual cases; frequency varies within very wide limits, from reptiles which at most may feed once a week and fast for long periods, to the smaller insectivorous birds which require tc be fed every two or three

hours, and which in the winter dark of northern latitudes must be lighted up once or twice in the night to have the opportunity of feeding. Knowledge of the habits of animals and experience are the best guides to the nature of food to be supplied, but the keepers should be required to observe the droppings of their charges and to judge from these of the extent to which any particular substances are being digested. The feeding of carnivores is on the whole the most easy ; the chief pitfall being the extreme liability of all except the larger forms to fatal digestive disturbances from food that is not quite fresh. The more powerful creatures in a state of nature are accustomed to kill a prey too large to be devoured at once, and to return to it again and again, long after it has become putrid; the smaller forms, for the most part, devour nothing but small creatures immediately after they have been captured and killed, and consequently in an absolutely fresh condition. The chief danger with herbivorous and frugivorous creatures is that their constitutions are not adapted to the richness of cultivated fruits and cereals, and, in captivity, they may suffer mechanically from the want of bulk in their food supply, or if they eat a quantity sufficient in bulk, it contains an excess of nutritive material. A minor problem in menageries is injudicious feeding by visitors. Many authorities attempt to restrain visitors from feeding the animals in their charge, but such a restriction, even if practicable, is not all gain, for animals in captivity are less inclined to mope, and are more intelligent and tamer, if they become accustomed to regard visitors as pleasant sources of tit-bits.

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ZOOLOGICAL NOMENCLATURE, the system by which it is attempted to designate, exactly and conveniently, the animals which exist now or are known to have existed. It is, in fact, the grammar of classification, and has the advantage that it is international. The popular names of animals differ from country to country, but even amongst civilized peoples, and st ill more amongst uneducated persons and the lower races, the animals denoted by popular names are a very small part of existing forms, whilst the connotation of the" names is vague and varying. Linnaeus was the first to adopt a precise system, which he explained and applied in 17 51 in his Philosophia botanica, and later extended to animals in the tenth edition of his Systema naturae (175S). The foundation of the system was the application of a binomial nomenclature to species (see Species). Each species was to be designated by two latinized names, the first being that of the genus to which it belonged, and the second the appellation peculiar to the species. There are many different cat-like animals, such as the common cat, lion, tiger and so forth, more obviously related to one another than they are to dogdike or hyaena-like carnivores. The assemblage of cats constitute the genus Felis, the wild cat being one species, Felis, catus, the lion another, Felis leo, the tiger yet another, Felis tigris, and so forth. The various genera were grouped into families, the family taking its designation from the leading genus, as, for instance, the family Felidae for the cats. Families were associated in orders, as the Cats, Dogs, Rears, &c, in the order Carnivora. and the orders in Classes. There is still little uniformity in the designation of the assemblages higher than families, and less agreement as to the degree or measure of separation to be indicated by the use of the de- signations employed. For the system adopted in the present work, see Zoology.

Linnaeus named very many species and genera, but the number known continues to increase at a prodigious rate, while precision of description has far surpassed his conceptions, with the result that his rules have long ceased to meet the needs of modern science. In 1842 the English ornithologist, H. E. Strickland, assisted by a committee of which Charles Darwin was a member, elaborated rules which became known as the Strickland Code, and were adooted in 1845 by the American Society of Geologists and Naturalists, and in 1846 by the 3ritish Association for the Advancement of Science. In 1881.

the International Congress of Geology, meeting at Bologna, constructed a code differing in many respects from that of Strickland and specially applicable to fossil forms. In 1881 the Zoological Society of France agreed on new rules, based on those of Strickland, but formulated by a committee of which Maurice Chaper and R. Blanchard were leading members. In 1885 the American Ornithologists' Union, urged by the needs of the great advance in ornithology in America, adopted rules which were still further

modified from the Strickland Code. In 1894 the Zoological Society of Germany framed another set of rules drawn up by J. V. Carus, L. Doderlein and K. Mbbius. In 1896 the English entomologist Lord Walsingham devised another modification of the Strickland Code, which became known as the Merton Rules, followed by many entomologists. The existence of so many conflicting authorities caused much confusion and an impractical condition of anarchy in which many distinguished and active systematists elaborated practices individual to themselves. When the International Congress of Zoology held its first meeting in Paris in 1889, one of the chief objects submitted to it was the necessity of framing rules which should be uniform in their application to the whole animal kingdom and which might receive international sanction. The discussion was carried over to the second meeting of the Congress, held at Moscow in 1892, when a code prepared by R. Blanchard was accepted. Further modifications were made, partly to reconcile it with the German Code, and a permanent commission was appointed to consider fresh points that might arise. In 1905 there was published, with the sanction of the Congress, in French, English and German (International Rules of Zoological Nomenclature, Paris, 1905, F. R. de Rudeval) a set of rules finally codified by MM. R. Blanchard, von MaehrenthaJ and C. W. Stiles, which appears to be a close approach to an international system applicable to every group in the animal kingdom. At subsequent meetings of the Congress minor alterations have been proposed and no doubt will continue to be proposed and occasionally adopted, but with one im- portant exception, to be referred to later, fundamental lines of agreement appear to have been reached,, and many of the most active workers have accepted the international code as binding. It is possible here to give only a short summary of the more important rules.

The goal to be reached is that the connotation and denotation of every zoological designation should be definite. One name is to be used for each sub-genus or higher group, two names for each species (following the invention of Linnaeus) and three names for each sub-species (a refinement not necessary in the time of Linnaeus). The scientific names must be Latin or Latinized forms. The name of a family is to be formed by adding the ending idae, the name of the sub-family by adding the ending inae to the root of the name of the genus from which it is derived, as Felidae and Felinae from Felis, When a generic name is changed there must be a corresponding change in the name of the family or sub-family derived from it. A generic name must consist of a single word, written with a capital initial letter, and treated as a substantive in the nominative singular. When a genus is divided into sub- genera the name of the typical sub-genus must be the same as the name of the genus, and when it is desired to cite the name of a sub-genus this name must be placed in parentheses between the

generic and the specific names, as, for instance, Vanessa (Vanessa) cardui and Vanessa (myrameis) cardui respectively, for the typical sub-genus and another sub-genus of the genus Vanessa.

Specific names are adjectives, substantives in apposition with the generic name or substantives in the genitive; they are written with a small initial letter except when they are substantives derived from the name of a person, but even in the latter case it is permitted and is becoming usual to employ the small initial letter, as Gazella cuvieri. If it be desired to cite the sub-specific name, such name is written immediately following the specific name without the interposition of any mark of punctuation, as Rana esculenta mar- morata. The author of a scientific name is that person who first publishes the name in association with a clear indication of what the name denotes, and if it be desired to cite the author's name, it should follow the specific name in a different type hut without the interposition of any mark of punctuation, e.g. Felis catus Linnaeus. Names are merely designations, or recognition marks, and not descriptions, and hence a name is not to be rejected or changed if it is otherwise valid, because it gives a wrong description; there is no more reason why Felis rufus should be a ruddy cat than John Black a person of swarthy complexion : nor is a name to be rejected

because of tautonomy, and thus Apus apus apus may be a valid designation of a sub-species if the names are otherwise valid.

It has happened frequently and continues to happen that a creature is discovered to have been given more than one name. Which of these is valid ? The decision of this is one of the most difficult and controverted problems in nomenclature. In the hope of settling it by some system which should be as nearly as possible automatic and should leave the least possible to the inclination or choice of the individual worker, there was formu- lated what is called the rule of priority. The valid name of a genus or species is that name under which it was first designated, but with the conditions first that the name was published and accompanied by an indication, definition or description, and second that the author applied the principles of binary nomen- clature. The tenth edition of Linnaeus' Sy sterna naturae (1758) is the work that first consistently applied the binary system to zoology generally and is accepted as the starting-point of zoological nomenclature. Beginning from this the oldest avail- able name is therefore to be retained.

The application of the rule of priority is in many cases very difficult, but the labours of zoologists in many groups are rapidly succeeding in making the necessary direct and incidental changes in nomen- clature, whilst, with regard to recent work, the rule is invaluable. A special difficulty has, however, arisen and is pressing so acutely that a most important modification is likely to be introduced. To systematists working with a large series of species in a museum or collection, one species is as important as another, and changes of names even of familiar animals are matters of little moment. But a comparatively small number of animals hold a prominent place in the attention of zoologists who are not specially systematists and of the public interested in natural history. It is complained that application of the rules of priority is changing the names of many familiar animals, designations that are sanctioned by long usage in museums and laboratories, in the famous treatises of comparative anatomy, of general biology, of travel, medicine, and the sciences and subjects closely related to zoology. There is being claimed, in fact, protection against the law of priority for a certain number of such familiar and customary appellations. The machinery for drafting such a list of exceptions exists in the permanent nomenclature commission of the International Congress of Zoology, and there is more than a hope that this change will come into operation.

To make the denotation of zoological names precise, exact workers are endeavouring to associate the conception of types with names, a process which can be made simple and definite with new work, but which presents great difficulties in the attempt to apply it to existing terms. Every family should have designated one of its genera as the type genus, every genus a type species and so forth. In the case of species or sub-species the type is a single specimen, either the only one before the author, when writing his description, or one definitely selected by him, the others being paratypes. Such type speci- mens are the keynote of modern expert systematic work and their careful preservation and registration is of fundamental importance. A co-type is one of several specimens which have together formed the basis of a species, no one of them having been selected by the author as a type. A topotype is a specimen killed at the typical locality. (P. C. M.)

ZOOLOGY (from Gr. fww, a living thing, and \670s, theory), that portion of biology (q.v.) which relates to animals, as dis- tinguished from that portion (Botany) which is concerned with plants.

History

There is something almost pathetic in the childish wonder and delight with which mankind in its earlier phases of civilization gathered up and

treasured stories of strange animals from distant lands or deep seas, such as are recorded in the Physiologns, in Albertus Magnus, and even at the present day in the popular treatises of Japan and China. That omnivorous universally credulous stage, which may be called

Change in the character of the science.

the u legendary," was succeeded by the age of collectors and travellers, when many of the strange stories believed in were actually demonstrated as true by the living or pre- served trophies brought to Europe. The possibility of verification established verification as a habit; and the collecting of things, instead of the accumulat- ing of reports, developed a new faculty of minute observation. The early collectors of natural curiosities were the founders of zoological science, and to this day the naturalist- traveller and his correlative, the museum curator and sys- tematise play a most important part in the progress of zoology. Indeed, the historical and present importance of this aspect or branch of zoological science is so great that the name " zoo- logy " has until recently been associated entirely with it, to the exclusion of the study of minute anatomical structure and function which have been distinguished as anatomy and physio- logy. Anatomy and the study of animal mechanism, animal physics and animal chemistry, all of which form part of a true zoology, were excluded from the usual definition of the word by the mere accident that the zoologist had his museum but not his garden of living specimens as the botanist had; 1 and, whilst the zoologist was thus deprived of the means of anato- mical and physiological study— only later supplied by the method of preserving animal bodies in alcohol — the demands of medicine for a knowledge of the structure of the human animal brought into existence a separate and special study of human anatomy and physiology.

From these special studies of human structure the knowledge of the anatomy of animals has proceeded, the same investigator who had made himself acquainted with the structure of the human body desiring to compare with the standard given by human anatomy the structures of other animals. Thus com- parative anatomy came into existence as a branch of inquiry apart from zoology, and it was only in the latter part of the 19th century that the limitation of the word " zoology " to a know- ledge of animals which expressly excludes the consideration of their internal structure was rejected by the general con- sent of those concerned in the progress of science. It is now generally recognized that it is mere tautology to speak of zoology and comparative anatomy, and that museum natu- ralists must give attention as well to the inside as to the outside of animals.

Scientific zoology really started in the 16th century with the awakening of the new spirit of observation and exploration, but for a long time ran a

separate course uninfluenced by the progress of the medical studies of anatomy and physiology. The active search for knowledge by means of observation and experiment found its natural home in the universities. Owing to the connexion of medicine with these seats of learning, it was natural that the study of the structure and functions of the human body and of the animals nearest to man should take root there; the spirit of inquiry which now for the first time became general showed itself in the anatomical schools of the Italian universities of the 16th century, and spread fifty years later to Oxford.

In the 17th century the lovers of the new philosophy, the investigators of nature by means of observation and experi- ment, banded themselves into academies or societies for mutual support and intercourse. The first founded of surviving European academies, the Academia Naturae Curiosorum (165-1), especially confined itself to the description and illustration of the structure of plants and animals; eleven years later (1662) the Royal Society of London was incorporated by royal charter, having existed without a name or fixed organization for*

1 The medieval attitude towards both plants and animals had no relation to real knowledge, but was part of a peculiar and in itself highly interesting mysticism. A fantastic and elaborate doctrine of symbolism existed which comprised all nature ; witchcraft, alchemy and medicine were its practical expressions. Animals as well a? plants were regarded as " simples " and used in medicine, and a knowledge of them was valued from this point of view.

*2 The Academia Secretorum Naturae was founded at Naples in 1560, but was suppressed bv t*p. ecclesiastical authorities.*

seventeen years previously (from 1645). A little later the Aca- demy of Sciences of Paris was established by Louis XIV. The influence of Lhese great academies of the 17th century on the progress of zoology was precisely to effect that bringing together of the museum-men and the physicians or anatomists which was needed for further development. Whilst the race of collectors and systematizers culminated in the latter part of the 18th century in Linnaeus, a new type of student made its appearance in such men as John Hunter and other anatomists, who, not satisfied with the superficial observations of the popular " zoo- logists," set themselves to

work to examine anatomically the whole animal kingdom, and to classify its members by aid of the results of such profound study. Under the influence of the touchstone of strict inquiry set on foot by the Royal Society, the marvels of witchcraft, sympathetic powders and other relics of medieval superstition disappeared like a mist before the sun, whilst accurate observations and demonstrations of a host of new wonders accumulated, amongst which were numerous contributions to the anatomy of animals, and none perhaps more noteworthy than the observations, made by the aid of microscopes constructed by himself, of Lceuwenhoek, the Dutch naturalist (1683), some of whose instruments were presented by him to the society.

It was not until the roth century that the microscope, thus early applied by Leeuwenhoek, Malpighi, Hook and Swammer- daro to the study of animal structure, was perfected as an instrument, and accomplished for zoology its final and most important service. The perfecting of the microscope led to a full comprehension of the great doctrine of cell-structure and the establishment of the facts — (1) that all organisms are either single corpuscles (so-called cells) of living material (microscopic animalcules, &c.) or are built up of an immense number of such units; (2) that all organisms begin their individual existence as a single unit or corpuscle of living substance, which multiplies by binary fission, the products growing in size and multiplying similarly by binary fission; and (3) that the life of a multi- cellular organism is the sum of the activities of the corpuscular units of which it consists, and that the processes of life must be studied in and their explanation obtained from an under- standing of the chemical and physical changes which go on in each individual corpuscle or unit of living material or protoplasm.

Meanwhile the astronomical theories of development of the solar system from a gaseous condition to its present form, put forward by Kant and by Laplace, had impressed men's minds Ideas of with the conception of a general movement of spon- rfere/op- taneous progress or development in all nature. The meat – science of geology came into existence, and the whole

panorama of successive stages of the earth's history, each with its distinct population of strange animals and plants, unlike those of the present day and simpler in proportion as they recede into the past, was revealed by Cuvier, Agassiz and others. The history of the crust of the earth was explained by Lyell as due to a process of slow development, in order to effect which he called in no cataclysmic agencies, no mysterious forces differ- ing from those operating at the present day. Thus he carried on the narrative of orderly development from the point at which it was left by Kant and Laplace — explaining by reference to the ascertained laws of physics and chemistry the configuration of the earth, its mountains and

seas, its igneous and its stratified rocks, just as the astronomers had explained by those same laws the evolution of the sun and planets from diffused gaseous matter of high temperature. The suggestion that living things must also be included in this great development was obvious.

The delay in the establishment of the doctrine of organic evolution was due, not to the ignorant and unobservant, but to the leaders of zoological and botanical science. Knowing the almost endless complexity of organic structures, realizing that man himself with all the mystery of his life and consciousness must be included in any explanation of the origin of living things, they preferred to regard living things as something apart frass

the rest of nature, specially cared for, specially created by a Divine Being. Thus it was that the so-called " Natur-philoso- phen " of the last decade of the 18th century, and The their successors in the first quarter of the 19th, Nata/y found few adherents among the working zoologists pMosa< and botanists. Lamarck, Treviranus, Erasmus Dar- win, Goethe, and Saint-Hilaire preached to deaf ears, for they advanced the theory that living beings had developed by a slow process of transmutation in successive generations from simpler ancestors, and in the beginning from simplest formless matter, without being able to demonstrate any existing mechanical causes by which such development must necessarily be brought about. They were met by the criticism that possibly such a development had taken place; but, as no one could show as a simple fact of observation that it kad taken place, nor as a result of legitimate inference that it must have taken place, it was quite as likely that the past and present species of animals and plants had been separately created or individually brought into existence by unknown and inscrutable causes, and (it was held) the truly scientific man would refuse to occupy himself with such fancies, whilst ever continuing to concern himself with the observation and record of indisputable facts. The critics did well; for the " Natur-philosophen," though right in their main conception, were premature.

*It was reserved for Charles Darwin, in the year 1859, to place the whole theory of organic evolution on a new footing, and by his discovery of a mechanical cause actually narwtu's existing and demonstrable by which organic evolution ■doctrine must be brought about, entirely to change the attitude «' organic in regard to it of even the most rigid exponents of f^**"" the scientific method. Darwin succeeded in estab- lishing the doctrine of organic evolution by the introduction into the web of the zoological and botanical sciences of a new science. The subject-matter of this new science, or branch of biological science, had been neglected: it did not form part of the studies of the collector and systematist, nor was it a branch of anatomy, nor of the physiology pursued by medical men, nor again was it included in the field of microscopy and the cell- theory. The area of*

biological knowledge which Darwin was the first to subject to scientific method and to render, as it were, contributory to the great stream formed by the union of the various branches, is that which relates to the breeding of animals and plants, their congenital variations, and the transmission and perpetuation of those variations. This branch of biological science may be called thremmatology (6/ikiifta, " a thing bred "). Outside the scientific world an immense mass of observation and experiment had grown up in relation to this subject. From the earliest times the shepherd, the farmer, the horticulturist, and the " fancier " had for practical purposes made themselves acquainted with a number of biological laws, and successfully applied them without exciting more than an occasional notice from the academic students of biology. It is one of Darwin's great merits to have made use of these observations and to have formulated their results to a large extent as the laws of variation and heredity. As the breeder selects a congenital variation which suits his requirements, and by breeding from the animals (or plants) exhibiting that variation obtains a new breed specially characterized by that variation, so in nature is there a selection amongst all the congenital variations of each generation of a species. This selection depends on the fact that more young are born than the natural provision of food will support. In consequence of this excess of births there is a struggle for existence and a survival of the fittest, and consequently an ever-present necessarily acting selection, which either maintains accurately the form of the species from generation to generation or leads to its modification in correspondence with changes in the surrounding circumstances which have relation to its fitness for success in the struggle for life.

Darwin's introduction of thremmatology into the domain of scientific biology was accompanied by a new and special de- velopment of a branch of study which had previously been knswn as teleology, tb> ?tudy of the adaptation of organi*

structures to the service of the organisms in which they occur. It cannot be said that previously to Darwin there had been Newdc- an y ver y profound study of teleology, but it had veiopmeat been the delight of a certain type of mind— that of ofteleo' the lovers of nature or naturalists par excellence,, as ogy ' they were sometimes termed— to watch the habits

of living animals and plants, and to point out the remarkable ways in which the structure of each variety of organic life was adapted to the

special circumstances of life of the variety or species. The astonishing colours and grotesque forms of some animals and plants which the museum zoologists gravely de- scribed without comment were shown by these observers of living nature to have their significance in the economy of the organism possessing them; and a general doctrine was re- cognized, to the effect that no part or structure of an organism is without definite use and adaptation, being designed by the Creator for the benefit of the creature to which it belongs, or else for the benefit, amusement or instruction of his highest creature — man. Teleology in this form of the doctrine of design was never very deeply rooted amongst scientific anatomists and systematists. It was considered permissible to speculate somewhat vaguely on the subject of the utility of this or that startling variety of structure; but few attempts, though some of great importance, were made systematically to explain by obser- vation and experiment the adaptation of organic structures to particular purposes in the case of the lower animals and plants. Teleology had, indeed, an important part in the development of physiology — the knowledge of the mechanism, the physical and chemical properties, of the parts of the body of man and the higher animals allied to him. But, as applied to lower and more obscure forms of life, teleology presented almost insur- mountable difficulties; and consequently, in place of exact experiment and demonstration, the most reckless though in- genious assumptions were made as to the utility of the parts and organs of lower animals. Darwin's theory had as one of its results the reformation and rehabilitation of teleology. Accord- ing to that theory, every organ, every part, colour and pecu- liarity of an organism, must either be of benefit to that organism itself or have been so to its ancestors: 1 no peculiarity of structure or general conformation, no habit or instinct in any organism, can be supposed to exist for the benefit or amusement of another organism, not even for the delectation of man him- self. Necessarily, according to the theory of natural selection, structures either are present because they are selected as useful or because they are still inherited from ancestors to whom they were useful, though no longer useful to the existing representa- tives of those ancestors. Structures previously inexplicable were now explained as survivals from a past age, no longer useful though once of value. Every variety of form and colour was urgently and absolutely called upon to produce its title to existence either as an active useful agent or as a survival. Darwin himself spent a large part of the later years of his life in thus extending the new teleology.

The old doctrine of types, which was used by the philo- sophically minded zoologists (and botanists) of the first half

1 A very subtle and important qualification of this generalization, has to be recognized (and was recognized by Darwin) in the fact that owing to the interdependence of the parts of the bodies of living things and their

profound chemical interactions and peculiar struc- tural balance (what is called organic polarity) the variation of one single part (a spot of colour, a tooth, a claw, a leaflet) may, and demonstrably does in many cases entail variation of other parts — what are called correlated variations. Hence many structures which are obvious to the eye, and serve as distinguishing marks of separate species, are really not themselves of value or use, but are the necessary concomitants of less obvious and even altogether obscure qualities, which are the real characters upon which selection is acting. Such "correlated variations" may attain to great size and complexity without being of use. But eventually they may in turn become, in changed conditions, of selective value. Thus in many cases the difficulty of supposing that selection has acted on minute and imperceptible initial variations, so small as to have no selective value, may be got i id of. A useless " correlated variation " may have attained great volume and quality before it is (as it were) seized upon and perfected by natural selection. All organisms are essentially and necessarily built up by such correlated variations.

of the 19th century as a ready means of explaining the failures and difficulties of the doctrine of design, fell into its proper place under the new dispensation. The adherence to type, the favourite conception of the transcendental morphologist, was seen to be nothing more than the expression of one of the laws of thremmatology, the persistence of hereditary trans- mission of ancestral characters, even when they have ceased to be significant or valuable in the struggle for existence, whilst the so-called evidences of design which was supposed to modify the limitations of types assigned to Himself by the Creator were seen to be adaptations due to the selection and intensification by selective breeding of fortuitous congenital variations, which happened to prove more useful than the many thousand other variations which did not survive in the struggle for existence.

*Thus not only did Darwin's theory give a new basis to the study of organic structure, but, whilst rendering the general theory of organic evolution equally acceptable and Btf ec t at necessary, it explained the existence of low and simple Darwin's forms of life as survivals of the earliest ancestry of theory more highly complex forms, and revealed the classi- "P * fixations of the systematist as unconscious attempts zo ° sy ' to construct the genealogical tree or pedigree of plants and animals. Finally, it brought the simplest living matter or formless protoplasm before the mental vision as the starting- point whence, by the operation of necessary mechanical causes, the highest forms have been evolved, and it rendered unavoid- able the conclusion that this earliest living material was itself evolved by gradual processes, the result also of the known and recognized laws of physics and chemistry, from material which we should call not living. It abolished the*

conception of life as an entity above and beyond the common properties of matter, and led to the conviction that the marvellous and exceptional qualities of that which we call " living " matter are nothing more nor less than an exceptionally complicated development of those chemical and physical properties which we recognize in a gradually ascending scale of evolution in the carbon com- pounds, containing nitrogen as well as oxygen, sulphur and hydrogen as constituent atoms of their enormous molecules. Thus mysticism was finally banished from the domain of biology, and zoology became one of the physical sciences — the science which seeks to arrange and discuss the phenomena of animal life and form, as the outcome of the operation of the laws of physics and chemistry.

A subdivision of zoology which was at one time in favour is simply into morphology and physiology, the study of form and structure on the one hand, and the study of scope the activities and functions of the forms and structures of zoo- on the other. But a logical division like this is not io sy necessarily conducive to the ascertainment and remembrance of the historical progress and present significance of the science. No such distinction of mental activities as that involved in the division of the study of animal life into morphology and physio- logy has ever really existed: the investigator of animal forms has never entirely ignored the functions of the forms studied by him, and the experimental inquirer into the functions and properties of animal tissues and organs has always taken very careful account of the forms of those tissues and organs. A more instructive subdivision must be one which corresponds to the separate currents of thought and mental preoccupation which have been historically manifested in western Europe in the gradual evolution of what is to-day the great river of zoological doctrine to which they have all been rendered contributory.

It must recognize the following five branches of zoological study : —

1. Morphography. — The work of the collector and systematist:

exemplified by Linnaeus and his predecessors, by Cuvter, Agassiz, llaeckel.

2. Bionomics.— The lore of the farmer, gardener, sportsman,

fancier and field-naturalist, including thremmatology, or the science of breeding, and the allied teleology, or science of organic adaptations: exemplified by the patriarch Jacob, the poet Virgil, Sprengel, Kirby and Spence, Wallace and Darwin.

CLASSIFICATION!

ZOOLOGY

3. Zoo-Dynamics, Zoo-Physics, Zoo-Chemistry. — The pursuit of .

the learned physician,— anatomy and physiology: exem- plified by Harvey, Haller, Hunter, Johann MUller.

4. Plasmology. — The study of the ultimate corpuscles of living

matter, their structure, development and properties, by the aid of the microscope; exemplified by Malpighi, Hook, Schwann, Kowalewsky.

5. Philosophical Zoology.- -General conceptions with regard to the

relations of living things (especially animals) to the universe, to man, and to the Creator, their origin and significance: exemplified in the writings of the philosophers of classical antiquity, and of Linnaeus, Goethe, Lamarck, Cuvier, Lyell, H. Spencer and Darwin.

It is unnecessary to follow in this article all these subjects, since they are for the most part treated under separate headings, not indeed under these names — which are too comprehensive for that purpose — but under those of the more specific questions which arise under each. Thus Bionomics is treated in such articles as Evolution, Heredity, Variation, Mendelism, Re- production, Sex, &c; Zoo-dynamics under Medicine, Surgery, Physiology, Anatomy, Embryology, and allied articles; Plas- mology under Cytology, Protoplasm, &c; and Philosophical /.oology under numerous headings, Evolution, Biology, &c. See also Zoological Distribution, Palaeontology, Oceano- graphy, Microtomy, &c.

It will be more appropriate here, without giving what would be a needless repetition of considerations, both historical and theoretical, which appear in other articles, to confine ourselves to two general questions, (1) the history of the various schemes of classification, or Morphography, and (2) the consideration of the main tendencies in the study of zoology since Darwin.

Systems of Classification

Morphography includes the systematic exploration and tabulation of the facts involved in the recognition of all the recent and extinct kinds of animals and their distribution in space and time. (1) The museum-makers of old days and their modern representatives the curators and describers of zoo- logical collections, (2) early explorers and modern naturalist-travellers and writers on zoo-geography, and (3) collectors of fossils and palaeontologists are the chief varieties of zoological workers coming under

this head. Gradually since the time of Hunter and Cuvier anatomical study has associated itself with the more superficial morphography until to-day no one considers a study of animal form of any value which does not include internal structure, histology and embryology in its scope.

The reai dawn of zoology after the legendary period of the middle ages is connected with the name of an Englishman, Edward Edward Wotton, born at Oxford in 1492, who practised Wotton. as a physician in London and died in 1555. He pub- lished a treatise De differentiis animolium at Paris in 1552. In many respects Wotton was simply an exponent of Aristotle, whose teaching, , with various fanciful additions, constituted the real basis of zoological knowledge throughout the middle ages. It was Wotton's merit that he rejected the legendary and fantastic accretions, and returned to Aristotle and the observation of nature.

The most ready means of noting the progress of zoology during the 16th. 17th and iSth centuries is to compare the Aristotle's classificatory conceptions of successive naturalists ctas&ifi- with those which are to be found in the works of cation. Aristotle himself. Aristotle did not definitely and in tabular form propound a classification of animals, but from a study of his treatises Historia animalium, De generaiione animalium. and De partibus animalium the following classi- fication can be arrived at : — ■

A. "Evtufia, blood-holding animals (= Vertebrala).

1. 'IdcaToˆouvTa iv aurols, viviparous Enaema (— Mammals, in- cluding the Whale).

2. "QpviBts (= Birds).

3. TtrpairoBa tj faaSa &otokouvto., four-footed or legless Enaema which lav eggs (= Reptiles and Amphibia).

4 'lyW.« O Fishes).

xxviii. ,0

B. "Avoi|jLa, bloodless animals (— Invertebrata) .

1. MoX&Kia, soft-bodied Anaema (= Cephalopoda).

2. Maka.KoiTTpa.tca., soft-shelled Anaema (= Crustacea).

3. "Evroixa, inserted Anaema or Insects (= Arthropoda t ex- clusive of Crustacea).

4. 'QarpanoShpiJULTa., shell-hearing Anaema (— Echini, Gastropoda and Lamellibranchia) .

*Wotton follows Aristotle l m the division of animals into the Enaema and the Anaema, and in fact in the recognition of all the groups above given, adding only one large group Wotton's to those recognized by Aristotle under the Anaema, modfflca- namely, the group of Zoophyte, in which Wotton tions * includes the Holotkuriae, Star-Fishes, Medusae, Sea-Anemones and Sponges. Wotton divides the viviparous quadrupeds into the many-toed, double-hoofed and single-hoofed. By the introduction of a method of classification which was due to the superficial Pliny— depending, not on structure, but on the medium inhabited by an animal, whether earth, air or water- Wot ton is led to associate Fishes and Whales as aquatic animals. But this is only a momentary lapse, for he broadly distin- guishes the two kinds.*

The Swiss professor, Konrad Gesner (1516-1565), is the most voluminous and instructive of these earliest writers on sys- tematic zoology, and was so highly esteemed that his Historia animalium was republished a hundred years after his death. His great work appeared in successive parts— e.g. Vivipara, ovipara, aves, pisces, serpentes el scorpio — and contains descriptions and illustrations of a large number of animal forms with reference to the lands inhabited by them. Gesner's work, like that of John Johnstone (b. 1603), who was of Scottish descent and studied at St Andrews, and like that of Ulysses Aldrovandi of Bologna (b. 1522), was essentially a compilation, more or less critical, of all such records, pictures and relations concerning beasts, birds, reptiles, fishes and monsters as could be gathered together by one reading in the great libraries of Europe, travelling from city to city, and fre- quenting the company of those who either had themselves passed into distant lands or possessed the letters written and sometimes the specimens brought home by adventurous persons.

The exploration of parts of the New World next brought to hand descriptions and specimens of many novel forms of animal life, and in the latter part of the 16th century and the Mˆicaj beginning of the 17th that careful study by " special- anatom- ists " of the structure and life-history of particular tsts and groups of animals was commenced, which, directed micr ˚Z t at first to common and familiar kinds, was gradually extended until it formed a sufficient body of knowledge to serve as an anatomical basis for classification. This minuter study had two origins, one in the researches of the medical anatomists,. such as Fabricius (1537-1619), Severinus (1580-1656), Harvey (1578-1657), and Tyson (1649-1708), the other in the careful work of the entomologists and first microscopists, such as Malpighi (1628-1604), Swammerdarn (1637-1680), and Hook

(1635-1702). The commencement of anatomical investiga- tions deserves notice here as influencing the general accuracy and minuteness with which zoological work was prosecuted, but it was not until a late date that their full influence was brought to bear upon systematic zoology by Georges Cuvier

(1769-1832).

The most prominent name between that of Gesner and Linnaeus in the history of systematic zoology is that of John Ray (1628-1705). A chief merit of Ray is to have John limited the term " species " and to have assigned to % a y it the significance which it bore till the Darwinian era, whereas previously it was loosely and vaguely applied. He also made*

1 If we remember that by " blood " Aristotle understood " red blood," and that he did not know of the existence of colourless blood, his primary division is not a bad one. One can imagine the interest and astonishment with which the great Greek would have been filled had some unduly precocious disciple shown to him the red-blood-system of the marine terrestrial Annelids; the red blood of Planorbis, of Apus cancriformis , and of the Mediterranean razor shell, Solen legumen.

considerable use of anatomical characters in his definitions of larger groups, and may thus be considered as the father of modern zoology. Associated with Ray in his work, and more especially occupied with the study of the Worms and Mollusca, was Martin Lister (1638-1712), celebrated also as the author of the first geological map.

After Ray's death the progress of anatomical knowledge, and of the discovery and illustration of new forms of animal life From from distant lands, continued with increasing vigour.

Kay to \y e note the names of Vallisnieri (1661-1730) and Linnaeus. Alexander Monro (1697-1767); the travellers Tourne- fort (1656-1708) and Shaw (1692-1751); the collectors Rumphius (1637-1706) and Hans Sloane (1660-17 53); the entomologist Reaumur (1683-1757); Lhwyd (1703) and Linck (1674-1734), the students of Star-Fishes; Peyssonel (b. 1694), the investigator of Polyps and the opponent of Marsigli and Reaumur, who held them to be plants; Woodward, the palaeontologist (1665-1722) — not to speak of others of less importance.

Two years after Ray's death Carl Linnaeus (1707-1778) was born. Unlike Jacob Theodore Klein (1685-1759), whose careful Linnaeus, treatises on various groups of plants and animals were published during the period between Ray and Lin- naeus, the latter had his career marked out for him in a university, that of Upsala, where he was first professor of medicine and subsequently of natural history. His lectures formed a new departure in the academic treatment of zoology and botany, which, in direct continuity from the middle ages, had hitherto been subjected to the traditions of the medical profession and regarded as mere branches of " materia medica." Linnaeus taught zoology and botany as branches of knowledge to be studied for their own intrinsic interest. His great work, the Sysiema naturae, ran through twelve editions during his lifetime (1st ed. 1735, 12th 1768). Apart from his special dis- coveries in the anatomy of plants and animals, and his descrip- tions of new species, the great merit of Linnaeus was his intro- duction of a method of enumeration and classification which may be said to have created systematic zoology and botany in their present form, and establishes his name for ever as the great organizer, the man who recognized a great practical want in the use of language and supplied it. Linnaeus adopted Ray's conception of species, but he made species a practical reality by insisting that every species shall have a double Latin name — the first half to be the name of the genus common to several species, and the second half to be the specific name. Previously to Linnaeus long many-worded names had been used, sometimes with one additional adjective, sometimes with another, so that no true names were fixed and accepted. Linnaeus by his binomial system made it possible to write and speak with accuracy of any given species of plant or animal. He was, in fact, the Adam of zoological science. He proceeded further to introduce into his enumeration of animals and plants a series of groups,, viz, genus, order, class, which he compared to the subdivisions of an army or the subdivisions of a territory, the greater containing several of the less, as follows: —

Class. Order. Genus. Species. Variety.

Genus sum- Genus inter- Genus proxi- Species. Individuum.

mum. medium. mum.

Proyincia. Territorium. Paroccia. Pagus>. Domicilium.

Legio. Conors. Mampulus. Contubernium. Miles.

Linnaeus himself recognized the purely subjective character of his larger groups; for him species were, however, objective: " there are, " he said, " just so many species as in the beginning the Infinite Being created." It was

reserved for a philosophic zoologist of the 19th century (Agassiz, Essay on Classification , 1859) to maintain that genus, order and class were also objective facts capable of precise estimation and valuation. This climax was reached at the very moment when Darwin was publishing the Origin of Species (1859), by which universal opinion has been brought to the position that species, as well as genera, orders and classes, are the subjective expressions of

a vast ramifying pedigree in which the only objective existences are individuals, the apparent species as well as higher groups being marked out, not by any distributive law, but by the inter- action of living matter and its physical environment, causing the persistence of some forms and the destruction of vast series of ancestral intermediate kinds.

The classification of Linnaeus (from Syst. Nat., 12th ed., 1766) should be compared with that of Aristotle. It ciassffl- is as follows — the complete list of Linnaean genera cation of being here reproduced: — Linnaeus.

Class I. Mammalia. Order 1. Primates.

Genera: Homo, Simla, Lemur, Vespertilio. „ 2. Bruta.

Genera : Elephas, Trichecus, Bradypus, Myrme- copkaga, Manis, Dasypus. „ 3. Ferae.

Genera: Pkoca, Cants, Felis, Viverra, Mustela, Ursus, Didelphys, Talpa, Sorex, Erinaceus. „ 4. Glires.

Genera: Hystrix, Lepus, Castor, Mus, Sciurus, Noctilio. „ 5. Pecora.

Genera: Camelus, Mosckus, Cervus, CaPra, Ovis, Bos. „ 6. Belluae.

Genera: Equus, Hippopotamus, Sus, Rhinoceros. „ 7. Cete.

Genera: Monodon, Balaetia, Physeter, Delphinus. Class II. Aves.

Order 1. Accipitres.

Genera : Vultur, Falco, Strix, Lanius. ,, 2. Picae.

Genera: (a) Trachiius, Certhia, Upupa, Buphaga, Sitta, Oriolus, Coracias, Gracula, Corvus, Para- disea; (b) Ramphastos, Trogon, Psittacus, Crotophaga, Picus, Yunx, Cuculus, Bucco; (c) Buce- ros, Alcedo, Merops, Todos. „ 3. Anseres.

Genera: (a) Anas, Mergus, Phaethon, Plot-us; (b) Rkyncops, Diomedea, Alca, Procellaria, Pelecanus, Larus, Sterna, Colymbus. „ 4. Grallae.

Genera: (a) Phoenicopterus, Platatea, Palamedea, Mycteria, Tantalus, Ardea, Recurvirostra, Scolo- pax, Tringa, Fulica, Parra, Rallus, Psopkia, Cancroma; (b) Hemaiopus, Cliaradrius, Otis, Struthio. „ 5. Gallinae.

Genera: Didus, Pavo, Meleagris, Crax, Phasianus, Tetrao, Numida. ,, 6. Passeres.

Genera, (a) Loxia, Fringilla, Emberiza; (&) Caprimulgus, Hirundo, Pipra; (c) Turdus, Ampelis, Tanagra, Muscicapa; (d) Parus t Motacilla, Alauda, Sturnus, Columba.

Class III. Amphibia. Order 1. Reptilia.

Genera: Testudo, Draco, Lacerta, Rana. ., 1. Serpentes.

Genera: Crotalus, Boa, Coluber, Anguis, Amphis~ baena, Caecilia. „ 3. Nantes.

Genera: Petromyzon, Raja, Squalus, Ckimaera, Lopkius, Acipenser, Cydopterus, Batistes, Os- – tracinn, Tetrodon, Diodon, Centriscus, Syngnatkus, Pegasus. Class IV. Pisces.

Order 1. Apodes.

Genera: Muraena, Gymnotus, Trichiurtts, Anar- rkichas, Ammodytes, Ophiddum, Stromateus, Xiphias. „ 2. Jugulares.

Genera: CaUionymus, Uranoscopus, Trachinus, Gadus, Blennius. „ 3. Thoracici.

Genera: Cepola, Echeneis, Corypkaena, Gobius, Cott-us, Scorpaena, Zeus, Pleuronectes, Chaetodon, Sparus, Labrus, Sciaena, Perca, Gasterosteus, Scomber, Mullus, Trigla. „ 4. Abdominales.

Genera: Cobitis, Amia, Silurus, Zeuthis, Lori- caria, Salmo, Fislularia, Esox, Ehps, Argen- tina, Atherina, Mugil, Mormyrus, Exocoetus, Polynemits, Clupea, Cyprinus.

Class V. Insbcta.

Order 1. Coleoptera.

Genera: (a) Scarabaeus, Lucanus, Dermestes, Ulster, Byrrhus, Gyrinus, Attelabus, Curculio, Silpha, Coccinella-; (b) Bruchus, Cassida, Ptinus, Chrysomela, Hispa, Meloe, Tenebrio, Lampyris, Motdella, Staphylinus; (c) Cerambyx, Leptura, Cantharis, Elater, Cicindela, Buprestis, Dytiscits, Carabus, Necydalis, Forficula. „ 2. Hemiptera.

Genera: Blatta, Mantis, Gryllus, Fitlgora, Cicada, Notonecta, Nepa, Cimex, Apkis, Ckermes, Coc- cus, Thrips.

3. Lepldoptera. Genera : Papilio, Sphinx, Phalaena.

4. Neuroptera. Genera : Libellula, Ephemera, Myrmeleon, Phry-

ganea, Hemerobius, Panorpa, Raphidia.

5. Hymenoptera. Genera: Cynips, Tentkredo, Sirex, Ichneumon,

Sphex, Chrysis, Vespa, Apis, Formica, Mutilla.

6. Diptera. Genera: Oestrus, Tipula, Musca, Tabanus, Culex,

Empis, Conops, Asiius, Bombylius, Hippobosca.

7. Aptera.

Genera: {a) Pedibus sex; capite a thorace dis- crete: Lepisma, Podura, Termes, Pedicu- lus, Pulex.*

(b) Pedibus 8-14; capite thoraceque unitis:

Acarus, Phalangium, Aranea, Scorpio, Cancer, Monoculus, Oniscus.

(c) Pedibus pluribus; capite a thorace discrete-:

Scolopendra, Julus. Class VI. Vermes.

Order 1. Intestina.

Genera: (a) Pertusa laterali poro: Lumbricus, Sipunadus, Fasciola. (b) Imperforata poro laterali nullo: Gordius, Ascaris, Hirudo, Myxine. „ 2. Mollusca.

Genera : (a) Ore supero ; basi se affigens : Actinia, Ascidia.

(b) Ore antico ; corpore pertuso laterali fora-

minulo: Limax, Aplysia, Doris, Tetkis.

(c) Ore antico; corpore tentaculis antice

cincto : Holothuria, Terebella.

(d) Ore antico; corpore brachiato: Triton,

Septa, Clio, Lernaea, Scyllaea.

(e) Ore antico; corpore pedato: Aphrodita,

Nereis. (/) Ore infero central!: Medusa, Asteria, Echinus. , t 3- Testacea.

Genera; (a) Multivalvia: Chiton, Lepas, Pholas.

(b) Bivalvia (= Conchae): Mya, Solen, Tellina,

Cardium, Mactra, Donax, Venus, Spon- dylus, Chama, Area, Ostrea, Anemia, Mytilus, Pinna.

(c) Univalvia spira regulari (= Cochleae) ; A rgo-

nauta, t Nautilus, Conus, Cypraea, Bidla, Valuta, Buccinum, Strombus, Murex, Trochus, Turbo, Helix, Nerita, Haliotis.

(d) Univalvia absque spira regulari: Patella,

Dentalium, Serpula, Teredo, Sabella. „ 4. Litkophyta.

Genera: Tubipora, Madrepora, Millepora, Celle- pora. „ 5. Zoophyta.

Genera: (a) Fixata: I sis, Gorgonia, Alcyonium, Spongia, Fluslra, Tubularia, Corallina, Sertuiaria, Vorticella. (b) Locoraotiva : Hydra, Pennatula, Taenia, Volvox, Furia, Chaos.

The characters of the six classes are thus given by Linnaeus:—

Cor biloculare, biauritum ;

Sanguine calido, rubro : Cor uniioculare, uniauritum; 1

Sanguine frigido', rubro: Cor uniioculare, inauritum;

Sanie frigida, albida:

viviparis, Mammalibus; oviparis, Ambus. pulmone arbitrario, Amphibiis; branchiis externis, Piscibus. antennatis, Insectis; tentaculatis, Vermibus.

1 The anatomical error in reference to the auricles of Reptiles and

Batrachians on the part of Linnaeus is extremely interesting, since it showsto what an extent the most patent facts may escape the observation of even the greatest observers, and what an amount of repeated dissection and unprejudiced attention has been necessary before the structure of the commonest animals has become known.

Between Linnaeus and Cuvier there are no very great names; but under the stimulus given by the admirable method and system of Linnaeus observation and description From of new forms from all parts of the world, both Unnaeus recent and fossil, accumulated. We can only cite the to Cuvier ‘ names of Charles Bonnet (1720-1793), the entomologist, who described the reproduction of Aphis; Banks and Solander, who accompanied Captain Cook on his first voyage(i76S-i77t); Thomas Pennant (1726-1798), the describer of the English fauna; Peter Simon Pallas (1741-1811), who specially extended the knowledge of the Linnaean Vermes, and under the patronage of the empress Catherine explored Russia and Siberia; De Geer (1 720-1 778), the entomologist; Lyonnet (1 707-1 789), the author of the monograph of the anatomy of the caterpillar of Cossus ligniperdus; Ca volini (17 56-1 810), the Keapoli tan marine zoologist and forerunner of Delia Chiaje (fl. 1828); O. F. Miiller (1730-1784), the describer of fresh-water Oligochaeta; Abraham Trembley (1700-1784), the student of Hydra; and O. F. Ledernniller (1719-1760), the inventor of the term In- fusoria. The effect of the Linnaean system upon the general conceptions of zoologists was no less marked than were its results in the way of stimulating the accumulation of accurately observed details. The notion of a scala naturae, which had since the days of classical antiquity been a part of the general philosophy of nature amongst those who occupied themselves with such conceptions, now took a more definite form in the minds of skilled zoologists. The species of Linnaeus were supposed to represent a -> eries of steps in a scale of ascending complexity, and it was thought possible thus to arrange the animal kingdom in a single series — the orders within the classes succeeding one another in regular gradation, and the classes succeeding one another in a similar rectilinear progression.

*J. B. P. de Lamarck (1744-1829) represents most completely, both by his development theory (to be further Lamarck’s mentioned below) and by his scheme of classifica- ciass/fh tion, the high-water mark of the popular but catioa * fallacious conception of a scala naturae. His classification (1801-1812) is as follows: —*

Invertebrata.

1. Apathetic Animals.

Class I. Infusoria.

Orders: Nuda, Appendtculata. Class II. Polypi.

Orders: Ciliati (Rotifera), Denudati (Hydroids), Vagi- nati (Anthozoa and Polyzoa), Natantes (Crinoids). Class III. Radiaria.

Orders: Mollia (Acalephae), Echinoderma (including Actiniae).

Class IV. TuNlCATA.

Orders: Bothryllaria, Ascidia. Class V. Vermes.

Orders: Molles (Tape- Worms and Flukes), Rigiduli (Nematoids), Hispiduli (Nais, &c), Epi&oariae (Lernaeans, &c).

2. Sensitive Animals.

Class VI. Insecta (Hexapoda).

Orders: Aptera, Diptera, Hemiptera, Lepidoptera, Hymenoptera, Neuroptera, Orthoptera, Coleoptera. Class VII. Arachnida.

Orders: Antennato-Trachealia ■ (=Thysanura and Myriapoda), Exantennato-Trachealia t Exantennalo- Branchialia. Class VIII. Crustacea.

Orders: Hcterobranchia (Branchiopoda, Isopoda, Am- phipoda, Stomapoda), Homobranchia (Decapoda). Class IX. Annelida.

Orders: Apoda, Antennata, Sedentaria. Class X. Cirripedia.

Orders: Sessilia, Peduncuiata. Class XI. Conchifera.

Orders: Dimyaria, Monomyaria. Class XII. Mollusca.

Orders: Pteropoda, Gasteropoda, Trachelipoda, Cepha- lopoda, Heteropoda.

Vertebrata.

3. Intelligent Animals. Class XIII. Fishes. ., XIV. Reptiles.

Class XV. Birds. „ XVI. Mammals.

The enumeration of orders above given will enable the reader to form some conception of the progress of knowledge relating to the lower forms of life during the fifty odd years which inter- vened between Linnaeus and Lamarck. .The number of genera recognized by Lamarck is more than ten times as great as that recorded by Linnaeus.

We have mentioned Lamarck before his great contemporary Cuvier because, in spite of his valuable philosophical doctrine of development, he was, as compared with Cuvier and estimated as a systematic zoologist., a mere enlargement and logical out- come of Linnaeus.

The distinctive merit of G. L. Cuvier (i 760-1832) is that he started a new view as to the relationship of animals, which he Cuvier ma y ˆ e said in a large measure to have demon strated as true by his own anatomical researches. He opposed the scala naturae theory, and recognized four distinct and divergent branches or embranckemens, as he called them, in each of which he arranged a certain number of the Linnaean classes, or similar classes. The embranckemens were charac- terized each by a different type of anatomical structure. Cuvier thus laid the foundation of that branching tree-like arrangement of the classes and orders of animals now recognized as being the necessary result of attempts to represent what is practically a genealogical tree or pedigree. Apart from this, Cuvier was a keen-sighted and enthusiastic anatomist of great skill and industry.,! It is astonishing how many good observers it re quires to dissect and draw and record over and over again the structure of an animal before an appi 'ximately correct account of it is obtained. Cuvier dissected many Molluscs and other animals which had not previously been anatomized; of others he gave more correct accounts than had been given by earlier writers. Another special distinction of Cuvier is his remarkable work in comparing extinct with recent organisms, his descriptions of the fossii Mammalia of the Paris basin, and his general applica- tion of the knowledge of recent animals to the reconstruction of extinct ones, as indicated by fragments only of their skeletons.

It was in 1812 that Cuvier communicated to the Academy of Sciences of Paris his views on the classification of animals. He says: —

" Si Ton consldere Ic rcgne animal d'apres les principes que nous venons de poser, en se debarassant des prejuges etablis surges divisions anciennement admises, en n'ayant egard qu 1 a I'organisa- tion et a la nature des animaux, et non pas a leur grandeur, a leur utilite, au plus ou moins de connaissance que nous en avons, ni a toutes les autres circonstances accessoires, on trouyera qu'il existe quatre formes principals, quatre plans generaux, si Ton peut s 'ex- primer ainsi, d'apres lesquels tons les animaux semblent avoir ete. modetes et dont les divisions ulterieures, de quelque titrc

cue les naturalistes les aient decorees, ne sont que des modifications assez Jegeres, fondees sur !e developpement, ou l'addition de quelques parties qui ne changent rien a I 'essence du plan."

His classification as finally elaborated in Le Regne Animal (Paris, 1829) is as follows: — ■

First Dranch. Animalia Vertebrata. Class L Mammalia.

Orders: Bimana, Quadrumana, Camivora, Marsupialia, Rodentia, Edentata., Pachydermata, Ruminantia, Cetacea. Class II. Birds.

Orders: Accipitres, Passeus, Scansores, Gallinae, Grallae, Palmipedes. Class III. Reptilia.

Orders: Chelonia, Sauria, Ophidia, Batrachia. Class IV. Fishes.

Orders: (a) Acanthopterygii, Abdominales, Subbrachu, Apodes, Lophobranchii, Plectognathi ; (b) Stur tones, Selachii, Cyclostomi.

Second Branch. Animalia Mollusca.

Class I. Cephalopoda.

Class II. Pteropoda.

Class III. Gastropoda. . ,

Orders: Pulmonale, Nudibranchia, Inferobranckta, Tech- branchia, Heteropoda, Pectinibranchia, Tubulibranchia, Scutibranchia, Cydobranckia. Class IV. Acephala.

Orders: Testacea., Tunicata. Class V. Brachiopoda. Class VI. Cirrhopoda.

Cuvier & classifl' cation.*

Third Branch. Animalia Articulata.

Class I. Annelides.

Orders: Tubicoloe, Dorsibranchiae, Abranckiae. Class II. Crustacea.

Orders: (a) ' Malacostraca : Decapoda, Stomapoda, Am- phipoda, Laemodipoda, Isopoda; (b) Hntomostraca: Branchio-boda, Poe.cilopoda, Trilobitae,. Class III. Araciinides.

Orders: Pulmonariae, Trachearіae. Class IV. Insects.

Orders: Myria-poda, Thysanura, Parasita, Suctoria, Coleo- ptera, Orthoptera, Hemiptera, Neuroptera, Ilymenopiera, Lepidoptera, Rhipiptera, Diptera. Fourth Branch. Animalia Radiata.

Class I. ECHINODERMS.

Orders: Pedicellata, Apoda. Class IL Intestinal Worms.

Orders: Netttaloidea, Parenchymatosa. Class III. ACALEPHAE.

Orders: Simplices, Hydrostalicae. Class IV. Polypi (including the Coelentera of later authorities and the Polyzoa).

Orders : Carnosi, Gelatinosi, Polypiarii. Class V. Infusoria.

Orders: Rotifera, Homogenea (this includes the Protozoa of recent writers and some Protophyta).

The leading idea of Cuvier, his four embranckemens, was con- firmed by the Russo-German naturalist Von Baer (1792-1876), who adopted Cuvier's divisions, speaking of them as Voa Bwr the peripheric, the longitudinal, the massive, and the vertebrate types of structure. Von Baer, however, has another place in the history of zoology, being the first and most striking figure in the introduction of embryology into the consideration of the relations of animals to one another.

Cuvier may be regarded as the zoologist by whom anatomy was made the one important guide to the understanding of the rela- tions of animals. But the belief, dating from Malpighi _. (1670}, that there is a relationship to be discovered, D tjaiT- and not merely a haphazard congregation of varieties of r. . " structure to be classified, had previously gained ground. ' |

Cuvier was familiar with the speculations of the " Natur-philo- sophen," and with the doctrine of transmutation and filiation by which they endeavoured to account for existing animal forms. The noble aim of F- W. J. Schcllfng, " das ganze System der Natur- lehre von dem Gesetze der Schwere bis zu den Bildungstrieben der Organismus als em organisches Ganze darzustellen," which has ultimately; been realized through Darwin, was a general one among the scientific men of the year 1800. Lamarck accepted the development theory fully, and pushed his speculations far beyond the realm of fact. The more cautious Cuvier adopted a view of the relationships of animals which, whilst denying genetic connexion as the explanation, recognized an essential identity of structure throughout whole groups of animals. This identity was held to be due to an ultimate law- of nature or the Creator's plan. The tracing out of this identity in diversity, whether regarded as evidence of blood-relationship or as a remarkable

display of skill on the part of the Creator in varying the details whilst retaining the essential, became at this period a special pursuit, to which Goethe, the poet, who himself contributed importantly to it, gave the name " morphology." C. F. Wolff, Goethe and Oken share the credit of having initiated these views, in regard especially to the structure of flowering plants and the Vertebrate skull. Cuvier's doctrine of four plans of structure was essentially a morpho- logical one, and so was the single-scale doctrine of Buffon and Lamarck, to which it was opposed. Cuvier's morphological doctrine received its fullest development in the principle of the " correla- tion of parts," which he applied to palaeontologies! investigation, namely, that every animal is a definite whole, and that no part can be varied without entailing correlated and law-abiding varia- tions in other parts, so that from a fragment it should be possible, had we a full knowledge of the laws of animal structure or morpho- l°gy- to reconstruct the whole. Here Cuvier w r as imperfectly formulating, without recognizing the real physical basis of the phenomena, the results of the laws of heredity, which were sub- senuently investigated and brought to bear on the problems of animal structure by Darwin.

Sir Richard Owen (1804-1892) may be regarded as the fore- most of Cuvier's disciples. Owen not only occupied himself with the dissection of rare animals, such as the Pearly Owea, Nautilus, Lingula, Limulus, Proioplerus, Apteryx, &c, and with the description and reconstruction of extinct reptiles, birds and mammals — following the Cuvierian tradition — but gave precision and currency to the morphological doctrines which had taken their rise in the beginning of the century by

the introduction of two terms, " homology " and " analogy," which were defined so as to express two different kinds of agree- ment in animal structures, which, owing to the want of such " counters of thought," had been hitherto continually confused.

Analogous structures in any two animals compared were by Oven defined as structures performing similar functions, but not necessarily derived from the modification of one and the same part in the " plan " or " archetype " according to which the two animals compared were supposed to be constructed. Homologous structures were such as, though greatly differing in appearance and detail from one another, and though performing widely different functions, yet were capable of being shown by adequate study of a series of intermediate forms to be derived from one and the same part or organ of the " plan-form " or " archetype." It is not easy to exaggerate the

service rendered by Owen to the study of zoology by the introduction of this apparently small piece of verbal mechanism; it takes place with the classifi- catory terms of Linnaeus. And, though the conceptions of " archetypal morphology," to which it had reference, are now abandoned in favour of a genetic morphology, yet we should remember, in estimating the value of this and of other speculations which have given place to new views in the history of science, the words of the great reformer himself. " Erroneous observations are in the highest degree injurious to the progress of science, since they often persist for a long time. But erroneous theories, when they are supported by facts, do little harm, since every one takes a healthy pleasure in proving their falsity " (Darwin). Owen's definition of analogous structures holds good at the present day. His homo- logous structures are now spoken of as " homogenetic " structures, the idea of community of representation in an archetype giving place to community of derivation from a single representative structure present in a common ancestor. Darwinian morphology has further rendered necessary the introduction of the terms " horao- plasy " and " homoplastic " (E. Ray Lankester, in Ann. and Mag, Nat. Hist. 1870) to express that close agreement in form which may be attained in the course of evolutional changes by organs or parts in two animals which have been subjected to similar moulding conditions of the environment, but have not a close genetic com- munity of origin, to account for their similarity in form and struc- ture, although they have a certain identity in primitive quality which is accountable for the agreement of their response to similar moulding conditions.

The classification adopted by Owen in his lectures (1855) Owea's does not adequately illustrate the progress of zoological knowledge between Cuvier's death and that date, but, such as it is, it is worth citing here. Province: Vertebrata (Myelencephala, Owen).

Classes: Mammalia, Aves, Reptti.ia, Pisces. Province: Articulata.

Classes: Arachnida, Insect a (including Sub-Classes Myria- poda, Ilexapoda), Crustacea (including Sub-Classes Enio- mostraca, Malacosiracd), Epizoa (Epizootic Crustacea), Annei.lata (Chaetopods and Leeches), Cirrii-edia, Province: Mollusca.

Classes : Cephalopoda, Gasteropoda, Pteropoda, Lamelli-

BRANCHIATA, BRACHIOPODA, TUNICATA.

Province: Radiata.

Sub-Province: Radiaria.

Classes: Echinodermata, Bryozoa, Anthozoa, Aca- lepiiae, Hydrozoa. Sub-Province: Entozoa,

Classes: Coelelmintiia, Sterelmintha. Sub-Province; Infusoria.

Classes: Rotifera, Polygastria {the. Protozoa of recent authors).

The real centre of progress of systematic zoology was no longer in France nor with the disciples of Cuvier in England, but after his death moved to Germany. The wave of mor- phological speculation, with its outcome of new systems and new theories of classification (see Agassiz, Essay on Classification, 1859), which were as numerous as the professors of zoological science, was necessarily succeeded in the true progress of the science by a period of minuter study in which the microscope, the discovery of embryologicai histories, and the all-important cell-theory came to swell the stream of exact knowledge.

The greatest of all investigators of animal structure in the 19th century was Johann Mtiller (1801-1858), the successor in MUiler Germany of the anatomists Rathke (1 793-1 86o) and Meckel (1781-1833). His true greatness can only be estimated by a consideration of the fact that he was a great teacher not only of human and comparative anatomy and zoology but also of physiology, and that nearly all the most

classifi- cation.

distinguished German zoologists and physiologists of the period 1850 to 1870 were his pupils and acknowledged his leader- ship. The most striking feature about Johann Muller's work, apart from the comprehensiveness of his point of view, in which he added to the anatomical and morphological ideas of Cuvier a consideration of physiology, embryology and microscopic structure, was the extraordinary accuracy, facility and com- pleteness of his recorded observations. He could do more with a single specimen of a rare animal (e.g. in his memoir on Amphioxus, Berlin, 1844) in the way of making out its complete structure than the ablest of his contemporaries or successors could do with a plethora. His power of rapid and exhaustive observation and of accurate pictorial reproduction was pheno- menal. His most important memoirs, besides that just mentioned, are those on the anatomy and classification ol Fishes, on the Caecilians and on the developmental history of the Echinoderms.

A name which is apt to be forgotten in the period between Cuvier and Darwin, because its possessor occupied an isolated position in England and was not borne up by any j. v. great school or university, is that of John Vaughan Thomp' Thompson (1779-1847), an army surgeon, who in 1816

son ‘ became district medical inspector at Cork, and then took to the study of marine Jtivertebrata by the aid of the microscope. Thompson made three great discoveries, which seem to have fallen in his way in the most natural and simple manner, but must be regarded really as the outcome of extraordinary genius. He showed (1830) that the organisms like Flustra are not hydroid Polyps, but of a more complex structure resembling Molluscs, and he gave them the name Polyzoa He discovered (1823) the Pentacrinus europaeus, and showed that it was the larval form of the Feather-Star Antedon (Comahda). He upset (1S30) Cuvier’s retention of the Cirripedes among Mollusca, and his subsequent treatment of them as an isolated class, by showing that they begin life as free-swimming Crustacea identical with the young forms of other Crustacea. Vaughan Thompson is a type of the marine zoologists, such as Dalyell, Michael Sars, P. J. Van Beneden, Clapar&de, and Allman, who during the 19th century approached the study of the lower marine organisms in the same spirit as that in which Trembley and Schaffer in the 18th century, and Swammerdam in the 17th, gave themselves to the study of the minute fresh-water forms of animal life.

It is impossible to enumerate or to give due consideration to all the names in the army of anatomical and embryologicai students of the middle third of the 19th century whose labours bore fruit in the modification of zoological theories and in the building up of a true classification of animals. Their results are best summed up in the three schemes of classification which follow below — those of Rudolph Leuckart (1823-1896), Henri Milne-Edwards (1800-1884), and T. H. Huxley (1825-1895), all of whom individually contributed very greatly by their special discoveries and researches to the increase of exact knowledge.

Contemporaneous with these were various schemes of classi- fication which were based, not on a consideration of the entire structure of each animal, but on the variations of a stoxte single organ, or on the really non-significant fact of tact the structure of the egg. All such single-fact systems systems have proved to be departures from the true line of ˆf!f ssU growth of the zoological system which was shaping itself year by year — unknown to those who so shaped it — as a genealogical tree. They were attempts to arrive at a true know- ledge of the relationships of animals by ” royal roads “; their followers were landed in barren wastes.*

R, Leuckart’s classification (Die Morpkologie und Leackart’s die Verwandtschaftsverh<nisse der wirbellosen Thieve, JjJjJJJJf’ Brunswick, 1848) is as follows: —*

*Type 1. Coelenterata. **

Class I. Polypi.

Orders: Anthozoa and Cylicozoa. „ II. Acalephae.

*Orders: Discophorae and Ctenophorae**

Type 2. Echinodermata. Class I. Pelmatozoa.

Orders : Cystidea and Crinoidea.

,, II. ACTINOZOA.

Orders: Echinida and Aster ida.

„ III. SCYTODEKMATA.

Orders: Holothuriae and Sipunculida. Type 3. Vermes.

Class I. Anenteraeti.

Orders: Cestodes and Acanthocephali. „ II. Apodes.

Orders: Nemertini, Turbellarii, Trematodes and Hirudinei. „ III. Ciliati.

Orders: Bryozoa and Rolifera. ,, IV. Annelides.

Orders: Nematodes Lumbricini and Branckiati. Type 4. Arthxopoda.

Class I. Crustacea.

Orders : Entomostraca and Malacostraca. ,, II. Insecta..

Orders: Myriapoda, Arachnida (Accra, Latr.), and Hexapoda. Type 5. Mollusca.

Class I. Tumcata.

Orders: A scidiae and Salpae.

„ II. ACEPHALA.

Orders: Latnellibranchiata and Brackiopoda. „ III. Gasteropoda.

Orders : Heterobranckia, Dermatobranckia, Hetero- poda, Ctenobranchia,

Pulmonata, and Cytf/o- iraws/wa. ,, IV. Cephalopoda. Type 6. Vertebrata. (Not specially dealt with.)

Miiae- ˆ xhe classification, given by Henri Milne-Edwards dassifi- ' iˆours &Bmentaire d'Histoire Naturelle, Paris, 1855) cation. is as follows: —*

Branch I. Osteozoaria or Vertebrata. Sub-Branch 1. Allantoidians.

Class I. Mammalia.

Orders: (a) Monodelphia: Bimana, Quadru- mana, Cheiroptera, Insectivora, Rodentia, Eden- tata, Carnivora, Amphibiaˆ Packydermata, Ruminantia, Cetacea; (b) Didelphia: Marsu- pialia, Monotremata. „ II. Birds.

Orders : Rapaces, Passeres, Scansores, Gallinae, Grallae, Palmipedes. ,, III. Reptiles.

Orders: Chelonia, Sauria, Ophidia. Sub-Branch 2. Anallantoidians. Class I. Batrachians.

Orders: Anura, Urodela, Perennibranchia, Cat- ciliae. „ II. Fishes.

Section 1. Ossei. Orders: Acanthopterygii, Abdominales, Sub- brackii, Apodes, Lophobranchii, Plectognathi. Section 2. Chondropterygii.

Orders: Siuriones, Selachii, Cyclostomi.

Branch II. Entomozoa or Annelata.

Sub-Branch 1. Arthropoda.

Class I. Insecta.

Orders: Coleoptera, Orihoptera, Neuroptera, Hymenoptera, Lepidoptera, Hemiptera, Di- ptera, Rhipiptera, Anopleura, Tkysanura. „ II. Myriapoda.

Orders: Chilognatha and Chilopoda. ,, III. Arachnids.

Orders : Pulmonaria and Trackearia, M IV. Crustacea.

Section 1. Podophthalmia.

Orders : Decapoda and Stomofoda. Section 2. Edriopkthahni.

Orders: Amphipoda, Loemodipoda and Iso- pvda. Section 3. Branchiopoda.

Orders: Ostracoda, Pkyltopoda and Trilo- bitae. Section 4. Entomostraca.

Orders: Copepoda, Ctadocera, Siphonostoma, Lernaeida, Cirripedia. # Section 5. Xipkosura. (The orders of the classes which follow are not given in the work quoted.)

Sub-Branch 2. Vermes. Class I. Annelids. ,, II. Helminths. ,, III. Turbellaria.

Class IV. Cestoidea. ,, V. Rotatoria.

Branch III. Malaeozoaria or Mollusca. Sub-Branch 1. Mollusca proper.

Class I. Cephalopoda. Class III. Gasteropoda.

„ II. Pteropoda. „ IV. Acephala.

Sub-Branch 2. Melius coidea,

Class I. Tunicata. Class II. Bryozoa.

Branch IV. Zoophytes.

Sub-Branch 1. Radiaria.

Class I. Eciiinoderms. Class III. Corallaria or

,, II. Acalephs. Polypi.

Sub-Branch 2. Saicodaria.

Class I. Infusoria.

Class II. Spongiaria.

In England T. H. Huxley adopted in his lectures Huxley's

(1869) a classification which was in many respects dassW-

similar to both of the foregoing, but embodied im- cstioa ' provements of his own. It is as follows:—

Sub-Kingdom I. Protozoa.

Classes: Rhizopooa, Gregarlnida, Radiolaria, Spongida. Sub-Kingdom II. Infusoria. Sub-Kingdom 111. Coelenterata.

Classes: Hydrozoa, Actinozoa. Sub-Kingdom IV. Annuloida.

Classes: Scolecida, Echinodermata. Sub-Kingdom V. Annulosa.

Classes: Crustacea, Arachnida, Myriapoda, Insecta.Chae- tognatila, Annelida. Sub-Kingdom VI. Molluscoida.

Classes: POLYZOA, BRACHIOPODA, TUNICATA.

Sub-Kingdom VII. Mollusca.

Classes : Lamellibranchiata.Branchiogastropoda.Pulmo- gastropoda, Pteropoda, Cephalopoda. Sub-Kingdom VIII. Vertebrata.

Classes: Pisces, Amphibia, Reptilia, Ayes, Mammalia.

We now arrive at the period when the doctrine of organic evolution was established by Darwin, and when naturalistˆ being convinced by him as they had not been by the trans- mutationists of fifty years' earlier date, were compelled to take an entirely new view of the significance of all attempts at framing a " natural " classification.

Many zoologists — prominent among thern in Great Britain being Huxley — had been repelled by the airy fancies and assumptions of the "

philosophical " morphologists. . The efforts of the best minds in zoology had been cations directed for thirty years or more to ascertaining based on with increased accuracy and minuteness the struc- struc- ture, microscopic and gross, of all possible forms of animals, and not only of the adult structure but of the steps of development of that structure in the growth of each kind of organism from the egg to maturity. Putting aside fantastic theories, these observers endeavoured to give in their classi- fications a strictly objective representation of the facts of animal structure and of the structural relationships of animals to one another capable of demonstration. The groups within groups adopted for this purpose were necessarily wanting in symmetry: the whole system presented a strangely irregular character. From time to time efforts were made by those who believed that the Creator must have followed a symmetrical system in his production of animals to force one or other artificial, neatly balanced scheme of classification upon the zoological world. The last of these was that of Louis Agassiz (1807-1873), who, whilst surveying all previous classifications, propounded a scheme of his own (Essay on Classification, 1859), in which, as well as in the criticisms he applies to other systems, the leading notion is that sub-kingdoms, classes, orders and families have a real existence, and that it is possible to ascertain and distinguish characters which are of class value, others which are only of ordinal value, and so on, so that the classes of one sub-kingdom should on paper, and in nature actually do, correspond in relative value to those of another sub-kingdom, and the orders of any one class similarly should be so taken as to be of equal

Influence of Dar- winian doctrine on taxo- nomy.

Haeckel.

value with those of another class, and have been actually so created.

The whole position was changed by the acquiescence, which became universal, in the doctrine of Darwin. That doctrine took some few years to produce its effect, but it became evident at once to those who accepted Dar- winism that the natural classification of animals, after which collectors and anatomists, morphologists, philosophers and embryologists had been so long striving, was nothing more nor less than a genea- logical tree, with breaks and gaps of various extent in its record. The facts of the relationships of animals to one another, which had been treated as the outcome of an inscrutable law by most zoologists and glibly explained by the

transcendental morpho- logists, were amongst the most powerful arguments in support of Darwin's theory, since they, together with all other vital phenomena, received a sufficient explanation through it. It is to be noted that, whilst the zoological system took the form of a genealogical tree, with main stem and numerous diverging branches, the actual form of that tree, its limitation to a certain number of branches corresponding to a limited number of diver- gences in structure, came to be regarded as the necessary consequence of the operation of the physico-chemical laws of the universe, and it was recognized that the ultimate explanation of that limitation is to be found only in the constitution of matter itself.

The first naturalist to put into practical form the conse- quences of the new theory, in so far as it affected zoological classification, was Ernst Haeckel of Jena (b. 1834), who in 1S66, seven years after the publication of Darwin's Origin of Species, published his suggestive Generelle Morphologic Haeckel introduced into classification a number of terms intended to indicate the branchings of a genealogical tree. The whole "system" or scheme of classification was termed a genealogical tree {Stammbaum}; the main branches were termed " phyla," their branchings " sub-phyla "; the great branches of the sub-phyla were termed " cladi," and the " cladi " divided into " classes," these into sub-classes, these into legions, legions into orders, orders into sub-orders, sub- orders into tribes, tribes into families, families into genera, genera into species. Additional branchings could be indicated by similar terms where necessary. There was no attempt in Hacckcl's use of these terms to make them exactly or more than approximately equal in significance; such attempts were clearly futile and unimportant where the purpose was the exhibition of lines of descent, and where no natural equality of groups was to be expected ex hypothesi. Haeckel's classifica- tion of 1866 was only a first attempt. In the edition of the Natiirliche Schopfungsgeschichte published in 1868 he made a great advance in his genealogical classification, since he now introduced the results of the extraordinary activity in the study of embryology which followed on the publication of the Origin of Species.

The pre-Darwinian systematists since the time of Von Baer had attached very great importance to embryological facts, holding that the stages in an animal's development were often more significant of its true affinities than its adult structure. Von Baer had gained unanimous support for his dictum, " Die Entwickelungsgeschichte ist der wahre Lichttrager fur Untersuchungen iiber organische Korper." Thus J. Mutter's studies on the larval forms of Echino- derms and the discoveries of Vaughan Thompson were appreciated. But it was only after Darwin that the cell-theory of Schwann was extended to the embryology of the animal kingdom generally, and that the knowledge of the development of an animal became a knowledge of the way in which the millions of cells of which its body is composed take their

origin by fission from a smaller number of celts, and these at last from the single egg-cell. Kolliker (Develop- ment of Cephalopods, 1844), Remak {Development of the Frog, 1850), and others had laid the foundations of this knowledge in isolated examples; but it was Kovalevsky, by his accounts of the develop- ment of Ascidians and of Amphioxus (1866), who really made zoologists see that a strict and complete cellular embryology of animals was as necessary and feasible a factor in the comprehension of their relationships as at the beginning of the century the coarse anatomy had been shown to be by Cuvier. Kovalevsky's work appeared between the dates of the Generelle Morphologie and the

Schopfungsgeschichte. Haeckel himself, with his pupi! Miklucho- Maclay, had in the meantime made studies on the growth from the egg of Sponges — studies which resulted in the complete separation of the unicellular or equicellular Protozoa from the Sponges, hitherto confounded with them. It is this introduction of the consideration of cell-structure and cell-development w r hich, subsequently to the establishment of Darwinism, has most profoundly modified the views of systematists, and led in conjunction with the genealogical doctrine to the greatest activity in research — an activity which culminated in the work (1873-1882) of F. M. Balfour, and produced the pro- foundest modifications in classification.

Haeckel's second pedigree is as follows:-

Phyla.

Protozoa.

Zoophyta.

Vermes.

Mollusca.

Echinoderma.

Arthropoda.

Vertebrata.

Ov

Clades.

LBlastularta.

fSPONGIAE.

1 ACALEPHAE.

ACOELOMI.

COELOMATI.

ACEPHALA. EUCERHALA. COLOURACHIA LlPOBRACHIA.

Carides. Tkacheata.

ACRANIA. MONORRHINA.

J Anamnia. Amniota

Classes.

Archezoa.

Gregarinae.

Infusoria.

“Planaeada. ■ Gastraeada.

Porifera. f Cor alia. -I Hydromedusae. [Ctenophora.

Plalyhelminthes. ‘ Nemathelminthes.

Bryozoa.

Tunica ta,

Rhynchocoela.

Gephyraea.

Rotatoria.

Annelida.

Spirobranchia.

L am ellibranchia.

Cochlides.

Cephalopoda. SAslerida. I Crinoida. j Echinida. t Holothuriae.

Crustacea. f Arqchnida. ■{ Myriapoda. i Insecta.

Leptocardia.

Cyclostoma. f Pisces. J Dipneusta. 1 Halisauria. [.Amphibia. (Reptilia. -{ Aves. {Mammalia.

HaeckeFs

1868

arrange- ment.

*In representing pictorially the groups of the animal kingdom as the branches of a tree, it becomes obvious that a distinction may be drawn, not merely between the individual main branches, but further as to the level at which f rm 1 ‘ they are given off from the main stem, so that one distribu- branch or set of branches may be marked off as be- tina of longing to an earlier or lower level than another set 2 *^ of branches; and the same plan may be adopted with regard to the clades, classes and smaller branches. The term ” grade ” was introduced by Ray Lankester (” Notes on Embryology and Classification,” in Quart. Joum. Micr. Sci. 1877), to indicate this giving off of branches at a higher or lower, i.e. a later or earlier, level of a main stem. 1 The mech- anism for the statement of the genealogical relationships of the groups of the animal kingdom was thus completed. Re- newed study of every group was the result of the acceptance of the genealogical idea and of the recognition of the importance*

1 Sir Edwin Ray Lankester (b. 1847) was the eldest son of Edwin Lankester (1814-1874), a physician and naturalist (F.R.S. 1845), who became well known as a scientific writer and lecturer, editor of the Quarterly Journal of Microscopical Science from 1853 to 1871, and from 1862, in succession to Thomas Wakley, coroner for Central Middlesex. Educated at St Paul’s and both at Downing College, Cambridge, and Christ Church, Oxford, E. Ray Lankester obtained the Raddiffe Travelling Fellowship at Oxford in 1870, and became a fellow and lecttuer at Exeter College in 1872. From 1874 to. 1890 he was professor of zoology and comparative anatomy at University College, London; and from 1891 to 1898 Linacre pro- lessor of comparative anatomy at Oxford. From 1898 to 1907 he was director of the Natural History Department of the British Museum. He was made K.C.B. in 1907. [Ed. E. B..

of cellular embryology. On the one hand, the true method of arriving at a knowledge of the genealogical tree was recognized as lying chiefly in attacking the problem of the genealogical relationships of the smallest twigs of the tree, and proceeding from them to the larger branches. Special studies of small families or orders of animals with this object in view were taken in hand by many zoologists. On the other hand, a survey of the facts of cellular embryology which were accumulated in regard to a variety of classes within a few years of Kovalevsky's work led to a generalization, independently arrived at by Haeckel and Lankester, to the effect that a lower grade of animals may be distinguished, the Protozoa or Plastidozoa, which consist either of single cells or colonies of equiformal cells, and a higher gwde, the. Melazoa or Enterozoa, in which the egg-cell by " cell division " gives rise to two layers of cells, the endoderm and the ectoderm, surrounding a primitive digestive chamber, the archenteron. Of these latter, two grades were further distin- guished by Lankester — those which remain possessed of a single archenteric cavity and of two primary cell-layers (the Codeniera or Diploblastica) , and those which by nipping off the archenteron give rise to two cavities, the coelom or body-cavity and the metenteron or gut (Coelomata or Triploblastica) . To the primitive two-cell-layered form, the hypothetical ancestor of all Mctazoa or Enterozoa, Haeckel gave the name Gastraea ; the em- bryonic form which represents in the individual growth from the egg this ancestral condition he called a " gastrula." The term " diblastula " was subsequently adopted in England for the gas- trula of Haeckel. The tracing of the exact mode of development, cell by cell, of the diblastula, the coelom, and the various tissues of examples of all classes of animals was in later years pursued with immense activity and increasing instrumental facilities.

Two names in connexion with post-Darwinian taxonomy and the ideas connected with it require brief mention here. FritI Fritz Miiller, by his studies on Crustacea (Fiir Darwin,

Mailer's 1S64), showed the way in which genealogical theory recapitu- ma y Dc applied to the minute study of a limited group. iatioa. j| e j s a j go reS p 0ns ;bi e for the formulation of an im- portant principle, called by Haeckel " the biogenetic funda- mental law," viz. that an animal in its growth from the egg to the adult condition tends to pass through a series of stages which are recapitulative of the stages through which its ancestry has passed in the historical development of the species from a primitive form; or, more shortly, that the development of the individual (ontogeny) is an epitome of the development of the race (phylogeny). Pre-Darwinian zoologists had been aware of the class of facts thus interpreted by Fritz Miiller, but the authoritative view on the subject had been that there is a parallelism between (a) the series of forms which occur in in- dividual development, (b) the series of existing forms from lower to higher, and ©

the series of forms which succeed one another in the strata of the earth's crust, whilst an explanation of this parallelism was either not attempted, or was illusively offered in the shape of a doctrine of harmony of plan in creation. It was the application of Fritz Miiller's law of recapitulation which gave the chief stimulus to embryological investigations between 1865 and 1890; and, though it is now recognized that " recapitulation " is vastly and bewilderingly modified by special adaptations in every case, yet the principle has served; and still serves, as a guide of great value.

Another important factor in the present condition of zoolo- gical knowledge as represented by classification is the doctrine of degeneration propounded by Anton Dohrn. Lamarck believed in a single progressive series of forms, whilst Cuvier introduced Dohra's l ˆ e conception of branches. The first post-Darwinian doctrine systematists naturally and without reflexion accepted ofdegea- the idea that existing simpler forms represent stages erat n, ˆ t ˆ e g rac j lla j p ro gress of development — are in fact survivors from past ages which have retained the exact grade of development which their ancestors had reached in past ages. The assumption made was that (with the rare exception of para sites) all the change of structure through which the successive generations of animals have passed has been one of progressive

elaboration. It is Dohrn 's merit to have pointed out 1 that this assumption is not warranted, and that degeneration or pro- gressive simplification of structure may have, and in many lines certainly has, taken place, as well as progressive elaboration and in other cases continuous maintenance of the status quo. The introduction of this conception necessarily has had a most important effect in the attempt to unravel the genealogical affinities of animals. It renders the task a more complicated one; at the same time it removes some serious difficulties and throws a flood of light on every group of the animal kingdom.

One result of the introduction of the new conceptions dating from Darwin was a healthy reaction from that attitude of mind which led to the regarding of the classes and orders recognized by authoritative zoologists as sacred institutions which were beyond the criticism of ordinary men. That state of mind was due to the fact that the groupings so recognized did not profess to be simply the result of scientific reasoning, but were necessarily regarded as the expressions of the " insight " of some more or less gifted persons into a plan or system which had been arbitrarily chosen by the Creator. Consequently there was a tinge of theological dogmatism about the whole matter.

Grade 1. PROrozOA.

A genealogical tree of animal kingdom (Lankester, 1884).

To deny the Linnae,an, or later the Cuvierian, classes was very much like denying the Mosaic cosmogony. But systematic zoology is now entirely free from any such prejudices, and the Linnaean taint which is apparent even in Haeckel and Gegen- baur may be considered as finally expunged.

There are, and probably always will be, differences of opinion as to the exact way in which the various kinds of animals may be divided into groups and those groups arranged tan- in such an order as will best exhibit their probable kester's genetic relationships. The main divisions which, v'* 1 "- writing in 1910, the present writer prefers, are those adopted in his Treatise on Zoology (Part II. ch. ii.) except that Phylum 17, Diplochorda (a name doubtfully applicable to Phoronis) is replaced by Podaxonia, a term employed by Lankester in the gth edition of this encyclopaedia and now used to include a number of groups of doubtful but possible affinity. The terms used for indicating groups are " Phylum " for the large diverging branches of the genealogical tree as introduced by Haeckel, each Phylum bears secondary branches which arc termed " classes," classes again branch or divide into orders, orders into families, families into genera, genera into species. The general purpose is to give something like an equivalence of importance to divisions or branches indicated by the same term, but it is not intended to imply that every phylum has the*

1 Ursprung der Wirbdthiere (Leipzig, 1875) ; and Lankester, Degen- eration (London, 1880)

same range and distinctive character as every other, nor to make such a proposition about classes, orders, families and genera. Where a further subdivision is desirable without descending to the next lower term of grouping, the prefix "sub " is made use of, so that a class may be divided first of all into sub- classes each of which is divided into orders, and an order into sub-orders each of which bears a group of families. The term " grade " is also made use of for the purpose of indicating the conclusion that certain branches on a larger or smaller stem of the genealogical tree have been given off at an earlier period in the history of the evolution of the stem in question than have others marked off as forming a higher grade. Thus, to begin with, the animal pedigree is divided into two very distinct grades, the Protozoa and the Metazoa. The Metazoa form two main branches; one, Parazoa, is but a small unpro- ductive stock comprising only the Phylum Porifcra or Sponges; the other, the great stem of the animal series

Enterozoa, gives rise to a large number of diverging Phyla which it is necessary to assign to two levels or grades — a lower, Enterocoela (often called Coelentera) , and a higher, Coelomocoela (often called Coelomata) . These relations are exhibited by the two following diagrams.

ParatqA

Entcroioa

Branch A.\ /8rarch 6.

Grade 6. METAZOA,

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7y

Grade A PROTOZOA.

Diagram showing the primary grades and branches' of the Animal Pedigree.

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GradeC. COELOMOCOEIA,

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Grade A. ENfEROCOELA. Branch B. ENTEROZOA.

Diagram to show the division of the great branch Enterozoa into two grades and the Phyla given off therefrom.

The Phylum Vertebrata in the above scheme branches into the sub-phyla Hemichorda, Urochorda, Cephalochorda and Craniata. The Phylum Appendiculata similarly branches into sub-phyla, viz. the Rotifera, the Chaetopoda and the Arthro- poda. Certain additional small groups should probably be recognized as independent lines of descent or phyla, but their relationships are obscure — they are the Mesozoa, the Polyzoa, the Acanthocephala and the Gastrotricha.

We may now enumerate these various large groups in tabular form. BIONTA— Phyta, Anxmalta.

Grade A. Protozoa (various groups included).

Grade B. Metazoa. Branch a. Parazoa.

Phylum 1. PORIFERA.

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work.

Branch b. Enterozoa. Grade 1. Enterocoela.

Phylum 2. Hydromedusae.

3. scyfiiomedusae.

4. Anthozoa.

5. Ctenophofa. Grade 2. Coelomocoela.

Phylum 6. Platyelmia.

7. Nematoidea.

8. Ciiaetogkatiia

9. Nemertina,

10. M0LLUSCA.

11. Appendiculata.

Sub-phyla: Rotifera, CriAETOPODA, Ar- throfoda.

12. echinoderma.

13. Vertebrata.

Sub-phyla: Hemichorda, Urochorda, Cephalochorda, Craniata.

14. Mesozoa.

15. Polyzoa.

16. Acanthocephala

17. Podaxonia.

18. Gastrotricha.

A statement may now be given of the classes and orders in each group, as recognized by the writers of the various special zoological articles in the Eleventh Edition of the Encyclopaedia Britannica. These sub- divisions of the larger groups are not necessarily those theoretically approved by the present writer, but they have the valuable sanction of the individual experts who have given special attention to different portions of the vast field represented by the animal kingdom. 1

Grade A. Protozoa (q.v.).

Phylum 1. Sarcodina (q.v.).

Class 1. ProteOmyxa (q.v.) Class 2. RHIZOP0DA (q.v.). Orders : Lobosa, Filosa. Class 3. HELI0Z0A (q.v.).

Class 4. FORAMINIFERA (q.V.).

Orders: Nttda, Allogromidiaceae, Astrorhizidiaceae, Lituolidaceae, Miliolidaceae, Textulidaridaceae, Ckeilostomellaceae, Lagenidaceae, Globigerinidaceae, Rotalidaceae, Nummulidiaceae. Insertae sedis. Xenophyophoridae (see Foramini- fera). Class 5. Radiolaria.

*Orders: Spumdlarta (— Peripylaed) , Acantkaria (—Actip.ylaea), Nasselaria (= Monopylaea), Phaeo- daria (*= Tripylaea). Class 6. Labyrinthulidea (q.v.).*

No Orders. Class 7. MyxomyCEtes. No Orders. Phylum 2. Mastigophora (q.v.). Class 1. Flagellata (q.v.). Sub-class A. Rhizo flagellar a.

Orders : Holomastigaceae, Rkizomastigaceae. Sub-class R. Euflagellata.

Orders: Protomastigaceae, Chrysomonadaceae, Crypto- monadaceae, Ckloromonadaceae, Euglenaceae, Volvo- caceae. Class 2. Dinoflagei.lata.

Orders: GymnodiniaCeae, Prorocentraceae, Peridini- aceae. Class 3. Cystoflagellata. No Orders. Phylum 3. Sporozoa (g.v.).

Class 1. Endospora (q.v.).

Orders: _ Myxosporidia, Actinomyxidia, Sarco- sporidia, Haplosporidia. Class 2. Ectospora (q.v).

Orders: Gregarina (seeGREGARiNEs), Coccidia (q.v.), Haemosporidia (q.v.). Phylum 4. Infusoria (q.v.). Class 1. Ciliata.

Orders : Gymonostomaceae, Trickostomata, A spira- trichaceae, Spirotricha, Ifeterotrichaceae, Oligo- trichaceae, Hypotrichaceae, Peritrichaceae. Class 2. Suctoria. No orders.

1 It is to be noted that the terms used for designating categories in the classification are not always identical in this summary and separate articles, as authors differ as to the use of these.

Grade B. Metazoa. Branch a. Parazoa. Phylum i. Porifera (se? Sponges). Sub-phylum I. Calcarea. Class. Calcarea.

Orders : Homocoela, Heterocoela. Sub-phylum 2. Non-Calcarea. Class 1. Myxospongida.

Order : Myxospongida. Class 2. Triaxonida (= IIexactinellida).

Orders: Ampkidiscophora, Hexasterophora. Class 3. Tetraxonida.

Sub-Class 1. Tetractinellida.

Orders: Homosclerophora, Astrophora, Sigmato- phora. Sub-class 2. Lkhistida.

No Orders. Sub-class 3. Monaxonellida.

Orders : Astromonaxonellida, Sigmatomonaxonel-

lida. Class 4. Euceratosa. Order: Euceratosa. Branch 6. Enterozoa.

Grade I. Ekterocoela (see Coelentera). Phylum 2. Hydromedusae or Hydrozoa (q.v.). Class. Hydromedusae, (q.v.).

Orders: Eleutheroblastea, Hydroidae seu Leptolinae (Sub-orders: Anthomed-usae, Leptomedusae), Hy- drocorallinae, Graplolitoidea Trachylinae (Sub- orders: Trachomedusae, Narcomedusae), Siphono-phora. Phylum 3. Scyphomedusae (q.v.). Class. Scyphomedusae.

Orders : Cubomedusae, Stauromedusae, Coronata, Discophora. Phylum 4. Anthozoa (q.v.). Class. Anthozoa.

Sub-class 1. Alcyonaria.

Orders: Stolonifera, AUyonacea, Pseudaxonia, Axi- fera, Stelechotokea, Coenothecalia. Sub-class 2. Zoantharia.

Orders: Zoanthidea, Cereanthidea, Antipathidea, Actiniidea (Sub-orders: Malacactiniae and Scler- actiniae or Madreporia). Phylum 5. Ctenophora. Class. Ctenophora.

Sub-class 1. Tentaculata.

Orders: Cydippidea, Lobata, Cestoidea. Sub-class 2. Nuda. No Orders. Grade 2. Coelomocoela. Phylum 6. PlatyeLmia (q.v.).

Class 1. Planaria (see Planarians).

Order: Turbellaria. Class 2. Temnocephaloidea (see appendix to Plan- arians). No Orders. Class 3. Trematoda (see Trematodes).

Orders: Heterecotylea, Aspidocotylea, Mulacoco- tylea. Class 4. Cestoda (see Tapeworms). Orders: Monozoa, Merozoa. Phylum 7. Nematoidea.

Class 1. Nematoda (see Nematode).

No .Orders. Class 2. Ciiaetosomidae (see Chaetosomatida).

No Orders. Class 3. Desmoscolecida (q.v.).

No Orders. Class 4. Nematomorpha (q.v.). No Orders. Phylum 8. Chaetognatha (q.v.).

No Orders. Phylum g. Nemertina.

Class. Nemertina (q.v.).

Orders: Protonemertini, MesonetnerHni, Meta- nemertini, Heteronemertini. Phylum 10. Mollusca (q.v.). Grade A. Isopleuka. Class 1. Amphineura (see Chiton).

Orders: Polyplacnphora, Aplacopkora. Grade B. Prorhipidoglossomorpha. Class 2. Gastropoda (q.v.). Sub-class 1. Streptoneura.

Orders: Aspidobranchia, Pcctinibranckia. Sub-class 2. Euthyneura.

Orders : Opisthobranchia, Ptilmonato. Class 3. Scaphopoda (q.v.). No Orders.

Class 4. Lamellibranchia (q.v.).

Orders: Protobranchia, Filibranchia, Eulamelli- branchia, Septibranchia. Grade C. Siphonopoda. Class 5. Cephalopoda (q.v.).

Orders : Tetrabranchia, Dibranchia.

Phylum 11. Appendicularˆ.

Sub-phylum 1. Rotifera (q.v.). Class. Rotifera.

Orders: Asplanchnaceae, MelUertaceae, Trocho- sphaeraceae, Ploimoidaceae, Bdelloidaceae, Floscu- laraceae, Ploima, Seisonaceae. Sub-phylum 2. Chaetopoda (q.v.).

ClaSS I. POLYCHAETA.

Orders : Nereidiformia, Cryptocephala, Capitelli- formia, Terebellifortnia, Spioniformia, Scaled- formia. Class 2. Oligochaeta.

Orders: Aphaneura, Limicolae, Moniligastres, Terricolae. Class 3. Hirudinae (see Leech).

Orders: Rhynchobdellidae, Gnathobdellidae, Acan- ikobdellidae. Class 4. Myzostomida (q.v.).

No Orders. Class 5. Saccocirriua.

No Orders. Class 6. Haplodrili (q.v.).

No Orders. Class 7. Echiuroidea (q.v.). No Orders. Sub-phylum 3. Arthropoda (q.v.). Grade 1. Ceratophora.

Class 1. Peripatidea (see Peripatus).

No Orders. Class 2. Chilopoda (see Centipede). Sub-class I. Pleurostigma.

Orders: Geophilomorpha, Scolopendromorpha, Crate- rostigmomorpha, Lithobiomorpha. Sub-class 2. Notostigma. Order: Scutigeromorpha. Class 3. Diplopoda (see Millipede). Sub-class i. Pselaphognatha.

Order: Penieillata. Sub-class 2. Chilognatha.

Orders: Oniscomorpha, Limacomorpha, Colobog- natha,

Ascospermopkora.Proterospermophora, Mero- chaeta, Opisthospermophora. Class 3. Pauropoda (see Millipede),

No Orders. Class 4. Symphyla (see Millipede).

No Orders. Class 5. Hexapoda (q.v.). Sub-class 1. Apterygota.

Order: Aptera. Sub-class 2. Exopterygota.

Orders; Dermaptera, Orthoptera, Plecoptera, Iso- ptera, Corrodentia, Ephemoptera, Odonata, Thysano- ptera, Hemiptera, Anoplura. Sub-class 3. Endopterygota.

Orders : Neuroptera, Coleoplera, Mecaptera, Tricho- ptera, Lepidoptera, Diptera, Sipkenaptera, Hymeno- plera. Grade 2. Acerata.

Class 1. Crustacea (q.v.).

Sub-class I. EntOmostraca (q.v.).

Orders : Branchiopoda (Sub-orders : Phyllopoda, Cladocera, Branchiura), Ostracoda, Cofepoda. Sub-class 2. Thyrostraca (q.v.) =(Cirripedia).

No Orders. Sub-class 3. Leptostraca.

No Orders. Sub-class 4. Malacostraca (q.v.).

Orders: Decapoda (Sub-orders: Brachyura, Mac- rura), Schizopoda (including Anaspides), Stoma- topoda, Sympoda (Cumacea), Isopoda (including Tanaidacea) , Amphipoda. Class 2. Arachnida (q.v.). Grade A. Trilobitae (see Trilobite).

(Orders not determined.) Grade B. Nomomeristica. Sub-class 1. Pantopoda.

Orders : Nymphonomorpha, A scorhynckomorpha, Pycnogonomorpha. Sub-class 2. Eu-Arachna. Grade a. Delobrancha (or Hydropneusta). Orders: Xiphosura, Gigantostraca.

Grade b. Embolobranchia (or Aeropneusta). Section. Pectiniftra. Order : Scorpionidea. Section. Rpectinata.

Orders : Pedipalpi, A raneae, Palpigradi, Soli- fugae, Pseudoscorpiones,

Podogona, Opiliones, Rhynchostomi (Atari). Clas= 3. Tardigrada (q.v.). “

No Orders.

Class 4. Linguataltna (see Pentastomida).

No Orders.

Phylum 12. Echinoderma (see Echinoderms).

Branch A. Pelmatozoa.

Class 1. Cystidea.

Orders: Amphoridea, Carpoidea, Rhomhifera, Apo- rita, Diploporita. Class 2. Blastoidea.

Divisions: Protoblastoidea, Eublastoidca. No Orders. Class 3. Crinoidea.

Orders : Monocyclica Inadunafa, Adunata, Mono- cyclica Cameraia, Dicyclica Inadunata, Flexibilia, Dicyclica Camerata. Class 4. Edrioasteroidea. No Orders. Branch B. Electherozoa.

Class I. HOLOTHUROIDEA.

Orders: Aspidochirota, Dendrochirota. Class 2. Stelliformia. Sub-class 1. Asterida.

Orders: Phanerozonia, Cryptozonia. Sub-class 2. Ophiurida.

Orders : Streptophiurae, Zygopkiurae, Cladophiurae. Class 3. Echinoidea.

Orders: Bothriocidaroida, Meloniloida, Cystocida- roida, Cidaroida, Diademoida, Holectypoida, Spatangoida, Clypeastroida. Phylum 13. Vertebrata (q.v.).

Sub-phylum a. Hemichorda (q.v.).

Class. Enteropneusta (see Balanoglossus). No Orders. Sub-phylum b. Urochorda. Class. Tunicata (q.v.).

Orders : Larvacea, Thaliacea (Sub-orders : Cyclo- myaria, Hemimyaria) , Ascidiacea (Sub-orders: Ascidiae Simplices, Ascidiae Compositae, Ascidiae Luciae). Sub-phylum c. Cephalochorda (see Amphioxus). Class. Cephalochorda. No Orders. Sub-phylum d. Craniata. 1 Class 1. Pisces (see Ichthyology). Sub-class 1. Cyclostomata (q.v.).

Orders: Myxinoides (or Hyperotreti), Petrowyzontes {or Hyper oar iii). Sub-class 2. Selachia or Elasmobranchii (see Sela- chians). Orders: Pleuropterygii, Acanthodii, Ichthyotomi, Plagiostomiˆ Holncephali. Sub-class 3. Teleostoma.

Orders : Ganoidea, Crossoplerygii, Dipneusti, Tele- ostei. Class 2. Batrachia (q.v.).

Orders: Stegocepha/ia, Apoda (or Peromela), Caudata ■ (or Urodela), Ecaudata (or Anura). Class 3. Reptilia (see Reptiles).

Orders : A nomodontia, Chelonia, Samopterygia, Ichthyopterygia, Rhyncocephalia, Dinosauria, Cro- codilia, Omithosauria, Squamata. Class 4. Aves (sec Bird and Ornithology). Sub-class 1. Archaeornithes.

No Orders. Sub-class 2. Neornithes. Division T. Ratif-ae. Orders : Struthiones, Rheae, Casuariae, Apteryges, Dinornitkes, Aepyornithes. Division 2. Odontolcae.

No Orders. Division 3. Carinatae.

Orders: Ichthyornes, Colymbif ormes, Sphenisci- f ormes, Procellariif ormes, Ciconiiformes, (Sub- orders : Steganopodes, Ardeae, Ciconiae, Phoeni- copteri). An serif ormes (Sub-orders: Palamedeae, Anseres), Falconif ormes (Sub-orders: Catkartae,

1 Craniata may be usefully divided into 3 grades: (a) Branchiata I leterodactyla, which includes Pisces except Cyclostomes. (b). Bran- chiata Pentadactyla, which includes Batrachia. (c) Lipobranchia Pentadactyla, which includes Reptiles, Birds and Mammals.

Accipitres), Tinamif ormes, Gallif ormes (Sub orders : Mesites, Turnices, Galli, Opistkocomi), Gruiformes, Charadriif ormes (Sub-orders: Limtcolae, Lari, Pterocles, Columhae), Cuculif ormes (Sub-orders: Cucuii, Psiltaci), Coraciiform.es (Sub-orders: Cor- aciae, Striges, Caprimulgi, Cypseli, Colii, Tro- gones, Pici), Passeriformes (Sub-orders: Passeres Anisomyodae, Passeres Diacromyodae). Class 4. Mammalia (q.v.).

Sub-class 1. Monotremata (q.v.) (Prototheria).

No Orders. Sub-class 2. Marsupialia (q.v.) (Metatheria). One Order: Marsupialia.

Sub-orders : Polyprotodonta, Pauciiuberculata, Di- protodonta. Sub-class 3. Placentalia (Monodelphia, q.v. ; or Euthcria). Orders: Insectivord, Chiroptera, Dermoptera, Eden- tata (Sub-orders : Xcnarthra, Pholidota,

Tubuliden- tata), Rndentia (Sub-orders: DuplicAdeniata, Simplicidentata), Tillodontia, Carnivora (Sub-orders: Fissipedia, Ptnnipedia, Creodonta), Cetacea (Sub- orders : A rchaeoceti, Odonloceti, Mysiacoceti) , Sirenia, Ungulate (Sub-orders: Probosctdea, Hyracoidea, Barypoda, Toxpdontia, Amblypoda, Litopterna, Ancylopoda, Condylarthra, Perissodactyla, Arliodactyla), Primates (Sub-orders: Pro- simiae, Anthropoidea). Phylum 14. Mesozoa (q.v.). Class 1. Rhombozoa.

No Orders. Class 2. Orthonectida. No Orders. Phylum 15. Polyzoa (q.v.). Class r. Entoprocta.

No Orders. Class 2. Ectoprocta.

Orders: Gymnolaemata (Sub-orders: Tripostomata, Cryptostomata, Cyclostomata, Ctenostomata, Cheilo- stomata) , Phylactolacmata. Phylum 16. Acanthocephala (q.v.). Class. Acanthocephala. No Orders. Phylum 17. Podaxonia.

Class 1. Sipunculoidea (q.v.).

No Orders. Class 2. Priapuloidea (q.v.).

No Orders. Class 3. Phoronidea (q.v.).

No Orders. Class 4. Pterobrachia (q.v.).

No Orders. Class 5. Brachiopoda (q.v.). Sub-class 1. Ecardines (Tnarticulata).

Orders: Atrcmata, Neotremata. Sub-class 2. Testicardines (Articulata). Orders: Protremata, Telotremata. Phylum 18. .Gastrotricha (q.v.). Class. Gastrotricha.

Sub-orders : Ichtkydina, Cepodina. (Possibly Kino- rhyncha (q-v.) with only Echinoderes is to be placed here).

General Tendencies since Darwin Darwin may be said to have founded the science of bionomics, and at the same time to have given new stimulus and new direction to morphegraphy, physiology, and plasmology, by uniting them as contrlbutorics to one common biological doctrine — the doctrine of organic evolution— itself but a part of the wider doctrine of universal evolution based on the laws of physics and chemistry. The immediate result was, as pointed out above, a reconstruction of the classification of animals upon a genealogical basis, and an investigation cf the individual development of animals in relation to the steps of their gradual building up by cell-division, with a view to obtain- ing evidence of their geaetic

relationships. On the other hand, the studies which occupied Darwin himself so largely subse- quently to the publication of the Origin of Species, viz. the explanation of animal (and vegetable) mechanism, colouring, habits, &c.j as advantageous to the species or to its ancestors, are only gradually being carried further. The most important work, in this direction has been done by Fritz Miiller (Fiir Darwin), by Herman Mtiller (Fertilization of Plants by Insects),

by August Weismann (memoirs translated by Meldola) by Edward B. Toulton (see his addresses and memoirs published in the Transactions of the Entomological Society and else- where), and by Abbot Thayer {Concealing Coloration in the Animal Kingdom, Macmillan & Co. 1910). In the branch of bionomics, however, concerned with the laws of variation and heredity (thremmatology), there has been considerable progress. In the first place, the continued study of human population has thrown additional light on some of the questions involved, whilst the progress of microscopical research has given us a clear foundation as to the structural facts connected with the origin of the egg-cell and sperm-cell and the process of fertili- zation.

Great attention has been given lately to the important ex- periments upon the results of hybridizing certain cultivated varieties of plants which were published so long ago as 1865, by the Abbe Mendel, but failed to attract notice until thirty-five years later, sixteen years after his death (see Mendelism). Meadei- Mendel's object was to gain further knowledge as to

- *the result of mixing by cross-fertilization or inter-*

breeding two strains exhibiting diverse characters or structural features. The whole question as to the mixture of characters in offspring thus produced was — and remains — very imper- fectly observed. Mendel's observations constitute an ingenious attempt to throw light on the matter, and in the opinion of some biologists have led to the discovery of an important principle. Mendel made his chief experiments with cultivated varieties of the self -fertilizing edible pea. He selected a variety with some one marked structural feature and crossed it with another variety in which that feature was absent. Instances of his selected varieties are the tall variety which he hybridized with a dwarf variety, a yellow-seeded variety which he hybridized with a green-seeded variety, and again a smooth-seeded variety which he hybridized with a wrinkle-seeded variety. In each set of experiments he concentrated his attention on the one character

selected for observation. Having obtained a first hybrid generation, he allowed the hybrids to self-fertilize, and recorded the result in a large number of instances (a thousand or more) as to the number of individuals in the first, second, third and fourth generations in which the character selected for experiment made its appearance. In the first hybrid generation formed by the union of the reproductive germs of the positive variety (that possessing the structural character selected for observation) with those of the negative variety, it is not surprising that all or nearly all the individuals were found to exhibit, as a result ot the mixture, the positive character. In subsequent generations produced by self-fertilization of the hybrids it was found that the positive character was not present in all the individuals, but that a result was obtained showing that in the formation of the reproductive cells (ova and sperms) of the hybrid, half were endowed with the positive character and half with the negative. Consequently the result of the haphazard pairing of a large number of these two groups of reproductive cells was to yield, according to the regular lav/ of chance combination, the proportion iPP, 2PN, iNN, where V stands for the positive character and N for its absence or negative character — the positive character being accordingly present in three-fourths of the offspring and absent from one- fourth. The fact that in the formation of the reproductive cells of the hybrid generation the material which carries the positive quality is not subdivided so as to give a half-quantity to each reproductive cell, but on the contrary is apparently distributed as an undivided whole to half only of the repro- ductive cells and not at all to the remainder, is the important inference from Mendel's experiments. Whether this inference is applicable to ether classes of cases than those studied by Mendel and his followers is a question which is still under investigation. The failure of the material carrying a positive character to divide so as to distribute itself among all the reproductive cells of a hybrid individual, and the limitation of its distribution to half only of those cells, must prevent the " swamping " of a newly appearing character in the course of

the inter-breeding of those individuals possessed of the character with those which do not possess it. The tendency of the pro- portions in the offspring of iPP, 2PN, iNN is to give in a series of generations a regular reversion from the hybrid form PN to the two pure races, viz. the race with the positive character simply and the race with the total absence of it. It has been maintained that this tendency to a severance of the hybrid stock into its components must favour the persistence of a new character of large volume suddenly appearing in a stock, and the observations of Mendel have been held to favour in this way the view p s of those who hold that the variations upon which natural selection has acted in the production of new species are not smsll variations but large and " discontinuous." It does not, however, appear that " large " variations would thus be favoured any more

than small ones, nor that the eliminating action of natural selection upon an unfavourable variation could be checked.

A good deal of confusion has arisen in the discussions of this latter topic, owing to defective nomenclature. By some writers the word " mutation " is applied only to large and suddenly appearing variations which are found to be capable of here- ditary transmission, whilst the term " fluctuation " is applied to small variations whether capable of transmission or not. By others the word " fluctuation " is apparently applied only to those small " acquired " variations due to the direct action of changes in food, moisture and other features of the environ- ment. It is no discovery that this latter kind of variation is not hereditable, and it is not the fact that the small variations, to which Darwin attached great but not exclusive importance as the material upon which natural selection operates, are of this latter kind. The most instructive classification of the " variations " exhibited by fully formed organisms consists in the separation in the first place of those which arise from antecedent congenital, innate, constitutional or germinal variations from those which arise merely from the operation of variation of the environment or the food-supply upon normally constituted individuals. The former arc " innate " variations, the latter are " superimposed " variations (so-called " ac- quired variations "). Both innate and superimposed varia- tions are capable of division into those which are more and those which are less obvious to the human eye. Scarcely perceptible variations of the innate class are regularly and in- variably present in every new generation of every species of living thing. Their greatness or smallness so far as human perception goes is not of much significance; their real import- ance in regard to the origin of new species depends on whether they are of value to the organism and therefore capable of selection in the struggle for existence. An absolutely imper- ceptible physiological difference arising as a variation may be of selective value, and it may carry with it correlated variations which appeal to the human eye but are of no selective value themselves. The present writer has, for many years, urged the importance of this consideration.

The views of de Vries and others as to the importance of " saltatory variation," the soundness of which was still by no means generally accepted in iqio, may be gathered from the articles Mendelism and Variation. A due appreciation of the far-reaching results of " correlated variation " must, it appears, give a new and distinct explanation to the phenomena winch are referred to as "large mutations," "" discontinuous variation " and " saltatory evolution." Whatever value is to be attached to Mendel's observation of the breaking up of self-fertilized hybrids of cultivated varieties into the two original parent forms according to the formula " iPP, 2PN, iNN," it cannot be considered as more than a contribution to the extensive investigation of heredity which still remains to

be carried out. The analysis of the specific variations of organic form so as to determine what is really the nature and limitation of a single " character " or " individual variation," and whether two such true and strictly defined single variations of a single structural unit can actually "blend" when one is transmitted by the male parent and the other by the female

parent, are matters which have yet to be determined. We do not yet know whether such absolute blending is possible or not, or whether all apparent blending is only a more or less minutely subdivided "mosaic" of non-combinable characters of the parents, in fact whether the combinations due to heredity in reproduction are ever analogous to chemical compounds or are always comparable to particulate mixtures. The attempt to connect Mendel's observation with the structure of the sperm- cells and egg cells of plants and animals has already been made. The suggestion is obvious that the halving of the number of nuclear threads in the reproductive cells as compared with the number of those present in the ordinary cells of the tissues — a phenomenon which has now been demonstrated as universal — may be directly connected with the facts of segregation of hybrid characters observed by Mendel. The suggestion requires further experimental testing, for which the case of the partheno genetic production of a portion of the offspring, in such insects as the bee, offers a valuable opportunity for research.

Another important development of Darwin's conclusions deserves special notice here, as it is the most distinct advance Varia- in the department of bionomics since Darwin's own Hon, writings, and at the same time touches questions of

fundamental interest. The matter strictly relates to the con- sideration of the " causes of variation," and is as follows. The fact of variation is a familiar one. No two animals, even of the same brood, are alike: whilst exhibiting a close similarity to their parents, they yet present differences, sometimes very marked differences, from their parents and from one another. Lamarck had put forward the hypothesis that structural alterations acquired by (that is to say, superimposed upon) a parent in the course of its life are transmitted to the offspring, and that, as these structural alterations are acquired by an animal or plant in consequence of the direct action of the environment, the offspring inheriting them would as a conse- quence not unfrequently start with a greater fitness for those conditions than its parents started with. In its turn, being operated upon by the conditions of life, it would acquire a greater development of the same

modification, which it would in turn transmit to its offspring. In the course of several generations, Lamarck argued, a structural alteration amounting to such difference as we call " specific " might be thus acquired. The familiar illustration of Lamarck's hypothesis is that of the giraffe, whose long neck might, he suggested, have been acquired by the efforts of a primitively short-necked race of herbivores who stretched their necks to reach the foliage of trees in a land where grass was deficient, the effort producing a distinct elonga- tion in the neck of each generation, which was then transmitted to the next. This process is known as "direct adaptation"; and there is no doubt that such structural adaptations are acquired by an animal in the course of its life, though such changes are strictly limited in degree and rare rather than fre- quent and obvious.

Whether such acquired characters can be transmitted to the next generation is a separate question. It was not proved by Lamarck that they can be, and, indeed, never has been proved by actual observation. Nevertheless it has been assumed, and also indirectly argued, that such acquired characters must be transmitted. Darwin's great merit was that he excluded from his theory of development any necessary assumption of the transmission of acquired characters. He pointed to the ad- mitted fact of congenital variation, and he showed that con- genital variations are arbitrary and, so to speak, non-significant. Causes of Thˆ 1 " causes are extremely difficult to trace in detail, congeal- but it appears that they are largely due to a " shaking up " of the living matter which constitutes the fertilized germ or embryo-cell, by the process of mixture in it of the substance of two cells — the germ- cell and the sperm-cell — derived from two different individuals. Other mechanical disturbances may assist in this production of congenital variation. Whatever its causes, Darwin showed that it is all-important. In some cases a pair of animals pro- duce ten million offspring, and in such a number a large range

tai varia- tion.

*of congenital variation is possible. Since on the average only two of the young survive in the struggle for existence to take the place of their two parents, there is a selection out of the ten million young, none of which are cxacLiy alike, and the selection is determined in nature by the survival of the congenital variety which is fittest to the conditions of life. Hence there is no necessity for an assumption of the perpetuation of direct adapta- tions. The selection of the fortuitously (fortuitously, Trans- that is to say, so far as the conditions of survival are mission concerned) produced varieties is sufficient, since it ofac- is ascertained that they will tend to transmit those aorfln- charactcrs with which they themselves were born, herited although it is not ascertained that they could transmit char- characters acquired on the way through life. A * c erSt simple illustration*

of the difference is this: a man born with four ringers only on his right hand is ascertained to be likely to transmit this peculiarity to some at least of his offspring; on the other hand, there is not the slightest ground for supposing that a man who has had one finger chopped off, or has even lost his arm at any period of his life, will produce offspring who are defective in rhe slightest degree in regard to fingers, hand or arm. Darwin himself, influenced by the consideration of certain classes of facts which seem to favour the Lamarckian hypothesis, was of the opinion that acquired characters are in some cases transmitted. It should be observed, however, that Darwin did not attribute an essential part to this Lamarckian hypothesis of the transmission of acquired char- acters, but expressly assigned to it an entirely subordinate importance.

*The new attitude which has been taken, since Darwin's writings on this question is to ask for evidence of the asserted transmission of acquired characters. It is held * that the Darwinian doctrine of selection of fortuitous congenital varia- tions is sufficient to account for all cases, that the Lamarckian hypothesis of transmission cf acquired characters is not sup- ported by experimental evidence, and that the latter should therefore be dismissed. Weismann has also ingeniously argued from the structure of the egg-cell and sperm-cell, and from the way in which, and the period at which, they are derived in the course of the growth of the embryo from the egg — from the fertilized egg-cell — that it is impossible (it would be better to say highly improbable) that an alteration in parental structure could produce any exactly representative change in the sub- stance of the germ or sperm-cells.*

The one fact which the Lamardrians can produce in their favour is the account of experiments by Brown-S£quard, in which he produced epilepsy in guinea-pigs by section of the large nerves or spinal cord, and in the course of which he was led to believe that in a few rare instances the artificially produced epilepsy and mutilation of the nerves was transmitted. This instance does not stand the test of criticism. The record of Brown-Sequard's original experiment is not satisfactory, and the subsequent attempts to obtain similar results have not been attended with success. On the other hand, the vast number of experiments in the cropping of the tails and ears of domestic animals, as well as of similar operations on man, are attended with negative results. No case of the transmission of the results of an injury can be produced. Stories of tailless kittens, puppies and calves, born from parents one of whom had been thus injured, are abundant, but they have hitherto entirely failed to stand before examination.

Whilst simple evidence of the fact of the transmission of an acquired character is wanting, the a priori arguments in its favour break down one after another when discussed. The very cases which are advanced as only

to be explained on the Lamarckian assumption are found on examination and experi- ment to be better explained, or only to be explained, by the Darwinian principle. Thus the occurrence of blind animals in caves and in the deep sea was a fact which Darwin himself regarded as best explained by the atrophy of the organ of vision in successive generations through the absence of light and 1 Weismann, Vererbtmg, &c. (1886).

consequent disuse, and the transmission (as Lamarck would have supposed) of a more and more weakened and structurally impaired eye to the offspring in successive generations, until the eye finally disappeared. But this instance is really fully explained (as the present writer has shown) by the theory of natural selection acting on congenital fortuitous variations. It is definitely ascertained that many animals are thus born with distorted or defective eyes whose parents have not had their eyes submitted to any peculiar conditions. Supposing a number of some species of arthropod or fish to be swept into a cavern or to be carried from less to greater depths in the sea, those individuals with perfect eyes would follow the glimmer of light and eventually escape to the outer air or the shallower depths, leaving behind those with imperfect eyes to breed in the dark place. A natural selection would thus be effected. In every succeeding generation this would be the case, and even those with weak but still seeing eyes would in the course of time escape, until only a pure race of eyeless or blind animals would be left in the cavern or deep sea.

It is a remarkable fact that it was overlooked alike by the supporters and opponents of Lamarck's views until pointed out by the present writer {Nature, i8o4, r p. 127), that the two statements called by Lamarck his first and second laws are contradictory one of the other. Lamarck's first jaw asserts that a past history of indefinite duration is powerless to create Educa- a bias by which the present can be controlled. He biuty. declares that in spite of long-established conditions

and correspondingly evoked characters new conditions will cause new responsive characters. Yet in the second law he asserts that these new characters will resist the action of yet newer conditions or a reversion to the old conditions and be maintained by heredity. If the earlier characters were not maintained by heredity why should the later be ? If a char- acter of much longer standing (certain properties of height, length, breadth, colour, &c.) had not become fixed and con- genital after many thousands of successive generations of individuals had developed it in response to environment, but gave place to a new character when new moulding

conditions operated on an individual (Lamarck's first law), why should we suppose that the new character is likely to become fixed and transmitted by mere heredity after a much shorter time of existence in response to environmental stimulus ? Why should we assume that it will be able to escape the moulding by environ- ment (once its evoking cause is removed) to which, according to Lamarck's first law, all parts of organisms are subject ? Clearly Lamarck gives us no reason for any such assumption, and his followers or latter-day adherents have not attempted to do so. His enunciation of his theory is itself destructive of that theory. Though an acquired or " superimposed " character is not transmitted to offspring as the consequence of the action of the external agencies which determine the " acquirement," yet the tendency to react to such agencies possessed by the parent is transmitted and may be increased and largely developed by survival, if the character developed by the reaction is valuable. This newly discovered inheritance of " variation in the tendency to react " has a wide application and has led the present writer to coin the word " educability." It has application to all kinds of organs and qualities, but is of especial significance in regard to the development of the brain and the mental qualities of animals and of man (see the jubilee volume of the Soc. de Biologie, 1899, and Nature, 1900, p. 624).

It has been argued that the elaborate structural adaptations of the nervous system which are the corporeal correlatives of Theory complicated instincts must have been siowly built at trans- up by the transmission to offspring of acquired ex- missioa perience, that is to say, of acquired brain structure. °Oncts J ˆ t nrst sight it appears difficult to understand how the complicated series of actions which are definitely exhibited as so-called " instincts " by a variety of animals can have been due to the selection of congenital variations, or can be otherwise explained than by the transmission of habits

acquired by the parent as the result of experience, and con- tinuously elaborated and added to in successive generations. It is, however, to be noted, in tne first place, that the imitation of the parent by the young possibly accounts for some part of these complicated actions, and, secondly, that there are cases in which curiously elaborate actions are performed by animals as a characteristic of the species, and as subserving the general advantage of the race or species, which, nevertheless, can not be explained as resulting from the transmission of acquired experience, and must be supposed to be due to the natural selection of a fortuitously developed habit which, like fortuitous colour or form variation, happens to prove beneficial. Such cases are the habits of " shamming dead " and the combined posturing and colour peculiarities of certain caterpillars (Lepidop- terous larvae) which cause them to resemble dead twigs or similar surrounding ' objects. The advantage to the animal of this imitation of surrounding objects is that it escapes the pursuit of (say) a bird which

would, were it not deceived by the resemblance, attack and eat the caterpillar. Now it is clear that preceding generations of caterpillars cannot have acquired this habit of posturing by experience. Either the caterpillar postures and escapes, or it does not posture and is eaten; it is not half eaten and allowed to profit by experience. We seem to be justified in assuming that there are many movements of stretching and posturing possible to caterpillars, and that some caterpillars had a congenital fortuitous tendency to one position, some to another, and, finally that among all the variety of habitual movements thus exhibited one has been selected and perpetuated because it coincided with the necessary conditions of safety, since it happened to give the caterpillar an increased resemblance to a twig.

The view that instinct is the hereditarily fixed result of habit derived from experience long dominated all inquiry into the subject, but we may now expect to see a renewed and careful study of animal instincts carried out with the view of testing the applicability to each instance of the pure Darwinian theory without the aid of Lamarckism.

Nothing can be further from the truth than the once favourite theory that instincts are the survivals of lapsed reasoning processes. Instincts, or the inherited structural mechanisms of the nervous centres, are in antagonism to the results of the reasoning process, which are not capable of hereditary trans- mission. Every higher vertebrate animal possesses the power of forming for itself a series of cerebral mechanisms or reasoned conclusions based on its individual experience, in proportion as it has a large cerebrum and has got rid of or has acquired the power of controlling its inherited instincts. Man, TbB compared with other animals, has the fewest inherited Recant mental mechanisms or instincts and at the same time « < *» the largest cerebrum in proportion to the size of his Pas ' – body. He builds up, from birth onwards, his own mental mechanisms, and forms more of them, that is to say, is more " educable," and fakes longer in doing so, that is to say, in growing up and maturing his experience, than any other animal. The later stages of evolution leading from his ape-like ancestors to man have consisted definitely in the acquirement of a larger and therefore more educable brain by man and in the conse- quent education of that brain. A new and most important feature in organic development makes its appearance when we set out the facts of man's evolutional history. It amounts to a new and unprecedented factor in organic development, external to the organism and yet produced by the activity of the organism upon which it permanently reacts. This factor is the Record of the Past, which grows and develops by laws other than those affecting the perishable bodies of successive genera- tions of mankind, and exerts an incomparable influence upon the educable brain, so that man, by the interaction of the Record and his educability, is removed to a large extent from the status of the organic world and placed in a new and unique position, subject to new*

laws and new methods of development unlike those by which the rest of the living world is governed. That which we term the Record of the Past comprises the " taboos,"

the customs, the traditions, the beliefs, the knowledge which are handed on by one generation to another independently of organic propagation. By it a new heredity, free from the limitations of protoplasmic continuity, is established. Its first beginnings are seen in the imitative tendencies of animals by which the young of one generation acquire some of the habits of their parents, and by which gregarious and social animals acquire a community of procedure ensuring the advantage of the group. ” Taboo/’ the systematic imposition by the com- munity of restrictions upon the conduct of the individual, is one of its earliest manifestations in primitive man and can be observed even in animal communities. But with the de- velopment of the power of inter-com muni cation by the use of language, the Record rapidly acquired an increased develop- ment, which was enormously extended by the continuous growth in mankind of the faculty of memory. To the mere tradition preserved by memory and handed on by speech was then added the written record and its later multiplication by the mechanical arts of printing, by which it acquired permanence and universal distribution. The result is the creation of an almost incon- ceivably vast body of traditional custom, law and knowledge into which every human being is born, less in the more isolated and barbarous communities, but large everywhere. Educa- tion is not in its essential nature a training administered to the young by an older generation, but is the natural and unaided assimilation of the Record of the Past by the automatically educable brain— an assimilation which is always in all races very large but becomes far larger in civilized communities. It is among them so important whilst the Record in all its details is so far beyond the receptive capacity of the brain, that selec- tion and guidance are employed by the elders in order to enable the younger generation to benefit to the utmost by the absorp- tion (so to speak) in the limited span of a lifetime of the most valuable influences to be acquired from this prodigious envelope of Recorded Experience. The imperishable Record invests the human race like a protective atmosphere, a new and yet a natural dispensation, giving to man, as compared with his animal ancestry, a new heaven and a new earth !

A result of the very greatest importance arising from the application of the generalizations of Darwinism to human development and to the actual phase of existing human popu- lation is that education has no direct effect

upon the mental or physical features of the race or stock: it can only affect those of the individual. Educability, defects or excellences, or peculiarities of mind or body, can be handed on from parent to offspring by protoplasmic continuity in reproduction. But the results of education cannot be so handed on. The educated man who has acquired new experiences, new knowledge, can place these on the great Record for the benefit of future genera- tions of men, but h$ cannot bodily transmit his acquirements to his offspring. Were acquired (superimposed) characters really transmissible by breeding, then every child born would inherit, more or less completely, the knowledge acquired by both its parents. But we know this is not the case: the child has to begin with a clean slate and learn for itself. Aptitudes and want of aptitude, which arc innate and constitutional, are transmitted to offspring, but not the results of experience, education and training. Blemishes in the stock, defects of mind or body, though they may be to some extent corrected in the individual by training, cannot be got rid of from the stock by any such process. A defective stock, if allowed to breed, will perpetuate its defects, in spite of the concealment of those defects in an individual by training or other treatment. Equally it must be concluded that the weakness and degradation pro- duced by semi-starvation and insanitary conditions of life are only an effect on the individual and cannot affect the stock. The stock may be destroyed, killed out by adverse conditions, but its quality is not directly affected, and if removed to more favourable conditions it will show no hereditary results of the pre- vious adversity; indeed it will probably have been strengthened in some ways by the destruction in severe conditions of its weaker members and the survival of the stronger individuals.

Such considerations have the very greatest importance for the guidance of the action of civilized man in seeking the health and happiness of the community. But it must not be forgotten that the problems presented by human communities are ex- tremely complex, and that the absence of any selection of healthy or desirable stock in the breeding of human communities leads to undesirable consequences. The most thrifty and capable sections of the people at the present day are not (it has been shown) in overcrowded areas, producing offspring at such a rate as to contribute to the increase of the population. That increase, it has been shown, is due to the early marriage and excessive reproduction of the reckless and hopeless, the poorest, least capable, least desirable members of the community. The questions raised by these considerations have attracted much public attention under the newly invented name of "eugenics," but they are of an exceedingly difficult and delicate nature.

(E.R.L.)

ZORILLA, MANUEL RUIZ, Don (18.34-1895), Spanish politician, was

born at Burgo de Osma in 1834. He began his education at Vailadolid, and studied law afterwards at Madrid University, where he leaned towards Radicalism in politics. In 1S56 he was elected deputy, and soon attracted notice among the most advanced Progressists and Democrats. He look part in the revolutionary propaganda that led to the military movement in Madrid on the 22nd of June 1866. He had to take refuge in France for two years, like his fellow-conspirators, and only returned to Spain when the revolution of 1868 took place. He was one of the members of the first cabinet after the revolution, and in 1869, under the regency of Marshal Serrano, he became minister of grace and justice. In 1870 he was elected president of the House of Deputies, and seconded Prim in offering the throne to Amadeus of Savoy. He w T ent to Italy as president of the commission, carrying to the prince at Florence the official news of his election. On the arrival of; Amadeus in Spain, Ruiz Zorilla became ministei of public works for a short time, and resigned by way of protesting against Serrano and Topete entering the councils of the new king. Six months later, in 1871, he was invited by Amadeus to form a cabinet, and he continued to be the principal councillor of the king until February 1873, when the monarch abdicated in disgust at the resistance he met with in the army, and at the lack of sincerity on the part of the very politicians and generals who had asked him to ascend the throne. After the departure of Amadeus, Ruiz Zorilla advocated the establish- ment of a republic. Notwithstanding this, he was not called upon either by the Federal Republicans to help them during the year 1873, or by Marshal Serrano during 1874 to join Martos and Sagasta in his cabinet. Immediately after the restora- tion of Alphonso XII., early in 1875, Ruiz Zorilla went to France. He was for nearly eighteen years the soul of the republican conspiracies, the prompter of revolutionary propa- ganda, the chief inspirer of intrigues concerted by discon- tented military men of al! ranks. He gave so much trouble to the Madrid governments that they organized a watch over him with the assistance of the French government and police, especially when it was discovered that the two military move- ments of August 1883 and September 1886 had been prepared and assisted by him. During the last two years of his life Ruiz Zorilla became less active; failing health and the loss of his wife had decreased his energies, and the Madrid government allowed him to return to Spain some months before he died at Burgos, on the 13th of June 1895, of heart disease.*

ZORNDOKF, a village of Prussia, in the Oder valley, north- east of Ciistrin. It is famous as the scene oE a battle in which the Prussians under Frederick the Great defeated the Russians commanded by Fermor, on the 25th of August 1758 (see S.EVEN Years' Wak).

ZOROASTER, one of the great teachers of the East, the founder of what was the national religion of the Perso-Iranian people from the time of the

Achaemenidae to the close of the Sassanian period. The name (Zupoaorpˆs) is the corrupt Greek form of the old Iranian Zarathustra (new Persian,

Zardushl). Its signification is obscure; but it certainly contains the word ushtra, " camel."

*Zoroaster was already famous in classical antiquity as the founder of the widely renowned wisdom of the Magi. His Evidence name is not mentioned by Herodotus in his sketch for his of the Medo-Persian religion (i. 131 seq.). It occurs **• for the first time in a fragment of Xanthus (29), and*

in the Alcibiades of Plato (i. p. 122), who calls him the son of Oromazdes. For occidental writers, Zoroaster is always the Magus, or the founder of the whole Magian system (Plut. de Is. et Osir. 46 ; Plat. loc. cit,; Diog. Laert. prooem. 2: other passages in Jackson's Zoroaster, 6 seq.). They sometimes call him a Bactrian, sometimes a Median or Persian (cf. Jackson, op. cit. 186). The ancients also recount a few points regarding the childhood of Zoroaster and his hermit-life. Thus, according to Pliny {Nat. Hist. vii. 15), he laughed on the very day of his birth — a statement found also in the Zardusht-N dma — and lived in the wilderness upon cheese (xi. 97). Plutarch speaks of his intercourse with the deity, and compares him with Lycurgus and Numa (Numa, 4). Dio Chrysostom, Plutarch's contemporary, declares that neither Homer nor Hesiod sang of the chariot and horses of Zeus so worthily as Zoroaster, of whom the Persians tell that, out of love to wisdom and righteousness, he withdrew himself from men, and lived in solitude upon a mountain. The mountain was consumed by fire, but Zoroaster escaped uninjured and spoke to the multitude (vol. ii. p. 60). Plutarch, drawing partly on Theopompus, speaks of his religion in hie I sis and Osiris (cc. 46-47). He gives a faithful sketch of the doctrines, mythology and dualistic system of the Magian Zoroaster.

As to the period in which he lived, most of the Greeks have already lost the vrue perspective. Hermodorus and Hermippus of Smyrna place him 5000 years before the Trojan war, Xanthus 6000 years before Xerxes, Eudoxus and Aristotle 6000 years before the death of Plato- Agathias remarks (ii. 24), with perfect truth, that it is no longer possible to determine with any certainty when he lived and legislated. " The Persians," he adds, " say that Zoroaster lived under Hystaspes, but do not make it clear whether by this name they mean the father cf Darius or another Hystaspes. But, whatever may have been his date, he was their teacher and in- structor in the

Magian religion, modified their former religious customs, and introduced a variegated and composite belief."

He is nowhere mentioned in the cuneiform inscriptions of the Achaemeuidae, although Darius and his successors were without doubt devoted adherents of Zoroastrianism. The A vest a is, indeed, our principal source for the doctrine of Zoroaster; on the subject of his person and his life it is comparatively reticent ; with regard to his date it is, naturally enough, absolutely silent. The 13th section, or Spend Nask, which was mainly consecrated to the description of his life, has perished; while the biographies founded upon it in the 7th book of the Dinkard (9th century A.D.), the Shah'Ndma. and the Zarduskt-Nama (13th century), are thoroughly legendary — full cf wonders, fabulous histories and miraculous deliverances.

Under all circumstances wc must imitate the ancient authors in holding fast to the historic personality of Zoroaster; though he — like many another name of the dim past — has failed to escape the fate of being regarded as a purely mythical creation (for instance, by Kern and by Darmesteter, in the Sacred Books of the East, vol. iv. 1880, introd. 76). According to Darmesteter, the Zarathustra of the Avesta is a mere myth, a divinity invested with human attri- butes, an incarnation of the storm-god, who with his divine word, the thunder, _ comes and smites the demons. Darmesteter has failed to realize sufficiently the distinction between the Zoroaster of the later Avesta and the Zoroaster of the Gathas. It cannot be denied that in the later Avesta, and stil! more in writings of more recent date, he is presented in a legendary light and endowed with superhuman powers. At his appearing all nature rejoices {Yasht, 13, 93); he enters into conflict with the demons and rids the earth of their presence (Yasht, 17,19); Satan approaches him as tempter to make him renounce his faith (Vendidad, 19, 6).

The Gathas alone within the Avesta make claim to be the ipsissima verba of the prophet; in the rest of that work they are put into Zoroaster's own mouth (Yasna, 9, 1) and are expressly called "the Gathas of the holy Zoroaster" {Yasna, 57, 8). The litanies of the Yasna, and the Yashts, refer to him as a personage belonging to the past. The Vendidad also merely gives accounts of the dialogues between Ormazd and Zoroaster. The Gathas alone claim to be authentic utterances of Zoroaster, his actual expressions in presence of the assembled congregation. They are the last genuine survivals of the doctrinal discourses with which — as the promulgator »f a new religion — he appeared at the court of King Vishtaspa

The person of the Zoroaster whom we meet with in these hymns differs toto coelo from the Zoroaster of the younger Avesta. He is the exact opposite^ of the miraculous personage of later legend — a mere man, standing always on the solid ground of reality, whose only arms are trust in his God and the protection of his powerful allies. At times his position is precarious enough. He whom we hear in the Gathas has had to face, not merely all forms of outward opposition and the unbelief and lukewarmness of adherents, but also the inward misgivings of his own heart as to the truth and final victory of his cause. At one time hope, at another despond- ency, now assured confidence, now doubt and despair, here a firm faith in the speedy coming of the kingdom of heaven, there the thought of taking refuge by flight — such is the range of the emotions which find their immediate expression in these hymns. And the whole breathes such a genuine originality, all is psychologically so accurate and just, the earliest beginnings of the new religious movement, the childhood of a new community of faith, are reflected so naturally in them all, that it is impossible for a moment to

think of a later period of composition by a priesthood whom we know to have been devoid of any historical sense, and incapable of recon- structing the spiritual conditions under which Zoroaster lived. So soon as the point of view is clear — that in the Gathas we have firm historical ground on which Zoroaster and his surroundings may rest, that here we have the beginnings of the Zoroastrian religion — then it becomes impossible to answer otherwise than affirmatively every general question as to the historical character of Zoroaster. Yet we must not expect too much from the Gathas in the way of definite detail. They give no historical account of the life and teaching of their prophet, but rather are, so to say, versus memoriales, which recapitulate the main points of interest, often again in brief outlines. They are more of general admonitions, asseverations, solemn prophecies, sometimes directed to the faithful flock or to the princes, but generally cast in the form of dialogues with God and the arch- angels, whom he repeatedly invokes as witnesses to his veracity. Moreover, they contain many allusions to personal events which later generations^ have forgotten. It must be remembered, too, that their extent is limited, and their meaning, moreover, frequently dubious or obscure.

The Person of the Prophet. — As to his birthplace the testi- monies are conflicting. According to the Avesta {Yasna, 9, 17), Airyanem Vaejo, on the river D£itya, the old sacred country of the gods, was the home of Zoroaster, and the scene of his first appearance. There, on the river Darejya, assuming that the passage {Vend., iq, 4) is correctly interpreted, stood the house of his father; and the Bundakisk (20, 32 and 24, 15) says expressly that the river Daraja lay in Airan Vej, on its bank was the dwelling of his father, and (hat there Zoroaster was born. Now, according to the Bundahisk (20, 12), Airan Vej was situated in the direction of Atropatene, and consequently Airyanem Vaejo is for the most part identified with the district of Arran on the river Aras (Araxes), close by the north-western frontier of Media. Other traditions, however, make him. a native of Rai (Ragha, T&7at). According to Yasna, 19, 18, the zarathushtrotema, or supreme head of the Zoroastrian priest- hood, had at a later (Sasanian) time, his residence in Ragha. The Arabic writer Shahrastani endeavours to bridge the diver- gence between the two traditions by moans of the following theory: his father was a man of Atropatene, while the mother was from Rai. In his home tradition recounts he enjoyed the celestial visions and the conversations with the archangels and Ormazd which are mentioned already in the Gathas. There, too, according to Yasht, 5, 105, he prayed that he might succeed in converting King Vishtaspa. He then appears to have quitted his native district. On this point the Avesta is wholly silent: only one obscure passage {Yasna, 53, 9) seems to intimate that he found an ill reception in Rai. Finally, in the person of Vishtaspa, who seems to have been a prince resident in cast Iran,

he gained the powerful protector and faithful disciple of the new religion whom he desired — though after almost super- human dangers and difficulties, which the later books depict in lively colours. According to the epic legend, Vishtaspa was king of Bactria. Already in the later Avesta he has become a half mythical figure, the last in the series of heroes of east Iranian legend, in the arrangement of which series priestly influence is unmistakably evident. He stands at the meeting point between the old world and the new era which begins with Zoroaster. In the Gathas he appears as a quite historical personage; it is essentially to his power and good example that the prophet is indebted for his success. In Yasna, $3, 2,

he is spoken of as a pioneer of the doctrine revealed by Ormazd. In the relation between Zoroaster and Vishtaspa already lies the germ of the state church which afterwards became com- pletely subservient to the interests of the dynasty and sought its protection from it.

Among the grandees of the court of Vishtaspa mention is made cf two brothers, Frashaoshtra and Jamaspa; both were, according to the later legend, vizirs of Vishtaspa. Zoroaster was nearly related to both: his wife, Hvovi, was the daughter of Frashaoshtra, and the husband oi his daughter, Pourucista, was Jamaspa. The actual role of intermediary was played by the pious queen Hutaosa. Apart from this connexion, the new prophet relies especially upon his own kindred (kvaelush). His first disciple, Maidhyoimaongha, was his cousin: his father was, according to the later Avesta, Pourushaspa, his mother Dughdova, his great-grandfather Haecataspa, and the ancestor of the whole family Spitama, for which reason Zarathushtra usually bears this surname. His sons and daughters are re- peatedly spoken of. His death is, for reasons easily intelligible, nowhere mentioned in the Avesta; in the Shdh-Ndma he is said to have been murdered at the altar by the Turanians in the storming of Balkh.

We are quite ignorant as to the date of Zoroaster; King Vishtaspa does not seem to have any place in any historical chronology, and the Gathas give no hint on the subject. In former times the assertion often was, and even now is often put forward, that Vishtaspa was one and the same person with the historical Hystaspes, father of Darius I. This identifica- tion can only be purchased at the cost of a complete renuncia- tion of the Avestan genealogy. Hutaosa is the same name as Atossa: but in history Atossa was the wife of Cambyscs and Darius. Otherwise, not one single name in the entourage of our Vishtaspa can be brought into harmony with historical nomenclature. According to the Arda Vlraf, 1, 2, Zoroaster taught, in

round numbers, some 300 years before the invasion of Alexander. The testimony of Assyrian inscriptions relegates him to a far more ancient period. If these prove the name Mazdaka to have formed part of Median proper names in the year 715 B.C., Eduard Meyer (v. Ancient Persia) is justified in maintaining that the Zoroastrian religion must even then have been predominant in Media. Meyer, therefore, conjecturally puts the date of Zoroaster at 1000 B.C., as had already been done by Duncker (Geschichte des Alteriums, 4 4 , 78). This, in its turn, may be too high: but, in any case, Zoroaster belongs to a prehistoric era. Probably he emanated from the old school of Median Magi, and appeared first in Media as the prophet of a new faith, but met with sacerdotal opposition, and turned his steps eastward. In the east of Iran the novel creed first ac- quired a solid footing, and subsequently reacted with success upon the West.

Zoroastrianism. — Zoroaster taught a new religion; but this must not be taken as meaning that everything he taught came, so to say, out of his own head. His doctrine was rooted in the old Iranian — or Aryan — folk-religion, of which we can only form an approximate representation by comparison with the religion of the Veda. The newly discovered Hittite inscrip- tions have now thrown a welcome ray of light on the primitive Iranian creed (Ed. Meyer, Sitzungsberichte der Pre-uss. Akademie, 1908). In these inscriptions Mitra, Varuna, Indra and Nasatya are mentioned as deities of the Iranian kings of Mitani at the beginning of the 14th century — all of them names with which we are familiar from the Indian pantheon. The Aryan folk- religion was polytheistic. Worship was paid to popular divinities, such as the war-god and dragon-slayer Indra, to natural forces and elements such as fire, but the Aryans also believed in the ruling of moral powers and of an eternal law in nature (v. Ed. Meyer in the article Persia: History, § Ancient). On solemn occasions the inspiring drink soma {haoma) ministered to the enjoyment of the devout. Numerous coincidences with the Indian religion survive in Zoroastrianism, side by side with astonishing diversities.

The most striking difference between Zoroaster's doctrine

of God and the old religion of India lies in this, that while in the Avesta the evil spirits are called daeva (Modern Persian div), the Aryans of India, in common with the Italians, Celts and Letts, gave the name of deva to their good spirits, the spirits of light. An alternative designation for deity in the Rig-Veda is asura. In the more recent hymns of the Rig-Veda and in later India, on the other hand, only evil spirits are understood by asuras, while in Iran the corresponding word ahura was 5 and ever has continued to be, the designation of God the Lord. Thus ahura-daeva, deva-asura in Zoroastrian and in later Brah- man theology are in their meanings diametrically opposed.

Asura-daiva represent originally two distinct races of gods (like the Northern Aser and Vaner) — two different aspects of the conception of deity, comparable to 5a.ifju}v and 5e«. Asura indicates the more sublime and awful divine character, for which man entertains the greater reverence and fear: daiva denotes the kind gods of light, the vulgar — more sensuous and anthropomorphic — deities. This twofold development of the idea of God formed the point of leverage for Zoroaster's reformation. While in India the conception of the asura had veered more and more towards the dreadful and the dreaded, Zoroaster elevated it again — at the cost, indeed, of the daivas (daevas), whom he degraded to the rank of malicious powers and devils. In one Asura, w r hose Aryan original was Varuna, he concentrated the whole of the divine character, and conferred upon it the epithet of "the wise" {mazddo). This culminating " stage in the a-swra-conception is the work of Zoroaster. The Wise Lord (Ahuro Mazddo — later Ormazd) is the primeval spiritual being, the All-father, who was existent before ever the world arose. From him that world has emanated, and its course is governed by his foreseeing eye. His guiding spirit is the Holy Spirit, which wills the good: yet it is not free, but restricted, in this temporal epoch, by its antagonist and own twin-brother (Yasna, 30, 3), the Evil Spirit (angro mainyush, Ahriman), who in the beginning was banished by the Good Spirit by means of the famous ban contained in Yasna, 45, 2, and since then drags out his existence in the darkness of Hell as the principle of ill — the arch-devil. In the Gathas the Good Spirit of Mazda and the Evil Spirit are the two great opposing forces in the world, and Ormazd himself is to a certain extent placed above them both. Later the Holy Spirit is made directly equivalent to Ormazd; and then the great watchword is: " Here Ormazd, there Ahriman!" The very daevas are only the inferior instruments, the corrupted children of Ahriman, from whom come all that is evil in the world. The daevas, unmasked and attacked by Zoroaster as the true enemies of mankind, are still, in the Gathas, without doubt the perfectly definite gods of old popular belief — the idols of the people. For Zoroaster they sink to the rank of spurious deities, and in his eyes their priests and votaries are idolaters and heretics. In the later, developed system the daevas are the evil spirits in general, and their number has increased to millions. Some few of these have names; and among those names of the old Aryan divinities emerge here and there, e.g. Indra and Naonhaitya. With some, of course — such as the god of fire— the connexion with the good deity was a priori indissoluble. Other pow r ers of light, such as Mitra the god of day (Iranian Mithra), survived unforgotten in popular belief till the later system incorporated them in the angelic body. The authentic doctrine of the Gathas had no room either for the cult of Mithra or for that of the Haoma. Beyond the Lord and his Fire, the Gathas only recognize the archangels and certain ministers of Ormazd, who are, without exception, personifications of abstract ideas. This hypo-*

stasization and all-egotization is especially characteristic of the Zoroastrian religion. The essence of Ormazd is Truth and Law asha = Vedic rta): this quality he embodies, and its personifica- tion (though conceived as sexless) is always by his side, a con- stant companion and intimate. The essence of the wicked spirit is falsehood: and falsehood, as the embodiment of the evil principle, is much more frequently mentioned in the Gathas than Ahriman himself. Zoroaster says of himself that he had received from God a

commission to purify religion (Yasna, 44, 9). He purified it from the grossly sensual elements of daeva worship, and up- lifted the idea of religion to a higher and purer sphere. The motley body of Aryan folk-belief, when subjected to the unify- ing thought of a speculative brain, was transformed to a self- contained theory of the universe and a logical dualistic principle. But this dualism is a temporally limited dualism — no more than an episode in the worid-whole — and is destined to ter- minate in monotheism. Later sects sought to rise from it to a higher unity in other ways. Thus the Zarvanites represented Ormazd and Ahriman as twin sons proceeding from the funda- mental principle of all — Zrvana Akarana, or limitless time.

Ethically, too, the new doctrine stands on a higher plane, and represents, in its moral laws, a superior civilization. The devil worshippers, at their sacrifices, slay the ox; and this the daevas favour, for they are foes to the cattle and to cattle breeding, and friends to those who work ill to the cow. In Zoroaster's eyes this -is an abomination: for the cow is a gift of Ormazd to man, and the religion of Mazda protects the sacred animal. It is the religion of the settled grazier and the peasant, while the ruder daeva-cult holds its ground among the uncivilized nomadic tribes. In an old confession of faith, the convert is pledged to abjure the theft and robbery of cattle and the ravaging of villages inhabited by worshippers of Mazda (Yasna, \2, 2).

Zoroaster's teachings show him to have been a man of a highly speculative turn, faithful, however, with all his originality, to the Iranian national character. With zeal for the faith, and boldness and energy, he combined diplomatic skill in his dealings with his exalted protectors. His thinking is consecutive, self restrained, practical, devoid of everything that might be called fantastic or excessive. His form of expression is tangible and concrete: his system is constructed on a clearly conceived plan and stands on a high moral level ; for its time it was a great advance in civilization. The doctrine of Zoroaster and the Zoroastrian Church may be sum marized somewhat as follows: —

At the beginning of things there existed the two spirits who repre- sented good and evil [Yasna, 30, 3). The existence of evil in the world is thus presupposed from the beginning. Both spirits possess creative power, which manifests itself positively in the one and negatively in the other. Ormazd is light and life, and creates all that is pure and good — in the ethical world of law, order and truth. His antithesis is darkness, filth, death, and produces all that is evil in the world. Until then the two spirits had counter-balanced one another. The ultimate triumph of the good spirit is an ethical demand of the religious consciousness and the quint- essence of Zoroaster's religion.

The evil spirit with his wicked hosts appears in the Gathas much less endowed with the attributes of personality and individuality than does Ahura Mazda. Within the world of the good Ormazd is Lord and God alone. In this sense Zoroastrianism is often referred to as the faith of Ormazd or as Mazdaism. Ormazd in his exalted majesty is the ideal figure of an Oriental king. He is not alone in his doings and conflicts, but has in conjunction with himself a number of genii — for the most part personifications of ethical ideas. These are his creatures, his instruments, servants and assistants. They are comprehended under the general name of ameshd spenia (" im- mortal holy ones ") and are the prototypes of the seven amshaspands of a later date. These are — (1) Vohu Man5 (eCftwa), good sense, i.e. the good principle, the idea of the good, the principle that works in man inclining him to what is good; (2) Ashem, afterwards Ashem Vahishtem (Plutarch's AXiˆeia), the genius of truth and the em- bodiment of all that is true, good and right, upright law and rule — ideas practically identical for Zoroaster; (3) Khshathrem, after- wards Khshathrem Vairim (efooula), the power and kingdom of Ormazd, which have subsisted from the nrst but not in integral completeness, the evil having crept in like tares among the wheat : the time is yet to come when it shall be fully manifested in all its unclouded majesty; (4) Armaiti (Poˆta), due reverence for the divine, verecundia, spoken of as daughter of Ormazd and regarded as having her abode upon the earth; (5) Hauryatat (ttXoOtos), per- fection; (6) Ameretat, immortality. Other ministering angels are Geush Urvan (''' the genius and defender of animals "), and Sraosha, the genius of obedience and faithful hearing.

As soon as the two separate spirits (cf. Bundahish, I, 4) encounter one another, their creative activity and at the same time their permanent conflict l>egin. The history ■ of this conflict is the history of the world. A great cleft runs right through the world: all creation divides itself into that which is Ahura's and that which is Ahriman's, Not that the two spirits carry on the struggle in person ; they leave it to be fought out by their respective creations and creatures which they sent into the fieM. The field of battle is the present world.

In the centre of battle is man: his soul is the object of the war. Man is a creation of Ormazd. who therefore has the right to call him to account. But Ormazd created him free in his determina- tions and in his actions, wherefore he is accessible to the influences of the evil powers. This freedom of the will is clearly expressed in Yasna, 31, 11: " Since thou, O Mazda, didst at the first create our being and our consciences in accordance with thy mind, and didst create our understanding and our life together with the body, and works and words in which man according to his own will can frame his confession, the liar and the truth-speaker alike lay hold of the word, the knowing and the ignorant each after his own heart and understanding. Armaiti searches, following thy spirit, where errors are found." Man takes part in this conflict by all his life and activity in the world. By a true confession of faith, by every good deed, word and thought, by continually keeping pure his body and his soul, he impairs the power of Satan and strengthens the might of goodness, and establishes a claim for reward upon Ormazd; by a false confession, by every evil deed, word and thought and defilement, he increases the evil and renders service to Satan.

The life of man falls into two parts — its earthly portion and that which is lived after death is past. The lot assigned to him after death is the result and consequence of his life upon earth. No religion has so clearly grasped the ideas of guilt and of merit. On the works of men here below a strict reckoning will be held in heaven (according to later representations, by Rashnu, the genius of justice, and Mithra). All the thoughts, words and deeds of each are entered in the book of life as separate items — all the evil works, &c, as debts. Wicked actions cannot be undone, but in the heavenly account can be counterbalanced by a surplus of good works. It is only in this sense that an evil deed can be atoned for by a good deed. Of a real remission of sins the old doctrine of Zoroaster knows nothing, whilst the later Zoroastrian Church admits repentance, expiation and remission. " After death the soul arrives at the cinvato peretu, or accountant's bridge, over which lies the way to heaven. Here the statement of his life account is made out. If he has a balance of good works in his favour, he passes forthwith into paradise (Garo demand) and the blessed life. If his evil works outweigh his good, he falls finally under the power of Satan, 'and the pains of hell are his portion for ever. Should the evil and the good be equally balanced, the soul passes into an intermediary stage of existence (the Hamestahdns of the Pahlavi books) and its final lot is not decided until the last judgment. This court of reckoning, the judicium parliculare, is called oka. The course of inexorable law cannot be turned aside by any sacrifice or offering, nor yet even by the free grace of God.

But man has been smitten with blindness and ignorance: he knows neither the eternal law nor the things which await him after death. He allows

*himself too easily to be ensnared by the craft of the evil powers who seek to ruin his future existence. He worships and serves false gods, being unable to distinguish between truth and lies. Therefore it is that Ormazd in his grace deter- mined to open the eyes of mankind by sending a prophet to lead them by the right way, the way of salvation. According to later legend (Vd,, 2, 1), Ormazd at first *vished to entrust this task to Yima (Jemshid), the ideal of an Iranian king. But Yima, the secular man, felt himself unfitted for it and declined it. He con- tented himself therefore with establishing in his paradise (vara) a heavenly kingdom in miniature, to serve at the same time as a pattern for the heavenly kingdom that was to come. Zorcaster at last, as being a spiritual man, was found fit for the mission. He experienced within himself the inward call to seek the ameliora- tion of mankind and their deliverance from ruin, and regarded this inner impulse, intensified as it was by long, contemplative solitude and by visions,, as being the call addressed to him by God Him- self. Like Mahommed after him he often speaks of his conversations with God and the archangels. He calls himself most frequently manthran {" prophet ") ; ratu {" spiritual authority "), and saoshyant (" the coming helper " — that is to say, when men come to be judged according to their deeds).*

The full contents of his dogmatic and ethical teaching we cannot gather from the Gathas. He speaks for the most part only in general references of the divine commands and of good and evil works. Among the former those most inculcated are renunciation of Satan, adoration of Ormazd, purity of soul and body, and care of the cow. We learn little otherwise regarding the practices con- nected with his doctrines. A ceremonial worship is hardly men- tioned. He speaks more in the character of prophet than in that of lawgiver. The contents of the Gathas are essentially eschato- logical. Revelations concerning the last things and the future lot, .whether bliss or woe, of human souls, promises for true believers, threatenings for misbelievers, his firm confidence as to the future triumph of the good— such are the themes continually dwelt on with endless variations.

It was not without special reason — so Zoroaster believed — that the calling of a prophet should have taken place precisely when it did. It was, he held, the final appeal of Ormazd to mankind at large. Like John the Baptist and the Apostles of Jesus, Zoroaster also believed that the fulness of time was near, that the kingdom of heaven was at hand. Through the whole of the Gathas runs

the pious hope that the end of the present world is not far distant. He

himself hopes, with his followers, to live to see the decisive turn of things, the dawn of the new and better aeon. Ormazd will summon together all his powers for a final decisive struggle and break the power of evil for ever; by his help the faithful will achieve the victory over their detested enemies, the daeva wor- shippers, and render them impotent. Thereupon Ormazd will hold a judicium universale, in the form of a general ordeal, a great test of all mankind by fire and molten metal, and will judge strictly according to justice, punish the wicked, and assign to the good the hoped-for reward. Satan will be cast, along with all those who have been delivered over to him to suffer the pains of hell, into the abyss, where he will henceforward lie powerless. Forthwith begins the one undivided kingdom of God in heaven and on earth. This is called, sometimes the good kingdom, sometimes simply the kingdom. Here the sun will for ever shine, and all the pious and faithful will live a happy life, which no evil power can disturb, in the eternal fellowship of Ormazd and his angels. Every believer will receive as his guerdon the inexhaustible cow r and the gracious gilts of the Vohu mano. The prophet and his princely patrons will be accorded specialhonour.

History and Later Development. — For the great mass of the people Zoroaster's doctrine was too abstract and spiritualistic. The vulgar fancy requires sensuous, plastic deities, which admit of visible representation; and so the old gods received honour again and new gods won acceptance. They arc the angels (yiizala) of New Zoroastrianism. Thus, in the later Avesta, we find not only Mithra but also purely popular divinities such as the angel of victory, Verethraghna, Anahita (Anaitis), the goddess of the water, Tishrya (Sirius), and other heavenly bodies, invoked with special preference. The Gathas know nothing of a new belief which afterwards arose in the Fravashi, or guardian angels of the faithful. Fravashi properly means " confession of faith," and when personified comes to be re- garded as a protecting spirit. Unbelievers have no fravashi.

On the basis of the new teaching arose a widely spread priest- hood (athravano) who systematized its doctrines, organized and carried on. its worship, and laid down the minutely elaborated laws for the purifying and keeping clean of soul and body, which are met with in the Vendidad. To these ecclesiastical precepts and expiations belong in particular the numerous ablutions, bodily chastisements, love of truth, beneficial works, support of comrades in the faith, alms, chastity, improvement of the land, arboriculture, breeding of cattle, agriculture, protection of useful animals, as the dog, the destruction of noxious animals, and the prohibition either to burn or to bury the dead. These are to be left on the appointed places (dakhmas) and exposed to the vultures and wild dogs. In the worship the drink prepared from the haoma (Indian soma) plant had a prominent place. Worship in the Zoroastrian Church was devoid of pomp; it was

independent of temples. Its centre was the holy fire on the altar. The fire altars afterwards developed to fire temples. In the sanctuary of these temples the various sacrifices and high and low masses were celebrated. As offerings meat, milk, show-bread, fruits, flowers and consecrated water were used. The priests were the privileged keepers and teachers of religion. They only performed the sacrifices (Herodotus, i. 132), educated the young clergy, imposed the penances; they in person executed the circumstantial ceremonies of purification and exercised a spiritual guardianship and pastoral care of the laymen. Every young believer in Mazda, after having been received into the religious community by being girt with the holy lace, had to choose a confessor and a spiritual guide (ra-tu).

Also in eschatology, as may be expected, a change took place. The last things and the end of the world are relegated to the close of a long period of time (3000 years after Zoroaster), when a new Saoshyant is to be born of the seed of the prophet, the dead are to come to life, and a new incorruptible world to begin.

Zoroastrianism was the national religion of Iran, but it was not permanently restricted to the Iranians, being professed by Turanians as well. The worship of the Persian gods spread to Armenia and Cappadocia and over the whole of the Near East (St.rabo, xv. 3, 14; xi. 8, 4; 14, 76}. Of the Zoroastrian Church under the Achac- menides and Aeracides little is known. After the overthrow of the dynasty of the Achaemenides a period of decay seems to have set in. Yet the Aeracides and the Indo-Scythian kings as well as the Achaemenides were believers in Mazda. The national restoration of the Sasanides brought new life to the Zoroastrian religion and long-lasting sway to the Church. Protected by this dynasty, the priesthood developed Into a completely organized state church, which was able to employ the power of the state in enforcing strict compliance with the religious law-book hitherto enjoined by their unaided efforts only. The head of the Church vZara-Shushtrotema) had his scat at Rai in Media and was the first person in the state next to the king. The formation of sects was at this period not infrequent (cf. Manichaeism). The

Mohammedan invasion (636), with the terrible persecutions of the fol- lowing centuries, was the death-blow of Zoroastrianism, In Persia itself only a few followers of Zoroaster, are now found (in Kerman and Yezd). The Parsees {q.v.) in and around Bombay hold by Zoroaster as their prophet and by the ancient religious usages, but their doctrine has reached the stage of a pure monotheism.

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ZORRILLA Y MORAL, JQSt (1817-1893), Spanish poet and dramatist, son of a magistrate in whom Ferdinand VII. placed special confidence, was born at Valladolid on the 21st of February 1817. He was educated by the Jesuits at the Real Seminario de Nobles in Madrid, wrote verses when he was twelve, became an enthusiastic admirer of Scott and Chateau- briand, and took part in the school performances of plays by Lope de Vega and Calderon. In 1833 he was sent to read law at the University of Toledo, but, after a year of idleness, he fled to Madrid, where he horrified the friends of his absolutist father by making violent speeches and by founding a newspaper which was promptly suppressed by the government. He narrowly escaped transportation to the Philippines, and passed the next few years in poverty. The death of the satirist Larra brought Zorrilla into notice. His elegiac poem, declaimed at Larra's funeral in February 1837, served as an introduction to the leading men of letters. In 1837 he published a book of verses, mostly imitations of Lamartine and Hugo, which was so favourably received that he printed six more volumes within three years. His subjects are treated with fluency and grace, but the carelessness which disfigures much of his work is pro- minent in these juvenile poems. After collaborating with Garcia Gutierrez, in a piece entitled Juan Ddndolo (1839) Zorrilla began his individual career as a dramatist with Cada cual con su razdn (1840), and during the following five years he wrote twenty-two plays, many of them extremely successful. His Cantos del trovador (1841), a collection of national legends versified with infinite spirit, showed a decided advance in kill, and secured for the author the place next to Espronceda in popular esteem. National legends also supply the themes of his dramas, though in this department Zorrilla somewhat com- promised his reputation for originality by adapting older plays which had fallen out of fashion. For example, in El Zapatero y el Rey he recasts El monlanes Juan Pascual by Juan de la Hoz y Mot a; in La mejor razdn la espada he borrows from Moreto's Travesuras del estudiante Pantoja; in Don Juan Tenorio he adapts from Tirso de Molina's Burlador de Sevilla and from the elder Dumas's Don Juan de Marana (which itself derives from Les dmes du purgatoire of

Prosper Merimee), But his rearrangements usually contain original elements, and in Sancho Garcia, El Rey toco, and El Alcalde Ronquillo he ap- parently owes little to any predecessor. The last and (as he himself believed) the best of his plays is Traidor, inconfeso y mdrtir (1845). Upon the death of his mother in 1847 Zorrilla left Spain, resided for a while at Bordeaux, and settled in Paris, where his incomplete Granada, a striking poem of gorgeous local colour, was published in 1852. In a fit of depression, the causes of which are not known, he emigrated to America three years later, hoping, as he says, that yellow fever or small- pox would carry him off. During eleven years spent in Mexico he produced little, and that little was of no merit. He returned in 1866, to find himself a half-forgotten classic. His old fertility was gone, and new standards of taste were coming into fashion. A small post, obtained for him 'through the influence of Jovellar and Canovas del Castillo, was abolished by the republican

minister. He was always poor, and for some twelve years after 1871 he was in the direst straits. The law of copyright was not retrospective, and, though some of his plays made the fortunes of managers, they brought him nothing. In his untrustworthy autobiography, Rccuerdos del tiempo viejo (1 88a), he complained of this. A pension of 30,000 realcs secured him from want in his old age, and the reaction in his favour became an apotheosis. In 1885 the Spanish Academy, which had elected him a member many years before, presented him with a gold medal of honour, and in 1880 he was publicly crowned at Granada as the national laureate. He died at Madrid on the 23rd of January 1893.

Zorrilla is so intensely Spanish that it is difficult for foreign critics to do him justice. It is certain that the extraordinary rapidity of his methods seriously injured his work. He declares that he wrote El Caballo del Rey Don Sancho in three weeks, and that he put together El Punal del Godo (which, like La Calentura, owes much to Southey) in two days; if so, his deficiencies need no other explanation. An improvisator with the characteristic faults of redundance and verbosity, he wrote far too much, and in most of his numbers there are numerous technical flaws. Yet the richness of his imagery, the movement, fire and variety of his versification, will preserve some few of his poems in the antho- logies. His appeal to patriotic pride, his accurate dramatic instinct, together with the fact that he invariably gives at least one of his characters a most effective acting part, have enabled him to hold the stage. It is by Don Juan Tenorio, the play of which he thought so meanly, that Zorrilla will be best remembered. (J. F.-

K.)

ZOSIMUS, bishop of Rome from the iSth of March 417 to the 26th of December 418, succeeded Innocent I. and was followed by Boniface I. For his attitude in the Pelagian controversy, see Pelagius. He took a decided part in the protracted dispute in Gaul as to the jurisdiction of the see of Aries over that of Vienne, giving energetic decisions in favour of the former, but without settling the controversy. His fractious temper coloured all the controversies in which he took part, in Gaul, Africa and Italy, including Rome, where at his death the clergy were very much divided.

ZOSIMUS, Greek historical writer, flourished at Constanti- nople during the second half of the 5th century a.d. According to Photius, he was a count, and held the office of " advocate " of the imperial treasury. His New History, mainly a compilation from previous authors (Dexippus, Eunapius, Olympiodorus) , is in six books: the first sketches briefly the history of the early emperors from Augustus to Diocletian (305); the second, third and fourth deal more fully with the period from the accession of Constantius and Galerius to the death of Theodosfus; the fifth and sixth cover the period between 305 and 410. The work, which is apparently unfinished, must have been written between 450-502. The style is characterized by Photius as concise, clear and pure. The historian's object was to account for the decline of the Roman empire from the pagan point of view, and in this undertaking he at various points treated the Christians with some unfairness.

The best edition is by Mendelssohn (1887), who fully discusses the question of the authorities used by Zosimus; there is an excellent appreciation of him in Ranke"s Weltgeschichte, iv. French translation by Cousin (,1678); English (anonymous), 1684, 1814.

ZOSTEROPS, 1 originally the scientific name of a genus of birds founded by N. A. Vigors and T. Horsfield {Trans. Linn. Society, xv. p. 235) on an Australian species called by them Z. dorsalis, but subsequently shown to be identical with the Certhia caerulescens, and also with the Sylvia lateralis, previously described by J, Latham. The name has been Anglicized in the same sense, and, whether as a scientific or a vernacular term, applied to a £reat number of species 2 of little birds which inhabit for the most part the tropical districts of the Old World, from Africa to most of the islands in the Indian and Pacific Oceans, and northwards in- Asia through India and China to the Amur regions and Japan.

1 The derivation is faarrip-Tjpm and &$, whence the word should be pronounced with all the vowels long. The allusion is to the ring of white feathers round the eyes, which is very conspicuous in many species.

*2 In 1883 R. B. Sharpe (Cat. 13. Brit. Museum, ix. pp. 146-203) admitted 85 species, besides 3 more which he had not been able to examine. *

The birds of this group are mostly of unpretending appearance, the plumage above being generally cither mouse-coloured or greenish olive; but some are varied by the white or bright yellow of their throat, breast or lower parts, and several have the flanks of a more or less lively bay. Several islands are inhabited by two perfectly distinct species, one belonging to the brown and the other to the green section, the former being wholly insular. The greater number of species seem to be confined to single islands, often of very small area, but others have a very wide distribution, and the type-species, Z. caerulescens, has largely extended its range. First described from New South Wales, where it is very plentiful, it had been long known to inhabit all the eastern part of Australia. In 1856 it was found in the South Island of New Zealand, when it became known to the Maories by a name signifying" Stranger,' 1 and to the British as the " Blight-bird," 3 from its clearing the fruit-trees of a blight. It soon after appeared in the North Island, where it speedily became common, and thence not only spread to the Chatham Islands, but was met with in considerable numbers 300 miles from land, as though in search of new countries to colonize. In any case it is obvious that this Zosterops must be a comparatively modern settler in New Zealand.

All the species of Zosterops are sociable, consorting in large flocks, which only separate on the approach of the pairing season. They build nests — sometimes suspended from a horizontal fork and sometimes fixed in an upright crctch— and lay (so far as is known) pale blue, spotless eggs, thereby differing wholly from several of the groups of birds to which they have been thought allied. Though mainly insectivorous, they eat fruits of various kinds. The habits of Z. caerulescens have been well described by Sir W. Buller (Birds of New Zealand'), and those of a species peculiar to Ceylon, Z. ceylonensis , by Col. Lcgge (B. Ceylon), while those of the widely ranging Indian Z. palpebrcsa and of the South- African Z. capensis have been succinctly treated by Jerdon (B. India, ii.) and Layard (B. South Africa) respectively.

It is remarkable that the largest known species of the genus, Z. albigularis, measuring nearly 6 in. in length, is confined to so small a spot as Norfolk Island, where also another, Z. tenuirostris, not much less in size, occurs; while a third, of intermediate stature, Z. sirenua, inhabits the still smaller Lord Howe's Island. A fourth, Z. vatensis, but little inferior in bulk, is found on one of the New Hebrides; the rest are from one-fifth to one-third less in length, and some of the smaller species hardly exceed 3ˆ in.

Placed by some writers, if not systematists, with the Paridae (sec

Titmouse), by others among the Meliphagidae (see Honey- Eater), and again by others with the Nectarinudae (see Sunbird), the structure of the tongue, as shown by H. F. Gadow (Proc. Zooi. Society, 1883, pp. 63, 68, pi. xvi. fig. 2), entirely removes it from the first and third, and from most of the forms generally included among the second. It seems safest to regard the genus, at least

fjrovisionaHy, as the Type of a distinct family— Zosteropidae — as amilies go among Passerine birds. (A. N.)

ZOUAVE, the name given to certain infantry regiments in the French army. The corps was first raised in Algeria in 183 1 with one and later two battalions, and recruited solely from the Zouaves, a tribe of Berbers, dwelling in the mountains of the Jurjura range (see Kabyles). In 1S38 a third battalion was raised, and the regiment thus formed was commanded by Lamoriciere. Shortly afterwards the formation of the Tirailleurs alg&riens, the Turcos, as the corps for natives, changed the enlistment for the Zouave battalions, and they became, as they now remain, a purely French body. Three regiments were formed in 1852, and a fourth, the Zouaves of the Imperial Guard, in 1S54. The Crimean War was the first service which the regiments saw outside Algeria. There are now four regiments, of five battalions each, four of which are permanently in Africa, the fifth being stationed in France as a depot regiment. For the peculiarly picturesque uniform of these regiments, see Uniform.

The Papal Zouaves were formed in defence of the Papal states by Lamoriciere in i860. After the occupation of Rome by Victor Emmanuel in 1870, the Papal Zouaves served the government of National Defence in France during the Franco-Prussian war, and were disbanded after the entrance of the German troops into Paris.

3 By most English-speaking people the prevalent species of Zosterops is commonly called ” White-eye ” or u Silver-eye.”

ZOUCH, RICHARD (c. 1590ˆ1661), English jurist, was born at Anstcy, Wiltshire, and educated at Winchester and after- wards at Oxfordˆ where he became a fellow of New College in 1609. He was admitted at Doctor’s Commons in January r6iS, and was appointed regius professor of law at Oxford in 1620. In 1625 he became principal of St Alban Hall and chancellor of the diocese of Oxford; in 1641 he was made judge of the High Court of Admiralty. Under the Commonwealth, having submitted to

the parliamentary visitors, he retained his university appointments, though not his judgeship; this last he resumed at the Restoration, dying soon afterwards at his apartments in Doctoi's Commons, London, on the 1st of March

1661.

He published Elementa jurisprudence (1629), Descriptio juris et judicii fetulalis, secundum consiie.titdin.es Mediolani et Normanniae, pro introdztctione ad juris prudentium Anglicanam (1634), Descriptio juris tt judicii tempore lis, secundum consueiudines feudales et Nor- mannicas (1636), Descriptio juris et judicii ecclesiastici, secundum canones et consuetudine.s Anglicanas (1636), Descriptiones juris et judicii sacri, . . . militaris, . , . maritimi (1640), Juris et judicii fecialis s-ive juris inter genles . . . explicaiio (1650), and Solutio quaestionis de legati delinquents judice competente (1657). In virtue of the List two he has the distinction of being one of the earliest systematic writers on international law. He was also the author of a poem, The Dove, or Passages of Cosmography (1613).

ZOUCHE, or ZotXH, the name of an English family descended from Alan la Zouche, a Breton, who is sometimes called Alan de Porrhoet. Having settled in England during the reign of Henry II., Alan obtained by marriage Ashby in Leicestershire (called after him Ashby de la Zouch) and other lands. His grandson, another Alan la Zouche, was justice of Chester and justice of Ireland under Henry III.; he was loyal to the king during the struggle with the barons, fought at Lewes and helped to arrange the peace of Kenihvorth. As the result of a quarrel over some lands with John, Earl Warenne, he was seriously injured in Westminster Hall by the earl and his retainers, and died on the 10th of August 1270. Alan's elder son Roger (d. 1285) had a son Alan la Zouche, who was summoned to parliament as a baron about 1298. He died without sons, and this barony fell into abeyance between his daughters and has never been revived. The elder Alan's younger son, Eades or Ivo, had a son William (c. 1276-1352), who was summoned to parliament as a baron in 1308, and this barony, which is still in existence, is known as thai, of Zouche of Haryngworth.

John, 7th baron Zouche of Haryngworth (c. 1460-1526), was attainted in 1485 as a supporter of Richard III., but was restored to his honours in 1495. His descendant, Edward, the nth baron (c. 1556-1625), was one of the peers who tried Mary, queen of Scots, and was sent by Elizabeth as ambassador to Scotland and to Denmark. He was president of Wales from 1602 to 161 5 and lord warden of the Cinque Ports from 1615 to 1624. lie was a member of the council of the Virginia Company and of the New England council. He had many literary friends, among them being Ben Jonson and Sir Henry Wot, ton. Zouche left no sens, and the barony

remained in abeyance among the descendants of his two daughters until 1S15, when the abeyance was terminated in favour of Sir Cecil Bisshopp, Bart. (1753- 1828), who became the 12th baron. He died without sons, a second abeyance being terminated in 1829 in favour of his daughter Harriet Anne (1787-1870}, wife of the Hon. Robert Curzon (1771-1S63). In 1873 her grandson, Robert Nathaniel Curzon (b. 1851), became the 15th baron.

Two antiquaries, Henry Zouch (c. 1725-1795) and his brother Thomas Zouch (1737-1815), claimed descent from the family of Zouche. Both were voluminous writers, Thomas's works including a Life of Izaak Walton (1823) and Memoirs of Sir Philip Sidney

(1808).

ZOUTPANSBERG, the north-eastern division of the Transvaal. This was the district to which Louis Trichard and Jan van Rensburg, the forerunners of the Great Trek, journeyed in 1835. In 1S45 Hendrik Potgieter, a prominent leader of the Trek Boers, removed thither. The Zoutpansberg Boers formed a semi-independent community, and in 1857 Stephanus Schoe- man, their commandant-general, sided against Marthinus

Pretorius and Paul Kruger when they invaded the Orange Free State. It was not until 1864 that Zoutpansberg was definitely incorporated in the South African Republic. Trichard and his companions had been shown gold workings by the natives, and it was in this district in 1867-70, and in the neighbouring region of Lydenburg, that gold mines were first worked by Europeans south of the Limpopo. The white settlers in Zoutpansberg had for many years a reputation for lawlessness, and were later regarded as typical " back velt Boers." Zoutpansberg contains a larger native population than any other region of the Transvaal. It is highly mineralized, next to gold, copper, found near the Limpopo (where is the Messina mine) being the chief metal worked. The district long suffered from lack of railway com- munications, but in 1910 the completion of the Selati line giving it direct access to Delagoa Bay was begun. The chief towns are Pietersburg and Leydsdorp.

Sec S. Hofmcyr, Twintig jaren in Zoutpansberg (Cape Town, 1890); Report on a Reconnaissance of the N.-W. Zoutpansberg District (Pretoria, 1908).

ZRINYI, MIKL6S, Count (1508-1566), Hungarian hero, was a son of Miklos Zrinyi and Ilona KarJovics. He distin- guished himself at the siege of Vienna in 1529, and in 1542 saved the imperial army from defeat before Pest by intervening with 400 Croats, for which service he was appointed ban of Croatia. In 1542 he routed the Turks at Somlyo. In 1543

he married Catherine Frangipan, who placed the whole of her vast estates at his disposal. The Emperor Ferdinand also gave him large possessions in Hungary, and henceforth the Zrinyis became as much Magyar as Croatian magnates. In 1556 Zrinyi won a series of victories over the Turks, culminating in the battle of Bab6csa. The Croatians, however, overwhelmed their ban with reproaches for neglecting them to fight for the Magyars, and the emperor simultaneously, deprived him of the captaincy of Upper Croatia and sent 10,000 men to aid the Croats, while the Magyars were left without any help, where- upon Zrinyi resigned the banship (1561). In 1563, on the coronation of the Emperor Maximilian as king of Hungary, Zrinyi attended the ceremony at the head of 3000 Croatian and Magyar mounted noblemen, in the vain hope of obtaining the dignity of palatine, vacant by the death of Thomas Nadasdy. Shortly after marrying(in 1564) his second wife, Eva Rosenberg, a great Bohemian heiress, he hastened southwards to defend the frontier, defeated the Turks at Segesd, and in 1566 from the 5th of August to the 7th of September heroically defended the little fortress of Szigetvar against the whole Turkish host, led by Suleiman the Magnificent in person, perishing with every member of the garrison in a last desperate sortie.

See F. Salamon, Ungarn im Zeitalter der Tilrkenherrschaft (Leipzig, 1887); J. Csuday, The Zrinyis in Hungarian History (Hung.), Szombathely. 1884, 8vo. (R. N. B.)

ZRINYI, MIKL6S, Count (1620-1664), Flungarian warrior, statesman and poet, the son of George Zrinyi and Magdalena Szechy, was born at Csakvar. At the court of Peter Pasmany the youth conceived a burning enthusiasm for his native lan- guage and literature, although he always placed arms before arts. From 1635 to 1637 he accompanied Szcnkveczy, one of the canons of Esztergom, on a long educative tour through Italy. During the next few years he learnt the art of war in defending the Croatian frontier against the Turks, and approved himself one 01 the first captains of the age. In 1645 he acted against the Swedes in Moravia, equipping an army corps at his own expense. At Szkalec he scattered a Swedish division and took 2000 prisoners. At Eger he saved the emperor, who had been surprised at night in his camp by Wrangel. Subse- quently he routed the army of Rakoczy on the Upper Theiss. For his services the emperor appointed him captain of Croatia. On his return from the war he married the wealthy Eusebia Draskovics. In 1646 he distinguished himself in the Turkish war. At the coronation of Ferdinand IV. he carried the sword of state, and was made ban and captain-general of Croatia. In this double capacity he presided over many Croatian diets ? always strenuously defending the political rights of the Croats

and steadfastly maintaining that as regarded Hungary they were to be looked upon not as partes annexae but as a regirum. During 1652-53 he was continually righting against the Turks, yet from his castle at Csaktornya he was in constant communication with the learned world; the Dutch scholar, Jacobus Tollius, even visited him. and has left in his Episiolae itinerariae a lively account of his experiences. Tollius was amazed at the linguistic resources of Zrinyi, who spoke German, Croatian, Hungarian, Turkish and Latin with equal facility. Zrinyi's Latin letters (from which we learn that he was married a second time, to Sophia Lobel) are fluent and agreeable, but largely interspersed with Croatian and Magyar expressions. The last year of his life was also its most glorious one. He set out to destroy the strongly fortified Turkish bridge at Esseg, and thus cut off the retreat of the Turkish army, re-capturing all the strong fortresses on his way. He destroyed the bridge, but the further pur- suance of the campaign was frustrated by the refusal of the imperial generals to co-operate. Still the expedition had covered him with glory. All Europe rang with his praises: It was said that only the Zrinyis had the secret of conquering the Turks. The emperor olTered him the title of prince. The pope struck a commemorative medal with the effigy of Zrinyi as a field-marshal. The Spanish king sent him the Golden Fleece. The French king created him a peer of France. The Turks, to wipe out the disgrace of the Esseg affair, now laid siege to Uj-Zerin, a fortress which Zrinyi had built, and the imperial troops under Montecuculi looked on while he hastened to relieve it, refusing all assistance, with the result that the fortress fell. It was also by the advice of Montecuculi that the disgraceful peace of Vasvar was concluded. Zrinyi hastened to Vienna to protest against it, but in vain. Zrinyi quitted Vienna in disgust, after assuring the Venetian minister, Sagridino, that he was willing at any moment to assist the Republic against the Turks with 6000 men. He then returned to Csaktornya, and there, on the 18th of November, was killed by a wild boar which he had twice wounded and recklessly pursued to its lair in the forest swamps, armed only with his hunting-knife.

His poetical works first appeared at Vienna in 1651, under the title of The Siren of the Adriatic (Hung.); but his principal work, Obsidio Szigetiana, the epopoeia of the glorious self- sacrifice of his heroic ancestor of the same name, only appeared in fragments in Magyar literature till Arany took it in hand. It was evidently written under the influence of both Virgil and Tasso, though the author had no time to polish and correct iLs rough and occasionally somewhat wooden versification. But the fundamental idea — the duty of Hungarian valour to shake off the Turkish yoke, with the help of God — is sublime, and the whole work is intense with martial and religious en- thusiasm. It is no unworthy companion of the other epics of

the Renaissance period, and had many imitators. Arany first, in 1848, began to recast the Zrinyiad, as he called it, on modern lines, and the work was completed by Antal Vekony in 1892.

See J. Arany and Kazmir Greksa, Zrinyi and Tasso (Hung.), Eger, 1892; Karoly Szechy, Life of Count Nicholas Zrinyi, the poet (Hung.), Budapest, 1896; Samlor Korosi, Zrinyi and Macckia- velli (Hung.), Budapest, 1893. (R. N. B.)

ZSCHOKKE, JOHANN HEINRICH DANIEL (1771—1S48), German author, was born at Magdeburg on the 22nd of March 1 77 1. He was educated at the monasterial {kloster) school and at the Aitstadter gymnasium of his native place. He spent some time as playwright with a company of strolling actors, but afterwards studied philosophy, theology and history at the university of Frankjort-on-the-Oder, where in 1792 he established himself as PrivaUlozent. He created much sensation by an extravagant novel, Abdllino, der grosse Bandit (1793; subse- quently also dramatized), modelled on Schiller's R&uber. and the melodramatic tragedy, Julius von Sassen (1796). The Prussian government having declined to make him a full professor, Zschokke in 1796 settled in Switzerland, where he conducted an educational institution in the castle of Reichenau. The authorities of the Orisons admitted him to the rights of a

citizen, and in 1798 he published his Geschickle des Freistaats der drei Bilnde im hohen Rdtien. The political disturbances of this year compelled him to close his institution. He was, however sent as a deputy to Aarau, where he was made president of the educational department, and afterwards as government com- missioner to Unterwalden, his authority being ultimately extended over the cantons of Uri, Schwyz and Zug. Zschokke distinguished himself by the vigour of his administration and by the enthusiasm with which he devoted himself to the interests of the poorer classes of the community. In 1800 he reorganized the institutions of the Italian cantons and was appointed lieutenant-governor of the canton of Basel. Zschokke retired from public life when the central government at Bern proposed to re-establish the federal system, but after the changes effected by Bonaparte he entered the service of the Ganton of Aargau, with which he remained connected. In 1 Soi he attracted attention by his Gcschichte vom Kampfe und Untergange der schweizerischen Berg und Wald-Rantone. Through his Schwei- zerhote, the publication of which began in 1804, he exercised a wholesome influence on public affairs; and the like may be said of his MiscelJ-en fiir die neueste Weltkunde, issued from 1807 to 1813. In 1811 he also started a monthly periodical, the Erheiterungen. He wrote various historical works, the most important of which is Des Schiveizerlandes Geschichte fiir das Schweizervolk (1822, 8th ed. 1849). Zschokke's tales, on which his literary reputation rests, are

collected in several series, Bilder aus der Sckwein (5 vols., 1824-25), Ausgewahlte Novcllen und Dicktungen (16 vols., 1838-39). The best known are: Addrich im Moos (1794); Der Frtihof von Aarau (1794); Alamontade (1802); Der Creole (1830); Das Goldmackerdorf (1817); and Meister Jordan (1845). In Stunden der Andachi (1S09-1816; 27 editions in Zschokke's lifetime), which was widely read, he expounded in a rationalistic spirit the funda- mental principles of religion and morality. Erne Selbstschau (1842) is a kind of autobiography. Zschokke was not a great original writer, but he secured an eminent place in the literature of his time by his enthusiasm for modern ideas in politics and religion, by the sound, practical judgment displayed in his works, and by the energy and lucidity of his style. He died at bis country house of Blumenhalde on the Aar on the 27th of June

1848.

An edition of Zschokke's selected works, in forty volumes, was issued in 1824-28. In 1851-54 an edition in thirty-five volumes was published. A new edition of the Novellen was published by A. Vbgtlin in twelve volumes (1904). There are biographies of Zschokke by E. Munch (1831); Emil Zschokke (3rd ed. 1876); R. Sauerlander (Aarau, 1884); and R. Wernly (Aarau, 1894). See also M. Sennet derreit, Zschokke, seine Weltanschauung und Lebensweisheit (1904). .

ZSCHOPAU, a town in the kingdom of Saxony, on the left bank of the Zschopau, 18 m. S.E. from Chemnitz by the railway to Annaberg. Pop. (1900) 6748. It contains a handsome parish church dedicated to St Martin, a town hall and a castle (Wildeck), built by the Emperor Henry I. in 932. The indus- tries include ironfounding, cotton and thread-spinning, cloth- weaving and furniture making.

ZUCCARELLI, FRANCESCO (1 702-1 788), Italian painter, was born at Pitigliano in Tuscany, and studied in Rome under Onesi, Morandi, and Nelli. At Rome, and later in Venice, he became famous as one of the best landscape . painters of the classicizing 18th century. Having visited England on a previous occasion, he was induced by some patrons to return thither in 1752, remaining until 1773; when he settled in Florence, dying there in 1788. Zuccarelli, who was one of the foundation members of the Royal Academy, enjoyed the patronage of royalty and of many wealthy English collectors, for whom he executed his principal works — generally landscapes with classic ruins and small figures. A large number of them are at Windsor Castle, and of the seven examples which formed part of the John Samuel collection two are now at the National Gallery. The royal palace in Venice contains as many as twenty-one, and the academy four. Others are at the Vienna Gallery and at the Louvre in Paris. His work was

very unequal, but at his

best he rivals the leading landscape painters of his time. His paintings often bear a mark, representing a pumpkin, a pictorial representation of bis name, which signifies " little pumpkin." ZUCCARO, or Zucchero, 1 the name of two Kalian painters.

I. Taddeo Zuccaeo (1529-1566), one of. the most popular painters of the so-called Roman mannerist school, was the son of Ottaviano Zuccaro, an almost unknown painter at St Angelo in Vado, where he was born in 1529. Taddeo found his way to Rome, and he succeeded at an early age in gaining a knowledge of painting and in finding patrons to employ him. When he was seventeen a pupil of Correggio, named Daniele da Parma, engaged him to assist in painting a series of frescoes in a chapel at Vitto near Sora, on the borders of the Abruzzi. Taddeo re- turned to Rome in 1548, and began his career as a fresco painter, by executing a series of scenes in monochrome from the life of Furius Camillus on the front of the palace of a wealthy Roman named Jacopo Mattel. From that time his success was assured, and he was largely employed by the popes Julius III. and Paul IV., by Delia Rovere, duke of Urbino, and by other rich patrons. His best frescoes were a historical series painted on the walls of a new palace at Caprarola, built for Cardinal Alessandro Farnese, for which Taddeo also designed a great quantity of rich decora- tions in stucco relief after the style of Giulio Romano and other pupils of Raphael. Nearly all his paintings were in fresco, very large in scale, and often in chiaroscuro or monochrome; they were more remarkable for rapidity of execution and a certain boldness of style than for any higher qualities. His work is mannered in style, artificial and pompous in conception, and lacks any close or accurate knowledge of the human form and its movements. He died in Rome in 1 566, and was buried in the Pantheon, not far from Raphael. _ _

Taddeo's easel pictures are less common than his decorative frescoes. A small painting on copper of the Adoration of the Shepherds, formerly in the collection of James II., is now at Hampton Court; it is a work of very small merit. The Capra- rola frescoes were engraved and published by Prenner, Illustri Fatti Farnesiani Coloriti nel Real Palazzo di Caprarola (Rome,

1748-50)-

II. Federigo Zuccaro (1543-1609) was in 1550 placed under his brother

Taddeo's charge in Rome, and worked as his assist- ant; he completed the Caprarola frescoes. Federigo attained an eminence far beyond his very limited merits as a painter, and was perhaps the most popular artist of his generation. Probably no other painter has ever produced so many enormous frescoes crowded with figures on the most colossal scale, all executed under the unfortunate delusion that grandeur of effect could be attained merely by great size combined with extravagance of attitude and exaggeration of every kind. Federigo's first work of this sort was the completion of the painting of the dome of the cathedral at Florence; the work had been begun by the art-historian Vasari, who wrote in the most generous language about his more successful rival. Re- gardless of the injury to the apparent scale of the interior of the church, Federigo painted about 300 figures, each nearly 50 ft. high, sprawling with violent contortions all over the surface. Happily age has so dimmed these pictures that their presence is now almost harmless. Federigo was recalled to Rome by Gregory XIII. to continue in the Pauline chapel of the Vatican the scheme of decoration begun by Michelangelo during his failing years, but a quarrel between the painter and members of the papal court led to his departure from Italy. He visited Brussels, and there made a series of cartoons for the tapestry- weavers. In 1574 he passed over to England, where he received commissions to paint the portraits of Queen Elizabeth, Mary, queen of Scots, Sir Nicholas Bacon, Sir Francis Walsingham, Lord High Admiral Howard, and others. A curious full-length portrait of Elizabeth in fancy dress, now at Hampton Court, is attributed to this painter, though very doubtfully. Another picture in the same collection appears to be a replica of his painting of the " Allegory of Calumny/' as suggested by Lucian's description of a celebrated work by Apelles; the satire in the

1 So spek by Vasari.

original painting, directed against some of his courtier enemies,

*was the immediate cause of Federigo's temporary; ! '*xite"fnMa Rome. His success as a painter of portraits and other works in oil was more reasonable than the admiration expressed for his colossal frescoes. A portrait of a " Man with Two Dogs " in the Pitti Palace at Florence, is a work of some real merit, as is also the " Dead Christ and Angels " in the Bofghese Gallery in Rome. Federigo was soon recalled to Rome to finish his work on the vault of the Pauline chapel. In 1585 he accepted an offer by Philip II. of Spain to decorate the new Escorial at a yearly salary of 2000 crowns, and worked at the Escorial from January 15S6 to the end of 1588, when he returned to Rome. He there founded in 1595, under a charter confirmed by Sixtus V., the Academy of St Luke, of which he was the first president. Its organization suggested to Sir Joshua Reynolds his*

scheme for founding the English Royal Academy.

Like his contemporary Giorgio Vasari, Federigo aimed at being an art critic and historian, but with very different success. His chief book, VIdea de' Pittari, Scultori, ed Architetti (Turin, 1607), is a senseless mass of the most turgid bombast. Little can be said in praise of his smaller works, consisting of two volumes printed at Bologna in 160S, describing his visit to Parma and a journey through central Italy. Federigo was raised to the rank of a cavaliere not long before his death, which took place at Ancona in 1609.

For both Taddeo and Federigo Zuccaro, see Vasari, pt. iii., and Lanzi, Storia PUlorica, Roman School, epoch iii. (J. II. M.)

ZUG (Fr. Zoug), a canton of central Switzerland. It is the smallest undivided canton, both as regards area and as regards population. Its total area is but 92-3 sq. m. ; of which, however, no fewer than 75-1 sq. m. are reckoned as " productive," forests covering 19-9 sq. m. Of the rest 10 sq. m. are occupied by the cantonal share of the lake of Zug (q.v.)-, and 2f sq. m. by the lake of Aegeri, which is wholly within the canton.

It includes the fertile strips on the eastern and western shores of the lower portion of the lake of Zug, together with the alluvial plain at its northern extremity. The lower range, culminating in the Zugerberg (3255 ft.), and the Wildspitz (5194 ft.), the highest summit of the Rossberg, that rises east of the lake of Zug, separates it from the basin and lake of Aegeri, as well as from the hilly distriet of Menzingen. The Lorze issues from the lake of Aegeri, forces its way through moraine deposits in a deep gorge with fine stalactite caverns and falls into the lake of Zug, issuing from it very soon to flow into the Reuss. The canton thus belongs to the hilly, not to the mountainous, Swiss cantons, but as it commands the entrance to the higher ground it has a certain strategical position. Railways connect it both with Lucerne and with Zurich, while lines running along either shore of the lake of Zug join at the Arth-Goldau station of the St Gotthard railway. On the eastern shore of the lake of Aegeri, and within the territory of the canton, is the true site of the famous battle of Morgarten (q.v.) won by the Swiss in 1315. Till 1814 Zug was in the diocese of Constance, but on the reconstruction of the diocese of Basel in 1828 it was assigned to it. In I900 the population of the canton was 25,093, of whom 24,042 were German-speaking, 819 Italian-speaking, and 157 French-speaking, while 23,362 were Romanists, 1701 Protestants, and 19 Jews. Its capital is Zug, while the manufacturing village of Baar, 2 m. N., had 4484 inhabitants, and the village of Cham, 3 m. N.W., had 3025 inhabitants. In both cases the environs of the villages are included, and this is even more the case with the wide-spreading parishes of Unter Aegeri with 2593 inhabitants, of Menzingen with 2495 inhabitants, and the great school for girls and female

teachers, founded in 1844 by Father Theodosius Florentini, and of Ober Aegeri with 1891 inhabitants.

In the higher regions of the canton the population is mainly engaged in pastoral pursuits and cattle-breeding. There are 61 " alps," or high pastures, in the canton. At Cham is a well-known factory of condensed milk, now united with that of Nestle of Vevey. At Baar there arc extensive cotton-spinning mills and other factories. Round the town of Zug there are great numbers of fruit trees, and " Kirschwasser " (cherry- water) and cider are largely manufactured. Apiculture too flourishes greatly. A number of factories have sprung up in the new quarter of the town, but the silk-weaving industry has all but disappeared. The canton forms a single administrative district, which comprises eleven communes. The legislature, or Kantonsrat, has one member to every 350 inhabitants, and the seven members of the executive, or Regierungsrat, are elected directly by popular vote, proportional representation obtaining in both cases if more than two members are to be elected in the same electoral district to posts in the same

authority. The term of office in both cases is four years. Besides the " facultative Referendum " by which, in case of a demand by one-third of the members of the legislative assembly, or by 800 citizens, any law, and any resolution involving a capital expenditure of 40,000, or an annual one of 10,000 francs, must be submitted to a direct popular vote, and the " initiative " at the demand of 1000 citizens in case of amendments to the cantonal constitution; there is also an " initiative " in case of bills, to be exercised at the demand of 800 citizens. The two members of the Federal Stdnderat, as well as the one member of the Federal Nationalrat, are also elected by a popular vote.

The earlier history of the canton is practically identical with that of its capital Zug (see below). From 1728 to 1738 it was distracted by violent disputes about the distribution of the French pensions. In 1798 its inhabitants opposed the French, and the canton formed part of the Tellgau, and later of one of the districts of the huge canton of the Waldstatten in the Helvetic republic. In 1803 it regained its independence as a separate canton, and by the constitution of 1814 the " Landsge- meinde," or assembly of all the citizens, which had existed for both districts since 1376, became a body of electors to choose a cantonal council. The reform movement of 1850 did not affect the canton, which in 1845 was a member of the Sonderbund and shared in the war of 1847. In 1848 the remaining functions of the Landsgemctndc were abolished. Both in 1848 and in 1S74

the canton voted against the acceptance of the federal constitutions. The constitution of 1S73-76 was amended in 1881, and was replaced by a new one in 1894.

Authorities. — J. J. Blumer, Staats- und Rechtsgeschichte der schweiz. Demokr alien, 3 vols. (St. Gall, 1850-9); Gesckichtsfreund, from 1843; A. Lutolf, Sagen, Brauche, Legenden aus den fiinf Orten (Lucerne, 1862); Achille Renaud, Staats- und Rechtsgeschichte d. Kant. Zug (Pforzheim, 1847); H. P.yffel, Die schweiz. Landsge- meinden (Zurich, 1903); F. K. Stadlin, Die Topographic d. Kant. Zug, 4 parts (Lucerne, 1819-24); B. Staub, Der Kant. Zug, 2nd ed. (?ug, 1869); A. Striiby, Die Alp- und Weidewirthschajt im Kant. Zuz fSoleure, 1901); and the Zugerisches Neujahrsblatt (Zug from i&h). (W. A. B. C.)

ZUG, capital of the Swiss canton of that name, a picturesque little town at the N.E. corner of the lake of Zug, and at the foot of the Zugcrberg (3255 ft.), which rises gradually, its lower slopes thickly covered with fruit trees. Pop. (1900) 6508, mainly German-speaking and Romanists. The lake shore has been embanked and forms a promenade, whence glorious views of the snowy peaks of the Bernese Oberland, as well as of the Rigi and Pilatus, are gained. Towards its northerly end a monument marks the spot where a part of the shore slipped into the lake in 1887. The older part of the town is rather crowded together, though only four of the wall towers and a small part of the town walls still survive. The most striking old building in the town is the parish church of St Oswald (late 15th century), dedicated to St Oswald, king of Northumbria (d. 642), one of whose arms was brought to Zug in 1485. The town hall, also a 1 5th-century building, now houses the Historical and Antiquarian Museum. There are some quaint old painted houses close by. A little way higher up the hill-side is a Capuchin convent in a striking position, close to the town wall and leaning against it. Still higher, and outside the old town, is the fine new parish church of St Michael, consecrated in 1902. The business quarter is on the rising ground north of the old town, near the railway station. Several fine modern buildings rise on or close to the shore in the town and to its south, whilst to the south- west is a convent of Capuchin nuns, who manage a large girls' school, and several other educational establishments.

The town, first mentioned in 1240, is called an "oppidum" in 1242, and a " castrum " in 1255. In 1273 it was bought by Rudolph of Habsburg from Anna, the heiress of Kyburg and wife of Eberhard, head of the cadet line of Habsburg, and in 127S part of its territory, the valley of Aegeri, was pledged by Rudolph as security for a portion of the marriage gift he promised to Joanna, daughter of Edward I. of England, who was betrothed to his son Ilartmann, whose death in 1281 prevented the marriage from taking place. The town of Zug was governed by a bailiff, appointed by the

Habsburgs, and a council, and was much favoured by that family. Several country districts

(Baar, Menzingen, and Aegeri) had each its own " Landsge- meinde " but were governed by one bailiff, also appointed by the Habsburgs; these were known as the " Aeusser Amt," and were always favourably disposed to the Confederates. On the 27th of June 1352 both the town of Zug and the Aeusser Amt entered the Swiss Confederation, the latter being received on exactly the same terms as the town, and not, as was usual in the case of country districts, as a subject land; but in September 1352 Zug had to acknowledge its own lords again, and in 1355 to break off its connexion with the league. About 1364 the town and the Aeusser Amt were recovered for the league by the men of Schwyz, and from this time Zug took part as a full member in all the acts of the league. In 1379 the German king Wenccs- laus exempted Zug from all external jurisdictions, and in 1389 the Habsburgs renounced their claims, reserving only an annual payment of twenty silver marks, and this came to an end in 141 5. In 1400 Wenceslaus gave all criminal jurisdiction to the town only. The Aeusser Amt then, in 1404, claimed that the banner and seal of Zug should be kept in one of the country districts, and were supported in this claim by Schwyz. The matter was finally settled in 1414 by arbitration and the banner was to be kept in the town. Finally in 1415 the right of electing their " landammann " was given to Zug by the Confederates, and a share in the criminal jurisdiction was granted to the Aeusser Amt by the German king Sigismund. In 1385 Zug joined the league of the Swabian cities against Leopold of Habsburg and shared in the victory of Sempach, as well as in the various Argovian (141 5) and Thurgovian (1460) conquests of the Confederates, and later iit those in Italy (1512), having already taken part in the occupation of the Val d'Ossola. Be- tween 1379 (Walchwil) and 1477 (Cham) Zug had acquired various districts in her own neighbourhood, principally to the north and the west, which were ruled till 1798 by the town alone as subject lands. At the time of the Reformation Zug clung to the old faith and was a member of the " Christliche Vereinigung " of 1529. In 1586 it became a member of the Golden League. (W. A. B. C.)

ZUG, LAKE OF, one of the minor Swiss lakes, on the out- skirts of the Alps and N. of that of Lucerne. Probably at some former date it was connected by means of the Lake of Lowerz and the plain of Brunnen with the Lake of Lucerne. At present it is formed by the Aa, which descends from the Rigi and enters the southern extremity of the lake. The Lorze pours its waters into the lake at its northern extremity, but if m. further W. issues from the lake to pursue its course towards the Reuss. The Lake of Zug has an area of about 15 sq. m., is about 9 m. in length, i\ m. in breadth, and has a maximum depth of 650 ft., while its surface is 1368 ft. above sea-level. For

the most part the lake is in the Canton of Zug, but the southern end is, to the extent of 3I sq. m., in that of Schwyz, while the Canton of Lucerne claims about § sq. m., to the N. of Immensee. Toward the S.W. extremity of the lake the Rigi descends rather steeply to the water's edge, while part of its east shore forms a narrow level band at the foot of the Rossberg (5194 ft.) and the Zugerberg. At its northern end the shores are nearly level, while on the west shore the wooded promontory of Buonas (with its castlce, old and new) projects picturesquely into the waters. The principal place on the lake is the town of Zug, whence a railway (formerly part of the St Gotthard main route) runs along its eastern shore past Walchwil to Arth at its south end, which is con- nected by a steam tramway with the Arth-Goldau station of the St Gotthard line. This line runs from Arth along the western shore to Immensee, where it bears S.W. to Lucerne, while from Immensee another railway leads (at first some way from the shore) to Cham, 3 m. W. of Zug. The first steamer was placed on the lake in 1852. Many fish (including pike and carp of considerable weights) are taken in the lake, which is especially famous by reason of a peculiar kind of trout (Salmo salveiinus, locally called Rotheli). (W. A. B. C.)

ZUHAIR [Zuhair ibn Abi Sulma Rabi' a ul-Muzanl] (6th century), one of the six great Arabian pre-Islamic poets. Of his life practically nothing is known save that he belonged to.

a family of poetic power; his stepfather, Aus ibn Hajar, his sister, Khansa, and his son, Ka'b ibn Zuhair, were all poets of eminence. He is said to have lived long, and at the age of one hundred to have met Mahomet. His home was in the land of the Bam Ghatafan. His poems are characterized by their peaceful nature and a sententious moralizing. One of them is contained in the Moallakat.

As a whole his poems have been published by W. Ahlwardt in his The Diwans of the six Ancient Arabic Poets (London, 1870); and with the commentary of al-A'lam (died 1083) by Count Landberg in the second part of his Primeurs arahes (Leiden, 1889). Some supplementary poems are contained in K. Dyron's Zur Gesckichte der Uberlieferung des Zuhairdiwans (Munich, 1892). (G- W. T.)

ZUIDER ZEE, or Zuyder Zee, a land-locked Inlet on the coast of Holland, bounded N. by the chain of the Frisian Islands, and W., S., and E. by the provinces of North Holland, Utrecht, Gelderland, Overysel, and Friesland. It is about 85 m. long N. to S., and from 10 to 45 m. broad, with an area

of 2027 sq. m., and contains the islands of Marken, Schokland, Urk, Wierin- gen, and Griend. In the early centuries of the Christian era the Zuider {i.e. Southern) Zee was a small inland lake situated in the southern part of the present gulf, and called Flevo by Tacitus, Pliny, and other early writers. It was separated from the sea by a belt of marsh and fen uniting Friesland and North Holland, the original coast-line being still indicated by the line of the Frisian Islands. Numerous streams, including the Vecht, Eem, and Ysel, discharged their waters into this lake and issued thence as the Vlie (Latin Flevus), which reached the North Sea by the Vliegat between the islands of Vlieland and Terschelling. In the Lex Frisonum the Vlie (Fli, or Flehi) is accepted as the boundary between the territory of the East and West Frisians. In time, however, and especially during the 1 2th century, high tides and north-west storms swept away the western banks of the Vlie and submerged great tracts of land. In 1 1 70 the land between Stavoren, Texel, and Medemblik was washed away, and a century later the Zuider Zee was formed. The open waterway between Stavoren and Enkhuisen, however, as it now exists, dates from 1400. In the south and east the destruction was arrested by the high sandy shores of Gooi, Veluwe, Voorst, and Gasterland in the provinces of Utrecht, Gelderland, Overysel, and Friesland respectively.

The mean depth of the Zuider Zee is 11-48 ft.; depth in the southern basin of the former lake, 19 ft.; at Val van Urk (deep water to the west of the island of Urk), 14I ft. If a line be drawn from the island of Urk to Marken, and thence westwards to Hoorn (North Holland) and N.N.E. to Lemmer (Friesland), these lines will connect parts of the Zuider Zee having a uniform depth of 8 ft. The other parts on the coast are only 3 ft. deep or less. This shallowness of its waters served to protect the Zuider Zee from the invasion of large ships of war. It also explains how many once flourishing commercial towns, such as Stavoren, Medemblik, Enkhuizen, Hoorn, Monnikendam, declined to the rank of orovincial trading and fishing ports. The fisheries of the Zuider Zee are of considerable importance. Eighty per cent, of the bottom consists of sea clay and the more recent silt of the Ysel ; 20 per cent, of sand, partly in the north about Urk and Enkhuizen, partly in the south along the high shores of Gooi, Veluwe, &c. The shallowness of the sea and the character of its bottom, promising fertile soil, occasioned various projects of drainage. The scheme recommended by the Zuider Zee Vereeniging (1886) formed the subject of a report in 1894 by a state commission. The principal feature in the scheme was the building of a dike from the island of Wieringen to the coast of Friesland. The area south of this would be divided into four polders, with reservation, however, of a lake, Yselmeer, in the centre, whence branches would run to Ysel and the Zwolschc Diep, to Amsterdam, and, by sluices near Wieringen, to the northern part of the sea. The four polders with their

areas of fertile soil would be: —

(1) North-west polder, area 53,599 acres; fertile soil, 46,189 acres.

(2) South-west ,, ,, 77,854 ,, ,, ,, 68,715 ,,

(3) South-east ,, ,, 266,167 ,, ,, ,, 222,275 ,,

(4) North-east ,, „ 125,599 ,, ,, ,, 120,783

The Lake Yselmeer would have an area of 560 sq. m. The gain would be the addition to the kingdom of a new and fertile pro- vince of the area of North Brabant, a saving of expenses on dikes, diminution of inundations, improvement of communication between the south and the north of the kingdom, protection of isles of the sea, &c The costs were calculated as follows: (1) enclosing dike,

sluices, and regulation of Zwolsche Diep, £1,760,000; (2) reclama- tion of four polders, £5,200,000; (3) defensive works, £400,000; (4) indemnity to fishermen, £180,000; total, £7,540,000.

In 1901 the government introduced a bill in the States General, based on the recommendations of the commission, providing for enclosing the Zuider Zee by building a dike from the North Holland coast, through the Amsteldiep to Wieringen and from that island to the Friesland coast at Piaam ; and further providing for the draining of two portions of the enclosed area, namely the N.W. and the S.W. polders shown in the table. The entire work was to be completed in 18 years at an estimated cost of £7,916,000. The bill failed to become law and in consequence of financial diffi- culties the project had not, up to 1910, advanced beyond the stage of consideration.

With the exception of Griend and Schokland, the islands of the Zuider Zee are inhabited by small fishing communities, who retain some archaic customs and a picturesque dress. Urk is already mentioned as an island in 966. The inhabitants of Schokland were compelled to leave the island by order of the state in 1859, it being considered insecure from inundation. The island of Griend (or Grind) once boasted a walled town, which was destroyed by flood at the end of the 13th century. But the island continued for some centuries to serve as a pasturage for cattle, giving its name to a well-known description of cheese. Like some of the other islands, sheep are still brought to graze upon it in summer, and a large number of birds' eggs are collected upon it in spring. Several of the islands were once the property of religious houses on the mainland.

The British Foreign Office report, Draining of ike Zuiderzee (1901), gives

full particulars of the Dutch government's scheme and a retrospect of all former proposals. See also De economische beteekens van de afsluiting en drcoglegging der Zuiderzee vom Zuiderzee- Verein (2nd ed., 1901), and D. Bellet, " Le dessechement du Zuiderzee," Rev. Geog. (1902) and W. J. Tuyn, Oude I-Iollandsche Dorpen aan de Zuiderzee (Haarlem, 1900).

ZULA, a small town near the head of Annesley Bay on the African coast of the Red Sea. It derives its chief interest from ruins in its vicinity which are generally supposed to mark the site of the ancient emporium of Adulis ("ASoiAis, 'AdovKd), the port of Axum (q.v.) and chief outlet in the early centuries of the Christian era for the ivory, hides, slaves and other exports of the interior. Cosmas Indicopleustes saw here an inscription of Ptolemy Eucrgetes (247-222 B.C.); and hence, as the earliest mention of Adulis is found in the geographers of the first century a.d.j it is conjectured that the town must have previously existed under another name and may have been the Berenice Panchrysus of the Ptolemies. Described by a Greek merchant of the time of Vespasian as " a well-arranged market/' the place has been for centuries buried under sand. The ruins visible include a temple, obelisks and numerous fragments of columns.

In 1857 an agreement was entered into by Dejaj Negusye, a chief of Tigre, in revolt against the Negus Theodore of Abyssinia, to cede ZuTa to the French. Negusye was defeated by Theodore, and the commander of a French cruiser sent to Annesley Bay in 1859 found the country in a state of anarchy. No farther steps were taken by France to assert its sovereignty, and Zula with the neighbouring coast passed, nominally, to Egypt in 1S66. Zula was the place where the British expedition of 1867-68 against Theodore disembarked, Annesley Bay affording safe and ample anchorage _ for the largest ocean-going vessels. The road made by the British from Zula to Senafe on the Abyssinian plateau is still in use. The authority of Egypt having lapsed, an Italian protectorate over the district of Zula was proclaimed in 1888, and in 1890 it was incorporated in the colony of Eritrea {q.v.).

See Eduard Ruppell, Reise in Abyssinien, i. 266 (1838); G. Rohlfs in Zeitschr. d. Gesell. f. Erdkunde in Berlin, Hi. (1868), and, for further references, the editions of the Periplus by C. Mtiller {Geog. Gr. Min., i. 259) and Fabricius (1883). Consult also Etiiiofia: The Axumite Kingdom.

ZULOAGA, IGNACIO (1870-), Spanish painter, was bom at Eibar, in the Basque country, the son of the metal- worker and damascener Placido Zuloaga, and grandson of the organizer and director of the royal armoury in Madrid. The career chosen for him by his father was that of an architect, and with this object in view he was sent to Rome, where he immediately followed the strong impulse that led him to paint- ing. After

only six months' work he completed his first picture, which was exhibited at the Paris Salon of 1890. Continuing his studies in Paris, he was strongly influenced by Gauguin and Toulouse Lautrec. Only on his return to his native soil he found his true style, which is based en the national Spanish

tradition embodied in the work of Velazquez, Zurbaran, El Greco, and Goya. His own country was slow in acknowledging the young artist whose strong, decorative, rugged style was the very negation of the aims of such well-known modern Spanish artists as Fortuny, Madrazo, and Benlliure. It was first in Paris, and then in Brussels and other continental art centres, that Zuloaga was hailed by the reformers as the regenerator of Spanish national art and as the leader of a school. He is now represented in almost every great continental gallery. Two of his canvases are at the Luxembourg, one at the Brussels Museum (" Avant la Corrida"), and one ("The Poet Don Miguel") at the Vienna Gallery. The Pau Museum owns an interesting portrait of a lady, the Barcelona Municipal Museum the important group " Amies," the Venice Gallery, " Madame Louise"; the Berlin Gallery, "The Topers." Other examples are in the Budapest, Stuttgart, Ghent and Posen galleries and in many important private collections.

A fully illustrated account of the artist and his work, by M. Utrillo, was published in a special number of Forma (Barcelona, 1907).

ZULULAND, a country of south-east Africa, forming the N.E. part of the province of Natal in the Union of South Africa. The " Province of Zululand," as it was officially styled from 1898 to 1010, lies between 26 50′ and 2a 15′ S. and 30° 40′ and 33 E., and has an area of 10,450 sq. m. It includes in the north the country of the Ama Tonga, Zaambanland, and other small territories not part of the former Zulu kingdom and stretches north from the lower Tugela to the southern frontier of Portuguese East Africa. Bounded S.E. by the Indian Ocean it has a coast line of 210 m. North and north-west it is bounded by the Utrecht and Vryheid districts of Natal and by Swaziland. Its greatest length in a direct line is 185 m., its greatest breadth 105 m. (For map see South Africa.)

Physical Features. — Zululand is part of the region of hills and plateaus which descend seaward from the Drakensberg— the great mountain chain which buttresses the vast tableland of inner South Africa. The coast, which curves to the N.E. T is marked by a line of sandhills covered with thick bush and rising in places to a height of 500 ft. There are occasional outcrops uf rock and low per- pendicular cliffs. Behind the sandhills is a

low-lying plain in which are a number of shallow lagoons. Of these St Lucia Lake and Kosi Lake are of considerable size and communicate with the sea by estuaries. St Lucia, the larger of the two, is some 35 m. long by 10 m. broad with a depth of 9 to 10 ft. It runs parallel to the ocean, from which it is separated by sandhills. The opening to the sea, St Lucia river, is at the south end. Kosi Lake lies further north, in Tongaland. It is not more than half the size of St Lucia and its opening to the sea is northward. Between Kosi and St Lucia lakes lies Lake Sibayi, close to the coast but not communicating with the sea. The coast plain extends inland from 5 to 30 m., increasing in width northward, the whole of Tonga- land being low lying. The rest of the country is occupied by ranges of hills and plateaus 2000 to 4000 ft. above sea level. Behind Eshowc, in the south, are the Entumeni Hills (3000 ft.), beyond which stretch the Nkandhla uplands (rising to 4500 ft.) densely wooded in parts and abounding in flat-topped hills with precipitous sides. Westward of the uplands are the Kyudeni Hills (5000 ft.), also densely wooded, situated near the junction of the SufTalo and TugeJa rivers. Further north, along the S.W. frontier, are Isandhlwana and the Nqutu hills. To the N.W. the Lebombo Mts. (1800 to 2000 ft.), which separate the coast plains from the interior, mark the frontier between Swaziland and Zululand. On their eastern (Zululand) side the slope of the Lebombo mountains is gentle, but on the west they fall abruptly to the plain.

The geological structure of the country is comparatively simple, consisting in the main of plateaus formed of sedimentary rocks, resting on a platform of granitic and metamorphic rocks (see Natal: Geology).

The country is well watered. Rising in the high tablelands or on the slopes of the Drakensberg or Lebombo mountains the rivers in their upper courses have a great slope and a high velocity. In the coast plains they become deep and sluggish. Their mouths are blocked by sand bars, which in the dry season check their flow and produce the lagoons and marshes which characterize the coast. After the rains the rivers usually clear the bars for a time. The following are the chief rivers in part or in whole traversing the country: — The Pongola, in its lower course, flows through Tongaland, piercing the Lebombo Mts, through a deep, narrow gorge with precipitous sides. Its point of confluence with the Maputa (which empties into Delagoa Bay) marks the parallel along which the frontier between Zululand and Portuguese East Africa is drawn. The Umgavuma which rises in Swaziland and also

pierces the Lebombo, joins the Pongola about ten miles above its confluence with the Maputa. The Umkuzi which rises in the Vryheid district of Natal forces its way through the Lebombo Mts. at their southern end and flows into the northern end of St Lucia Lake. The Umfolpsi, with two main

branches, the Black and White Umfolosi, drains the central part of the country and reaches the ocean at St Lucia Bay. In the bed of the White Umfolosi are dangerous quicksands. Farther south the Umhla- tuzi empties into a lagoon which communicates with the ocean by Richards Bay. For a considerable part of their course the Blood, Buffalo and Tugela rivers form the S.W. frontier of Zulu- land (see Tugela). There are numerous other rivers— every valley has its stream, for the most part unnavigable.

Climate.— The climate of the coast belt is semi-tropical and malaria is prevalent; that of the highlands temperate. The summer is the rainy season, but in the higher country snow and sleet are not uncommon in the winter months of 'May,' June and July. On the coast about 40 in. of rain fall in the summer months and about 7 in. in the winter months. A fresh S.E. wind is fairly constant in the inland regions during the middle of the day. A hot wind from the N.W. is occasionally experienced in the high- lands. •

Flora and Fauna,— The coast plain (in large part), the river valleys, and the eastern sides of the lower hills are covered with mimosa and other thorn trees. This is generally known as thorn- bush and has little undergrowth. " Coast forests " grow in small patches along the lower courses of the rivers, at their mouths, and on the sandhills along the coast. They contain stunted timber trees, palms, mangroves and other tropical and sub-tropical plants and have an almost impenetrable undergrowth. The largest coast forest is that of Dukuduku, some 9 m. by 15 m. in extent, adjacent to St Lucia Bay. The upland regions are those of high timber forests, the trees including the yellow- wood and iron- wood. The most noteworthy timber forests are those of Nkandhla and Kyudeni and that near Eshowe. Large areas of the plateau are covered with grass and occasional thorn trees. Orchids are among the common flowers.

The fauna includes the lion and elephant, found in the neigh- bourhood of the Portuguese frontier (the lion was also found as late as 1895 in the Ndwandwe district), the white and the black rhinoceros, the leopard, panther, jackal, spotted hyena, aard-wolf, buffalo, zebra, gnu, impala, inyala, oribi, hartebeeste, kudu, spring- bok, waterbuck, eland, roan antelope, duiker, See, hares and rabbits. Hippopotami are found on the coast, and alligators are common in the rivers and lagoons of the low country- Venomous snakes abound. The great kori bustard, the koorhan, turkey buzzards (known as insingisi), wild duck, and paauw are among the game birds. The ostrich and secretary-bird are also found. Of domestic animals the Zulus possess a dwarf breed of smooth-skinned humped cattle. Locusts are an occasional pest.

Inhabitants. — The population in 1904 was estimated at 230,000. Of these only 5635 lived outside the area devoted to native locations. The

white population numbered 1693, The vast majority of the natives are Zulu (see Kaffirs), but there is a settlement of some 2000 Basutos in the Nqutu district. After the establishment of the Zulu military ascendancy early in the 19th century various Zulu hordes successively invaded and overran a great part of east-central Africa, as far as and even beyond the Lake Nyasa district. Throughout these regions they are variously known as Ma-Zitu, Ma-Ravi, Wa-Ngoni (Angoni), Matabele (Ame-Ndebeli), Ma-Viti, and Aba-Zanzi. Such was the terror inspired by these fierce warriors that many of the tribes, such as the Wa-Nindi of Mozambique, adopted the name of their conquerors or oppressors. Hence the impres- sion that the true Zulu are far more numerous north of the Limpopo than has ever been the case. In most places they have become, extinct or absorbed in the surrounding populations owing to their habit of incorporating prisoners in the tribe. But they still hold their ground as the ruling element in the region between the Limpopo and the middle Zambezi, which from them takes the name of Matabeleland. The circumstances and history of the two chief migrations of Zulu peoples north- ward are well known; the Matabele were led by Mosilikatze (Umsiligazi), and the Angoni by Sungandaba, both chiefs of Chaka who revolted from him in the early 19th century.

The Zulu possess an elaborate system of laws regulating the inheritance of personal property (which consists chiefly of cattle), the complexity arising from the practice of polygamy and the exchange of cattle made upon marriage. The giving of cattle in the latter case is generally referred to as a barter and sale of the bride, from which indeed it is not easily distinguishable. But it is regarded in a different light by the natives. The kraal is

under the immediate rule of its headman, who is a patriarch respon- sible for the good behaviour of all its members. Over the headman, whose authority may extend to more than one kraal, is the tribal chief, and above the tribal chief was the king, whose authority is now exercised by a British commissioner. By the custom of Idonipa a woman carefully avoids meeting her husband's parents or the utterance of any word which occurs in the names of the principal members of her husband's family: e.g. if she have a brother-in-law named U'Nkomo, she would not use the Zulu for "cow," inkotno, but would invent some other word for it. The huaband observes the same custom with regard to his mother-in- law. The employment of "witch doctors 'for " smelliqg out" criminals or abatagati (usually translated " wizards," but meaning evildoers of any kind, such as poisoners), once common m Zulu- land- as in neighbouring countries, was

discouraged by Cetywayo, who established " kraals of refuge " for the reception of persons rescued by him from condemnation as abatagati. " Smelling out " was finally suppressed by the British in the early years of the 20th century. (For the Zulu speech, see Bantu LANGUAGES.)

Towns. — The Zulus live in kraals, circular enclosures with, generally, a ring fence inside forming a cattle pen. Between this fence and the outer fencing are the huts of the inhabitants. The royal kraal for a considerable period was at Ulundi, 111 the valley of the White Umfolosi. The last king to occupy it was Cetywayo; Dinizulu's kraal was farther north near the Ndwanciwe magistracy. The chief white settlements are Eshowe and Melmoth. Eshowe (pop. 1904, 1855 of whom 570 were whites) is about 95 m. N.E. of Durban, lies 15 m. inland and some 1800 ft. above the sea. Eshowe is 2 m. W. of the mission station of the same name in which Col. Pearson was besieged by the Zulus in 1879, and was laid out in 1883. It is picturesquely situated on a well-wooded plateau and has a bracing climate. Two hundred acres of forest land in the centre of the town have been reserved as a natural park. Melmoth, 25 m. N.N.E. of Eshowe, lies in the centre of a district farmed by Boers. Somkele is the headquarters of the St Lucia coal-fields district. Nkandhla is a small settlement in the south-west of the country.

Communications. — Notwithstanding its 2 10 m. of coast line Zulu land possesses no harbours. Thirty-six miles N.E. of the mouth of the Tugela there is, however, fairly safe anchorage, except in S.S.W. or W. winds, about 1500 yds. from the shore. The landing- place is on the open sandy beach, where a small stream enters the sea. This landing-place is dignified with the name of Port Durn- ford. It was used to land stores in the war of 1879. Well-made roads connect all the magistracies. The Tugela is crossed by well-known drifts, to which roads from Natal and Zululand con- verge. Two, the Lower Tugela and Bond's Drift, are both near the mouth of the river. The Middle Drift is 36 m. in a direct line above the mouth of the Tugela. Rorke's Drift, 48 m., also in a direct line, above the Middle Drift, is a crossing of the Buffalo river a little above the Tugela confluence. A railway, completed in 1904, which begins at Durban and crosses into Zululand by a bridge over the Tugela near the Lower Drift, runs along the coast belt over nearly level country to the St Lucia coal-fields in Hlabisa magistracy — 167 m. from Durban, of which 98 are in Zululand. There is telegraphic communication between the magistracies and townships and with Natal.

Industries. — The Zulu gives little attention to the cultivation of the soil. Their main wealth consists in their herds of cattle and flocks of sheep. They raise, however, crops of maize, millet, sweet potatoes and tobacco. Sugar, tea and coffee are grown in the coast belt by whites. Anthracite is mined in

the St Lucia Bay district, and bituminous coal is found in the Nqutu and Kyudem hills. Gold, iron, copper and other minerals have also been found, but the mineral wealth of the country is undeveloped. There is a considerable trade with the natives in cotton goods, &c, and numbers of Zulu seek service in Natal. (Trade statistics are included in those of Natal.)

Administration. — Zululand for provincial purposes is governed by the provincial council of Natal; otherwise it is subject to the Union parliament, to which it returns one member of the House of Assembly. It was formerly represented in the Natal legis- lature by three members, one member sitting in the Legislative Council, and two being elected to the Legislative Assembly, one each for the districts of Eshowe and Melmoth. Their selection and election were governed by the same laws as in Natal proper^ and on the establishment of the Union the franchise qualifications — which practically exclude natives — remained unaltered. The parliamentary voters in 1910 numbered 1442. The executive power is in the hands of a civil commissioner whose residence is at Eshowe. Zululand is divided into eleven magistracies, and the district of Tongaland (also called Mputa or Amaputaland). In the magistracies the authority of the chiefs and indumas (headmen) is exercised under the control of resident magistrates. The Ama-Tonga enjoy a larger measure of home rule, but are under the general supervision oi the civil commissioner. The Ingwavuma magistracy, like Tongaland, formed no part of the dominions of the Zulu kings, but was ruled by independent chiefs until its annexa- tion by Great Britain in 1895.

With the exception of the townships and a district of Emton- janeni magistracy known as " Proviso B," 1 mainly occupied by Boer farmers, all the land was vested in the crown and very little has been parted with to Europeans. The crown lands are, in effect, native reserves. A hut tax of 14s. per annum is levied on all natives. The tax has to be paid for each wife a Zulu may possess, whether or not each wife has a separate hut. Since 1906 a poll tax of £1 a head is also levied on all males over eighteen, European or native.

History.— At what period the Zulu (one of a number of closely allied septs) first reached the country to which they have given their name is uncertain; they were probably settled in the valley of the White Umfolosi river at the beginning of the 17th century, and they take their name from a chief who flourished about that time. The earliest record of contact between Europeans and the Zulu race is believed to be the account of the wreck of the " Doddington " in 1756. The survivors met with hospitable treatment at the hands of the natives of Natal, and afterwards proceeded up the coast to St Lucia Bay. They describe the natives as " very proud and haughty, and not so accommodating as those lately left." They differed from the other natives in the superior neatness of their method of preparing their food, and

were more cleanly in their persons, bathing every morning, apparently as an act of devotion. Their chief pride seemed to be to keep their hair in order. It is added . that they watched strictly over their women.

At the close of the 18th century the Zulu were an unimportant tribe numbering a few thousands only. At that time the most powerful of the neighbouring tribes was the Umtetwa (mTetwa or Aba-Tetwa) which dwelt in the country north-east of the Tugela. The ruler of the Umtetwa was a chief who had had in early life an adventurous career and was known as Dingiswayo (the Wanderer). He had lived in Cape. Colony, and #/ se there, as is supposed, had observed the manner in of the which the whites formed their soldiers into disciplined Zulu regiments. He too divided the young men of his aa on ‘ tribe into impis (regiments), and the Umtetwa became a. formid- able military power. Dingiswayo also encouraged trade and opened relations with the Portuguese at Delagoa Bay, bartering ivory and oxen for brass and beads. In 1805 he was joined by Chaka, otherwise Tshaka (born c. 1783), the son of the Zulu chief Senzangakona; on the latter’s death in 1810 Chaka, through the influence of Dingiswayo, was chosen as ruler of the Ama-Zulu, though not the rightful heir. Chaka joined in his patron’s raids, and in 1812 the Umtetwa and Zulu drove the Amangwana across the Buffalo river. About this time Dingis- wayo was captured and put to death by Zwide, chief of the Undwandwe clan, with whom he had waged constant war. The Umtetwa army then placed themselves under Chaka, who not long afterwards conquered the Undwandwe. By the incorpora- tion of these tribes Chaka made of the Zulu a power- chaka ful nation. He strengthened the regimental system adopted by Dingiswayo and perfected the discipline of his army. A new order of battle was adopted— the troops being massed in crescent formation, with a reserve in the shape of a parallelo- gram ready to strengthen the weakest point. 2 Probably Chaka’s greatest innovation was the introduction of the stabbing assegai. The breaking short of the shaft of the assegai when the weapon was used at close quarters was already a common practice among the Ama-Zulu, but Chaka had the shaft of the assegais made short, and their blades longer and heavier, so that they could be used for cutting or piercing. At the same time the size of the shield was increased, the more completely to cover the body of the warrior. Military kraals were formed in which the warriors

1 The Boers obtained the right to settle in this district in virtue of Proviso B of an agreement made, on the 22nd of October 1886, between the settlers in the ” New Republic ” and Sir A. E. Have- lock, governor of Natal.

2 Dr G. McCall Theal states that the ancestors of the tribes living in what is now Natal and Zululand were acquainted with the regimental system and the method of attack in crescent shape formation in the 17th century.

Memories of these customs lingered even if the practice had died out. Among the Ama-Xosa section of Kaffirs they apjwar to have been quite unknown.

were kept apart. Members of a regiment were of much the same age, and the young warriors were forbidden to marry until they bad distinguished themselves in battle.

Chaka had but two ways of dealing with the tribes with whom he came in contact; either they received permission to be incorporated in the Zulu nation or they were practically exterminated. In the latter case the only persons spared were young girls and growing lads who could serve as carriers for the army. No tribe against which he waged war was able successfully to oppose the Zulu arms. At first Chaka turned his attention northward. Those who could fled before him, the first of importance so to do being a chief named Swangendaba (Sungandaba), whose tribe, of the same stock as the Zulu, was known as Angoni. He. was followed by another tribe, which under Manikusa for many years ravaged the district around and north of Dclagoa Bay (see Gazaland). Chaka next attacked the tribes on his southern border, and by 1820 had made himself master of Natal, which he swept almost clear of in- habitants. It was about 1820 that Mosilikatze (properly Umsilikazi), a general in the Zulu army, having incurred Chaka's wrath by keeping back part of the booty taken in an expedition, fled with a large following across the Drakensberg and began to lay waste a great part of the country between the Vaal and Limpopo rivers. Mosilikatze was not of the Zulu tribe proper, and he and his followers styled themselves Abaka-Zulu. Chaka's own dominions, despite his conquests, were not very extensive. He ruled from the Pongolo river on the north to the Umkomanzi river on the south, and inland his power extended to the foot of the Drakensberg; thus his territory coincided almost exactly with the limits of Zululand and Natal as constituted in 1903. His influence, however, extended from the Limpopo to the borders of Cape Colony, and through the ravages of Swangen- daba and Mosilikatze the terror of the Zulu arms was carried far and wide into the interior of the continent.

Chaka seems to have first come into contact with Europeans in 1824. In that year (see Natal) he was visited by F. G. Arrival Farewell and a few companions, and to them he made of the a grant of the district of Port Natal. Farewell found

British, (he kj n g a t Umgungindhlovu, the royal kraal on the White

Umfolosi, " surrounded by a large number of chiefs' and about Scoo or 9000 armed men, observing a state and ceremony in our introduction little expected." At this time an attempt was made to murder Chaka; but the wound he received was cured by one of Farewell's companions, a circumstance which made the king very friendly to Europeans. Anxious to open a political connexion with the Cape and British governments, Chaka entrusted early in rS28 one of his principal chiefs, Sotobi, and a companion to the care of J. S. King, one of the Natal settlers, to be conducted on an embassage to Cape Town, Sotobi being commissioned to proceed to the king of England. But they were not allowed to proceed beyond Port Elizabeth, and three months later were sent back to Zululand. In July of the same year Chaka sent an army westward which laid waste the Pondo country. The Zulu force did not come into contact with the British troops guarding the Cape frontier, but much alarm was caused by the invasion. In November envoys from Chaka reached Cape Town, and it was determined to send a British officer to Zululand to confer with him. Before this embassy started, news came that Chaka had been murdered (23rd of September 1828) at a military kraal on the Umvote about fifty miles from Port Natal. Chaka was a victim to a conspiracy by his half brothers Dingaan and Umthlangana, while a short time afterwards Dingaan murdered Umthlangana, overcame the opposition of a third brother, and made himself king of the Zulu.

Bloodstained as had been Chaka's rule, that of Dingaan appears to have exceeded it in wanton cruelty, as is attested by several trustworthy European travellers and Dingaan. merc } larl t s w jj now w ;th some frequency visited Zululand. The British settlers at Port Natal were alternately terrorized and conciliated. In 1835 Dingaan gave permission to the British settlers at Port Natal to establish missionary

stations in the country, in return for a promise made by the settlers not to harbour fugitives from his dominions. In r836 American missionaries were also allowed to open stations; in 1837 he permitted the Rev. F. Owen, of the Church Missionary Society, to reside at his great kraal, and Owen was with the king when in November 1837 he received Pieter Retief, thf leader of the first party of Boer immigrants to enter Natal.

Coming over the Drakensberg in considerable numbers during r837, the Boers found the land stretching south from the mountains almost deserted, and Retief went to Arrival Dingaan to obtain a formal cession of the country of the west of the Tugela, which river the Zulu recognized Bom. as the boundary of Zululand proper. After agreeing to Retief's request Dingaan caused the Boer leader and his companions to be murdered (6th of February 1838), following up his treachery by slaying as many as possible of the other Boers who had entered Natal. After two unsuccessful

attempts to avenge their slain, in which the Boers were aided by the British settlers at Port Natal, Dingaan's army was totally defeated on the 16th of December 1838, by a Boer force under Andries Pretorius. Operating in open country, mounted on horseback, and with rifles in their hands, the Boer farmers were able to inflict fearful losses on their enemy, while their own casualties were few. On " Dingaan's day " the Boer force received the attack of the Zulu while in laager; the enemy charged in dense masses, being met both by cannon shot and rifle fire, and were presently attacked in the rear by mounted Boers. After the defeat Dingaan set fire to the royal kraal (Umgungindhlovu) and for a time took refuge in the bush; on the Boers recrossing the Tugela he established himself at Ulundi at a little distance from his former capital. His power was greatly weakened and a year later was overthrown, the Boers in Natal (January r84o) supporting his brother Mpande (usually called Panda) in rebellion against him. The movement was completely successful, several of Dingaan's regiments going over to Panda. Dingaan passed into Swaziland in advance of his retreating forces, and was there murdered, while Panda was crowned king of Zululand by the Boers.

When in 1843 the British succeeded the Boers as masters of Natal they entered into a treaty with Panda, who gave up to the British the country between the upper Tugela and the Buffalo rivers, and also the district of St Lucia Bay. (The bay was not then occupied by the British, whose object in obtaining the cession was to prevent its acquisi- tion by the Boers. Long afterwards the treaty with Panda was successfully invoked to prevent a German occupation of the bay.) No sooner had the British become possessed of Natal than there was a large immigration into it of Zulu fleeing from the misgovernment of Panda. That chief was not, however, as warlike as his brothers Chaka and Dingaan; and he remained throughout his reign at peace with the government of Natal. 1 With the Boers who had settled in the Transvaal, however, he was involved in various frontier disputes. He had wars with the Swazis, who in 1855 ceded to the Boers of Lydenburg a tract of land on the north side of the Pongolo in order to place Europeans between themselves and the Zulu. In 1856 a civil war broke out between two of Panda's sons, Cetywayo and Umbulazi, who were rival claimants for the succession. A battle was fought between them on the banks of the Tugela in December 1856, in which Umbulazi and many of his followers were slain. The Zulu country continued, however, excited and disturbed until the government of Natal in 1861 obtained the formal nomination of a successor to Panda; and Cetywayo was appointed. The agent chosen to preside at the nomination ceremony was Mr (afterwards Sir) Theophilus Shepstone, who was in charge of native affairs in Natal and had won in a

1 Bishop Schreuder, a Norwegian missionary long resident in Zululand,

gave Sir Bartle Frere the following estimate of the three brothers who successively reigned over the Zulu : — " Chaka was a really great man, cruel and unscrupulous, but with many great qualities. Dingaan was simply a beast on two legs. Panda was a weaker and less able man, but kindly and really grateful, a very rare quality among Zulus. He used to kill sometimes, but never wantonly or continuously."

remarkable degree the respect and liking of the Zulu. Panda died in October 1872, but practically the government of Zululand had been in Cetywayo 's hands since the victory of 1856, owing both to political circumstances and the failing health of his father. In 1873 the Zulu nation appealed to the Natal govern- ment to preside over the installation of Cetywayo as king; and this request was acceded to, Shepstone being again chosen as British representative. During the whole of Panda's reign the condition of Zululand showed little improvement. Bishop Colenso visited him in 1857 and obtained a grant of land for a mission station, which was opened in 1860, by the Rev. R. Robertson, who laboured in the country for many years, gaining the confidence both of Panda and Cetywayo. German, Nor- wegian and other missions were also founded. The number of converts was few, but the missionaries exercised a very whole- some influence and to them in measure was due the comparative mildness of Panda's later years.

The frontier disputes between the Zulu and the Transvaal Boers ultimately involved the British government and were one Disputes ° * ne causcs °f the war which broke out in 1879. wkh the They concerned, chiefly, territory which in 1854 was Trens- proclaimed the republic of Utrecht, the Boers who vaa ' had settled there having in that year obtained a deed*

of cession from Panda. In i860 a Boer commission was ap- pointed to beacon the boundary, and to obtain, if possible, from the Zulu a road to the sea at St Lucia Bay. The com- mission, however, effected nothing. In 1861 Uml.onga, a brother of Cetywayo, fled to the Utrecht district, and Cetywayo assembled an army on that frontier. According to evidence brought forward later by the Boers, Cetywayo offered the farmers a strip of land along the border if they would surrender his brother. This they did on the condition that Umtonga's life was spared, and in 1861 Panda signed a deed making over the land to the Boers. The southern boundary of the strip added to Utrecht ran from Rorke's Drift on the Buffalo to a point on the Pongolo. The boundary was beaconed ia 1864, but when in 1865 Umtonga fled from Zululand to Natal, Cety- wayo, seeing that he had lost his part of

the bargain (for he feared that Umtonga ! might be used to supplant him as Panda had been used to supplant Dingaan), caused the .beacon to be removed, the Zulu claiming also the land ceded by the Swazis to Lydenburg. The Zulu asserted that the Swazis were their vassals and denied their right to part with the territory. During the year a Boer commando under Paul Kruger and an army under Cetywayo were posted along the Utrecht border. Hos- tilities were avoided, but the Zulu occupied the land north of the Pongolo. Questions were also raised as to the validity of the documents signed by the Zulu concerning the Utrecht strip; in 1S69 the services of the lieu t. -govern or of Natal were accepted by both parties as arbitrator, but the attempt then made to settle the difficulty proved unsuccessful.

*Such was the position when by his father's death Cetywayo (g.v.) became absolute ruler of the Zulu. As far as possible Cetywayo he revived the military methods of his uncle Chaka, **"£' and even succeeded in equipping his regiments with*

firearms. It is believed that he instigated the Kaffirs in the Transkei to revolt, and he aided Sikukuui in his struggle with the Transvaal. His rule over his own people was tyrannous. By Bishop Schreuder he was described as " an able man, but for cold, selfish pride, cruelty and untruthfulness worse than any of his predecessors." In September 1876 the massacre of a large number of girls (who had married men of their own age instead of the men of an older regiment, for whom Cetywayo had designed them-) provoked a strong remonstrance from the government of Natal, inclined as that government was to look leniently on the doings of the Zulu. The tension between Cetywayo and the Transvaal over border disputes continued, and when in 1877 Britain annexed the Transvaal the dispute was transferred to the new owners of the country. A commission

1 Umtonga had been originally designated by Panda as his successor. He afterwards served in the Zulu war with Wood's column.

was appointed by the lieut. governor of Natal in February 1878 to report on the boundary question. The commission reported in July, and found almost entirely in favour of the contention of the Zulu. Sir Bartle Frere, then High Com missioner, who thought the award "one-sided and unfair to the Boers" (Martineau, Life of Frere, ii. xix.), stipulated that, on the land being given to the Zulu, the Boers living on it should be compensated if they left, or protected if they remained. Cetywayo (who now found no defender in Natal save Bishop Colenso) w T as in a defiant humour, and permitted outrages by Zulu both on the Transvaal and Natal borders. Frere was convinced that the peace of South Africa could be „ , preserved only if the power of Cetywayo was curtailed, aitima- Therefore in forwarding his

award on the boundary turn. dispute the High Commissioner demanded that the affs™ military system should be remodelled. The youths were to be allowed to marry as they came to man's estate, and the regiments were not to be called up except with the consent of the council of the nation and also of the British government. Moreover, the missionaries were to be unmolested and a British resident was to be accepted. These demands were made to Zulu deputies on the nth of December 1878, a definite reply being required by the 31st of that month.

Cetywayo returned no answer, and in January 1879 a British force under General Thesiger (Lord Chelmsford) invaded Zulu- land. Lord Chelmsford had under him a force of 5000 Europeans and 8200 natives; 3000 of the latter were employed in guarding the frontier of Natal; another force of 1400 Euro- peans and 400 natives were stationed in the Utrecht district. Three columns were to invade Zululand, from the Lower Tugela, Rorke's Drift, and Utrecht respectively, their objective being Ulundi, the royal kraal. Cetywayo's army numbered fully 40,000 men. The entry of all three columns was unopposed. On the 22nd of January the centre column (1600 Europeans, 2500 natives), which had advanced from Rorke's Drift, was encamped near Isandhlwana; on the morning of Jssndhl- that day Lord Chelmsford moved out with a small wana, force to support a reconnoitring party. After he had left, the camp, in charge of Col. Durnford, was surprised by a Zulu army nearly 10,000 strong. The British were overwhelmed and almost every man killed, the casualties being 806 Europeans (more than half belonging to the 24th regiment) and 471 natives. All the transport was also lost. Lord Chelmsford and the reconnoitring party returned to find the camp deserted; next day they retreated to Rorke's Drift, which had been the scene of an heroic and successful defence. After the victory at Isandhlwana several impis of the Zulu army had Rorke's moved to the Drift. The garrison stationed there, Drift under Lieuts. Chard and Bromhead, numbered about 80 men of the 24th regiment, and they had in hospital between 30 and 40 men. Late in the afternoon they were attacked by about 4000 Zulu. On six occasions, the Zulu got within the entrenchments, to be driven back each time at the bayonet's point. At dawn the Zulu withdrew, leaving 350 dead. The British loss was 17 killed and 10 wounded.

In the meantime the right column under Colonel Pearson had reached Eshowe from the Tugela; on receipt ■ of ■ the news of Isandhlwana most of the mounted men and the native troops were sent back to the Natal, leaving at Eshowe a garrison of 1300 Europeans and 65 natives. This force was hemmed in by the enemy. The left column under Colonel (afterwards Sir) Evelyn Wood, which had done excellent work, found itself obliged to act on the defensive after the disaster to the centre column. 2 For a time an invasion of Natal was feared. The Zulu, however, made no attempt to enter

Natal, while Lord Chelmsford awaited reinforcements before resuming his advance. During this time (March the 12th) an escort of stores marching to Luneberg, the headquarters of the Utrecht force, was attacked when encamped on both sides of the Intombe river. The camp was surprised, 62 out of 106 men were killed, and all the stores were

2 With the column were 40 Boers, the Uys clan, under Piet Uvs. whose father had been killed in 1838 in the wars with Dingaan.

lost. News of Isandhhvana reached England on the nth of February, and on the same day about 10,000 men were ordered out to South Africa. The first troops arrived at Durban on the :7th of March. On the 20th a column, under Lord Chelmsford, consisting of 3400 Europeans and 2300 natives, marched to the relief of Eshowe, entrenched camps being formed each night. On the 2nd of April the camp was attacked at Ginginhlovo, the Zulu being repulsed. Their loss was estimated at 1200 while the British had only two killed and 52 wounded. The next day Eshowe was relieved. Wood, who had been given leave to make a diversion in northern Zululand, on the 28th of March occupied Hlcbane (Inhlobane) mountain. The force was, how- ever, compelled to retreat owing to the unexpected appearance of the main Zulu army, which nearly outflanked the British. Besides the loss of the native contingent (those not killed deserted) there were 100 casualties among the 400 Europeans engaged. 1 At mid-day next day the Zulu army made a desperate attack, lasting over four hours, on Wood's camp at Kambula; the enemy — over 20,000 strong — was driven off, losing fully 1000 men, while the British casualties were 18 killed and 65 wounded.

By the middle of April nearly all the reinforcements had reached Natal, and Lord Chelmsford reorganized his forces. The ist division, under major-general Crealock, advanced along the coast belt and was destined to act as a support to the 2nd division, under major-general Newdigate, which with Wood's flying column, an independent unit, was to march on Ulundi from Rorke's Drift and Kambula.' Owing to difficulties of transport it was the beginning of June before Newdigate was ready to advance. On the ist of that month the prince imperial of France (Louis Napoleon), who had been allowed to accompany the British troops, was killed while out with a reconnoitring party. On the ist of July Newdigate and Wood had reached the White Umfolosi, in the heart of the enemy's country. During their advance messengers were sent by Cetywayo to treat for peace, but he did not accept the terms offered. Meantime Sir Garnet (afterwards Lord) Wolseley had been sent out to super- sede Lord Chelmsford, and on the 7th

of July he

”” ‘ reached Crealock’s headquarters at Port Durnford. But by that time the campaign was practically over. The 2nd division (with which was Lord Chelmsford) and Wood’s column crossed the White Umfolosi on the 4th of July — the force numbering 4200 Europeans and 1000 natives. Within a mile of Ulundi the British force, formed in a hollow square, was attacked by a Zulu army numbering 12,000 to 15,000. The battle ended in a decisive victory for the British, whose losses were about 100, while of the Zulu some 1500 men were killed (see Ulundi).

After this battle the Zulu army dispersed, most of the leading chiefs tendered their submission, and Cetywayo became a Wolaeley’s fugitive. On the 27th of August the king was cap- settle- tured and sent to Cape Town. His deposition was ”””” formally announced to the Zulu, and Wolseley drew

up a new scheme for the government of the country. The Chaka dynasty was deposed, and the Zulu country portioned among eleven Zulu chiefs, John Dunn, 2 a white adventurer, and Hlubi, a Basuto chief who had done good service in the war. A Resident was appointed who was to be the channel of com- munication between the chiefs and the British government. This arrangement was productive of much bloodshed and disturbance, and in 1882 the British government determined to restore Cetywayo to power. In the meantime, however, blood feuds had been engendered between the chiefs Usibepu

_ l For his action on this occasion Colonel (afterwards General Sir) Redvers Buller, who was Wood’s principal assistant, received the V.C. Piet Uys was among the slain.

2 Dunn was a son of one of the early settlers in Natal and had largely identified himself with the Zulu. In 1856 he fought for Umbulazi against Cetywayo, but was high in that monarch’s favour at the time of his coronation in 1873. When Frere’s ultimatum was delivered to Cetywayo, Dunn, with 2000 followers, crossed the Tugela into Natal (loth of January 1879). In 1888 he fought against Dinizulu.

(Zibebu) and Hamu 3 on the one side and the tribes who sup- ported the ex-king and his family on the other. Cetywayo’s party (who now became known as Usutus) suffered severely at the hands of the two chiefs, who were aided by a Dand of white freebooters. When Cetywayo was restored Usibepu was left in possession of his territory, while Dunn’s land and that of the Basuto chief (the country between the Tugela and the Umhlatuzi, i.e. adjoining Natal) was constituted a reserve, in which locations were to be

provided for Zulu unwilling to serve the restored king. This new arrangement proved as futile as had Wolseley's. Usibepu, having created a formidable force of well-armed and trained warriors, and being left in independence on the borders of Cetywayo's territory, viewed with displeasure the re-installation of his former king, and Cetywayo was desirous of humbling his relative. A collision very soon took place; Usibepu's forces were victorious, and on the 22nd of July 1883, led by a troop of mounted whites, he made a sudden descent upon Cetywayo's kraal at Ulundi, which he destroyed, massacring such of the inmates of both sexes as could not save themselves by flight. The king escaped, though wounded, into the Reserve; there he died in February

1884.

Cetywayo left a son, Dinizulu, who sought the assistance of some of the Transvaal Boers against Usibepu, whom he defeated and drove into the Reserve. These Boers, led by Lukas Meyer (1846-1902), claimed as a stipulated reward for their services the cession of the greater and more valuable part of central Zululand. On the 21st of May the Boer adventurers The had proclaimed Dinizulu king of Zululand; in August New following they founded the " New Republic," carved Republic out of Zululand, and sought its recognition by the British government. The Usutu party now repented of their bad bargain, for by the end of 1885 they found the Boers claiming some three-fourths of their country. The British government intervened, took formal possession of St Lucia Bay (to which Germany as well as the Transvaal advanced claims), caused the Boers to reduce their demands, and within boundaries agreed to recognize the New Republic — whose territory was in 1888 incorporated in the Transvaal and has since 1903 formed the Vryheid division of Natal.

Seeing that peace could be maintained between the Zulu chiefs only by the direct exercise of authority, the British government annexed Zululand (minus the New Re- _ public) in 1887, and placed it under a commissioner taaa responsible to the governor of Natal. In the following annexed year Dinizulu, who continued bis feud with Usibepu, by Great rebelled against the British. After a sharp campaign r an ' (June to August 1888), the Usutu losing 300 killed in one encounter, Dinizulu fled into the Transvaal. He surrendered himself to the British in November; in April i83o he and two of his uncles (under whose influence he chiefly acted) were found guilty of high treason and were exiled to St Helena.

Under the wise administration of Sir Melmoth Osborn, the commissioner, whose headquarters were at Eshowe, and the district magistrates, the Zulu became reconciled to British rule, especially as European settlers were excluded from the greater part of the country. Large numbers of natives

sought employment in Natal and at the Rand gold mines, and Zulu- land enjoyed a period of prosperity hitherto unknown. Order was maintained by a mounted native police force.

At the end of 1888 and at the beginning of 1890 some small tracts of territory lying between Zululand and Tongaland, under the rule of petty semi-independent chiefs, The Boer were added to Zululand; and in 1895 the territories road to of the chiefs Zambaan (Sambana) and Umtegiza, the sea 688 sq. m. in extent, lying between the Portuguese b '» cke <) – territories, Swaziland, Zululand and Tongaland, were also added. In the same year a British protectorate was declared over Tongaland. The coast-line was thus secured for. Great Britain up to the boundary of the Portuguese territory at

3 Both these chiefs were members of the royal family.

Delagoa Bay. At that time the Transvaal government — which had been the first to reap the benefit of Great Britain's defeat of the Zulu by acquiring the " New Republic "• — was endea- vouring to obtain the territories of Zambaan and Umtegiza, hoping also to secure a route through Tongaland to Kosi Bay. President Kruger protested in vain against this annexation, Great Britain being determined to prevent another Power establishing itself on the south-east African seaboard.

In 1893 Sir M. Osbom was succeeded as resident commissioner by Sir Marshal Clarke, 1 who gained the confidence and good

will of the Zulu. At the close of 1897 Zululand, in made part "Wˆich Tongaland had been incorporated, was handed of Natal, ovei by the imperial government to Natal, and Sir

(then Mr) C. J. R. Saunders was appointed civil commissioner of the province, with whose government he had been associated since 1887. In 1898 Dinizulu was allowed to return and was made a l! government induna." Officially one of several chiefs subject to the control of the resident magistrate, he was, in fact, regarded by most of the Zulu as the head of their nation. His influence appeared to be in the main exercised on the side of order. During the war of 1899-1902 there was some fighting between the Zulu and the Boers, pro- voked by the Boers entering Zulu territory. A Zulu kraal having been raided, the Zulu retaliated and, surrounding a small Boer commando, succeeded in killing every member of it. In September iqoi Louis Botha made an attempt to invade Boer Natal by

way of Zululand, but the stubborn defence

raids. made by the small posts at Itala and Prospect Hill,

both within the Zulu border, caused him to give up the project. Throughout the war the Zulu showed marked partiality for the British side.

At the close of the war the Natal government decided to allow while settlers in certain districts of Zululand, and a Lands Delimitation Commission was appointed. The commission, however, reported (1905) that four-fifths of Zululand was unfit for European habitation, and the remaining fifth already densely populated. The commissioners urged that the tribal system should be maintained. Meantime the coal mines near St Lucia Bay were opened up and connected with Durban by railway. At this time rumours were current of disaffection among the Zulu, but this was regarded as the effervescence natural after the war. In 1905 a poll tax of £1 on all adult males was imposed by the Natal legislature; this tax was the ostensible cause of a revolt in 1906 among the natives of Natal, The Re' w ^° were largely of Zulu origin. Bambaata, the volt of leader of the revolt, fled to Zululand. He took 1906. refuge in the dense bush in the Nkandhla highlands,

intzuus wnere Cetywayo's grave became the rallying-point

of the rebels, who in April were joined by an aged chief named Siganandа and his tribe. After an arduous cam- paign, the Natal force (about 5000 strong) being commanded by Col. Sir Duncan McKenzie, the rebellion was crushed by July 1906, without the aid of imperial Iroops. Bambaata was killed in bailie (June 10th); his head was cut off for purposes of identification, but afterwards buried with the body. Siga- nanda surrendered. In all some 3500 Zulus were killed and about 3000 taken prisoners, the majority of the prisoners being released in 1907 (see further Natal: History). Zululand re- mained, however, in a disturbed condition, and a number of white traders and officials were murdered. Dinizulu had been accused of harbouring Bambaata, and in December T907 the Natal government felt justified in charging him with high treason, murder ;nid other crimes. A military force entered Zululand, rind Dinizulu surrendered without opposition. He was brought to trial in. November 1908, and in March tooq was found guilty of harbouring rebels. The more serious charges against him

1 Lieut. -Col. Sir Marshal James Clarke, R.A. (1841-1909) was A.L.C. to Sir Theophilus Shepstone when the Transvaal was annexed in 1877. lie served in the Beer war of 1880-81 ; was resident iomnmsioner of Basutoland from 1884 to 1893, anr -' after leaving ZuUiland became

resident commissioner in Southern Rhodesia (189SL He \va ir.ade a K.C.M.G. in 1886.*

were not proved. lie was sentenced to four years' imprison- ment and deprived of his position as a government induna. Other Zulu chiefs were convicted of various offences and sen- tenced to imprisonment. At his trial Dinizulu was defended by W. P. Schreiner, ex-premier of Cape Colony, while Miss H. E. Colenso (a daughter of Bishop Colenso) constituted herself his champion in the press of Natal and Great Britain. On the day that the Union of South Africa was established (31st of May 1910), the Botha ministry released Dinizulu from prison. He was subsequently settled on a farm in the Transvaal and given a pension of £500 a year.

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ZUMALACARREGUI, THOMAS (1788-1835), Spanish Carlist general, was born at Ormaiztegui in Navarre on the 29th of December 1788. His father, Francisco Antonio Zumalacarregui, was a lawyer who possessed some property, and the son was articled to a solicitor. When the French invasion took place in 1808 he enlisted at Saragossa. He served in the first siege, at the battle of Tudela, and during the second siege until he was taken prisoner in a sortie. lie succeeded in escaping and in reaching his family in Navarre. For a short time he served with Gaspar de Jauregui, known as" The Shepherd " {El Pastor), one of the minor guerrillcro leaders. But Zumalacarregui, who was noted for his grave and silent disposition and his strong religious principles, disliked the disorderly life of the guerrillas, and when regular forces were organized in the north he entered the 1st battalion of Gnipuzcoa as an officer. During the re mainder of the war he served in the regular army. In 181 2 he was sent with despatches to the Regency at Cadiz, and received his commission as captain. In that rank he was present at the battle of San Martial (31st of August 1S13). After the restoration of Ferdinand VII. he continued in the army, and is said to have made a careful study of the theory of war. Zumala- carregui had no sympathy with the liberal principles which were spreading in Spain, and became noted as what was called a Servil or strong Royalist. He attracted no attention at headquarters, and was still a captain when the revolution of 1820 broke out. His brother officers, whose leanings were liberal, denounced him to the revolutionary government, and asked that he might be removed. The recommendation was not acted on. but Zumalacarregui knew of it, and laid up the

offence in his mind. Finding that he was suspected (probably with truth) of an intention to bring the soldiers over to the royalist side, he escaped to France. In 1823 he returned as an officer in one of the royalist regiments which had been organized on French soil by the consent of the government. He was now known as a thoroughly trustworthy servant of the despotic royalty, but he was too proud to be a courtier. For some years he was employed in bringing regiments which the government distrusted to order. He became lieutenant-colonel in 1825 and colonel in TS29. In 1832 he was named military governor of Ferrol. Before Ferdinand VII. died in 1833, Zumalacarregui was marked out as a natural supporter of the

absolutist party which favoured the king's brother, Don Carlos. The proclamation of the king's daughter Isabella as heiress was almost the occasion of an armed conflict between him and the naval authorities at Ferrol, who were partisans of the constitutional cause. He was put on half pay by the new authorities and ordered to live under police observation at Pamplona. When the Carlist rising began on the death of Ferdinand he is said to have held back because he knew that the first leaders would be politicians and talkers. He did not take the field till the Carlist cause appeared to be at a very low ebb, and until he had received a commission from Don Carlos as commander-in-chief in Navarre. The whole force under his orders when he escaped from Pamplona on the night of the 29th of October 1833, and took the command next day in the Val de Araquil, was a few hundred ill-armed and dispirited guerrilleros. In a few months Zumalacarregui had organized the Carlist forces into a regular army. The difficulty he found in obtaining supplies was very great, for the coast towns — and notably Bilbao — were constitutional in politics. It. was mainly by captures from the government troops that he equipped his forces. He gradually obtained full possession of Navarre and the Basque provinces, outside of the fortresses, which he had not the means to besiege. Whether as a gucrrillero leader, or as a general conducting regular war in the mountains, he proved unconquerable. By July 1834 he had made it safe for Don Carlos to join his headquarters. The pretender was, however, a narrow-minded, bigoted man, who regarded Zumalacarregui with suspicion, and was afraid of his immense personal influence with the soldiers. Zumala- carregui had therefore to drag behind him the whole weight of the distrust and intrigues of the court. Yet by the beginning of June 1835 he had made the Carlist cause triumphant to the north of the Ebro, and had formed an army of more than 30,000 men, of much better quality than the constitutional forces. If Zumalacarregui had been allowed to follow his own plans, which were to concentrate his forces and march on Madrid, he might well have put Don Carlos in possession of the capital. But the court was eager to obtain command of a seaport, and Zumaiacarregui was ordered to besiege Bilbao. He obeyed reluctantly, and on the 14th of June 1835 was wounded by a musket bullet in. the calf of the leg. The wound was trifling and would probably have been cured with ease if he had been allowed to employ an English doctor whom he trusted. But Don Carlos insisted on sending his own physicians, and in their hands the general died on the 24th of June 1835 — not without suspicion of poison. Zumalacarregui was a fine type of the old royalist and religious principles of his people. The ferocity with which he conducted the war was forced on him by the government generals, who refused quarter.

An engaging account of Zumalacarregui will be found in The Most Striking Events of a Twelvemonth Campaign with Zumala- carregui in Navarre and

the Basque Provinces, by C. F. Henningsen (London, 1836). A chap-book called Vida politica y militar de Don Tomas Zumalacarregui, which gives the facts of his life with fair accuracy, is still very popular in Spain. (L). H.)

ZUMPT, the name of two German classical scholars. Kakl Gottlob Zumpt (1792-1894), who was educated at Heidelberg and Berlin, was from 1S12 to 1827 a schoolmaster in Berlin, and in 1S27 became professor of Latin literature at the university. His chief work was his Laleinische Grammstik (1818), which stood as a standard work until superseded by Madvig's in 1844.

He edited Quintilian's Insiitulio oraioria (1831), Cicero's Ver- rines and De ojjiciis (1837), and Curtius. Otherwise he devoted himself mainly to Roman history, publishing Annates veterum rcgnonim el populorum (3rd ed. 1862), a work in chronology down to A.D. 476, and other antiquarian studies. His nephew, August Wilhelm Zumpt (1815-1877), studied in Berlin, and in 1851 became professor in the Friedrich Wilhelm Gymnasium. He is known chiefly in connexion with Latin epigraphy, his papers on which (collected in Commentationcs epigraphicae, 2 vols., 1850-54) brought him into conflict with Mommsen in connexion with the preparation of the Corpus inscriptionum Lalinarum, a scheme for which, drawn up by Mommsen, was approved in 1847. His works include Monumentum Ancyranum (with Franck, 1847) and De monumento Ancyrano supplendo (1869); Studia Romana (1859); Das Kriminalrecht der ram. Republik (1865-60); Der Kriminalprozess der rbm. Republik (1871); editions of Namatianus (1840), Cicero's Pro Murena (1S59) and De lege agraria (1861). Ihne incorporated materials left by him in the 7th and 8th vols, of his Romische Geschichtc

(1840).

ZUHZ, LEOPOLD (1794-1886), Jewish scholar, was born at Detmold in 1794, and died in Berlin in 1886. He was the founder of what has been termed the " science of Judaism," the critical investigation of Jewish literature, hymnology and ritual. Early in the 19th century he was associated with Cans Moser and Heine in an association which the last named called " Young Palestine." The ideals of this Verein were not des- tined to bear religious fruit, but the " science of Judaism " survived. Zunz took no large share in Jewish reform, but never lost faith in the regenerating power of " science " as applied to the traditions and literary legacies of the ages. He had thoughts of becoming a preacher, but found the career un- congenial. He influenced Judaism from the study rather than from the pulpit. In 1832 appeared what E. H. Hirsch rightly terms " the most important Jewish book published in the 19th century." This was

Zunz's Gottesdienstliche Vorirdge der Juden, i.e. a history of the Sermon. It lays down principles for the investigation of the Rabbinic exegesis (Midrash, q.v.) and of the prayer-book of the synagogue. This book raised Zunz to the supreme position among Jewish scholars. In 1840 he was appointed director of a Lehrerseminar, a post which relieved him from pecuniary troubles. In 1845 appeared his Zur Geschichte und Literalur, in which he threw light on the literary and social history of the Jews. Zunz was always interested in politics, and in 1848 addressed many public meetings. In 1850 he resigned his headship of the Teachers' Seminary, and was awarded a pension. He had visited the British Museum in 1846, and this confirmed him in his plan for his third book, Synagogalc Poesie des Millelalters (1855). It was from this book that George Eliot translated the following opening of a chapter of Daniel Deronda: " If there are ranks in suffering, Israel takes precedence of all the nations "... &c. After its publication Zunz again visited England, and in 1859 issued his Rilus. In this he gives a masterly survey of synagogal rites. His last great book was his Literalur geschichte der synagogalen Poesie (1865). A supplement appeared in 1S67. Besides these works, Zunz published a new translation of the Bible, and wrote many essays which were afterwards collected as Gesam-mclte Schrifien. Throughout his early and married life he was the champion

See Emil G. Hirsch, in Jewish Encyclopedia, xii. 699-704.

(I. A.)

ZURBARAN, FRANCISCO (1598-1662), Spanish painter, was born at Fuente de Cantos in Estremadura on the 7th of November 159S. His father was Luis Zurbaran, a country labourer, his mother Isabel Marquet. In childhood he set about imitating objects with charcoal; and his father sent him, still young, to the school of Juan de Roelas in Seville. Francisco soon became the best pupil in the studio of Roelas, surpassing the master himself; and before leaving him he had achieved a

solid reputation, full though Seville then was of able painters. He may have had here the opportunity of copying some of the paintings of Michelangelo da Caravaggio; at any rate he gained the name of " the Spanish Caravaggio/' owing to the forcible realistic style in which he excelled. He constantly painted direct from nature, following but occasionally improving on his model; and he made great use of the lay-figure in the study of draperies, in which he was peculiarly proficient. He had a special gift for

white draperies; and, as a consequence, Car- thusian houses are abundant in his paintings. To these rigid methods Zurbaran is said to have adhered throughout his career, which was prosperous, wholly confined to Spain, and varied by few incidents beyond those of his daily labour. His subjects were mostly of a severe and ascetic kind — religious vigils, the flesh chastised into subjection to the spirit — the compositions seldom thronged, and often reduced to a single figure. The style is more reserved and chastened than Caravaggio's, the tone of colour often bluish to excess. Exceptional effects are attained by the precise finish of foregrounds, largely massed out in light and shade. Zurbaran married in Seville Leonor de Jordera, by whom he had several children. Towards 1630 he was appointed painter to Philip IV.; and there is a story that on one occasion the sovereign laid his hand on the artist's shoulder, saying. " Painter to the king, king of painters." It was only late in life that Zurbaran made a prolonged stay in Madrid, Seville being the chief scene of his operations. He died, probably in 1662, in Madrid.

In 1627 he painted the great altarpiece of St Thomas Aquinas, now in the Seville museum; it was executed for the church of the college of that saint there. This is Zurbaran's largest composition, containing figures of Christ and the Madonna, various saints, Charles V. with knights, and Archbishop Deza (founder of the college) with monks and servitors, all the principal personages being beyond the size of life. It had been preceded by the numerous pictures of the screen of St Peter Nolasco in the cathedral. In the church of Guadalupe he painted various large pictures, eight of which relate to the history of St Jerome, and in the church of St Paul, Seville, a famous figure of the Crucified Saviour, in grisaille, presenting an illusive effect of marble. In 1633 he finished the paintings of the high altar of the Carthusians in Jerez. In the palace of Buenretiro, Madrid, are four large canvases representing the Labours of Hercules, an unusual instance of non-Christian subjects from the hand of Zurbaran. A fine specimen is in the National Gallery, London, a whole-length, life-sized figure of a kneeling Franciscan holding a skull. It seems probable that another picture in the same gallery, the " Dead Roland," which used to be ascribed to Velasquez, is really by Zurbaran. His principal scholars, whose style has as much affinity to that of Ribera as to Caravaeeio's, were Bernabe dc Ayala and the brothers Polanco.

(W. M. R.)

ZURICH (Fr. Zurich; Ital. Zurigo), one of the cantons of north-eastern Switzerland, ranking officially as the first in the Confederation. Its total area is 665-7 sq. m., of which 625-2 sq. rri. are reckoned as "productive" (forests covering iSo-8 sq. m., and vineyards 16-9 sq. m., the most extensive Swiss wine district save in Vaud and in Ticino). Of the rest, 21

sq. m. are occupied by the cantonal share of the lake of Zurich, while wholly within the canton are the smaller lakes of Greifen (3 J sq. m.) and Pfaffikon (1$ sq. m.). The canton is of irregular shape, consisting simply of the acquisitions made in the course of years by the town. Of these the more important, were the whole of the lower part of the lake (1362), Klissnacht (1384), Thalwil (1385), Erlenbach (1400), Greifensee (140 3), Horgen (1406), Griiningen and Stiifa (1408), Bulach and Regensberg (1409), Wald (1425), Kyburg (1452), Winterthur; (1467), Eglisau (1496), Konau (1512), and Wader.swil (1549) — Stein was held from 1484 to 1798, while in 1798 the lower part of the Stammheim glen, and finally in 1803 Rheinau, were added to the canton. In 1798 the town ruled nineteen " inner " bailiwicks and nine rural bailiwicks, besides the towns of Stein and of Winterthur. The canton at present extends from the left bank of the Rhine (including also Eglisau on the right bank) to the region west of the lake of Zurich. It is bounded on the E. and W. by low hills that divide it respectively from the valleys of the Thur, and from those of the Reuss and of the Aar. In itself the canton consists of four shallow river valleys, separated by low ranges, all xxvm. S4

running from S.E. to N.W. The most important of these is that of the Linth (q.v.), which forms the lake of Zurich. To the cast are the valleys of the Glat.t (forming lake Greifen) and of the Toss (forming lake Pfaffikon), both sending their streams direct to the Rhine. The highest point in the canton is the Albishorn (3012 ft.) in the Albis range, which limits the Sihl valley to the west. All the valleys named are traversed by railway lines, while many lines branch off in every direction from the town of Zurich. The first railway line opened (1847) in Switzerland was that from Zurich to Baden in Aargau (14 m.). From the town of Zurich mountain railways lead S.W. to near the summit of the Uetliberg (2864 ft.) and N.E. towards the Zurichberg (2284 ft.).

In 1900 the population was 431,036, of whom 413,141 were German-speaking, 11,192 Italian speaking, 3894 French-speaking, and 610 Romonsch-speaking, while there were 345,446 Protestants, 80,752 Catholics (Roman or " Old "), and 2933 Jews. The capital of the canton is Zurich (q.v.), but Winterthur {q.v.) is the only other considerable town, Uster (7623 inhabitants), and Horgen (6883 inhabitants) being rather large manufacturing villages. The land in the canton is highly cultivated and much subdivided. But the canton is above all a great manufacturing district, especially o f machinery and railway rolling-stock, while both silk weaving and cotton weaving are widely spread. It is divided into n administrative districts, which comprise 189 communes. In 1869 the cantonal constitution was revised in a democratic sense, and with the exception of a few changes made later, it is the existing con- stitution. There is an executive or Jiegierungsrat of seven members and a legislature or

Kantonsrat (one member to every T 500 resident Swiss citizens or a fraction over 750), each holding office forthree years and elected at the same time directly by the vote of the people. The referendum exists in both forms, compulsory and optional: all laws and all money grants of a total siim over 250,000 frcs. or an annual sum of 20.000 must be submitted to a popular vote, the people meeting for that purpose at least twice in each year, while the executive may submit to a popular vote any other matter, though it fall within its powers as defined bylaw. One- third of the members of the legislature or 5000 legally qualified voters can force the government to submit to the peopleanymatter whatsoever (initiative). Both members of the Federal Standerat and the 22 members of the Federal Nationalrai are elected simul- taneously by a popular vote and hold office for three years. The constitution provides for the imposition of a graduated and pro- gressive income tax. In '885 the penalty of death was abolished in the canton. (W. A. B. C.)

ZURICH (Fr. Zurich; Ital. Zurigo), the capital of the Swiss canton of the same name. It is the most populous, the most important, and on the whole the finest town in Switzerland, and till 1848 was practically the capital of the Swiss Confedera- tion. It is built on both banks of the Limmat (higher up called Linth) as it issues from the lake of Zurich, and also of its tributary, the Sihl, that joins it just below the town. That portion of the town which lies on the right bank of the Limmat is called the " Grosse Stadt " and that on the left bank the " Kleine Stadt." Till 1893 the central portion of the town on either bank of the Limmat formed the " city " and ruled the outlying communes or townships that had sprung up around it. But at that time the eleven outer districts (including Aussersihl, the workmen's quarter on the left bank of the Sihl) or suburbs were incorporated with the town, which is now governed by a town council of 125 members (one to every 1200 inhabitants), and an executive of 9 members, both chosen direct by a popular vote. Much land has been rescued from the lake, and is the site of fine quays, stately public buildings, and splendid private villas. The older quarters are still crowded. But the newer quarters stretch up the slope of the Ziirichberg (above the right bank of the Limmat) while the fine Bahnhof- strasse (extending from the railway station to the lake) has the best shops and is in the neighbourhood of the more important public buildings.

Zurich has always been wealthy and prosperous. It has increased enormously, as is shown by the following figures. Its population in 1900 (including the eleven suburbs above named) was 150,703, while (without these) in 1888 it was 94,129; in 1880, 78,343; in 1870, 58,657; in i860, 44,978; and in 1850 only 35,483. Of the inhabitants in 1900 no fewer than 43,761 (as against 20,928 in 1888 and 3155 in 1850) were not Swiss citizens, Germans number- ing 31,125, Italians 5350, Austrians

4210, Russians 683, French 652. British subjects 157, and citizens of the United States 233. In

1900 there were in the town 140.803 German-speaking persons, 5100 Italian-speaking, 2586 French-speaking, and 415 Romonsch- speaking. In 1888 the corresponding figures were 90,500, 1135, 1320, and 148. In 1900 the town numbered 102,794 Protestants, 43.655 ” Catholics ” (Roman or ” Old “) and 2713 Jews. In 1888 the religious figures were 70,970, 20,571 and 1221 respectively, while in 1850 the numbers were 32,763, 2664 and 56, The inter- national character of the town has thus become much more marked. This is partly due to the immigration of many foreign workmen, and partly to the arrival of Russian and Polish exiles. Both have added a turbulent cosmopolitan element to the town, in which the Socialist party is strong, and is increasing in power and influ- ence, even in matters concerned with civic government.

Of the old buildings the finest and most important is the Gross Mtinster (or Propstei), on the right bank of the Limmat. This was originally the church of the king’s tenants, and in one of the chapels the bodies of Felix, Regula and Exuperantius, the patron saints of the city, were buried, the town treasury being formerly kept above this chapel. The present building was erected at two periods (c. 1090-1150 and c. 1225-1300), the high altar having been consecrated in 1278. The towers were first raised above the roof at the end of the 15th century and took their present form in 1779. The chapter consisted of twenty-four secular canons; it was reorganized at the Reformation (1526), and suppressed in 1832. On the site of the canons’ houses stands a girls’ school (opened 1853), but the fine Romanesque cloisters (12th and 13th centuries) still remain. There is a curious figure of Charlemagne in a niche on one of the towers; to him is attributed the founding or reform of the chapter. On the left bank of the Limmat stands the other great church of Zurich, the Frau Minister (or Abtei), founded for nuns in 853, by Louis the German. The high altar was consecrated in 1170; but the greater part of the buildings are of the 13th and 14th centuries. It was in this church that the relics of the three patron saints of the town were preserved till the Reformation, and it was here that the burgomaster Waldmann was buried in. 1489. There were only twelve nuns of noble family, com- paratively free from the severer monastic vows; the convent was suppressed in 1524. Of the other old churches may be mentioned St Peter’s, the oldest parish church, though the present buildings date in part from the 13th century only (much altered in the early 18th century), and formerly the meeting-place of the citizens; the Dominican

church (13th century), in the choir of which the cantonal library of 80,000 volumes has been stored since 1873; the church of the Austin friars (14th century), now used by the Old Catholics, and the Wasserkirche. The last-named church is on the site of a pagan holy place, where the patron saints of the city were martyred; since 1631 it has housed the Town Library, the largest in Switzer- land, which contains 170,000 printed volumes and 4500 MSS. (among these being letters of Zwingli, Bullinger and Lady Jane Grey), as well as a splendid collection of objects from the lake dwellings of Switzerland. The building itself was erected from 1479 to 1484, and near it is a statue of Zwingli, erected in 1885. The existing town-hall dates from 1698, while the gild houses were mostly rebuilt in the 18th century. One of the most magnificent of the newer buildings is the Swiss National Museum, behind the railway station. This museum, which was opened in 1898, contains a wonderful collection of Swiss antiquities (especially medieval) and art treasures of all kinds, some of which are placed in rooms of the actual date, removed from various ancient buildings. There are some fine old fountains (the oldest dating back to 1568). There are several good bridges, Roman traces being seen in the case of the Nieder- brucke (now called the Rathausbrucke). The mound of the Lindenhof was formerly crowned by the king's house, which disappeared in the 13th century, and the hillock was planted with limes as early as 1422.

The town is noted for its numerous clubs and societies, and is the intellectual capital of German-speaking Switzerland. Cotton- spinning and the manufacture of machinery are two leading indus- tries, but by far the most important is the silk-weaving industry. This flourished in Zurich in the 12th and 13th centuries, but dis- appeared about 1420; it was revived by the Protestant exiles (such as the Muralti and Orelli families) from Locarno (1555) and

by the Huguenot refugees from France (1682 and 1685). The value of the silk annually exported (mainly to France, the United States and England) is estimated at over three millions sterling. Zurich is the banking centre of Switzerland. Besides the excellent primary and secondary schools, there are the Cantonal School, including a gymnasium and a technical side (opened 1842), and a high school for girls (opened 1875). The Cantonal University and the Federal Polytechnic School are housed in the same building. but have no other connexion. The university was opened in 1833, no doubt as a successor to the ancient chapter school at the Gross Minister said to date back to Charlemagne's time— hence its name the Carolinum — reorganized at the Reformation, and suppressed in 1832. The Polytechnic School, opened in 1855, includes seven main sections (industrial chemistry, industrial mechanics, engineer ing, training of scientific and mathematical teachers, architecture, forestry and agriculture, and the military sciences), besides a general philosophical and political science department. The Poly-

technic School has good collections of botanical specimens and of engravings. Near it is the observatory (1542 ft.). There are also in Zurich many institutions for special branches of education — e.g. veterinary surgery, music", industrial art, silk-weaving, &c.

The earliest inhabitants of the future site of Zurich were the lake dwellers. The Celtic Helvetians had a settlement on the Lindenhof when they were succeeded by the Romans, who established a custom station here for goods going to and coming from Italy; during their rule Christianity was introduced early in the 3rd century by Felix and Regula, with whom Exuperantius was afterwards associated. The district was later occupied by the Alamanni, who were conquered by the Franks.

The name Zurich is possibly derived from the Celtic dur (water). It is first mentioned in 807 under the form " Turigus," then in 853 as " Turegus." The true Latinized form is Turicum, but the false form Tigurum was given currency by Glareanus and held its ground from 1512 to 1748. It is not till the 9th century that we find the beginnings of the Teutonic town of Zurich, which arose from the union of four elements: (1) the royal house and castle on the Lindenhof, with the king's tenants around, (2) the Gross 'Mtinster, (3) the Frau Mtinster, (4) the community of " free men " (of Alamahnian origin) on the Ziirichberg. Similarly we can distinguish four stages in the constitutional development of the town: (i.) the gradual replacing (c. 1250) of the power of the abbess by that (real, though not nominal) of the patricians, (ii.) the admittance of the craft gilds (1336) to a share with the patricians in the government of the town, (iii.) the granting of equal political rights (1831) to the country districts, hitherto ruled as subject lands by the burghers, and (iv.) the reception as burghers of the numerous immigrants who had settled in the town (town schools opened in 1860, full incorporation in 1893).

The Frankish kings had special rights over their tenants, were the protectors of the two churches, and had jurisdiction over the free community. In 870 the sovereign placed his powers over all four in the hands of a single official (the Rcichsvogt), and the union was still further strengthened by the wall built round the four settlements in the 10th century as a safeguard against Saracen marauders and feudal barons. The " Reichsvogtei " passed to the counts of Lenzburg (1063-1173), and then to the dukes of Zahringen (extinct 1218). Meanwhile the abbess of the Benedictine Frau Minister had been acquiring extensive rights and privileges over all the inhabitants, though she never obtained the criminal jurisdiction. The town flourished greatly in the 12th and 13th centuries, the silk trade being introduced from Italy. In 1218 the " Reichsvogtei " passed back into the hands of the king, who appointed one of the burghers as his deputy, the town thus becoming a free imperial city under the nominal rule of a distant

sovereign. The abbess in 1234 became a princess of the empire, but power rapidly passed from her to the council which she had originally named to look after police, &c, but which came to be elected by the burghers, though the abbess was still " the lady of Zurich." This council (all powerful since 1304) was made up of the representatives of certain knightly and rich mercantile families (the " patricians "), who excluded the craftsmen from all share in the government, though it was to these last that the town was largely indebted for its rising wealth and importance.

In October 1291 the town made an alliance with Uri and

Schwyz, and in 1292 failed in a desperate attempt to seize the Habsburg town of Winterthur. After that Zurich began to display strong Austrian leanings, which characterize much of its later history. In 1315 the men of Zurich fought against the Swiss Confederates at Morgarten. The year 1336 marks the admission of the craftsmen to a share in the town government, which was brought about by Rudolf Brun, a patrician. Under the new constitution (the main features of which lasted till 1798) the Little Council was made up of the burgomaster and thirteen members from the " Constafel " (which included the old patricians and the wealthiest burghers) and the thirteen masters of the craft gilds, each of the twenty-six holding office for six months. The Great Council of 200 (really 212) members consisted of the Little Council, plus 78 representatives each of the Constajel and of the gilds, besides 3 members named by the burgomaster. The office of burgomaster was created and given to Brun for life. Out of this change arose a quarrel with one of the branches of the Habsburg family, in consequence of which Brun was induced to throw in the lot of Zurich with the Swiss Confederation (1st May 1351). The double position of Zurich as a free imperial city and as a member of the Everlasting League was soon found to be embarrassing to both parties (see Switzerland). In 1373 and again in 1393 the powers of the Constajel were limited and the majority in the executive secured to the craftsmen, who could then aspire to the burgomastership. Meanwhile the town had been extending its rule far beyond its walls — a process which began in the 14th, and attained its height in the 15th century (1362-1467). This thirst for terri- torial aggrandizement brought about the first civil war in the Confederation (the "Old Zurich War," 1436-50), in which, at the fight of St Jacob on the Sihl (1443), under the walls of Zurich, the men of Zurich were completely beaten and their burgomaster Stiissi slain. The purchase of the town of Winter- thur from the Habsburgs (1467) marks the culmination of the territorial power of the city. It was to the men of Zurich and their leader

Hans Waldmann that the victory of Morat (1476) was due in the Burgundian war ; and Zurich took a leading part in the Italian campaign of 1512-15, the burgomaster Schmid naming the new duke of Milan (1512). No doubt her trade connexions with Italy led her to pursue a southern policy, traces of which are seen as early as 1331 in an attack on the Val Leventina and in 1478, when Zurich men were in the van at the fight of Giornico, won by a handful of Confederates over 12,000 Milanese troops.

In 1400 the town obtained from the Emperor Wenceslaus the Reichsvogtei, which carried with it complete immunity from the empire and the right of criminal jurisdiction. As early as 1393 the chief power had practically fallen into the hands of the Great Council, and in 149S this change was formally recognized.

This transfer of all power to the gilds had been one of the aims of the burgomaster Hans Waldmann (1483-89), who wished to make Zurich a great commercial centre. He also introduced many financial and moral reforms, and subordinated the interests of the country districts to those of the town. He practically ruled the Confederation, and under him Zurich became the real capital of the League. But such great changes excited opposition, and he was overthrown and executed. His main ideas were embodied, however, in the constitution of 1498, by which the patricians became the first of the gilds, and which remained in force till 1798; some special rights were also given to the subjects in country districts. It was the prominent part taken by Zurich in adopting and propagating (against the strenuous opposition of the Constajel) the principles of the Reformation (the Frau Miinster being suppressed in 1524) which finally secured for it the lead in the Confederation (see Switzer- land and Zwingli).

The environs of Zurich are famous m military history on account of the two battles of 1799. In the first battle (4th June) the French under Massena.on the defensive, wore attacked by the Austrians under the Archduke Charles, Massena retiring behind the Limmat before the engagement had reached a decisive stage. The second

and far more important battle took place on the 25th and 26th of September. Massena, having forced the passage of the Limmat, attacked and totally defeated the Russians and their Austrian allies under Korsakov's command. (See French Revolutionary Wars.)

In the 17th and iSth centuries a distinct tendency becomes observable in the town government to limit power to the actual holders. Thus the country districts were consulted for the last time in 1620 and 1640; and a similar breach of the charters of 1489 and 1531 (by which the consent of these districts was required for the conclusion of important alliances, war and

peace, and might be asked for as to other matters) occasioned disturbances in 1777. The council of 200 came to be largely chosen by a small committee of the members of the gilds actually sitting in the council — by the constitution of 1713 it consisted of 50 members of the Little Council (named for a fixed term by the Great Council), 18 members named by the Constajel, and 144 selected by the 12 gilds, these 162 (forming the majority) being co-opted for life by those members of the two councils who belonged to the gild to wh'ch the deceased member himself had belonged. Early in the 18th century a determined effort was made to crush by means of heavy duties the flourishing rival silk trade in Winterthur. It was reckoned that about 1650 the number of privileged burghers was 9000, while their rule ex- tended over 170,000 persons. The first symptoms of active discontent appeared later among the dwellers by the lake, who founded in 1794 a club at Stafa and claimed the restoration of the liberties of 1489 and 1531, a movement which was put down by force of arms in 1795. The old system of government perished in Zurich, as elsewhere in Switzerland, in February j 798, and under the Helvetic constitution the country districts obtained political liberty. The cantonal constitution was rather complicated, and under it the patrician party obtained a small working majority. That constitution was meant to favour the town as against the country districts. But under the cantonal constitution of 1814 matters were worse still, for the town (10,000 inhab.) had 130 representatives in the Great Council, while the country districts (200,000 inhab.) had only 82. A great meeting at Uster on the 22nd of November 1830 demanded that two-thirds of the members in the Great Council should be chosen by the country districts; and in 1831 a new constitution was drawn up on these lines, the town getting 71 representatives as against 141 allotted to the country districts, though it was not till 1837-38 that the town finally lost the last relics of the privileges which it had so long enjoyed as com- pared with the country districts. From 1803 to 1814 Zurich was one of the six u directorial cantons," its chief magistrate becoming for a year the chief magistrate of the Confederation, while in 181 5 it was one of the three cantons, the government of which acted for two years as the Federal government when the diet was not sitting. In 1833 Zurich tried hard to secure a revision of the Federal constitution and a strong central govern- ment. The town was the Federal capital for 1839-40, and consequently the victory of the Conservative party there in 1839 (due to indignation at the nomination by the Radical govern- ment to a theological chair in the university of D. F. Strauss, the author of the famous Life of Jesus) caused a great stir throughout Switzerland. But when in 1845 the Radicals re- gained power at Zurich, which was again the Federal capital for 1845-46, that town took the lead in opposing the Sonderbund cantons. It of course voted in favour of the Federal con- stitutions of 1848 and of 1874, while the cantonal constitution of 1869 was remarkably advanced

for the time. The enormous immigration from the country districts into the town from the " thirties " onwards created an industrial class which, though "settled " in the town, did not possess the privileges of burghcr- ship, and consequently had no share in the municipal govern- ment. First of all in i860 the town schools, hitherto open to " settlers " only on paying high fees, were made accessible to all, next in 1875 ten years' residence ipso facto conferred the right of burghership, while in 1893 the eleven outlying districts (largely peopled by working folk) were incorporated with the

town proper. The town and canton continued to be on the Liberal, or Radical, or even Socialistic side, while from 1848 to 1907 they claimed 7 of the 37 members of the Federal executive or Bundesral, these 7 having filled the presidential chair of the Confederation in twelve years, no canton surpassing this record. From 1833 onwards the walls and fortifications of Zurich were little by little pulled down, thus affording scope for the ex- tension and beautification of the town.

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(W. A. B. C.)

ZURICH, LAKE OF, a Swiss lake, extending S.E. of the town of Zurich. It is formed by the river Linth, which, rising in the glaciers f the Todi range in Glarus, was diverted by the Escher canal (completed in 1811) into the Walensee, whence, by means of the Linth canal (completed in 1S16), its waters are carried to the east end of the lake of Zurich. This river issues from the lake at its north-west end, passing through the town of Zurich, but is then called the Limmat. No streams of im- portance flow into the lake. Its area is about 34 sq. m., its extreme length 25 m., its greatest breadth 2\ m., and its greatest depth 469 ft., while its surface is 1342 ft. above sea-level. It is included, or the greater portion, in the Canton of Zurich, but at its east end 8§- sq. m. towards the southern shore are in that of Schwyz, and 4 sq. m. towards the northern shore in that of St Gall. The great dam of masonry, carrying the railway line and carriage road from Rapperswil to Pfaffikon, which cuts off the extreme eastern part of the lake from the rest, is passed only by small boats; steamers (of which the first was placed on the lake in 1835) do not go beyond the dam, as the eastern portion of the lake is shallow and choked by weeds. West of this dam is the small island of Ufenau, where in 1523 Ulrich von

Hutten took refuge and died. Both shores are well cultivated and fertile. There are many villas, particularly near Zurich, and elsewhere numerous factories in the various flourishing villages. Zurich, at the north end of the lake, is the principal place on it. On the west shore (which gradually becomes the south shore) are Thalwil, Horgen, Wadenswil, Richterswil, Pfaffikon, and Lachen. On the opposite shore are Meilen (near which the first lake dwellings were discovered in 1853-54), Stafa, and the quaint town of Rapperswil, the castle of which shelters a Polish museum, wherein is the heart of Kosciuszko. Schmerikon is close to the east end of the lake, and a little beyond is the more important town of Uznach. (W. A. B. C.)

ZURITA Y CASTRO, JER6NIMO (1512-1580), Spanish his- torian, was born at Saragossa, and studied at Alcala de Henares under the celebrated Hellenist, Hernan Nunez. Through the influence of his father, Miguel de Zurita, physician to Charles V., he entered the public service as magistrate at Barbastro, and in 1537 was appointed assistant-secretary of the Inquisition. In 1548 Zurita was nominated official chronicler of the kingdom of Aragon, and in 1566 Philip II. attached him as secretary to the council of the Inquisition, delegating to him the conduct of all matters sufficiently important to require the king's signature. Zurita resigned these posts on the 21st of January 1571, obtained a sinecure at Saragossa, and dedicated himself wholly to the composition of his Anales de la corona de Aragon, the first part of which had appeared in 1562; he lived to see the last volume printed at Saragossa on the 22nd of April 1580, and died on the 3rd of November following. Zurita's style is somewhat crabbed and dry, but his authority is unquestionable; he displayed a new conception of an historian's duties, and, not content with the ample materials stored in the archives of Aragon, continued his researches in the libraries of Rome, Naples and Sicily; he founded the school of historical scholarship in Spain.

ZUTPHEN, or Zutfen, a town in the province of Gelderland, Holland, on the right bank of the Ysel at the influx of the Berkel, and a junction station 18 m. by rail N.N.E.of Arnhem. Pop. 19,000. It is a picturesque old town with several brick houses of the 16th and 17th centuries. The most important building is the Groote Kerk, of St Walpurgis, which dates from the 12th century and contains monuments of the former counts of Zutphen, a 13th-century candelabrum, an elaborate copper font (1527), and a fine modern monument to the van Heeckeren family. The chapter-house contains a pre-Reformation library which includes some valuable MSS. and incunabula. There are some, remains of the old town walls. The place has an active trade, especially in grain and in the timber floated down from the Black Forest by the Rhine and the Ysel; the industries include tanning, weaving, and oil and paper manufactures. Not far from Zutphen on the west at Monnikhuizen once stood the Carthusian convent founded by Reinald III., duke of Gelder- land, in 1342 and dissolved in 1572. About 3

m. to the north of Zutphen is the agricultural colony of Nederlandsch-Mettray, founded by a private benefactor for the education of poor friendless boys in 1851, and since that date largely extended.

In the middle ages Zutphen was the seat of a line of counts, which became extinct in the 12th century. Having been fortified the town stood several sieges, specially during the wars of freedom waged by the Dutch, the most celebrated fight under its walls being the one in September 1586 when Sir Philip Sidney was mor- tally wounded. Taken by the Spaniards in 1587 Zutphen was recovered by Maurice, prince of Orange, in 1591, and except for two short periods, one in 1672 and the other during the French Revolutionary Wars, it has since then remained a part of the United Netherlands. Its fortifications were dismantled in 1874.

ZWEIBRUCKEN, a town of Germany, in the Palatinate, on the Schwarzbach, and on the railway between Germersheim and Saarbriicken. Pop. (1905) 14,711. The town was the capital of the former duchy of Zweibrticken, and the Alexander-Kirche contains the tombs of the dukes. The ducal castle is now occupied by the chief court of the Palatinate. There is a fine Gothic Catholic church. Weaving and brewing and the manu- facture of machinery, chicory, cigars, malt, boots, furniture and soap are the chief industries.

Zweibriicken (" two bridges ") is the Latin Bipontinuw, it appears in early documents also as Geminus Pons, and was called by the French Deux-Ponts. The independent territory was at first a countship, the counts being descended from Henry I., youngest son of Simon I., count of Saarbriicken (d. 1180). This line became extinct on the death of Count Ebcrhard (1393). who in 1385 had sold half his territory to the count palatine of the Rhine, and held the other half as his feudatory. Louis (d. 1489), son of Stephen, count palatine of Zim mem- Veld enz, founded the line of the dukes of Zweibriicken, which became extinct in 1 73 1, when the duchy passed to the Birkenfeld branch, whence it came under the sway of Bavaria in 1799. At the peace of Luneville Zweibriicken was ceded to France; on its reunion with Germany in 1814 the greater part of the territory was given to Bavaria, the remainder to Oldenburg and Prussia. At the ducal printing office at Zweibriicken the fine edition of the classics known as the Bipontine Editions was published (1799 sqq.)-

See Lehmann, Geschichte des Herzogtums Zweibriicken (Munich,

1867).

ZWICKAU, a town of Germany, in the kingdom of Saxony, situated in a pleasant valley at .the foot of the Erzgebirge, on the left bank of the Zwickauer Mulde, 41 m. S. of Leipzig and 20 m. S.W. of Chemnitz on the main line of railway Dresden- Hof and at the junction of several other lines. Pop. (1834) 6701; (1880) 35,005; (1890) 44,198; (1905) 68,502. Among the nine churches, the fine Gothic church of St Mary (1451-1536 and restored 1885-91), with a spire 285 ft. high and a bell weighing 5ˆ tons, is remarkable. The church contains an altar with wood-carving and eight pictures by Michael Wohlgemuth and a remarkable Pietd in carved and painted wood, probably by Veit Stoss. The late Gothic church of St Catharine (restored 1S93-94) has an altarpiecc ascribed to Lucas Cranach the Elder, and is memorable for the pastorate (1520-22) of Thomas Miinzer. Of the secular buildings the most noteworthy are the town-hall of 1581, with the municipal archives, including documents dating back to the 13th century and an autograph MS. of the works of Hans Sachs, and the late Gothic Gewandhaus (cloth merchants' hall), built 1522-24 and now in part converted into a theatre. The manufactures of Zwickau include spinning and weaving, machinery, motor-cars, chemicals, porcelain, paper, glass, dyestuffs, wire goods, tinware, stockings, and curtains. There are also steam saw-mills, diamond and glass polishing works, iron-foundries, and breweries. Though no longer relatively so important as when it lay on the chief trade route from Saxony to Bohemia and the Danube, Zwickau carries on considerable commerce in grain, linen, and coal. The mainstay of the industrial prosperity of the town is the adjacent coalfield, which in 1908 employed 13,000 hands, and yields %\ million Ions of coal annually. The mines are mentioned as early as 1348; but they have only been actively worked since 1823, during which time the population has increased more than tenfold.

Zwickau is of Slavonic origin, and is mentioned in n 18 as a trading place. The name is fancifully derived from the Latin cygnea, from a tradition that placed a " swan lake " here which had the property of renewing the youth of those who bathed in it. Zwickau was an imperial possession, but was pledged to Henry the Illustrious, margrave of Meissen (d. 1288). The German king Charles VI. conferred it as a fief in 1348 on the margraves of Meissen, and it thus passed to their successors the electors of Saxony. The discovery of silver in the Schnee- berg in 1470 brought it much wealth. The Anabaptist move- ment of 1525 began at Zwickau under the inspiration of the " Zwickau prophets." Robert Schumann (181 0-1856), the musical composer, was born here in a house which still stands in the market-place.

See Herzog, Chronik der Kreisstadt Zwickau (2 vols., Zwickau, 1839-45), Geschichte des Zwtckauer Steinkohlenbaues (Dresden, 1852) ; Ilansch, Das

Zwickau- Chemnitzer Kohlengebiet (Meissen,

1908).

ZW1EDINECK VON SUDENHORST, HANS (1845-1906), German historian, was born at Frankfort-on-the-Main on the

14th of April 1845. He studied at the university of Gratz, where he became a professor in 1885, and died at Gratz on the 22nd of November 1906.

Sudenhorst's principal writings arc Dorfleben im 18 Jakrkundert (Vienna, 1877); Hans Ulrich, Filrst von Eggenberg (Vienna, 1880); Die Politik der Republic Venedig wdhrend des dreissigjdhrigen Krieges (Stuttgart, 1882-85); Venedig ah Wdtmachl und Welisladt (Biele- feld, 1899 and 1906); Kriegsbilder aus der Zeit der Landsknechte (Stuttgart, 1883) ; Die offentliche Meinung in Deuischland im Zeitaiter Ludwigs XIV. 1650-1700 (Stuttgart, 1888); Erzhersog Jokann im Feldzuge von iSog (Gratz, 1892) ; and Maria Tkeresia (Bielefeld, 1905). He edited the Bibliotheh deutscher Geschichte, writing for this series, Deutsche Geschichte im Zeitaiter der Gritndung des preussischen Konigtums (Stuttgart, 1887-94) ; and Deutsche Geschichte von der Aufiosung des alien bis zur Griindung des neuen Retches (Stuttgart, 1897-1905). He completed A. Wolf's Oester- reich unter Maria Theresia, Josef II. und Leopold II. (Berlin, 1882-84), and edited the Zeitschrift fur allgemeine Geschichte (Stutt- gart, 1884-88).

ZWINGLI, HULDREICH (1484-1531), Swiss reformer, was born on the ist of January 1484, at Wildhaus in the Toggenburg valley, in the canton of St Gall, Switzerland. He came of a free peasant stock, his father being amimann of the village; bis mother, Margaret Meili, was the sister of the abbot of Fischingen in Thurgau. His uncle, Bartholomew Zwingli, afterwards dekau or superintendent of Wesen, had been elected parish priest of Wildhaus. As he was keen at his books and fond of music he was destined for the Church, and when eight years old was sent to school at Wesen, where he lived with his uncle, the dean. Two years later he was sent to a school in Basel, where he remained three years, passing thence to the high school at Bern, where his master, Heinrich Wolflin, inspired him with an enthusi- asm for the classics. After some two years there the boy took up his abode in the Dominican monastery. But his father had no thoughts of letting him become a monk, and in 1 500 he was sent to the university of Vienna, where he remained for another two years and " included in his studies all that philosophy embraces. " He then returned to Basel, where he graduated in the university and became a teacher of the classics in the school of St Martin's church.

The circumstances and surroundings of Zwingli's early life were thus

dissimilar from those of his contemporary, Martin Luther. Zwingli, moreover, never knew any tiling of those spiritual experiences which drove Luther into a cloister and goaded him to a feverish " searching of the Scriptures " in the hope of finding spiritual peace. Zwingli was a humanist, a type abhorred of Luther; and he was far more ready for the polite Erasmian society of Basel than for a monastery. Luther never quite shook off scholasticism, whereas Zwingli had early learnt from Dr Thomas Wyttenbach that the time was at hand wnen scholastic theology must give place to the purer and more rational theology of the early Fathers and to a fearless study of the New Testament. He heard from this same teacher bold criticisms of Romish teaching concerning the sacraments, monastic vows and papal indulgences, and unconsciously he was thus trained for the great remonstrance of his maturer life.

At the age of twenty-two Zwingli was ordained by the bishop of Constance (1506), preached his first sermon at Rapperswyl, and said his first mass among his own people at Wildhaus In the same year he was elected parish priest of Glarus, in spite of the pope's nomination of Heinrich Goldli, an influential pluralist of Zurich, whom Zwingli found it necessary to buy off at an expense of more than a hundred gulden. The Holy See, much dependent at that time on its Swiss mercenaries in the pursuit of its secular ends, expressed no resentment on this occasion. Zwingli indeed seemed still to be devoted to the pope, whom he styled " beatissimus Christi viearius/' and he publicly pro- claimed the mercenary aid given by the Swiss to the papal cause to be its dutiful support of the Holy See. The Curia, following its accustomed policy, rewarded his zeal with a pension of 50 gulden.

The ten years which Zwingli spent at Glarus laid the founda- tions of his work as a reformer. He there began the study of

Greek that he might " learn the teaching of Christ from the original sources," and gave some attention to Hebrew. He read also the older Church Fathers and soon won for himself fame as a student, whilst his skill in the classics led his friends to hail him as '' the undoubted Cicero of our age." He had an unbounded admiration for Erasmus, with whom he entered into corre- spondence, and from whom he received a somewhat chilling patronage; whilst the brilliant humanist, Pico della Mirandola (1463-1494), taught him to criticize, in a rationalizing way, the medieval doctrines of Rome. His first publications, which ap- peared as rhymed allegories, were political rather than religious, being aimed at what he deemed the degrading Swiss practice of hiring out mercenaries in the*

European wars. His con- victions on this matter were so much intensified by his later experiences as army chaplain that in 1521 he prevailed upon the authorities of the canton of Zurich to renounce the practice altogether. Especially did he oppose alliances with France; but the French party in Glarus was strong, and it retaliated so fiercely that in 1516 Zwingli was glad to accept the post of people's priest at Einsiedeln. He always in later days dated his arrival at evangelical truth from the three years (1516-19) which he spent in this place. There he studied the New Testa- ment in the editions of Erasmus and began to found his preaching on " the Gospel," which he declared to be simple and easy to understand. He held that the Bible was the sufficient revela- tion of the will of God, and he threw away the philosophy and theology of the later Roman Church, whereas he declared that the early Church Fathers were helpful, though still fallible, interpreters of the Word. In his definite recognition of the theological place of Scripture he showed, says E>r T. M. Lindsay (History of the Reformation) , clearer insight than the Lutherans, and Zwingli rather than Luther was in this matter Calvin's guide, and the guide of the reformed churches of Switzerland, France, England and the Netherlands. All these set forth in their symbolical books the supreme place of Scripture, accepting the position which Zwingli laid down in 1536 in The First Helvetic Confession, namely, that " Canonic Scripture, the Word of God, given by the Holy Spirit and set forth to the world by the Prophets and Apostles, the most perfect and ancient of all philosophies', alone contains perfectly all piety 'and the whole rule of life."

Zwingli began to preach "the Gospel" in 1516, but a con- temporary says that he did it so cunningly (listiglich) that none could suspect his drift. He still, to use his own words, hung his new exposition on to " the old doctrines, however much they at times pained me, rather than on to the purer and clearer"; for he hoped that the reformation of the Church would proceed quietly and from within. The papal curia had no wish to bring things to a quarrel with him. The Swiss, who furnished them with troops, were to be treated with consideration; and the pope sought to silence the reformer by offers of promotion, which he refused. He held himself, as did the Swiss in general, very free of papal control. They had long been used, in their orderly democratic life, to manage their own ecclesiastical affairs. Church property paid its share of the communal taxes, and religious houses were subject to civil inspection. Zwingli looked rather to the City Fathers than to the pope, and as long as he had them with him he moved confidently and laboured for reforms which were as much political and moral in character as religious. He had none of Luther's distrust of " the common man " and fear of popular government, and this fact won for his teaching the favour of the towns of South Germany not less than of Switzerland.

As yet he had preached his Gospel without saying much about corruptions in the Roman Church, and it was his political denunciation of the fratricidal wars into which the pope, not less than others, was drawing his fellow-countrymen, that first led to rupture with the papal see. Three visits which he had paid to Italy in his capacity of army chaplain had done much to open his eyes to the worldly character of the papal rule, and it was not long before he began to attack at Einsiedeln the superstitions which attended the great pilgrimages made to

that place. Zwingli denounced the publication of plenary indulgence to all visitors to the shrine, and his sermons in the Swiss vernacular drew great crowds and attracted the attention of Rome. His quarrel was turned more immediately against the pope himself when in August 1518 the Franciscan monk Becnardin Samson, a pardon-seller like Johann Tetzel, made his appearance in Switzerland as the papally commissioned seller of indulgences. Zwingli prevailed on the council to forbid his entrance into Zurich; and even then the pope argued that, so long as the preacher was still receiving a papal pension, he could not be a formidable adversary, and he gave him a further sop in the form of an acolyte chaplaincy.

Zwingli had never meant to> remain at Einsiedeln long, and he now threw himself into a competition for the place of people's priest at the Great Minster of Zurich, and obtained it (1518) after some opposition. He stipulated that his liberty to preach the truth should be respected. In the beginning of 1519 he began a series of discourses on St Matthew's Gospel, the Acts of the Apostles, and the Pauline epistles; and with these it may be said that the Reformation was fairly begun in Zurich. He had made a copy of St Paul's epistles and committed them to memory, and from this arsenal of Scripture he attacked the unrighteousness of the state no less than the superstition of the Church. His correspondence of this year shows him jealous of the growing influence of Luther. It was his claim that he had discovered the Gospel before ever Luther was heard of in Switzerland, and he was as anxious as Erasmus to make it clear that he was not Luther's disciple. Towards the end of September he fell a victim to the plague which was ravaging the land, and his illness sobered his spirit and brought into his message a deeper note than that merely moral and common-sense one with which, as a polite humanist, he had hitherto been content. He began to preach against fasting, saint worship and the celibacy of priests; and some of his hearers began to put his teachings into practice. The monasteries raised an outcry when people were found eating flesh in Lent, and the bishop of Constance accused them before the council of Zurich. Zwingli was heard in their defence and the accusation was abandoned. His first Reformation tract, April 1522, dealt with this subject: " Von Erkiesen und Fryheit der Spysen." The matter of the celibacy. ■ of the clergy was more serious. Zwingli had joined in an address to the bishop of Constance calling

on him no longer to endure the scandal of harlotry, but to allow the priests to marry wives, or, at least, to wink at their marriages. He and hia co-signatories confessed that they had lived unchastely, but argued that priests could not be expected to do otherwise, seeing that God had not seen fit to give the gift of continence. Pope Adrian VI. interfered and asked the Ziirichers to abandon Zwingli, but the reformer persuaded the council to allow a public disputation (1523), when he produced sixty seven theses l and vindicated his position so strongly that the council de cided to uphold their preacher and to separate the canton from the bishopric of Constance. Thus legal sanction was given in Zurich to the Reformation. In 1522 Zwingli produced his first considerable writing, the Architeles, " the beginning and the end." in which he sought by a single blow to win his spiritual freedom from the control of the bishops, and in a sermon of that year he contended that only the Holy Spirit is requisite to make the Word intelligible, and that there is no need of Church, council, or pope in the matter.

The progress of the Reformation attracted the attention of all Switzerland, but there was a strong opposition to it, especially in the five Forest Cantons: Lucerne, Zug, Schwyz, Uri and Unter- walden; and the Ziirichers felt it necessary to form a league in its defence. They were especially anxious to gain Bern, and Zwingli challenged the Romanists to a public disputation in that city. No less than 350 ecclesiastics came to Bern from the various cantons to hear the pleadings, which began on the 2nd of January 1523 and lasted nineteen days. Zwingli

1 Cf. P. Schaff, Creeds of the Evangelical Protestant Churches, p. 197-

and his companions undertook to defend the following pro- positions : — ■

(1) That the Holy Christian Church, of which Christ is the only Head, is born of the Word of God, abides therein, and does not listen to the voice of a stranger; (2) that this Church imposes no laws on the conscience of people without the sanction of the Word of God, and that the laws of the Church are binding only in so far as they agree with the Word; (3) that Christ alone is our righteousness' and our salvation, and that to trust to any other merit or satisfaction is to deny Him; (4) that it cannot be proved from the Holy Scripture that the body and blood of Christ are corporeally present in the bread and in the wine of the Lord's Supper; (5) that the mass, in which Christ is offered to God the Father for the sins of the living and of the dead, is contrary to Scripture and a gross affront to the sacrifice

and death of the Saviour; (6) that we should not pray to dead mediators and inter- cessors, but to Jesus Christ alone; (7) that there is no trace of purgatory in Scripture; (8) that to set up pictures and to adore them is 'also contrary to Scripture, and that images and pictures ought to be destroyed where there is danger of giving them adora- tion ; (9) that marriage is lawful to all, to the clergy as well as to the laity; (10) that shameful living is more disgraceful among the clergy than among the laity.

The result of the discussion was that Bern was won over to the side of the reformer, who apprehended the whole struggle of Protestantism as turning directly on the political decisions of the various units of the Confederation. He bad enunciated in his theses the far-reaching new principle that the congregation, and not the hierarchy, was the representative of the Church; and he sought henceforward to ieorganize the Swiss constitution on the principles of representative democracy so as to reduce the wholly disproportionate voting power which, till then, the Forest Cantons had exercised. He argued that the administra- tion of the Church belongs, like all administration, to the state authorities, and that if these go wrong it then lies with Christian people to depose them.

On the 2nd of April 1524 the marriage cf Zwingli with Anna Reinhard was publicly celebrated in the cathedral, though for some two years already he had had her to wife. Many of his colleagues followed his example and openly made profession of marriage. In the August, of that year Zwingli printed a pamphlet in which he set forth his views of the Lord's Supper. They proved the occasion of a conflict with Luther which was never settled, but in the meantime more attention was attracted by Zwingli's denunciation of the worship of images and of the Roman doctrine of the mass. These points were discussed at a fresh congress where about goo persons were present, and where Vadian (Joachim von Watt, the reformer of St Gall) presided. It was decided that images are forbidden by Scripture and that the mass is not a sacrifice. Shortly afterwards the images were removed from the churches, and many ceremonies and festivals were abolished. When a solemn embassy of rebuke was sent to Zurich from a diet held at Lucerne, on the 26th of January 1524, the city replied that in matters relating to the Word of God and the salvation of souls she would brook no interference. When a new embassy threatened Zurich with exclusion from the union she began to make preparations for war.

It was at this moment that the controversy between Luther and Zwingli took on a deeper significance. In March 1525 the latter brought out his long Commentary on the True and False Religion, in which he goes over all the topics of practical theology. Like others of the Reformers he had been led inde- pendently to preach justification by faith and to declare that Jesus Christ was the one and only Mediator between sinful man and God; but his

construction rested upon what he regarded as biblical conceptions of the nature of God and man rather than upon such private personal experiences as those which Luther had made basal. In this Commentary there appear the mature views of Zwingli on the subject of the Elements of the Lord's Supper, He was quite as clear as Luther in repudiating the medieval doctrine of transubstantiation, but he declined to accept Luther's teaching that Christ's words of institution re- quired the belief that the real flesh and blood of Christ co-exist in and with the natural elements. He declared that Luther was in a fog, and that Christ had warned His disciples against

all such notions, and had proclaimed that by faith alone could His presence be received in a feast which He designed to be commemorative and symbolical. Efforts to reach agreement failed. The landgrave of Hesse brought the two Reformers together in vain at Marburg in October 1529, and the whole Protestant movement broke into two camps, with the result that the attempt made at Schmalkaldcn in 1530 to form a compre- hensive league of defence against all foes of the Reformation was frustrated.

But the close of Zwingli's life was brought about by trouble nearer home. The long-felt strain between opposing cantons led at last to civil war. In February 1531 Zwingli himself urged the Evangelical Swiss to attack the Five Cantons, and on the 10th of October there was fought at Kappel a battle, disastrous to the Protestant cause and fatal to its leader. Zwingli, who as chaplain was carrying the banner, was struck to the ground, and was later despatched in cold blood. His corpse, after suffering every indignity, was quartered by the public hangman, and burnt with dung by the Romanist soldiers. A great boulder, roughly squared, standing a little way off the road, marks the place where Zwingli fell. It is inscribed, " ' They may kill the body but not the soul ': so spoke on this spot Ulrich Zwingli, who for truth and the freedom of the Christian Church died a hero's death, Oct. 11, 1531."

Zwingli's theological views are expressed succinctly in the sixty- seven theses published at Zilrich in 1523, and at greater length in the First Helvetic Confession, compiled in 1536 by a number of his disciples. 1 They contain the elements of Reformed as distinguished from Lutheran doctrine. As opposed to Luther,. Zwingli insisted more firmly on the supreme authority of Scripture, and broke more thoroughly and radically with the medieval Church. Luther was content w r ith changes in one or two fundamental doctrines; Zwingli aimed at a reformation of government and discipline as well as of theology. Zwingli never faltered in his trust in the people, and was earnest to show that no class of men ought to be called spiritual simply because they were selected to perform certain functions. He thoroughly believed also that it was the duty ol ail in authority to rule in Christ's name and to obey His laws. He was led from these ideas to think

that there should be no government in the Church separate from the civil government which ruled the commonwealth. All rules and regulations about the public worship, doctrines and discipline of the Church were made in Zwingli's time, and with his consent, by the council of Zurich, which was the supreme civil authority in the state. This was the ground of his quarrel with the Swiss Anabaptists, for the main idea in the minds of these greatly .maligned men was the modern thought of a free Church in a free state. Like all the Reformers, he was strictly Augustinian in theology, but he dwelt chiefly on the positive side of predestination — the election to salva- tion — and he insisted upon the salvation of infants and of the pious heathen. His most distinctive doctrine is perhaps his theory of the sacrament, which involved him and his followers in a long and, on Luther's part, an acrimonious dispute with the German Protestants. His main idea was that the sacrament of the Lord's Supper was not the repetition of the sacrifice of Christ, but the faithful remembrance that that sacrifice had been made once for all ; and his deeper idea of faith, which included in the act of faith a real union and communion of the faithful soul with Christ, really preserved what was also most valuable in the distinctively Lutheran doctrine. His peculiar theological opinions were set aside in Switzerland for the somewhat profounder views of Calvin. The publication of the Zurich Consensus (Consensus Tigurinus) in 1549 marks the adherence of the Swiss to Calvinist theology.

Zwingli's most im pert ant writings are — Von Erkiesen and Fryheit der Spy sen (April 1522); De Canone Missae Epichiresis (September I 523); Commentarius de Vera et Falsa Religione (1525); Vom Touf, vom Wiedertouf, una vom Kindertouf (1525); Ein klare Unterrichtung vom Nacktmal Christi (1526); De Frovidentia Dei (r 53°); and Christianas Fidei Expositio (1 = 31). For a full bihlio- graphy see G. Finsler, Zwingli-Bibliographic (Zurich, 1897).

Works. — Collected editions, 4 vols. (Zurich, 1545, 1581); by M. Schuler and Joh. Schulthess, 8 vols. (Zurich, 1828-42, with " supplement orum fasciculus," 1861); by E. Egli and G. Finsler in " Corpus Reformatorum " (Berlin, 1905 sqq.).

Lives. — O. Myconius (1532); H. Bullinger's Reform ations- geschichie (erl. Hottingerand Voegli, 1838); J. M. Schuler (1818); R. Christoffel (1857, Eng. tr, by j. Cochran, Edinburgh, 1858); J. C. Morikofer, 2 vols. (Leipzig, 1867-69); R. Stahelih, 2 vols. (Basel, 1895-97): S. M. Jackson in Heroes of the Reformation (New York and London, 1901); Prof. Egli's articles in Hauck-Herzog's Realencyklopddie fur prot. Theologie u. Kirche, and Zwingliana,

l 1 P. Schaff, Creeds of the Evangelical Protestant Churches, p. 3ii.

published twice a year since 1897 at Zurich. S. M. Jackson's book gives a chapter on Zwingli's Theology by Prof. F. H. Foster, and lull details of further information on the subject, together with a list of modern English translations of Zwingli's works.

(E. Ar.*)

ZWOLLE, the capital of the piovince of Overysel, Holland, on the Zwarte Water, and a junction station 24! m. N.E. of Hardcnvyk. Pop. (1905) 23,773. It * s the centre of the whole northern and eastern canal systems, and by means of the short canal, the Willemsvaart, which joins the Zwarte Water and the Vsel, has regular steamboat communication with Kampen and Amsterdam, The Groote Kerk, of St Michael (first half of the 15th century) occupies the site of an earlier church of which, an interesting 11th-century bas-relief remains. The church con- tains a richly carved pulpit, the work of Adam Stracs van Wcilborch about 1620, and there is besides some good carving and a fine organ (1721). The Roman Catholic church, also dedicated to St Michael, dates from the end of the 14th century. The modernized town hall was originally built in 1448, Mention should also be made of the Sassen Poort, one of the old city gates; a gild-house (1571); the provincial government offices, containing the archives; and a museum of antiquities and natural history. Three miles from Zwolle, on a slight eminence

.called the Agnietenberg, or hill of St Agnes, once stood the Augustinian convent in which Thomas a Kempis spent the greatest part of his life and died in 1471, Zwolle has a consider- able trade by river, a large fish market, and the most impor- tant cattle market in Holland after Rotterdam. The more important industries comprise cotton manufactures, iron works, boat-building, dyeing and bleaching, tanning, rope-making and salt-making.

ZYMOTIC DISEASES (Gr. fO/wj, ferment), a term in medicine, formerly applied to the class of acute infectious maladies. As originally employed by Dr W. Farr, of the British Registrar- General's department, the term included the diseases which were " epidemic, endemic and contagious," and were regarded as owing their origin to the presence of a morbific principle in the system, acting in a manner analogous to, although not identical with, the process of fermentation. A large number of diseases were accordingly included under this designation. The term, however, came to be restricted in medical nomenclature to the chief fevers and contagious diseases {e.g.

typhus and typhoid fevers, smallpox, scarlet fever, measles, erysinelas, cholera, whooping-cough, diphtheria, &c.)- The science of bacteriology has displaced the old fermentation theory, and the term has practically dropped out of use.

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